

LIEBHERR

Crawler crane with lattice mast

LR11350

LR 11350-007

Operating instructions

BAL No.: 19005-01-33

| | |
|------------|--|
| Serial No. | |
| Date | |

ORIGINAL OPERATING INSTRUCTIONS

The operating instructions are part of the crane and must be followed!

The operating instructions must always be available within reach!

All local regulations for crane operation must be observed!

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Preface

Manufacturer

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California Proposition 65

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

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

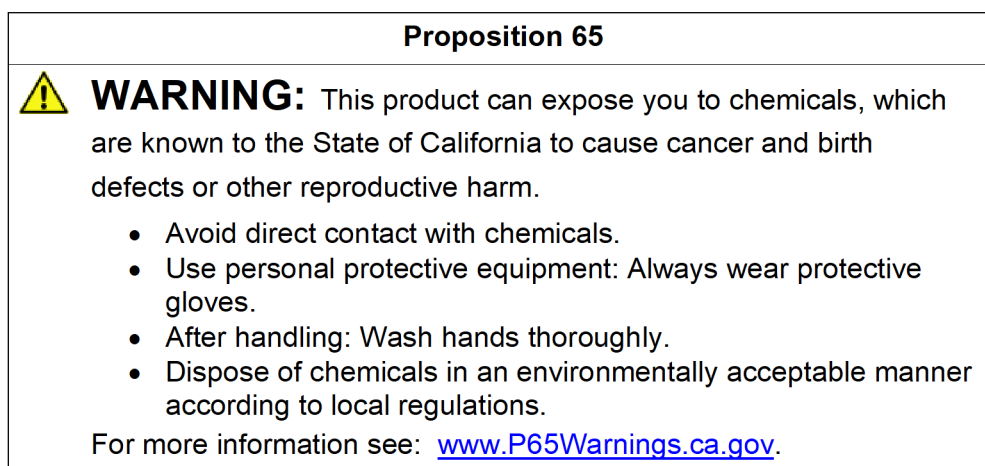


Fig.154660: Example of a Proposition 65 sign for USA: Chemicals

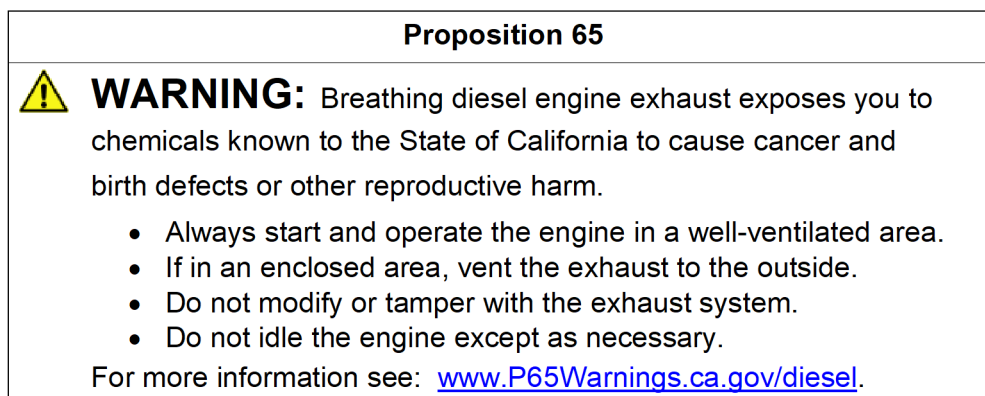


Fig.154661: Example of a Proposition 65 sign for USA: Diesel engine exhaust

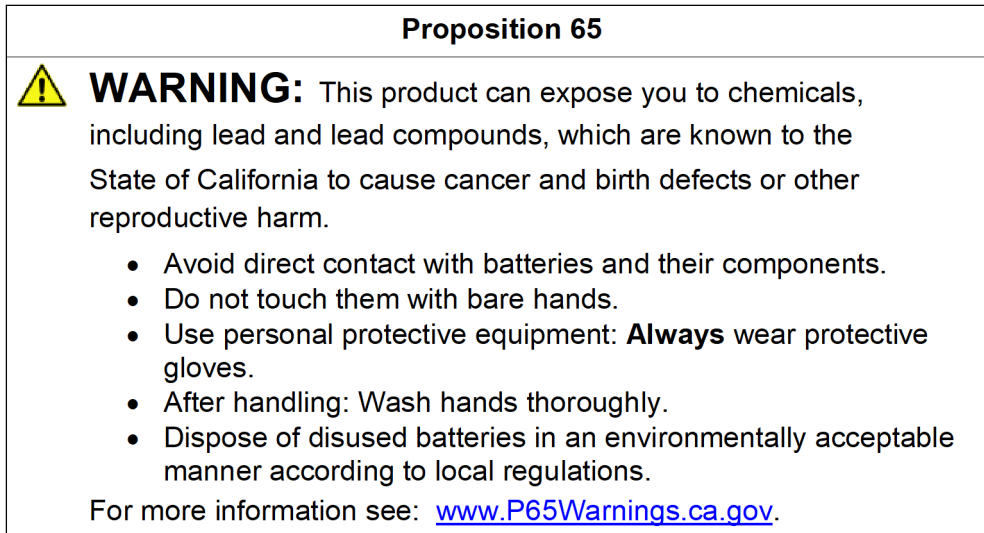


Fig.154662: Example of a Proposition 65 sign for USA: Lead and lead compounds

General

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

This crane may only be used:

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

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

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

Data logger

This crane is equipped with a data recording device. Among others, the following data is recorded:




- Date and time of day
- Entered set up configuration of the crane
- Actual load
- Percentage of crane utilization
- Boom radius (working radius)
- Main boom angle, luffing jib angle
- Total telescopic boom length, length of each telescopic section
- Every actuation of bypass devices

The recorded data can be read with an appropriate software.

Safety and warning display

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


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 or are located nearby.

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

¹⁾ This could also result in property damage.

Additional notes

The term **Note** is used in the crane documentation to make all persons working with the crane or who are located nearby 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:

- indicates how to use the crane safely
- supports the operators in using the permissible application possibilities of the crane
- provides 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.

If you find any errors or if any misunderstandings arise when reading the crane documentation, please contact Liebherr-Werk Ehingen GmbH immediately.



WARNING

Danger of accident due to incorrect operation of the crane!

Incorrect operation of the crane can lead to accidents.

Death, severe bodily injuries, property damage.

- ▶ Only authorized and trained expert personnel are permitted to work on the crane or have access to it.
- ▶ 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.

The crane documentation must be accessible in the driver's cab or in the crane cab.



WARNING

Outdated version of crane documentation!

If subsequently supplied information, updates and addenda to the crane documentation are not observed and added, there is a danger of accident.

Death, severe bodily injuries, property damage.

- ▶ Add and observe all subsequently supplied information, updates and supplements for the crane documentation.
- ▶ Make sure that all involved persons always know of and understand the latest version of the crane documentation.

If there is any doubt regarding if the crane documentation is **not** up to date:

- ▶ Do **not** operate the crane. Contact Liebherr-Werk Ehingen GmbH.



WARNING

Crane documentation is not understood!

If parts of the crane documentation are not understood and the tasks are carried out on or with the crane, then there is a danger of accident.

Death, severe bodily injuries, property damage.

- ▶ Clarify any open questions with Customer Service at Liebherr-Werk Ehingen GmbH before carrying out the respective task.

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

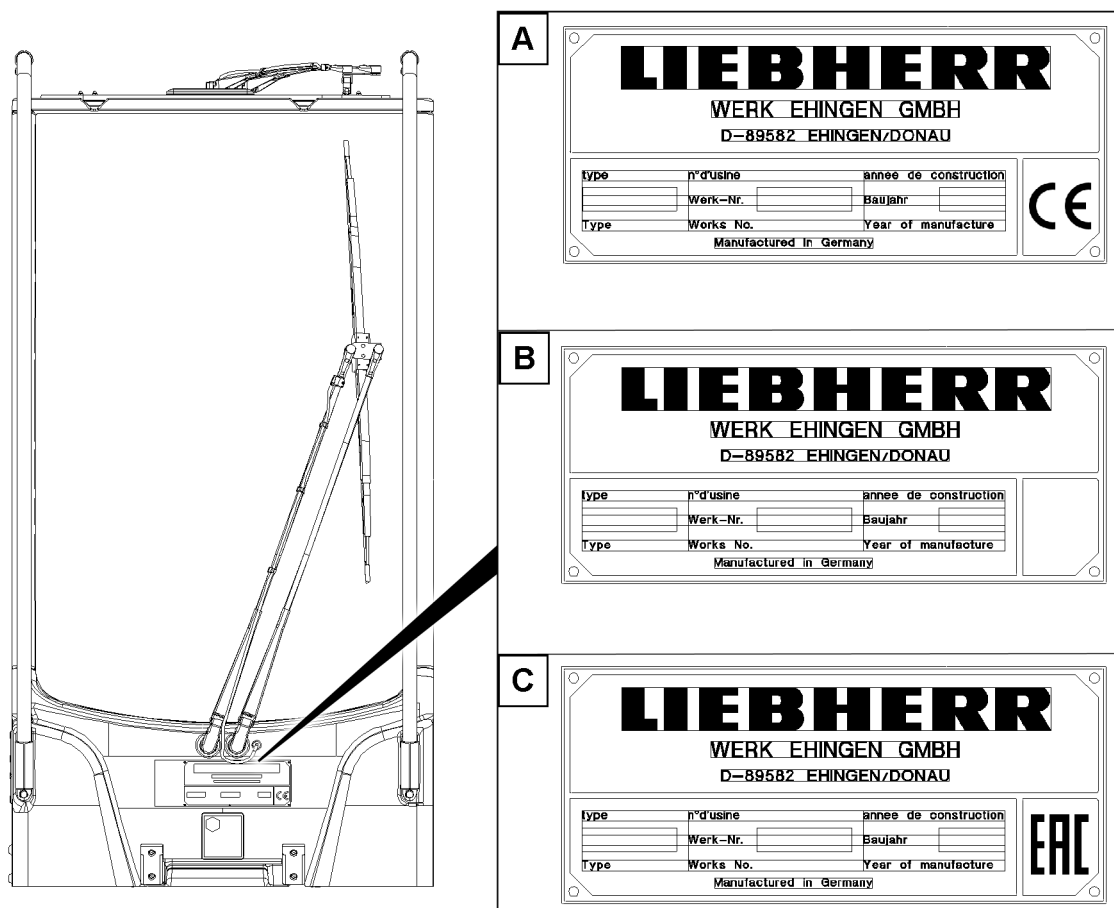


Fig.154689: Data tag shown as an example

- A** Data tag with CE mark
B Data tag without CE mark
C Data tag with EAC mark

CE marking

The CE marking is a mark according to EU laws:

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

EU Declaration of Conformity

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



Note

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

Intended use

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

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

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 considered **non-intended use**.

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

The manufacturer is **not** liable for damage caused by non-intended 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-intended use

Non-intended use is:

- Working outside the permissible set up configurations according to the load chart.
- Working outside the permissible boom radii and slewing ranges according to the load chart.
- Selecting load charts, which do not correspond to the actual set up configuration.
- Selection of a set up configuration via code or via manual entry, which does not correspond to the actual set up configuration.
- Working with bypassed / deactivated safety equipment, for example bypassed load torque limiter or with bypassed hoist limit switch.
- Increasing the boom radius of the lifted load after a LMB shut-off, for example by diagonally pulling the load.
- Using the support pressure display as information in order to utilize the crane up to the tipping limit.
- Use of equipment parts that are not approved for the crane.
- Operation of the crane in an area exposed to explosion hazards.
- Using the crane at sports and recreational events, especially for "Bungee" jumps and / or "Dinner in the sky".
- On-road driving in an impermissible travel condition (axle load, dimension).
- Driving with the equipment in place in an impermissible travel condition.
- Pushing, pulling or lifting loads with the level control, the sliding beams or the support cylinders.

- Pushing, pulling or lifting loads by actuating the slewing gear, the luffing gear or the telescoping gear.
- Ripping stuck objects loose with the crane.
- Utilizing the crane for a longer period of time for material handling tasks.
- Releasing the crane suddenly (grab or dumping operation).
- Utilizing the crane when the weight of the load is suspended on the crane is changed, for example by filling a container suspended on the load hook, except:
 - The load torque limiter was checked before for function with a known load.
 - The crane cab is occupied.
 - The crane is operational.
 - The container size is selected in such a way that an overload of the crane with full load is eliminated within the valid utilized load chart.

The crane may **not** be used for:

- Fastening a stuck load for which the weight and center of gravity are not known and which is released only by flame cutting, for example.
- Letting persons ride along outside the driver's cab.
- Letting persons ride along outside the crane cab.
- Transporting personnel in the crane cab while driving.
- Transporting personnel with the load handling equipment and on the load.
- Transporting of persons with work baskets (cherry pickers), if the national regulations of the responsible work safety organization are not observed.
- Transporting loads and objects on the crane chassis.
- Transporting loads and objects on the crane superstructure.
- Transporting loads and objects on the ballast trailer.
- Transporting loads and objects on the suspended ballast.
- Transporting loads and objects on the boom lattice sections and / or the crane boom.
- Two hook operation without auxiliary equipment.
- Longer periods of material handling operation.
- Crane operation on a floating device if the conditions in chapter „Crane on a floating device“ are not fulfilled and the written release by **Liebherr Werk Ehingen GmbH** is not present.

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

Ambient temperature

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

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



WARNING

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

If the crane is operated at an ambient temperature lower than -20 °C:

- ▶ Make sure that the crane is equipped with the corresponding „auxiliary equipment for working at low temperatures“. Observe and comply with chapter 2.08.
- ▶ Use the operating fluids for the corresponding ambient temperature in time. Observe and comply with chapter 7.07.

Safety equipment

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

**Note**

Your motto must always be:

► **Safety first!**

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

Equipment and spare parts

**WARNING**

Danger of fatal injury if original equipment parts are **not** used!
If the crane is operated with **not** original equipment parts, the crane can fail.
Death, severe bodily injuries, property damage.

- Operate the crane only with original equipment parts!
- Crane operation with equipment parts, which do **not** belong to the crane is prohibited!
- If there is any doubt about the origin of equipment parts, contact Customer Service at Liebherr-Werk Ehingen GmbH.

**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 Customer Service at Liebherr-Werk Ehingen GmbH.

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

Definition of directional data for mobile cranes

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

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

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

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

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

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

Definition of directional data for crawler cranes

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

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

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

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

Optional equipment and functions

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

Conversion chart

| | Initial unit | Multiplication factor | Target unit |
|---------------|-----------------------|-----------------------|-----------------------|
| Length | mm | 0.03937 | in |
| | in | 25.4000 | mm |
| | mm | 0.00328 | ft |
| | ft | 304.8 | mm |
| | cm | 0.39370 | in |
| | in | 2.5400 | cm |
| | cm | 0.0328 | ft |
| | ft | 30.48 | cm |
| | m | 39.37 | in |
| | in | 0.0254 | m |
| | m | 3.281 | ft |
| | ft | 0.3048 | m |
| | km | 0.62137 | mile |
| | mile | 1.6093 | km |
| Area | cm ² | 0.155 | in ² |
| | in ² | 6.4516 | cm ² |
| | m² | 10.764 | ft² |
| | ft² | 0.0929 | m² |
| Volume | cm ³ | 0.06102 | in ³ |
| | in ³ | 16.387 | cm ³ |
| | m ³ | 35.3147 | ft ³ |
| | ft ³ | 0.0283 | m ³ |
| | l | 0.001 | m ³ |
| | m ³ | 1000 | l |
| | l | 61.024 | in ³ |
| | in ³ | 0.016387 | l |
| | l | 0.0353 | ft ³ |
| | ft ³ | 28.32 | l |
| | l | 0.264178 | US. liq. gal |
| | US. liq. gal | 3.7853265 | l |

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| | Initial unit | Multiplication factor | Target unit |
|-----------------------|------------------------|-----------------------|------------------------|
| Mass (weight) | kg | 2.20462 | lb |
| | lb | 0.45359 | kg |
| | t | 2204.62 | lb |
| | lb | 0.0004536 | t |
| | t | 1.1023 | short ton US (tn. sh.) |
| | short ton US (tn. sh.) | 0.90718 | t |
| | t | 0.45359 | kip |
| | kip | 2.20462 | t |
| Mass / length | kg/m | 0.055998 | lb/in |
| | lb/in | 17.857781 | kg/m |
| | kg/m | 0.67197 | lb/ft |
| | lb/ft | 1.48816 | kg/m |
| Force | N | 0.2248 | lbf |
| | lbf | 4.4483986 | N |
| | kN | 224.809 | lbf |
| | lbf | 0.0044483986 | kN |
| Turning moment | Nm | 8.85075 | lbf·in |
| | lbf·in | 0.112984 | Nm |
| | Nm | 0.73756 | lbf·ft |
| | lbf·ft | 1.3559 | Nm |
| Performance | HP (DIN HP) | 0.7355 | kW |
| | kW | 1.3596 | HP (DIN HP) |
| Speed | m/s | 39.37 | in/s |
| | in/s | 0.0254 | m/s |
| | m/s | 3.28084 | ft/s |
| | ft/s | 0.3048 | m/s |
| | km/h | 0.62137 | mph (mi/h) |
| | mph (mi/h) | 1.60935 | km/h |
| | m/s | 2.2369 | mph (mi/h) |
| | mph (mi/h) | 0.44704 | m/s |

| | Initial unit | Multiplication factor | Target unit |
|--------------------------|-------------------------------|------------------------------|-------------------------------|
| Pressure | kPa (kN/m ²) | 0.01 | bar |
| | bar | 100 | kPa (kN/m ²) |
| | bar | 14.5038 | psi |
| | psi | 0.06895 | bar |
| | kPa (kN/m²) | 0.145038 | psi |
| | psi | 6.894759 | kPa (kN/m²) |
| | N/cm ² | 1.450377 | psi |
| | psi | 0.6894759 | N/cm ² |
| | N/m ² | 0.000145038 | psi |
| | psi | 6894.759 | N/m ² |
| | t/m ² | 204.81 | lbs/ft ² |
| | lbs/ft ² | 0.0048828 | t/m ² |
| Load-related area | m ² /t | 0.004882 | ft ² /lbs |
| | ft ² /lb | 204.81 | m ² /t |
| Temperature | °C | ([°C] · 1.8) + 32 | °F |
| | °F | ([°F] - 32) / 1.8 | °C |

Conversion chart



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1 Description of crane

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1.01 Terminology

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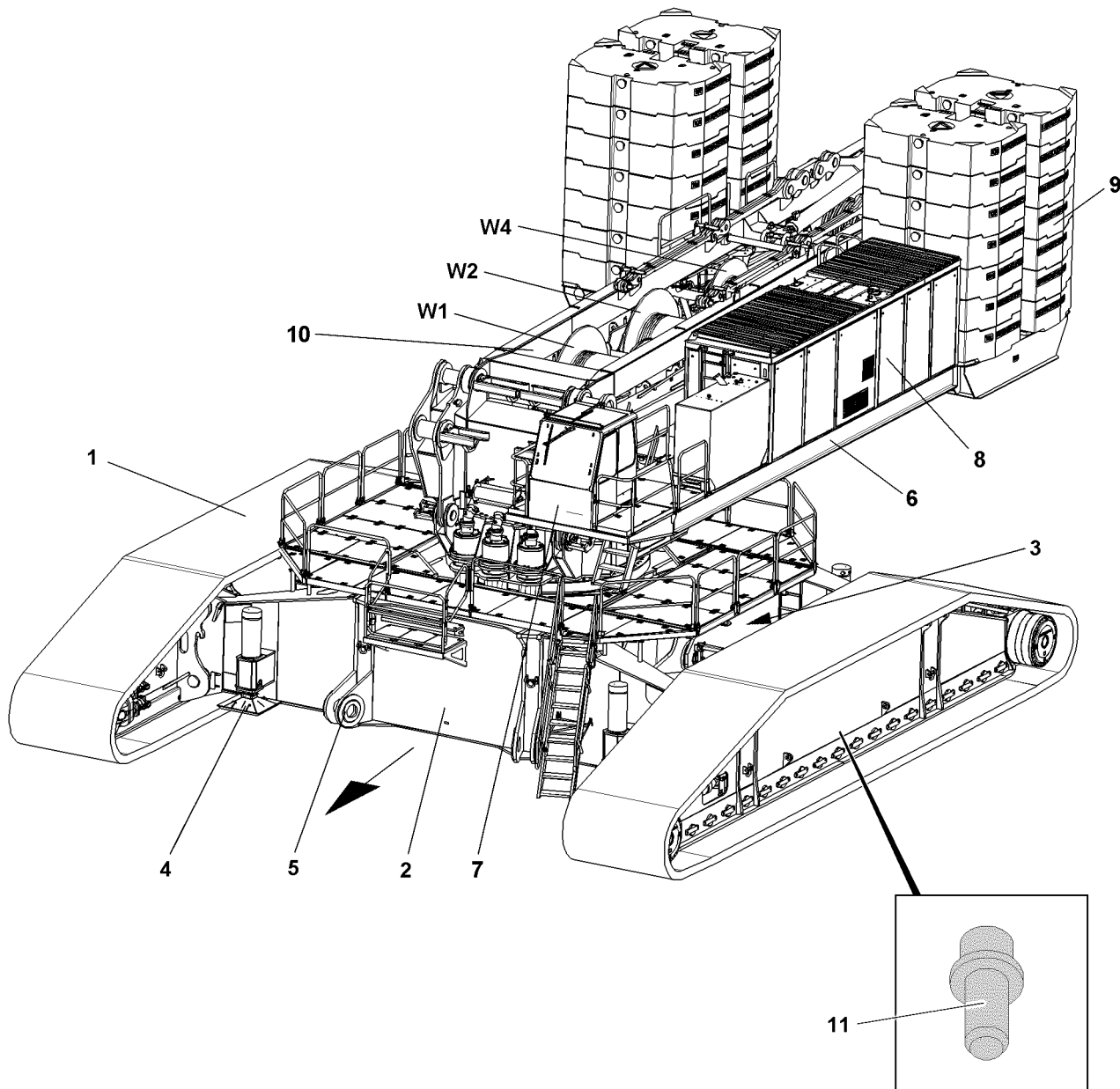


Fig.147685

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
- 11 Ground connection



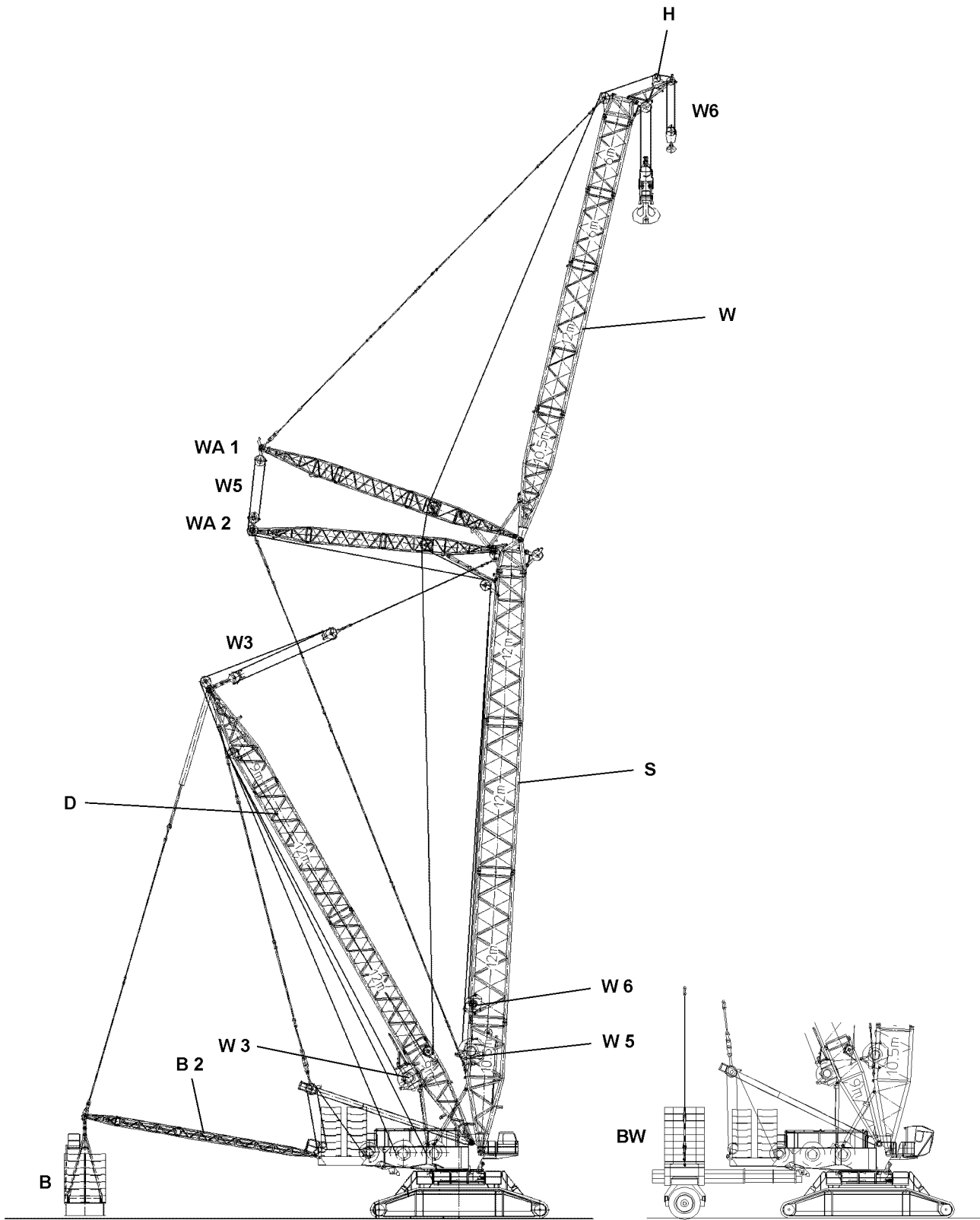
Note

Ground the crane:

- ▶ Observe and adhere to the instructions in chapter 2.04.
-

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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Fig.104753

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 the **derrick ballast**.

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

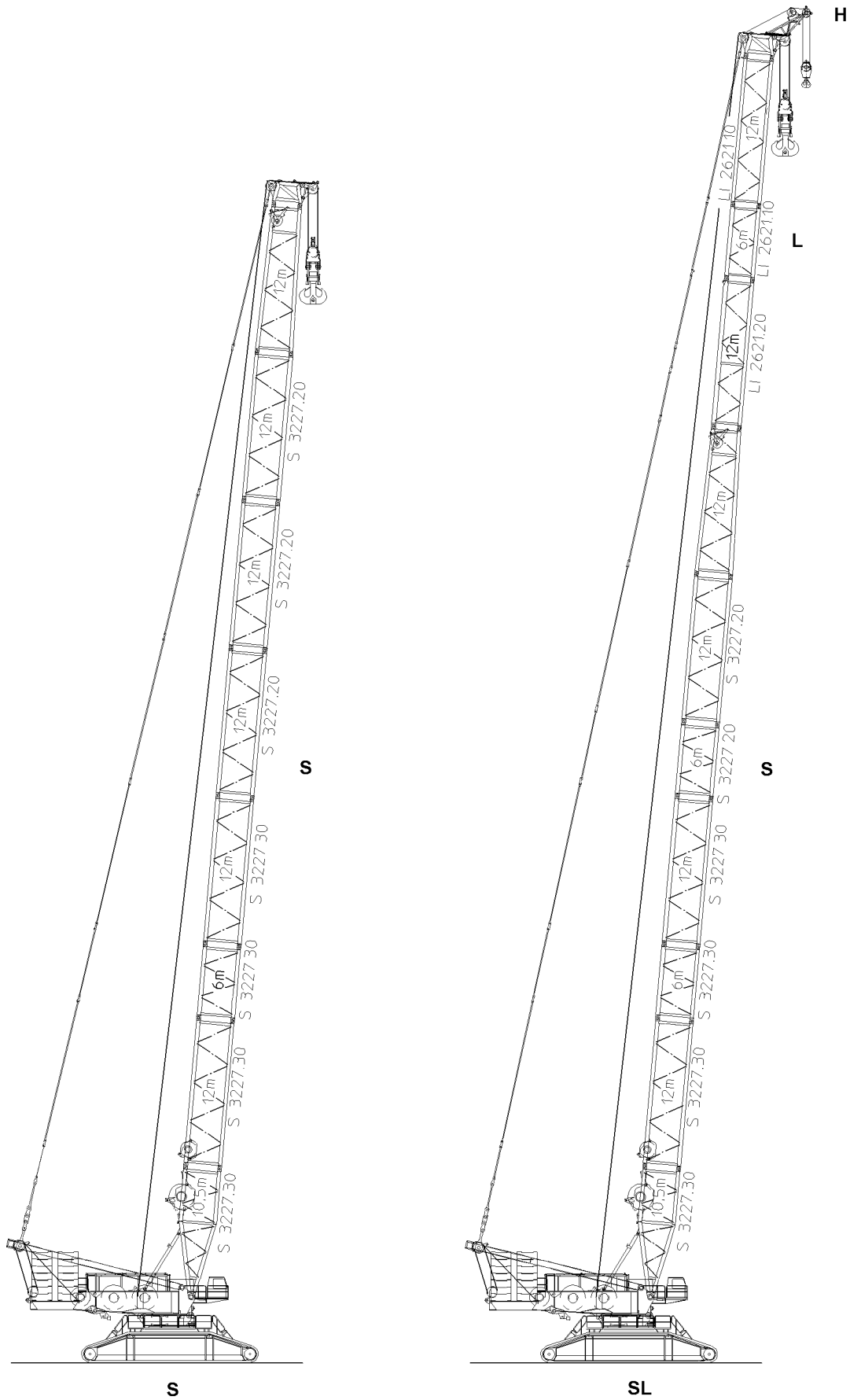


Fig.104487

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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

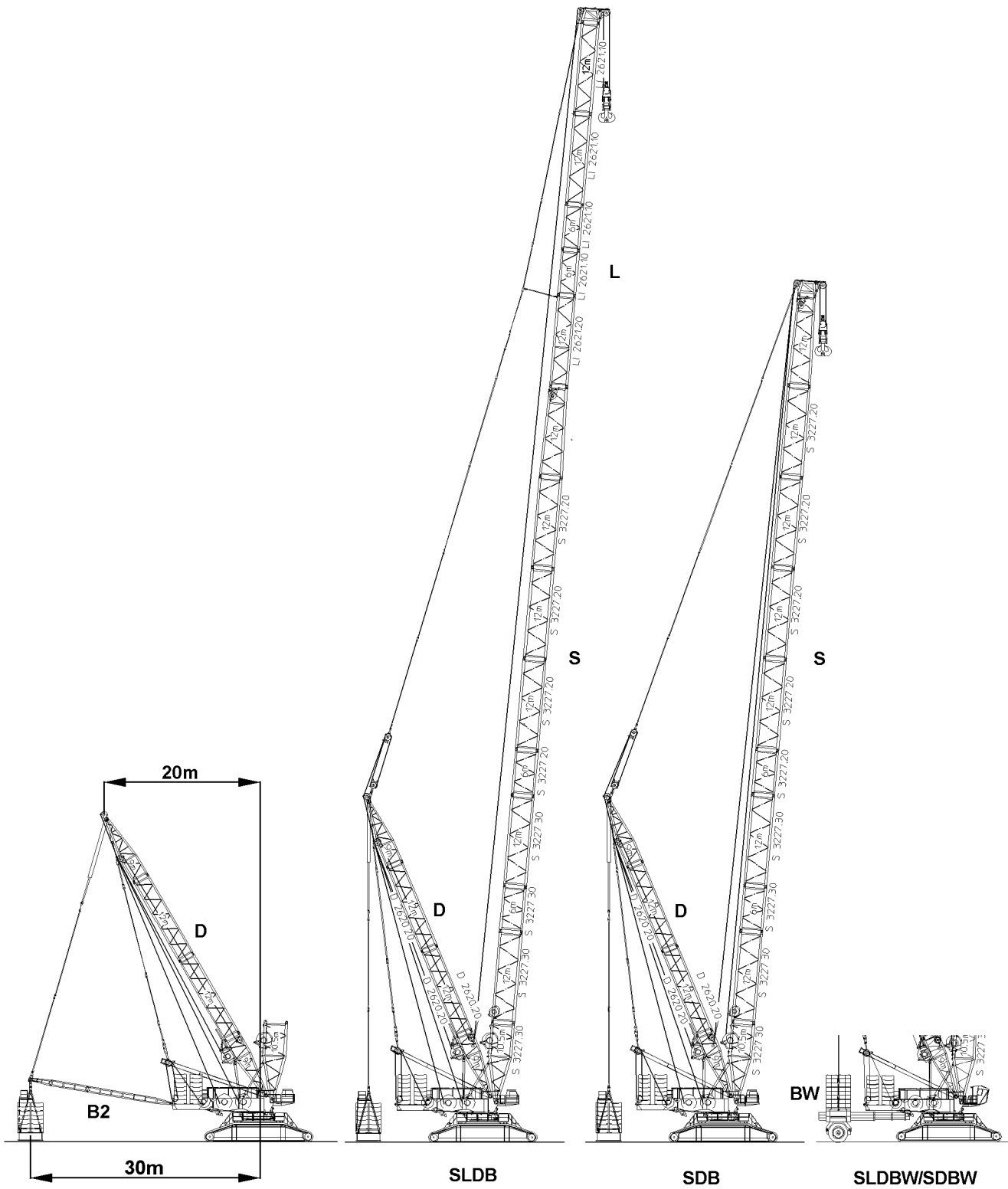
SL = Lattice mast - main boom **S**, supplemented on top with light **L** lattice sections.

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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Fig.104488

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

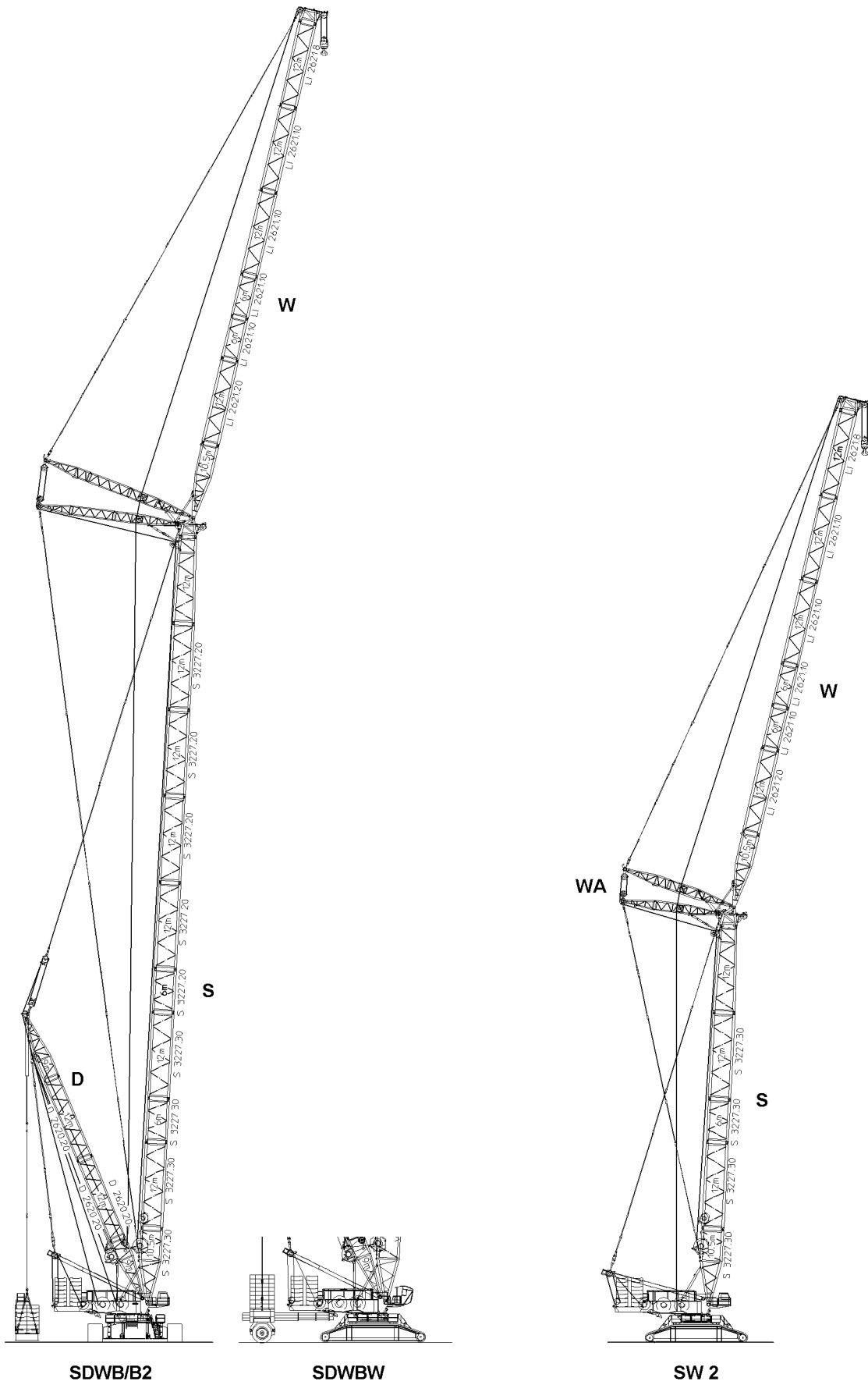


Fig.104751

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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 combination

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

S = 54.00 m

W = 84.00 m

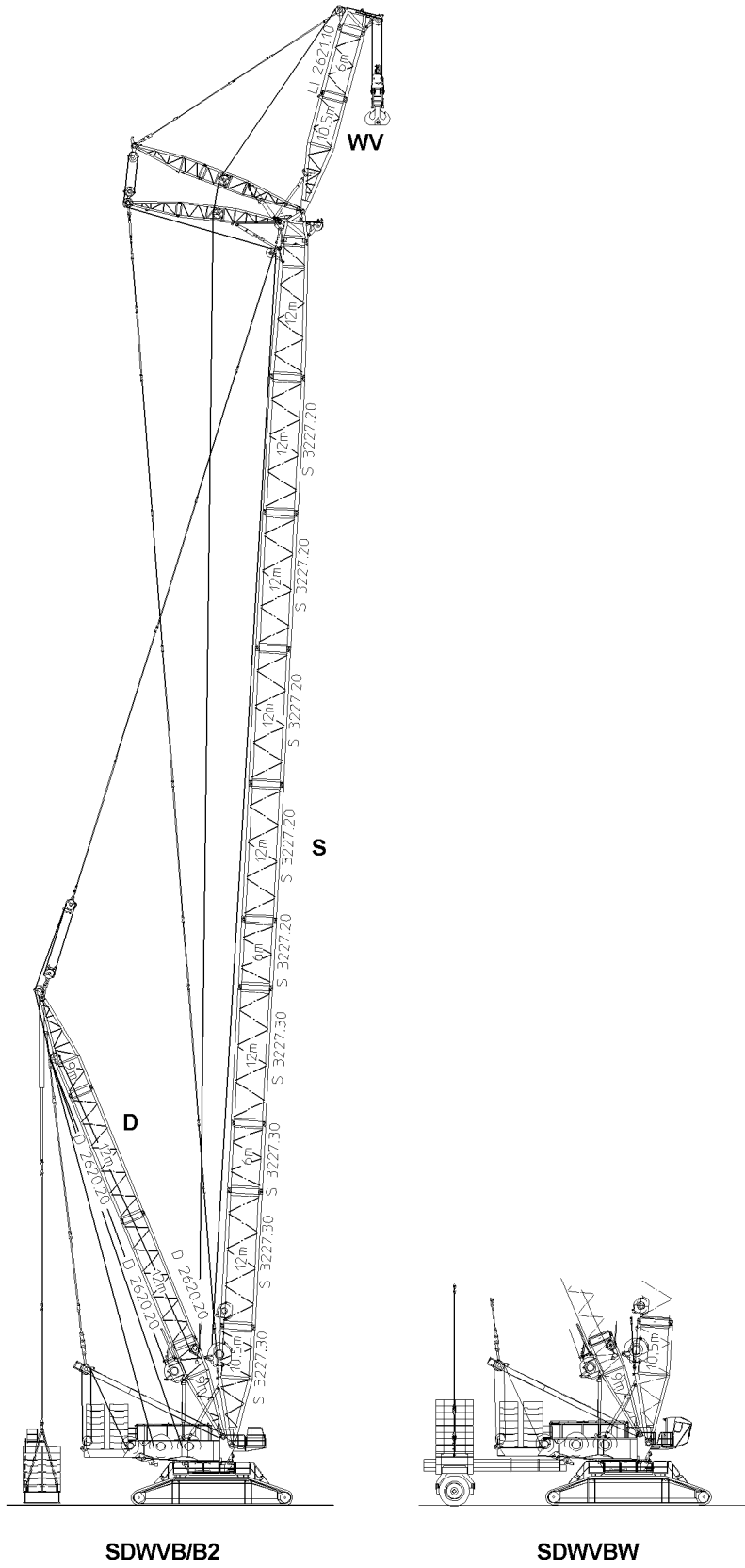
S = 66.00 m

W = 48.00 m



Note

► W2 identifies short WA-frames (15.5m).



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Fig.104752

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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1.02 Product description

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| 1 | Crawler travel gear | 3 |
| 2 | Crane superstructure | 3 |
| 3 | Boom systems | 5 |
| 4 | Auxiliary equipment | 6 |

Fig.195219

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1 Crawler travel gear

1.1 Frame

In-house manufactured, distortion-resistant welded structure made from high-strength, close-grained structural steel, 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 Track

Maintenance free, dirt protected crawler travel gear 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: 4x

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 Engine

Liebherr Diesel engine D 9512 A7-04 or CUMMINS Diesel engine QSK23 860 is installed for this crane.

The devices can be equipped with different exhaust aftertreatment systems.

Refer to the diesel engine operating instructions to see which engine exhaust aftertreatment system is installed in your crane.

2.2.1 Liebherr diesel engine

Liebherr Diesel engine D 9512 A7-04.

The Diesel engine is equipped with an exhaust aftertreatment system.

12-cylinder diesel, manufactured by Liebherr, water cooled.

Engine exhaust emissions Stage V according to Regulation (EU) 2016/1628

Engine exhaust emissions Tier 4 according to EPA / CARB

Performance: 750 KW at 2000 rpm

Maximum torque: 4774 Nm at 1500 rpm

2.2.2 CUMMINS Diesel engine

CUMMINS Diesel engine QSK23 860.

6-cylinder diesel, produced by Cummins, water cooled

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

2.11 Safety equipment

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 S-system main boom

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

Boom lengths from S 36 m to S 90 m.

Boom lengths from SDB 48 m to SDB 150 m with derrick system.

3.2 P-system main boom

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 PD B150 m.

3.3 W-system luffing lattice jib

Can be installed on the S-system.

Can be installed on the P-system.

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

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

Winch 5 is required for crane operation with a luffing lattice jib.

3.4 Heavy duty jib WV

Use of existing lattice sections of W-system.

Can be installed on the S-system.

Can be installed on the P-system.

Operating range between 12° and 20° to S-boom.

Lengths: 12 m or 18 m

3.5 D-system derrick boom

Winch 3 is required for crane operation with a derrick boom.

4 Auxiliary equipment

4.1 Ballast pallet B

For a 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 a 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 the 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 the 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 the 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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1.03 Technical data

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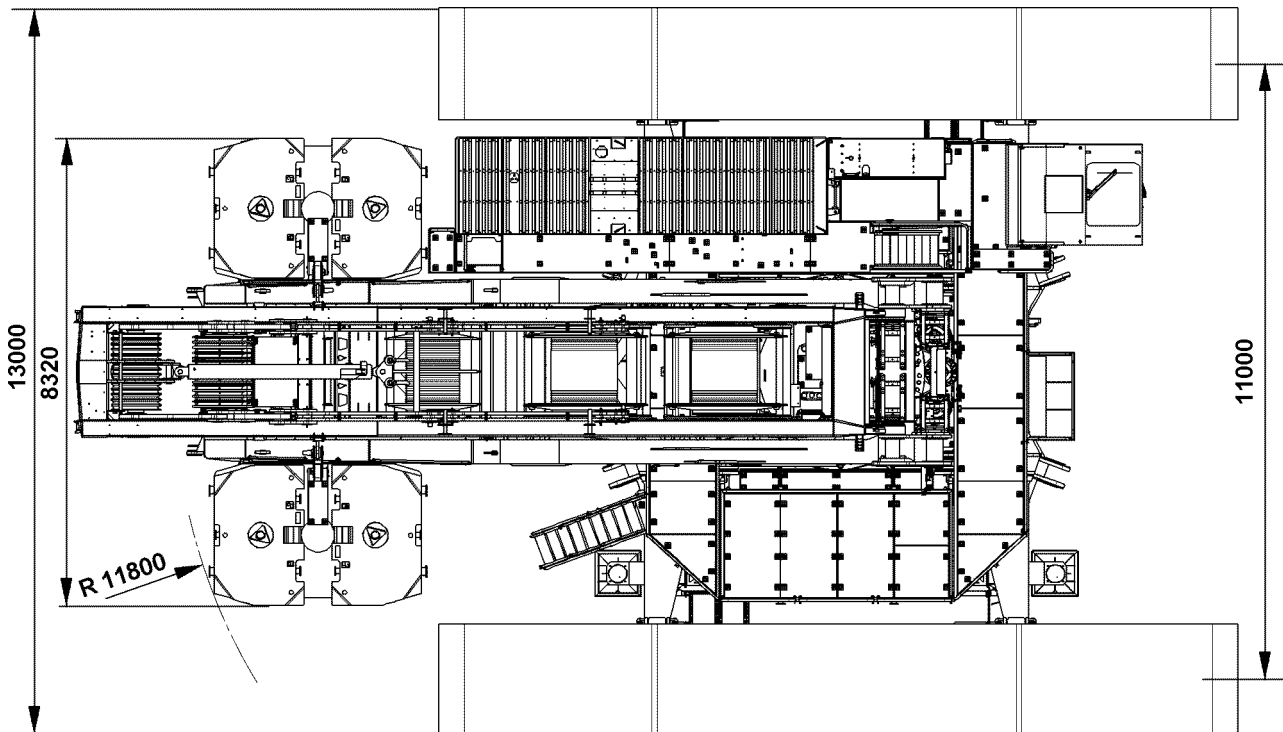
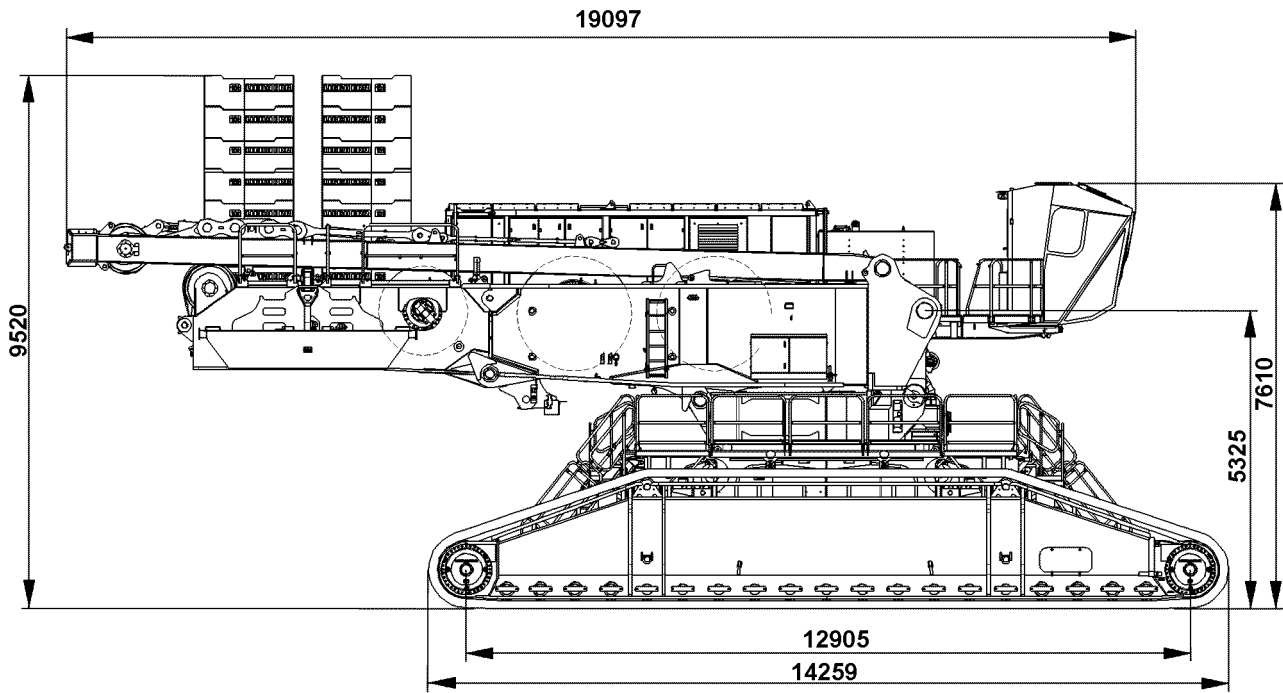


Fig.102880

LWE/LR 11350-007/19005-01-02/en

1 Dimensions and weights

1.1 Dimensions of crawler travel gear with crane superstructure

**Note**

► For dimensions, see opposite illustration.

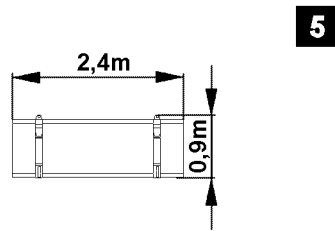
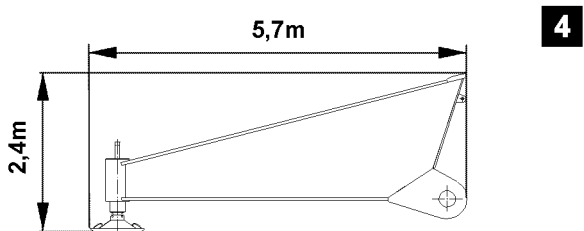
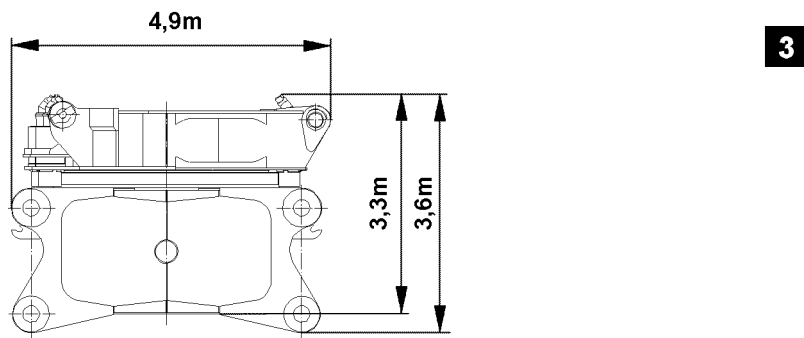
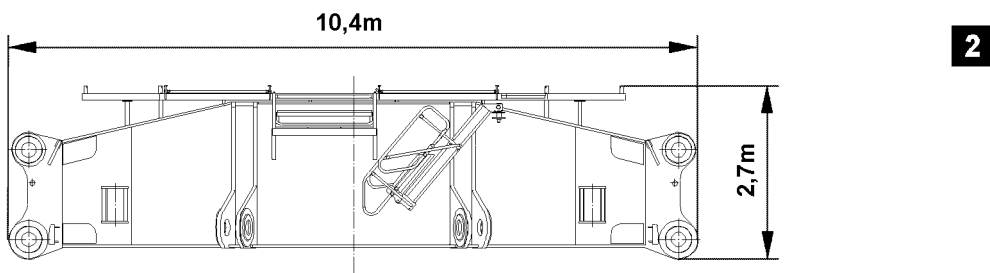
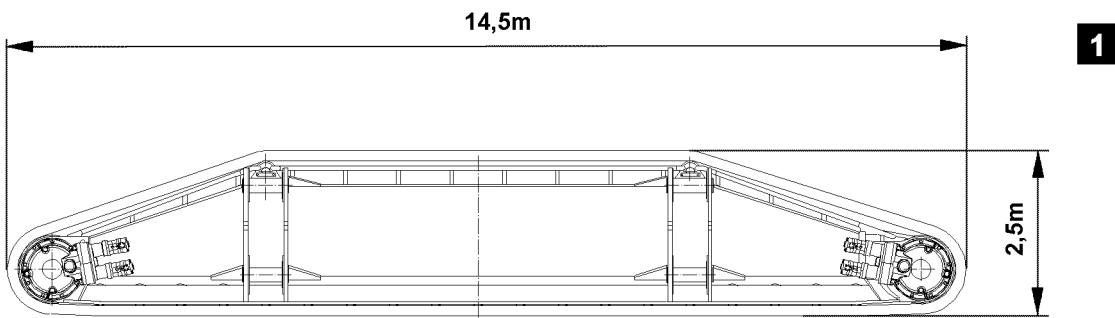


Fig.103124

LWE/LR 11350-007/19005-01-02/en

1.2 Crawler carrier

1 See illustration

| 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 |

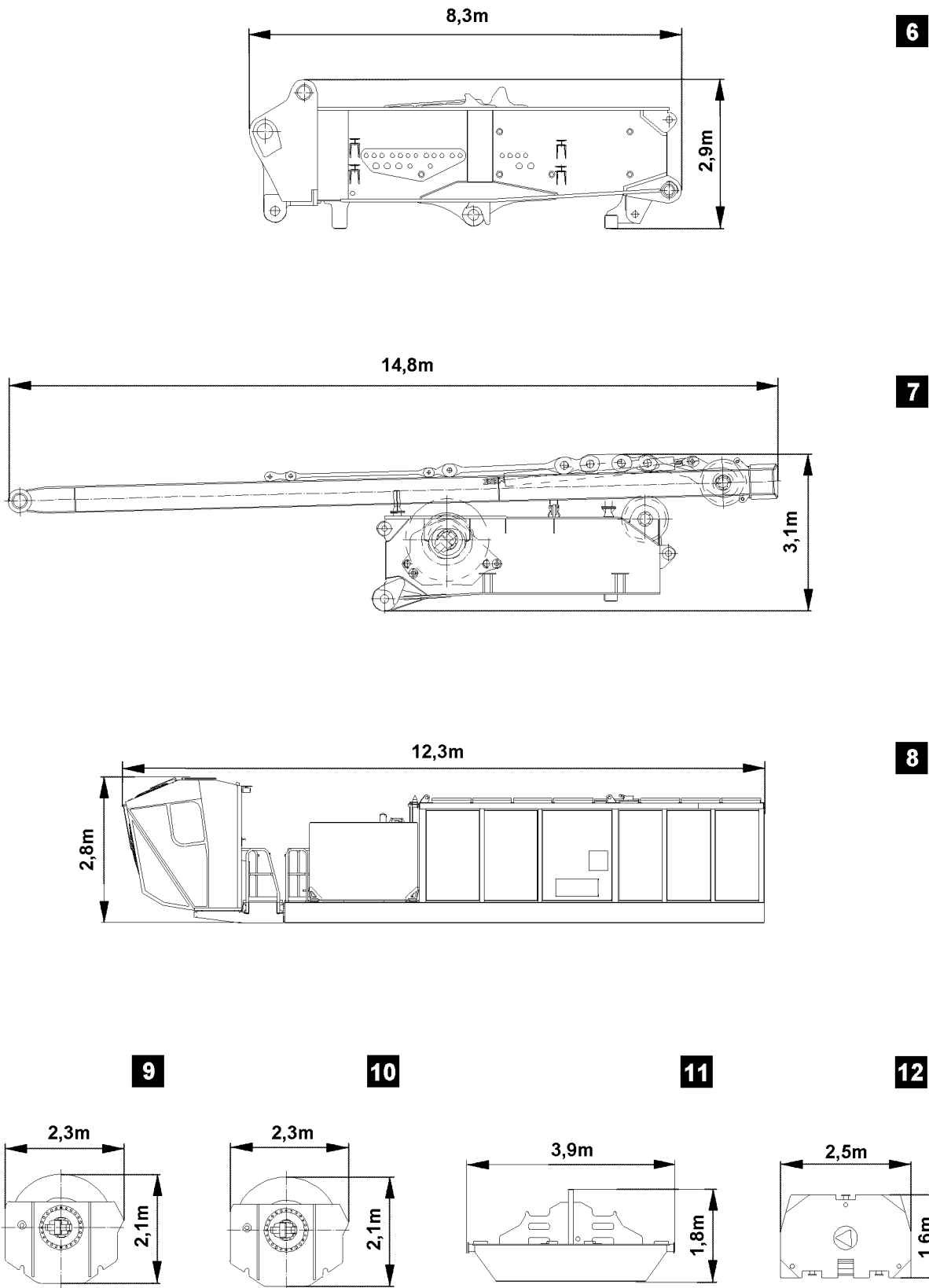


Fig.103125

LWE/LR 11350-007/19005-01-02/en

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 |

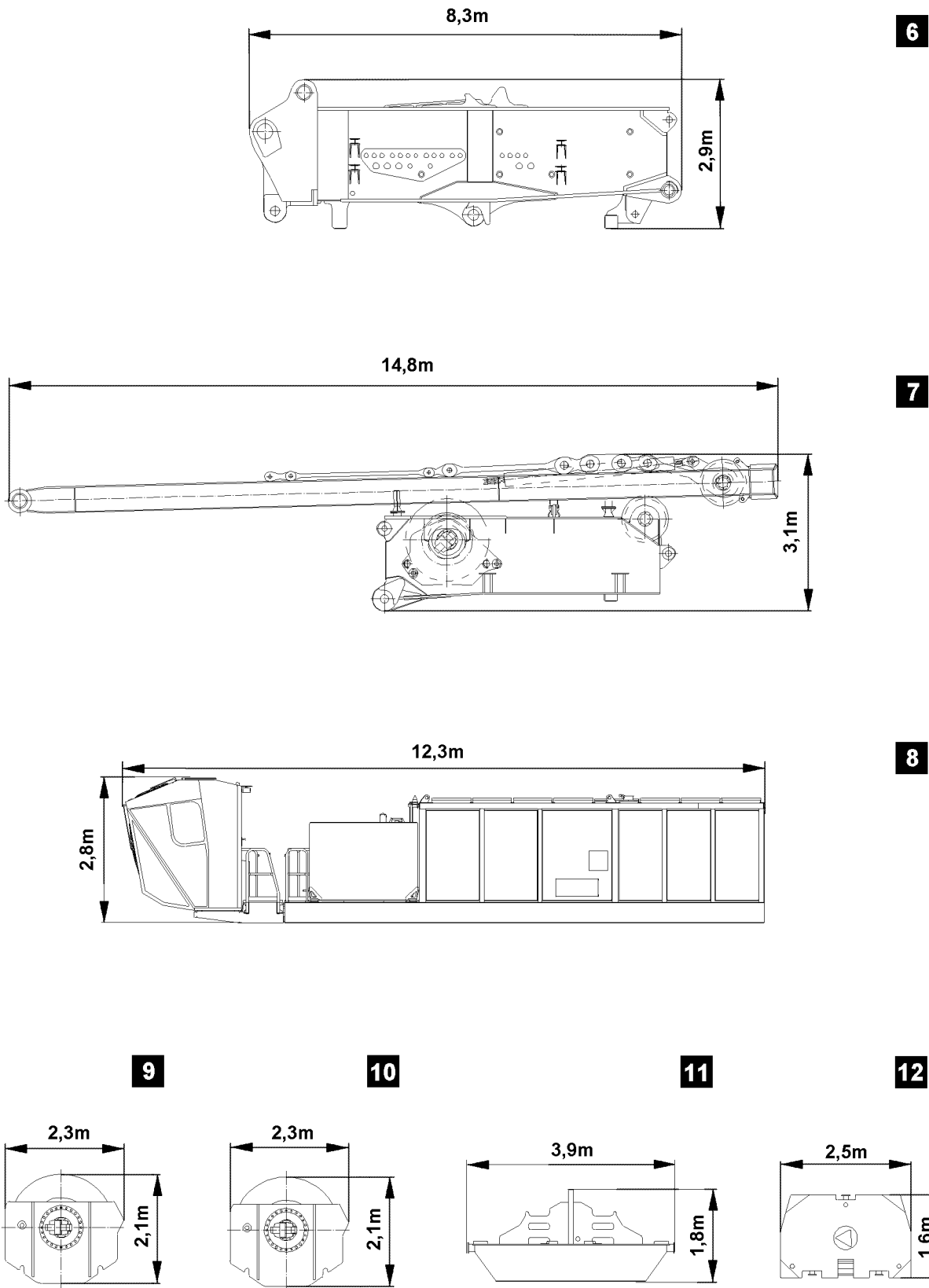


Fig.103125

LWE/LR 11350-007/19005-01-02/en

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 |

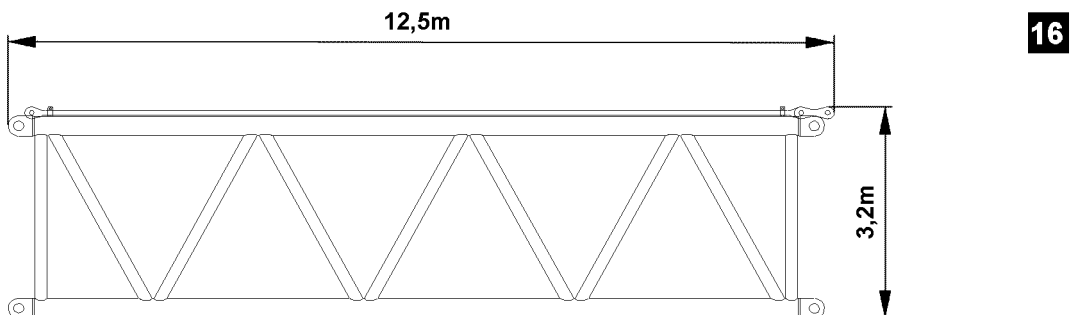
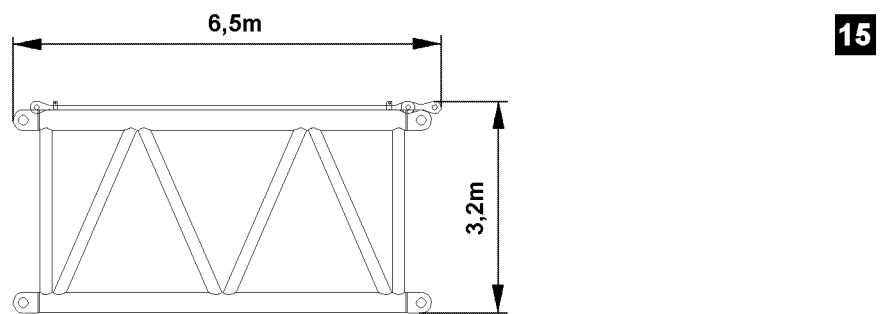
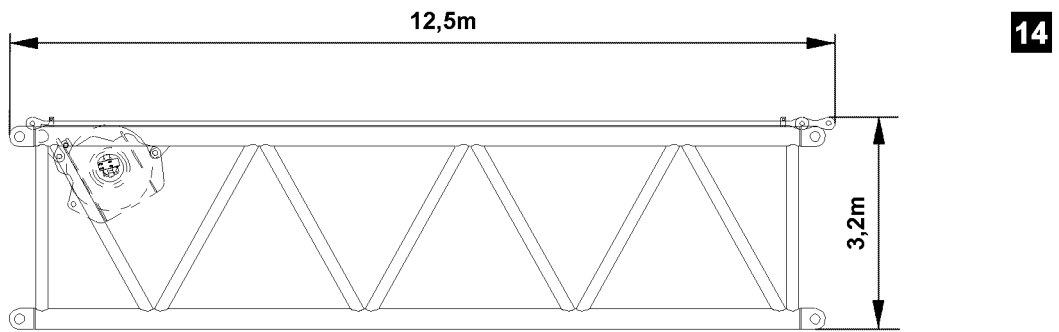
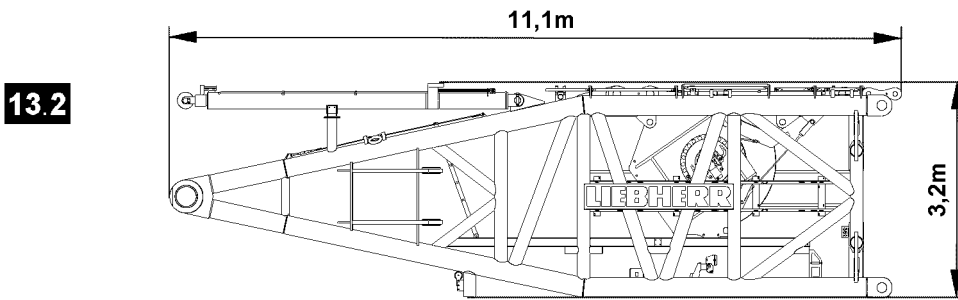
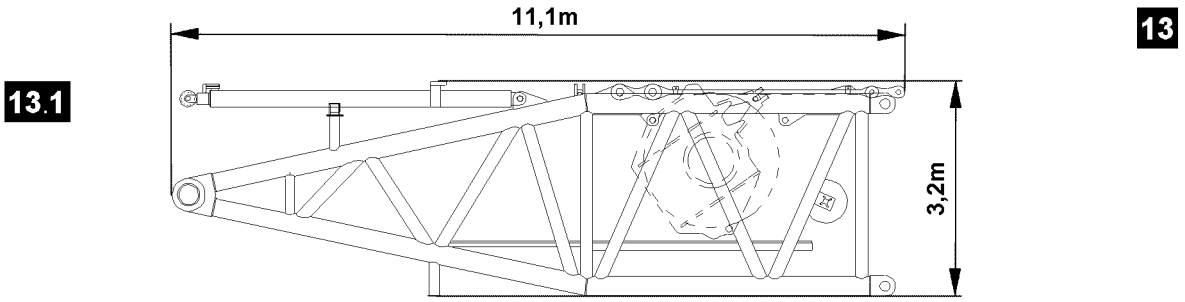


Fig.115417

LWE/LR 11350-007/19005-01-02/en

1.14 S-pivot section 10.5 m for S-operating modes

See illustration 13.1.

| 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-pivot section 10.5 m reinforced, for S-operating modes and P-operating modes

See illustration 13.2.

| Weight | Width |
|----------------------|-------|
| 56.5 t ¹⁾ | 3.5 m |
| 35.5 t ²⁾ | 3.5 m |

1) with winch 5

2) without winch 5

1.16 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

1.17 S-intermediate section 6 m , 3227.30

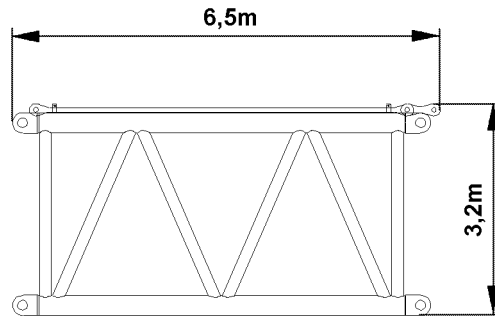
See illustration 15.

| Weight | Width |
|--------|-------|
| 9.9 t | 3.5 m |

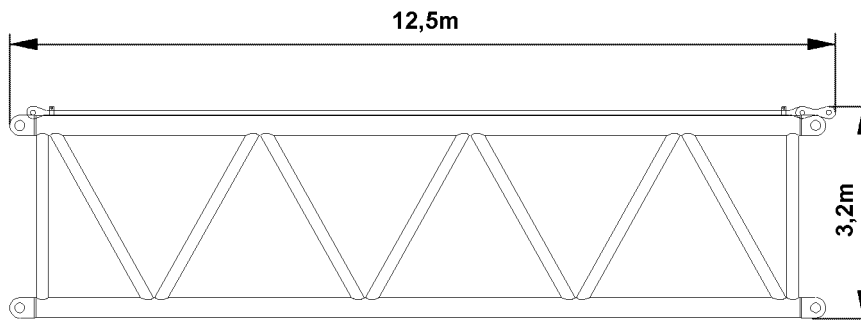
1.18 S-intermediate section 12 m , 3227.30

See illustration 16.

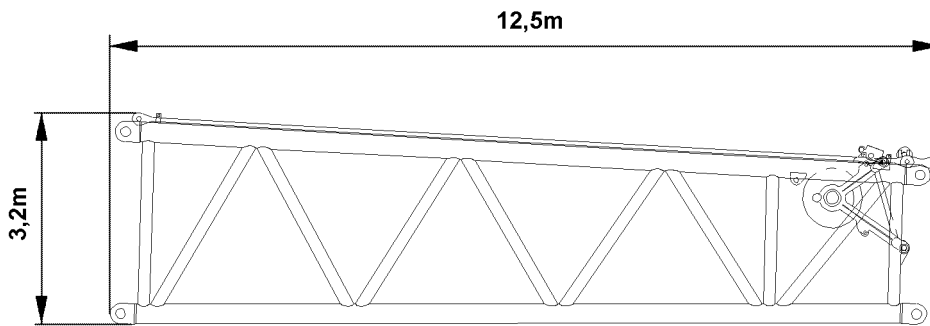
| Weight | Width |
|--------|-------|
| 18.2 t | 3.5 m |



17

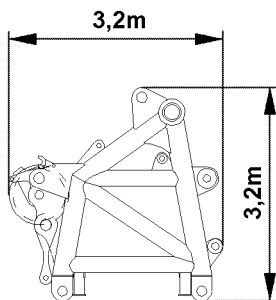


18

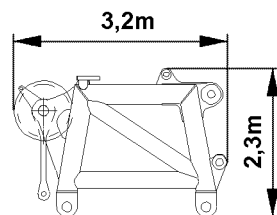


19

20



21



22

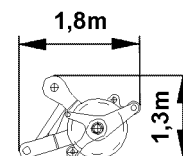


Fig.103136

LWE/LR 11350-007/19005-01-02/en

1.19 S-intermediate section 6 m , 3227.20

See illustration 17.

| Weight | Width |
|--------|-------|
| 8.8 t | 3.5 m |

1.20 S-intermediate section 12 m , 3227.20

See illustration 18.

| Weight | Width |
|--------|-------|
| 15.5 t | 3.5 m |

1.21 S-adapter 12 m

See illustration 19.

| Weight | Width |
|--------|-------|
| 17.9 t | 3.5 m |

1.22 W-connector head 1.5 m , 675 t

See illustration 20.

| Weight | Width |
|--------|-------|
| 10.0 t | 3.5 m |

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

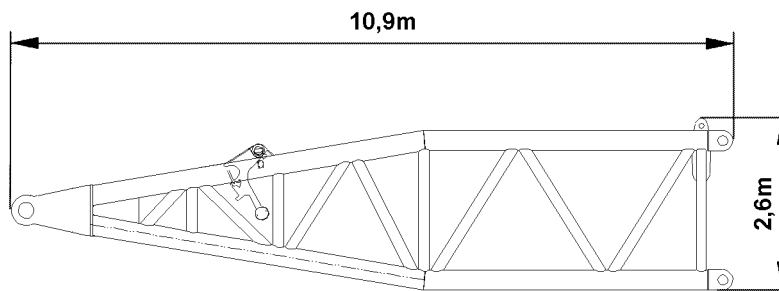
See illustration 21.

| Weight | Width |
|--------|-------|
| 8.8 t | 3.5 m |

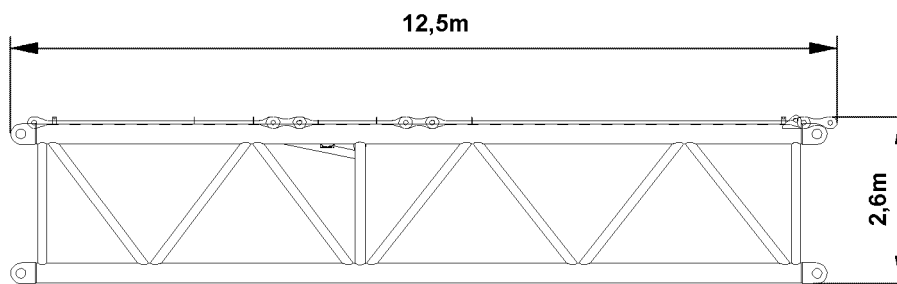
1.24 Pulley set 675 t

See illustration 22.

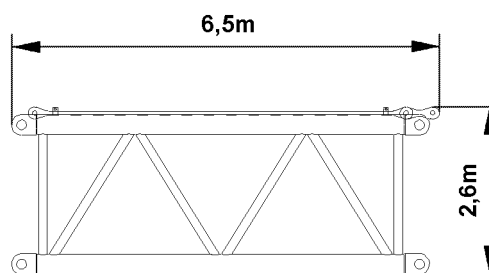
| Weight | Width |
|--------|-------|
| 2.8 t | 1.9 m |



23



24



25

Fig.103137

LWE/LR 11350-007/19005-01-02/en

1.25 W-pivot section 10.5 m

See illustration 23.

| Weight | Width |
|--------|-------|
| 12.6 t | 3.0 m |

1.26 LI-intermediate section 12 m , 2621.20

See illustration 24.

| Weight | Width |
|--------|-------|
| 11.5 t | 3.0 m |

1.27 LI-intermediate section 6 m , 2621.20

See illustration 25.

| Weight | Width |
|--------|-------|
| 5.9 t | 3.0 m |

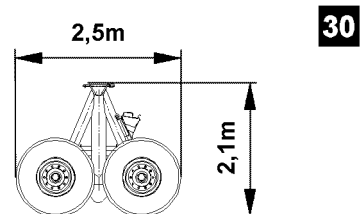
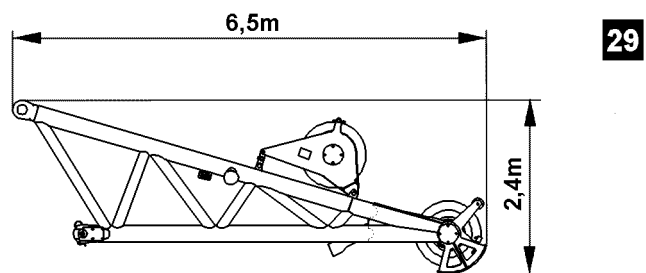
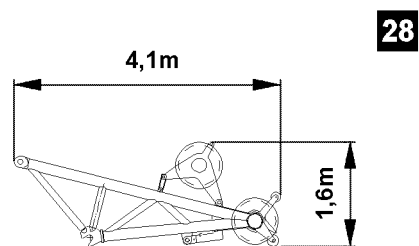
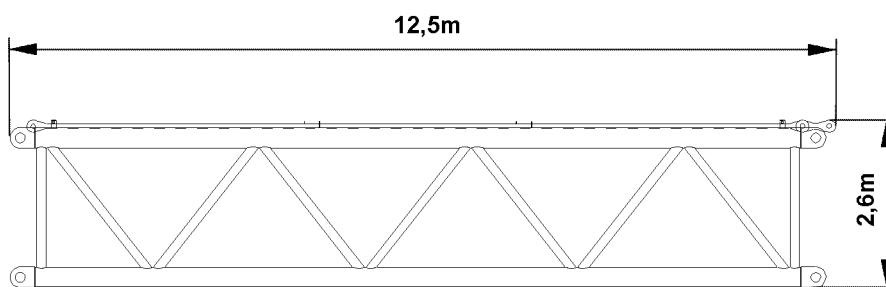
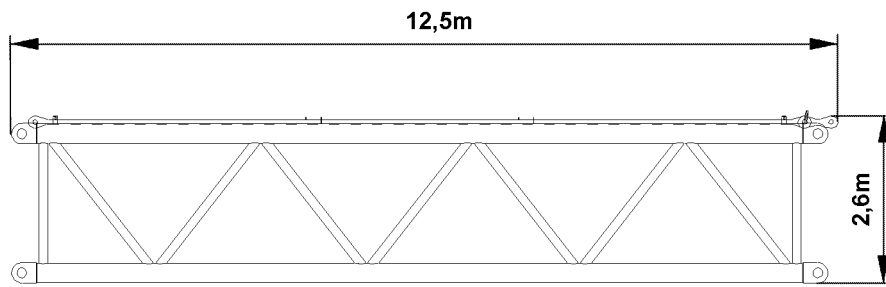


Fig.103138

1.28 LI-intermediate section 12 m , 2621.10

See illustration 26.

| Weight | Width |
|--------|-------|
| 9.8 t | 3.0 m |

1.29 LI-intermediate section 12 m , 2621.8

See illustration 27.

| Weight | Width |
|--------|-------|
| 8.2 t | 3.0 m |

1.30 Boom nose 62 t

See illustration 28.

| Weight | Width |
|--------|-------|
| 1.3 t | 1.1 m |

1.31 Boom nose 120 t

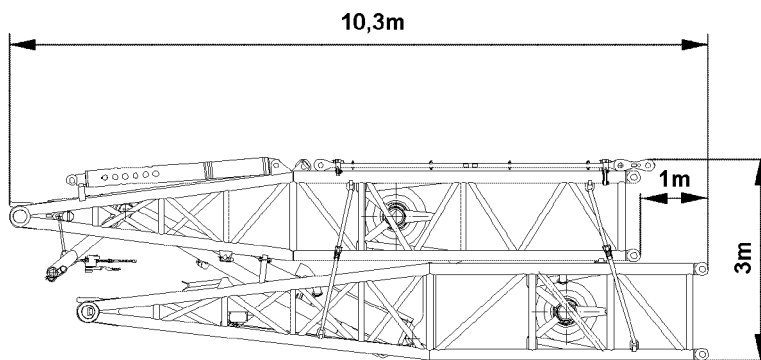
See illustration 29.

| Weight | Width |
|--------|-------|
| 3.8 t | 2.3 m |

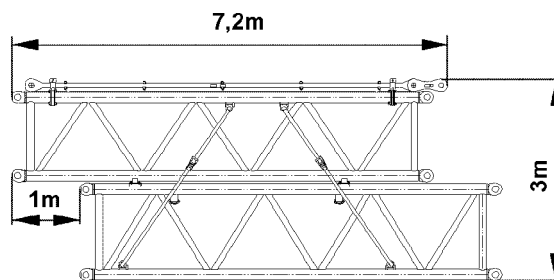
1.32 Erection cart

See illustration 30.

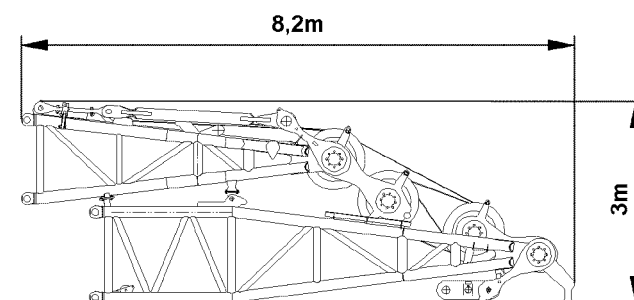
| Weight | Width |
|--------|-------|
| 3.4 t | 3.1 m |



31



32



33

Fig.102877

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

See illustration 31.

| Weight | Width |
|--------|-------|
| 15.0 t | 3.0 m |

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

See illustration 32.

| Weight | Width |
|--------|-------|
| 4.9 t | 2.9 m |

1.35 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 |

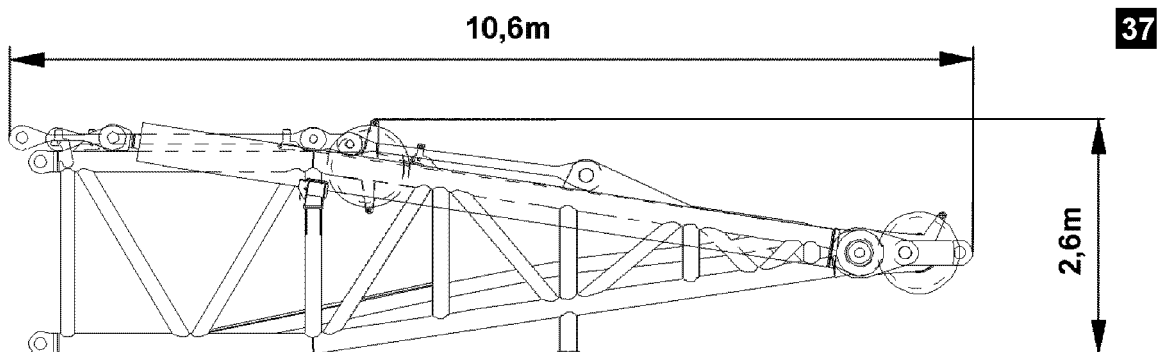
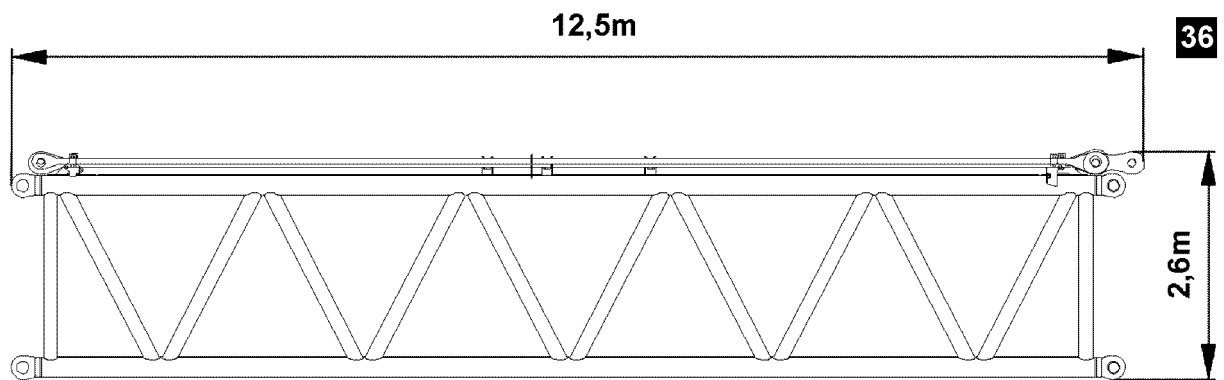
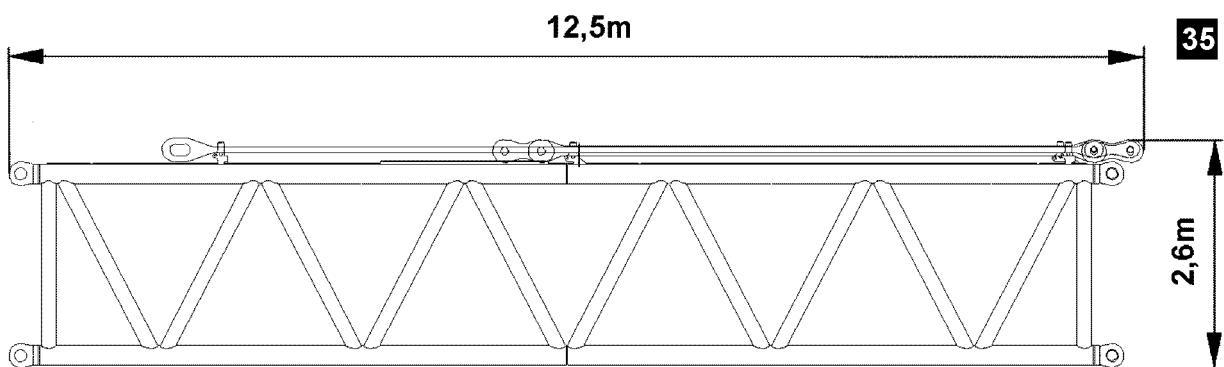
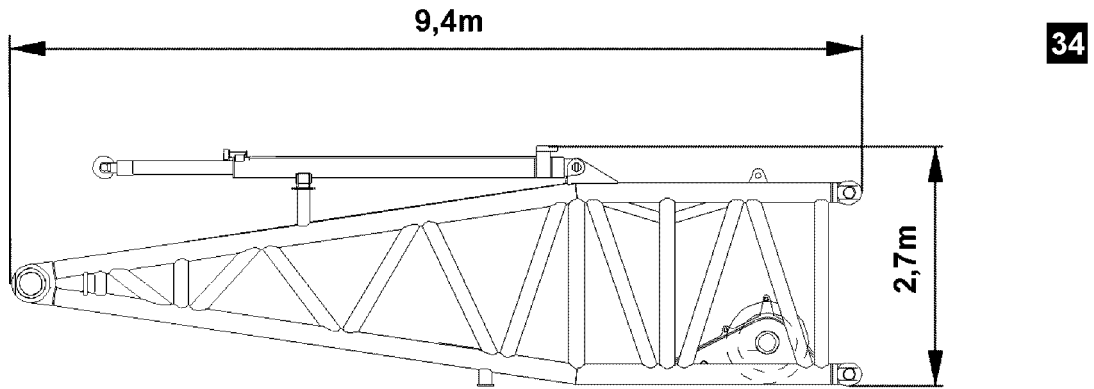


Fig.102878

1.36 D-pivot section 9 m

See illustration 34.

| Weight | Width |
|--------|-------|
| 12.4 t | 3.0 m |

1.37 D-intermediate section 12 m

See illustration 35.

| Weight | Width |
|--------|-------|
| 12.5 t | 3.0 m |

1.38 D-reducer section 12 m

See illustration 36.

| Weight | Width |
|--------|-------|
| 12.2 t | 3.0 m |

1.39 D-end section 9 m

See illustration 37.

| Weight | Width |
|--------|-------|
| 35.6 t | 3.5 m |

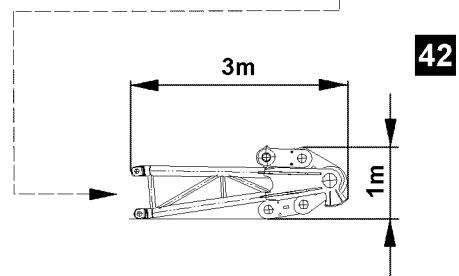
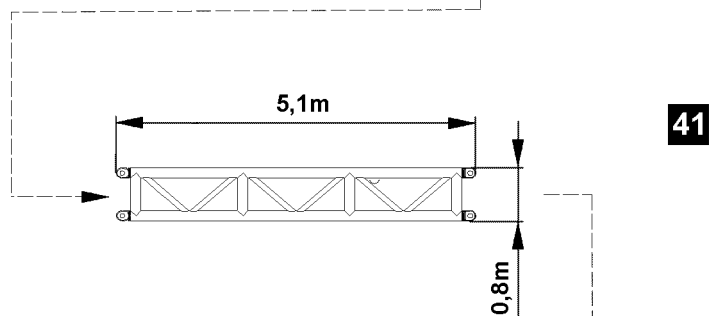
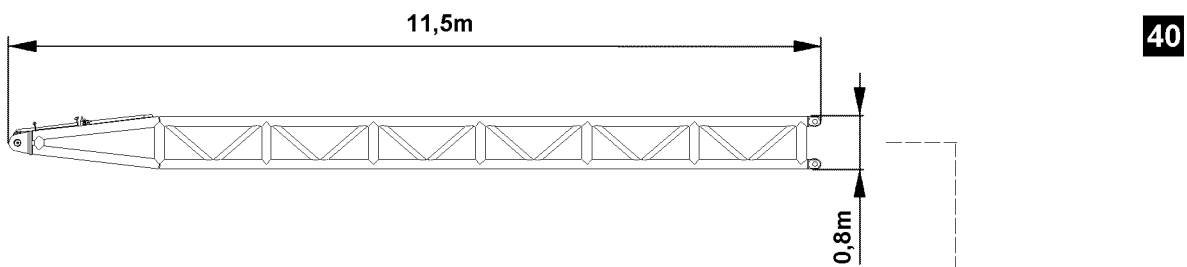
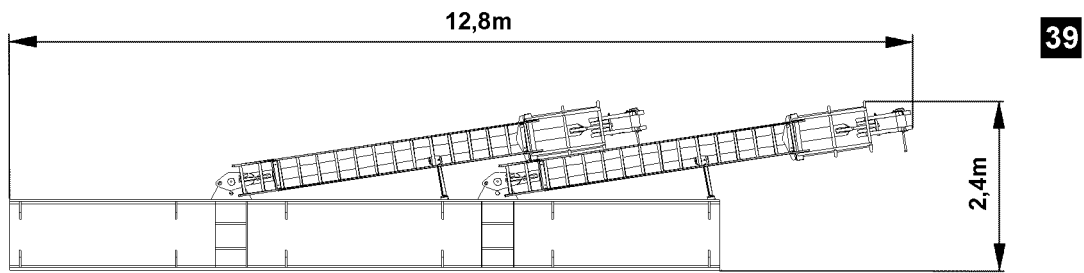
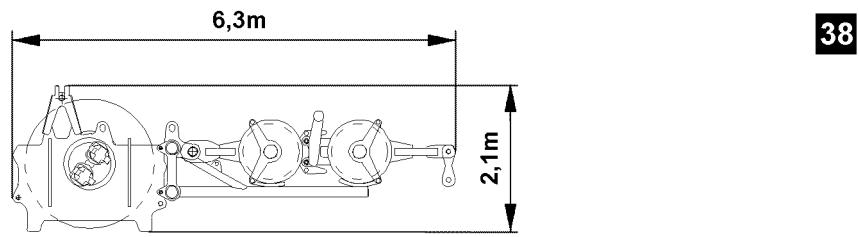


Fig.103139

LWE/LR 11350-007/19005-01-02/en

1.40 Winch 3 with pulley blocks

See illustration 38.

| Weight | Width |
|--------|-------|
| 29.5 t | 2.9 m |

1.41 Ballast pallet

See illustration 39.

| Weight | Width |
|--------|-------|
| 21.1 t | 3.0 m |

1.42 Suspended ballast guide pivot section

See illustration 40.

| Weight | Width |
|--------|-------|
| 2.8 t | 3.0 m |

1.43 Suspended ballast guide intermediate section

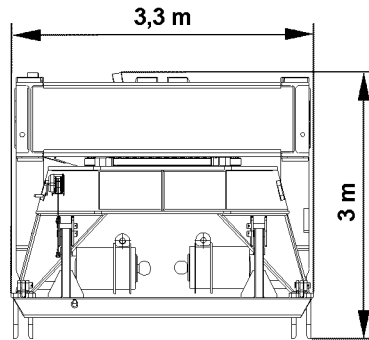
See illustration 41.

| Weight | Width |
|--------|-------|
| 1.2 t | 3.0 m |

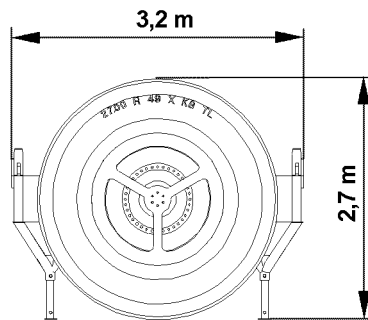
1.44 Suspended ballast guide end section

See illustration 42.

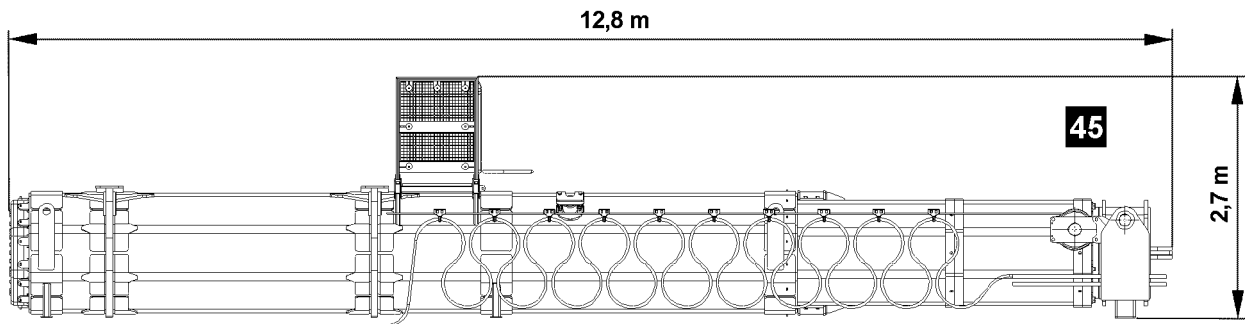
| Weight | Width |
|--------|-------|
| 3.1 t | 4.3 m |



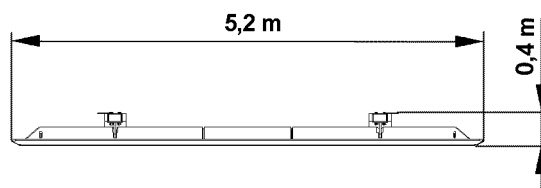
43



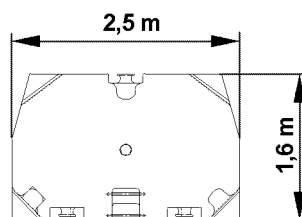
44



45



46



47

Fig.105484

1.45 Ballast trailer frame

See illustration 43.

| Weight | Width |
|--------|--------|
| 35.1 t | 10.0 m |

1.46 Wheel set

See illustration 44.

| Weight | Width |
|--------|-------|
| 24.0 t | 4.8 m |

1.47 Ballast trailer guide

See illustration 45.

| Weight | Width |
|--------|-------|
| 35.5 t | 2.5 m |

1.48 Support plate

See illustration 46.

| Weight | Width |
|--------|-------|
| 2.4 t | 1.2 m |

1.49 Ballast plate

See illustration 47.

| Weight | Width |
|--------|-------|
| 10.0 t | 0.6 m |

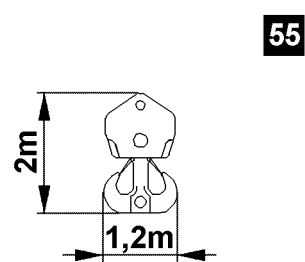
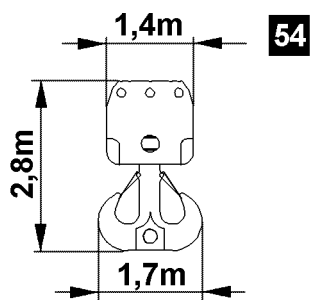
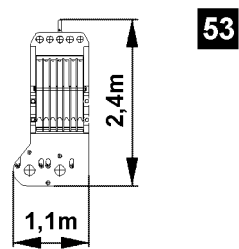
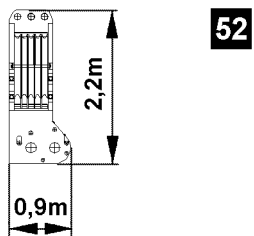
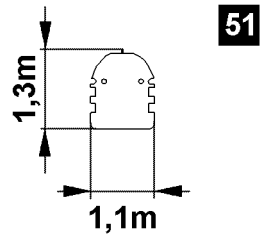
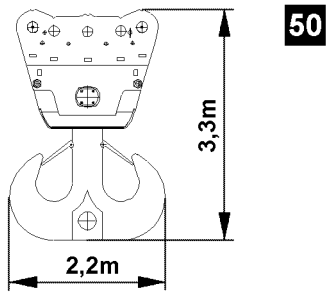
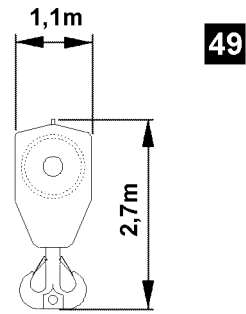
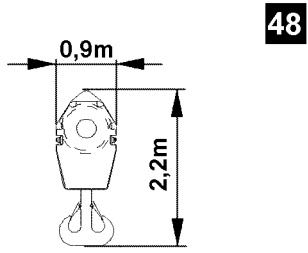


Fig.105485

LWE/LR 11350-007/19005-01-02/en

1.50 Hook block 125DM

See illustration 48.

| Weight | Width |
|--------|-------|
| 5.5 t | 1.0 m |

1.51 Hook block 200DM

See illustration 49.

| Weight | Width |
|--------|-------|
| 11.9 t | 1.4 m |

1.52 Hook block 1350DMZ

See illustration 50.

| Weight | Width |
|--------|-------|
| 12.8 t | 1.2 m |

1.53 Auxiliary weight

See illustration 51.

| Weight | Width |
|--------|-------|
| 1.0 t | 0.2 m |

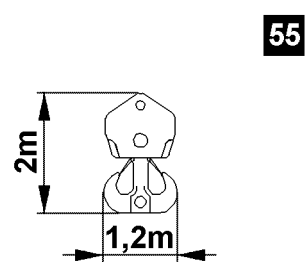
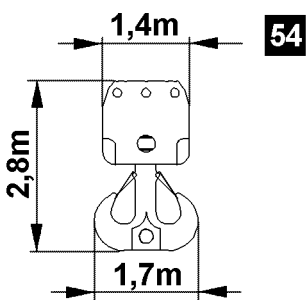
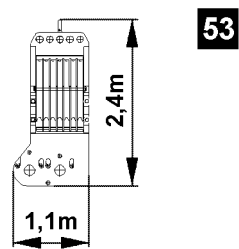
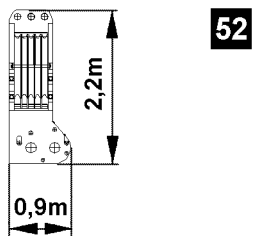
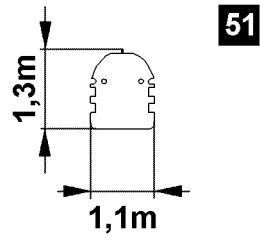
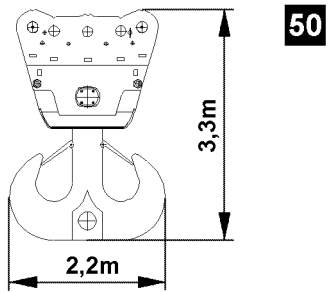
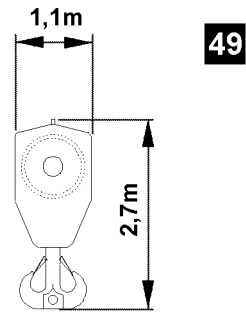
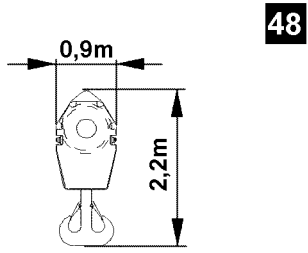


Fig.105485

LWE/LR 11350-007/19005-01-02/en

1.54 Pulley block

See illustration 52.

| Weight | Width |
|--------|-------|
| 3.7 t | 1.1 m |

1.55 Pulley block

See illustration 53.

| Weight | Width |
|--------|-------|
| 4.7 t | 1.1 m |

1.56 Hook with traverse 630DZ

See illustration 54.

| Weight | Width |
|--------|-------|
| 6.0 t | 1.0 m |

1.57 Hook with traverse 320DZ

See illustration 55.

| Weight | Width |
|--------|-------|
| 3.7 t | 1.0 m |

2 Load handling equipment



Note

► For load handling equipment, see load chart manual.

3 Ground pressure

| 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 limbs are exposed | not more than 2.5 m/s ² |
| Effective value of weighted acceleration to which the entire body is exposed to | 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 | Rope category number RCN |
|---------|---------------|--------------------------|
| Winch 1 | 38 mm | See Rope certificate |
| Winch 2 | 38 mm | See Rope certificate |
| Winch 6 | 38 mm | See Rope certificate |
| Winch 6 | 28 mm | See Rope certificate |

7.2 Control ropes

| | Rope diameter | Rope category number RCN |
|---------|---------------|--------------------------|
| Winch 3 | 38 mm | See Rope certificate |
| Winch 4 | 38 mm | See Rope certificate |
| Winch 5 | 38 mm | See Rope certificate |

7.3 Guy ropes

| | Rope diameter | Rope category number RCN |
|------------------|---------------|--------------------------|
| Auxiliary guying | 54 mm | See Rope certificate |
| Auxiliary guying | 36 mm | See Rope certificate |

7.4 Assembly rope

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

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1.03.10 Outrigger pads

| | | |
|---|--|----|
| 1 | Description | 2 |
| 2 | Safety | 2 |
| 3 | Fastening the outrigger pad | 5 |
| 4 | Technical outrigger pad data for cranes with a telescopic boom | 6 |
| 5 | Technical outrigger pad data for cranes with a lattice mast boom | 13 |

1 Description

By using the outrigger pads, the support load is distributed over a large area of the ground. Liebherr-Werk Ehingen GmbH offers different versions of outrigger pads. The outrigger pads suitable for the respective crane type can be taken via the corresponding LWE ID number from the following table „Outrigger pads for support load distribution“.

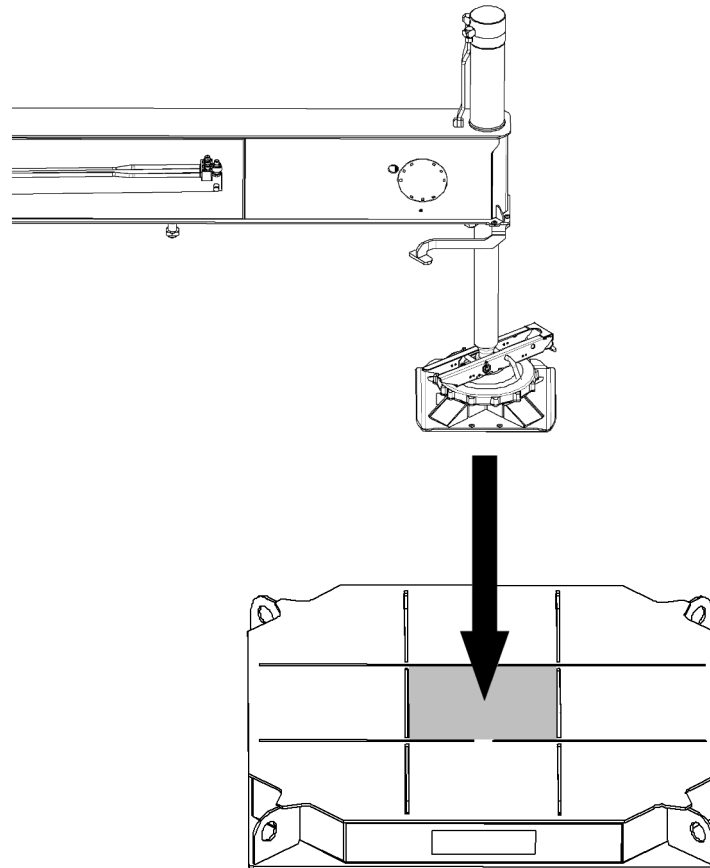


Fig.154813: Sample illustration of a outrigger pad for a crane with a telescopic boom

2 Safety

Before working with the outrigger pads, observe the safety instructions:

- General safety instructions, see chapter 2.04.
- Supporting the crane, see chapter 3.05.
- Installing and driving the outrigger pad (not for all crane types), see chapter 3.05.
- Assembling the outrigger pad (not for all crane types), see chapter 3.10.



WARNING

Impermissible support plate substructure!

The crane can topple over.

Death, bodily injury, property damage.

- ▶ The ground must be able to safely absorb the occurring forces.
- ▶ Place the outrigger pads **centrally** below the support plates.
- ▶ The outrigger pad must be able to safely absorb the support force.

2.1 Placement width

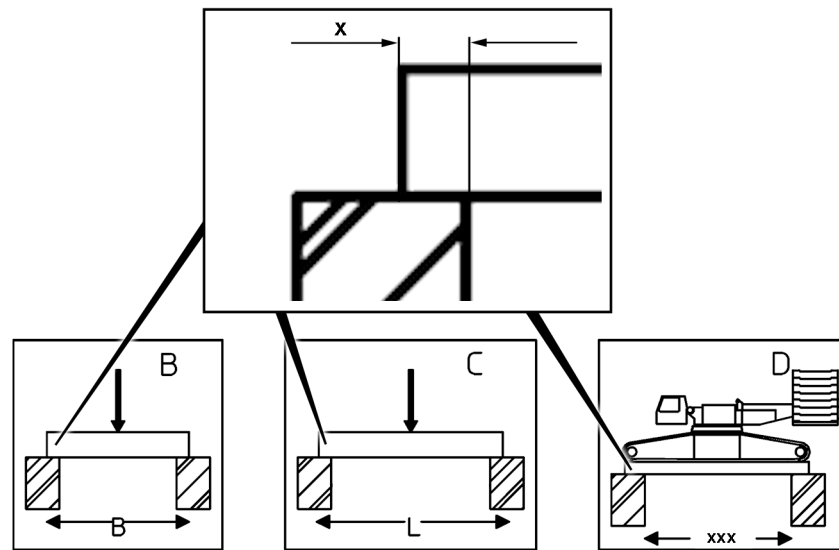


Fig.154918: Placement width x



WARNING

Placement width x **not** adhered to!
The crane can topple over.
Death, bodily injury, property damage.
► Adhere to the placement width x .

2.2 Loads on the ground

When the crane is supported, significant forces (support forces) are transferred by the support cylinders via the support plates to the ground, see chapter 2.04. The same applies for crane operation on crawler. In this case, the forces (support forces) are transferred via the crawler plates to the ground.

- The ground must be able to safely withstand the resulting pressure. If the surface area of the crawler plates or support plates is inadequate, a substructure is required according to the load bearing capacity of the ground. Outrigger pads can be used for this.
- The support plate must be placed in the **center** on the outrigger pad. If off-center positioning is permitted, this is indicated for the corresponding outrigger pad with permissible support area.
- The required substructure for outrigger pads can be calculated from the load bearing capacity of the ground and the crawler pressures of the crane, see chapter 2.04. For the calculation examples, an even pressure distribution over the substructure surface is assumed.



Note

► An even pressure distribution over the substructure surface can be obtained by centrally positioning the crawler or the support plates on the outrigger pad.

2.2.1 Permissible load configurations

Pressure forces distribute themselves differently on the ground depending on the support type and the support condition. The permissible load configurations are shown in the following illustration.

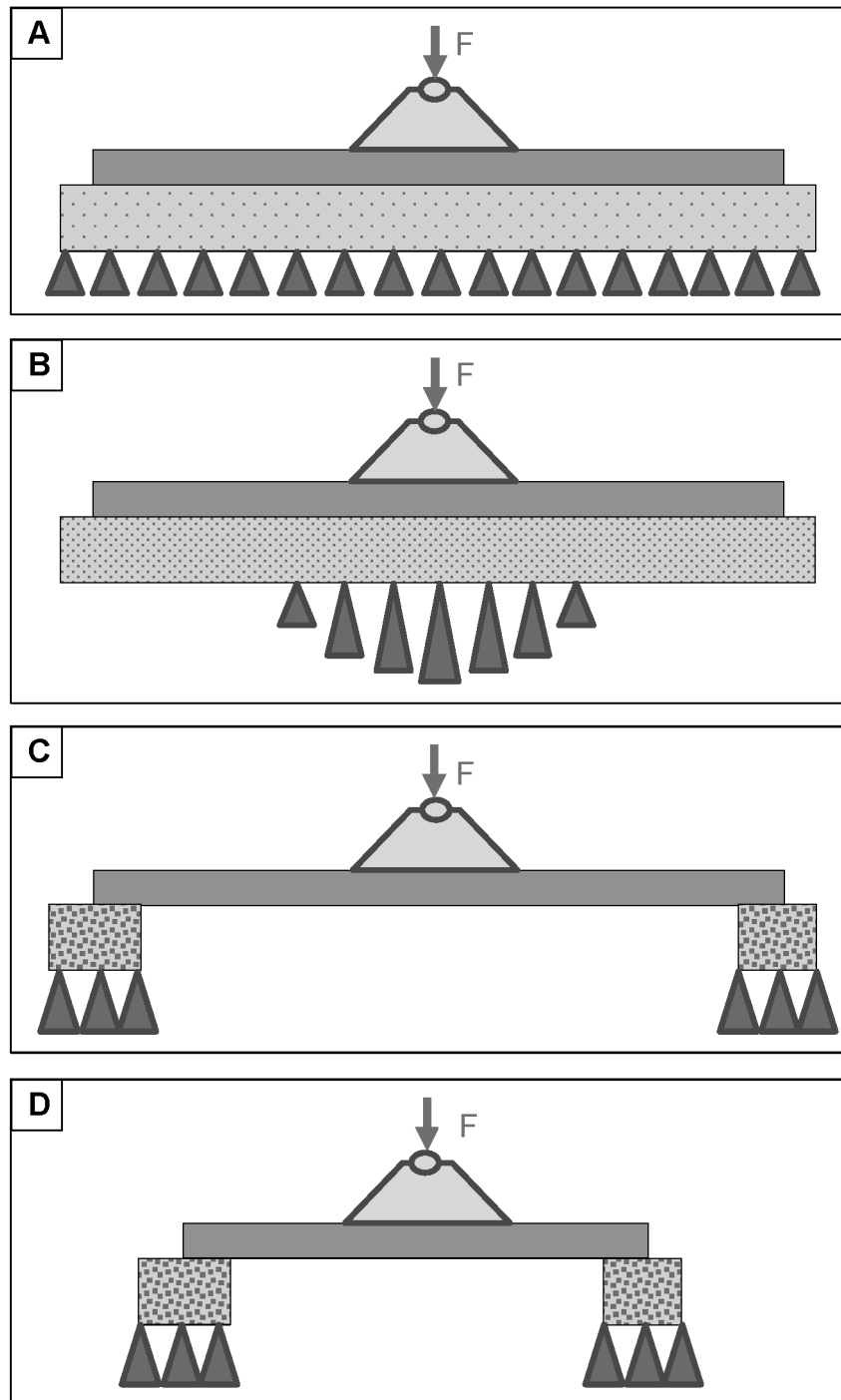


Fig.154921: Permissible load configurations

- | | |
|---|---|
| A Soft ground — even pressure distribution | C Bridge a cavity (longitudinal direction) — concentrated pressure distribution on the support surface |
| B Hard ground — concentrated pressure distribution in the middle | D Bridge a cavity (cross direction) — concentrated pressure distribution on the support surface |

3 Fastening the outrigger pad



WARNING

Incorrectly fastened outrigger pad!
Death, severe bodily injury, property damage.

- ▶ Fasten a maximum of **one** outrigger pad.
- ▶ Fasten the outrigger pad to **all** fastening points.
- ▶ Use only approved and suitable fastening equipment.
- ▶ Always maintain a sufficient distance from the suspended load.
- ▶ Carry out all crane movements with suspended load precisely and with caution.

3.1 Fastening the outrigger pad

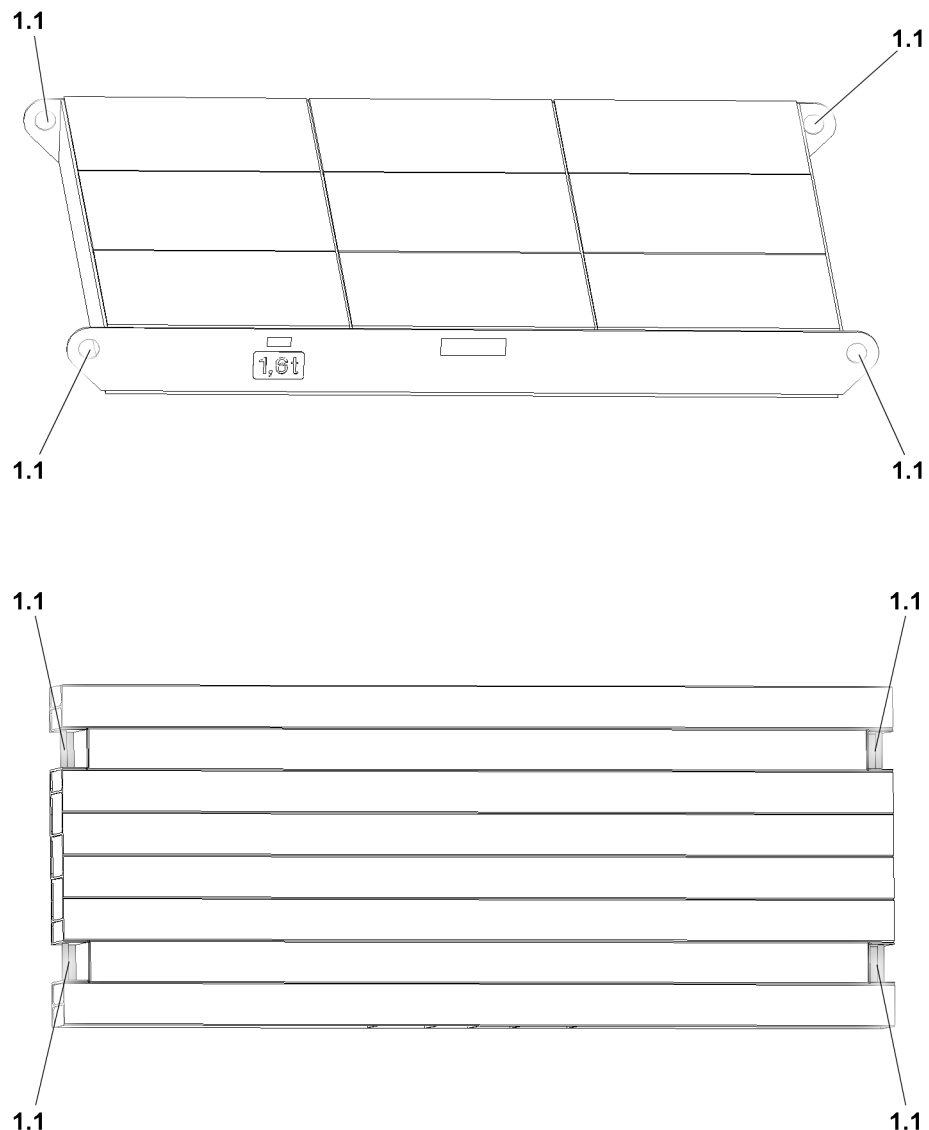


Fig.154993: Fastening points on the outrigger pads are shown as an example
Fasten the outrigger pad to the fastening points 1.1.

4 Technical outrigger pad data for cranes with a telescopic boom

The following description of the outrigger pads only applies for supported crane operation.

4.1 Outrigger pad LWE ID number 914786508

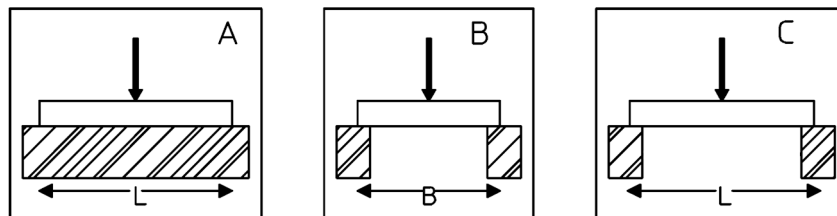


Fig.154815: Permissible support pressures

- A** The outrigger pad is placed completely on the surface
- B** The outrigger pad is positioned in the cross direction over a cavity
- C** The outrigger pad is placed in the longitudinal direction over a cavity

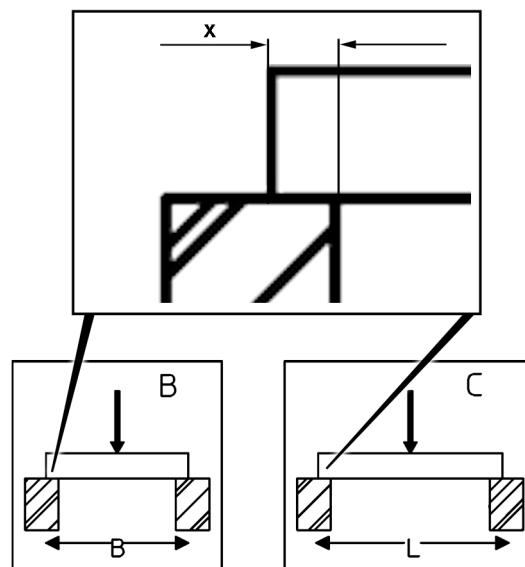


Fig.154911: Placement width x

The placement width x must be at least 1.5 x height of the outrigger pad.

| LWE ID number | Dimensions L x W x H ¹⁾ | Surface | Mass | Permissible support pressures | | |
|---------------|---------------------------------------|------------------|--------|-------------------------------|-----------------|-----------------|
| | | | | A ²⁾ | B ³⁾ | C ⁴⁾ |
| 914786508 | 1.0 x 1.0 x 0.12 m | 1 m ² | 130 kg | 100 t | 100 t | 100 t |

Outrigger pads for support load distribution

- ¹⁾ Dimensions in Length x Width x Height
- ²⁾ The outrigger pad is placed completely on the surface
- ³⁾ The outrigger pad is positioned in the cross direction over a cavity
- ⁴⁾ The outrigger pad is placed in the longitudinal direction over a cavity

4.2 Outrigger pad LWE ID number 914861908

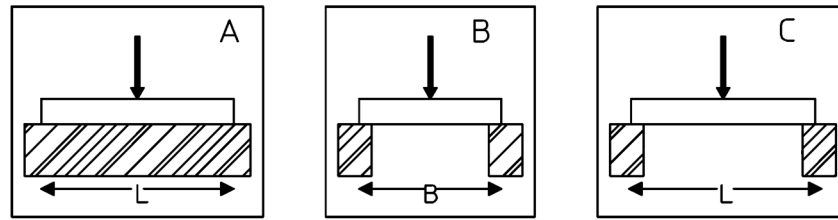


Fig.154815: Permissible support pressures

- A** The outrigger pad is placed completely on the surface
- B** The outrigger pad is positioned in the cross direction over a cavity
- C** The outrigger pad is placed in the longitudinal direction over a cavity

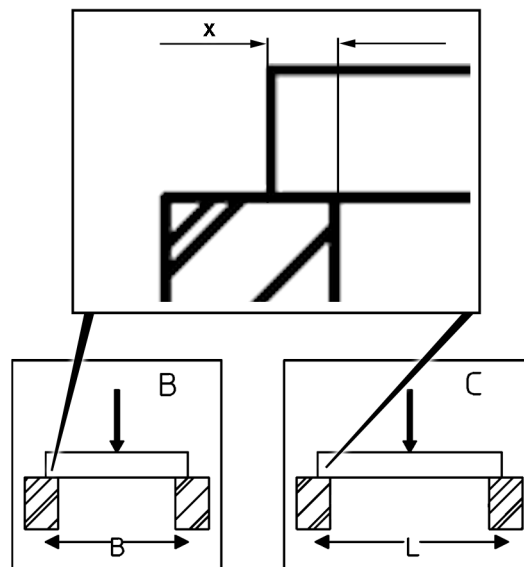


Fig.154911: Placement width x

The placement width x must be at least 1.5 x height of the outrigger pad.

| LWE ID number | Dimensions L x W x H ¹⁾ | Surface | Mass | Permissible support pressures | | |
|---------------|---------------------------------------|---------------------|--------|-------------------------------|-----------------|-----------------|
| | | | | A ²⁾ | B ³⁾ | C ⁴⁾ |
| 914861908 | 1.4 x 1.2 x 0.122 m | 1.68 m ² | 232 kg | 130 t | 130 t | 130 t |

Outrigger pads for support load distribution

- ¹⁾ Dimensions in Length x Width x Height
- ²⁾ The outrigger pad is placed completely on the surface
- ³⁾ The outrigger pad is positioned in the cross direction over a cavity
- ⁴⁾ The outrigger pad is placed in the longitudinal direction over a cavity

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4.3 Outrigger pad LWE ID number 914786808

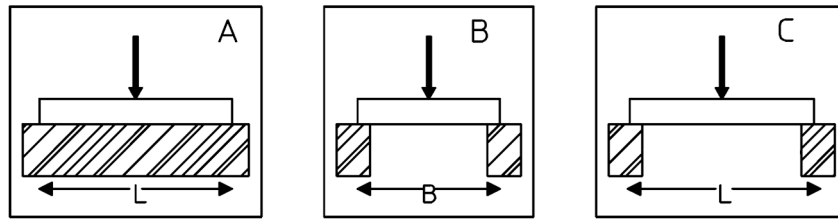


Fig.154815: Permissible support pressures

- A** The outrigger pad is placed completely on the surface
- B** The outrigger pad is positioned in the cross direction over a cavity
- C** The outrigger pad is placed in the longitudinal direction over a cavity

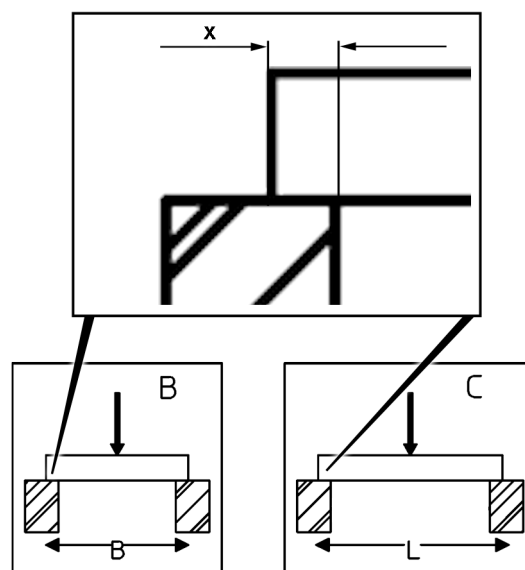


Fig.154911: Placement width x

The placement width x must be at least 1.5 x height of the outrigger pad.

| LWE ID number | Dimensions L x W x H ¹⁾ | Surface | Mass | Permissible support pressures | | |
|---------------|---------------------------------------|--------------------|--------|-------------------------------|-----------------|-----------------|
| | | | | A ²⁾ | B ³⁾ | C ⁴⁾ |
| 914786808 | 2.0 x 1.8 x 0.2 m | 3.6 m ² | 555 kg | 210 t | 210 t | 210 t |

Outrigger pads for support load distribution

- ¹⁾ Dimensions in Length x Width x Height
- ²⁾ The outrigger pad is placed completely on the surface
- ³⁾ The outrigger pad is positioned in the cross direction over a cavity
- ⁴⁾ The outrigger pad is placed in the longitudinal direction over a cavity

4.4 Outrigger pad LWE ID number 915236308

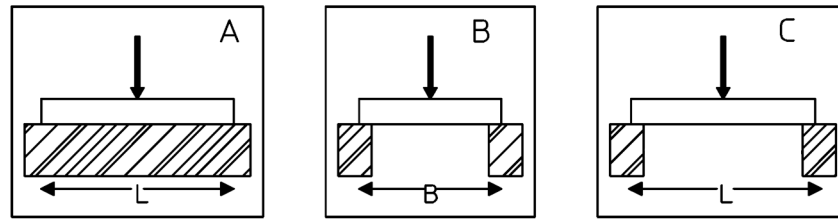


Fig.154815: Permissible support pressures

- A** The outrigger pad is placed completely on the surface
- B** The outrigger pad is positioned in the cross direction over a cavity
- C** The outrigger pad is placed in the longitudinal direction over a cavity

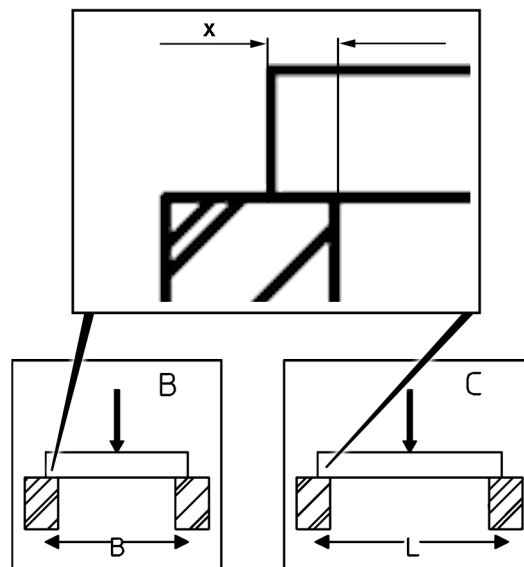


Fig.154911: Placement width x

The placement width x must be at least 1.5 x height of the outrigger pad.

| LWE ID number | Dimensions L x W x H ¹⁾ | Surface | Mass | Permissible support pressures | | |
|---------------|---------------------------------------|------------------|---------|-------------------------------|-----------------|-----------------|
| | | | | A ²⁾ | B ³⁾ | C ⁴⁾ |
| 915236308 | 2.5 x 2.4 x 0.25 m | 6 m ² | 1600 kg | 320 t | 320 t | 320 t |

Outrigger pads for support load distribution

- ¹⁾ Dimensions in Length x Width x Height
- ²⁾ The outrigger pad is placed completely on the surface
- ³⁾ The outrigger pad is positioned in the cross direction over a cavity
- ⁴⁾ The outrigger pad is placed in the longitudinal direction over a cavity

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4.4.1 Positioning the support plate off-center on the outrigger pad

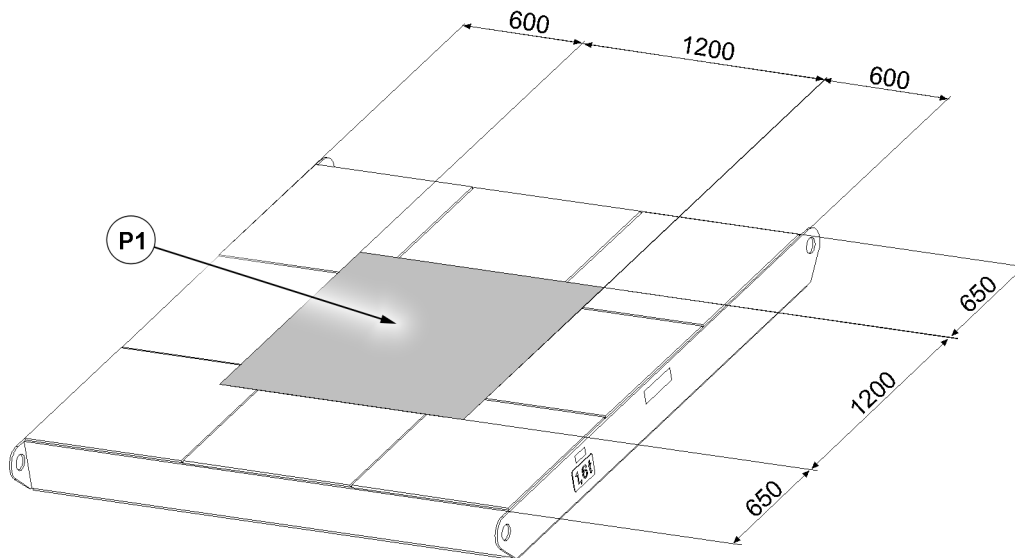


Fig.154923: Permissible placement surface for support plates

P1 Support surface for support plates with permissible support pressure 320 t

An even pressure distribution over the substructure surface can be obtained by centrally positioning the support plates on the outrigger pad.



WARNING

Impermissible support plate substructure!
The crane can topple over.
Death, bodily injury, property damage.

► Place the outrigger pads **centrally** or according to the description under the support plates.

4.5 Outrigger pad LWE ID number 915236408/915464608

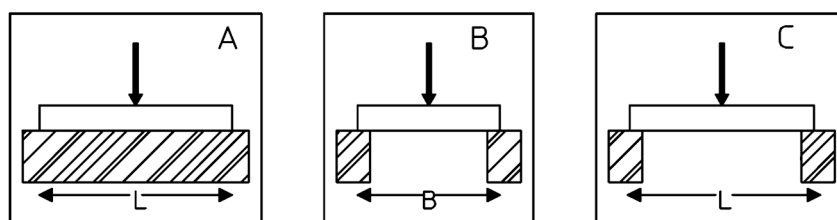


Fig.154815: Permissible support pressures

A The outrigger pad is placed completely on the surface
B The outrigger pad is positioned in the cross direction over a cavity

C The outrigger pad is placed in the longitudinal direction over a cavity

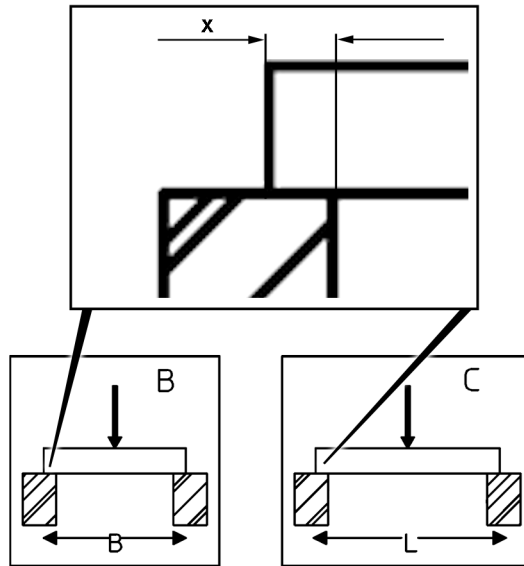


Fig.154911: Placement width x

The placement width x must be at least 1.5 x height of the outrigger pad.

| LWE ID number | Dimensions L x W x H ¹⁾ | Surface | Mass | Permissible support pressures | | |
|-------------------------|---------------------------------------|--------------------|---------|-------------------------------|-----------------|-----------------|
| | | | | A ²⁾ | B ³⁾ | C ⁴⁾ |
| 915236408/9154646 08 | 3.5 x 2.4 x 0.25 m | 8.4 m ² | 2350 kg | 320 t | 320 t | 320 t |

Outrigger pads for support load distribution

- ¹⁾ Dimensions in Length x Width x Height
- ²⁾ The outrigger pad is placed completely on the surface
- ³⁾ The outrigger pad is positioned in the cross direction over a cavity
- ⁴⁾ The outrigger pad is placed in the longitudinal direction over a cavity

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4.5.1 Positioning the support plate off-center on the outrigger pad

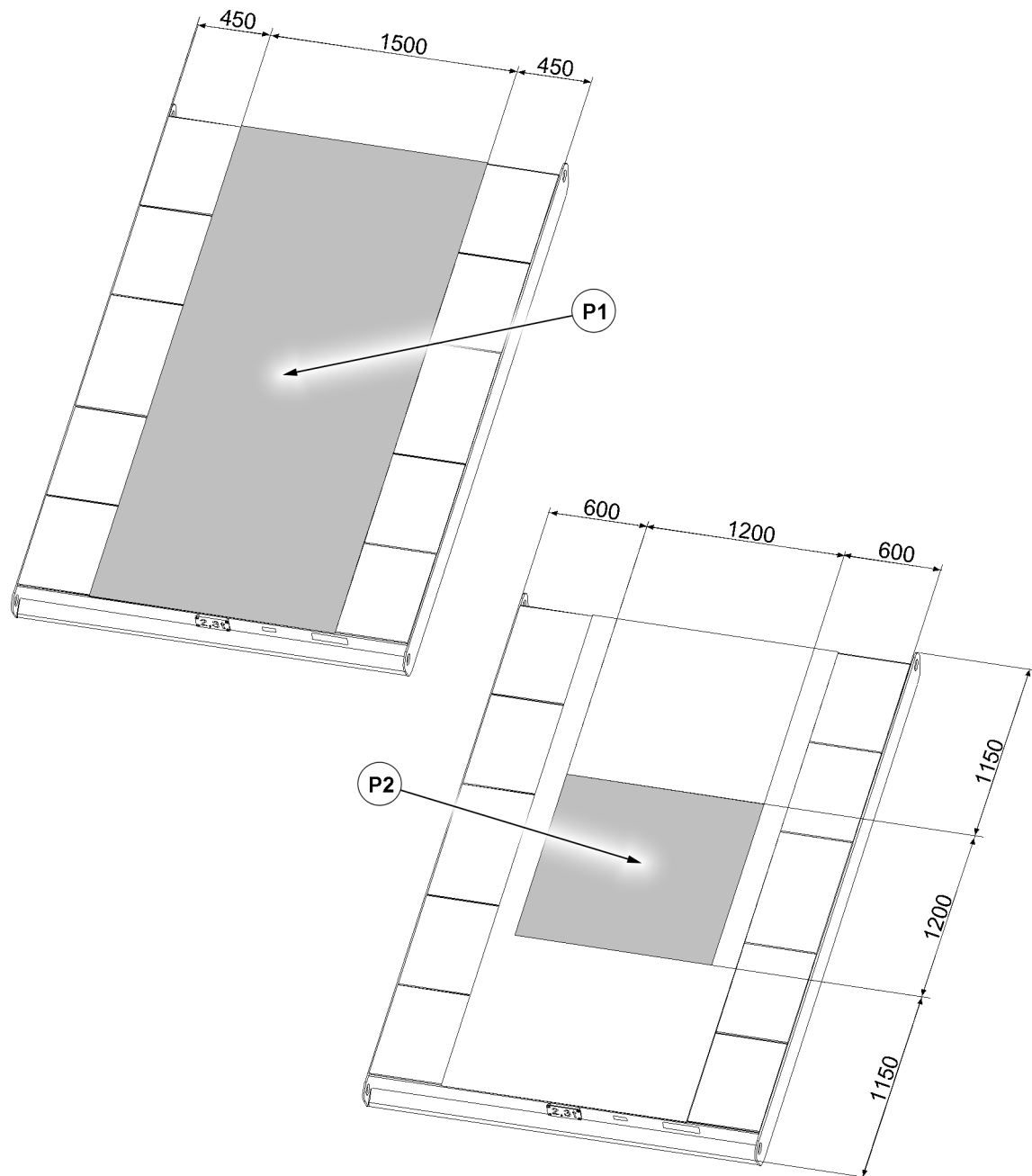


Fig. 154924: Permissible placement surface for support plates

P1 Support surface for small support plates with permissible support pressure 210 t

P2 Support surface for normal support plates with permissible support pressure 320 t

An even pressure distribution over the substructure surface can be obtained by centrally positioning the support plates on the outrigger pad.



WARNING

Impermissible support plate substructure!

The crane can topple over.

Death, bodily injury, property damage.

► Place the outrigger pads **centrally** or according to the description under the support plates.

5 Technical outrigger pad data for cranes with a lattice mast boom

The following description of the outrigger pads only applies for supported crane operation and in crane operation on crawler.

5.1 Outrigger pad LWE ID number 914618608

Observe the additional information:

- Installing and driving the outrigger pad, see chapter 3.05.

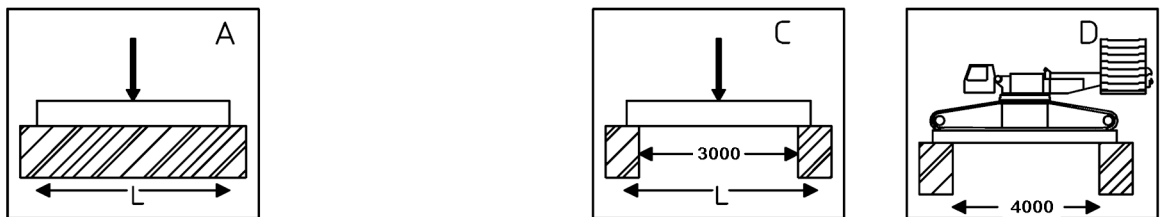


Fig.154942: Permissible support pressures

- A** The outrigger pad is placed completely on the surface
- C** The outrigger pad is placed in the longitudinal direction over a cavity
- D** The outrigger pad is placed in the longitudinal direction over a cavity and driven with the crawler crane



Note

- Driving the outrigger pads is only permissible with the own weight of the crane (without a hoist load).

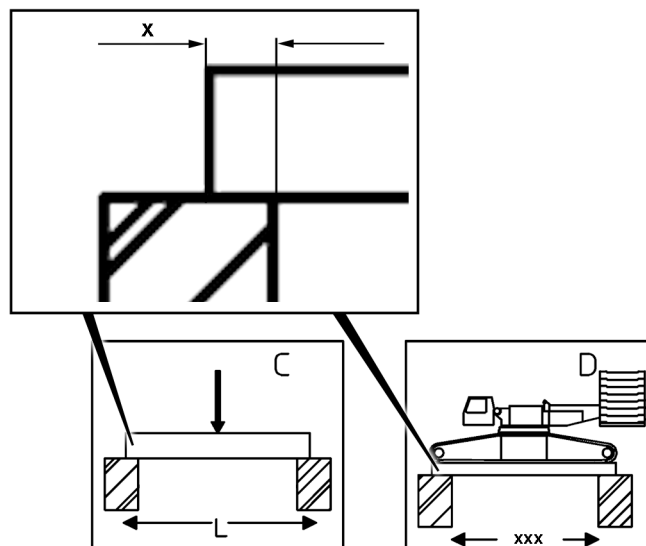


Fig.154941: Placement widths x

- C** The placement width must be at least 1.5 m.
- D** The placement width must be at least 1.0 m.

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| LWE ID number | Dimensions L x W x H ¹⁾ | Surface | Mass | Permissible support pressures | | | |
|---------------|---------------------------------------|---------------------|---------|-------------------------------|-----------------|-----------------|-----------------|
| | | | | A ²⁾ | B ³⁾ | C ⁴⁾ | D ⁵⁾ |
| 914618608 | 6.0 x 2.4 x 0.3 m | 14.4 m ² | 7800 kg | 450 t | | 450 t | |

Outrigger pads for support load distribution

1) Dimensions in Length x Width x Height

2) The outrigger pad is placed completely on the surface

3) The outrigger pad is positioned in the cross direction over a cavity

4) The outrigger pad is placed in the longitudinal direction over a cavity

5) The outrigger pad is placed in the longitudinal direction over a cavity and driven with the crawler crane

5.1.1 Positioning the support plate off-center on the outrigger pad

Off-center positioning is only permitted if the outrigger pad lies across the entire circumference (not only on two sides) on ground that is at least 100 mm wide.

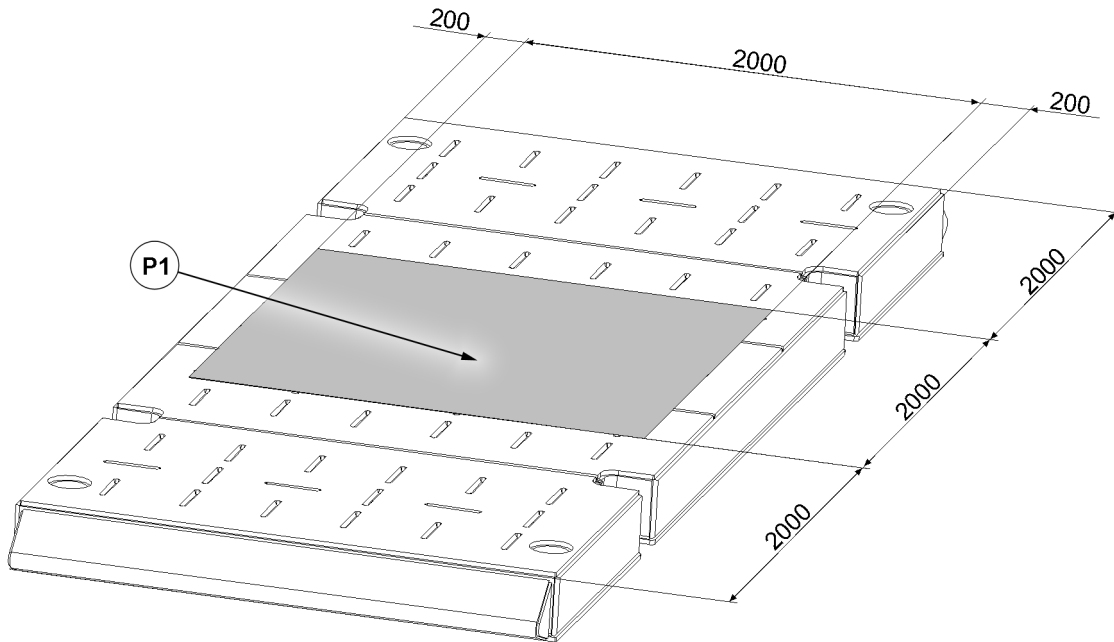


Fig.154926: Permissible placement surface for support plates

P1 Support surface for support plates with permissible support pressure 450 t

An even pressure distribution over the substructure surface can be obtained by centrally positioning the support plates on the outrigger pad.



WARNING

Impermissible support plate substructure!

The crane can topple over.

Death, bodily injury, property damage.

► Place the outrigger pads **centrally** or according to the description under the support plates.

5.2 Outrigger pad LWE ID number 915696408

Observe the additional information:

- Outrigger pad assembly, see chapter 3.10.

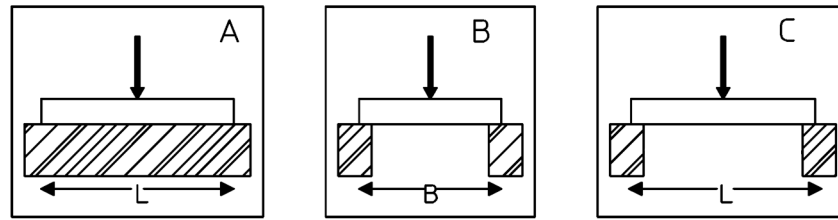


Fig.154815: Permissible support pressures

- A** The outrigger pad is placed completely on the surface
- B** The outrigger pad is positioned in the cross direction over a cavity
- C** The outrigger pad is placed in the longitudinal direction over a cavity

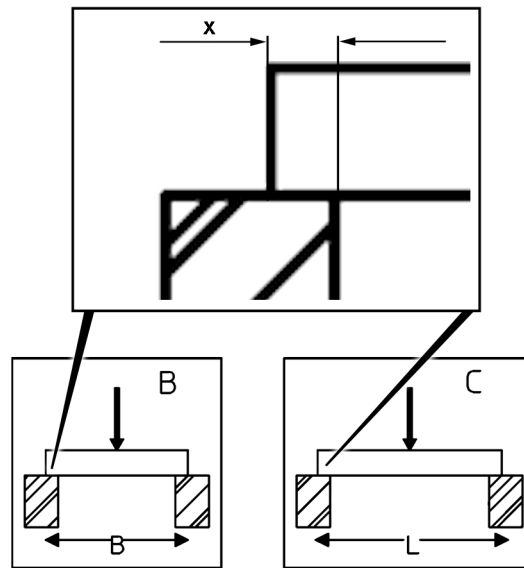


Fig.154911: Placement width *x*

The placement width *x* must be at least 2.5 x height of the outrigger pad.

| LWE ID number | Dimensions L x W x H ¹⁾ | Surface | Mass | Permissible support pressures | | |
|---------------|---------------------------------------|--------------------|---------|-------------------------------|-----------------|-----------------|
| | | | | A ²⁾ | B ³⁾ | C ⁴⁾ |
| 915696408 | 4.0 x 2.4 x 0.25 m | 9.6 m ² | 3300 kg | 450 t | 450 t | 450 t |

Outrigger pads for support load distribution

- ¹⁾ Dimensions in Length x Width x Height
- ²⁾ The outrigger pad is placed completely on the surface
- ³⁾ The outrigger pad is positioned in the cross direction over a cavity
- ⁴⁾ The outrigger pad is placed according to the longitudinal direction over a cavity

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5.3 Outrigger pad LTE ID number 918339808

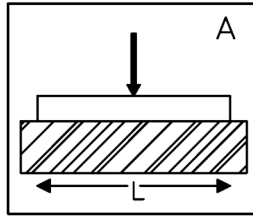


Fig.154917: Permissible support pressures

- A** The outrigger pad is placed completely on the surface

| LTE ID number | Dimensions L x W x H ¹⁾ | Surface | Mass | Permissible support pressures |
|---------------|---------------------------------------|---------------------|---------|-------------------------------|
| | | | | A²⁾ |
| 918339808 | 6.0 x 2.4 x 0.4 m | 14.4 m ² | 7900 kg | 265 t |

Outrigger pads for support load distribution

¹⁾ Dimensions in Length x Width x Height

²⁾ The outrigger pad is placed completely on the surface

5.3.1 Positioning the support plate off-center on the outrigger pad

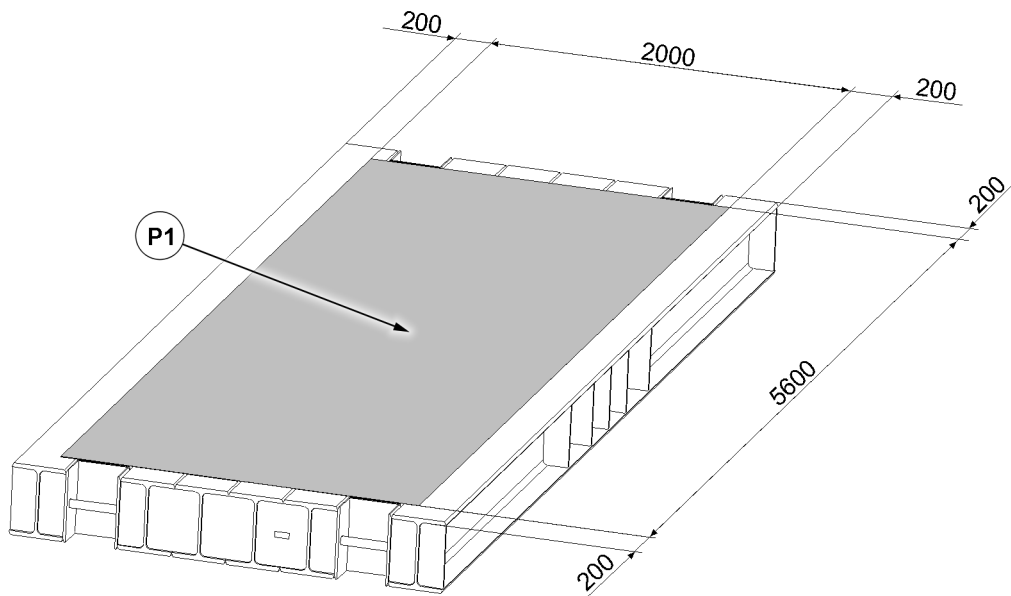


Fig.154925: Permissible placement surface for support plates

P1 Support surface for support plates with permissible support pressure 265 t

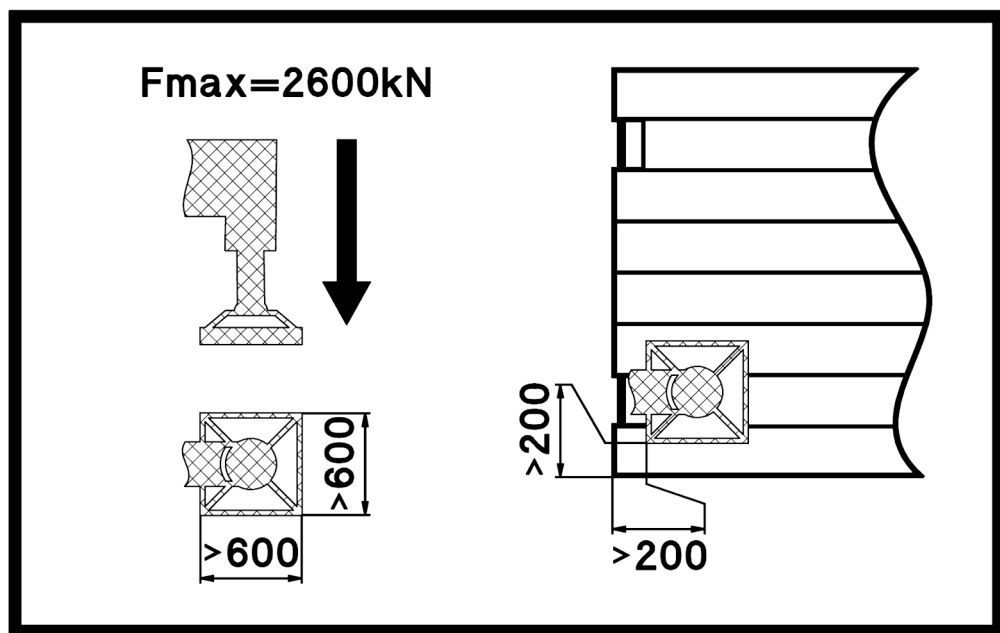


Fig.154913: Positioning the support plate is off-center on the outrigger pad

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An even pressure distribution over the substructure surface can be obtained by centrally positioning the support plates on the outrigger pad.



WARNING

Impermissible support plate substructure!
The crane can topple over.

Death, bodily injury, property damage.

► Place the outrigger pads **centrally** or according to the description under the support plates.

A support plate can be placed off-center on this outrigger pad. The minimum distance is 200 mm from the side edge of the outrigger pad. The side length of the support plate must be at least 600 mm.

5.3.2 Driving the outrigger pad in the cross direction with a crawler crane

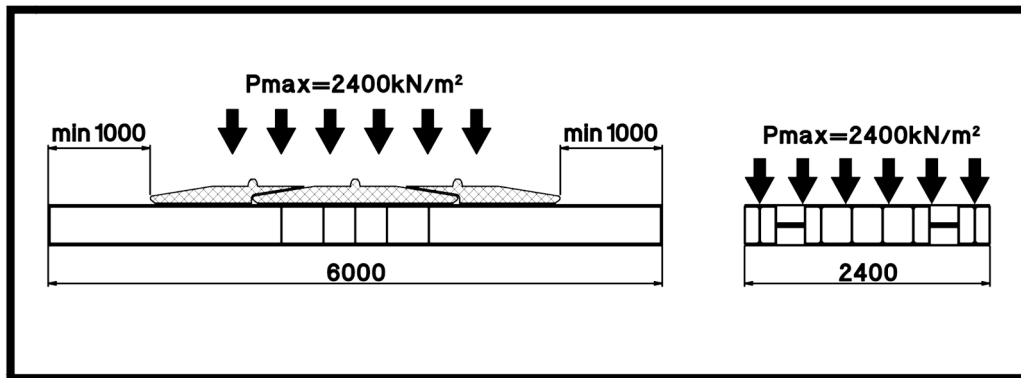


Fig.154912: Driving the outrigger pad in the cross direction with a crawler crane

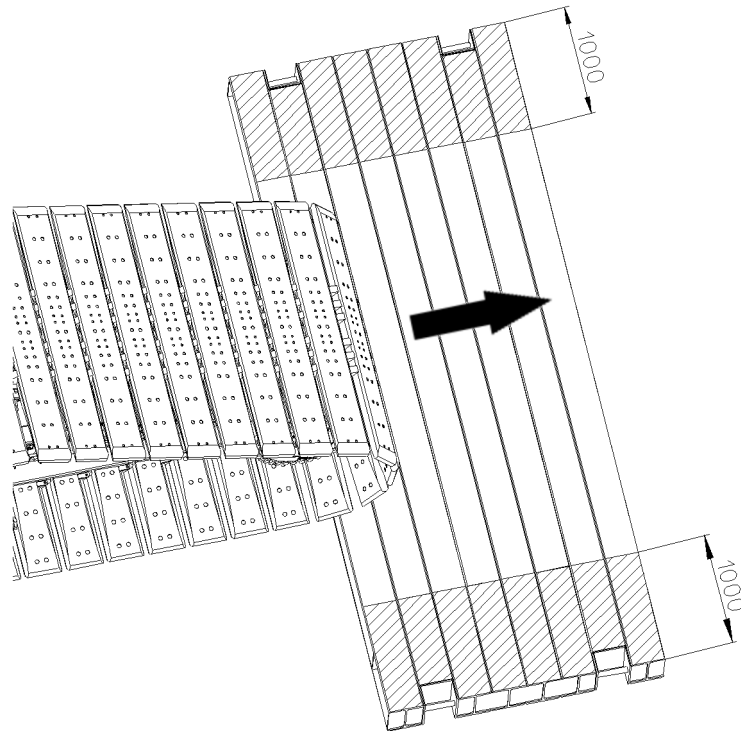


Fig.154922: Permissible driving range with the crawler crane

This outrigger pad can be driven in the cross direction with an approved crawler crane. The distance of at least 1000 mm to the side edges (longitudinal side) of the outrigger pad must be observed.

2 Safety

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2.03 Job planning

1 Planning Crane operation

3

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Fig.195219

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1 Planning Crane operation

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



WARNING

Missing information!

Death, severe bodily injuries, property damage.

► Obtain the required information and adhere to it.

Obtain the following information before crane operation and adhere to it:

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

Assemble the equipment for crane operation:

- Hook block / load hook
- Auxiliary boom
- Fastening equipment
- Counterweight
- Base materials for support plates

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2.04 Technical safety instructions

| | | |
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Fig.195219

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**Note**

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

1 Dangers on the crane

1.1 Chemicals

Proposition 65 of the US State of California warns against chemicals that are known to cause cancer and birth defects or other reproductive harm. For additional information, see the website: www.P65Warnings.ca.gov

| Proposition 65 | |
|----------------|--|
| | <p>WARNING: This product can expose you to chemicals, which are known to the State of California to cause cancer and birth defects or other reproductive harm.</p> <ul style="list-style-type: none"> • Avoid direct contact with chemicals. • Use personal protective equipment: Always wear protective gloves. • After handling: Wash hands thoroughly. • Dispose of chemicals in an environmentally acceptable manner according to local regulations. <p>For more information see: www.P65Warnings.ca.gov.</p> |

Fig.154660: Example of a Proposition 65 sign for USA: Chemicals

**WARNING**

Chemicals!

Damage to health such as cancer and birth defects or other reproductive harm.

- ▶ Avoid direct contact with chemicals.
- ▶ Use personal protective equipment: **Always** wear protective gloves.
- ▶ After handling: Wash hands thoroughly.
- ▶ Dispose of chemicals in an environmentally acceptable manner according to local regulations.

1.2 Diesel engine exhaust emissions

Proposition 65 of the US State of California warns against diesel engine exhaust emissions that are known to cause cancer and birth defects or other reproductive harm. For additional information, see the website: www.P65Warnings.ca.gov


| Proposition 65 | |
|---|---|
|  | <p>WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.</p> <ul style="list-style-type: none"> • Always start and operate the engine in a well-ventilated area. • If in an enclosed area, vent the exhaust to the outside. • Do not modify or tamper with the exhaust system. • Do not idle the engine except as necessary. <p>For more information see: www.P65Warnings.ca.gov/diesel.</p> |

Fig.154661: Example of a Proposition 65 sign for USA: Diesel engine exhaust emissions



WARNING

Diesel engine exhaust emissions!

Damage to health such as cancer and birth defects or other reproductive harm.

- ▶ Always start and operate the diesel engine in properly ventilated spaces.
- ▶ If in enclosed areas: Direct the exhaust gas to the outside.
- ▶ Do not convert the exhaust system or make any other changes.
- ▶ Do not run the engine at idle speed for longer than necessary.

1.3 Lead and lead compounds

Proposition 65 of the US State of California warns against lead and lead compounds that are known to cause cancer and birth defects or other reproductive harm. For additional information, see the website: www.P65Warnings.ca.gov


| Proposition 65 | |
|---|---|
|  | <p>WARNING: This product can expose you to chemicals, including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm.</p> <ul style="list-style-type: none"> • Avoid direct contact with batteries and their components. • Do not touch them with bare hands. • Use personal protective equipment: Always wear protective gloves. • After handling: Wash hands thoroughly. • Dispose of disused batteries in an environmentally acceptable manner according to local regulations. <p>For more information see: www.P65Warnings.ca.gov.</p> |

Fig.154662: Example of a Proposition 65 sign for USA: Lead and lead compounds

**WARNING**

Batteries, battery poles, battery terminals and other battery components contain lead and lead compounds!

Damage to health such as birth defects and other reproductive harm.

- ▶ Avoid direct contact with batteries and their components.
- ▶ Do not touch them with bare hands.
- ▶ Use personal protective equipment: **Always** wear protective gloves.
- ▶ After handling: Wash hands thoroughly.
- ▶ Dispose of disused batteries in an environmentally acceptable manner according to local regulations.

1.4 Hydraulic oil, diesel fuel, operating fluids

**WARNING**

Due to technical defects or open tank covers, hydraulic oil, diesel fuel or service fluids spill out! Dirt from the road and ground.

Traffic endangerment: Danger of skidding, death, severe bodily injuries.

Environmental pollution: Death, severe damage to health.

- ▶ Remedy the technical defect immediately.
- ▶ Securely close the tank cover after refuelling.
- ▶ Immediately and thoroughly remove traces of hydraulic oil, diesel fuel, operating fluids.
- ▶ Avoid skin contact with hydraulic oil, diesel fuel and operating fluids.
- ▶ Wear personal protective equipment.

**WARNING**

Hot hydraulic oil! Hot service fluids!

Severe burns, severe scalds and severe bodily injuries.

- ▶ Before all work: Let hot hydraulic oil and hot operating fluids cool off.
- ▶ Avoid contact with hot hydraulic oil and hot operating fluids.
- ▶ Wear personal protective equipment.

1.5 Heated crane components

**WARNING**

Heated crane components! Hot surfaces!

Severe burns.

This applies in particular to exhaust systems, engines and transmissions.

- ▶ Let the components cool down before touching them.
- ▶ Proceed with special caution near heated crane components.
- ▶ Avoid skin contact with hot surfaces.
- ▶ Use personal protective equipment, such as protective gloves.

2 Danger zone of crane

2.1 Crane in operation

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

**WARNING**

Do not stay in danger zone!

Personnel within the danger zone can be hit by falling loads or components.

Personnel in the danger zone can be caught by moving crane components or loads.

Fatal or severe injuries can be the result.

- ▶ Warn any personnel within the danger zone with the warning device of the crane.
- ▶ After the warning is issued, wait and ensure that no personnel remains within the danger zone.
- ▶ If required, block off the danger zone at a safety distance.

2.2 Crane out of service

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

**WARNING**

Actual wind speed higher than the wind speed permitted for the crane set up configuration!

Personnel within the danger zone can be hit by a toppling crane or crane components.

- ▶ Make sure that the condition of the crane complies with the regulations and the wind speed charts.
- ▶ If required, block off the danger zone at a safety distance.

**WARNING**

Icing on the boom!

Personnel within the danger zone can be hit by a falling ice.

- ▶ Make sure that there is no personnel in the danger zone.
- ▶ If required, block off the danger zone at a safety distance.

3 Traffic endangerment and environmental damage

**WARNING**

Danger of slipping and skidding!

If the road becomes contaminated due to technical defects, open tank covers or leaking hydraulic oil, then this would pose a severe traffic endangerment.

Fatal accidents can result.

- ▶ Remove oil immediately and thoroughly.

4 Endangering air traffic

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

**WARNING**

Endangering air traffic!

If no protective measures are taken, this can result in endangerment to air traffic.

- ▶ Get the approval from agency responsible for air traffic.
- ▶ Install the airplane warning light on the boom head and turn it on.
- ▶ If the airplane warning lights is operated for a longer period of time, with the engine turned off, then the battery can be discharged and as the result the airplane warning light turns off. To prevent the battery from discharging, an external electrical power supply must be established.

5 Movement on the crane



WARNING

Danger of slipping and falling!

The traction of steps, walkways and hand rails changes due to effects of the weather, such as wetness, ice, snow, frost and dirt.

Personnel can be severely injured or killed.

The crane can be damaged.

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

6 Emergency exit

6.1 Emergency exit - driver's cab

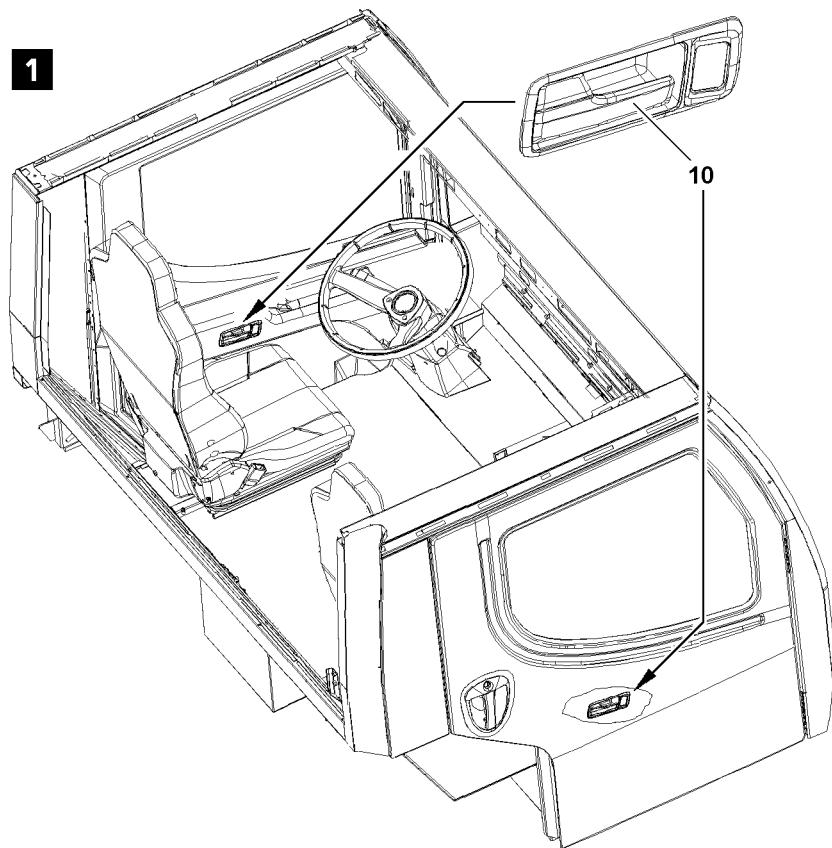


Fig.120932: Example of emergency exit - driver's cab

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



Note

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

6.2 Emergency crane cab exit



WARNING

Danger of falling!

If the crane driver cannot leave the crane cab through the door or if the crane cab is tilted, then there is a danger of falling during the emergency exit.

Death or severe injuries.

► Exit carefully in an emergency.

During the emergency exit there is an increase danger of accidents:

► Accept help from others.

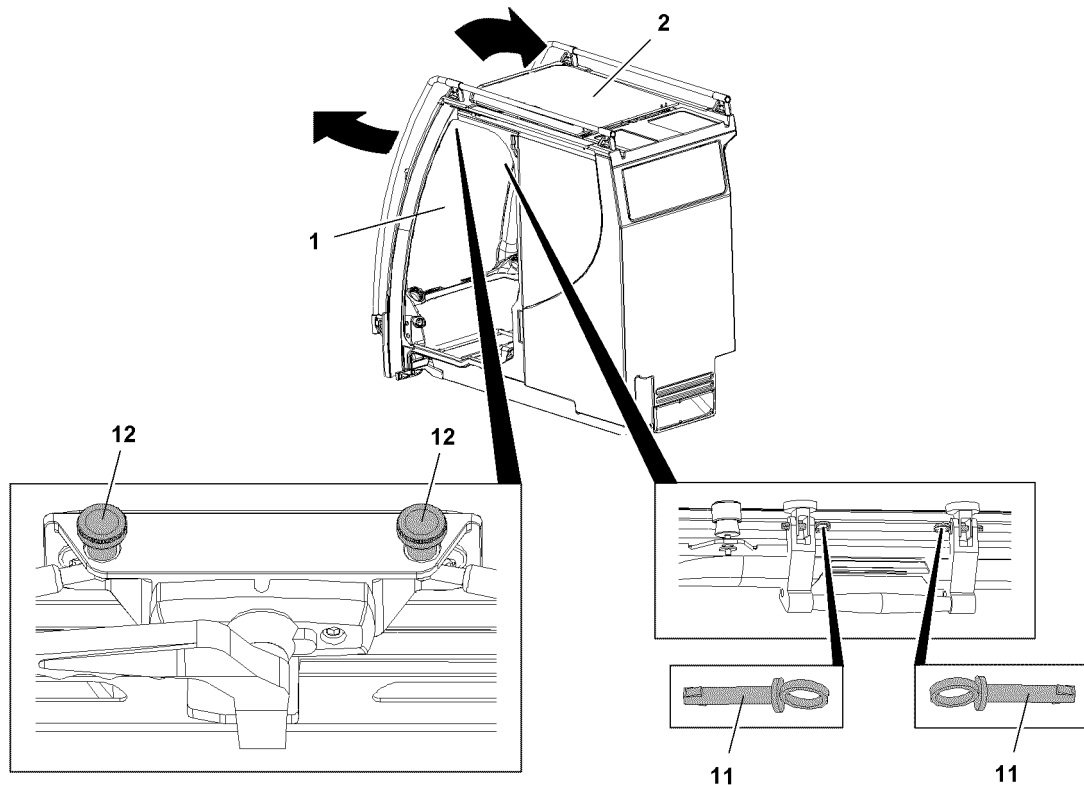


Fig.121111: Examples of emergency exit from the crane cab

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

The following openings are possible:

- 1 Front window
- 2 Roof window

6.2.1 Emergency exit through front window

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

6.2.2 Emergency exit through the roof window

There are two ways to unlock the roof window 2 for the emergency exit:

- Unpin both pins 11.
- Release both thumbscrews 12.
- Unlock all turn handles.

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

6.2.3 Emergency exit with EMERGENCY hammer*

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

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

7 Personal protective equipment

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

Personal protective equipment includes the following:

- Supplied fall arrest system (safety harness and height safety equipment)
- Supplied height rescue system
- Head protection with chin strap
- Safety shoes
- Protective gloves
- Safety goggles
- Warning apparel
- Hearing protection
- Respiratory protection



WARNING

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

The crane operator must ensure the following:

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

7.1 Supplied fall arrest system

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

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



WARNING

Persons not secured!
Personnel can fall down. Death, severe bodily injuries.

- ▶ Use the supplied fall arrest system.

**WARNING**

Fall arrest system damaged!

Personnel can fall down. Death, severe bodily injuries.

- ▶ Do **not** use a damaged fall arrest system.
- ▶ Replace a damaged fall arrest system immediately with a new fall arrest system.
- ▶ Do **not** use the fall arrest system as fastening equipment for loads.
- ▶ Protect the fall arrest system from external influences.

The fall arrest system must be protected against the following external influences:

- Extreme temperatures
- Guiding the connecting devices over or around sharp edges
- Chemical influences
- Electrical influences
- Cuts, wear
- Climatic effects

**Note**

If the fall arrest system (safety harness and height safety equipment) is not available or is damaged:

- ▶ Order is from Liebherr-Werk Ehingen GmbH.

Identification and operating instructions

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

7.1.1 Safety harness with height safety equipment

The fall arrest system consists of the following components:

- Safety harness **1** approved according to **EN 361**
- Single strand height safety equipment **2** approved according to **EN 360** (for horizontal use and sharp edges)
- or two strand height safety equipment **3** approved according to **EN 360** (for horizontal use and sharp edges)

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

**WARNING**

Impermissible fall arrest system!

Personnel can fall down. Death, severe bodily injuries.

- ▶ Utilize exclusively a fall arrest system from Liebherr-Werk Ehingen GmbH.

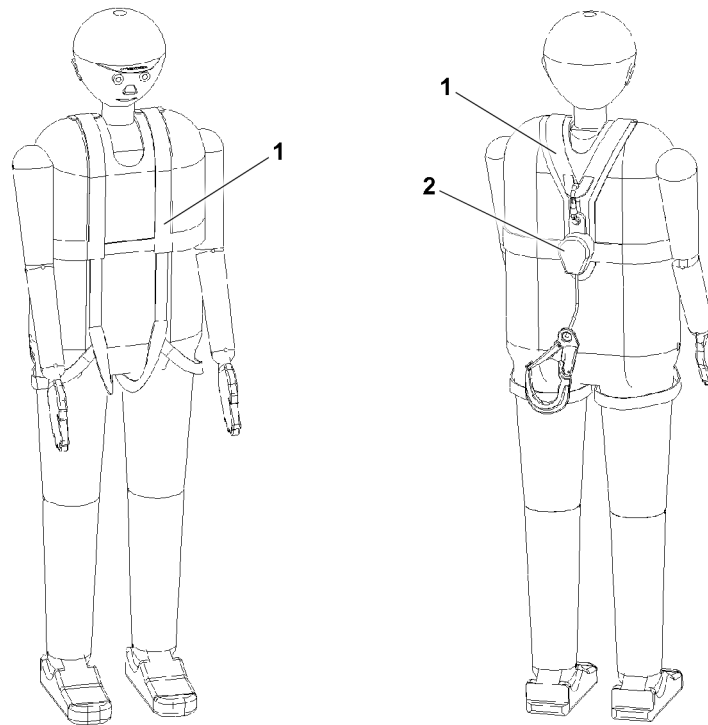


Fig.146453: Example of a safety harness 1 with a single strand height safety equipment 2

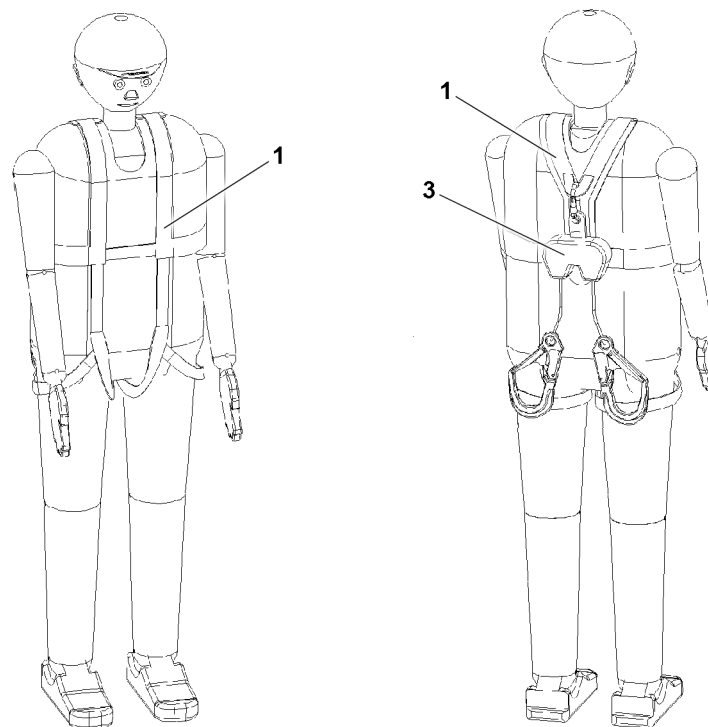


Fig.146454: Example of a safety harness 1 with a two strand height safety equipment 3

Prior to crane operation:

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

Handling the supplied fall arrest system:

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

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

Behavior in the case of a fall, damage or impairment of the functionality:

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

Storage of the fall arrest system:

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

The operator must ensure the following:

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

Single strand height safety equipment

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

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

Two strand height safety equipment

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

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



WARNING

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

When two safety ropes are present on the booms, lattice sections or other components:

- ▶ Only use the height safety equipment with two belt straps.
- ▶ Hook one belt strap with snap hook for the fall arrest system per safety rope.
- ▶ When transferring to new safety equipment, a snap hook for the fall arrest system must **always** be hooked.

7.2 Height rescue system

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

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

The height rescue system consists of the following components:

- Rappelling rescue device
- Telescopic rod for hooking the snap hook on the safety harness



WARNING

Height rescue system not present!

Fallen person cannot be saved. Suspension trauma, death, severe bodily injuries.

- ▶ Always have the height rescue system ready.



WARNING

Height rescue system damaged!

Personnel cannot be saved.

- ▶ Do **not** use a damaged height rescue system.
- ▶ Replace a damaged height rescue system immediately with a new height rescue system.
- ▶ Protect the height rescue system from external influences.

The height rescue system must be protected against the following external influences:

- Extreme temperatures
- Chemical influences
- Electrical influences
- Cuts, wear
- Climatic effects

Prior to crane operation:

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

Handling the height rescue system:

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

Behavior in the case of a fall, damage or impairment of the functionality:

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

Storage of the height rescue system:

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

The operator must ensure the following:

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

7.3 Hard hat

Wear a hard hat with a chin strap, if head injuries are possible. For example, due to:

- Striking
- Falling, tipping or flying objects
- Oscillating objects

Replace the hard hat immediately, if:

- If is struck with force
- It has visible defects
- The maximum service life specified by the manufacture has been reached

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



WARNING

Suspended and falling loads!

Death, severe bodily injuries.

- ▶ Do **not** remain under suspended loads.

7.4 Protective gloves

Wear protective gloves, if hand injuries are possible. For example, due to:

- Pointy or sharp objects
- Hot surfaces

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

7.5 Safety shoes

Wear safety shoes, if foot injuries are possible. For example, due to:

- Oscillating or falling parts
- Pointy or sharp objects
- Impact or trapping
- Slipping on slippery ground or surfaces

7.6 Warning apparel

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

The „warning clothing“ category includes, for example:

- Safety vest
- Safety jacket
- Safety pants

7.7 Safety goggles

Wear safety goggles when eye injuries are possible. For example, due to:

- Corrosive fluids
- Pressurized fluids
- Flying parts

7.8 Hearing protection

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

7.9 Respiratory protection

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

7.10 Aids for work at a height

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

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

- Work platforms

- Scaffolding
- Assembly platform
- Catwalks
- Ladders

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



WARNING

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

When work platforms, scaffolding, catwalks or similar are not available and the work cannot be carried out from the ground:

- ▶ Secure personnel with the supplied fall arrest system to prevent falling.

When fall protection equipment such as hook points, safety ropes and fastening points are available on the crane:

- ▶ Secure personnel with the fall arrest system to the fall protection equipment. See chapter 2.06.

When stepping on a ladder:

- ▶ Do not hold any objects in your hands.
- ▶ Adhere to the 3-point support. See chapter 2.04.10.

Rules when using the aids:

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

8 Supplied fire extinguisher

Storage of the fire extinguisher:

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

Before crane operation and travel operation:

- Make sure that the fire extinguisher is always freely accessible and functional.

After use:

- Have the fire extinguisher refilled immediately or replaced.

Replace the fire extinguisher immediately, if:

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

The operator must ensure the following:

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

9 Securing persons to prevent them from falling



WARNING

Danger of falling!

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

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

When performing assembly or disassembly work on a ladder, people can fall down:

- A second person must be present to hand the necessary items to the person on the ladder.

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

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

9.2 Walking on the telescopic boom



WARNING

Danger of falling!

The assembly personnel can fall down by slipping on the telescopic boom and be killed or severely injured!

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

Assembly of the hoist rope or the TY-guying:

- During assembly, the assembly personnel must hook themselves on the fastening devices on the left and right with both snap hooks of the fall arrest system and secure themselves against falling.

9.3 Accessing the lattice sections or booms

Climbing the ladder:

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

Changing from ladder to catwalk **without** transition aid:

- From a transition height above 1.8 m: **Before** transitioning, assembly personnel must hook at least one snap hook of the fall arrest system to a safety rope and secure themselves against falling.

Changing from ladder to catwalk **with** transition aid:

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

9.4 Walking on lattice sections or booms

Walking on catwalks:

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

9.5 Working on lattice sections or booms

Pinning, unpinning the lattice sections of pull rods:

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

Fastening the lattice sections:

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

9.6 Descending from lattice sections or booms

Accessing the ladder **without** transition aid:

- From a transition height above 1.8 m: **Before** stepping on the ladder, assembly personnel must hook at least one snap hook of the fall arrest system to a safety rope and secure themselves against falling.
- When stepping on the ladder, the assembly personnel must ensure a 3-point support.
- The snap hook of the fall arrest system may only be unhooked after standing safely on the ladder (3-point support).

Accessing the ladder **with** transition aid:

- When stepping on the ladder, the assembly personnel must ensure a 3-point support.

Climbing down the ladder:

- When descending, the assembly personnel must ensure a 3-point support.

10 Rescuing the assembly personnel

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

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



WARNING

Danger of falling!

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

10.1 First aid measures after rescue



WARNING

Danger of fatal injury!

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

11 Crane cab

11.1 Extendible step* for cranes on tires

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

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

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



WARNING

Extendible step in the incorrect position!

Personnel can fall down. Death, severe bodily injuries.

- ▶ Make sure that the extendible step is in the correct position.

When directly accessing the crane cab via the ladder from the ground or when directly descending from the crane cab via the ladder to the ground:

- The extendible step must be **retracted**.

When accessing the crane cab via the crane chassis or the crane superstructure:

- The extendible step must be **extended**.

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

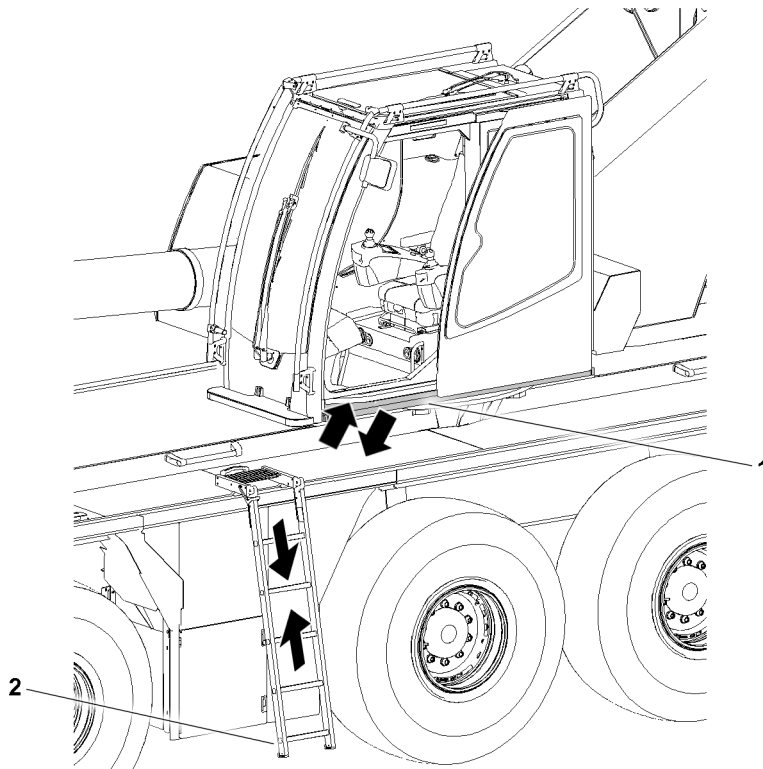


Fig.152871: Crane superstructure in the 0° position or 180° position: Step retracted

Prior to ascending to the crane cab via the ladder from the ground or before descending from the crane cab via the ladder **2** to the ground, the following prerequisites must be met:

- The crane superstructure is in the 0° position or 180° position.
- In the case of a crane cab with incline adjustment: The crane cab is in the horizontal position.
- The step **1** under the crane cab is **retracted**.
- The folding ladders are in the ascent and descent position.



WARNING

Extendible step in the incorrect position!

Personnel can fall down. Death, severe bodily injuries.

- ▶ Make sure that the extendible step is fully retracted.



WARNING

The step **1** cannot be retracted!

People can fall during ascent and descent via the ladder **2**. Death, severe bodily injuries.

- ▶ Guarantee safe ascent / descent: Set up suitable climbing aids, such as a platform or ladder.

11.1.2 Crane cab access on the crane chassis

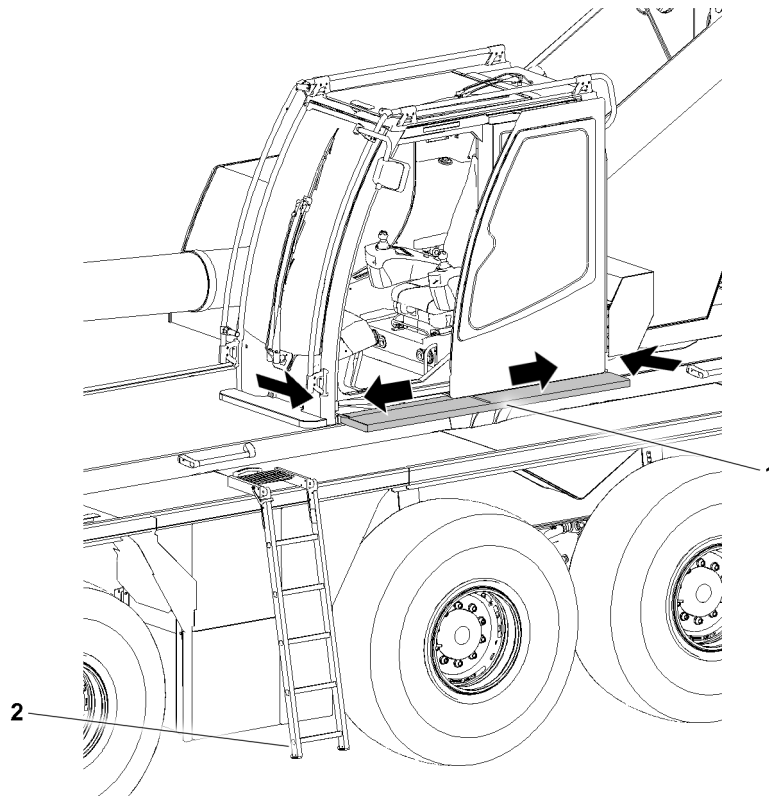


Fig.152870: Crane superstructure in the 0° position or 180° position: Step **extended**

When accessing the crane cab via the crane chassis or the crane superstructure the following prerequisites must be met:

- The extendible step **must** be extended.
- In the case of a crane cab with incline adjustment: The crane cab is in the horizontal position.



WARNING

Extendible step in the incorrect position!
Personnel can fall down. Death, severe bodily injuries.

- ▶ Make sure that the extendible step is fully extended.

11.1.3 Crane cab access with a turned crane superstructure

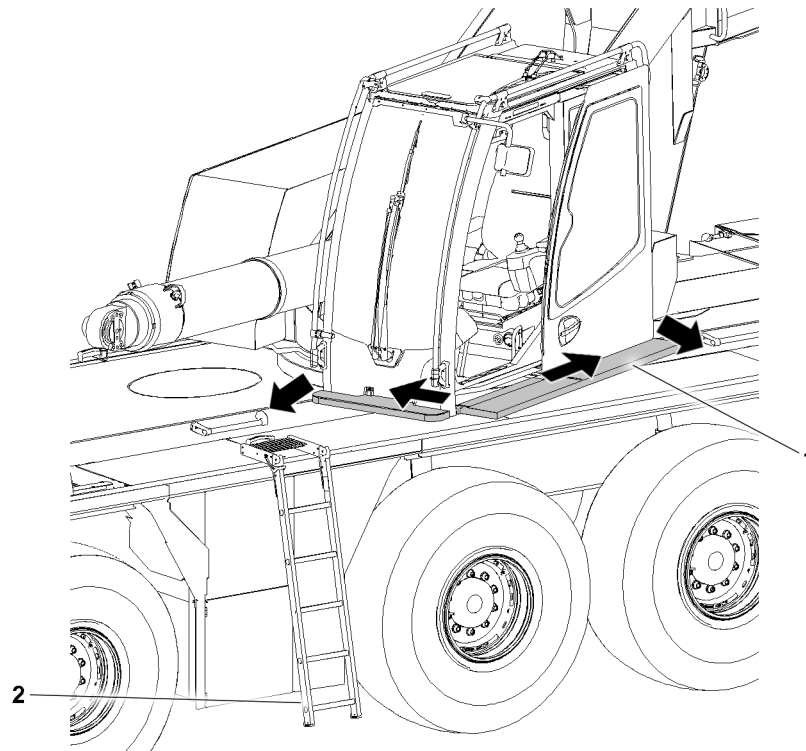


Fig.152872: Crane superstructure turned: Step extended

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

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



WARNING

Extendible step in the incorrect position!

Personnel can fall down. Death, severe bodily injuries.

- ▶ Make sure that the extendible step is fully extended.

11.2 Extendible step* for LTR cranes

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

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

11.2.1 Extendible step for LTR 1060 and LTR 1100

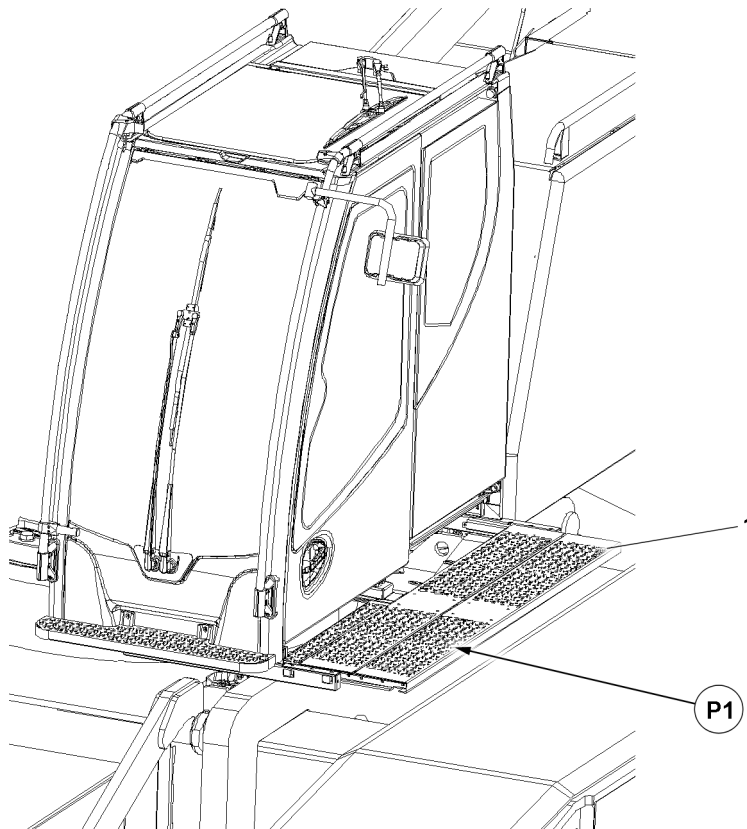


Fig.149549: Extendible step for LTR 1060 and LTR 1100

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

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

- The crane superstructure is in the 0° position or 180° position.
- In the case of a crane cab with incline adjustment: The crane cab is in the horizontal position.
- The step 1 under the crane cab is extended in position P1.



WARNING

The crane superstructure is in 0°-position or in 180° position and the step 1 is **not** extended! Personnel can fall down. Death, severe bodily injuries.

- ▶ Before entering or exiting: Extend the step 1 completely.

If the step 1 **cannot** be extended:

- ▶ Guarantee safe entry and exit: Set up suitable climbing aids, such as a platform or ladder.



WARNING

The crane **cannot** be brought into the safe 0° position or 180° position for ascent or descent via the walking surfaces of the crawler chain!

The distance between the step and the walking surfaces of the crawler chain is more than 300 mm. Personnel can fall down. Death, severe bodily injuries.

- ▶ Guarantee safe ascent and descent: Set up suitable climbing aids, such as a platform or ladder.

11.2.2 Extendible step for LTR 1220

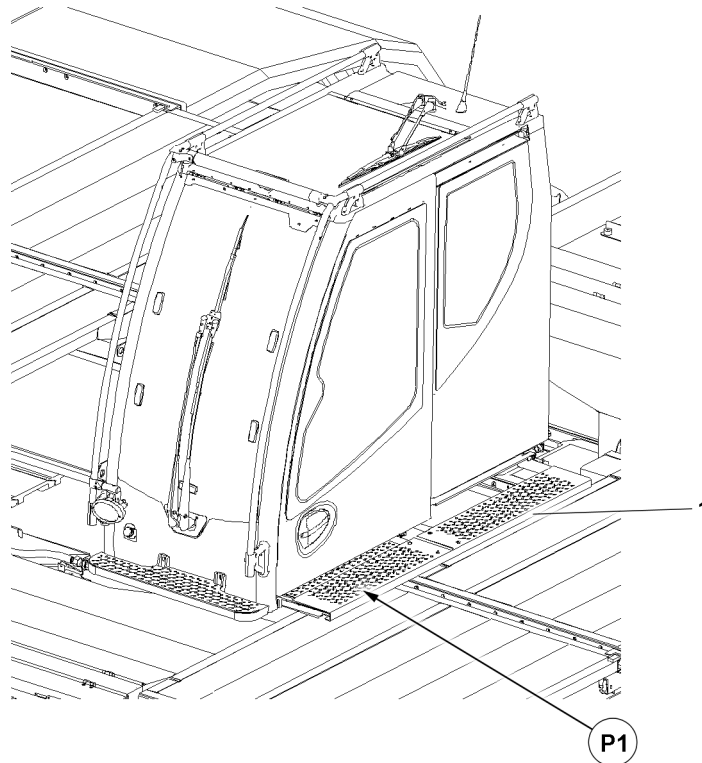


Fig.149550: Extendible step for LTR 1220

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

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

- The crane superstructure is turned to the point where a safe access to walkable surfaces of the crane chassis is ensured.
- In the case of a crane cab with incline adjustment: The crane cab is in the horizontal position.
- The step 1 under the crane cab is extended in position P1.



WARNING

The crane **cannot** be brought into the safe 0° position or 180° position for ascent or descent via the walking surfaces of the crawler chain!

The distance between the step and the walking surfaces of the crawler chain is more than 300 mm. Personnel can fall, death, severe bodily injuries.

- ▶ Guarantee safe ascent and descent: Set up suitable climbing aids, such as a platform or ladder.

11.3 Crane cab with incline adjustment



WARNING

Danger of falling!

If the crane cab cannot be swung from an inclined position (for example 20° position) to the horizontal position, for example due to a problem, then utmost caution must be used when entering and exiting. Personnel can fall, death, severe bodily injuries.

- ▶ For safety reasons, we recommend making use of outside help.
- ▶ If necessary, have platforms or other suitable entry aids set up to ensure safe exit from the crane cab.

**WARNING**

Danger of accident!

If the door of the crane cab is opened in inclined position, then the door can move back suddenly. Hands can be crushed or injured.

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

11.4 Securing bracket

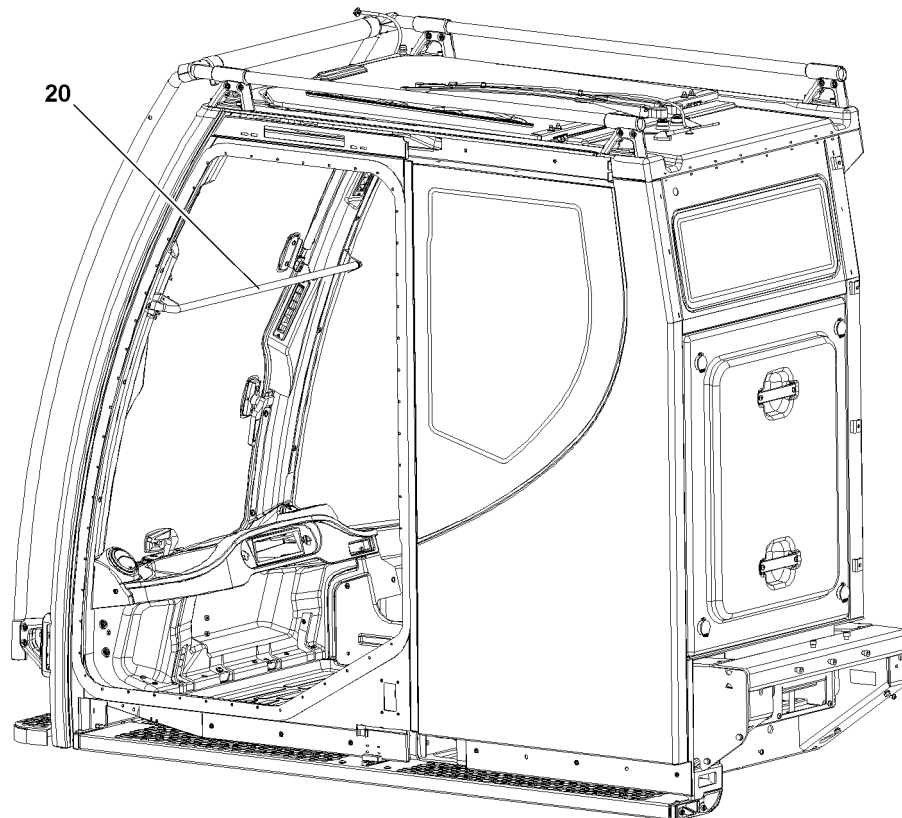


Fig.121158: Example of crane cab with securing bracket

**Note**

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

11.5 Closing the side window pane

**WARNING**

Danger of crushing!

Never close the side window pane carelessly or uncontrolled. Significant crushing injuries can occur.

- ▶ During closing, watch the side window pane as it moves up.
- ▶ Make sure that no personnel or objects are crushed.

12 Transport



WARNING

Error during transport!

Death, severe bodily injuries, property damage.

- ▶ To avoid accidents, observe and follow the notes provided in the following sections.
- ▶ Observe the legal as well as country-specific regulations for load securing.



WARNING

Falling of crane components!

If rigging devices are released and removed from crane components after transport, the crane components can slip or fall over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the crane components are fastened to the auxiliary crane after releasing the rigging devices.
- ▶ Make sure that the fastening equipment is tensioned before releasing the rigging devices on the crane components.

12.1 Crane and crane components

Follow the notes provided below to safely transport the crane and crane components:

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

12.2 Lattice sections

Follow the notes provided below to safely transport the telescoped lattice sections:

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

12.3 Fiber guy ropes



WARNING

Damage to the fiber guy ropes during storage and transport!

If the following prerequisites for storage and transport are not observed, then the load bearing capacity can be significantly reduced and the fiber guy ropes can rip off.

Death, severe bodily injuries, property damage.

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

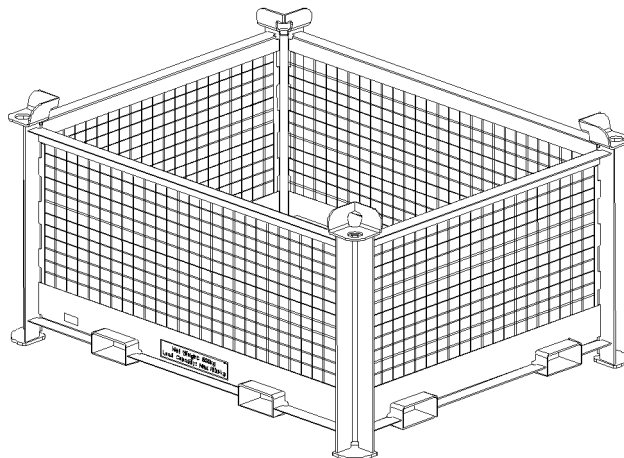


Fig.149503: Transport box for fiber guy ropes

12.4 Mobile cranes

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

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

12.5 Accelerating, changing the load

NOTICE

Permissible acceleration exceeded!
Damage to the crane.

- ▶ Observe the maximum permissible longitudinal acceleration of 1.0 g.
- ▶ Observe the maximum permissible lateral acceleration of 0.8 g.
- ▶ Offloading and running is prohibited during rail transport.

If higher accelerations are expected (sea transport, rail transport, maneuvering operation):

- ▶ Carry out the special measures to secure the crane and crane components.

NOTICE

Frequent dynamic load change!
Premature fatigue of load bearing crane components.

- ▶ Demount and properly secure components with large masses.
- ▶ Prior to transport: Have the rigging points and crane structures checked for damage by an authorized inspector. See chapter 8.01.

13 Fastening



WARNING

Defective fastening equipment or fastening points!
The load can fall down.

- ▶ Make sure that the fastening points and fastening equipment are in a perfect condition.
- ▶ Regularly check the rigging points and fastening points. See the Crane operating instructions, chapter 8.01.
- ▶ Check the fastening equipment regularly. See the Crane operating instructions, chapter 8.01.



WARNING

Load bearing capacity of the fastening equipment is **not** sufficient!
The load can fall down.

- ▶ Determine the weight of the crane component to be fastened.
- ▶ Fasten the components solely with approved and sufficiently load bearing fastening equipment.



WARNING

Component incorrectly fastened!
The load can fall down.

- ▶ Attach the components only on the intended fastening points.

14 Heated crane components



WARNING

Danger of burns!

You can get severely burnt on the surfaces of hot components.

This applies especially to exhaust systems, the engines and the respective gears in the crane chassis and in the crane superstructure.

- ▶ Let the components cool down before touching them.
- ▶ Proceed with special caution near heated crane components.

15 Crane operator responsibilities

15.1 General

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

The following important safety instructions will help you achieve this.

Many crane accidents are caused by crane control errors.



WARNING

Danger due to operating error!

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

Operating errors, which are made again and again during travel operation or crane operation are especially careless while working, in particular:

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

In many cases, crane damage is caused by improper maintenance:

- Insufficient oil, grease or antifreeze
- Contamination
- Broken cable wires, defective tires, worn components
- Emergency limit switch or load torque limiter (LMB) not operating properly
- Brake and clutch failure
- Hydraulic defects; for example cracked hoses
- Loose bolts

15.2 Working on the crane superstructure or boom



WARNING

Danger of falling!

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

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

15.3 Obligations of the crane operator

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

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

16 Selecting the location

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

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

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

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

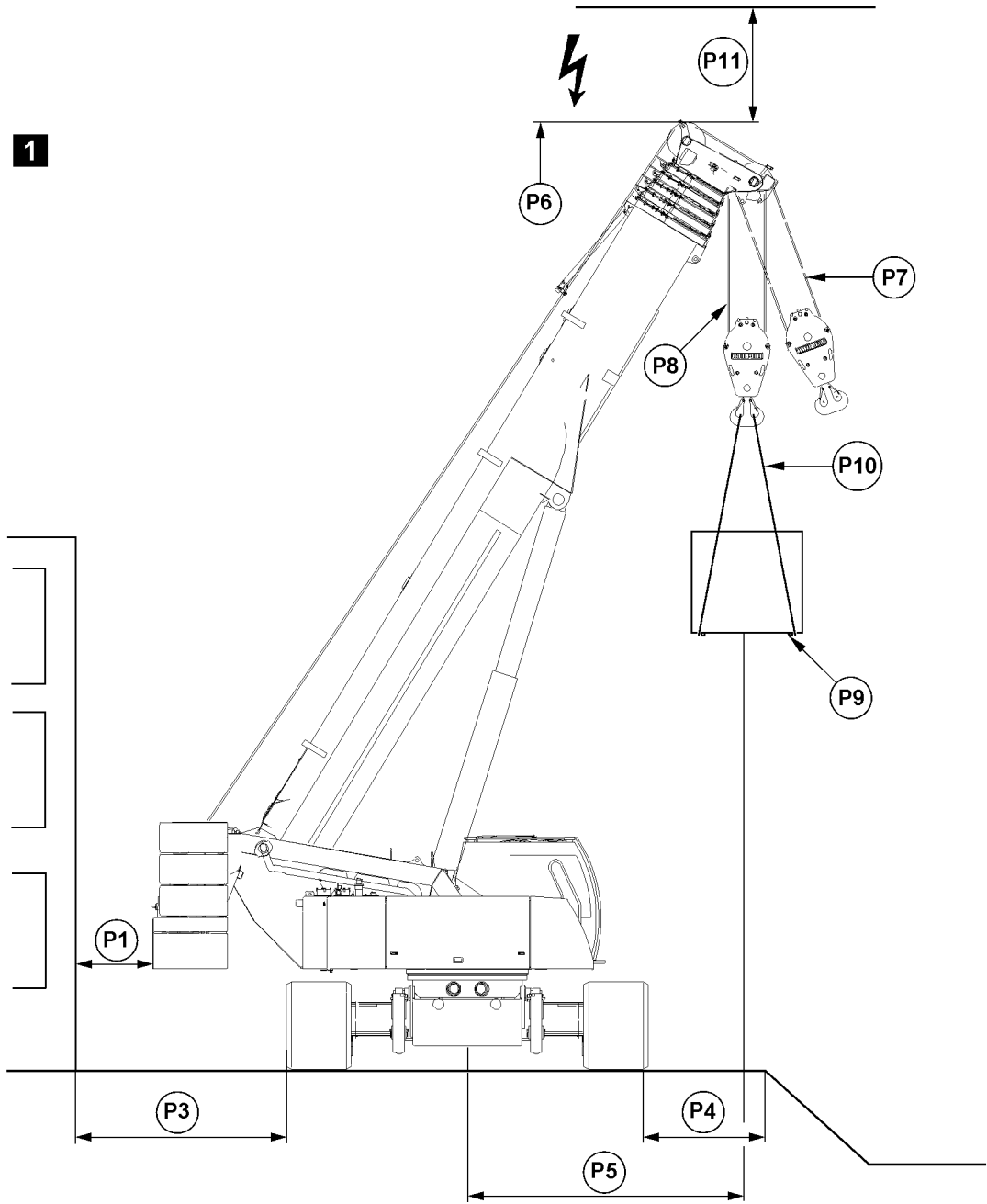


Fig.121166: Example of crawler crane with telescopic boom

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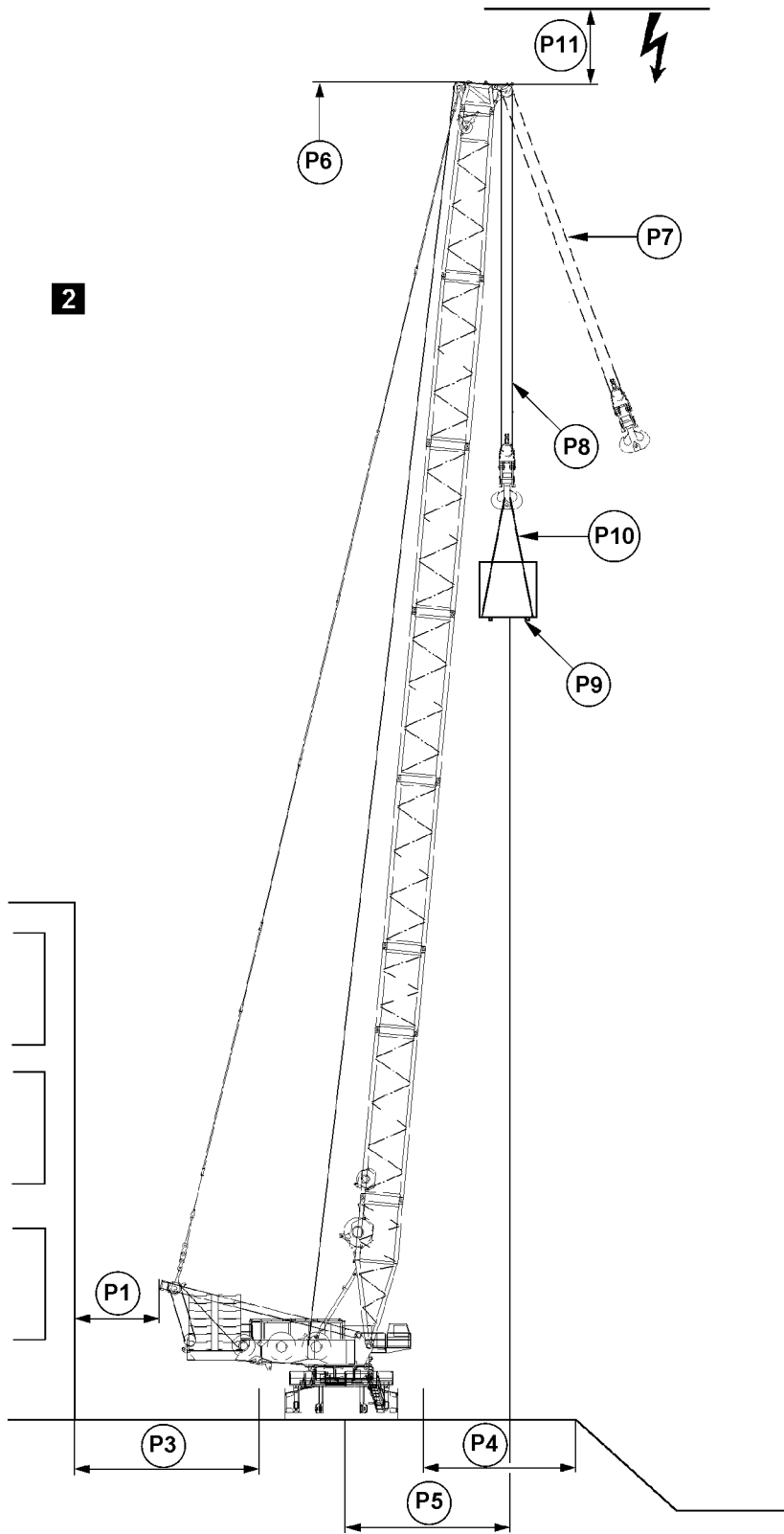


Fig.121167: Example of crawler crane with lattice mast boom

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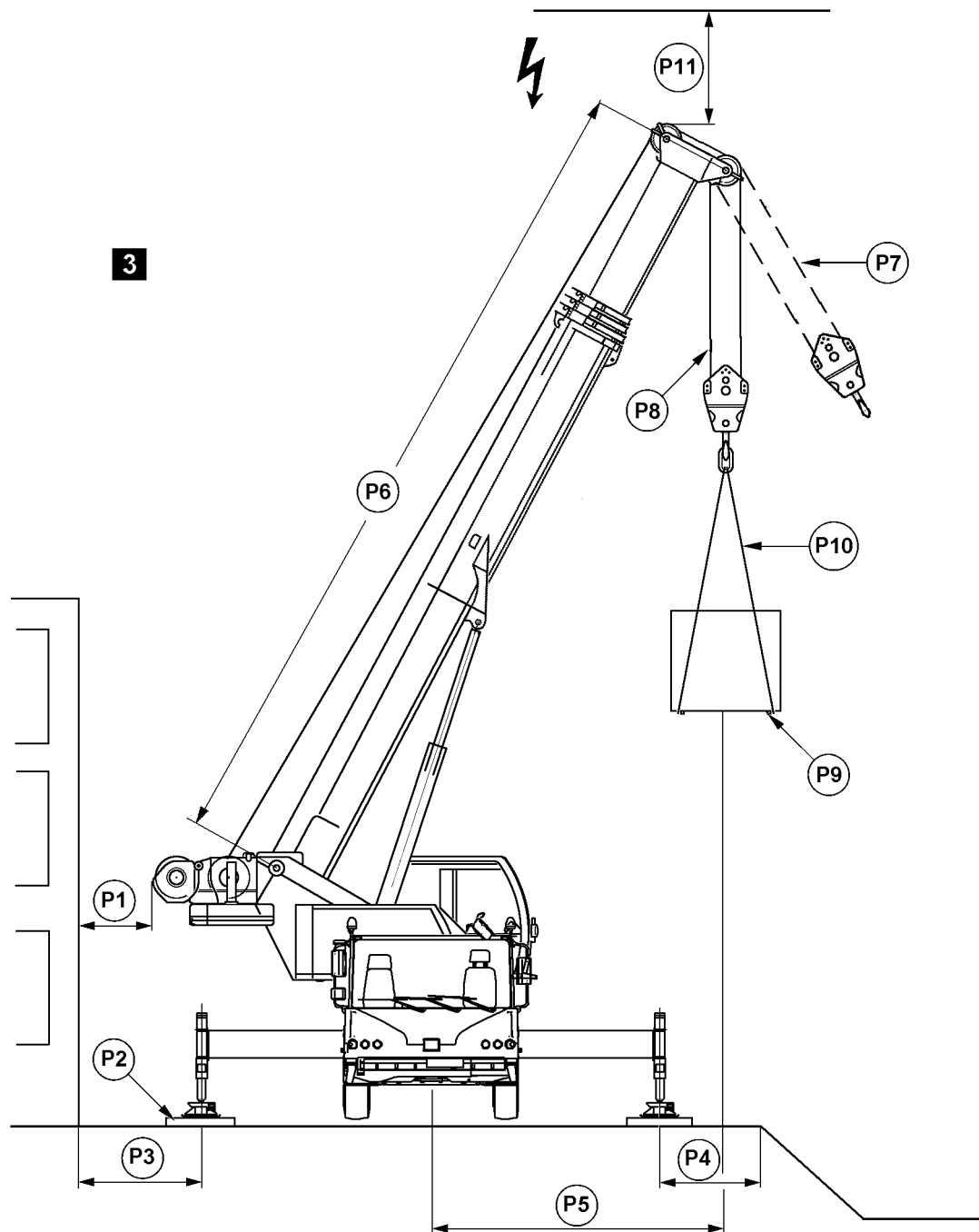


Fig.121168: Example of mobile cranes



DANGER

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

If the crane is supported or driven on ground with **insufficient** load bearing capacity, then the crane can topple over and kill personnel.

- ▶ Only support or drive the crane on ground with sufficient load bearing capacity.
- ▶ Act responsibly when planning and selecting the crane location and route.
- ▶ Observe the following points.

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

17 Slopes and excavations

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

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

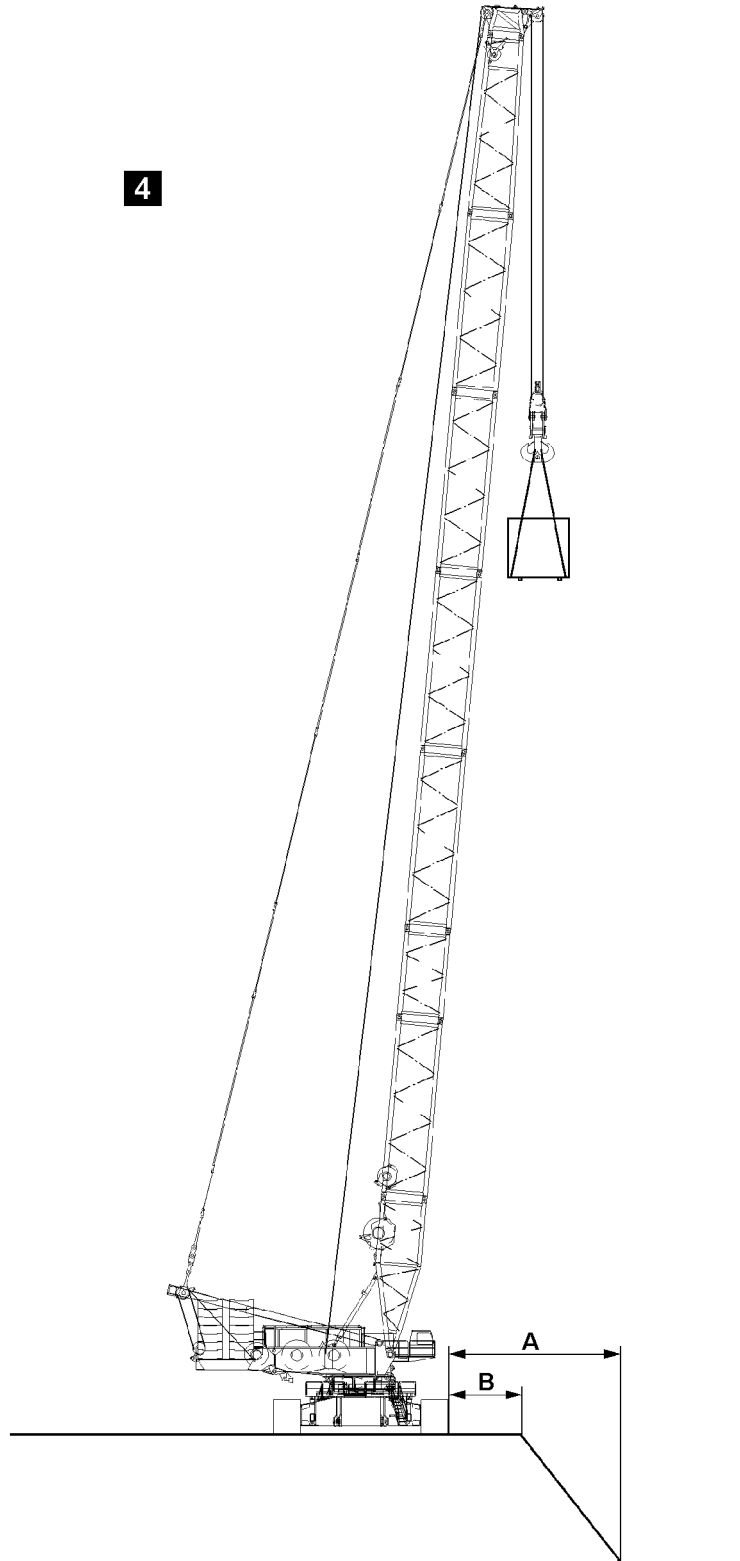


Fig.121162: Example of crawler cranes

- A** Distance from the bottom of excavation
- B** Distance from the excavation

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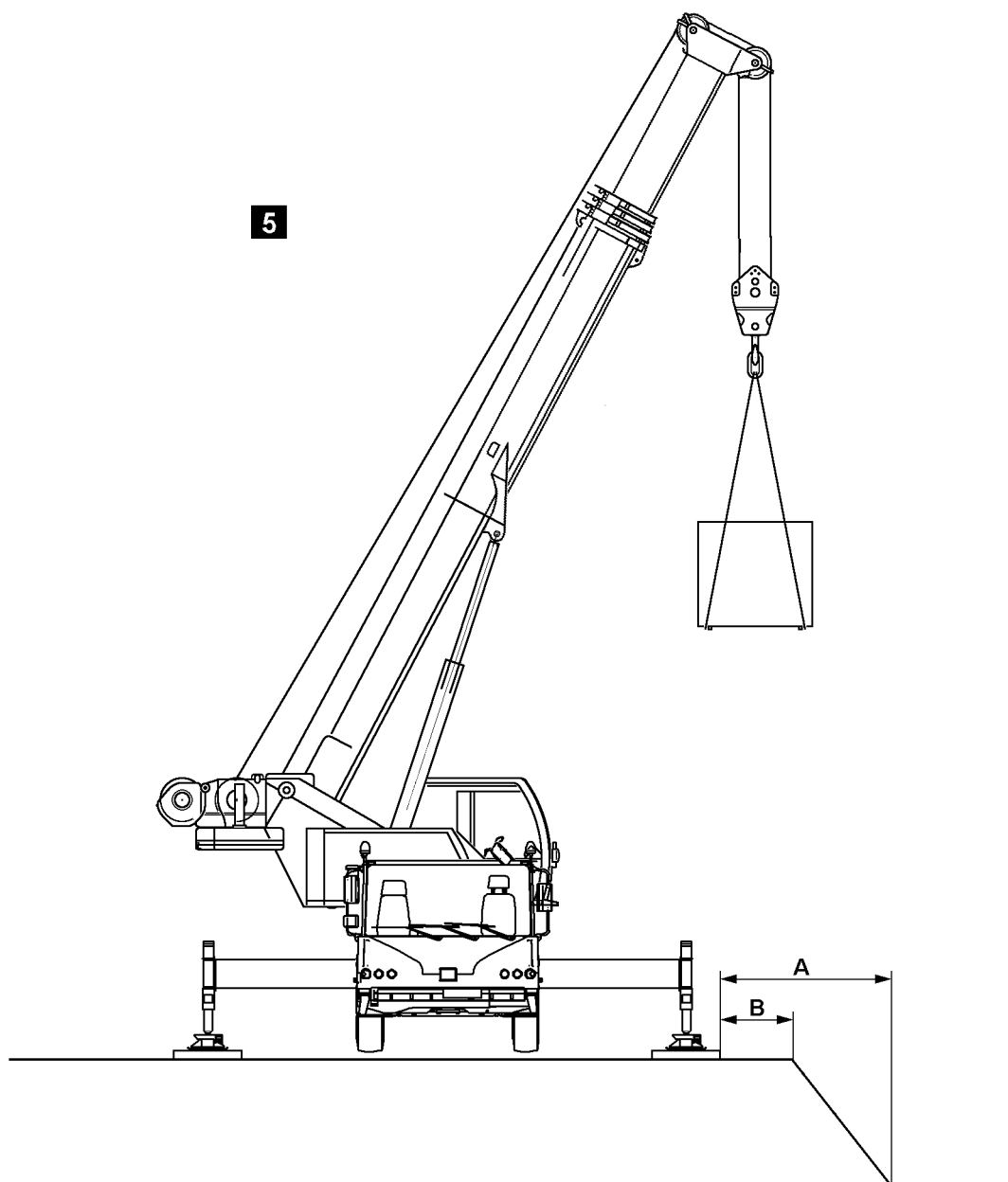


Fig.121163: Example of mobile cranes

- A** Distance from the bottom of excavation
B Distance from the excavation



WARNING

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

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

18 Loads on the ground due to crane operation



Note

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

18.1 Load burdens on the ground on cranes on crawlers

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

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



WARNING

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

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

To obtain an even pressure distribution over the substructure surface:

- ▶ Set the crawlers centered on the substructure.



Note

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

18.2 Load burdens on the ground on cranes on supports

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

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

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

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



WARNING

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

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

To obtain an even pressure distribution over the substructure surface:

- ▶ Set the support plates centered on the substructure.

18.3 Examples of the load bearing capacity of the ground

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

Examples: Permissible ground pressure of the ground

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

18.4 Calculation examples

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

| Example: Calculation of ground pressure of support plates for cranes on supports | | □ |
|--|---|---|
| Support force according to Crane operating instructions, chapter 1.03 for example: 720 kN | 720 kN | |
| Surface of square support plate with 550 mm side length according to the crane operating instructions, chapter 1.03, for example: $0.55 \text{ m} \times 0.55 \text{ m} = 0.3 \text{ m}^2$ | 0.3 m ² | |
| 80 % as carrying surface of support plate: $0.3 \text{ m}^2 \times 0.8 = 0.24 \text{ m}^2$ | 0.24 m ² | |
| Ground pressure = Support force / load bearing surface support plate | $720 \text{ kN} / 0.24 \text{ m}^2 = 3000 \text{ kN/m}^2$ | |
| Ground pressure per support: | 3000 kN/m² | |

Example: Calculation of ground pressure

- The value of the ground pressure is far higher than the permissible ground pressure for all types of granular soil.
- If this crane is utilized on bedrock, gravel type of ground, permissible ground pressure 200 kN/m², then the support surface must be increased.

| Example: Calculation of required support surface for cranes on supports | | □ |
|---|---|---|
| Support force according to Crane operating instructions, chapter 1.03 for example: 720 kN | 720 kN | |
| Ground pressure from chart <i>Permissible ground pressures</i> for example: 200 kN/m ² | 200 kN/m ² | |
| Required support surface = Support force / permissible ground pressure | $720 \text{ kN} / 200 \text{ kN/m}^2 = 3.6 \text{ m}^2$ | |
| Required support surface per support: | 3.6 m² | |

Example: Calculation of support surface

- The surface of the substructure for each support plate must be at least **3.6 m²**.
- The height of the substructure must be selected depending on the load distribution angle.



Note

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

18.5 LICCON job planner

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

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

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

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

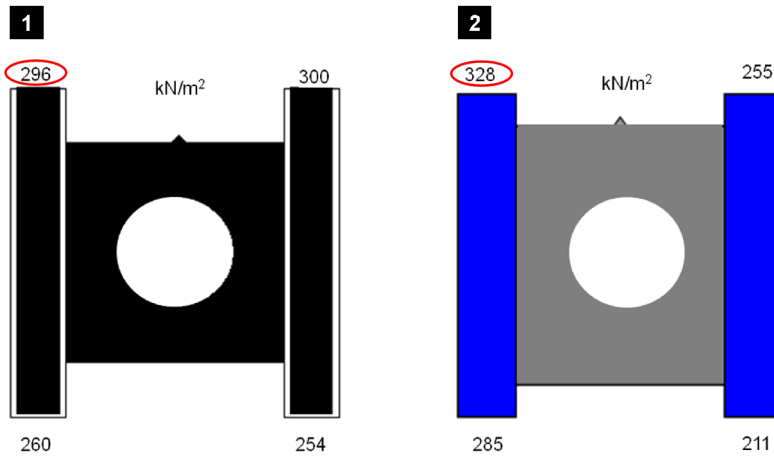


Fig.125052: Example of crane on crawler with derrick boom, suspended ballast and short (main) boom system

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

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

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

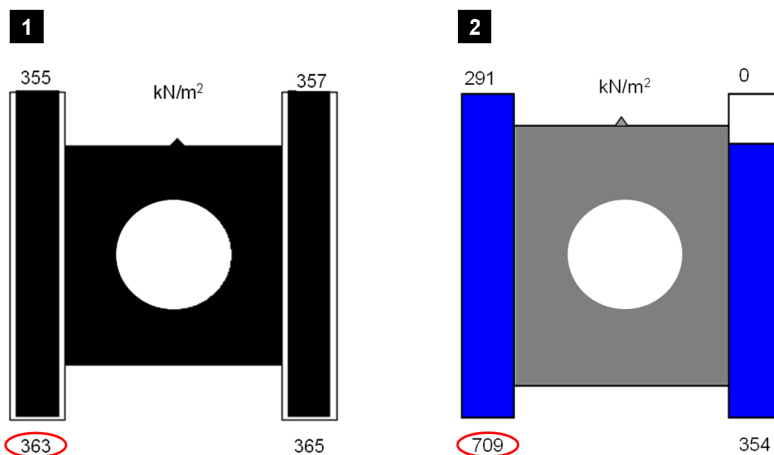


Fig.125053: Example of crane on crawler with derrick boom, suspended ballast and long (main) boom system

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

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

18.5.3 Example of crane on supports

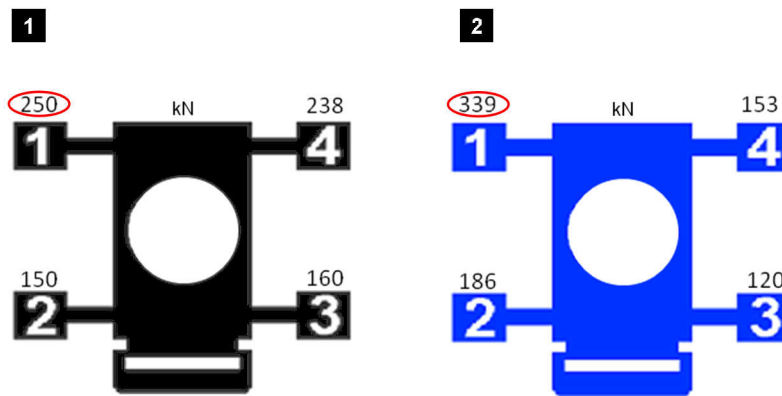


Fig.125054: Example of crane on supports

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

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

19 Support

19.1 Support plates

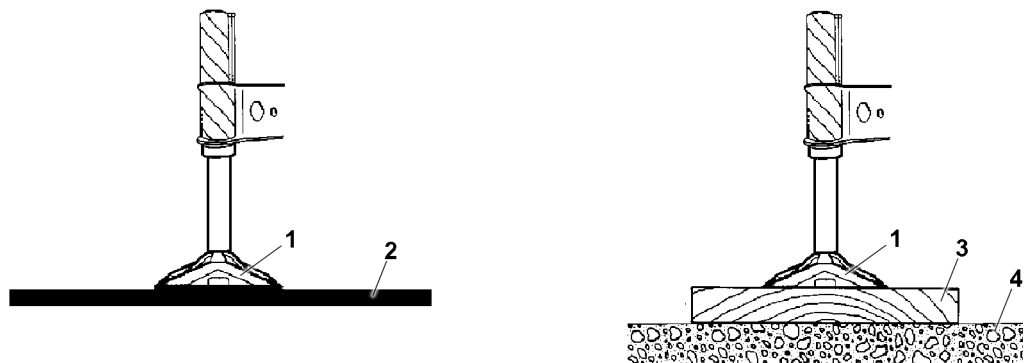


Fig.144244: Support plates

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

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



WARNING

The support plates are **not** laying horizontally!

The crane can topple over, death, property damage.

- ▶ Before supporting the crane, align the support plates horizontally.

19.2 Supporting the crane



WARNING

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



DANGER

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

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

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

The crane may only be supported in these extension conditions.



WARNING

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



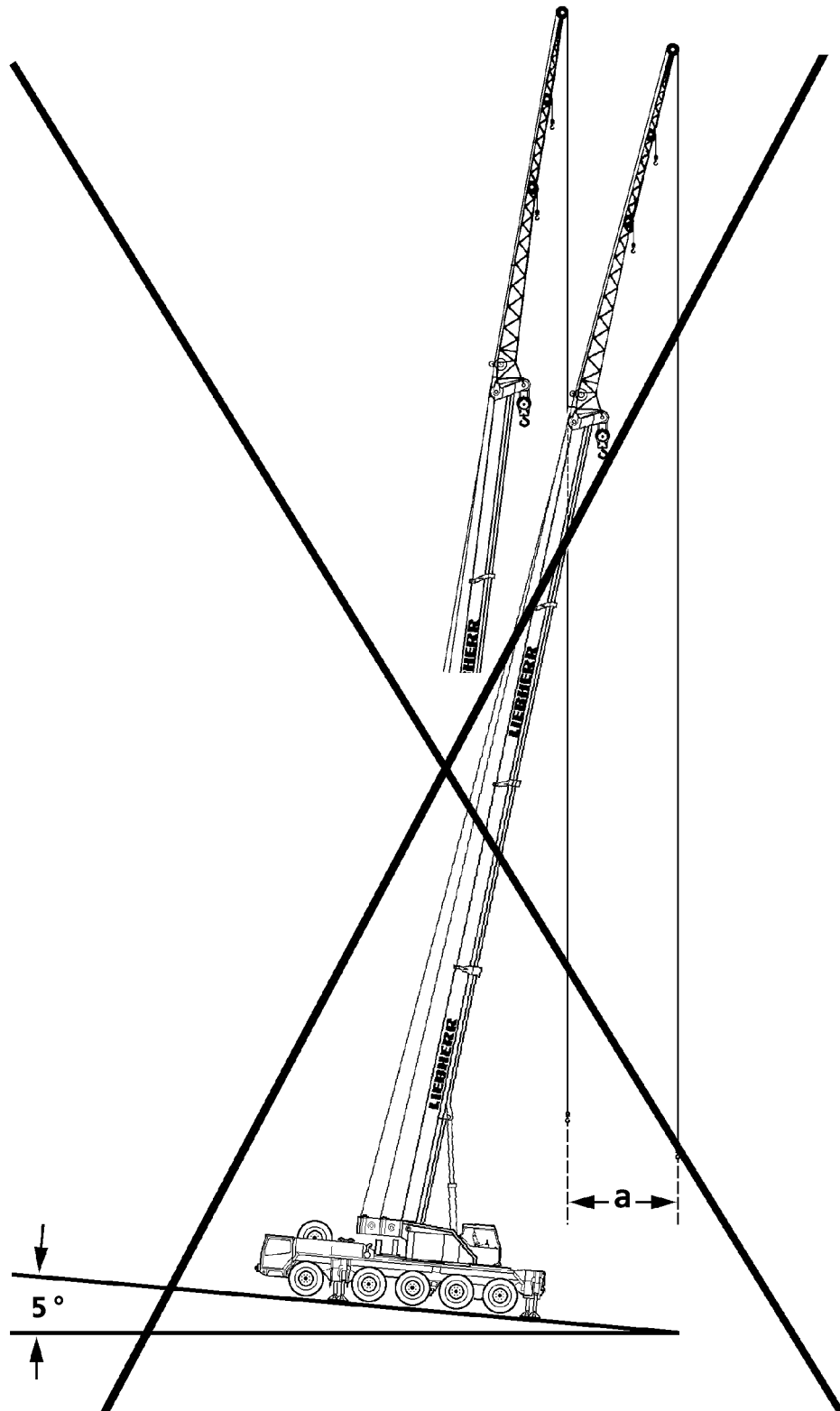
WARNING

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

19.3 Supporting the crane with a *variable support*

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

20 Aligning the crane



LWE/LR 11350-007/19005-01-02/en

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

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

**DANGER**

The crane can topple over due to the incline position!

If the crane is positioned at an incline, and if the boom is turned towards the slope, then the boom radius is increased as a result.

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

Personnel can be severely injured or killed.

▶ Align the crane horizontally before starting crane operation.

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

▶ Set the load down on the ground before readjusting the crane.

For cranes on crawlers, readjustment is **not** possible:

▶ If possible, use load charts for limited terrain incline.

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

21 Checking the safety measures

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

22 Safety instructions in case of an external power supply



Fig.197720

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

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



WARNING

Danger of fatal injury if the body conducts current!

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

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

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

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

23 Grounding

23.1 Grounding the crane

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

**WARNING**

Danger of fatal injury due to electric shock!

There is a danger of electrical shock, if the crane is not properly grounded.

- ▶ Properly ground the crane.
- ▶ Make sure that there is a potential equalization between the crane and the ground.

The crane must be grounded before start up:

- Near transmitters (radio and TV transmitters, radio stations, etc.)
- Near high frequency switching stations
- In case of severe possibility of thunderstorms or potential thunderstorms

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

23.2 Grounding the load

**WARNING**

Danger of fatal injury due to electric shock!

There is a danger of electrical shock, if the load is not properly grounded.

- ▶ Properly ground the load.
- ▶ Make sure that there is a potential equalization between the load and the ground.

The load must be grounded before start up:

- Near transmitters (radio and TV transmitters, radio stations, etc.)
- Near high frequency switching stations
- In case of severe possibility of thunderstorms or potential thunderstorms

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

24 Working in the vicinity of transmitters

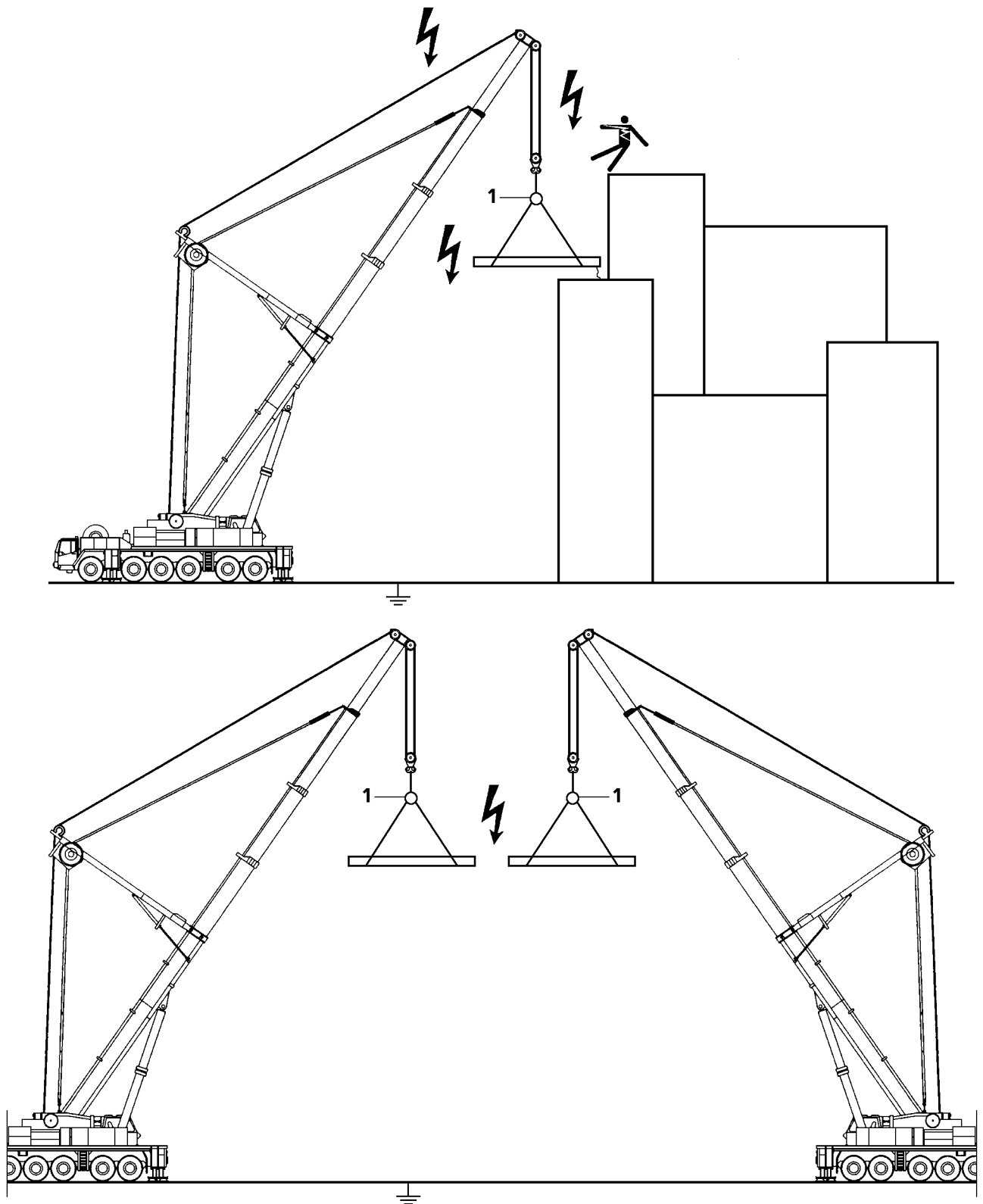


Fig.121165: Example of electrostatic charge

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

These electromagnetic fields can pose direct or indirect danger to persons or objects, for example:

- Effect on human organs due to temperature increase

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



DANGER

Danger due to electromagnetic fields!

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

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

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

25 Crane operation in case of thunderstorms

In weather conditions, which can include lightning:

- Stop work on the crane.
- If possible, take the load down.
- If possible, telescope the boom in and / or take it down in the boom receptacle and bring it into a safe condition.

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

**WARNING**

Danger of accidents due to lightning strikes!

- ▶ Make sure that there are no persons in the immediate area of the crane.

26 Wind influences

**Note**

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

**WARNING**

Disregard of permissible wind speeds!

If the permissible wind speeds are disregarded, the crane can topple over. Personnel can be severely injured or killed.

- ▶ It is prohibited to erect the crane to measure the wind speed.
- ▶ Observe the permissible wind speeds depending on the assembly / crane conditions and act accordingly, see following chart.

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

**Note**

No wind speed charts available!

For a set up configuration for which no wind speed charts are available:

- ▶ Observe and adhere the maximum wind speeds of the load charts.

The wind load on the crane boom has **not** been taken into account for the planning of crane operation with the LICCON job planner.

- As a result, the actual values of the support force and / or the crawler pressure can be significantly higher than the values determined with the LICCON Job planner.
- The wind affecting the crane and the load, the elastic distortion of the crane structure, incline position as well as wind exposure surface (A_w) per ton of hoist load larger than 1.2 m²/t can significantly increase the support force and / or the crawler pressure.

**WARNING**

Increase of support force and / or the crawler pressure!

The resulting pressure on the ground becomes larger.

The permissible ground pressure can be exceeded.

- ▶ Do not exceed the permissible ground pressure.

**Note**

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

26.1 Wind speed charts for a *variable support*

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

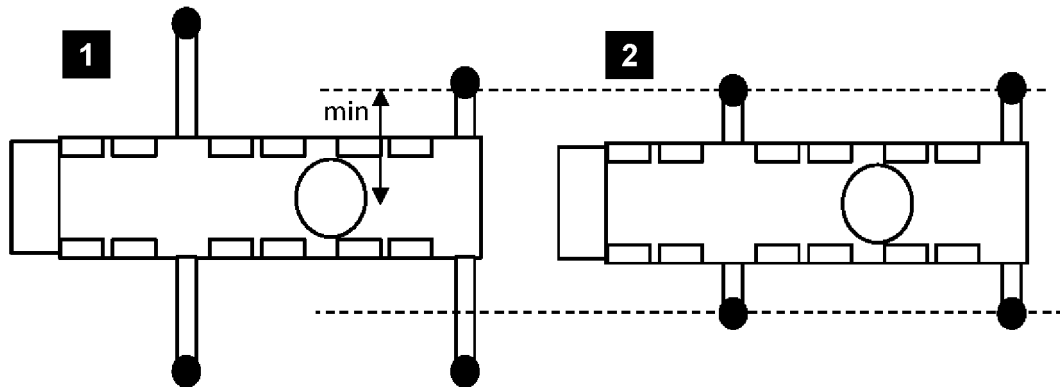


Fig.121577: Example of the selection of wind speed charts for a variable support

Example of the selection of wind speed charts for a *variable support*:

- The crane is supported with *variable support* according to illustration 1.
- Select wind speed charts according to the support base in illustration 2.

**Note**

No wind speed charts available!

If the smallest extension length of a sliding beam is less than those of the wind speed charts on hand:

- ▶ Observe and adhere the maximum wind speeds of the load charts.

26.2 Wind speed, wind gust speed and wind direction

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

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

The site selection is thus especially important for wind measurement.

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

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

26.3 Measurement of wind speed

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

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 coefficient: 1.2) given wind speed.

If the permissible wind speed must be reduced for loads due to large wind exposure surfaces, no acoustic wind warning is issued.

There is no shut-off of crane movement.

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

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

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



Note

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

26.4 Conversion chart for wind force



Note

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

| Wind force | | Wind speed | | Effect of the wind Inland |
|-----------------|-----------------------------|------------|----------|--|
| Beaufort number | Designation | [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 |
| 4 | Moderate breeze | 5.5 to 7.9 | 20 to 28 | Swirls up dust and loose paper, moves twigs and thin branches |

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

Beaufort scale

26.5 Height dependant wind speed



Note

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



Note

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

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

| Beaufort number | 3 | 4 | 5 ^a | 5 | 6 | 7 ^a | 7 | 8 | 9 | 10 |
|---|------|------|----------------|------|------|----------------|------|------|------|------|
| 60 | 9.1 | 13.3 | 17.0 | 18.0 | 23.3 | 24.1 | 28.8 | 34.9 | 41.1 | 47.9 |
| 70 | 9.3 | 13.5 | 17.3 | 18.3 | 23.6 | 24.5 | 29.3 | 35.5 | 41.8 | 48.7 |
| 80 | 9.4 | 13.7 | 17.6 | 18.6 | 24.0 | 24.8 | 29.7 | 36.0 | 42.4 | 49.4 |
| 90 | 9.5 | 13.9 | 17.8 | 18.8 | 24.3 | 25.1 | 30.1 | 36.4 | 42.9 | 50.0 |
| 100 | 9.6 | 14.1 | 18.0 | 19.1 | 24.6 | 25.4 | 30.4 | 36.9 | 43.4 | 50.6 |
| 110 | 9.7 | 14.2 | 18.2 | 19.2 | 24.8 | 25.7 | 30.8 | 37.2 | 43.9 | 51.1 |
| 120 | 9.8 | 14.3 | 18.3 | 19.4 | 25.1 | 25.9 | 31.1 | 37.6 | 44.3 | 51.6 |
| 130 | 9.9 | 14.5 | 18.5 | 19.6 | 25.3 | 26.2 | 31.3 | 37.9 | 44.7 | 52.0 |
| 140 | 10.0 | 14.6 | 18.7 | 19.8 | 25.5 | 26.4 | 31.6 | 38.2 | 45.1 | 52.5 |
| 150 | 10.0 | 14.7 | 18.8 | 19.9 | 25.7 | 26.6 | 31.8 | 38.5 | 45.4 | 52.9 |
| 160 | 10.1 | 14.8 | 18.9 | 20.1 | 25.9 | 26.8 | 32.1 | 38.8 | 45.7 | 53.2 |
| 170 | 10.2 | 14.9 | 19.1 | 20.2 | 26.0 | 27.0 | 32.3 | 39.1 | 46.0 | 53.6 |
| 180 | 10.3 | 15.0 | 19.2 | 20.3 | 26.2 | 27.1 | 32.5 | 39.3 | 46.3 | 53.9 |
| 190 | 10.3 | 15.1 | 19.3 | 20.4 | 26.4 | 27.3 | 32.7 | 39.5 | 46.6 | 54.2 |
| 200 | 10.4 | 15.2 | 19.4 | 20.6 | 26.5 | 27.4 | 32.8 | 39.8 | 46.9 | 54.6 |
| ^a Wind stages for the crane in operation: 1 light $v_m = 10.1$ m/s at $z = 10$ m $v(z) = 14.1$ m/s $q(z) = 125$ N/m ² 2 normal $v_m = 14.3$ m/s at $z = 10$ m $v(z) = 20.0$ m/s $q(z) = 250$ N/m ² | | | | | | | | | | |
| ^b Upper limit of Beaufort scale | | | | | | | | | | |

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

| Sign | Unit | Definition |
|--------|---------------------|---|
| v_m | [m/s] | Wind speed determined over a time of 10 minutes at a height of 10 m |
| z | [m] | Height above level ground |
| $v(z)$ | [m/s] | Speed effective at height z , decisive for the calculation of a 3 second gust |
| $q(z)$ | [N/m ²] | At a height z effective quasi-static dynamic pressure, determined from $v(z)$ |

Symbol

26.6 Wind influences during erection and take-down



WARNING

The crane can topple over!

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

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

**WARNING**

Wind speed higher than permissible!

When the permissible wind speed for „Crane out of operation“ is higher than the permissible wind speed for take-down: Take-down of the boom is not permissible in case of unexpected increase of wind speed.

The crane can topple over. Death, severe injury, property damage.

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

26.7 Wind influences during crane operation

**WARNING**

The crane can topple over!

Unforeseeable factors, such as sudden wind gusts on the crane and the load cannot be exactly predicted in advance.

- ▶ The size and shape of the load has a significant influence on the permissible wind speed during crane operation.
- ▶ Carry out a professional job planning with authorized and trained expert personnel. All environmental conditions, such as weather forecast and wind speeds must be taken into account.
- ▶ The authorized and trained expert personnel must have sufficient knowledge in the area of „Wind influences in crane operation“.

**Note**

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

Depending on crane application, for example:

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

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

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

**WARNING**

The crane can topple over!

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

- ▶ If wind speeds are expected that are larger than the maximum permissible wind speeds for the equipped crane, then the equipment and the boom must be taken down.
- ▶ If wind speeds are expected that are larger than the maximum permissible winds speeds for crane operation, then it is prohibited to lift a load.

26.8 Wind influences for „Crane out of operation“



WARNING

The crane can topple over. Death, severe injury, property damage!

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

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

27 Lifting a load with two cranes

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



WARNING

Overload and toppling of the cranes!

If the load is not lifted or lowered exactly evenly by both cranes, then the center of gravity changes. The cranes can be overloaded and topple over.

Personnel can be killed or seriously injured.

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



Note

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

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

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

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

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

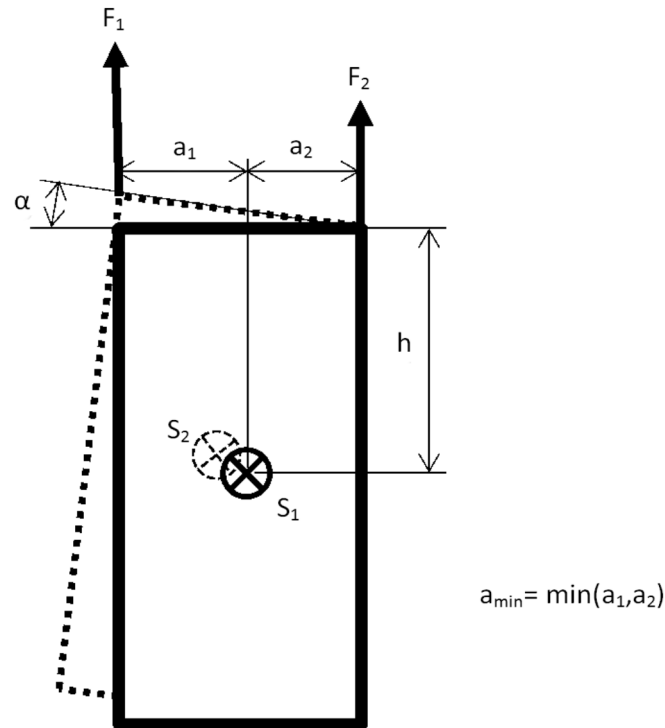


Fig.124126: Geometric conditions

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

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

29 Hand signals for guidance

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



WARNING

Danger of accident if standing under suspended loads!

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

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

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



WARNING

Danger of accident caused by misunderstood hand signals!

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

29.1 Hand signals

29.1.1 Starting operation, follow my instructions

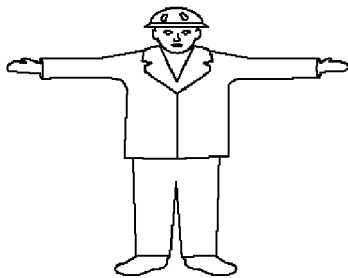


Fig.111700: Starting operation, follow my instructions

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

29.1.2 Stop (normal stop)



Fig.144245: Stop (normal stop)

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

29.1.3 Emergency stop (quick stop)

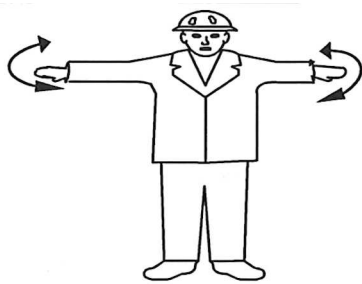


Fig.144246: Emergency stop (quick stop)

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

29.1.4 Ending operation, no longer follow my instructions

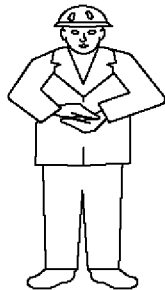


Fig.111703: Ending operation, no longer follow my instructions

Fold hands together at chest height in front of body.

29.1.5 Creeper gear or very slow movement

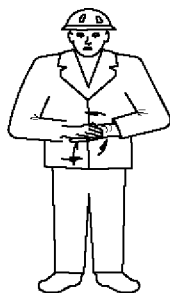


Fig.111704: Creeper gear or very slow movement

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

29.2 Vertical movements

29.2.1 Showing the vertical distance

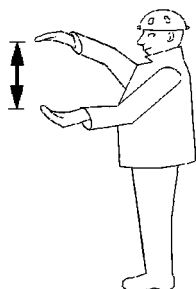


Fig.121364: Showing the vertical distance

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

29.2.2 Lifting / lowering a load with even speed



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

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

29.2.3 Lifting slowly



Fig.121365: Lifting slowly

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

29.2.4 Lowering the load while stationary

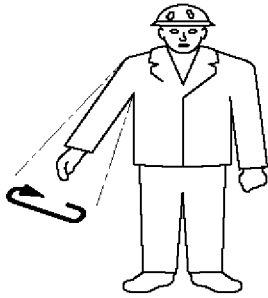


Fig.111708: Lowering the load while stationary

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

29.2.5 Lowering slowly



Fig.121366: Lowering slowly

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

29.3 Horizontal movements

29.3.1 Driving / swinging in the specified direction

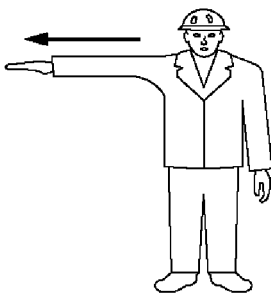


Fig.111710: Driving / swinging in the specified direction

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

29.3.2 Moving away from me

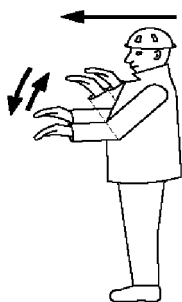


Fig.111711: Moving away from me

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

29.3.3 Moving toward me

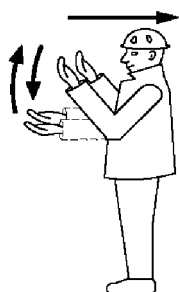


Fig.111712: Moving toward me

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

29.3.4 Moving both track chains

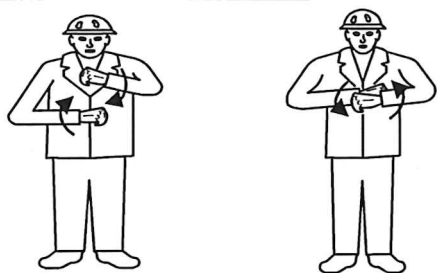


Fig.144247: Moving both track chains

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

29.3.5 Moving one crawler chain



Fig.144248: Moving one crawler chain

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

29.3.6 Showing the horizontal distance

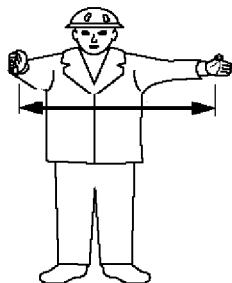


Fig.121380: Showing the horizontal distance

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

29.3.7 Transfer (between two cranes or two hooks)

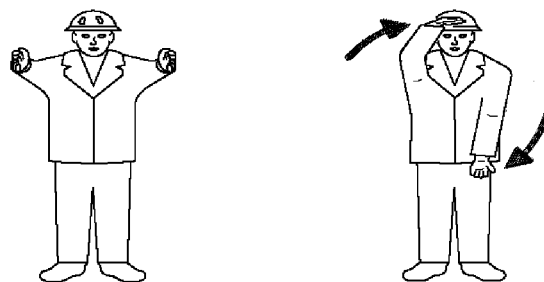


Fig.121368: Transfer (between two cranes or two hooks)

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



WARNING

Load bearing capacity is **not** sufficient!

The crane can topple over, death, property damage.

- ▶ Make sure that the load bearing capacity of the individual crane and hook is sufficient even if the transfer of the load is suddenly asymmetric.

29.4 Machine related movements

29.4.1 Lifting with main winch

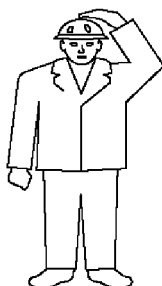


Fig.111719: Lifting with main winch

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.

29.4.2 Lifting with auxiliary winch

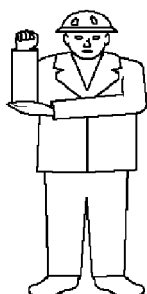


Fig.111720: Lifting with auxiliary winch

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

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

29.4.3 Lifting the boom

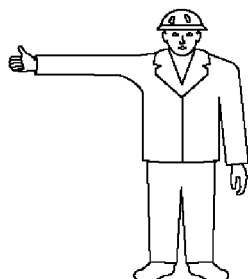


Fig.111721: Lifting the boom

Hold one arm horizontally with thumb directed upward.

29.4.4 Lowering the boom

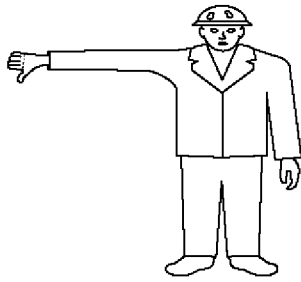


Fig.111722: Lowering the boom

Hold one arm horizontally with thumb directed downward.

29.4.5 Extending the boom



Fig.144249: Extending the boom

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

29.4.6 Retracting the boom



Fig.144250: Retracting the boom

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

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

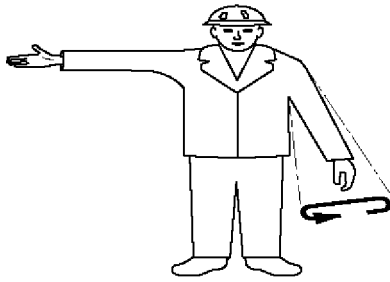


Fig.111725: Lifting the boom and lower the load at the same time

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

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

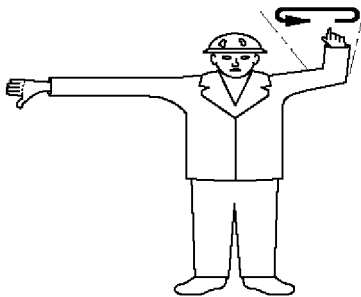


Fig.111726: Lowering the boom and lift the load at the same time

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

30 Travel operation

30.1 Starting to drive

Before starting to drive the crane

- Close all doors.
- Keep the doors closed during the travel operation.

30.2 Turning / driving in reverse



WARNING

Danger of accidents when turning or driving in reverse!

When turning or driving in reverse, personnel can be overlooked and killed.

Objects can be severely damaged.

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

30.3 Driving with a trailer

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

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

30.3.1 Driving with a reduced load

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

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

30.3.2 Driving with an extremely reduced load

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



WARNING

Driving with a trailer with an extremely reduced load!

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

Danger of accident, death, property damage.

- ▶ In the case of an extremely reduced load, do **not** drive the crane vehicle with a trailer.

30.4 Stopping the mobile crane

Make sure that the following prerequisites are met:

- The mobile crane is standing on load bearing, level and tractive ground.
- The parking brake is applied.

**WARNING**

Parking brake is **not** applied!

The mobile crane can roll off, death, property damage.

- ▶ Park the mobile crane exclusively with applied parking brake.

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

When a battery master switch is present:

- Turn off the battery master switch and remove the switch cams.

**WARNING**

Downhill or uphill slope is too large!

The mobile crane can roll off, death, property damage.

- ▶ Park the mobile crane at an downhill or uphill slope of no more than maximum 18 %.

Under the following conditions the mobile crane must be additionally secured with wheel chocks to prevent it from rolling off:

- The mobile crane is parked on a slope or an incline.
- The mobile crane is defective, particularly when the brake system is defective.

**WARNING**

Wedges incorrectly placed!

The mobile crane can roll off, death, property damage.

- ▶ So that the wedges have an immediate braking action and hold the mobile crane in park position:
Place all wedges tightly directly under the wheel.
- ▶ Place all specified wedges.
- ▶ All wedges must counteract the downhill slope force.

If necessary:

- Place the wedges.

31 Crane operation

31.1 Before starting to work

Before starting to work with the crane:

- Make sure that the cylinders are free of ice.
- Close all doors.
- Keep the doors closed during crane operation.

31.2 While working with the crane

**WARNING**

Defective crane!

Death, severe bodily injuries, property damage.

If an erroneous function of a crane movement is recognized during crane operation:

- ▶ Telescope the boom in all the way and take it down, find the source of the problem and remedy it.

**WARNING**

Relapse cylinder pressure loss!

The luffing lattice jib can luff uncontrollably.

If the luffing lattice jib is assembled

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

**WARNING**

Relapse cylinder pressure loss!

The luffing lattice jib can luff uncontrollably due to slack rope on the luffing pulley block.

If an actuated luff down movement does not take place as expected:

- ▶ Immediately stop the luff down movement.
- ▶ Make sure that no slack rope has formed.

If slack rope has formed:

- ▶ Remedy the slack rope.

NOTICE

Freezing rain!

Property damage to the cylinder seals.

If freezing rain starts when working with the crane:

- ▶ Working with the crane is prohibited.
- ▶ Make sure that all cylinders are free of ice.

31.3 Crane operation with a load

**WARNING**

The crane can topple over!

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

Personnel can be severely injured or killed.

- ▶ Before starting to work, the crane operator must ensure that the crane is in operationally safe condition.
- ▶ If safe crane operation cannot be ensured by the crane operator, then crane operation is prohibited until an operationally safe condition for the crane is established.
- ▶ Safety equipment, for example: Load torque limiter, hoist limit switch, brakes must be fully functioning, otherwise crane operation is prohibited.

Make sure that the following prerequisites are met:

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

**Note**

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

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

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

**DANGER**

There is a high danger of accidents should the following points not be observed!

- ▶ Observe the following points.

There is a great danger of accident if:

- The load torque limiter is not set in accordance with the current crane set up configuration and is therefore not able to provide proper protection.
- The load torque limiter is defective or taken out of operation.
- The hoist limit switches are defective or not functioning.
- For crawler cranes and mobile cranes with luffing lattice jib:
The angle sensor and the force test brackets are not functioning.
- For mobile cranes and crawler cranes with support:
The sliding beams of the hydraulic support are not extended to the dimensions specified in the load chart.
- On crawler cranes:
The crawlers are not supported with stable base material sufficiently large for the ground conditions.
- For mobile cranes and crawler cranes with support:
The support plates are not supported with stable materials large enough for the ground conditions.
- Angular pulling is performed.
Angular pulling to the side is particularly dangerous, because the boom has only minimal lateral resistance momentum.

Angular pull is prohibited.

- Load attached during disassembly is too heavy and is freely suspended on the crane after release.
- The load hook is used to break away stuck loads.
Even if the weight of a stuck load does not exceed the permissible load capacity, the crane can topple over backwards if the load is suddenly released due to the tension of the boom, which can cause it to tip backwards.
- Working when the wind is excessively strong.
Comply with the load chart specifications.
- The crane is not levelled and the load is slewed in the direction of the slope.
- If improper control of crane movements cause the suspended load to swing like a pendulum.
- The loads and boom radii specified in the load charts are exceeded.
- When working in the vicinity of electricity transmission lines:
 - The electricity transmission lines were not turned off by expert electricians.
 - The danger zone was not covered or blocked off.

**WARNING**

Danger of current transfer!

If electricity transmission lines are not shut off nor covered nor blocked off, then there is an increased danger of accident due to current transfer.

- ▶ Adhere to the safety distance according to the following chart.

If the crane becomes electrified despite having taken all necessary precautions, proceed as follows:

- ▶ Remain calm.
- ▶ Do not leave the crane cab.
- ▶ Warn people outside: Stay in place and do not touch the crane.
- ▶ Move the crane away from the danger zone.

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

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

Safety distance to electrical power lines depending on the nominal voltage

31.3.1 Counterweight and / or ballast

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



WARNING

The crane can topple over!

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

► Install the counterweight and / or ballast according to the load chart.

31.3.2 Derrick ballast - suspended ballast

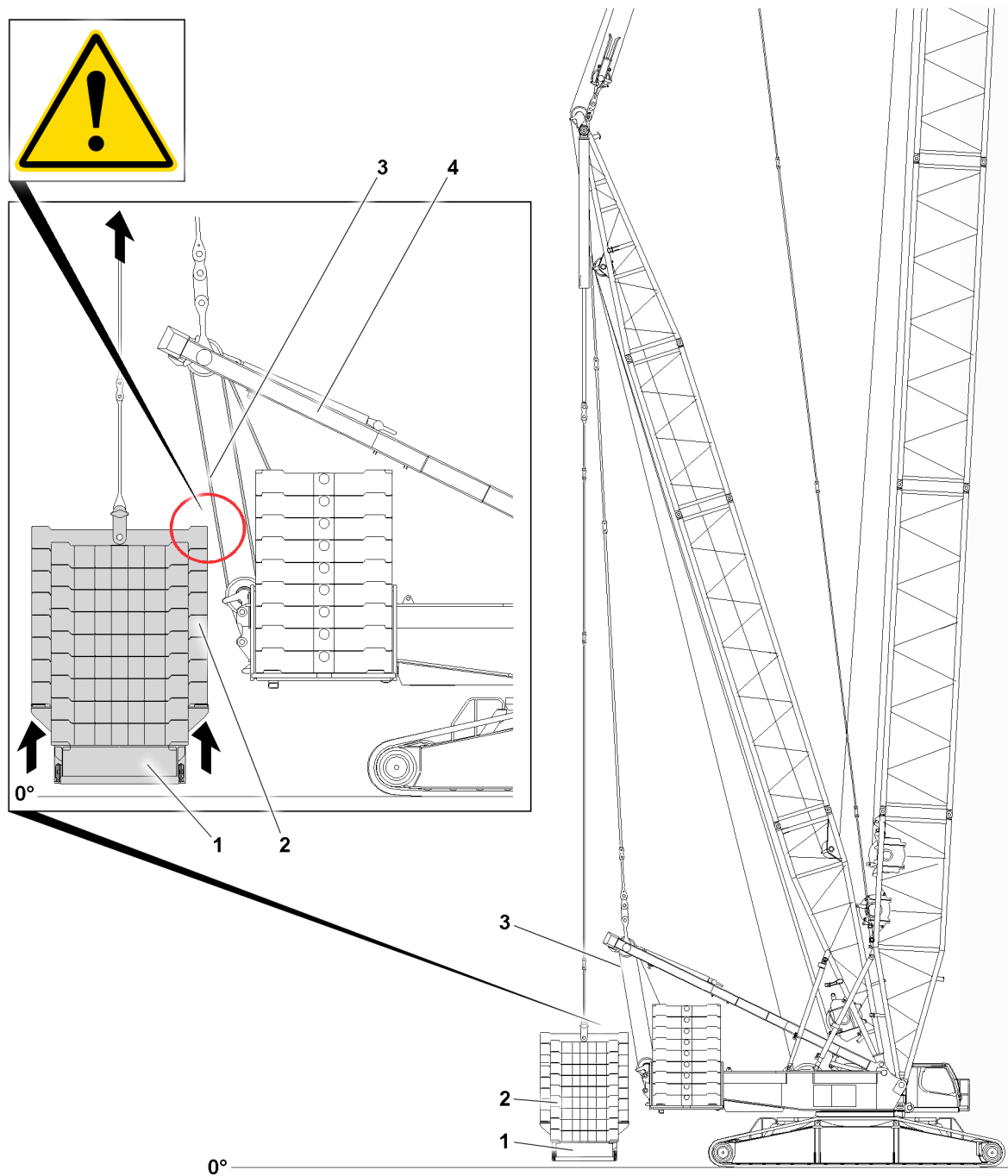


Fig.154801: Danger of collision when lifting the derrick ballast with small derrick ballast radii

- 1 Suspended ballast pallet
- 2 Derrick ballast plate
- 3 Winch 4 control rope
- 4 SA-frame

**WARNING**

Danger of collision!

With small derrick ballast radii, the derrick ballast plates **2** can collide with the winch **4** control rope **3** when lifting the derrick ballast up off the ground.

Death, severe bodily injuries, property damage.

- ▶ Make sure that a guide monitors the lifting of the derrick ballast up off the ground.
- ▶ Adapt the lifting height of the derrick ballast.

31.3.3 Hoist gear, hoist rope

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

If the load to be lifted is heavier than the pull force 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 pull force of the hoist gear.

31.3.4 Hydraulically adjustable auxiliary boom

**WARNING**

Impermissible luffing of the auxiliary boom!

Damage to the auxiliary boom due to collision with the ground or other objects. Component failure.

Death, severe bodily injuries, property damage.

- ▶ Do **not** luff the auxiliary boom down onto the ground or other objects by means of hydraulic adjustment.
- ▶ Do **not** luff the auxiliary boom down onto the ground or other objects by means of luffing down the main boom.

31.4 Interrupting crane operation

**WARNING**

Impermissible weather conditions!

If the crane is exposed to impermissible weather conditions during interruption of crane operation, situations can occur which could bring the crane into an unsafe condition.

Toppling crane, death, severe bodily injuries, property damage.

- ▶ Get the weather forecast for the entire period during which the crane is set up.

If the predicted wind speeds are above the permissible values according to the load chart and / or the wind speed chart:

- ▶ Take the boom and equipment down in time before impermissible wind speeds occur. See Crane operating instructions, wind speed charts and Erection and take down charts.

When wind conditions are present, which are above the permissible values of the wind speed chart and the boom can no longer be taken down:

- ▶ Make sure that there is no danger for persons, crane and surrounding area. Secure the crane and surrounding area of the crane far enough against access. Warn persons in the surrounding area and bring them in safety.

A weather forecast includes information about:

- Changing weather conditions
- Wind
- Ice
- Precipitation
- Flooding
- Lightning



WARNING

Defective crane!

Death, severe bodily injuries, property damage.

If a crane movement occurs during the interruption of crane operation:

- ▶ Make sure, when an unintentional crane movement occurs, for example as a result of leak, no danger for persons, crane and surrounding is created.

Leaks can occur all on pressurized hydraulic cylinders, for example on the following cylinders:

- Support cylinder
- Luffing cylinder
- Telescoping cylinder
- Control cylinder
- Relapse cylinders



Note

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



WARNING

Set up crane is not supervised!

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

Toppling crane, death, severe bodily injuries, property damage.

- ▶ Always watch the crane and keep it under control.

If the crane is in set up condition:

- ▶ Do **not** leave the crane.

If the crane can **not** be constantly kept under control:

- ▶ Take the equipment down and telescope the boom in and place it down.
- ▶ The boom on the crane may only be placed down if the predicted wind speeds according to the wind speed charts are less than the maximum permissible wind speeds during assembly and disassembly.
- ▶ Before the crane is unsupervised: Establish an emergency plan.
- ▶ Carry out the measures listed below.



Note

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

If possible:

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

On mobile cranes:

- Lift the axles to the maximum position and block the hydraulic suspension.

On lattice mast cranes:

- Set the Derrick ballast, if present, down on the ground.

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

When the hook block remains installed:

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

If the construction site has limited space:

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

If crane operation with a set up crane is interrupted:

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

If the predicted wind speeds are above the permissible values:

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

Situations are for example:

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

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

31.5 Resuming crane operation

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



WARNING

Danger of accident!

When the crane operator leaves the crane cab:

- ▶ Before resuming work, check the operating mode setting and reset, if necessary.

31.6 Ending crane operation

Before the crane operator may leave the crane, the following prerequisites must be met:

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

32 Lifting of personnel

32.1 Intended use

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



Note

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

**WARNING**

Non-designated use of the crane!

Personnel can be severely injured or killed.

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

32.2 Prerequisites for lifting of personnel

Make sure that the following prerequisites are met:

- Lifting personnel with cranes is permissible by national and local laws in the country where this crane application is carried out.

**DANGER**

Lifting of personnel!

Accidents which occur when lifting personnel often result in severe injuries or even death.

- ▶ This exceptional application is within the scope of responsibility of the user and is only permitted if the requirements and instructions in the next sections are observed and adhered to.
- ▶ The company, the supervisor, the crane operator and auxiliary personnel must proceed especially carefully and safety conscious.
- ▶ Before the lifting procedure, a meeting must be held with all associated personnel.
- ▶ The following warning notes and safety regulations must be strictly observed.

32.2.1 Legal prerequisites

Make sure that the following prerequisites are met:

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

32.2.2 Prerequisites for crane equipment and accessories

Make sure that the following prerequisites are met:

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

32.2.3 Inspecting before start up

Make sure that the following inspections are made before starting up the lifting cage (cherry picker):

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

32.2.4 Prerequisites for operation with lifting cage (cherry picker)

Make sure that the following prerequisites are met for operation with lifting cage (cherry picker):

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



WARNING

Superimposed crane movements with hydraulic auxiliary users!

Superimposed crane movements by actuating hydraulic auxiliary users can lead to the unwanted acceleration or deceleration of the safety cage movement.

- ▶ It is prohibited to superimpose crane movements with hydraulic auxiliary users to tilt the cab, for example.

33 Securing personnel on shut off crane

33.1 Terms and abbreviations

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

33.2 Intended use

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

When the following prerequisites are met, the personnel protection may be permissible:

- A justified individual case is present.
- A project-specific written risk assessment and work procedure for the precise case by the employer is on hand.
- The specific safety measures are strictly adhered to.

Limitations for movement and operation:

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

33.3 Prerequisites



WARNING

Prerequisites for personnel protection are **not** met!
Danger of accident. Death, severe bodily injuries.

- ▶ Carry out the personnel protection on the shut off crane only when **all** prerequisites in this section have been met.

Make sure that the following prerequisites are met:

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

33.3.1 Personnel and qualification

Make sure that the following prerequisites for personnel and qualification are met:

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

33.3.2 PSAgA, rescue equipment and tools

Make sure that the following prerequisites and measures are met:

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

33.3.3 Crane

Make sure that the following prerequisites are met:

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

33.4 Fastening device

Make sure that the following prerequisites are met:

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

33.5 Rescue

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

Carry out the following measures to ensure a safe rescue operation:

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

33.6 Additional risks

Make sure that the following risks are taken into account:

- Wind effect and environmental influences.
- Crushing and shearing points.
- Endangerment by additional cranes, for example material transport.

34 Welding work on the load



Note

- ▶ The load must also be grounded.

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

2.04.10 Ladders

| | | |
|---|-----------------------|----|
| 1 | Intended use | 2 |
| 2 | Safety instructions | 2 |
| 3 | Safety signs | 3 |
| 4 | Ladder inspection | 12 |
| 5 | User guidelines | 12 |
| 6 | Assembling the ladder | 14 |
| 7 | Ladder access | 25 |

1 Intended use

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

Ladders are designated for the ascent and descent of personnel.

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

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

2 Safety instructions

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

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

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

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



WARNING

Safety instructions not observed!

Personnel can fall, death, severe bodily injuries.

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

2.1 Ladder categories

Ladders are divided into two categories according to the most up-to-date specifications:

- Ladders for industrial use
- Ladders for private use

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

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

2.2 Stationary stability

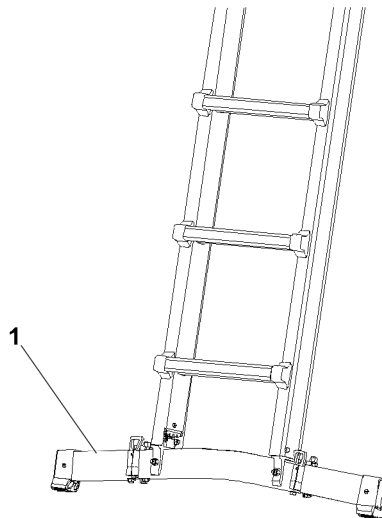


Fig.149993: Ladder with cross beam

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

2.3 Retrofitting old ladders

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

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




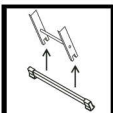

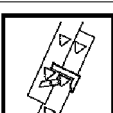
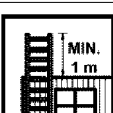

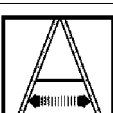
3 Safety signs

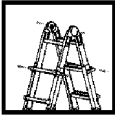
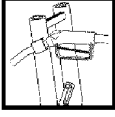
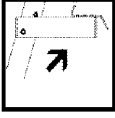





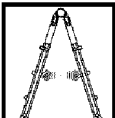
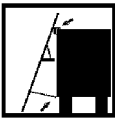


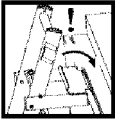
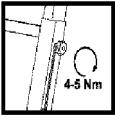








Note











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

3.1 Symbols until the end of 2017




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

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







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

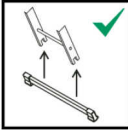









| Sign | Explanation |
|---|---|
|  | Do not use the inner section of multi-part hinged ladders without outer sections as a stepladder |
|  | Crushing danger |
|  | Set the ladder up on horizontal and solid ground |
|  | Set the ladder up on solid ground |
|  | Use the ladder in the correct set up direction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











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






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

3.2 Symbols from 2018

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

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

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

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

4 Ladder inspection

Make sure that the following conditions are met:

- All ladders are inspected at least every 12 months. See chapter 8.17.
- The inspection may be made exclusively by authorized and trained expert personnel.
- The results of the inspection are documented.

5 User guidelines

Make sure that the following prerequisites are met before using the ladder:

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

- Level
- Horizontal
- Slip-resistant
- Unmoveable

When climbing up the ladder:

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

When using the ladder:

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

If this is not possible: Take additional safety measures, such as: Use the WORK POSITIONING SYSTEM (WPS).

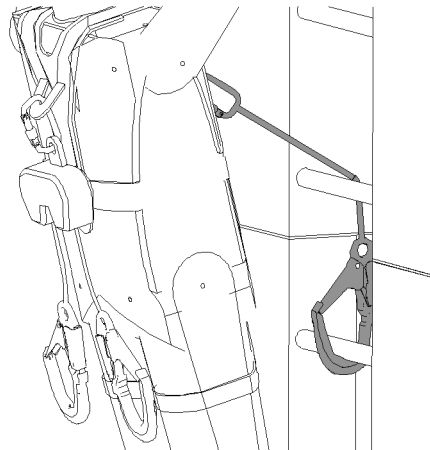


Fig.126746: Example of how to use the WPS

For repair, maintenance and storage of a ladder:

- Have repairs and maintenance made by expert personnel according to the manufacturer's instructions.
- Store the ladders according to the manufacturer's instructions.

Before transporting the ladders:

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

6 Assembling the ladder

6.1 Supplied cross beam

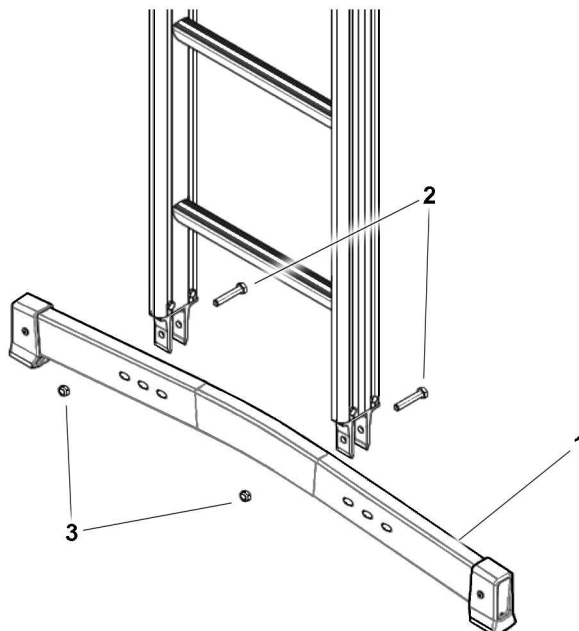


Fig.149565: Assembling the cross beam

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

Required tools:

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

Tightening torque:

- Approx. 8 Nm

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

6.2 Folding cross beam

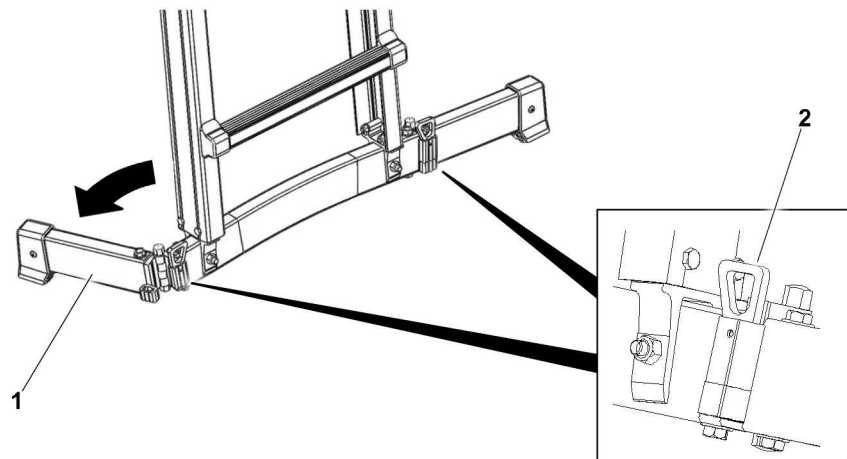


Fig.149566: Using the folding cross beam

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

6.2.1 Bringing the cross beam into the operating position

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

6.2.2 Bringing the cross beam into the transport position

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

6.3 Cross beams for platform ladder

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

Required tools:

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

6.3.1 Assembling the cross beam without wheels

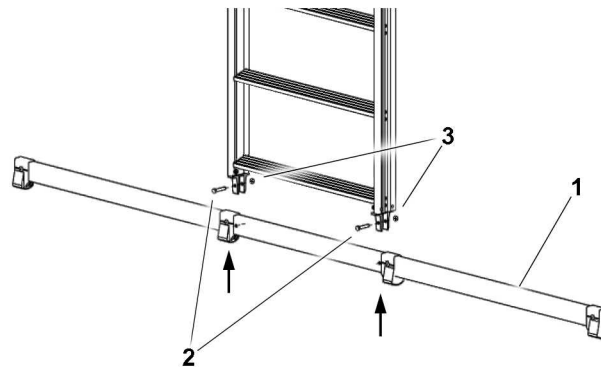


Fig.149595: Assembling the cross beam

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

6.3.2 Assembling the cross beam with wheels

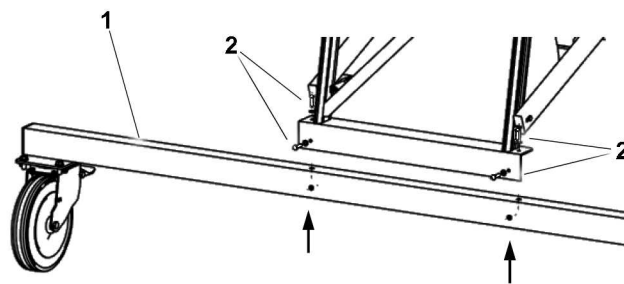


Fig.149596: Assembling the cross beam

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

6.4 Platform ladder

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

6.4.1 Assembling the platform ladder



WARNING

Platform ladder not correctly assembled!
Personnel can fall down. Death, severe bodily injuries.

- ▶ Before the platform ladder is correctly assembled: Do **not** step on or load the platform ladder.

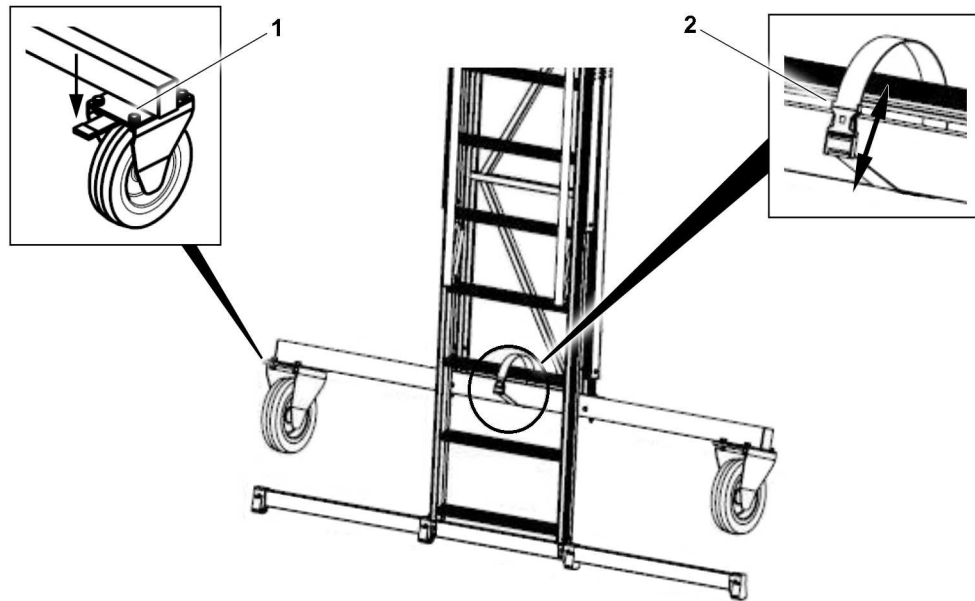


Fig.149597: Preparing the ladder

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

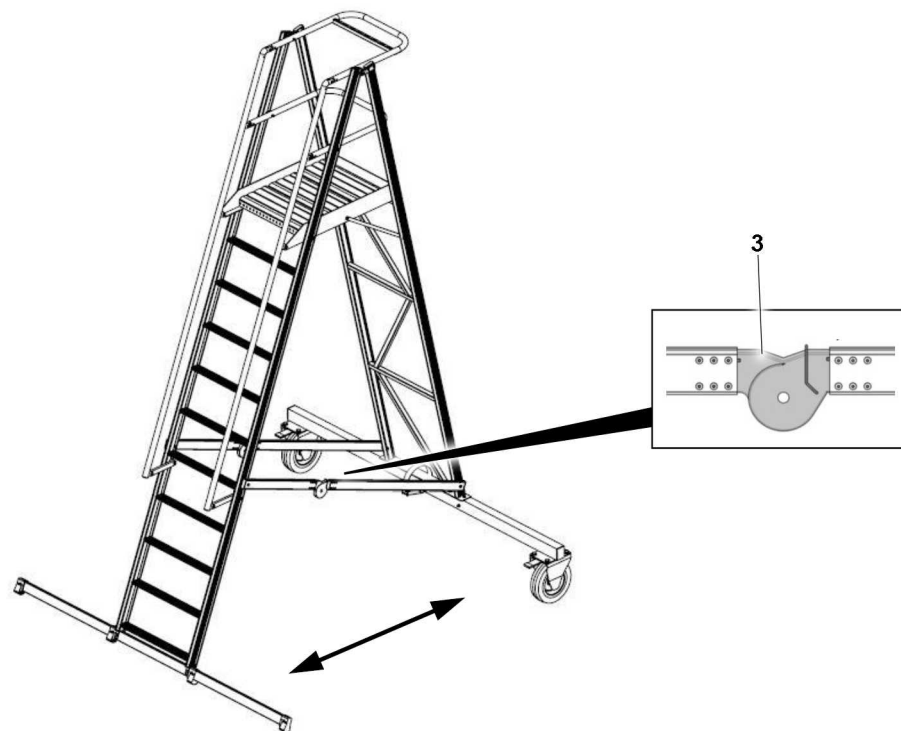


Fig.149598: Setting up the ladder

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

Result:

- The ladder is now assembled.

6.4.2 Dismantling the platform ladder

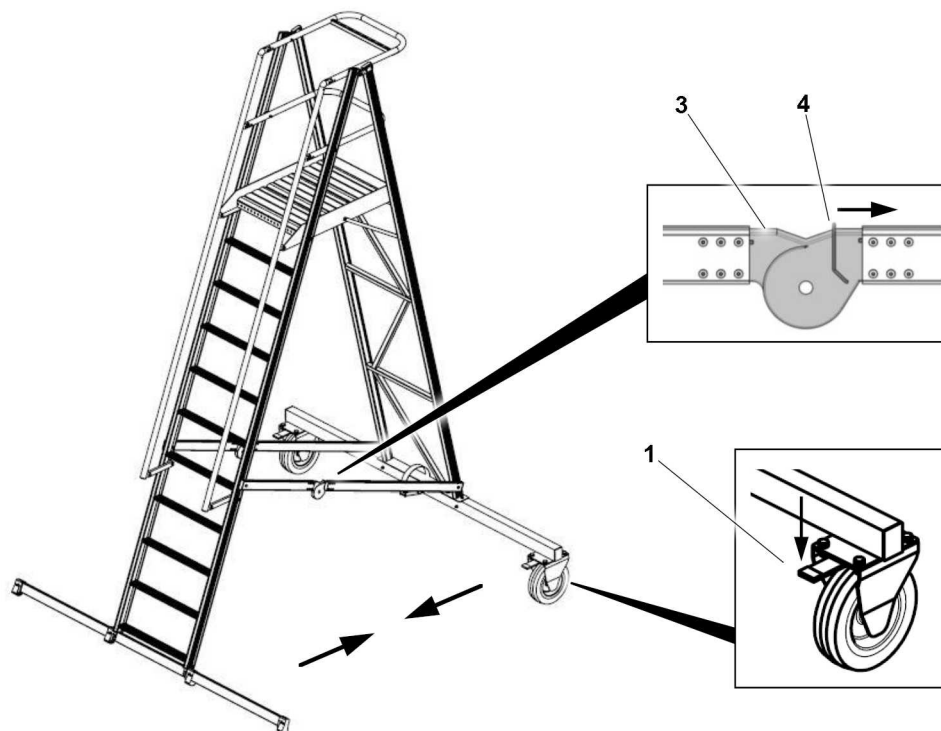


Fig.149599: Releasing the hinges

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

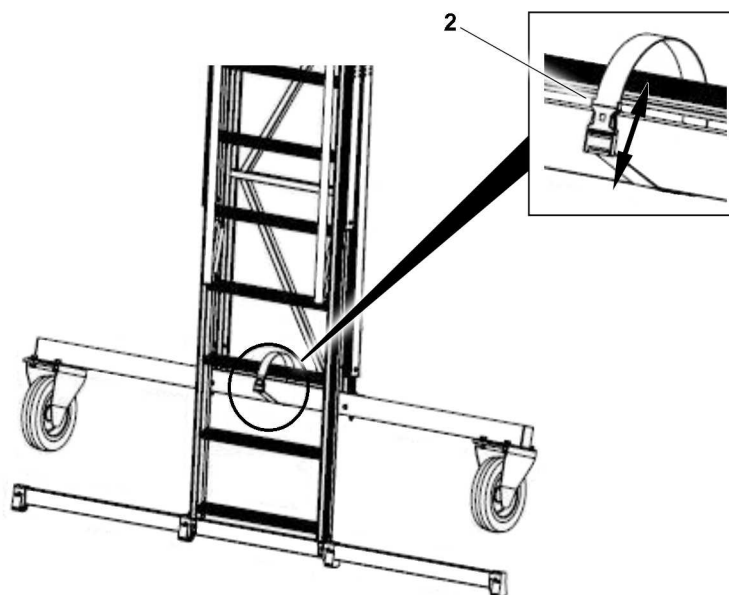


Fig.149600: Securing the ladder in the transport position

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

Result:

- The ladder is dismantled and secured in the transport position.

6.5 Hinged ladders

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

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

6.5.1 Using a hinged ladder as a leaning ladder

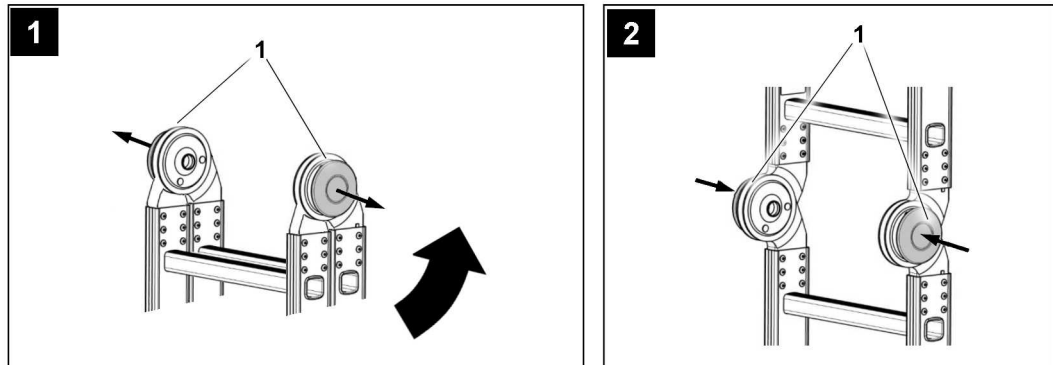


Fig.149567: Using a hinged ladder as a leaning ladder

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

6.5.2 Bringing the leaning ladder into the transport position

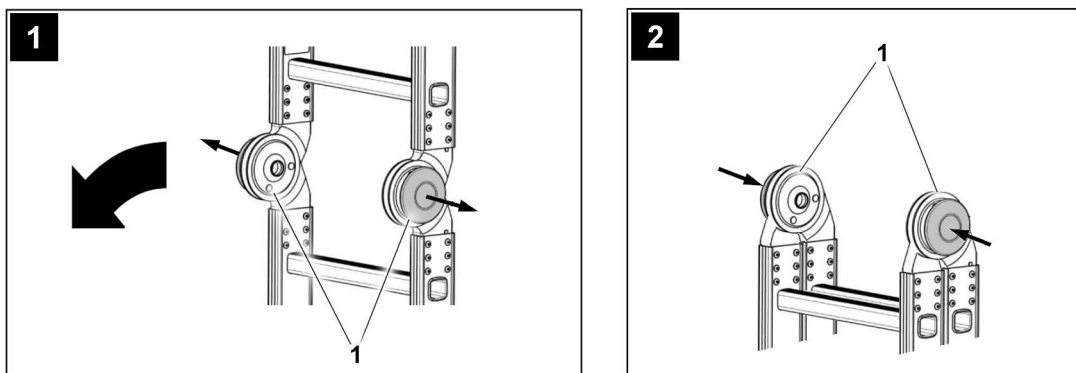


Fig.151625: Bringing the leaning ladder into the transport position

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

Result:

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

6.5.3 Using a hinged ladder as a stepladder

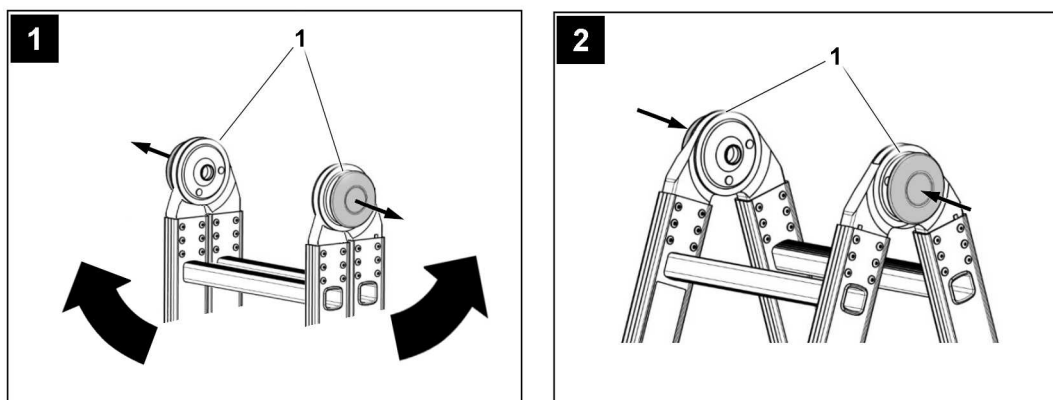


Fig.149568: Using a hinged ladder as a stepladder

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

6.5.4 Bringing the stepladder into the transport position

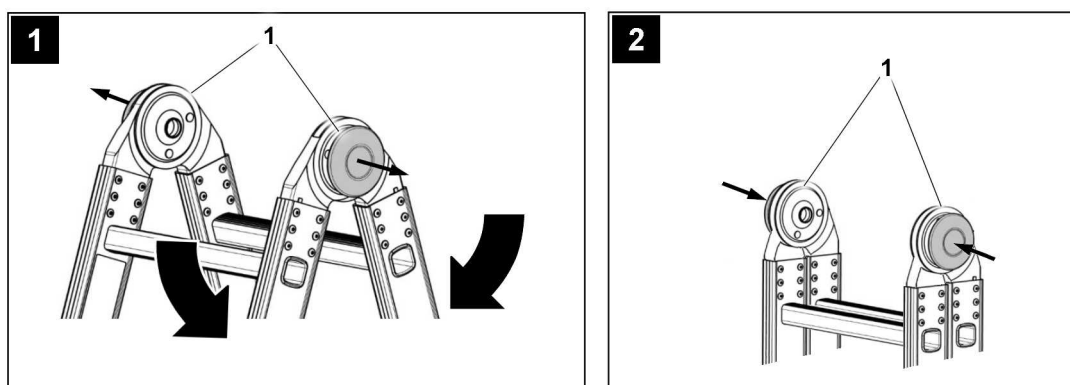


Fig.151607: Bringing the stepladder into the transport position

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

Result:

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

6.6 Multi-purpose ladder with height adjustment

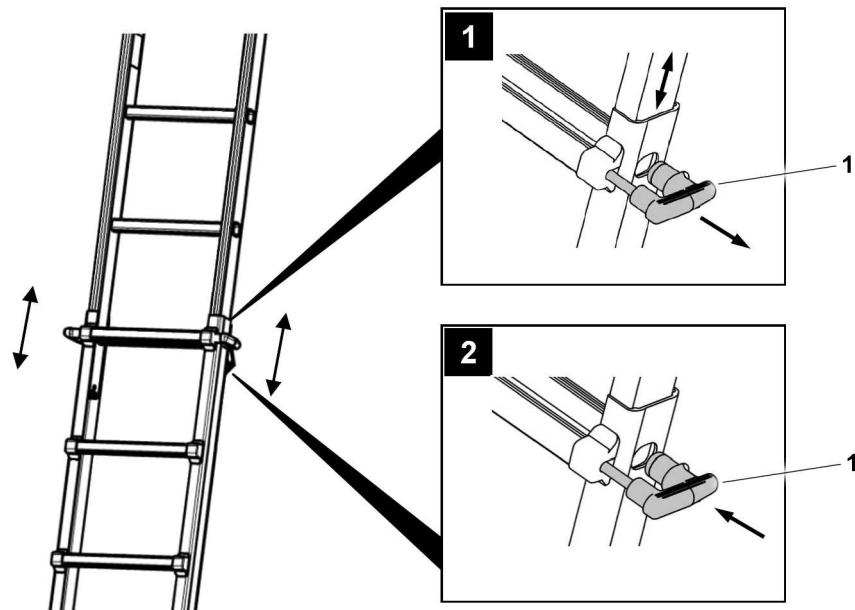


Fig.149570: Ladder with height adjustment

Multi-purpose ladders have a height adjustment device.

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

6.7 Three-part multi-purpose ladder

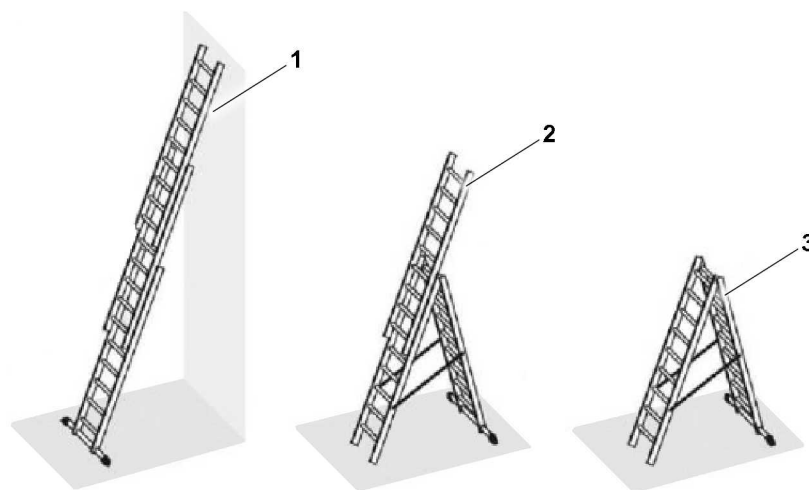


Fig.152833: Three-part multi-purpose ladder

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

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

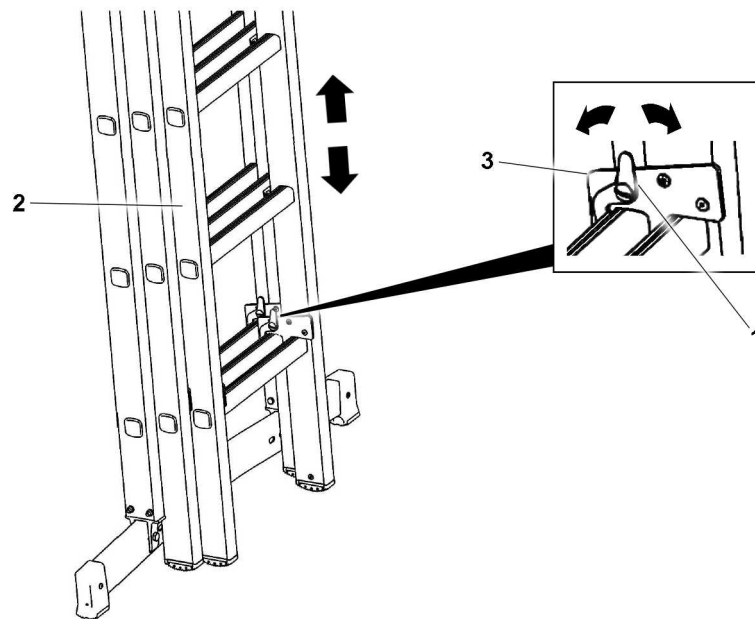


Fig.152834: Pushing out the ladder

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

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

Push out the middle ladder section:

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

Result:

- The ladder can now be used.

Push the ladder together:

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

Result:

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

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

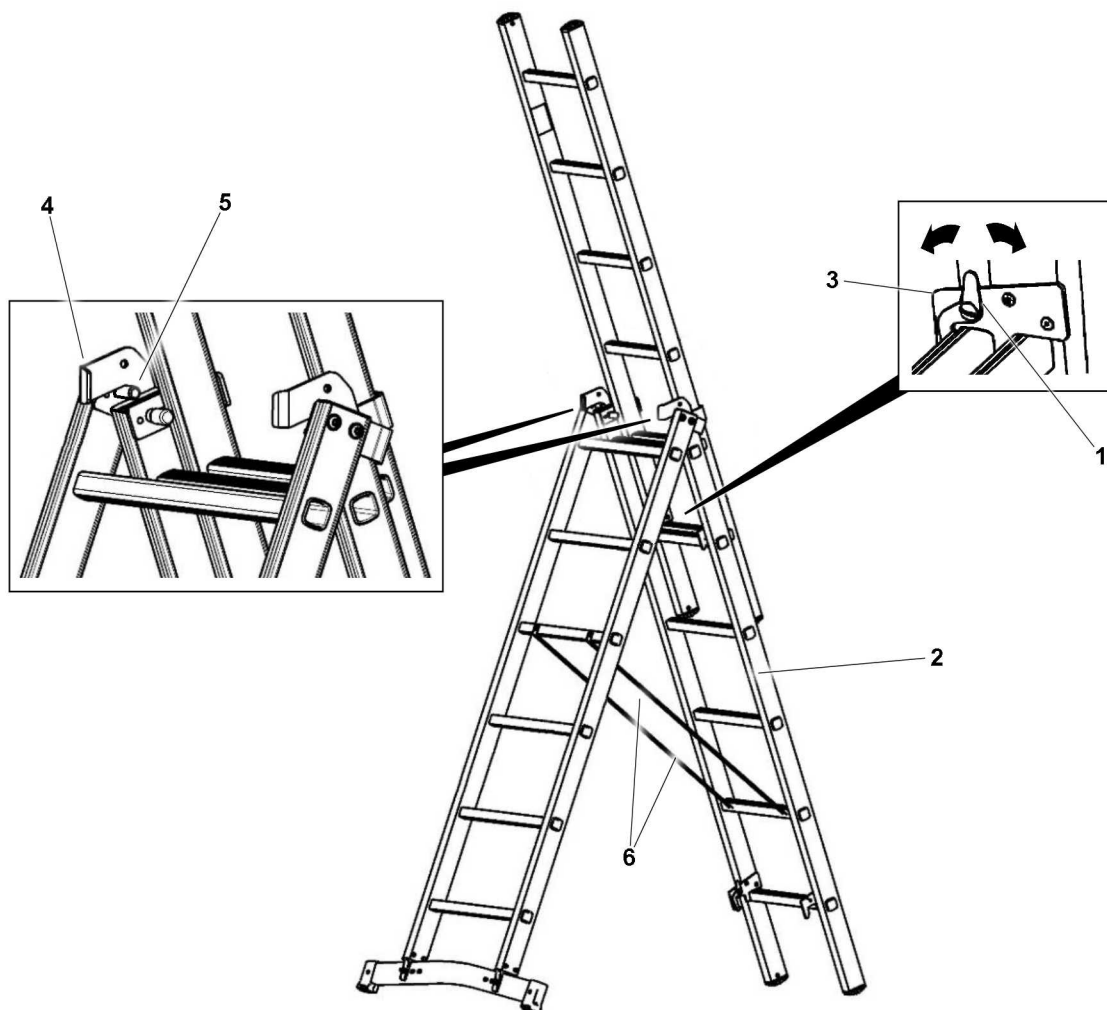


Fig.152835: Setting up the ladder

Push out the upper ladder section:

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

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

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

Result:

- The ladder can now be used.

Bring the ladder into the transport position:

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

Result:

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

6.8 Extension ladder

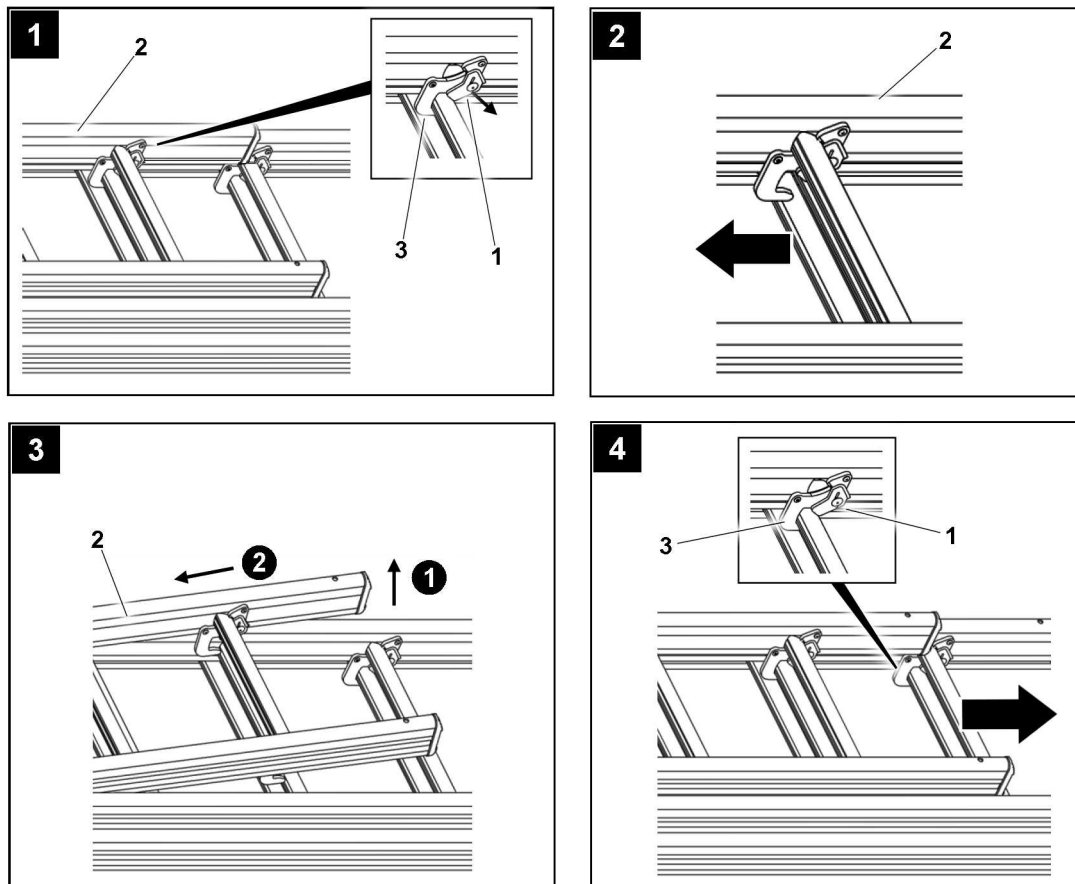


Fig.149569: Pushing out the ladder

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

Push out the upper ladder section:

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

Push out the middle ladder section:

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

Result:

- The ladder can now be used.

Push the extension ladder together:

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

Result:

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

7 Ladder access

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

7.1 Ladder safeguards

The ladder can be secured to prevent it from sliding away to the side by:

- Restraint device, for example: Tether or side stops on component
- Friction lock, for example: Rubber caps or plastic caps on the end of the ladder beam at direct placement on a surface

The ladder can be secured to prevent it from tipping to the rear by:

- The correct placement angle

7.2 3-point support

A 3-point support is ensured when:

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

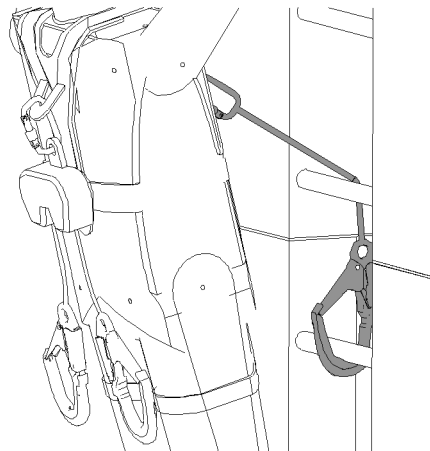


Fig.126746: Example of how to use the WPS

7.3 Light and / or heavy work

The following lists various light and heavy work

Examples for light work:

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

Examples for heavy work:

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

7.4 Removing the end section on the conical leaning ladder

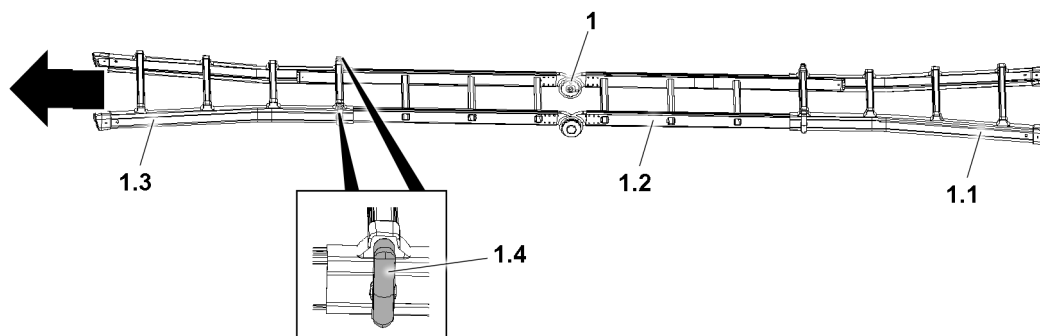


Fig.126873: Leaning ladder 1

The leaning ladder 1 consists of the following components:

- 1.1 Base
- 1.2 Center section
- 1.3 End section
- 1.4 Locks

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



CAUTION

Fingers in the spring range of the lock 1.4!
Finger crushing when locking and unlocking.

- ▶ Grip the lock 1.4 outside of the spring range.
- ▶ Release the locks 1.4 on the left and right.
- ▶ Slide the end section 1.3 out of the center section 1.2 and remove it.

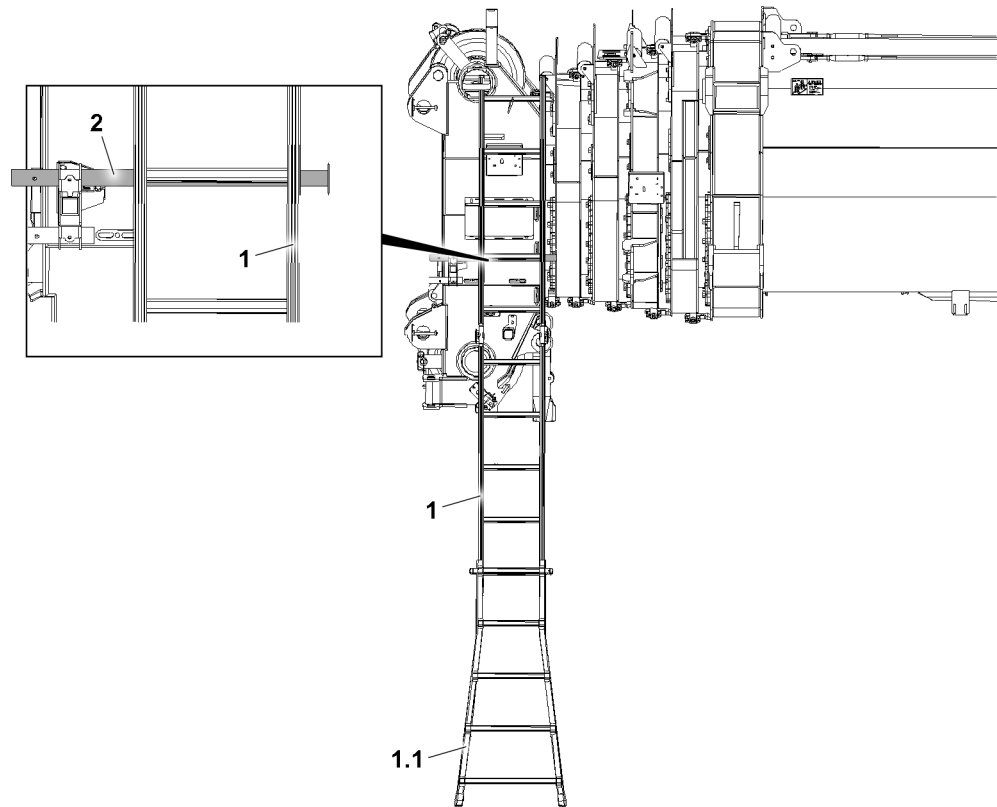


Fig.126874: Leaning ladder 1 placed on the leaning tube 2

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

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



WARNING

The leaning ladder 1 is wider than the leaning tube 2 or the intended placement surface! Assembly personnel can fall when stepping on the leaning ladder 1 and be severely injured.

- ▶ When stepping on the leaning ladder 1 make sure that the leaning ladder 1 **is not** wider than the leaning tube 2 or the intended placement surface.
 - ▶ Climb on the leaning ladder 1. Carry out the assembly work.
- Before leaving the jobsite, the end section 1.3 must be reinstalled.
- ▶ Before leaving the jobsite: Install the end section 1.3.
 - ▶ Secure the leaning ladder 1 in transport position.

7.5 Types of ladders

7.5.1 Stepladder

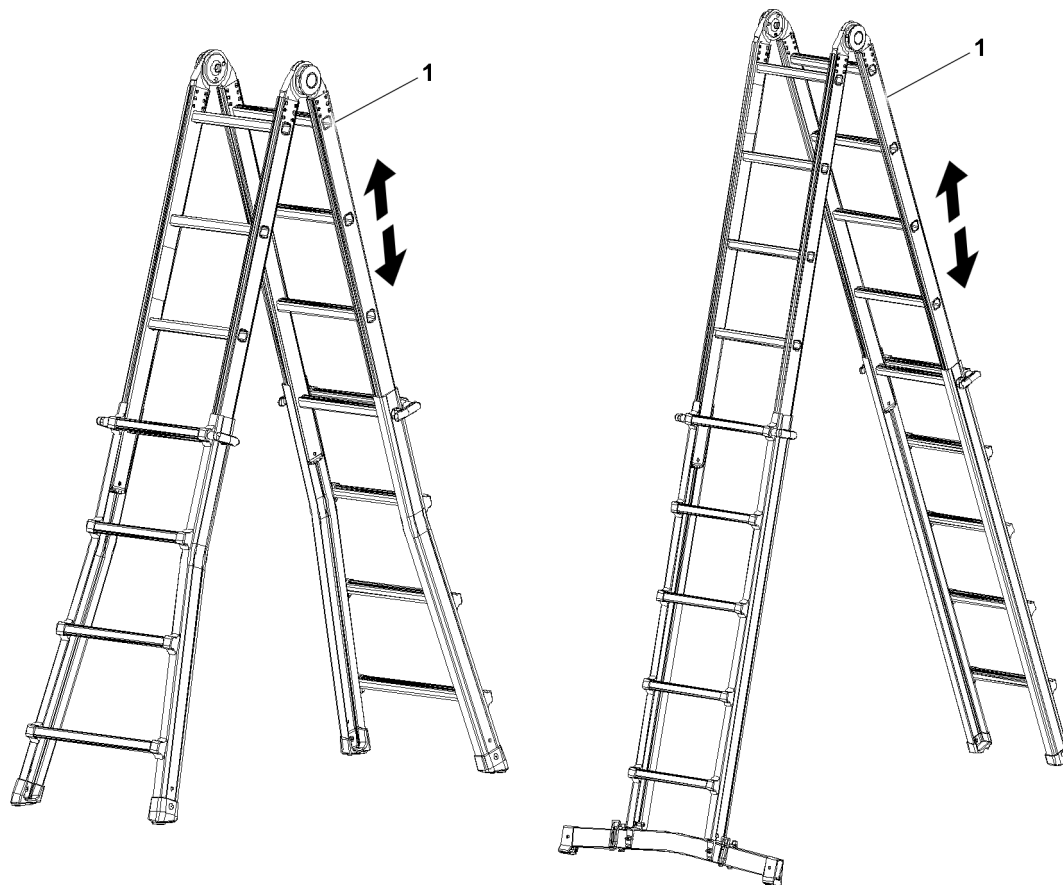


Fig.149996: Example of stepladders



WARNING

Transitioning from a stepladder 1 to other components!
Personnel can fall, death, severe bodily injuries.

- ▶ Do **not** transition from a stepladder 1 to other components.



WARNING

3-point support not adhered to!
Personnel can fall, death, severe bodily injuries.

- ▶ When using stepladders 1, adhere to the 3-point support.
- ▶ Adhere to the prerequisites and conditions for the use of stepladders 1.

Prerequisites for the use of stepladders 1:

- Make sure that the weight of the tool carried along does not weigh more than 10 kg.

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

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

Conditions for access and work on stepladders 1

7.5.2 Leaning ladder

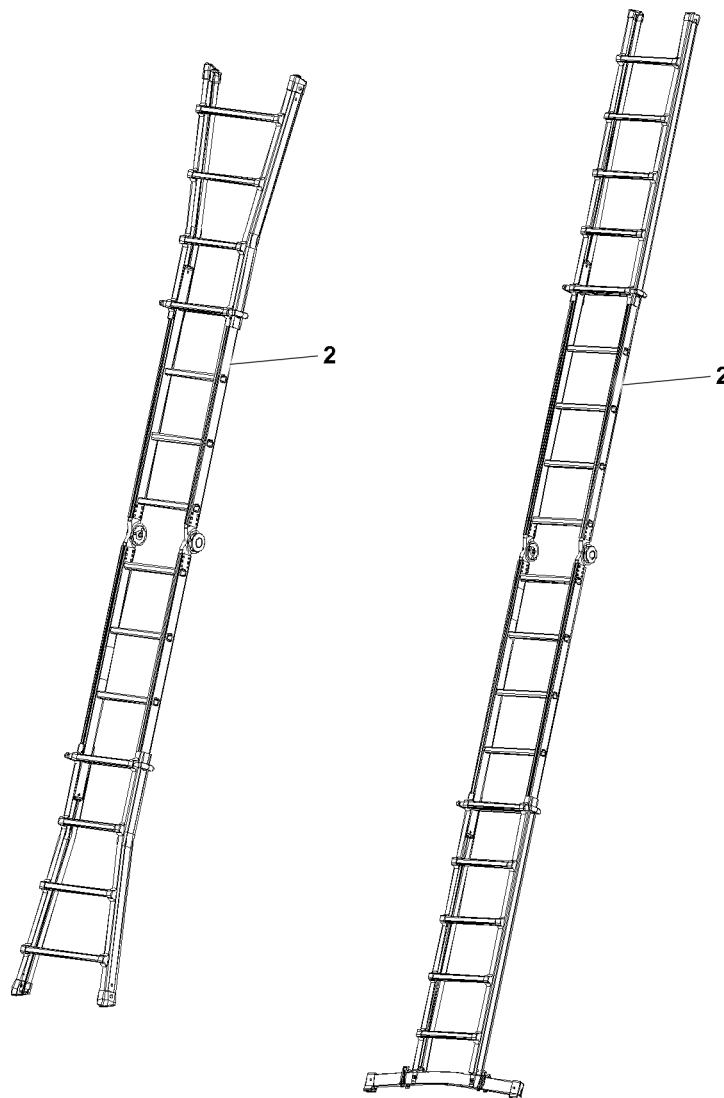


Fig.149997: Example of leaning ladders

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**WARNING**

3-point support not adhered to!

Personnel can fall, death, severe bodily injuries.

- ▶ When using leaning ladders **2**, adhere to the 3-point support.
- ▶ Adhere to the prerequisites and conditions for the use of leaning (extension) ladders **2**.

Prerequisites for the use of leaning (extension) ladders **2**:

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

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

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

7.5.3 Leaning ladder with transition

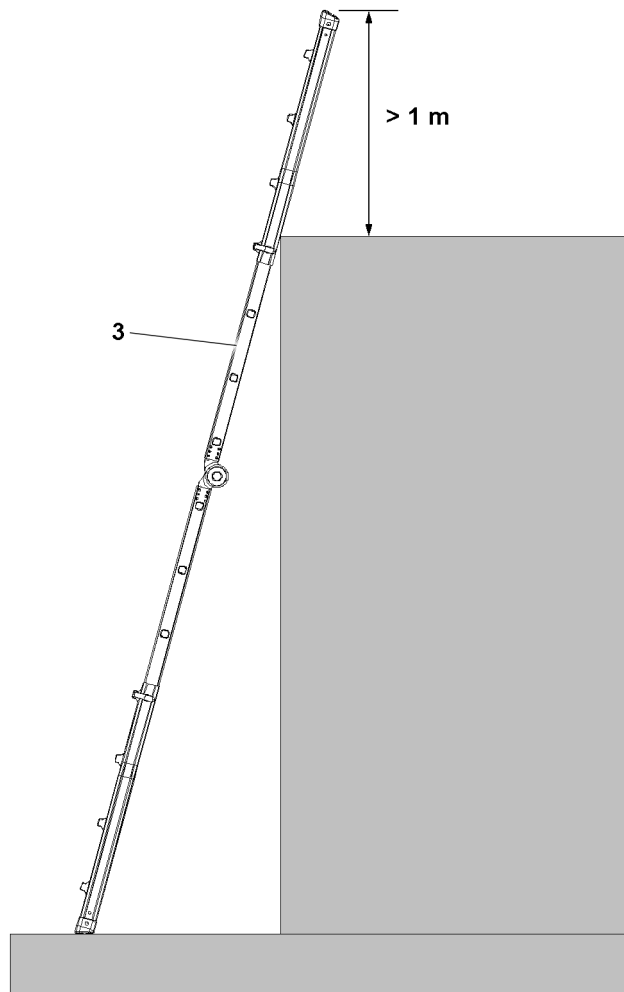


Fig.151626: Examples for leaning ladders with ladder overhang above the exit level

The leaning ladder can be used for transitioning.



WARNING

3-point support not adhered to!

Personnel can fall, death, severe bodily injuries.

- ▶ When transitioning, adhere to the 3-point support.
- ▶ Adhere to the prerequisites and conditions for the use of leaning ladders as a transition **3**.

Prerequisites for the use of leaning ladders as a transition **3**:

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

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

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

7.5.4 Vertical ladder with transition aid

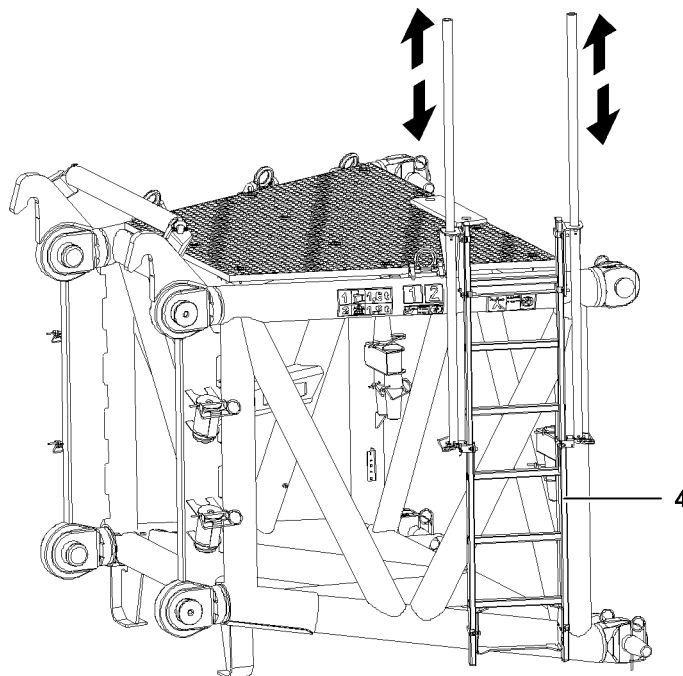


Fig.121178: Example for vertical ladder with transition aid



WARNING

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

When using vertical ladders with transition aid 4:

- ▶ Adhere to the 3-point support.

Before transitioning:

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

Prerequisites for the use of vertical ladders with transition aid **4**:

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

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

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

| Ascent | Transition |
|--|---|
| 3-point support required | 3-point support required |
| Rise to 5 m: Personal protective equipment to prevent falling not required | Rise to 1.8 m: Without transition aid: Personal protective equipment to prevent falling not required |
| Rise above 5 m: Fall arrest system with moving along fall arrest device or back protection required | Rise above 1.8 m: Without transition aid: Personal protective equipment to prevent falling required |

*Conditions for ascent and transition to vertical ladders with / without transition aid **4***

7.5.5 Platform ladder

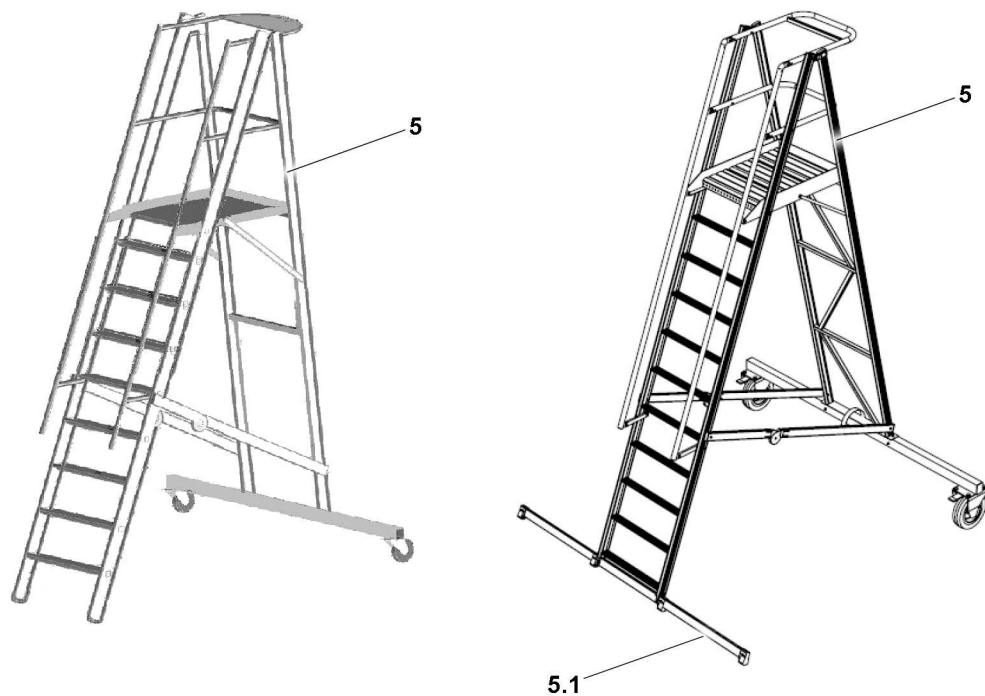


Fig. 149995: Example of platform ladders

A platform ladder **5** with a cross beam **5.1** offers more stability. It is recommended to use a platform ladder with a cross beam.

**WARNING**

Transitioning from a platform ladder **5** to other components!
Personnel can fall, death, severe bodily injuries.

- ▶ Do **not** transition from a platform ladder **5** to other components.

**WARNING**

3-point support not adhered to!
Personnel can fall, death, severe bodily injuries.

When using platform ladders **5**:

- ▶ Adhere to the 3-point support.
- ▶ Adhere to the prerequisite and conditions for the use of platform ladders **5**.

Prerequisite for the use of platform ladders **5**:

- Make sure that the weight of the tool carried along does not weigh more than 10 kg.

| Access | Working on the ladder | Working on the platform |
|---------------------------------|--|--|
| Maximum rise to platform height | Maximum rise to platform height | Maximum height: Platform height |
| 3-point support required | 3-point support required | |
| | Rise to 1 m: Personal protective equipment to prevent falling not required | |
| | Rise above 1 m to 7 m Light work: Personal protective equipment to prevent falling not required | Platform height Light work: Personal protective equipment to prevent falling not required |
| | Rise above 1 m to 7 m Heavy work: Personal protective equipment to prevent falling required | Platform height Heavy work: Personal protective equipment to prevent falling required |

Conditions for access and work on platform ladders 5

2.05 Signs on the crane

1 Signs

2

1 Signs

1.1 11952500 – California Proposition 65 Label

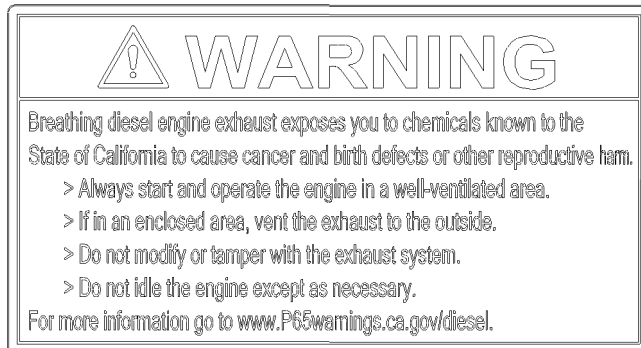


Fig.156191: California Proposition 65 Label



WARNING

Diesel engine exhaust emissions!

Damage to health such as cancer and birth defects or other reproductive harm.

- ▶ Always start and operate the diesel engine in properly ventilated spaces.
- ▶ If in enclosed areas: Direct the exhaust gas to the outside.
- ▶ Do not convert the exhaust system or make any other changes.
- ▶ Do not run the engine at idle speed for longer than necessary.

1.2 7725039 – Warning of high voltage



Fig.116269: Warning of high voltage



Note

- ▶ Only for certain countries.

1.3 772564008 – Slewing range



Fig.116270: Slewing range



Note

► Only for certain countries.

1.4 772580408 – Limitation of maximum travel speed



Fig.106035: Limitation of maximum travel speed

1.5 Vehicle height

| Vehicle height | |
|----------------|--|
| 970610408 | |
| 970629508 | |
| 970596108 | |
| 970608708 | |
| 979459108 | |

Vehicle height

LWE/LR 11350-007/19005-01-02/en



Note

▶ Vehicle height x.x m (x.x ft).

1.6 97124295 – Load stop

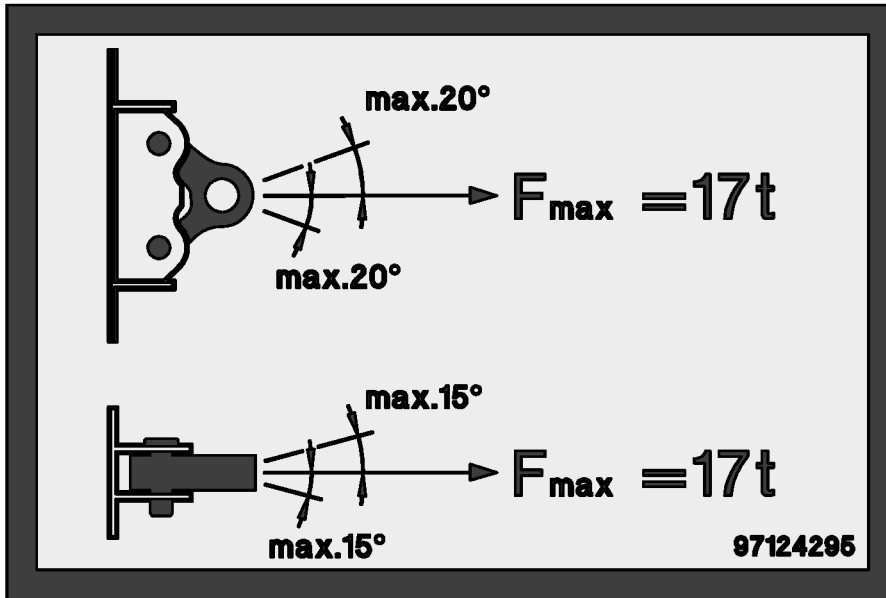


Fig.154929: Fastening the load according to the specifications on the sign

1.7 Assembly aid

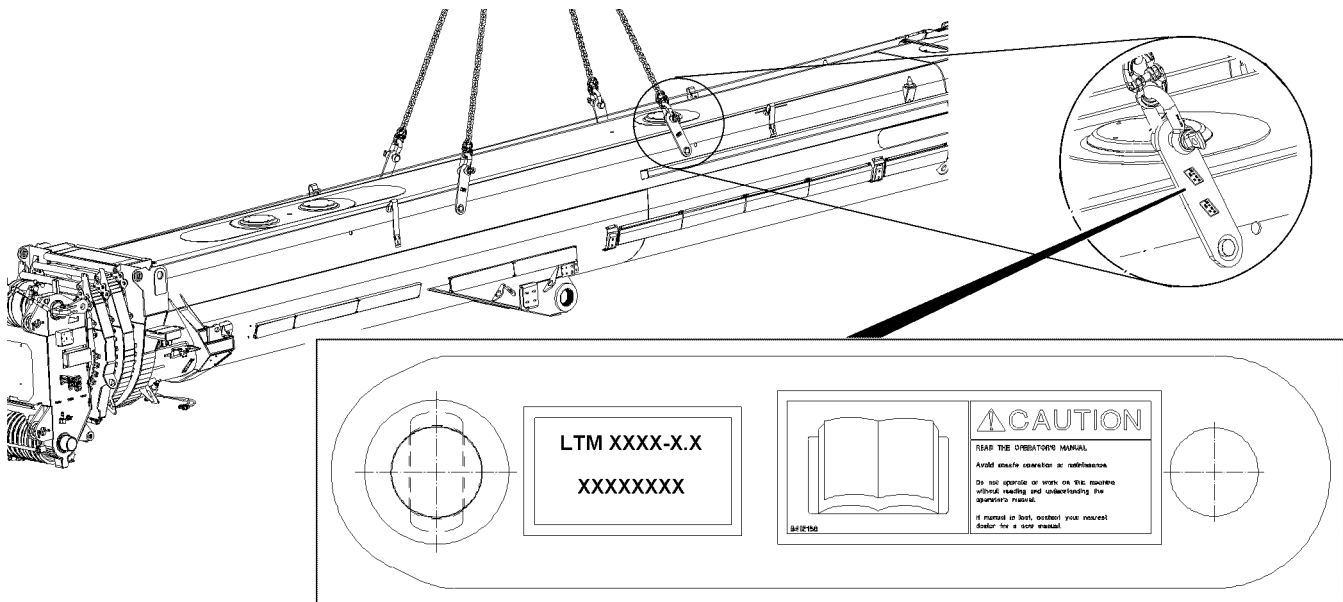


Fig.122741: Assembly aid



WARNING

Wrong assembly aids used!

The telescopic boom can fall down. Death, property damage.

▶ To assemble and disassemble the telescopic boom: Use solely the assembly aids that belong to the crane.

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1.8 97127242 – Assembly aid

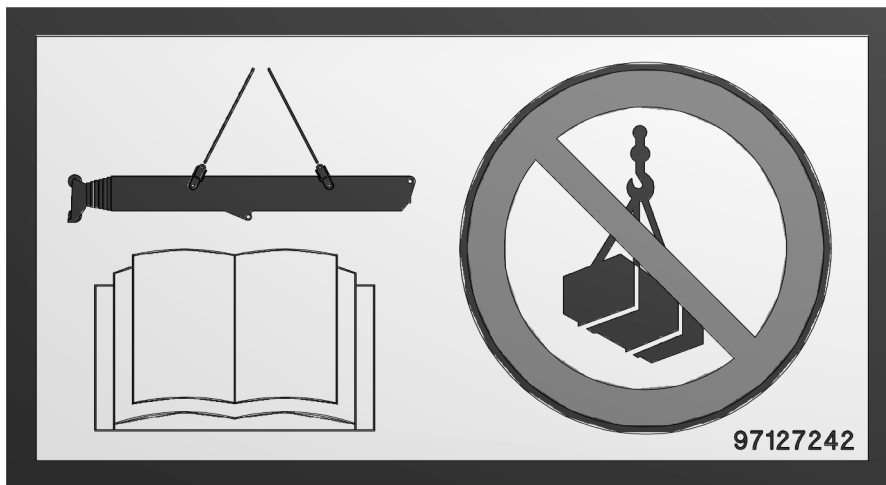


Fig.154928: Assembly aid



WARNING

Wrong assembly aids used!

The telescopic boom can fall down. Death, property damage.

- ▶ To assemble and disassemble the telescopic boom: Use solely the assembly aids that belong to the crane.
- ▶ Only use the assembly aids to assemble and disassemble the telescopic boom.

1.9 9412158 – Reading the operating instructions

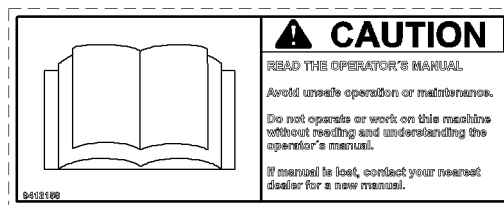


Fig.106048: Reading the operating instructions



WARNING

Danger of accident due to non-observance of operating instructions!

If the operating instructions are not read or understood, then this can lead to unsafe operation and improper maintenance.

Accidents with bodily injuries and property damage can result.

- ▶ The crane may only be operated if the contents of the operating instructions have been read and understood.
- ▶ Replace lost or incomplete operating instructions immediately.

1.10 97004046 – Safety harness, maximum two persons



Fig.115119: Safety harness, maximum two persons



DANGER

Danger of accidents due to overloaded safety ropes!

If safety ropes are used by more than two persons, then the safety ropes can be overloaded and fail in case of an accident.

Personnel can be severely injured or killed.

- ▶ Safety ropes are designed to secure a maximum of two persons against falling, one on the right and one on the left.

1.11 97017585 – Falling telescopic boom during disassembly / assembly

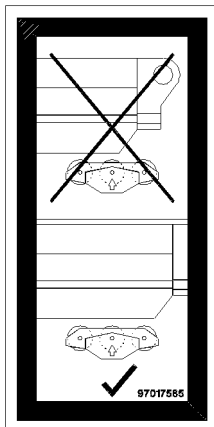


Fig.118467: Falling telescopic boom during disassembly / assembly



WARNING

Fatal accidents due to falling telescopic boom!

- ▶ Make sure that all pulleys are touching and carrying during the assembly and disassembly of the telescopic boom.

1.12 97018351 – Falling telescopic boom during transport!

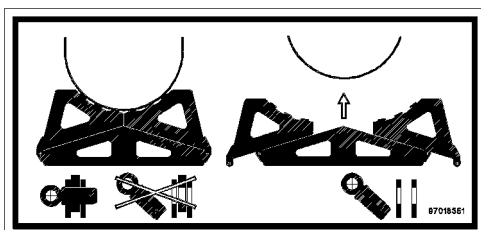


Fig.118466: Falling telescopic boom during transport

**WARNING**

Fatal accidents due to falling telescopic boom during transport!
 ► Pin and secure the transport bracket on the left and right.

1.13 97018564 – Falling telescopic boom during transport!

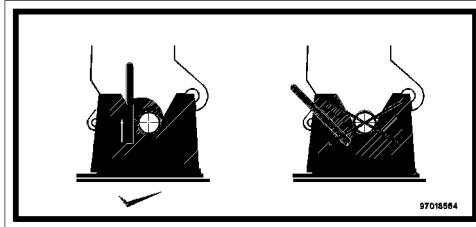


Fig.118533: Falling telescopic boom during transport

**WARNING**

Fatal accidents due to falling telescopic boom during transport!
 ► Lock the telescopic boom in the head receptacle.

1.14 97027147 – Overloading of the combi box is prohibited

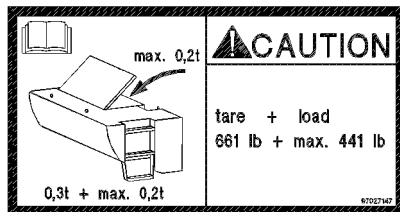


Fig.113829: Overloading of the combi box is prohibited

**WARNING**

Danger of overload!

If the combi box is subjected to a load of more than 0.2 t , the combi box can be damaged!

- The own weight of the combi box is 0.3 t and may be loaded with a maximum payload of 0.2 t.
- Do not subject the combi box to a weight of more than 0.2 t.

1.15 97036733 – Fastening point

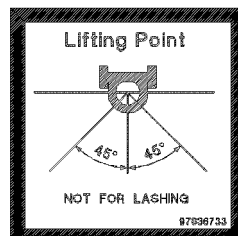


Fig.121184: Fastening point



WARNING

Damage to the fastening points!

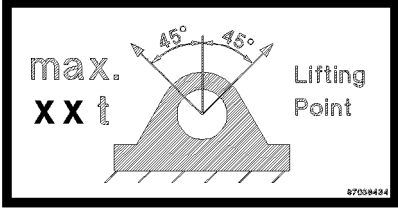
- ▶ Use the fastening point solely to lift the load.
- ▶ Observe the maximum permissible fastening angle.



Note

- ▶ Fastening points and fastening angle.

1.16 Suspended load fastening point

| Suspended load fastening point | |
|--------------------------------|--|
| 97038434 |  <p style="text-align: center;"><i>Fastening point</i></p> |
| 97037482 | |
| 97039068 | |



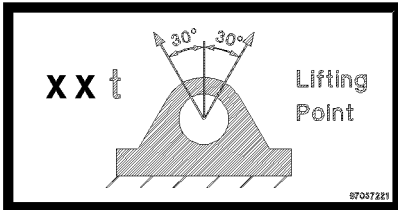
WARNING

Mortal danger if the load falls down!

If the maximum suspended load or the maximum fastening angle is exceeded, the load can fall down and kill personnel.

- ▶ Observe the maximum permissible suspended load and fastening angle.

1.17 Suspended load fastening point

| Suspended load fastening point | |
|--------------------------------|--|
| 97037221 |  <p style="text-align: center;"><i>Fastening point</i></p> |
| 97037223 | |



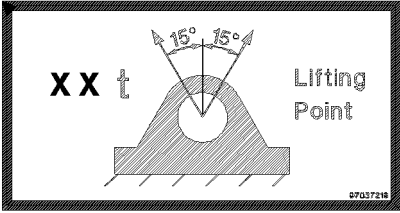
WARNING

Mortal danger if the load falls down!

If the maximum suspended load or the maximum fastening angle is exceeded, the load can fall down and kill personnel.

- ▶ Observe the maximum permissible suspended load and fastening angle.

1.18 Suspended load fastening point

| Suspended load fastening point | |
|--------------------------------|---|
| 97037219 |  <p style="text-align: center;">Fastening point</p> |



WARNING

Mortal danger if the load falls down!

If the maximum suspended load or the maximum fastening angle is exceeded, the load can fall down and kill personnel.

► Observe the maximum permissible suspended load and fastening angle.

1.19 97037625 – Suspended load Fastening points / rigging points

| LIFTING AND LASHING | | | |
|---------------------|------------------|------------|--|
| Type III | Lashing Capacity | | |
| | LC-N [daN] | LC-G [daN] | |
| 4 | 4 000 | 2 800 | |
| 6,7 | 6 700 | 4 690 | |
| 10 | 10 000 | 7 000 | |
| 16 | 16 000 | 11 200 | |
| 31,5 | 31 500 | 22 050 | |

Fig.11988: Fastening points / rigging points



Note

► Fastening points and rigging points.

1.20 9402377 – Fastening point / lifting point

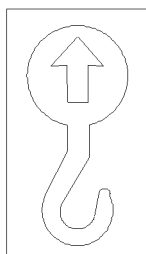


Fig.127586: Fastening point / lifting point



Note

► Fastening point / lifting point.

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1.21 97106824 – Installing the N-assembly unit

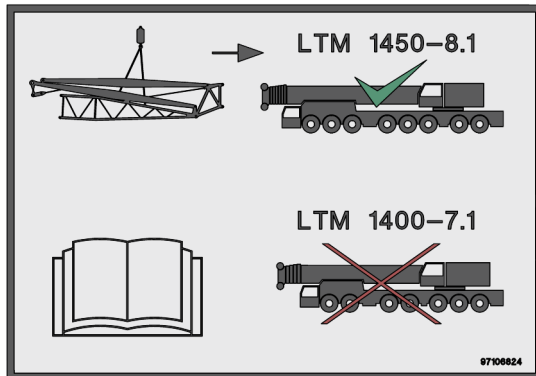


Fig.147594: Installing the N-assembly unit



WARNING

N-assembly unit installed on an impermissible crane type!
Death, severe bodily injuries, property damage.

- ▶ Use N-assembly units marked with this sign only for crane type LTM 1450-8.1.
- ▶ Observe and adhere to the operating instructions.

1.22 97096132 – Fastening points for N-assembly unit

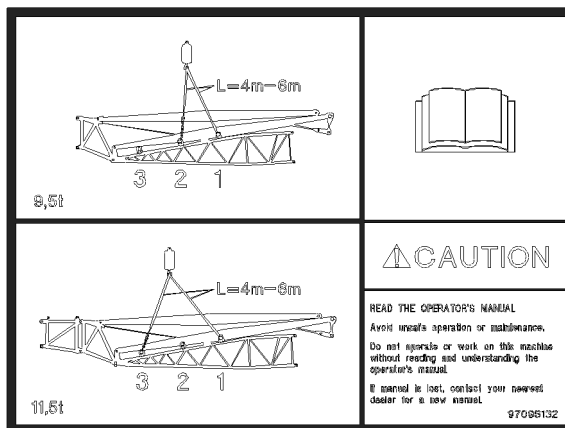


Fig.144774: Fastening points for N-assembly unit



WARNING

Incorrectly selected fastening points!

The N-assembly unit can tip over and kill personnel.

- ▶ Fasten the N-assembly unit only on the intended fastening points.
- ▶ Use fastening equipment with the correct strand length.
- ▶ Observe and adhere to the operating instructions.
- ▶ Replace lost or incomplete operating instructions immediately.

1.23 97036735 – Fastening point for lattice section

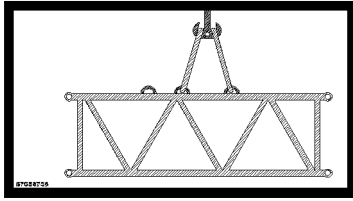


Fig.116266: Fastening point for lattice section



Note

► Fastening points for lattice section.

1.24 97036736 – Fastening point for lattice sections

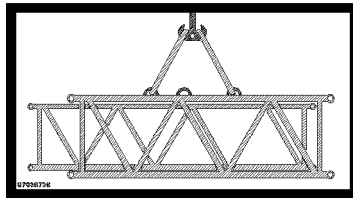


Fig.116267: Fastening point for lattice sections



Note

► Fastening points for lattice sections.

1.25 97038442 – Fastening point for lattice section

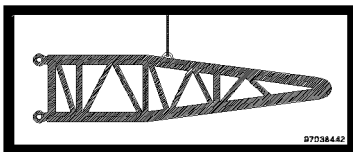


Fig.116288: Fastening point for lattice sections



Note

► Fastening point for lattice section.

1.26 97038452 – Fastening point for lattice sections

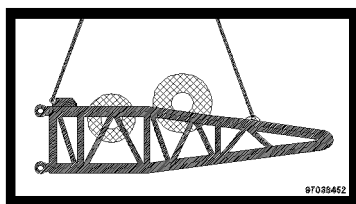


Fig.116289: Fastening point for lattice sections



Note

► Fastening points for lattice sections.

1.27 97038454 – Fastening point for lattice sections

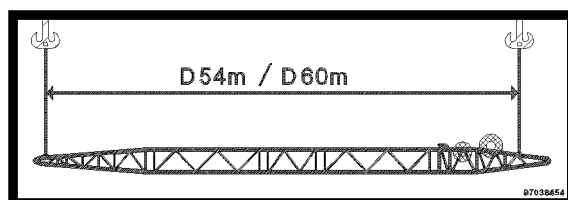


Fig.116290: Fastening point for lattice sections



Note

► Fastening points for lattice sections.

1.28 97037871 – Fastening points for lattice sections

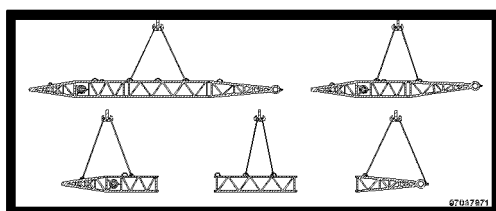


Fig.116292: Fastening points for lattice sections



Note

► Fastening points for lattice sections.

1.29 97053410 – Fastening equipment

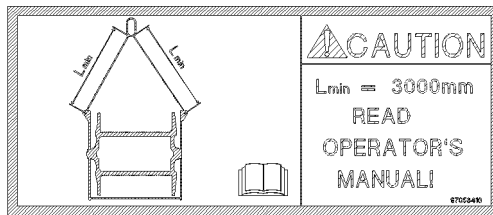


Fig.155031: Fastening equipment

NOTICE

The fastening equipment is too short!

The fastening equipment is overloaded, the load can fall down.

The assembly procedure cannot be carried out.

- ▶ Use fastening equipment with a minimum length of 3000 mm.
- ▶ Use only authorized fastening equipment with a suitable load bearing capacity.
- ▶ Observe and adhere to the operating instructions.

1.30 97057767 – Fastening points for lattice sections

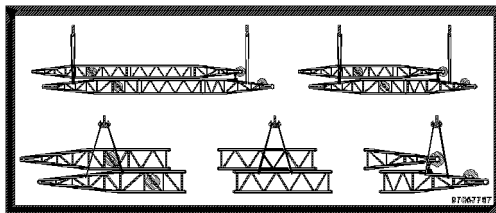


Fig.121181: Fastening points for lattice sections



Note

- ▶ Fastening points for lattice sections.

1.31 97057524 – Fastening point for assembly of lattice sections

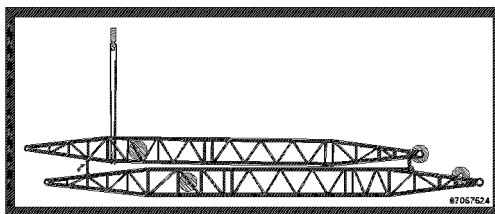


Fig.121182: Fastening point for assembly of lattice sections



Note

- ▶ Fastening point for assembly of lattice sections.

1.32 97057097 – Fastening point to turn the component

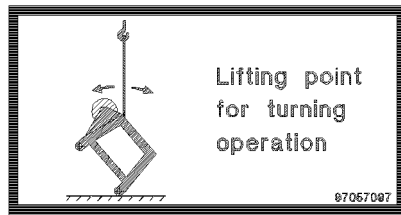


Fig.119987: Fastening point to turn the component



Note

- ▶ Fastening point to turn the component.

1.33 97039035 – Suspended load Assembly unit

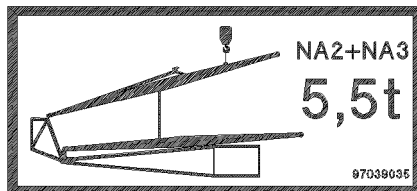


Fig.117348: Suspended load Assembly unit



Note

- ▶ Notice the suspended load.

1.34 97059339 – Suspended load Derrick pivot section

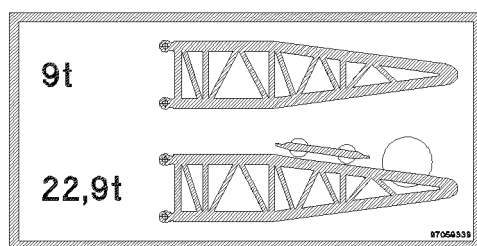


Fig.127469: Suspended load Derrick pivot section



Note

- ▶ Suspended load Derrick pivot section.
- ▶ Suspended load Derrick pivot section with rope winch and luffing pulley block.

1.35 Fastening point for end section

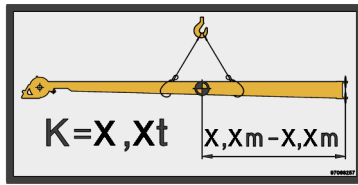


Fig.147595: Fastening point for end section

K = Weight in tons (t)

X.X to X.X = Distance of center of gravity in meters (m)



WARNING

End section improperly fastened!
The end section can tip over and fall down.
Death, severe bodily injuries, property damage.

- ▶ Fasten the end section only with two hooks.
- ▶ Select the fastening point such that the center of gravity is located within the fastening points.

1.36 97095312 – Suspended load and fastening points for counterweight frame

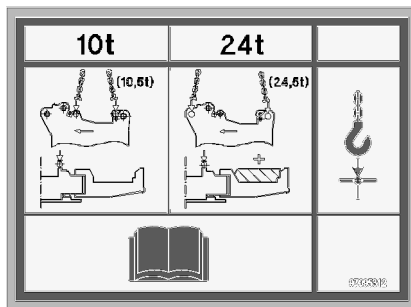


Fig.148126: Suspended load and fastening points for counterweight frame



Note

- ▶ Observe the suspended load and fastening points for counterweight frame.
- ▶ Observe and adhere to the operating instructions.

1.37 97003109 – Accessing the step ladder



Fig.109032: Accessing the step ladder

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**WARNING**

Danger of falling!

If the step ladder is accessed before it is completely folded out, the assembly personnel can fall and be fatally injured.

- ▶ Before accessing the step ladder, fold the lowest step out.

1.38 97003110 – Folding the step ladder in and out

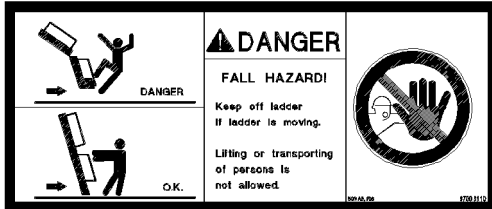


Fig.109033: Folding the step ladder in and out

**WARNING**

Danger of falling!

When folding the step ladder in or out or when driving the crane, no persons may remain on the step ladder or within the entire danger zone! Persons can fall from the step ladder or be killed as the step ladder folds in or out.

- ▶ Fold the step ladder in and out only if there are no persons within the danger zone.

1.39 97006167 – Identifying the support base

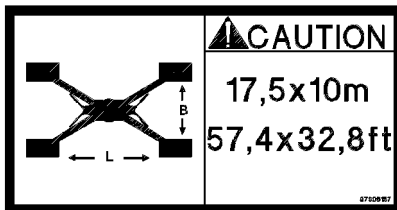


Fig.116285: Identifying the support base

**Note**

- ▶ The support beams are swung out / extended to a support base of 17.50 m x 10.0 m ; (57.4 ft x 32.8 ft).

1.40 97006167 – Identifying the support base

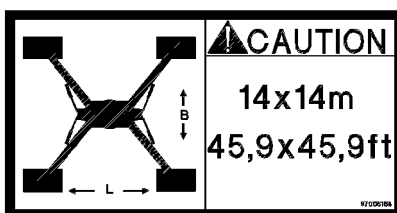


Fig.116286: Identifying the support base

**Note**

- ▶ The support beams are swung out / extended to a support base of 14.0 m x 14.0 m ; (45.9 ft x 45.9 ft).

1.41 97008514 – Warning of head injuries



Fig.110550: Warning of head injuries

**WARNING**

Head injuries!

Due to falling parts, personnel can be killed or severely injured.
Hitting the head can cause injuries.

- ▶ Protect your head with a hard hat.
- ▶ Proceed in an aware and safe manner.

1.42 97009799 – Data logger

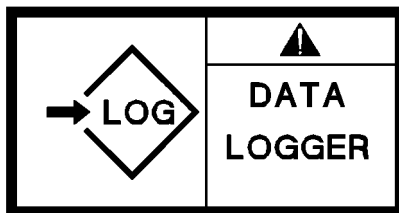


Fig.116261: Data logger

**Note**

- ▶ Data logger.

1.43 97012949 – Maximum load

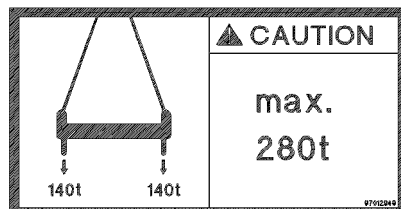


Fig.116263: Maximum load

**CAUTION**

Property damage due to overload!
If the cross beam is subjected to a higher load than permissible, damage can occur.
▶ Do not overload the cross beam.

1.44 97012095 – Maximum load

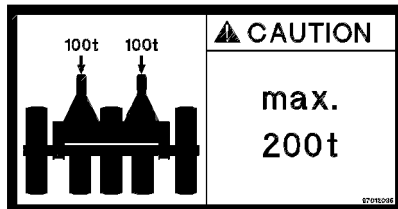


Fig.116265: Maximum load

**CAUTION**

Property damage due to overload!
If the roller cart is subjected to a higher load than permissible, damage can occur.
▶ Do not overload the roller cart.

1.45 97069053 – Storage boxes open

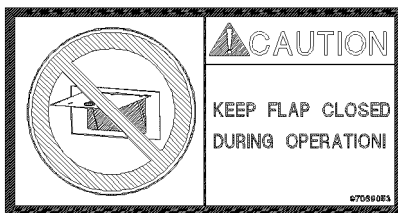


Fig.144736: Storage boxes open

NOTICE

Storage boxes open!
Damage of storage boxes.
▶ Before crane operation and before driving the crane, close the storage boxes.

1.46 97068370 – Closing the cab door

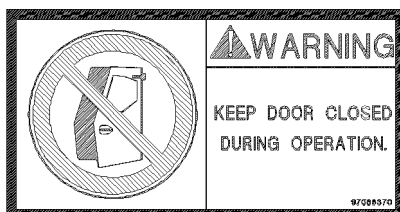


Fig.144737: Closing the cab door

**WARNING**

Cab door during crane operation **not** closed!
 The crane operator can fall down.
 Death, severe bodily injuries.
 ► Close the cab door during crane operation.

1.47 97053409 – Entanglement hazard during winch operation



Fig.144738: Entanglement hazard during winch operation

**DANGER**

Entanglement hazard during winch operation!
 Body parts can be caught and entangled.
 Death, severe bodily injuries, property damage.
 ► Do **not** stand in the hazard area of the winch.

1.48 97011689 – Danger of crushing

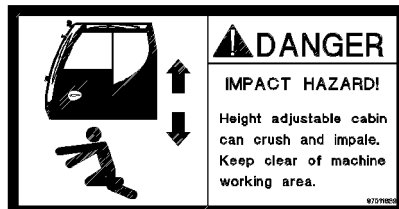


Fig.111047: Danger of crushing

**DANGER**

Danger of fatal injury!
 ► It is prohibited to remain within the danger zone of the cab.
 ► Stay away from the movement range of the cab.

1.49 97011690 – Overload of cab is prohibited

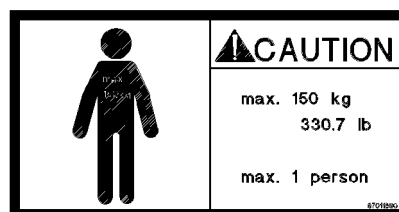


Fig.111048: Overload of cab is prohibited

**WARNING**

Danger of overload!

If the cab is subjected to a load of more than 150 kg then the cab or the telescoping arm can be damaged!

- ▶ Only one person at a time may remain in the cab!
- ▶ Do not subject the cab to a weight of more than 150 kg.

1.50 97016304 – Refueling

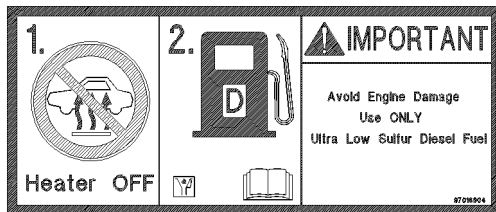


Fig.155029: Refueling

**WARNING**

Danger of fire and explosion!

- ▶ Turn the auxiliary heater* off approx. 3 min before refueling the fuel tank.
- ▶ Before refueling the fuel tank, turn the engine off.

NOTICE

Property damage to the engine!

If incorrect fuel is added, the engine can be severely damaged.

- ▶ Refuel with fuel according to the Engine manufacturer's operating instructions.

1.51 97046488 – Corrosion inhibitor - antifreeze fluids

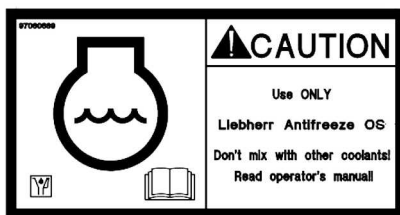


Fig.127585: Corrosion inhibitor - antifreeze fluids

NOTICE

Mixing of different corrosion inhibitor-antifreeze agents!

Damage to the cooling system.

- ▶ Fill the cooling system with corrosion inhibitor-antifreeze, see Service fill list.

1.52 97016392 – Crushing danger for feet



Fig.112474: Crushing danger for feet



WARNING

Crushing danger for feet!
Feet can be trapped or crushed.

- ▶ Keep feet away from the crushing area.

1.53 97012737 – Danger of accident

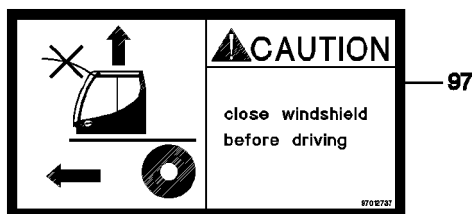


Fig.111748: Danger of accident



WARNING

Danger of accident!

- ▶ Close the windshield when driving.

1.54 97023034 – Disassembling

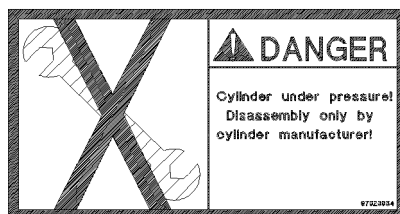


Fig.116264: Disassembling



DANGER

Danger of fatal injury due to repair!
Cylinder is pressurized.
Disassembly of the cylinder can result in death or serious injuries.

- ▶ The cylinder may only be removed by the manufacturer.

1.55 97036732 – Access via 3-point support

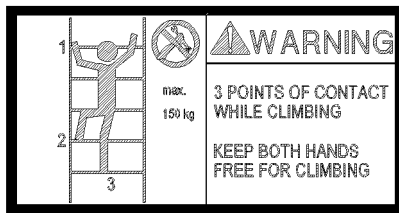


Fig.115172: Access via 3-point support



DANGER

Access via 3-point support!

While climbing up and down via a ladder, assembly personnel can fall down and be injured severely.

- ▶ When climbing up and down, a 3-point support must be ensured.
- ▶ Use ladders only up to a weight of 150 kg.
- ▶ When climbing up and down, hands must be free.

A 3-point support is ensured when:

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

1.56 97003112 – Maximum suspended load

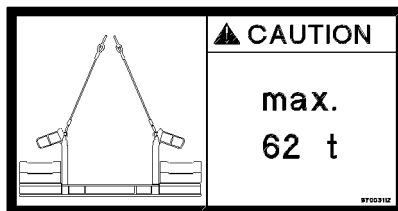


Fig.116282: Maximum suspended load



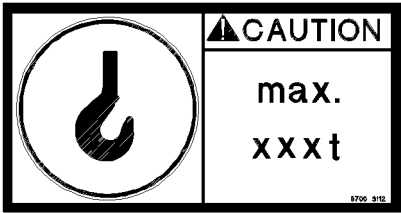
WARNING

Maximum suspended load!

If the maximum suspended load of 62 t is exceeded, the load can fall down and kill personnel.

- ▶ Observe the maximum permissible suspended load.

1.57 97036917 – Maximum suspended load

| | Suspended load fastening point |
|----------|--|
| 97047630 |  |
| 97036917 | |
| 97047630 | |
| 97077237 | |



WARNING

Mortal danger if the load falls down!
 If the maximum suspended load is exceeded, the load can fall down and kill personnel.
 ► Observe the maximum permissible suspended load.

1.58 97037383 – Urea

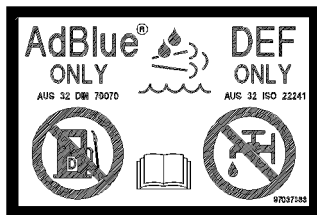


Fig.115173: Urea



CAUTION

Property damage due to incorrect operating fluids!
 When refilling urea and the urea which is specified by the engine manufacturer is not used, then damage can occur.
 ► Refill **exclusively** urea.
 ► See engine manufacturer's operating instructions.

1.59 97037952 – Warning of fatal electric shock

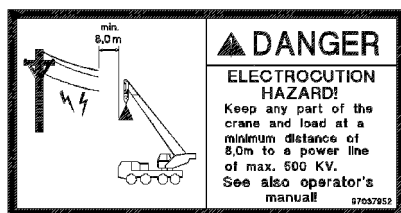


Fig.116280: Warning of fatal electric shock

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**DANGER**

Danger of fatal injury due to electric shock!

If the boom or the hoist rope is under electric voltage, then death or severe injuries can occur if anyone touches the crane, the vehicle or the load.

- ▶ Keep a minimum distance of 8.0 m from current carrying parts.

1.60 97042730 – Falling luffing cylinder

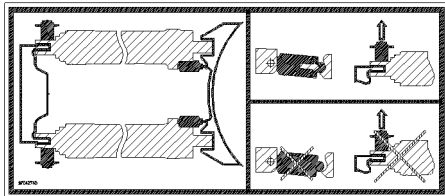


Fig.118465: Falling luffing cylinder

**WARNING**

Mortal danger if the luffing cylinders fall down!

- ▶ Make sure, before unpinning the luffing cylinder, that the erection cylinders are placed on both luffing cylinders.

1.61 97047810 – Pinning brackets

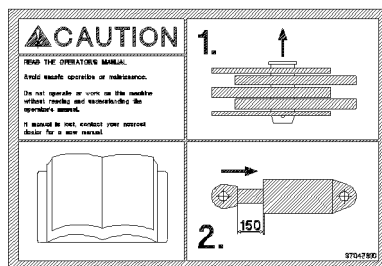


Fig.121709: Pinning brackets

NOTICE

Damage of brackets due to collision!

- ▶ Make sure, before pinning and unpinning, that the hydraulic cylinder is set to a distance of 150 mm.

1.62 97042797 – Overload of components

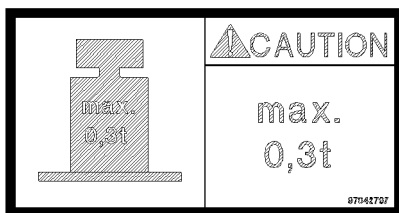


Fig.117347: Overload of components

**DANGER**

Danger of falling due to overload!

If a component, such as a sliding beam platform, is subjected to a weight of more than 0.3 t , then the sliding beam platform can break.

Personnel can fall down and be severely injured or killed.

- ▶ Subject the component (sliding beam platform) to no more than maximum 0.3 t.

1.63 97041305 – Overload of components

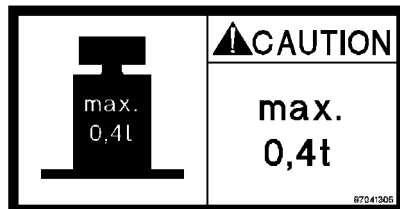


Fig.116792: Warning of overload of components

**DANGER**

Danger of falling due to overload!

If a component, such as a sliding beam platform, is subjected to a weight of more than 0.4 t , then the sliding beam platform can break.

Personnel can fall down and be severely injured or killed.

- ▶ Subject the component (sliding beam platform) to no more than maximum 0.4 t.

1.64 97070905 – Removing the auxiliary jib (boom nose)

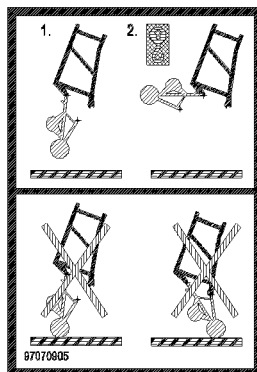


Fig.122645: Removing the auxiliary jib (boom nose)

NOTICE

Property damage

Before taking the N-head down:

- ▶ Remove the auxiliary jib (boom nose).

1.65 97077304 – Positioning the track pad

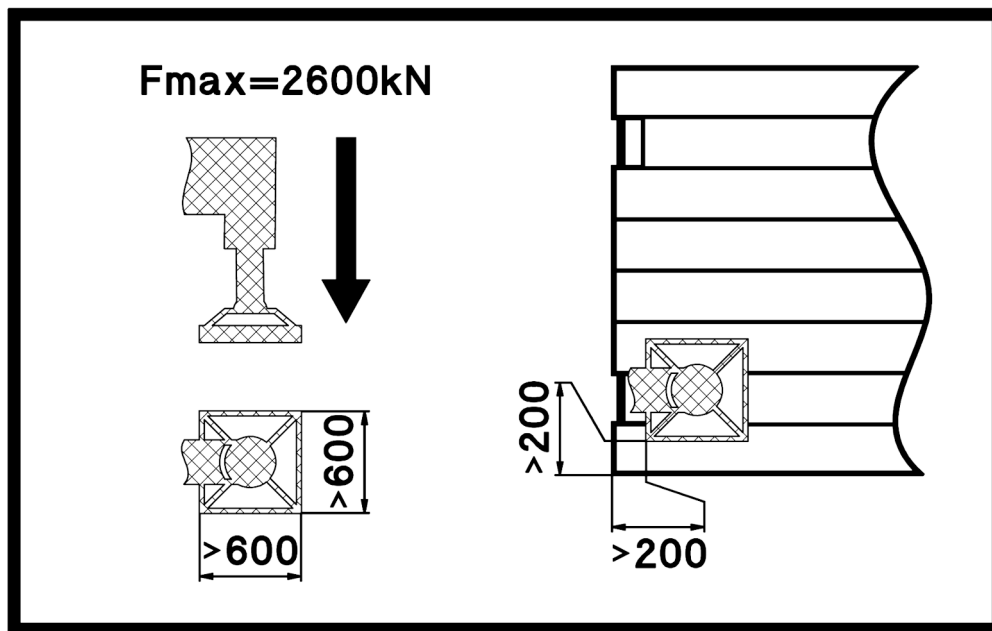


Fig.154913: Positioning the track pad



WARNING

Track pad incorrectly positioned!
The crane can topple over. Death, property damage.

- Position the track pad **in the center** or according to the description in chapter 1.03.10 under the support plate.

1.66 9707704 – Driving with the track pad

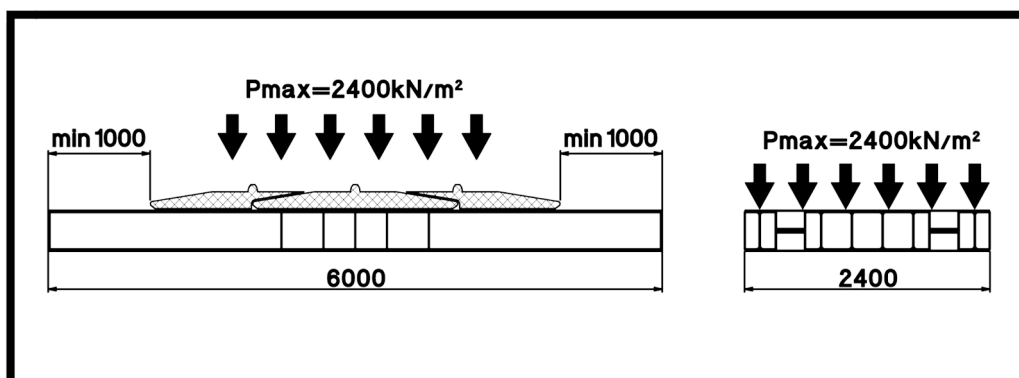


Fig.154912: Driving with the track pad



WARNING

Track pad incorrectly driven!
The crane can topple over. Death, property damage.

- Drive with the track pad according to the specifications on the sign.

1.67 Permissible support pressures on the track pad [A-B-C]

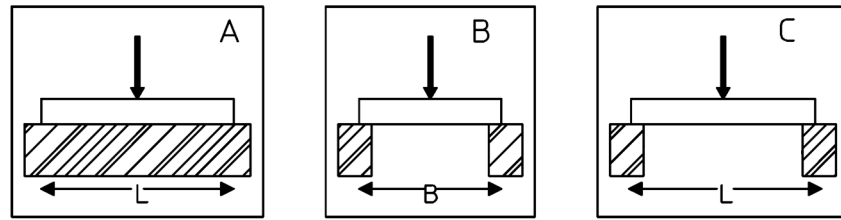


Fig.154815: Permissible support pressures on the track pad for application cases [A-B-C]

1.68 Permissible support pressures on the track pad [A-B-C-D]

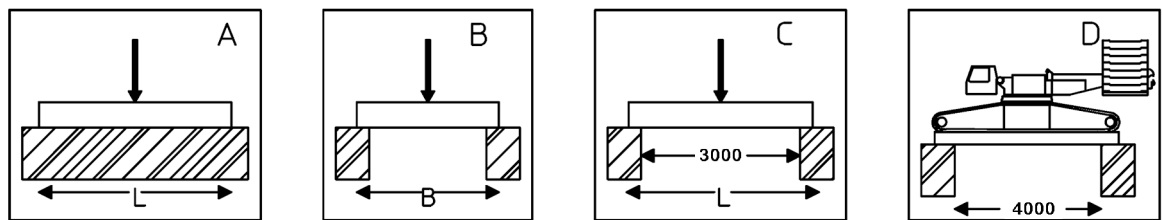


Fig.154816: Permissible support pressures on the track pad for application cases [A-B-C-D]

1.69 97033982 – Assembling / disassembling the Derrick pivot section

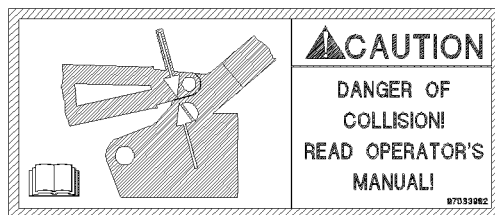


Fig.127470: Assembling / disassembling the Derrick pivot section

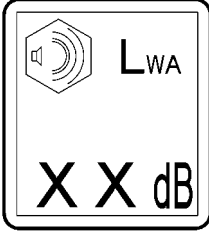
NOTICE

Derrick pivot section assembly procedure carried out incorrectly!

Damage to the Derrick pivot section receptacle.

► Perform the assembly procedure according to the operating instructions.

1.70 Maximum sound power level

| | Maximum sound power level |
|-----------|--|
| 975809508 |  <p><i>Maximum sound power level</i></p> |
| 971693308 | |
| 971693408 | |
| 971693508 | |
| 971693608 | |



Note

- ▶ The maximum sound power level can be read on the outside of the crane operator's cab or in the CE declaration of conformity.

1.71 97097951 – Counterweight

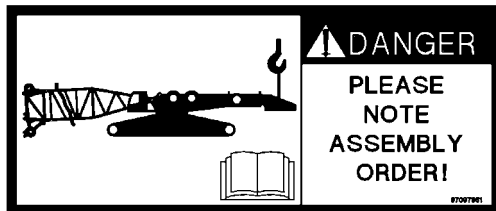


Fig.146805: Counterweight



DANGER

Counterweight not secured!

Falling counterweight death, property damage.

- ▶ Observe and adhere to the operating instructions.
- ▶ Do not remove the auxiliary crane until the counterweight is pinned and secured on both sides with the turntable.

1.72 97107101 – Unlocking the telescopic boom locking pin

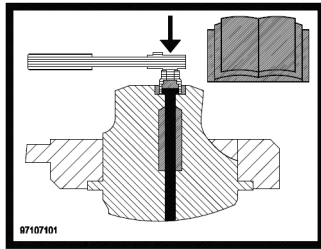


Fig.148421: Unlocking the telescopic boom locking pin



Note

- ▶ The locking pin may be unlocked according to the operating instructions.
- ▶ Observe and adhere to the operating instructions.

1.73 97107199 – Do not unlock the telescopic boom locking pin

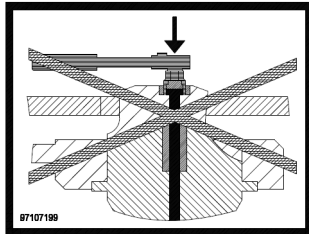


Fig.148422: Do not unlock the telescopic boom locking pin



WARNING

Impermissible telescopic boom locking pin unlocked!
 The telescopic boom can retract in an uncontrolled manner.
 Death, severe bodily injuries, property damage.

If a locking pin is marked with this sign:

- ▶ **Never** unlock the locking pin.

1.74 97128894 – Counterweight and counterweight radius

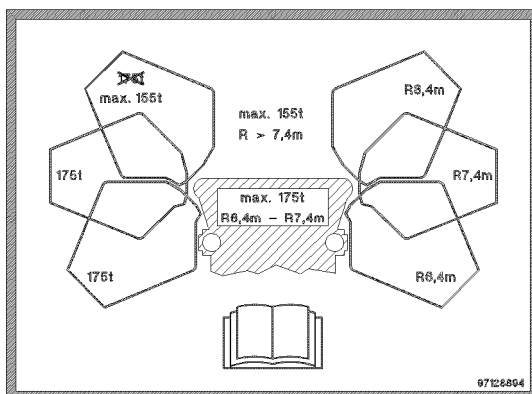


Fig.155030: Counterweight and counterweight radius

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| Counterweight radius | Maximum permissible counterweight |
|----------------------|-----------------------------------|
| R- 6.4 m – R- 7.4 m | 175.0 t |
| R- > 7.4 m | 155.0 t |

**Note**

- ▶ This notice sign indicates the maximum permissible counterweight for the different weight radii.
- ▶ Observe and adhere to the operating instructions.

1.75 97131530 – Reduced crawler crane track width

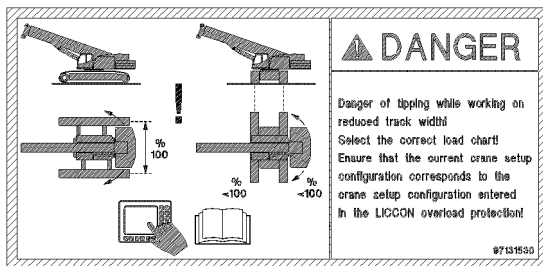


Fig.156174: Reduced crawler crane track width

**DANGER**

Danger of tipping when working with a reduced track width!

- ▶ Select the correct load chart.
- ▶ Make sure that the actual crane set up configuration and the set up configuration entered in the LICCON overload protection match.

1.76 977055908 – Fastening point for swingable sliding beam

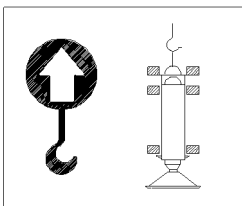


Fig.106894: Fastening point for swingable sliding beam

1.77 971494208 – Limitation of maximum travel speed

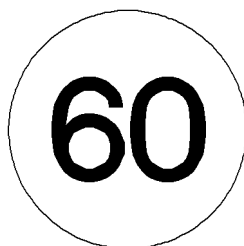


Fig.106034: Limitation of maximum travel speed

1.78 971539808 – Warning notice for unpinning the auxiliary boom on the pulley head

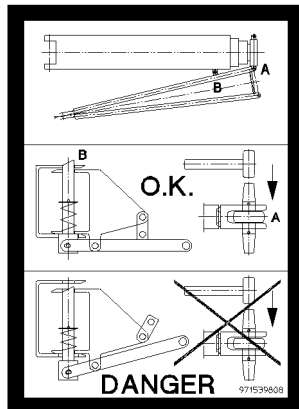


Fig.106040: Warning notice for unpinning the auxiliary boom on the pulley head



DANGER

Danger of fatal injury!

If the auxiliary boom is not locked correctly to the pivot section, it can fall down. Personnel can be severely injured or killed.

- ▶ Unpinning the auxiliary boom on the pulley head is prohibited.

1.79 971539908 – Warning notice for unlocking the auxiliary boom

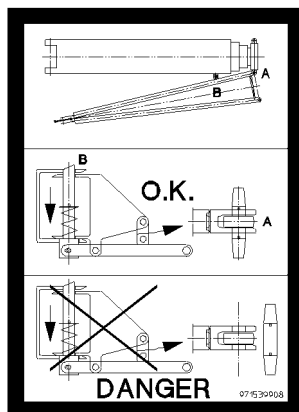


Fig.106041: Warning notice for unlocking the auxiliary boom



DANGER

Danger of fatal injury!

If the auxiliary boom is not locked correctly to the pulley head, it can fall down. Personnel can be severely injured or killed.

- ▶ Unpinning the auxiliary boom on the pivot section is prohibited.

1.80 978673908 – Warning of suspended load

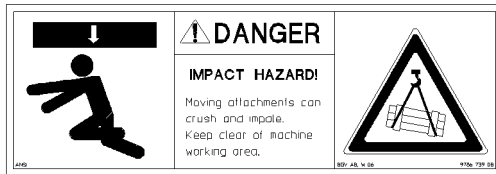


Fig.106026: Warning of suspended load



DANGER

Danger of fatal injury under suspended load!

- ▶ Standing under a suspended load is prohibited.
- ▶ Stay away from the working range of the machine.

1.81 978674008 – Access for unauthorized personnel prohibited



Fig.106037: Access for unauthorized personnel prohibited



DANGER

Danger of fatal injury!

If the crane or the working area is accessed by unauthorized personnel, life threatening injuries can occur as a result.

- ▶ It is prohibited for unauthorized personnel to enter the crane or the working area.

1.82 97039753 – Danger of stumbling

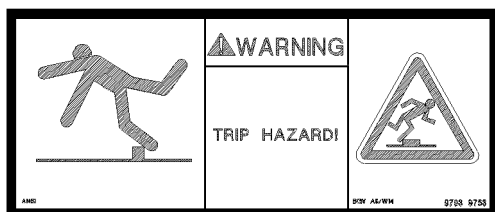


Fig.117346: Danger of stumbling



WARNING

Danger of stumbling!

- ▶ Move with caution.

1.83 978674108 – Warning of crushing danger

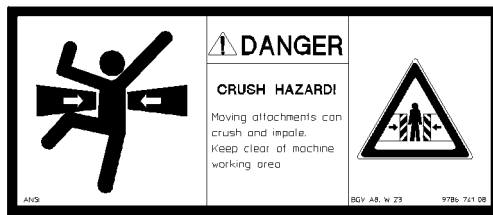


Fig.106027: Danger of crushing



DANGER

Danger of fatal injury when remaining in areas with crushing danger!

- ▶ It is prohibited for anyone to remain in areas where there is a crushing danger.
- ▶ Stay away from the working range of the machine.

1.84 97016911 – Danger of collision

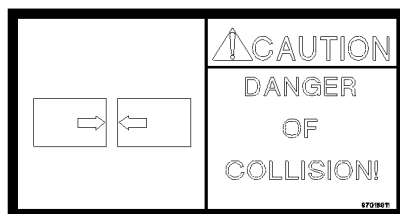


Fig.117344: Danger of collision

NOTICE

Danger of collision!

- ▶ Avoid a collision.

1.85 978674308 – Radio remote control

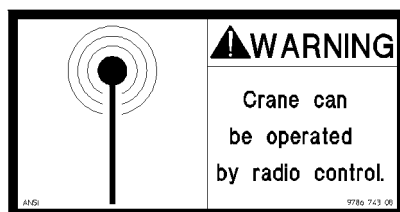


Fig.106047: Radio remote control



WARNING

Danger of injury due to crane operation with radio remote control!

- ▶ The crane can be operated with radio remote control!
- ▶ During crane operation, it is prohibited for anyone to remain in the danger zone!

1.86 978674408 – Danger of burns to hands



Fig.106028: Danger of burns to hands



WARNING

Danger of burns when touching hot surfaces!

- ▶ Do not touch hot surfaces.

1.87 978674508 – Warning of rotating parts

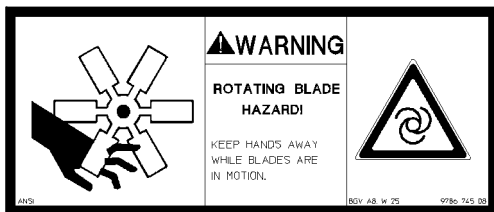


Fig.106029: Warning of rotating parts



WARNING

Rotating parts!

The rotating fan blade can cause finger and hand injuries.

- ▶ Keep your hands away from the rotating fan blade.

1.88 978674608 - Crushing danger for hands



Fig.106030: Crushing danger for hands



WARNING

Danger of injuries for hands!

Hands can be caught, trapped or crushed within the danger zone.

- ▶ Keep hands away from the danger zone!

1.89 978674808 – Personal protective equipment



Fig.123900: Personal protective equipment



DANGER

Danger of falling!

- ▶ Use personal protective equipment.

1.90 978674908 – Accessing the area is prohibited



Fig.106038: Accessing the area is prohibited



WARNING

Danger of accident!

If the prohibited area is accessed, accidents can occur.
Personnel can be severely injured or killed.

- ▶ Do not access the prohibited area.

1.91 978675008 – Access prohibited



Fig.106039: Access prohibited



WARNING

Danger of falling!

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

- ▶ Do not get on the crane.

1.92 978687408 – Rigging point



Fig.112475: Rigging point



WARNING

Rigging point!

- ▶ Use the rigging point **solely** for rigging.
- ▶ Lifting on the rigging point is prohibited.

1.93 97036734 – Rigging point

| NOT FOR LIFTING! | | | |
|------------------|------------------|---------------|--|
| Type (t) | Lashing Capacity | | |
| | LC-N (daN) | LC-Q (daN) | |
| 4 | 4 000 | 2 000 | |
| 8,7 | 8 700 | 4 000 | |
| 10 | 10 000 | 7 000 | |
| 16 | 16 000 | 11 200 | |
| 31,5 | 31 500 | 22 050 | |

Fig.116287: Rigging point



WARNING

Rigging point!

- ▶ Use the rigging point **solely** for rigging.
- ▶ Lifting on the rigging point is **prohibited**.

1.94 978867108 – Warning of fatal electric shock

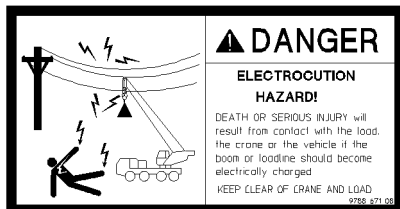


Fig.106814: Warning of fatal electric shock



DANGER

Danger of fatal injury due to electric shock!

If the boom or the hoist rope is under electric voltage, then death or severe injuries can occur if anyone touches the crane, the vehicle or the load.

- ▶ Stay away from the crane and load.

1.95 97094940 – Spark catcher

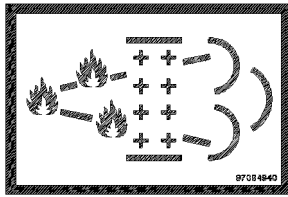


Fig.144735: Spark catcher



Note

► The exhaust system is equipped with an integrated spark catcher.

1.96 979383308 – Oil change

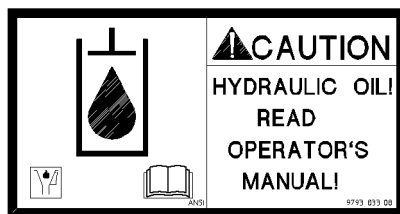


Fig.113827: Oil change



CAUTION

Property damage due to oil change!

If the oil specified in the operating instructions is not used during the oil change, it can lead to damage.

► See the Crane operating instructions, chapter 7.07.

1.97 979561108 – Counterweight

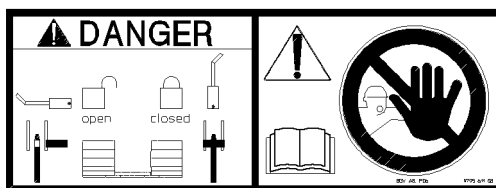


Fig.109026: Counterweight



WARNING

The counterweight can fall down!

If the auxiliary crane is removed on the counterweight before the counterweight is locked on both sides with the turntable, then the counterweight will fall down and can fatally injure assembly personnel.

► Do not remove the auxiliary crane until the counterweight is locked and secured on both sides with the turntable. See the Crane operating instructions, chapter 4.07.

1.98 97001802 – Falling platform

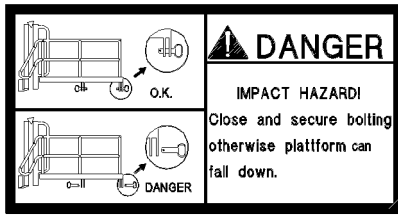


Fig.117345: Falling platform



WARNING

Falling platform!

► Pin and secure the platform in assembly / disassembly position.

1.99 973974408 - Transport weights of the components

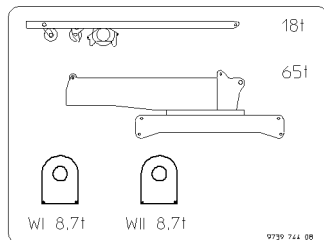


Fig.112440: Transport weights of the components

1.100 973974608 - Transport weights of the components

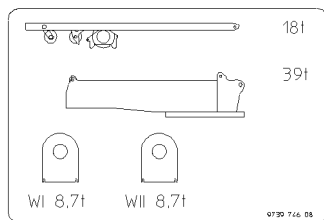


Fig.112441: Transport weights of the components

1.101 97011336 - Transport weights of the components

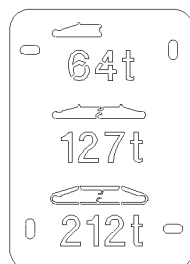


Fig.116271: Transport weights of the components

1.102 97068839 - Transport weights of the components / fastening length of the fastening equipment

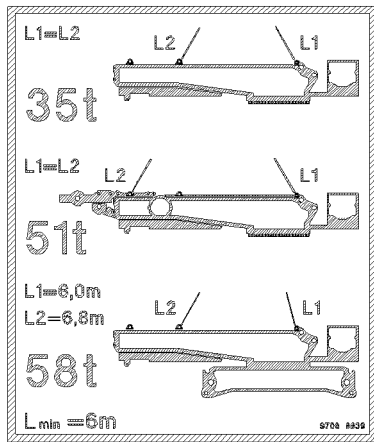


Fig.127587: Transport weights of the components / fastening length of the fastening equipment

1.103 Identification of sliding beam

| | Identification of sliding beam |
|-----------|--|
| 978675108 | <p style="text-align: center;"><i>Identification of sliding beam</i></p> |
| 978675208 | |
| 978772808 | |
| 978772908 | |
| 978809308 | |
| 978809408 | |
| 978809508 | |
| 978818408 | |
| 978818508 | |
| 978875908 | |
| 978902608 | |
| 978903108 | |
| 97029203 | |
| 978903208 | |
| 979126008 | |
| 979126108 | |
| 979210508 | |

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| | Identification of sliding beam |
|-----------|--------------------------------|
| 979210608 | |
| 979210608 | |
| 979210708 | |
| 979309108 | |
| 979309208 | |
| 97019140 | |
| 97003224 | |
| 979410808 | |

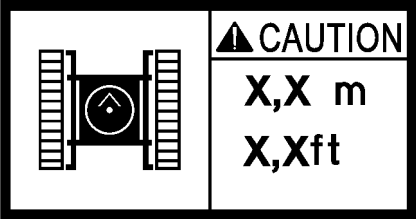
Identification of sliding beam



Note

- ▶ Extend the sliding beams to a support width of X.X m (X.X ft).

1.104 Identification Track width retracted

| | Identification Track width retracted |
|----------|---|
| 97009840 |  <p><i>Identification of track width</i></p> |
| 97009841 | |
| 97017044 | |
| 97017045 | |
| 97017046 | |

Identification of track width



Note

- ▶ Track width retracted to x.xx m (x.x ft).

1.105 976624808 – Fastening the load

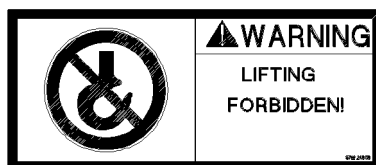


Fig.116283: Fastening the load



WARNING

Fastening the load is prohibited!
 If the load is lifted on this point, the load can fall down and kill personnel.
 ► Lifting the load on unmarked locations is prohibited.

1.106 Note Weight sliding beams

| Weight of sliding beams | |
|-------------------------|---|
| 979932008 | <p style="text-align: center;"><i>Weight of sliding beams</i></p> |
| 979932108 | |
| 979932708 | |
| 979932808 | |



Note

► Pay attention to the weight of the sliding beams.

1.107 Center of gravity of the counterweight

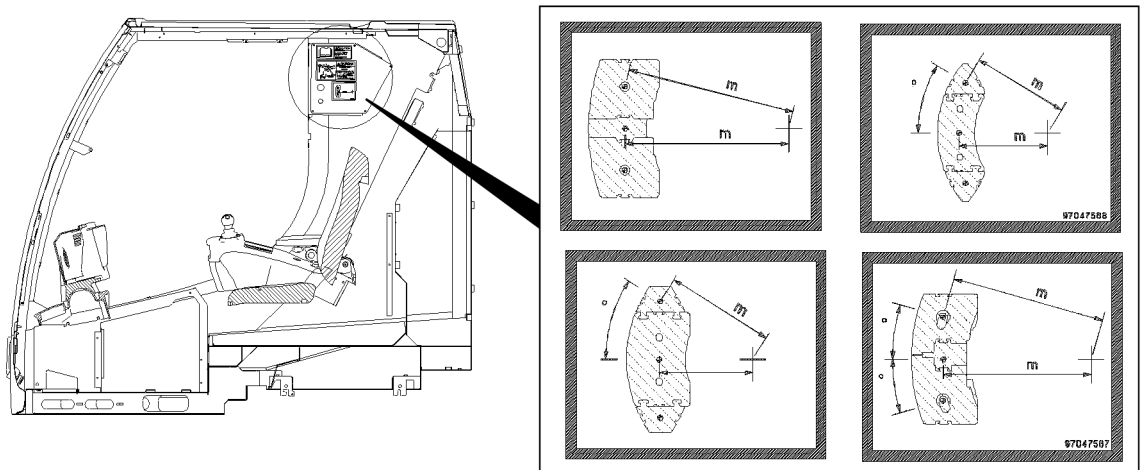


Fig. 154058: Notice sign: Distance between center of gravity of counterweight and center of rotation

The depicted notice sign are only examples and can differ depending on the crane type.

The notice signs are displayed in the crane operator's cab.



Note

► This notice sign indicates the distance between the center of rotation and the center of gravity of the counterweight.

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| Notice sign: Distance between center of gravity of counterweight and center of rotation | | | |
|---|-----------------------|--------------|-----------------------|
| Crane type | ID number notice sign | Crane type | ID number notice sign |
| LTM 1030-2.1 | 97096584 | LTM 1230-5.1 | 97103719 |
| LTM 1040-2.1 | 97095218 | | 97103720 |
| LTM 1050-3.1 | 97094881 | LTM 1250-5.1 | 97070214 |
| LTM 1055-3.1 | 97047566 | | 97070215 |
| LTM 1060-3.1 | 97051053 | LTM 1300-6.2 | 97064080 |
| LTM 1070-4.1 | 97095971 | LTM 1350-6.1 | 97128099 |
| LTM 1090-4.1 | 97092106 | LTM 1450-8.1 | 97093816 |
| | 97092109 | | |
| LTM 1095-5.1 | 97047565 | LTC 1050-3.1 | 97095960 |
| LTM 1100-4.2 | 97094364 | LTF 1045-4.1 | 97095046 |
| LTM 1100-5.2 | 97095763 | LTF 1060-4.1 | 97096030 |
| LTM 1130-5.1 | 97055765 | LTR 1060 | 97128100 |
| LTM 1160-5.2 | 97081129 | | |

1.108 Minimum rope reeving / minimum hook block weight

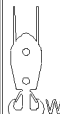

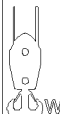


| ⚠ CAUTION | | | | | |
|--|--|---|--------------|---|---|
| LTM 1400-7.1 | | | LTM 1450-8.1 | | |
| |  WT _{min} =? |  n _{min} =? | |  WT _{min} =? |  n _{min} =? |
| TN | | | TN | | |
| N-14,0m | 3,1 t | n = 5 | N-14,0m | 3,1 t | n = 5 |
| N-21,0m | 2,6 t | n = 4 | N-17,5m | 2,6 t | n = 5 |
| N-28,0m | 1,4 t | n = 2 | N-21,0m | 2,6 t | n = 4 |
| TN +  | | | N-24,5m | 2,6 t | n = 4 |
| N-14,0m | 2,3 t | n = 3 | N-28,0m | 1,4 t | n = 2 |
| N-21,0m | 2,3 t | n = 2 | TNH | | |
| | | | N-14,0m | 2,3 t | n = 3 |
| | | | N-17,5m | 1,8 t | n = 3 |
| | | | N-21,0m | 2,3 t | n = 2 |
| | | | N-24,5m | 1,8 t | n = 2 |

Fig.127972: Minimum rope reeving / minimum hook block weight with luffing lattice jib / boom nose



WARNING

Minimum rope reeving / minimum hook block weight not adhered to!
 Too low hook block weight leads to the formation of slack rope.
 Rope reeving too low, hoist rope is overloaded.
 ► Adhere to the hook block weight and hoist rope reeving.

Example: LTM 1400-7.1

With a luffing lattice jib -TN **N-21 m** a hook block with a weight of **2.6 t** **must** be installed and minimum rope reeving of **4** must be used.

With a luffing lattice jib **N-21 m** and boom nose a hook block with a weight of **2.3 t must** be installed and minimum rope reeving of **2** must be used.

Empty page!

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2.05.10 Labeling of the load carriers

| | | |
|---|--|---|
| 1 | Identifications on the hook block or load hook | 3 |
| 2 | Identifications on single hook or double hook | 4 |
| 3 | Identifications on auxiliary weights | 5 |

Fig.195219

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1 Identifications on the hook block or load hook

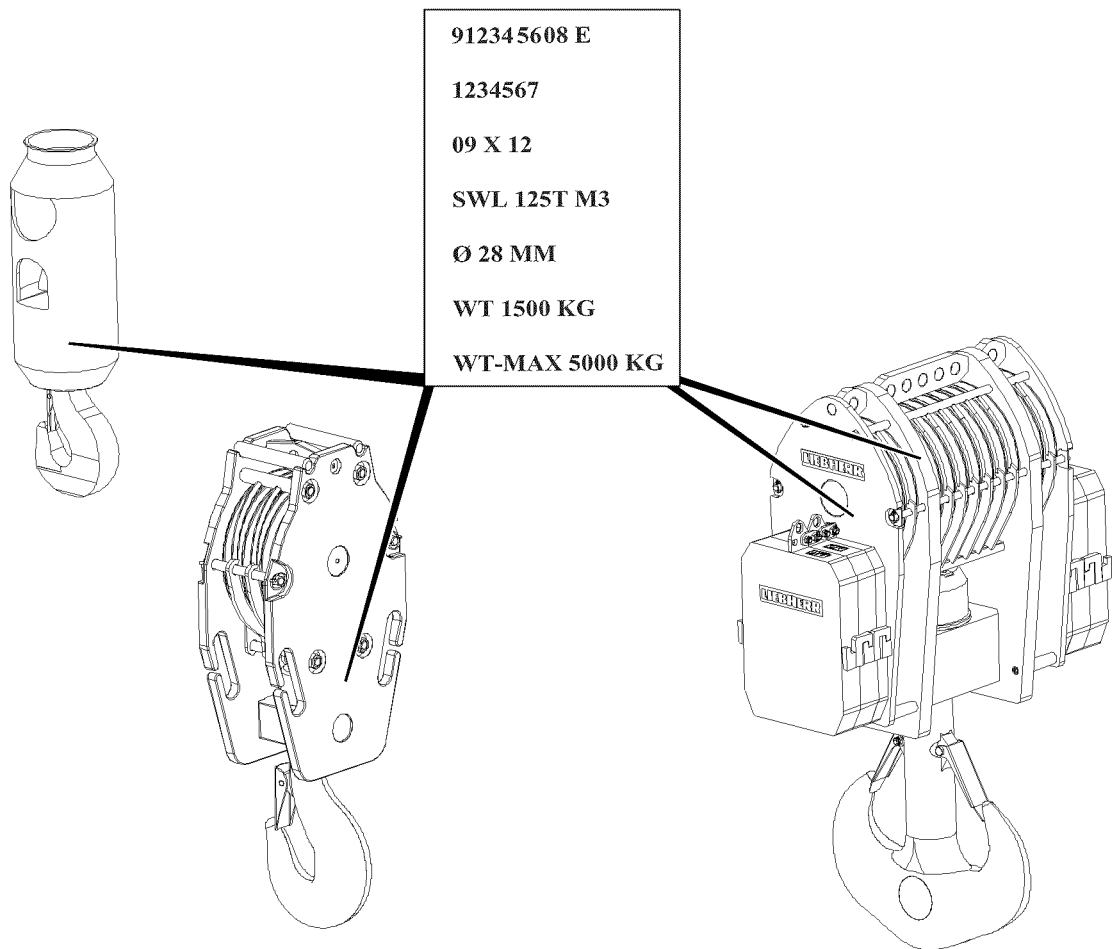


Fig.118509: Identifications on the hook block or load hook



Note

- ▶ The load hooks and hook blocks approved for this crane type can be found in the load chart.
- ▶ The hook blocks shown are examples only and can deviate from the existing hook block.

| Punch mark area | Explanation |
|-----------------|---|
| 912345608 E | Liebherr ID no., „E = entschärft (deburred)“ |
| 123456 | Series or factory test number |
| 09 X 12 | Month of construction / supplier marks / year of construction |
| SWL 125T M3 | SWL (Safe Working Load) = Load carrying capacity for power train group M3 |
| Ø 28 mm | Hoist rope diameter |
| WT 1500 Kg | WT (Weight Tare) = Own weight (without auxiliary weights) |

| Punch mark area | Explanation |
|-----------------|---|
| WT-MAX 5000 Kg | WT-Max = Maximum permissible own weight of lower pulley block and total number of progressively installed auxiliary weights |
| | Limits the number of installed auxiliary weights |
| | Determination via addition of assembled own weights (number of auxiliary weights + hook block) |

Identifications on the hook block or load hook

2 Identifications on single hook or double hook

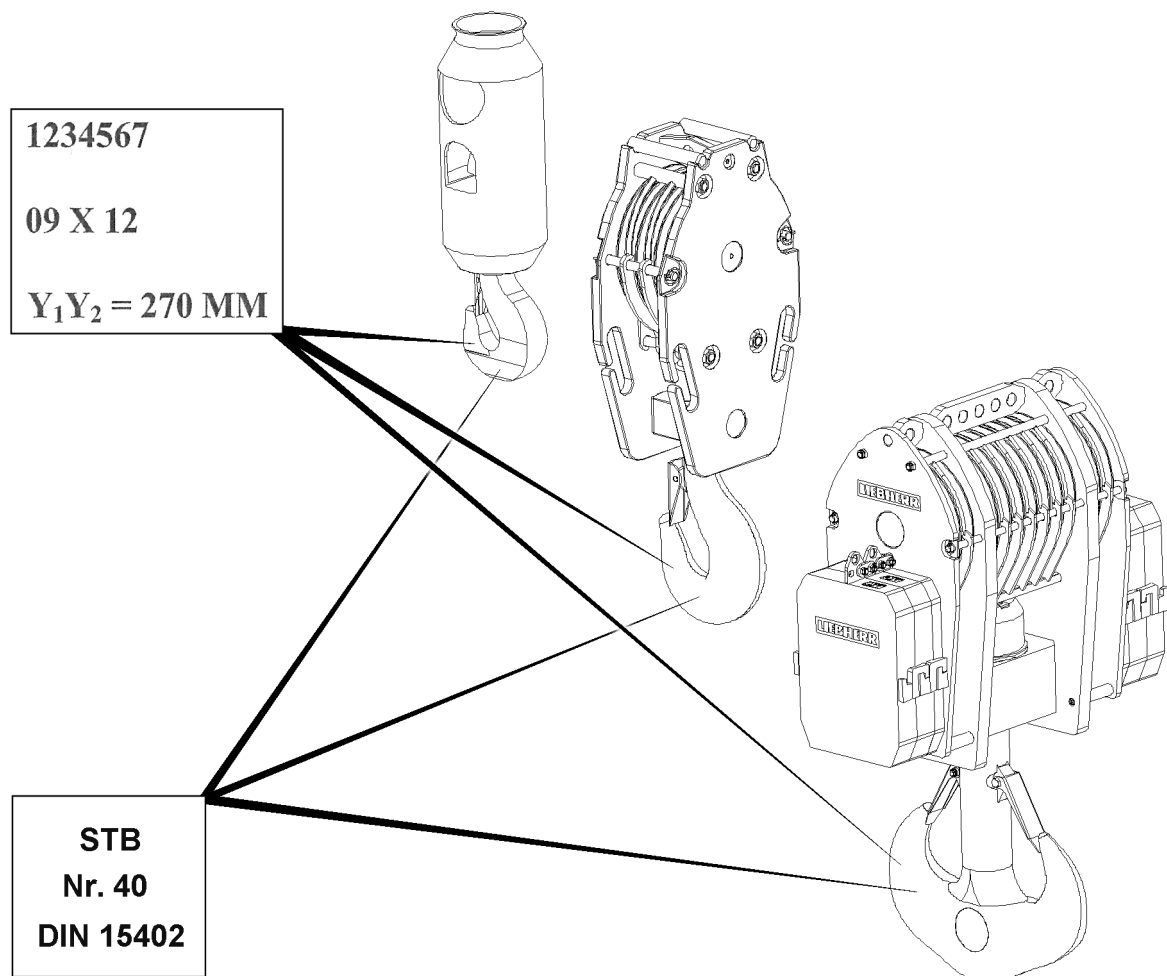


Fig.149061: Identifications on single hook or double hook

| Punch mark area | Explanation |
|-----------------|--|
| STB | Hook manufacturer |
| 40-T | Hook number + strength class according to DIN 15 400 |
| DIN | Hook shape according to DIN 15 401 /DIN 15 402 |
| 123456 | Series or factory test number |

| Punch mark area | Explanation |
|-----------------|--|
| 09 X 12 | Month of construction / supplier marks / year of construction |
| Y1Y2 = 270 mm | Dimension Y or dimension Y1 and dimension Y2 according to DIN (= Test dimensions for recurrent tests) |

Identifications on single hook or double hook

3 Identifications on auxiliary weights

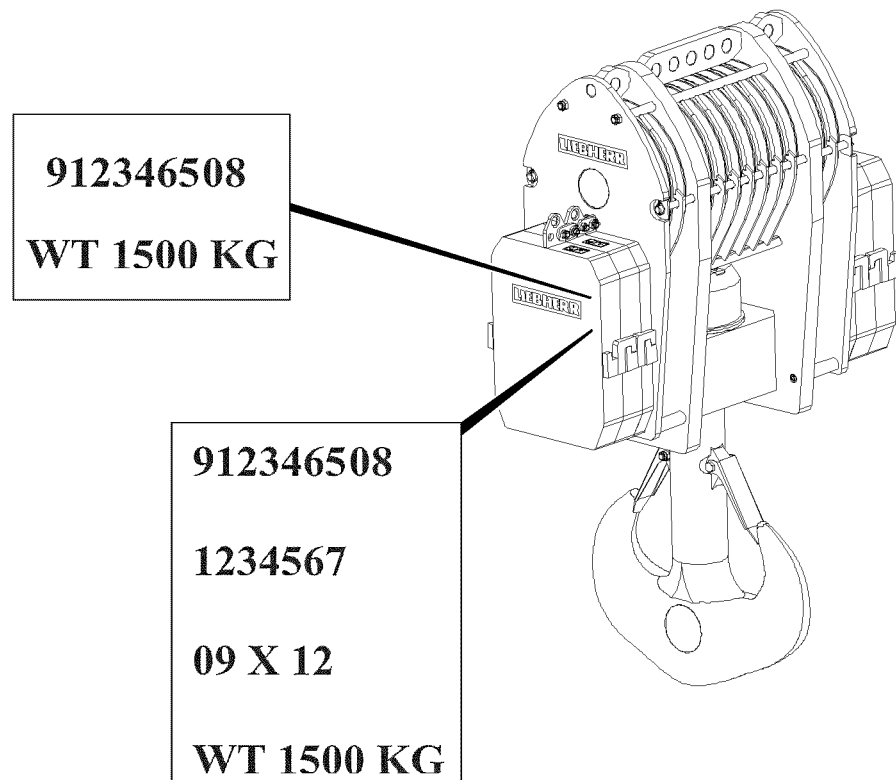


Fig.118511: Identifications on auxiliary weights



Note

- The own weight of the individual auxiliary weight is noted on the side on the respective auxiliary weight.

3.1 Identifications on auxiliary weights at delivery

| Punch mark area | Explanation |
|-----------------|--|
| 912346508 | Liebherr ID no. |
| WT 1500 Kg | WT (Weight Tare) = Own weight of individual auxiliary weight |

Identifications of auxiliary weights at delivery

3.2 Identifications on auxiliary weights for reorder

| Punch mark area | Explanation |
|-----------------|---|
| 912346508 | Liebherr ID no. |
| 123456 | Series or factory test number |
| 09 X 12 | Month of construction / supplier marks / year of construction |
| WT 1500 Kg | WT (Weight Tare) = Own weight of individual auxiliary weight |

Identifications of auxiliary weights at reorder

2.06 Fall protection equipment on the crane

| | | |
|---|--|----|
| 1 | Personal protective equipment | 2 |
| 2 | Fall protection equipment on the crawler travel gear | 2 |
| 3 | Fall protection equipment on the turntable | 33 |
| 4 | Fall protection equipment on the counterweights | 41 |
| 5 | Fall protection equipment on the boom pivot sections and on the lattice sections | 42 |
| 6 | Fall protection equipment on the ballast trailer | 55 |

1 Personal protective equipment



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and be killed or seriously injured.

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



Fig.149476: Warning sticker — danger of falling

1 Sign



Note

- ▶ The sign 1 marks the fastening points where assembly personnel must hook in the fall arrest system to secure themselves against falling.

2 Fall protection equipment on the crawler travel gear



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and be killed or seriously injured.

- ▶ For assembly / disassembly work, maintenance work and inspections, swing all railings and platforms into position and secure.
- ▶ Only step on the aids, ladders and platforms with clean shoes.
- ▶ Keep aids, ladders and platforms free of heavy dirt, snow and ice.
- ▶ Replace damaged ladders and platforms immediately.
- ▶ Assemble all ladders and platforms stable and safe to access.

**WARNING**

When working at a height, there is a danger of falling!

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

2.1 Assembling the grating on the crawler center section in the operating position

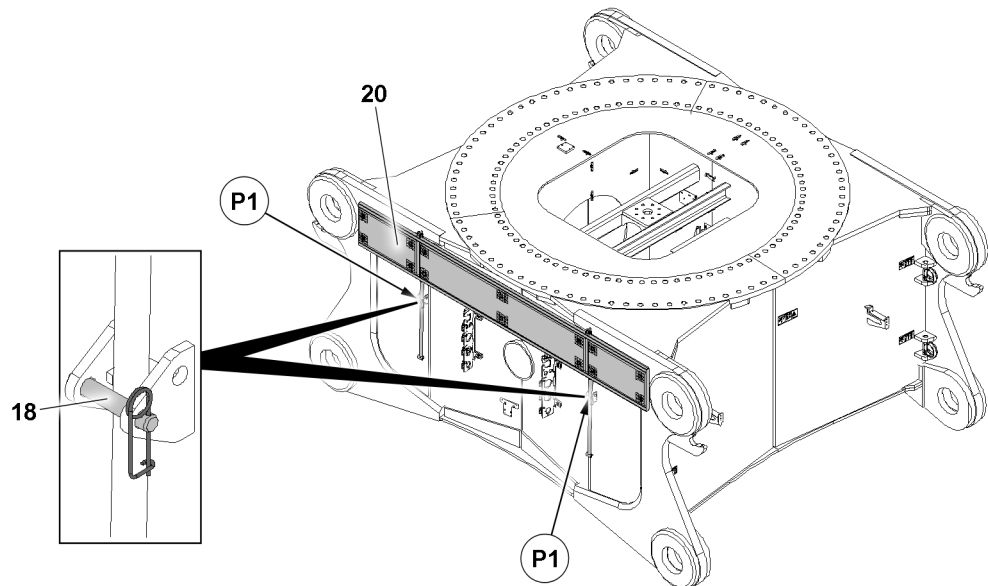


Fig.149487: Assembling the grating on the crawler center section in the operating position — folding up the grating

18 Pin

20 Grating

- ▶ Release the pin 18 in points P1 and unpin.
- ▶ Fold up the grating 20.

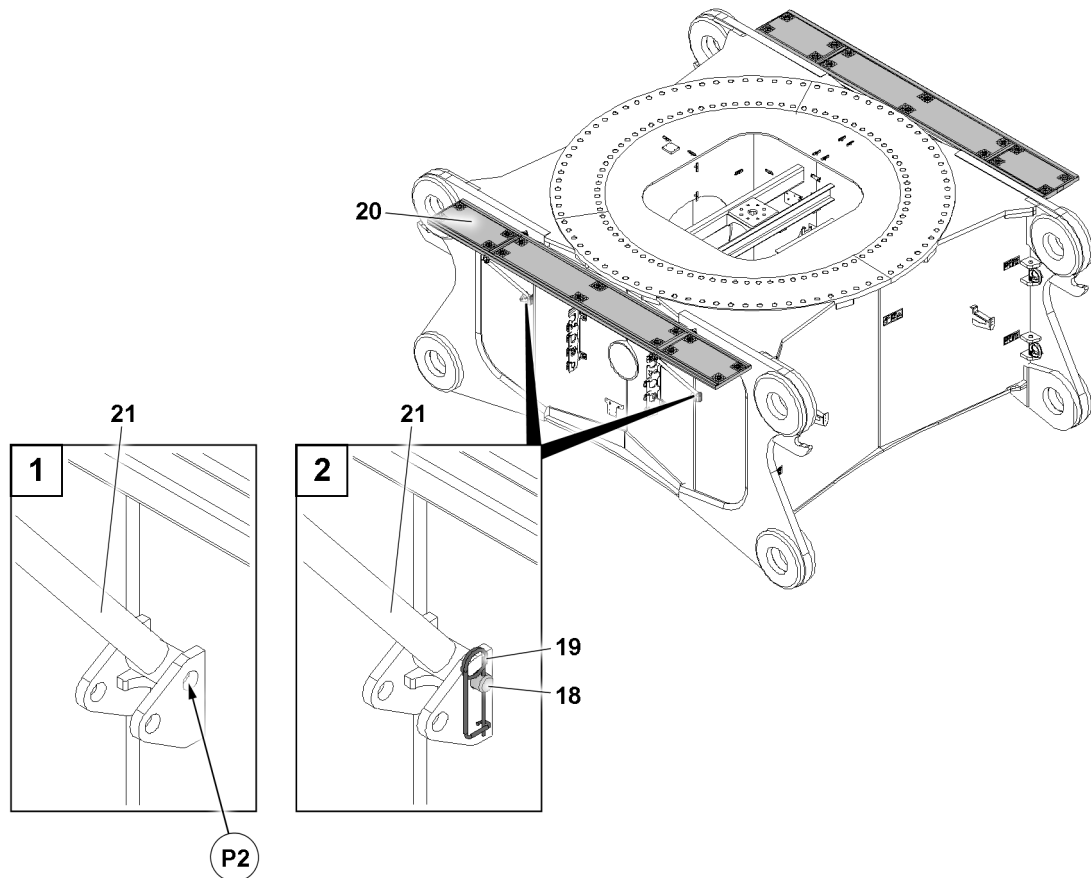


Fig.149488: Assembling the grating on the crawler center section in the operating position — assembling the supports

| | | | |
|----|-------------------|----|---------|
| 18 | Pin | 20 | Grating |
| 19 | Retaining element | 21 | Support |

- ▶ Position the supports **21** such that the supports **21** can be repinned in points **P2**.
- ▶ Insert the pin **18** in points **P2** and secure with the retaining element **19**.

Result:

- The grating **20** is in the operating position.

2.2 Assembling the ladders on the cross carrier in the operating position

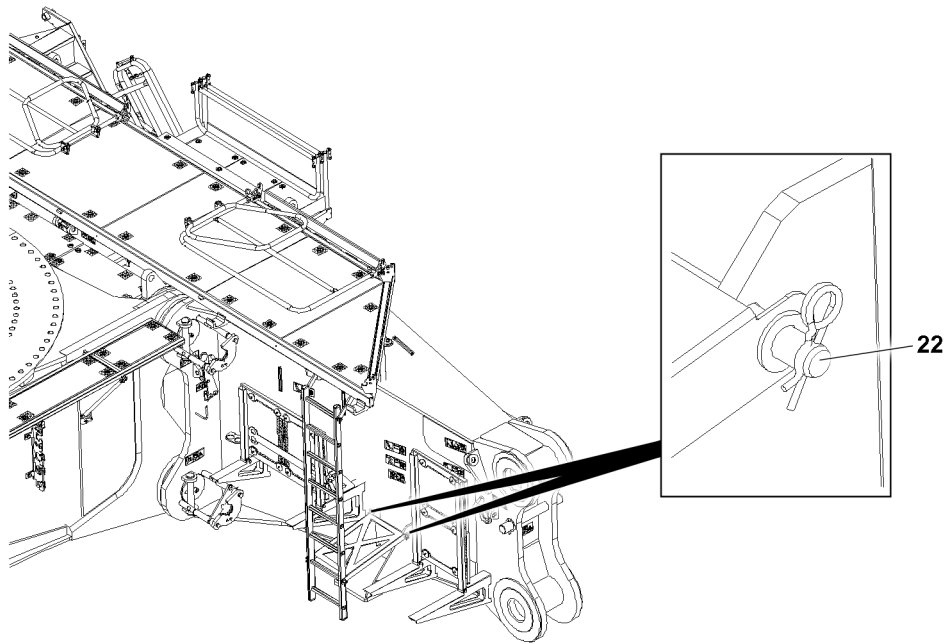


Fig.149489: Assembling the ladders on the cross carrier in the operating position

22 Pin

- ▶ Release and unpin the pin 22 on both sides.

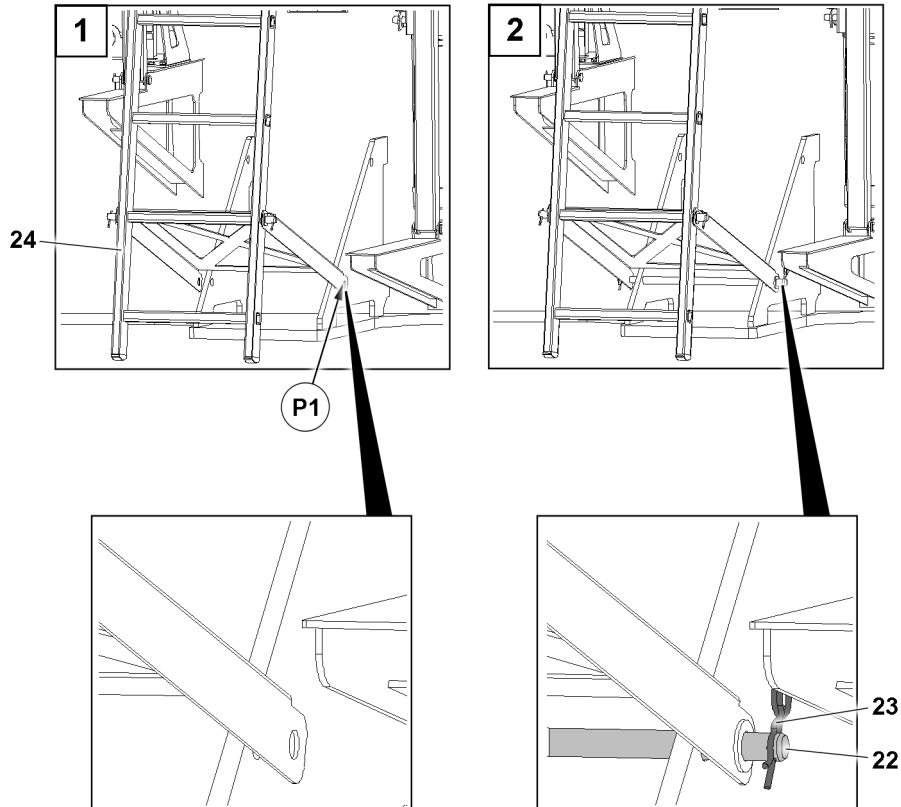


Fig.149490: Assembling the ladders on the cross carrier in the operating position — positioning the ladder in the operating position

22 Pin

24 Ladder

23 Retaining element

- ▶ Position the ladder **24** to permit pinning in points **P1**.
- ▶ Insert the pin **22** on both sides and secure with the retaining elements **23**.

2.3 Assembling the platforms on the cross carrier in the operating position

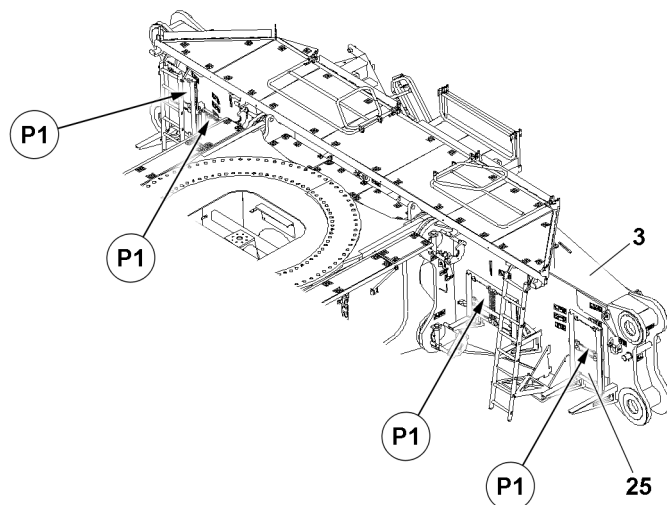


Fig.149491: Assembling the platforms on the cross carrier in the operating position

3 Cross carrier

25 Platform

**Note**

- ▶ Assembling the platforms **25** in the operating position is described based on the example of one platform **25**.
- ▶ Assembly takes place in the same way for all four platforms **25** (point **P1**) of a cross carrier **3**.

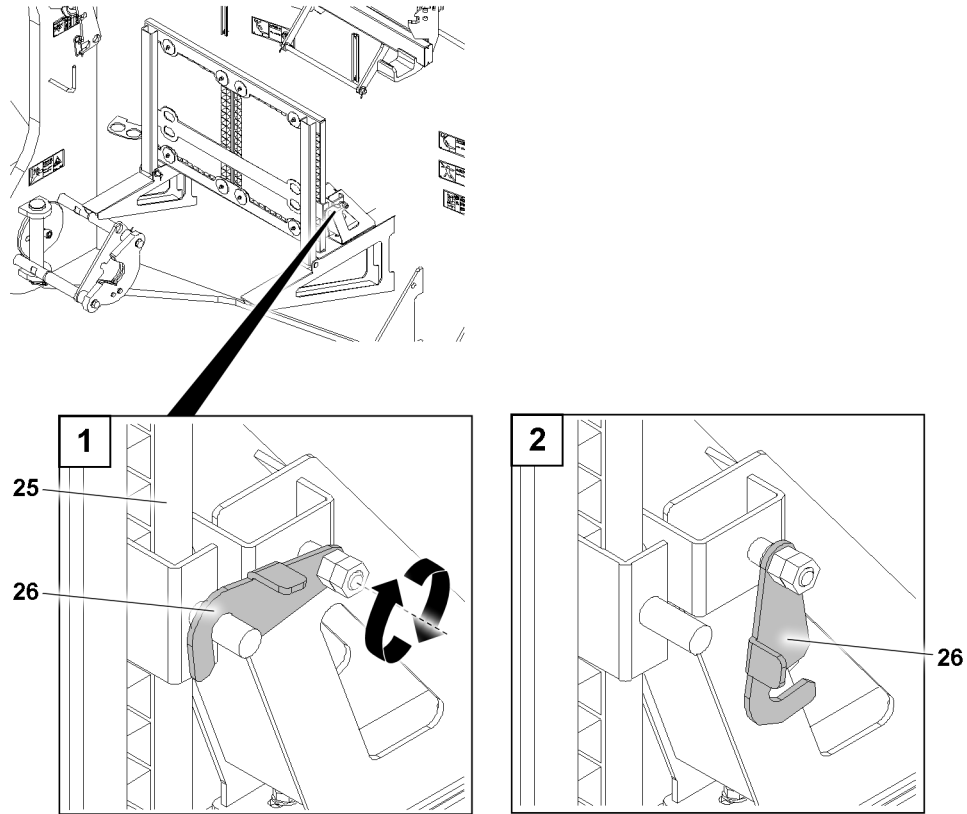


Fig.149492: Assembling the platforms on the cross carrier in the operating position — releasing the platform

25 Platform

26 Retaining element

- ▶ Release the platform **25**: Unhook the retaining element **26**.

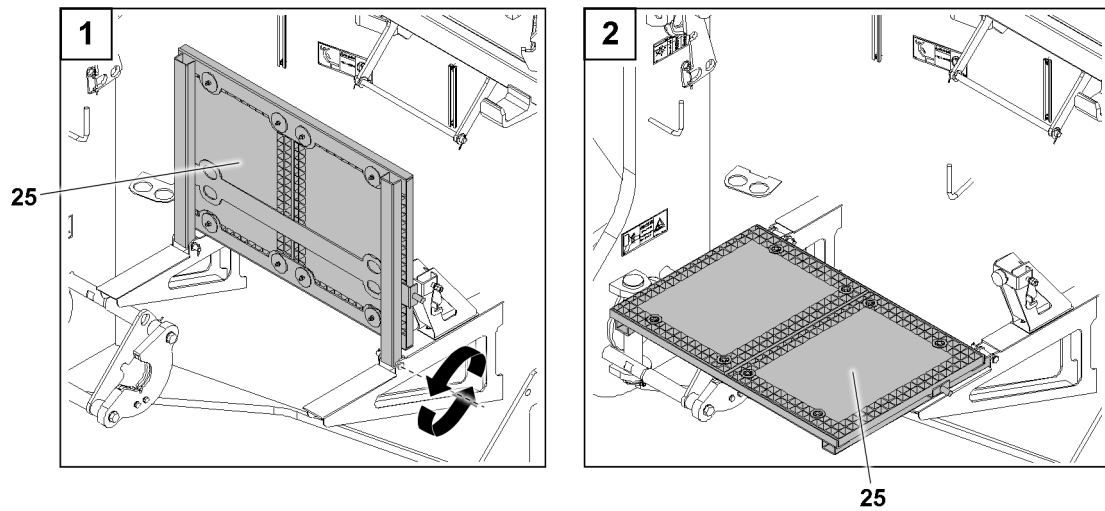


Fig. 149493: Assembling the platforms on the cross carrier in the operating position — folding the platform into the operating position

25 Platform

- ▶ Fold the platform **25** into the operating position.

2.4 Assembling the stairs in the operating position

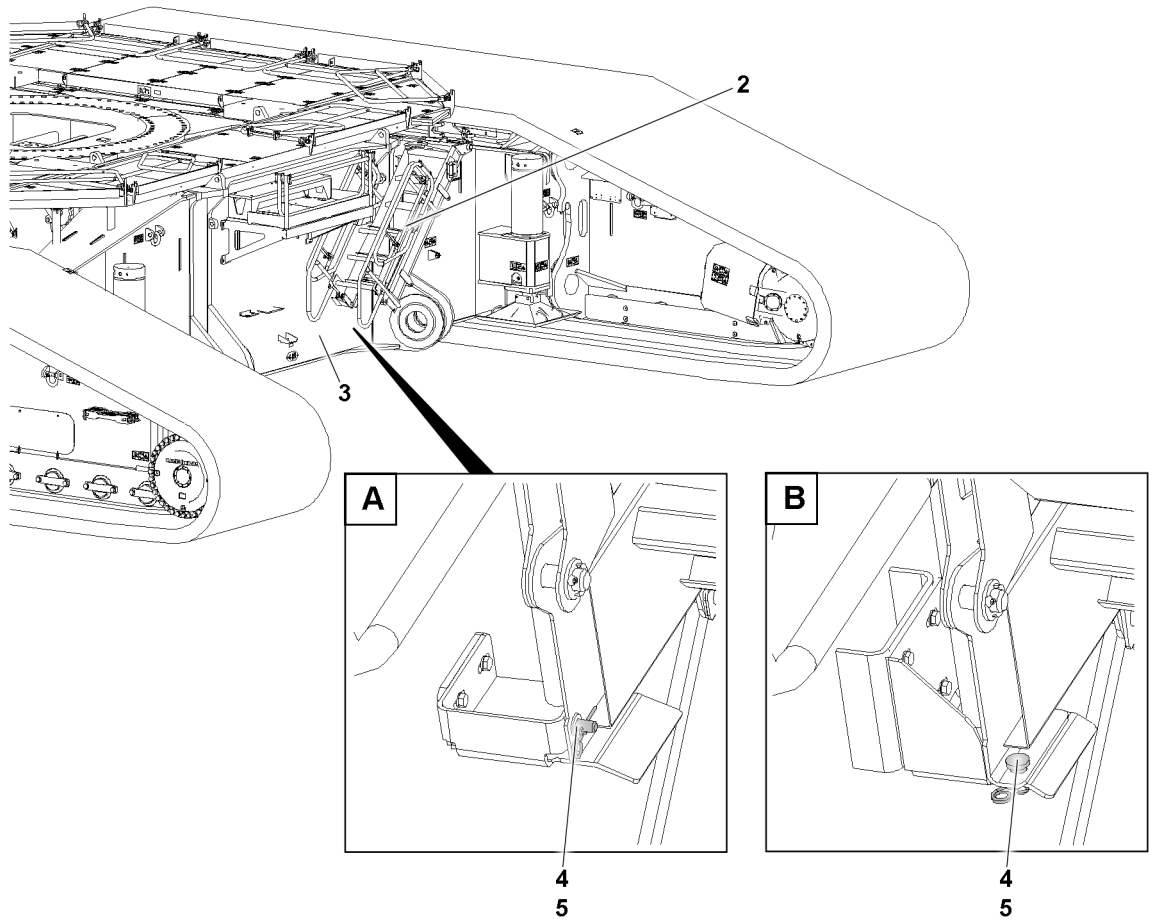


Fig.149477: Assembling the stairs in the operating position — releasing the stairs in the transport position

- | | | | |
|---|---------------|---|-------------------|
| 2 | Stairs | 4 | Pin |
| 3 | Cross carrier | 5 | Retaining element |

► Unpin the stairs 2 on the cross carrier 3: Release and unpin the pin 4.

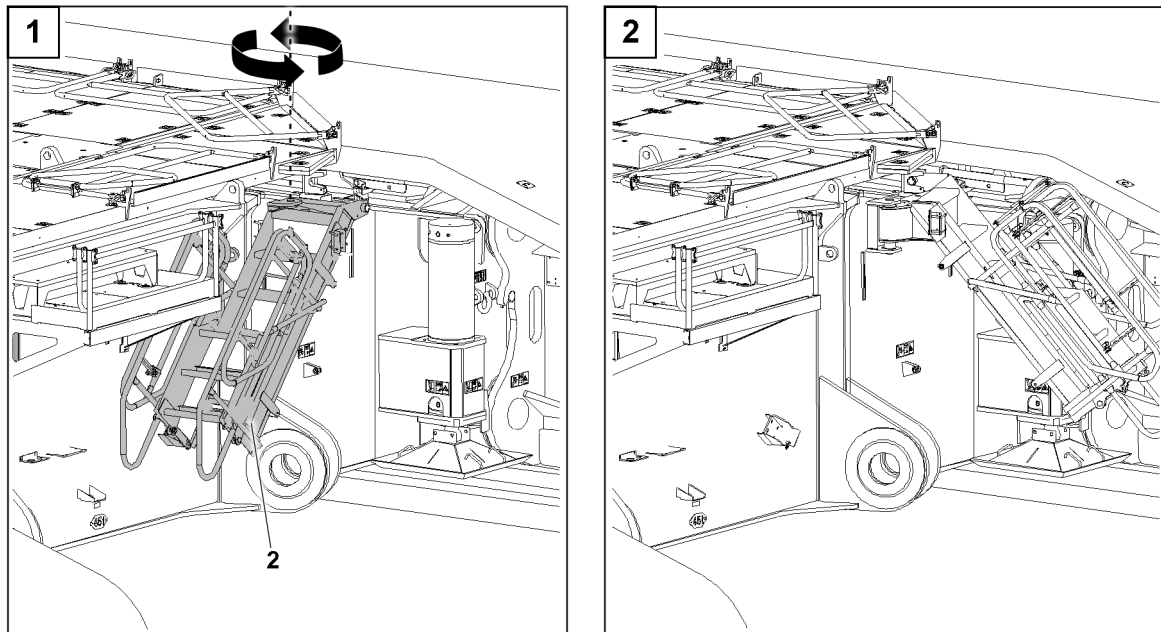


Fig.149478: Assembling the stairs in the operating position — turning the stairs

2 Stairs

- ▶ Swing the stairs **2** to the stop.

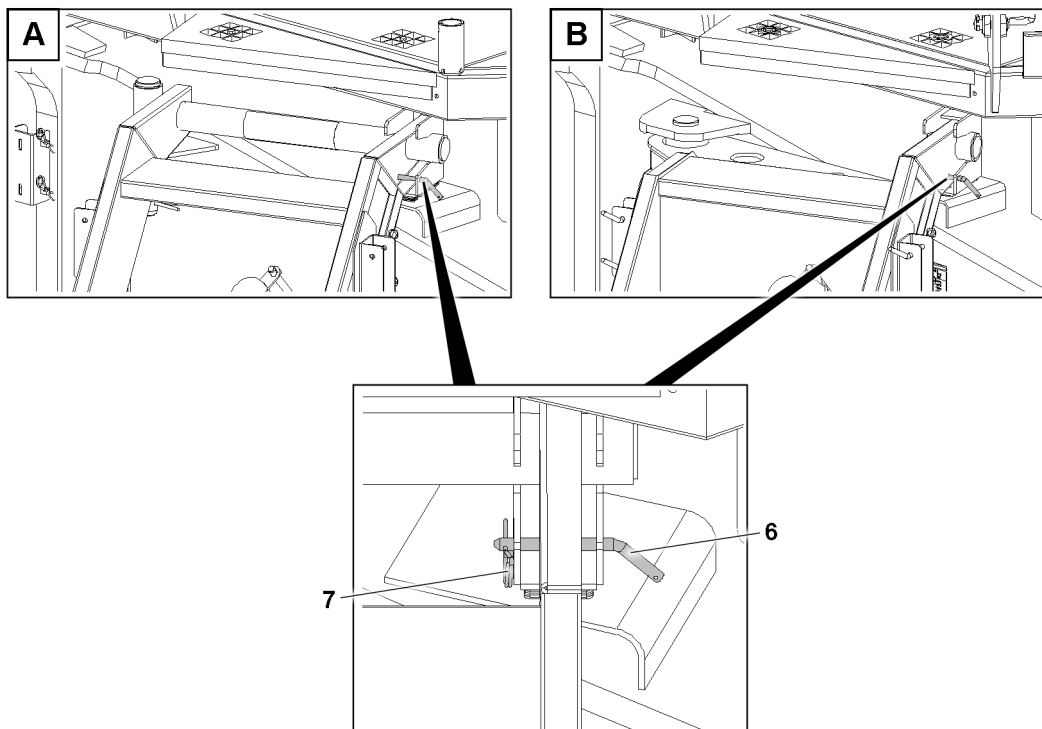


Fig.149479: Assembling the stairs in the operating position — pinning the stairs

6 Pin

7 Retaining element

- ▶ Insert the pin **6** and secure it with the retaining element **7**.

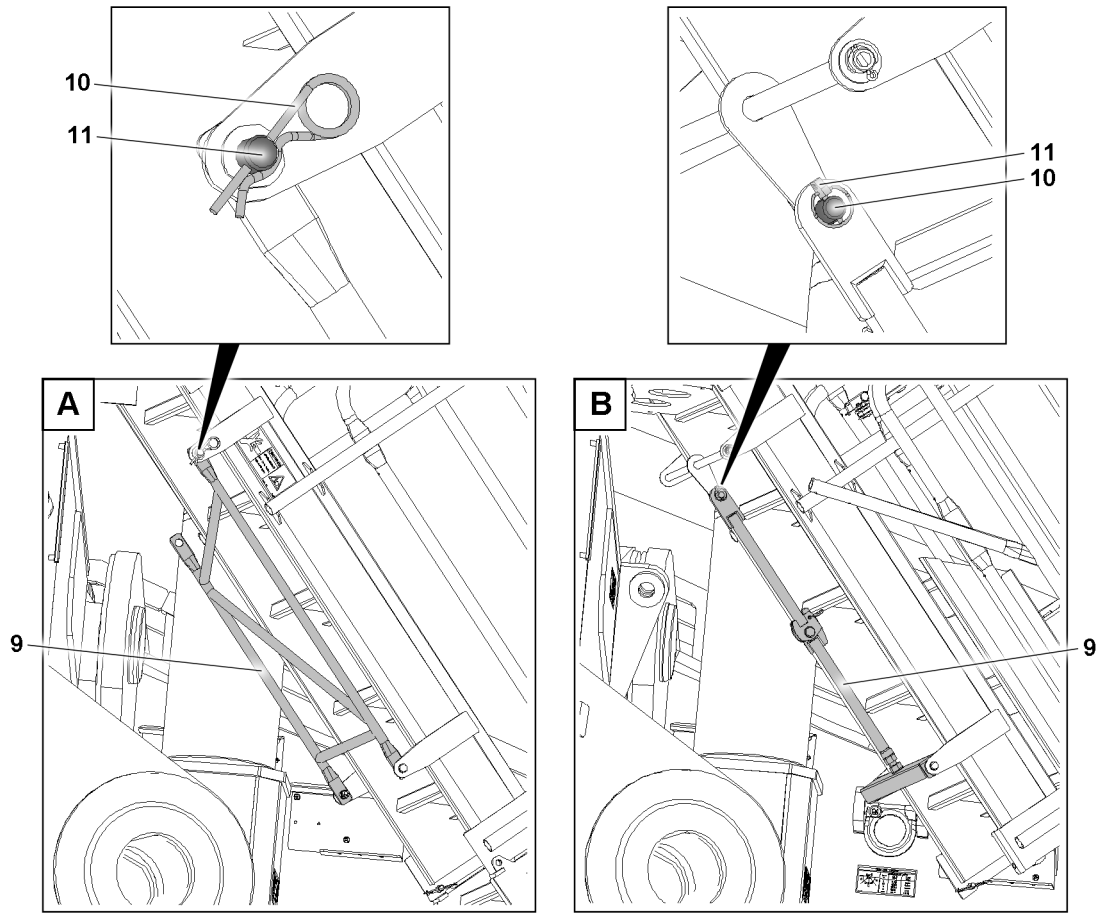


Fig.149481: Assembling the stairs in the operating position — releasing the support

9 Support
10 Pin

11 Retaining element

► Release the support **9**: Remove the retaining element **11** and unpin the pin **10**.

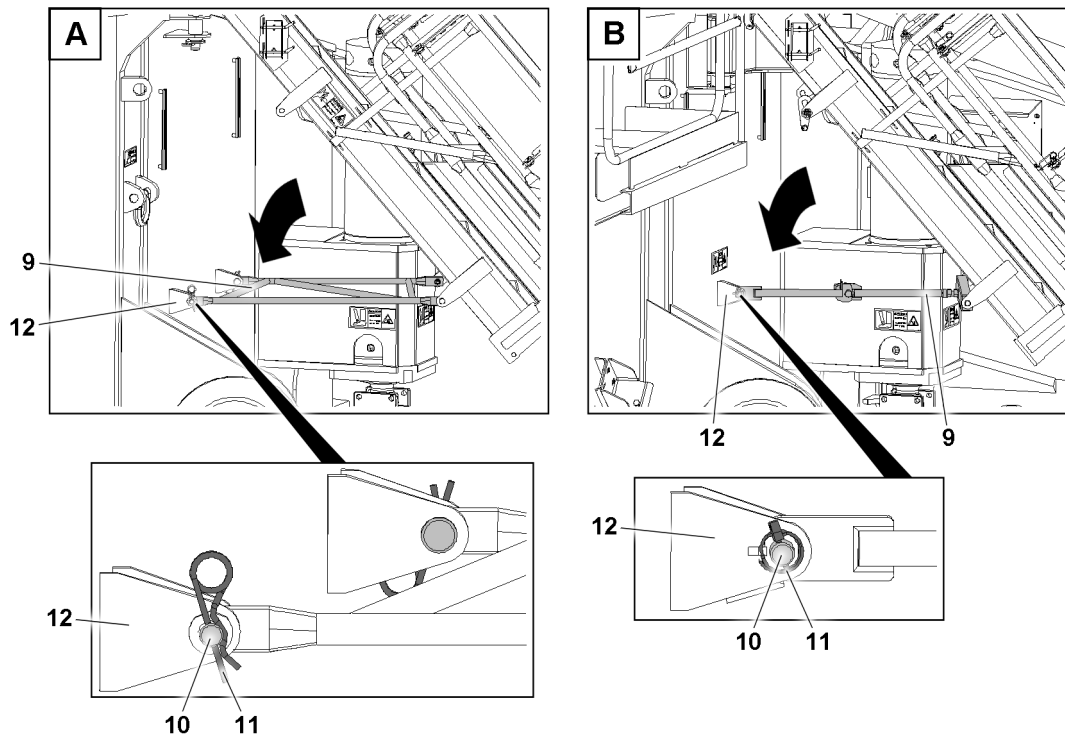


Fig.149482: Assembling the stairs in the operating position — positioning the support in the operating position

9 Support

10 Pin

11 Retaining element

12 Lug

► Fold the support 9 down to the bracket 12.

► Pin the support 9 on the bracket 12: Insert the pin 10 and secure it with the retaining element 11.

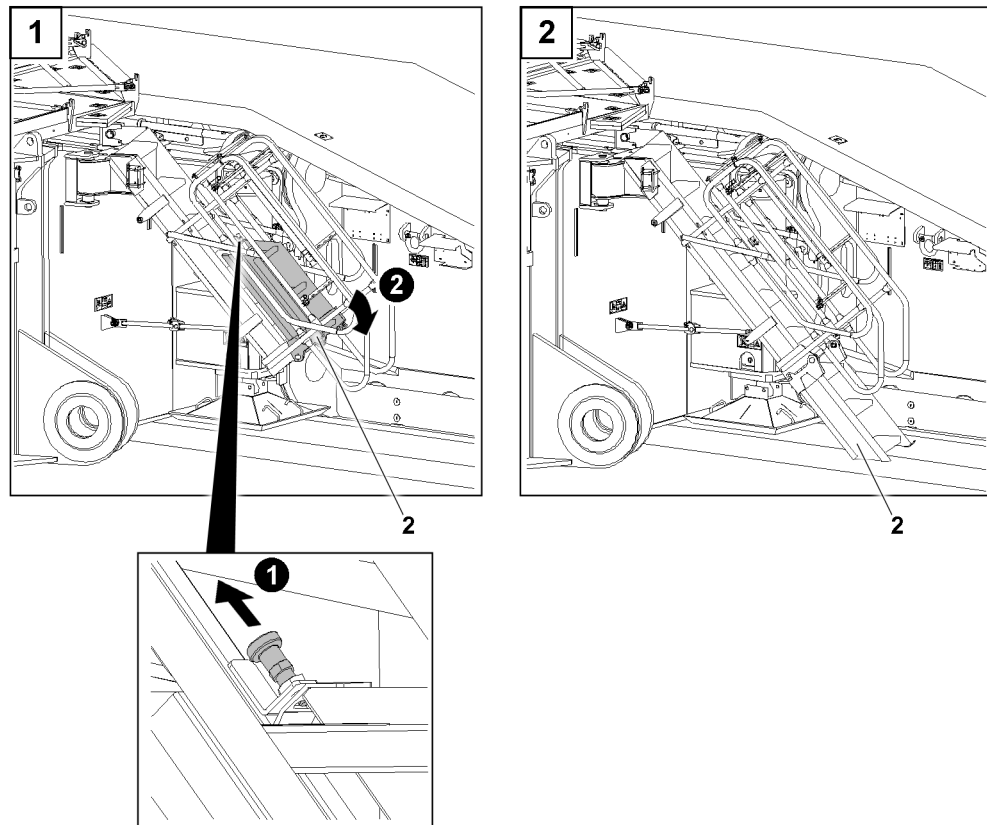


Fig.149480: Assembling the stairs in the operating position — folding the lower section of the ladder into the operating position

2 Stairs

8 Detent pin

- ▶ Release the lower section of the turntable stairs **2**: Pull the detent pin **8** and fold the lower section of the stairs **2** downward.

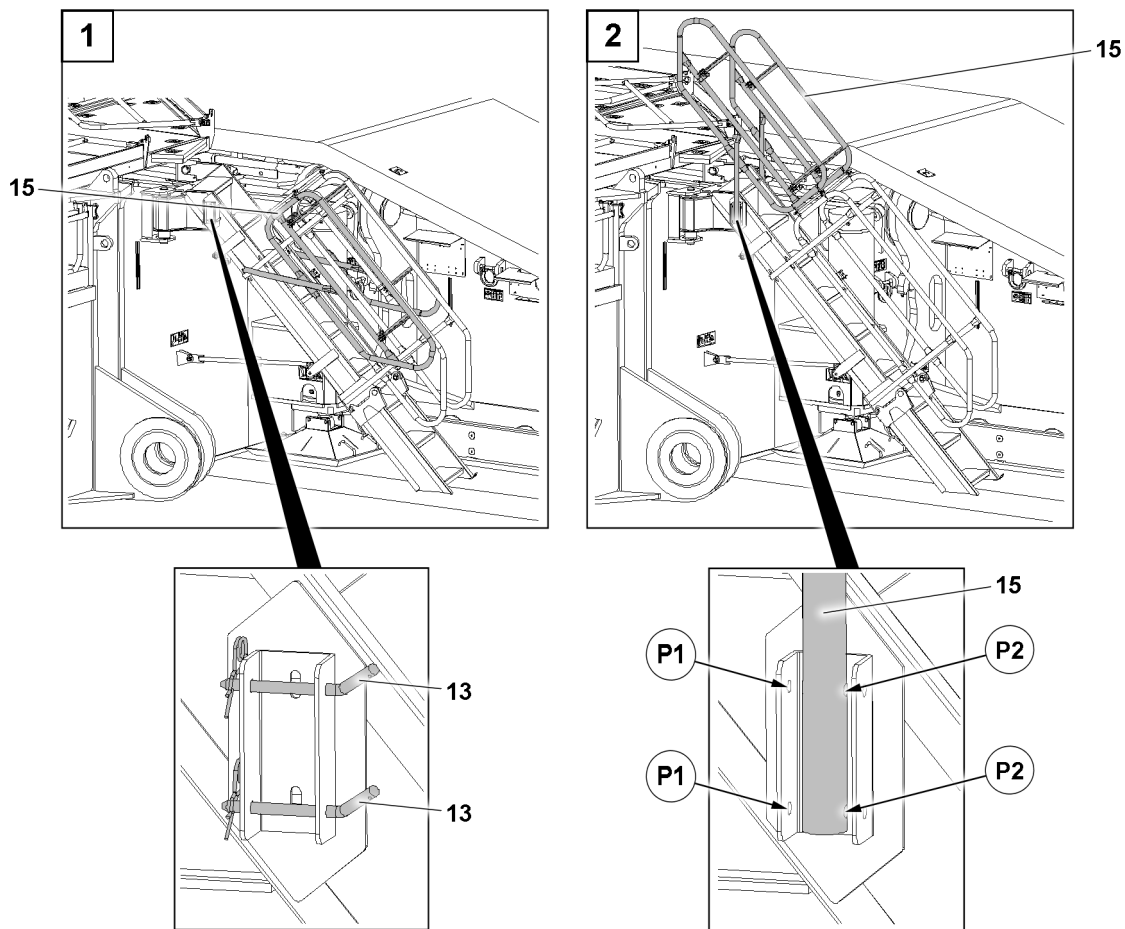


Fig. 149483: Assembling the stairs in the operating position — positioning the railing in the operating position

13 Pin

15 Railing

- ▶ Release and unpin both pins 13.
- ▶ Until bores P1 and bores P2 align: Swing the railing 15 upward.

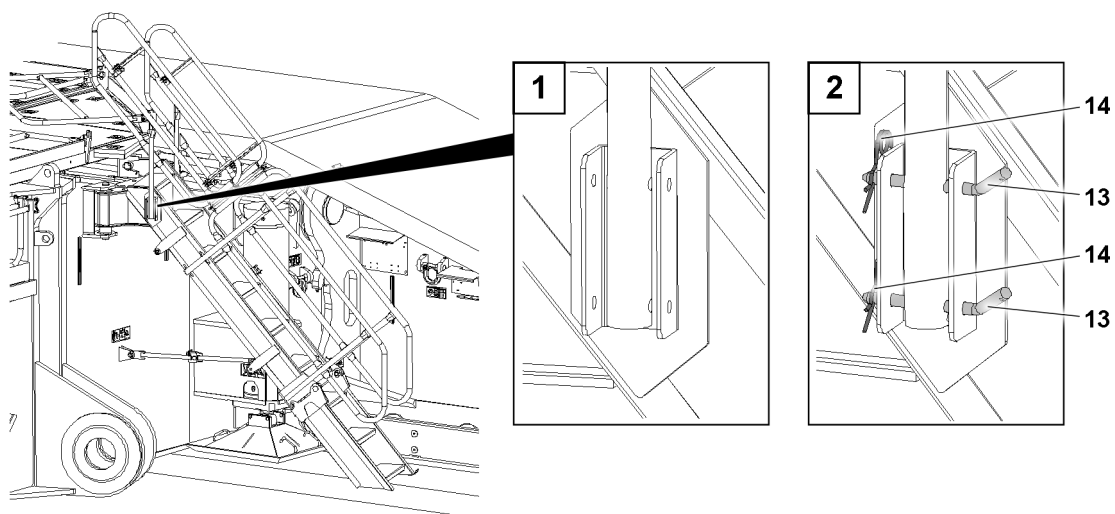


Fig. 149484: Assembling the stairs in the operating position — securing the railing in the operating position

13 Pin

14 Retaining element

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- ▶ Insert both pins **13** and secure with the retaining element **14**.
- ▶ Repeat the procedure in the same way as described above for the other railing side.

2.5 Assembling the railings in the operating position for ballast trailer operation

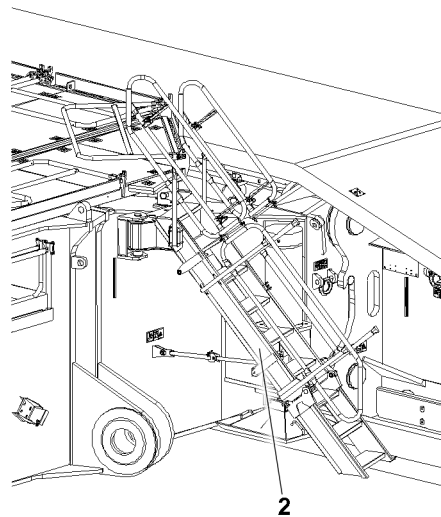


Fig. 149485: Assembling the railings in the operating position for ballast trailer operation

2 Stairs



Note

- ▶ Assemble the stairs **2**, see section: „Assemble the stairs in the operating position.“

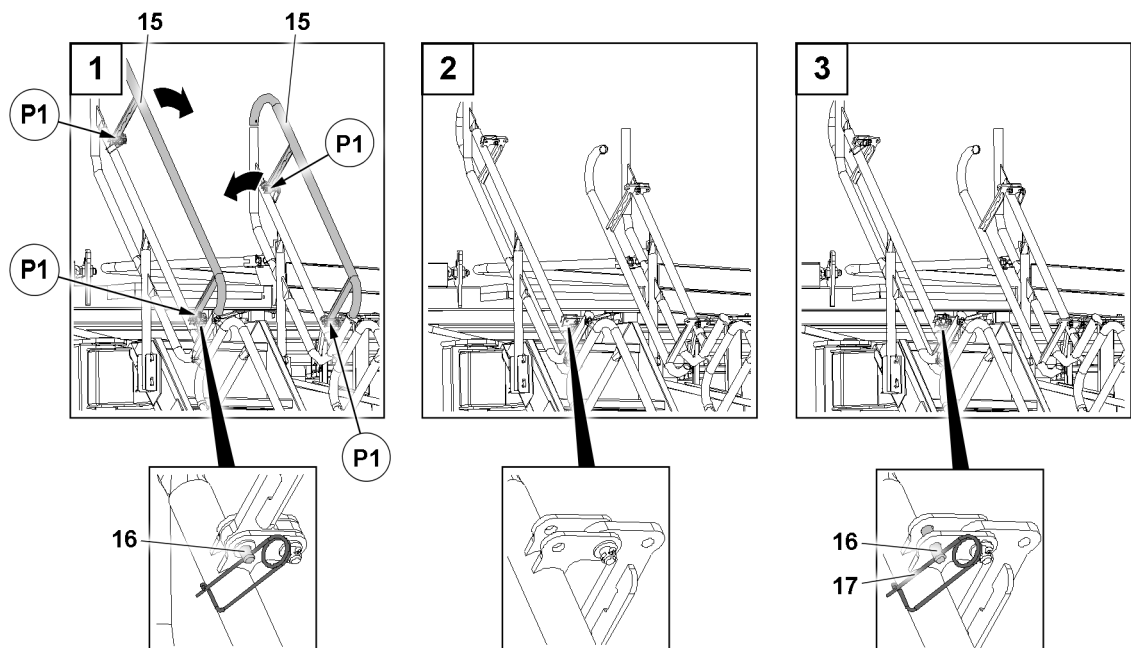


Fig. 149486: Assembling the railings in the operating position for ballast trailer operation — secure the railing

- 15** Railing
- 16** Pin

- 17** Retaining element

- ▶ Release the pin **16** in points **P1** and unpin.

- ▶ Fold the upper section of the railing **15** downward.
- ▶ Insert the pin **16** in points **P1** and secure with the retaining element **17**.

2.6 Assembling the railing in the operating position

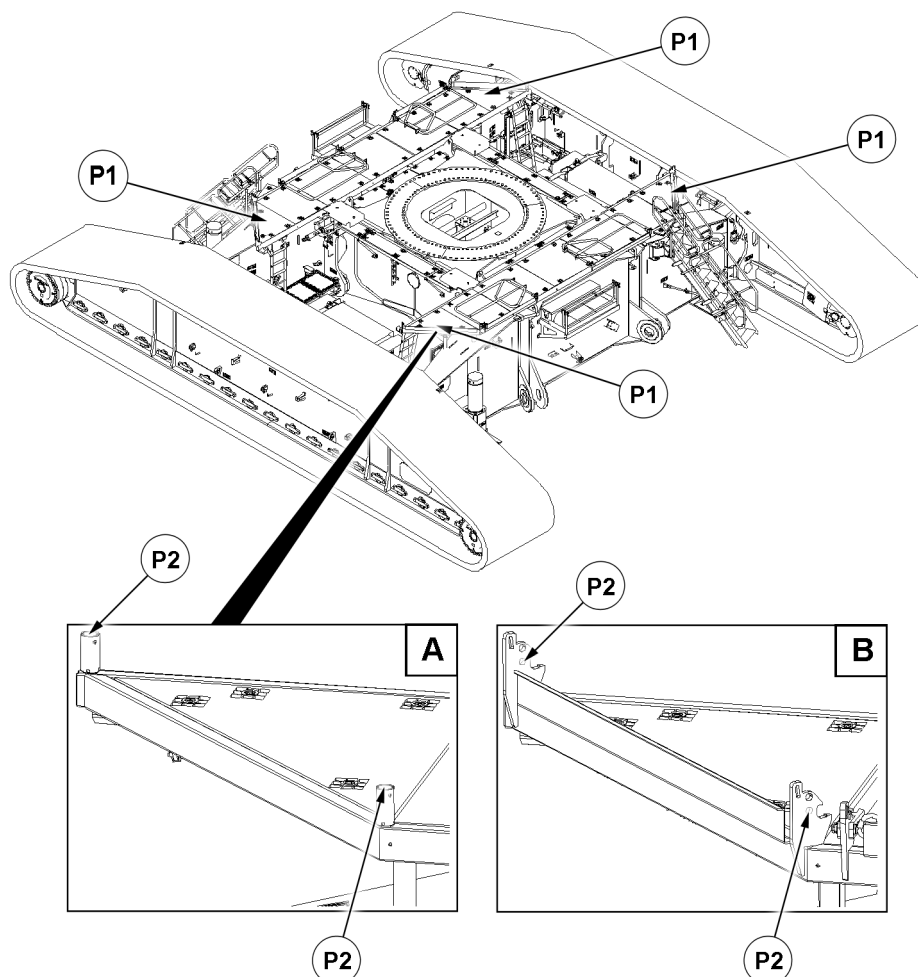


Fig.149494: Assembling the railing in the operating position — positioning the railing

- ▶ Position the railing in the points **P1** in such a way that it can be pinned in points **P2**.

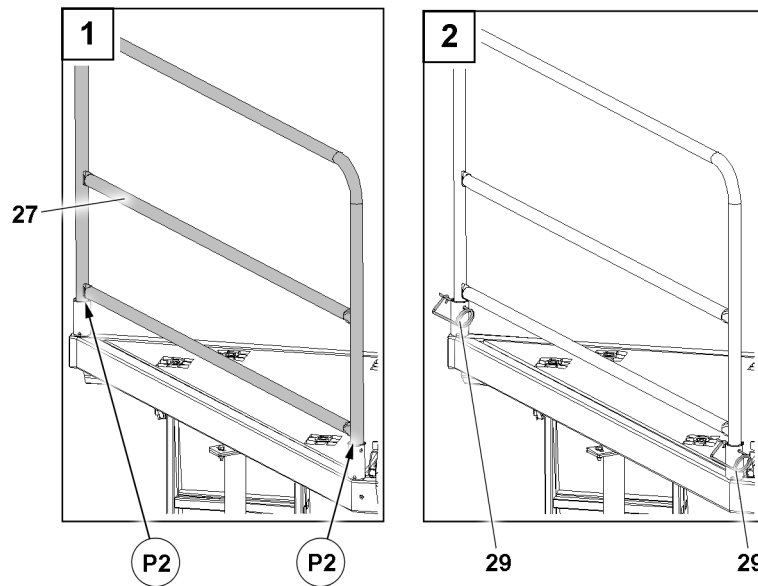


Fig. 149495: Assembling the railing in the operating position — assembling the railing variation A

27 Railing

29 Retaining element

When variation A is installed:

- ▶ Assemble the railing 27 in points P2 and secure with the retaining elements 29.

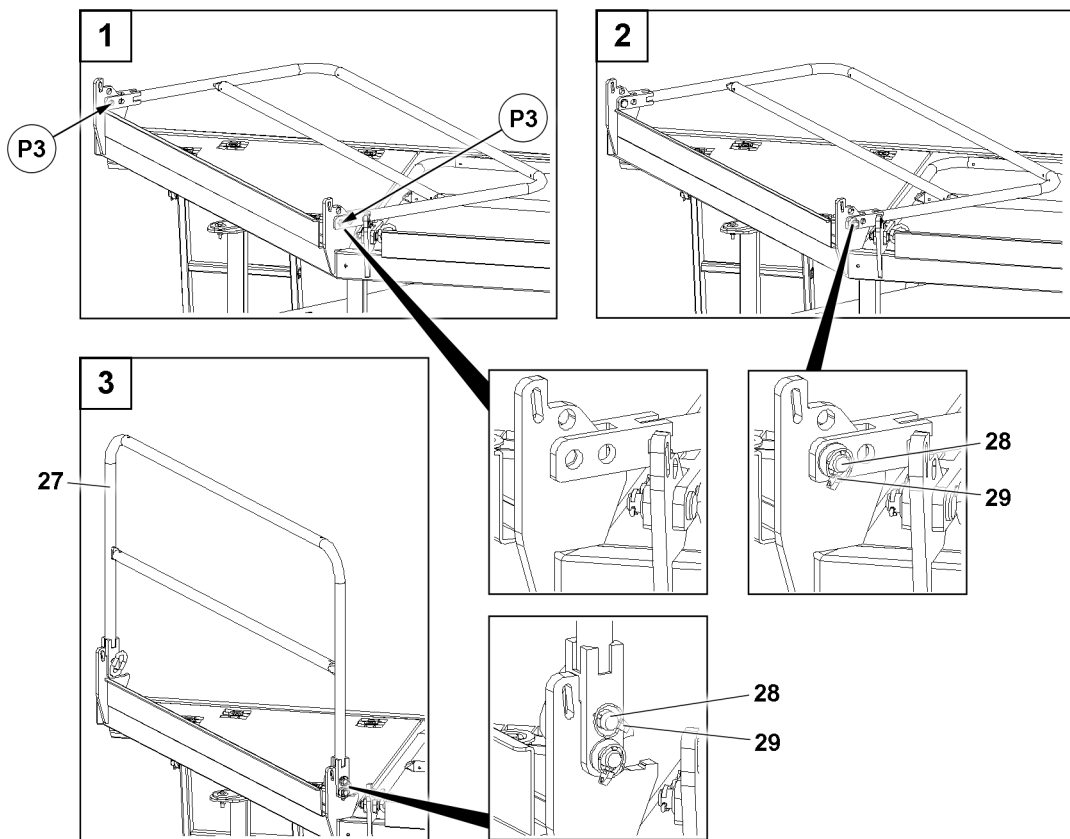


Fig. 149496: Assembling the railing in the operating position — assembling the railing variation B

27 Railing

29 Retaining element

28 Pin

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When variation B is installed:

- ▶ Insert the pin **28** in points **P3** and secure with the retaining element **29**.
- ▶ Swing the railing **27** into the operating position.
- ▶ Secure the railing **27** with the pin **28** and the retaining element **29** in the operating position.

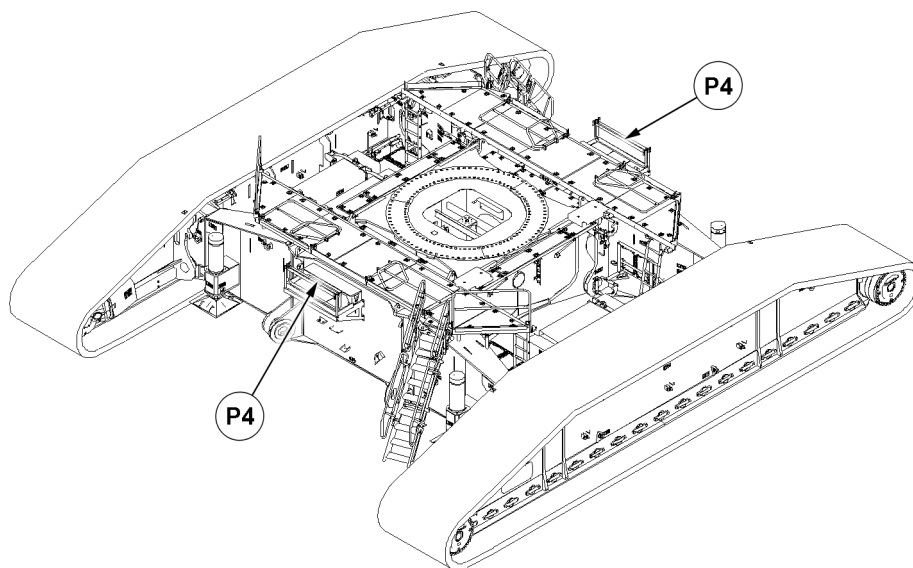


Fig.149497: Assembling the railing in the operating position — assembling the central railing



Note

- ▶ The railings in the points **P4** are assembled in the same manner.
- ▶ The assembly procedure is described based on an example.

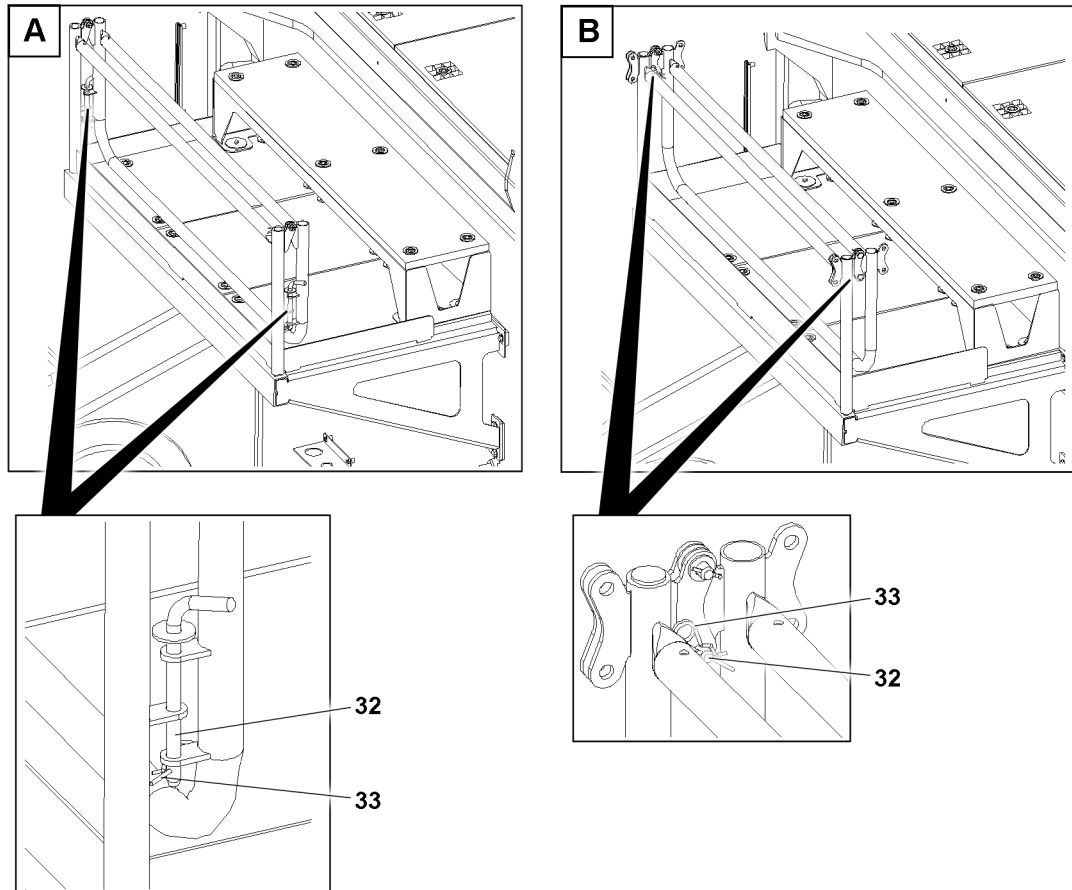


Fig.149498: Assembling the railing in the operating position — releasing and unpinning the pin

32 Pin

33 Retaining element

- ▶ Remove the retaining element **33**.
- ▶ Unpin the pin **32**.

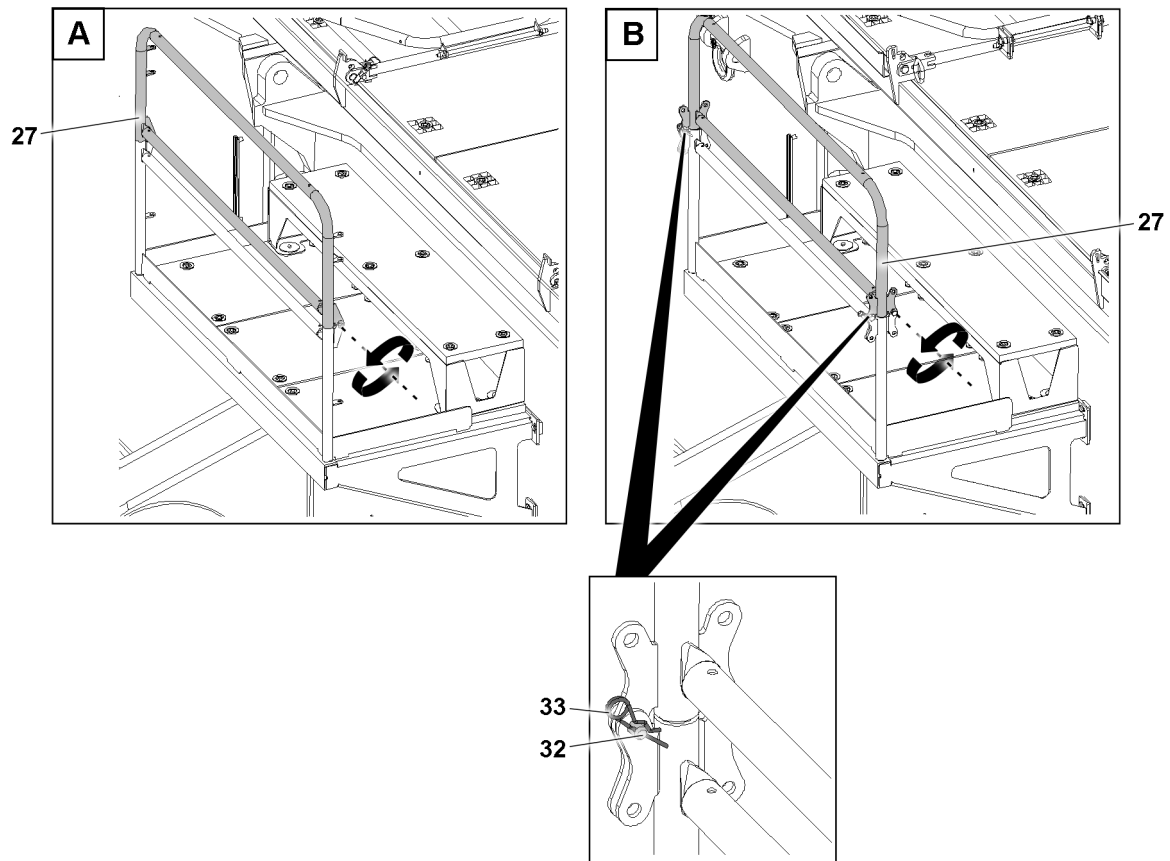


Fig.149499: Assembling the railing in the operating position — pinning and securing the railing

27 Railing
32 Pin

33 Retaining element

When variation A is installed:

- Fold the railing 27 up.

When variation B is installed:

- Fold up the railing 27 and secure with the pin 32 and the retaining element 33 in the operating position.

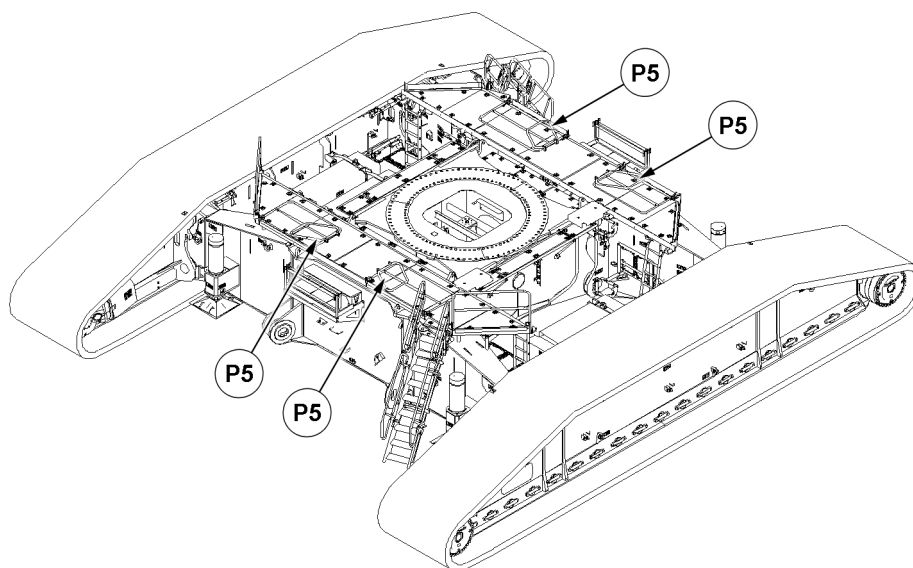


Fig.149500: Assembling the railing in the operating position — overview

**Note**

- ▶ The railings in the points **P5** are assembled in the same manner.
- ▶ The assembly procedure is described based on an example.

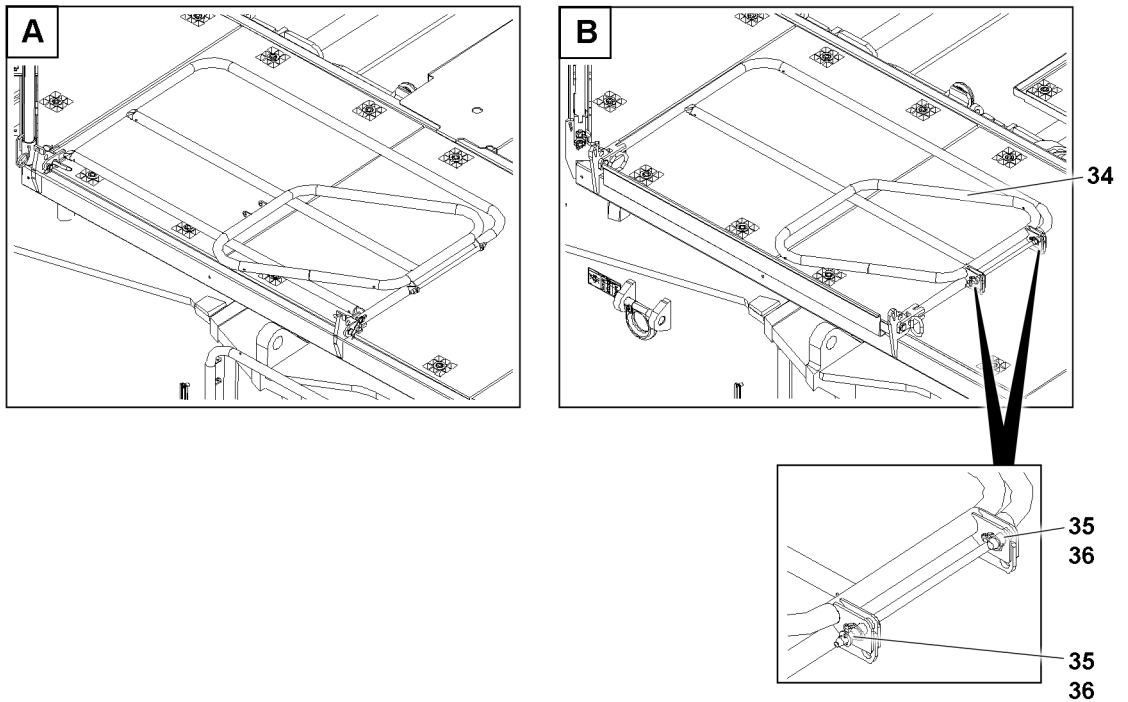


Fig.152979: Assembling the railing in the operating position — unpinning the pin (variation B)

34 Folding railing

36 Retaining element

35 Pin

When variation B is installed:

- ▶ Release the folding railing **34**: Remove the retaining elements **36** on both sides and unpin the pin **35** on both sides.

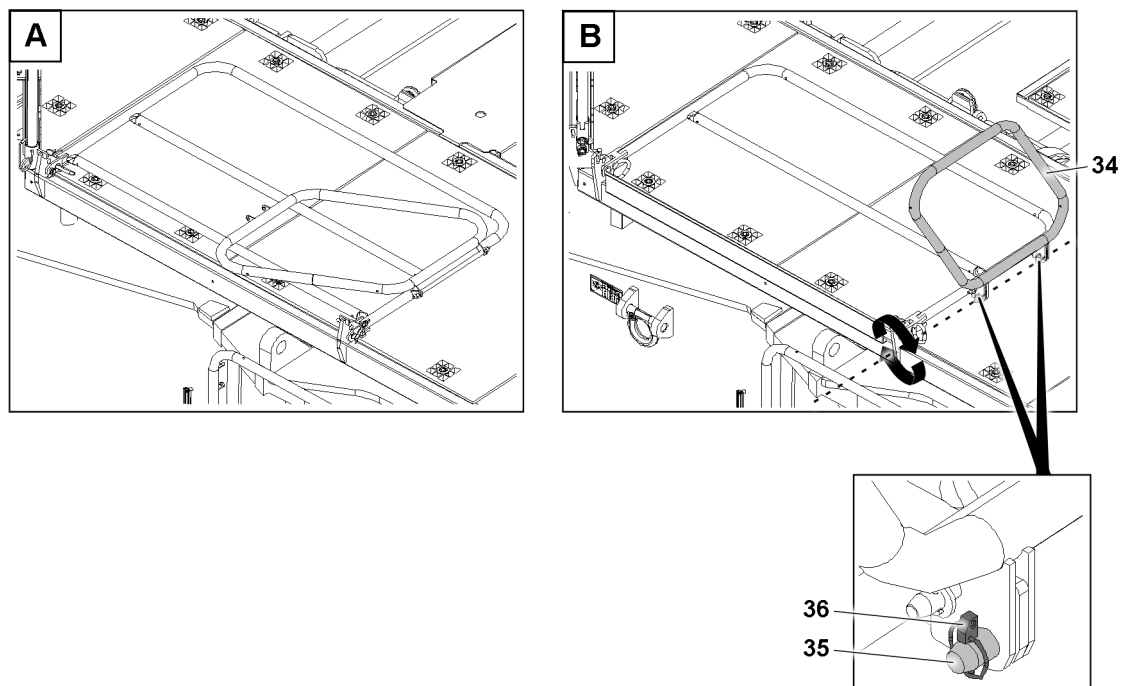


Fig.152980: Assembling the railing in the operating position — assembling the folding railing in the operating position

34 Folding railing
35 Pin

36 Retaining element

When variation B is installed:

- ▶ Swing the folding railing **34** into the operating position and secure on both sides with the pin **35** and retaining element **36**.

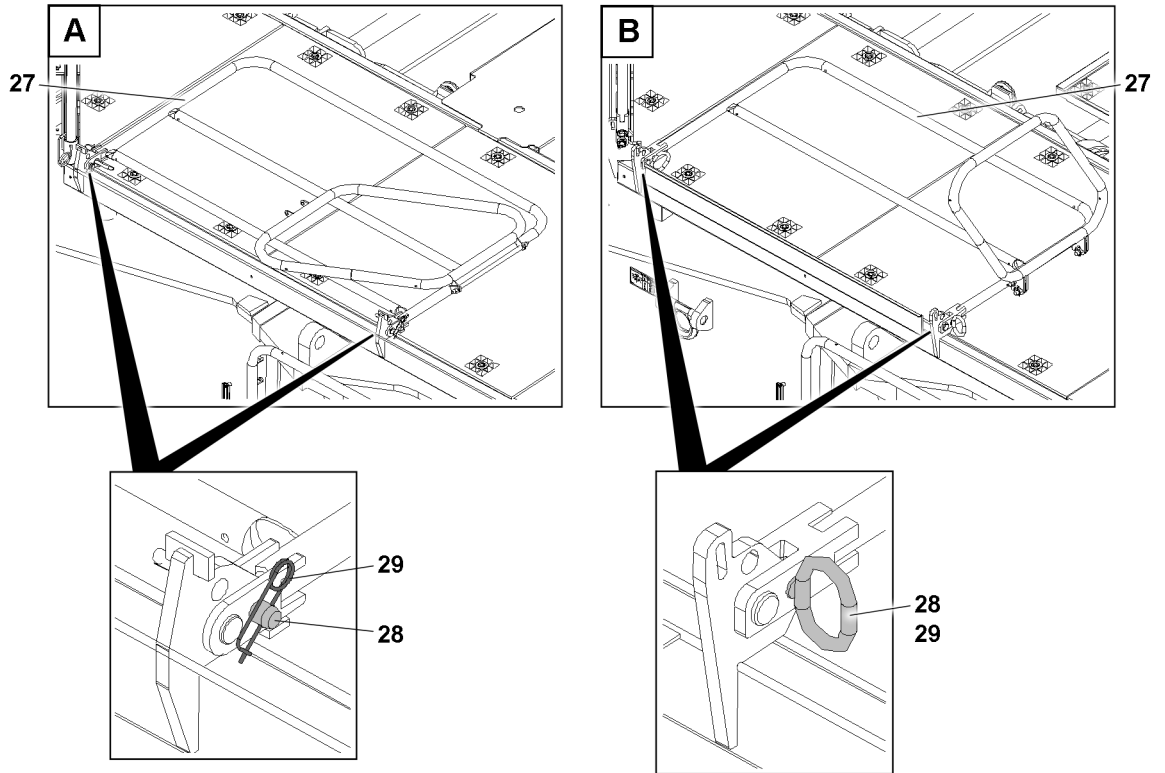


Fig. 152978: Assembling the railing in the operating position — releasing the railing in the transport position

27 Railing
28 Pin

29 Retaining element

- ▶ Release the railings **27** in the transport position: Remove the retaining element **29** on both sides and unpin the pin **28** on both sides.

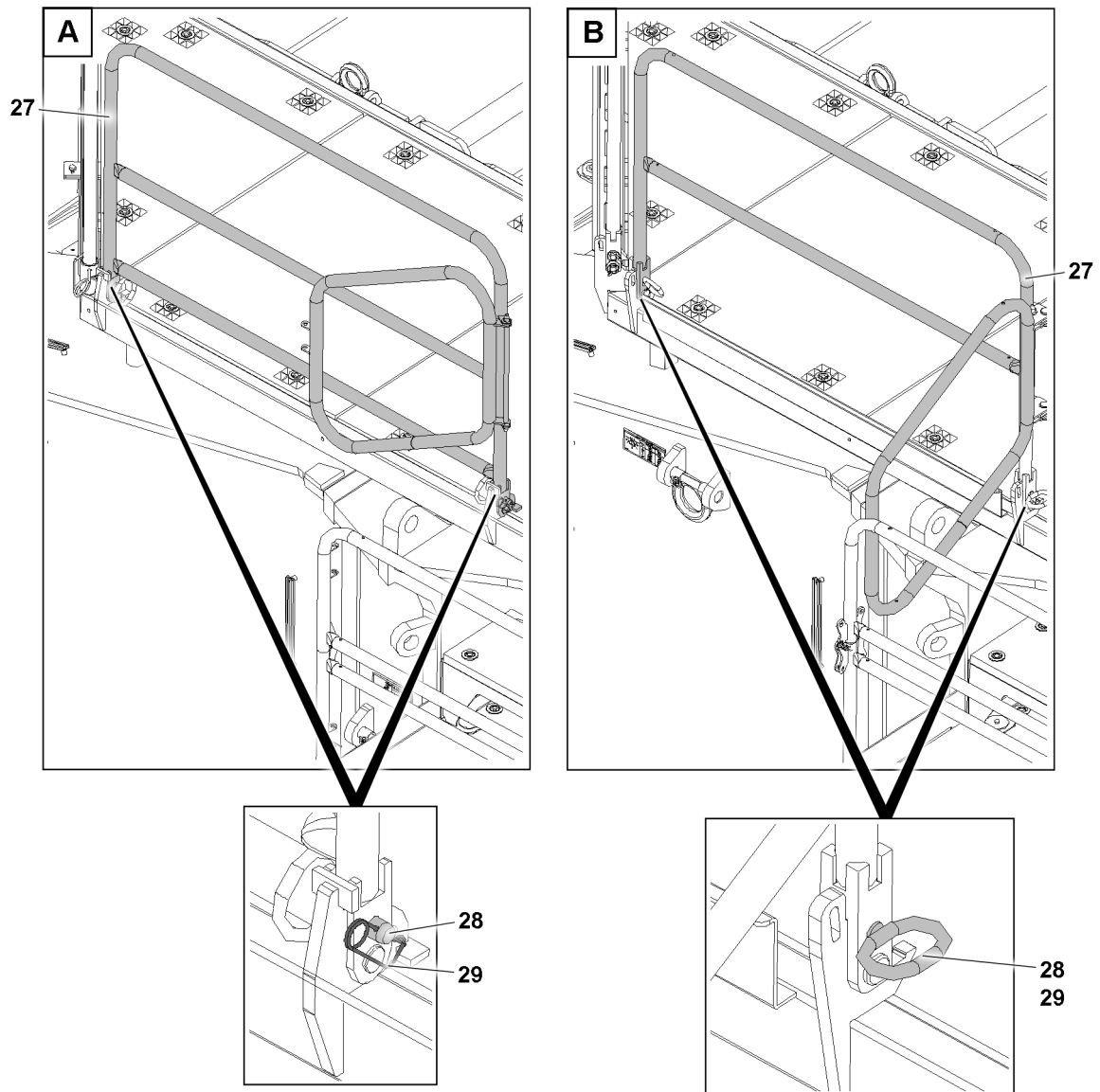


Fig.152981: Assembling the railing in the operating position — positioning the folding railing in the operating position

27 Railing
28 Pin

29 Retaining element

- ▶ Swing the railing **27** into the operating position.
- ▶ Insert the pin **28** on both sides and secure with the retaining element **29**.

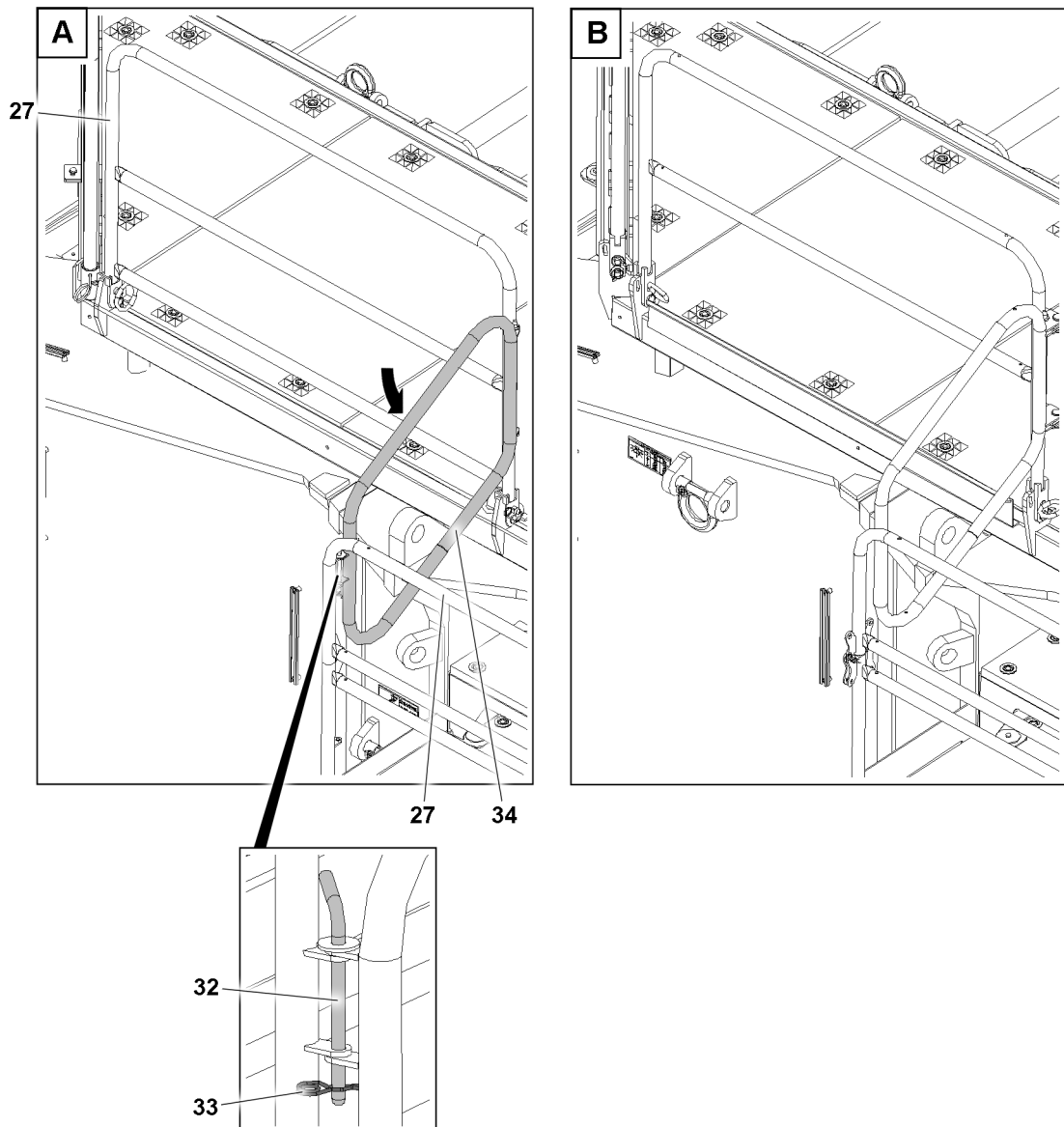


Fig. 152982: Assembling the railing in the operating position — pinning the folding railing in the operating position

27 Railing

32 Pin

33 Retaining element

34 Folding railing

When variation A is installed:

- ▶ Swing the folding railing **34** into the operating position.
- ▶ Pin the folding railing **34** with the railing **27**: Insert the pin **32** and secure it with the retaining element **33**.

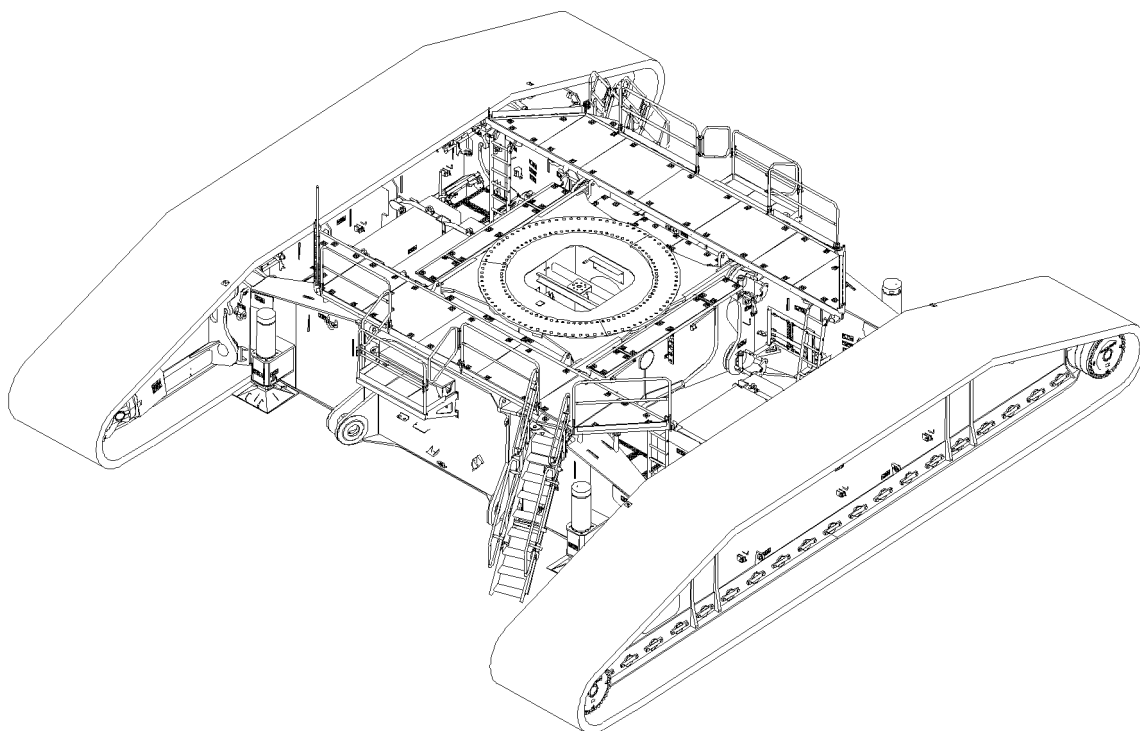


Fig.152983: Assembling the railing in the operating position — overview

27 Railing

- ▶ Repeat the procedure the same way for all further railings 27.

2.7 Assembling / disassembling the catwalk

2.7.1 Dimensions and weights



Note

- ▶ See chapter 1.03.

2.7.2 Catwalk fastening points



WARNING

Components incorrectly fastened!
Death, severe bodily injuries, property damage.

- ▶ Fasten the components only on the intended fastening points on both sides, see section „Fastening points“.

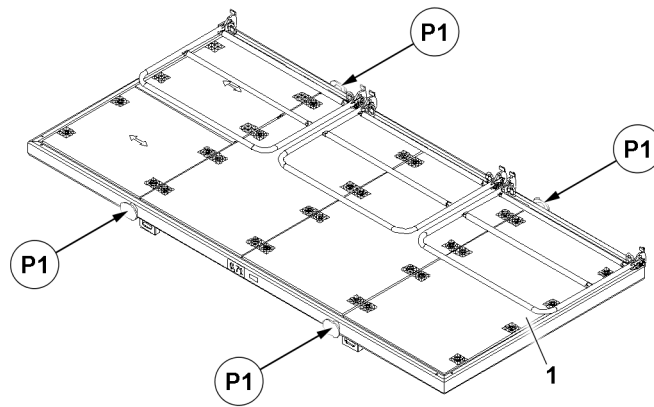


Fig.149475: Catwalk fastening points

| Fastening points | Component |
|------------------|-----------|
| P1 | Catwalk |

2.7.3 Assembling the catwalk



WARNING

When working at a height, there is a danger of falling!
Death, severe bodily injuries, property damage.

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

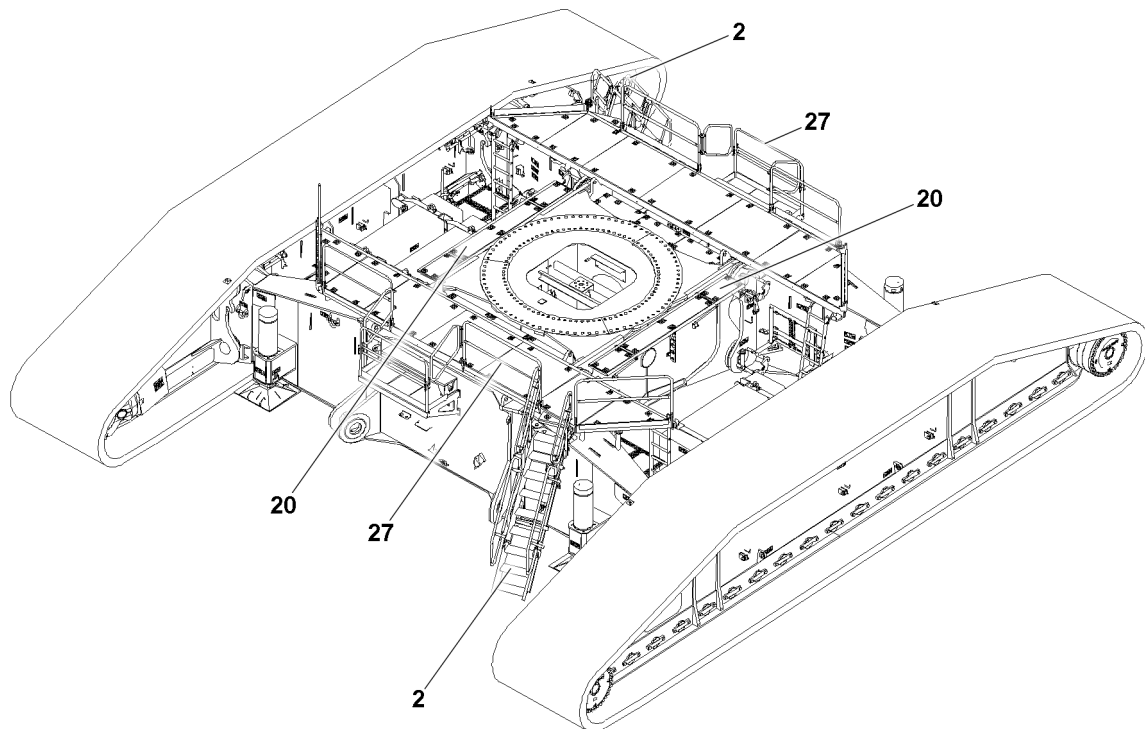


Fig.152984: Assembling the catwalk — prerequisites

- | | |
|--------------------|-------------------|
| 2 Stairs | 27 Railing |
| 20 Gratings | |

Make sure that the following prerequisites are met:

- The stairs **2** are assembled in the operating position.
- All railings **27** of the cross carrier are assembled in the operating position.
- Both gratings **20** are assembled in the operating position.
- An auxiliary crane is available.



Note

- ▶ The catwalks are assembled on both sides in the same manner.
- ▶ The assembly procedure is described as an example based on one side.

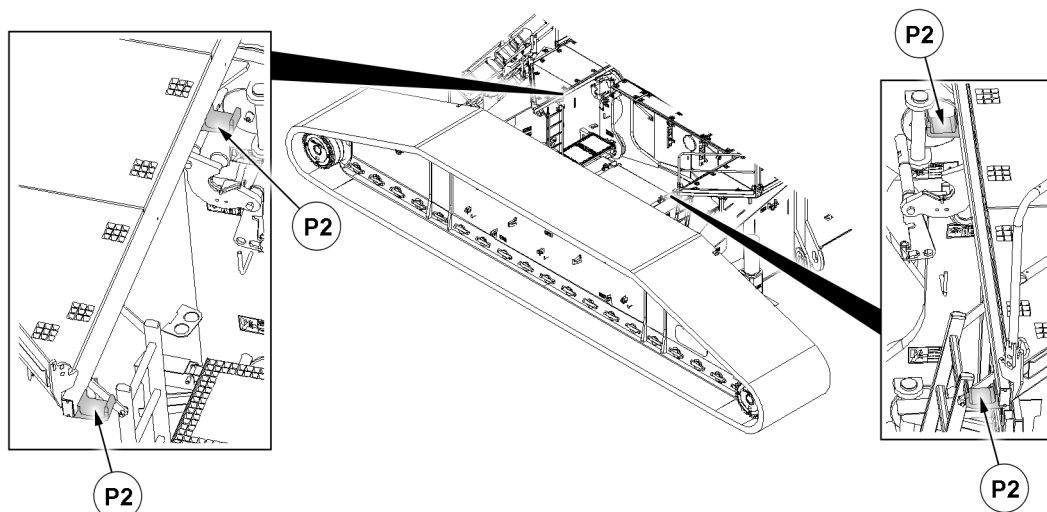


Fig.152985: Assembling the catwalk — positioning the catwalk

- | |
|-------------------|
| 37 Catwalk |
|-------------------|

- ▶ Fasten the catwalk **37** to the auxiliary crane, see section „Catwalk fastening points“.
- ▶ Position the catwalk in such a way that it can be pinned in points **P2**.
- ▶ Remove the fastening equipment.

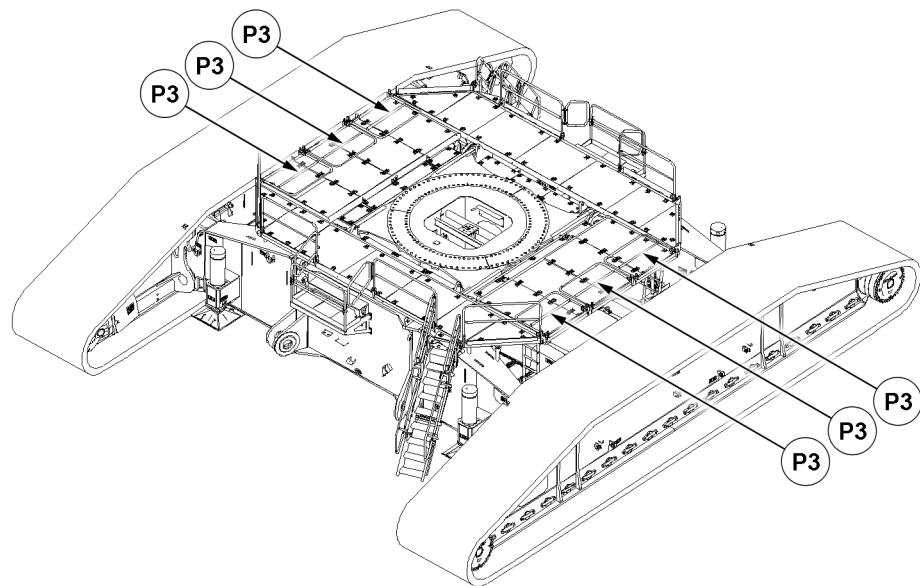


Fig.152986: Assembling the catwalk — positioning the railings



Note

- ▶ The railings in the points **P3** are assembled in the same manner.
- ▶ The assembly procedure is described based on an example.

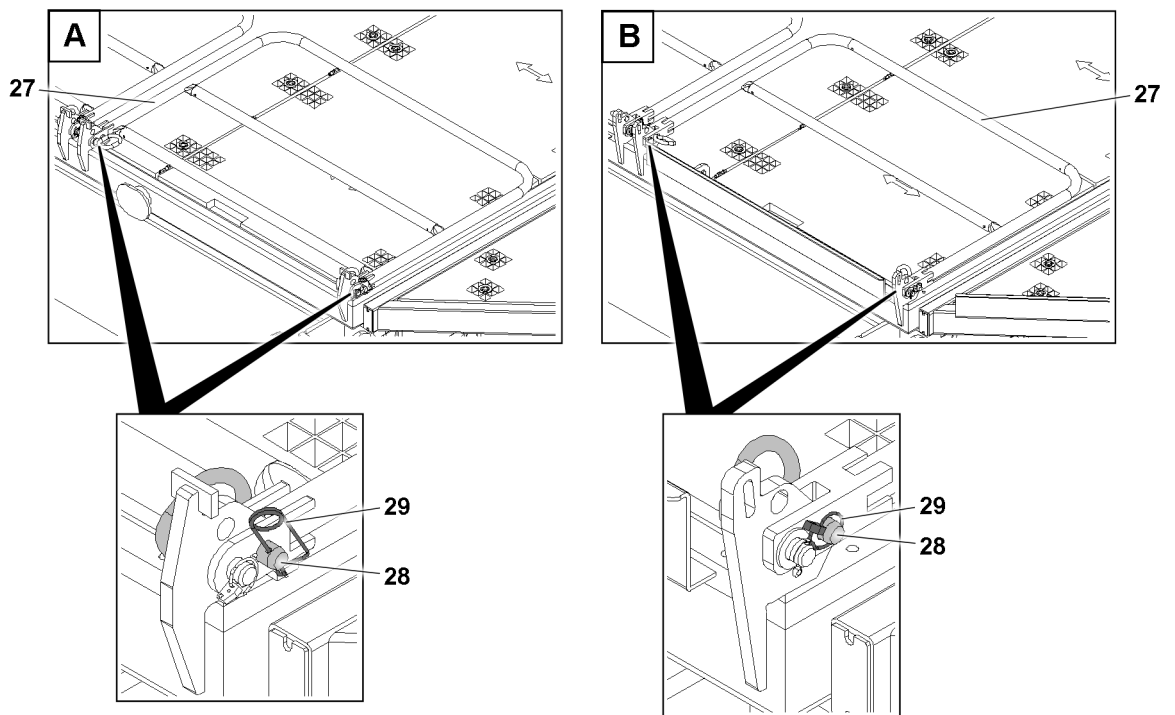


Fig.152987: Assembling the catwalk — releasing the railing in the transport position

27 Railing
28 Pin

29 Retaining element

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- Release the railings **27** in the transport position: Remove the retaining element **29** on both sides and unpin the pin **28** on both sides.

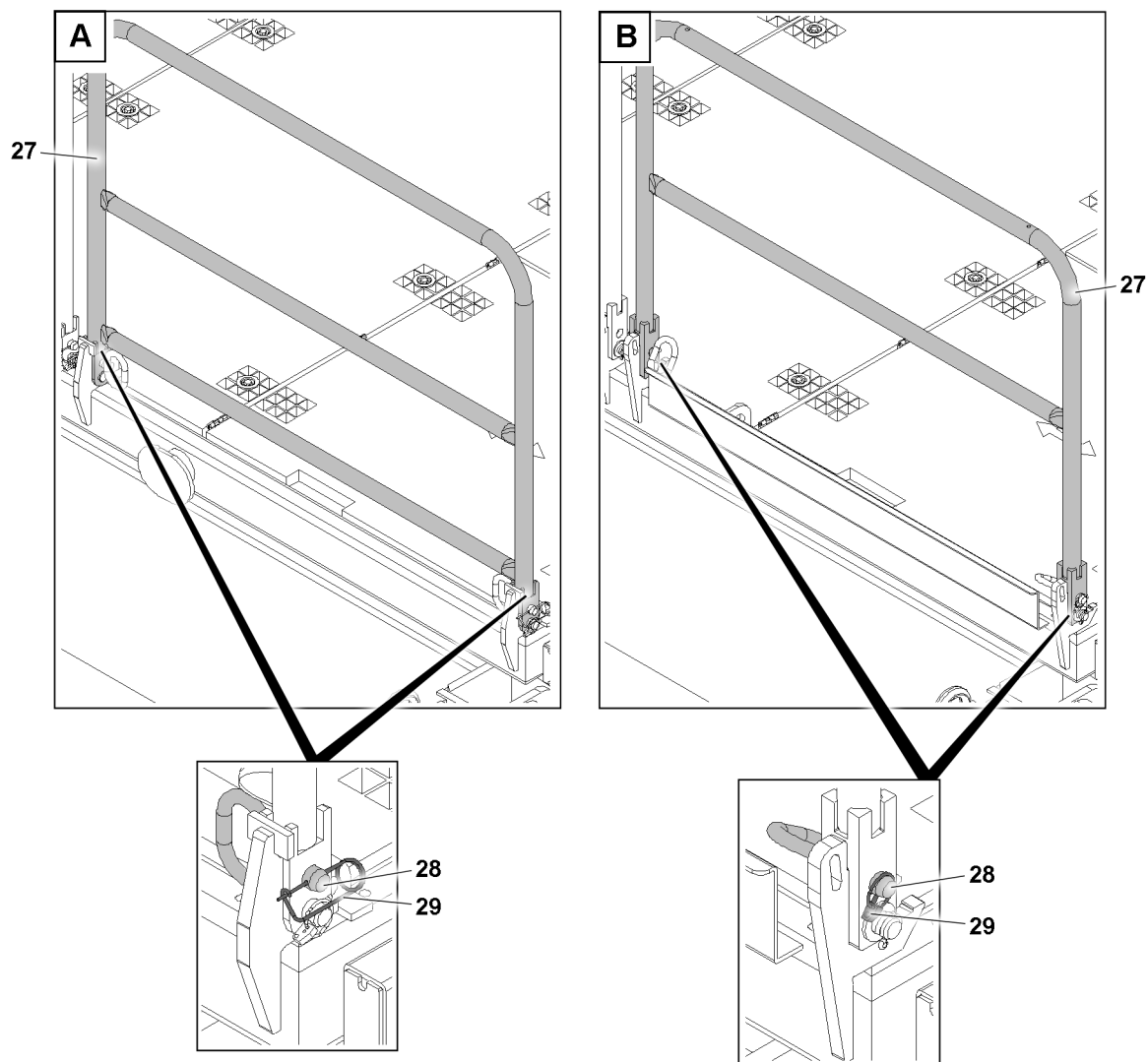


Fig.152988: Assembling the catwalk — pinning the railing in operating position

27 Railing
28 Pin

29 Retaining element

- Swing the railing **27** into the operating position.
- Insert the pin **28** on both sides and secure with the retaining element **29**.

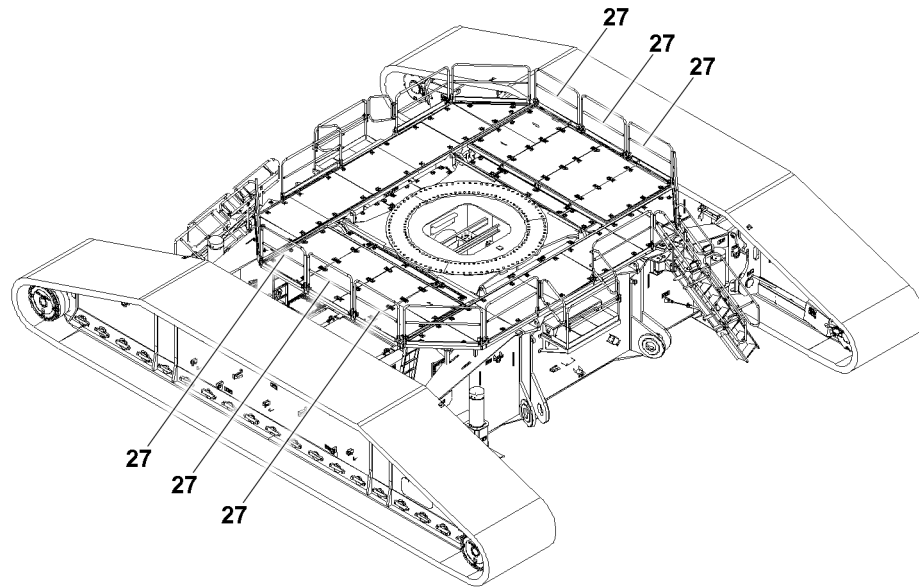


Fig.152989: Assembling the catwalk — overview of assembled railings

27 Railing

- ▶ Repeat the procedure the same way for all further railings 27.

2.7.4 Installing the steps



WARNING

The steps are not assembled!

If the steps are not installed before assembly of the turntable, then assembly personnel can fall. Death, severe bodily injuries.

- ▶ Make sure that the steps are assembled.



WARNING

The fall protection equipment is not properly assembled and secured!

Death, severe bodily injuries.

- ▶ All fall protection equipment, for example platforms, ladders and railings are properly assembled and secured.

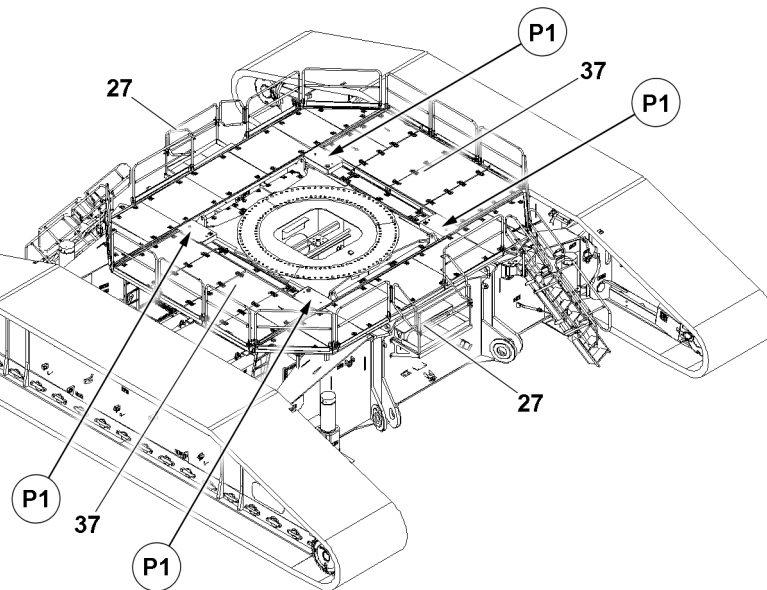


Fig.152990: Assembling the steps – Prerequisites

27 Railing

37 Catwalk

Make sure that the following prerequisites are met:

- The catwalks 37 are assembled.
- The railings 27 are assembled.



Note

- ▶ The steps in the points **P1** are assembled in the same manner.
- ▶ The assembly procedure is described based on an example.

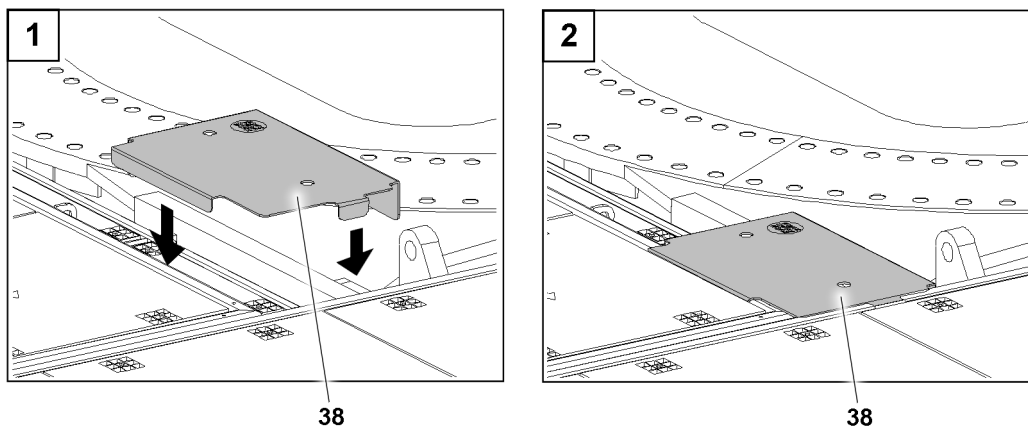


Fig.152991: Assembling the steps – connecting the steps

38 Step



WARNING

Hands in the danger zone!
Death, severe bodily injuries.

- ▶ Do not reach with your hands into the danger zone.
- ▶ Connect the step 38.
- ▶ Repeat the procedure for the other steps the same way as described above.

3 Fall protection equipment on the turntable



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and be killed or seriously injured.

- ▶ For assembly / disassembly work, maintenance work and inspections, swing all railings and platforms into position and secure.
- ▶ Only step on the aids, ladders and platforms with clean shoes.
- ▶ Keep aids, ladders and platforms free of heavy dirt, snow and ice.
- ▶ Replace damaged ladders and platforms immediately.
- ▶ Assemble all ladders and platforms stable and safe to access.

3.1 Assembling the engine compartment ladder in the transport position / operating position

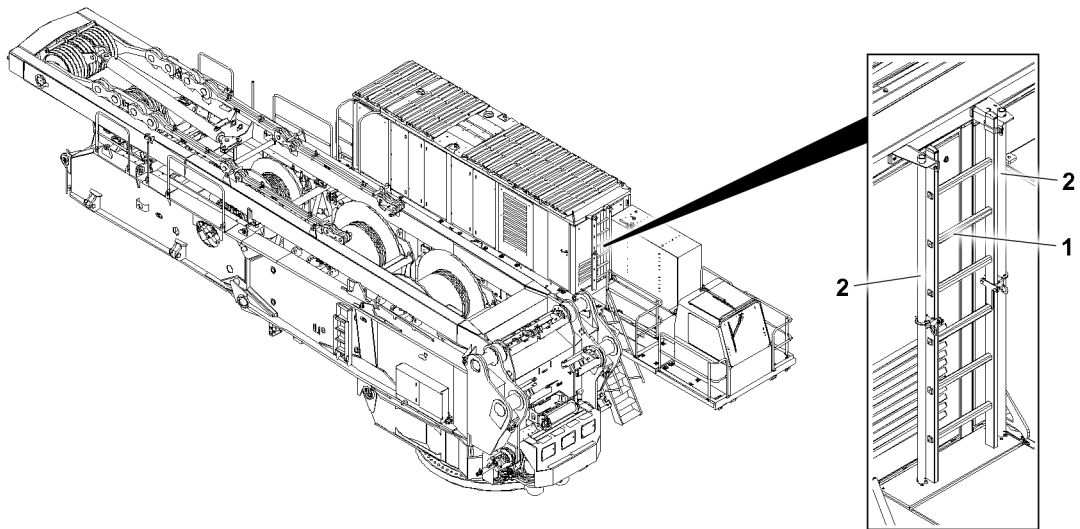


Fig. 152992: Assembling the engine compartment ladder in the transport position / operating position

1 Ladder

2 Pipe



WARNING

The pipe 2 is not assembled and secured in operating position!

Death, severe bodily injuries.

- ▶ Assemble and secure the pipe 2 in the operating position.
- ▶ Before using the ladder 1, both pipes 2 must be assembled in the operating position.

3.1.1 Assembling the pipes in the operating position

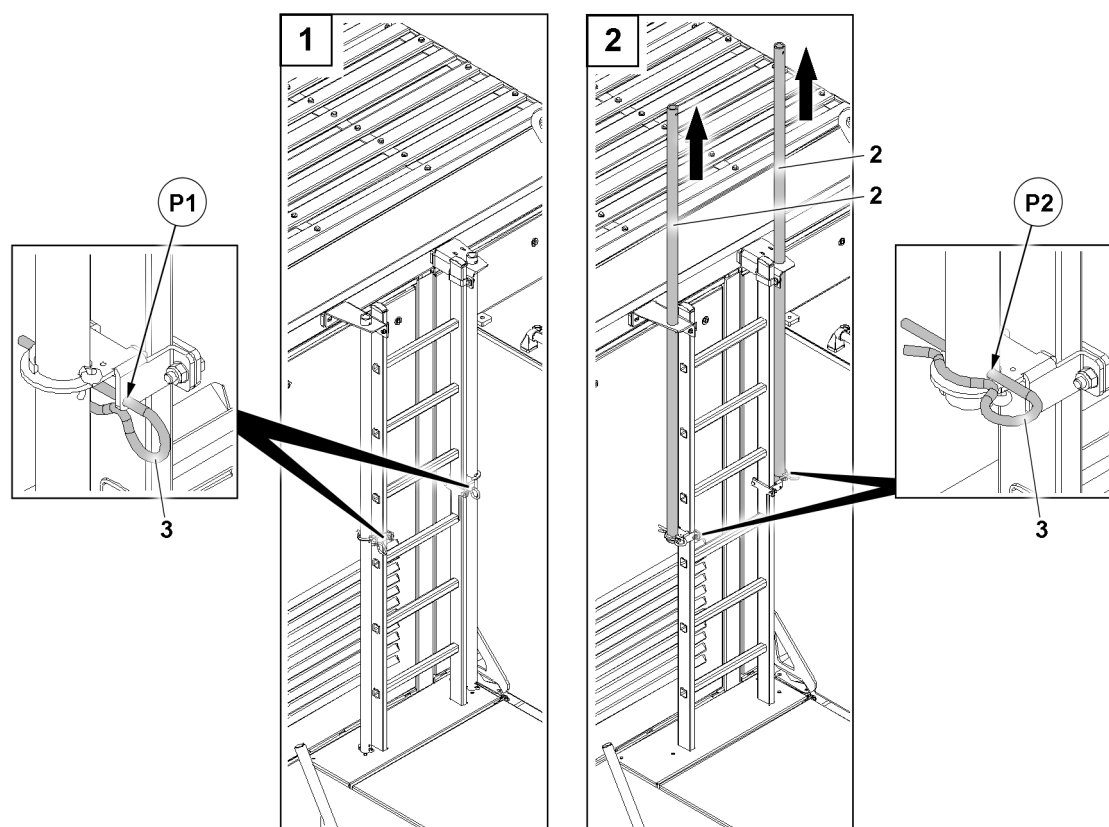


Fig.152993: Assembling the pipes in the operating position

2 Pipe **3** Retaining element

- ▶ Remove the retaining element **3** from the park position **P1**.
- ▶ Push the pipes **2** on both sides upward into the operating position.
- ▶ Secure the pipes **2** in points **P2** with the retaining elements **3**.

3.1.2 Assembling the pipes in the transport position

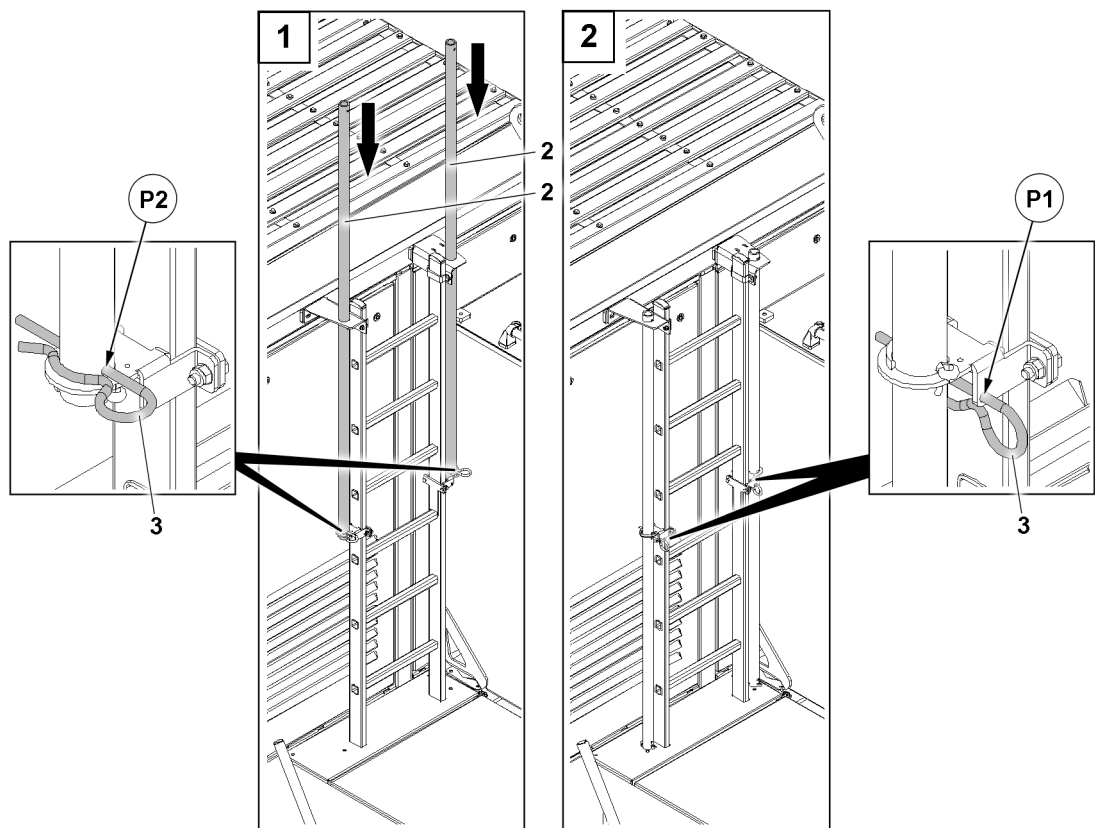


Fig.152994: Assembling the pipes in the transport position

2 Pipe **3** Retaining element

- ▶ Remove the retaining elements **3** in points **P2**.
- ▶ Push the pipes **2** on both sides into the transport position.
- ▶ Assemble the retaining elements **3** in the park position.

3.2 Assembling the turntable ladder in the transport position / operating position

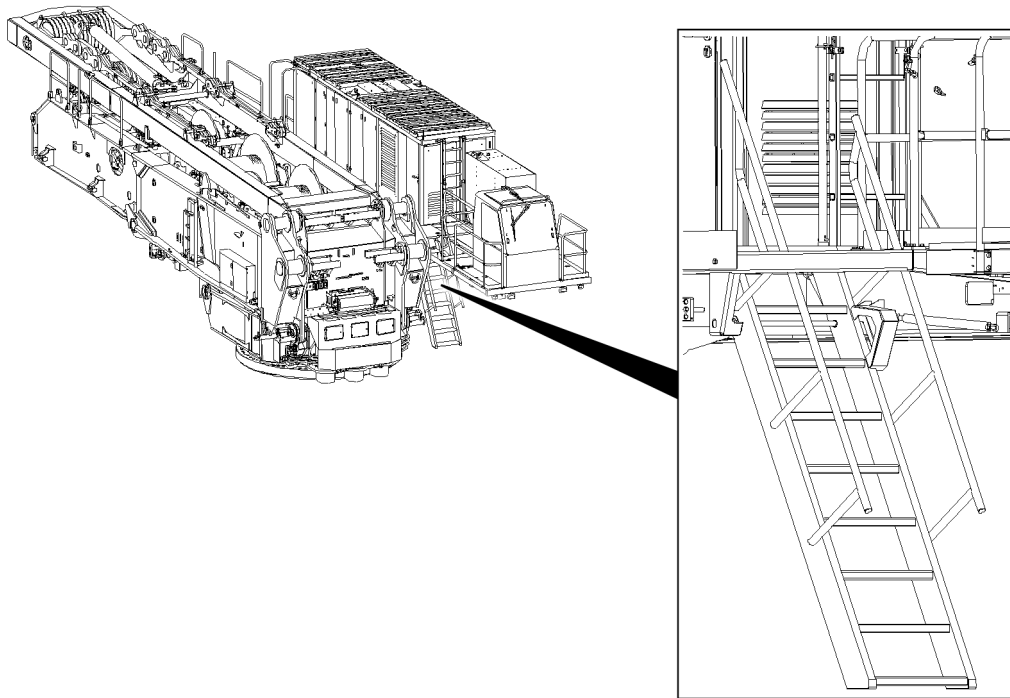


Fig.152995: Assembling the turntable ladder in the transport position / operating position

3.2.1 Assembling the ladder in the operating position

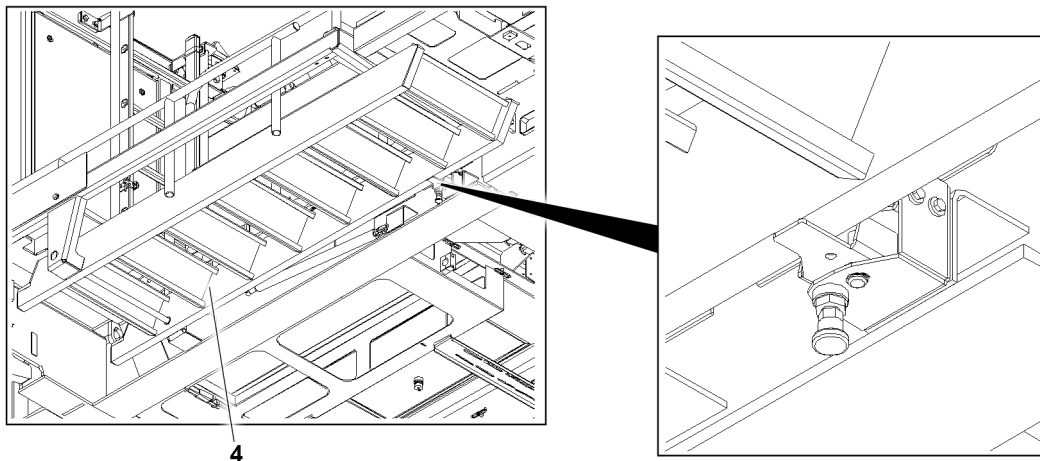


Fig.152997: Assembling the ladder in the operating position — prerequisites

4 Ladder

Make sure that the following prerequisite is met:

- The ladder 4 is assembled in the transport position.

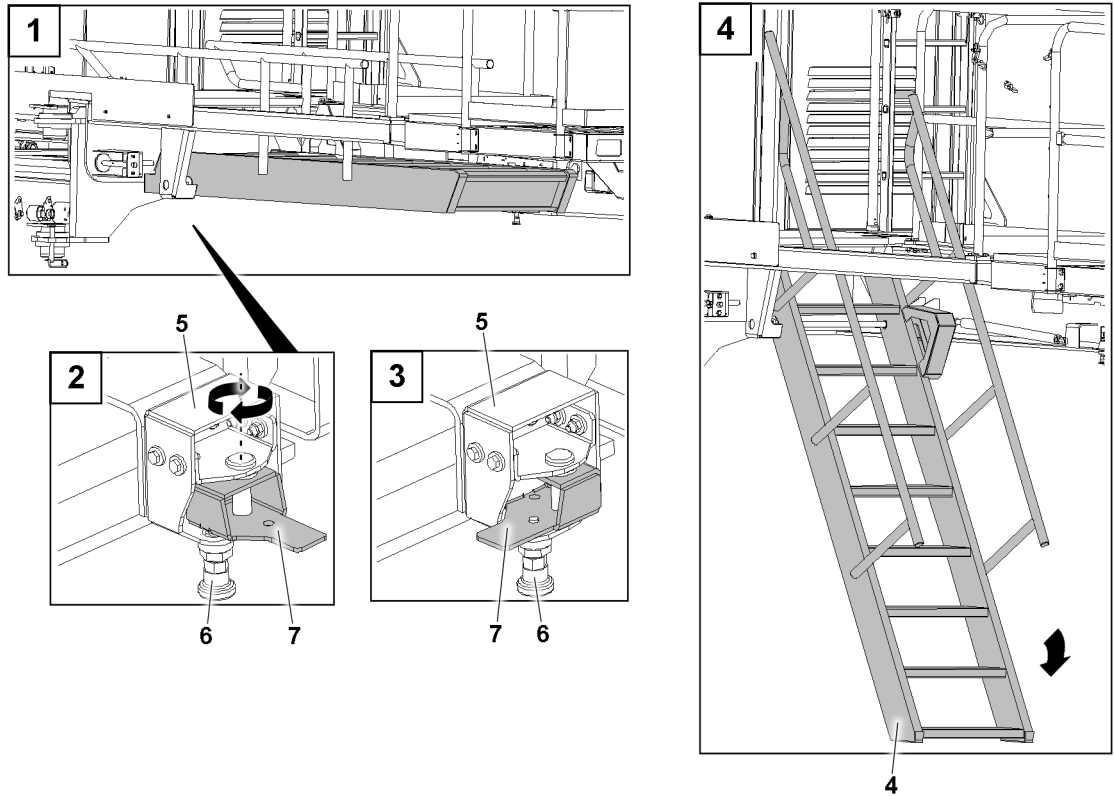


Fig.152998: Assembling the ladder in the operating position

- | | | | |
|---|---------|---|-----------------|
| 4 | Ladder | 6 | Detent pin |
| 5 | Bracket | 7 | Retaining plate |

- ▶ Pull the locking pin 6.
- ▶ Turn the retaining plate 7 until the detent pin 6 has engaged.
- ▶ Swing the ladder 4 down completely.

3.2.2 Assembling the ladder in the transport position

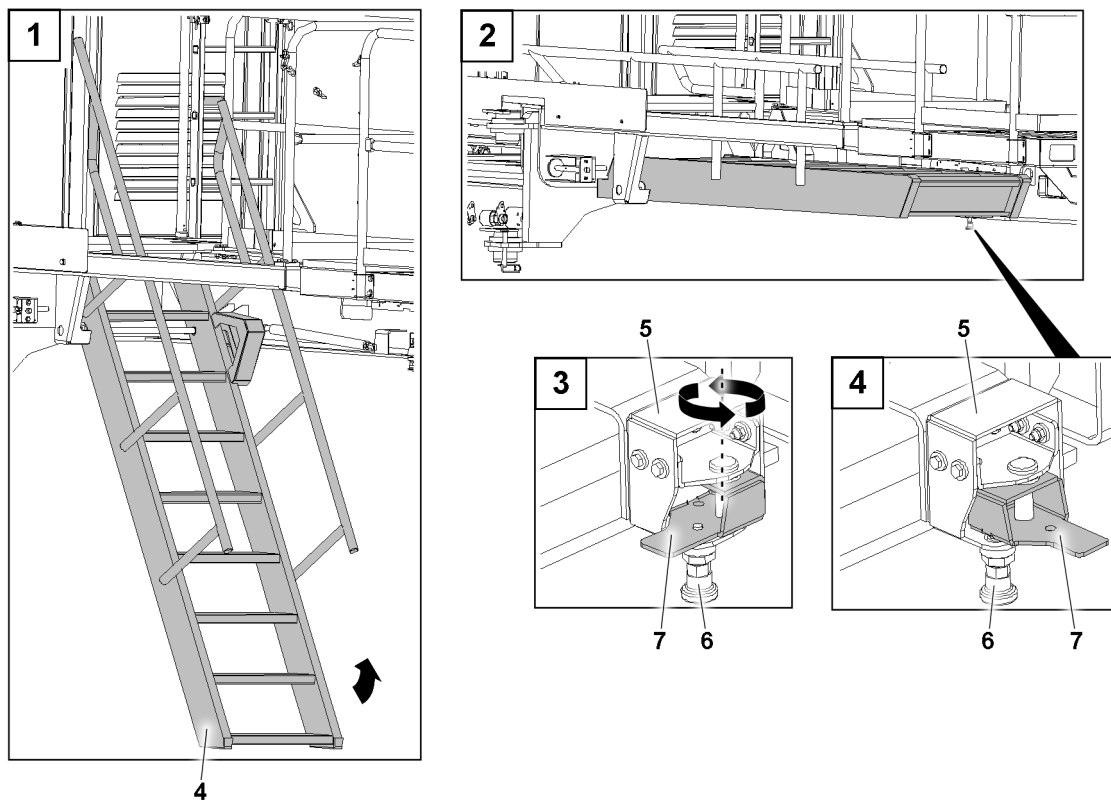


Fig.152996: Assembling the ladder in the transport position

- | | | | |
|---|---------|---|-----------------|
| 4 | Ladder | 6 | Detent pin |
| 5 | Bracket | 7 | Retaining plate |

- ▶ Swing the ladder 4 up to the bracket 5.
- ▶ Pull the locking pin 6.
- ▶ Turn the retaining plate 7 until the detent pin 6 has engaged.

Result:

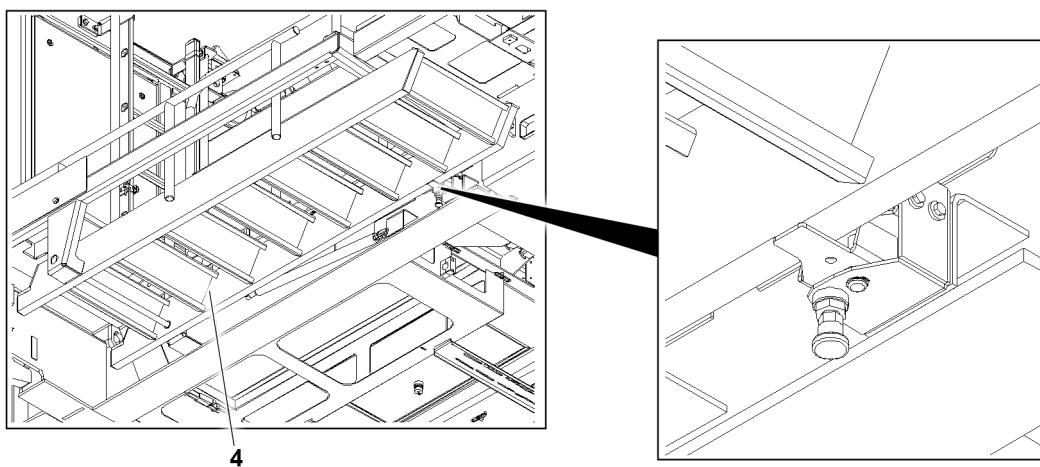


Fig.152997: Securing the ladder in the transport position

- | | |
|---|--------|
| 4 | Ladder |
|---|--------|
- The ladder 4 is assembled and secured in the transport position.

3.3 Assembling the railing

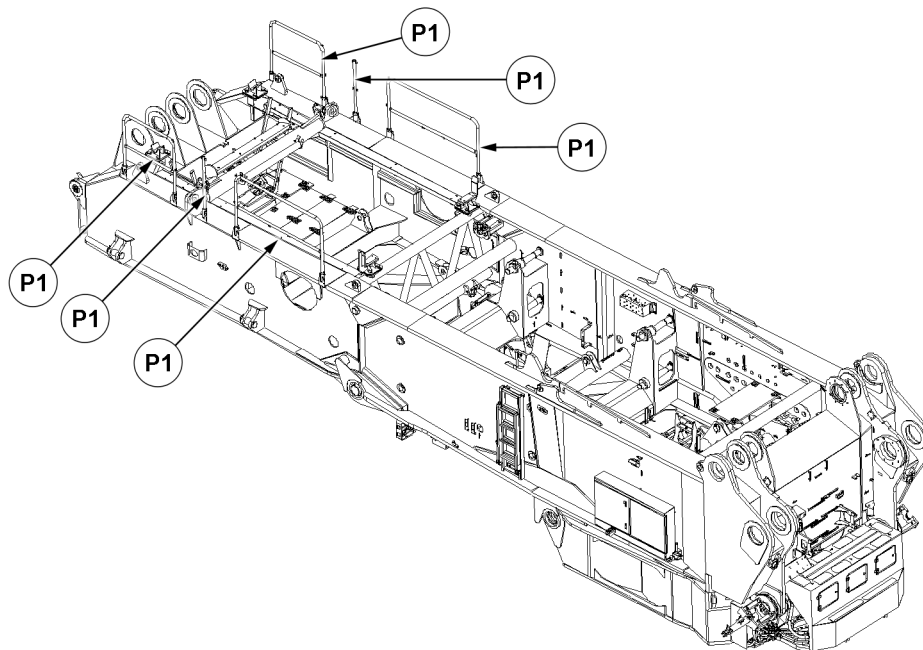


Fig.152999: Assembling the railing — railing positions



Note

- ▶ The railings in the points **P1** are assembled in the same manner.
- ▶ The assembly procedure is described based on an example.

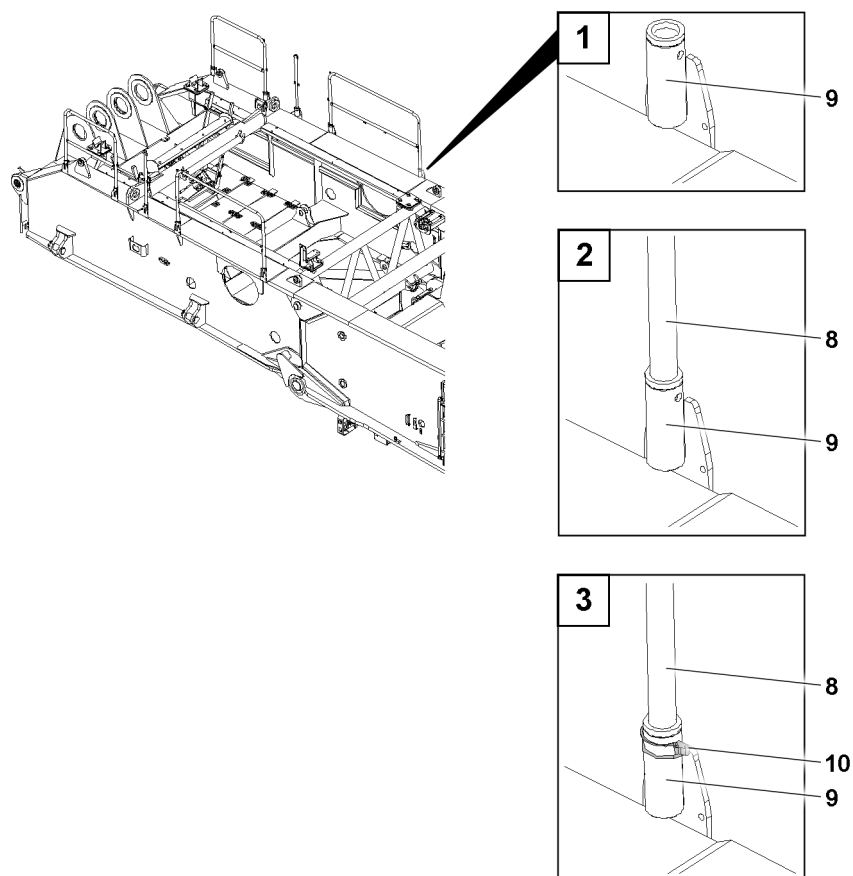


Fig.153000: Assembling the railing — inserting and securing the railing

8 Railing
9 Retainer

10 Retaining element

► Insert the railing 8 in the retainers 9 and secure with the retaining elements 10.

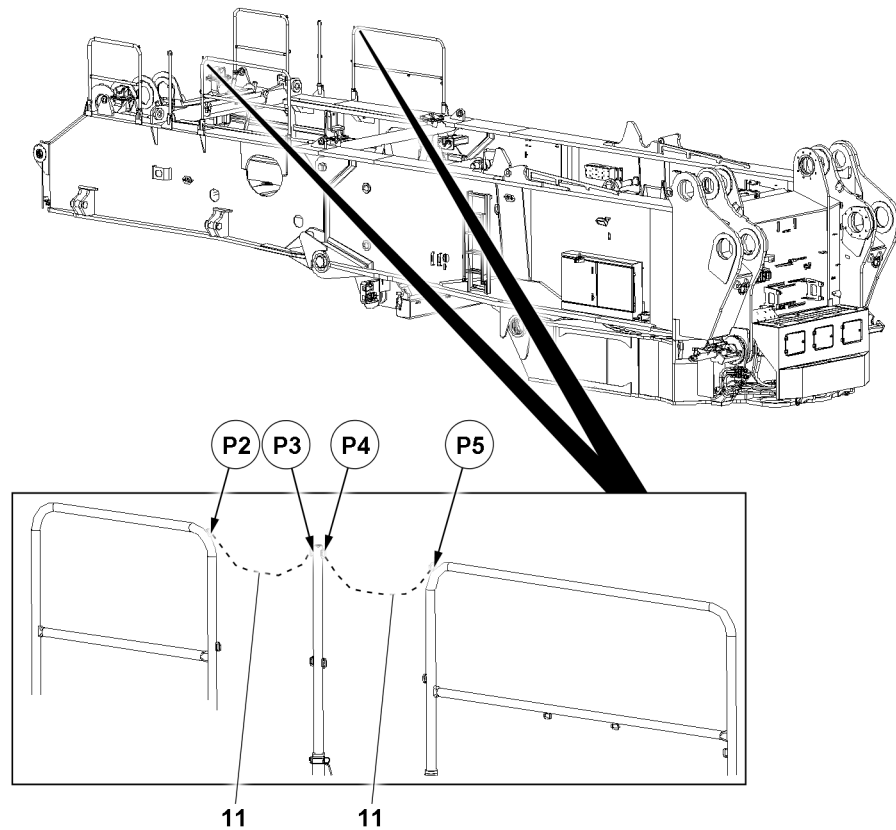


Fig.153001: Assembling the railing — chain assembly

11 Chain

- ▶ Assemble the chain **11** between point **P2** and point **P3**.
- ▶ Assemble the chain **11** between point **P4** and point **P5**.

4 Fall protection equipment on the counterweights

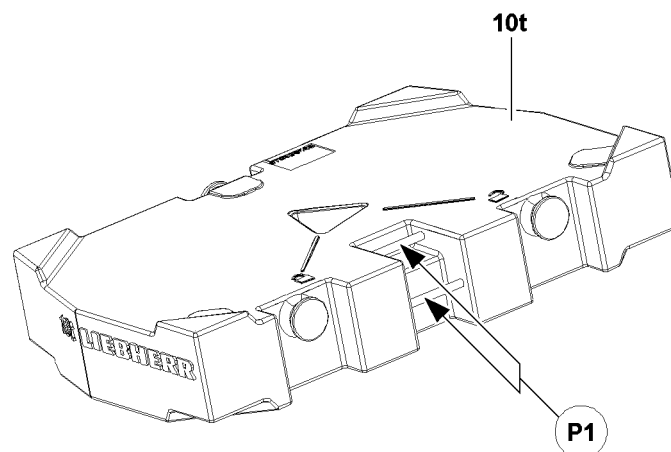


Fig.153002: Fall protection equipment on the counterweights

The steps on the counterweight plates serve as connection points for assembly tasks **P1** for the approved fall arrest system for assembly personnel.

**WARNING**

When working at a height, there is a danger of falling!

If the following notes are not observed, assembly personnel could fall and suffer life-threatening injuries.

- ▶ Assembly personnel must wear an approved fall arrest system and protective equipment before performing any assembly / disassembly and maintenance work on the counterweights.
- ▶ The assembly personnel must hook themselves onto the fastening points **P1** with an approved fall arrest system to prevent them from falling.

5 Fall protection equipment on the boom pivot sections and on the lattice sections

5.1 Assembling the railing

**WARNING**

Danger of falling!

During the assembly / disassembly of the railings, assembly personnel can fall down and be fatally injured.

- ▶ Make sure that the personal fall arrest system is worn properly and correctly fastened to the provided fastening points.

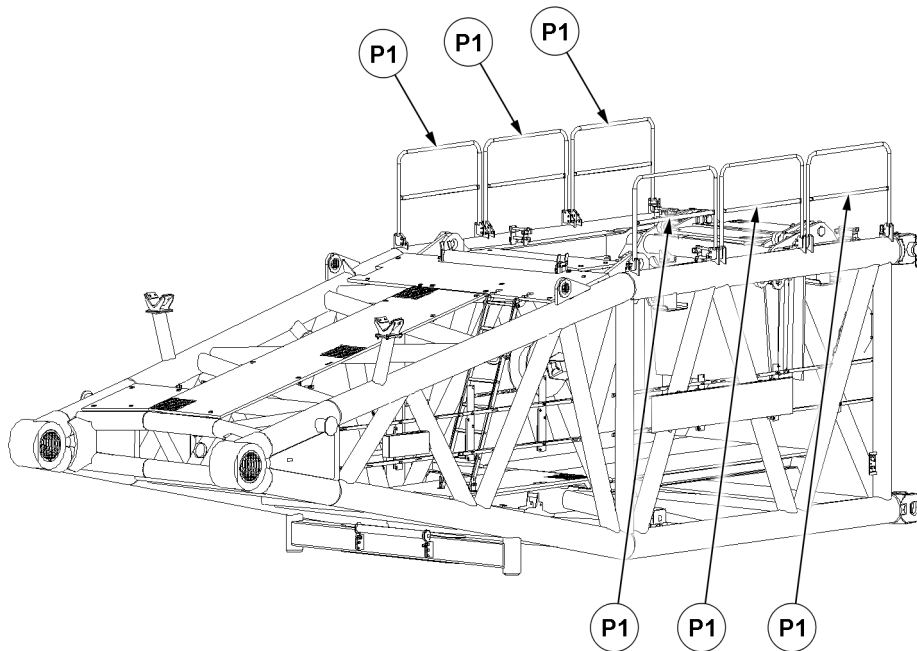


Fig. 153003: Fall protection equipment on the boom pivot sections and on the lattice sections — railing positions

**Note**

- ▶ The railings in the points **P1** are assembled in the same manner.
- ▶ The assembly procedure is described based on an example.

5.1.1 Installing the railings in the operating position

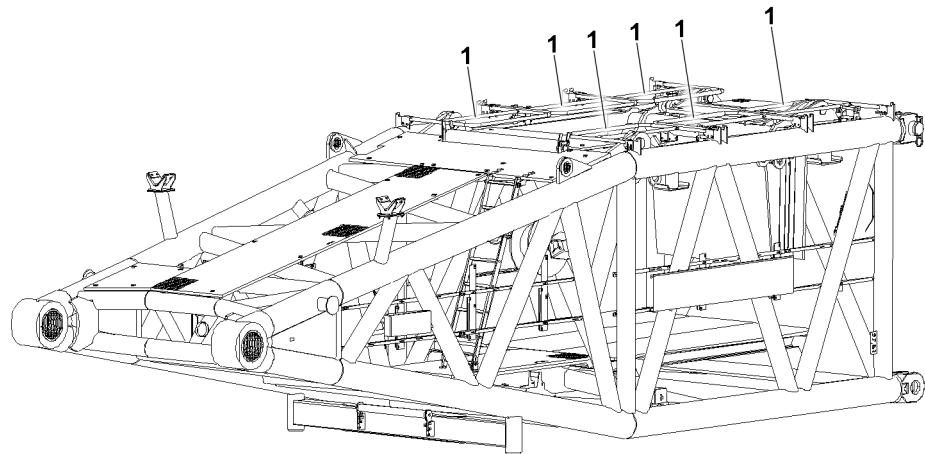


Fig. 153006: Fall protection equipment on the boom pivot sections and on the lattice sections — prerequisites

1 Railing

Make sure that the following prerequisite is met:

- The railings 1 are in the transport position.

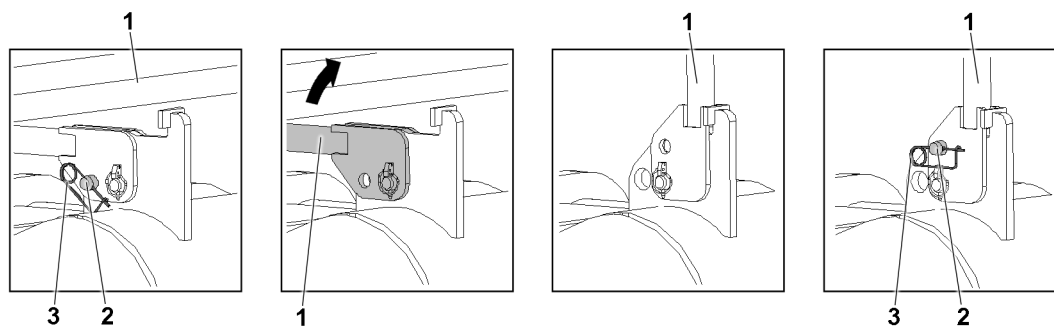


Fig. 153007: Fall protection equipment on the boom pivot sections and on the lattice sections — assembling the railing in the operating position

1 Railing

3 Retaining element

2 Pin

- ▶ Unpin the pin 2 in the transport position: Remove the retaining element 3 and unpin the pin 2.
- ▶ Swing the railings 1 upward into operating position.

When the railing 1 is in the operating position:

- ▶ Insert the pin 2 and secure it with the retaining element 3.

5.1.2 Assembling the railing in the transport position

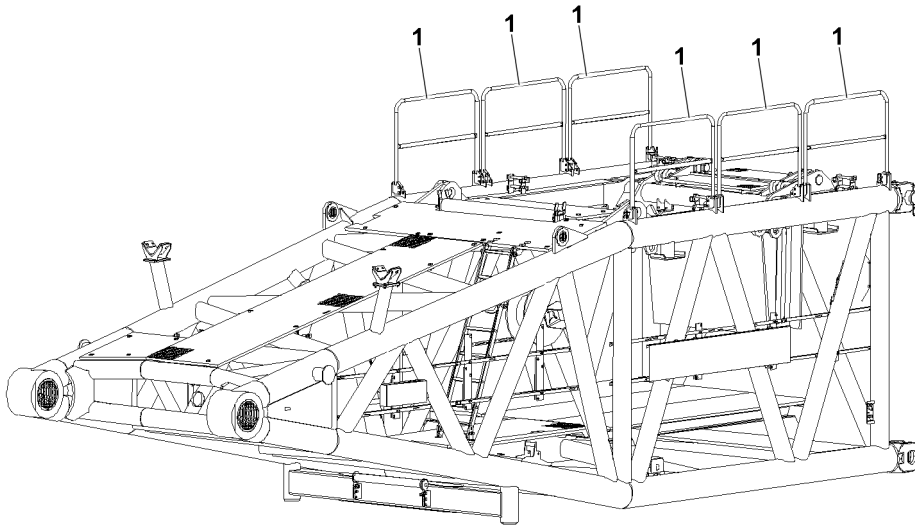


Fig. 153004: Fall protection equipment on the boom pivot sections and on the lattice sections — prerequisites

1 Railing

Make sure that the following prerequisites are met:

- Winch 5 is disassembled on the S-pivot section or is in the transport position.
- The railings 1 are in the operating position.

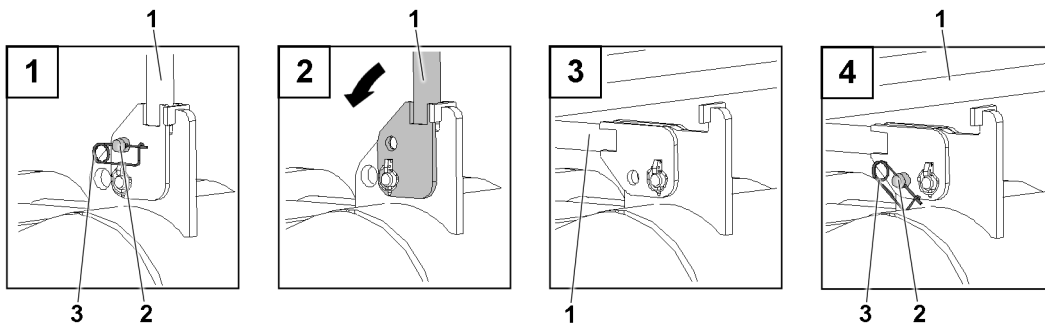


Fig. 153005: Fall protection equipment on the boom pivot sections and on the lattice sections — assembling the railing in the transport position

1 Railing

2 Pin

3 Retaining element

- ▶ Remove the retaining element 3 and unpin the pin 2.
- ▶ Swing the railing 1 down.

When the railings 1 are in the transport position:

- ▶ Insert the pin 2 and secure it with the retaining element 3.

5.2 Installing the assembly pedestal

Make sure that the following prerequisite is met:

- The railings on the S-pivot section are in the operating position.

5.2.1 Assembling the assembly pedestal in the operating position

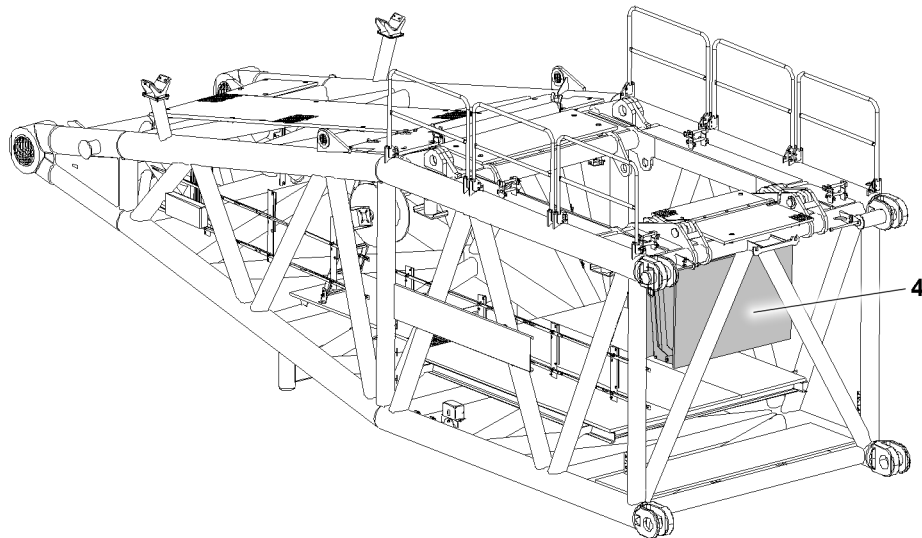


Fig. 153008: Assembling the assembly pedestal in the operating position — assembly pedestal

4 Assembly pedestal



Note

- The assembly pedestal 4 can only be assembled in the operating position if winch 5 is not installed on the S-pivot section.



WARNING

Danger of falling!

If the assembly pedestal 4 is not completely folded open and not pinned, there is a danger of falling.

- The assembly pedestal 4 may only be accessed when it is completely folded open, pinned and secured.

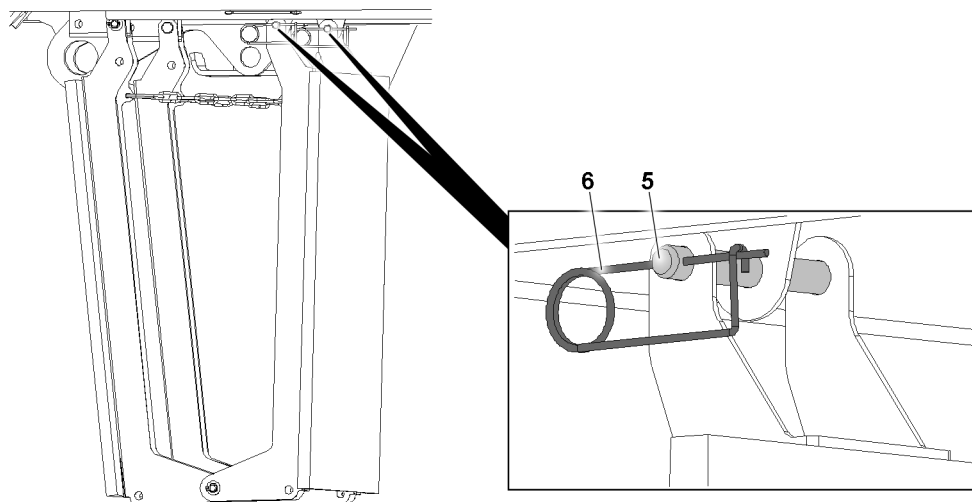


Fig. 153009: Assembling the assembly pedestal in the operating position — unpinning the assembly pedestal in the transport position

4 Assembly pedestal

5 Pin

6 Retaining element

**WARNING**

Assembly pedestal **4** incorrectly fastened!

Death, severe bodily injuries.

► Fasten the assembly pedestal **4** so that it cannot swing down uncontrolled.

► Fasten the folded assembly pedestal **4** to the auxiliary crane.

► Remove the retaining element **6** and unpin the pin **5**.

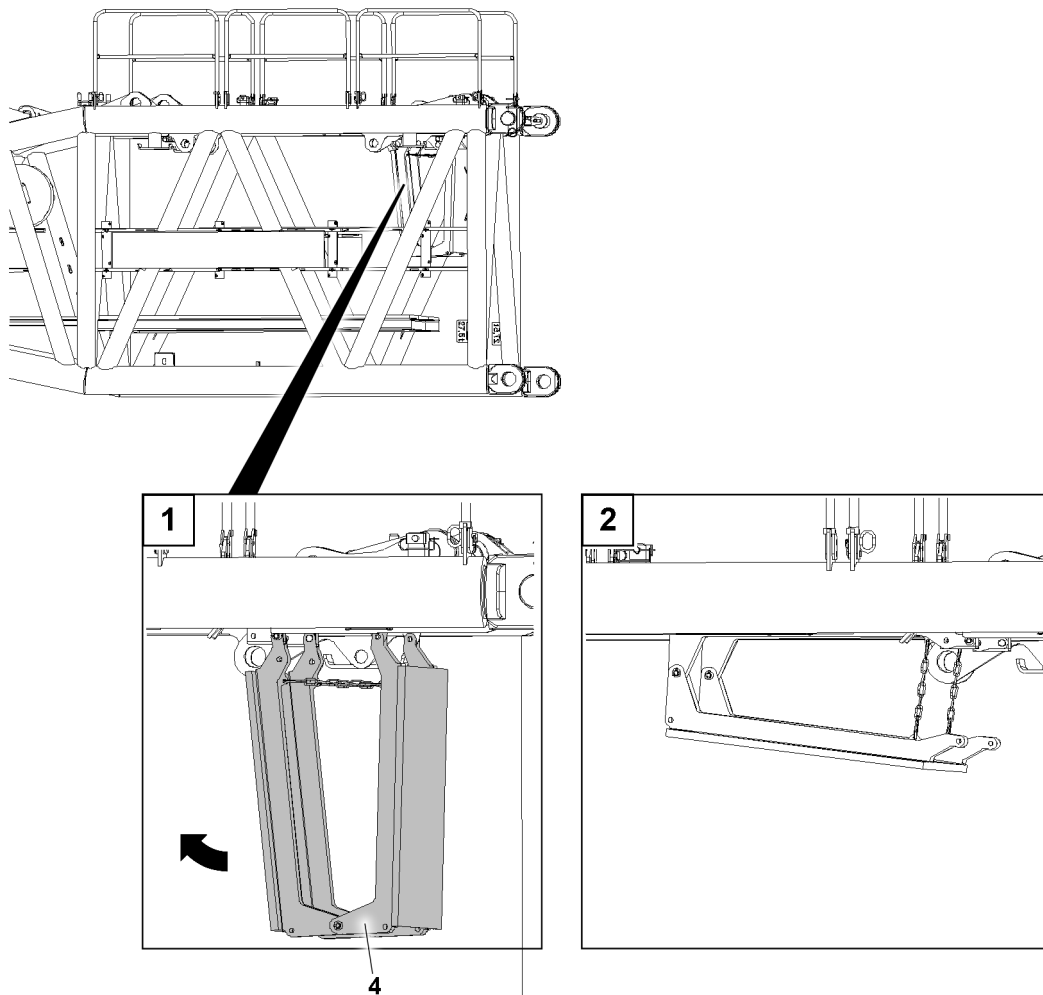


Fig.153010: Assembling the assembly pedestal in the operating position — folding up the assembly pedestal

4 Assembly pedestal

► Pull up the assembly pedestal **4** to the horizontal with the auxiliary crane.

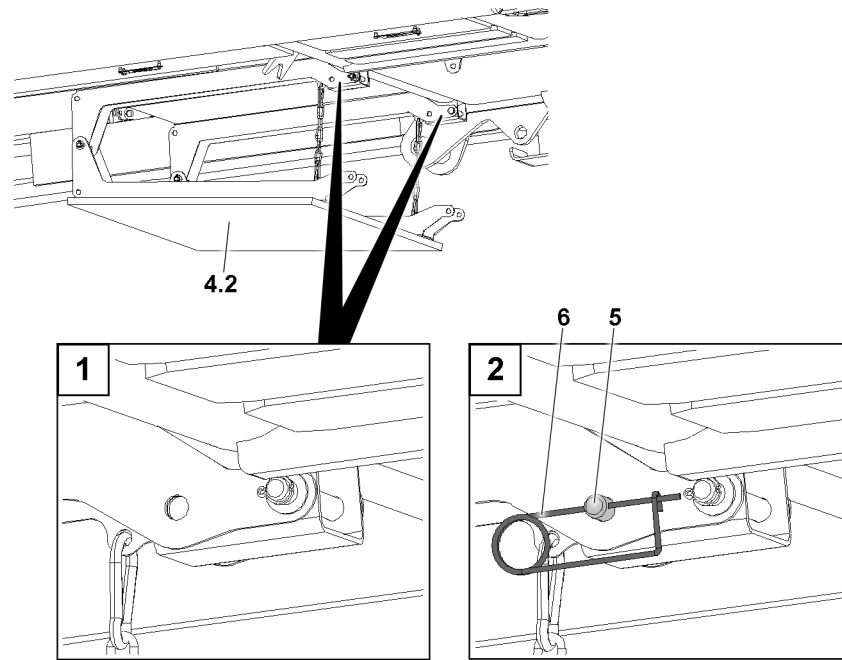


Fig.153011: Assembling the assembly pedestal in the operating position — pinning the assembly pedestal in the horizontal position

4.2 Lower platform
5 Pin

11 Retaining element

- ▶ Insert the pin **5** and secure it with the retaining element **11**.
- ▶ Remove the auxiliary crane.
- ▶ Fasten the auxiliary crane to the lower platform **4.2**.

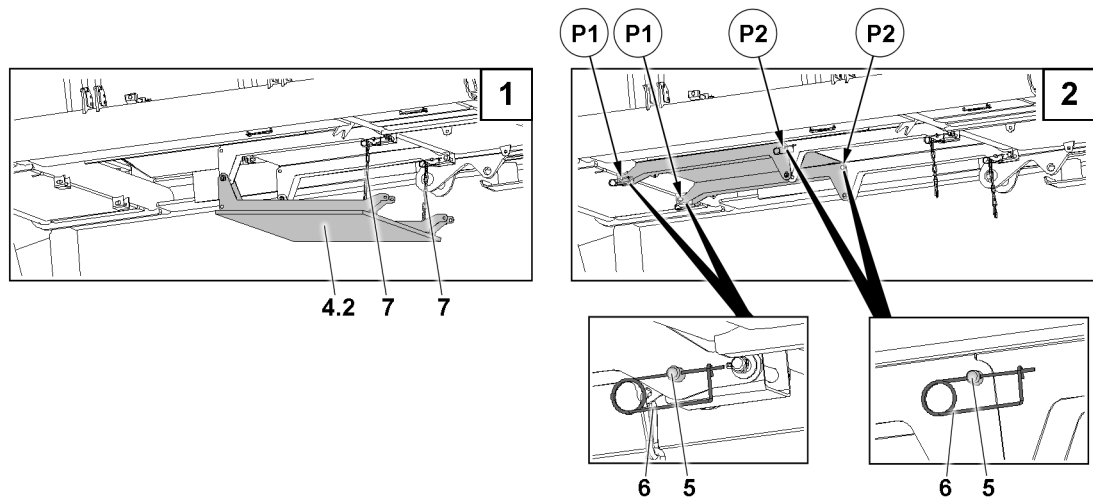


Fig.153012: Assembling the assembly pedestal in the operating position — positioning the lower platform in the operating position

4.2 Lower platform
5 Pin

6 Retaining element
7 Chain

- ▶ Disassemble the chains **7**.
- ▶ Lower the lower platform **4.2** with the auxiliary crane.
- ▶ Pull the lower platform **4.2** with the auxiliary crane to the horizontal.
- ▶ Insert the pin **5** in points **P1** and secure with the retaining element **6**.
- ▶ Insert the pin **5** in points **P2** and secure with the retaining element **6**.

5.2.2 Assembling the assembly pedestal in the transport position

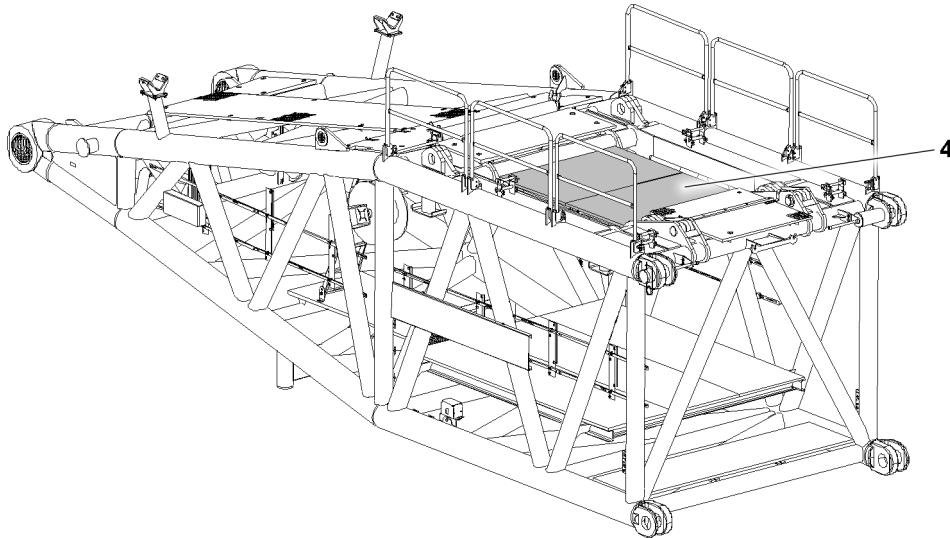


Fig. 153016: Assembling the assembly pedestal in the transport position — assembly pedestal

4 Assembly pedestal



Note

- The assembly pedestal 4 can only be disassembled if winch 5 is not installed on the S-pivot section.

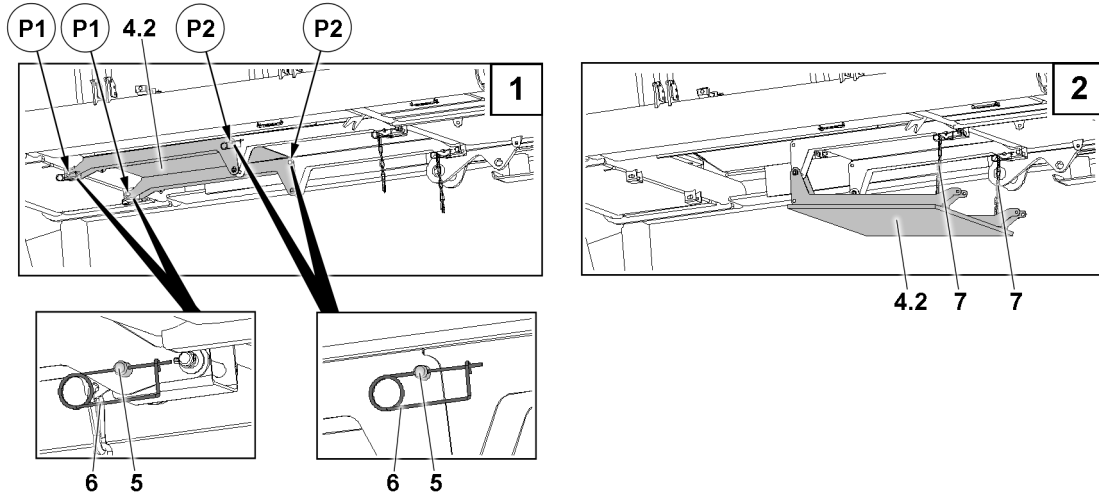


Fig. 153013: Assembling the assembly pedestal in the transport position — unpinning and folding down the front platform

4.2 Front platform

5 Pin

6 Retaining element

7 Chain



WARNING

Assembly pedestal 4 incorrectly fastened!
Death, severe bodily injuries.

- Fasten the assembly pedestal 4 so that it cannot swing down uncontrolled.

- Fasten the auxiliary crane to the front platform 4.2.
- Remove the retaining elements 6 in points P2 and unpin the pin 5.
- Remove the retaining elements 6 in points P1 and unpin the pin 5.

- ▶ Lower the front platform 4.2 with the auxiliary crane.
- ▶ Secure the front platform 4.2 with chains 7.

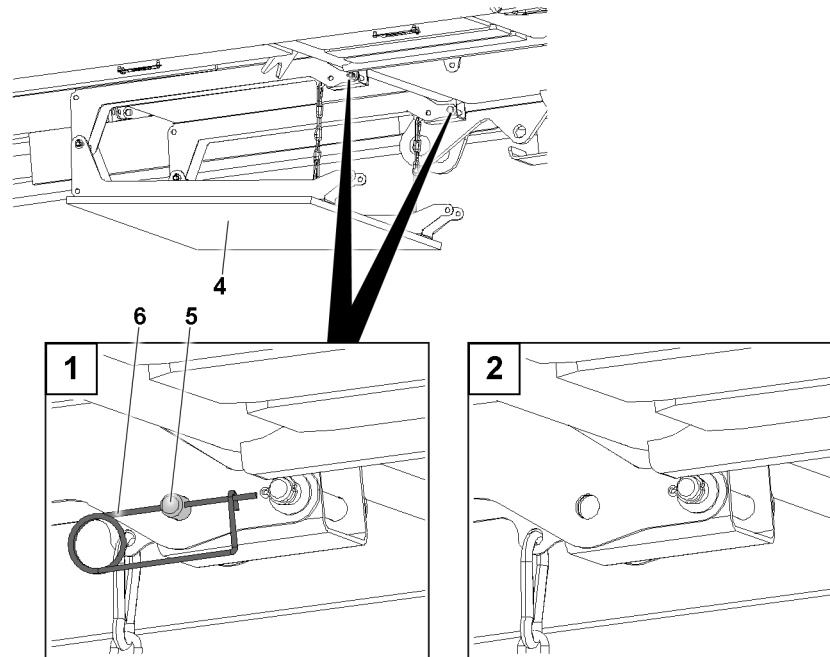


Fig.153014: Assembling the assembly pedestal in the transport position — unpinning the platform

- | | | | |
|---|-------------------|---|-------------------|
| 4 | Assembly pedestal | 6 | Retaining element |
| 5 | Pin | | |

- ▶ Fasten the folded assembly pedestal 4 to the auxiliary crane.
- ▶ Remove the retaining elements 6 and unpin the pin 5.

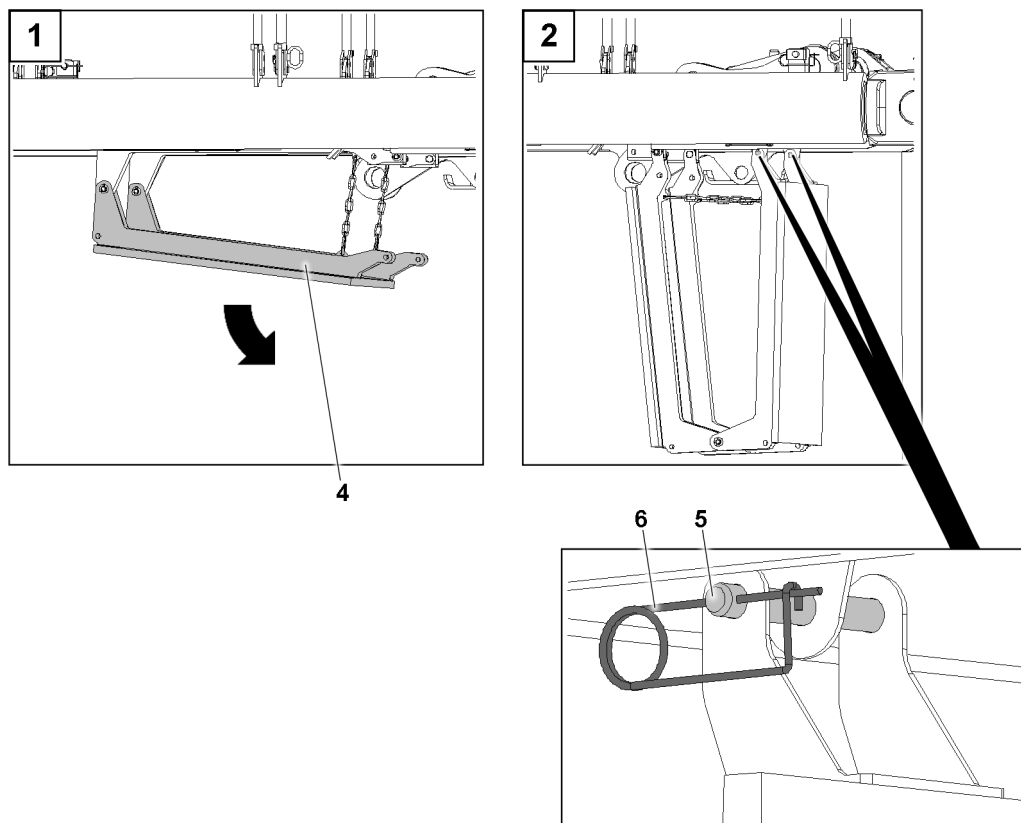


Fig.153015: Assembling the assembly pedestal in the transport position — pinning the and securing the platform in transport position

4 Assembly pedestal

6 Retaining element

5 Pin

- ▶ Lower the assembly pedestal **4** carefully with the auxiliary crane.
- ▶ Pin the assembly pedestal **4** in the transport position: Insert the pin **5** and secure with the retaining elements **6**.

When the assembly pedestal is pinned and secured in the transport position:

- ▶ Remove the auxiliary crane.

5.3 Safety ropes on the S- and D-pivot section

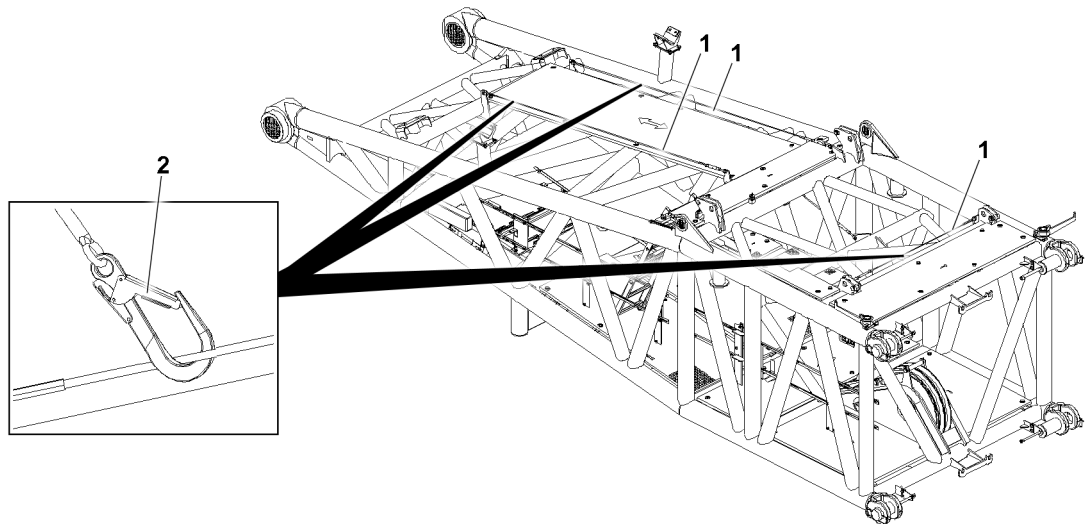


Fig.153017: Safety ropes on the S- and D-pivot section

1 Safety rope

2 Snap hook

Safety ropes **1** are installed on the lattice sections, on the upper left and right hand side, as fall protection equipment.

NOTICE

Danger of damage!

By hanging loads or other objects on the safety ropes, they can be damaged and fail in case of an emergency.

► Never hang loads or objects on the safety ropes **1**.

**WARNING**

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.

- ▶ 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 an approved fall arrest systems to avoid falling, see chapter 2.04.
- ▶ Assembly personnel must hook themselves for all assembly / disassembly work, maintenance and inspection work on the lattice mast boom with approved fall arrest systems on the safety ropes **1** on the left and right hand side with both snap hooks **2** and secure themselves to prevent them from falling. (For example: Safety harness with self-actuating blocking function and an automatic tension and pull in device for the connectors)
- ▶ The connector must be set to a length as short as possible so that it is impossible to hit the ground in case of a fall.
- ▶ Do not use fall absorbers because they stretch too much in case of a fall.
- ▶ On the safety ropes **1** on the left and right only a **maximum of two persons** may hook themselves with snap hooks **2** at the same time.
- ▶ Releasing a snap hook **2** is only permissible in the connection points from lattice section to lattice section.
- ▶ When transferring from lattice section to lattice section, one snap hook **2** must always be hooked to one safety rope **1**.
- ▶ Never release both snap hooks **2** simultaneously from the safety ropes **1**.
- ▶ Before any assembly / disassembly work, maintenance and inspection work it must be ensured that all obstacles below the work place have been removed and that there is sufficient clearance in case of a fall.
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited.

5.4 Safety ropes on the lattice sections

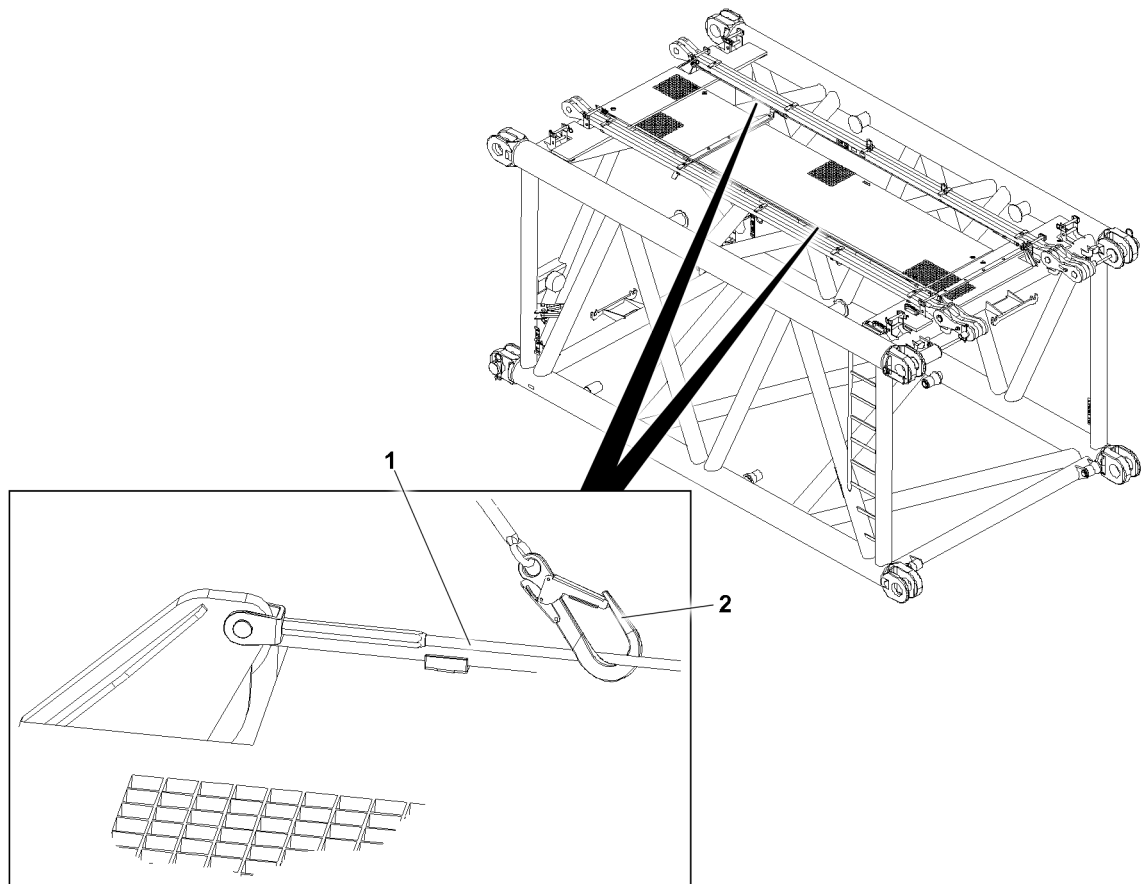


Fig.153018: Safety ropes on the lattice sections

1 Safety rope

2 Snap hook

Safety ropes **1** are installed on the lattice sections, on the upper left and right hand side, as fall protection equipment.

NOTICE

Danger of damage!

By hanging loads or other objects on the safety ropes, they can be damaged and fail in case of an emergency.

► Never hang loads or objects on the safety ropes **1**.

**WARNING**

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.

- ▶ 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 an approved fall arrest systems to avoid falling, see chapter 2.04.
- ▶ Assembly personnel must hook themselves for all assembly / disassembly work, maintenance and inspection work on the lattice mast boom with approved fall arrest systems on the safety ropes **1** on the left and right hand side with both snap hooks **2** and secure themselves to prevent them from falling. (For example: Safety harness with self-actuating blocking function and an automatic tension and pull in device for the connectors)
- ▶ The connector must be set to a length as short as possible so that it is impossible to hit the ground in case of a fall.
- ▶ Do not use fall absorbers because they stretch too much in case of a fall.
- ▶ On the safety ropes **1** on the left and right only a **maximum of two persons** may hook themselves with snap hooks **2** at the same time.
- ▶ Releasing a snap hook **2** is only permissible in the connection points from lattice section to lattice section.
- ▶ When transferring from lattice section to lattice section, one snap hook **2** must always be hooked to one safety rope **1**.
- ▶ Never release both snap hooks **2** simultaneously from the safety ropes **1**.
- ▶ Before any assembly / disassembly work, maintenance and inspection work it must be ensured that all obstacles below the work place have been removed and that there is sufficient clearance in case of a fall.
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited.

5.5 Inspecting and replacing safety ropes

5.5.1 Replacing safety ropes subjected to a fall

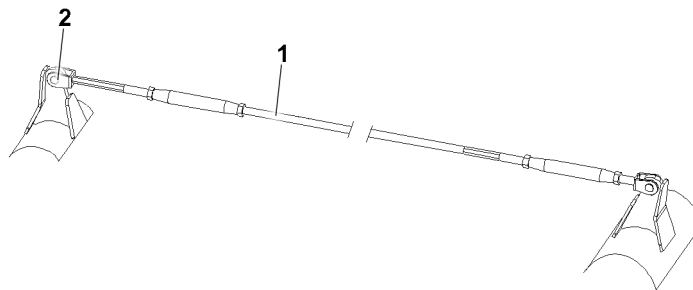


Fig.153019: Inspecting and replacing safety ropes — replacing safety ropes subjected to a fall

1 Safety rope

2 Anchor point

**Note**

- ▶ The illustration of the anchor points **2** is an example and can differ on the various lattice sections or crane components.

**WARNING**

Danger of accident due to fall subjected safety ropes!

If safety ropes that have been subjected to a fall are not replaced after the fall, the safety ropes **1** can fail in case of another fall.

Assembly personnel can be killed or critically injured.

- ▶ **Expert personnel** must immediately replace any safety ropes **1** which were subjected to a fall and inspect the respective anchor points **2** for damage.
- ▶ If the anchor points **2** are damaged, then they must be replaced immediately by **expert personnel**.

5.5.2 Checking the safety ropes and anchor points

For detailed description of the "Inspection of safety ropes and anchor points" refer to chapter 8.01.

6 Fall protection equipment on the ballast trailer

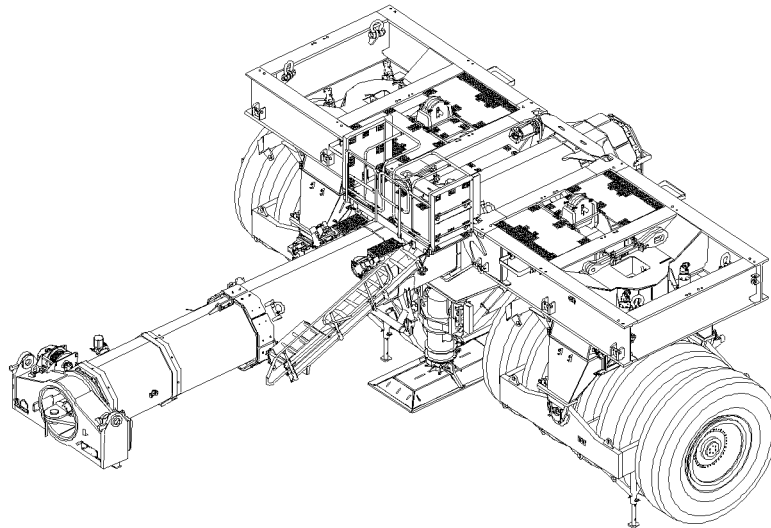


Fig. 153020: Fall protection equipment on the ballast trailer — overview

**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 be killed or seriously injured.

- ▶ 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.

6.1 Assembling the ladder

6.1.1 Assembling the ladder in the operating position

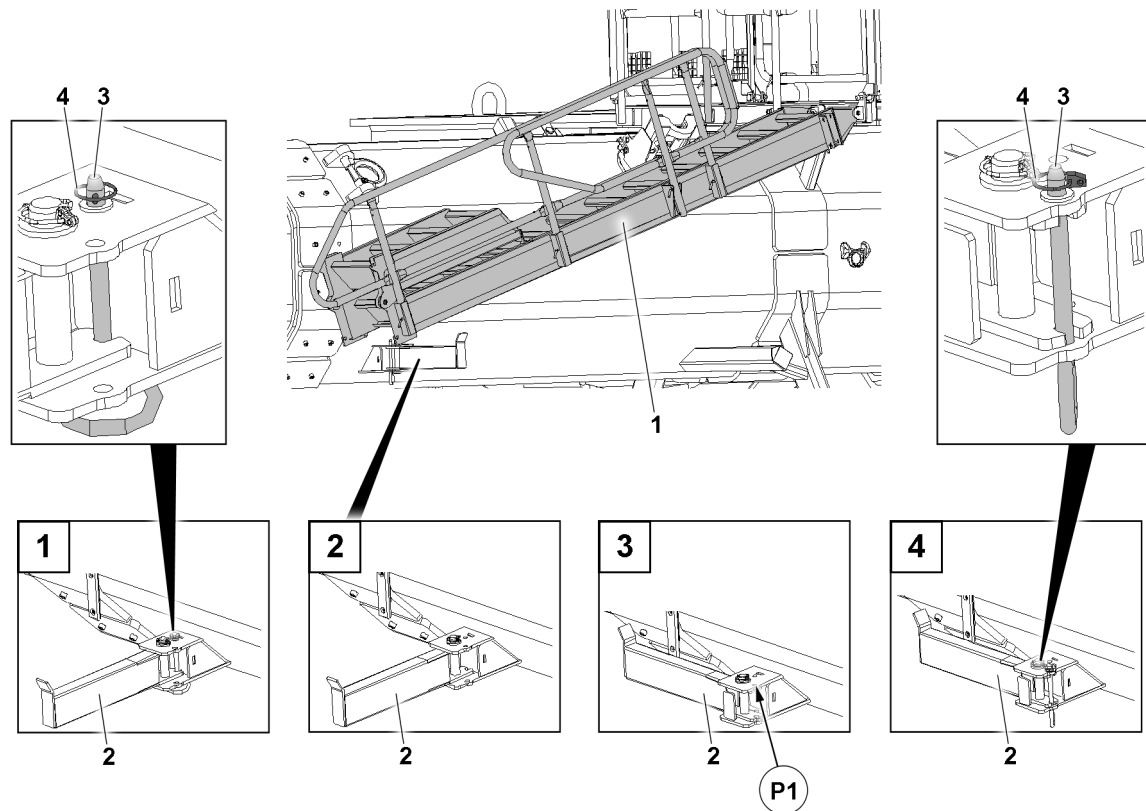


Fig.153021: Assembling the ladder in the operating position — assembling the bracket in the transport position

| | | | |
|---|---------|---|-------------------|
| 1 | Ladder | 3 | Pin |
| 2 | Bracket | 4 | Retaining element |

- ▶ Fasten the ladder 1 to the auxiliary crane.
- ▶ Lift the ladder 1 slightly with the auxiliary crane.
- ▶ Remove the retaining element 4.
- ▶ Unpin the pin 3.
- ▶ Swing the bracket 2 until it can be pinned in position P1.
- ▶ Insert the pin 3 and secure it with the retaining element 4.

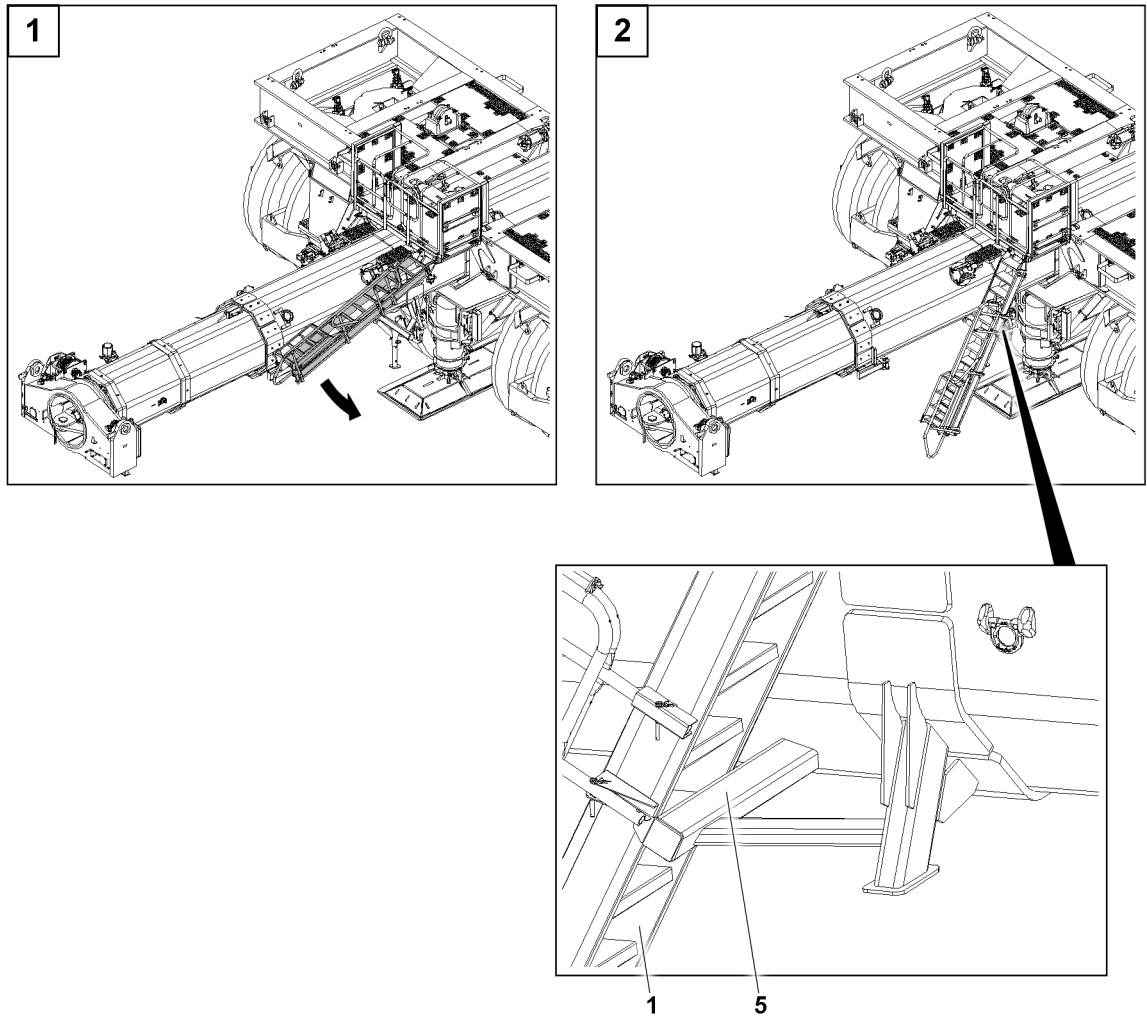


Fig.153022: Assembling the ladder in the operating position — folding the ladder into the operating position

1 Ladder

5 Bracket

► Until the ladder **1** is lying on the bracket **5**, lower the ladder **1** with the auxiliary crane.

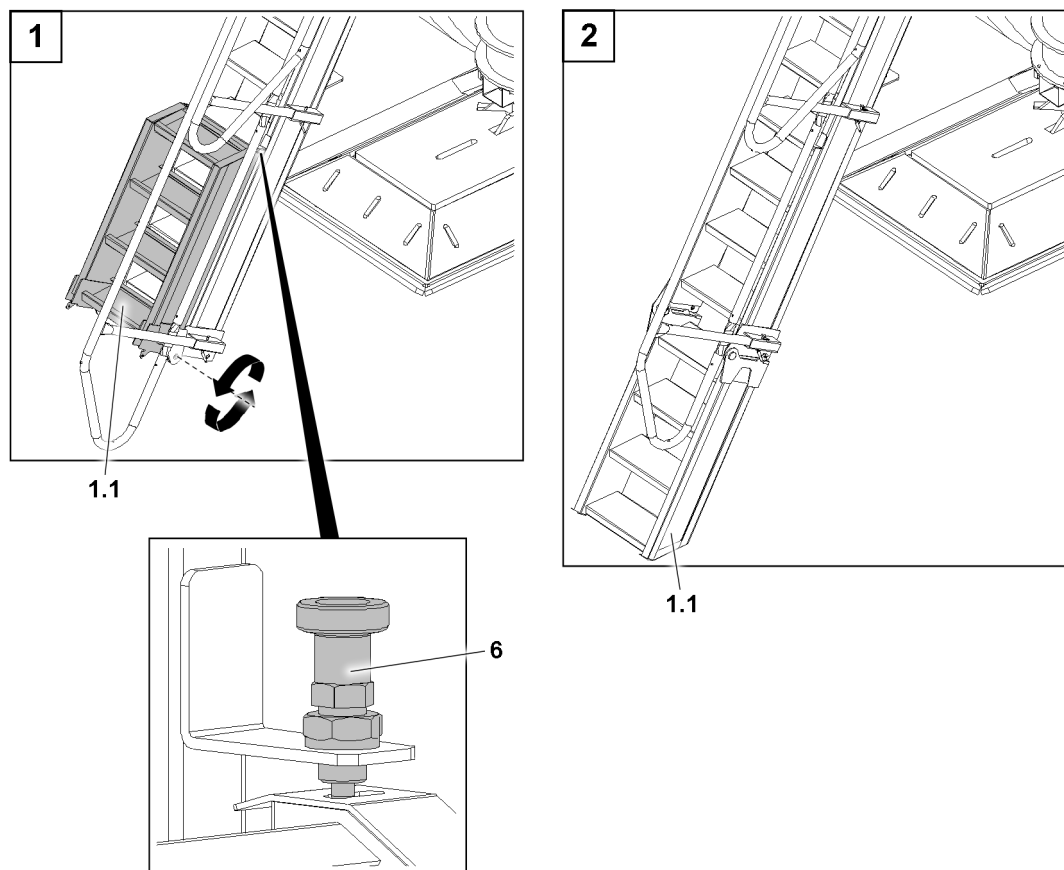


Fig. 153023: Assembling the ladder in the operating position — folding the lower section of the ladder into the operating position

1.1 Ladder

6 Detent pin

- ▶ Pull the detent pin **6** and fold the lower section of the ladder **1.1** into the operating position.

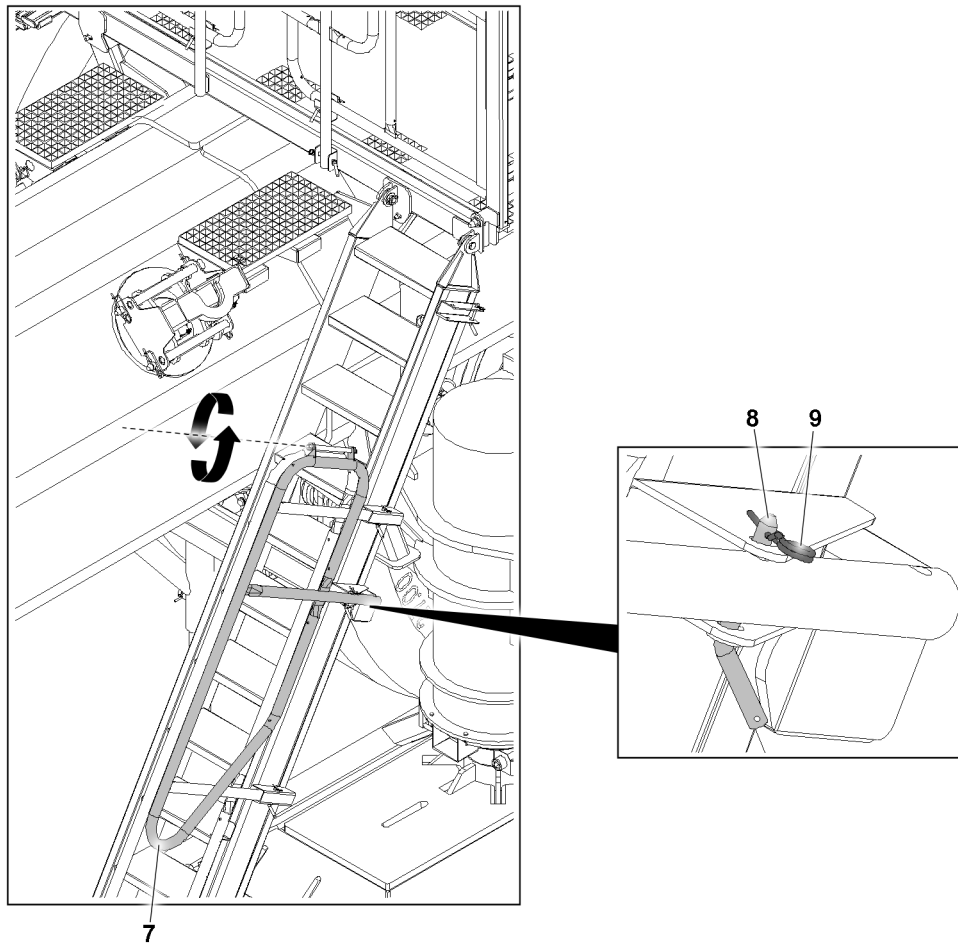


Fig.153024: Assembling the ladder in the operating position — folding the railing into the operating position

7 Railing
8 Pin

9 Retaining element

- ▶ Remove the retaining element **9** and unpin the pin **8**.
- ▶ Fold the railing **7** into the operating position.

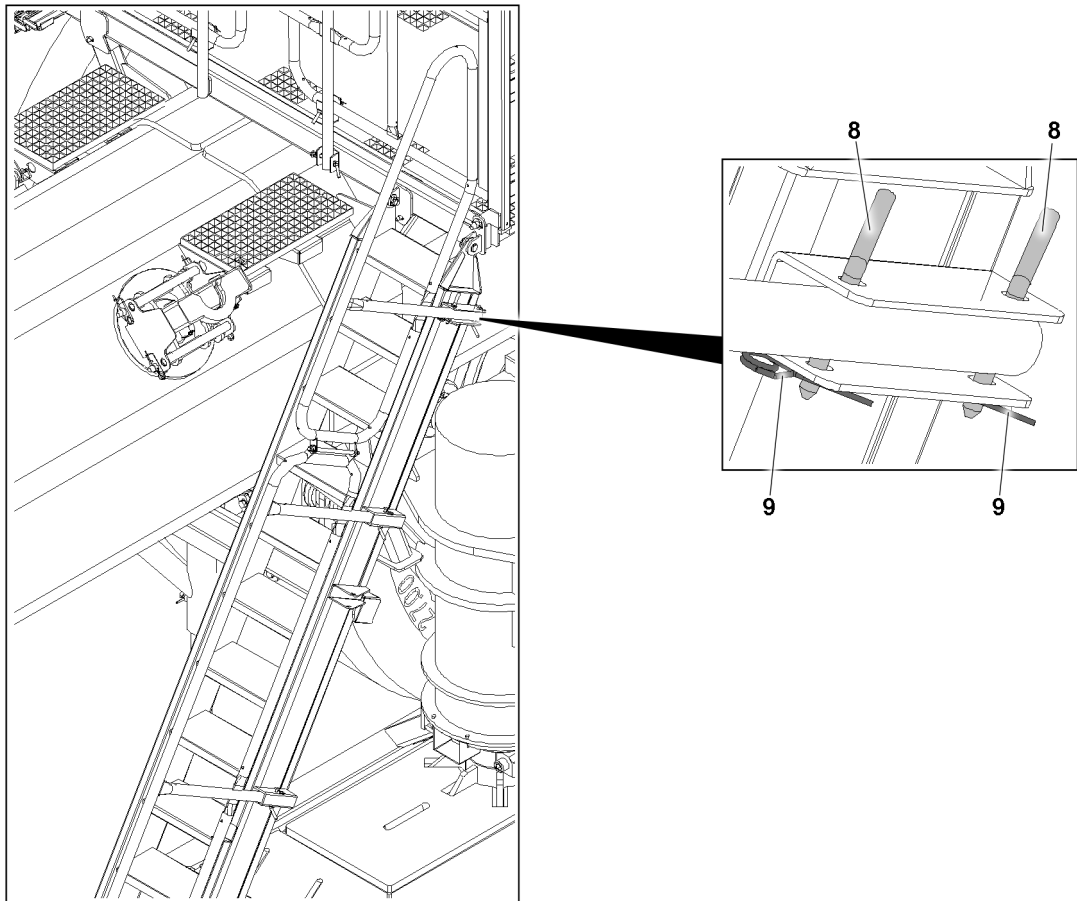


Fig.153025: Assembling the ladder in the operating position — pinning the railing

8 Pin

9 Retaining element

► Insert both pins **8** and secure with the retaining elements **9**.

6.1.2 Assembling the ladder in the transport position

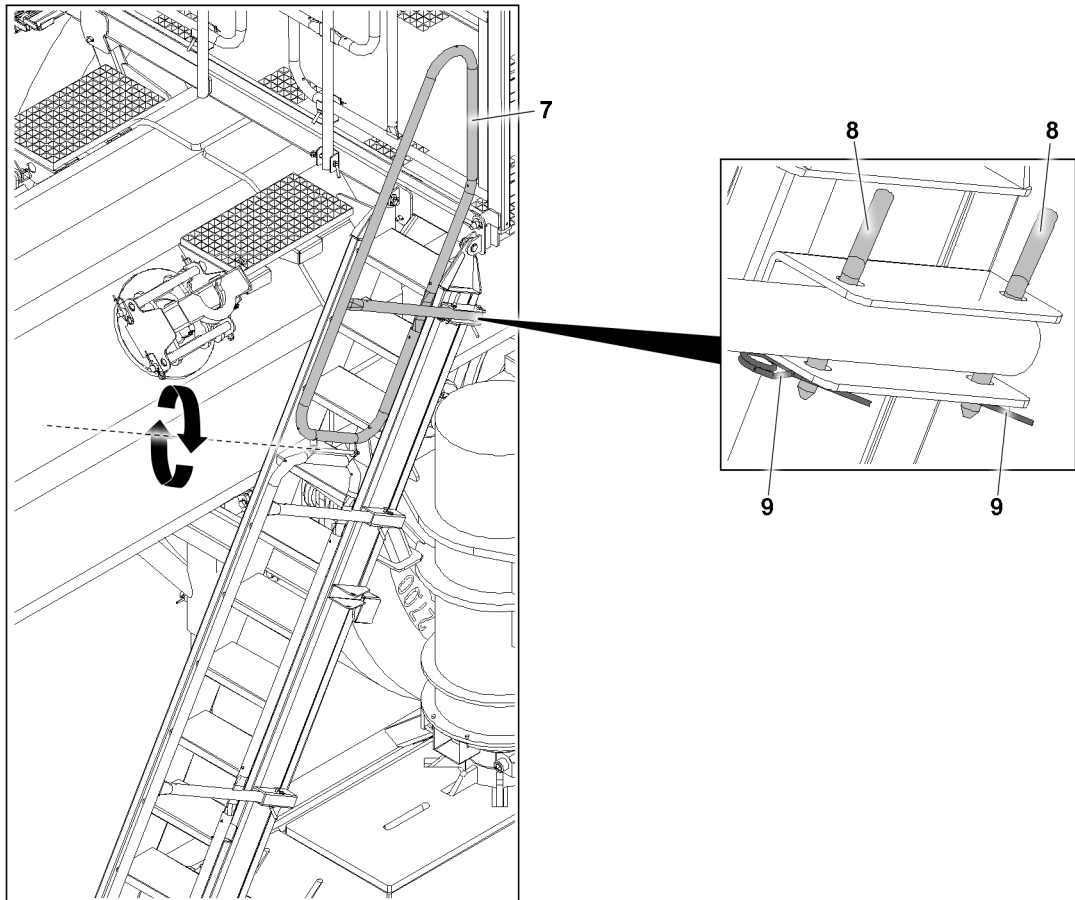


Fig.153026: Assembling the ladder in the transport position — unpinning the railing in the operating position

7 Railing
8 Pin

9 Retaining element

- ▶ Remove the retaining elements 9 and unpin the pin 8.
- ▶ Fold the railing 7 down.

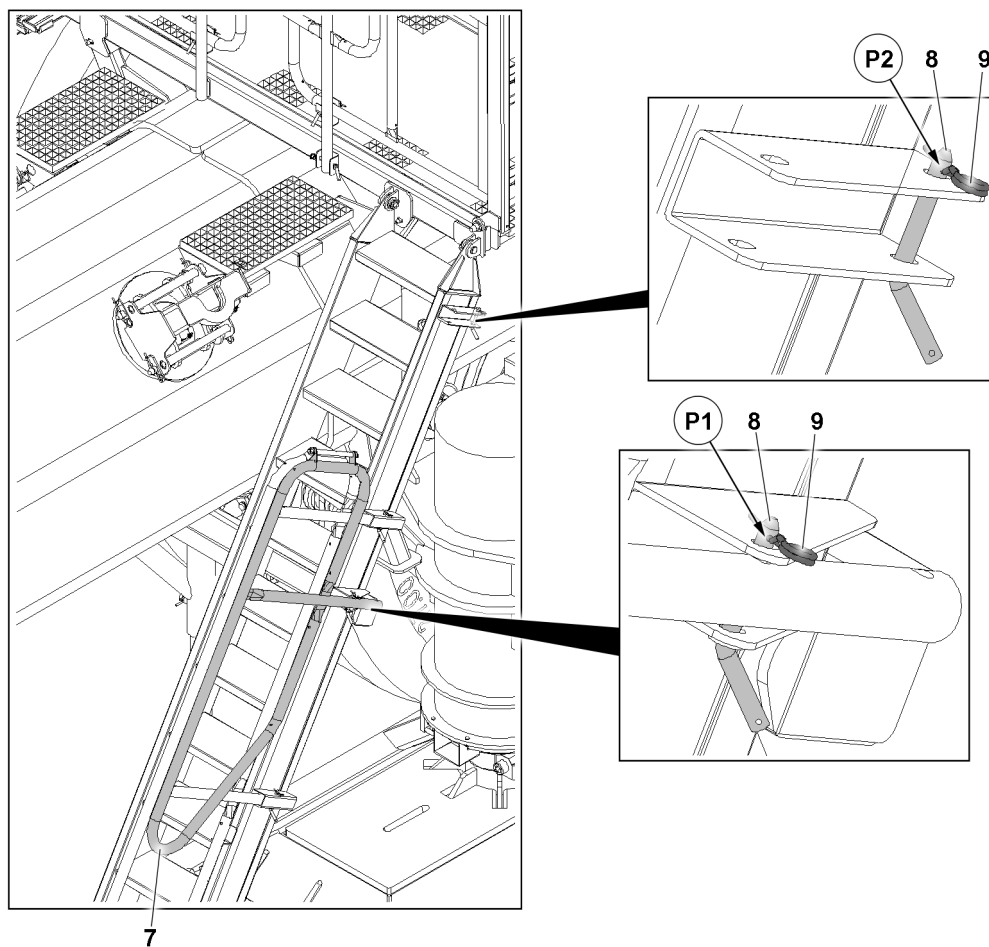


Fig.153027: Assembling the ladder in the transport position — securing the railing in the transport position

7 Ladder
8 Pin

9 Retaining element

- ▶ Insert the pin 8 in position P1 and secure with the retaining element 9.
- ▶ Insert the pin 8 in the transport position P2 and secure with the retaining element 9.

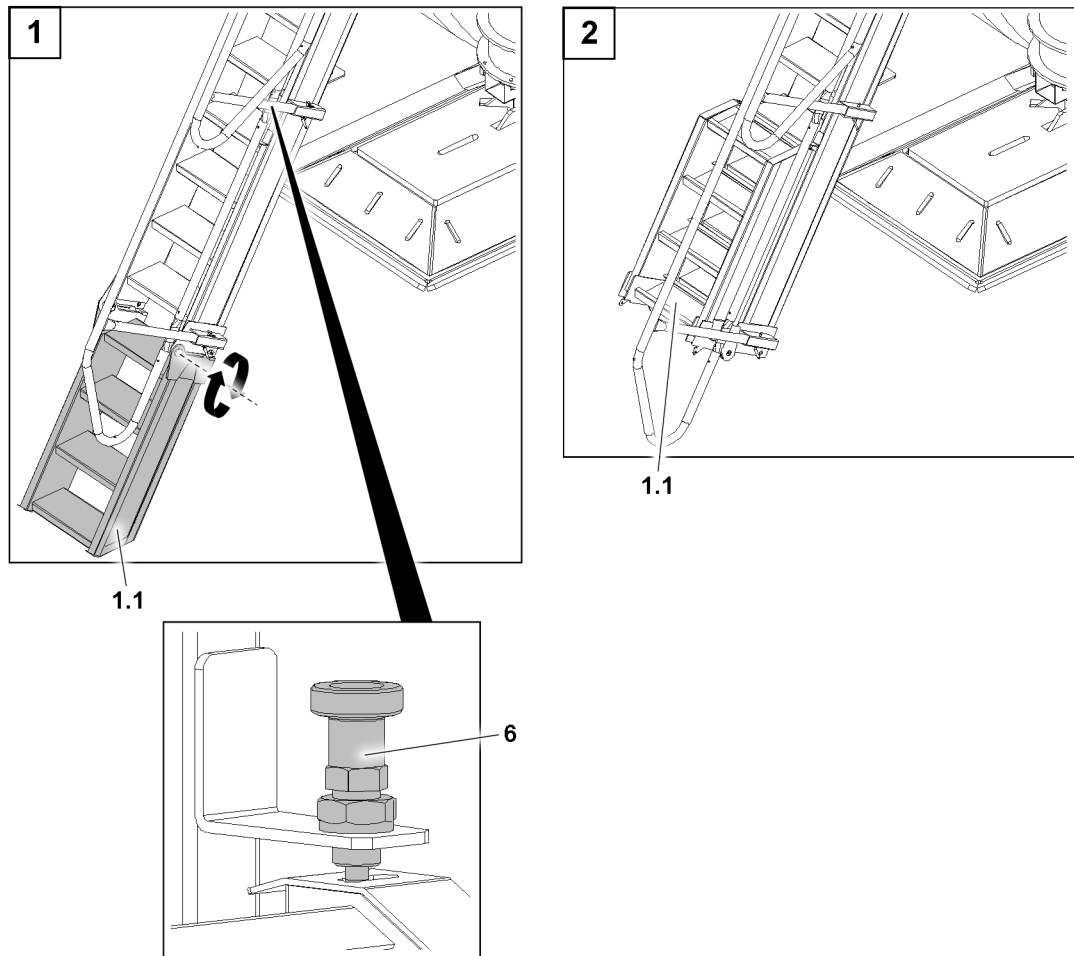


Fig.153028: Assembling the ladder in the transport position — securing the lower section of the ladder in the transport position

1.1 Ladder

6 Detent pin

- ▶ Pull the detent pin **6** and fold the lower section of the ladder **1.1** into the transport position.

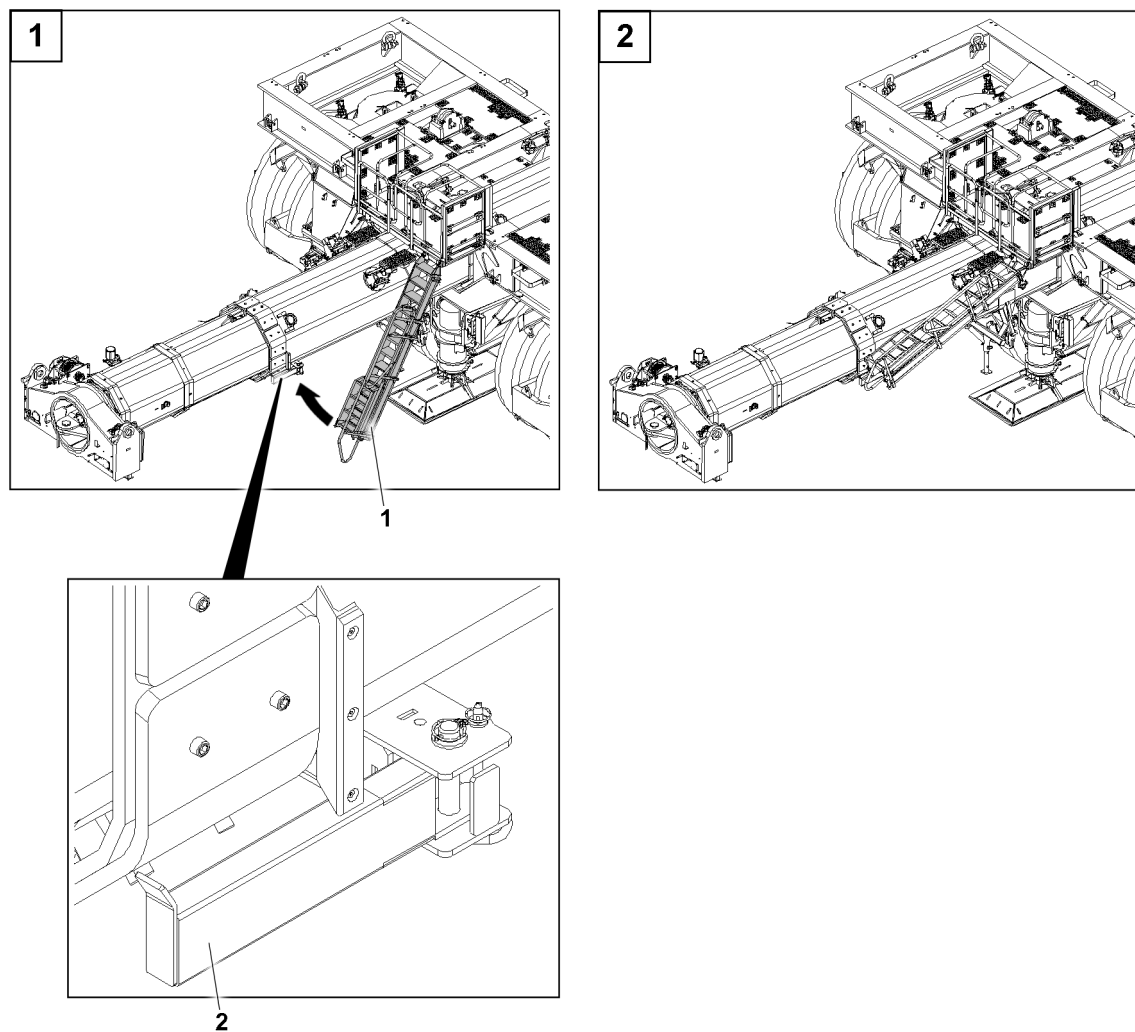


Fig.153029: Assembling the ladder in the transport position — lifting the ladder over the bracket

1 Ladder

2 Bracket

- ▶ Fasten the ladder 1 to the auxiliary crane.
- ▶ Lift the ladder 1 with the auxiliary crane until the ladder 1 is above the bracket 2.

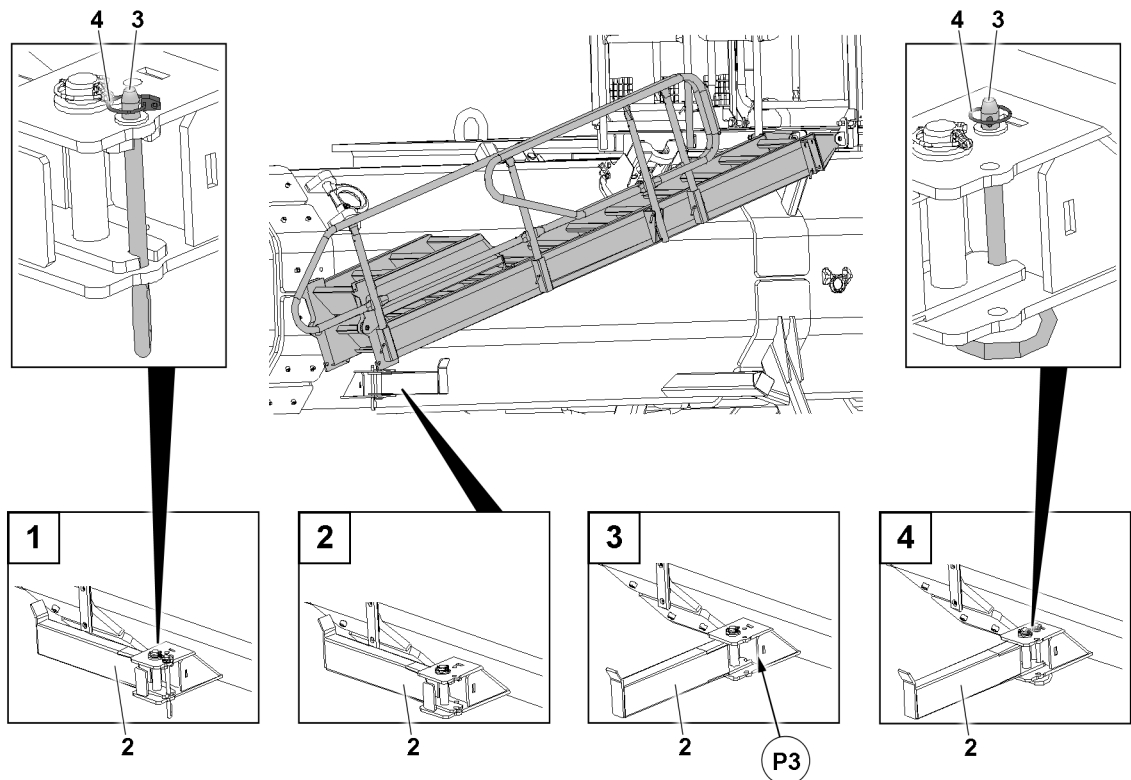


Fig. 153030: Assembling the ladder in the transport position — assembling the bracket in the operating position

- | | | | |
|---|---------|---|-------------------|
| 1 | Ladder | 3 | Pin |
| 2 | Bracket | 4 | Retaining element |

- ▶ Remove the retaining element 4 and unpin the pin 3.
- ▶ Swing the bracket 2 into the operating position.
- ▶ Insert the pin 3 and secure it with the retaining element 4.
- ▶ Take the ladder 1 down with the auxiliary crane onto the bracket 2.
- ▶ Remove the auxiliary crane.

6.2 Assembling the platform

6.2.1 Assembling the platform in the operating position

Make sure that the following prerequisite is met:

- The stairs are in the operating position.

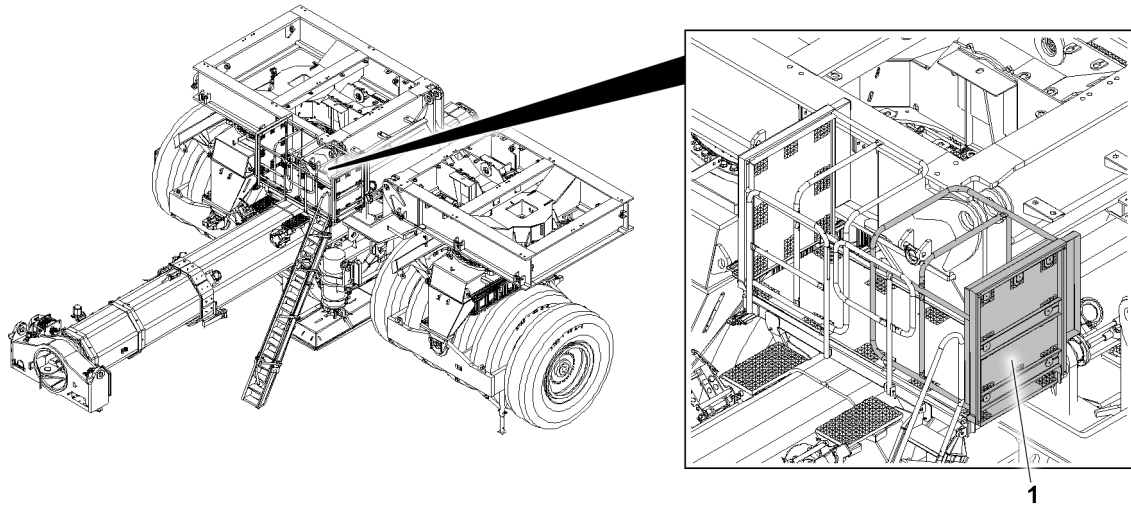


Fig.153031: Assembling the platform in the operating position — fastening the platform to the auxiliary crane

1 Platform

► Fasten the platform **1** to the auxiliary crane.

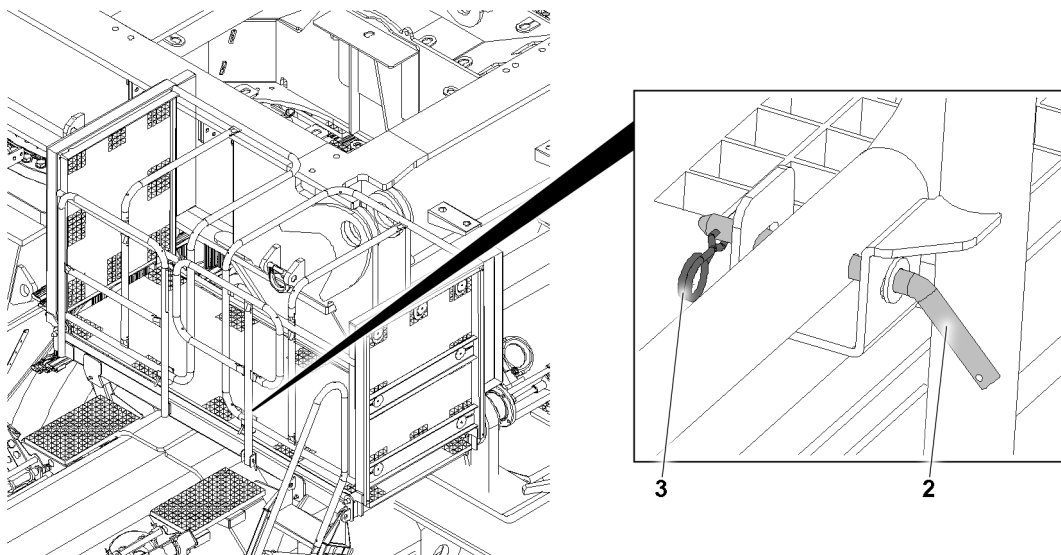


Fig.153032: Assembling the platform in the operating position — unpinning the platform

2 Pin

3 Retaining element

► Remove the retaining element **3**.

► Unpin the pin **2**.

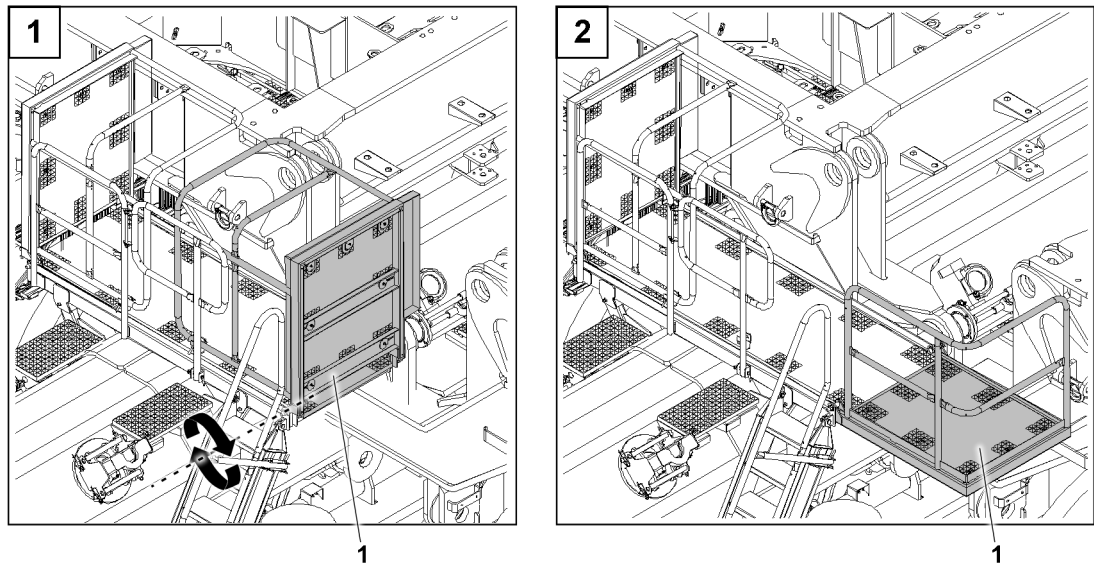


Fig.153033: Assembling the platform in the operating position — lowering the platform into the operating position

1 Platform

- ▶ Lower the platform 1 with the auxiliary crane into operating position.

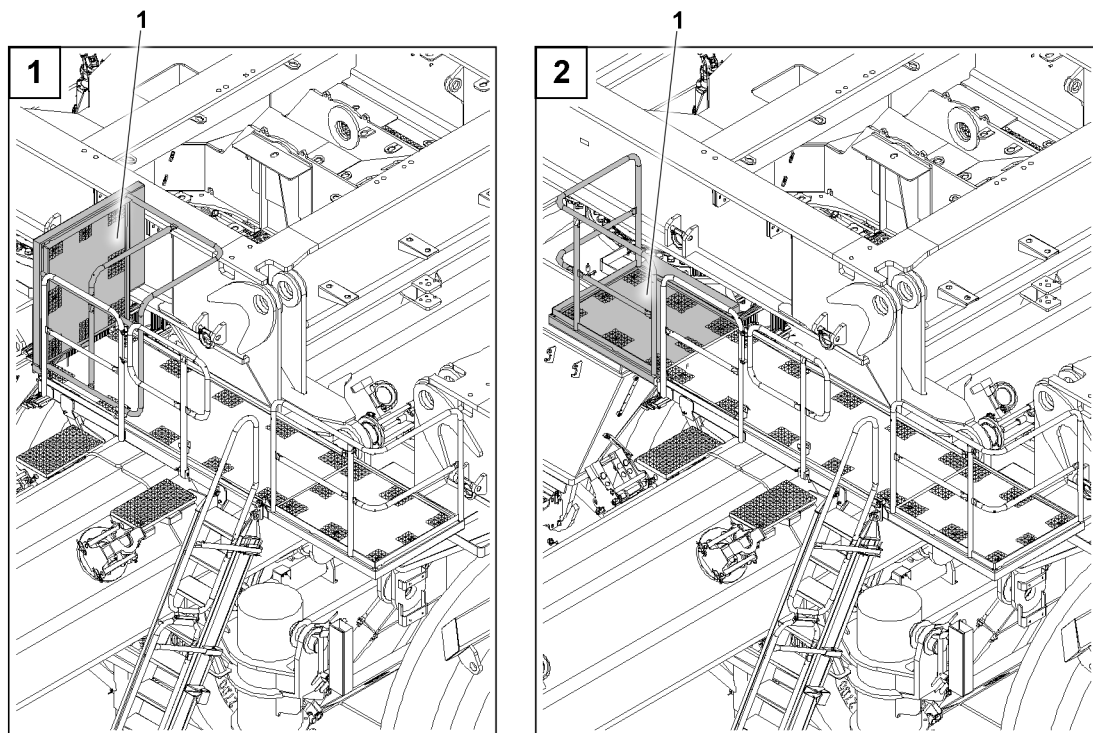


Fig.153035: Assembling the platform in the operating position — assembling the second platform in the operating position

1 Platform

- ▶ Repeat the procedure for the second platform 1 the same way as described above.

6.2.2 Assembling the platform in the transport position

Make sure that the following prerequisite is met:

- The stairs are in the operating position.

**Note**

- ▶ This procedure is described based on the example of one side.

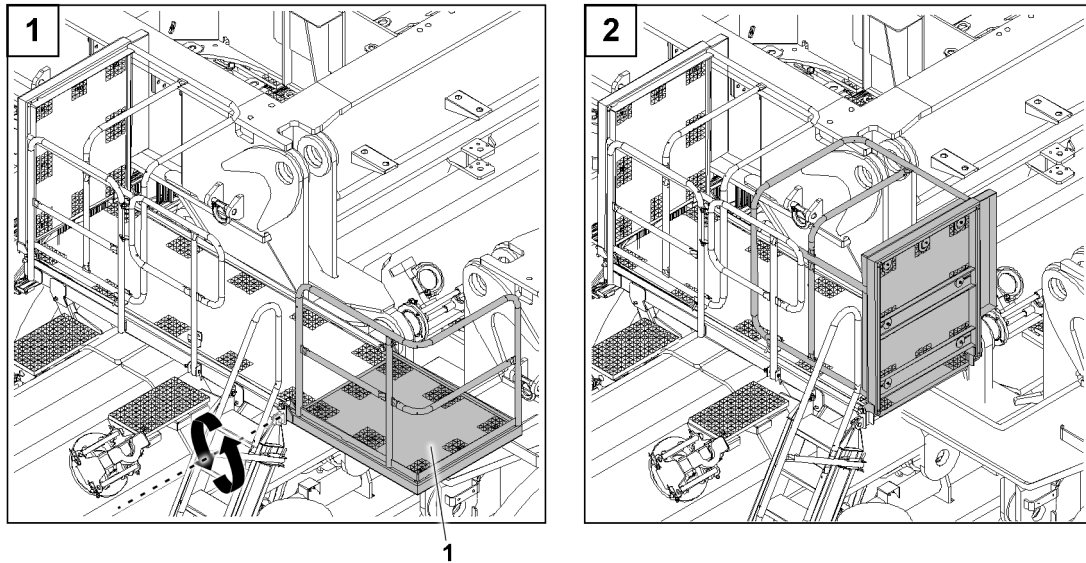


Fig.153034: Assembling the platform in the transport position — fastening the platform to the auxiliary crane

1 Platform

- ▶ Fasten the platform 1 to the auxiliary crane.
- ▶ Lift the platform 1 with the auxiliary crane into the transport position.

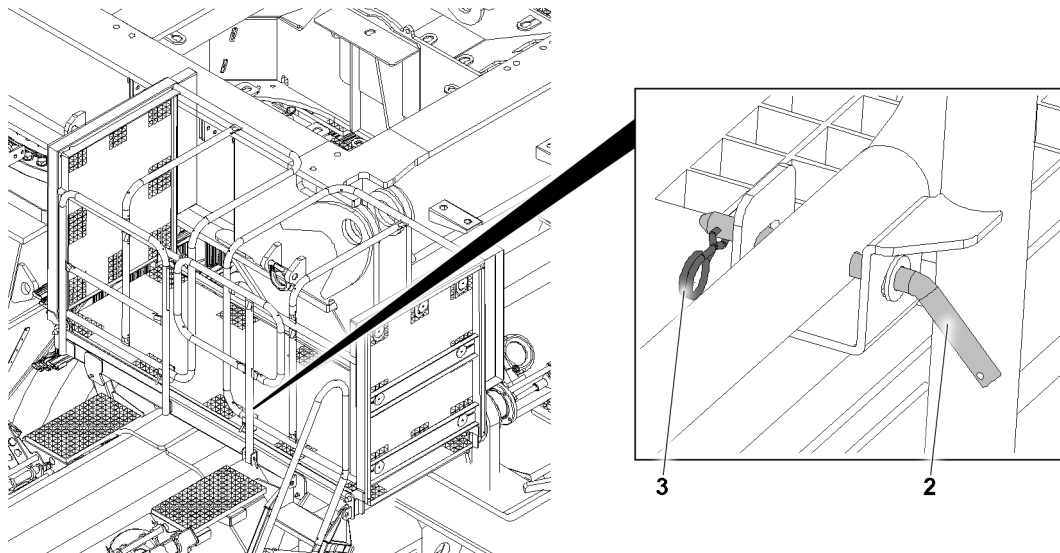


Fig.153032: Assembling the platform in the transport position — pinning the platform in the transport position

2 Pin**3 Retaining element**

- ▶ Insert the pin 2 and secure it with the retaining element 3.
- ▶ Remove the auxiliary crane.

2.08 Working in low temperatures

| | | |
|---|--|---|
| 1 | Auxiliary equipment | 2 |
| 2 | Safety | 2 |
| 3 | Environmental / component temperature below -20 °C | 3 |
| 4 | Maintenance | 7 |

1 Auxiliary equipment

At ambient temperatures between -20 °C and $+50\text{ °C}$ the crane „can be operated and stored without auxiliary equipment for working in low temperatures“.

At ambient temperatures below -20 °C , the crane must be modified and equipped with „auxiliary equipment for working at low temperatures“.



WARNING

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

If the crane is operated at an ambient temperature lower than -20 °C :

- ▶ Make sure that the crane is equipped with the corresponding „auxiliary equipment for working at low temperatures“.
- ▶ Match the operating fluids in time to the ambient temperature.

2 Safety

Temperature changes cause technological changes to material properties in the case of steel / cast steel and many other materials.

Crane components made of steel / cast steel are very sensitive to sudden movements, impacts and shocks at decreasing negative temperatures.

This effect increases if the crane compacts are impacted with a load and / or large weights.

To ensure safe operation at low temperatures, the crane structure must be checked at short intervals for cracks.



Note

- ▶ Observe and adhere to the instructions in chapter 8.01.



DANGER

The crane can topple over!

Due to decreasing negative temperatures, crane components reach their technological load limits much earlier.

Crane components can break.

The crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ For safe crane operation, the **temperature of the crane components is the deciding factor** and not the ambient temperature.
- ▶ For safe crane operation with component temperatures **down to -40 °C** , the crane must be equipped with „auxiliary equipment for working at low temperatures“.
- ▶ With component temperatures **below -40 °C** , do not operate the crane. In the case of doubt, contact Customer Service at LIEBHERR-Werk Ehingen GmbH.

3 Environmental / component temperature below -20 °C

3.1 Winter operation

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

Freezing takes place often at low temperatures.



WARNING

Snow, frost and ice on the accesses!

Personnel can fall from the accesses.

Death, severe bodily injuries, property damage.

- ▶ Remove the snow, frost and ice from all accesses, steps and catwalks.
- ▶ Remove the snow, frost and ice from the crane.

NOTICE

Snow, frost and ice on the crane components!

The crane components can be damaged and fail.

Cylinder seals can be destroyed by frozen piston rods.

- ▶ Remove the snow, frost and ice from the piston rods.
- ▶ Remove the snow, frost and ice from all rope pulleys and winches.
- ▶ Remove the snow, frost and ice from the hose drums and limit switches.



WARNING

Snow, frost and ice below the support plates or the crawler carriers!

The crane can slide.

Death, severe bodily injuries, property damage.

- ▶ Remove the snow, frost and ice on top and below the support plates.
- ▶ Remove the snow, frost and ice on top and below the crawler carrier.
- ▶ Remove the snow, frost and ice from the roadway.

Prerequisites for crane start up with component temperatures below -20 °C

- The hose drums and cables are easy to move.
- All rope pulleys are easily movable.
- The view from the crane cab is free.
- The mirrors are free of snow, frost and ice.
- Fastening equipment is approved for the ambient temperatures present.
- The load fastening points are approved for the ambient temperatures present.

3.2 Preheating time



WARNING

Limited crane control during radio operation!

In the case of falling minus temperatures, the LCD displays react increasingly slowly to changes made to images and icons on the displays.

In the case of minus temperatures below -25 °C, changes made to images and icons could be displayed with a considerable delay or not at all.

This can lead to dangerous situations if warnings are displayed with a delay.

Death, severe bodily injuries, property damage.

- ▶ If the component temperature of the radio remote control is below -25 °C: Preheat the radio remote control prior to start up.
- ▶ In the case of increasing sluggishness of the LCD displays during radio operation with temperatures below -25 °C: Warm up or preheat the radio remote control occasionally.

| Crane components | Preheating time |
|--|-------------------|
| Engine preheating up to start at -40 °C component temperature | 45 minutes |
| Preheat the hydraulic system in the crane superstructure and the crane chassis | 30 minutes |
| Preheat the crane cab / driver's cab for start up at the same time up to 5 °C | 10 minutes |
| Total preheating time | 75 minutes |

- ▶ To ensure safe crane operation: Adhere to the preheating times.

3.3 Engine preheating

If the components temperature is lower than -20 °C the chassis engine and / or superstructure engine must be preheated before starting.

Depending on the crane type, a chassis engine and / or a superstructure engine is installed.

Pre-warming the chassis engine is described in chapter 6.01.

Pre-warming the superstructure engine is described in chapter 6.02.

- ▶ Preheat the chassis engine and / or the superstructure engine.
- ▶ Start the chassis engine and / or the superstructure engine.

When the chassis engine and / or the superstructure engine has reached its operating temperature:

- ▶ Turn off engine preheating.

3.4 Preheating the hydraulic oil

If the ambient temperature is lower than -20 °C the hydraulic oil must be preheated prior to crane operation.

NOTICE

Hydraulic oil **not** preheated!

The hydraulic system can be damaged during crane operation.

- ▶ Before starting crane operation, preheat the hydraulic oil to at least 20 °C.
- ▶ Retract and extend all the hydraulic cylinders in an unloaded state over the entire stroke multiple times.



WARNING

Persons in the area of the hoist movement!
Death, severe bodily injuries, property damage.

- ▶ Observe the area of the hoist movement.
- ▶ Make sure that there are **no** persons in the area of the hoist movement.

3.4.1 Turning the hydraulic oil preheating on

Make sure that the following prerequisites are met:

- The engine is running.
- Hydraulic oil preheating is available.

Hydraulic oil preheating is described in chapter 4.03.

- ▶ Turn the hydraulic oil preheating on.

When the hydraulic oil is preheated:

- ▶ Turn the hydraulic oil preheating off.

3.4.2 Supporting the crane

Supporting the crane vehicle is described in chapter 3.05.

All support plates must be supported with suitable and stable materials.

If moveable support plates are not available, the support plates must be supported **on one side of the crane** with greased polyamide plates.



WARNING

No movable support plates or crane **not** supported with greased polyamide plates!

The sliding beams can bend. The support plates can suddenly move to the side.

The load can oscillate.

Death, severe bodily injuries, property damage.

► Use moveable support plates.

If there are no movable support plates available:

► Support the support plates **on one side of the crane** with greased polyamide plates.

When supporting the crane, extend the support cylinder a maximum of 50 %.

The wheels must not come in to contact with the ground after the crane is supported.

► Support the support plates when necessary.

► Support the crane.

3.4.3 Cranes with lattice mast boom

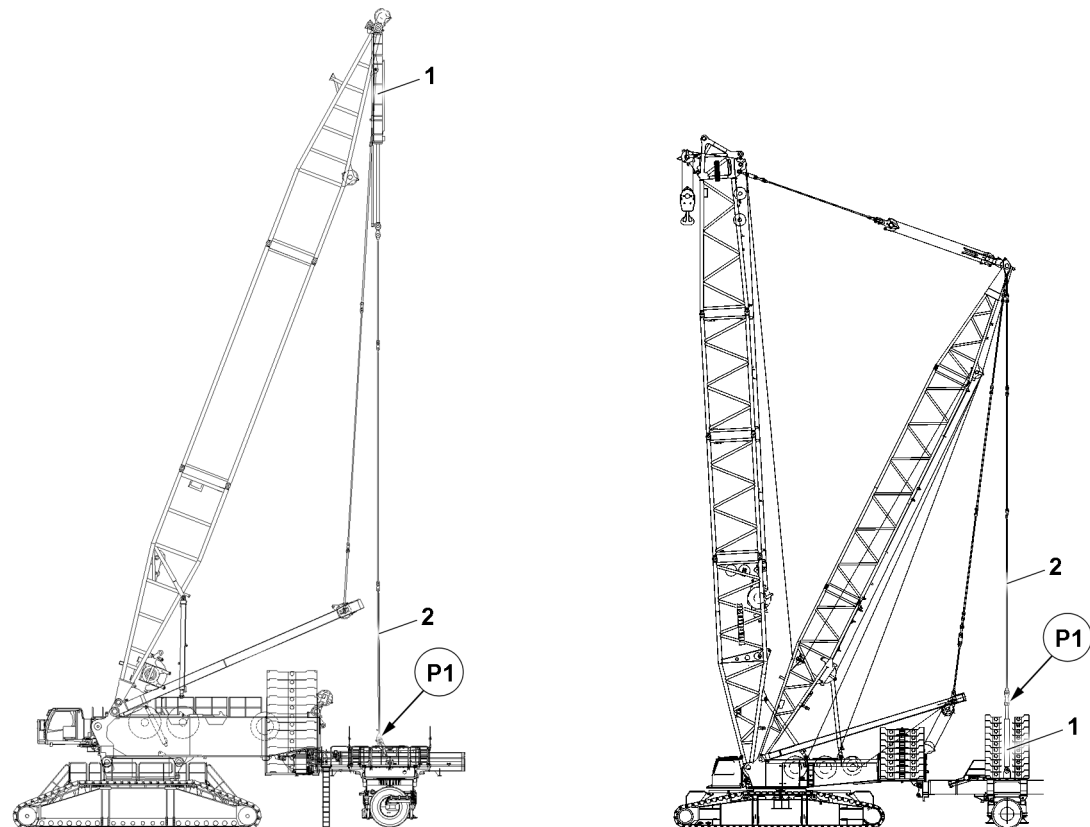


Fig.126875: Removing the guy rods on the derrick ballast

With component temperatures of less than $-20\text{ }^{\circ}\text{C}$, the pull cylinders must be preheated by means of retraction and extension. Before the pull cylinders can be preheated, the guy rods **2** must be removed in position **P1** on the derrick ballast.

Disassembly and assembly of the guy rods **2** on the derrick ballast is described in the Crane operating instructions, chapter 5.35 and chapter 5.36.

► Remove the guy rods **2** at position **P1** on the derrick ballast.

NOTICE

Danger of collision!

Damage of the guy rods, derrick ballast or other components.

▶ When retracting and extending the guy rods, avoid contact with other components.

▶ Retract and extend the pull cylinders **1** in an unloaded state over the entire stroke multiple times.

When additional hydraulic cylinders are installed on the crane with lattice mast:

▶ Retract and extend the hydraulic cylinders in an unloaded state over the entire stroke multiple times.

3.4.4 Cranes with telescopic boom

Make sure that the following prerequisites are met:

- The crane is supported and horizontally aligned.
- There is no load on the hook.

▶ Retract and extend the luffing cylinder in an unloaded state over the entire stroke multiple times.

▶ Retract and extend the telescoping cylinder in an unloaded state over the entire stroke multiple times.

3.5 Assembling / disassembling the crane component

If the component temperature is lower than $-20\text{ }^{\circ}\text{C}$, there is an increased danger that in the case of impact and / or strong component contact that the crane components will be damaged as a result of their changed technological material properties. In particular counterweights and crane components made of cast steel are subject to a greater risk of damage due to impact at component temperatures below $-20\text{ }^{\circ}\text{C}$.

NOTICE

Striking of the crane component during assembly or disassembly!

Crane components can be damaged.

▶ Do **not** strike the crane component during assembly and disassembly.

▶ Carry out all work slowly and with utmost caution.

3.6 Reducing rope pull

When working with rope / component temperature below $-20\text{ }^{\circ}\text{C}$ Liebherr-Werk Ehingen GmbH recommends reducing the rope pull.

The rope pull on the hoist rope can be reduced by increasing the rope reeving.

**Note**

Increase of rope reeving!

Due to the increased rope reeving, the hoist rope length may not be sufficient for lowering the hook block to the ground.

▶ Pay attention to rope length.

NOTICE

Rope reeving higher than specified in the load chart!

Danger of slack rope formation due to a too low hook block weight. Damage to the hoist rope.

▶ Increase the hook block weight accordingly.

▶ Increase the rope reeving specified in the load chart.

▶ If necessary: Increase the hook block weight.

3.7 Increasing the hook block weight

The calculation of the minimum required hook block weight is described in the load chart.

| Rope / component temperature | Increasing the hook block weight |
|------------------------------|---|
| -21 °C to -30 °C | Increase the minimum required hook block weight by 10 % |
| -31 °C to -40 °C | Increase the minimum required hook block weight by 15 % |

- ▶ Increase the required hook block weight depending on the rope or component temperature.
- ▶ Observe and adhere to the „hook block weight“ charts.

**Note**

- ▶ Observe and comply with the permissible hook block weights for erection and take-down of the boom systems in the erection and take down charts.

3.8 Crane operation

In case of an ambient / component temperature below -20 °C , crane operation requires an anticipatory working procedure adapted to the weather conditions.

**WARNING**

Sudden acceleration and deceleration of crane movements!

Crane components can break.

Death, severe bodily injuries, property damage.

- ▶ Accelerate and decelerate crane movements sensitively and with utmost caution.

3.8.1 Decreasing crane utilization

Cranes with lattice mast boom

In the case of cranes with pull cylinders in the derrick ballast guying, if the component temperature is between -30 °C and -40 °C the maximum derrick ballast must be reduced. The maximum load is also reduced due to the reduction of the maximum derrick ballast.

**Note**

- ▶ Take load reduction into account during job planning.

- ▶ Reduce the maximum derrick ballast by 15 % in case of component temperatures between -30 °C and -40 °C.

Cranes with telescopic boom

In the case of cranes with a telescopic boom, if the component temperature is between -30 °C and -40 °C crane utilization must be reduced.

- ▶ Reduce crane utilization by 15 % in the case of component temperatures between -30 °C and -40 °C.

4 Maintenance

4.1 Load bearing crane structures

Checking the load bearing crane structure is described in Chapter 8.01.

- ▶ The load bearing crane structure must be visually inspected more often at low temperatures.

4.2 Rope pulleys and hydraulic cylinders

Checking the rope pulleys and hydraulic cylinders is described in Chapter 8.01.

- ▶ Rope pulleys and hydraulic cylinders must be visually inspected more often at low temperatures.

2.15 General technical safety instructions for operation with a ballast trailer

| | | |
|---|----------------------------------|---|
| 1 | Safety guidelines | 2 |
| 2 | Inspecting tires and disk wheels | 4 |

1 Safety guidelines



WARNING

Danger of falling!

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

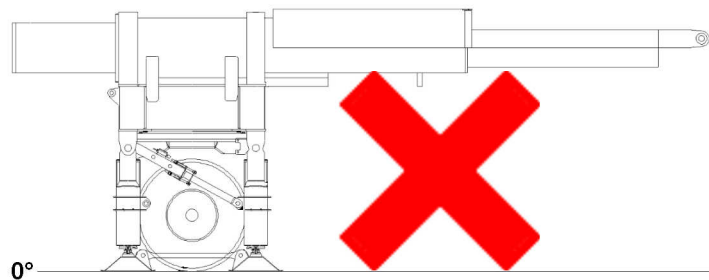
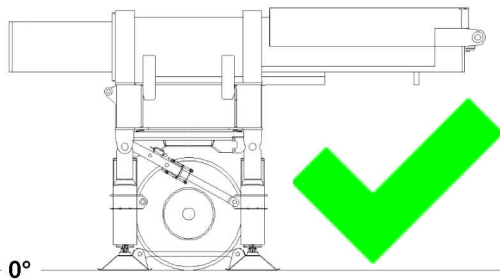


Fig.144267: Ballast trailer correctly parked // ballast trailer incorrectly parked



WARNING

Ballast trailer tipping danger!

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

Death, severe bodily injuries, property damage.

- ▶ The ballast trailer may only be parked on level ground with a sufficient load bearing capacity.
- ▶ The ballast trailer may only be unpinned from the crane and parked if the ballast trailer guide is fully retracted.
- ▶ The ballast trailer may only be unpinned from the crane and parked if there is sufficient ballast on the ballast trailer to ensure the stability of the ballast trailer.
- ▶ To unpin and disassemble the ballast trailer from the crane, it may be necessary for the ballast trailer guides to not be fully retracted. This is only permissible when in chapter 5.35 the procedure for this is fully described and specifically permitted. The specifications and prerequisites in chapter 5.35 must be observed and adhered to.
- ▶ The ballast trailer may only be unpinned from the crane and parked if the support cylinders are extended and the tires are relieved.
- ▶ The ballast trailer may only be unpinned from the crane and parked if the brace on the support cylinders is pinned and secured.



WARNING

Danger of fatal injury if the permissible travel speed is exceeded!

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

Death, severe bodily injuries, property damage.

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

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

**WARNING**

The crane can topple over if the level of the road differs!

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

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

Depending on the distortion of the turntable and the load of the tires on the ballast trailer, a shut-off of crane movements may be activated with a retracted ballast trailer guide due to an excessive inclination of the ballast trailer (depending on the crane type and time of crane delivery), see chapter 4.02.

Death, severe bodily injuries, property damage.

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

**WARNING**

The crane can topple over!

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

Death, severe bodily injuries, property damage.

- ▶ When lifting or lowering the ballast trailer, pay attention to the horizontal alignment of the ballast trailer.
- ▶ The assembly or disassembly work must be carried out according to chapter 5.35 or chapter 5.35.10 or chapter 5.35.20.

NOTICE

Damage to the ballast trailer, ballast trailer guide and / or the turntable!

If the ballast trailer inclination is too large or the level difference of the standing levels between the crane and ballast trailer are too large, this can cause damage to the ballast trailer, the ballast trailer guide and / or the turntable.

- ▶ Keep the ballast trailer inclination as small as possible.
- ▶ Do not exceed the maximum permissible level difference of the standing levels of 250 kg between the crane and the ballast trailer.

NOTICE

Danger of damage to the crane and the ballast trailer!

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

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

**Note**

General technical safety instructions!

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

2 Inspecting tires and disk wheels



Note

- ▶ See chapter 8.01.



WARNING

Danger of fatal injury when using non-approved tires!

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

The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged. Death, severe bodily injuries, property damage.

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

NOTICE

Damage to tires!

Due to external environmental influences (for example: rain, wind, snow, rime, frost, sun exposure) and the great weight load on the tires by the ballast trailer, the tires can become porous and the body can 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 chapter 7.02.

2.1 Tires with air inflation

It is imperative to comply with the following instructions:

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



Note

Inflation pressure of ballast trailer tires!

- ▶ The inflation pressure in all tires inflated with air that were approved in writing by **LIEBHERR-Werk Ehingen GmbH** is **10 bar**.
- ▶ Check the inflation pressure according to the specified maintenance intervals for tight seating, see chapter 7.02.



WARNING

Danger of accident due to damaged ballast trailer tires!

Due to extended downtime of the crane, when the ballast trailer tires are not relieved with supports, the tires can become irregular.

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

Death, severe bodily injuries, property damage.

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

**WARNING**

Danger of accident due to damaged ballast trailer tires!

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

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

Death, severe bodily injuries, property damage.

- ▶ The travel route of the crane or the ballast trailer must be level, of sufficient load bearing capacity and free of rocks or other foreign matter.
- ▶ The travel route of the crane must be walked off personally in advance by the crane operator.
- ▶ Rocks and other foreign matter on the travel route must be removed before starting to travel.
- ▶ If the crane operator cannot ensure that the ballast trailer tires may not be damaged when driving the crane, then the ballast trailer tires must be foamed with a special foam approved by **LIEBHERR-Werk Echingen GmbH**. Contact **LIEBHERR-Werk Echingen 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 Echingen GmbH**.

2.2 Tires foamed with special foam

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

Due to extended downtime of the crane, when the ballast trailer tires are not relieved with supports, the tires can become irregular.

It is imperative to comply with the following instructions:

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

**WARNING**

Danger of fatal injury when using non-approved tire foams!

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

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

Death, severe bodily injuries, property damage.

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

**WARNING**

Danger of accident due to retreaded tires!

If tires foamed with the special foam are retreaded, the usage properties can be significantly changed in a negative manner.

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

Death, severe bodily injuries, property damage.

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

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LWE/LR 11350-007/19005-01-02/en

2.25 Crane on floating body

| | | |
|---|-------------------------------------|---|
| 1 | Non-destined use | 3 |
| 2 | Destined use | 3 |
| 3 | Floating device | 3 |
| 4 | Operating conditions | 3 |
| 5 | Crane transport on floating devices | 4 |
| 6 | Increased corrosion | 5 |

Fig.195219

LWE/LR 11350-007/19005-01-02/en

1 Non-destined use



WARNING

Non-destined use!

The boom can break off. The crane can topple over.
Death, severe injuries, property damage.

- ▶ Only use the crane as intended.
- ▶ Comply with the operating conditions and notes provided in this chapter.

Liebherr mobile cranes and crawler cranes are **not** designed for special requirements according to „EN 13852-2, Cranes - Offshore cranes“ or other offshore specifications and regulations.

For a precise definition of **non**-destined use, see the preface to the crane operating instructions.

2 Destined use

Liebherr mobile cranes and crawler cranes are only designed for assembly work and erection work and can only withstand a limited number of load cycles.

Liebherr mobile cranes and crawler cranes are designed for special properties and movements: evenly distributed drive forces, only occasional operation and load conditions according to „EN 13000, Cranes - Mobile cranes“ and comparable international standards.

For a precise definition of destined use, see the preface to the crane operating instructions.

3 Floating device

The term floating device includes all floating devices such as barges and ships.

The floating device must fulfil the prerequisites for crane operation.

4 Operating conditions

Observe the areas of responsibility:

- The crane contractor and crane operator are responsible for ensuring that the conditions for crane operation at the job site are fulfilled. It is strongly recommended to consult a naval engineer.
- The correct functional, technical and static interaction between the crane and the floating device is the sole responsibility of the crane contractor and the crane operator. This must be clarified and checked before operating the crane on a floating device.

Observe the following to ensure the safe operation of the crane on floating devices:

- Comply with all country-specific, legal specifications and conditions.
- Perform a risk assessment according to the Occupational Safety and Health Act to ensure safe working conditions.
- Outrigger forces or crawler pressures generated by crane operation must be safely supported by the steel construction of the floating device.
- Assemble and operate the crane according to manufacturer specifications.
- Comply with the maximum permissible lateral deflection angle between the hoist rope and the rope pulley. The deflection angle consists of the lateral elastic deformation of the boom system, the inclination of the crane supporting surface and a possible diagonal pull on the hoist rope.

Maximum permissible deflection angle:

- 2.5° with a hoist rope diameter of less than 23 mm
- 5° with a hoist rope diameter of 23 mm or more
- The conditions when working on a floating device must correspond with the conditions on land.

- Lifting and lowering loads in very calm waters and on very calmly moving floating devices correspond to the lifting and lowering a load on land.

4.1 Floating device, supported

Observe the following to ensure the safe operation of the crane on supported floating devices:

- For crawler cranes, observe the maximum permissible ground inclination of the crane of $\pm 0.3^\circ$, see the load charts.
- Supported cranes must be horizontally aligned (0°).

4.2 Floating device, not supported

Observe the following to ensure the safe operation of the crane on **non** supported floating devices:

- Crane operation on a floating device is only permissible in very calm waters.
- Crane operation is only permissible on a floating device with a main boom (no derrick operation, no operation with luffing jib permitted).
- The inclination of the floating device may **not** exceed the maximum permissible ground inclination of the crane according to the load chart.
- Before the crane is operated on the floating device: The inclination of the floating device in the lateral and longitudinal direction must be calculated in advance. This incline results from the interaction of the crane with the floating device.
- Comply with the maximum permissible ground inclination according to the load charts:
 - $\pm 0.3^\circ$ for cranes operating on a crawler travel gear.
 - 0° for cranes operating on outriggers.
- The load values must be reduced when the above indicated include values are exceeded.
- Load charts for higher permissible ground inclinations (for example 1° , 2°) can be provided upon request of LWE customers only for operation with a „main boom“ and with a „main boom + jib boom“.
- LTR 1060, LTR 1100 and LTR 1220 are programmed with load charts that permit operation up to a maximum ground inclination of 4° . The crane's respective maximum permissible ground inclination depends on the crane's operating mode.

5 Crane transport on floating devices

Observe the areas of responsibility:

- The crane contractor is solely responsible for transporting the crane on a floating device.
- The crane contractor and crane operator are responsible for the assembly and disassembly of the crane on the floating device.

Observe the following to ensure the safe transport of the crane on floating devices:

- Secure the crane during „transport on a floating device“ so that the following is prevented:
 - Damage and releasing of components on the crane
 - Slipping of the crane
 - Inadvertent turning of the superstructure
 - Capsizing of the floating device
- Transport at sea can have a negative impact on the structural strength / stability and the fatigue limit of the crane.

Make sure that the following measures are carried out prior to „transport on a floating device“:

- Take the boom down and support it using adequate means.
- With telescope cranes: Disassemble the counterweight plates and secure on the floating device.
- On crawler cranes: Support the turntable and counterweight using adequate means and secure against slipping.
- Observe and adhere to the specifications for transporting the crane and the crane components, see Crane operating instructions, chapter 3.80.

6 Increased corrosion

Extremely salty air near the sea can cause severe corrosion on the crane.

Increased corrosion can cause premature damage to the components (for example, the hydraulic cylinder, wire ropes, electrical and electronic components, driver's cab).

Submerging the hook block in water causes damage to the hook block and the rope.

The crane contractor and the crane operator are solely responsible for preventing severe corrosion.

Measures for preventing corrosion:

- Avoid direct contact between the crane and its components with salt water.
- Do **not** submerge the hook block in water.

Measures for detecting premature damage:

- Have the crane checked regularly and extensively by a qualified person.

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3 Crane assembly

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3.01 Crawler carrier assembly

| | | |
|---|--|----|
| 1 | Crawler travel gear component overview | 3 |
| 2 | Installing the crawler travel gear | 7 |
| 3 | Disassembling the crawler travel gear | 25 |

Fig.195219

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1 Crawler travel gear component overview

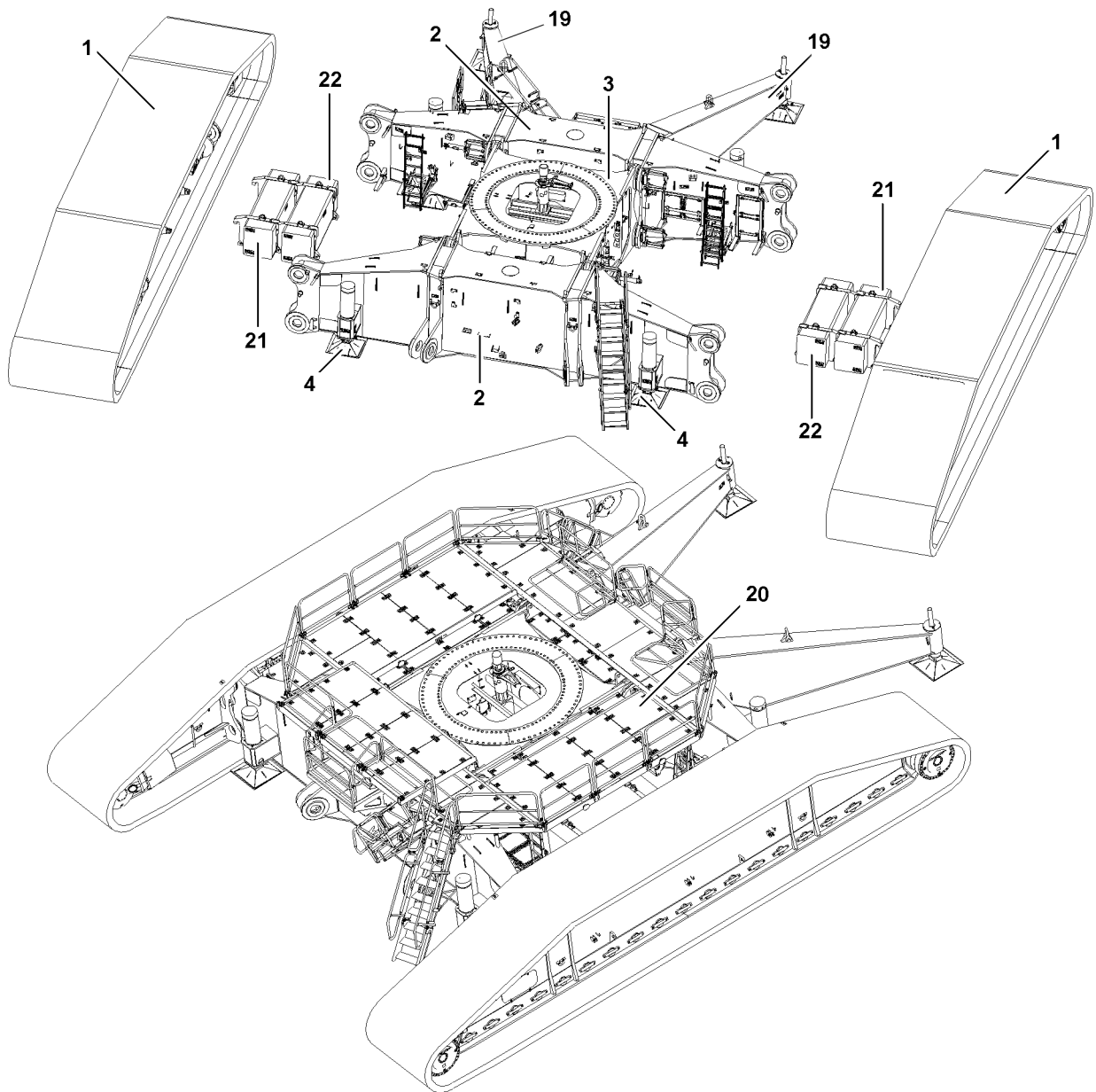


Fig.144893: Crawler travel gear component overview

- 1 Crawler carrier
- 2 Cross carrier
- 3 Crawler center section
- 4 Hydraulic assembly support
- 19 Mechanical auxiliary support
- 20 Platform
- 21 Auxiliary weight
- 22 Auxiliary weight

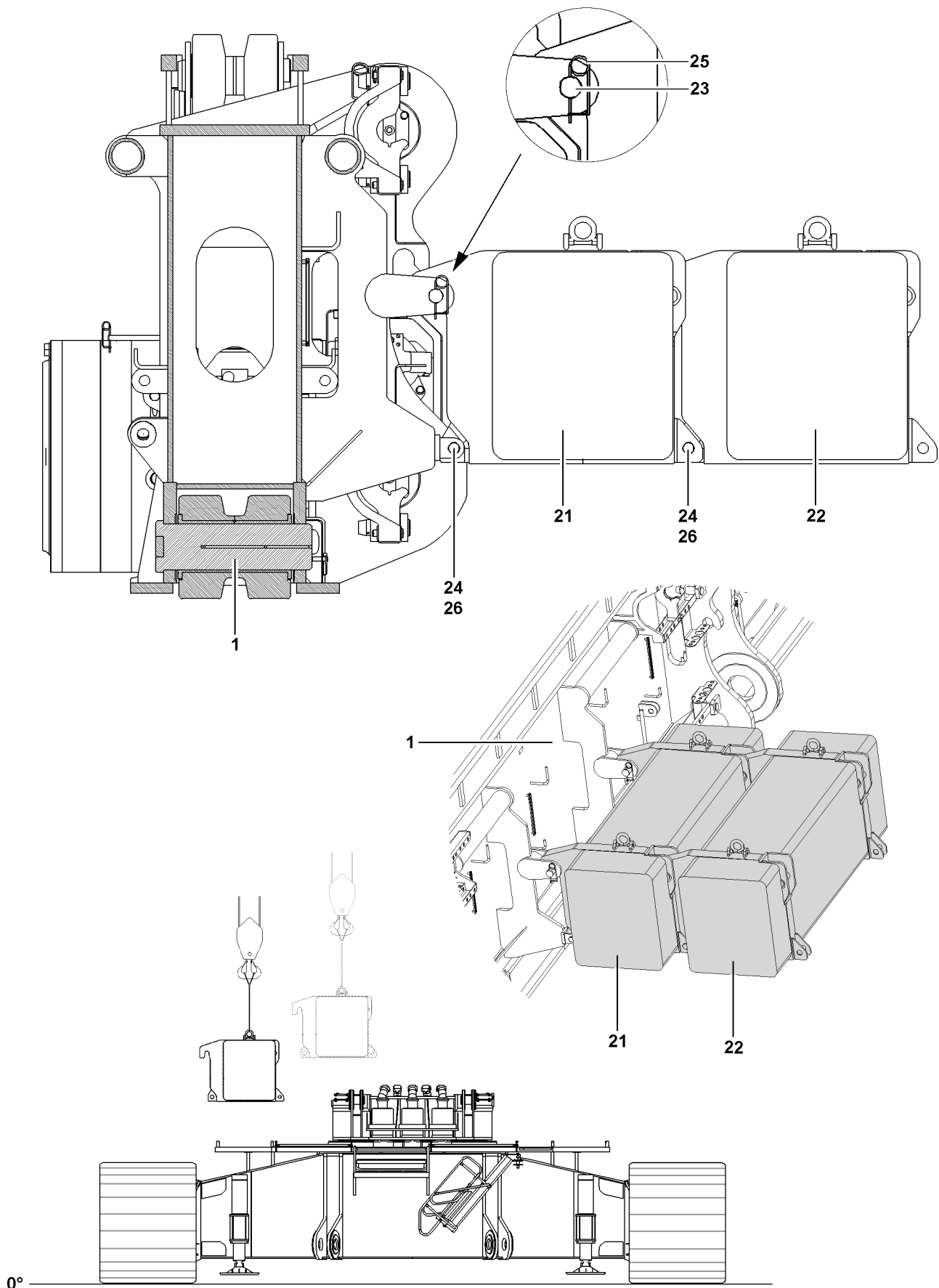


Fig.144885

LWE/LR 11350-007/19005-01-02/en

1.1 Component overview of auxiliary weights

- 21 Auxiliary weight
- 22 Auxiliary weight
- 23 Pin
- 24 Pin
- 25 Spring retainer
- 26 Linch pin

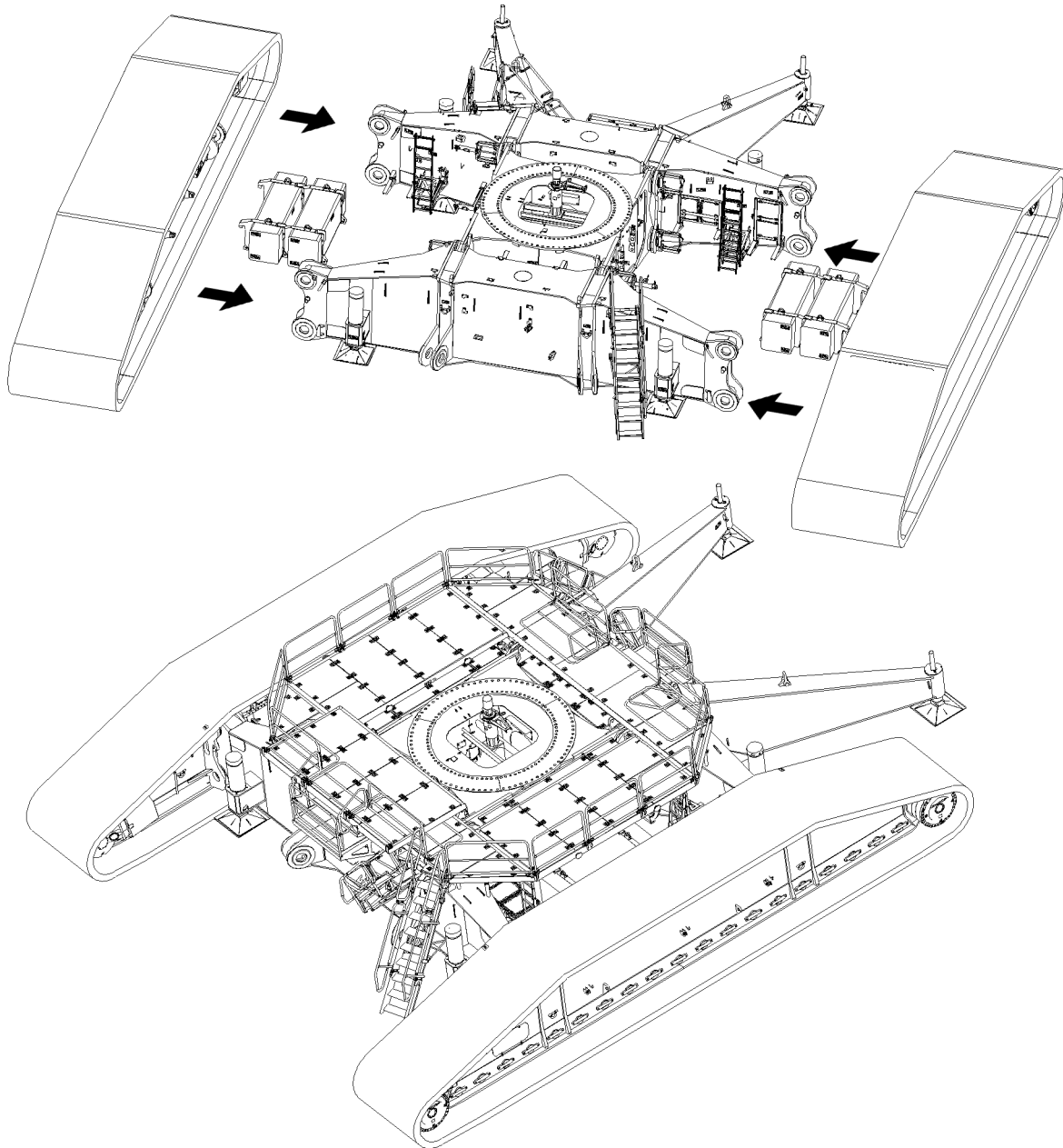


Fig.144891: Installing the crawler travel gear

2 Installing the crawler travel gear



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.



WARNING

Danger of impact / crushing!

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

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

Death, severe bodily injuries, property damage.

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



DANGER

The components can fall down!

If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.

Death, severe bodily injuries, property damage.

- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

Make sure that the following prerequisites are met:

- The ground is level and of sufficient load carrying capacity.
- An auxiliary crane is available.
- Use suitable material for the substructure of the crawler center section.

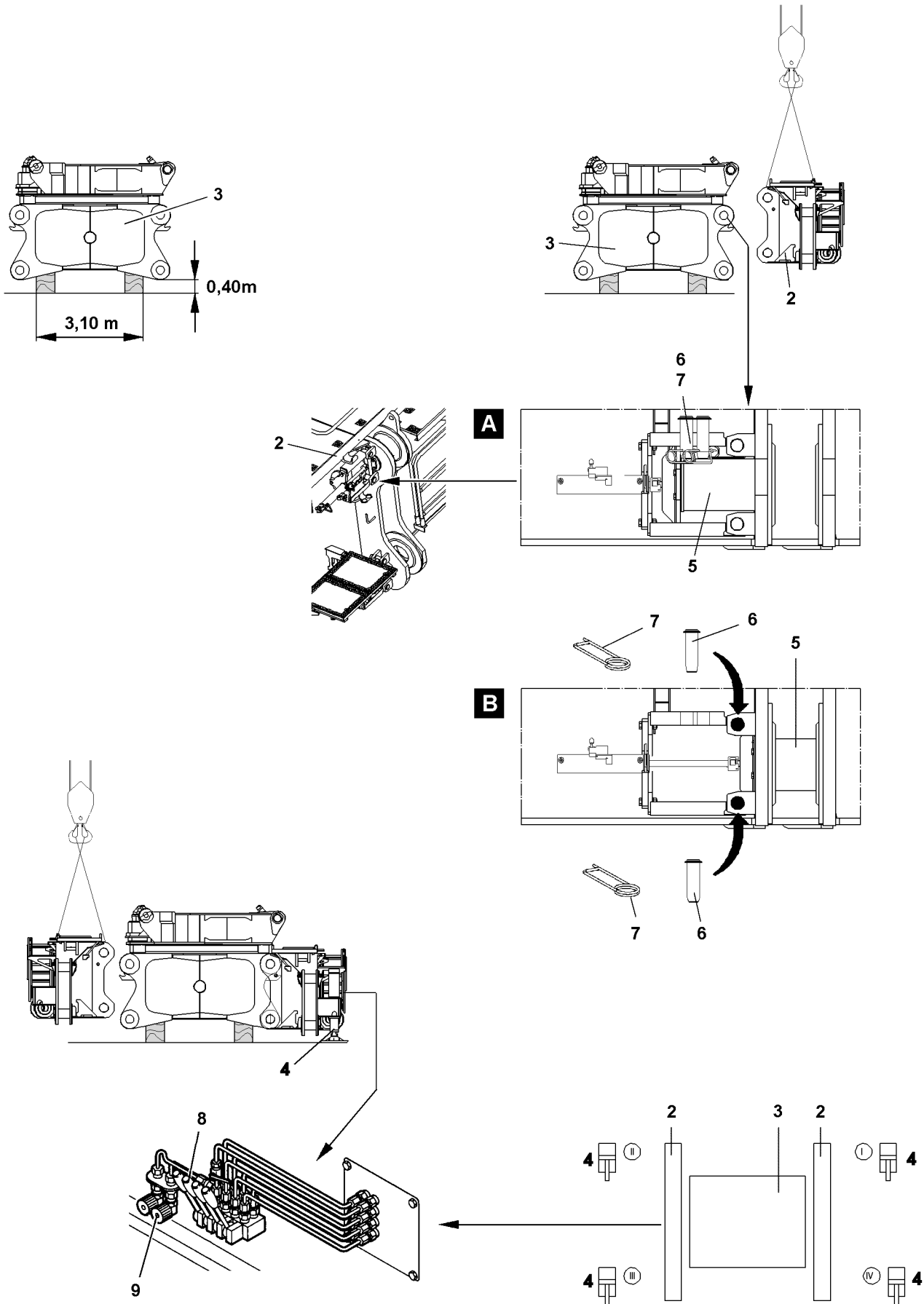


Fig.144880

LWE/LR 11350-007/19005-01-02/en

2.1 Supporting the crawler center section



WARNING

Improper substructure!

If the crawler center section is not properly supported, then it can sink into the ground.

Death, severe bodily injuries, property damage.

- ▶ The substructure must be able to safely absorb the weight of the crawler center section, the turntable and the crawler carrier.
- ▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.



Note

- ▶ It must be constructed in such a way that the cross carriers can be installed on the left and right without interference.
 - ▶ The substructure for the crawler center section must be built up to at least 0.40 m.
 - ▶ The distance between the substructure must be at least 3.10 m.
-
- ▶ Support the crawler center section **3** with hardwood timbers or other suitable materials.
 - ▶ Lift the crawler center section **3** with the auxiliary crane and set it onto the substructure.

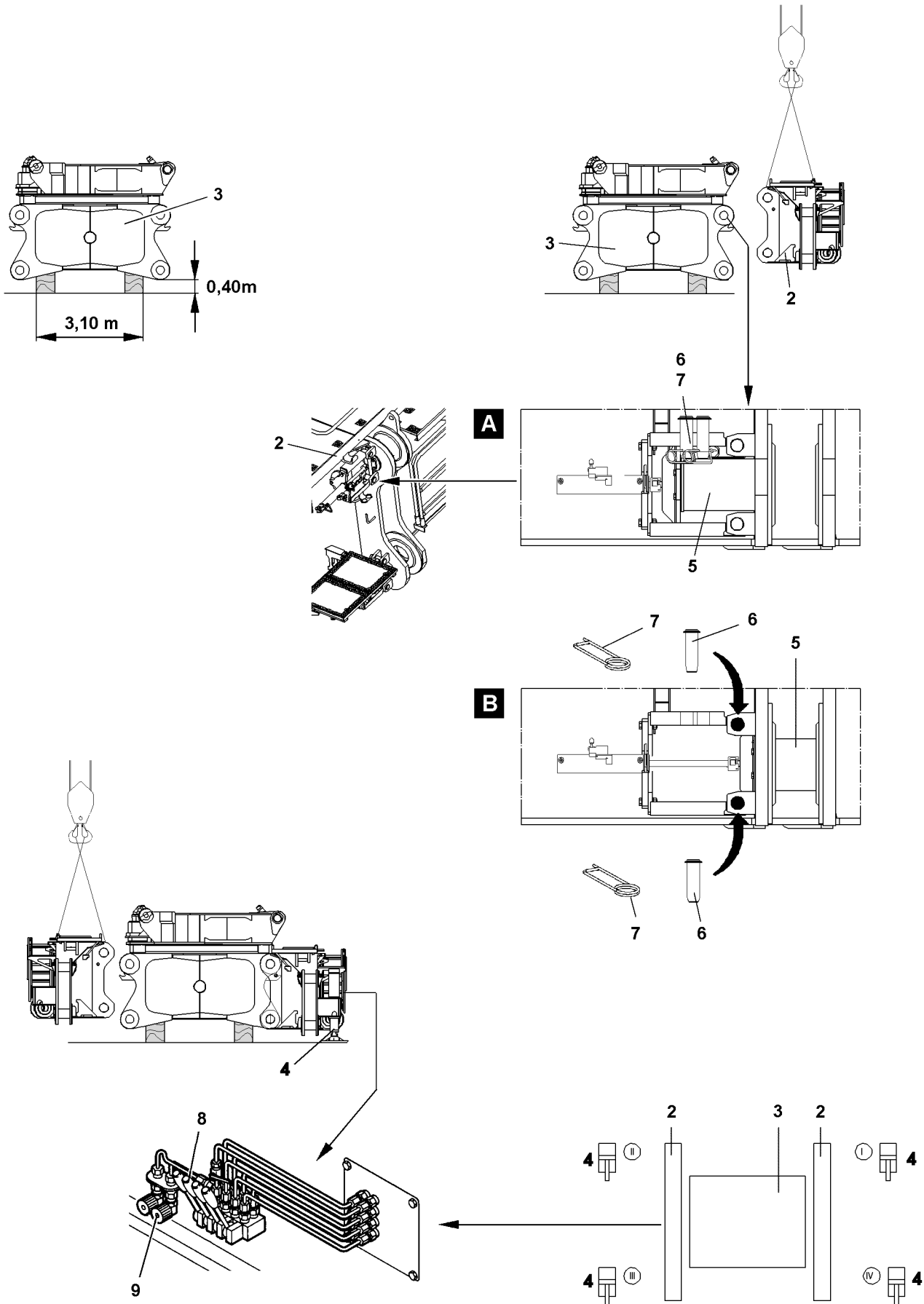


Fig.144880

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2.2 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 extended.
-
- ▶ 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 pin **6** with the spring retainer **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 pin **6** with the spring retainer **7**.



WARNING

Tipping of the center section and cross carrier!

Without a support with the assembly cylinders or without a substructure, the installed cross carrier can tip over.

Death, severe bodily injuries, property damage.

- ▶ Support the cross carrier with the support cylinders or support it properly from below.
-

- ▶ Properly support the support plates.
- ▶ Connect the hydraulic assembly support **4** to the hydraulic aggregate of the pin pulling device - quick coupling **9**.
- ▶ Actuate the hand lever **8** and extend both support cylinders to the ground or the substructure.
- ▶ Fasten the **second** cross carrier **2** to 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 pin **6** with the spring retainer **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 pin **6** with the spring retainer **7**.
- ▶ Properly support the support plates.
- ▶ Operate the hand lever **8**, extend the assembly cylinders and horizontally lift the center section with the attached cross carriers.
- ▶ Remove the substructure from the center section.

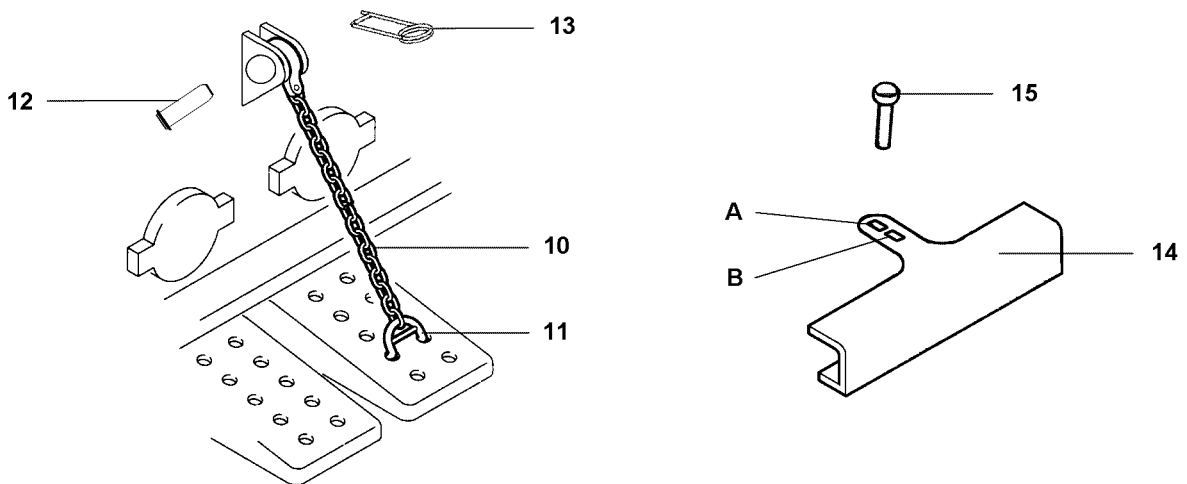
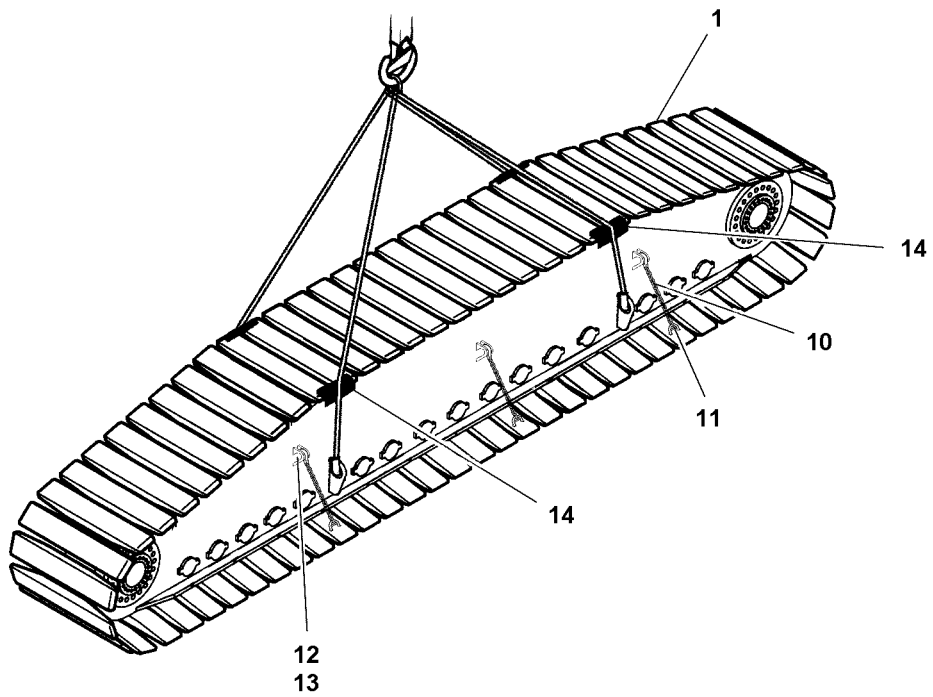
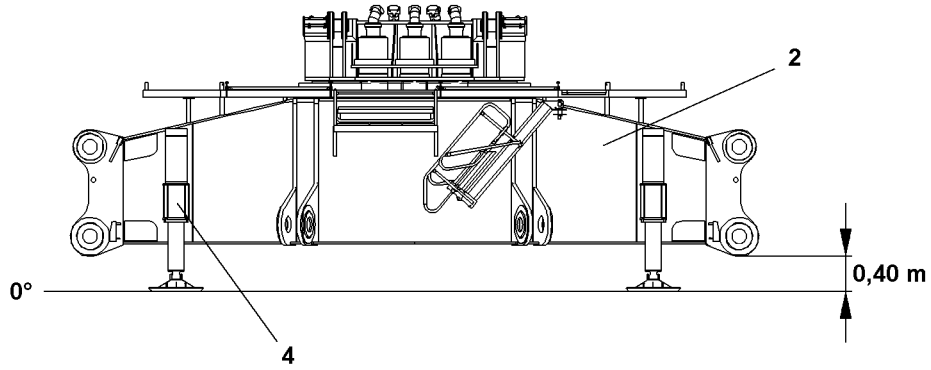


Fig.144882

LWE/LR 11350-007/19005-01-02/en

2.3 Assembling the crawler carrier

The crawler carriers can be assembled two ways:

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



WARNING

Improper substructure!

If the crawler center section is not properly supported, then it can sink into the ground.

Death, severe bodily injuries, property damage.

- ▶ The substructure must be able to safely absorb the weight of the crawler center section, the turntable and the crawler carrier.
- ▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

2.3.1 Assembling the crawler carrier with the auxiliary crane

Make sure that the following prerequisite is met:

- The turntable is disassembled.

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

- ▶ Connect the hydraulic assembly support **4** to 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 the bracket **11** on 3 lower crawler pads on both sides.
- ▶ Pin the other end of the chain on the crawler carrier: Insert the pin **12** and secure with the 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 the retaining pin **15**.
- ▶ Pin the fastening equipment on the crawler carrier and guide over the guard plates **14**.
- ▶ Lift the crawler center section and cross carrier with the support cylinders to at least 0.40 m and align horizontally.

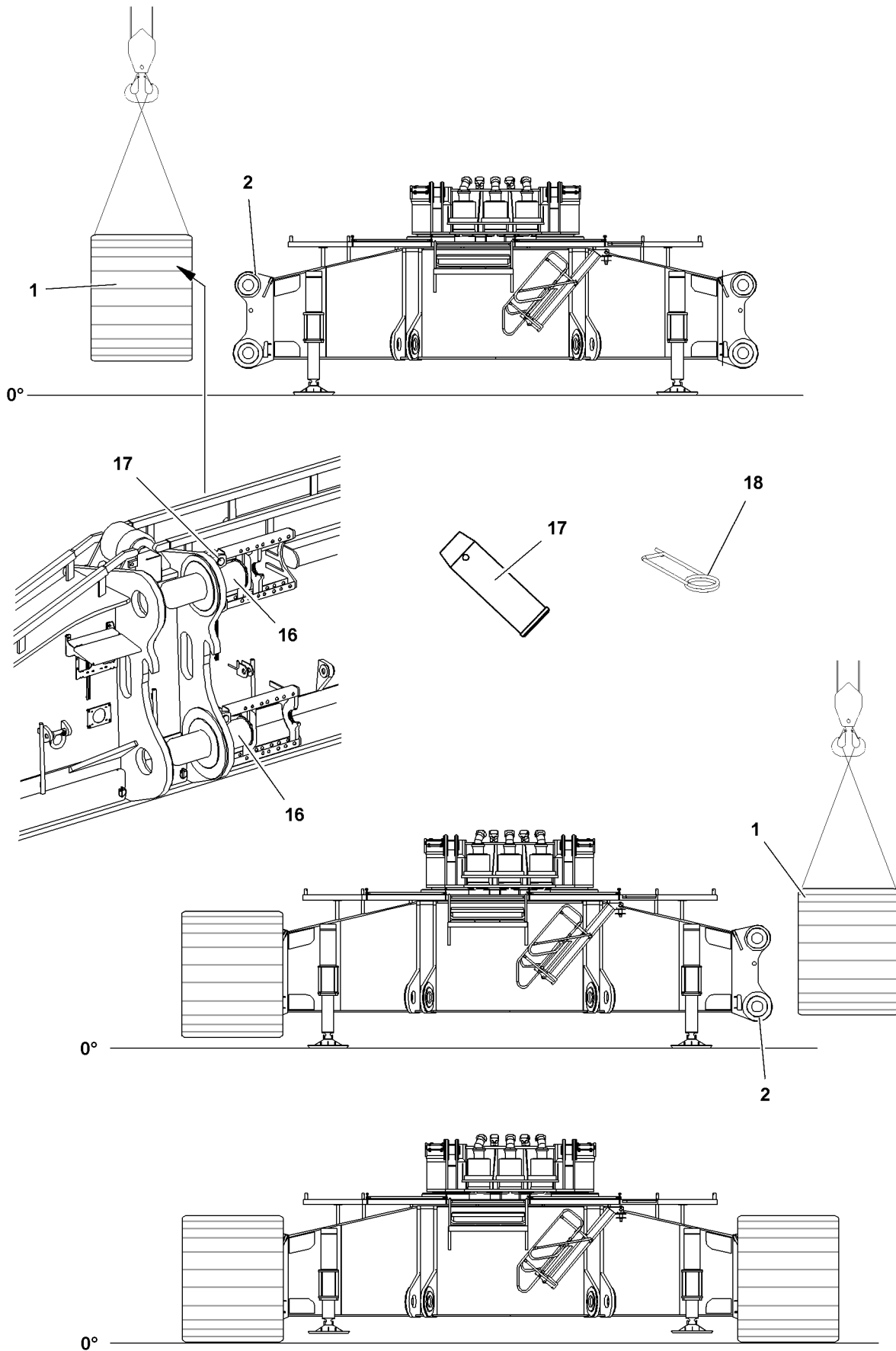


Fig.144886

LWE/LR 11350-007/19005-01-02/en

Assembling the crawler carrier with the auxiliary crane



WARNING

The guard plates are not assembled!

If the crawler carriers are lifted without the guard plates, then the fastening equipment can be damaged or rip off.

Death, severe bodily injuries, property damage.

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

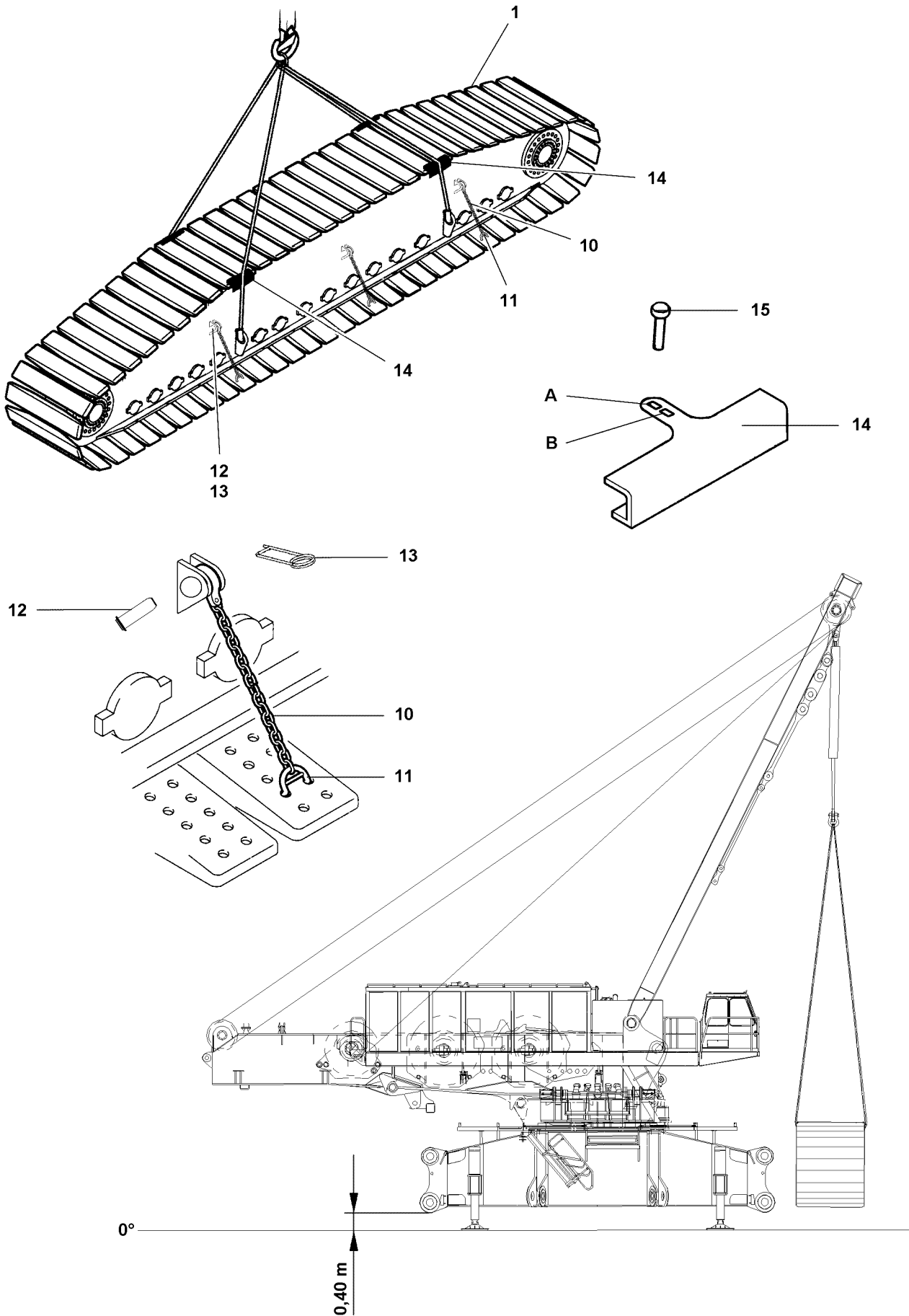
Make sure that the following prerequisites are met:

- The crawler center section must be lifted at least 0.40 m and horizontally aligned.
- The track pads of the crawler carrier are secured with chains to prevent them from sagging.
- The guard plates for the fastening equipment are installed on the upper crawler pads.



Note

- ▶ Note the identification on the crawler carrier and the cross carrier.
- ▶ Hang the first crawler carrier **1** on 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 pin **17** with the spring retainer **18**.
- ▶ Fasten the second crawler carrier **1** to 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 pin **17** with the spring retainer **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.



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Fig.144887

2.3.2 Assembling the crawler carrier with the SA-frame

Make sure that the following prerequisites are met:

- The cross carriers are assembled.
- The crawler center section is horizontally aligned.
- The turntable is assembled.



Note

- ▶ Assemble the turntable, see chapter 3.02.

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



WARNING

The crane can topple over!

When turning the turntable with an installed counterweight on the turntable, the crane can topple over. Death, severe bodily injuries, property damage.

- ▶ Make sure that the counterweight on the turntable has been removed.
- ▶ Turn the turntable along the longitudinal axis 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 carrier to be lifted.



Note

- ▶ To set up the SA-frame, see chapter 5.02.
- ▶ The maximum forward radius of the SA-frame is 9 m.
- ▶ Extend the support cylinder 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 assembly of the crawler carrier with the auxiliary crane“.

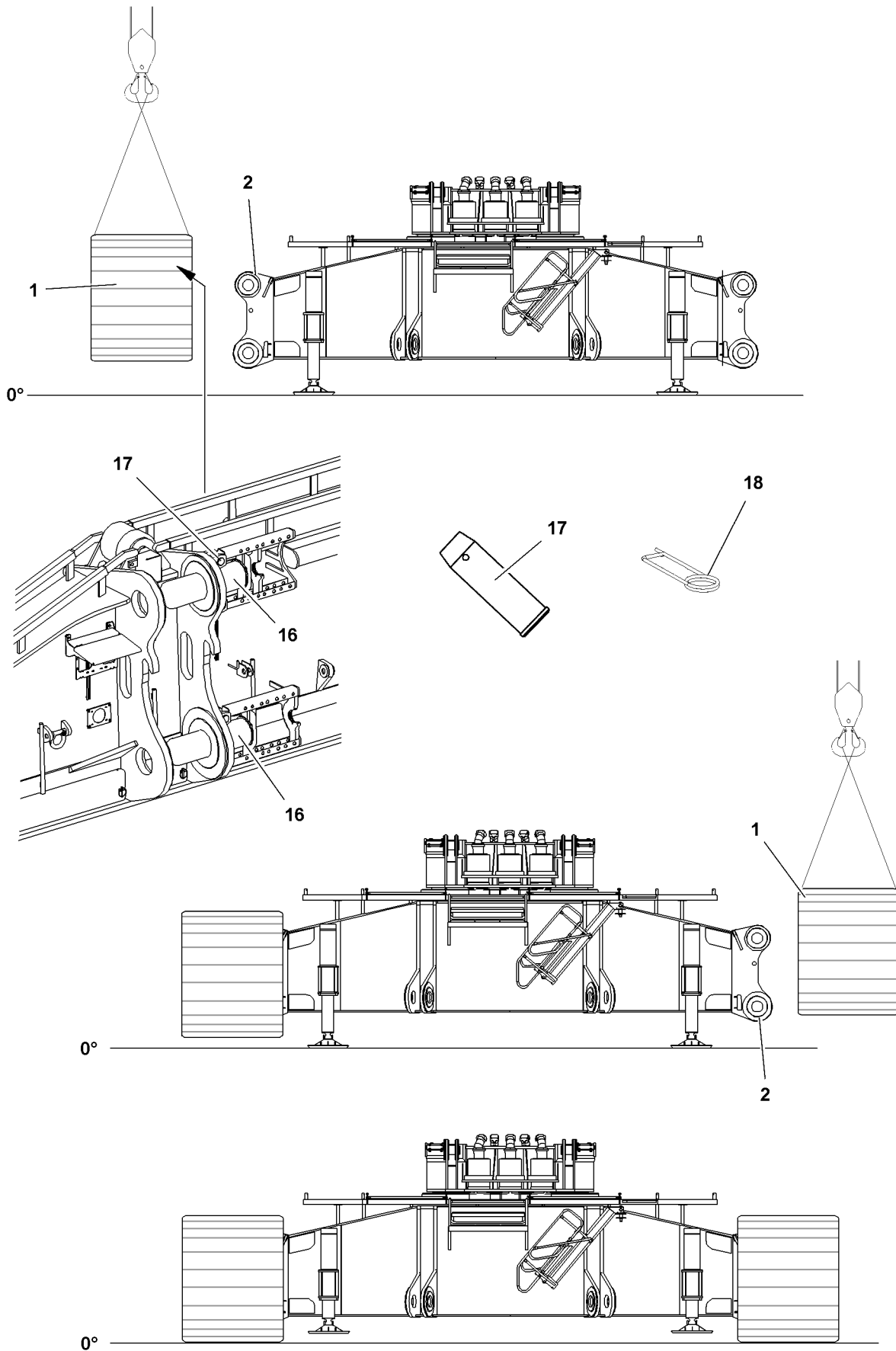


Fig.144886

LWE/LR 11350-007/19005-01-02/en

Assembling the crawler carrier with the SA-frame

Make sure that the following prerequisites are met:

- The crawler center section must be lifted at least 0.40 m and horizontally aligned.
- The track pads of the crawler carrier are secured with chains to prevent them from sagging.
- The guard plates for the fastening equipment are installed on the upper crawler pads.



WARNING

The guard plates are not assembled!

If the crawler carriers are lifted without the guard plates, then the fastening equipment can be damaged or rip off.

Death, severe bodily injuries, property damage.

- ▶ 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 pin **17** with the spring retainer **18**.
- ▶ Turn the turntable 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 pin **17** with the spring retainer **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.

Fig.195219

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2.3.3 Establishing the connections to the crawler carriers

Make sure that the following prerequisite is met:

- Both crawler carriers are properly installed, pinned and secured.

Establishing the hydraulic connections

The hydraulic connections are made with quick couplings.

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.



WARNING

Pressure in the hydraulic lines!

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

Death, severe bodily injuries, property damage.

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



WARNING

Loss of pressure or leakage!

Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.

- ▶ Check that the quick couplings have been properly connected before using the crane.
 - ▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
 - ▶ Tighten the hydraulic coupling by hand. Turn the knurled nut until it reaches a tangible, fixed stop position.
 - ▶ Establish the hydraulic connections, see the Hydraulic diagram.
-

Establishing the electrical connections

- ▶ Establish the electrical connections, see the Electric wiring diagram.

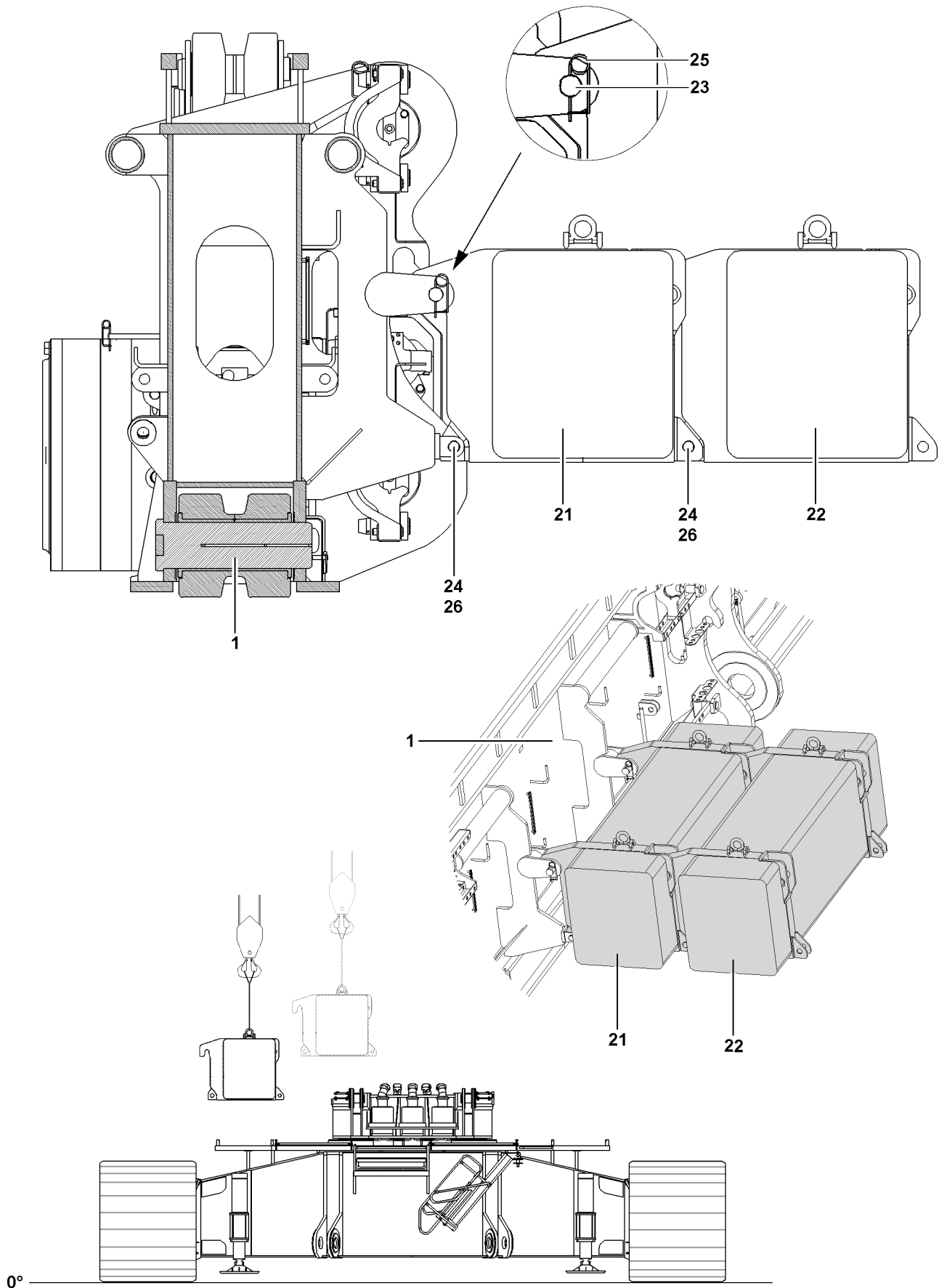


Fig.144885

LWE/LR 11350-007/19005-01-02/en

2.4 Assembling the auxiliary weights



WARNING

Tipping of the crawler carrier!

If the auxiliary weights are installed on the freestanding crawler carrier, then the crawler carrier tips over.

Death, severe bodily injuries, property damage.

- ▶ 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.

Death, severe bodily injuries, property damage.

- ▶ Assemble the auxiliary weights individually.



WARNING

Staying between the cross carriers!

When lifting the auxiliary weights from the assembly area between the cross carriers, limbs can be crushed or severed.

The auxiliary weights can fall down.

Death, severe bodily injuries, property damage.

- ▶ It is prohibited for anyone to remain between the cross carriers when assembling or disassembling 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 the spring retainer **25**.
- ▶ Fasten the auxiliary weight **21** to 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 the 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 the linch pin **26**.
- ▶ Assemble the auxiliary weights on the second crawler carrier.
- ▶ Assemble the platform, see chapter 2.06.

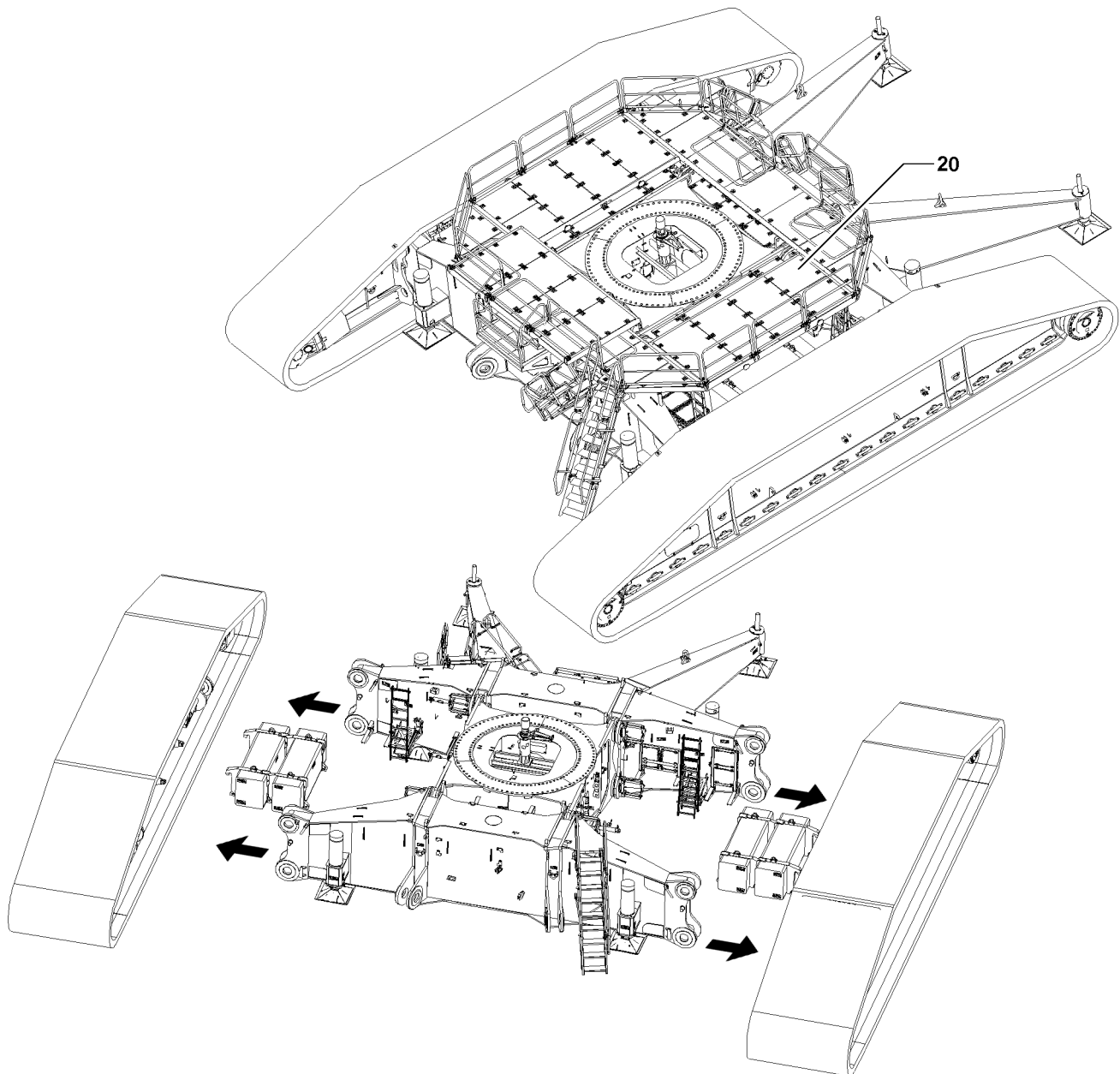


Fig.144892: Disassembling the crawler travel gear

3 Disassembling the crawler travel gear



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.



WARNING

Danger of impact / crushing!

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

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

Death, severe bodily injuries, property damage.

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



DANGER

The components can fall down!

If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.

Death, severe bodily injuries, property damage.

- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.



Note

- ▶ Disassemble the platform, see chapter 2.06.

Make sure that the following prerequisites are met:

- The platforms **20** on the crawler travel gear have been disassembled.
- The ground is level and of sufficient load carrying capacity.
- An auxiliary crane is available.

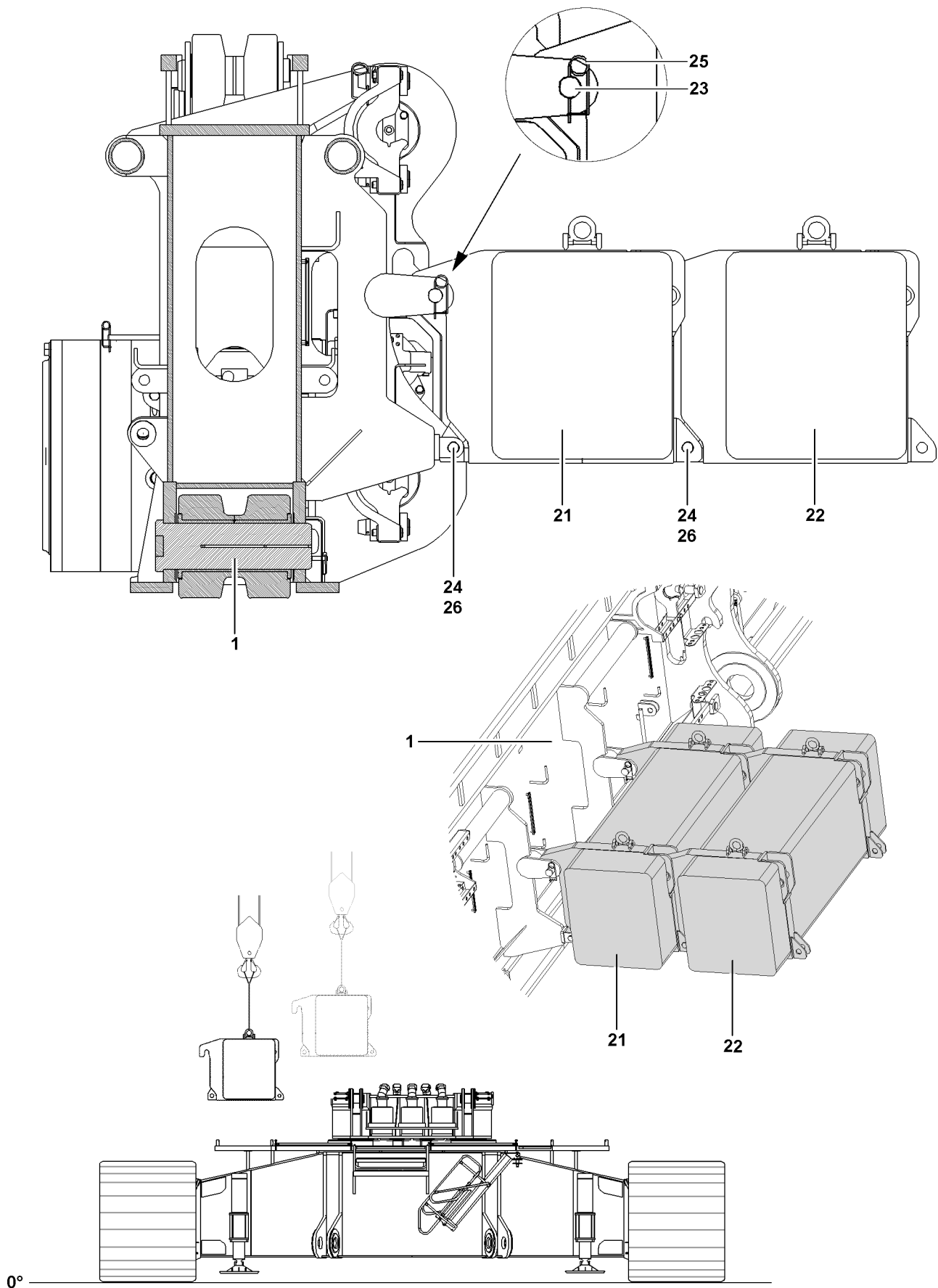


Fig.144885

LWE/LR 11350-007/19005-01-02/en

3.1 Disassembling the auxiliary weights

Make sure that the following prerequisite is met:

- The platforms on the crawler travel gear have been disassembled.



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.

Death, severe bodily injuries, property damage.

- ▶ Disassemble the auxiliary weights individually.



WARNING

Staying between the cross carriers!

When lifting the auxiliary weights from the assembly area between the cross carriers, limbs can be crushed or severed.

Death, severe bodily injuries, property damage.

- ▶ It is prohibited for anyone to remain between the cross carriers when assembling or disassembling the auxiliary weights.

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

- ▶ Fasten the auxiliary weight **22** to 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**.

- ▶ Fasten the auxiliary weight **21** to 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**.
- ▶ Disassemble the auxiliary weights on the second crawler carrier.

Fig.195219

LWE/LR 11350-007/19005-01-02/en

3.2 Disconnecting the connections to the crawler carriers

3.2.1 Disconnecting the hydraulic connections

The hydraulic connections are made with quick couplings.

When disconnecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.



WARNING

Pressure in the hydraulic lines!

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

Death, severe bodily injuries, property damage.

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

- ▶ Release the hydraulic coupling by hand.
- ▶ Disconnect the hydraulic connections, see Hydraulic diagram.
- ▶ Protect the hydraulic connections from contamination with caps.

3.2.2 Disconnecting the electrical connections

- ▶ Disconnect the electrical connections to the crawler carrier, see Electrical wiring diagram.
- ▶ Close the electrical connections off properly with dummy plugs or protective caps.

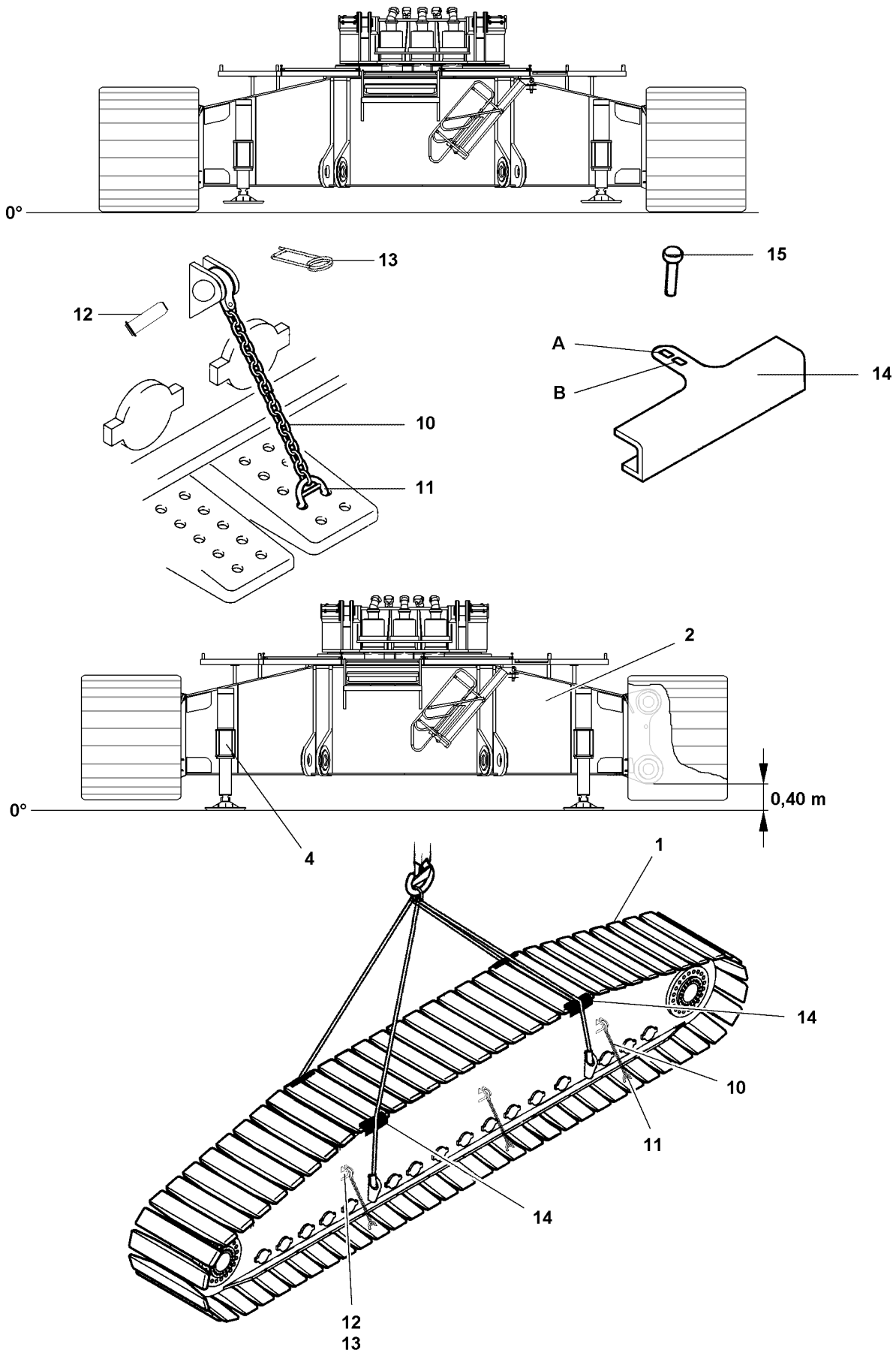


Fig.144883

LWE/LR 11350-007/19005-01-02/en

3.3 Disassembling the crawler carriers

The crawler carrier can be disassembled in two ways:

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



WARNING

Tipping of the crawler carrier!

If the auxiliary weights are assembled during the disassembly of the crawler carriers, the crawler carrier tips over.

Death, severe bodily injuries, property damage.

- ▶ Disassemble the auxiliary weights before disassembling the crawler carriers.



WARNING

Improper support!

If the crawler center section is not properly supported, then it can sink into the ground.

Death, severe bodily injuries, property damage.

- ▶ The substructure must be able to safely absorb the weight of the crawler center section, the turntable and the crawler carrier.
- ▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

Make sure that the following prerequisites are met:

- The auxiliary weights have been disassembled.
- Use suitable material for the substructure of the crawler center section.

3.3.1 Disassembling the crawler carrier with the auxiliary crane

Make sure that the following prerequisites are met:

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

Preparing for the disassembly 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 the 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 the spring retainer **13**.



Note

- ▶ The retaining pins **15** are inserted in case of a track pad width of 2.0 m in bore **A**.
- ▶ The retaining pins **15** are inserted in case of a track pad width of 1.5 m in bore **B**.

- ▶ Fasten the guard plate **14** on the upper track pads: Insert the retaining pin **15**.
- ▶ Pin the fastening equipment on the crawler carrier and guide over the guard plates **14**.
- ▶ Properly support the support plates.
- ▶ Connect the hydraulic assembly support **4** to 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.

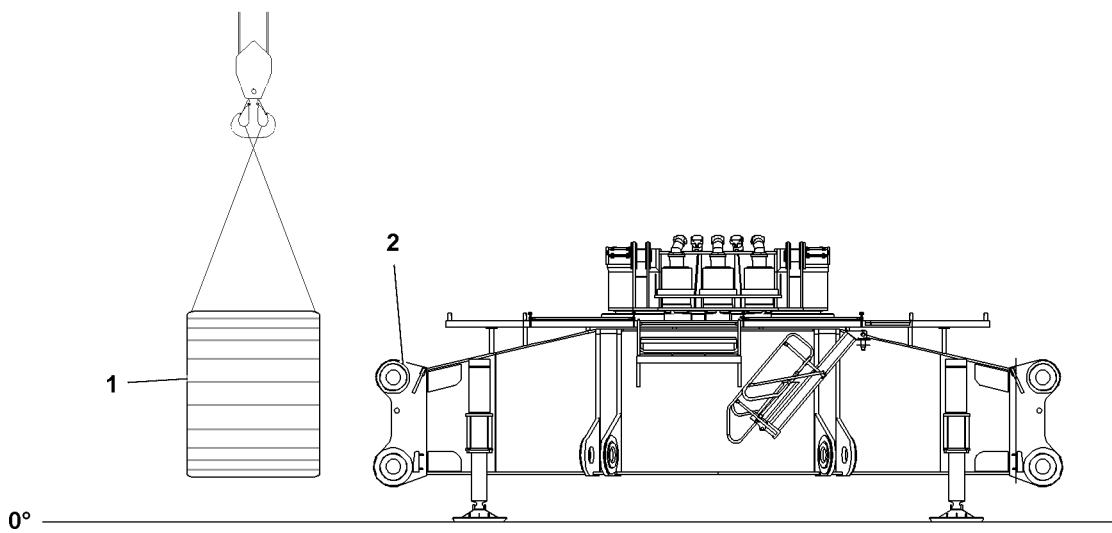
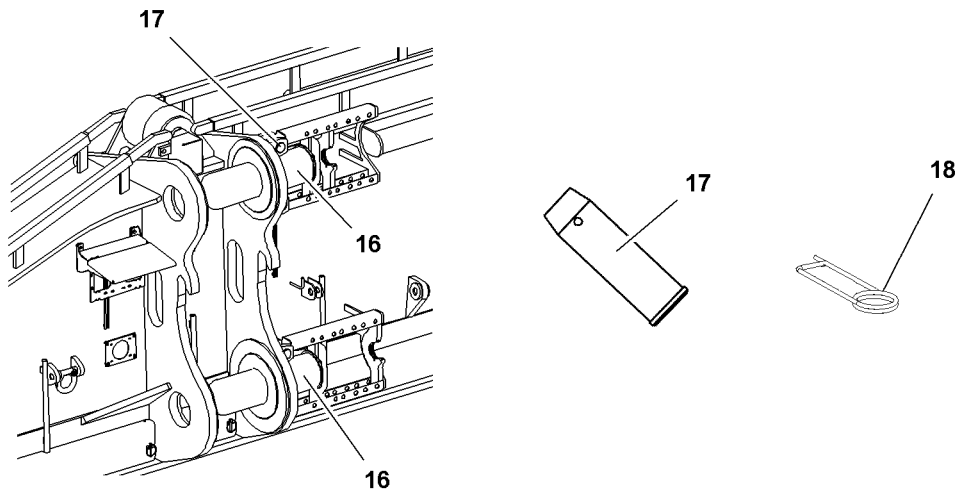
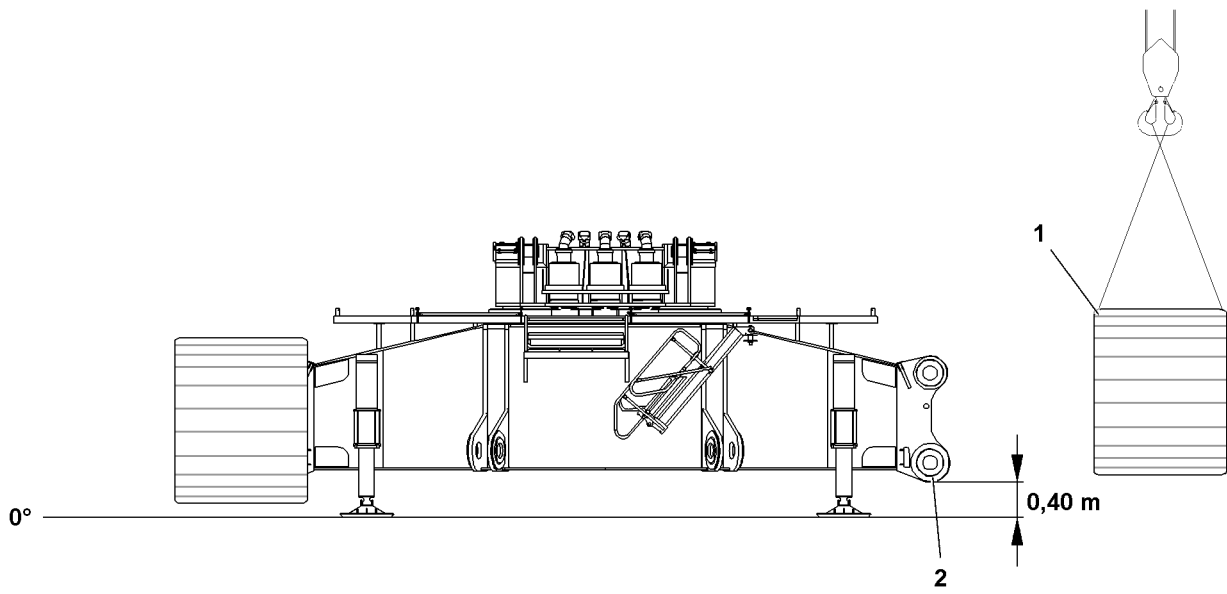


Fig.144884

LWE/LR 11350-007/19005-01-02/en

Disassembling the crawler carrier with the auxiliary crane



WARNING

The guard plates are not assembled!

If the crawler carriers are lifted without the guard plates, then the fastening equipment can be damaged or rip off.

Death, severe bodily injuries, property damage.

- ▶ 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.
- ▶ Fasten the **first** crawler carrier **1** to the auxiliary crane and tension with the fastening equipment.
- ▶ Release the pin **16** „at 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.
- ▶ Fasten the **second** crawler carrier **1** to 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.

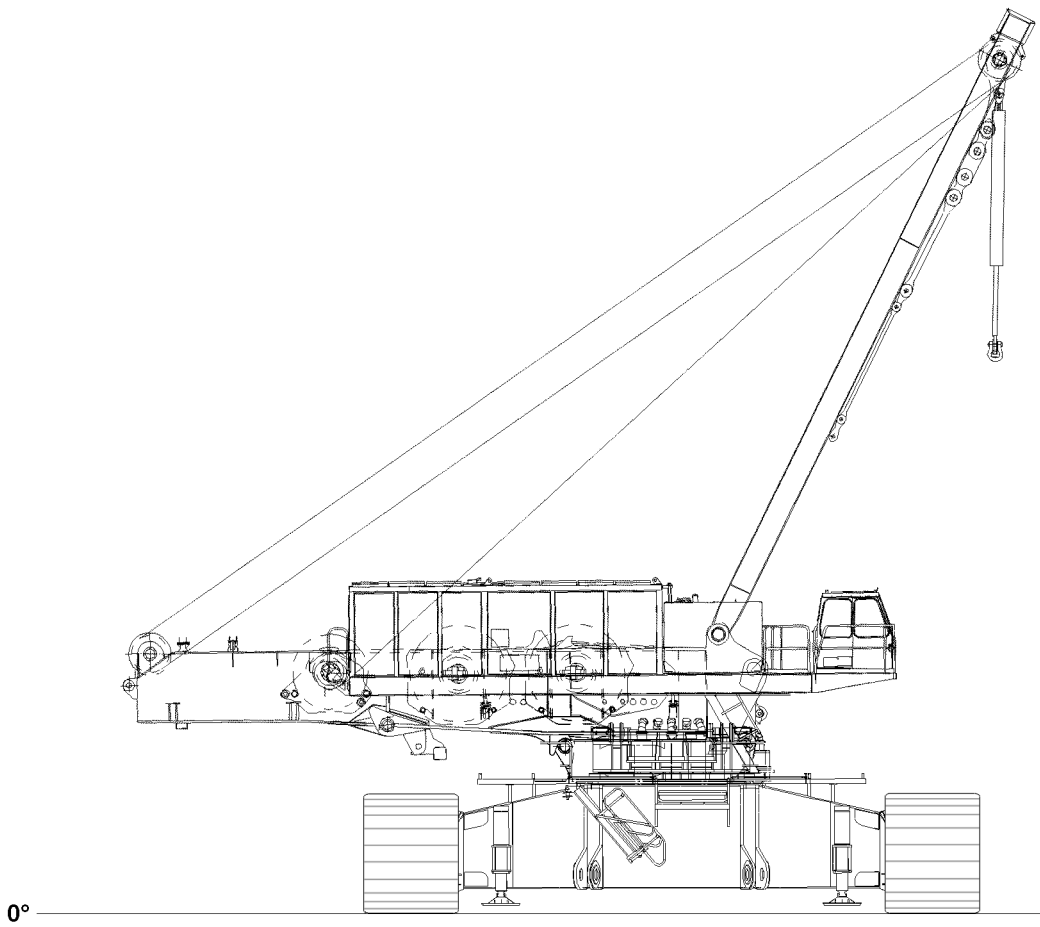


Fig.144889

3.3.2 Disassembling the crawler carrier with the SA-frame

Make sure that the following prerequisites are met:

- The turntable is assembled.
- The boom and the derrick are disassembled from the turntable.
- The counterweight is disassembled from the turntable.

**Note**

- ▶ Assemble the turntable, see chapter 3.02.
-

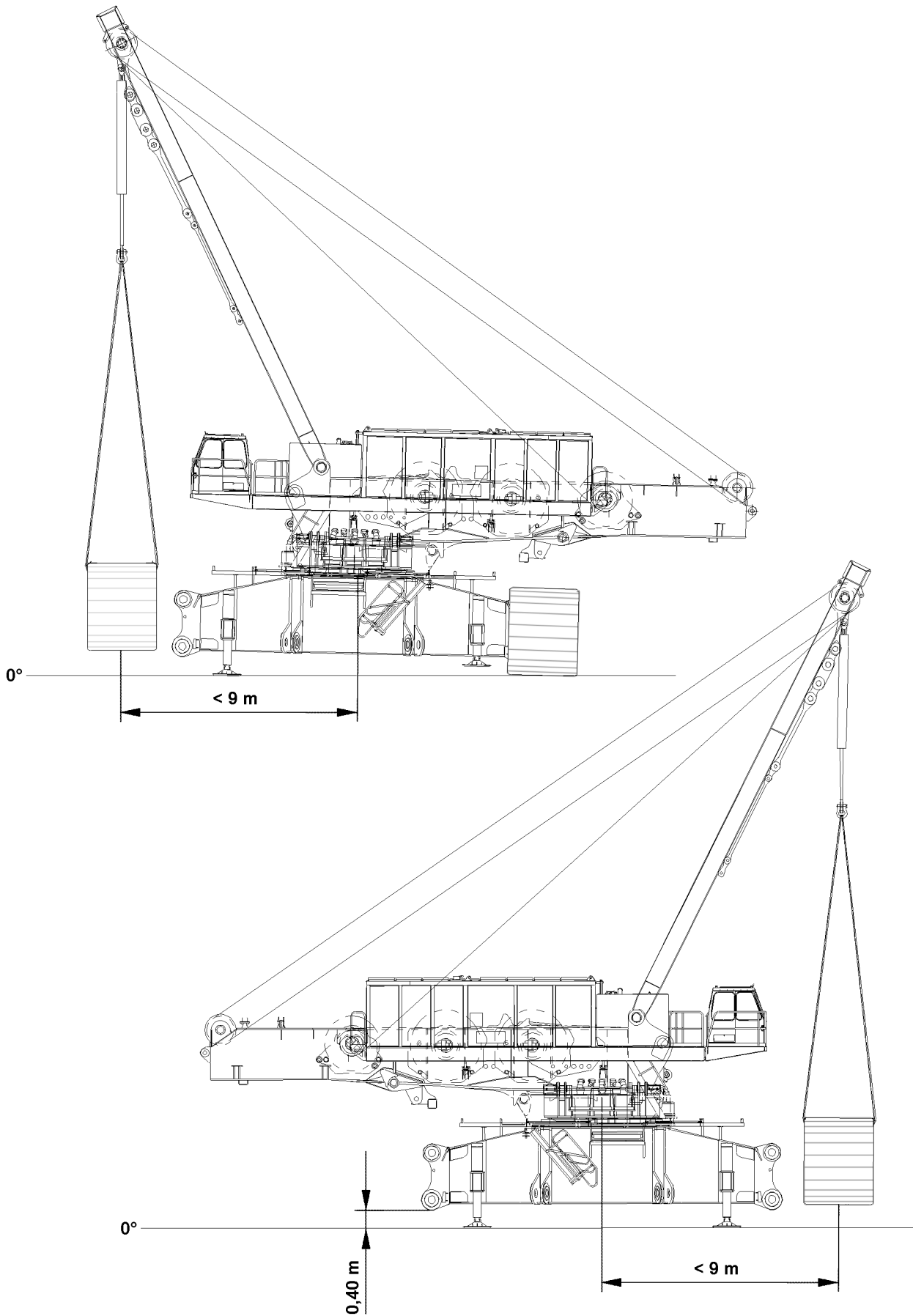


Fig.144890

LWE/LR 11350-007/19005-01-02/en

Preparing for the disassembly of the crawler carriers



WARNING

The crane can topple over!

When turning the turntable with an installed counterweight on the turntable, the crane can topple over. Death, severe bodily injuries, property damage.

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

▶ Turn the turntable along the longitudinal axis to the cross carriers.

▶ Extend the support cylinder on the side where the crawler carrier is being disassembled to the point where the crawler carrier can be disassembled 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 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 carrier to be lifted.

▶ Extend the assembly cylinder.

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

▶ Carry out the instructions, see section „Preparing for disassembly of the crawler carriers with the auxiliary crane“.

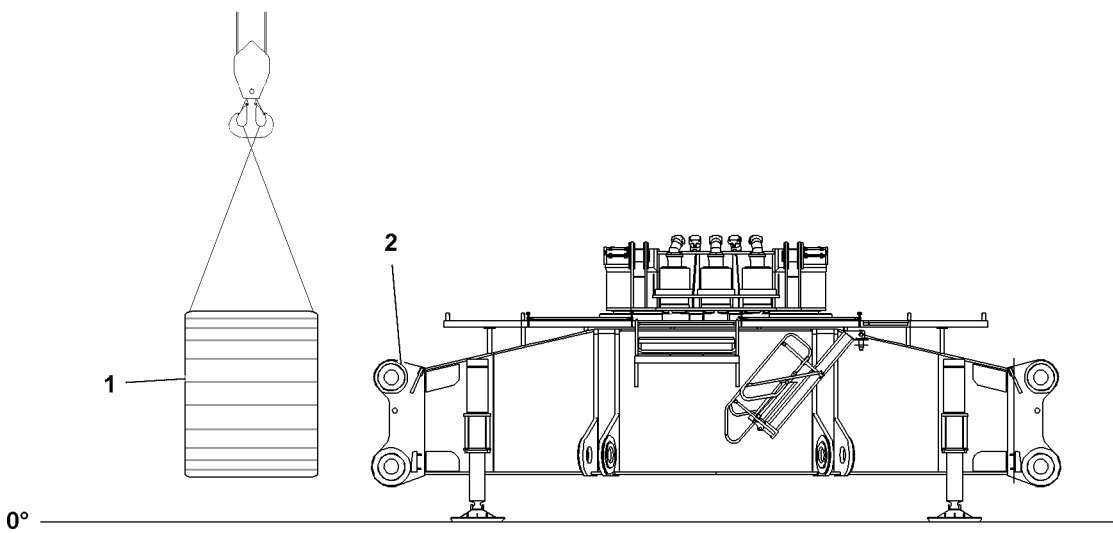
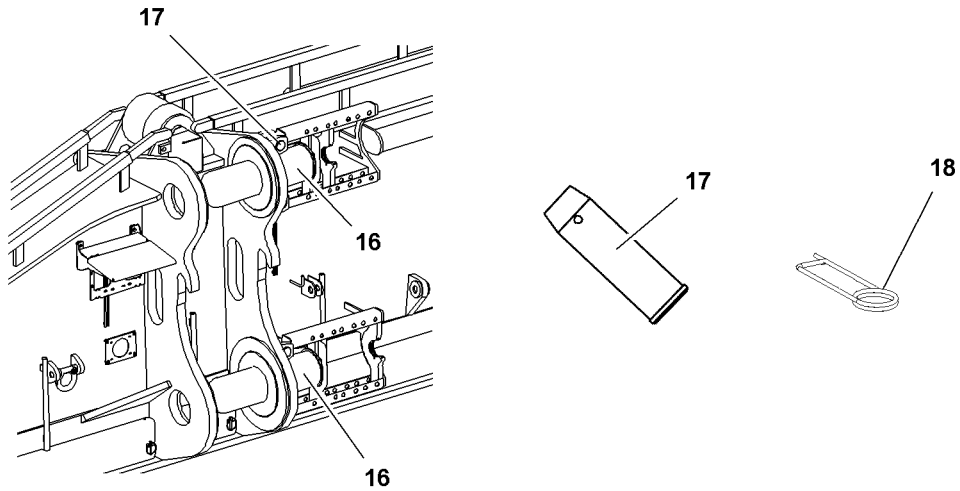
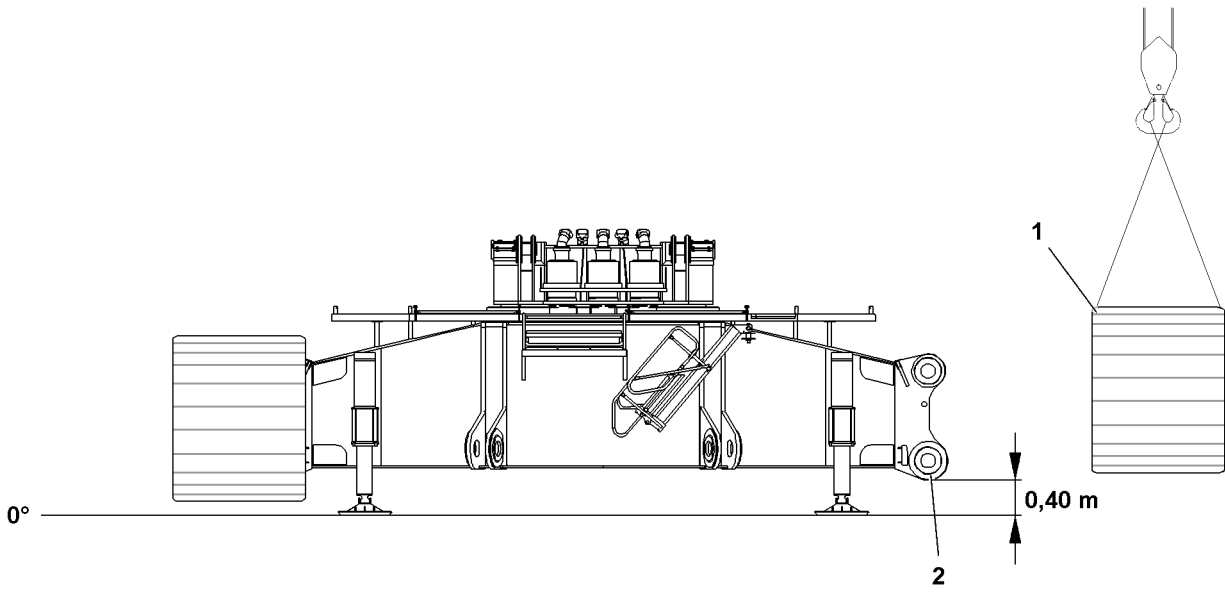


Fig.144884

LWE/LR 11350-007/19005-01-02/en

Disassembling the crawler carrier with the SA-frame



WARNING

The guard plates are not assembled!

If the crawler carriers are lifted without the guard plates, then the fastening equipment can be damaged or rip off.

Death, severe bodily injuries, property damage.

- ▶ 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.
- ▶ Fasten the **first** crawler carrier **1** to the assembly cylinder and tension with the fastening equipment.
- ▶ Release the pin **16** „at 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 retract the assembly cylinder.
- ▶ Turn the turntable 180°.
- ▶ Extend the support cylinder on the side where the second crawler carrier is being disassembled until the crawler carrier can be disassembled without interference.
- ▶ Fasten the **second** crawler carrier **1** to 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 retract the support cylinder.
- ▶ Disassemble the turntable, see chapter 3.02.

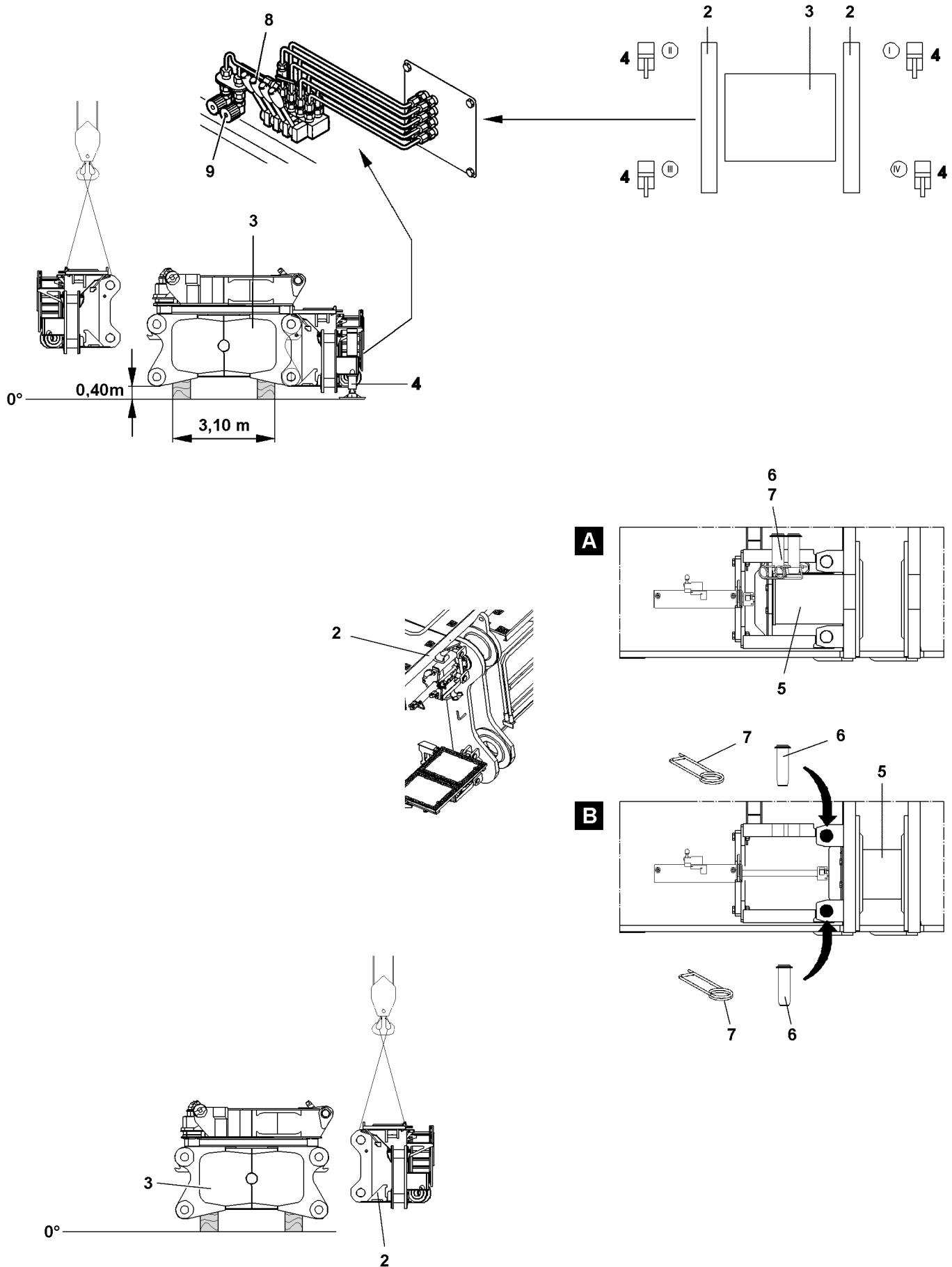


Fig.144881

LWE/LR 11350-007/19005-01-02/en

3.3.3 Supporting the crawler center section

Make sure that the following prerequisites are met:

- The crawler carriers are removed.
- The turntable is disassembled.



Note

- ▶ Disassemble the turntable, see 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 substructure for the crawler center section must be built up to at least 0.40 m.
 - ▶ The distance between the substructure must be at least 3.10 m.
-
- ▶ Support the crawler center section **3** with hardwood timbers or other suitable materials.
 - ▶ Retract the support cylinder and set the crawler center section **3** on the substructure.

3.3.4 Disassembling the cross carrier



Note

- ▶ First disassemble the cross carrier without installed hydraulic connections.
- ▶ Retract the support cylinder 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 the crawler travel gear!

Without support with the assembly cylinders, the installed cross carrier can tip over.
Death, severe bodily injuries, property damage.

- ▶ Support the cross carrier with the support cylinders or support it from below.
-
- ▶ Fasten the **first** cross carrier **2** to the auxiliary crane and tension with the fastening equipment.
 - ▶ Release the pin **5** „at 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.
 - ▶ Fasten the **second** cross carrier **2** to the auxiliary crane and tension with the fastening equipment.
 - ▶ Release the pin **5** „at 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**.

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3.02 Turntable assembly

| | | |
|---|------------------------|----|
| 1 | Component overview | 3 |
| 2 | Dimensions and weights | 5 |
| 3 | Assembly | 7 |
| 4 | Disassembly | 19 |

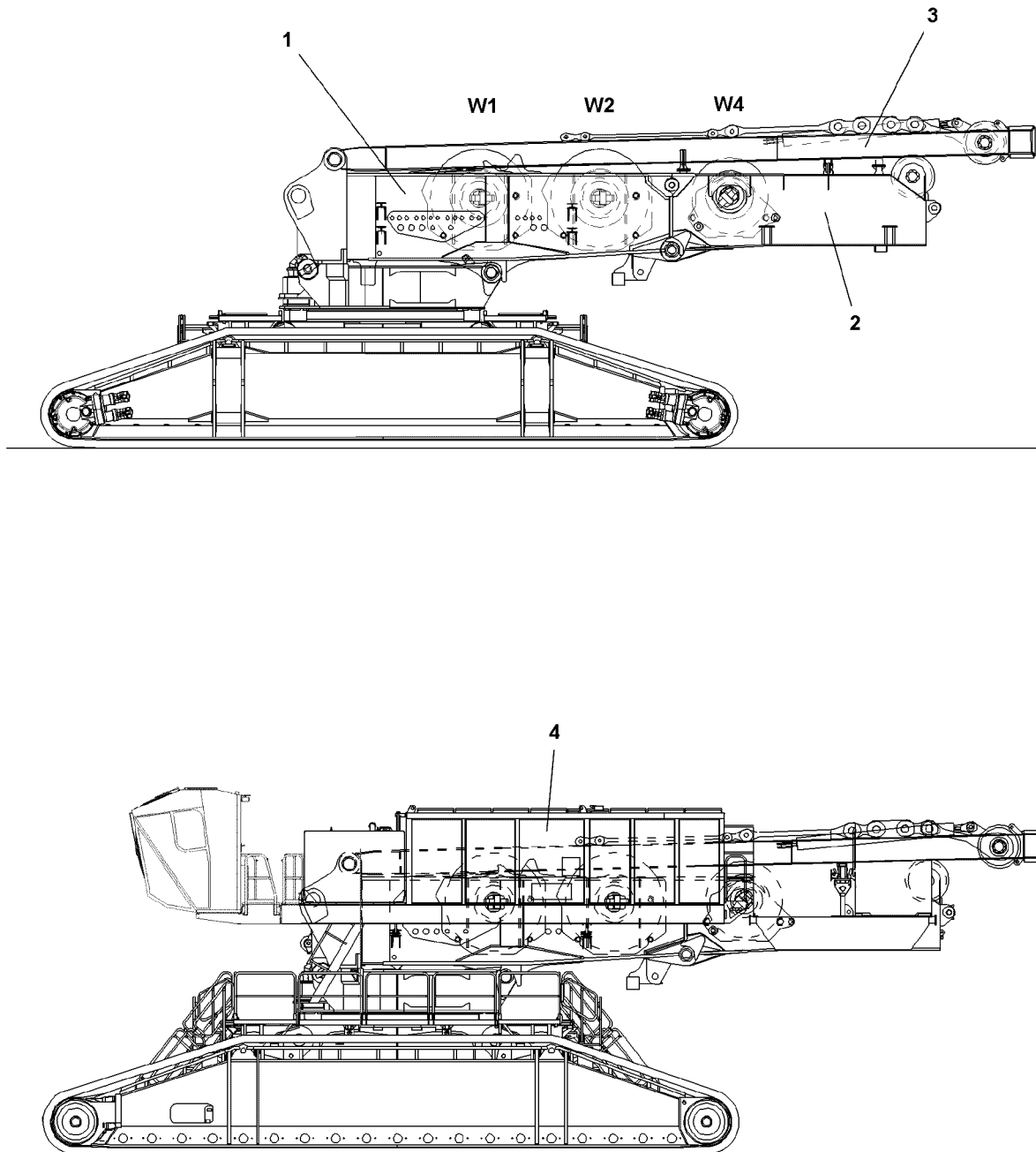


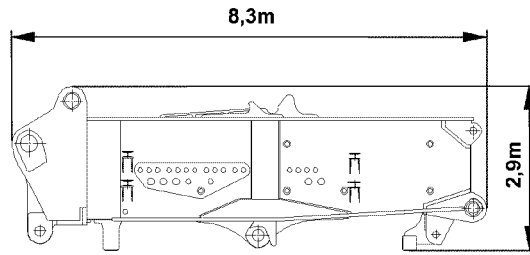
Fig.102864

1 Component overview

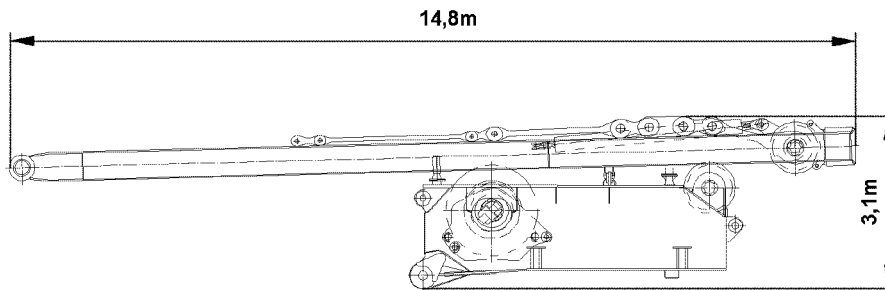
1.1 Turntable

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

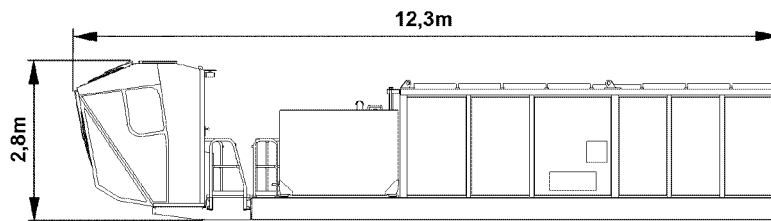
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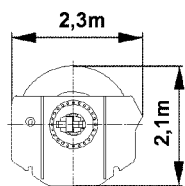
2



3



4



5

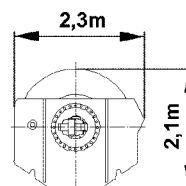


Fig.102876

LWE/LR 11350-007/19005-01-02/en

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

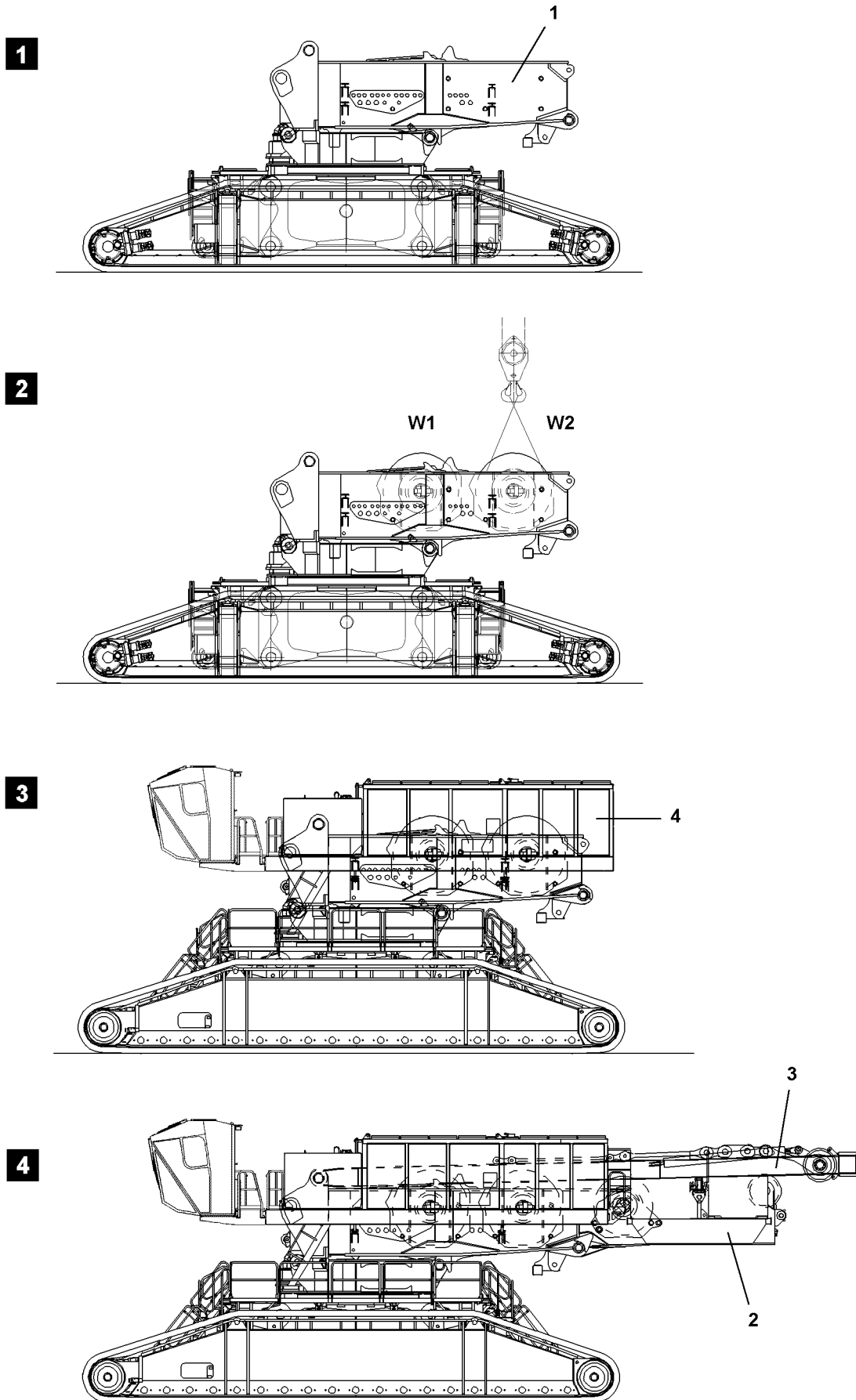


Fig.102967

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**

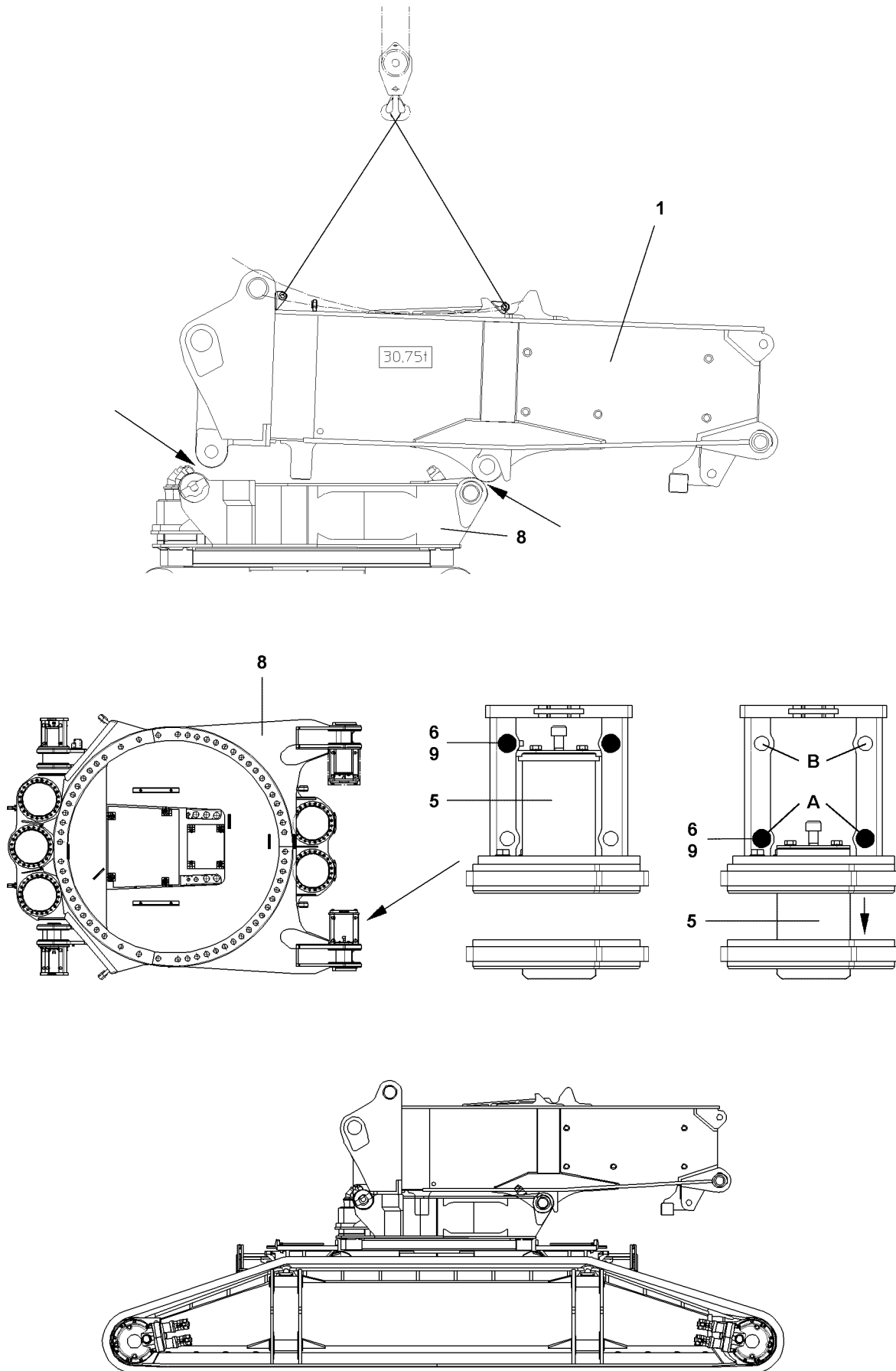


Fig.102731

LWE/LR 11350-007/19005-01-02/en

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.

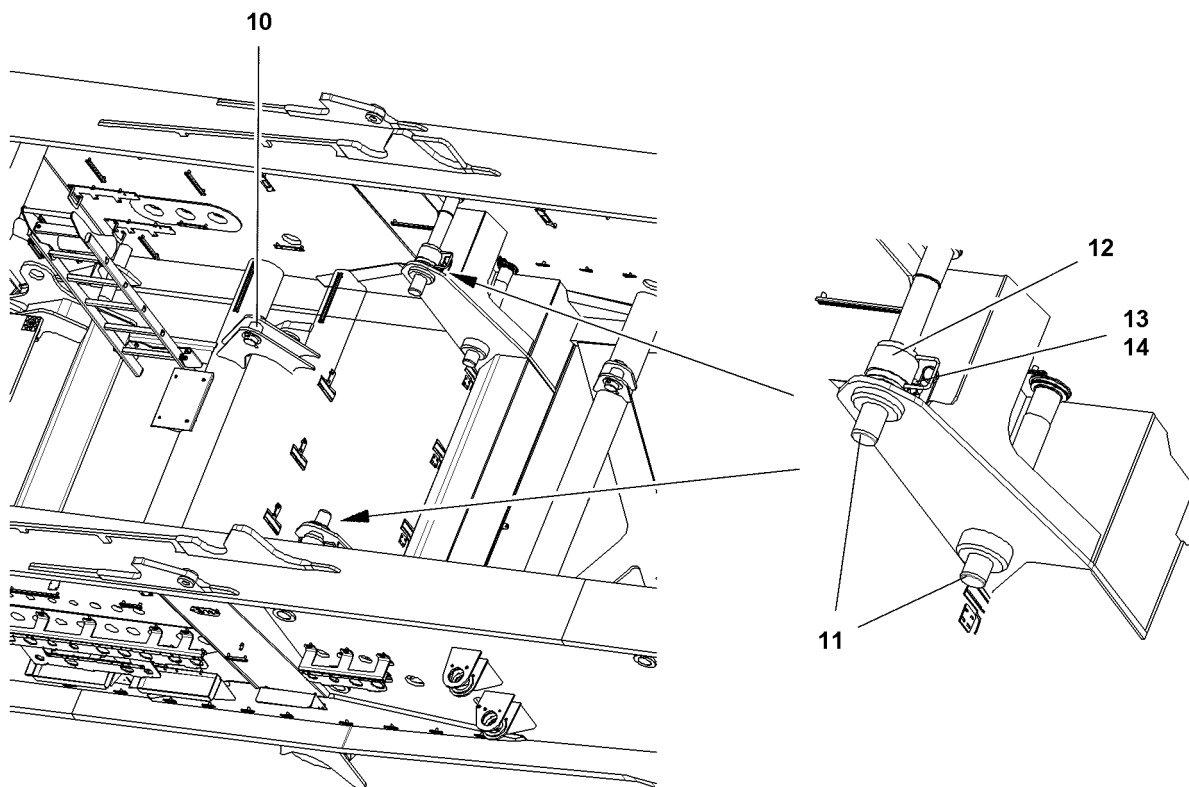
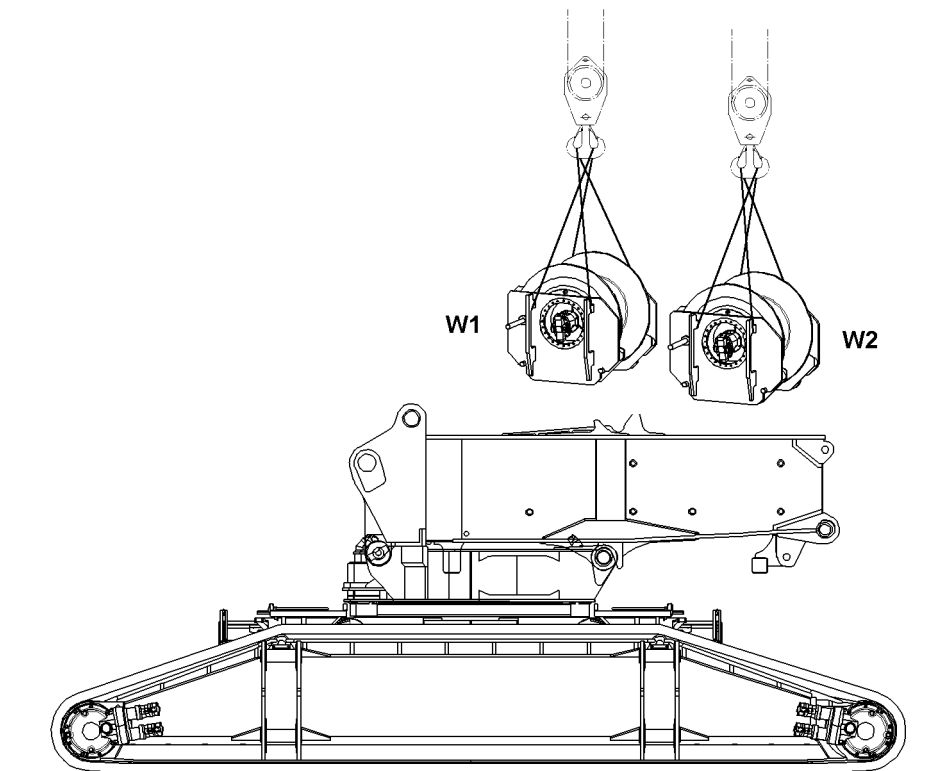


Fig.102732

LWE/LR 11350-007/19005-01-02/en

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.
-

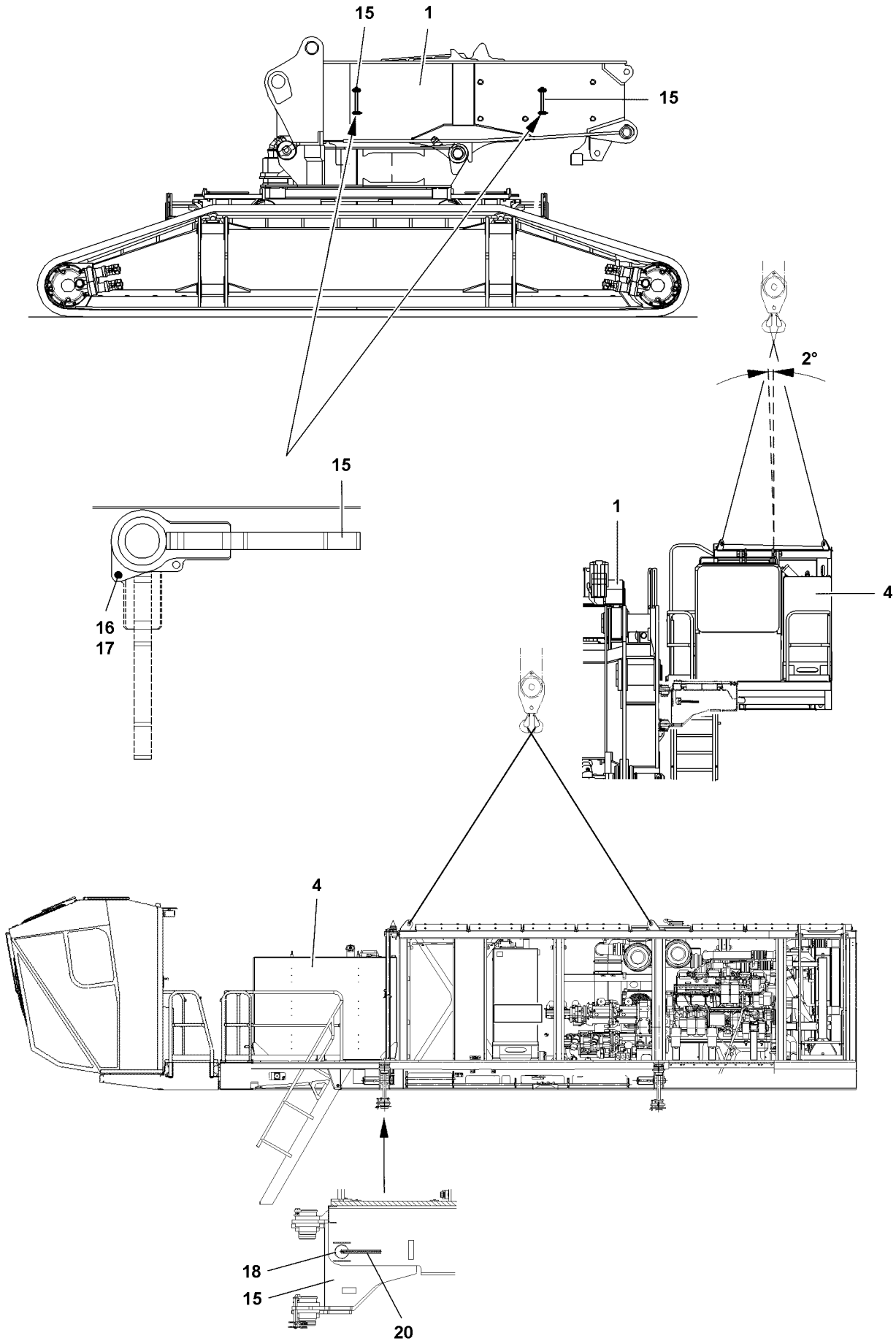


Fig.103123

LWE/LR 11350-007/19005-01-02/en

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.

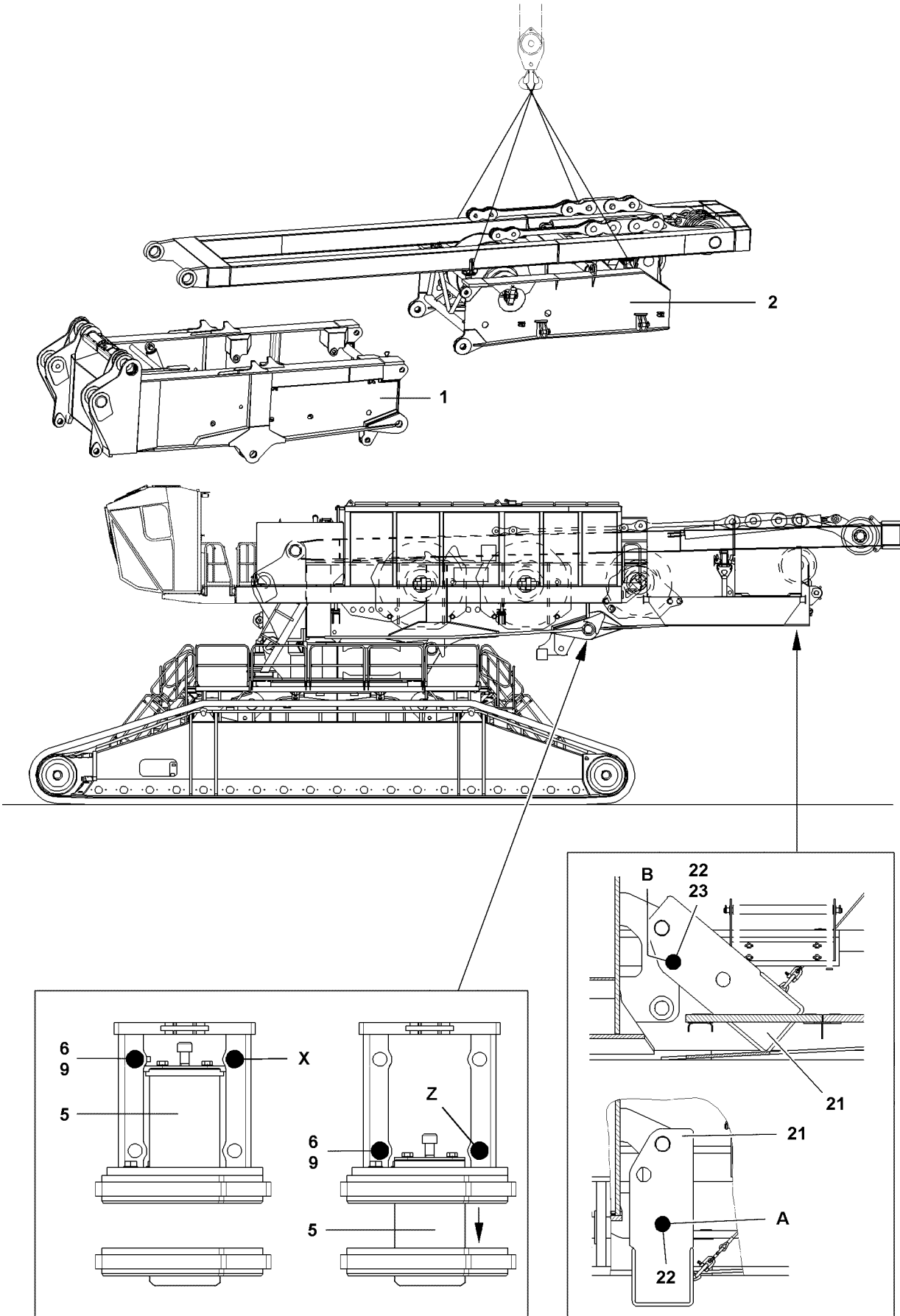


Fig.103303

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**.
-

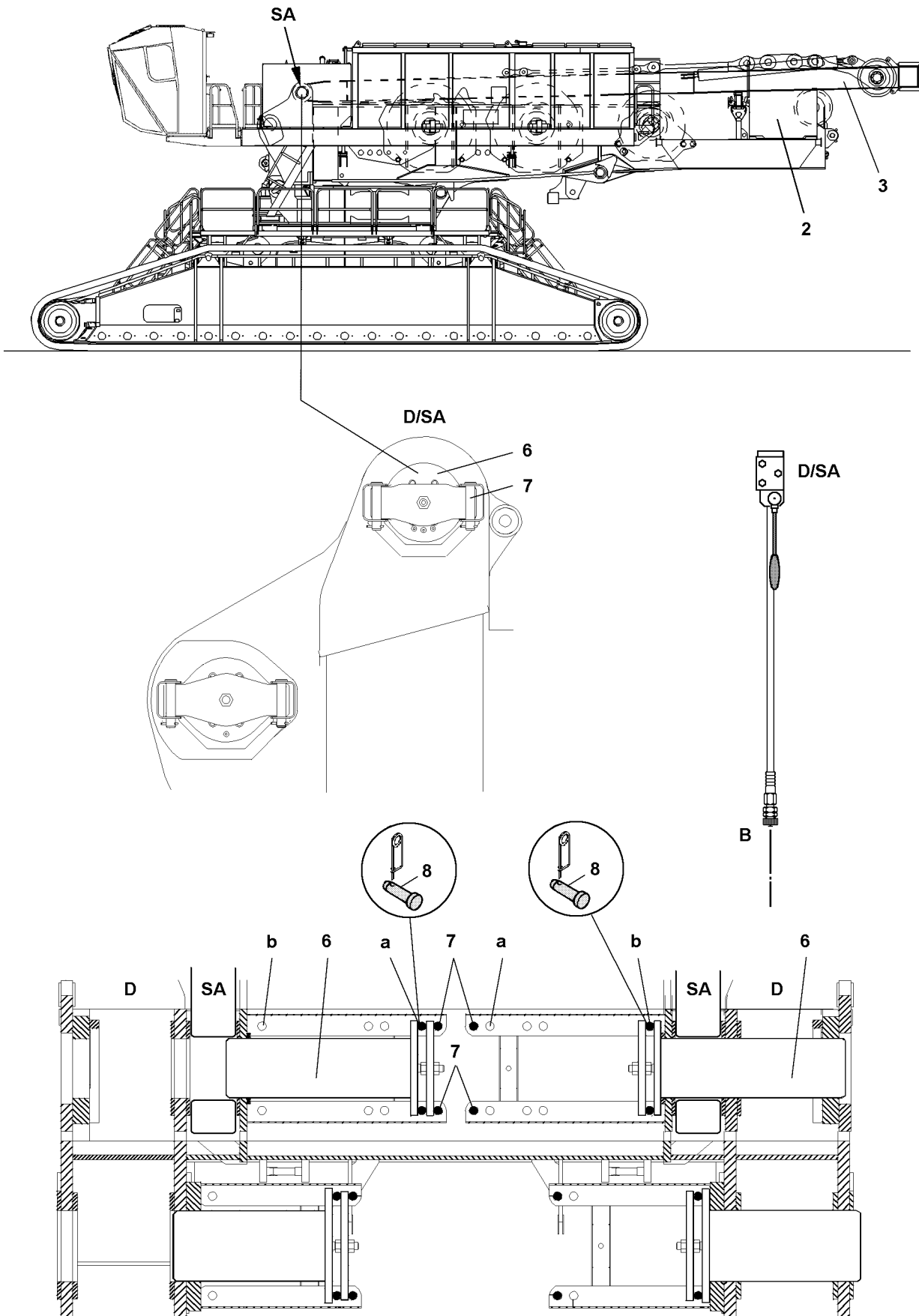


Fig.103304

LWE/LR 11350-007/19005-01-02/en

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.

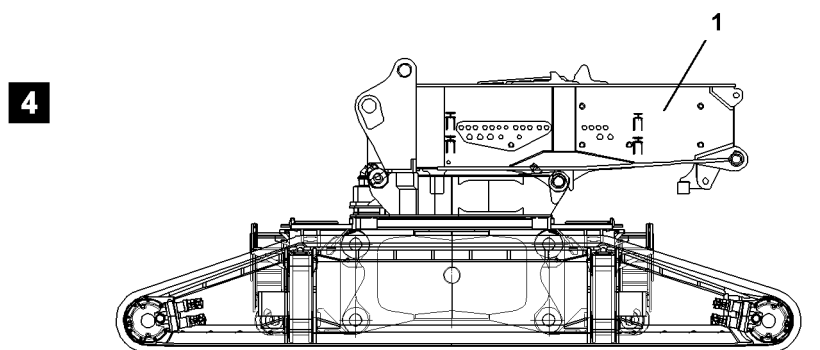
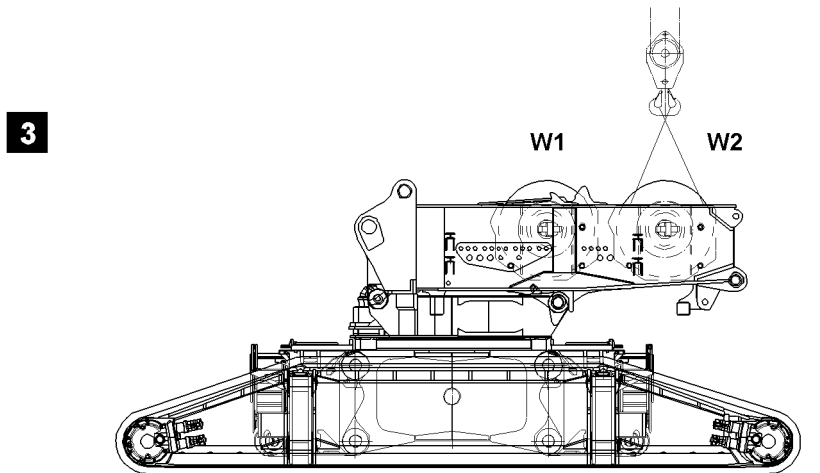
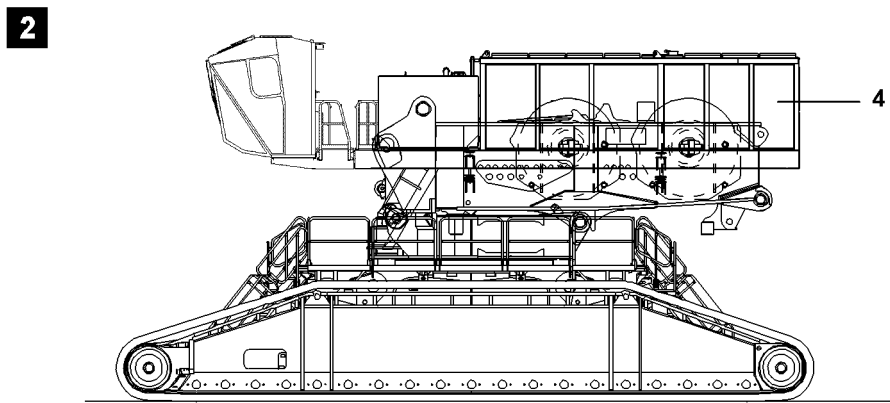
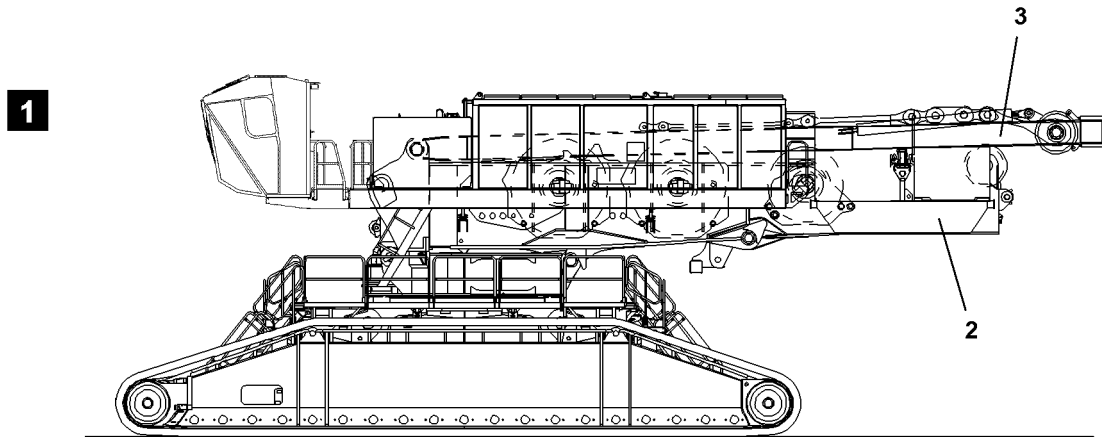


Fig.103305

LWE/LR 11350-007/19005-01-02/en

4 Disassembly



DANGER

Risk of accident!

During assembly and disassembly, personnel must be secured with appropriate antifaall 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**

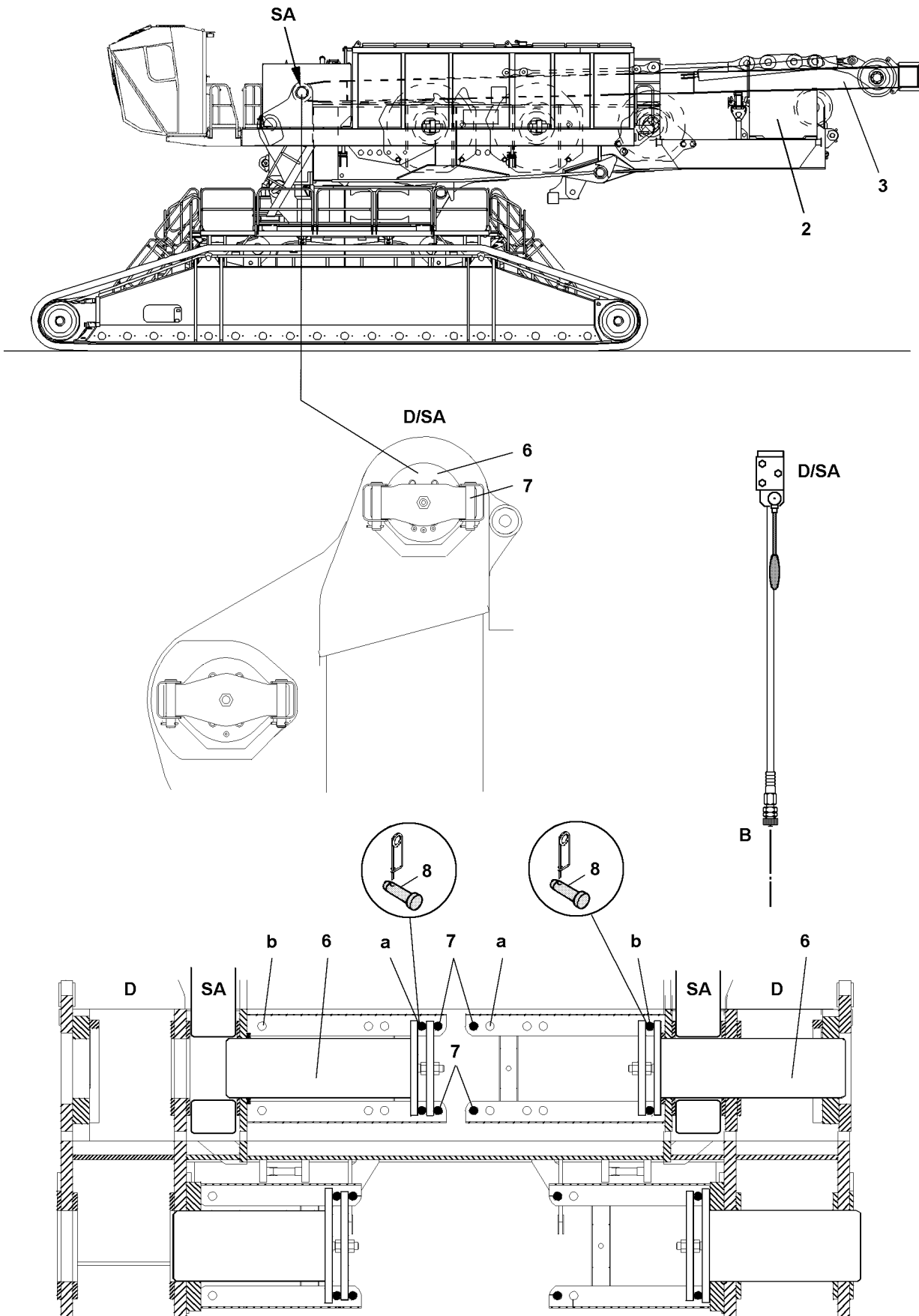


Fig.103304

LWE/LR 11350-007/19005-01-02/en

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.

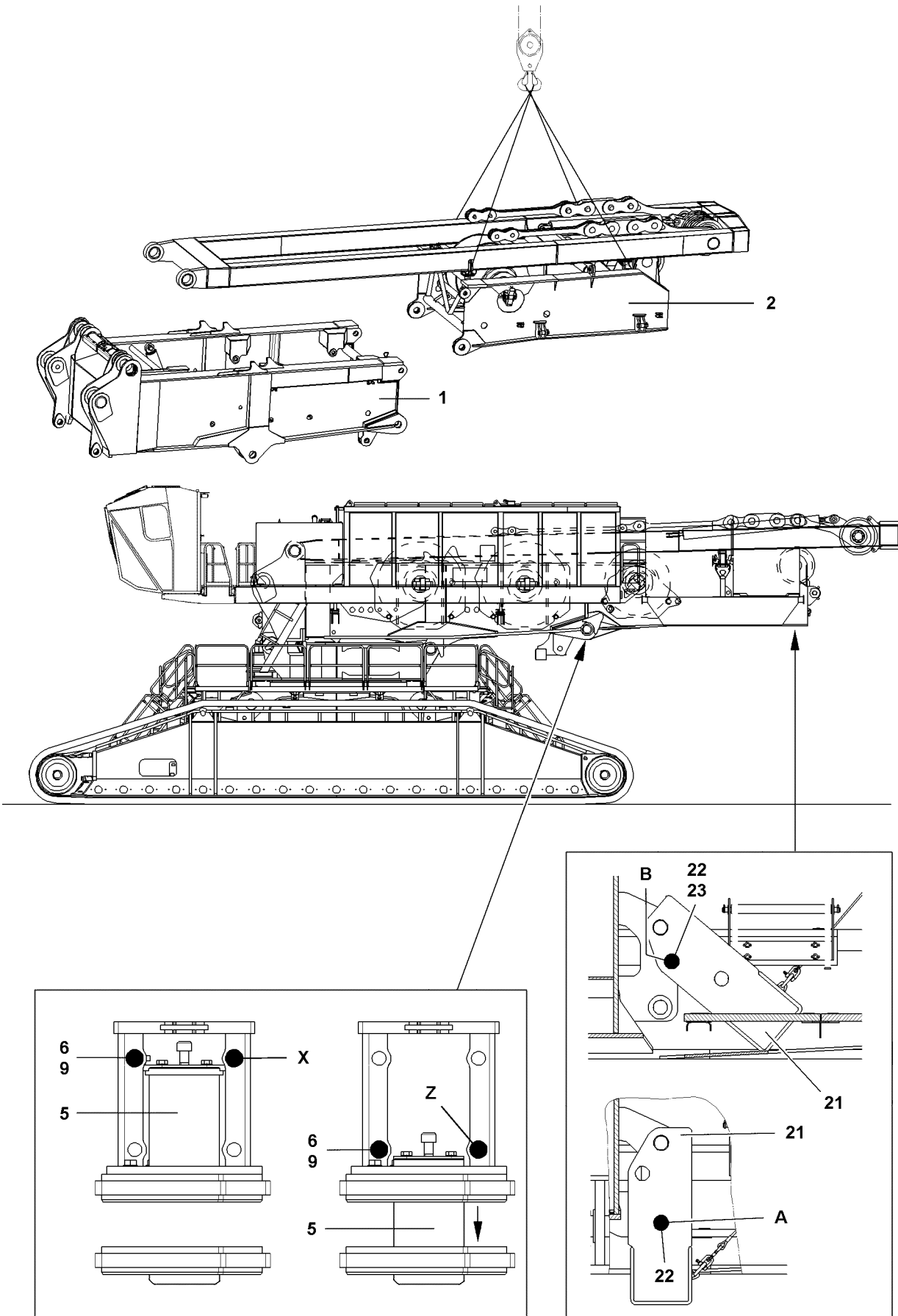


Fig.103303

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**.

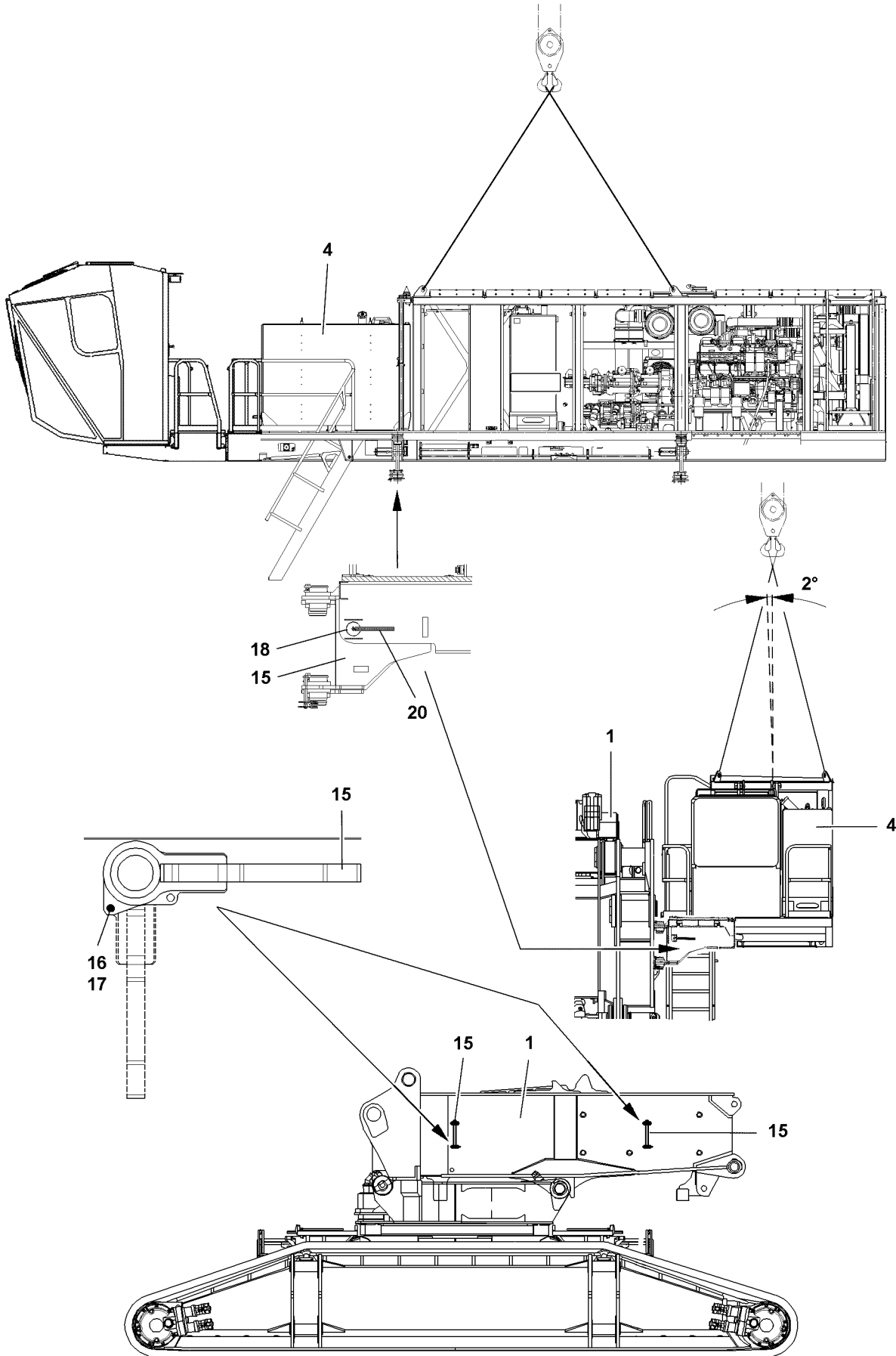


Fig.103306

LWE/LR 11350-007/19005-01-02/en

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**.

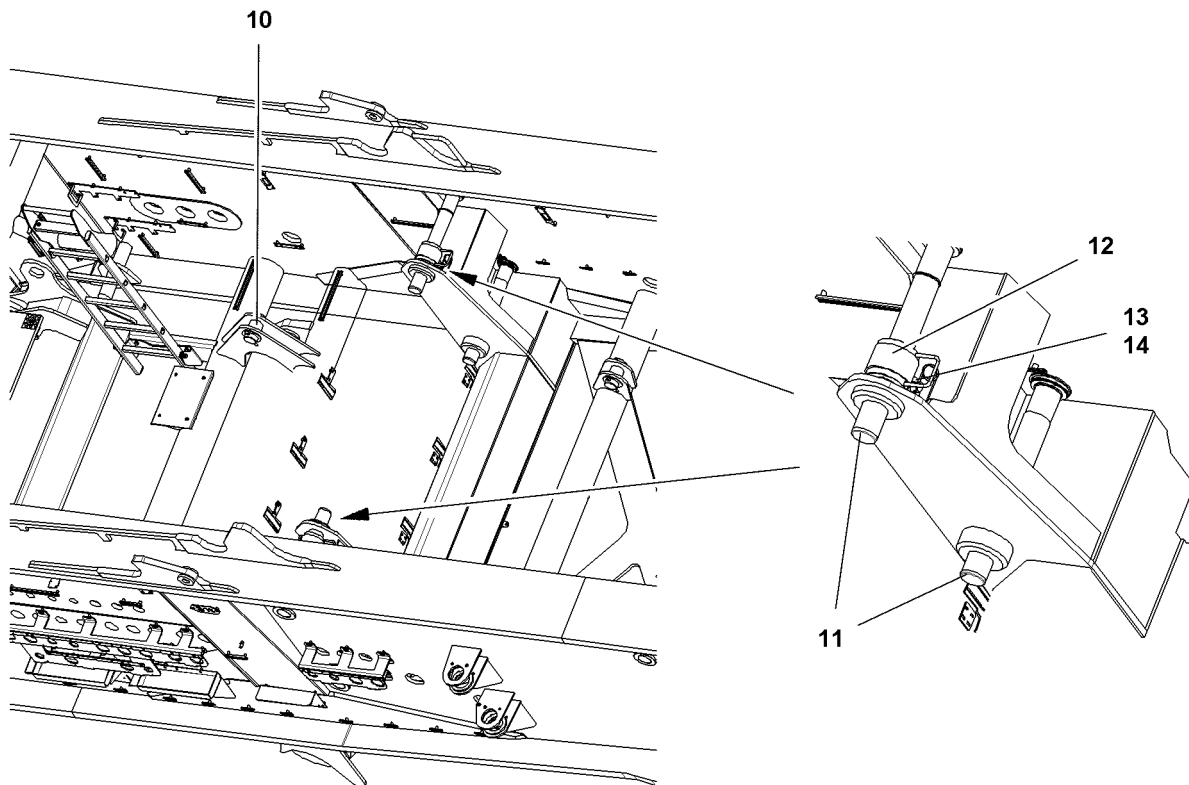
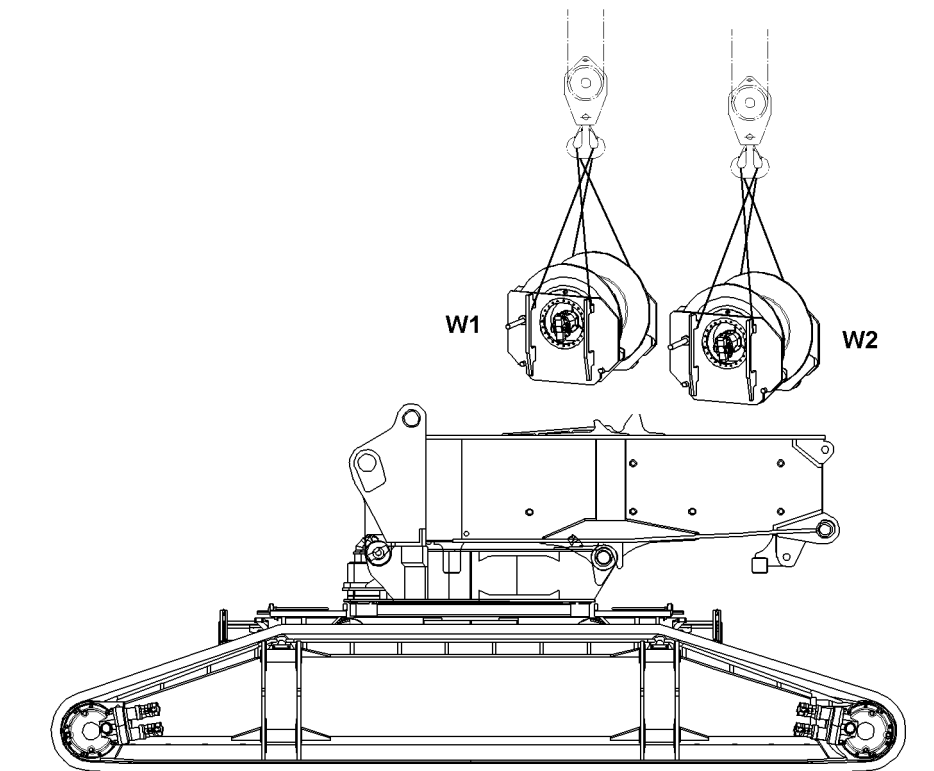


Fig.102732

LWE/LR 11350-007/19005-01-02/en

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.
-

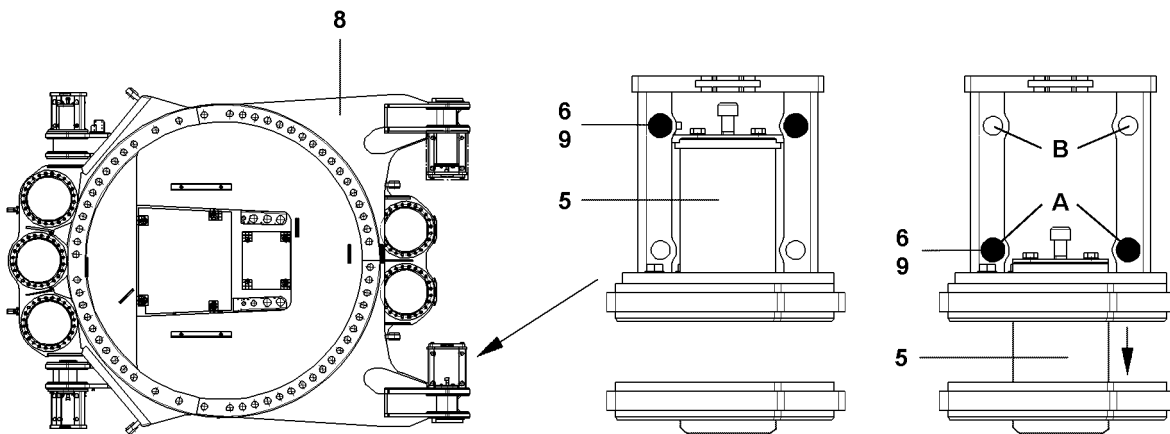
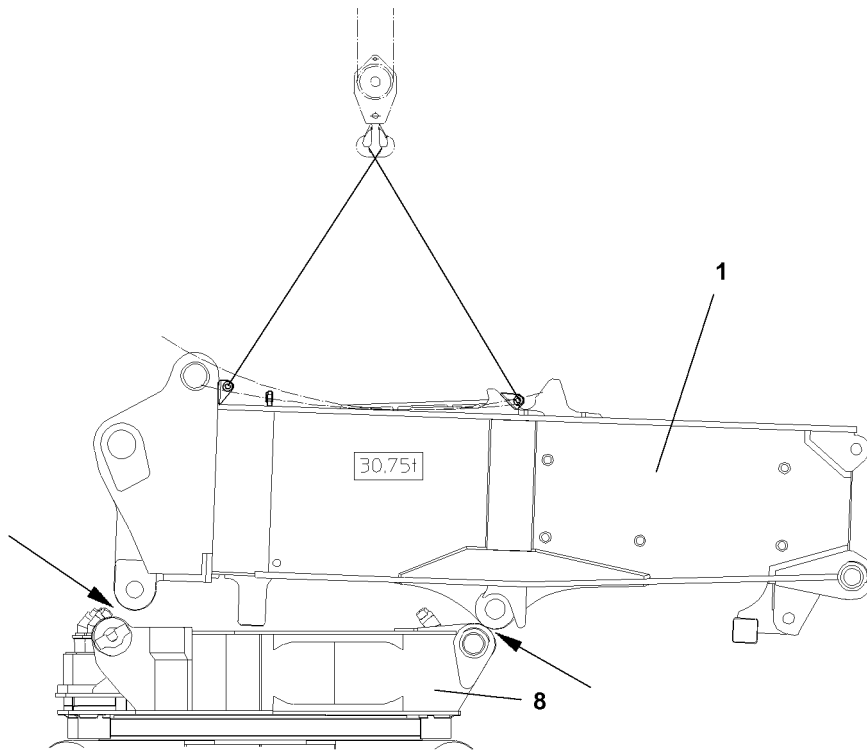
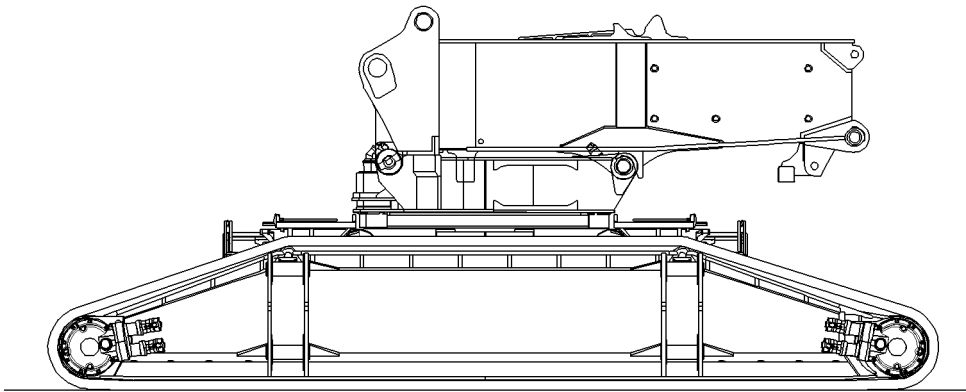


Fig.102763

LWE/LR 11350-007/19005-01-02/en

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.

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3.04 Mechanical auxiliary support

| | | |
|---|------------|---|
| 1 | Components | 3 |
| 2 | Assembly | 3 |

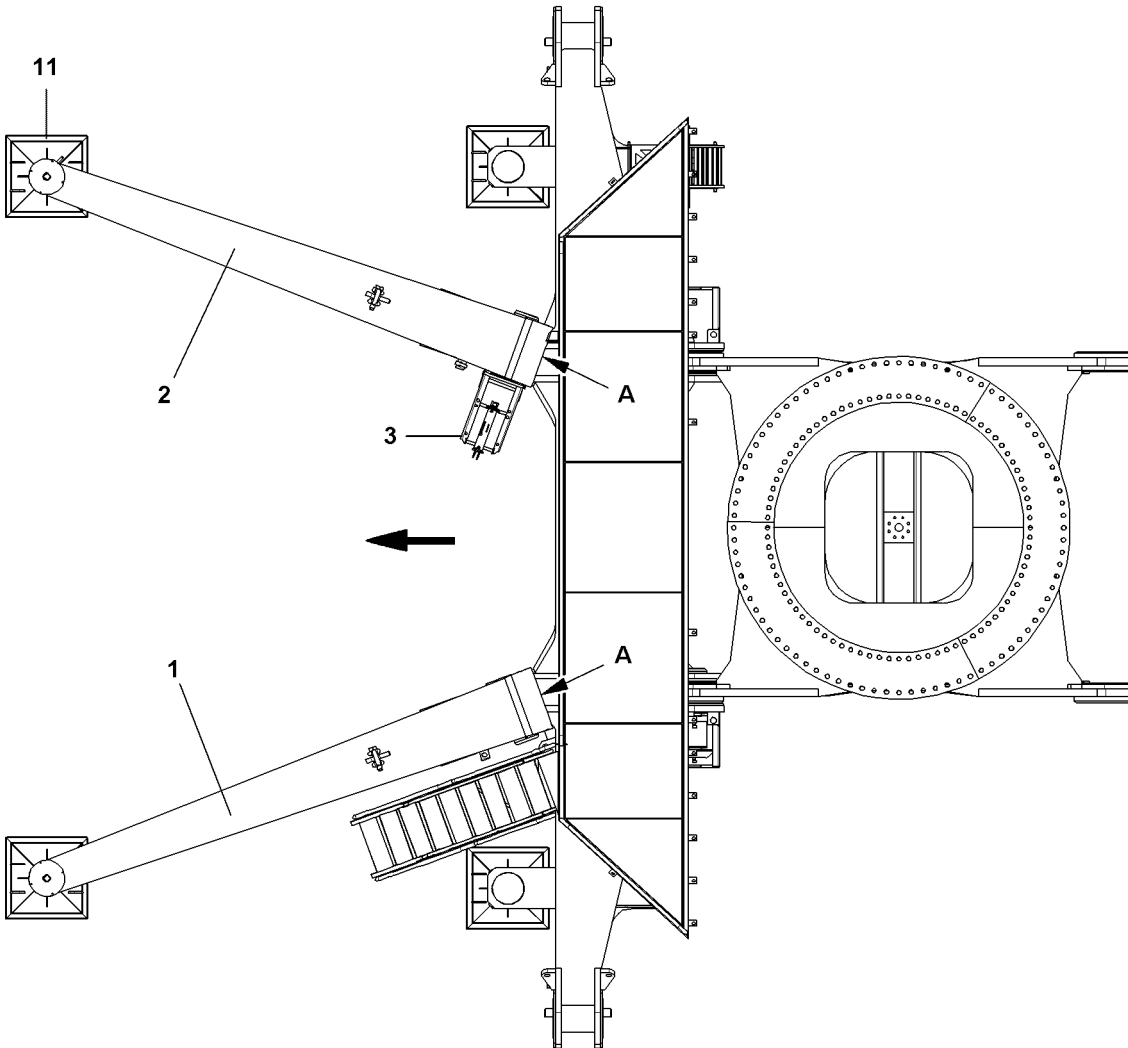
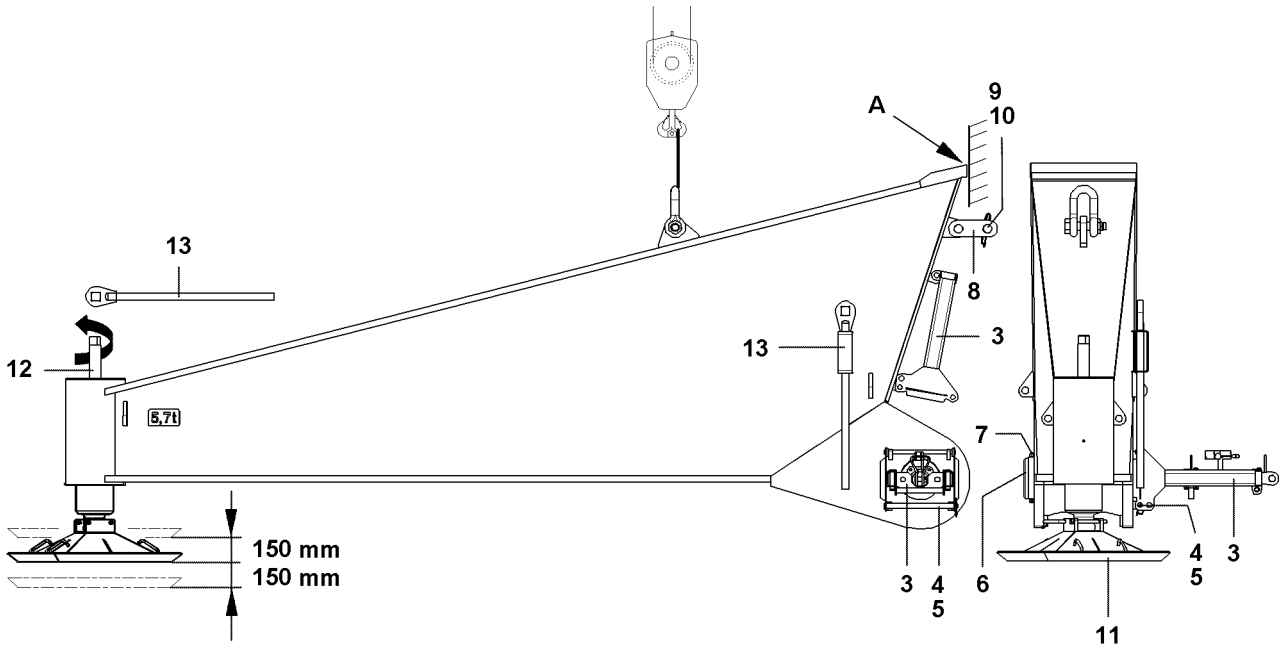


Fig.103423

LWE/LR 11350-007/19005-01-02/en

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**.

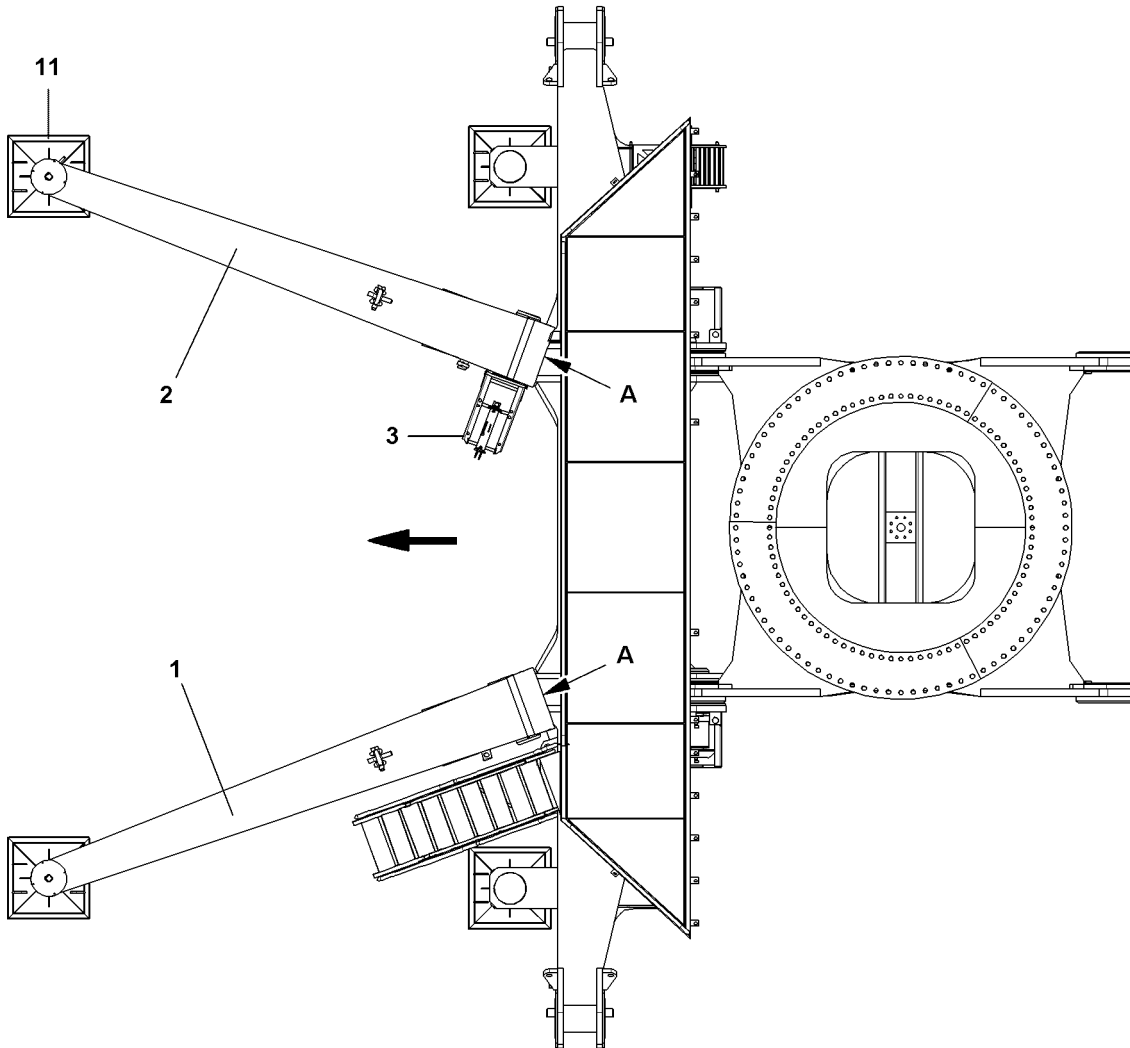
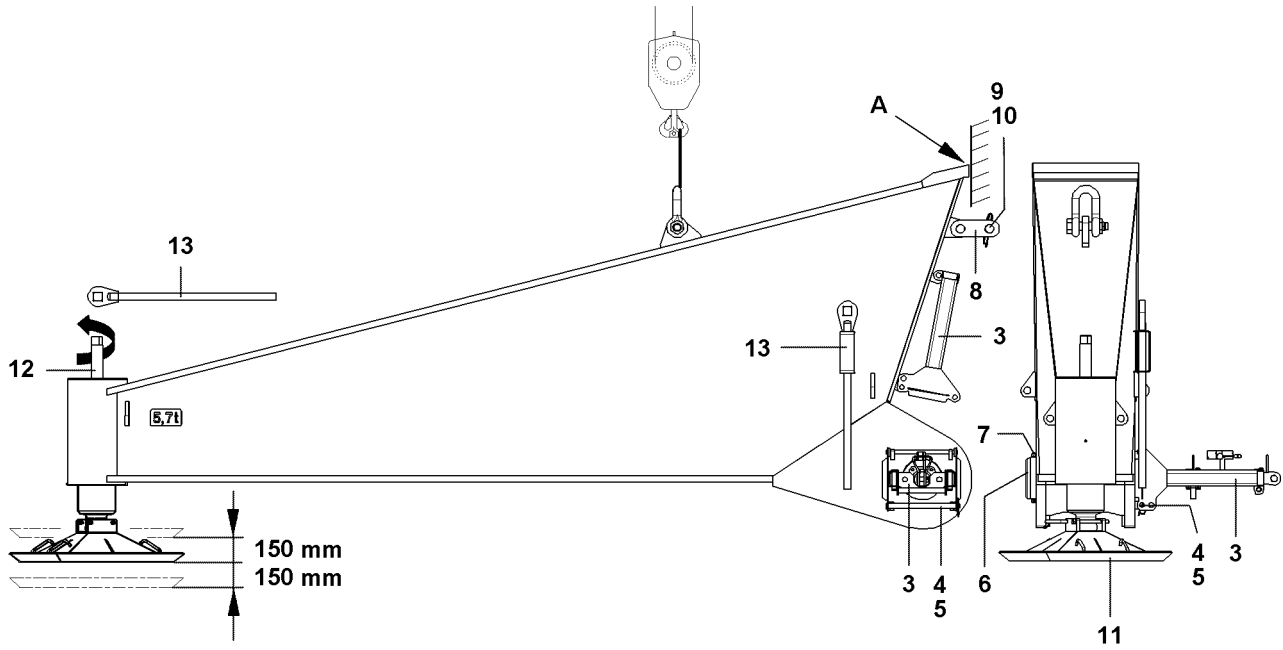


Fig.103423

LWE/LR 11350-007/19005-01-02/en

**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.

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4 Operation of crane superstructure

LWE/LR 11350-007/19005-01-02/en

LWE/LR 11350-007/19005-01-02/en

4.01 Operating and monitoring instruments on the crane superstructure

| | | |
|---|---------------------------------------|----|
| 1 | General operating elements | 3 |
| 2 | Instrument panel operating elements | 5 |
| 3 | Control panel operating elements | 15 |
| 4 | Camera monitoring | 25 |
| 5 | Power aggregate operating elements | 29 |
| 6 | Engine compartment operating elements | 29 |

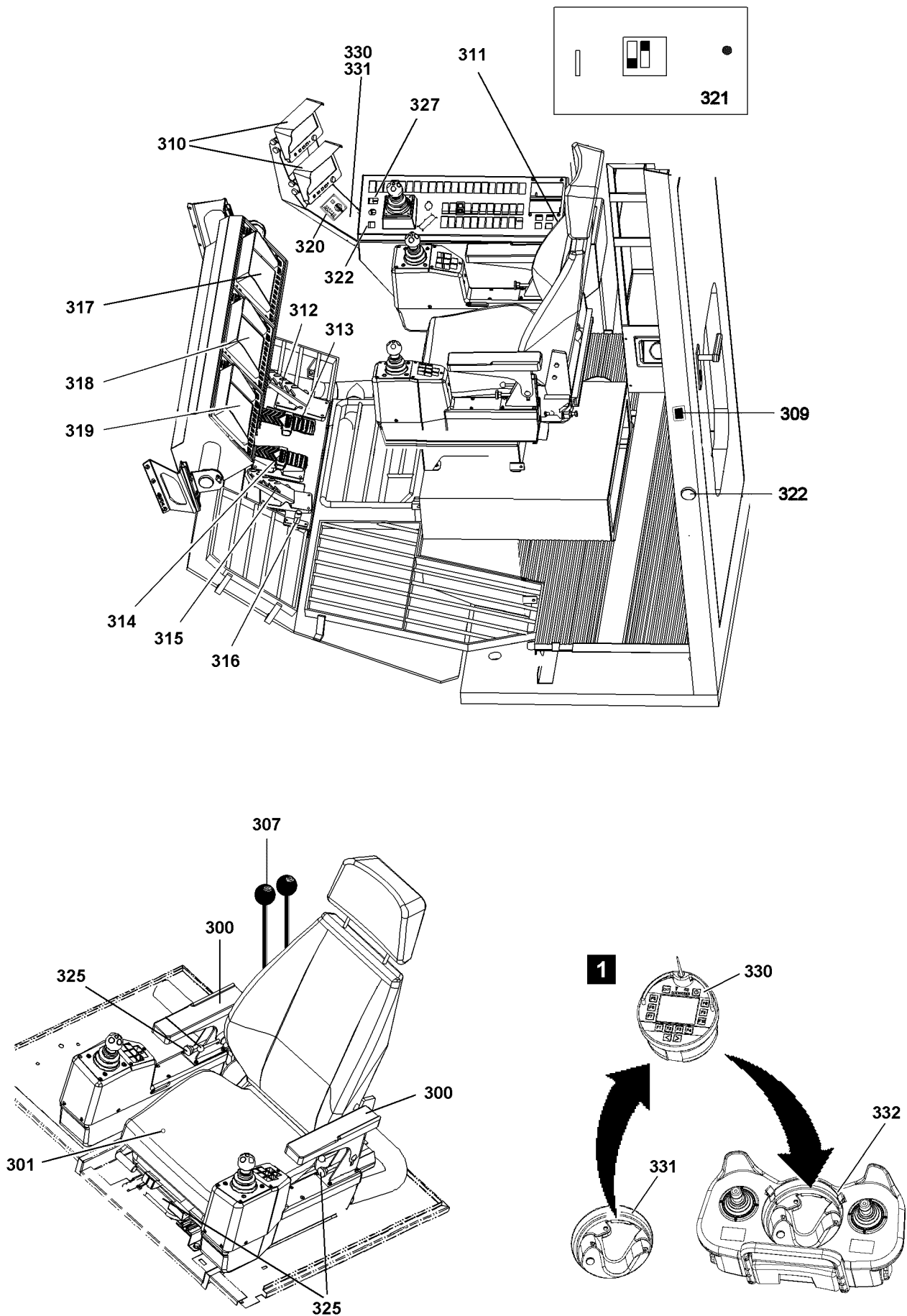


Fig.156322

LWE/LR 11350-007/19005-01-02/en

1 General operating elements

- 300** Armrest
- 301** Seat contact button
- 307** Manual control lever
 - Insert the manual control lever in the foot rocker **313** and foot rocker **314**.
 - Drive the crawler forward or backward on the left hand side
 - Drive the crawler forward or backward on the right hand side
- 309** Switch
 - Cab lighting
- 310** Monitors
 - Camera monitoring
- 311** Socket 24 V
- 312** Pedal
 - Engine regulation
- 313** Foot rocker (MS 5)
 - Drive the crawler forward or backward on the right hand side
- 314** Foot rocker (MS 4)
 - Drive the crawler forward or backward on the left hand side
- 315** Pedal
 - Slewing gear foot brake
- 316** Foot button
 - Freewheeling slewing gear
- 317** LICCON monitor 0
- 318** LICCON monitor 1
- 319** LICCON monitor 2
- 320** Instrument box
 - Operating element for the power aggregate, section „Power aggregate operating elements“
- 321** Switch
 - Climate control system
- 322** EMERGENCY OFF switch
- 325** Seat operating elements
 - Adjust the seat, see chapter 4.03.
- 327** Operating hour meter
 - Diesel engine operating hour meter

Crane types with BTT, see illustration 1

- 330** BTT
 - Observe chapter 6.08 in the radio remote control operating instructions.
- 331** BTT charging cradle
- 332** Radio remote control panel

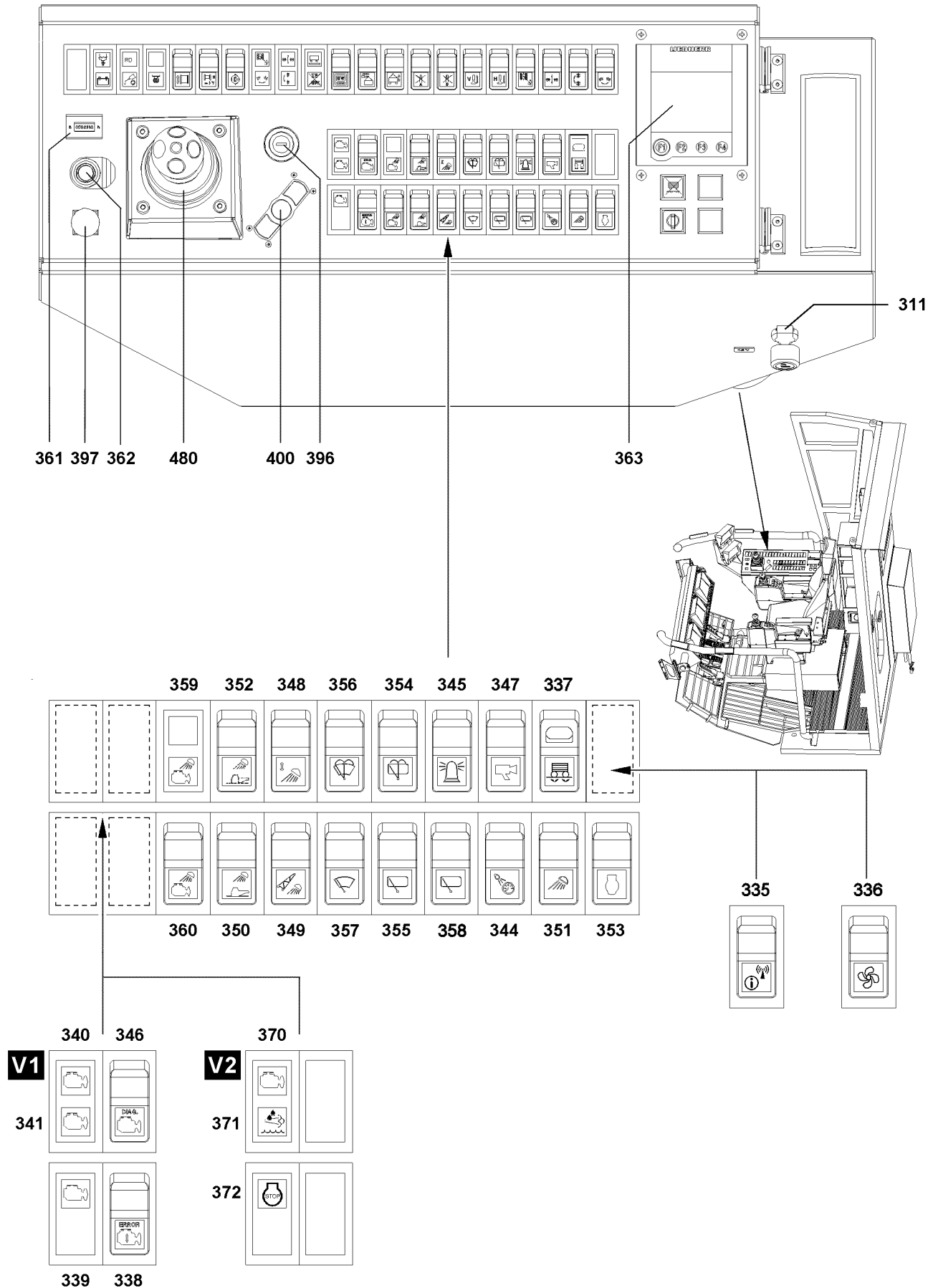


Fig.156313

LWE/LR 11350-007/19005-01-02/en

2 Instrument panel operating elements

2.1 Instrument panel I operating elements

- 335** Switch
 - GSM module remote diagnostics, observe the diagnostics manual.
Note: Not present on all crane types.
- 336** Switch
 - Front window blower
Note: Not present on all crane types.
- 337** Switch
 - Ballast trailer drive
- 344** Switch
 - Instrument panel illumination, reading light
- 345** Switch
 - Airplane warning light
- 347** Switch
 - Camera lighting
 - Position 1:
 - Winch 3, winch 5, winch 6 lighting
 - Position 2:
 - Winch 1 to winch 6 lighting
 - Lighting to the rear
- 348** Button*
 - Boom pivot section floodlight height adjustment
- 349** Switch*
 - Floodlight on the boom pivot section
- 350** Switch*
 - Turntable lighting, center section access
- 351** Switch*
 - Lighting, platform, rear cab
- 352** Button
 - Lighting, center section access
 - When the engine is turned off, the lighting is limited to 5 minutes.
- 353** Switch
 - Turntable socket
- 354** Button
 - Window washer system - roof window
- 355** Switch
 - Window wiper roof window, 2 stages: 1 intermittent, 2 wipe
- 356** Button
 - Window washer system - front window

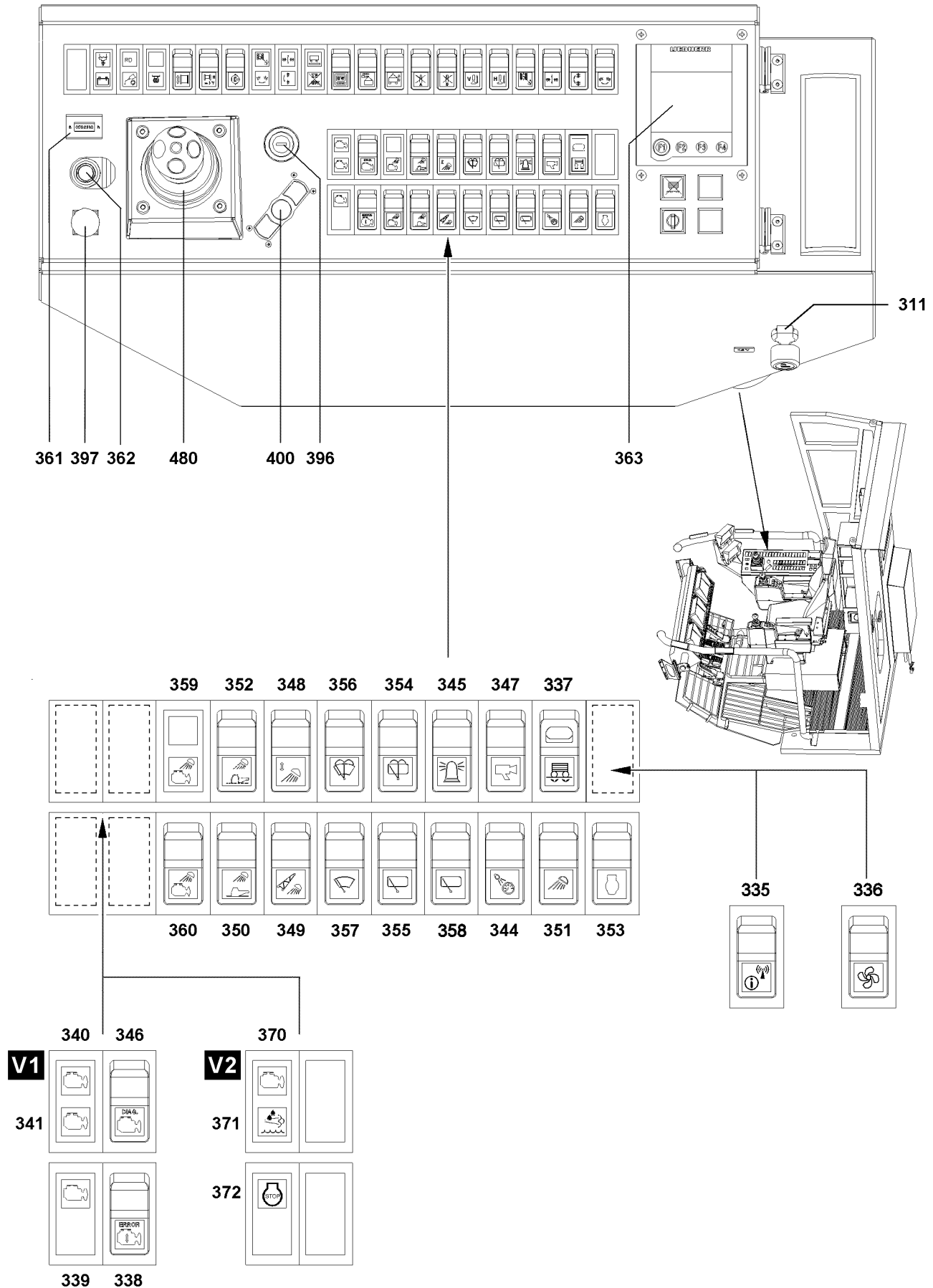


Fig.156313

LWE/LR 11350-007/19005-01-02/en

- 357** Switch
 - Window wiper - front window, 2 stages: 1 intermittent, 2 wipe
- 358** Switch
 - Window wiper - skylight
- 359** Indicator light
 - Control cabinet switch box and engine compartment lighting
- 360** Switch
 - Control cabinet switch box and engine compartment lighting
- 361** Operating hour meter
 - Recording of crane operating hours
- 362** Opener
 - Instrument panel
- 363** Touch display
 - Heater and climate control system, see chapter 6.01 / 6.02
For a detailed description see Chapter 6.01 / 6.02

2.2 Instrument panel I operating elements: Engine monitoring

Depending on the exhaust aftertreatment of the crane engine, engine monitoring variation **V1** or engine monitoring variation **V1** is installed.

NOTICE

Danger of severe engine damage!

If the engine monitoring reports a problem and / or warning occurrence, then you must react immediately and remedy the problem.

- ▶ React to problems and / or warning occurrences immediately and remedy the problem.
 - ▶ If necessary, stop crane operation and turn the engine off.
-

2.2.1 Engine monitoring variation V1

- 338** Button
 - Engine ERROR
 - Note:** Turn on the switch **346**, press the button **338** and search for the engine error.
- 339** Error code light
 - White, crane engine error message output, see the Crane operating instructions, chapter 7.15.
- 340** Error code light
 - Red, crane engine error message output, see the Crane operating instructions, chapter 7.15.
- 341** Error code light
 - Yellow, crane engine error message output, see the Crane operating instructions, chapter 7.15.
- 346** Switch
 - Engine DIAGNOSTICS

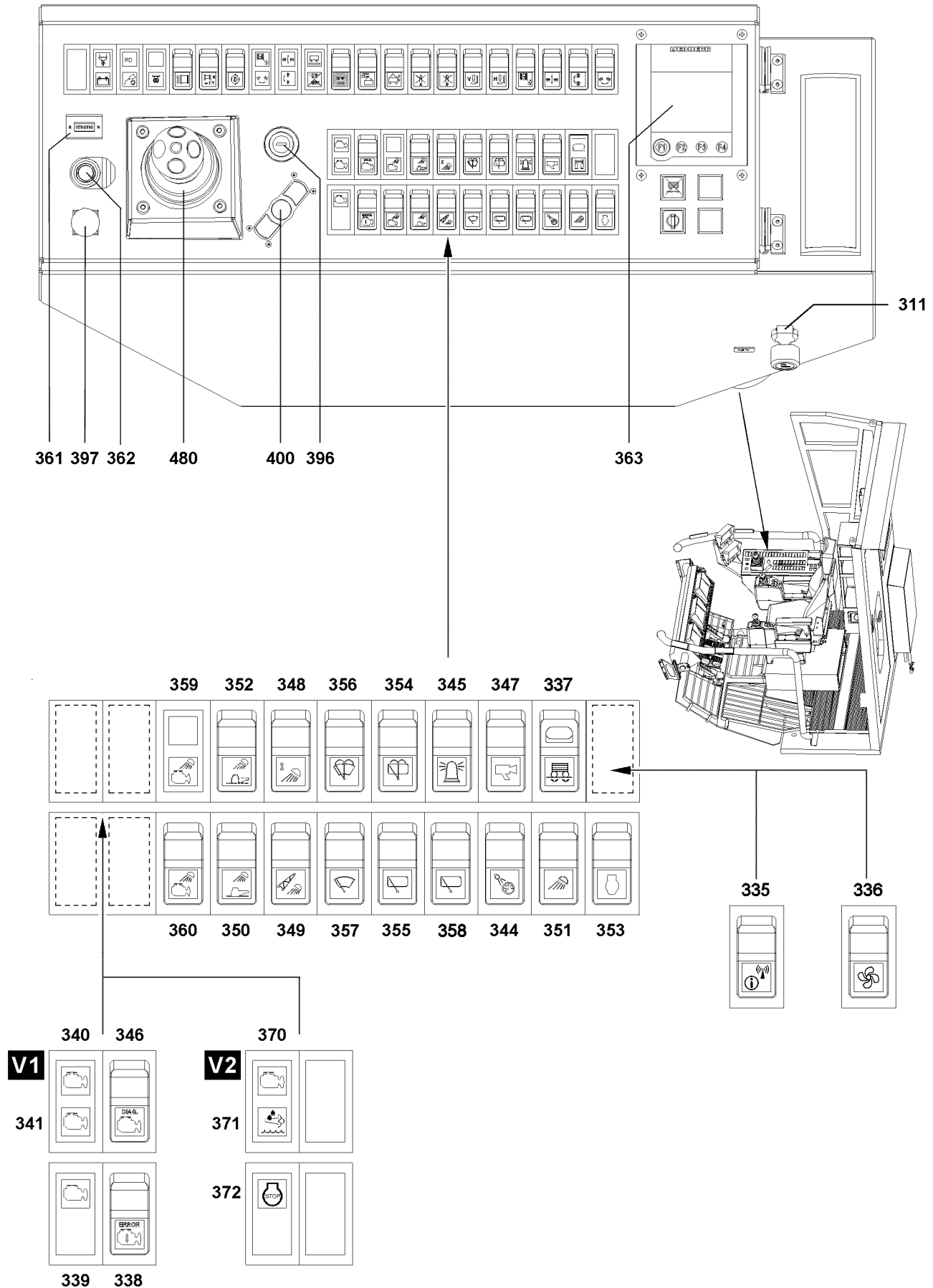


Fig.156313

LWE/LR 11350-007/19005-01-02/en

2.2.2 Engine monitoring variation V2



WARNING

Insufficient Urea in the Urea reservoir or malfunction in the SCR exhaust aftertreatment system!
Due to insufficient Urea level or faulty function in the SCR system, a reduction in engine power can be activated by the engine control or a start block of the engine can be triggered.

The crane operation can be limited.

- ▶ Add missing Urea in the Urea reservoir in time.
- ▶ Remedy faulty function in the SCR system immediately.
- ▶ Observe the national / regional regulations valid on the job site.

370 Exhaust aftertreatment / SCR indicator light

- Indicator light off: The exhaust aftertreatment reports no error
- Indicator light blinks: Advance warning: Exhaust aftertreatment, observe the error message.
- Indicator light on statically: Exhaust aftertreatment is no longer ensured, observe the error message.
- **Note:** Only for crane types with the SCR exhaust aftertreatment system

371 Urea / DEF indicator light

- Indicator light off: Urea is available.
- Indicator light on statically: Urea is getting low or faulty function of the exhaust aftertreatment, observe the error message.
Add urea or remedy the erroneous function of the exhaust aftertreatment.
- Indicator light blinks: Urea almost empty or faulty function of the exhaust aftertreatment, observe the error message.
Add urea immediately or remedy the faulty function of the exhaust aftertreatment.
- **Note:** Only for crane types with the SCR exhaust aftertreatment system

372 Engine stop request indicator light

- Indicator light off: No warning.
- Indicator light lights up / blinks: Turn off the engine, observe the error message, remedy the cause of the error

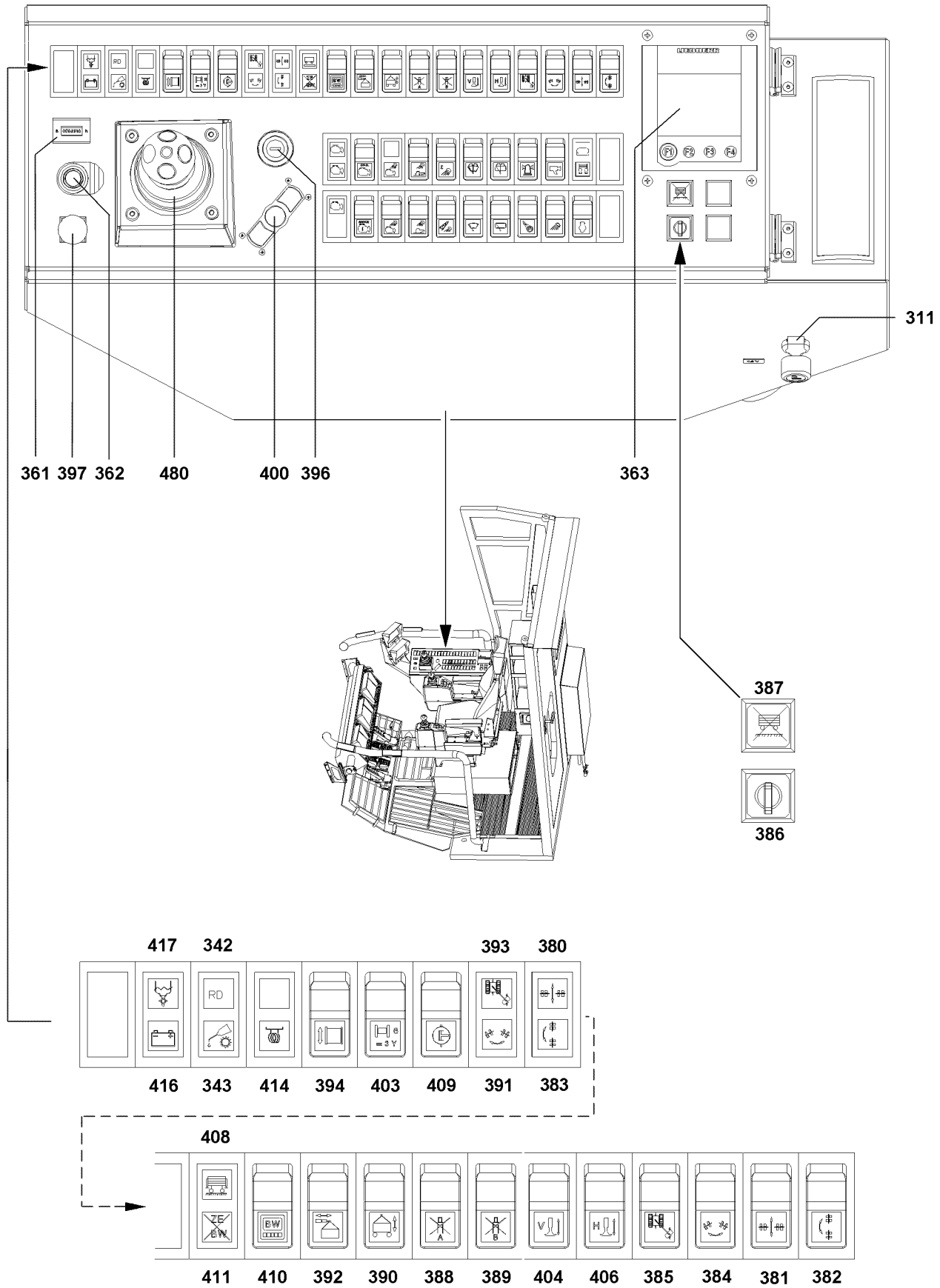


Fig.156314

LWE/LR 11350-007/19005-01-02/en

2.3 Instrument panel II operating elements

- 342** Indicator light
 - Slewing ring central lubrication problem
- 343** Indicator light
 - Slewing ring central lubrication operation
- 380** Indicator light
 - Ballast trailer wheels in the towing position
- 381** Button*
 - Turn the ballast trailer wheels into the 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 the ballast trailer wheels in the circular driving position
- 385** Button*
 - Turn the ballast trailer wheels in the parallel driving position
- 386** Key button
 - Ballast trailer lifted off, see Crane operating instructions, chapter 5.11.
 - 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.
 - 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 the circular driving position
- 392** Button*
 - Telescope the ballast trailer in and out
- 393** Indicator light*
 - Ballast trailer wheels in the parallel driving position

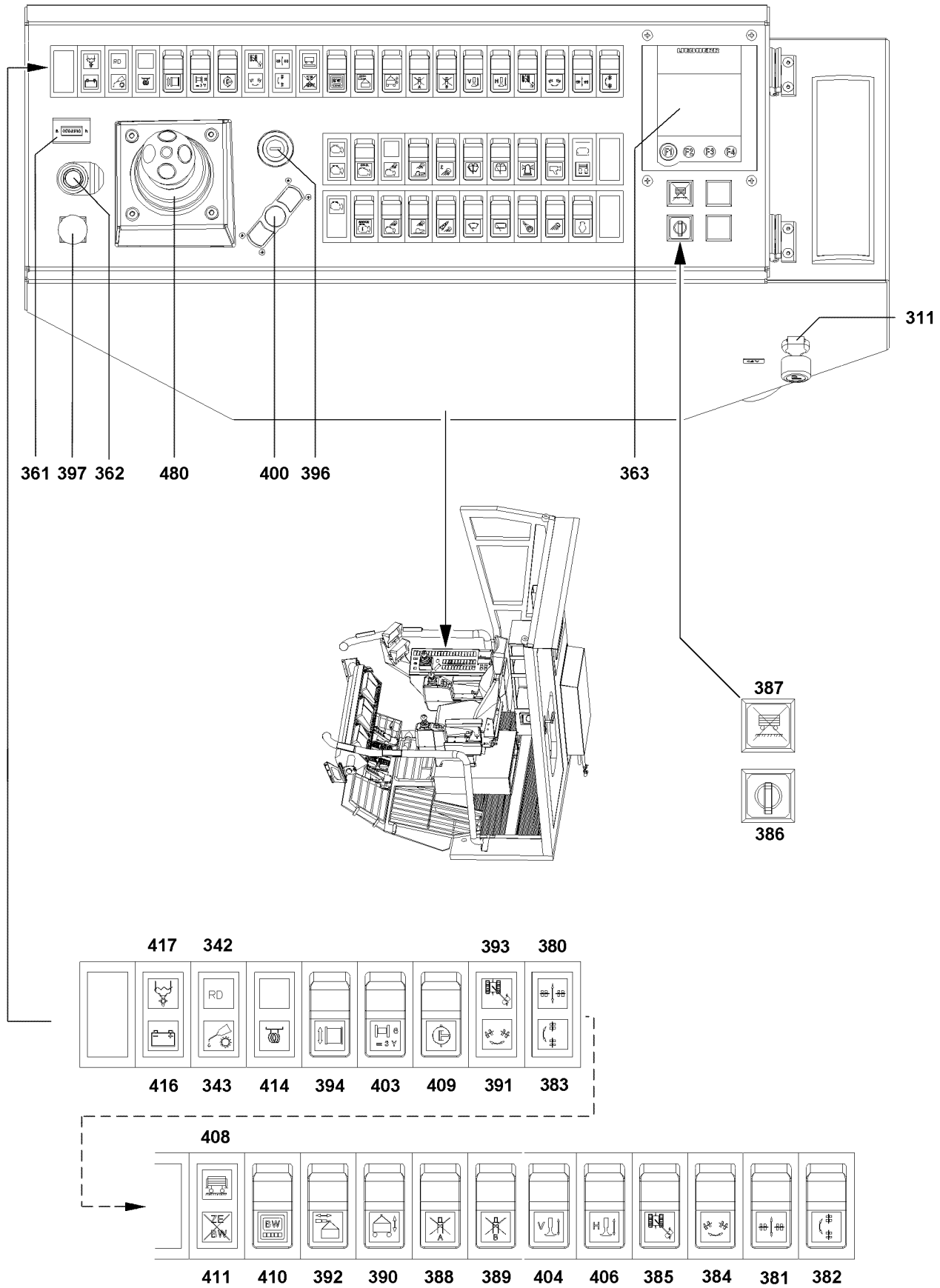


Fig.156314

LWE/LR 11350-007/19005-01-02/en

- 394** Button
 - Spool assembly winch up and out
- 396** Ignition switch
 - Engine
- 397** EMERGENCY OFF switch
- 400** Micro module (Mouse)
 - LICCON job planner operation
- 403** Switch
 - Assignment of winch 6 on master switch MS3y
- 404** Button*
 - Ballast trailer support cylinder front down and up
- 406** Button*
 - Ballast trailer support cylinder 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 ballast trailer control test system.
Note:
Can only be switched over when the engine is off.
- 411** Warning light*
 - Control ballast trailer is not running or one of the turn sensors or length sensors is defective or missing.
- 414** Warning light
 - Engine preheating, flame start system
- 416** Warning light
 - Charge monitoring
- 417** Indicator light
 - Fuel condensation drainage

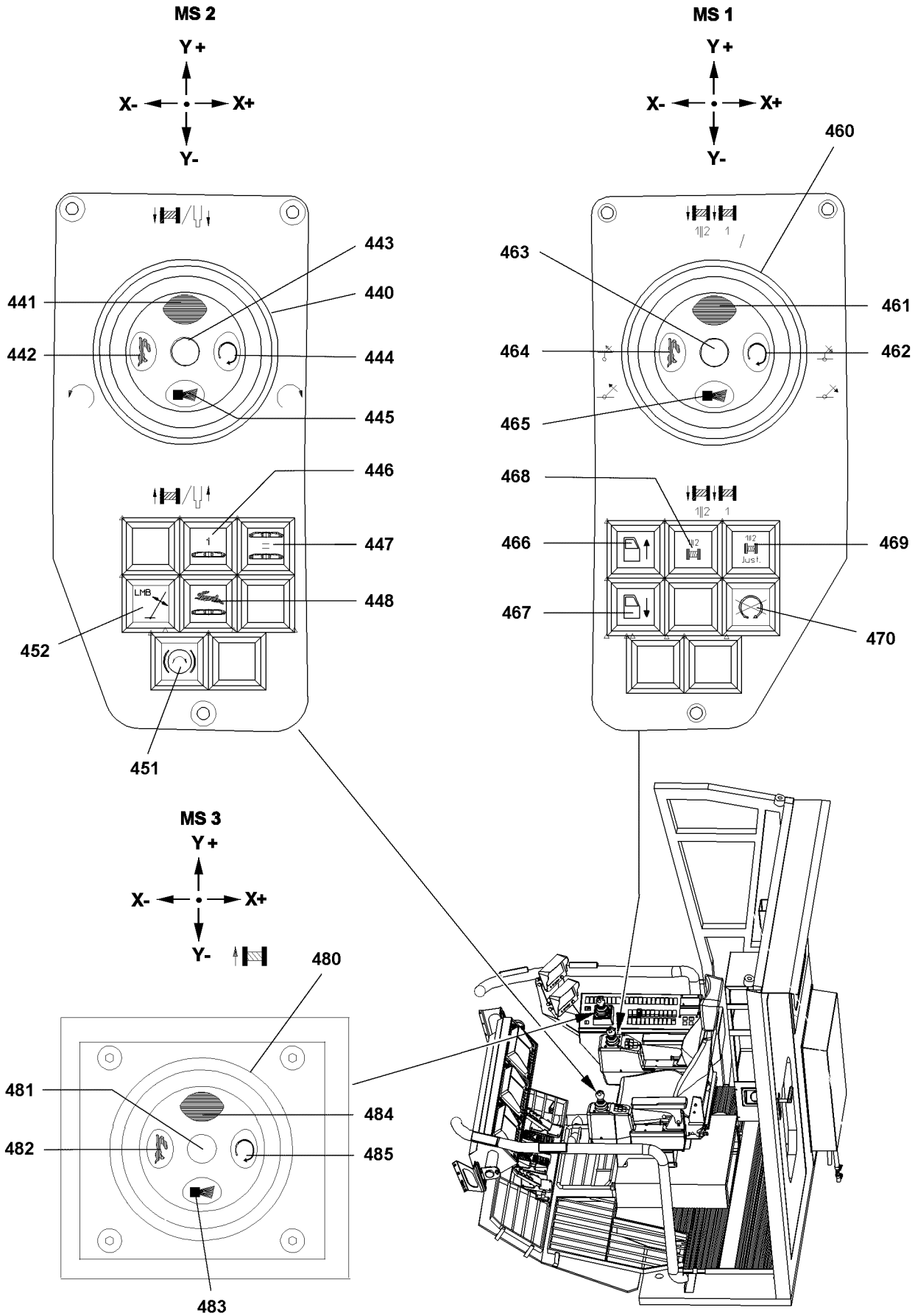


Fig.102768

LWE/LR 11350-007/19005-01-02/en

3 Control panel operating elements

**Note**

► There are two variations of the control panel operating elements.

3.1 Control panel operating elements variation 1

Control panel, left:

440 Left master switch (MS 2)

- **Note:**

For the assignment of master switches to operating modes, see the Crane operating instructions, chapter 4.05.

441 Button

- Bypass of the seat contact button. **Or** if the seat contact button is actuated: Activation of the vibration sensor **441**.

442 Button

- Power Plus addition, crane operation

443 Vibration sensor

- Turn sensor, slewing gear and winches

444 Button

- Engine rpm lock

- **Note:**

By pressing the button **444** the engine rpm is locked in the current state.

445 Button

- Horn

446 Switch **446** with indicator light

- Crawler operation On / Off

- **Note:**

The indicator light lights up when crawler operation is „ON“.

447 Switch **447** with indicator light

- Crawler parallel driving On / Off

- **Note:**

The indicator light lights up when crawler parallel travel is „on“.

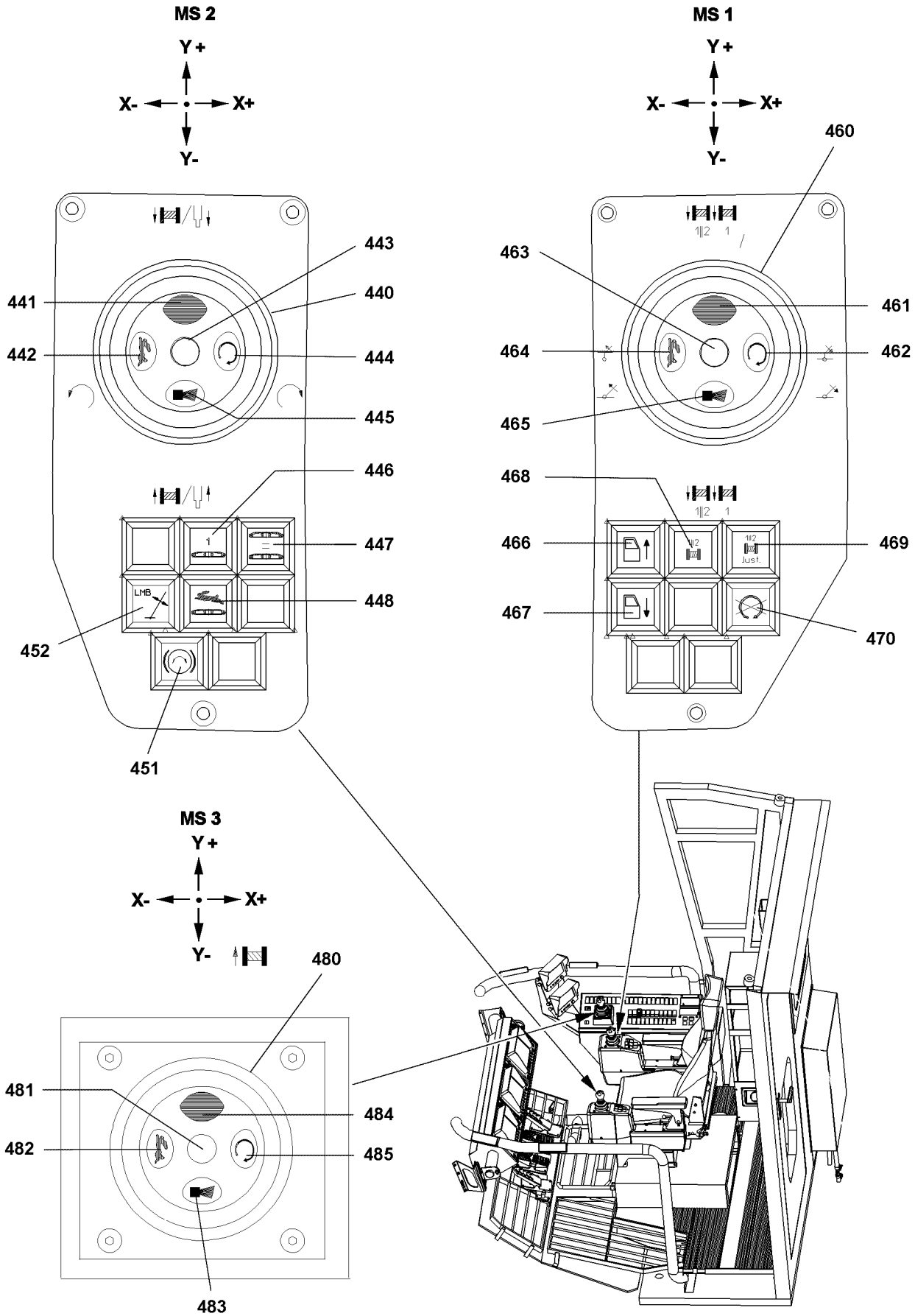


Fig.102768

LWE/LR 11350-007/19005-01-02/en

- 448** Switch **448** with indicator light
- Crawler rapid gear On / Off
- Note:**
The indicator light lights up when crawler rapid gear is „on“.
- 451** Switch **451** with indicator light
- Turn the slewing gear brake off / on
- Note:**
The indicator light lights up when the slewing gear brake is „On“.
- 452** Button
- „Luffing in with a suspended load“
Pressing the button releases „Luffing in with suspended load“.
- Danger:**
The exceedance of the overload protection may only be carried out if the overload with freely suspended load has been caused by a load moment increasing crane movement and the crane operator is absolutely certain that he can leave the overload range by „Luffing in with suspended load“. See the Crane operating instructions, chapter 4.20.

Control panel, right:

- 460** Master switch - right (MS 1)
- 461** Button
- Bypass of the seat contact button. **Or** if the seat contact button is actuated: Activation 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

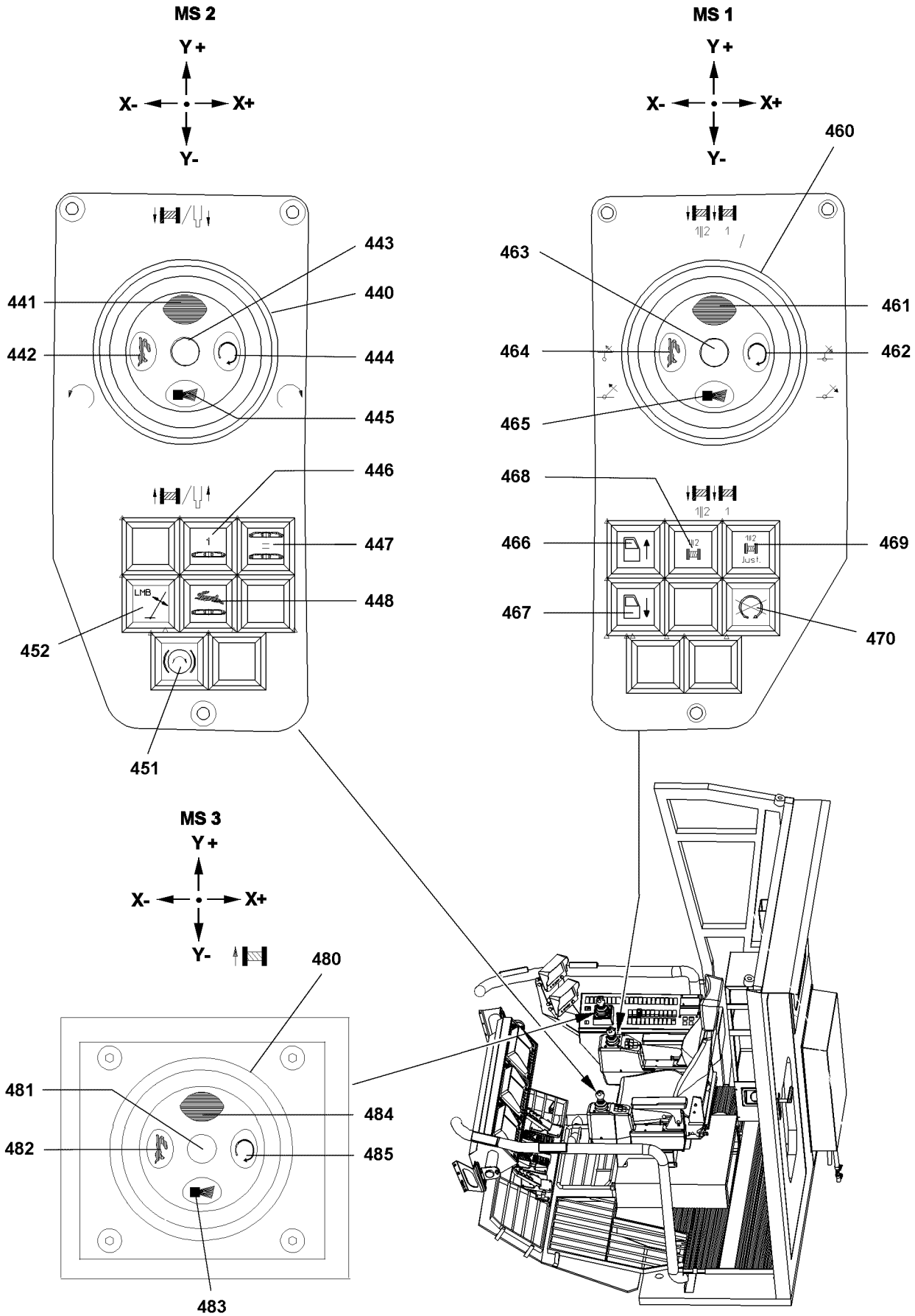


Fig.102768

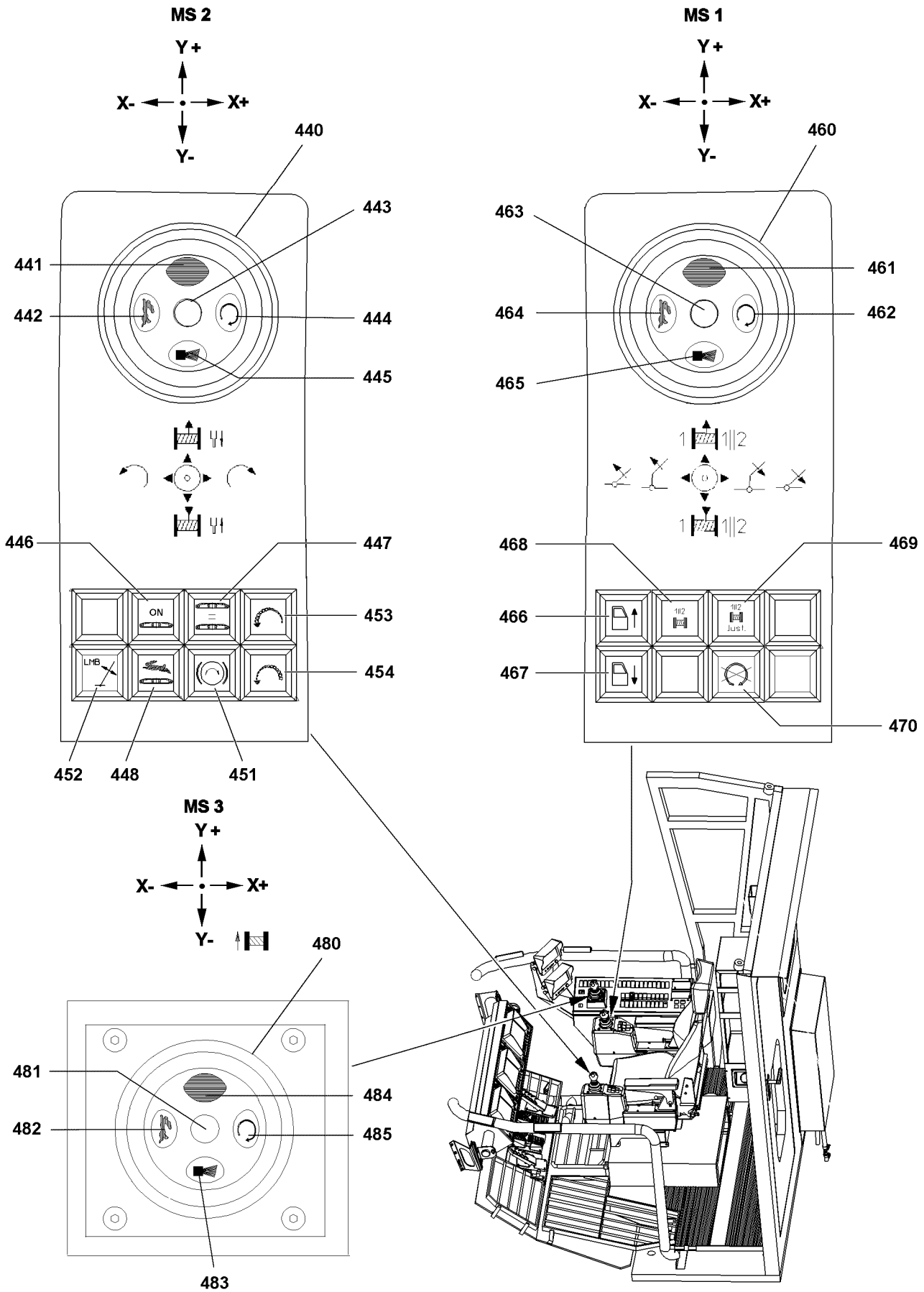
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- 466** Button
 - Tilting the cab upward
- 467** Button
 - Move the cab to the horizontal position
- 468** Switch **468** with indicator light
 - Winch 1 II 2 parallel operation

Note:
The indicator light lights up when winch 1 II winch 2 parallel operation is „On“.
- 469** Button
 - Adjust Winch 1 II winch 2 parallel control

Note:
Adjust only with parallel hook blocks, Winch 1 II winch 2 parallel control.
- 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 the seat contact button. **Or** if the seat contact button is actuated: Activation 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.



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3.2 Control panel operating elements variation 2

Control panel, left:

- 440** Left master switch (MS 2)
- **Note:**
For the assignment of master switches to operating modes, see the Crane operating instructions, chapter 4.05.
- 441** Button
- Bypass of the seat contact button. **Or** if the seat contact button is actuated: Activation of the vibration sensor **441**.
- 442** Button
- Power Plus addition, crane operation
- 443** Vibration sensor
- Turn sensor, slewing gear and winches
- 444** Button
- Engine rpm lock
- Note:**
By pressing the button **444** the engine rpm is locked in the current state.
- 445** Button
- Horn
- 446** Switch **446** with indicator light
- Crawler operation On / Off
- Note:**
The indicator light lights up when crawler operation is „ON“.
- 447** Switch **447** with indicator light
- Crawler parallel driving On / Off
- Note:**
The indicator light lights up when crawler parallel travel is „on“.
- 448** Switch **448** with indicator light
- Crawler rapid gear On / Off
- Note:**
The indicator light lights up when crawler rapid gear is „on“.
- 451** Switch **451** with indicator light
- Turn the slewing gear brake off / on
- Note:**
The indicator light lights up when the slewing gear brake is „On“.
- 452** Button
- „Luffing in with a suspended load“
Pressing the button releases „Luffing in with suspended load“.
- Danger:**
The exceedance of the overload protection may only be carried out if the overload with freely suspended load has been caused by a load moment increasing crane movement and the crane operator is absolutely certain that he can leave the overload range by „Luffing in with suspended load“. See the Crane operating instructions, chapter 4.20.

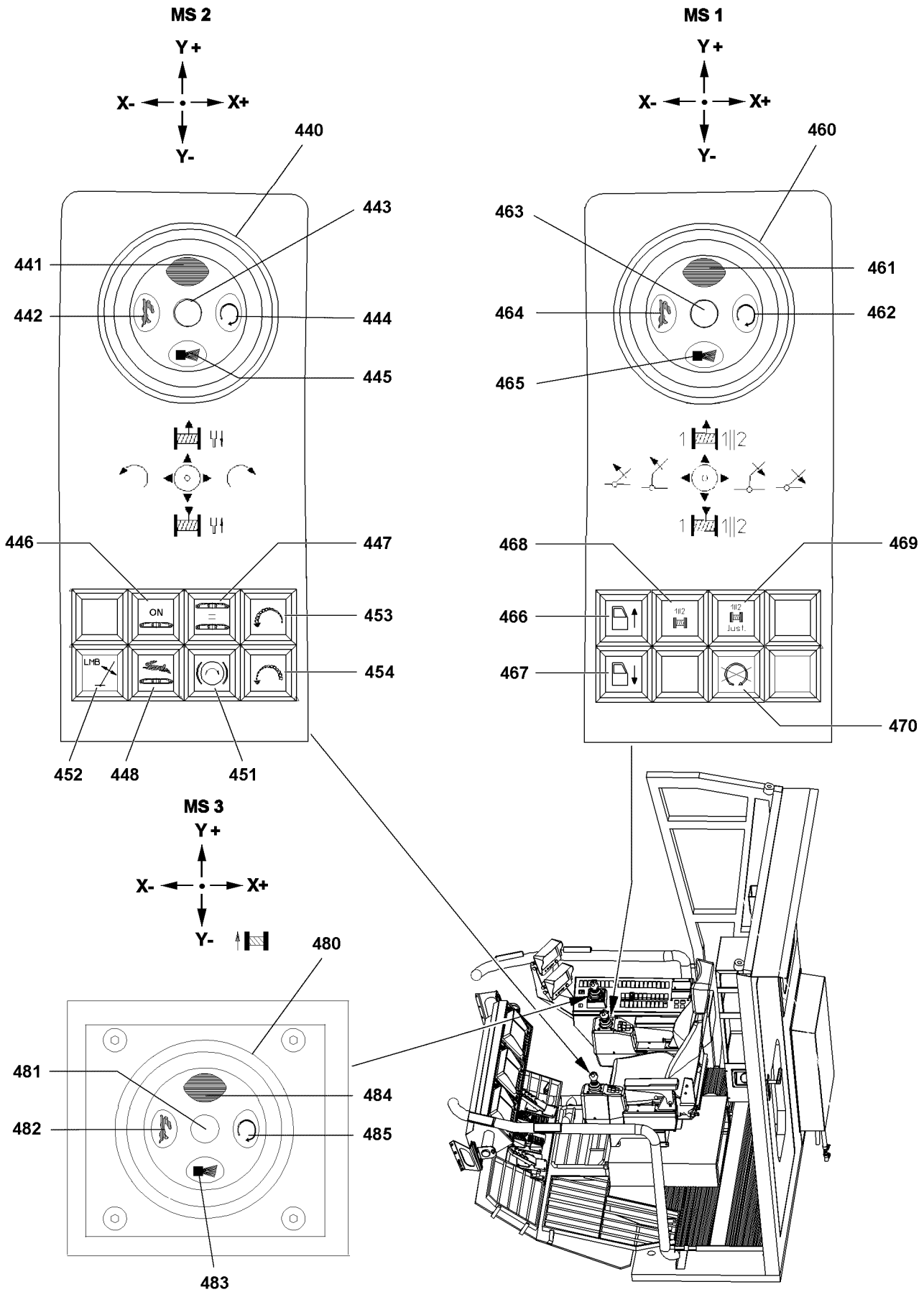


Fig.156315

LWE/LR 11350-007/19005-01-02/en

Control panel, right:

- 460** Master switch - right (MS 1)
- 461** Button
 - Bypass of the seat contact button. **Or** if the seat contact button is actuated: Activation 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 to the horizontal position
- 468** Switch **468** with indicator light
 - Winch 1 II 2 parallel operation
 - Note:**
The indicator light lights up when winch 1 II winch 2 parallel operation is „On“.
- 469** Button
 - Adjust Winch 1 II winch 2 parallel control
 - Note:**
Adjust only with parallel hook blocks, Winch 1 II winch 2 parallel control.
- 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 the seat contact button. **Or** if the seat contact button is actuated: Activation 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.

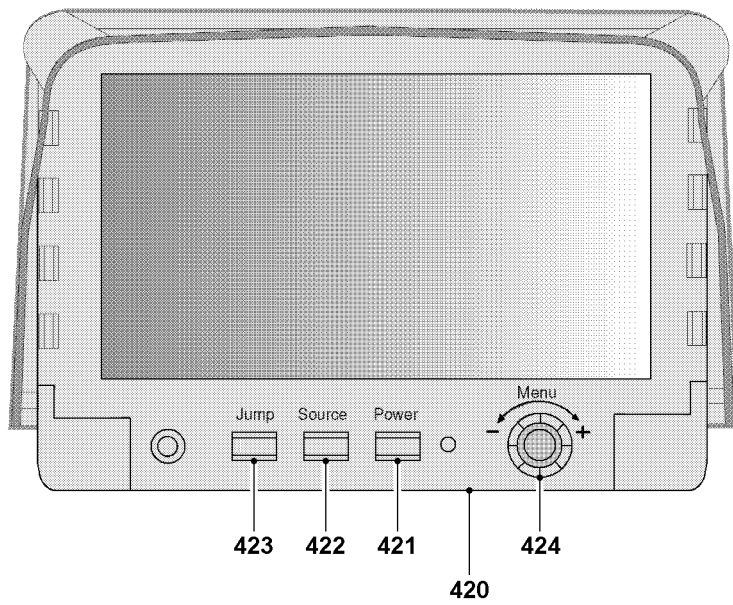


Fig.107376

4 Camera monitoring

4.1 Monitor with rotary selection switch

- 420 TFT monitor
- 421 „Power“ key
 - Monitor on / off
- 422 „Source“ key
 - By pressing the „Source“ key in turned on condition, the view on the monitor is changed
- 423 „Jump“ key
 - By pressing the „Jump“ key, the preset camera inputs can be selected
- 424 Selection knob / pressure switch
 - The selection menu on the monitor is activated by pressing the selection knob / pressure switch
 - Note:**
If no adjustments are made after activation of the 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 „Screen adjustments“ menu.

- Brightness control, contrast, color, tint, automatic brightness control, direction display

- **OSD adjustments**

- **Note:**

The following adjustments can be made in the „OSD adjustments“ menu.

- Display, distance display

- **Camera adjustments**

- **Note:**

The following adjustments can be made in the „Camera adjustments“ menu.

- Reflection, change over, video output
- **Reset**
 - The display is reset to default settings
- **Output**
 - OSD selection is ended

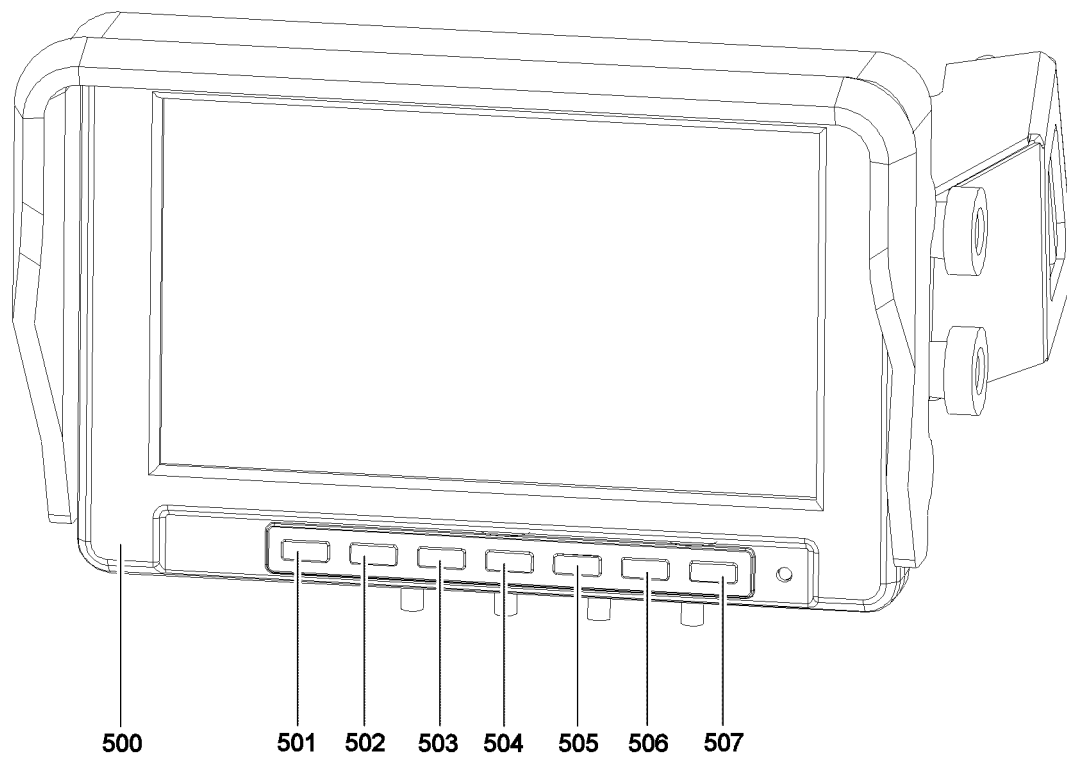


Fig.107370

4.2 Monitor with keypad

- 500** TFT monitor
- 501** Key
 - Monitor on / off
- 502** „MODE“ button
 - 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, brightness, contrast, works setting, volume, language, reflection
 - Return to the main menu with „Enter“. End menu with „End“.
- 505** „Minus“ key
 - By pressing the „Minus“ button, the value of a setting is reduced.
- 506** „Plus“ key
 - By pressing the „Plus“ button, the value of a setting is increased.
- 507** Button „Change between day / night“
 - Press the „Change between day / night“ button to match the brightness of the display to the time of day.

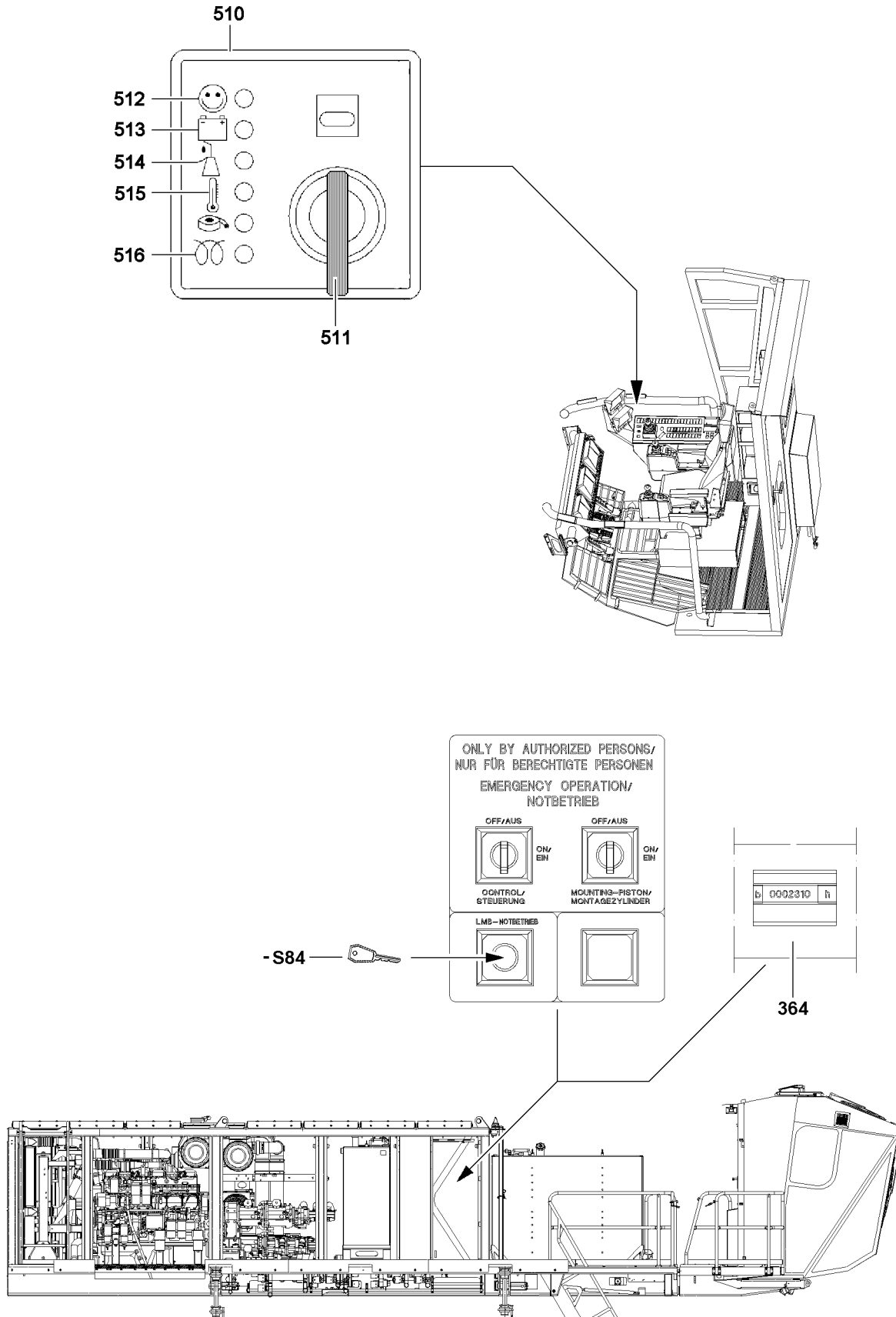


Fig.113008

5 Power aggregate operating elements

- 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.

6 Engine compartment operating elements

- 364** Operating hour meter
 - Recording of crawler operating hours
- S84** Key switch
 - LMB emergency operation

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4.02 LICCON computer system

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Fig. 199898

1 General



Note

- ▶ The monitor illustrations in this chapter are only examples!
- ▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly!
- ▶ Numbers and letters can be replaced by place holders!
- ▶ In addition, many of the illustrations show the maximum configuration of the LICCON monitor with icons!
- ▶ During 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 torque limiter = **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:

- Set up program
- Crane operation program
 - Crane operation program on monitor 0
 - Crane operation program on monitor 1
- Control parameter program
- Engine monitoring program
- LICCON computer system in stand-by mode

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

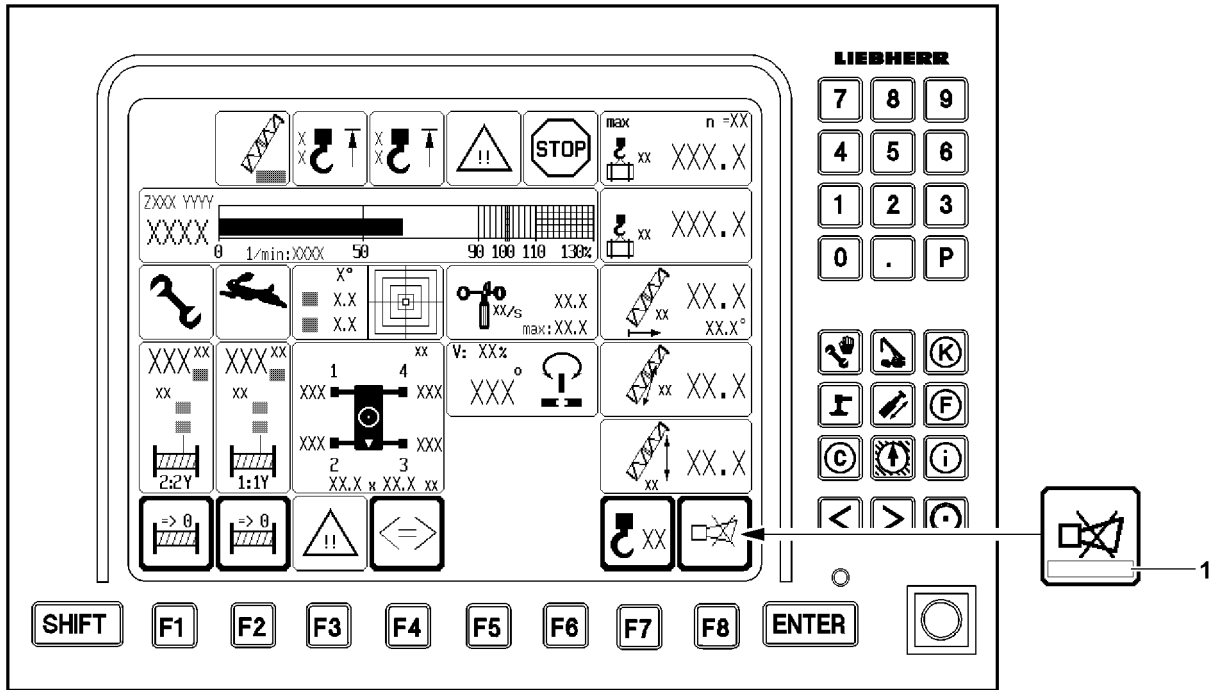


Fig.111937

1.1 Overload protection (LMB)

The 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 determined by recording 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 **boom radius** is calculated with 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 determined for the set up configuration, 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 load chart and reeving“ are compared. When they approach the specified limit, an advance warning is issued. If this limit is exceeded, an LMB-STOP is triggered and any crane movements that increase the load momentum are turned off.

1.2 Error messages

The LICCON computer system monitors the crane permanently for operating / system errors.

If errors occur, error messages **1** are issued. Error messages appear in the horn icon of LICCON monitor 0.



Note

- ▶ Always pay attention to error messages **1**!
- ▶ For the procedure in case of error messages, see the Diagnostics manual and the respective chapter in the Crane operating instructions!

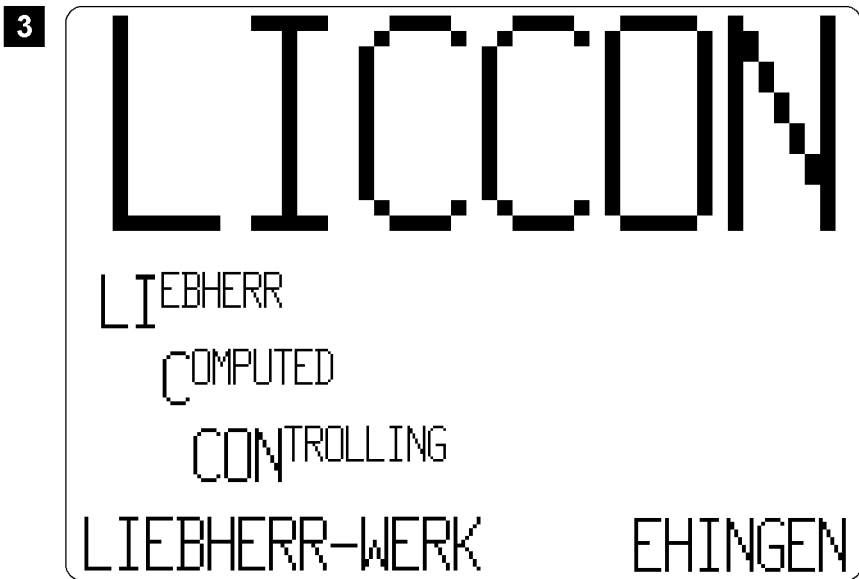
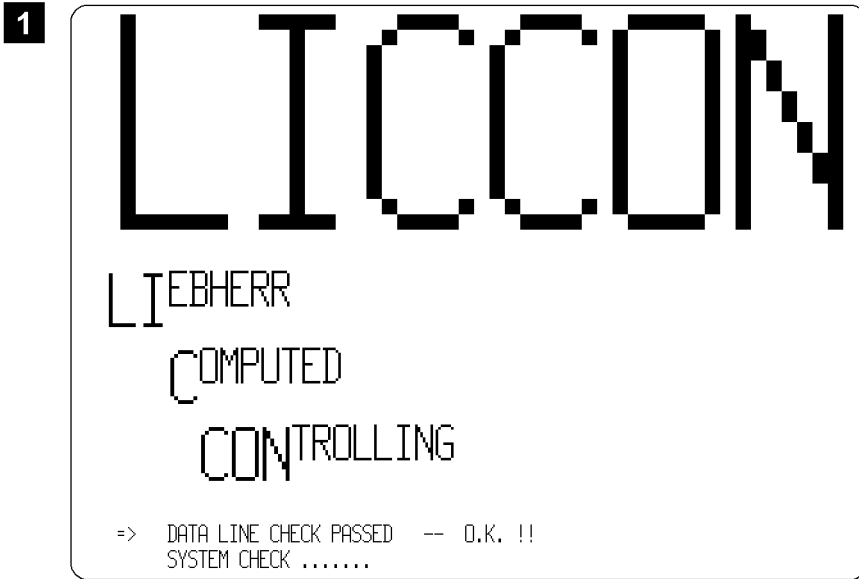


Fig.199899

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2 Booting up the LICCON computer system

There are two operating modes for the LICCON computer system:

- The LICCON computer system in normal mode (crane engine turned on).
- The LICCON computer system in stand-by mode (crane engine turned off).

Starting in normal mode:

- Boot up of LICCON computer system in connection with a started crane engine.

Starting in stand-by mode:

- See Section „LICCON computer system in stand-by mode“.

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 was found during the test, then the monitor shows the message „O.K. !!“, see illustration 1.

If the test does not find any connection problems, a system test of all the microprocessor central processing units (CPU) is performed. The incremental sequence of the self test can be monitored on the 7 segment displays of the CPUs. If no error was found during the system test, then the monitor shows the message „O.K. !!“, see illustration 2.

Shortly after that, this general initialisation screen appears on the monitor, see illustration 3.



Note

Errors during LICCON computer system boot up!

If an error is found while the LICCON computer system boots up, then the boot up procedure is interrupted!

- ▶ For the procedure if an error occurs while the LICCON computer system boots up, see the Diagnostics manual!

3 Operating mode preselection on the LICCON computer system



WARNING

Danger of accident due to deviating set up configuration!

If the set up configuration and the operating mode of the crane set on the LICCON computer system **do not** match, then the crane can be overloaded unnoticed and topple over!

Personnel can be severely injured or killed!

- ▶ In the operating mode preselection, only the operating mode that actually corresponds to the equipment set up configuration of the crane may be selected!

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

- **LICCON monitor 0** - the operating mode preselection screen for approx. 3 seconds
- **LICCON monitor 1** the title screen with the words: „**LIEBHERR-WERK EHINGEN**“

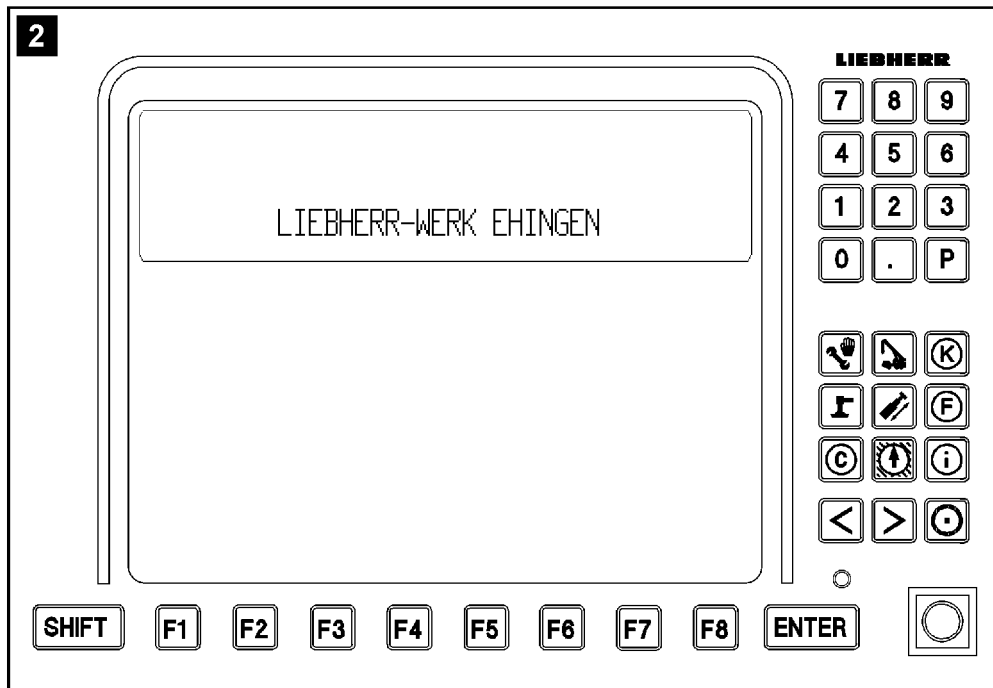
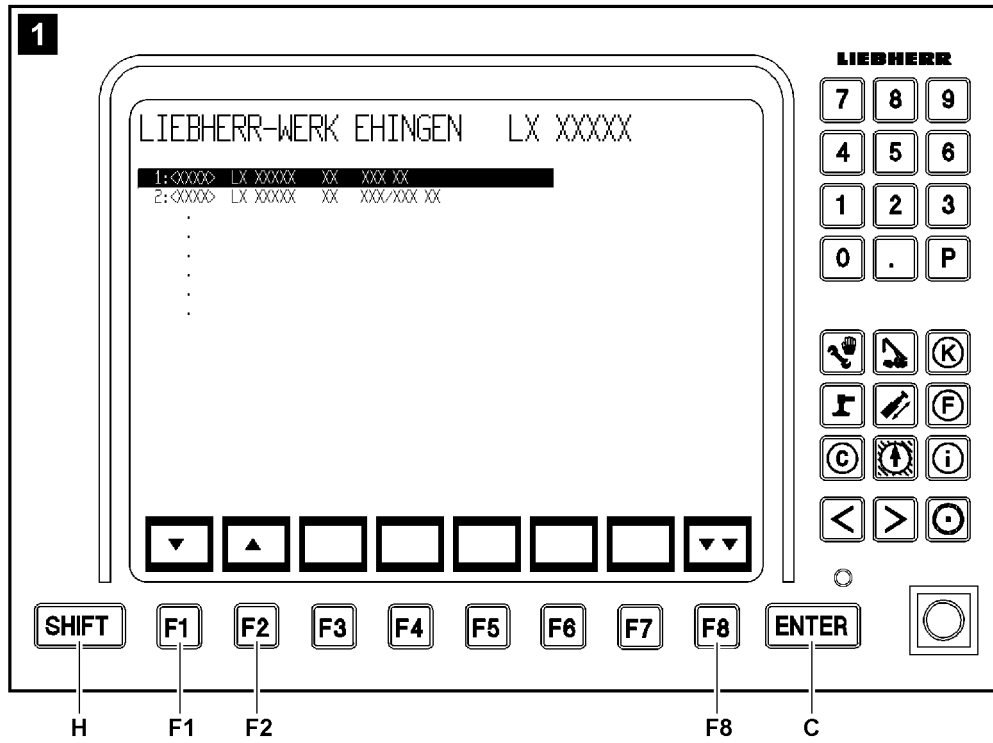


Fig.112950

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3.1 LICCON monitor 0

After successful starting procedure, the operating mode preselection screen appears on the **LICCON monitor 0** for approximately three seconds, see illustration 1.



Note

- ▶ The operating mode preselection screen is skipped if the crane only has one level! For example: The crane has only one S-boom (only S-operation possible)! In this case, the system changes directly to the set up 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 set up screen appears!

The function key **F1** or the function key **F2** is pressed within three seconds when the operating mode preselection screen appears.

Result:

- The operating mode preselection screen is retained until the settings are confirmed by pressing the function key **F8** or the ENTER key **C**.



Note

- ▶ If neither the function key **F1** nor the function key **F2** are pressed within three seconds, then the last active operating mode remains set. The corresponding set up screen appears automatically!

To select the required operating mode group for crane operation, press the function key **F1** (cursor down) or function key **F2** (cursor up).



Note

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

Press the function key **F8** or the ENTER key **C**.

Result:

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

3.2 LICCON monitor 1

After successful starting procedure, the title screen with the words appears on the **LICCON monitor 1**: „**LIEBHERR-WERK EHINGEN**“, see illustration 2.



Note

- ▶ Depending on the set up configuration of the crane, it is possible that a note for an operating mode appears!

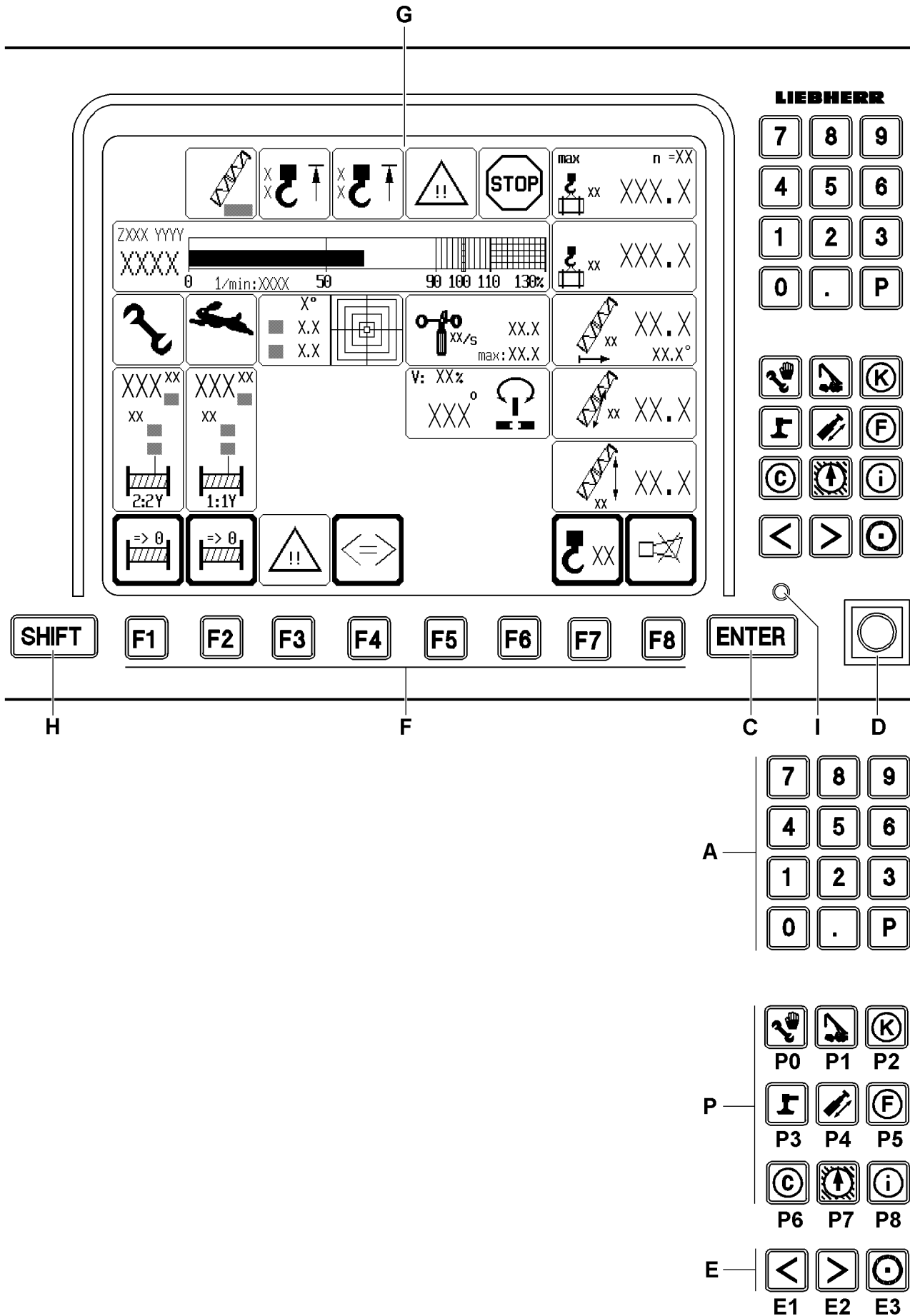


Fig.112357

4 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 that 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** Set up
 - **SHIFT** and **P0**: Engine monitoring
- P1** Crane operation
- P2** Crane acceptance
 - Correction coefficients (program blocked - for LIEBHERR service personnel only)
- P3** —
 - Program key not assigned!
- P4** —
 - Program key not assigned!
- P5** Hook block weight input window
- P6** Control parameter
- P7** —
 - Program key not assigned!
- P8** Test system
 - **Note:**
For a description of the test system, see the Diagnostics manual!
- C** ENTER input key
 - Confirmation of changes
- D** Set up key
 - Zero position (not actuated):
Normal operation.
 - Touching:
Function „Exceedance of shut off limits of LICCON overload protection“ is released and / or the hoist limit switch is bypassed



Note

Double function set up key!

If the crane has **no** CE-mark, when actuating the set up key **D**, the release for the „Emergency operation LICCON overload protection“ is automatically engaged!

- ▶ Take into account, when actuating the set up key **D**, that the „Emergency operation LICCON overload protection“ is automatically released!
-



Note

- ▶ By pressing the set up key **D**, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available!
-

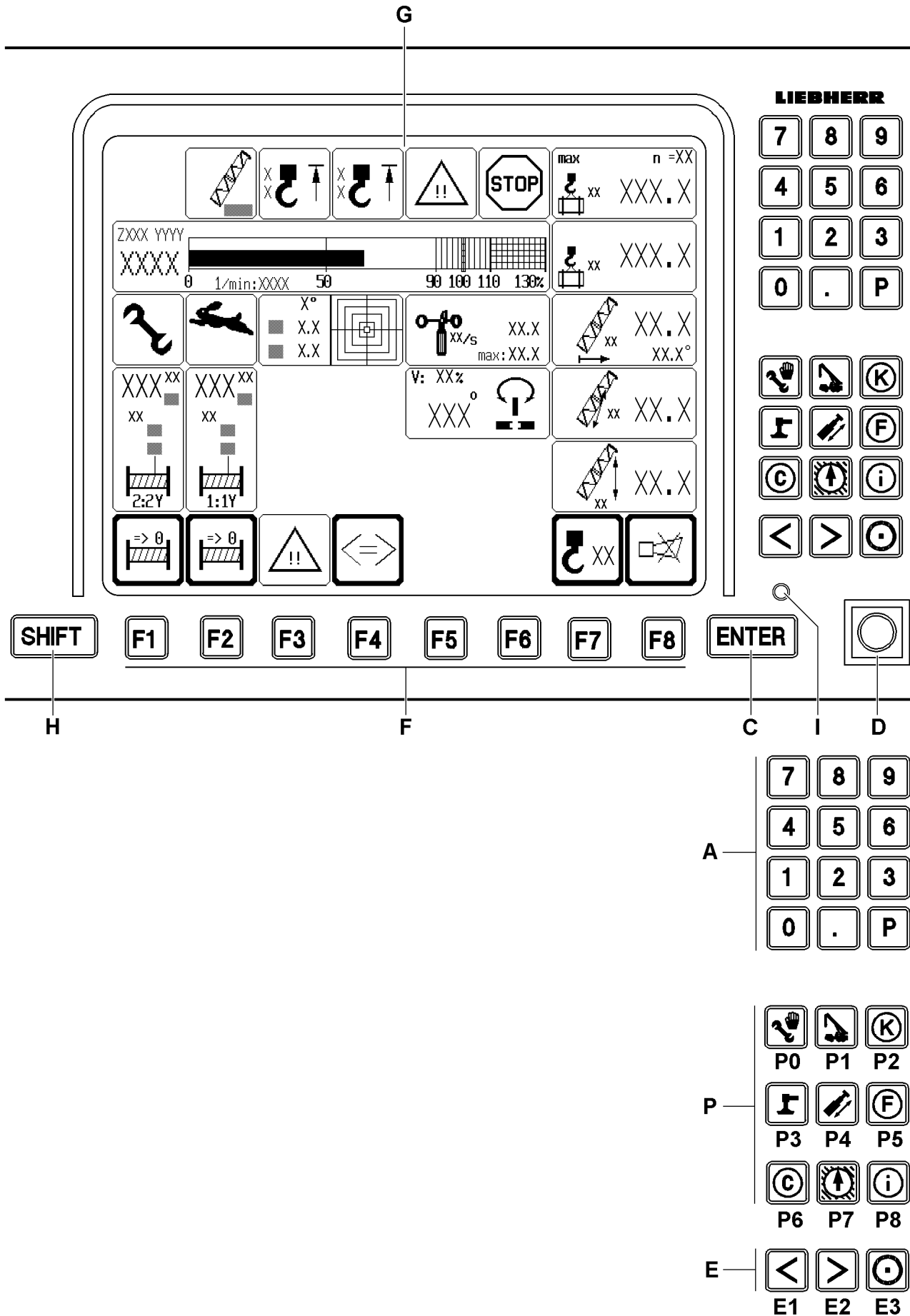


Fig.112357

LWE/LR 11350-007/19005-01-02/en

- E** Special function keys
 - Monitor brightness adjustment
 - Key combination **E3** and **E1**: Turn background illumination on / off
 - Key combination **E3** and **E2**: Brightness adjustment in three stages
 - **Note:**
Additional functions of the special function keys are program-dependent and are explained further in the description 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** Display
 - Display of the individual programs (example: Crane operation program).
- H** SHIFT key
 - Second-level key assignments, for example „Supervisory function“
- I** LED display
 - Monitor supply voltage present

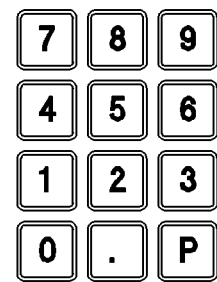
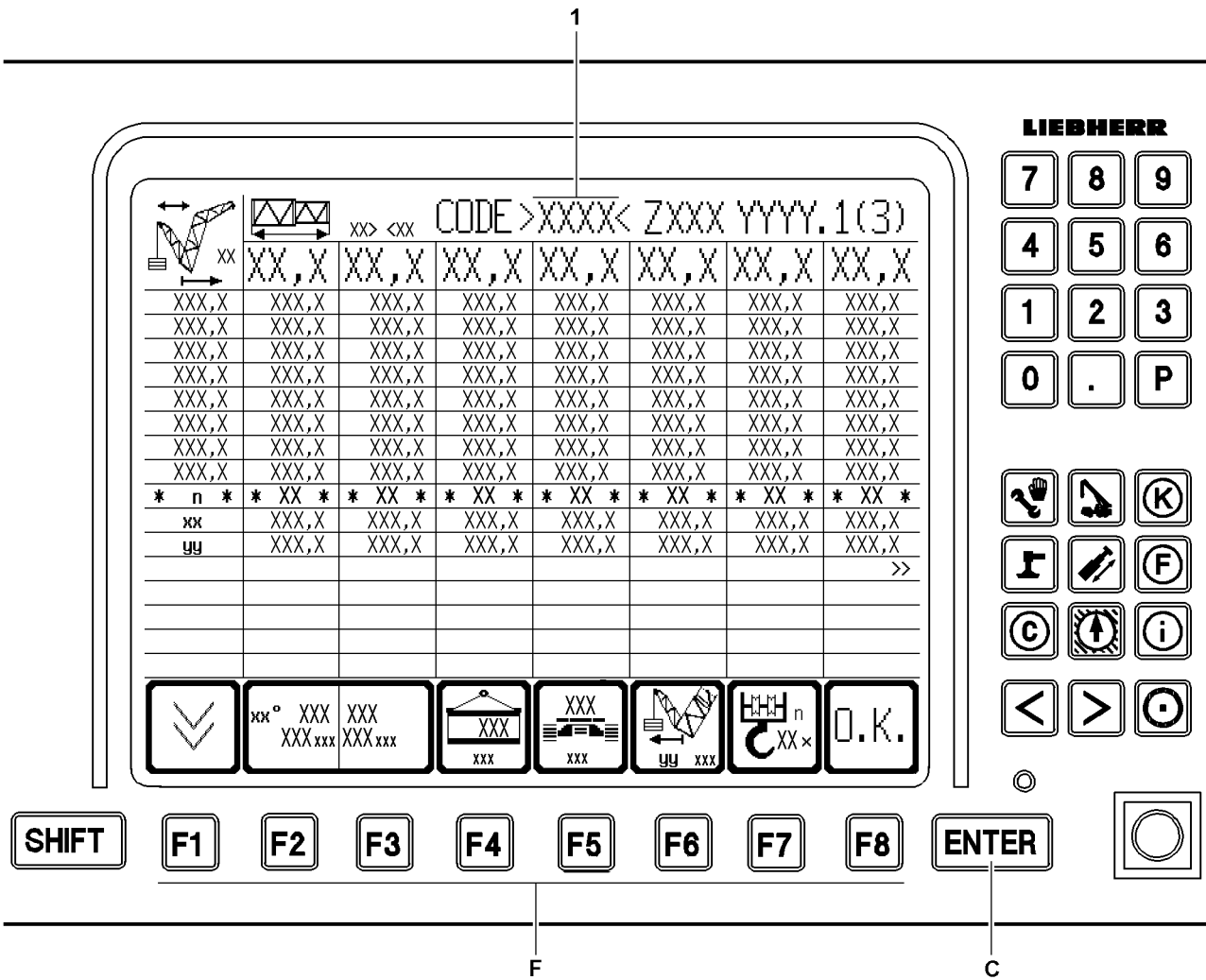


Fig.112305

LWE/LR 11350-007/19005-01-02/en

5 The set up program

After the LICCON computer system boots up correctly, it changes automatically to the set up program.



Note

- ▶ All entries and settings that are made by the crane operator in the set up program can only be carried out on **LICCON monitor 0!**



Note

Adjustment and display of set up configuration and reeving!

- ▶ Normally, the most recently run set up configuration and the reeving used at that time will be automatically set and displayed!
- ▶ If the computer system is started for the first time after set up of the crane, then the first valid set up configuration appears on the set up screen (first valid operating mode and reeving number „0“)!
- ▶ After rebooting the computer system, due to a „cold start“ (for example: battery or CPU change), the first valid set up configuration appears on the set up screen (first valid operating mode and reeving number „0“)!

Using the set up program, the crane operator can set the current operating mode, the current set up configuration of the crane and the reeving number of the hoist rope.

In addition, in the set up program he can also see all the load charts programmed into the LICCON computer system.

5.1 Setting the operating mode and set up configuration

The crane operator can select the operating mode and the set up configuration with the function keys **F** or by entering a 4-digit short code **1**.

5.1.1 Setting the operating mode and set up configuration via the function keys

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

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

Result:

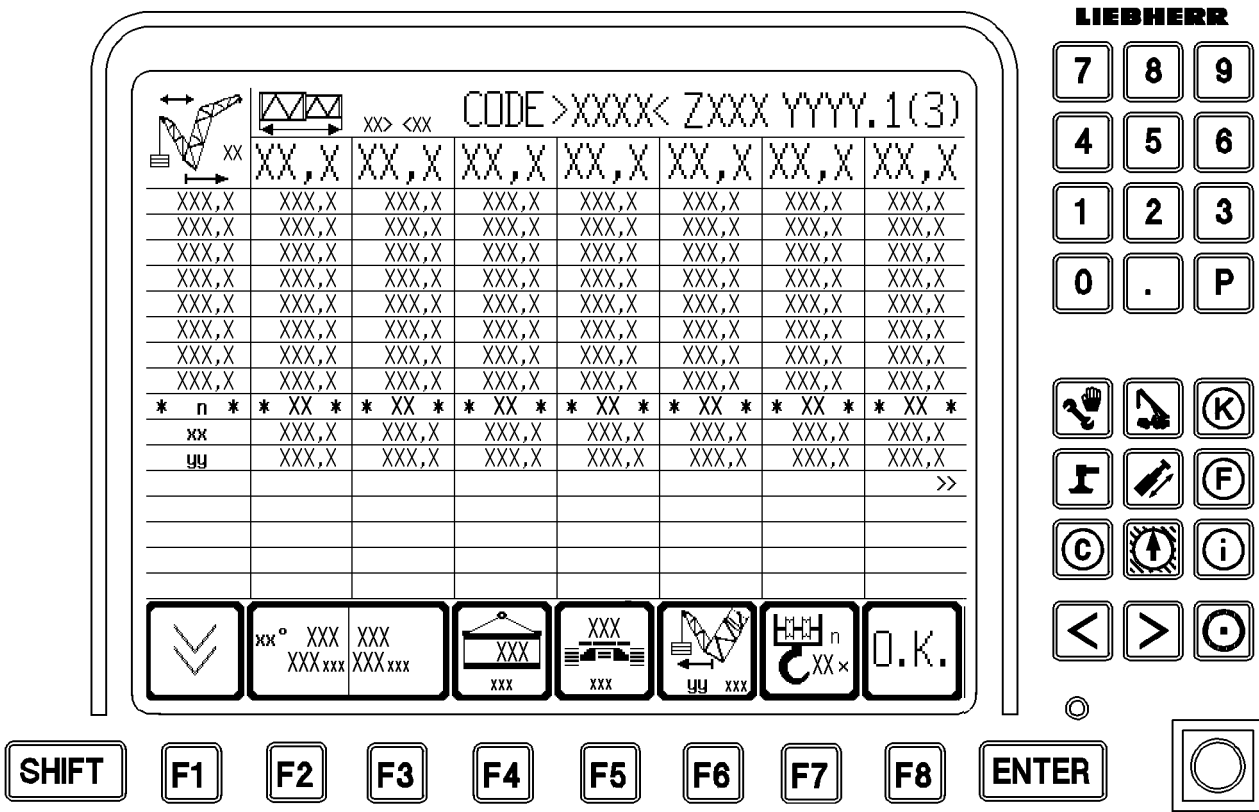
- The data of the selected load chart can be viewed.

5.1.2 Setting the operating mode and set up configuration via the 4-digit short code

- ▶ Enter a 4-digit short code **1** with the keypad **A** on the **LICCON monitor 0**.
- ▶ Press the ENTER key **C** to confirm and accept the settings.

Result:

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



$xx > < xx$ CODE >XXXX< ZXXX YYYY.1(3) — 1

| | | | | | | | | |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| | xx | 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 | 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 | 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 |
| * n * | * XX * | * XX * | * XX * | * XX * | * XX * | * XX * | * XX * | * XX * |
| xx | XXX,X | 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 | XXX,X |
| | | | | | | | | >> |

— 2

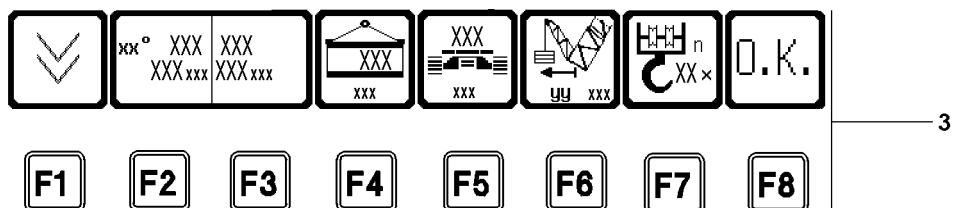


Fig.112306

5.2 Set up program areas



Note

- ▶ The monitor illustrations in this chapter are only examples!
- ▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly!
- ▶ Numbers and letters can be replaced by place holders!
- ▶ The programmed load charts for the crane are binding!

The monitor is divided into three areas in the set up program:

- 1 General information line
- 2 Display area of load chart values
- 3 Function key line with assigned icons

5.2.1 General information line

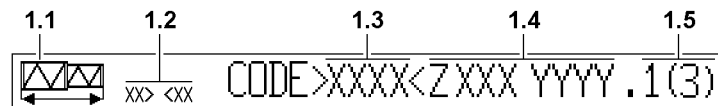


Fig.111920

- 1.1 Main boom length icon
 - The icon is identical for all operating modes.
- 1.2 Measuring unit
 - For the programmed length units (LE) and weight units (GE)
- 1.3 4-digit short code
 - It is located next to the text „CODE“ inside angled brackets
 - Each short code uniquely identifies a crane set up configuration. The valid set up configuration and their associated short code numbers for the crane can be found in the load chart manual of the crane.
- 1.4 Organization number
 - For internal Liebherr load chart administration
- 1.5 Page number
 - Relates to the currently displayed part of the load chart
 - Is separated from the organization number with „.“
 - The total number of pages in this load chart is in parentheses

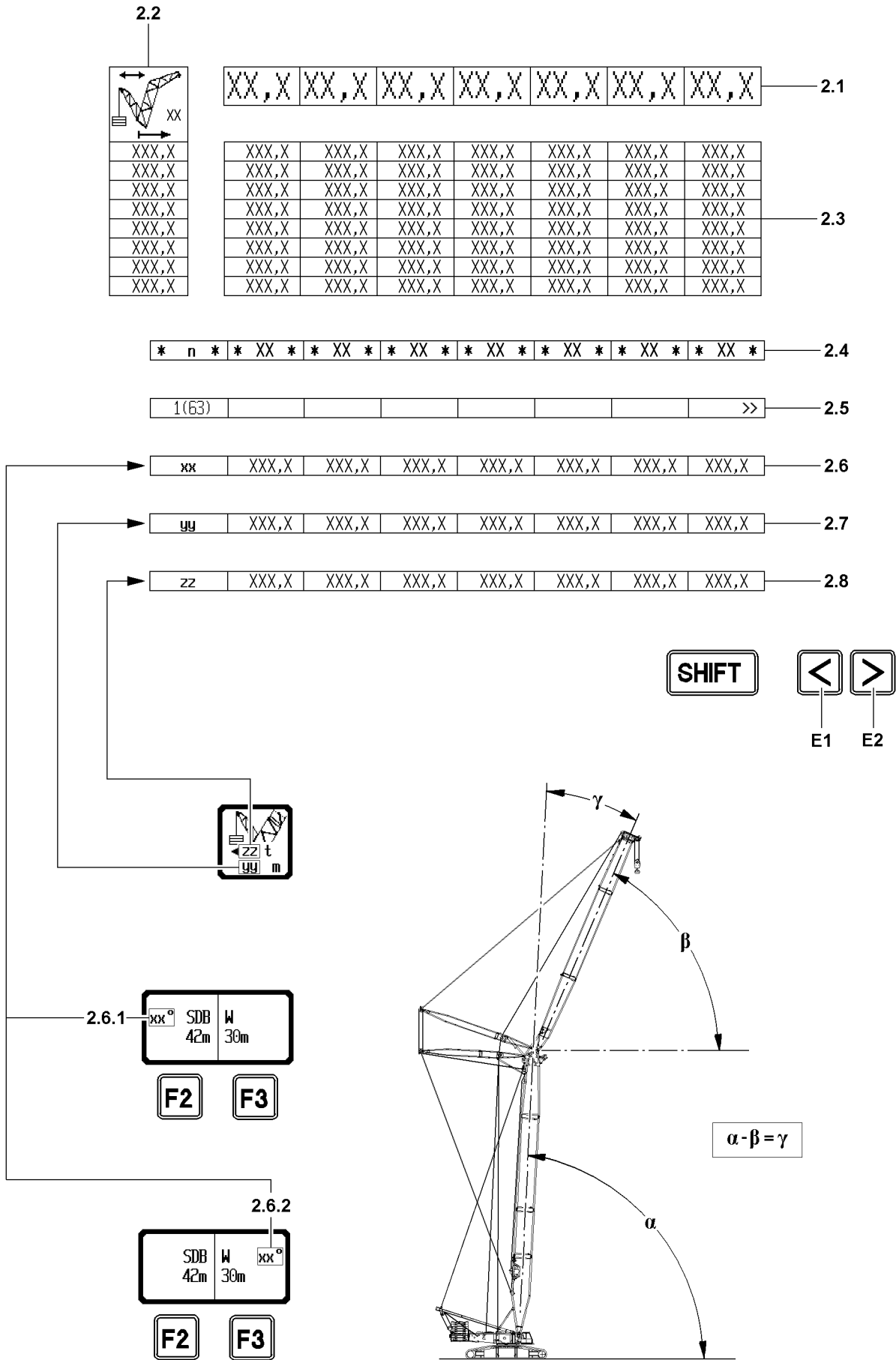


Fig.112631

LWE/LR 11350-007/19005-01-02/en

5.2.2 Display area of load chart values

2.1 Main boom lengths

- In [m] or [ft]
- Maximum of 7 columns per display page



Note

View „Boom radius“ icon **2.2!**

- ▶ Depending on the operating mode of the crane, the view changes from the „Boom radius“ icon **2.2!**
- ▶ In the illustration, the „Boom radius“ icon **2.2** shows an operating mode with (luffing) auxiliary boom / accessory, derrick boom and derrick ballast!

2.2 „Boom radius“ icon

- In [m] or [ft]
- Maximum 10 lines of radius values
- Vertical axis of load value field

2.3 Load value field

- Columns under the main boom lengths and in the lines to the right of radius values
- Load values depending on boom length and boom radius

2.4 Hoist rope reeving number

- * 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

- Enter and confirm the reeving on the LICCON monitor 0, according to the reeving on the boom head

NOTICE

Special equipment necessary!

- ▶ 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

Parallel operation of hoist winches!

- ▶ For parallel operation of hoist winches (1||2), when reeving in the hoist rope, enter the total reeving of winch 1 and winch 2 in 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!

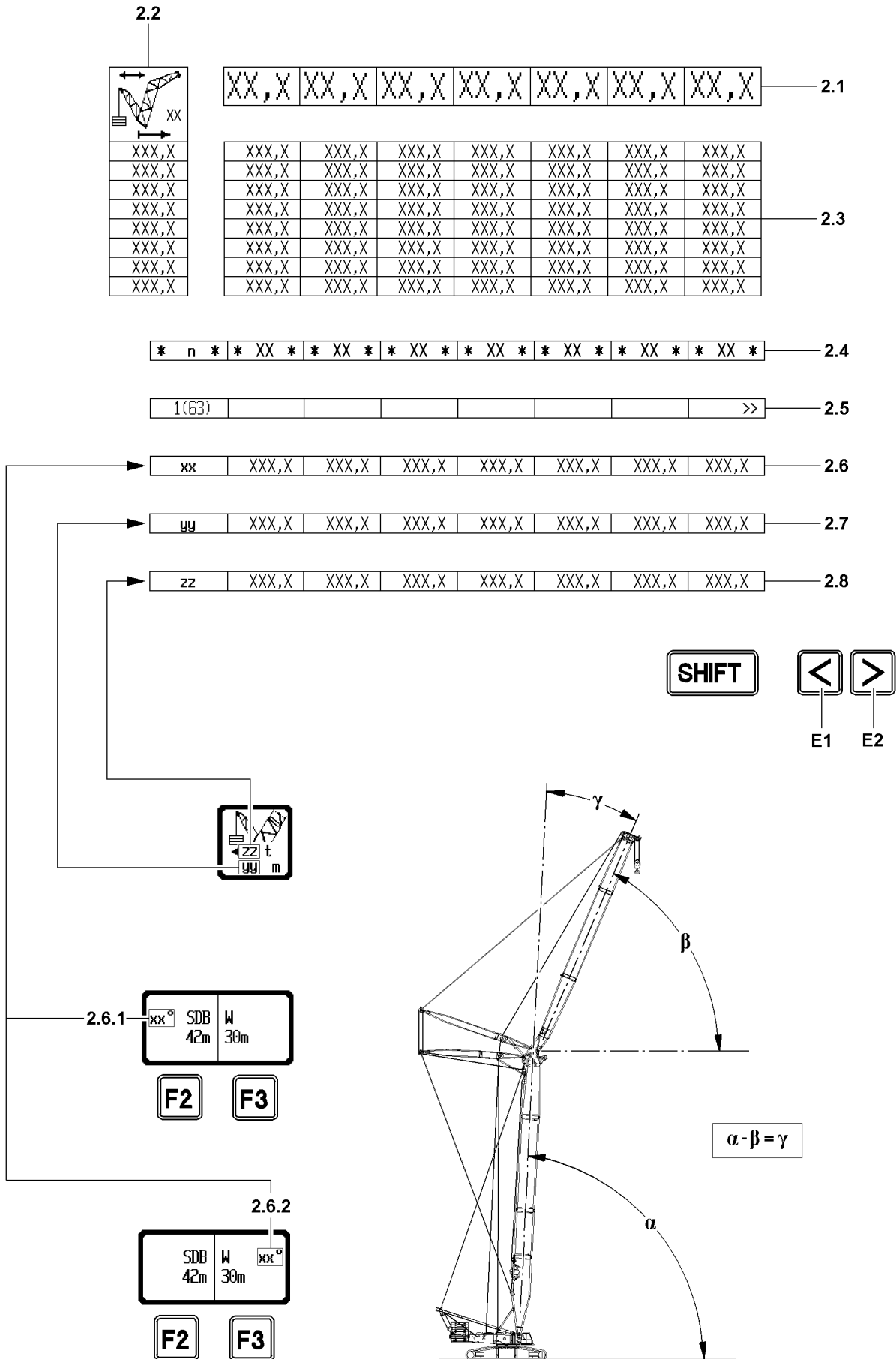


Fig.112631

LWE/LR 11350-007/19005-01-02/en

2.5 Line for special displays

- If a load chart consists of more than seven columns, it cannot be fully displayed because of the size of the monitor. In that case, the marking arrows in the first or the seventh field indicate that there are additional columns to the left or right of the displayed chart. They can be shown by pressing the key **E1** or the key **E2**.
- **Note:**
Using the key combination **SHIFT** and **E1** or **SHIFT** and **E2**, you can, where possible, scroll left or right by 7 load chart columns (corresponds to 1 page)!

2.6 Boom angle

- Line **xx**
- In [°]
- **Note:**
Appears **only** in operating modes with luffing auxiliary boom / accessory!

2.6.1 Main geometry

- If „**xx**°“ appears in the main geometry status icon (for example: „**xx**° **SDB**“), then „**xx**°“ = main boom angle α in [°].
- Line **xx** lists the main boom angles that must be set in order to be able to lift the load values in the corresponding load chart column.

2.6.2 Auxiliary geometry

- Appears „**xx**°“ in auxiliary geometry icon (for example: „**W**“ „ **xx**°““) then means „**xx**°“ = relative angle auxiliary boom / accessory γ in [°].
- In the load chart columns, the relative angles auxiliary boom / accessory, which must be set to be able to lift the load values in the corresponding load chart column are listed next to each other.



Note

- ▶ Main boom angle α : The angle of the main boom to the placement surface of the crane!
- ▶ Auxiliary boom / accessory angle β : The angle of the auxiliary boom / accessory to the placement surface of the crane!
- ▶ Relative angle auxiliary boom / accessory γ : The angle of the auxiliary boom / accessory is determined relative to the main boom!

2.7 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.

2.8 Derrick ballast weight

- Line **zz**
- In [m] or [ft]
- **Note:**
Appears **only** in operating modes with derrick ballast!
- Line **zz** lists the derrick ballast weights that must be attached in order to be able to lift the load values in the corresponding load chart column.

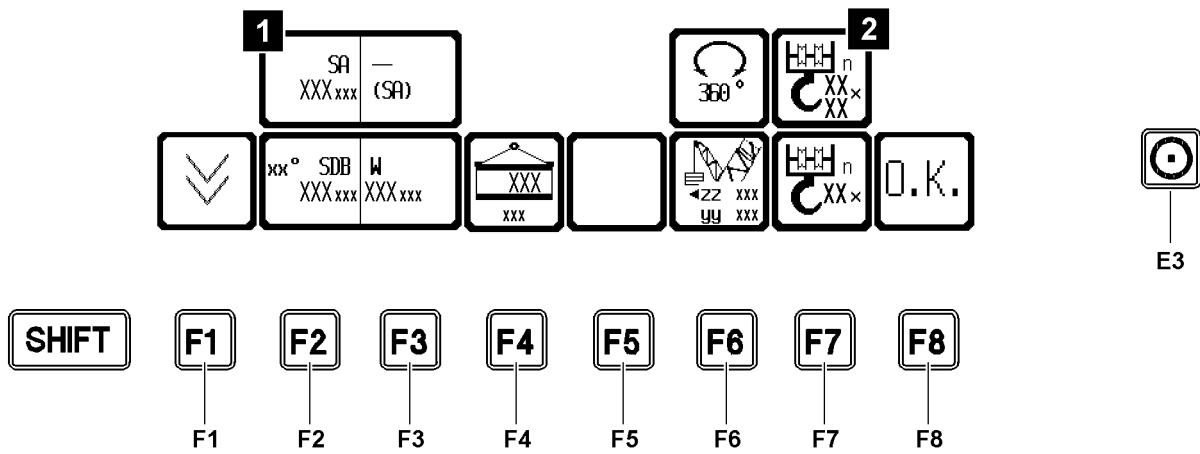


Fig.112632

5.2.3 Function key line in the set up program

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
- set up 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

- 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, then the display is spread over several pages. When pressing a key, the next page of the load chart will be displayed, and the number of the current page in the „general information line“ will be counted up by 1. When the last page is reached, page 1 will appear again after pressing the function key **F1**.

F2 Main boom geometry

- Adjustment possibility of different main boom operating modes and main boom lengths of the crane (if available). The types are described by abbreviations (for example: **SDB** = heavy main boom, derrick boom and suspended ballast) and length data in the icon.
- **Note:**
In addition to the main boom operating modes, the assembly operating mode SA can be set via the function key **F2**, see illustration 1.

SHIFT and **F2**

- Previous main boom geometry (if available)

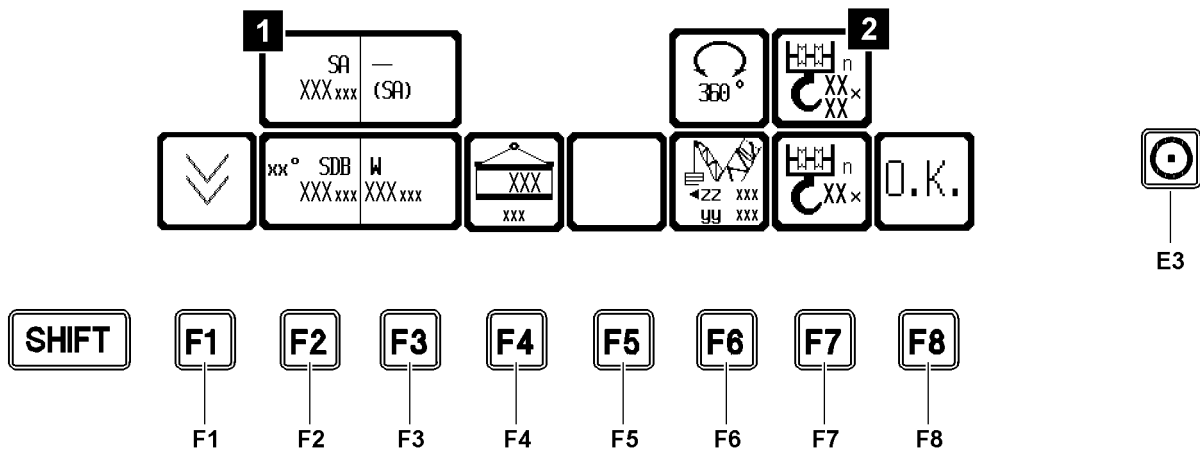


Fig.112632

F3 Boom geometry auxiliary boom / accessory

- Adjustment possibility of different auxiliary boom operating modes and auxiliary boom lengths of the crane (if available). The types are described by abbreviations (for example: **W** = luffing lattice jib) and length data in the icon. Possibly additional angle data is noted in the icon.

- **Note:**

Pressing the function key **F2** and / or the function key **F3** deletes all data (operating mode, set up configuration) from the monitor and sets the short code in the general information line to „CODE >????<“!

- **Operating mode data:**

- Boom length icon in the general information line
- Length units and weight units
- Load chart organization number
- Boom radius icon
- Boom length data

- **Set up dependent data:**

- Numbering of current page number and total number of pages in the load chart
- Radius values in length units
- Load values in weight units

SHIFT and F3

- Previous auxiliary boom geometry (if available)

F4 Counterweight

- 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:
„ 110 t “ = total counterweight of 110 t

F5 Crane chassis

- In operating modes, where there are various crane chassis versions (for example: Ballast on crawler travel gear), this can be set with the function key **F5**.
- If there is no setting option, then the key has no function.

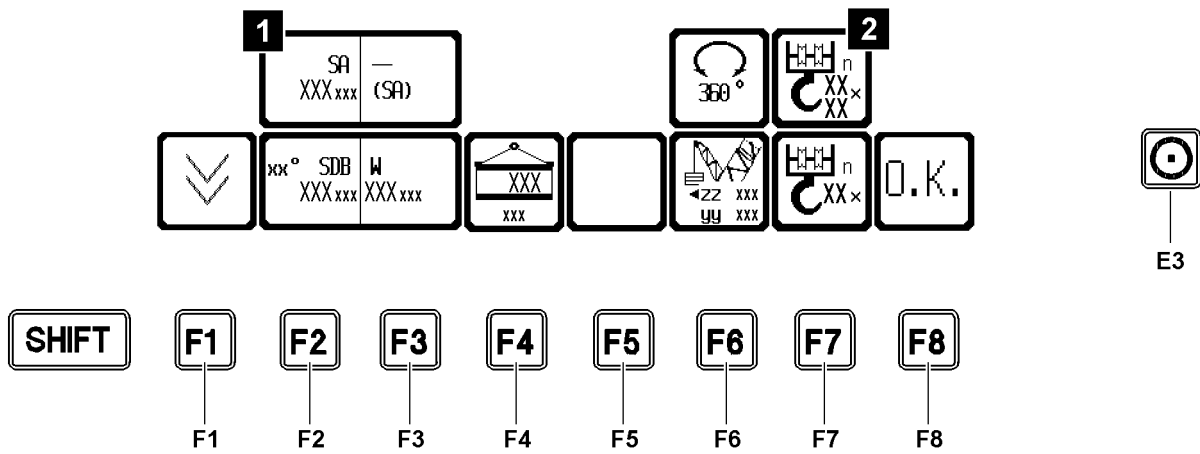


Fig.112632

**Note**

- ▶ For crane operating modes without derrick ballast, the crane superstructure slewing range icon appears at **F6!**
- ▶ For crane operating modes with derrick ballast, the derrick ballast radius icon appears at **F6!**

- F6** Crane superstructure slewing range
- „360° slewing range icon“

or

- F6** Derrick ballast radius
- Set the derrick ballast radius set up configuration **yy** in [m] or [ft]
 - Set the derrick ballast weight set up configuration **zz** in [t] or [lbs]
- F7** Hoist rope reeving
- Adjustment possibility for the **number of hoist rope strands on the boom** to obtain a certain load carrying capacity.
 - Press the key: Reeving number on boom is increased by 1.
- SHIFT** and **F7**
- Press the key: Reeving number on boom is reduced by 1.

**Note**

- ▶ The number of hoist rope strands (reeving) displayed in the icon will be increased with every keystroke by one counter, up to a fixed maximum value (depending on the operating mode)! If the maximum value is exceeded, the counter starts again at the 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**

Parallel operation of hoist winches!

- ▶ For parallel operation of hoist winches (1|12), when reeving in the hoist rope, enter the total reeving of winch 1 and winch 2 in 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**

- Adjustment possibility for the **number of hoist rope strands on the boom nose** to obtain a certain load carrying capacity.
- Press the key: Reeving number on boom nose* (upper number in „Hoist rope reeving“ icon) is increased by 1.

SHIFT and **E3** and **F7**

- Press the key: Reeving number on boom nose* (upper number in „Reeving“ icon) is reduced by 1.

**Note**

Display reeving boom nose!

- ▶ The reeving for the boom nose is only shown (illustration 2) if the boom nose is assembled!
- ▶ If the boom nose is installed during operation, then the reeving of the boom nose must be correctly entered in the set up program!

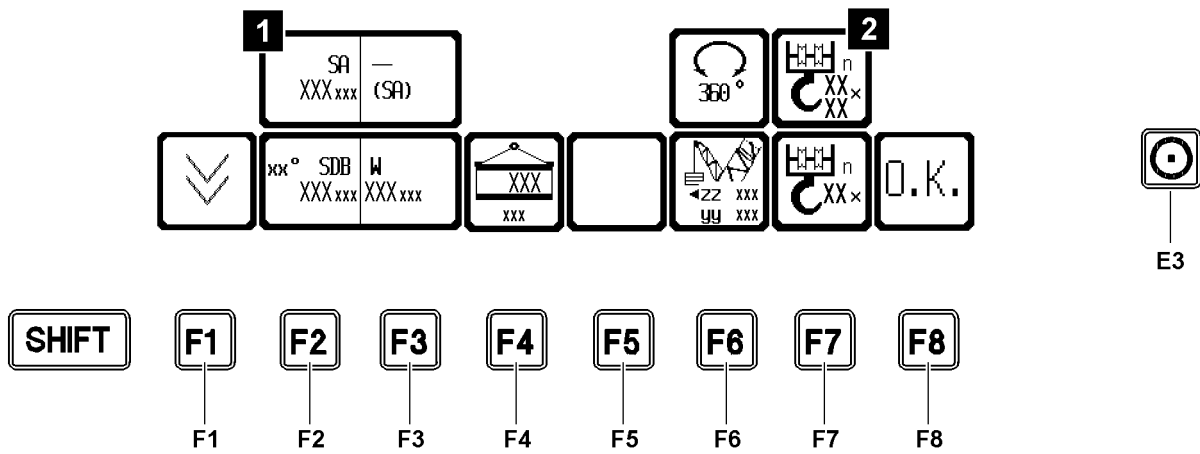


Fig.112632

F8 Confirmation key

- For confirmation of selected set up configuration
- **Prerequisites:**
 - The entry of the set up configuration must be completed all the way. A valid short code is shown and in the chart field are load values.
 - The external conditions for this set up configuration, if stipulated, must be met.
 - The crane may not be utilized more than 20 % in the previous set up configuration (applies only if the load suspended on the hook is heavier than 0.5 t). Switching to the crane operation program can otherwise only be done with the program key **P1**. In that case, the newly entered set up configuration is not accepted.

**Note**

- ▶ Make sure that the selected set up configuration (short code) and the hoist rope reevings are taken over after switching to the operating screen!
-

**Note**

Display of operating errors from the set up program!

- ▶ Operating errors created in the set up program are displayed in the icon above the function key **F8** and are saved in the error stack 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 will be displayed documentarily!
 - ▶ The operating error will not be saved!
 - ▶ Operating errors are always placed on top in the error stack, see the Diagnostics manual!
-

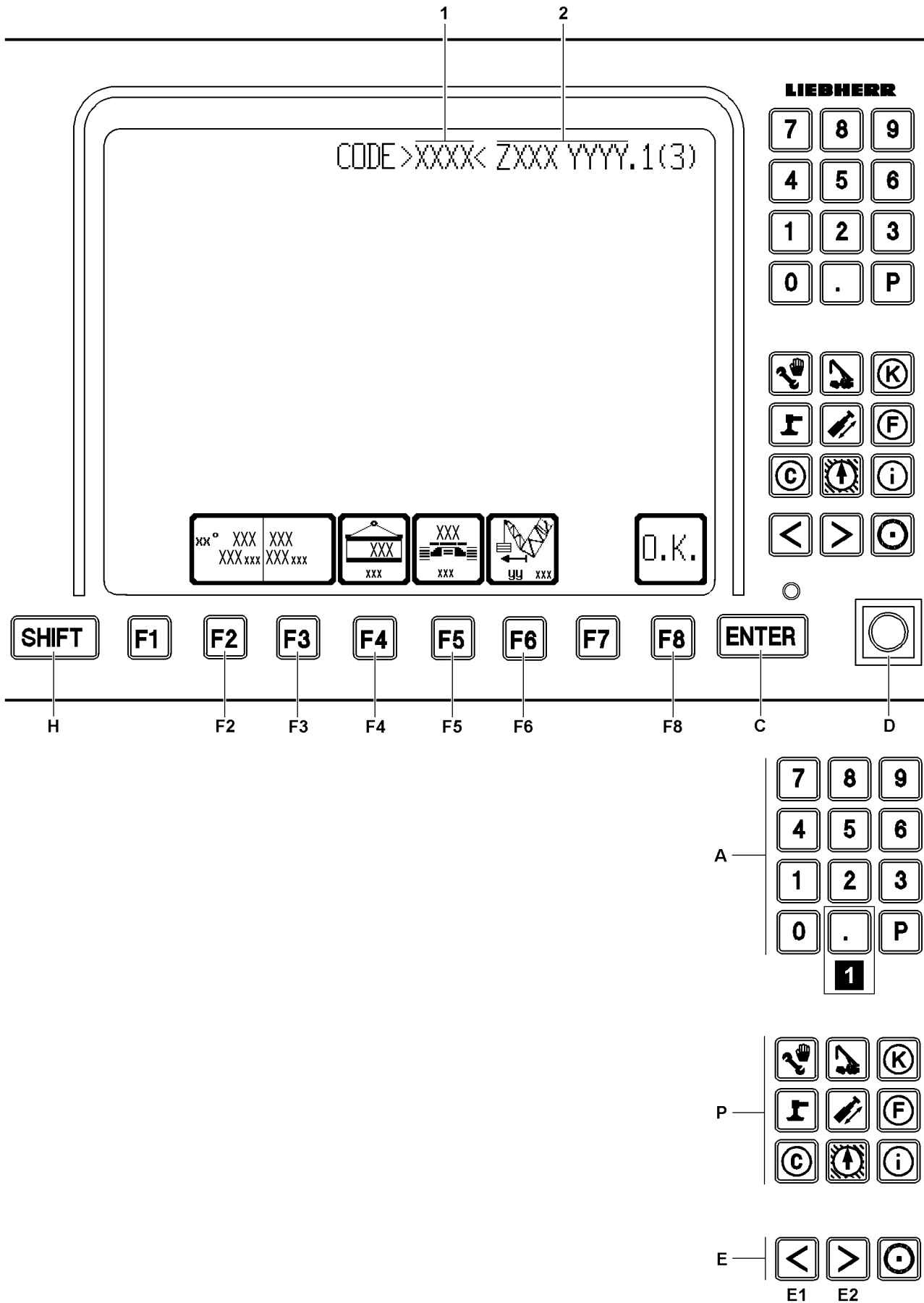


Fig.112308

LWE/LR 11350-007/19005-01-02/en

5.2.4 Control elements in the set up program

A Keypad

- Pressing the keypad deletes all operating mode and set up 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 „**„** (illustration 1) have no function in the set up program.

P Program keys

- Selection of individual programs. The settings in the set up program are discarded and the set up configuration and reeving, which were last confirmed with the function key **F8** (OK) are continued to be used.
A program currently running **cannot** be called again using its program key.

C ENTER input key

- Confirmation of input both for short codes **1** as well as for any change in the set up configuration via the function keys.
- **ENTER** after entering the short code, the short code **1** 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 **2** 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 set up configuration and displays the load chart and its short code **1**. In the event of an error, the short code **1** remains on „CODE ?????“, the organization number **2** is displayed as „ZXXX????“ and the acoustic signal „Horn“ sounds.
- **ENTER** after a change in the set up configuration with the function keys **F4** and **F5** as well as the function key **F6** displays this load chart (if the chart exists) with the short code **1** on the monitor. In the event of error, the short code **1** remains on „CODE ?????“ and the acoustic signal „Horn“ sounds.



Note

Use of place holders

- ▶ The Short code **1** and the Organization number **2** are shown in this chapter with place holders (for example XXXX or ZXXX) instead of real numbers and letters!

D Set up key

- Has no function in the set up program

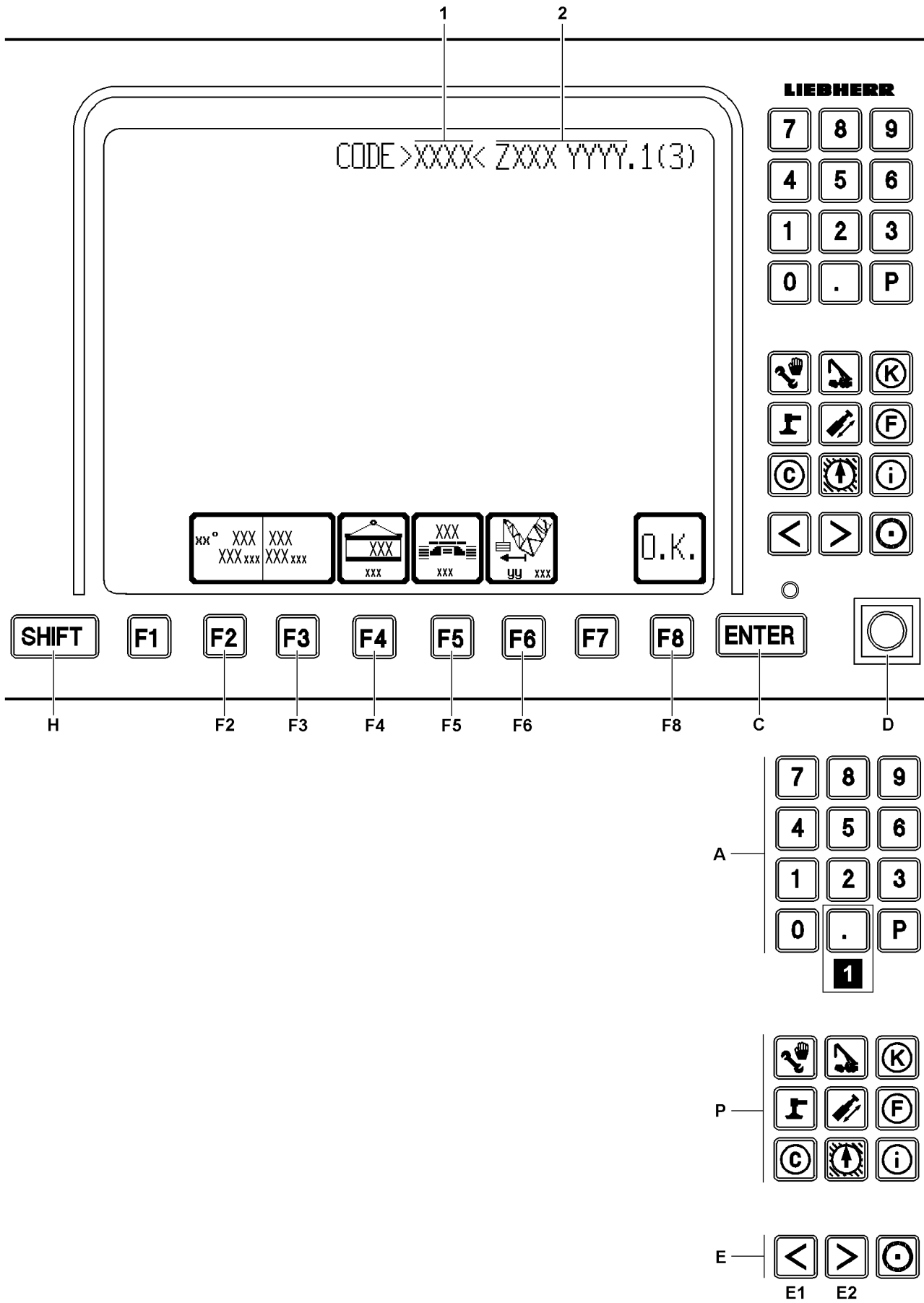


Fig.112308

E Horizontal paging• **Note:**

The key **E1** and key **E2** only have a function if this is indicated in the „Line for special displays“!

- If a load chart consists of more than 7 columns, the first display of the set up configuration only shows columns 1 to 7
- Pay attention to the double arrow on the right (>>) and / or on the left (<<) edge of the line of the load chart! It points to additional columns in the respective direction!
- Press the key **E1** to display the next left chart column.
- Press the key **E2** to display the next right chart column.

• **Note:**

Using the key combination **SHIFT** and **E1** or **SHIFT** and **E2**, you can, where possible, scroll 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 boom geometry, the auxiliary boom geometry and the previous reeving are reset.
- **Note:**
See section „The function key line“ in the set up program!

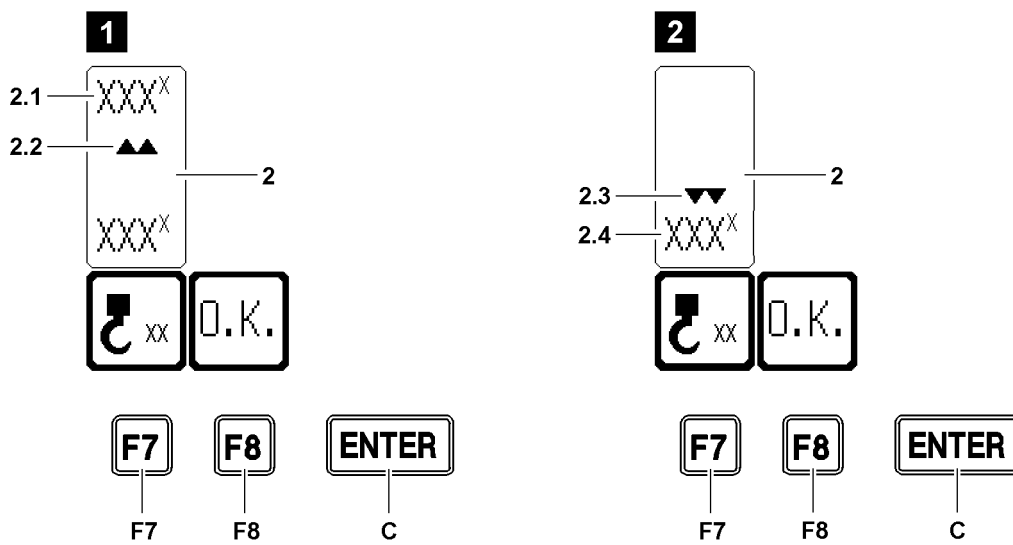
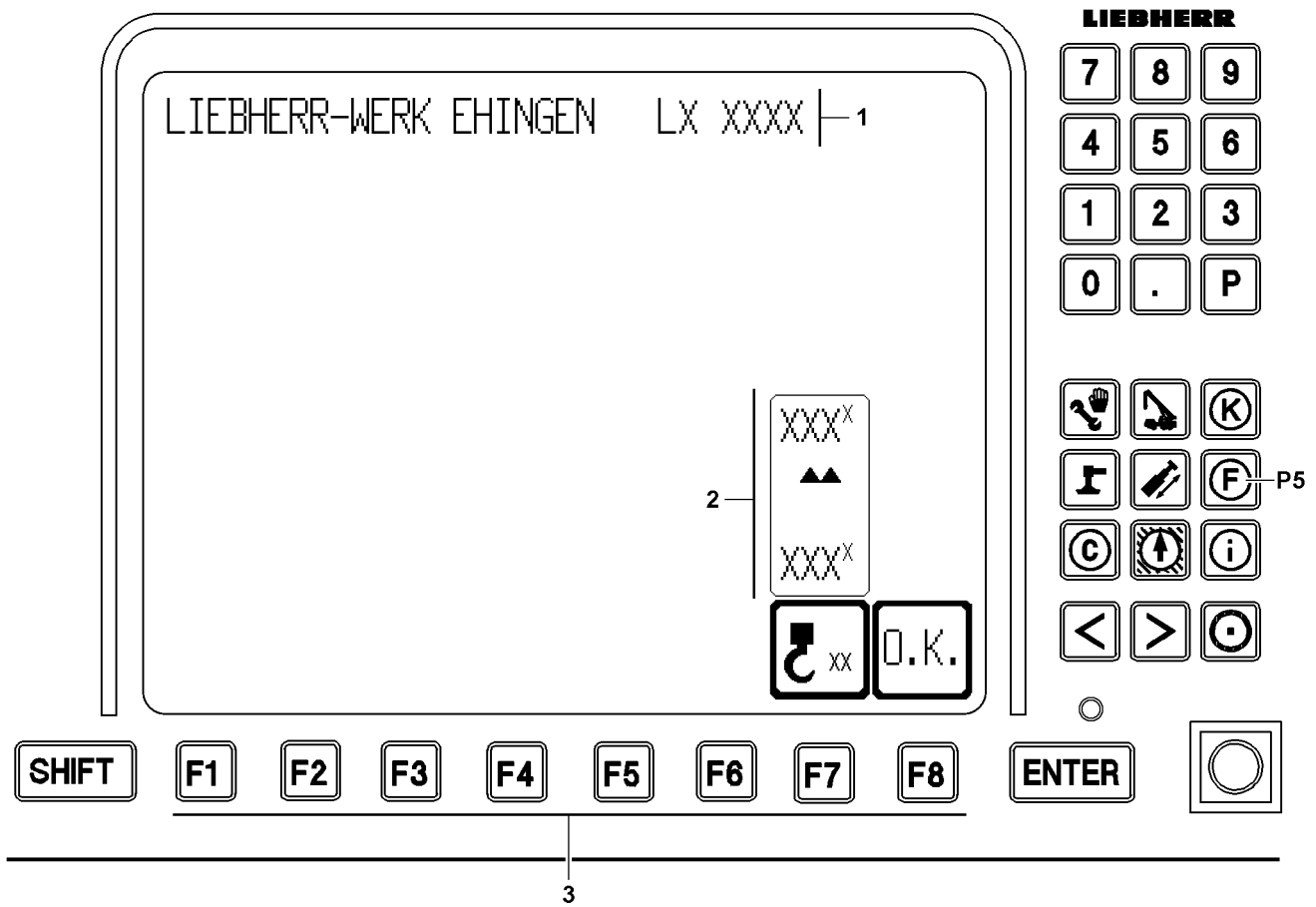


Fig.112339

LWE/LR 11350-007/19005-01-02/en

5.3 Hook block weight input window

After the selected set up configuration was confirmed in the set up program with the function key **F8**, the set up parameters are taken over by the LICCON computer system. Then the input window hook block weight appears automatically.



WARNING

Deviation from specifications of erection and take down charts!

In case of a deviation from the specifications of the erection and take-down charts, the crane can be overloaded and topple over!

Personnel can be severely injured or killed!

- ▶ The entered value must be taken from the erection and take-down charts, depending on the selected set up configuration!
- ▶ If the actual weight of the hook block exceeds the permissible hook block weight, then the hook block must be carried along for erection / take-down of the boom!
- ▶ The entered hook block weight is recorded with the data logger!

5.3.1 Starting the hook block weight input window

In the input window hook block weight, the crane operator must determine a hook block weight corresponding on the operating mode for erection / take-down of the boom systems according to the erection / take-down charts.

- ▶ Press the function key **F8** in the set up screen.
or
Press the program key **P5**.

Result:

- The input window hook block weight appears.

5.4 Operating interface

- 1 Crane type identification
- 2 Hook block weight icon
- 2.1 Hook block weight input field
- 2.2 Double arrow up
 - Input field is active, illustration 1
- 2.3 Double arrow down
 - Current input value is active, illustration 2
- 2.4 Current input value of hook block weight
- 3 Function key line

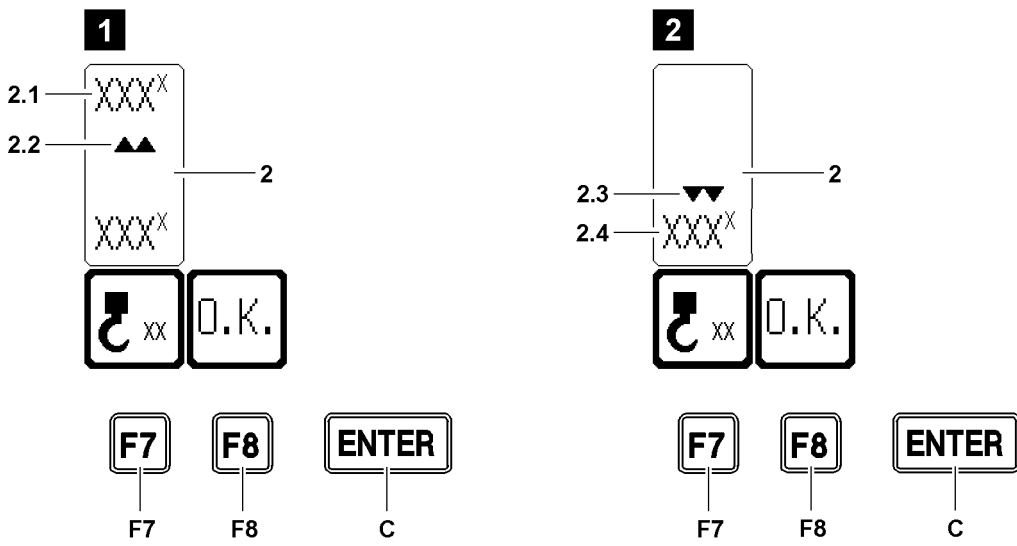
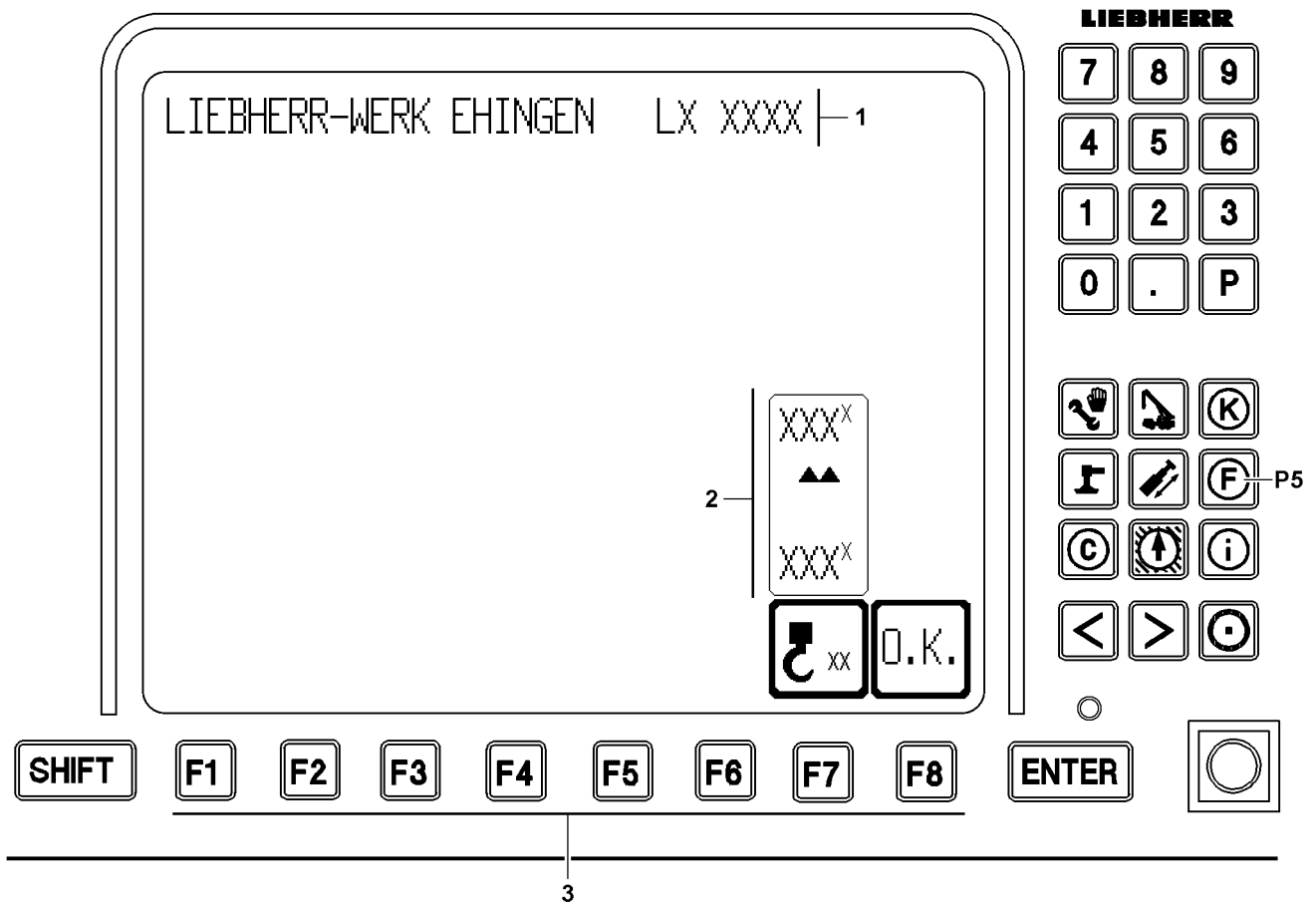


Fig.112339

LWE/LR 11350-007/19005-01-02/en

5.5 Entering the hook block weight

To be able to erect / take-down a boom system, a valid hook block weight must first be entered in the hook block weight input window in the LICCON computer system and confirmed.

The permissible weight of the hook block must be taken according to the selected set up configuration from the erection and take-down charts.

Make sure that the following prerequisite is met:

- A valid set up configuration is entered and confirmed.

▶ Press the function key **F7**.

The double up arrow **2.2** is shown, hook block weight input field **2.1** is active.

▶ Enter the hook block weight using the keypad.

When the entered hook block weight is shown in the input field hook block weight **2.1**:

▶ Press the ENTER **C** input key.

Result:

- The hook block weight is taken over as current input value hook block weight **2.4**, illustration 2.
- The input field hook block weight **2.1** is faded out.
- Double arrow down **2.3** is shown.



Note

▶ By pressing the function key **F7** again, the entered hook block weight can be changed!

When the entered hook block weight has been accepted:

▶ Press the function key **F8** (OK).

Result:

- The entered hook block weight is accepted into the LICCON computer system.
- The crane operating screen appears.

Problem remedy

When luffing the boom up / down **with the hook block**, is the maximum load exceeded according to the load chart and reeving and is a LMB stop triggered?

▶ Take the hook block down and carry it along.

Problem remedy

When erecting / taking down the boom **with the hook block**, a higher value than the actual weight on the hook block is shown in the „Current load“ icon (crane operating screen)?

▶ For further procedure, see section „Adapt the input value hook block weight“.

Problem remedy

When erecting / taking down the boom **without the hook block** (load weighting), a value of more than 0 t is shown in the „Current load“ icon (crane operating screen)?

▶ For further procedure, see section „Adapt the input value hook block weight“.

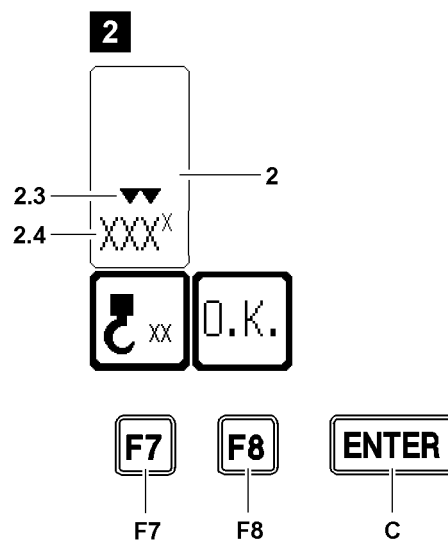
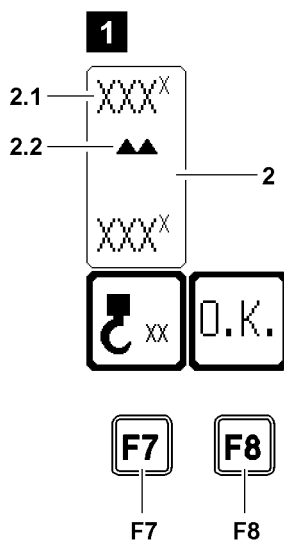
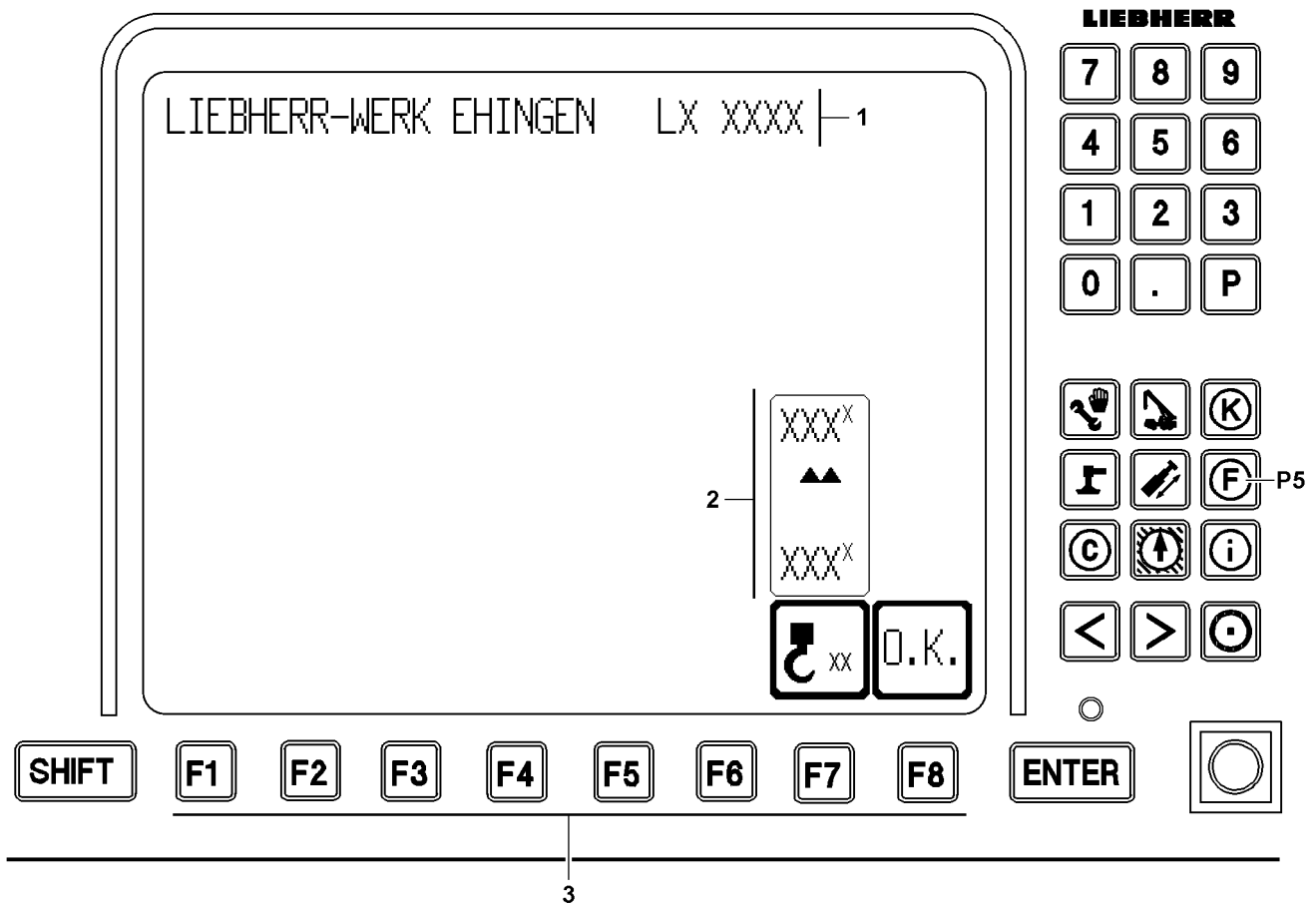


Fig.112339

5.6 Adapting the input value hook block weight

It may be possible that the crane movement is shut off due to overload when trying to erect / take down the boom.

The reason for the shut-off may be a weighing error.



Note

Weighing error!

- ▶ A weighing error is a combination of environmental influences, manufacturing and sensor tolerances!
- ▶ This combination can cause an increased display value in the „Current load“ icon (crane operating screen)!

A weighing error can be compensated for by adapting the input value hook block weight.



WARNING

All-inclusive adaptation of the hook block weight!

If the hook block weight input value is adapted without a weighing error being determined, then the crane can be overloaded and topple over!

Personnel can be severely injured or killed!

- ▶ Before adapting the hook block weight input value, an existing weighing error must have been found!
- ▶ Only the determined weighing error may be added to the permissible hook block weight!

If a weighing error is suspected, then the crane operator must ensure, before carrying out additional steps, that:

- A valid set up configuration has been entered in the LICCON computer system!
- The assembled boom system matches the entered set up configuration of the crane!
- The boom system is assembled according to the rod plans!
- All attachment parts on the boom have been removed!
- No guy rods are on the boom!
- The boom is free of snow and ice!
- The wind influence on the boom is not too great!
- The weighing error is plausible and comprehensible!

If it is ensured that the above listed prerequisites are adhered to, then the determined weighing error may be added to the permissible hook block weight and entered in the hook block weight icon.

- ▶ Enter the adapted hook block weight, see section „Entering the hook block weight“.

Problem remedy

The adapted value of the hook block weight is **not** taken over into the LICCON computer system, even though the weighing error is plausible and comprehensible?

- ▶ For erection of the boom system, carry the hook block along.

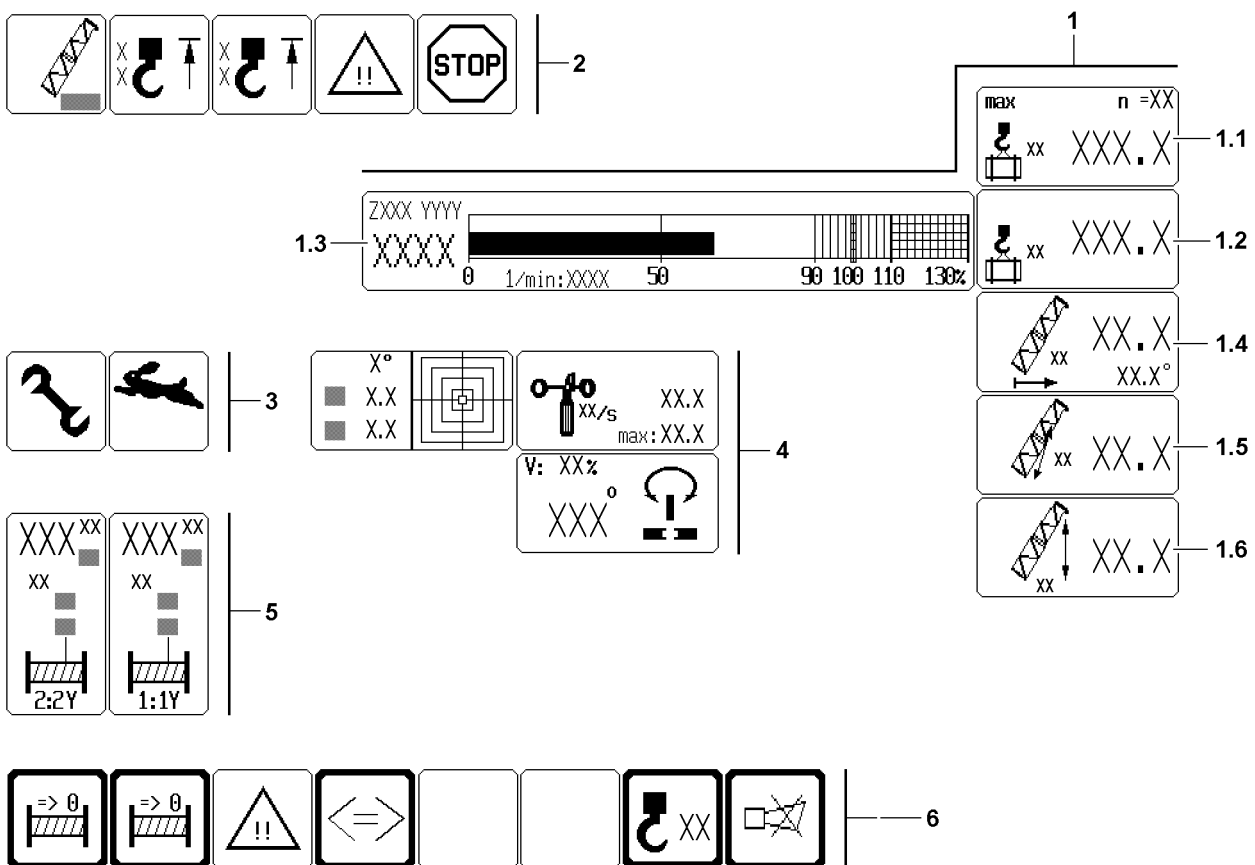
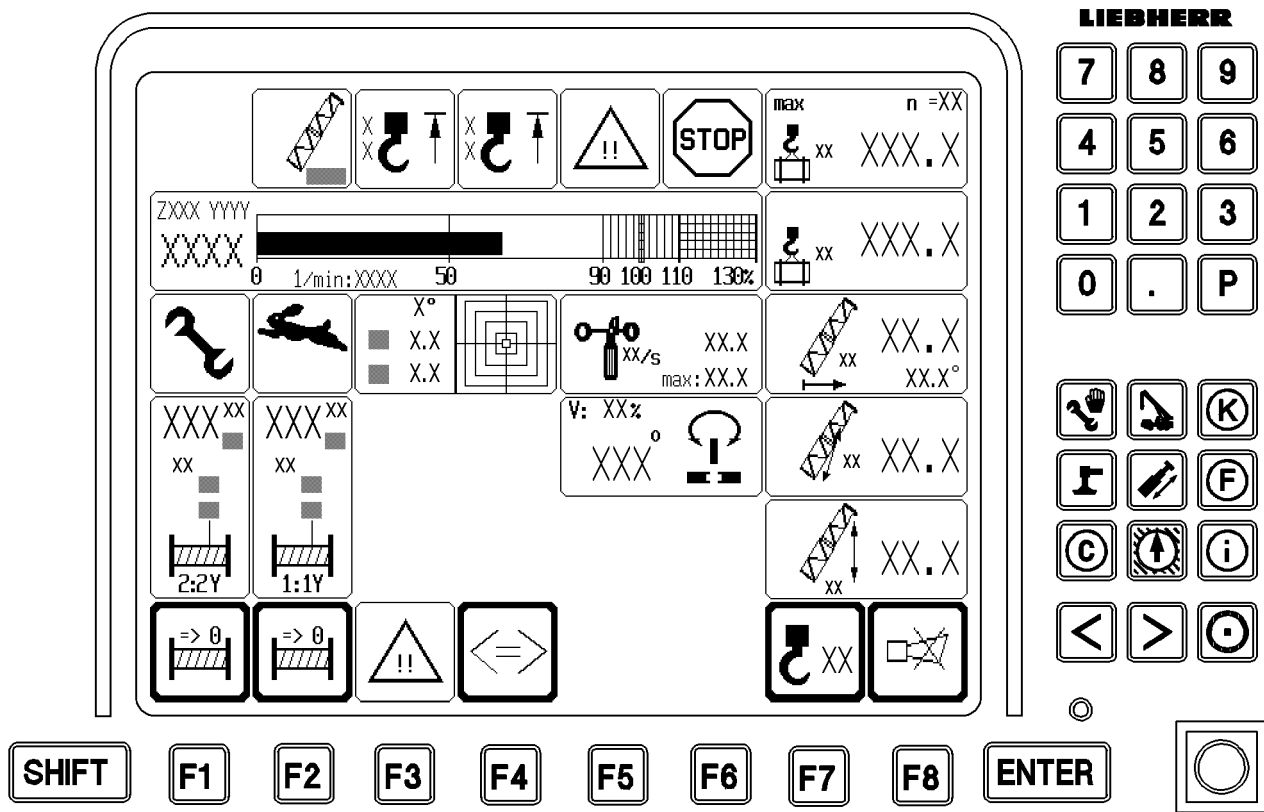


Fig.113450

LWE/LR 11350-007/19005-01-02/en

6 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 acoustic signal accompanies all critical displays. Depending on the equipment, a range of other icons may also be turned on as additional displays, either as required by the crane operator, or automatically in case of a problem.

It also alerts the crane operator to imminent overload conditions. In the event of overload and many error conditions, which could be hazardous during crane operation, the system shuts off.

The LICCON monitor is divided into six areas in the crane operation program:

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



Note

- ▶ The monitor illustrations in this chapter are only examples!
- ▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly!
- ▶ The configuration of the LICCON monitor with icons is only descriptive!
- ▶ An identical icon display will **not** appear during crane operation!

6.1 Crane geometry and load information



Note

- ▶ The crane illustrations in this section are only examples and are generalized!
- ▶ They may differ from the crane type and equipment!

The information regarding crane geometry and load is shown in six icons:

- 1.1 "Maximum load" icon
- 1.2 "Current load" icon
- 1.3 "Dynamic utilization bar" icon
- 1.4 "Boom radius" icon
- 1.5 "Boom length" icon
- 1.6 "Pulley head height" icon

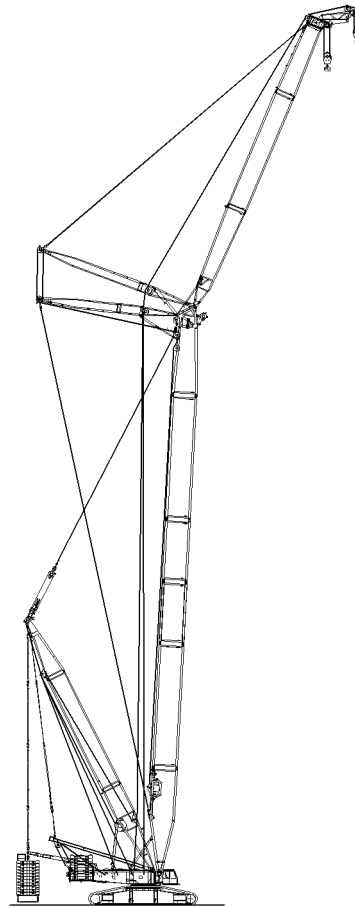
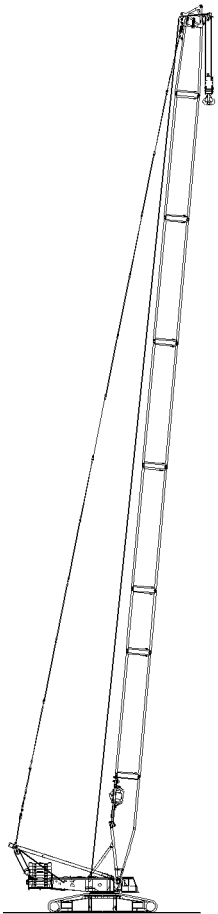
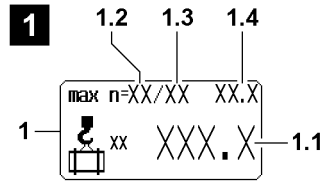
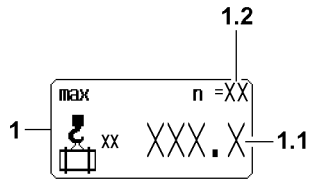


Fig.111931

LWE/LR 11350-007/19005-01-02/en

6.1.1 Maximum load

According to the set up configuration, the following changes:

- The illustration of the icon.
- The position of values in the icon, see sample illustration 1!

1 „Maximum load“ icon

- In [t] or [lbs]
- **Note:**
„? ? ? . ?“ is shown when no load chart value can be accessed!
An error message is issued, see the Diagnostics manual!

1.1 Maximum load on the boom

- In [t] or [lbs]
- The load capacity depends on:
 - The selected operating mode
 - The selected set up configuration (load chart)
 - The boom radius
 - The various boom angles
 - The derrick ballast radius*
 - The currently pulled derrick ballast*
 - The reeving of the hoist rope on the boom



Note

- ▶ The maximum load on the boom (also: maximum load according to the load chart and the reeving on the boom) is the load that the crane can lift in its current operating condition with the maximum utilized ballast / counterweight!
- ▶ In assembly operating mode SA, the maximum load capacity is shown in [t] or [lbs], according to the corresponding load chart.

1.2 Hoist rope reeving number on the boom

- n = reeving number of hoist rope on the pulley head selected via the load chart. The reeving number has been set first in the set up program.



Note

- ▶ In the assembly operating mode SA, the reeving number is always 0.

1.3 Reeving number of hoist rope on the boom nose*

- n = reeving number of hoist rope on the installed boom nose*. The reeving number has been set first in the set up program.

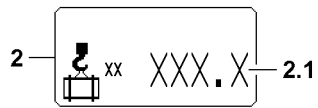
1.4 Maximum load of the installed boom nose*

- In [t] or [lbs]



Note

- ▶ The „Maximum load carrying capacity“ of the boom nose* depends on the set reeving of the boom nose*.
- ▶ The maximum load carrying capacities on the boom (1.1) and on the boom nose* (1.4) are monitored simultaneously. If the load on one position is exceeded, then an LMB stop is issued.



1

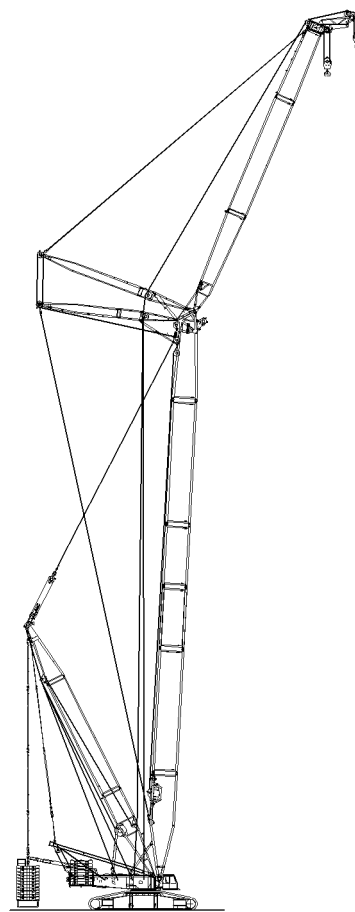
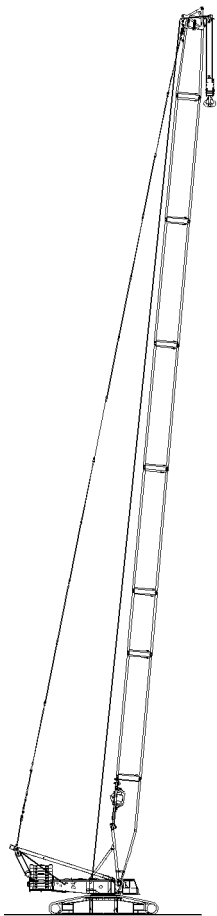
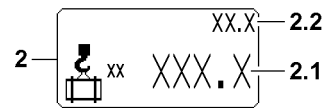


Fig.111932

6.1.2 Current load

According to the set up configuration, the following changes:

- The illustration of the icon.
- The position of values in the icon, see sample illustration 1!

2 „Current load“ icon

- In [t] or [lbs]

- **Note:**

„? ? ? . ?“ is shown when no load chart value can be accessed!

An error message is issued, see the Diagnostics manual!

2.1 Current load on the boom

- Actual load display = current load in [t] or [lbs] on the selected boom.
- Display of the calculated total load including the weights of the carrying equipment, the load handling equipment (hook block) and / or the fastening equipment, but **without** the nominal weight of the hoist rope.



Note

Assembly operating mode SA

- ▶ In assembly operating mode SA, the SA-frame is treated as the boom!
- ▶ The current load on the SA-frame is determined via pressure sensors on the assembly cylinder and shown in the „Current load“ icon 2.

2.2 Current load on the boom nose*

- Actual load display = current load in [t] or [lbs] 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 fastening equipment, **including** the hoist rope.



WARNING

Tolerances on the actual load display!

Due to tolerances, there may be a deviation in the actual load display in the „Current load“ icon 2!

The current load display in the „Current load“ icon 2 is not a calibrated weighing device!

- ▶ Always observe the actual weight of the load in connection with the load charts and the set up configuration!



Note

Net load display in the „Current load“ icon 2!

- ▶ By using the „Tare“ function (see description of function key **F7** in section „Function key line“) the display can be changed over to display the net load! The icon also contains the word „Net“!

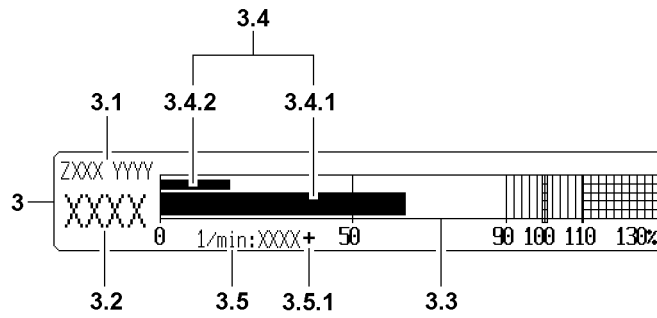


Fig.111933

LWE/LR 11350-007/19005-01-02/en

6.1.3 Dynamic utilization bar

- 3 „Dynamic utilization bar“ icon
 - In percent [%]
- 3.1 Organization number
 - For internal Liebherr load chart administration
- 3.2 Short code
 - Identifies the selected set up configuration
- 3.3 Utilization scale
 - Marking from a utilization of 90 %: **Advance warning**
 - Marking at a utilization of 100 %: **STOP shut-off**
- 3.4 Utilization bar
 - 3.4.1 Crane utilization bar
 - According to load chart and reeving
 - **Note:**
The utilization bar is the measurement for the current utilization of the crane!

| | |
|--|--|
| 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:**
Maximum load carrying capacity of the boom nose*: Load that can be lifted by the boom nose* alone!
Prerequisite: Sufficiently high load capacity on the boom head!

| | |
|---------------------------------|---|
| 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] or [n/min]
 - **Note:**
„????“ is displayed in case of an error in rpm value for approximately 5 seconds!
Then the nominal speed for the diesel engine is set for the output regulation of the drives!
The set nominal speed is shown blinking!
An error message is issued!
 - 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.

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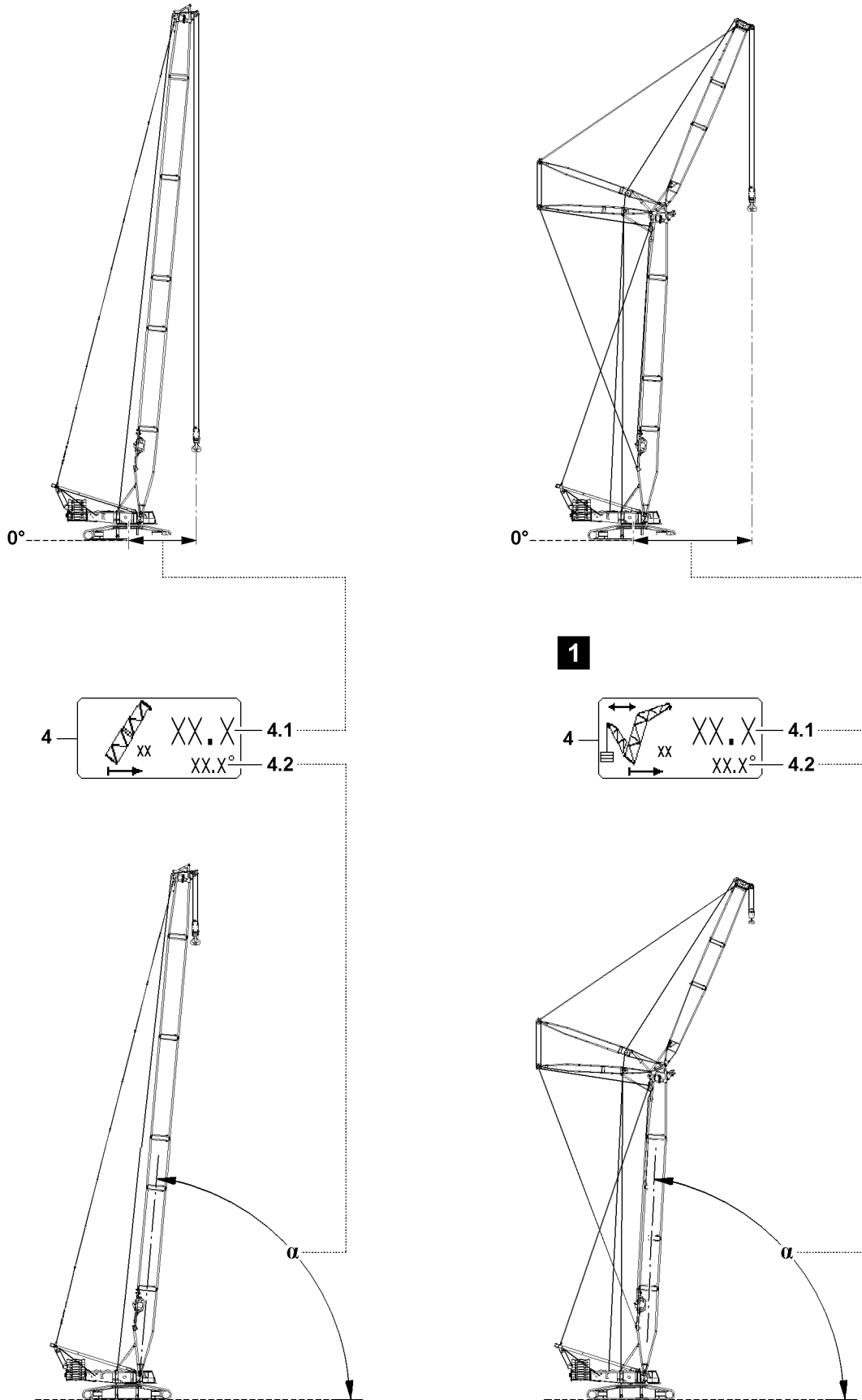


Fig.112633

LWE/LR 11350-007/19005-01-02/en

6.1.4 Boom radius

According to the set up configuration, the following changes:

- The illustration of the icon.
- The position of values in the icon, see sample illustration 1!

4 „Boom radius“ icon

- **Note:**

„? ? ? . ?“ is shown if the value cannot be calculated / determined!
An error message is issued, see the Diagnostics manual!

4.1 Boom radius

- In [m] or [ft]

Indicates the horizontal distance of the load hook from the rotation axis of the crane 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!

4.2 Main boom angle

- 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.



Note

► Main boom angle 4.2 (angle α): The angle of the main boom to the placement surface of the crane!

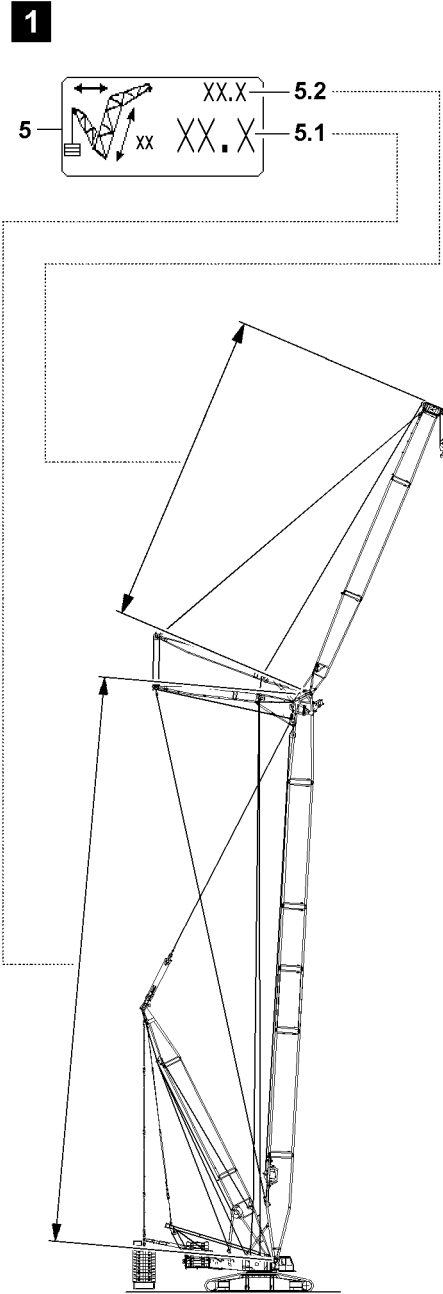
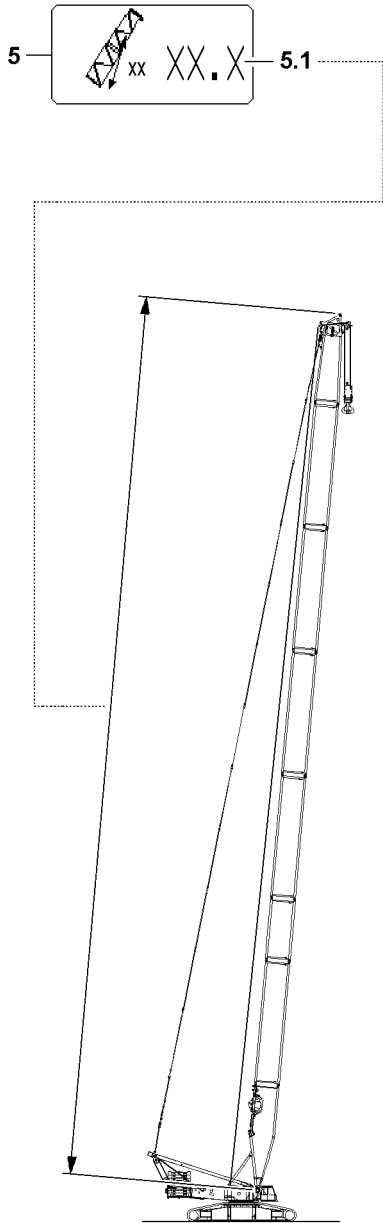


Fig.112638

LWE/LR 11350-007/19005-01-02/en

6.1.5 Boom length

According to the set up configuration, the following changes:

- The illustration of the icon.
- The position of values in the icon, see sample illustration 1!

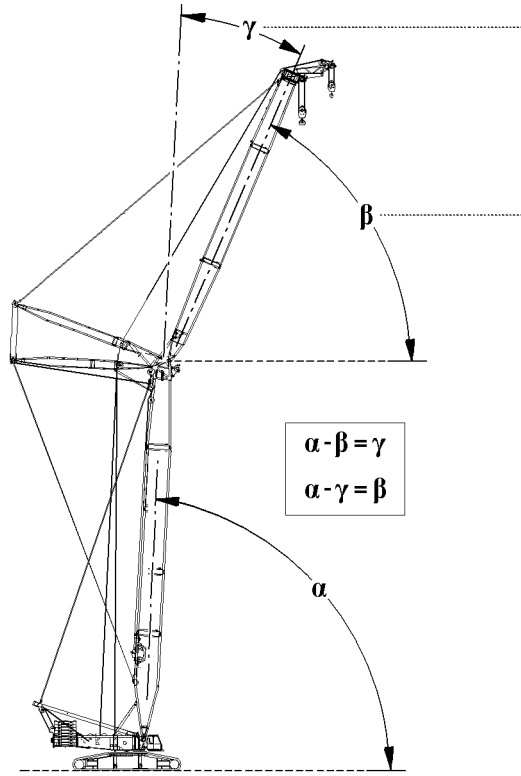
5 „Boom length“ icon

5.1 Length of main boom

- In [m] or [ft]

5.2 Length of auxiliary boom / accessory

- In [m] or [ft]



1

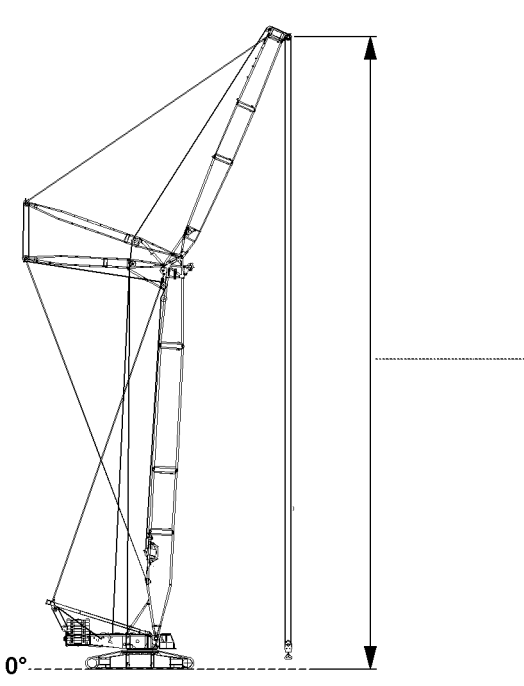
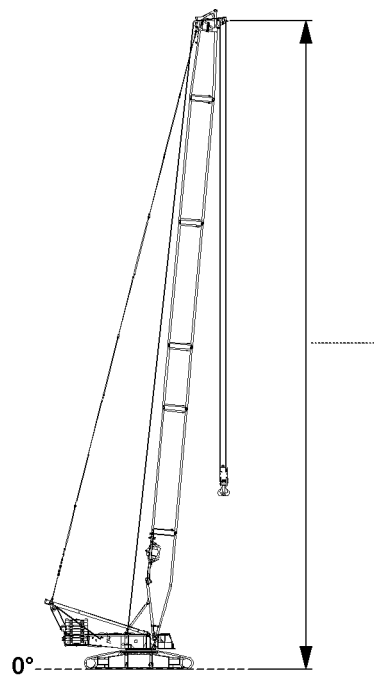
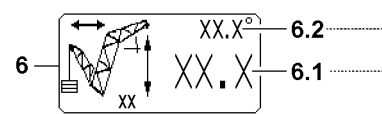
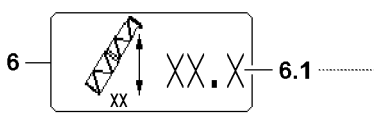


Fig.112639

LWE/LR 11350-007/19005-01-02/en

6.1.6 Pulley head height



Note

- ▶ Main boom angle α : The angle of the main boom to the placement surface of the crane!
- ▶ Auxiliary boom / accessory angle β : The angle of the auxiliary boom / accessory to the placement surface of the crane!
- ▶ Relative angle auxiliary boom / accessory γ : The angle of the auxiliary boom / accessory is determined relative to the main boom!

According to the set up configuration, the following changes:

- The illustration of the icon.
- The position of values in the icon, see sample illustration 1!

6 „Pulley head height“ icon

• Note:

„? ? ? . ?“ is shown if the value cannot be calculated / determined!
An error message is issued, see the Diagnostics manual!

6.1 Pulley head height

- In [m] or [ft]
- Marks the vertical distance from the placement surface of the crane to the selected pulley head axle.
The displayed maximum load is valid for the selected pulley head axle.

6.2 Auxiliary boom / accessory angle

- In [°]



Note

- ▶ Depending on the set up configuration and the load chart, a differentiation is made between an absolute angle display or a relative angle display!

β Auxiliary boom / accessory absolute angle

- The angle of the auxiliary boom / accessory to the horizontal (placement surface of the crane) in [°]
- Display absolute angle: For operating modes with a load chart for a fixed defined main boom angle!

or

γ Relative angle auxiliary boom / accessory

- Angle between the main boom and the auxiliary boom / accessory in [°]
- Display relative angle: For operating modes with a load chart for a fixed defined auxiliary boom / accessory angle!

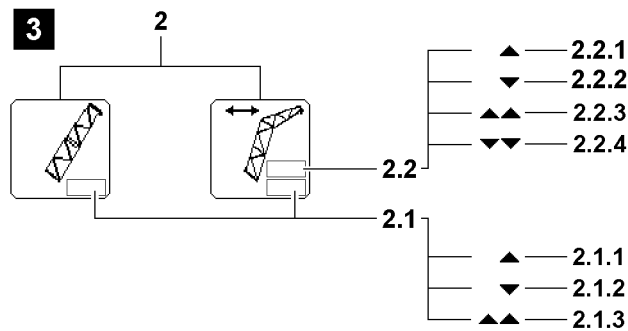
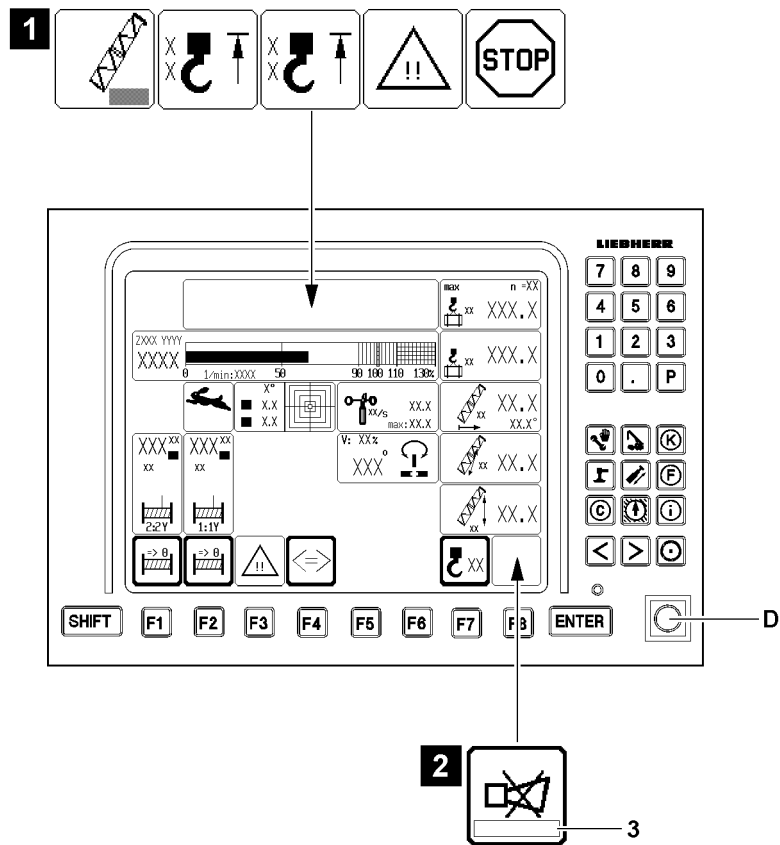


Fig.111930

6.2 Alarm functions

NOTICE

Triggered alarm function!

If an alarm function is triggered (for example an advance warning occurrence or LMB Stop), the cause must be determined!

- ▶ Always pay attention to triggered alarm functions!
 - ▶ Alarm functions can flash over the monitor!
-

The limit ranges of the crane movements are monitored. When the limit ranges are reached, the crane operator is warned by the alarm functions.

The alarm functions are shown by the LICCON monitor:

- Optically with icons, see illustration 1.
- Acoustically by a warning sound „Horn“, see illustration 2.

In case of a failure of the relevant sensors / limit switches, special error messages 3 are added.

6.2.1 Boom limitation

See illustration 3

Limit signs main boom



Note

- ▶ The „Boom limitation“ icon 2 can change in different operating modes, but it is shown always in the same position on the LICCON monitor!
 - ▶ The field 2.1 „on the bottom“ refers to the main boom!
 - ▶ The field 2.2 „on the top“ refers to the auxiliary boom / accessory!
-

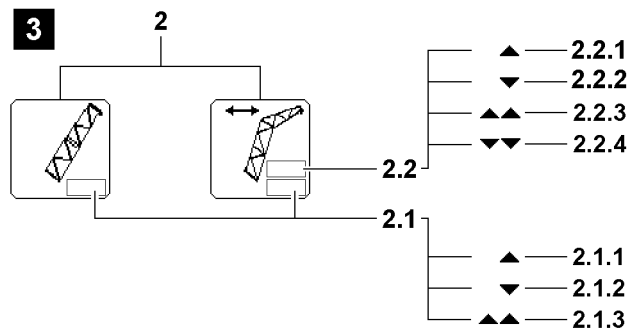
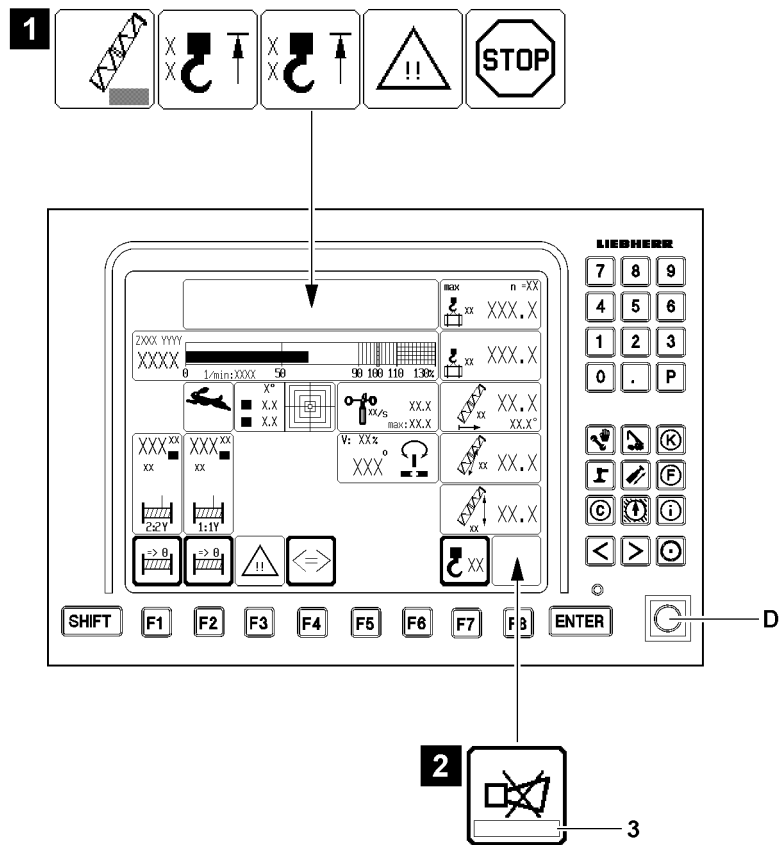


Fig.111930

2.1 „Boom limitation Main boom“ icon

- The luffing range of the main boom is limited both upward and downward.
- This icon appears if an end position determined by the load chart is reached when luffing the boom or when luffing the boom is disabled by a proximity switch.
- Exclamation marks show when an associated sensor is defective.

| Position | Symbol | Description |
|----------|--------|--|
| 2.1.1 | ▲ | The „Luffing up the main boom“ shut-off is triggered by running against the upper load chart limit or Utilization greater than 95 % and falling load carrying capacity when luffing up the main boom Note: Luffing down the main boom is still possible! |
| 2.1.2 | ▼ | The „Luffing down the main boom“ shut-off is triggered by running against the lower load chart limit Note: Luffing up the main boom is still possible! |

**WARNING**

Alarm function deactivated!

When the set up key **D** is actuated, there is no shut-off of crane movement via position **2.1.1** and position **2.1.2**!

► Observe the Crane operating instructions, chapter 4.20!

| Position | Symbol | Description |
|----------|--------|---|
| 2.1.3 | ▲▲ | The „Luffing up the main boom“ shut-off is triggered by running against the block limit switch of the main boom relapse cylinders on the left / right (boom steep) or due to an error in one block limit switch of the main boom relapse cylinders Note: Luffing down the main boom is still possible! |

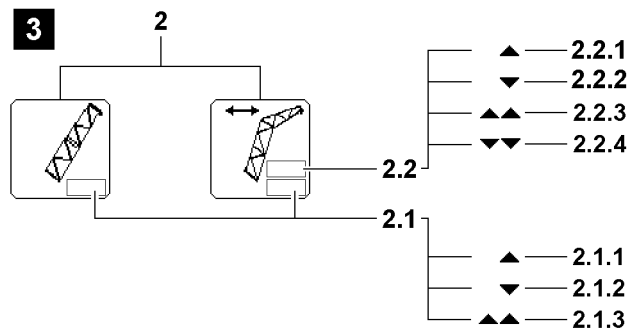
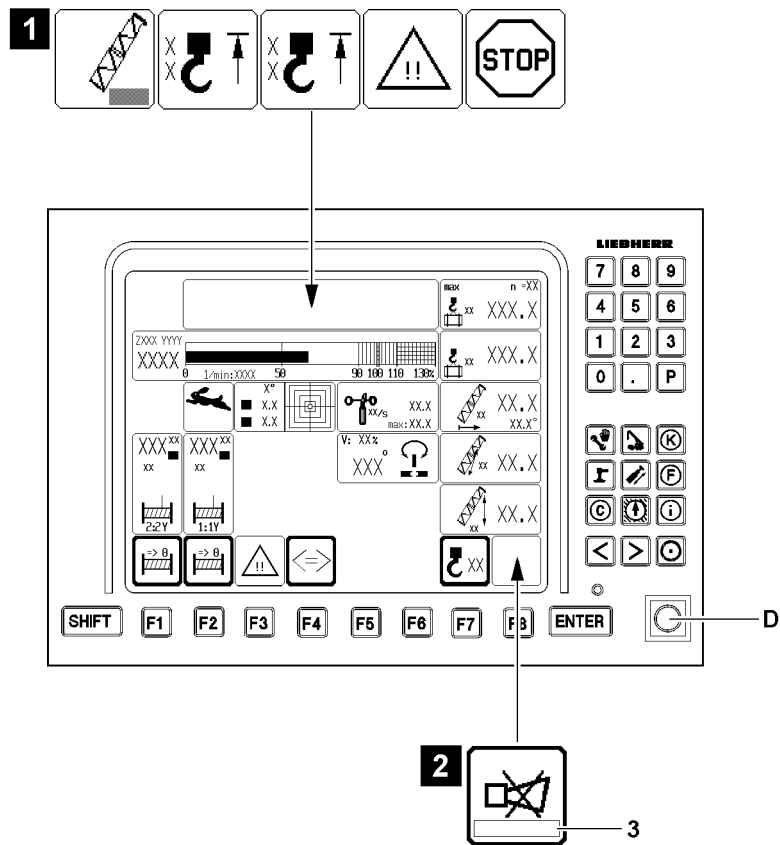


Fig.111930

Auxiliary boom / accessory limit signs



Note

- ▶ The „Boom limitation“ icon **2** can change in different operating modes, but it is shown always in the same position on the LICCON monitor!
- ▶ The field **2.1** „on the bottom“ refers to the main boom limit sign!
- ▶ The field **2.2** „on the top“ refers to the auxiliary boom / accessory limit sign!

2.2 „Auxiliary boom / accessory boom limitation“ icon

- The luffing range of the auxiliary boom / accessory is limited both upward and downward.
- This icon appears if an end position determined by the load chart is reached when luffing the auxiliary boom / accessory or when luffing is disabled by a limit switch.
- Exclamation marks show when an associated sensor is defective.

| Position | Symbol | Description |
|----------|--------|---|
| 2.2.1 | ▲ | The „Luffing up the auxiliary boom / accessory“ shut-off is triggered by running against the upper load chart limit Note: Luffing the auxiliary boom / accessory down remains possible! |
| 2.2.2 | ▼ | The „Luffing down the auxiliary boom / accessory“ shut-off is triggered by running against the lower load chart limit Note: Luffing the auxiliary boom / accessory up remains possible! |



WARNING

Alarm function deactivated!

When the set up key **D** is actuated, there is no shut-off of crane movement via position **2.2.1** and position **2.2.2**!

- ▶ Observe the Crane operating instructions, chapter 4.20!

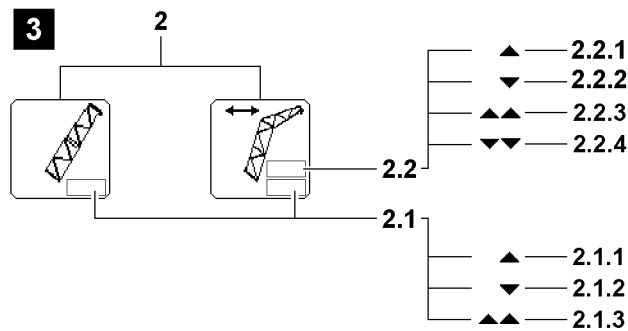
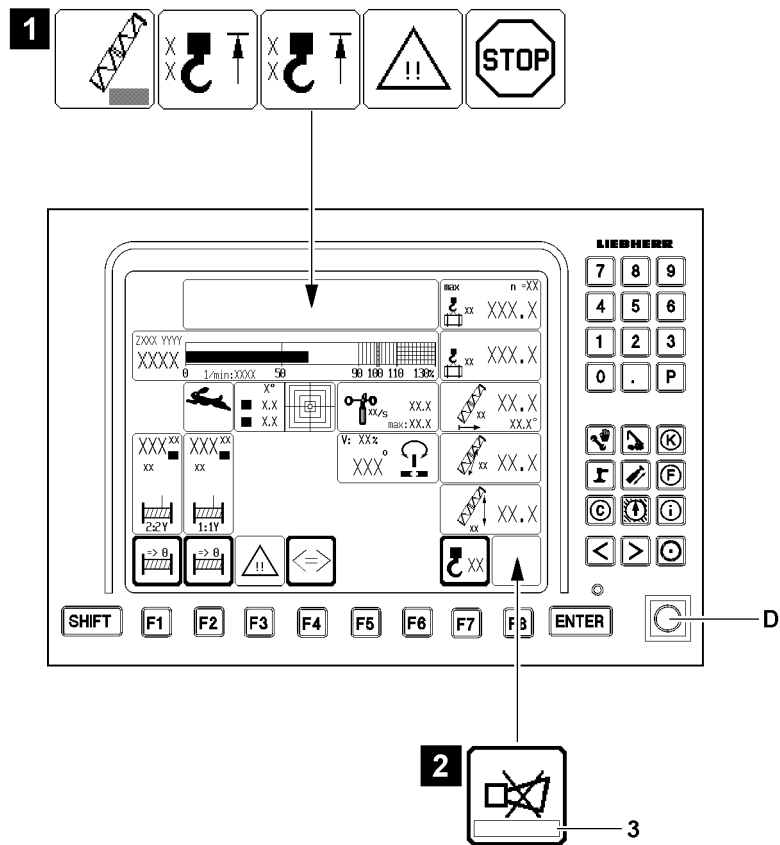




Fig.111930

| Position | Symbol | Description |
|----------|---|---|
| 2.2.3 |  | <p>The „Luffing up the auxiliary boom / accessory“ shut-off is triggered by running against a block limit switch of the auxiliary boom / accessory relapse cylinders</p> <p>or</p> <p>the relapse flap</p> <p>or</p> <p>an error on one limit switch occurs</p> <p>Note: Luffing the auxiliary boom / accessory down remains possible!</p> |
| 2.2.4 |  | <p>The „Luffing down the auxiliary boom / accessory“ shut-off is triggered by running against a block limit switch („Auxiliary boom / accessory lower left / right“)</p> <p>or</p> <p>an error occurs on one of these limit switches</p> <p>Note: Luffing the auxiliary boom / accessory up remains possible!</p> |

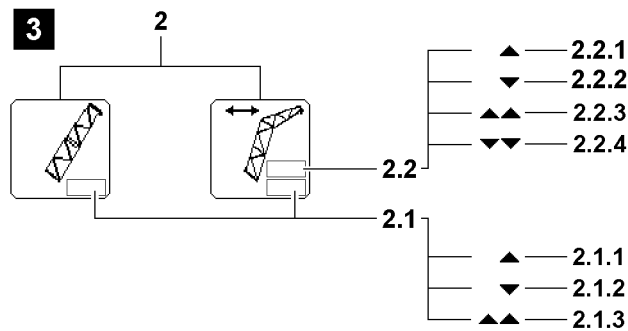
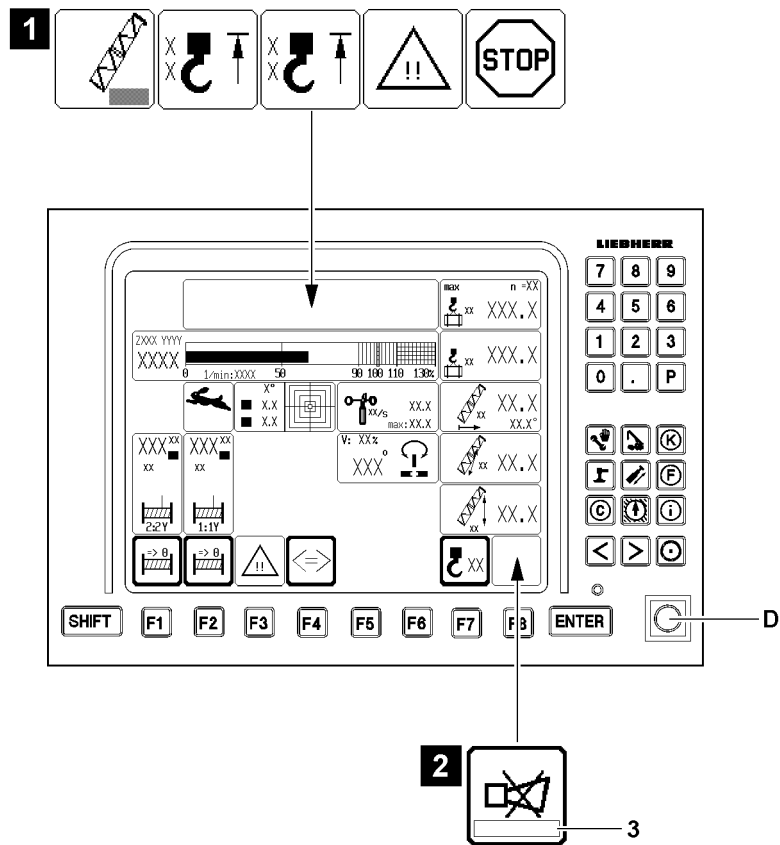


Fig.111930

6.2.2 Failure of sensor / limit switch

NOTICE

Failure of sensor / limit switch!

Depending on the classification of the sensor / limit switch, the crane can continue to be operated with limitation or is shut off by the control!

An error message is issued in the horn icon **3**, see illustration **2**!

The error message shows defective sensors / limit switches, see the Diagnostics manual!

- ▶ The error must be remedied immediately!
- ▶ Crane movements after a failure of a sensor / limit switch must be carried out anticipatorily and with extreme caution!

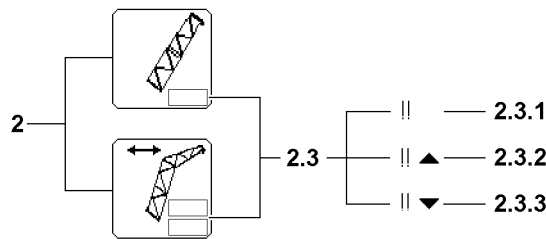


Fig.111928

| Position | Symbol | Description |
|----------|--------|---|
| 2.3.1 | !! | At least one associated sensor / limit switch is defective / missing on the auxiliary boom / accessory. If an alarm function occurs at the same time, then the icon can be shown differently, see position 2.3.1, position 2.3.2 or position 2.3.3. |
| 2.3.2 | !!▲ | |
| 2.3.3 | !!▼ | Note: Not every failure of a sensor / limit switch on the boom is shown in the „Boom limitation“ icon 2 . Observe the error message in the Horn 3 icon! |



Note

- ▶ Depending on the classification of the sensor / limit switch, the respective crane movement is shut off **unbypassably** in case of a failure!
- ▶ When deflecting the master switch, an operating error message is output in the horn icon **3**! The operating error message shows defective sensors / limit switches!
- ▶ If the error cannot be remedied by yourself, contact Liebherr Service!

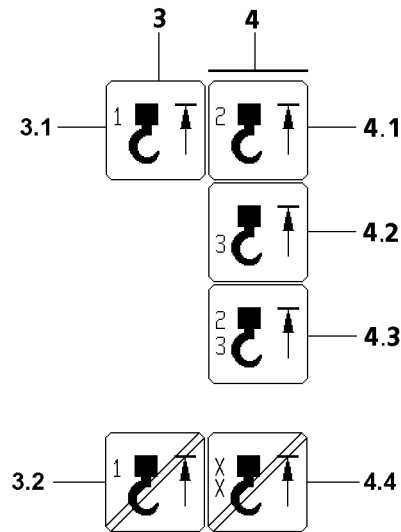


Fig.112365

6.2.3 Hoist top limit switch HES1

- 3 „Hoist top on HES1“ icon
- In order to prevent the crane from being operated without hoist limit switches (HES), the minimum hoist limit switch configuration is continuously monitored to ensure it is present. If a hoist limit switch required for a particular operating mode is not plugged in, therefore not active in the LSB bus system, an LMB STOP is triggered and an operating error report is also issued.
 - **Note:**
HES1 (HES1A + HES1B) must be present for all operating modes with main boom!
HES1 (HES1A + HES1B) turn the same functions off like the remaining hoist limit switches!
- 3.1 HES1
- Location HES1A:
Main boom end section: left, bus address: 27
 - Location HES1B:
Main boom end section: right, bus address: 28
 - The „**HES1**“ icon appears if:
 - The hook block runs against the HES1A.
 - HES1A is not active, although it must be present on the bus.
 - HES1A has an internal error.
 - The hook block runs against the HES1B.
 - HES1B is not active, although it must be present on the bus.
 - HES1B has an internal error.
 - **Note:**
The spool hoist winch up, luff boom down as well as luff derrick boom down crane movements are turned off!
- 3.2 „Hoist top on boom bypassed“ icon
- The icon appears when the „Hoist top shut-off“ is bypassed

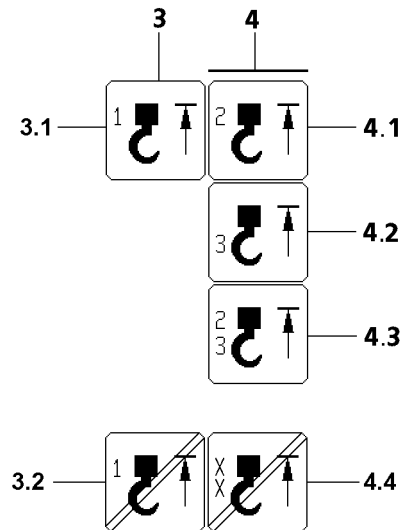


Fig.112365

6.2.4 Hoist top limit switch HES2 and HES3

4 „Hoist top on HES2 / HES3“ icon

- In order to prevent the crane from being operated without hoist limit switches (HES), the minimum hoist limit switch configuration is continuously monitored to ensure it is present. If a hoist limit switch required for a particular operating mode is not plugged in, therefore not active in the LSB bus system, an LMB STOP is triggered and an operating error report is also issued.
- **Note:**
HES2 (HES2A + HES2B) must be present for all operating modes with an auxiliary boom / accessory!
HES1 (HES2A + HES2B) turn the same functions off like the remaining hoist limit switches!
- **Note:**
HES3 must be present for all operating modes with a boom nose*!
HES3 turn the same functions off like the remaining hoist limit switches!

4.1 HES2

- Location HES2A: Auxiliary boom / accessory*
Bus address: 27
- Location HES2B: Auxiliary boom / accessory*
Bus address: 28
- The „**HES2**“ icon appears if:
 - The hook block moves against the HES2A on the auxiliary boom / accessory.
 - 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 auxiliary boom / accessory.
 - HES2B is not active, although it must be present on the bus.
 - HES2B has an internal error.
- **Note:**
The spool hoist winch up, luff boom down as well as luff derrick boom down crane movements are turned off!

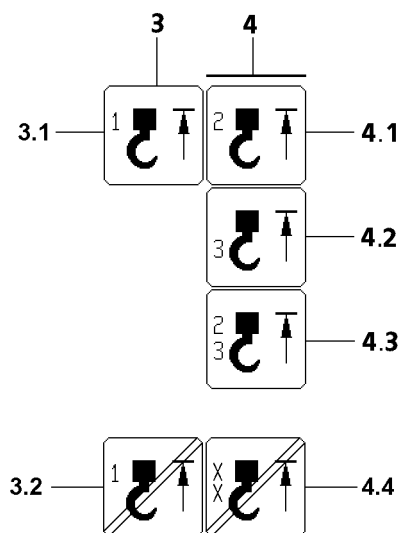


Fig.112365

4.2 „Hoist top on HES3“ icon

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*
- Auxiliary boom / accessory boom nose 1, bus address: 24*
- Auxiliary boom / accessory boom nose 2, bus address: 25*
- Auxiliary boom / accessory boom nose 3, bus address: 26*
- The „**HES3**“ icon appears if:
 - The hook block runs against the HES3.
 - HES3 is not active, although it must be present on the bus.
 - HES3 has an internal error.

• **Note:**

The spool hoist winch up, luff boom down as well as luff derrick boom down crane movements are turned off!

4.3 HES2 and HES3

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

4.4 „Hoist top on boom bypassed“ icon

- The icon appears when the „Hoist top shut-off“ is bypassed

• **Note:**

Only the icons for active and bypassed hoist limit switches appear!

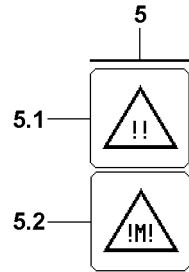


Fig.112366

6.2.5 LMB advance warning / engine monitoring advance warning

5 „Advance warning“ icon

5.1 Advance warning LMB

- 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 advance warning

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

NOTICE

Shut off engine monitoring!

Outside of the crane operation program, the engine monitoring is turned off!

When the engine monitoring is turned off, problems and warning occurrences are not recognized!

This could result in crane failure!

- ▶ If work is not carried out in the crane operation program, then turn the crane engine off and operate the LICCON computer system in stand-by mode, see section „LICCON computer system in stand-by mode“!
 - ▶ If work has to be carried out for a longer period outside of the crane operation program, with the crane engine running, then switch regularly into the engine monitoring screen!
-

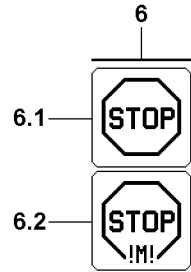


Fig.112367

6.2.6 LMB STOP / Engine monitoring STOP

6 „STOP“ icon

6.1 LMB STOP

- The „STOP“ icon appears when the load chart utilization exceeds the **100 % mark** (LMB STOP).

- **Note:**

All crane movements that increase the load momentum are shut off!

or

6.1 Sensor error

- The „STOP“ icon appears when a sensor which is required to monitor the load chart has an error (LMB STOP is actuated).

- **Note:**

All crane movements that increase the load momentum are shut off!

or

6.1 No load chart

- The „STOP“ icon appears if no load chart is available (LMB STOP is actuated).

- **Note:**

All crane movements that increase the load momentum are shut off!

6.2 Engine monitoring STOP

- 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.

NOTICE

Shut off engine monitoring!

Outside of the crane operation program, the engine monitoring is turned off!

When the engine monitoring is turned off, problems and warning occurrences are not recognized!

This could result in crane failure!

- ▶ If work is not carried out in the crane operation program, then turn the crane engine off and operate the LICCON computer system in stand-by mode, see section „LICCON computer system in stand-by mode“!
 - ▶ If work has to be carried out for a longer period outside of the crane operation program, with the crane engine running, then switch regularly into the engine monitoring screen!
-

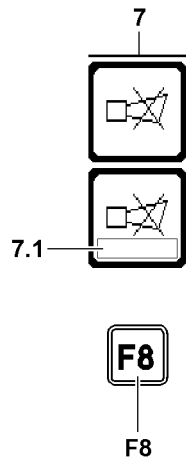


Fig.111270

6.2.7 Acoustic warning on monitor 0

Acoustic warnings on monitor 0 are indicated by the warning sound „Horn“.

The „horn“ warning sound is divided into two categories:

- „Horn“ is a beeping sound that lasts approximately 0.5 seconds and that is repeated every second.
- „Short horn“ is a beeping sound of a duration of approximately 0.1 seconds, which is repeated in a second cycle.

7 Horn icon

- When the horn icon is shown in the LICCON monitor, any acoustic signals which will occur can be shut off by the LICCON monitor **0** by pressing the function key **F8**.
- If an error message is shown in the horn icon **7** in field **7.1**, then the present error can be determined through it in the diagnostics manual. Pressing the function key **F8** twice, automatically changes to the error determination screen of the test system. The error is displayed in documentary form.

„Horn“ acoustic signal

1. Sounds in addition to the visual display of an error message in field **7.1** if operational errors are found that lead to the shut-off of a crane movement.

Operational errors are:

- Overload
 - Boom outside of the angle / boom radius range of the load chart
2. In case of application errors with error number (LICCON Error Code LEC). For example sensor errors, which occur due to insufficient sensor signals or a defective sensor.

The following sensors are monitored:

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

„Short horn“ acoustic signal

Sounds in addition to the visual display of error messages that do not have an error number and do not lead directly to crane movement shut-off by the LICCON overload protection

Monitored error messages are:

- Maximum permissible wind speed exceeded (only with an activated wind sensor*)
- Crane utilization value for „Advance warning“ (90 %) reached

Priority acoustic signal

- 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“ immediately become active again if an error recurs!

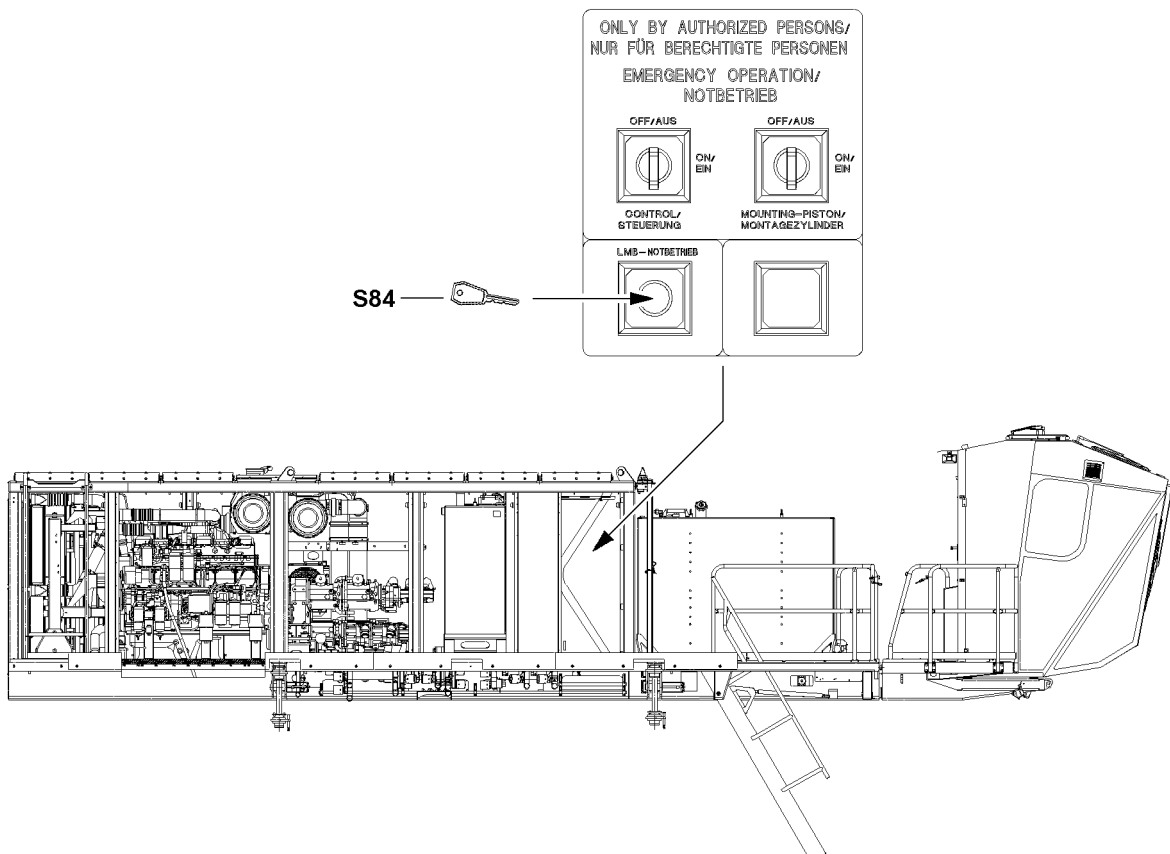
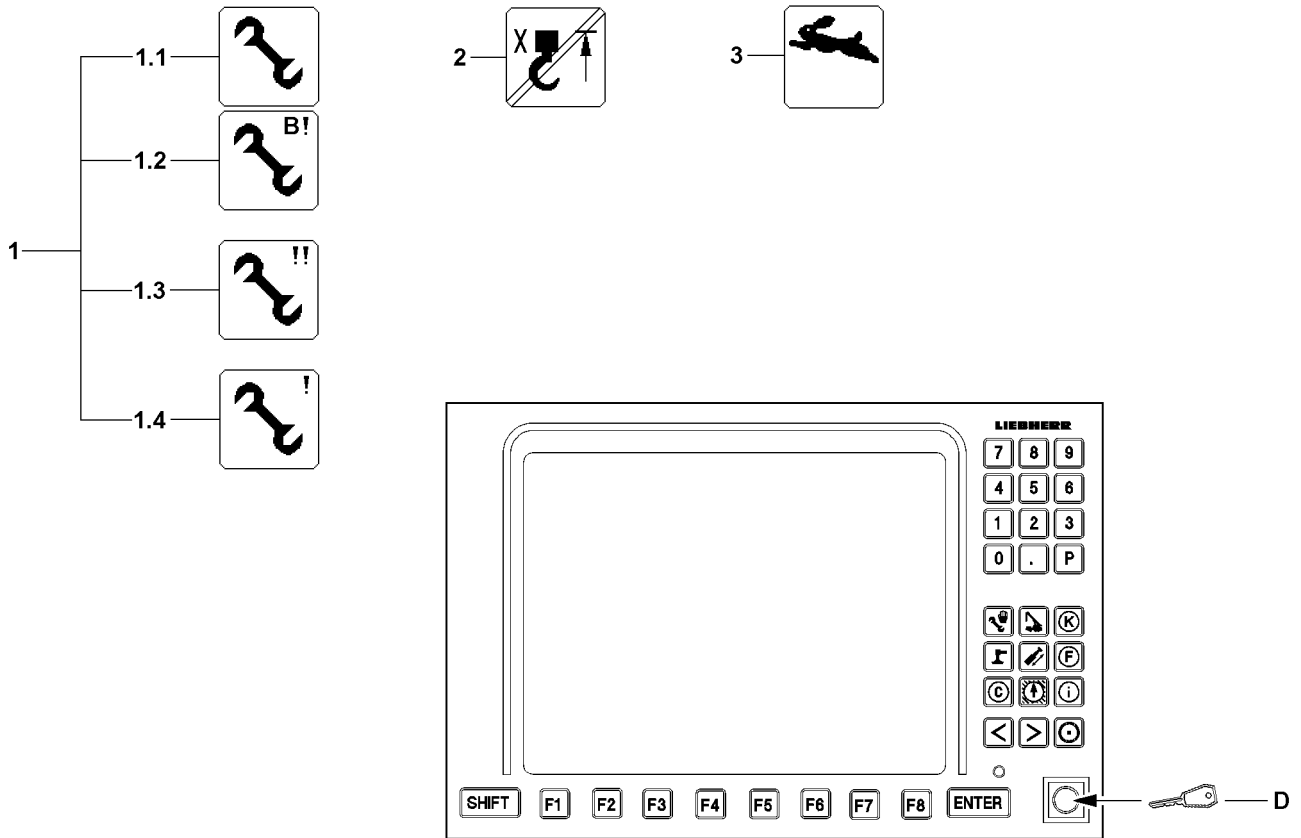


Fig.112949

LWE/LR 11350-007/19005-01-02/en

6.3 Special functions



Note

Double function set up key!

If the crane has **no** CE-mark, when actuating the set up key **D**, the release for the „Emergency operation LICCON overload protection“ is automatically engaged!

- ▶ Take into account, when actuating the set up key **D**, that the „Emergency operation LICCON overload protection“ is automatically released!



Note

- ▶ The various icons **1** are shown on the same position in the LICCON monitor, depending on the operating mode, illustration **2**.
- ▶ For operation and specifications for using the set up key **D** see Crane operating instructions, chapter 4.20 and 7.15.

6.3.1 Exceeding the shut off limits of the LICCON overload protection

1.1 Exceeding the shut off limits of the LICCON overload protection

- The icon appears:
 - When the shut off limits of the LICCON overload protection are bypassed via the set up key **D**.
 - **Note:**
The Crane operation program is locked, meaning, no other program can be turned on via the program keys.

6.3.2 No load chart is available

1.2 No load chart is available

- The icon appears:
 - When the shut off limits of the LICCON overload protection are bypassed via the set up key **D** **and** no load chart is available.
 - **Note:**
By actuating the set up key **D**, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available!

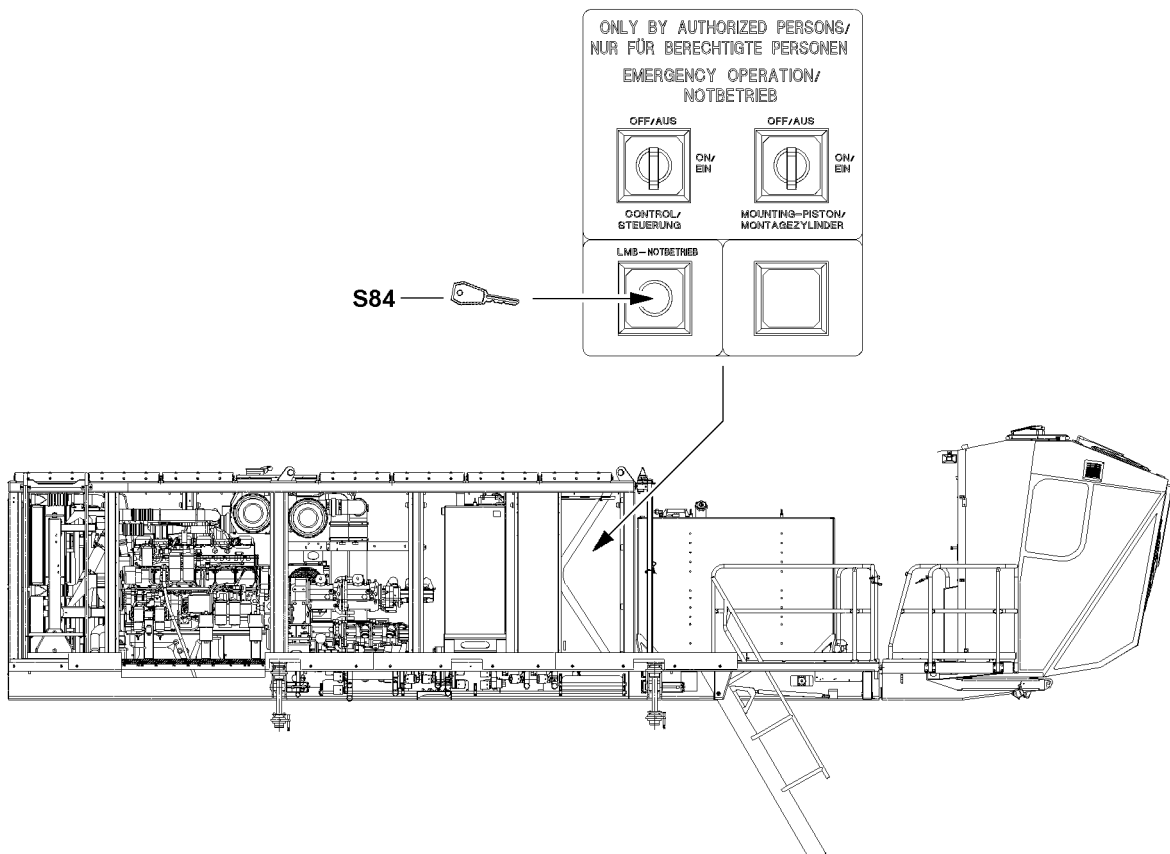
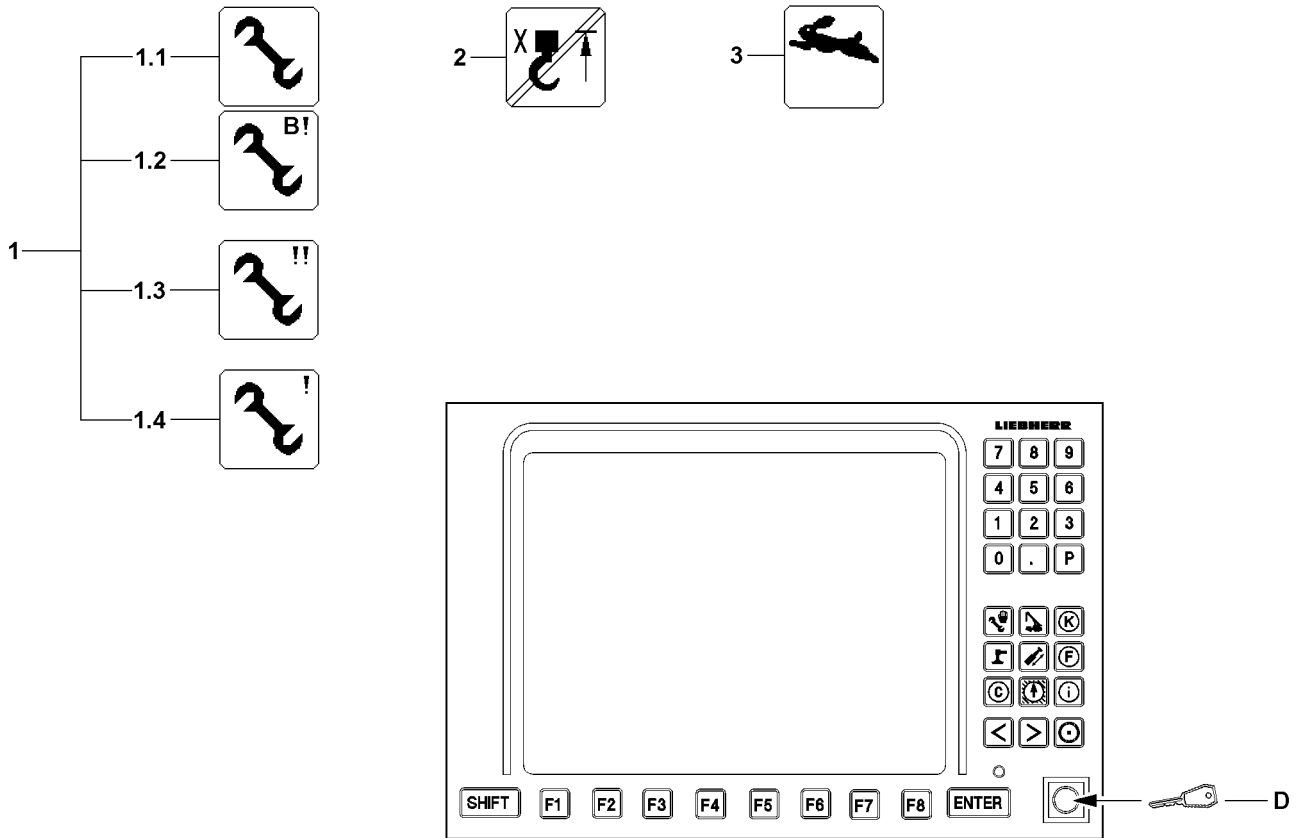


Fig.112949

LWE/LR 11350-007/19005-01-02/en

6.3.3 Emergency operation LICCON overload protection (according to EN 13000:2010)

1.3 LMB emergency operation activated

- The icon appears:
 - when the LMB-emergency operation is activated via the key button **S84**.
 - **Note:**
The Crane operation program is locked, meaning, no other program can be turned on via the program keys.

6.3.4 Emergency operation LICCON overload protection (crane without CE mark)



Note

If the crane has **no** CE mark, then the functions of the „Emergency operation of the LICCON overload protection“ are also engaged by the set up key **D!**

- ▶ Only crane without CE-mark: If the emergency operation LICCON overload protection is needed, actuate the key button **S84** or the set up key **D!**

1.3 LMB emergency operation activated

- The icon appears:
 - If the LMB emergency operation is activated by the key button **S84** or the set up key **D**.
 - **Note:**
Depending on the reason for the LMB emergency operation, the icon for no load chart available **1.2** can also appear.
 - **Note:**
The Crane operation program is locked, meaning, no other program can be turned on via the program keys.

6.3.5 Additional emergency operating modes



WARNING

Improper crane operation!

If one of the icons for additional emergency operating modes **1.4** appears, then there is a danger of accident due to erroneous operation of the crane!

Personnel can be killed or injured!

This could result in property damage!

- ▶ Deactivate additional operating modes **1.4** again or contact Liebherr Service and coordinate further procedure.

1.4 Additional emergency operating modes

- Icon **1.4** appears if additional emergency operating modes were activated.

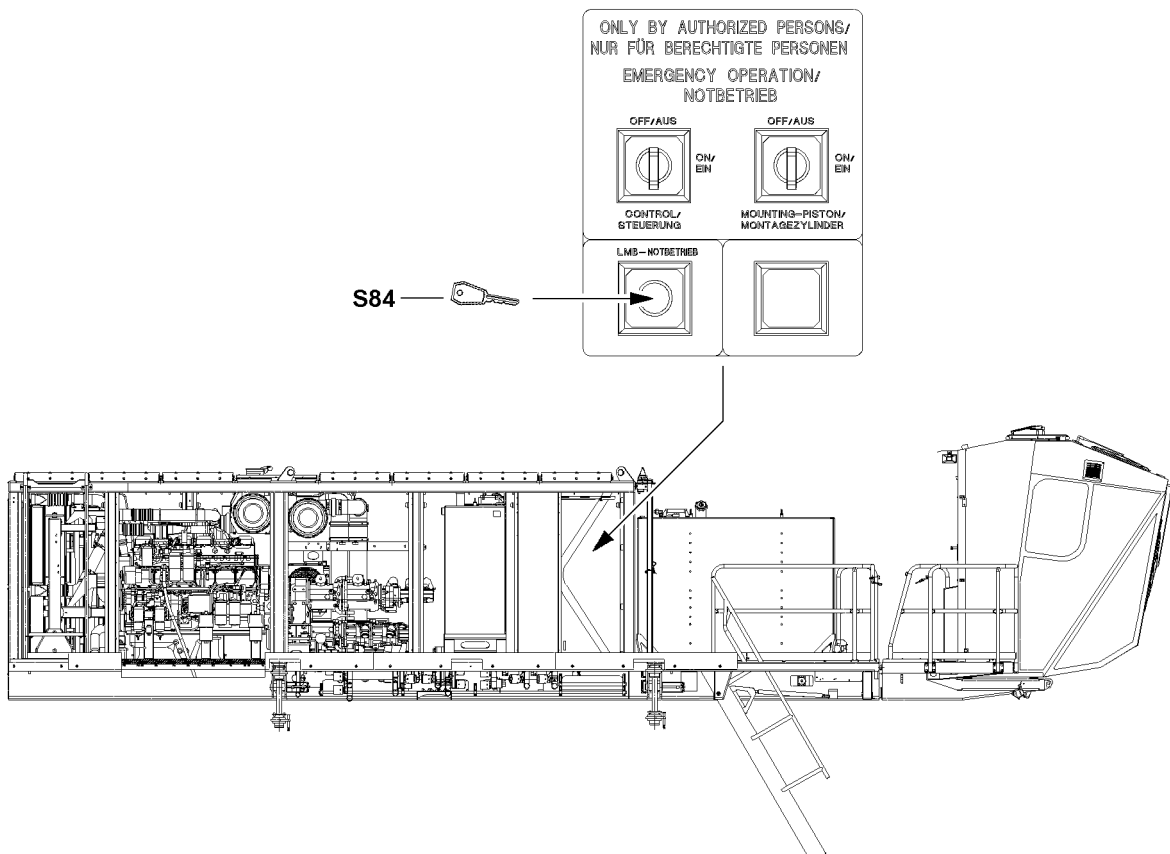
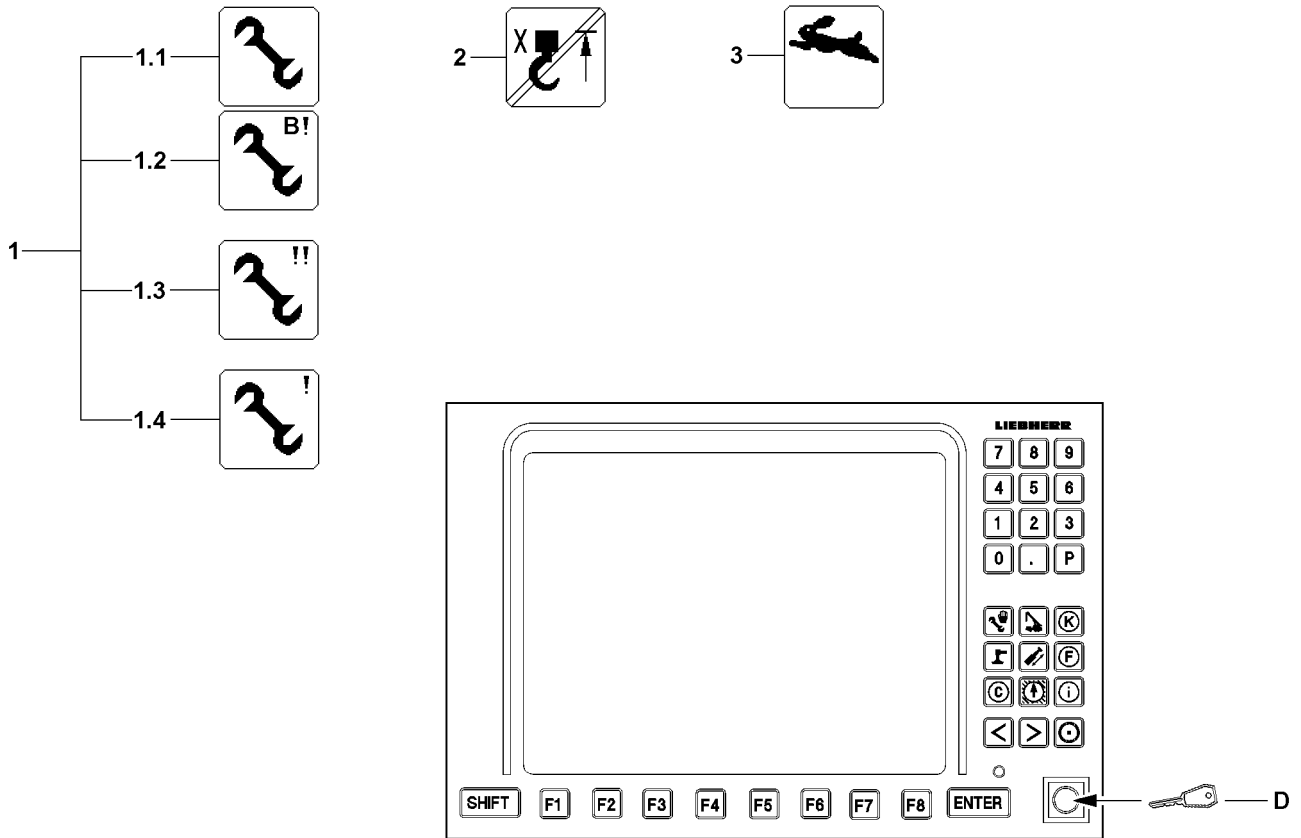


Fig.112949

LWE/LR 11350-007/19005-01-02/en

6.3.6 Bypass „Hoist top“

2 Bypass „Hoist top“

- The icon appears:
 - When the „hoist top“ shut-off is bypassed via the set up key **D**
 - **Note:**
The Crane operation program is locked, meaning, no other program can be turned on via the program keys.

6.3.7 Rapid gear



Note

- ▶ **Crane operation without rapid gear:** The speeds of the individual crane movements are independent of each other. There is no interference of the movement speeds.
- ▶ **Crane operation with rapid gear:** If the rapid gear is added, the individual crane movements can reach the largest possible movement speed. However, this means that all crane movements can be slowed down if there are multiple crane movements.

Activate the rapid gear only when:

- If the highest possible movement speed is to be made possible for individual crane movements **and**
- An interference amongst the movement speeds creates no problem.

3 „Rapid gear“ icon

- The icon appears if the rapid gear is activated for one or more crane movements.

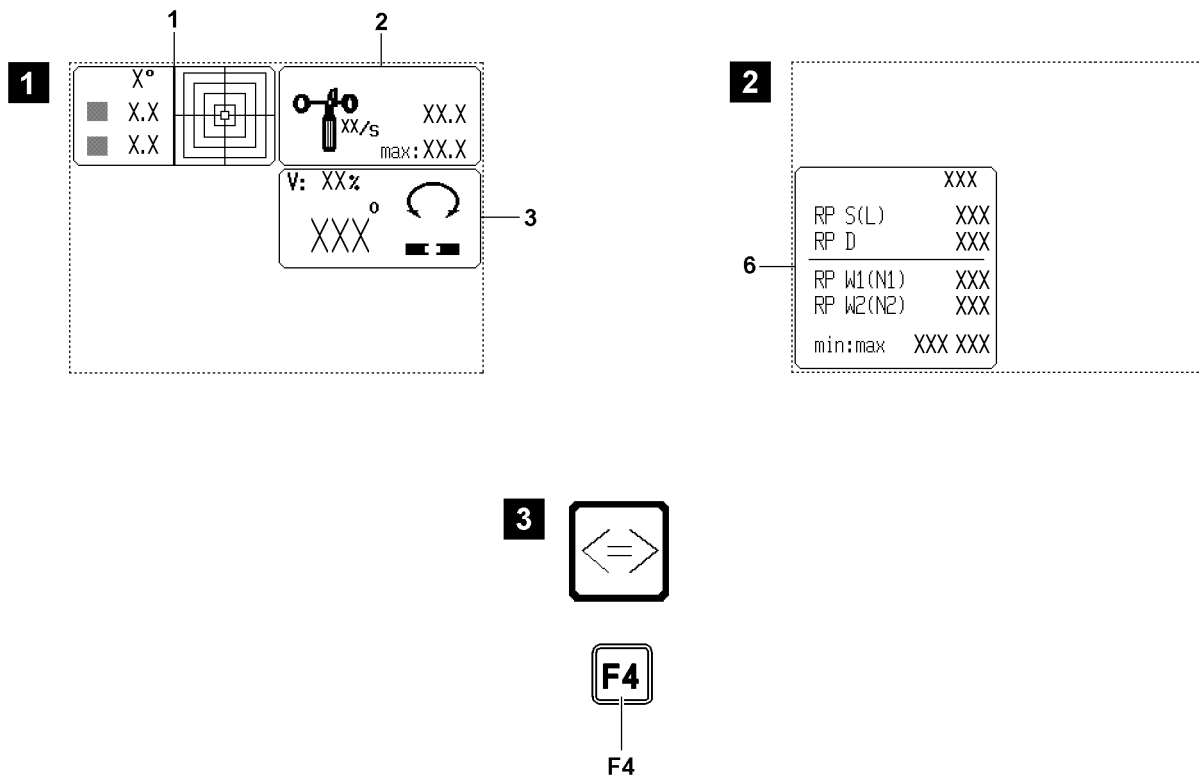
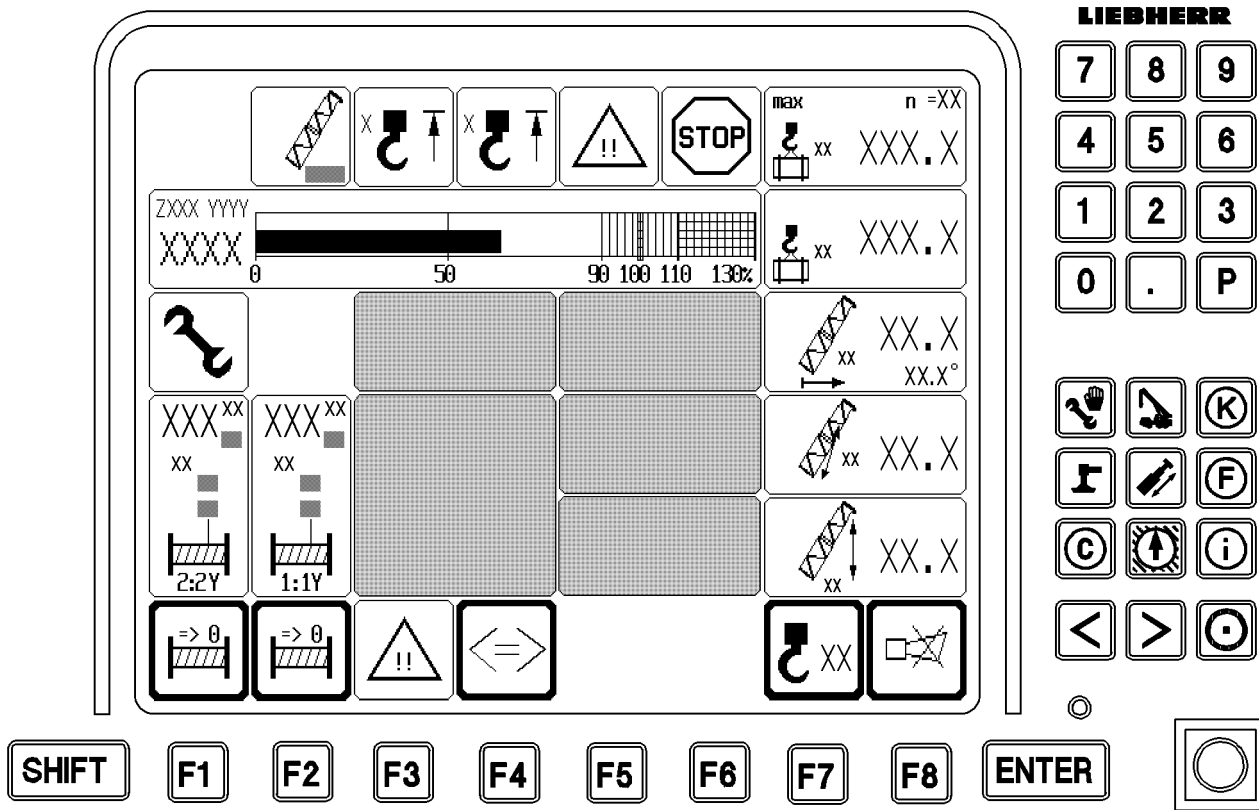


Fig.112351

LWE/LR 11350-007/19005-01-02/en

6.4 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.



Note

- ▶ 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):

- 1 Crane incline
- 2 Wind speed
- 3 Slewing range

Page 2 (illustration 2):

- 6 Monitoring of relapse cylinders



Note

- ▶ Depending on if the monitored auxiliary functions are turned off or on, the illustration of the monitored auxiliary functions differs!
- ▶ The „Change page“ icon can be actuated if it appears / blinks over the function key **F4**, see illustration 3!

Monitored auxiliary functions turned off:

- No error:
Icons are not shown.
- 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:
The icon is displayed on page 1 and the „Change page“ icon above function key **F4** blinks (= indicates an error of a function on page 2).

Monitored auxiliary functions turned on:

- No error:
Optional icons (customer request) are displayed.
If there are also optional icons on page 2, the „Change page“ icon over the function key **F4** is activated (= indication for change 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).

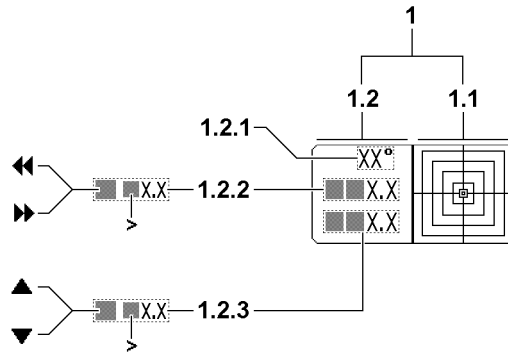


Fig.113445

6.4.1 General



Note

„?“ instead of display value!

- ▶ The value cannot be determined due to an error!
- ▶ If an error occurs and an error message is issued, see the Diagnostics manual!
- ▶ Always pay attention to error messages!
- ▶ Remedy the error always as quickly as possible!

6.4.2 Crane incline



WARNING

The crane can topple over!

The „larger than symbol“ shows that the crane is inclined further than can be shown!

The exact incline can then not be read!

- ▶ Do not exceed the permissible incline of the crane!

1 „Incline“ icon

- Display of the inclination of the crane to the horizontal in the longitudinal and lateral direction. The display is graphic as well as numeric.
- The directional data refers to the direction of the crane superstructure (view from the cab).

1.1 Graphic part

- The graphic display is in the form of a spirit level, with a moving dot representing the air bubble. The center of the dot shows the precise incline value.

1.2 Numeric part

1.2.1 Incline range

- This value describes the resolution of the graphic view. The resolution is matched automatically to the inclination

1.2.2 Lateral direction

- Incline of crane in lateral direction in [°]
- The double arrow shows the direction of the incline
- If the „greater than symbol“ appears, then the crane is inclined further than can be shown!

1.2.3 Longitudinal direction

- Incline of crane in the longitudinal direction in [°].
- The arrow shows the direction of the incline
- If the „greater than symbol“ appears, then the crane is inclined further than can be shown!

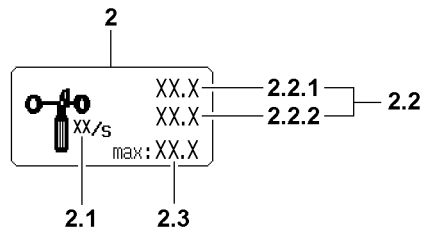


Fig.111265

6.4.3 Wind speed



WARNING

Wind speed too high!

If the maximum permissible wind speed is exceeded with an erected boom system, there is a danger of accident!

Dangerous situations can arise, such as a swinging load or shaking crane!

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

▶ **The crane movements will not be shut off!**

- ▶ The boom system must be taken down in time before exceeding the maximum permissible wind speed of the crane.
- ▶ The danger notes, see the Crane operating instructions, chapter 2.04 must be strictly observed and adhered to!

2 „Wind speed“ icon

- The wind speeds are displayed in [m/sec.] or [ft/sec.] depending on the units of measurement shown in the load chart
- If a value starts to blink and the „short horn“ acoustic alarm sounds, then the maximum permissible wind speed of the crane is exceeded.

2.1 „Wind speed“ unit

- [m/s] or [ft/s]

2.2 Current wind speed

• **Note:**

If a wind sensor is connected, then the wind speed appears at **2.2.1**

If two wind sensors are connected (example: Crane operation with auxiliary boom / accessory), a second wind speed appears additionally at **2.2.2**

- **2.2.1** current wind speed WG1
- **2.2.2** current wind speed WG2



WARNING

Crane operation without wind speed display value!

If the current wind speed **2.2** „???“ appears on the display, then a wind sensor that must be present is missing or there is an error in the wind sensor!

- ▶ Before starting to work with the crane, make sure that all wind sensors that must be present are present and functioning.
- ▶ Remedy the error immediately!
- ▶ If an error cannot be remedied, then it must be ensured that the wind speed is monitored otherwise!

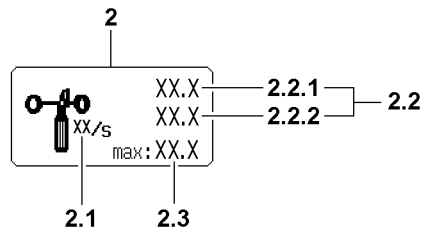


Fig.111265

**Note**

- ▶ If several wind sensors are connected, the installation location of the wind sensor determines the corresponding display in the icon „Wind speed“.
- ▶ The priority depends on the installation location of the wind sensor, from „outside“ (auxiliary boom / accessory) to „inside“ (main boom). The wind speed for the „outside“ wind sensor is shown independent from the „inside“ wind sensor.

2.3 Maximum permissible wind speed

- The value depends on the operating mode and the set up configuration.
- If the current wind speed value exceeds the displayed maximum value, the maximum value starts to blink and the „Short horn“ acoustic alarm sounds!

**Note**

- ▶ If access to a load chart is not possible, then the maximum value starts to blink and the „Short horn“ acoustic alarm sounds!

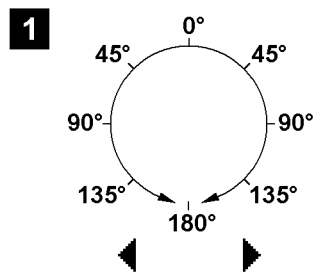
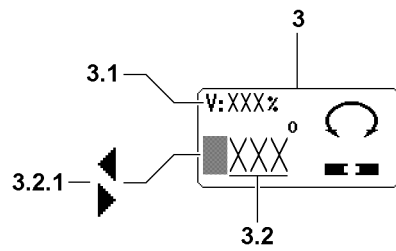


Fig.112352

6.4.4 Slewing range



DANGER

Danger of accident in case of excessive slewing speed!

► Select the slewing speed according to the specifications in the load chart manual!

3 „Slewing range“ icon

3.1 Maximum slewing speed

- V: [%]
- Identifies the current (selected) „Maximum slewing speed“ of the slewing gear with a fully deflected master switch, relating to the maximum attainable slewing speed of the slewing gear.
This value may be preselected in fixed percentage stages in the LICCON program control parameter.

3.2 Current position of the crane superstructure

- In relation to the main working direction (0 [°])
Increasing to the maximum value of 180°, see illustration 1

3.2.1 Direction of deviation

- The arrow in front of the value indicates the direction of the deviation.
 - Right arrow: Crane superstructure is turned to the right.
 - Left arrow: Crane superstructure is turned to the left.

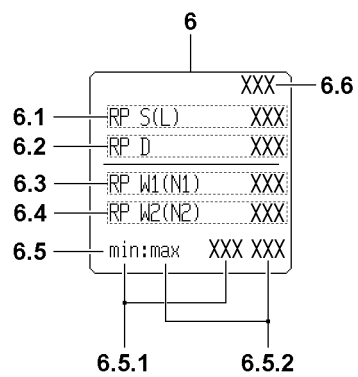


Fig.111897

6.4.5 Monitoring of relapse cylinders



Note

Display values pressure display!

- ▶ Pressure display = „0“, if these relapse cylinders are not present for the set operating mode!
- ▶ Pressure display = „??“, if the pressure sensor signal is erroneous! There is an error display with error number!

6 „Monitoring relapse cylinder“ icon

6.1 Pressure display RP S(L)

- Relapse cylinder S-, SL- or L-boom

6.2 Pressure display RP D

- Relapse cylinder Derrick boom

6.3 Pressure display RP W1(N)

- Pressure W1-relapse cylinder (=RP W1) at W-operation
- or**
- Pressure N1-relapse cylinder (=RP N1) at N-operation

6.4 Pressure display RP W2

- Pressure W2-relapse cylinder (=RP W2) at W-operation
- or**
- Pressure N2-relapse cylinder (=RP N2) at N-operation

6.5 Pressure limits

- Monitored pressure limits of relapse cylinders (W/N)
Minimum / maximum pressure for RP W1(N) and RP W2

6.5.1 Minimum pressure (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.
- This monitored minimum pressure is calculated from the angle of the main boom and the auxiliary boom / accessory. 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 Maximum pressure (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.

6.6 „Monitoring relapse cylinder“ measuring unit

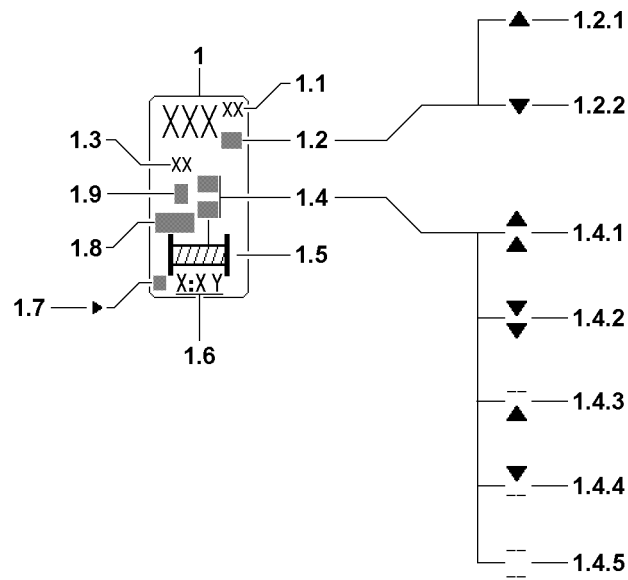


Fig.112353

6.5 Winch display

1 Winch icon

- The winch 1 and winch 2 icons have the same meaning and are explained based on one icon.
- The icon for winch 1 or winch 2 is only shown on monitor 0 if the crane is equipped with the respective winch.

1.1 Traveled distance

- In [m] or [ft]
From a zero point to be determined
- For single operation with the reeving set in the Set up program: completed hook path.
- For parallel operation with the set total reeving made in the set up program: distance completed by the hook block.
- The positions before the decimal point are displayed with a maximum of three large digits. The digits after the decimal point are displayed with small digits. (Setting to zero point, see section „The function key line“).
- A prerequisite for a correct display is that the reeving value entered equals the actual number of rope strands between the boom head and the hook block.



Note

Display area of winch displays!

- ▶ The „Traveled distance“ display **1.1** has only three positions before the decimal point, any positions before that are cut off! The crane operator must evaluate for himself if, for example 200 m of rope are spooled up on a winch or 1200 m. **The display in both cases would be identical to 200 m !**
- ▶ The hook path calculation only works accurately if the load is suspended freely and is not luffed during the lifting procedure! Flexation and rope expansion are not taken into account!
- ▶ The length display (hook path display) is only accurate and the layer jump is only taken into account correctly if the winch has been calibrated and there have been no interruptions in the CPU power supply (cold start)!

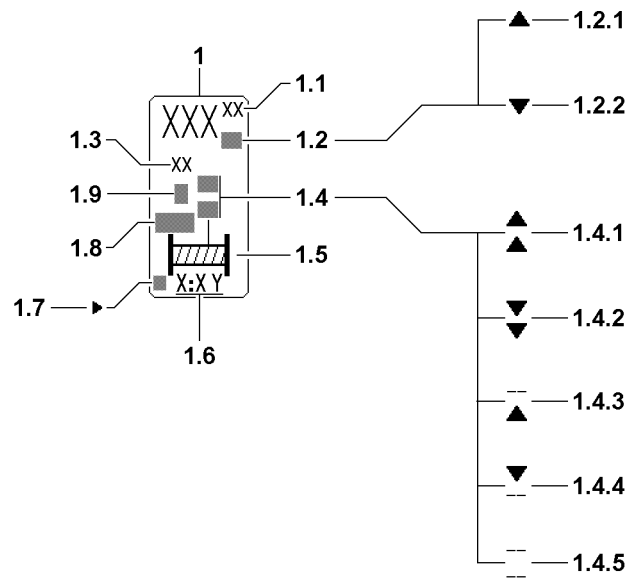


Fig.112353

LWE/LR 11350-007/19005-01-02/en

1.2 Direction of hook movement

The arrows on the length value show the direction of the hook movement in relation to the zero point:

- Arrow up **1.2.1**: Hook moves upward from the zero point
- Arrow down **1.2.2**: Hook moves downward from the zero point

1.3 Hook path display measuring unit

1.4 Winch status display

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

1.4.1 Spool out

1.4.2 Spool up

1.4.3 Spooled out

- Spooling out is blocked

1.4.4 Spooled up

- Spooling up is blocked

1.4.5 Winch is deactivated or unplugged

- Spooling up and spooling out are blocked (via Control parameter program)

- **Note:**

If a winch status icon does not appear, the activated winch is inactive and is neither spooled up nor out!

1.5 Winch icon

- (with rope end for winch status icon)

1.6 Winch number with master switch number and master switch operating direction

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

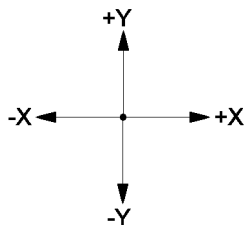


Fig.195422

1.7 Vibration sensor

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

- **Note:**

The vibration sensor is activated for the first actuated crane function!

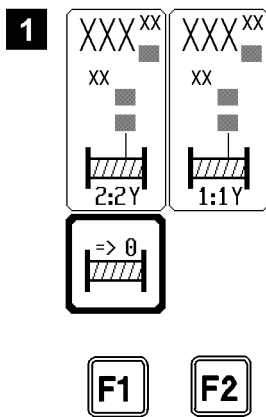
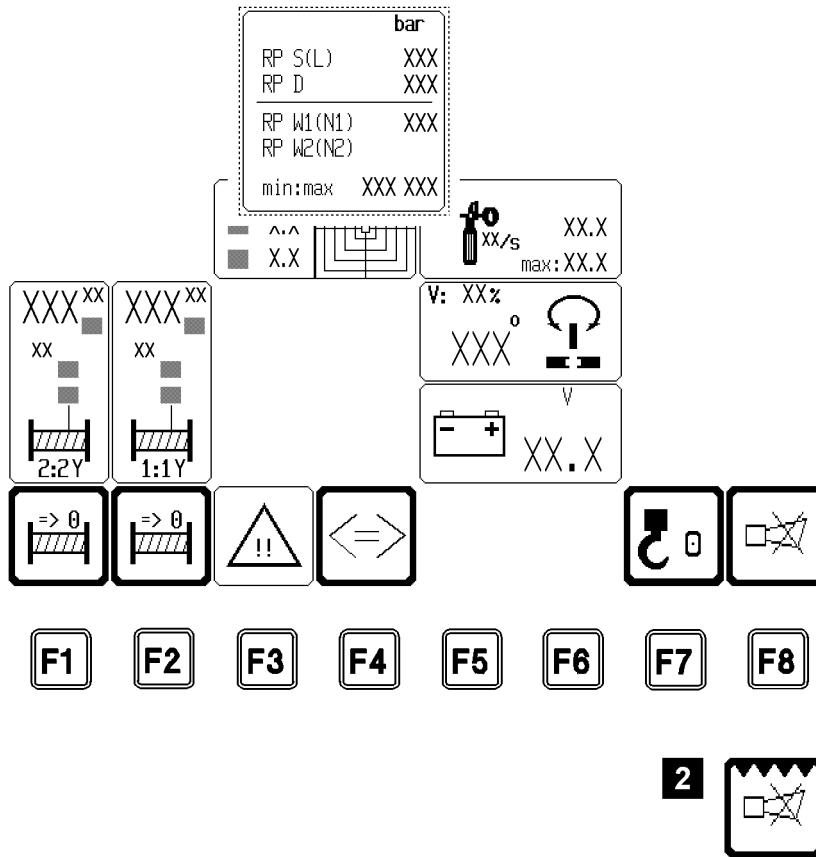


Fig.112364

6.6 The function key line in the crane operation program

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

- Zero point for hook path display, winch 2
- Pressing the function key **F1** causes the „Set winch display to zero“ icon to appear, i.e. the winch 2 hook path display in the winch icon above is set to „000.00“ when the key is pressed. Path measurement starts here.

F2 Function key

- Zero point for hook path display, winch 1
- Pressing the function key **F2** causes the „Set winch display to zero“ icon to appear, i.e. the winch 1 hook path display in the winch icon above is set to „000.00“ when the key is pressed. Path measurement starts here.
- **Note:**
When winch 1 and winch 2 work in parallel operation, then the length displays of winch 1 and winch 2 can only be set together with the function key **F1** to „000.00“! Then the function key **F2** has no function, see illustration 1!

F3 Function key

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

F4 Function key

- Change monitoring page (if present)
see also section „Monitored auxiliary functions for crane operation“



Note

- ▶ The monitoring of all auxiliary functions is always active, even if the monitoring icons are hidden!
- ▶ When a monitored limit is exceeded, then an acoustic warning (horn) sounds and the respective icon is shown!

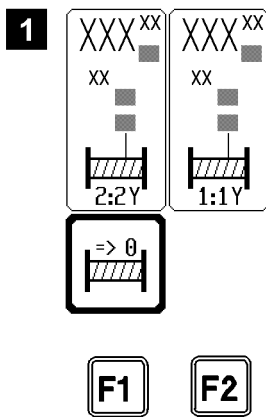
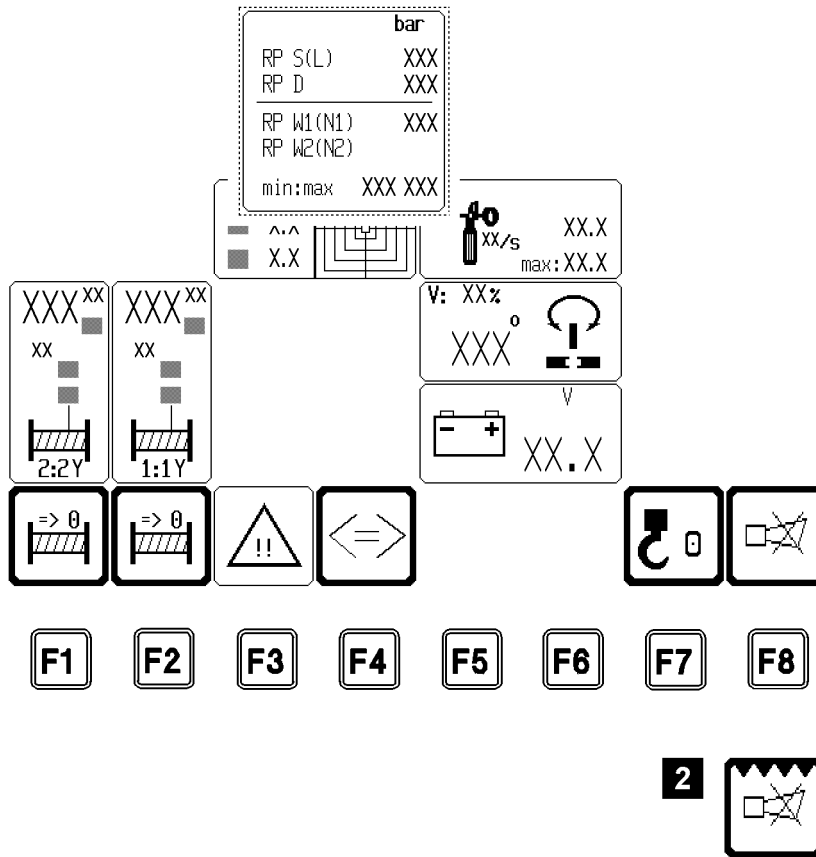


Fig.112364

- F5** Function key
- Not assigned
- F6** Function key
- 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, load handling and fastening 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.
 - Tare is cancelled by one of the following two actions:
 1. By pressing the function key **F7** again.
 2. By luffing by more than $\pm 4^\circ$.
 - **Note:**
The function key **F7** acts the same way on the actual load display of the boom nose if a boom nose is installed!
- F8** Function key
- Shut-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!



WARNING

Malfunctions in the crane control!

A special program is available for LIEBHERR crane acceptance in the LICCON computer system! This program is blocked after conclusion of crane acceptance!

If an additional marking is displayed in the „Horn“ icon (talons along the upper margin, see illustration 2), then the special program is activated!

- ▶ Contact LIEBHERR Service immediately!
 - ▶ In order to prevent error functions, access to the special program is only permitted for trained LIEBHERR personnel!
-

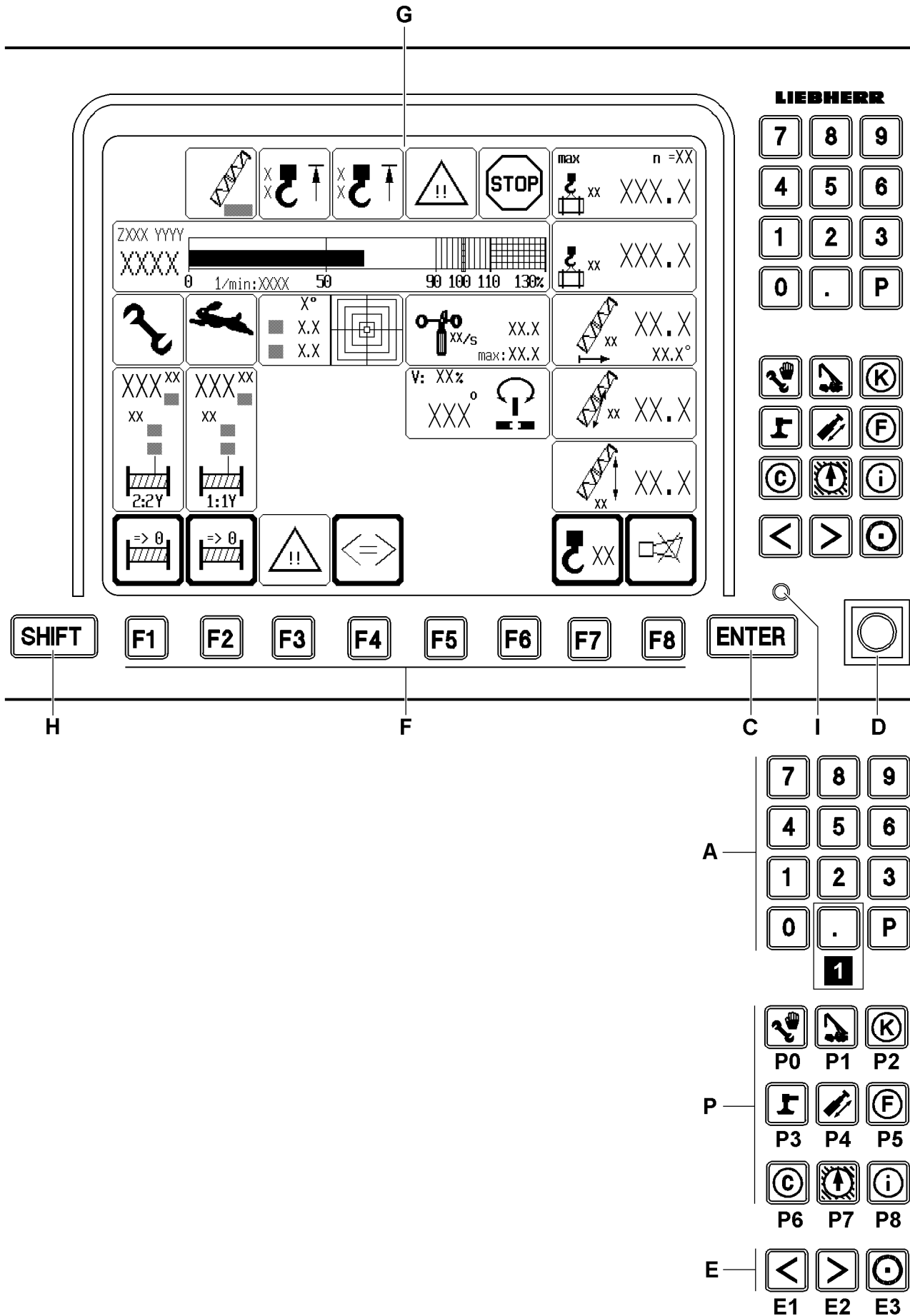


Fig.112354

6.7 Other operating elements

The following functions are assigned to the other operating elements of the display and operating unit of the LICCON computer system in the Crane operation program.

A Keypad

- Keys „0“ to „9“ and „P“ have no function in the crane operation program

- Key „.“, illustration 1

With the key „.“ the so-called test screen function is turned on and off. All existing icons appear with a test value on the LICCON monitor.

- **Note:**

The monitored auxiliary functions must be opened on the desired page to appear on the test screen!

The test screen display can be retained by pressing the SHIFT key **H** and the key „.“!

By pressing the key „.“ again, the normal crane operating screen appears again!

If the test screen is not retained, then the normal crane operating screen appears after 10 seconds!

P Program keys

- The program keys are used to select individual programs. However, the appropriate program-specific features (for example, switching from set up to crane operation once with „O.K.“) must be noted.

- **Note:**

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

The programs can only be called up with their program key when the set up key was not pressed before!

C ENTER input key

- No function in crane operation program

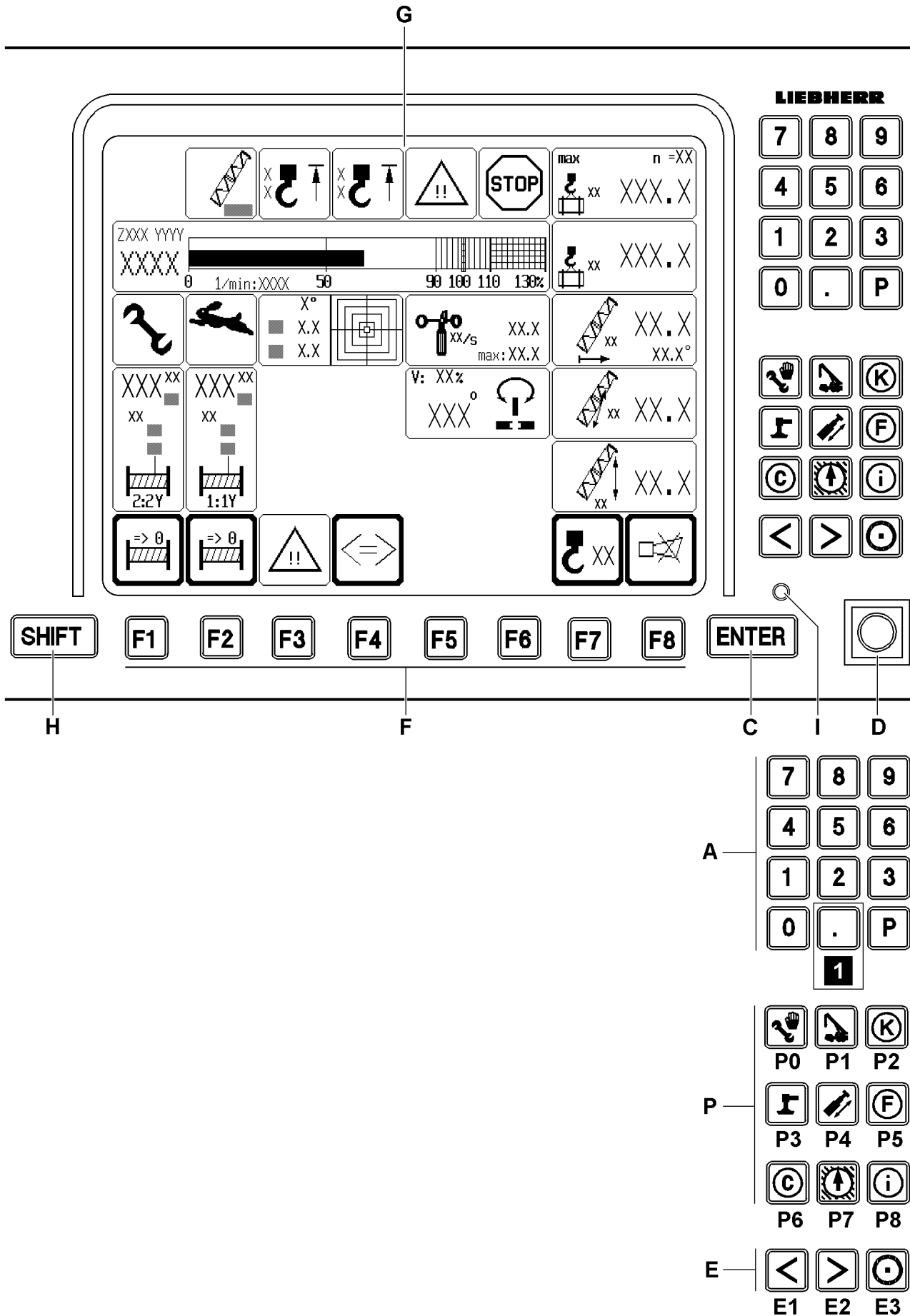


Fig.112354

D Set up key

- Zero position (not actuated):
Normal operation.
- Touching:
Function „Exceedance of shut off limits of the LICCON overload protection“ released.
- **Exceeding the shut-off limits of the LICCON overload protection!**
If the shut off limits of the LICCON overload protection are exceeded, the LICCON overload protection shuts the crane movements off!
These shut-offs can be exceeded by the set up key **D** in the „Right touching“ position!
To do so, chapter 4.20 in the Crane operating instructions must be observed!

**Note**

Double function set up key!

If the crane has **no** CE-mark, when actuating the set up key **D**, the release for the „Emergency operation LICCON overload protection“ is automatically engaged!

- ▶ Take into account, when actuating the set up key **D**, that the „Emergency operation LICCON overload protection“ is automatically released!
-

**Note**

Carry out the erection / take down procedures!

- ▶ By pressing the set up key **D**, all erection / take down procedures can be carried out within the erection / take-down charts, for which no load charts are available!
-

- **Bypass of the hoist top shut-off**

If the hook block touches the hoist limit switch weight during upward movement, the hoist limit switch is activated. The „spool up winches“ crane movement and others are shut off. This shut-off can be bypassed with the set up key **D** in the „right touching“ position. To do so, chapter 4.20 in the Crane operating instructions must be observed!

E Special function keys

- Monitor brightness adjustment
 - Key combination **E3** and **E1**: Turn background illumination on / off
 - Key combination **E3** and **E2**: Brightness adjustment in three stages
-

**Note**

- ▶ Additional functions of the special function keys **E** are program-dependent and are explained further in the description of the individual LICCON programs!
-

H SHIFT key

- Second level key assignments

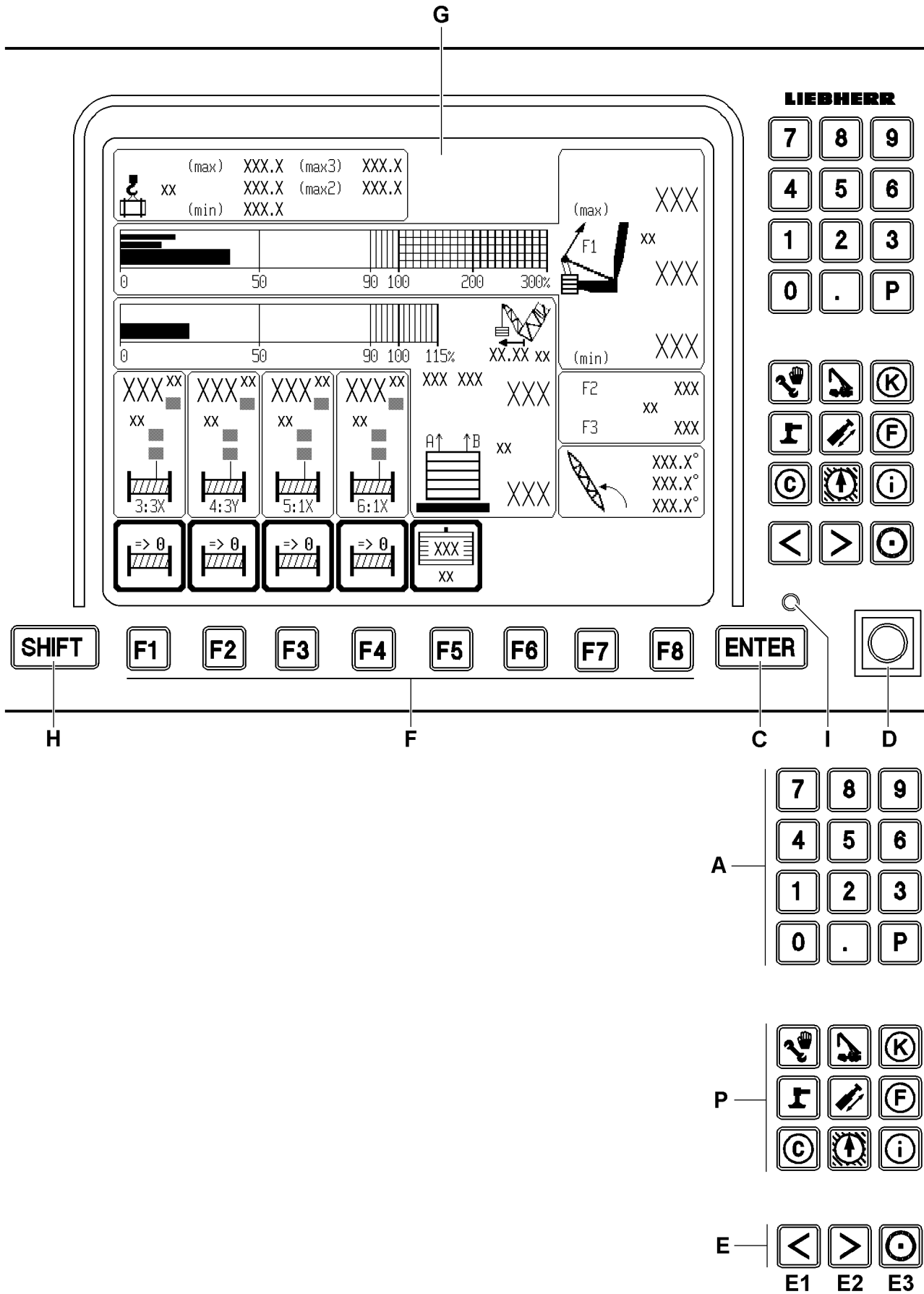


Fig.112941

7 Operating elements of the LICCON computer system on monitor 1

- A** Keypad
 - For input of derrick ballast value
- P** Program keys
 - No function
- C** ENTER input key
 - Confirmation of changes
- D** Key button
 - Acoustic signals which can be shut off of bell / horn turntable can be shut off.
- E** Special function keys
 - Monitor brightness adjustment
 - Key combination **E3** and **E1**: Turn background illumination on / off
 - Key combination **E3** and **E2**: Brightness adjustment in three stages



Note

- Additional functions of the special function keys **E** are program-dependent and are explained further in the description 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** Display
 - In the display appears „normally“ the crane operating screen of monitor 1.
- H** SHIFT key
 - No function
- I** LED display
 - Monitor supply voltage present

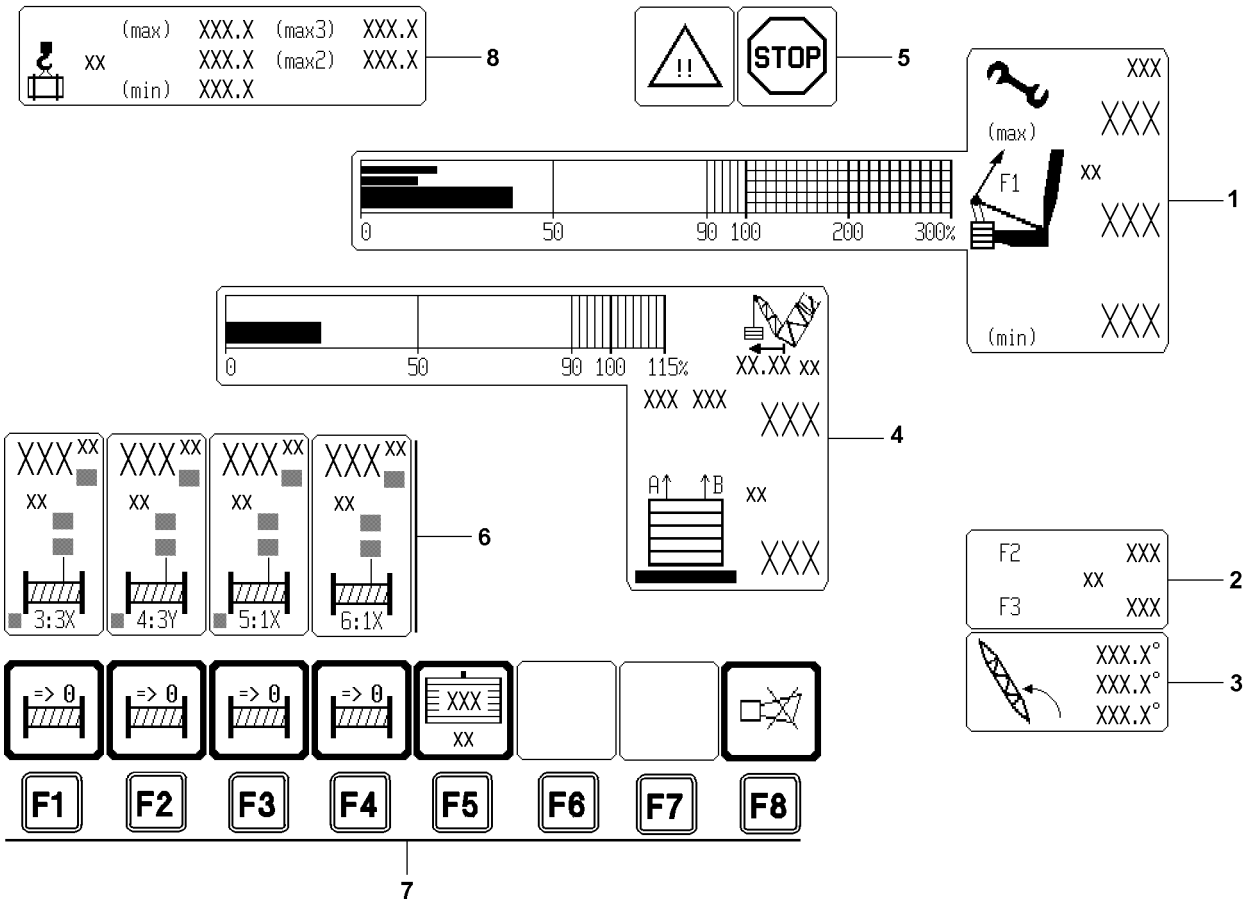
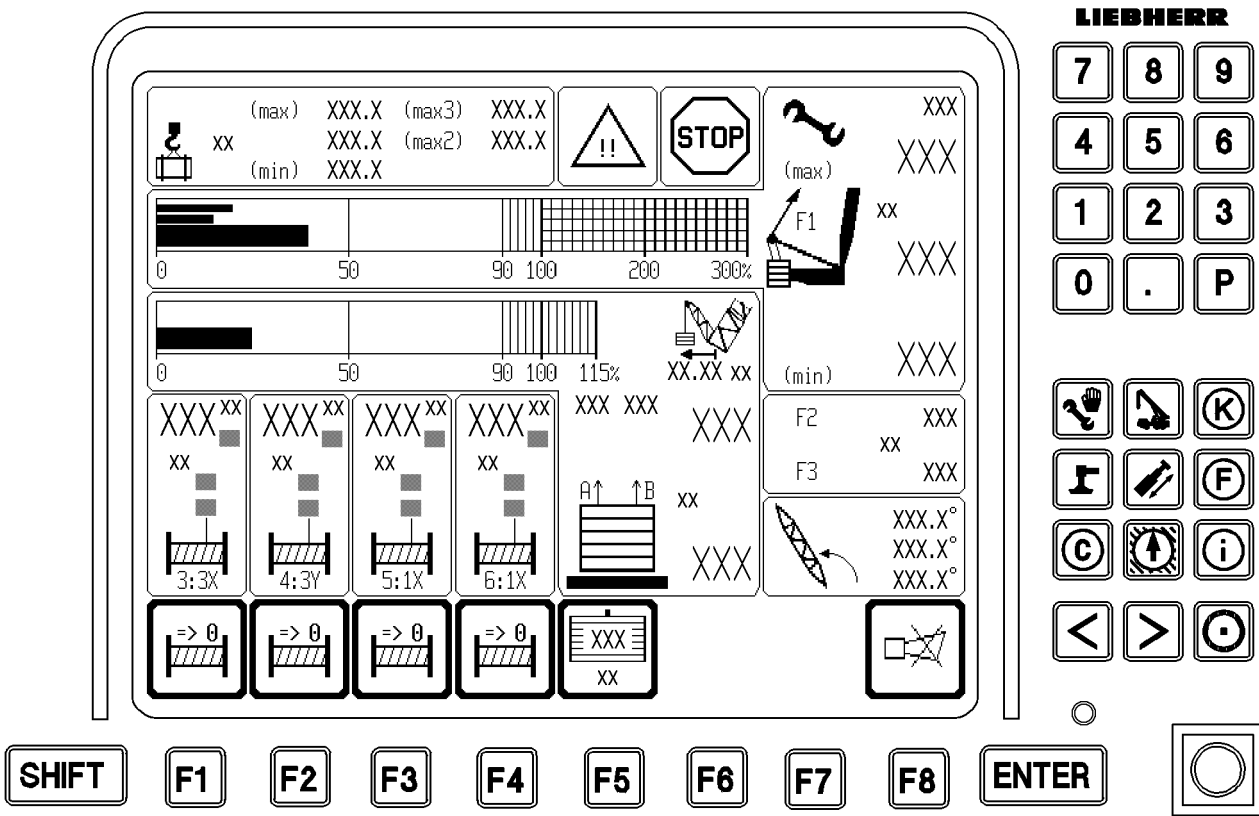


Fig.112942

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8 The Crane operation program on monitor 1



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!**

In the crane operation program on monitor 1, the monitor is divided into eight areas:

- 1 Test point 1 = F1
 - F1-load display
 - Pull test brackets in test points 1A and 1B in the SA-frame guying
- 2 Test points 2 / 3 = F2 / F3
 - Pull test brackets in test points 2A and 2B in the N/W guying
 - Pull test brackets in test points 3A and 3B in the S-guying during derrick operation
- 3 Derrick boom angle
- 4 Derrick ballast, weight and utilization
 - Derrick ballast, placed and pulled.
 - Derrick ballast radius
 - Derrick ballast utilization.
- 5 Alarm functions
 - „Advance warning“ and „**STOP**“ icons.
- 6 Winch displays
 - Winch 3*
 - Winch 4
 - Winch 5*
 - Winch 6*
- 7 Function key line
 - Function keys always refer to the icon shown directly above
 - **Note:**
If no icon is shown in the line directly above the function key, then no function is assigned in the program to the function key!
See for example function key F6 and function key F7!
- 8 Min / max load

8.1 Test point 1 = F1



DANGER

Overload of crane in assembly operation!

If the crane is utilized in assembly operation past the assembly limit, then crane components can be overloaded!

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

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

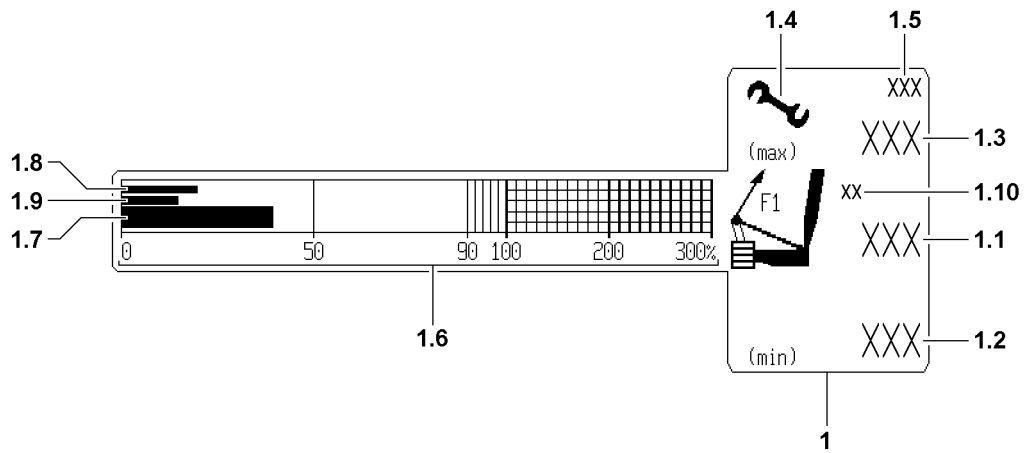


Fig.111912

8.1.1 F1-assembly maximum force

The F1-assembly-maximum force is abbreviated in the chapter as $F1_{\text{max-assembly}}$.



Note

- ▶ A load chart is available in the operating range of the crane! Outside of the operating range, if no load chart is available, the specifications for assembly operation apply!
- ▶ $F1_{\text{max-assembly}}$ **1.5** can be greater within the operating range for static reasons than $F1_{\text{max-assembly}}$ **1.5** outside the operating range!
- ▶ When luffing out of the operating range with load chart, the value $F1_{\text{max-assembly}}$ **1.5** can therefore be significantly reduced!



DANGER

Failure of angle sensor!

If angle sensors on the boom for the LMB are defective, then the LMB uses the highest permissible $F1_{\text{max-assembly}}$ **1.5** as the non-bypassable maximum value!

This ensures that the boom can always be taken down, even with a defective angle sensor!

If the crane is not taken down after a failure of the angle sensors exactly according to the data in the operating instructions and the erection / take-down charts, then it can be overloaded!

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

- ▶ Take the crane down if needed exactly according to the data in the operating instructions and the erection / take-down charts!

Operating modes without derrick boom

For operating modes without derrick boom, there is a unbyassable $F1$ -limit value:

- **1.5** $F1_{\text{max assembly}}$
as upper limit for erection / take-down of the boom
and
for crane operation with load chart

Operating modes with derrick boom

For operating modes with derrick boom there are two $F1$ -limit values

- $F1_{\text{max-assembly}}$ **1.5** outside the operating range
For erection and assembly of the crane (unbypassable)
- **1.3** $F1_{\text{max-operation}}$
As upper limit for crane operation with load chart (and a few angle degrees next to it)

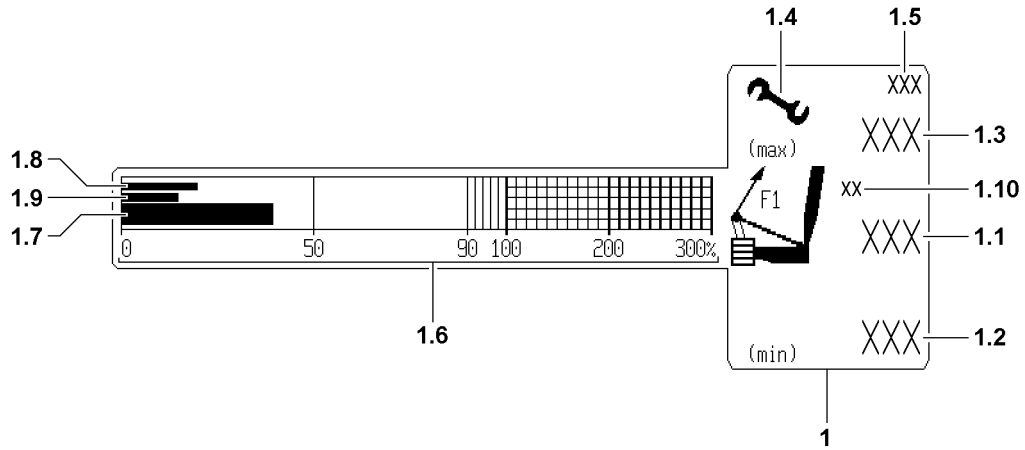


Fig.111912

LWE/LR 11350-007/19005-01-02/en

8.1.2 Test point 1 = F1 / icon description

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

| Position | Icons / display values | Type of display | Is shown |
|----------|--|-----------------|---|
| 1 | Icon „Test point 1“ | Static | Always |
| 1.1 | F1 actual force = $F1_{actual}$ $F1_{actual} = F1A_{actual} + F1B_{actual}$ $F1A_{actual} = F1$ -actual force test point 1A (SA-frame left) $F1B_{actual} = F1$ -actual force test point 1B (SA-frame right) | Static | For valid value |
| | | „???“ blinking | For invalid value |
| 1.2 | F1-minimum force = $F1_{min}$ | Static | Always when $F1_{min}$ is larger than 0 Note: A shut-off occurs when falling below $F1_{min}$ If no value is shown $F1_{min} = 0!$ |
| 1.3 | F1-operational maximum force = $F1_{max-operation}$ | Static | Only in operating modes with derrick ballast (DB/DBW) Note: $F1_{max-operation}$ is the maximum value that may be reached during crane operation! During crane operation, the shut-off occurs at $F1_{actual}$ greater than $F1_{max-operation} + F1_{addition for shut off}$ For cranes with maximum load carrying capacity of more than 1000 t , $F1_{addition for shut-off} = 40$ t applies |



Note

Shut-off $F1_{min}$

- ▶ If the utilization of the derrick ballast is below 50 %, then there is no immediate shut-off when falling below $F1_{min}$ **1.2!**
- ▶ The acoustical and optical warnings remain unaffected by the utilization of the derrick ballast!

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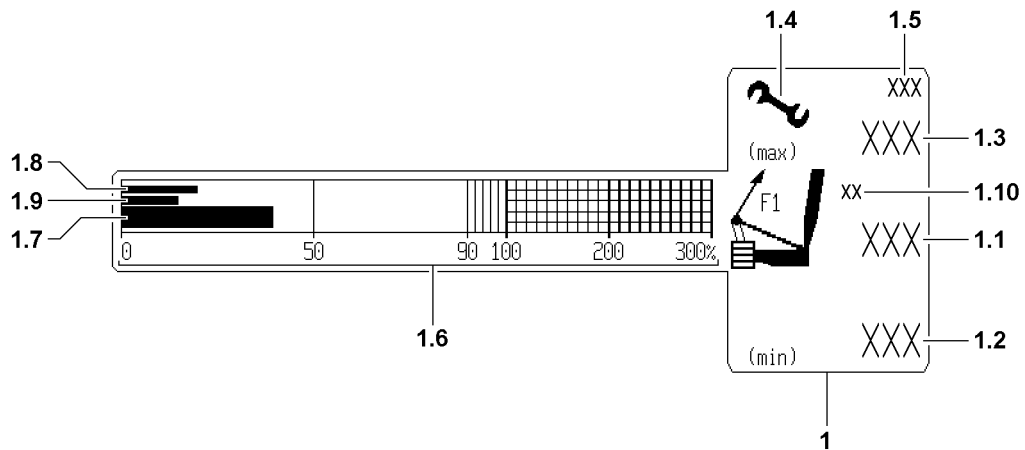


Fig.111912

LWE/LR 11350-007/19005-01-02/en

| Position | Icons / display values | Type of display | Is shown |
|----------|---|-------------------|---|
| 1.4 | Assembly icon | Static / blinking | In „assembly operation: Boom not in operating range“ and / or Advance warning / shut-off: Observe F1 limit values! |
| 1.5 | F1-assembly maximum force = F1 _{max assembly} | Static / blinking | In „assembly operation: Boom not in operating range“ and / or Advance warning / shut-off: Observe F1 limit values! Note: Appears if F1 _{actual} is greater than 90 % of F1 _{max-assembly} |
| 1.6 | F1-utilization scale in percent [%] | Static | Always |
| 1.7 | F1-utilization bar = Ratio F1 _{actual} to F1 _{max-operation} No display (0 percent) at: F1 _{max-operation} = 0 or No value or F1 _{min} = invalid | Dynamic | In operating modes with derrick ballast (DB/DBW) |

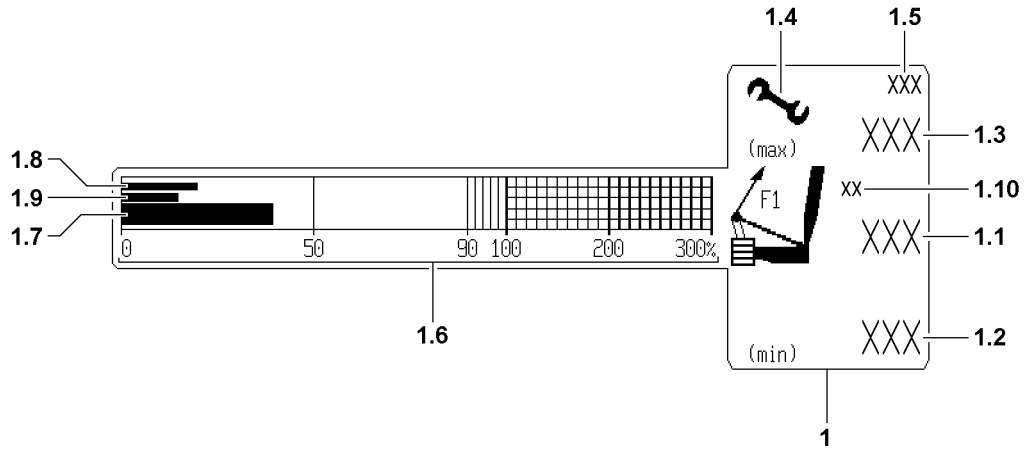


Fig.111912

| Position | Icons / display values | Type of display | Is shown |
|----------|--|-----------------|---|
| 1.8 | <p>F1-Min-warning bar =</p> <p>Ratio $F1_{\text{min-warning value}}$ to $F1_{\text{max-operation}}$</p> <p>($F1_{\text{min warning value}} =$ $F1_{\text{min}} + \Delta_{F1}$)</p> <p>No display (0 percent) at:</p> <p>$F1_{\text{max-operation}} = 0$</p> <p>or</p> <p>No value</p> <p>or</p> <p>$F1_{\text{max operation}} = \text{invalid}$</p> | Dynamic | <p>In operating modes with derrick ballast (DB/DBW)</p> <p>$\Delta_{F1} = 30 \text{ t}$ for cranes with max. load capacity of $\geq 1000 \text{ t}$</p> |
| 1.9 | <p>F1-Min-Stop bar =</p> <p>Ratio $F1_{\text{min}}$ to $F1_{\text{max-operation}}$</p> <p>0 percent [%] for:</p> <p>$F1_{\text{max-operation}} = 0$</p> <p>or</p> <p>No value</p> <p>or</p> <p>$F1_{\text{max operation}} = \text{invalid}$</p> | Dynamic | In operating modes with derrick ballast (DB/DBW) |
| 1.10 | Measuring unit icon | Static | Always |

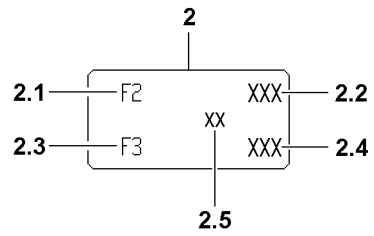


Fig.111913

8.2 Test point 2 = F2 and test point 3 = F3

Pull test brackets test point 2A and 2B are in the N/W-guying

Pull test brackets test point 3A and 3B are in the derrick boom / main boom guying on the main boom head

| Position | Icons / display values | Type of display | Is shown |
|----------|---|-----------------|--|
| 2 | Icon for N/W-guy force and main boom guy force in derrick operation | Static | In operating modes with auxiliary boom / accessory and / or derrick boom |
| 2.1 | Icon F2 for N/W-guy force test point 2 | Static | In operating modes with auxiliary boom / accessory |
| 2.2 | $F2_{\text{actual}} = F2_{\text{actual}}$ | Static | In operating modes with auxiliary boom / accessory and valid F2-value |
| | $F2_{\text{actual}} = F2A_{\text{actual}} + F2B_{\text{actual}}$ Test point 2A = left Test point 2B = right | „???“ blinking | In operating modes with auxiliary boom / accessory and invalid F2-value |
| 2.3 | Icon F3 for main boom guy force test point 3 | Static | In operating modes with derrick boom |
| 2.4 | $F3_{\text{actual}} = F3_{\text{actual}}$ | Static | In operating modes with derrick boom and valid F3-value |
| | $F3_{\text{actual}} = F3A_{\text{actual}} + F3B_{\text{actual}}$ Test point 3A = left Test point 3B = right | „???“ blinking | In operating modes with derrick boom and invalid F3-value |
| 2.5 | Measuring unit icon | Static | Always |

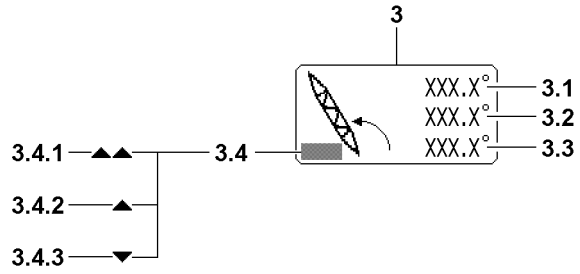


Fig.111914

LWE/LR 11350-007/19005-01-02/en

8.3 Derrick boom angle

| Position | Icons / display values | Type of display | Is shown |
|----------|---|-----------------|--|
| 3 | Derrick boom angle icon | Static | In operating modes with derrick boom |
| 3.1 | Maximum derrick boom angle in crane operation = angle-D _{max} in [°] | Static | In operating modes with derrick boom and angle-D _{current} smaller or same as angle-D _{max} |
| | | Blinking | In operating modes with derrick boom and angle-D _{current} larger than angle-D _{max} |
| 3.2 | Current derrick boom angle = angle-D _{current} in [°] | Static | In operating modes with derrick boom and valid value |
| | | „???“ blinking | In operating modes with derrick boom and invalid value |
| 3.3 | Minimum derrick boom angle during crane operation = angle-D _{min} in [°] | Static | In operating modes with derrick boom and angle-D _{current} larger or same as angle-D _{min} |
| | | Blinking | In operating modes with derrick boom and angle-D _{current} smaller than angle-D _{min} |
| 3.4 | Alarm functions derrick boom | | Limitation / monitoring of relapse cylinders Note: When an icon appears, an error message is issued! |
| 3.4.1 | Two arrows pointing up | Static | Relapse press on block (limit switch actuated) or sensor / limit switch defective |
| 3.4.2 | Arrow up | Static | At angle-D _{current} larger than angle-D _{max} |
| 3.4.3 | Arrow down | Static | At angle-D _{current} smaller than angle-D _{min} |

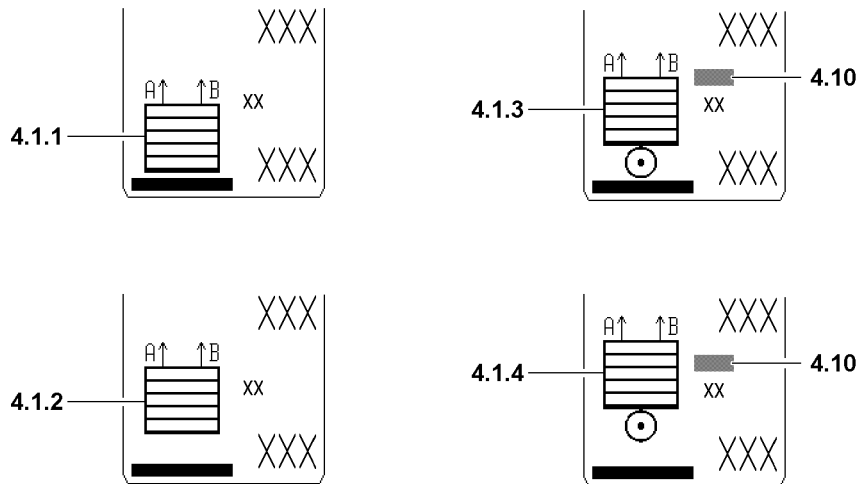
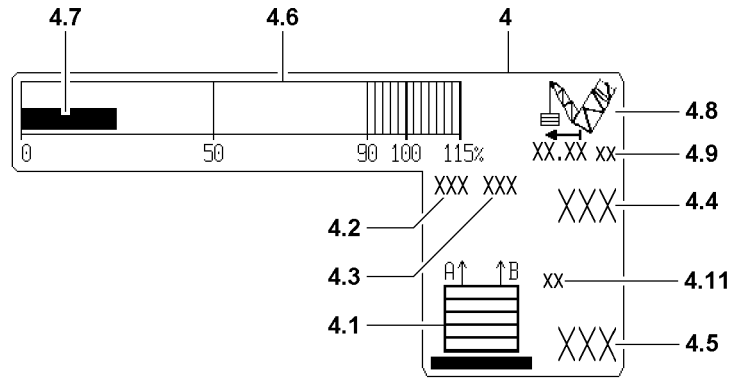


Fig.112943

8.4 Derrick ballast, weight and utilization

Test points for derrick ballast guying A are:

- Test point 4A = pressure sensor ring surface left F4A
- Test point 5A = pressure sensor piston surface left F5A

Test points derrick ballast guying B are:

- Test point 4B = pressure sensor ring surface right F4B
- Test point 5B = pressure sensor piston surface right F5B

| 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“ icon | 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) |



Note

- ▶ The view of the „derrick ballast“ icon **4.1** changes depending on if the derrick ballast is set up as a suspended ballast or as a ballast trailer!
- ▶ During crane operation observe the respective chapters for suspended ballast or ballast trailer in the Crane operating instructions!

| Position | Icons / display values | Type of display | Is shown |
|----------|--|-----------------|--|
| 4.1.1 | „Suspended ballast on the ground“ icon | Static | Ground contact sensor reports „Suspended ballast not suspended “ |
| 4.1.2 | „Suspended ballast suspended“ icon | Static | Ground contact sensor reports „Suspended ballast suspended “ |
| 4.1.3 | „Ballast trailer on the ground“ icon | Static | Key button ballast trailer in position „Ballast trailer not suspended “ |
| 4.1.4 | „Ballast trailer suspended“ icon | Static | Key button ballast trailer in position „Ballast trailer suspended “ |

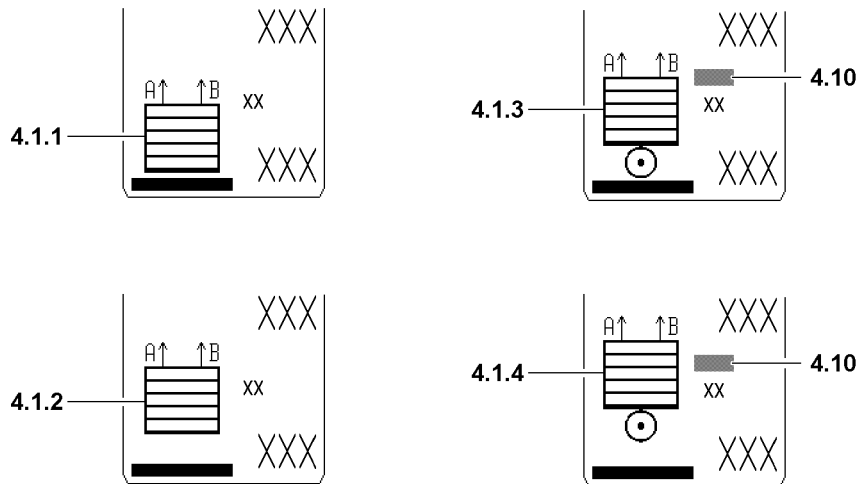
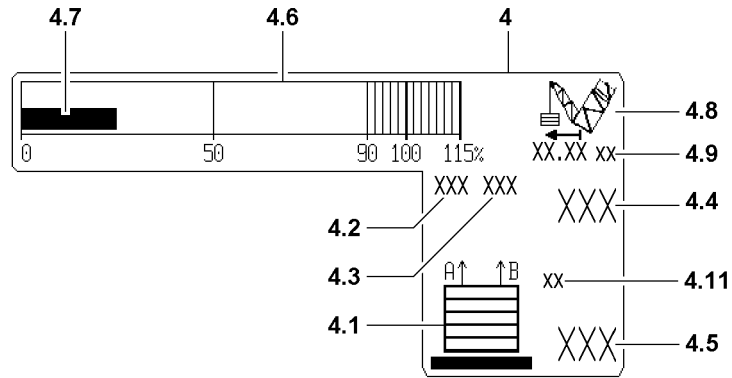


Fig.112943

| Position | Icons / display values | Type of display | Is shown |
|----------|--|-------------------|---|
| 4.2 | Force Derrick ballast guying A (left) Test point 4A Test point 5A | Static | „Test point values“ valid |
| | | Blinking | „Test point values“ valid and Difference between guy force A and B is greater than permissible |
| | | „???“ Blinking | At least one „Value test point“ invalid |
| 4.3 | Force Derrick ballast guying B (left) Test point 4B Test point 5B | Static | „Test point values“ valid |
| | | Blinking | „Test point values“ valid and Difference between guy force A and B is greater than permissible |
| | | „???“ Blinking | At least one „Value test point“ invalid |



Note

Pressure sensor failure!

- ▶ If only one pressure sensor fails, for example F5A (test point 5A) is invalid, then the LICCON computer system assumes F5A = F5B in the interim! An error message is issued!
- ▶ The error must be remedied immediately!

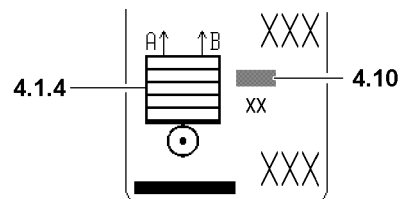
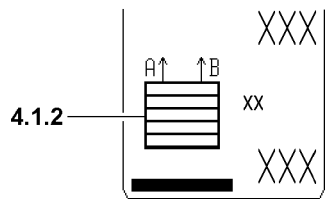
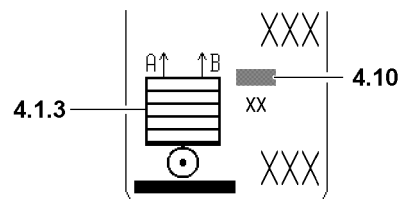
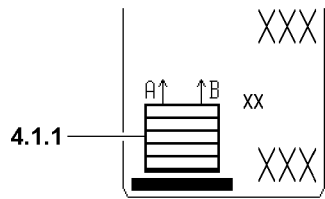
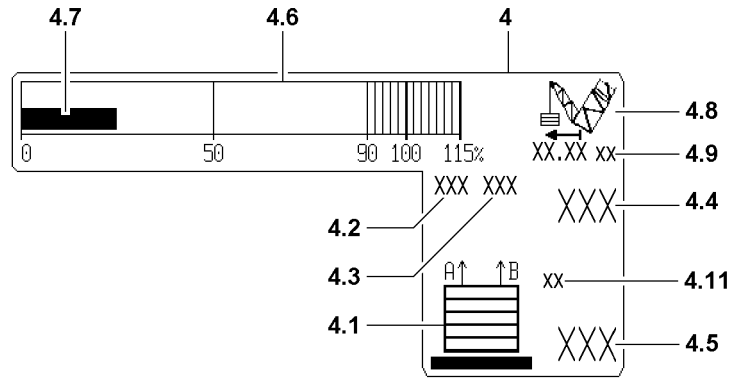


Fig.112943

| Position | Icons / display values | Type of display | Is shown |
|----------|---|-------------------|---|
| 4.4 | Pulled derrick ballast = BA_{pulled} = vertical force components in derrick ballast guying, calculated from test points 4A, 4B, 5A and 5B Note: The sum of forces in the derrick ballast guying A and B is greater than or equal to the pulled derrick ballast (BA_{pulled})! | Static | If value BA_{pulled} is valid |
| | | „???“ Blinking | If value BA_{pulled} is invalid or Operating mode with BW and derrick ballast radius invalid |
| 4.5 | Placed derrick ballast = BA_{placed} Note: This value has been entered manually 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 | If value BA_{placed} is permissible |
| | | Blinking | If value BA_{placed} is questionable |
| | | „???“ blinking | If value BA_{placed} is invalid |

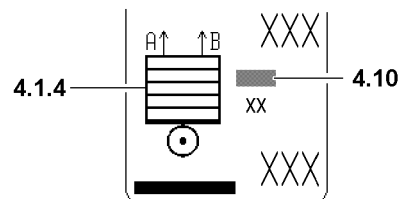
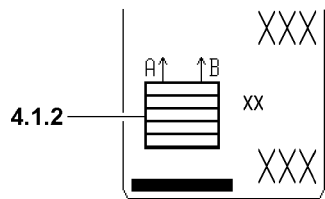
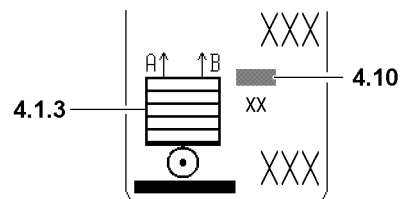
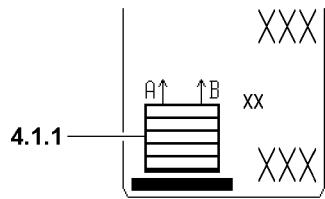
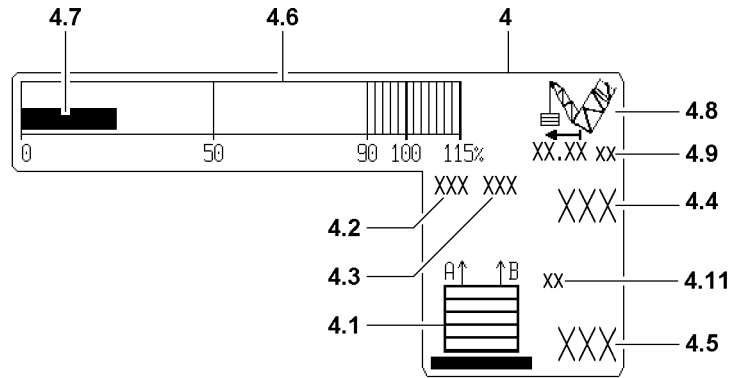


Fig.112943

| Position | Icons / display values | Type of display | Is shown |
|----------|---|-----------------|--|
| 4.6 | Ballast utilization scale | Static | Always |
| 4.7 | Derrick ballast utilization bar = Ratio BA_{pulled} to BA_{placed} in percent Derrick ballast utilization bar is 0 at: BA_{placed} smaller than BA_{placed_min} or BA_{pulled} = invalid | Dynamic | In operating modes with derrick ballast Note: The utilization bar can show max. 115 %! |
| 4.8 | „Derrick ballast radius“ icon | Static | In operating modes with derrick ballast |
| 4.9 | Display of derrick ballast radius with measuring unit | Static | When the derrick ballast radius value is valid |
| | | „???“ blinking | When the derrick ballast radius value is invalid |
| 4.10 | Ballast trailer alarm functions | If actuated | Note: See section „Ballast trailer alarm functions“ |
| 4.11 | Measuring unit Derrick ballast weight | Static | Always |

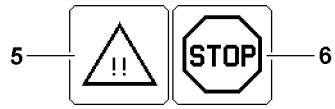


Fig.112317

8.5 Alarm functions

8.5.1 General alarm functions

NOTICE

Triggered alarm function!

If an alarm function is triggered (for example an advance warning occurrence or LMB Stop), the cause must be determined!

- ▶ Always pay attention to triggered alarm functions!
- ▶ Alarm functions can flash over the monitor!



Note

LMB Stop shut off delay!

- ▶ An LMB stop with shut off delay remains for a certain period of time! Possible fluctuating movements of the crane can be thereby minimized!

| Position | Icons / display values | Type of display | Is shown |
|----------|------------------------|-----------------|---|
| 5 | „Advance warning“ icon | Blinking | If an advance warning occurs, for example: $F1_{\text{min-advance warning}}$ $F1_{\text{actual}}$ less than $F1_{\text{min-warning value}}$ |
| 6 | „STOP“ icon | Blinking | If an LMB stop occurrence results, for example: At $F1_{\text{min-stop}}$ ($F1_{\text{is}}$ smaller than $F1_{\text{min}}$) with shut off delay 3 s or At $F1_{\text{max-operation stop}}$ ($F1$ larger or same as $F1_{\text{max-operation shut off value}}$) with three seconds shut off delay or $F1_{\text{max-assembly-stop}}$ ($F1_{\text{is}}$ larger or same as $F1_{\text{max-assembly}}$) with three seconds shut off delay Note: $F1_{\text{min-operation shut off value}} = F1_{\text{max-operation}} + F1_{\text{addition for shut-off}}$ |

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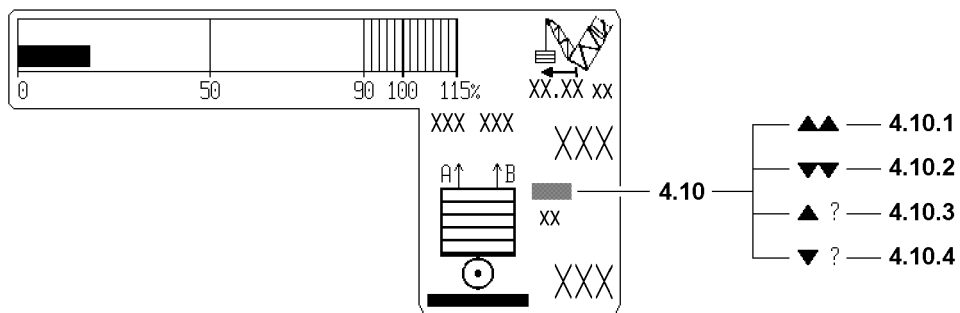


Fig.112944

8.5.2 Ballast trailer alarm functions

4.10 Ballast trailer limit signs



Note

- ▶ The **ballast trailer limit signs 4.10** are displayed exclusively for ballast trailer operation, providing that a corresponding event is present!
- ▶ The level difference between the placement surface of the crane and the ballast trailer is limited both upward and downward. In order to avoid damaging the crane or the ballast trailer, the upper and lower stop positions are monitored by limit switches. If one of the stop positions is reached, the corresponding limit signs „ballast trailer block position“ appears on LICCON monitor 1. The movements on the crane or on the ballast trailer as described below are turned off!

4.10.1 Two arrows pointing up

- They indicate that the **shut-off** of movements
 - Driving the crawler
 - Turning the turntable
 - Telescoping the ballast trailer guide
 - Lifting the ballast trailer via the support cylinders
 - Lifting the ballast trailer via the pull cylinders
 - Derrick adjustment by spooling out winch 4, are triggered by: Running against the „ballast trailer up block position“.

4.10.2 Two arrows pointing down

- They indicate that the **shut-off** of movements
 - Driving the crawler
 - Turning the turntable
 - Telescoping the ballast trailer guide
 - Lowering the ballast trailer via the support cylinders
 - Lowering the ballast trailer via the pull cylinders
 - Derrick adjustment by spooling up winch 4, are triggered by: Running against the „ballast trailer down block position“.

4.10.3 Arrow pointing up with?

- There is at least one limit switch - „ballast trailer up block position“ - defective.

Note:

There is no shut-off when reaching the up or down block position!

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

4.10.4 Arrow pointing down with?

- There is at least one limit switch - „ballast trailer down block position“ - defective.

Note:

There is no shut-off when reaching the up or down block position!

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

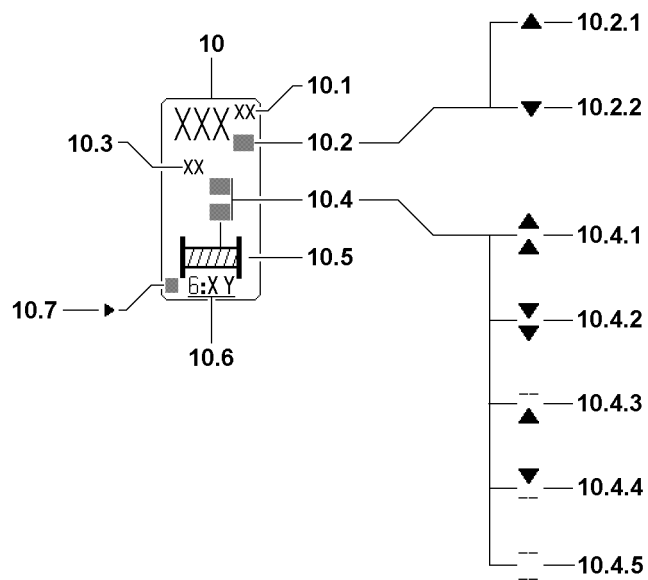
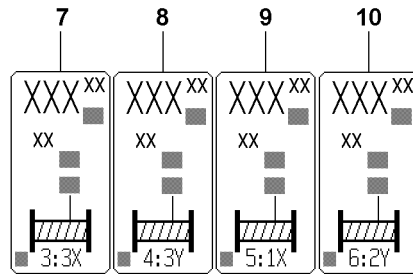


Fig.112945

8.6 Winch displays

8.6.1 Winches 3 to 6

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

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



Note

- ▶ If one of the winches is used as a hoist winch according to the set operating mode, then the **completed hook path** is shown in the winch icon. The value, which was tared by the corresponding function key is still shown unchanged, even after turning off and on or after an operating mode change!
- ▶ If one of the winches is used as a control winch, then the current **rope length on the winch drum** is shown, not the hook path. Then taring is possible, but after turning on and off again or after an operating mode change, the original value „Rope length on the rope drum“ is shown again!

| Position | Icons / display values | Type of display | Is shown |
|----------|------------------------|-----------------|--------------------------------------|
| 7 | Winch display winch 3* | Static | For installed and activated winch 3* |
| 8 | Winch display winch 4 | Static | For installed and activated winch 4 |
| 9 | Winch display winch 5* | Static | For installed and activated winch 5* |
| 10 | Winch display winch 6* | Static | For installed and activated winch 6* |



Note

Control winch / hoist winch assignment

- ▶ „Winch 3*“, „winch 4“ and „winch 5*“ are always calculated as control winches!
- ▶ „Winch 6*“ is always calculated as a hoist winch in the "Boom nose" operating system!
- ▶ „Winch 6*“ in single operation of winch I and winch II is not assigned to a master switch. If winch 1 and winch 2 are operated in parallel, then winch 6 is assigned the master switch of winch 2, MS2Y!

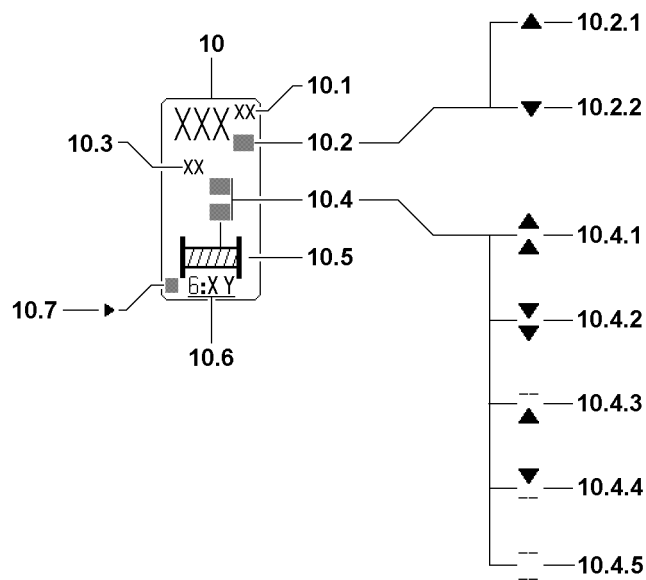
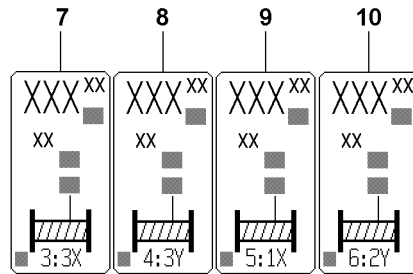


Fig.112945

8.6.2 Winch display

The winch 3 and winch 6 icons have the same meaning, which are explained based on the „Winch 6“ **10** icon.



Note

Display area of winch displays!

- ▶ The „Traveled distance“ display **1.1** has only three positions before the decimal point, any positions before that are cut off! The crane operator must evaluate for himself if, for example 200 m of rope are spooled up on a winch or 1200 m. **The display in both cases would be identical to 200 m !**
- ▶ The hook path calculation only works accurately if the load is suspended freely and is not luffed during the lifting procedure! Flexation and rope expansion are not taken into account!
- ▶ The length display (hook path display) is only accurate and the layer jump is only taken into account correctly if the winch has been calibrated and there have been no interruptions in the CPU power supply (cold start)!



Note

Error in winch path measurement!

- ▶ In case of an error in the winch path measurement, blinking „???“ appear as the display value **10.1!**
- ▶ If an error occurs and an error message is issued, see the Diagnostics manual!

10 „Winch 6“ icon

10.1 Completed hook path

- In [m] or [ft]
From a zero point to be determined

• Note:

It is displayed statically when the winch is calculated as a **hoist winch** and a manually entered reeving must be assigned to this winch!

or

10.1 Rope length on the winch drum

- In [m] or [ft]

• Note:

It is displayed statically when the winch is calculated as a **control winch!**



Note

- ▶ For winch 4 (intake gear), the rope length is valid equally for the left and the right half of the rope drum!

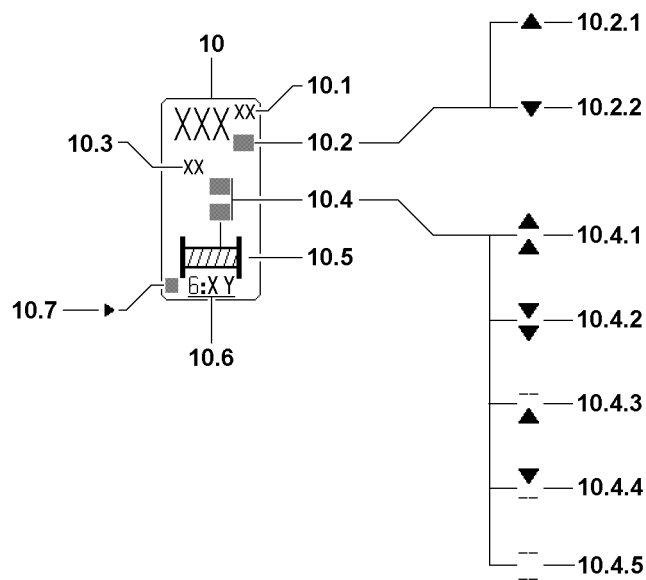
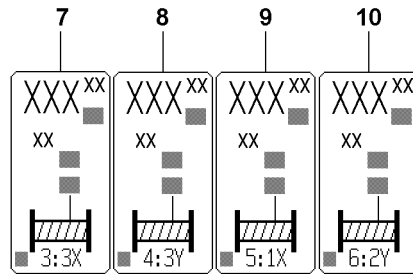


Fig.112945

10.2 Direction of hook movement

The arrows on the length value show the direction of the hook movement in relation to the zero point:

- Arrow up **10.2.1**: Hook has moved upward from the zero point
- Arrow up **10.2.2**: The hook has moved down from the zero point

10.3 Length unit for hook path display

- In [m] or [ft]

10.4 Winch status display

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

10.4.1 Spool out**10.4.2** Spool up**10.4.3** Spooled out

- Spooling out is blocked

10.4.4 Spooled up

- Spooling up is blocked

10.4.5 Winch is deactivated

- Spooling up and spooling out are blocked (via Control parameter program)

• **Note:**

If a winch status icon does not appear, the activated winch is inactive and is neither spooled up nor out!

10.5 Winch icon

- (with rope end for winch status icon)

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

- Example: 6:2Y

First digit: Winch number.

Second digit: Master switch number.

Letter: Master switch operating direction.

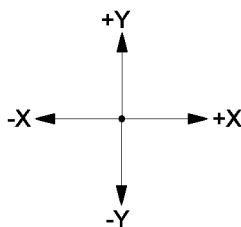


Fig.199930

10.7 Vibration sensor

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

• **Note:**

The vibration sensor is activated for the first actuated crane function!

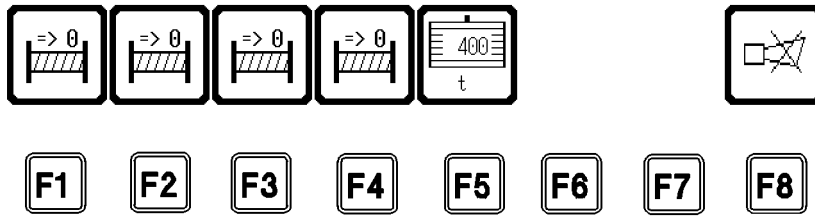


Fig.199942

8.7 Function key line

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

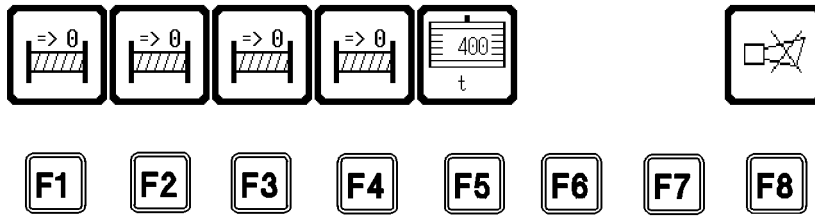


Fig.199942

| Position | Function / function key line | Type of display | Is shown |
|----------|--|-----------------|---|
| F5 | <p>Ballasting 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 input field. The value for the placed ballast can only be entered in the displayed weight unit [t] or [kips] via the keypad on monitor 1</p> <p>The ballast input can be ended as follows:</p> <p>- Pressing the ENTER key C = take over value. The entered value appears now as value for the placed ballast (BA_{placed}) in the ballast icon</p> <p>or</p> <p>- Pressing the „F5“ key = abort ballast input The change is discarded The old value of BA_{placed} remains in the ballast icon.</p> | Static | In operating modes with derrick ballast |



Note

- When entering the ballast, make sure to observe the respective section regarding the derrick ballast, see the Crane operating instructions, chapter 4.03!
-

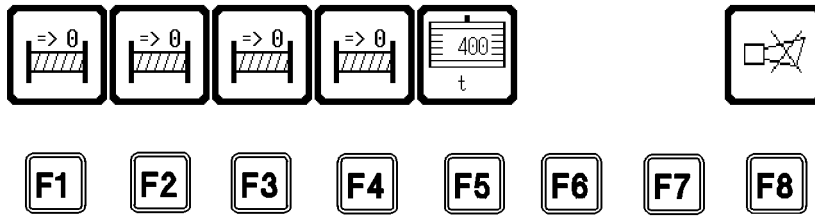


Fig.199942

| Position | Function / function key line | Type of display | Is shown |
|----------|--|-----------------|---|
| F5* | Ballast input value (BA _{edit})* = entered ballast value in function key icon of „F5“ | Static | For valid ballast input value |
| | | „???“ blinking | For invalid ballast input value |
| F6 | Not assigned | | |
| F7 | Not assigned | | |
| F8 | „Horn“ icon - Turn off the „Horn“ acoustic signal on monitor 1 by pressing the „F8“ key | Blinking | If the acoustic signal „Horn“ sounds on monitor 1. See section „Acoustic warning on monitor 1“. |

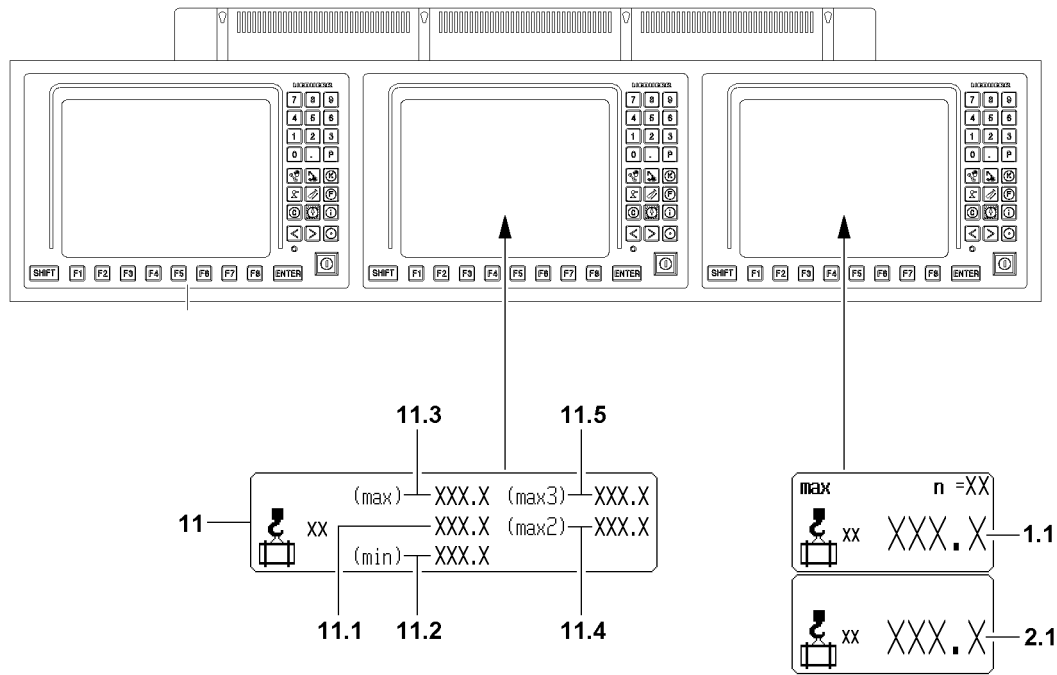


Fig.157605

8.8 Min / max load

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

11 Min / max load

- In [t] or [kips])

11.1 Current load on the boom

- Actual load display = **Load** that is currently hanging on the selected boom.
- Display of the calculated total load including the weights of the carrying equipment, the load lifting equipment (hook block) and / or the fastening equipment, 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“) 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.

11.2 Min load

- This is the minimum load that the crane must pull in the current operating condition with the currently pulled derrick ballast, so that $F1_{\text{actual}}$ is greater than $F1_{\text{min}}$ and no $F1_{\text{min}}$ shut-off occurs as a result.
If this „min-load“ is **not** reached, then the $F1_{\text{min}}$ 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 greater than the weight of the hook and the fastening equipment, 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 $F1_{\text{min}}$ shut-off occurs.

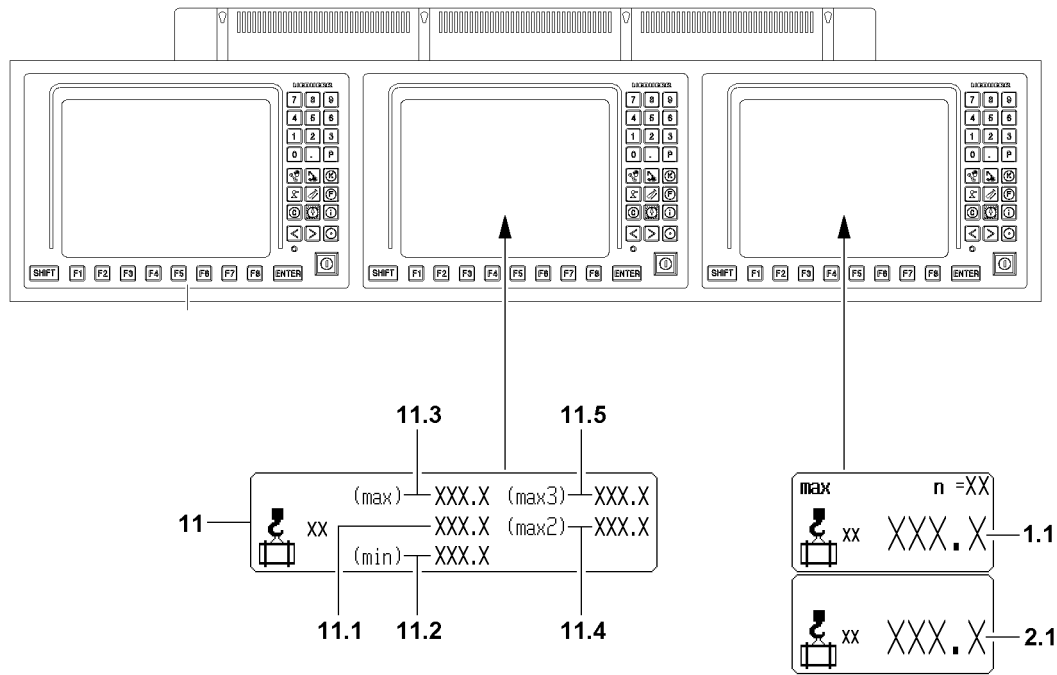


Fig.157605

11.3 Max load

- This is the maximum load („maximum load according to the load chart and reeving on the boom“ **1.1**) that the crane can lift in the current operating condition with the currently **pulled** derrick ballast.

Note:

The „max-load“ on monitor 1 and the „maximum load“ on monitor 0 are identical. The displayed values must always match.

11.4 Max2 load

- This is the maximum load that the crane can lift in the current operating condition, when the **placed** derrick ballast is fully **pulled**.

11.5 Max3 load

- This is the maximum load that 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 „min / max load“ **11** icon correspond:

- ▶ The „current load on the boom“ **11.1** and the actual force „F_{1_{is}}“
- ▶ the „min-load“ **11.2** and the minimum force „F_{1_{min}}“
- ▶ the „max-load“ **11.3** and the maximum operating force „F_{1_{max-operation}}“

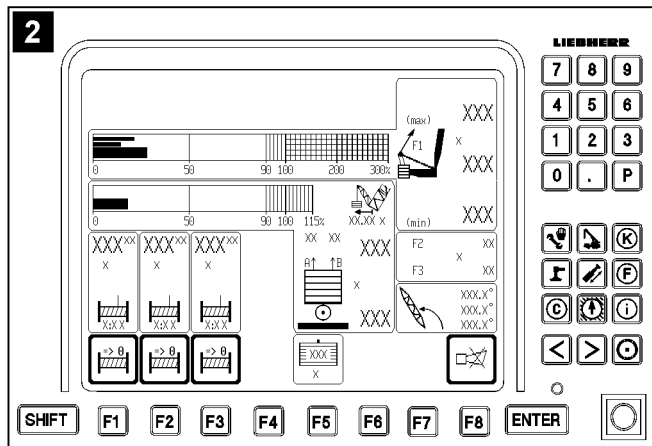
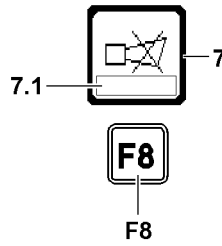
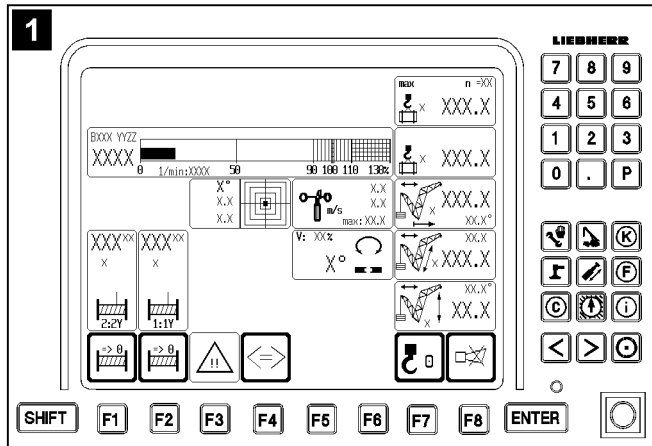


Fig.112359

8.9 Acoustic warning on monitor 1

Acoustic warnings on monitor 1 (illustration 2) are indicated by the „horn“ warning sound.

Error messages are only shown in the Horn icon 7 of LICCON monitor 0 (illustration 1).

The „horn“ warning sound is divided into two categories:

- „Horn“ is a beeping sound that lasts approximately 0.5 seconds and that is repeated every second.
- „Short horn“ is a beeping sound of a duration of approximately 0.1 seconds, which is repeated in a second cycle.

7 Horn icon

- When the Horn icon 7 is shown in the LICCON monitor, any acoustic signals which will occur can be shut off by the LICCON monitor 1 by pressing the function key **F8**.

8.9.1 „Horn“ acoustic signal

For some operational errors found on the Central Processing Unit 1 (CPU 1), which can lead to a shut-off of a movement, it is important to check the operating screen on monitor 1 and monitor 0. These errors are reported by the „horn“ warning sound on monitor 1 and additionally as visual display of the error message 7.1 on monitor 0.

Operational errors 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 boom angle.
- Falling below minimum derrick boom angle.

Operational errors with error messages (LICCON-Error-Code 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 an error message on LICCON monitor 0!
- ▶ There is **no** „horn“ acoustic signal on monitor 1!

8.9.2 „Short horn“ acoustic signal

Sounds in addition to the visual display of error messages that do not have an error number and do not lead directly to crane movement shut-off by the LICCON overload protection

Monitored error messages are:

- Advance warning threshold of test point 1 - minimum force has been reached

8.9.3 Priority acoustic signal

- 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“ immediately become active again if an error recurs!

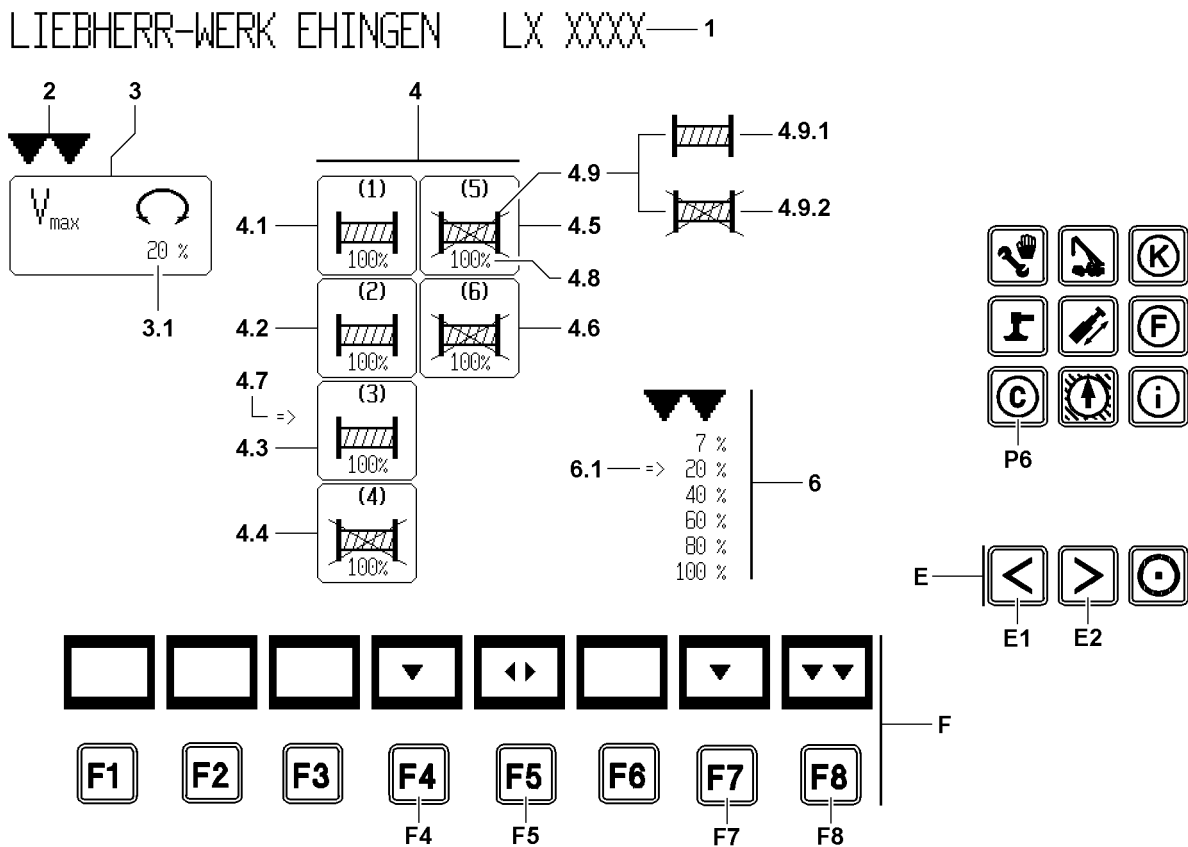
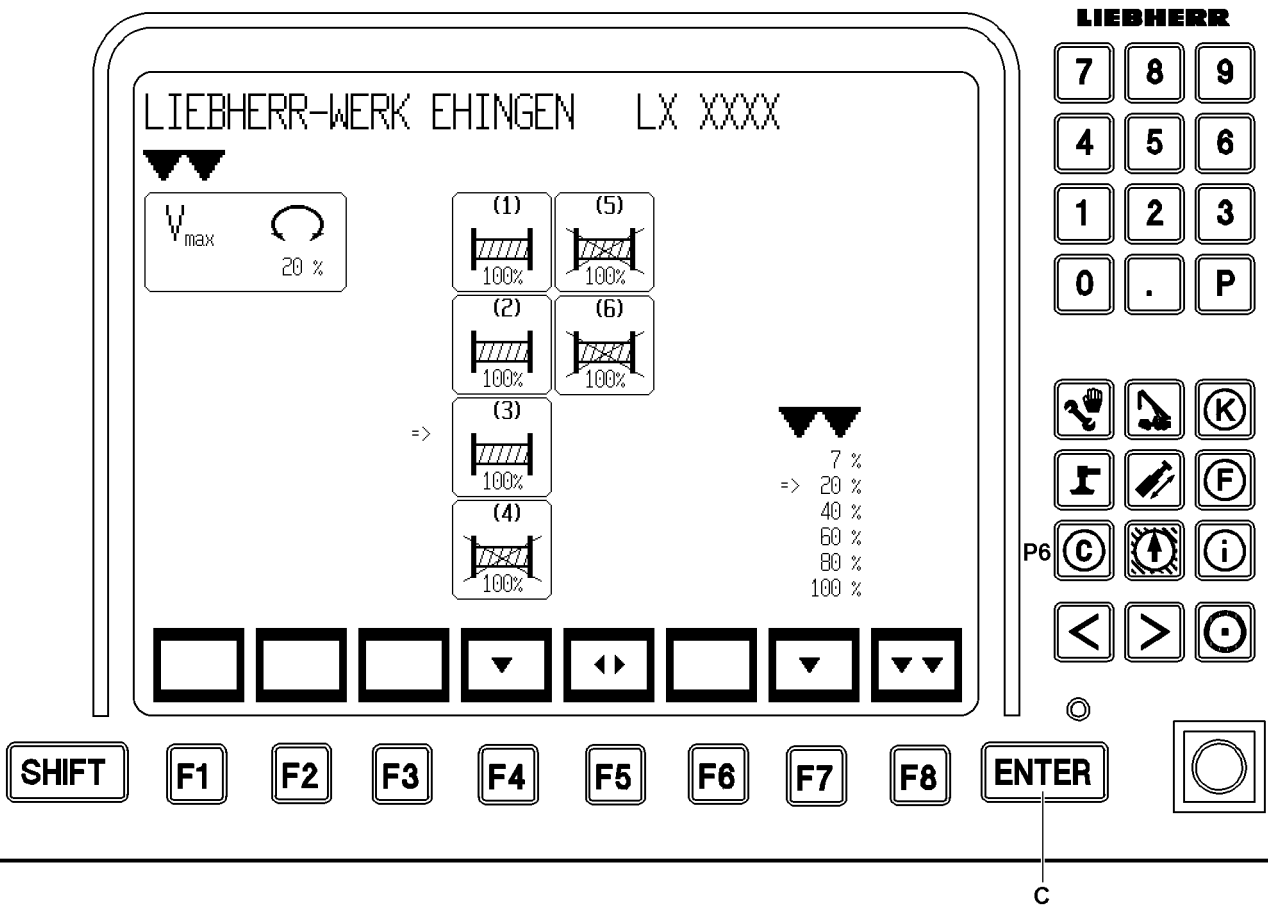


Fig.112947

LWE/LR 11350-007/19005-01-02/en

9 The Control parameter program

The Control parameter program offers the following possibilities:

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

During the Control parameter program, the exceedance of shut off limits of the LICCON overload protection may not be activated. Otherwise the system switches back immediately to the Crane operation program.



DANGER

Danger of accident!

- ▶ **Never** change the speeds or the activation / deactivation of the winches while actuating a crane movement!
-

9.1 Starting the program

- ▶ Press the program key **P6**.

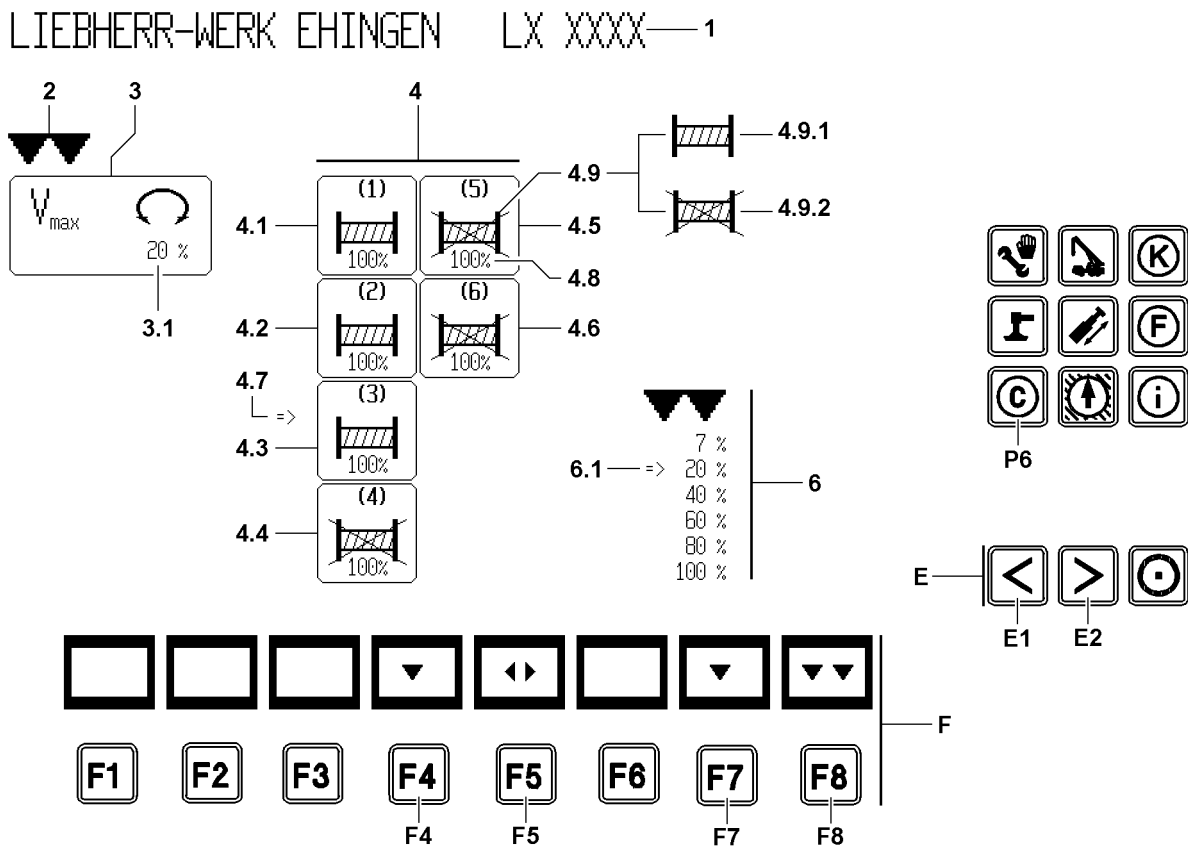
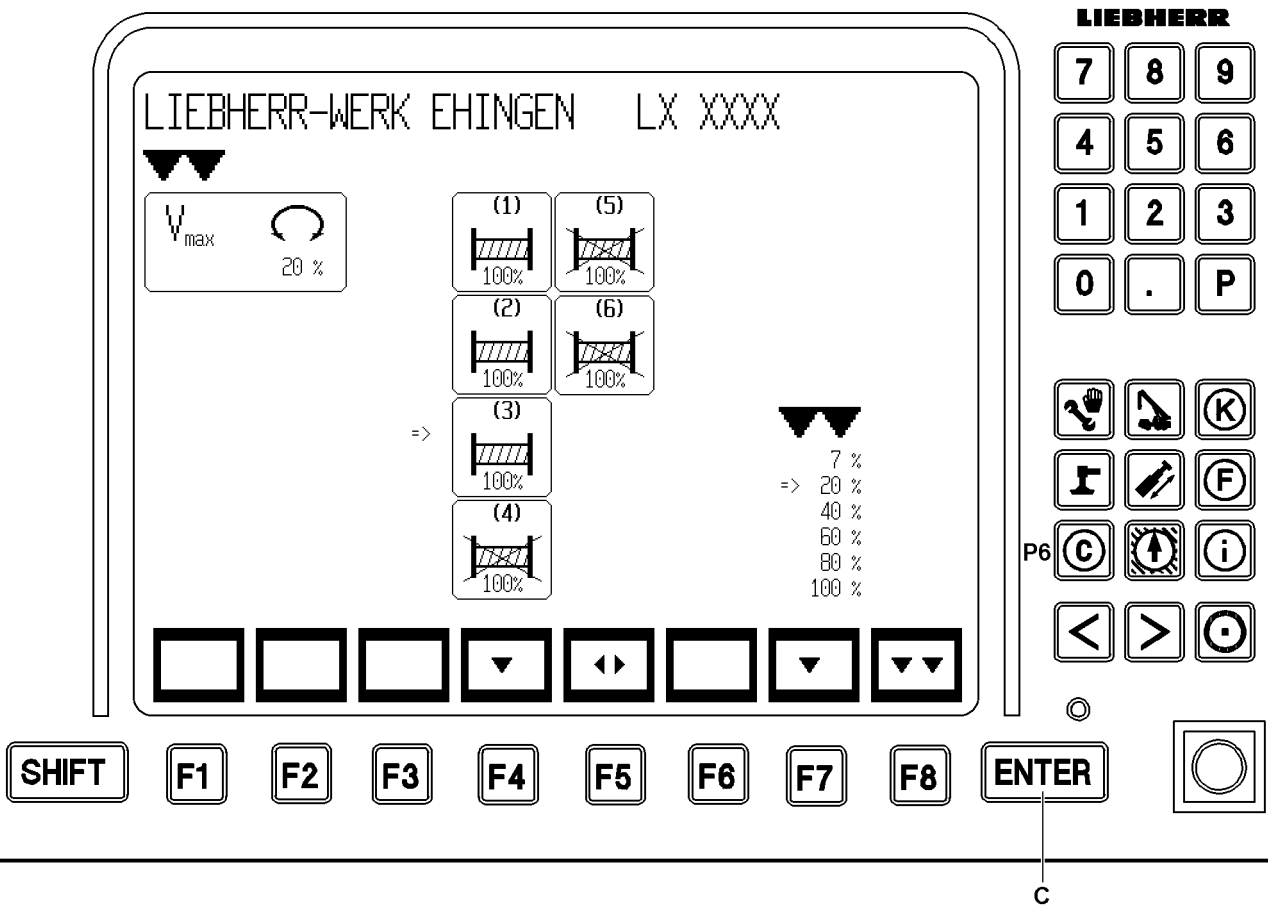


Fig.112947

LWE/LR 11350-007/19005-01-02/en

9.2 Operating interface

- 1 Crane type
- 2 Selector „Icon selection“
 - Shown by the double down arrow
 - Select icon.
- 3 „Slewing gear“ icon
- 3.1 „Maximum slewing speed“
 - V_{\max} in percent [%]
- 4 „Winch“ icon group



Note

► The setting options are the same for all winches and are explained based on the Winch 5* icon **4.5!**

- 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
 - Shown by the right arrow
 - Select the winch for which the „properties“ are to be changed
- 4.8 Winch speed
 - In percent [%]
 - Current for the selected speed for the respective winch
- 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.
- F 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
 - Switch back to the crane operation program and take over parameter.
- C ENTER input key
 - Take over the selected speed setting for the preset functions.
- E Special function keys
 - 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

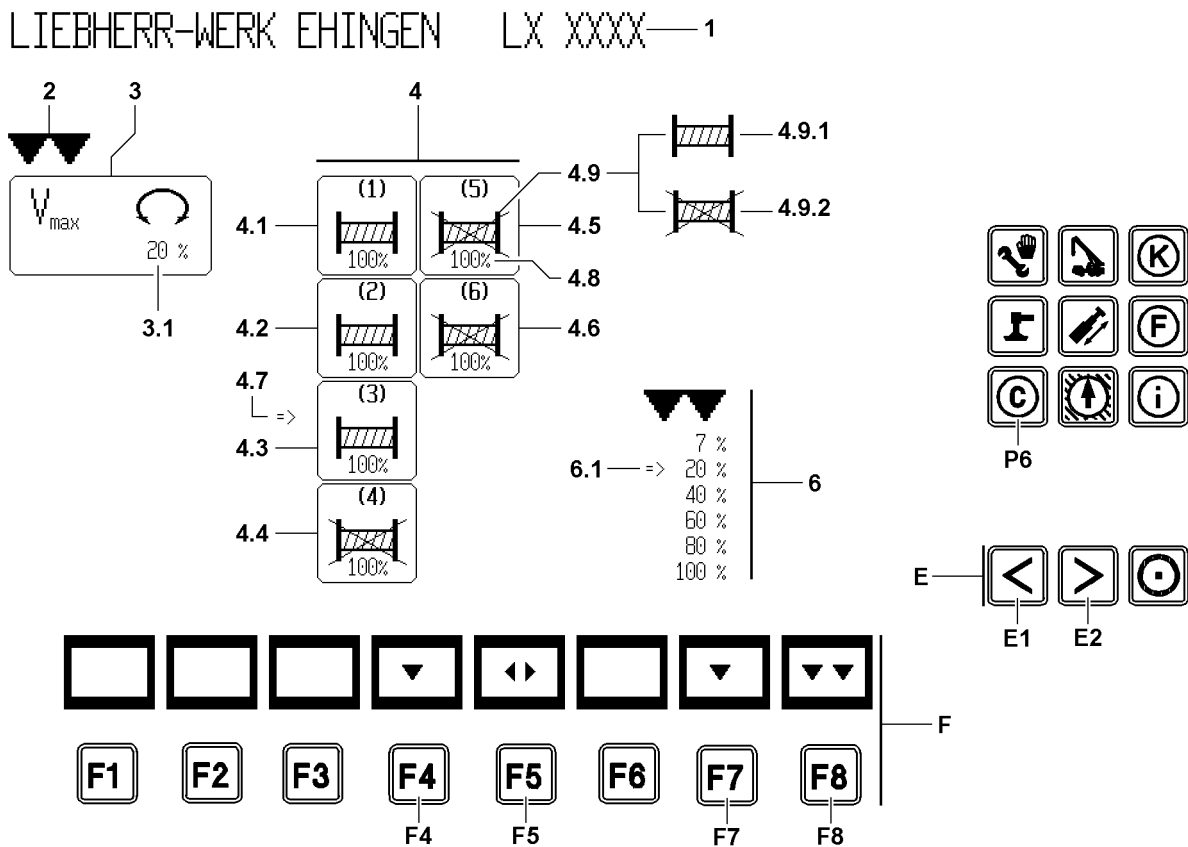
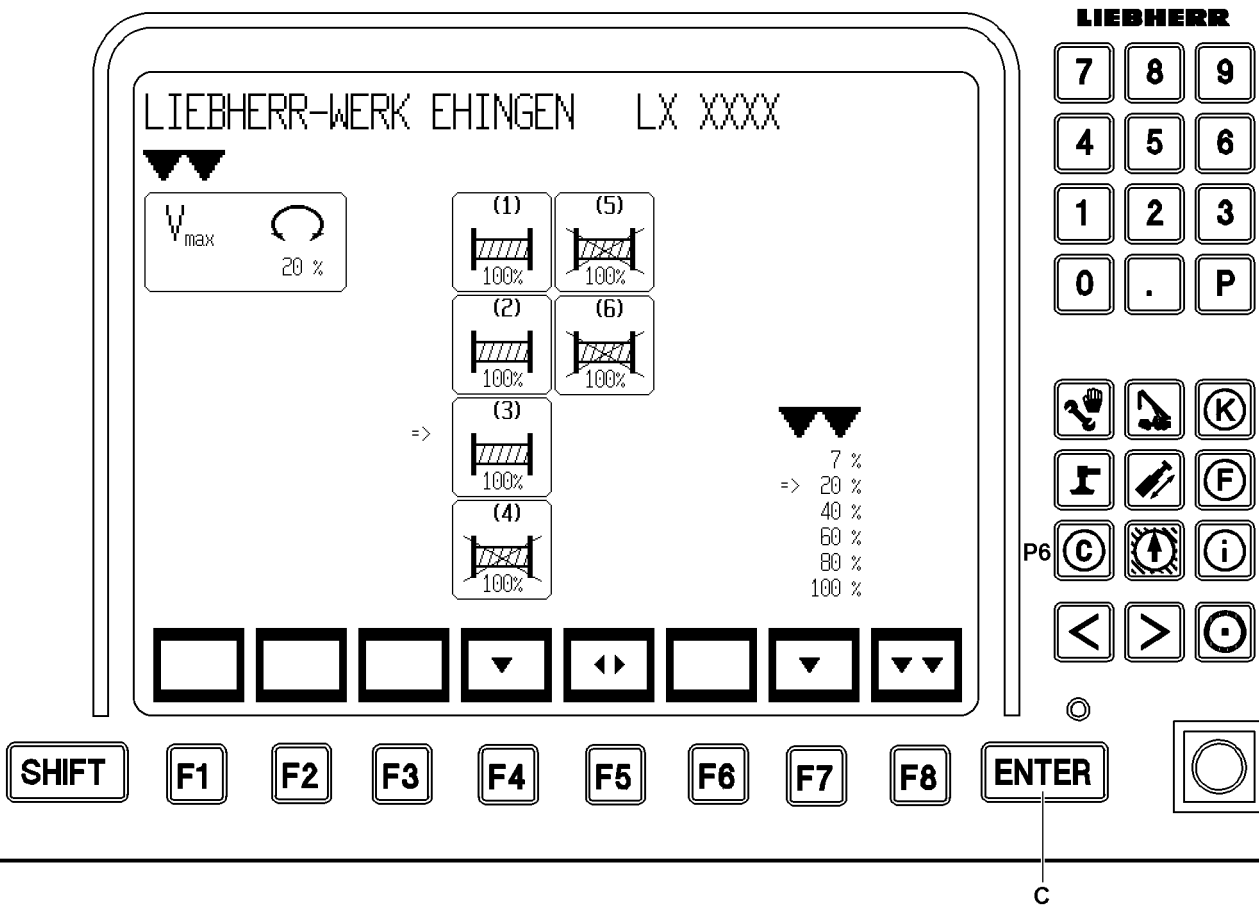


Fig.112947

LWE/LR 11350-007/19005-01-02/en

9.3 Changing the maximum rotational speed of slewing gear



DANGER

Danger of accident!

- ▶ Always adhere to the maximum speeds relative to the boom length and the operating modes during crane operation with loads (according to load charts)!
- ▶ The longer and heavier the boom is and the greater the load, the smaller the set „Maximum slewing speed“ must be!
- ▶ **Never** deflect the master switch for the slewing gear to the stop at maximum load!

- ▶ Use the special function key **E1** or special function key **E2** to select the „Slewing gear“ icon **3**.

Result:

- Selector (double arrow down) **2** appears above the „Slewing gear“ icon **3**.

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

Result:

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

- ▶ Use the ENTER key **C** to confirm the selected „Maximum rotational speed“.

Result:

- The value of the „Maximum rotational speed“ is shown in the icon and taken over into the control.

9.4 Winches

9.4.1 Changing maximum winch 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 „Winches“.

- ▶ With the function key **F4**, select the icon for „winch 1“, or „winch 2“, or „winch 3“, or „winch 4“, or „winch 5“ or winch 6“ **4.6**.

Result:

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

- ▶ Select the „Maximum winch speed“ in percent [%] with function key **F7**.

Result:

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

- ▶ Use the ENTER key **C** to confirm the selected „Maximum winch speed“.

Result:

- The value of the „Maximum winch speed“ is shown in the selected winch icon and taken over into the control.

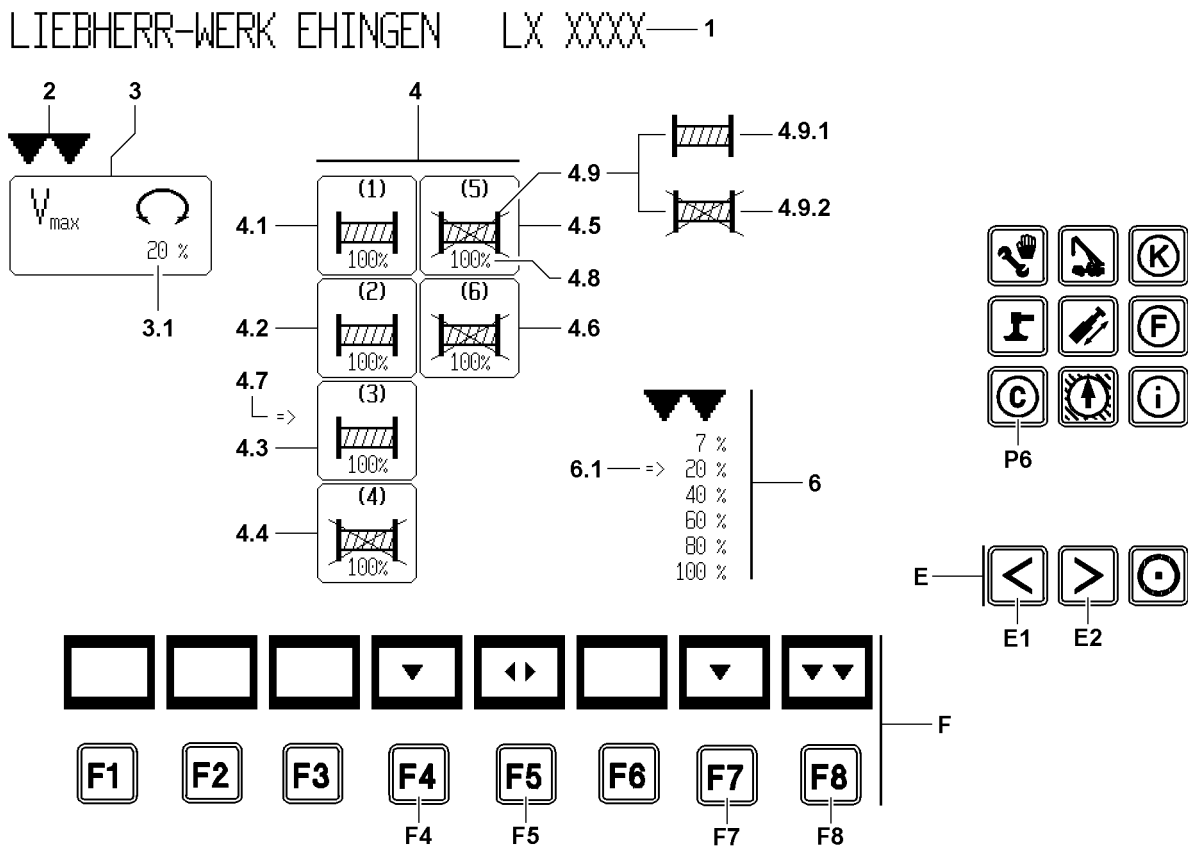
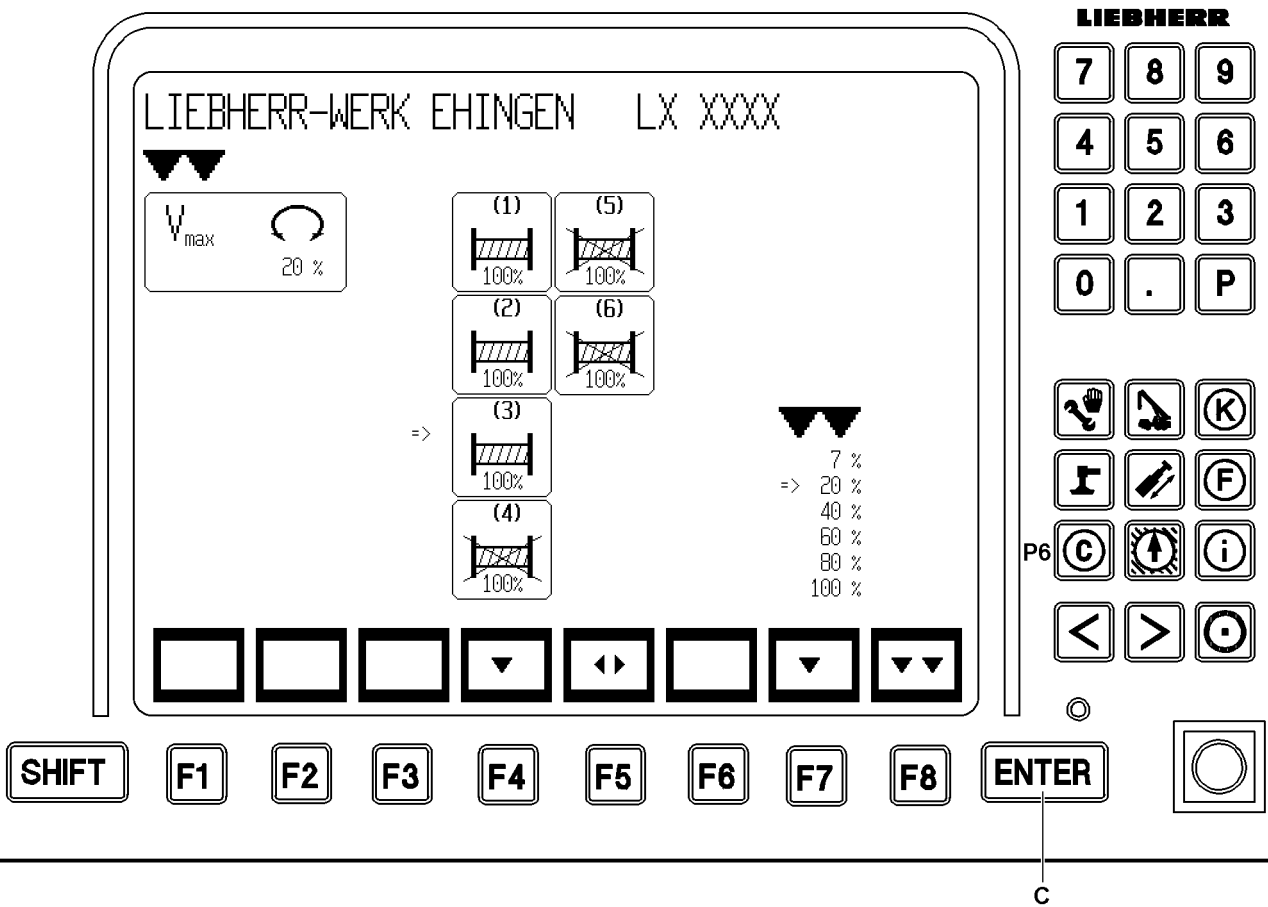


Fig.112947

LWE/LR 11350-007/19005-01-02/en

9.4.2 Activating / deactivating individual winches

In order to prevent unintentional activation of a winch that is currently not required, deactivate 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 „Winches“ **4**.

- ▶ With the function key **F4**, select the icon for „winch 1“, or „winch 2“, or „winch 3“, or „winch 4“, or „winch 5“.

Result:

- Selector (right arrow) **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**.

9.5 Switching back to the crane operation program

- ▶ Press the function key **F8**.

Result:

- The parameters previously confirmed with the ENTER key **C** will be taken over into the control.

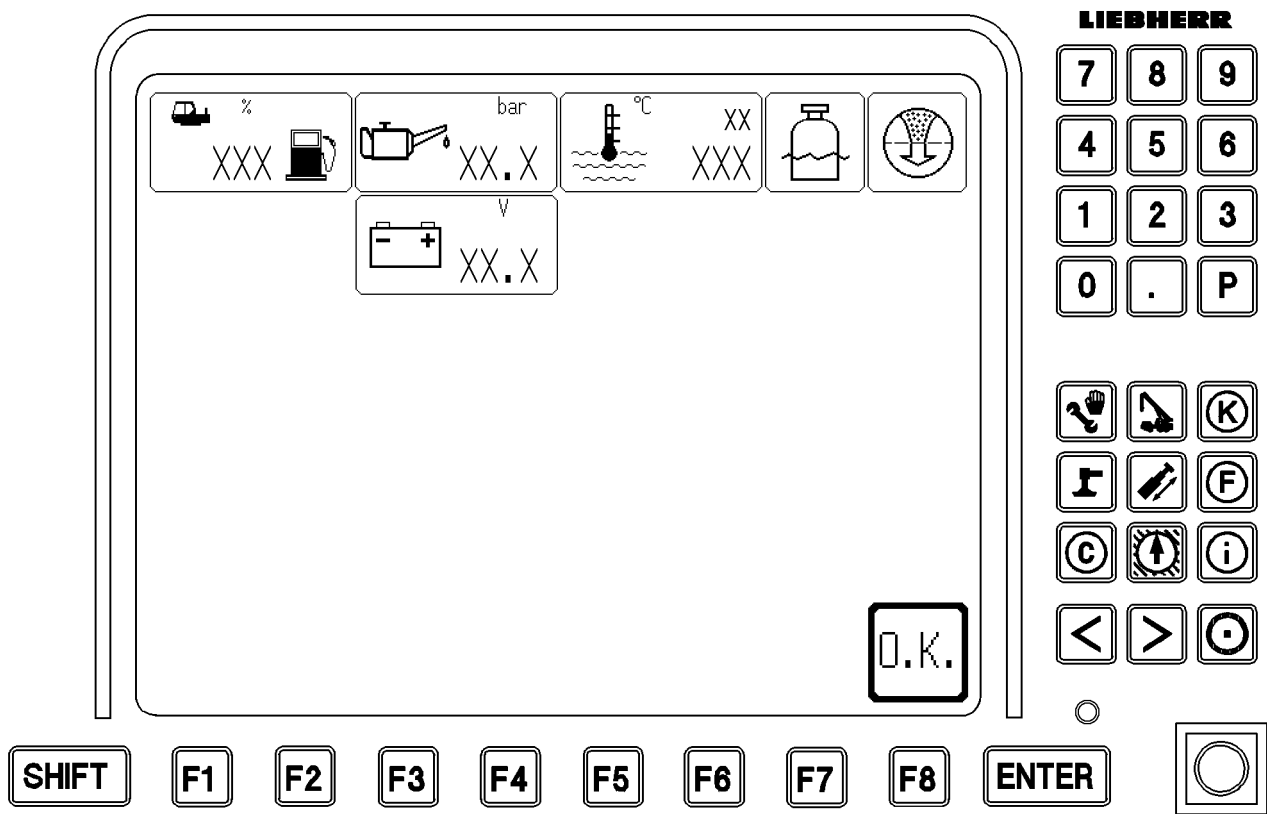
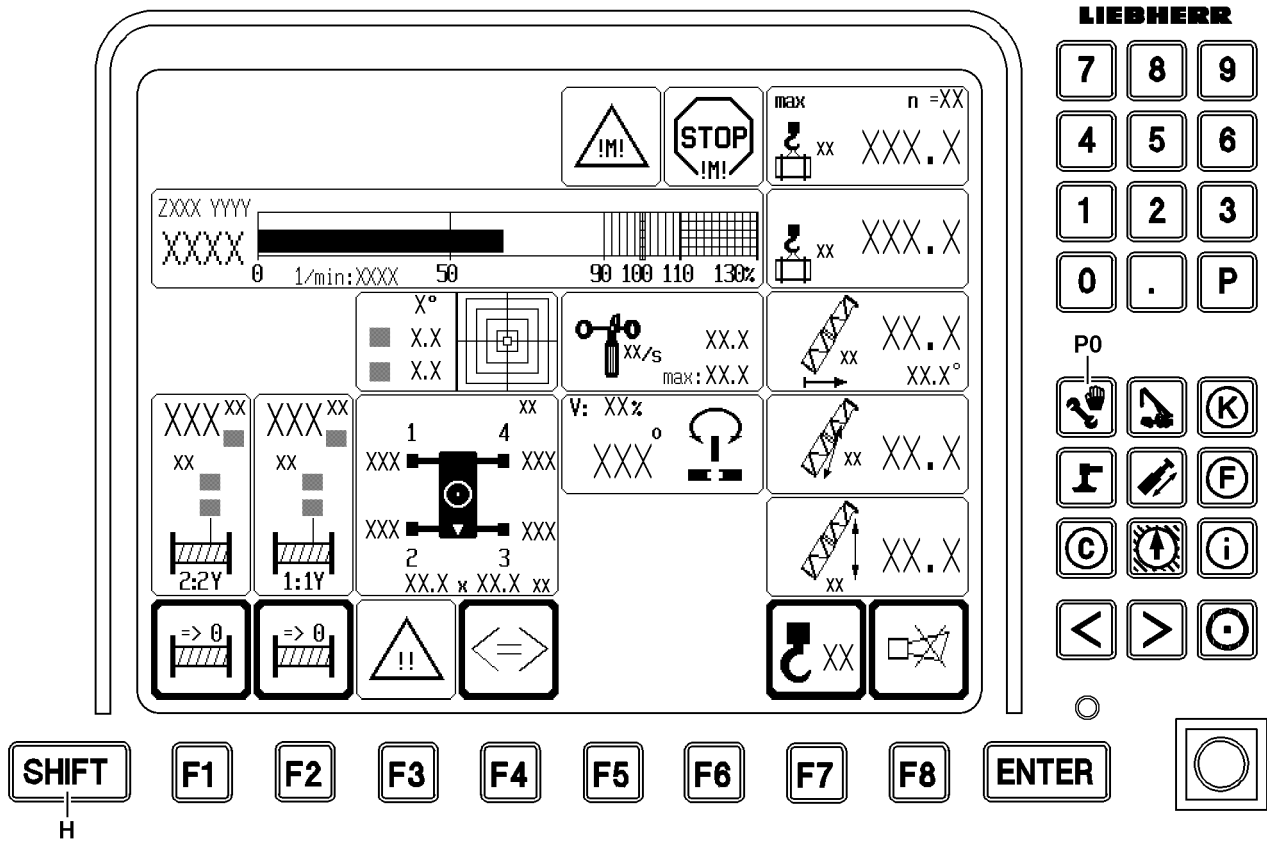


Fig.112361

10 The Engine monitoring program

All engine-related data is displayed by the engine monitoring program, such as the engine oil pressure, coolant temperature etc. The change from the crane operation into the engine monitoring program is made automatically in case of a problem.

10.1 Starting the program

NOTICE

Danger of severe engine damage!

If the engine monitoring program reports a problem and / or warning occurrence, then you must react immediately and remedy the problem!

- ▶ React to problems and / or warning occurrences immediately and remedy the problem!
 - ▶ If necessary, stop crane operation and turn the engine off!
-

NOTICE

Shut off engine monitoring!

Outside of the crane operation program, the engine monitoring is turned off!

When the engine monitoring is turned off, problems and warning occurrences are not recognized!

This could result in crane failure!

- ▶ If work is not carried out in the crane operation program, then turn the crane engine off and operate the LICCON computer system in stand-by mode, see section „LICCON computer system in stand-by mode“!
 - ▶ If work has to be carried out for a longer period outside of the crane operation program, with the crane engine running, then switch regularly into the engine monitoring screen!
-

The program starts automatically:

- ▶ Once if a STOP event of the engine monitoring takes place during **crane operation** on the crane operation program (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 crane operating screen.

or

At an advance warning, warning or STOP event of the engine monitoring during the boot up of the LICCON computer system.

This is how you start the program at the prompt:

- ▶ Press the key combination SHIFT **H** + program key **P0**.

Result:

- The engine monitoring screen is shown.
- All **load moment increasing** crane movements are blocked or turned off.

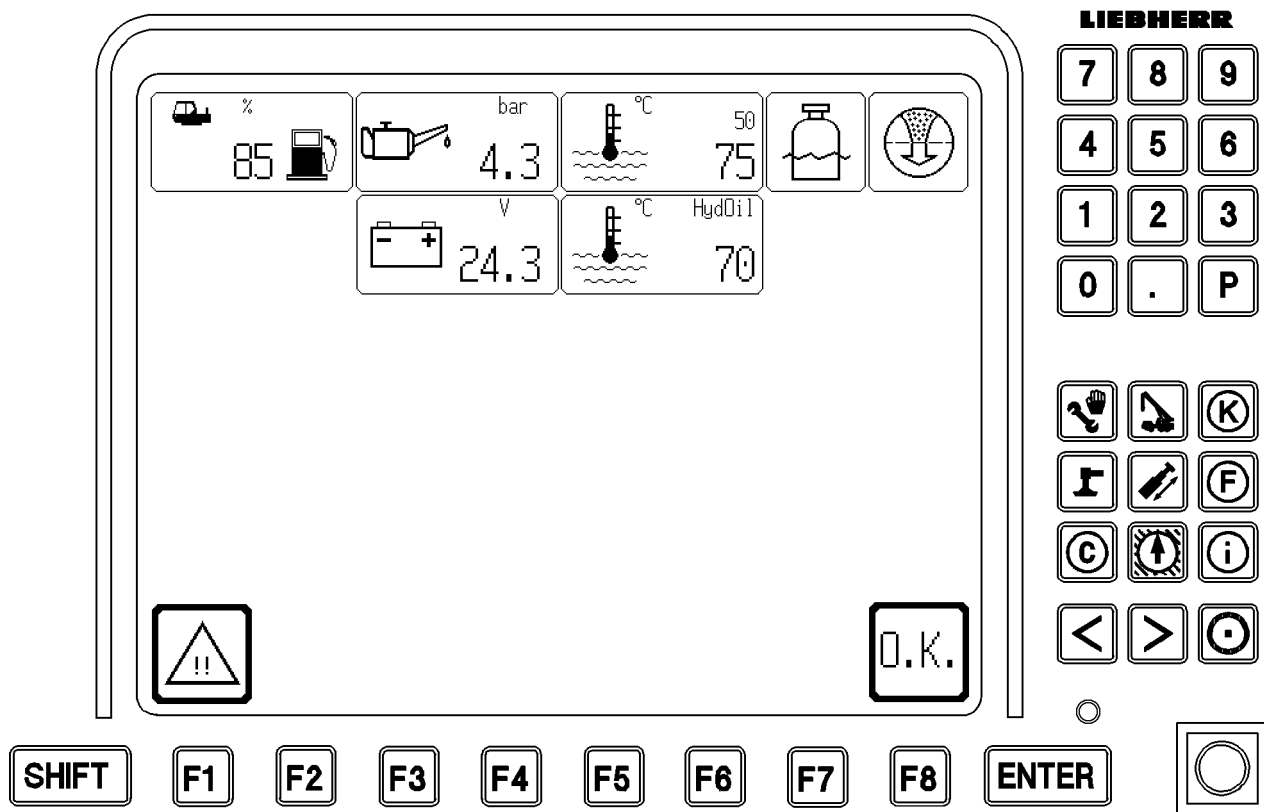
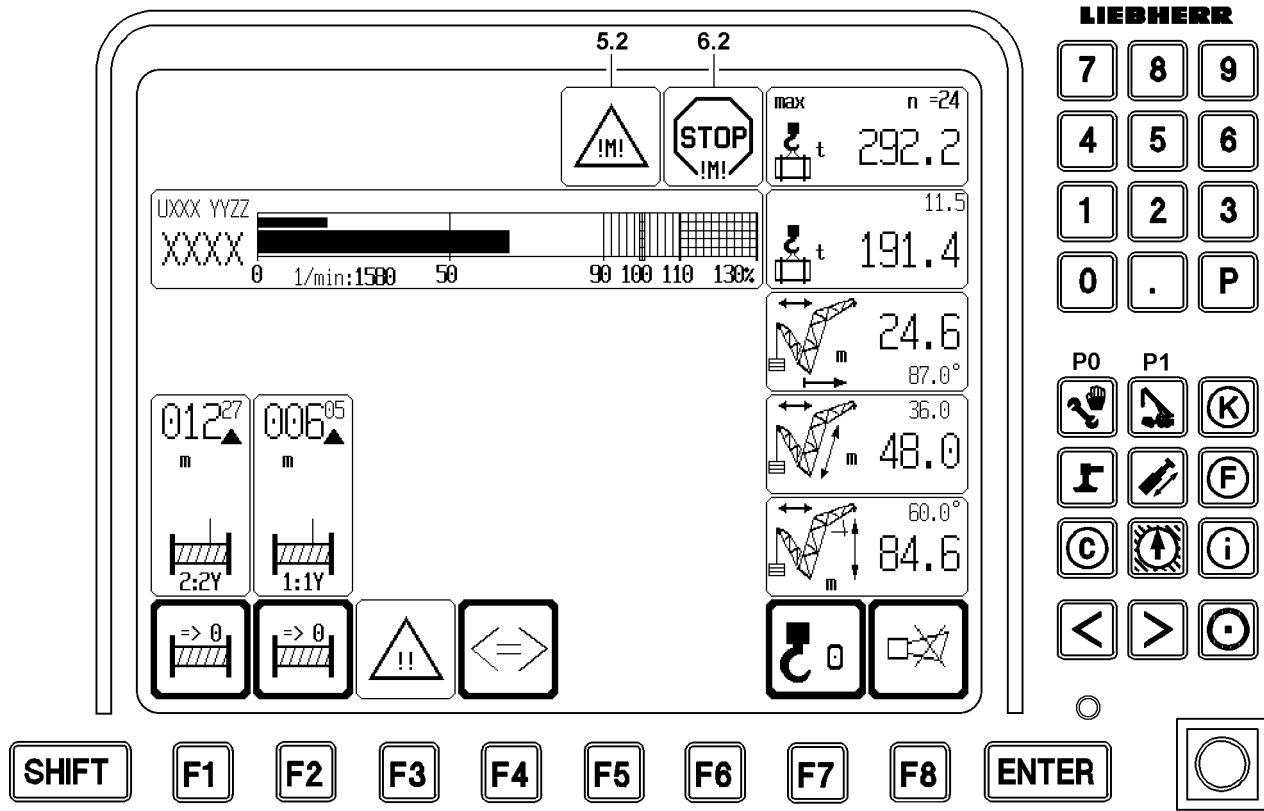


Fig.199923

10.2 Possible engine monitoring advance warning, warning and STOP events

| Events | Advance warning | Warning 5.2 | STOP 6.2 |
|--|-----------------|-------------|----------|
| Engine oil pressure (display value) missing | | x | |
| Erroneous engine oil pressure (display value) | | x | |
| Engine oil pressure warning active | | | x |
| Coolant / charge air temperature (display value) missing | | x | |
| Erroneous coolant / charge air temperature (display value) | | x | |
| Coolant / charge air temperature warning active | | | x |
| Coolant level warning active | | | x |
| Hydraulic oil temperature (display value) 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.

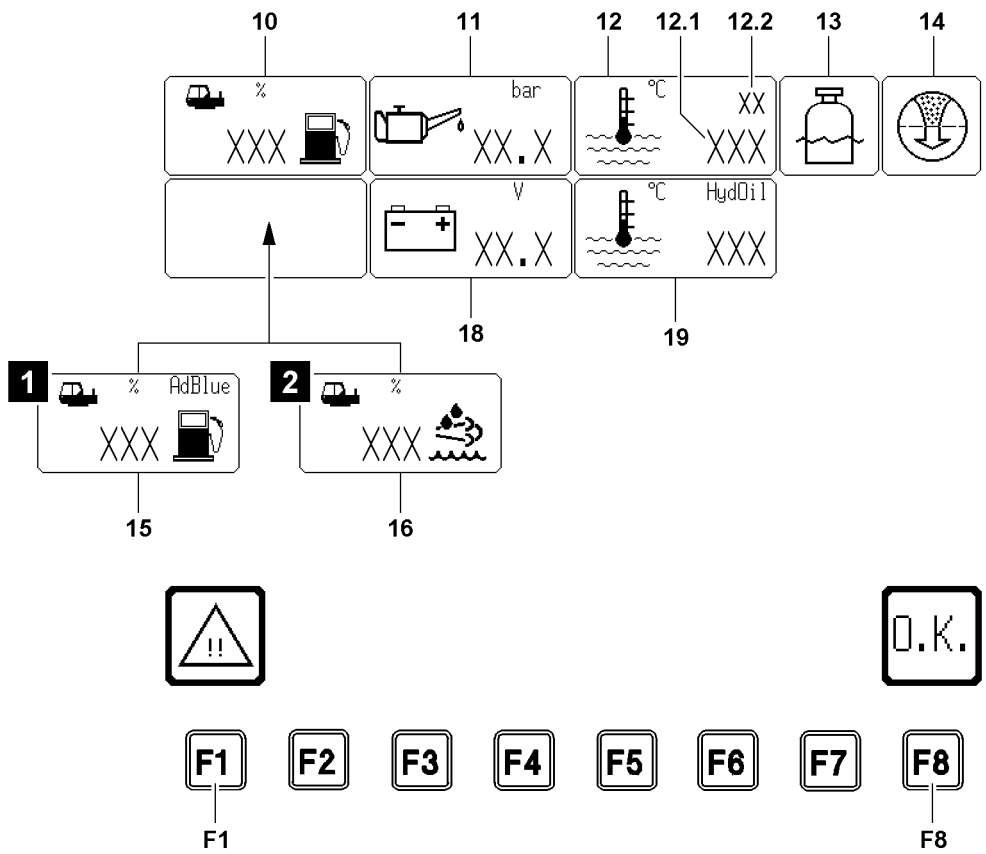


Fig.156323

10.3 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. Advance warnings are **not** pointed out in the „crane operation“ program.



WARNING

There is 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 „Set up“ 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!

The automatic change over in the engine monitoring screen has been made:

▶ Press the function key **F1**.

Result:

- The engine monitoring screen is retained.
- Icon frames are displayed with a thin border.
- All load torque increasing crane movements will be turned off or locked.

Switch back to the „Crane operation“ program:

▶ Press the function key **F8**.

Result:

- The 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.

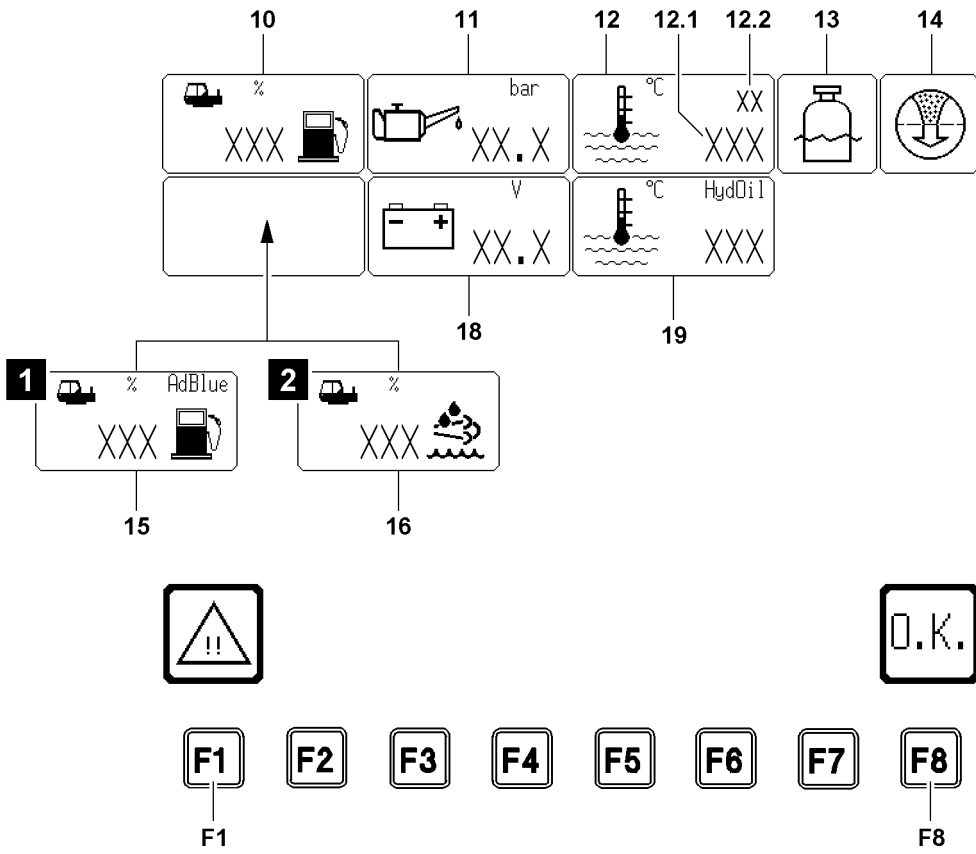


Fig.156323

10.4 Engine monitoring icons

10.4.1 Crane engine

- 10 Tank content
 - In percent [%]
The icon blinks if the fuel reserve is less than 10 %.
- 11 Oil pressure
 - In [bar]
Numeric display in icon blinks if the engine oil pressure is too low
- 12 Coolant / charge air temperature
 - In [°C]
- 12.1 Coolant temperature
 - Numeric display blinks if the coolant temperature is too high
- 12.2 Charge air temperature
 - Numeric display blinks if the charge air temperature is too high
- 13 Coolant level too low
 - Icon appears if the coolant level is too low
- 14 Air filter is dirty
 - Icon appears if the air filter is dirty
- 15 Urea reserve
 - Fuel level as a [%]
 - **Note:** Only for crane types with SCR exhaust aftertreatment. Either the illustration 1 or illustration 2 icon appears.
Observe the respective indicator lights in the crane operator's cab roof console, see the Crane operating instructions, chapter 4.01.
- 16 Urea reserve
 - Fuel level as a [%]
 - **Note:** Only for crane types with SCR exhaust aftertreatment. Either the illustration 1 or illustration 2 icon appears.
Observe the respective indicator lights in the crane operator's cab roof console, see the Crane operating instructions, chapter 4.01.
- 18 Battery voltage
 - In [V]
Numeric display in icon blinks if the operating voltage is less than 16 V or above 36 V
- 19 Hydraulic oil temperature
 - In [°C]
 - Numeric display blinks if the hydraulic oil temperature is too high

10.5 Function key line

- F1 Function key
 - Retaining the engine monitoring screen
- F8 Function key
 - Switching back to the crane operation program



Note

- ▶ The function keys „F2“ to „F7“ are **not** assigned in the engine monitoring program!

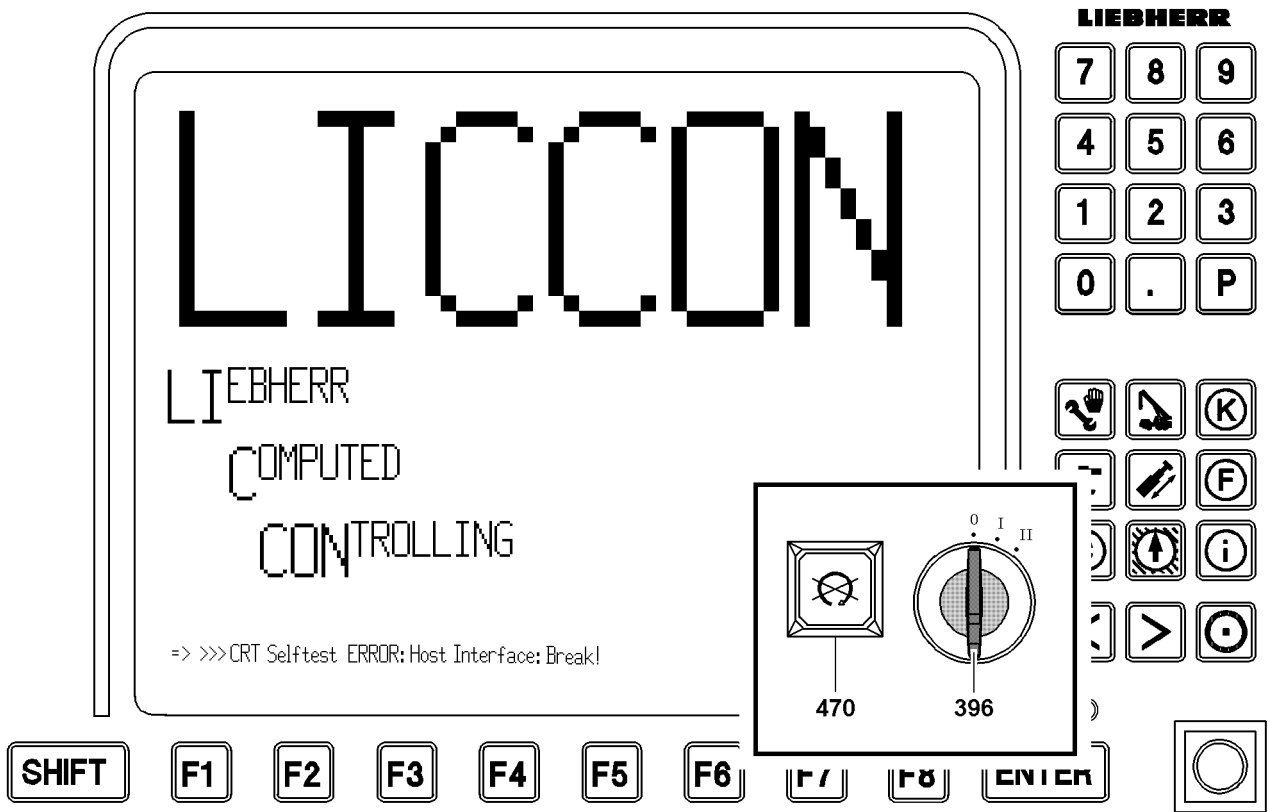


Fig.105191

LWE/LR 11350-007/19005-01-02/en

11 LICCON computer system in stand-by mode

11.1 Starting the LICCON computer system in stand-by mode

There are two ways of achieving stand-by mode with the LICCON computer system.

Option 1: Starting the LICCON computer system without the engine running:

- ▶ Turn the ignition switch **396** to position „I“ and leave it there.

Result:

- The LICCON computer system runs and the LICCON monitor shows the set up screen, or alternatively for a stop / warning / advance warning, the engine monitoring screen.

- ▶ Press the function key **F8** (O.K.).

Result:

- System switches to the „Crane operation“ program.

Option 2: Turning off the running engine with the engine stop button 470:

- ▶ Press the engine stop button **470**.
- ▶ Leave the ignition switch **396** in position „I“.

Result:

- The engine is turned off, the LICCON computer system continues to run.

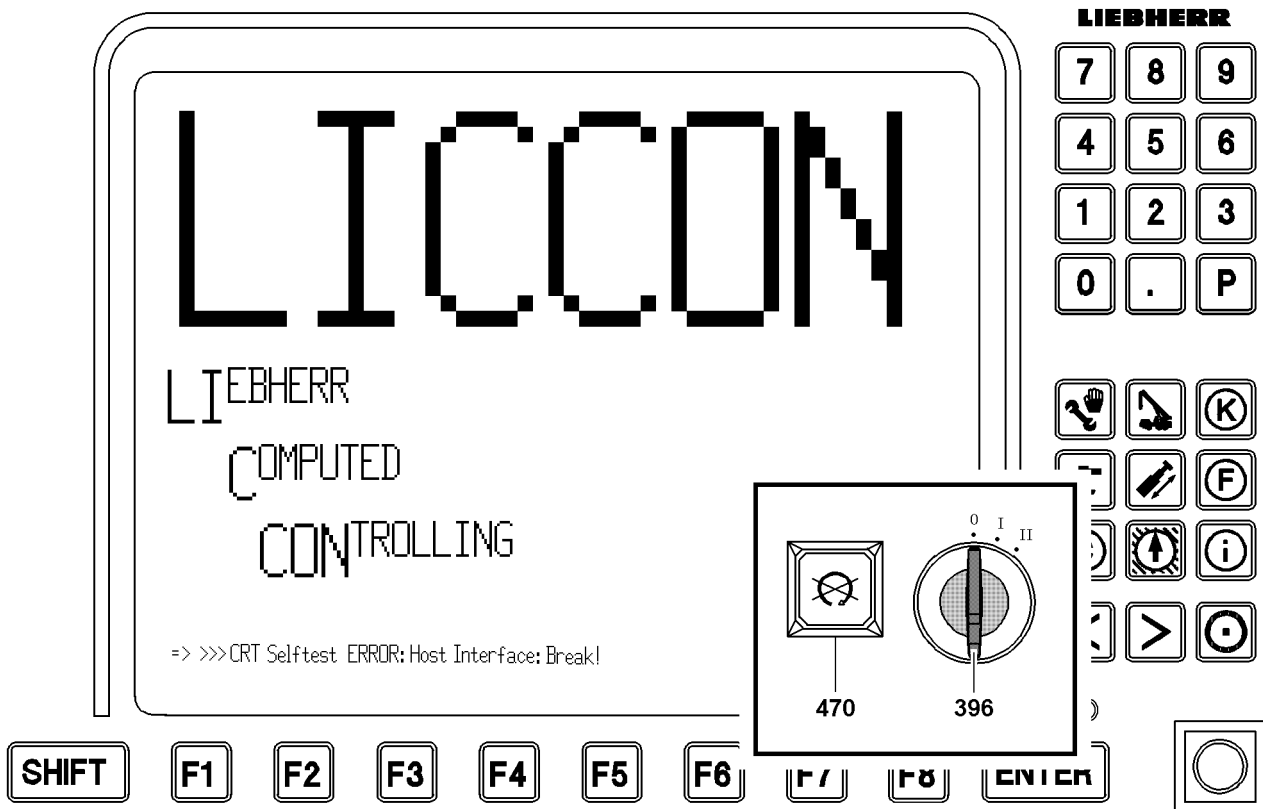
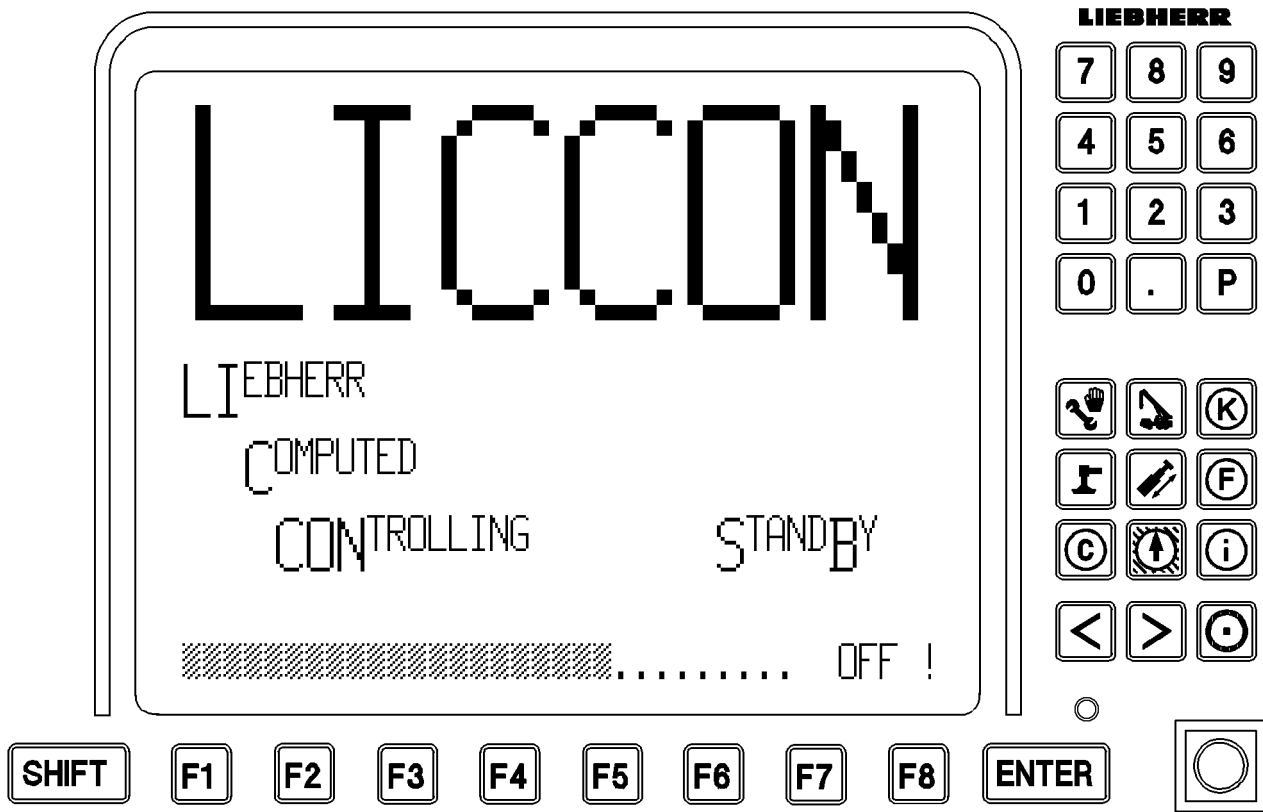


Fig.105191

11.2 Active stand-by operation / alarm

The operating programs and the monitor displays function exactly the same as in the turn-on procedure for the LICCON computer system with engine start (crane operation).

No crane movements are possible. If despite this a crane movements is selected, 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:

- The system switches back to the interrupted program.
- The stand-by time is extended by another 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 Selftest: 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 interrupted.

11.3 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.

Empty page!

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4.03 Start up and shut down of crane

| | | |
|---|---|----|
| 1 | Checking before start up | 2 |
| 2 | Crane operator's cab work station | 5 |
| 3 | Starting and turning off the engine | 16 |
| 4 | LICCON computer system after engine start | 23 |
| 5 | Load weighing and load display | 29 |

1 Checking before start up

Various inspections must be carried out prior to crane start up.

The inspection and maintenance of the components of the crane chassis are described in chapter 7.04.

The inspection and maintenance of the components of the crane superstructure are described in chapter 7.05.

The fill quantities of the components are listed in the Service fill.

Additionally observe and adhere to the instructions in chapter 7.06 and chapter 7.07.



WARNING

Defective function of the crane!

Defects in components, missing quantities or dirty filters affect the operating safety of the crane.

If a defect is found in a component:

- ▶ Rectify the defect.

If an incorrect quantity is found:

- ▶ Bring the incorrect quantity to normal level.

If a very dirty filter is found:

- ▶ Clean or replace the filter.



WARNING

Hot surfaces of components!

Severe burns.

- ▶ Let any components to be serviced or inspected cool off.



WARNING

Emergency devices not operational!

Death, severe bodily injuries, property damage.

- ▶ Check emergency devices for accessibility and operational readiness.
- ▶ Open or remove anti-theft device.



WARNING

Operating fluids not suitable for ambient temperature!

Death, severe bodily injuries, property damage.

- ▶ Adjust the operating fluids in time to the ambient temperatures.

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 reserve



Note

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

- ▶ Refuel in time.

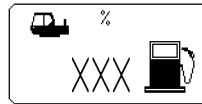


Fig.127362: Fuel reserve

The tank content is shown on the LICCON monitor in the form of a numerical display in percent [%].

- ▶ Check the fuel reserve.

1.3 Filling the fuel tank

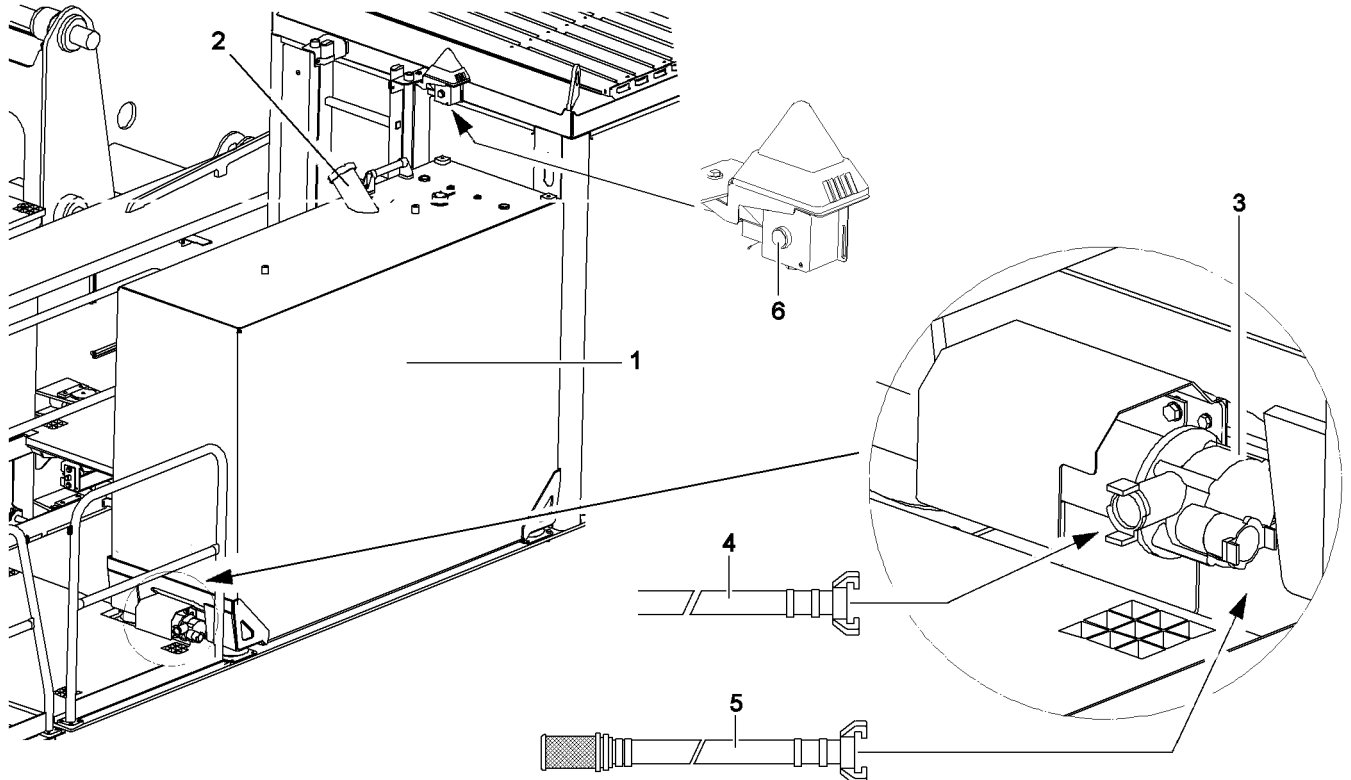


Fig.157613: Filling the fuel tank

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

- ▶ Connect the tank hose 4 and tank hose 5 to the tank pump 3.
- ▶ Insert the tank hose 4 into the filler neck 2.
- ▶ Guide the tank hose 5 to the tanker.
- ▶ Actuate the tank pump 3: Press the button 6.
- ▶ Check the tank contents on the LICCON monitor.

1.4 Checking the urea reserve



Note

- ▶ Valid only for engines that are equipped with an exhaust aftertreatment with SCR system.

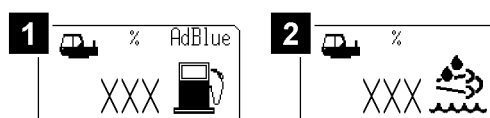


Fig.156303: Urea reserve

The urea reserve is shown on the LICCON monitor in the form of a numerical display in percent [%]. Either the illustration 1 or illustration 2 icon appears.

- ▶ Check the urea reserve.

1.5 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 until it overflows on the filler neck.

- ▶ Check the coolant level.

1.6 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 lights - are checked 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!

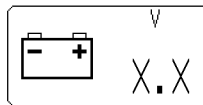


Fig.127364: Battery voltage

The battery voltage is shown on the LICCON monitor in the form of a numerical display [V].

- ▶ Check the battery voltage.

1.7 Checking the central lubrication system

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

- ▶ Check the grease container.

1.8 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 jib boom, such as pins, spring retainers or ice.
- ▶ Check if the safety equipment is functional.
- ▶ Check if the crane is standing on level, load bearing ground.
- ▶ 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 Crane operator's cab work station

2.1 Crane driver's seat Version 1

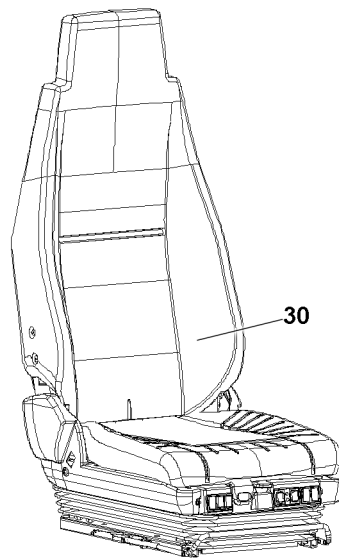


Fig.147578: Adjusting the crane driver's seat

The crane driver's seat **30** can be adjusted to suit any body size.



WARNING

Sudden backward movement of the crane driver's seat when the crane cab is tilted!
Danger of crushing.

- ▶ Adjust the seat position only when the crane cab is in the horizontal position.

2.1.1 Horizontal adjustment

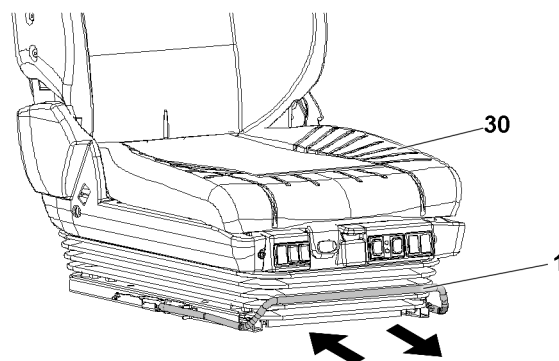


Fig.147579: Adjusting the crane driver's seat horizontally

- ▶ Pull the lever **1** up.
- ▶ Push the crane driver's seat **30** forward / backward.
- ▶ Engage the lever **1**.

Result:

- The crane driver's seat **30** is horizontally adjusted.

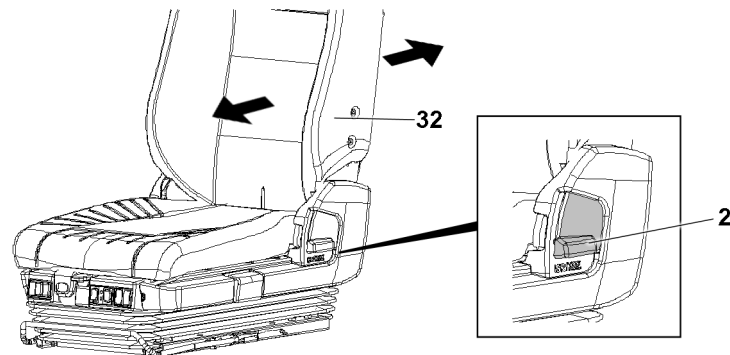
2.1.2 Backrest adjustment

Fig.147580: Adjusting the backrest

- ▶ Pull the lever **2** up completely.
- ▶ Bring the backrest **32** into the desired position using body weight.
- ▶ Engage the lever **2**.

Result:

- The desired backrest position is adjusted.

2.1.3 Integrated pneumatic system (IPS)

The „Integrated pneumatic system“ (IPS) makes it possible to optimally adapt the backrest contour to the body.

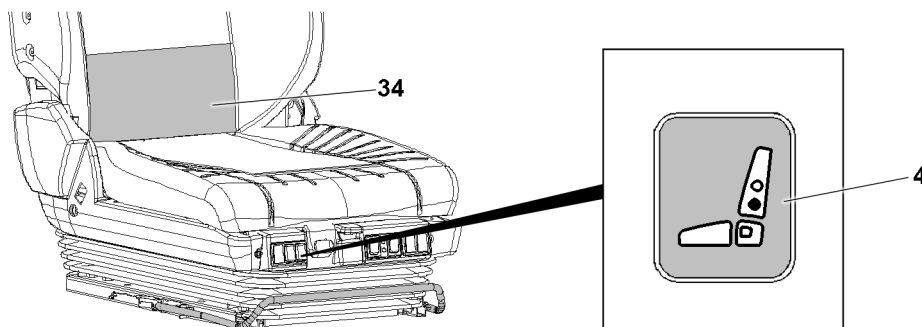
„Lower“ lumbar area support

Fig.147581: Lower lumbar area support

- ▶ Press the button **4**.

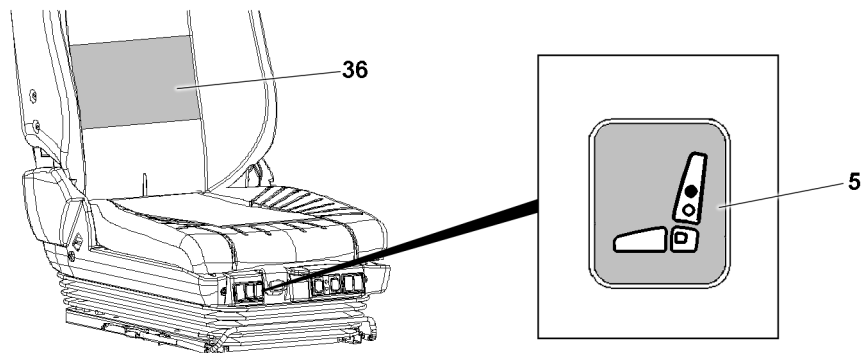
Result:

- The air chamber **34** for the „lower lumbar area support“ is inflated.

- ▶ Press the button **4**.

Result:

- The air chamber **34** for the „lower lumbar area support“ is deflated.

„Upper“ lumbar area support*Fig.147582: Upper lumbar area support*

- ▶ Press the button **5** forward.

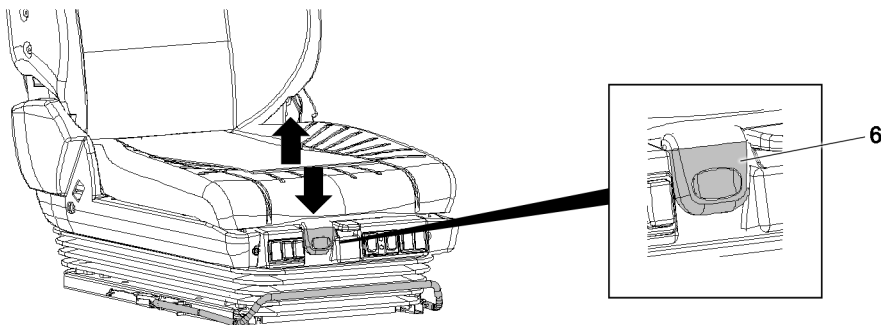
Result:

- The air chamber **36** for the „upper lumbar area support“ is inflated.

- ▶ Press the button **5** backward.

Result:

- The air chamber **36** for the „upper lumbar area support“ is deflated.

2.1.4 Incline adjustment*Fig.147583: Incline adjustment*

- ▶ Pull the lever **6** up.
- ▶ Adjust the seat incline by inflating or releasing the front of the seat cushion.
- ▶ Engage the lever **6**.

Result:

- The incline adjustment has been set.

2.1.5 Seat cushion adjustment

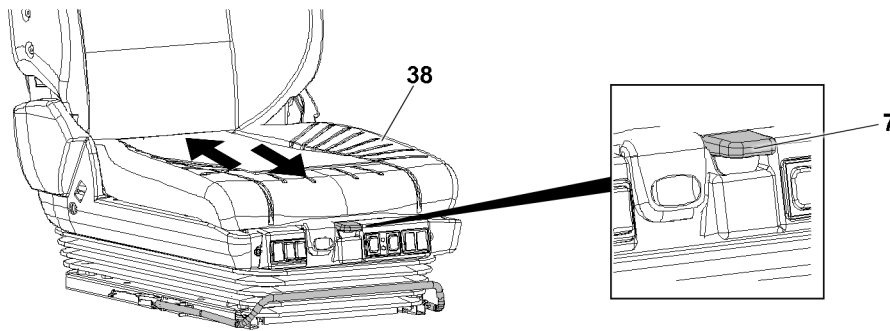


Fig.147584: Adjusting the seat cushion

- ▶ Pull the lever 7 up.
- ▶ Push the seat cushion 38 forward / backward.
- ▶ Engage the lever 7.

Result:

- The seat cushion 38 is adjusted.

2.1.6 Height adjustment

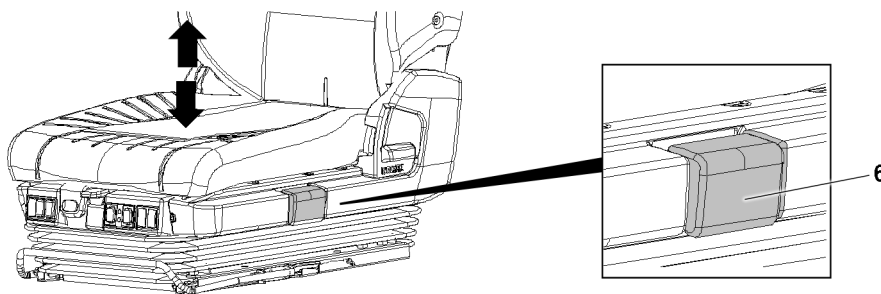


Fig.147585: Adjusting the seat height

NOTICE

Crane driver's seat adjusted too low!

No seat suspension is available.

- ▶ Before starting to work: Adjust the crane driver's seat so that there is headroom and the pedals can be pressed down fully.

-
- ▶ Adjust the seat height: Pull or press the handle 6.
 - ▶ Release the handle 6.

Result:

- The desired seat height is adjusted.

2.1.7 Heater / climate control

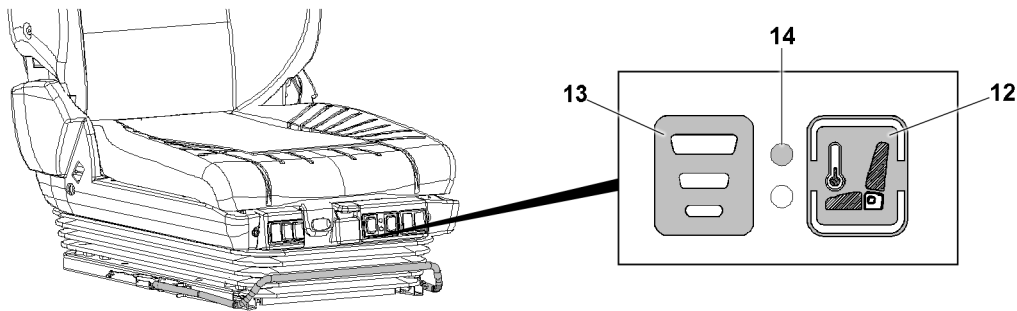


Fig.147586: Heater / climate control

NOTICE

Anomalous use of the heater / climate control!
Overheating, damage to the seat.

- ▶ Do **not** dry wet clothing.
- ▶ Do **not** place objects such as clothing, cushions, bags on the seat.
- ▶ Do **not** use seat covers on the seat.
- ▶ If the seat is not occupied, use of the heater / climate control is prohibited.



WARNING

Continuous operation of the climate control!
Undercooling.

- ▶ Avoid the continuous operation of the climate control.

Heater / climate control

The button **12** has three switch positions.

Switch position neutral (center position): No function, switch position „OFF“.

Switch position up: Heater turned on.

Switch position down: Fan on.

- ▶ Button **12** in the „OFF“ switch position.

Result:

- The heater / climate control is turned off.

- ▶ Push the button **12** upward.

Result:

- Heater turned on.

- ▶ Press the button **12** downward.

Result:

- Fan on.

Heater / fan stages

The button **13** has three switch stages. The switch levels can be selected from low to high.

- ▶ Select the switch level: Press the button **13**.

Result:

- The heater / fan stage is set.

Heater / climate control indicator light

If the red indicator light **14** blinks, a problem is displayed.

- ▶ The red indicator light **14** blinks: Switch the button **12** to the neutral switch position (center position).

Result:

- The heater / climate control is turned off.
- ▶ Remedy the problem.

2.1.8 Folding the console



Note

- ▶ Only for crane types with folding consoles.

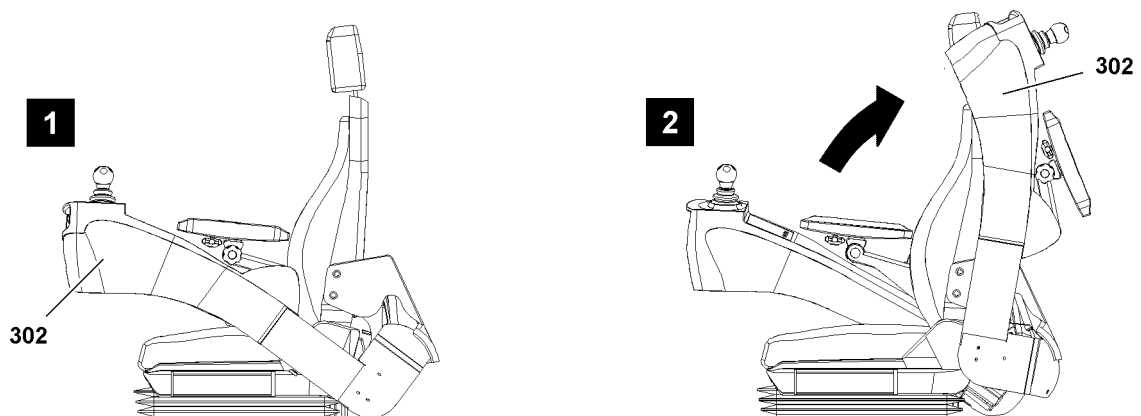


Fig.122071: Folding the console

The console **302** can be folded up or down.

- Operating position: The console **302** is folded down, illustration 1.
- Entry / exit position: The console **302** is folded up, illustration 2.



WARNING

Sudden folding down of the console!
Danger of crushing, property damage.

After entering and exiting:

- ▶ Fold down the console **302** each time after entering and exiting.
- ▶ Do not allow the console **302** to fall down.

Before entering and exiting:

- ▶ Fold the console **302** up.

2.1.9 Adjusting the consoles

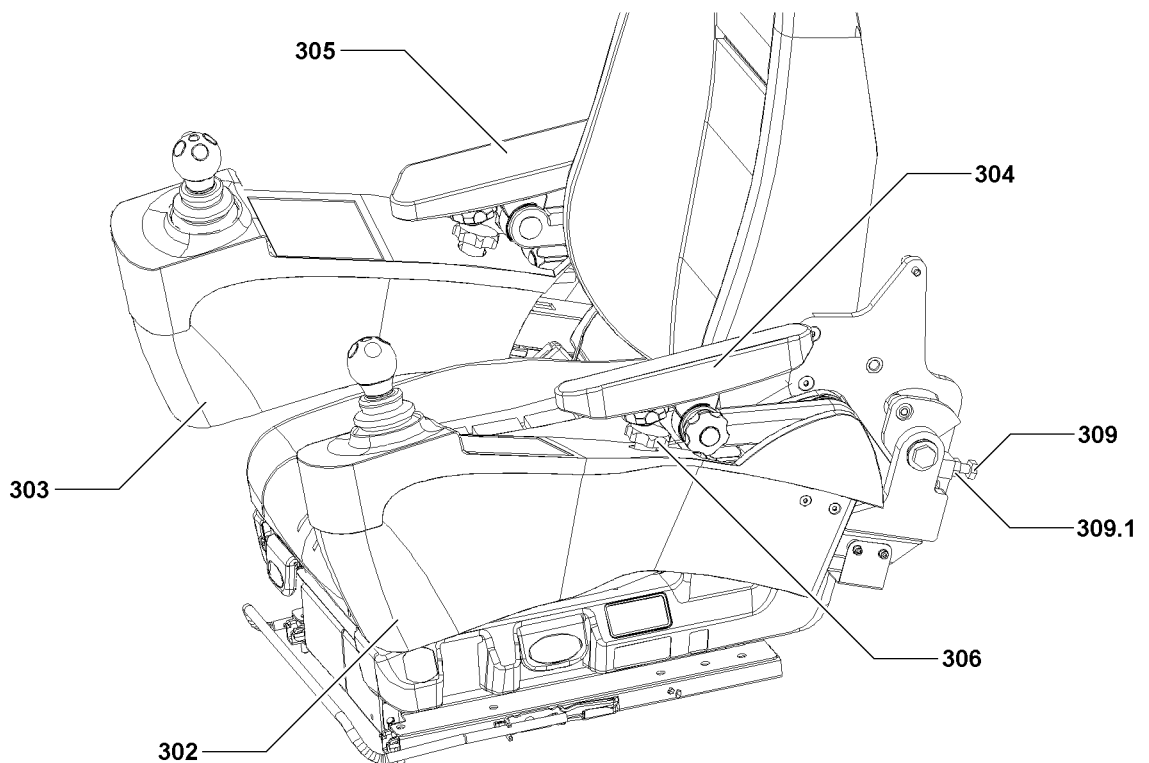


Fig.122072: Adjusting the consoles

The consoles can be adjusted individually to the respective body size of the crane driver.

The consoles can be adjusted to suit the crane driver as described for the left console **302**. The adjustment of the right console **303** functions the same way.

Adjusting the incline

- ▶ Bring the console **302** to the operating position.
- ▶ Release the nut **309.1**.
- ▶ Turn the stop screw **309** until the console **302** is set to the desired inclination.
- ▶ Secure the stop screw **309** with the nut **309.1**.

Result:

- The console inclination is adjusted.

Adjusting the console horizontally



Note

- ▶ The star handle screw **306** functionally a combination of a clamping screw and a detent pin.
- ▶ Fold the armrest **304** up.
- ▶ Turn the star handle screw **306** and unclamp the console **302**.
- ▶ Tighten the star handle screw **306**.

Result:

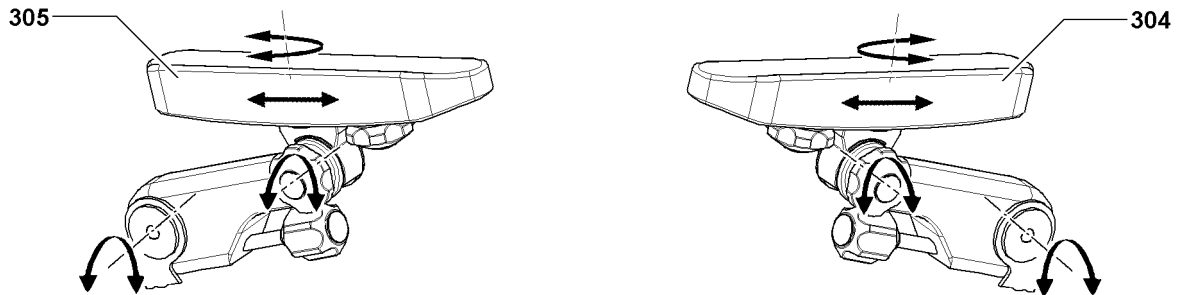
- The console **302** is unlocked.
- ▶ Adjust the console **302** by moving it horizontally.

When the console **302** is in the desired position:

- ▶ Release and engage the star handle screw **306**.
- ▶ Turn the star handle screw **306** and clamp the console.

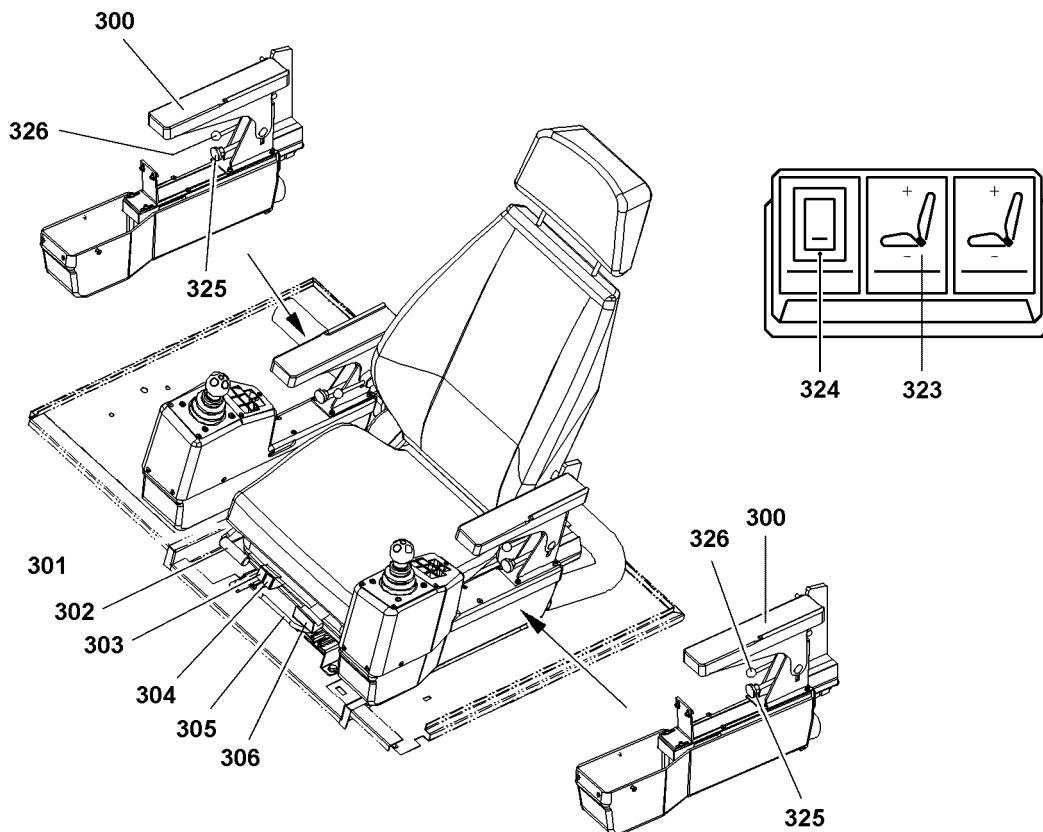
Result:

- The console **302** is horizontally adjusted.
- ▶ Fold the armrest **304** down.

2.1.10 Armrests*Fig.122073: Armrests*

By releasing the adjustment screws, the armrests can be adjusted individually. To operate the master switches comfortably, set the armrests to the size of the crane driver.

- ▶ Release the adjustment screws.
- ▶ Adjust the left armrest **304** and right armrest **305**.
- ▶ Close the adjustment screws.

2.2 Crane driver's seat Version 2*Fig.157606: Crane driver's seat Version 2*

**WARNING**

Sudden backward movement of the crane driver's seat when the crane cab is tilted!
Danger of crushing.

- ▶ Adjust the seat position only when the crane cab is in the horizontal position.

**WARNING**

Continuous operation of the cooling function*!
Continuous operation of the cooling function!* for the crane driver's seat can lead to body undercooling.

- ▶ Avoid the continuous operation of the cooling function.

NOTICE

Anomalous use of the heater / climate control!
Overheating, damage to the seat.

- ▶ Do **not** dry wet clothing.
- ▶ Do **not** place objects such as clothing, cushions, bags on the seat.
- ▶ Do **not** use seat covers on the seat.
- ▶ If the seat is not occupied, use of the heater / climate control is prohibited.

NOTICE

Crane driver's seat adjusted too low!
No seat suspension is available.

- ▶ Before starting to work: Adjust the crane driver's seat so that there is headroom and the pedals can be pressed down fully.

2.2.1 Adjusting the crane operator's seat

The crane operator's seat can be adjusted to suit different body sizes.

- ▶ Use the lever **302** to adjust the seat cushion incline.
- ▶ Use the lever **302** to adjust the seat height.
- ▶ Use the button **303** to adjust the pneumatic lumbar support in lower part of the backrest.
- ▶ Use the button **304** to adjust the pneumatic lumbar support in upper part of the backrest.
- ▶ Unlock the horizontal seat adjustment with the bracket **305**.
- ▶ Use the lever **306** to adjust the angle of the backrest.

2.2.2 Adjusting the arm rests

- ▶ Use the set screw **325** to set the inclination of the armrests **300**.
- ▶ Use the lever **326** to set the height of the armrests **300**.

2.2.3 Turning the seat heater* on

- ▶ Actuate the switch **324**.

Result:

- The seat is heated.

2.2.4 Adjusting the backrest suspension*

- ▶ Press the button **323**.

Result:

- The suspension of the backrest is adjusted.

2.3 Turning on the heater and climate control system

The crane operator's cab can be heated or ventilated, depending on the desired temperature. For a detailed description, see the Crane operating instructions, chapter 6.01 / 6.02.

2.4 Tilting the crane cab

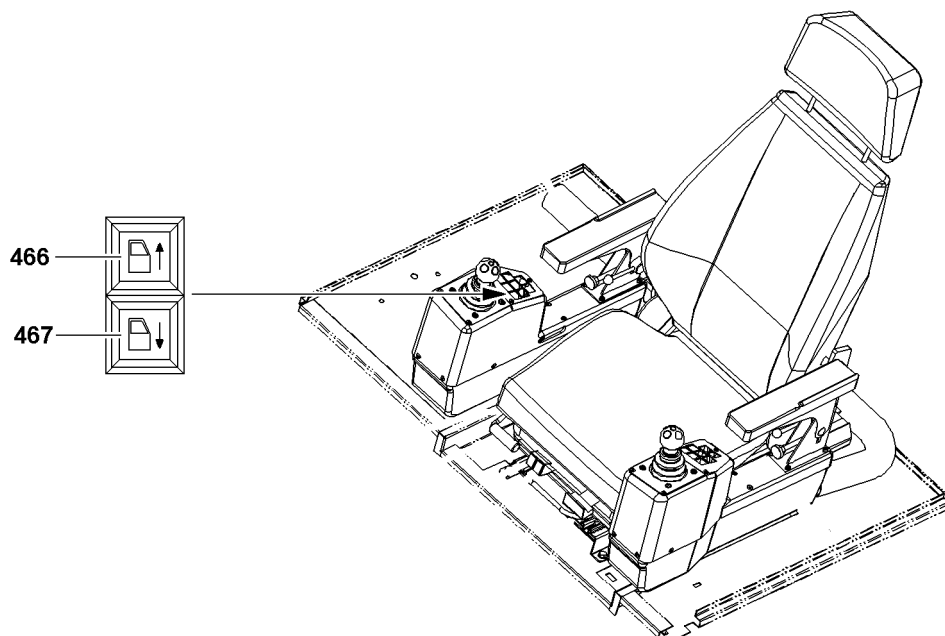


Fig.157607: Tilting the crane cab

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 the cab horizontally.

2.4.1 Tilting the cab upward

- ▶ Press the button **466**.

Result:

- The cab swings upward.

2.4.2 Moving the cab to the horizontal position

- ▶ Press the button **467**.

Result:

- The cab swings downward.

2.5 Operating the window wiper / window washer system

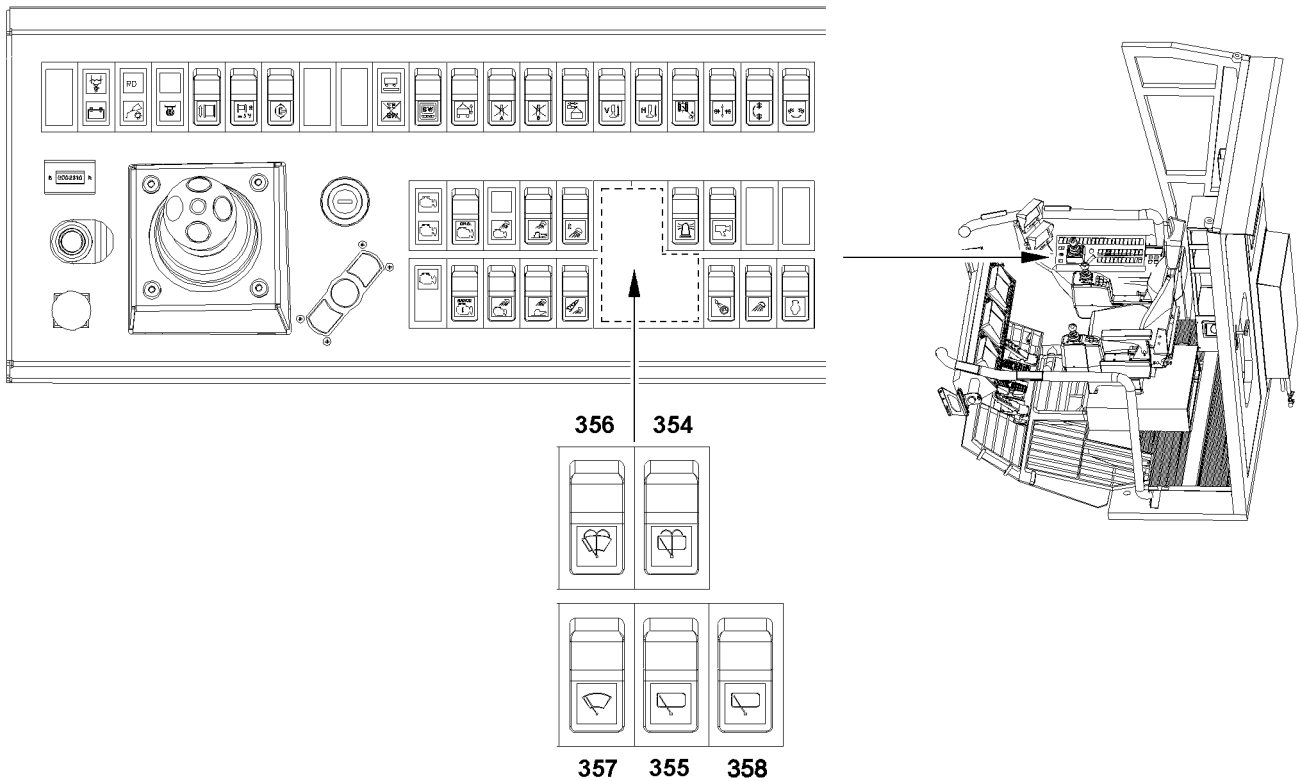


Fig.157612: Operating the window wiper / window washer system

2.5.1 Operating the window wipers

The window wipers are operated with a 2-stage switch (first stage - intermittent, second stage - continuous wipe).

To activate the window wiper on the front window:

- ▶ Actuate the switch **357**.

To activate the window wiper on the roof window:

- ▶ Actuate the switch **355**.

To activate the window wiper on the skylight*:

- ▶ Actuate the switch **358**.

2.5.2 Operating the window washer system

The window wipers on the front and roof windows can be assisted by a window washer system.

Before the start of the cold season, fill the container for the window washer fluid with standard anti-freeze mix.

To activate the window washer system for the front window:

- ▶ Press the button **356**.

To activate the window washer system for the roof window:

- ▶ Press the button **354**.

2.6 Opening the roof window



WARNING

Danger of hand injury due to trapping!

- ▶ 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 strap to set the desired opening angle.

2.7 Checking the horn

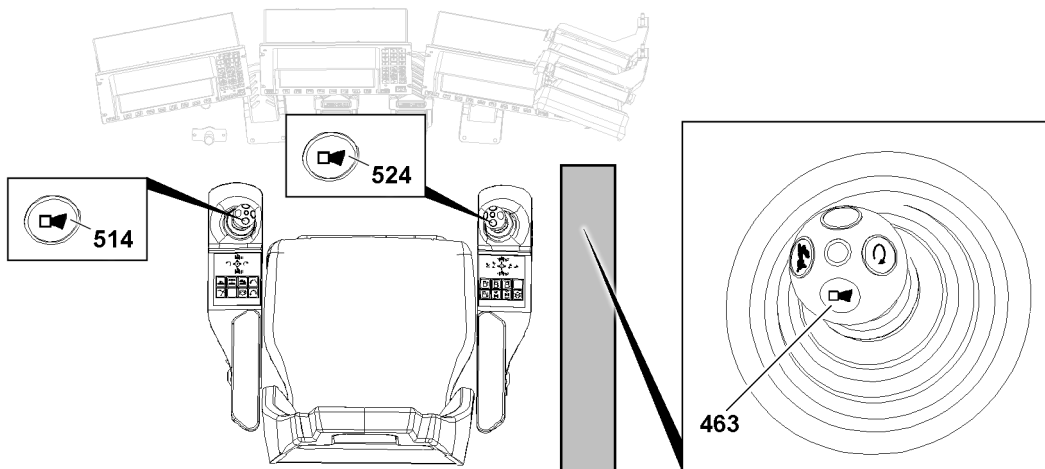


Fig.127371: Checking the horn



WARNING

Improper use of horn! Loss of signal effect!

When the horn is checked:

- ▶ Announce it to all persons who are present.

When the horn test is completed:

- ▶ Announce it to all persons who are present.
- ▶ Only use the horn in dangerous situations to maintain its warning effect.

- ▶ Before starting to work, check that the horn is functioning: Press the button **463**.
or
Press the button **514**.
or
Press the button **524**.

3 Starting and turning off 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 at idling speed!
- ▶ The idling 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, 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

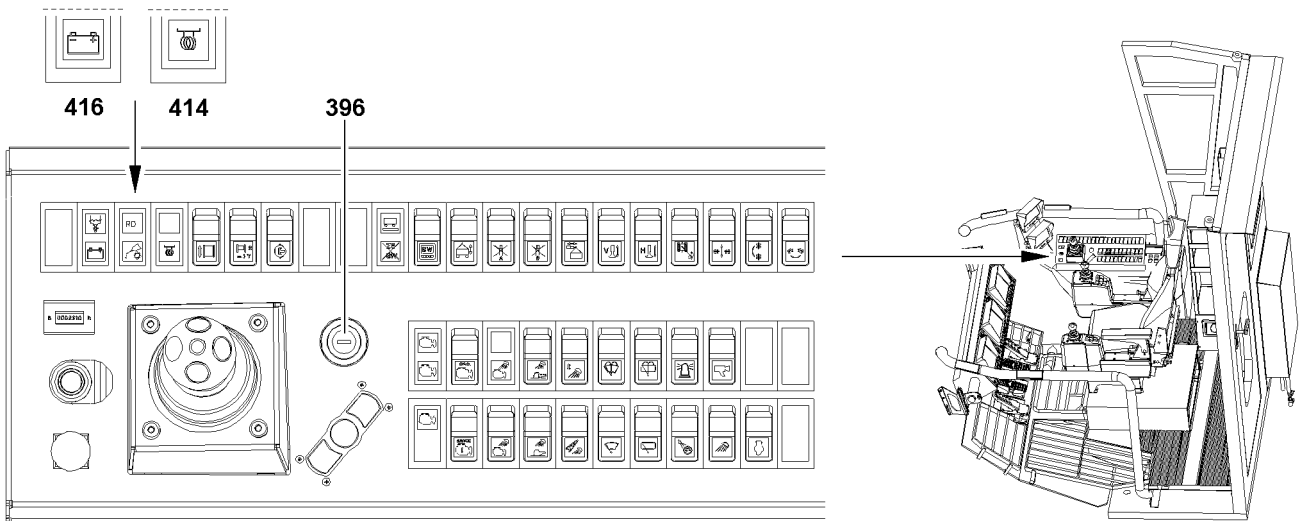


Fig.157611: Starting the engine

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

Result:

- The indicator 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 the engine!

- ▶ Do not press down on the gas pedal when starting.
- ▶ Do not actuate the starter motor for longer than 30 seconds.
- ▶ Always wait for 2 minutes between starting attempts.
- ▶ Let the engine run for 3-5 minutes at idle before the engine is at full capacity.

- ▶ Check the instruments after starting.

3.2 Checking the instruments after starting

As soon as a stable voltage is present with the engine running, the electric crane control and the LICCON computer system are automatically turned on. A self-test of the microprocessor system follows and after a few seconds the set up configuration screen appears on the monitor. Confirming the set up configuration switches to the crane operating screen.

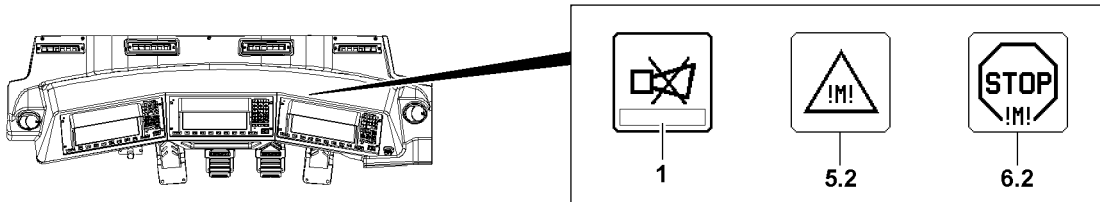


Fig.156310: Observing the indicator lights and error messages

If the engine monitoring advance warning **5.2** icon appears, a warning event occurred during engine monitoring.

If the engine monitoring STOP **6.2** icon appears, a warning event occurred during engine monitoring.

Pay attention to error messages **1**.

NOTICE

Danger of severe crane engine damage!

If the engine monitoring reports a problem and / or warning event, then you must react immediately and remedy the problem.

- ▶ React to problems, illuminated indicator lights and / or warning events immediately and remedy the problem.
 - ▶ If necessary, stop crane operation and turn the crane engine off.
-

NOTICE

Shut off engine monitoring!

Outside of the crane operation program, engine monitoring is limited.

When engine monitoring is limited, problems and warning events are not recognized.

This could result in crane failure.

- ▶ If work is not carried out in the crane operation program, then turn the crane engine off and operate the LICCON computer system in stand-by mode, see chapter 4.02.
 - ▶ If work has to be carried out for a longer period outside of the crane operation program, with the crane engine running, then switch continuously to the engine monitoring program and check the display values.
 - ▶ Record changes in the display values mindfully and proceed anticipatorily, for example, refuel in time.
-

3.3 Checking the displays on the LICCON monitor

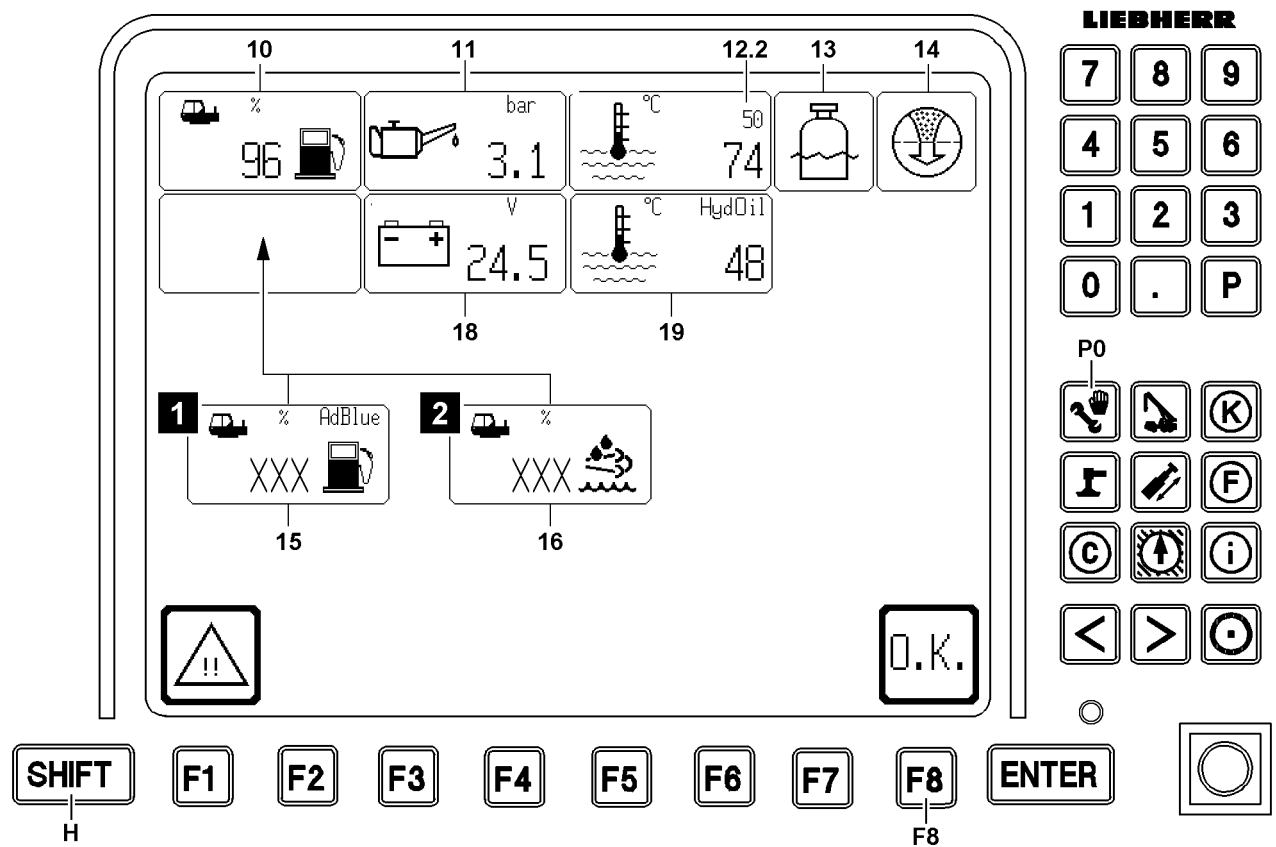


Fig.157608: Checking the displays on the LICCON monitor



Note

Not all icons appear for some crane types.

- ▶ Check all displayed icons.
- ▶ For a detailed description of the engine monitoring program, see Chapter 4.02.

Call up the engine monitoring program:

- ▶ Press the key combination SHIFT H + program key P0.
- ▶ Check the „fuel content“ icon 10.
- ▶ Check the „Engine oil pressure“ icon 11 on the LICCON monitor.

Problem remedy

Does the numerical display for the engine oil pressure in the icon 11 blink after approximately 10 seconds or does it start to blink during crane operation?

The engine oil pressure is too low. The engine can be damaged as a result of insufficient oil pressure.

- ▶ Turn the engine off immediately and determine the cause.
- ▶ Check the numerical display for the coolant temperature in the icon 12.1.

Problem remedy

Does the numerical display for the „coolant temperature“ in the icon 12.1 blink during operation?

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

- ▶ Turn the engine off immediately.
- ▶ Check the „charge air temperature“ icon 12.2.
- ▶ Check the „coolant level“ icon 13.

- ▶ Check the icon **14** for „air filter“.
- ▶ Check the icon **18** for „battery voltage“.
- ▶ Check the „hydraulic oil temperature“ icon **19**.

Valid only for engines that have an installed exhaust aftertreatment with SCR system:

- ▶ Check the **15** „urea reserve“ icon or the **16** „urea reserve.“ icon.

If all display values are OK:

- ▶ Press the function key **F8**.

Result:

- The engine monitoring program is hidden.

3.4 Checking the instrument panel

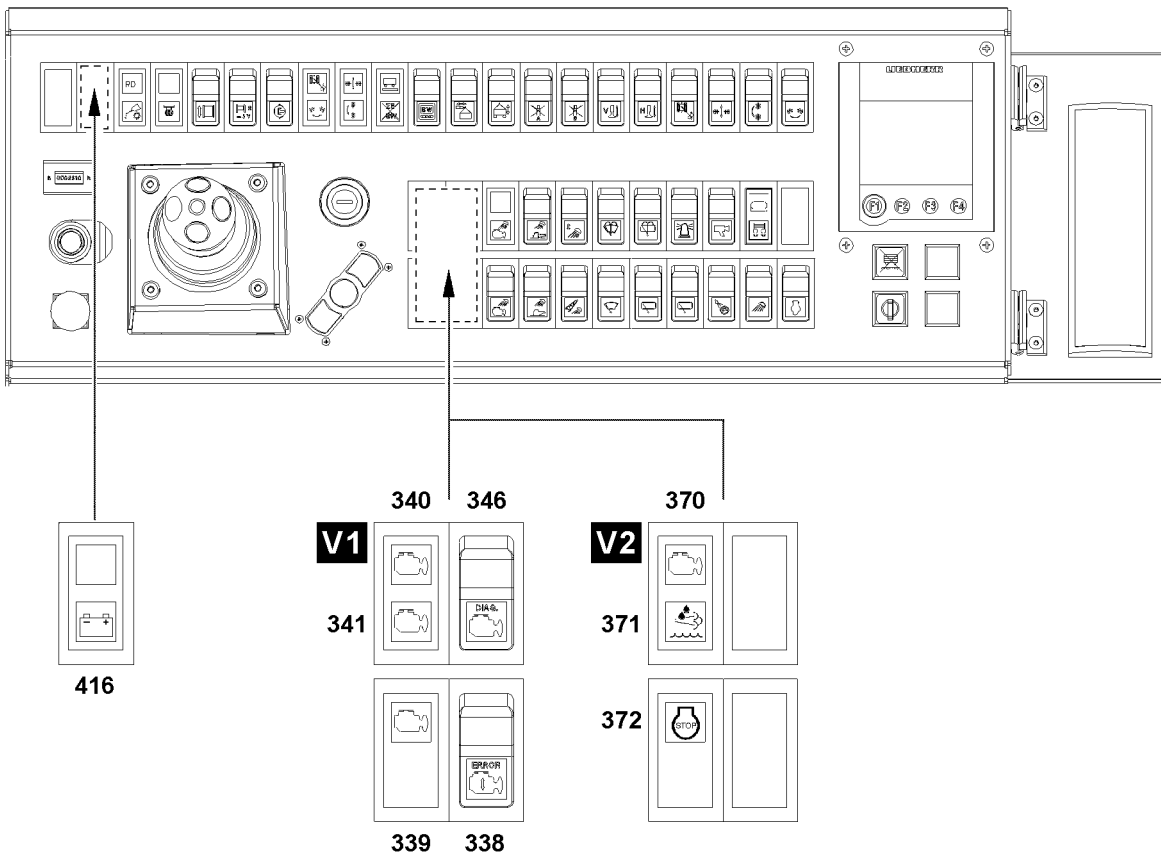


Fig.157609: Checking the instrument panel



Note

Not all warning lights appear for some crane types. Button, error code light switch and indicator lights.

- ▶ All present warning lights. Check the button, error code light switch and indicator lights.
- ▶ For a detailed description see Chapter 4.01.

- ▶ Check the „charge indicator“ warning light **416**.
- ▶ Check the „engine ERROR“ button **338**.
- ▶ Check the error code light **339**.
- ▶ Check the error code light **340**.
- ▶ Check the error code light **341**.
- ▶ Check the „engine DIAGNOSTICS“ switch **346**.
- ▶ Check the „exhaust aftertreatment / SCR“ indicator light **370**.
- ▶ Check the „urea / DEF“ indicator light **371**.
- ▶ Check the „engine stop request“ indicator light **372**.

3.5 Turning the engine off

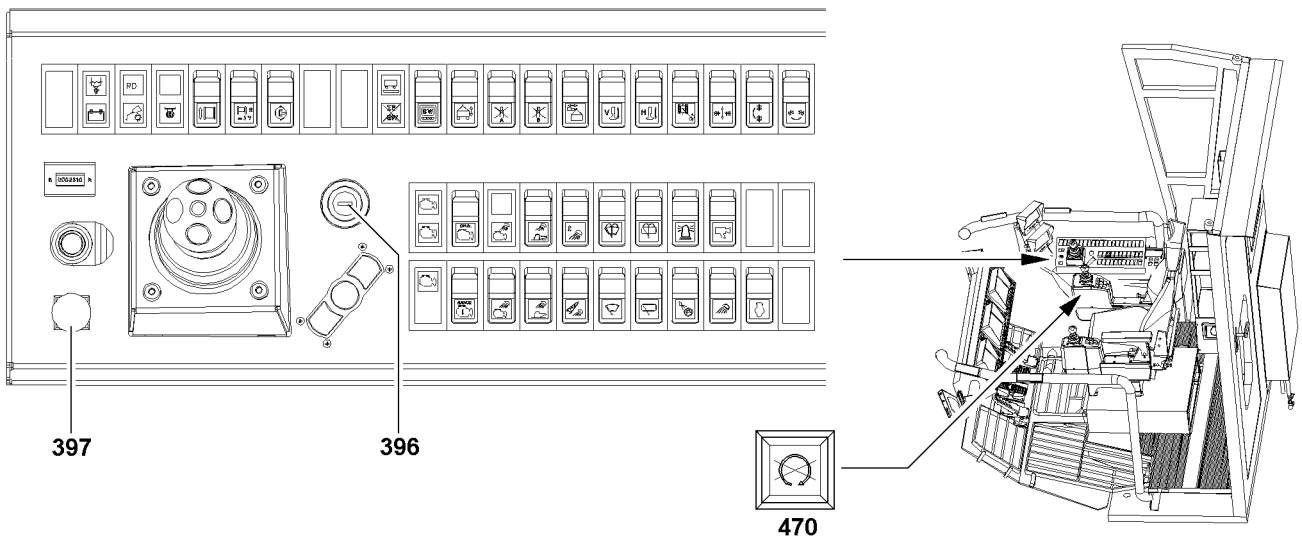


Fig.157610: Turning the engine off

3.5.1 Turning the engine off after operation

After operation with full engine capacity, let the engine run without a load for 3-5 minutes at idling speed.

- ▶ Turn the ignition switch **396** back to the stop.
- ▶ Pull the ignition switch **396** out and store it.



Note

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

3.5.2 Turning the engine off in the event of danger



CAUTION

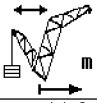
Operate the emergency off switch

- ▶ 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 prohibited!


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

Result:


- The crane will be turned off immediately.





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|-------|-----------------|-----------------|----------------------------|-----------------|-----------------|-----------------|-----------------|
| | 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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


Fig.199902

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 set up configuration and reeving number will be displayed.

If a master switch is moved away from the zero position during the boot up phase, then the function circuit of the electrical safety chain is interrupted.

In this case:

- ▶ Turn the engine and ignition off and then start again.

Problem remedy

Does an error message appear on the LICCON monitor?

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

Problem remedy

The LICCON monitor does not show the most recently entered 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

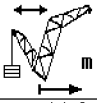
Check on the operating screen if the correct short code and the correct reeving number have been set, see the Crane operating instructions, chapter 4.02.

If the settings on the operating screen are correct:

- ▶ Press the function key **F8**.

Result:

- The „Set up“ program is ended and the adjusted parameters are accepted for the newly started „Operation“ program.



CODE >XXXX< UXXX YYZZ .1(2)

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| | 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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Fig.199902

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 the 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 ended and the adjusted parameters are accepted for the newly started „Operation“ program.
- ▶ Check on the operating screen if the correct short code and the correct reeving number have been set, see the Crane operating instructions, chapter 4.02.

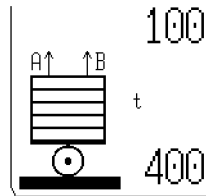
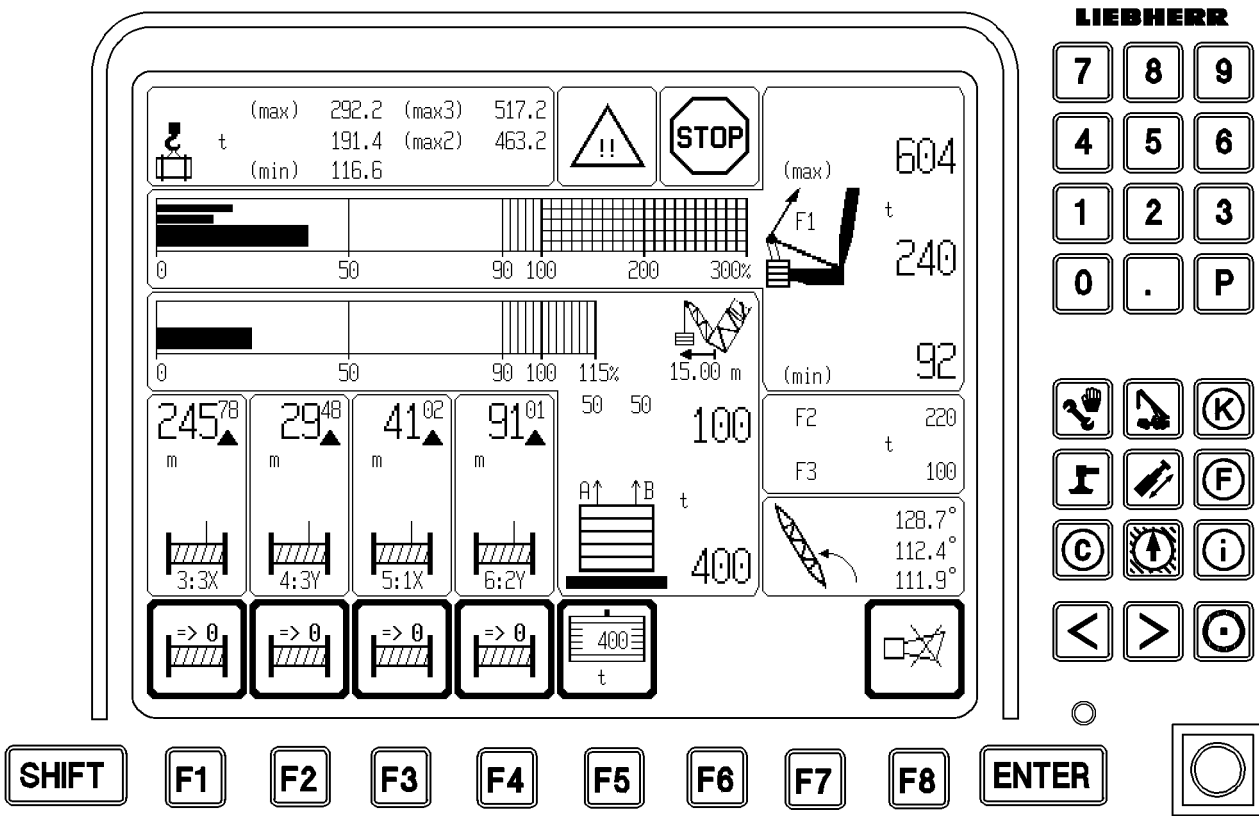


Fig.104480

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 LICCON monitor 1 with key **F5**, see the 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

Danger of accident!

- ▶ The set derrick ballast value must match the actually installed derrick ballast weight. If a derrick ballast value is set that is too low, then the derrick ballast utilization display is too large. If a derrick ballast value is set that is too high, 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

- ▶ When editing the ballast, the remaining monitor displays cannot be actualized. The operating screen 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.

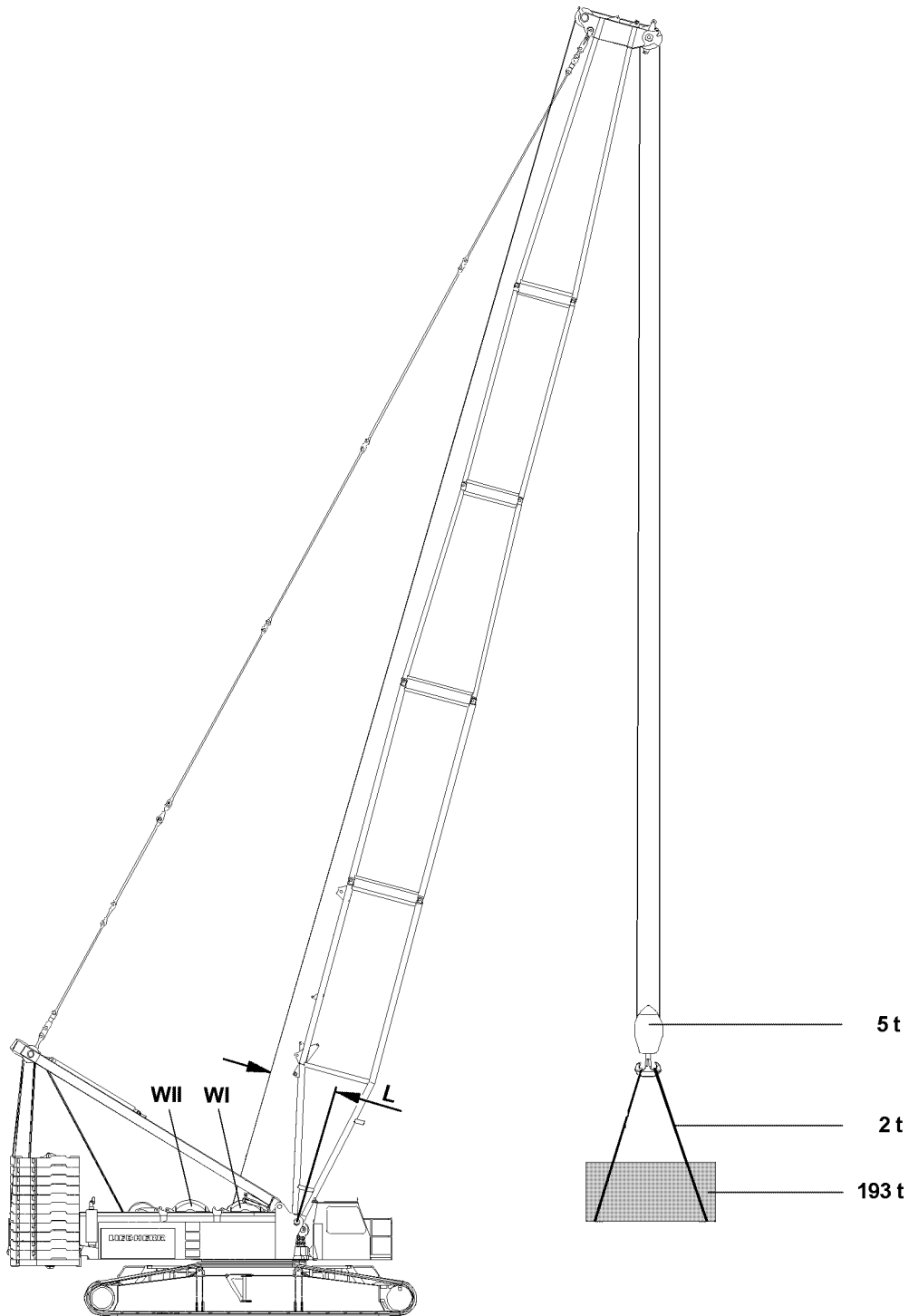


Fig.103667

LWE/LR 11350-007/19005-01-02/en

5 Load weighing and load display

The loads indicated in the load charts include the weights of the load carrier, load handling 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 the lever arm **L** to the winch **1** is always used.
- ▶ For that reason, to ensure an exact load weighing to lift the load on the main boom and on the fixed accessories (for example the fixed jib), winch 1 must be used.



DANGER

Danger of accident due to overload!

In case of inaccurate load weighing or load display, a danger exists due to 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 driver must check, before lifting the load, if he may even lift the load according to the data in the load chart.

Fig.195219

LWE/LR 11350-007/19005-01-02/en

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 precisely 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 accident 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.

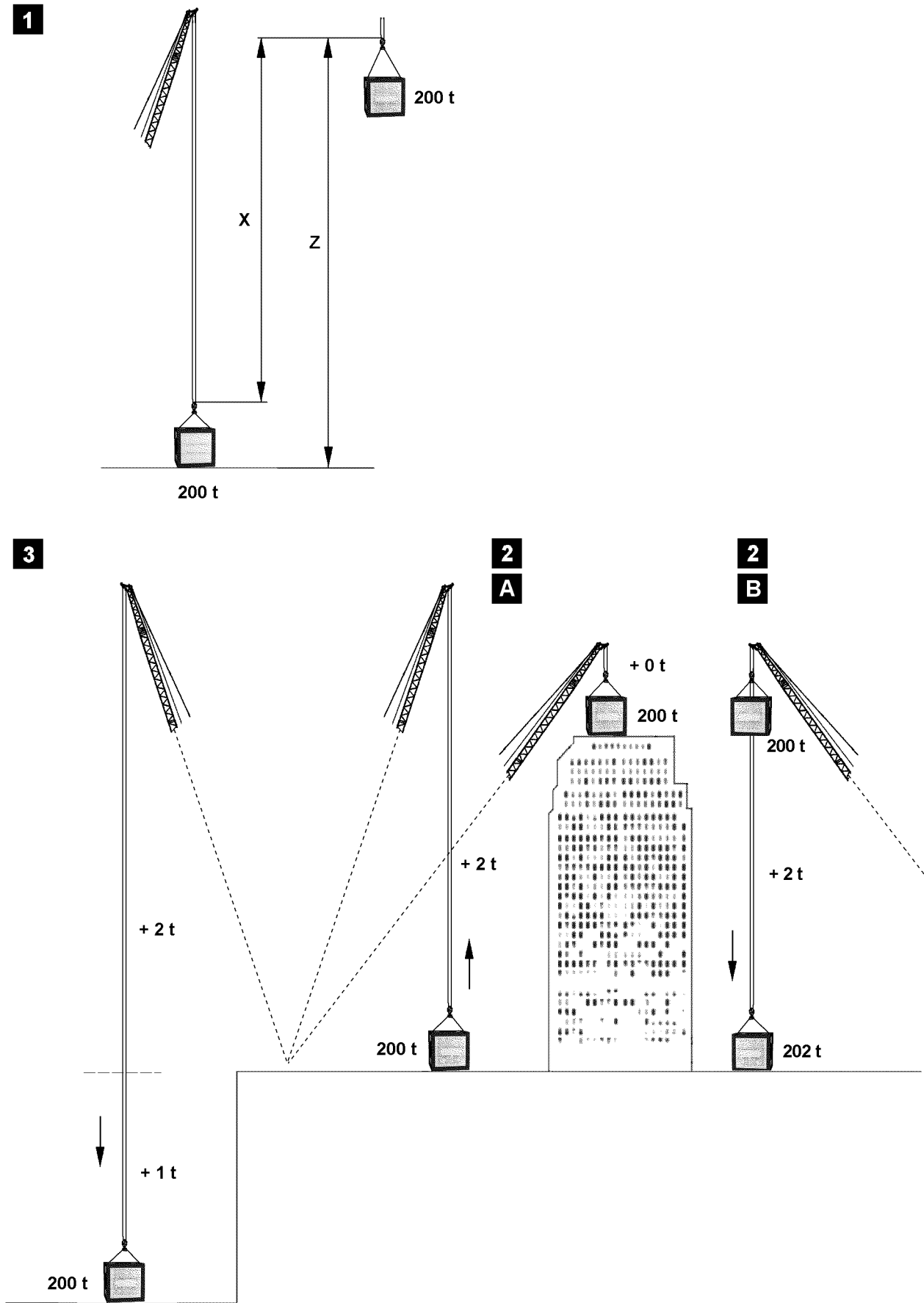


Fig.103643

LWE/LR 11350-007/19005-01-02/en

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 lifted above the crane level (high rise), then the hoist rope to the ground is always deducted anyway for the display, therefore the load seems increasing lighter when lifting than it did on the ground.

Therefore a somewhat larger load can be lifted in large heights than on the ground, without triggering the LMB overload shut off at 100 %.

This poses no danger because the load stress for the crane is the same if, for example 200 t if load on the bottom and 2 t rope or 202 t load on top and 0 t rope hang on the pulley head.

5.2.3 Taking on a load on the 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 accident 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.

- ▶ In the case of an 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 a large hoist rope weight on the pulley head. The crane driver must know this, so that he can relieve the crane by careful lifting again in this special case, even though the lifting and not the lowering of the load is automatically shut off.

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4.04 Safety equipment

| | | |
|---|--------------------------------|---|
| 1 | General | 3 |
| 2 | Quick test Crane geometry | 3 |
| 3 | Quick test Overload protection | 3 |
| 4 | LICCON computer system | 3 |
| 5 | Safety devices on the crane | 9 |

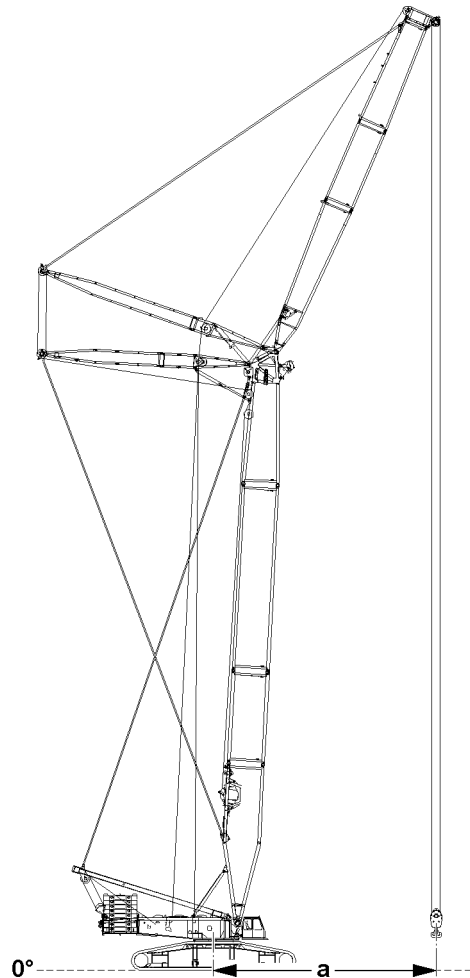
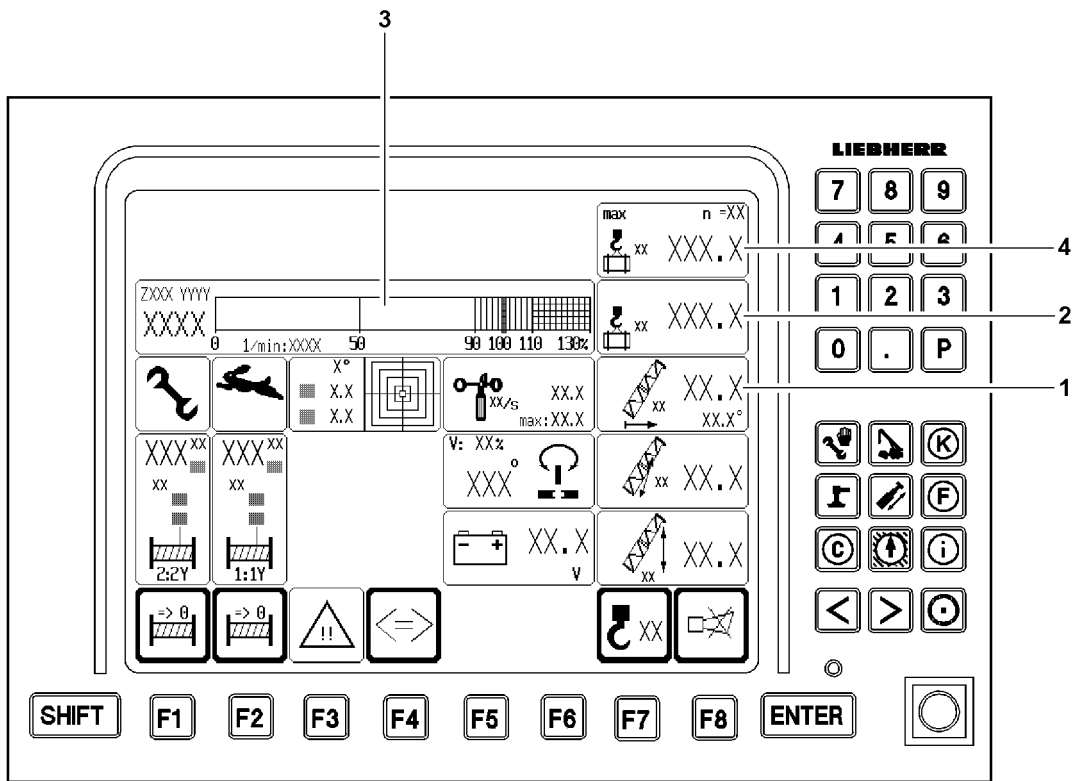


Fig.112968

LWE/LR 11350-007/19005-01-02/en

1 General

The crane operator is obligated before every crane operation to ensure that the warning and safety devices are functioning.



WARNING

Danger of accident due to defective warning and safety systems!

If the crane is operated with defective warning and safety devices, then there is a danger of accidents! Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Make sure that all warning and safety devices are functioning.
- ▶ Make sure that the overload protection is functioning.

2 Quick test Crane geometry

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The set up status has been entered correctly into the LICCON computer system.
- There is no load on the hook.

Measure the horizontal distance of the load hook from the center of rotation of the crane superstructure on the ground:

- The value display radius **1** must match the measured value **a**.

3 Quick test Overload protection

Lift a known weight completely, such as the hook block or a counterweight plate and then set it down.

Make sure that the following prerequisite is met:

- The crane is aligned in horizontal direction.

The respective displayed values must be plausible:

- **2** Actual load display
- Utilization bar **3**: Ratio of value of Actual load display **2** to maximum load value **4**
- Example:
Value Actual load display **2** is 40 t.
Maximum load value **4** is 80 t.
Utilization bar **3** shows 50 %.

4 LICCON computer system

The LICCON computer system is a system for controlling and monitoring mobile cranes. In addition to the LICCON overload protection (Load torque limiter = LMB), there are a number of application programs that can be used for controlling and monitoring the crane movements. For a detailed description see Crane operating instructions, chapter 4.02 and chapter 4.20.

4.1 LICCON overload protection

The LICCON overload protection is programmed to **shut off** the crane movements if the permissible load moment is exceeded (LMB-STOP).

The LICCON overload protection may not be used as an operational shut off device for crane movements of any kind.

An overload protection cannot detect all occurring conditions by itself. Careful and diligent crane operation by the crane operator is important.

The basis for the calculation of the utilization of the crane are:

- The currently data and values recorded by the crane control.
- The set up configuration entered by the crane operator.

Direct influence has, for example:

- Failure of a test device (for example: Pull test brackets, angle sensor, pressure sensor).
- A set up configuration incorrectly entered by the crane operator.
- Environmental influences not considered (such as wind influence, ground with insufficient load bearing capability).
- Assembly and operating errors.



WARNING

Danger of accident due to assembly and operating errors!

Due to assembly and operating errors it is possible that the overload protection is not effective or shut off is delayed!

A set up configuration which deviates from the load chart cannot be detected by the overload protection!

Environmental influences which are not considered cannot be detected by the overload protection!

Dangerous situations and accidents can result!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Always assemble and operate the crane carefully!



WARNING

Operational utilization of the overload protection!

If the LICCON overload protection is utilized as an operational shut off device for crane movements, then there is a danger of accidents!

For example, crane movements can be shut off abruptly or uncontrolled!

The behavior of load and crane cannot be foreseen in such a case!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Do not use the LICCON overload protection as an operational shut off device for crane movements!



WARNING

Lifting of unknown loads!

The presence of the overload protection does not relieve the crane operator of his obligation for care and attention!

The crane may not only be operated according to the displays of the LICCON overload protection!

Lifting of loads with unknown weight and unknown properties can lead to accidents!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Before lifting a load, its weight and properties must be known to the crane operator!
- ▶ The crane operator must check with the load chart if the crane is able to carry out the work safely!

The LICCON computer system detects various values, which result in optical and acoustical warnings if exceeded:

Within the crane operator's cab:

- Acoustic warning „Horn / short horn“ on the LICCON monitor
- Optical warning „blinking value / display“ on the LICCON monitor

Outside the crane operator's cab:

- Acoustic warning via the horn on the slewing platform
- Optical warning via the warning light on the slewing platform

All warnings, even those which do not lead to an immediate shut off must be noted by the crane operator and personnel within the danger zone.

The overload protection can **not** detect (examples of cases):

- The hooking of the load or the load suspension equipment.
- Excessive retarding forces.
- Loads falling onto the rope.
- Angular pulling.
- Driving the crane on ground with large slope.
- Collapsing ground.

4.1.1 Failure of the overload protection



WARNING

Crane operation without overload protection!

If the LICCON overload protection is no longer functioning properly because of one or more errors, then there is a danger of accidents if crane operation is continued!

Due to operation of the crane with failed LICCON overload protection, the crane can be overloaded and collapse!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Crane operation without overload protection is prohibited!
- ▶ Do not take up crane operation again until the overload protection is functioning again!

A failed overload protection:

- Must be repaired before the crane can be operated again.
- May only be bypasses in emergency cases or emergency situations.

4.2 Bypass of overload protection

The overload protection can be bypassed in case of:

- Failure of the overload protection.
- In an emergency situation (according to EN 13000:2010).

4.2.1 Bypass of overload protection: Failure of the overload protection



Note

- ▶ Does **not** apply for cranes with CE-mark and configuration according to EN 13000:2010!

To bring the crane into safe condition after failure of a component required for the overload protection, it can be necessary that the overload protection has to be bypassed.



WARNING

Bypassed overload protection!

If the overload protection is bypassed, crane movements are no longer monitored!

The crane can be overloaded and collapse!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Only carry out crane movements within the range of the load chart as well as the erection / take down charts!



Note

- ▶ For procedure in case of problems, see Crane operating instructions, chapter 7.15.
- ▶ For procedure of shut off of crane movement, see Crane operating instructions, chapter 4.20.

4.2.2 Bypass of overload protection: Failure of overload protection (according to EN 13000:2010)



Note

- ▶ Applies **only** apply for cranes configuration according to EN 13000:2010!

To bring the crane into safe condition after failure of a component required for the overload protection, it can be necessary that the overload protection has to be bypassed.

With the specification that:

- The bypass is automatically reset at engine stop.
- The bypass is automatically reset after no later than 30 minutes.
- The bypass of the overload protection limits the working speed to no more than maximum 15%.



WARNING

Bypassed overload protection!

If the overload protection is bypassed, crane movements are no longer monitored!

The crane can be overloaded and collapse!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Only carry out crane movements within the range of the load chart as well as the erection / take down charts!



Note

- ▶ For procedure in case of problems, see Crane operating instructions, chapter 7.15.
- ▶ For procedure of shut off of crane movement, see Crane operating instructions, chapter 4.20.

4.2.3 Bypass of overload protection: Emergency situation (according to EN 13000:2010)

In an emergency situation, a bypass of the overload protection may become necessary.

With the specification that:

- The bypass is automatically reset at engine stop.
- The bypass is automatically reset after no later than 30 minutes.
- The bypass of the overload protection limits the working speed to no more than maximum 15%.



DANGER

Overload of crane!

After a bypass of the overload protection, the crane movements are no longer shut off in case of a danger of overload of the crane!

A bypass of the crane can result in severe damage or collapse!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Do not subject the crane to such a load that it collapses!
- ▶ Clear and secure the danger zone of the crane!



Note

- ▶ Location of bypass device, see Crane operating instructions, chapter 4.01 and chapter 4.02.

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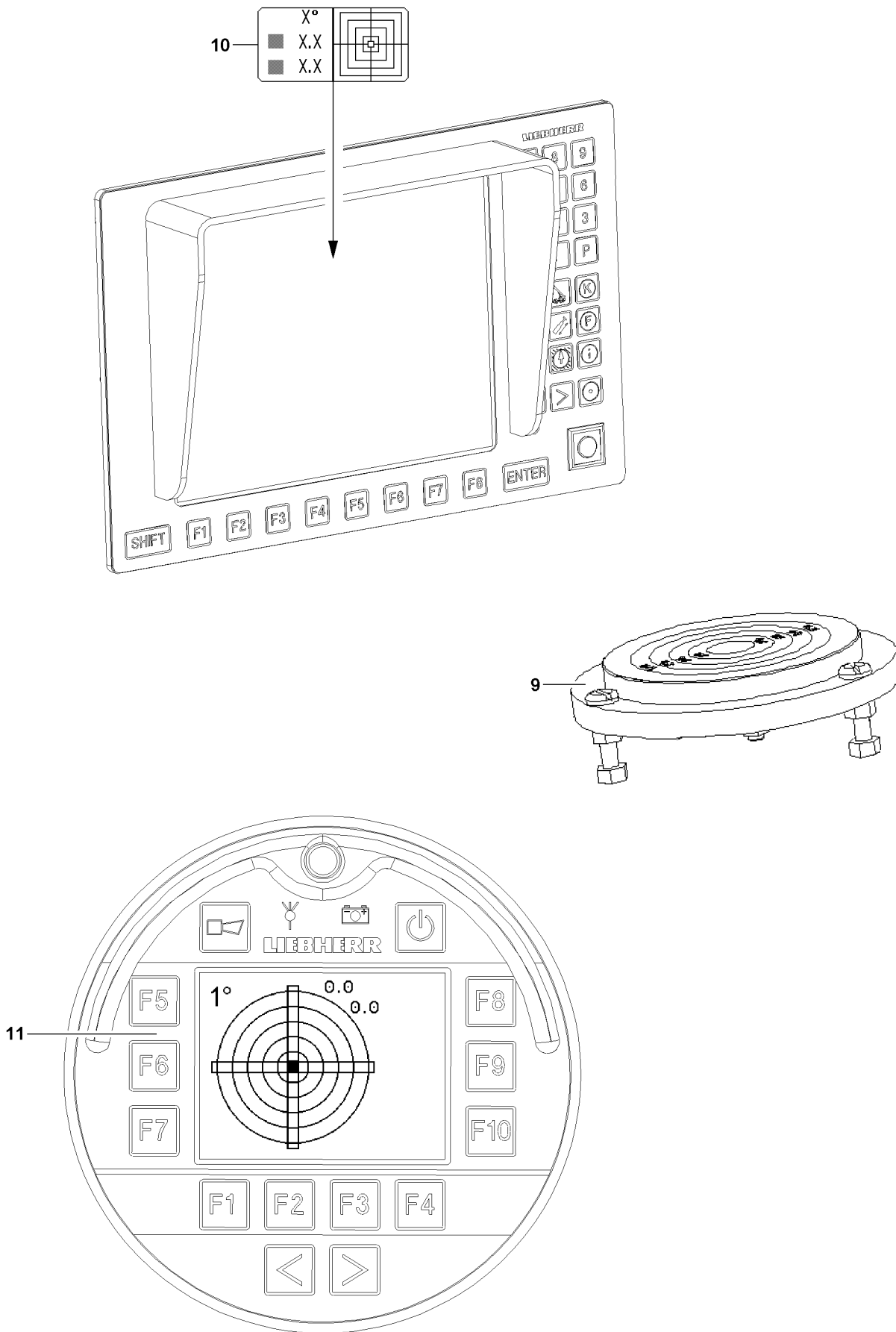


Fig.112969

LWE/LR 11350-007/19005-01-02/en

5 Safety devices on the crane

5.1 Leveling instruments

To ensure the working safety of the crane, the crane must be aligned on level ground with sufficient load bearing capacity according to the load chart.

The current values are continuously shown in the Incline icon **10**, see Crane operating instructions, chapter 4.02.

The incline is shown manually in the sight gauge **9** on the crawler travel gear.



WARNING

The crane can topple over!

If the leveling instruments are defective or incorrectly adjusted, there is a danger that the crane is not aligned according to the load chart!

A crane which is not aligned according to the load chart can topple over!

Personnel can be killed or seriously injured!

This could result in property damage!

► Make sure to align the crane according to the load chart!

5.1.1 Leveling instruments in the LICCON monitor

The incline of the crane is shown in the Incline icon **10** graphically as well as numerically, see Crane operating instructions, chapter 4.02.

5.1.2 Leveling instrument in the BTT

Only LR1600/2-W.

The incline of the crane is shown in the Incline display menu **11** graphically as well as numerically, see Crane operating instructions, chapter 3.10 and chapter 5.31.

5.1.3 Quick test Leveling instrument



Note

The horizontal alignment of the crane can be checked with a spirit level on the top of the slewing ring, for example.

► The alignment of the top of the slewing ring is the determining factor for the incline display.

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- There is no load on the hook.

For horizontally aligned crane:

- The sight gauge **9** on the crawler travel gear must show 0°.
- In the incline icon **10** 0° must be shown.

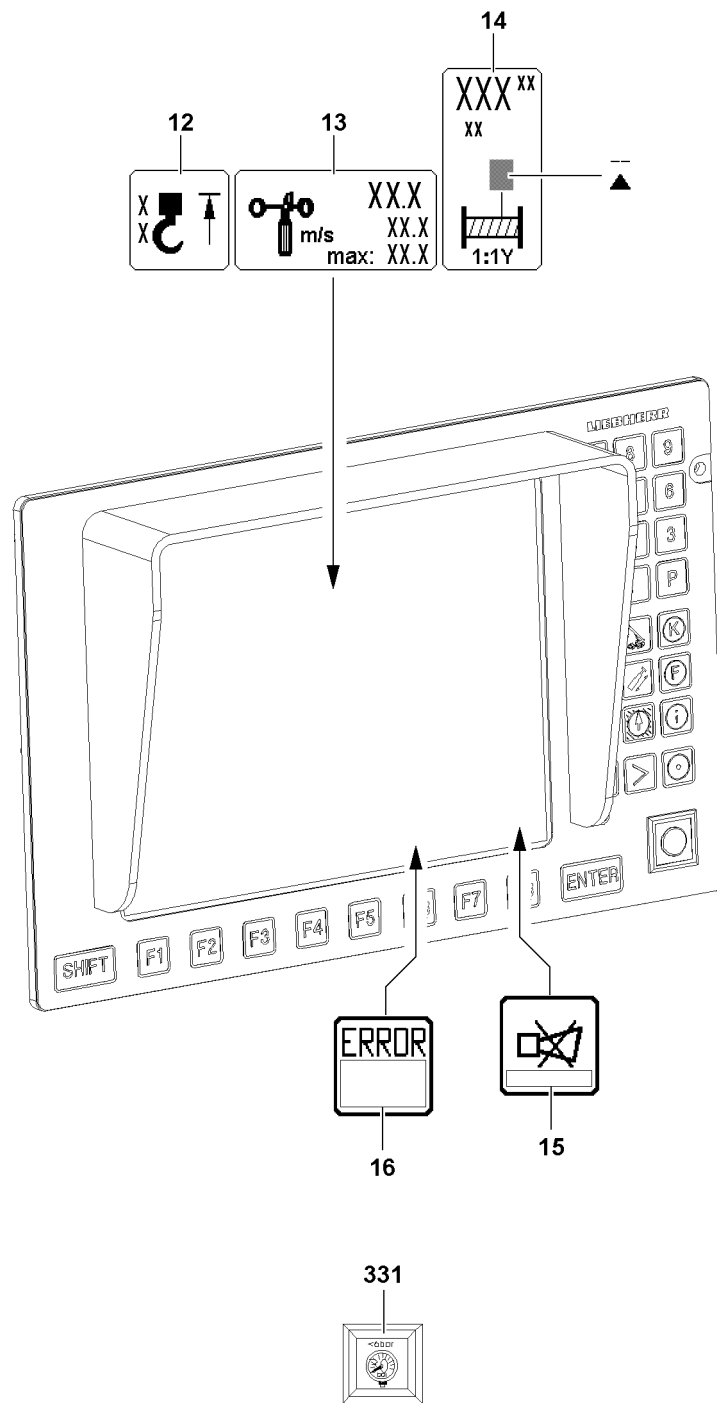


Fig.112972

5.2 Acoustic and optical warning devices



Note

► Overview of acoustic and optical warnings, see Crane operating instructions, chapter 4.20.

- The acoustic and optical warning devices must be functioning and operational.
- Take care of any possible detriments in function, such as snow on the warning lights.

5.3 Hoist limit switch „Hoist top“

The hoist limit switch is intended to prevent the hook block from running against the boom head.

Before every crane application, the function of the hoist limit switch must be checked by running against the switch weight with the hook block.

For installation purposes and in emergency cases, the hoist limit switch can be bypassed, see Crane operating instructions, chapter 4.20.



WARNING

Falling load and property damage!

If the hoist limit switch is defective, there is the danger that the hook block or the load hook is pulled against the pulley head!

Falling load and property damage can result!

Personnel can be severely injured or killed!

- Crane operation without or with defective hoist limit switch is prohibited!
- Repair or replace a defective hoist limit switch!

The hoist limit switch must actuate when the hoist limit switch weight is lifted by the load hook / hook block:

- When the hoist limit switch is actuated, the icon **12** „Hoist top“ appears in the operating screen. The crane movement „Spool winch up“ as well as other crane movements which have an influence on the hoist rope are shut off.

5.3.1 Quick test Hoist limit switch

When the hoist limit switch weight is lifted:

- The icon **12** „Hoist top“ must appear in the operating screen.
- The actuated crane movement must be shut off.

5.4 Error messages by the LICCON computer system

Two types are differentiated (all crane types except LR1400/2):

- Operating errors
 - Displayed in field **15** by error number / LEC: B.....
- System errors in LICCON computer system
 - Displayed in field **15** by error number / LEC: E.....

Only LR1400/2:

- Error messages
 - Displayed in field **16**

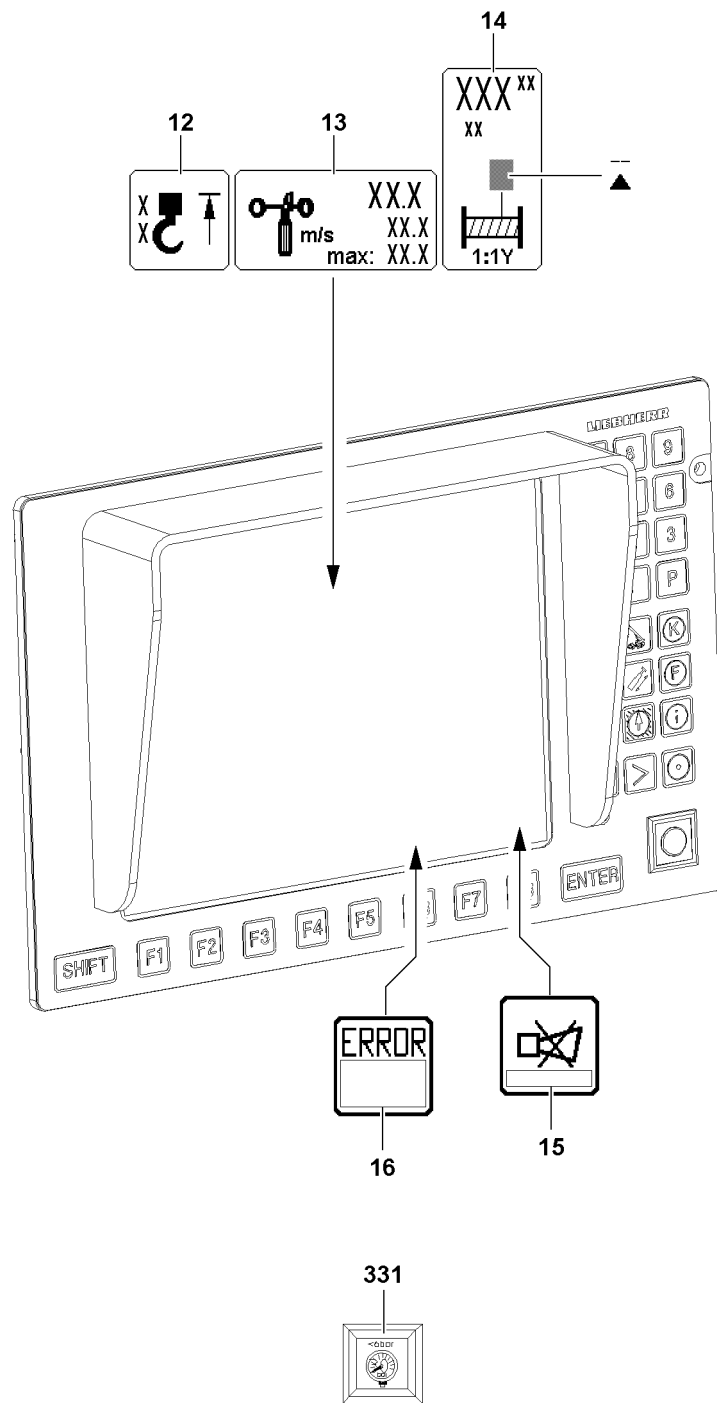


Fig.112972

LWE/LR 11350-007/19005-01-02/en

5.5 Wind speed sensor

The wind warning by the warning speed sensor appears in the operating screen of the LICCON computer system.



WARNING

The crane can topple over!

If the crane is operated with a defective wind speed sensor, then there is the danger that excessively high wind speeds are not recognized!

The crane can topple over!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Crane operation with a defective wind speed sensor is prohibited!
- ▶ Repair / replace a defective wind speed sensor!

If wind occurs, then the wind speed sensor must report it speed:

- If the actual wind speed value exceeds the displayed maximum value, the value in the icon **13** „Wind speed“ starts to blink and the acoustic alarm „Short horn“ sounds on the LICCON monitor. But there is **no shut off** of crane movements.

5.5.1 Quick test Wind speed sensor

When blowing in the cups:

- The wind speed sensor must start to move.
- An actual value must be shown in the icon **13** „Wind speed“.

5.6 Limit switch winch spooled out

The limit switches for the winches are adjusted at the factory. If used properly, the winches will not need readjustment.



Note

Minimum rope coils on the shut off point!

For the winches, a minimum of three rope coils are set for each drum.

- ▶ The shut off must occur **before** reaching the third minimum rope coil.



WARNING

The load can fall off!

If the limit switch „Winch spooled out“ does not turn off **before** three minimum rope coils are reached, then there is the danger, when it is further spooled out, that the rope mounting locks are ripped out and the load falls down!

Falling load can cause the crane to sway and / or topple over!

Personnel can be severely injured or killed!

This could result in property damage!

- ▶ Crane operation with an incorrectly or non-adjusted winch is strictly prohibited!
- ▶ If the winch falls below the three minimum rope coils per winch, have it readjusted by **Liebherr Service!**

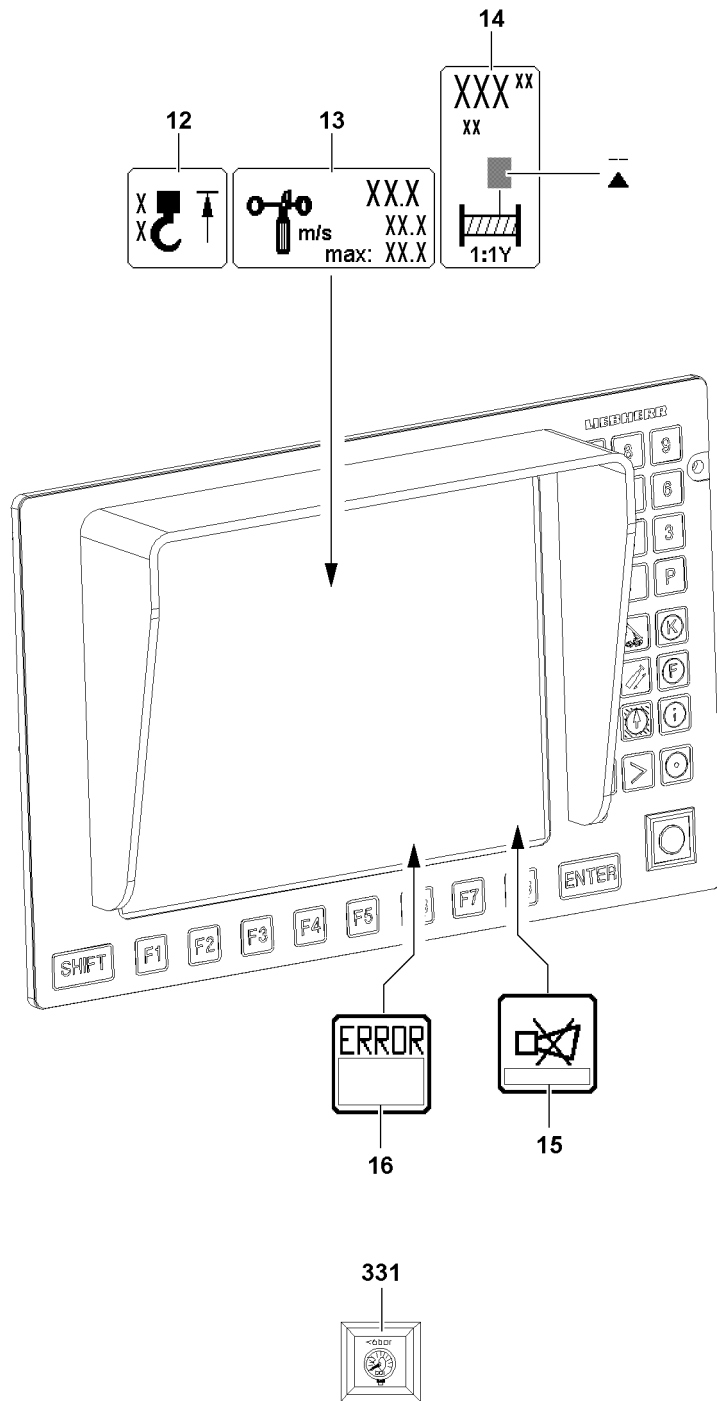


Fig.112972

**WARNING**

The load can fall off!

If the rope is not spooled up or out properly, then the adjustment of the limit switch „Winch spooled out“ is changed!

If the adjustment of the limit switch „Winch spooled out“ has changed, then the minimum rope coils are fallen below!

The load can fall down!

Falling load can cause the crane to sway and / or topple over!

Personnel can be severely injured or killed!

This could result in property damage!

- ▶ **Never** pull the end of rope underneath the winch by spooling up the rope winch!
- ▶ **Never** pull the rope from the „stationary“ winch!
- ▶ If you suspect that the limit switch „Winch spooled out“ is not adjusted correctly: Check the shut off without a load on the hook!

The limit switch „Winch spooled out“ must shut off when the minimum rope coils for the winch are reached:

- When the minimum rope coil for the winch is reached, then the display „Winch spooled out“ appears in the Winch icon **14**, see illustration. The crane movement „Spool winch out“ is shut off.

5.6.1 Quick test Limit switch winch

When the minimum rope coil is reached:

- The display „Winch spooled out“ must appear in the Winch icon **14**.
- The crane movement „Spool winch out“ must be shut off.

5.7 Servo oil pressure monitoring in the winches

All crane types except LR1400/2:

- If no servo oil pressure is present when the master switch is actuated, a corresponding error message appears in field **15**.

Only LR1400/2:

- If the servo oil pressure is too low, then the indicator light **331** in the right instrument panel appears.

5.8 Pressure monitoring in the relapse cylinders

Pressure sensors are installed in the hydraulic cylinders. The pressure measured with the pressure sensor is shown on the LICCON monitor, see Crane operating instructions, chapter 4.02.

**WARNING**

Risk of accident due to crane toppling over or destruction of the crane!

If the pressure drops, the relapse cylinder can no longer stabilize the boom!

The crane can topple over or be destroyed!

Personnel can be severely injured or killed!

- ▶ During crane operation: Constantly monitor the pressure in the relapse cylinders!

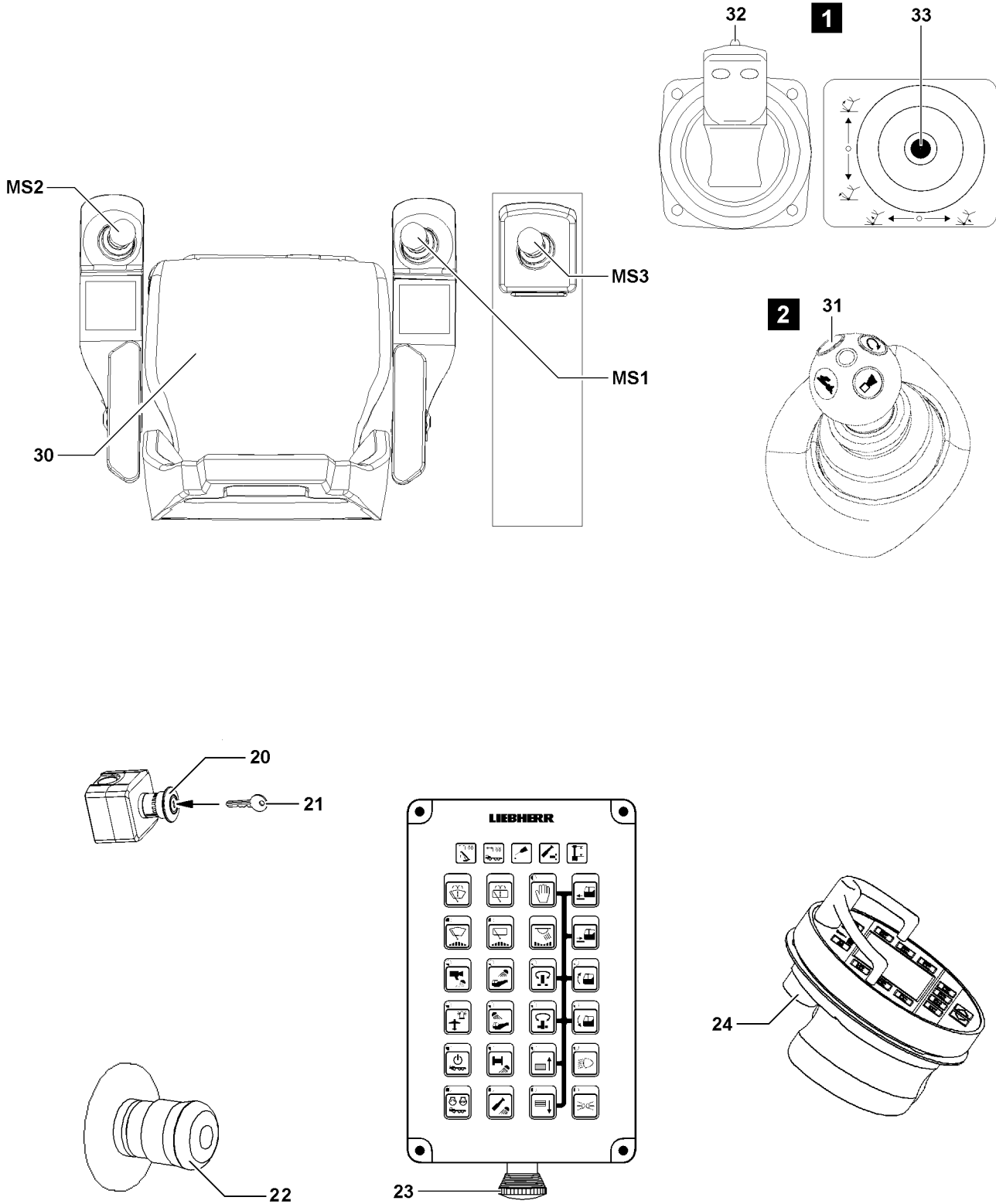


Fig.112970

LWE/LR 11350-007/19005-01-02/en

5.9 EMERGENCY STOP switch / EMERGENCY OFF switch

If an EMERGENCY STOP switch / EMERGENCY OFF switch is actuated, then the crane movement can be stopped with it.



WARNING

Defective EMERGENCY STOP switch / EMERGENCY OFF switch!

If the crane is operated with a defective EMERGENCY STOP switch / EMERGENCY OFF switch, then the crane movement cannot be stopped by actuating the EMERGENCY STOP switch!

This could result in accidents!

Personnel can be killed or seriously injured!

This could result in property damage!

► Crane operation with a defective EMERGENCY STOP switch / EMERGENCY OFF switch is prohibited!

► Repair or replace a defective EMERGENCY STOP switch / EMERGENCY OFF switch!

NOTICE

Operational actuation of the EMERGENCY STOP switch / EMERGENCY OFF switch

Actuation of the EMERGENCY STOP switch / EMERGENCY OFF switch causes the crane movement to stop abruptly!

Abruptly stopping the crane movement can cause the load to swing!

Swinging loads can cause accidents!

► Do not use the EMERGENCY STOP switch / EMERGENCY OFF switch operationally!

► Use the EMERGENCY STOP switch / EMERGENCY OFF switch only in emergency situations!

The EMERGENCY STOP switch / EMERGENCY OFF switch is available in various versions, depending on the crane type:

- After actuation of a switch of version* **20**, the release is only obtained by an authorized person with key **21** and by subsequently turning the ignition „Off - On“ momentarily.
- After actuation of the switch of version* **22**, the release is obtained by turning and unlocking the knob and subsequently turning the ignition „Off - On“ momentarily.
- After actuation of the switch of version* **23**, the release is obtained by turning and unlocking the knob and subsequently turning the ignition „Off - On“ momentarily.
- After actuation of the switch of version* **24**, the release is obtained by turning and unlocking the knob and subsequently turning the ignition „Off - On“ momentarily.



Note

► Which EMERGENCY STOP switch / EMERGENCY OFF switch is on the crane depends on the crane type.

► The switch **24** on the BTT is only activated when working with the BTT.

5.9.1 Quick test EMERGENCY STOP switch / EMERGENCY OFF switch

After actuation of the EMERGENCY STOP switch / EMERGENCY OFF switch:

- The crane movements must be stopped.
- No crane movements must be possible until the release was issued by turning and unlocking the knob and then turning the ignition „Off - On“ momentarily.

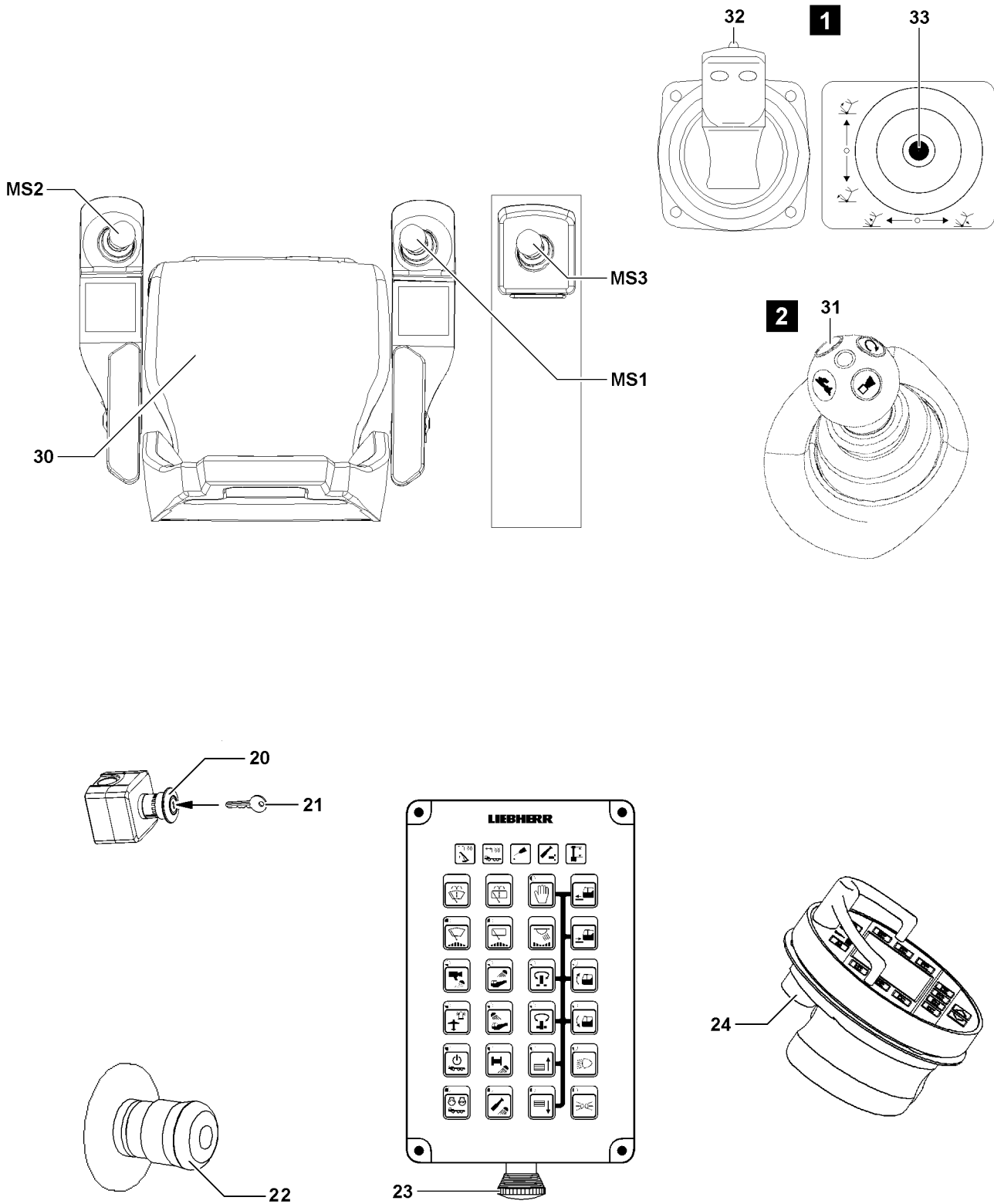


Fig.112970

LWE/LR 11350-007/19005-01-02/en

5.10 Control release

The control release can be made via three switches:

- **30** Seat contact button
- Button **31** on master switch **MS1** and **MS2** and **MS3**.
- or
- Button **32** on master switch **MS1** and **MS2** (only LR1400/2)
- Button **33** on master switch **MS3** (only LR1400/2)

The seat contact button **30** shuts down the crane control as soon as the crane operator gets up from the seat.

This prevents unintended crane movements by accidentally touching the master switch, for example when getting in or out of the cab.

Button **31** or button **32** and the button **33** bypass the seat contact switch **30**, if necessary, for example, when work must be performed standing.

5.11 Hydraulic safety valves

A differentiation is made between three types:

- Pressure relief valves
 - Prevent pipe and hose bursts due to excessive pressure.
- Shut off valves
 - Control and secure the working cylinders.
- Check valves
 - Control and secure the flow direction.

5.12 Gravity actuated relapse retainer



Note

- ▶ Only for cranes with luffing accessories.

The gravity actuated relapse retainer (oscillation guard / flap / relapse support) prevent luffing accessory from tipping to the rear in „steepest position“.



WARNING

The crane can topple over!

If the gravity actuated relapse retainer (oscillation guard / flap / relapse support) is hard to move, then it will no longer function.

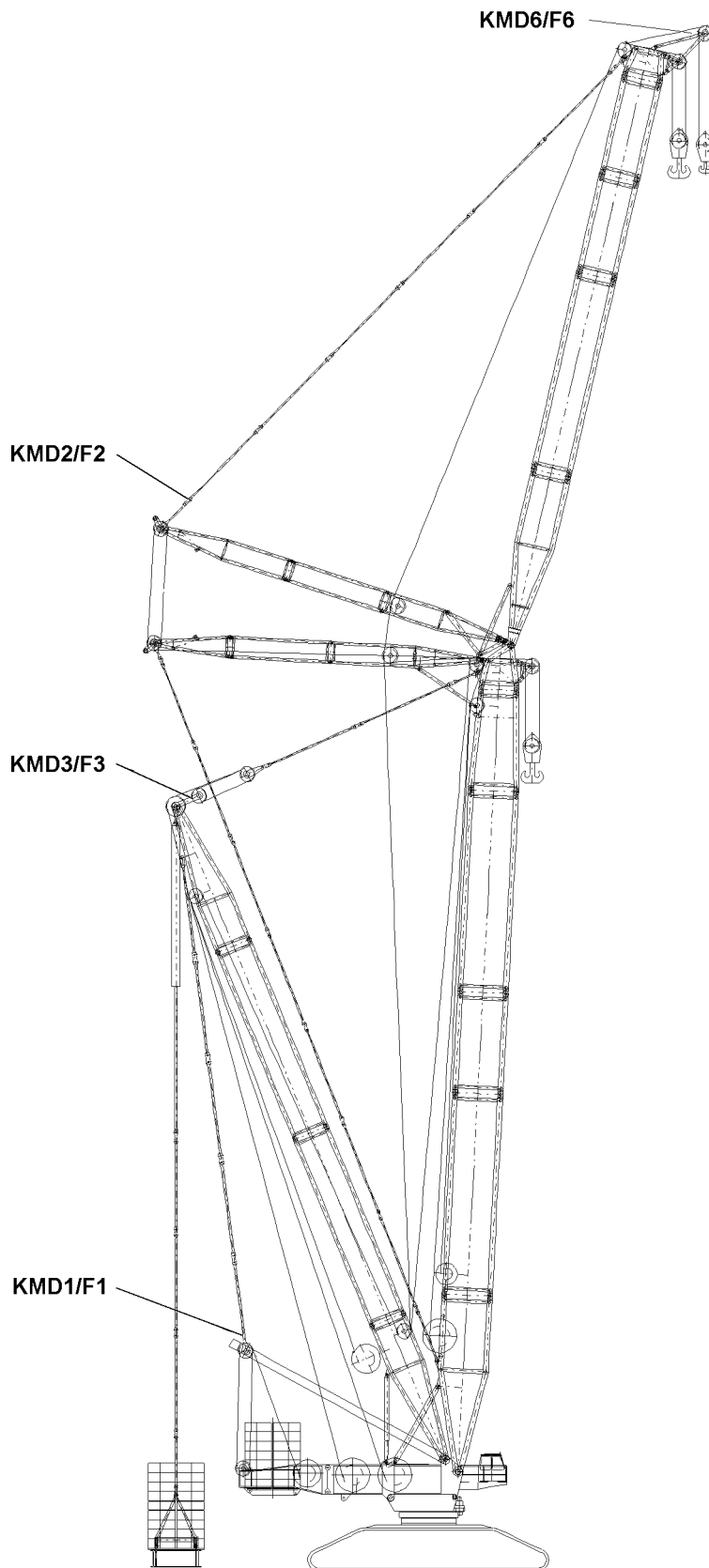
Shut off and limit functions can be set out of service!

The crane can be overloaded and topple over!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Before erecting the crane, check the relapse retainer for easy movement!
- ▶ Crane operation with hard to move relapse retainer is prohibited!



LWE/LR 11350-007/19005-01-02/en

Fig.112971

5.13 Angle sensors

| Component | Description - Angle sensor (WG) |
|---|---------------------------------|
| S-pivot section | Main boom bottom |
| S/W-end section, if used on boom | Main boom top |
| S/W-end section, if used on luffing jib | Luffing jib up |
| W-pivot section | Luffing jib bottom |
| W-connector head | Main boom top |
| D-pivot section | Derrick bottom |
| D-end section | Derrick top |
| SA-frame | SA-frame |

5.14 Test brackets (KMD = force test box)

The test brackets measure the force in the guying, which results from the load and the boom momentum.

The test brackets are located:

- **KMD 1**, in the boom guying, SA-frame to boom for all operating modes **without** derrick
- **KMD 1**, in the derrick guying, SA-frame to derrick for all operating modes **with** derrick
- **KMD 2**, in the lattice jib guying, WA-frame 1 to lattice jib end section
- **KMD 3**, in the boom guying, derrick to boom for all operating modes **with** derrick
- **KMD 6**, in the boom nose (not LR1400/2)

5.15 Limit switch Boom system



WARNING

Danger of toppling or destroying the crane!

If the crane movement is stopped by the block limit switches, then the load forces cannot be absorbed and calculated by the control!

The crane can be overloaded and topple over!

Personnel can be hit and killed or seriously injured!

This could result in property damage!

- ▶ Do **not** use the hoist limit switch as an operational shut off device!
- ▶ Do not actuate the block limit switches!

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LWE/LR 11350-007/19005-01-02/en

4.05 Crane operation

| | | |
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Fig.195219

LWE/LR 11350-007/19005-01-02/en

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.
-

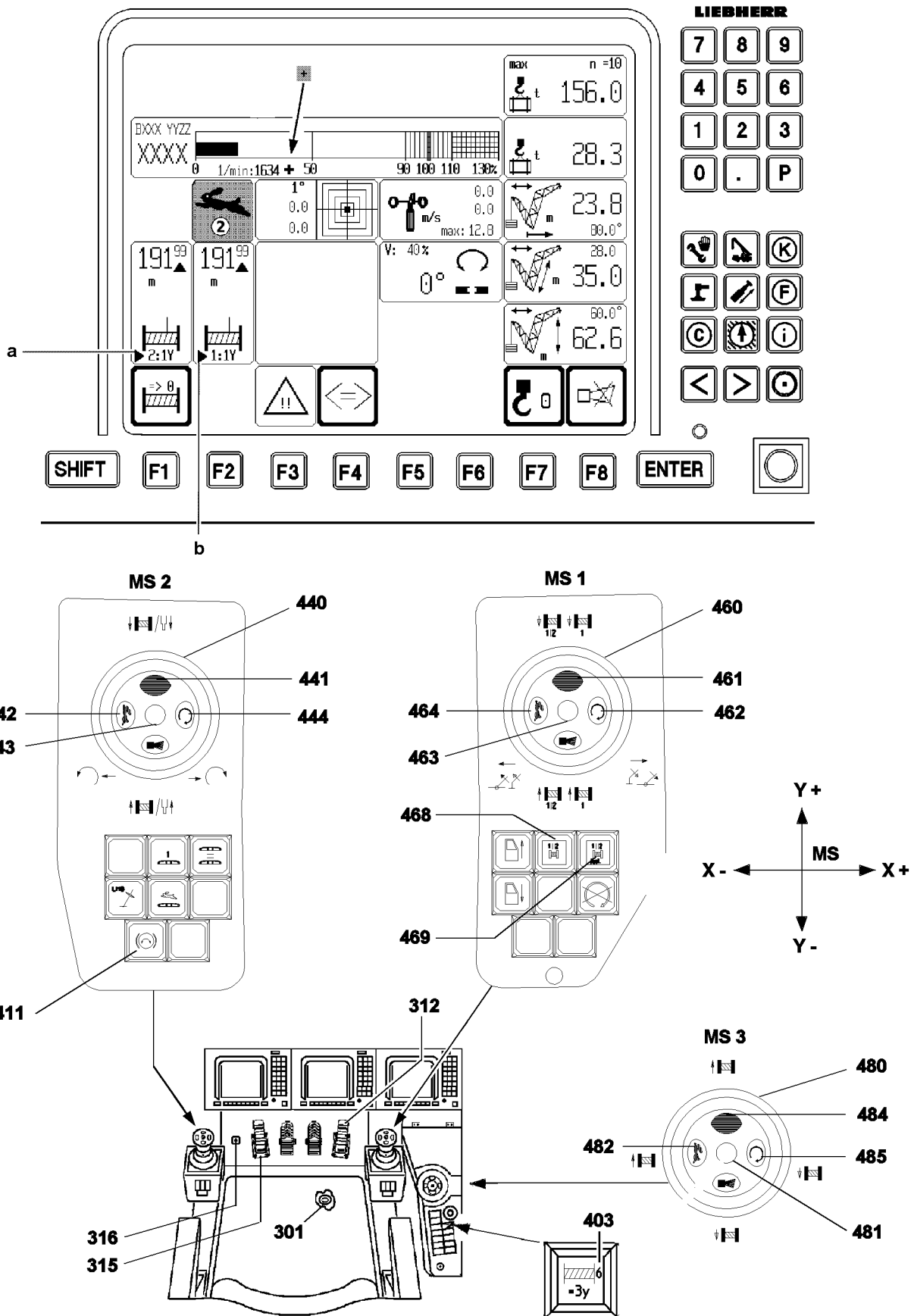


Fig.113073

LWE/LR 11350-007/19005-01-02/en

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.

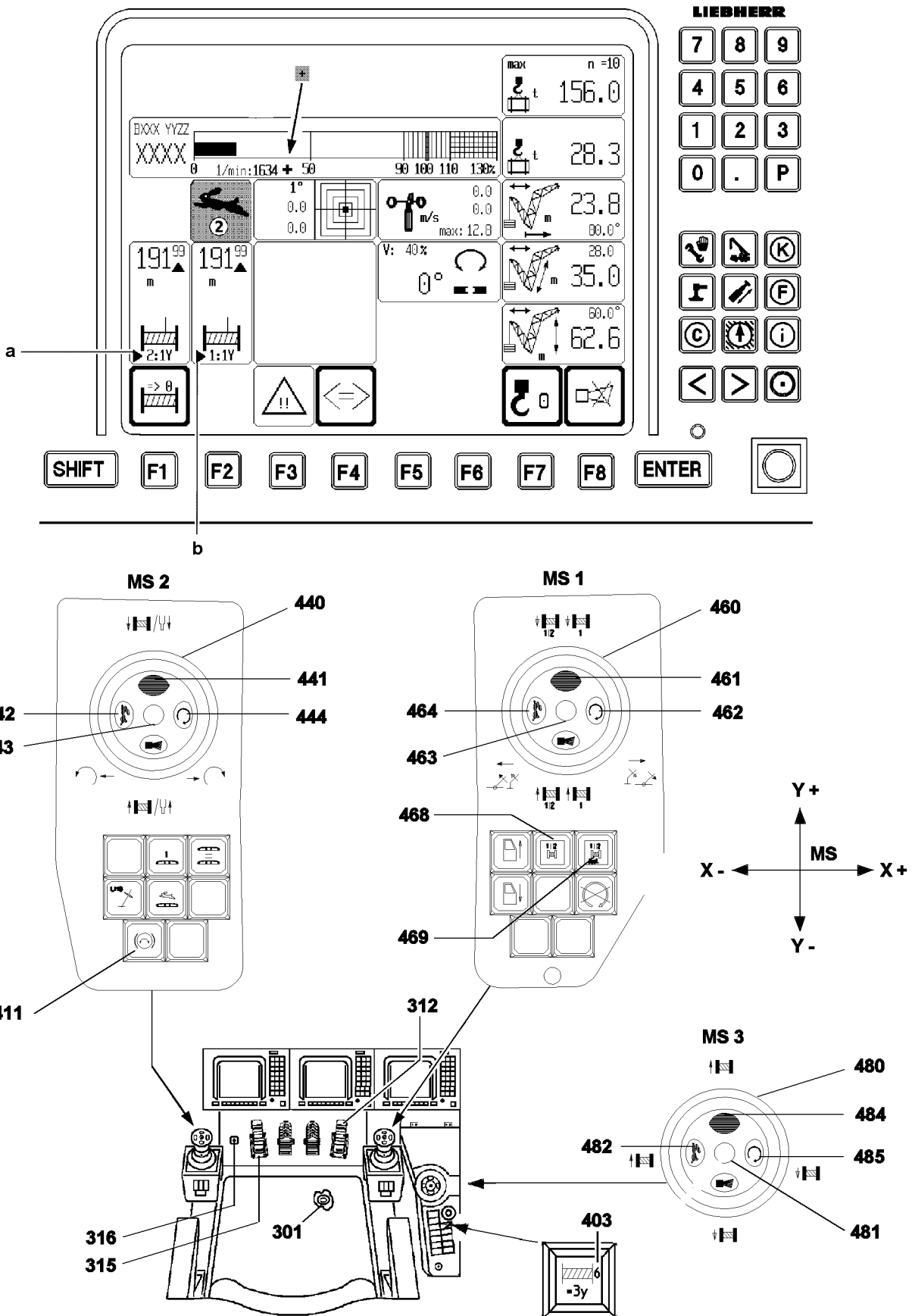


Fig.113073

LWE/LR 11350-007/19005-01-02/en

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.

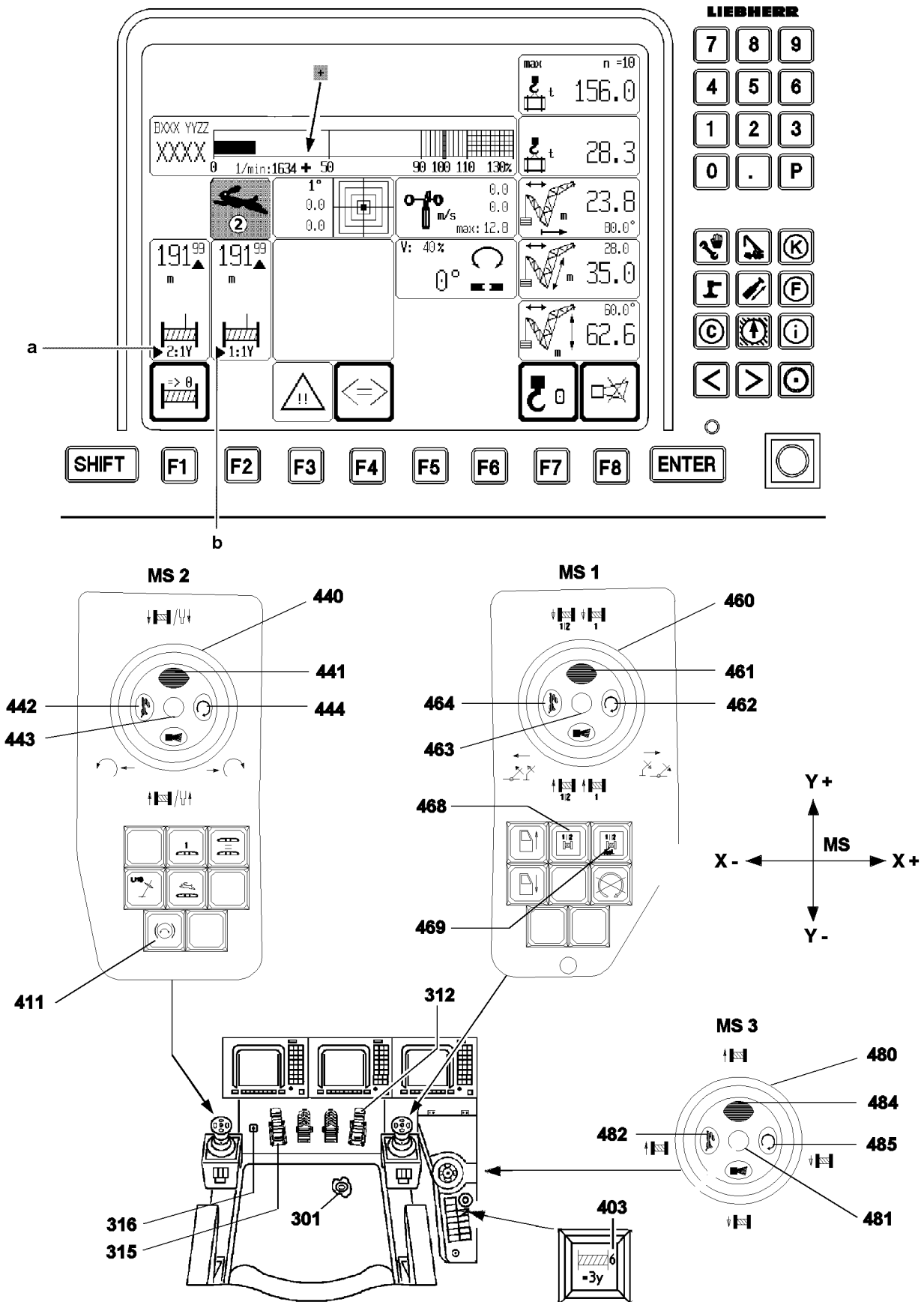


Fig.113073

LWE/LR 11350-007/19005-01-02/en

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.

Fig.195219

LWE/LR 11350-007/19005-01-02/en

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.

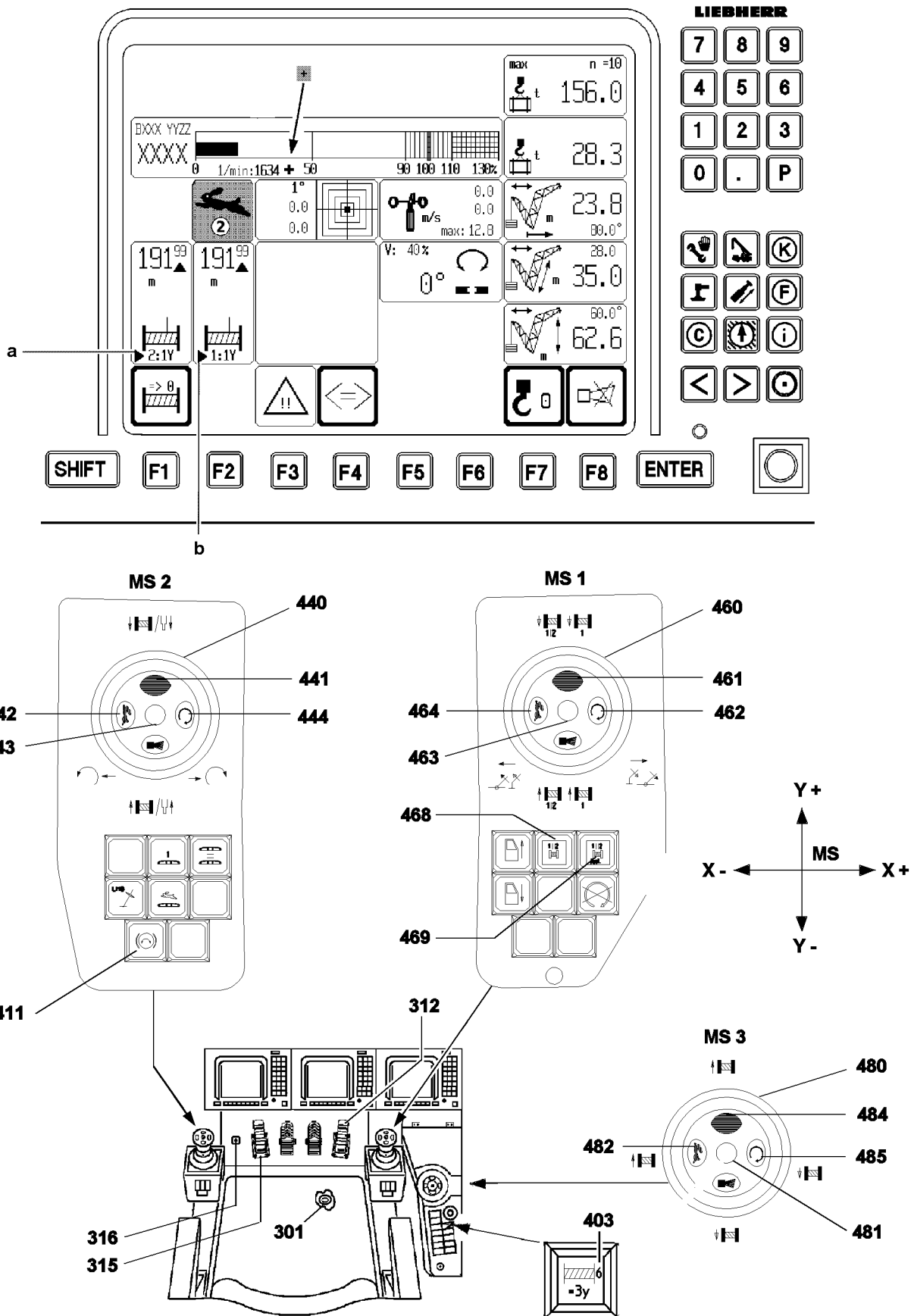


Fig.113073

LWE/LR 11350-007/19005-01-02/en

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.

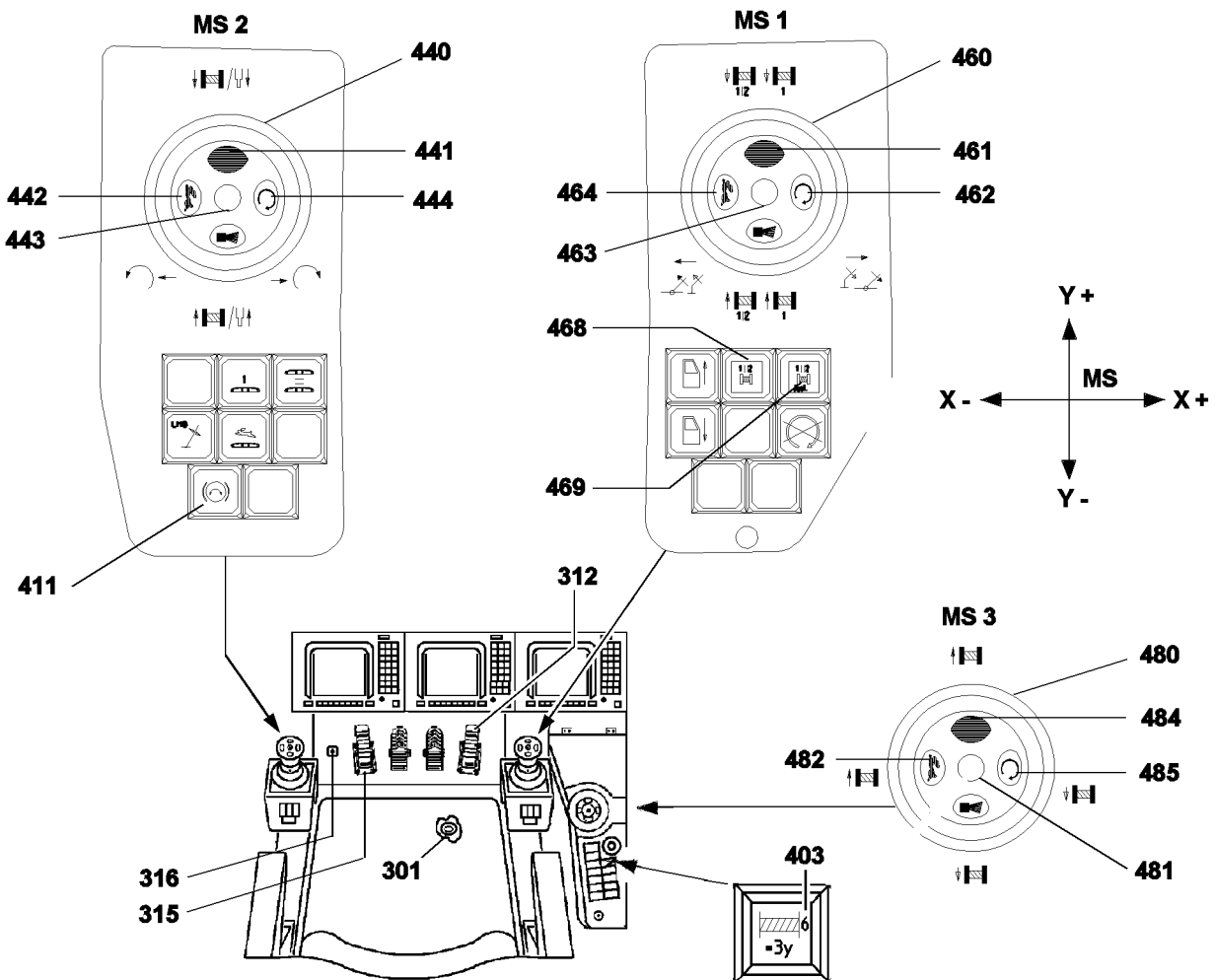
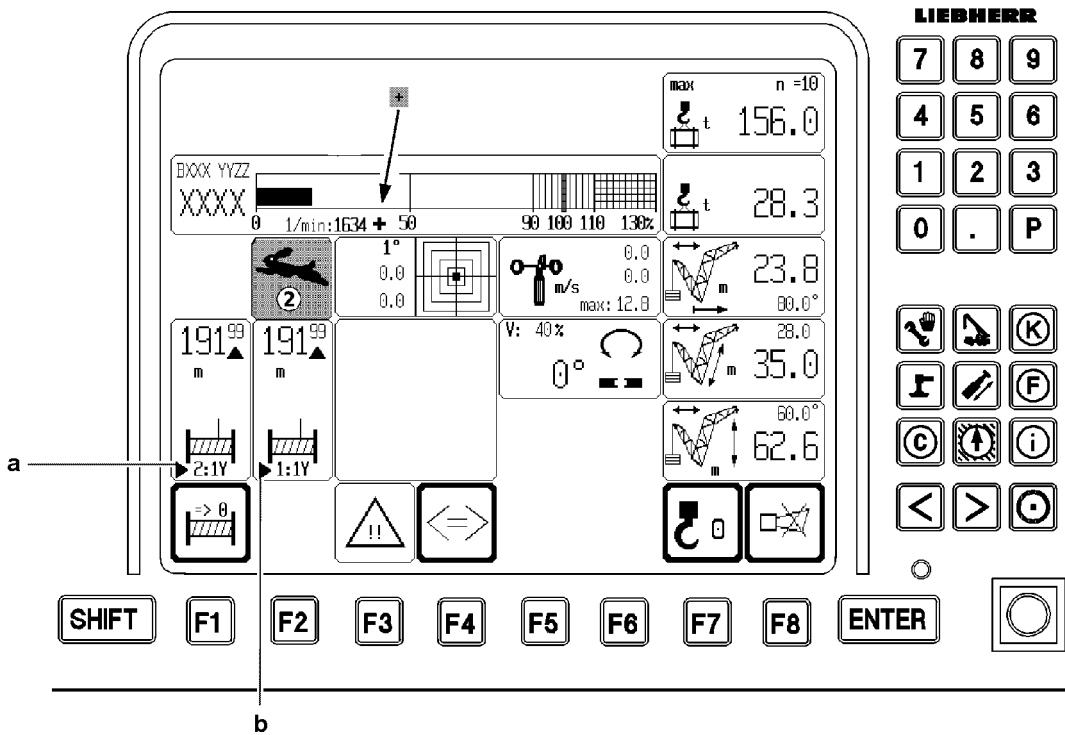


Fig.113073

LWE/LR 11350-007/19005-01-02/en

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.

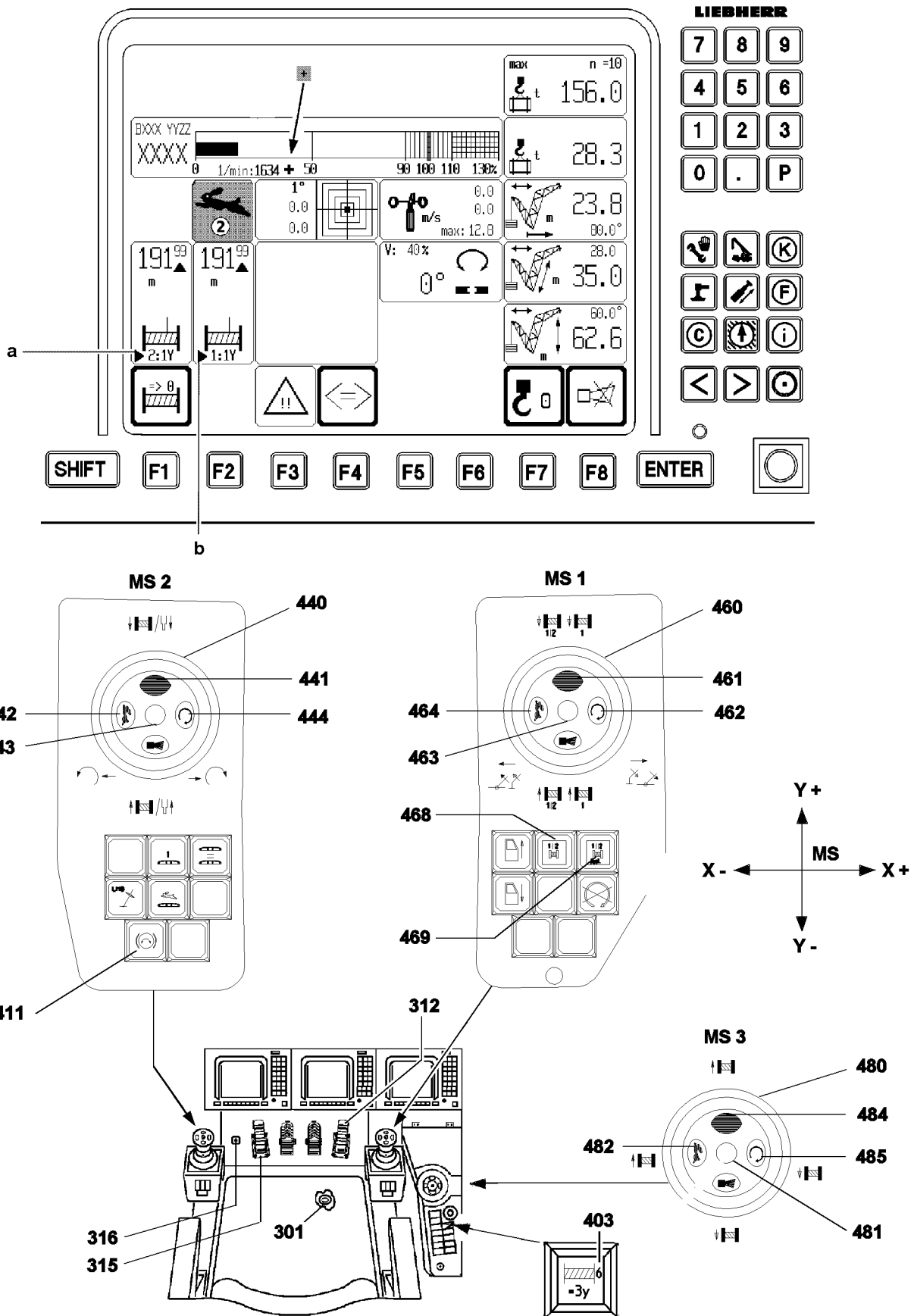


Fig.113073

LWE/LR 11350-007/19005-01-02/en

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.

Fig.195219

LWE/LR 11350-007/19005-01-02/en

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.

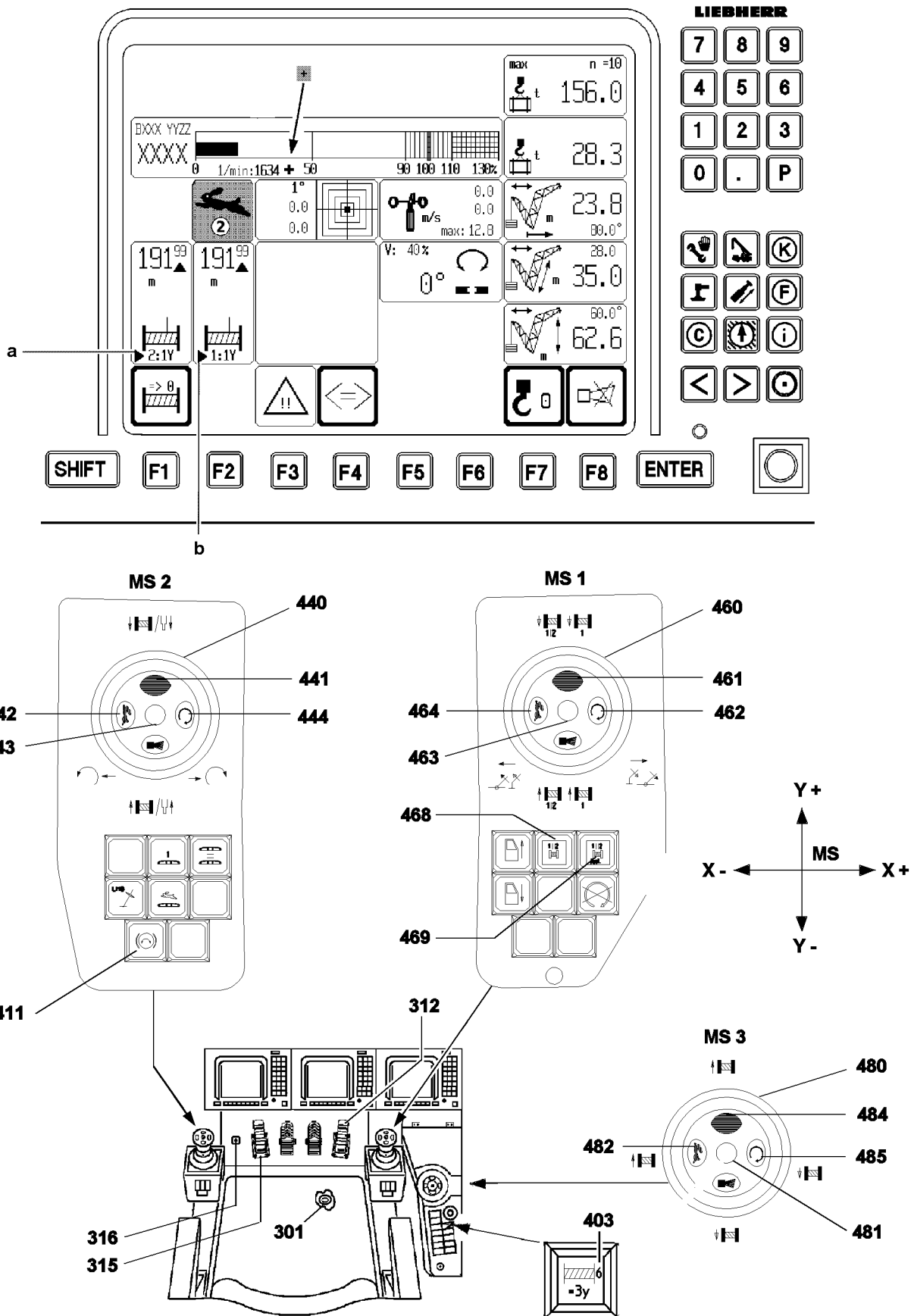


Fig.113073

LWE/LR 11350-007/19005-01-02/en

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.

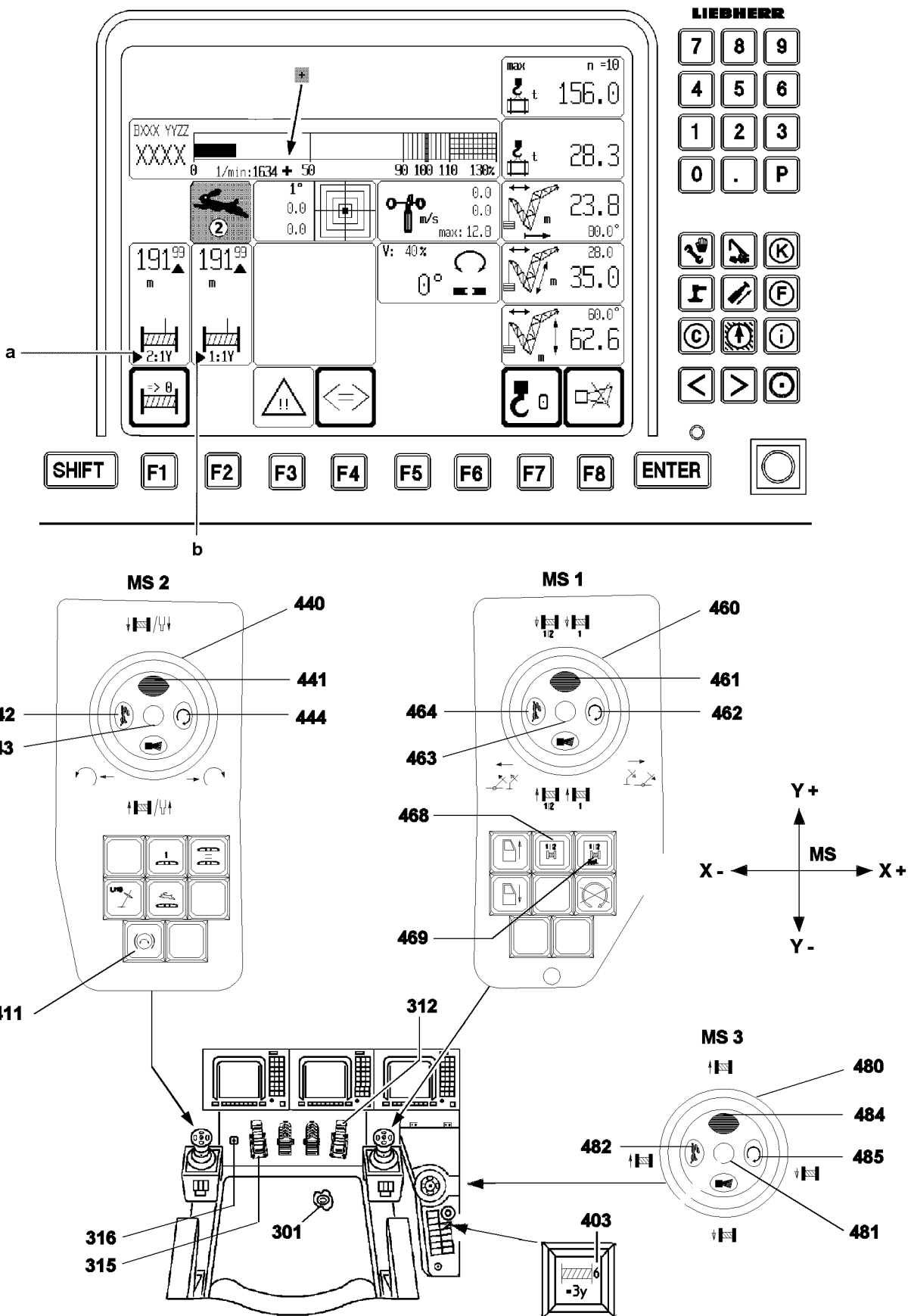


Fig.113073

LWE/LR 11350-007/19005-01-02/en

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.

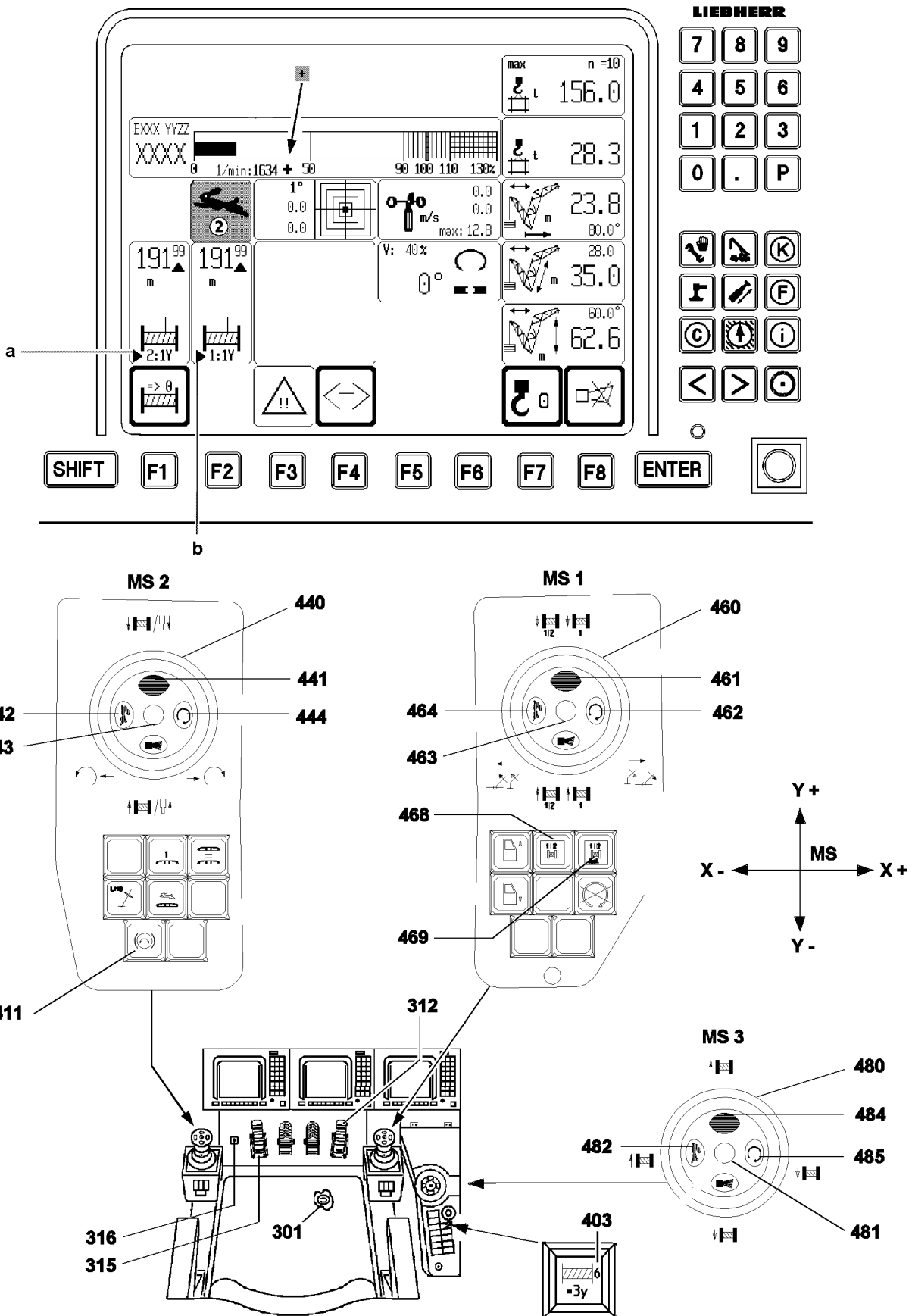


Fig.113073

LWE/LR 11350-007/19005-01-02/en

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.

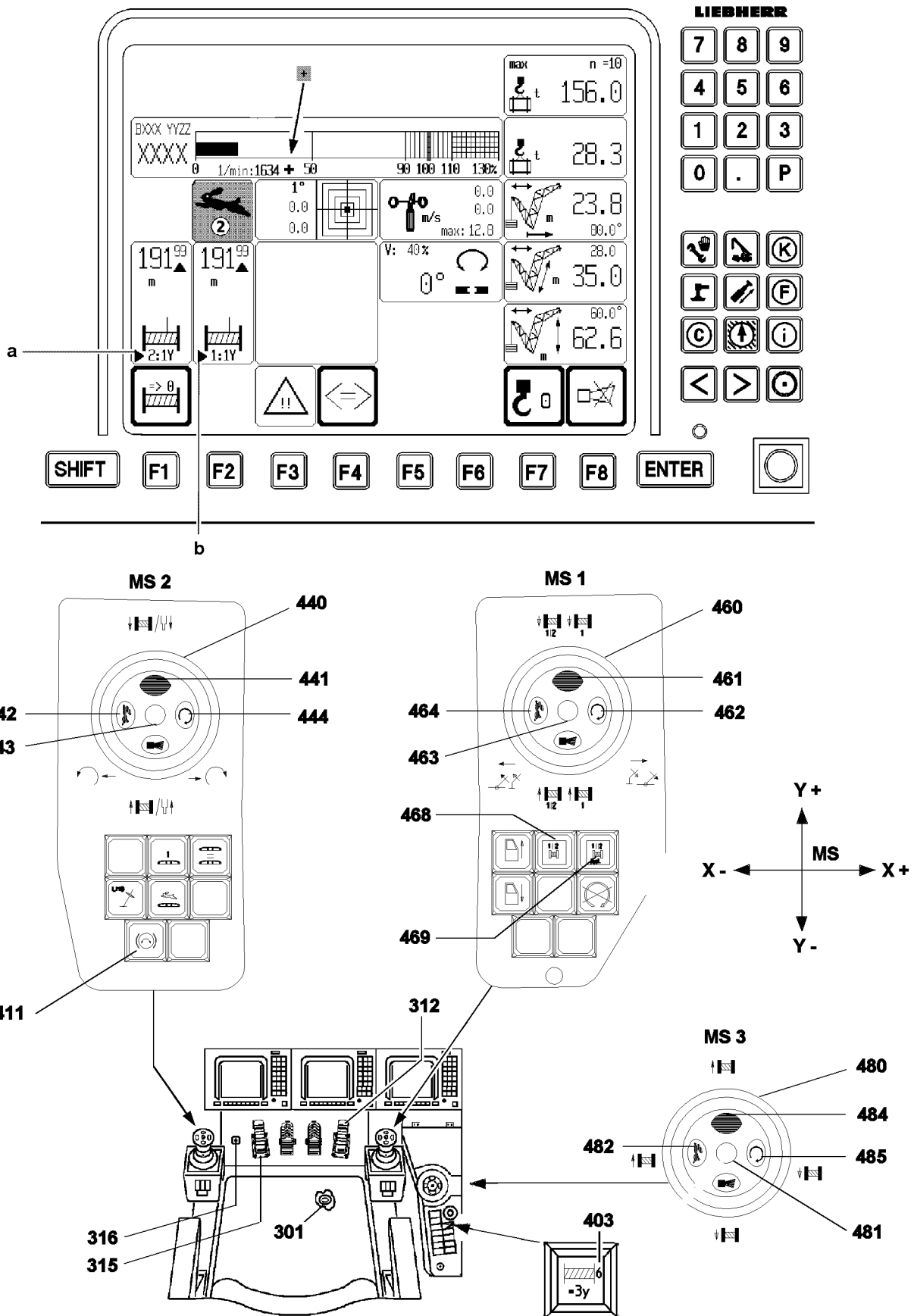


Fig.113073

LWE/LR 11350-007/19005-01-02/en

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.

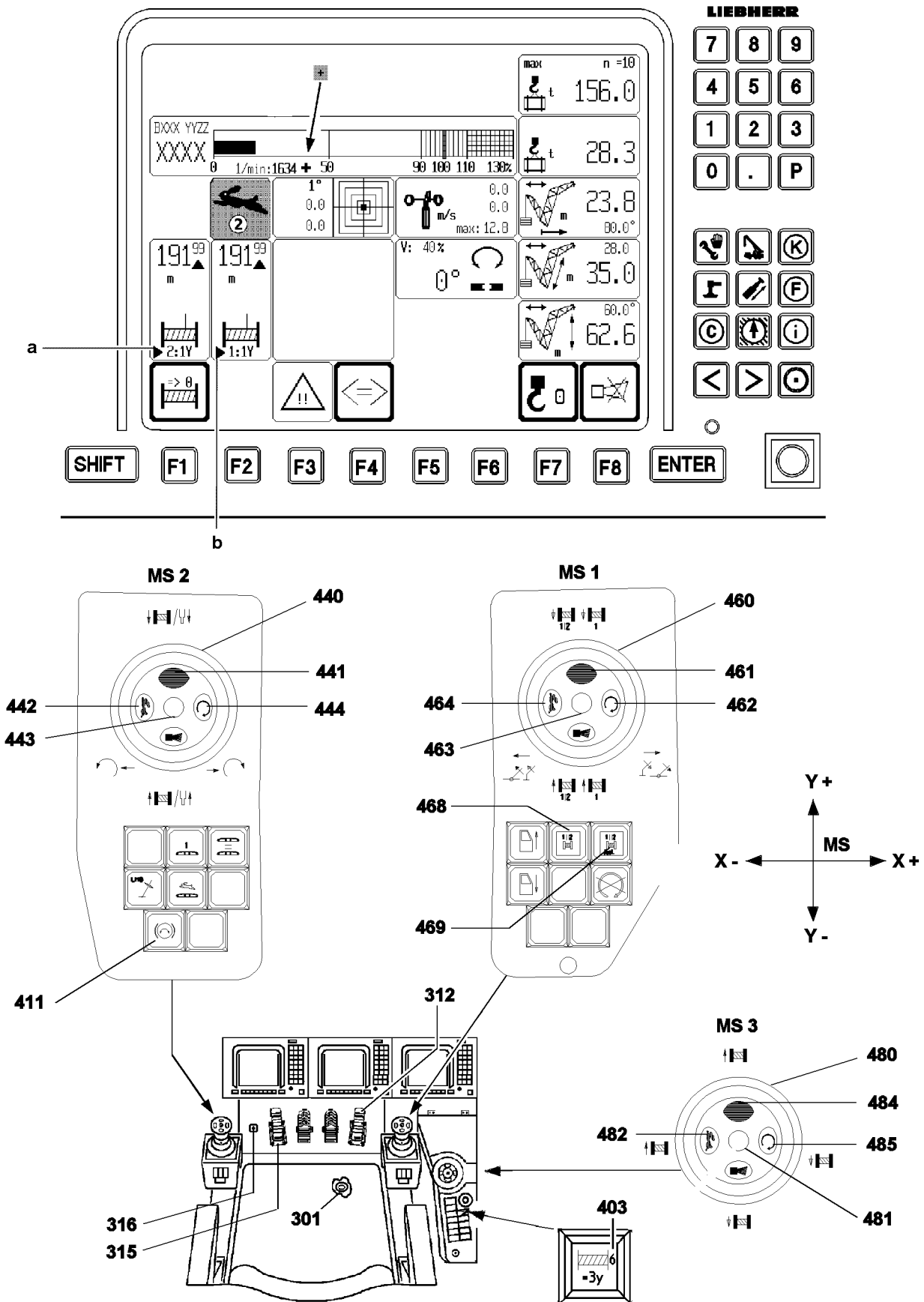


Fig.113073

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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.

Problem remedy

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.

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4.06 Rope reeving

| | | |
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| 2 | Reeving in the hoist rope | 5 |
| 3 | Reeving the hook block in and out | 8 |
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| 6 | Attaching / removing the hoist limit switch weight | 19 |
| 7 | Assembling / disassembling the wedge lock | 21 |
| 8 | Rope reeving | 22 |

Fig.195219

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1 Wire ropes and rope end connections

1.1 Wire ropes

Check if a **rotating resistant** or a **non-rotating** rope is required for the application. The selected type of rope then requires the corresponding rope end connections, see Crane operating instructions, chapter 8.04.



Note

- ▶ Correct choice and use of the wire rope and the rope end connections are a decisive precondition for proper and accident-free crane operation.



DANGER

Incorrect rope type!

Danger of severe injuries to personnel and property damage.

- ▶ **Never** use rotation-resistant ropes with a rotating rope end connection.
- ▶ **Never** install a twist compensator / swivel.

1.2 Rope end connections

Rope end connections are grouped into:

- Rope end connections with locking clamp or locking cast sleeve
- The L-shaped rope end connection with locking clamp or locking cast sleeve (LR 11000 only)
- Rope end connection **without** locking clamp or locking cast sleeve



Note

- ▶ The locking clamp **8** is pressed on the rope.
- ▶ The locking cast sleeve **8** is cast with the rope.

1.2.1 Rope end connections with locking clamp or locking cast sleeve

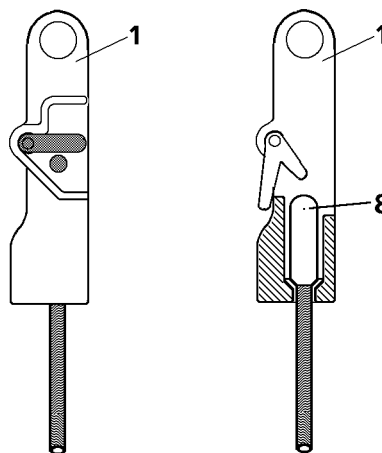


Fig.144019: Rope end connections with locking clamp **8** or locking cast sleeve **8**

- Rope end connections **with** locking clamp **8** or locking cast sleeve **8**.
A rope end connection **1** or an L-shaped rope end connection **24** should be used for this.

1.2.2 The L-shaped rope end connection with locking clamp or locking cast sleeve (LR 11000 only)



WARNING

Load can be ripped off!

Death, severe bodily injuries, property damage.

- ▶ The L-shaped rope end connection **24** is only permitted for use on LR 11000.
- ▶ It is prohibited to use the L-shaped rope end connection **24** on other crane types.
- ▶ Make sure that the L-shaped rope end connection is only used for **reeving with a even number of strands**.

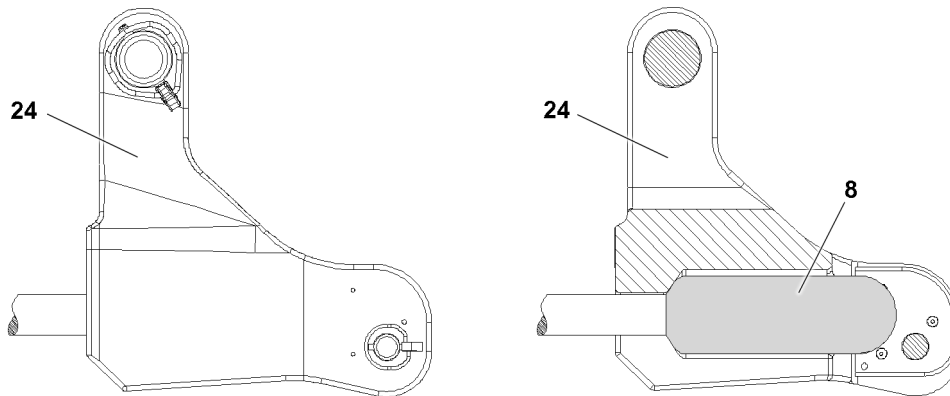


Fig.144020: L-shaped rope end connection **24** with locking clamp **8** or locking cast sleeve **8**

- Rope end connections **with** locking clamp **8** or locking cast sleeve **8**.
An L-shaped rope end connection **24** or a rope end connection **1** should be used for this.

1.2.3 Rope end connection without locking clamp or locking cast sleeve

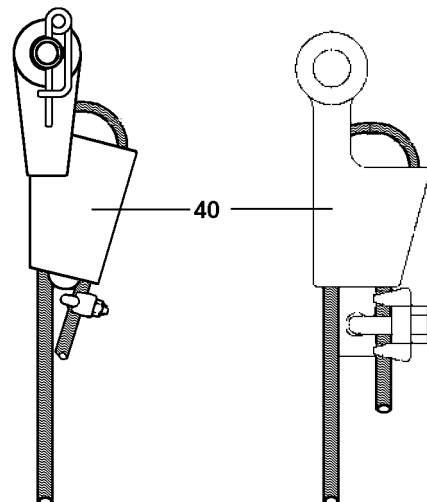


Fig.144021: Rope end connection without locking clamp or locking cast sleeve

- Rope end connections **without** locking clamp **8** or locking cast sleeve **8**.
For that, use a wedge lock **40**.

2 Reeving in the hoist rope



WARNING

Slipping at assembly work!

Danger of falling.

Death, severe injury, property damage.

- ▶ The boom system may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling.
- ▶ If retaining ropes are present on the boom system, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the boom system on the left and right with both snap hooks and secure themselves to prevent them from falling.
- ▶ Without appropriate safety measures it is **strictly** prohibited to step on the boom system.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
- ▶ Carry out all assembly work from a safe location.
- ▶ Observe the assembly guidelines in the Crane operating instructions, chapter 5.01.

Make sure that the following prerequisites are met:

- The ground is level and of sufficient load carrying capacity.
- **Only for cranes with crane support:** The crane is properly supported.
- The crane is horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The slewing gear brake is applied.
- The boom end section is just above the ground.

2.1 Reeving in the hoist rope with the assembly winch

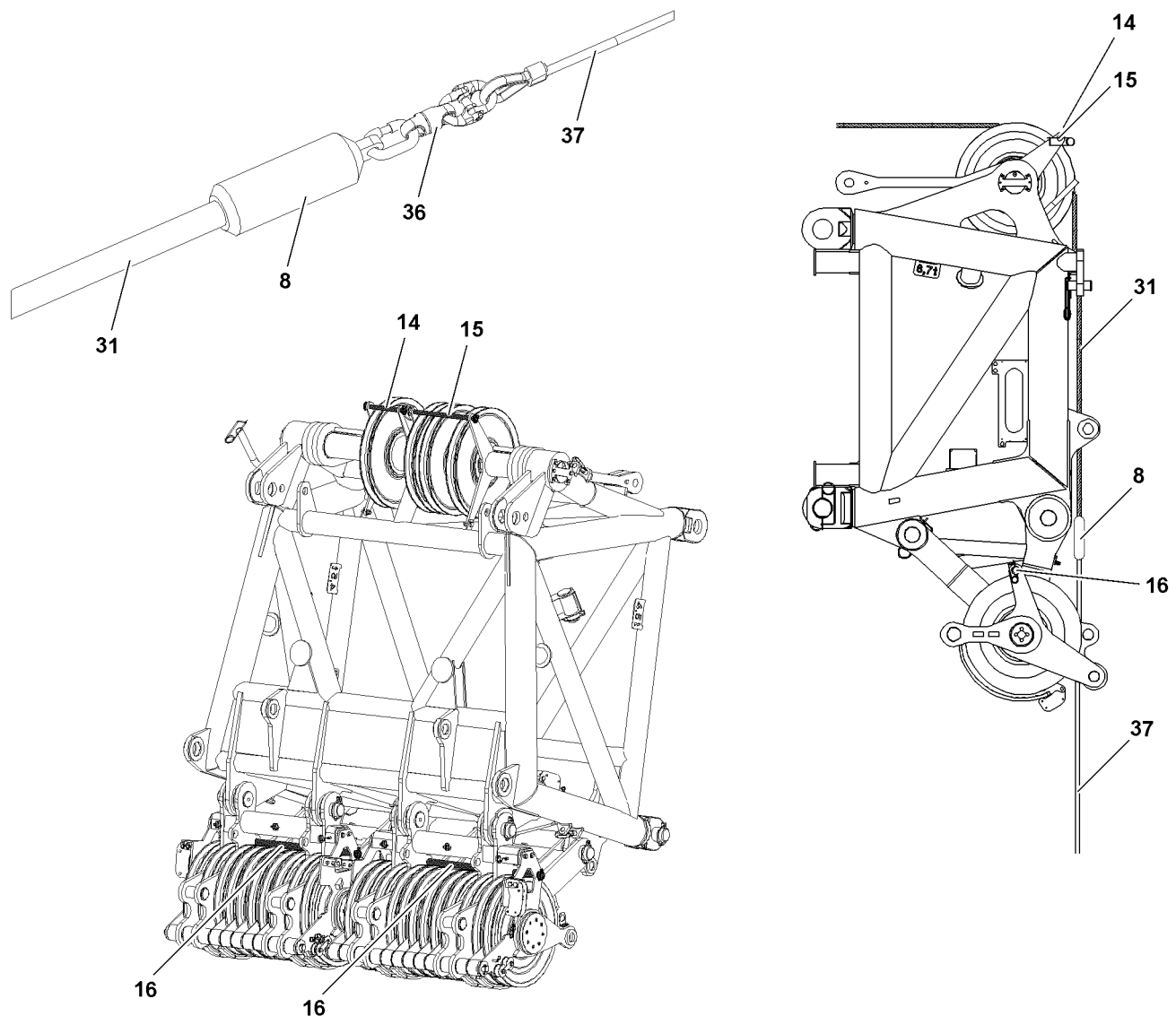


Fig.121853: Reeving in with assembly winch

- ▶ Wear approved fall arrest system and protective equipment, see Crane operating instructions, chapter 2.04.
- ▶ Bring the fall protection equipment on the crane superstructure and on the lattice boom in operating position and secure, see Crane operating instructions, chapter 2.06.
- ▶ Properly hang the fall arrest system on the intended safety ropes and / or fastening points.
- ▶ Switch the assembly winch to freewheeling.
- ▶ Remove the rope retaining pin **14**, rope retaining pin **15** and rope retaining pin **16**.
- ▶ Connect the auxiliary rope **37** with the auxiliary reeving rope (hemp rope).
- ▶ Reeve in the auxiliary rope **37** in the reverse direction between the hook block and the pulley head.
- ▶ Bring the auxiliary rope **37** with the auxiliary reeving rope (hemp rope) upward over the back pulley, which is to be reeved according to the reeving plan.
- ▶ Pull the auxiliary rope **37** to the rear to the hoist winch.
- ▶ Release the auxiliary reeving rope (hemp rope) from the auxiliary rope **37**.

When the auxiliary rope is on the hoist winch:

- ▶ Connect the auxiliary rope **37** with the hoist rope **31**: Open the connecting link **36**, connect it with the eyehook of the lock clamp **8** and close the connecting link **36**.
- ▶ Turn the freewheeling off on the assembly winch.

NOTICE

Hoist rope tension too low!

Slack rope formation.

- ▶ Permit no slack rope on the hoist winch and the assembly winch.

-
- ▶ Reeve in the hoist rope **31**: Spool the hoist rope **31** from the hoist winch and simultaneously spool up the auxiliary rope **37** on the assembly winch.

When the hoist rope **31** is reeved:

- ▶ Release the auxiliary rope **37** from the hoist rope **31**.
- ▶ Spool the auxiliary rope on the assembly winch.
- ▶ Pin and secure the rope retaining pin **14**, rope retaining pin **15** and rope retaining pin **16**.
- ▶ Hang the hoist rope properly in on the rope lock, see section „Hanging the hoist rope in on the rope lock“.

When the hoist rope is properly hung in on the rope lock:

- ▶ Attach the hoist limit switch weight, see section „Attaching the hoist limit switch weight“.

**Note**

Parallel operation of winch 1 and winch 2!

- ▶ Repeat the above described reeving procedure with the second hoist rope.
 - ▶ Observe the reeving plan.
-

3 Reeving the hook block in and out

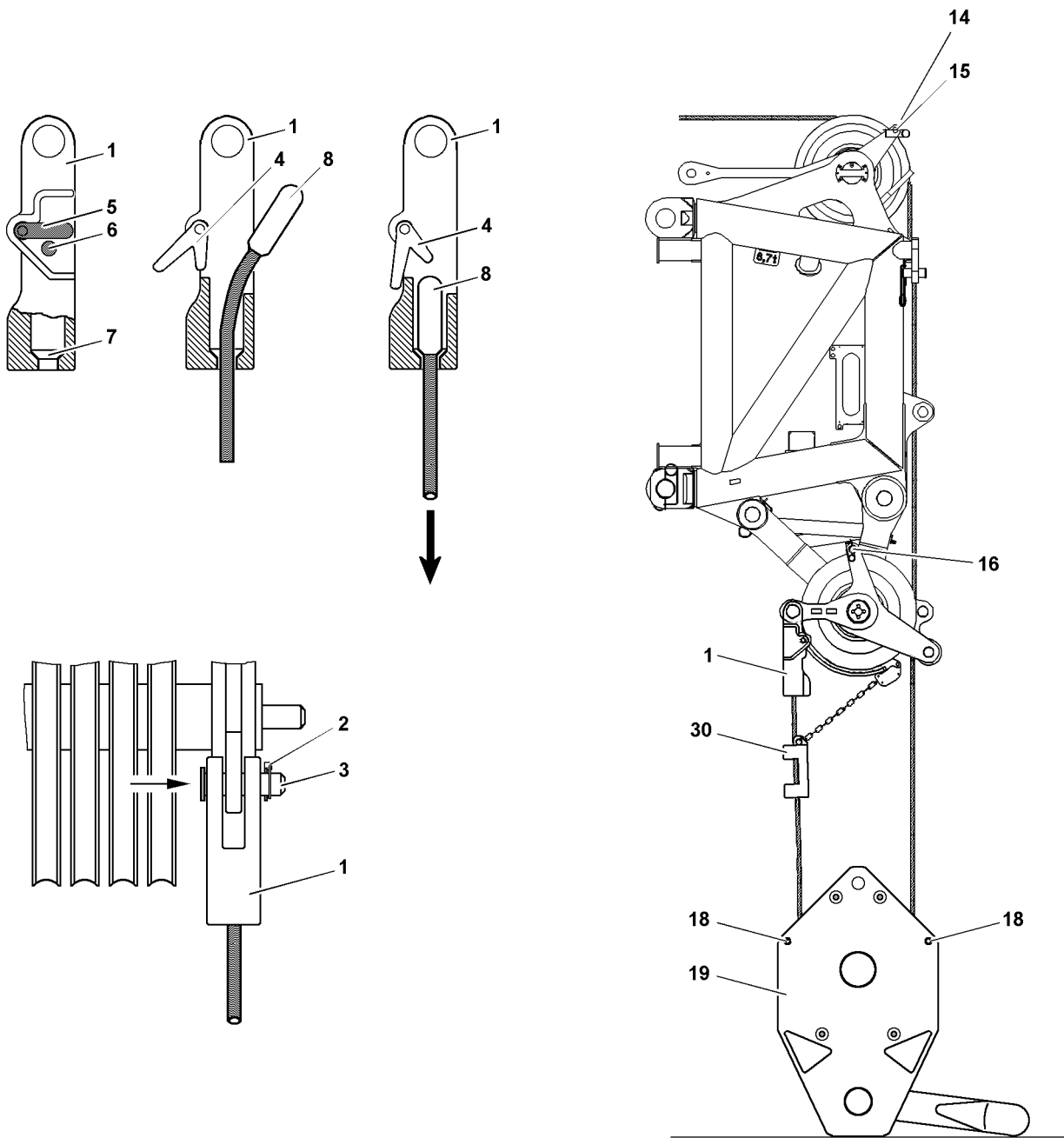


Fig.144024: Details Reeving Hook block

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3.1 Reeving in the hook block



WARNING

Toppling of hook block!

If the retaining pins are **not** pinned in the roller block / the pulley blocks of the hook block before placing the hook block down, then the pulley blocks / the hook block can topple over when unreeving the hoist rope.

Death, severe injury, property damage.

- ▶ Pin the retaining pins, see Crane operating instructions, chapter 5.19 or separate operating instructions.

3.1.1 Preparing the hook block

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- The slewing gear brake is applied.
- The hook block is set down on the ground properly.
- The boom is luffed down to the point where the pulley head is above the hook block.
- An assistant is present to guide the hoist rope.



WARNING

Danger of accident due to side wind!

If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.

Death, severe injury, property damage.

The crane can collide with close-by structures or objects.

- ▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

NOTICE

Hook block incorrectly reeved!

Damage to the hoist rope.

- ▶ Carry out the reeving of the hoist rope according to the reeving plan.
- ▶ Select the rope fixed point on the hook block in such a way that the last strand runs parallel to the remaining rope strands, as much as possible.

- ▶ Set the required hook block under the boom head.
- ▶ At the hook block **19**, remove the spring retainers **18** for both rope retaining pins and pull them both out.



WARNING

Slipping at assembly work!

Danger of falling.

Death, severe injury, property damage.

- ▶ The boom system may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling.
- ▶ If retaining ropes are present on the boom system, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the boom system on the left and right with both snap hooks and secure themselves to prevent them from falling.
- ▶ Without appropriate safety measures it is **strictly** prohibited to step on the boom system.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
- ▶ Carry out all assembly work from a safe location.
- ▶ Observe the assembly guidelines in the Crane operating instructions, chapter 5.01.

- ▶ Reeve the hook block.
- ▶ Insert the rope retaining pins again and secure with spring retainers.

3.1.2 Hooking the hoist rope on the rope lock

NOTICE

Hoist rope is incorrectly installed!
Damage to the hoist rope.

- ▶ Always insert the pins **3** from „inside to outside“ and secure from the outside.
- ▶ The rope lock **1** must be pinned in either at the pulley head or on the hook block and secured with locking pins **2**, depending on reeving.
- ▶ On the rope lock **1**, push the safety pin **6** in.
- ▶ Swing the lever **5** „down“ and hold it in this position.

Result:

- The latch **4** is swung „downward“.
- ▶ Attach the rope end with the locking clamp **8** in the rope lock **1** and pull „down“ firmly (in direction of arrow), until the locking clamp **8** is touching in the cone **7**.



WARNING

Locking clamp is incorrectly installed!
Danger of accident.
Death, severe injuries, property damage.

- ▶ The locking clamp **8** must touch on the cone **7** after hanging it into the rope lock **1** and must be secured by the latch **4**.

- ▶ Release the lever **5**.

Result:

- The lever **5** returns to the initial position and is locked by the safety pin **6**.
- ▶ Check the rope retainer. Visual check.

3.2 Unreeving the hook block



WARNING

Toppling of hook block!
If the retaining pins are **not** pinned in the roller block / the pulley blocks of the hook block before placing the hook block down, then the pulley blocks / the hook block can topple over when unreeving the hoist rope.

Death, severe injury, property damage.

- ▶ Pin the retaining pins, see Crane operating instructions, chapter 5.19 or separate operating instructions.

Make sure that the following prerequisites are met:

- The ground is level and of sufficient load carrying capacity.
- **Only for cranes with crane support:** The crane is properly supported.
- The crane is horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The slewing gear brake is applied.
- The boom end section is just above the ground.



WARNING

Danger of accident due to side wind!

If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.

Personnel can be severely injured or killed.

The crane can collide with close-by structures or objects.

- ▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

3.2.1 Lowering the hook block



WARNING

Crushing of hands!

When unreeving the hook block, it can topple over.

Death, severe injury, property damage.

- ▶ Use the handles in the safe area of the hook block.
- ▶ Make sure the hook block is safely positioned.

- ▶ Lower the hook block and set it on the ground.
- ▶ Remove the hoist limit switch weight.

3.2.2 Detaching the hoist rope

- ▶ On the rope lock **1**, push the safety pin **6** in.
- ▶ Swing the lever **5** „down“ and hold it in this position.

Result:

- The latch **4** is swung downward.
- The locking clamp **8** is released.
- ▶ Push the hoist rope up and detach the locking clamp **8**.
- ▶ Release and unpin the rope retaining pin on the hook block.
- ▶ Unreeve the hoist rope from the hook block and the pulley head.
- ▶ Insert the rope retaining pins again and secure with spring retainers.

4 Reeving in / reeving out the hook block, L-shaped rope end connection (LR 11000 only)



WARNING

Load can be ripped off!

Death, severe bodily injuries, property damage.

- ▶ The L-shaped rope end connection **24** is only permitted for use on LR 11000.
- ▶ It is prohibited to use the L-shaped rope end connection **24** on other crane types.
- ▶ Make sure that the L-shaped rope end connection is only used for **reeving with a even number of strands**.

Depending on the number of rope strands, with the even reeving of the hook block, the L-shaped rope end connection must be installed on one of the pin points (pin point **P1** to pin point **P4**) on the roller set / roller sets.

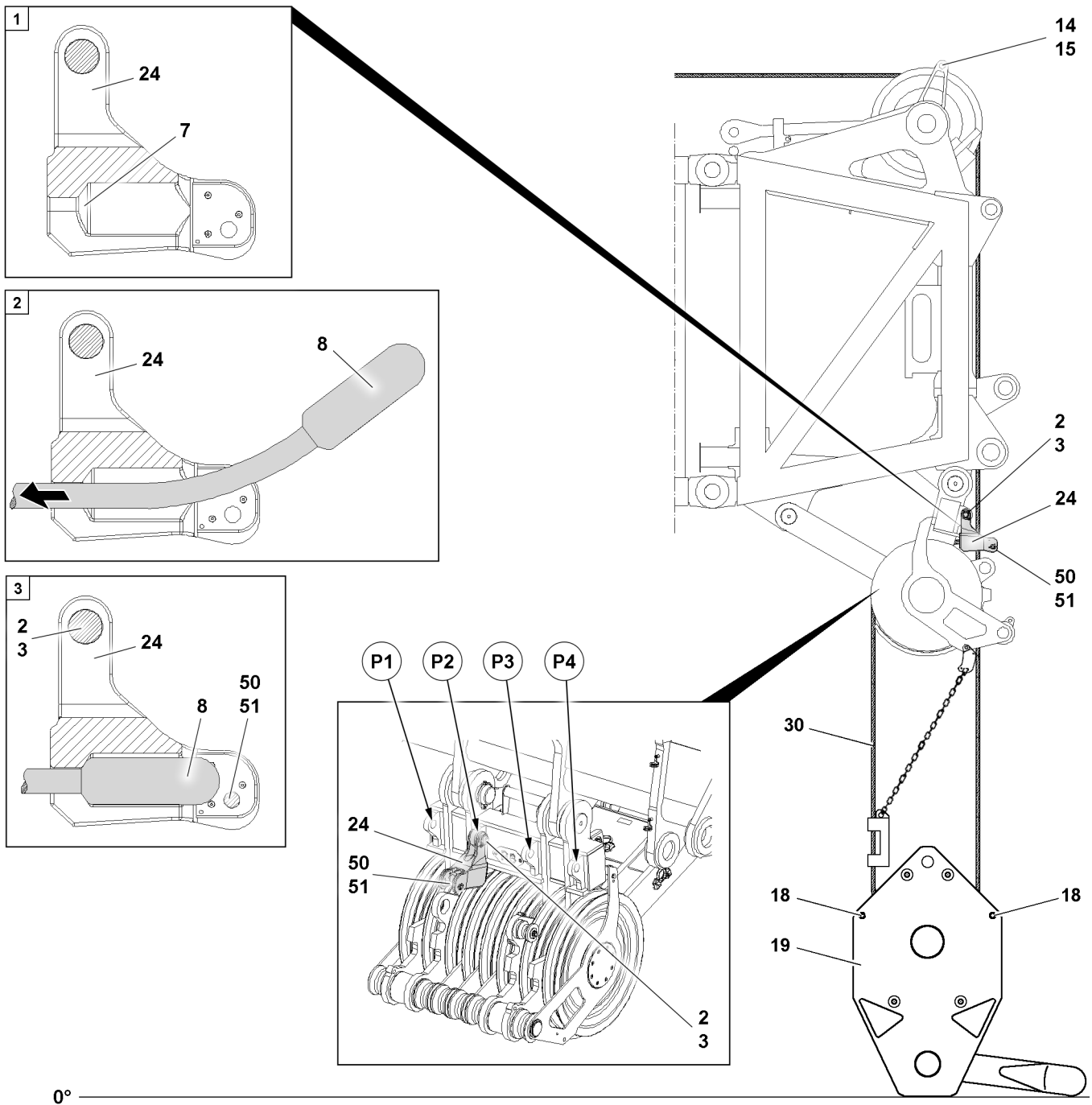


Fig.144022: Details reeving hook block, L-shaped rope end connection 24

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4.1 Reeving in the hook block



WARNING

Toppling of hook block!

If the retaining pins are **not** pinned in the roller block / the pulley blocks of the hook block before placing the hook block down, then the pulley blocks / the hook block can topple over when unreeving the hoist rope.

Death, severe injury, property damage.

- ▶ Pin the retaining pins, see Crane operating instructions, chapter 5.19 or separate operating instructions.

4.1.1 Preparing the hook block

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- The slewing gear brake is applied.
- The hook block is set down on the ground properly.
- The boom is luffed down to the point where the pulley head is above the hook block.
- An assistant is present to guide the hoist rope.



WARNING

Danger of accident due to side wind!

If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.

Death, severe injury, property damage.

The crane can collide with close-by structures or objects.

- ▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

NOTICE

Hook block incorrectly reeved!

Damage to the hoist rope.

- ▶ Carry out the reeving of the hoist rope according to the reeving plan.
- ▶ Select the rope fixed point on the hook block is in such a way that the last strand runs parallel to the remaining rope strands, as much as possible.
- ▶ Set the required hook block under the boom head.
- ▶ At the hook block **19**, remove the spring retainers **18** for both rope retaining pins and pull them both out.



WARNING

Slipping at assembly work!

Danger of falling.

Death, severe injury, property damage.

- ▶ The boom system may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling.
- ▶ If retaining ropes are present on the boom system, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the boom system on the left and right with both snap hooks and secure themselves to prevent them from falling.
- ▶ Without appropriate safety measures it is **strictly** prohibited to step on the boom system.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
- ▶ Carry out all assembly work from a safe location.
- ▶ Observe the assembly guidelines in the Crane operating instructions, chapter 5.01.

- ▶ Reeve the hook block.
- ▶ Insert the rope retaining pins again and secure with spring retainers.

4.1.2 Fitting the hoist rope on the rope lock, L-shaped rope end connection

NOTICE

Hoist rope is incorrectly installed!
Damage to the hoist rope.

- ▶ Always insert the pins **50** from „inside to outside“ and secure from the outside.
- ▶ Only pin the rope lock **24** on the roller set / roller sets and secure with a locking pin **2**.
- ▶ On the rope lock **24**, release and unpin the retaining pin **50**.
- ▶ Fit the rope end with the locking clamp **8** in the rope lock **24** and pull the rope firmly in the direction of the arrow, until the locking clamp **8** contacts the cone **7**.



WARNING

Locking clamp is incorrectly installed!
Danger of accident.
Death, severe injuries, property damage.

- ▶ The locking clamp **8** must touch on the cone **7** after fitting it into the rope lock **24** and must be secured by the retaining pin **50**.
- ▶ Insert the retaining pin **50** and secure properly with the retaining element **51**.
- ▶ Check the rope retainer. Visual check.

4.2 Unreeving the hook block



WARNING

Toppling of hook block!
If the retaining pins are **not** pinned in the roller block / the pulley blocks of the hook block before placing the hook block down, then the pulley blocks / the hook block can topple over when unreeving the hoist rope.
Death, severe injury, property damage.

- ▶ Pin the retaining pins, see Crane operating instructions, chapter 5.19 or separate operating instructions.

Make sure that the following prerequisites are met:

- The ground is level and of sufficient load bearing capacity.
- **Only for cranes with crane support:** The crane is properly supported.
- The crane is horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The slewing gear brake is applied.
- The boom end section is just above the ground.



WARNING

Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.
Personnel can be severely injured or killed.
The crane can collide with close-by structures or objects.

- ▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

4.2.1 Lowering the hook block

**WARNING**

Crushing of hands!

When unreeving the hook block, it can topple over.

Death, severe injury, property damage.

- ▶ Use the handles in the safe area of the hook block.
- ▶ Make sure the hook block is safely positioned.

- ▶ Lower the hook block and set it on the ground.
- ▶ Remove the hoist limit switch weight.

4.2.2 Detaching the hoist rope

- ▶ On the rope lock **24**, release and unpin the retaining pin **50**.

Result:

- The locking clamp **8** is released.
- ▶ Push the hoist rope forward and detach the locking clamp **8**.
- ▶ Release and unpin the rope retaining pin on the hook block.
- ▶ Unreeve the hoist rope from the hook block and the pulley head.
- ▶ Insert the rope retaining pins again and secure with spring retainers.

5 Attaching and removing the load hook*

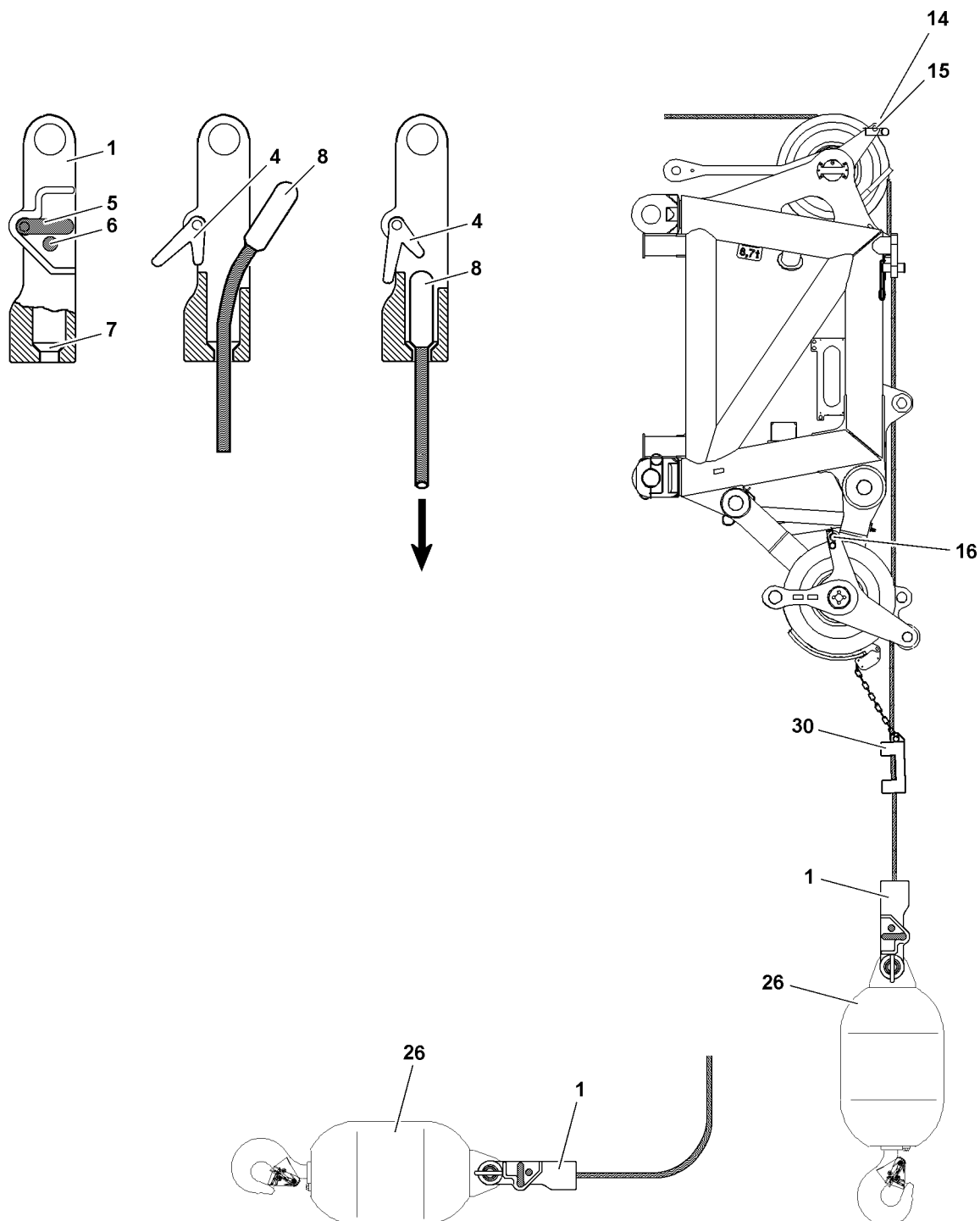


Fig.121854: Fastening load hook

5.1 Fastening the load hook*

5.1.1 Assembling the load hook*

- ▶ Place the load hook under the pulley head of the boom.
- ▶ Release and unpin the rope retaining pins on the back pulley and on the pulley head.

**WARNING**

Slipping at assembly work!

Danger of falling.

Death, severe injury, property damage.

- ▶ The boom system may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling.
- ▶ If retaining ropes are present on the boom system, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the boom system on the left and right with both snap hooks and secure themselves to prevent them from falling.
- ▶ Without appropriate safety measures it is **strictly** prohibited to step on the boom system.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
- ▶ Carry out all assembly work from a safe location.
- ▶ Observe the assembly guidelines in the Crane operating instructions, chapter 5.01.

- ▶ Place the hoist rope over the back pulley on the boom head.
- ▶ Insert the rope retaining pins again and secure with spring retainers.
- ▶ Pin the rope lock **1** in the load hook **26** and secure with spring retainers.

5.1.2 Fastening the hoist rope

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- The slewing gear brake is applied.
- The hook block is set down on the ground properly.
- The boom is luffed down to the point where the pulley head is above the hook block.
- An assistant is present to guide the hoist rope.

**WARNING**

Danger of accident due to side wind!

If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.

Personnel can be severely injured or killed.

The crane can collide with close-by structures or objects.

- ▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.
- ▶ On the rope lock **1**, push the safety pin **6** in.
- ▶ Swing the lever **5** „down“ and hold it in this position.

Result:

- The latch **4** is swung „downward“.
- ▶ Attach the rope end with the locking clamp **8** in the rope lock and pull „down“ firmly (in direction of arrow), until the locking clamp **8** is touching in the cone **7**.

**WARNING**

Locking clamp is incorrectly fastened!

Damage to locking clamp.

Death, severe injuries, property damage

- ▶ The locking clamp **8** must touch on the cone **7** after hanging it into the rope lock **1** and must be secured by the latch **4**.

- ▶ Release the lever **5**.

Result:

- The lever **5** returns to the initial position and is locked by the safety pin **6**.

5.2 Removing the load hook*

Make sure that the following prerequisites are met:

- The ground is level and of sufficient load carrying capacity.
- **Only for cranes with crane support:** The crane is properly supported.
- The crane is horizontally aligned.
- The slewing gear brake is applied.
- The load hook is prepared for assembly.
- An assistant is present to guide the hoist rope.

5.2.1 Lowering the load hook



WARNING

Crushing of hands!

When unreeving the hook block, it can topple over.
Death, severe injury, property damage.

- ▶ Use the handles in the safe area of the hook block.
- ▶ Make sure the hook block is safely positioned.

- ▶ Place the load hook **26** on the ground.
- ▶ Remove the hoist limit switch weight.

5.2.2 Detaching the hoist rope



WARNING

Danger of accident due to side wind!

If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.

Death, severe injury, property damage.

The crane can collide with close-by structures or objects.

- ▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

- ▶ On the rope lock **1**, push the safety pin **6** in.
- ▶ Swing the lever **5** „down“ and hold it in this position.

Result:

- The latch **4** is swung „downward“.
- The locking clamp **8** is released.
- ▶ Push the hoist rope in the direction of the load hook and detach the locking clamp **8**.
- ▶ Remove the rope retaining pins on the pulley head and on the back pulley.
- ▶ Lift the hoist rope from the rope pulleys.
- ▶ Insert the rope retaining pins again and secure with spring retainers.

6 Attaching / removing the hoist limit switch weight

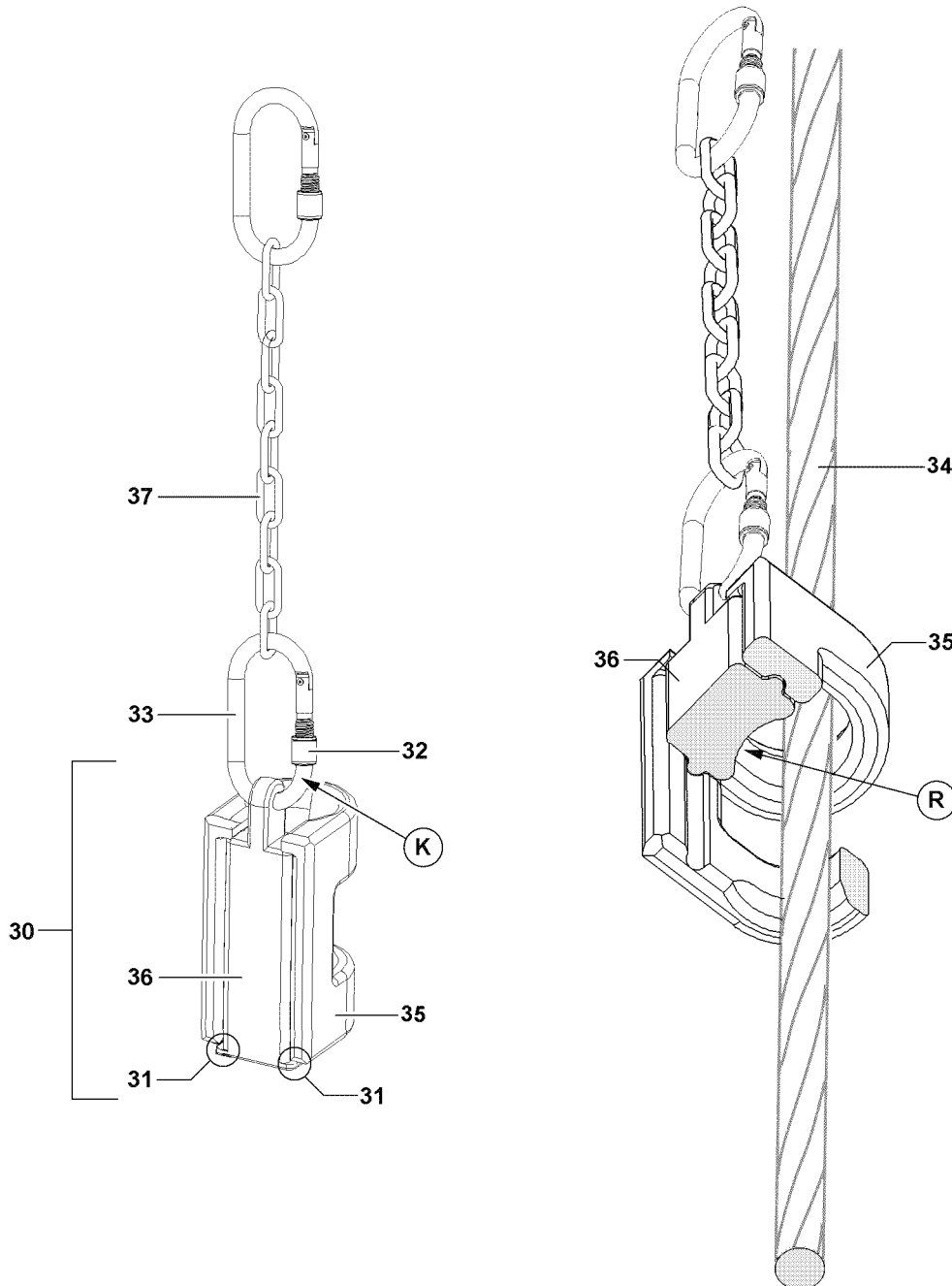


Fig.122728: Details Hoist limit switch weight

6.1 Attaching the hoist limit switch weight

The hoist limit switch weight **30** consists of two parts, which are pushed into each other:

- The weight **35**
- The carrier section **36**

► Loosen and open the screw retainer **32**.

**WARNING**

Hoist limit switch weight is incorrectly installed!

Hoist limit switch weight can fall down. Death, severe injuries.

- ▶ Do not replace the snap hook **33** with other parts, such as a shackle or similar.
- ▶ When detaching or attaching the hoist limit switch weight **30** make sure that the weight **35** and the carrier section **36** do not fall down.
- ▶ Make sure that the curvature **R** of the carrier section **36** points to the hoist rope **34**.
- ▶ Make sure that the noses **31** of the carrier section **36** is placed on the weight **35**.
- ▶ Make sure that the screw retainer **32** can be turned to be closed from top to bottom, point **K**.

The attachment of the hoist limit switch weight **30** depends on the position of the rope fixed point.

Rope fixed point on the pulley head:

- In the event of multiple hoist rope reeving, the hoist limit switch weight **30** must always be laid around the „stationary rope strand“, in other words around the rope strand that leads directly to the cable lock.

Rope fixed point on hook block:

- The hoist limit switch weight **30** is laid around the outer strand which shows the least angular pull, i.e. the one with the smallest angle between the hanging hoist limit switch weight and the hoist rope.

**Note**

- ▶ The chain **37** must be attached in full length during crane operation and may not be shortened.
- ▶ Push the weight **35** with one hand on the hoist rope **34** and hold.
- ▶ With the other hand, guide the carrier section **36** behind the hoist rope **34** and under the weight **35**. The curvature **R** of the carrier section **36** must point to the hoist rope **34**.
- ▶ Push the weight **35** on the carrier section **36**.
- ▶ Hang in the hoist limit switch weight **30** with the carrier section **36** in the snap hook **33**.

The snap hook **33** must be secured with the screw retainer **32**.

- ▶ Screw the screw retainer **32** closed on the snap hook **33**.

6.2 Removing the hoist limit switch weight

**WARNING**

Hoist limit switch weight is incorrectly installed!

Hoist limit switch weight can fall down. Death, severe injuries.

- ▶ When detaching or attaching the hoist limit switch weight **30** make sure that the weight **35** and the carrier section **36** do not fall down.
- ▶ It is prohibited to remain within the danger zone.
- ▶ Release and open the screw retainer **32** on the snap hook **33**.
- ▶ Detach the hoist limit switch weight **30** from the snap hook **33**.
- ▶ Hold the weight **35** with one hand and with the other hand, push the carrier section **36** from the weight **35**.
- ▶ Store the weight **35** and carrier section **36** safely.

7 Assembling / disassembling the wedge lock

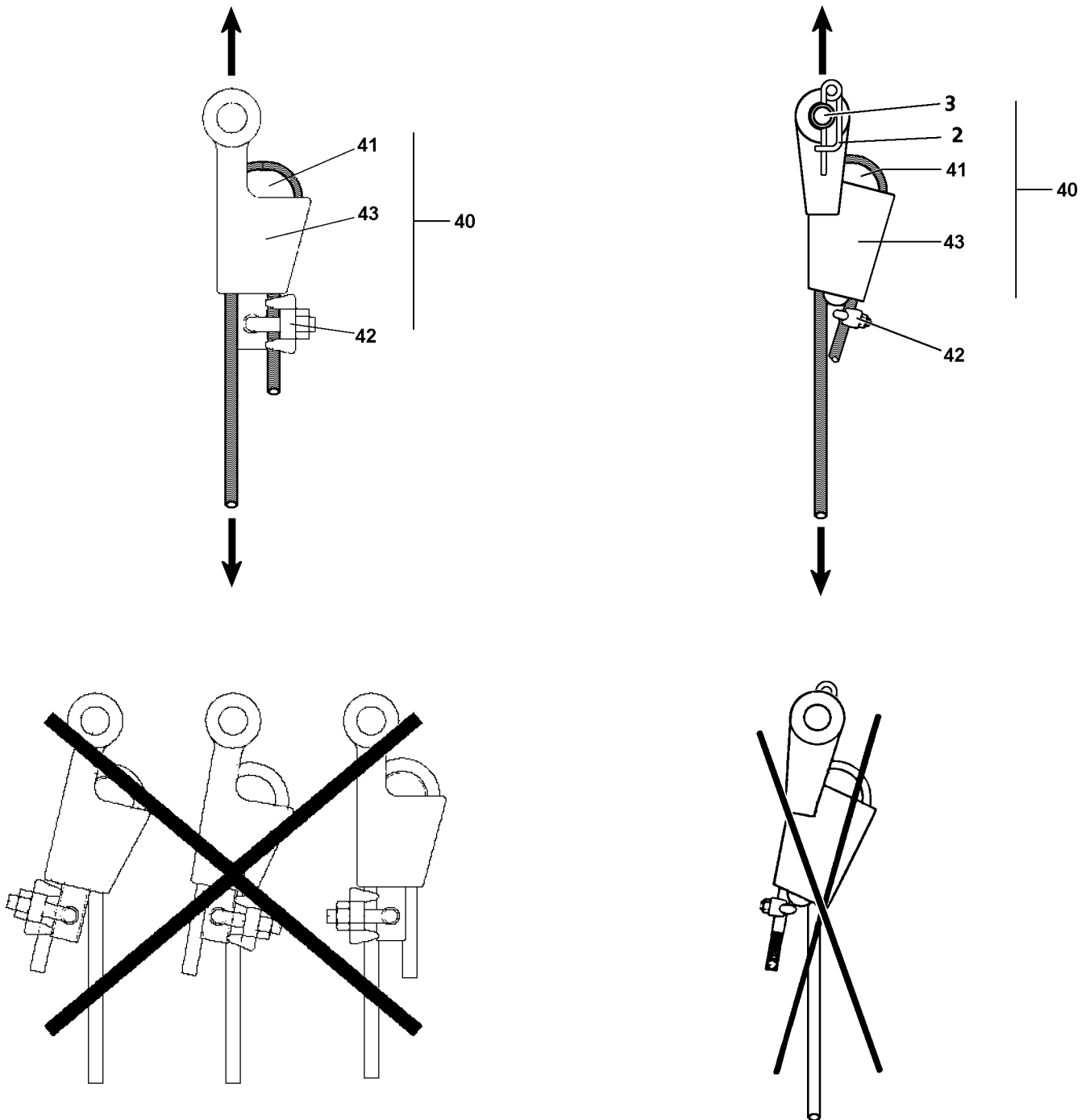


Fig.122729: Wedge lock

Make sure that the following prerequisites are met:

- The rope clamp is cut off on the hoist rope.
- The hook block or the load hook is ready for assembly.

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7.1 Installing the wedge lock



WARNING

Wedge lock is incorrectly installed!

Hook block or load can fall down. Death, severe injuries, property damage.

- ▶ Use only a wedge lock **40** approved by Liebherr-Werk Ehingen.
- ▶ Install the wedge lock **40** correctly.
- ▶ Place the hoist rope with the wedge **41** into the housing **43** in such a way that the rope strand runs in the pull axle of the wedge lock **40**.
- ▶ The dead end of the rope must be secured by the clamp **42** to prevent it from being pulled through.
- ▶ It is prohibited for personnel to remain in the danger zone.

- ▶ Take a matching wedge lock **40** from the tool box.
- ▶ Place the hoist rope with the wedge **41** into the housing **43**.
- ▶ If possible, assemble the clamp **42** through the wedge **41** on the dead end of the rope.

NOTICE

Damage to the hoist rope!

If the pin **3** has been assembled incorrectly, the hoist rope may rub against the pin **3** or on the lynch pin **2**.

- ▶ Always insert the pins **3** from „inside to outside“ and secure from the outside.
- ▶ Pin and secure the wedge lock **40** on the fixed point of the pulley head or on the fixed point of the hook block or on the load hook, depending on the reeving plan.

7.2 Removing the wedge lock

- ▶ Unpin the wedge lock **40** on the fixed point.
- ▶ Remove the clamp **42** and pull the hoist rope with the wedge from the housing.
- ▶ Store the wedge lock **40**.

8 Rope reeving

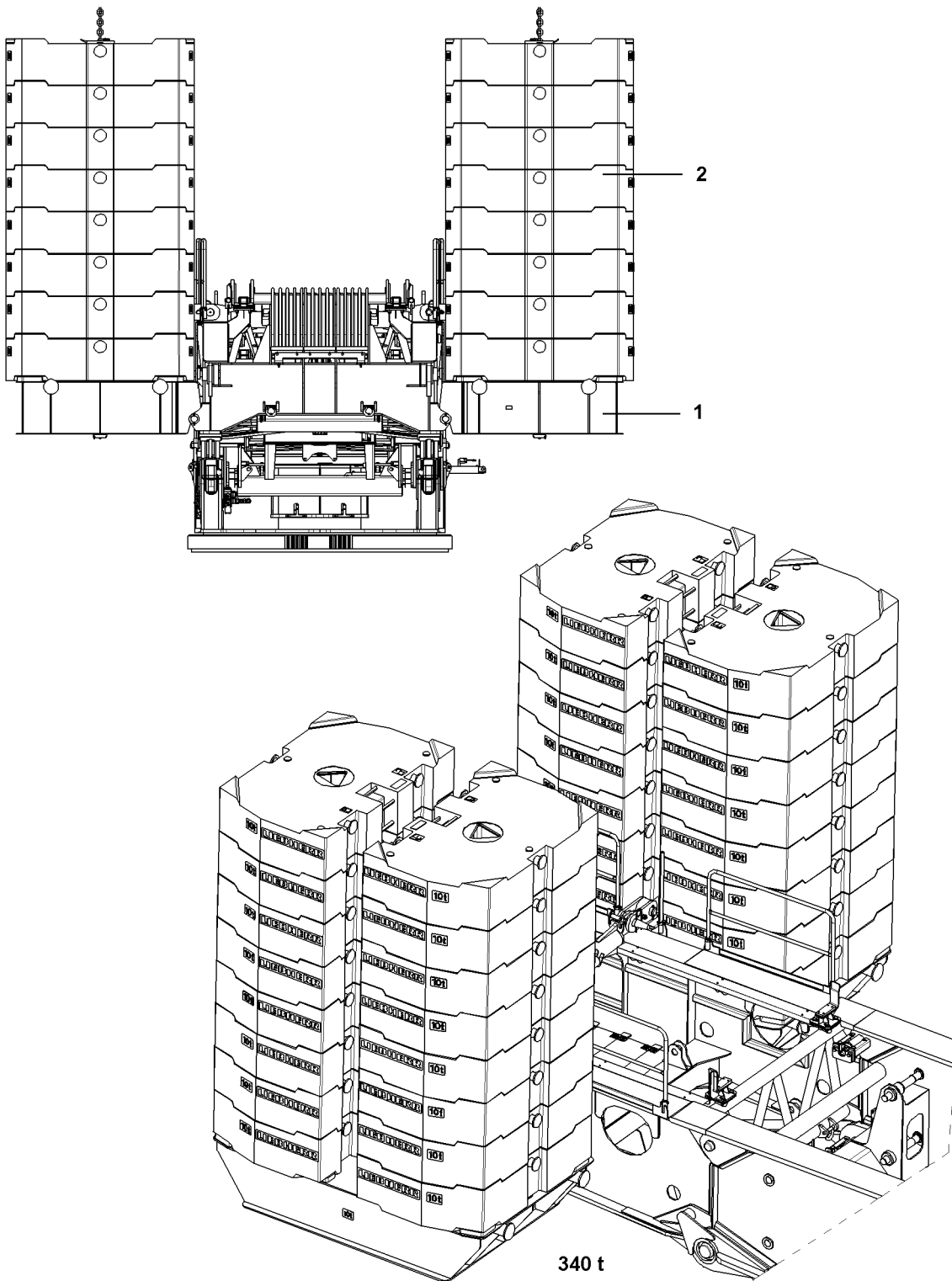


Note

- ▶ See separate reeving plans.

4.07 Counterweight

| | | |
|---|-------------|----|
| 1 | General | 3 |
| 2 | Assembly | 13 |
| 3 | Disassembly | 21 |



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Fig.103023

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!

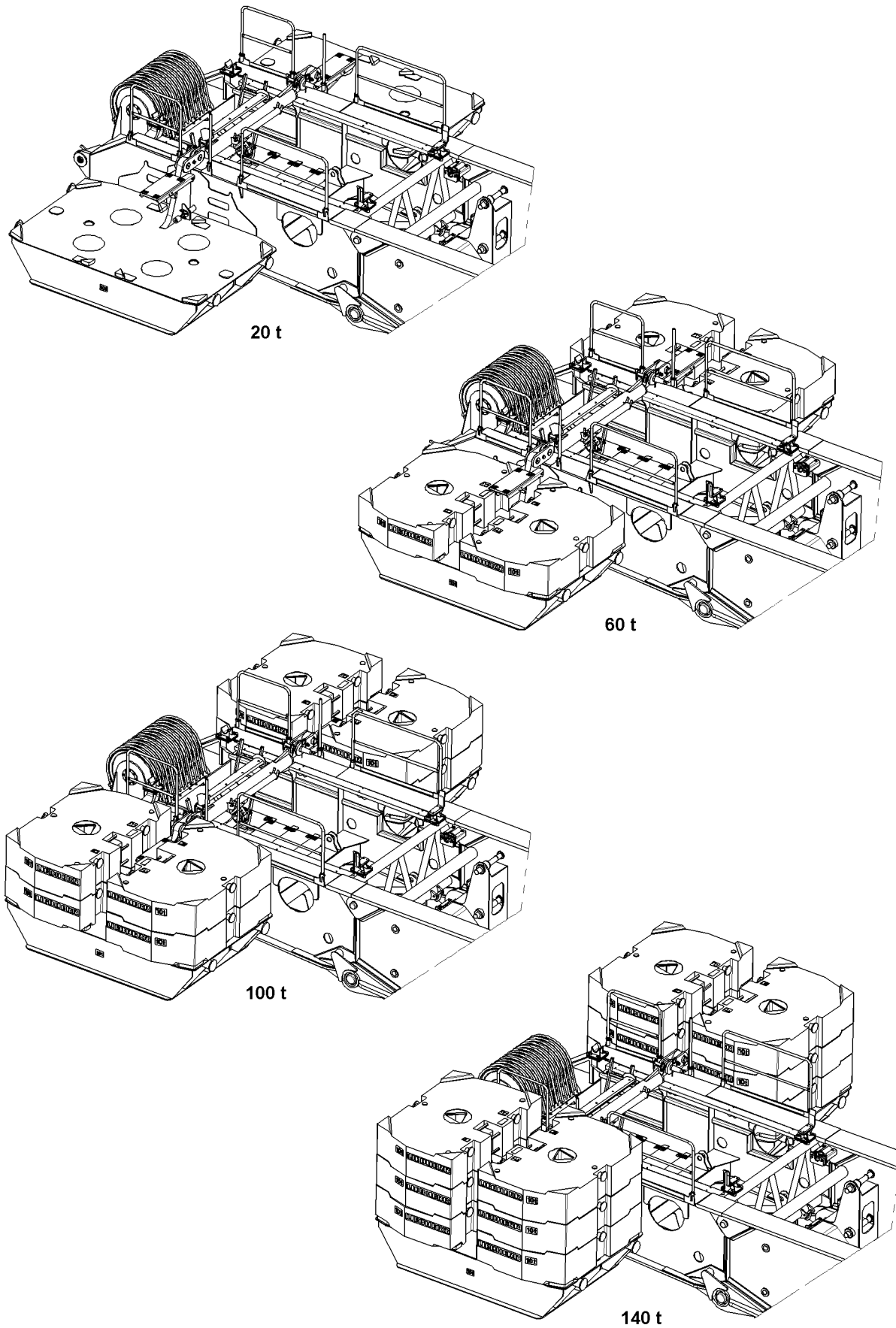


Fig.103024

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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 |

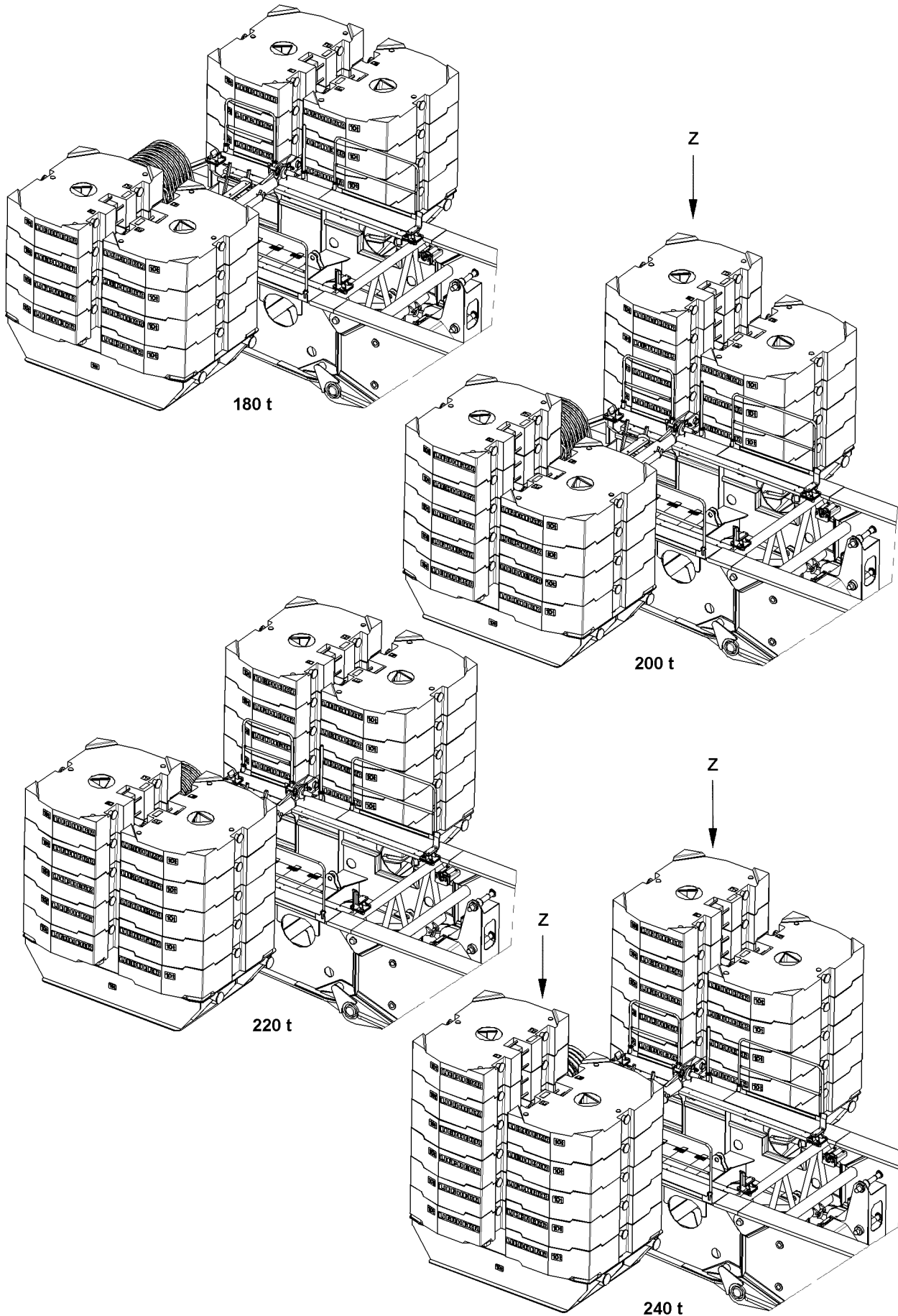


Fig.103025

LWELR 11350-007/19005-01-02/en

| 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.

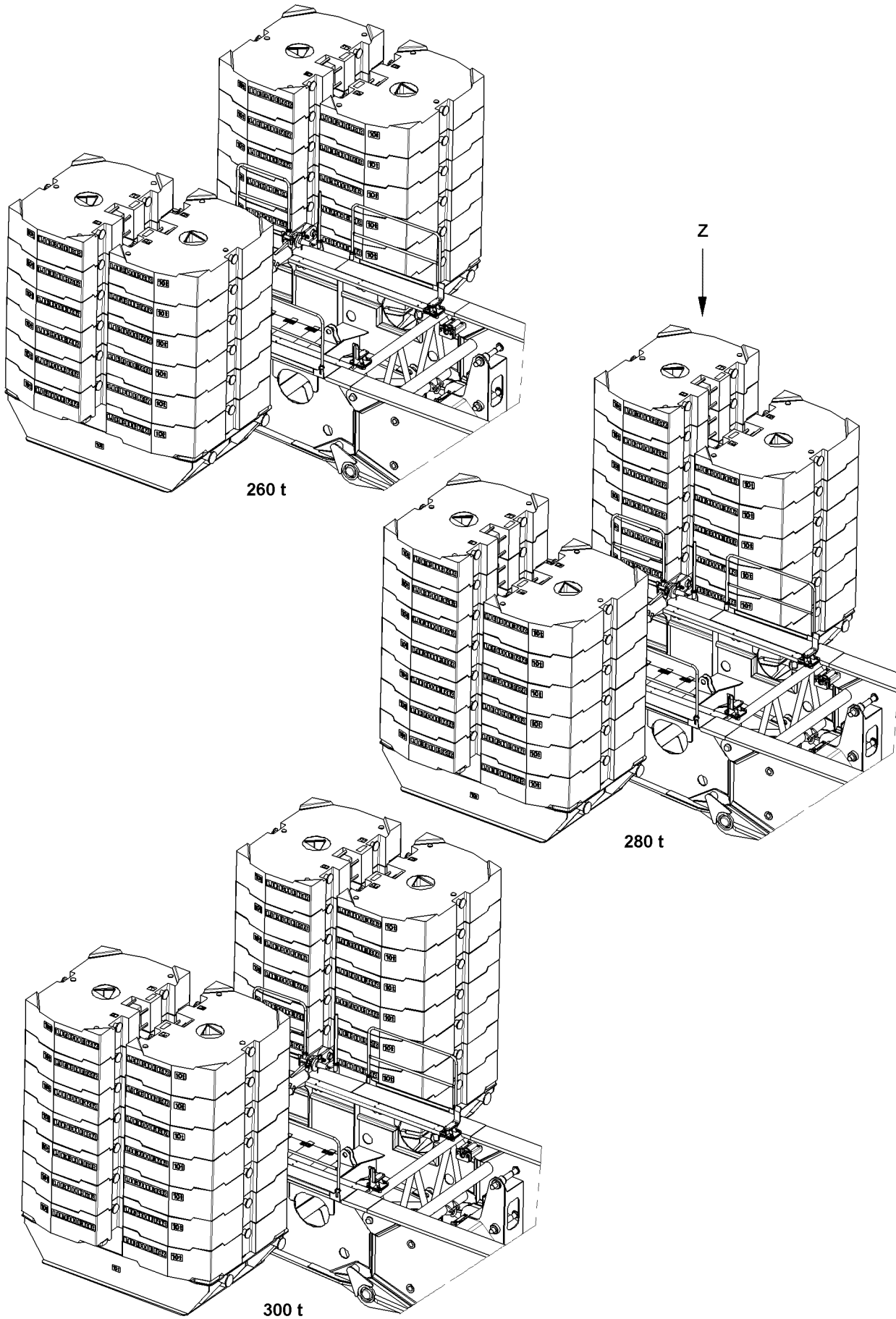


Fig.103026

LWE/LR 11350-007/19005-01-02/en

| 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 |

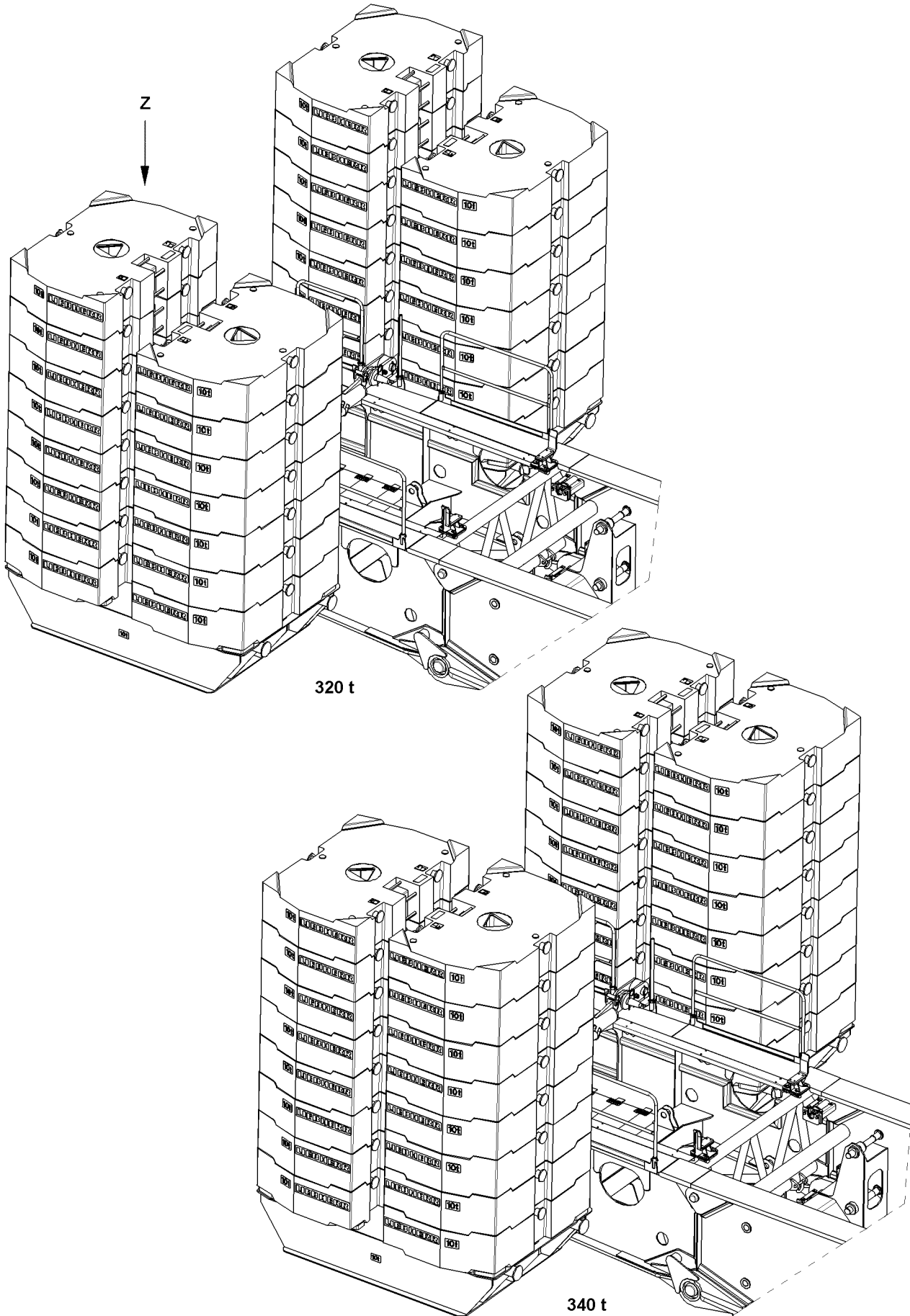


Fig.103027

LWELR 11350-007/19005-01-02/en

| 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 |

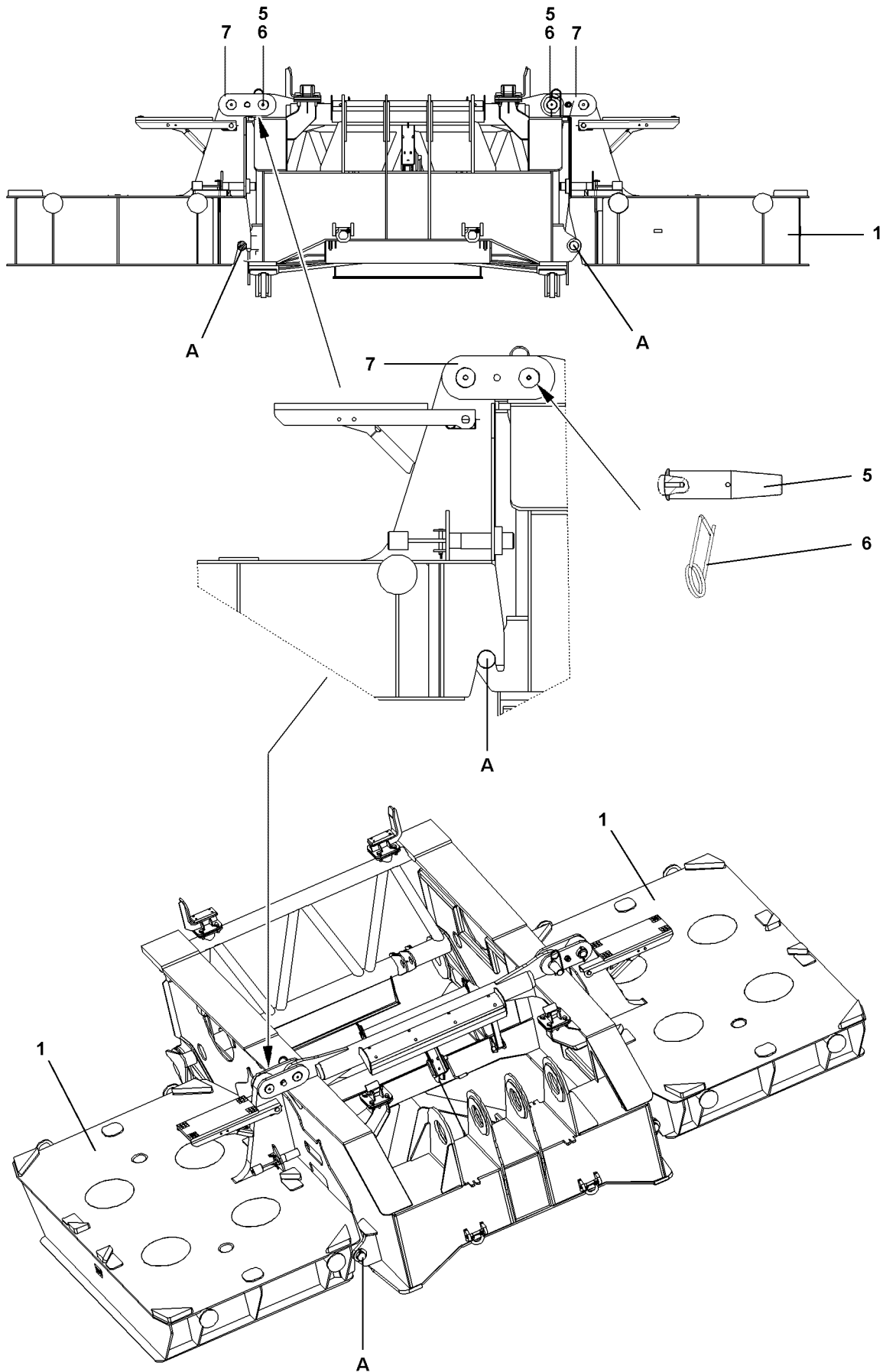


Fig.103028

LWE/LR 11350-007/19005-01-02/en

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**.

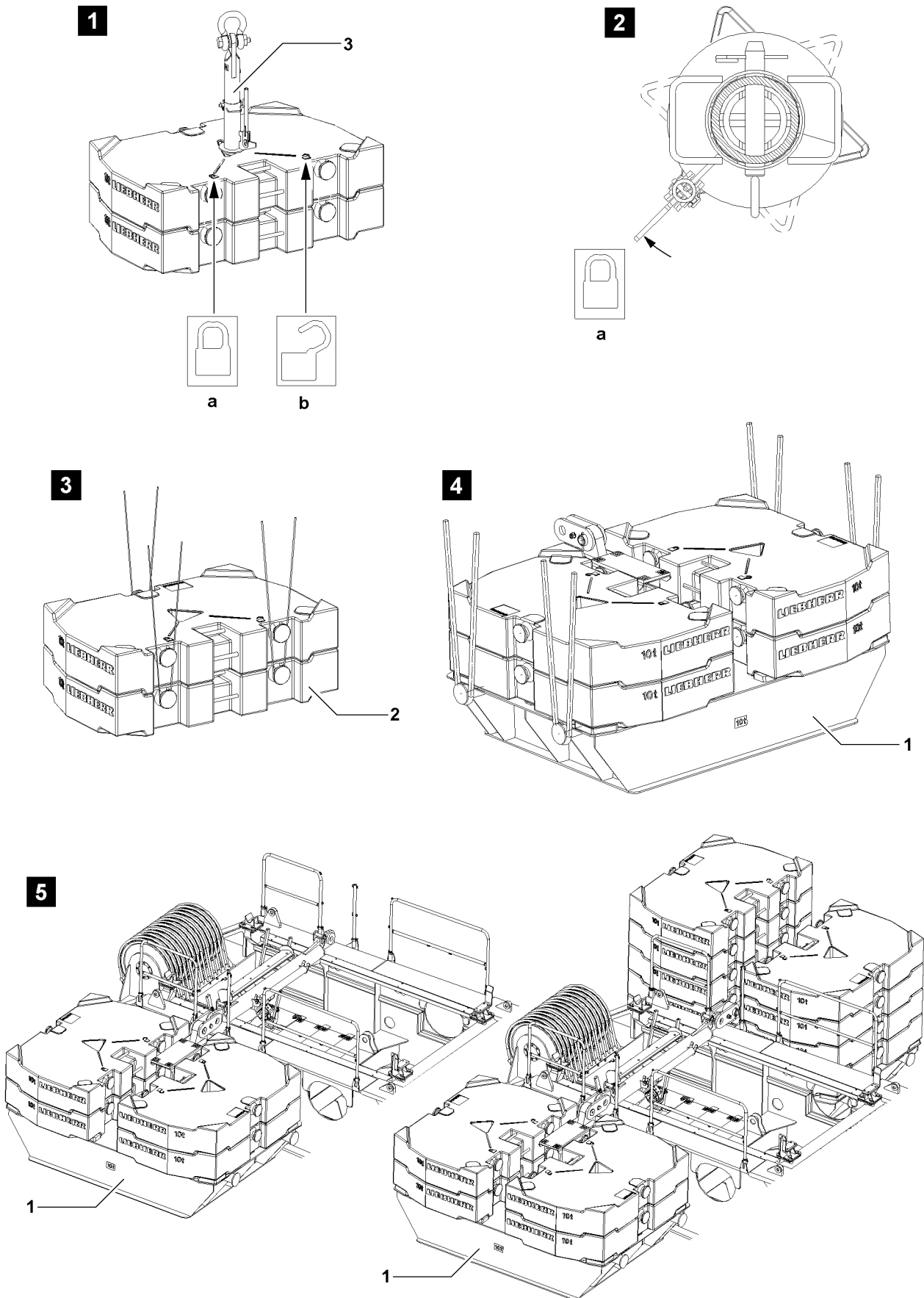


Fig.109394

LWE/LR 11350-007/19005-01-02/en

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

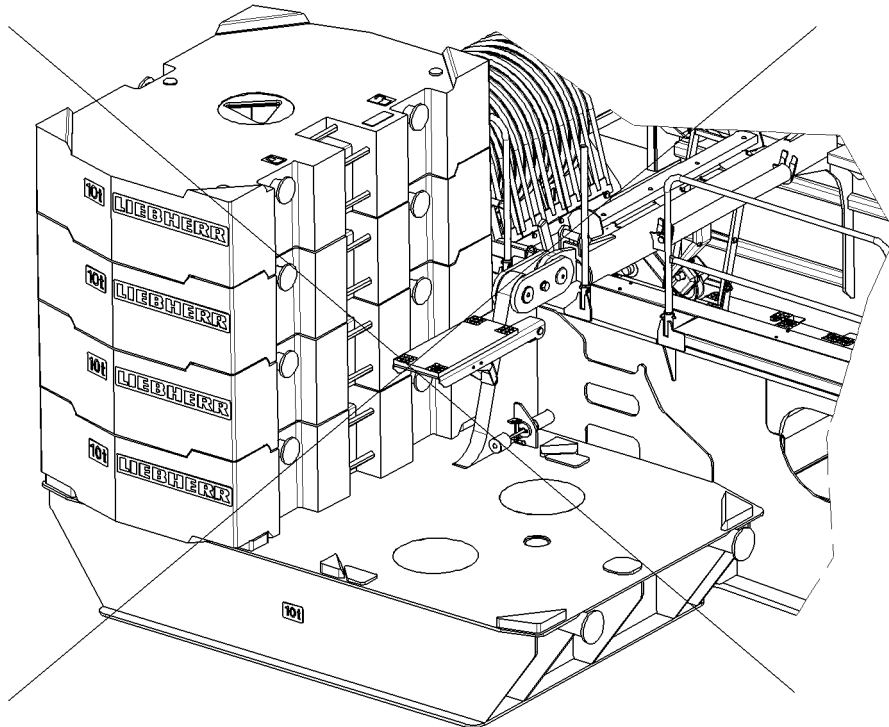
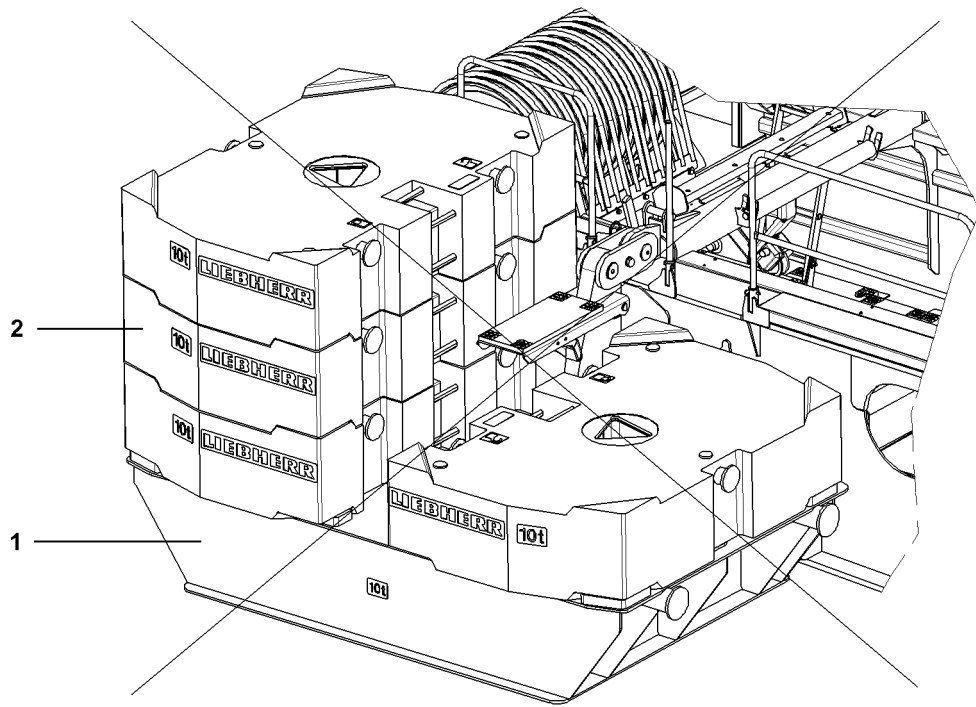


Fig.103030

LWE/LR 11350-007/19005-01-02/en

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.

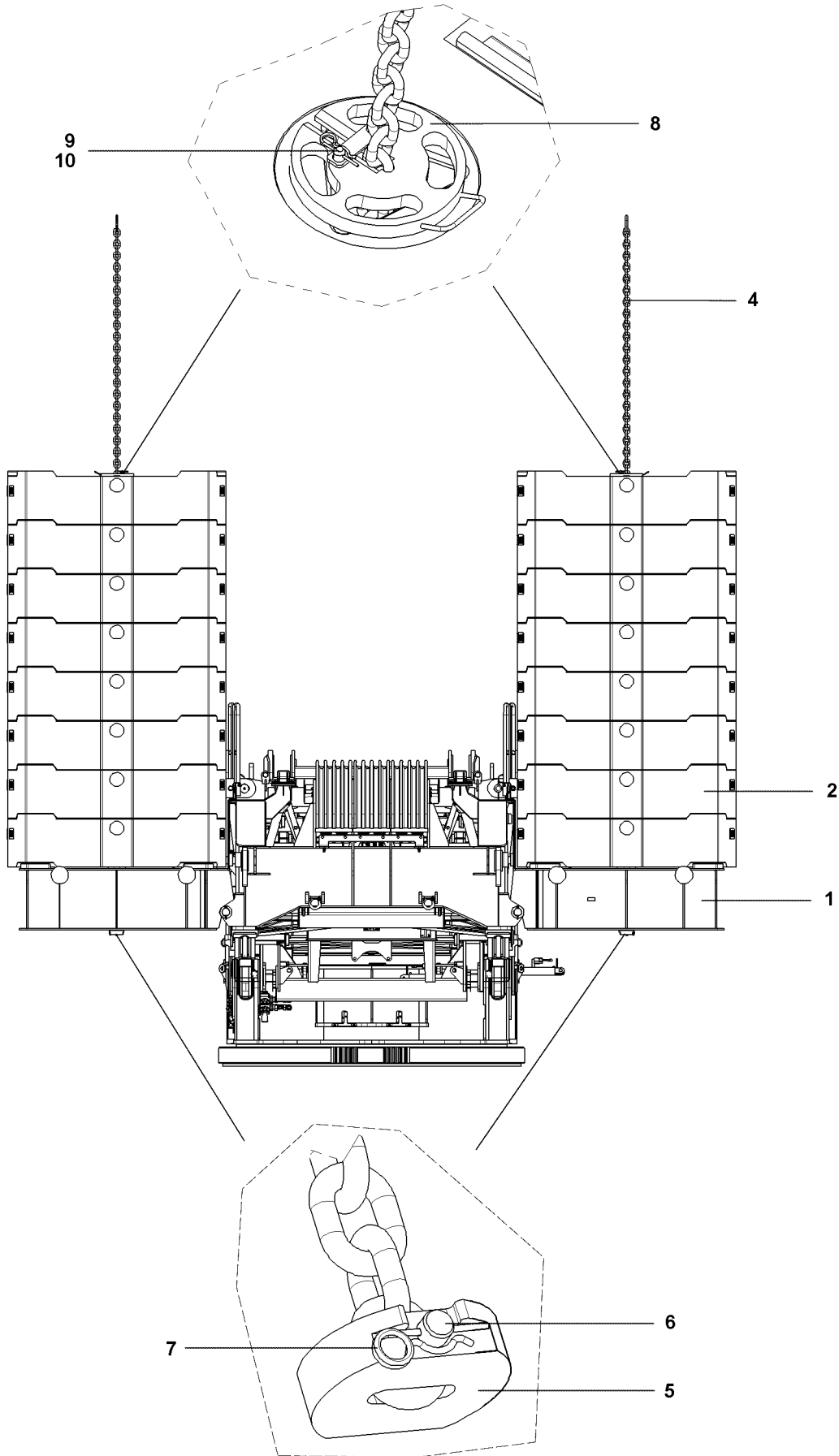


Fig.103031

LWE/LR 11350-007/19005-01-02/en

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**.

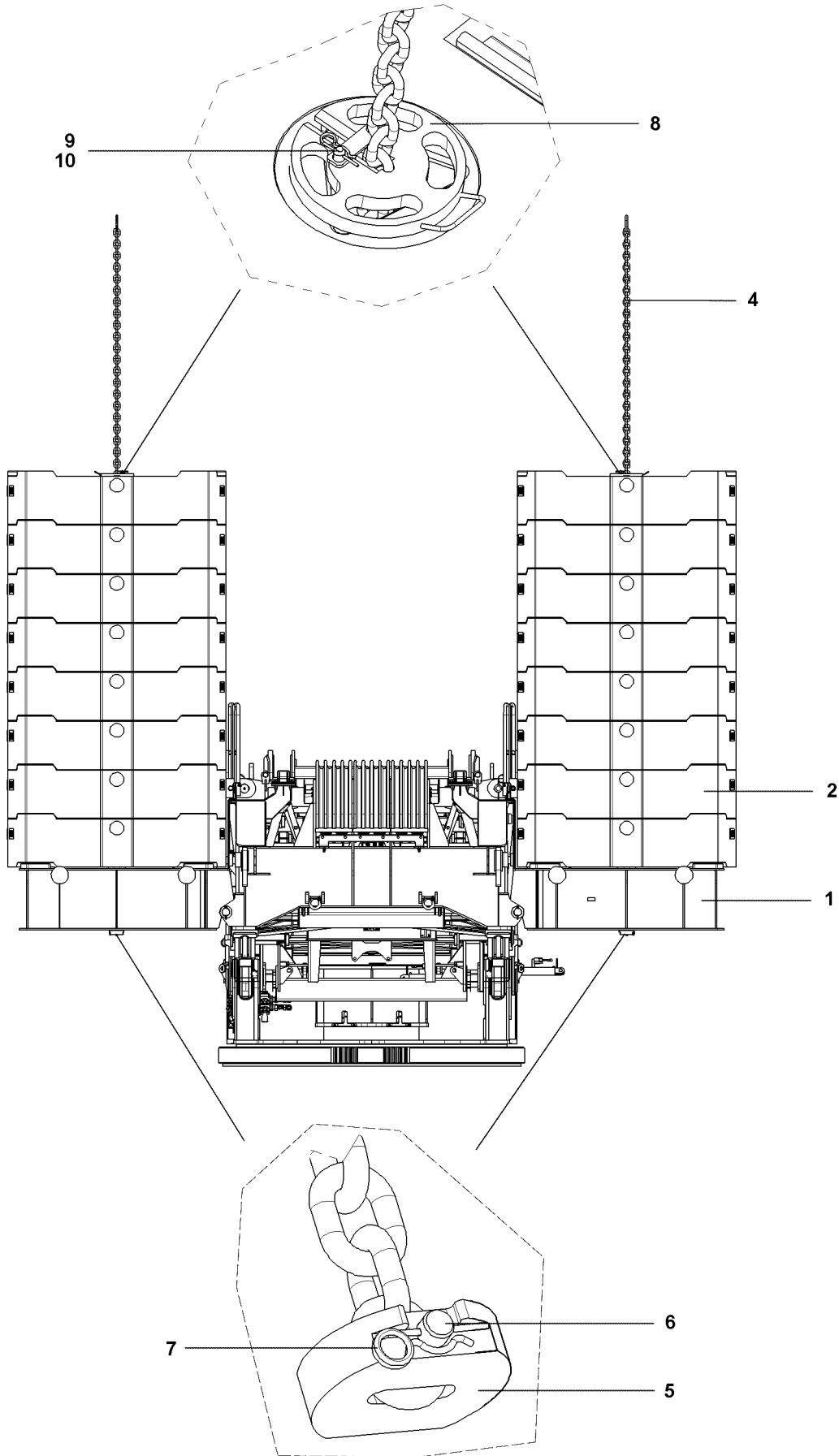


Fig.103031

LWE/LR 11350-007/19005-01-02/en

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.

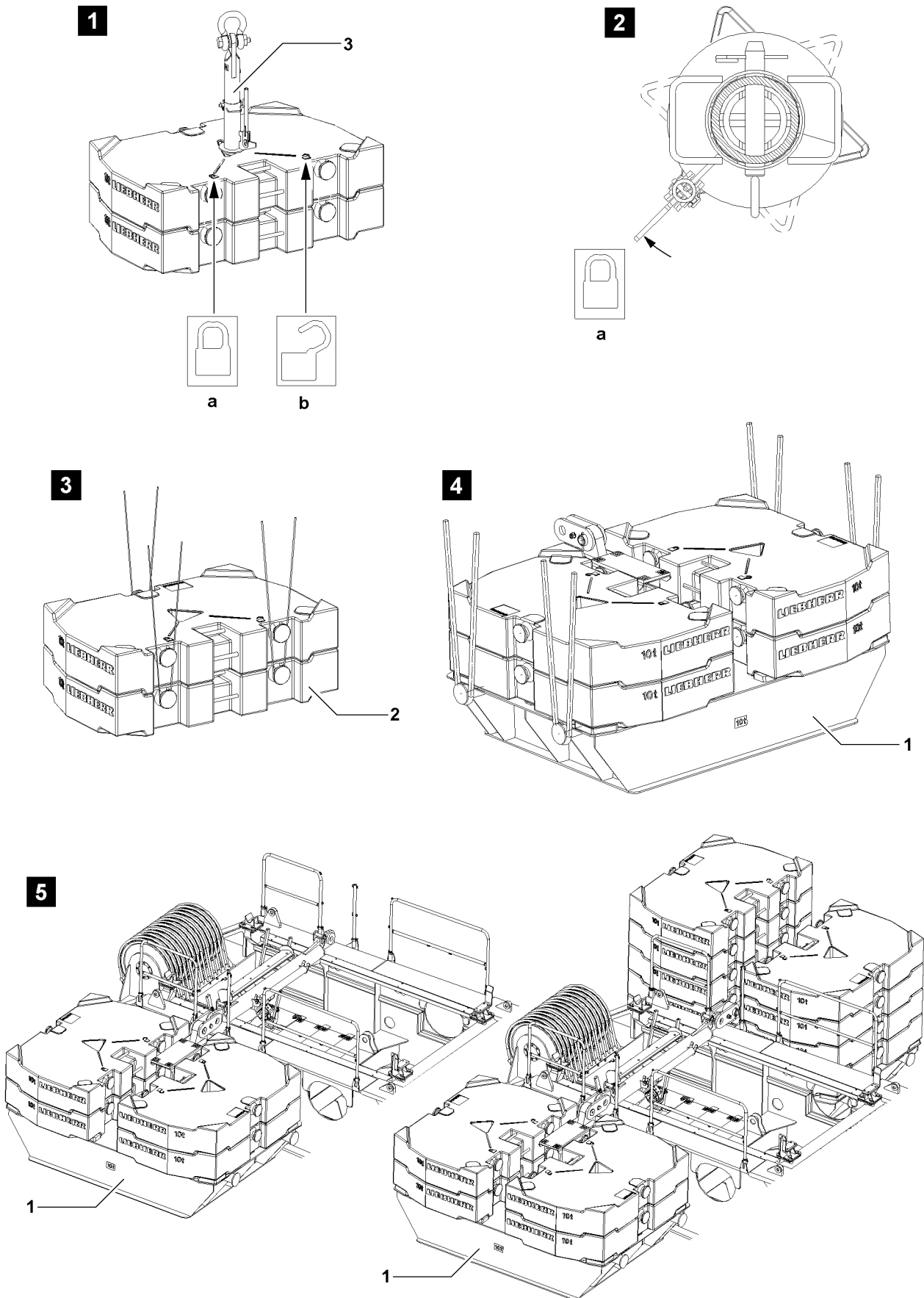


Fig.109394

LWE/LR 11350-007/19005-01-02/en

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.

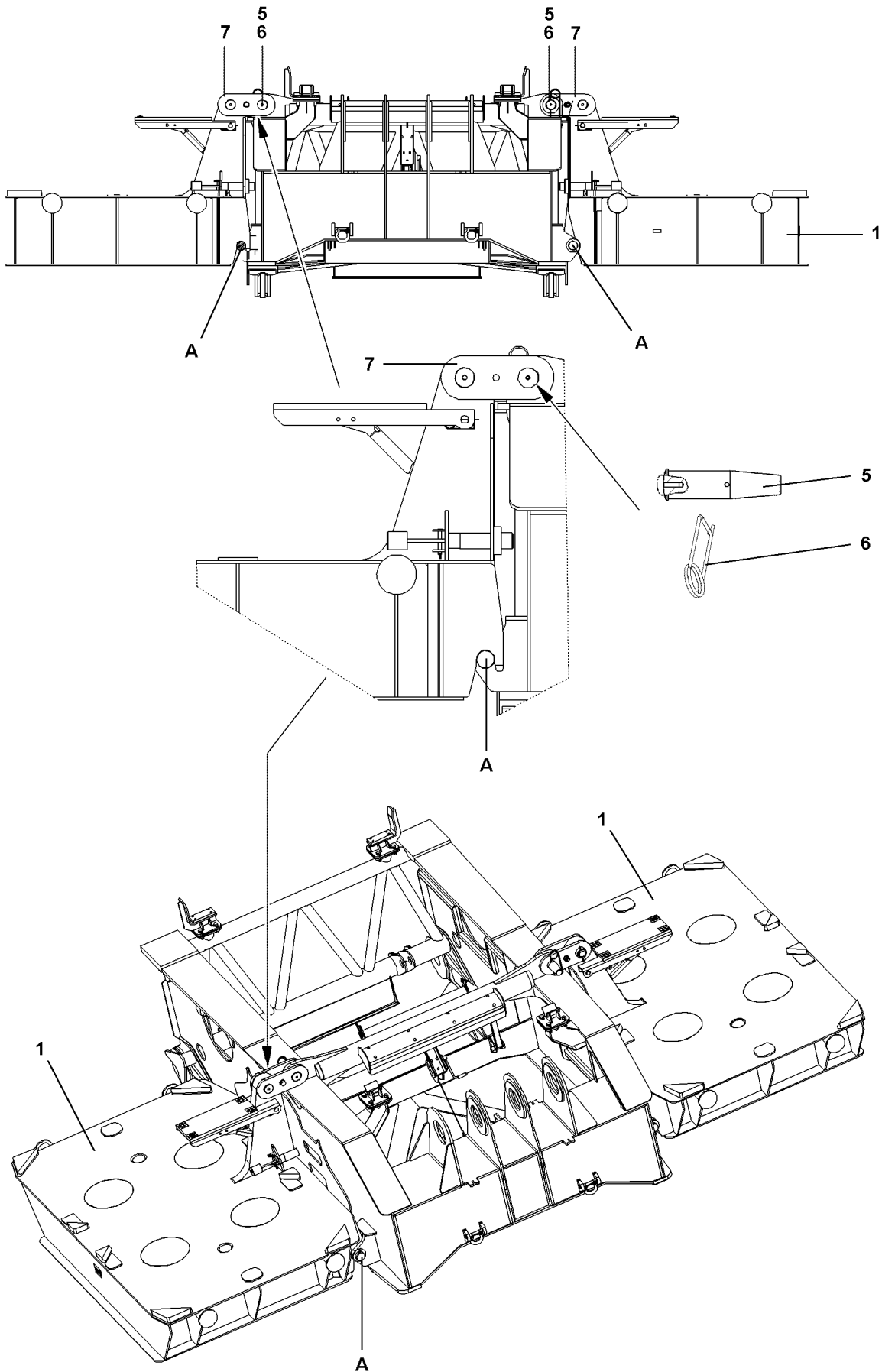


Fig.103028

LWE/LR 11350-007/19005-01-02/en

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**.

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4.08 Working with a load

| | | |
|---|---|----|
| 1 | Safety instructions | 3 |
| 2 | Checks before starting to work with the crane | 4 |
| 3 | Telescoping crane movement | 5 |
| 4 | Taking on a load | 7 |
| 5 | Crane operation | 13 |
| 6 | Ram work or pulling sheet piles | 14 |
| 7 | Crane rope pretension | 15 |

Fig.195219

LWE/LR 11350-007/19005-01-02/en

1 Safety instructions

In addition, observe the general technical safety instructions in chapter 2.04.

In steep boom positions for which no loads are specified in the load charts, there is a danger of tipping to the rear to the counterweight side.

The danger of tipping to the rear exists especially in case of:

- Crane operation on tires
- Supported, with retracted sliding beams
- Reduced support base



WARNING

Crane operation in steep boom positions for which no loads are specified in the load charts!

The crane can tip to the rear and fatally injure personnel.

- ▶ Comply with the boom radius specified in the load chart.
- ▶ Crane operation outside the permissible set up configurations, boom radii and slewing ranges according to the load chart is prohibited.



WARNING

Incorrect reeving number set up!

If the reeving number on the pulley head is less than the reeving number set on the LICCON computer system, it can result in an overload of the hoist rope.

The hoist rope can rip. The load can fall down and fatally injure personnel.

- ▶ Comply with the reeving numbers specified in the load chart for maximum loads.
- ▶ Make sure that the reeving on the pulley head and the reeving set on the LICCON computer system match.

The minimum rope coils must remain on the rope winches. The number of minimum rope coils depends on if the rope winch is equipped with a cam limit switch or a winch speed sensor.



WARNING

Minimum rope coils fallen below!

The rope will be ripped out. The load falls down.

Personnel can be killed.

- ▶ Make sure that the minimum rope coils remain on the rope winch.
- ▶ Observe and comply with the number of the minimum rope coils in chapter 5.01.



WARNING

Lift the load by luffing up!

The crane can topple over and fatally injure personnel.

- ▶ Lift the load with the hoist gear.

Always comply with the maximum loads specified in the load chart.

The weight of the hook block according the load chart must be taken into account. Subtract the weight of the hook block from the load chart value. The minimum hook block weight must be determined according to the reeving number and the data in the load charts.

For the stroke, use the hook block which is suited best for the existing set up configuration in connection with the load chart.

Initiate all crane movements carefully. Also brake the crane movements carefully. That way you can avoid a swinging or pendulum motion in the suspended load.

2 Checks before starting to work with the crane

Before starting work with the crane, the crane operator must carry out a further inspection to satisfy himself about the crane's operational safety:

- Check that the crane is properly supported and level.
- Check that the set up configuration set in the control matches the actual set up configuration.
- Check that all values in the load chart that apply to the current equipment configuration have been entered and met.
- Ensure that there are no people or objects within the danger zone of the crane.



WARNING

Persons in the slewing range!
Crushing danger, death, severe bodily injuries.

- ▶ Monitor the slewing range.
- ▶ Make sure that there are **no** persons within the slewing range.
- ▶ Block off the slewing range if necessary.



WARNING

Obstacle in the slewing range!
Property damage on crane and on obstacle.

- ▶ Make sure that there are **no** obstacles within the turning range of the crane and the crane components.

2.1 Visual check for damage



WARNING

Danger of accident!

If the crane is operated despite existing defects, personnel can be severely injured or killed.

- ▶ In the event of deficiencies which threaten operational safety, stop crane operation immediately.

The following deficiencies threaten the crane's operational safety:

- Damage to load-bearing parts of the crane design, such as booms, supports etc.
- Failure of the hoist gear brake and consequent slipping of the load
- Functional failures in the crane control system
- Functional defects in the indicator and warning lights
- Damage to the hoist ropes
- Safety defects in the safety equipment
- Leaks on safety relevant components of the crane hydraulic

Inform the appropriate supervisor about the deficiencies on the crane and also inform your relief when crane operators are changed.

2.2 Operating with telescopic boom and auxiliary boom

When operating with a telescopic boom and auxiliary boom in the 0° position and with a steep luffed up telescopic boom, the hook blocks can collide with the telescopic boom or the auxiliary boom.

NOTICE

Operation with the telescopic boom and auxiliary boom in the 0° position and steep luffed up telescopic boom!

The hook block can collide with the telescopic boom or auxiliary boom.

- ▶ Make sure that the hook block is always at a sufficient distance from the crane structure.

Before collision of the hook block with the telescopic boom or the auxiliary boom:

- ▶ Stop spooling up the winch or end luffing up the boom.

With a hydraulic auxiliary boom:

- ▶ Increase the freedom of movement of the hook block with respect to the auxiliary boom by luffing down the auxiliary boom.

2.3 Telescopic boom distortion because of sunshine on one side

A temperature difference occurs between the side facing the sun and the side facing away from the sun for cranes with telescopic booms. This causes telescopic boom side distortion, which can reduce the load bearing capacity of the telescopic boom.

For example, a temperature difference between the two boom sides of 30 °C and a boom length of 60 m results in a length difference caused by the temperature difference between the two sides of the telescopic boom of approximately 22 mm. With narrow boom parts, this causes the profiles to bend sideways.

If the maximum load is being utilized during operation with a telescopic boom extension such as a fixed lattice jib, luffing lattice jib or folding jib, then it must be ensured through a visual inspection before picking up the load that the boom is not showing signs of side deformation due to one-sided sun exposure.

**WARNING**

Danger of accident due to component overload!

If the telescopic boom has become distorted because of one-sided sunlight, this can cause component overload and therefore accidents.

- ▶ Turn the crane so that both sides of the boom are heated up equally, eliminating side deformation due to temperature difference.

3 Telescoping crane movement

If the telescopic boom is telescoped with the jib boom or telescopic boom extension, before the telescoping procedure, ensure that:

- The crane is properly supported and horizontally aligned.
- The telescopic boom is evenly warmed up by solar radiation.
- There is no strong side wind.

**WARNING**

Damage to the telescopic boom or the hoist rope!

If these 3 factors are not adhered to, damage of the telescopic boom or the hoist rope can occur and lead to accidents.

- ▶ Support the crane properly and align it horizontally.
- ▶ Keep both sides of the boom at about the same temperature.
- ▶ Telescope only to the permissible wind speed according to the load chart.
- ▶ If the actual wind speed is higher than the permissible wind speed noted on the load chart, telescoping is prohibited.

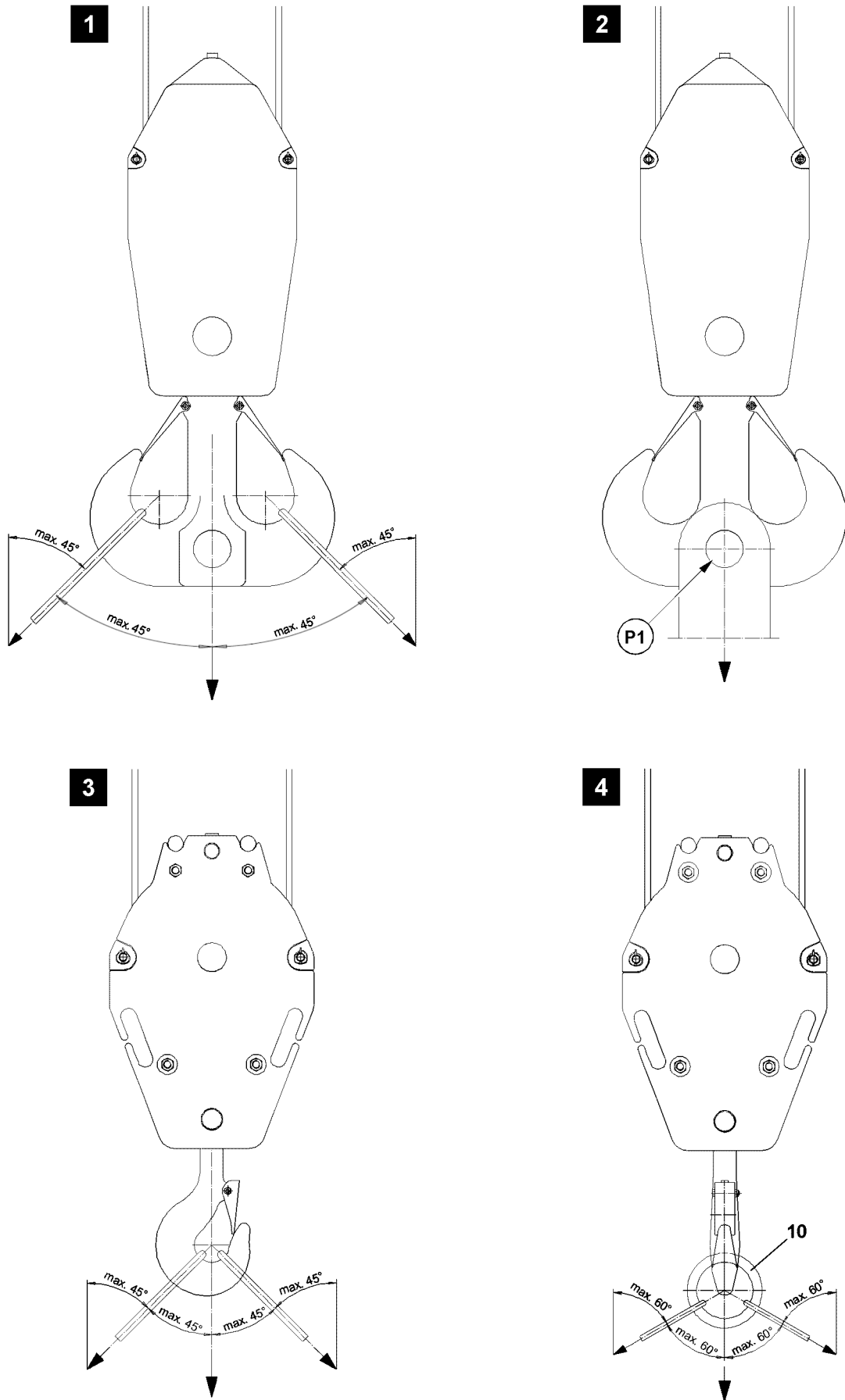


Fig.145147

LWE/LR 11350-007/19005-01-02/en

4 Taking on a load

The crane must always be operated in such a way that its load-bearing parts are not destroyed or damaged and its stability is ensured.

Make sure that the following prerequisites are met:

- The crane is supported and horizontally aligned.
- The LICCON overload protection has been set according to the load chart and the set up configuration.
- The LICCON overload protection is active.
- In the case of cranes with central ballast: The central ballast is installed according to the load chart.
- The counterweight is installed according to the load chart.
- In the case of cranes with derrick ballast: The derrick ballast is installed according to the load chart.
- The hook block or the load hook is correctly reeved.

4.1 Fastening the load



WARNING

Load can be ripped off!

If impermissible fastening and / or load handling equipment is used when taking on a load on the centric bore on the double hook at point **P1** (illustration 2), then the double hook as well as the hook block can be damaged.

The load can rip off and fall down.

Personnel can be severely injured or killed.

- ▶ Lift the load via the centric bore on the double hook (point **P1**): For the technical requirements and the technical design of the fastening and / or load handling equipment contact the hook block manufacturer.



WARNING

The crane can topple over!

If the following conditions are not met, the crane can topple over.

Personnel can be severely injured or killed.

This could result in significant property damage.

- ▶ Pay attention to the own weight of the load handling equipment.
- ▶ Pay attention to the load bearing capacity of the load handling equipment.
- ▶ The maximum permissible incline of the strands fastened on the single or double hook in the hook jaws is 45°. See illustration 1 and illustration 3.

If necessary for the single hook:

- ▶ Use fastening equipment with a suspension link **10**. The maximum permissible incline in this case is 60°. See illustration 4.
- ▶ Load a single and double hook symmetrically. A maximum deviation of $\pm 3^\circ$ from the direction of the center of gravity is permissible.

If necessary:

- ▶ Use cross beam or two cranes for taking on the load.

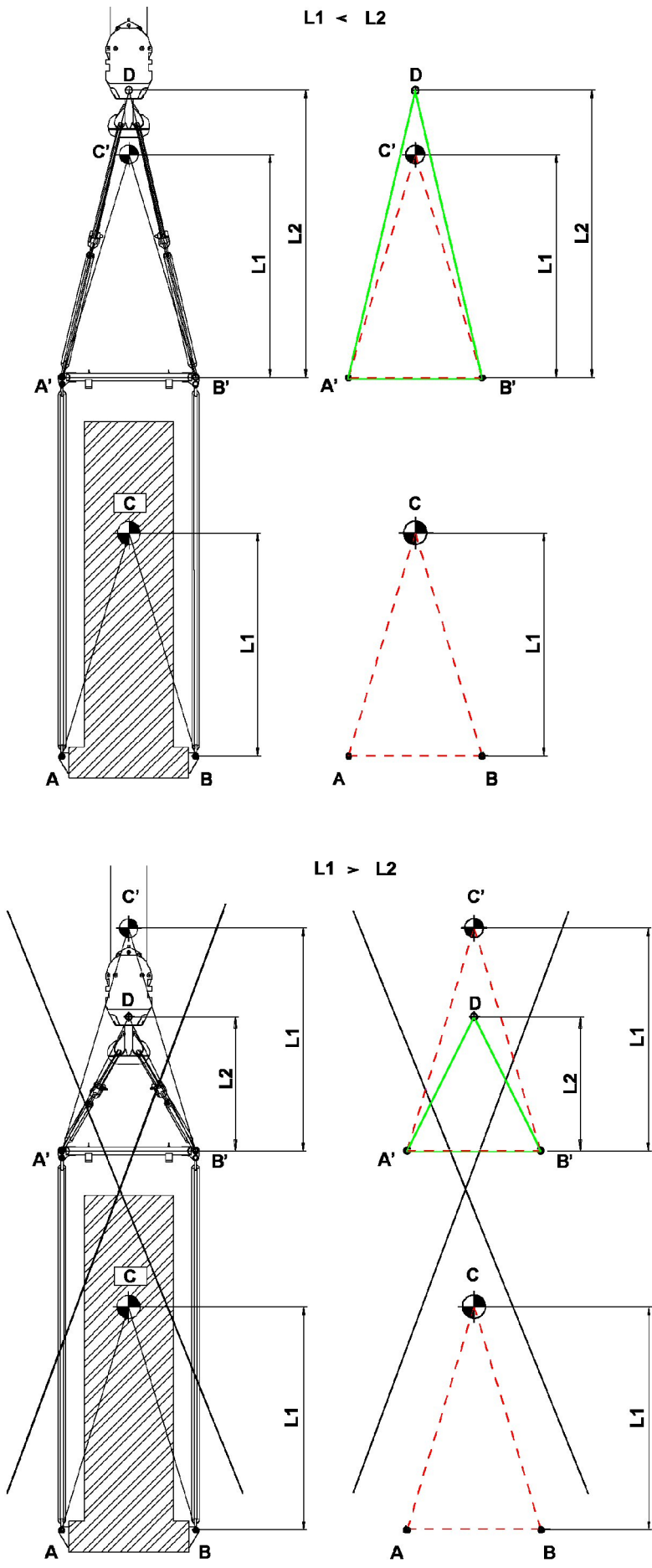


Fig.116274

LWE/LR 11350-007/19005-01-02/en

4.2 Taking on a load with cross beam

Cross beam are load handling equipment between crane hook and load.

The distance of the center of gravity **L1** is the vertical dimension from the fastening point of the load to the center of gravity of the load.

The cross beam height **L2** is the vertical dimension from the point of rotation of the crane hook to the next lower linkage point of the cross bar.



WARNING

Tipping of load to the side!

If fastening ropes are used which are too short, so that the load center of gravity is above the fastening point, then there is a danger of the load tipping to the side.

Personnel can be severely injured or killed.

- ▶ The load center of gravity must be below the crane hook.
- ▶ The distance of the center of gravity **L1** must be smaller than the cross beam height **L2** ($L1 < L2$).
- ▶ The triangle **A'B'C'** must be within the triangle **A'B'D**.

4.3 Transporting the hook block

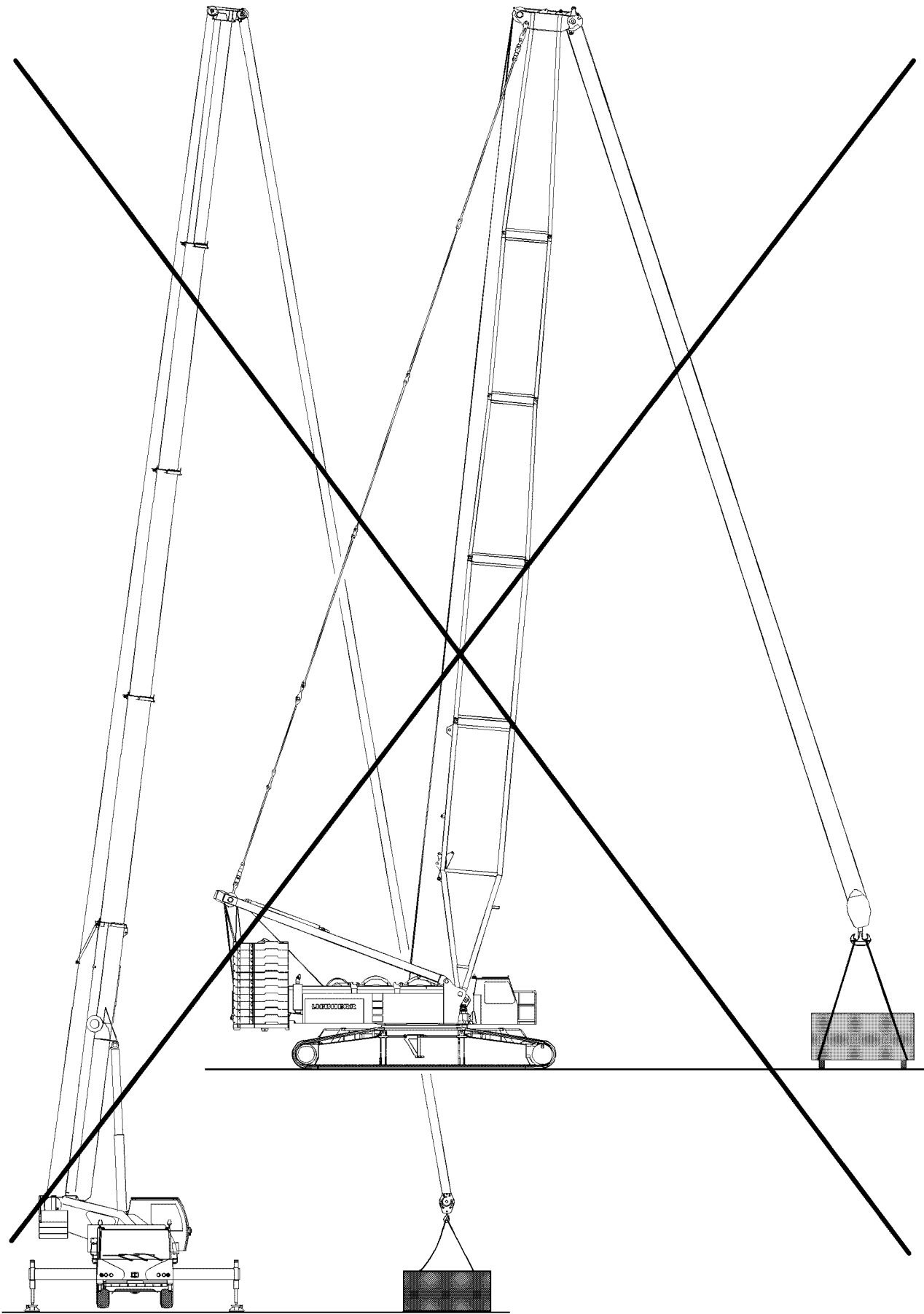


WARNING

Danger of accident!

If a hook block is fastened incorrectly for transport, personnel can be injured.

- ▶ Fasten the hook block for transport on the fixed point in the center.
- ▶ Fastening the complete hook block on the auxiliary weights is prohibited.
- ▶ When setting down, secure the hook block against falling over.
- ▶ Prevent the load hook from rolling away.



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Fig.102716

4.4 Lifting the load



WARNING

Danger of crushing for people in the load zone!

If personnel is located between the load to be lifted and a possible interfering edge (such as a wall of a building or similar) when the load is lifted, personnel can be severely injured or killed.

- ▶ Before lifting the load it must be ensured that there are no persons within the danger zone.
- ▶ It is prohibited to remain in the danger zone.
- ▶ It is prohibited for anyone to be under the load. Maintain a safety distance.
- ▶ Swinging the load is prohibited.
- ▶ Exercise extreme caution when lifting a load.



WARNING

The crane can topple over!

If an attempt to lift a load over the hoist gear causes the LICCON overload protection to turn off, then the load may not be lifted by luffing up the boom. This causes overload or toppling the crane. Personnel can be severely injured or killed.

- ▶ Do not lift the load by luffing up the boom off the ground.



Note

When using the assembly winch* observe the following:

- ▶ Use the assembly winch* only for assembly and not for lifting loads.
- ▶ Lifting of loads with the auxiliary winch is prohibited.

If the fastening rope is manually attached by an assistant to the load to be lifted:

- Make sure that the assistant's hands are not crushed by the tightened ropes between the load and the fastening rope.
- Make sure that the assistant's body parts (hands, legs etc.) are not crushed by a swaying movement of the load during lifting.

4.5 Angular pull



WARNING

The crane can topple over!

Angular pulling can destroy the crane or cause it to topple over.

Personnel can be severely injured or killed.

- ▶ Fasten (hang) the hook block always vertically over the center of gravity of the load to be lifted.
- ▶ Do not use the slewing gear to pull and set up loads.
- ▶ When lifting, compensate for boom deflection.
- ▶ Angular pull is prohibited.

The crane is designed only to lift loads vertically. During angular pulling, regardless of whether this is done in the same direction as the boom or laterally, horizontal forces are generated from the load in addition to the vertical forces, for which the boom is not designed.

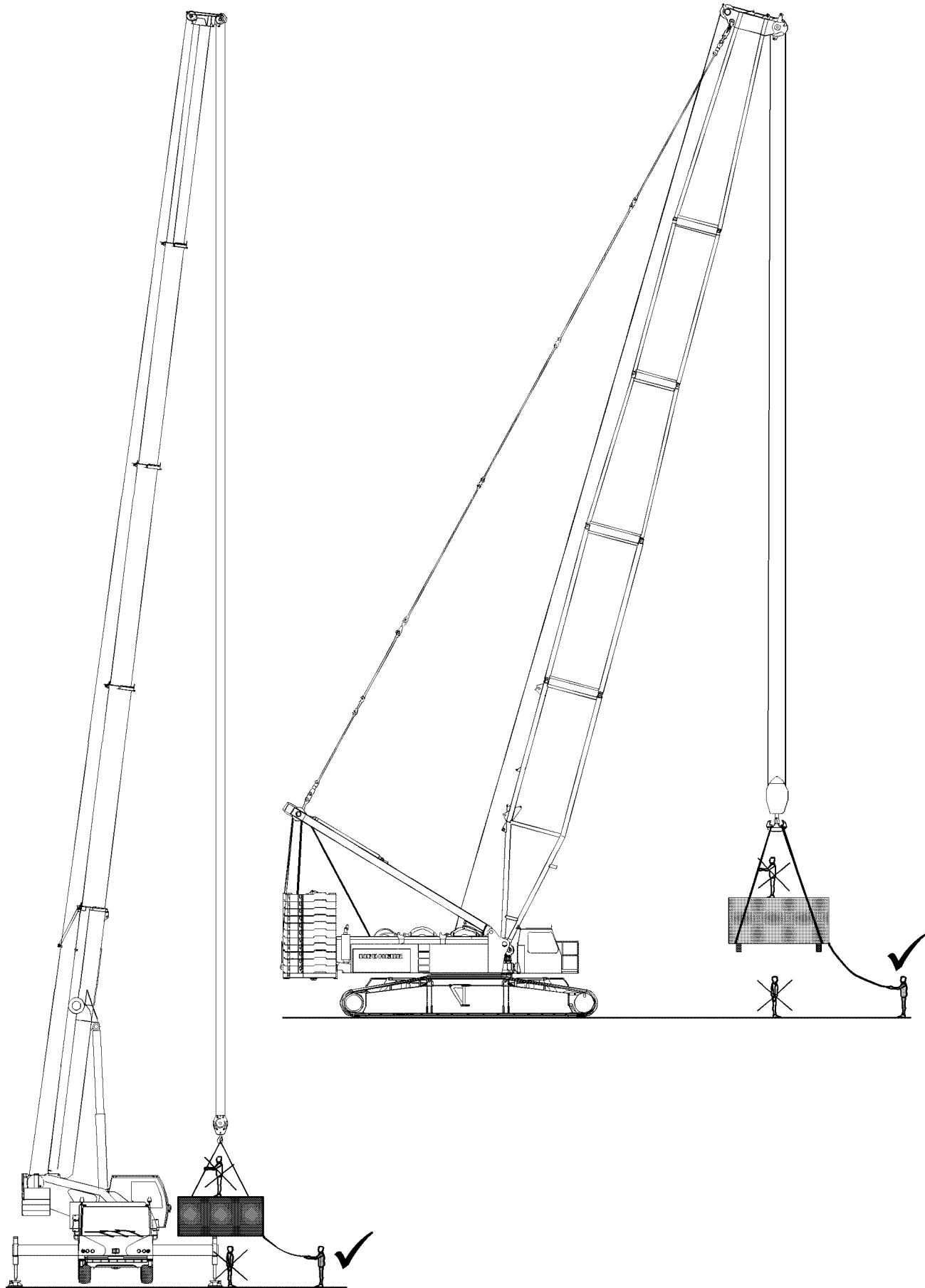


Fig.102717

LWE/LR 11350-007/19005-01-02/en

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 in the block position, the overload protection is not functioning.

- ▶ Crane operation at block position of luffing cylinders is prohibited.

5.1 General

A suspended load must always be kept under control. A fundamental requirement for this is the safe and delicate control of the crane's functions.



WARNING

Danger of accident due to swaying loads!

A swaying load can damage the crane and cause it to topple.

- ▶ All crane movements must be executed slowly and delicately.
- ▶ Initiate all crane movements slowly.
- ▶ Apply the brakes slowly in all crane movements.
- ▶ Crane operation with swaying load is prohibited.

NOTICE

Damage of rope pulleys!

- ▶ Place down hook blocks, booms, folding jibs, jib booms and boom noses in such a way that the rope pulleys do not lie on the ground and are damaged.

5.2 Guiding the load

The use of guide ropes is recommended to help the crane operator manage the load more precisely and to prevent the load from swaying. This will prevent undesirable movements of the load and consequent damage.

5.3 Danger of crushing



WARNING

Danger of fatal injury!

Extreme caution is needed when lowering a load. Danger of fatal injury exists for personnel in the immediate area of the load being lowered.

Personnel can be severely injured or killed.

- ▶ Standing under a suspended loads is strictly prohibited.
- ▶ Observe the danger of tipping when setting down the load. For example, small support surfaces or unsuitable ground.

5.4 Danger of falling



WARNING

Danger of fatal injury!

If persons are on the suspended load, then they can fall down and be severely injured or killed.

- ▶ Remaining on a suspended load is strictly prohibited.
- ▶ Remaining on or within crane components (for example: At assembly of boom sections, lattice sections) which are moved during lifting, lowering, turning or closing procedures is strictly prohibited.

5.5 Working in the vicinity of electricity transmission lines

If there are electricity transmission lines in the immediate vicinity of the building site, then the electrical transmission lines must be turned off by qualified electricians. If this is not possible, the danger area must be covered over or cordoned off.



WARNING

Danger of current transfer!

If electricity transmission lines are not shut off nor covered nor blocked off, then there is an increased danger of accident due to current transfer.

- ▶ For rated voltages up to 500 kV AC: Adhere to a safety distance of 8 m.

If the crane becomes electrified despite having taken all necessary precautions, proceed as follows:

- ▶ Remain calm.S
- ▶ Do not leave the crane cab.
- ▶ Warn people outside: Stay in place and do not touch the crane.
- ▶ Move the crane away from the danger zone.

6 Ram work or pulling sheet piles

The cranes from Liebherr Werk Ehingen GmbH have been designed to lift loads. When working with a free-riding vibrating unit for ramming and pulling operations, vibrations may be transmitted to the load bearing steel structure even if a vibration damper is used. This vibration can cause premature fatigue of the material and therefore cracks in the supporting steel structure. Furthermore, the components can loosen and fall down due to the vibrations. This work should only be performed on the mobile crane in exceptional situations or when the use of machines built specially for this work is not possible.

Before performing this work, a risk assessment must be carried out that concerns the particular risks when driving and pulling the sheet piles and handling them.

Following higher loads on the crane, shorter inspection intervals for the mobile crane and the hook block must be defined by an authorized inspector. Before and after performing the work on the free-riding jogging unit, the crane, hook block and fastening equipment as well as the vibrating unit must be inspected for damage.

The free-riding vibrating unit must be equipped with vibration dampers. Rigid connections for this equipment to the crane are prohibited!

The following vibrating unit and vibration damper combinations are permissible:

- Free-riding vibrating unit with integrated vibration dampers.
- Free-riding jogging unit combined with a vibration damper designed for this equipment.

Specifications for working with the free-riding vibrator:

- Slack rope and angular pull on the hoist rope are prohibited.
- The vibrator may only be switched on if the vibrator is connected correctly with the ramming element and the ramming element is lying flush on the ground or is partially in the ground.
- Starting or stopping the vibrating unit must take place with an eccentric moment of zero (no vibrator vibration), in order to avoid peak vibration amplitudes and resonances due to the possibility of running through the natural frequency band of the vibrator. Only after reaching the nominal speed and the operating pressure of the unit may the eccentric moment be set to the desired value or amplitude.

NOTICE

No vibration dampers used!

The boom or the crane can be damaged.

- ▶ Use ramming equipment and pulling equipment with vibration dampers.
 - ▶ The ramming equipment and pulling equipment may **not** pass on vibrations to the boom.
-

When pulling sheet piles, the maximum permissible pull force must be limited to 50% of the load chart value for the corresponding crane boom radius. The utilization of the hook block load may not exceed 50%.



Note

- ▶ When pulling sheet piles, **only** work in main boom operation or telescopic boom operation.
 - ▶ Do **not** use operating modes with a Derrick, auxiliary boom or boom extensions.
-

NOTICE

Maximum permissible pull force exceeded when pulling sheet piles!

The boom or the crane can be damaged.

- ▶ Limit the maximum permissible pull force to 50% of the load chart value for the corresponding crane boom radius.
 - ▶ Additionally check the pull force by measuring it.
 - ▶ Do not limit the maximum pull force of the crane **exclusively** by means of the overload protection.
-

NOTICE

Hook block load utilization exceeded when pulling sheet piles!

The hook blocks or the crane can be damaged.

- ▶ Limit the utilization of the hook block load to maximum 50%.
-

Liebherr Werk Ehingen GmbH shall not be held liable for damage caused to the machine, to the used ramming and pulling equipment, on the piling element or in the surroundings (for example adjacent buildings) due to the installation and use of the free-riding vibrator.

7 Crane rope pretension

Damage that can occur with multi layer spooling:

- Abrasion
- Broken wires and loop formation
- Flattenings, deformations

NOTICE

Crane rope pretension too low!

Loosely coiled rope layers.

Rope damage. Reduced service life of the crane rope.

Cutting of the crane rope into the lower rope layers. The load can not be lowered any further.

- ▶ To maximize the service life of the crane rope, carry out the measures in the following sections.

**Note**

- ▶ Liebherr recommends to shorten crane ropes with damage in the cross over area of the coils, in order to lengthen the service life. Shortening the crane rope, see Crane operating instructions, chapter 7.05.50.

7.1 Working with a high rope pull

If multiple lifts are performed with a high rope pull, loosen the lower rope layers that are rarely or never spooled out.

NOTICE

Loosely spooled out rope layers!

Rope damage.

Upper rope layers with a high rope pull deform the lower rope layers in the cross over area of the crane rope.

Spooling deformed rope sections over rope pulleys reduces the service life of the crane rope.

- ▶ Place a shorter crane rope.

When the lower rope layers are **not** used during repeat work:

- ▶ Increase the pretension of the lower rope layers: Spool out the entire rope length and then spool back up with the highest rope pull possible. See section „Increasing the hoist rope pretension“.

7.1.1 Placing a shorter crane rope

**Note**

- ▶ Liebherr recommends using the entire rope length.

Unused rope sections cause the loosening of the lower rope layers.

When only a part of the crane rope length is used for a longer period of time:

- ▶ Place a shorter crane rope.

7.1.2 Reducing rope unwinding

Telescopic boom

When telescoping out less, then the smallest amount of fixed coiled up crane rope is spooled out.

- ▶ Telescope out as little as possible.

Picking up the fastening equipment

If the fastening equipment with a flat boom system must be picked up, then the smallest possible amount of crane rope is spooled up loose.

- ▶ Establish a flat boom system: Telescope out or luff up the boom.
- ▶ Pick up the fastening equipment.

7.1.3 Restoring hoist rope pretension

Brief description

If a multi-pulley hook block is reeved, then the entire hoist rope length can be spooled out from the rope drum.

- ▶ Spool the hoist rope out until three safety coils.
- ▶ Create 10 % maximum strand pull: Attach the load.

While the hoist rope is spooled up:

- Hold the load just off the ground.
 - In the permissible range of the load chart of the relevant set up configuration: Increase the load radius by luffing down.
- ▶ Spool the hoist rope up.

Description using the example LR 1600-2, SL3F

This section explains the procedure with the help of the set up configuration for LR 1600-2 with boom system SL3F.

The crane-specific parameters ensure that rope is spooled out until four rope coils and as many rope coils with pretension as possible can be spooled up.

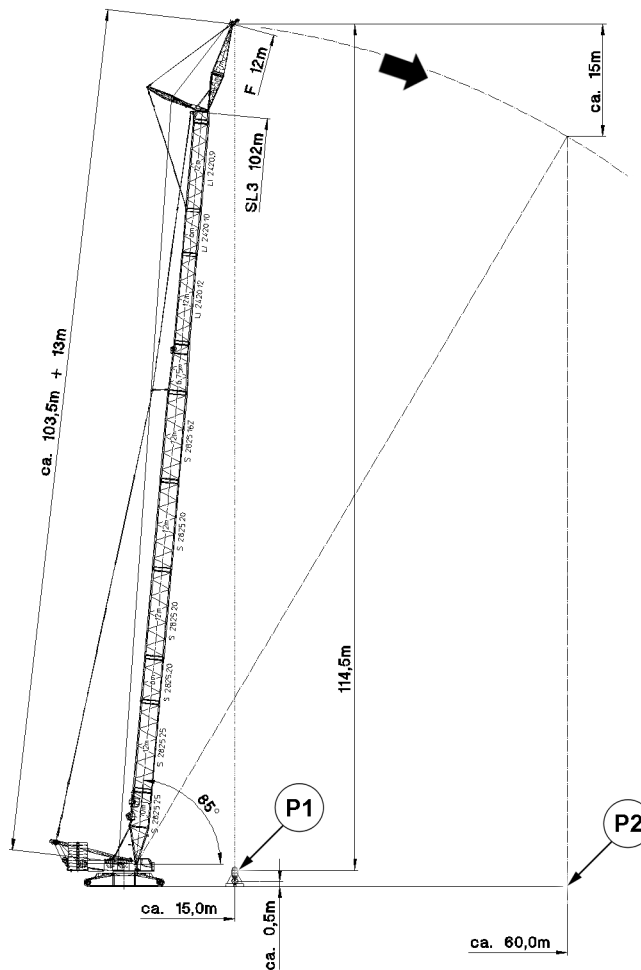


Fig.127131: LR 1600-2, SL3F: Spooling up hoist rope with pretension

| Boom radius | Load | 10 % of maximum strand pull |
|-------------|--------|-----------------------------|
| 60 m | 14.4 t | 1.8 t |

Load example: LR 1600-2, SL3 102, F12, according to the load chart

Hoist rope for this example:

- Hoist rope with a length of 1050 m

Hook block for this example:

- Hook block 200 DM, 5-pulley, reeved 8 times
- The weight of the hook block with ten auxiliary weights is 7.0 t

Make sure that the following prerequisites are met when hanging the load:

- Load is hung as short as possible.
- For a boom radius of 15.0 m, the hoist rope can be spooled out on the winch until four coils.

To reach sufficient rope pull, another load must be hung in addition to the hook block.

The additional load of 7.4 t is calculated from the difference between the load 14.4 t and the weight of the hook block 7.0 t.

- ▶ Fasten the load with 7.4 t.
- ▶ Until the load is 0.5 m above the ground: Lift the load.
- ▶ Set the boom system to boom radius 15.0 m.
- ▶ Spool the hoist rope out.

Result:

- In position **P1** there are 9 m of hoist rope (four coils) on the hoist winch:

| Spoiled out rope section | Length |
|--|-----------------------|
| 8-way reeving, distance of ground to the F-jib with boom radius 15 m | 8 x 114,5 m = 916,0 m |
| Winch to FA-frame | 103.5 m |
| F-head | 13.0 m |
| Rope pulleys | 7.5 m |
| Total of spoiled out hoist rope | 1040.0 m |

Rope lengths in position P1

While the hoist rope is spooled up:

- Hold the load just off the ground.
- In the permissible range of the load chart of the relevant set up configuration: Increase the load radius by luffing down.
- ▶ Until a boom radius of 60.0 m is reached: Spool up the hoist rope and luff down the boom at the same time.
- ▶ Set down the load.

Result:

- The pretension of the first and second position of the rope coils is restored.
- In position **P2** there are 130 m of hoist rope (23 coils) on the hoist winch:

| Spoiled up rope section | Length |
|--|------------------|
| Four coils initial situation | 9 m |
| 8-way reeving, F-jib height difference with boom radius 60 m | 8 x 15 m = 120 m |
| Total of spoiled up hoist rope | 130 m |

Rope lengths in position P2

- ▶ Make sure that the hoist rope on the winch remains pretensioned: Reeve out the hook block and reeve in with slower reeving. See Reeving plan.

7.2 Picking up and lowering overhead loads

The load is picked up overhead in the following application examples:

- Repowering wind power plants
- Disassembly of slewing tower cranes

NOTICE

Load picked up overhead with loosely coiled rope layers!

The rope pull increases when the load is picked up. The rope coils in the lower rope layers move laterally and are compressed. The hoist rope can cut into the lower rope layers.

- ▶ Spool up the hoist rope without a load only with rope pretension.
-

NOTICE

Load lowered with cut in rope layers!

The hoist rope is pulled jerkily from the lower rope layers. Vibrations are introduced into the crane system.

Cut in hoist rope clamped between the lower rope layers. The load can **not** be lowered any further.

- ▶ To prevent the cutting in of the hoist rope, carry out the measures in the following sections.
-

7.2.1 Increasing the reeving number

NOTICE

Higher reeving number than indicated on the load chart!

Slack rope formation.

The crane load drops due to additional weight from the rope strands and hook block.

If a higher reeving number is not considered in the set up configuration, the load display on the LIC-CON monitor no longer corresponds.

- ▶ Redetermine the hook block weight according to the load chart manual and adjust if necessary.
 - ▶ Check if the crane load is sufficient for higher reeving.
 - ▶ After telescoping out, check if the hook block can still reach the desired position for putting down the load.
-

A higher reeving number reduces the rope pull. A lower rope pull prevents the cutting in of the hoist rope in the lower rope layers.

- ▶ Select the highest reeving number possible for the hoist rope.

7.2.2 Increasing the hook block weight

NOTICE

Lift the hook block without a load!

The hoist rope is spooled up with a low rope pull. The rope layers are spooled up loose on the rope pulley.

- ▶ Increase the rope pull: Increase the hook block weight.
-

A higher hook block weight increases the rope pull.

- ▶ Increase the hook block weight.

If the crane load is sufficient:

- ▶ Attach an auxiliary weight between the load and hook block.

7.2.3 Pretensioning the hoist rope with pretensioning ballast with two hook operation

The pretensioning ballast is **not** included in the Liebherr delivery scope.

NOTICE

Lift the hook block without a load!

The hoist rope is spooled up with a low rope pull. The rope layers are spooled up loose on the rope drum.

- ▶ Pretension the hoist rope with pretensioning ballast with two hook operation.
-

Make sure that the following prerequisites are met:

- The crane is equipped for two hook operation.
- The pretensioning ballast is present.

Properties of the pretensioning ballast:

- Developed by Liebherr.
- The weight is 4 t.
- Special tow coupling

- ▶ Fasten the pretensioning ballast on the main hook and on the auxiliary hook.

The pretensioning ballast is lifted with the main hook, the auxiliary hook is carried along without a load.

- ▶ Lift the pretensioning ballast.

When the main hook has reached the required height:

- ▶ Stop the main hook.

After the load is completely transferred to the auxiliary hook, the main hook fastening ropes release automatically.

- ▶ Lift the auxiliary hook until the pretensioning ballast hangs completely on the auxiliary hook.

When the main hook fastening ropes have released:

- ▶ Lower the pretensioning ballast with the auxiliary hook and place it on the ground.

Result:

- The full load is present on the main hook.

4.10 Driving from the crane cab

| | | |
|---|---|----|
| 1 | Prerequisites for driving / moving crawler cranes (crawler operation) | 2 |
| 2 | Driving with a load and / or Derrick ballast | 7 |
| 3 | Driving without a load and without derrick ballast | 9 |
| 4 | Driving uphill / downhill | 11 |
| 5 | Driving the crawler crane | 17 |

1 Prerequisites for driving / moving crawler cranes (crawler operation)

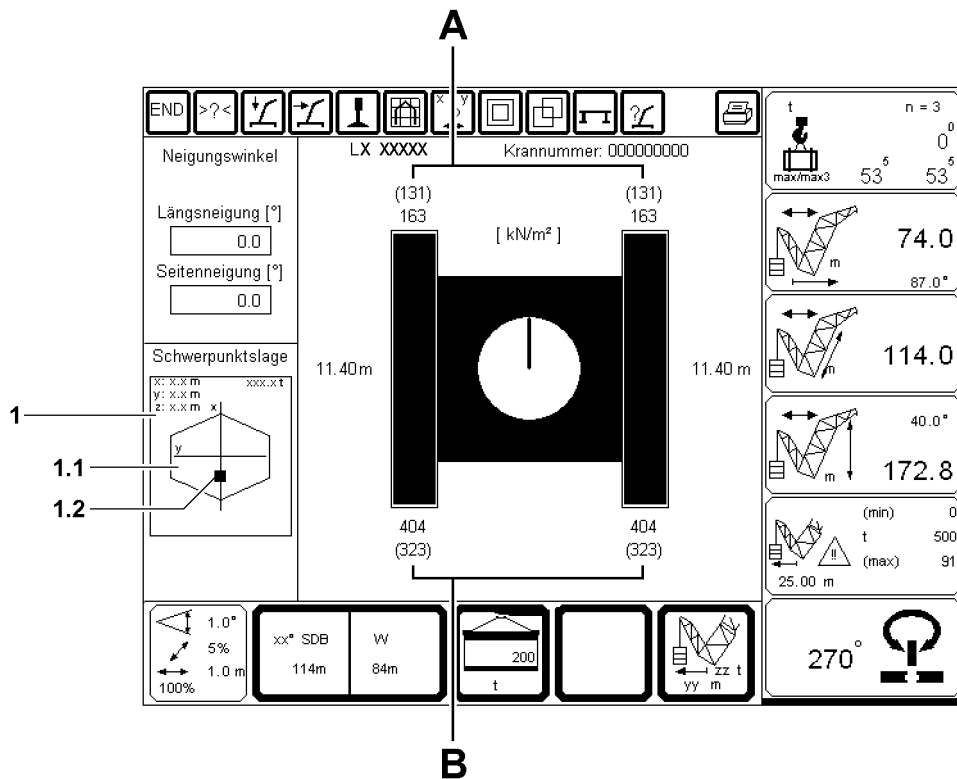


Fig.153643: Planner program: Job planner



WARNING

The crane can topple over!

If the following instructions are not observed, the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Before driving the crane with the equipment in place, the optimum boom position must be determined with the aid of the job planner, to obtain as even a surface pressure on the crawler travel gear as possible.
- ▶ The maximum permissible wind speed from the load chart is not exceeded.



WARNING

Crane with narrow crawler travel gear!

- ▶ When moving cranes with narrow crawler travel gear (example: LR1600/2-W) and respective equipment, in addition to the „prerequisites for driving the crane“, the special travel charts and danger notes must be observed and adhered to, see „Driving with the equipment in place“.



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.

- ▶ For ground inclinations of more than 0.3°, make sure that the turntable is aligned parallel to the crawler travel gear in the 0° or 180° position before driving the crawler crane.

**WARNING**

The crane can topple over!

If the following specifications, instructions and prerequisites are not observed, then the crane can topple over or be overloaded.

Death, severe bodily injuries, property damage.

- ▶ The crane operator is responsible for adhering to all specifications, instructions and prerequisites in the crane documentation.
- ▶ The crane operator may not drive the crane if not all specifications, instructions and prerequisites in the crane documentation can be adhered to.
- ▶ The crane operator is responsible for the correct and complete data entry into the LICCON computer system and into the LICCON job planner, if applicable.
- ▶ All acceleration and delay maneuvers must be initiated with extreme caution and at the lowest possible speed.
- ▶ Depending on the situation, additional observers, who are acoustically or visually in contact with the crane operator (for example by radio or sight), may have to support the crane operator with shared responsibility.

**WARNING**

Combined crane movements at crawler operation!

- ▶ In crawler operation, do not carry out any additional crane movements.
- ▶ Carry out additional crane movements when the crane is at a standstill, if possible.

Make sure that the following prerequisites are met:

- No personnel or objects are within the danger zone.
- The crane is in an operational condition.
- The crane is in a set up configuration permitted for travel operation.
- The installed ballast (central ballast, counterweight and derrick ballast) is locked and secured.
- There are no loose objects on the crane.

1.1 Travel route

**WARNING**

The crane can topple over!

If the following specifications, instructions and prerequisites are not observed, then the crane can topple over or be overloaded.

Death, severe bodily injuries, property damage.

- ▶ The transfer from the horizontal to an uphill slope and from an uphill slope to the horizontal must be made evenly, i.e.: There may be no edges that can cause the crane to topple over. Any inclination changes must be made continuously.
- ▶ If the travel route cannot safely take on the surface pressure, then measures must be taken to be able to safely introduce the forces into the ground.
- ▶ If measures were taken to transfer the forces to the ground, then they must be checked by an expert before starting to drive for proper execution and sufficient supportability.
- ▶ An insufficient ground condition can cause accidents, for example the crane can slide away to the side and as a result get into an impermissible incline position.

Make sure that the following prerequisites are met:

- Before starting to drive, the travel route was determined.
- Before starting to drive, the condition of the ground has been checked.
- The entire travel route can safely absorb the surface pressure.
- All inclinations occurring on the travel route can be driven safely by the crane.
- The entire travel route is free of obstacles.
- The friction coefficient between crawler travel gear and ground is sufficiently large to absorb the occurring drive forces or to exclude that the crane slips away in an incline position.
- Possible environmental influences while driving the crane (among others precipitation and wind) were taken into account for the travel route.
- The travel route was selected and prepared in such a way that the boom system can be taken down at any time.

- Select the travel route in such a way that no steering movements are required, if possible.
- With a load on the hook: setting down the load is possible at any time.
- The entire travel route is secured as a danger zone.
- The travel route has been selected in such a way that it is possible to maintain a sufficient distance from local facilities (power lines, etc.).

For ground inclinations outside the range of a valid load chart, the following applies additionally:

- Before starting to drive, the travel route was checked in connection with the actual set up configuration of the crane on the LICCON job planner.
- Before starting to drive, the optimum positions for the boom system were determined to obtain as even a surface pressure as possible - the LICCON job planner can be used for this purpose.



Note

- ▶ For a detailed description of the LICCON job planner on the crane, see the operating instructions LICCON job planner.
- ▶ For a detailed description of the LICCON job planner computer program, see the separate description.

1.1.1 Optimizing measures for the travel route

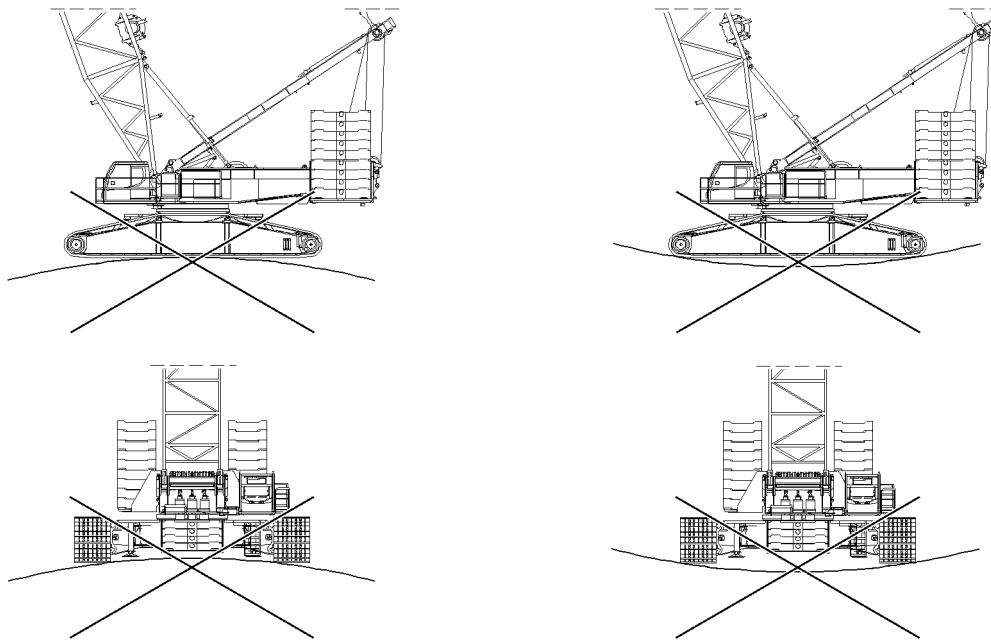


Fig.119598: Depressions, crests, track grooves and other uneven areas of the travel route cause localized pressure on the crawler travel gear

NOTICE

Damage to the crawler travel gear!

Continuous localized pressure on the crawler travel gear causes increased wear.

Continuous increased wear can cause damage to the crawler travel gear.

- ▶ Set up the travel routes in such a way that the crawler travel gear is not subjected to continuous localized pressure.
- ▶ For extended travel operation shorten the maintenance intervals.

Through the following configuration features of the travel route, wear on the crawler travel gear can be minimized:

- Shapings of the travel route (such as depressions, crests, track grooves) have been eliminated via suitable measures.

- Lay out the travel route in such a way that no steering movements are required, if possible.

1.2 Travel gear / hydraulic motors / track rollers

NOTICE

Damage to the travel gear, hydraulic motors and track rollers!

On longer travel routes and / or when driving uphill / downhill, the travel gears, hydraulic motors and / or track rollers can be overheated and damaged.

- ▶ Make sure that the travel gears - before driving the crane - have the maximum fill level.
- ▶ With suitable measuring devices make sure that the maximum permissible temperature of the travel gears, hydraulic motors and / or track rollers in travel operation over longer distances is below 90 °C. For a short time (**maximum** 10 minutes), the temperature may increase to a value between 90 °C and 100 °C.
- ▶ As soon as the maximum permissible temperature in one position is exceeded, take a break from driving for cooling down.
- ▶ The crane operator is responsible for any damage to travel gears, hydraulic motors and / or track rollers.

When the maximum permissible temperature range on a travel gear and / or hydraulic motor is reached:

- ▶ Take a break until the temperature on travel gear(s), hydraulic motor(s) and / or track rollers had dropped considerably.

| Maximum permissible temperature range on travel gear(s) / hydraulic motor(s) | | |
|--|------------|----------------------------|
| | to 90 °C | between 90 °C and 100 °C |
| Duration of exposure | continuous | not longer than 10 minutes |

When the temperature of all travel gears / hydraulic motors has dropped below 90 °C:

- ▶ Travel operation is permissible again.

1.3 Center of gravity display



WARNING

Shifting of the center of gravity!

The calculation of the values for the display of the center of gravity in the job planner are based on ideal assumptions.

- ▶ Side deformations of the boom system due to wind, incline position and elastic resilience of the steel structure are not taken into account but they can lead to a shifting of the center of gravity.

| Position | Name |
|----------|---------------------------|
| 1 | Center of gravity display |
| 1.1 | Core area |
| 1.2 | Center of gravity |



WARNING

Center of gravity of the crane is outside the core area!

If the center of gravity **1.2** of the crane is outside the core area **1.1**, then the crane can topple over. Death, severe bodily injuries, property damage.

- ▶ To drive the crane, the center of gravity **1.2** must always be within the core area **1.1**.
- ▶ If the center of gravity is outside of 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.

The following specifications and instructions must be observed:

- By luffing the boom system up and down, the position of the center of gravity **1.2** must be corrected in such a way that the overall center of gravity remains within the core area **1.1**.

1.4 Distribution of the surface pressure

**WARNING**

Increased surface pressure!

The calculation of the values for the display of the surface pressure in the job planner are based on ideal assumptions.

- ▶ Side deformations of the boom system due to wind, incline position and elastic resilience of the steel structure are not taken into account but they can lead to an increase of the surface pressure.

**Note**

- ▶ The boom must be luffed down before driving until the load is evenly 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 surface pressure for driving is obtained.

1.5 Suitable distribution of the surface pressure

If the distribution of the surface pressure is even (front surface pressure and rear surface pressure approx. the same value), then steering is difficult or not possible at all.

For the suitable distribution of the surface pressure, the following applies:

- A = Surface pressure on the side of the two tracks with the lower load.
- B = Surface pressure on the side of the two tracks with the higher load.
- The center of gravity must however always be within the core area **1.1**.

| Distribution of surface pressure A to B | | | |
|---|---|---|----------------------------|
| A | / | B | = |
| | | | should be greater than 0.3 |

In case of unfavorable distribution of surface pressure it is required to position the boom system in such a way that a suitable distribution of the surface pressure is reached for driving.

- ▶ The turntable should be turned while at a standstill: The boom system should be luffed in such a way that the crawlers are subjected to a load as evenly as possible.
- ▶ Driving uphill: The boom system should be luffed in such a way that the side of the crawler travel gear with less load is in the rear.
- ▶ Driving downhill: The boom system should be luffed in such a way that the side of the crawler travel gear with less load is in the front.

1.6 Steering ability



Note

High load on the crane!

When driving the crane, steering movements cause a high load on the crane travel gear.

- ▶ If possible, forego steering movements with a load on the hook and / or derrick ballast.
- ▶ Select the travel route in such a way that no steering movements are required, if possible.
- ▶ If not otherwise possible, before initiating a steering movement, set down the load and / or derrick ballast.

The steering ability of the crane depends on the following factors:

- Friction conditions under the chains.
- Evenness of the ground:
 - Steering is not possible if the crawler travel gear is only making contact with the ground in the front and rear.
- Load bearing capacity of the ground:
 - If the crawler travel gear sinks into the ground, then the steering ability is significantly restricted.
- Position of the total center of gravity:
 - If the total center of gravity - taking the suspended load into account - is in the center of the crane, then steering is hard or not possible at all.

Crane steering ability can be improved by:

- Placing metal sheeting, sand, gravel, water underneath.
- Taking the load bearing capacity of the ground and the position of the center of gravity into account: Changing the center of gravity.

2 Driving with a load and / or Derrick ballast



WARNING

The crane can topple over!

If the following prerequisites are not observed for crawler operation, the crane can topple over. Death, severe bodily injuries, property damage.

- ▶ Make sure that the prerequisites for crawler operation are read and have been understood - before „driving with a load and / or Derrick ballast“.

2.1 Prerequisites for driving with a load and / or derrick ballast



WARNING

The crane can topple over!

If load charts with lateral inclines of more than 0.3° are available, then the crane may be driven with a load within these load charts.

If the following points are not observed, the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ The following prerequisites for driving with a load must be adhered to.
- ▶ Driving the crane with lateral and longitudinal inclines of more than $\pm 0.3^\circ$ - 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 inclination | $\pm 0.3^\circ$ |

**WARNING**

The crane can topple over!

If the following conditions are not observed, the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ The ground must be level ($\pm 0.3^\circ$) and have adequate load bearing capacity.
- ▶ The ground must be able to safely absorb the maximum occurring surface pressures.

**WARNING**

The crane can topple over!

If the crane is driven on lateral and longitudinal inclines of more than $\pm 0.3^\circ$ with a load or derrick ballast, then crane structures can fail and the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Driving uphill / downhill 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.

Death, severe bodily injuries, property damage.

- ▶ 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 difficult and often not possible at all. Make sure that slewing gear free wheeling is actuated for steering.
- ▶ 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 in test point 1 **MS1**.

**WARNING**

The crane can topple over if the level of the road differs!

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

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

Depending on the distortion of the turntable and the load of the tires on the ballast trailer, a shut-off of crane movements may be activated with a retracted ballast trailer guide due to an excessive inclination of the ballast trailer (depending on the crane type and time of crane delivery), see chapter 4.02.

Death, severe bodily injuries, property damage.

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

NOTICE

Damage to the ballast trailer, ballast trailer guide and / or the turntable!

If the ballast trailer inclination is too large or the level difference of the standing levels between the crane and ballast trailer are too large, this can cause damage to the ballast trailer, the ballast trailer guide and / or the turntable.

- ▶ Keep the ballast trailer inclination as small as possible.
- ▶ Do not exceed the maximum permissible level difference of the standing levels of 250 kg between the crane and the ballast trailer.

3 Driving without a load and without derrick ballast

**WARNING**

The crane can topple over!

If the following prerequisites are not observed for crawler operation, the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the prerequisites for crawler operation are read and have been understood - before „driving without a load and without Derrick ballast“.

**WARNING**

The crane can topple over!

When driving on lateral inclines, the crane can slip off or topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the overall center of gravity of the crane is in the center of rotation when driving on lateral inclines.
- ▶ The overall center of gravity for driving without a load must be constantly checked with the LICCON job planner.
- ▶ Make sure that the permissible lateral and longitudinal inclines are not exceeded.

**Note**

- ▶ By luffing the 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 area **1.1**.
- ▶ When driving the crane on terrain with a longitudinal and lateral incline, 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 „Center of gravity display“.

**WARNING**

The crane can topple over!

When driving on lateral inclines with boom lengths of more than 150 m the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Driving on lateral inclines with boom lengths of more than 150 m is **exclusively** permitted after a written release is obtained from **Liebherr-Werk Ehingen GmbH**.

**WARNING**

The crane can topple over!

If the following conditions are not met when driving the crawler crane uphill / downhill, then the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ The ground must be able to take on the occurring surface pressures.
- ▶ The friction coefficient between the road and the ground must be large enough to take on the occurring drive forces.
- ▶ Slippery ground, especially ice, frost and snow can cause the crane to slide off sideways on longitudinal and lateral inclines and therefore cause the crane to topple over.
- ▶ The turntable must be parallel to the crawler carriers and secured to prevent it from turning.
- ▶ All acceleration and delay maneuvers must be initiated with extreme caution and at the lowest possible speed.
- ▶ The transfer from the horizontal onto an uphill / downhill incline and from the uphill / downhill incline to the horizontal must be made evenly.
- ▶ Edges, over which the crane tilts are impermissible.
- ▶ Any inclination changes must be made continuously.
- ▶ The surface 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.
- ▶ 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 set up configuration must be determined with the job planner.

3.1 Prerequisites for driving without a load and without derrick ballast

Make sure that the following prerequisites are met:

- The maximum permissible oil fill quantity is present in the engine.
- The oil level in the hydraulic oil tank must be lowered by extending the cylinders so that overflow is not possible.
- The content of the fuel tank must be reduced so that overflow is not possible.
- The maximum permissible wind speed of 9 m/s is not 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 travel gear, 0° or 180° position.

**WARNING**

Crane with narrow crawler travel gear!

- ▶ When driving cranes with narrow tracks and corresponding equipment, the special travel charts and danger notes must be observed and adhered to.

| Permissible lateral inclines for driving without a load / derrick ballast | |
|---|---|
| Overall boom length | Maximum permissible lateral inclination |
| Shorter than / equal to 96 m | ± 3° |
| 97 m to 150 m | ± 2° |

| Permissible longitudinal inclines for driving without a load / derrick ballast | |
|--|--|
| Overall boom length | Maximum permissible longitudinal inclination |
| To 150 m | ± 10° |

4 Driving uphill / downhill

The maximum climbing ability of the crawler crane is limited by the following criteria:

- The location of the center of gravity for the complete crawler crane.
- The friction coefficient between the road and track pads.
- The transition between the horizontal and the uphill / downhill incline.
- The maximum permissible longitudinal incline of $\pm 10^\circ$ up to a boom length of 150 m.
- The oil level in the engine.
- The oil level in the travel gears.

4.1 Calculation of required length of transfers on uphill / downhill slopes

The required length L of the transfers results from the existing uphill angle α and the length of the tracks LC .

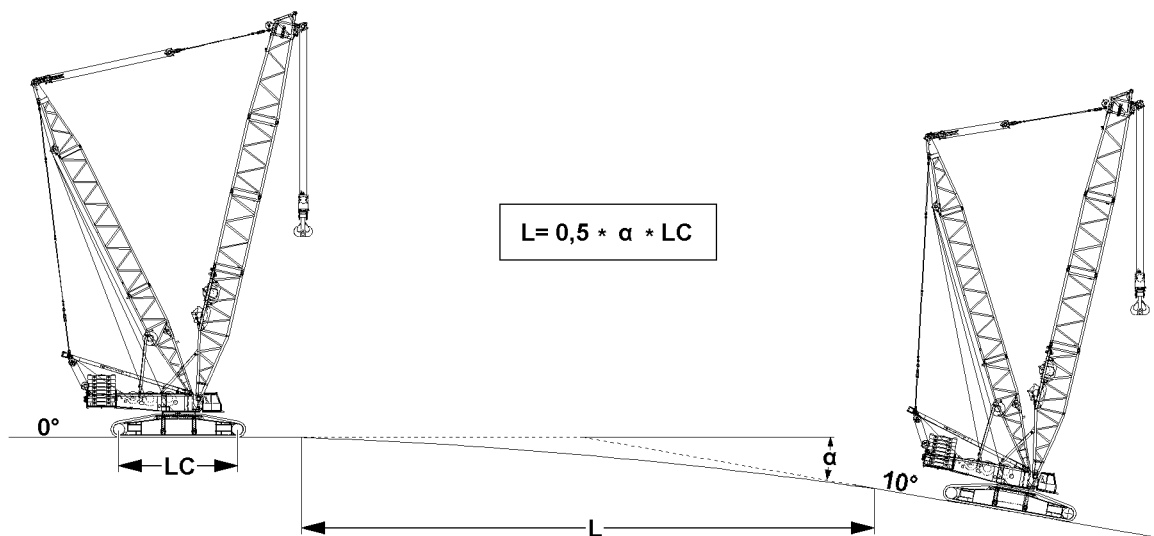


Fig.119612: Visualization: Length of transfers on uphill / downhill slopes

| Abbreviation | Description |
|--------------|---|
| L | Required length of transfers |
| α | Angle rising / falling inclines in degrees |
| LC | Length of crawlers between drive wheels / steering wheels |

4.1.1 Calculation example

Given:

$$\alpha = 10^\circ$$

$LC = 17.3$ m (only use the actual crane value!)

Wanted:

$$L = ?$$

| Calculation formula | | | | | | |
|---------------------|---|--------|---|----------|---|--------|
| L | = | 0.5 | * | α | * | LC |
| L | = | 0.5 | * | 10 | * | 17.3 m |
| L | = | 86.5 m | | | | |

4.2 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 / downhill is the exact knowledge of the existing operational conditions on the jobsite and the surface pressures, permissible boom angles and inclines as well as the overall center of gravity 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.

Death, severe bodily injuries, property damage.

- ▶ Driving uphill / downhill must always be anticipatory, with utmost caution and at the slowest speed.

There are two different possibilities for driving crawler cranes uphill / downhill:

- with boom angle adjustment
- without boom angle adjustment

4.2.1 Prerequisites for driving uphill / downhill with boom angle adjustment



Note

- ▶ When driving into an uphill / downhill incline, during the transition between the horizontal into the uphill / downhill incline, the original boom angle must be changed continuously in such a way that the original boom angle always remains between the boom and the horizontal. This angle must be retained on the uphill / downhill incline.
- ▶ When driving out of an uphill / downhill incline, during the transition between the uphill / downhill incline into the horizontal, the original boom angle must be changed continuously in such a way that the original boom angle always remains between the boom and the horizontal.
- ▶ In addition, the overall center of gravity of the crane must be observed.



WARNING

The crane can topple over!

When driving on uphill / downhill inclines with a load or derrick ballast, structural parts can break, the carrying crane structures can be damaged or the crane can topple over.

If the boom angle is not matched to the uphill / downhill incline when driving the crane in uphill / downhill slopes, then the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Driving uphill / downhill with a load and / or derrick ballast is prohibited.
- ▶ Match the boom angle to the uphill / downhill incline.

Positive longitudinal incline



Note

- ▶ When driving on positive longitudinal inclines (uphill slopes), the boom / the luffing jib must be luffed down continuously - maximum by the **uphill incline angle α** .
- ▶ The uphill incline angle α is 4° in the displayed example, see opposite graphic.
- ▶ Incline and boom angle display (as seen from the crane operator's cab in the direction of travel).

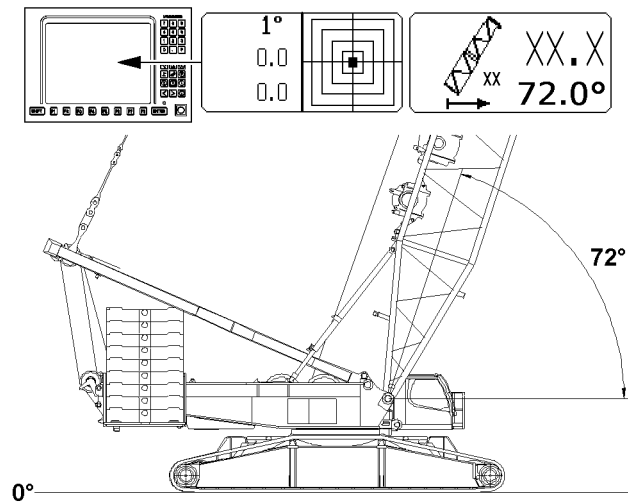


Fig.153630: The crane is horizontally aligned

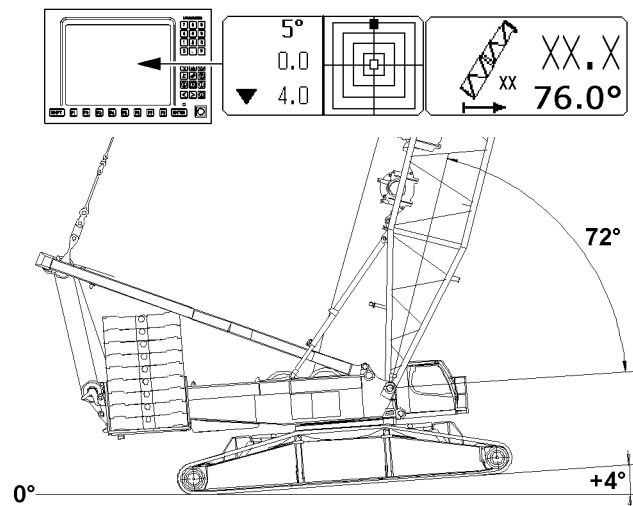


Fig.153631: Crane at 4° uphill incline (positive longitudinal incline), no lateral incline



Note

- ▶ The boom angle is always shown to the horizontal.
- ▶ Example display of boom angle = 76° (72° + 4°).
- ▶ Correct the boom angle.

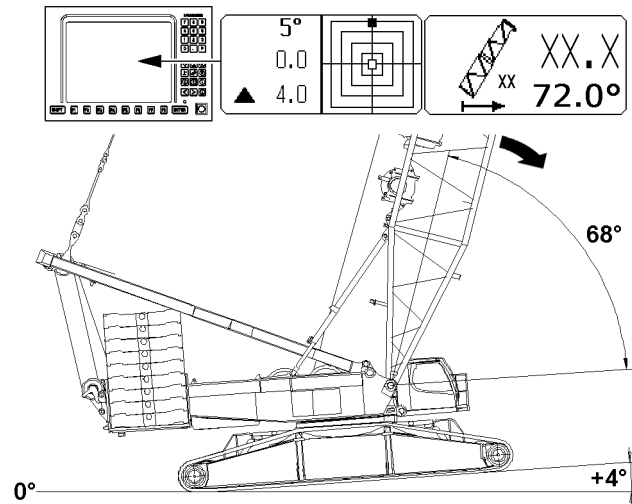


Fig.153635: Crane at 4° uphill incline (positive longitudinal incline), no lateral incline



Note

- ▶ The boom angle is always shown to the horizontal.
- ▶ Luff the boom down by the uphill angle (4°) so that the display boom angle = 72° (68° plus 4°).

Negative longitudinal incline



Note

- ▶ When driving on negative longitudinal inclines (downhill incline), the boom / luffing jib must be luffed up continuously - maximum by the **uphill incline angle α** .
- ▶ The uphill incline angle α is 4° in the displayed example, see opposite graphic.
- ▶ Incline and boom angle display (as seen from the crane operator's cab in the direction of travel).

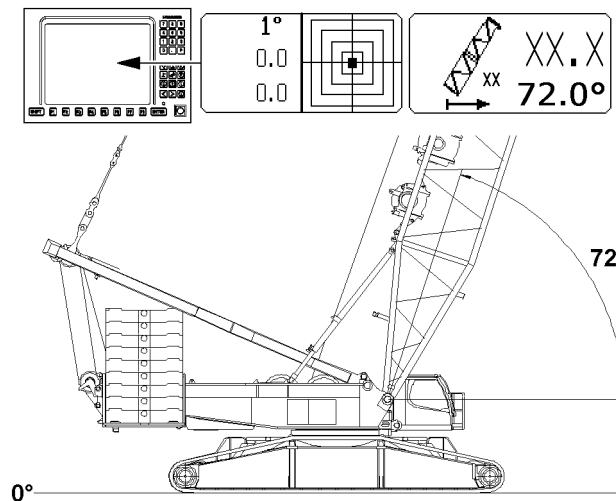


Fig.153636: The crane is horizontally aligned

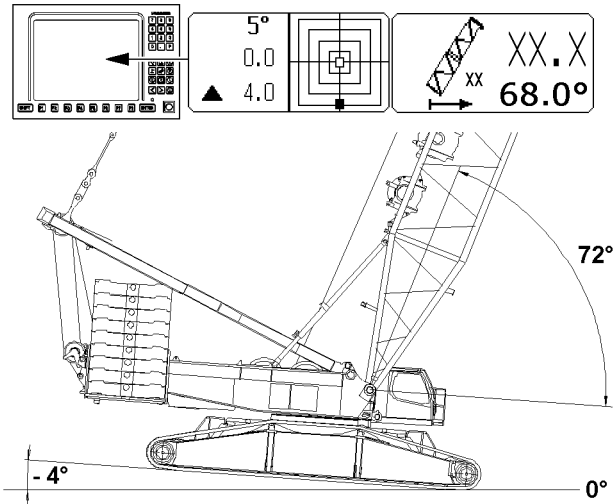


Fig.153637: Crane at 4° downhill incline (negative longitudinal incline), no lateral incline



Note

- ▶ The boom angle is always shown to the horizontal.
- ▶ Example display of boom angle = 68° (72° minus 4°).
- ▶ Correct the boom angle.

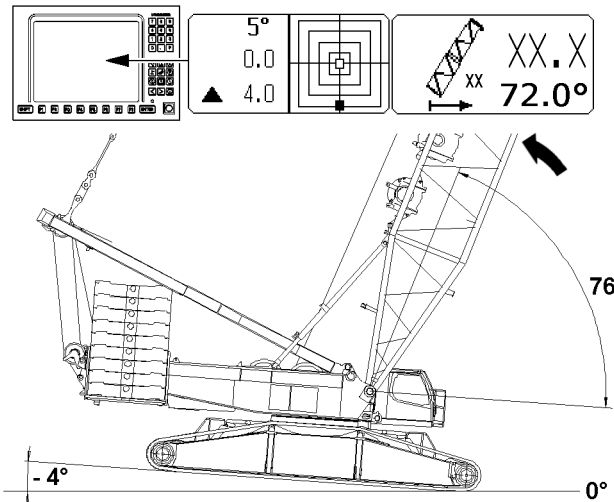


Fig.153638: Crane at 4° downhill incline (negative longitudinal incline), no lateral incline



Note

- ▶ The boom angle is always shown to the horizontal.
- ▶ Luff the boom up by the uphill angle (4°) so that the display boom angle = 72° (76° minus 4°).

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4.2.2 Prerequisites for driving on uphill / downhill inclines without boom angle adjustment

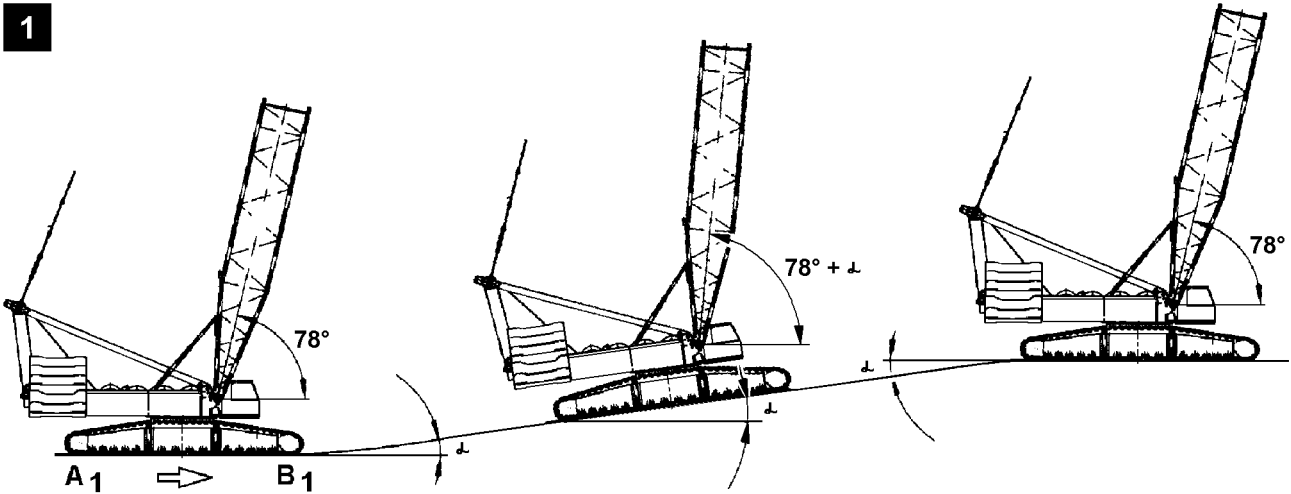


Fig.153639: Increasing the boom angle by the uphill angle α

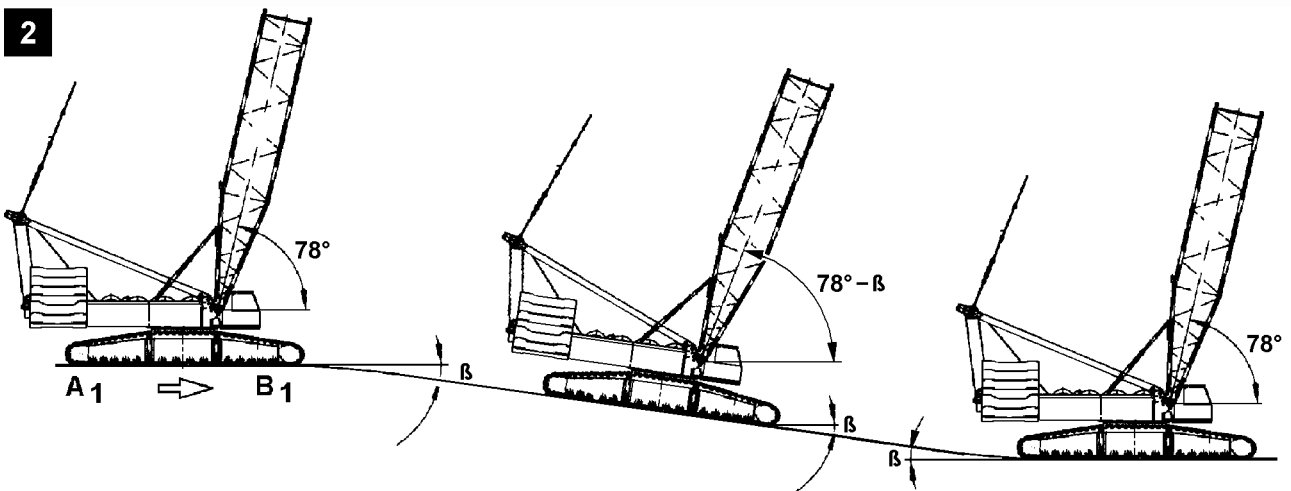


Fig.153640: Decreasing the boom angle by the uphill angle β



WARNING

The crane can topple over!

If the overall center of gravity of the crane is outside the core area when driving on uphill / downhill inclines without boom angle adjustment, then the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Before driving onto uphill / downhill inclines, 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 on uphill / downhill inclines with the job planner, the boom angle must be increased by the incline angle α when driving on uphill / downhill inclines, illustration 1.
- ▶ To be able to approximately determine the changes in the center of gravity on downhill inclines with the job planner, the boom angle must be decreased by the incline angle β when driving on downhill inclines, illustration 2.
- ▶ Before driving the crane, determine exactly with the job planner if the crane may drive on the intended route without changing the boom angle.
- ▶ If the intended uphill / downhill incline cannot be driven without changing the boom angle according to the job planner, then the boom angle must be changed to be able to drive on the uphill / downhill incline.

5 Driving the crawler crane



Note

- ▶ Test point 1 **MS1** = F1 in icon 1.
- ▶ For a description of test point 1, see chapter 4.02.

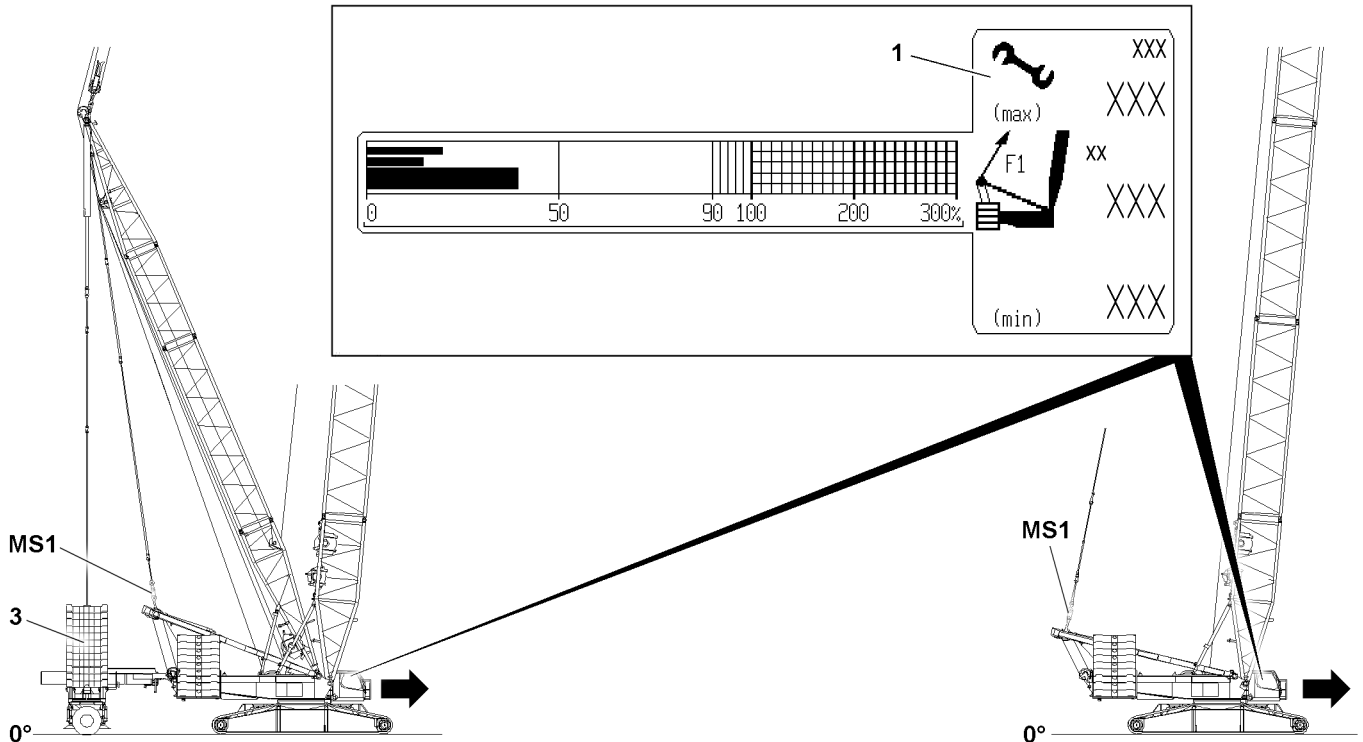


Fig.153642: Test point 1 1 and test point 1 MS1 location icon



WARNING

The crane can topple over!

When driving the crane - this also applies for „circular travel“ - the ballast trailer **3** is raised due to ground unevenness, the force on test point 1 **MS1** increases very quickly and the crane will be overloaded.

If the ballast trailer **3** sinks while driving due to ground unevenness, the force on test point 1 **MS1** drops and the ballast trailer **3** lifts off the ground, or the entire boom system is pulled backward.

There is no LMB shut off.

Death, severe bodily injuries, property damage.

- ▶ The crane operator must constantly observe the displays on the LICCON monitor while driving the crawler crane.
- ▶ The crane operator must correct the force changes in test point 1 **MS1** 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.

Death, severe bodily injuries, property damage.

- ▶ Before driving the crane with the equipment in place, the optimal boom position must be determined with the aid of the job planner, to obtain as even a surface pressure as possible.
- ▶ When driving crawler cranes, it must be ensured that the ground can take on the surface pressures safely, 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 observer, who is in radio contact with the crane driver must ensure that there are no persons or obstacles within the danger zone of the crane.

Make sure that the following prerequisite is met:

- The crane engine is running.

5.1 Surface pressures and force distribution when driving the crane

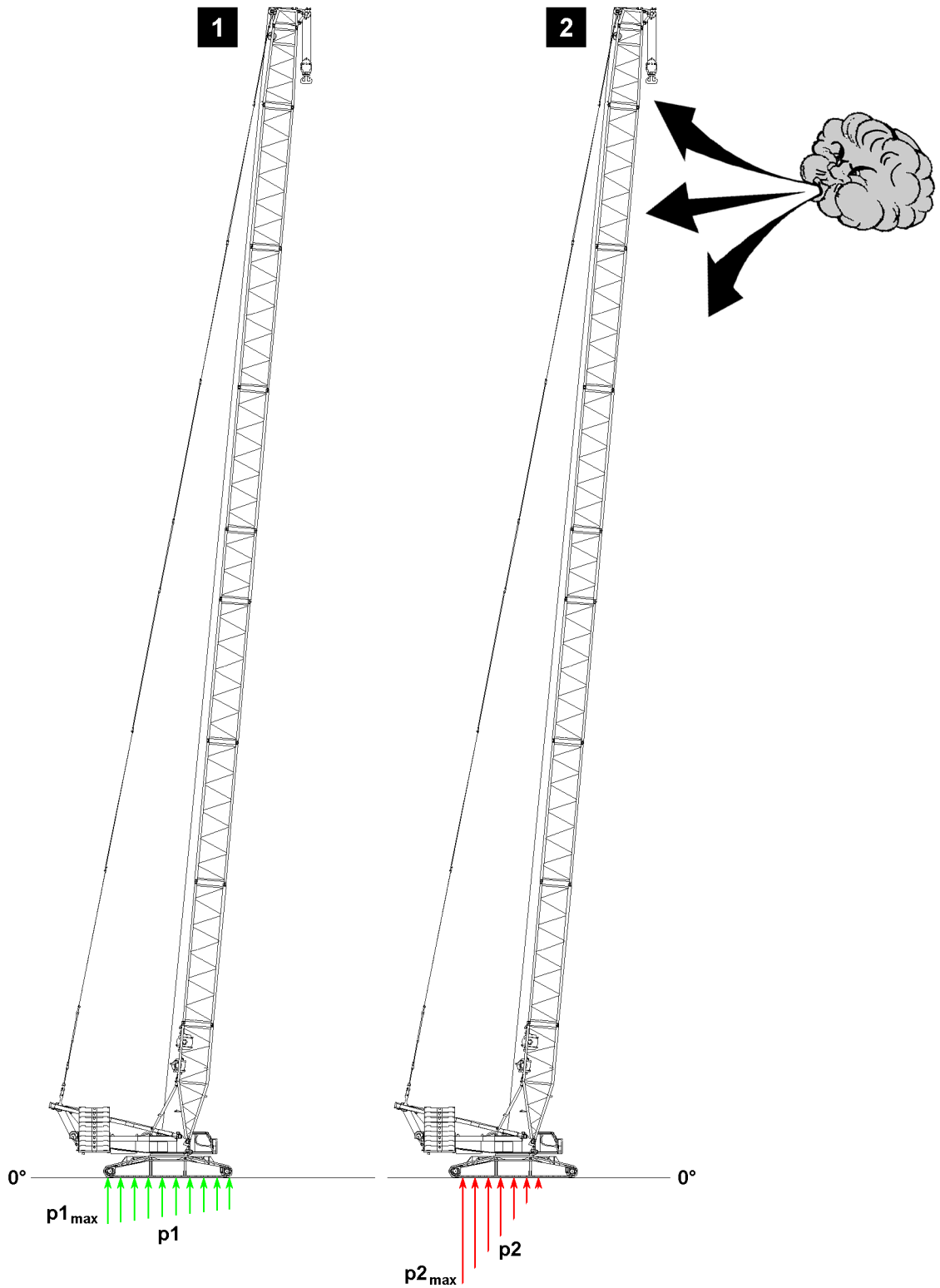


Fig. 153644: $p2_{max}$ greater than $p1_{max}$

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**WARNING**

The crane can topple over!

When driving crawler cranes, surface pressures can significantly increase or change due to different factors.

This can cause the crane to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the ground has a sufficient load bearing capacity in the entire working range and / or over the entire travel route, to be able to safely absorb even increased surfaces pressures of the crane.
- ▶ Make sure that the center of gravity is always within the core area, see section „Prerequisites for crawler operation“ and LICCON job planner.

5.1.1 Surface pressures in case of wind load on the boom

**WARNING**

The crane can topple over!

When driving the crane with long boom lengths and / or when driving with large sized loads and / or at high wind speeds, the surface pressures can increase significantly.

This can cause the crane to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the entire travel route of the crane is sufficiently load bearing to be able to absorb even increase surface pressures - for example if „wind is coming front the front on the boom“.
- ▶ Change of surface pressures on the crawler travel gear under wind load, see the adjacent graphic.

Illustration 1:

- Surface pressures **p1** on the crawler travel gear without wind load

Illustration 2:

- Surface pressures **p2** on the crawler travel gear in case of wind load from the front

5.1.2 Force distribution when driving on pressure distributor plates

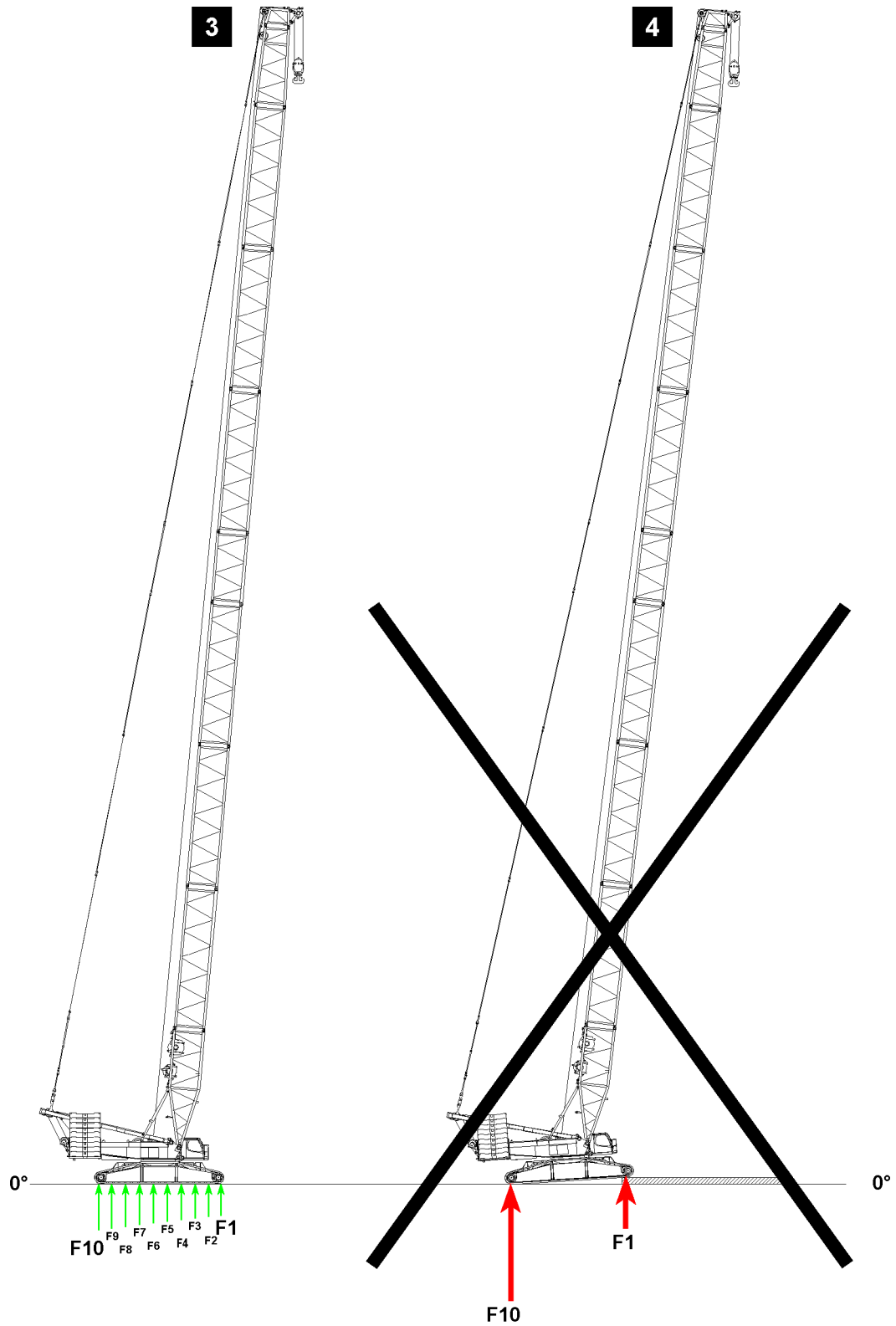


Fig. 153645: Force distribution during normal operation // driving on pressure distributor plates

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WARNING

The crane can topple over!

When driving the crane on pressure distributor plates, a movement of forces occurs due to the reduction of the ground contact surfaces on the crawler travel gear. The forces concentrate at force **F1** and force **F10**, see illustration 4.

This can cause the crane to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure, before driving the crane on pressure distributor plates, that a load bearing transfer (height equalization) was established, see section „Calculation of required length of transfers“.
- ▶ Driving the crane on pressure distributor plates without transfer (height equalization) is prohibited.

Illustration 3:

- Force distribution on crawler travel gear of the crane (normal operation)
 - Without wind influence

Illustration 4:

- Not permissible

5.2 Operating elements for the crawler operation

5.2.1 Pedal carrier

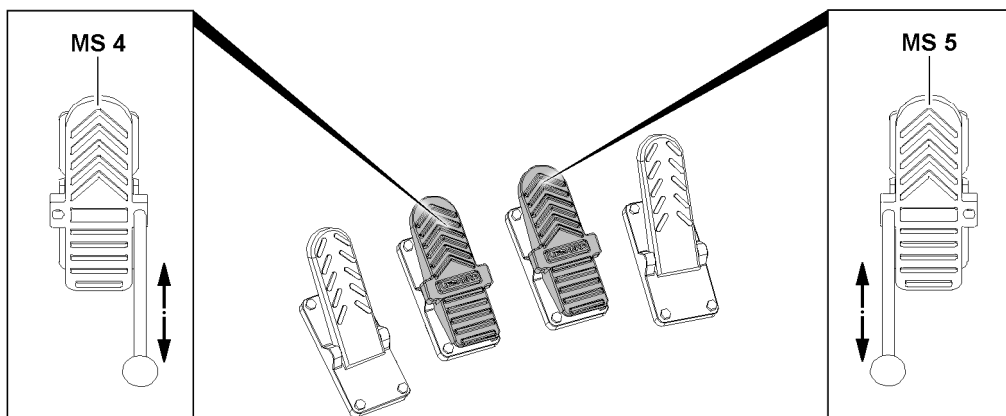
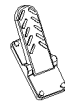





Fig.153646: Pedal carrier

| Pedal carrier (Pedal assignment, see opposite illustration) | | | | |
|--|---|---|---|---|
| |  |  |  |  |
| | <i>Pedal</i> | <i>Foot rocker MS4</i> | <i>Foot rocker MS5</i> | <i>Pedal</i> |
| Function: | Slewing gear brake | „Left“ crawler travel | „Right“ crawler travel | Engine regulation: |
| | Note: see also chapter 4.01 and chapter 4.05 | | | |

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5.2.2 Switch for crawler operation

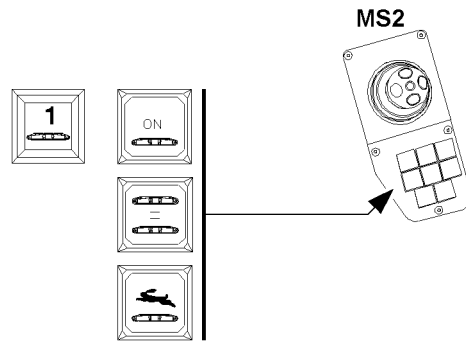






Fig.153647: Arrangement: Crawler operation switch

| Control panel MS2 | | | |
|------------------------------------|---|---|--|
| |  „Crawler operation“ switch or:  „Crawler operation“ switch |  „Crawler parallel travel“ switch |  „Rapid gear“ switch |
| Function: | On / off | On / off | On / off |
| Note: see also chapter 4.01 | | | |

5.3 Activating crawler operation



Note

- ▶ The engine rpm is increased or decreased using the „engine regulation“ pedal.
- ▶ The „crawler operation“ switch can differ somewhat, depending on the crane type.

- ▶ Actuate the „crawler operation“ switch.

Result:

- Crawler operation is activated.
- The indicator light in the „crawler operation“ switch lights up.

To deactivate crawler operation:

- ▶ Actuate the „crawler operation“ switch.

Result:

- Crawler operation is deactivated.
- The indicator light in the „crawler operation“ switch turns off.

5.4 Selecting the travel speed

This crawler crane has 2 possible speeds:

1. Speed stage 1:

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- Creeper gear
- 2. Speed stage 2:
Rapid gear

5.4.1 Activating the creeper gear

Make sure that the following prerequisites are met:

- The „rapid gear“ switch is not actuated.
- The indicator light in the „rapid gear“ switch is off.

▶ Actuate the „crawler operation“ switch.

Result:

- The creeper gear is active.

5.4.2 Activating the rapid gear



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.

Death, severe bodily injuries, property damage.

▶ Driving with a load or derrick ballast in rapid gear is prohibited.

Make sure that the following prerequisites are met:

- The „crawler parallel travel“ switch is not actuated.
- The indicator light in the „crawler parallel travel“ switch is off.
- The creeper gear is active.

To select speed stage 2:

▶ Actuate the „rapid gear“ switch.

Result:

- The rapid gear is activated.
- The indicator light in the „rapid gear“ switch lights up.

5.5 Driving the crawler



WARNING

The crane can topple over!

If a crane is driven with a load and / or derrick ballast in rapid gear, then the load and / or the boom can start to swing, structural components can be damaged and the crane can topple over.

Death, severe bodily injuries, property damage.

▶ 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 in the danger zone.

Death, severe bodily injuries, property damage.

▶ An additional observer, who is in radio contact with the crane operator must ensure that there are no persons or obstacles within the danger zone of the crane.

▶ The observer may not remain in the danger zone of the crane.

**Note**

- ▶ Take the hand lever 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 refers only in their assignment to the corresponding foot rockers in the assembled (connected) condition.

Make sure that the following prerequisite is met:

- The „crawler operation“ switch is actuated.

5.5.1 Changing the travel direction

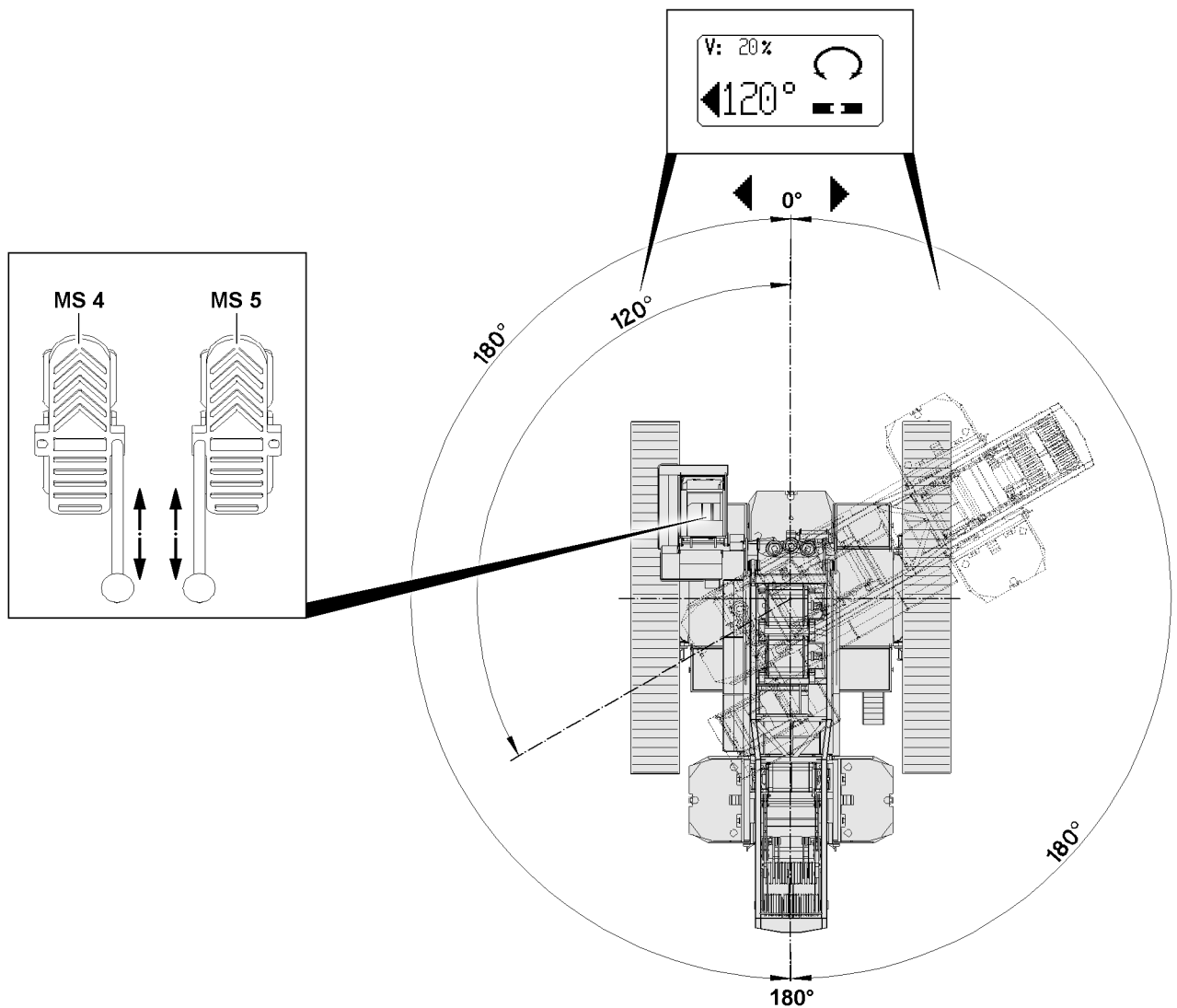


Fig.153652: Changing the travel direction

**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 the neutral position.

This means the new travel direction becomes active only if the corresponding foot rocker / manual control lever is no longer actuated.

5.5.2 Driving the crawler forward and backward

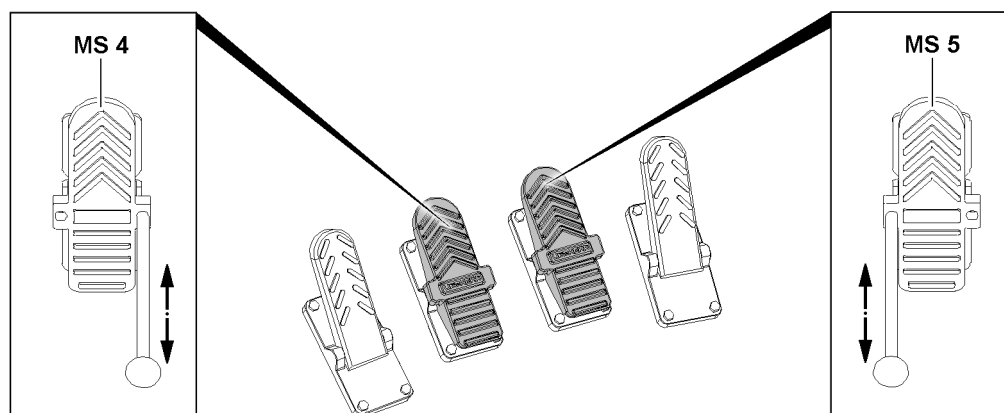


Fig.153646: Pedal carrier

The crawler travel gear can be operated with the foot rockers:

- Left crawler travel gear: Foot rocker **MS4**
- Right crawler travel gear: Foot rocker **MS5**

Alternatively, a hand 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 crawlers forward

- ▶ Push the right foot rocker **MS5** forward.
or
Move the hand lever on the foot rocker **MS5** forward.

Result:

- The right crawler moves forward.

- ▶ Push the left foot rocker **MS4** forward.
or
Move the hand lever on the foot rocker **MS4** forward.

Result:

- The left crawler moves forward.

Driving the crawlers backward

- ▶ Push the right foot rocker **MS5** backward.
or
Move the hand lever on the foot rocker **MS5** backward.

Result:

- The right crawler moves backward.

- ▶ Push the left foot rocker **MS4** backward.
or
Move the hand lever on the foot rocker **MS4** backward.

Result:

- The left crawler moves backward.

5.5.3 Activating „crawler parallel travel“

If „crawler parallel travel“ is activated, both crawlers are simultaneously controlled by pressing down on foot rocker **MS4** or foot rocker **MS5**. The foot rocker that is actuated first is used to control both crawler travel gears. This makes it possible to drive the crawler exactly straight forward on suitable ground.



Note

- ▶ If, with the „rapid gear“ turned on, the „crawler parallel travel“ function is activated, then the „rapid gear“ function is deactivated: The indicator light in the „rapid gear“ switch turns off. However, the switch remains actuated.
- ▶ If the „crawler parallel travel“ function is turned off again, the rapid gear activates automatically: The indicator light in the „rapid gear“ switch lights up.

Make sure that the following prerequisite is met:

- Rapid gear is deactivated: The indicator lights in the „rapid gear“ switch is off.
- ▶ Actuate the „crawler parallel travel“ switch.

Result:

- „Crawler parallel travel“ is activated.
- The indicator light in the *crawler parallel travel* switch lights up.

5.5.4 Steering the crane



WARNING

The crane can topple over!

If the crane is steered with applied slewing gear brake, then the boom system can be damaged due to high side acceleration.

Death, severe bodily injuries, property damage.

- ▶ When steering the crawler, always activate slewing gear freewheeling.



WARNING

The crane can topple over!

If the crawler is steered with a sagging chain, then the centering cams of the track pads can no longer be centered and guided in the drive wheels and the track rollers.

The centering cams are damaged and / or the chain can jump from the drive wheels and damage them.

Death, severe bodily injuries, property damage.

- ▶ Stop steering movements immediately.
- ▶ Drive straight forward until all centering cams are centered again in the track rollers.
- ▶ If possible, retension the track chain, see chapter 7.04.



WARNING

The crane can topple over!

When steering in small radii or when steering on the spot, the crawler tracks can „dig“ into the ground and cause the crane to topple over.

Death, severe bodily injuries, property damage.

- ▶ Steer the crawler tracks in as large a radius as possible.
- ▶ Avoid turning on the spot.

Steering the crawler travel gear to the left

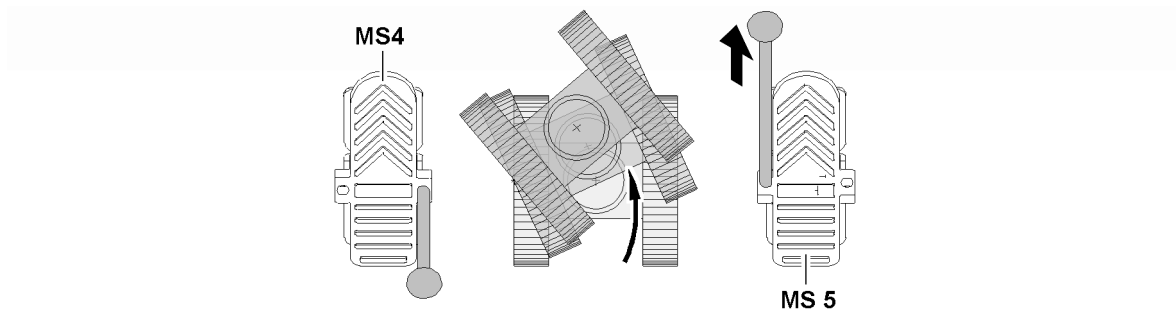


Fig.153648: Steering the crawler travel gear to the left

- ▶ Push the right foot rocker **MS5** forward.
- or
- Move the hand lever on the foot rocker **MS5** forward.

Steering the crawler travel gear to the right

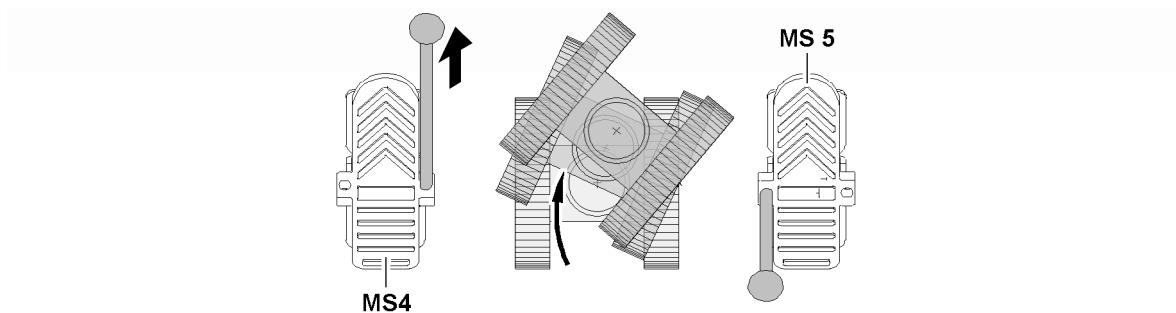


Fig.153649: Steering the crawler travel gear to the right

- ▶ Push the left foot rocker **MS4** forward.
- or
- Move the hand lever on the foot rocker **MS4** forward.

Turning the crawler travel gear on the spot to the left

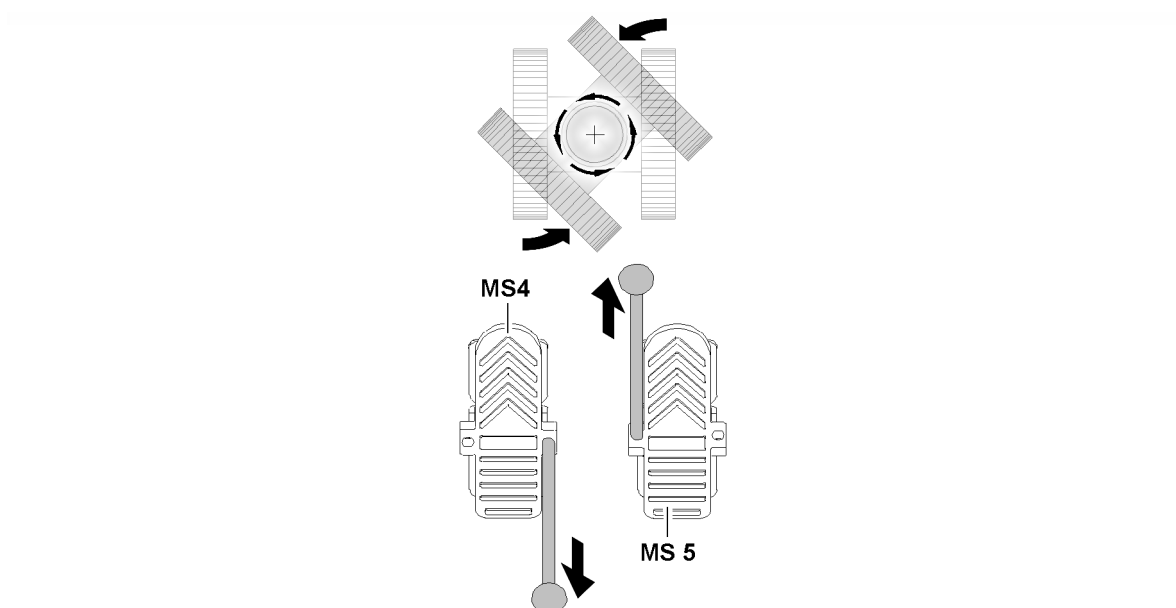


Fig.153650: Turning the crawler travel gear on the spot to the left

- ▶ Push the right foot rocker **MS5** forward and the left foot rocker **MS4** backward.
- or**
- Move the hand lever on the foot rocker **MS5** forward and move the foot rocker **MS4** backward.

Turning the crawler travel gear on the spot to the right

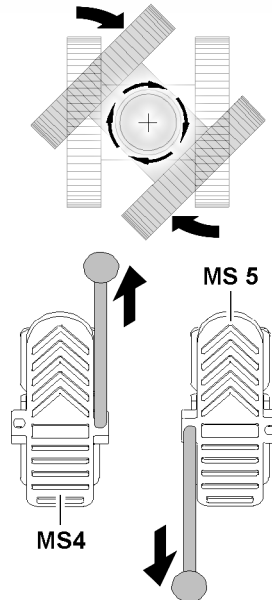


Fig.153651: Turning the crawler travel gear on the spot to the right

- ▶ Push the left foot rocker **MS4** forward and the right foot rocker **MS5** backward.
- or**
- Move the hand lever on the foot rocker **MS4** forward and move the foot rocker **MS5** backward.

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4.20 Procedure for shut-off of crane movement

| | | |
|---|--|----|
| 1 | General | 3 |
| 2 | Instructions for resuming crane movements for cranes with CE mark | 7 |
| 3 | Instructions for resuming crane movements for cranes without CE mark | 55 |

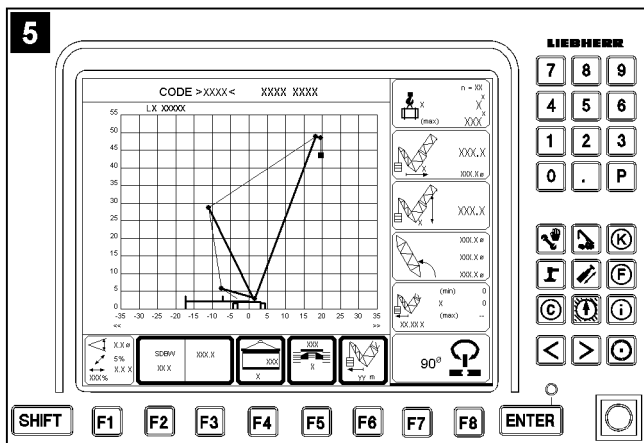
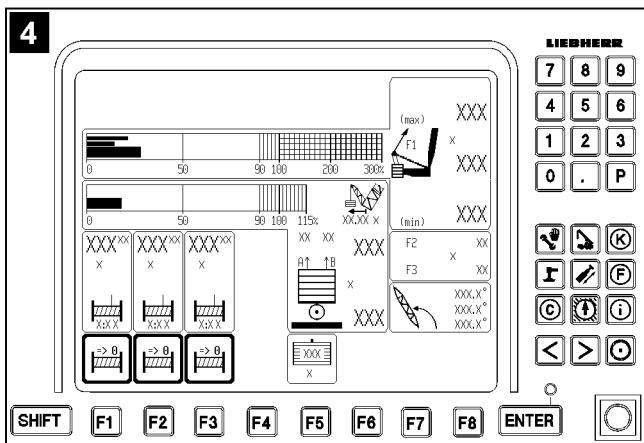
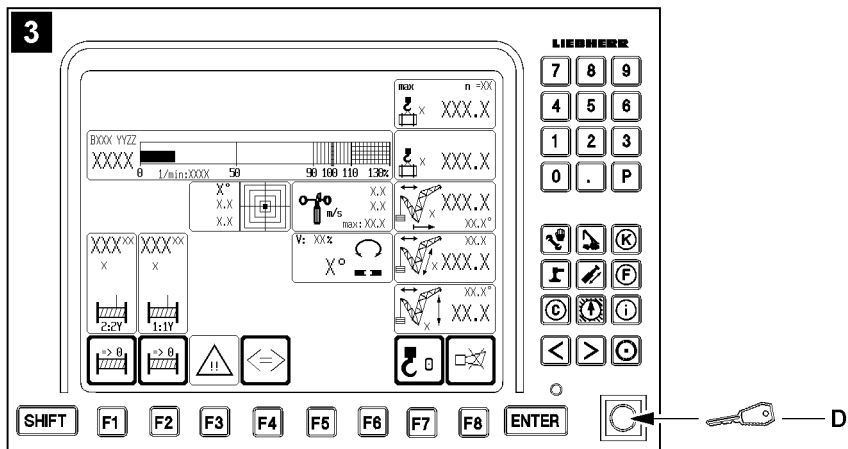
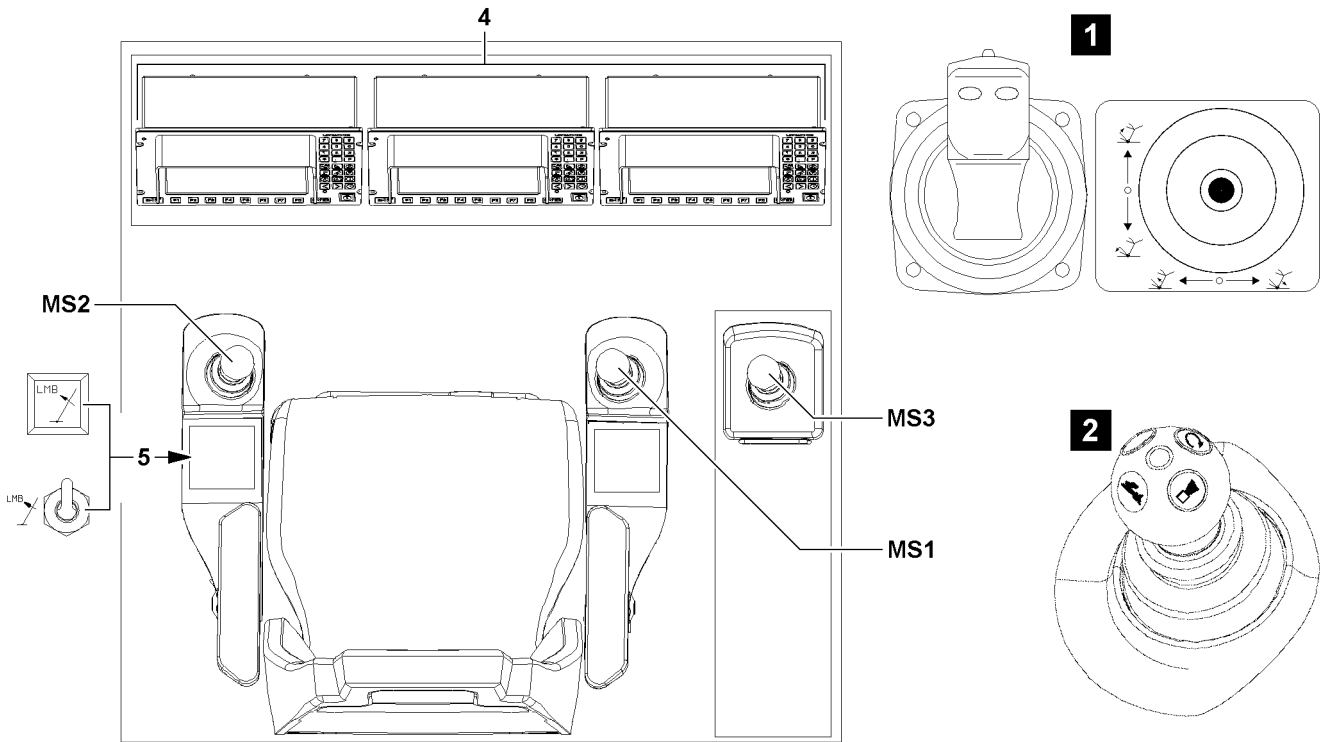


Fig.112332

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1 General

To operate the crane, three manually actuated master switches (MS1, MS2, MS3) are available.

- **MS1** Master switch
 - Right control console
- **MS2** Master switch
 - Left control console
- **MS3** Master switch
 - Right instrument panel

To monitor the crane, depending on the crane type, two or three LICCON monitors **4** are in the instrument panel.

- LICCON monitor, illustration **3**
 - User interface for entry of equipment configurations and for crane operation (crane operating screen), also described as LICCON monitor 0
- LICCON monitor, illustration **4**
 - User interface for operation with „Derrick“ boom, also described as LICCON monitor 1
- LICCON monitor, illustration **5**
 - User interface for „LICCON job planner“ (only for crane types with three monitors), also described as LICCON monitor 2

| Equipment in the crane cab | | |
|----------------------------|---|-----------------|
| Crane type | Manually actuated master switches | LICCON monitors |
| LR 1350/1 | Three (version illustration 2) | Two (three*) |
| LR 1400/2 | Three (versions illustration 1) | Two |
| LR 1600/2 | Three (version illustration 2) | Three |
| LR 1600/2–W | Three (version illustration 2) | Three |
| LR 1750 | Three (version illustration 2) | Three |
| LR 1750/2 | Three (version illustration 2) | Three |
| LG 1750 | Three (version illustration 2) | Three |
| LR 11350 | Three (version illustration 2) | Three |

In the crane operator's cab, two buttons are installed to make it possible to bring the crane from an emergency situation after a shut off of the LICCON overload protection.

- Set up key **D** (Function „Exceeding the shut off limits for the LICCON overload protection“) on the LICCON monitor with crane operating screen, illustration **3**
- Button **5** „Luffing in with suspended load“ in the left control console

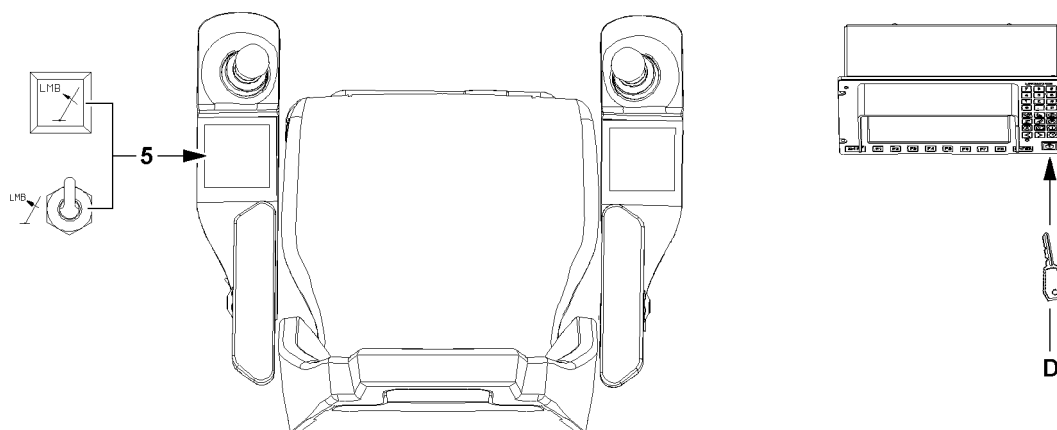


Fig. 112333

The function „Exceedance of shut off limits of the LICCON overload protection“, which is activated with the set up key **D** includes the following:

- Exceedance of the maximum permissible load moment
- Bypass of the hoist top shut off
- Exceedance of limit values from load charts
- Exceedance of maximum value test point 1 (force F1)
- Allowance of individual, limited crane movements after LMB STOP (error message)
- Completion of crane movements outside of load charts (erection / take down procedures)

NOTICE

Multi action function „Exceedance of shut off limits of the LICCON overload protection“!

If the set up key **D** is actuated, then it is possible to exceed several shut off limits of the LICCON overload protection simultaneously.

The LICCON overload protection as a whole is deactivated or limited.

There is no additional protection against crane overload.

- ▶ When the set up key **D** is actuated, it must be taken into account that the LICCON overload protection as a whole is deactivated or limited.



Note

The set up key **D** has two functions, independent of each other:

- ▶ If no crane movement can be carried out due to the shut off of crane operation by the LICCON overload protection, then by pressing the set up key **D**, a 100 % utilization can be exceeded and / or an active shut off can be bypassed. The crane can thereby be controlled again in normal operating status (utilization below 100 % and no active shut off).
- ▶ When the set up key **D** is actuated, all erection / take down procedures can be carried out within the erection / take down charts (assembly operation).

**WARNING**

Danger of accident due to function „Exceedance of shut off limits of the LICCON overload protection“! If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.

Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.

Personnel can be severely injured or killed.

- ▶ The button **5** „Luffing in with suspended load“ and the set up key **D** may only be actuated when it is ensured that no normal operating condition (utilization below 100 % and no active shut off) can be reached without the function „Exceedance of shut off limits of the LICCON overload protection“!
- ▶ Actuate the set up key **D** only when no normal operating condition (utilization below 100 % and no active shut off) can be reached with the button **5** „Luffing in with suspended load“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload protection“ is prohibited.

**WARNING**

Expanded working / danger zone of the crane!

Due to the function „Exceedance of shut off limits of the LICCON overload protection“ it is possible that the working / danger zone of the crane is significantly expanded.

If these circumstances are not observed, collisions and accidents can occur.

Personnel can be severely injured or killed.

- ▶ With activated function „Exceedance of shut off limits of the LICCON overload protection“ take an expanded working / danger zone of the crane into account and monitor it.

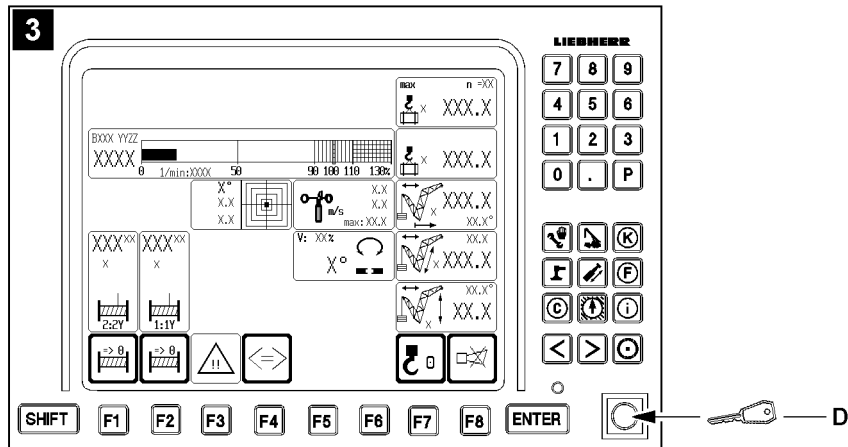
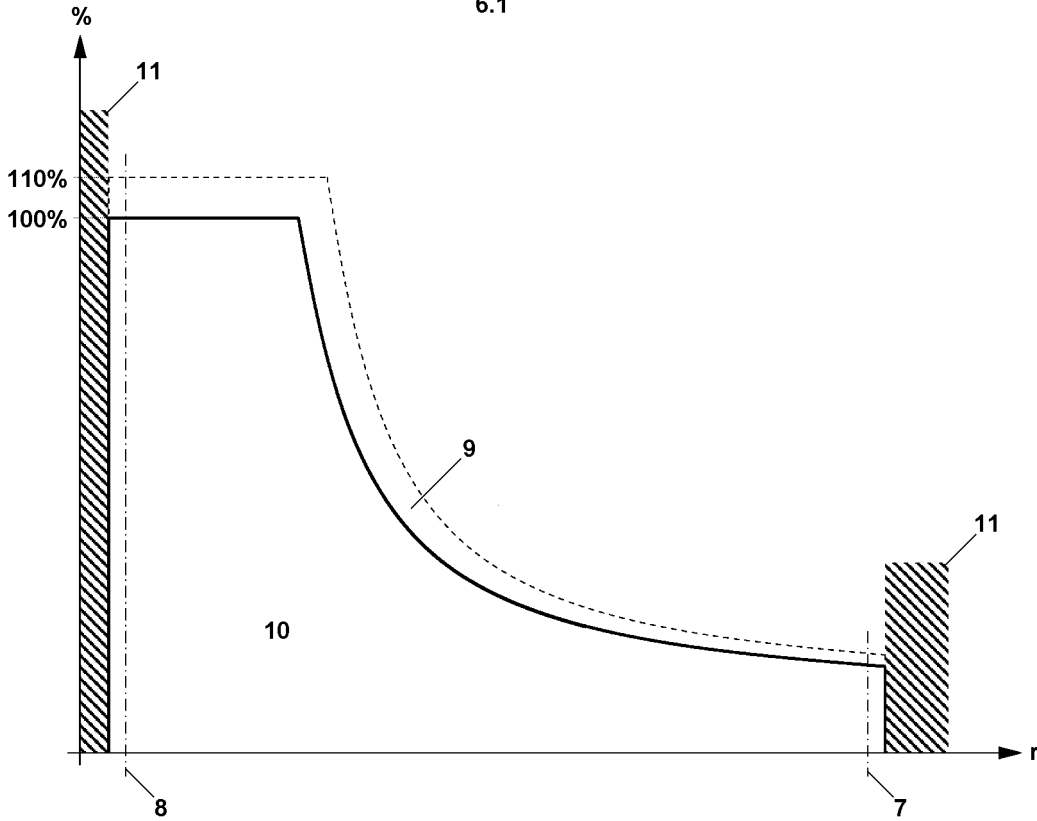
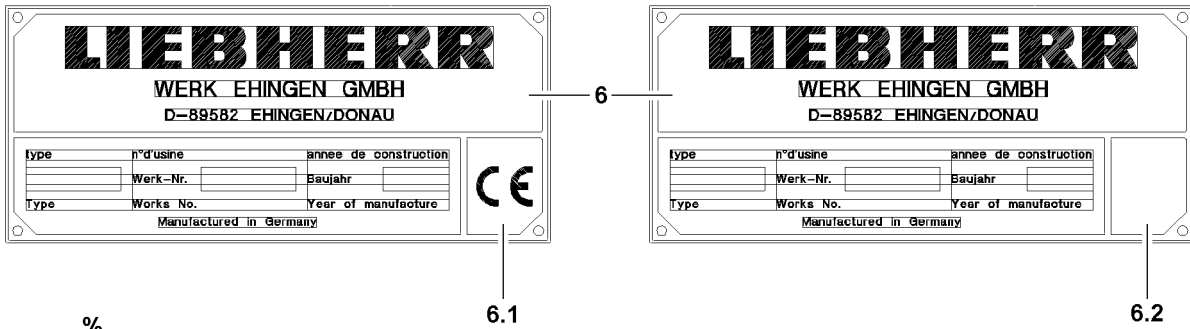


Fig.111211

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2 Instructions for resuming crane movements for cranes with CE mark



WARNING

Danger of accident!

If the following points are not observed, personnel can be severely injured or killed.

- ▶ The crane operator bears the sole and full responsibility for the adherence to measures to be taken in case of shut off of crane movement.
- ▶ The crane operator must make sure, before crane operation, that he is using the correct description for the current programming.



Note

- ▶ Check the data tag **6** to determine if your crane has a CE mark.
- ▶ The following section applies to a crane with CE mark, see data tag **6.1**.
- ▶ If your crane does not have a CE mark, see data tag **6.2**, then you must observe the description in section „Instructions for resuming a crane movement for cranes without CE mark“.

2.1 Overview load chart for cranes with CE mark

| Axle | Description |
|------|---|
| r | Radius boom (working radius) |
| % | Utilization of the crane in percentages |

| Position | Description |
|----------|--|
| 7 | Lower limit angle load chart |
| 8 | Upper limit angle load chart |
| 9 | Utilization up to 110 % with reduced working speed |
| 10 | Range „Load chart available“ |
| 11 | Range „No load chart available“ |



Note

- ▶ If the set up key **D** (LICCON monitor with crane operating screen, illustration **3**) is actuated in the area „load chart available“, then the working speed is reduced and all displays of the LICCON overload protection remain functional.
- ▶ If the set up key **D** is actuated in the area „no load chart available“, then the working speed is not reduced.

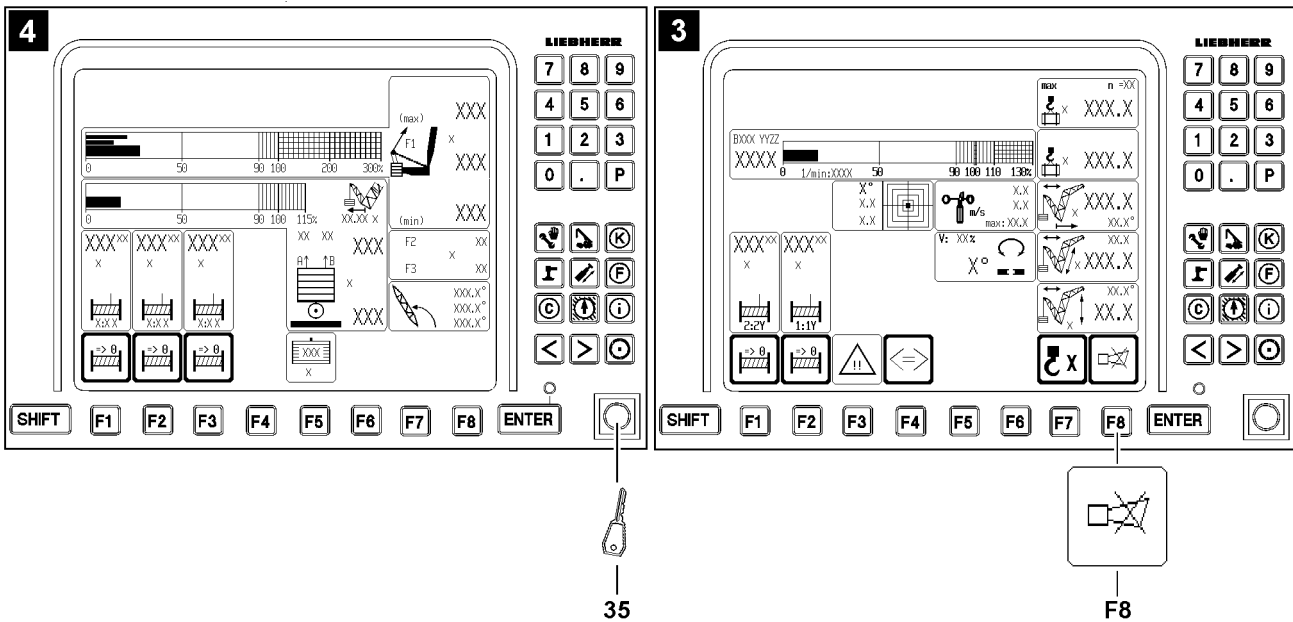
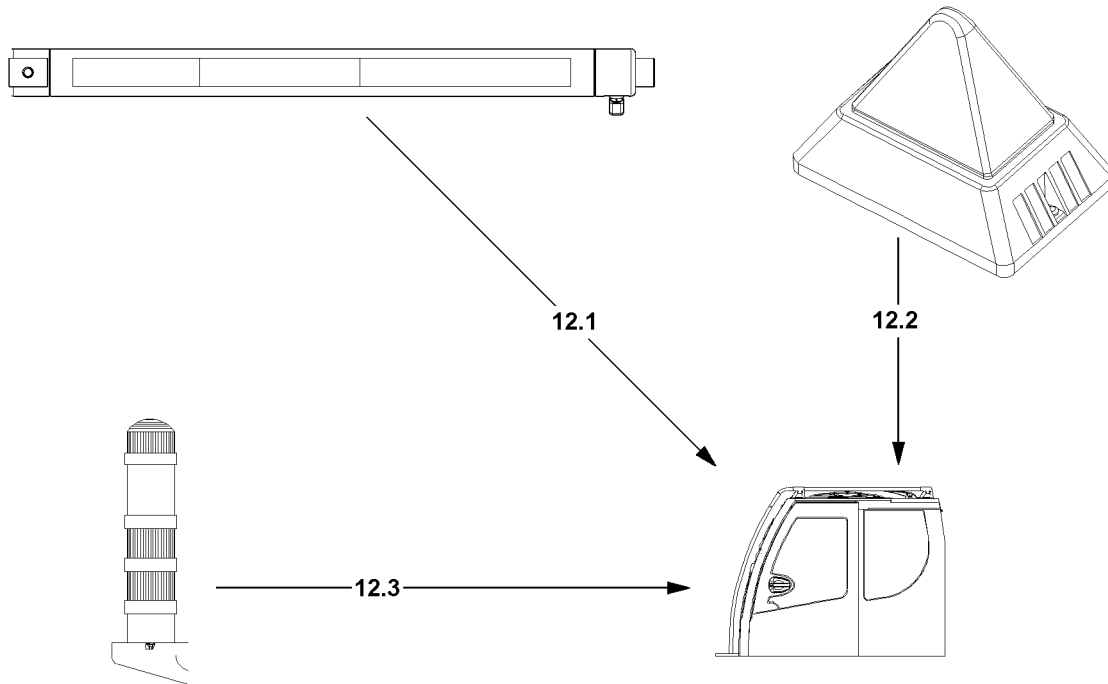


Fig.111212

2.2 Overview of acoustic / visual warnings for cranes with CE mark

- Depending on the crane type, either a warning light **12.1** or a flashing beacon **12.2** or a combination of flashing beacon **12.2** and warning light* **12.3** are installed.
- The acoustic warnings within the crane operator's cab are turned off by pressing the button **F8** on the LICCON monitor with crane operating screen (illustration **3**).
- The acoustic warnings outside the crane operator's cab are turned off by actuating the key button **35** on the LICCON monitor with derrick operating screen (illustration **4**).

2.2.1 Description of acoustic / visual warnings

The case numbers from the chart „Overview of case numbers“ are valid for the following charts in this chapter:

- „Acoustic / visual warnings on the LICCON monitor“
- „Warning light 12.1“
- „Flashing beacon 12.2“
- „Warning light 12.3“

| Overview of case numbers | |
|--------------------------|---|
| Case number | Description Case |
| Case 001 | Utilization of crane from 0 % to 89 % |
| Case 002 | Utilization of crane from 90 % to 100 % |
| Case 003 | Utilization of crane over 100 % |
| Case 004 | Shut off of crane movements - LMB STOP |
| Case 005 | Luffing in with suspended load |
| Case 006 | Participating sensor (LMB) defective |
| Case 010 | Exceeding the shut off limits of the LICCON overload protection |
| Case 011 | Bypass of shut off hoist top |
| Case 016 | Bypass of shut off luffing down the boom / auxiliary boom / accessories, „Load chart available“ |
| Case 018 | Bypass of shut off luffing down the boom / auxiliary boom / accessories, „No load chart available“ |
| Case 020 | Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures, „No load chart available“ |

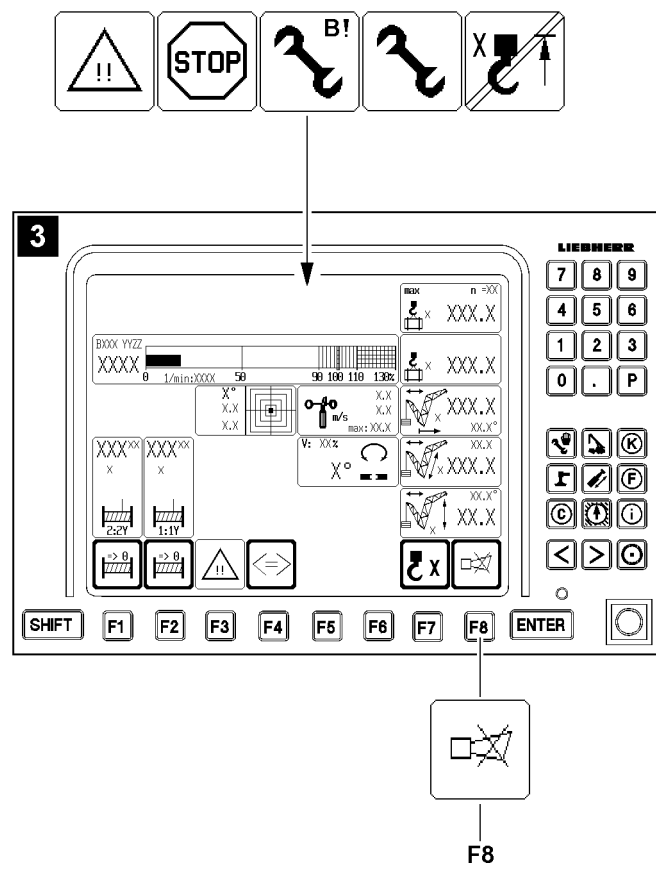


Fig.111209

2.2.2 Acoustic / visual warnings within the crane operator's cab



Note

► Description of individual case numbers, see chart „Overview of case numbers“.

| Acoustic / visual warnings on the LICCON monitor | | | | | | | | | |
|--|---|----------------|----------------|-------------------------------|-------------|------------|---|---|---|
| Case number | Acoustic warning LICCON monitor at utilization of crane | | | Visual warning LICCON monitor | | | | | |
| | Short sound | Long sound | Long sound | Utilization of crane | | Occurrence | | | |
| | From 90 % | Above 100 % | Always | From 90 % | Above 100 % | LMB STOP | Appears if the set up key D is actuated | | |
| | | | | | | | | | |
| Case 001 | | | | | | | — | — | — |
| Case 002 | X ² | | | O | | | — | — | — |
| Case 003 | | X ² | | O | O | | — | — | — |
| Case 004 | | | X ² | | O | | — | — | — |
| Case 005 | X ² | X ² | | O | O | | — | — | — |
| Case 006 | | | X ² | | | O | Cannot be bypassed ⁵ | | |
| Case 010 | X ² | X ² | | O | O | | O | | |
| Case 011 | | | X ² | O | O | O | O | | O |
| Case 016 | X ² | X ² | | O | O | | O | | |
| Case 018 | | | X ² | | | O | | O | |
| Case 020 | | | X ² | | | O | | O | |

O = cannot be turned off

X² = can be turned off immediately on the LICCON monitor key **F8**

Cannot be bypassed⁵ = contact Liebherr Service

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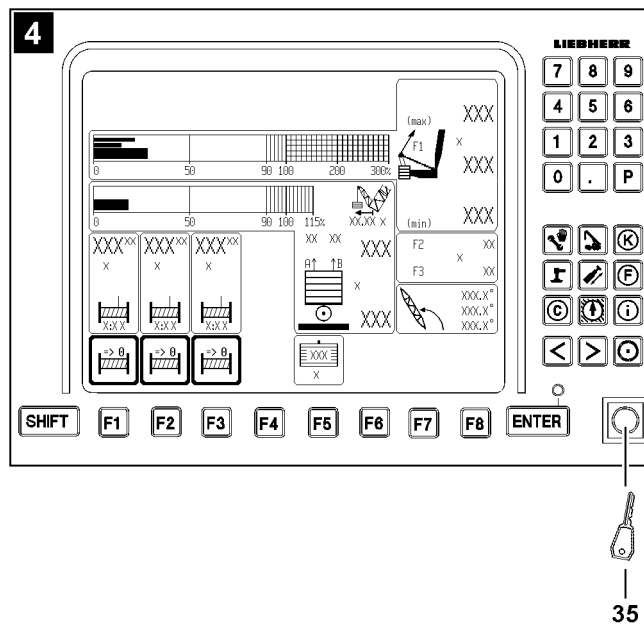
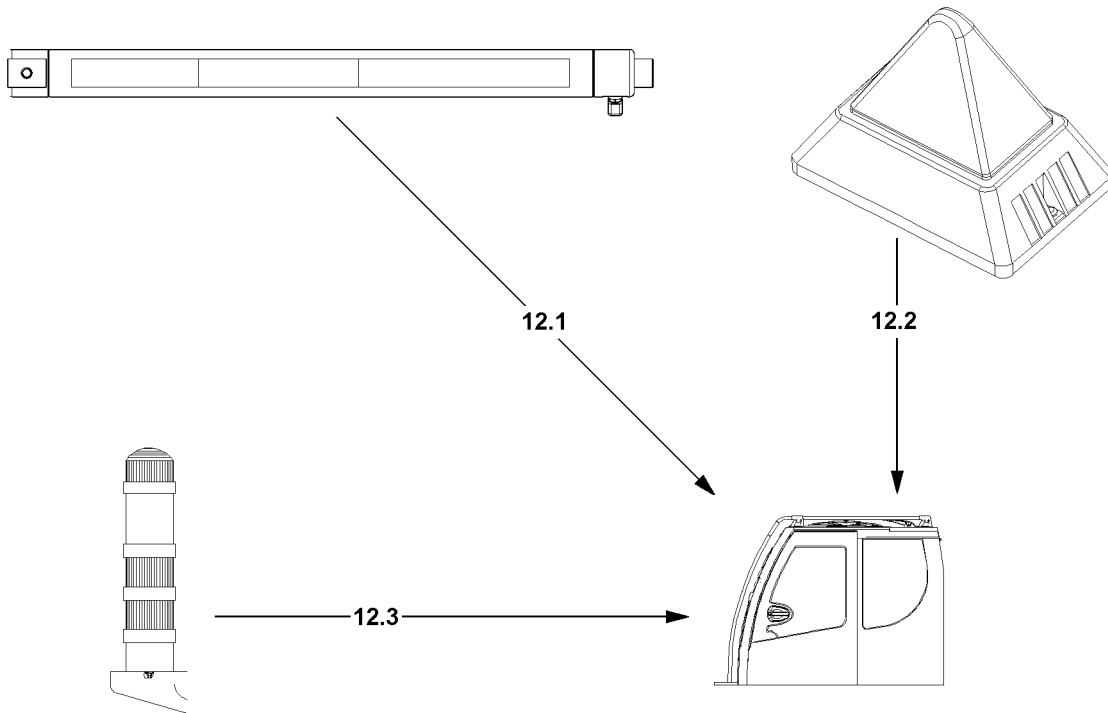


Fig.111206

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2.2.3 Acoustic / visual warnings outside the crane operator's cab



Note

► Description of individual case numbers, see chart „Overview of case numbers“.

| Warning light 12.1 | | | | | |
|--------------------|-------------------------|------------------|----------------|----------------|----------------|
| Case number | At utilization of crane | Acoustic warning | Visual warning | | |
| | | Signal turntable | Green | Yellow | Red |
| Case 001 | From 0 % to 89 % | | O ¹ | | |
| Case 002 | From 90 % to 100 % | | | O ¹ | |
| Case 003 | Above 100 % | X ¹ | | | O ¹ |
| Case 004 | - | | | | O ¹ |
| Case 005 | From 0 % to 89 % | | O ¹ | | |
| Case 005 | From 90 % to 100 % | | | O ¹ | |
| Case 005 | Above 100 % | X ¹ | | | O ² |
| Case 006 | - | | | | O ¹ |
| Case 010 | From 0 % to 89 % | | O ¹ | | |
| Case 010 | From 90 % to 100 % | | | O ¹ | |
| Case 010 | Above 100 % to 110 % | | | O ² | |
| Case 010 | Above 110 % | X ¹ | | | O ¹ |
| Case 011 | Up to 110 % | | | O ² | |
| Case 011 | Above 110 % | O | | | O ² |
| Case 016 | From 0 % to 89 % | | O ¹ | | |
| Case 016 | From 90 % to 100 % | | | O ¹ | |
| Case 016 | Above 100 % to 110 % | | | O ² | |
| Case 016 | Above 110 % | X ¹ | | | O ¹ |
| Case 018 | No value available | | | O ² | |
| Case 020 | No value available | | | O ² | |

O = cannot be turned off

O¹ = warning light **12.1** lights up

O² = warning light **12.1** blinks

X¹ = can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

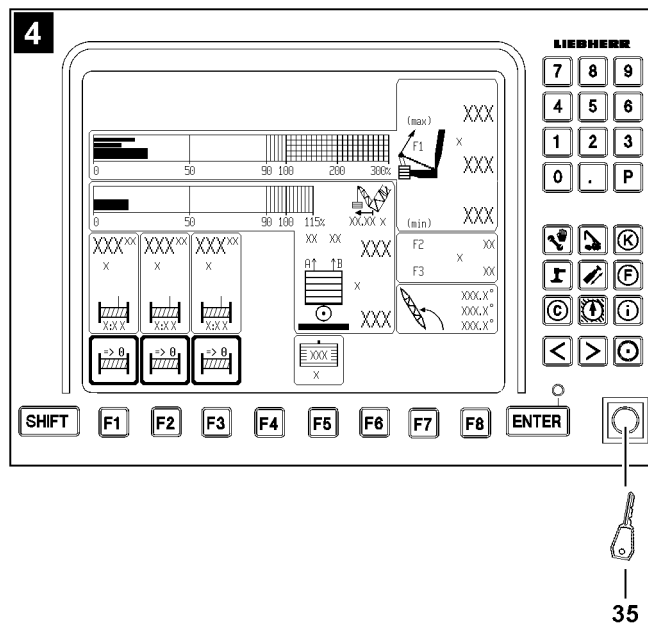
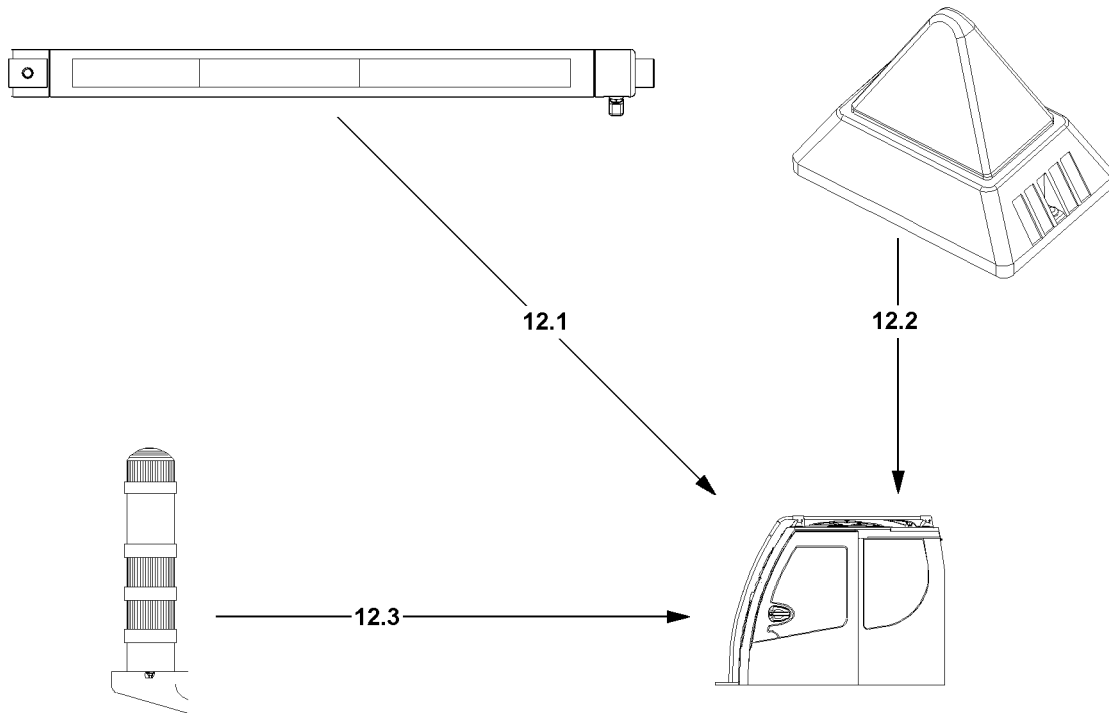


Fig.111206

**Note**

► Description of individual case numbers, see chart „Overview of case numbers“.

| Flashing beacon 12.2 | | | |
|----------------------|-------------------------|------------------|----------------|
| Case number | At utilization of crane | Acoustic warning | Visual warning |
| | | Signal turntable | Red |
| Case 001 | 0 % to 89 % | - | - |
| Case 002 | 90 % to 100 % | - | - |
| Case 003 | Above 100 % | X ¹ | O ² |
| Case 004 | - | | O ² |
| Case 005 | Above 100 % | X ¹ | O ² |
| Case 006 | - | | O ² |
| Case 010 | Above 110 % | X ¹ | O ² |
| Case 011 | Above 110 % | X ¹ | O ² |
| Case 016 | Above 110 % | X ¹ | O ² |
| Case 018 | No value available | | O ² |
| Case 020 | No value available | | O ² |

O = cannot be turned off

O² = flashing beacon **12.2** blinks

X¹ = can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

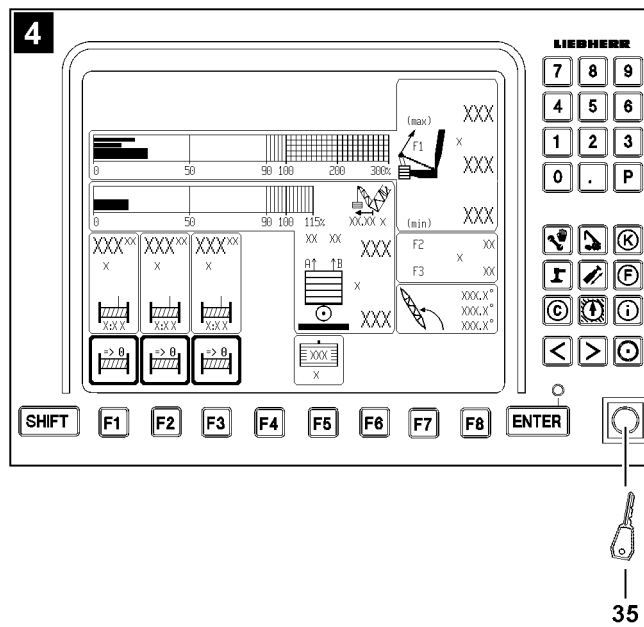
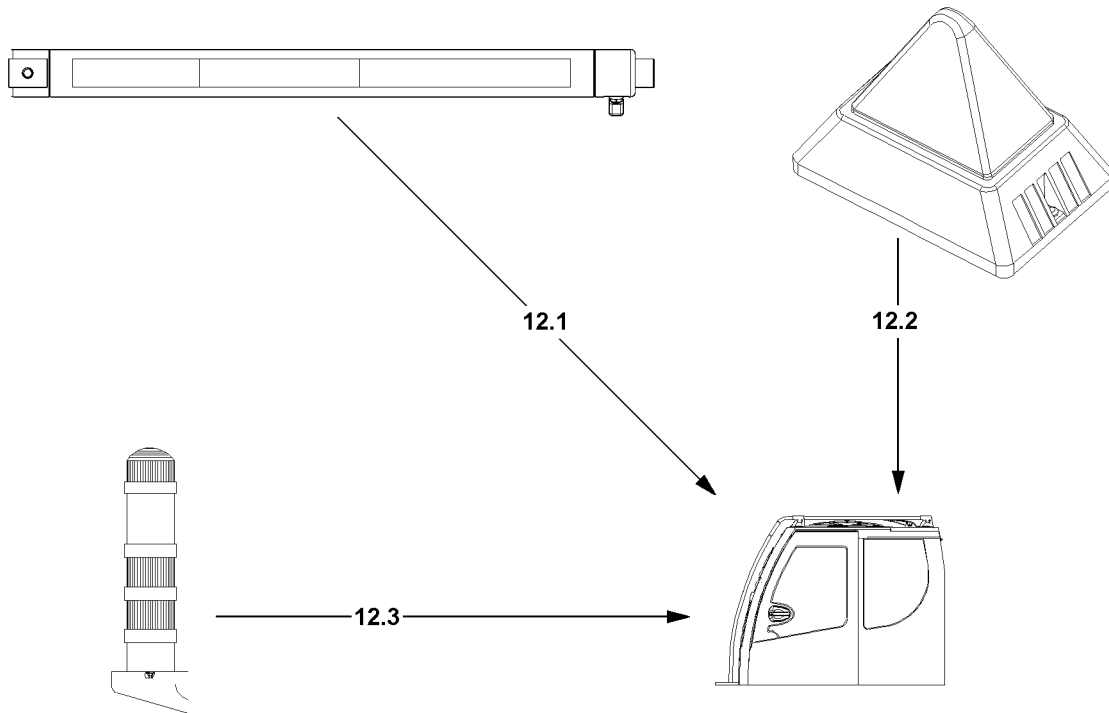


Fig.111206

LWE/LR 11350-007/19005-01-02/en

**Note**

► Description of individual case numbers, see chart „Overview of case numbers“.

| Warning light 12.3 | | | | | |
|--------------------|-------------------------|------------------|----------------|----------------|----------------|
| Case number | At utilization of crane | Acoustic warning | Visual warning | | |
| | | Signal turntable | Green | Yellow | Red |
| Case 001 | From 0 % to 89 % | | O ¹ | | |
| Case 002 | From 90 % to 100 % | | | O ¹ | |
| Case 003 | Above 100 % | X ¹ | | | O ² |
| Case 004 | - | | | | O ² |
| Case 005 | From 0 % to 89 % | | O ¹ | | |
| Case 005 | From 90 % to 100 % | | | O ¹ | |
| Case 005 | Above 100 % | X ¹ | | | O ² |
| Case 006 | - | | | | O ² |
| Case 010 | From 0 % to 89 % | | O ¹ | | |
| Case 010 | From 90 % to 110 % | | | O ¹ | |
| Case 010 | Above 110 % | X ¹ | | | O ² |
| Case 011 | Up to 110 % | | | O ¹ | |
| Case 011 | Above 110 % | X ¹ | | | O ² |
| Case 016 | From 0 % to 89 % | | O ¹ | | |
| Case 016 | From 90 % to 110 % | | | O ¹ | |
| Case 016 | Above 110 % | X ¹ | | | O ² |
| Case 018 | No value available | | | | O ² |
| Case 020 | No value available | | | | O ² |

O = cannot be turned off

O¹ = warning light **12.3** lights up

O² = warning light **12.3** blinks

X¹ = can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

2.3 Monitoring of crane movement

**Note**

- If the LICCON overload protection turns the crane movement off, then the exact cause for the shut off must be determined first.
- As a first step, try to rescind the crane movement which has caused a shut off.
- If it is not possible to rescind the affected crane movement, then the additional steps are described in the following sections of the chapter.

**Note**

- For detailed description of the individually listed symbols, see Crane operating instructions, chapter 4.02.

The LICCON overload protection carries out the following shut offs if a limit value is exceeded in crane operation:

- Shut off luffing the main boom up / down
- Shut off Upper limit shut off angle (OGAW)
- Shut off Luffing the auxiliary boom / accessory up / down
- Shut off maximum / minimum value test point 1 (force F1)
- Shut off spooling the winch up / out
- Shut off Hoist top
- Shut off due to error message

The LICCON overload protection warns if the limit values are exceeded, but does not turn off:

- Minimum / maximum support forces

2.3.1 Shut off luffing the main boom up / down

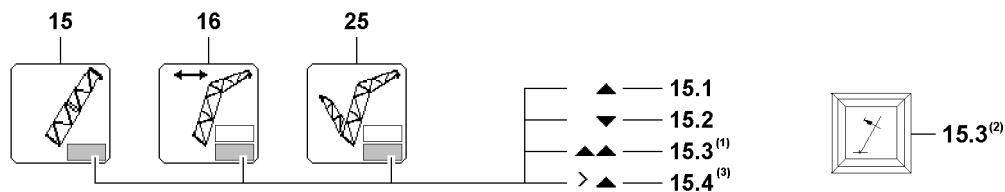


Fig.124701

⁽¹⁾not LR 1400/2

⁽²⁾only LR 1400/2

⁽³⁾Only for certain crane types

In symbol **15**, or symbol **16**, or symbol **25** appears in the lower field symbol **15.1**, or symbol **15.2** or symbol **15.4** and the LICCON overload protection has shut the crane movement off.

„Luffing the main boom up“ (symbol **15.1**) or „Luffing the main boom down“ (symbol **15.2**) or „upper limit shut off angle“ reached (symbol **15.4**), was shut off because the upper / lower limit angle of the selected load chart was exceeded / fallen below.

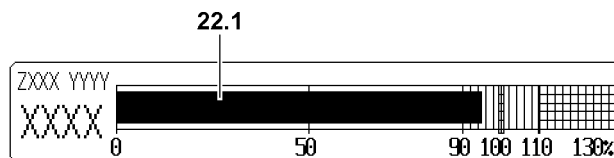


Fig.112340



Note

- ▶ If the utilization of the crane is more than 95 % (utilization bar **22.1** exceeds 95 %) and the maximum load according to the load chart (falling load capacity) drops by continuing to luff up the boom, then the symbol **15.1** also appears and the crane movement „Luffing the main boom up“ is turned off.

If the symbol / warning light **15.3** appears, then:

- **either** it was luffed up to a limit switch or the limit switch has turned off the crane movement „Luffing the main boom up“
- **or** there is an error on one of the limit switches „Main boom top“

The symbol **15.1** appears and the crane movement „Luffing the main boom up“ was turned off:

- ▶ Luff the main boom down.

Result:

- Crane operation is possible again.

The symbol **15.2** appears and the crane movement „Luffing the main boom down“ was turned off:

- ▶ Luff the main boom up.

Result:

- Crane operation is possible again.

The symbol / warning light **15.3** appears and the crane movement „Luffing the main boom up“ was turned off:

- ▶ Luff the main boom down.

Result:

- Crane operation is possible again.

Problem remedy

The symbol / warning light **15.3** appears continuously?

If a symbol / warning light **15.3** appears without having luffed the main boom up to a limit switch, then there may be an error in the limit switches „Main boom top“.

- ▶ Check if there is an error message from the LICCON computer system, see Diagnostics manual.
- ▶ If yes: Remedy the error immediately.

The symbol **15.4** appears and the crane movement „Luffing the main boom up“ (upper limit shut off angle) was turned off:

- ▶ Luff the main boom down.

Result:

- Crane operation is possible again.



WARNING

Limited warning functions!

If one of the double version limit switches is not ok and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited.

- ▶ The crane can only be operated in an emergency after failure of a double version limit switch.
- ▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

2.3.2 Shut off Luffing the auxiliary boom / accessory up / down

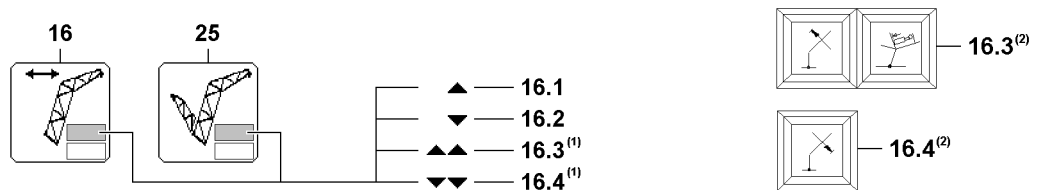


Fig.124702

⁽¹⁾not LR 1400/2

⁽²⁾only LR 1400/2

In symbol **16** or symbol **25** appear in the upper field symbol **16.1** or symbol **16.2** and the LICCON overload protection has shut off the crane movement.

„Luffing the auxiliary boom / accessory up“ (symbol **16.1**) or „Luffing the auxiliary boom / accessory down“ (symbol **16.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded / fallen below.

If the symbol / warning light **16.3** appears, then:

- **either** it was luffed up to a limit switch or the limit switch has turned off the crane movement „Luffing the auxiliary boom / accessory up“

- **or** the mechanical relapse support has turned off the crane movement „Luffing the auxiliary boom / accessory up“
- **or** there is an error on one of the limit switches „Auxiliary boom / accessory top“.

If the symbol / warning light **16.4** appears, then:

- **either** it was luffed down to a limit switch „Auxiliary boom / accessory bottom“ and the limit switch has turned off the crane movement „Luffing the auxiliary boom / accessory up“
- **or** there is an error on one of the limit switches „Auxiliary boom / accessory bottom“

The symbol **16.1** appears and the crane movement „Luffing the auxiliary boom / accessory up“ was turned off:

- ▶ Luff the auxiliary boom / accessory down.

Result:

- Crane operation is possible again.

The symbol **16.2** appears and the crane movement „Luffing the auxiliary boom / accessory down“ was turned off:

- ▶ Luff the auxiliary boom / accessory up.

Result:

- Crane operation is possible again.

The symbol / warning light **16.3** appears and the crane movement „Luffing the auxiliary boom / accessory up“ was turned off:

- ▶ Luff the auxiliary boom / accessory down.

Result:

- Crane operation is possible again.

Problem remedy

The symbol / warning light **16.3** appears continuously?

If a symbol / warning light **16.3** appears without having luffed up to a limit switch, then there may be an error in the limit switches „Auxiliary boom / accessory top“.

- ▶ Check if there is an error message from the LICCON computer system, see Diagnostics manual.
- ▶ If yes: Remedy the error immediately.

The symbol / warning light **16.4** appears and the crane movement „Luffing the auxiliary boom / accessory down“ was turned off:

- ▶ Luff the auxiliary boom / accessory up.

Result:

- Crane operation is possible again.

Problem remedy

The symbol / warning light **16.4** appears continuously?

If a symbol / warning light **16.4** appears without having luffed down to a limit switch, then there may be an error in the limit switches „Auxiliary boom / accessory bottom“.

- ▶ Check if there is an error message from the LICCON computer system, see Diagnostics manual.
- ▶ If yes: Remedy the error immediately.



WARNING

Limited warning functions!

If one of the double version limit switches is not ok and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited.

- ▶ The crane can only be operated in an emergency after failure of a double version limit switch.

- ▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

2.3.3 Shut off maximum / minimum value test point 1 (force F1)



Note

- ▶ The force determined on test point 1 is generally described as $F1_{\text{actual}}$ (actual value F1).
- ▶ In the icon **17** (F1-load display), the force relationship as well as the number values are shown in number values as well as a bar display (called F1-bar display).
- ▶ The value $F1_{\text{max-operation}}$ **17.3** corresponds to 100 % in the F1-bar display.
- ▶ The F1-utilization bar **17.1** shows the relationship $F1_{\text{actual}}$ **17.2** to $F1_{\text{max-operation}}$ **17.3**.
- ▶ In crane operation without derrick ballast, fewer values may be shown in the icon **17** (F1-load display).

Shut off maximum value F1 in crane operation

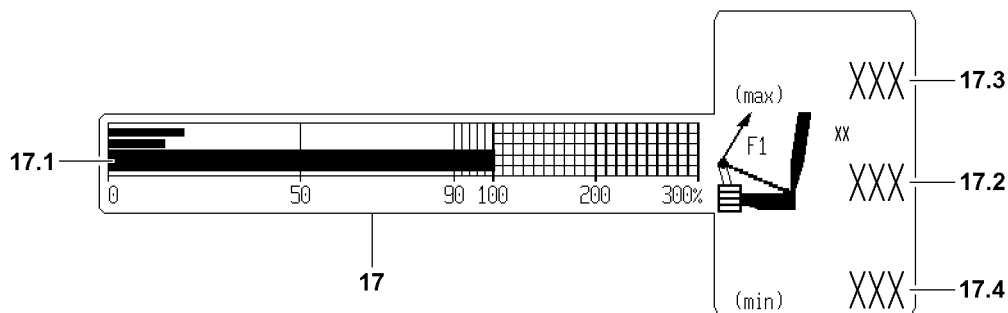


Fig. 110991

In the icon **17**(F1-load display) the F1-utilization bar **17.1** exceeds the 100 % mark and the LICCON overload protection has shut off the crane movement. The value $F1_{\text{actual}}$ **17.2** has exceeded the value $F1_{\text{max-operation}}$ **17.3**.

All further movements, which lead to an increase of the force F1 (value $F1_{\text{actual}}$) are shut off.

- ▶ Reverse any crane movement which has caused the shut off.
or
Initiate an alternative crane movement, which lowers the force F1 (value $F1_{\text{actual}}$).

Result:

- Crane operation is possible again.

Problem remedy

The crane operation is limited because the value $F1_{\text{max-operation}}$ apparently is being reached too early?

- ▶ Make sure that a valid set up status has been entered on the LICCON computer system.
- ▶ Make sure that the crane is assembled according to the assembly drawings.
- ▶ Make sure that the actual set up status and the entered set up status of the crane match.
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed (weight).
- ▶ Make sure that the boom system is free of snow and ice (weight).
- ▶ Make sure that the wind influence onto the boom is not too great.

If no irregularities can be found:

- ▶ Contact Liebherr Service.

Shut off minimum value F1 in crane operation



Note

- ▶ A shut off minimum value F1 ($F1_{\text{min}}$) only occurs in operating modes with derrick ballast. The status $F1_{\text{actual}} = F1_{\text{min}}$ cannot be reached in all other operating modes.

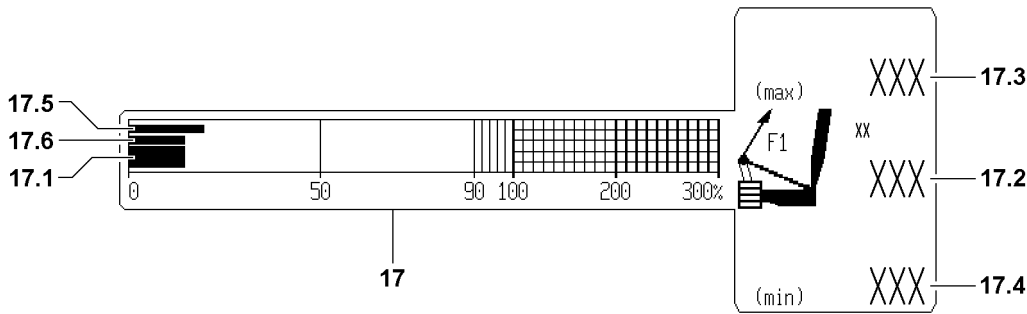


Fig.110992

In the icon **17** (F1-load display), when falling below the $F1_{\min}$ advance warning bar **17.5**, a warning of the upcoming shut off is issued by the F1-utilization bar **17.1**.

If the F1-utilization bar **17.1** falls below the $F1_{\min}$ -STOP bar **17.6**, then the LICCON overload protection shuts off the crane movement. The value $F1_{\text{actual}}$ **17.2** has fallen below the value $F1_{\min}$ **17.4**.

**Note**

Shut off $F1_{\min}$

- ▶ If the utilization of the derrick ballast is below 50 %, then there is no immediate shut off when falling below value $F1_{\min}$.

All further movements, which lead to an decrease of the force $F1$ (value $F1_{\text{actual}}$) are shut off.

- ▶ Reverse any crane movement which has caused the shut off.
or
Initiate an alternative crane movement, which increases the force $F1$ (value $F1_{\text{actual}}$).

Result:

- Crane operation is possible again.

Problem remedy

The crane operation is limited because the value $F1_{\min}$ apparently is being reached too early?

- ▶ Make sure that a valid set up status has been entered on the LICCON computer system.
- ▶ Make sure that the crane is assembled according to the assembly drawings.
- ▶ Make sure that the actual set up status and the entered set up status of the crane match.
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed (weight).
- ▶ Make sure that the boom system is free of snow and ice (weight).
- ▶ Make sure that the wind influence onto the boom is not too great.

If no irregularities can be found:

- ▶ Contact Liebherr Service.

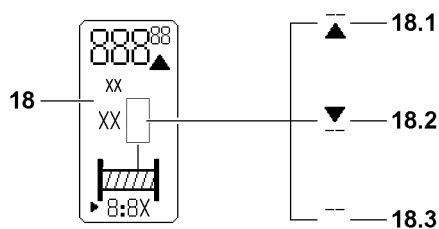
2.3.4 Shut off spooling the winch up / out

Fig.110878

In symbol **18** appears symbol **18.1**, symbol **18.2** or symbol **18.3** and the LICCON overload protection has shut off the crane movement.

„Spooling the winch out“ (symbol **18.1**) or „spooling the winch up“ (symbol **18.2**) was shut off because the upper / lower limit value of the rope for the selected winch was exceeded or fallen below.

If symbol **18.3** appears blinking in the symbol **18**, then the affected winch is deactivated.

The symbol **18.1** appears and the crane movement „Spooling the winch out“ was turned off:

► Spool the winch up.

Result:

– Crane operation is possible again.

The symbol **18.2** appears and the crane movement „Spooling the winch up“ was turned off:

► Spool the winch out.

Result:

– Crane operation is possible again.

The line / line **18.3** appear and the winch is deactivated:

► Activate the winch, see Crane operating instructions, chapter 4.02.

Result:

– Crane operation is possible again.

2.3.5 Shut off hoist top

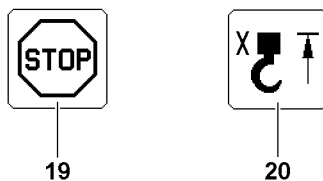


Fig.110875

The symbol **19** and hoist top icon **20** appear in the LICCON monitor and the LICCON overload protection has turned the crane movement off.

Spooling the hoist winch up was turned off because the hook block or the load hook has run against a hoist limit weight during the upward movement and the affected hoist limit switch was triggered.



WARNING

Property damage / falling load!

► After shut off spool hoist winch up (hoist top), for every further crane movement, the distance between the hook block / load hook and the boom head must be checked.



Note

► After a hoist top shut off occurred, further crane movements, which affect the length of the hoist rope are also shut off.

► Spool the hoist winch out.

Result:

– Crane operation is possible again.

2.3.6 Shut off due to error message

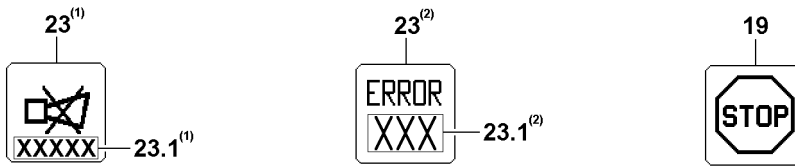


Fig.112331

⁽¹⁾not LR 1400/2

⁽²⁾only LR 1400/2

In the icon **23** appears an error message, the icon **19** appears in the LICCON monitor and the LICCON overload protection has turned off crane movement.

- ▶ Determine the existing error with the help of the error message from the error field **23.1** in icon **23**, see Diagnostics manual.
- ▶ Remedy the error.

If the error cannot be remedied:

- ▶ Contact Liebherr Service.

Problem remedy

The erection of the crane, for example after assembly on a new job site or with another equipment configuration, is not possible due to an error message?

- ▶ Evaluate the error message.
- ▶ Make sure that all electrical connections are established correctly.
- ▶ Check if all sensors or dummy plugs with integrated electric have been connected properly.



Note

- ▶ If there is a defect on a participating sensor (LMB), then the crane can no longer be operated in normal operating condition. Contact Liebherr Service and fix / replace the sensors.

2.3.7 Minimum / maximum support forces



Note

- ▶ Applies only for cranes with support force monitoring*.
- ▶ Description of support force monitoring, see Crane operating instructions, chapter 4.02.

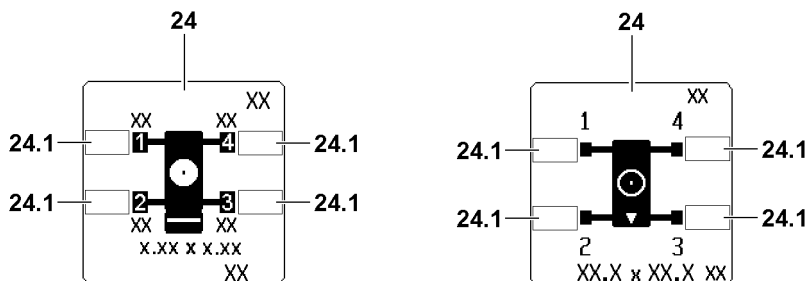


Fig.110881

**WARNING**

The crane can topple over!

When reaching the programmed minimum / maximum support forces there is no automatic shut off of crane movements.

The displayed support force values are subjected to fluctuating influences, for example crane operation, surrounding and environmental influences.

The resulting tolerance field of the determined values may not be utilized by the support force display to determine the tipping limit of the crane.

If this is disregarded, then the crane can topple over.

Personnel can be severely injured or killed.

- ▶ The displayed support force values of the support force display may not be used to utilize the crane up to the tipping limit.
- ▶ Make sure that all support force values are within the minimum / maximum support forces.

The icon **24** (depending on the crane, similar to the left or right illustration) is shown in the LICCON monitor with blinking value in one or several fields **24.1**. Blinking values in the fields **24.1** signal exceedance of the minimum / maximum support forces.

- ▶ Reverse the crane movements, which caused the support forces to be outside the minimum / maximum values.

Result:

- All values in the fields **24.1** are within the minimum / maximum support forces.
- ▶ Carry out crane movements in such a way that the support forces always remain within the minimum / maximum values.

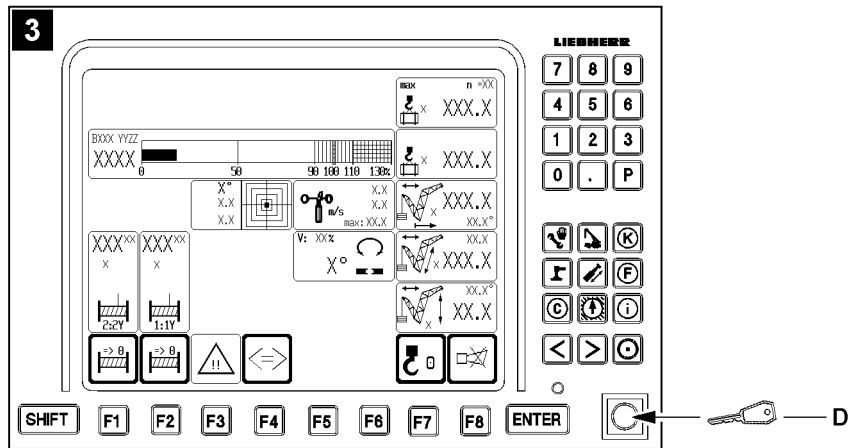
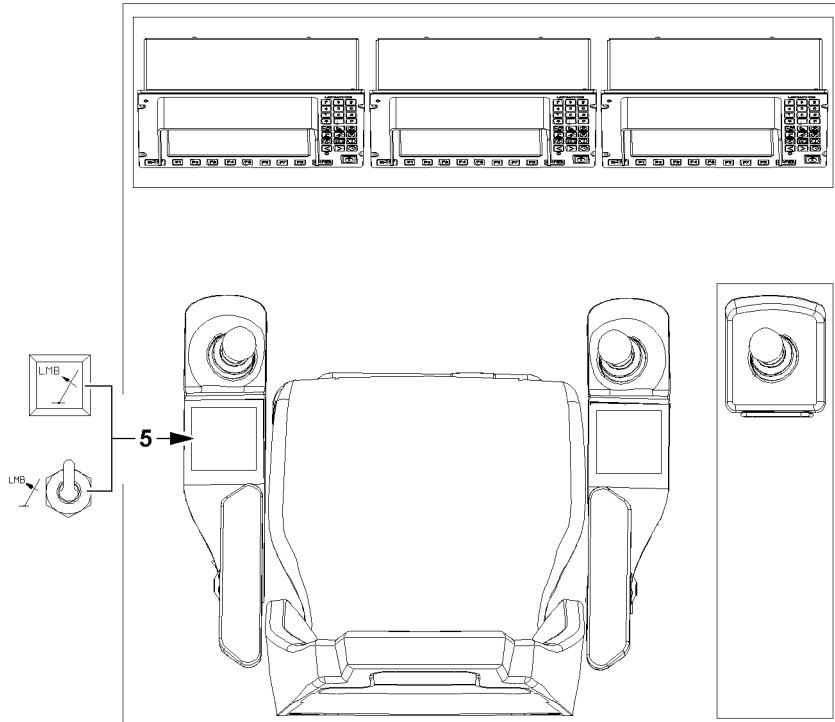


Fig.112334

LWE/LR 11350-007/19005-01-02/en

2.4 Shut off of crane movement: LMB STOP by LICCON overload protection



WARNING

Risk of overload and toppling the crane!

If the shut off limits of the LICCON overload protection are exceeded without knowing the exact cause for the shut off by the LICCON overload protection, then the crane can be overloaded and topple over. Personnel can be severely injured or killed.

- ▶ Before activating the function „Exceedance of shut off limits of the LICCON overload protection“ determine the exact cause for the shut off.



WARNING

Danger of accident due to function „Exceedance of shut off limits of the LICCON overload protection“! If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.

Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.

Personnel can be severely injured or killed.

- ▶ The button **5** „Luffing in with suspended load“ and the set up key **D** may only be actuated when it is ensured that no normal operating condition (utilization below 100 % and no active shut off) can be reached without the function „Exceedance of shut off limits of the LICCON overload protection“!
- ▶ Actuate the set up key **D** only when no normal operating condition (utilization below 100 % and no active shut off) can be reached with the button **5** „Luffing in with suspended load“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload protection“ is prohibited.



WARNING

Expanded working / danger zone of the crane!

Due to the function „Exceedance of shut off limits of the LICCON overload protection“ it is possible that the working / danger zone of the crane is significantly expanded.

If these circumstances are not observed, collisions and accidents can occur.

Personnel can be severely injured or killed.

- ▶ With activated function „Exceedance of shut off limits of the LICCON overload protection“ take an expanded working / danger zone of the crane into account and monitor it.

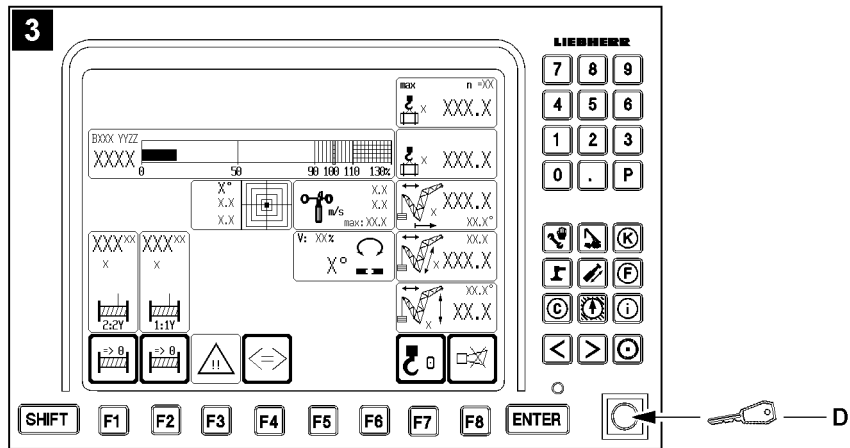
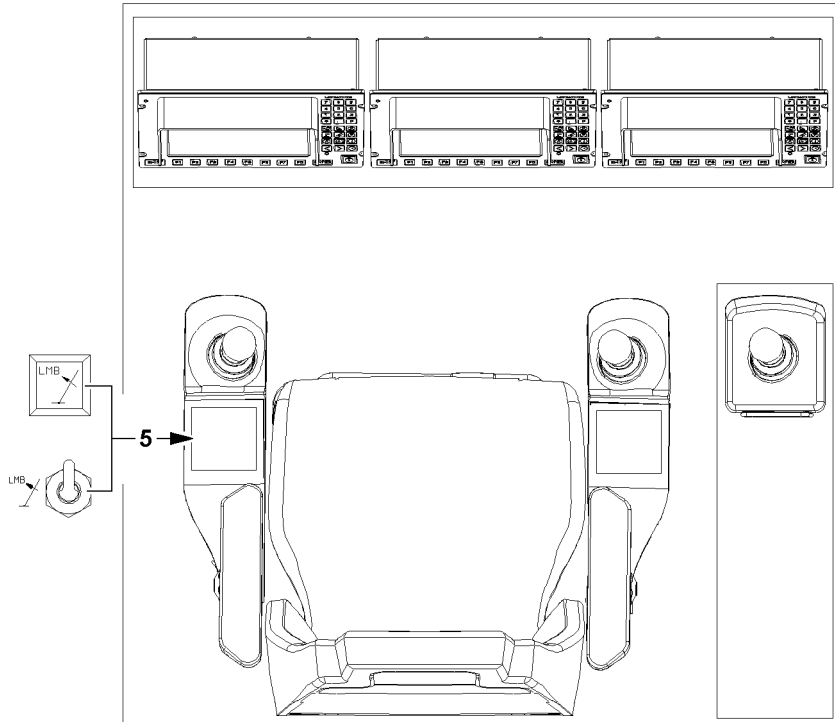


Fig.112334

LWE/LR 11350-007/19005-01-02/en

**WARNING**

Overload of crane!

When taking on a load by luffing the boom up, the crane can be overloaded.

This could result in serious accidents.

- ▶ Taking on load by luffing up the boom is prohibited.
- ▶ Take on a load only with the hoist gear.

**Note**

- ▶ If the set up key **D** is actuated in the area „load chart available“, then the working speed is reduced.
- ▶ If the set up key **D** is actuated in the area „no load chart available“, then the working speed is not reduced.

There are two possibilities to exceed the shut off limits of the LICCON overload protection after LMB STOP:

- With button **5** „Luffing in with suspended load“ in the left control console
- With the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**

NOTICE

Danger of mix up!

The function „Exceedance of shut off limits of LICCON overload protection“ can only be activated with the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**.

The key buttons on the other monitors are not assigned with this function.

- ▶ Do not mix up the set up key **D** with the other key buttons.
- ▶ In case of mix up: Deactivate the activated function.

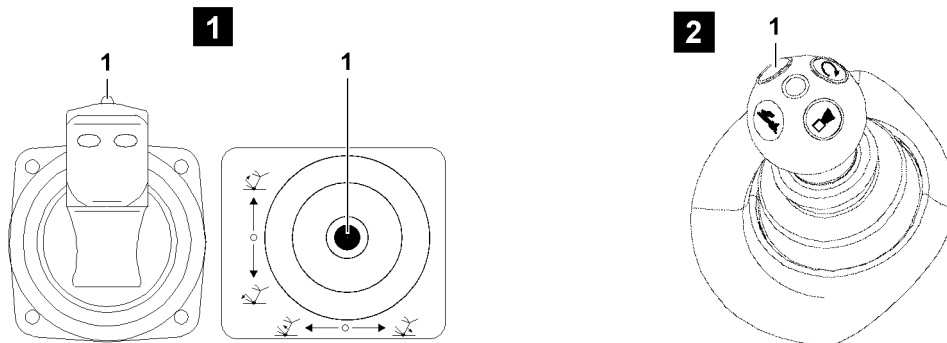
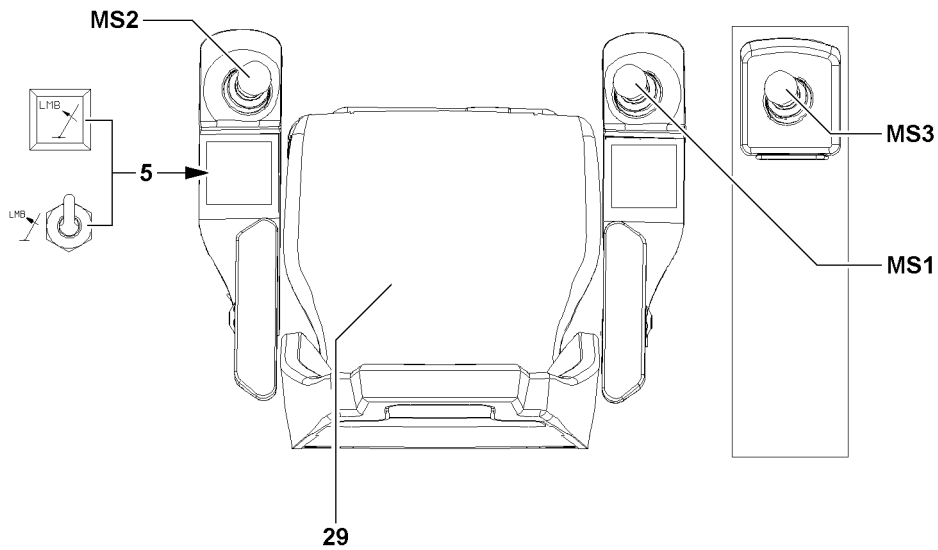
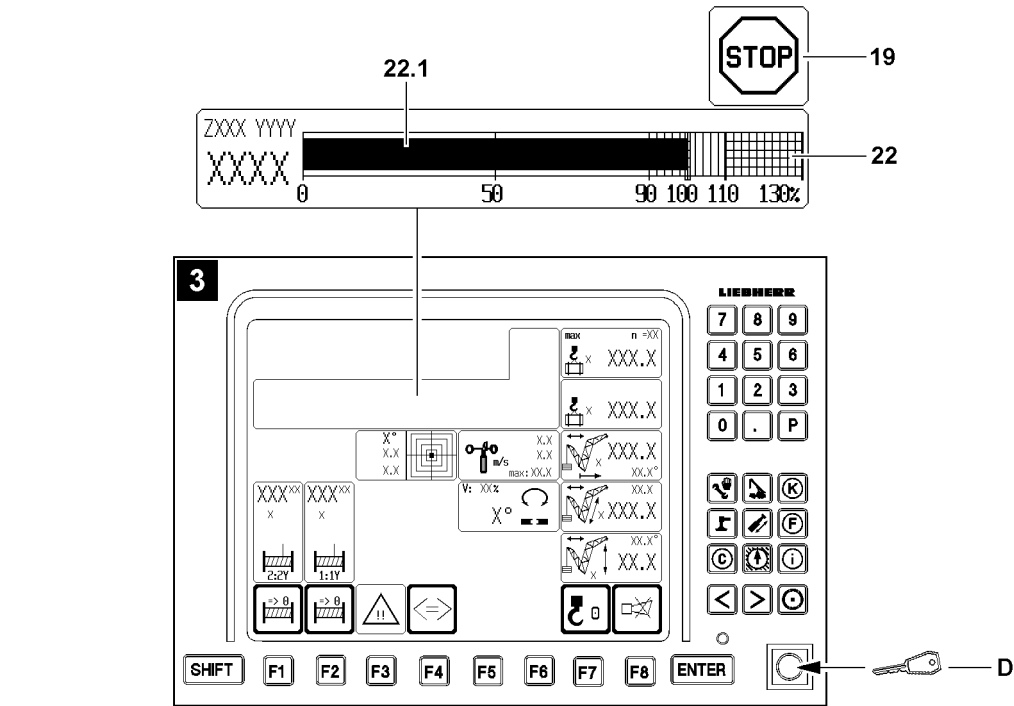


Fig.112335

LWE/LR 11350-007/19005-01-02/en

2.4.1 Luffing in with suspended load

If the maximum permissible load torque is exceeded, the LICCON overload protection turns off all crane movements that increase load torque.

In the icon **22** (load moment display) the utilization bar **22.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**.

This shut off limit can be exceeded by actuating the button **5** „Luffing in with suspended load“.

Make sure that the following prerequisite is met:

- Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.



Note

- ▶ If the load is reduced by luffing up, then the button **5** „Luffing in with suspended load“ is possibly not functioning.
- ▶ For the procedure when the button **5** „Luffing in with suspended load“ is not functioning, see section „Exceedance of maximum permissible load moment“.

-
- ▶ Press the function key **5** „Luffing in with suspended load“ and hold it.

Result:

- The LICCON overload protection is inactive.

- ▶ Luff the load in.

Result:

- If the crane reaches a normal operation status (utilization below 100 % and no active shut off) then the icon **19** turns off, normal crane operation is possible again.

The function „Luffing in with suspended load“ is deactivated:

- When the function key **5** „Luffing in with suspended load“ is not longer actuated.
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- In case of defect of an associated sensor (LMB).
- At engine stop.

The function „Luffing in with suspended load“ is deactivated:

- The LICCON overload protection is active.
- ▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

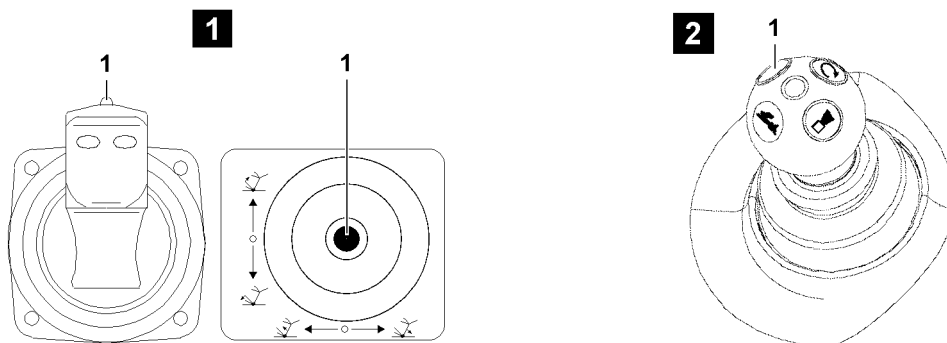
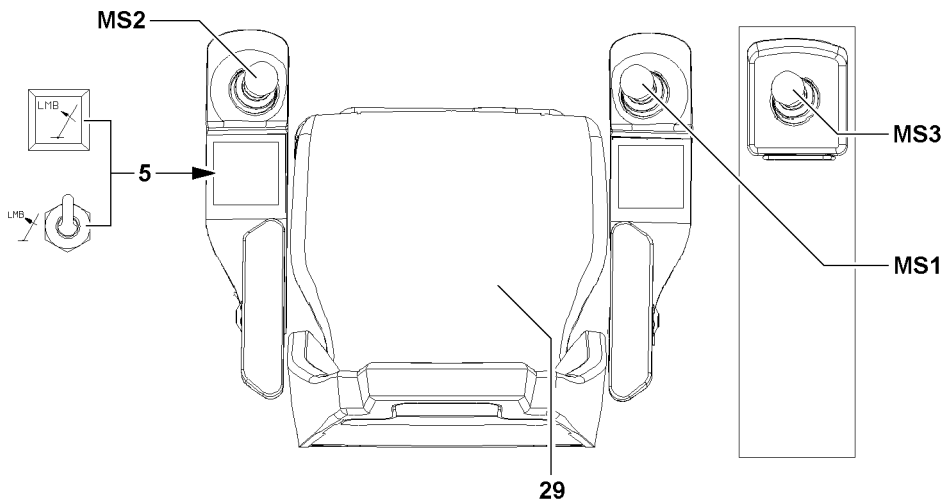
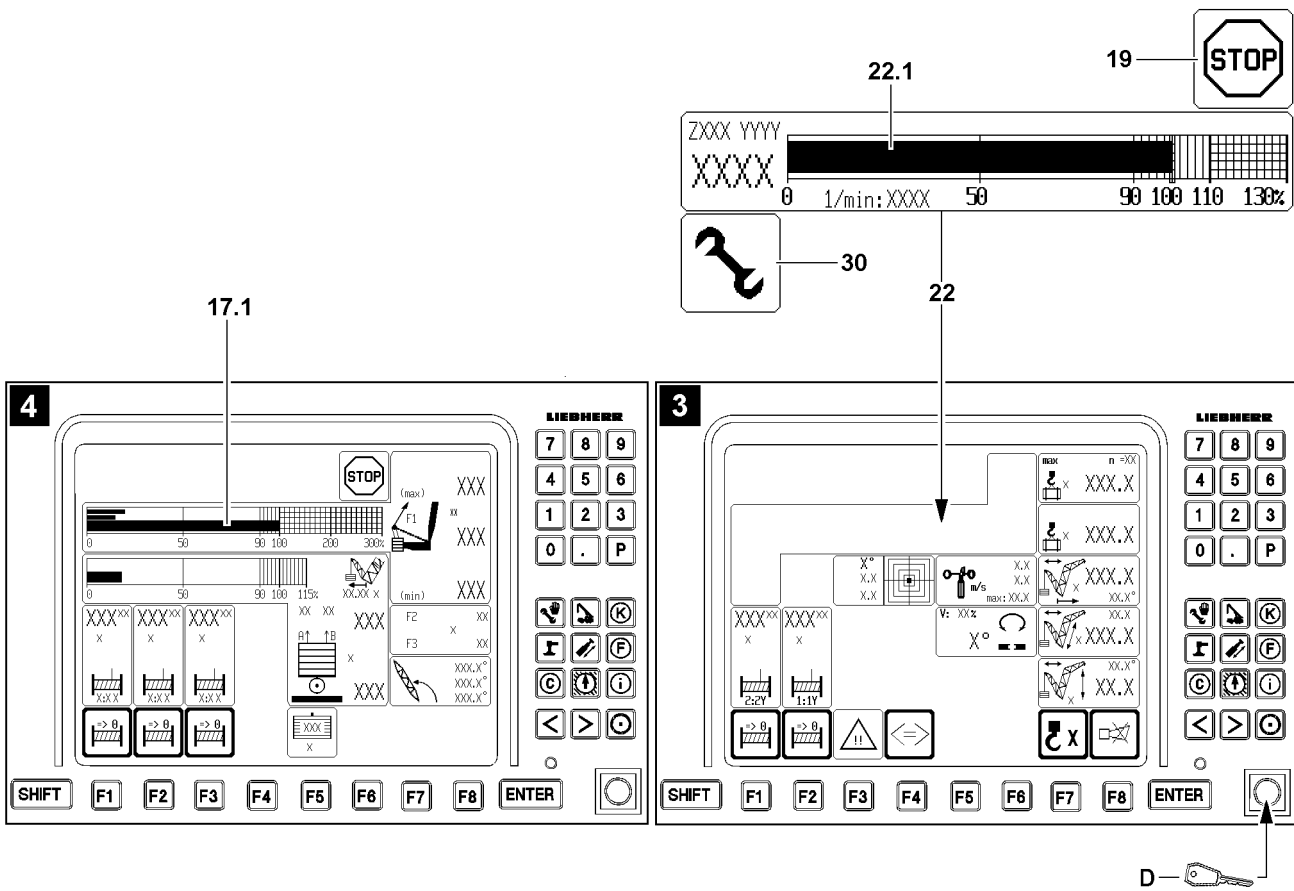


Fig.112336

LWE/LR 11350-007/19005-01-02/en

2.4.2 Exceedance of the maximum permissible load moment

If the maximum permissible load torque is exceeded, the LICCON overload protection turns off all crane movements that increase load torque.

In the icon **22** (load moment display) the utilization bar **22.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**.

This shut off can be exceeded by the set up key **D** in the „right touching“ position.



WARNING

Shut off safety device!

If the function „Exceedance of shut off limits of LICCON overload protection“ is activated by actuating the set up key **D** then it is possible to exceed the maximum permissible load moment. The function „Exceedance of maximum value test point 1“ is automatically activated too. Thus there is no shut off when exceeding the maximum value test point 1.

- ▶ All notes regarding the function „Exceedance of shut off limits of LICCON overload protection“ must be observed.
- ▶ The utilization bar $F1_{\text{actual}}$ **17.1** of the F1 load display must be observed.



Note

- ▶ In emergency situations, the function „Exceedance of shut off limits of the LICCON overload protection“ can be activated with the set up key **D** and the maximum permissible load moment can be exceeded by 10 % to maximum 110 %.

The set up key **D** on the LICCON monitor has two positions:

- Operating position (not actuated): Crane is in normal operation
- Position to right (touching): The function „Exceedance of shut off limits of the LICCON overload protection“ is activated, the assembly icon **30** appears in the LICCON monitor.

Make sure that the following prerequisites are met:

- With the button **5** „Luffing in with suspended load“ no normal operating status (utilization below 100 % and no active shut off) can be reached.
- All master switches (MS1, MS2, MS3) are in zero position (not deflected).
- Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- Radio operation* is not active.
- The load moment display 110 % has not been reached and a load chart is available.
- ▶ Turn the set up key **D** to the right (touching).

Result:

- The LICCON overload protection is inactive.
- The assembly icon **30** appears in the LICCON monitor.
- The working speed in the area „Load chart available“ is reduced for all functions.

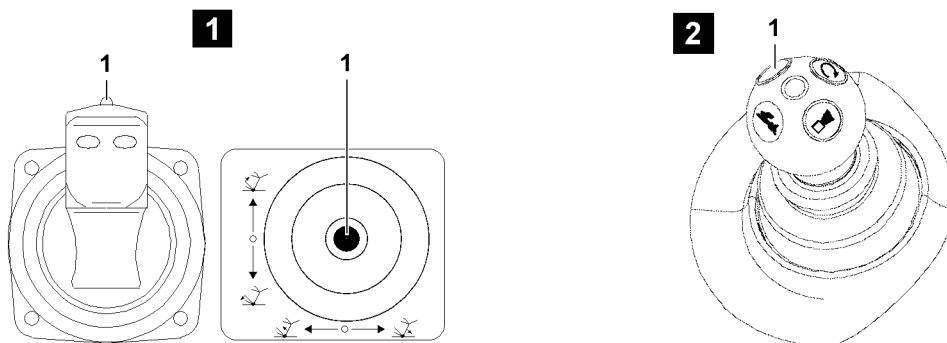
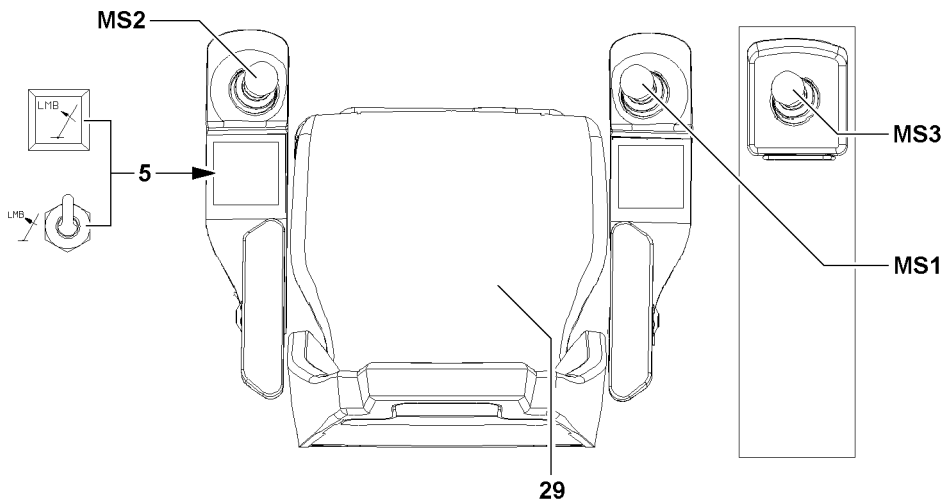
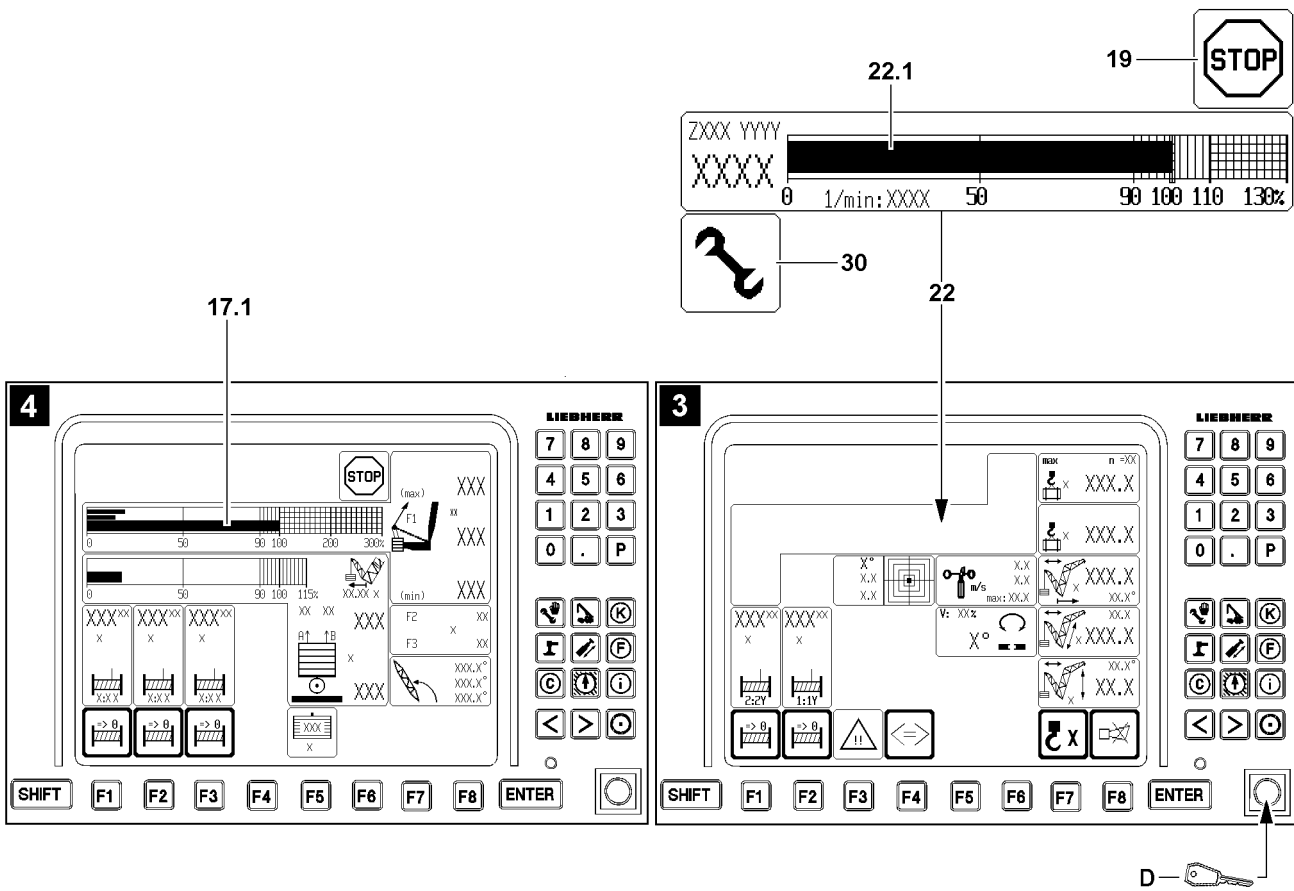


Fig.112336

LWE/LR 11350-007/19005-01-02/en

- ▶ Initiate crane movements which directly lead to a normal operating status (utilization below 100 % and no active shut off).

Result:

- If a crane reaches a normal operation status (utilization below 100 % and no active shut off), then the function „Exceedance of shut off limits of the LICCON overload protection“ shuts off, the assembly icon **30** and icon **19** in the LICCON monitor turn off.

In addition, the function „Exceedance of shut off limits of LICCON overload protection“ turns off immediately:

- If the set up key **D** is actuated again.
- If all master switches (MS1, MS2, MS3) are in neutral position for 10 seconds (with load chart available).
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- If radio operation* is activated.
- At engine stop.
- At hoist top shut off.
- When leaving the angle range of the load chart.
- When the utilization bar **22.1** (load moment display) exceeds a utilization of 110 %.



Note

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only turned off when the assembly icon **30** in the LICCON monitor turns off.
- ▶ If the function „Exceedance of shut off limits of the LICCON overload protection“ does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

The function „Exceedance of shut off limits of the LICCON overload protection“ has / was shut off:

- The assembly icon **30** in the LICCON monitor turns off.
- The working speed is reduced until all master switches (MS1, MS2, MS3) are in zero position at the same time.
- ▶ Make sure that the assembly icon **30** does no longer appear in the LICCON monitor.
- ▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

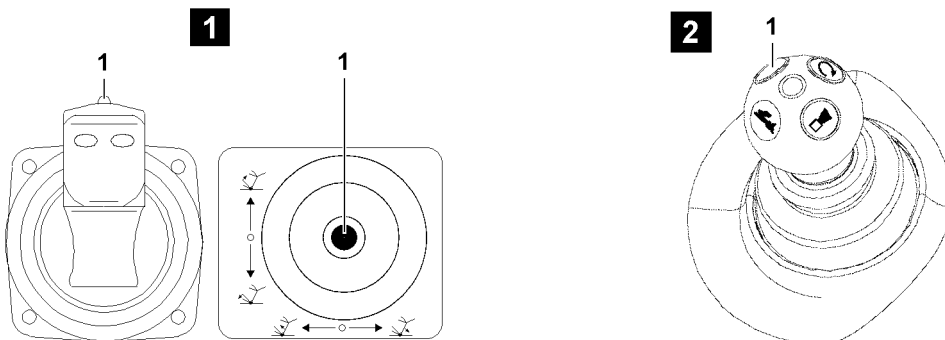
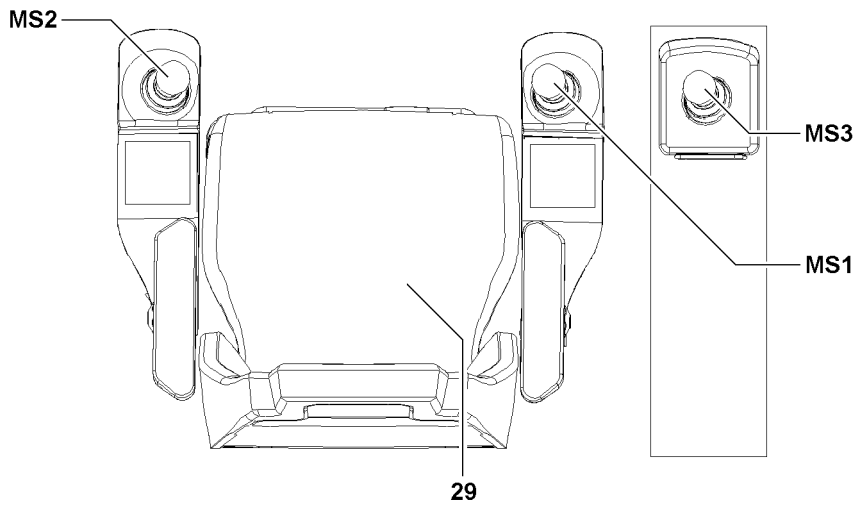
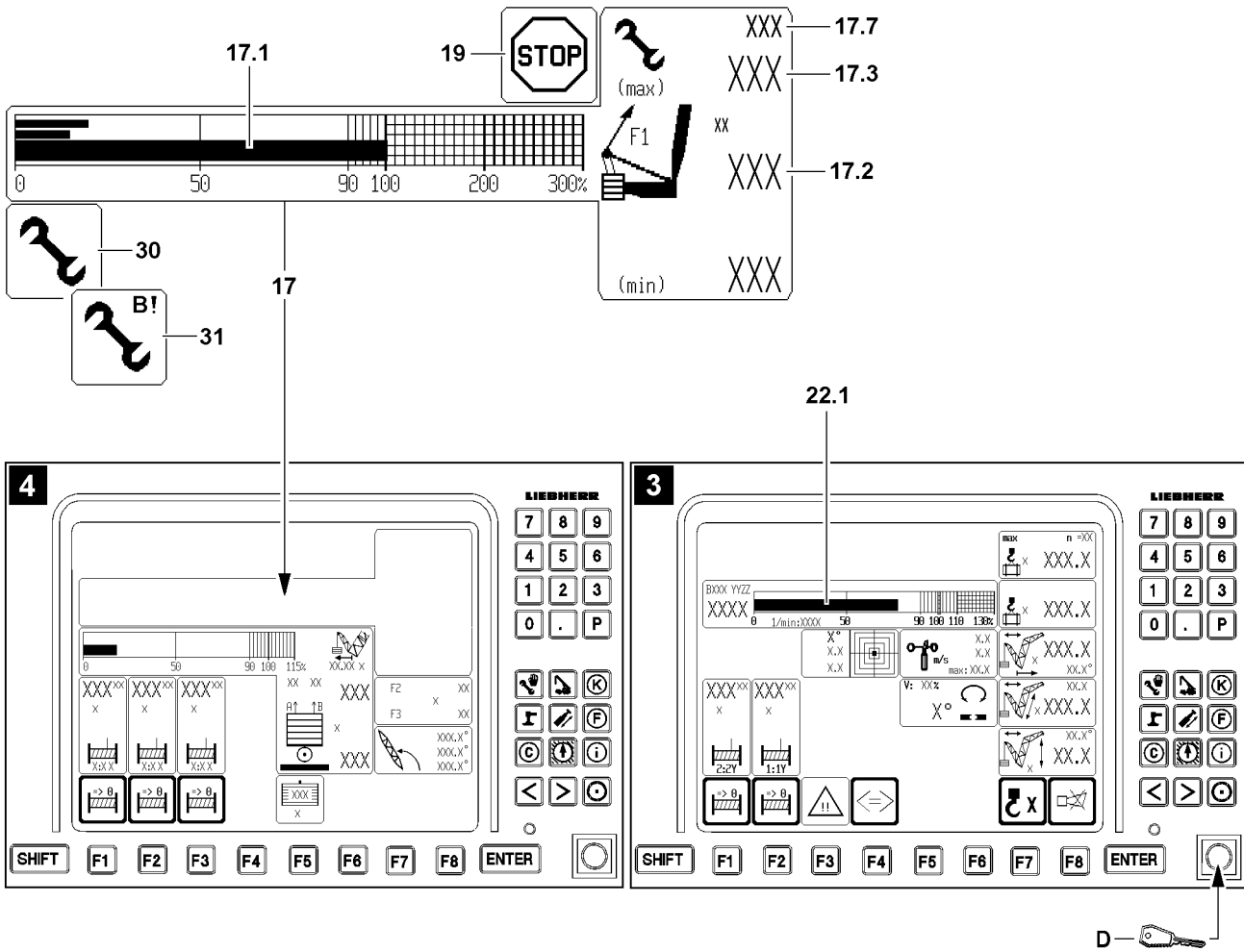


Fig.112337

LWE/LR 11350-007/19005-01-02/en

2.4.3 Exceedance of maximum value test point 1 (force F1) in crane operation



WARNING

Leaving the load chart with load on hook!

If, by actuating the set up key **D**, the shut off is bypassed by value $F1_{\text{max-operation}}$ **17.3** and exceeded by more than 110 %, then the crane is in assembly operation, the assembly icon **31** appears in the LICCON monitor.

There is no load chart available any longer and various display values may not be shown any longer in the crane operating screen.

The load on the hook is no longer monitored by the load chart.

Severe accidents due to crane overload can result.

Personnel can be severely injured or killed.

▶ In assembly operation, the data in the erection / take down charts is binding.



WARNING

Shut off safety device!

If, by actuating the set up key **D**, the function „Exceedance of maximum value test point 1“ is activated, then the function „Exceedance of shut off limits of LICCON overload protection“ is also activated automatically. Thus there is no shut off if the maximum permissible load moment is exceeded.

▶ All notes regarding the function „Exceedance of shut off limits of LICCON overload protection“ must be observed.

▶ The utilization bar **22.1** of the load moment display must be observed.



Note

▶ The force determined on test point 1 is generally described as $F1_{\text{actual}}$ (actual value F1).

▶ In the icon **17** (F1-load display), the force relationship as well as the number values are shown in number values as well as a bar display (called F1-bar display).

▶ The value $F1_{\text{max-operation}}$ **17.3** corresponds to 100 % in the F1-bar display.

▶ The F1-utilization bar **17.1** shows the relationship $F1_{\text{actual}}$ **17.2** to $F1_{\text{max-operation}}$ **17.3**.

▶ In crane operation without derrick ballast, fewer values may be shown in the icon **17** (F1-load display).

▶ If the actual load is **larger** than the permissible hook block weight according to the erection / take down charts, then it can be exceeded up to maximum 110 % of $F1_{\text{max-operation}}$ **17.3**.

▶ If the actual load is **smaller** than the permissible hook block weight according to the erection / take down charts, then the assembly operation becomes active above 110 % of $F1_{\text{max-operation}}$ **17.3**. In assembly operation, there is no load chart available.

▶ The value $F1_{\text{max-assembly}}$ **17.7** appears in crane operation when 90 % of its nominal value is exceeded.

In the icon **17**(F1 load display) the utilization bar $F1_{\text{actual}}$ **17.1** exceeds the 100 % mark and the LICCON overload protection has shut off the crane movement. The value $F1_{\text{actual}}$ **17.2** has exceeded the value $F1_{\text{max-operation}}$ **17.3**.

All further movements, which lead to an increase of the force (value $F1_{\text{actual}}$) are shut off.

In the LICCON monitor with the derrick operating screen (illustration **4**) appears the icon **19**.

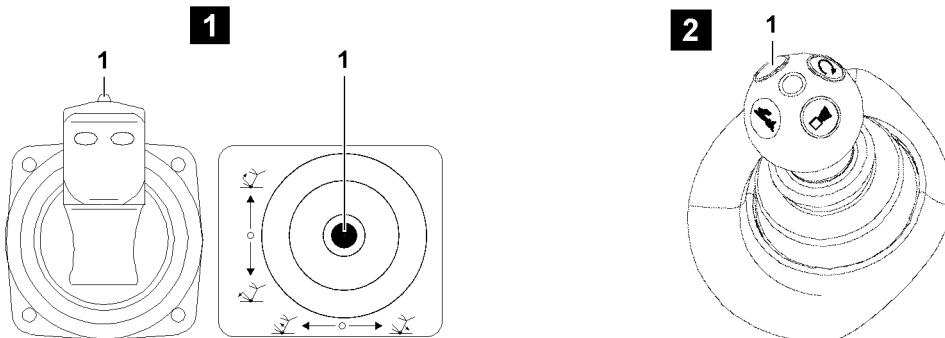
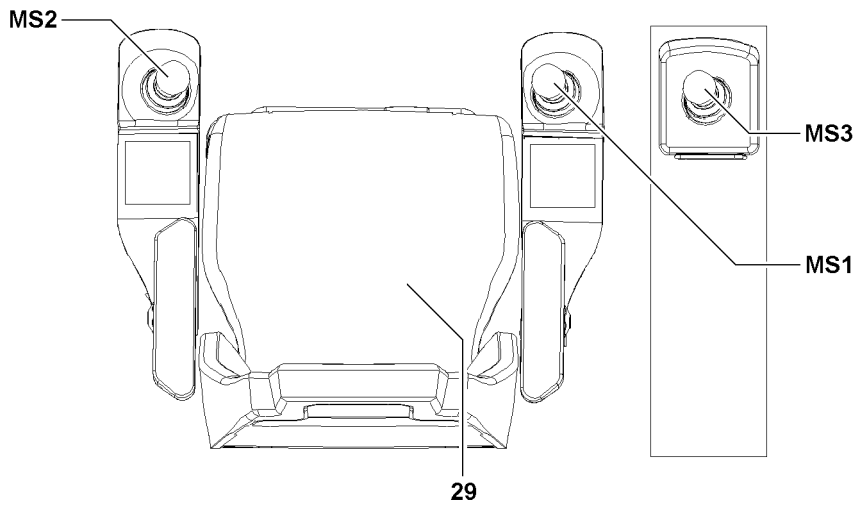
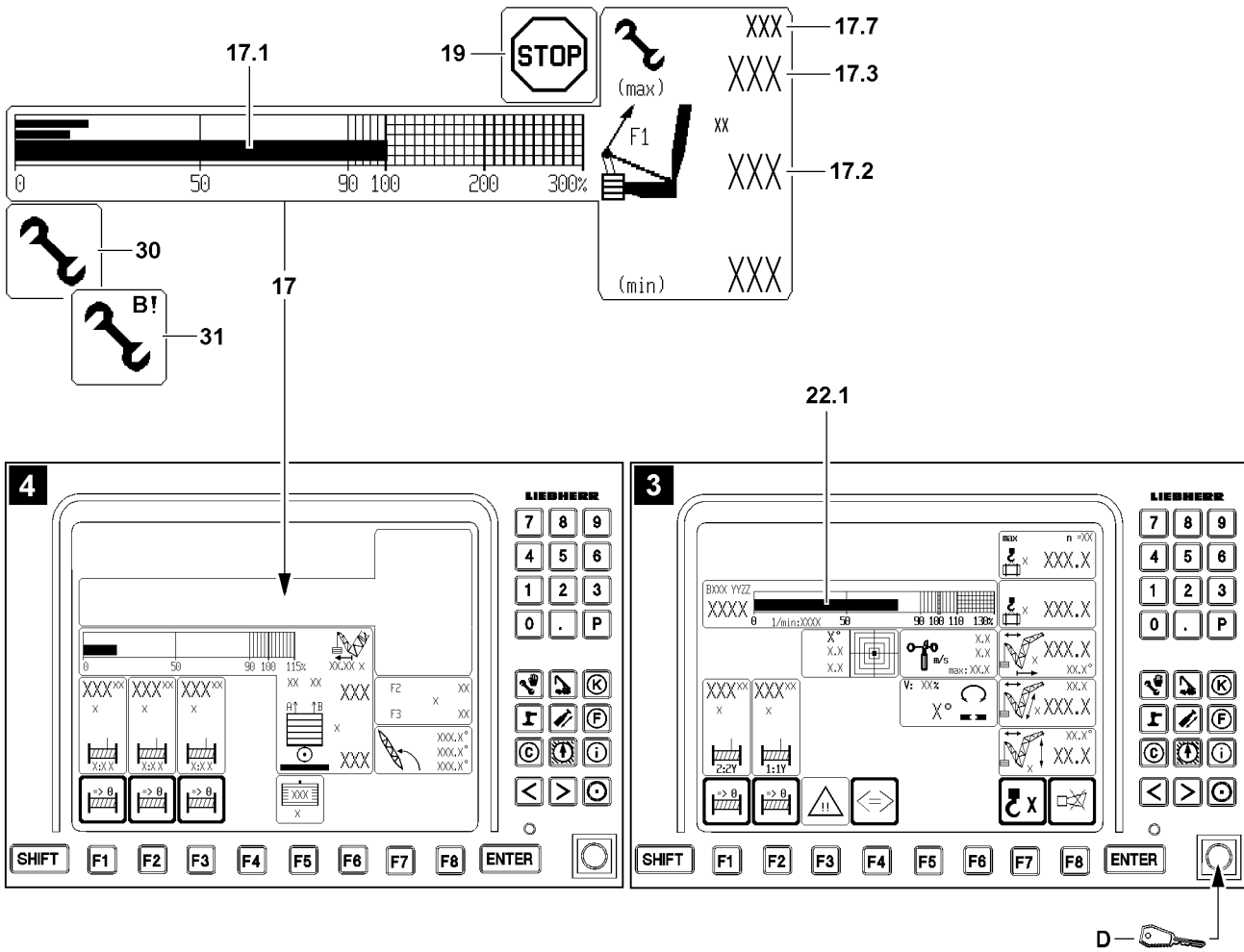


Fig.112337

LWE/LR 11350-007/19005-01-02/en

Make sure that the following prerequisites are met:

- All master switches (MS1, MS2, MS3) are in zero position (not deflected).
 - Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
 - Radio operation* is not active.
 - The F1 load display 110 % has not been reached and a load chart is available.
- ▶ Turn the set up key **D** to the right (touching).

Result:

- The function „Exceedance of maximum value test point 1“ is activated in connection with the function „Exceedance of the shut off limits of the LICCON overload protection“.
- $F1_{\text{max-operation}}$ **17.3** can be exceeded.

The function „Exceedance of shut off limits of the LICCON overload protection“ in connection with the function „Exceedance of the maximum value test point 1“ also shuts off immediately:

- If the set up key **D** is actuated again.
- If all master switches (MS1, MS2, MS3) are in neutral position for 10 seconds (with load chart available).
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- If radio operation* is activated.
- At engine stop.
- At hoist top shut off.



Note

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only turned off when the assembly icon **30** in the LICCON monitor turns off.
- ▶ If the function „Exceedance of shut off limits of the LICCON overload protection“ does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

The function „Exceedance of shut off limits of the LICCON overload protection“ has / was shut off:

- The assembly icon **30** in the LICCON monitor turns off.
 - The working speed is reduced until all master switches (MS1, MS2, MS3) are in zero position at the same time.
- ▶ Make sure that the assembly icon **30** does no longer appear in the LICCON monitor.
- ▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

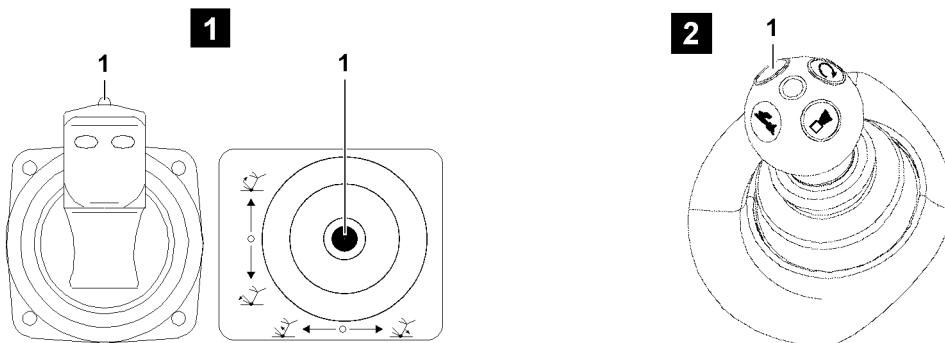
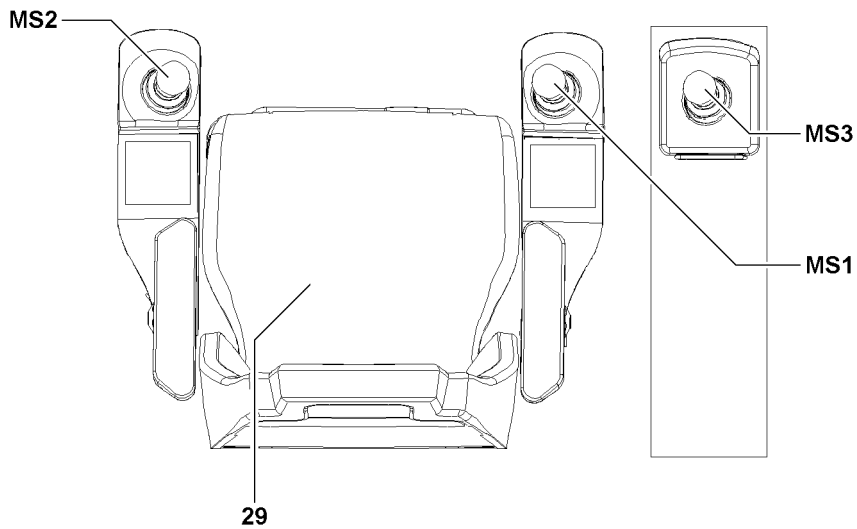
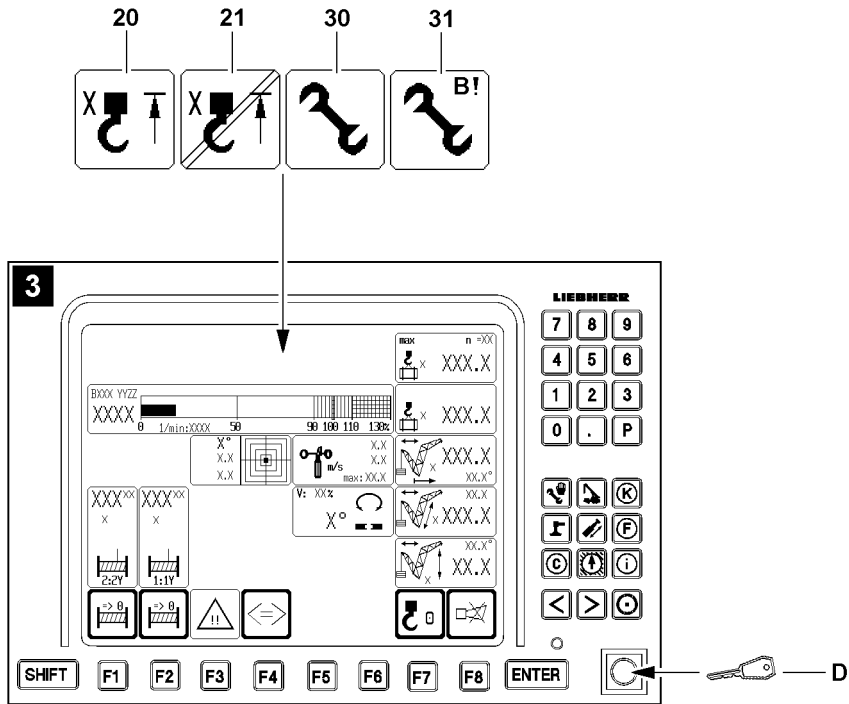


Fig.111230

LWE/LR 11350-007/19005-01-02/en

2.5 Bypass of the hoist top shut off



WARNING

Improper use of the function „Bypass of hoist top shut off“!

- ▶ The function „Bypass of hoist top shut off“ may never be used to increase the lifting height during crane operation.



WARNING

Property damage and falling load!

If the function „Bypass of hoist top shut off“ is activated, there is the danger that the hook block or the load hook is pulled against the pulley head.

This danger exists especially when the hoist winch is continued to be spooled up and for crane movements which have an influence on the hoist rope, for example luffing the boom, the auxiliary boom / accessory or the derrick boom.

Property damage and falling load can result.

Personnel can be severely injured or killed.

- ▶ The function „Bypass of hoist top shut off“ may only be carried out by an authorized person, along with a guide. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block / load hook and the boom head.
- ▶ Carry out all crane movements with utmost caution.



Note

- ▶ The activation of the function „Bypass of hoist top shut off“ is only possible if the hoist limit switch was touched and the hoist top shut off has occurred.
- ▶ If the hoist limit switch is triggered when the set up key **D** is actuated (function „Exceedance of shut off limits of the LICCON overload protection“ is active, the assembly icon **30** or the assembly icon **31** appear), then a hoist top shut off occurs and the function „Exceedance of shut off limits of the LICCON overload protection“ is deactivated.
- ▶ For assembly purposes or in emergency cases, if the activation of the function „Bypass of hoist top shut off“ **and** activation of the function „Exceedance of shut off limits of the LICCON overload protection“ is necessary, then the set up key **D** must be actuated until the icon **21** and assembly icon **30** or assembly icon **31** (assembly operation) appear.

Make sure that the following prerequisites are met:

- A hoist top shut off has occurred, the hoist top icon **20** appears in the LICCON monitor.
- Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- All master switches (MS1, MS2, MS3) are in zero position (not deflected).
- The radio operation* is not active.

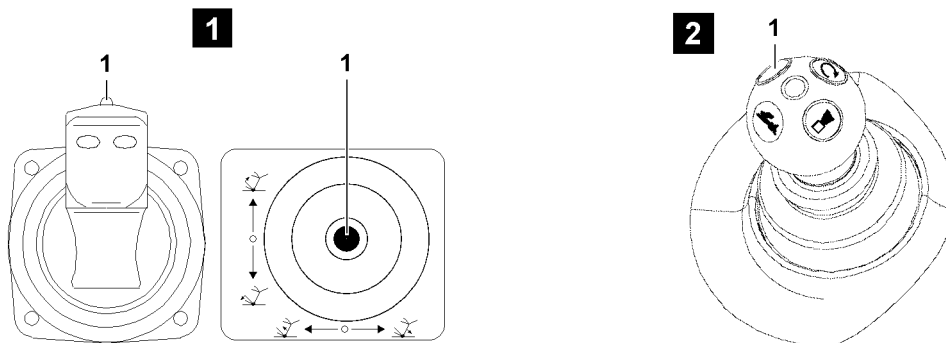
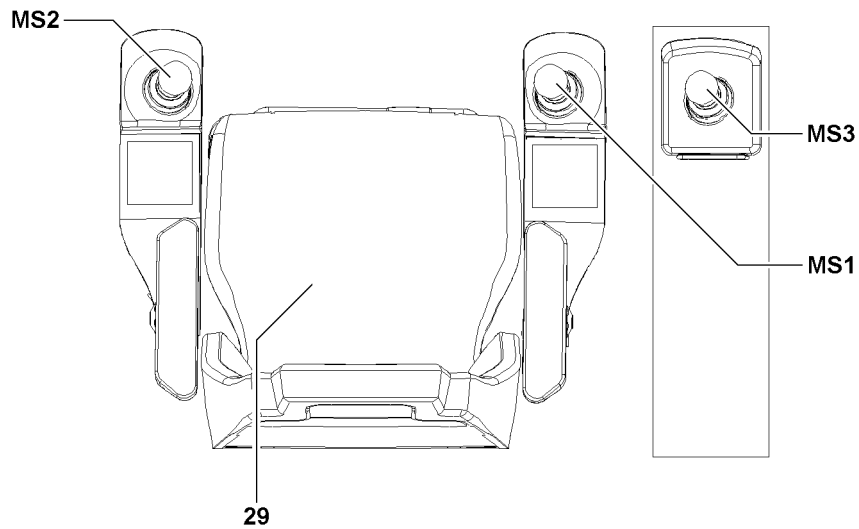
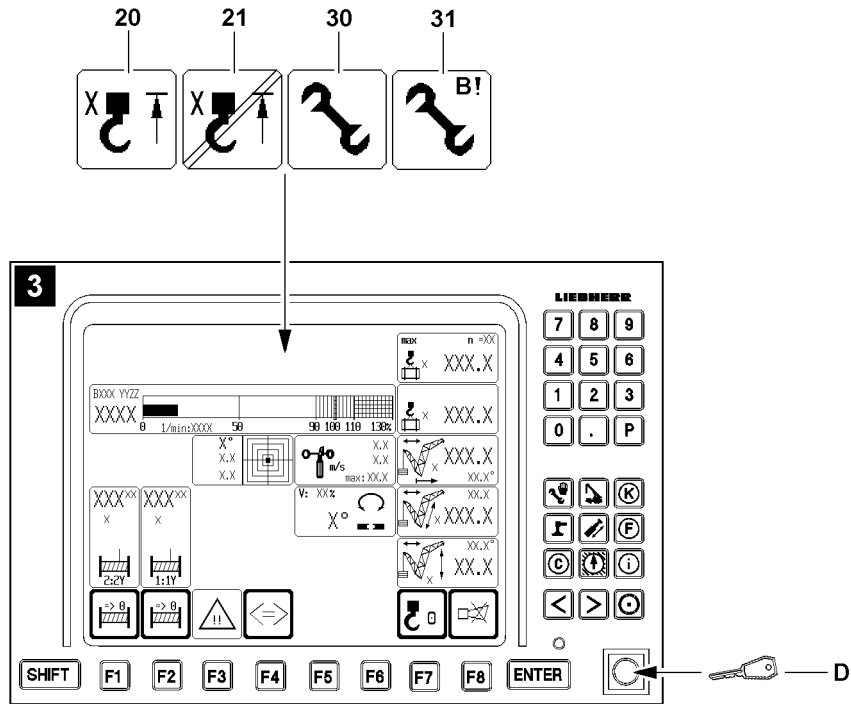


Fig.111230

LWE/LR 11350-007/19005-01-02/en

- ▶ Turn the set up key **D** to the right (touching).

Result:

- The assembly icon **30** or the assembly icon **31** (assembly operation) appear in the LICCON monitor.
 - The hoist top icon **20** in the LICCON monitor changes to the icon **21**.
 - The working speed is reduced for all functions (if load chart is available).
 - All hoist limit switches are bypassed.
- ▶ Carry out a crane movement with bypassed hoist limit switches with utmost caution and by taking the safety guidelines into account.

The function „Bypass of the hoist top shut off“ turns off:

- If the set up key **D** is actuated again.
- When no master switch (MS1, MS2, MS3) was deflected for 10 seconds.
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- If there is no longer a shut off of a hoist limit switch.
- If the radio operation* is active.
- At engine stop.

The function „Bypass of the hoist top shut off“ has / was turned off:

- The assembly icon **30** or the assembly icon **31** (assembly operation) in the LICCON monitor turn off.
 - The icon **21** on the LICCON monitor turns off.
 - The working speed is reduced until all master switches (MS1, MS2, MS3) are in zero position at the same time.
- ▶ Make sure that the assembly icon **30** or the assembly icon **31** (assembly operation) as well as the icon **21** no longer appear in the LICCON monitor.
 - ▶ Carry out the crane movements in such a way that no repeated hoist top shut off occurs.

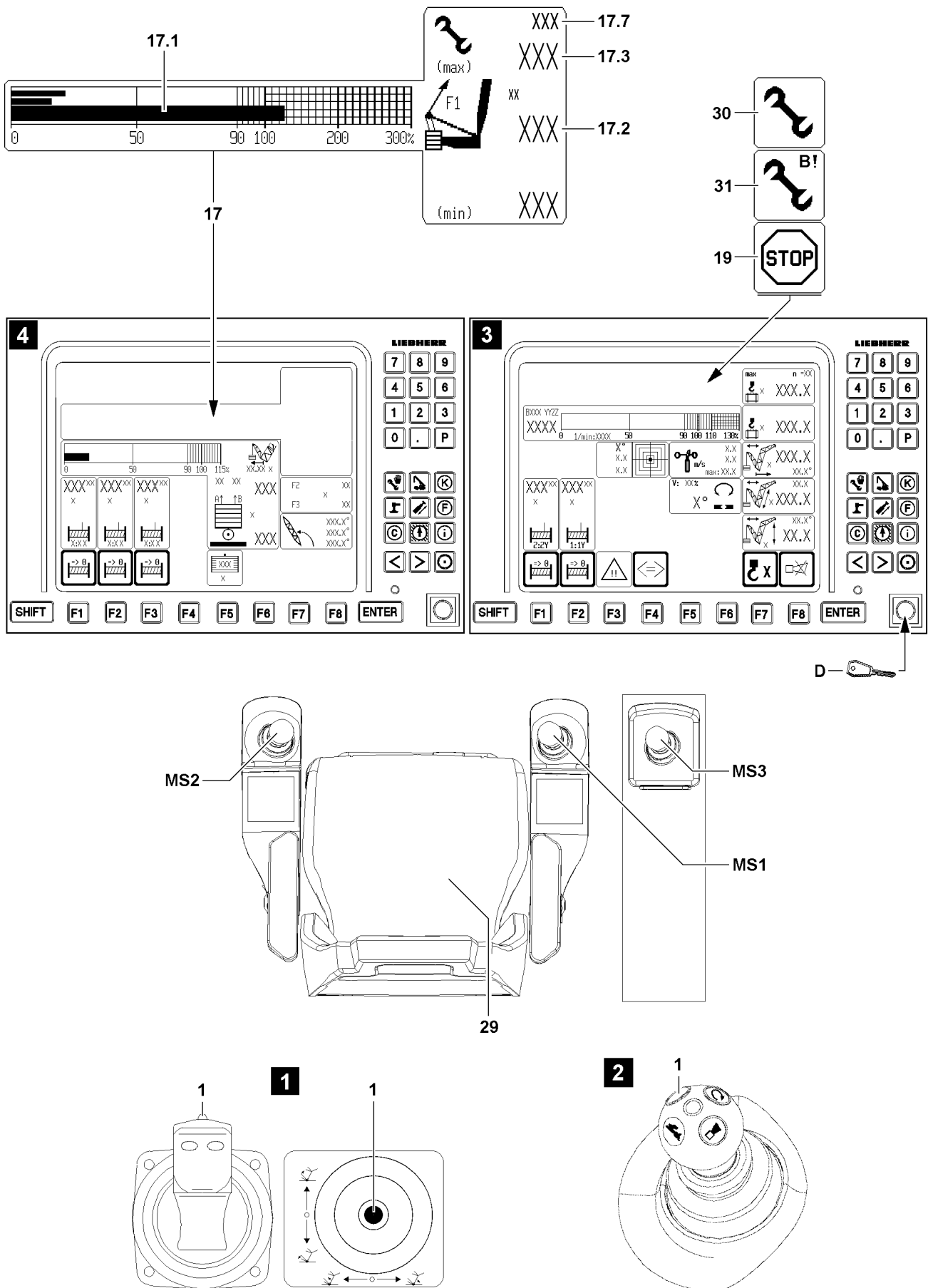


Fig.112343

LWE/LR 11350-007/19005-01-02/en

2.6 Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures (assembly operation)



Note

- ▶ If the crane is in the range „No load chart available“ then there is a shut off of the crane control by the LICCON overload protection. The icon **19** appears in the LICCON monitor.
- ▶ By an actuated set up key **D**, the function „Exceedance of shut off limits of the LICCON overload protection“ can be activated, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available.



WARNING

Danger of accident during erection / take down procedures!

If the erection / take down charts are not observed, the crane could collapse, the boom can break off or the crane can topple over.

Personnel can be severely injured or killed.

- ▶ The erection / take down charts must be observed.
- ▶ Press the set up key **D** only when the configuration status has been entered correctly in the LICCON computer system and matches the actual situation.



Note

- ▶ The force determined on test point 1 is generally described as $F1_{\text{actual}}$ (actual value F1).
- ▶ In the icon **17** (F1-load display), the force relationship as well as the number values are shown in number values as well as a bar display (called F1-bar display).
- ▶ The value $F1_{\text{max-operation}}$ **17.3** corresponds to 100 % in the F1-bar display.
- ▶ The F1-utilization bar **17.1** shows the relationship $F1_{\text{actual}}$ **17.2** to $F1_{\text{max-operation}}$ **17.3**.
- ▶ In crane operation without derrick ballast, fewer values may be shown in the icon **17** (F1-load display).
- ▶ If a load chart is available, then the value $F1_{\text{max-operation}}$ **17.3** is valid as the limit value for a shut off of crane operation.
- ▶ When leaving the area „Load chart available“, the assembly icon **30** turns off and the assembly icon **31** appears.
- ▶ When leaving the area „Load chart available“ then $F1_{\text{max-assembly}}$ **17.7** is valid as the upper limit value.
- ▶ $F1_{\text{max-assembly}}$ **17.7** might only appear when 90 % of its nominal value is exceeded.

2.6.1 Carrying out erection procedures (assembly operation)

Make sure that the following prerequisites are met:

- All master switches (MS1, MS2, MS3) are in zero position (not deflected).
- Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- Radio operation* is not active.
- The set up configuration corresponds to the erection / take down charts.
- The set up status has been entered correctly into the LICCON computer system.

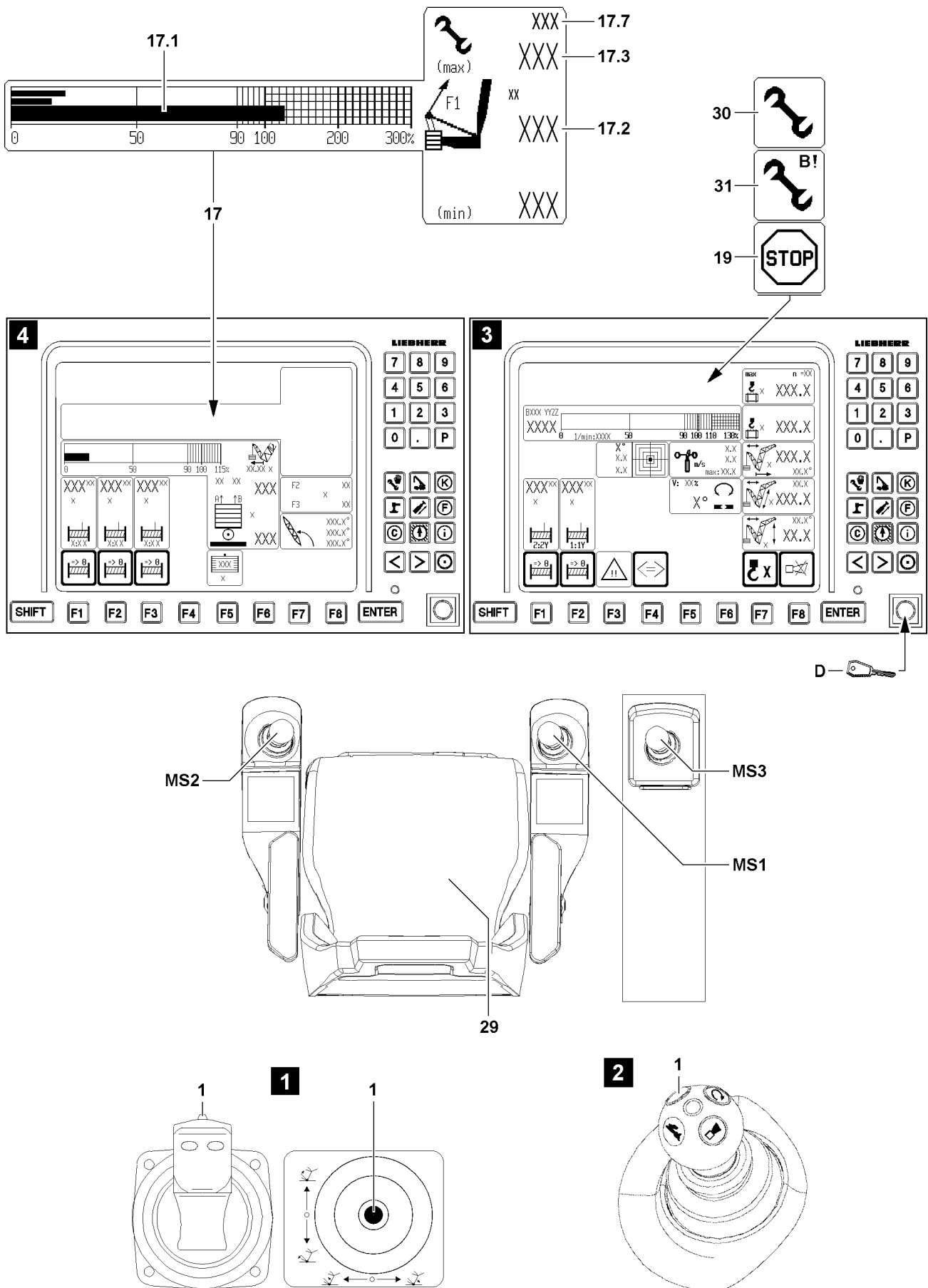


Fig.112343

LWE/LR 11350-007/19005-01-02/en

- ▶ Turn the set up key **D** to the right (touching).

Result:

- The assembly icon **31** appears in the area „No load chart available“.
- The erection / take down procedures can be carried out.
- ▶ Watch the icon **17** (F1-load display), the value $F1_{\text{actual}}$ **17.2** may not exceed the value $F1_{\text{max-assembly}}$ **17.7**.

Problem remedy

The erection / take down procedure cannot be carried out due to shut off „ $F1_{\text{max-assembly}}$ **17.7** exceeded“?

- ▶ See section „Danger of exceeding $F1_{\text{max-assembly}}$ “.
-

Problem remedy

The function „Exceedance of shut off limits of the LICCON overload protection“ can not be activated during erection / take down procedures?

- ▶ Check the error messages.
 - ▶ Check the electrical connections.
 - ▶ Check if all sensors or dummy plugs with integrated electric have been connected properly.
-

The function „Exceedance of shut off limits of the LICCON overload protection“ turns off:

- If the set up key **D** is actuated again.
- When an range with existing load chart is reached (erection procedure).
- If all master switches (MS1, MS2, MS3) are in neutral position for 10 seconds (with „Load chart available“).
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- At engine stop.

The function „Exceedance of shut off limits of the LICCON overload protection“ has / was shut off:

- The assembly icon **30** or the assembly icon **31** in the LICCON monitor turns off.
- ▶ After completion of the erection / take down procedures, make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.

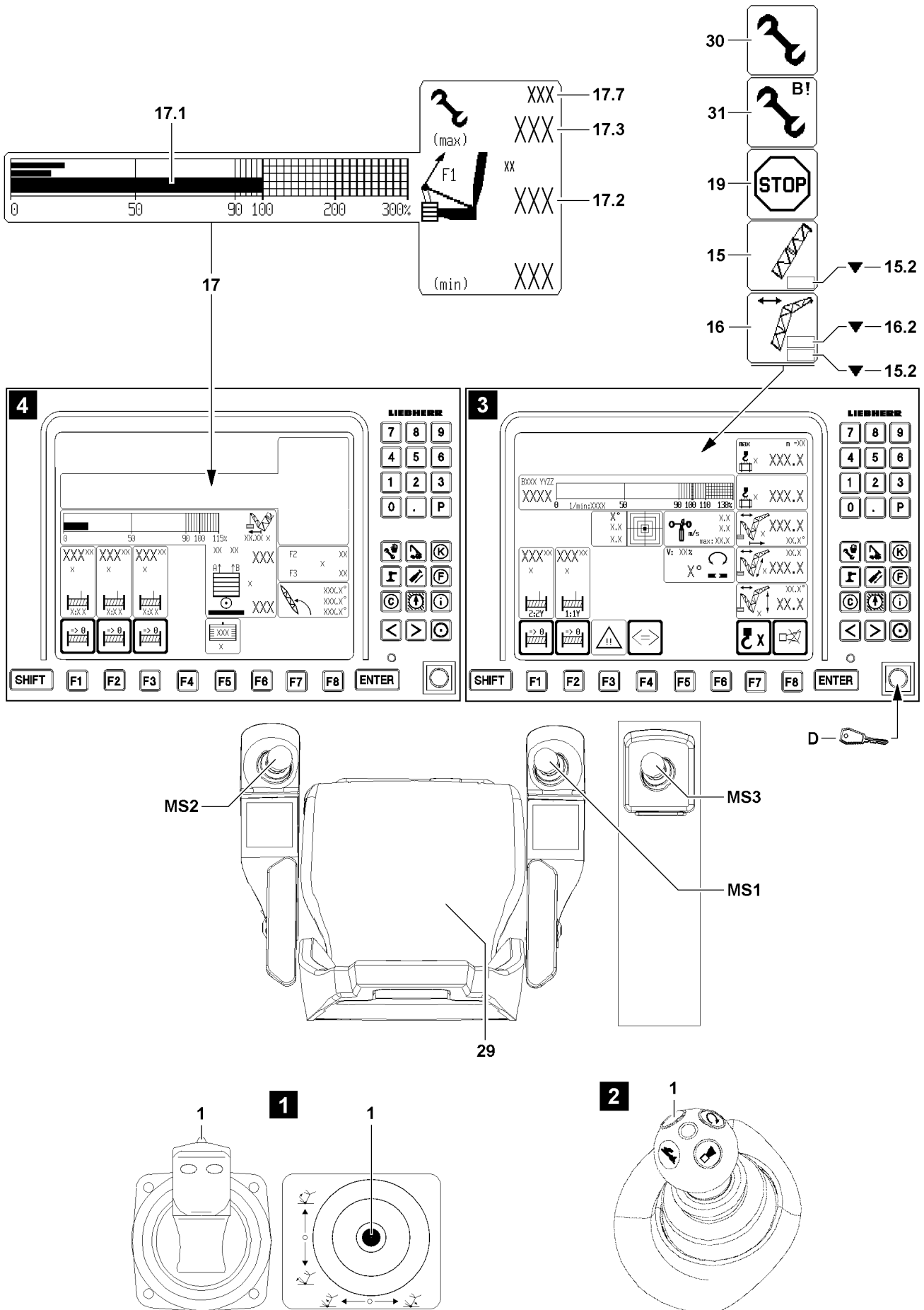


Fig.112341

LWE/LR 11350-007/19005-01-02/en

2.6.2 Carrying out take down procedures (assembly operation)



WARNING

Increased danger of accidents due to bypass of shut off of luffing the main boom / auxiliary boom / accessory down!

When the shut off luffing the main boom / auxiliary boom / accessory down is bypassed, then the LICCON overload protection as a whole is deactivated or limited.

When the shut off luffing the main boom / auxiliary boom / accessory down is bypassed and the main boom and / or the auxiliary boom / accessory is further luffed down, then there is no load chart available any longer.

Crane operation with bypassed shut off luffing the main boom / auxiliary boom / accessory down is prohibited, since severe accidents can result.

Personnel can be severely injured or killed.

- ▶ Activate the bypass of the shut off luffing the main boom / auxiliary boom / accessory down only in emergency cases or for erection / take down procedures with erection / take down charts.
- ▶ Carry out all crane movements with utmost caution.

Make sure that the following prerequisites are met:

- In symbol **15** or symbol **16** appear symbol **15.2** or symbol **16.2** and the LICCON overload protection has shut off the crane movement.
- Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- All master switches (MS1, MS2, MS3) are in zero position (not deflected).
- The radio operation* is not active.

- ▶ Turn the set up key **D** to the right (touching).

Result:

- The assembly icon **30** appears in the LICCON monitor.
- The function „Exceedance of shut off limits of the LICCON overload protection“ is activated and has bypassed the shut off luffing the main boom / auxiliary boom / accessory down.



Note

- ▶ If a load chart is available, then the value $F1_{\text{max operation}}$ **17.3** is valid as the limit value for a shut off of crane operation.
- ▶ When leaving the area „Load chart available“, the assembly icon **30** turns off and the assembly icon **31** appears.
- ▶ When leaving the area „Load chart available“ then $F1_{\text{max assembly}}$ **17.7** is valid as the upper limit value.
- ▶ If no derrick boom is installed, then the icon **17** only shows $F1_{\text{actual}}$ **17.1** and $F1_{\text{max-assembly}}$ **17.7**.
- ▶ $F1_{\text{max-assembly}}$ **17.7** might only appear when 90 % of its nominal value is exceeded.

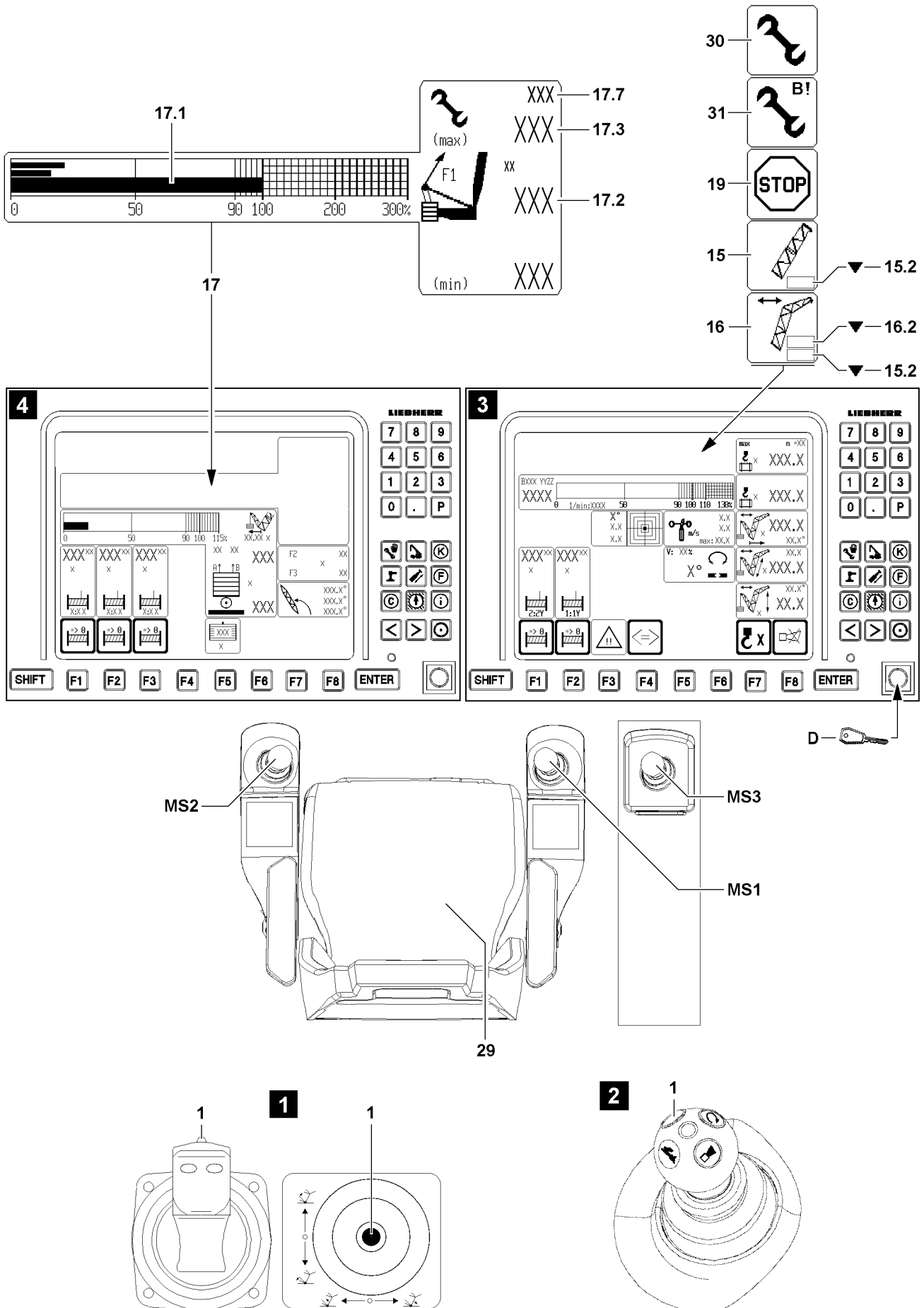


Fig.112341

LWE/LR 11350-007/19005-01-02/en

**DANGER**

The crane can topple over!

There is **no** shut off of the luff down movement after reaching the limit value $F1_{\text{max assembly}}$ **17.7**.

If the warnings by the LICCON overload protection are ignored, then the crane will be overloaded or topples over.

Personnel can be severely injured or killed.

- ▶ The symbol **17** (F1-load display) must be watched permanently. It must be ensured that the value $F1_{\text{actual}}$ **17.2** is smaller than the value $F1_{\text{max assembly}}$ **17.7**.
- ▶ The luff down movement must be stopped before the value $F1_{\text{actual}}$ **17.2** exceeds the limit value $F1_{\text{max assembly}}$ **17.7**.

- ▶ During the take down procedure watch the icon **17** (F1-load display).

Problem remedy

The take down procedure cannot be carried out due to danger of exceeding the $F1_{\text{max assembly}}$ **17.7**?

- ▶ See section „Danger of exceeding $F1_{\text{max assembly}}$ “.

The bypass of the shut off luffing the main boom / auxiliary boom / accessory down turns off:

- If the set up key **D** is actuated again.
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- When an area with existing load chart is reached.
- If the radio operation* is active.
- At engine stop.

The bypass of the shut off luffing the main boom / auxiliary boom / accessory down has / was turned off:

- The assembly icon **31** or the assembly icon **30** in the LICCON monitor turns off.
- ▶ Make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.

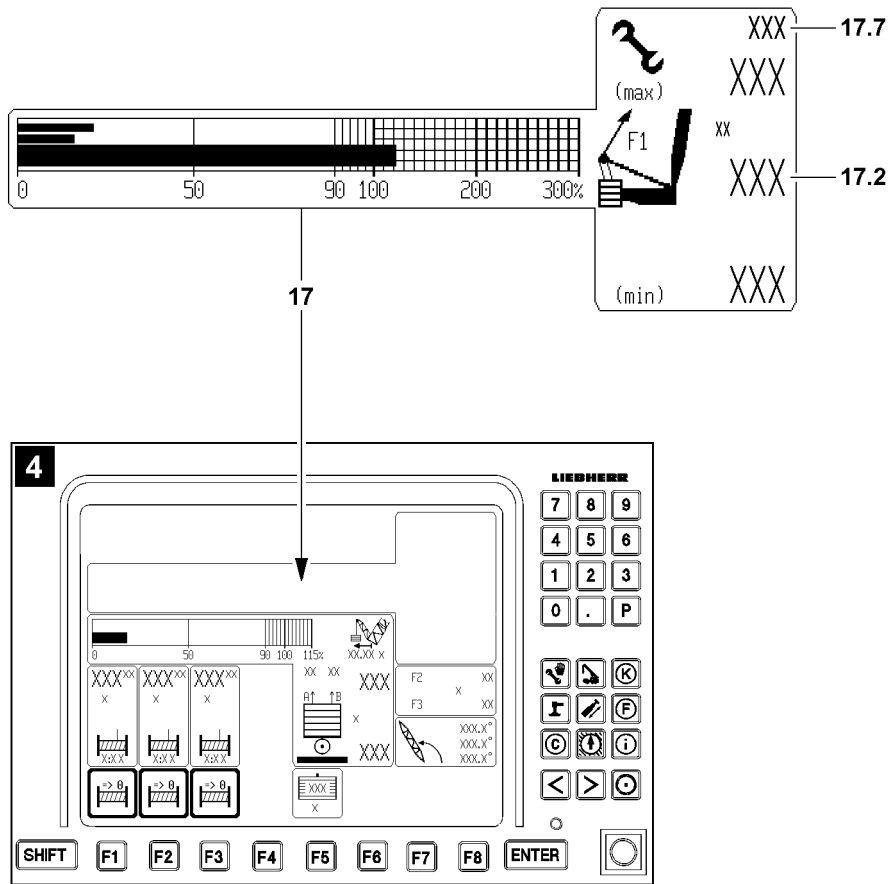


Fig.112344

2.6.3 Danger of exceeding $F1_{\text{max assembly}}$



Note

- ▶ $F1_{\text{max-assembly}}$ **17.7** might only appear when 90 % of its nominal value is exceeded.



DANGER

The crane can topple over!

There is **no** shut off of the luff down movement after reaching the limit value $F1_{\text{max assembly}}$ **17.7**.

If the warnings by the LICCON overload protection are ignored, then the crane will be overloaded or topples over.

Personnel can be severely injured or killed.

- ▶ The luff down movement must be stopped before the value $F1_{\text{actual}}$ **17.2** exceeds the limit value $F1_{\text{max assembly}}$ **17.7**.

In the icon **17** (F1-load display), the value $F1_{\text{actual}}$ **17.2** has reached the upper limit value $F1_{\text{max-assembly}}$ **17.7**.

- ▶ Check if a crane movement, which can lower the force $F1$ (value $F1_{\text{actual}}$ **17.2**) can be initiated, for example setting down the hook block / load hook.
- ▶ Check if the correct set up configuration has been entered on the LICCON computer system.
- ▶ Check if the actual set up configuration matches the entered set up configuration.
- ▶ Check if the correct hook block weight has been entered.
- ▶ Check if the respective hook block / load hook is installed.
- ▶ Check if all attachment parts and guy rods on the boom system, which are not needed, have been removed.
- ▶ Check if environmental influences (wind, snow or ice) on the crane are not too great.



Note

- ▶ Hook block weight entry and correction of weighing errors, see Crane operating instructions, chapter 4.02.

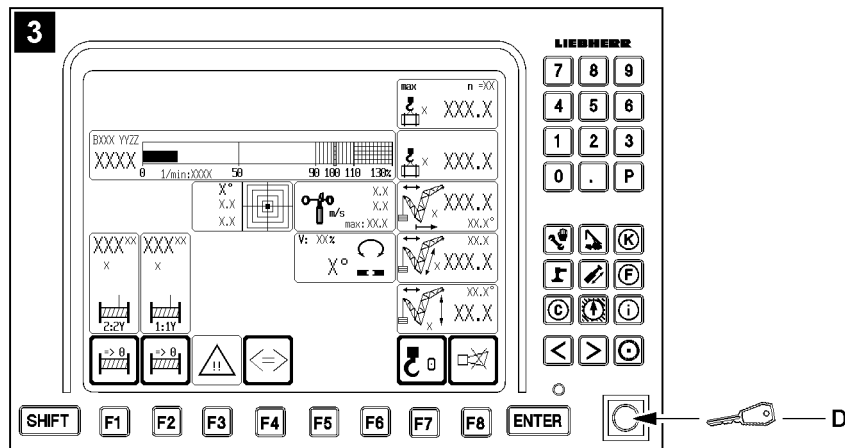
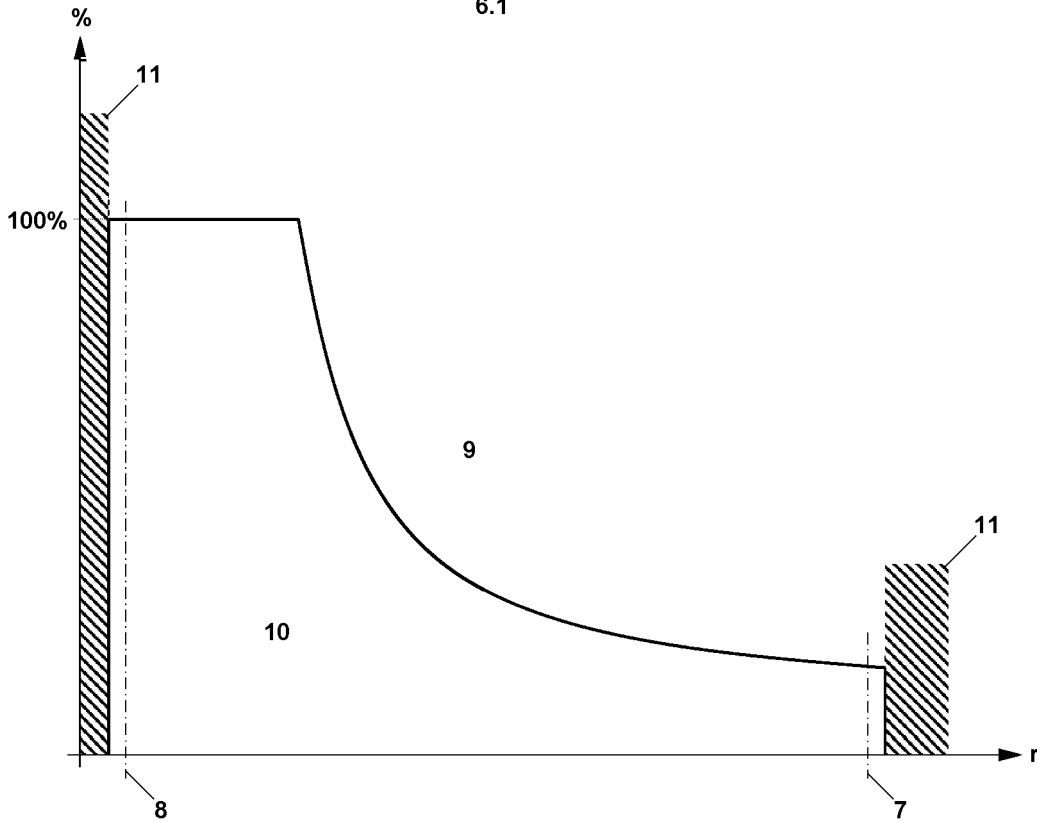
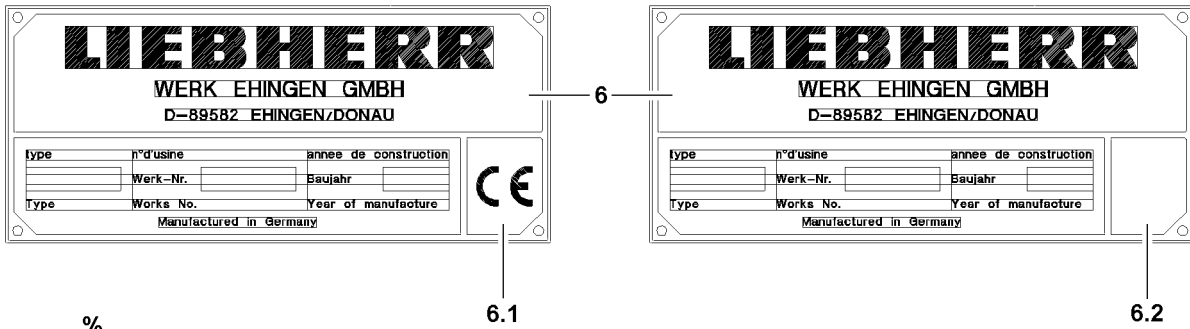


Fig.111208

LWE/LR 11350-007/19005-01-02/en

3 Instructions for resuming crane movements for cranes without CE mark



WARNING

Danger of accident!

If the following points are not observed, personnel can be severely injured or killed.

- ▶ The crane operator bears the sole and full responsibility for the adherence to measures to be taken in case of shut off of crane movement.
- ▶ The crane operator must make sure, before crane operation, that he is using the correct description for the current programming.



Note

- ▶ Check the data tag **6** to determine if your crane has a CE mark.
- ▶ The following section applies to a crane without CE mark, see data tag **6.2**.
- ▶ If your crane does have a CE mark, see data tag **6.1**, then you must observe the description in section „Instructions for resuming a crane movement for cranes with CE mark“.

3.1 Overview load chart for cranes without CE mark

| Axle | Description |
|------|---|
| r | Radius boom (working radius) |
| % | Utilization of the crane in percentages |

| Position | Description |
|----------|--|
| 7 | Lower limit angle load chart |
| 8 | Upper limit angle load chart |
| 9 | Area „Exceeding the overload protection“ |
| 10 | Range „Load chart available“ |
| 11 | Range „No load chart available“ |



Note

- ▶ If the set up key **D** (LICCON monitor with crane operating screen, illustration **3**) is actuated, the working speed is not reduced.

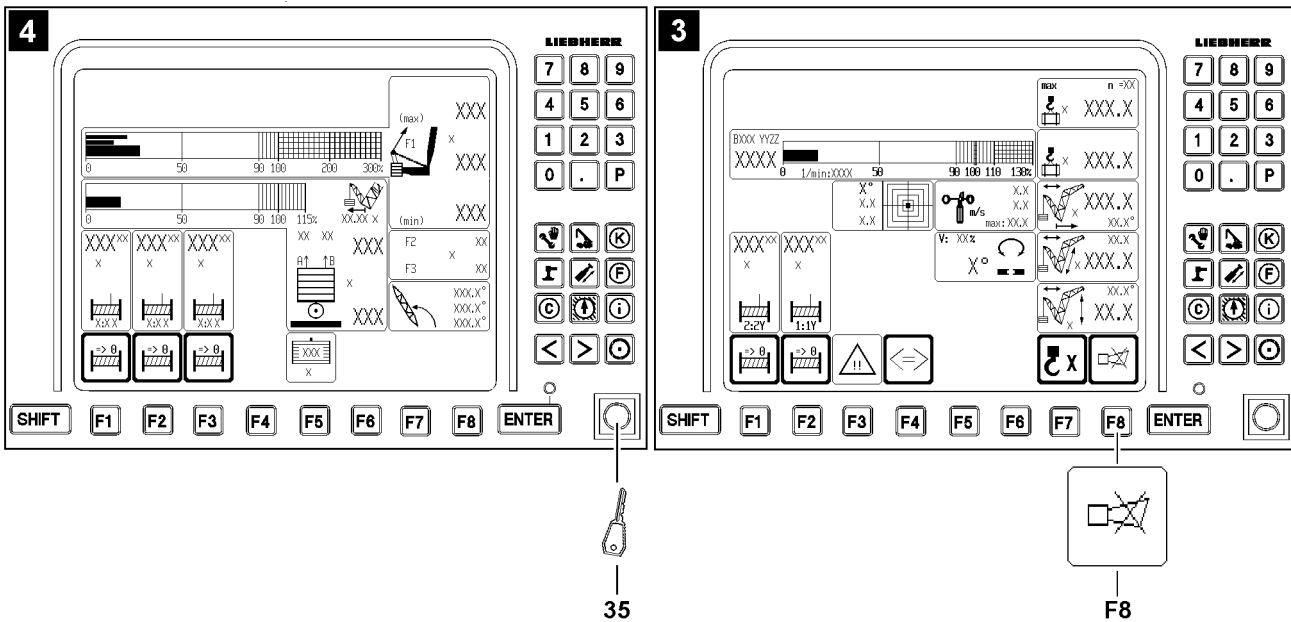
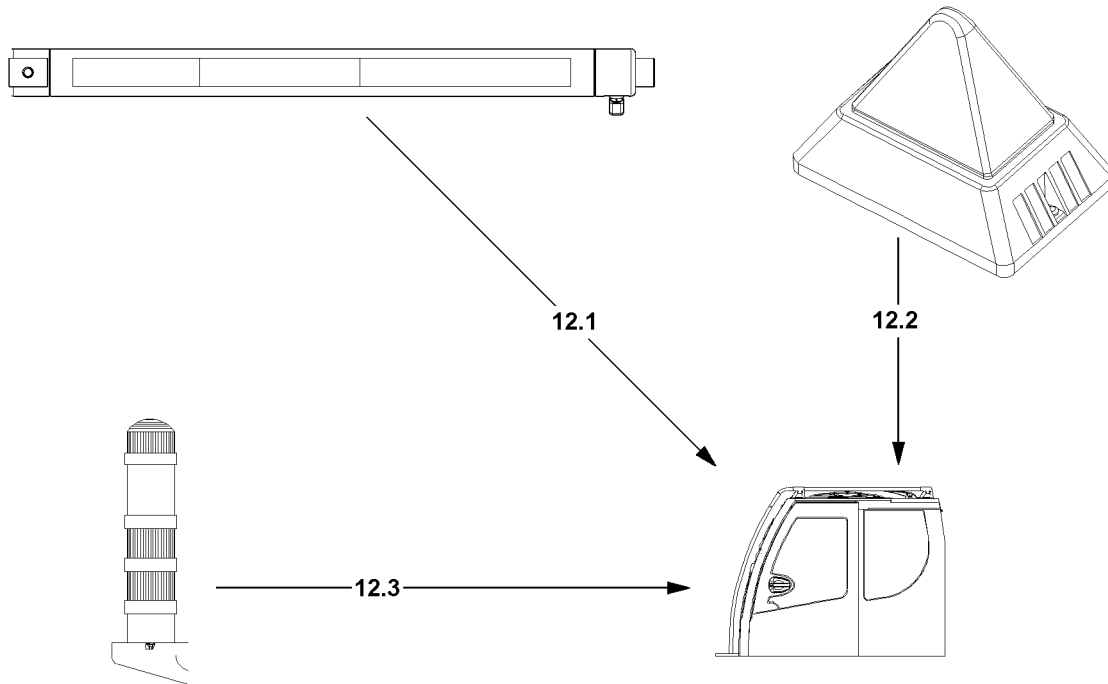


Fig.111212

LWE/LR 11350-007/19005-01-02/en

3.2 Overview of acoustic / visual warnings for cranes without CE mark

- Depending on the crane type, either a warning light **12.1** or a flashing beacon **12.2** or a combination of flashing beacon **12.2** and warning light* **12.3** are installed.
- The acoustic warnings within the crane operator's cab are turned off by pressing the button **F8** on the LICCON monitor with crane operating screen (illustration **3**).
- The acoustic warnings outside the crane operator's cab are turned off by actuating the key button **35** on the LICCON monitor with derrick operating screen (illustration **4**).

3.2.1 Description of acoustic / visual warnings

The case numbers from the chart „Overview of case numbers“ are valid for the following charts in this chapter:

- „Acoustic / visual warnings on the LICCON monitor“
- „Warning light 12.1“
- „Flashing beacon 12.2“
- „Warning light 12.3“

| Overview of case numbers | |
|--------------------------|---|
| Case number | Description Case |
| Case 001 | Utilization of crane from 0 % to 89 % |
| Case 002 | Utilization of crane from 90 % to 100 % |
| Case 003 | Utilization of crane over 100 % |
| Case 004 | Shut off of crane movements - LMB STOP |
| Case 005 | Luffing in with suspended load |
| Case 006 | Participating sensor (LMB) defective |
| Case 010 | Exceeding the shut off limits of the LICCON overload protection |
| Case 011 | Bypass of shut off hoist top |
| Case 016 | Bypass of shut off luffing down the boom / auxiliary boom / accessories, „Load chart available“ |
| Case 018 | Bypass of shut off luffing down the boom / auxiliary boom / accessories, „No load chart available“ |
| Case 020 | Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures, „No load chart available“ |

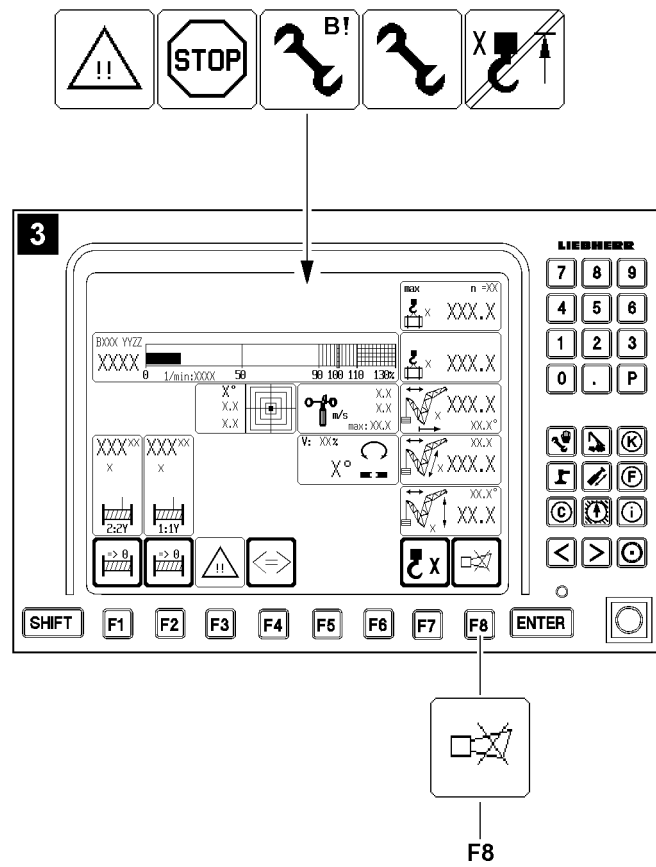


Fig.111209

3.2.2 Acoustic / visual warnings within the crane operator's cab



Note

► Description of individual case numbers, see chart „Overview of case numbers“.

| Acoustic / visual warnings on the LICCON monitor | | | | | | | | | |
|--|---|----------------|----------------|-------------------------------|-------------|------------|---|---|---|
| Case number | Acoustic warning LICCON monitor at utilization of crane | | | Visual warning LICCON monitor | | | | | |
| | Short sound | Long sound | Long sound | Utilization of crane | | Occurrence | | | |
| | From 90 % | Above 100 % | Always | From 90 % | Above 100 % | LMB STOP | Appears if the set up key D is actuated | | |
| | | | | | | | | | |
| Case 001 | | | | | | | — | — | — |
| Case 002 | X ² | | | ○ | | | — | — | — |
| Case 003 | | X ² | | ○ | ○ | | — | — | — |
| Case 004 | | | X ² | | ○ | | — | — | — |
| Case 005 | X ² | X ² | | ○ | ○ | | — | — | — |
| Case 006 | | | X ² | | | ○ | | ○ | |
| Case 010 | X ² | X ² | | ○ | ○ | | ○ | | |
| Case 011 | | | X ² | ○ | ○ | ○ | ○ | | ○ |
| Case 016 | X ² | X ² | | ○ | ○ | | ○ | | |
| Case 018 | | | X ² | | | ○ | | ○ | |
| Case 020 | | | X ² | | | ○ | | ○ | |

○ = cannot be turned off

X² = can be turned off immediately on the LICCON monitor key **F8**

LWE/LR 11350-007/19005-01-02/en

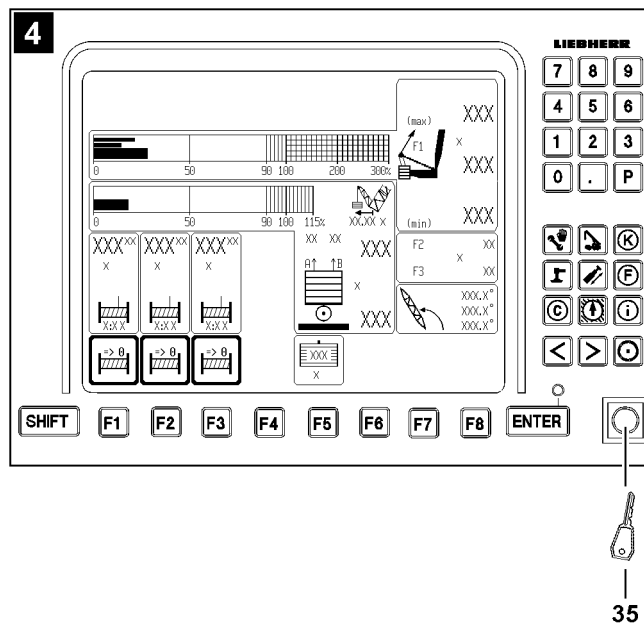
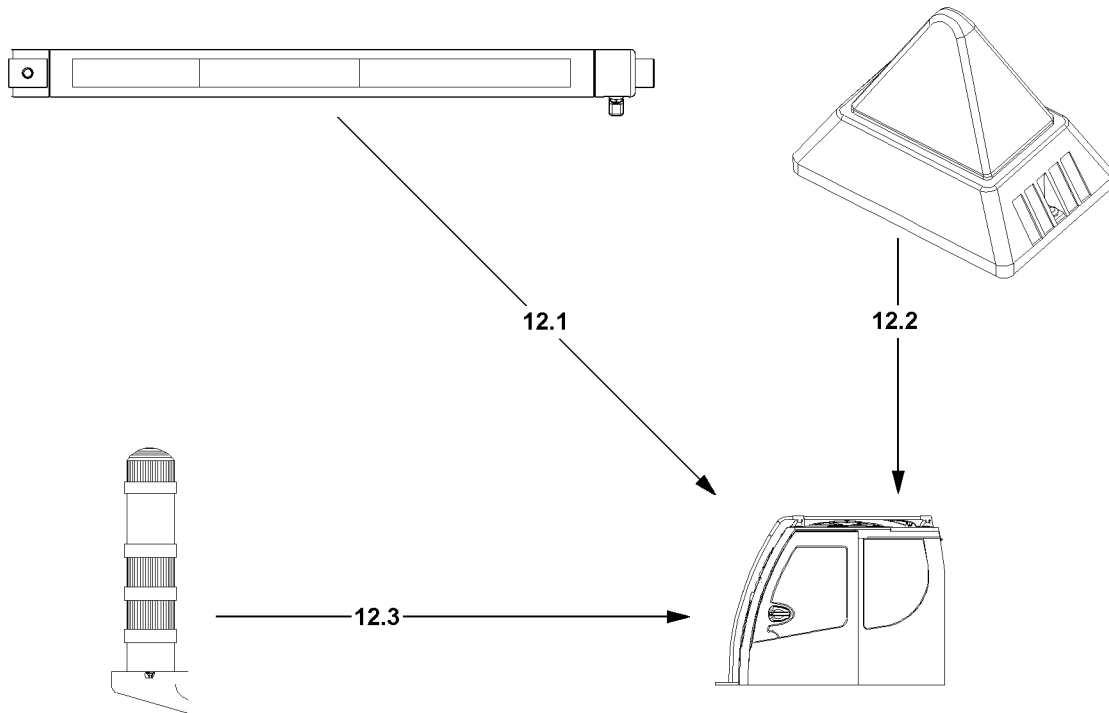


Fig.111206

LWE/LR 11350-007/19005-01-02/en

3.2.3 Acoustic / visual warnings outside the crane operator's cab



Note

► Description of individual case numbers, see chart „Overview of case numbers“.

| Warning light 12.1 | | | | | |
|--------------------|-------------------------|------------------|----------------|----------------|----------------|
| Case number | At utilization of crane | Acoustic warning | Visual warning | | |
| | | Signal turntable | Green | Yellow | Red |
| Case 001 | From 0 % to 89 % | | O ¹ | | |
| Case 002 | From 90 % to 100 % | | | O ¹ | |
| Case 003 | Above 100 % | X ¹ | | | O ¹ |
| Case 004 | - | | | | O ¹ |
| Case 005 | From 0 % to 89 % | | O ¹ | | |
| Case 005 | From 90 % to 100 % | | | O ¹ | |
| Case 005 | Above 100 % | X ¹ | | | O ² |
| Case 006 | - | | | O ² | |
| Case 010 | From 0 % to 89 % | | O ¹ | | |
| Case 010 | From 90 % to 100 % | | | O ¹ | |
| Case 010 | Above 100 % | O | | | O ² |
| Case 011 | From 0 % to 100 % | | | O ² | |
| Case 011 | Above 100 % | O | | | O ² |
| Case 016 | Up to 90 % | | O ¹ | | |
| Case 016 | Above 90 % to 100 % | | | O ¹ | |
| Case 016 | Above 100 % | O | | | O ² |
| Case 018 | No value available | | | O ² | |
| Case 020 | No value available | | | O ² | |

O = cannot be turned off

O¹ = warning light **12.1** lights up

O² = warning light **12.1** blinks

X¹ = can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

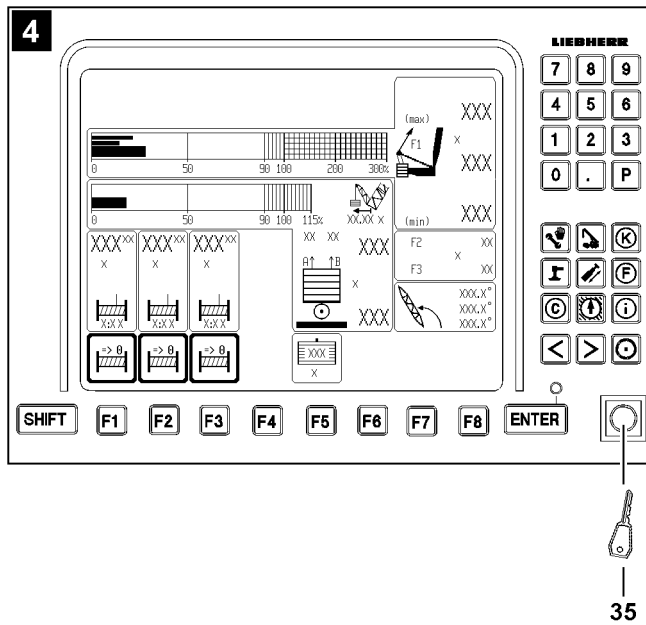
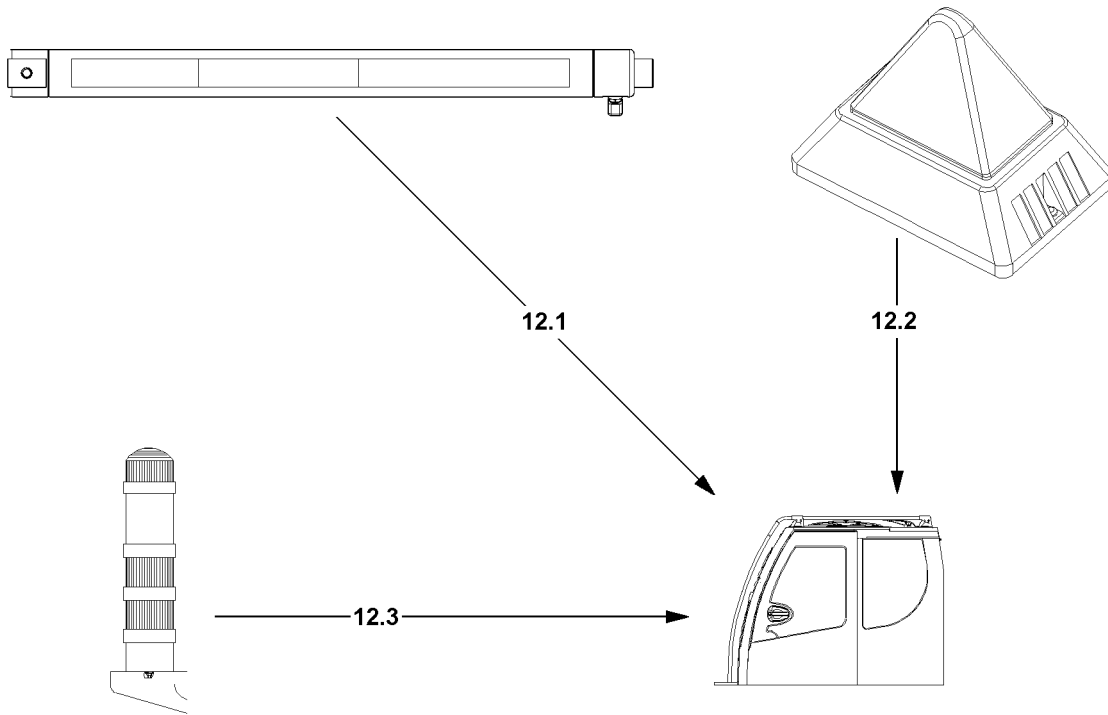


Fig.111206

LWE/LR 11350-007/19005-01-02/en

**Note**

► Description of individual case numbers, see chart „Overview of case numbers“.

| Flashing beacon 12.2 | | | |
|----------------------|-------------------------|------------------|----------------|
| Case number | At utilization of crane | Acoustic warning | Visual warning |
| | | Signal turntable | Red |
| Case 001 | 0 % to 89 % | - | - |
| Case 002 | 90 % to 100 % | - | - |
| Case 003 | Above 100 % | X ¹ | O ² |
| Case 004 | - | | O ² |
| Case 005 | Above 100 % | X ¹ | O ² |
| Case 006 | - | | O ² |
| Case 010 | Above 100 % | O | O ² |
| Case 011 | Above 100 % | O | O ² |
| Case 016 | Above 100 % | O | O ² |
| Case 018 | No value available | | O ² |
| Case 020 | No value available | | O ² |

O = cannot be turned off

O² = flashing beacon **12.2** blinks

X¹ = can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

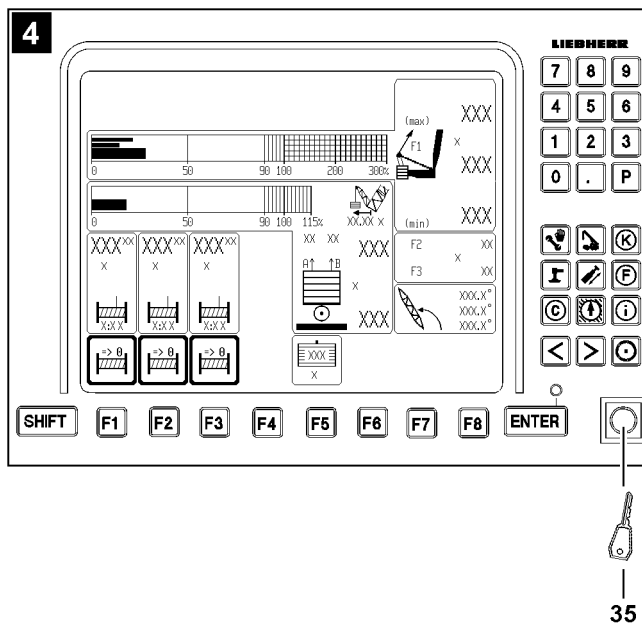
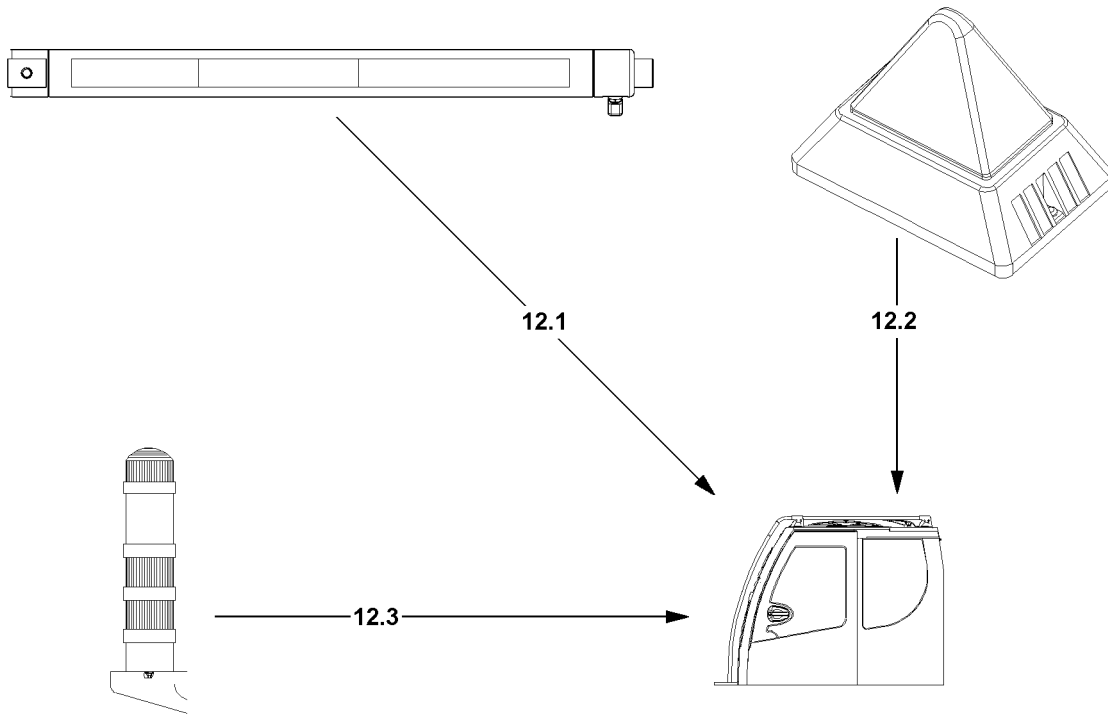


Fig.111206

LWE/LR 11350-007/19005-01-02/en

**Note**

► Description of individual case numbers, see chart „Overview of case numbers“.

| Warning light 12.3 | | | | | |
|--------------------|-------------------------|------------------|----------------|----------------|----------------|
| Case number | At utilization of crane | Acoustic warning | Visual warning | | |
| | | Signal turntable | Green | Yellow | Red |
| Case 001 | From 0 % to 89 % | | O ¹ | | |
| Case 002 | From 90 % to 100 % | | | O ¹ | |
| Case 003 | Above 100 % | X ¹ | | | O ² |
| Case 004 | - | | | | O ² |
| Case 005 | From 0 % to 89 % | | O ¹ | | |
| Case 005 | From 90 % to 100 % | | | O ¹ | |
| Case 005 | Above 100 % | X ¹ | | | O ² |
| Case 006 | - | | | | O ² |
| Case 010 | From 0 % to 89 % | | O ¹ | | |
| Case 010 | From 90 % to 100 % | | | O ¹ | |
| Case 010 | Above 100 % | O | | | O ² |
| Case 011 | From 0 % to 100 % | | | O ¹ | |
| Case 011 | Above 100 % | O | | | O ² |
| Case 016 | From 0 % to 89 % | | O ¹ | | |
| Case 016 | From 90 % to 100 % | | | O ¹ | |
| Case 016 | Above 100 % | O | | | O ² |
| Case 018 | No value available | | | | O ² |
| Case 020 | No value available | | | | O ² |

O = cannot be turned off

O¹ = warning light **12.3** lights up

O² = warning light **12.3** blinks

X¹ = can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

3.3 Monitoring of crane movement

**Note**

- If the LICCON overload protection turns the crane movement off, then the exact cause for the shut off must be determined first.
- As a first step, try to rescind the crane movement which has caused a shut off.
- If it is not possible to rescind the affected crane movement, then the additional steps are described in the following sections of the chapter.

**Note**

- For detailed description of the individually listed symbols, see Crane operating instructions, chapter 4.02.

The LICCON overload protection carries out the following shut offs if a limit value is exceeded in crane operation:

- Shut off luffing the main boom up / down
- Shut off Upper limit shut off angle (OGAW)
- Shut off Luffing the auxiliary boom / accessory up / down
- Shut off maximum / minimum value test point 1 (force F1)
- Shut off spooling the winch up / out
- Shut off Hoist top
- Shut off due to error message

The LICCON overload protection warns if the limit values are exceeded, but does not turn off:

- Minimum / maximum support forces

3.3.1 Shut off luffing the main boom up / down

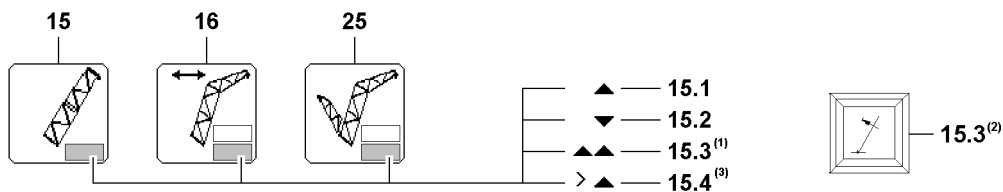


Fig.124701

⁽¹⁾not LR 1400/2

⁽²⁾only LR 1400/2

⁽³⁾Only for certain crane types

In symbol **15**, or symbol **16**, or symbol **25** appears in the lower field symbol **15.1**, or symbol **15.2** or symbol **15.4** and the LICCON overload protection has shut the crane movement off.

„Luffing the main boom up“ (symbol **15.1**), „Luffing the main boom down“ (symbol **15.2**) or „upper limit shut off angle“ reached (symbol **15.4**), was shut off because the upper / lower limit angle of the selected load chart was exceeded / fallen below.

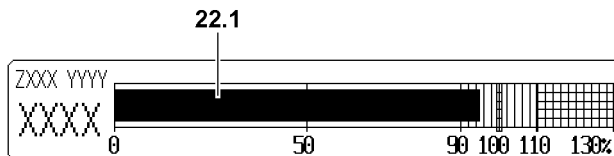


Fig.112340



Note

- ▶ If the utilization of the crane is more than 95 % (utilization bar **22.1** exceeds 95 %) and the maximum load according to the load chart (falling load capacity) drops by continuing to luff up the boom, then the symbol **15.1** also appears and the crane movement „Luffing the main boom up“ is turned off.

If the symbol / warning light **15.3** appears, then:

- **either** it was luffed up to a limit switch or the limit switch has turned off the crane movement „Luffing the main boom up“
- **or** there is an error on one of the limit switches „Main boom top“

The symbol **15.1** appears and the crane movement „Luffing the main boom up“ was turned off:

- ▶ Luff the main boom down.

Result:

- Crane operation is possible again.

The symbol **15.2** appears and the crane movement „Luffing the main boom down“ was turned off:

- ▶ Luff the main boom up.

Result:

- Crane operation is possible again.

The symbol / warning light **15.3** appears and the crane movement „Luffing the main boom up“ was turned off:

- ▶ Luff the main boom down.

Result:

- Crane operation is possible again.

Problem remedy

The symbol / warning light **15.3** appears continuously?

If a symbol / warning light **15.3** appears without having luffed the main boom up to a limit switch, then there may be an error in the limit switches „Main boom top“.

- ▶ Check if there is an error message from the LICCON computer system, see Diagnostics manual.
- ▶ If yes: Remedy the error immediately.

The symbol **15.4** appears and the crane movement „Luffing the main boom up“ (upper limit shut off angle) was turned off:

- ▶ Luff the main boom down.

Result:

- Crane operation is possible again.



WARNING

Limited warning functions!

If one of the double version limit switches is not ok and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited.

- ▶ The crane can only be operated in an emergency after failure of a double version limit switch.
- ▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

3.3.2 Shut off Luffing the auxiliary boom / accessory up / down

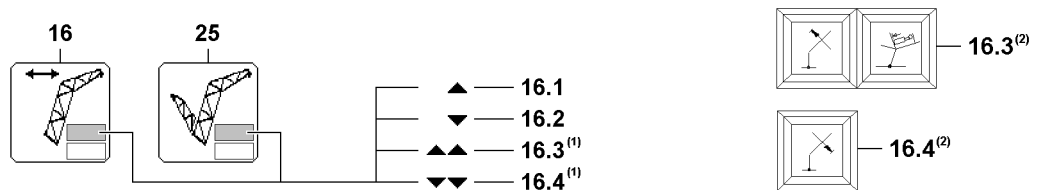


Fig.124702

⁽¹⁾not LR 1400/2

⁽²⁾only LR 1400/2

In symbol **16** or symbol **25** appear in the upper field symbol **16.1** or symbol **16.2** and the LICCON overload protection has shut off the crane movement.

„Luffing the auxiliary boom / accessory up“ (symbol **16.1**) or „Luffing the auxiliary boom / accessory down“ (symbol **16.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded / fallen below.

If the symbol / warning light **16.3** appears, then:

- **either** it was luffed up to a limit switch or the limit switch has turned off the crane movement „Luffing the auxiliary boom / accessory up“

- **or** the mechanical relapse support has turned off the crane movement „Luffing the auxiliary boom / accessory up“
- **or** there is an error on one of the limit switches „Auxiliary boom / accessory top“.

If the symbol / warning light **16.4** appears, then:

- **either** it was luffed down to a limit switch „Auxiliary boom / accessory bottom“ and the limit switch has turned off the crane movement „Luffing the auxiliary boom / accessory up“
- **or** there is an error on one of the limit switches „Auxiliary boom / accessory bottom“

The symbol **16.1** appears and the crane movement „Luffing the auxiliary boom / accessory up“ was turned off:

- ▶ Luff the auxiliary boom / accessory down.

Result:

- Crane operation is possible again.

The symbol **16.2** appears and the crane movement „Luffing the auxiliary boom / accessory down“ was turned off:

- ▶ Luff the auxiliary boom / accessory up.

Result:

- Crane operation is possible again.

The symbol / warning light **16.3** appears and the crane movement „Luffing the auxiliary boom / accessory up“ was turned off:

- ▶ Luff the auxiliary boom / accessory down.

Result:

- Crane operation is possible again.

Problem remedy

The symbol / warning light **16.3** appears continuously?

If a symbol / warning light **16.3** appears without having luffed up to a limit switch, then there may be an error in the limit switches „Auxiliary boom / accessory top“.

- ▶ Check if there is an error message from the LICCON computer system, see Diagnostics manual.
- ▶ If yes: Remedy the error immediately.

The symbol / warning light **16.4** appears and the crane movement „Luffing the auxiliary boom / accessory down“ was turned off:

- ▶ Luff the auxiliary boom / accessory up.

Result:

- Crane operation is possible again.

Problem remedy

The symbol / warning light **16.4** appears continuously?

If a symbol / warning light **16.4** appears without having luffed down to a limit switch, then there may be an error in the limit switches „Auxiliary boom / accessory bottom“.

- ▶ Check if there is an error message from the LICCON computer system, see Diagnostics manual.
- ▶ If yes: Remedy the error immediately.



WARNING

Limited warning functions!

If one of the double version limit switches is not ok and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited.

- ▶ The crane can only be operated in an emergency after failure of a double version limit switch.

- ▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

3.3.3 Shut off maximum / minimum value test point 1 (force F1)



Note

- ▶ The force determined on test point 1 is generally described as $F1_{\text{actual}}$ (actual value F1).
- ▶ In the icon **17** (F1-load display), the force relationship as well as the number values are shown in number values as well as a bar display (called F1-bar display).
- ▶ The value $F1_{\text{max-operation}}$ **17.3** corresponds to 100 % in the F1-bar display.
- ▶ The F1-utilization bar **17.1** shows the relationship $F1_{\text{actual}}$ **17.2** to $F1_{\text{max-operation}}$ **17.3**.
- ▶ In crane operation without derrick ballast, fewer values may be shown in the icon **17** (F1-load display).

Shut off maximum value F1 in crane operation

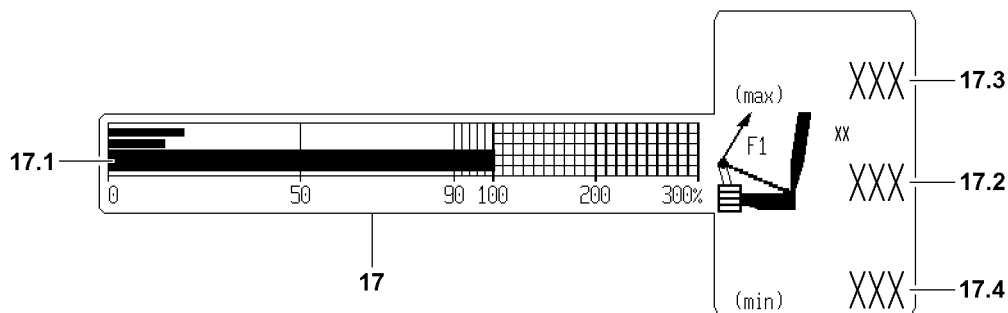


Fig. 110991

In the icon **17**(F1-load display) the F1-utilization bar **17.1** exceeds the 100 % mark and the LICCON overload protection has shut off the crane movement. The value $F1_{\text{actual}}$ **17.2** has exceeded the value $F1_{\text{max-operation}}$ **17.3**.

All further movements, which lead to an increase of the force F1 (value $F1_{\text{actual}}$) are shut off.

- ▶ Reverse any crane movement which has caused the shut off.
or
Initiate an alternative crane movement, which lowers the force F1 (value $F1_{\text{actual}}$).

Result:

- Crane operation is possible again.

Problem remedy

The crane operation is limited because the value $F1_{\text{max-operation}}$ apparently is being reached too early?

- ▶ Make sure that a valid set up status has been entered on the LICCON computer system.
- ▶ Make sure that the crane is assembled according to the assembly drawings.
- ▶ Make sure that the actual set up status and the entered set up status of the crane match.
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed (weight).
- ▶ Make sure that the boom system is free of snow and ice (weight).
- ▶ Make sure that the wind influence onto the boom is not too great.

If no irregularities can be found:

- ▶ Contact Liebherr Service.

Shut off minimum value F1 in crane operation



Note

- ▶ A shut off minimum value F1 ($F1_{\text{min}}$) only occurs in operating modes with derrick ballast. The status $F1_{\text{actual}} = F1_{\text{min}}$ cannot be reached in all other operating modes.

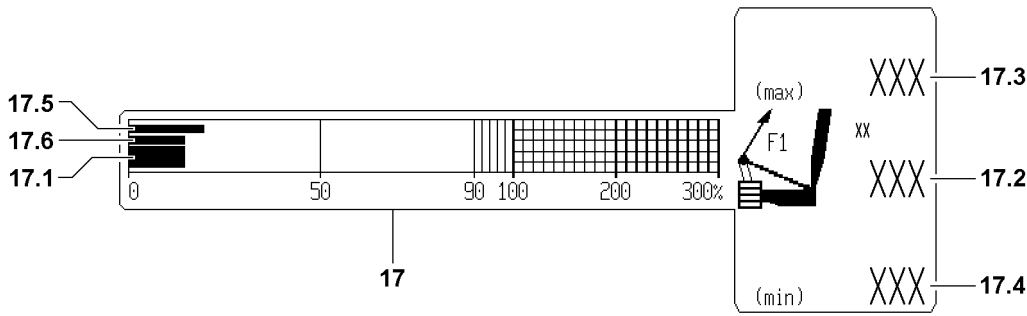


Fig.110992

In the icon **17** (F1-load display), when falling below the $F1_{min}$ advance warning bar **17.5**, a warning of the upcoming shut off is issued by the F1-utilization bar **17.1**.

If the F1-utilization bar **17.1** falls below the $F1_{min}$ -STOP bar **17.6**, then the LICCON overload protection shuts off the crane movement. The value $F1_{actual}$ **17.2** has fallen below the value $F1_{min}$ **17.4**.

**Note**

Shut off $F1_{min}$!

- ▶ If the utilization of the derrick ballast is below 50 %, then there is no immediate shut off when falling below value $F1_{min}$ **17.4**.

All further movements, which lead to an decrease of the force $F1$ (value $F1_{actual}$) are shut off.

- ▶ Reverse any crane movement which has caused the shut off.
or
Initiate an alternative crane movement, which increases the force $F1$ (value $F1_{actual}$).

Result:

- Crane operation is possible again.

Problem remedy

The crane operation is limited because the value $F1_{min}$ apparently is being reached too early?

- ▶ Make sure that a valid set up status has been entered on the LICCON computer system.
- ▶ Make sure that the crane is assembled according to the assembly drawings.
- ▶ Make sure that the actual set up status and the entered set up status of the crane match.
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed (weight).
- ▶ Make sure that the boom system is free of snow and ice (weight).
- ▶ Make sure that the wind influence onto the boom is not too great.

If no irregularities can be found:

- ▶ Contact Liebherr Service.

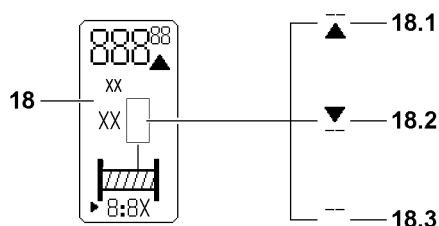
3.3.4 Shut off spooling the winch up / out

Fig.110878

In symbol **18** appears symbol **18.1**, symbol **18.2** or symbol **18.3** and the LICCON overload protection has shut off the crane movement.

„Spooling the winch out“ (symbol **18.1**) or „spooling the winch up“ (symbol **18.2**) was shut off because the upper / lower limit value of the rope for the selected winch was exceeded or fallen below.

If symbol **18.3** appears blinking in the symbol **18**, then the affected winch is deactivated.

The symbol **18.1** appears and the crane movement „Spooling the winch out“ was turned off:

► Spool the winch up.

Result:

– Crane operation is possible again.

The symbol **18.2** appears and the crane movement „Spooling the winch up“ was turned off:

► Spool the winch out.

Result:

– Crane operation is possible again.

The symbol **18.3** appears and the winch is deactivated:

► Activate the winch, see Crane operating instructions, chapter 4.02.

Result:

– Crane operation is possible again.

3.3.5 Shut off hoist top

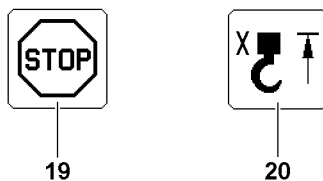


Fig.110875

The symbol **19** and hoist top icon **20** appear in the LICCON monitor and the LICCON overload protection has turned the crane movement off.

Spooling the hoist winch up was turned off because the hook block or the load hook has run against a hoist limit weight during the upward movement and the affected hoist limit switch was triggered.



WARNING

Property damage / falling load!

► After shut off spool hoist winch up (hoist top), for every further crane movement, the distance between the hook block / load hook and the boom head must be checked.



Note

► After a hoist top shut off occurred, further crane movements, which affect the length of the hoist rope are also shut off.

► Spool the hoist winch out.

Result:

– Crane operation is possible again.

3.3.6 Shut off due to error message

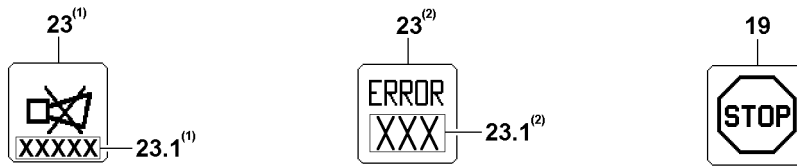


Fig.112331

⁽¹⁾not LR 1400/2

⁽²⁾only LR 1400/2

In the icon **23** appears an error message, the icon **19** appears in the LICCON monitor and the LICCON overload protection has turned off crane movement.



WARNING

Limited warning functions!

If there is a defect on a participating sensor (LML) and the crane is continued to be operated by bypassing the sensor other otherwise, then the warning functions and the shut offs of the LICCON overload protection are deactivated.

- ▶ If there is a defect on a participating sensor (LMB), then the crane may be operated further only in emergency cases.
- ▶ Fix / replace the sensor before starting crane operation again.

- ▶ Determine the existing error with the help of the error message from the error field **23.1** in icon **23**, see Diagnostics manual.
- ▶ Remedy the error.

Problem remedy

The erection of the crane, for example after assembly on a new job site or with another equipment configuration, is not possible due to an error message?

- ▶ Evaluate the error message.
- ▶ Make sure that all electrical connections are established correctly.
- ▶ Check if all sensors or dummy plugs with integrated electric have been connected properly.

If the error cannot be remedied:

- ▶ Contact Liebherr Service.

3.3.7 Minimum / maximum support forces



Note

- ▶ Applies only for cranes with support force monitoring*.
- ▶ Description of support force monitoring, see Crane operating instructions, chapter 4.02.

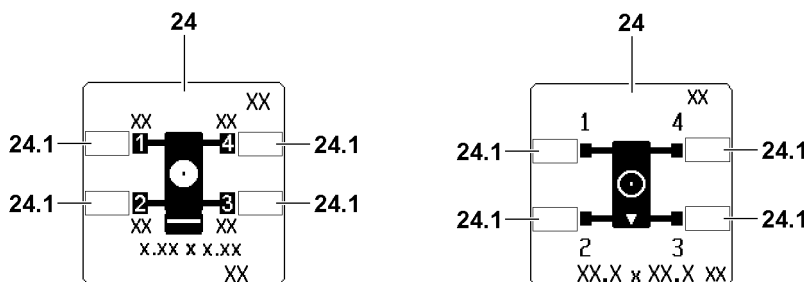


Fig.110881

LWE/LR 11350-007/19005-01-02/en

**WARNING**

The crane can topple over!

When reaching the programmed minimum / maximum support forces there is no automatic shut off of crane movements.

The displayed support force values are subjected to fluctuating influences, for example crane operation, surrounding and environmental influences.

The resulting tolerance field of the determined values may not be utilized by the support force display to determine the tipping limit of the crane.

If this is disregarded, then the crane can topple over.

Personnel can be severely injured or killed.

- ▶ The displayed support force values of the support force display may not be used to utilize the crane up to the tipping limit.
- ▶ Make sure that all support force values are within the minimum / maximum support forces.

The icon **24** (depending on the crane, similar to the left or right illustration) is shown in the LICCON monitor with blinking value in one or several fields **24.1**. Blinking values in the fields **24.1** signal exceedance of the minimum / maximum support forces.

- ▶ Reverse the crane movements, which caused the support forces to be outside the minimum / maximum values.

Result:

- All values in the fields **24.1** are within the minimum / maximum support forces.
- ▶ Carry out crane movements in such a way that the support forces always remain within the minimum / maximum values.

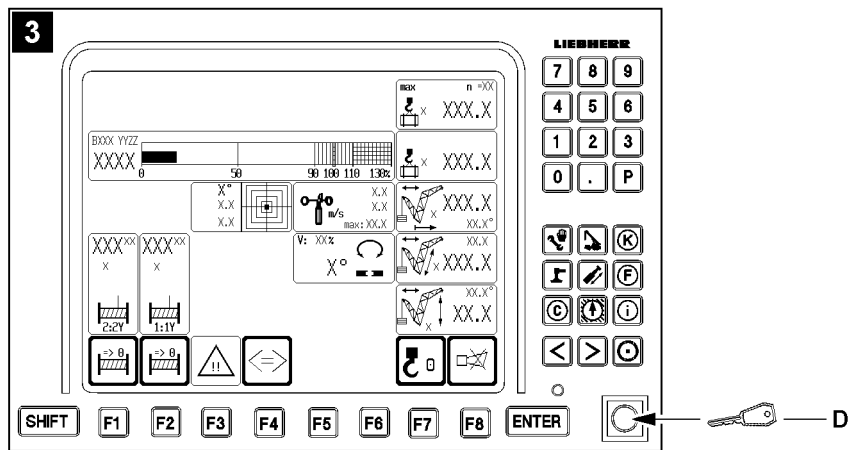
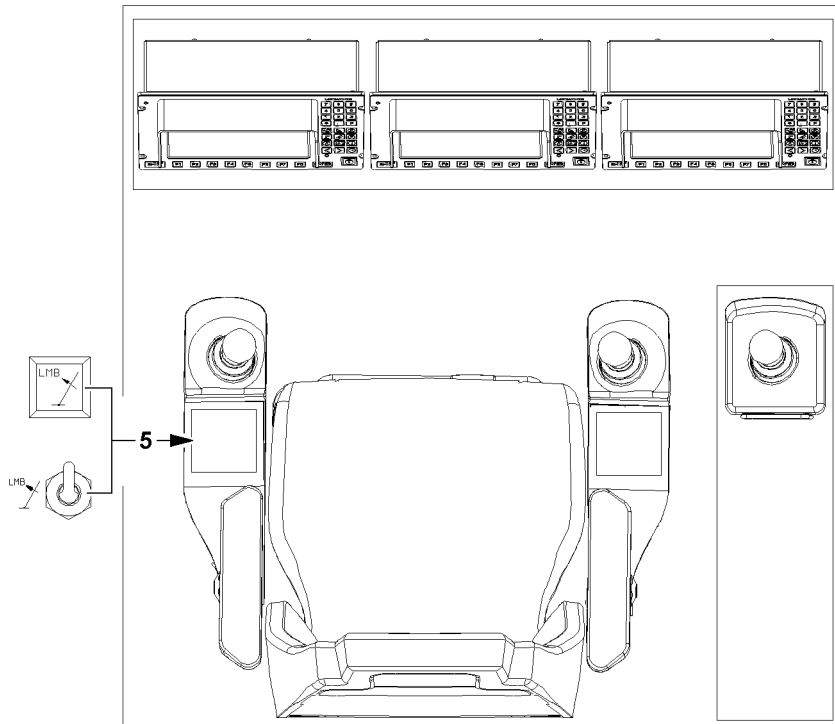


Fig.112334

LWE/LR 11350-007/19005-01-02/en

3.4 Shut off of crane movement: LMB STOP by LICCON overload protection



WARNING

Risk of overloading and toppling of the crane!

If the shut off limits of the LICCON overload protection are exceeded without knowing the exact cause for the shut off by the LICCON overload protection, then the crane can be overloaded and topple over. Personnel can be severely injured or killed.

- ▶ Before activating the function „Exceedance of shut off limits of the LICCON overload protection“ determine the exact cause for the shut off.



WARNING

Danger of accident due to function „Exceedance of shut off limits of the LICCON overload protection“! If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.

Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.

Personnel can be severely injured or killed.

- ▶ The button **5** „Luffing in with suspended load“ and the set up key **D** may only be actuated when it is ensured that no normal operating condition (utilization below 100 % and no active shut off) can be reached without the function „Exceedance of shut off limits of the LICCON overload protection“!
- ▶ Actuate the set up key **D** only when no normal operating condition (utilization below 100 % and no active shut off) can be reached with the button **5** „Luffing in with suspended load“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload protection“ is prohibited.



WARNING

Expanded working / danger zone of the crane!

Due to the function „Exceedance of shut off limits of the LICCON overload protection“ it is possible that the working / danger zone of the crane is significantly expanded.

If these circumstances are not observed, collisions and accidents can occur.

Personnel can be severely injured or killed.

- ▶ With activated function „Exceedance of shut off limits of the LICCON overload protection“ take an expanded working / danger zone of the crane into account and monitor it.

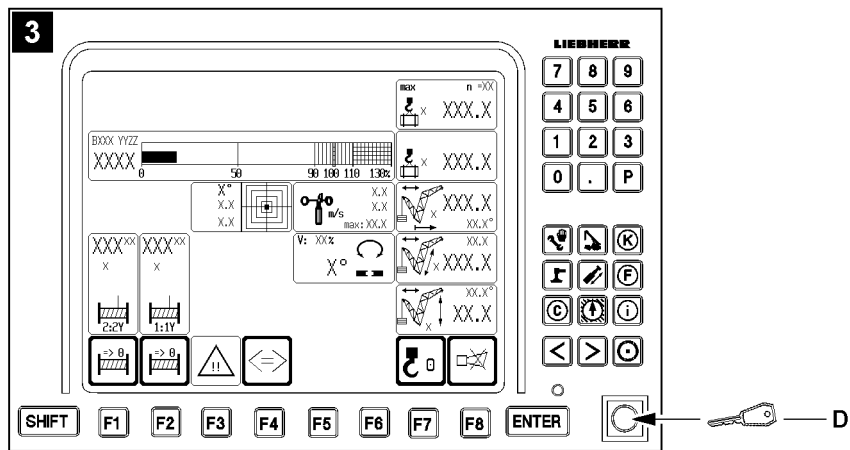
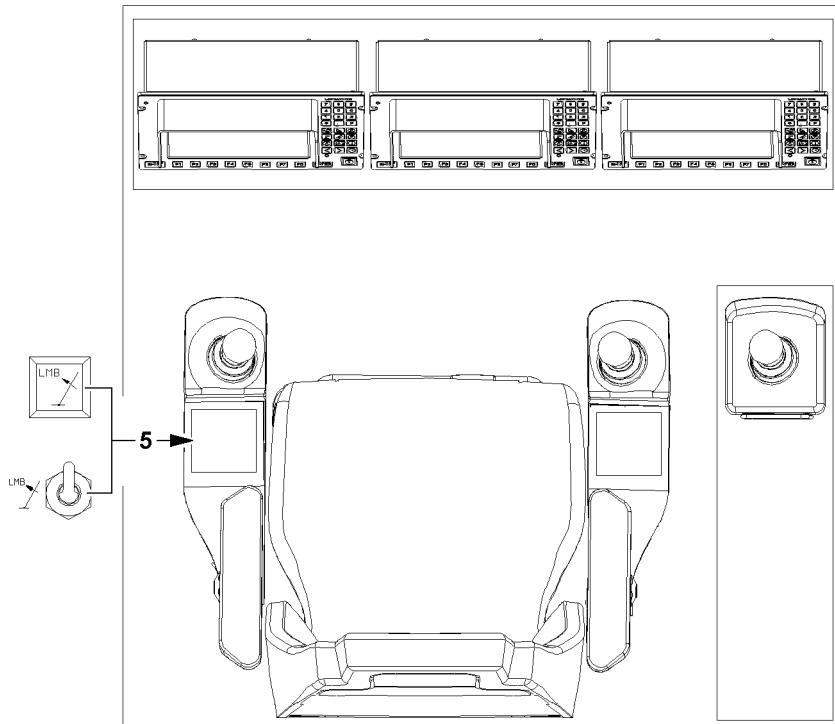


Fig.112334

LWE/LR 11350-007/19005-01-02/en

**WARNING**

Overload of crane!

When taking on a load by luffing the boom up, the crane can be overloaded.

This could result in serious accidents.

- ▶ Taking on load by luffing up the boom is prohibited.
- ▶ Take on a load only with the hoist gear.

There are two possibilities to exceed the shut off limits of the LICCON overload protection after LMB STOP:

- With button **5** „Luffing in with suspended load“ in the left control console
- With the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**

NOTICE

Danger of mix up!

The function „Exceedance of shut off limits of LICCON overload protection“ can only be activated with the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**.

The key buttons on the other monitors are not assigned with this function.

- ▶ Do not mix up the set up key **D** with the other key buttons.
- ▶ In case of mix up: Deactivate the activated function.

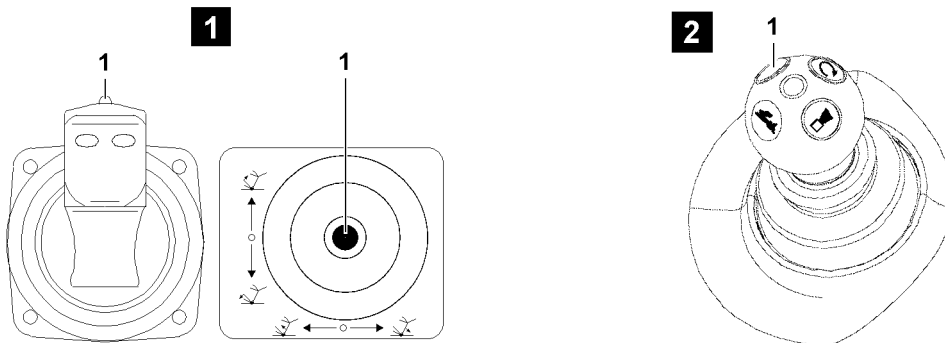
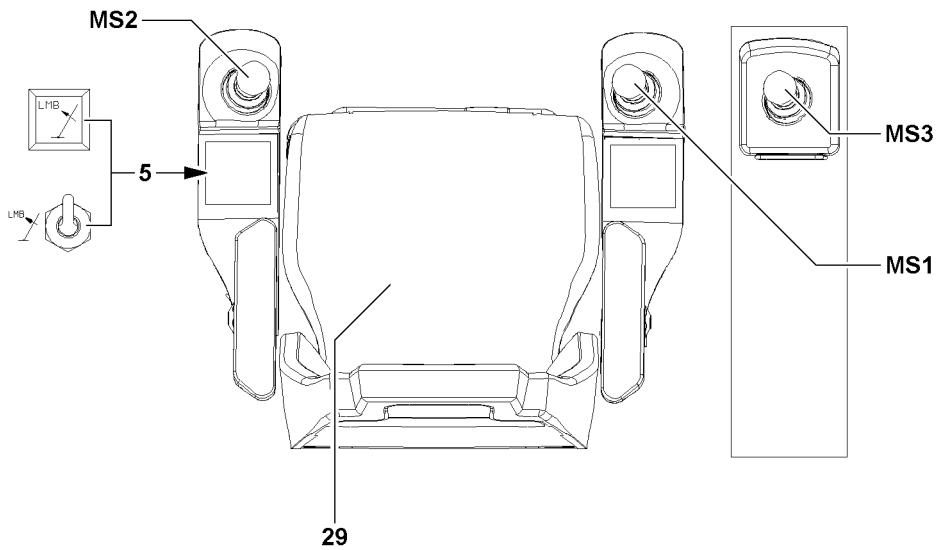
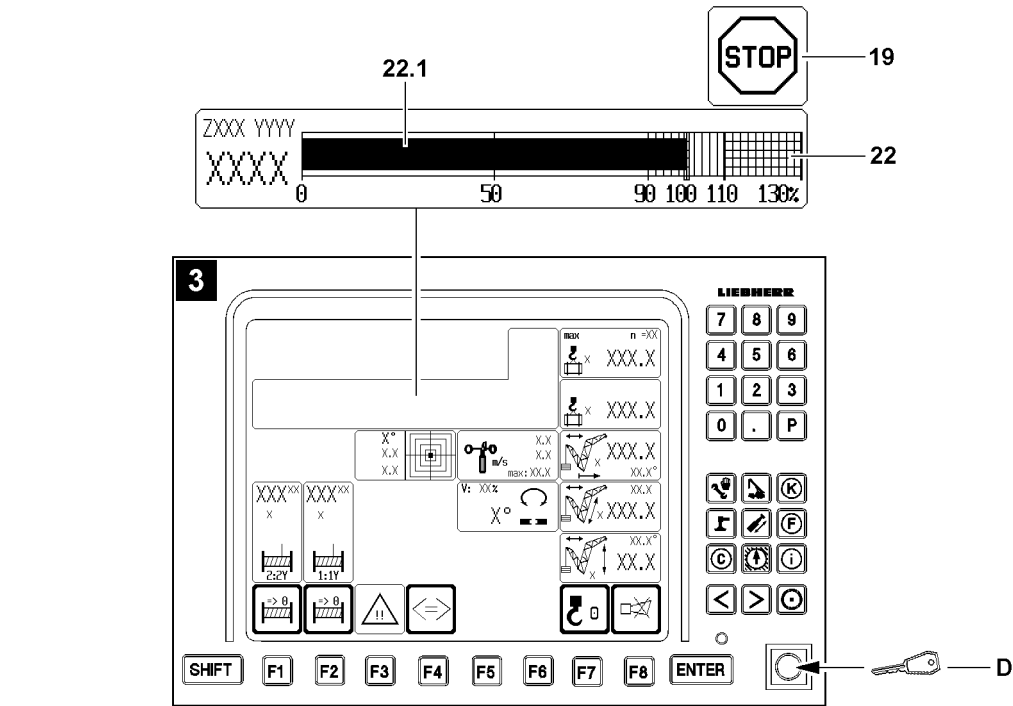


Fig.112335

LWE/LR 11350-007/19005-01-02/en

3.4.1 Luffing in with suspended load

If the maximum permissible load torque is exceeded, the LICCON overload protection turns off all crane movements that increase load torque.

In the icon **22** (load moment display) the utilization bar **22.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**.

This shut off limit can be exceeded by actuating the button **5** „Luffing in with suspended load“.

Make sure that the following prerequisite is met:

- Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.



Note

- ▶ If the load is reduced by luffing up, then the button **5** „Luffing in with suspended load“ is possibly not functioning.
- ▶ For the procedure when the button **5** „Luffing in with suspended load“ is not functioning, see section „Exceedance of maximum permissible load moment“.

- ▶ Press the function key **5** „Luffing in with suspended load“ and hold it.

Result:

- The LICCON overload protection is inactive.

- ▶ Luff the load in.

Result:

- If the crane reaches a normal operation status (utilization below 100 % and no active shut off) then the icon **19** turns off, normal crane operation is possible again.

The function „Luffing in with suspended load“ is deactivated:

- When the function key **5** „Luffing in with suspended load“ is not longer actuated.
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- At engine stop.

The function „Luffing in with suspended load“ is deactivated:

- The LICCON overload protection is active.
- ▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

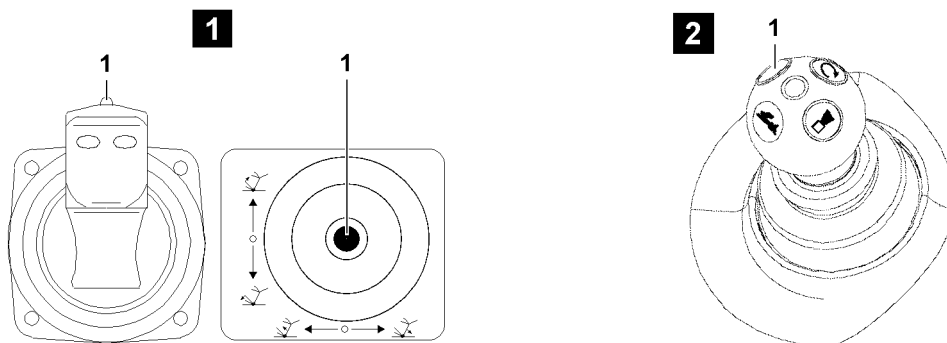
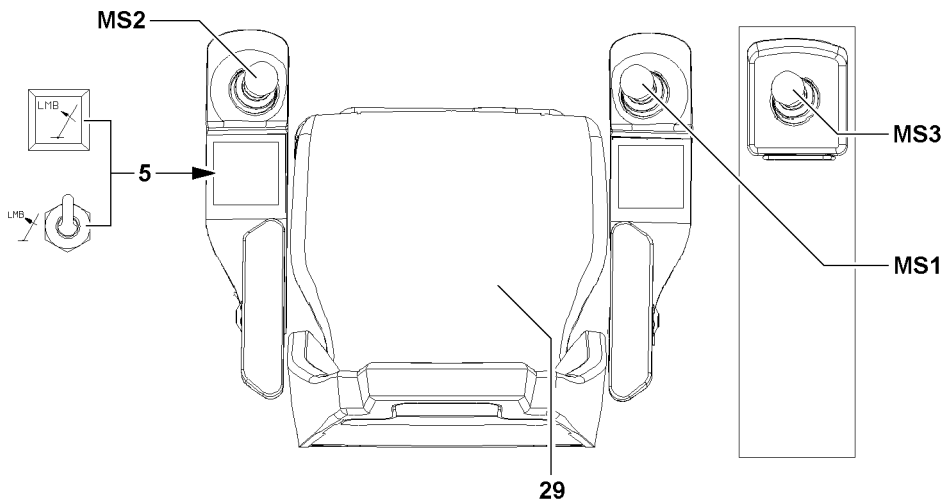
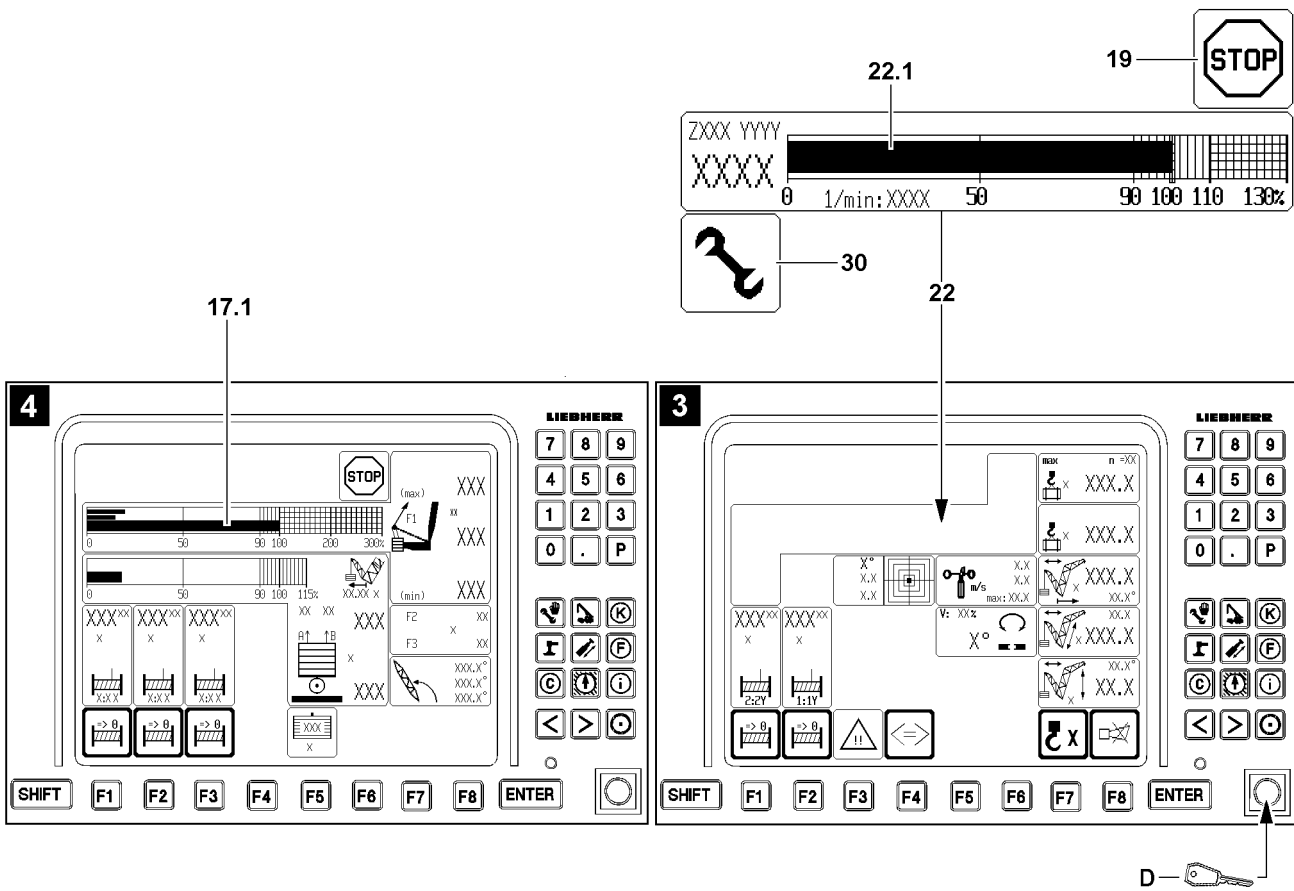


Fig.112336

3.4.2 Exceedance of the maximum permissible load moment

If the maximum permissible load torque is exceeded, the LICCON overload protection turns off all crane movements that increase load torque.

In the icon **22** (load moment display) the utilization bar **22.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**.

This shut off can be exceeded by the set up key **D** in the „right touching“ position.



WARNING

Shut off safety device!

If the function „Exceedance of shut off limits of LICCON overload protection“ is activated by actuating the set up key **D** then it is possible to exceed the maximum permissible load moment. The function „Exceedance of maximum value test point 1“ is automatically activated too. Thus there is no shut off when exceeding the maximum value test point 1.

- ▶ All notes regarding the function „Exceedance of shut off limits of LICCON overload protection“ must be observed.
- ▶ The utilization bar $F1_{\text{actual}}$ **17.1** of the F1 load display must be observed.



Note

- ▶ In emergency situations, the function „Exceedance of shut off limits of the LICCON overload protection“ can be activated with the set up key **D** and the maximum permissible load moment of 100 % can be exceeded.

The set up key **D** on the LICCON monitor has two positions:

- Operating position (not actuated): Crane is in normal operation
- Position to right (touching): The function „Exceedance of shut off limits of the LICCON overload protection“ is activated, the assembly icon **30** appears in the LICCON monitor.

Make sure that the following prerequisites are met:

- With the button **5** „Luffing in with suspended load“ no normal operating status (utilization below 100 % and no active shut off) can be reached.
 - All master switches (MS1, MS2, MS3) are in zero position (not deflected).
 - Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
 - Radio operation* is not active.
- ▶ Turn the set up key **D** to the right (touching).

Result:

- The LICCON overload protection is inactive.
- The assembly icon **30** appears in the LICCON monitor.

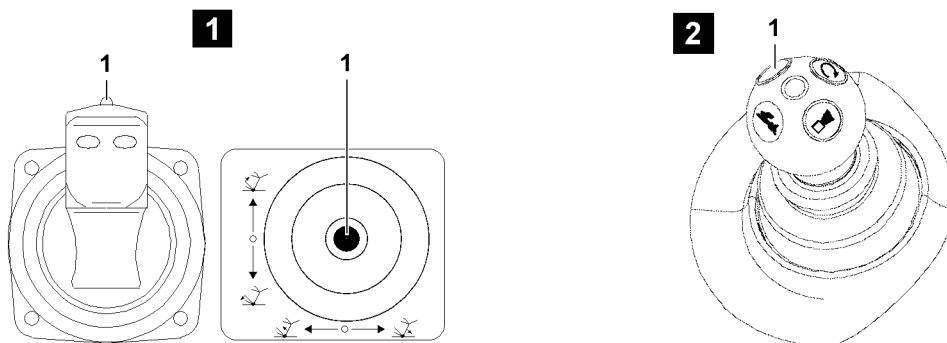
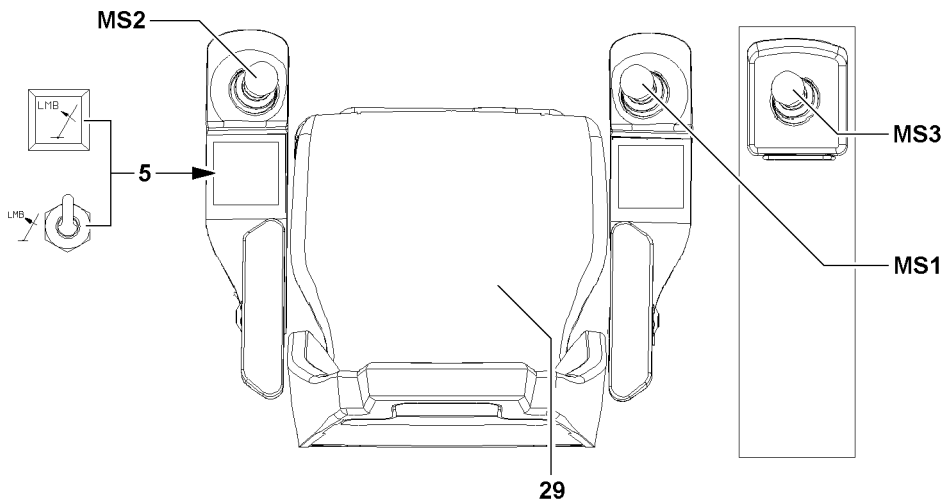
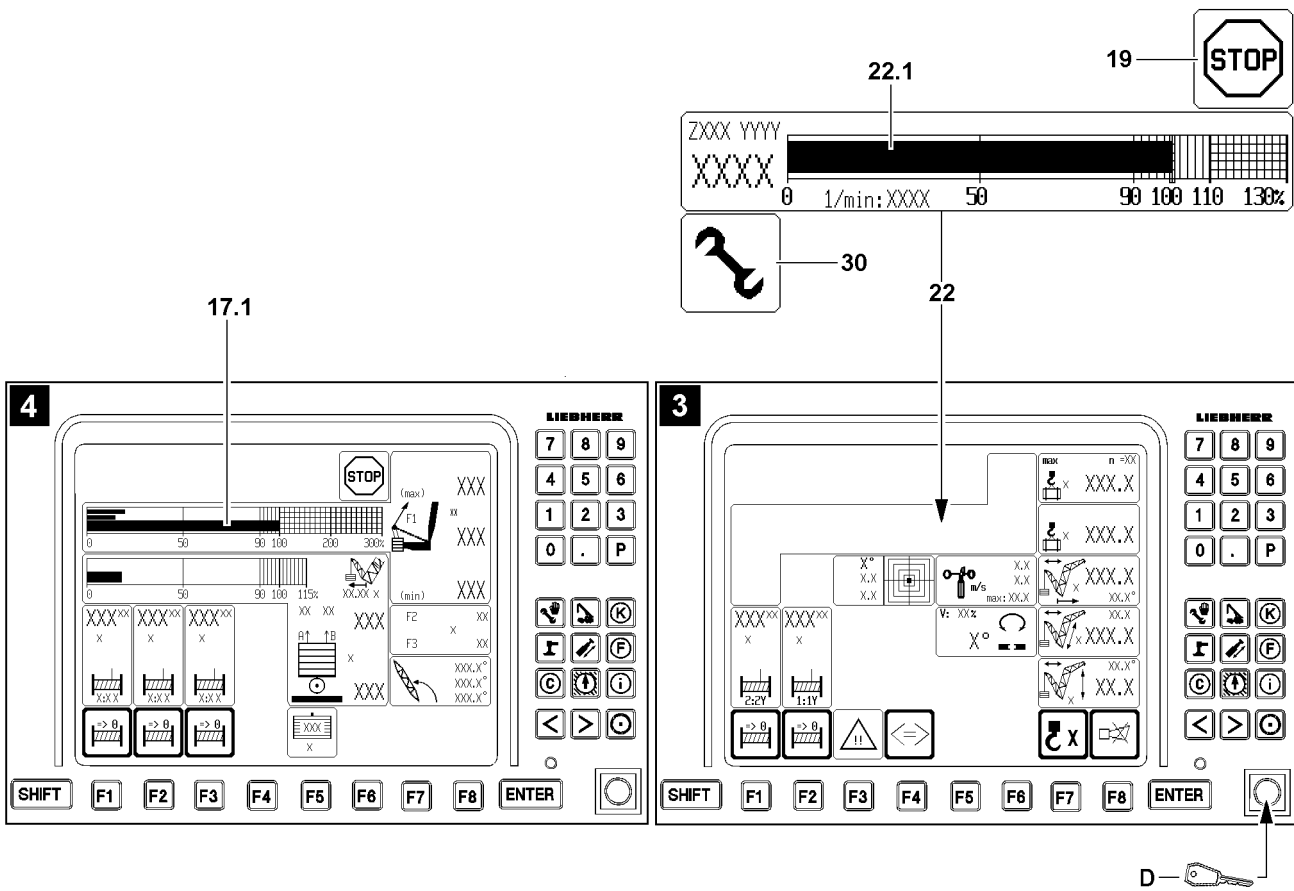


Fig.112336

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- ▶ Initiate crane movements which directly lead to a normal operating status (utilization below 100 % and no active shut off).

Result:

- If a crane reaches a normal operation status (utilization below 100 % and no active shut off), then the function „Exceedance of shut off limits of the LICCON overload protection“ shuts off, the assembly icon **30** and icon **19** in the LICCON monitor turn off.

In addition, the function „Exceedance of shut off limits of LICCON overload protection“ turns off immediately:

- If the set up key **D** is actuated again.
- If all master switches (MS1, MS2, MS3) are in neutral position for 10 seconds (with load chart available).
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- If radio operation* is activated.
- At engine stop.
- At hoist top shut off.
- When leaving the angle range of the load chart.



Note

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only turned off when the assembly icon **30** in the LICCON monitor turns off.
- ▶ If the function „Exceedance of shut off limits of the LICCON overload protection“ does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

The function „Exceedance of shut off limits of the LICCON overload protection“ has / was shut off:

- The assembly icon **30** in the LICCON monitor turns off.
- ▶ Make sure that the assembly icon **30** does no longer appear in the LICCON monitor.
- ▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

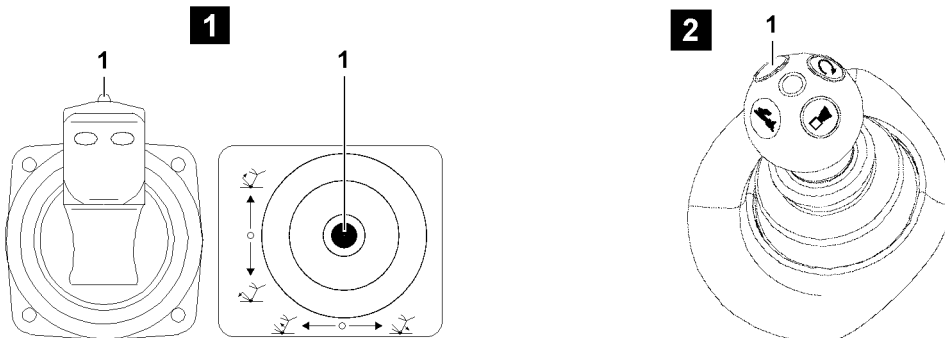
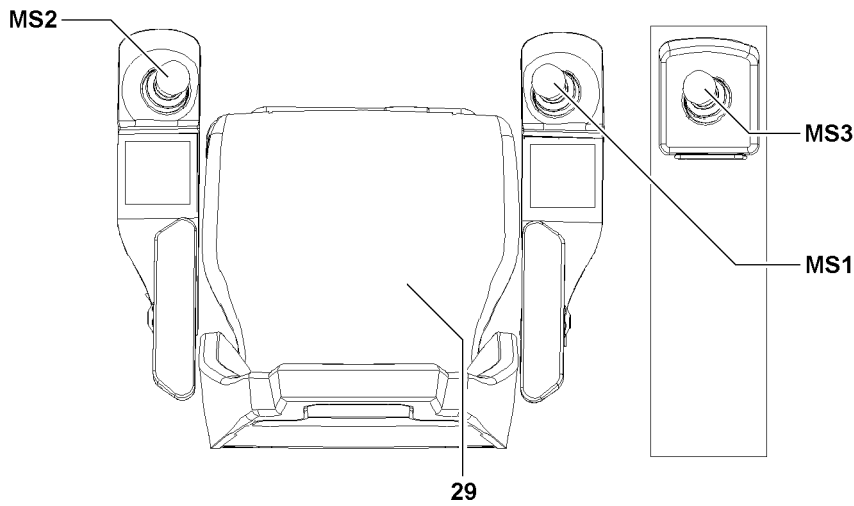
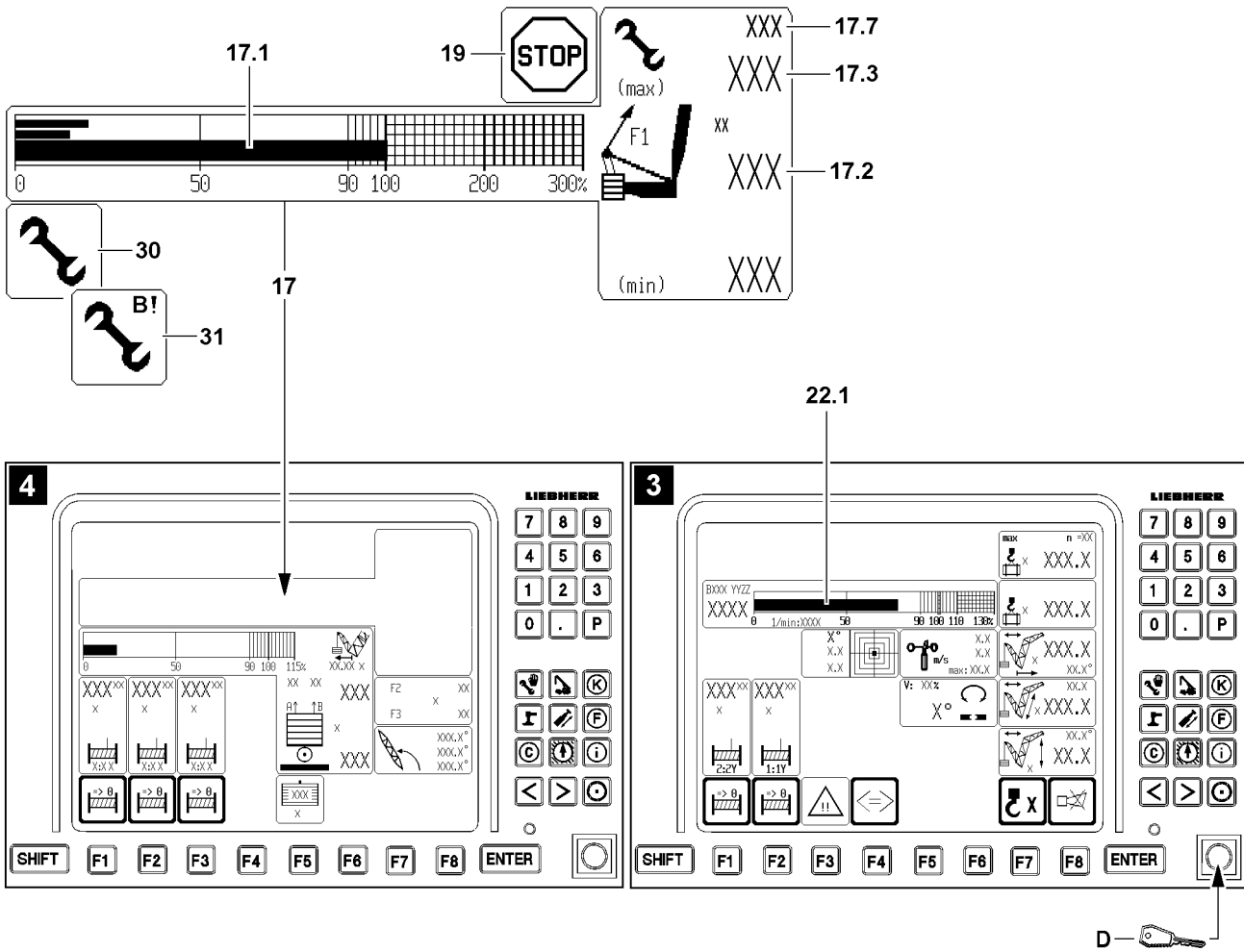


Fig.112337

LWE/LR 11350-007/19005-01-02/en

3.4.3 Exceedance of maximum value test point 1 (force F1) in crane operation



WARNING

Leaving the load chart with load on hook!

If, by actuating the set up key **D**, the shut off is bypassed by value $F1_{\text{max-operation}}$ **17.3** and exceeded by more than 110 %, then the crane is in assembly operation, the assembly icon **31** appears in the LICCON monitor.

There is no load chart available any longer and various display values may not be shown any longer in the crane operating screen.

The load on the hook is no longer monitored by the load chart.

Severe accidents due to crane overload can result.

Personnel can be severely injured or killed.

▶ In assembly operation, the data in the erection / take down charts is binding.



WARNING

Shut off safety device!

If, by actuating the set up key **D**, the function „Exceedance of maximum value test point 1“ is activated, then the function „Exceedance of shut off limits of LICCON overload protection“ is also activated automatically. Thus there is no shut off if the maximum permissible load moment is exceeded.

▶ All notes regarding the function „Exceedance of shut off limits of LICCON overload protection“ must be observed.

▶ The utilization bar **22.1** of the load moment display must be observed.



Note

▶ The force determined on test point 1 is generally described as $F1_{\text{actual}}$ (actual value F1).

▶ In the icon **17** (F1-load display), the force relationship as well as the number values are shown in number values as well as a bar display (called F1-bar display).

▶ The value $F1_{\text{max-operation}}$ **17.3** corresponds to 100 % in the F1-bar display.

▶ The F1-utilization bar **17.1** shows the relationship $F1_{\text{actual}}$ **17.2** to $F1_{\text{max-operation}}$ **17.3**.

▶ In crane operation without derrick ballast, fewer values may be shown in the icon **17** (F1-load display).

▶ If the actual load is **larger** than the permissible hook block weight according to the erection / take down charts, then it can be exceeded up to maximum 110 % of $F1_{\text{max-operation}}$ **17.3**.

▶ If the actual load is **smaller** than the permissible hook block weight according to the erection / take down charts, then the assembly operation becomes active above 110 % of $F1_{\text{max-operation}}$ **17.3**. In assembly operation, there is no load chart available.

▶ The value $F1_{\text{max-assembly}}$ **17.7** appears in crane operation when 90 % of its nominal value is exceeded.

In the icon **17**(F1 load display) the utilization bar $F1_{\text{actual}}$ **17.1** exceeds the 100 % mark and the LICCON overload protection has shut off the crane movement. The value $F1_{\text{actual}}$ **17.2** has exceeded the value $F1_{\text{max-operation}}$ **17.3**.

All further movements, which lead to an increase of the force (value $F1_{\text{actual}}$) are shut off.

In the LICCON monitor with the derrick operating screen (illustration **4**) appears the icon **19**.

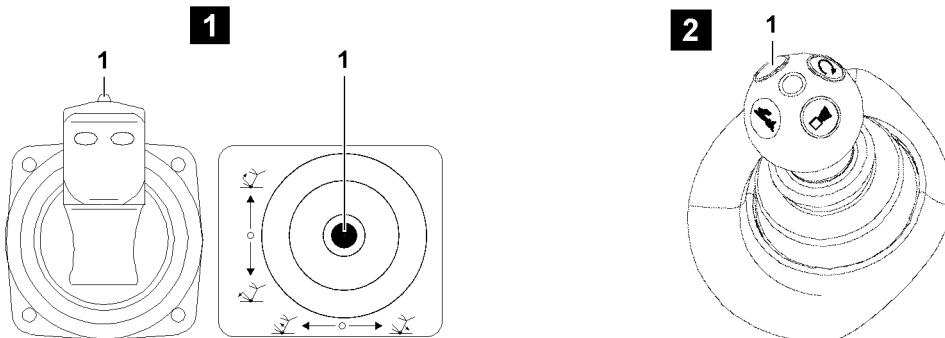
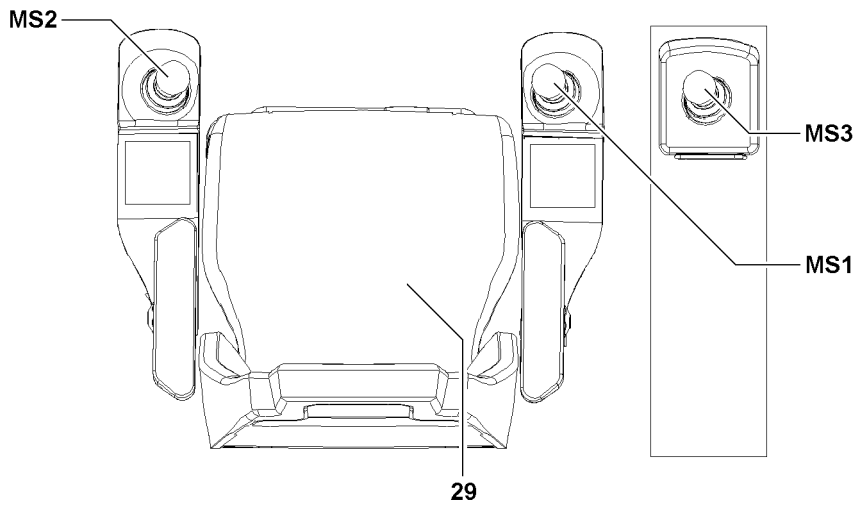
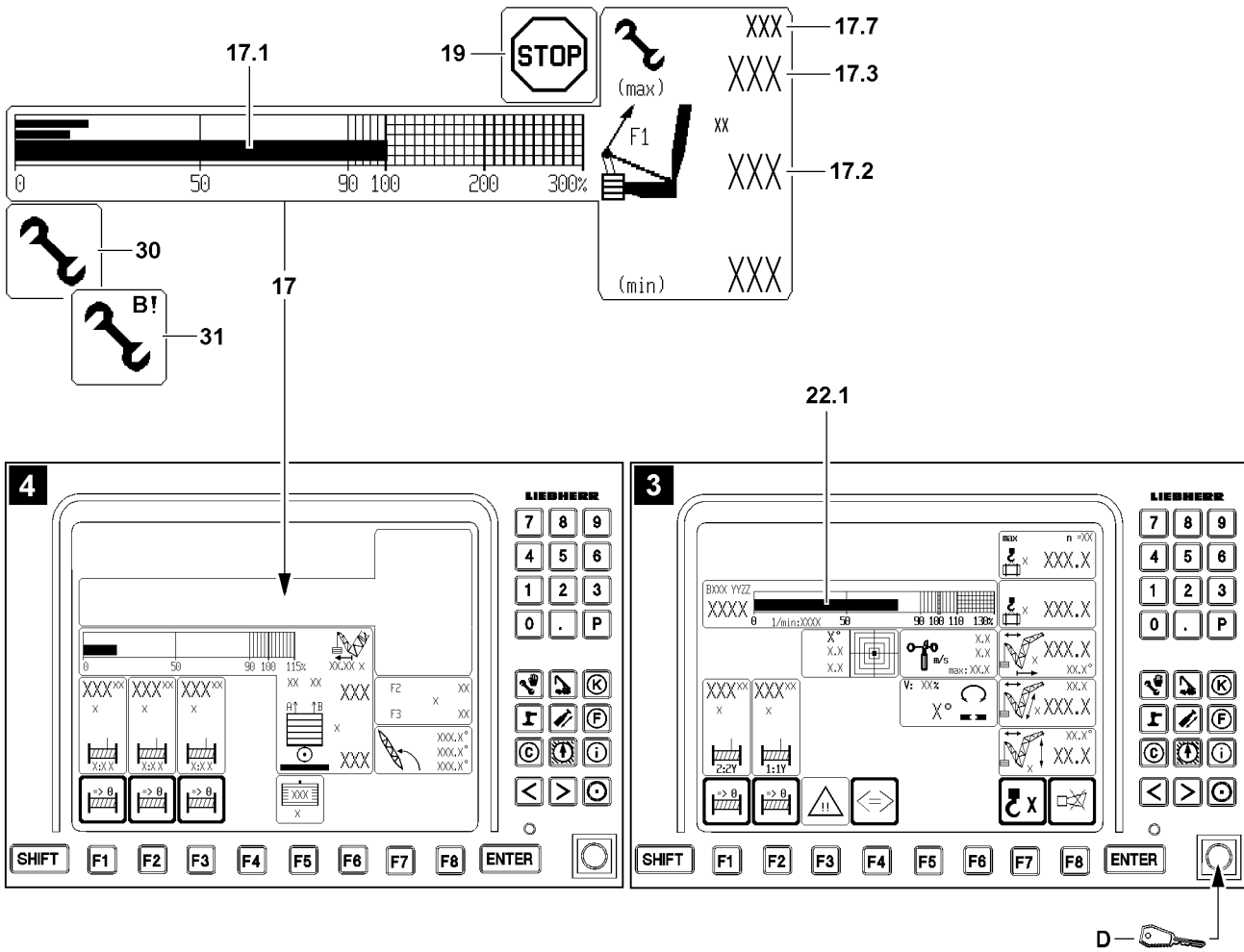


Fig.112337

LWE/LR 11350-007/19005-01-02/en

Make sure that the following prerequisites are met:

- All master switches (MS1, MS2, MS3) are in zero position (not deflected).
 - Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
 - Radio operation* is not active.
 - The F1 load display 110 % has not been reached and a load chart is available.
- ▶ Turn the set up key **D** to the right (touching).

Result:

- The function „Exceedance of maximum value test point 1“ is activated in connection with the function „Exceedance of the shut off limits of the LICCON overload protection“.
- $F1_{\text{max-operation}}$ **17.3** can be exceeded.

The function „Exceedance of shut off limits of the LICCON overload protection“ in connection with the function „Exceedance of the maximum value test point 1“ also shuts off immediately:

- If the set up key **D** is actuated again.
- If all master switches (MS1, MS2, MS3) are in neutral position for 10 seconds (with load chart available).
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- If radio operation* is activated.
- At engine stop.
- At hoist top shut off.



Note

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only turned off when the assembly icon **30** in the LICCON monitor turns off.
- ▶ If the function „Exceedance of shut off limits of the LICCON overload protection“ does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

The function „Exceedance of shut off limits of the LICCON overload protection“ has / was shut off:

- The assembly icon **30** in the LICCON monitor turns off.
 - The working speed is reduced until all master switches (MS1, MS2, MS3) are in zero position at the same time.
- ▶ Make sure that the assembly icon **30** does no longer appear in the LICCON monitor.
- ▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

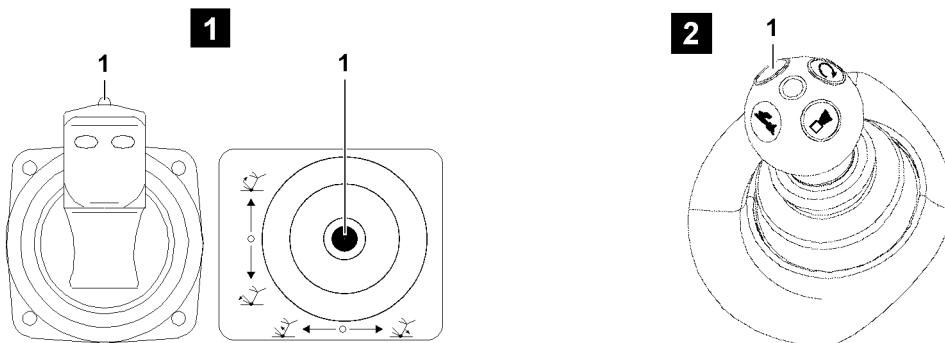
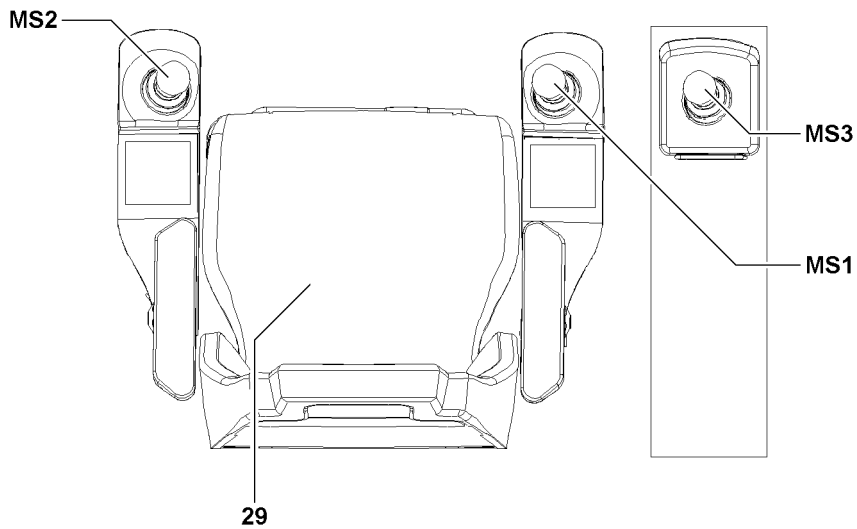
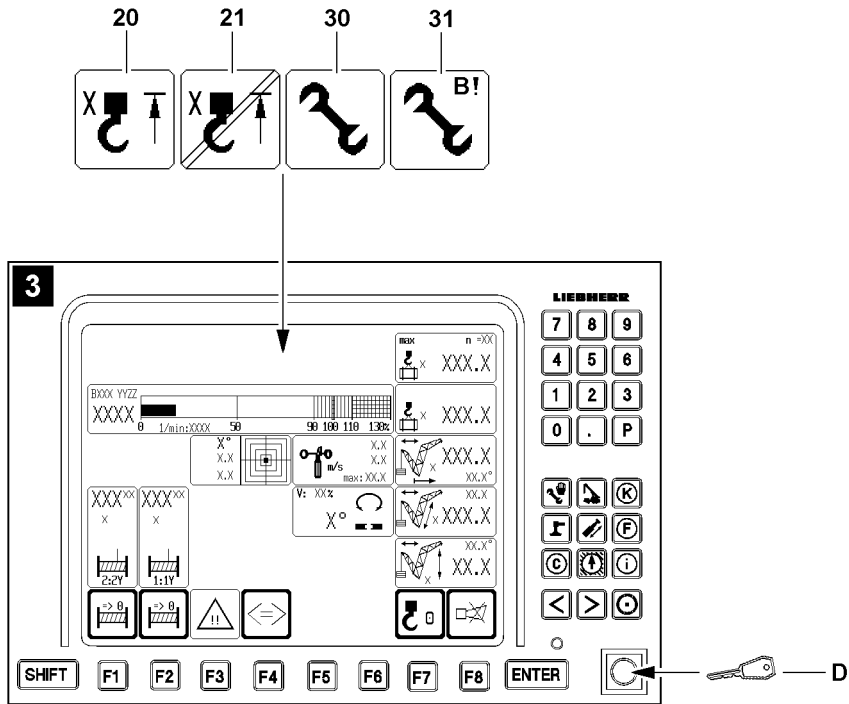


Fig.111230

LWE/LR 11350-007/19005-01-02/en

3.5 Bypass of the hoist top shut off



WARNING

Improper use of the function „Bypass of hoist top shut off“!

- ▶ The function „Bypass of hoist top shut off“ may never be used to increase the lifting height during crane operation.



WARNING

Property damage and falling load!

If the function „Bypass of hoist top shut off“ is activated, there is the danger that the hook block or the load hook is pulled against the pulley head.

This danger exists especially when the hoist winch is continued to be spooled up and for crane movements which have an influence on the hoist rope, for example luffing the boom, the auxiliary boom / accessory or the derrick boom.

Property damage and falling load can result.

Personnel can be severely injured or killed.

- ▶ The function „Bypass of hoist top shut off“ may only be carried out by an authorized person, along with a guide. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block / load hook and the boom head.
- ▶ Carry out all crane movements with utmost caution.



Note

- ▶ The activation of the function „Bypass of hoist top shut off“ is only possible if the hoist limit switch was touched and the hoist top shut off has occurred.
- ▶ If the hoist limit switch is triggered when the set up key **D** is actuated (function „Exceedance of shut off limits of the LICCON overload protection“ is active, the assembly icon **30** or the assembly icon **31** appear), then a hoist top shut off occurs and the function „Exceedance of shut off limits of the LICCON overload protection“ is deactivated.
- ▶ For assembly purposes or in emergency cases, if the activation of the function „Bypass of hoist top shut off“ **and** activation of the function „Exceedance of shut off limits of the LICCON overload protection“ is necessary, then the set up key **D** must be actuated until the icon **21** and assembly icon **30** or assembly icon **31** (assembly operation) appear.

Make sure that the following prerequisites are met:

- A hoist top shut off has occurred, the hoist top icon **20** appears in the LICCON monitor.
- Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- All master switches (MS1, MS2, MS3) are in zero position (not deflected).
- The radio operation* is not active.

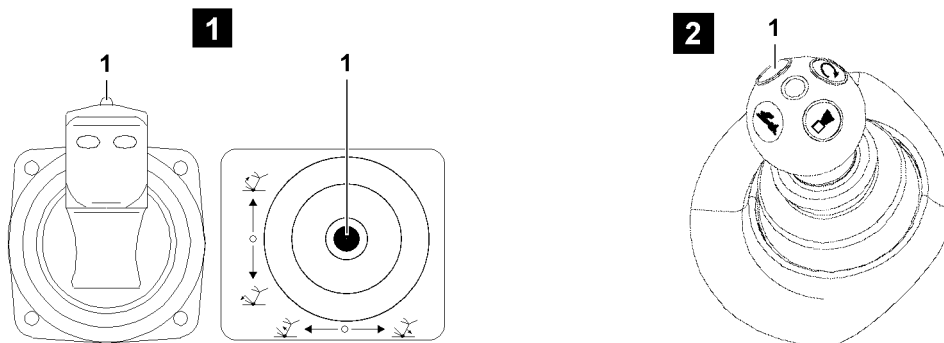
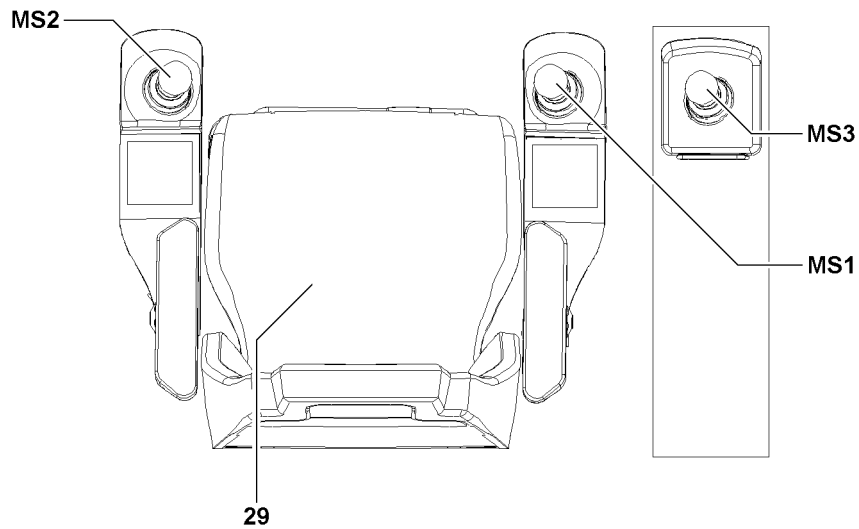
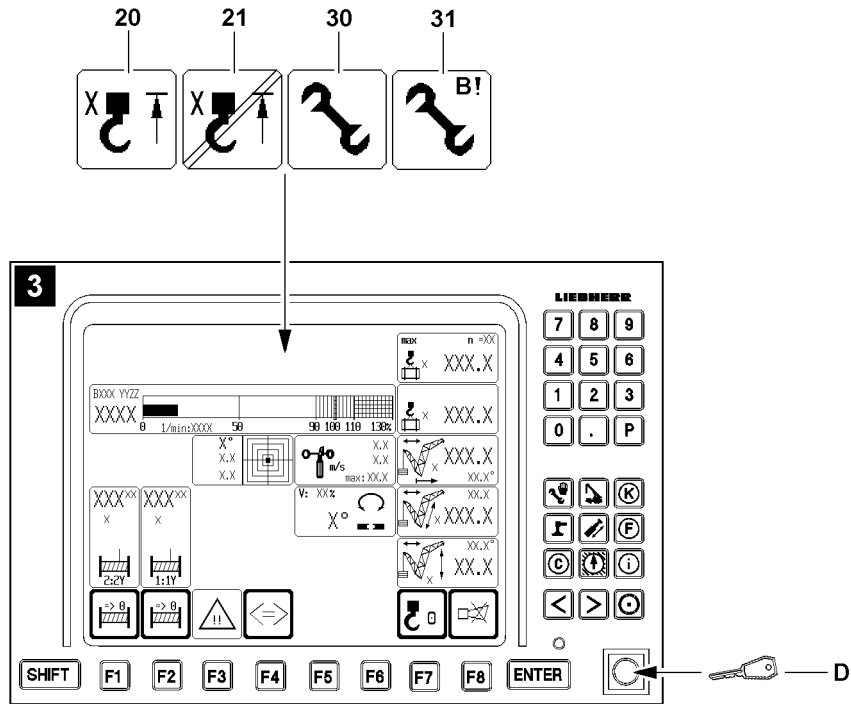


Fig.111230

LWE/LR 11350-007/19005-01-02/en

- ▶ Turn the set up key **D** to the right (touching).

Result:

- The assembly icon **30** or the assembly icon **31** (assembly operation) appear in the LICCON monitor.
 - The hoist top icon **20** in the LICCON monitor changes to the icon **21**.
 - All hoist limit switches are bypassed.
- ▶ Carry out a crane movement with bypassed hoist limit switches with utmost caution and by taking the safety guidelines into account.

The function „Bypass of the hoist top shut off“ turns off:

- If the set up key **D** is actuated again.
- When no master switch (MS1, MS2, MS3) was deflected for 10 seconds.
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- If there is no longer a shut off of a hoist limit switch.
- If the radio operation* is active.
- At engine stop.

The function „Bypass of the hoist top shut off“ has / was turned off:

- The assembly icon **30** or the assembly icon **31** (assembly operation) in the LICCON monitor turn off.
 - The icon **21** on the LICCON monitor turns off.
- ▶ Make sure that the assembly icon **30** or the assembly icon **31** (assembly operation) as well as the icon **21** no longer appear in the LICCON monitor.
 - ▶ Carry out the crane movements in such a way that no repeated hoist top shut off occurs.

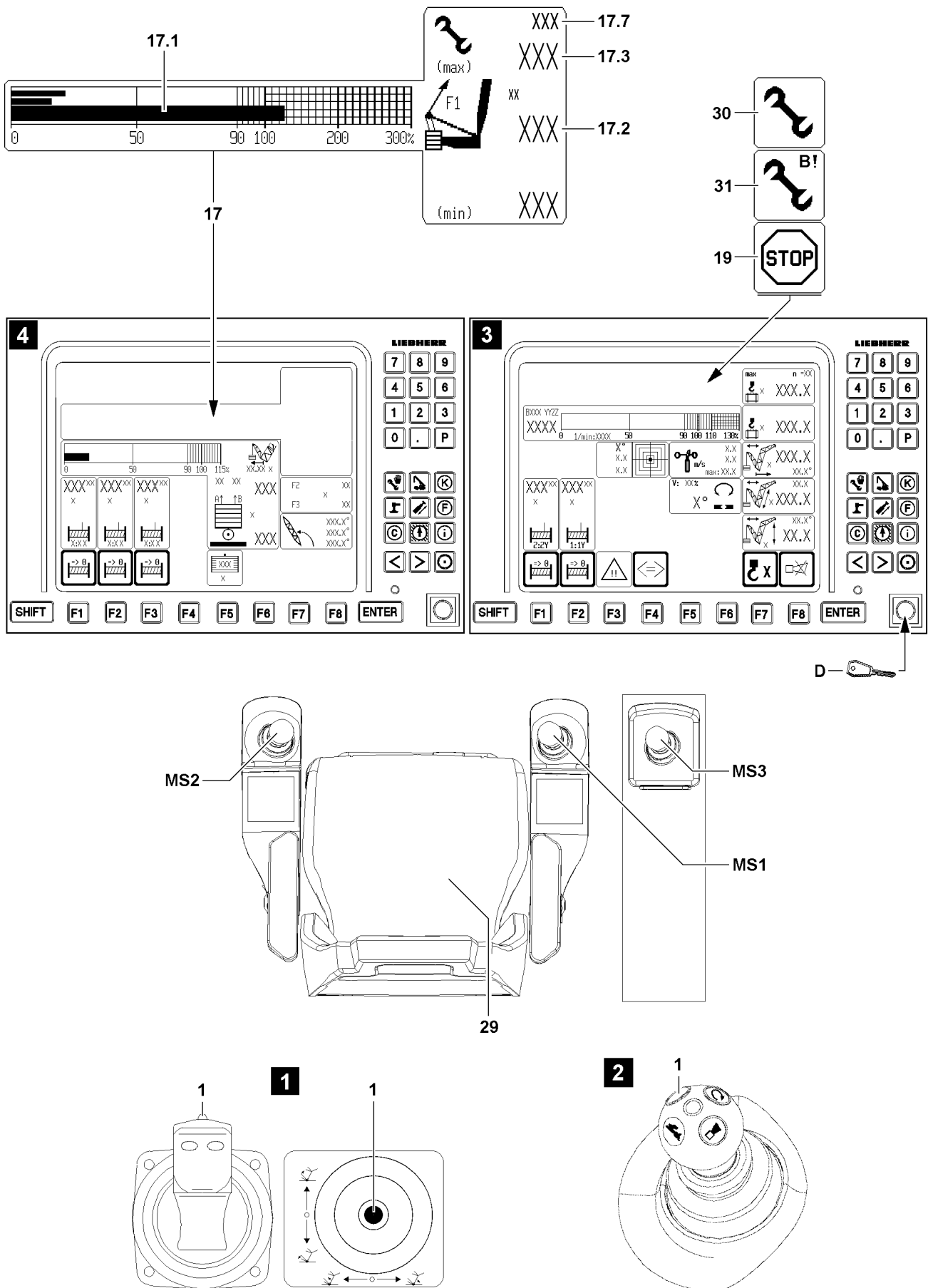


Fig.112343

LWE/LR 11350-007/19005-01-02/en

3.6 Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures (assembly operation)



Note

- ▶ If the crane is in the range „No load chart available“ then there is a shut off of the crane control by the LICCON overload protection. The icon **19** appears in the LICCON monitor.
- ▶ By an actuated set up key **D**, the function „Exceedance of shut off limits of the LICCON overload protection“ can be activated, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available.



WARNING

Danger of accident during erection / take down procedures!

If the erection / take down charts are not observed, the crane could collapse, the boom can break off or the crane can topple over.

Personnel can be severely injured or killed.

- ▶ The erection / take down charts must be observed.
- ▶ Press the set up key **D** only when the configuration status has been entered correctly in the LICCON computer system and matches the actual situation.



Note

- ▶ The force determined on test point 1 is generally described as $F1_{\text{actual}}$ (actual value F1).
- ▶ In the icon **17** (F1-load display), the force relationship as well as the number values are shown in number values as well as a bar display (called F1-bar display).
- ▶ The value $F1_{\text{max-operation}}$ **17.3** corresponds to 100 % in the F1-bar display.
- ▶ The F1-utilization bar **17.1** shows the relationship $F1_{\text{actual}}$ **17.2** to $F1_{\text{max-operation}}$ **17.3**.
- ▶ In crane operation without derrick ballast, fewer values may be shown in the icon **17** (F1-load display).
- ▶ If a load chart is available, then the value $F1_{\text{max-operation}}$ **17.3** is valid as the limit value for a shut off of crane operation.
- ▶ When leaving the area „load chart available“, the assembly icon **30** turns off and the assembly icon **31** appears.
- ▶ When leaving the area „Load chart available“ then $F1_{\text{max-assembly}}$ **17.7** is valid as the upper limit value.
- ▶ $F1_{\text{max-assembly}}$ **17.7** might only appear when 90 % of its nominal value is exceeded.

3.6.1 Carrying out erection procedures (assembly operation)

Make sure that the following prerequisites are met:

- All master switches (MS1, MS2, MS3) are in zero position (not deflected).
- Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- Radio operation* is not active.
- The set up configuration corresponds to the erection / take down charts.
- The set up status has been entered correctly into the LICCON computer system.

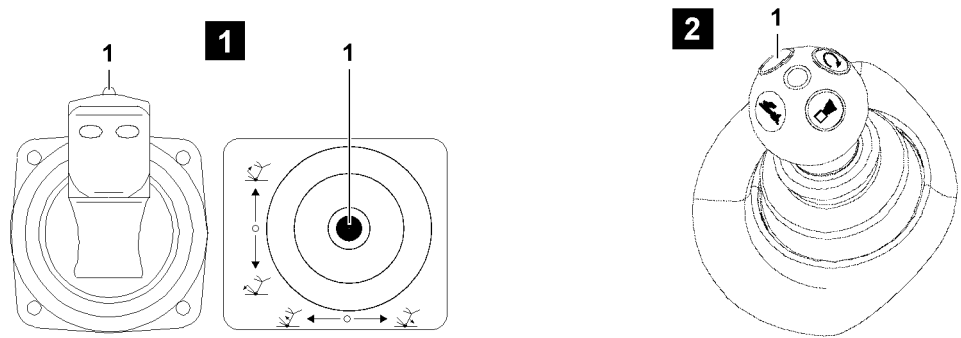
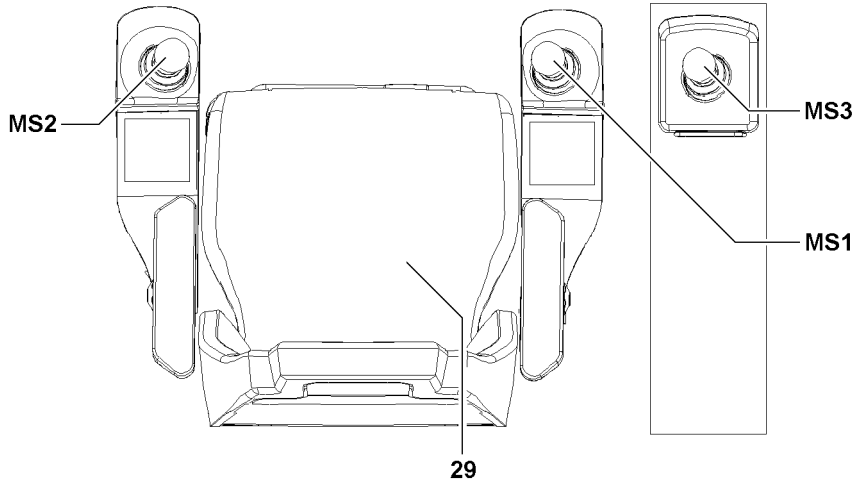
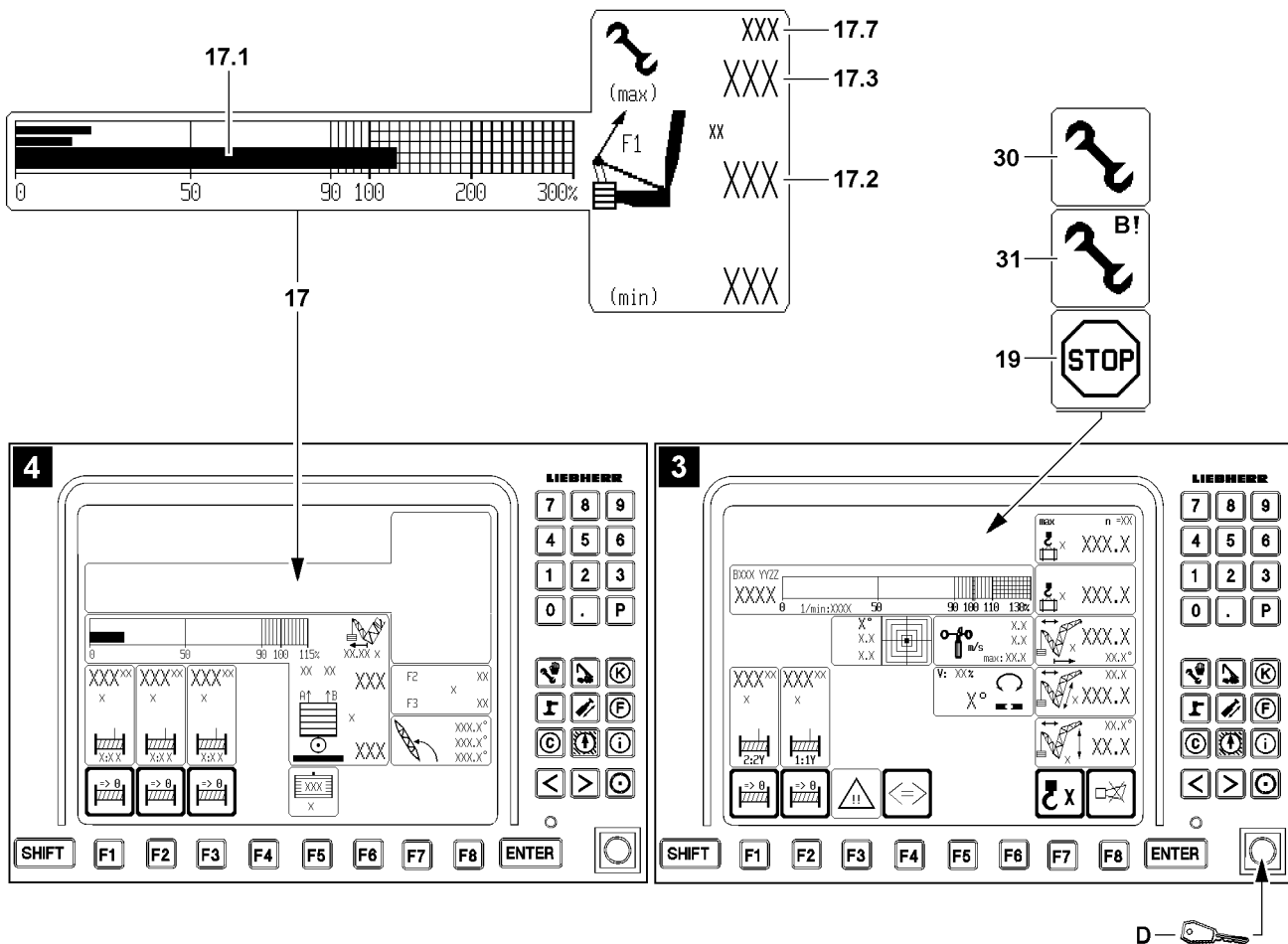


Fig.112343

LWE/LR 11350-007/19005-01-02/en

- ▶ Turn the set up key **D** to the right (touching).

Result:

- The assembly icon **31** appears in the area „No load chart available“.
- The erection / take down procedures can be carried out.
- ▶ Watch the icon **17** (F1-load display), the value $F1_{\text{actual}}$ **17.2** may not exceed the value $F1_{\text{max-assembly}}$ **17.7**.

Problem remedy

The erection / take down procedure cannot be carried out due to shut off „ $F1_{\text{max-assembly}}$ **17.7** exceeded“?

- ▶ See section „Danger of exceeding $F1_{\text{max-assembly}}$ “.
-

Problem remedy

The function „Exceedance of shut off limits of the LICCON overload protection“ can not be activated during erection / take down procedures?

- ▶ Check the error messages.
 - ▶ Check the electrical connections.
 - ▶ Check if all sensors or dummy plugs with integrated electric have been connected properly.
-

The function „Exceedance of shut off limits of the LICCON overload protection“ turns off:

- If the set up key **D** is actuated again.
- When an range with existing load chart is reached (erection procedure).
- If all master switches (MS1, MS2, MS3) are in neutral position for 10 seconds (with „Load chart available“).
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- At engine stop.

The function „Exceedance of shut off limits of the LICCON overload protection“ has / was shut off:

- The assembly icon **30** or the assembly icon **31** in the LICCON monitor turns off.
- ▶ After completion of the erection / take down procedures, make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.

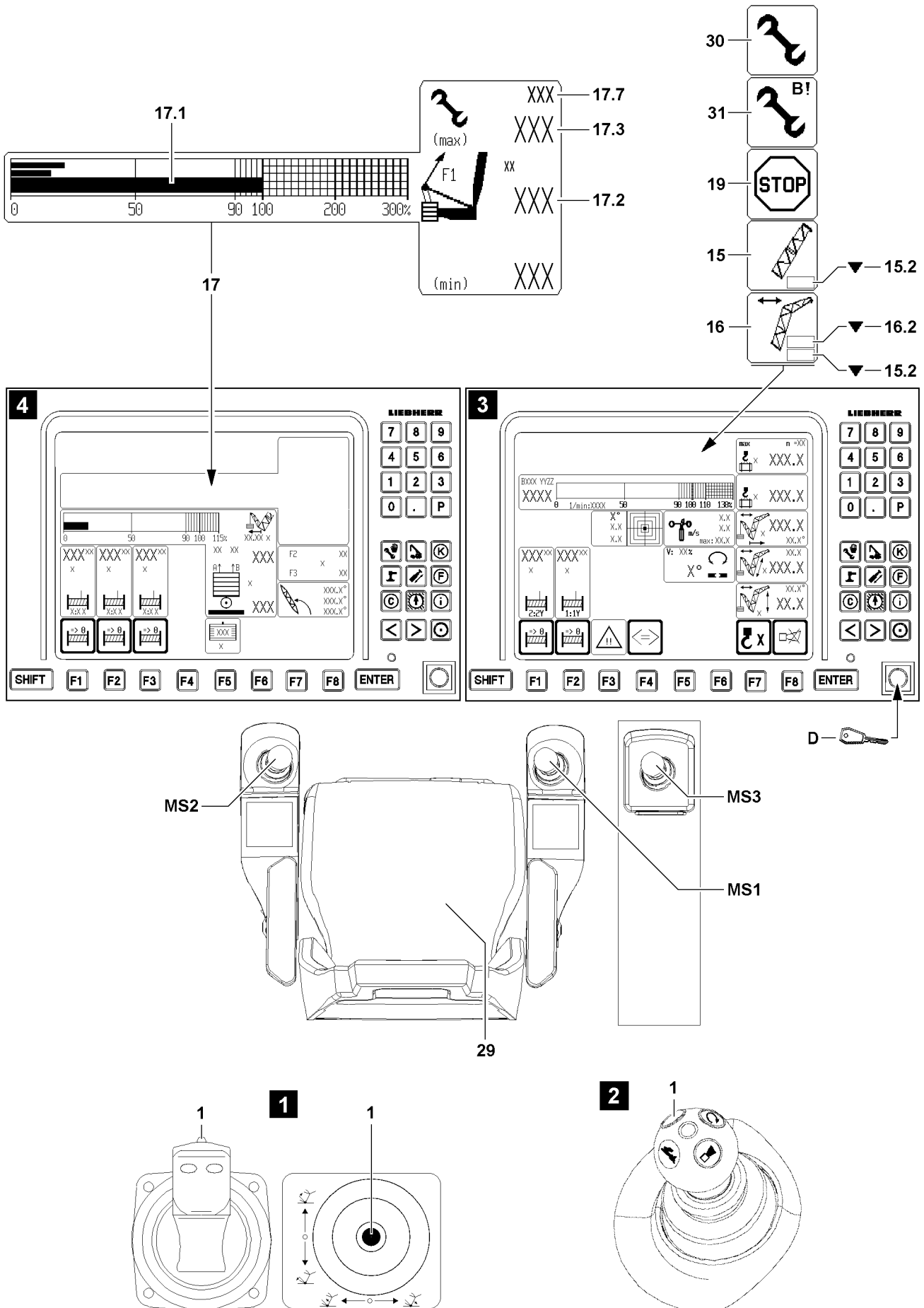


Fig.112341

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3.6.2 Carrying out take down procedures (assembly operation)



WARNING

Increased danger of accidents due to bypass of shut off of luffing the main boom / auxiliary boom / accessory down!

When the shut off luffing the main boom / auxiliary boom / accessory down is bypassed, then the LICCON overload protection as a whole is deactivated or limited.

When the shut off luffing the main boom / auxiliary boom / accessory down is bypassed and the main boom and / or the auxiliary boom / accessory is further luffed down, then there is no load chart available any longer.

Crane operation with bypassed shut off luffing the main boom / auxiliary boom / accessory down is prohibited, since severe accidents can result.

Personnel can be severely injured or killed.

- ▶ Activate the bypass of the shut off luffing the main boom / auxiliary boom / accessory down only in emergency cases or for erection / take down procedures with erection / take down charts.
- ▶ Carry out all crane movements with utmost caution.

Make sure that the following prerequisites are met:

- In symbol **15** or symbol **16** appear symbol **15.2** or symbol **16.2** and the LICCON overload protection has shut off the crane movement.
- Either the seat contact button **29** or one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- All master switches (MS1, MS2, MS3) are in zero position (not deflected).
- The radio operation* is not active.

- ▶ Turn the set up key **D** to the right (touching).

Result:

- The assembly icon **30** appears in the LICCON monitor.
- The function „Exceedance of shut off limits of the LICCON overload protection“ is activated and has bypassed the shut off luffing the main boom / auxiliary boom / accessory down.



Note

- ▶ If a load chart is available, then the value $F1_{\text{max operation}}$ **17.3** is valid as the limit value for a shut off of crane operation.
- ▶ When leaving the area „load chart available“, the assembly icon **30** turns off and the assembly icon **31** appears.
- ▶ When leaving the area „Load chart available“ then $F1_{\text{max assembly}}$ **17.7** is valid as the upper limit value.
- ▶ If no derrick boom is installed, then the icon **17** only shows $F1_{\text{actual}}$ **17.1** and $F1_{\text{max-assembly}}$ **17.7**. $F1_{\text{max-assembly}}$ **17.7** might only appear when 90 % of its nominal value is exceeded.

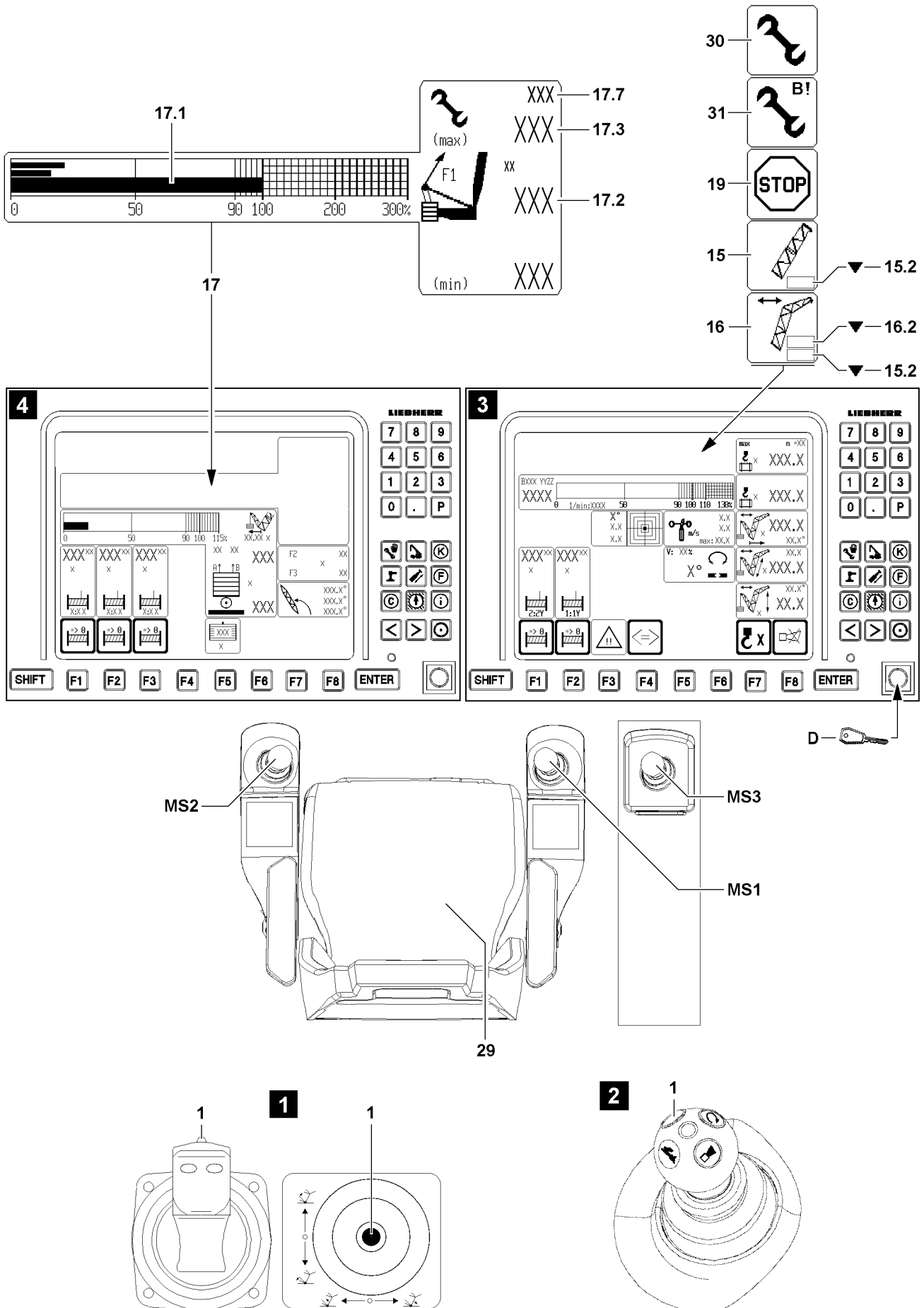


Fig.112341

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**DANGER**

The crane can topple over!

There is **no** shut off of the luff down movement after reaching the limit value $F1_{\text{max assembly}}$ **17.7**.

If the warnings by the LICCON overload protection are ignored, then the crane will be overloaded or topples over.

Personnel can be severely injured or killed.

- ▶ The symbol **17** (F1-load display) must be watched permanently. It must be ensured that the value $F1_{\text{actual}}$ **17.2** is smaller than the value $F1_{\text{max assembly}}$ **17.7**.
- ▶ The luff down movement must be stopped before the value $F1_{\text{actual}}$ **17.2** exceeds the limit value $F1_{\text{max assembly}}$ **17.7**.

- ▶ During the take down procedure watch the icon **17** (F1-load display).

Problem remedy

The take down procedure cannot be carried out due to danger of exceeding the $F1_{\text{max assembly}}$ **17.7**?

- ▶ See section „Danger of exceeding $F1_{\text{max assembly}}$ “.

The bypass of the shut off luffing the main boom / auxiliary boom / accessory down turns off:

- If the set up key **D** is actuated again.
- When neither the seat contact button **29** nor one of the buttons **1** of the master switches (MS1, MS2, MS3) is actuated.
- When an area with existing load chart is reached.
- If the radio operation* is active.
- At engine stop.

The bypass of the shut off luffing the main boom / auxiliary boom / accessory down has / was turned off:

- The assembly icon **31** or the assembly icon **30** in the LICCON monitor turns off.
- ▶ Make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.

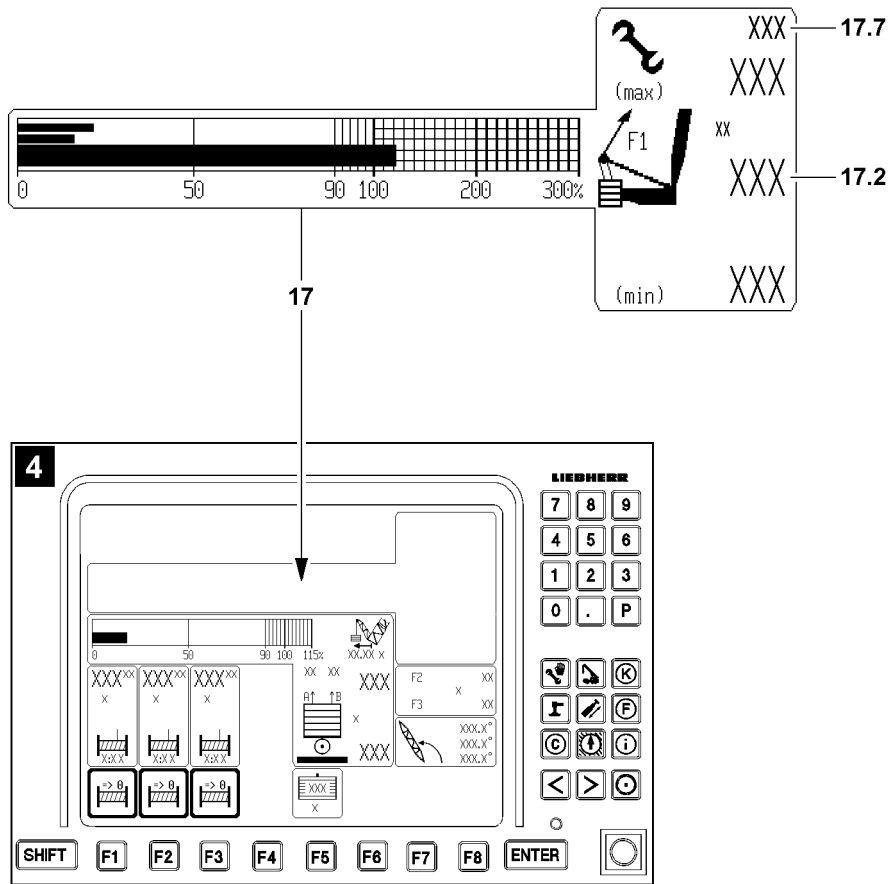


Fig.112344

3.6.3 Danger of exceeding $F1_{\text{max assembly}}$



Note

- ▶ $F1_{\text{max-assembly}}$ **17.7** might only appear when 90 % of its nominal value is exceeded.



DANGER

The crane can topple over!

There is **no** shut off of the luff down movement after reaching the limit value $F1_{\text{max assembly}}$ **17.7**.

If the warnings by the LICCON overload protection are ignored, then the crane will be overloaded or topples over.

Personnel can be severely injured or killed.

- ▶ The luff down movement must be stopped before the value $F1_{\text{actual}}$ **17.2** exceeds the limit value $F1_{\text{max assembly}}$ **17.7**.

In the icon **17** (F1-load display), the value $F1_{\text{actual}}$ **17.2** has reached the upper limit value $F1_{\text{max-assembly}}$ **17.7**.

- ▶ Check if a crane movement, which can lower the force $F1$ (value $F1_{\text{actual}}$ **17.2**) can be initiated, for example setting down the hook block / load hook.
- ▶ Check if the correct set up configuration has been entered on the LICCON computer system.
- ▶ Check if the actual set up configuration matches the entered set up configuration.
- ▶ Check if the correct hook block weight has been entered.
- ▶ Check if the respective hook block / load hook is installed.
- ▶ Check if all attachment parts and guy rods on the boom system, which are not needed, have been removed.
- ▶ Check if environmental influences (wind, snow or ice) on the crane are not too great.



Note

- ▶ Hook block weight entry and correction of weighing errors, see Crane operating instructions, chapter 4.02.

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5 Equipment

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5.01 Technical safety instructions for assembly and disassembly

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1 Equipment

1.1 Checking the steel structures

All components part of the crane scope of delivery must be checked regularly together with the crane.

If equipment or components are assembled that are part of the delivery scope of another crane: Prior to first time use, check load bearing crane structures, especially steel structures, see chapter 8.01.

1.2 Checking the labeling



WARNING

Labeling **not** legible or **not** present!

Components, especially guy rods, can be mixed up.

Death, severe bodily injuries, property damage.

- ▶ Do **not** continue to use the components, especially the guy rods.

2 Rope pulleys



WARNING

Danger of crushing due to rotating rope pulleys!

Arms and legs can be caught and crushed or severed between the rope pulley and the rope due to rotating rope pulleys.

- ▶ It is prohibited to touch the ropes or rope pulleys during operation.
- ▶ Adhere to the safety distance to ropes and rotating rope pulleys.

3 Ropes



WARNING

Danger of accident!

- ▶ The ropes must be checked by an expert before assembly and checks must be performed at regular intervals in order to detect possible damage or wear and tear at an early stage. See chapter 8.04.

The ropes must be taken down immediately if any of the following damage is detected:

- Breakage of a strand
- Wire breaks
- Broken wire nests
- Reduction in the rope diameter by 10 % or more of the nominal size
- Rope deformations

3.1 Placing the hoist rope or the control rope

In order to guarantee safety and operating characteristics, only original Liebherr replacement parts or parts approved by Liebherr may be used.

NOTICE

Damage to the hoist rope or the control rope!

If a hoist rope or control rope is placed with worn rope pulleys, damage can occur.

- ▶ Before placing a rope, check the rope pulleys. See chapter 8.01.
- ▶ Replace worn or damaged rope pulleys.

3.2 Minimum rope coils

NOTICE

If the following notes are not observed, the cam limit switch / winch speed sensor must be readjusted!

- ▶ When the hoist rope is spooled up, the end of the hoist rope must remain in front of the winch and may not be pulled over the winch.
- ▶ Pull the hoist rope end never under the winch by spooling the winch up.
- ▶ Pull the hoist rope never off from the „stationary“ winch.
- ▶ The winch speed sensor must also be readjusted, if it is determined during operation or when changing the hoist rope that the winch does not shut off when the minimum rope coils are reached.

3.2.1 Cranes with cam limit switch

The cam limit switch is adjusted at the factory that it turns off before the minimum rope coils are reached (three hoist rope coils on the winch).



WARNING

Danger of accident due to falling load!

If the following instructions are not observed, the hoist rope end attachment may be torn out, causing the load to topple.

- ▶ If a new hoist rope is used, the cam limit switch must be reset.
- ▶ The cam limit switch must be adjusted so that it turns off when only 3 hoist rope coils remain on the winch.

3.2.2 Cranes with winch speed sensor

The winch speed sensor is adjusted at the factory that it turns off before the minimum rope coils are reached (four hoist rope coils on the winch). If used properly, the winch turn sensor will not need readjustment.



WARNING

Danger of accident due to falling load!

If the following instructions are not observed, the hoist rope end attachment may be torn out, causing the load to topple.

- ▶ If a new hoist rope is placed, the winch speed sensor must be checked.
- ▶ The winch speed sensor must be set to turn off when only 4 hoist rope coils remain on the winch.

4 Fiber guy ropes



Note

- ▶ Depending on the crane type and equipment, the fiber guy ropes have different diameters and lengths as boom guying and as auxiliary guying.
- ▶ Fiber guy ropes are subjected to high loads and therefore must be checked regularly.



WARNING

Load can be ripped off!

Death, severe bodily injuries, property damage.

- ▶ The ropes must be checked by an expert before assembly and checks must be performed at regular intervals in order to detect possible damage or wear and tear at an early stage. See chapter 8.16.
- ▶ Notes regarding the proper transport of the fiber guy ropes, see chapter 2.04.

5 Control measures before crane operation



WARNING

The crane can topple over!

If the following control measures and the crane-specific additional controls are not carried out before crane operation or if they are not carried out sufficiently, then accidents can occur.

The crane can topple over, be overloaded or damaged.

Loose parts, aids or ice can fall down from the boom or the crane superstructure.

Death, severe bodily injuries, property damage.

- ▶ Crane operation with safety equipment that is **not** functioning correctly is strictly prohibited.
- ▶ Start crane operation only after all safety equipment have been checked and are functioning correctly.
- ▶ Start crane operation only if the overload protection has been set according to the data in the load chart.
- ▶ Start crane operation only if the crane is properly supported and horizontally aligned.
- ▶ Only start crane operation after making sure that there are not loose parts on the boom, crane superstructure or crane chassis.
- ▶ Only start crane operation after making sure that there is no snow, frost or ice on the boom.
- ▶ Only start crane operation after making sure that all specifications, crane conditions and / or properties that are checked and required during the extensive control measures and additional controls have also been completely fulfilled.



WARNING

Interruption of crane operation!

If the following specifications for interruption of crane operation are not observed, accidents can occur.

- ▶ If the crane operator leaves the crane cab even if for just a short time, the crane must be secured to prevent unauthorized access.
- ▶ Before starting to work again with the crane, the crane operator is obligated to check the operating mode settings and to reset them, if necessary.



Fig.113437: Control displays

Make sure that the following prerequisites are met:

- The overload protection is not bypassed.
- No assembly operation is activated.

5.1 General controls before crane operation

- Make sure that no visible damage is present on the crane.
- Make sure that there are no loose parts on the boom, crane chassis and crane superstructure.
- Make sure that all hoist and control ropes are free of snow, frost and ice.
- Make sure that the boom system is free of snow, frost and ice.
- Make sure that exposed rope pulleys are free of snow, frost and ice.
- Make sure that the cable / rope drums as well as the limit switches are free of snow and ice.
- Make sure that the cylinders are free of ice.
- Make sure that the gear ring of the slewing ring connection is clean and greased.
- Make sure that the air supply to the oil and water cooler is clear.
- Make sure that steps, ladders and platforms are in the correct position for crane operation.
- Make sure that all tool boxes, compartments, coverings, covers and cabinet doors are closed.
- Make sure that no persons or objects are within the danger zone of the crane.
- Make sure that the crane is standing on level, load bearing ground.
- Make sure that the crane is sufficiently supported depending on the load case and the ground conditions.

- Make sure that there is a sufficient safety distance to excavations and slopes.
- Make sure that no obstacles are within the working range of the crane, which obstruct the required crane movements.
- Make sure that the crane has sufficient distance to live power lines.
- Make sure that the LICCON overload protection is set according to the data in the load chart.
- Make sure that the overload protection is set according to the actual set up configuration of the crane.
- Make sure that the electrical connections, the connector plug, the pull release, the cables and the protective insulation function. Replace missing or defective parts.
- Make sure that the cable routings on the electrical connections are seated tightly. If necessary, tighten loose screw connections.
- Make sure that the existing safety equipment is functioning.
- Make sure that the overload protection is functioning.
- Make sure that the hoist limit switches are functioning.
- Make sure that the limit switch boom „steepest position“ is functioning.
- Make sure that the wind speed sensor easily moves and is functioning.

5.2 Additional controls for cranes with crane support

- Make sure that the folding / sliding beams are secured with pins to prevent them from sliding.
- Make sure that the support plates are secured in the operating position.
- Make sure that the crane is properly supported.
- Make sure that the crane is horizontally aligned.
- Make sure that the axle suspension is blocked (mobile crane).
- Make sure that the tires have no contact to the ground (mobile crane).
- Make sure that the track chains are secured to prevent them from sagging (crawler crane).

5.3 Additional controls for cranes on tires on the front and supported on the rear

- Make sure that the rear folding / sliding beams are secured with pins to prevent them from sliding.
- Make sure that the rear support plates are secured in the operating position.
- Make sure that the crane is properly supported on the rear.
- Make sure that the axle pressure compensation is correctly switched.
- Make sure that the axle suspension is blocked.
- Make sure that the tires of the rear axle group have no contact with the ground.
- Make sure that a sufficient tire pressure is present in the tires.
- Make sure that the ground for the front axle group is sufficiently level and has a sufficient load bearing capacity.

5.4 Additional controls for cranes supported on the front and on tires on the rear

- Make sure that the front folding / sliding beams are secured with pins to prevent them from sliding.
- Make sure that the front support plates are secured in the operating position.
- Make sure that the crane is properly supported on the front.
- Make sure that the axle pressure compensation is correctly switched.
- Make sure that the axle suspension is blocked.
- Make sure that the tires of the front axle group have no contact with the ground.
- Make sure that a sufficient tire pressure is present in the tires.
- Make sure that the ground for the rear axle group is sufficiently level and has a sufficient load bearing capacity.

5.5 Additional controls for freestanding crane operation (on tires)

- Make sure that all prerequisites for freestanding crane operation are met.
- Make sure that sufficient tire pressure is in all tires for crane operation on tires.

- Make sure that the ground is sufficiently level for crane operation on tires and has a sufficient load bearing capacity.

5.6 Additional controls for cranes with a derrick boom

- Make sure that the shut-off via the limit switch - derrick is functioning.
- Make sure that the entire slewing range of the suspended ballast / ballast trailer is free of personnel and obstacles.

5.7 Additional controls for cranes with luffing auxiliary boom / accessories

- Make sure that the shut-off via the limit switch luffing auxiliary boom / accessories „steepest position“ is functioning.
- Make sure that the shut-off via the limit switch luffing auxiliary boom / accessories „lowest position“ is functioning.
- Make sure that the shut-off via the limit switch flap in „steepest position“ position is functioning.
- Make sure that the pendulum of the mechanical relapse retainer moves easily over the entire slewing range and is functioning.

5.8 Additional controls for certain crawler cranes

For existing crawler assembly key button:

- Make sure that the crawler assembly key button is turned off.

6 Relapse cylinders

6.1 Block position of the relapse cylinders when setting down the load

NOTICE

Damage to the boom or the relapse cylinders!

If the block position of the relapse cylinders is triggered by the boom or the derrick with attached, freely suspended load, then there is a danger of damaging the boom or the relapse cylinders when setting the load on the ground. By setting down the load, the crane is relieved, and this movement causes the boom system to move to the rear.

There is no shut-off of the hoist gear lowering function.

- ▶ Actuate the opposite direction of movement which caused the block position and eliminate the block position.

7 Pneumatic springs

Pneumatic springs are installed on various crane components to simplify the assembly of these components.

**WARNING**

Danger of crushing!

Defective pneumatic springs no longer provide the supporting properties on the movable components. Components can fall down.

Death, severe bodily injuries, property damage.

- ▶ Always check pneumatic springs for damage before actuating the corresponding components.
- ▶ Do not use components with defective pneumatic springs. Replace defective pneumatic springs immediately.
- ▶ Make sure that no persons or objects are in the movement range of the moving components which is supported by the pneumatic spring.
- ▶ It is strictly prohibited to remain or place any objects in the movement or other danger zone of the moving crane components which are supported by the pneumatic spring.

8 Manual rope winches

Manual rope winches are installed on various components to simplify the assembly or disassembly of these components.

**WARNING**

Danger of crushing!

Defective manual rope winches no longer provide the supporting action on the movable components. Components can fall down.

Death, severe bodily injuries, property damage.

- ▶ Always check manual rope winches for external and functional damage before actuating the respective components.
- ▶ Check the rope of the manual rope winch for damage.
- ▶ At least two rope coils must always remain on the rope drum.
- ▶ Do not use components with defective manual rope winches. Replace defective manual rope winches.
- ▶ It is strictly prohibited for personnel or objects to remain within the movement range of the components, which are supported by the manual rope winch.
- ▶ It is prohibited for personnel or objects to remain within the danger zone of the moving components.

9 Weights

**Note**

- ▶ The weight of each component is specified in the chapter 1.03 or the respective chapter in the Crane operating instructions or is stated on the tag attached to the corresponding component.
- ▶ If components are pushed into one another (for example the boom intermediate sections) or folded together (for example the folding jib), then the total weight is given by the sum of the individual components.

NOTICE

False estimation of weights

- ▶ Contact the Service department at **Liebherr-Werk Ehingen GmbH** if the weight of the respective component is not stated on the tag or in the Crane operating instructions.
- ▶ Use an auxiliary crane with sufficient load carrying capacity including judicious reserve.

10 Guy rods



WARNING

The boom can break off!

The arrangement of the guy rods for the boom or boom systems is stipulated in the rod plan. If the arrangement of the guy rods according to the rod plan is not observed, the crane can collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Always carry out the arrangement of the guy rods according to the rod plan.
- ▶ If an auxiliary guying is required for a certain boom length, then it must always be installed according to the rod plan on the position defined in the rod plan.



WARNING

Unutilized guy rods on boom!

If guy rods are on the lattice sections which are not used for operation, then there is a danger of accident.

Unused guy rods can loosen up and fall down.

Death, severe bodily injuries, property damage.

The load chart is invalid.

The load display of the LICCON computer system shows an incorrect value.

The weight of the boom is too heavy for erection.

- ▶ Disassemble and remove the guy rods that are not needed on the transport retainers before erecting the boom.



Note

- ▶ Inspection and maintenance of guy rods, see chapter 8.15.
- ▶ In reference to the guy rods, observe section „Erection / take-down“.

10.1 Guy rods for telescopic cranes with luffing lattice jib

This section applies only to cranes with a telescopic boom and luffing lattice jib.

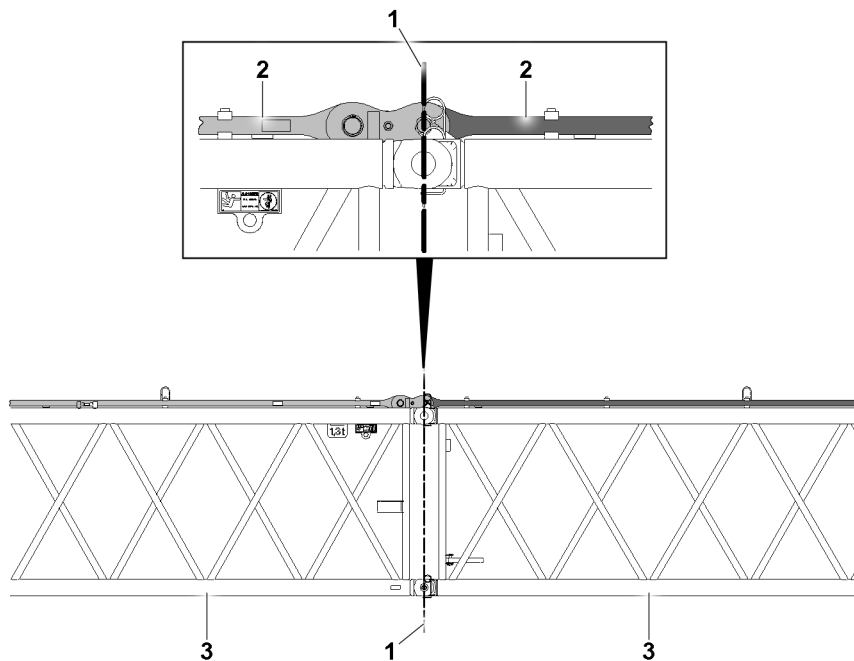


Fig.152299: Lattice section pin level

1 Pin level

2 Guy rods

3 Lattice section

If guy rods **2** are assembled, then close the guy rods **2** in the pin level **1** of the lattice sections **3**. In this way it can be determined if the correct guy rods **2** are assembled.

To completely check the guying, the requirements of the **rod plan**, the **assembly drawings** and the **operating instructions** must be observed.

11 Auxiliary guying

The auxiliary guying is of significant importance for safe crane operation.

The auxiliary guying is a deciding factor in relieving the boom, or the boom system during erection and take-down as well as during crane operation.



WARNING

The crane can topple over!

If the auxiliary guying is not installed or not installed on the position specified in the rod plan, then the crane can collapse, the boom can break off or the crane can topple over.

- ▶ If an auxiliary guying is specified in the rod plan for the required boom length, then it must be installed on the respective position.
- ▶ Make sure that the auxiliary guying is always completely installed and that all pins are properly pinned and secured.

12 Bypassing the overload protection



Fig.113438: Bypassing the overload protection

- Illustration 1: LICCON monitor (only certain crane types).
- Illustration 2: Indicator light „Assembly“ in instrument panel crane cab (only certain crane types).

The overload protection is considered bypassed for:

- All types of assembly operations.
- All types of exceeded shut off limits of the overload protection.
- All types of emergency operation.
- All types of crane operation with deactivated or defective sensors and limit switches.
- All types of deviation from specified set up configuration of the crane.

**DANGER**

Increased danger of accident due to bypass of the overload protection!

Proper and destined use of the crane is ensured due to the construction of the overload protection system and observance of the information in the Crane operating instructions. All **sensibly foreseeable erroneous operations** of the crane have been taken into consideration.

Impermissible crane operation with bypassed overload protection – with the aim of increasing the maximum load bearing capacity of the crane above the rated value in the load chart or of extending the designated working range of the crane – does not constitute a **reasonably foreseeable erroneous operation**, rather **deliberate improper use with high danger of accident**.

The possible risks and consequences of such improper use are detailed in the Crane operating instructions.

Such deliberate improper use can neither be prevented by means of the structural design nor by means of information in the Crane operating instructions.

- ▶ Bypass the overload protection only according to the Crane operating instructions.
- ▶ Exceed the shut off limits of the overload protection only according to the Crane operating instructions.
- ▶ Any other use of the crane with bypassed overload protection than that described in the Crane operating instructions is prohibited.

If the maximum permissible load moment is exceeded, the overload protection turns all load moment increasing crane movements off.

This shut-off can be bypassed or exceeded various ways, for example:

- Exceeding the shut off limits (utilization more than 100 % or leaving the load chart).
- Activating an assembly operation.
- Activating an emergency operation.

The displays of the LICCON overload protection remain functioning when all associated sensors and limit switches are active and a load chart is available.

**WARNING**

Increased danger of accident due to bypass of the overload protection!

If the overload protection is bypassed, there is no longer any protection against crane overload.

In the event of improper use, the crane could collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

This could result in significant property damage.

- ▶ It is only permitted to bypass the overload protection for assembly or in emergencies.
- ▶ The bypass of the overload protection may only be carried out by persons who are aware of the effects of their acts.
- ▶ Bypassing the overload protection requires the presence of a person authorized by the crane operator and must be performed with utmost caution.
- ▶ Crane operation is strictly prohibited when the overload protection is bypassed.

12.1 Bypassing the LICCON overload protection

**Note**

- ▶ Applies only for cranes with LICCON overload protection.

Depending on the crane version, one or more operating elements are available to bypass the overload protection:

- Button in the control panel.
- Key button on the LICCON monitor.
- Key button in the instrument panel.
- Key button in the control cabinet.
- Sensor for transponder on the crane cab.

The functions of the operating elements are described in chapter 4.20.

- ▶ Actuate the respective operating element.

Result:

- The LICCON overload protection is bypassed / inactive.
- The „Assembly“ icon appears on the LICCON monitor.
- Depending on the circumstances, acoustic and / or optical warning signals (blinkers, flashing lights, bells and horns) sound.

If the LICCON overload protection is to be reactivated:

- ▶ No longer actuate the respective operating element or reset.

Result:

- The LICCON overload protection is active.
- The „Assembly“ icon no longer appears on the LICCON monitor.
- The acoustic and / or optical warning signals which were triggered by the bypass are turned off again.

12.2 Bypassing the PAT overload protection

**Note**

- ▶ Applies only for cranes with PAT overload protection.

- ▶ Actuate the bypass key button and turn the PAT overload protection off.

Result:

- The PAT overload protection is bypassed / inactive.

- ▶ Actuate the bypass key button and turn the PAT overload protection on.

Result:

- The PAT overload protection is active.

13 Bypassing the hoist top shut-off

**Note**

- ▶ Applies only for cranes with hoist limit switch.

If the hook block touches the hoist limit switch weight during upward movement, the hoist limit switch is activated. The „Spool up winches“, „Luff boom down“ and „Telescope the telescopic boom out“ crane movements are turned off. The shut-off can be bypassed.

**WARNING**

Danger of accident due to bypass of hoist top shut-off!

When bypassing the hoist top shut-off, there is a danger that the hook block may be pulled against the pulley head when continuing to lift or luffing down the boom. This may damage the pulleys and cause the loads to fall.

- ▶ The bypass of the hoist top shut-off in crane operation with a load may only be carried out by a person authorized by the crane operator with the aid of a „Guide“. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block and the boom head.
- ▶ Carry out all crane movements with maximum caution and minimum speed.

14 Pin connections



WARNING

Pin connections **not** lubricated!

If pins or pin connections are not properly greased or lubricated before assembly, then they can corrode.

The pins can be stuck in the pin bores and be damaged.

During the unpinning procedure, the pins can suddenly release.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all pins, which are not supplied with grease via the central lubrication system are sufficiently greased before assembly.
- ▶ Make sure that all lube points, which are equipped with a grease fitting, are properly greased at assembly and according to the respective interval specification.
- ▶ Never insert or unpin pins by force.



WARNING

Pin **not** secured to prevent it from loosening up by itself!

The pin connection could loosen up suddenly.

Death, severe bodily injuries, property damage.

- ▶ Secure all pins with retaining elements against loosening up by itself.



WARNING

Distorted pin!

Angular pull or excessive or low hoisting force of the auxiliary crane may result in distortion of the pins.

Distorted parts can suddenly fly off when the pins are unpinned.

Death, severe bodily injuries, property damage.

- ▶ When the pins are unpinned, the lifting force of the auxiliary crane must be adapted to the weight of the components being lifted.
- ▶ Do **not** unpin difficult to remove pins by force.
- ▶ Remedy the cause of the distortion.

14.1 Pinning the collar pin

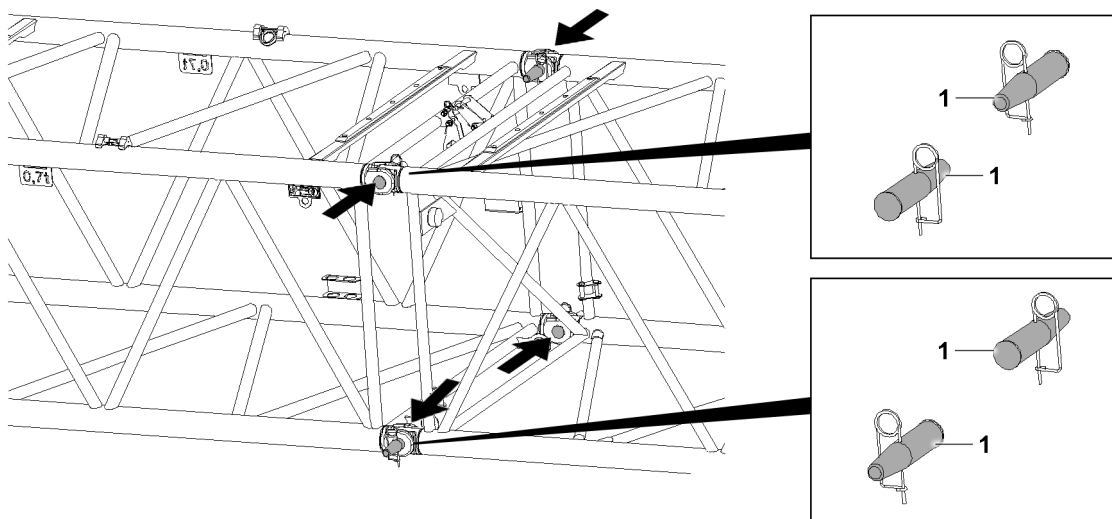


Fig.143114: Pinning the collar pin

**WARNING**

The collar pin is incorrectly pinned!

Death, severe bodily injuries, property damage.

- ▶ Insert or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Pin the upper collar pin **1** from the **outside to the inside** and unpin from the **inside to the outside**.
- ▶ Pin the lower collar pin **1** from the **inside to the outside** and unpin from the **outside to inside**.

14.2 Assembling the double cone pins horizontally

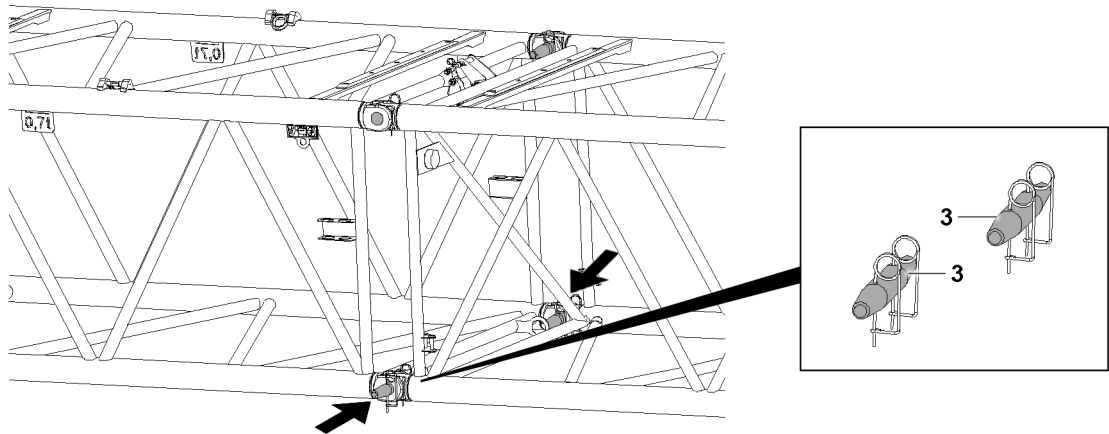


Fig.143115: Pinning the double cone pins horizontally

**WARNING**

Double cone pins incorrectly pinned!

Death, severe bodily injuries, property damage.

- ▶ Insert or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Pin and unpin the horizontally installable double cone pins **3** from the **outside to the inside**.

14.3 Assembling the double cone pins vertically

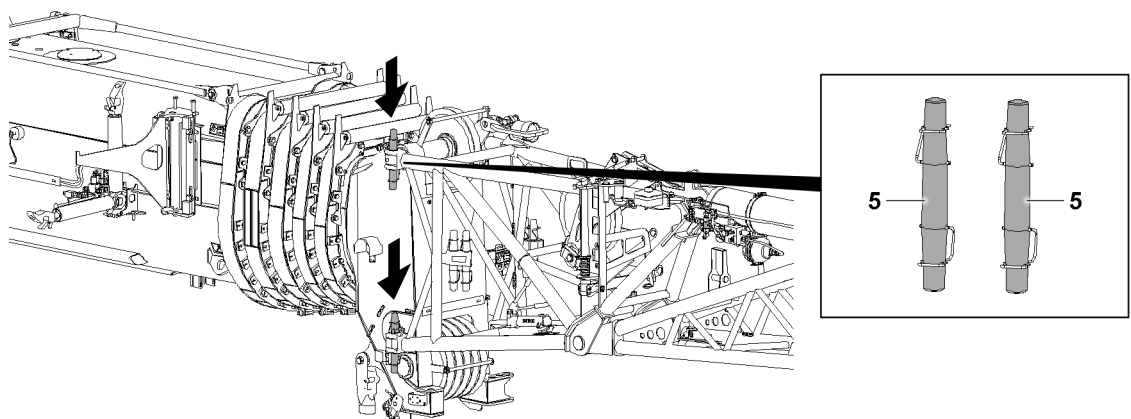


Fig.143116: Assembling the double cone pins vertically

**WARNING**

Double cone pins incorrectly pinned!

Death, severe bodily injuries, property damage.

- ▶ Pin and unpin the vertically installable double cone pins **5** from the **top to the bottom**.

14.4 Impact protection

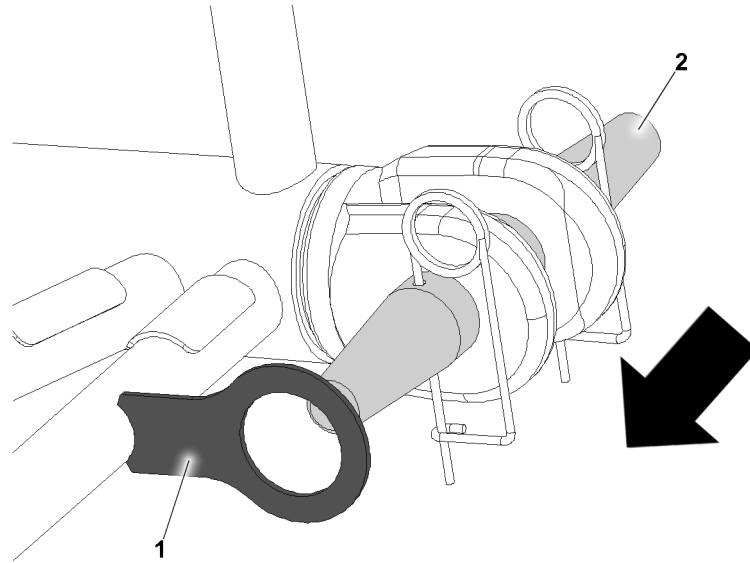


Fig.148194: Lattice section impact protection

Impact protection 1 is installed on certain lattice sections. The impact protection 1 should prevent the pins from being unpinned from the **inside to the outside**.

If impact protection 1 is installed:

- ▶ Only use double cone pins 2.
- ▶ Only pin and unpin the double cone pins 2 from the **outside to the inside**.

15 Retaining elements

15.1 Checking the retaining elements

Retaining elements are used to secure the pins. Due to mechanical damage / distortion, the function of the retaining elements can be compromised. In addition, the spring force of the retaining elements can be reduced significantly. Do **not** re-use retaining elements if there is insufficient spring force. The pin retainer must be secured with a correctly **functioning** retaining element.



WARNING

Mechanical damage or deformation of the retaining element!

The retaining elements can fail.

The pin can unpin by itself.

Death, severe bodily injury, property damage.

- ▶ Use exclusively functioning retaining elements in a proper condition.
- ▶ Replace defective retaining elements.

15.2 Overview of the retaining elements

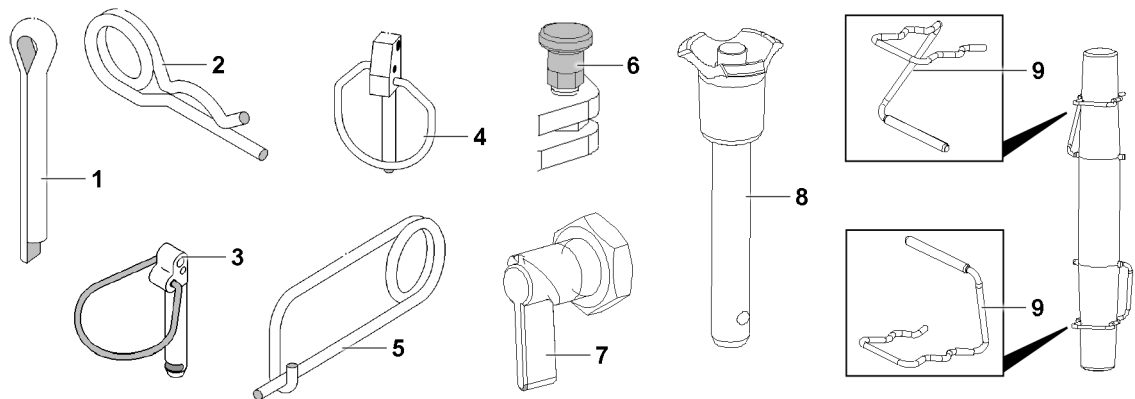


Fig.143102: Retaining elements

- | | | | |
|---|--------------------|---|------------------|
| 1 | Split pin | 6 | Detent pin |
| 2 | Cotter pin | 7 | Latch |
| 3 | Safety locking pin | 8 | Ball locking pin |
| 4 | Linch pin | 9 | Retaining clip |
| 5 | Spring retainer | | |

15.3 Split pin

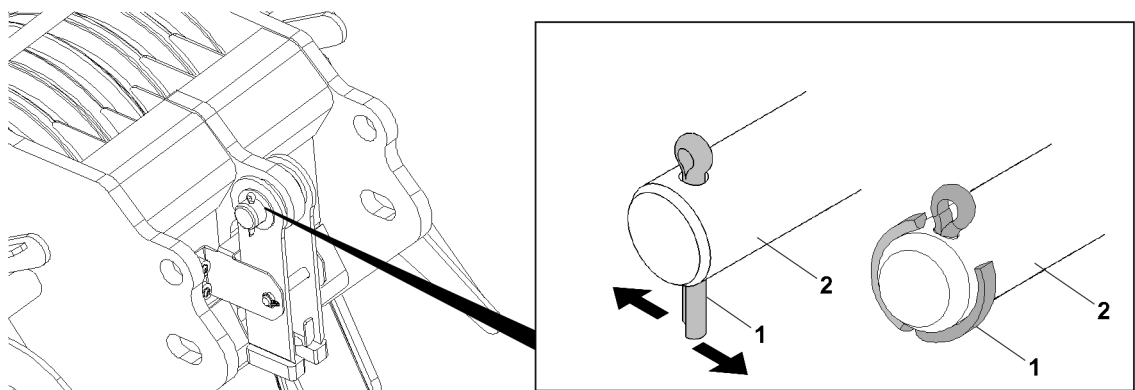


Fig.143105: Split pin

- | | | | |
|---|-----------|---|-----|
| 1 | Split pin | 2 | Pin |
|---|-----------|---|-----|



WARNING

Multiple use of a split pin 1!
The split pin 1 can break.

- ▶ Assemble the split pin 1 only once.
- ▶ Use a correctly sized split pin 1.

- ▶ Secure the pin 2: Insert the split pin 1.
- ▶ Bend the end of the split pin 1 toward the outside.

Problem remedy

Split pin 1 defective!

- ▶ Replace the split pin 1.

15.4 Cotter pin

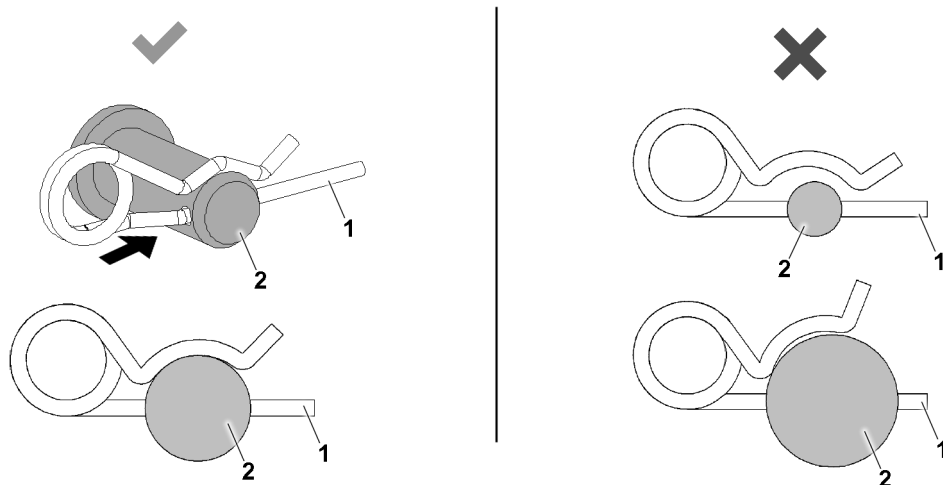


Fig.143106: Cotter pin, correct and incorrect dimensions

1 Cotter pin

2 Pin



WARNING

Improper dimensions of the cotter pin 1!
The cotter pin 1 can loosen up by itself.

- ▶ Use a correctly sized cotter pin 1.
- ▶ Secure the pin 2: Insert the cotter pin 1.

Problem remedy

Spring tension is too low?
The cotter pin 1 is defective.
▶ Replace the cotter pin 1.

15.5 Safety locking pin

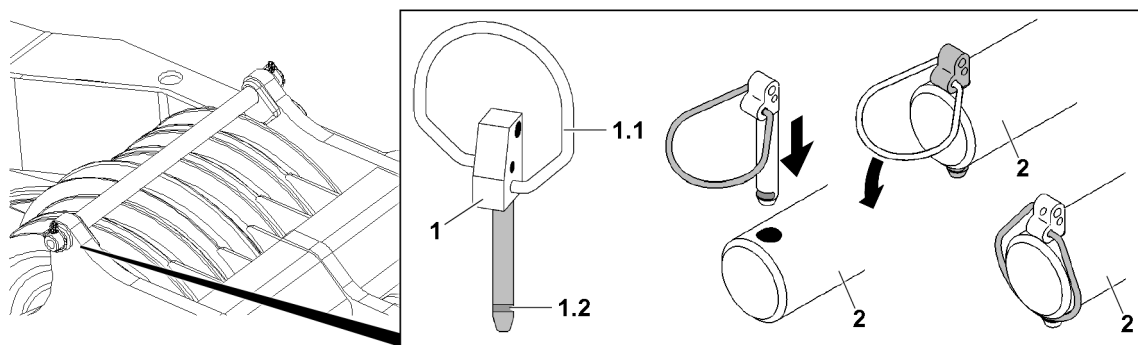


Fig.143103: Safety locking pin

1 Safety locking pin

1.2 Groove

1.1 Spring clip

2 Pin

Increased effort is necessary for opening the safety locking pin 1.



WARNING

Spring clip 1.1 not engaged!
The safety locking pin 1 can loosen up by itself.

- ▶ Engage the spring clip 1.1 completely in the groove 1.2.

- ▶ Secure the pin **2**: Insert the safety locking pin **1**.
- ▶ Close the spring clip **1.1** and engage it completely in the groove **1.2**.

Problem remedy

The spring clip **1.1** does **not** engage completely?

Tension of the spring clip **1.1** is too low.

- ▶ Replace the safety locking pin **1**.

15.6 Linch pin

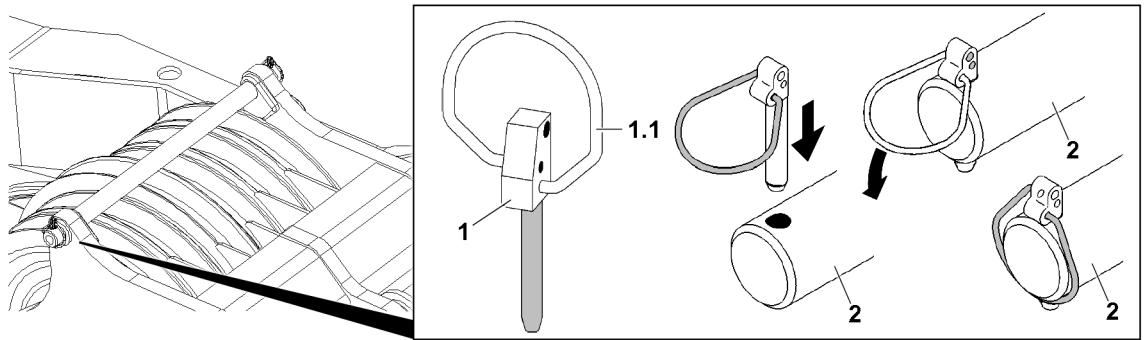


Fig.143104: Linch pin

1 Safety locking pin
1.1 Spring clip

2 Pin

**WARNING**

The linch pin **1** is **not** completely closed!

The locking pin **1** can loosen up by itself.

- ▶ Close the spring clip **1.1** completely.
- ▶ Secure the pin **2**: Insert the locking pin **1**.
- ▶ Close the spring clip **1.1** completely.

Problem remedy

The spring clip **1.1** does not close completely?

Tension of the spring clip **1.1** is too low.

- ▶ Replace the locking pin **1**.

15.7 Spring retainer

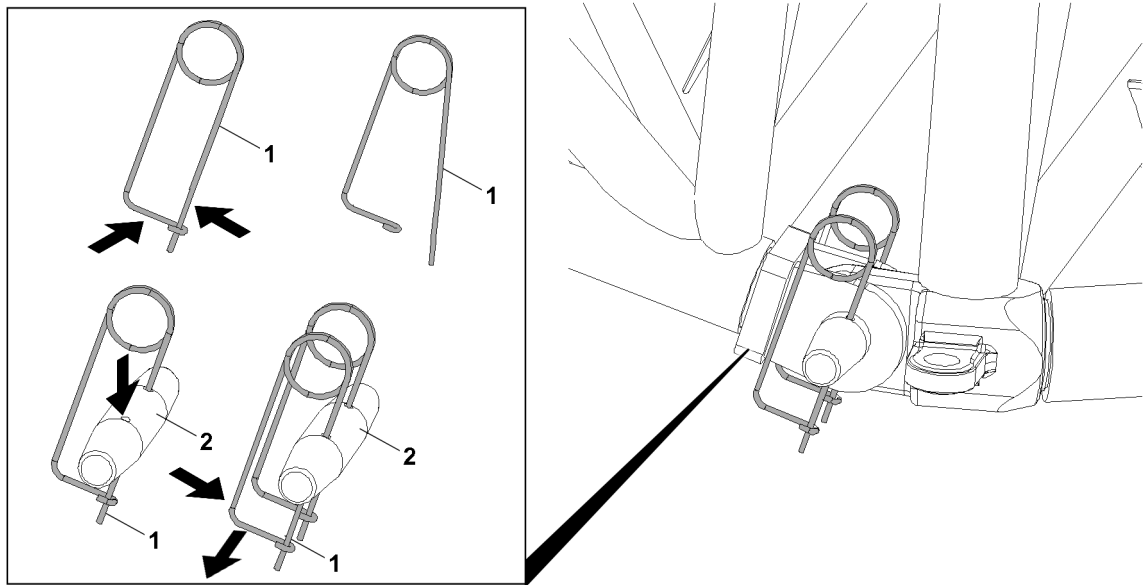


Fig.143108: Spring retainer

1 Spring retainer



WARNING

The spring retainer 1 is **not** closed!
The spring retainer 1 can loosen up by itself.

- ▶ Close the spring retainer 1.
- ▶ Secure the pin 2: Insert the spring retainer 1.
- ▶ Close the spring retainer 1.

Problem remedy

Spring tension is too low?
The spring retainer 1 is defective.
▶ Replace the spring retainer 1.

15.8 Detent pin

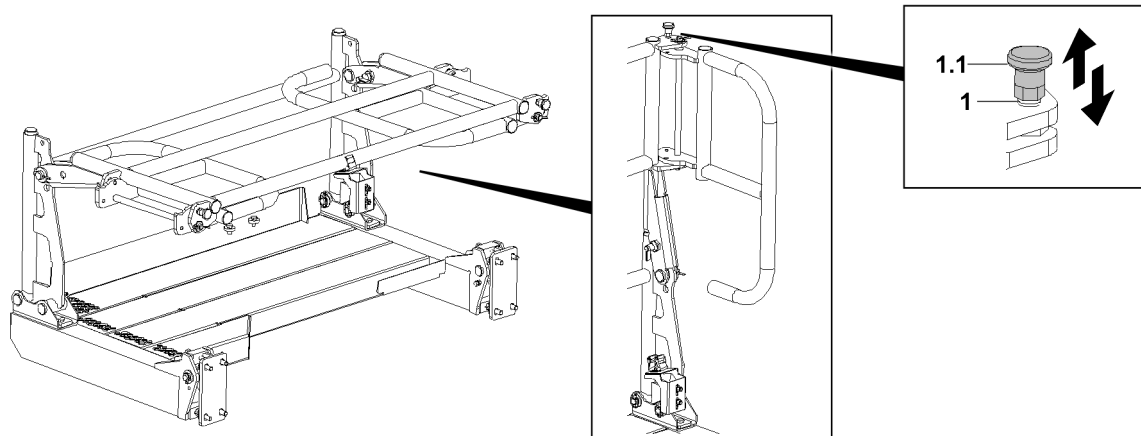


Fig.143110: Detent pin

1 Detent pin

1.1 Handle

**WARNING**

The handle **1.1** is **not** locked!
The detent pin **1** can loosen up by itself.
▶ Lock the detent pin **1**.

▶ Pull the handle **1.1**.

Result:

- The detent pin **1** is unlocked.
- ▶ Insert the detent pin **1**: Release the handle **1.1**.

Result:

- The detent pin **1** is pinned.

Problem remedy

The handle **1.1** cannot be pulled.
The detent pin **1** is defective.
▶ Replace the detent pin **1**.

15.9 Latch

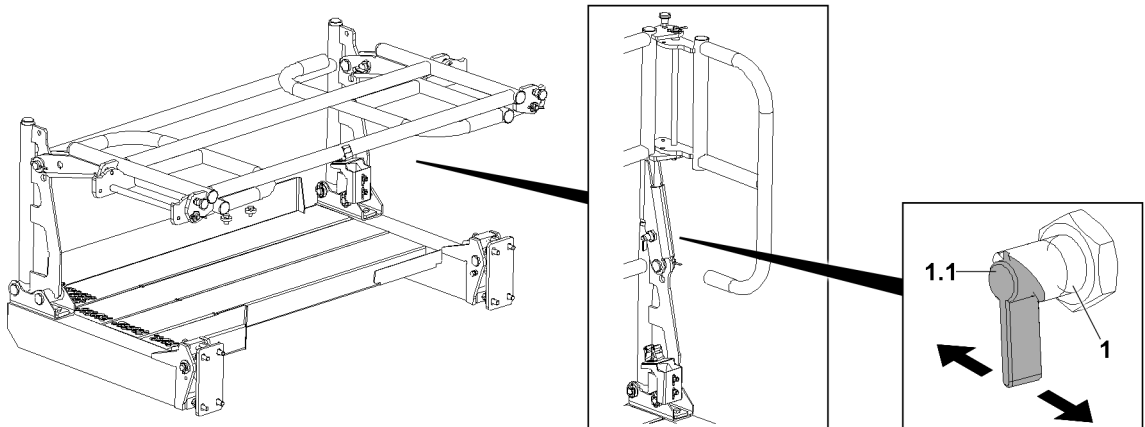


Fig.143111: Latch

1 Latch

1.1 Lever

**WARNING**

The latch **1** is **not** locked!
The latch **1** can loosen up by itself.
▶ Lock the latch **1**.

▶ Operate the lever **1.1**.

Result:

- The latch **1** is unlocked.
- ▶ Pin the latch **1**: Release the lever **1.1** and swing the railing until the latch is pinned.

Problem remedy

The lever **1.1** cannot be actuated?
The latch **1** is defective.
▶ Replace the latch **1**.

15.10 Ball locking pin

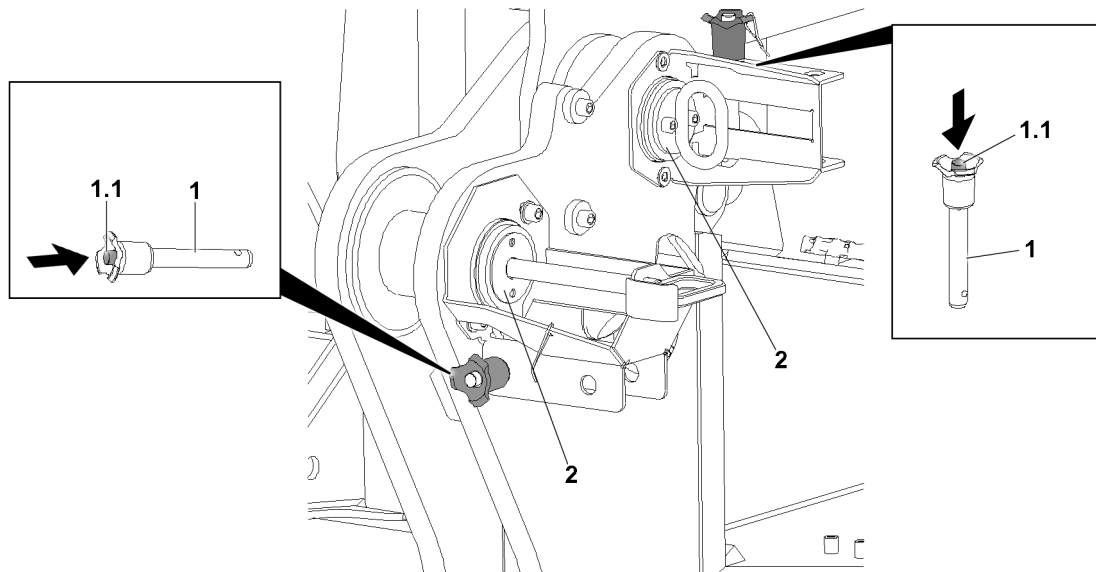


Fig.143109: Ball locking pin

- 1 Ball locking pin
1.1 Press button
2 Pin



WARNING

The ball locking pin **1** is **not** locked!
The ball locking pin **1** can loosen up by itself.

- ▶ Lock the ball locking pin **1**.
- ▶ Secure the pin **2**: Actuate the press button **1.1**.

Result:

- The ball locking pin **1** is unlocked.
- ▶ Pin the ball locking pin **1** and release the press button **1.1**.

Result:

- The ball locking pin **1** is pinned and secured.

Problem remedy

The press button **1.1** cannot be actuated?

The ball locking pin **1** is defective.

- ▶ Replace the ball locking pin **1**.

15.11 Retaining clips

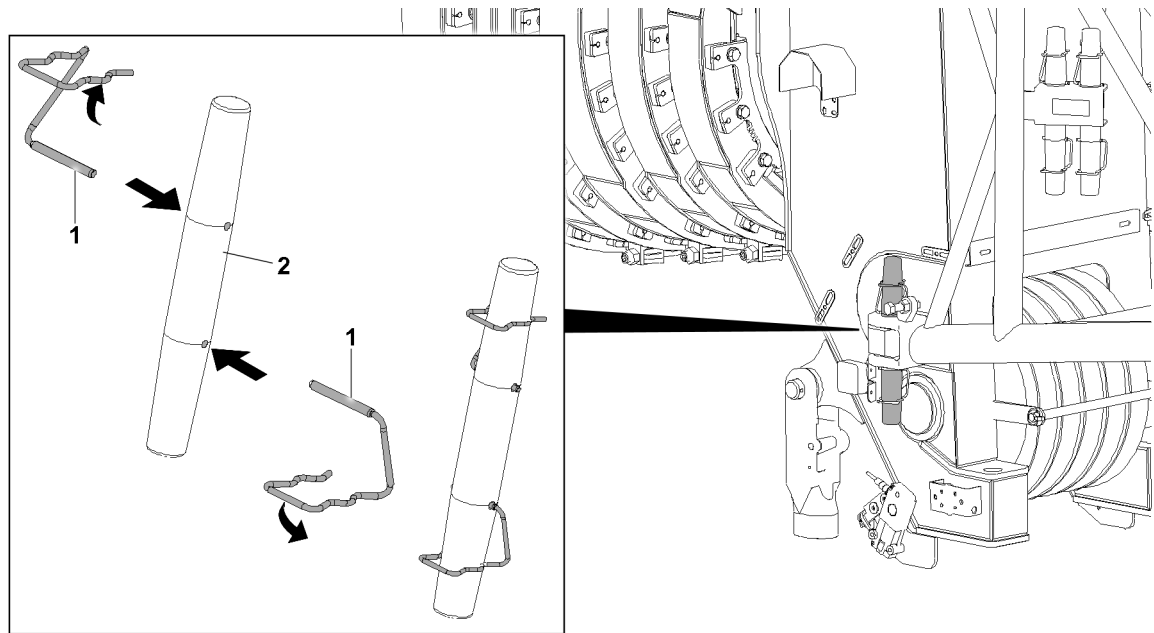


Fig.143107: Retaining clips 1

1 Retaining clip

2 Pin



WARNING

Incorrect retaining element!
Shearing off of the retaining element.

- ▶ To secure the folding jib pinning: Use retaining clips 1.
- ▶ The use of other retaining elements is **prohibited**.



WARNING

Retaining clip **not** engaged!
The retaining clip 1 can loosen up by itself.

- ▶ Engage the retaining clip 1.
- ▶ Secure the pin 2: Insert the retaining clip 1.
- ▶ Engage the retaining clip 1.

Problem remedy

Retaining clip 1 defective?
The spring force of the retaining clip 1 is too low.

- ▶ Replace the retaining clip 1.

16 Assembling / disassembling



WARNING

Danger of fatal injury due to incorrect assembly or disassembly!

The assembly / disassembly of lattice sections and / or components may never be performed by untrained personnel.

An erroneous assembly / disassembly of lattice sections and / or components can cause damage on load carrying crane structures.

Crane components can fail due to improper assembly / disassembly.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the assembly / disassembly of lattice sections and / or components is carried out only by authorized and trained expert personnel.
- ▶ Make sure that the fastening equipment on lattice sections and / or components is always fastened properly.
- ▶ Make sure that lattice sections and / or components are always properly pinned and secured at assembly.
- ▶ For assembly / disassembly of individual components, also observe the chapters relating to those components.
- ▶ The boom combinations must be assembled according to the separately supplied rod plans.
- ▶ All components which must be transported separately must be transported with suitable auxiliary cranes and fastening equipment near ground level.



WARNING

Failure of auxiliary winch!

- ▶ Only use the auxiliary winch (assembly or reeving winch) for assembly and not to lift loads.
- ▶ Lifting of loads with the auxiliary winch is prohibited.



WARNING

Danger of impact / crushing!

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

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

Death, severe bodily injuries, property damage.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ Make sure that the crane is horizontally aligned.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.
- ▶ During assembly / disassembly no one may be in the dangerous area around or underneath the suspended components before the load has been secured.

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

- Lifting platforms
- Scaffolding
- Auxiliary cranes
- Ladders

**WARNING**

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping and walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the assembly personnel.
- ▶ For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

**DANGER**

The components can fall down!

If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.

Death, severe bodily injuries, property damage.

- ▶ Do not disengage the auxiliary crane and the fastening equipment until the respective component is pinned and secured.

**WARNING**

The components can fall down!

If the corresponding component is unpinned without being secured by an auxiliary crane, the corresponding component can fall down.

Death, severe bodily injuries, property damage.

- ▶ Do not unpin the components until they are secured by an auxiliary crane.

**WARNING**

Falling components and tools!

Whenever working at a height, for example on the crane or on an aerial platform, components or tools can fall down.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the danger zone under the work area is blocked off and marked and that no personnel is located within it.

16.1 Assembly drawings



WARNING

Use of assembly drawings!

Due to sole use of assembly drawings, dangerous situations can arise up to toppling of the crane. Death, severe bodily injuries, property damage.

- ▶ Assembly drawings should only be considered to be **additional** and **supplementary** information.
- ▶ The respective chapters in the crane operating instructions are decisive for the assembly and disassembly of crane structures, lattice sections or crane components.
- ▶ The detailed information and danger notes in the respective chapters must be observed.

16.2 Guiding crane structures, lattice sections or crane components



WARNING

Danger due to oscillating load!

During the assembly of crane structures, lattice sections or crane components with the auxiliary crane, they can start to swing back and forth.

Death, severe bodily injuries, property damage.

- ▶ To guide and position crane structures, lattice sections or crane components always use a guide rope.
- ▶ Make sure that there are no persons or obstacles within the danger zone.
- ▶ Make sure that the guide rope is long enough.

16.3 Assembling / disassembling of electrical lines



WARNING

The crane can topple over!

If mechanical crane components, which have electrical connections are not immediately electrically connected after assembly then the limit switches and / or electrical sensors are not functioning.

Safety relevant shut offs are not recognized by the LICCON computer system.

Any errors or safety relevant messages which might occur are not shown on the LICCON computer system.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the electrical connections are made immediately after installation of the respective crane components on the crane.
- ▶ Make sure that the procedure to make the electrical connections to the boom end sections in the respective assembly and set up chapters are observed.

NOTICE

Danger of damage to the electrical connections!

If the following measures are not adhered to, the electrical connections can be damaged.

- ▶ Do not plug in the plug connection or unplug them under tension.
- ▶ Do not pinch or crush electrical connections.

When pulling the cable out:

- ▶ Hold the plug and not the cable. Do not pull on the cable to release the plug connection.
- ▶ Relieve the electrical connections in operating condition.
- ▶ In case of defective or faulty electrical lines, contact Customer Service at Liebherr-Werk Ehingen GmbH.

**WARNING**

Malfunction if dummy plugs are not installed!

If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.

- ▶ Make sure that all non-required electrical connections, which have a dummy plug, are closed off with dummy plugs.
- ▶ Pay attention to the Electrical wiring diagram.

NOTICE

Property damage due to dirt and / or corrosion!

The plug connections are only protected when plugged in. If the plug connections are not plugged in, then the contact surfaces can corrode.

This could result in malfunctions.

- ▶ Always plug or screw the plug connections together properly.
- ▶ Keep plug connections clean and dry. Clean contact surfaces provide the best signal transfer.
- ▶ Close off the plug connections that are not used with dust caps.

- ▶ Establish the electrical connections to the installed crane components properly.

- ▶ As a rule, close off on-required electrical connections (for example of accessories which are not installed) with the respective dummy plugs.

- ▶ Properly close off electrical connections, which have no dummy plugs, with the corresponding protective dust or cover caps.

If a pull release for the cable drum is present:

- ▶ Hang the pull release in on the fixed point and relieve the plug connections from the pull strain.

After installing the plug connections:

- ▶ Check all plug connections for proper connection.

If a plug connection is not properly connected:

- ▶ Plug or screw the plug connection together properly.

After removing the plug connections:

- ▶ Protect the electrical connections with protective dust or cover caps or place them in intended storage retainers.
- ▶ After unplugging the electrical plug connections, install the dummy plugs, see Electrical wiring diagram.

If locking brackets are present:

- ▶ Close the locking bracket.

16.4 Assembling / disassembling of hydraulic lines

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

**WARNING**

Danger of accident due to loss of pressure or leakage!

Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.

Death, severe bodily injuries, property damage.

- ▶ Check the quick couplings after assembly for correct connection.
- ▶ Make sure that the sleeve and plug are bolted with the knurled nut after assembly.

**WARNING**

Pressure in the hydraulic lines!

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

Death, severe bodily injuries, property damage.

- ▶ Release the pressure in the hydraulic system before releasing. Interrupt the pressure supply and wait for a short time.
-
- ▶ Release the pressure in the hydraulic system before connecting or disconnecting: Turn the engine off and wait for a short time.
 - ▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
 - ▶ Tighten the hydraulic coupling by hand. Turn the knurled nut until it reaches a tangible, fixed stop position.

16.5 Bypassing at crawler assembly / disassembly

**Note**

- ▶ Applies only for cranes with crawler assembly key button.

**WARNING**

High danger of accident in case of actuated crawler assembly key button!

If the crawler assembly key button is actuated, the overload protection is bypassed. No shut-off at overload will occur in assembly operation nor in crane operation.

In the event of misuse, the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ The crawler assembly key button may only be actuated for assembly tasks.
- ▶ All other usage of the crawler assembly key button other than as described in the operating instructions is prohibited.
- ▶ Crane operation with the crawler assembly key button enabled is strictly prohibited.

16.5.1 Activating the bypass at crawler assembly and crawler disassembly

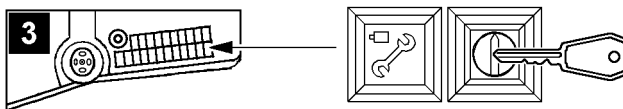


Fig.113441: Activating the bypass

- Illustration 3: Crawler assembly key button and indicator light *Crawler assembly* with touch function *Crawler assembly off*

- ▶ Actuate the crawler assembly key button.

Result:

- The LICCON overload protection is inactive.
- The indicator light *Crawler assembly* lights up.

16.5.2 Deactivating the bypass at crawler assembly and crawler disassembly

Make sure that the following prerequisites are met:

- The LICCON overload protection is bypassed / inactive and the „Bypass at assembly and disassembly“ is activated.
- The *crawler assembly* indicator light illuminates.

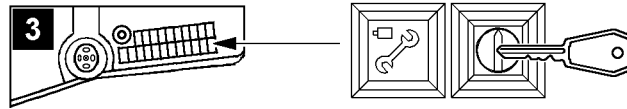


Fig. 113441: Deactivating the bypass

If the bypass at crawler assembly is to be turned off:

- ▶ Turn the crawler assembly off by pressing the off button *Crawler assembly off*.

Result:

- The indicator light in the button *Crawler assembly* turns off.

16.6 Bypassing at assembly / disassembly

Depending on the crane version, the „Bypass at assembly and disassembly“ is activated by:

- The set up button (key button) on the LICCON monitor.
- The assembly key button in the instrument panel.



Note

- ▶ Applies only for cranes with LICCON overload protection.
- ▶ Indicator light *Assembly* is only present in the instrument panel for certain crane types.



WARNING

High danger of accident at crane operation with activated „Bypass at assembly and disassembly“! At activated „Bypass at assembly and disassembly“ the overload protection and possibly bypassed hoist limit switches.

In the event of improper use, the crane could collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ The activation of the „Bypass at assembly and disassembly“ is only permissible for assembly and disassembly purposes.
- ▶ All other usage of the „Bypass at assembly and disassembly“ other than as described in the operating instructions is prohibited.
- ▶ The „Bypass at assembly and disassembly“ may only be activated by persons who are aware of the consequences of a bypass.
- ▶ Crane operation with activated „Bypass at assembly and disassembly“ is strictly prohibited.
- ▶ The „Bypass at assembly and disassembly“ must be deactivated immediately after assembly and disassembly work.
- ▶ The crane operator or a person authorized by him must make sure that no misuse of the bypass device is possible (remove the key and store it safely, if necessary).

16.6.1 Activating the bypass at assembly and disassembly



Fig. 113438: Activating the bypass at assembly and disassembly

- Illustration 1: LICCON monitor (only certain crane types).
- Illustration 2: Indicator light „Assembly“ in instrument panel crane cab (only certain crane types).

- ▶ Actuate the respective operating element.

Result:

- The LICCON overload protection is bypassed / inactive and the „Bypass at assembly and disassembly“ is activated.

- The „Assembly“ icon appears in the LICCON monitor and / or the indicator light „Assembly“ in the instrument panel lights up.
- Depending on the circumstances, acoustic and / or optical warning signals (blinkers, flashing lights, bells and horns) sound.

16.6.2 Bypassing at assembly and disassembly



Fig.113437: Bypassing at assembly and disassembly

- ▶ No longer actuate the respective operating element or reset.

Result:

- The LICCON overload protection is active and the „Bypass at assembly and disassembly“ is deactivated.
- The „Assembly“ icon turns off in the LICCON monitor and / or the indicator light „Assembly“ in the instrument panel no longer lights up.
- The acoustic and / or optical warning signals which were triggered by the bypass are turned off again.

16.7 Actuation of winch and / or crane movements during assembly / disassembly



Note

- ▶ The winches and / or crane movements can be controlled from the crane cab or, depending on the crane set up configuration, with the Bluetooth™ Terminal (BTT) or the radio remote control*.
- ▶ Observe the chapter 4.05, chapter 5.31 and chapter 6.08.



WARNING

Uncoordinated procedure for assembly tasks!
Death, severe bodily injuries, property damage.

- ▶ Before starting the assembly tasks, define the course of action and agree on all steps with all involved personnel.
- ▶ Monitor all steps and continuously check the course of action.
- ▶ In the case of unforeseen events, stop the course of action and agree on the new situation with all involved personnel.
- ▶ Make sure that winches and / or crane movements are only controlled by people who are aware of the effects on the crane and / or boom system as well as the connected dangers.
- ▶ Make sure that no persons, objects or obstacles are within the danger zone of the crane.
- ▶ Prewarn persons within the surrounding area of the crane, for example via a horn signal.
- ▶ Perform all winch and / or crane movements anticipatorily and at a low speed.

16.8 Assembling / disassembling the counterweight

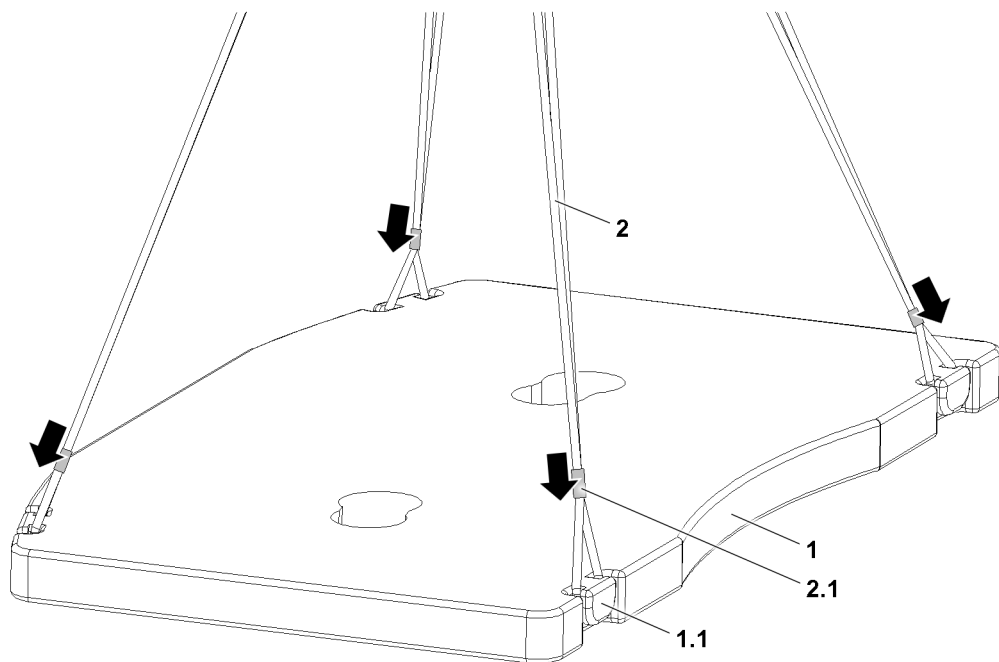


Fig.152587: Grommets and cable laid fastening rope

16.8.1 Grommets and cable laid fastening rope

Use the supplied fastening ropes **2** only for set up work on the crane.

The fastening ropes **2** are marked with the maximum load bearing capacity.



WARNING

Fastening ropes used incorrectly!

The fastening ropes can fail. The load can fall down.

- ▶ Do **not** exceed the load bearing capacity or the fastening ropes **2** when lifting the counterweight.
- ▶ **Never** fasten the fastening ropes **2** to the red marked impact points.
- ▶ **Never** cross or twist the fastening ropes **2**.

Depending on the structural form of the counterweight **1**, use two, three or four fastening ropes **2**.

- ▶ Lay the fastening rope **2** around the bitts **1.1** of the counterweight **1** to be lifted.
- ▶ Until the fastening ropes **2** are positioned firmly on the fastening points: Push the mobile ferrules **2.1** in the direction of the fastening point of the counterweight **1**.

16.9 Assembling / disassembling the booms



WARNING

The crane can topple over!

Angular pull can overload the crane.

Overload can cause destruction of the crane or cause it to topple over.

Death, severe bodily injuries, property damage.

- ▶ The hook block must always be attached (hooked) vertically over the center of gravity of the load to be lifted.
- ▶ Angular pull is prohibited

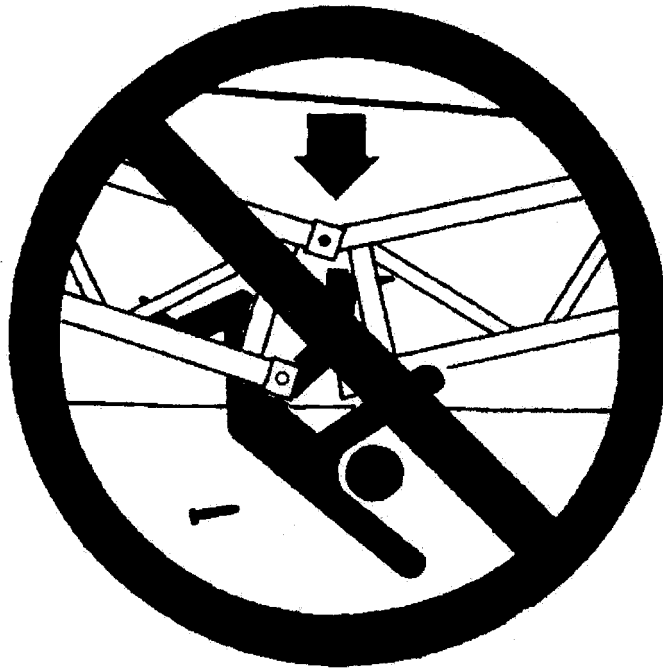


Fig.113444: Danger of accident during assembly / disassembly



WARNING

Danger of accident at assembly / disassembly of booms!

When you disassemble unsecured or unsupported booms, they can fall down.

Death, severe bodily injuries, property damage.

- ▶ Never unpin the pins under unsecured or unsupported booms.
- ▶ Never unpin the connector pins on unsecured or unsupported booms.
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms.
- ▶ Secure the pins in the bearing points and in the racks.
- ▶ The railing must be horizontal during the assembly and disassembly of the booms.
- ▶ Do not lean the ladder against the component being disassembled.

Make sure that the following prerequisites are met for the closing assembly:

- If parts of the equipment (for example lattice sections) are not in contact with the ground during assembly / disassembly, then they must be supported with suitable, stable materials.
- Take down the parts of the equipment with rope pulleys in such a way that the rope pulleys are not damaged.
- During disassembly make sure that the auxiliary crane can lift the load vertically.
- Have an auxiliary crane with sufficient load bearing capacity available to be able to hold the load at the corresponding radius.

16.10 Fastening positions for assembly / disassembly of the lattice jib



WARNING

Danger of fatal accidents due falling components!

The maximum permissible tensile load on the fastening eye is engraved on the fastening eye.

The maximum permissible fastening load of the respective components can differ to the maximum permissible tensile load of the fastening eye.

Components can be damaged at overload and fall down during lifting.

- ▶ Observe the maximum permissible fastening load according to the operating instructions and the tags on the components.
- ▶ Fasten the lattice jib only according to the following descriptions.
- ▶ Do not overload the components.

16.10.1 Closing the end section

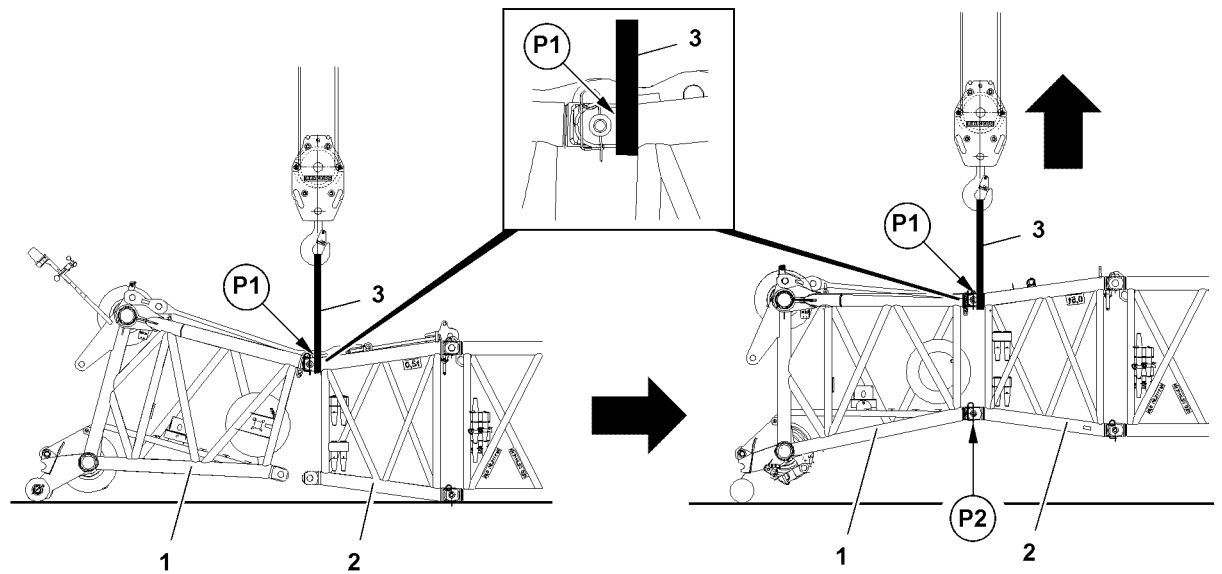


Fig.117840: Closing the end section

For closing the end section, observe the following:

- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.

Before fastening:

- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment **3** on the upper pin points **P1** between the end section **1** and the pinned components **2**.
- ▶ Lift the lattice jib until the lower pin points **P2** align between the end section **1** and components **2**.
- ▶ Pin the end section **1** and components **2** on the lower pin points **P2** on the left and right.

After pinning:

- ▶ Remove the textile type fastening equipment **3**.

16.10.2 Taking the lattice jib down into the roller cart



Note

- ▶ The following illustrations are examples and may not match your crane exactly.

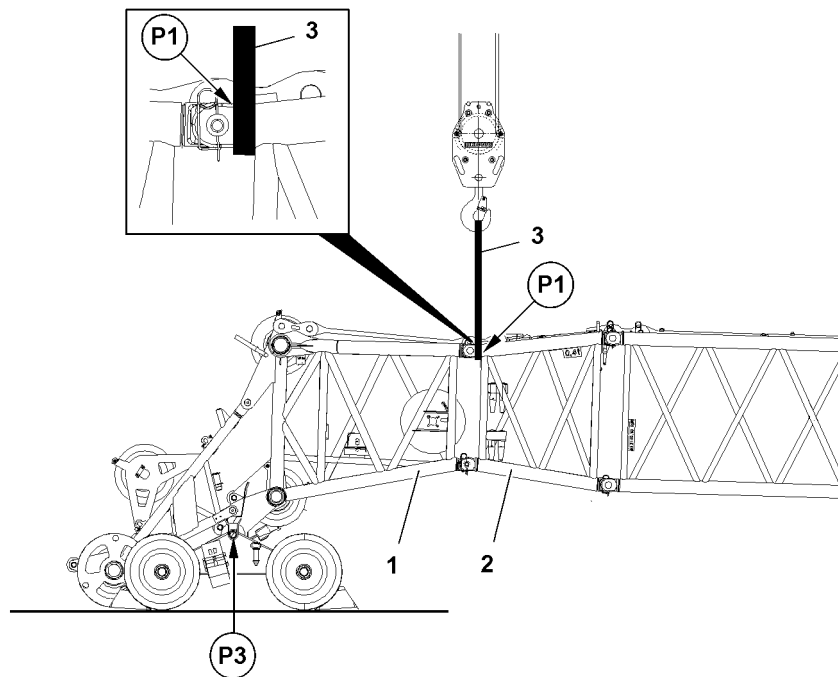


Fig.117842: Taking the lattice jib down into the roller cart (telescopic crane with lattice jib)

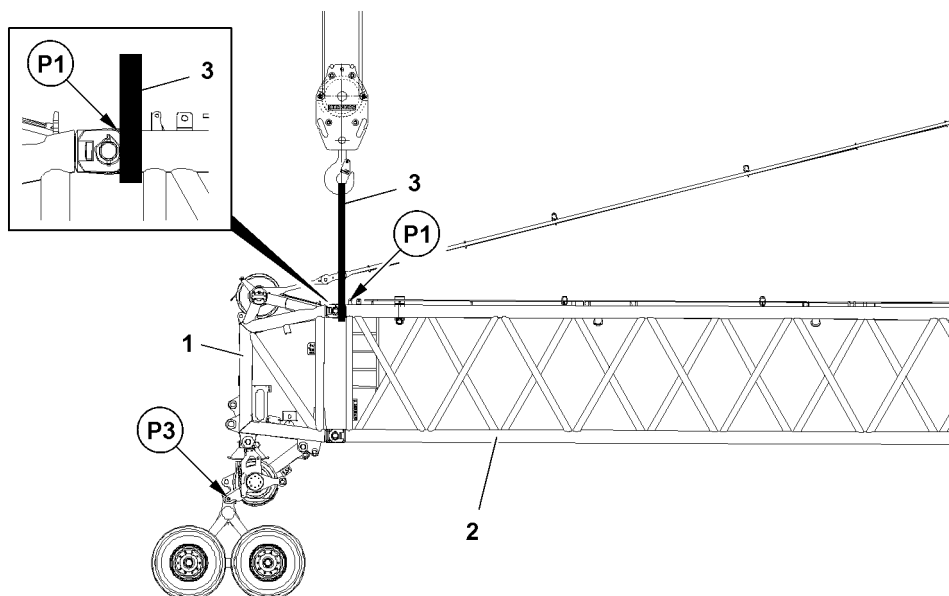


Fig.121550: Taking the lattice jib down into the roller cart (crane with lattice mast)

When taking it down into the roller cart, observe the following:

- The end section 1 is completely assembled.
- Use textile type fastening equipment 3.
- Loop the textile type fastening equipment 3 on the left and right around on the pin points.

Before fastening:

- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment 3 on the upper pin points P1 between the end section 1 and the pinned components 2.
- ▶ Lift the lattice jib and take it down in the roller cart 4.
- ▶ Pin the end section 1 with the roller cart 4 on the pin points P3 on the left and right.
- ▶ Remove the textile type fastening equipment 3.

**Note**

- ▶ The disassembly and removal of the pulley cart 4 is handled accordingly.

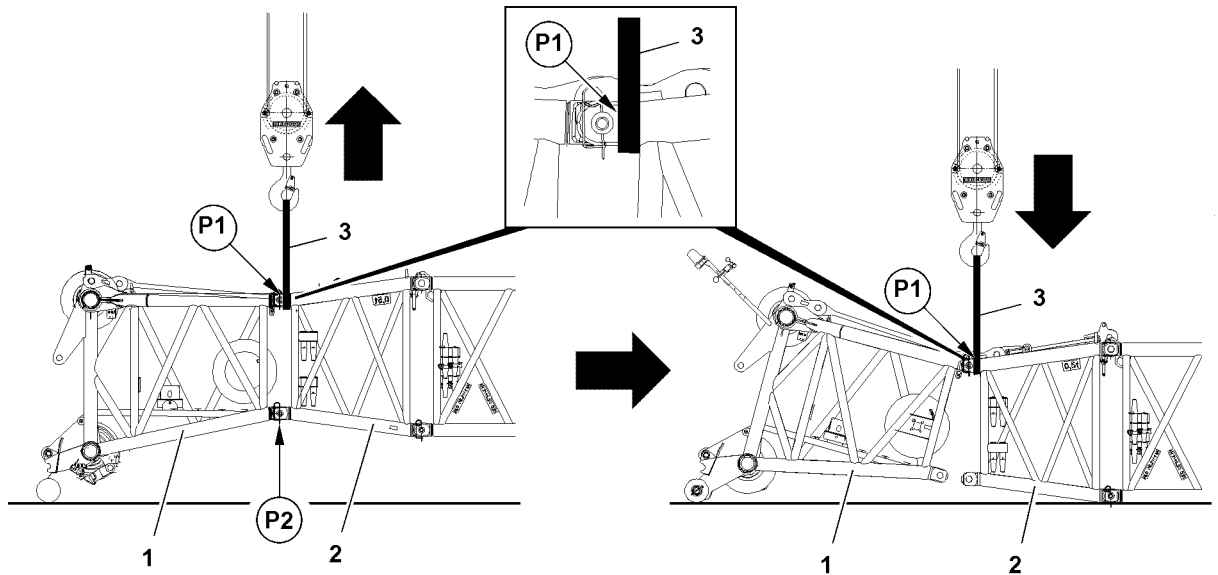
16.10.3 Opening the end section

Fig.117841: Opening the end section

For opening the end section, observe the following:

- The roller cart is disassembled and removed.
- Use textile type fastening equipment 3.
- Loop the textile type fastening equipment 3 on the left and right around on the pin points.

Before fastening:

- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment 3 on the upper pin points P1 between the end section 1 and the pinned components 2.
- ▶ Lift the lattice jib and relieve the pins on the lower pin points P2.
- ▶ Unpin the end section 1 and components 2 on the lower pin points P2 on the left and right.
- ▶ Take the lattice jib down onto the ground.
- ▶ Remove the textile type fastening equipment 3.

16.10.4 Holding the luffing lattice jib

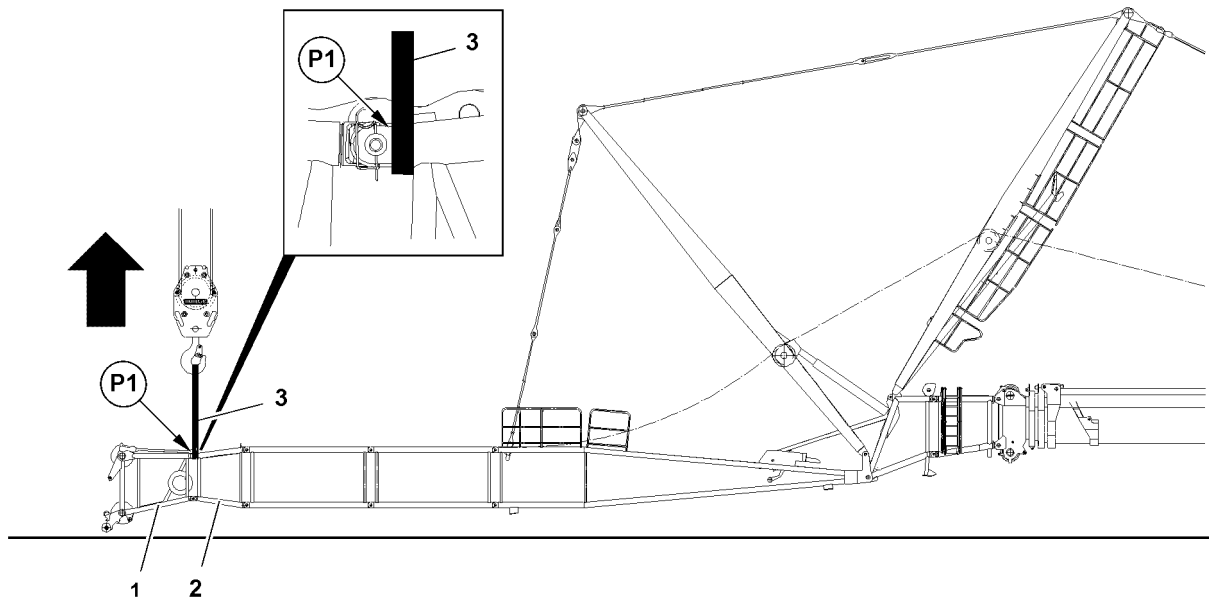


Fig. 117843: Holding the luffing lattice jib

To be able to install or remove the guy rods and "flying assembly", the luffing lattice jib must be held on the upper pin points **P1**.

When holding the luffing lattice jib, observe the following:

- The lattice jib has been completely assembled.
- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.

Before fastening:

- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment **3** on the upper pin points **P1** between the end section **1** and the pinned components **2**.
- ▶ Lift the lattice jib and install the guy rods.

When the guy rods are installed:

- ▶ Remove the textile type fastening equipment **3**.



Note

- ▶ The removal of the guy rods is handled accordingly.

16.10.5 Assembling the fixed lattice jib on the TF-adapter



WARNING

Mortal danger if the lattice jib tilts over!

Due to unfavorable center of gravity, only certain lattice jib lengths can be installed / removed as an assembled lattice jib.

If a lattice jib length cannot be installed / removed as an assembled lattice jib, then they must be installed / removed individually in flying mode.

- ▶ Check if the respective lattice jib length can be installed / removed as an assembled lattice jib. See charts in chapter 5.01.10.

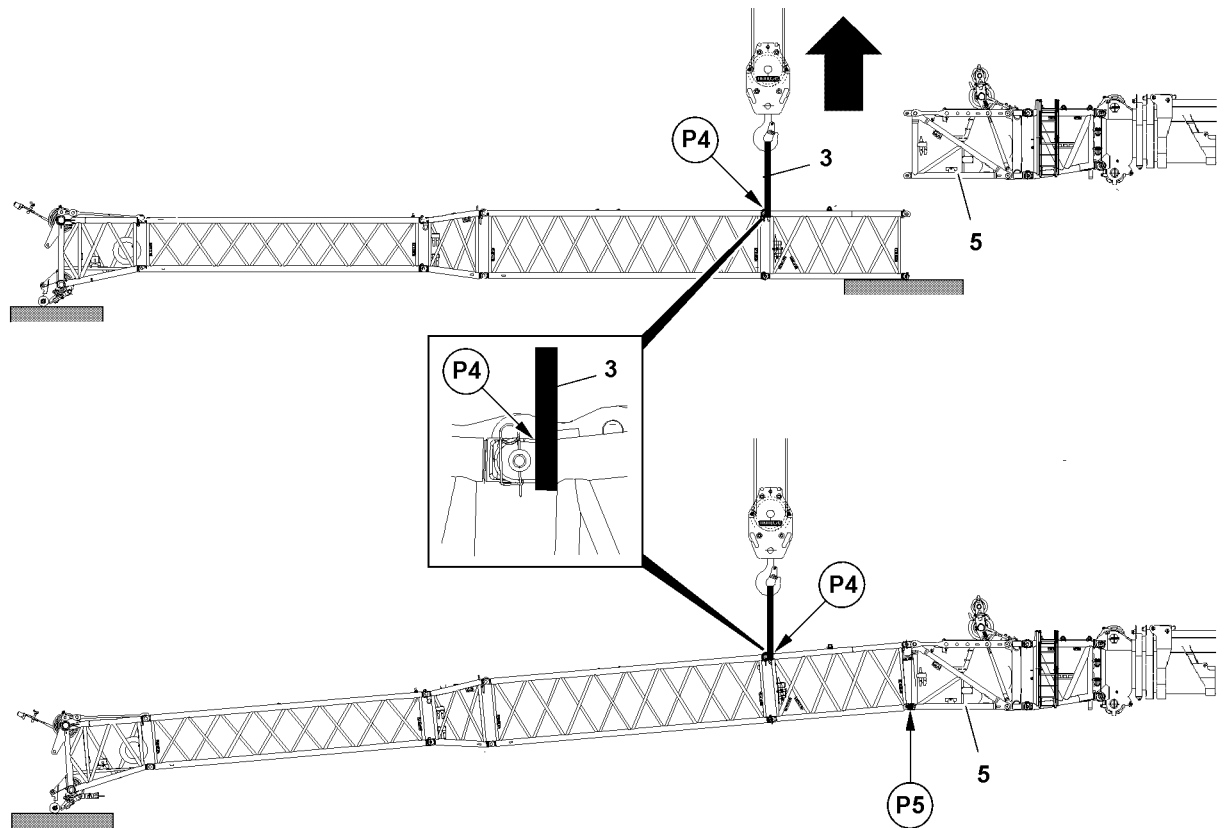


Fig.117844: Assembling the lattice jib on the TF-adapter

For installation on the TF-adapter, observe the following:

- The lattice jib has been assembled.
- The TF-adapter **5** is assembled.
- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.

Before fastening:

- ▶ Check the position of the spring retainers and correct, if necessary.

Fasten between the lattice sections, which are installed directly on the TF-adapter.

- ▶ Fasten the textile type fastening equipment **3** on the upper pin points **P4**.
- ▶ Lift the lattice jib and affix on the lower pin point **P5** on the TF-adapter **5**.
- ▶ Pin the lattice jib on the lower pin point **P5** with the TF-adapter **5**.

After pinning:

- ▶ Remove the textile type fastening equipment **3**.



WARNING

Mortal danger if the lattice jib tilts over!

- ▶ Make sure to always observe the permissible lattice jib length at disassembly.
- ▶ Disassemble accordingly.

16.10.6 Closing the fixed lattice jib

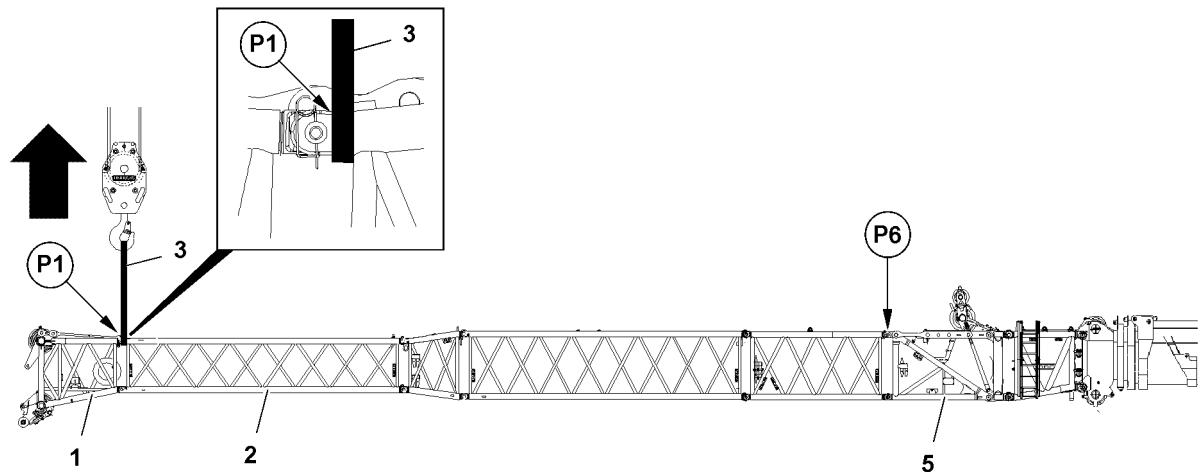


Fig.117850: Closing the lattice jib

For installation on the TF-adapter, observe the following:

- The lattice jib is pinned on the lower pin points of the TF-adapter 5.
- Use textile type fastening equipment 3.
- Loop the textile type fastening equipment 3 on the left and right around on the pin points.

Before fastening:

- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment 3 on the upper pin points P1 between the end section 1 and the pinned components 2.
- ▶ Lift the lattice jib and affix on the upper pin point P6 on the TF-adapter 5.
- ▶ Pin the lattice jib on the upper pin point P6 with the TF-adapter 5.

After pinning:

- ▶ Remove the textile type fastening equipment 3.



Note

- ▶ Disassemble accordingly.

16.10.7 Angle adjustment on the fixed lattice jib with mechanical adjustment

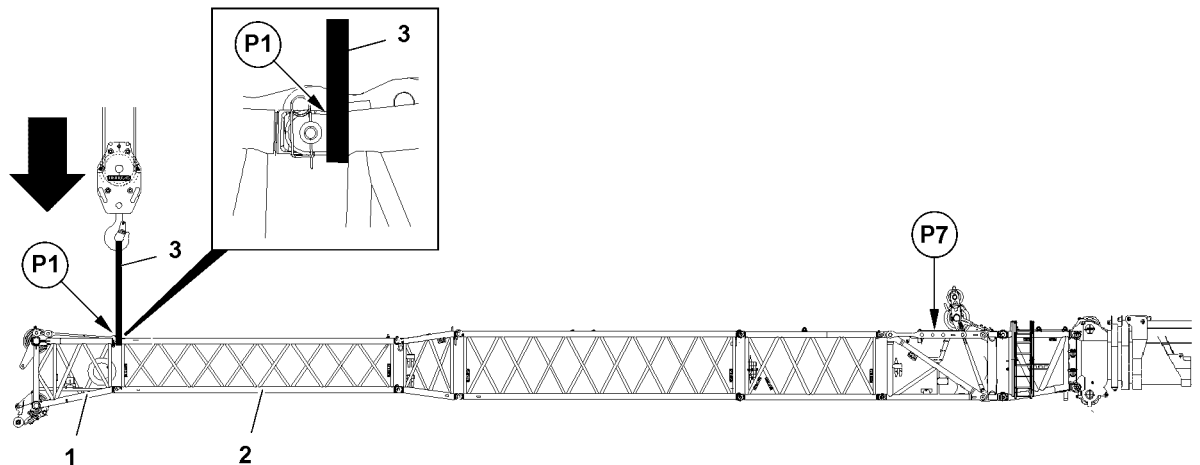


Fig.117851: Angle adjustment on the fixed lattice jib

For the angle adjustment on the fixed lattice jib, observe the following:

- The lattice jib has been completely assembled.
- Use textile type fastening equipment 3.
- Loop the textile type fastening equipment 3 on the left and right around on the pin points.

Before fastening:

- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment 3 on the upper pin points P1 between the end section 1 and the pinned components 2.
- ▶ Lift the lattice jib and relieve the pins on the angle adjustment P7.
- ▶ Unpin the angle adjustment P7, see chapter 5.03.
- ▶ Set and pin a New angle on the angle adjustment P7, see chapter 5.03.
- ▶ Lower the lattice jib.

After lowering:

- ▶ Remove the textile type fastening equipment 3.

16.10.8 Loading the preassembled lattice jib

For loading the lattice jib, observe the following:

- The lattice jib has been preassembled.
- Use textile type fastening equipment.
- Loop the textile type fastening equipment on the left and right around on the pin points.

Before fastening:

- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the preassembled lattice jib according to the fastening points, chapter 5.03.

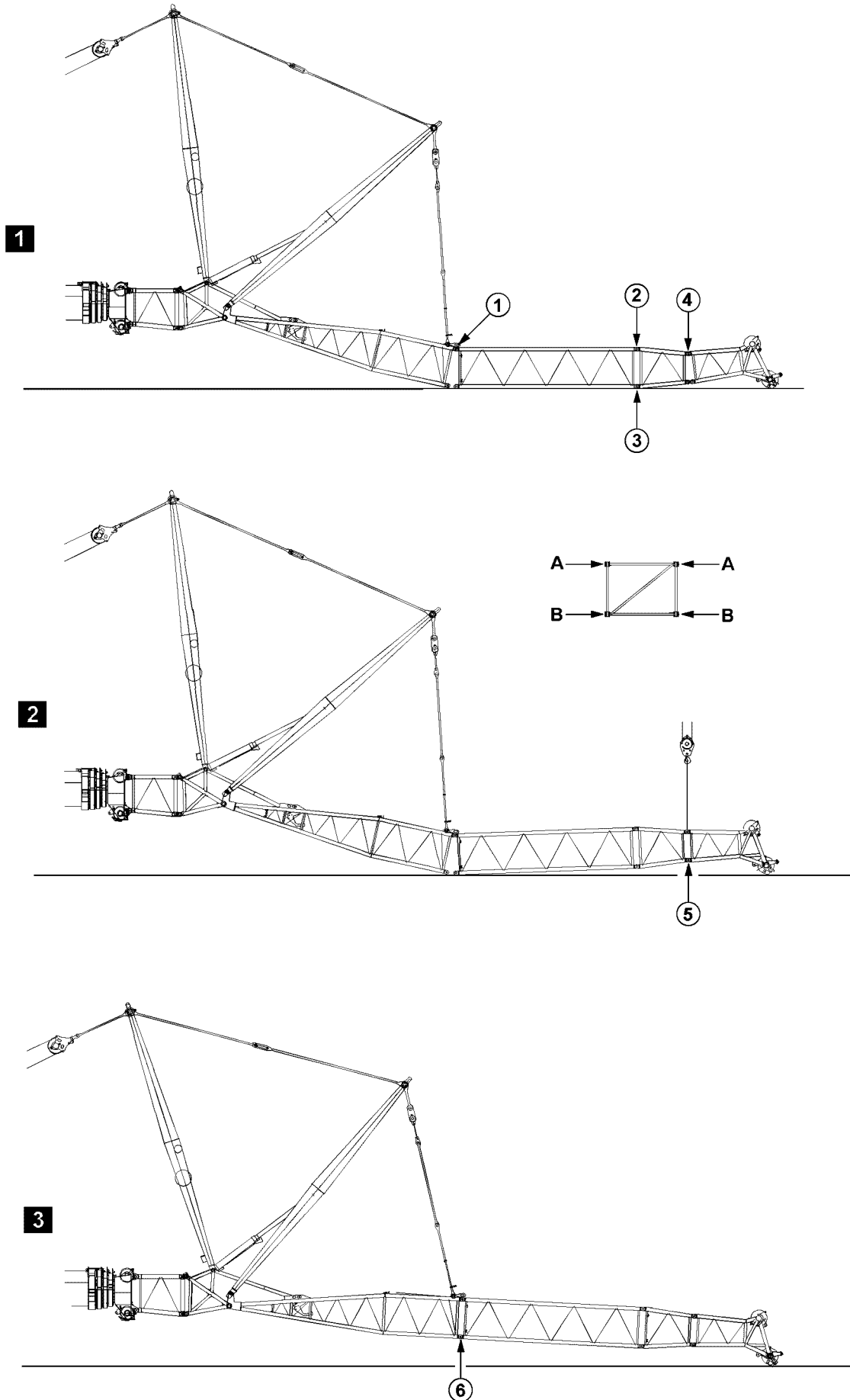


Fig.197718: Example of cranes with a telescopic boom

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16.11 Assembling / disassembling the lattice sections on telescopic cranes with a luffing lattice jib

16.11.1 Assembling the lattice sections on a luffing lattice jib

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

Danger of fatal injury when assembling auxiliary booms!

If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

▶ Pins must be pinned in the order specified.

- ▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin and secure pins at both sides (level **A**) at point **2**, illustration 1.
- ▶ Pin and secure pins at both sides (level **B**) at point **3**, illustration 1.
- ▶ Pin and secure pins at both sides (level **A**) at point **4**, illustration 1.
- ▶ Close the end section with the auxiliary crane, illustration 2.
- ▶ Pin and secure pins at both sides (level **B**) at point **5**, illustration 2.
- ▶ Lift the lattice sections, illustration 3.
- ▶ Pin and secure pins at both sides (level **B**) at point **6**, illustration 3.

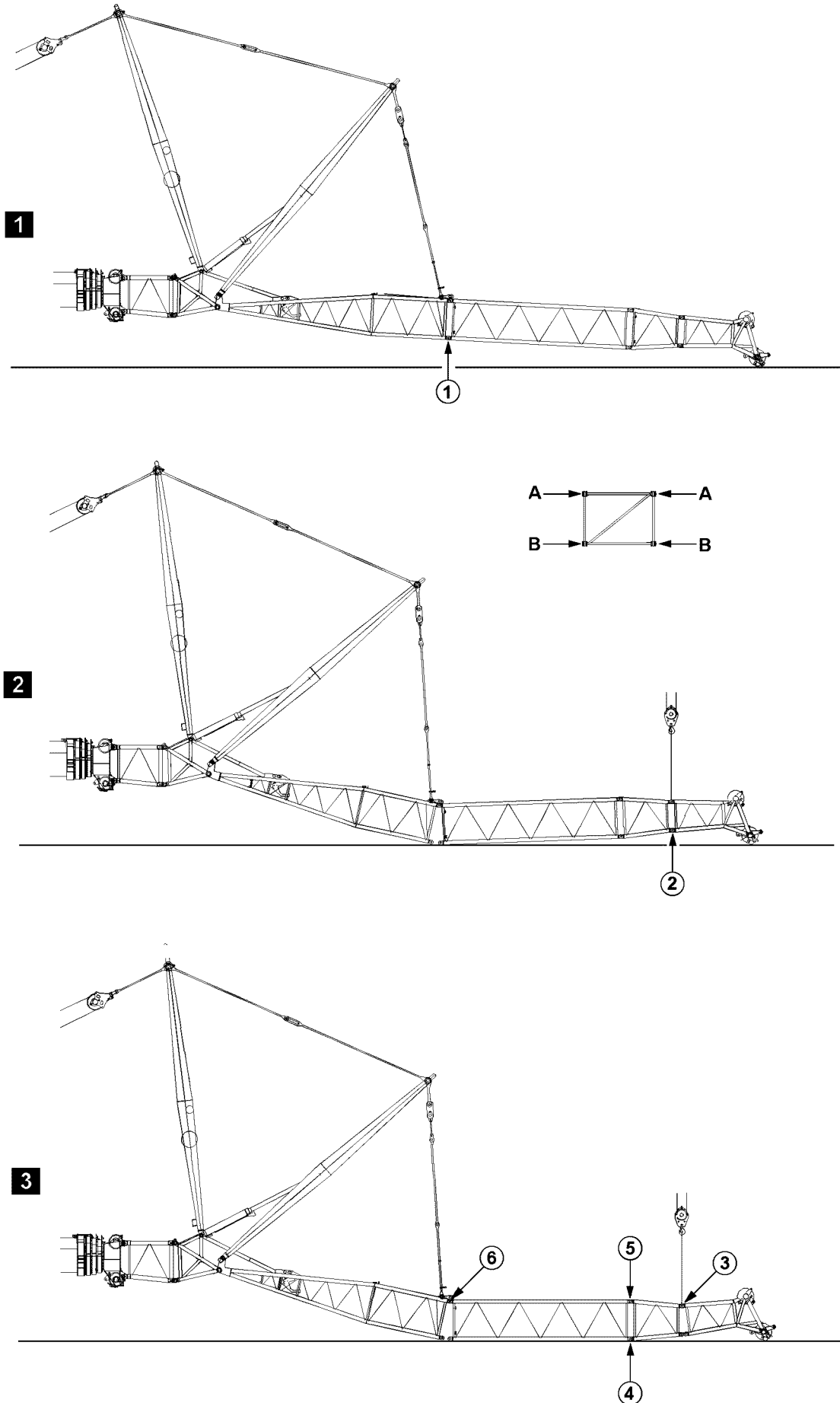


Fig.197719: Example of cranes with a telescopic boom

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16.11.2 Disassembling the lattice sections on a luffing lattice jib

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

Danger of fatal injury when disassembling auxiliary booms!

If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

▶ Pins must be unpinned in the specified order.

- ▶ Luff the boom down until the end section touches the ground slightly, illustration 1.
- ▶ Guy the boom with NA-frame I, illustration 1.
- ▶ Release and unpin the pins on both sides (level **B**) at point 1, illustration 1.
- ▶ Open the boom with the NA-frame I and completely take down the boom, illustration 2.
- ▶ Lift the end section with the auxiliary crane, illustration 2.
- ▶ Release and unpin the pins on both sides (level **B**) at point 2, illustration 2.
- ▶ Release and unpin the pins on both sides (level **A**) at point 3, illustration 3.
- ▶ Release and unpin the pins on both sides (level **B**) at point 4, illustration 3.
- ▶ Release and unpin the pins on both sides (level **A**) at point 5, illustration 3.
- ▶ Release and unpin the pins on both sides (level **A**) at point 6, illustration 3.

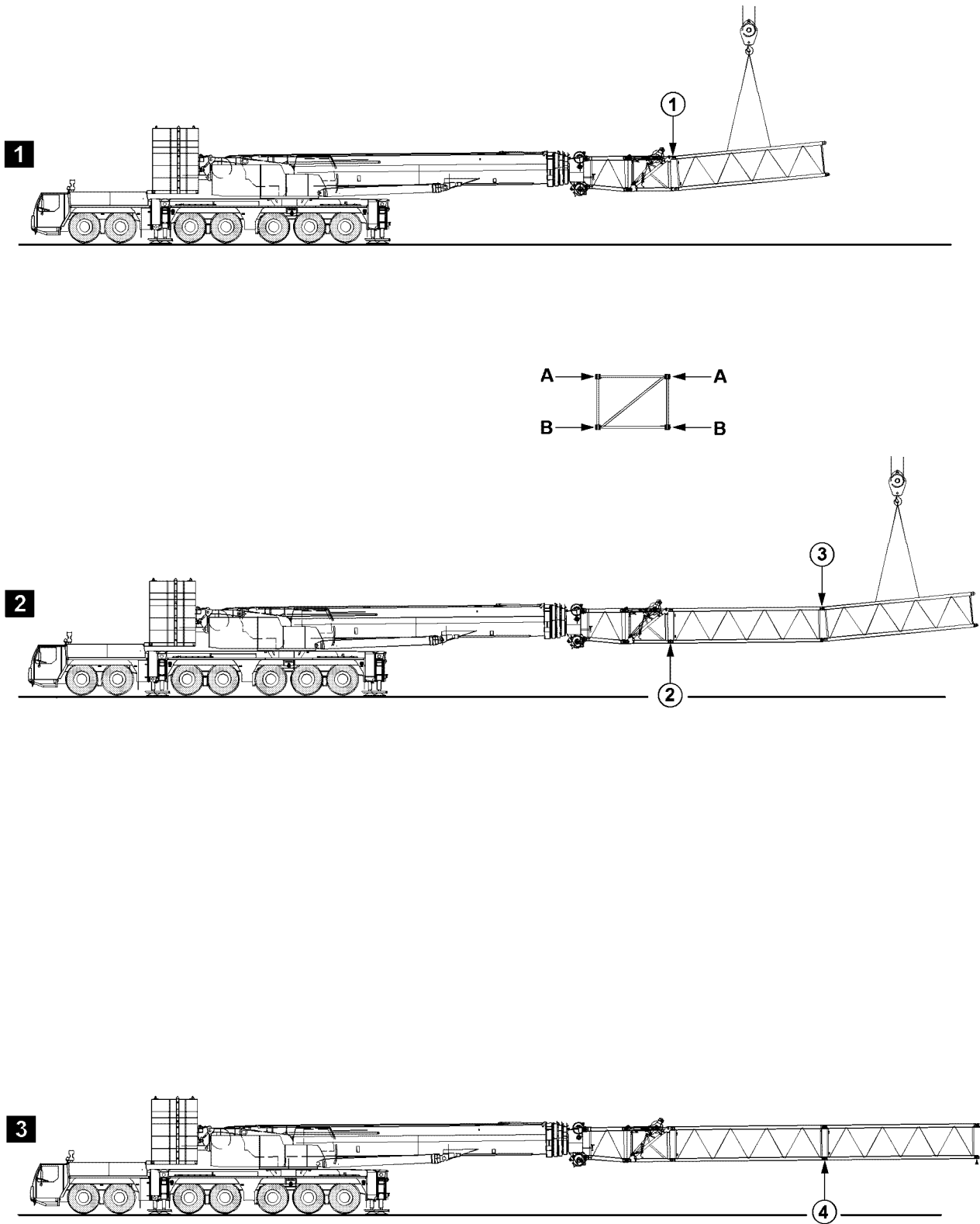


Fig.197705: Example of cranes with a telescopic boom

16.12 Assembling / disassembling the lattice sections on telescopic cranes with an auxiliary boom, with an auxiliary crane

16.12.1 Assembling the lattice sections on an auxiliary boom with an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

Danger of fatal injury when assembling auxiliary booms!

If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

▶ Pins must be pinned in the order specified.

- ▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin and secure pins at both sides (level **B**) at point **2**, illustration 2.
- ▶ Pin and secure pins at both sides (level **A**) at point **3**, illustration 2.
- ▶ Pin and secure pins at both sides (level **B**) at point **4**, illustration 3.

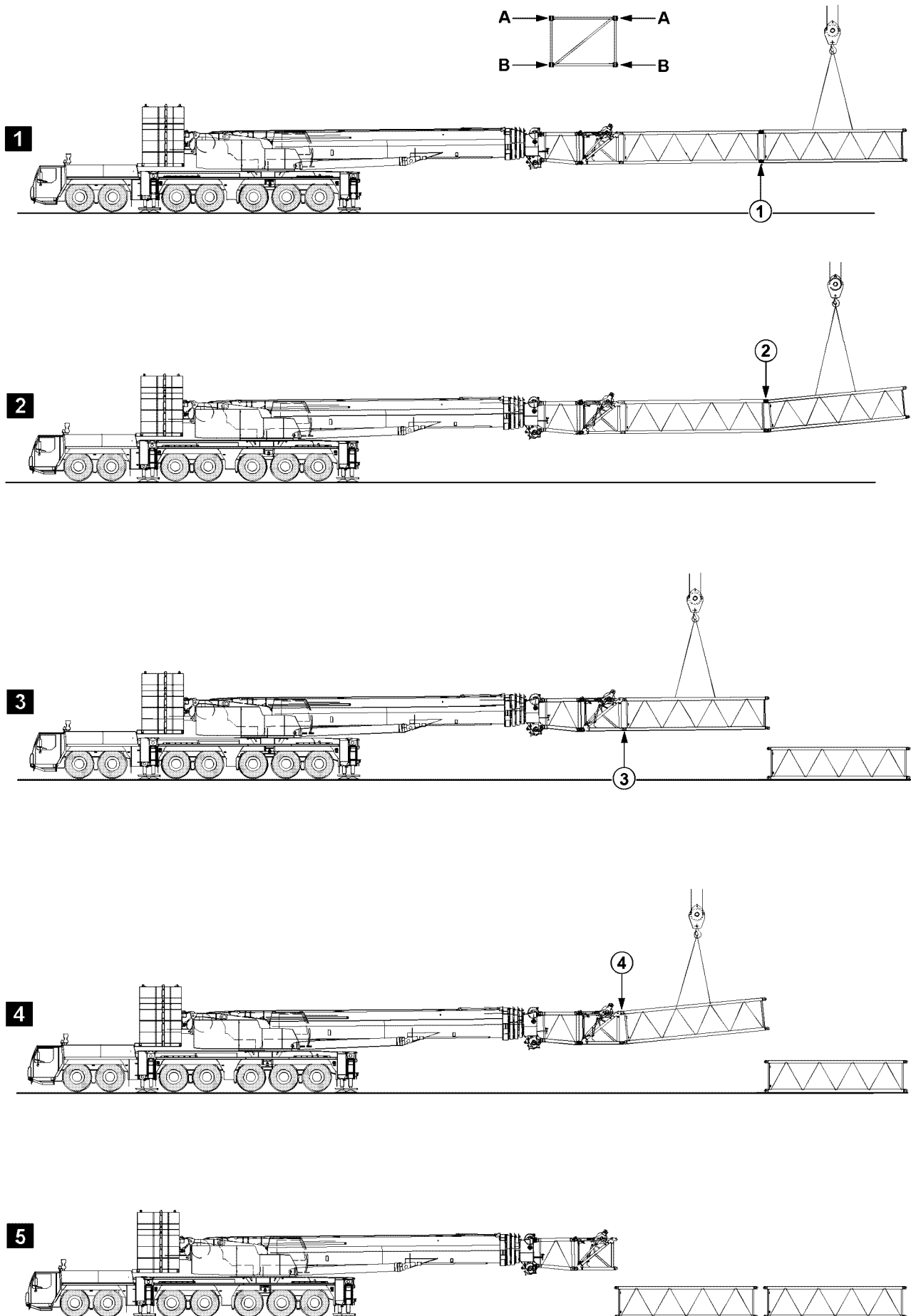


Fig.105510: Example of cranes with a telescopic boom

16.12.2 Disassembling the lattice sections on an auxiliary boom with an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

Danger of fatal injury when disassembling auxiliary booms!

If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

▶ Pins must be unpinned in the specified order.

- ▶ Release and unpin the pins on both sides (level **B**) at point **1**, illustration **1**.
- ▶ Release and unpin the pins on both sides (level **A**) at point **2**, illustration **2**.
- ▶ Release and unpin the pins on both sides (level **B**) at point **3**, illustration **3**.
- ▶ Release and unpin the pins on both sides (level **A**) at point **4**, illustration **4**.

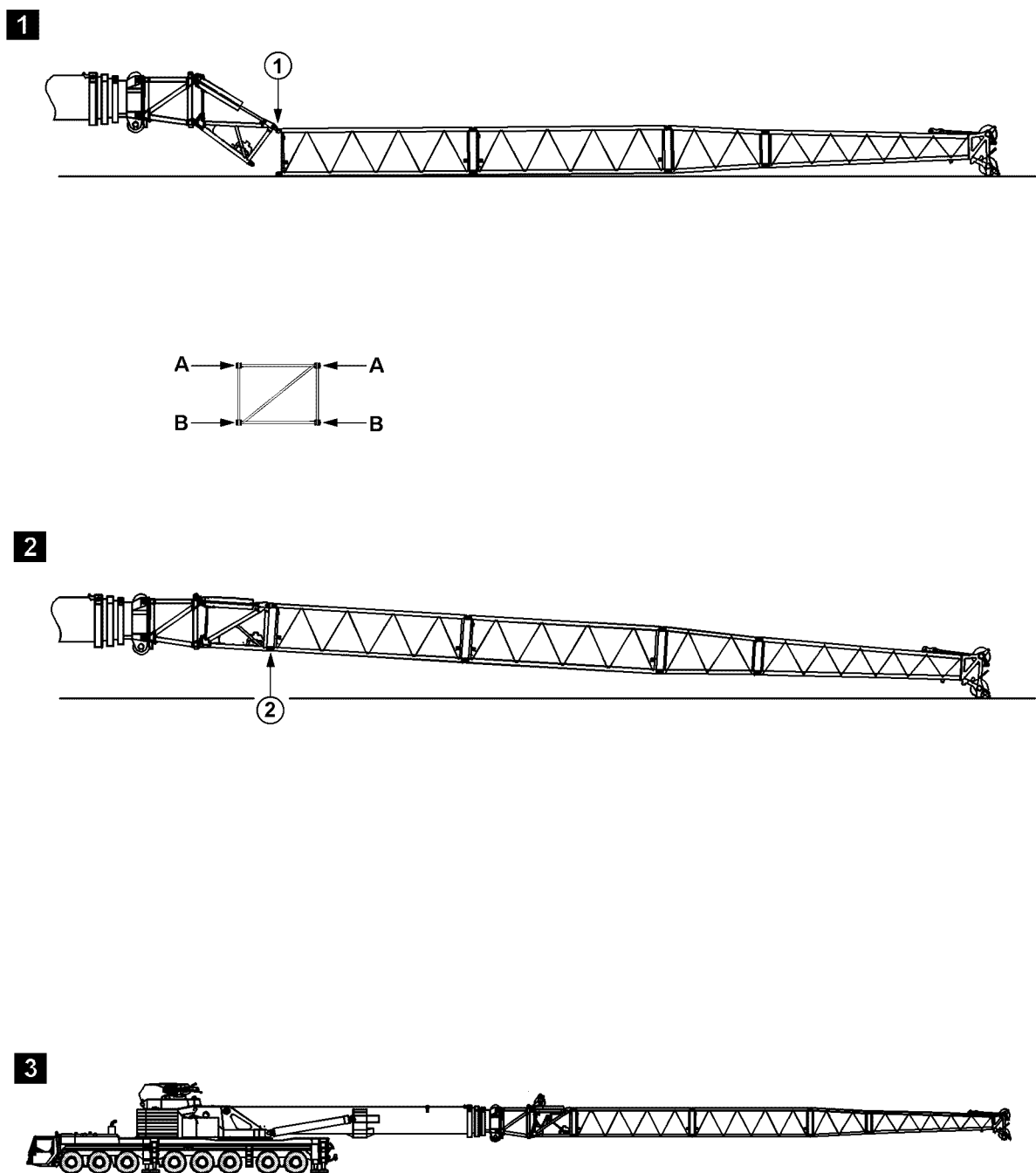


Fig.197712: Example of cranes with a telescopic boom

16.13 Assembling / disassembling the lattice sections on telescopic cranes with an auxiliary boom, without an auxiliary crane

16.13.1 Assembling the lattice sections on an auxiliary boom without an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

Danger of fatal injury when assembling auxiliary booms!

If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

▶ Pins must be pinned in the order specified.

For cranes with hydraulic angle adjustment and self-supporting auxiliary boom, the assembly / disassembly of additional lattice sections may be performed using the crane itself.

In order to do so, proceed as follows.

- ▶ Assemble the lattice sections to the required length.
- ▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Close the auxiliary boom until the pins can be pinned at point **2**, illustration 2.
- ▶ Pin and secure pins at both sides (level **B**) at point **2**, illustration 2.

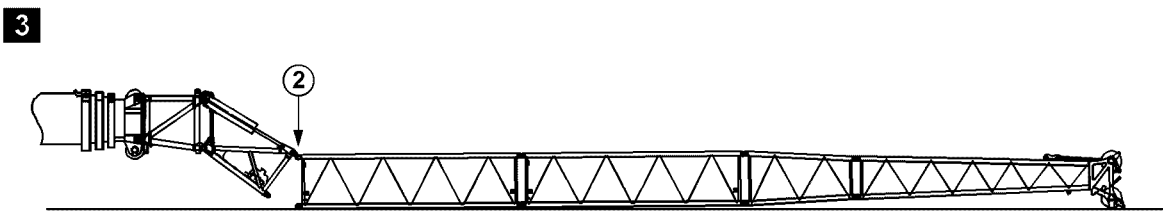
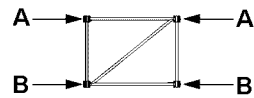
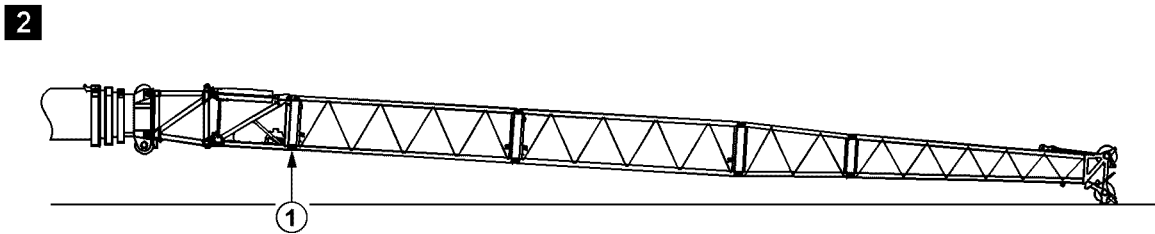
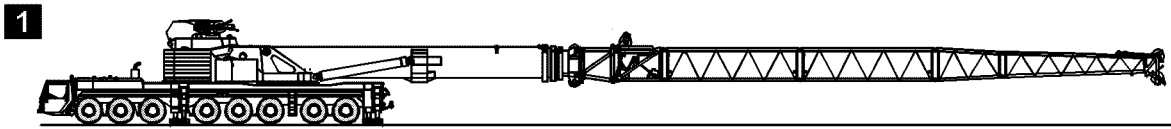


Fig.197713: Example of cranes with a telescopic boom

16.13.2 Disassembling the lattice sections on an auxiliary boom without an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

Danger of fatal injury when disassembling auxiliary booms!

If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

- ▶ Pins must be unpinned in the specified order.

For cranes with hydraulic angle adjustment and self-supporting auxiliary boom, the assembly / disassembly of additional lattice sections may be performed using the crane itself.

In order to do so, proceed as follows.

NOTICE

Damage of hydraulic cylinders on the TF-adapter!

- ▶ As soon as the lattice jib is placed, stop the luff down movement.
- ▶ It is prohibited to set down the fixed lattice jib „hard“.

-
- ▶ Luff the main boom down until the end section touches the ground slightly, illustration 2.

If it is not possible to luff down that far:

- ▶ Adjust the TF-adapter until the end section touches the ground slightly, illustration 2.
- ▶ Release and unpin the pins on both sides (level **B**) at point 1, illustration 2.

NOTICE

Damage of hydraulic cylinders on the TF-adapter.

- ▶ As soon as the lattice jib is placed, stop the opening movement.

-
- ▶ Open the auxiliary boom until the lattice sections to be removed are laying completely on the ground, illustration 3.
 - ▶ Release and unpin the pins on both sides (level **A**) at point 2, illustration 3.
 - ▶ Completely remove the auxiliary boom.

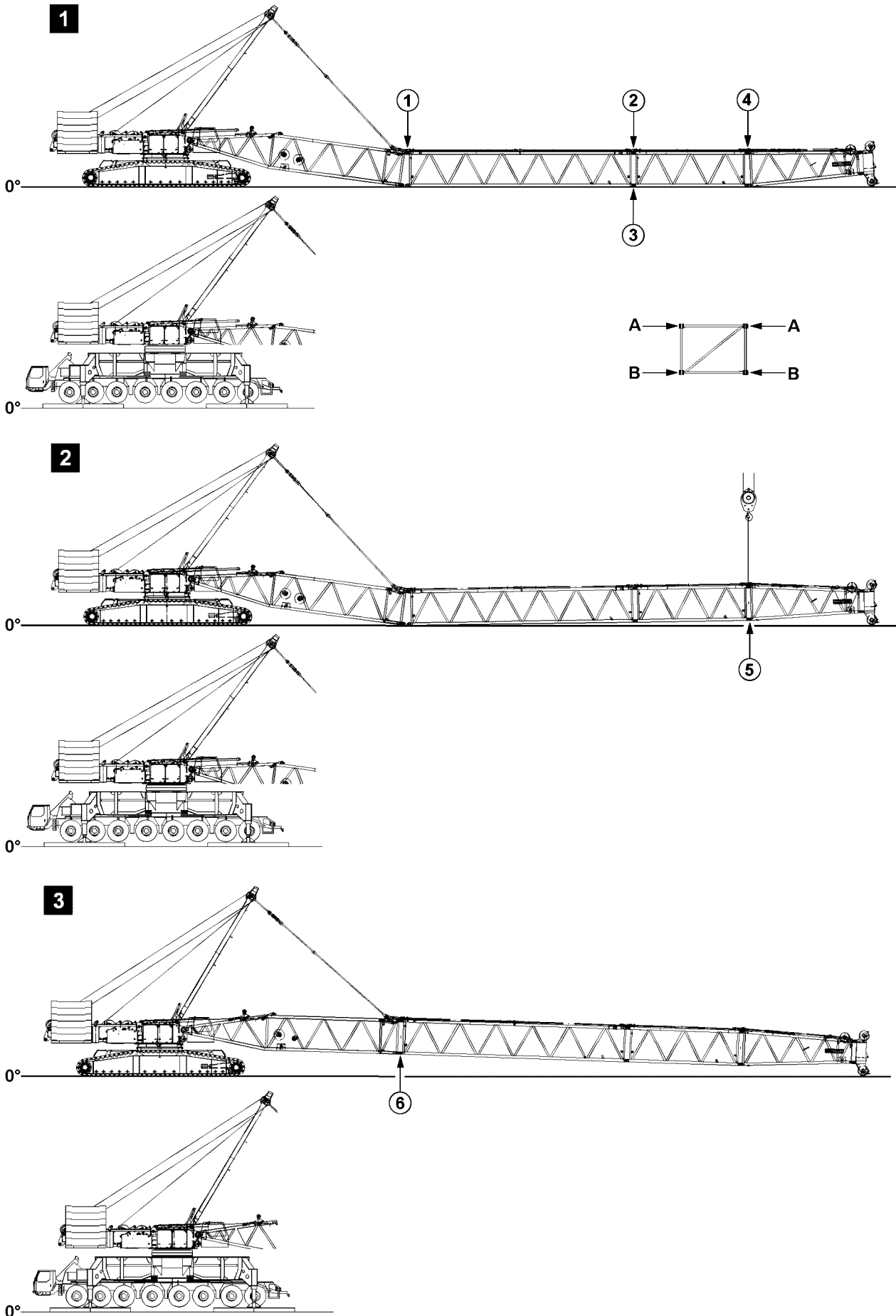


Fig.121633: Example of cranes with a lattice mast boom

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16.14 Assembling / disassembling of lattice sections for lattice mast cranes

16.14.1 Assembling lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

Danger of fatal injury when assembling booms!

If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

▶ Pins must be pinned in the order specified.

- ▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin and secure pins at both sides (level **A**) at point **2**, illustration 1.
- ▶ Pin and secure pins at both sides (level **B**) at point **3**, illustration 1.
- ▶ Pin and secure pins at both sides (level **A**) at point **4**, illustration 1.
- ▶ Lift the end section with the auxiliary crane, illustration 2.
- ▶ Pin and secure pins at both sides (level **B**) at point **5**, illustration 2.
- ▶ Close the boom system with the SA-frame, illustration 3.
- ▶ Pin and secure pins at both sides (level **B**) at point **6**, illustration 3.

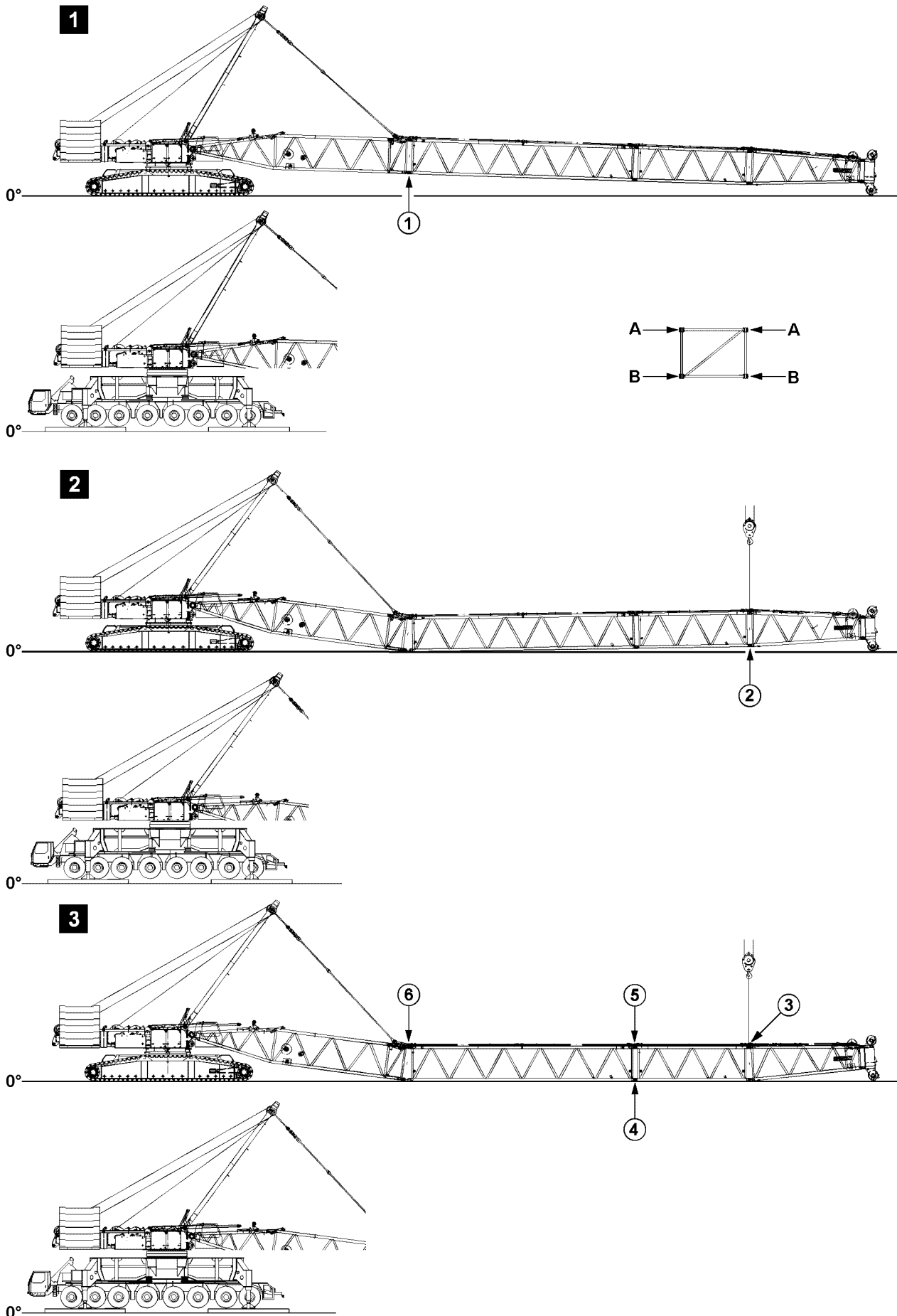


Fig.121634: Example of cranes with a lattice mast boom

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16.14.2 Disassembling lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

Danger of fatal injury when disassembling booms!

If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the SA-frame guying is tensioned before the pins are unpinned in point **1**, see illustration **1**.
 - ▶ Pins must be unpinned in the specified order.
-
- ▶ Luff the boom down until the end section touches the ground slightly, illustration **1**.
 - ▶ Guy the boom with SA-frame, illustration **1**.
 - ▶ Release and unpin the pins on both sides (level **B**) at point **1**, illustration **1**.
 - ▶ Open the boom system with the SA-frame, illustration **2**.
 - ▶ Take the lattice sections down completely, illustration **2**.
 - ▶ Lift the end section with the auxiliary crane, illustration **2**.
 - ▶ Release and unpin the pins on both sides (level **B**) at point **2**, illustration **2**.
 - ▶ Release and unpin the pins on both sides (level **A**) at point **3**, illustration **3**.
 - ▶ Release and unpin the pins on both sides (level **B**) at point **4**, illustration **3**.
 - ▶ Release and unpin the pins on both sides (level **A**) at point **5**, illustration **3**.
 - ▶ Release and unpin the pins on both sides (level **A**) at point **6**, illustration **3**.

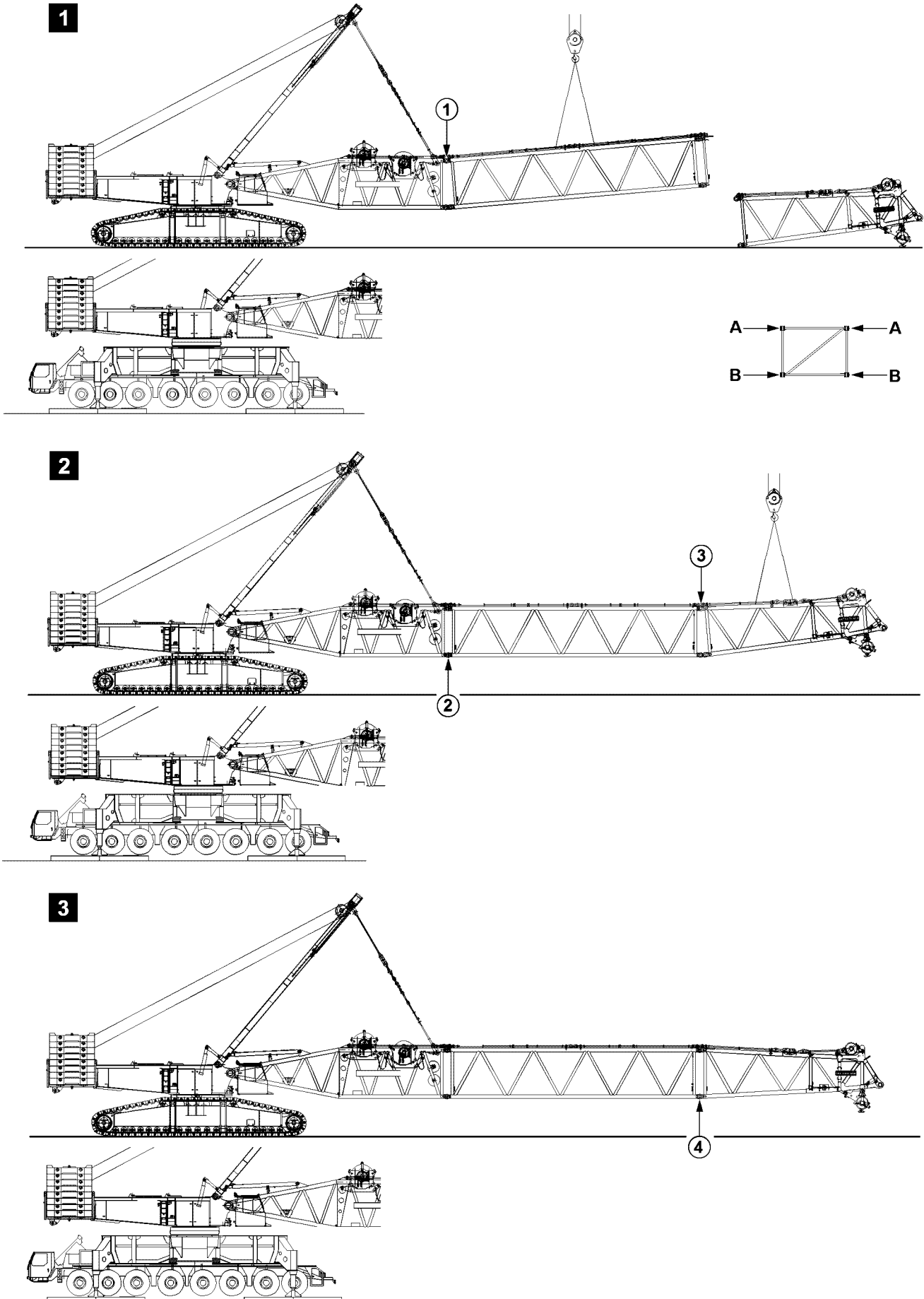


Fig.198182: Example of cranes with a lattice mast boom

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16.15 Flying assembly / disassembly of lattice sections

16.15.1 Flying assembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

Danger of fatal injury when assembling booms!

If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

▶ Pins must be pinned in the order specified.

- ▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **B**) at point **2**, illustration **2**.
- ▶ Pin and secure pins at both sides (level **A**) at point **3**, illustration **2**.
- ▶ Pin and secure pins at both sides (level **B**) at point **4**, illustration **3**.

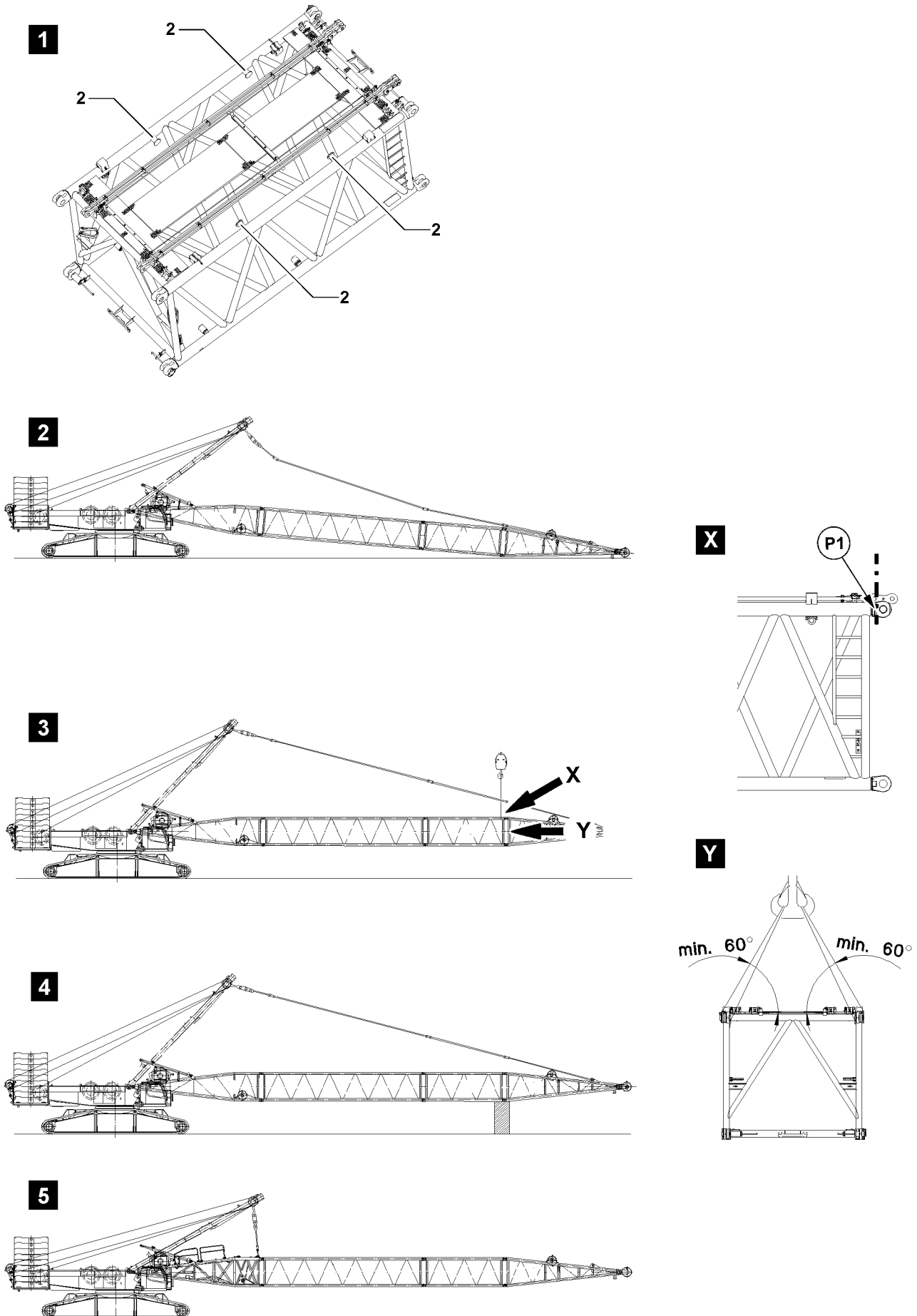


Fig.111448: Guying the pivot section with the SA-frame

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16.15.2 Flying disassembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

The flying disassembly of lattice sections can be used on:

- Derrick boom
- Main boom

Make sure that the following prerequisite is met:

- Before guying the pivot section, secure the boom properly to prevent it from falling down.

Guying the pivot section in flying mode with the SA-frame

There are three ways to change the guying point for flying disassembly:

- Take down the boom on the ground.
 - Secure the boom with the auxiliary crane.
 - Support the boom.
- ▶ Take down the boom on the ground, see illustration 2.
or



WARNING

Lattice section incorrectly attached!

If the fastening equipment is attached on the bits **2** when securing the boom, then the bits will be overloaded. The lattice section will be damaged.

The boom can fall down.

Death, severe bodily injuries, property damage.

If an auxiliary crane is used to secure the boom for flying disassembly:

- ▶ Do **not** fasten the lattice section on the 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 the lattice section and guyed fastening equipment is at least 60°, see detail **Y**.

Secure the boom with the auxiliary crane, see illustration 3.

or



WARNING

Falling boom!

If the boom is not properly and securely supported from below, then the boom can fall down.

- ▶ Support the boom properly and safely with suitable material.

Support the boom, see illustration 4.

Result:

- The guy rods can be disassembled.
- ▶ Take down, secure and disassemble the guy rods.
- ▶ Pin and secure the guy rods SA-frame on the pivot section.
- ▶ Tighten the guy rods SA-frame until the boom is in horizontal position.

Result:

- Pivot section is guyed in flying mode with the SA-frame, see illustration 5.
- The lattice sections can be disassembled in flying mode.

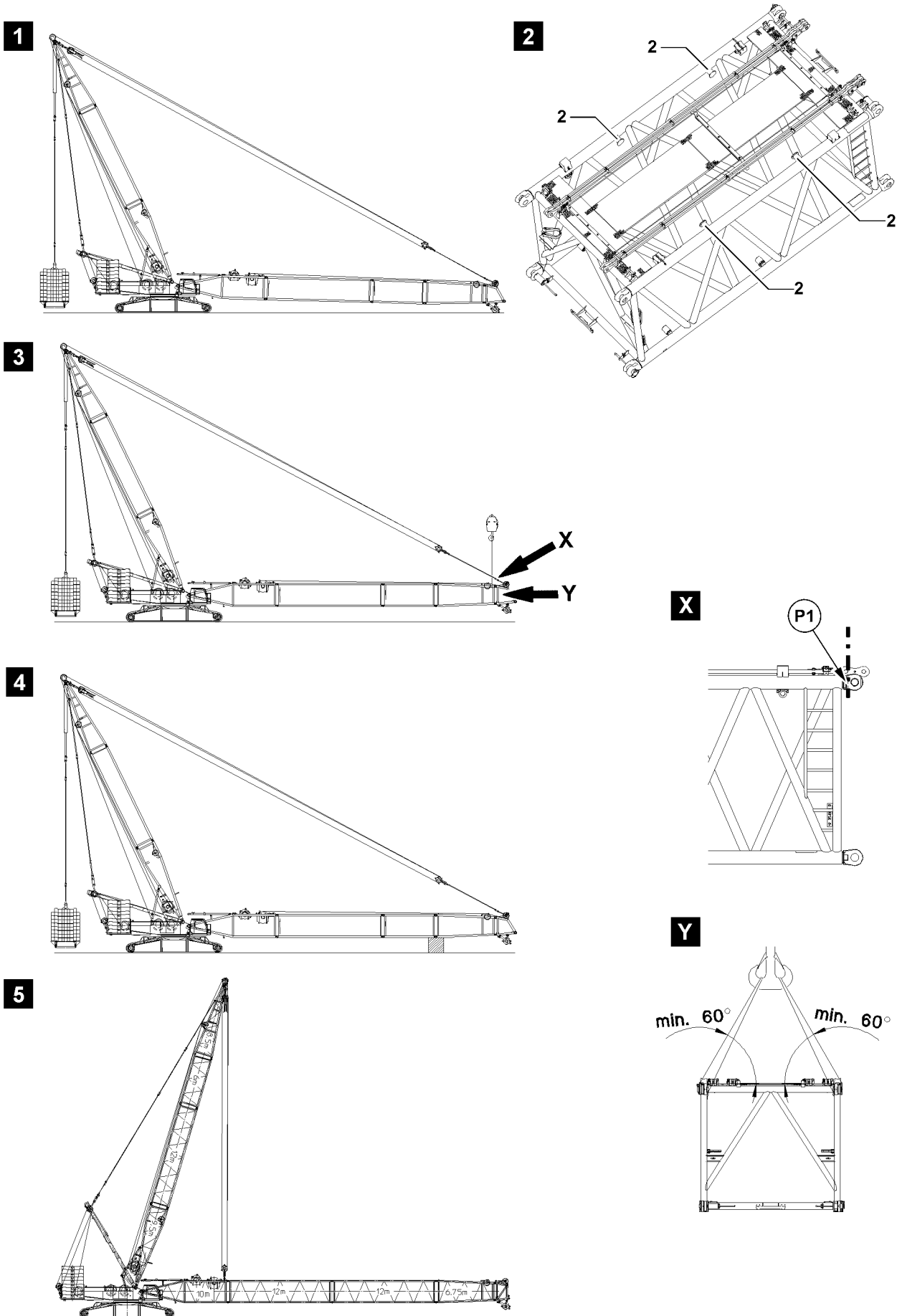


Fig.111449: Guying the pivot section with the derrick boom

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Guying the pivot section in flying mode with the derrick boom

There are three ways to change the guying point for flying disassembly:

- Take down the boom on the ground.
 - Secure the boom with the auxiliary crane.
 - Support the boom.
- ▶ Take down the boom on the ground, see illustration 1.
or



WARNING

Lattice section incorrectly attached!

If the fastening equipment is attached on the bits **2** when securing the boom, then the bits will be overloaded. The lattice section will be damaged.

The boom can fall down.

Death, severe bodily injuries, property damage.

If the auxiliary crane is used to secure the boom for flying disassembly:

- ▶ Do **not** fasten the lattice section on the 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 the lattice section and guyed fastening equipment is at least 60°, see detail **Y**.

Secure the boom with the auxiliary crane, see illustration 3.

or



WARNING

Falling boom!

If the boom is not properly supported from below, then the boom can fall down.

- ▶ Support the boom properly and safely with suitable material.

Support the boom, see illustration 4.

Result:

- The guy rods can be disassembled.
- ▶ Take down, secure and disassemble the guy rods.
- ▶ Pin and secure the luffing pulley block on the pivot section.
- ▶ Tighten the control rope until the boom is in horizontal position.

Result:

- Pivot section is guyed in flying mode with the derrick boom, see illustration 5.
- The lattice sections can be disassembled in flying mode.

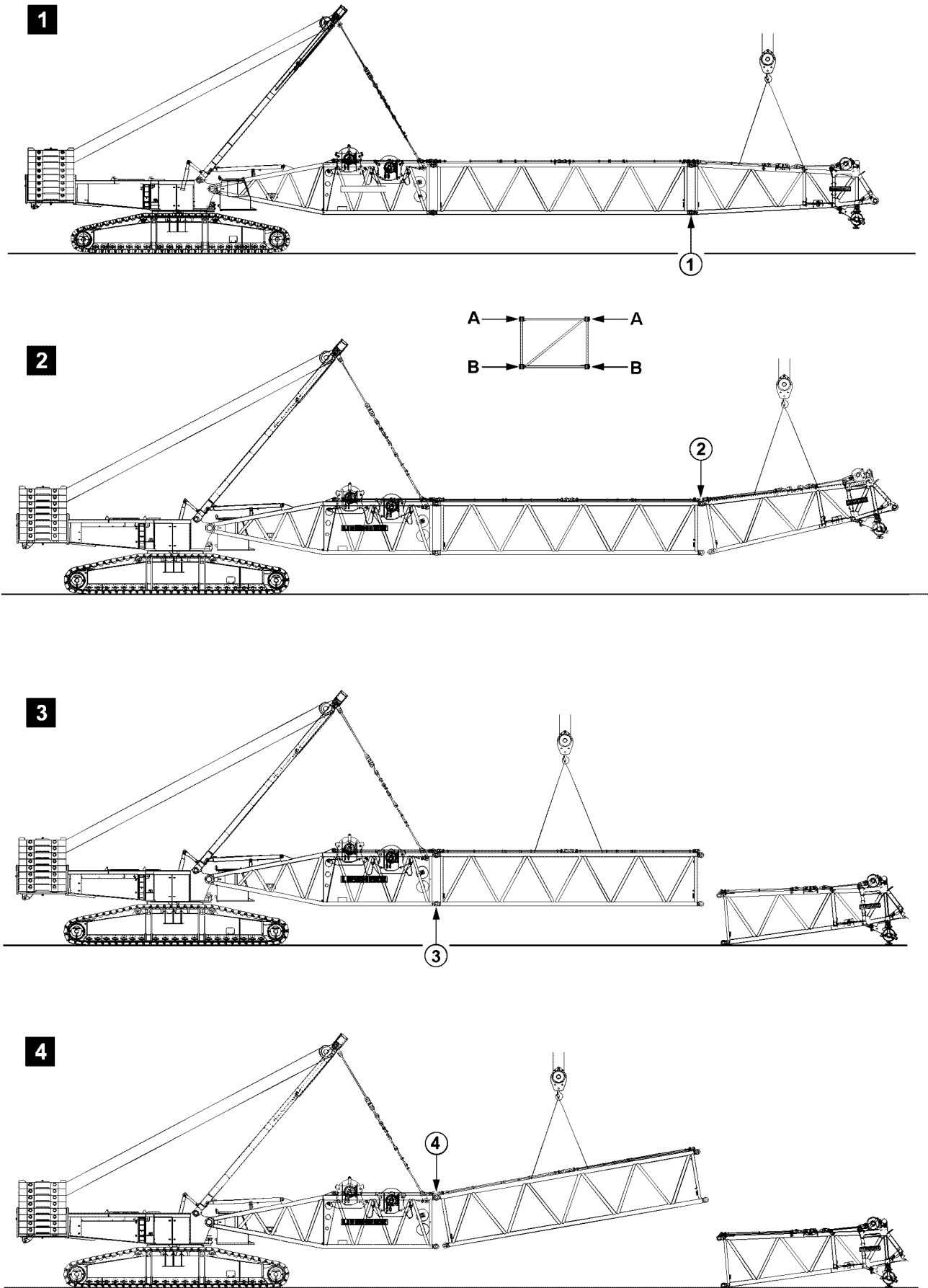


Fig.105511: Example of cranes with a lattice mast boom

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Unpinning the lattice components



WARNING

Danger of fatal injury when disassembling booms!

If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

► Pins must be unpinned in the specified order.

► Release and unpin the pins on both sides (level **B**) at point **1**, illustration 1.

► Release and unpin the pins on both sides (level **A**) at point **2**, illustration 2.

► Release and unpin the pins on both sides (level **B**) at point **3**, illustration 3.

► Release and unpin the pins on both sides (level **A**) at point **4**, illustration 4.

16.16 Assembling / disassembling of boom systems for supporting on ascending terrain (assembly / disassembly schematic)



Note

► The following assembly steps are simplified and are examples and may not match your crane exactly.



WARNING

Danger of fatal injury when assembling / disassembling booms!

If the pins are not pinned / unpinned in the specified sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

► Pin / unpin pins in the specified sequence, see section „Assembly of lattice sections“.

► Observe all safety technical notes in section „Assembly / disassembly“.

► Make sure that there is no personnel in the danger zone.



WARNING

Horizontal movement of the boom!

► Make sure that there is no personnel in the danger zone.

16.16.1 Assembling the boom systems on ascending terrain

Make sure that the following prerequisites are met:

- An auxiliary crane with sufficient load bearing capacity is available.

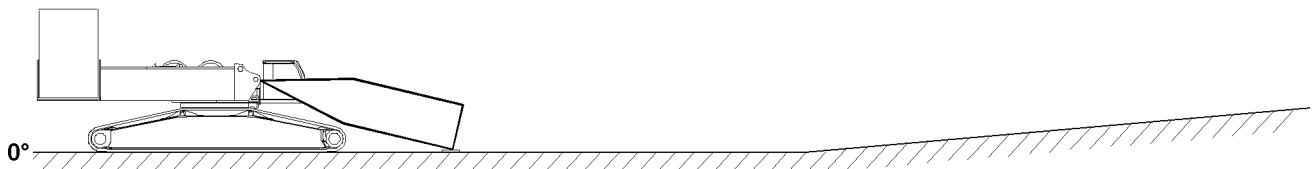


Fig. 121635: Boom - pivot section installed on the turntable and taken down on the ground

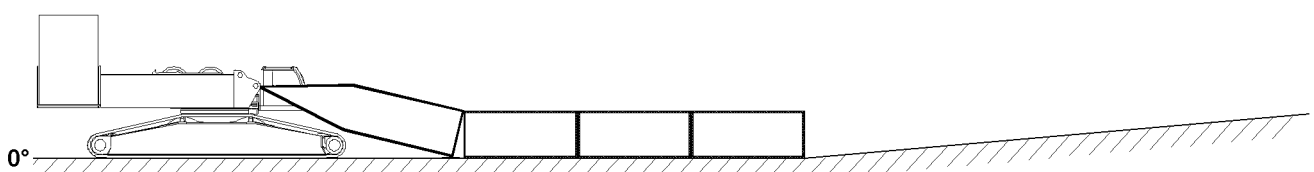


Fig. 121636: Boom - intermediate sections installed on the boom - pivot section and taken down on the ground

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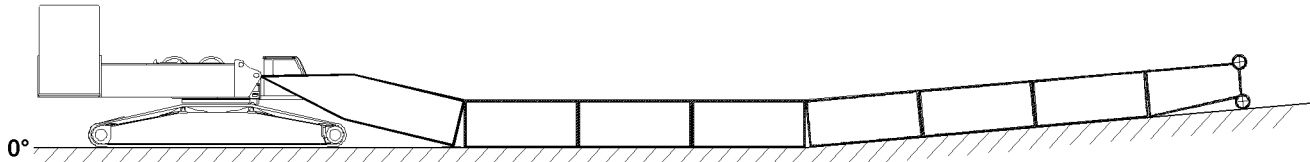


Fig.121637: Boom - intermediate sections installed and taken down on ascending terrain

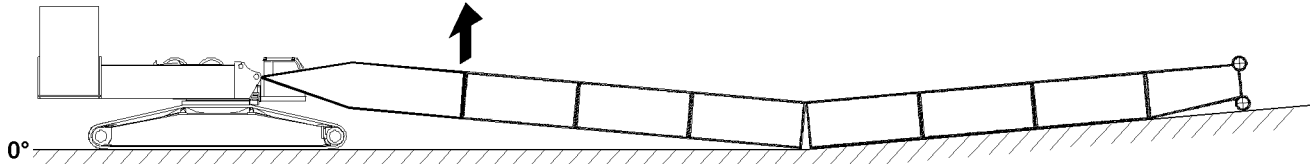


Fig.121638: Lifting and close the boom system in the area of the boom - pivot section

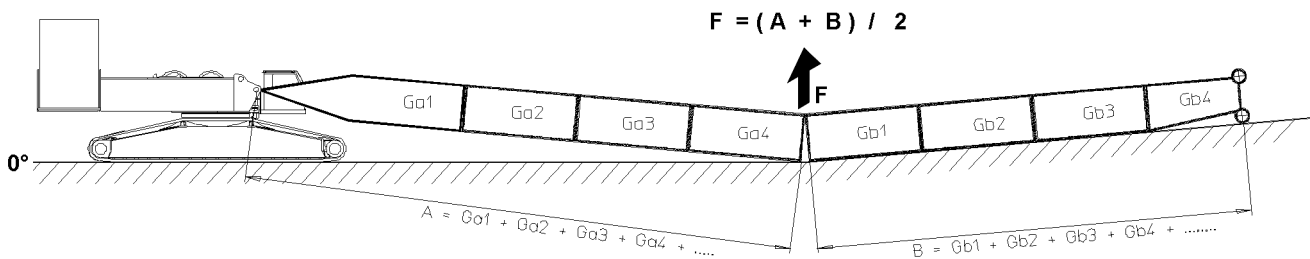


Fig.145512: Calculation of force for the closing procedure of the boom system



Note

- ▶ The abbreviations Ga1, Ga2, ... and Gb1, Gb2, ... are for the weights of the individual lattice sections.
- ▶ The weights of the lattice sections are noted on the welded on weight tags on the lattice sections.

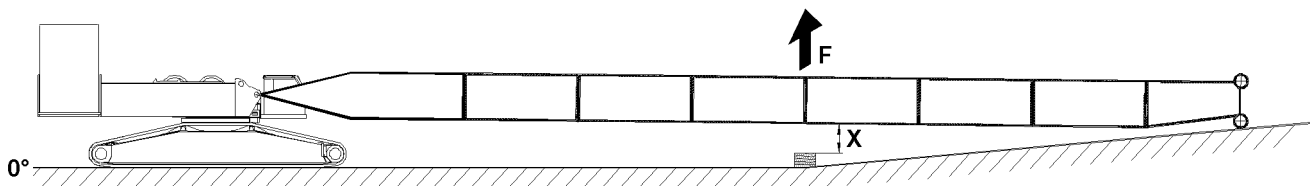


Fig.121639: Lifting and close the boom system // Support the boom system



Note

- ▶ The height of the substructure or the dimension X is noted on the respective boom assembly chapter, see chapter 5.38 or chapter 5.39.
- ▶ If the dimension X is not available in chapter 5.38 or chapter 5.39, see the separately supplied drawing „Support assembly drawing“.
- ▶ Support the boom system properly after the closing procedure.

16.16.2 Disassembling boom systems on ascending terrain

Make sure that the following prerequisites are met:

- An auxiliary crane with sufficient load bearing capacity is available.

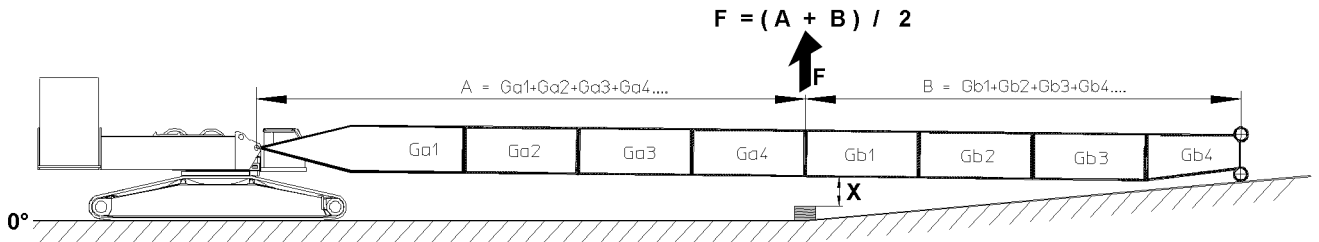


Fig. 145513: Calculation of force for opening the boom system // Lift the boom system // Remove the substructure // Open the boom system



Note

- ▶ The abbreviations Ga1, Ga2, ... and Gb1, Gb2, ... are for the weights of the individual lattice sections.
- ▶ The weights of the lattice sections are noted on the welded on weight tags on the lattice sections.

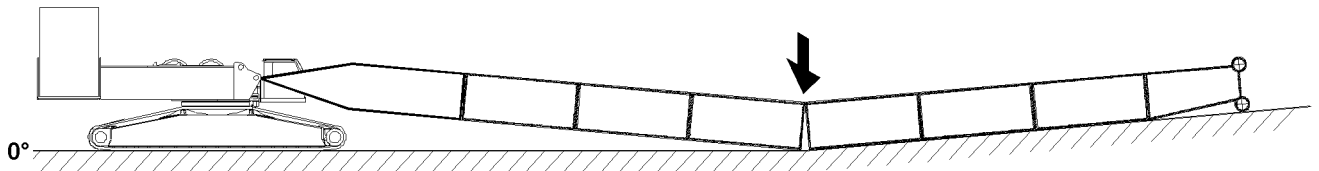


Fig. 121657: Taking the boom system down

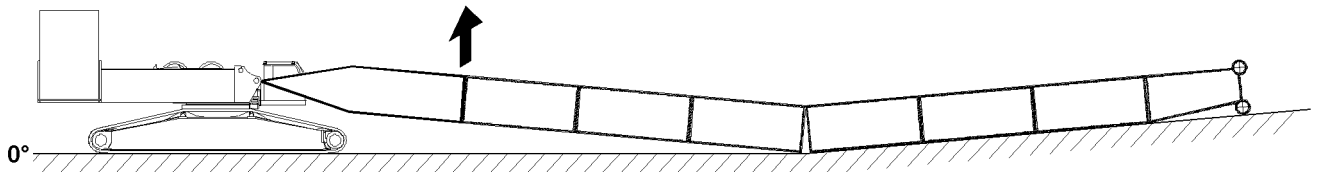


Fig. 121652: Lifting and opening the boom system

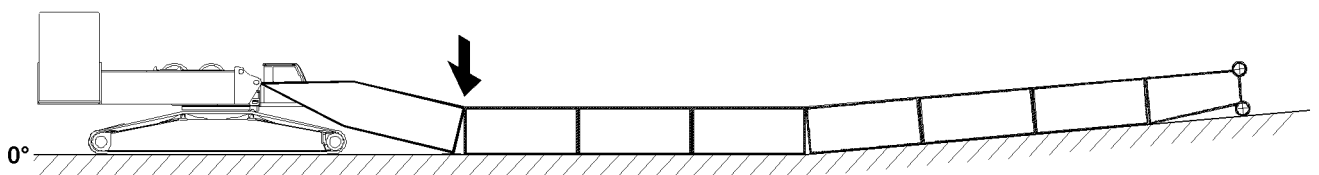


Fig. 121653: Taking the boom system down

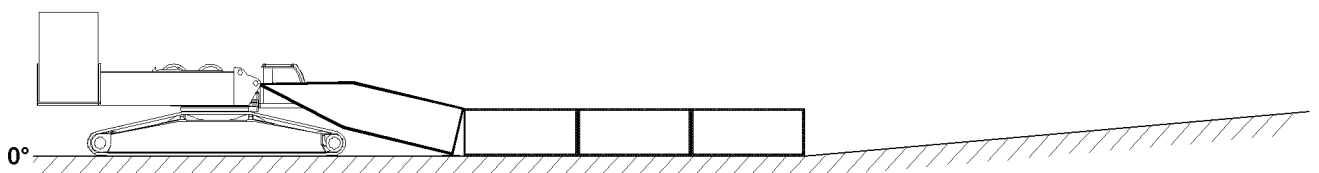


Fig. 121636: Disassembling and removing the boom - intermediate sections with the end section

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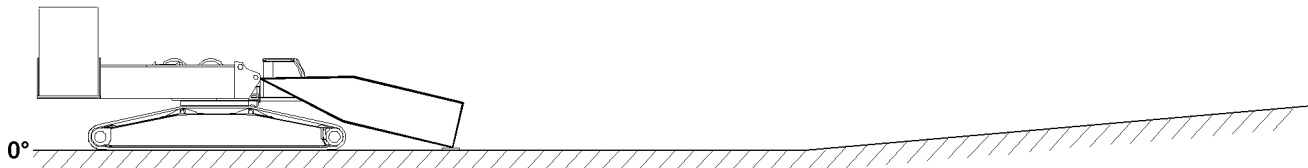


Fig. 121635: Disassembling and removing the boom - intermediate sections to the boom - pivot section

- ▶ Disassemble and remove the boom - pivot section.

16.17 Assembling / disassembling of boom systems for supporting on descending terrain (assembly / disassembly schematic)



Note

- ▶ The following assembly steps are simplified and are examples and may not match your crane exactly.



WARNING

Danger of fatal injury when assembling / disassembling booms!

If the pins are not pinned / unpinned in the specified sequence, then lattice sections may suddenly fold down or fall down.

Death, severe bodily injuries, property damage.

- ▶ Pin / unpin pins in the specified sequence, see section „Assembly of lattice sections“.
- ▶ Observe all safety technical notes in section „Assembly / disassembly“.
- ▶ Make sure that there is no personnel in the danger zone.

16.17.1 Assembling the boom systems on descending terrain

Make sure that the following prerequisites are met:

- The lattice sections are properly assembled.
- An auxiliary crane with sufficient load bearing capacity is available.

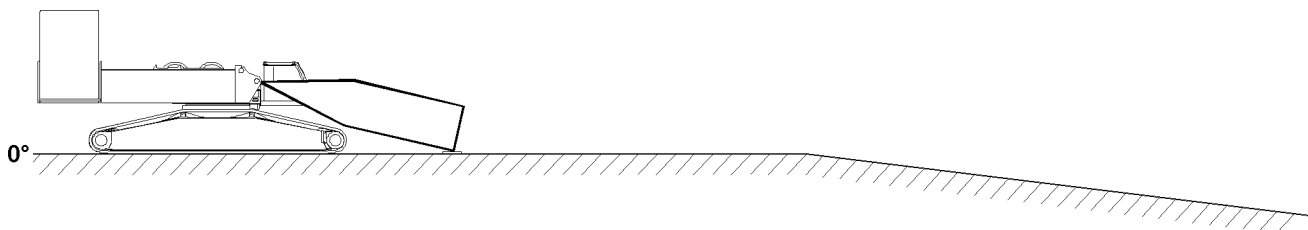


Fig. 121640: Boom - pivot section installed on the turntable and taken down on the ground

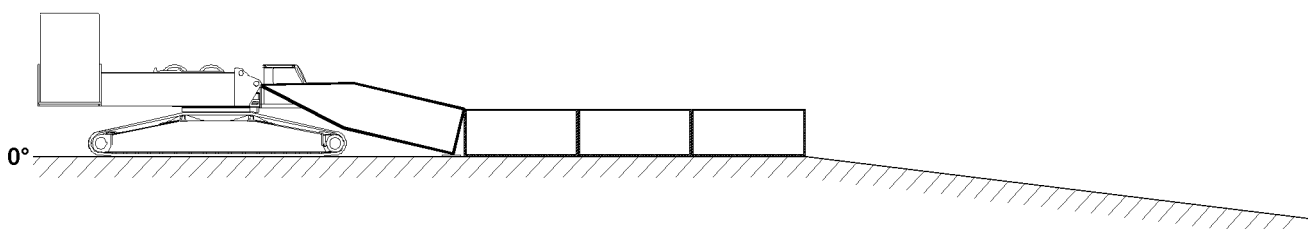


Fig. 121641: Boom - intermediate sections installed on the boom - pivot section and taken down on the ground

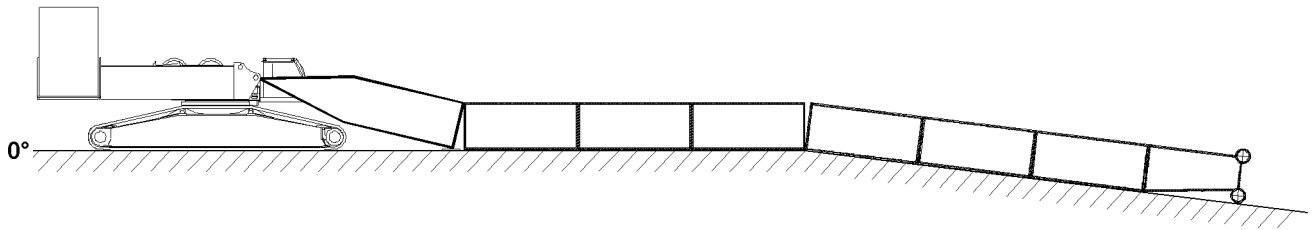


Fig.121642: Boom - intermediate sections installed and taken down on descending terrain

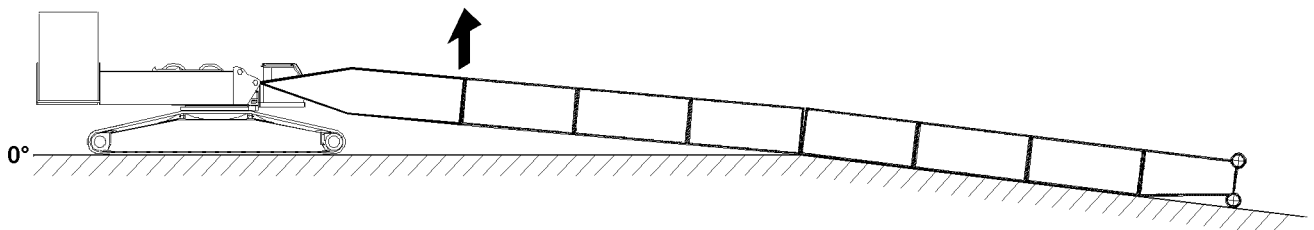


Fig.121643: Lifting and close the boom system in the area of the boom - pivot section

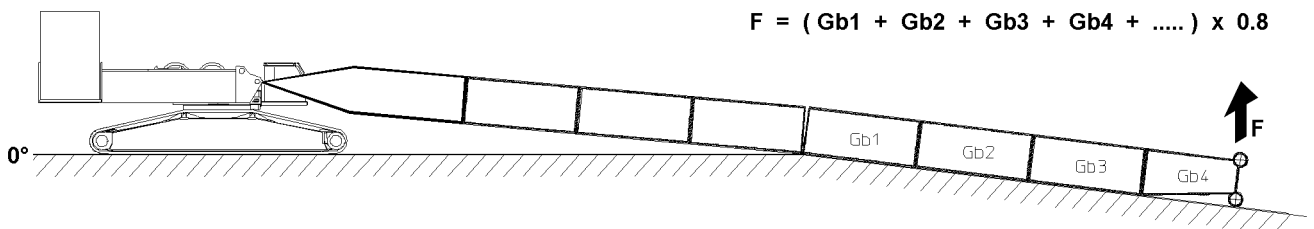


Fig.145514: Calculation of force for the closing procedure of the boom system



Note

- ▶ The abbreviations Gb1, Gb2, ... are for the weights of the individual lattice sections.
- ▶ The weights of the lattice sections are noted on the welded on weight tags on the lattice sections.

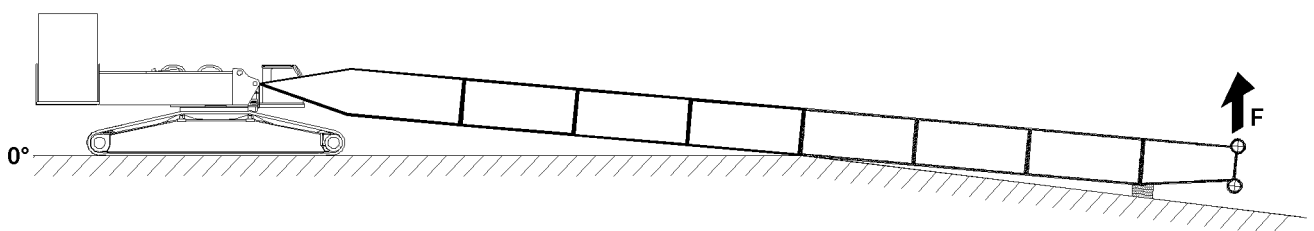


Fig.121644: Lifting and close the boom system // Support the boom system



Note

- ▶ The height of the substructure depends on the lay of the terrain and the resulting incline of the boom system.
- ▶ Support the boom system properly after the closing procedure.

16.17.2 Disassembling boom systems on descending terrain

Make sure that the following prerequisite is met:

- An auxiliary crane with sufficient load bearing capacity is available.

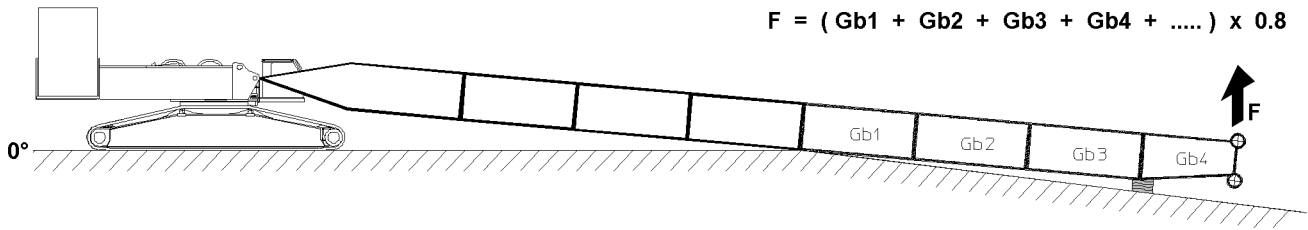


Fig.145515: Calculation of force for opening the boom system // Lift the boom system // Remove the substructure // Open the boom system



Note

- ▶ The abbreviations Gb1, Gb2, ... are for the weights of the individual lattice sections.
- ▶ The weights of the lattice sections are noted on the welded on weight tags on the lattice sections.

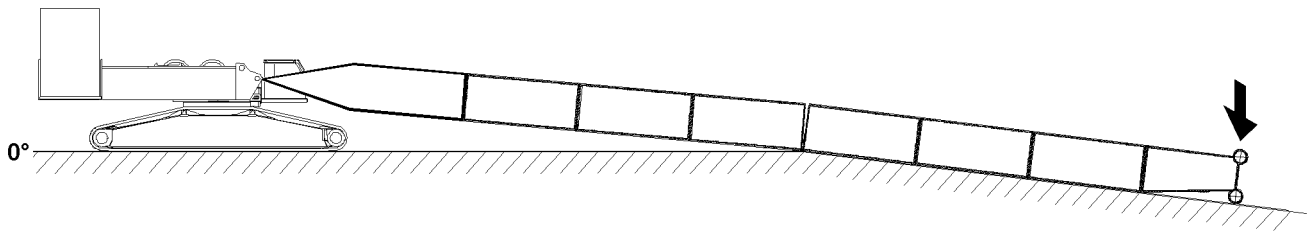


Fig.121658: Taking the boom system down

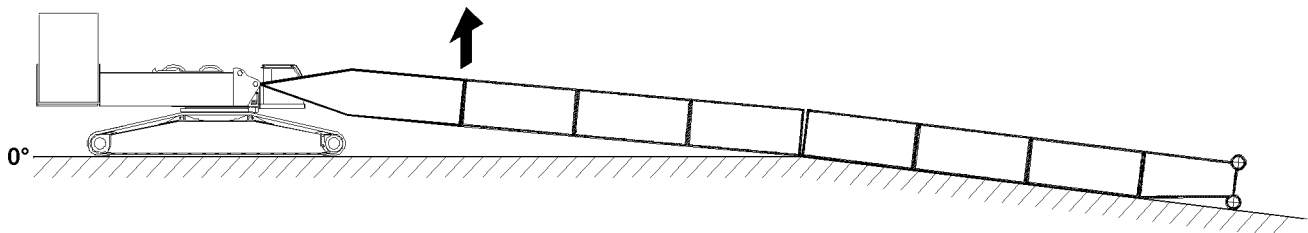


Fig.121655: Lifting and opening the boom system

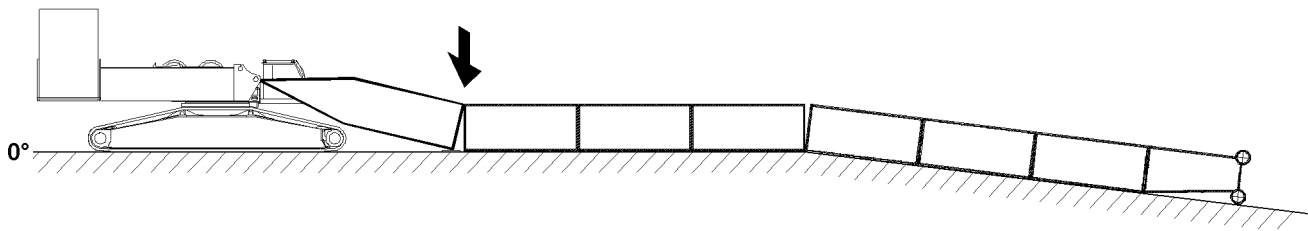


Fig.121656: Taking the boom system down

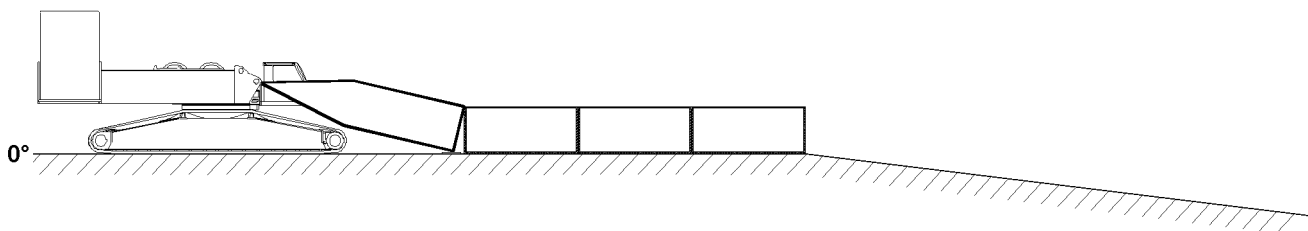


Fig.121641: Disassembling and removing the boom - intermediate sections with the end section

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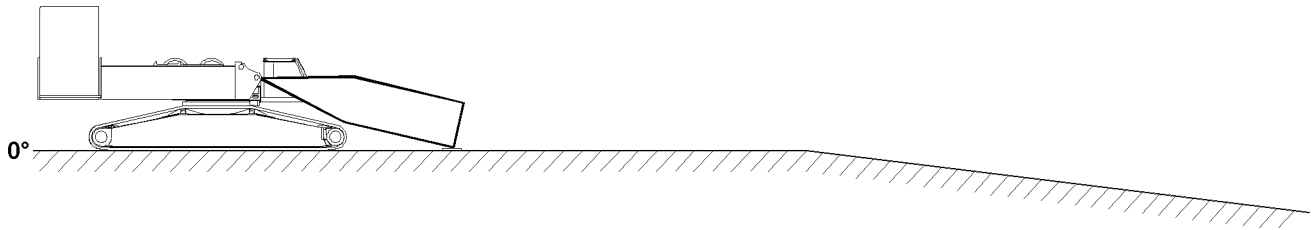


Fig.121640: Disassembling and removing the boom - intermediate sections to the boom - pivot section

- ▶ Disassemble and remove the boom - pivot section.

17 Erecting / taking-down



WARNING

The crane can topple over!

Due to an unforeseen occurrence, for example: Sudden strong wind or storm can lead to dangerous operating situations, up to toppling the crane.

Death, severe bodily injuries, property damage.

- ▶ The boom must be able to be taken down at any time with its current equipment, observe the erection and take-down charts. Observe the job planner.
- ▶ The counterweights and / or ballasts required for this must always be in direct vicinity of the crane.
- ▶ The crane operator must ensure that the required counterweight and / or the required ballast is carried along when driving the crane with the equipment in place and that the boom can be placed down at any time.



WARNING

Danger of fatal injury!

- ▶ Incorrectly installed or non-functioning limit switches as well as falling parts (pins, cotter pins, ice etc.) can cause accidents.

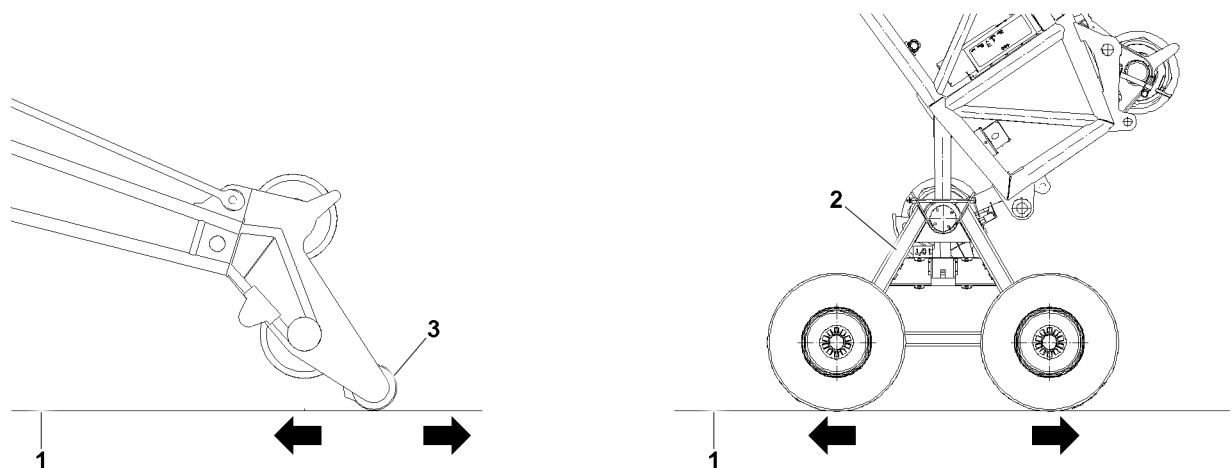


Fig.152357: Roller cart road or lattice head track roller

- | | | | | | |
|---|------|---|-------------|---|---------------------------|
| 1 | Road | 2 | Roller cart | 3 | Lattice head track roller |
|---|------|---|-------------|---|---------------------------|

When erecting or taking down with the aid of a roller cart 2 or a lattice head track roller 3, make sure that the following prerequisites are met:

- The road 1 is level.
- The road 1 is of sufficient load bearing capacity.
- The road 1 is free of obstacles.
- The road 1 is free of persons.

17.1 Erecting / taking down with mobile cranes

Make sure that the following prerequisites are met:

- The crane is properly supported.
 - The crane is horizontally aligned.
 - The counterweight has been installed on the turntable according to the load chart or the erection / take down charts.
 - In the case of cranes with derrick ballast: The derrick ballast (suspended ballast or ballast trailer ballast) is installed according to the load chart or the erection / take down charts.
 - For cranes with a telescopic boom: The telescopic boom is telescoped in all the way.
 - The boom has been installed according to the load chart and the Crane operating instructions.
 - The hoist rope has been correctly placed in the rope pulleys and prevented from jumping out with the rope retaining pins.
 - All limit switches have been correctly assembled and are fully operational.
 - All pin connections are secured.
 - No persons in the danger zone.
 - No loose parts on the boom or the auxiliary boom.
 - The exposed rope pulleys are free of snow and ice.
 - The boom and its components (limit switches, cable drums, airplane warning light, wind speed sensor etc.) must be kept free of ice and snow.
- ▶ Check if all prerequisites have been met.

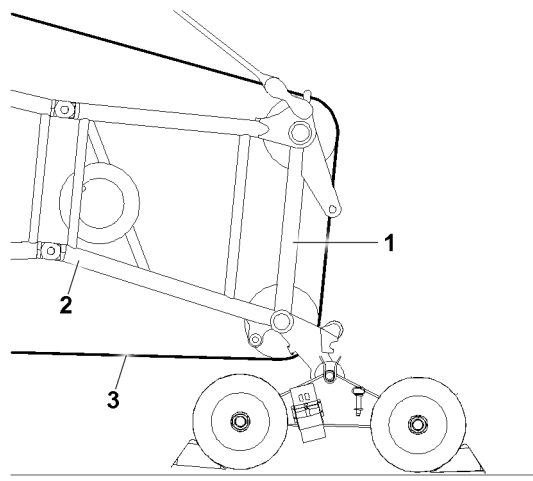


Fig.152358: Securing the hoist rope on the head of the lattice jib

When the luffing lattice jib is erected or taken down **angled**, then the hoist rope must be secured **prior to reeving in** or **after reeving out** the hook block.

Before the hook block is reeved in or after the hook block is reeved out, it is possible that the hoist rope is pulled out of the head of the lattice jib. Therefore the hoist rope must be secured by a hemp rope.



WARNING

Hoist rope not secured!

The hoist rope can run back in the direction of the hoist winch after reeving out or reeving in the hook block.

▶ Secure the hoist rope with the hemp rope.

▶ Fasten the hemp rope with Prusik knots to the hoist rope **3**.

▶ Fasten the hemp rope with the other end on the corner bar pipe **2** of the head **1** of the lattice jib with tie knots.

17.2 Erecting / taking down with crawler cranes

Make sure that the following prerequisites are met:

- Comply with the maximum permissible incline of the crane specified in the load chart manual.
 - For cranes with a support: The crane is properly supported.
 - For cranes with a support: The crane is horizontally aligned.
 - The counterweight has been installed on the turntable according to the load chart.
 - The central ballast is installed according to the load chart.
 - The counterweight is installed according to the load chart or the erection / take down charts.
 - In the case of cranes with derrick ballast: The derrick ballast (suspended ballast or ballast trailer ballast) is installed according to the load chart or the erection / take down charts.
 - For cranes with a telescopic boom: The telescopic boom is telescoped in all the way.
 - The boom has been installed according to the load chart and the Crane operating instructions.
 - The hoist rope has been correctly placed in the rope pulleys and prevented from jumping out with the rope retaining pins.
 - All limit switches have been correctly assembled and are fully operational.
 - All pin connections are secured.
 - No persons in the danger zone.
 - No loose parts on the boom or the auxiliary boom.
 - The exposed rope pulleys are free of snow and ice.
 - The boom and its components (limit switches, cable drums, airplane warning light, wind speed sensor etc.) must be kept free of ice and snow.
- ▶ Check if all prerequisites have been met.

17.3 Rigging the guy rods on lattice booms on placed down boom system



WARNING

Danger of fatal injury due to damaged guy rods!

If the boom system is placed on the ground or a load bearing substructure in strong wind or longer downtime, the guy rods can be damaged due to wind influence on the boom guying. This wind influenced oscillations can lead to fatigue on the guy rods.

As a result, the guy rods could break or rip off under load - for example when erecting the boom system or in crane operation. The boom system can therefore fall uncontrolled forward onto the ground. Death, severe bodily injuries, property damage.

- ▶ Make sure that the guy rods are taken down completely on the lattice sections and relieved when the boom systems are taken down on the ground.
- ▶ Make sure that freely suspended guy rods are rigged on the lattice boom.
- ▶ Make sure that the upper pulley block is rigged on the lattice boom in Derrick operating modes.
- ▶ Make sure, that the guying on the luffing lattice jib is removed on lattice mast cranes.
- ▶ Make sure that the guy rods are inspected before resuming crane operation and that no damage or cracks are present.
- ▶ Make sure that the maintenance intervals of the guy rods are adhered to.



Note

- ▶ In case of strong wind or longer downtimes of the crane, the boom system must be placed on the ground or on a load bearing substructure.
- ▶ The guying must be relieved and the guy rods must be placed on the transport receptacles.
- ▶ The following illustrations are examples and may not match your crane exactly.

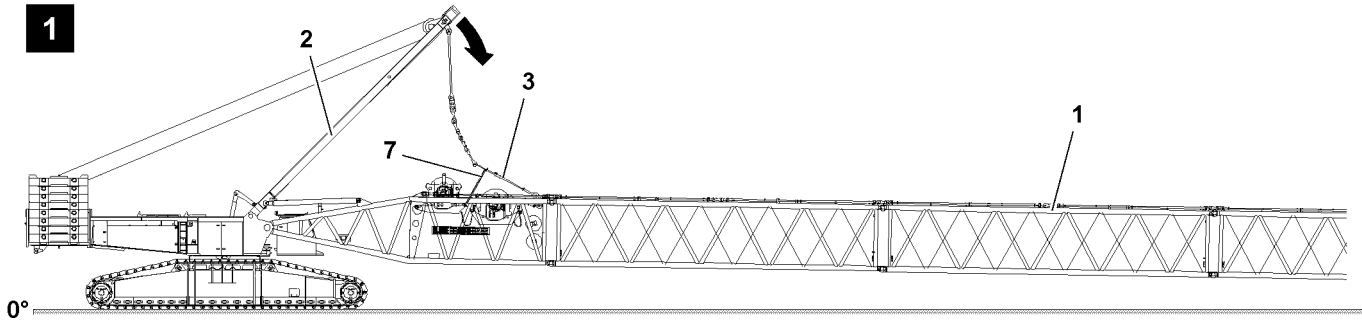


Fig.120722: Guying placed in transport receptacle and SA-frame guying relieved

- ▶ Take the guy rods down on the lattice sections 1: Luff the SA-frame 2 down to the front until the guying is placed completely in the transport receptacles on the lattice sections and the SA-frame guying 3 is relieved, see illustration 1.
- ▶ To minimize side oscillation of the SA-frame guying 3 due to wind influence: Rig the SA-frame guying 3 with suitable rigging straps / ropes 7 against the boom, see illustration 1.

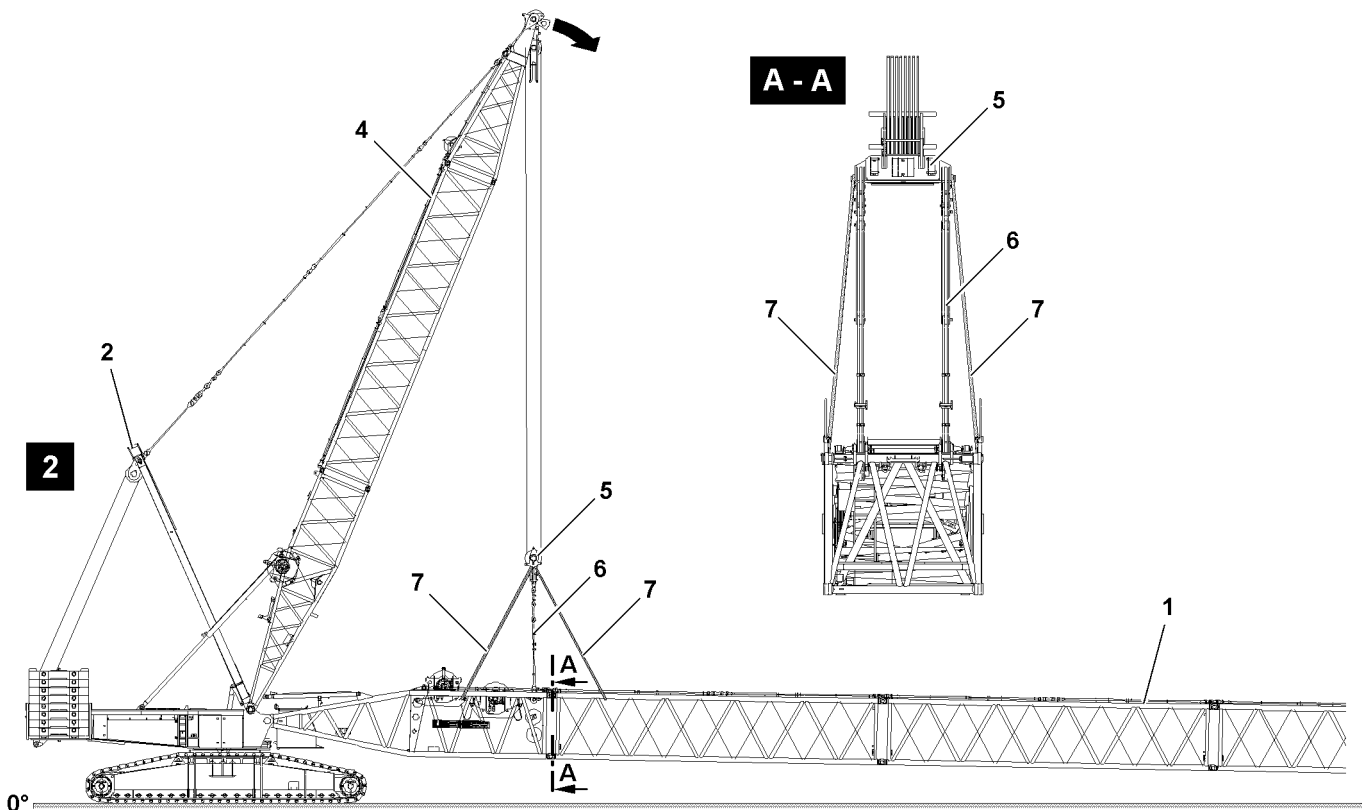


Fig.120771: Guying placed in transport receptacle and upper pulley block rigged against the boom

- ▶ Take the boom system down and - if present - release the derrick guying to the derrick ballast.
- ▶ Take the guy rods down on the lattice sections 1: Luff the D-boom 4 down to the front until the main boom guying is placed completely in the transport receptacles on the lattice sections and the upper pulley block 5 is positioned over the S-pivot section, see illustration 2.
- ▶ To minimize side oscillation of the upper pulley block 5 due to wind influence: Rig the upper pulley block 5 with suitable rigging straps / ropes 7 against the boom, see illustration 2.

For lattice mast cranes with luffing lattice jib the following applies:

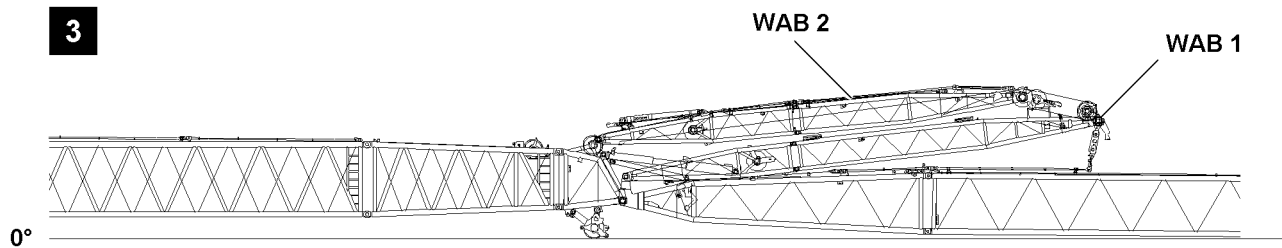


Fig.120821: Guying in transport receptacle(s) and WA-frames placed down to the front (example crane with lattice mast)



WARNING

Danger of accident when removing the W-guying!

When taking down and removing the guying dangerous situations can arise.

- ▶ Make sure that the danger notes in the respective chapter of the Crane operating instructions are observed.
- ▶ Remove the guy rods on the luffing lattice jib and take them down into the transport receptacles.
- ▶ Take the WA-frames (WA-frame 1 **WAB 1** and WA-frame 2 **WAB 2**) down to the front.

For telescopic cranes with luffing lattice jib the following applies:

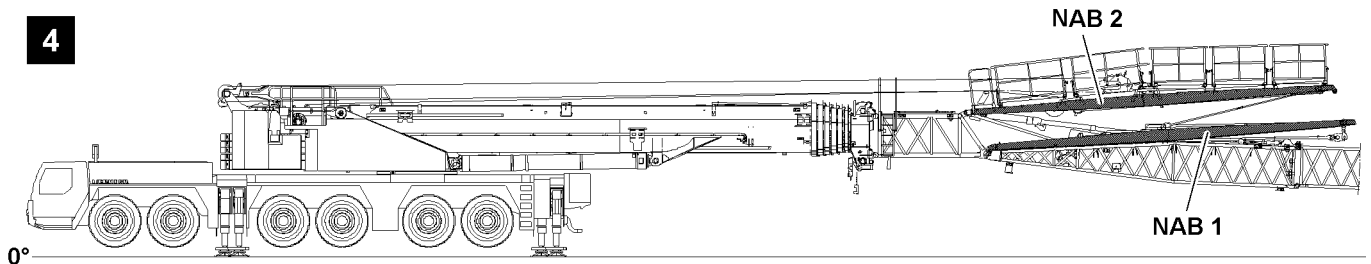


Fig.121261: Guying in transport receptacle(s) and NA-frames placed down to the front (example telescopic crane)



WARNING

Danger of accident when taking the NA-frames down!

When taking the guy rods as well as the NA-frames down dangerous situations can arise.

- ▶ Make sure that the danger notes in the respective chapter of the Crane operating instructions are observed.
- ▶ Spool the jib control winch out and take the NA-frames down to the front so that the guy rods are relieved.

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5.02 SA-frame

1 SA-frame

3

LWE/LR 11350-007/19005-01-02/en

Fig.195219

LWE/LR 11350-007/19005-01-02/en

1 SA-frame

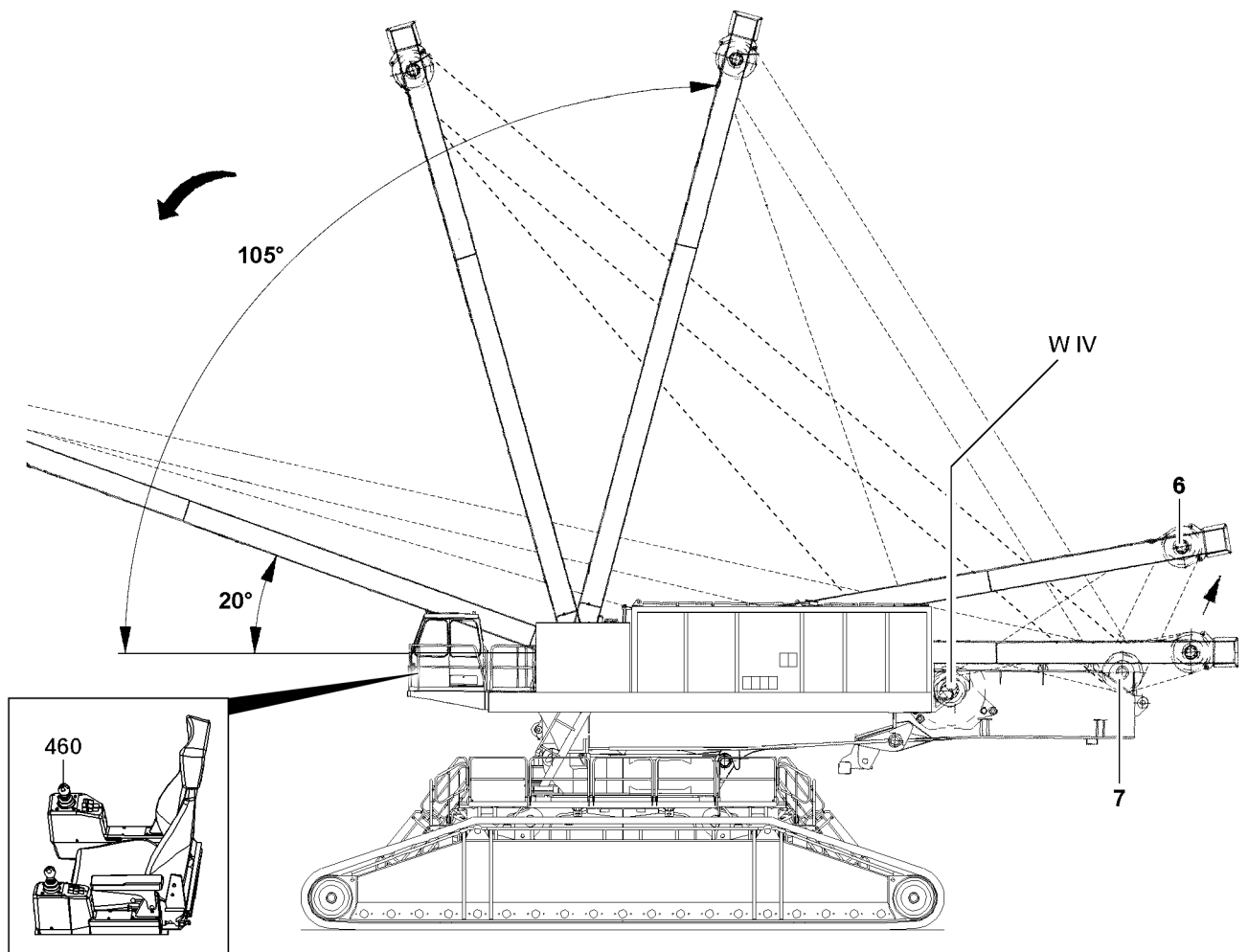


Fig.124296



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.

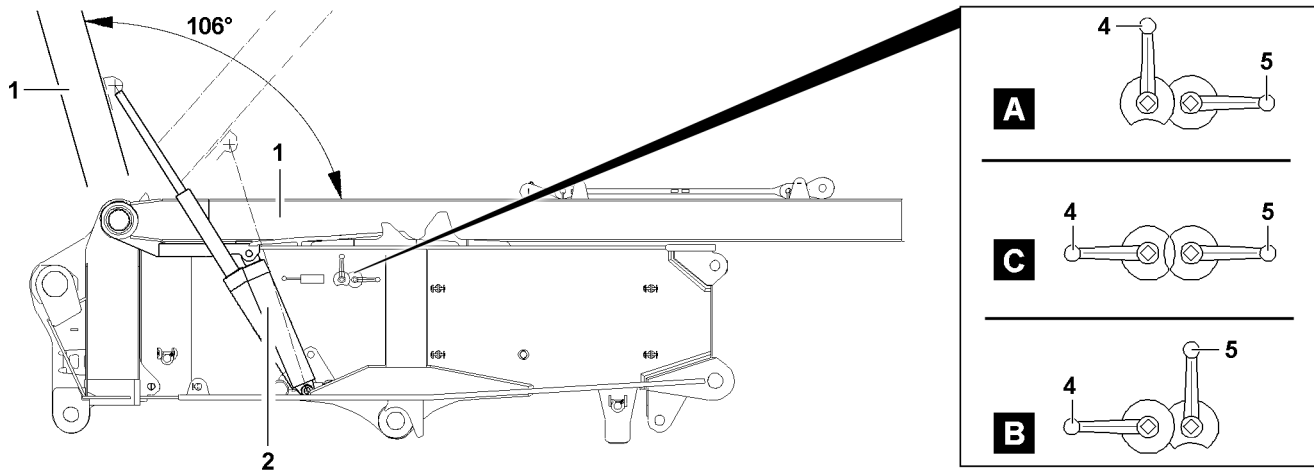


Fig.124297: Switch positions of ball valves

| 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 | Erect the SA-frame | Assembly and crane operation |

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 on the pulley set of the SA-frame.
- The engine is running.
- The assembly operation is engaged.
- The assembly icon on the LICCON monitor blinks.
- The SA-operating mode has been set and confirmed on the LICCON computer system.



WARNING

Danger of accident due to function „Exceedance of shut off limits of the LICCON overload protection“! If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.

Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload protection“ is prohibited.

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.

**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.

Death, severe bodily injuries, property damage.

It can result in slack rope formation.

- ▶ 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!

- ▶ Inspect 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**

Danger of accident due to function „Exceedance of shut off limits of the LICCON overload protection“! If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.

Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload protection“ is prohibited.

- ▶ Activate the LICCON overload safety device: Turn assembly operation off.

**Note**

- ▶ See Crane operating instructions, chapter 4.02.

**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 operation 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).

Death, severe bodily injuries, property damage.

- ▶ After assembly, secure the ball valves immediately with a lock.

- ▶ Secure the ball valves.

1.2 Placing the SA-frame onto the turntable

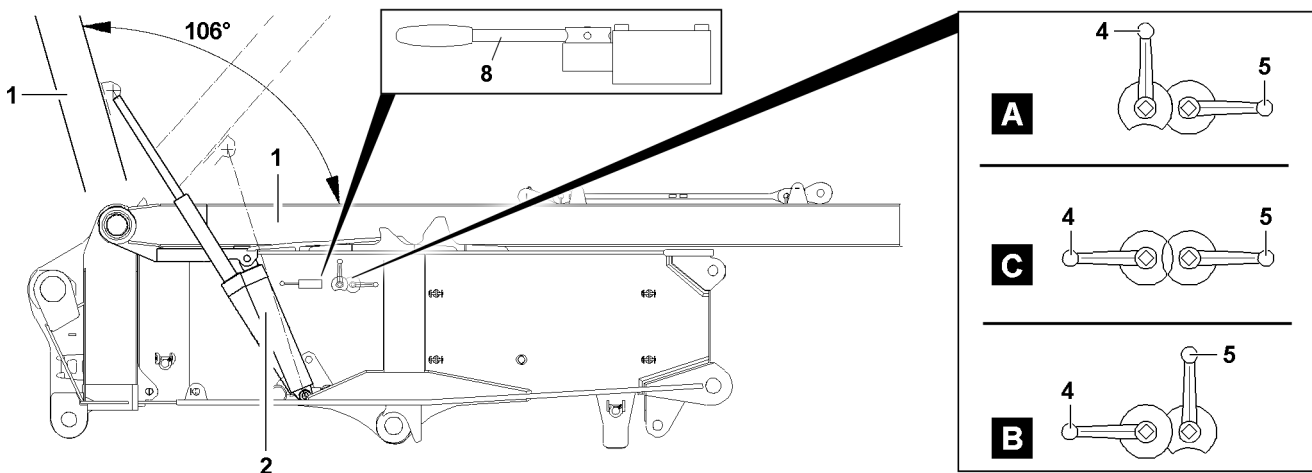


Fig.124298: Switch positions of ball valves // hand lever 8

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**

Danger of accident due to function „Exceedance of shut off limits of the LICCON overload protection“! If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.

Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload protection“ is prohibited.

- ▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

- The shut off limits of the LICCON overload protection are exceeded.
- The assembly icon appears on the LICCON monitor.

**Note**

- ▶ See Crane operating instructions, chapter 4.02.

**WARNING**

Danger of fatal injury due to SA-frame!

Death, severe bodily injuries, property damage.

- ▶ 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.

Death, severe bodily injuries, property damage.

It can result in slack rope formation 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 assembly operation 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.

5.03 Boom systems

| | | |
|---|---|----|
| 1 | Boom components | 2 |
| 2 | Arrangement of intermediate sections and guy rods on the booms / boom systems | 2 |
| 3 | Auxiliary guying | 5 |
| 4 | Fiber guy rope auxiliary guying | 13 |

1 Boom components



Note

- ▶ For boom components including associated system dimensions, lengths and component weights refer to chapter 1.03.

2 Arrangement of intermediate sections and guy rods on the booms / boom systems



Note

- ▶ The following description is an example and may not exactly match your crane.
- ▶ Lengths, weights and system dimensions of the intermediate sections are examples and may differ from the data on your crane.
- ▶ For exact crane data, and for the arrangement of intermediate sections and guy rods, refer to the respective rod plan.
- ▶ For dimensions and weights of crane components, see chapter 1.03 as well as the weight signs on the corresponding components.



WARNING

The boom can break off!

The arrangement of the intermediate sections on booms or boom systems are based on extensive static calculations.

If the arrangement of the intermediate sections according to the rod plan is not observed, the crane can collapse, the boom can break off or the crane can topple over.

If the arrangement of the guy rods according to the rod plan is not observed, the crane can collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Only arrange the intermediate sections according to the rod plan.
- ▶ Only arrange the guy rods according to the rod plan.

If an auxiliary guying is required for a certain boom length:

- ▶ Only assemble the auxiliary guying according to the rod plan in the position defined in the rod plan.

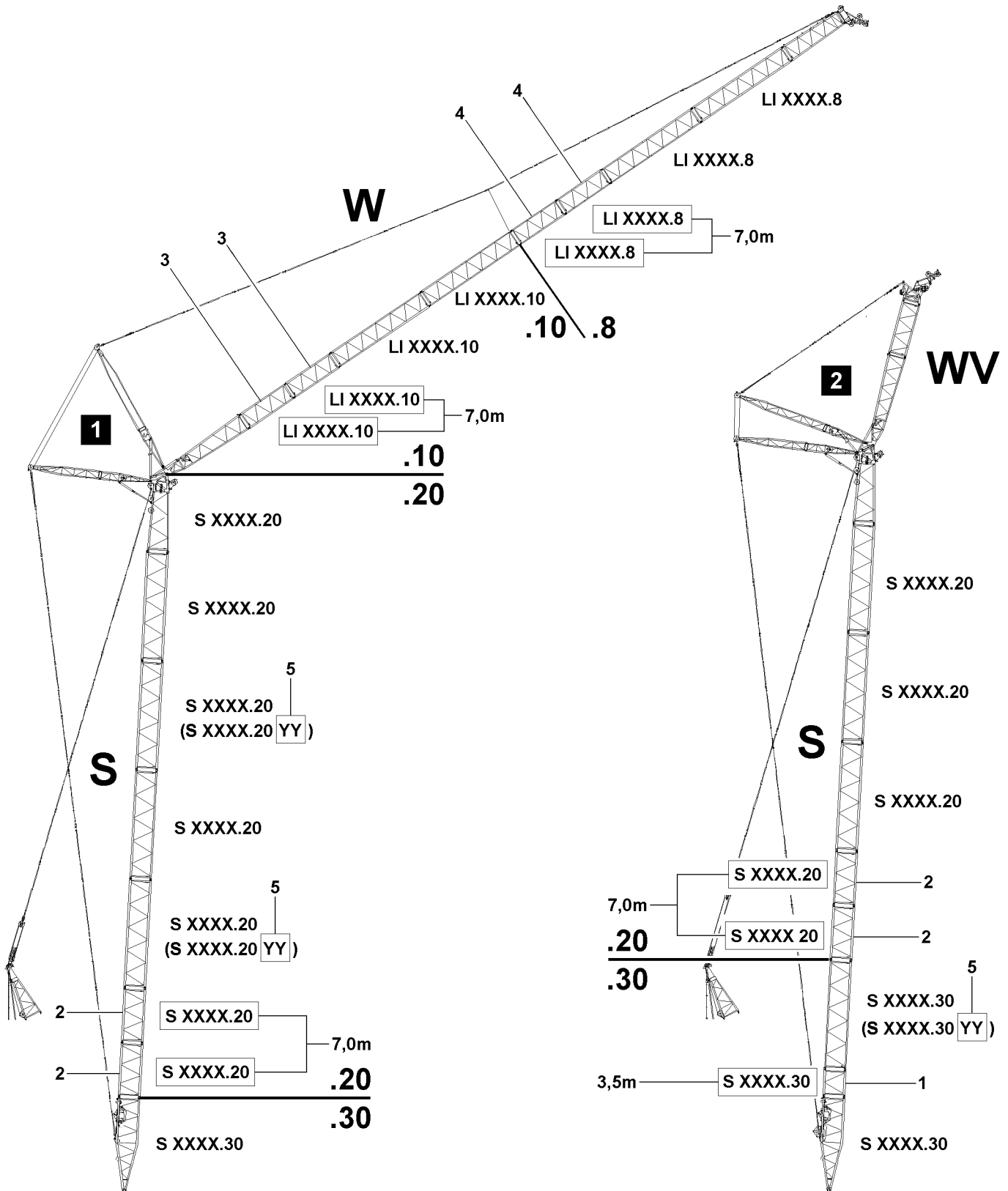


Fig.151885: Arrangement of intermediate sections and the guy rods

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| System dimensions and assignment | | | | |
|----------------------------------|---------|--------|-------|-------|
| Position | System | | Heavy | Light |
| 1 | S XXXX | .30 | X | |
| 2 | S XXXX | .20 | | X |
| 3 | LI XXXX | .10 | X | |
| 4 | LI XXXX | .8 | | X |
| 5 | S XXXX | .40 YY | X | |

General specifications for the configuration of booms or boom systems:

- With the same system dimension, two short intermediate sections with a length of 3.0 m (3.5 m) are heavier than one single intermediate section with a length of 6.0 m (7.0 m).
- With the same system dimension, two short intermediate sections with a length of 6.0 m (7.0 m) are heavier than one single intermediate section with a length of 12.0 m (14.0 m).
- With the same system dimension, two short intermediate sections with a length of 3.0 m (3.5 m) can be replaced by one single intermediate section with a length of 6.0 m (7.0 m).
- With the same system dimension, two short intermediate sections with a length of 6.0 m (7.0 m) can be replaced by one single intermediate section with a length of 12.0 m (14.0 m).
- For intermediate sections with the same system dimension but different lengths, always install the short intermediate sections on the bottom in the boom, due to their weight, in direction of the slewing ring connection, see illustration 1 and illustration 2.
- The heavier one intermediate section is, the higher is the value of the last two digits on the system dimension plate.
- Pay attention to the last two letters following the letter combinations (YY) 5 on the last two letters on the system dimension plate and observe them.

2.1 Arrangement of the intermediate sections



WARNING

Danger of accidents due to incorrectly assembled intermediate sections!

Death, severe bodily injuries, property damage.

- ▶ Any other arrangement of the intermediate sections than specified in the operating instructions or the rod plans is prohibited.
- ▶ There is the danger that intermediate sections are mixed up, they are differently sized and do **not** differ externally.
- ▶ The intermediate sections differ externally only by the welded on plates (.8, .10, .12, .16, .20, .25, .30, .40 YY).
- ▶ When assembling the boom, it must be ensured that the intermediate sections are only arranged and installed according to their description as indicated on the rod plan.
- ▶ Observe and adhere to the additional letter combinations (YY) 5 on the system dimension plate of the intermediate sections at assembly of the intermediate sections.



WARNING

Arrangement of the intermediate sections!

If the arrangement of the intermediate sections is not carried out according to the rod plan, then the boom can be overloaded, bend down and break off.

Death, severe bodily injuries, property damage.

- ▶ For intermediate sections with the same system dimension but different length the shorter intermediate sections must always be installed on the bottom in the boom, in direction of the slewing ring connection, except if another installation position is specified in the rod plan.
- ▶ Adhere to the specifications in the rod plan in any case.

2.2 Arrangement of the guy rods



WARNING

Danger of accidents due to incorrectly assembled guy rods!
Death, severe bodily injuries, property damage.

- ▶ Any other arrangement of the guy rods than specified in the operating instructions or the rod plans is prohibited.
- ▶ When assembly the boom / boom system, only arrange and install the guy rods according to their description in the rod plan.



WARNING

Arrangement of the guy rods!

If the arrangement of the guy rods is not carried out according to the rod plan, then the boom can be overloaded, bend down and break off.

Death, severe bodily injuries, property damage.

- ▶ Adhere to the specifications in the rod plan in any case.

3 Auxiliary guying



Note

- ▶ The following descriptions and illustrations are examples and may not match your crane exactly.
- ▶ For exact crane data refer to the respective rod plan.
- ▶ In the case of questions: Contact Customer Service at Liebherr-Werk Ehingen GmbH.

The auxiliary guying, in regards to safe crane operation - especially for long boom systems - is of vital importance.

The auxiliary guying is a deciding factor in relieving the boom, or the boom system during erection and take-down as well as during crane operation.

Guy ropes with different lengths are used in the different auxiliary guyings.

The assembly of the auxiliary guying between the boom guying and the boom system is implemented using different lugs, cross brackets and connecting lugs.



Note

- ▶ The boom lengths, for which an auxiliary guying is required in addition to a boom guying, can be seen in the rod plan.

Depending on the crane type and boom length:

- ▶ Assembling the auxiliary guying: Remove the standard lugs and install the tension lugs **12**.

**WARNING**

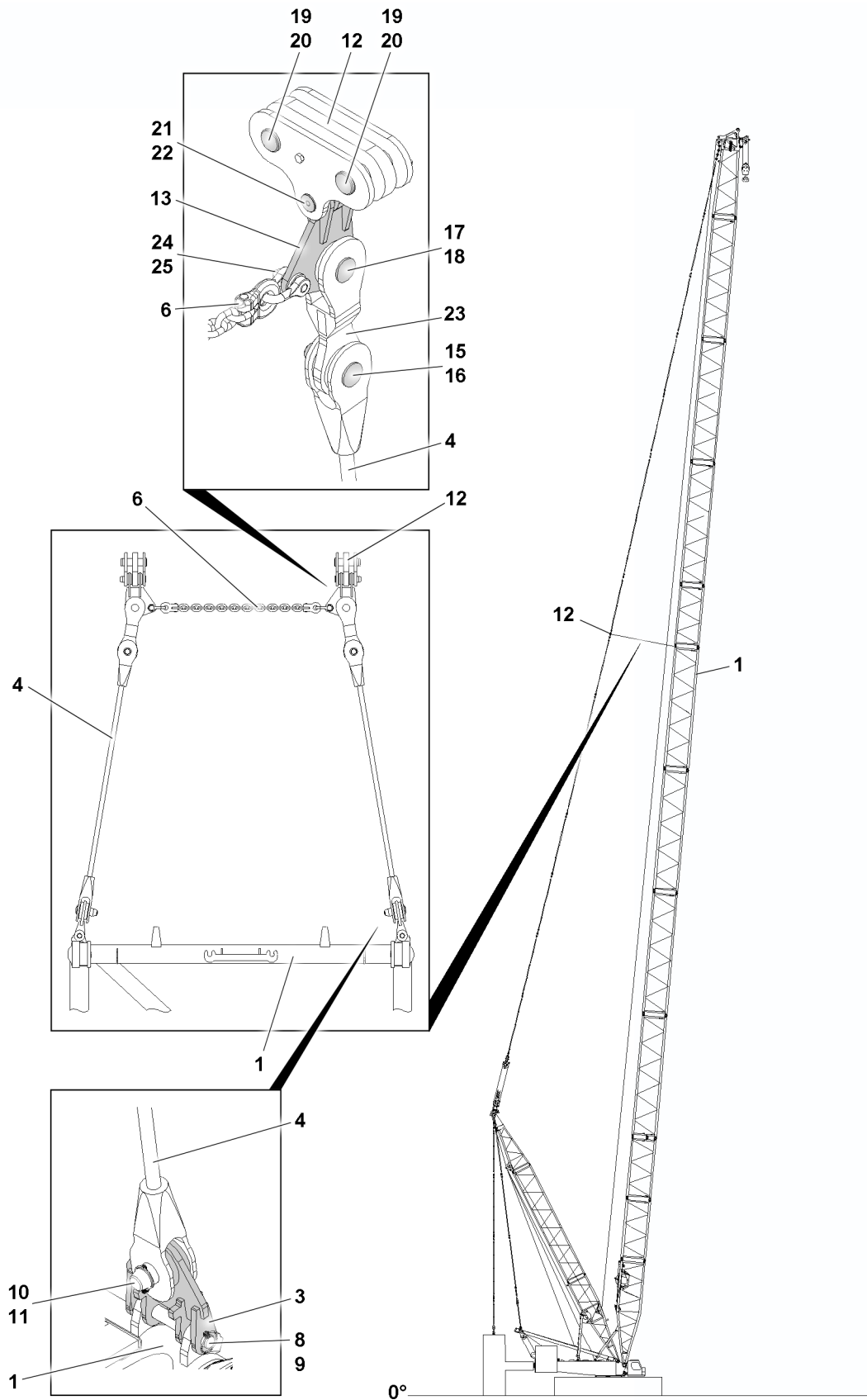
The crane can topple over!

If the auxiliary guying is not installed or not installed on the position specified in the rod plan, then the crane can collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Only assemble the auxiliary guying in the position specified in the rod plan.
- ▶ Make sure that the auxiliary guying is always completely installed and that all pins are properly pinned and secured.
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is laying on the floor.
- ▶ **or:**
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is laying on a load bearing substructure.
- ▶ **or:**
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is securely held by the auxiliary crane.

3.1 Assembling the auxiliary guying on the main boom



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Fig.153507: „Long“ auxiliary guying on the main boom

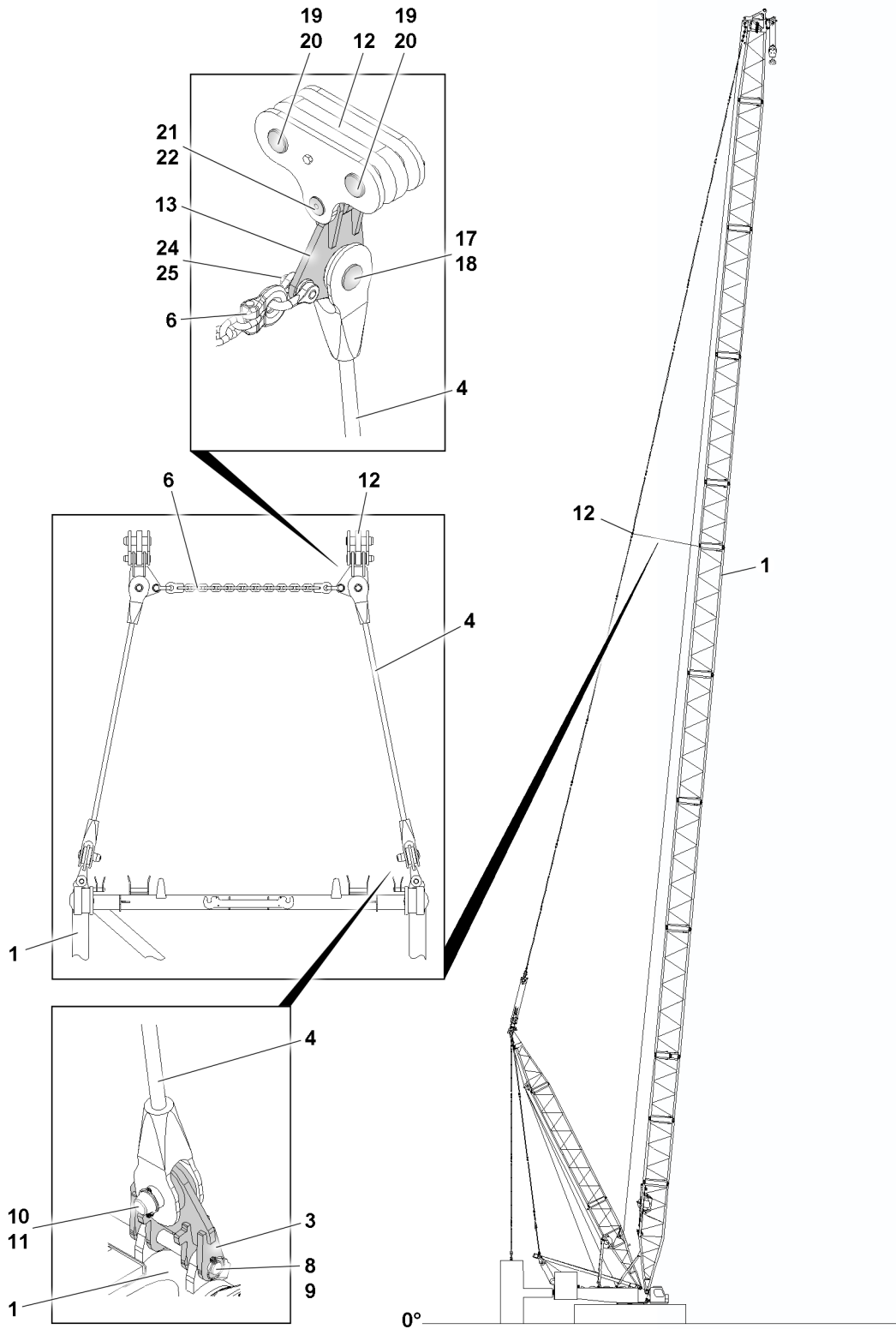


Fig.153603: „Short“ auxiliary guying on the main boom

- | | | | | | |
|----|------------------------------------|----|-------------------|----|-------------------|
| 1 | Intermediate section ¹⁾ | 11 | Retaining element | 19 | Pin |
| 3 | Connecting lug | 12 | Tension lug | 20 | Retaining element |
| 4 | Guy rope ²⁾ | 13 | Cross bracket | 21 | Pin |
| 6 | Chain | 15 | Pin | 22 | Retaining element |
| 8 | Pin | 16 | Retaining element | 23 | Lug |
| 9 | Retaining element | 17 | Pin | 24 | Shackle |
| 10 | Pin | 18 | Retaining element | 25 | Screw pin |

¹⁾ for the exact designation of the intermediate section: see the rod plan

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²⁾ for the exact designation of the guy rope: see the rod plan

The tension lugs **12** must be installed in the boom guying instead of standard lugs. The auxiliary guying is installed on the tension lugs **12**.

Make sure that the following prerequisites are met:

- The standard lugs are have been disassembled in the boom guying.
 - The tension lugs **12** are installed properly on both sides in the boom guying instead of standard lugs.
 - The tension lugs **12** are pinned properly together with pins **19** in the boom guying and secured with a retaining element **20**.
 - The connecting lug **3** is pinned on both sides on the intermediate section **1** with pins **8** a secured with a retaining element **9**.
- ▶ Pin the cross bracket **13** on the tension lug **12**: Insert the pin **21** and properly secure with the retaining element **22**.

In the case of a longer auxiliary guying:

- ▶ Pin the lug **23** on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.
- ▶ Install the guy rope **4**: Pin the guy rope **4** on the lug **23** with a pin **15** and secure with the retaining element **16**.
- or**

In the case of a shorter auxiliary guying:

Install the guy rope **4**: Pin the guy rope **4** on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.

If the guy rope **4** is properly pinned and secured on both sides to the lug **23** or both sides to the cross bracket **13**:

- ▶ Pin the guy rope **4** on the connecting lug **3** with a pin **10** and secure with the retaining element **11**.

Install the chain **6** between the cross brackets **13**:

- ▶ Properly install the chain **6** to the left and right on the cross brackets **13** with a shackle **24** and screw pin **25**.



WARNING

The crane can topple over!

If the chain **6** is not installed in connection with the auxiliary guying, then the boom guying can be damaged, the boom can break off and the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Only assemble the auxiliary guying in the position specified in the rod plan.
 - ▶ If a chain **6** is specified in the rod plan, then it must always be installed in connection with the auxiliary guying, otherwise the guy rods will be pulled apart.
-
- ▶ Recheck the proper and complete assembly of the auxiliary guying before erecting the boom / boom system.

3.2 Assembling the auxiliary guying on the W-boom

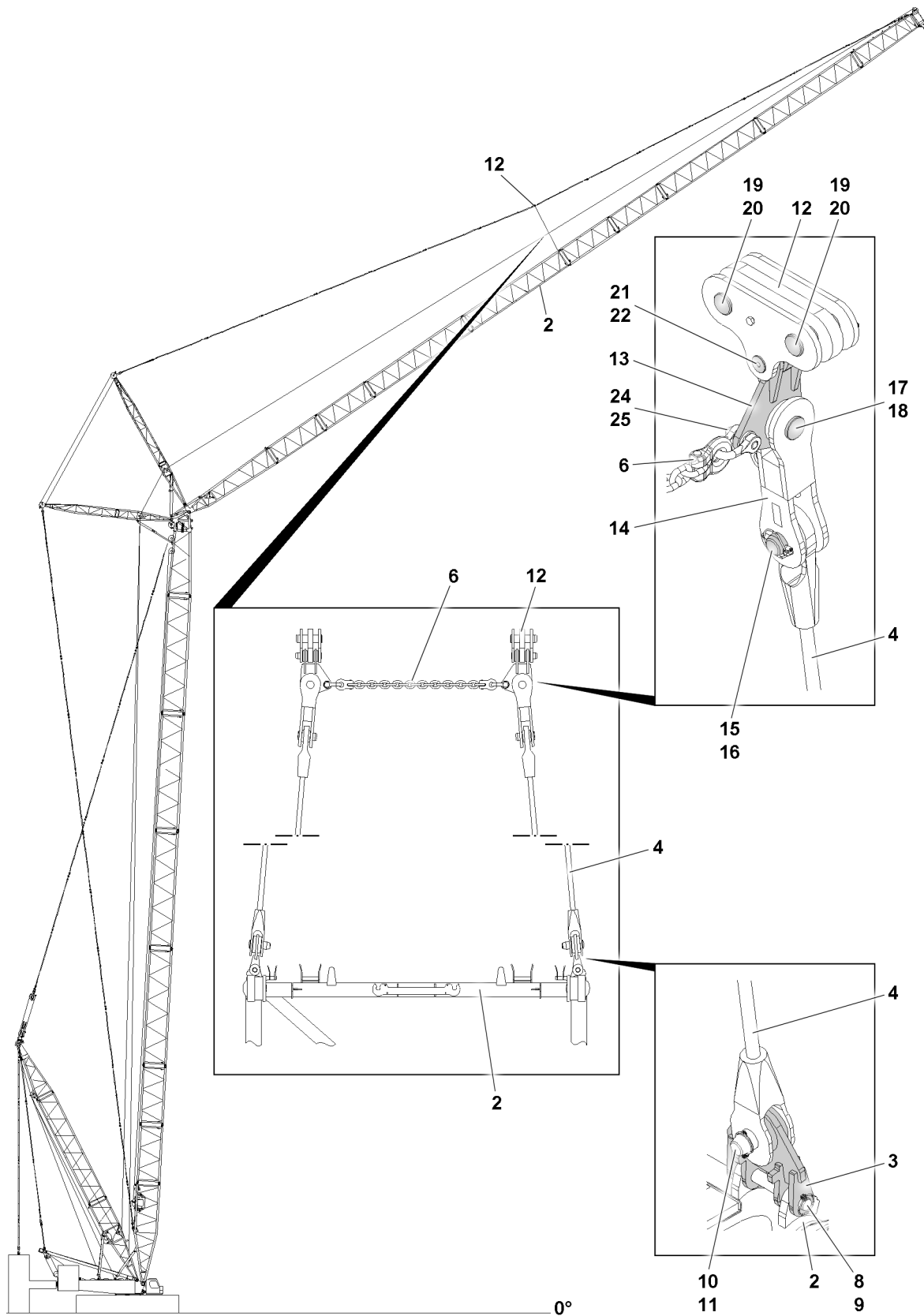


Fig.153508: Auxiliary guying on the W-boom

2 Intermediate section ¹⁾

11 Retaining element

18 Retaining element

For continuation of legend for illustrations, see next page

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| | | | | | |
|-----------|------------------------|-----------|-------------------|-----------|-------------------|
| 3 | Connecting lug | 12 | Tension lug | 19 | Pin |
| 4 | Guy rope ²⁾ | 13 | Cross bracket | 20 | Retaining element |
| 6 | Chain | 14 | Cross bracket | 21 | Pin |
| 8 | Pin | 15 | Pin | 22 | Retaining element |
| 9 | Retaining element | 16 | Retaining element | 24 | Shackle |
| 10 | Pin | 17 | Pin | 25 | Screw pin |

¹⁾ for the exact designation of the intermediate section: see the rod plan

²⁾ for the exact designation of the guy rope: see the rod plan

The tension lugs **12** must be installed in the boom guying instead of standard lugs. The auxiliary guying is installed on the tension lugs **12**.

Make sure that the following prerequisites are met:

- The standard lugs are have been disassembled in the boom guying.
- The tension lugs **12** are installed properly on both sides in the boom guying instead of standard lugs.
- The tension lugs **12** are pinned properly together with pins **19** in the boom guying and secured with a retaining element **20**.
- The connecting lug **3** is pinned on both sides on the intermediate section **2** with pins **8** a secured with a retaining element **9**.
- ▶ Pin the cross bracket **13** on the tension lug **12**: Insert the pin **21** and properly secure with the retaining element **22**.
- ▶ Pin the cross bracket **14** on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.
- ▶ Install the guy rope **4**: Pin the guy rope **4** on the cross bracket **14** with a pin **15** and secure with the retaining element **16**.

If the guy rope **4** is properly pinned and secured on both sides to the cross bracket **14**:

- ▶ Pin the guy rope **4** on the connecting lug **3** with a pin **10** and secure with the retaining element **11**.

Install the chain **6** between the cross brackets **13**:

- ▶ Properly install the chain **6** to the left and right on the cross bracket **13** with a shackle **24** and screw pin **25**.



WARNING

The crane can topple over!

If the chain **6** is not installed in connection with the auxiliary guying, then the boom guying can be damaged, the boom can break off and the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Only assemble the auxiliary guying in the position specified in the rod plan.
- ▶ If a chain **6** is specified in the rod plan, then it must always be installed in connection with the auxiliary guying, otherwise the guy rods will be pulled apart.

- ▶ Recheck the proper and complete assembly of the auxiliary guying before erecting the boom / boom system.

Fig.195219

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4 Fiber guy rope auxiliary guying



Note

- ▶ The auxiliary guying made out of fiber guy ropes are not available for all crane types.
- ▶ The following descriptions and illustrations are examples and may not match your crane exactly.
- ▶ For exact crane data refer to the respective rod plan.
- ▶ In the case of questions: Contact Customer Service at Liebherr-Werk Ehingen GmbH.

NOTICE

Damage to the fiber guy ropes!

If the fiber guy ropes are kinked, turned or damaged, they must be taken down and may no longer be used. Damaged fiber guy ropes can rip.

Death, severe bodily injuries, property damage.

- ▶ Never installed twisted fiber guy ropes.
- ▶ Observe the notes regarding the transport of the fiber guy ropes, see chapter 2.04.

The auxiliary guying, in regards to safe crane operation - especially for long boom systems - is of vital importance.

The auxiliary guying is a deciding factor in relieving the boom, or the boom system during erection and take-down as well as during crane operation.

Guy ropes with different lengths are used in the different auxiliary guying.

The installation of the auxiliary guying between the boom guying and the boom system is implemented using different lugs, cross brackets or connecting lugs.



Note

- ▶ The boom lengths, for which an auxiliary guying is required in addition to a boom guying, can be seen in the rod plan.

Depending on the crane type and boom length:

- ▶ Assembling the auxiliary guying: Remove the standard lugs and install the tension lugs **12**.



WARNING

The crane can topple over!

If the auxiliary guying is not installed or not installed on the position specified in the rod plan, then the crane can collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Only assemble the auxiliary guying in the position specified in the rod plan.
- ▶ Make sure that the auxiliary guying is always completely installed and that all pins are properly pinned and secured.
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is laying on the floor.
- ▶ **or:**
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is laying on a load bearing substructure.
- ▶ **or:**
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is securely held by the auxiliary crane.

4.1 Assembling the auxiliary guying on the main boom

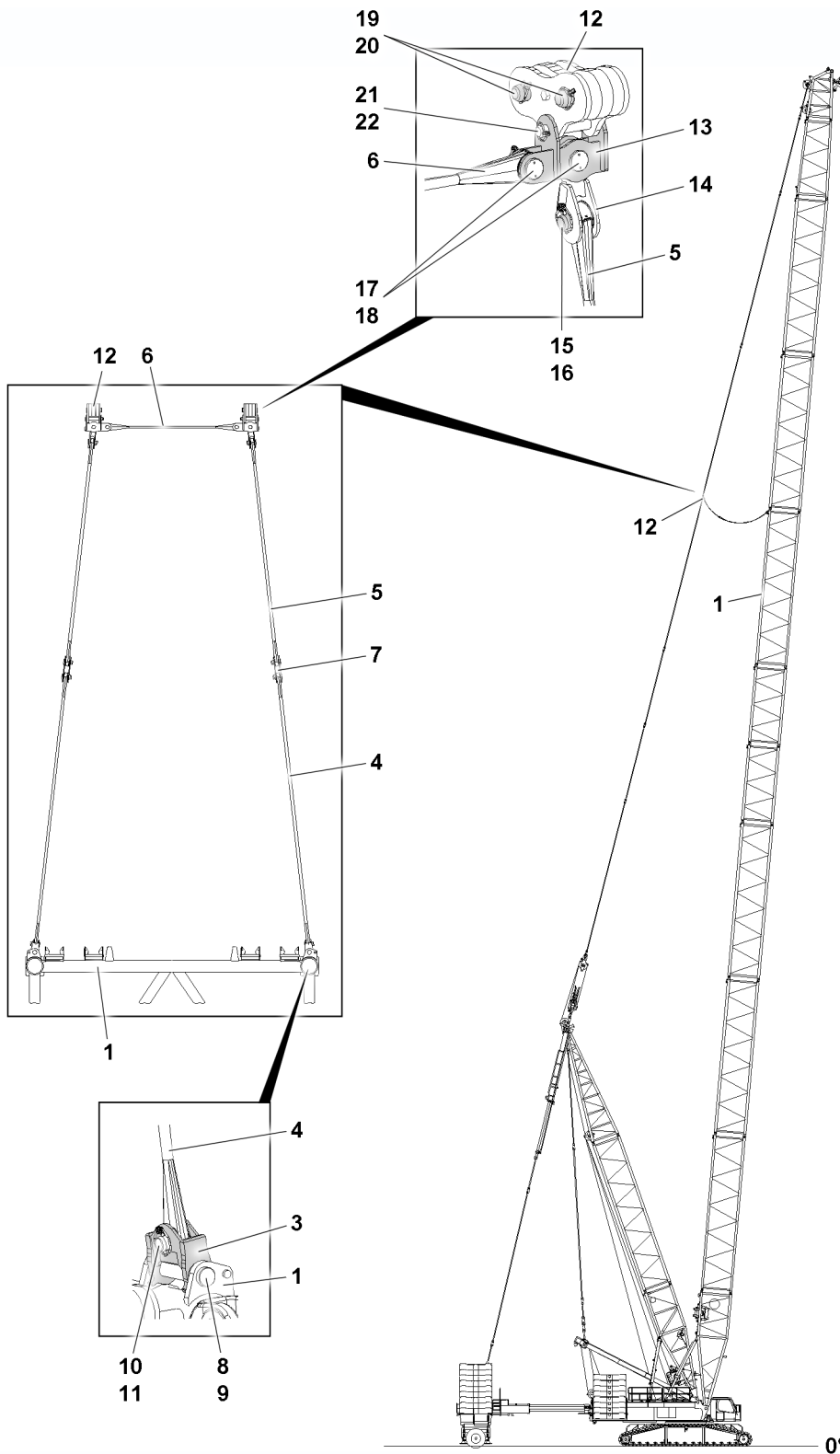


Fig.153504: Auxiliary guying on the main boom

- | | | | | | |
|---|------------------------------------|----|-------------------|----|-------------------|
| 1 | Intermediate section ¹⁾ | 9 | Retaining element | 16 | Retaining element |
| 3 | Connecting lug | 10 | Pin | 17 | Pin |
| 4 | Fiber guy rope ²⁾ | 11 | Retaining element | 18 | Retaining element |
| 5 | Fiber guy rope ²⁾ | 12 | Tension lug | 19 | Pin |

For continuation of legend for illustrations, see next page

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| | | | | | |
|----------|------------------------------|-----------|---------------|-----------|-------------------|
| 6 | Fiber guy rope ²⁾ | 13 | Cross bracket | 20 | Retaining element |
| 7 | Connector bracket | 14 | Cross bracket | 21 | Pin |
| 8 | Pin | 15 | Pin | 22 | Retaining element |

¹⁾ for the exact designation of the intermediate section: See the rod plan

²⁾ for the exact designation of the guy rope: See the rod plan

The tension lugs **12** must be installed in the boom guying instead of standard lugs. The auxiliary guying is installed on the tension lugs **12**.

Make sure that the following prerequisites are met:

- The standard lugs are have been disassembled in the boom guying.
- The tension lugs **12** are installed properly on both sides in the boom guying instead of standard lugs.
- The tension lugs **12** are pinned properly together with pins **19** in the boom guying and secured with a retaining element **20**.
- The connecting lug **3** is pinned on both sides on the intermediate section **1** with pins **8** a secured with a retaining element **9**.
- ▶ Pin the cross bracket **13** on the tension lug **12**: Insert the pin **21** and properly secure with the retaining element **22**.
- ▶ Pin the cross bracket **14** on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.
- ▶ Install the guy rope **5**: Pin the guy rope **5** on the cross bracket **14** with a pin **15** and secure with the retaining element **16**.

If the guy rope **5** is properly pinned and secured on both sides to the cross bracket **14**:

- ▶ Properly pin and secure the guy rope **4** with the connecting bracket **7** to the guy rope **5**.
- ▶ Pin the guy rope **4** on the connecting lug **3** with a pin **10** and secure with the retaining element **11**.

Install the guy rope **6** between the cross brackets **13**:

- ▶ Pin the guy rope **6** to the left and right on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.



WARNING

The crane can topple over!

If the guy rope **6** is not installed in connection with the auxiliary guying, then the boom guying can be damaged, the boom can break off and the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Only assemble the auxiliary guying in the position specified in the rod plan.
 - ▶ If a guy rope **6** is specified in the rod plan, then it must always be installed in connection with the auxiliary guying, otherwise the guy rods will be pulled apart.
-
- ▶ Recheck the proper and complete assembly of the auxiliary guying before erecting the boom / boom system.

4.2 Assembling the auxiliary guying on the W-boom

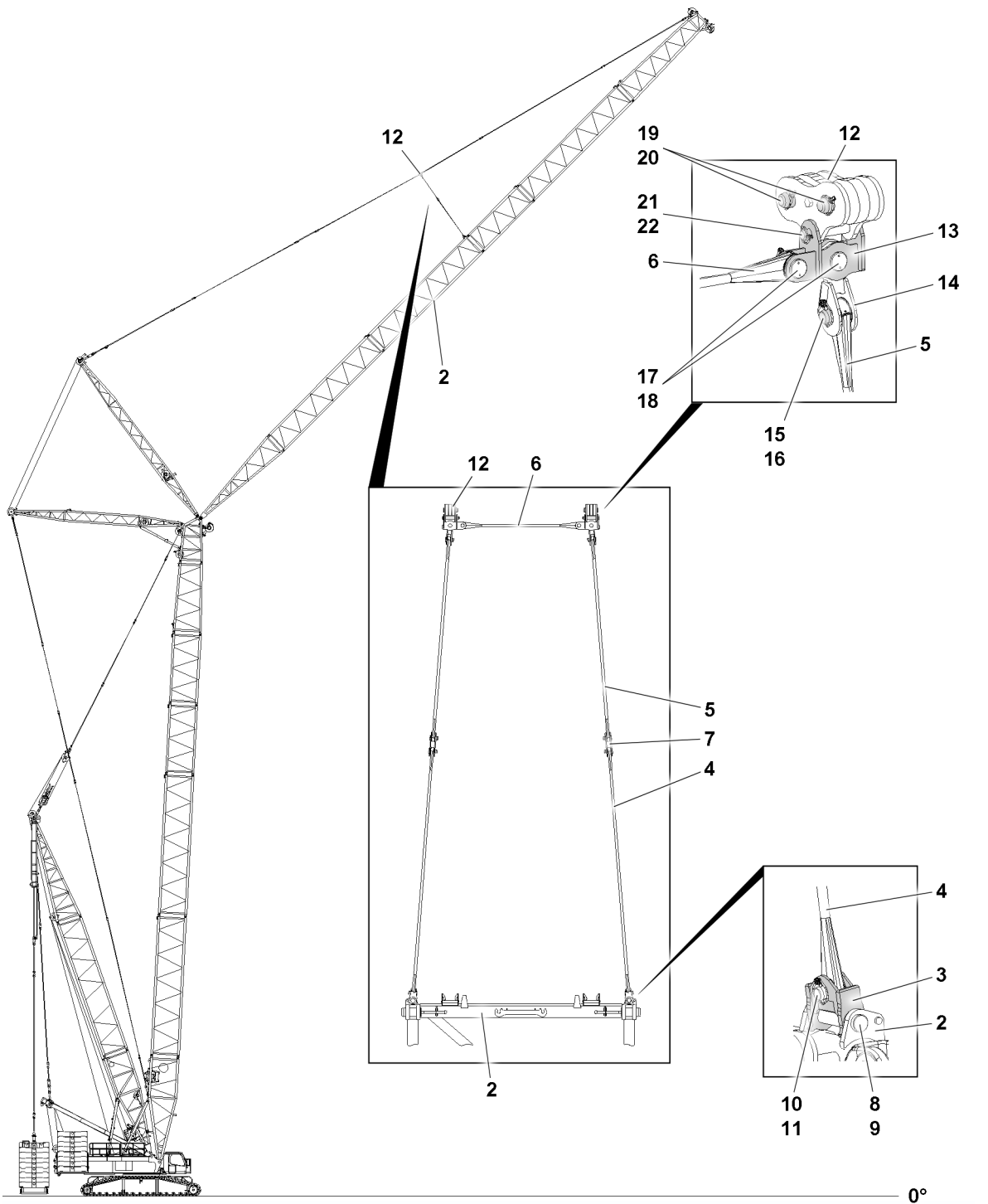


Fig.153505: Auxiliary guying on the W- boom

| | | | | | |
|---|------------------------------------|----|-------------------|----|-------------------|
| 2 | Intermediate section ¹⁾ | 9 | Retaining element | 16 | Retaining element |
| 3 | Connecting lug | 10 | Pin | 17 | Pin |
| 4 | Fiber guy rope ²⁾ | 11 | Retaining element | 18 | Retaining element |
| 5 | Fiber guy rope ²⁾ | 12 | Tension lug | 19 | Pin |
| 6 | Fiber guy rope ²⁾ | 13 | Cross bracket | 20 | Retaining element |
| 7 | Connector bracket | 14 | Cross bracket | 21 | Pin |
| 8 | Pin | 15 | Pin | 22 | Retaining element |

¹⁾ for the exact designation of the intermediate section: See the rod plan

²⁾ for the exact designation of the guy rope: See the rod plan

The tension lugs **12** must be installed in the boom guying instead of standard lugs. The auxiliary guying is installed on the tension lugs **12**.

Make sure that the following prerequisites are met:

- The standard lugs are have been disassembled in the boom guying.
- The tension lugs **12** are installed properly on both sides in the boom guying instead of standard lugs.
- The tension lugs **12** are pinned properly together with pins **19** in the boom guying and secured with a retaining element **20**.
- The connecting lug **3** is pinned on both sides on the intermediate section **1** with pins **8** a secured with a retaining element **9**.
- ▶ Pin the cross bracket **13** on the tension lug **12**: Insert the pin **21** and properly secure with the retaining element **22**.
- ▶ Pin the cross bracket **14** on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.
- ▶ Install the guy rope **5**: Pin the guy rope **5** on the cross bracket **14** with a pin **15** and secure with the retaining element **16**.

If the guy rope **5** is properly pinned and secured on both sides to the cross bracket **14**:

- ▶ Properly pin and secure the guy rope **4** with the connecting bracket **7** to the guy rope **5**.
- ▶ Pin the guy rope **4** on the connecting lug **3** with a pin **10** and secure with the retaining element **11**.

Install the guy rope **6** between the cross brackets **13**:

- ▶ Pin the guy rope **6** to the left and right on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.



WARNING

The crane can topple over!

If the guy rope **6** is not installed in connection with the auxiliary guying, then the boom guying can be damaged, the boom can break off and the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Only assemble the auxiliary guying in the position specified in the rod plan.
 - ▶ If a guy rope **6** is specified in the rod plan, then it must always be installed in connection with the auxiliary guying, otherwise the guy rods will be pulled apart.
-
- ▶ Recheck the proper and complete assembly of the auxiliary guying before erecting the boom / boom system.

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5.05 D-boom

| | | |
|---|---------------------------------|----|
| 1 | Components and fastening points | 3 |
| 2 | Assembly | 5 |
| 3 | Disassembly | 31 |

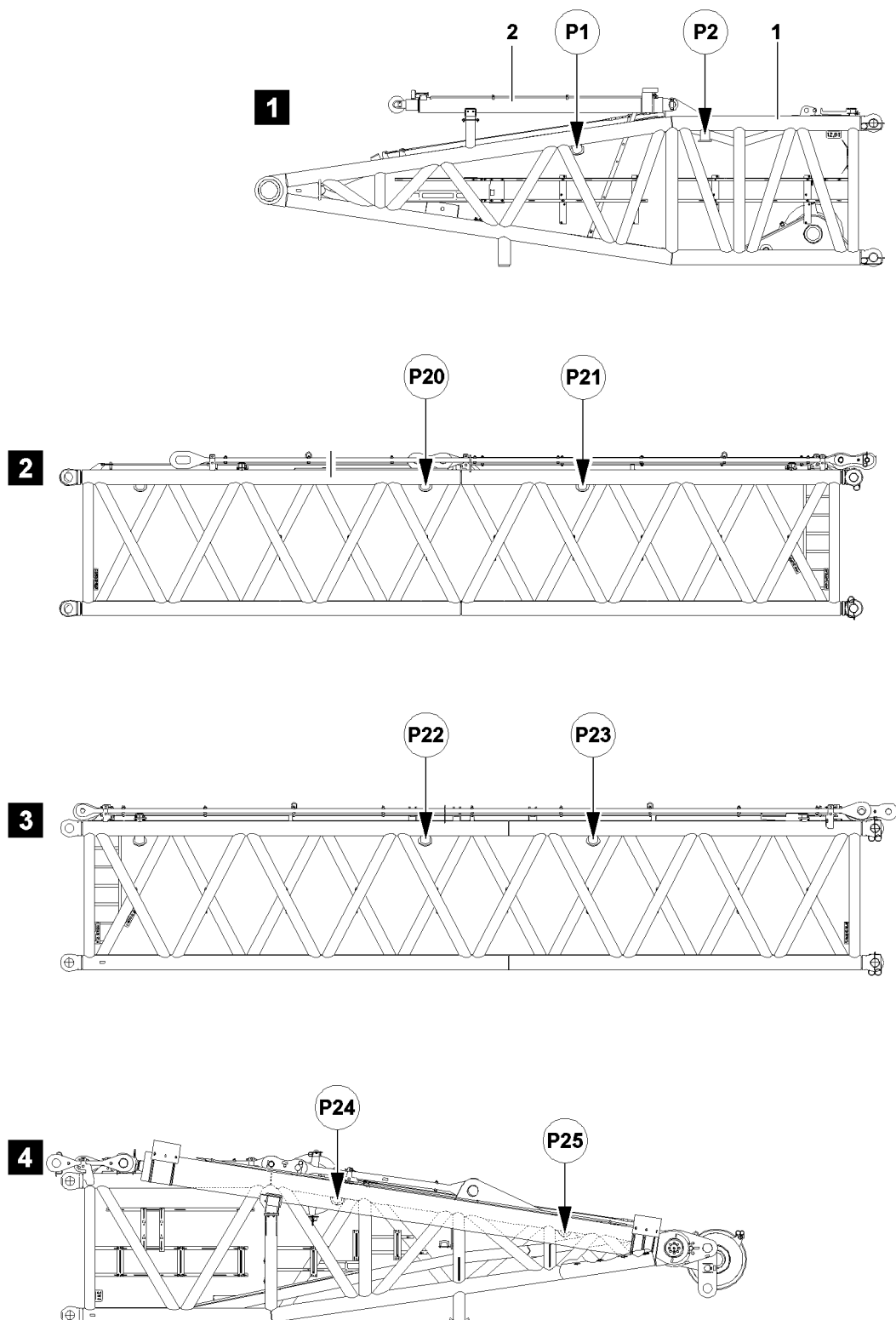


Fig.112580

1 Components and fastening points

1.1 Component overview on D-pivot section

| Position | Component | Weight ¹⁾ |
|----------|--|----------------------|
| 1 | D-pivot section without winch 3 | 12.80 t |
| 2 | D-relapse cylinder | 1.75 t |

1) The stated weights are approximate.

1.2 Fastening points on the D-lattice sections

1.2.1 Fastening points on D-pivot section

| Fastening points | |
|------------------|--|
| P1 and P2 | for D-pivot section without winch 3 |

1.2.2 Fastening points on D-intermediate section

| Fastening points | |
|------------------|----------------------------|
| P20 and P21 | for D-intermediate section |

1.2.3 Fastening points on D-reducer section

| Fastening points | |
|------------------|-----------------------|
| P22 and P23 | for D-reducer section |

1.2.4 Fastening points on D-end section

| Fastening points | |
|------------------|-------------------|
| P24 and P25 | for D-end section |

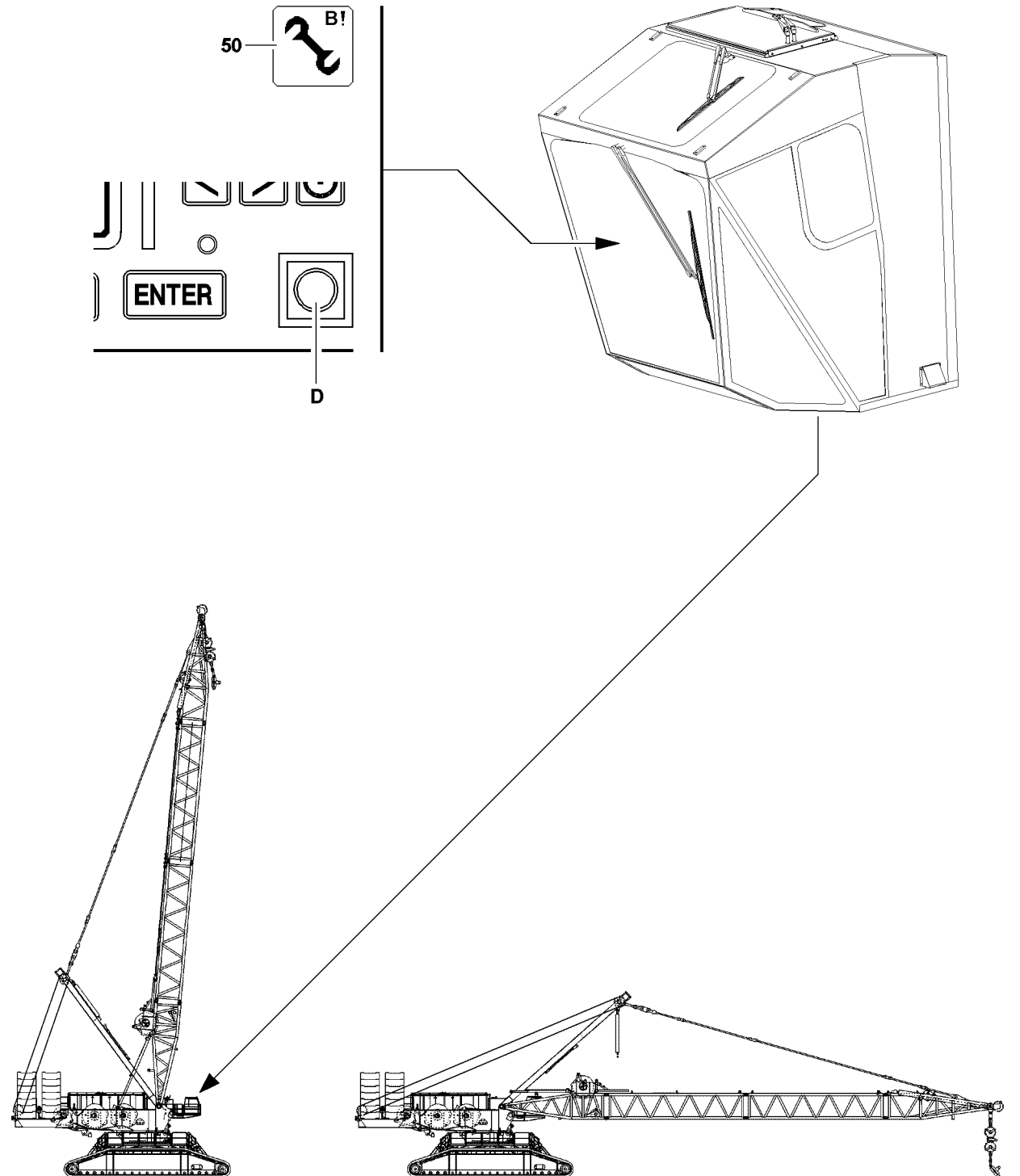


Fig.112570

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!



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 aligned in horizontal position to avoid the support beams from swinging by themselves!
- ▶ When working in danger zones: Use aids to protect limbs!
- ▶ Guide components with suitable aids to minimize oscillation!

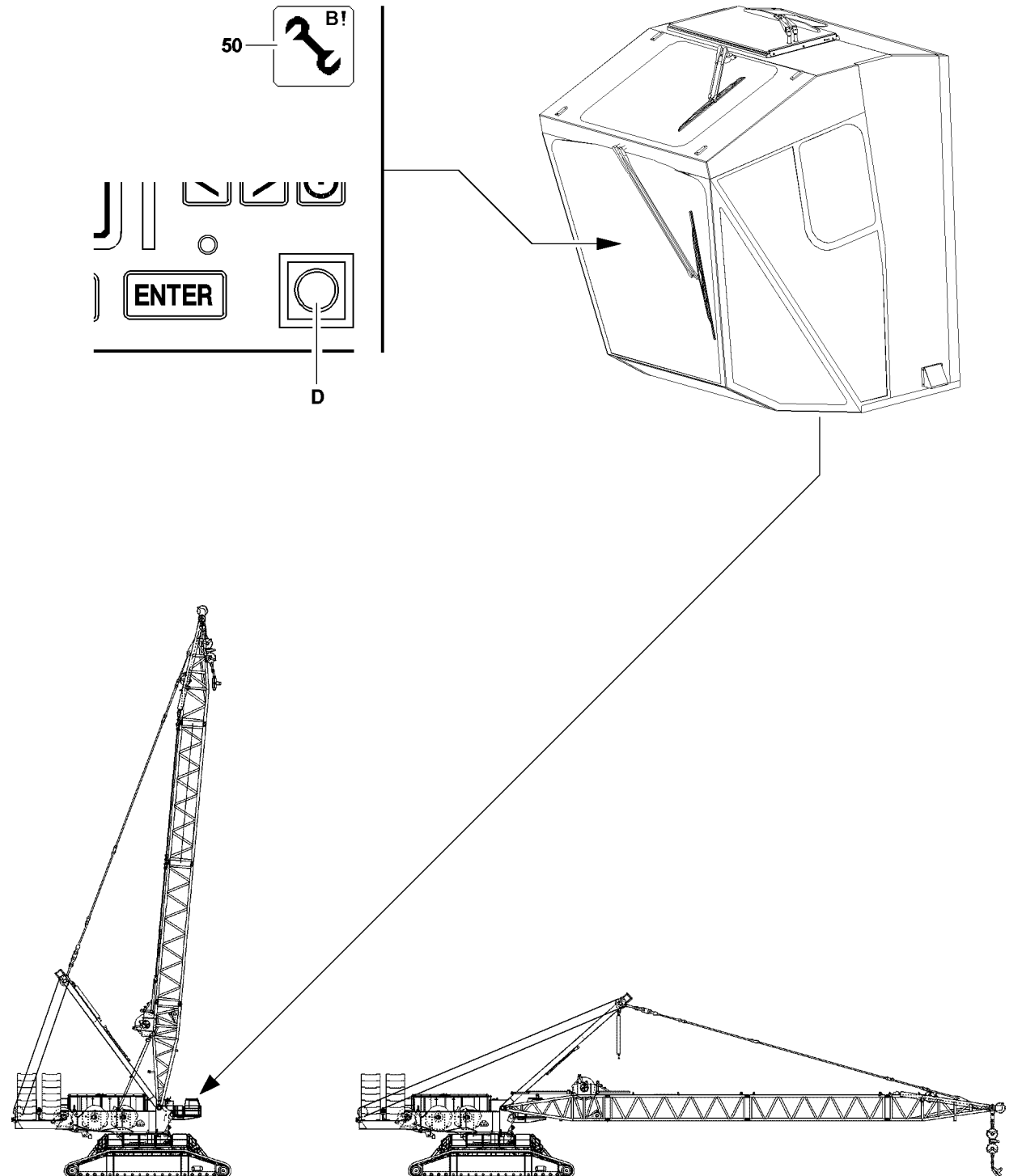


Fig.112570

NOTICE

Damage of derrick boom and SA-frame!

If the SA-frame is pulled by winch 4 (intake gear) to the rear in direction of the turntable, then the derrick boom and the SA-frame can be severely damaged!

Expensive and extensive repairs can result!

- ▶ As long as the guying between the SA-frame and the assembled D-pivot section or between the SA-frame and the assembled D-boom is **not** assembled and guyed, do not pull the SA-frame to the rear in direction of the turntable!

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.

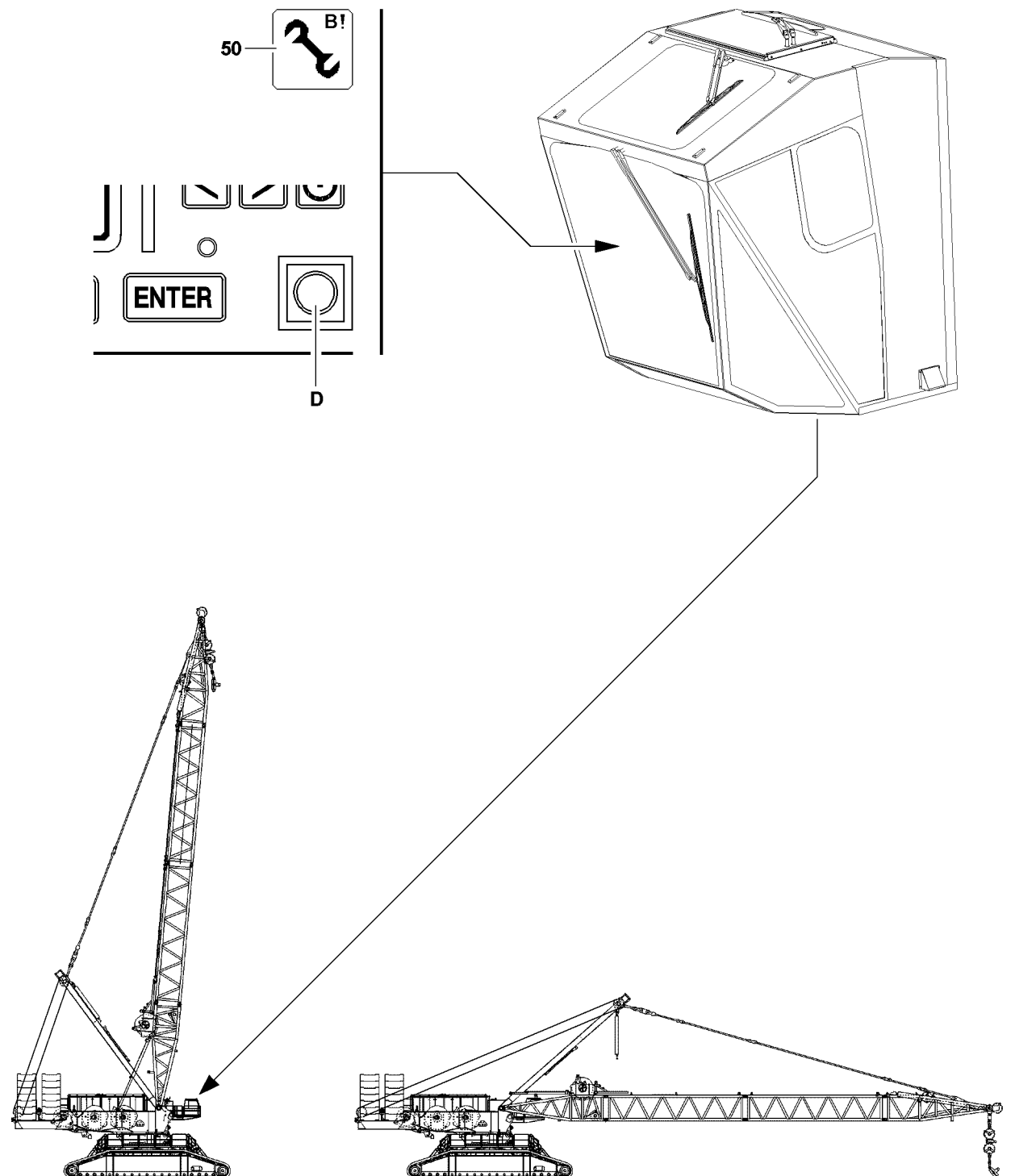


Fig.112570

2.1 Assembling the D-boom

2.1.1 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 D-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 in longitudinal direction of the travel gear or to the side.

2.1.2 Exceeding the LICCON overload protection for assembly



WARNING

Assembly with turned on set up key!

When the set up key 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 severely injured or killed!

This could result in high property damage!

▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!

▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!

▶ Observe the erection / take down charts!

▶ Crane operation with the set up key **D** turned on is strictly prohibited!

▶ Turn the set up key **D** to the right.

Result:

- The LICCON overload protection is exceeded.
- The assembly icon **11** appears on the LICCON monitor.

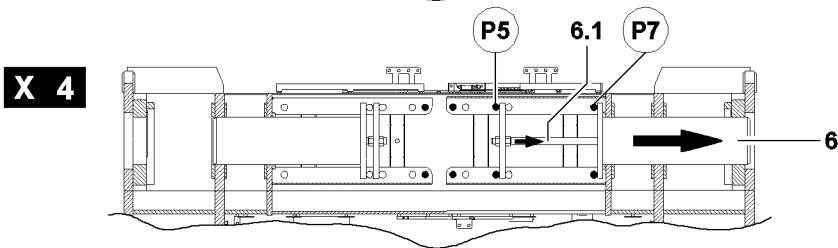
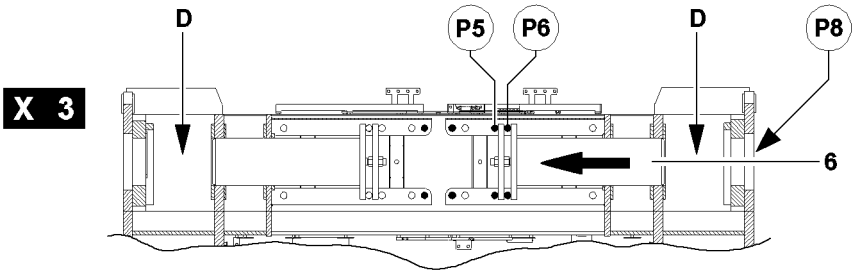
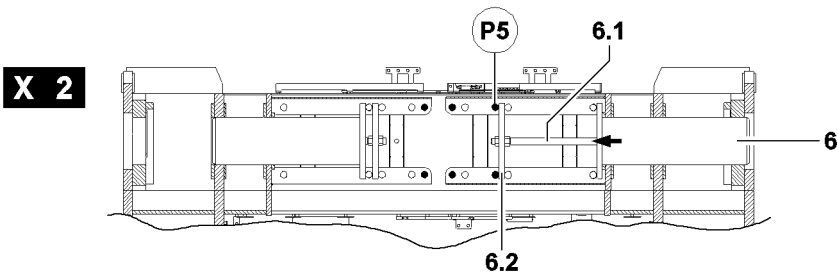
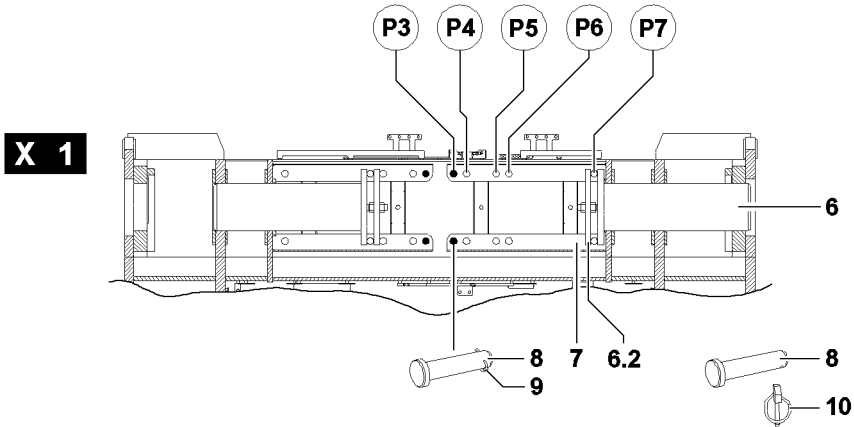
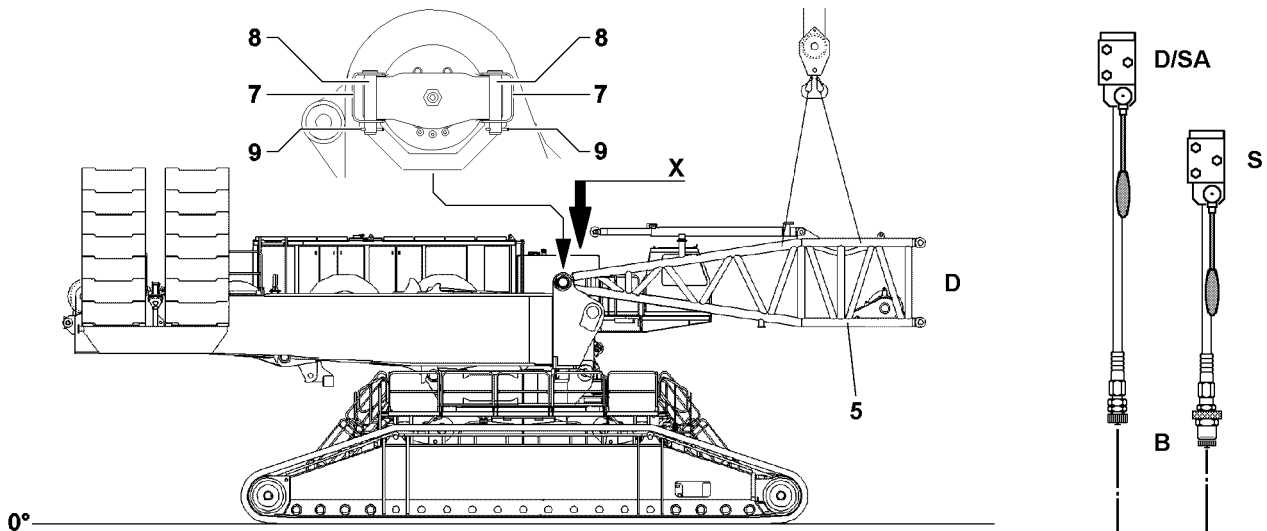


Fig.112574

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2.1.3 Pinning the D-pivot section on the turntable



DANGER

Danger of fatal accidents due falling components!

If the components are not properly pinned and secured, pins can loosen up by themselves and cause components to fall off!

Personnel can be severely injured or killed!

- ▶ All pins must be secured after assembly with the intended safety elements! Check visually!
- ▶ The guy rods must be inspected regularly, see Crane operating instructions, chapter 8.15!

NOTICE

Damage to the D-pivot section!

If the D-pivot section with installed winch 3 is installed on the turntable, then the D-pivot section can be overloaded and damaged.

- ▶ At assembly of the D-pivot section, winch 3 may be installed on the turntable, not on the D-pivot section.

Make sure that the following prerequisites are met:

- The SA-frame is erected to approx. 85°.
- The pins **6** are completely pinned on both sides on the turntable, see illustration / view **X1**.
- The pins **8** are pinned on both sides on the guide **7** at point **P3** and are secured with cotter pins **9**.



Note

- ▶ Select the fastening points on the D-pivot section in such a way that the D-pivot section hangs horizontally on the auxiliary crane at assembly, see section „Fastening points“!



WARNING

Falling SA-frame!

For the assembly of the D-pivot section, the pins **6** may not be unpinned too far, otherwise the SA-frame can fall down!

- ▶ Make sure that the pins **8** are pinned on both sides at point **P5** as stop pins before assembly of the D-pivot section **5** on the turntable.



Note

- ▶ The hand levers **S**, **D/SA** and the hydraulic connections **B** for the pin pulling device integrated in the pin **6** are on the left side of the turntable.

- ▶ Establish the hydraulic connections from the pins **6** to the turntable, see Hydraulic diagram.
- ▶ Unpin the pin **6** for derrick assembly: Insert the pin **8** on both sides as stop pin at point **P5** and secure with linch pin **10**, see illustration / view **X2**.
- ▶ Move the hand lever **D/SA** and extend the piston rod **6.1** until the plate **6.2** touches on the stop pins **8** at point **P5**, illustration / view **X2**.

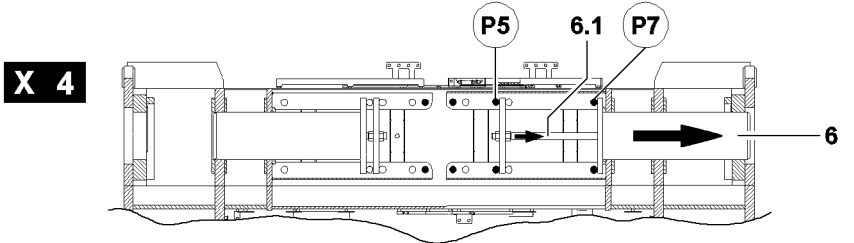
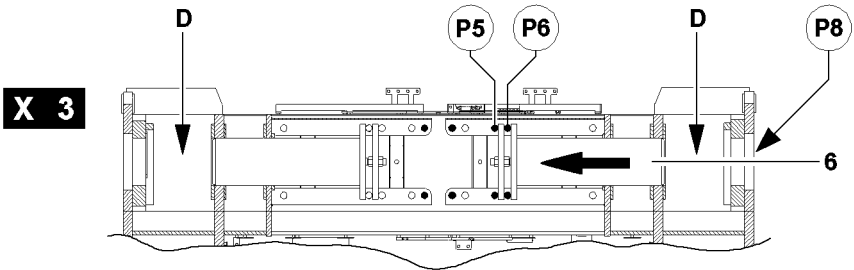
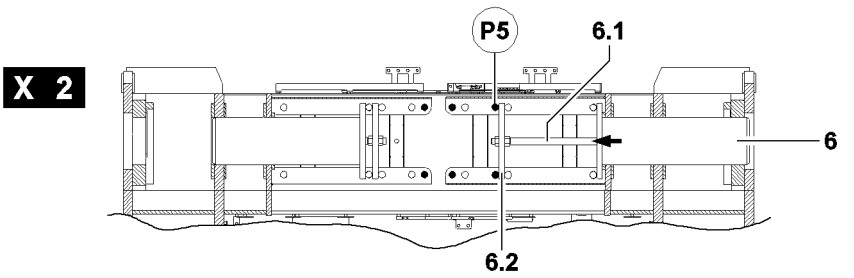
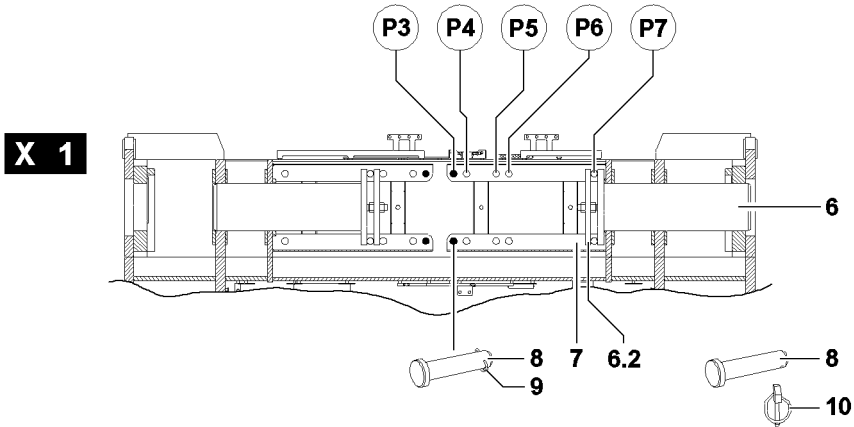
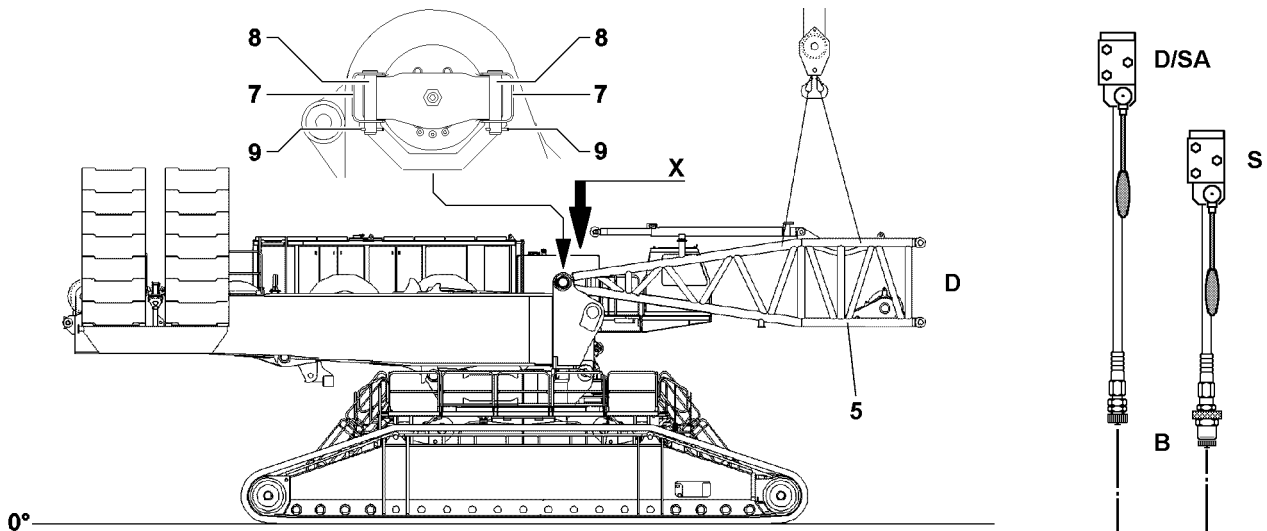


Fig.112574

LWE/LR 11350-007/19005-01-02/en

- ▶ Insert the additional pins **8** on both sides on points **P6** and secure with lynch pins **10**, see illustration / view **X2**.

Result:

- The plate **6.2** is „tensioned“ between the pins **8** at point **5** and point **P6**.
- ▶ Move the hand lever **D/SA** and unpin the pin **6** until the pin **6** touches on the pins **8** at point **P6**, illustration / view **X3**.

Result:

- The D-pivot section can be swung in to the pin bores on the turntable.
- ▶ Hang the D-pivot section **5** onto the auxiliary crane and swing in to the pin points on the turntable.

When the pin points of the D-pivot section **5** align with the pin points of the turntable:

- ▶ Pin the D-pivot section **5** on both sides with the pin pulling device: Move the hand lever **D** and insert the pins **6** completely on both sides.
- ▶ Secure the pins **6**: Release the pins **8** on both sides at point **P6** and unpin, then pin on both sides at point **P7** and secure with lynch pin **10**, illustration / view **X4**.
- ▶ Move the hand lever **D** and move the piston rod **6.1** of pin **6** all the way in.

Result:

- The pins **6** are completely pinned.

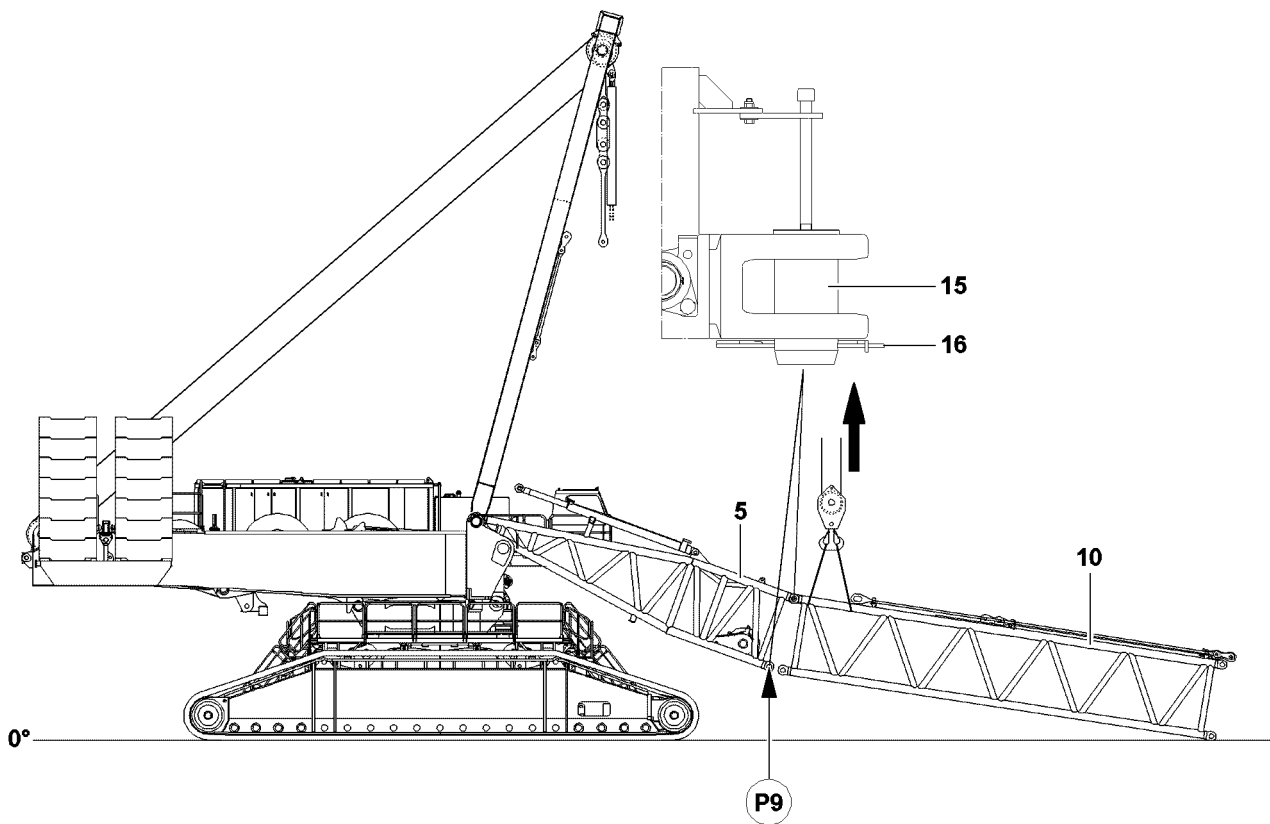
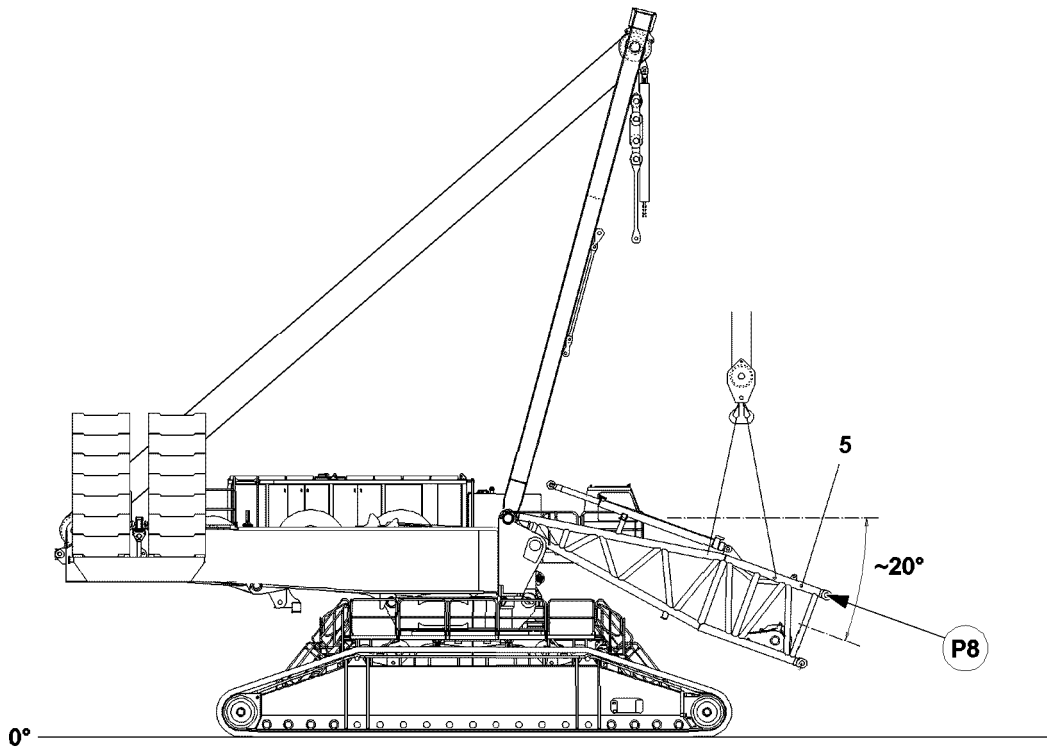


Fig.112575

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2.1.4 Assembling the D-intermediate section on the D-pivot section

Make sure that the following prerequisites are met:

- The D-pivot section is pinned and secured on the turntable.
- The D-pivot section hangs on the auxiliary crane.
- The winch 3 is **not** installed on the D-pivot section.



Note

- ▶ Always support the D-lattice sections sufficiently for easier assembly!
- ▶ Pin and unpin the D-lattice sections with the pin pulling device, see Crane operating instructions, chapter 5.30!

NOTICE

Damage to the D-pivot section!

If the D-pivot section with installed winch 3 and pinned D-intermediate section is laying on the turntable, the D-pivot section can be overloaded and damaged.

- ▶ Winch 3 may only be installed on the D-pivot section after closing the D-pivot section with the D-intermediate section.

- ▶ Lower the D-pivot section **5** with the auxiliary crane until it rests on the turntable.
- ▶ Release the auxiliary crane on the D-pivot section **5** and attach on the D-intermediate section **10**.
- ▶ Attach the D-intermediate section on the auxiliary crane and swing it in to the D-pivot section.
- ▶ Pin the D-intermediate section **10** on the D-pivot section **5** at point **P8 on top**: Insert the pin **15** and secure with spring retainer **16**.
- ▶ Close the D-intermediate section **10** and the D-pivot section **5** with the auxiliary crane and pin on both sides at point **P9 on the bottom**: Insert the pin **15** and secure with spring retainer **16**.

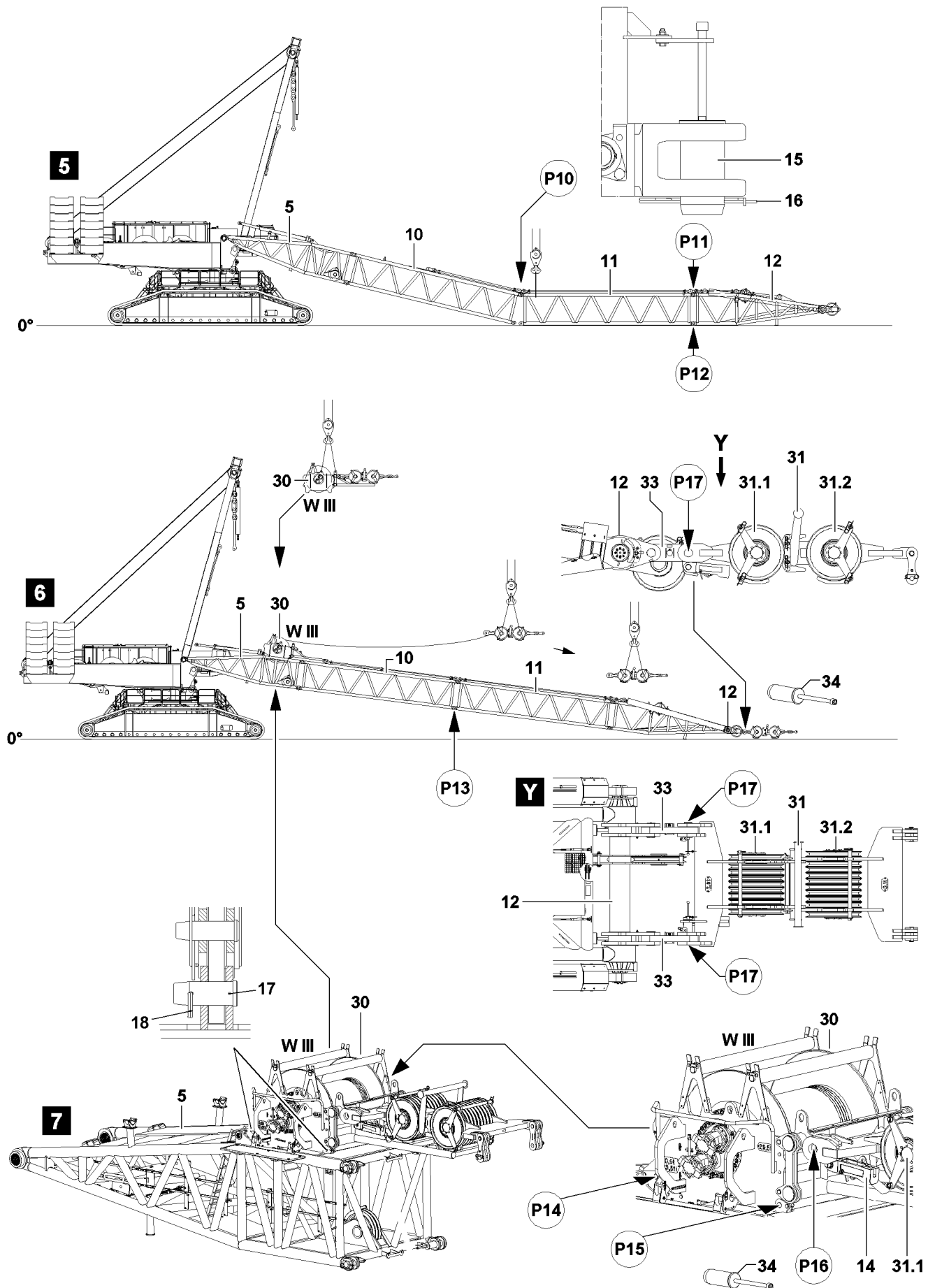


Fig.112576

LWE/LR 11350-007/19005-01-02/en

2.1.5 Assembling the D-reducer section and the D-end section

- ▶ Pin the D-reducer section **11** on the D-intermediate section **10** at point **P10 on top**: Insert the pin **15** and secure with spring retainer **16**, see illustration.
- ▶ Pin the D-end section **12** on the D-reducer section **11** at point **P11** and point **P12** on both sides: Insert the pin **15** and secure with spring retainer **16**.
- ▶ Closing the D-boom: Lift the D-reducer section **11** with the auxiliary crane until the pin bores align at point **P13 on the bottom**.

When the pin bores align:

- ▶ Insert the pin **15** on both sides at point **P13 on the bottom** and secure with spring retainer **16**.
- ▶ Position winch 3 **W III** with the auxiliary crane on the D-pivot section **5**.

When winch 3 **W III** is laying on the centering pins on the D-pivot section **5**:

- ▶ Pin winch 3 **W III**: Insert the pin **17** at point **P14** and point **P15** on both sides and secure with spring retainer **18**.

2.1.6 Assembling the pulley block on the D-end section

Make sure that the following prerequisites are met:

- Winch 3 **W III** is reeved in on the pulley block **31**.
- The rope clamp of winch 3 **W III** is installed on the lock **14** on the lower pulley block **31.1**.



WARNING

Falling pulley block!

If the pulley block **31** is not held safely by the auxiliary crane when unpinning it on the transport receptacle, then the pulley block can fall down!

Personnel can be severely injured or killed!

- ▶ The pulley block **31** must hang safely on the auxiliary crane before unpinning it on the transport receptacle!
- ▶ Attach the pulley block **31** onto the auxiliary crane.
- ▶ Unpin the pulley block **31** on the transport receptacle at point **P16**: Release and unpin the pin **34**.

NOTICE

Danger of slack rope on winch 3!

When spooling out winch 3 **W III**, the rope may slacken up!

- ▶ Spool out only as much rope as is actually needed to position the pulley block on the D-end section!
- ▶ Pull the pulley block **31** with the auxiliary crane to the D-end section **12** while spooling out winch 3 **W III** at the same time.
- ▶ Pin the pulley block **31** on the pull test brackets **33** on the D-end section **12**: Insert the pins **34** on both sides at point **P17** and secure.
- ▶ Spool up winch 3 **W III** until the control rope is slightly tensioned between the upper pulley block and the lower pulley block.

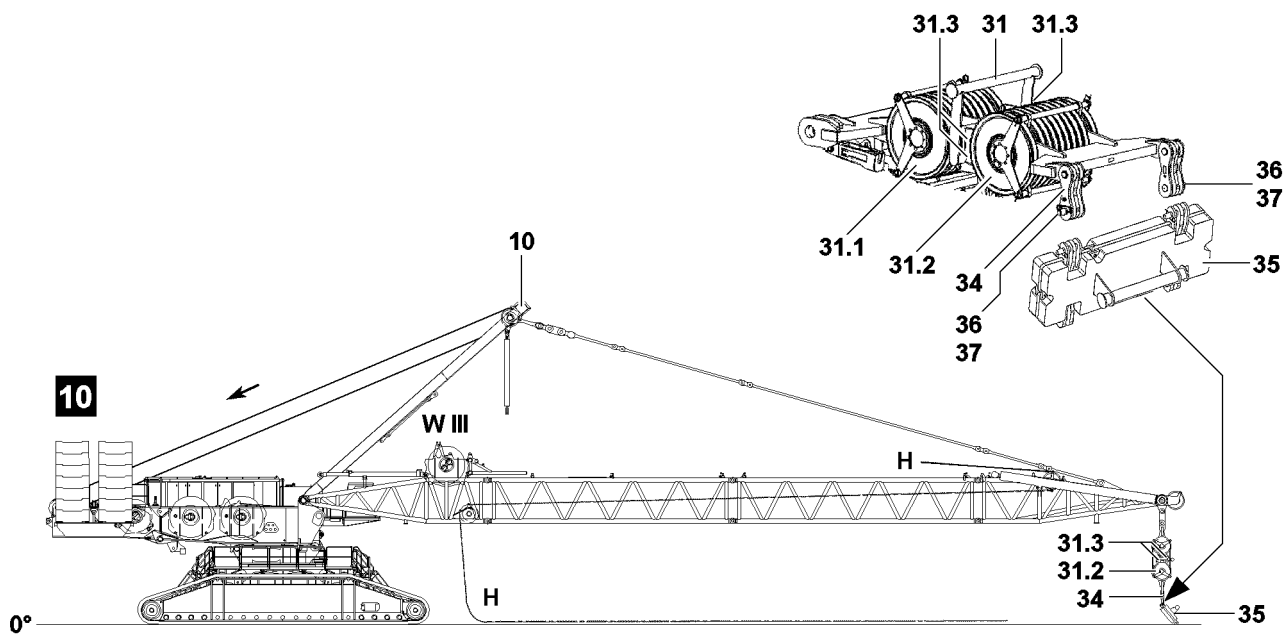
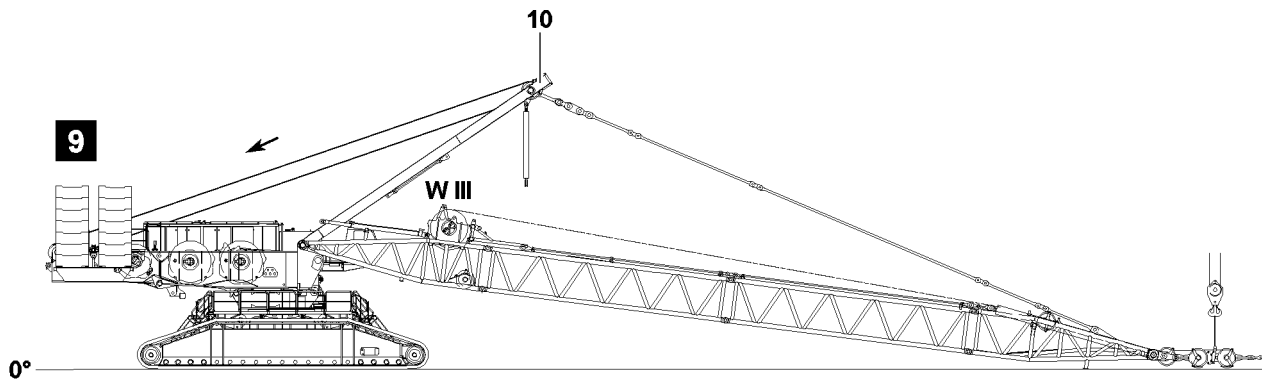
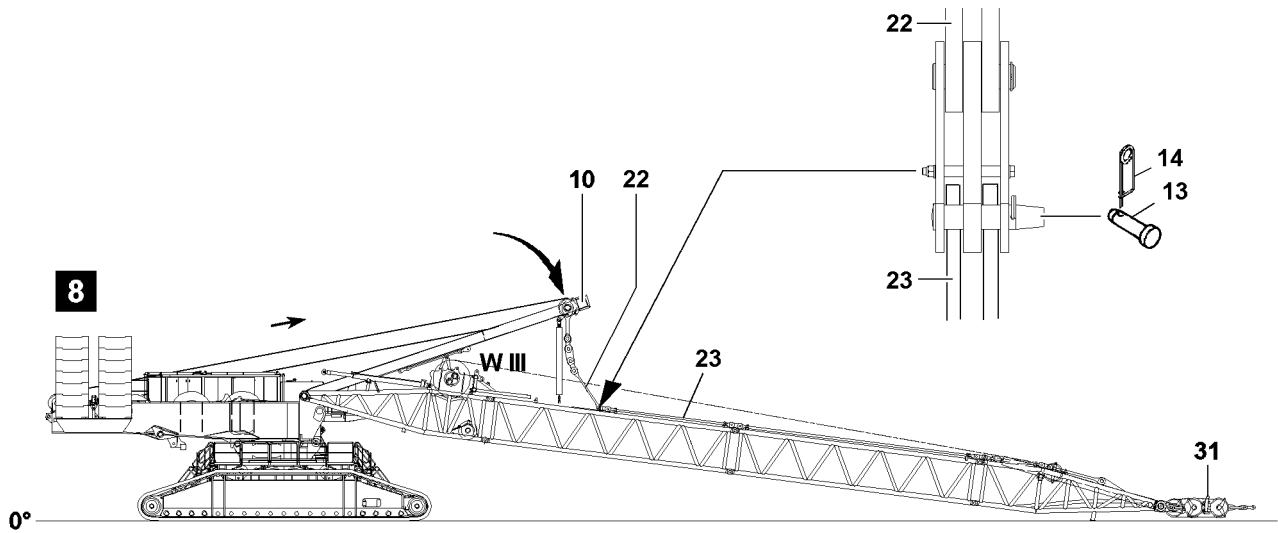


Fig.112577

LWE/LR 11350-007/19005-01-02/en

2.1.7 Assembling the D-guy rods



Note

- ▶ Assemble and secure the D-guy rods according to the rod plan.
- ▶ The numbering on the guy rods must match the numbering in the rod plan.

The D-guy rods are placed and secured for transport on the D-lattice sections. Before assembly, the transport retainers must be released.

- ▶ Release the transport retainers on the guy rods.

The guy rods for the derrick ballast are placed and secured for transport **inside** on the D-lattice sections. Before assembly, they must be placed on the folded out receptacles toward the outside.

- ▶ Lower the SA-frame **10** to the front.
- ▶ Pin the guy rods **22** with the guy rods **23**: Insert the pin **13** and secure with spring retainer **14**.

When the guy rods are pinned and secured:

- ▶ Luff up the D-boom until the pulley block **31** hangs freely above the ground.
- ▶ Pin the assemble weight **35** on the lugs **34** and secure: Insert the pin **36** and secure with spring retainer **37**.



WARNING

Falling upper pulley block!

When unpinning the transport retaining pipes between the lower pulley block **31.1** and the upper pulley block, the upper pulley block **31.2** can fall down!

Personnel can be severely injured or killed!

- ▶ Make sure that the control rope of winch 3 **W III** is reeved and tensioned between the lower pulley block **31.1** and the upper pulley block **31.2**!
- ▶ Make sure that there are no persons within the danger zone when unpinning the pulley blocks!
- ▶ Release and unpin the transport retaining pipes **31.3** between the upper pulley block **31.2** and the lower pulley block **31.1**.



WARNING

Falling hoist rope!

If the hoist rope is not reeved with the respective length over the D-boom before the erection procedure, then it can fall backward due to its own weight!

Personnel can be severely injured or killed!

- ▶ 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!
- ▶ Do not step into the danger zone!
- ▶ Pull the hoist rope over the rope pulleys on the D-end section and the D-pivot section.

Fig.195219

LWE/LR 11350-007/19005-01-02/en

2.2 Establishing the electrical connections

Make sure that the following prerequisite is met:

- The D-boom is completely assembled.



Note

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

- ▶ Establish the electrical connections.
- ▶ Make sure that all electrical connections on the boom are established.

2.3 Establishing the hydraulic connections

The hydraulic connections are made with quick-release couplings.

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



WARNING

Pressure in the hydraulic lines!

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

Personnel can be severely injured or killed!

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

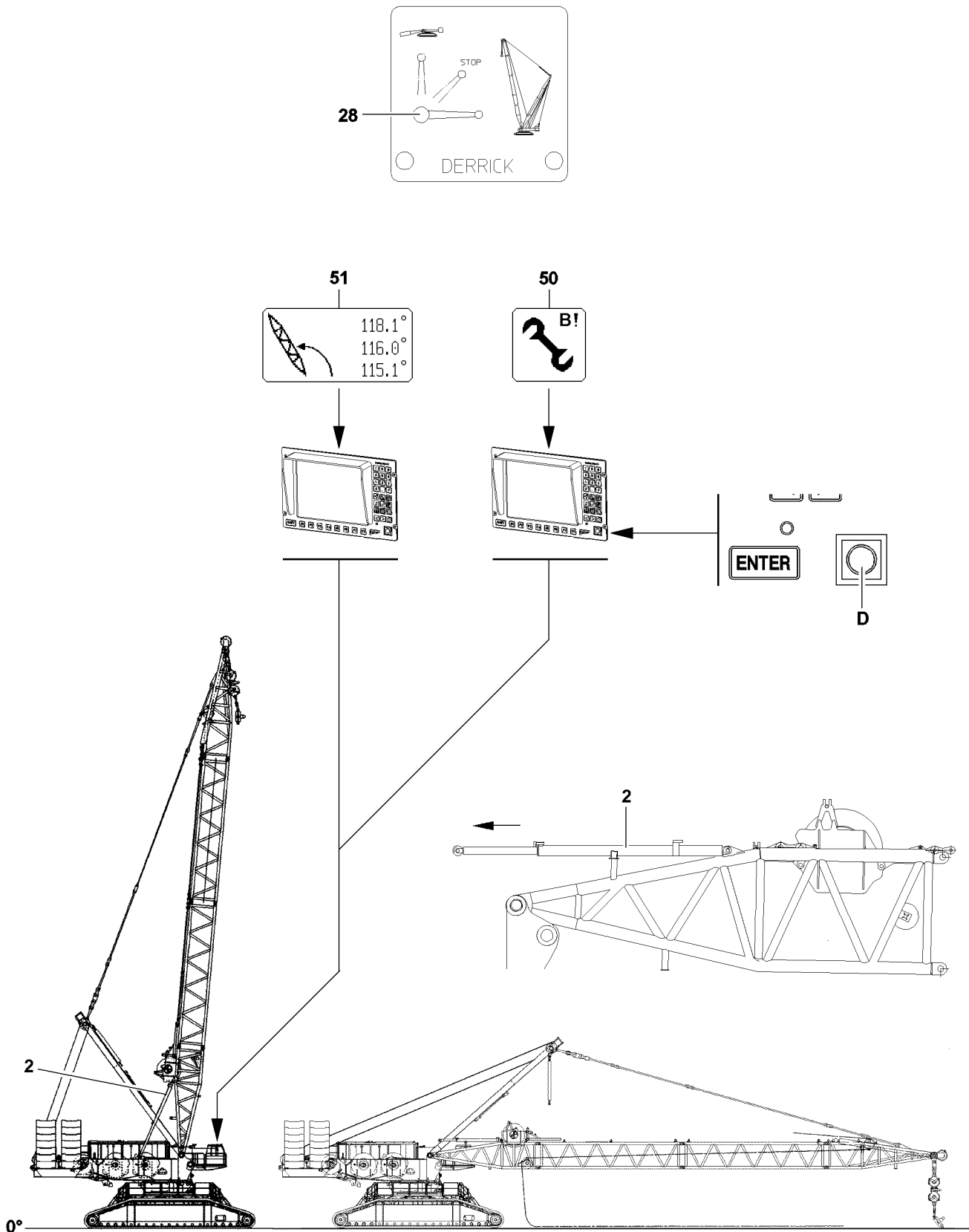


WARNING

Loss of pressure or leakage!

Incorrectly coupled or self-loosening quick-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 using the crane!
- ▶ Connect the coupling components (sleeve and connector) and screw together with the hand-tightened nut.
- ▶ Tighten hydraulic coupling by hand. Rotate the hand-tightened nut until it reaches a tangible, fixed stop position.
- ▶ Establish the hydraulic connection to the D-relapse cylinders.



LWE/LR 11350-007/19005-01-02/en

Fig.112573

2.4 Checking the function of the safety devices



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 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.

2.4.1 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 spool up function of the hoist winch turns off.
- The icon „Derrick boom angle“ appears on LICCON monitor 1, see illustration 51.
- The limit switch is functioning.

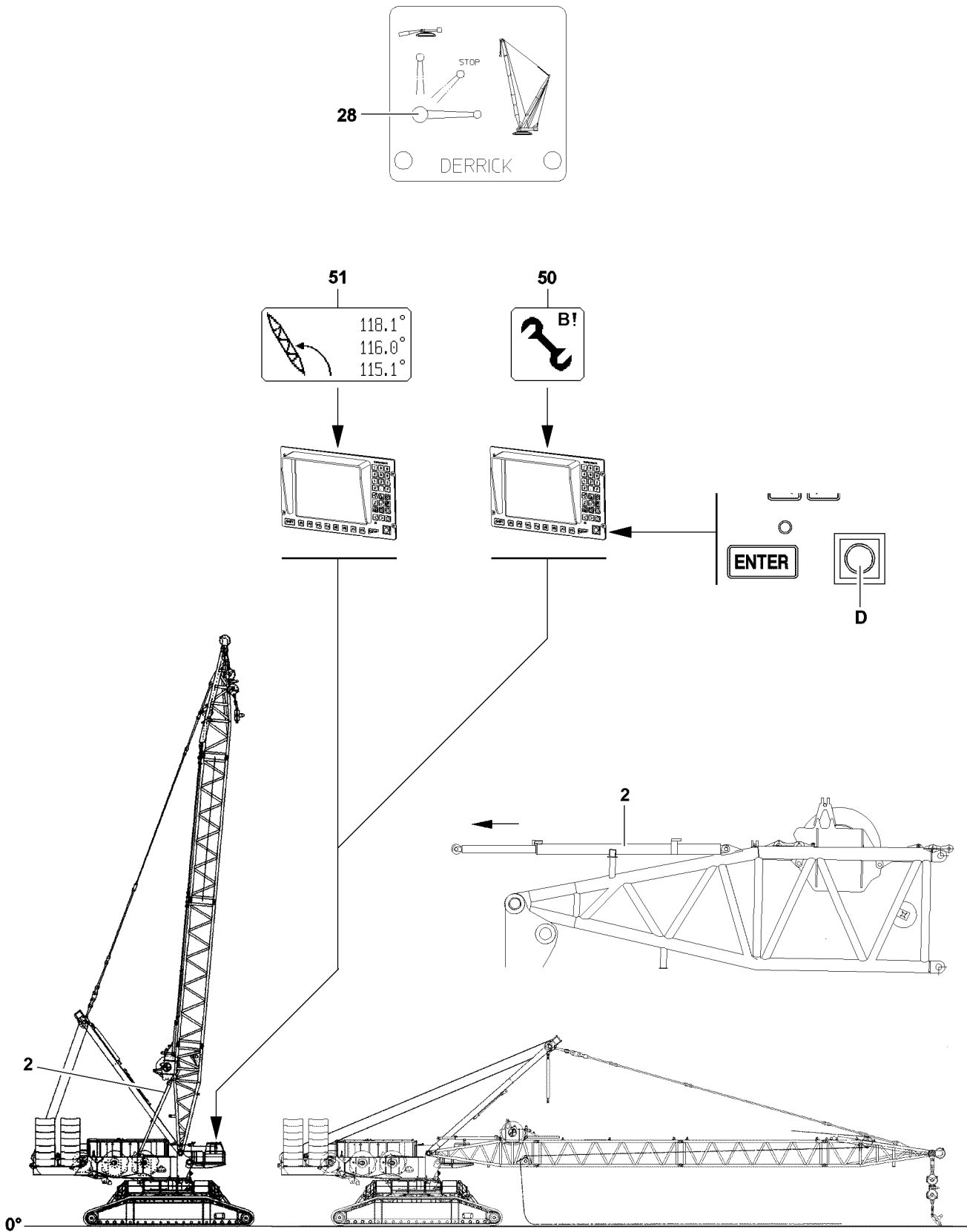


Fig.112573

LWE/LR 11350-007/19005-01-02/en

2.5 Erecting the D-boom



DANGER

The crane can topple over!

- ▶ It is not permitted to turn the crane during the erection procedure!
- ▶ Observe the data in the erection and take down charts!



WARNING

The crane can topple over!

If the following conditions are not met before erecting the D-boom, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Observe the safety technical notes, see Crane operating instructions, chapter 5.01!
- ▶ Extend the D-relapse cylinder **2** before erection!
- ▶ Do not allow slack cable to build up on the winch **3**!
- ▶ The ball valve cabinet must be locked!
- ▶ Always pull the key on the ball valve cabinet and hand it to an authorized person!



WARNING

Falling hoist rope!

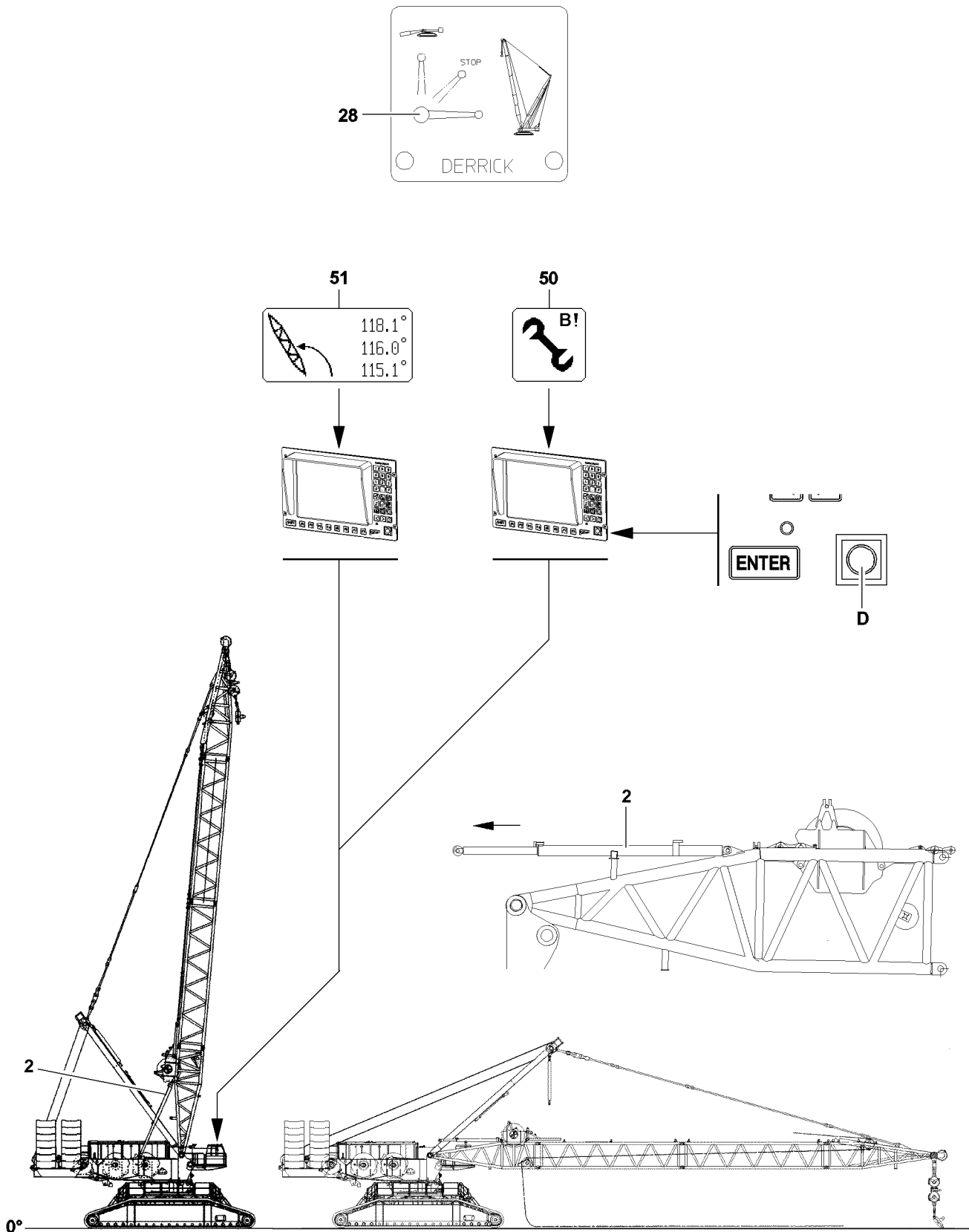
If the hoist rope is not reeved with the respective length over the D-boom before the erection procedure, then it can fall backward due to its own weight!

Personnel can be severely injured or killed!

- ▶ Reeve the hoist rope before the erection procedure with sufficient length on the D-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 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 actual crane configuration.
- The LICCON overload protection is exceeded.
- The assembly icon **50** is visible on the LICCON monitor.
- No personnel is within the danger zone.



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Fig.112573

2.5.1 Extending the D-relapse cylinder



WARNING

Mortal danger due to the D-boom!

If the D-relapse cylinders are not extended before erecting the D-boom, then the D-boom can fall backward!

Personnel can be severely injured or killed!

- ▶ The D-relapse cylinders **2** must be extended before erection of the D-boom!
- ▶ The ball valve **28** must be secured during crane operation to prevent unintended actuation!

The piston rod on the D-relapse cylinder **2** must be extended by actuating the ball valve **28**.

| Ball valve positions | |
|----------------------|--|
| Horizontal | Crane operation, extend the piston rod |
| Vertical | Assembly, retract the piston rod |
| 45° | STOP (the piston rod cannot be retracted / extended) |

Make sure that the following prerequisite is met:

- All hydraulic connections have been made.
- ▶ Move the ball valve **28** into horizontal position.

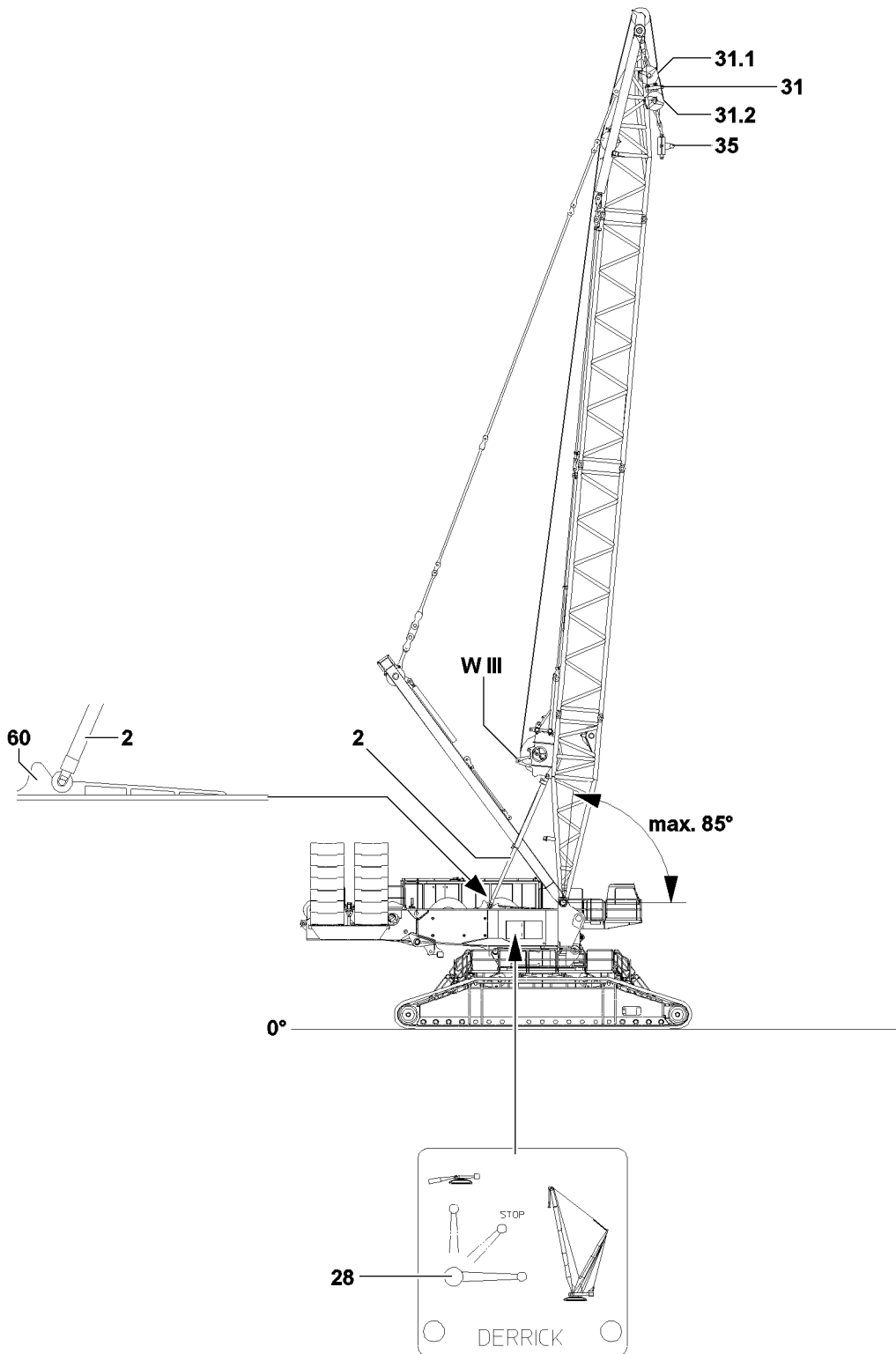
Result:

- The piston rods of the D-relapse cylinders **2** extend.



Note

- ▶ The ball valve is secured by closing the cabinet door and removing the key!
- ▶ Close the cabinet door and pull the key.
- ▶ Hand the key to an authorized person.



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Fig.112578

2.5.2 Erection procedure

Make sure that the following prerequisites are met:

- The D-relapse cylinders **2** are fully extended before erection.
- The control rope of winch 3 **W III** is properly reeved on the pulley block **31** and properly secured on the rope fixed point.
- The assembly weight **35** is assembled on the upper pulley block **31.2**.
- The transport retaining pipes between the upper pulley block **31.2** and the lower pulley block **31.1** are unpinned.



WARNING

The crane can topple over!

When erecting the D-boom, observe and adhere to the following conditions!

- ▶ It is not permitted to turn the crane superstructure during erection procedure!
 - ▶ Do not allow slack rope to build up on the winch 3 **W III**!
 - ▶ Make sure that the D-relapse supports **2** are moved into the stop rail **60**!
 - ▶ Do not erect the D-boom further than maximum 85° to the horizontal!
-
- ▶ Actuate winch 4 and erect the D-boom to an angle range of 75° to 85°.

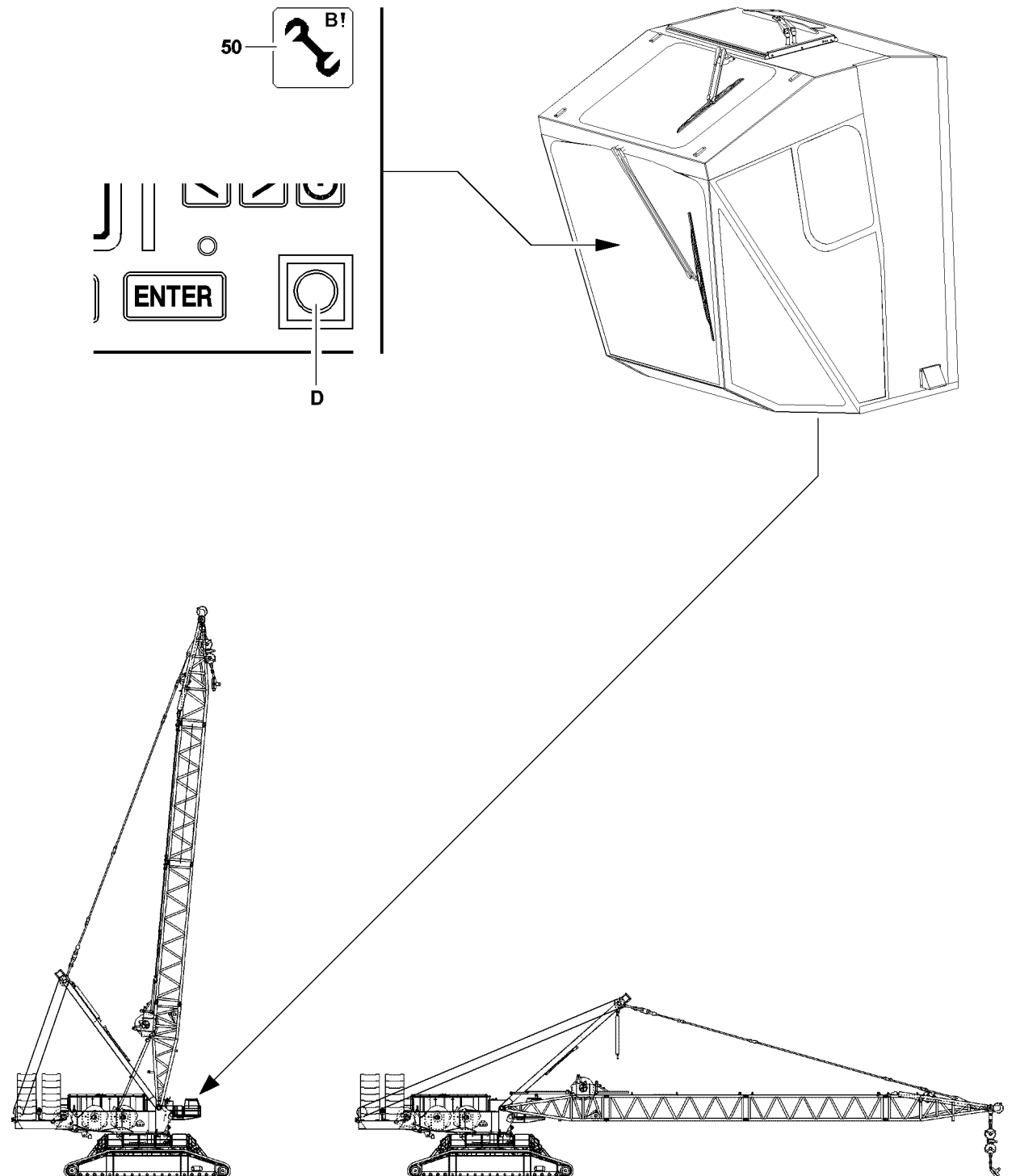


Fig.112570

3 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!



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 aligned in horizontal position to avoid the support beams from swinging by themselves!
- ▶ When working in danger zones: Use aids to protect limbs!
- ▶ Guide components with suitable aids to minimize oscillation!

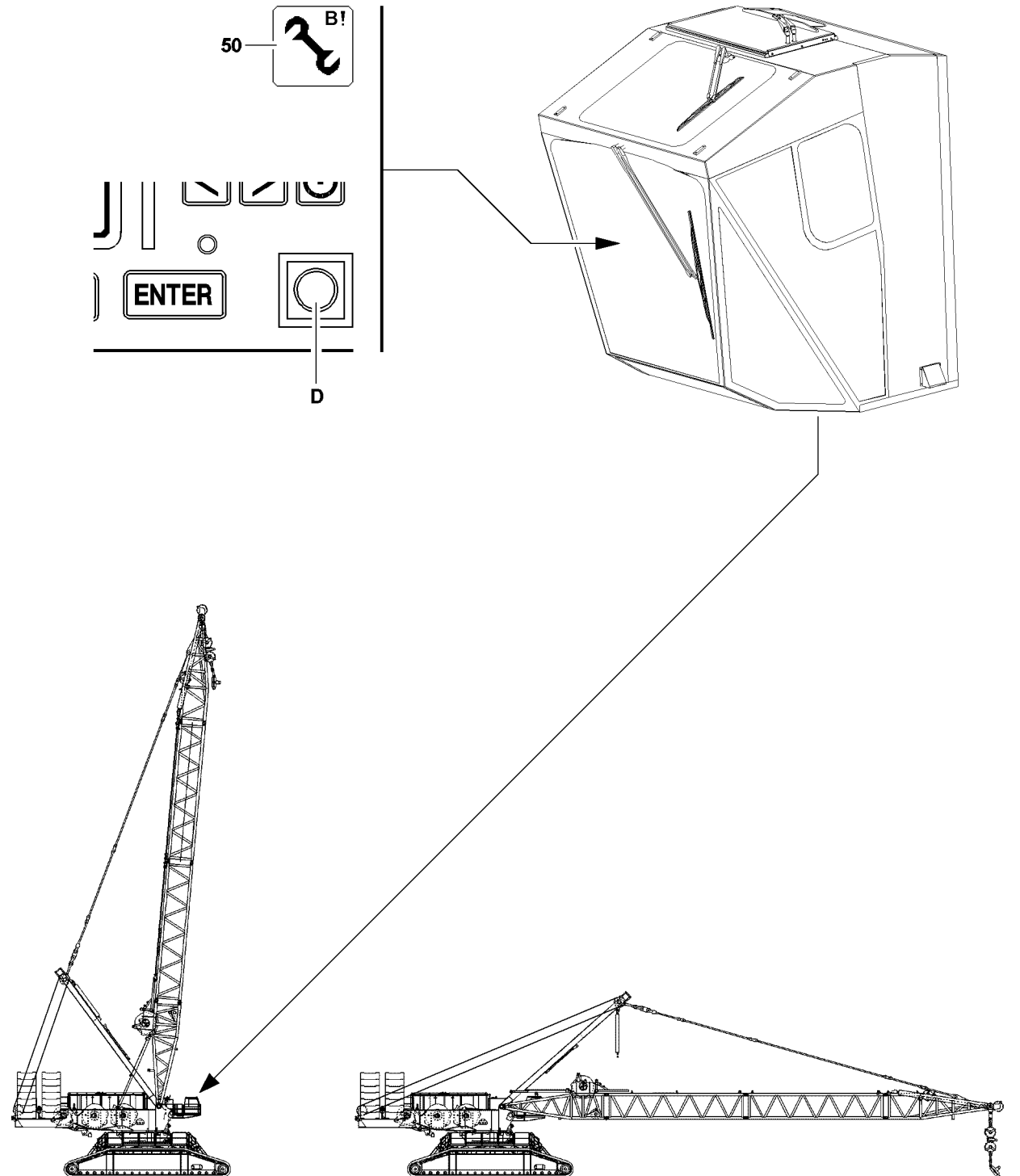


Fig.112570

3.1 Disassembling the D-boom



WARNING

Falling boom!

If the D-boom is not properly supported before disassembly or held with an auxiliary crane, then the D-boom can fall down when it is unpinned!

Personnel can be severely injured or killed!

- ▶ Before supporting the D-boom, the ground condition must be checked regarding load bearing capability and level!

If the ground condition is not classified as sufficient:

- ▶ Support the D-boom properly and safely with suitable material!

3.1.1 Turning the turntable into assembly position



DANGER

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 in longitudinal direction of the travel gear or to the side.

3.1.2 Exceeding the LICCON overload protection for disassembly



WARNING

Disassembly with turned on set up key!

When the set up key 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 severely injured or killed!

This could result in high property damage!

- ▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
- ▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with the set up key **D** turned on is strictly prohibited!

- ▶ Turn the set up key **D** to the right.

Result:

- The LICCON overload protection is exceeded.
- The assembly icon **50** appears on the LICCON monitor.

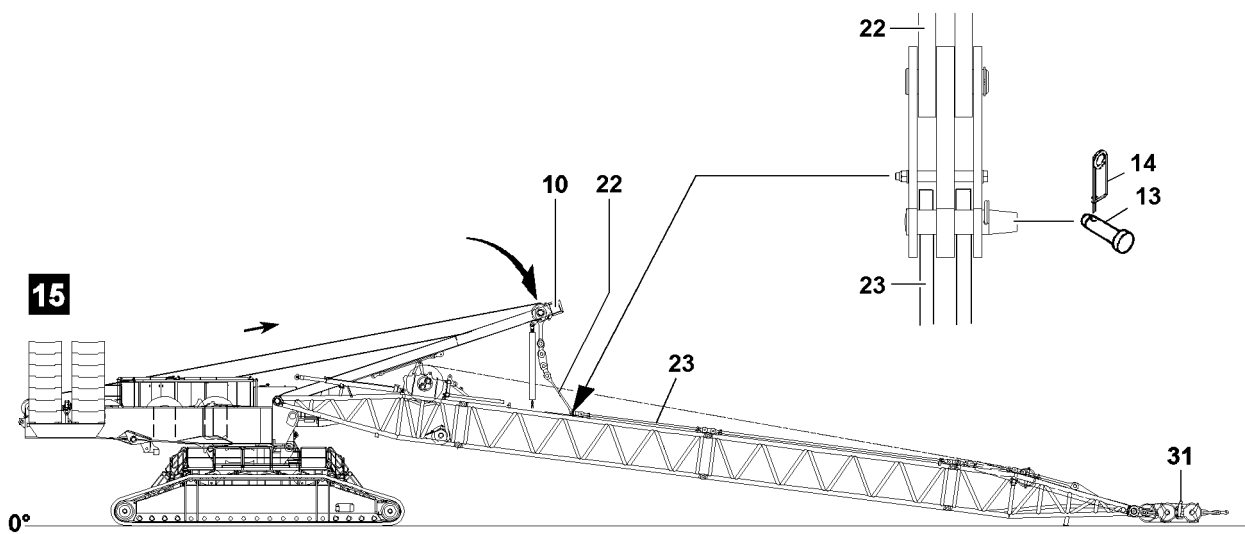
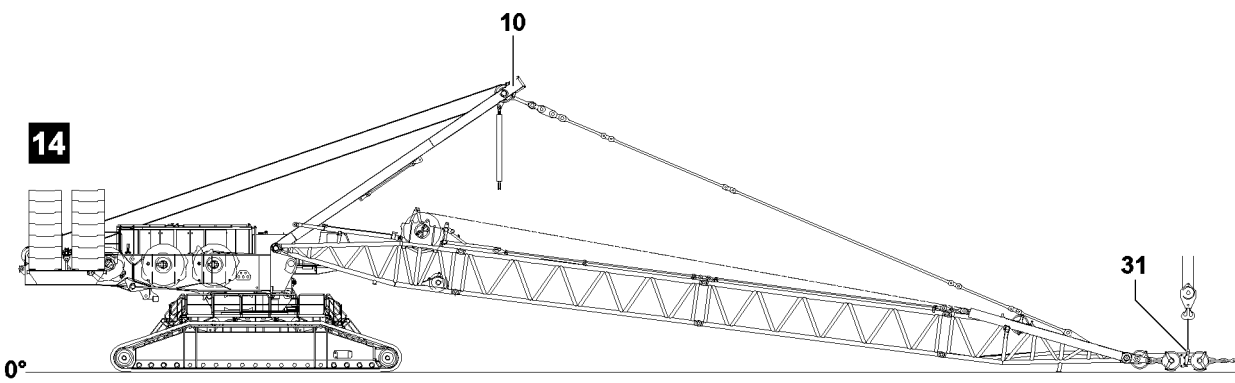
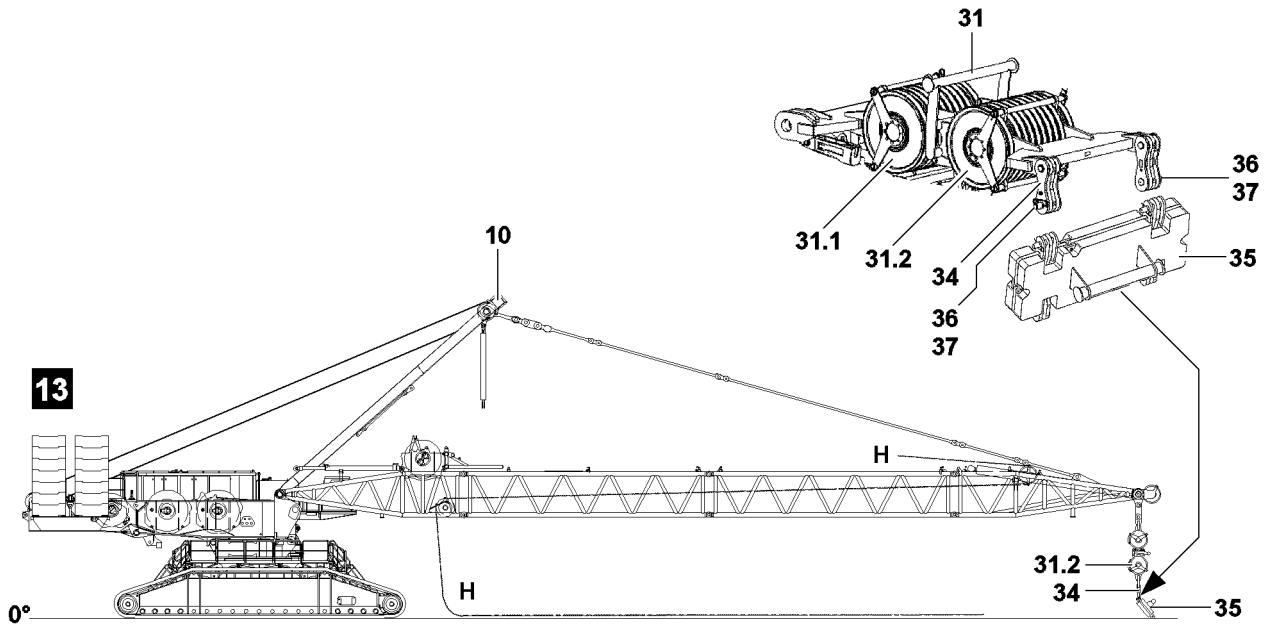


Fig.112579

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3.1.3 Luffing the D-boom down

- ▶ When luffing the D-boom down, spool up winch 3 **W III** simultaneously.

NOTICE

Damage to the pulley block!

By luffing the D-boom down too fast „in forward direction“, the pulley block can hit the ground. Significant damage can occur on the pulley block and on the D-end section!

- ▶ Luff the D-boom down carefully to the front!

-
- ▶ Luff the D-boom down to the front until the pulley block is just above the ground.

When the pulley block is just above the ground:

- ▶ Unreeve the hoist rope **H**.
- ▶ Attach the assembly weight **35** onto the auxiliary crane.
- ▶ Unpin the assembly weight **35** on the brackets **34**: Release the pins **36** and unpin.
- ▶ Remove the assembly weight **35** with the auxiliary crane.

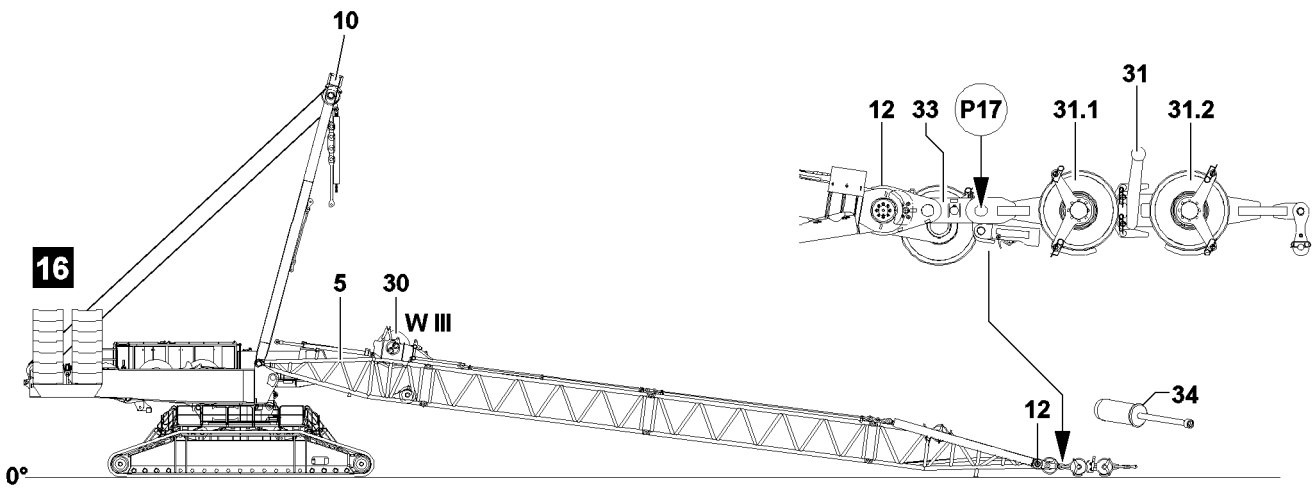
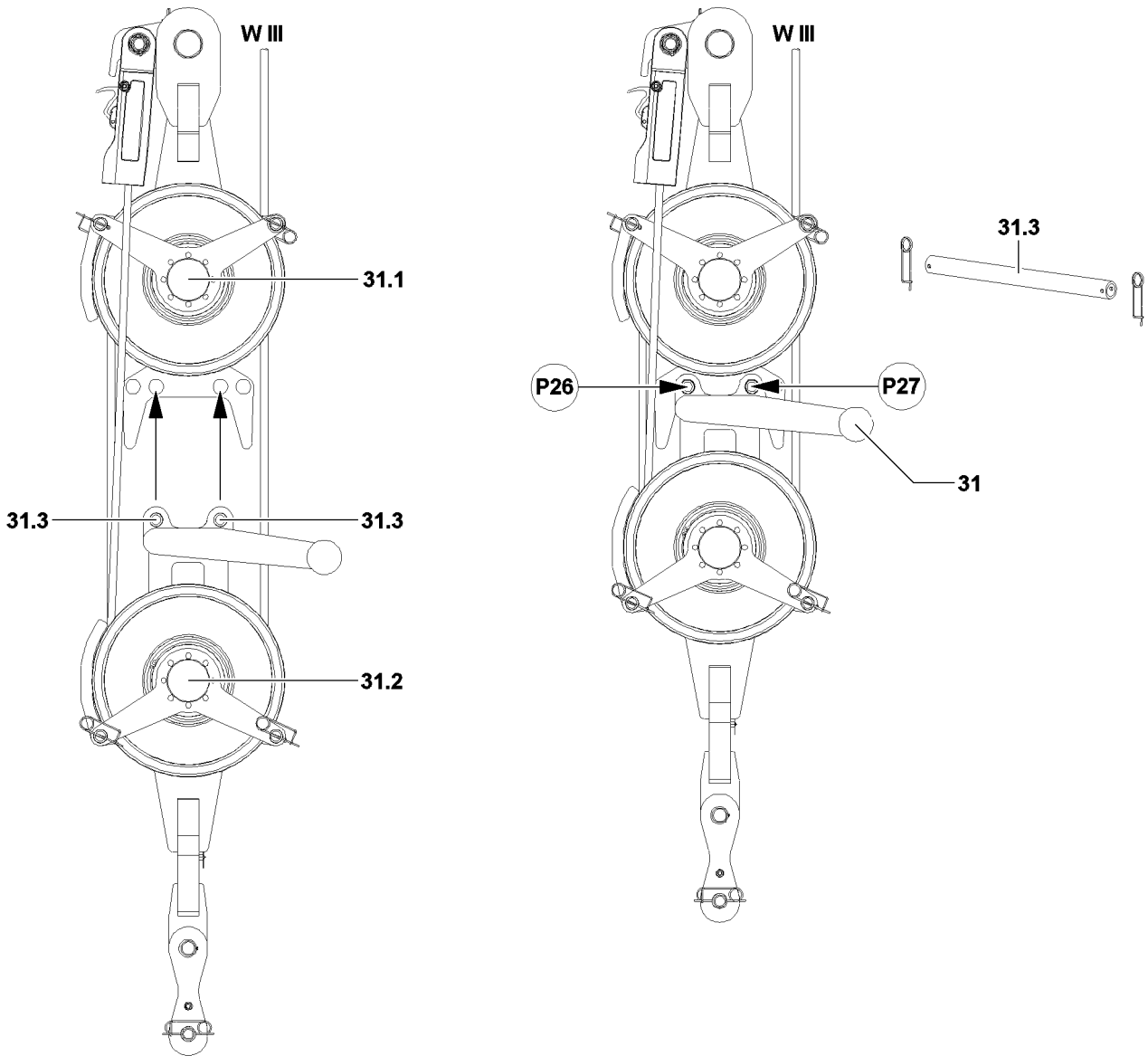


Fig.112581

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3.1.4 Pinning the upper pulley block with the lower pulley block

Make sure that the following prerequisites are met:

- The main boom is completely disassembled.
- The upper pulley block **31.2** hangs in reeved condition above the ground level.
- The transport retaining pipes **31.3** on the bracket of the lower pulley block **31.1** are unpinned.

The upper pulley block must be pinned with the lower pulley block before the complete pulley block can be placed in the transport receptacle on the D-pivot section.

- ▶ Luff the D-boom down slowly and spool up winch 3 at the same time until the upper pulley block **31.2** has moved together with the lower pulley block **31.1**.

NOTICE

Danger of property damage on the pulley block!

If the D-boom is luffed down too quickly, then significant property damage can occur on the upper as well as the lower pulley block!

- ▶ Always use a guide when connecting the upper and lower pulley block!
 - ▶ Carry out all crane movements slowly and with utmost caution!
 - ▶ When the upper pulley block and the lower pulley block are moved together completely, then the luff down movement of the D-boom must be stopped immediately!
-
- ▶ Move the upper pulley block **31.2** and the lower pulley block **31.1** completely together until the bores for the transport retaining pipes align at point **P26** and point **P27**.

When the upper pulley block and the lower pulley block are moved together completely:

- ▶ Stop winch 3 immediately.
- ▶ Pin the upper pulley block **31.2** with the lower pulley block **31.1**: Insert the transport retaining pipes **31.3** and secure with spring retainer.

Result:

- The upper pulley block **31.2** is connected with the lower pulley block **31.1** and now forms the „transport unit“ pulley block **31**.

3.1.5 Disassembling the pulley block

- ▶ Pull the pulley block **31** with the auxiliary crane up until the horizontal.
- ▶ Luff the D-boom down until the D-end section **12** is laying on the ground.
- ▶ Place the pulley block **31** carefully on the ground with the auxiliary crane.

Disassemble the pulley block on the pull test brackets **33** on the D-end section **12**:

- ▶ Release pins **34** on both sides at point **P17** and unpin.

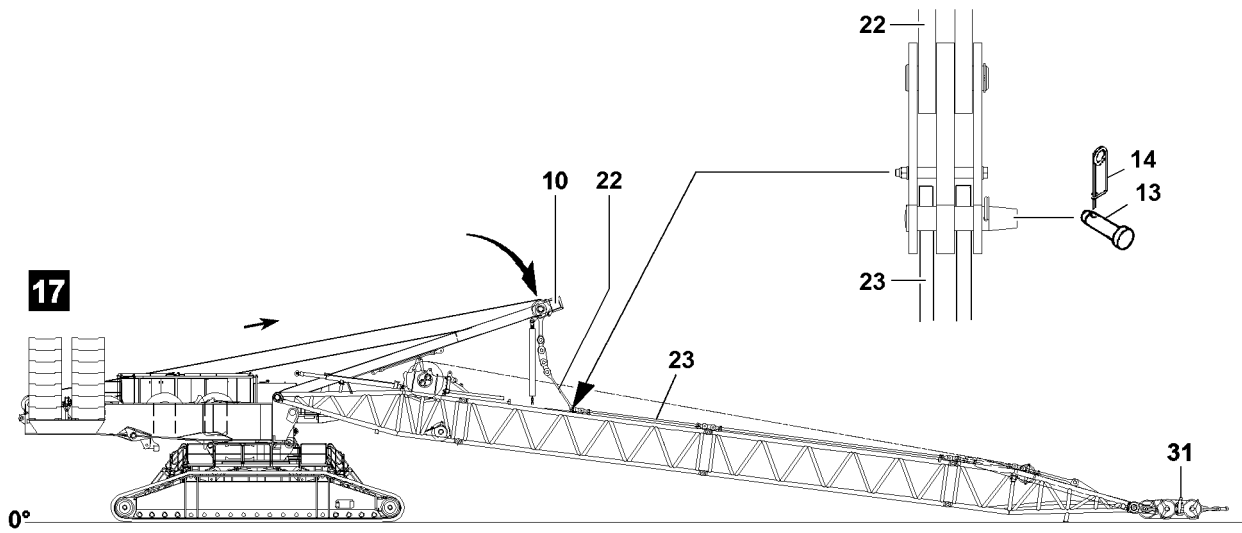


Fig.112582

3.1.6 Disassembling the D-guy rods

- ▶ Place the guy rods **22** into the transport retainers of the D-lattice sections: Lower the SA-frame **10** to the front.
- ▶ Luff the SA-frame to the front.
- ▶ Unpin the guy rods **22** on the guy rods **23**: Release spring retainer **14** and unpin the pin **13**.

The guy rods for the derrick ballast are placed and secured for transport inside on the D-lattice sections.

- ▶ Secure the guy rods in the transport retainers.
- ▶ Luff the SA-frame **10** up.

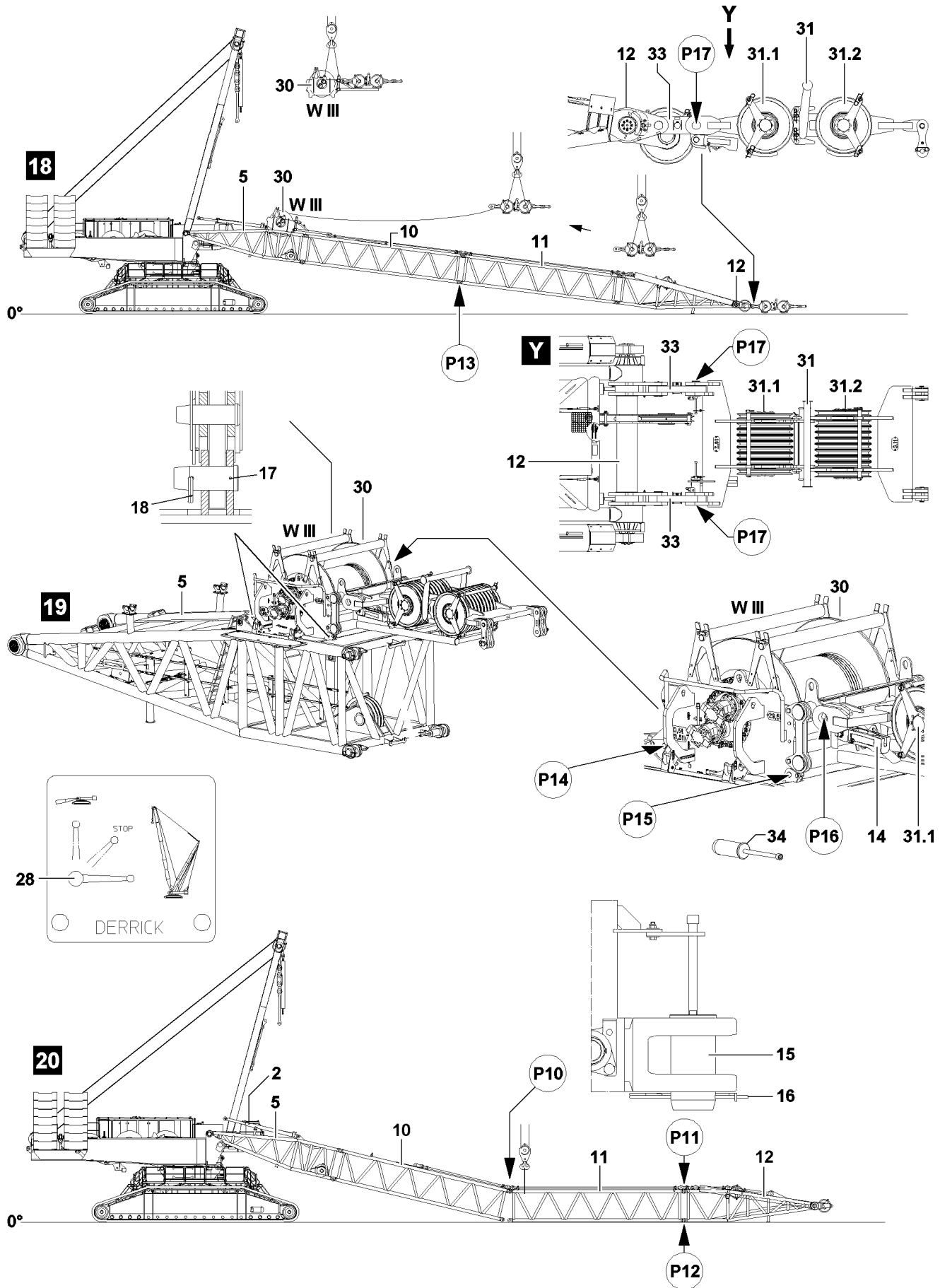


Fig.112583

LWE/LR 11350-007/19005-01-02/en

3.1.7 Disassembling the pulley block and winch 3



WARNING

Falling pulley block!

If the following condition is not met before unpinning winch 3, the pulley block **31** can fall down. Personnel can be severely injured or killed!

- ▶ The pulley block **31** must be pinned and secured on winch 3, check visually!

Make sure that the following prerequisites are met:

- The pulley block is unpinned on the pull test brackets **33** on the D-end section **12**.
- The guy rods are pinned and secured in the transport retainers of the D-lattice sections.
- The SA-frame is luffed up to approx. 75° to 85°.

- ▶ Attach the pulley block **31** onto the auxiliary crane.
- ▶ Pull the pulley block **31** with the auxiliary crane to the transport receptacle on winch 3 **W III** while spooling up winch 3 at the same time.
- ▶ Assemble the pulley block **31** on winch 3 **W III** at point **P16**: Insert and secure pin **34**.
- ▶ Attach winch 3 **W III** on the auxiliary crane.

When winch 3 **W III** is safely held by the auxiliary crane:

- ▶ Unpin winch 3 **W III** on the D-pivot section **5** at point **P14** and point **P15**: Release spring retainer **18** and unpin the pin **17**.
- ▶ Lift winch 3 complete, including pulley block, with the auxiliary crane from the D-pivot section **5**.

3.1.8 Retracting the D-relapse cylinder

The piston rod on the D-relapse cylinder **2** must be retracted by actuating the ball valve **28**.

| Ball valve positions | |
|----------------------|--|
| Horizontal | Crane operation, extend the piston rod |
| Vertical | Assembly, retract the piston rod |
| 45° | STOP (the piston rod cannot be retracted / extended) |

- ▶ Move the ball valve **28** into vertical position.

Result:

- The piston rod of the D-relapse cylinder **2** retracts.

Fig.195219

LWE/LR 11350-007/19005-01-02/en

3.1.9 Disconnecting the electrical connections

- ▶ Disconnect all electrical connections on the D-boom properly and store the plug and cable properly.

3.1.10 Disconnecting the hydraulic connections

When 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!
-
- ▶ Release the hydraulic coupling by hand.
 - ▶ Disconnect the hydraulic connection.
 - ▶ Store the hydraulic hoses properly.

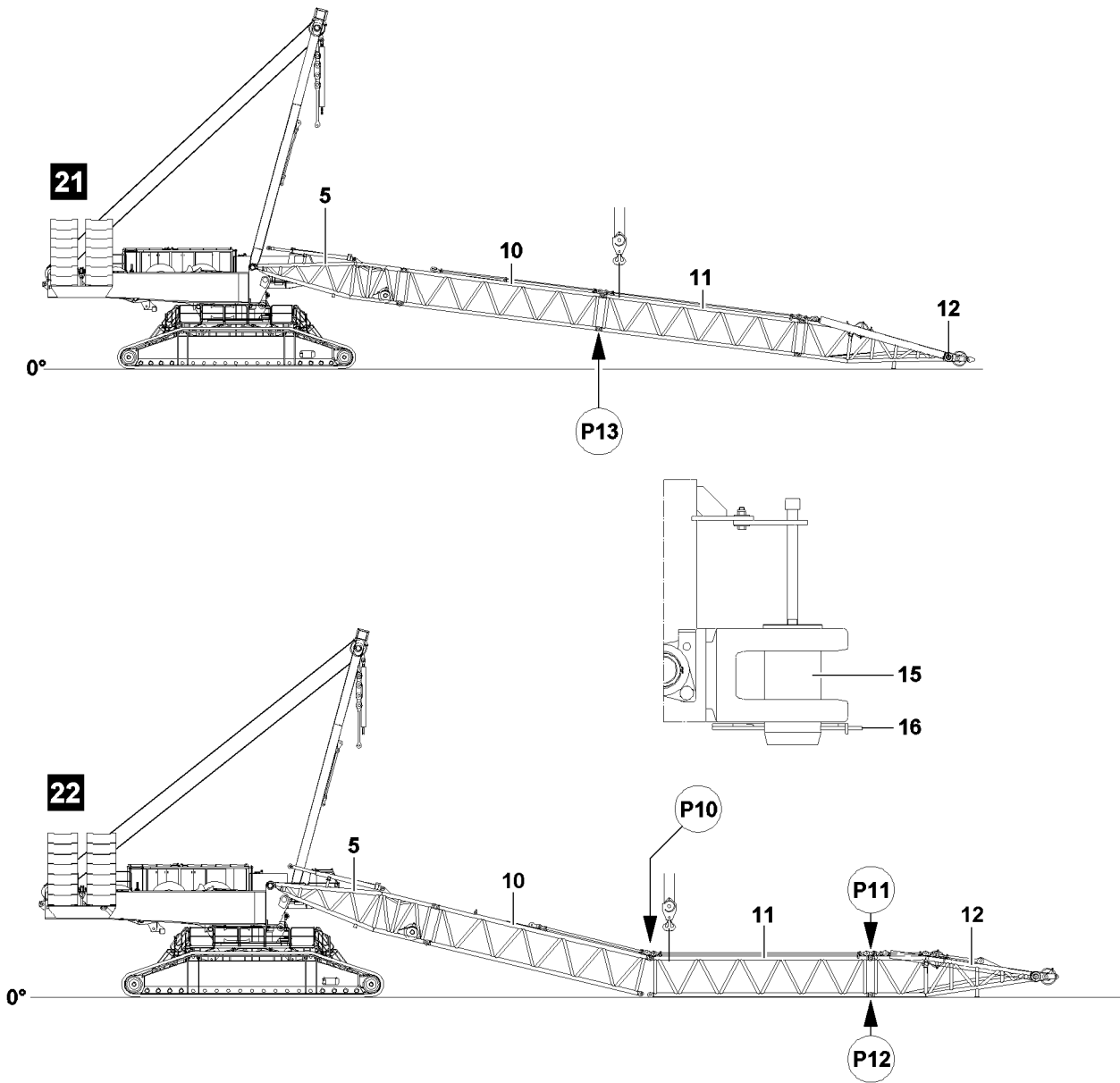


Fig.112584

3.1.11 Disassembling the D-end section and the D-reducer section

- ▶ Attach the auxiliary crane on the D-reducer section **11**.
- ▶ Lift the D-boom with the auxiliary crane until the D-end section **12** lifts off the ground.

When the D-end section has lifted off the ground:

- ▶ Unpin the pins **15** on both sides on point **P13 on the bottom**: Release spring retainer **16** and unpin the pin **15**.
- ▶ Place the D-boom with the auxiliary crane carefully on the ground.

When the D-reducer section and the D-end section are laying completely on the ground:

- ▶ Release and unpin the pins **15** on both sides at point **P11 on top** and at point **P12 on the bottom**.
- ▶ Attach the D-end section **13** on the auxiliary crane.
- ▶ Remove the D-end section **13** with the auxiliary crane.
- ▶ Attach the auxiliary crane on the D-reducer section **11**.
- ▶ Unpin the D-reducer section **11** on the D-intermediate section **10** on both sides at point **P10 on top**: Release spring retainer **16** and unpin the pin **15**.
- ▶ Attach the D-reducer section **11** on the auxiliary crane.
- ▶ Remove the D-reducer section **11** with the auxiliary crane.

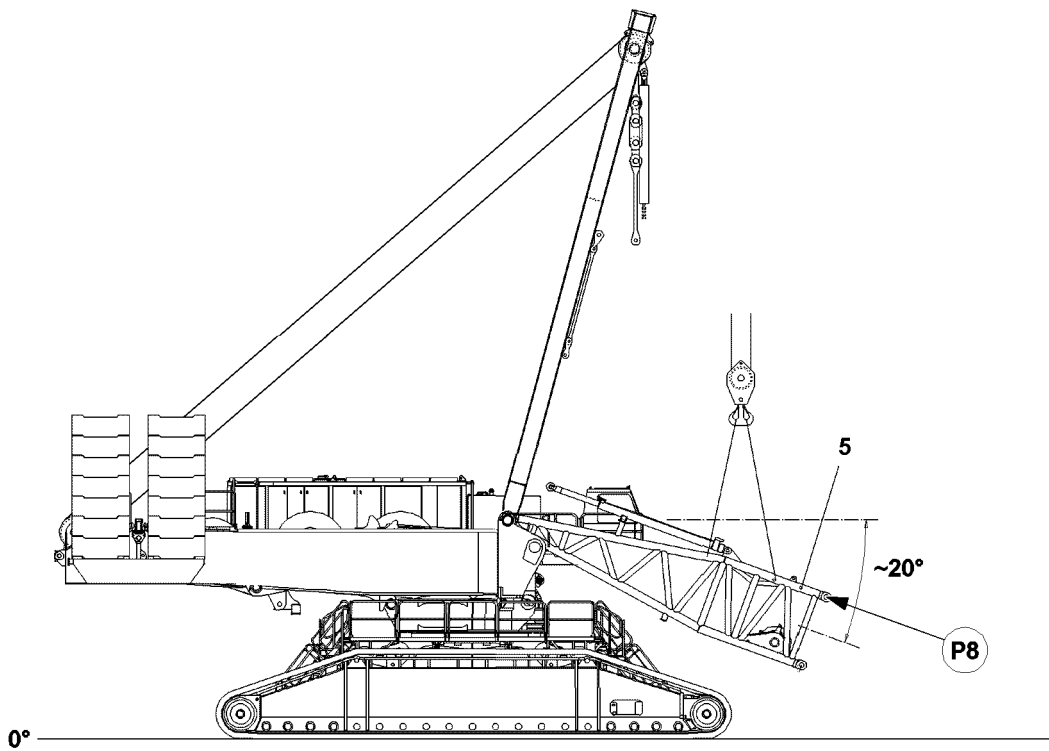
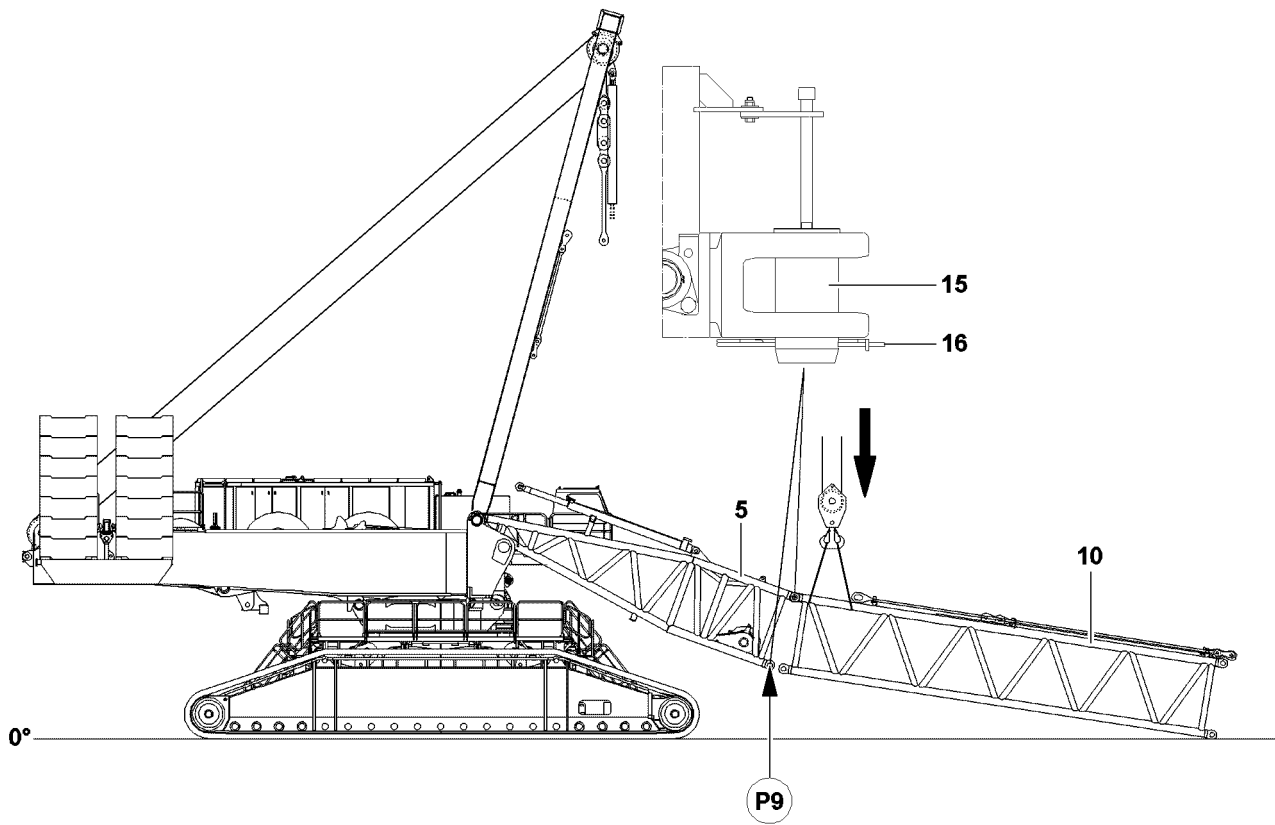


Fig.112585

LWE/LR 11350-007/19005-01-02/en

3.1.12 Disassembling the D-intermediate section

Make sure that the following prerequisites are met:

- Winch 3 is disassembled on the D-pivot section **5**.
- The D-intermediate section hangs on the auxiliary crane.
- The D-pivot section is not laying on the turntable.
- The D-intermediate section is pinned on both sides on the bottom and on top on the D-pivot section.

NOTICE

Damage of the D-pivot section and winch 3!

If winch 3 is still installed on the D-pivot section at disassembly of the D-intermediate section, then the D-pivot section and winch 3 can be significantly damaged!

- ▶ Make sure that winch 3 has been removed from the D-pivot section before disassembly of the D-intermediate section!

-
- ▶ Attach the D-intermediate section **10** on the auxiliary crane.

When the D-intermediate section is being safely held by the auxiliary crane:

- ▶ Release the pin **15** on both sides at point **P9 on the bottom** and unpin.
- ▶ „Open“ the D-boom **10** with the auxiliary crane until the D-pivot section **5** is laying on the turntable.
- ▶ Unpin the D-intermediate section **10** on the D-pivot section **5: on top**: Release pins **15** on both sides at point **P8** and unpin.
- ▶ Remove the D-intermediate section **10** with the auxiliary crane.

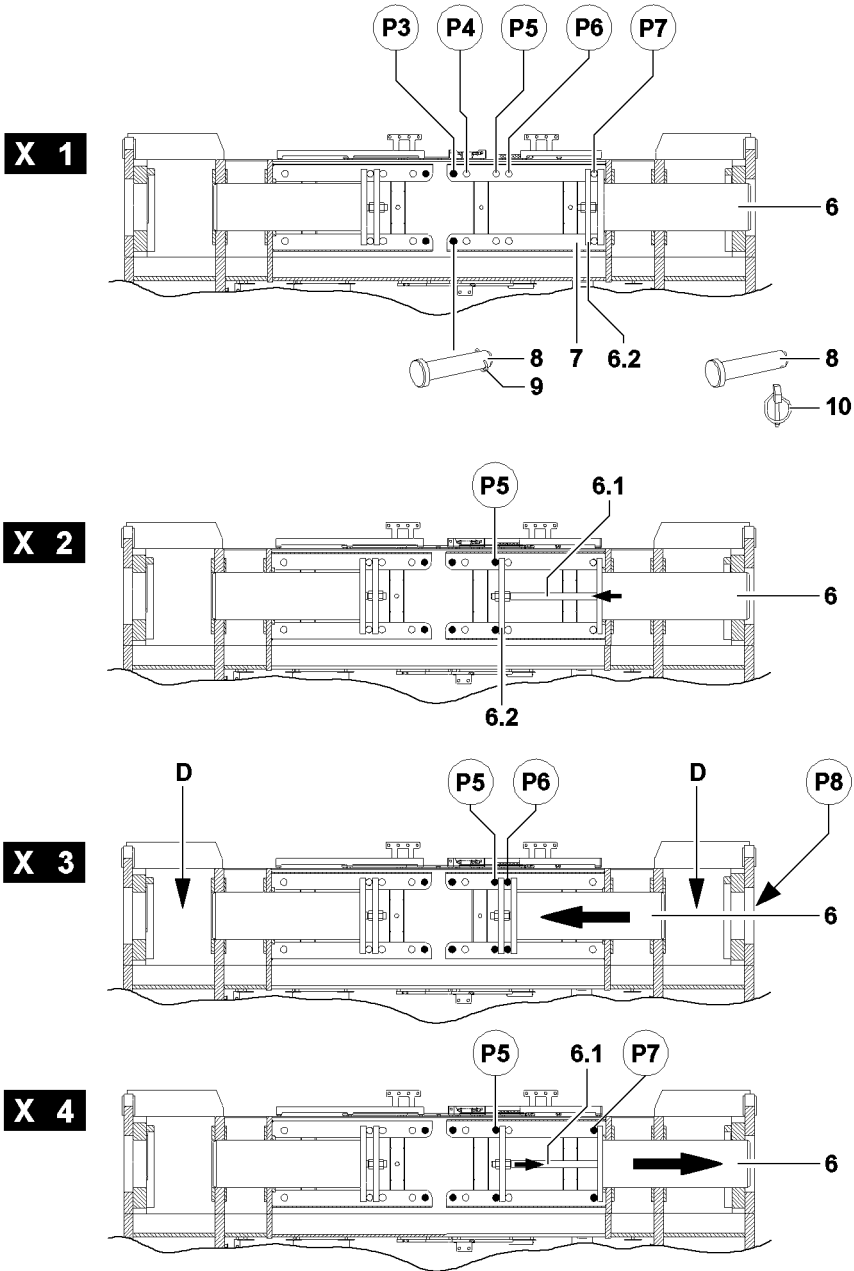
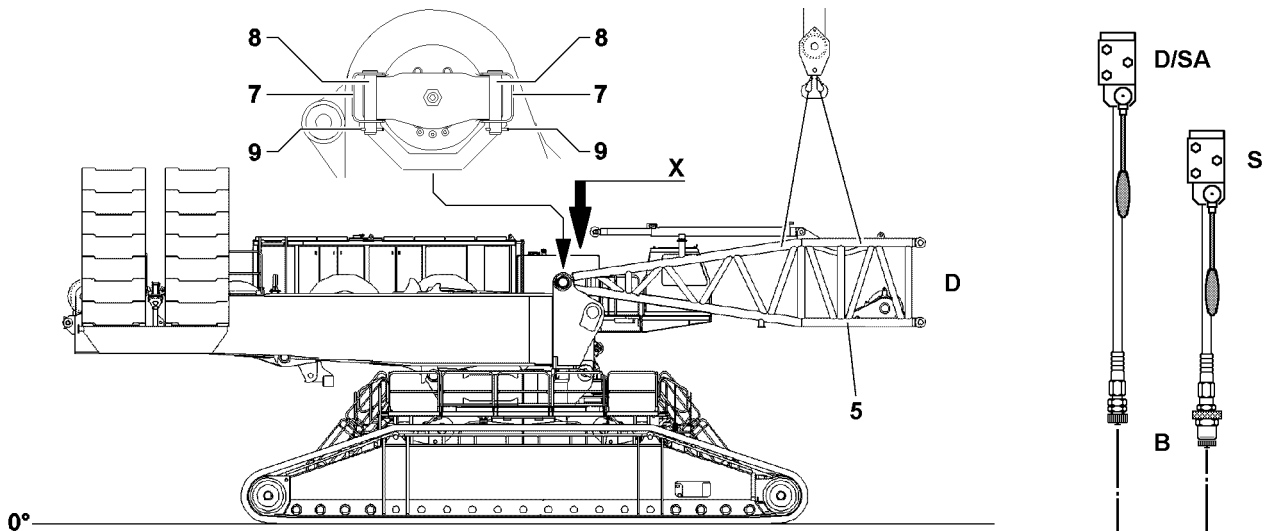


Fig.112586

LWE/LR 11350-007/19005-01-02/en

3.1.13 Unpinning the D-pivot section on the turntable

Make sure that the following prerequisites are met:

- The SA-frame is erected to approx. 85°.
- The pins **6** are completely pinned on both sides on the turntable, see illustration / view.
- The pins **7** are inserted and secured.



WARNING

Falling SA-frame!

For the disassembly of the D-pivot section, the pins **6** may not be unpinned too far, otherwise the SA-frame can fall down!

- ▶ Make sure that the pins **8** are pinned on both sides at point **P5** as stop pins before disassembly of the D-pivot section **5** on the turntable.



Note

- ▶ The hand levers **S**, **D/SA** and the hydraulic connections **B** for the pin pulling device integrated in the pin **6** are on the left side of the turntable.

- ▶ Establish the hydraulic connections from the pins **6** to the turntable, see Hydraulic diagram.
- ▶ Unpin the pins **6**: Release pins **8** on both sides at point **P7** and unpin, illustration / view **X2**.
- ▶ Insert the pin **8** again on both sides as stop pin at point **P5** and secure with linch pin **10**, see illustration / view **X2**.



WARNING

Falling D-pivot section!

If the D-pivot section is not properly secured with the auxiliary crane before unpinning, then the D-pivot section can fall down!

Personnel can be severely injured or killed!

- ▶ Make sure that the D-pivot section is safely held by the auxiliary crane before unpinning!
- ▶ Move the hand lever **D/SA** and extend the piston rod **6.1** until the plate **6.2** touches on the stop pins **8** at point **P5**, illustration / view **X2**.

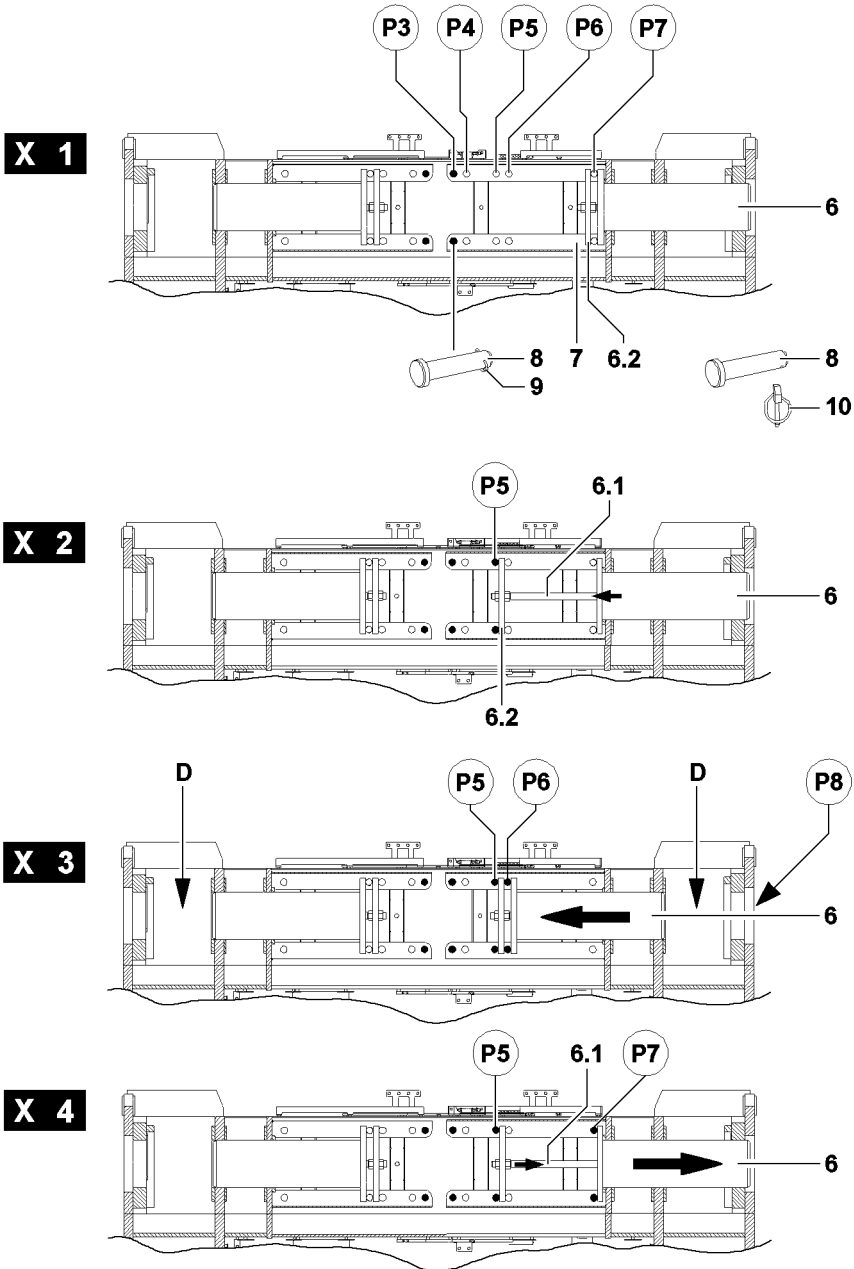
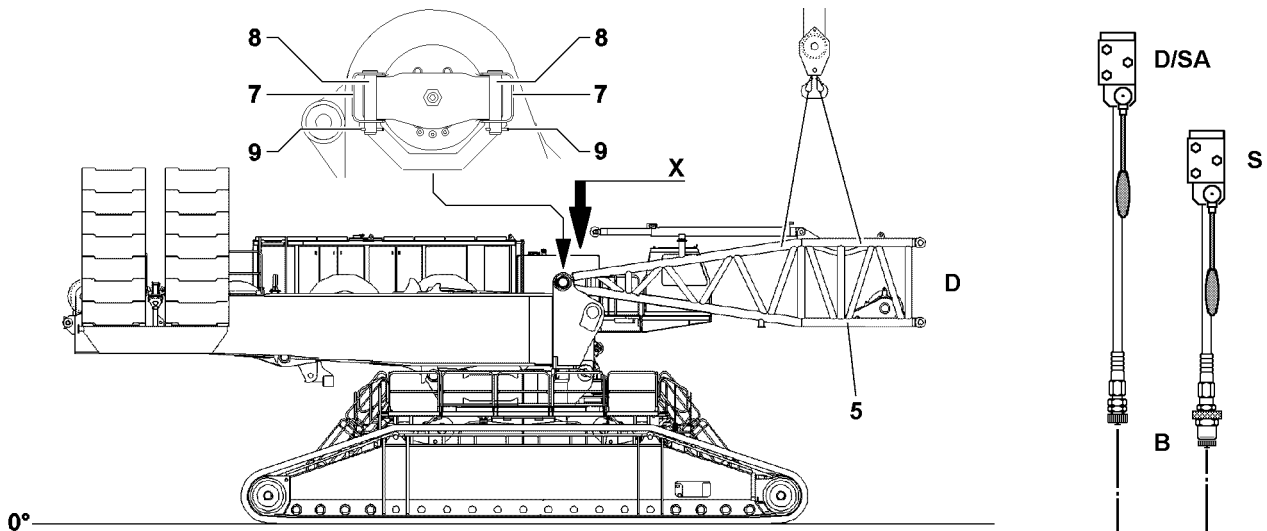


Fig.112586

LWE/LR 11350-007/19005-01-02/en

- ▶ Insert the additional pins **8** on both sides on points **P6** and secure with lynch pins **10**, see illustration / view **X3**.

Result:

- The plate **6.2** is „tensioned“ between the pins **8** at point **P5** and point **P6**.
- ▶ Move the hand lever **D/SA** and unpin the pin **6** until the pin **6** touches on the pins **8** at point **P6**, illustration / view **X3**.

Result:

- The D-pivot section can be swung out from the turntable with the auxiliary crane.
- ▶ Swing the D-pivot section out from the turntable with the auxiliary crane.

When the D-pivot section is swung out from the turntable:

- ▶ Insert the pins **6** again completely: Move the hand lever **D** and move the pins **6** all the way in on both sides.
- ▶ Secure the pins **6**: Release the pins **8** on both sides at point **P6** and unpin, then pin on both sides at point **P7** and secure with lynch pin **10**, illustration / view **X4**.

Result:

- The pins **6** are secured.
- ▶ Move the hand lever **D** and move the piston rod **6.1** of pin **6** all the way in.

**Note**

- ▶ Disassembly of the SA-frame, see Crane operating instructions, chapter 3.05!

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5.07 SW/SDW boom combination

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| 5 | Crane operation | 42 |
| 6 | Placing the boom down | 44 |
| 7 | Disassembly | 47 |

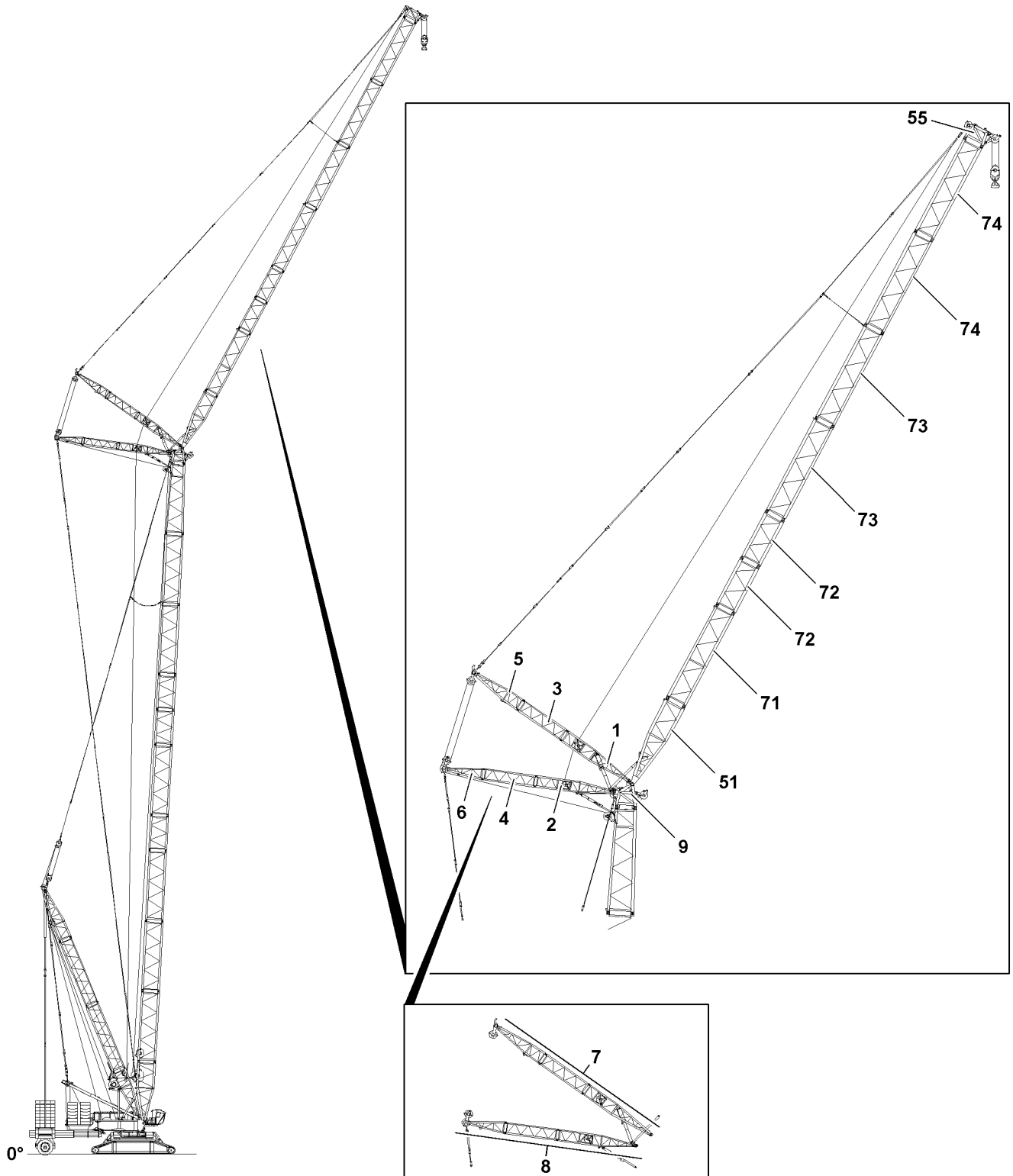


Fig.121138

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1 Component overview W-lattice jib / WA-frames



Note

- ▶ The dimensions and weights of the individual lattice sections and transport units are described in the Crane operating instructions, chapter 1.03.
- ▶ The combination of the W-lattice jib as well as the length of the WA-frames depends on the boom configuration or the operating mode. For the combinations / piecing of the various boom configurations, refer to the Rod plan and the Crane operating instructions, chapter 5.03.

- 1 WA-frame 1, pivot section
- 2 WA-frame 2, pivot section
- 3 WA-frame 1 intermediate section
- 4 WA-frame 2 intermediate section
- 5 WA-frame 1, end section
- 6 WA-frame 2, end section
- 7 WA-frame 1 complete¹⁾
- 8 WA-frame 2 complete²⁾
- 9 W-connector head
- 51 W-pivot section
- 71 LI-intermediate section 12 m 2621.20
- 72 LI-intermediate section 6 m 2621.10
- 73 LI-intermediate section 12 m 2621.10
- 74 LI-intermediate section 12 m 2621.8
- 55 SW-end section

1) consists of: WA-frame 1 pivot section **1**, WA-frame 1 intermediate section **3**, WA-frame 1 end section **5**

2) consists of: WA-frame 2 pivot section **2**, WA-frame 1 intermediate section **4**, WA-frame 1 end section **6**

2 Fastening points



WARNING

Falling lattice sections!

If the lattice sections are not properly fastened on the respective fastening points, then the lattice sections can tip over or fall down.

Personnel can be severely injured or killed.

- ▶ Make sure that the lattice sections are properly fastened on the respective fastening points.
- ▶ Make sure that the fastening equipment has the appropriate length and a sufficient load carrying capacity.
- ▶ Make sure that a crane with sufficient load carrying capacity is available for the assembly of the W-lattice jib.
- ▶ Pay attention and adhere to the labels on the fastening points on the lattice sections and crane components.

2.1 Fastening points Transport unit 1 (T1)

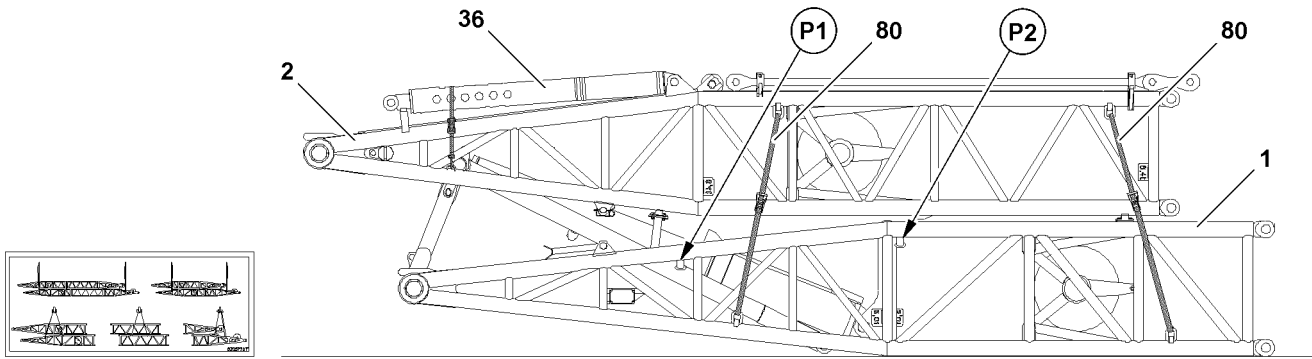


Fig.121131: Fastening points Transport unit T1

| Fastening points | |
|------------------|----------------------------|
| P1 + P2 | Assembly Transport unit T1 |

2.2 Fastening points Transport unit 2 (T2)

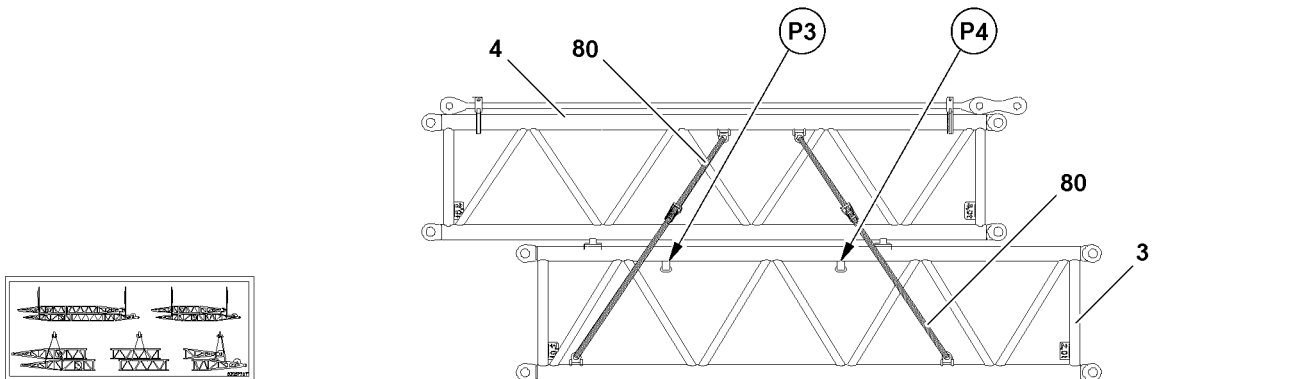


Fig.121132: Fastening points Transport unit T2

| Fastening points | |
|------------------|----------------------------|
| P3 + P4 | Assembly Transport unit T2 |

2.3 Fastening points Transport unit 3 (T3)

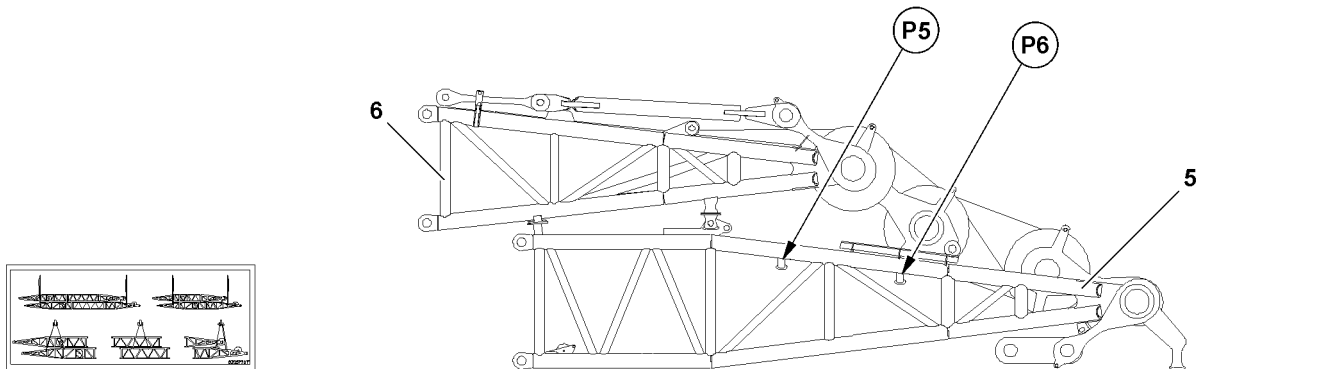


Fig.121133: Fastening points Transport unit T3

| Fastening points | |
|------------------|----------------------------|
| P5 + P6 | Assembly Transport unit T3 |

2.4 Fastening points Transport unit 4 (T4) (T4 = T1 + T3)

2.4.1 Short WA-frames

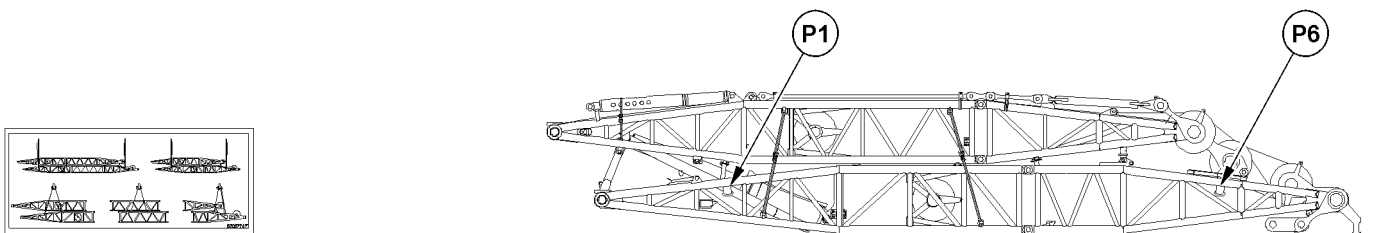


Fig.121136: Fastening points Transport unit T1 and T3 assembled

| Fastening points | |
|------------------|---|
| P1 + P6 | Assembly Transport unit T1 and T3 assembled |

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2.5 Fastening points Transport unit 5 (T5) ($T5 = T1 + T2 + T3$)

2.5.1 Long WA-frames

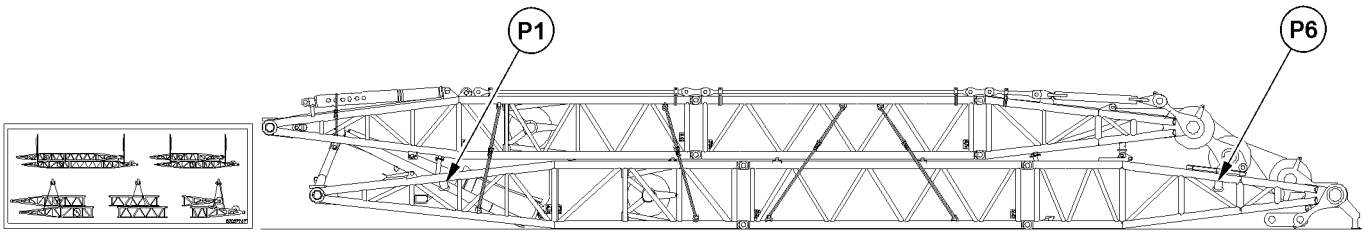


Fig.121134: Fastening points Transport unit T1, T2 and T3 assembled

| Fastening points | |
|------------------|---|
| P1 + P6 | Assembly Transport unit T1, T2 and T3 assembled |

2.6 Fastening points W-pivot section

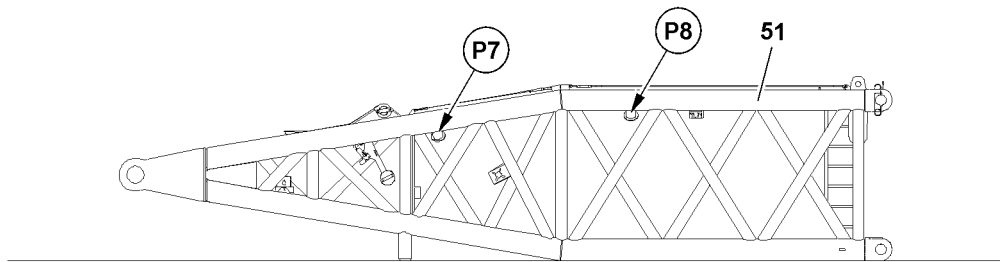


Fig.121140: Fastening points W-pivot section

| Fastening points | |
|------------------|-----------------|
| P7 + P8 | W-pivot section |

2.7 Fastening points LI-intermediate section 12 m 2621.20

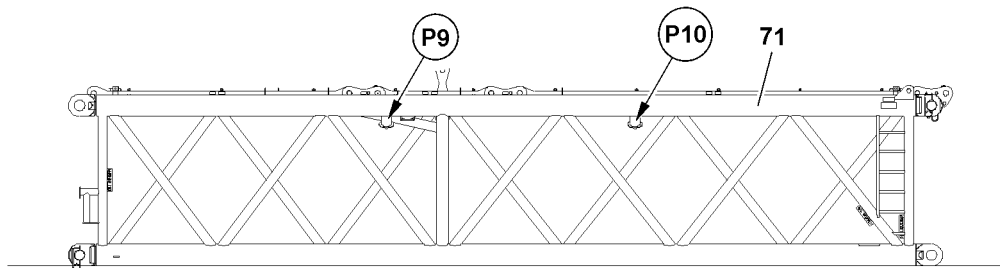


Fig.121231: Fastening points LI-intermediate section 12 m 2621.20

| Fastening points | |
|------------------|--------------------------------------|
| P9 + P10 | LI-intermediate section 12 m 2621.20 |

2.8 Fastening points LI-intermediate section 6 m 2621.10

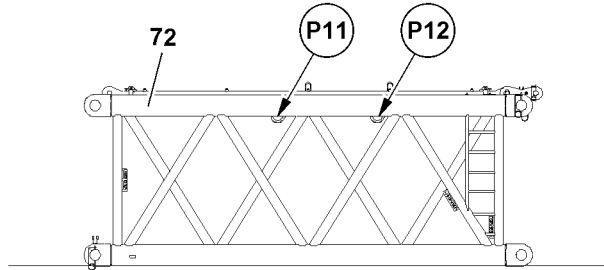


Fig.121232: Fastening points LI-intermediate section 6 m 2621.10

| Fastening points | |
|------------------|-------------------------------------|
| P11 + P12 | LI-intermediate section 6 m 2621.10 |

2.9 Fastening points LI-intermediate section 12 m 2621.10

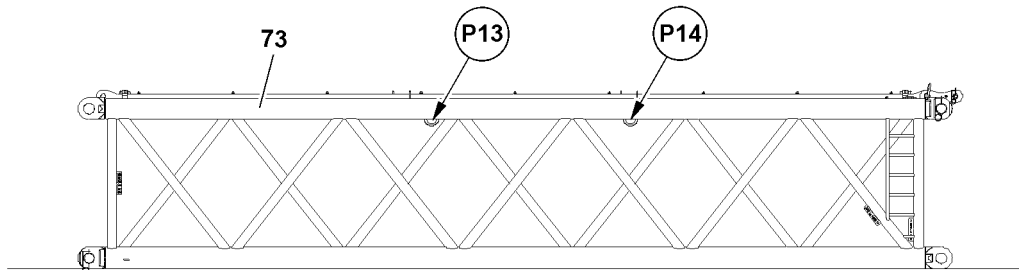


Fig.121233: Fastening points LI-intermediate section 12 m 2621.10

| Fastening points | |
|------------------|--------------------------------------|
| P13 + P14 | LI-intermediate section 12 m 2621.10 |

2.10 Fastening points LI-intermediate section 12 m 2621.8

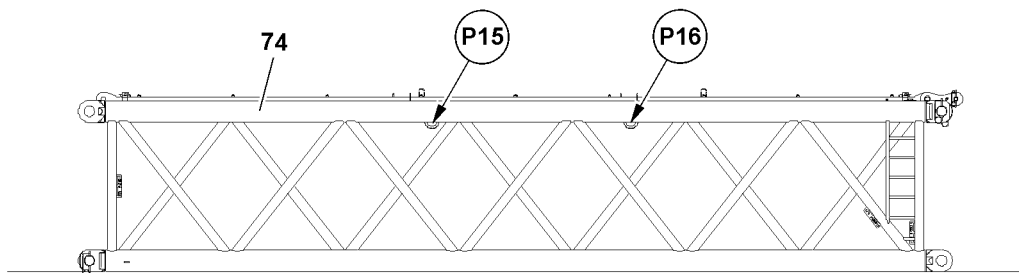


Fig.121234: Fastening points LI-intermediate section 12 m 2621.8

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| Fastening points | |
|------------------|-------------------------------------|
| P15 + P16 | LI-intermediate section 12 m 2621.8 |

2.11 Fastening points SW-end section

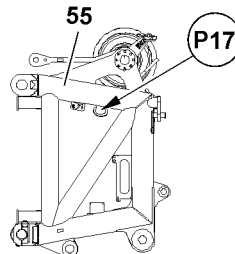


Fig.121235: Fastening points SW-end section

| Fastening points | |
|------------------|-------------------------|
| P17 | Assembly SW-end section |

3 Assembly



WARNING

Danger of falling!

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

- ▶ 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, 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 as well as under 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 step on the boom system or an auxiliary boom without suitable protective devices.
- ▶ Stepping and 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 fatally injure personnel.

- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Secure the pins in the bearing points and the receptacles.
- ▶ It is prohibited to lean the ladder against the component 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 severely injured or killed.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ Make sure that the crane is aligned in horizontal position to avoid the support beams from swinging by themselves.
- ▶ 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 crane is aligned in horizontal direction.
- The S-boom is assembled and aligned in horizontal direction.
- The counterweight is attached on the turntable according to the load chart and placed on the suspended ballast / ballast trailer.
- The LICCON overload protection has been set according to the data in the load chart.
- An auxiliary crane is available.

3.1 Attaching the W-assembly unit to the S-boom

3.1.1 Exceeding the LICCON overload protection for assembly

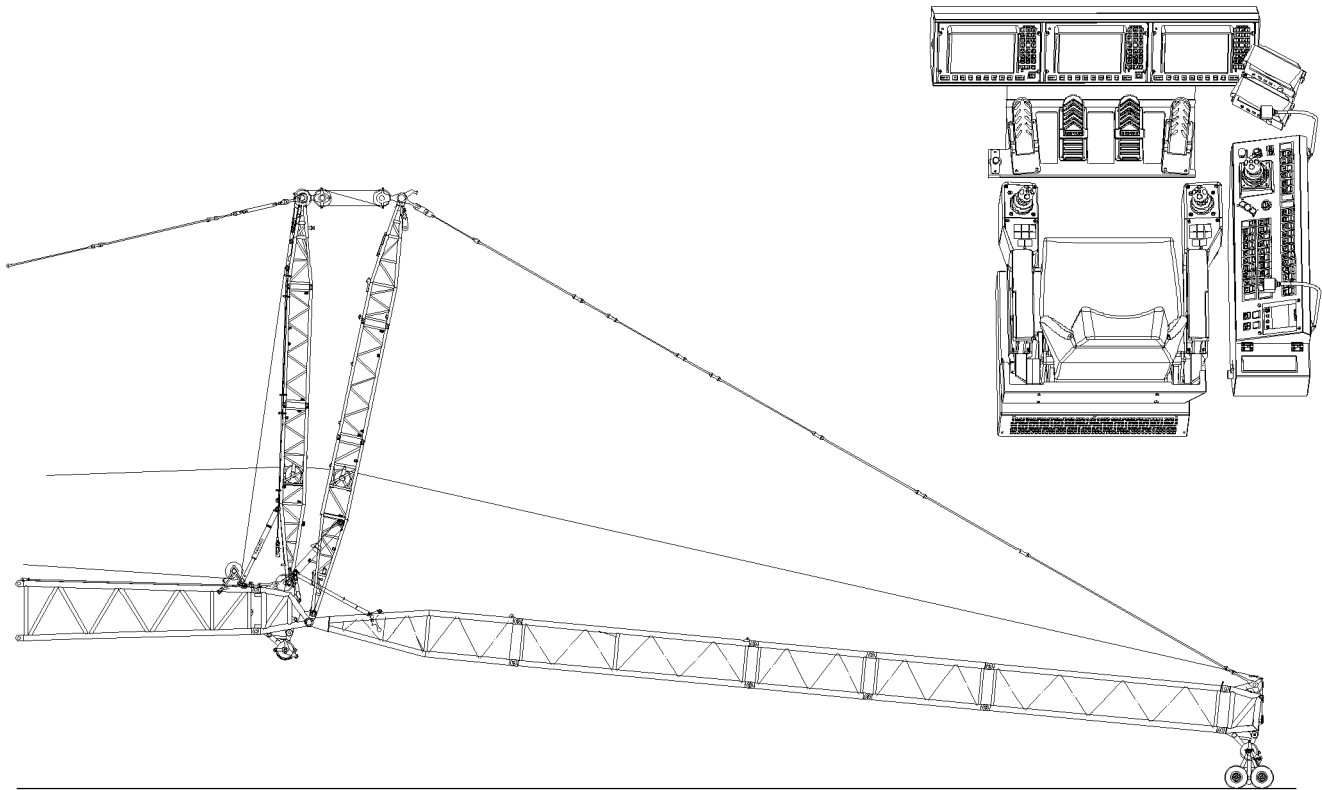


Fig.121126



WARNING

Danger of accident due to function „Exceedance of shut off limits of the LICCON overload protection“! If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.

Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.

Personnel can be severely injured or killed.

- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload protection“ is prohibited.

- ▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

- The shut off limits of the LICCON overload protection are exceeded.
- The assembly icon appears on the LICCON monitor.



Note

- ▶ See Crane operating instructions, chapter 4.02.

3.1.2 Preparing the WA-frames for assembly

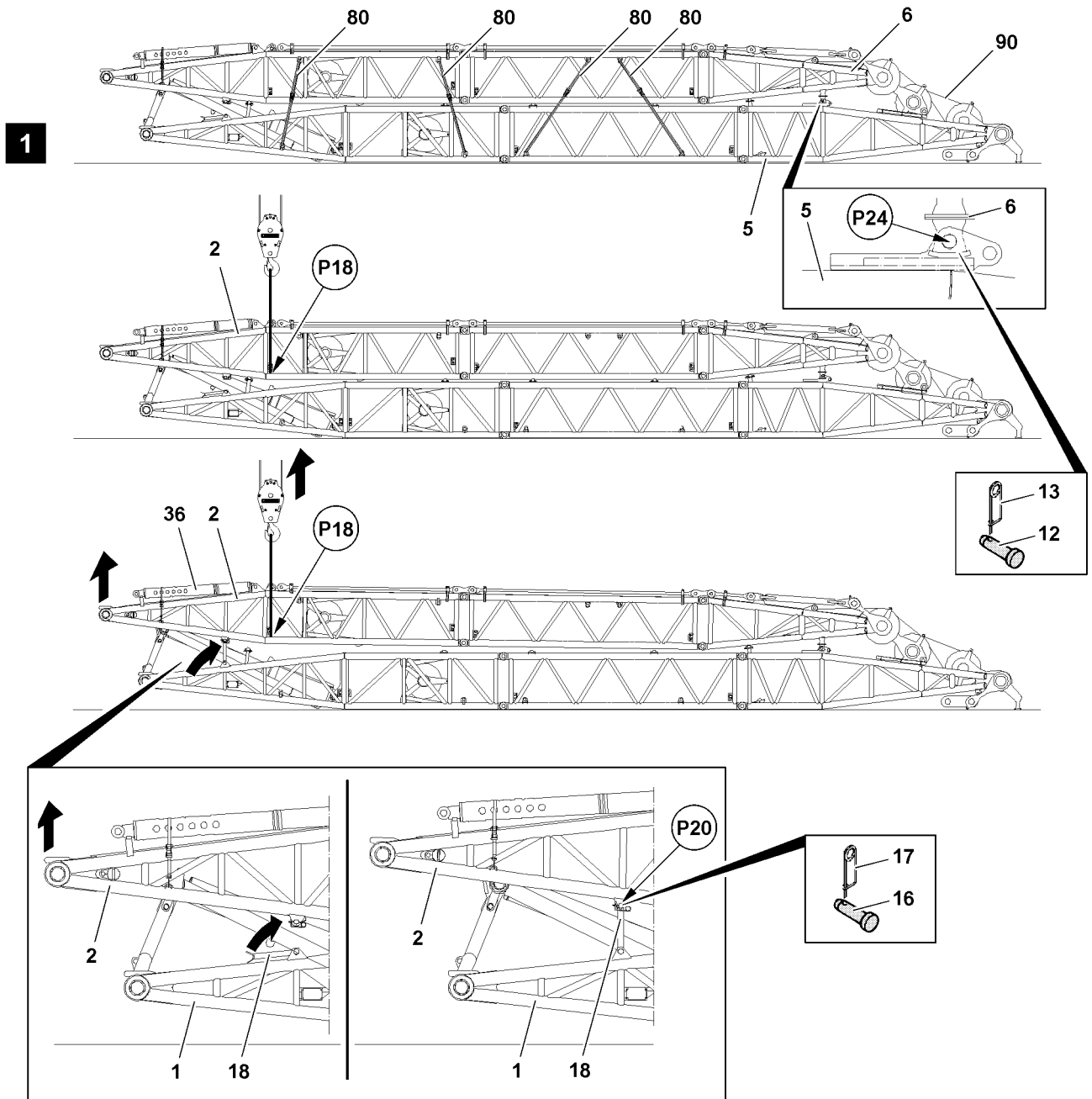


Fig.121135: Remove rigging / tension belts // lift WA-frame 2 // set up support 18



Note

- ▶ The following description is an example and will be described by means of the „long“ WA-frames.
- ▶ The procedure for the short WA-frames is identical and is not separately described.

Make sure that the following prerequisites are met:

- The WA-frame 1 and WA-frame 2 are pinned on the end sections at point **P24** with pin **12** and secured with spring retainer **13**.
- WA-frame 1 and WA-frame 2 are tensioned together with rigging / tension belts **80**.
- The reeving rope **75** is reeved between the WA-frame 1 and WA-frame 2 end sections.
- The relapse supports **36** are rigged on the WA-frame 2.
- ▶ Fasten the auxiliary crane on the studs of the WA-frame 2 pivot section **2** at point **P18**.

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When the WA-frame 2 pivot section **2** is fastened on the auxiliary crane:

- ▶ Release and remove the rigging / tension belts **80**.
- ▶ Carefully lift the WA-frame 2 pivot section **2** with the auxiliary crane and erect the support **18** on both sides.

When the support **18** is in assembly position:

- ▶ Insert the pins **16** on both sides and secure with spring retainers **17**.

3.1.3 Pinning the WA-frames on the W-connector head

Make sure that the following prerequisites are met:

- The S-boom is properly assembled and secured.
- The S-boom is properly placed on the ground.
- The hoist rope / the hoist ropes are pulled forward to the W-connector head.
- The W-control rope (winch 5) is pulled forward to the W-connector head.



Note

- ▶ The total weight of the long WA-frames (T1 + T2 + T3) is approx. 33 t.
- ▶ The total weight of the short WA-frames (T1 + T3) is approx. 28 t.
- ▶ Dimensions and weights, see Crane operating instructions, chapter 1.03.

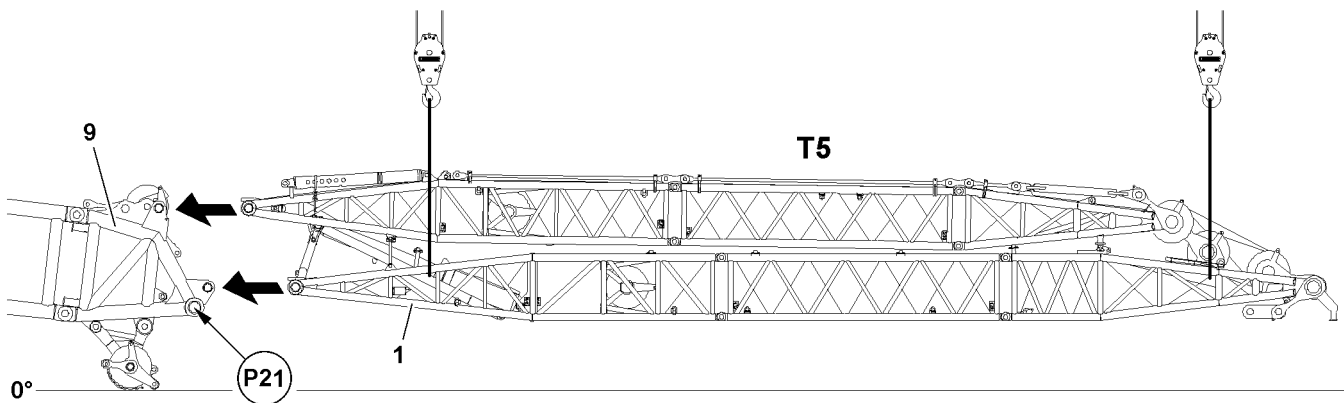


Fig.121237: Swing the transport unit **T5** in with the auxiliary cranes for assembly on the W-connector head

- ▶ Fasten the auxiliary cranes on the specified studs of the transport unit **T5**, see section „Fastening points“.
- ▶ Carefully lift the transport unit **T5** with the auxiliary crane off the ground.



WARNING

Crushing danger due to transport unit **T5**!

When swinging the transport unit **T5** in to the pin points on the W-connector head **9** there is a crushing danger.

Personnel can be severely injured or killed.

- ▶ Make sure, when swinging the transport unit **T5** in to the pin points on the W-connector head **9** that no personnel is between the transport unit **T5** and the W-connector head **9**.
- ▶ Swing the transport unit **T5** in with the auxiliary cranes to the pin points until the bores of the WA-frame 1 pivot section **1** and the W-connector head **9** align at point **P21**.

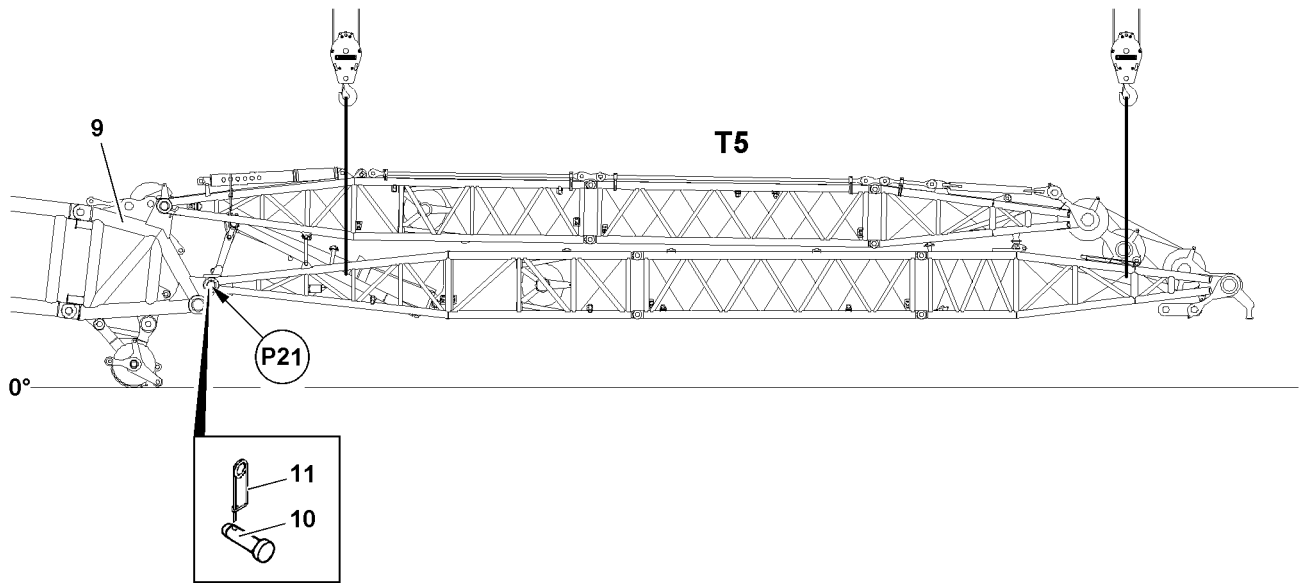


Fig.121238: Pin the transport unit **T5** at point **P21** on the W-connector head.

Pin the transport unit **T5** on the W-connector head **9** at point **P21** on both sides with the pin pulling device, see Crane operating instructions, chapter 5.30.



WARNING

Crushing danger due to oscillating load!

If any persons are for assembly purposes between two of the components to be pinned, then the components can start to oscillate due to slight crane movements.

Personnel can be crushed between the components and be severely injured or killed.

- ▶ Make sure that no crane movements are carried out as long as personnel is between two unpinned components.
- ▶ Make sure that no personnel is in the danger zone between the components during the pinning procedure of the components with the pin pulling device.

When the transport unit **T5** is positioned properly over the centering aids on the W-connector head **9**:

- ▶ Insert the pin pulling device in operating position.
- ▶ Insert the pins **10** on both sides with the pin pulling device, see Crane operating instructions, chapter 5.30.

When the pins **10** are properly pinned at point **P21**:

- ▶ Secure the pins **10** on both sides with spring retainers **11**.

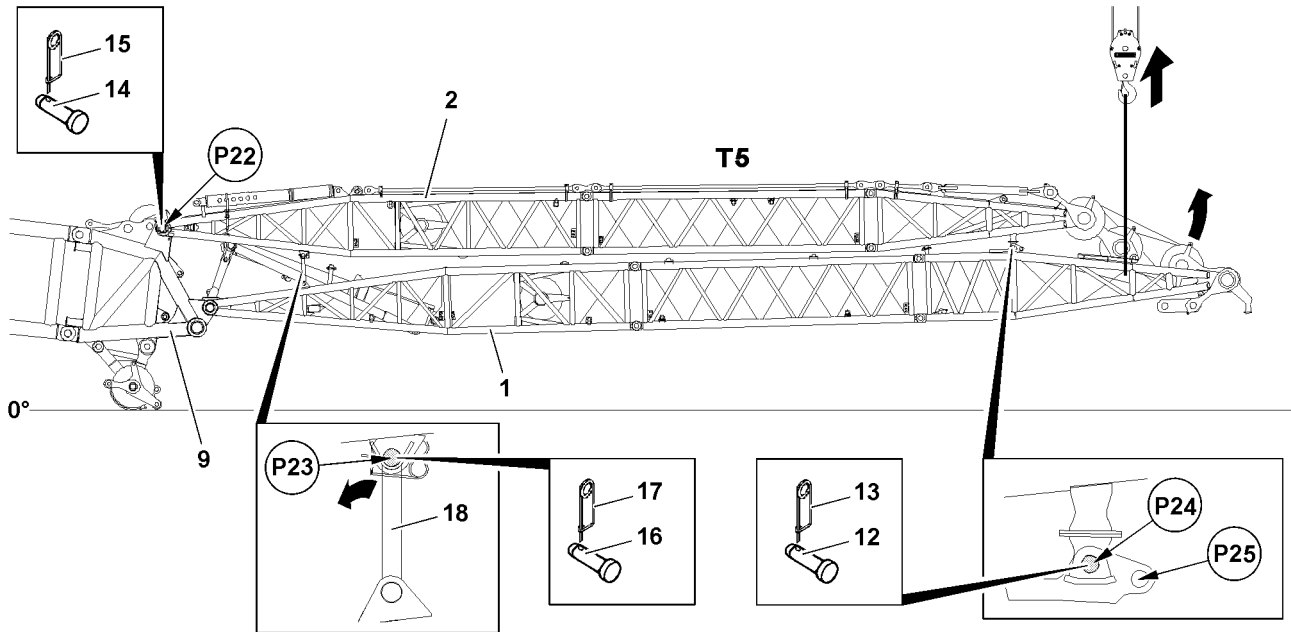


Fig.121239: Lift the transport unit **T5** and pin the WA-frame 2 pivot section **2** at point **P22** on the W-connector head.

Pin the transport unit **T5** on the W-connector head **9** at point **P22** on both sides with the pin pulling device, see Crane operating instructions, chapter 5.30.

When the transport unit **T5** is pinned and secured at point **P21**:

- ▶ Lift the transport unit **T5** with the auxiliary crane until the bores of the WA-frame 2 pivot section **2** and the W-connector head **9** align at point **P22**.

When the transport unit **T5** is positioned properly on the W-connector head **9**:

- ▶ Insert the pin pulling device in operating position.
- ▶ Insert the pins **14** on both sides with the pin pulling device, see Crane operating instructions, chapter 5.30.

When the pins **14** are properly pinned at point **P22**:

- ▶ Secure the pins **14** on both sides with spring retainers **15**.

Place the support **18** down in transport position.

When the transport unit **T5** is properly pinned at point **P22**:

- ▶ Release pins **16** on both sides at point **P23** and unpin.

When the pins **16** are unpinned on both sides:

- ▶ Place the support **18** in direction of the arrow on the WA-frame 1 pivot section **1**.
- ▶ Insert the pin **16** on both sides at point **P23** and secure with spring retainer **17**.

Unpin the transport retainer on the end sections of the WA-frames at point **P24**.

- ▶ Unpin the pin **12** on both sides at point **P24** and insert in park position at point **P25** and secure with spring retainer **13**.

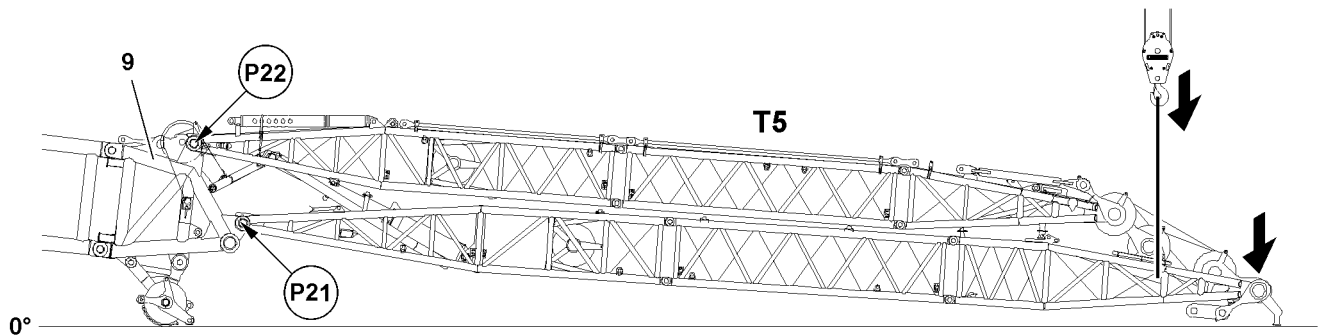


Fig.121241: Place the transport unit **T5** down on the ground.

When the transport retainer is removed between the WA-frame 1 and WA-frame 2:

- ▶ Place the transport unit **T5** on the ground with the auxiliary crane.

3.1.4 Installing the retaining frame on the W-connector head

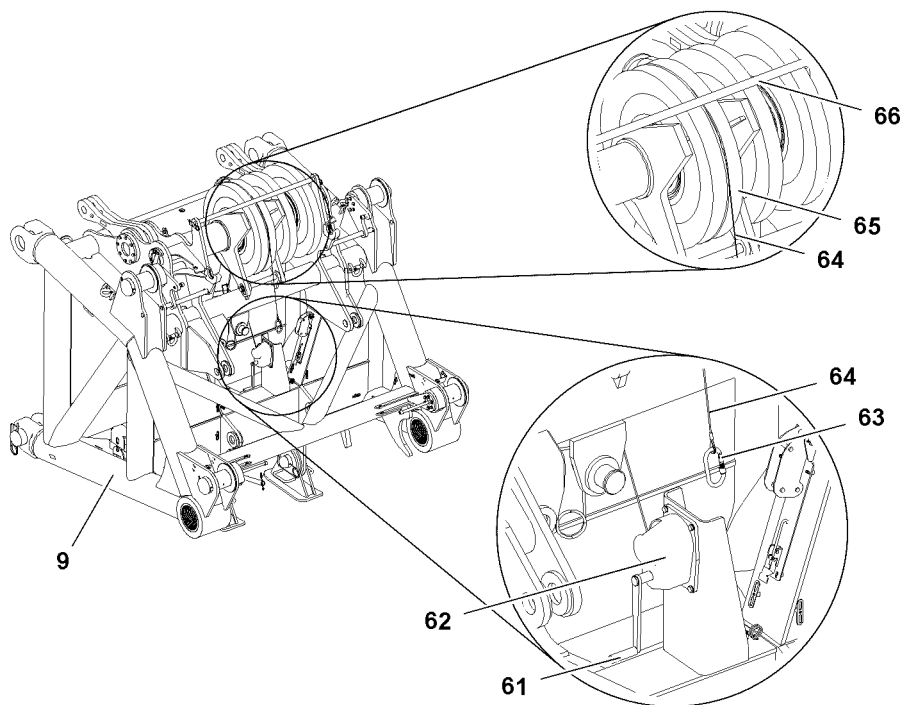


Fig.114713: Install the retaining frame on the W-connector head - spool the wire rope of the manual winch out

Make sure that the following prerequisites are met:

- The WA-frames are properly pinned and secured on the W-connector head **9**.
- The transport unit **T5** is placed on the ground.
- ▶ Install the hand crank **61** on the manual winch **62**.
- ▶ Remove the snap hook **63** on the eye of the wire rope **64**.
- ▶ Spool the wire rope **64** out and guide it from the rear over the rope pulley **65** to the front.
- ▶ Guide the wire rope **64** between the rope pulley **65** and retaining pipe **66**.

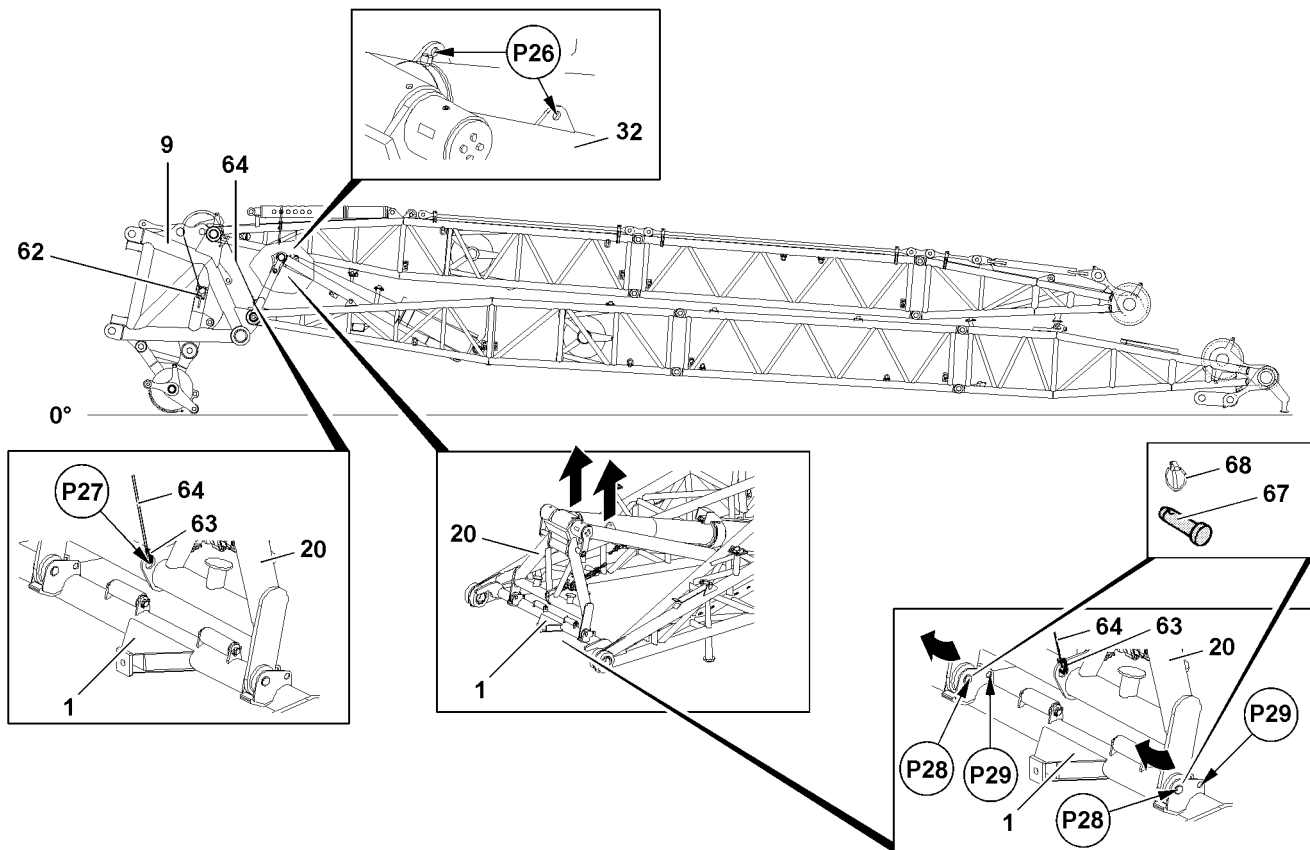


Fig.121242: Installing the retaining frame on the W-connector head

- ▶ Spool the wire rope **64** out with the manual winch **62** until point **P27**.
- ▶ Fasten the wire rope **64** with the snap hook **63** on point **P27** on the retaining frame **20**.
- ▶ Secure the snap hook **63** with *screw retainer*: Screw the *screw retainer* closed.
- ▶ Tighten wire rope **64** slightly with the manual winch **62**.
- ▶ Fasten the auxiliary crane on relapse support **32**: Attach the fastening equipment, using shackles, on both sides on the brackets (point **P26**) of the relapse support **32**.



WARNING

Fastening equipment **not** tensioned!

If the fastening equipment is not pretensioned, then the relapse support **32** can fall down when unpinning the pins **67** on point **P28**.

Limbs can be crushed or severed.

Personnel can be severely injured or killed.

- ▶ Make sure that the fastening equipment is slightly tensioned at point **P26**.

When the auxiliary crane is properly fastened on points **P26**:

- ▶ Carefully bring the fastening equipment to tension.
- ▶ Unpin the retaining frame **20** on WA-frame 1 pivot section **1**: Release pins **67** on both sides on points **P28** and unpin.
- ▶ Insert the pins **67** in park position at point **P29** and secure with locking pins **68**.

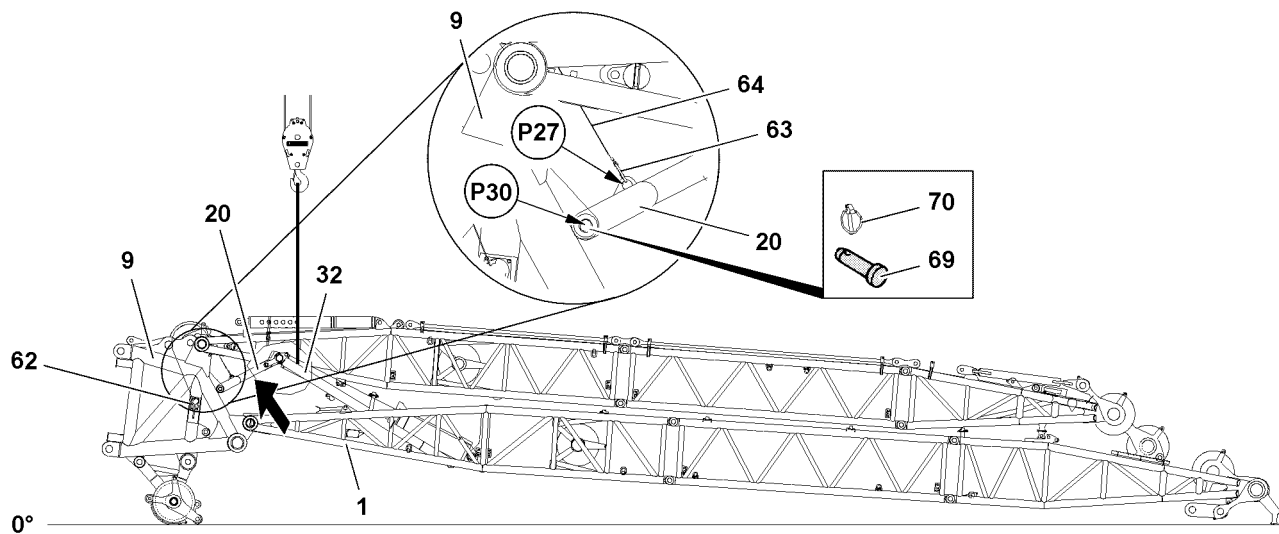


Fig.121243: Install the retaining frame on the W-connector head - pin the retaining frame with the W-connector head

- ▶ Pull the retaining frame **20** up with the manual winch **62** until the pin points align at point **P30**.

Problem remedy

The pin points on point **P30** do not align.

- ▶ With the auxiliary crane, carefully lift or lower the relapse support **32** until the pin points on point **P30** align.
- ▶ Pin the retaining frame **20** with the W-connector head **9**: Insert the pins **69** on both sides at point **P30** and secure with locking pins **70**.
- ▶ Remove the snap hook **63** on the retaining frame **20**: Screw on the screw retainer and remove the snap hook **63** on point **P27**.

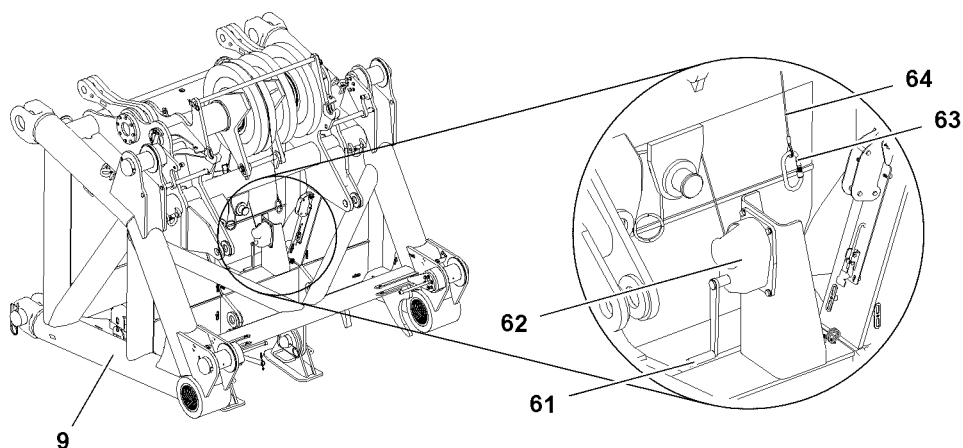


Fig.114714: Install the retaining frame on the W-connector head - spool the wire rope up

- ▶ Spool the wire rope **64** up completely.

**WARNING**

The hand crank **61** is in the manual winch **62!**

If the hand crank **61** is not removed, then it can fall down during crane operation and severely injure or kill personnel.

- ▶ Make sure that the hand crank **61** is removed.
-
- ▶ Install the snap hook **63** on the eye of the wire rope **64**.
 - ▶ Remove the fastening equipment from the relapse support **32**.

3.1.5 Placing the relapse support on the ground

Make sure that the following prerequisites are met:

- The WA-frames are properly pinned on the W-connector head **9**.
- The retaining frame **20** is properly pinned on the W-connector head **9**.

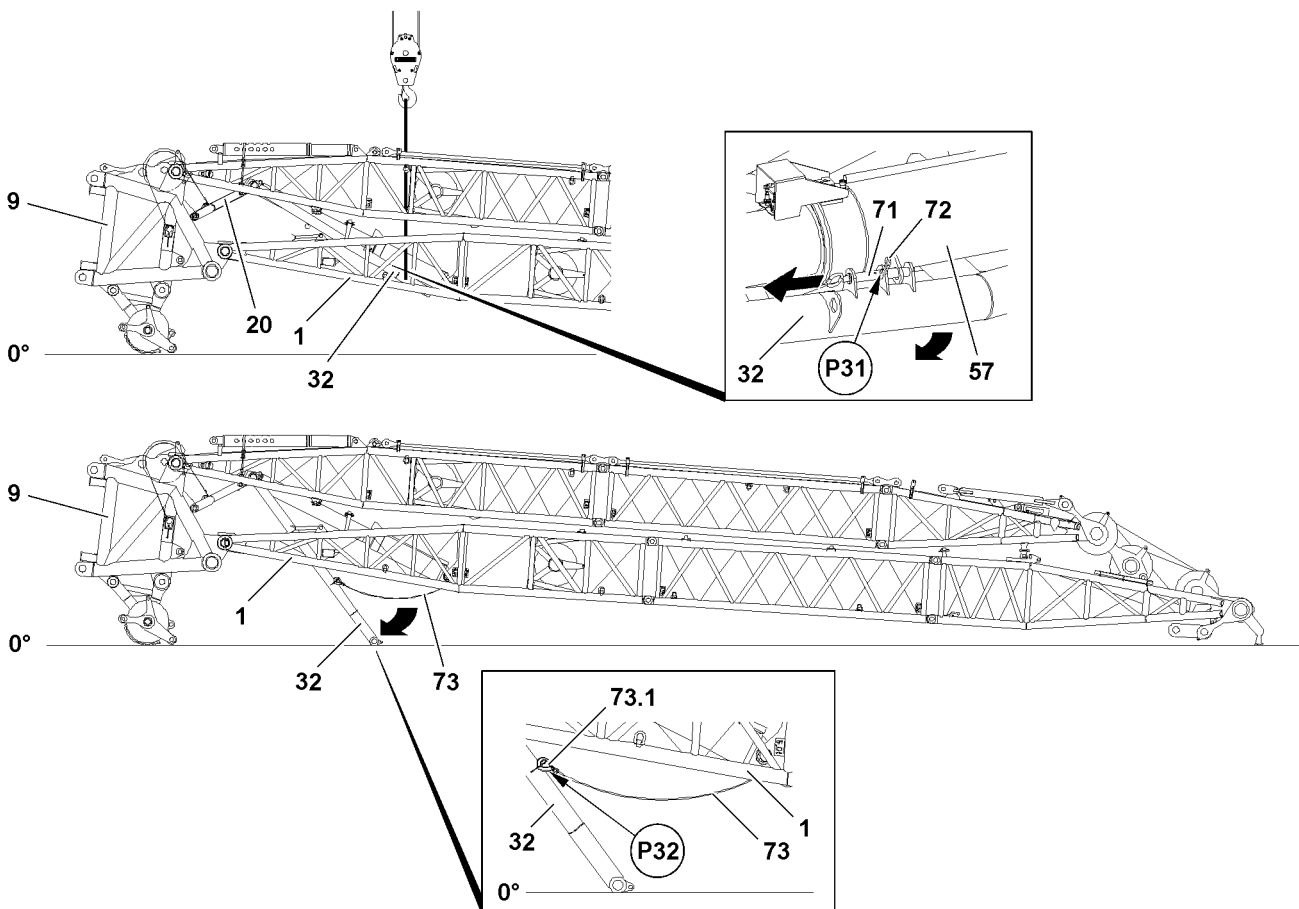


Fig.121244: Unpin the relapse support **32** on the relapse cylinder **57** and place it on the ground with the auxiliary crane.

- ▶ Fasten the auxiliary crane properly on relapse support **32**.

**WARNING**

Unsecured relapse support **32!**

If the mechanical relapse support **32** is not properly held by the auxiliary crane then the mechanical relapse support **32** can fall down when unpinning it.

Personnel can be severely injured or killed.

- ▶ Make sure that the relapse support **32** is safely held by the auxiliary crane before unpinning.
- ▶ Make sure that there are no persons within the danger zone.

When the relapse support **32** is safely held by the auxiliary crane:

- ▶ Release the transport retainer: Release the pin **71** at point **P31** and unpin.

Result:

- The relapse support **32** is unpinned in transport position.
- ▶ Pin **71** at point **P31** in position „unpinned“ secure with spring retainer **72**.
- ▶ Carefully lower the relapse support **32** to the ground with the auxiliary crane.

When the relapse support **32** is laying on the ground:

- ▶ Remove the auxiliary crane.

When the auxiliary crane is removed on the relapse support **32**:

- ▶ Hang the retaining rope **73** on the relapse support **32** at point **P32** with snap hook **73.1**.

3.2 Reeving the W-control rope on the WA-frames

Make sure that the following prerequisites are met:

- The retaining frame **20** is pinned and secured on the W-connector head **9**.
- The reeving rope **75** is reeved on the WA-frames.
- The change over pulley **104** on the S-adaptor **103** is located in operating position.

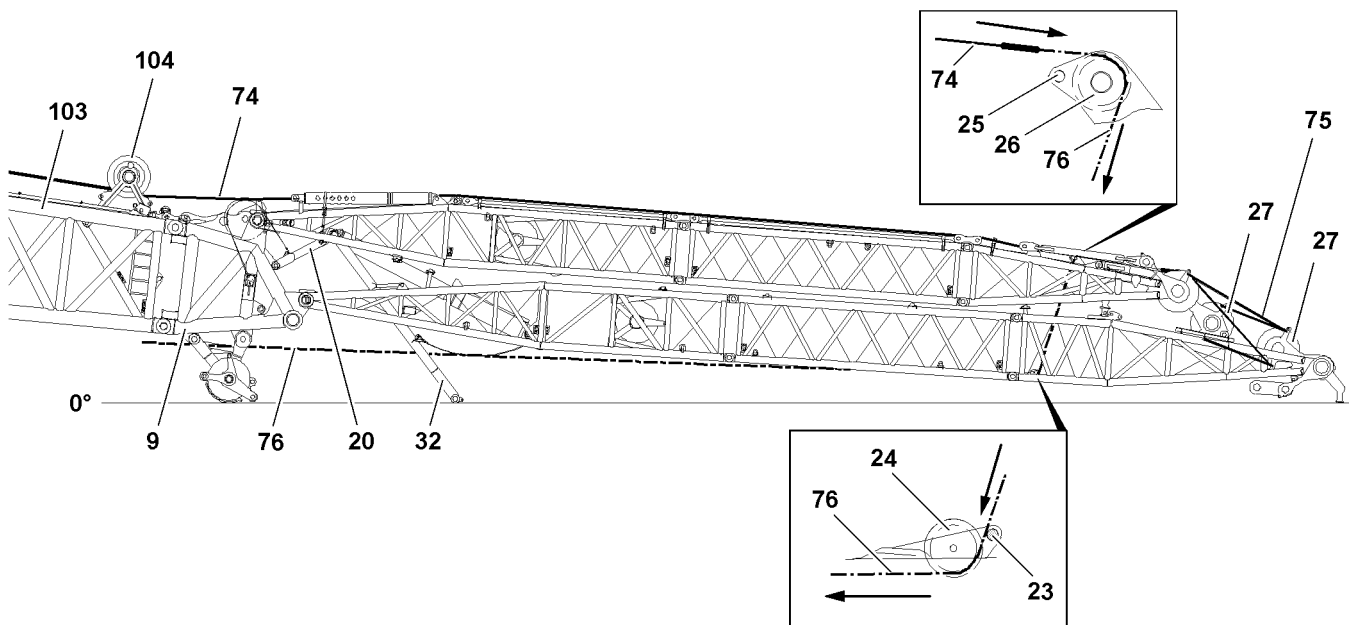


Fig.121245: Reeving the W-control rope **74** on the WA-frames

NOTICE

Slack rope formation!

The W-control rope **74** can be damaged if any ropes are slack.

- ▶ Make sure that the W-control rope **74** is always slightly tensioned when spooling it out.



Note

- ▶ Reeving the W-assembly unit, see Reeving plan.

- ▶ Release and unpin the rope retaining pin **23**.
- ▶ Place auxiliary rope **76** over the change over pulley **24** and over the change over pulley **26**.
- ▶ Insert and secure the rope retaining pin **23**.
- ▶ Connect the W-control rope **74** of winch 5 with the auxiliary rope **76**.
- ▶ Spool the auxiliary rope **76** up and spool the W-control rope **74** out until the W-control rope **74** has arrived on the change over pulley **26**.

- ▶ Release the connection from the auxiliary rope **76** and the W-control rope **74**.
- ▶ Release and unpin the rope retaining pin **25**.
- ▶ Place the auxiliary rope **76** from the left side over the change over pulley **26**.
- ▶ Insert and secure the rope retaining pin **25**.
- ▶ Connect the W-control rope **74** with the reeving rope **75**.
- ▶ Connect the auxiliary rope **76** with the reeving rope **75**.
- ▶ Release the rope retaining pipes on the pulley heads of the WA-frame end sections and unpin.
- ▶ Lift the W-pulley blocks **27** with the auxiliary crane.

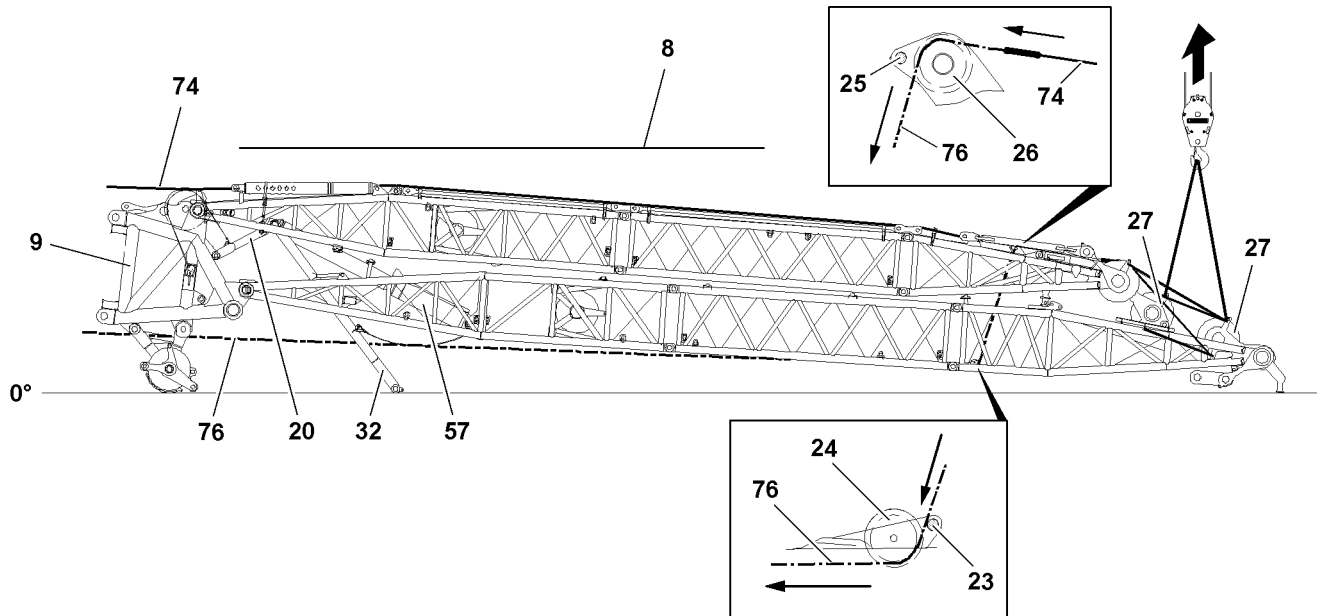


Fig.121351: Reeving the W-control rope on the WA-frames

- ▶ Spool the auxiliary rope **76** up and spool the W-control rope **74** out until the W-control rope **74** is completely reeved.

When the W-control rope **74** is completely reeved:

- ▶ Pin the rope retaining pipes on the W-pulley blocks **27** and secure.
- ▶ Release the auxiliary rope **76** and the W-control rope **74** from the reeving rope.
- ▶ Attach the W-control rope **74** on the WA-frame 2 with the lock.
- ▶ Spool up the auxiliary rope **76** and store the reeving rope **75**.

NOTICE

Damage to relapse cylinder!

Before erecting the WA-frame 2 **8**, the electrical connection for the limit switches of the relapse cylinder **57** must be established.

If this is **not** the case, the WA-frame 2 **8** 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**.
- ▶ Check the function of the limit switches: 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.

3.3 Installing the assembly rope(s) on the WA-frame 2

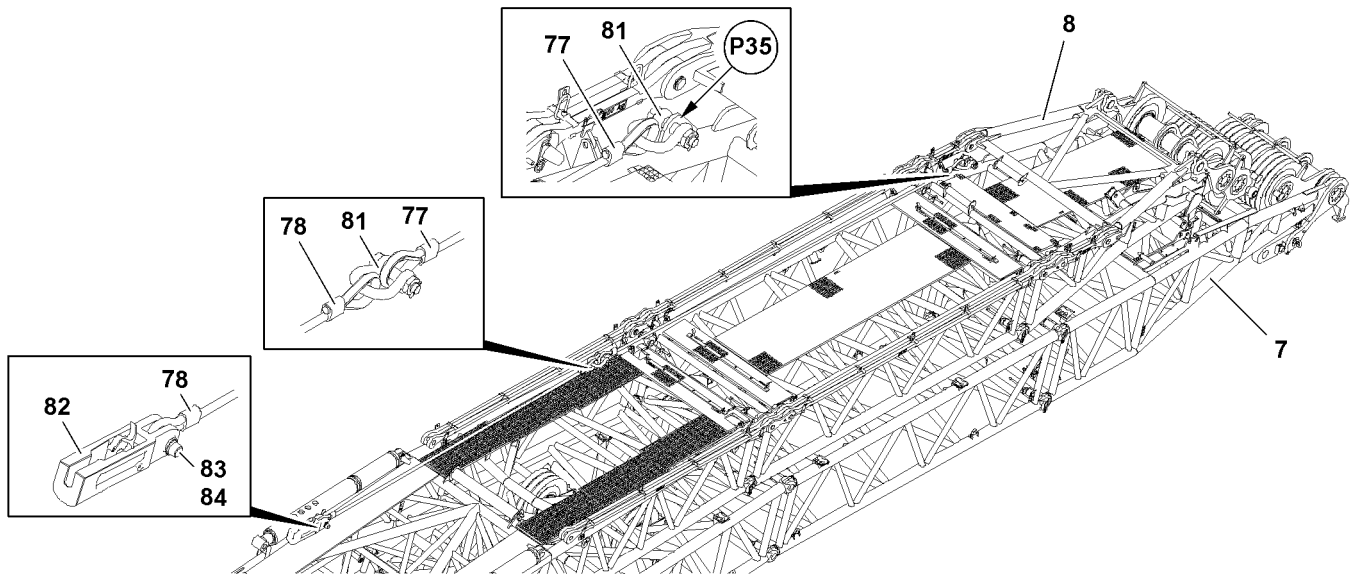


Fig.121353: Install the assembly rope(s) for erection of the WA-frame 2 8 (example: long WA-frames)



Note

- ▶ For erection of the short WA-frames: Use assembly rope 77.
- ▶ For erection of the long WA-frames: Extend the assembly rope 77 with the assembly rope 78.

Make sure that the following prerequisite is met:

- The WA-frame 2 8 is laying on WA-frame 1 7.

Install the assembly rope for short WA-frames:

- ▶ Fasten the assembly rope 77 with shackle 81 on the fixed point P35.
- ▶ Fasten the lock 82 on the assembly rope 77: Use pin 83 and locking pin 84.

Result:

- The assembly rope 77 is completely installed on the WA-frame 2.

Install the assembly rope for long WA-frames:

- ▶ Fasten the assembly rope 77 with shackle 81 on the fixed point P35.
- ▶ Fasten the assembly rope 78 with shackle 81 on the assembly rope 77.
- ▶ Fasten the lock 82 on the assembly rope 78: Use pin 83 and locking pin 84.

Result:

- The assembly ropes (assembly rope 77 and assembly rope 78) are completely installed on the WA-frame 2.

3.4 Pinning the WA-frame 2 guy rods

Make sure that the following prerequisites are met:

- The WA-frame 2 8 is laying on WA-frame 1 7.
- When using short WA-frames: The assembly rope 77 is properly installed on the WA-frame 2.
- When using long WA-frames: The assembly ropes (assembly rope 77 and assembly rope 78) are completely installed on the WA-frame 2.
- The assembly rope is released on the WA-frame 2 8.
- The hoist rope 79 is hung and fastened into the lock 82 of the assembly rope.
- The transport retainers of the WA-frame 2 guy rods are released and unpinned.
- The auxiliary crane is fastened on the studs 80 at point P33 of WA-frame 2 8.

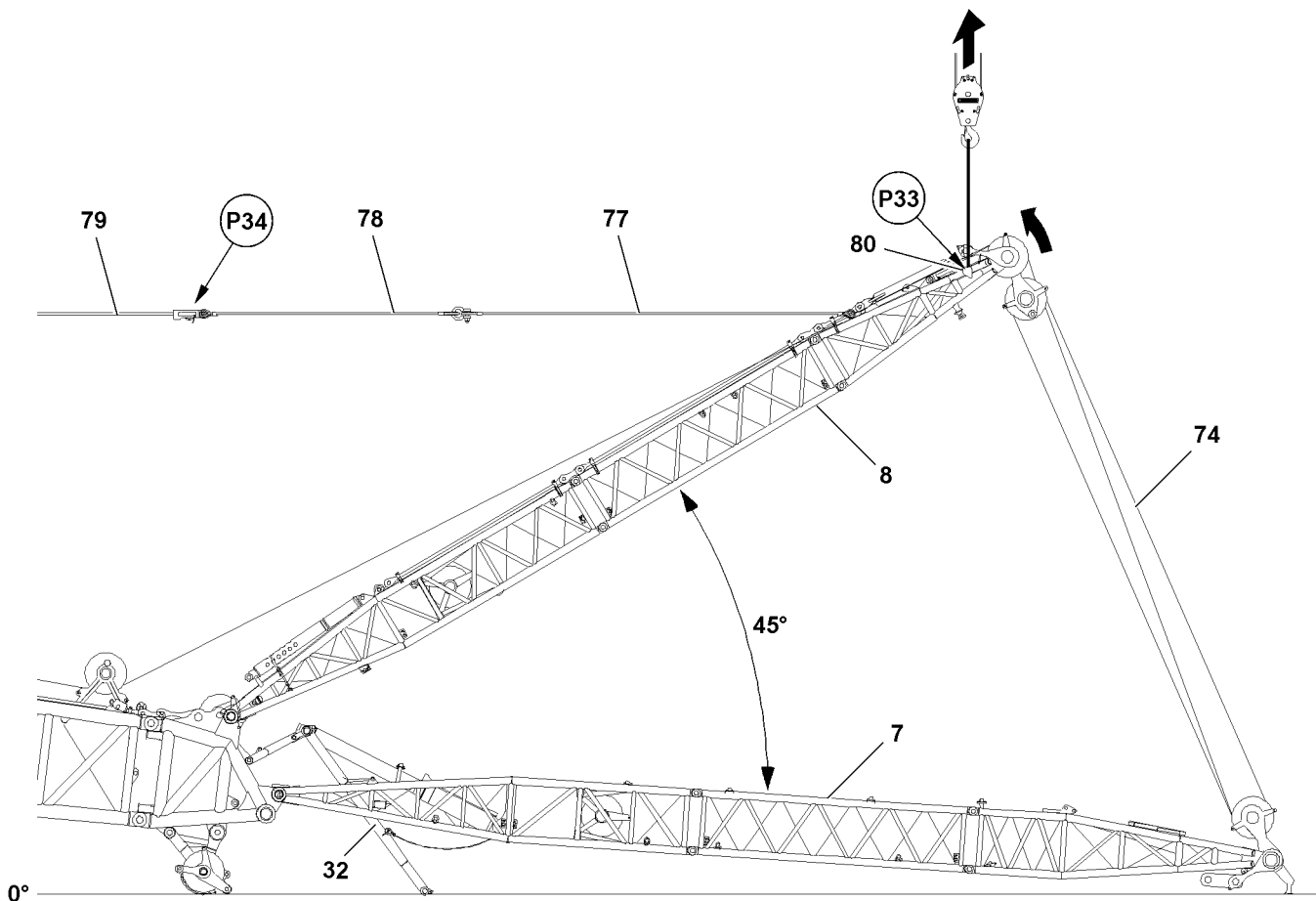


Fig.121352: Erection of WA-frame 2

NOTICE

Slack rope formation!

The W-control rope 74 can be damaged if any ropes are slack.

- ▶ When lifting the WA-frame 2 8, lift the WA-frame 1 7 slightly off the ground.
- ▶ Lift the WA-frame 2 8 with the auxiliary crane about 45° and simultaneously spool out the W-control rope 74.

When the WA-frame 2 8 is at approx. 45°:

- ▶ Tension the hoist rope 79.

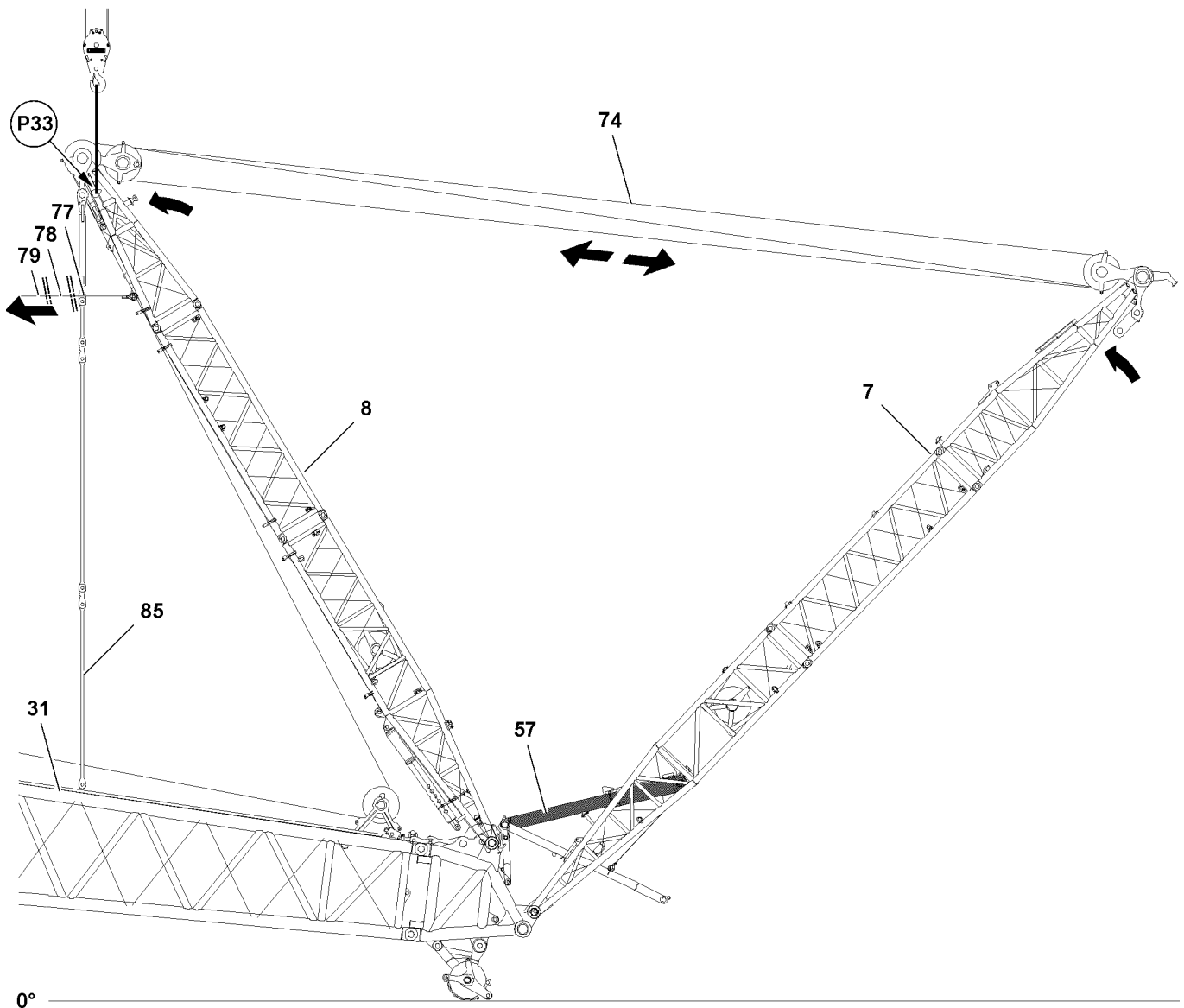


Fig.121354: Pinning the WA-frame 2 guy rods



Note

- ▶ For further erection of the WA-frame 2 8 make sure that the WA-frame retain the 45° angle to each other.
- ▶ Spool the W-control rope 74 slightly up or out as needed.

When the hoist rope 79 is tensioned:

- ▶ Spool the hoist rope 79 up and pull the WA-frame 2 8 up until the relapse cylinder 57 on the WA-frame 1 7 builds up pressure.

NOTICE

Damage of hoist rope and / or of WA-frame 2!

If the W-control rope 74 is not spooled out simultaneously at further erection of WA-frame 2 8, the hoist rope 79 can be overloaded and the WA-frame 2 8 can be significantly damaged.

- ▶ Make sure, at further erection of WA-frame 2 8 with the hoist rope 79, the W-control rope 74 is spooled out simultaneously to hold the WA-frame 1 7 in position.
- ▶ Leave the auxiliary crane fastened on the WA-frame 2 to secure the WA-frame 2 8.

When the relapse cylinder has built up sufficient pressure:

- ▶ Pull the WA-frame 2 **8** with the hoist rope backward until the WA-frame 2 guy rods **85** can be pinned with the WA-frame 2 guy rods on the S-system.



Note

- ▶ The WA-frame 2 guy rods **85** 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 **85** properly with the WA-frame 2 guy rods on the S-boom and secure.

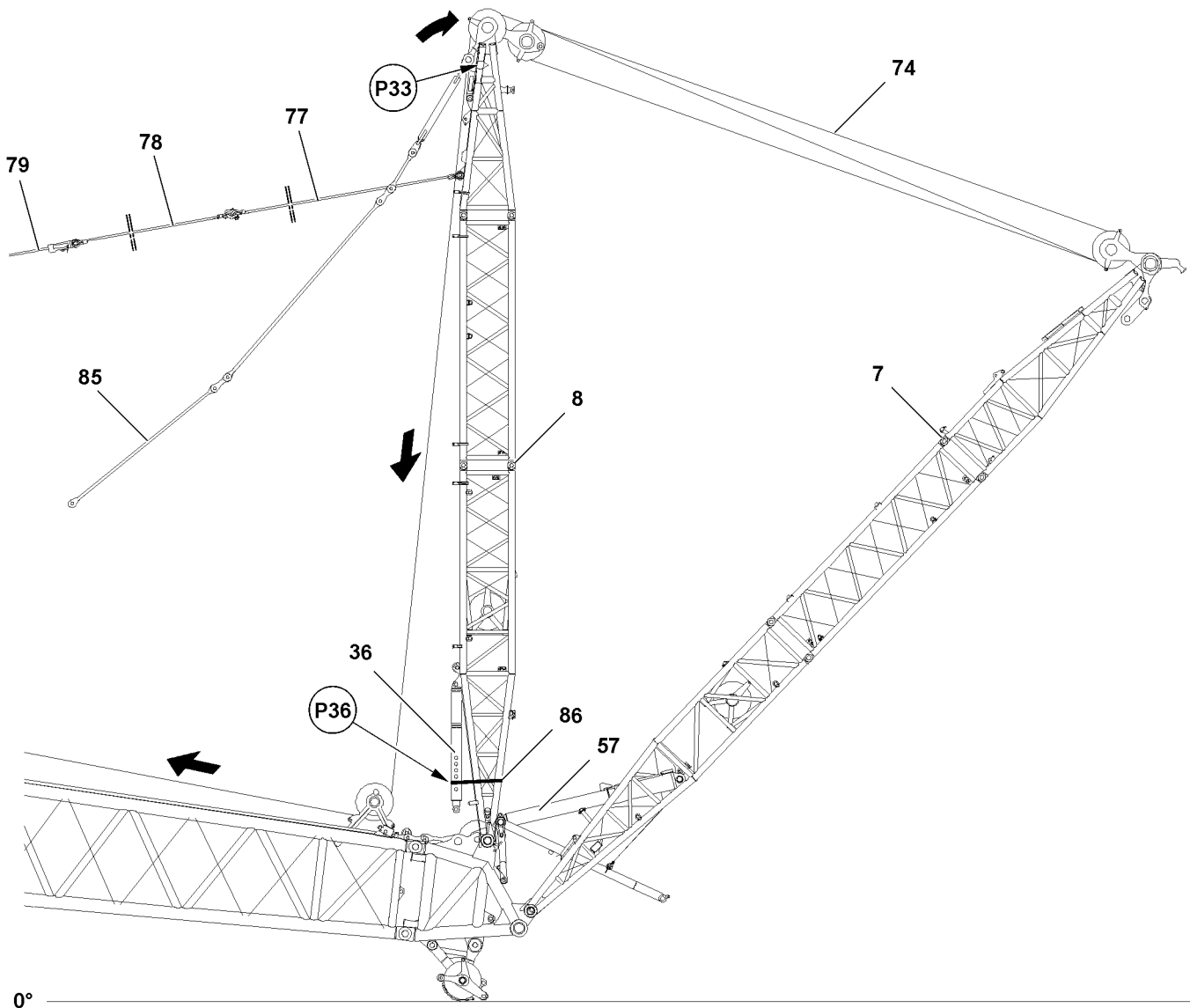


Fig.121355: Erect the WA-frame 2 **8** until vertical



Note

- ▶ Make sure that the WA-frame 1 **7** remains in position when erecting the WA-frame 2 **8**.
- ▶ Make sure that sufficient pressure is available in the relapse cylinder **57**.

**WARNING**

Uncontrolled swinging of the relapse supports **36**!

If the tension belts **86** on the relapse supports **36** are removed without the WA-frame 2 **8** in vertical position, then the relapse supports **36** can swing to the side uncontrolled.

Personnel can be severely injured or killed.

- ▶ Set the WA-frame 2 **8** vertically before removing the tension belts **86**.

When the WA-frame 2 guy rods **85** are properly pinned and secured:

- ▶ Erect the WA-frame 2 **8** with the W-control (W-control rope **74**) until vertical.
- ▶ Remove the auxiliary crane on the WA-frame 2 **8** at point **P33**.
- ▶ Remove the tension belt **86** on the relapse supports **36** at point **P36**.

3.5 Pinning the relapse supports on the S-boom and pinning in operating position

To pin the WA-frame 2 relapse supports **36** on the S-adapter **103** the WA-frame 2 **8** must be pulled back with the hoist rope **79** until the WA-frame 2 relapse supports **36** are positioned over the pin points **P37** on the S-adapter **103**.

**WARNING**

Oscillating relapse supports!

When pulling the WA-frame 2 **8** back, the WA-frame 2 relapse supports **36** can start to swing back and forth.

Personnel can be severely injured or killed.

- ▶ Make sure that no personnel is within the danger zone when pulling the WA-frame 2 **8** back.
- ▶ Make sure that the WA-frame 1 **7** is held in „up“ position.

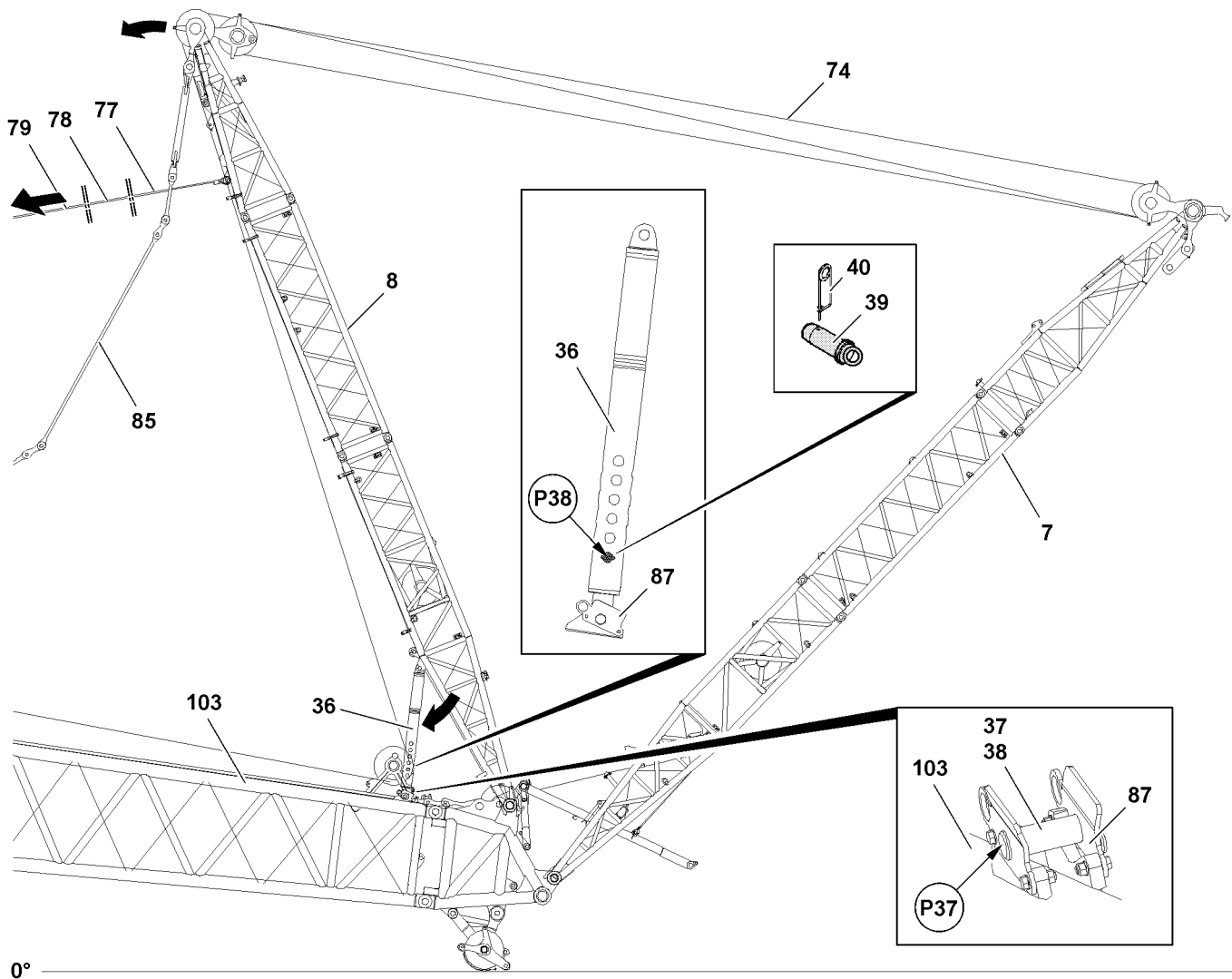


Fig.121356: Pin the WA-frame 2 relapse supports on the S-adapter

- ▶ Pull the WA-frame 2 **8** back (approx. 120°): Spool the hoist rope **79** up and simultaneously spool the W-control rope **74** out until the relapse support **36** is standing vertically over the pin point **P37**.
- ▶ Pin the relapse support **36** on the S-adapter **103**: Insert the pin **37** on both sides at point **P37** and secure with spring retainer **38**.

Result:

- The relapse supports **36** are pinned on the S-adapter **103**.

NOTICE

Damage of WA-frame 2 **8!**

If the connecting pin **39** is not unpinned from the park position at point **P38** before erecting the WA-frame 2 **8**, WA-frame 2 **8** can be damaged during erection.

- ▶ Unpin the pin **39** only after the relapse supports **36** are pinned on both sides on the S-adapter **103** at point **P37**.
- ▶ Release the pin **39** on both sides and unpin from the park position at point **P38** on the relapse supports **36**.

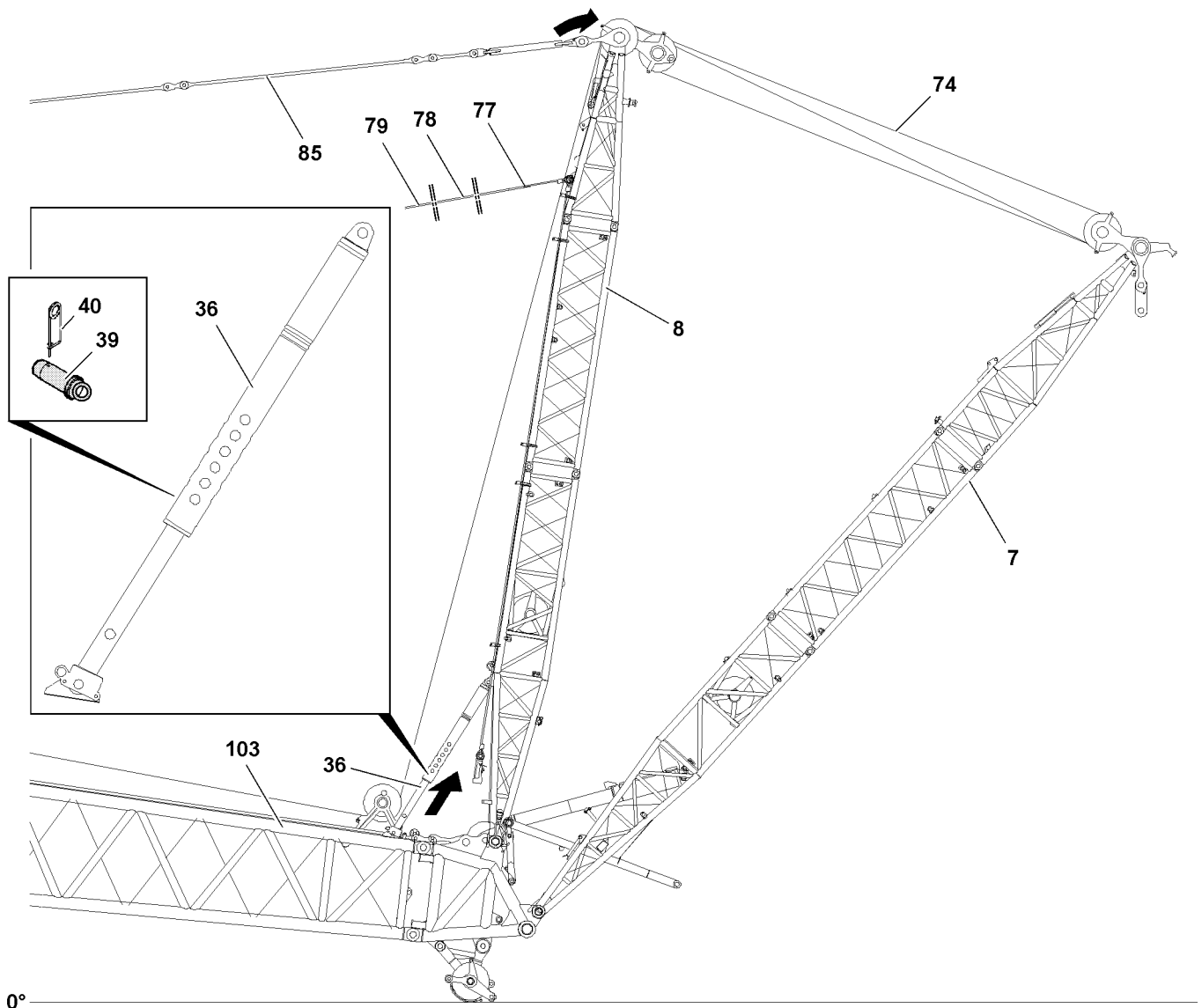


Fig.121710: WA-frame 2 **8** erected and pin WA-frame 2 relapse supports **36** in operating position

- ▶ Spool the hoist rope **79** out and simultaneously spool the W-control rope **74** up until the WA-frame 2 guy rods **85** are tensioned.
- ▶ Insert the pins **39** on both sides in maximum possible length on the next bore of the relapse support **36** and secure with spring retainer **40**.

When the relapse supports **36** are pinned on both sides in maximum possible length and secured with the pins **39**:

- ▶ Spool out the hoist rope **79** and remove from the lock of the assembly rope **78** or assembly rope **77**.

3.6 Assembling the W-guy rods

Make sure that the following prerequisites are met:

- The WA-frame 2 guy rods are properly pinned and secured.
- The WA-frame 2 is erected in operating position.
- The WA-frame 2 guy rods are tensioned.
- The WA-frame 2 relapse supports **36** are properly pinned and secured in maximum length.
- The electrical connections to the limit switches on the relapse cylinder are established.

- ▶ Attach the assembly rope on the WA-frame 2 **8** in transport position.

**Note**

- The assembly of the guy rods on the WA-frame 1 is described as an example on one rod side. The assembly of the guy rods on the other side is identical.

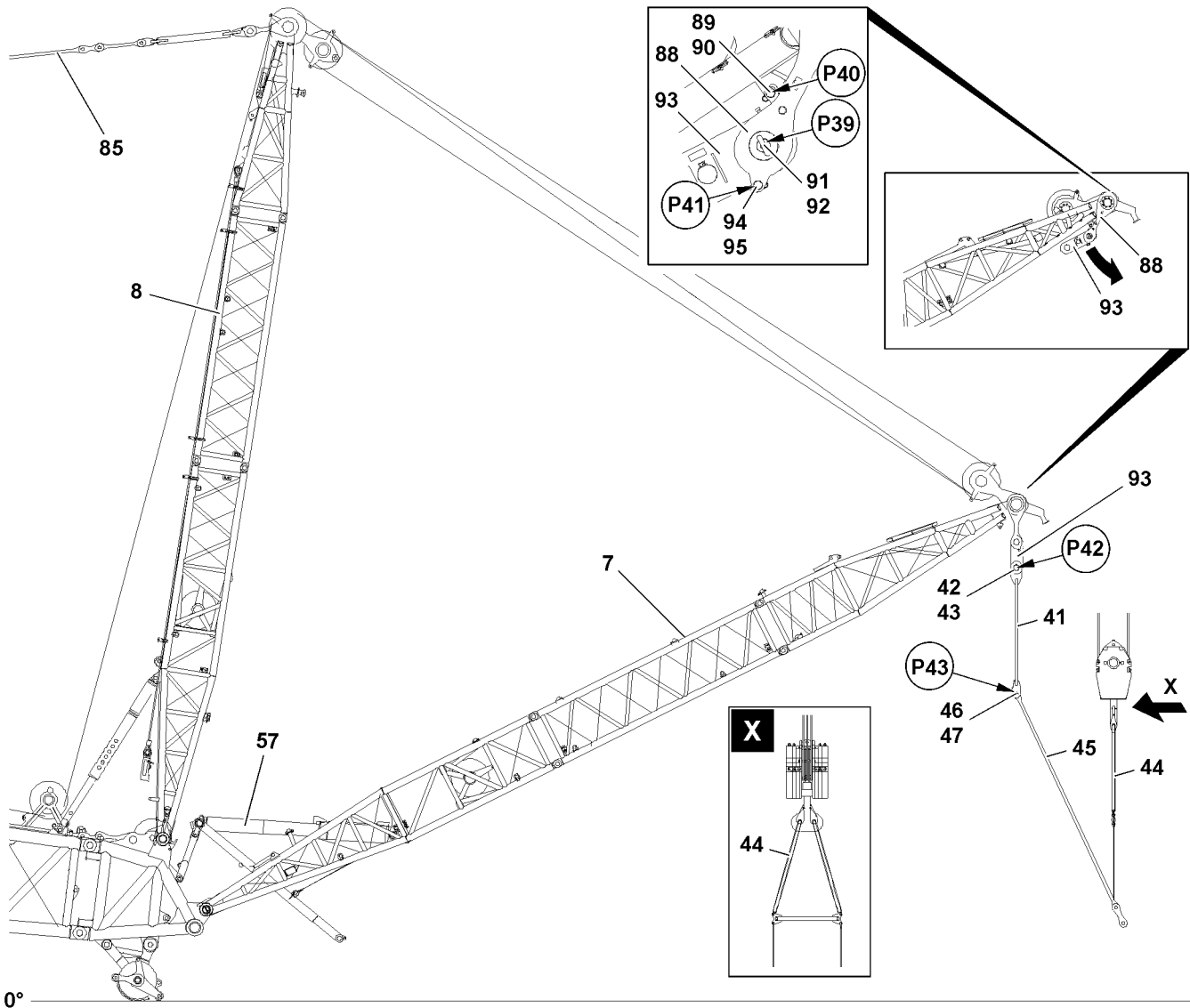


Fig.121357: Assemble the W-guy rods on the WA-frame 1 end section

Assemble the W-guy rods 41 with the auxiliary crane on the WA-frame 1 7.

**Note**

- For simpler assembly of the W-guy rods 41 the WA-frame 1 can be lowered to the horizontal.

NOTICE

Damage of relapse support!

When lowering the WA-frame 1 in the horizontal, the relapse support 32 can be damaged.

- Make sure that the ground in the area of WA-frame 1 and the relapse support 32 is level and free of objects.
- If necessary, place a low-friction base under the relapse support 32.

- Fasten the pull test bracket 93 on the eyebolt 91 at point P39 on the auxiliary crane.

When the auxiliary crane is properly fastened on the eyebolt 91:

- Tension the fastening equipment.

When the fastening equipment is tensioned:

- ▶ Release the transport retaining pin **89** at point **P40** and unpin.
- ▶ Lower the pull test bracket **93** with the auxiliary crane and repin and secure the transport retaining pin **89** at point **P40**.
- ▶ Remove the auxiliary crane on the eyebolt **91** at point **P39**.



WARNING

Crushing danger due to pull test bracket!

When unpinning the transport retaining pin **94** the pull test bracket **93** can suddenly swing down and start to swing back and forth.

Limbs can be caught and / or crushed.

Personnel can be severely injured or killed.

- ▶ Make sure that the pull test bracket **93** is secured to prevent it from swinging back and forth before unpinning the transport retaining pin **94**.

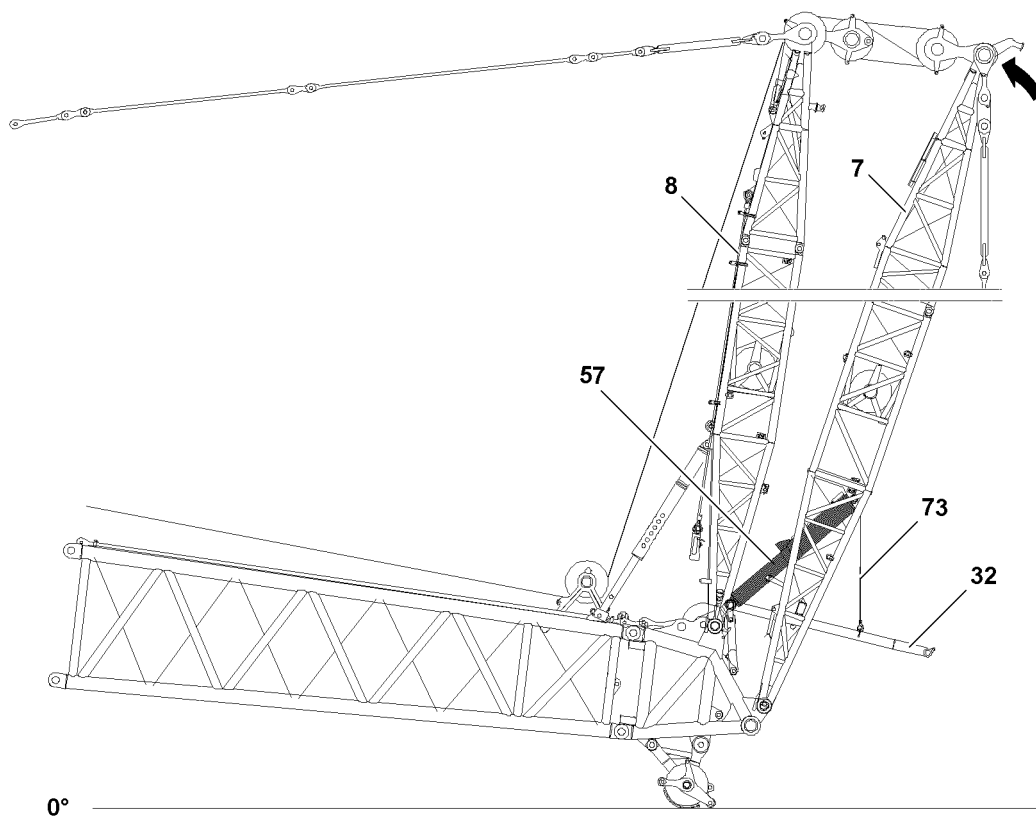
- ▶ Release the transport retaining pin **94** at point **P41** and unpin.
- ▶ Swing the pull test bracket **93** down.

When the pull test bracket **93** is in „down“ position:

- ▶ Assemble the W-guy rods with the auxiliary crane on the pull test bracket **93**.
- ▶ Pin the W-guy rods **41** at point **P42** with pin **43** on pull test bracket **93** and secure with spring retainer **42**.
- ▶ Attach the cross bar **44** on the auxiliary crane and lift the W-guy rods **41** so that they will not scrape on the ground when lifting the WA-frame **1 7**.

When the WA-frame **1 7** is raised and the W-guy rods hang vertically:

- ▶ Assemble the W-guy rods **45** with the auxiliary crane on the W-guy rods **41**: Insert the pin **46** and secure with spring retainer **47**.
- ▶ Attach the cross bar **44** on the auxiliary crane and lift the W-guy rods **45** so that they will not scrape on the ground when lifting the WA-frame **1 7** further.



0°

Fig.121358: Pull up the WA-frame **1 7** // relapse cylinder **57** is completely retracted

- ▶ Pull up the WA-frame **1 7** until the relapse cylinder **57** is completely retracted.

Result:

- The mechanical relapse support **32** is raised by the retaining rope **73**.
- The assembly area for the W-lattice jib is freely accessible.

3.7 Assembling the W-lattice jib**Note**

- ▶ During assembly of the W-lattice jib, adhere to the pin sequence, see Crane operating instructions, chapter 5.01.

Make sure that the following prerequisites are met:

- The W-guy rods on the WA-frame 1 are assembled.
- The WA-frame 1 is completely pulled up.

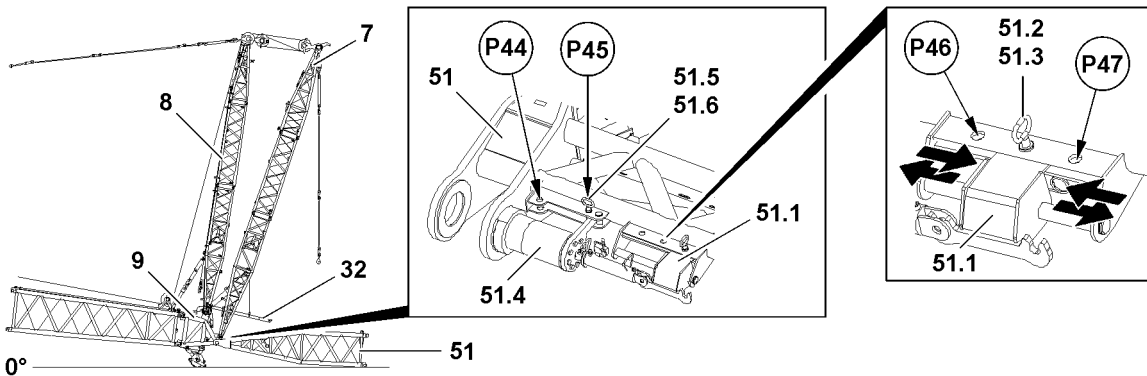
3.7.1 Pinning the W-pivot section

Fig.121532: Assemble the W-pivot section on the W-connector head

**WARNING**

Danger of accident!

If the W-pivot section is not properly pinned and secured on the W-connector head severe accidents can occur.

Personnel can be severely injured or killed.

- ▶ Make sure that the W-lattice jib is supported from below during the assembly and disassembly with suitable materials.
- ▶ Make sure that all pins are properly pinned and secured after assembly.

Make sure that the following prerequisites are met:

- The connector pins **51.4** on the W-pivot section are completely unpinned on both sides.
- The connector pins **51.4** are secured in assembly position at point **P45** on both sides with pin **51.5** and spring retainer **51.6**

**Note**

- ▶ Pay attention to the fastening points of the lattice sections, see section „Fastening points“.

- ▶ Fasten the W-pivot section **51** on the auxiliary crane and position on the pin points on the W-connector head **9**.

**Note**

- ▶ The connector pins **51.4** between the W-pivot section **51** and W-connector head **9** can only be individually pinned with the pin pulling device.
- ▶ Move the hook device **51.1** for the pin pulling cylinders in the respective position and pin and secure with pin **51.2** each at point **P47** or point **P48**.

When the W-pivot section **51** is positioned properly on the W-connector head **9**:

- ▶ Pin the W-pivot section **51** on the W-connector head **9** on both sides with the pin pulling device, see Crane operating instructions, chapter 5.30.

When the connector pins **51.4** are completely pinned on both sides:

- ▶ Secure the connector pins **51.4** on both sides: Insert the pin **51.5** at point **P44** on both sides and secure with spring retainer **51.6**.
- ▶ Remove the pin pulling cylinder from the pin pulling device.
- ▶ Lower the W-pivot section **51** with the auxiliary crane on the support on the ground.

When the W-pivot section **51** is lowered on the support on the ground:

- ▶ Remove the auxiliary crane.
- ▶ Lower the WA-frame 1 **7** until the relapse support **32** is laying on the W-pivot section **51**.

When the relapse support **32** is laying on the W-pivot section **51**:

- ▶ Remove the retaining rope **73** on the relapse support **32** and secure on the WA-frame 1 pivot section.

3.7.2 Establishing the electrical connections to the W-pivot section

Make sure that the following prerequisite is met:

- The W-pivot section **51** is properly pinned and secured on the W-connector head **9**.
- ▶ Properly establish the electrical connections from the W-connector head **9** to the W-pivot section **51**, see Electric wiring diagram

3.7.3 Assembling the W-lattice jib on the W-pivot section

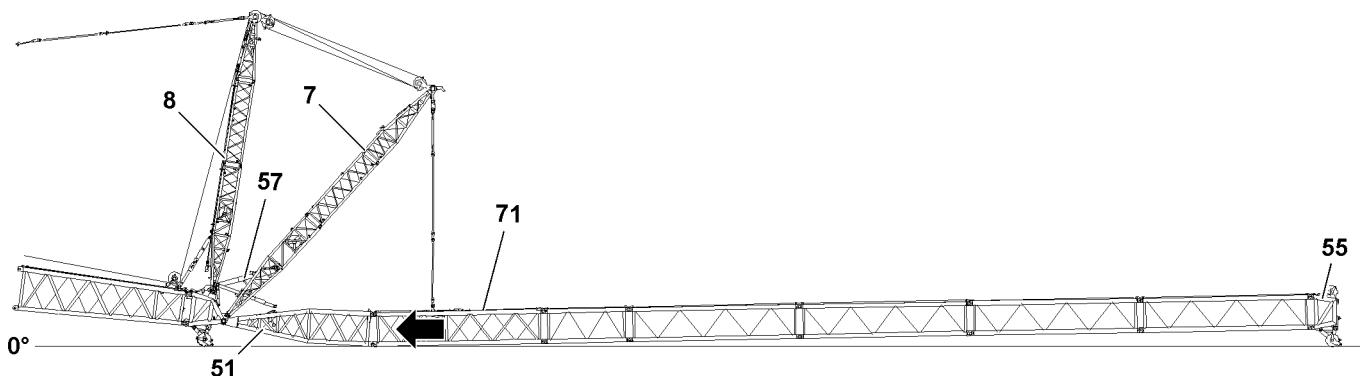


Fig.121359: Assemble the W-lattice jib on the W-pivot section



WARNING

Crushing danger for personnel within the area of the load!

If personnel are located between the load to be lifted and a possible interfering edge when lifting a load, personnel can be severely injured or killed.

- ▶ Before lifting the load it must be ensured that there are no persons within the danger zone.
- ▶ It is prohibited to remain within the danger zone.
- ▶ It is prohibited for anyone to be under the load.
- ▶ Keep a safety distance.
- ▶ Swinging the load is prohibited.
- ▶ Exercise extreme caution when lifting a load.

**WARNING**

General danger notes!

If the following danger notes are not observed, severe accidents can occur.

Personnel can be severely injured or killed.

- ▶ Make sure that the W-lattice jib is supported from below during the assembly and disassembly with suitable materials.
- ▶ Make sure that all pins are properly pinned and secured after assembly.
- ▶ Make sure that the guy rods are properly installed and secured.
- ▶ The guy rods must be checked regularly, see Crane operating instructions, chapter 8.15.

**Note**

- ▶ During assembly of the W-lattice jib, adhere to the pin sequence, see Crane operating instructions, chapter 5.01.

Make sure that the following prerequisites are met:

- The guy rods are assembled on the WA-frame 1 **7**.
- The WA-frame 1 **7** is luffed to the point where the WA-frame 1 guy rods are standing over the guy rods of the lattice sections.
- The function of the relapse cylinder **57** is ensured.
- The WA-frame 2 **8** is guyed.
- The required guy rods are laying on the lattice sections to be installed.

**Note**

- ▶ For the composition of the different W-lattice jib length, observe the Rod plan.

To pin the W-lattice jib with the pin pulling device, see Crane operating instructions, chapter 5.30.

The assembly of the W-lattice jib is the same as the assembly of the boom, see Crane operating instructions, chapter 5.39.

- ▶ Assemble the W-lattice jib to the required length: Position the lattice sections and pin them properly with the connector pins.
- ▶ Secure the pin connections of the lattice sections properly.

3.7.4 Closing the W-lattice jib

**Note**

- ▶ When the W-lattice jib has been erected closed already at the assembly of the lattice sections, then the assembly step: „Closing the W-lattice jib“ can be eliminated.

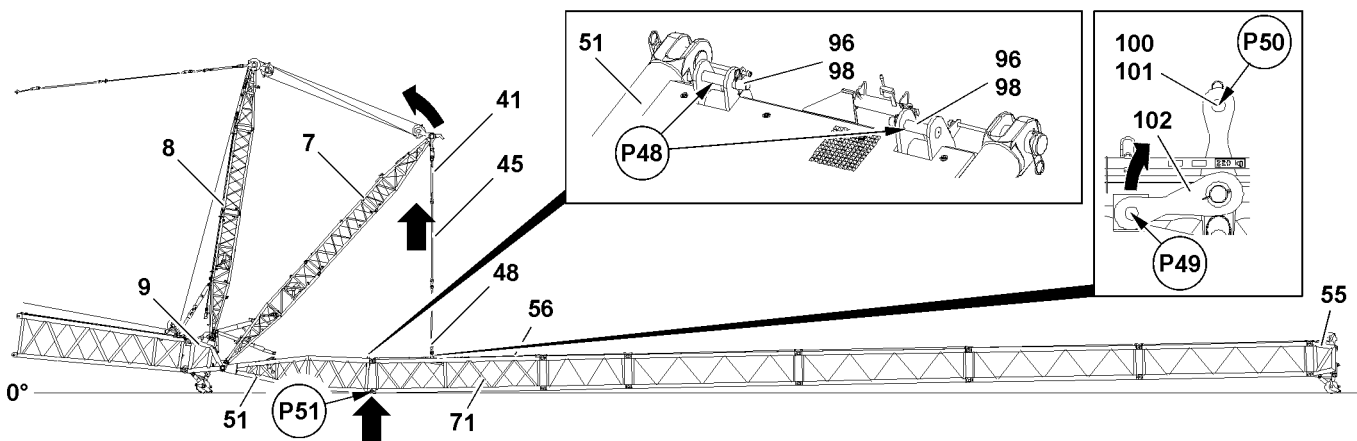


Fig.121535: Closing the W-lattice jib

For the short WA-frames the following applies:

- ▶ Pin the W-guy rods **45** of WA-frame 1 **7** on the pin points **P48** on the W-pivot section **51**.
- ▶ Pin the W-guy rods **45** on the pin points **P48** on both sides with pin **96** and secure with spring retainer **98**.

For the long WA-frames the following applies:

- ▶ Release the brackets **102** in park position **P49** and swing upward in operating position.

When the brackets **102** are in operating position:

- ▶ Pin the W-guy rods **45** of WA-frame 1 **7** on the brackets **102** (point **P50**) on the LI-intermediate section **71**: Use pin **100** and spring retainer **101**.

When the W-guy rods of WA-frame 1 are pinned with the brackets on the W-pivot section **or** on the LI-intermediate section **71**:

- ▶ Pull the WA-frame 1 **7** with the W-control upward and close the W-lattice jib.

When the pin bores between the W-pivot section **51** and the LI-intermediate section **71** align on the „bottom“ (point **P51**):

- ▶ Pin the lattice sections with the pin pulling device: Pin the connector pins between the W-pivot section **51** and the LI-intermediate section **71** on both sides and secure properly with spring retainer.

3.7.5 Installing the auxiliary guying

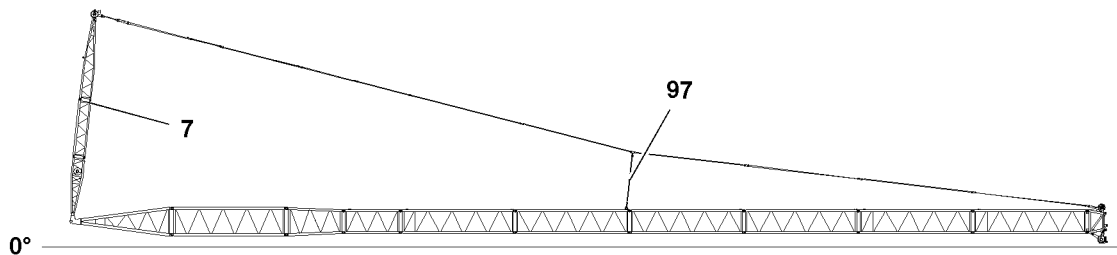


Fig.121540: Install the auxiliary guying

When one auxiliary guying **97** is required according to the Rod plan:

- ▶ Assemble the auxiliary guying **97** properly, see Crane operating instructions, chapter 5.03.

3.7.6 Placing the W-lattice jib in the pulley cart and tension the W-guying

NOTICE

Damage to the boom system!

If the boom system is incorrectly fastened on the auxiliary crane and lifted, then the boom system can be damaged.

This could result in high property damage.

- ▶ Make sure that the boom system is only fastened and lifted on the intended locations on the auxiliary crane, see Crane operating instructions, chapter 5.01 and 5.61.

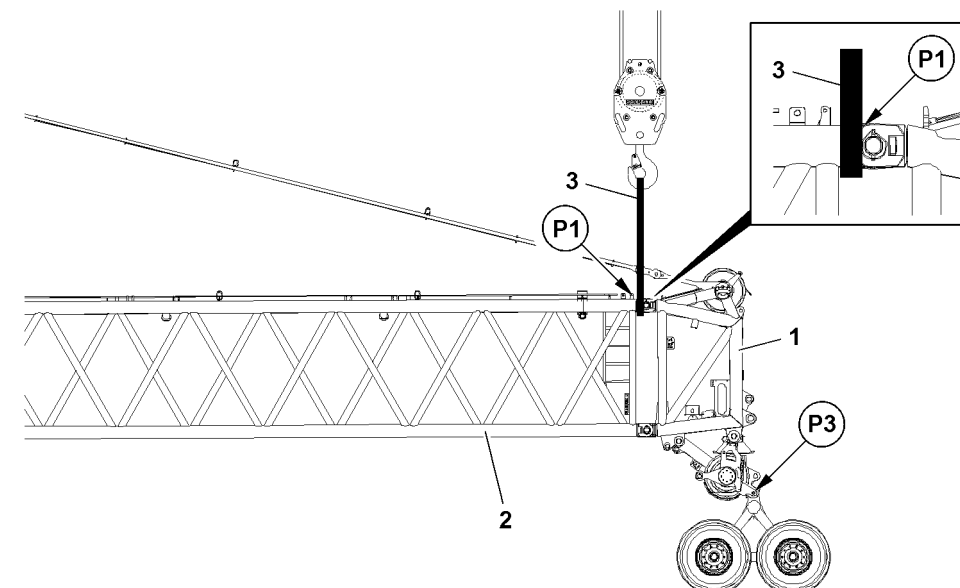


Fig.121583: Lift the boom end section in the pulley cart // illustration is an example

Make sure that the following prerequisite is met:

- The retaining pins on the pulley cart are unpinned.
- ▶ Fasten the W-lattice jib properly on the auxiliary crane and lift, see Crane operating instructions, chapter 5.01.



WARNING

Crushing danger due to pulley cart!

If personnel remains in the danger zone, they can be crushed and / or limbs can be severed. Personnel can be severely injured or killed.

- ▶ Make sure that there are no persons within the danger zone.

- ▶ Position the pulley cart under the SW-end sections.

When the pulley cart is properly positioned:

- ▶ Place the W-lattice jib with the SW-end section in the pulley cart and secure.

When the lattice jib is properly placed in the pulley cart:

- ▶ Release the transport retainers of the W-guy rods on the lattice sections.
- ▶ Pin the W-guy rods of the WA-frame 1 with the W-guy rods of the LI-lattice sections.
- ▶ Pin the W-guy rods of the LI-lattice sections with the W-guy rods of the SW-end section.

Result:

- The W-lattice jib is fully assembled and secured.



WARNING

The crane can topple over!

If the main boom is erected to the point where the pulley cart lifts off the ground, the crane can be overloaded and topple over.

Personnel can be severely injured or killed.

- ▶ Make sure that the pulley cart remains on the ground when tensioning the W-guying.
- ▶ Erect the main boom until the W-guying is tensioned.

- ▶ Tension the W-guying.

3.8 Establishing the electrical connections to the SW-end section

Make sure that the following prerequisite is met:

- The W-boom is completely assembled.
- The W-guying is tensioned.
- The airplane warning light and the wind speed sensor are installed.

NOTICE

Damage to the electrical connection on the cable drum!

If the electrical connection from the cable drum to the terminal box on the W-pivot section is established first before the connection to the terminal box on the SW-end section, then the electrical connection will be damaged when spooling out the cable drum.

- ▶ Establish first the electrical connection from the cable drum on the W-pivot section to the terminal box on the SW-end section and then the electrical connection from the terminal box on the W-pivot section to the cable drum on the W-pivot section.



Note

- ▶ To establish the electrical connections, use the Electric wiring diagram.
- ▶ Establish the electrical connections.
- ▶ Make sure that all electrical connections on the boom are established.

3.9 Checking the function of the safety equipment

Make sure that the following prerequisites are met:

- All electrical connections have been made.
- The appropriate operating mode is set.

3.9.1 Wind speed sensor*

- ▶ Check the movement and the function of the wind speed sensor.

3.9.2 Airplane warning light*

- ▶ Turn the airplane warning light on and visually check the function.

3.9.3 Oscillation guard

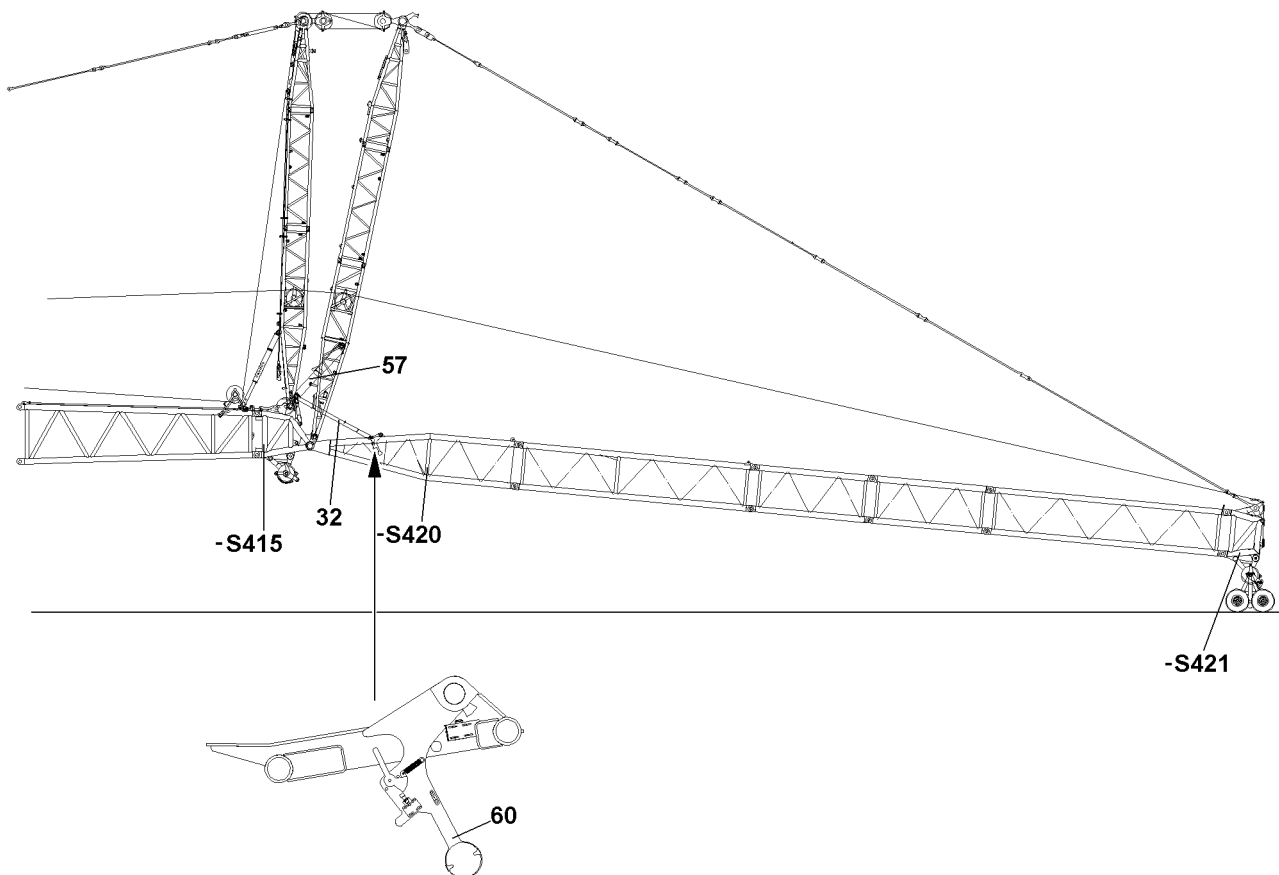


Fig.121533: Check the oscillation guard for correct function



WARNING

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. Personnel can be severely injured or killed.

- ▶ Crane operation with hard to move oscillation guard **60** is prohibited.
- ▶ Check the oscillation guard **60** for easy movement.

3.9.4 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 actuators must be checked as described in the separate „Diagnostics manual“.
- ▶ The limit switch actuators are checked manually as follows.

3.9.5 Hoist limit switch

When replacing or changing the hoist limit switch (HES), the HES must have the correct bus address and the correct software version in order to be recognized again by the bus system (LSB).



- ▶ Actuate the hoist limit switch manually.

Result:

- The icon appears on the LICCON monitor.
- The **spool up function** of the hoist winch turns off.

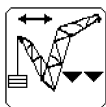
3.9.6 Limit switch W-lattice jib, „steepest“ position, relapse cylinder

- ▶ Cover the limit switch actuators individually with a metal plate, see Crane operating instructions, chapter 8.12.

Result:

- The icon appears on the LICCON monitor.
- The **spool up function** of the W-control winch turns off.

3.9.7 Limit switch W-lattice jib, „lowest“ position, relapse cylinder



- ▶ Cover the „lowest“ position of the limit switch initiators individually with a metal plate, see Crane operating instructions, chapter 8.12.

Result:

- The icon appears on the LICCON monitor.
- The **spool out function** of the W-control winch turns off.

3.9.8 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.

4 Erecting the boom

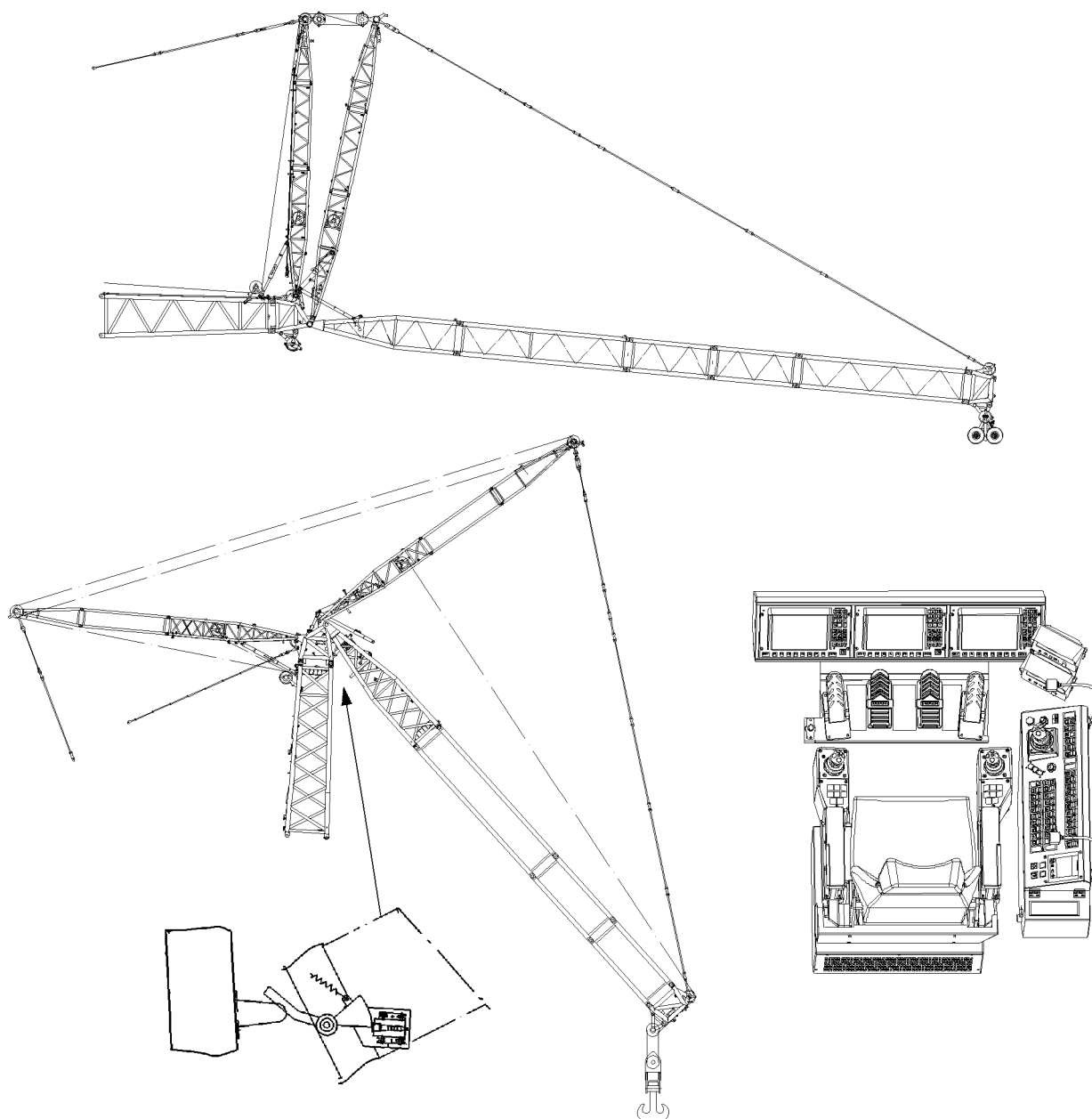


Fig.121127



WARNING

The crane can topple over!

If the following conditions are not met before erecting the boom, the crane can be overloaded and topple over.

Personnel can be severely injured or killed.

- ▶ While the boom system is erected, turning is prohibited.
- ▶ Observe the technical safety notes, see Crane operating instructions, chapter 5.01.
- ▶ Observe the specifications in the erection and take down charts.
- ▶ Extend the relapse cylinder before erection.

**WARNING**

The crane can topple over!

For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down chart.

- ▶ 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**.

**WARNING**

Tipping lattice jib!

If the easy movement on the pendulum of the mechanical relapse support is not checked before erection or not re-established, if necessary, then the mechanical relapse support will not engage in steep lattice jib position.

Personnel can be severely injured or killed.

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**

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.

- ▶ The lattice jib must roll on the ground with its entire weight.
- ▶ Spool the lattice jib adjustment out in such that guy rods sag slightly.
- ▶ Do not allow slack rope to build up on the W-control winch.

**WARNING**

Unutilized guy rods on boom!

If guy rods are on the lattice sections which are not used for operation, then there is a danger of accidents.

Personnel can be severely injured or killed.

Guy rods can loosen up and fall down.

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 unutilized guy rods on the transport retainers before erecting the boom.

4.1 Erecting the boom

Make sure that the following prerequisites are met:

- The W-lattice jib is fully assembled.
- The pulley cart is assembled on the SW-end section.
- No personnel is within the danger zone.
- The crane is aligned in horizontal direction.
- All electrical connections have been made.
- All limit switches are functioning.
- The counterweight is installed on the turntable according to the load chart and the Erection and take down chart.
- The derrick ballast has been installed on the derrick according to the load chart or 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.
- The hoist rope has been pulled with the respective length over the SW-end section.
- There are no loose parts on the boom or the lattice jib.
- Boom, lattice jib and safety devices are free from snow, frost 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 actual set up configuration.
- The LICCON overload protection is bypassed, see Crane operating instructions, chapter 4.02.
- The assembly icon is visible on the LICCON monitor.



WARNING

Falling hoist rope!

If the hoist rope is not pulled with the respective length over the SW-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 SW-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 spool the W-control winch out to keep the lattice jib with the SW-end section placed on the pulley cart on the ground. Continue with this process until the S-boom and the W-lattice jib form an angle of approximately 45°, **Switch position W-lattice jib bottom**, or until the SW-end section lifts off from the ground first or the WA-frame 1 is in the **bottom** position.
 - ▶ Unpin the pulley cart on the SW-end section, see Crane operating instructions, chapter 5.15.
 - ▶ Luff the S-boom up until the SW-end section lifts off the pulley cart.
 - ▶ Check the actual load on the LICCON monitor.

Problem remedy

Actual load on the LICCON monitor is larger than 0.0 t.

- ▶ Observe the notes for input of hook block weight, see Crane operating instructions, chapter 4.02.
-
- ▶ Reeve in the hook block properly and secure the hoist rope on the rope fixed point, see Reeving plan.
 - ▶ Attach the hoist limit switch weight.
 - ▶ Enter the weight of the hook block into the LICCON computer system.

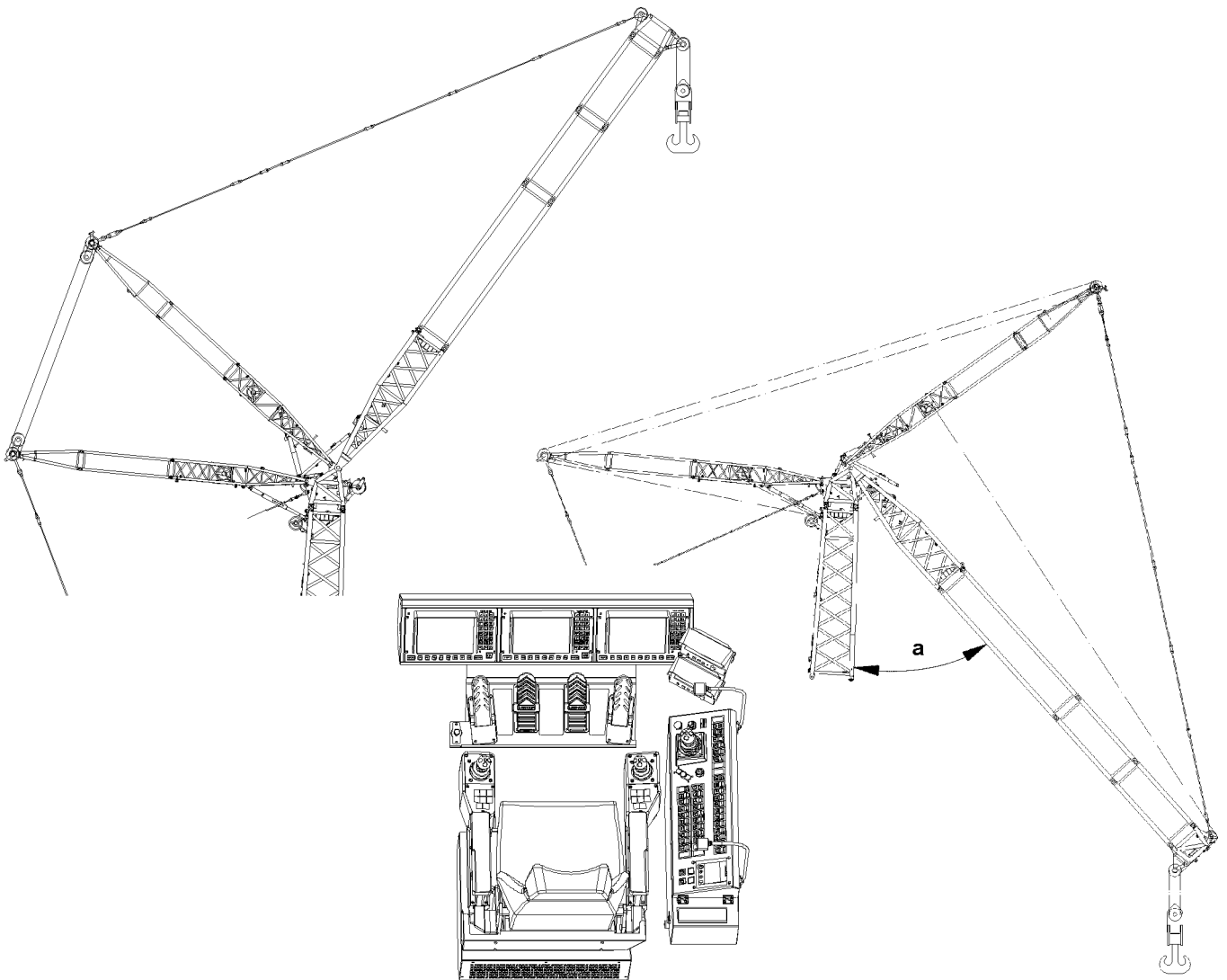


Fig.121128

NOTICE

Damage to crane!

- ▶ Luff up the S-boom and simultaneously spool out the hoist winch to prevent the hook block from colliding with the SW-end section.

- ▶ Luff up the S-boom to the operating position.

**WARNING**

The crane can topple over!

In crane operation with exceeded LICCON overload protection, the crane can topple over. 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.

**Note**

- ▶ When the lowest operating position of the W-lattice jib 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 **11** on the LICCON monitor turns off.

Result:

- The LICCON overload protection is active.

5 Crane operation



Note

- ▶ Observe the notes, see Crane operating instructions, chapter 4.05, chapter 4.08 and chapter 5.01.

Make sure that the following prerequisites are met:

- The LICCON overload protection is active.
- The LICCON overload protection has been set according to the data in the load chart.



WARNING

The crane can topple over!

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

5.1 Checking the settings

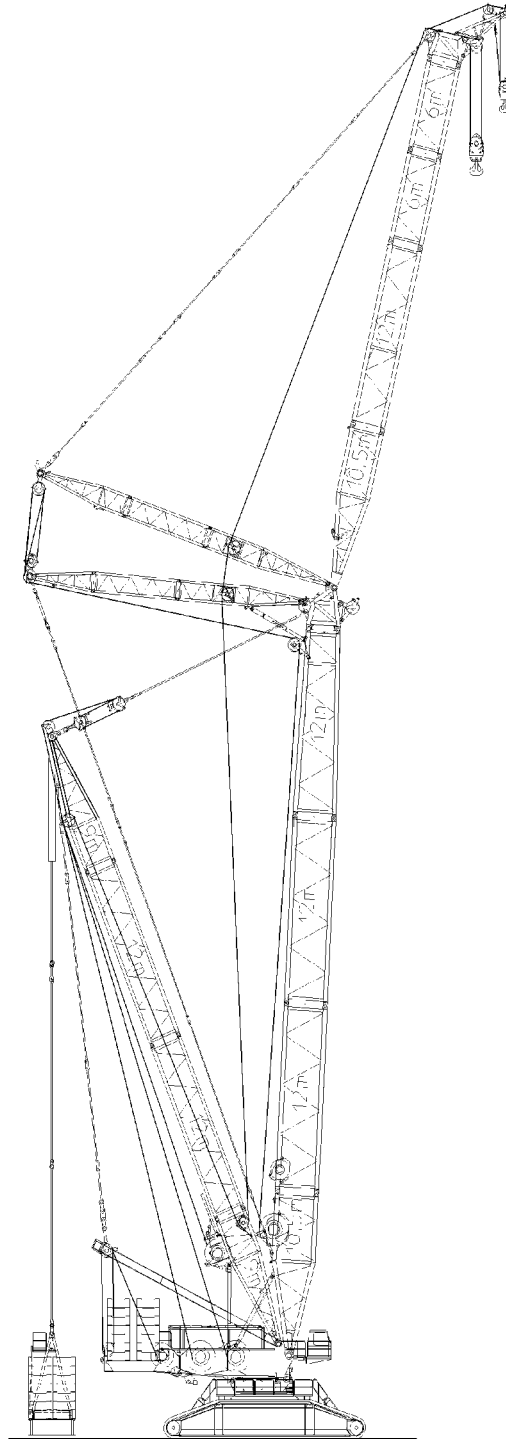


Fig. 121129: Crane in operating position

- ▶ 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.

6 Placing the boom down

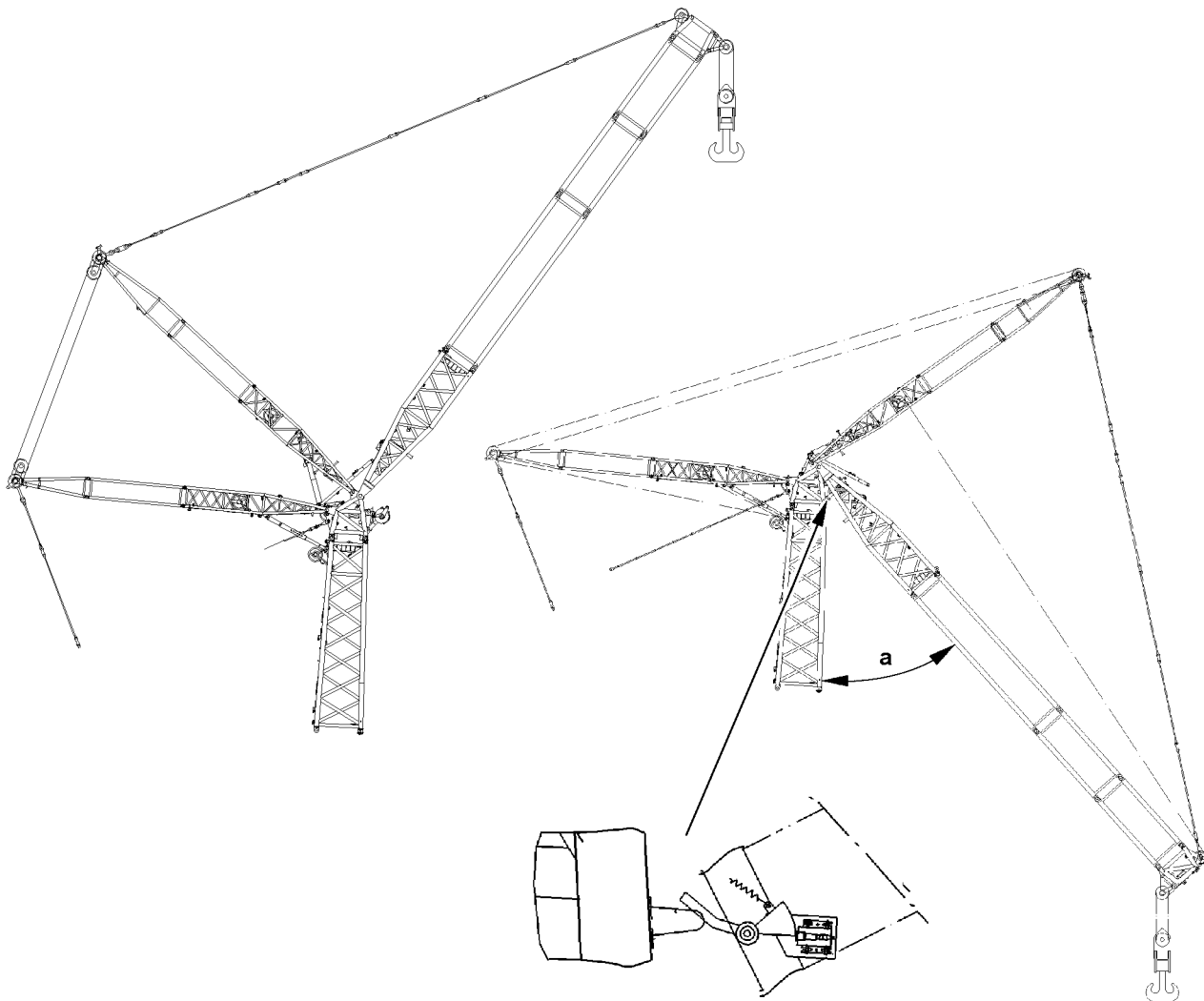


Fig.121130: Luff the W-lattice jib down and place the boom system down



WARNING

The crane can topple over!

If the following conditions are not met before taking down the boom, the crane can be overloaded and topple over.

Personnel can be severely injured or killed.

- ▶ While the boom system is taken down, turning is prohibited.
- ▶ Observe the technical safety notes, see Crane operating instructions, chapter 5.01.
- ▶ Observe the specifications in the erection and take down charts.



WARNING

The crane can topple over!

For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down chart.

- ▶ 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**.

6.1 Placing the boom down

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
 - The S-boom is in the steepest position, 87°.
 - The pulley cart is on hand for the take down procedure.
 - No personnel is within the danger zone.
 - The counterweight is installed on the turntable according to the load chart and the Erection and take down chart.
 - The derrick ballast has been installed on the derrick according to the load chart or the Erection and take down chart.
 - Boom, lattice jib and safety devices are free from snow, frost and ice.
 - The LICCON overload protection has been set according to the data in the load chart.
- ▶ Luff the W-lattice jib down to the **lowest** operating position.

Result:

- The luff down movement is turned off.
- The „STOP“ icon appears on the LICCON monitor.
- The horn icon appears on the LICCON monitor.



WARNING

Danger of accident due to function „Exceedance of shut off limits of the LICCON overload protection“! If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.

Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.

Personnel can be severely injured or killed.

- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload protection“ is prohibited.

When the W-lattice jib has reached the „lowest“ operating position:

- ▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

- The shut off limits of the LICCON overload protection are exceeded.
- The assembly icon appears on the LICCON monitor.

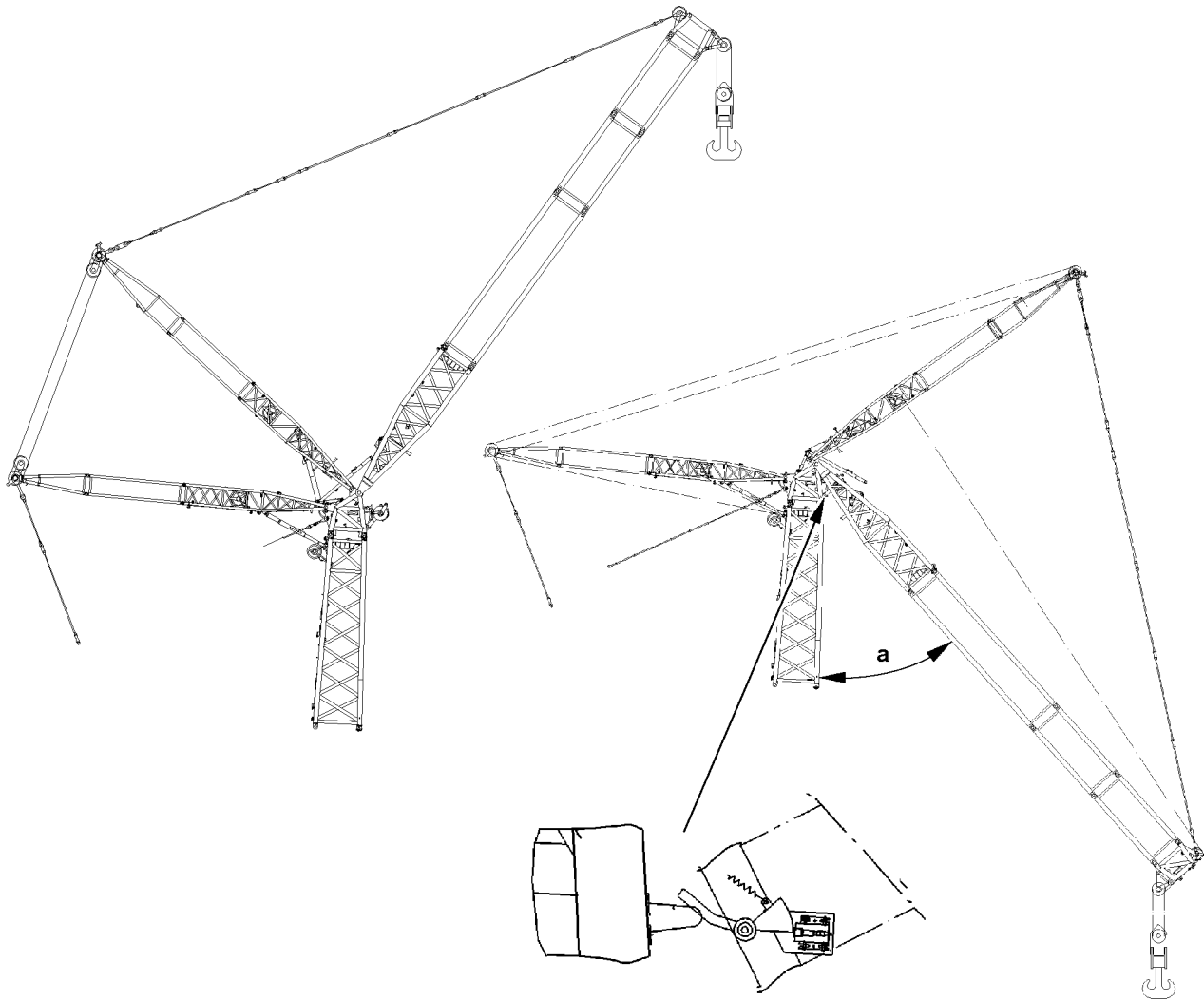


Fig.121130: Luff the W-lattice jib down and place the boom system down

- ▶ Continue to luff the W-lattice jib down until an angle a of approximately 45° is reached between the S-boom and the W-lattice jib.

Result:

- The crane movement „Luff the W-lattice jib down“ is shut off.

When the crane movement „Luff the W-lattice jib down“ is shut off:

- ▶ Luff the S-boom down.

NOTICE

Damage to crane!

- ▶ Luff the S-boom down and simultaneously spool out the hoist winch to prevent the hook block from colliding with the SW-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.

When the hook block is properly unreeved:

- ▶ Remove the hook block with the auxiliary crane.
- ▶ Continue to luff down the S-boom until the SW-end section is laying on the pulley cart.
- ▶ Assemble the SW-end section on pulley cart, see Crane operating instructions, chapter 5.61.

**WARNING**

The crane can topple over!

- ▶ Make sure that the W-lattice jib - over the entire take down procedure - is rolling with the entire weight on the ground.
 - ▶ Make sure that the W-guying always sags slightly during the take down procedure with the pulley cart.
 - ▶ Spool the W-control winch up slowly during the entire take down procedure and at slow speed.
 - ▶ Make sure that no slack rope formation occurs on the W-control winch during the take down procedure.
-
- ▶ Luff down S-boom further and simultaneously spool the W-control winch up.
 - ▶ Luff the S-boom down until the W-connector head is laying on the support on the ground.

7 Disassembly

**WARNING**

Danger of falling!

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

- ▶ 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, 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 as well as under 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 step on the boom system or an auxiliary boom without suitable protective devices.
- ▶ Stepping and 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 fatally injure personnel.

- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Secure the pins in the bearing points and the receptacles.
- ▶ It is prohibited to lean the ladder against the component 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 severely injured or killed.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ Make sure that the crane is aligned in horizontal position to avoid the support beams from swinging by themselves.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

7.1 Removing the hoist ropes

Make sure that the following prerequisite is met:

- On the W-connector head all rope retainers are removed.
- The hoist rope is connected with the auxiliary rope.

NOTICE

Slack rope formation!

The hoist rope can be damaged if ropes are slack.

This could result in high property damage.

- ▶ When spooling the hoist rope up or out, allow now slack rope formation.
- ▶ When spooling the hoist rope up or out, hold the hoist rope taut with the auxiliary rope of the assembly winch.

**WARNING**

Danger of accident!

Personnel can be severely injured or killed.

- ▶ It is prohibited to remain within the danger zone of the running ropes.
- ▶ Radio contact is available between crane operator and assembly personnel.
- ▶ Slowly spool the hoist rope up and pull it over the rope pulleys to the rear which are within the WA-frames.

**Note**

- ▶ Spool the hoist rope up only to the W-connector head and not to the winch, since the hoist rope is still needed for the disassembly or the take down of the WA-frames.
- ▶ Spool the hoist rope up until the end of the rope can be placed down on the W-connector head.
- ▶ Place the hoist rope down on the W-connector head.
- ▶ Secure the hoist rope to prevent it from falling.

7.2 Removing the auxiliary guying

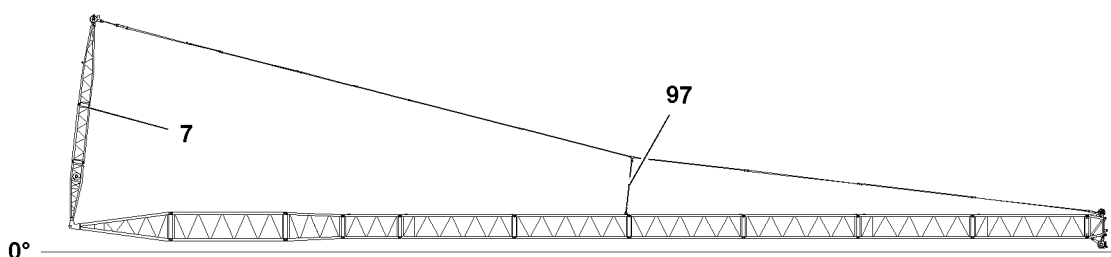


Fig.121540: Removing the auxiliary guying

When one auxiliary guying **97** is installed:

- ▶ Lower the WA-frame **1 7** until the W-guying releases tension and the auxiliary guying **97** can be removed.
- ▶ For disassembly of the auxiliary guying **97**, see Crane operating instructions, chapter 5.03.

7.3 Placing the W-guy rods down on the lattice sections

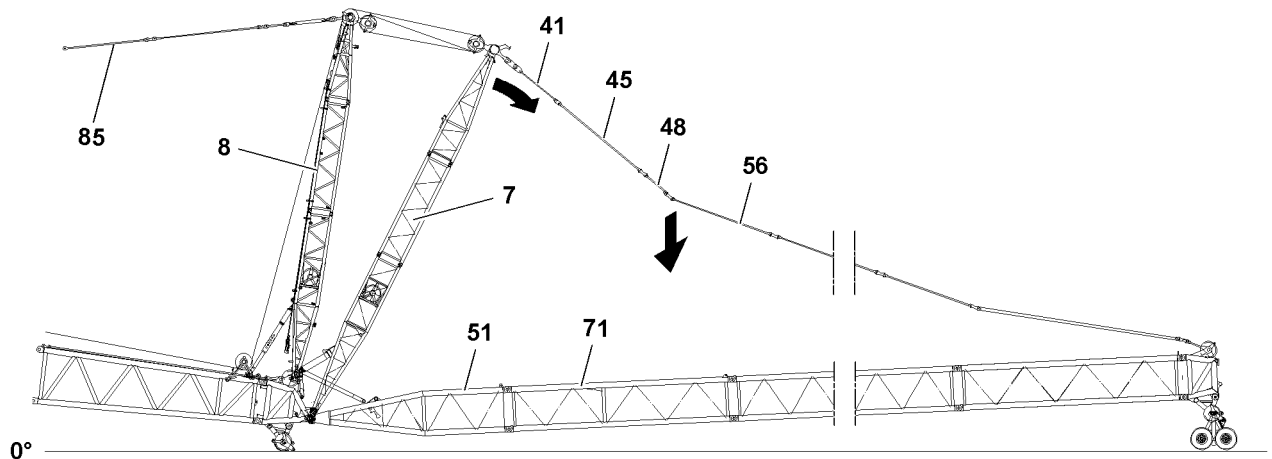


Fig.121534: Relieve the W-guying and place it on the lattice sections

Make sure that the following prerequisite is met:

- The auxiliary guying is properly removed.

- ▶ Relieve the W-guy rods **56** by lowering the WA-frame **1 7**: Spool the W-control winch out.

When the W-guy rods **56** are laying on the lattice sections of the W-lattice jib:

- ▶ Unpin the W-guy rods **56** on the guy rods **48**: Remove the spring retainer **50** and unpin the pin **49**.
- ▶ Place the guy rods **56** for transport on the W-lattice sections and properly secure them in the transport retainers.

7.4 Lifting the W-lattice jib from the pulley cart

NOTICE

Damage to the boom system!

If the boom system is incorrectly fastened on the auxiliary crane and lifted, then the boom system can be damaged.

This could result in high property damage.

- ▶ Make sure that the boom system is only fastened and lifted on the intended locations on the auxiliary crane, see Crane operating instructions, chapter 5.01 and 5.61.

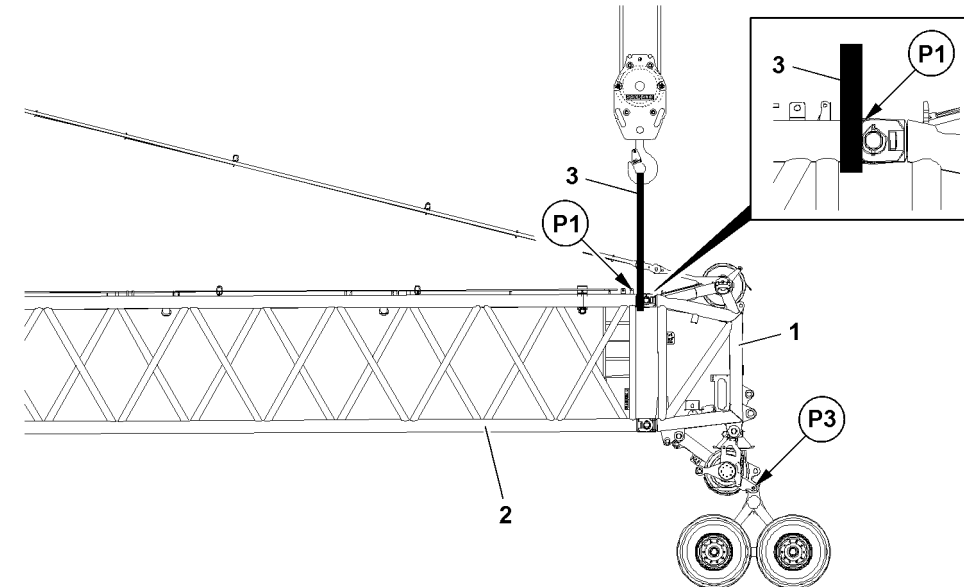


Fig.121583: Lift the boom end section from the pulley cart // illustration is an example

- ▶ Fasten the W-lattice jib properly on the auxiliary crane.
- ▶ Unpin the retaining pins on the pulley cart.



WARNING

Crushing danger due to pulley cart!

If personnel remains in the danger zone, they can be crushed and / or limbs can be severed. Personnel can be severely injured or killed.

- ▶ Make sure that there are no persons within the danger zone.

When the retaining pins on the pulley cart are unpinned:

- ▶ Slowly lift the W-lattice jib with the auxiliary crane.

When the W-lattice jib is lifted out of the receptacles on the pulley cart:

- ▶ Remove the pulley cart.
- ▶ Place the W- boom system with the auxiliary crane on the support on the ground.
- ▶ Remove the auxiliary crane.

7.5 Opening the W-lattice jib



Note

- ▶ **Short WA-frames:** When using the short WA-frames, pin the WA-frame 1 guying at point **P48** on the W-pivot section **51**.
- ▶ **Long WA-frames:** When using the long WA-frames, pin the WA-frame 1 guying at point **P50** on the brackets of the LI-intermediate section **71**.

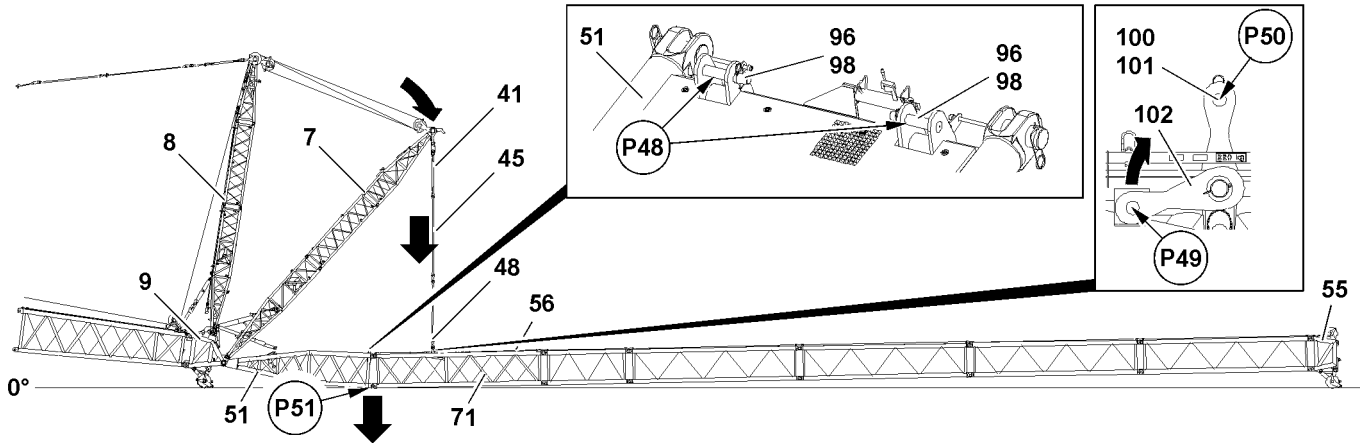


Fig.121541: Open the W-lattice jib

- ▶ Properly pin the WA-frame 1 guying on the W-pivot section **51** or on the LI-intermediate section **71**.
- ▶ Secure the pin connections properly.

When the WA-frame 1 guying is properly installed and secured:

- ▶ Carefully bring the WA-frame 1 guying to tension: Spool the W-control winch up slowly.



WARNING

Danger of accident when opening the W-lattice jib!
 Personnel can be severely injured or killed.

- ▶ Make sure, when opening or taking down the W-lattice jib, that no personnel is within the danger zone.

When the WA-frame 1 guying is tensioned:

- ▶ Release the connector pins between the W-pivot section **51** and LI-intermediate section **71** on the „bottom“ at point **P51** on both sides.
- ▶ Unpin the connector pins with the pin pulling device on the LI-intermediate section **71** „on the bottom“ on both sides, see Crane operating instructions, chapter 5.30.
- ▶ Open the W-lattice jib: Slowly spool out the W-control winch and place the W-pivot section **51** on the support on the ground.
- ▶ Release the WA-frame 1 guying on the W-pivot section **51** or on the LI-intermediate section **71**.

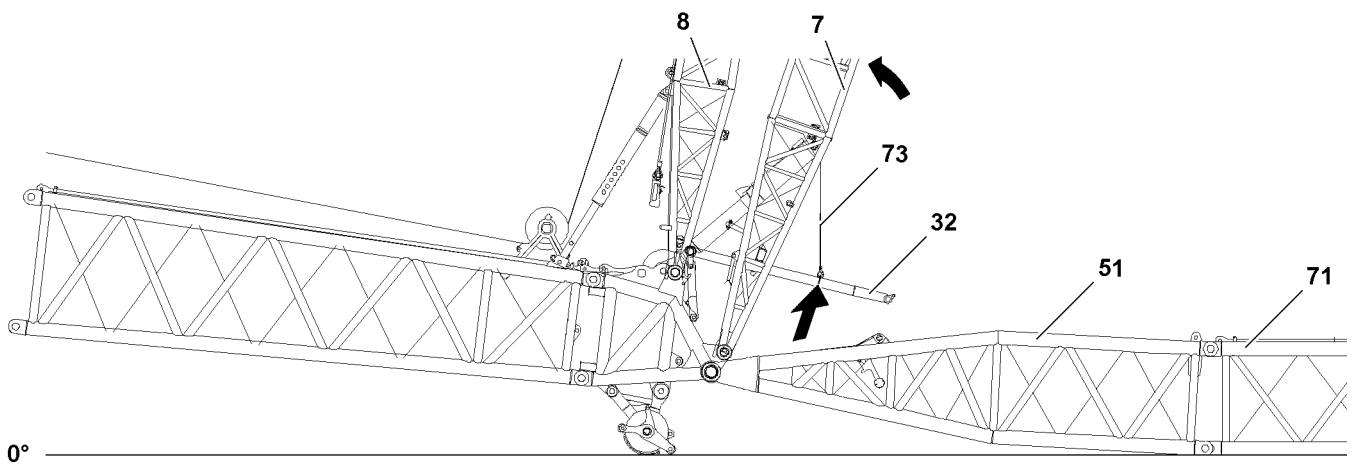


Fig.121542

- ▶ Install the retaining rope **73** on the mechanical relapse support **32**.

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When the WA-frame 1 guying is released and the retaining rope **73** is installed on the mechanical relapse support **32**:

- ▶ Pull the WA-frame 1 **7** up with the W-control winch.

Result:

- The mechanical relapse support **32** is lifted along.
- In the assembly area of the W-pivot section **51** sufficient space is available for the disassembly.

7.6 Disconnecting the electrical connections

Make sure that the following prerequisite is met:

- The W-boom is placed on the support / the supports.

NOTICE

Damage to cable drum or cable!

If the cable of the cable drum 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 plugs and cables properly.
-

7.7 Disassembling the W-lattice jib on the W-pivot section

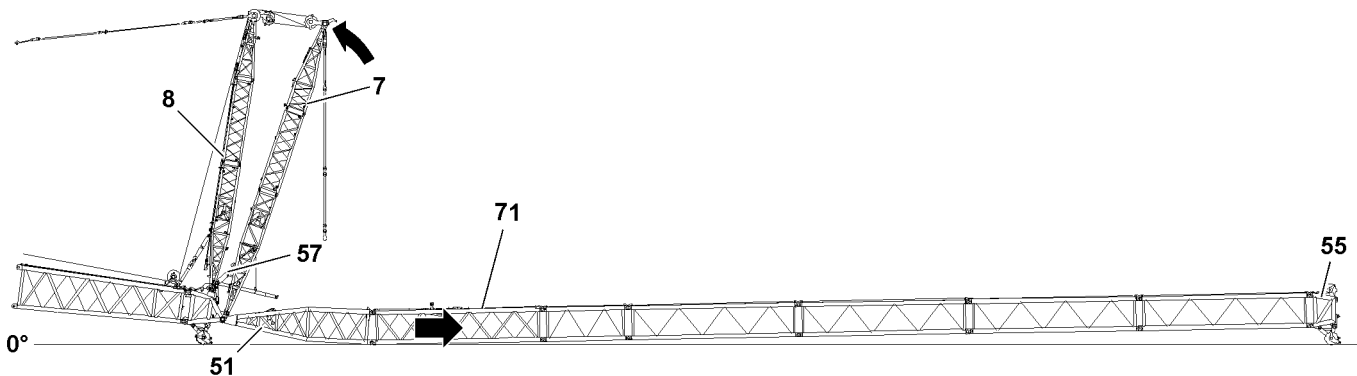


Fig.121539: Disassemble the W-lattice jib on the W-pivot section



WARNING

Crushing danger for personnel within the area of the load!

If personnel are located between the load to be lifted and a possible interfering edge when lifting a load, personnel can be severely injured or killed.

- ▶ Before lifting the load it must be ensured that there are no persons within the danger zone.
 - ▶ It is prohibited to remain within the danger zone.
 - ▶ It is prohibited for anyone to be under the load.
 - ▶ Keep a safety distance.
 - ▶ Swinging the load is prohibited.
 - ▶ Exercise extreme caution when lifting a load.
-

**WARNING**

General danger notes!

If the following danger notes are not observed, severe accidents can occur.

Personnel can be severely injured or killed.

- ▶ Make sure that the W-lattice jib is supported from below during the assembly and disassembly with suitable materials.
- ▶ Make sure that all pins are properly pinned and secured after assembly.
- ▶ Make sure that the guy rods are properly installed and secured.
- ▶ The guy rods must be checked regularly, see Crane operating instructions, chapter 8.15.

**Note**

- ▶ During disassembly of the W-lattice jib, adhere to the unpinning sequence, see Crane operating instructions, chapter 5.01.

Make sure that the following prerequisites are met:

- The function of the relapse cylinder **57** is ensured.
- The WA-frame **2 8** is guyed.

To unpin the W-lattice jib with the pin pulling device, see Crane operating instructions, chapter 5.30.

**WARNING**

Danger of accident due to lattice sections!

If the danger notes for the assembly / disassembly of the W-lattice sections in the Crane operating instructions, chapter 5.01 are not observed, personnel can be hurt.

Personnel can be severely injured or killed.

- ▶ Make sure that the danger notes for disassembly of the W-lattice sections in the Crane operating instructions, chapter 5.01 are adhered to.
- ▶ Disassemble the W-lattice jib properly.

7.8 Unpinning the W-pivot section

Make sure that the following prerequisites are met:

- The electrical connections are properly disconnected.
- The W-lattice jib has been disassembled.
- The W-pivot section **51** is laying on the ground on the support.

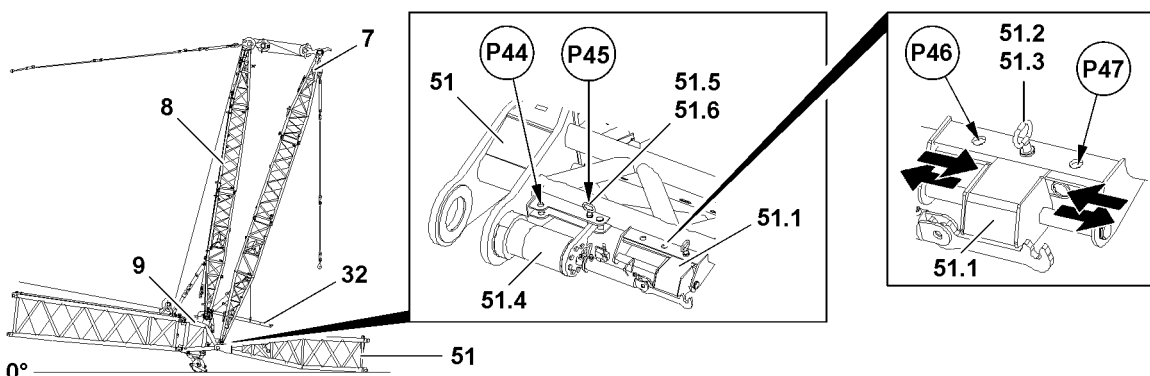


Fig.121532: Disassemble the W-pivot section on the W-connector head

- ▶ Attach the W-pivot section **51** properly on the auxiliary crane, observe section „Fastening points“.

When the fastening equipment is properly fastened on W-pivot section **51**:

- ▶ Tension the fastening equipment.

**Note**

- ▶ The weight of the W-pivot section is: 12.6 t

**WARNING**

Falling W-pivot section!

If the W-pivot section **51** is unpinned before the fastening equipment is tensioned, the W-pivot section **51** can fall down.

Personnel can be severely injured or killed.

- ▶ Make sure that the fastening equipment is tensioned before the W-pivot section **51** is unpinned on the W-connector head **9**.

When the fastening equipment is tensioned:

- ▶ Release the connector pins on both sides: Release the retaining pins and unpin on both sides.

When the retaining pins are completely removed on both sides:

- ▶ Unpin the connector pins between the W-pivot section **51** and the W-connector head **9** on both sides with the pin pulling device, see Crane operating instructions, chapter 5.30.

When the connector pins are fully unpinned on both sides:

- ▶ Swing the W-pivot section **51** out with the auxiliary crane.
- ▶ Place the W-pivot section **51** on a load bearing support on the ground or on the transport vehicle.
- ▶ Remove the auxiliary crane.

7.9 Disassembling the W-guy rods on the WA-frame 1

Make sure that the following prerequisites are met:

- The W-pivot section is disassembled on the W-connector head.
- The WA-frame 1 is lowered to the front.

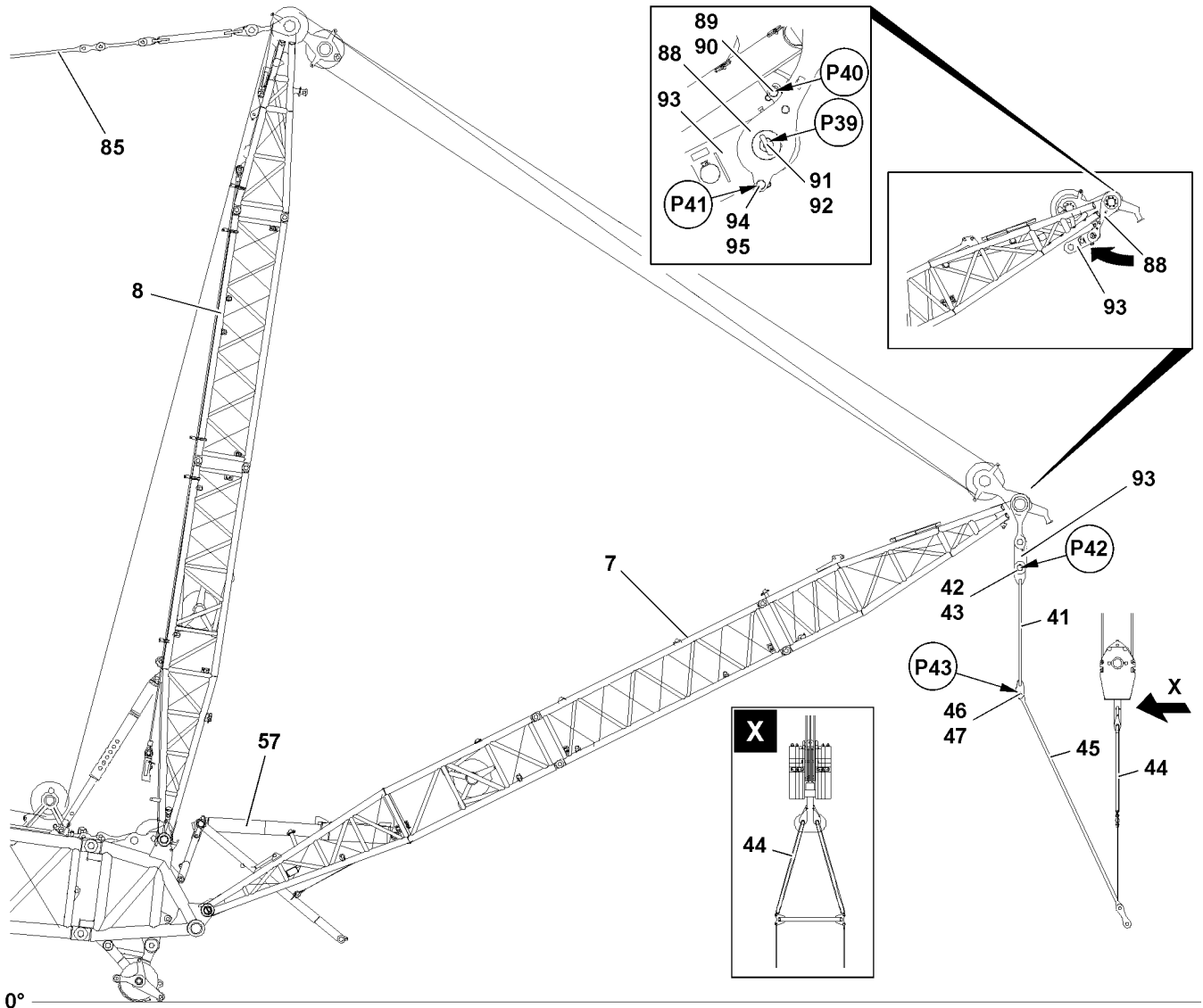


Fig.121538: Disassemble the WA-frame 1 guy rods // bring the pull test bracket in transport position

- ▶ Hang the cross bar **44** on the WA-frame 1 guy rods **45**.
- ▶ Lift the WA-frame 1 guy rods **45** with the auxiliary crane and simultaneously lower the WA-frame 1 **7**.

When the WA-frame 1 guy rods are laying on the ground:

- ▶ Unpin the WA-frame 1 guy rods **45**.
- ▶ Hang the cross bar **44** on the WA-frame 1 guy rods **41**.
- ▶ Lift the WA-frame 1 guy rods **41** with the auxiliary crane and simultaneously lower the WA-frame 1 **7**.

When the WA-frame 1 guy rods **41** are laying on the ground:

- ▶ Unpin the WA-frame 1 guy rods **41**.
- ▶ Place the guy rods for transport on the LI-lattice sections and properly secure them in the transport retainers.
- ▶ Secure the pull test bracket **93** in transport position at point **P41** properly: Insert the transport retaining pin **94** at point **P41** and secure properly with spring retainer **95**.

- ▶ Secure the bracket **88** on the WA-frame 1 end section at point **P40** properly: Insert the transport retaining pin **89** at point **P40** and secure properly with spring retainer **90**.

7.10 Unpinning the WA-frame 2 relapse supports

Make sure that the following prerequisites are met:

- The WA-frame 1 guy rods are disassembled.
- The pull test brackets on the WA-frame 1 end section are in transport position.
- The brackets on the WA-frame 1 end section are in transport position.

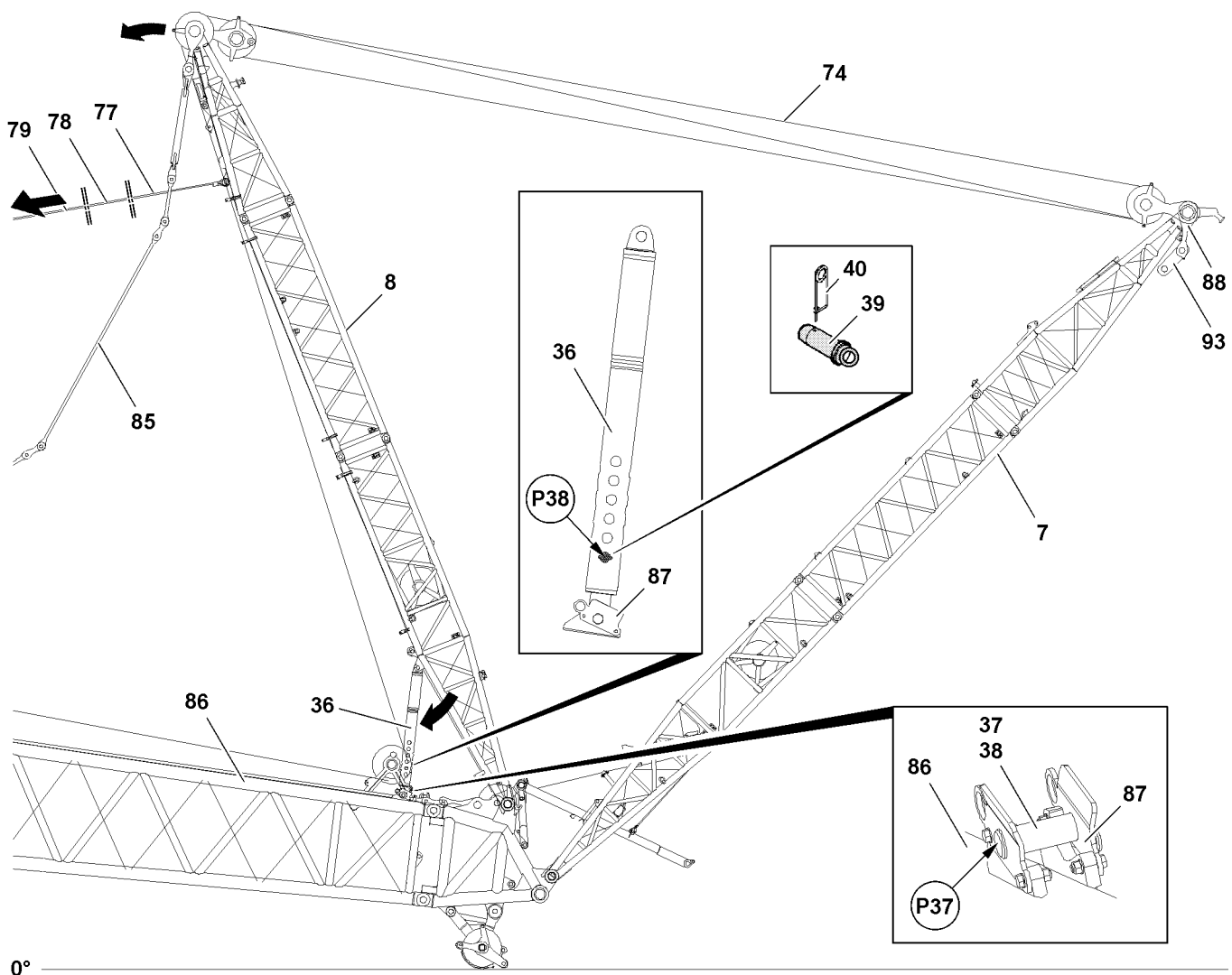


Fig.121543: Unpinning the relapse supports

- ▶ Pull the WA-frame 1 **7** up until the relapse cylinder **57** has built up sufficient pressure.
- ▶ Release the assembly rope on the WA-frame 2 **8**.
- ▶ Spool out the hoist rope **79** and hang it on the lock of the assembly rope and tension.

NOTICE

Damage of hoist rope and / or of WA-frame 2 **8**!

If the connecting pin **39** on the relapse supports **36** is not unpinned before pulling the WA-frame 2 **8** back with the hoist rope **79**, then the hoist rope or the WA-frame 2 **8** can be damaged. There is no shut off of the hoist winch.

- ▶ Unpin the connecting pins **39** on both sides before pulling the WA-frame 2 **8** back.
- ▶ Remove the spring retainer **40** and unpin the connecting pin **39**.
- ▶ Make sure that the hoist winch is spooled up slowly and with utmost caution.

- ▶ Spool the W-control rope out and simultaneously spool the hoist rope **79** up until the relapse supports **36** are pushed together completely.

When the relapse support is completely pushed together:

- ▶ Insert the connecting pins **39** again on both sides in park position point **P38** and secure.
- ▶ Unpin the relapse supports **36** on the S-boom: Remove spring retainers **38** and unpin pins **37**.
- ▶ Spool up the W-control rope **74** and simultaneously spool out the hoist rope **79** until the WA-frame **2 8** is vertical.

When the WA-frame **2 8** is standing vertically:

- ▶ Fasten the relapse supports **36** with the rigging / tension belts on the WA-frame **2**.

7.11 Unpinning the WA-frame 2 guy rods

Make sure that the following prerequisites are met:

- The WA-frame 2 relapse support 36 is rigged properly on the WA-frame 2 8
- The auxiliary crane is properly fastened on the WA-frame 2 8 at point P33



WARNING

Danger of accident due to WA-frames!

- ▶ Make sure that the WA-frame 1 7 stays in position while the WA-frame 2 8 is pulled back.

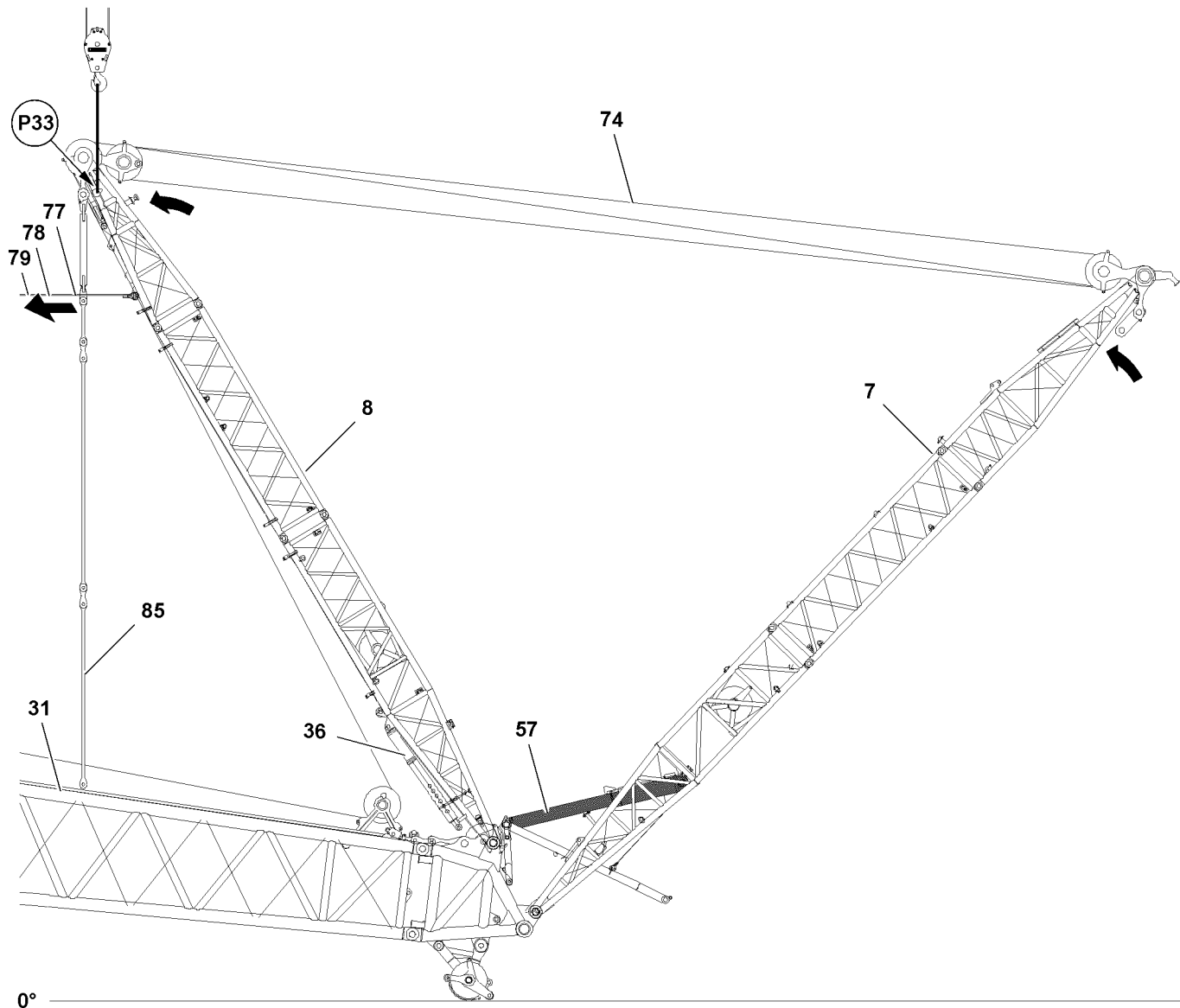


Fig.121544: Unpinning the WA-frame 2 guy rods

- ▶ Pull the WA-frame 2 8 back with the hoist rope 79 and spool the W-control winch out simultaneously.

When the WA-frame 2 guy rods are laying on the S-lattice sections:

- ▶ Release and unpin the WA-frame 2 guy rods 85 on the WA-frame 2 guy rods 31.

**Note**

- ▶ The WA-frame 2 guy rods **85** are attached for transport on the WA-frame 2 **8**.
- ▶ The WA-frame 2 guy rods **31** are placed for transport in the transport receptacles of the S-lattice sections and secured.

7.12 Placing the WA-frames down

Make sure that the following prerequisite is met:

- The auxiliary crane is properly fastened on the WA-frame 2 **8** at point **P33**.

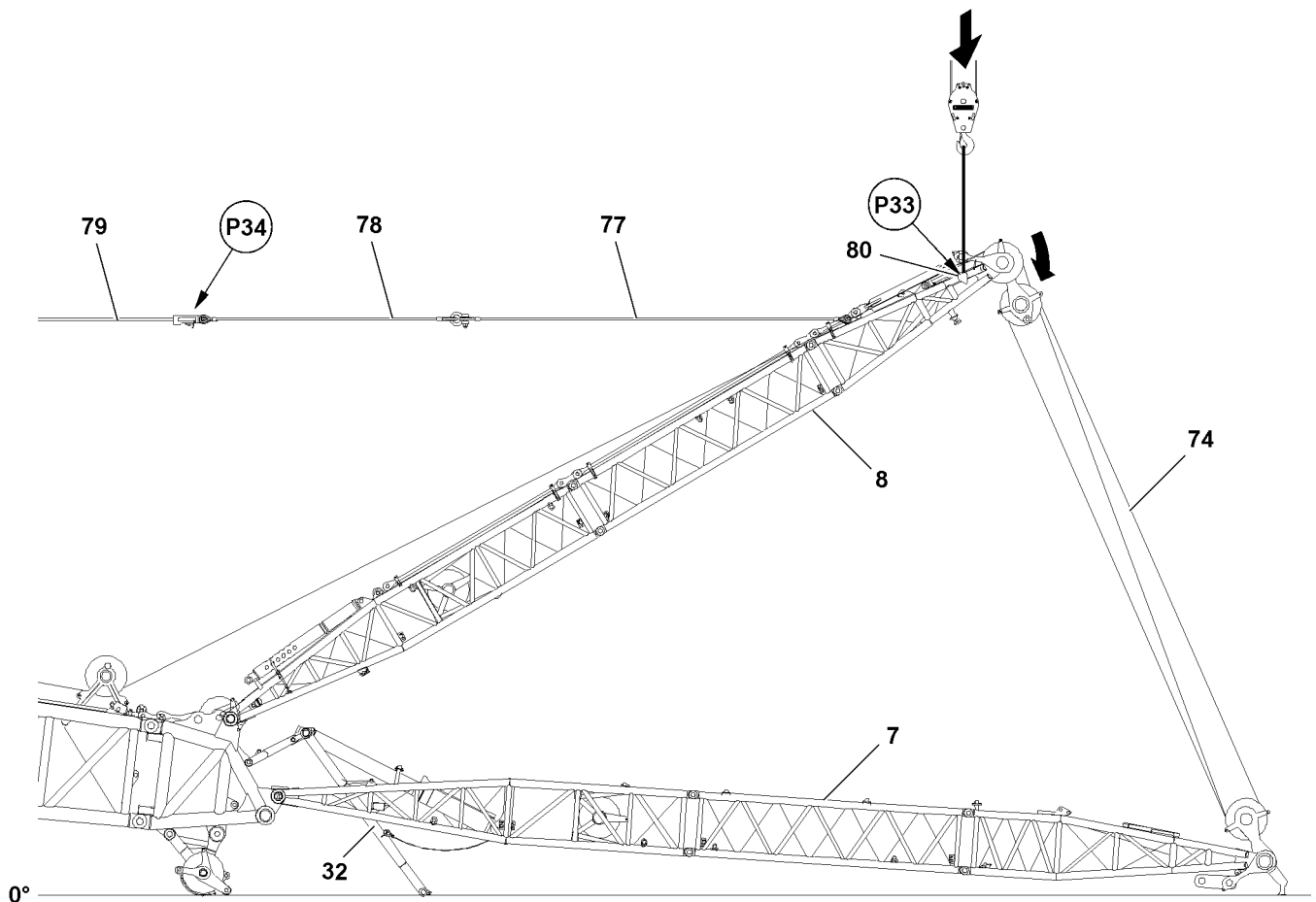


Fig.121582: Place the WA-frames down

**WARNING**

WA-frame 2 can tip forward!

If the WA-frame 2 is erected for disassembly with the W-control and pulled forward past the vertical position, then the WA-frame 2 can fold forward by itself.

Personnel can be severely injured or killed.

- ▶ Make sure that the hoist rope is attached properly on the assembly rope.
 - ▶ Make sure that the auxiliary crane - to secure WA-frame 2 - is properly fastened on the WA-frame 2 at point **P33**.
 - ▶ Make sure that the WA-frame 1 remains in position when spooling the W-control winch up.
-
- ▶ Spool the W-control rope up and simultaneously spool out the hoist rope **79** until the WA-frame 2 is vertical.

**Note**

- ▶ Retain the angle between the WA-frame 1 and WA-frame 2 when placing the WA-frame 1 on the ground.

NOTICE

Damage of relapse support!

When placing the WA-frame 1 on the ground, the relapse support **32** can be damaged.

- ▶ Make sure that the ground in the placement area of WA-frame 1 and the relapse support **32** is level and free of objects.
- ▶ Place a low-friction base under the relapse support **32**.

NOTICE

Danger of property damage and slack rope formation!

If lowering the WA-frames is carried out by spooling the hoist rope **79** out, then the hoist rope **79** can be overloaded and severely damaged.

- ▶ Make sure that the WA-frame 2 **8** is solely lowered further with the auxiliary crane, at least when reaching the 45° position to the horizontal. Further lowering with the hoist rope **79** is prohibited.
- ▶ Make sure that the hoist rope **79** is relieved.
- ▶ When lowering the WA-frame 2 with the auxiliary crane, make sure that the hoist rope **79** is spooled out slowly and with even speed to avoid slack rope formation on the hoist rope **79**.

When the WA-frame 2 has reached the vertical position:

- ▶ Spool the hoist rope out slowly.

Result:

- The WA-frame 1 lowers in direction to the ground.

When the WA-frame 2 has reached the 45° position to the horizontal:

- ▶ Continue to lower the WA-frames further with the auxiliary crane.

When the relapse support **32** touches the ground:

- ▶ Continue to spool out the hoist rope until the WA-frame 1 is laying completely on the ground.

**WARNING**

WA-frame 2 folding down!

If the WA-frame 2 is lowered to the front without being secured by the auxiliary crane, then the WA-frame 2 can fall down.

Personnel can be severely injured or killed.

- ▶ Make sure that the WA-frame 2 is secured with the auxiliary crane when lowering it.
- ▶ Make sure that there are no persons within the danger zone.

When the WA-frame 1 is laying on the ground:

- ▶ Place the WA-frame 2 on WA-frame 1: Spool the hoist rope out and simultaneously spool the control winch up.

When the WA-frame 2 is laying on the WA-frame 1:

- ▶ Unhook the hoist rope **79** on the lock **82** of the assembly rope **74**

NOTICE

Danger of slack rope formation!

- ▶ Make sure that the hoist rope is secured against slack rope formation after disengaging it on the lock of the assembly rope.
- ▶ Spool the hoist rope **79** up on the winch.
- ▶ Attach the assembly rope **78** on the WA-frame 2 **8** in transport position.
- ▶ Remove the auxiliary crane on the WA-frame 2 **8** at point **P33**.

7.13 Pinning the relapse support on the relapse cylinder

Make sure that the following prerequisites are met:

- The pin **71** is unpinned on the transport retainer at point **P31**.

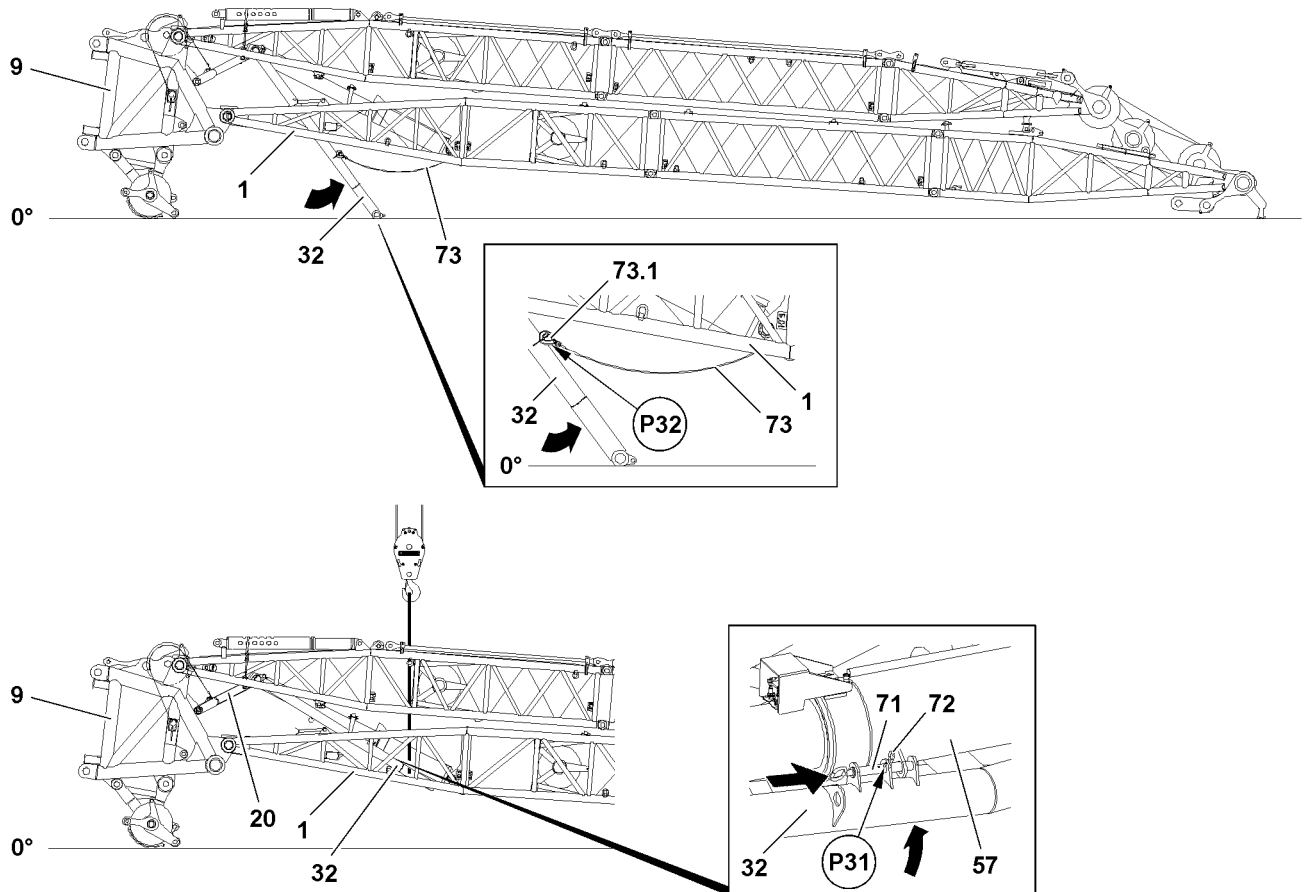


Fig.121545: Lift the relapse support **32** with the auxiliary crane and pin on the relapse cylinder **57**.

- ▶ Fasten the auxiliary crane properly on relapse support **32**.



WARNING

Unsecured relapse support **32**!

If the relapse support **32** is not properly held by the auxiliary crane then the relapse support **32** can fall down.

Personnel can be severely injured or killed.

- ▶ Make sure that the relapse support **32** is properly pinned and secured on the relapse cylinder **57** before the auxiliary crane is removed.
- ▶ Make sure that there are no persons within the danger zone.

- ▶ Lift the relapse support **32** with the auxiliary crane to the pin position on the relapse cylinder **57**.

When the relapse support **32** is safely held in pin position by the auxiliary crane:

- ▶ Insert the pin **71** on point **P31** and secure with spring retainer **72**.

When the relapse support **32** is properly pinned and secured on the relapse cylinder **57**:

- ▶ Remove the auxiliary crane.
- ▶ Fasten the WA-frame 2 guy rods properly on the WA-frame 2.
- ▶ Secure the WA-frame 2 guy rods properly in the transport receptacles of the S-lattice sections.

7.14 Unreeving the W-control rope

Make sure that the following prerequisites are met:

- The retaining frame **20** is pinned and secured on the W-connector head **9**.
- The W-control rope **74** is unhooked on 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.

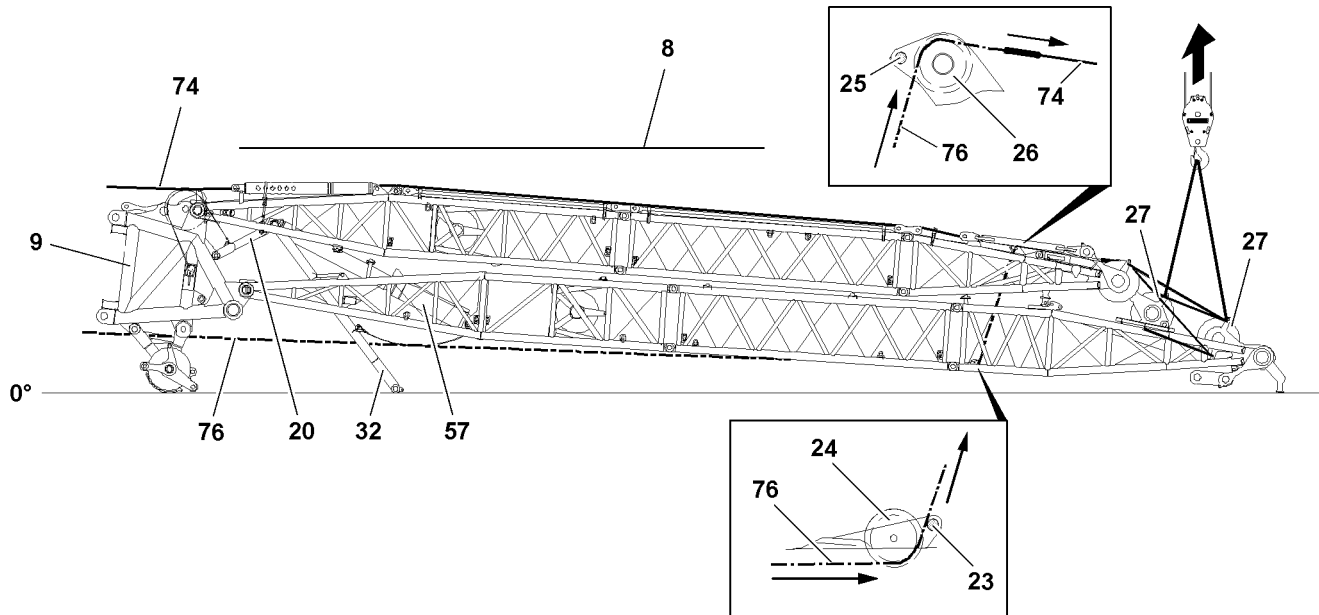


Fig.121547: Unreeve the W-control rope

NOTICE

Slack rope formation!

The W-control rope **74** can be damaged if any ropes are slack.

- ▶ Do not allow slack rope formation when spooling the W-control rope **74** up.
- ▶ When spooling the W-control rope **74** up, keep the rope tight.

- ▶ Connect the auxiliary rope **76** with the reeving rope **75**.
- ▶ Run the reeving rope **75** over change over pulley **24** and over the change over pulley **26**.
- ▶ Connect the reeving rope **75** with the W-control rope **74**.
- ▶ Spool up the W-control rope **74** and simultaneously spool out the auxiliary rope **76** and reeve the reeving rope **75** in the rope pulleys **27**.
- ▶ Spool up the W-control rope **74** until it is reeved out of the rope pulleys **27** and is laying on the WA-frame 2 head.

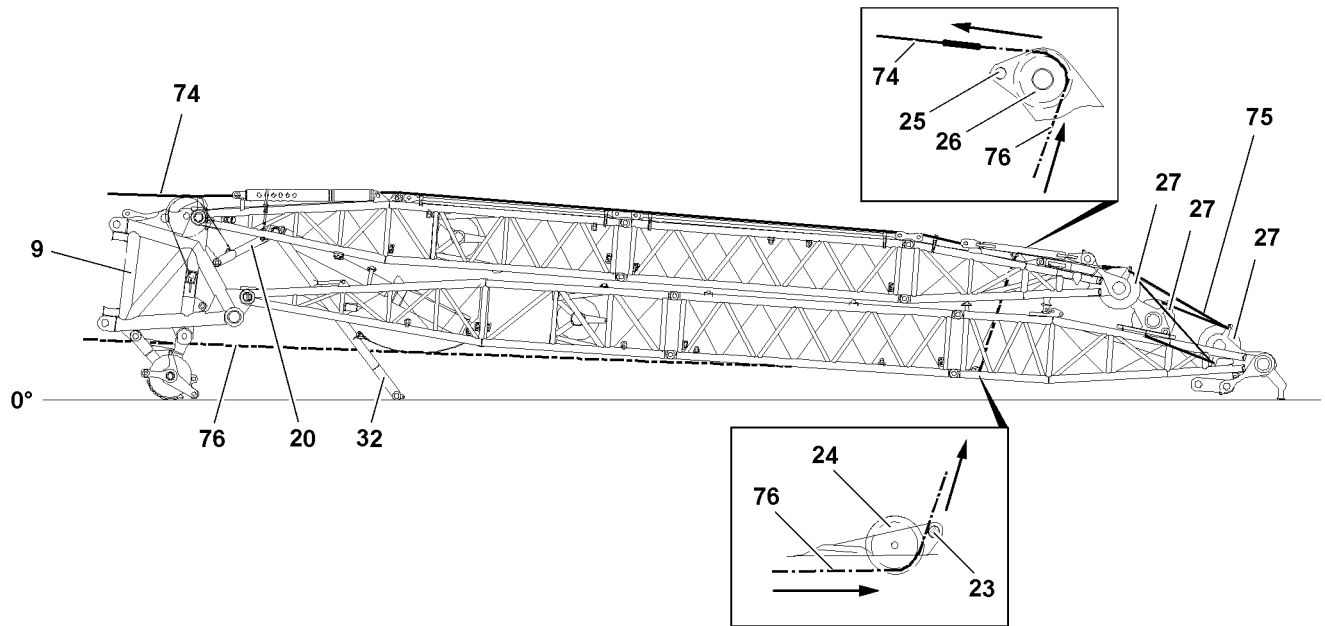


Fig.121546: Unreeve the W-control rope

- ▶ Release the reeving rope **75** on the W-control rope **74**.
- ▶ Release the connection from the auxiliary rope **76** and the reeving rope **75**.
- ▶ Place the auxiliary rope over change over pulley **24** and over the change over pulley **26**.
- ▶ Establish the connection from the auxiliary rope **76** and the W-control rope **74**.
- ▶ Install the rope retaining pins on the rope pulleys.

7.15 Disassemble the retaining frame on the W-connector head

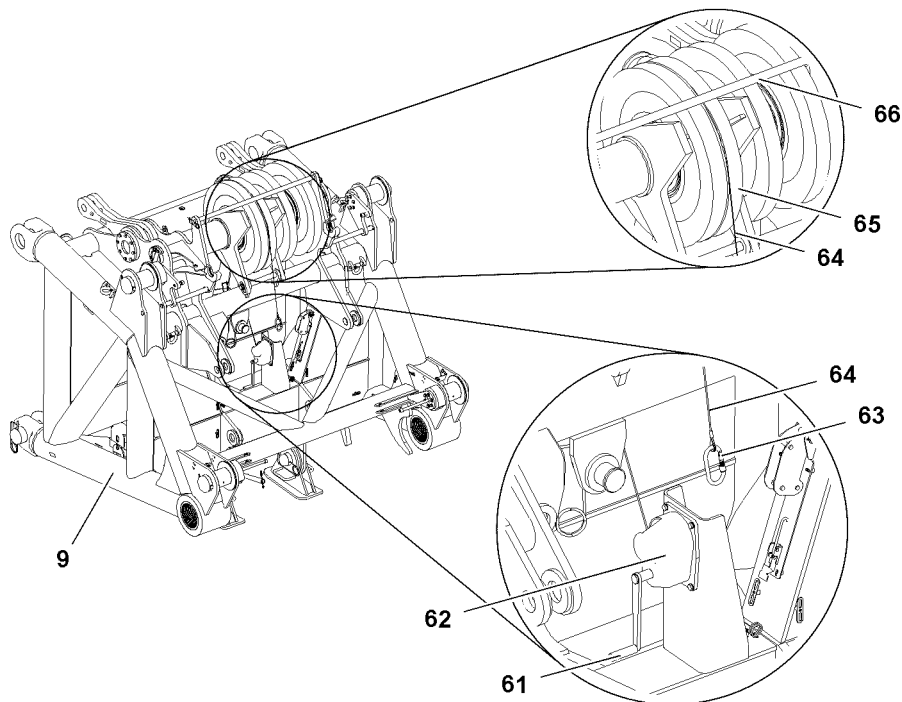


Fig.114713: Remove the retaining frame on the W-connector head - spool the wire rope out

Make sure that the following prerequisites are met:

- The WA-frames are pinned and secured on the W-connector head **9**.
- The WA-frames are placed on the ground.
- ▶ Install the hand crank **61** on the manual winch **62**.
- ▶ Remove the snap hook **63** on the eye of the wire rope **64**.
- ▶ Spool the wire rope **64** out and guide it from the rear over the rope pulley **65** to the front.
- ▶ Guide the wire rope **64** between the rope pulley **65** and retaining pipe **66**.

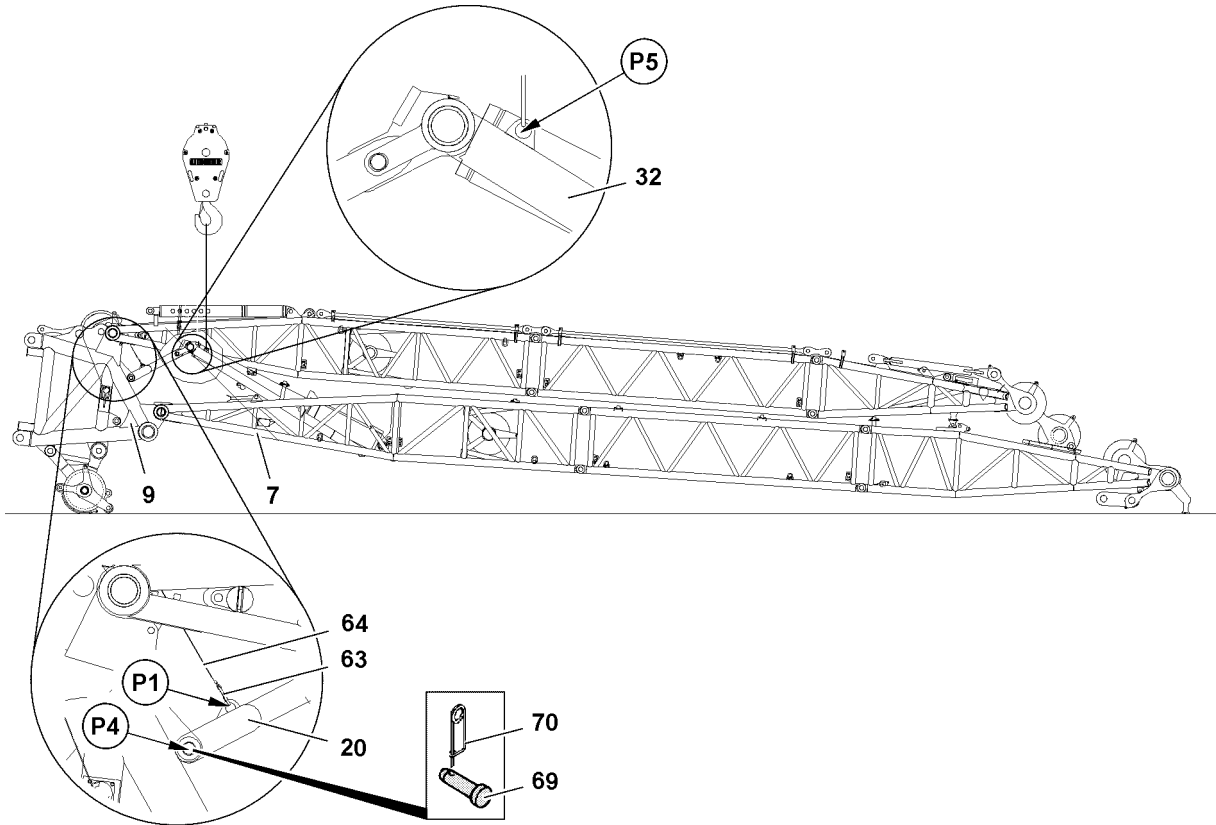


Fig.114715: Remove the retaining frame on the W-connector head - remove the retaining frame on the W-connector head

- ▶ Spool the wire rope **64** out to point **P1**.
- ▶ Connect the wire rope **64** via the snap hook **63** on point **P1** with the retaining frame **20**.



WARNING

Wire rope **64** and fastening equipment are **NOT** tensioned!

Before unpinning of the retaining frame **20** the fastening equipment and the wire rope **64** must be tensioned or the retaining frame **20** will fall down suddenly.

Personnel can be severely injured or killed.

- ▶ Make sure that the wire rope **64** and the fastening equipment are slightly tensioned.
- ▶ Fasten the auxiliary crane on relapse support **32**: Attach the fastening equipment on both sides on point **P5** of the relapse support **32**.
- ▶ Unpin the retaining frame **20** on the W-connector head **9**: Release pins **69** on both sides on point **P4** and unpin.

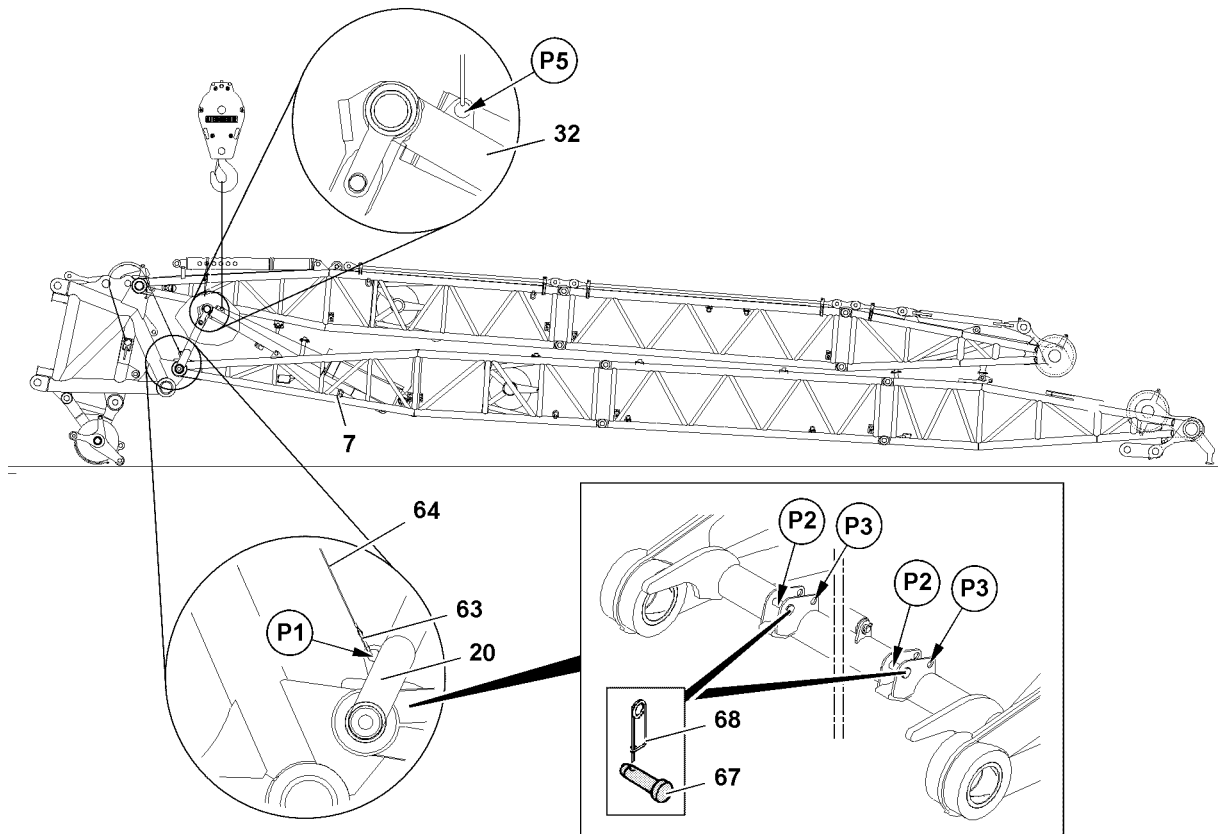


Fig.114711: Remove the retaining frame on the W-connector head - install the retaining support on the WA-frame 1

- ▶ Lower the retaining frame **20** with the manual winch **62** until it can be pinned on point **P2**.
- ▶ Release the pin **67** on point **P3** and unpin.
- ▶ Pin the retaining frame **20** with the WA-frame 1 **7**: Insert the pins **67** on both sides on point **P2** and secure with spring retainer **68**.
- ▶ Remove the snap hook **63** on the retaining frame **20**: Screw on the screw retainer and remove the snap hook **63** on point **P1**.
- ▶ Remove the fastening equipment from the relapse support **32** on point **P5**.

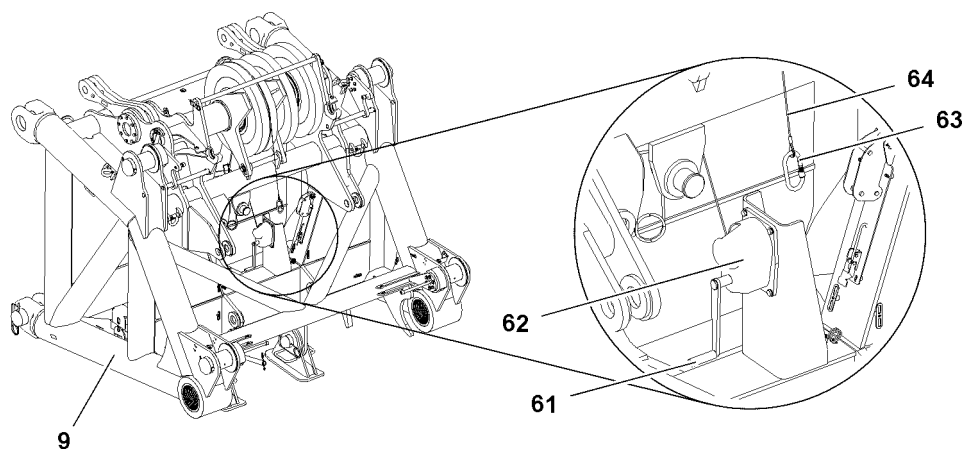


Fig.114714: Remove the retaining frame on the W-connector head - spool the wire rope up

- ▶ Spool the wire rope **64** up completely.
- ▶ Remove the hand crank **61** from the manual winch **62**.
- ▶ Install the snap hook **63** on the eye of the wire rope **64**.

7.16 Unpinning the WA-frames on the W-connector head

- ▶ Hang the auxiliary crane on the relevant studs of the WA-frames.



Note

- ▶ The total weight of the WA-frames is approximately: 33 t.

NOTICE

Danger of property damage!

If the WA-frame 2 pivot section is **not** unpinned at point **P22** before lowering the WA-frames, then damage can occur in the area of the pin bores and on the lattice sections.

- ▶ Make sure that the connector pins are unpinned at point **P22** before lowering the WA-frames.

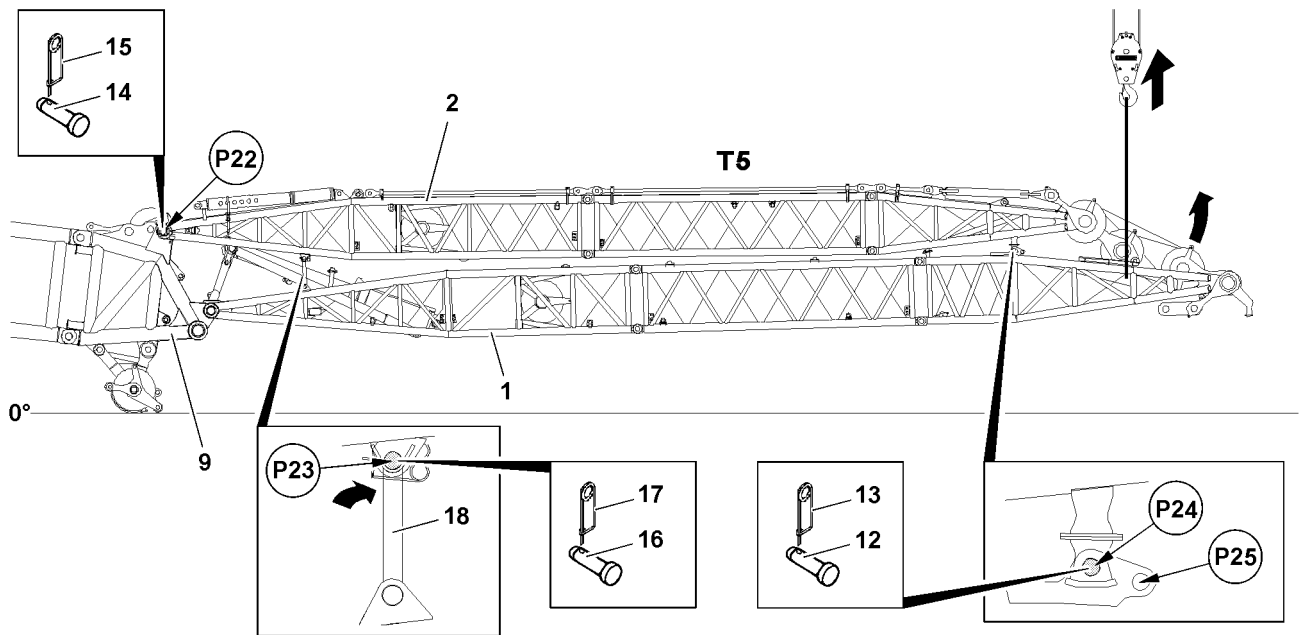


Fig.121548: Pin the WA-frame 2 with the WA-frame 1 for transport

- ▶ Lift the WA-frames with the auxiliary crane until the bores on the transport retainer align at point **P24**.
- ▶ Unpin the pin **12** from the park position at point **P25** and insert and secure on both sides in the transport retainer at point **P24**.



WARNING

Crushing danger due to tipping the WA-frame 2 7!

If the WA-frame 2 7 is uninned at point **P22** without having erected the supports **18** then the WA-frame 2 7 tips downward.

Limbs can be crushed or severed.

Personnel can be severely injured or killed.

- ▶ Make sure that the WA-frame 2 7 is uninned at point **P22** only when the supports **18** are set up on both sides and secured.
- ▶ Fold the support **18** up on both sides.
- ▶ Insert the pin **16** on both sides at point **P23** and secure with spring retainer **17**.
- ▶ Lift the WA-frames (transport unit **T5**) and unpin the WA-frame 2 pivot section **8** at point **P22** on the W-connector head **9**: Release and unpin the pins **14** on both sides, see Crane operating instructions, chapter 5.30.

When the WA-frame 2 8 with the WA-frame 2 pivot section is properly uninned on the W-connector head **9**:

- ▶ Lower the WA-frames (transport unit **T5**) with the auxiliary crane on the ground.

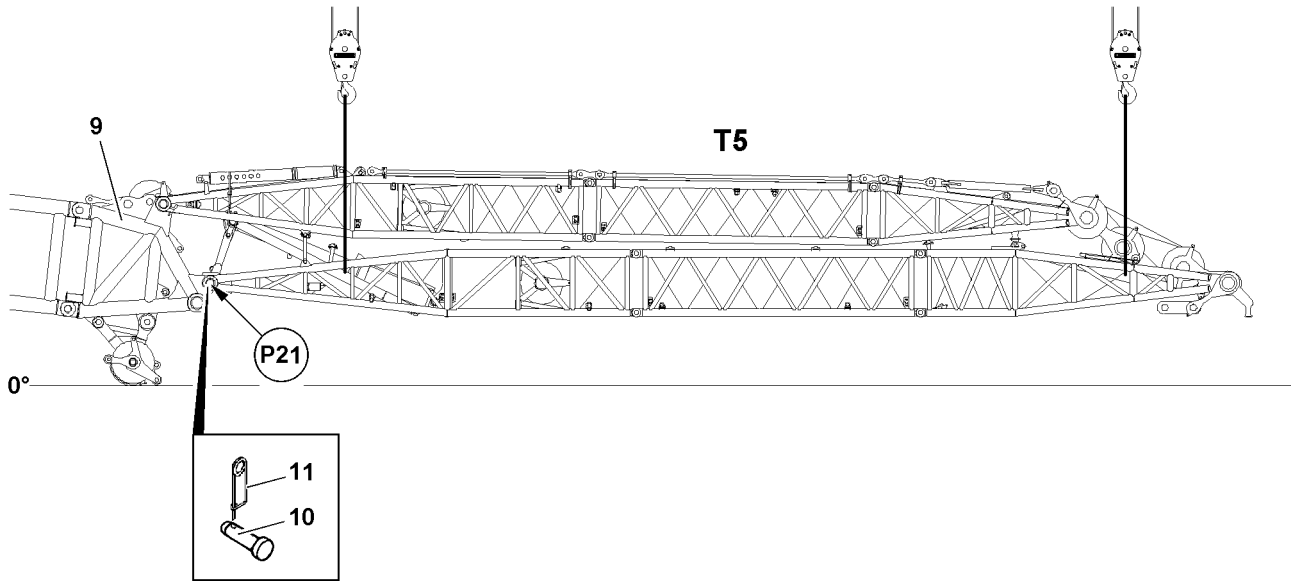


Fig.121238: Unpin the transport unit **T5** at point **P21** on the W-connector head **9**.

- ▶ Lift the WA-frames (transport unit **T5**) and unpin the WA-frame 1 pivot section **7** at point **P21** on the W-connector head **9**: Release and unpin the pins **10** on both sides, see Crane operating instructions, chapter 5.30.

When the transport unit **T5** is completely unpinned on the W-connector head **9**:

- ▶ Swing the transport unit **T5** out on the W-connector head **9** and place it on the support on the ground.

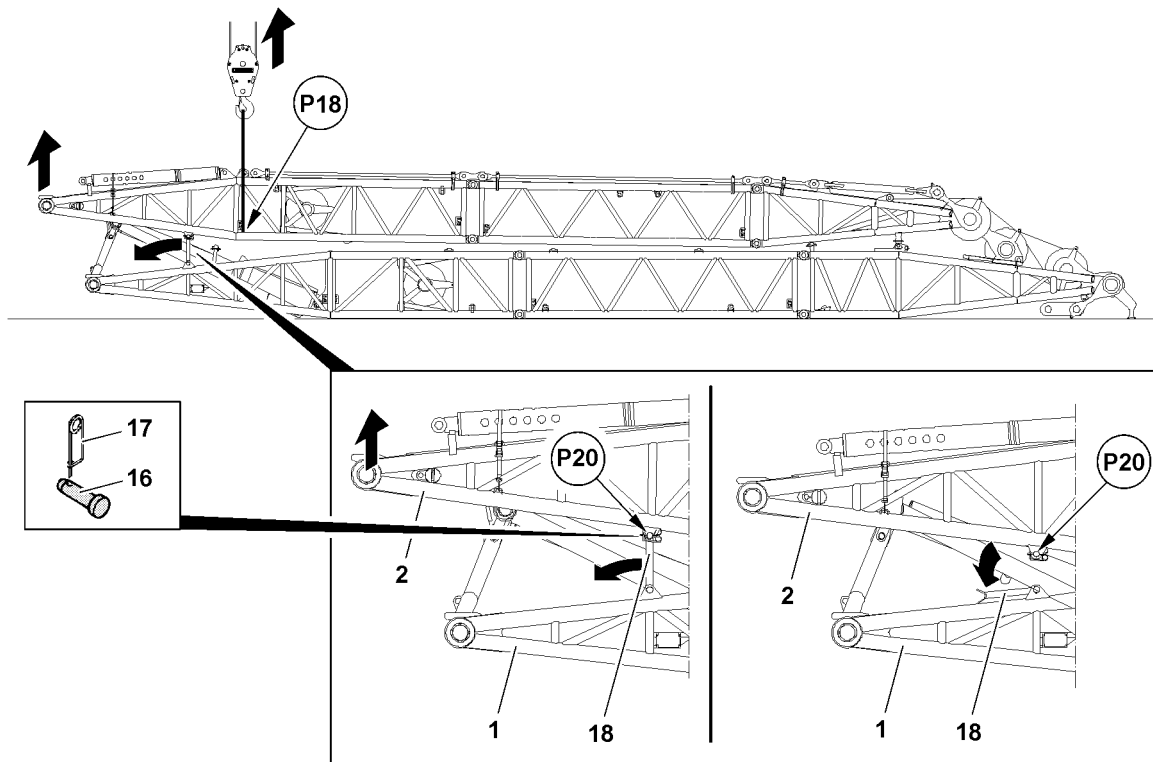


Fig.121581: Place the support **18** on the WA-frame **1** pivot section **1**.

When the transport unit **T5** is placed on the support on the ground:

- ▶ Fasten the auxiliary crane on the studs of the WA-frame **2** pivot section **2** at point **P18**.

When the WA-frame 2 pivot section **2** is fastened on the auxiliary crane:

- ▶ Carefully lift the WA-frame 2 with the auxiliary crane and place the support **18** down on both sides.

When the supports are placed down on both sides in park position:

- ▶ Place the WA-frame 2 on the WA-frame 1.

When the WA-frame 2 is laying completely on the WA-frame 1:

- ▶ Remove the auxiliary crane.

7.17 Preparing the WA-frames for transport

Make sure that the following prerequisites are met:

- The WA-frames are properly removed on the W-connector head.
- The WA-frame 1 is laying completely on the WA-frame 2.
- The supports **18** are placed down on both sides in park position.

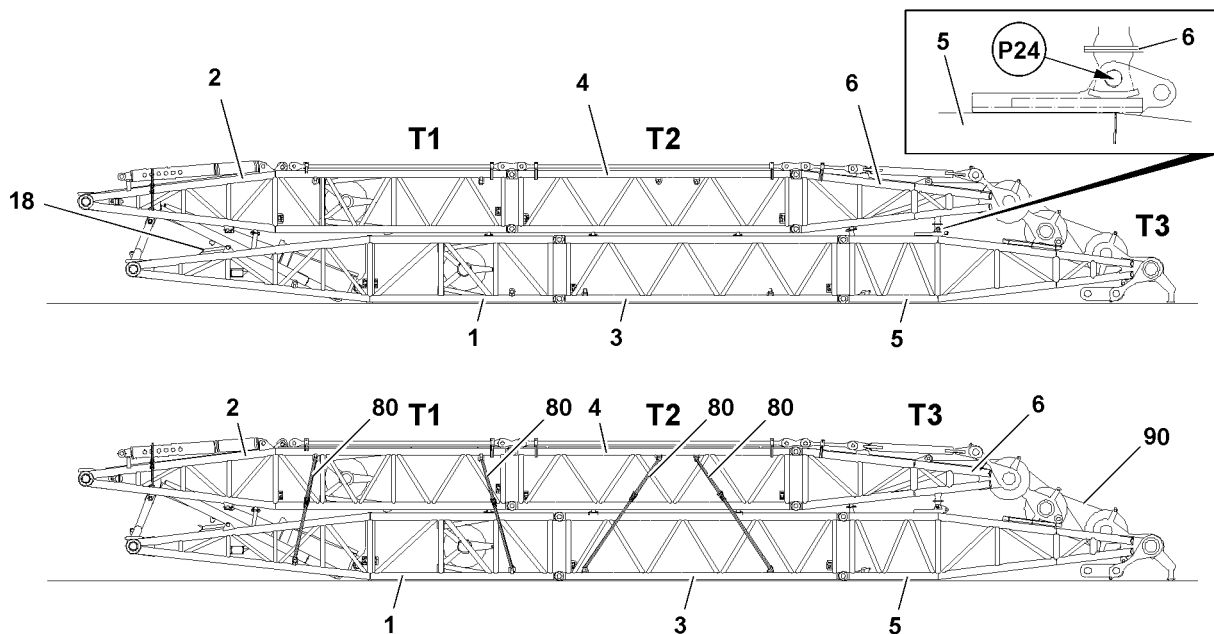


Fig.121549: Rig the WA-frames with rigging / tension belts and prepare for transport

- ▶ Rig the WA-frame 1 pivot section **1** and WA-frame 2 pivot section **2** (transport unit **T1**) with rigging / tension belts **80** properly on both sides.
- ▶ Rig the WA-frame 1 intermediate section **3** and WA-frame 2 intermediate section **4** (transport unit **T2**) with rigging / tension belts **80** properly on both sides.

7.18 Disassembling the WA-frames

Make sure that the following prerequisites are met:

- The WA-frames are properly pinned and secured on the WA-frame end sections at point **P24**.
- The WA-frames are properly rigged on both sides with the rigging / tension belts **80**.

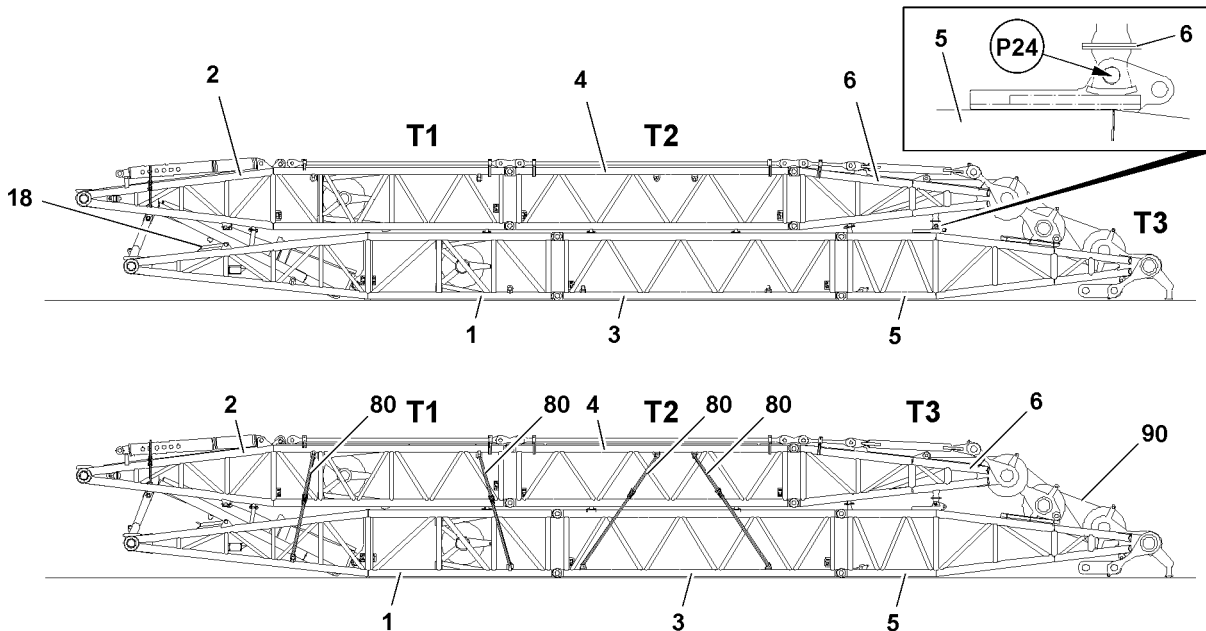


Fig.121549: WA-frames rigged with rigging / tension belts and prepared for disassembly



Note

- ▶ For disassembly of the WA-frames, observe section „Fastening points“.

- ▶ Fasten the auxiliary crane properly on the transport unit **T1**.
- ▶ Carefully bring the fastening equipment to tension.

When the fastening equipment is tensioned:

- ▶ Unpin the connector pin between the transport unit **T1** and transport unit **T2**.
- ▶ Lift the transport unit **T1** with the auxiliary crane and swing out.
- ▶ Set the transport unit **T1** on the ground or on the transport vehicle and remove the auxiliary crane.
- ▶ Fasten the auxiliary crane properly on the transport unit **T2**.
- ▶ Carefully bring the fastening equipment to tension.

When the fastening equipment is tensioned:

- ▶ Unpin the connector pin between the transport unit **T2** and transport unit **T3**.
- ▶ Lift the transport unit **T2** with the auxiliary crane and swing out.
- ▶ Set the transport unit **T2** on the ground or on the transport vehicle and remove the auxiliary crane.

5.08 WV-lattice jib

| | | |
|---|-----------------|----|
| 1 | General | 3 |
| 2 | Assembly | 5 |
| 3 | Crane operation | 19 |
| 4 | Disassembly | 21 |

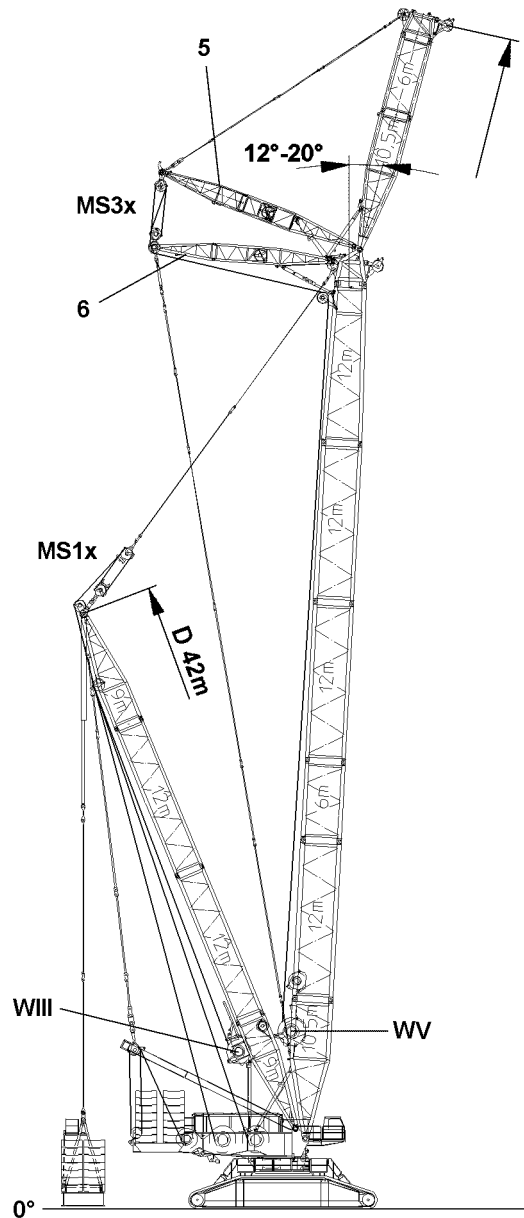
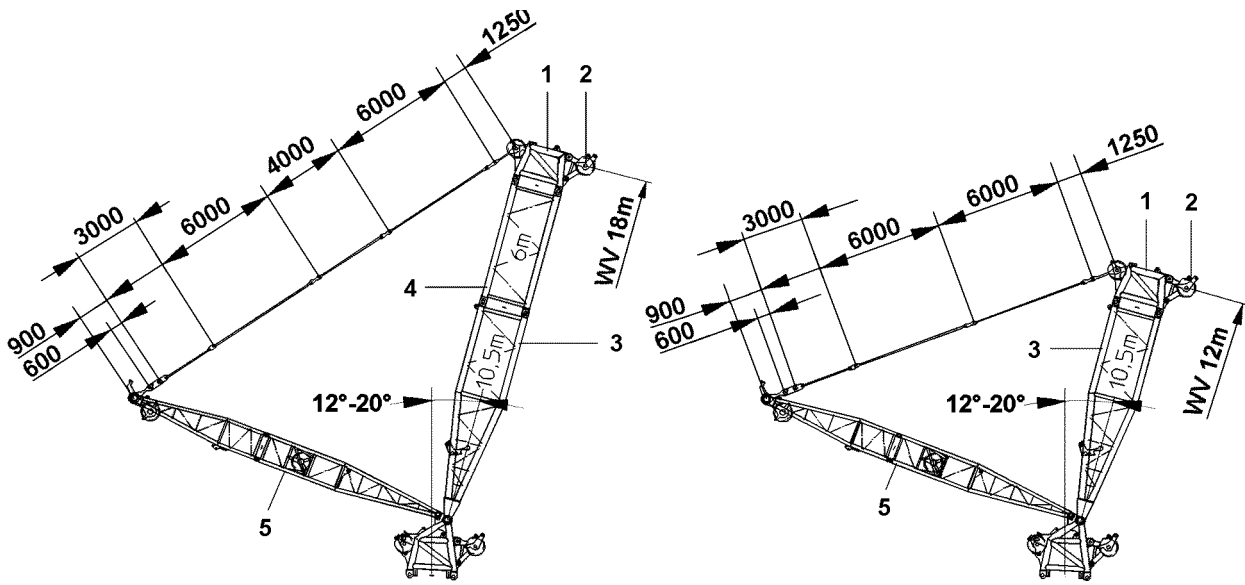


Fig.113075

LWE/LR 11350-007/19005-01-02/en

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 **WV** 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 **WIII** with the master switch **MS1** in X-direction.



Note

- ▶ For arrangement of intermediate sections of boom system, see Crane operating instructions, chapter 5.03!!
- ▶ Assembly of guy rods, see Rod plans!



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 | — | — | — |

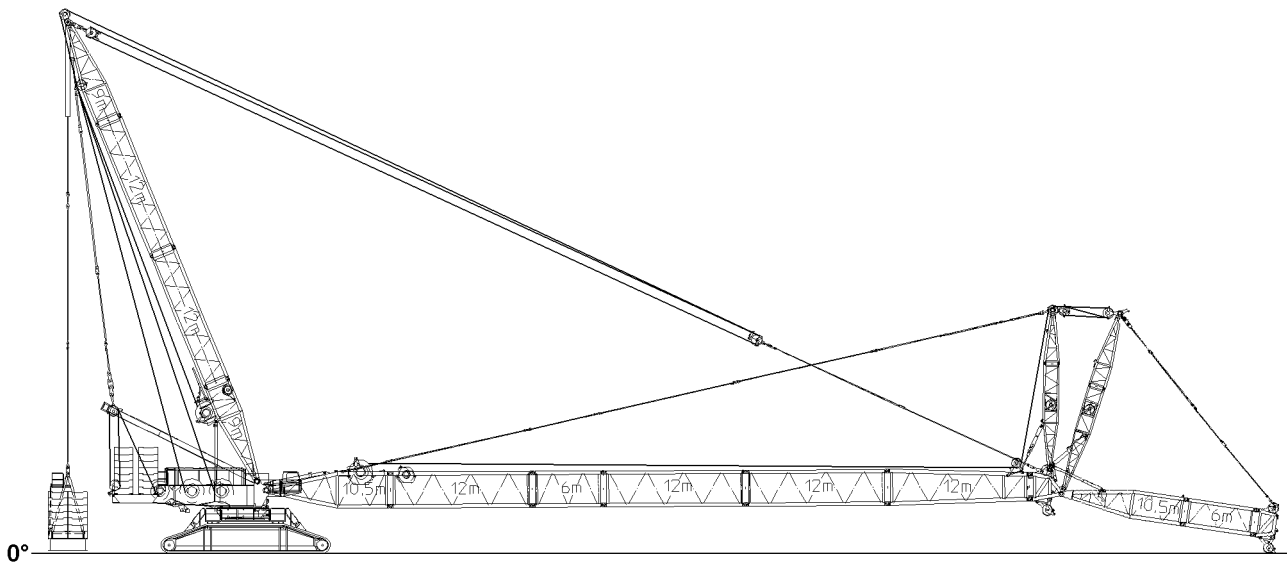
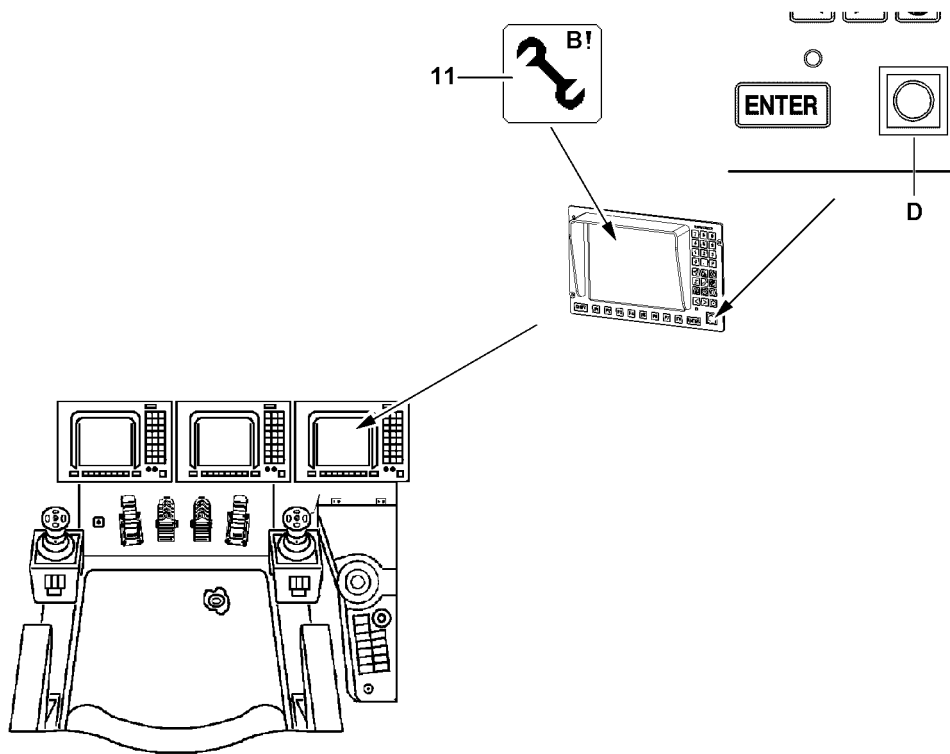


Fig.112760

LWE/LR 11350-007/19005-01-02/en

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

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel!

- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right!**
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom!
- ▶ 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 aligned in horizontal position to avoid the support beams from swinging by themselves!
- ▶ When working in danger zones: Use aids to protect limbs!
- ▶ Guide components with suitable aids to minimize oscillation!

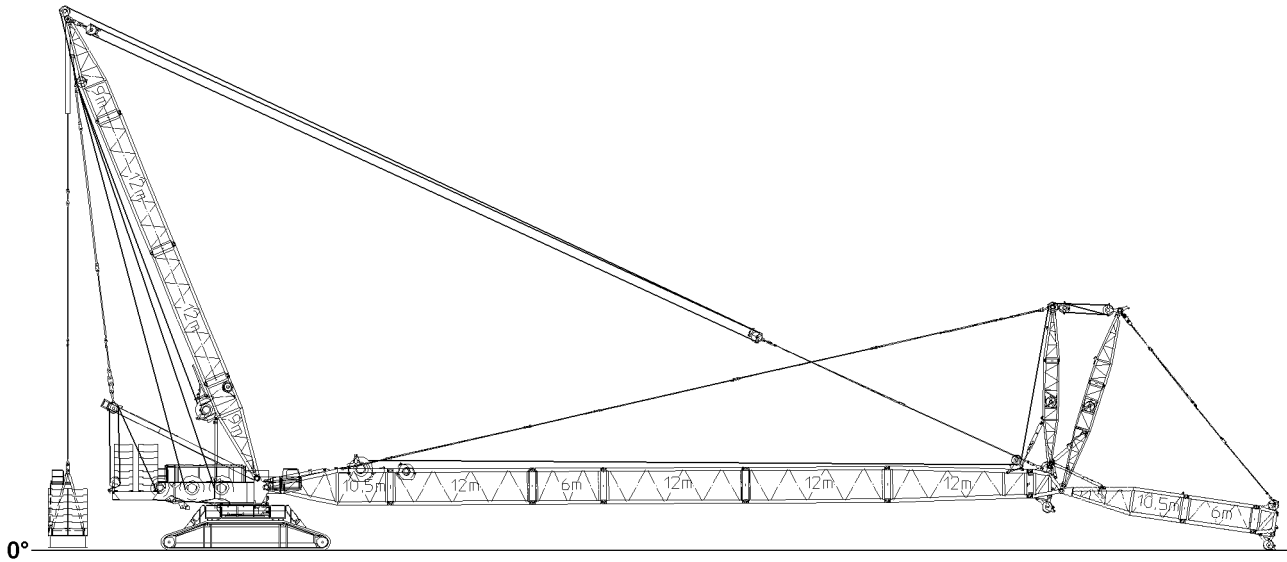
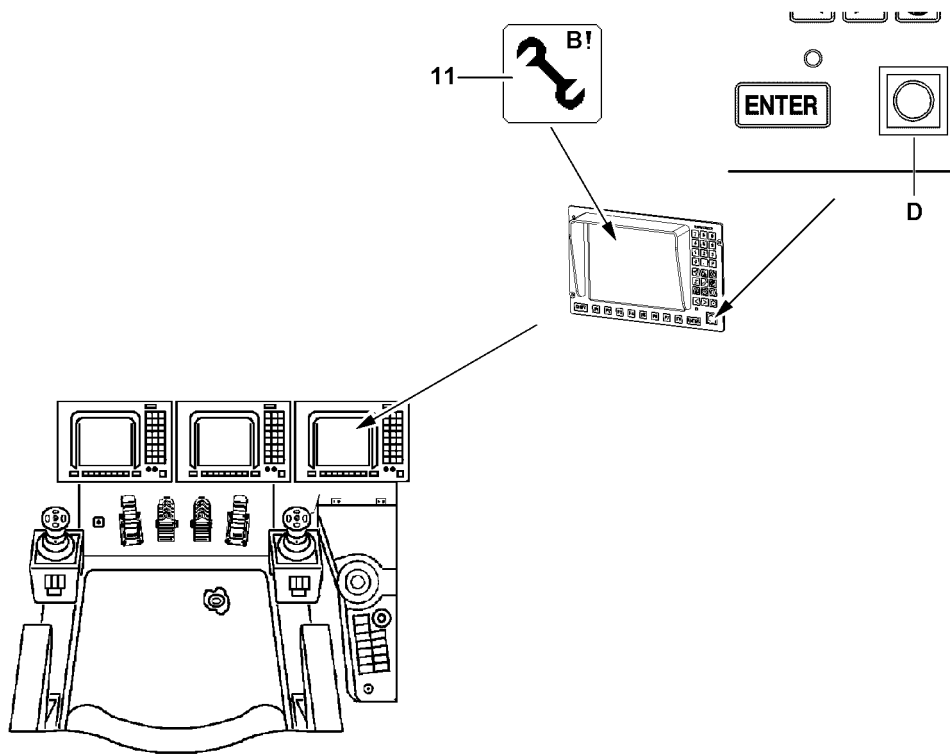


Fig.112760

LWE/LR 11350-007/19005-01-02/en

**WARNING**

Assembly with turned on set up key!

When the set up key 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 severely injured or killed!

This could result in high property damage!

- ▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
- ▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with the set up key **D** turned on is strictly prohibited!

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The SD-boom combination is assembled, see Crane operating instructions, 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 Crane operating instructions, 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 pulley set, see Crane operating instructions, 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.
- The LICCON overload protection settings have been compared with the actual crane configuration.
- The LICCON overload protection is exceeded.
- The assembly icon **11** is visible on the LICCON monitor.
- An auxiliary crane is available.

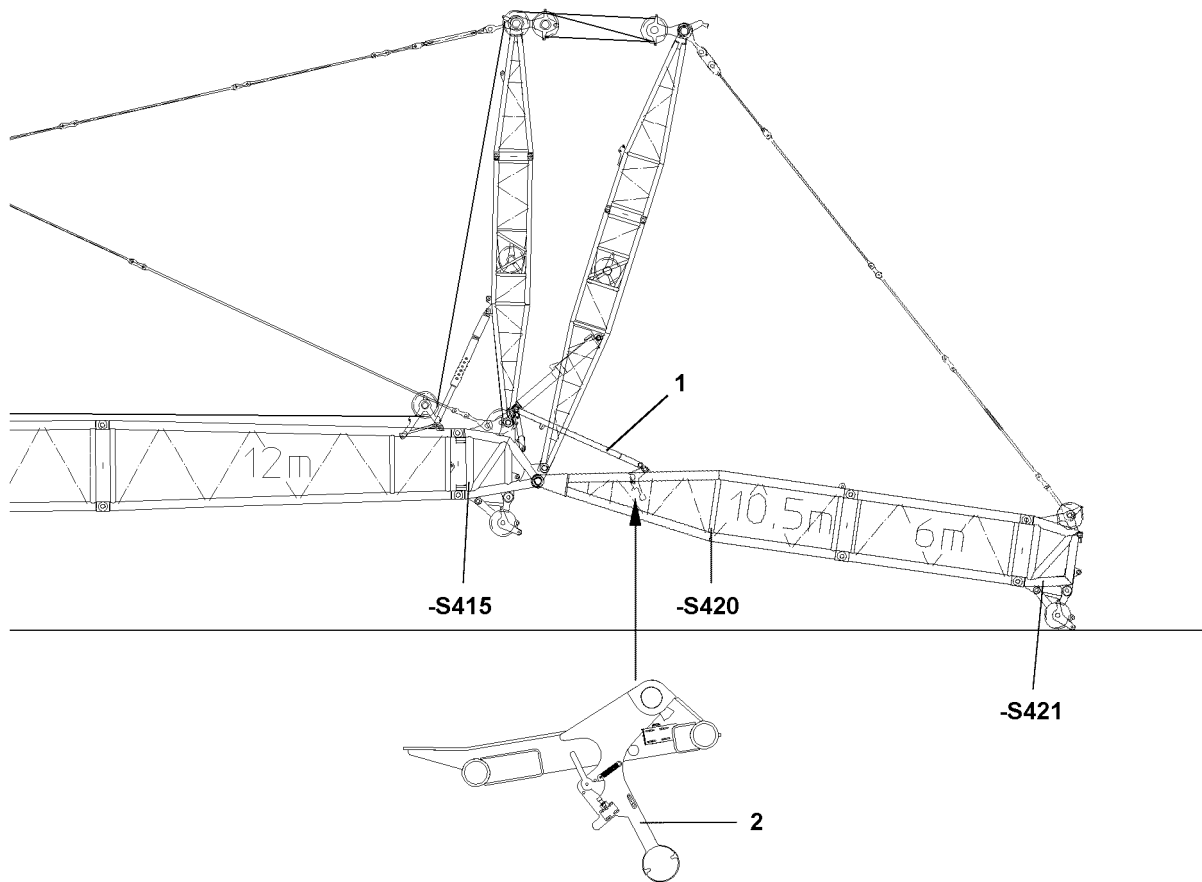


Fig.102973

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.
- The W-boom is completely assembled.
- The airplane warning light and the wind speed sensor are installed.



CAUTION

Damage to the electrical connection on the cable drum!

If the electrical connection from the cable drum to the terminal box on the W-pivot section is established first before the connection to the terminal box on the SW-end section, then the electrical connection will be damaged when spooling out the cable drum!

- ▶ Establish first the electrical connection from the cable drum on the W-pivot section to the terminal box on the SW-end section and then the electrical connection from the terminal box to the cable drum on the W-pivot section!



Note

- ▶ To establish the electrical connections on the W-boom, see Electric wiring diagram!

- ▶ Establish the electrical connections.
- ▶ Make sure that all electrical connections on the boom are established.

2.2 Checking the function of the safety devices

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.

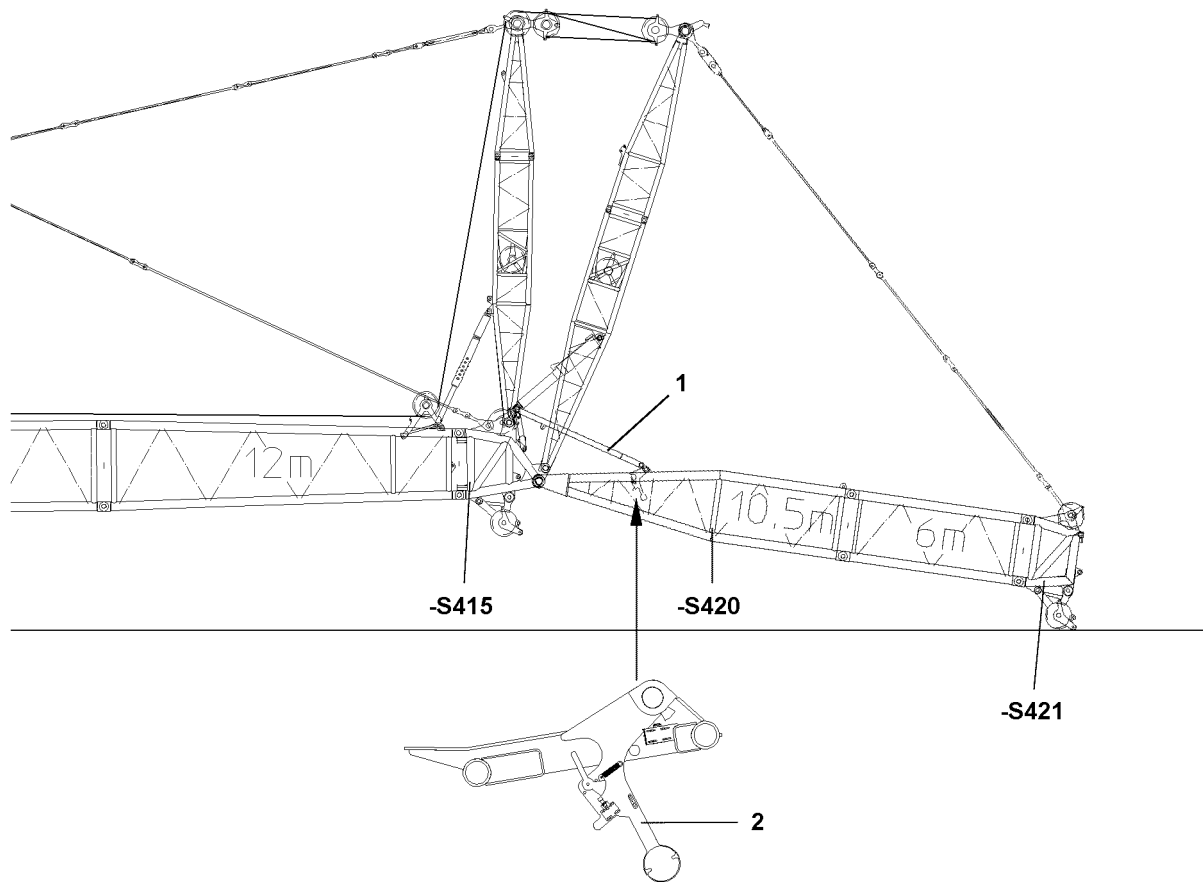


Fig.102973

2.2.4 Limit switch - General

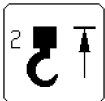


Note

- ▶ 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).



- ▶ Manually actuate the hoist limit switch.

Result:

- The icon is visible 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 initiators individually with a metal plate, see Crane operating instructions, chapter 8.12.

Result:

- The icon is visible 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 „lowest“ position of the limit switch initiators individually with a metal plate, see Crane operating instructions, chapter 8.12.

Result:

- The icon is visible 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 initiators individually with a metal plate.

Result:

- The icon is visible on the LICCON monitor.
- The **spool up function** of the W-control winch turns off.

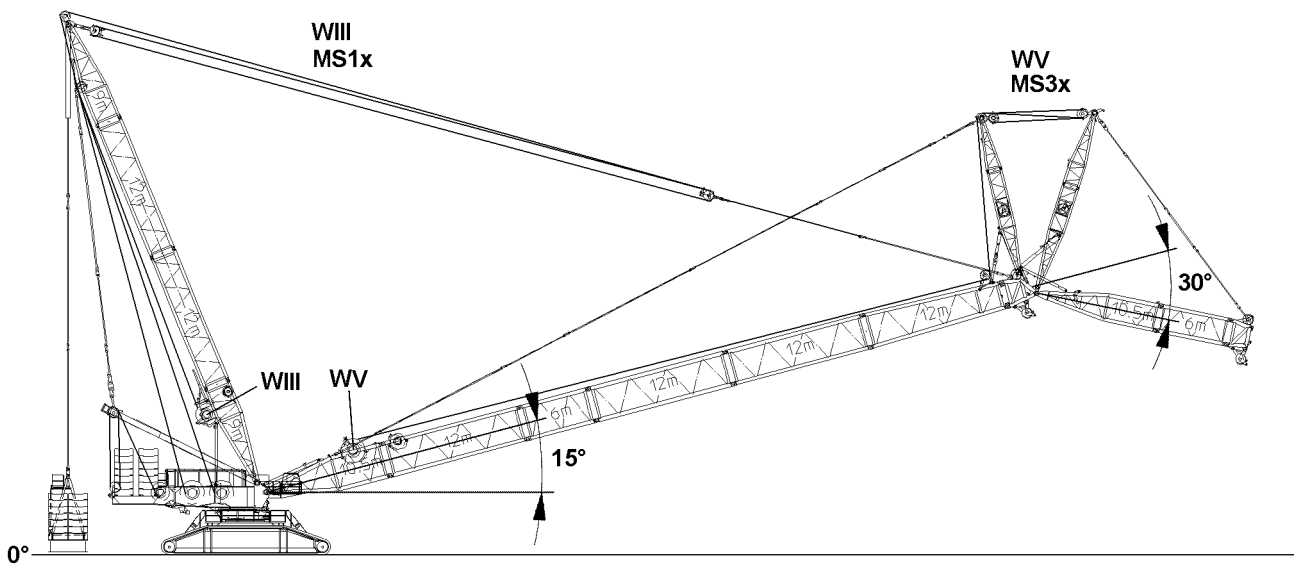
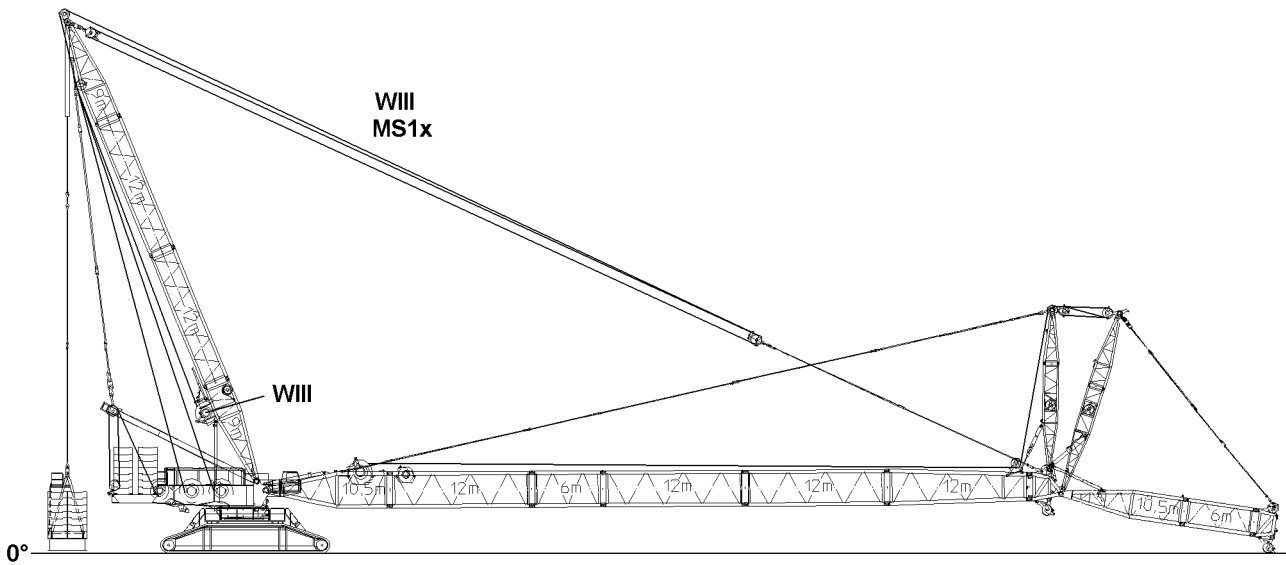
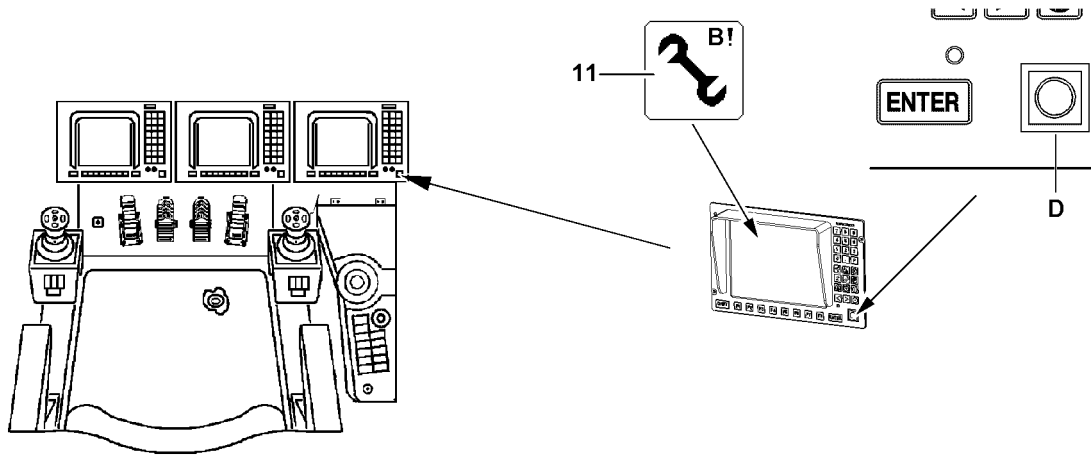


Fig.112910

LWE/LR 11350-007/19005-01-02/en

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!
- ▶ It is not permitted to turn the crane during erection!



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!

Personnel can be severely injured or killed!

Guy rods can loosen up and fall down!

The load chart is invalid!

The load display of the LICCON computer system shows the incorrect value!

The weight of the boom is too large for erection!

- ▶ Disassemble and remove unutilized guy rods on the transport retainers before erecting the boom!

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 actual crane configuration.
- The LICCON overload protection is exceeded.
- The assembly icon **11** is visible on the LICCON monitor.

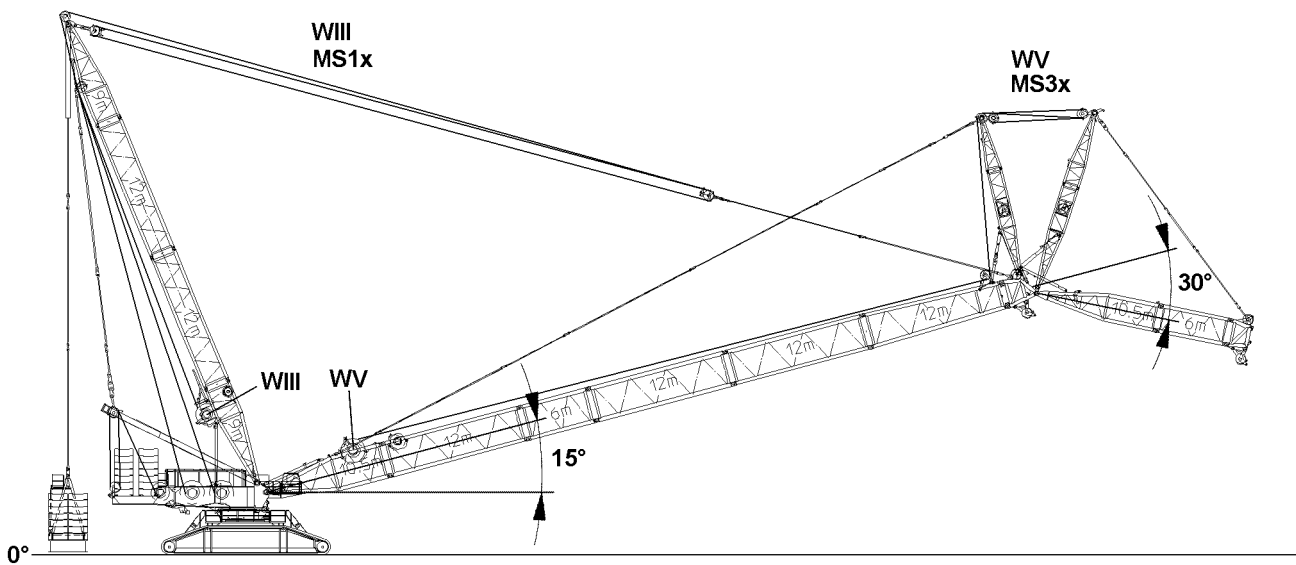
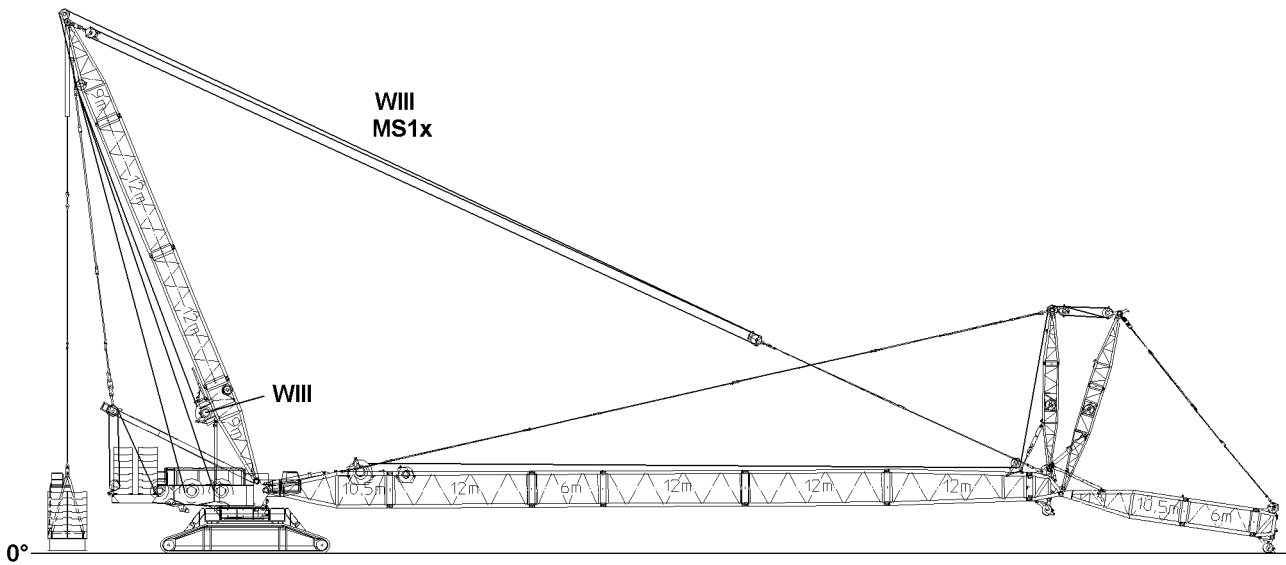
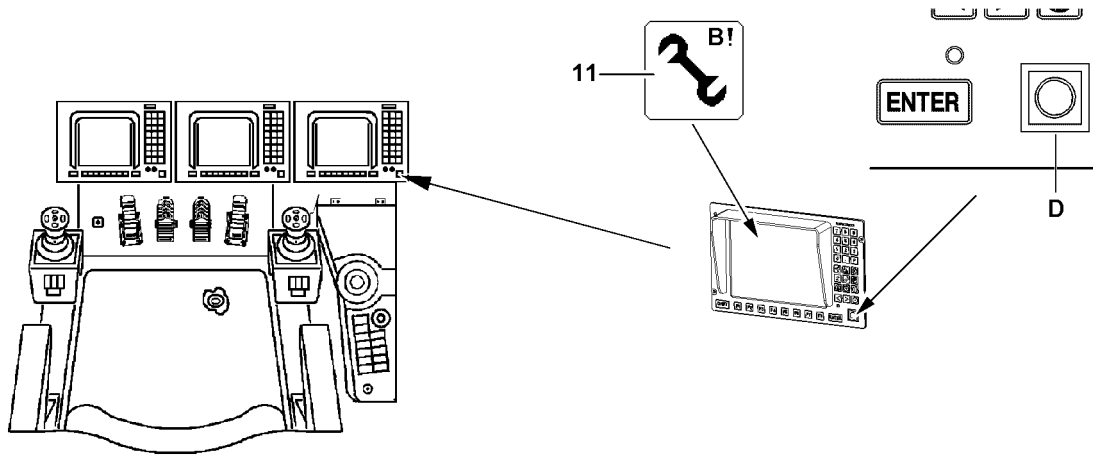


Fig.112910

LWE/LR 11350-007/19005-01-02/en

2.3.1 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!

If required in the erection and take down chart:

- ▶ Carry the hook block along with the auxiliary crane!
-

- ▶ Check the actual load on the LICCON monitor.
-

Problem remedy

Actual load on the LICCON monitor is larger than 0.0 t !

- ▶ Observe the notes for input of hook block weight, see Crane operating instructions, chapter 4.02!
- ▶ Reeve in the hook block properly and secure the hoist rope on the rope fixed point, see Reeving plan.
- ▶ Attach the hoist limit switch weight.
- ▶ Enter the weight of the hook block into the LICCON computer system!
- ▶ 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.

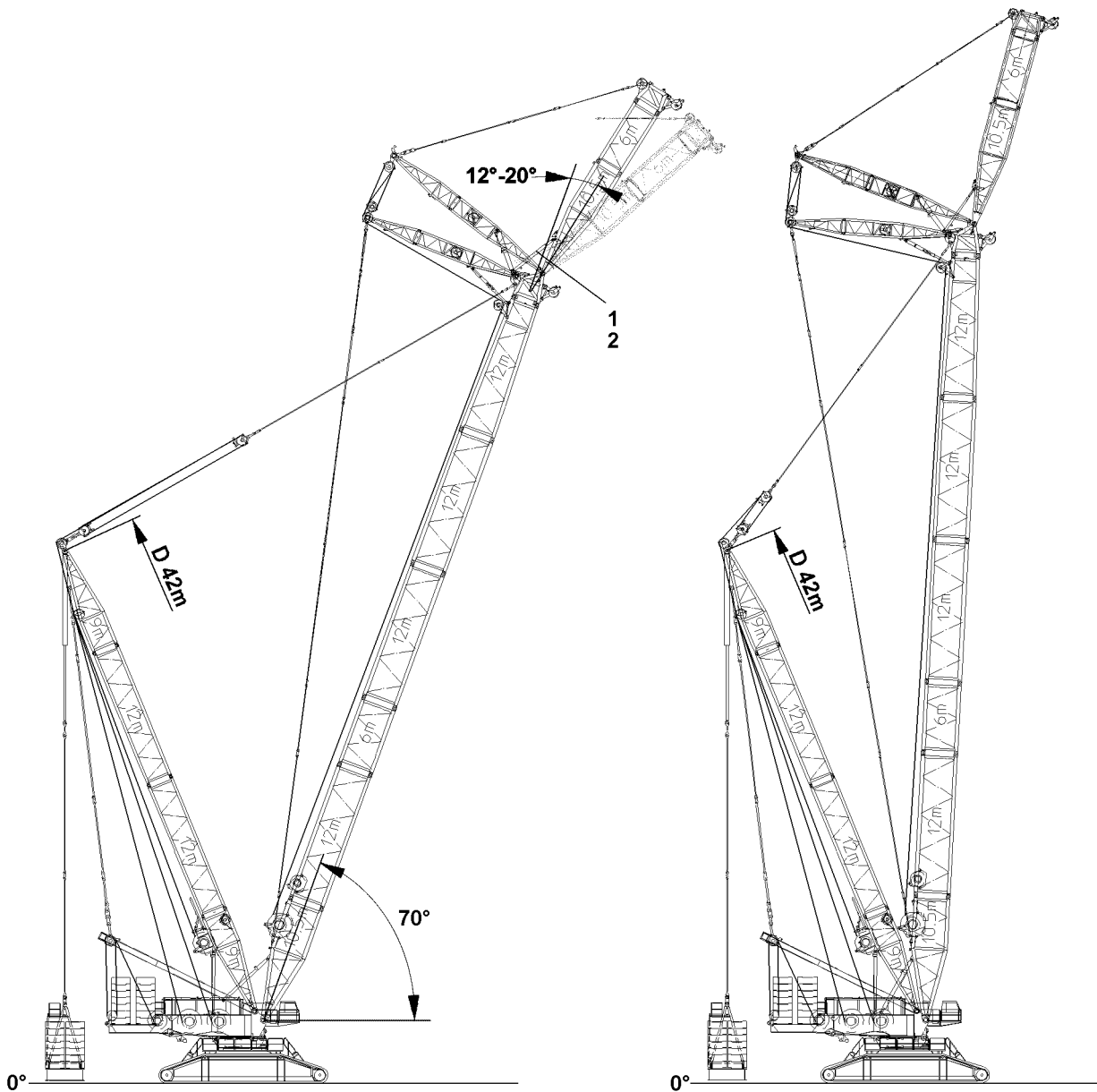
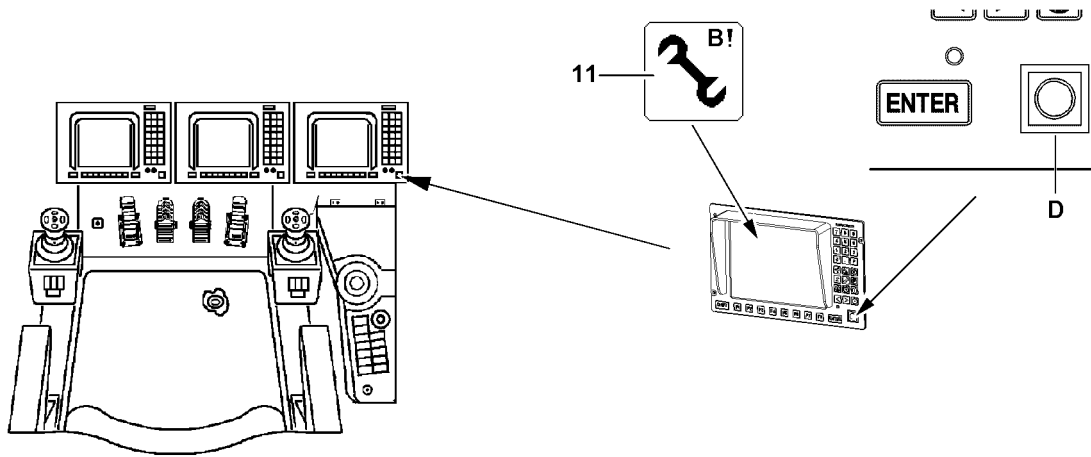


Fig.112911

LWE/LR 11350-007/19005-01-02/en

2.3.2 Erection - continuation

- ▶ Luff the S-boom up to 70°. Move master switch **MS1** in x-direction.



DANGER

Risk 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.



Note

- ▶ When the lowest operating position 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. Move master switch **MS1** in X-direction.

When the boom has reached the lowest operating position:

- ▶ Make sure that the assembly icon **11** on the LICCON monitor turns off.

Result:

- The LICCON overload protection is active.

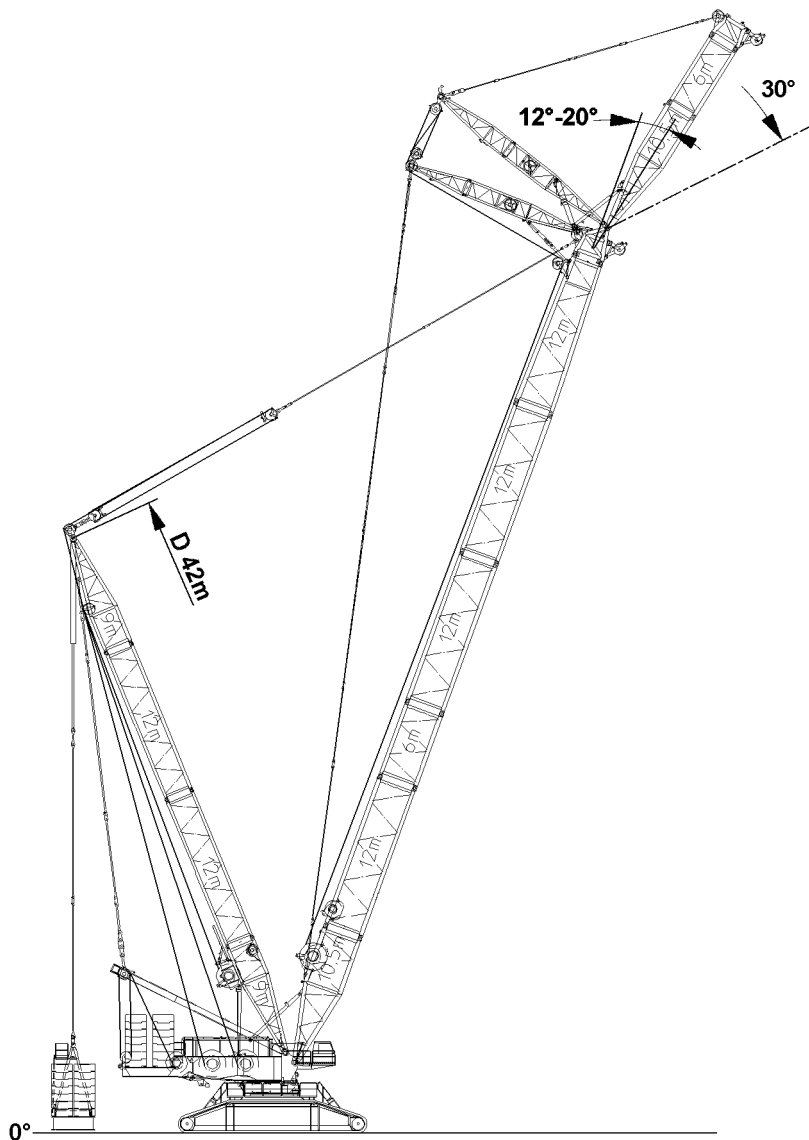
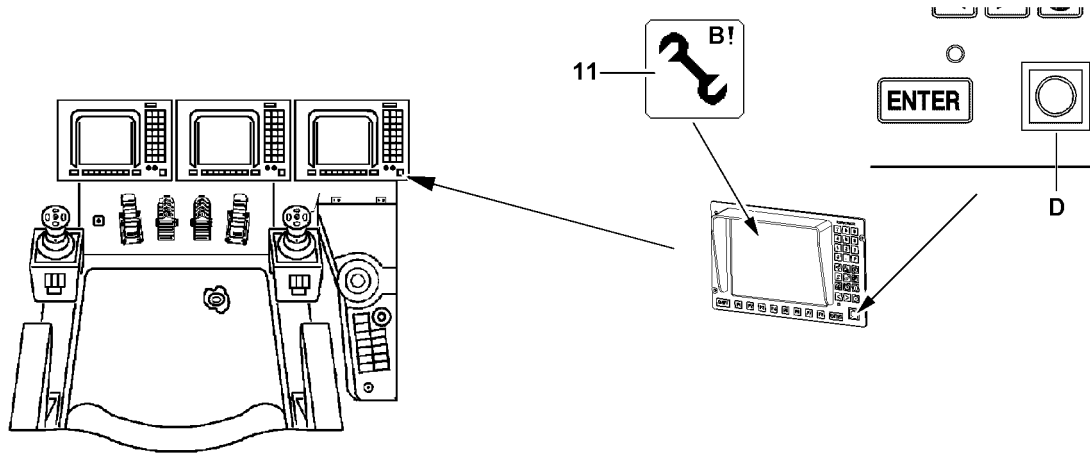


Fig.112912

LWE/LR 11350-007/19005-01-02/en

3 Crane operation



Note

- ▶ Observe the notes, see Crane operating instructions, chapter 4.05, chapter 4.08 and chapter 5.01!

Make sure that the following prerequisites are met:

- The LICCON overload protection is active.
- The LICCON overload protection has been set according to the data in the load chart.
- 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°.



WARNING

The crane can topple over!

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

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.

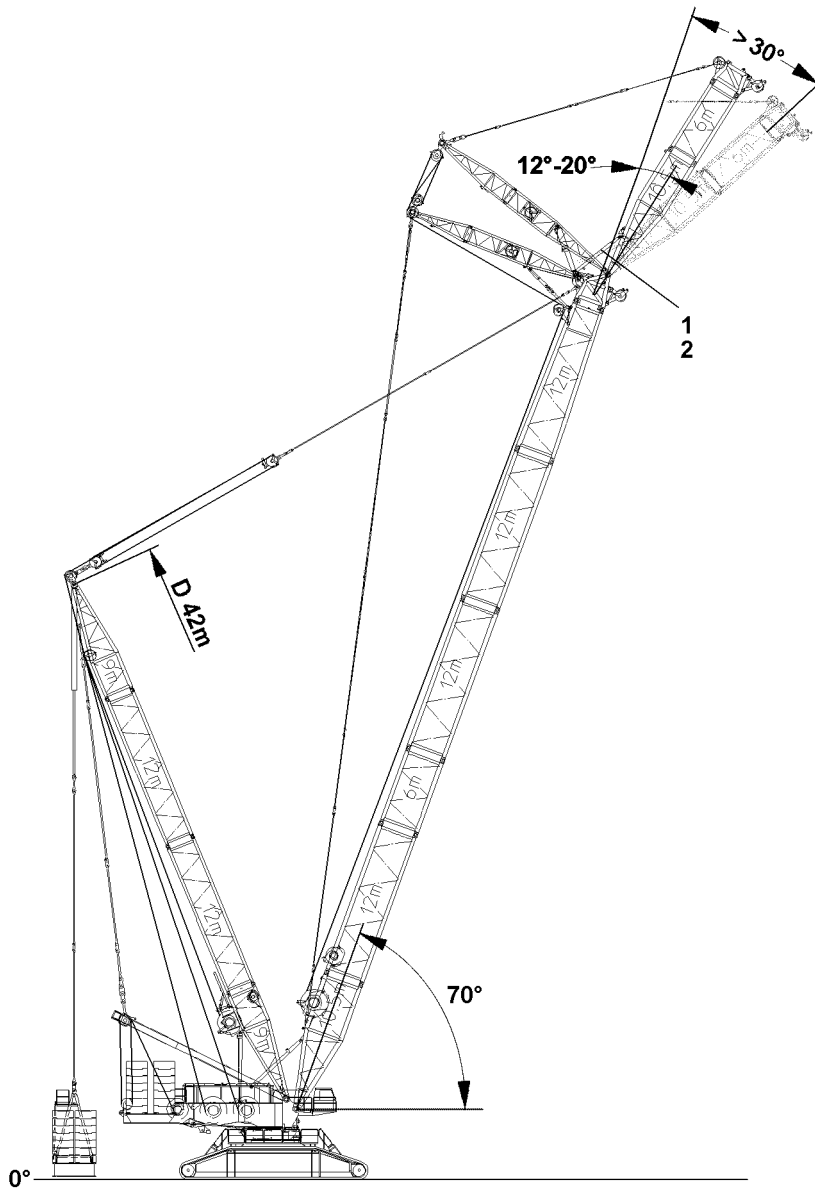
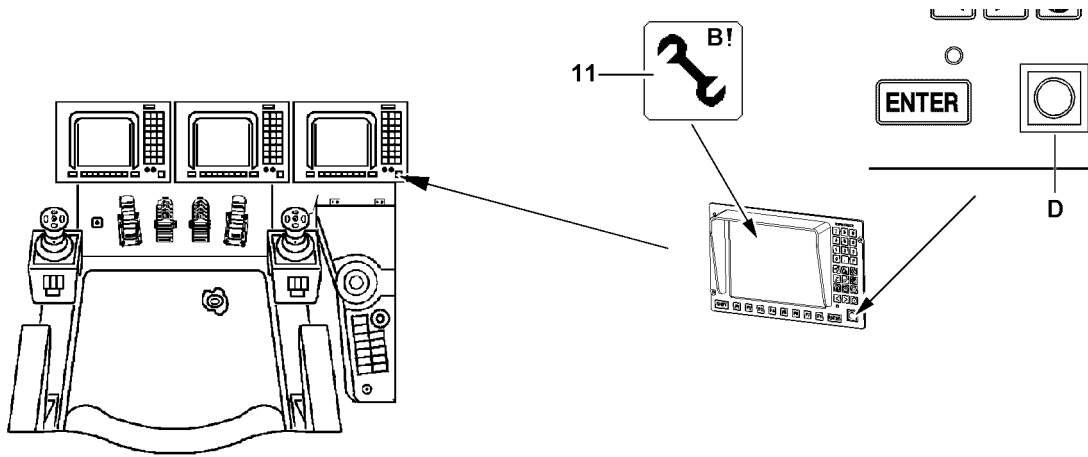


Fig.112913

LWE/LR 11350-007/19005-01-02/en

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

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel!

- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right!**
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom!
- ▶ 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 aligned in horizontal position to avoid the support beams from swinging by themselves!
- ▶ When working in danger zones: Use aids to protect limbs!
- ▶ Guide components with suitable aids to minimize oscillation!

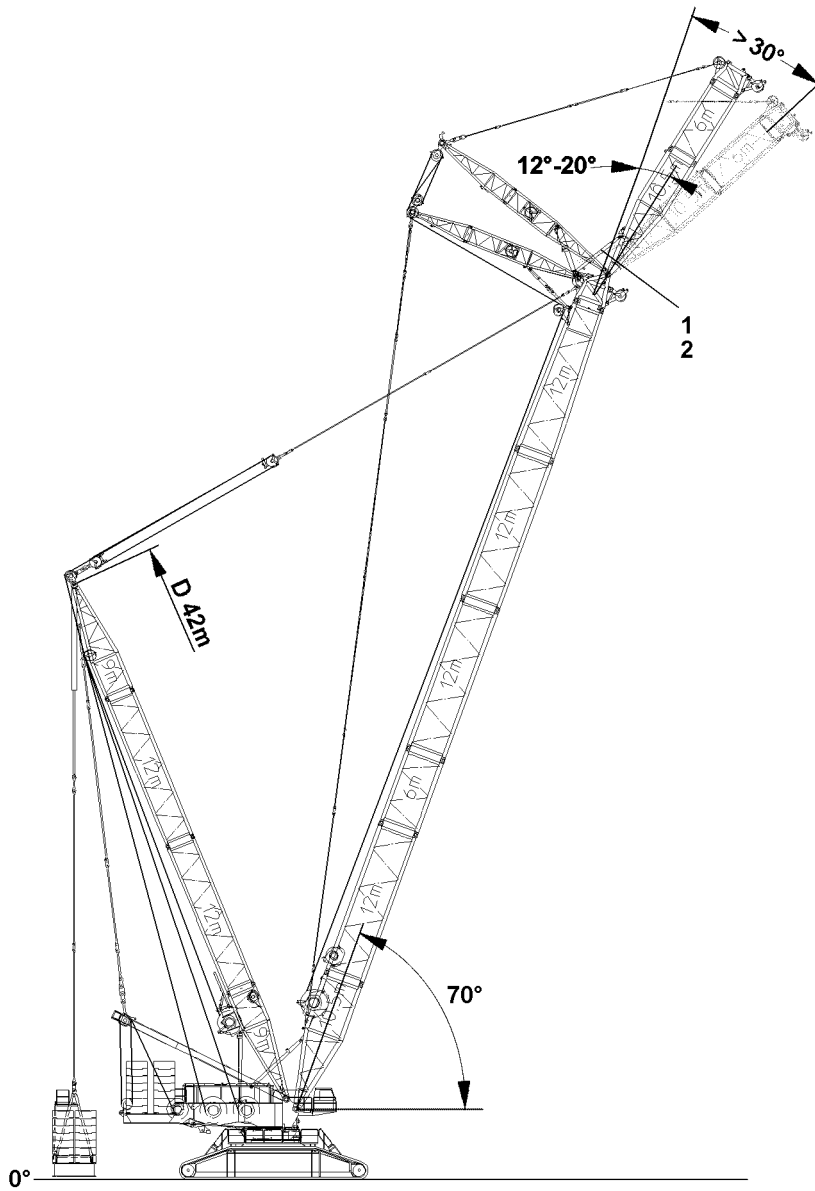
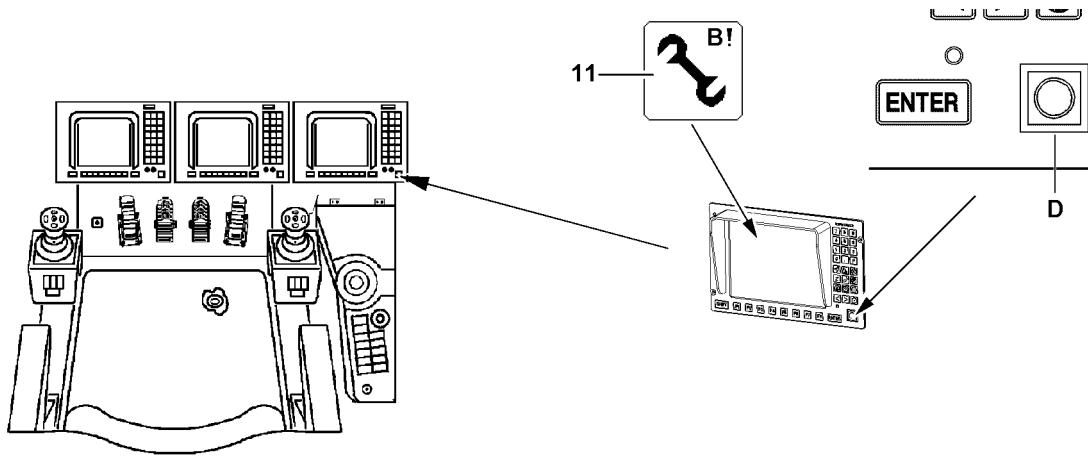


Fig.112913

LWE/LR 11350-007/19005-01-02/en

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

Risk of collision!

If the angle between the boom and the lattice jib is smaller than or equal to 30°, the mechanical re-lapse 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.

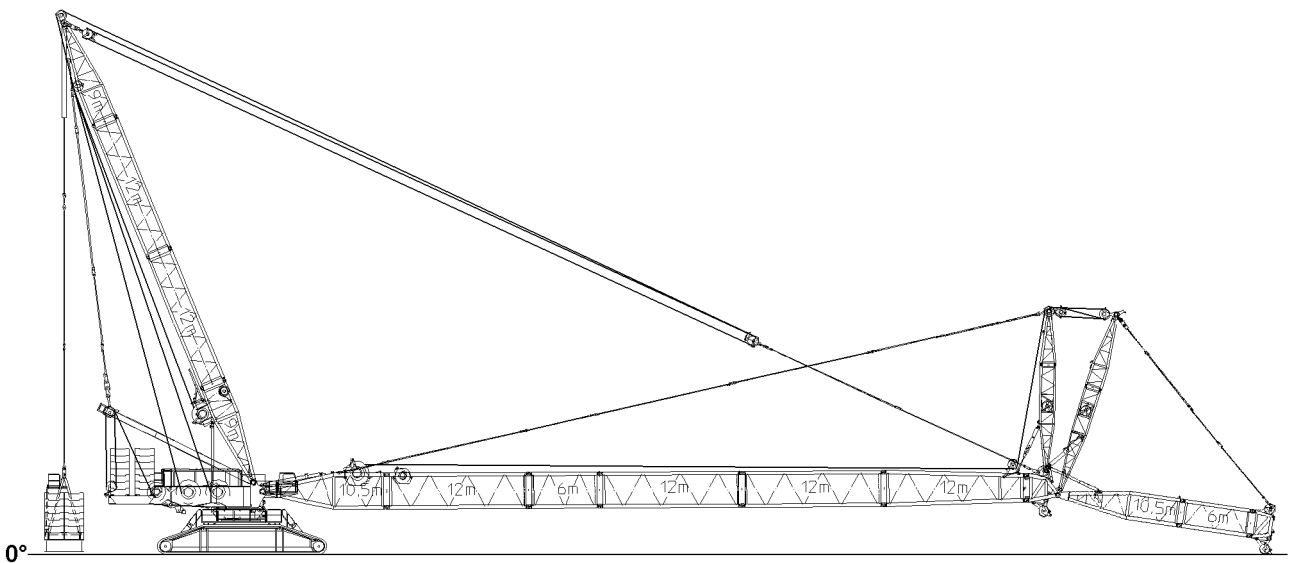
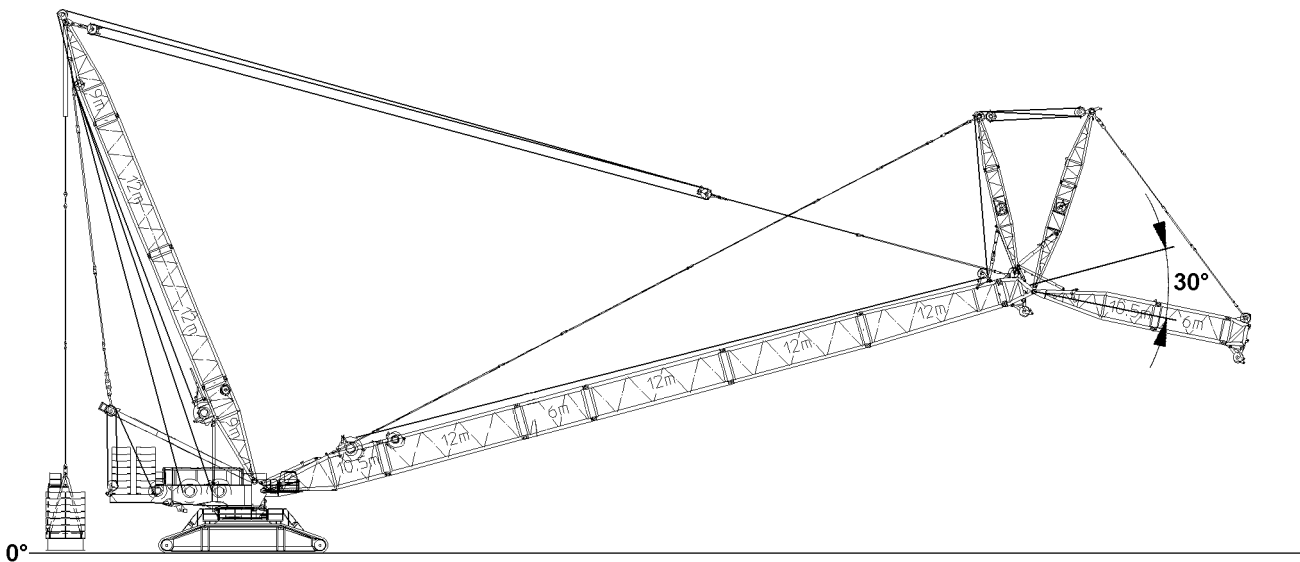
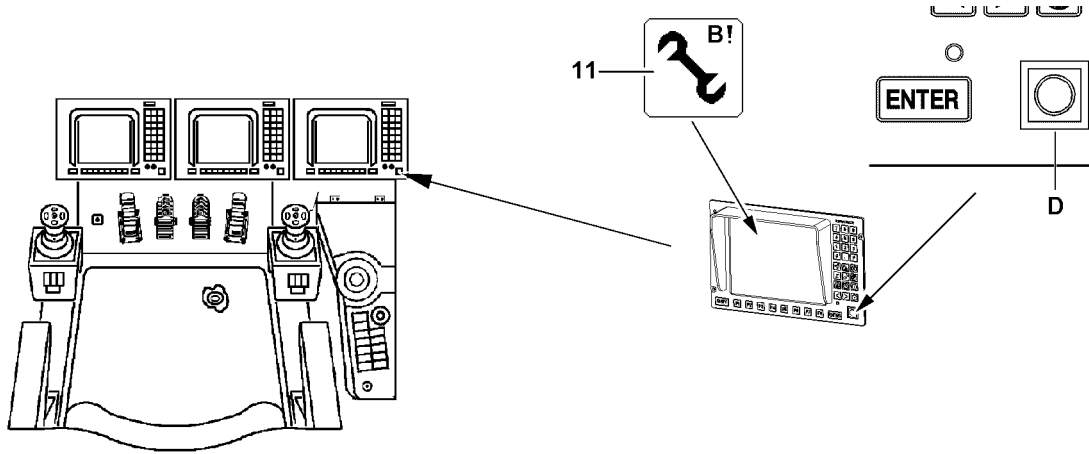


Fig.112914

LWE/LR 11350-007/19005-01-02/en

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



WARNING

Assembly with turned on set up key!

When the set up key 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 set up key **D** may only be actuated by persons who know the effects of a bypass!
- ▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with the set up key **D** turned on is strictly prohibited!

When the W-lattice jib has reached the „lowest“ operating position:

- ▶ Turn the set up key **D** to the right.

Result:

- The LICCON overload protection is deactivated.
- The assembly icon **11** appears on the LICCON monitor.
- ▶ 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 disassembly of W-assembly unit, see Crane operating instructions, chapter 5.07.

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5.10 Boom nose lattice boom

| | | |
|---|-----------------|----|
| 1 | Boom nose 62 t | 3 |
| 2 | Boom nose 120 t | 27 |

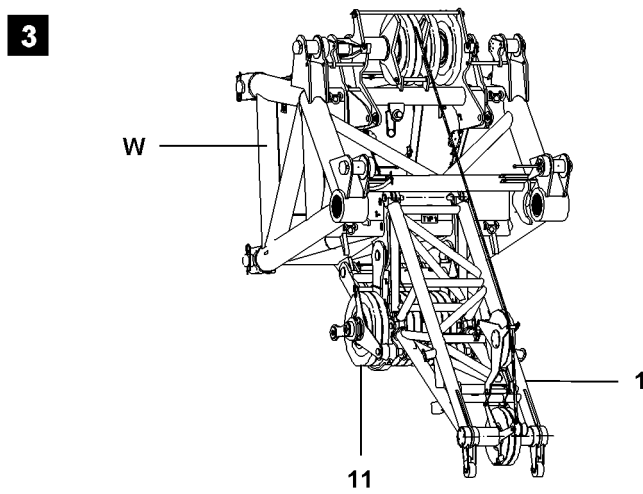
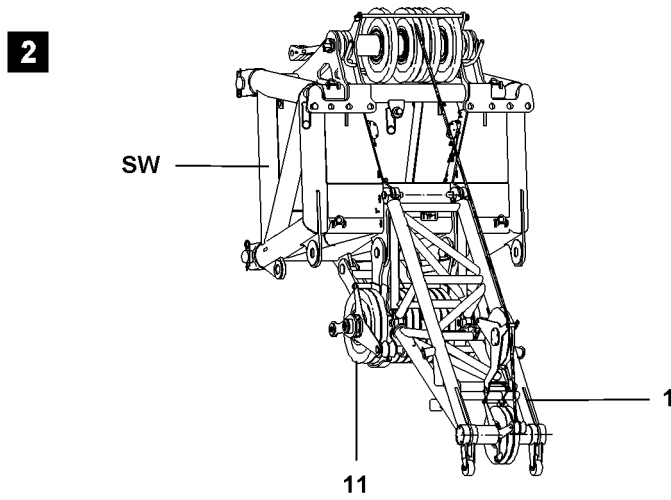
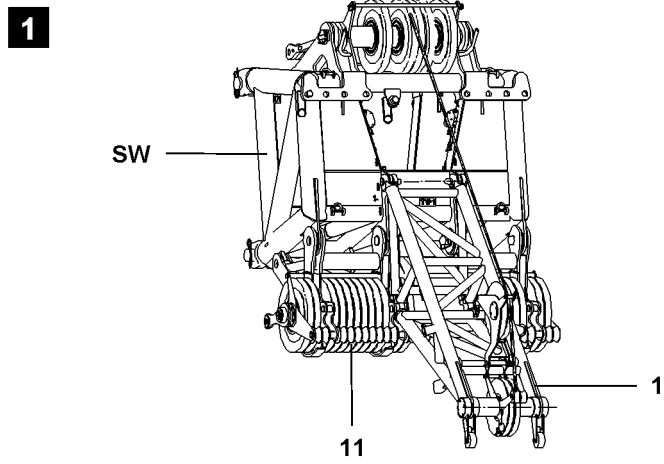


Fig.102974

LWE/LR 11350-007/19005-01-02/en

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**.

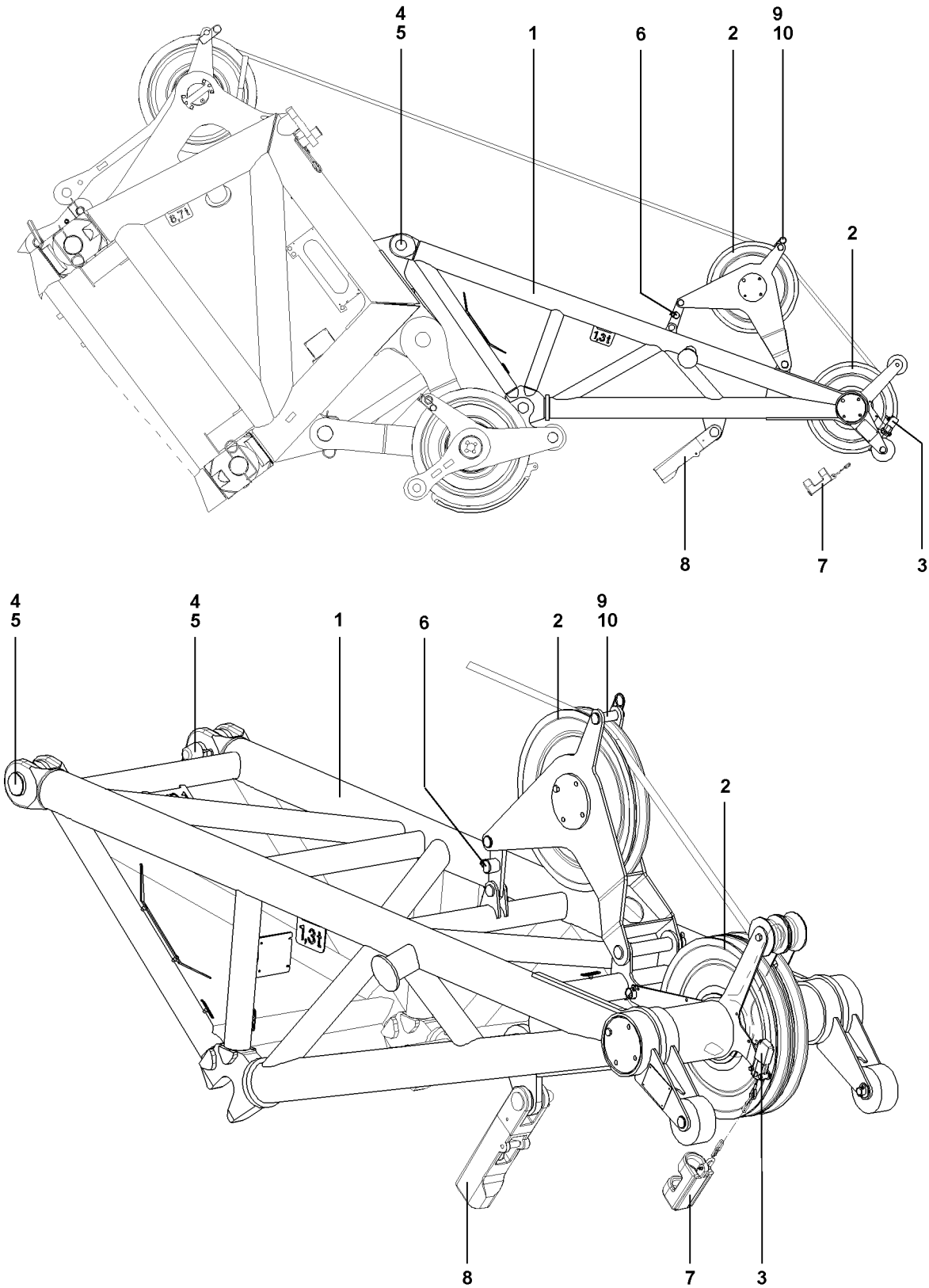


Fig.102970

LWE/LR 11350-007/19005-01-02/en

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 | — |

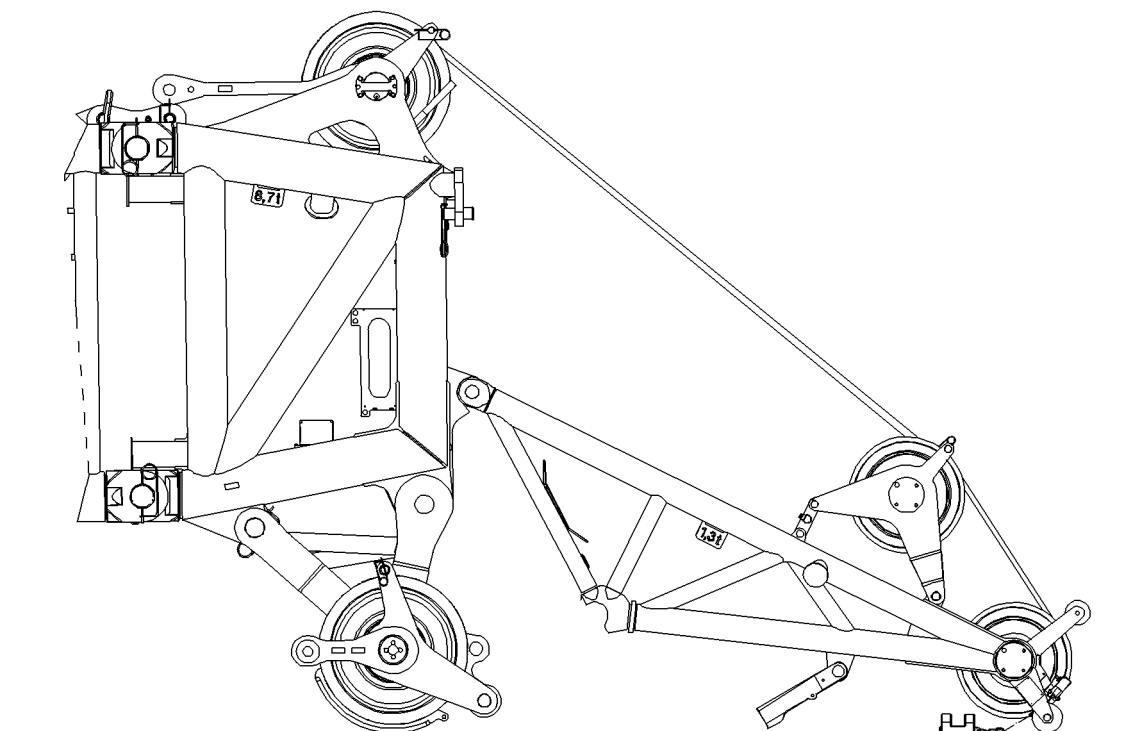


Fig.112924

LWE/LR 11350-007/19005-01-02/en

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!

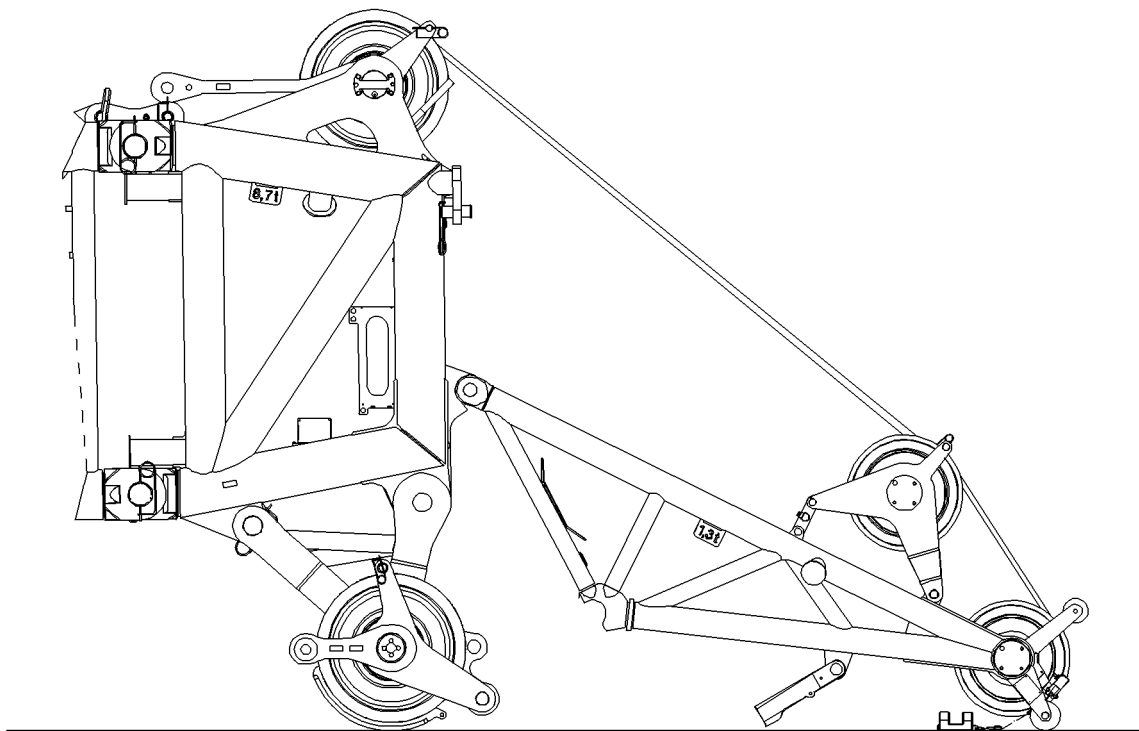


Fig.112924

LWE/LR 11350-007/19005-01-02/en

**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.

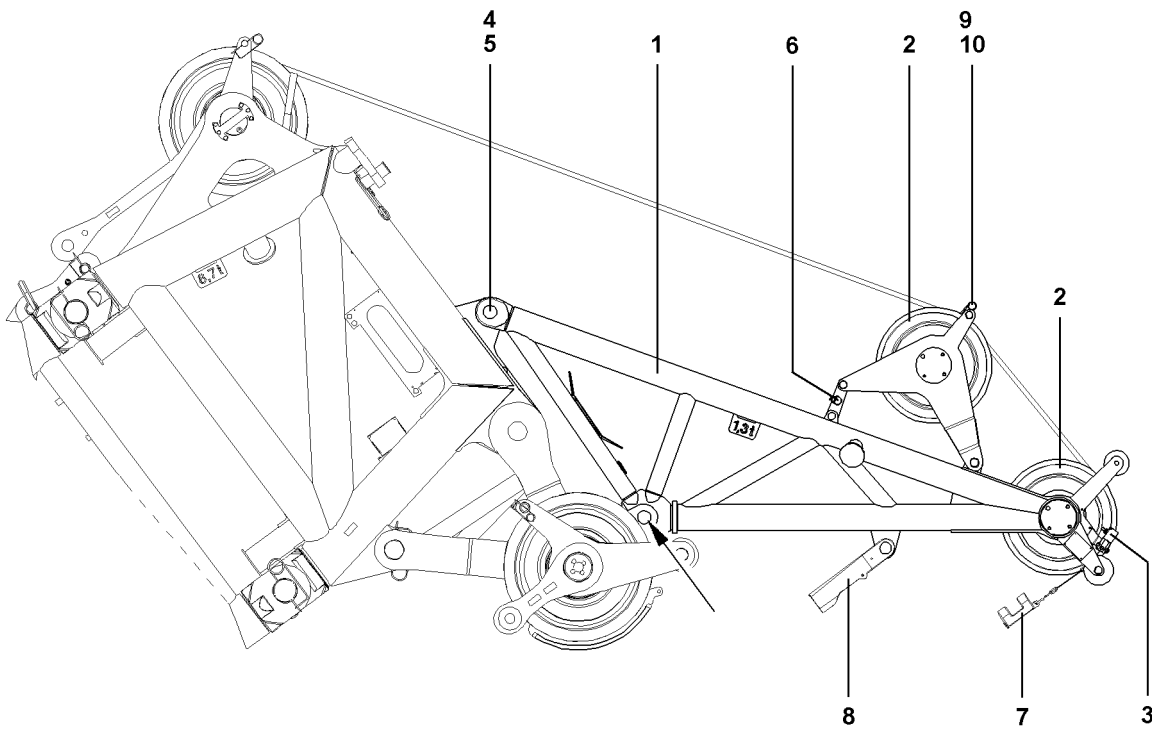
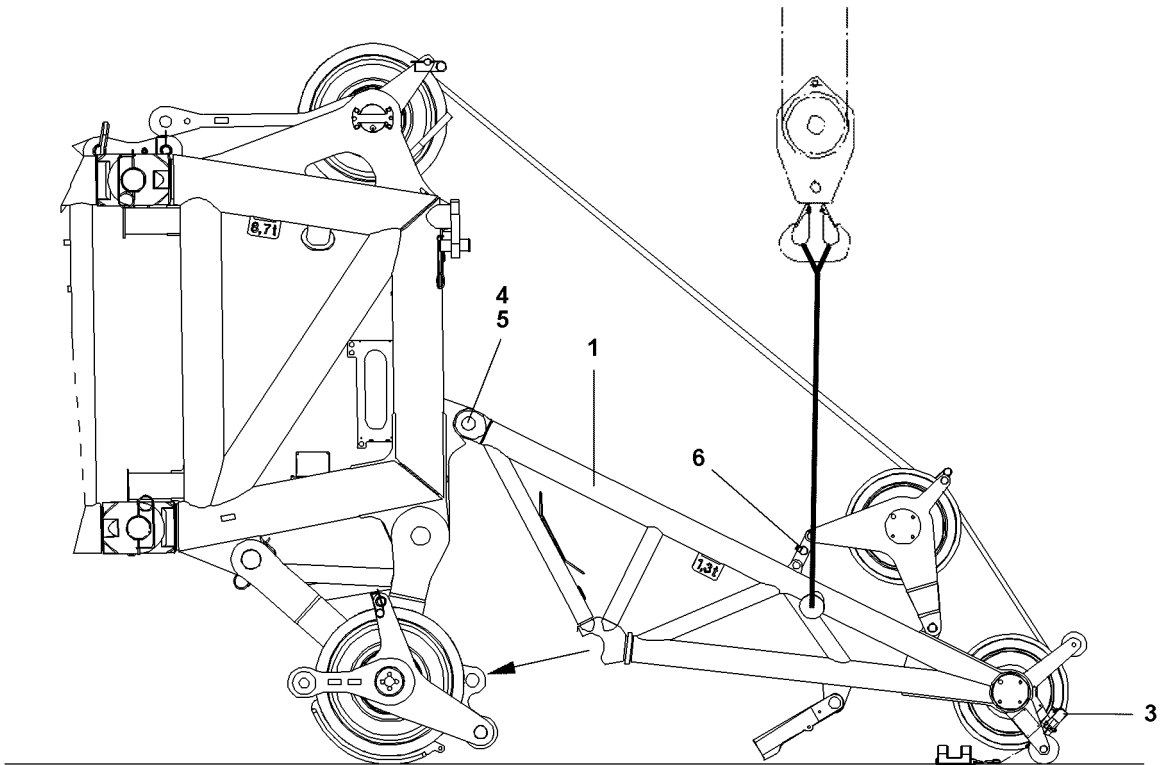


Fig.103003

LWE/LR 11350-007/19005-01-02/en

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!

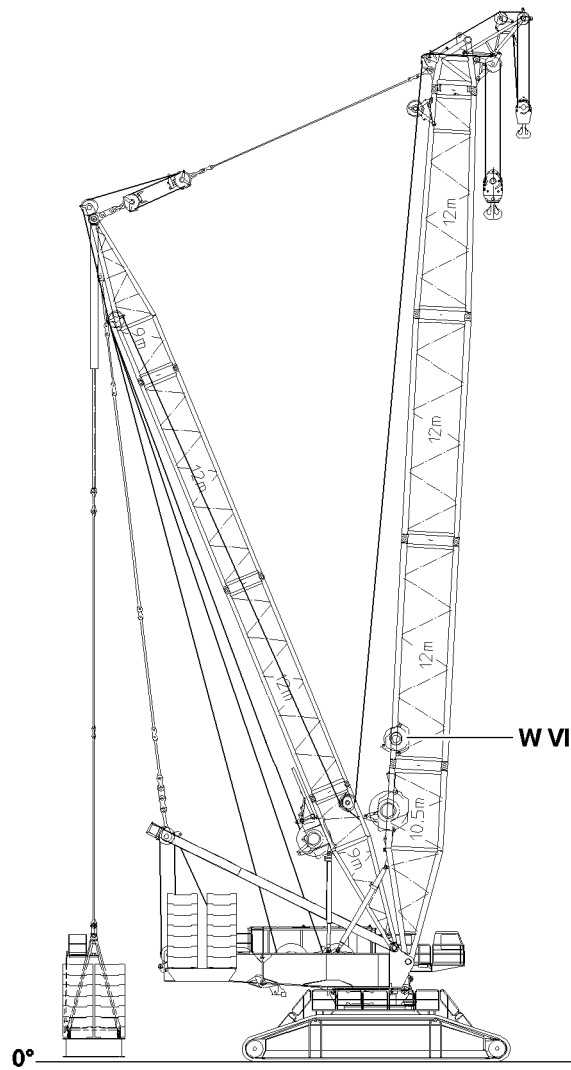
- ▶ Cover the limit switch initiators on the S-relapse cylinders individually with a metal plate.

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.

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LWE/LR 11350-007/19005-01-02/en



LWE/LR 11350-007/19005-01-02/en

Fig.112925

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.

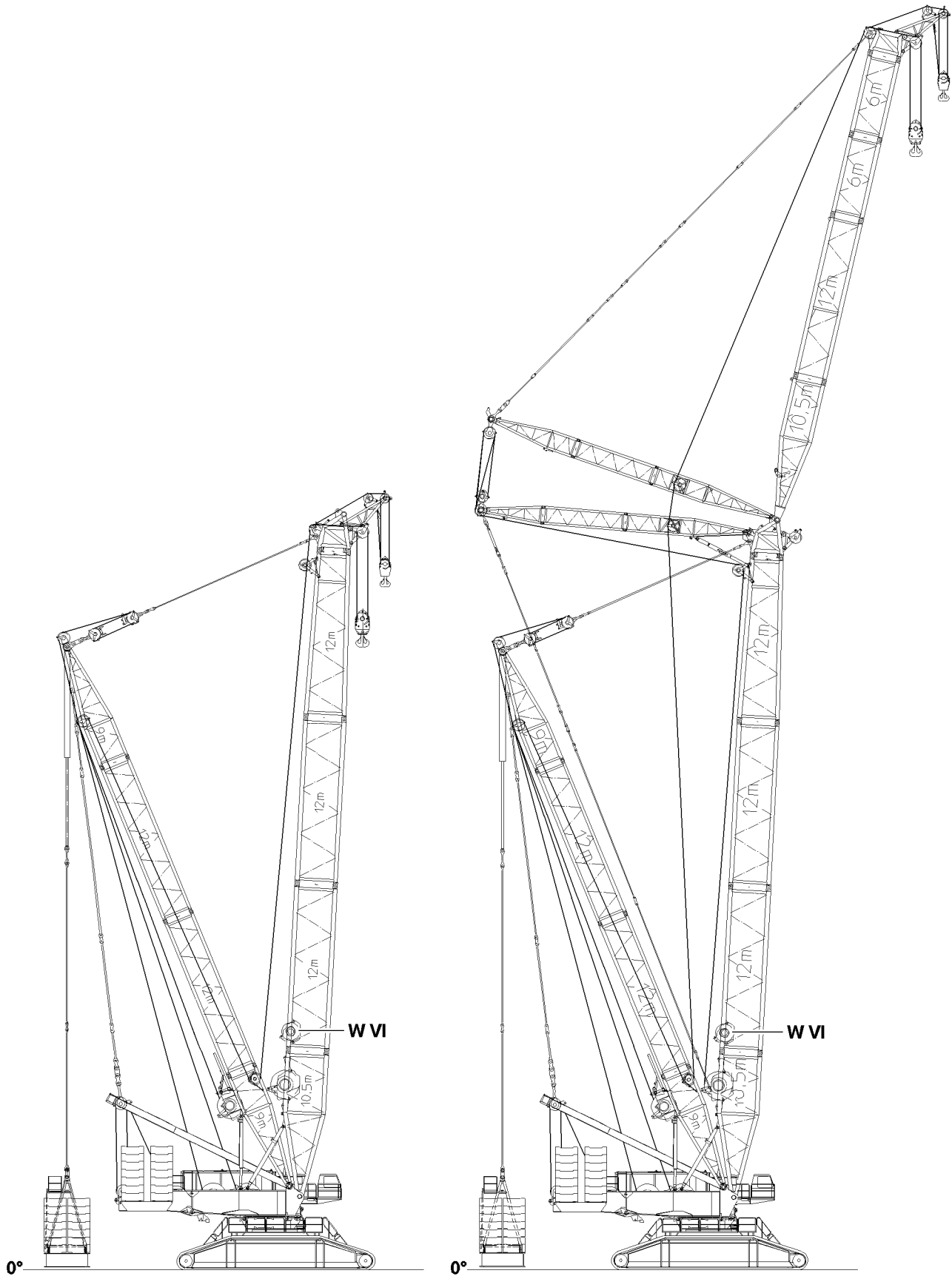


Fig.112926

LWE/LR 11350-007/19005-01-02/en

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.



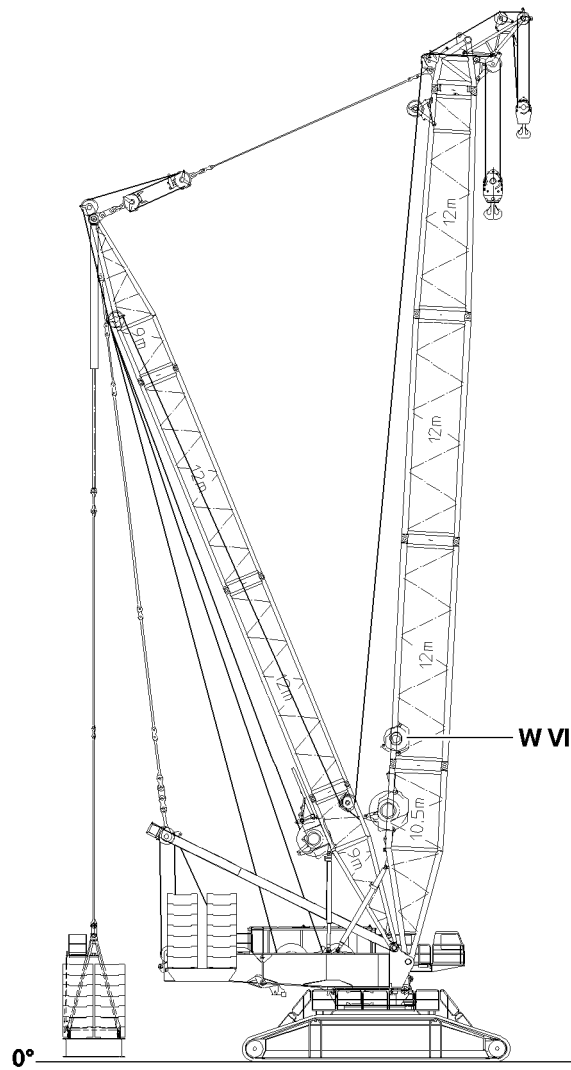
DANGER

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.



LWE/LR 11350-007/19005-01-02/en

Fig.112925

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!



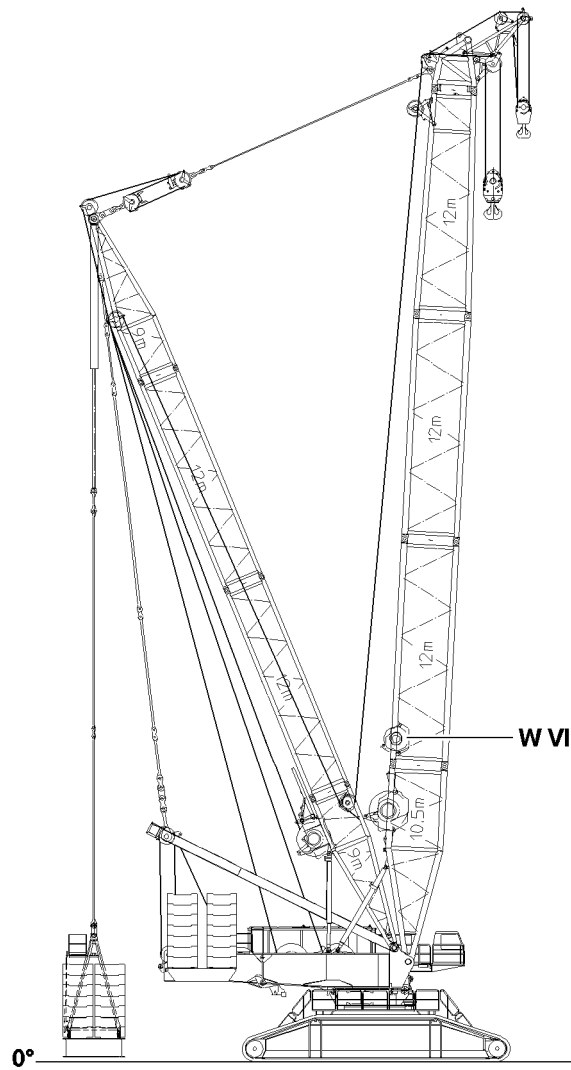
WARNING

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!



LWE/LR 11350-007/19005-01-02/en

Fig.112925

**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!

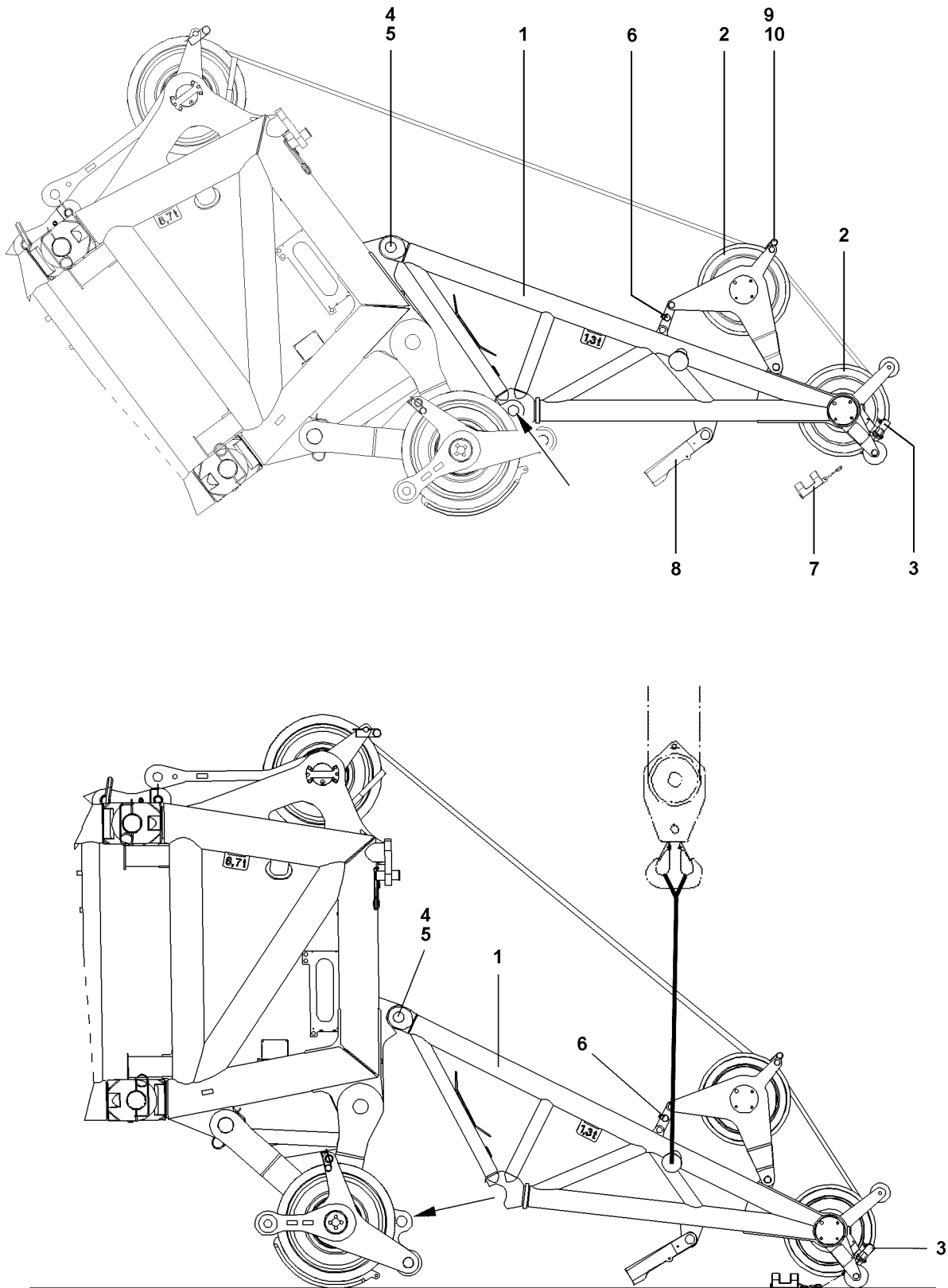


Fig.103007

LWE/LR 11350-007/19005-01-02/en

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.

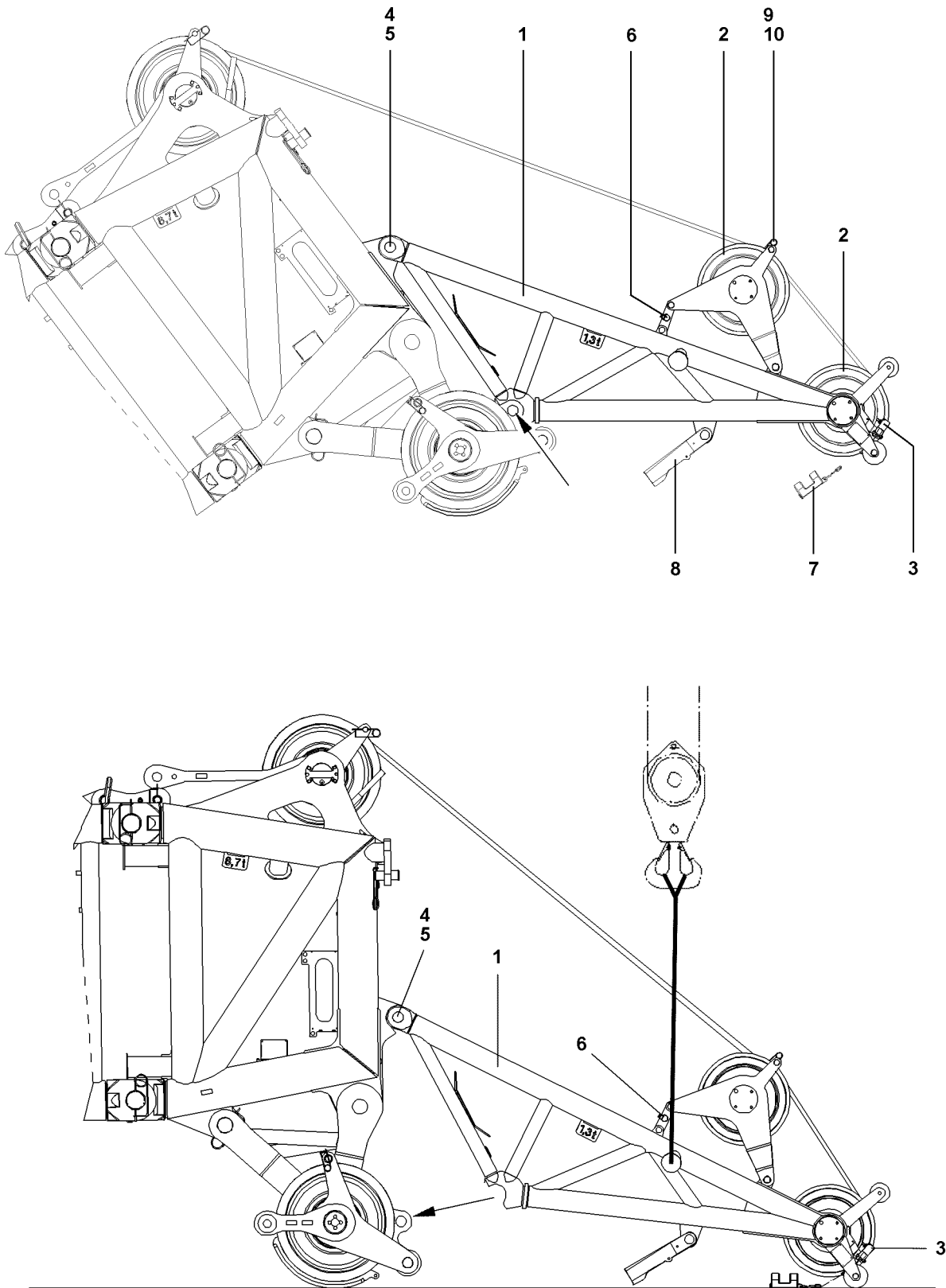


Fig.103007

LWE/LR 11350-007/19005-01-02/en

**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.

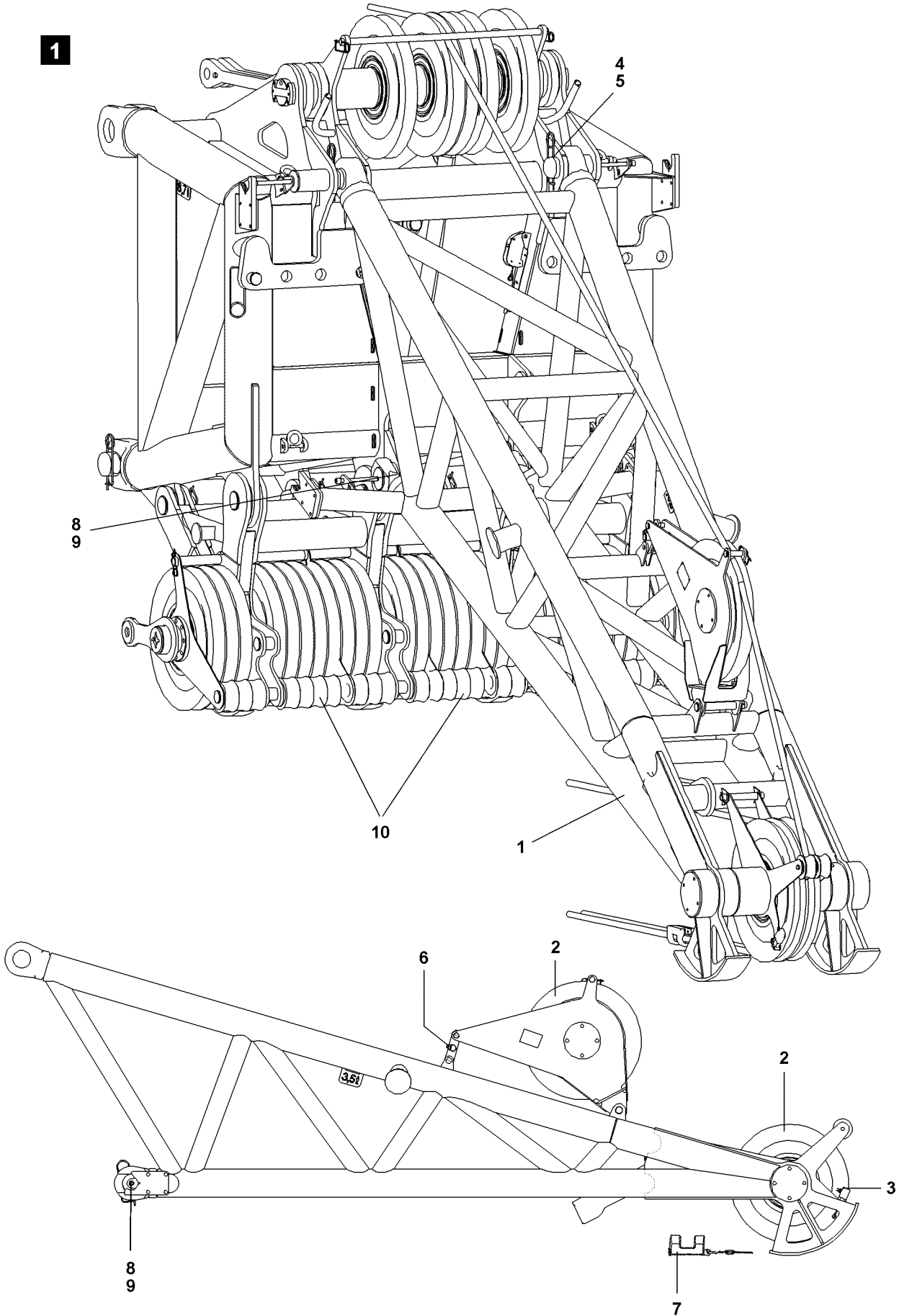


Fig.103344

LWE/LR 11350-007/19005-01-02/en

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 | — |

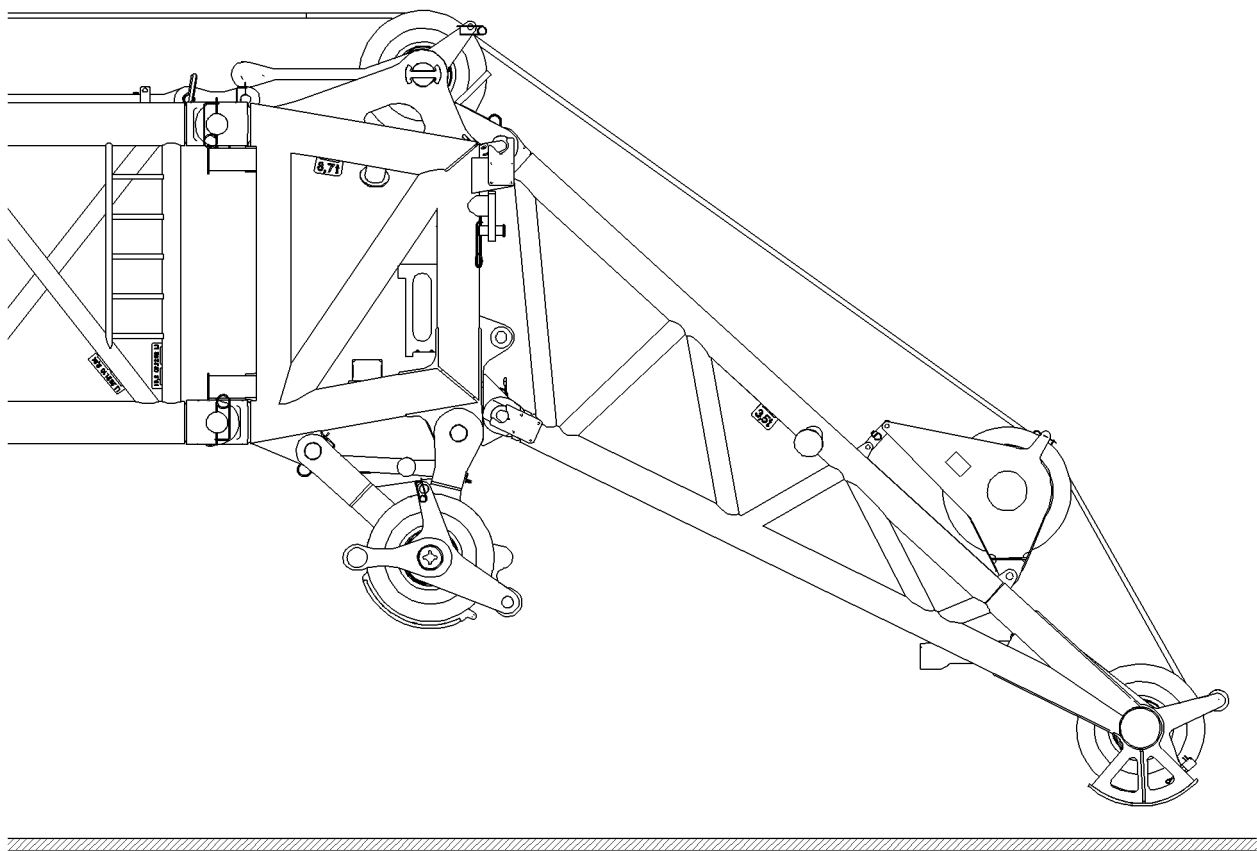


Fig.112927

LWE/LR 11350-007/19005-01-02/en

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!

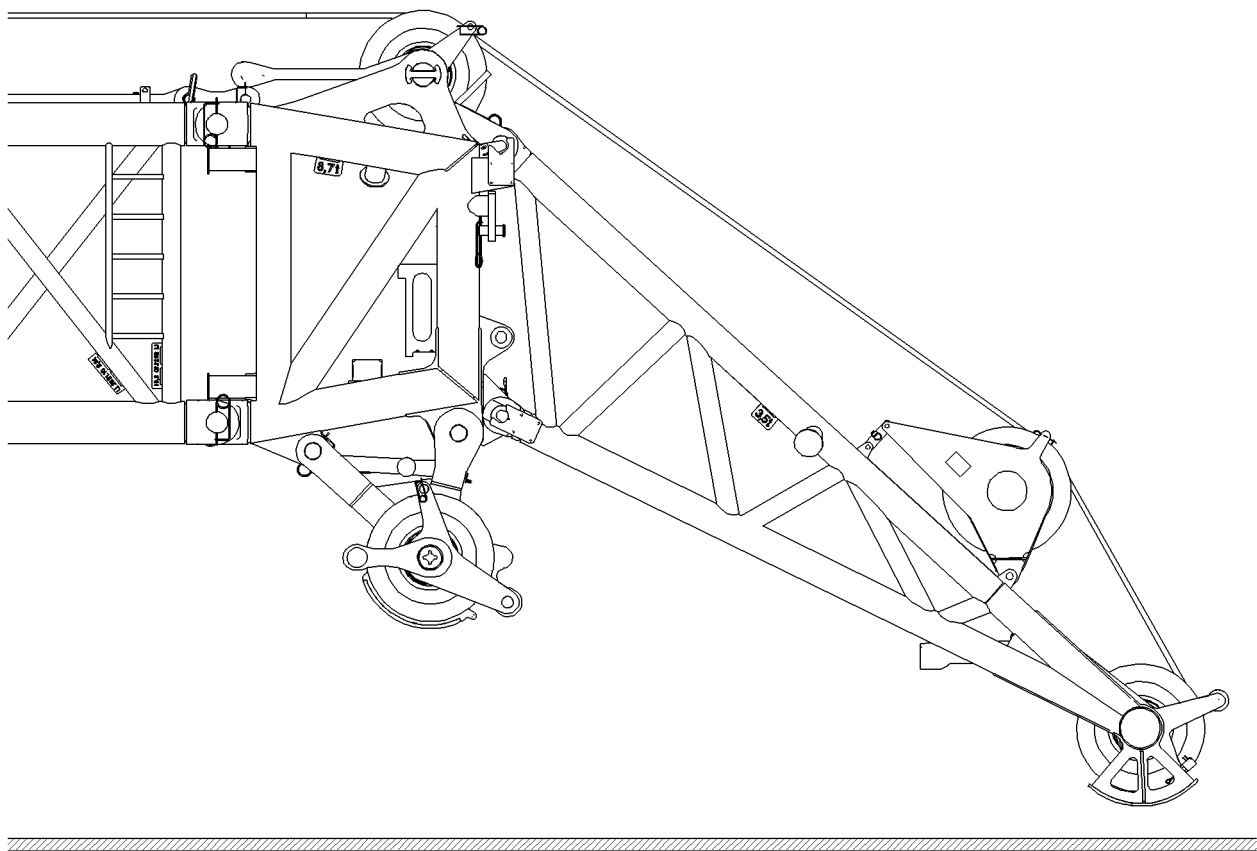


Fig.112927

**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.

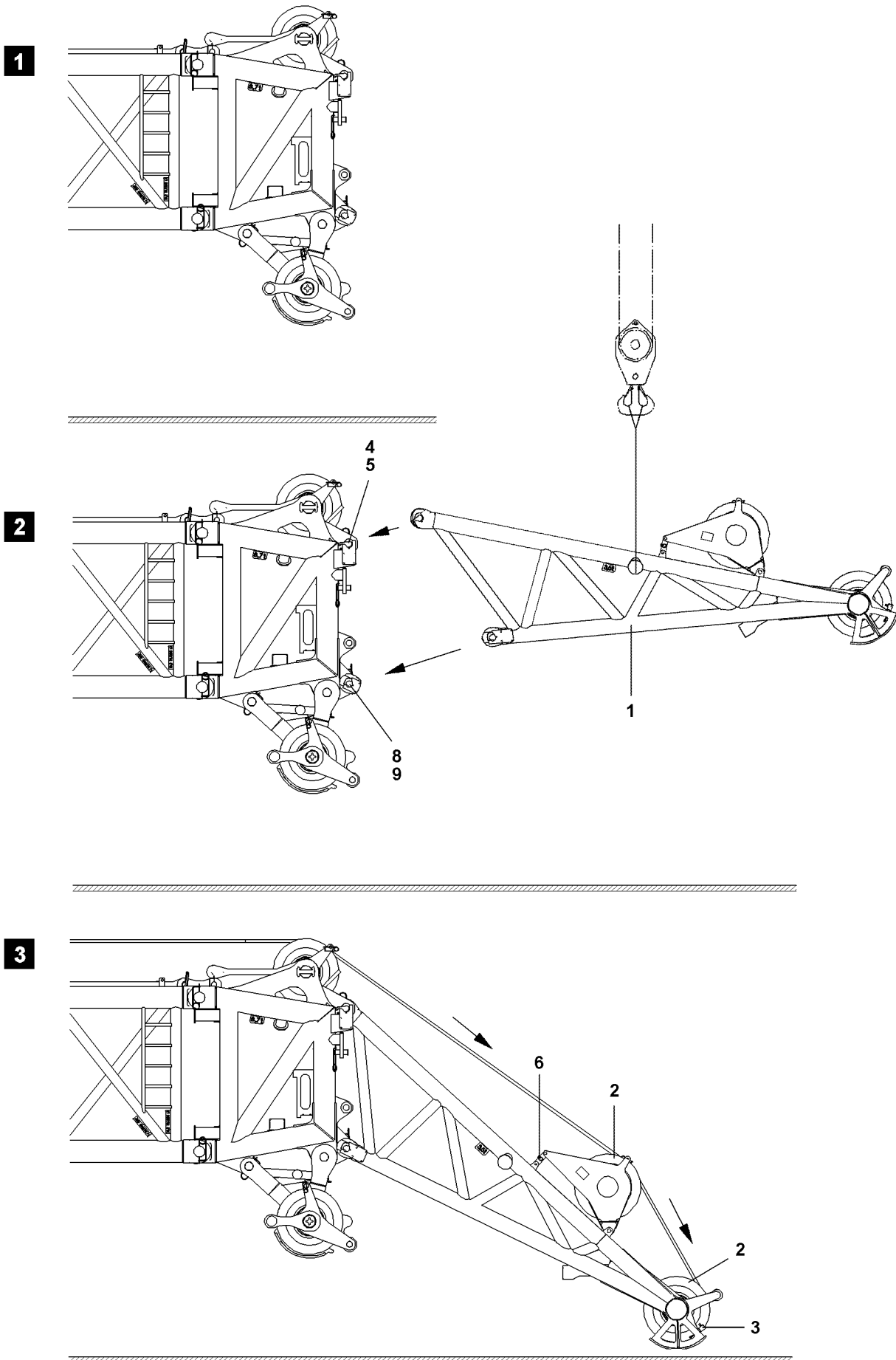


Fig.103346

LWE/LR 11350-007/19005-01-02/en

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.

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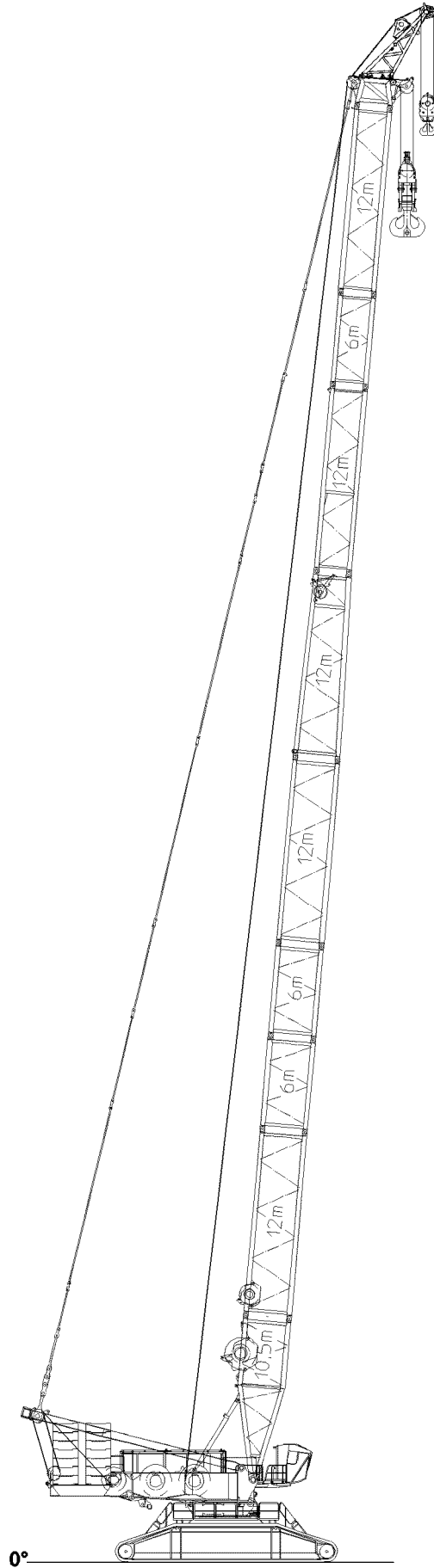


Fig.112928

LWE/LR 11350-007/19005-01-02/en

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.

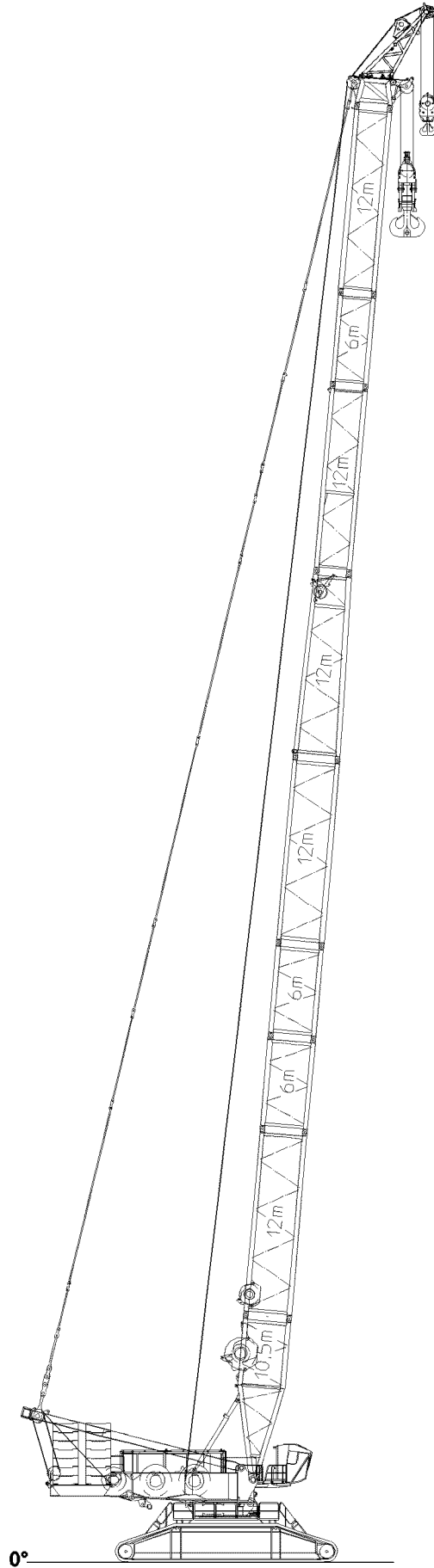


Fig.112928

LWE/LR 11350-007/19005-01-02/en

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

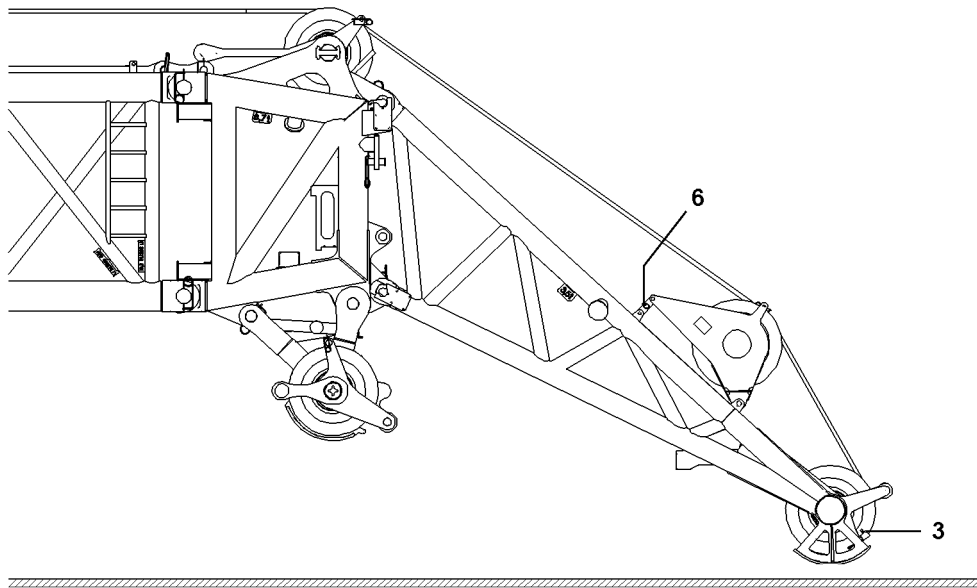
The crane can topple over!

- ▶ 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

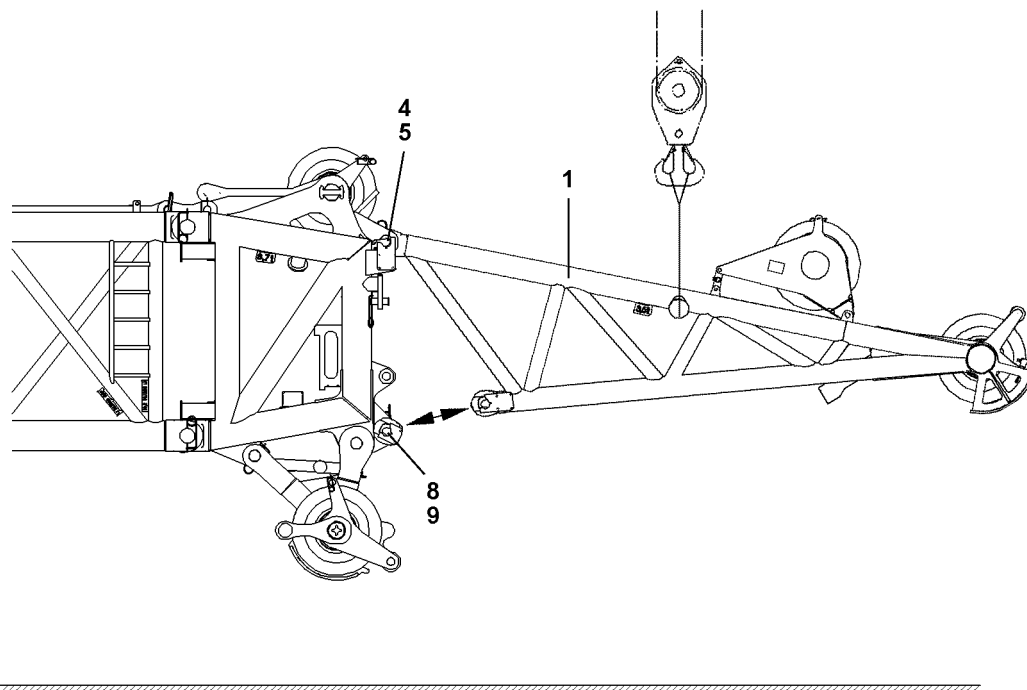


Fig.112929

LWE/LR 11350-007/19005-01-02/en

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

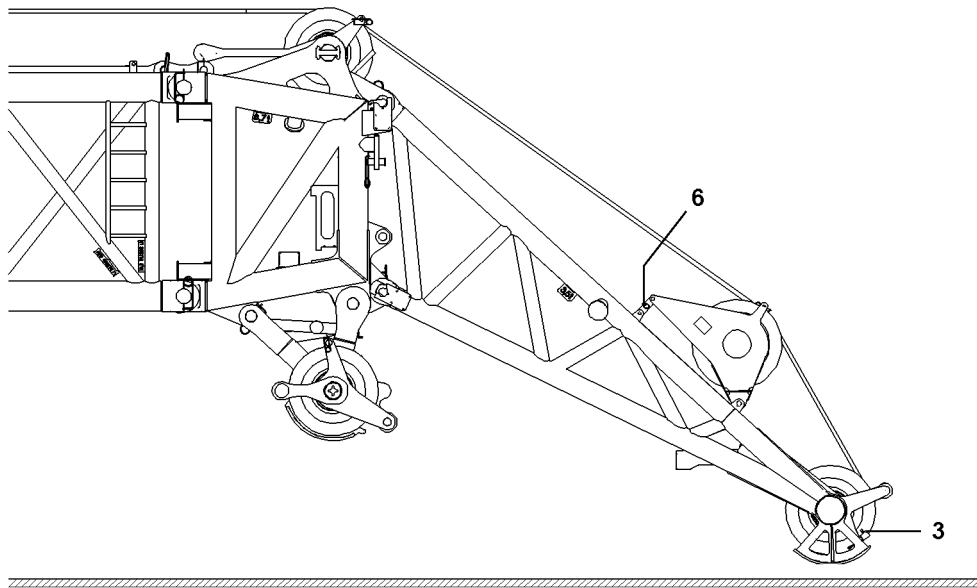
Falling components!

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

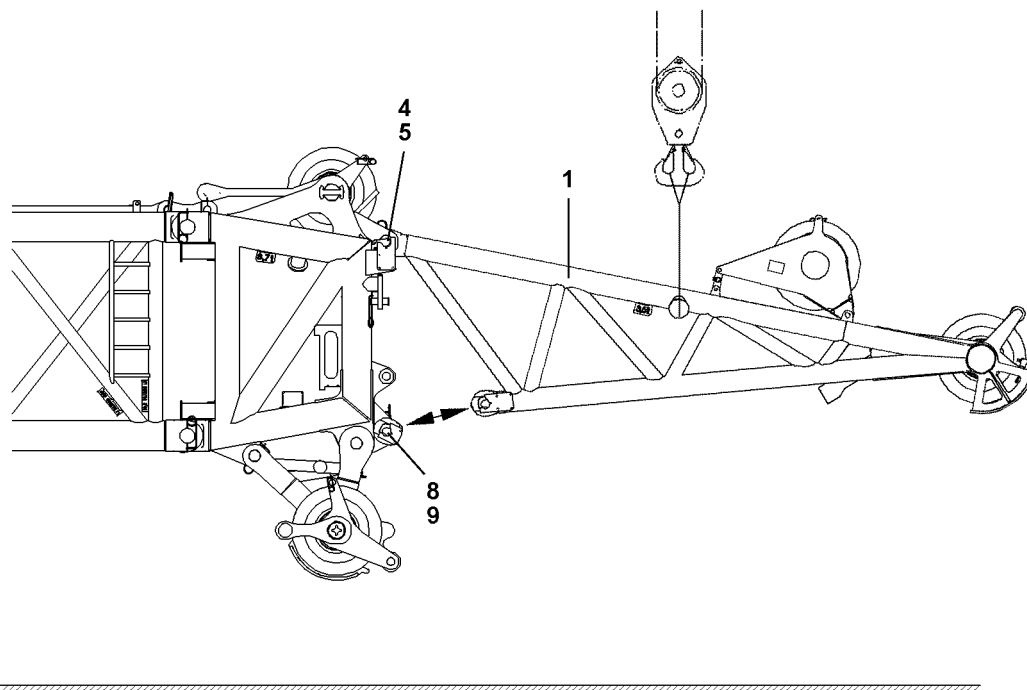


Fig.112929

LWE/LR 11350-007/19005-01-02/en

**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**

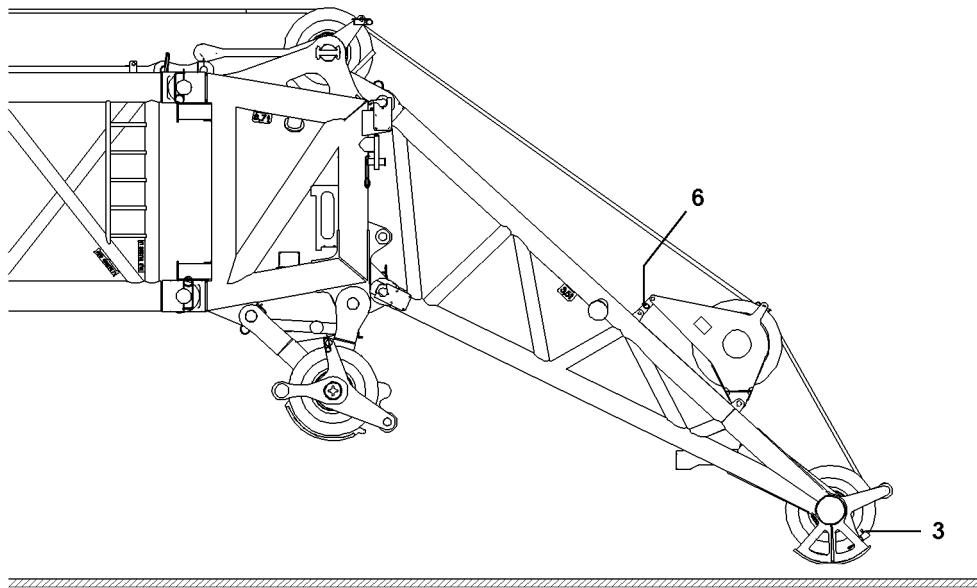
The crane can topple over!

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

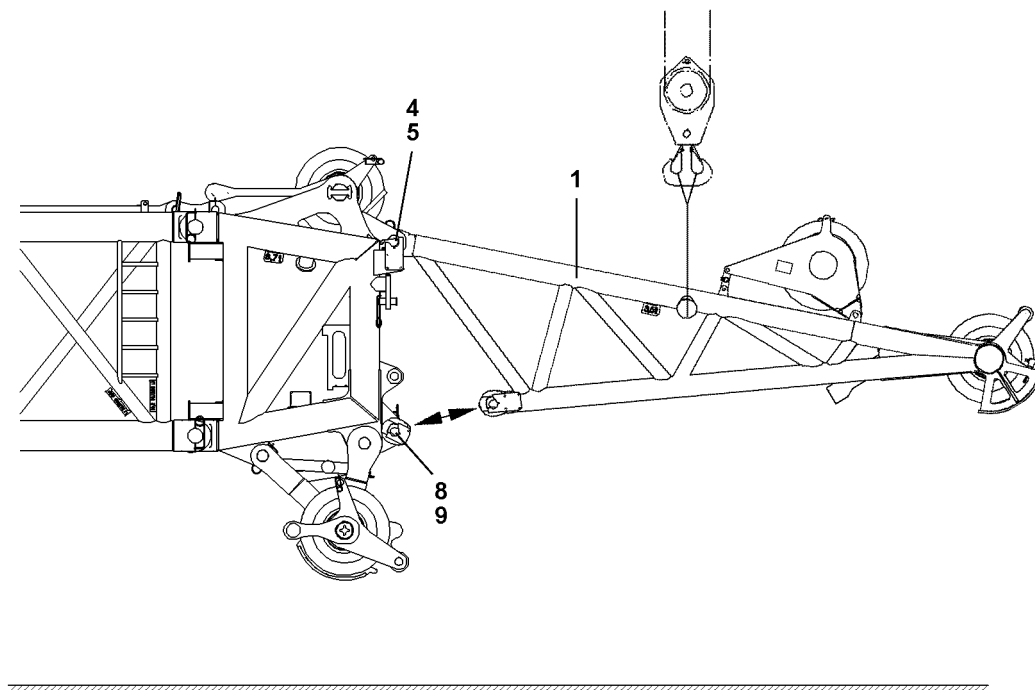


Fig.112929

LWE/LR 11350-007/19005-01-02/en

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.

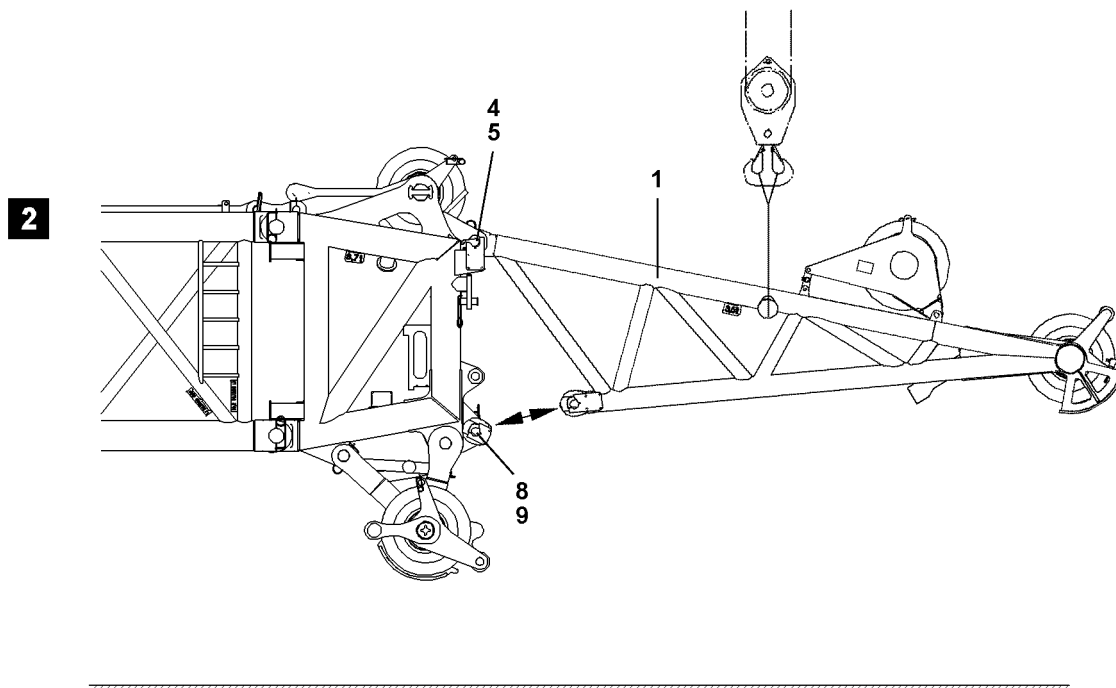
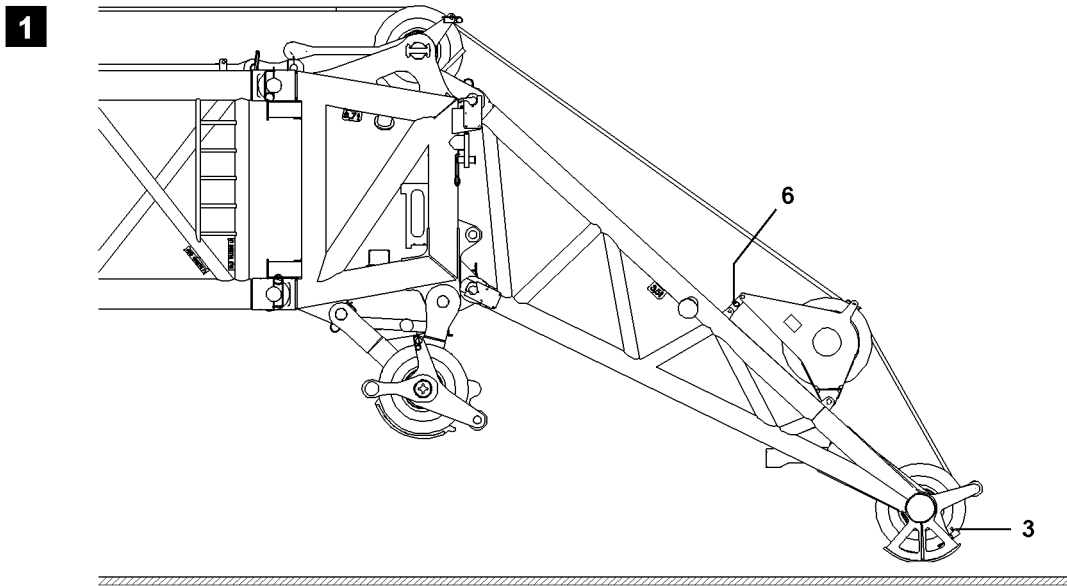


Fig.112929

LWE/LR 11350-007/19005-01-02/en

**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.

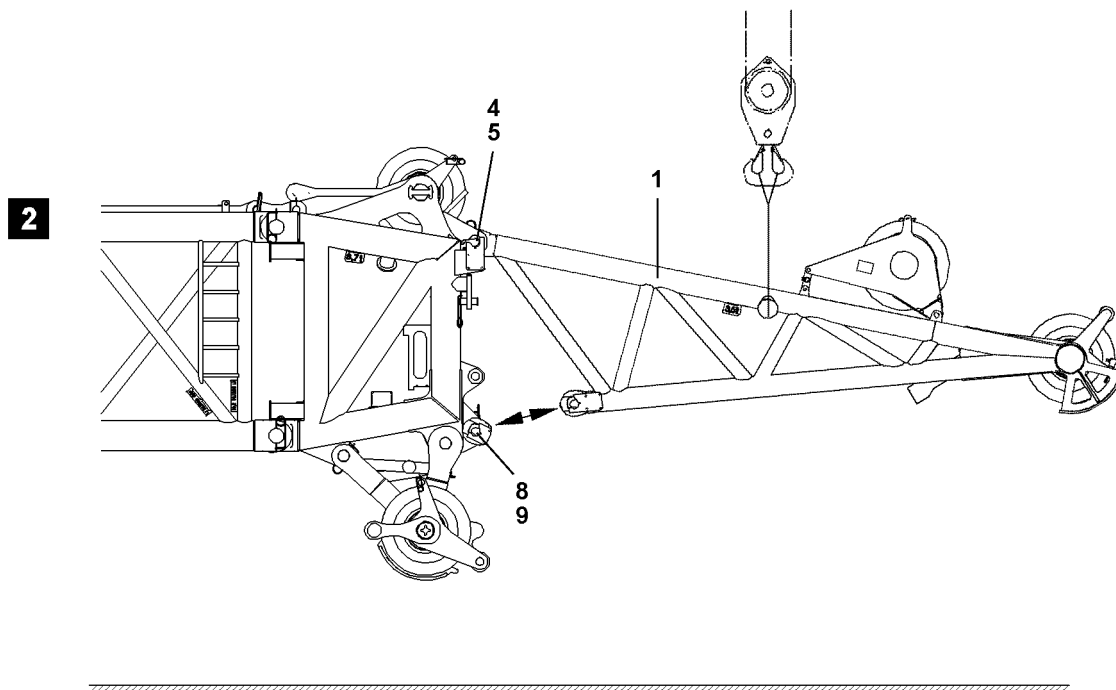
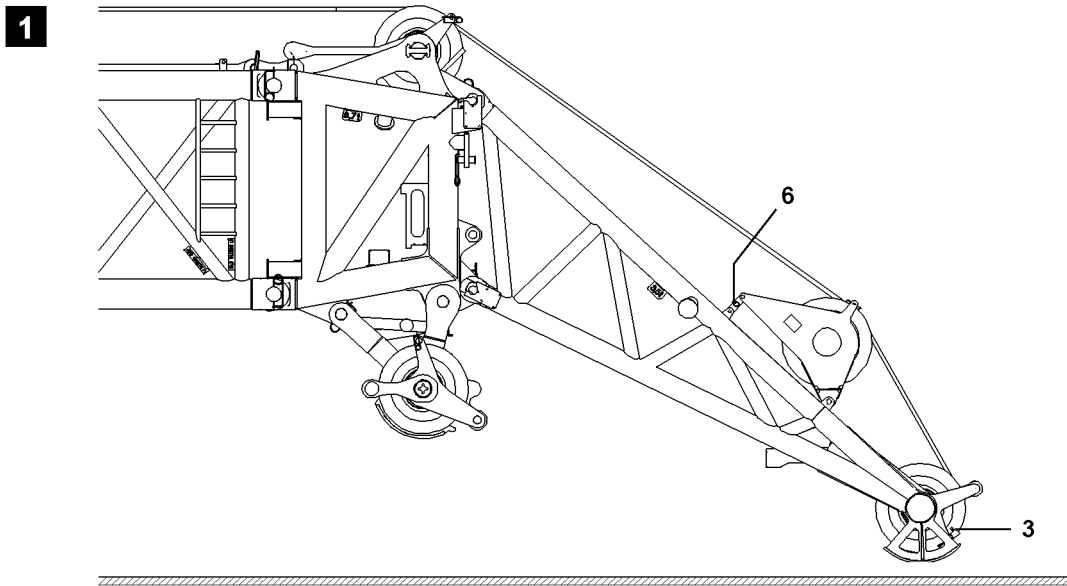


Fig.112929

LWE/LR 11350-007/19005-01-02/en

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**“.

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5.14 Roller set 675t

| | | |
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| 2 | Component overview of the SW-end section with one roller set 675 t | 3 |
| 3 | Component overview of the W-connector head with one roller set 675 t | 4 |
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| 7 | Roller set fastening points | 6 |
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| 9 | W-lattice jib on the W- connector head | 14 |
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1 Component overview of the SW-end section with two roller sets 675 t

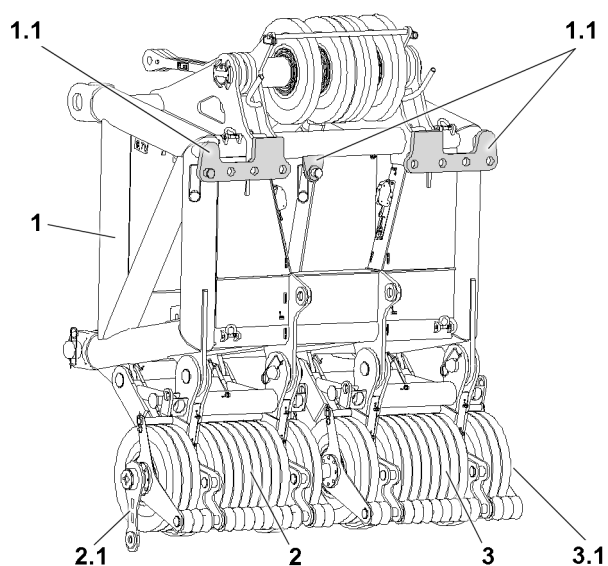


Fig.151892: SW-end section with two roller sets 675 t

- 1 SW-end section
- 1.1 SW- head rope fixed points
- 2 Roller set 675 t right
- 2.1 Rope fixed point roller set right
- 3 Roller set 675 t left
- 3.1 Rope fixed point roller set left

2 Component overview of the SW-end section with one roller set 675 t

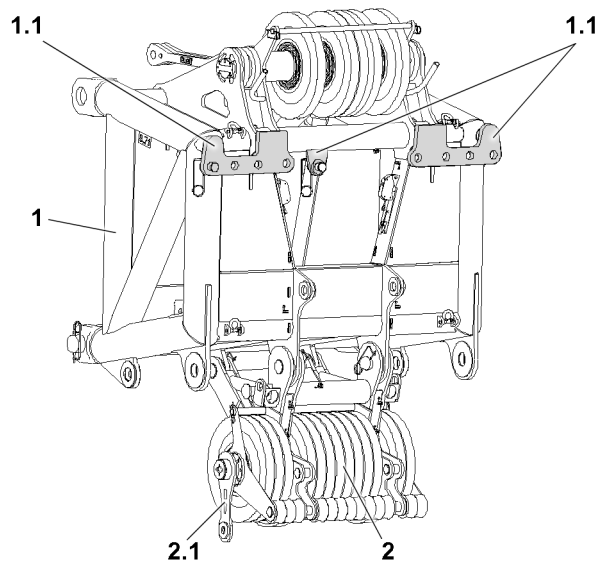


Fig.151893: SW-end section with roller set 675 t right

- 1 SW-end section
- 1.1 SW- head rope fixed points
- 2 Roller set 675 t right
- 2.1 Rope fixed point right



Note

- ▶ If only one roller set 675 t is installed on the SW-end section, then it must **always** be installed centered on the SW-end section.
- ▶ When using only one roller set, it is recommended to install „roller set 675 t right“ on the SW-end section.

3 Component overview of the W-connector head with one roller set 675 t

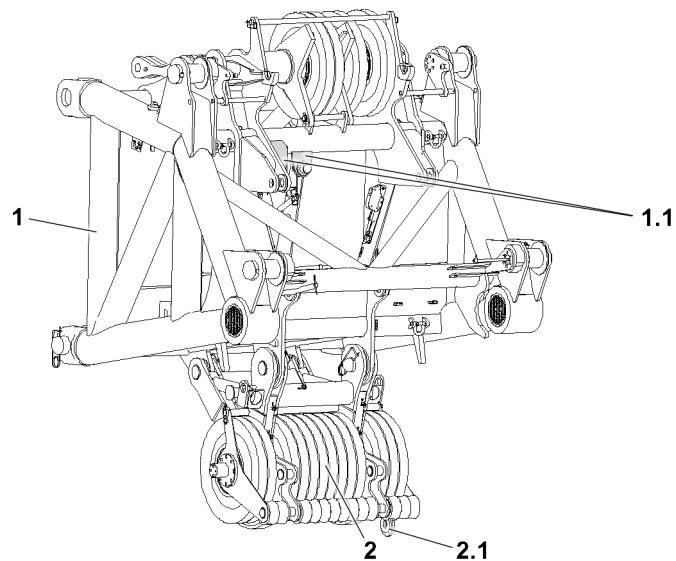


Fig.151894: W-connector head with one roller set 675 t

- 1 W-connector head
- 1.1 Rope fixed points W-connector head
- 2 Roller set 675 t left
- 2.1 Rope fixed point left



Note

- Only one roller set 675 t can be installed on the W-connector head.
- It is recommended to install the „roller set 675 t left“ on the W-connector head.

4 Component overview of the roller set 675 t rack

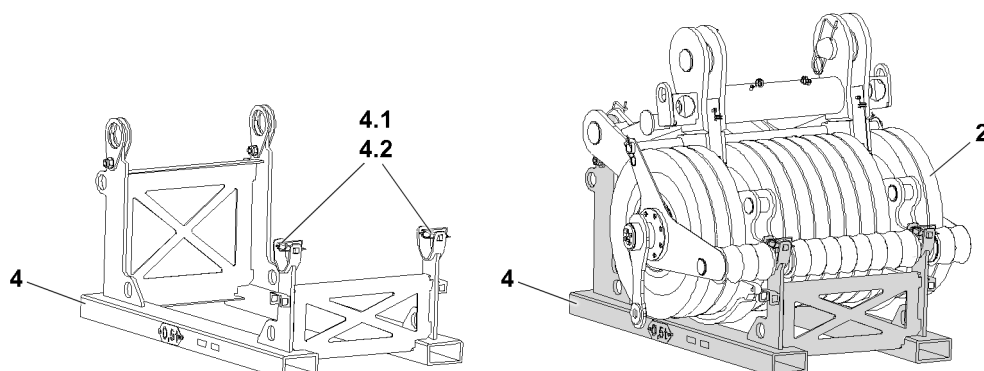


Fig.151895: Roller set 675 t rack for roller set left / right

- 2 Roller set 675 t right
- 4 Roller set rack
- 4.1 Pin
- 4.2 Retaining element

**Note**

- ▶ The receptacle 4 is identical for roller set 675 t right and roller set 675 t left

5 Rack fastening points

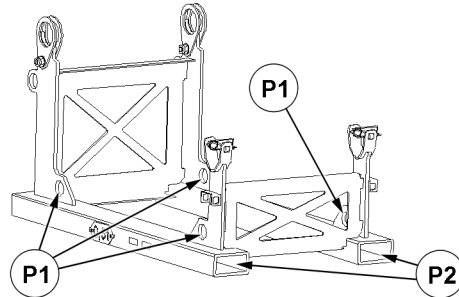


Fig.151896: Rack fastening points

| Fastening points | |
|------------------|--|
| P1 | Fastening points |
| P2 | Receptacles for telescopic lift truck / forklift truck |

**WARNING**

Falling components!

Death, severe bodily injuries, property damage.

- ▶ Fasten components with approved fastening equipment to the defined fastening points **P1**.

or:

- ▶ Pick up components using a telescopic lift truck or forklift truck with a suitable load bearing capacity using the provided receptacles **P2**.

6 Roller set fastening points with rack

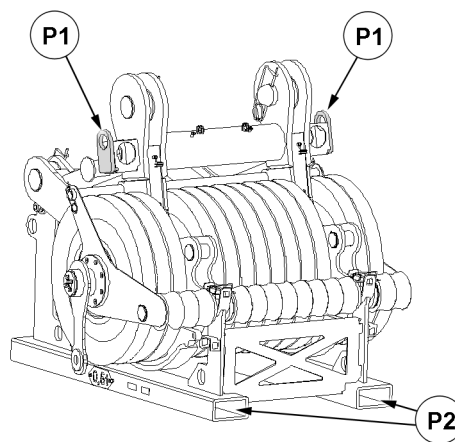


Fig.151897: Roller set fastening points with rack

| Fastening points | |
|------------------|--|
| P1 | Fastening points |
| P2 | Receptacles for telescopic lift truck / forklift truck |

**WARNING**

Falling components!
Death, severe bodily injuries, property damage.

- ▶ Fasten components with approved fastening equipment to the defined fastening points **P1**.

or:

- ▶ Pick up components using a telescopic lift truck or forklift truck with a suitable load bearing capacity using the provided receptacles **P2**.

7 Roller set fastening points

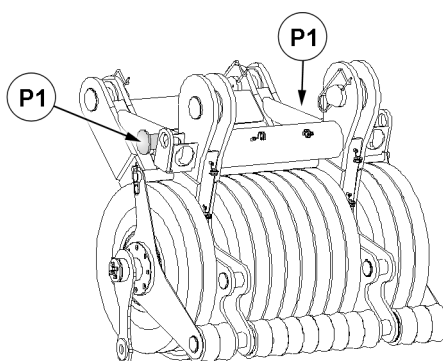


Fig.151898: Roller set fastening points

| Fastening points | |
|------------------|------------------|
| P1 | Fastening points |

**WARNING**

Falling components!
Death, severe bodily injuries, property damage.

- ▶ Fasten components with approved fastening equipment to the defined fastening points.

8 Assembling the roller set on the SW-end section with rack



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.



WARNING

Danger of impact / crushing!

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

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

Death, severe bodily injuries, property damage.

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



DANGER

The components can fall down!

If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.

Death, severe bodily injuries, property damage.

- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.



WARNING

Falling roller set!

If the roller set is not pinned and secured correctly, then it can fall down.

Death, severe bodily injuries, property damage.

- ▶ Pin or unpin both pins, which are laying in one horizontal level.
- ▶ It is prohibited to stand under the roller set or within the complete danger zone during the pinning and unpinning procedure of the roller set.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.

**WARNING**

The crane can topple over!

If the roller set is improperly assembled, the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Observe the Erection and take down charts.
- ▶ Observe the load charts.
- ▶ Pay attention to the designation on the roller set.

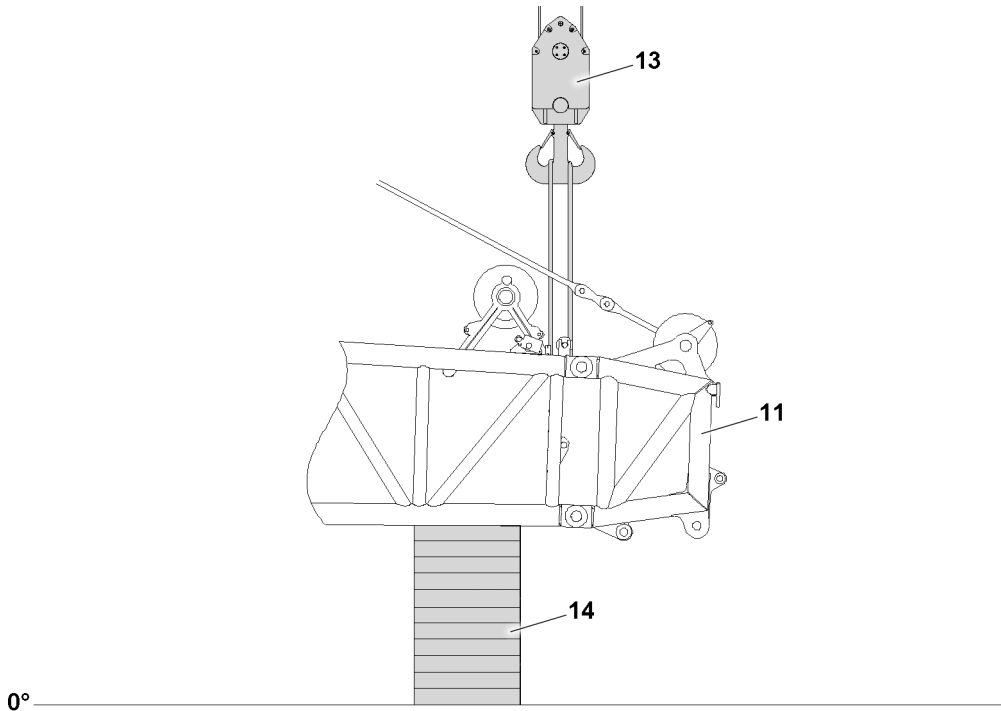


Fig.149980: Securing the main boom with the auxiliary crane **13** or with the substructure **14**

**Note**

- ▶ For assembly of the roller set on the main boom, the main boom can be held by its own main boom guying.
- ▶ Liebherr-Werk Ebingen GmbH recommends securing the main boom additionally upon assembly of the roller set(s) with an auxiliary crane **13** with sufficient load bearing capacity **or** to support it with load bearing materials **14**.

**WARNING**

Working under a suspended load!

The boom can fall down.

Death, severe bodily injuries, property damage.

- ▶ Make sure that there is no personnel in the danger zone.
- ▶ Make sure that the auxiliary crane is properly supported and horizontally aligned.
- ▶ Make sure that the utilization of the auxiliary crane is **maximum 90 %**.
- ▶ Make sure that the engine of the auxiliary crane is turned off during assembly of the roller set.
- ▶ When assembling the roller set on the W-lattice jib, make sure that the W-lattice jib is held securely by the auxiliary crane or that the boom is supported with load bearing materials.

**WARNING**

Impermissible fastening equipment!

The boom can fall down.

Death, severe bodily injuries, property damage.

- ▶ Use only inspected fastening equipment.
- ▶ Use only load bearing and approved substructures.

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- The boom system is completely closed.
- The SW-end section or W-connector head is properly assembled and secured.
- The SW-end section or W-connector head is located at a suitable assembly distance above the ground.
- The boom system is supported with materials **14** with load bearing capacity.
- **or**
- The boom system is safely held by the auxiliary crane **13**.
- An assembly scaffolding / work platform is available.
- A telescopic handler / forklift is available.
- The roller set **1** is properly installed on the rack **2**.
- The pins on the roller set **1** are unpinned on both sides in point **P1**.
- The pins on the roller set **1** are unpinned on both sides in point **P3**.

8.1 Assembling the roller set with a telescopic handler / forklift



Note

- ▶ The assembly of the roller set(s) is described based on the sample of the SW-end section.
- ▶ Only the assembly of one roller set on the SW-end section is described.
- ▶ The assembly of the second roller set is identical to the assembly of the first roller set.
- ▶ The assembly of the roller set(s) is described based on the example with a telescopic lift truck.
- ▶ The assembly of the roller set(s) on the W-connector head is identical to the assembly on the SW-end section.

Make sure that the following prerequisites are met:

- The pin points **P1** are clear.
- The pins **8** in the roller set **1** are in the park position in point **P10**.

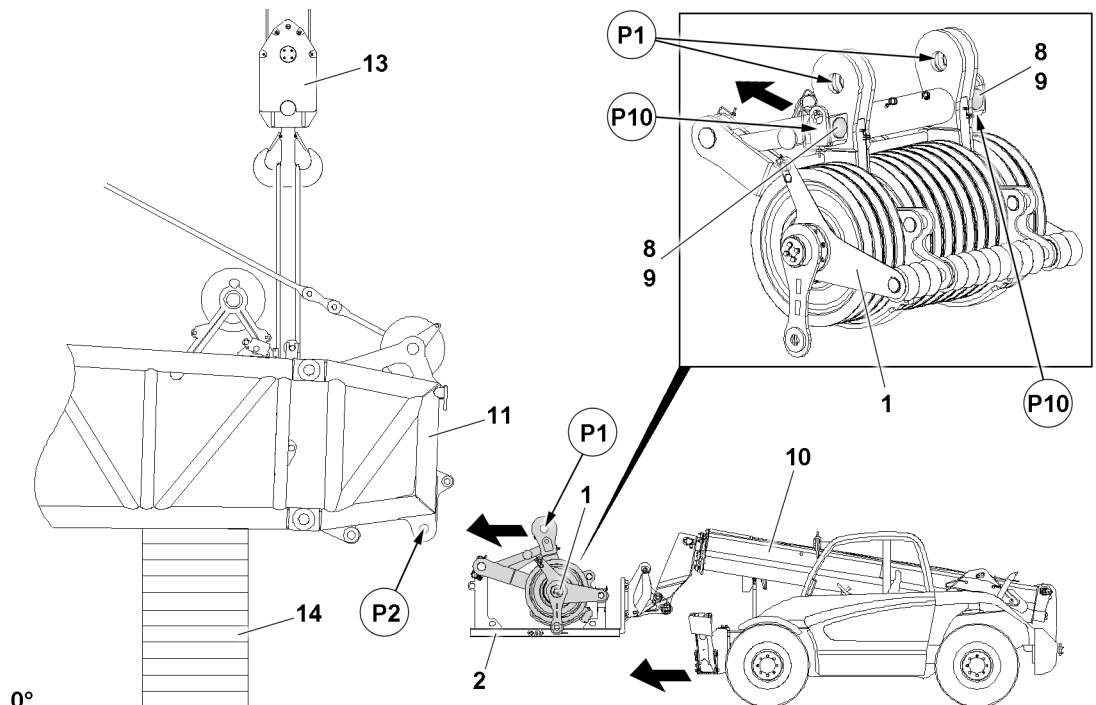


Fig.151899: Retracting the roller set with the telescopic handler / forklift to the SW-end section

- ▶ Properly pick up the rack **2** with an installed roller set **1** with the telescopic handle / forklift **10**.
- ▶ Lift the roller set **1** with the telescopic handler / forklift **10** and retract it into the pin points **P2** on the SW-end section **11**.
- ▶ Align the pin bores **P1** in the roller set **1** with the pin bores in point **P2** using a telescopic handler / forklift **10**.

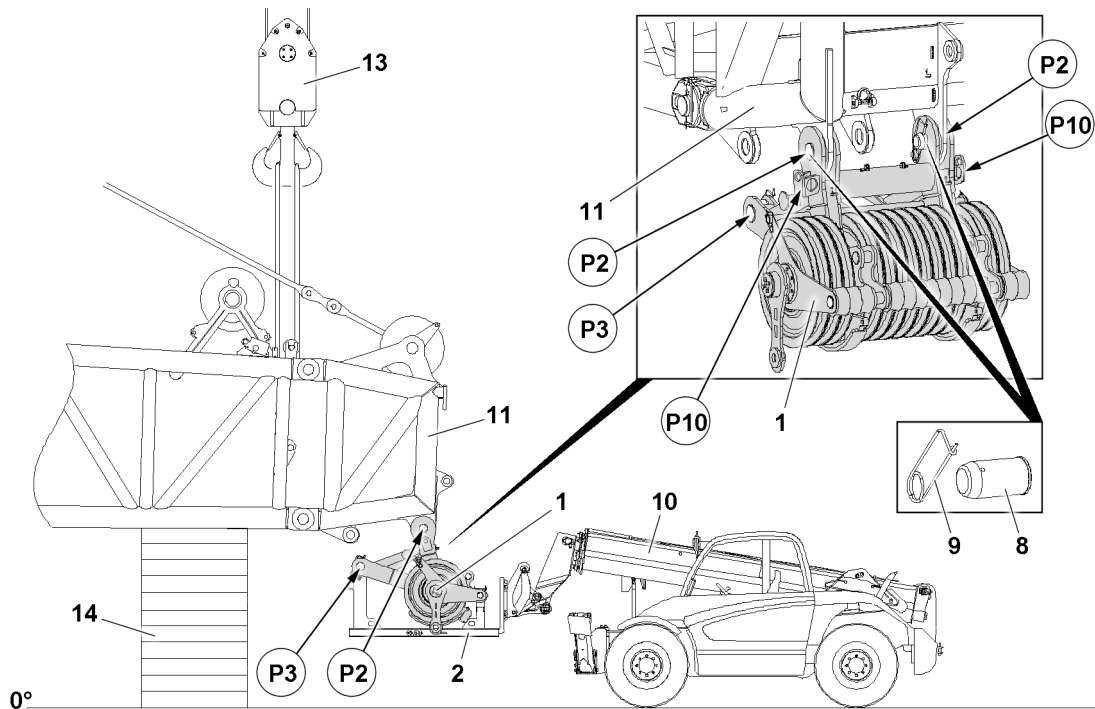


Fig.151900: Aligning and pinning the roller set 1 on the SW-end section 11



Note

- Each of the maximum of two roller sets 1 that can be assembled on the SW-end section is pinned a total of four times on the SW-end section.

When the pin bores of the roller set 1 (points P1) align with the pin bores in the SW-end section 11 (points P2):

- Pinning the roller set 1 to the SW-end section 11: Remove the pin 8 from the park position on the roller set in point P10 and insert it in point P2 on both sides from the outside to the inside and secure with the retaining element 9.

Result:

- The roller set 1 is pinned in point P2 on the SW-end section 11.



WARNING

Falling pins!

If the pins from point P3 for the further assembly of the roller set are not inserted and secured in the park position in point P10, the pins can fall down.

Death, severe bodily injuries, property damage.

- Make sure that when handling the pin 8 that no persons are located in the danger zone.
- Insert the pin 8 after unpinning in point P3 immediately in the park position in point P10.

If the roller set 1 is properly pinned and secured in point P2 on both sides:

- Unpin the roller set 1 on the rack 2: Remove the retaining element 9 and unpin the pin 8 at point P3 on both sides.

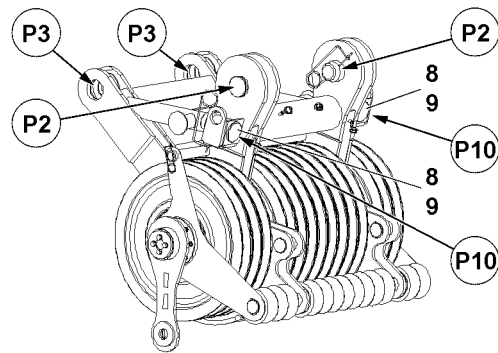


Fig. 151901: Roller set

- ▶ After unpinning the pin **8** in points **P3** immediately insert it in the park position in point **P10** and properly secure with the retaining element **9**.

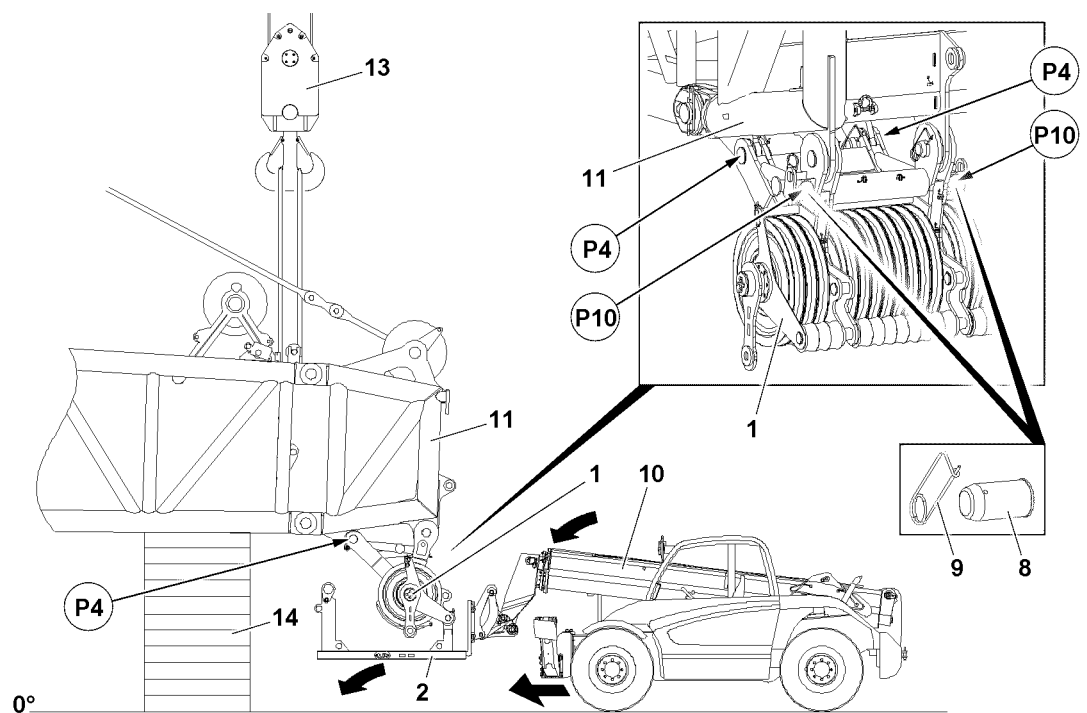


Fig. 151902: Positioning the roller set **1** with the telescopic handler / forklift **10** and pinning on the SW-end section **11**



WARNING

Danger of crushing!
Death, severe bodily injuries, property damage.

- ▶ Make sure that the roller set **1** is positioned using the telescopic handler / forklift **10** very carefully and at the lowest speed in the pin points **P4**.
- ▶ Make sure that there is no personnel in the danger zone.
- ▶ By slowly lowering the rack **2** while driving the telescopic handler / forklift **10** forward to the SW-end section, position the roller set **1** on the SW-end section **11** in points **P4**.

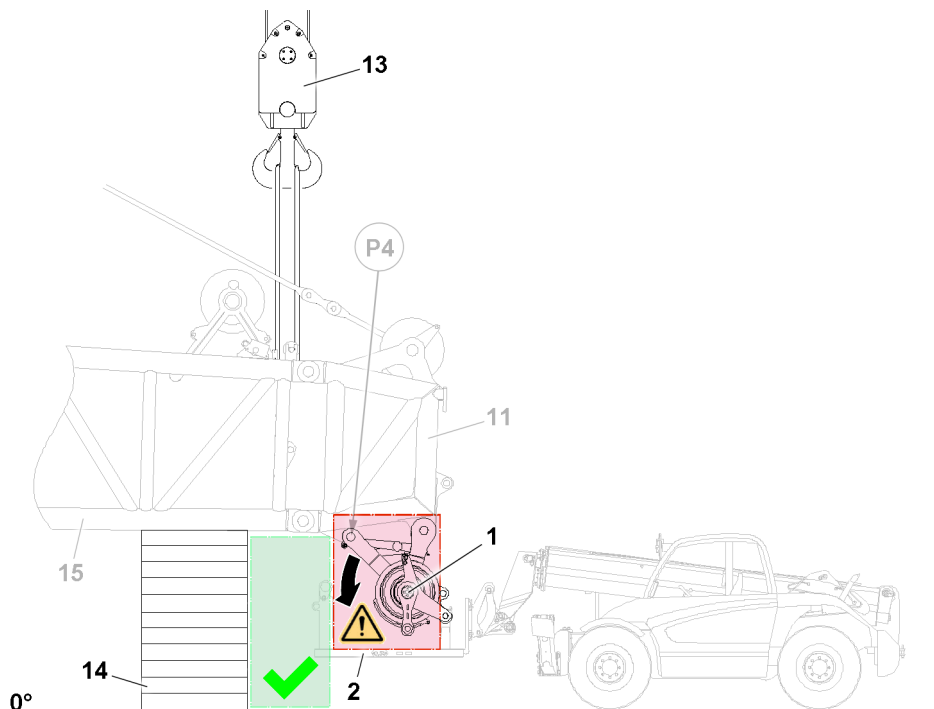


Fig. 149982: Assembling the roller set



WARNING

Danger of crushing when folding back the roller set **11**!
The roller set can swing away during assembly on the SW-end section.
Death, severe bodily injuries, property damage.

- ▶ Make sure that assembly personnel remains on the lattice section side at the lattice section **15** when pinning the roller set **1** in the pin points **P4**.
- ▶ It is prohibited to remain on the rack **2**.
- ▶ It is prohibited for anyone to remain in the slewing range of the roller set **1**.

When the pin bores between the roller set **1** and the SW-end section **11** align on both sides in point **P4**:

- ▶ Pin the roller set **1** in point **P4** on both sides with the SW-end section **11**: Unpin the pin **8** from the park position in point **P10** and insert it in point **P4** from the outside to the inside and secure with the retaining element **9**.

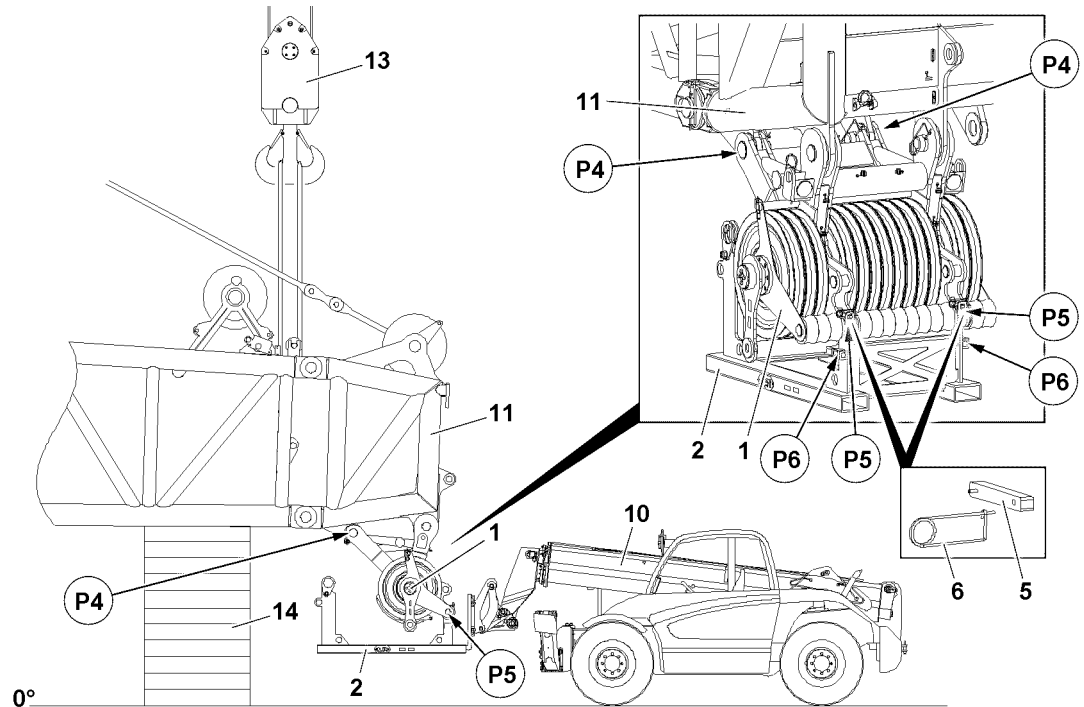


Fig. 151903

When the roller set 1 is properly pinned and secured in points P4:

- ▶ Release the roller set 1 on the rack 2: Remove the retaining element 6 on both sides in point P5 and unpin the pin 5.
- ▶ Insert the pin 5 in the park position P6 and secure with the retaining element 6.

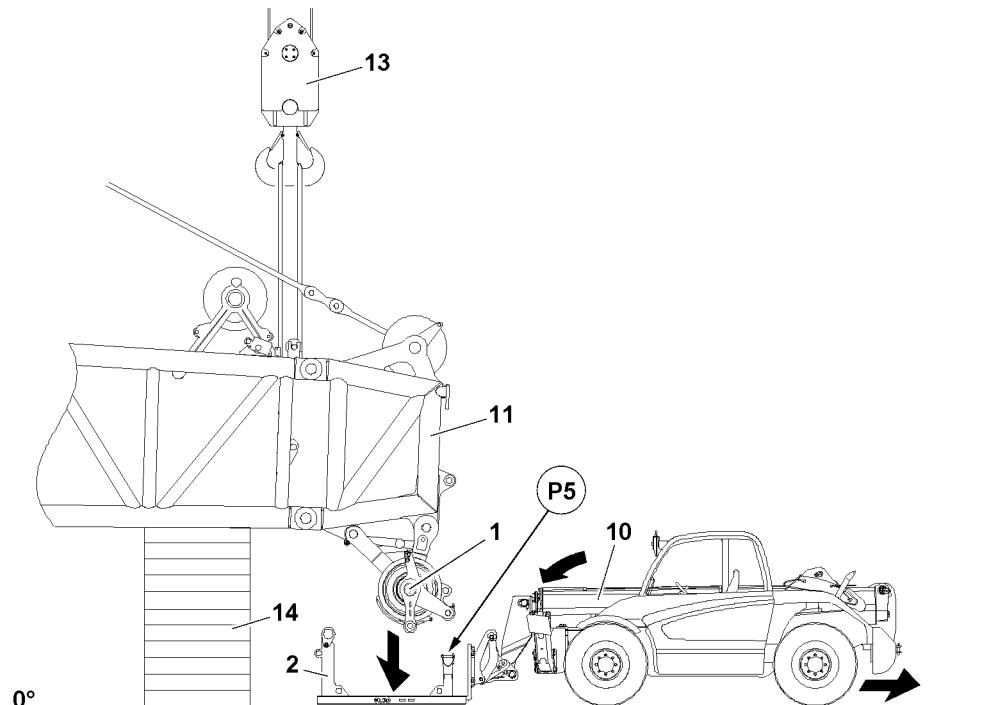


Fig. 151904

When the roller set 1 is unpinned on both sides on the rack 2 in point P5:

- ▶ Carefully lower the rack 2 with the telescopic handler / forklift 10.
- ▶ Remove the rack 2 with the forklift 10.

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Result:

- The roller set is assembled.

**Note**

- ▶ Establish the electrical connections on the SW-end section and / or the W-connector head according to the electrical wiring diagram.

If it is necessary to install an additional roller set for the upcoming hoist:

- ▶ Install a second roller set in the same manner as the assembly of the first roller set in the designated installation position.

9 W-lattice jib on the W- connector head

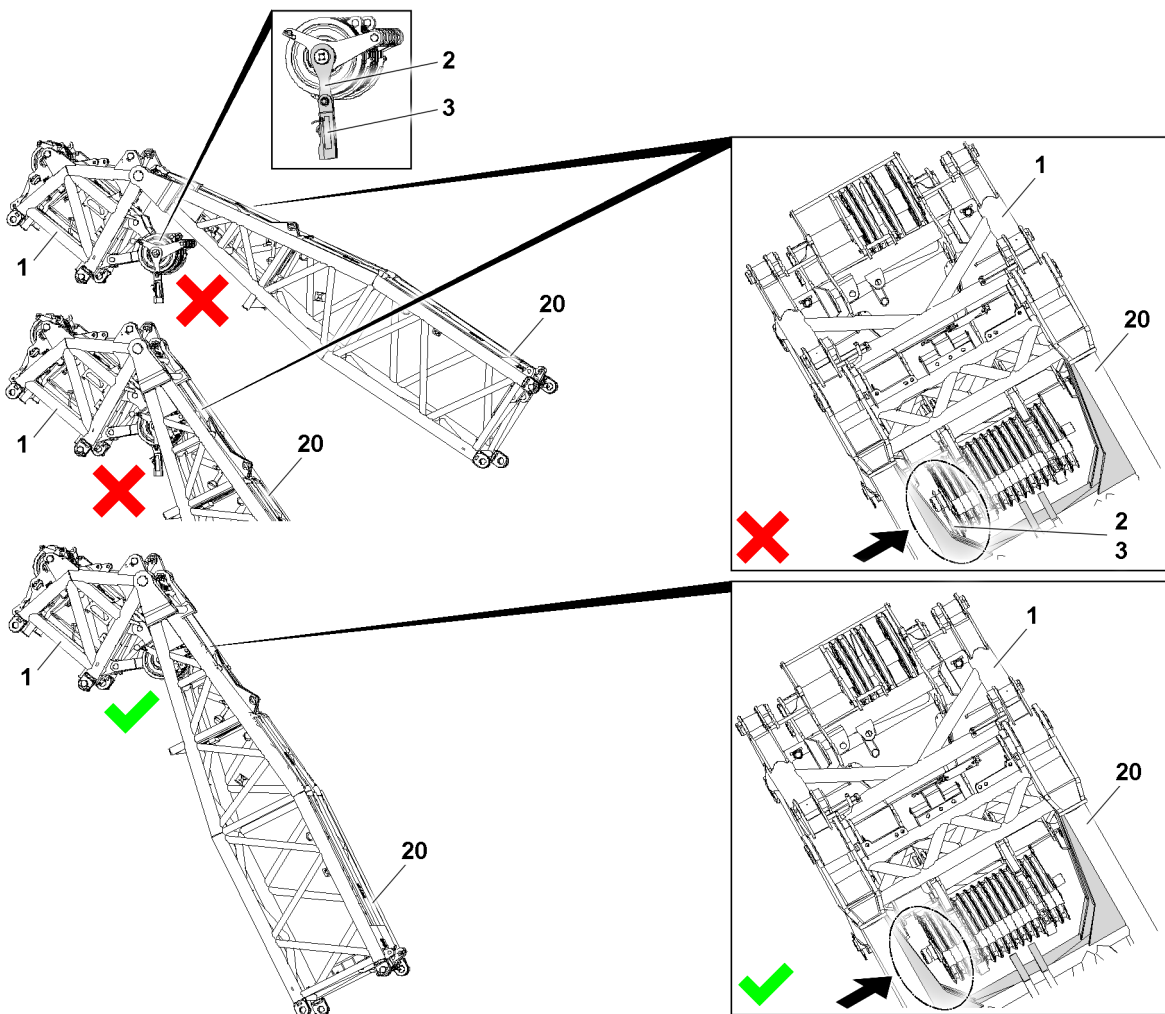


Fig.149989: Danger of collision: W-lattice jib/W-pivot section 20 an W-connector head 1

**Note**

- ▶ The „roller set 675 t right“ is shown in the illustration.
- ▶ Liebherr-Werk Ehingen GmbH recommends installing the „roller set 675 t left“ on the W-connector head 1.
- ▶ Independently of the installed roller set there is danger of collision in general with the W-pivot section 20 if the rope fixed point 2 is installed on the roller set.

**WARNING**

Falling crane components!

If, when the roller set is installed on the W-connector head **1**, the W-lattice jib is installed on the W-connector head **1** and the lock **3** and the rope fixed point **2** on the roller set are **not** removed, the roller set and the W-pivot section **20** can be damaged or ripped off during assembly of the W-lattice section. Crane components can fall down from a great height.

Death, severe bodily injuries, property damage.

- ▶ When assembling the W-lattice jib on the W-connector head **1**, remove the lock **3** and rope fixed point **2** on the roller set.
 - ▶ The lock **3** and rope fixed point **2** may **not** remain on the roller set.
-
- ▶ Remove the lock **3** and the rope fixed point **2** properly from the roller set.

10 Assembling the hoist limit switch weight

**Note**

- ▶ The assembly of the hoist limit switch weight is described in chapter 4.06.
-
- ▶ Assemble the hoist limit switch weight properly.

11 Disassembling the hoist limit switch weight

**Note**

- ▶ The disassembly of the hoist limit switch weight is described in chapter 4.06.
-
- ▶ Disassemble the hoist limit switch weight properly.

12 Disassembling the roller set on the SW-end section with rack



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.



WARNING

Danger of impact / crushing!

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

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

Death, severe bodily injuries, property damage.

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



DANGER

The components can fall down!

If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.

Death, severe bodily injuries, property damage.

- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.



WARNING

Falling roller set!

If the roller set is not pinned and secured correctly, then it can fall down.

Death, severe bodily injuries, property damage.

- ▶ Pin or unpin both pins, which are laying in one horizontal level.
- ▶ It is prohibited to stand under the roller set or within the complete danger zone during the pinning and unpinning procedure of the roller set.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.

**WARNING**

- The crane can topple over!
If the roller set is improperly assembled, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Observe the Erection and take down charts.
 - ▶ Observe the load charts.
 - ▶ Pay attention to the designation on the roller set.

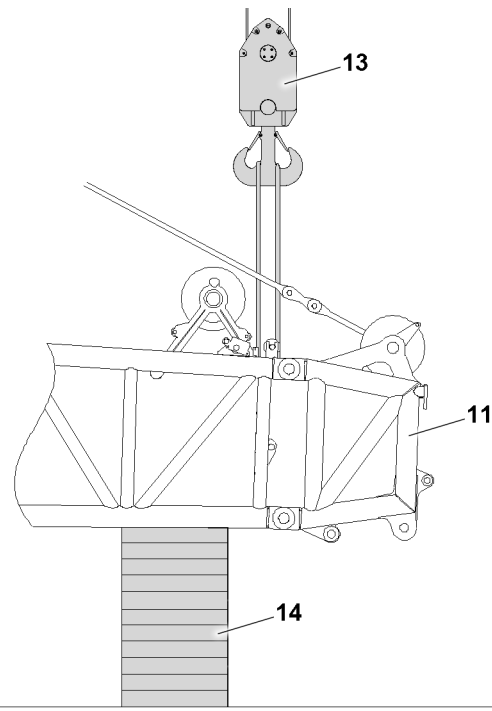


Fig.149980: Securing the main boom with the auxiliary crane 13 or with the substructure 14

**Note**

- ▶ For disassembly of the roller set on the main boom, the main boom can be held by its own main boom guying.
- ▶ Liebherr-Werk Ehingen GmbH recommends securing the main boom additionally upon disassembly of the roller set(s) with an auxiliary crane 13 with sufficient load bearing capacity **or** to support it with load bearing materials 14.

**WARNING**

- Working under a suspended load!
The boom can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that there is no personnel in the danger zone.
 - ▶ Make sure that the auxiliary crane is properly supported and horizontally aligned.
 - ▶ Make sure that the utilization of the auxiliary crane is **maximum 90 %**.
 - ▶ Make sure that the engine of the auxiliary crane is turned off for assembly of the roller sets.
 - ▶ When assembling the roller set on the W-lattice jib, make sure that the W-lattice jib is held securely by the auxiliary crane or that the boom is supported with load bearing materials.

**WARNING**

- Impermissible fastening equipment!
The boom can fall down.
Death, severe bodily injuries, property damage.
- ▶ Use only inspected fastening equipment.
 - ▶ Use only load bearing and approved substructures.

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- The boom system is completely closed.
- The SW-end section or W-connector head is properly assembled and secured.
- The SW-end section or W-connector head is located at a suitable assembly distance above the ground.
- The boom system is supported with materials **14** with load bearing capacity.
- **or**
- The boom system is safely held by the auxiliary crane **13**.
- An assembly scaffolding / work platform is available.
- A telescopic handler / forklift is available.
- The rack **2** is available.

12.1 Disassembling the roller set with a telescopic handler / forklift



Note

- ▶ The disassembly of the roller set(s) is described based on the sample of the SW-end section.
- ▶ Only the disassembly of one roller set on a SW-end section is described.
- ▶ The disassembly of the second roller set is identical to the disassembly of the first roller set.
- ▶ The disassembly of the roller set(s) is described based on the example with a telescopic handler.
- ▶ The disassembly of roller set(s) on the W-connector head is identical to the disassembly on the SW-end section.

Make sure that the following prerequisite is met:

- The pins **5** are pinned and secured on the rack **2** in park position **P6**.
- The hoist rope has been reeved out.
- The hoist limit switch weight is disassembled.
- The electrical connections to the roller set are properly removed.

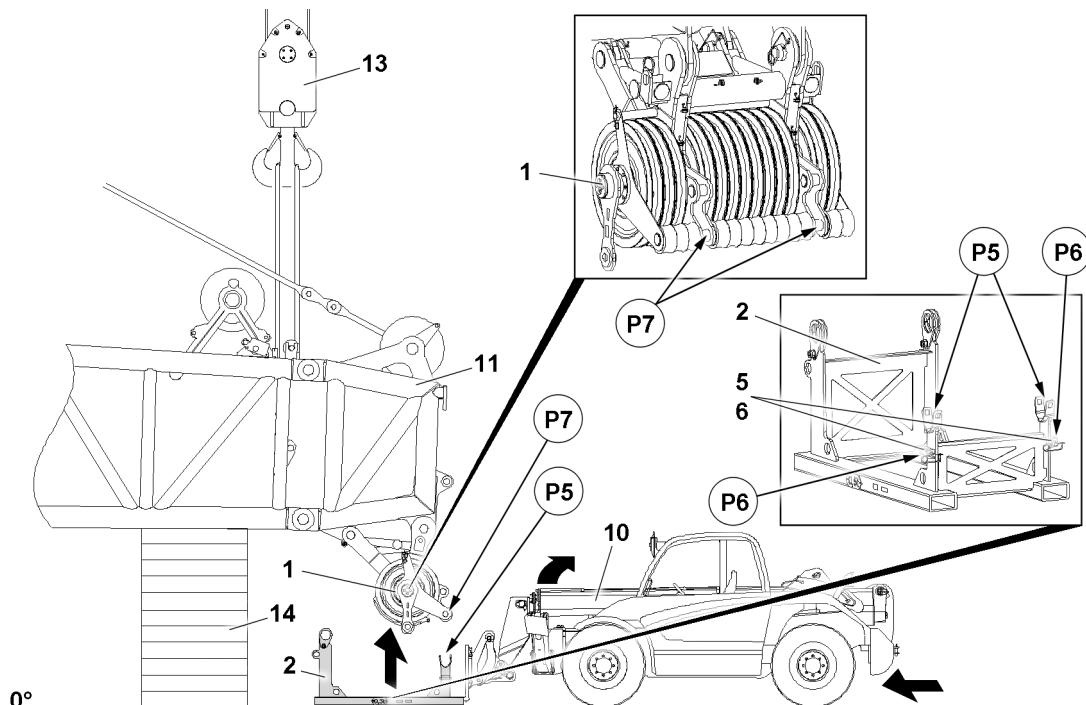


Fig.151906: Positioning the rack **2** with the telescopic handler / forklift on the roller set **1**

- ▶ Carefully pick up the rack **2** with the telescopic handler / forklift.
- ▶ Position the rack **2** with the telescopic handler / forklift below the boom end section / roller set.
- ▶ Lift the rack **2** with the telescopic handler / forklift **10** until the receptacles **P5** are lying evenly against the receptacles **P7** on both sides on the roller set **1**.

- Remove the pin 5 out of par position P6 and properly secure the roller set 1 in the rack 2: Pin the pin 5 in point P5 and secure with the retaining element 6.

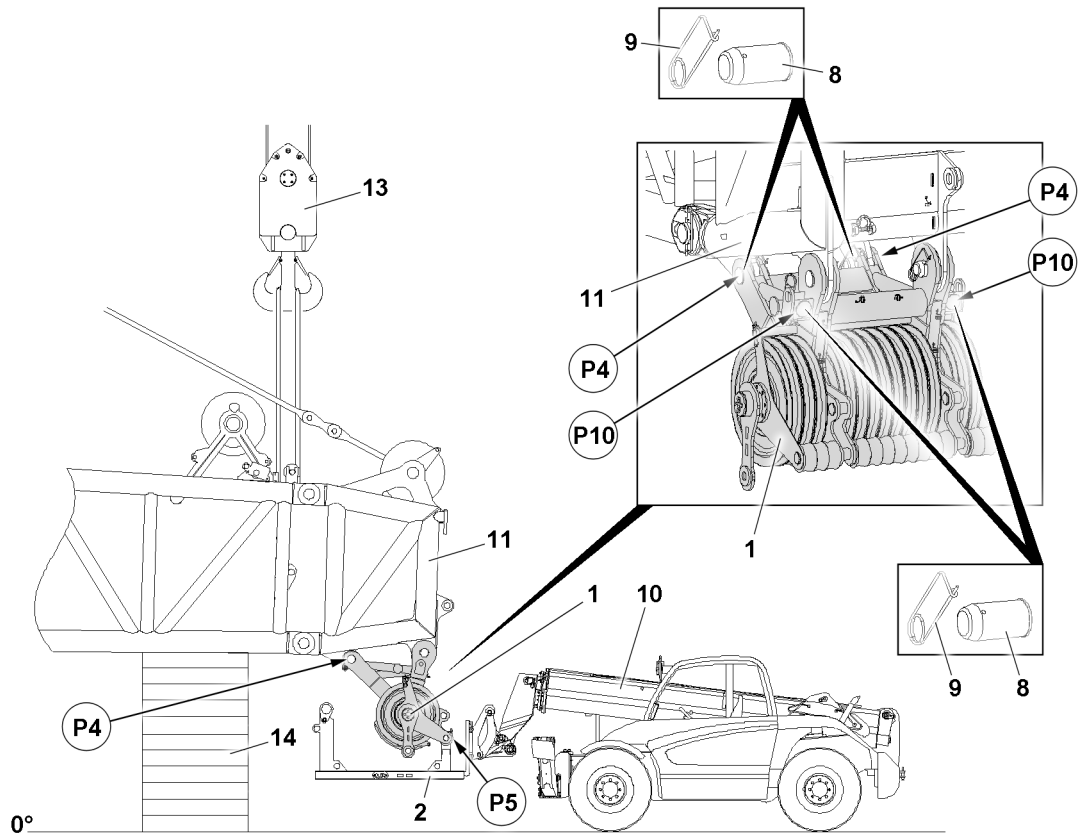


Fig.151905: Unpinning the roller set 1 from the SW-end section in point P4

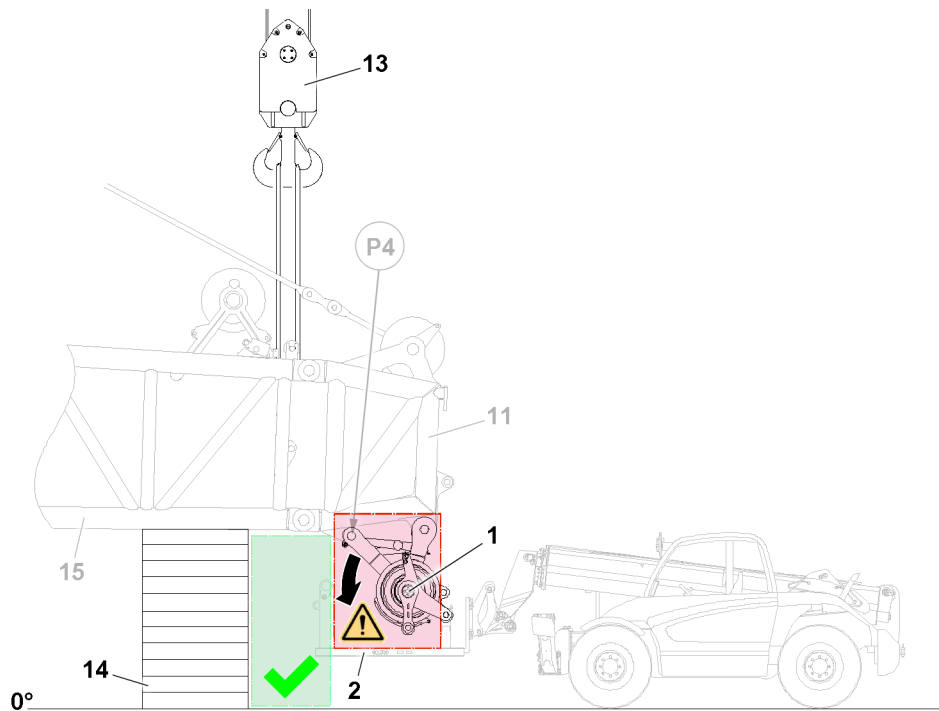


Fig.149982: Disassembling the roller set

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**WARNING**

Danger of crushing when folding back the roller set 11!

The roller set can swing away during disassembly on the SW-end section.

Death, severe bodily injuries, property damage.

- ▶ Make sure that assembly personnel remains on the lattice section side at the lattice section 15 when unpinning the roller set 1 in the pin points P4.
- ▶ It is prohibited to remain on the rack 2.
- ▶ It is prohibited for anyone to remain in the slewing range of the roller set 1.

When the roller set 1 is properly secured to the rack 2 in point P5:

- ▶ Release the roller set 1 in point P4 on both sides: Remove the retaining element 9 on both sides.
- ▶ Unpin the pin 8 in point P4 on both sides and insert in park position in point P10 and properly secure with the retaining element 9.

Result:

- The roller set 1 is unpinned in point P4.
- The pins 8 are in park position P10.

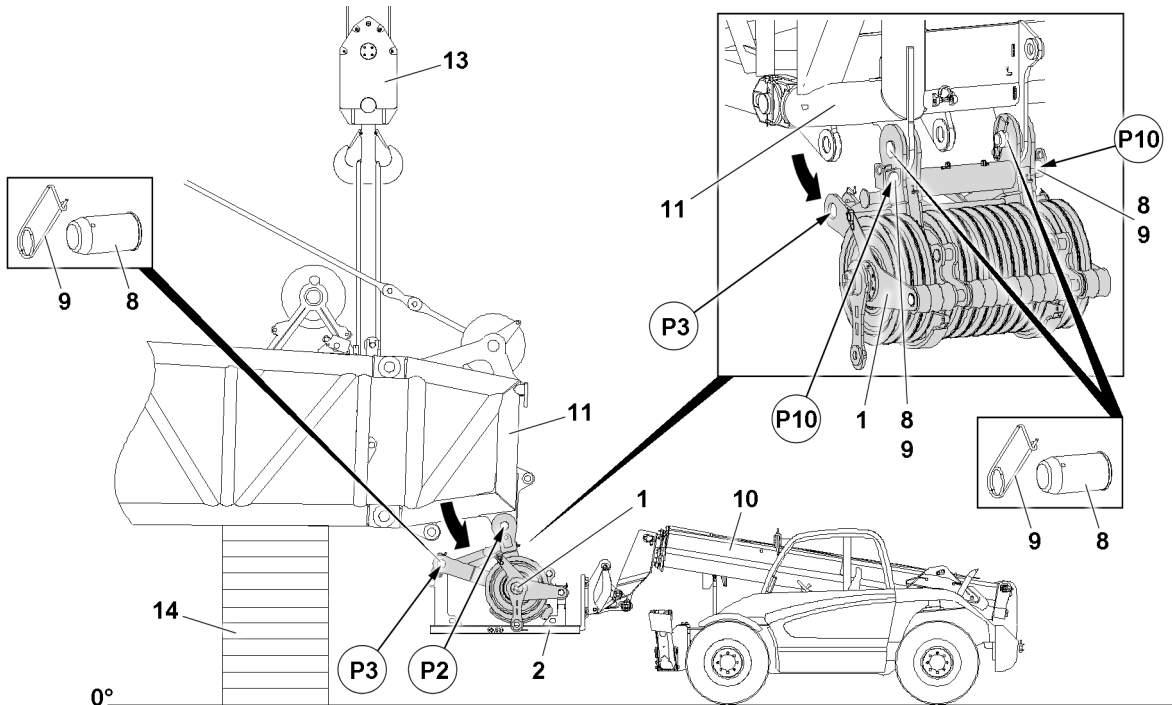


Fig.151908: Taking the roller set 1 down on the rack 2

- ▶ Drive the telescopic handler / forklift 10 backward slowly and carefully.

Result:

- The roller set 1 lowers itself in point P3 into the rack 2.

**WARNING**

Falling pins!

If the pins 8 are unpinned in the park position P10 and not immediately inserted in the pin bores in point P3, the pins 8 can fall down.

Death, severe bodily injuries, property damage.

- ▶ Make sure that when handling the pin 8 that no persons are located in the danger zone.
- ▶ After unpinning in the park position P10 insert the pins 8 immediately in point P3.

When the bores in the roller set 1 align with the bores in the rack 2 in point P3:

- ▶ Release the pins 8 in park position in point P10 and unpin.
- ▶ Insert the pin 8 in point P3 on both sides and properly secure with the retaining element 9.

**WARNING**

Falling roller set!

Death, severe bodily injuries, property damage.

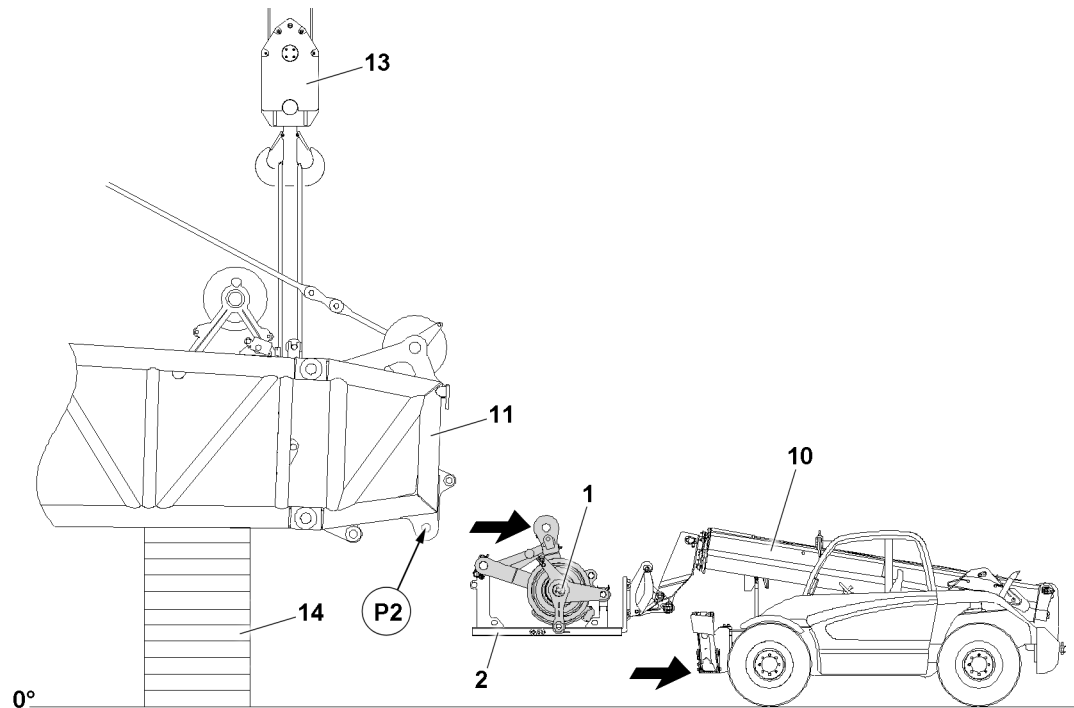
- ▶ Make sure that the rack on the telescopic handler / forklift **10** is safely held by the forklift before removing the roller set completely from the forklift.

When the roller set **1** is properly pinned and secured to the rack **2** in point **P3**:

- ▶ Completely unpin the roller set **1** from the SW-end section **11**: Release the pins **8** on both sides in point **P2** and unpin.

When the pins **8** are unpinned in point **P2**:

- ▶ Immediately insert the pins **8** on both sides in the park position in point **P10** and secure.



*Fig.151909: Extending the roller set **1** on the SW-end section **11***

When the roller set **1** is properly unpinned on both sides on the SW-end section **11**:

- ▶ Carefully extend the roller set **1** with the telescopic handler / forklift **10** to the SW-end section **11**.

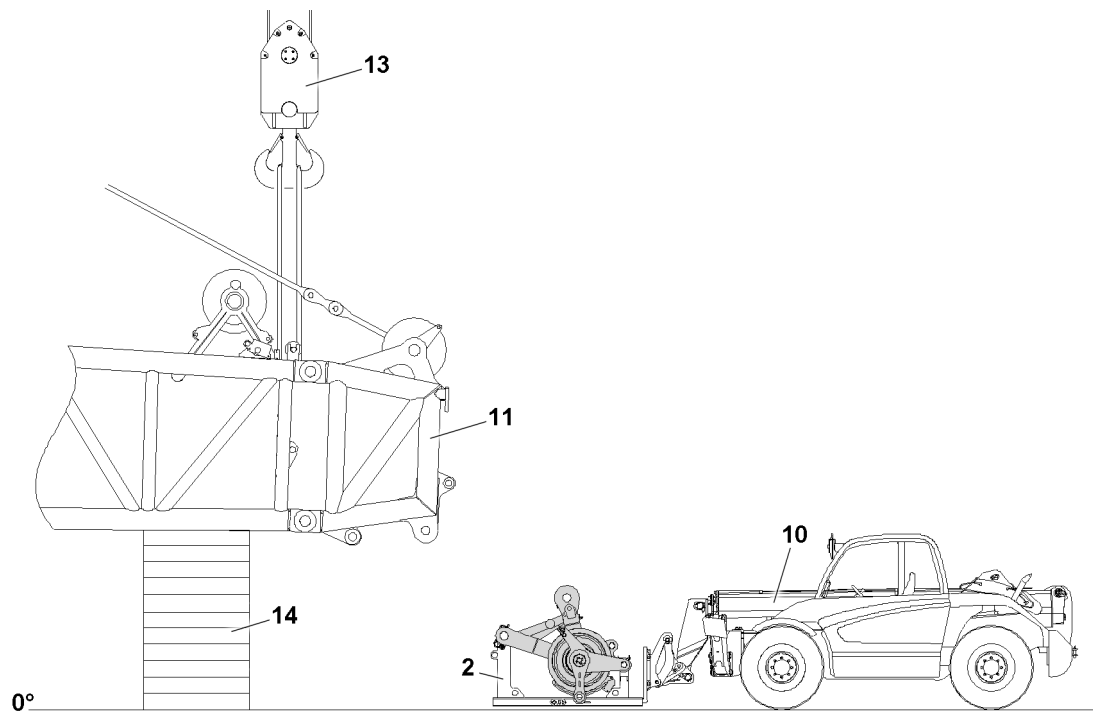


Fig.151910: Rack 2 with disassembled roller set

- ▶ Place the rack 2 on load bearing ground or a load bearing substructure.

Result:

- The roller set is disassembled.

- ▶ Extend the telescopic handler / forklift 10 out of the rack.

If a second roller set is assembled on the SW-end section:

- ▶ Disassemble the second roller set in the same way as the first roller set.

13 Assembling / disassembling the roller set with the auxiliary crane



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.



WARNING

Danger of impact / crushing!

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

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

Death, severe bodily injuries, property damage.

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



WARNING

Falling roller set!

If the roller set is not pinned and secured correctly, then it can fall down.

Death, severe bodily injuries, property damage.

- ▶ Pin or unpin both pins, which are laying in one horizontal level.
- ▶ It is prohibited to stand under the roller set or within the complete danger zone during the pinning and unpinning procedure of the roller set.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.



WARNING

Impermissible fastening equipment!

The boom can fall down.

Death, severe bodily injuries, property damage.

- ▶ Use only inspected fastening equipment.
- ▶ Use only load bearing and approved substructures.

13.1 Assembling the roller set

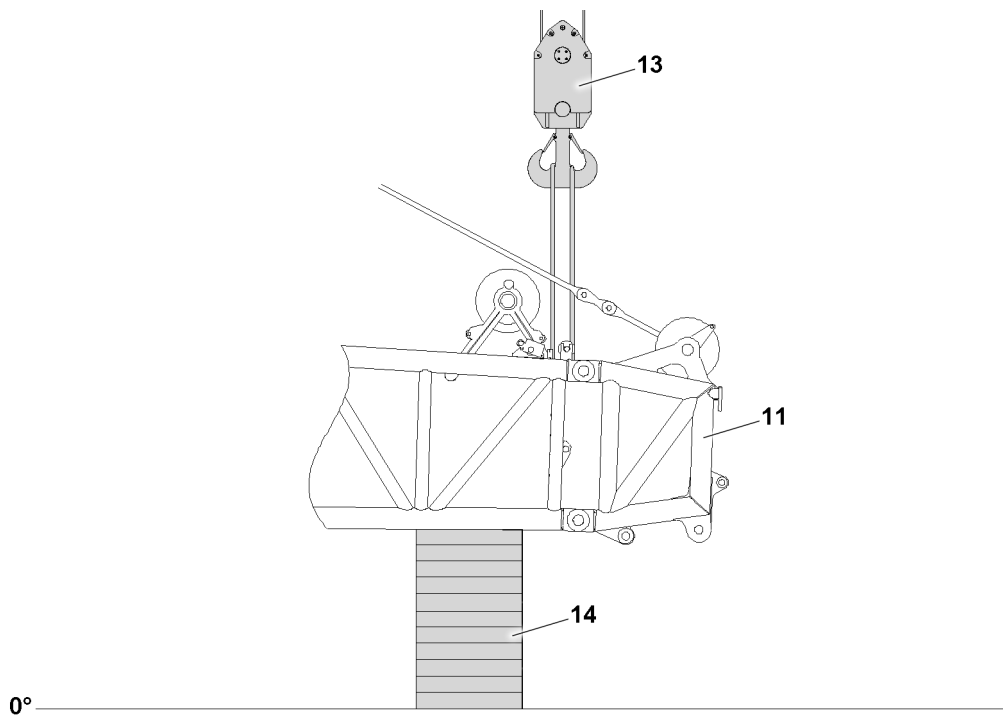


Fig.149980: Securing the main boom **11** with the auxiliary crane **13** or with the substructure **14**



Note

- ▶ For assembly of the roller set on the main boom, the main boom can be held by its own main boom guying.
- ▶ Liebherr-Werk Ehingen GmbH recommends securing the main boom additionally upon disassembly of the roller set(s) with an auxiliary crane **13** with sufficient load bearing capacity **or** to support it with load bearing materials **14**.



WARNING

Working under a suspended load!

The boom can fall down.

Death, severe bodily injuries, property damage.

- ▶ Make sure that there is no personnel in the danger zone.
- ▶ Make sure that the auxiliary crane is properly supported and horizontally aligned.
- ▶ Make sure that the utilization of the auxiliary crane is **maximum 90 %**.
- ▶ Make sure that the engine of the auxiliary crane is turned off during assembly of the roller set.
- ▶ When assembling the roller set on the W-lattice jib, make sure that the W-lattice jib is held securely by the auxiliary crane or that the boom is supported with load bearing materials.



Note

- ▶ The assembly of the roller set is described based on the example of the SW-end section.



WARNING

The crane can topple over!

If the roller sets are improperly assembled, the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Select the roller sets according to the operating mode, as specified in the load charts.
- ▶ Observe the instructions in the erection and take-down charts.

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- The boom system is completely closed.
- The SW-end section or W-connector head is properly assembled and secured.
- The SW-end section or W-connector head is located at a suitable assembly distance above the ground.
- The boom system is supported with materials **14** with load bearing capacity.
- **or**
- The boom system is safely held by the auxiliary crane **13**.
- An assembly scaffolding / work platform is available.
- An auxiliary crane is available.



Note

- ▶ The assembly of the roller set(s) is described based on the sample of the SW-end section.
 - ▶ Only the assembly of one roller set on the SW-end section is described.
 - ▶ The assembly of the second roller set is identical to the assembly of the first roller set.
 - ▶ The assembly of the roller set(s) is described based on the example with a telescopic handler.
 - ▶ The assembly of the roller set(s) on the W-connector head is identical to the assembly on the SW-end section.
-
- ▶ Position the roller set **1** under the SW-end section **11**.
 - ▶ Lower the fastening equipment with the auxiliary crane through the SW-end section **11** to the roller set **1**.
 - ▶ Properly fasten the fastening equipment of the roller set **1**.

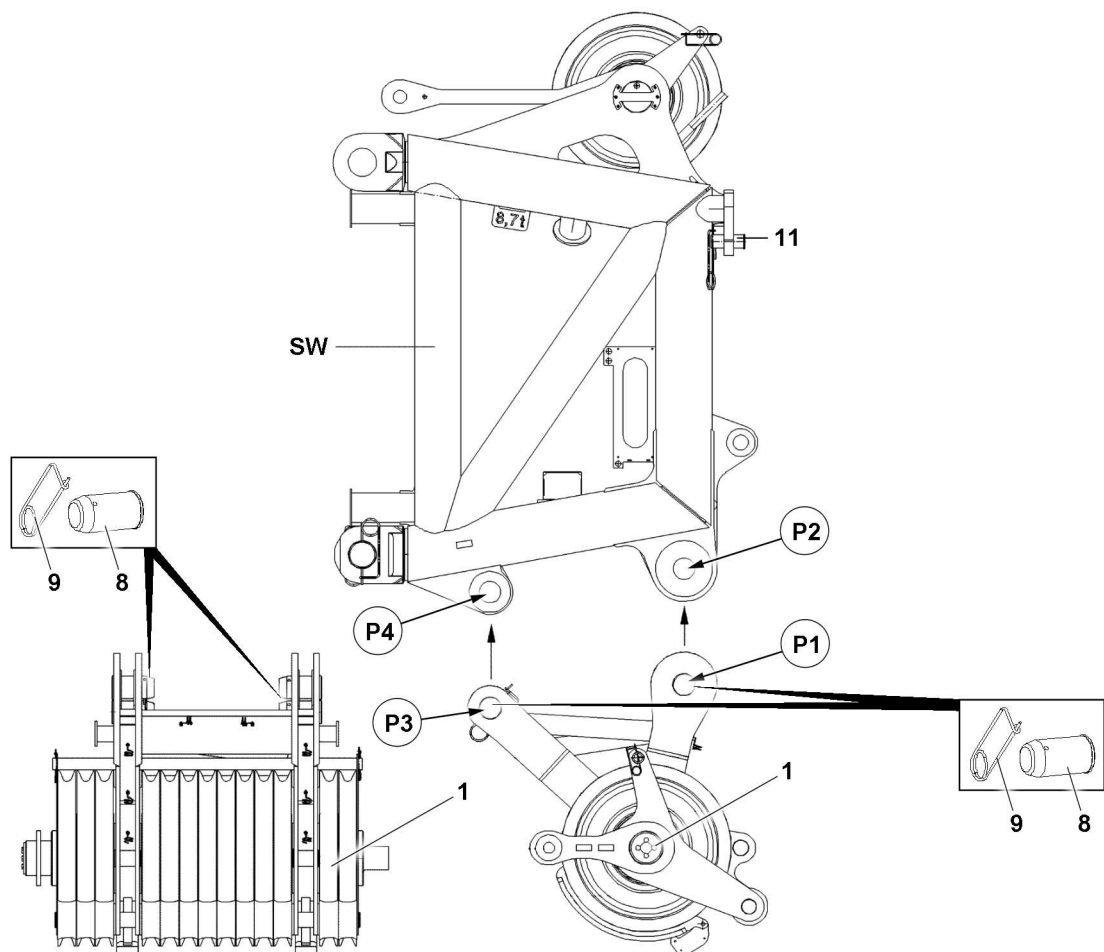


Fig.149988: Assembling the roller set

When the roller set **1** is properly fastened:

- ▶ Lift the roller set **1** with the auxiliary crane up to the pin points on the SW-end section.
- ▶ Position the roller set **1** on the SW-end section **11** or the W-connector head in such a way that the pin bores align.

When the pin bores align:

- ▶ Insert the pins **8** in the four pin points from the outside to the inside and secure with the retaining element **9**.
- ▶ Pin and secure the lock on the rope fixed point.



Note

- ▶ Establish the electrical connections on the SW-end section and / or the W-connector head according to the electrical wiring diagram.

- ▶ Establish the electrical connections.
- ▶ Attach the hoist limit switch weight, see chapter 4.06.

Result:

- The roller set **1** is assembled.

13.2 Disassembling the roller set



WARNING

Danger of crushing!

When luffing the boom system down, personnel can be caught and crushed.

Death, severe bodily injuries, property damage.

- ▶ Make sure that no personnel is within the danger zone when luffing the boom system down.
- ▶ Luff the boom system down with utmost caution.

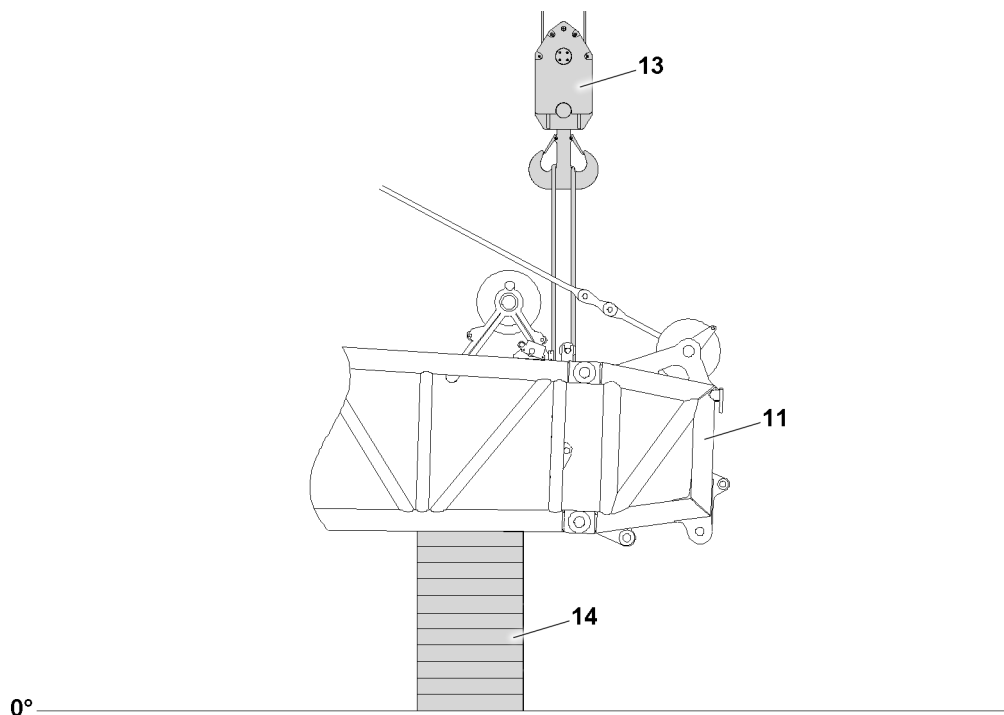


Fig.149980: Securing the main boom **11** with the auxiliary crane **13** or with the substructure **14**

**Note**

- ▶ For disassembly of the roller set on the main boom, the main boom can be held by its own main boom guying.
- ▶ Liebherr-Werk Ehingen GmbH recommends securing the main boom additionally upon disassembly of the roller set(s) with an auxiliary crane **13** with sufficient load bearing capacity **or** to support it with load bearing materials **14**.

**WARNING**

Working under a suspended load!

The boom can fall down.

Death, severe bodily injuries, property damage.

- ▶ Make sure that there is no personnel in the danger zone.
- ▶ Make sure that the auxiliary crane is properly supported and horizontally aligned.
- ▶ Make sure that the utilization of the auxiliary crane is **maximum 90 %**.
- ▶ Make sure that the engine of the auxiliary crane is turned off during assembly of the roller set.
- ▶ When assembling the roller set on the W-lattice jib, make sure that the W-lattice jib is held securely by the auxiliary crane or that the boom is supported with load bearing materials.

**Note**

- ▶ The disassembly of the roller set is described based on the example of the SW-end section.

**WARNING**

The crane can topple over!

If the roller sets are improperly assembled, the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ Select the roller sets according to the operating mode, as specified in the load charts.
- ▶ Observe the instructions in the erection and take-down charts.

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- The SW-end section or W-connector head is located at a suitable assembly distance above the ground.
- The boom system is supported with materials **14** with load bearing capacity.
- **or**
- The boom system is safely held by the auxiliary crane **13**.
- An assembly scaffolding / work platform is available.
- An auxiliary crane is available.

**Note**

- ▶ The disassembly of the roller set(s) is described based on the sample of the SW-end section.
- ▶ Only the disassembly of one roller set on a SW-end section is described.
- ▶ The disassembly of the second roller set is identical to the disassembly of the first roller set.
- ▶ The disassembly of the roller set(s) is described based on the example with a telescopic handler.
- ▶ The disassembly of roller set(s) on the W-connector head is identical to the disassembly on the SW-end section.

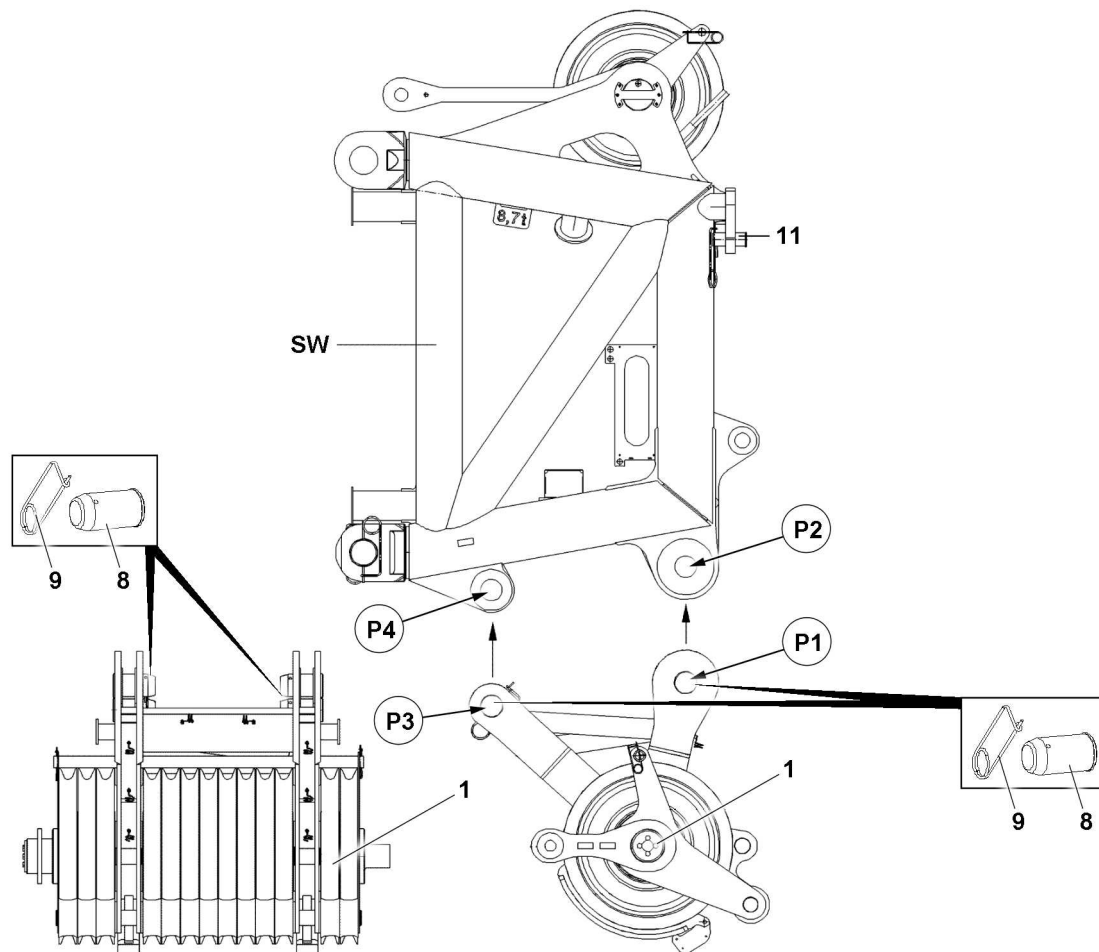


Fig.149988: Disassembling the roller set

- ▶ Fasten the roller set 4 to the auxiliary crane, see section „Roller set fastening points“.
- ▶ Tension the fastening equipment with the auxiliary crane.



Note

- ▶ Disconnect the electrical connections on the SW-end section and / or the W-end section.
- ▶ Disconnect the electrical connections.

When the roller set is properly fastened to the auxiliary crane and the fastening equipment is tensioned:

- ▶ Remove the retaining element 9 on both sides in point P3/P4 and point P1/P2 and unpin the pin 8 on both sides.

When the pins are completely unpinned:

- ▶ Lower the roller set 1 slowly with the auxiliary crane in a controlled manner.
- ▶ Take the roller set 1 down with the auxiliary crane onto the substructure.
- ▶ Remove the fastening equipment.
- ▶ Insert the pins 8 in points P1 at points P3 and secure with the retaining element 9.

Result:

- The roller set 1 is disassembled.
- ▶ Remove the auxiliary crane.

5.19 Hook blocks

| | | |
|---|--|----|
| 1 | Procedure in case of slack rope | 2 |
| 2 | Hook block variations 1350 DMZ (1350 t) | 2 |
| 3 | Assembling / disassembling hook block 1350 DMZ (1350 t) | 6 |
| 4 | Hook block variations 630 DZ (630 t) | 19 |
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| 7 | Assembling / disassembling auxiliary weights on the double hook block for parallel operation | 35 |
| 8 | Assembling / disassembling auxiliary weight 4 t on hook block 1350 DMZ | 40 |
| 9 | Assembling the auxiliary weights on the single blocks | 43 |

1 Procedure in case of slack rope

1.1 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.

1.1.1 Spooling up loose hoist rope

- ▶ Spool up loose hoist rope between the boom head and the winch carefully onto the winch.



Note

- ▶ A small amount of rope sag must remain between the boom head and the winch.
-

1.1.2 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.

1.1.3 Lowering the hook block

- ▶ Lower the hook block carefully with the hoist gear.

2 Hook block variations 1350 DMZ (1350 t)



Note

- ▶ The combination possibilities for hook block 1350 DMZ (1350 t) are listed below, which have an effect on the maximum possible / permissible load.
-

2.1 Hook block 1350 DMZ for load 1350 t

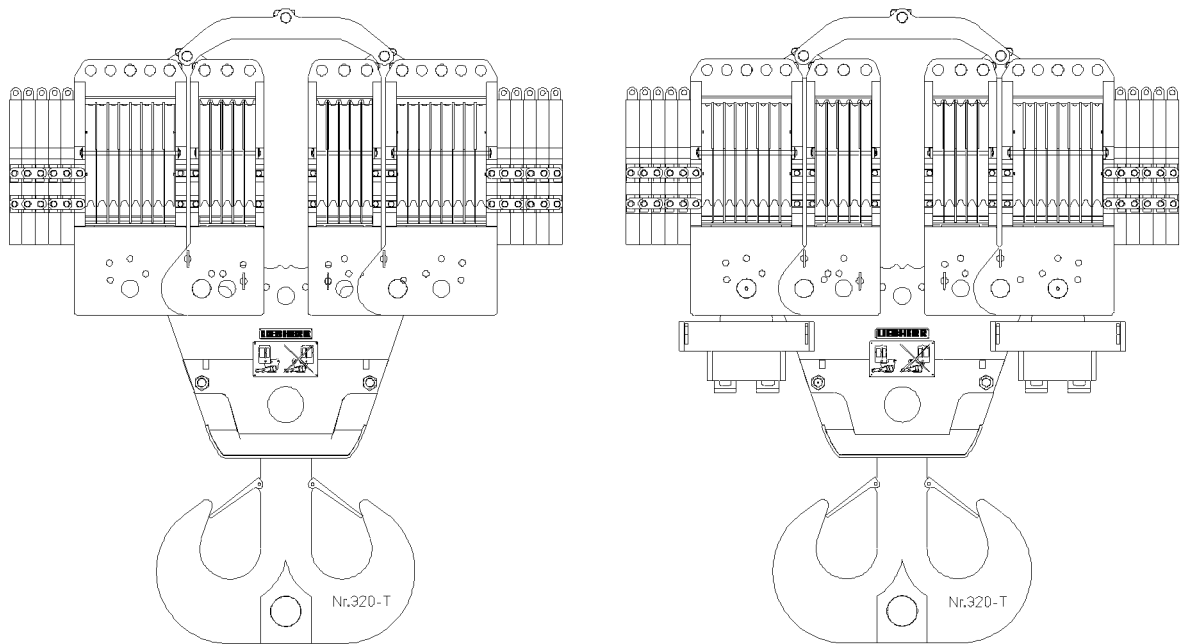


Fig.149504: Hook block 1350 DMZ for load 1350 t

| Load | Strands | Rope pulleys |
|--------|---------|--------------|
| 1350 t | 2 x 26 | 2 x 13 |

2.2 Hook block 1350 DMZ for load 940 t

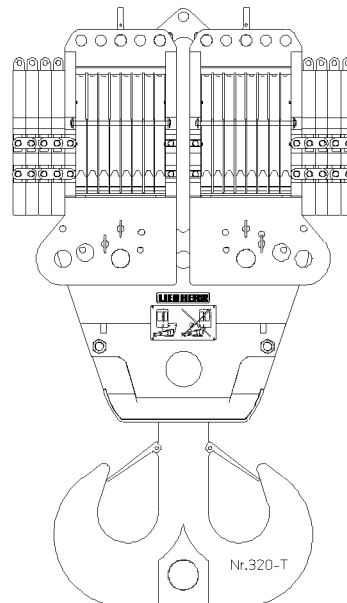


Fig.149505: Hook block 1350 DMZ for load 940 t

| Load | Strands | Rope pulleys |
|-------|---------|--------------|
| 940 t | 2 x 17 | 2 x 8 |

2.3 Hook block 1350 DMZ for load 815 t

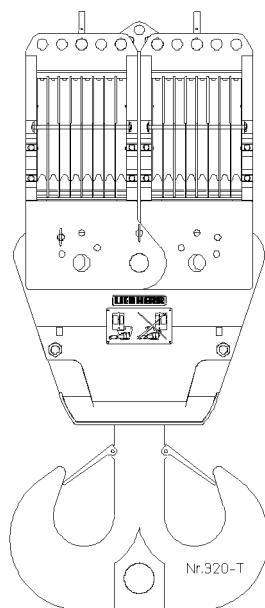


Fig.149506: Hook block 1350 DMZ for load 815 t

| Load | Strands | Rope pulleys |
|-------|---------|--------------|
| 815 t | 1 x 33 | 2 x 8 |

2.4 Hook block 1350 DMZ for load 630 t

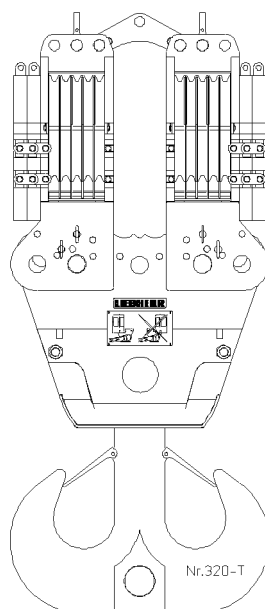


Fig.149507: Hook block 1350 DMZ for load 630 t

| Load | Strands | Rope pulleys |
|-------|---------|--------------|
| 630 t | 2 x 11 | 2 x 5 |

2.5 Hook block 1350 DMZ for load 470 t

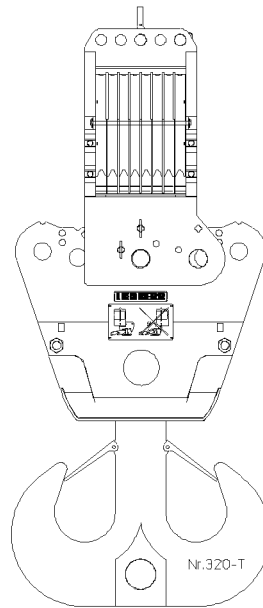


Fig.149509: Hook block 1350 DMZ for load 470 t

| Load | Strands | Rope pulleys |
|-------|---------|--------------|
| 470 t | 1 x 17 | 1 x 8 |

2.6 Hook block 1350 DMZ for load 320 t

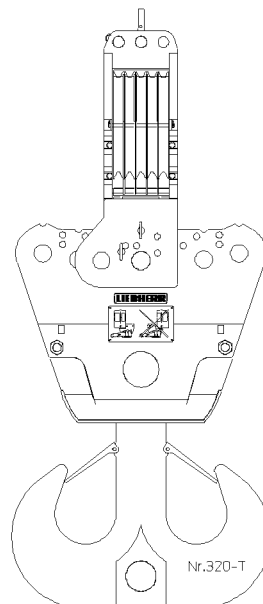


Fig.149913: Hook block 1350 DMZ for load 320 t



Note

- ▶ Hook block 320 t for a 1 winch operation with cross beam 320 t .

| Load | Strands | Rope pulleys |
|-------|---------|--------------|
| 320 t | 1 x 11 | 1 x 5 |

3 Assembling / disassembling hook block 1350 DMZ (1350 t)



WARNING

Danger of accident when assembling / disassembling hook blocks.

When assembling / disassembling components on the hook block, components such as roller blocks or block connectors can fall down.

Death, severe bodily injuries, property damage.

- ▶ Never unpin the retaining pins on unsecured 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 storage locations as well as in the receptacles.

3.1 Hook block 1350 t

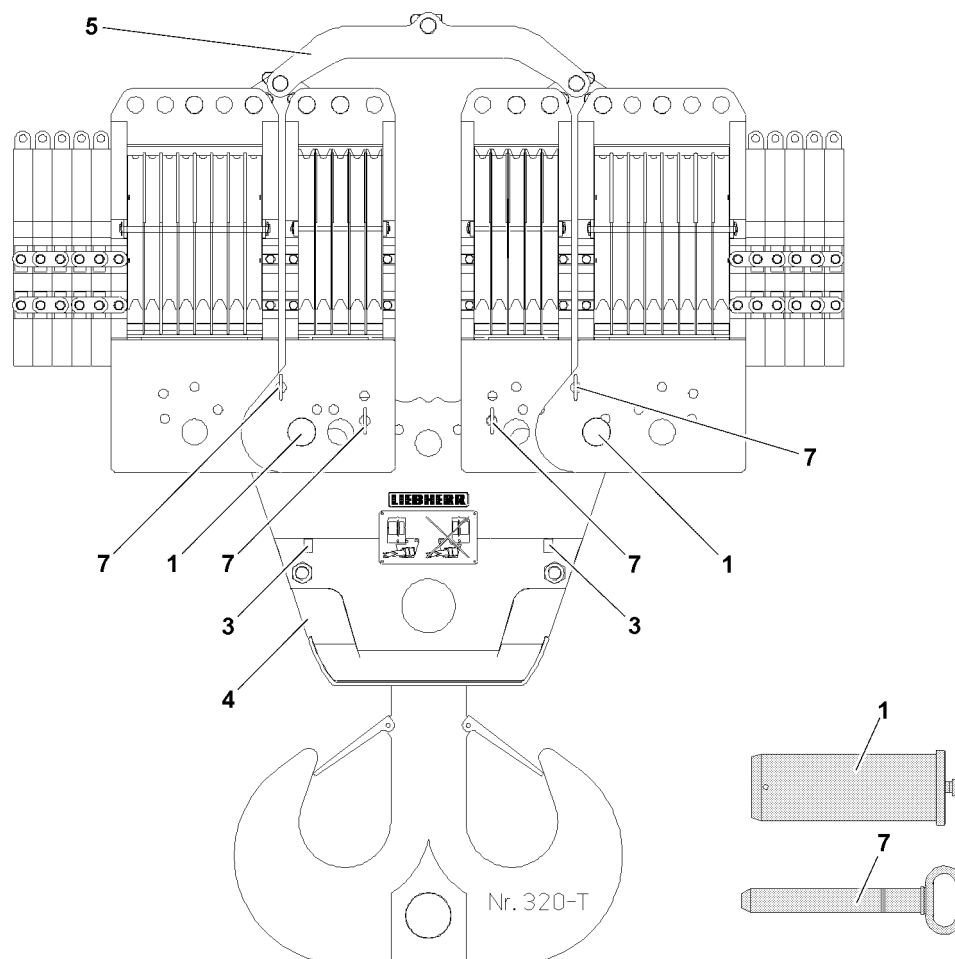


Fig.149914: Hook block 1350 DMZ for load 1350 t

The hook block 1350 DMZ for a load of 1350 t is a double 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

3.1.1 Assembling a 1350 t hook block

- ▶ Pin the 5-pulley roller blocks (2x) and the 8-pulley roller blocks (2x) to the cross beam **4**: Insert and secure the pin **1**.
- ▶ Install the block connector **5** to the hook block.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins **7** before crane operation.

Before starting crane operation:

- ▶ Insert the retaining pins **7** into the receptacles **3** and secure.

3.1.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section „Assembling / disassembling the auxiliary weights“.
- ▶ Observe the minimum required hook block weight.

3.1.3 Disassembling a 1350 t hook block



WARNING

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller blocks can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller blocks have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.

When the roller blocks are secured by the retaining pins **7**:

- ▶ Remove the block connector **5** on the hook block.
- ▶ Unpin the 5-pulley roller blocks (2x) and the 8-pulley roller blocks (2x) on the cross beam **4**: Release and unpin the pin **1**.

3.2 Hook block 940 t

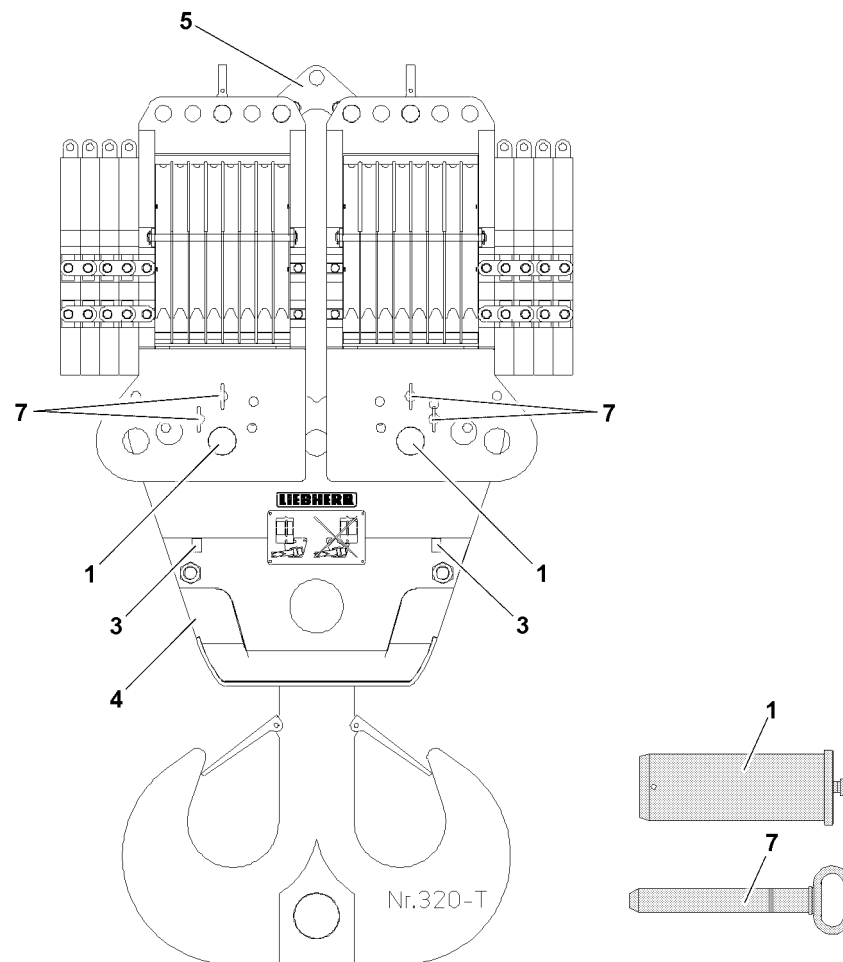


Fig.149915: Hook block 940 t

Hook block 940 t for a 2 winch operation with cross beam 1350 t.

The 940 t hook block is a double 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

3.2.1 Assembling a 940 t hook block

- ▶ Pin the 8-pulley roller blocks (2x) with the cross beam 4: Insert and secure the pin 1.
- ▶ Install the block connector 5 to the hook block.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins **7** before crane operation.

Before starting crane operation:

- ▶ Insert the retaining pins **7** into the receptacles **3** and secure.

3.2.2 Assembling / disassembling the auxiliary weights

**Note**

- ▶ The assembly / disassembly of the auxiliary weights is described in section „Assembling / disassembling the auxiliary weights“.
- ▶ Observe the minimum required hook block weight.

3.2.3 Disassembling a 940 t hook block

**WARNING**

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller blocks can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller blocks have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.

When the roller blocks are secured by the retaining pins **7**:

- ▶ Remove the block connector **5** on the hook block.
- ▶ Unpin the 8-pulley roller blocks (2x) on the cross beam **4**: Release and unpin the pin **1**.

3.3 Hook block 815 t

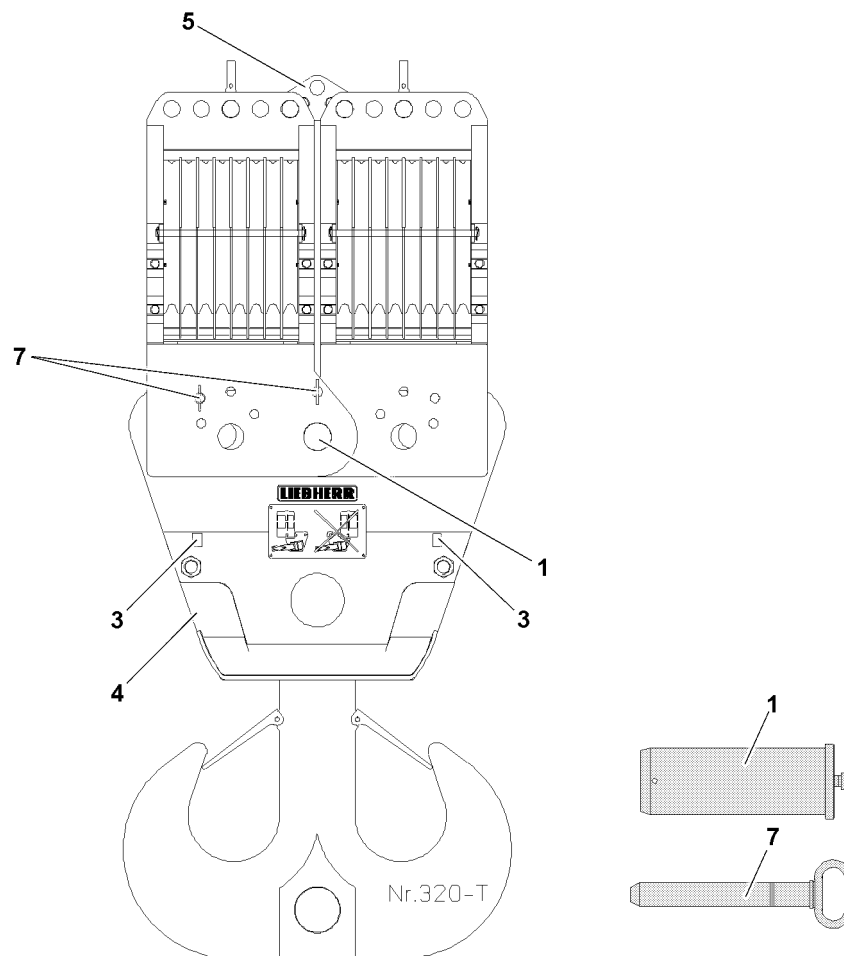


Fig.149916: Hook block 815 t

Hook block 815 t for a 1 winch operation with cross beam 1350 t

The 815 t hook block is a single 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

3.3.1 Assembling a 815 t hook block

- ▶ Pin the 8-pulley roller blocks (2x) with the cross beam 4: Insert and secure the pin 1.
- ▶ Install the block connector 5 to the hook block.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins **7** before crane operation.

Before starting 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“.
- ▶ Observe the minimum required hook block weight.

3.3.3 Disassembling a 815 t hook block

**WARNING**

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller blocks can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller blocks have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.

When the roller blocks are secured by the retaining pins **7**:

- ▶ Remove the block connector **5** on the hook block.
- ▶ Unpin the 8-pulley roller blocks on the cross beam **4**: Release and unpin the pin **1**.

3.4 Hook block 630 t

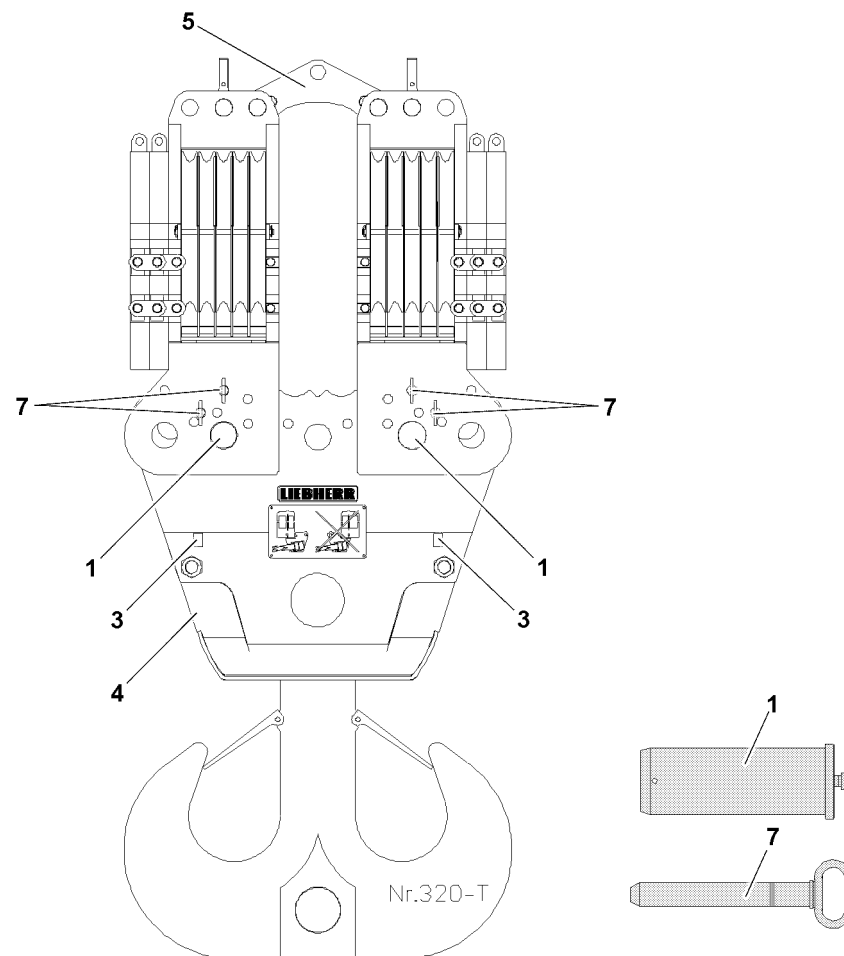


Fig.149917: Hook block 630 t

Hook block 630 t for a 2 winch operation with cross beam 1350 t.

The 630 t hook block is a double 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

3.4.1 Assembling a 630 t hook block

- ▶ Pin the 5-pulley roller blocks (2x) with the cross beam 4: Insert and secure the pin 1.
- ▶ Install the block connector 5 to the hook block.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins **7** before crane operation.

Before starting 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“.
- ▶ Observe the minimum required hook block weight.

3.4.3 Disassembling a 630 t hook block

**WARNING**

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller blocks can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller blocks have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.

When the roller blocks are secured by the retaining pins **7**:

- ▶ Remove the block connector **5** on the hook block.
- ▶ Unpin the 5-pulley roller blocks (2x) on the cross beam **4**: Release and unpin the pin **1**.

3.5 Hook block 560 t

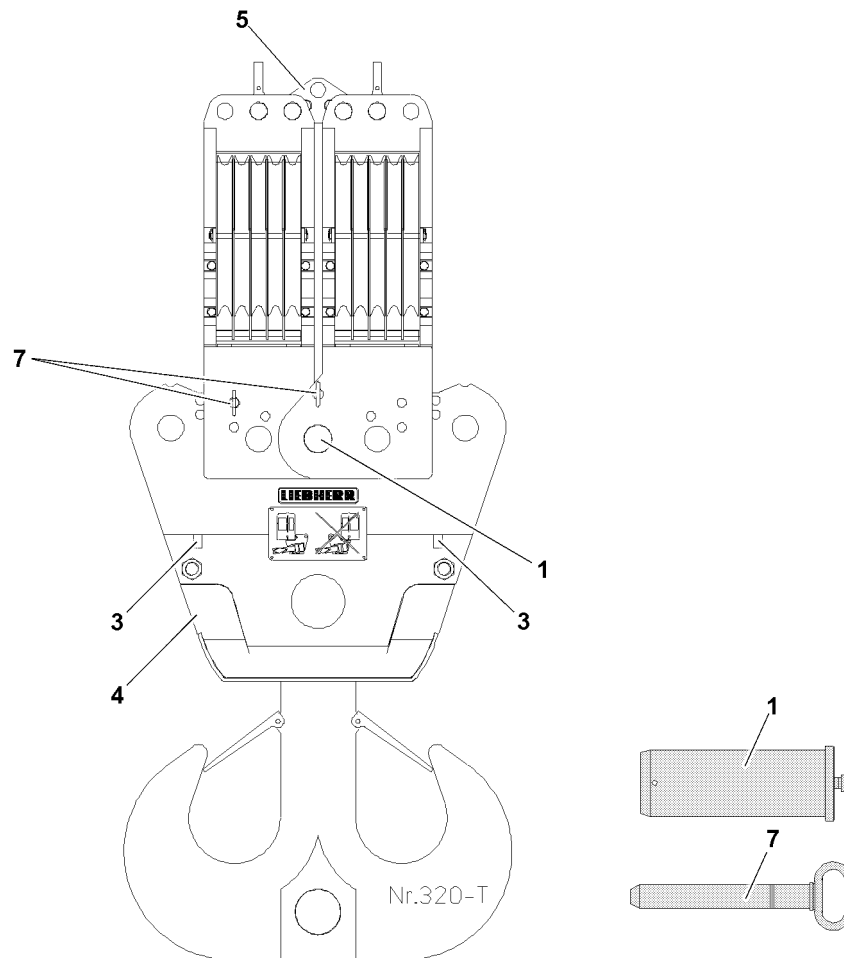


Fig.149918: Hook block 560 t

Hook block 560 t for a 1 winch operation with cross beam 1350 t

The 560 t hook block is a single 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

3.5.1 Assembling a 560 t hook block

- ▶ Pin the 5-pulley roller blocks (2x) with the cross beam 4: Insert and secure the pin 1.
- ▶ Install the block connector 5 to the hook block.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins **7** before crane operation.

Before starting 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“.
- ▶ Observe the minimum required hook block weight.

3.5.3 Disassembling a 560 t hook block

**WARNING**

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller blocks can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller blocks have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.

When the roller blocks are secured by the retaining pins **7**:

- ▶ Remove the block connector **5** on the hook block.
- ▶ Unpin the 5-pulley roller blocks (2x) on the cross beam **4**: Release and unpin the pin **1**.

3.6 Hook block 470 t

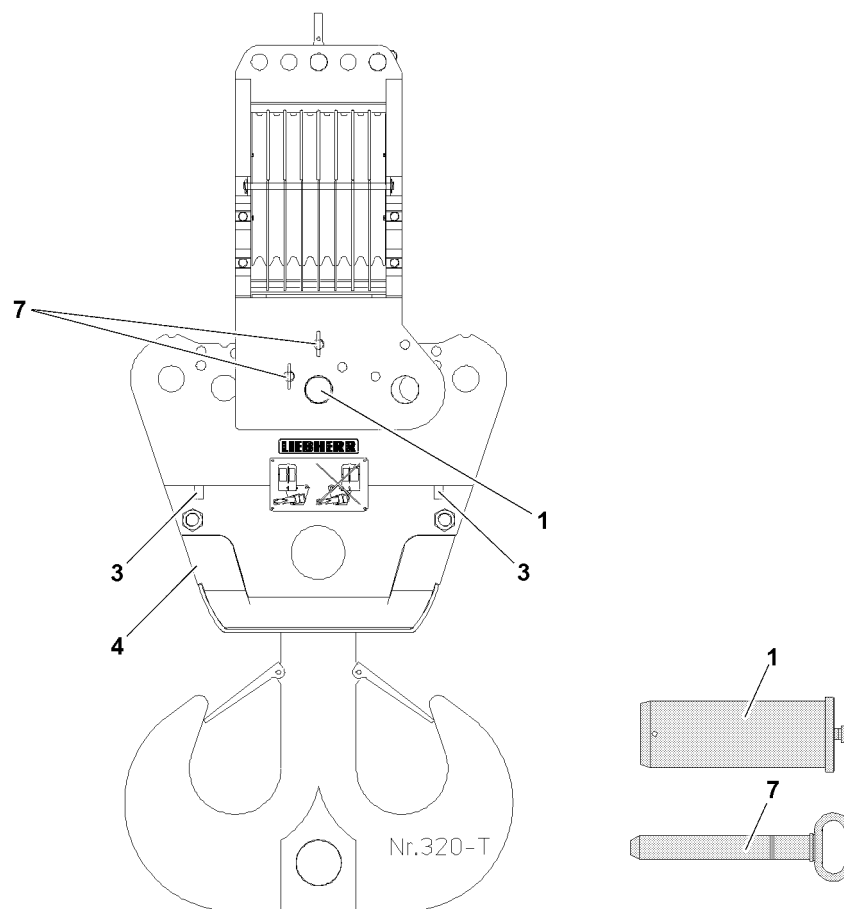


Fig.149919: Hook block 470 t

Hook block 470 t for a 1 winch operation with cross beam 1350 t

The 470 t hook block is a single 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

3.6.1 Assembling a 470 t hook block

- ▶ Pin the 8-pulley roller block to the cross beam 4: Insert and secure the pin 1.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins 7 before crane operation.

Before starting 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“.
- ▶ Observe the minimum required hook block weight.

3.6.3 Disassembling a 470 t hook block



WARNING

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller block can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller block have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.
- ▶ Unpin the 8-pulley roller block on the cross beam **4**: Release and unpin the pin **1**.

3.7 Hook block 320 t

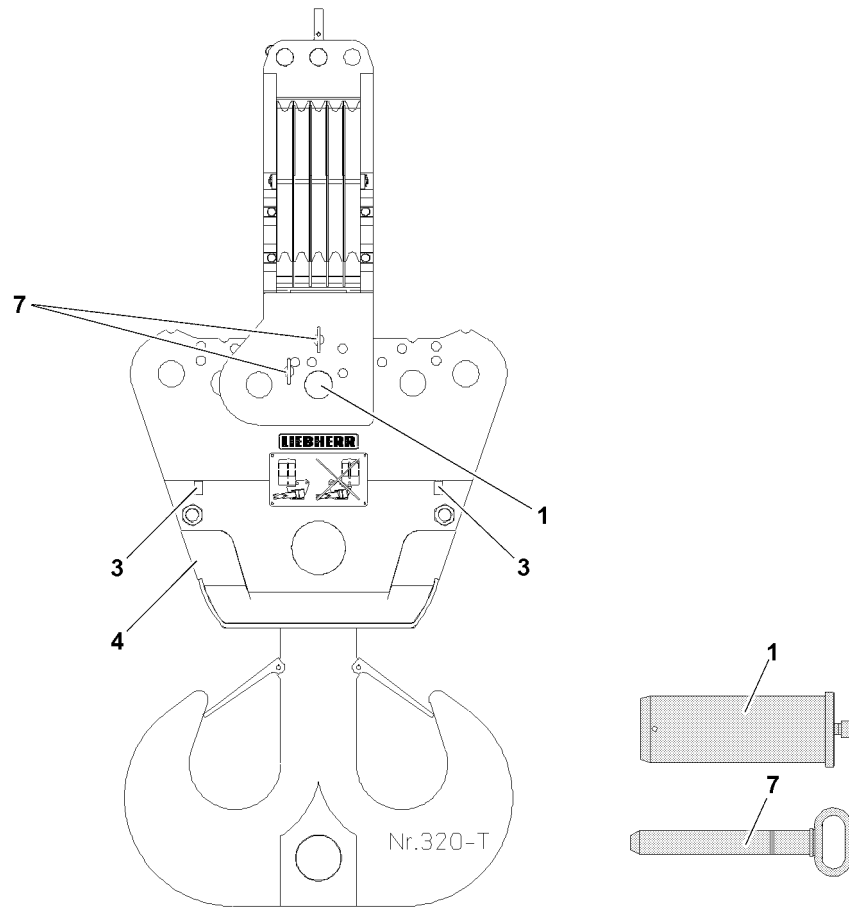


Fig.149920: Hook block 320 t

Hook block 320 t for a 1 winch operation with cross beam 1350 t

The 320 t hook block is a single 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

3.7.1 Assembling a 320 t hook block

- ▶ Pin the 5-pulley roller block to the cross beam 4: Insert and secure the pin 1.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins 7 before crane operation.

Before starting 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“.
- ▶ Observe the minimum required hook block weight.

3.7.3 Disassembling a 320 t hook block



WARNING

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller block can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller block have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.
- ▶ Unpin the 5-pulley roller block on the cross beam **4**: Release and unpin the pin **1**.

4 Hook block variations 630 DZ (630 t)



Note

- ▶ The combination possibilities for hook block 630 t are listed below, which have an effect on the maximum possible / permissible load.

4.1 Hook block 630 DZ for load 630 t

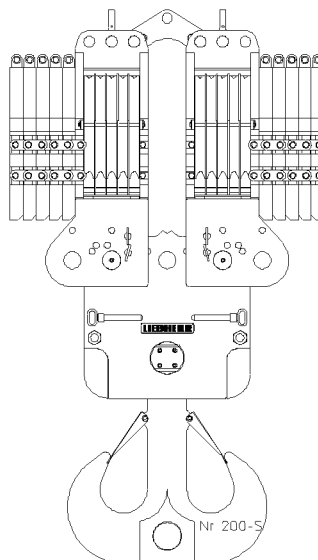


Fig.149921: Hook block 630 DZ for load 630 t

| Load | Strands | Rope pulleys |
|-------|---------|--------------|
| 630 t | 2 x 11 | 2 x 5 |

4.2 Hook block 630 DZ for load 560 t

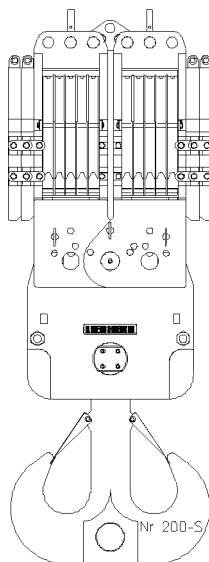


Fig.149922: Hook block 630 DZ for load 560 t

| Load | Strands | Rope pulleys |
|-------|---------|--------------|
| 560 t | 1 x 21 | 2 x 5 |

4.3 Hook block 630 DZ for load 470 t

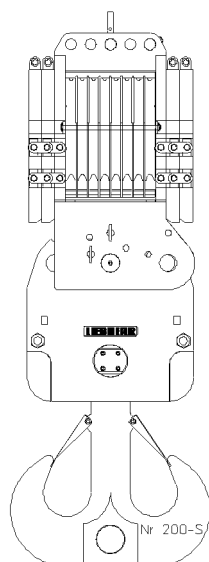


Fig.149923: Hook block 630 DZ for load 470 t

| Load | Strands | Rope pulleys |
|-------|---------|--------------|
| 470 t | 1 x 17 | 1 x 8 |

4.4 Hook block 630 DZ for load 420 t

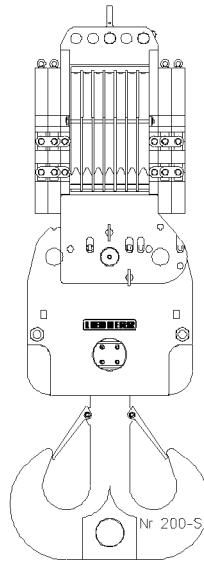


Fig.149924: Hook block 630 DZ for load 420 t

| Load | Strands | Rope pulleys |
|-------|---------|--------------|
| 420 t | 1 x 15 | 1 x 7 |

4.5 Hook block 630 DZ for load 320 t

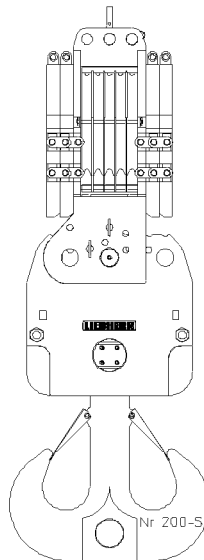


Fig.149925: Hook block 630 DZ for load 320 t

| Load | Strands | Rope pulleys |
|-------|---------|--------------|
| 320 t | 1 x 11 | 1 x 5 |

5 Assembling / disassembling hook block 630 DZ (630 t)

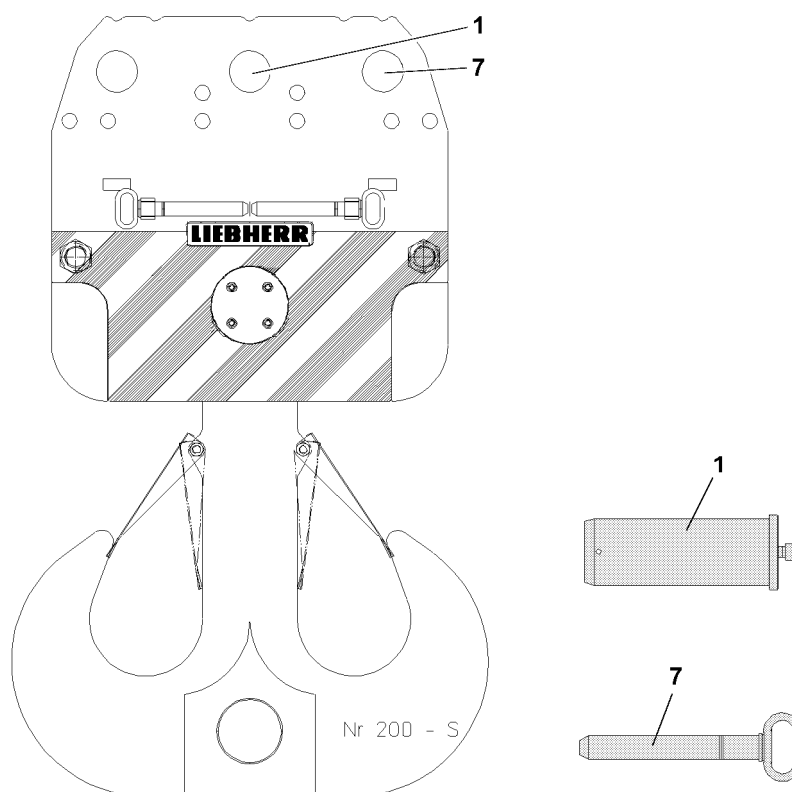


Fig.149926



WARNING

Danger of accident when assembling / disassembling hook blocks!

When assembling / disassembling components on the hook block, components such as roller blocks or block connectors can fall down.

Death, severe bodily injuries, property damage.

- ▶ Never unpin the retaining pins on unsecured 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 storage locations as well as in the receptacles.

5.1 Hook block 630 t

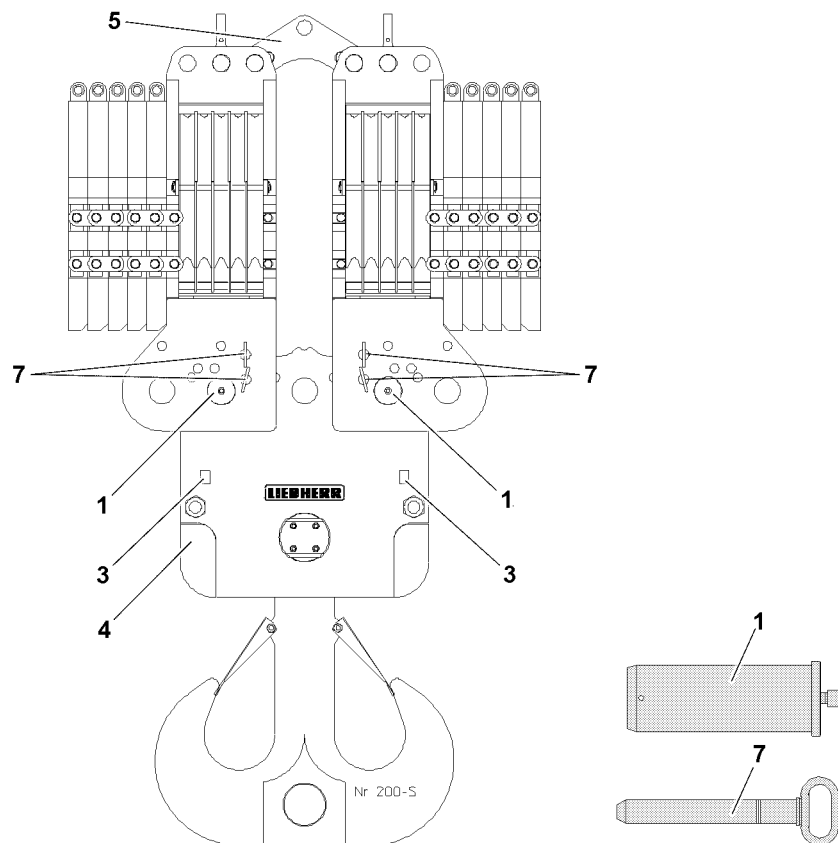


Fig.149927: Hook block 630 t

The 630 t hook block is a double 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

5.1.1 Assembling a 630 t hook block

- ▶ Pin the 5-pulley roller blocks (2x) with the cross beam 4: Insert and secure the pin 1.
- ▶ Install the block connector 5 to the hook block.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins 7 before crane operation.

Before starting crane operation:

- ▶ Insert the retaining pins 7 into the receptacles 3 and secure.

5.1.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section „Assembling / disassembling the auxiliary weights“.
- ▶ Observe the minimum required hook block weight.

5.1.3 Disassembling a 630 t hook block



WARNING

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller blocks can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller blocks have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.

When the roller blocks are secured by the retaining pins **7**:

- ▶ Remove the block connector **5** on the hook block.
- ▶ Unpin the 5-pulley roller blocks (2x) on the cross beam **4**: Release and unpin the pin **1**.

5.2 Hook block 560 t

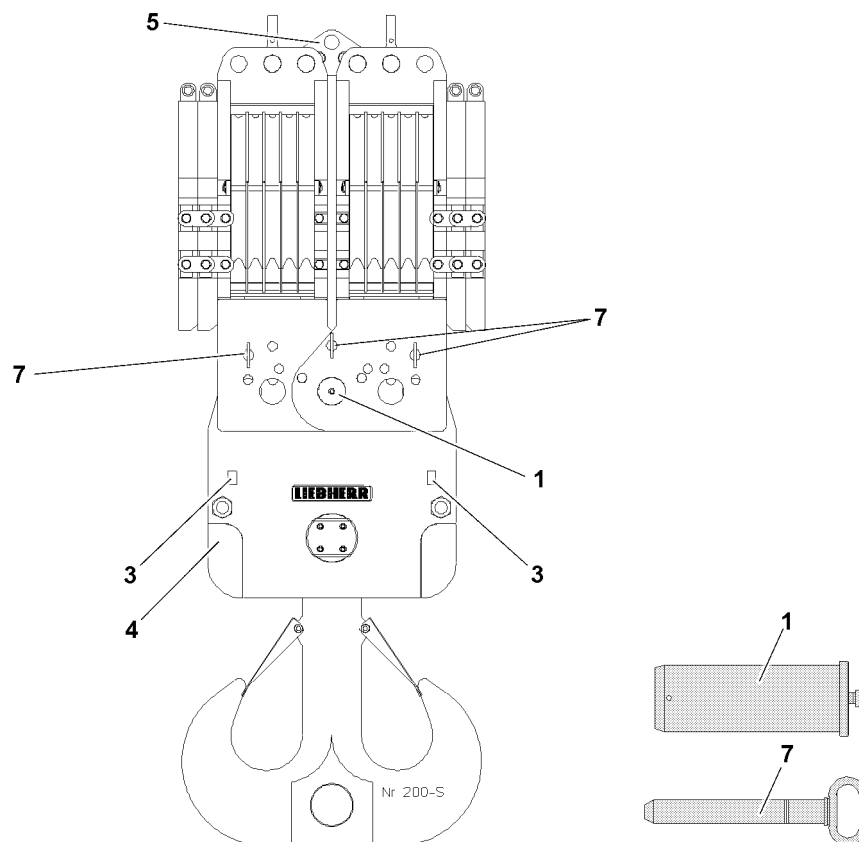


Fig.149928: Hook block 560 t

Hook block 560 t for a 2 winch operation with cross beam 630 t

The 560 t hook block is a double 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

5.2.1 Assembling a 560 t hook block

- ▶ Pin the 5-pulley roller blocks (2x) with the cross beam **4**: Insert and secure the pin **1**.
- ▶ Install the block connector **5** to the hook block.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins **7** before crane operation.

Before starting crane operation:

- ▶ Insert the retaining pins **7** into the receptacles **3** and secure.

5.2.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section „Assembling / disassembling the auxiliary weights“.
- ▶ Observe the minimum required hook block weight.

5.2.3 Disassembling a 560 t hook block



WARNING

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller blocks can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller blocks have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.

When the roller blocks are secured by the retaining pins **7**:

- ▶ Remove the block connector **5** on the hook block.
- ▶ Unpin the 5-pulley roller blocks (2x) on the cross beam **4**: Release and unpin the pin **1**.

5.3 Hook block 470 t

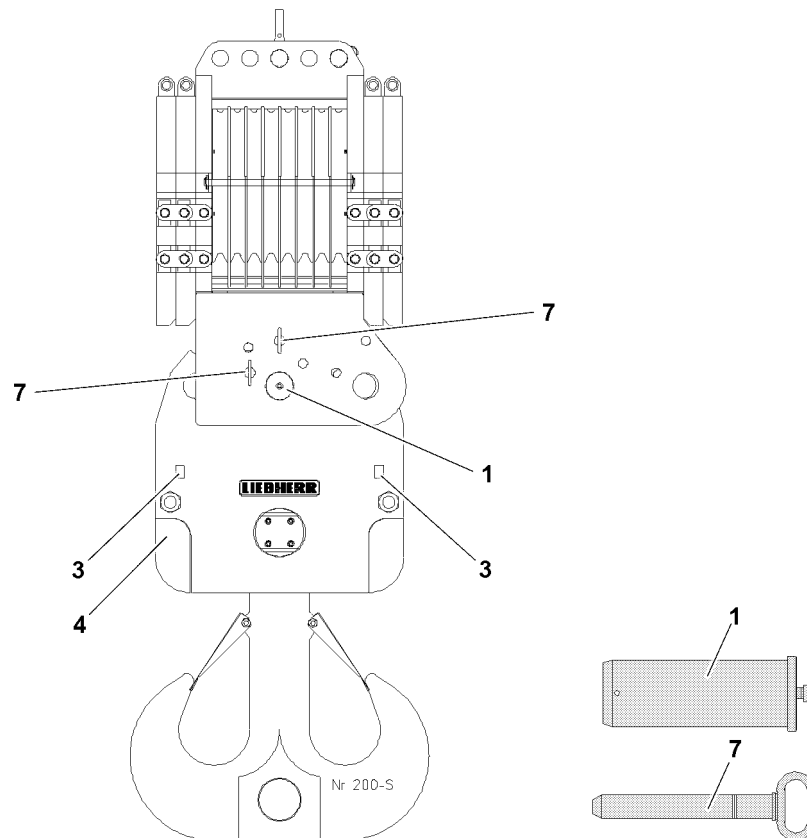


Fig. 149930: Hook block 470 t

Hook block 470 t for a 1 winch operation with cross beam 630 t

The 470 t hook block is a single 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

5.3.1 Assembling a 470 t hook block

- ▶ Pin the 8-pulley roller block to the cross beam 4: Insert and secure the pin 1.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins 7 before crane operation.

Before starting crane operation:

- ▶ Insert the retaining pins 7 into the receptacles 3 and secure.

5.3.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section „Assembling / disassembling the auxiliary weights“.
- ▶ Observe the minimum required hook block weight.

5.3.3 Disassembling a 470 t hook block



WARNING

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller block can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller block have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.
- ▶ Unpin the 8-pulley roller block on the cross beam **4**: Release and unpin the pin **1**.

5.4 Hook block 420 t

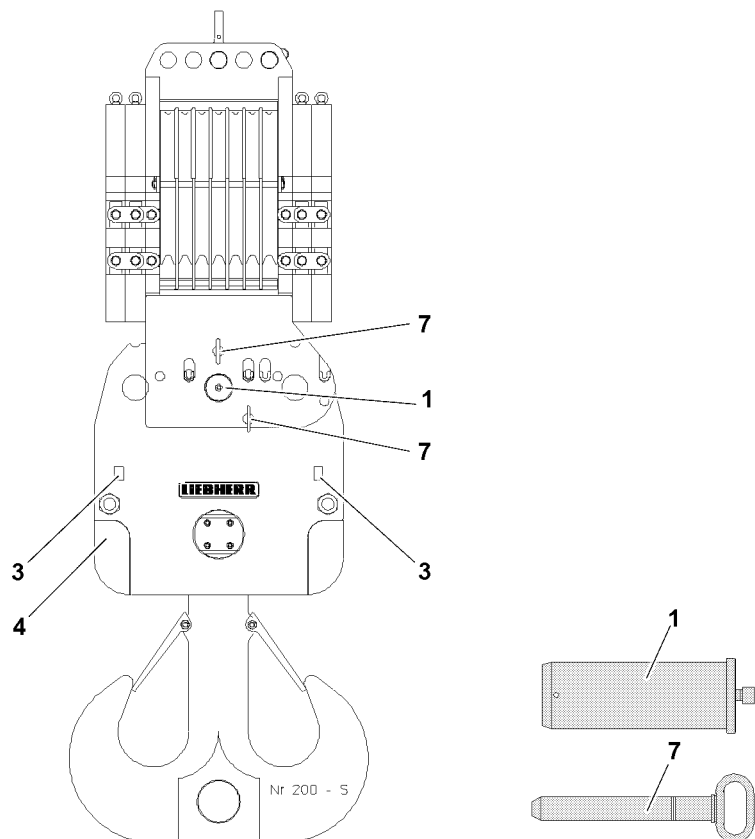


Fig.149931: Hook block 420 t

Hook block 420 t for a 1 winch operation with cross beam 630 t

The 420 t hook block is a single 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

5.4.1 Assembling a 420 t hook block

- ▶ Pin the 7-pulley roller block to the cross beam **4**: Insert and secure the pin **1**.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins **7** before crane operation.

Before starting crane operation:

- ▶ Insert the retaining pins **7** into the receptacles **3** and secure.

5.4.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section „Assembling / disassembling the auxiliary weights“.
- ▶ Observe the minimum required hook block weight.

5.4.3 Disassembling a 420 t hook block



WARNING

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller block can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller block have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.
- ▶ Unpin the 7-pulley roller block on the cross beam **4**: Release and unpin the pin **1**.

5.5 Hook block 320 t

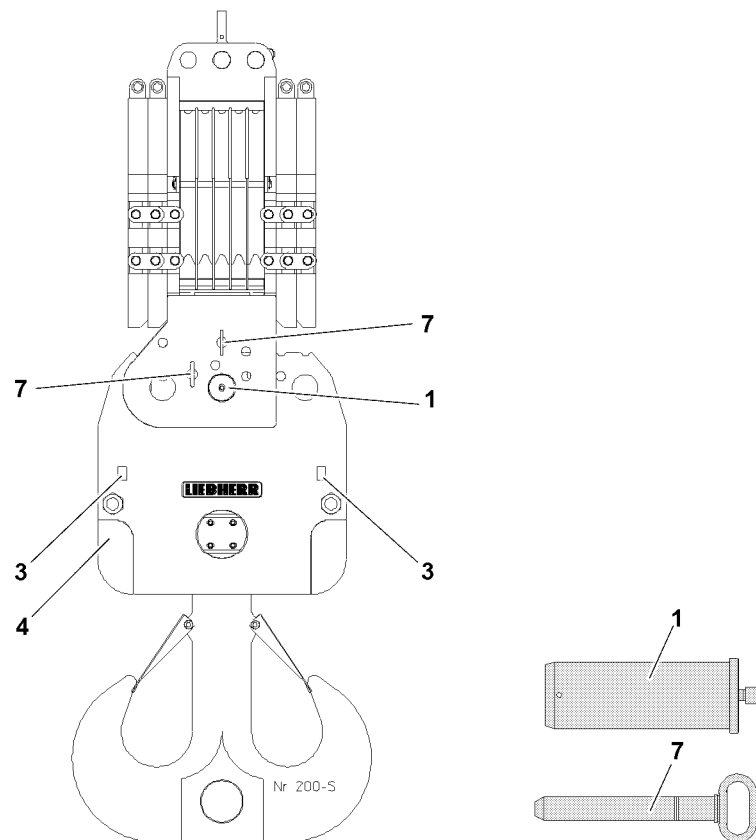


Fig.149932: Hook block 320 t

Hook block 320 t for a 1 winch operation with cross beam 630 t

The 320 t hook block is a single 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

5.5.1 Assembling a 320 t hook block

- ▶ Pin the 5-pulley roller block to the cross beam 4: Insert and secure the pin 1.

In order to prevent the hook block from tilting during assembling and reeving in, 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.

Death, severe bodily injuries, property damage.

- ▶ Unpin the retaining pins 7 before crane operation.

Before starting crane operation:

- ▶ Insert the retaining pins 7 into the receptacles 3 and secure.

5.5.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section „Assembling / disassembling the auxiliary weights“.
- ▶ Observe the minimum required hook block weight.

5.5.3 Disassembling a 320 t hook block



WARNING

Toppling of hook block!

If the retaining pins **7** are not inserted into the hook block before reeving out or disassembling, then the roller block can tilt away to the side and cause the hook block to topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that all auxiliary weights on the roller block have been removed before disassembling the hook block.
- ▶ Insert the retaining pin **7** into the hook block before reeving out.

Before starting hook block disassembly:

- ▶ Insert the retaining pins **7** into the hook block.
- ▶ Unpin the 5-pulley roller block on the cross beam **4**: Release and unpin the pin **1**.

6 Assembling / disassembling auxiliary weights on the double hook block for single operation



Note

- ▶ The „Minimum required hook block weight“ is decisive for ballasting the hook block with auxiliary weights, see the load chart manual.
- ▶ 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.

6.1 Assembling the auxiliary weights

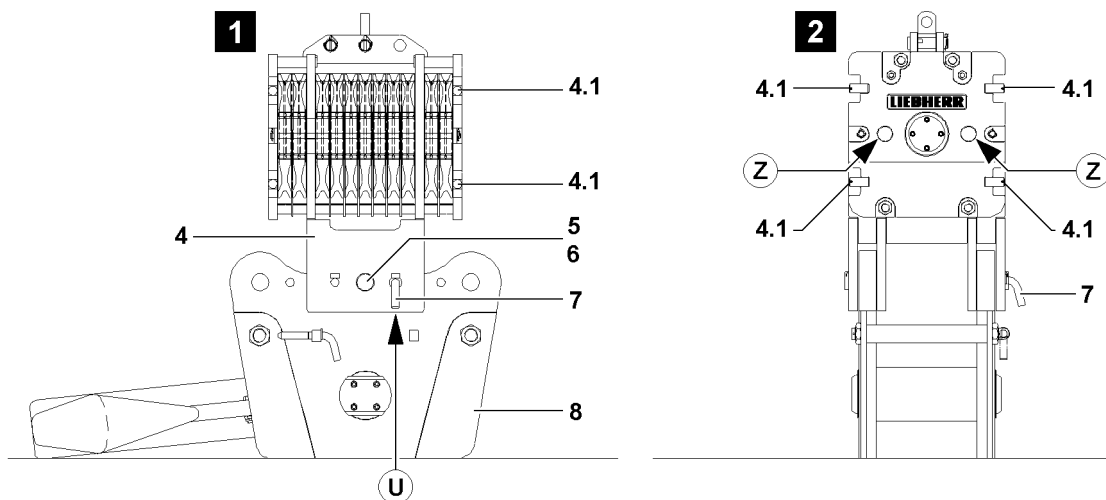


Fig.149933

**Note**

- ▶ The own weight of each auxiliary weight is marked on the auxiliary weight.

**WARNING**

Toppling of the hook block!

If the auxiliary weights are installed on one side, the hook block can topple over.

Death, severe bodily injuries, property damage.

- ▶ The auxiliary weights may only be installed **individually** and alternating left and right on the roller block.
- ▶ When the required auxiliary weight is installed on the roller 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 roller block **4** is properly assembled and secured.
- The retaining pin **7** is pinned and secured in point **U**.

**WARNING**

Falling auxiliary weights!

If the auxiliary weights are not properly assembled on the roller block, then they can fall down during assembly or crane operation.

Death, severe bodily injuries, property damage.

- ▶ Standing under a suspended auxiliary weight is prohibited.
- ▶ Make sure that the auxiliary weights are properly assembled and secured.
- ▶ Crane operation with insufficiently secured auxiliary weights is prohibited.

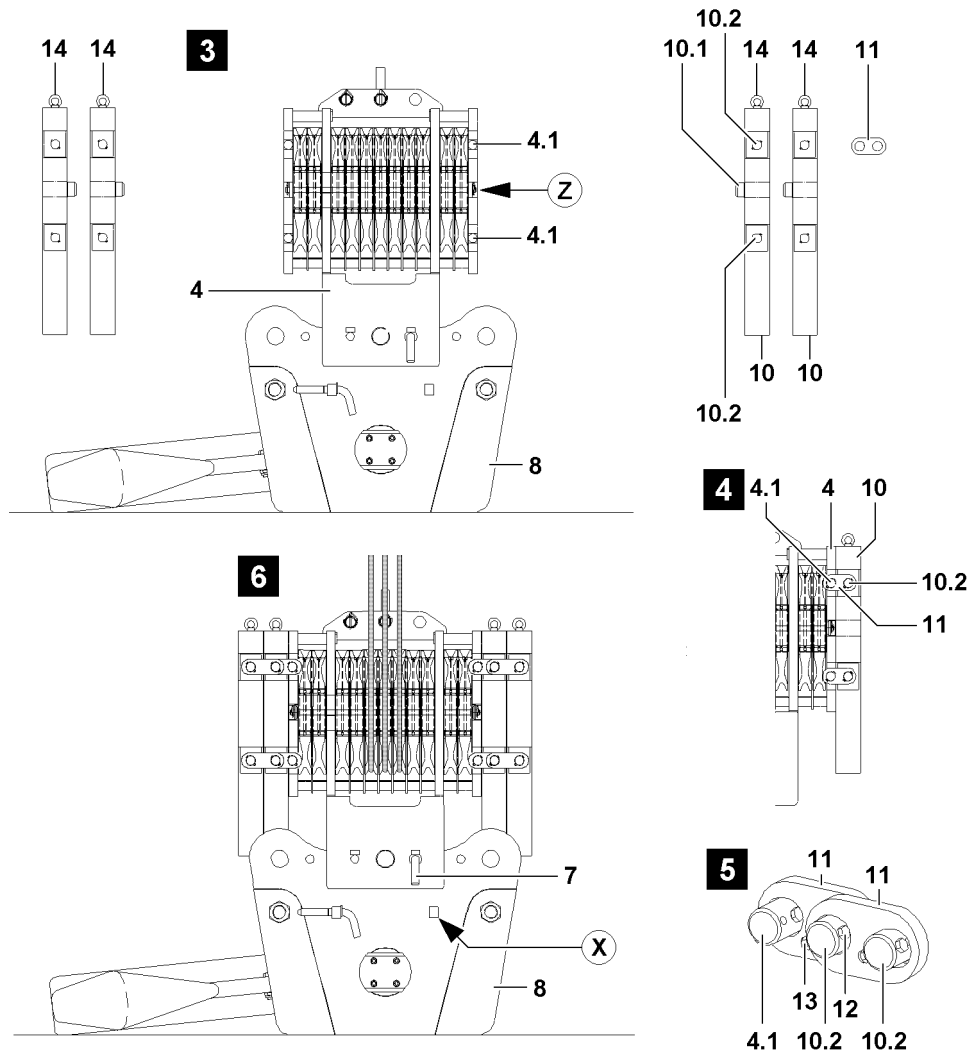


Fig. 149934

- Fasten the auxiliary weight **10** to the ring screw **14** to the auxiliary crane, illustration **3**.

**WARNING**

Danger of crushing!
Death, severe bodily injuries, property damage.

- It is prohibited for anyone to remain between the roller block and the auxiliary weight.
- Swing the auxiliary weights in to the roller block with utmost caution and at the lowest speed possible.

- Align the auxiliary weight **10** with the roller block **4**.
- Move the centering pin **10.1** of the auxiliary weight into the centering bores **Z** on the roller 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.

Death, severe bodily injuries, property damage.

- 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 roller 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.

Death, severe bodily injuries, property damage.

► 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 assembled and secured:

► Remove the auxiliary crane.

6.2 Disassembling the auxiliary weights



Note

► The own weight of each auxiliary weight is marked on the auxiliary weight.

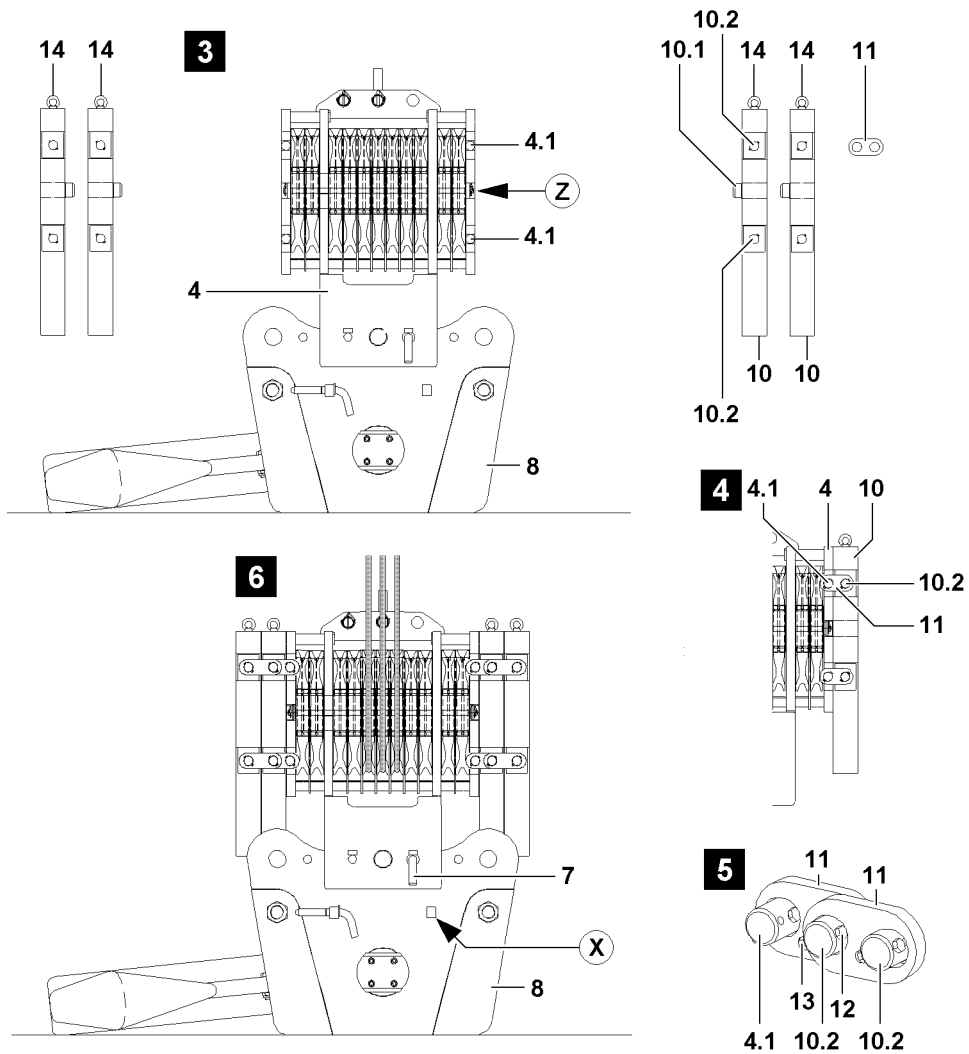


Fig.149934

LWE/LR 11350-007/190005-01-02/en

**WARNING**

Toppling of the hook block!

If the auxiliary weights are disassembled on one side, the hook block can topple over.
Death, severe bodily injuries, property damage.

- ▶ The auxiliary weights may only be disassembled **individually** and alternating left and right on the roller block.
- ▶ The difference between the left and the right side when disassembling the auxiliary weights may never be more than one auxiliary weight.
- ▶ Asymmetrical disassembly of auxiliary weights is prohibited.

Make sure that the following prerequisite is met:

- The retaining pin **7** is pinned and secured in point **U**.

**WARNING**

Falling auxiliary weights!

If the auxiliary weights on the roller block are not disassembled properly, then they can fall down during disassembly.

Death, severe bodily injuries, property damage.

- ▶ Standing under a suspended auxiliary weight is prohibited.
- ▶ Fasten the auxiliary weight **10** to the ring screw **14** on the auxiliary crane.
- ▶ Tension the fastening equipment with caution.

**WARNING**

Oscillating auxiliary weights!

During the disassembly of the auxiliary weights, the auxiliary weights can start to swing back and forth.
Death, severe bodily injuries, property damage.

- ▶ It is prohibited to remain in the danger zone.
- ▶ Make sure that the auxiliary weight which is being removed is properly fastened to 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.

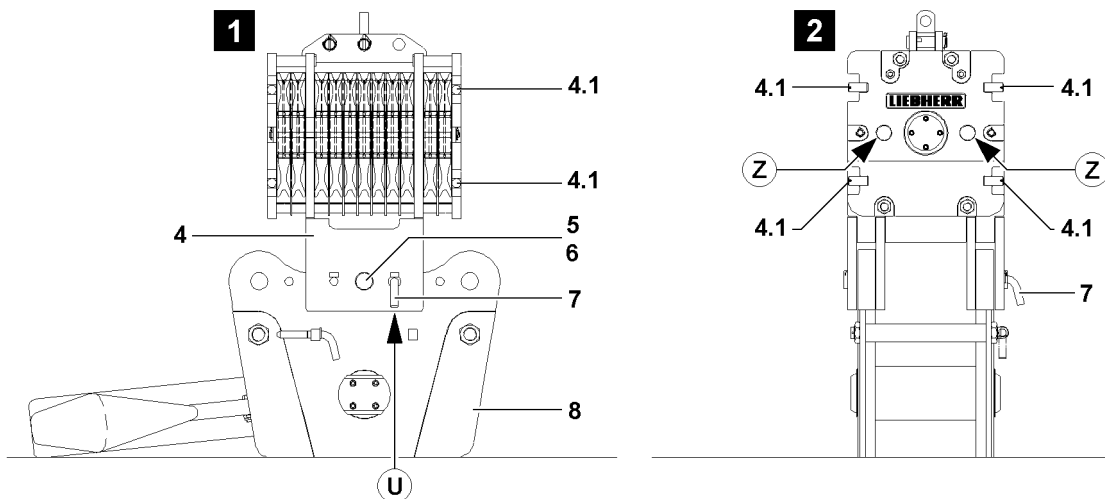


Fig.149933

**WARNING**

Falling auxiliary weights!

If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down.

Death, severe bodily injuries, property damage.

- ▶ 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.

Death, severe bodily injuries, property damage.

- ▶ 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 being disassembled is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the roller block.
- ▶ Take the auxiliary weight down on the ground.
- ▶ Remove the auxiliary crane.
- ▶ Disassemble the additional auxiliary weights as described above.

7 Assembling / disassembling auxiliary weights on the double hook block for parallel operation

**Note**

- ▶ The „Minimum required hook block weight“ is decisive for ballasting the hook block with auxiliary weights, see the load chart manual.
- ▶ 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.

7.1 Assembling the auxiliary weights

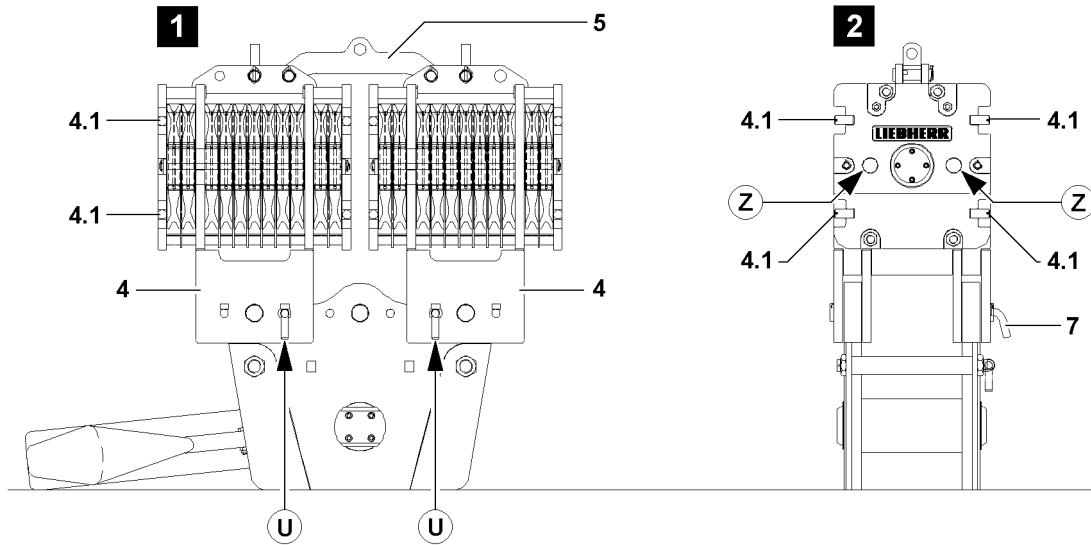


Fig.149935



Note

- ▶ The own weight of each auxiliary weight is marked on the auxiliary weight.



WARNING

Toppling of the hook block!

If the auxiliary weights are installed on one side, the hook block can topple over.

Death, severe bodily injuries, property damage.

- ▶ The auxiliary weights may only be placed **individually** and alternating left and right on the roller blocks of the hook block.
- ▶ When the required auxiliary weight is installed on the roller 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 roller blocks **4** are properly installed and secured.
- The retaining pins **7** are inserted and secured in point **U**.
- The block connector **5** is properly assembled and secured.



WARNING

Falling auxiliary weights!

If the auxiliary weights on the roller blocks are not properly assembled, then they can fall down during assembly or during crane operation.

Death, severe bodily injuries, property damage.

- ▶ Standing under a suspended auxiliary weight is prohibited.
- ▶ Make sure that the auxiliary weights are properly assembled and secured.
- ▶ Crane operation with insufficiently secured auxiliary weights is prohibited.

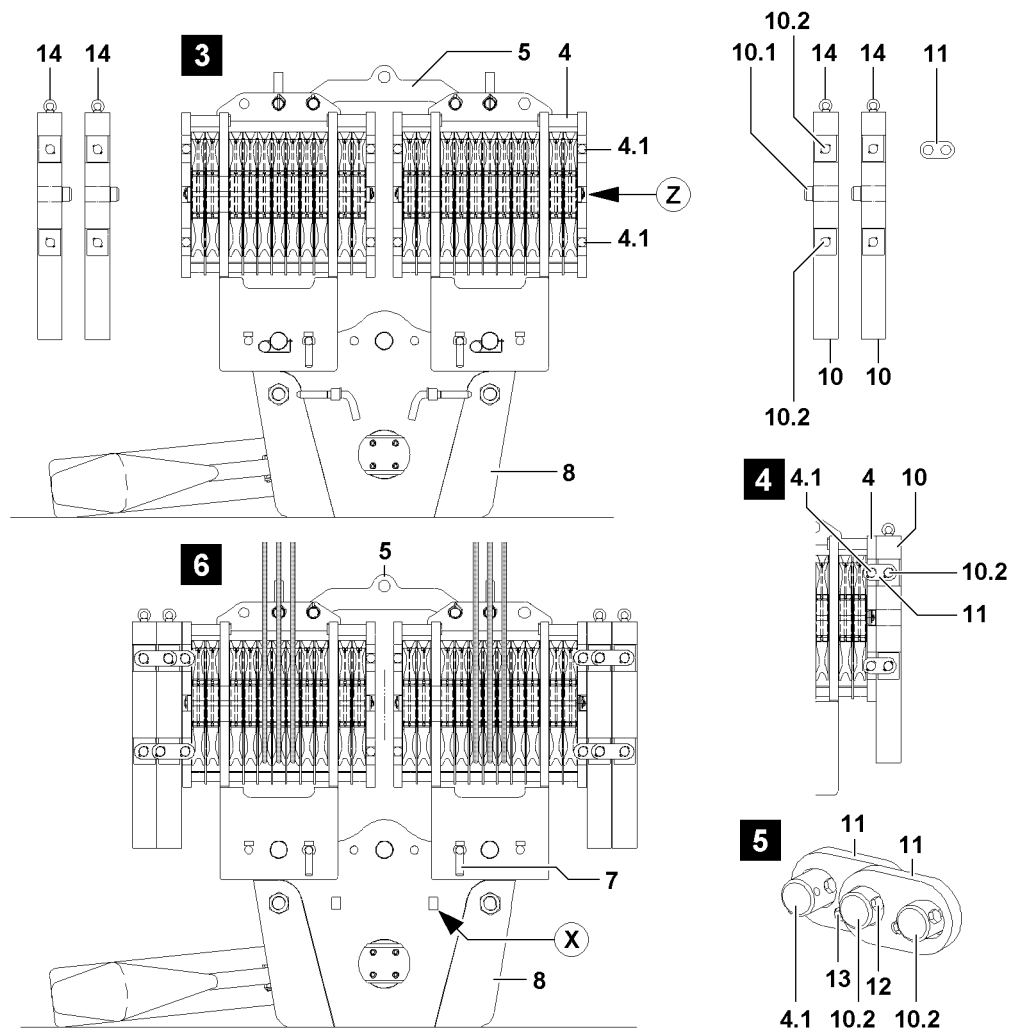


Fig.149936

- Fasten the auxiliary weight **10** to the ring screw **14** on the auxiliary crane.

**WARNING**

Danger of crushing!
Death, severe bodily injuries, property damage.

- It is prohibited for anyone to remain between the roller blocks and the auxiliary weight.
- Swing the auxiliary weights in to the roller block with utmost caution and at the lowest speed possible.

- Align the auxiliary weight **10** with the roller block **4**.
- Move the centering pin **10.1** of the auxiliary weight into the centering bores **Z** on the roller 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.

Death, severe bodily injuries, property damage.

- 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 roller 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.

Death, severe bodily injuries, property damage.

► 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 assembled and secured:

► Remove the auxiliary crane.

7.2 Disassembling the auxiliary weights



Note

► The own weight of each auxiliary weight is marked on the auxiliary weight.

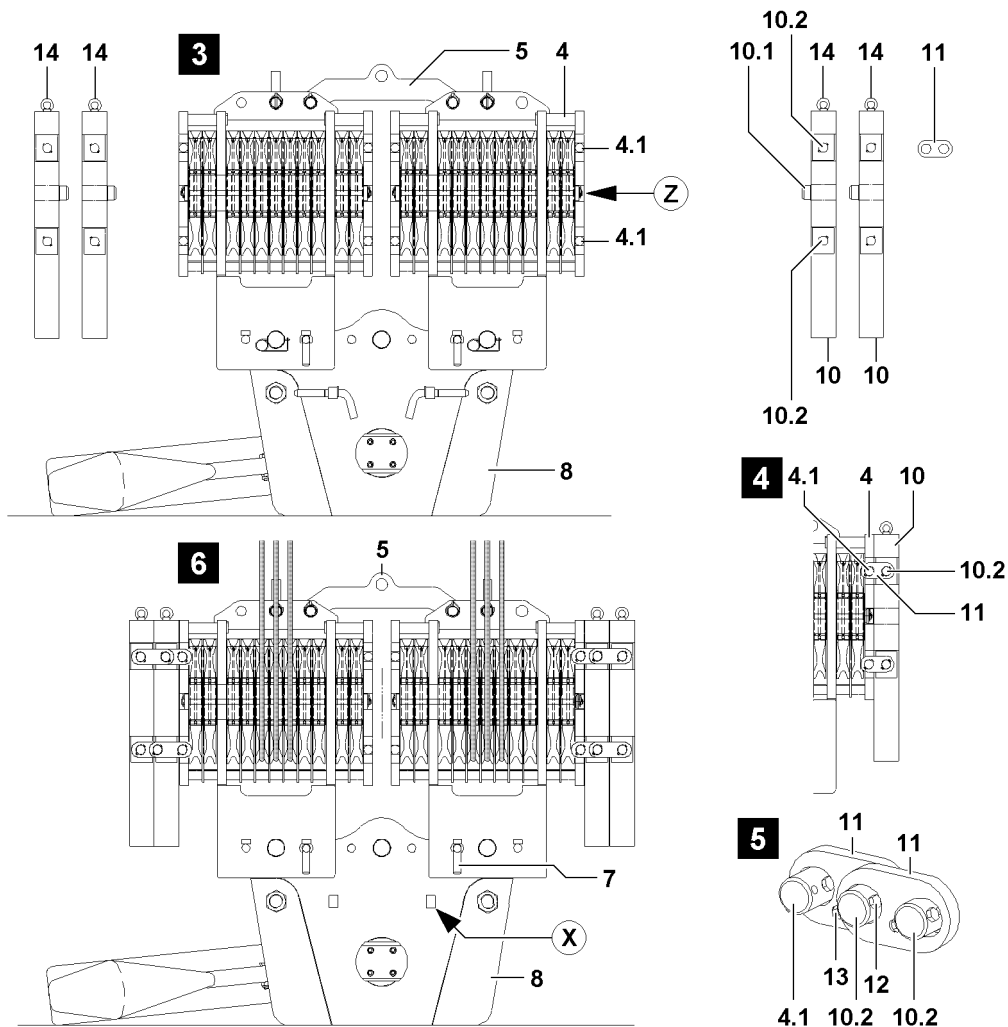


Fig.149936

LWE/LR 11350-007/19005-01-02/en

**WARNING**

Toppling of the hook block!

If the auxiliary weights are disassembled on one side, the hook block can topple over.

Death, severe bodily injuries, property damage.

- ▶ The auxiliary weights may only be disassembled **individually** and alternating left and right on the roller blocks of the hook block.
- ▶ The difference between the left and the right side when disassembling the auxiliary weights may never be more than one auxiliary weight.
- ▶ Asymmetrical disassembly of the auxiliary weights is prohibited.

Make sure that the following prerequisites are met:

- The retaining pins **7** are inserted and secured on both sides in point **U**.
- The block connector **5** has been disassembled.

**WARNING**

Falling auxiliary weights!

If the auxiliary weights on the roller blocks are not properly disassembled, then they can fall down during disassembly.

Death, severe bodily injuries, property damage.

- ▶ Standing under a suspended auxiliary weight is prohibited.

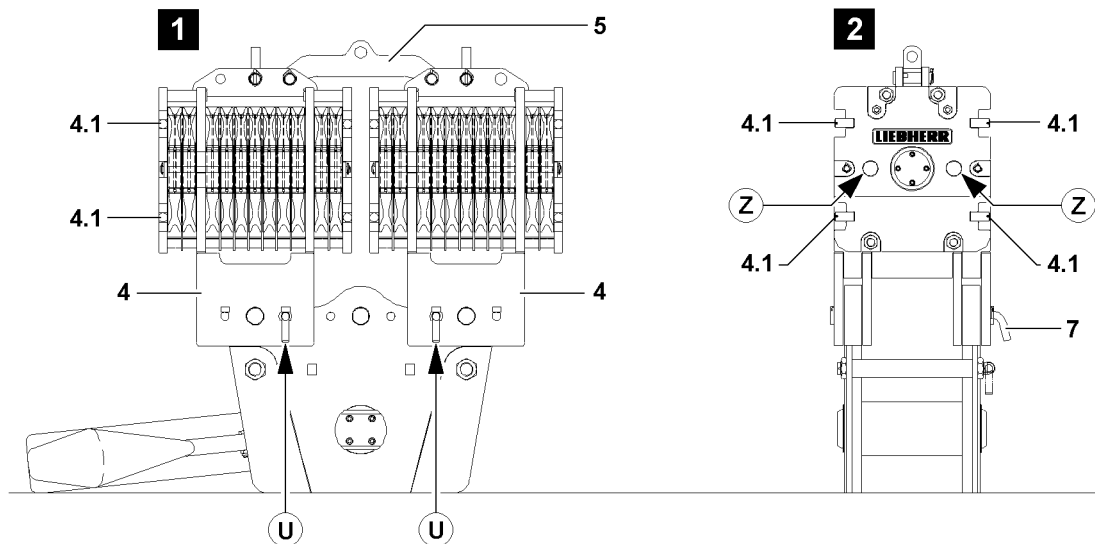


Fig.149935

- ▶ Fasten the auxiliary weight **10** to the ring screw **14** on the auxiliary crane.
- ▶ Tension the fastening equipment with caution.

**WARNING**

Oscillating auxiliary weights!

During the disassembly of the auxiliary weights, the auxiliary weights can start to swing back and forth.

Death, severe bodily injuries, property damage.

- ▶ It is prohibited to remain in the danger zone.
- ▶ Make sure that the auxiliary weight which is being removed is properly fastened to 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.

Death, severe bodily injuries, property damage.

- ▶ 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.

Death, severe bodily injuries, property damage.

- ▶ 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 being disassembled is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the roller block.
- ▶ Take the auxiliary weight down on the ground.
- ▶ Remove the auxiliary crane.
- ▶ Disassemble the additional auxiliary weights as described above.

8 Assembling / disassembling auxiliary weight 4 t on hook block 1350 DMZ

**Note**

- ▶ The „Minimum required hook block weight“ is decisive for ballasting the hook block with auxiliary weights, see the load chart manual.
- ▶ The hook block can be operated with various auxiliary weights.
- ▶ The installation of the side auxiliary weights is described in section „Assembling / disassembling the auxiliary weights“.
- ▶ When installing the auxiliary weight 4 t **10**, the side auxiliary weight may already be properly assembled on the hook block.

8.1 Assembling the auxiliary weight 4 t

**WARNING**

Toppling of hook block!

If the first auxiliary weight 4 t **10** is assembled on the side facing away from the hook, the entire hook block can topple over.

Death, severe bodily injuries, property damage.

- ▶ Always assemble the first auxiliary weight 4 t **10** on the hook side, observe the sign **4**.
- ▶ Make sure that no personnel is within the danger zone during the assembly of the auxiliary weights.

Make sure that the following prerequisites are met:

- The hook block is taken down on even ground with sufficient load bearing capacity or a load bearing substructure.
- The roller blocks (roller blocks 2 and roller blocks 3) are properly assembled on the cross beam 1.
- The roller blocks (roller blocks 2 and roller blocks 3) are secured properly against toppling over.
- The roller blocks are properly connected with the block connectors.
- An auxiliary crane or forklift with sufficient load carrying capacity is available.
- Make sure that when assembling the auxiliary weight with the auxiliary crane the fastening equipment is long enough and has a sufficient load carrying capacity.

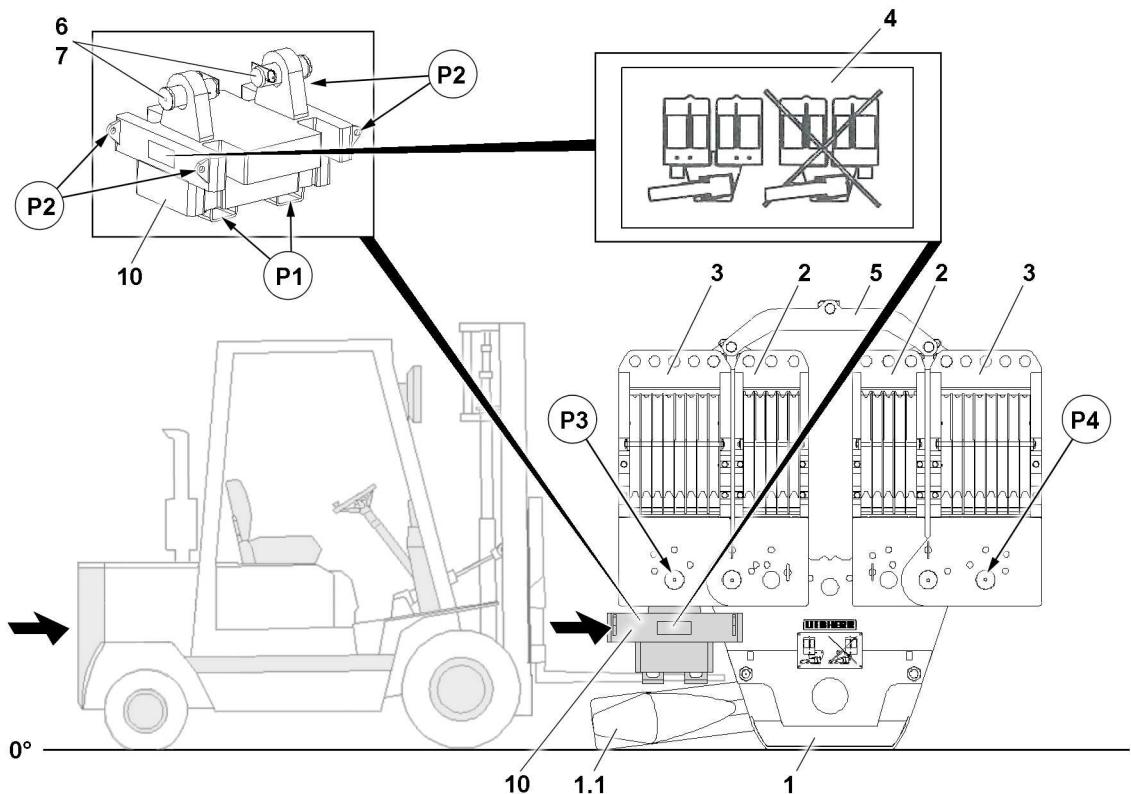


Fig.149938: Assembling the auxiliary weight 4 t 10 on the double hook block 1350 DMZ

- ▶ Pick up the auxiliary weight 4 t 10 at the points P1 with the forks of the forklift.
or
Properly fasten the auxiliary weight 4 t 10 in the points P2 (4x) with the auxiliary crane, using shackles and fastening equipment.

When the auxiliary weight 4 t 10 is properly lifted / fastened:

- ▶ Retract the auxiliary weight 4 t 10 on the roller block 3 of the hook block slowly and carefully.

When the pin bores of the auxiliary weight 4 t 10 align with the pin bores on the roller block 3 in point P3:

- ▶ Insert the pin 6 in point P3 on both sides and properly secure with the retaining element 7.

Result:

- The auxiliary weight 4 t 10 is pinned on the roller block 3.



WARNING

Falling auxiliary weight.
Death, severe bodily injuries, property damage.

- ▶ Make sure before removing the forklift truck or the auxiliary crane that the auxiliary weight 4 t 10 is properly pinned and secured on the roller block 3 of the hook block in point P3.

During assembly with the forklift:

- ▶ Drive the forklift carefully out of the auxiliary weight 4 t **10**.
- or

During assembly with an auxiliary crane:

- Remove the fastening equipment on the auxiliary weight 4 t **10**.
- ▶ Assemble the second auxiliary weight 4 t **10** on the side facing away from the hook in point **P4**.

8.2 Disassembling the auxiliary weight 4 t

Make sure that the following prerequisites are met:

- The hook block is taken down on even ground with sufficient load bearing capacity or a load bearing substructure.
- An auxiliary crane or forklift with sufficient load carrying capacity is available.
- Make sure that when disassembling the auxiliary weight with the auxiliary crane the fastening equipment is long enough and has a sufficient load carrying capacity.

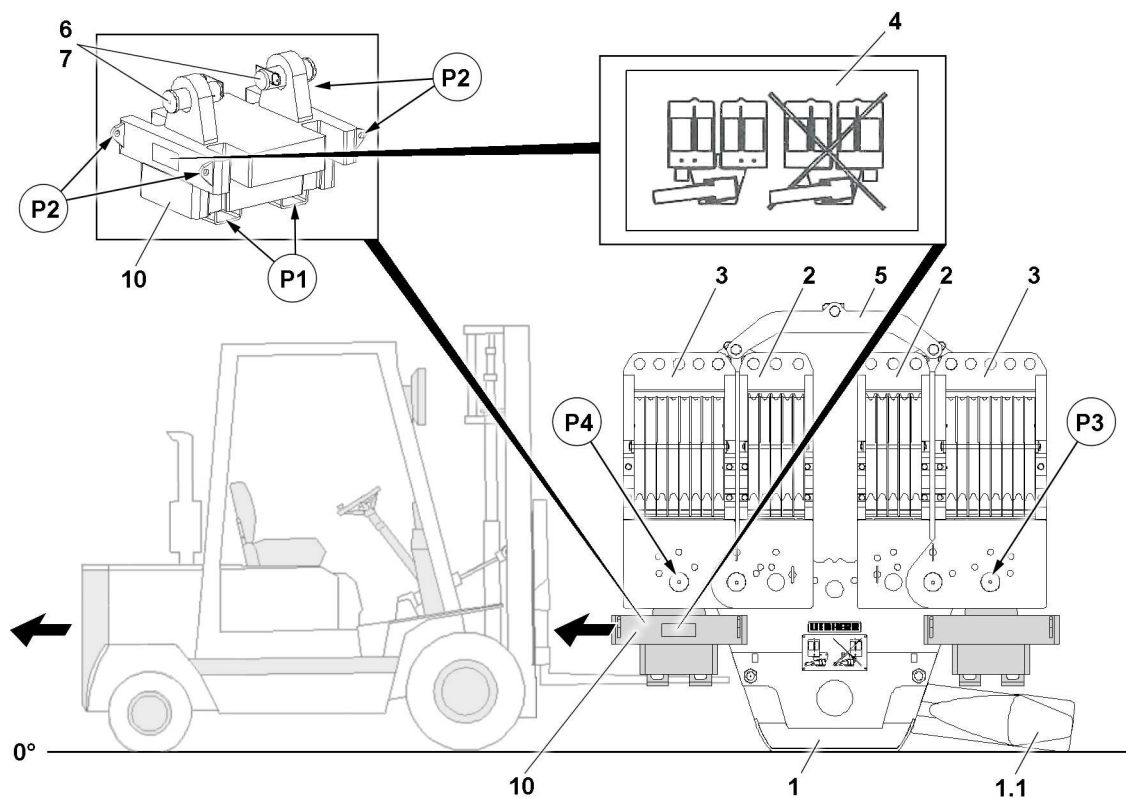


Fig.149939: Disassembling the auxiliary weights 4 t on the double hook block 1350 DMZ



WARNING

Toppling of hook block!

If the first auxiliary weight 4 t **10** on the hook side is disassembled, the entire hook block can topple over.

Death, severe bodily injuries, property damage.

- ▶ Disassemble the first auxiliary weight 4 t **10** always on the side facing away from the hook, observe the sign **4**.
- ▶ Make sure that no personnel is within the danger zone during the disassembly of the auxiliary weights.

- ▶ Pick up the auxiliary weight 4 t **10** at the points **P1** with the forks of the forklift.

or

Properly fasten the auxiliary weight 4 t **10** in the points **P2** (4x) with the auxiliary crane, using shackles and fastening equipment.

**WARNING**

Falling auxiliary weight.

Death, severe bodily injuries, property damage.

- ▶ Make sure before unpinning it from the roller block **3** of the hook block, that the auxiliary weight **4 t 10** is securely held in position by the forklift truck or the auxiliary crane.
- ▶ Make sure that there are no persons in the danger zone.

When the auxiliary weight **4 t 10** is held properly in position:

- ▶ Unpin the auxiliary weight **4 t 10** on the roller block **3** of the hook block in point **P4**: Release and unpin the pin **6**.

When the auxiliary weight **4 t 10** is unpinned on the roller block **3**:

- ▶ Extend the auxiliary weight **4 t 10** with utmost caution and at a low speed.
- ▶ Take the auxiliary weight **4 t 10** down on the ground or on a load bearing substructure.

During disassembly with the forklift:

- ▶ Drive the forklift carefully out of the auxiliary weight **4 t 10**.
- or

During disassembly with an auxiliary crane:

Remove the fastening equipment on the auxiliary weight **4 t 10**.

- ▶ Disassemble the second auxiliary weight **4 t 10** on the hook side in point **P3**.

9 Assembling the auxiliary weights on the single blocks

**Note**

- ▶ The „Minimum required hook block weight“ is decisive for ballasting the hook block with auxiliary weights, see the load chart manual.
- ▶ 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.

9.1 Assembling the auxiliary weights

**Note**

- ▶ The own weight of each auxiliary weight is marked on the auxiliary weight.

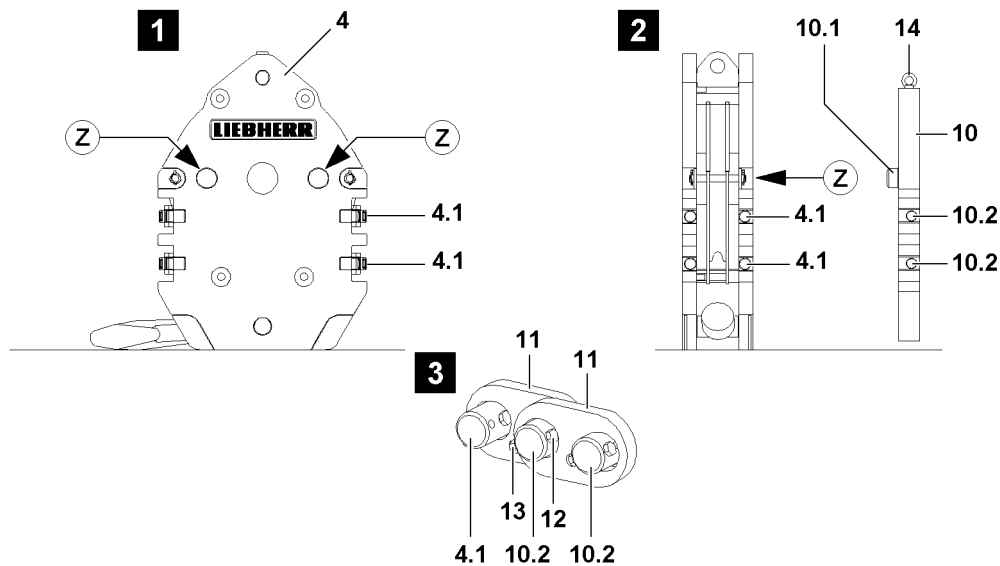


Fig. 149937

**WARNING**

Toppling of the hook block!

If the auxiliary weights are installed on one side, the hook block can topple over.

Death, severe bodily injuries, property damage.

- ▶ 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 assembled on the hook block, then they can fall down during assembly or during crane operation.

Death, severe bodily injuries, property damage.

- ▶ Standing under a suspended auxiliary weight is prohibited.
- ▶ Make sure that the auxiliary weights are properly assembled and secured.
- ▶ Crane operation with insufficiently secured auxiliary weights is prohibited.
- ▶ Fasten the auxiliary weight **10** to the ring screw **14** on the auxiliary crane.

**WARNING**

Danger of crushing!

Death, severe bodily injuries, property damage.

- ▶ It is prohibited for anyone to remain between the hook block and the auxiliary weight.
- ▶ Swing the auxiliary weights in to the hook block with utmost caution and at the lowest speed possible.
- ▶ Align the auxiliary weight **10** with 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.

Death, severe bodily injuries, property damage.

- ▶ 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.

Death, severe bodily injuries, property damage.

- ▶ 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 assembled and secured:

- ▶ Remove the auxiliary crane.

9.2 Disassembling the auxiliary weights

**Note**

- ▶ The own weight of each auxiliary weight is marked on the auxiliary weight.

**WARNING**

Toppling of the hook block!

If the auxiliary weights are disassembled on one side, the hook block can topple over.

Death, severe bodily injuries, property damage.

- ▶ The auxiliary weights may only be disassembled **individually** and alternately on the left and right on the hook block.
- ▶ The difference between the left and the right side when disassembling the auxiliary weights may never be more than one auxiliary weight.
- ▶ Asymmetrical disassembly of the auxiliary weights is prohibited.

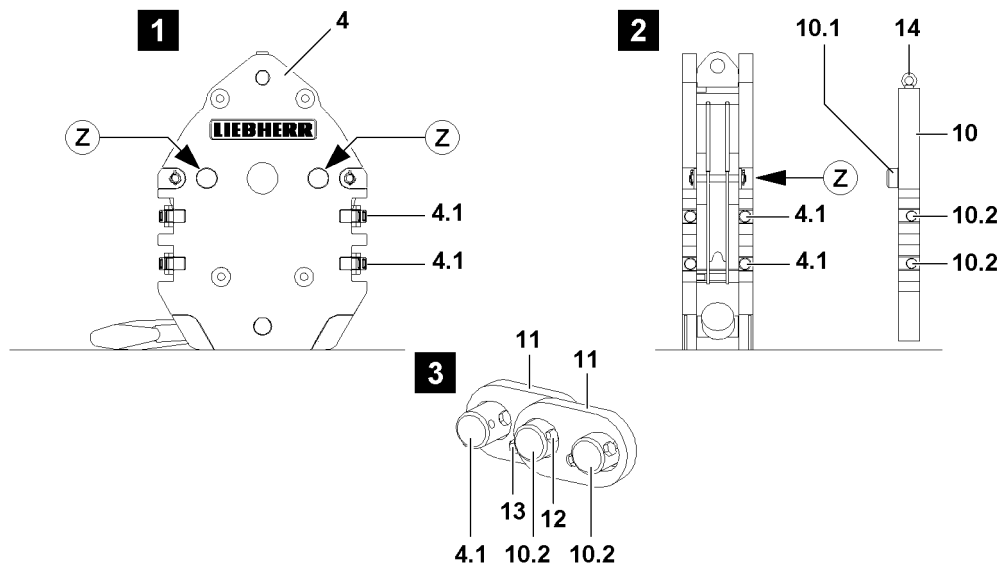


Fig. 149937

**WARNING**

Falling auxiliary weights!

If the auxiliary weights on the roller block are not disassembled properly, then they can fall down during disassembly.

Death, severe bodily injuries, property damage.

► Standing under a suspended auxiliary weight is prohibited.

- Fasten the auxiliary weight **10** to the ring screw **14** on the auxiliary crane.
- Tension the fastening equipment with caution.

**WARNING**

Oscillating auxiliary weights!

During the disassembly of the auxiliary weights, the auxiliary weights can start to swing back and forth. Death, severe bodily injuries, property damage.

- It is prohibited to remain in the danger zone.
- Make sure that the auxiliary weight which is being removed is properly fastened to 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.

Death, severe bodily injuries, property damage.

- 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.

Death, severe bodily injuries, property damage.

- ▶ 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 being disassembled is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the hook block.
- ▶ Take the auxiliary weight down on the ground.
- ▶ Remove the auxiliary crane.
- ▶ Disassemble the additional auxiliary weights as described above.

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5.30 Pin pulling device

1 Pinning and unpinning with pin pulling device

3

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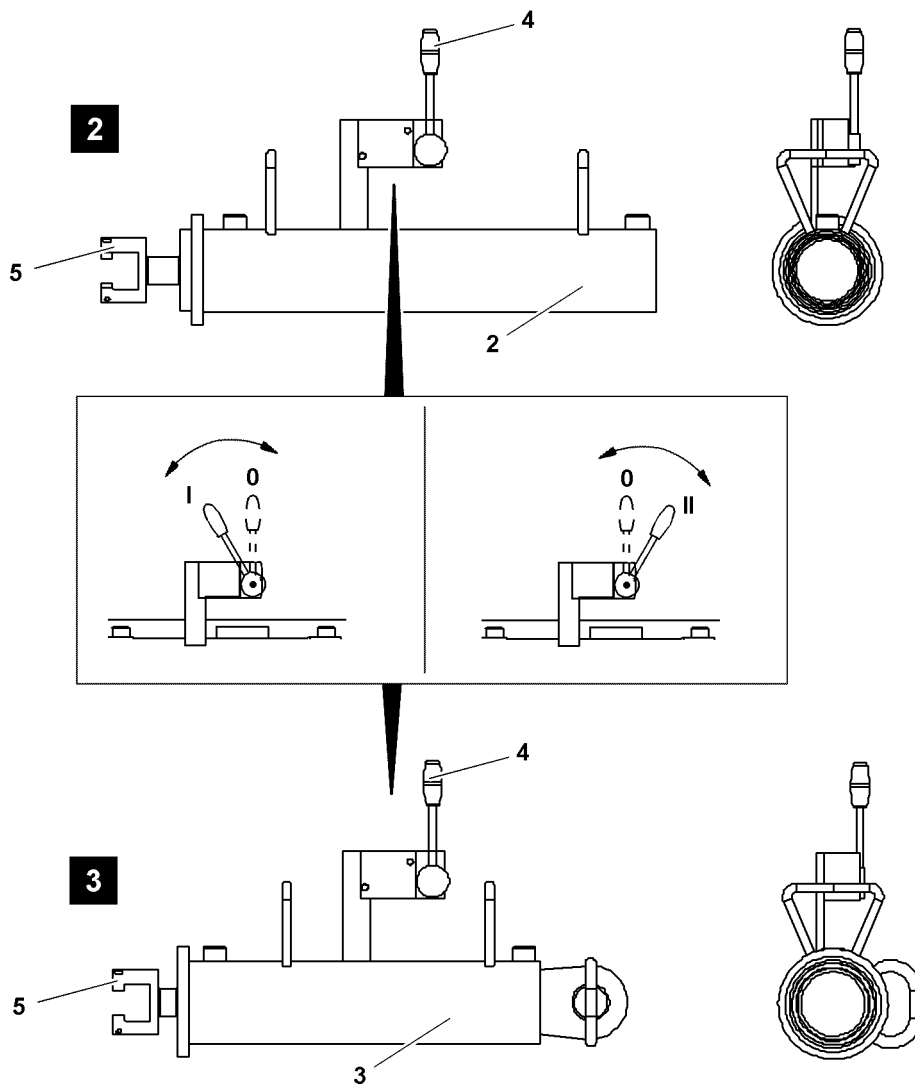
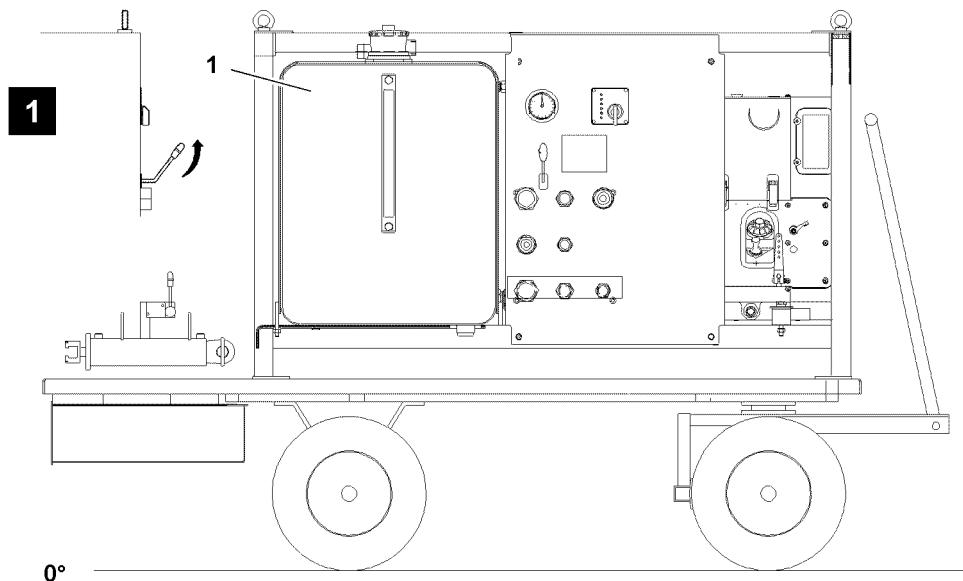


Fig.121949

LWE/LR 11350-007/19005-01-02/en

1 Pinning and unpinning with pin pulling device

The pin pulling device consists of the hydraulic aggregate and the pin pulling cylinders. The connector pins on the crawler crane and on the lattice sections are pinned and unpinned with these pin pulling cylinders.



Note

- ▶ The pin pulling cylinder **2** is used for pinning and unpinning on the chassis.



Note

- ▶ The pin pulling cylinder **3** is used for pinning and unpinning on the lattice sections.



DANGER

Danger of accident!

When you disassemble unsecured or unsupported crane parts, they can fall down!

Personnel can be severely injured or killed!

- ▶ Never stand **under** unsecured or unsupported crane parts and unpin the pins!
- ▶ Never unpin the connecting pins on unsecured or unsupported booms!
- ▶ Do not stand under the crane parts or within the complete danger zone during the pinning and unpinning procedure!
- ▶ Do not lean the ladder against the crane part being disassembled!



WARNING

Pressure in the hydraulic lines!

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

Personnel can be severely injured or killed!

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



WARNING

Loss of pressure or leakage!

Incorrectly coupled or self-loosening quick-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!
- ▶ Assemble coupling components (sleeve and connector) and screw together with the hand-tightened nut!
- ▶ Tighten the hydraulic coupling by hand. Rotate hand-tightened nut until it reaches a tangible, fixed stop position!

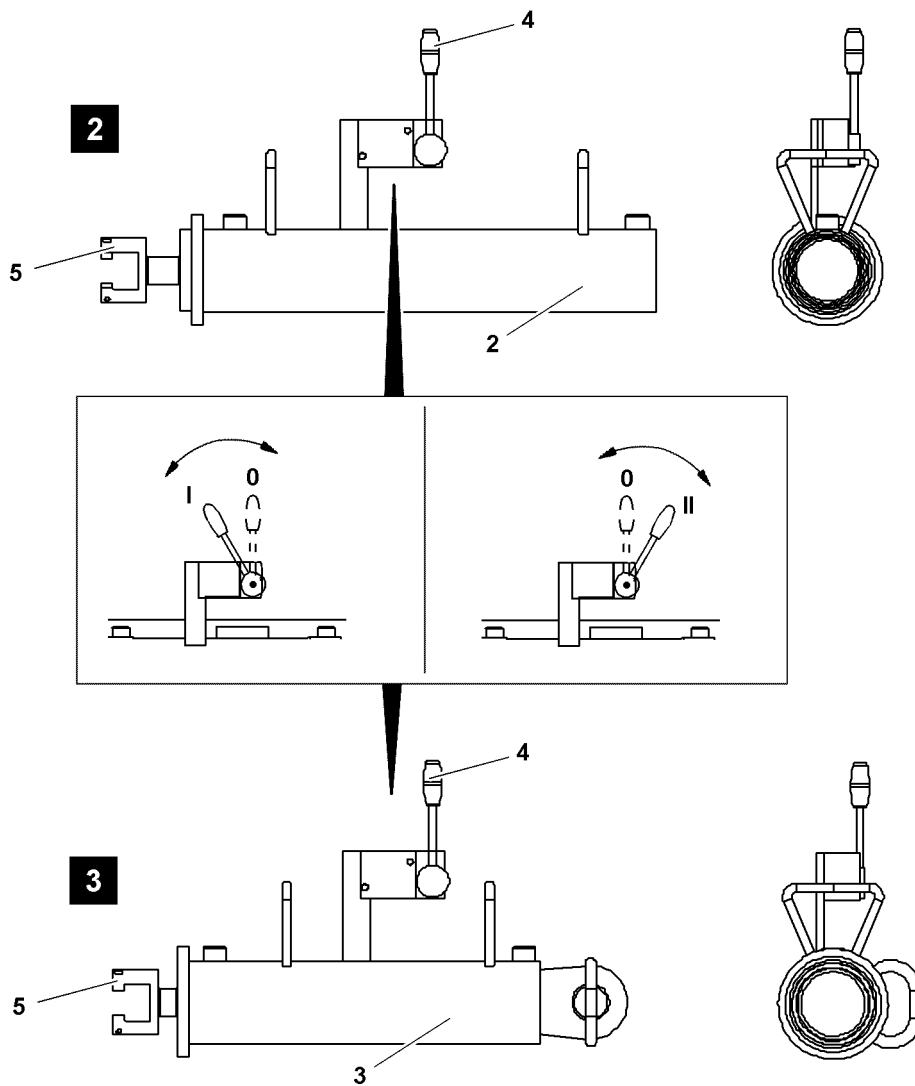
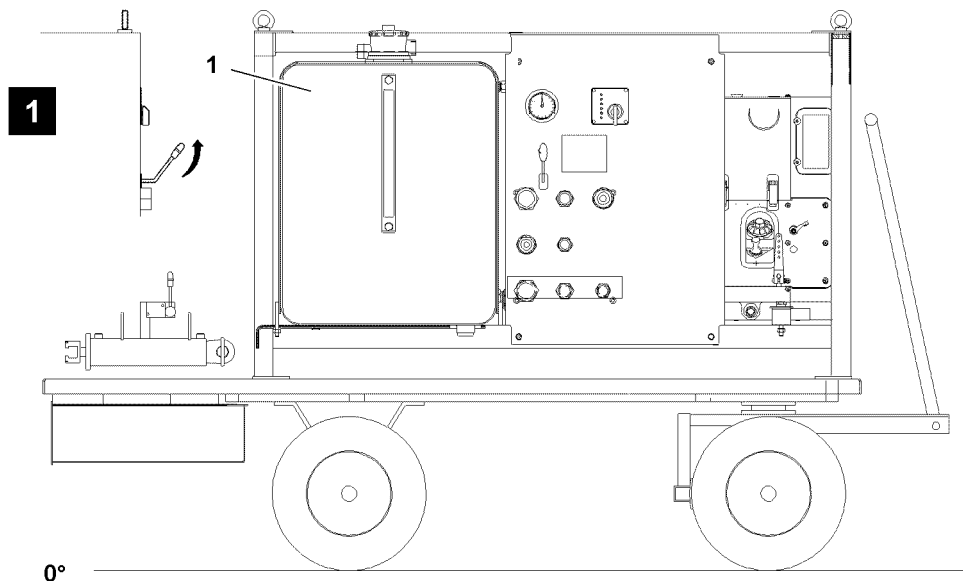


Fig.121949

LWE/LR 11350-007/19005-01-02/en

1.1 Hydraulic oil level



Note

- ▶ The hydraulic oil tank is filled when starting the hydraulic aggregate.
- ▶ Check the hydraulic oil level, see Operating and maintenance instructions for the Hydraulic aggregate.

NOTICE

Emerging hydraulic oil!

When the hydraulic aggregate is changed and / or the operational crane hydraulic is connected, then there is a danger that the hydraulic oil is supplied during the working process into the hydraulic tank circuit and thus forwarded into the hydraulic tank of the hydraulic aggregate.

The forwarded hydraulic oil quantity exceeds the tank volume of the hydraulic aggregate. Hydraulic oil runs over and contaminates the environment.

- ▶ Make sure that the hydraulic aggregate is separated from the hydraulic circuit of the crane before hydraulic components are actuated via the crane hydraulic.
- ▶ Make sure, before the hydraulic aggregate is separated from the crane, that the working process is ended with the same hydraulic aggregate.
- ▶ Make sure that the identical amount of hydraulic oil is in the hydraulic oil tank of the hydraulic aggregate after application than before.

1.2 Pin and unpin the pin with the pin pulling cylinder 2

1.2.1 Preparatory work

Make sure that the following prerequisites are met:

- The hydraulic aggregate **1** is not yet started.
- The lever **4** is in **0-position**.
- ▶ Connect the hydraulic hoses of the required pin pulling cylinder on the pin pulling aggregate **1**.
- ▶ Hang or pin the pin pulling cylinder in the retainer on the component.
- ▶ Connect the piston rod head **5** with the screw on the pin.

1.2.2 Pinning or unpinning pins



Note

- ▶ Operate the hydraulic aggregate, see Operating and maintenance instructions for the Hydraulic aggregate.

- ▶ Start the hydraulic aggregate **1**.
- ▶ Set the engine rpm on the hydraulic aggregate **1**.
- ▶ Operate the lever **4** on the pin pulling cylinder **2**.



Note

- ▶ **I-position**, insert the pin, see illustration **2** and illustration **3**.
- ▶ **II-position**, unpin the pin, see illustration **2** and illustration **3**.
- ▶ Pin or unpin the pin.

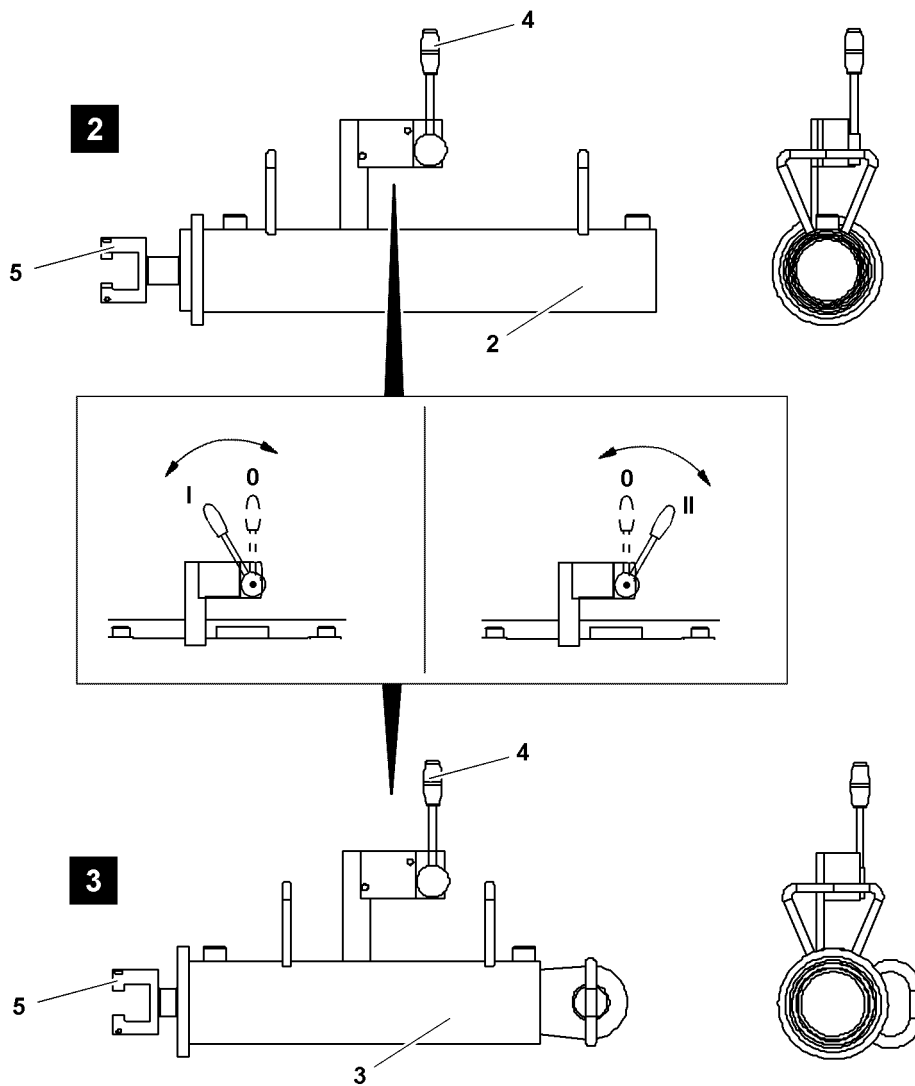
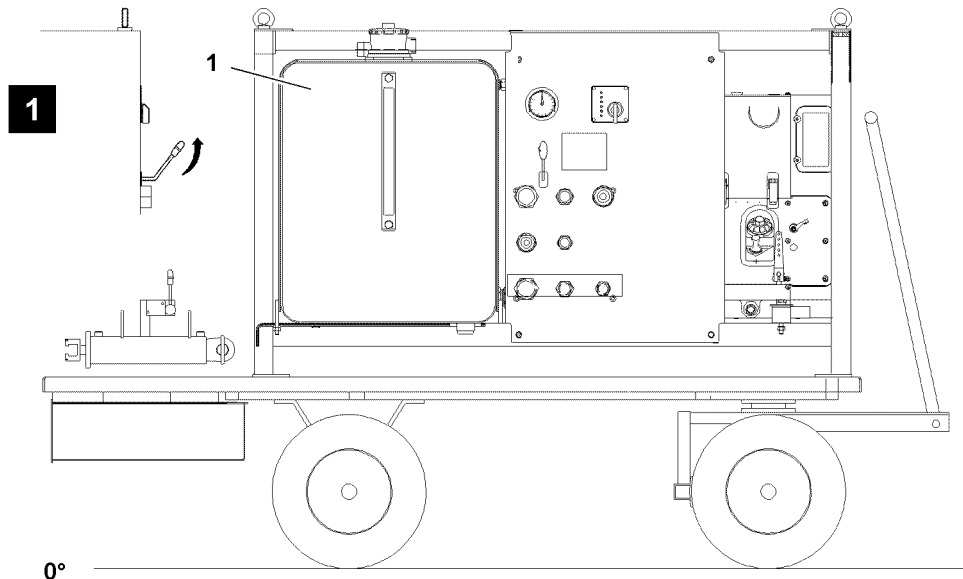


Fig.121949

LWE/LR 11350-007/19005-01-02/en

1.3 Pin and unpin the pin with the pin pulling cylinder 3

1.3.1 Preparatory work

Make sure that the following prerequisites are met:

- The hydraulic aggregate **1** is not yet started.
- The lever **4** is in **0-position**.
- ▶ Connect the hydraulic hoses of the required pin pulling cylinder on the pin pulling aggregate **1**.
- ▶ Hang or pin the pin pulling cylinder in the retainer on the component.
- ▶ Connect the piston rod head **5** with the screw on the pin.

1.3.2 Pinning or unpinning pins



Note

- ▶ The pin pulling cylinder **3** is actuated for safety reasons on the hydraulic aggregate **1**!
- ▶ Before pinning and unpinning the lattice sections, engage the lever **4** in **I-position** or **II-position**.
- ▶ Engage the lever **4** on the pin pulling cylinder **3** in **I-position** or **II-position**, see illustration **3**.



Note

- ▶ **I-position**, insert the pin, see illustration **2** and illustration **3**.
- ▶ **II-position**, unpin the pin, see illustration **2** and illustration **3**.



Note

- ▶ Operate the hydraulic aggregate, see Operating and maintenance instructions for the Hydraulic aggregate.
- ▶ Start the hydraulic aggregate **1**.
- ▶ Set the engine rpm on the hydraulic aggregate **1**.
- ▶ Operate the change over lever on the hydraulic aggregate **1**.

Result:

- The piston rod of the pin pulling cylinder **3** moves in or out.

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5.31 Bluetooth Terminal (BTT)

1 Using the BTT

2

1 Using the BTT

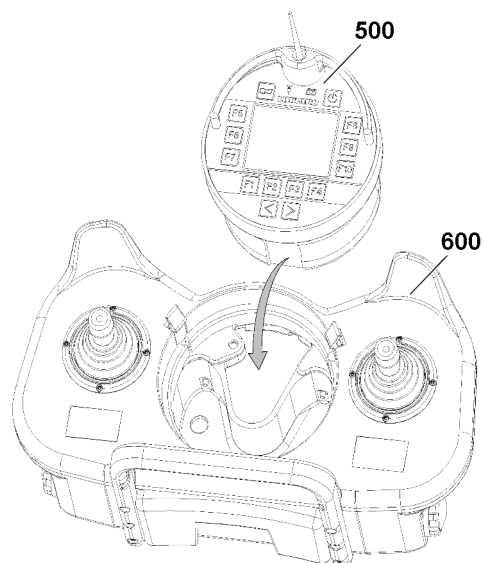


Fig. 126305



Note

Use the BTT **500** in connection with the radio remote control panel **600**.

- ▶ To operate the radio remote control, see the radio remote control operating instructions, chapter 6.08.
-

5.35 Derrick ballast - ballast trailer

| | | |
|---|--|-----|
| 1 | General | 3 |
| 2 | Assembling | 13 |
| 3 | Setting the ballast trailer radii | 39 |
| 4 | Adjusting the wheel sets | 47 |
| 5 | Driving with the ballast trailer | 61 |
| 6 | Crane operation with the derrick ballast | 73 |
| 7 | Disassembling | 95 |
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| 9 | Ballast trailer maintenance intervals / maintenance instructions | 119 |

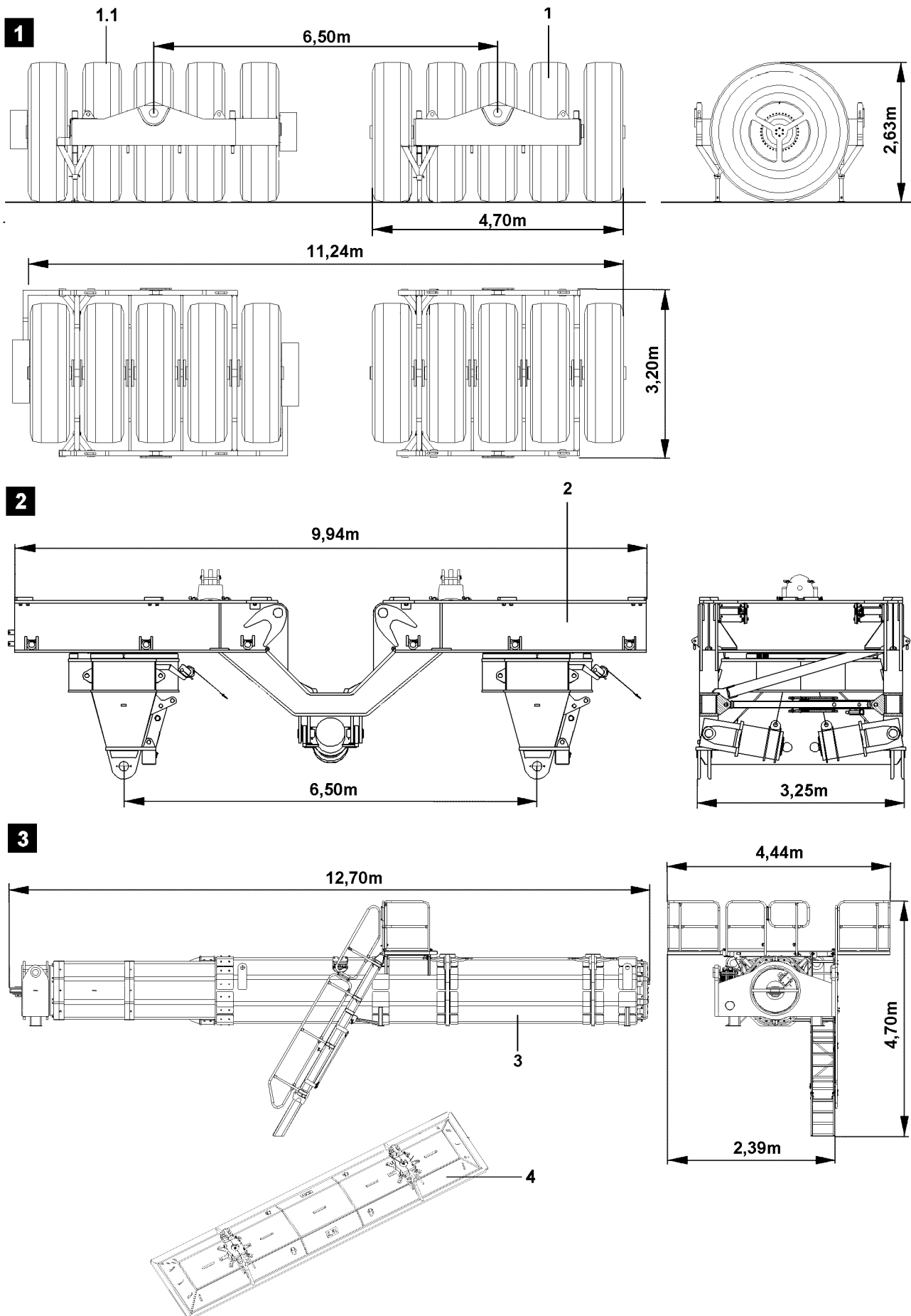


Fig.106366

LWE/LR 11350-007/19005-01-02/en

1 General

The ballast trailer consists of:

- 2 wheel sets, oscillating mounted
- Ballast frame
- Guide pipe
- Support plate

Hydraulic, telescopeable guide for ballast trailer radii from R 15 m - R 25 m and R 20 m -R 30 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



Note

► See illustration 1, illustration 2, illustration 3 and chapter 1.02.

| 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



Note

► See illustration 1, illustration 2, illustration 3 and chapter 1.02.

4

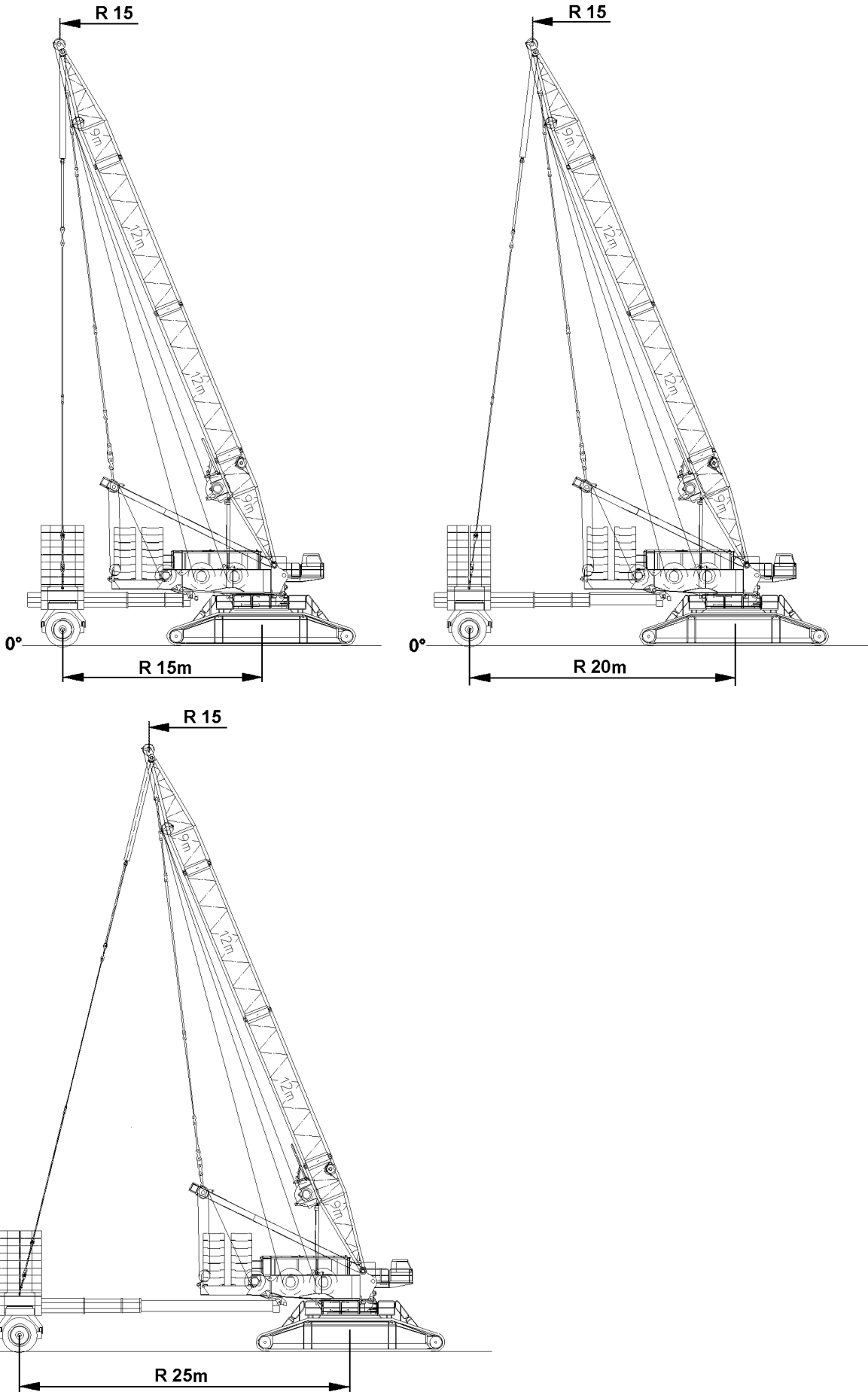


Fig.103645

LWE/LR 11350-007/19005-01-02/en

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

► With a derrick radius of R 15 m , the ballast trailer can be telescoped out to maximum R 25 m !

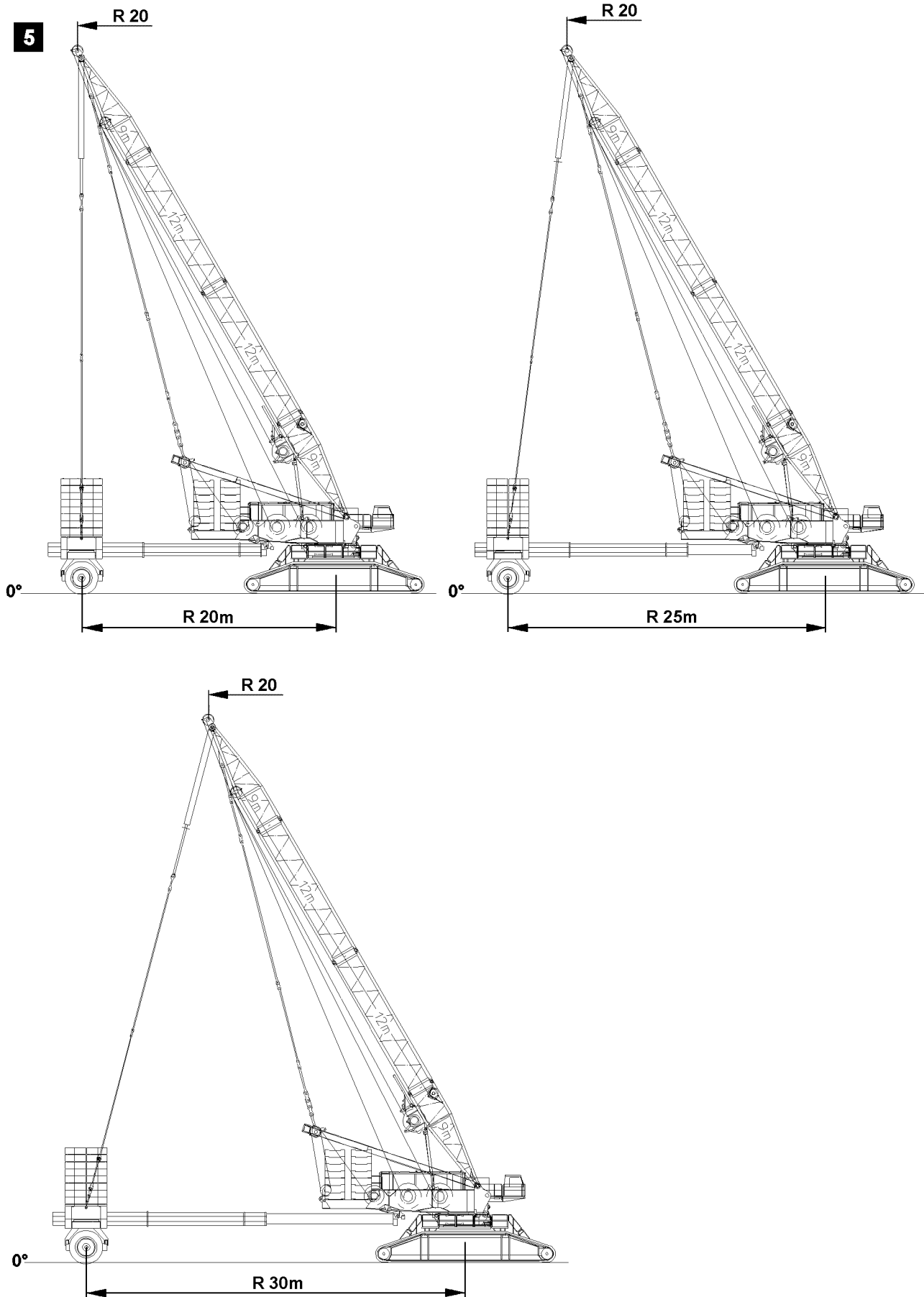


Fig.103646

LWE/LR 11350-007/19005-01-02/en

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

- ▶ With 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!
-

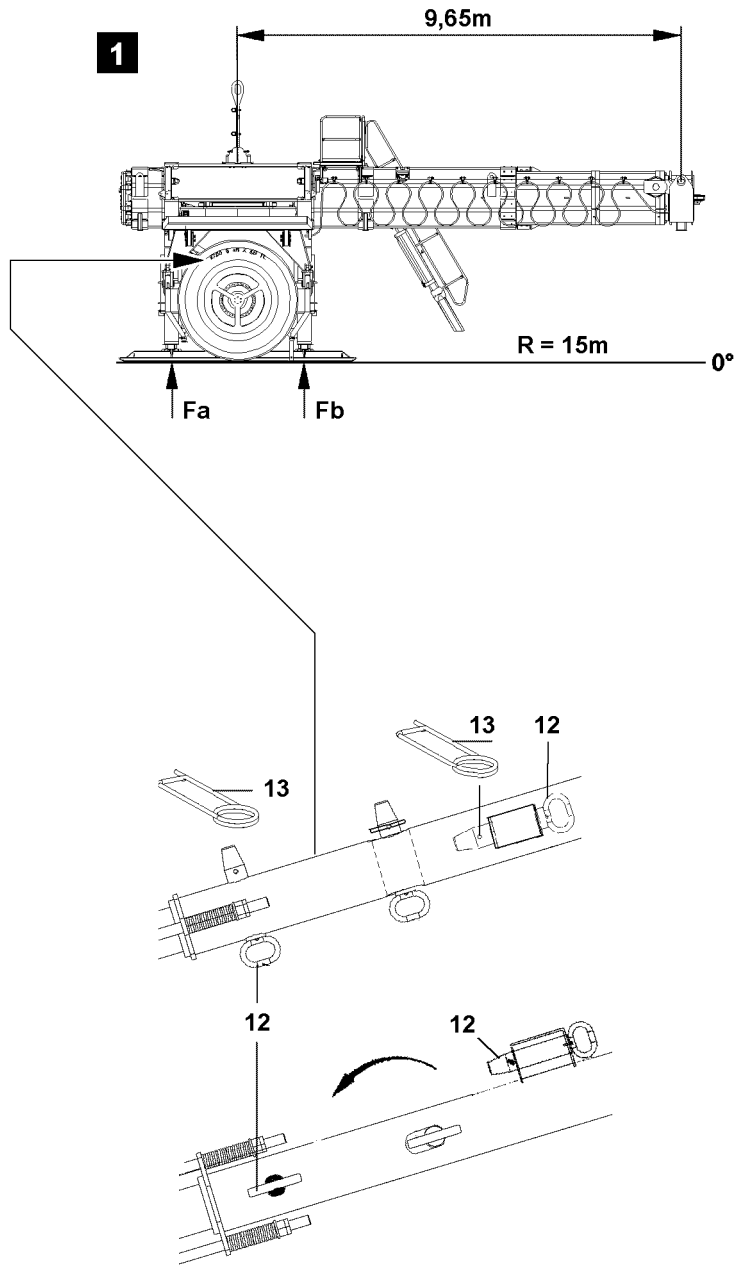


Fig.112898

LWE/LR 11350-007/19005-01-02/en

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 guide is hydraulically fully retracted.
- The ballast trailer is supported and horizontally aligned.



WARNING

Ballast trailer tipping danger!

If the ballast trailer is not assembled on the turntable and the ballast trailer guide is not fully retracted, then the ballast trailer can tip over!

Personnel can be severely injured or killed!

- ▶ Before the disassembly of the ballast trailer on the turntable, the locking pin **12** must be pinned on the strut of the ballast trailer and secured with the spring retainer **13**!
- ▶ The ballast trailer guide must be fully retracted before the disassembly of the ballast trailer on the turntable!
- ▶ The support cylinders are extended to the point where the tires are relieved!
- ▶ Make sure that the safety technical notes for crane operation with ballast trailer are observed and adhered to, see chapter 2.15!

| Illustration | Ballast trailer radius | Ballast | Maximum support pressure F_a | Maximum support pressure F_b |
|--------------|------------------------|---------|--------------------------------|--------------------------------|
| 1 | R = 15.0 m | 0 t | 24.5 t | 122.5 t |

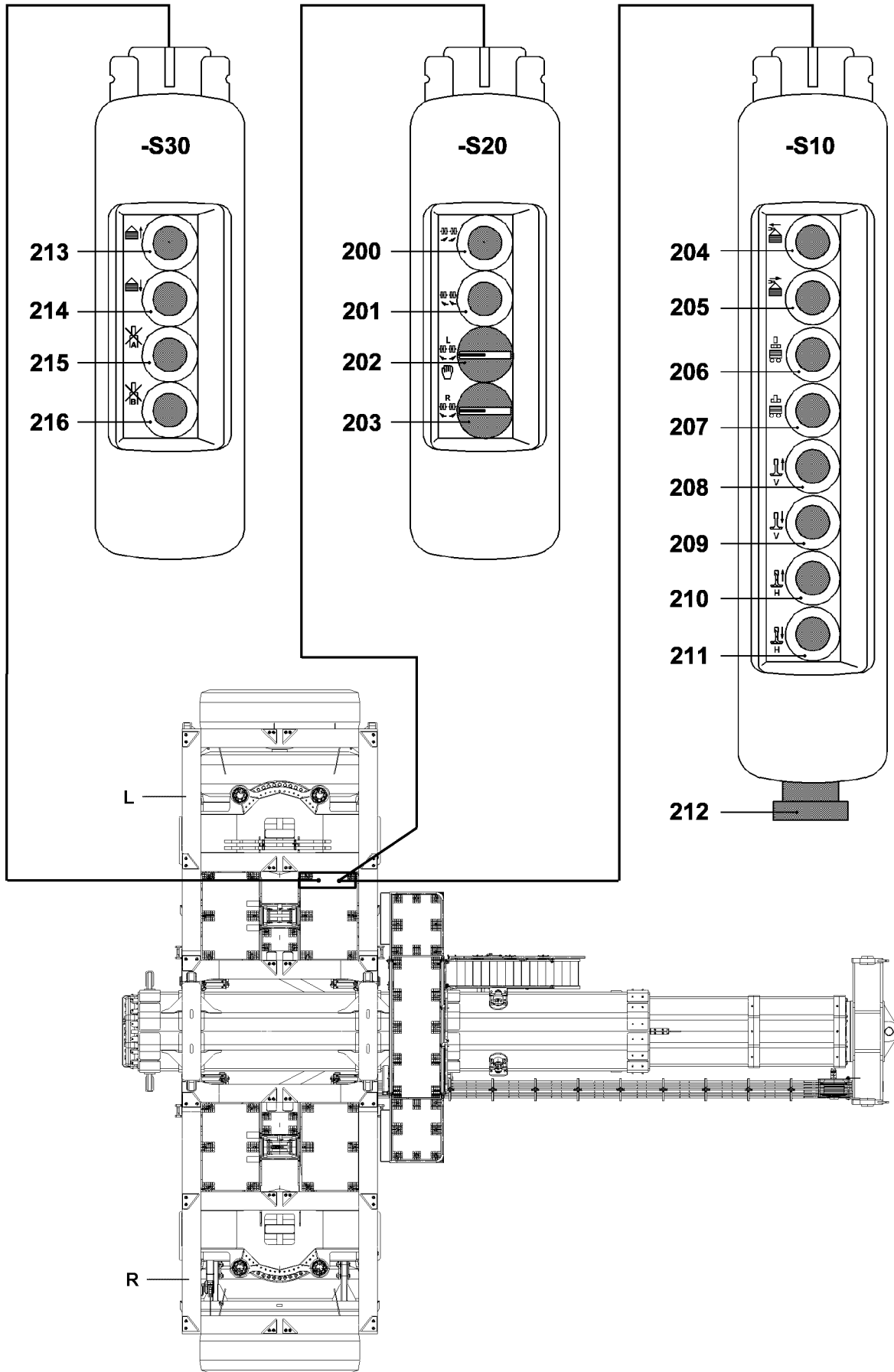


Fig.103461

LWE/LR 11350-007/19005-01-02/en

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, retract the guide cylinder |
| 205 | Button | • Ballast trailer, extend the guide cylinder |
| 206 | Button | • Ballast trailer on turntable - unpin |
| 207 | Button | • Ballast trailer on turntable - pin |
| 208 | Button | • Retracting the front support cylinder |
| 209 | Button | • Extending the front support cylinder |
| 210 | Button | • Retract the rear support cylinder |
| 211 | Button | • Extend 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 is in the left driving direction |
| 216 | Button | • Block cylinder B , cylinder B is in the right driving direction |

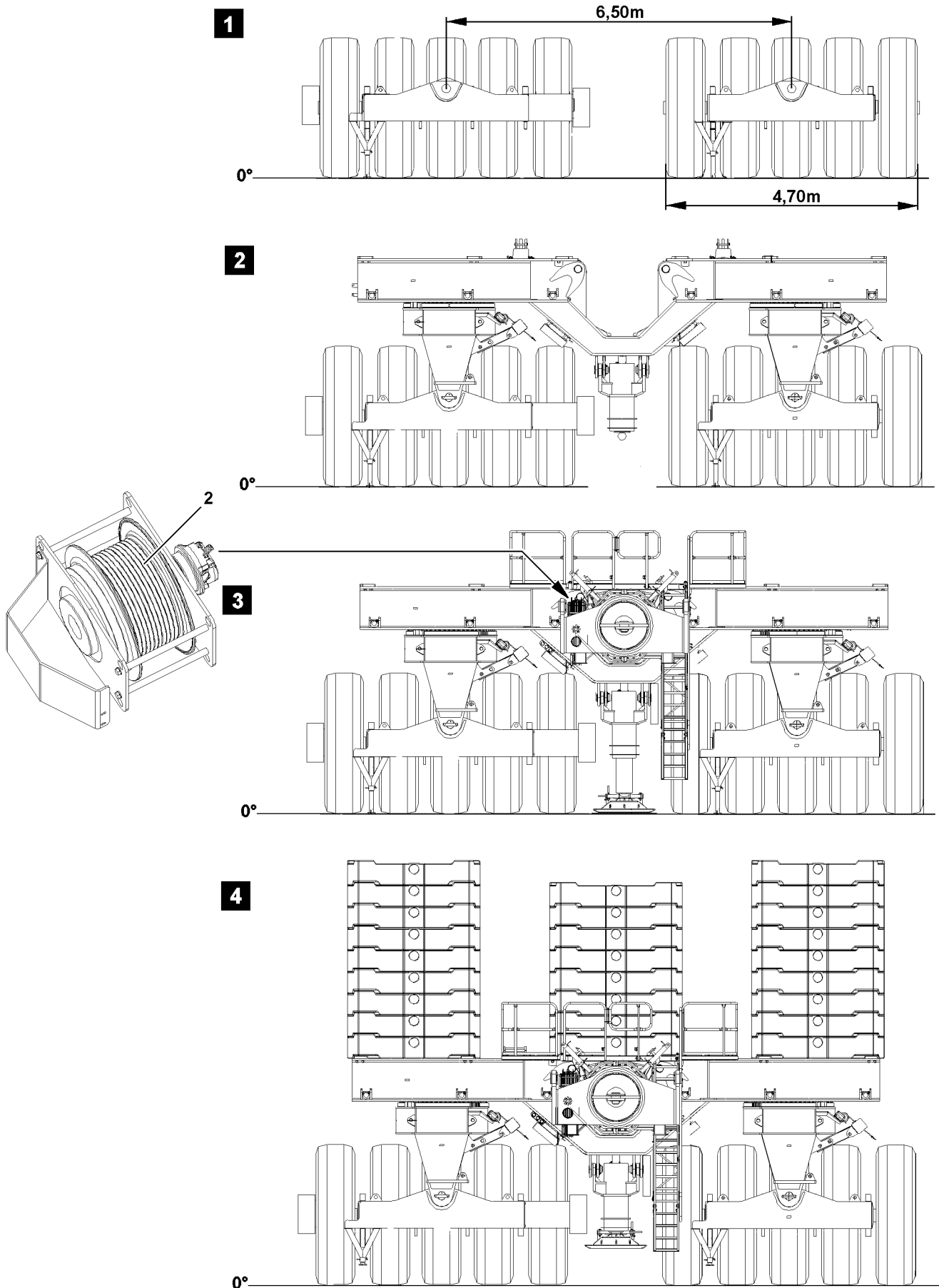


Fig.114078

LWE/LR 11350-007/19005-01-02/en

2 Assembling



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- ▶ For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.



WARNING

The components can fall down!

If the components are not pinned and secured correctly, then they can fall down.

Death, severe bodily injuries, property damage.

- ▶ Insert or unpin both pins on the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the components or within the entire danger zone during the pinning and unpinning procedure of the ballast trailer.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.
- ▶ It is prohibited to lean the ladder against the component being disassembled.



WARNING

Danger of impact / crushing!

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

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

Death, severe bodily injuries, property damage.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ Make sure that the crane is horizontally aligned.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

**WARNING**

Ballast trailer tipping danger!

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 have adequate load bearing capacity.
- An auxiliary crane is available.

2.1 Brief description of the assembly procedure

**Note**

- ▶ The brief description of the assembly procedure is only intended as an overview!
- ▶ The complete assembly description must also be read and understood!

Illustration 1

- Use the auxiliary crane to place the wheels sets next to each other at a distance of 6.5 m 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“

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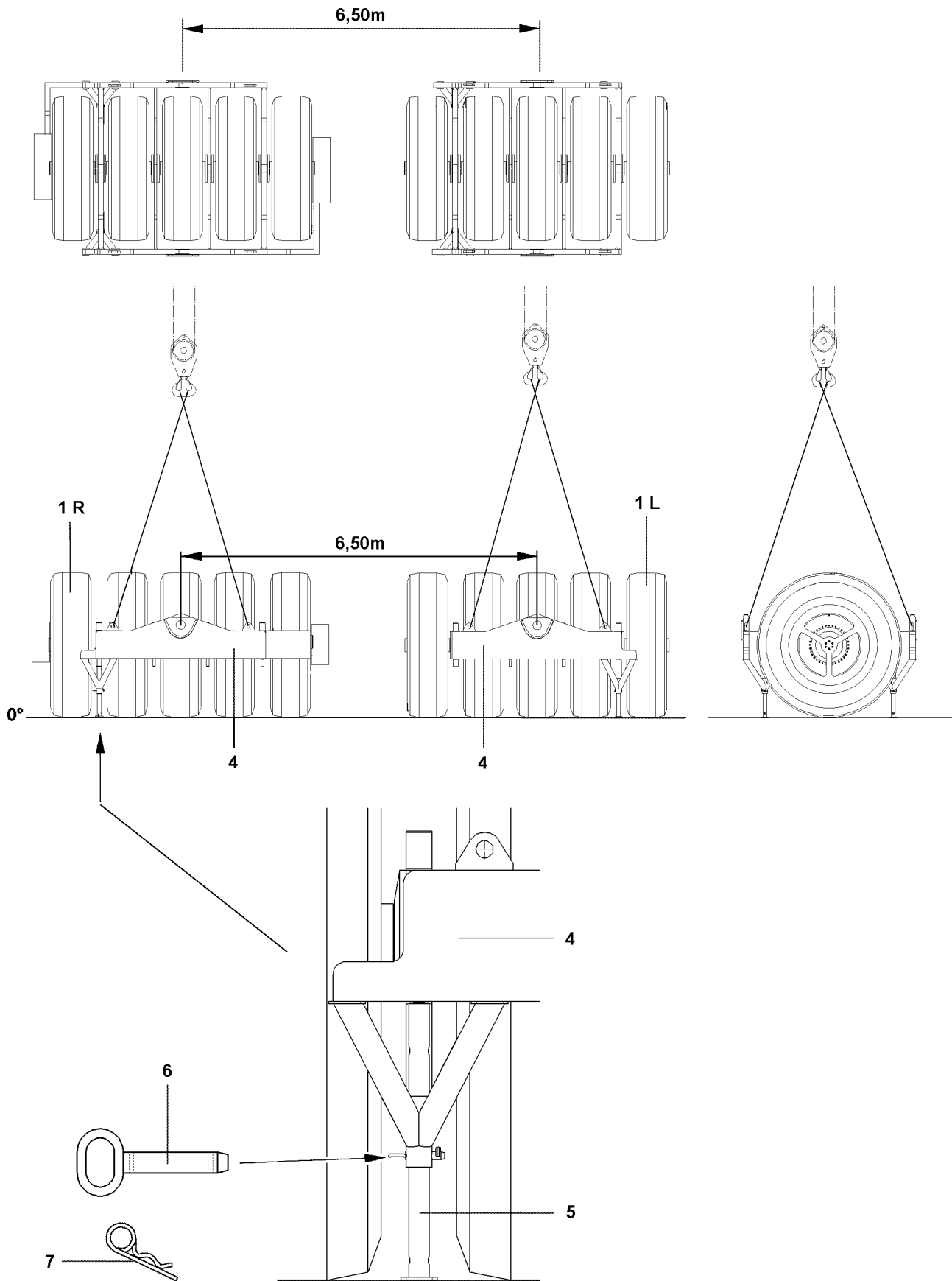


Fig.106368

LWE/LR 11350-007/19005-01-02/en

2.2 Setting up the wheel sets



Note

- ▶ The wheel sets are not equipped with their own brake system!



DANGER

Danger of accident due to the wheel sets tipping!

There is a tipping hazard if the wheel sets are not resting on the mechanical support legs!

- ▶ Support the wheel sets with 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 have adequate load bearing capacity.
- The wheel sets are set up 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 with the cotter pin **7**.
- ▶ Place 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 with the cotter pin **7**.
- ▶ Place the second wheel set on the support legs.

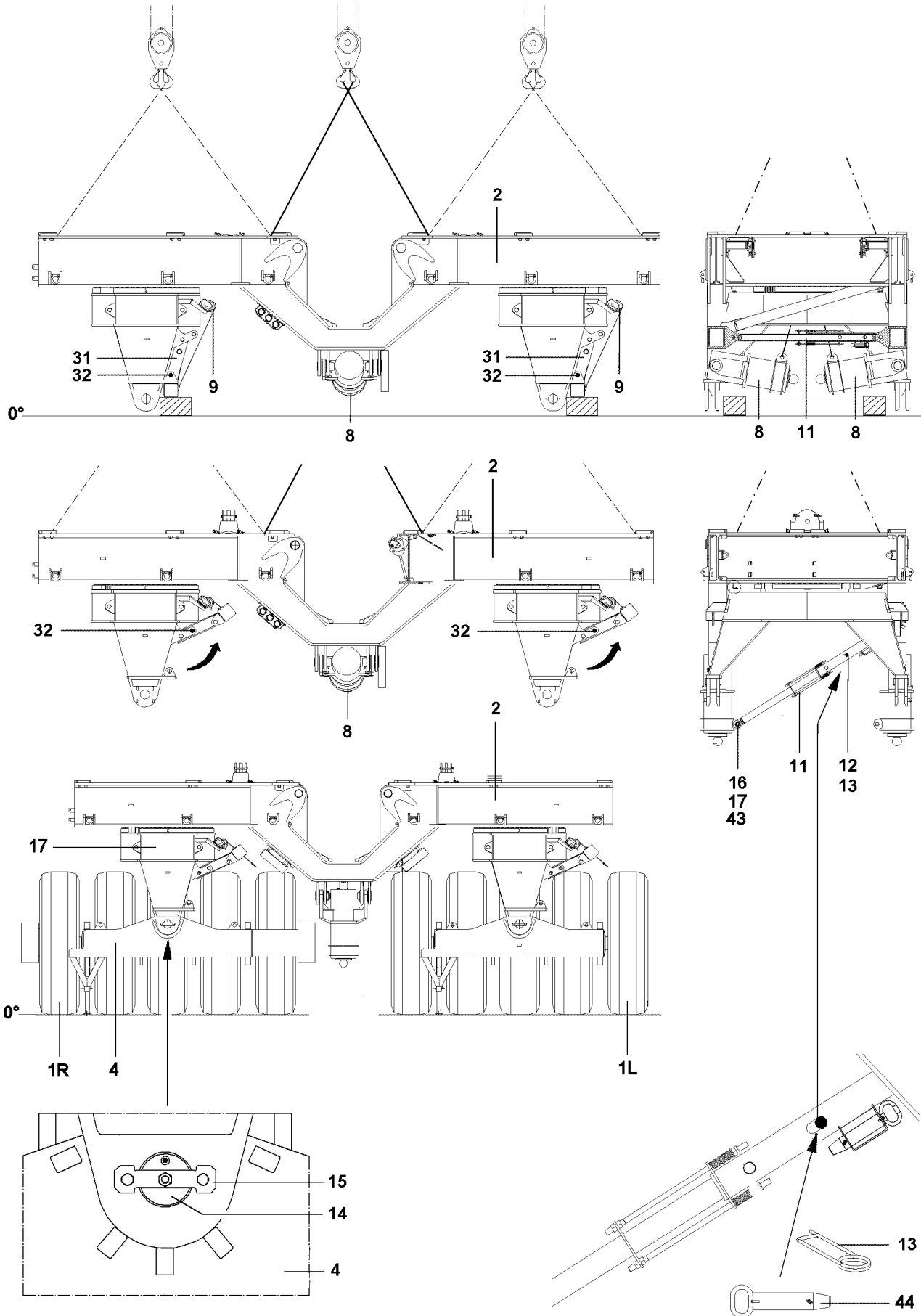


Fig.106369

LWE/LR 11350-007/19005-01-02/en

2.3 Assembling the 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 the direction of the axle.
- ▶ Attach the ballast frame **2** to the auxiliary crane and lift.
 - ▶ Connect the rope winch to 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**.
 - ▶ Attach the grip hoist or the auxiliary crane to the support cylinder **8** and tension. Release the chain connection and lower the support cylinder from the transport position.
 - ▶ Attach the grip hoist or the auxiliary crane to the strut **11** and tension. Unpin the strut from the transport position and pin on the bottom of the support cylinder. Insert and secure the pin.
 - ▶ Insert the pin **16**, insert the washer **43** and secure with spring retainer **17**.
 - ▶ Insert the pin **44** in the slot and secure with the spring retainer **13**.

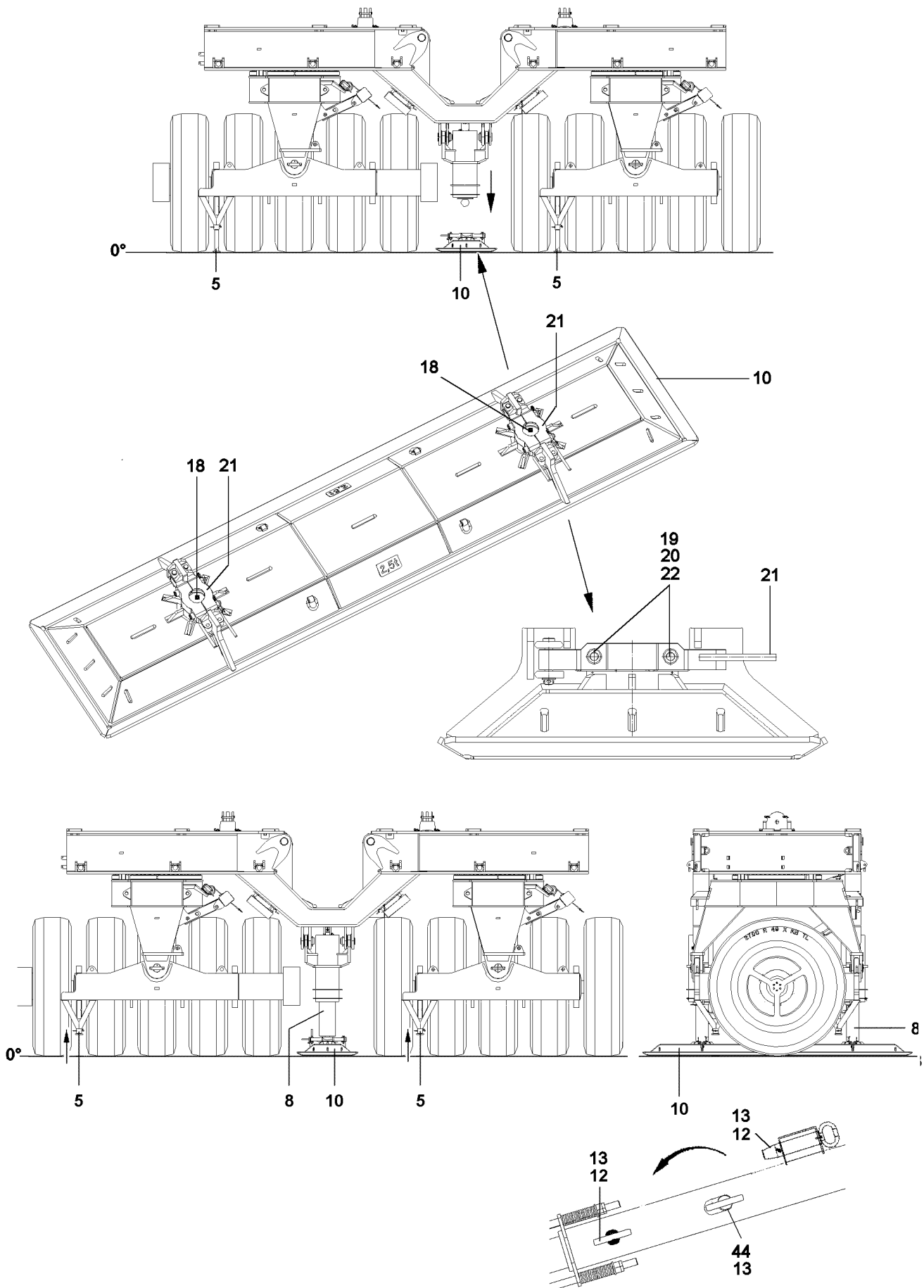


Fig.106365

LWE/LR 11350-007/19005-01-02/en

2.4 Supporting the ballast trailer with the support cylinder



WARNING

Danger of tipping!

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 are secured with chocks.
- The guide is not yet assembled.

2.4.1 Establishing the 24 volt power supply to the ballast trailer

- ▶ Insert the A100 assembly plug into the socket on the ballast frame.
- ▶ Connect the 15 m (WLFVS) to the A100 assembly plug.
- ▶ Connect the 0.5 m cable (WLFVZ) to the 15 m cable.

There is a KFZ (vehicle) plug on the 0.5 m cable.

- ▶ Connect the KFZ (vehicle) plug, the 24V supply, to the crane, truck or other equipment, for example.

2.4.2 Assembling the 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 retract 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**. **22** Install the crown nuts **22** and secure with the 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**.

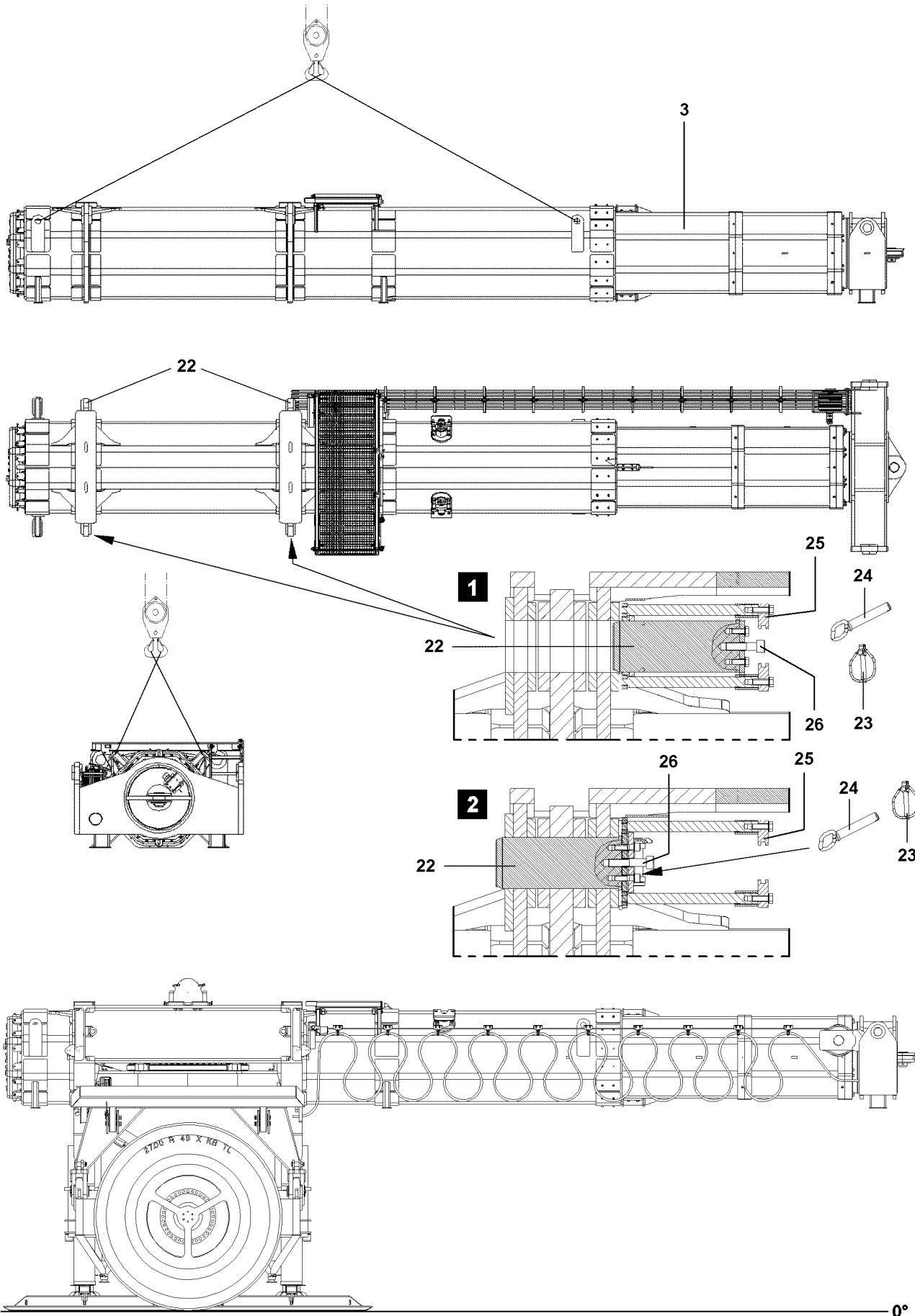


Fig.103782

LWE/LR 11350-007/19005-01-02/en

2.5 Installing the guide on the ballast frame



Note

- ▶ Park the ballast trailer for assembly of the ballast trailer guide on level ground with sufficient load bearing capacity in the vicinity of the crane!
- ▶ Observe the safety guidelines, see chapter 2.15!

Make sure that the following prerequisites are met:

- The ballast trailer is supported with the support cylinders **8** and aligned horizontally.
- The locking pin **12** is pinned in the strut **11**.



DANGER

Danger of tipping!

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 free, see illustration **1**.
- ▶ Attach the guide **3** to the auxiliary crane and swing it in to the pin points on the ballast frame and fasten.
- ▶ Hang the pin pulling cylinder on the retainer **25** and on the screw head **26**.
- ▶ Pin the guide **3** in all four pin points.
- ▶ Insert and secure the pin **22**.
- ▶ Insert the retaining pin **24** and secure with the locking pin **23**, see illustration **2**.

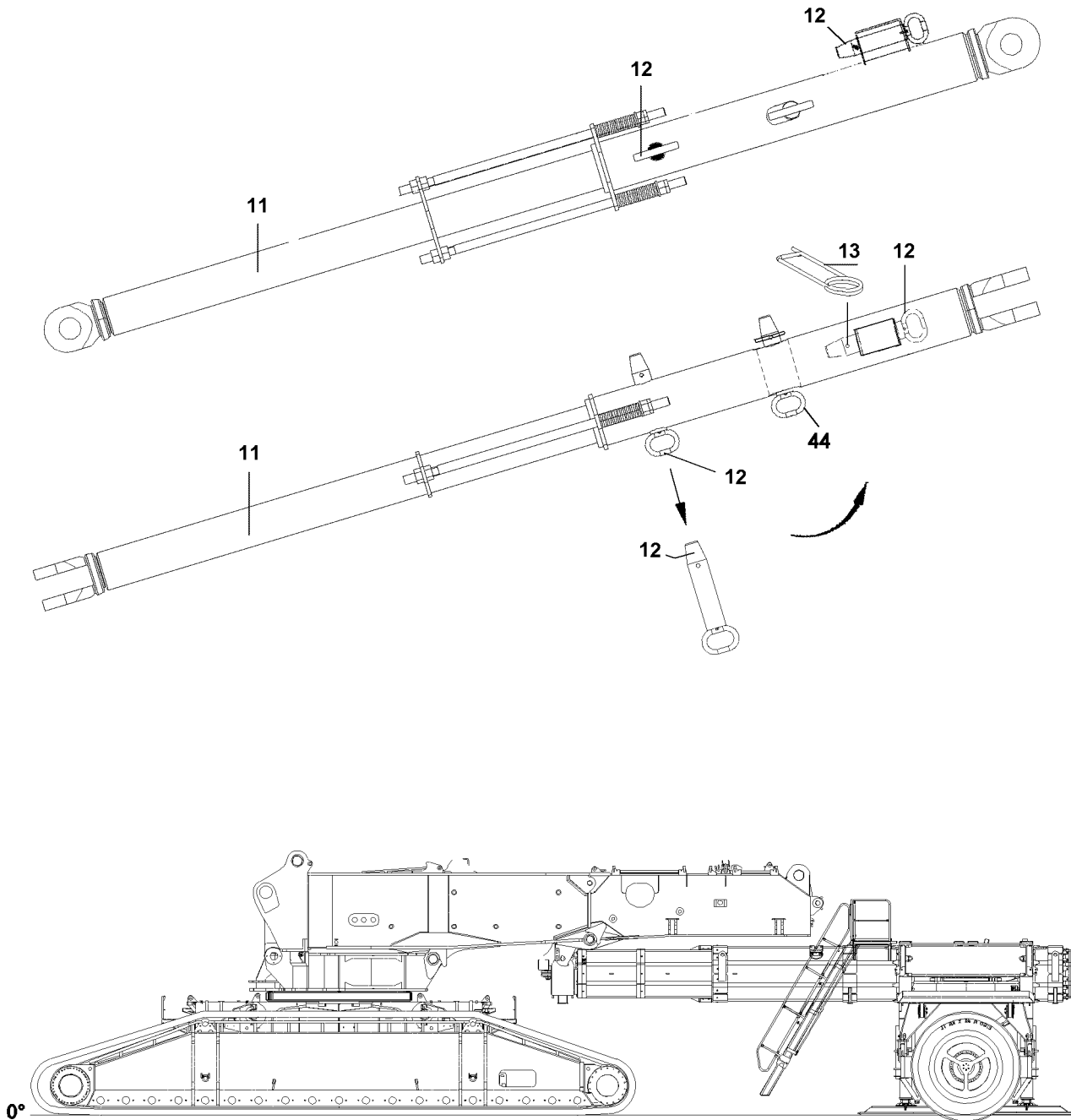


Fig.112899

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 speed 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 the Electric wiring diagram!
- ▶ Establish the electrical connections.

2.6.2 Establishing the hydraulic connection from the ballast trailer to the turntable

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



DANGER

Danger of accident due to loss of pressure or leakage!

Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure!

- ▶ Check that the quick couplings have been properly connected before using the crane!
- ▶ Release the pressure in the hydraulic system before connecting or disconnecting: Turn the engine off and wait a short time.
- ▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
- ▶ Tighten the hydraulic coupling by hand: Turn the knurled nut until it reaches a tangle, fixed stop position.

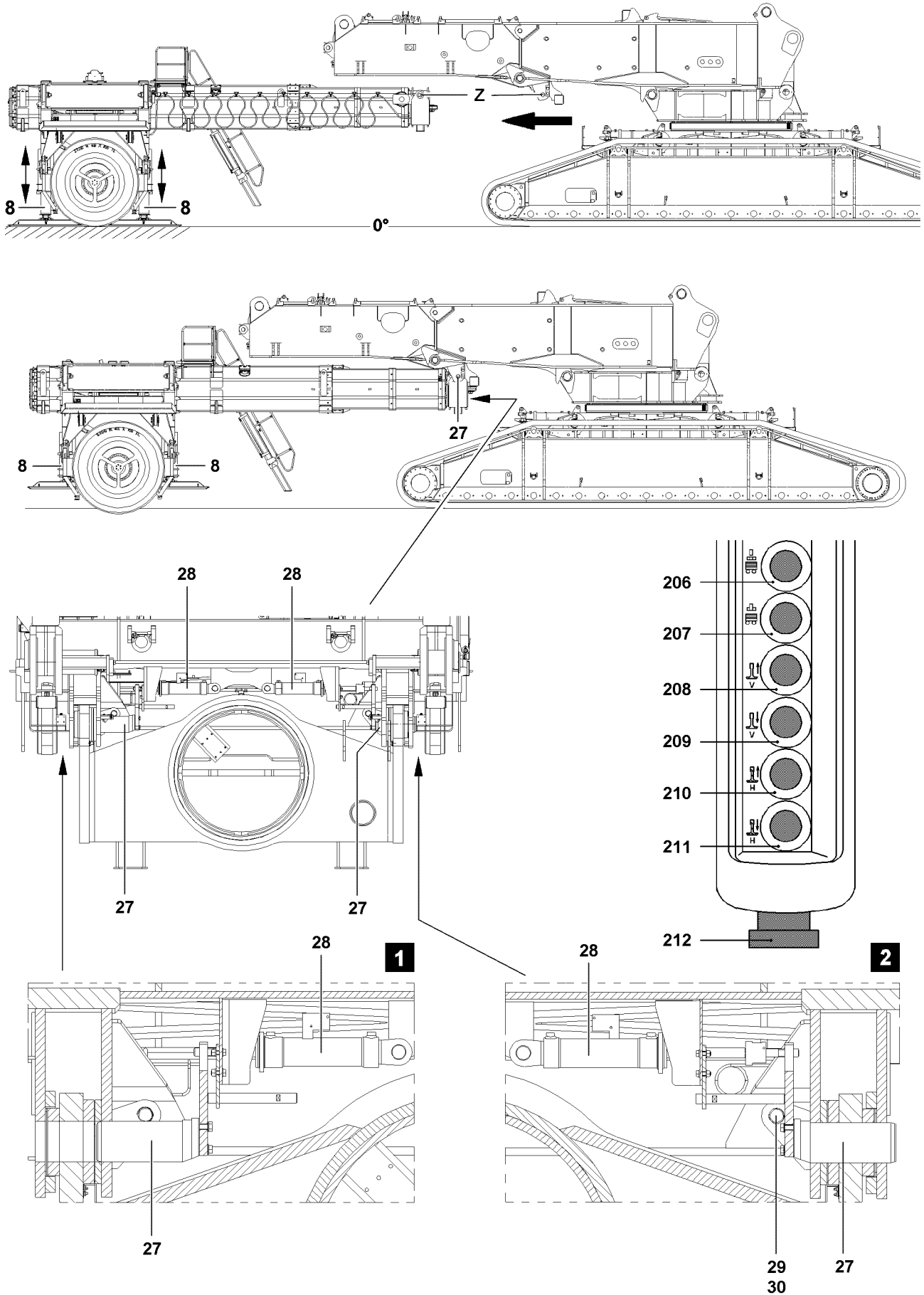


Fig.103783

LWE/LR 11350-007/19005-01-02/en

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 applied.



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 the spring retainer **30**.



Note

- ▶ The crane control recognizes via the limit switch initiators on the left and right in the pin points if the pins are fully inserted in the turntable!
- ▶ After pinning, it must be rechecked if both pins are properly pinned and secured and if the connection lines are connected correctly and completely!
- ▶ 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!

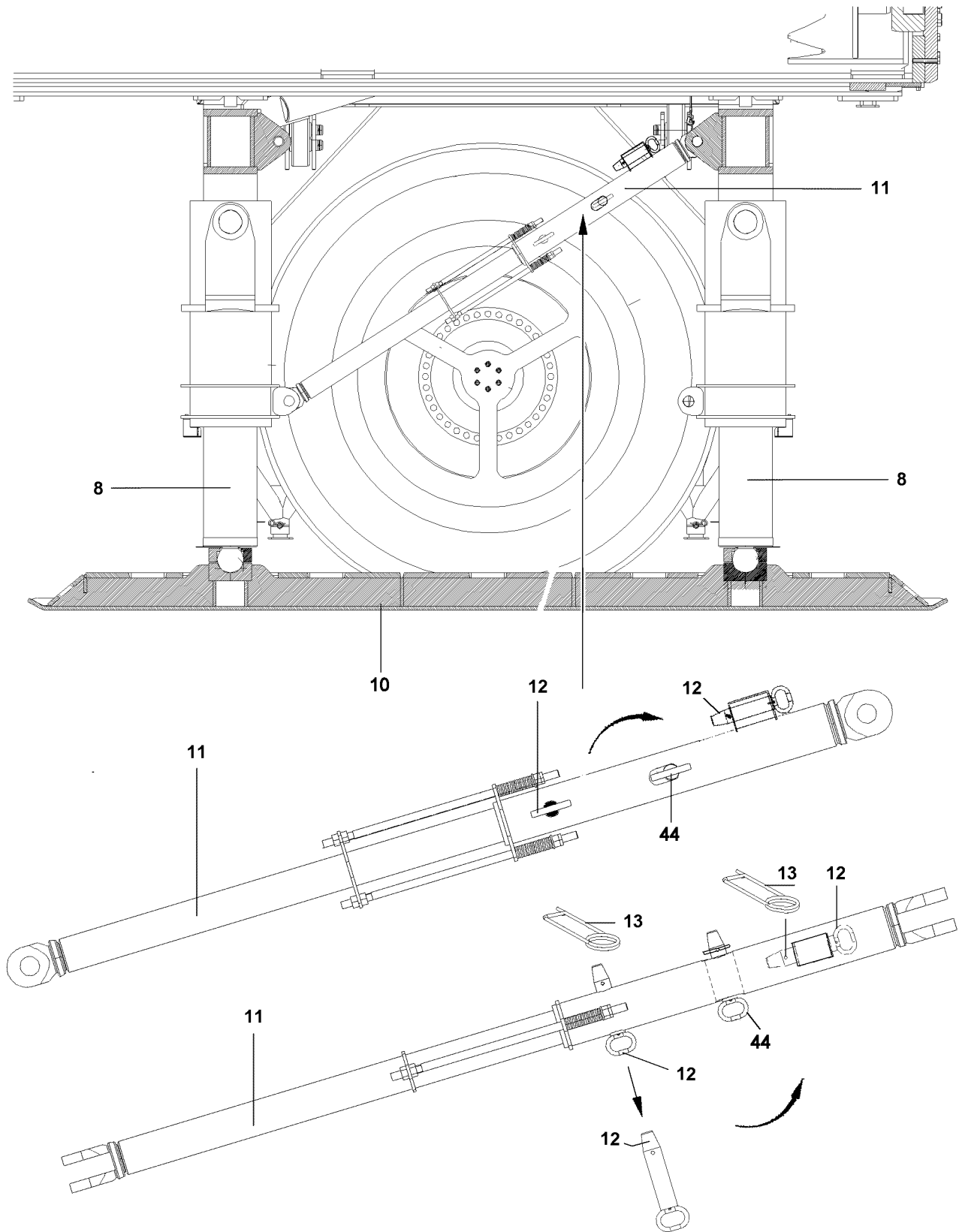


Fig.106913

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 the spring retainer **13**.



Note

- ▶ The locking pin **12** can only be unpinned if the support cylinders **8** are relieved!

NOTICE

Overload of the 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!
- ▶ Retract the support cylinders completely. The warning light in the cab lights up.

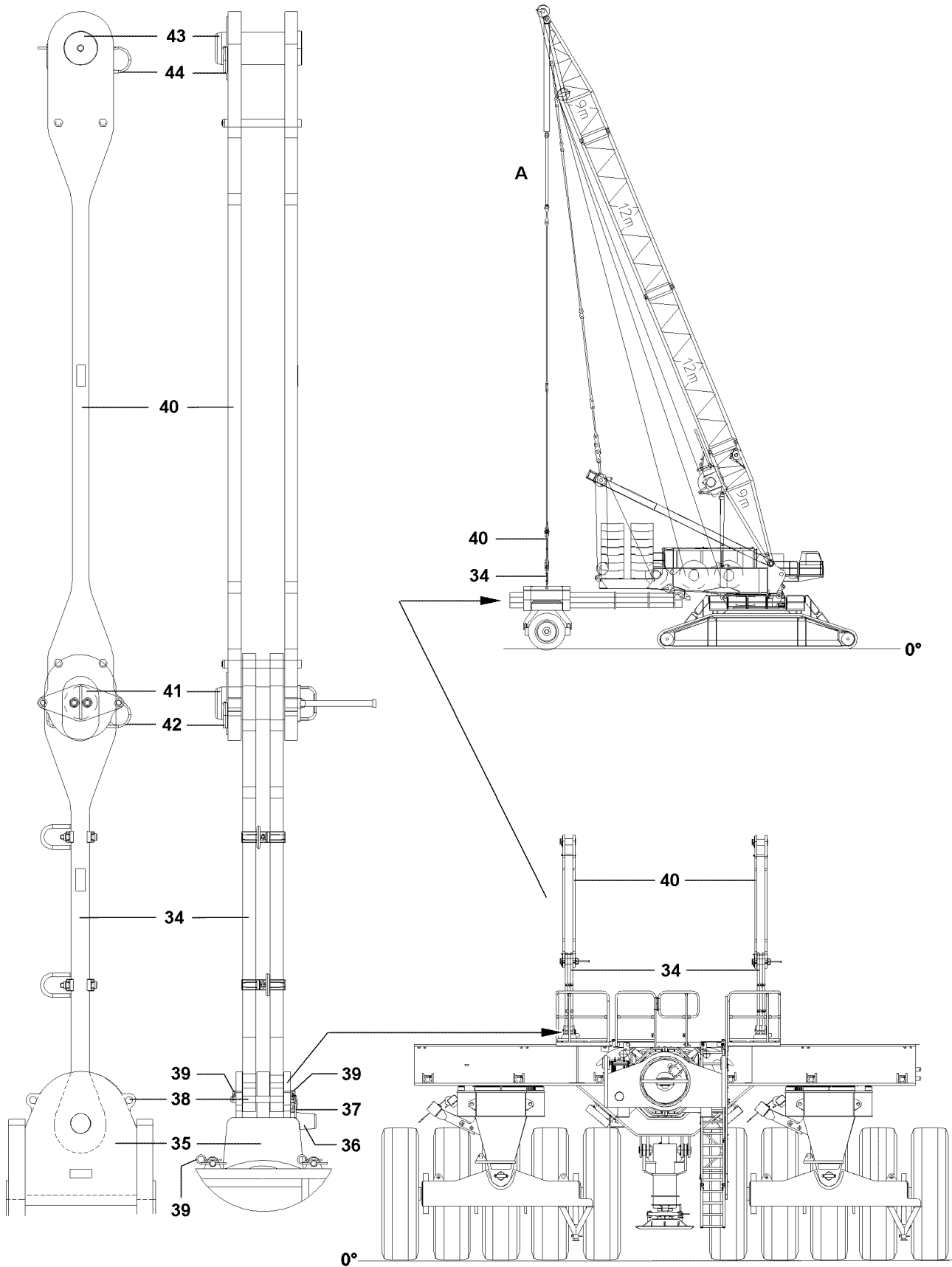


Fig.103786

LWE/LR 11350-007/19005-01-02/en

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 boom 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.
 - ▶ Attach the guy rods **34** to the auxiliary crane and position vertically over the cross bracket **35**.
 - ▶ Pin the guy rod **34**.
 - ▶ Insert the pin **36** and secure with the 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 the guy rod **34**.
 - ▶ Insert the pin **41** and secure with the spring retainer **42**.

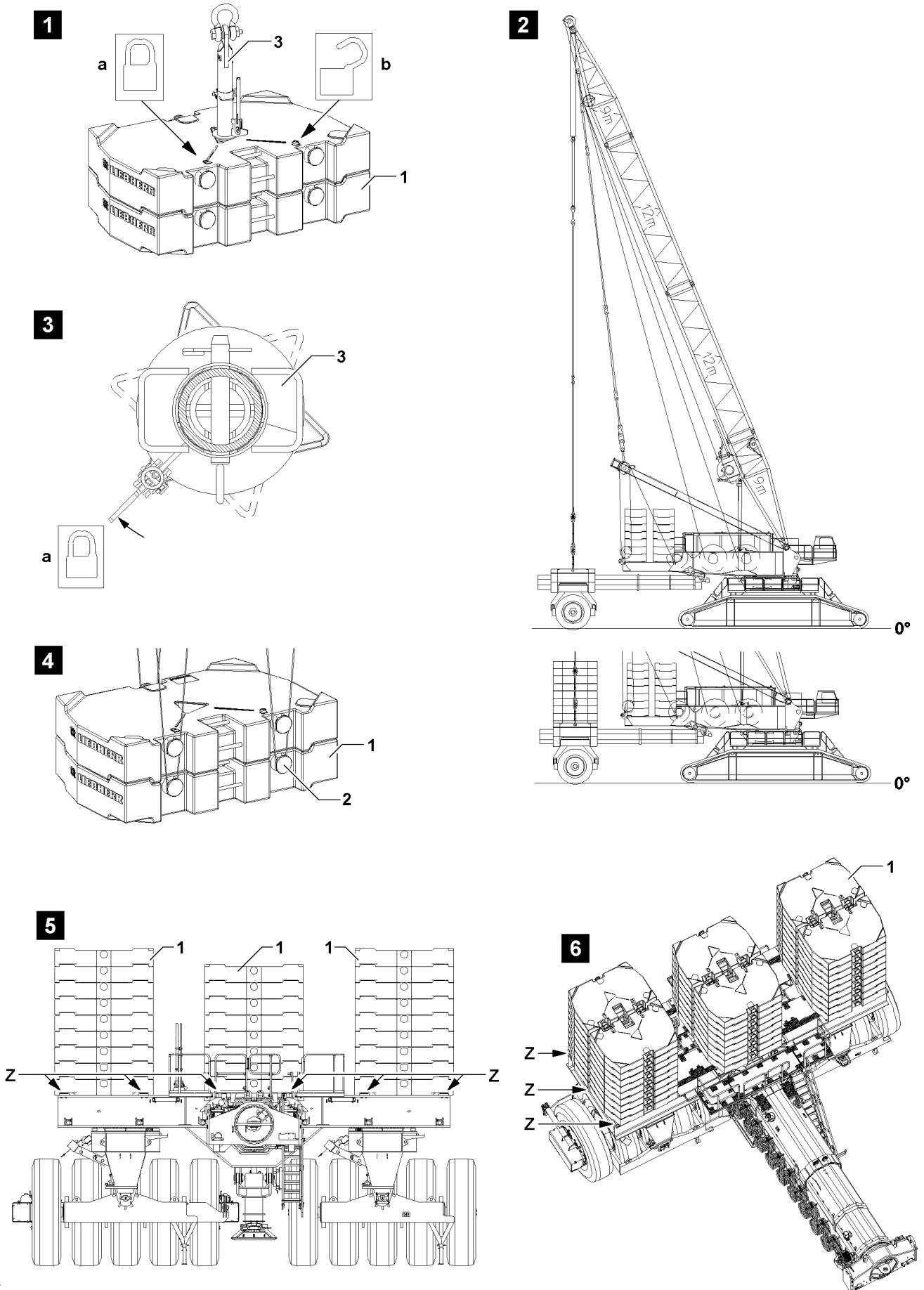


Fig.109592

LWE/LR 11350-007/19005-01-02/en

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 retract / extend!

Make sure that the following prerequisite is met for lifting with the receptacle stud **3**:

- The receptacle stud **3** must be in position **a**: The „receptacle stud **3** must be 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 taken down ballast plate **1**, see illustration **5** and illustration **6**.

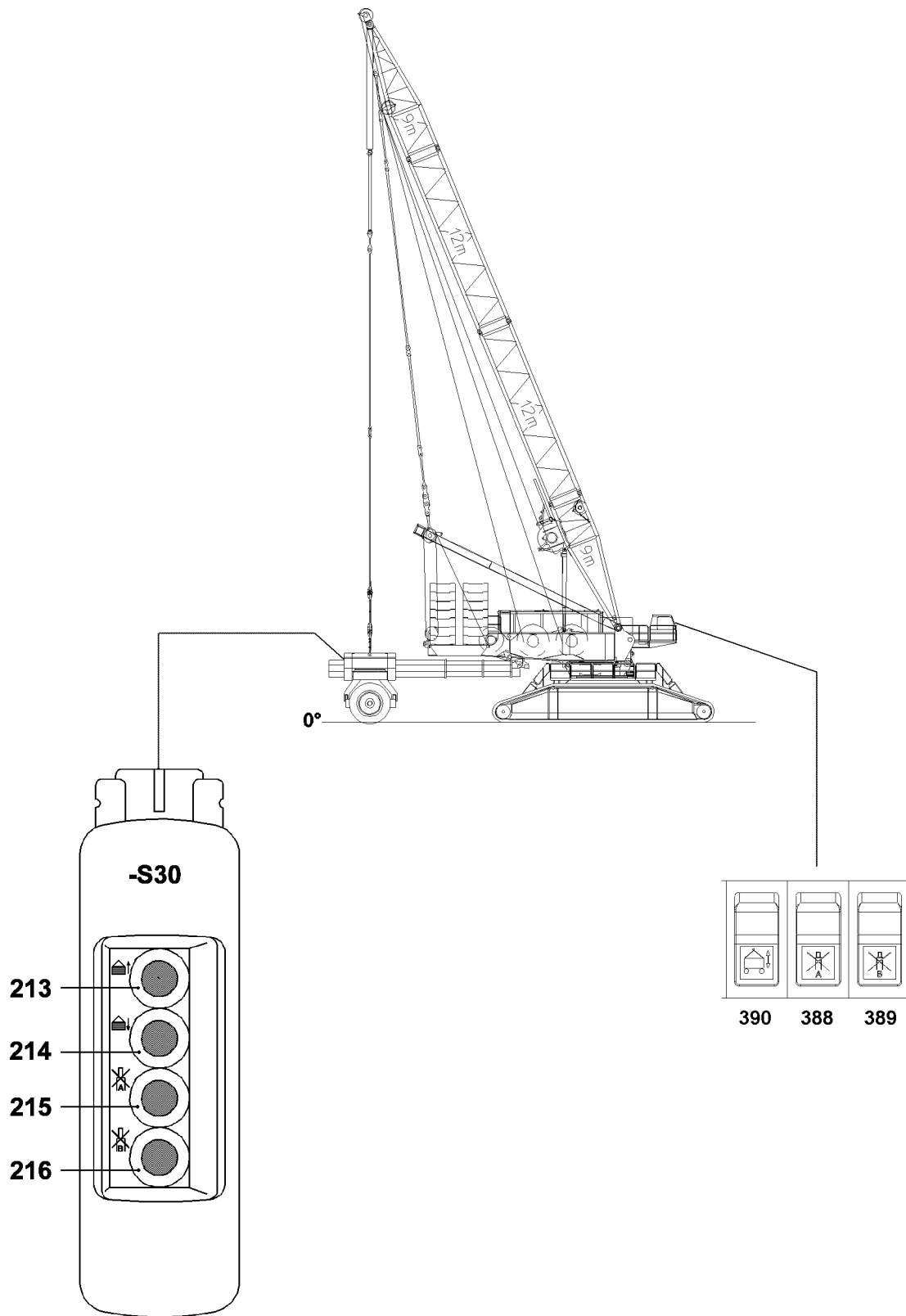


Fig.105088

LWE/LR 11350-007/19005-01-02/en

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 absorb 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 the button **390 in front**, the derrick ballast is lifted using the pull cylinders.
- Press the button **390 at the rear**, the derrick ballast is lowered using the pull cylinders.

Actuate the pull cylinders from the control panel (**S30**):

- Press the button **213**, the derrick ballast is lifted using the pull cylinders.
- Press the button **214**, the derrick ballast is lowered using the pull cylinders.



DANGER

Danger of accident!

- ▶ The control panel may **only** be used for assembly!
- ▶ The crane driver 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, ensure there is no great difference in the forces exerted on the ballast guying!
- ▶ The LICCON displays both forces and will issue a warning if the difference is too large!
- ▶ See section „Differential force monitoring of ballast guying“!

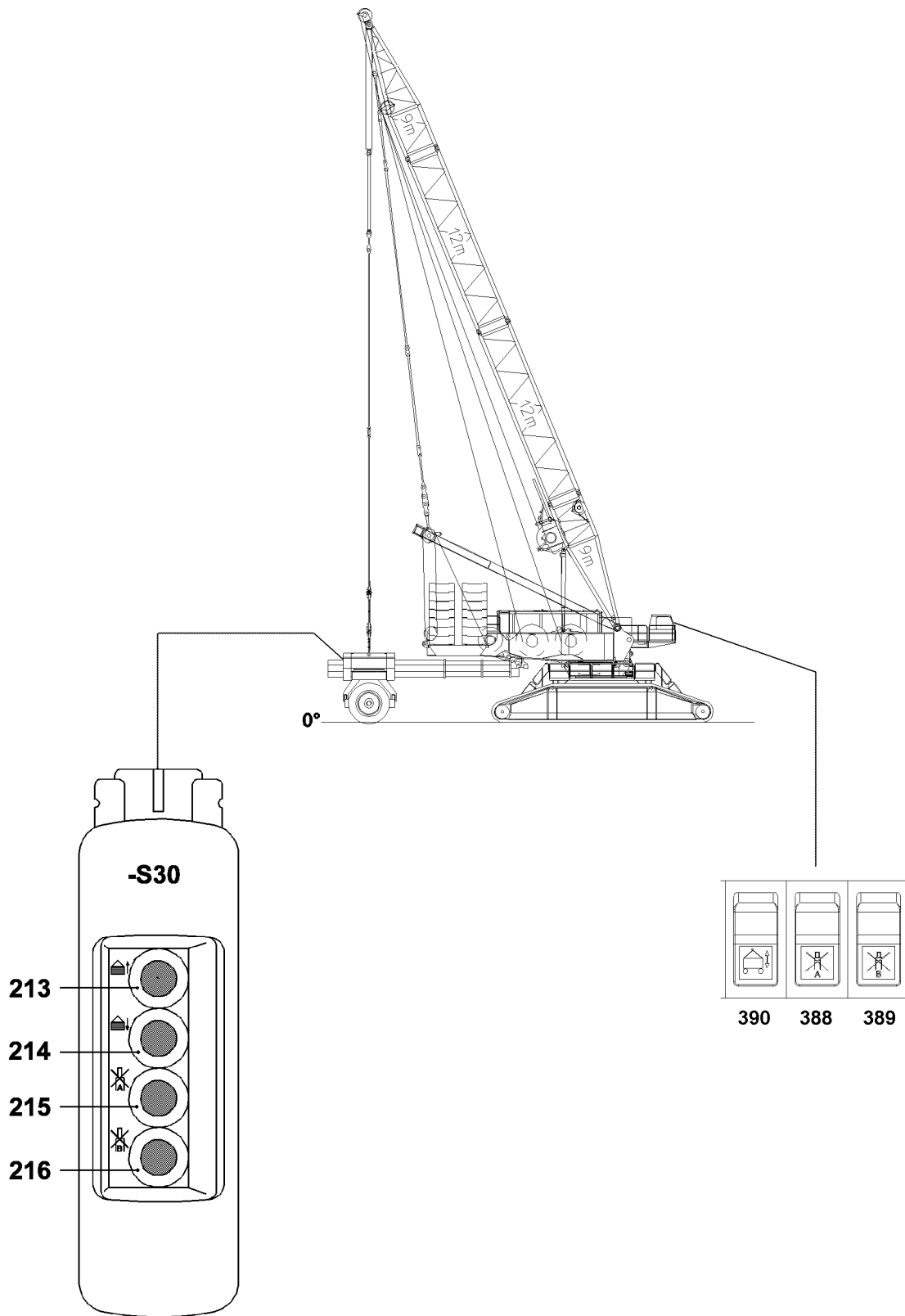


Fig.105088

LWE/LR 11350-007/19005-01-02/en

**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 the 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 ballast trailer level to $\pm 0.3^\circ$!
 - ▶ With a ballast utilization of less 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 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 accident!
-
- Press the button **388** or button **215**, the left pull cylinder (A) is blocked.
 - Press the button **389** or button **216**, the right pull cylinder (B) is blocked.

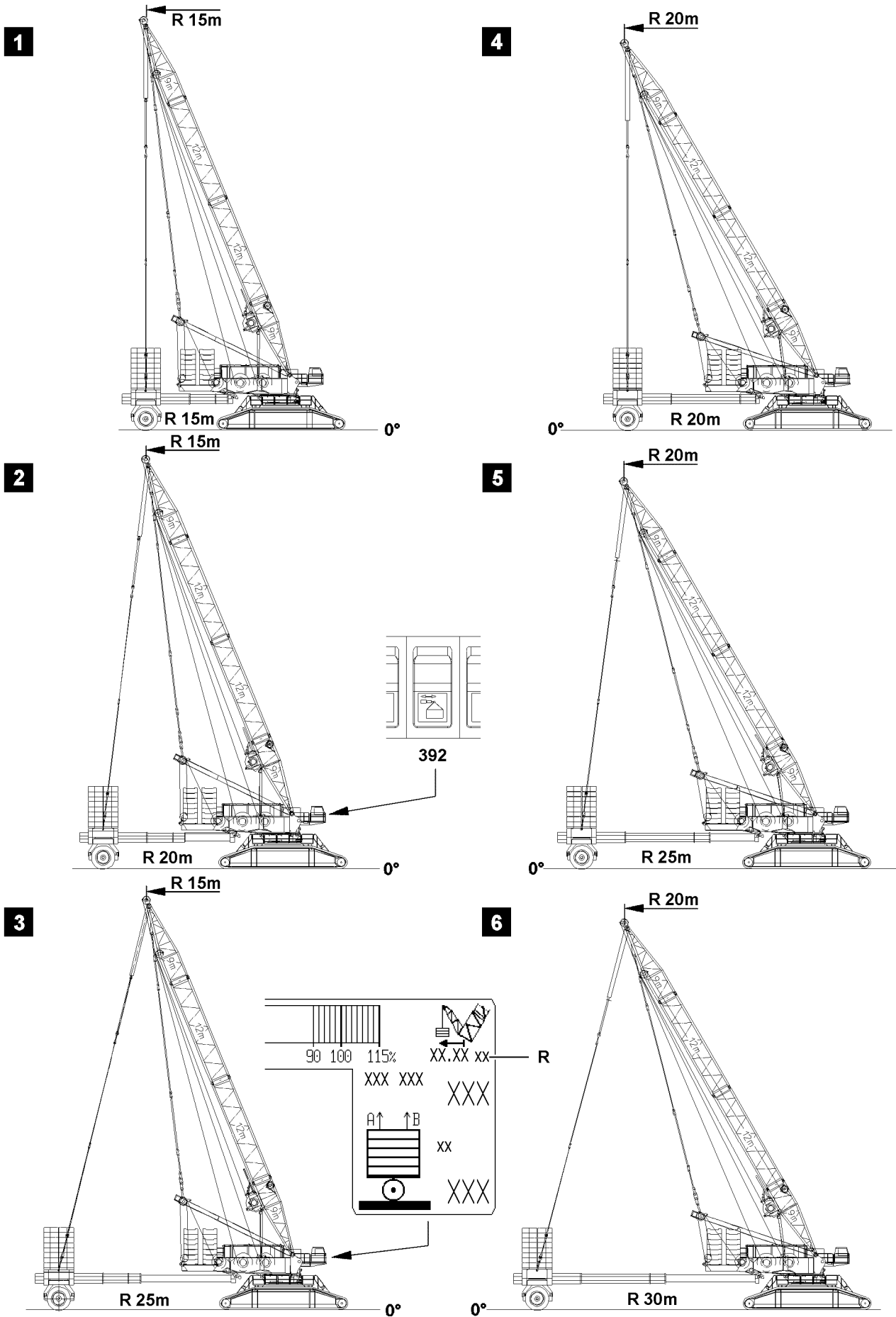


Fig.112900

LWE/LR 11350-007/19005-01-02/en

3 Setting the ballast trailer radii

The ballast trailer can be hydraulically telescoped steplessly 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 prerequisite is met:

- The ballast trailer wheels are in the 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

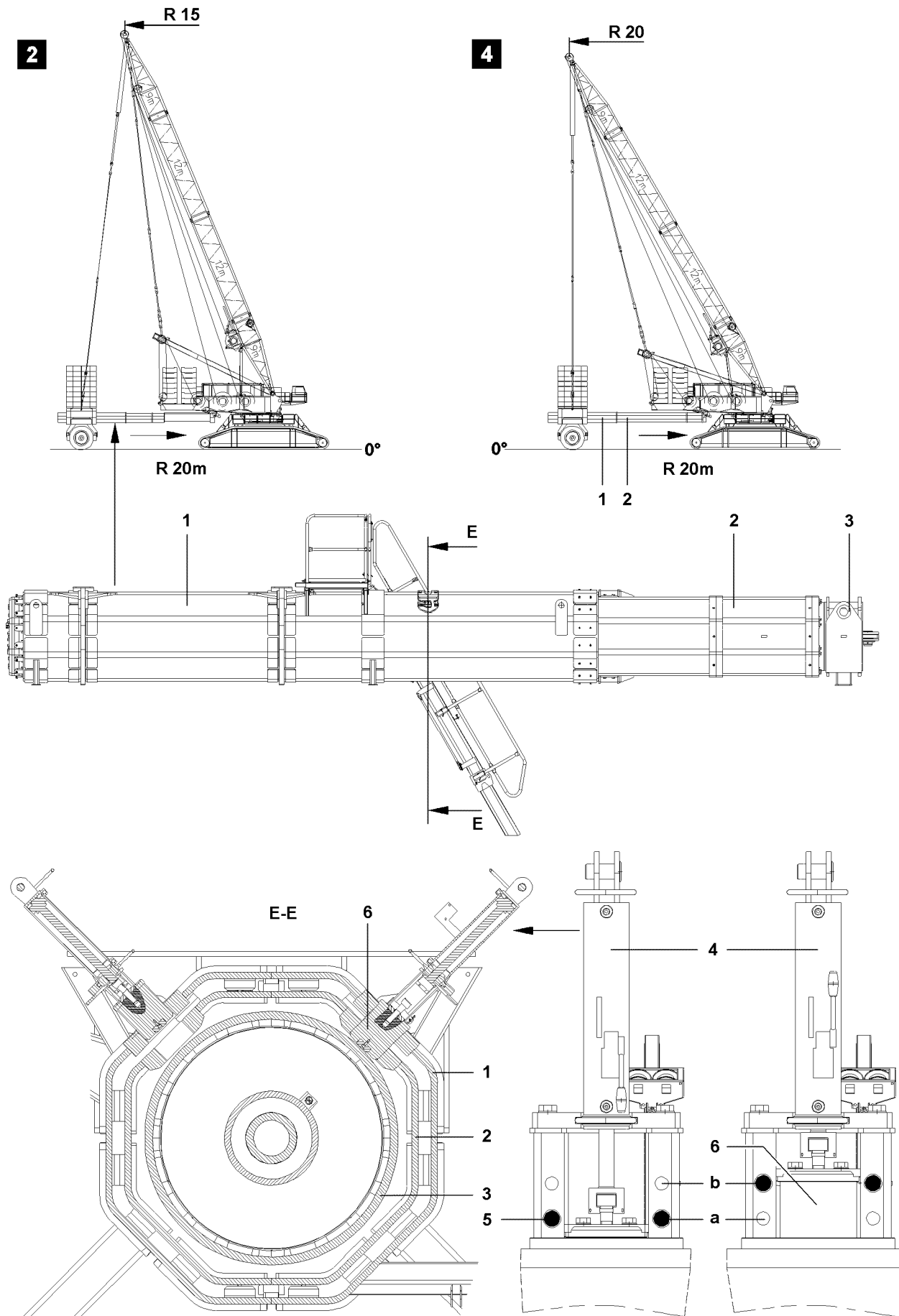


Fig.104092

LWE/LR 11350-007/19005-01-02/en

3.1 Unlocking and locking the center pipe

Make sure that the following prerequisites are met:

- The ballast trailer radius is 20 m.
- The ballast trailer is supported.
- The locking pin is pinned on the strut in the locking bore.
- The ball 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

- ▶ Connect the pin pulling device **4**.
- ▶ Release the retaining pins **5** and unpin from the bores **a**.
- ▶ Actuate the hand lever and unpin the pin **6** completely.
- ▶ Pin and secure the retaining pins **5** in the bores **b**.

3.1.2 Locking

- ▶ Connect the pin pulling device **4**.
- ▶ Release the retaining pins **5** and unpin from the bores **b**.
- ▶ Actuate the hand 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.

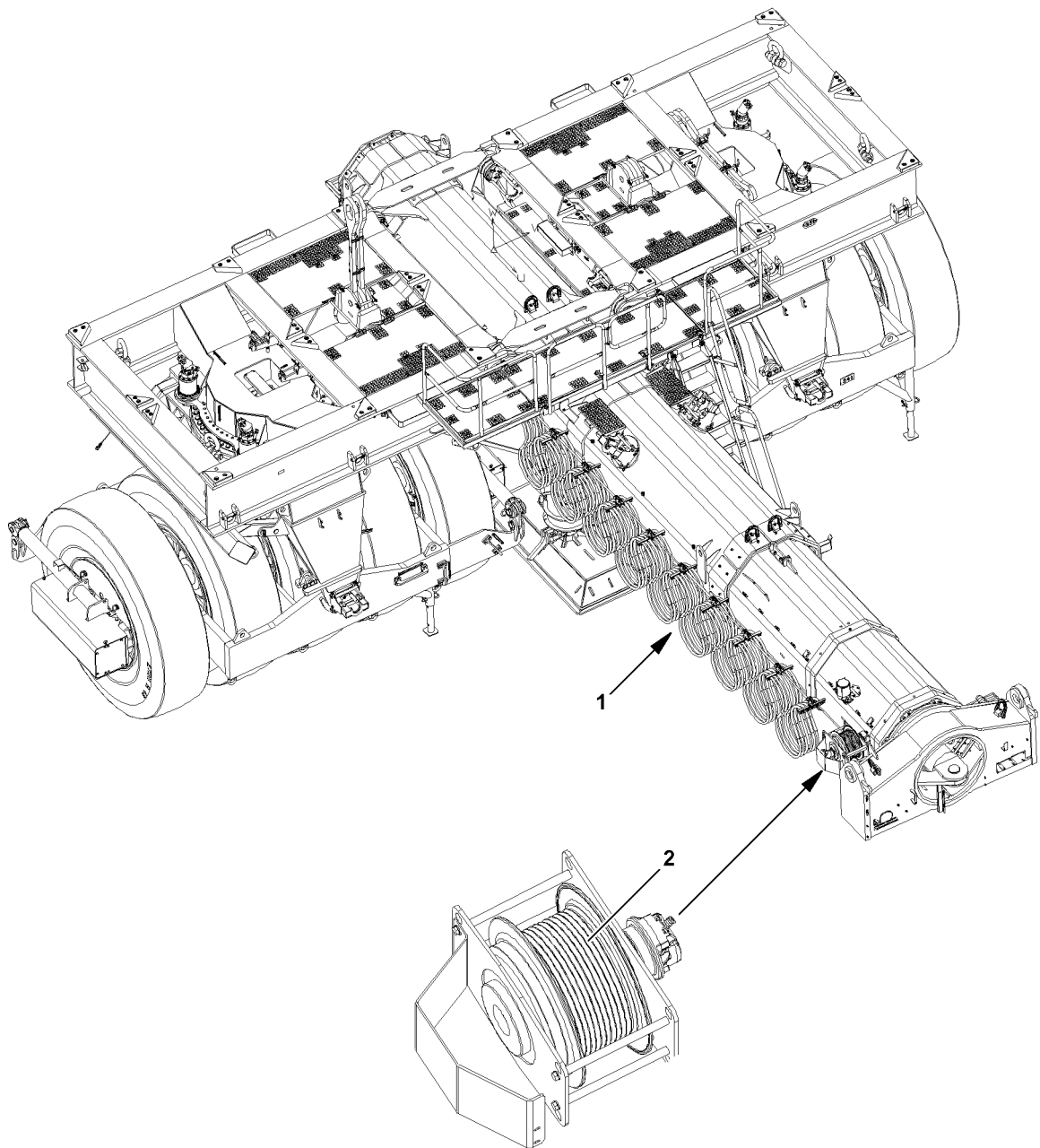


Fig.114077

LWE/LR 11350-007/19005-01-02/en

3.2 Telescoping the ballast trailer guide out and in

NOTICE

Damage to the hose guide 1!

After replacement of the winch speed sensor on winch 7 2 or after replacement of the memory card on the power pack of the LICCON component group, winch 7 2 must be readjusted!
If no adjustment of winch 7 is made, the hose guide can be damaged!

▶ Please contact the Customer Service at **LIEBHERR-Werk Ehingen GmbH!**

NOTICE

Damage to the 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 measure functions correctly, see 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 with 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!

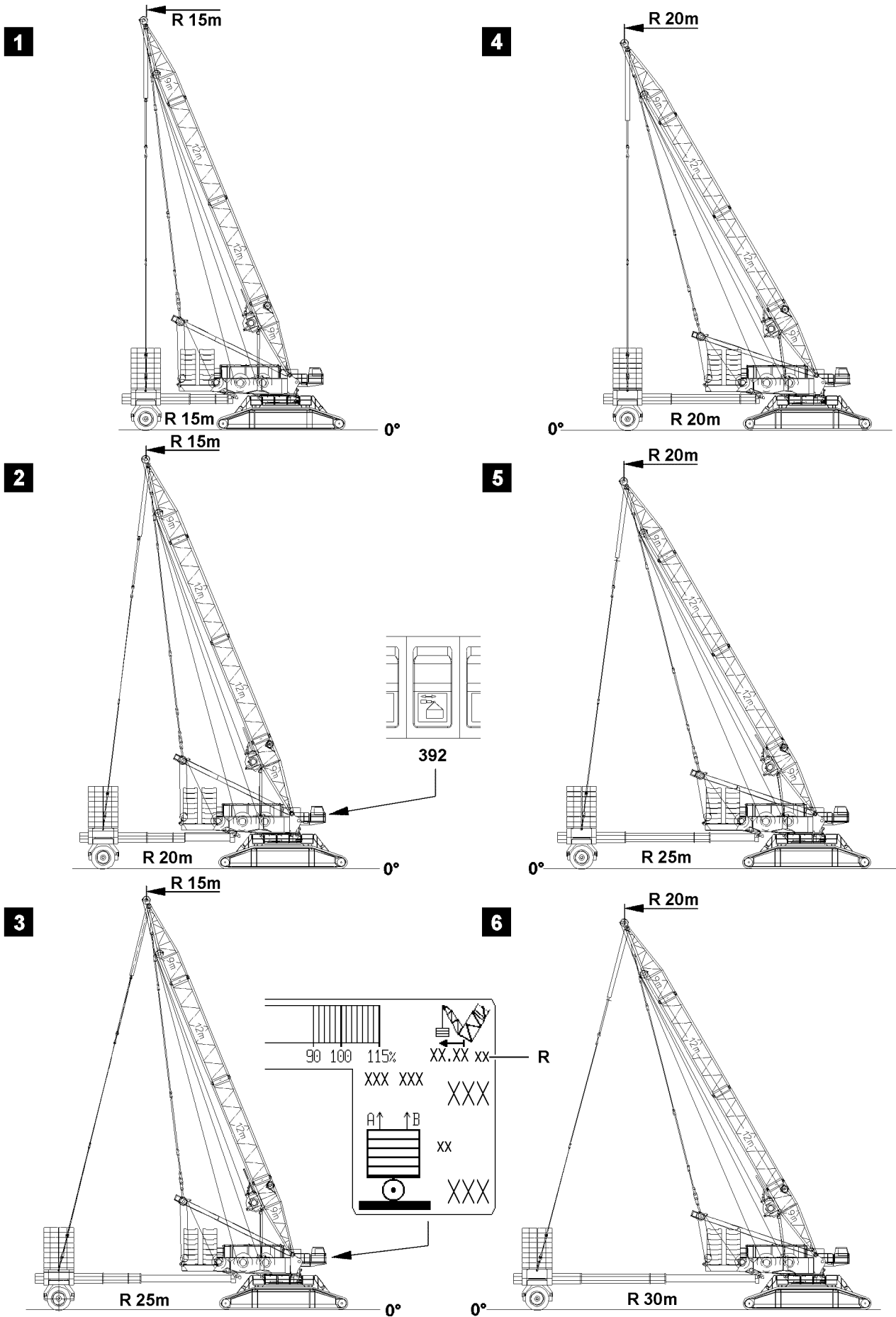


Fig.112900

LWE/LR 11350-007/19005-01-02/en

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.

The initial position is shown in 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 pipe **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.

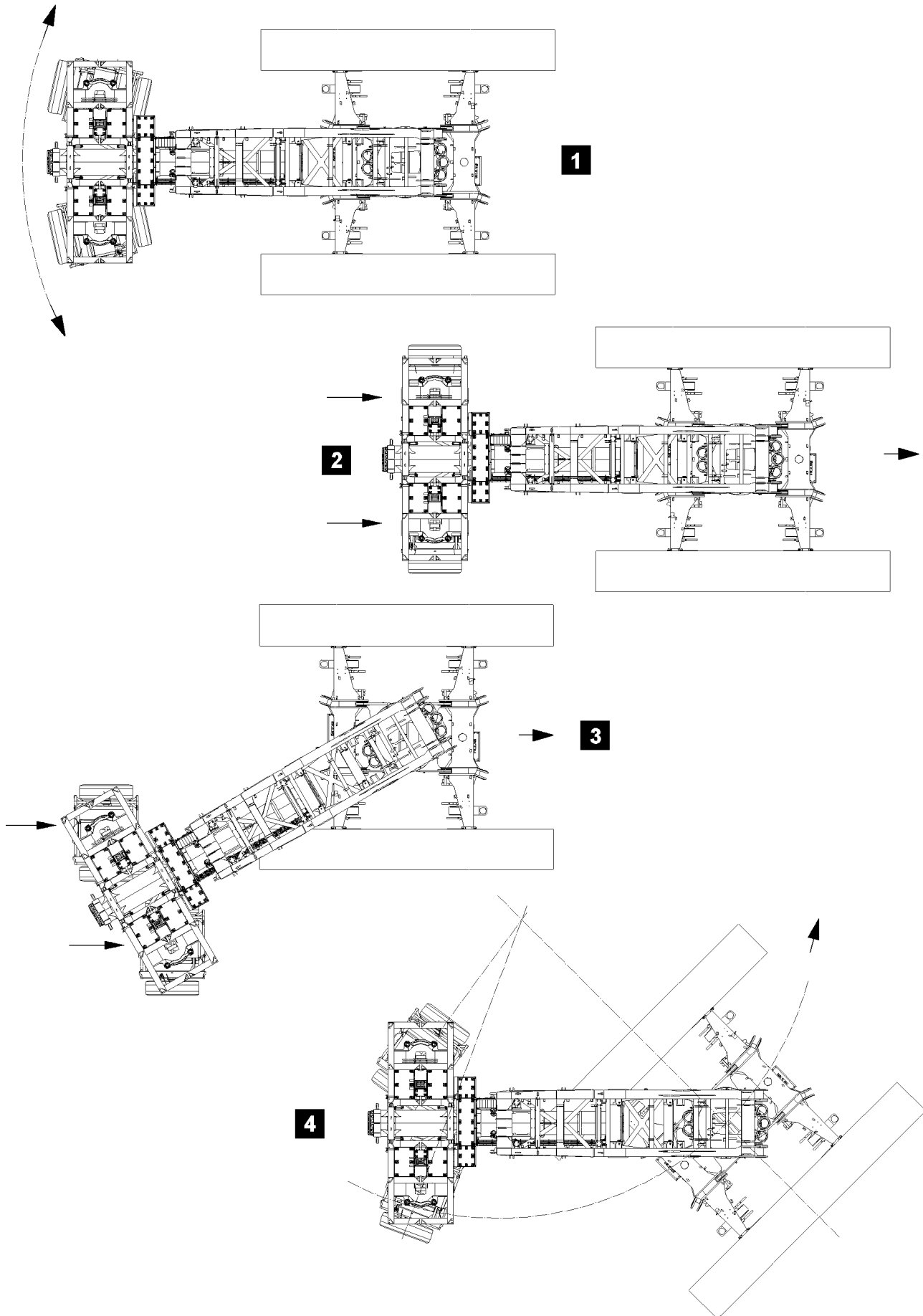


Fig.103457

LWE/LR 11350-007/19005-01-02/en

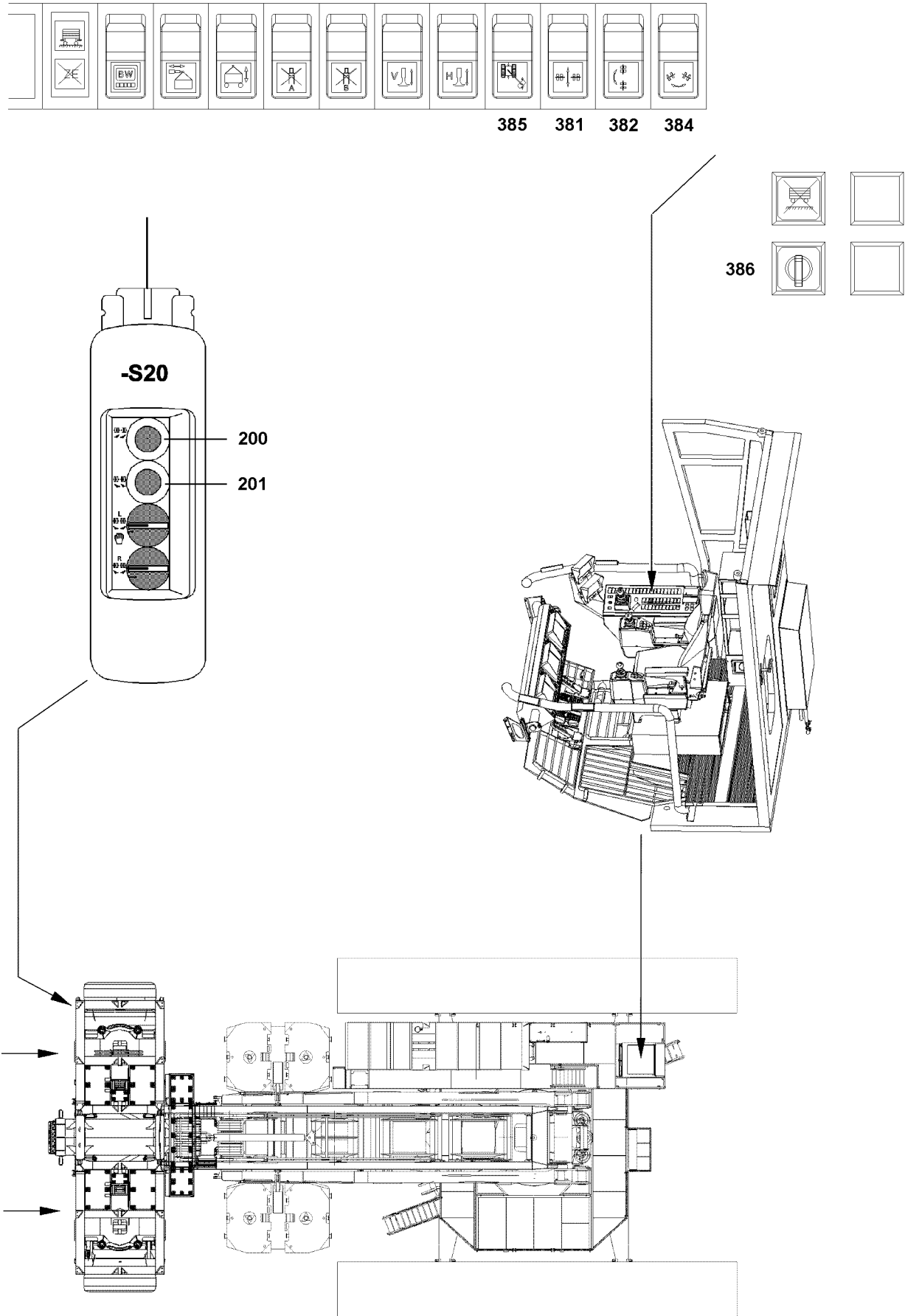
4 Adjusting the wheel sets

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.



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4.2 Notes to adjust the wheel sets

The adjustment 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 adjustment 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 „Ballast trailer lifted off“ key button **386** 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 the key button **386** turned on, then the ballast trailer and the crane will be damaged!

- ▶ If the „Ballast trailer lifted off“ key button **386** is turned on, it is imperative that a person monitors that the wheels **do not scrape on the ground!**

4.3 Adjusting the wheel sets

The adjustment procedure is the same for all steering programs.



Note

- ▶ If the ballast trailer is **not loaded**, the wheel sets can be adjusted without relieving the tires!
- ▶ If the ballast trailer is **loaded**, the ballast trailer must be raised first with the support cylinders until the tires are relieved!
- ▶ 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 the 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 absorb the entire weight and will therefore be overloaded!

- ▶ Actuate both support cylinders simultaneously!



DANGER

Danger of accident 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 observe the monitor display, Force in test point F1, at the same time.

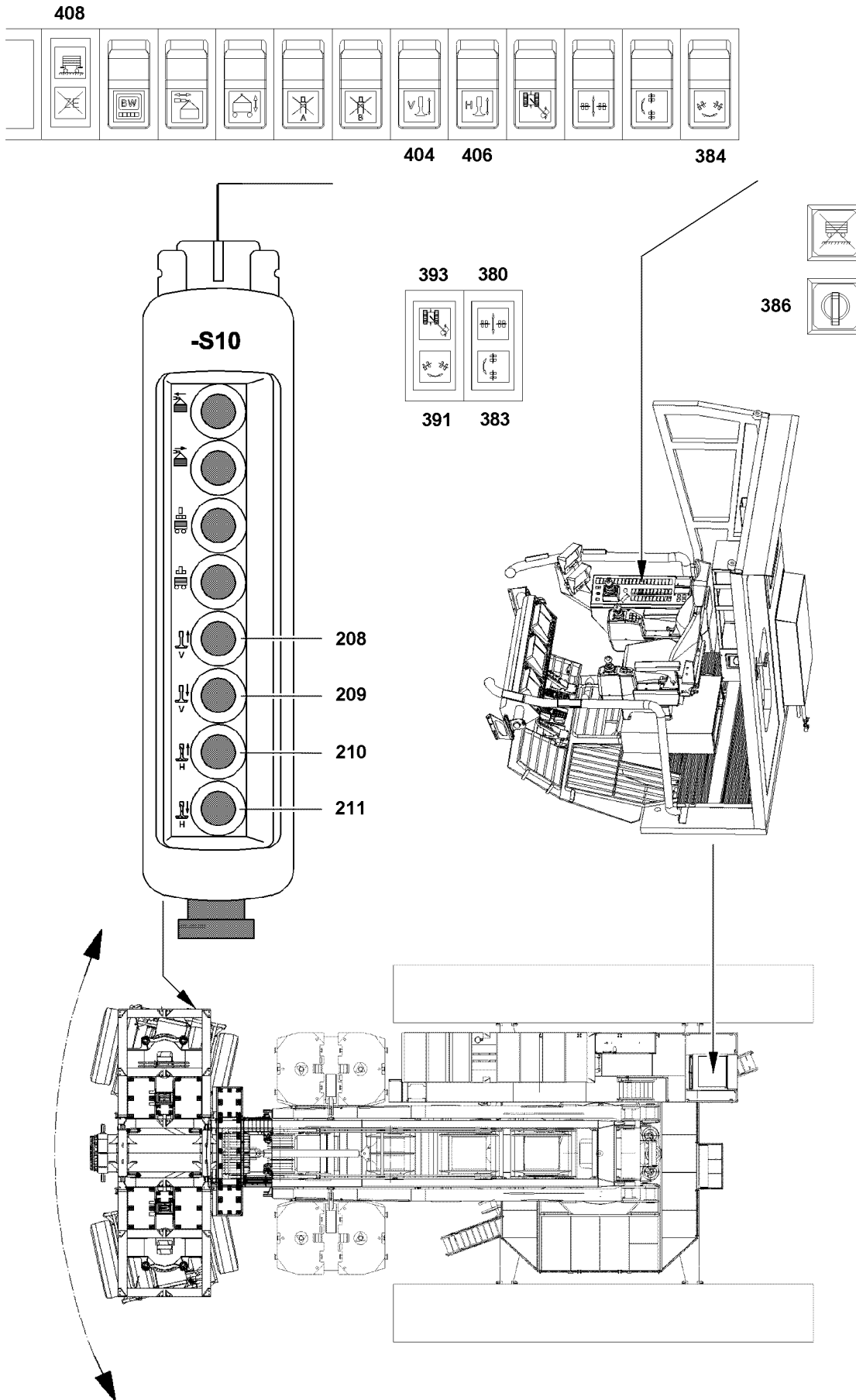


Fig.112901

LWE/LR 11350-007/19005-01-02/en

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 Lifting the ballast trailer with the support cylinders

- ▶ Press the button **404** and button **406** or button **209** and button **211** simultaneously and extend the support cylinders on the front and rear simultaneously.
- ▶ Lift the ballast trailer until the tires are relieved.

4.4.2 Setting the axles to the circular travel position

- ▶ Press the 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** illuminates 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!

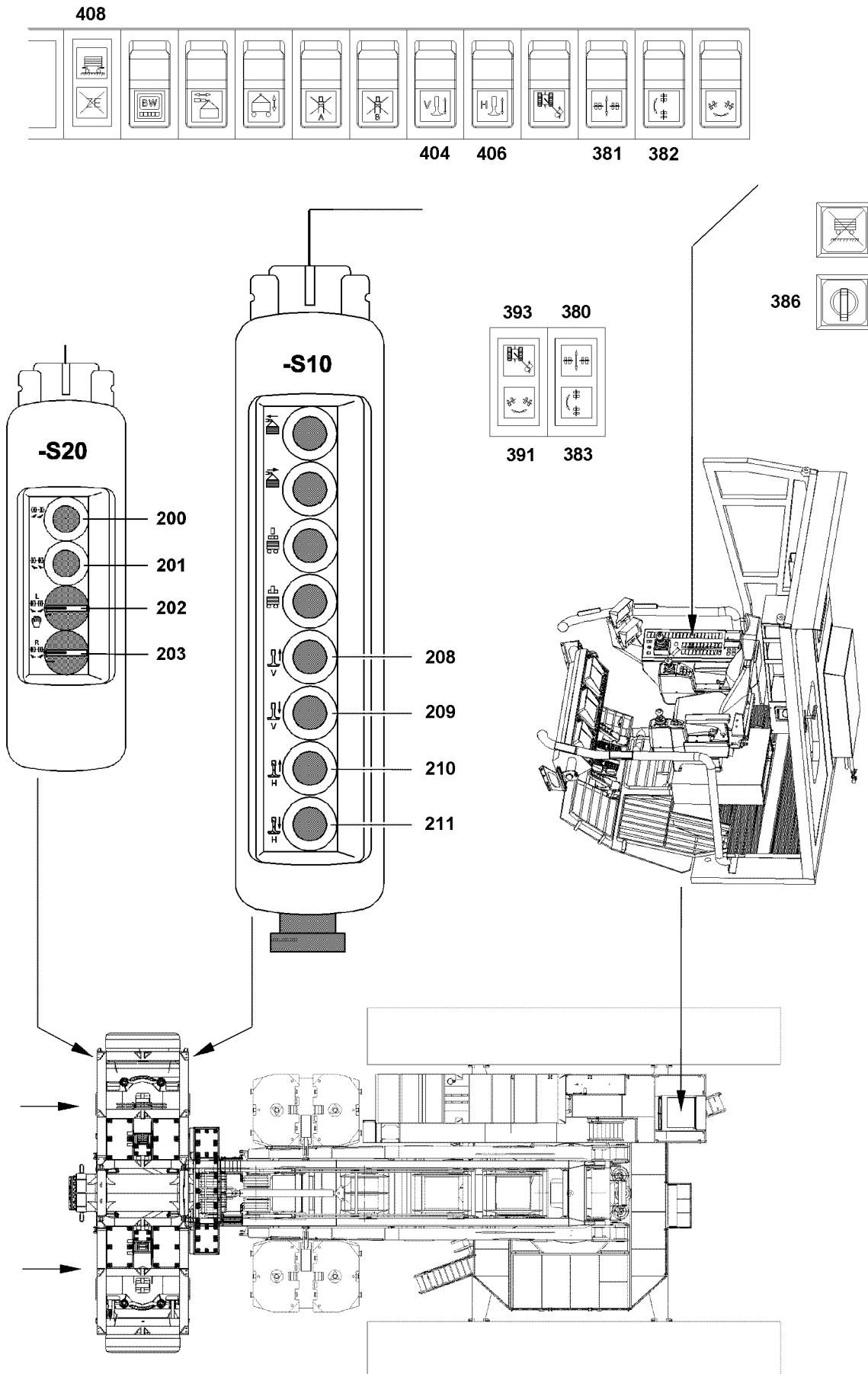
- ▶ Press the button **384** again.

4.4.3 Lowering the ballast trailer with the support cylinders

- ▶ Press the button **404** and button **406** or button **208** and button **210** simultaneously and retract the support cylinders on the front and rear completely at the same time.

Result:

- The indicator light **408** lights up, the support cylinders are retracted.



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4.5 Towing

4.5.1 Lifting the ballast trailer with the support cylinders

- ▶ Press the button **404** and button **406** or button **209** and button **211** simultaneously and extend the support cylinders on the front and rear simultaneously.
- ▶ Lift the ballast trailer, see circular travel.

4.5.2 Setting the axles in the towing position

- ▶ Press the 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** illuminates when the towing travel position is reached.

4.5.3 Lowering the ballast trailer with the support cylinders

- ▶ Press the 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 the 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 the 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 a large load, correct the steering only **in travel operation!**
- ▶ Monitor the distortion of the wheels!



Note

- ▶ Changing from the towing operating mode to the corrective steering operating mode 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!

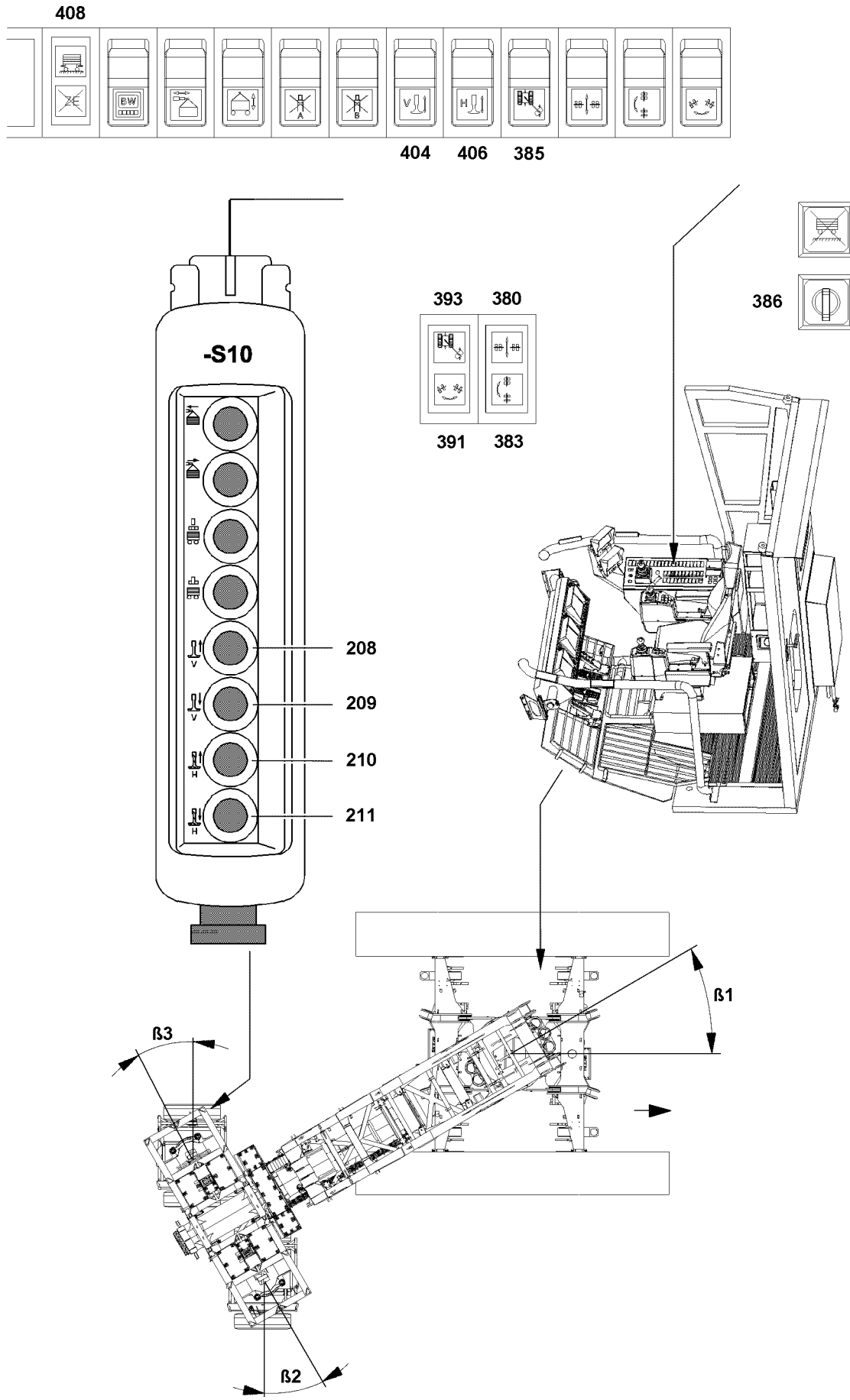


Fig.112903

LWE/LR 11350-007/19005-01-02/en

4.6 Parallel travel

Make sure that the following prerequisite is met:

- Crawler operation is turned on.

NOTICE

Property damage!

- ▶ During parallel travel, steering the crawler is prohibited!
 - ▶ During parallel travel, a person must observe 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 the 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 Lifting the ballast trailer with the support cylinders

- ▶ Press the 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 in the parallel position

- ▶ Press the button **393**, the axles are turned to the parallel position.

Result:

- The indicator light **393** blinks until the parallel position is reached. The indicator light **393** illuminates 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 the 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, 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 travel gear is stopped. The indicator light **393** blinks!
 - ▶ The crawler travel gear 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 the „Parallel travel“ operating mode!
-

- ▶ Check the settings.
-

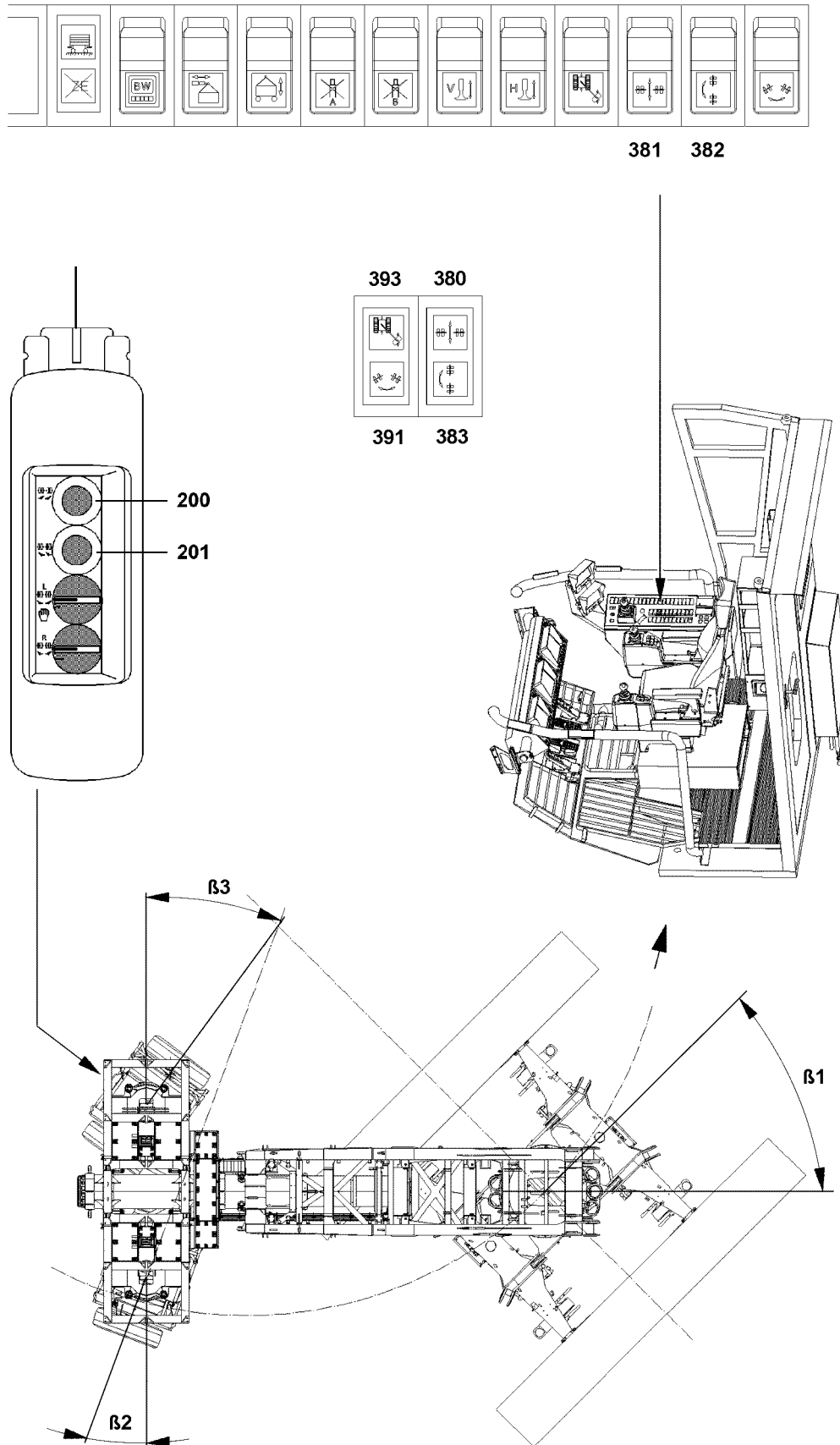


Fig.104030

LWE/LR 11350-007/19005-01-02/en

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:

- The towing operating mode is selected **and** the ballast trailer axles have reached the towing position.

The indicator light **380** lights up.

- ▶ Press the button **382** or button **200**, the ballast trailer wheels turn to the right.
- ▶ Press the 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 operating 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** illuminates.



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!
 - ▶ If the crawler is driven and the turntable angle β_1 exceeds the specified value, operation switches automatically to the towing operating mode. The indicator light **380** blinks!
 - ▶ Manual corrective steering is possible again once the towing position is reached. The indicator light **380** illuminates!
 - ▶ Generally, the wheels sets only move during corrective steering if either the button **382** 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.

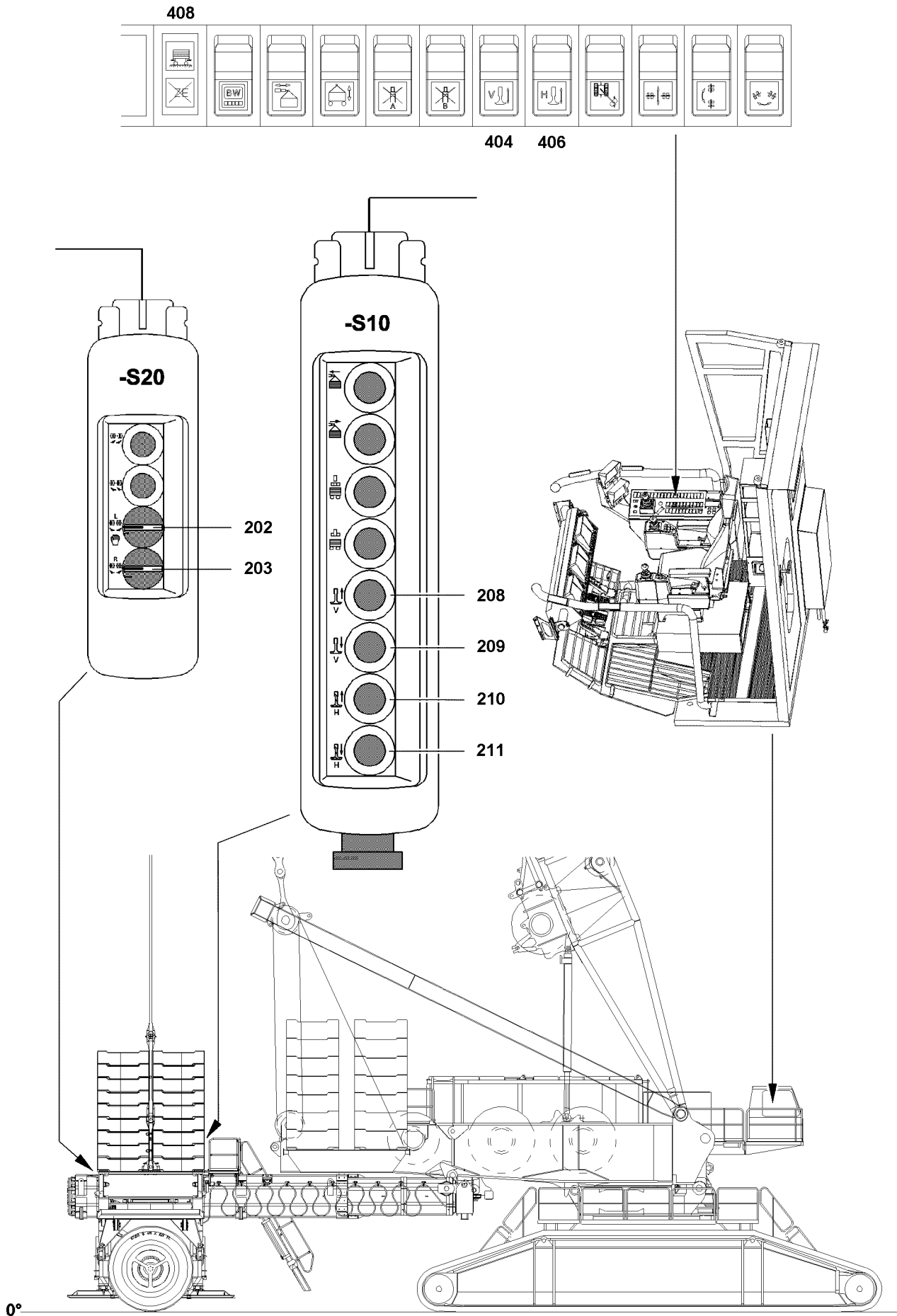


Fig.103464

LWE/LR 11350-007/19005-01-02/en

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 Lifting the ballast trailer with the support cylinders

- ▶ Press the 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 the 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.

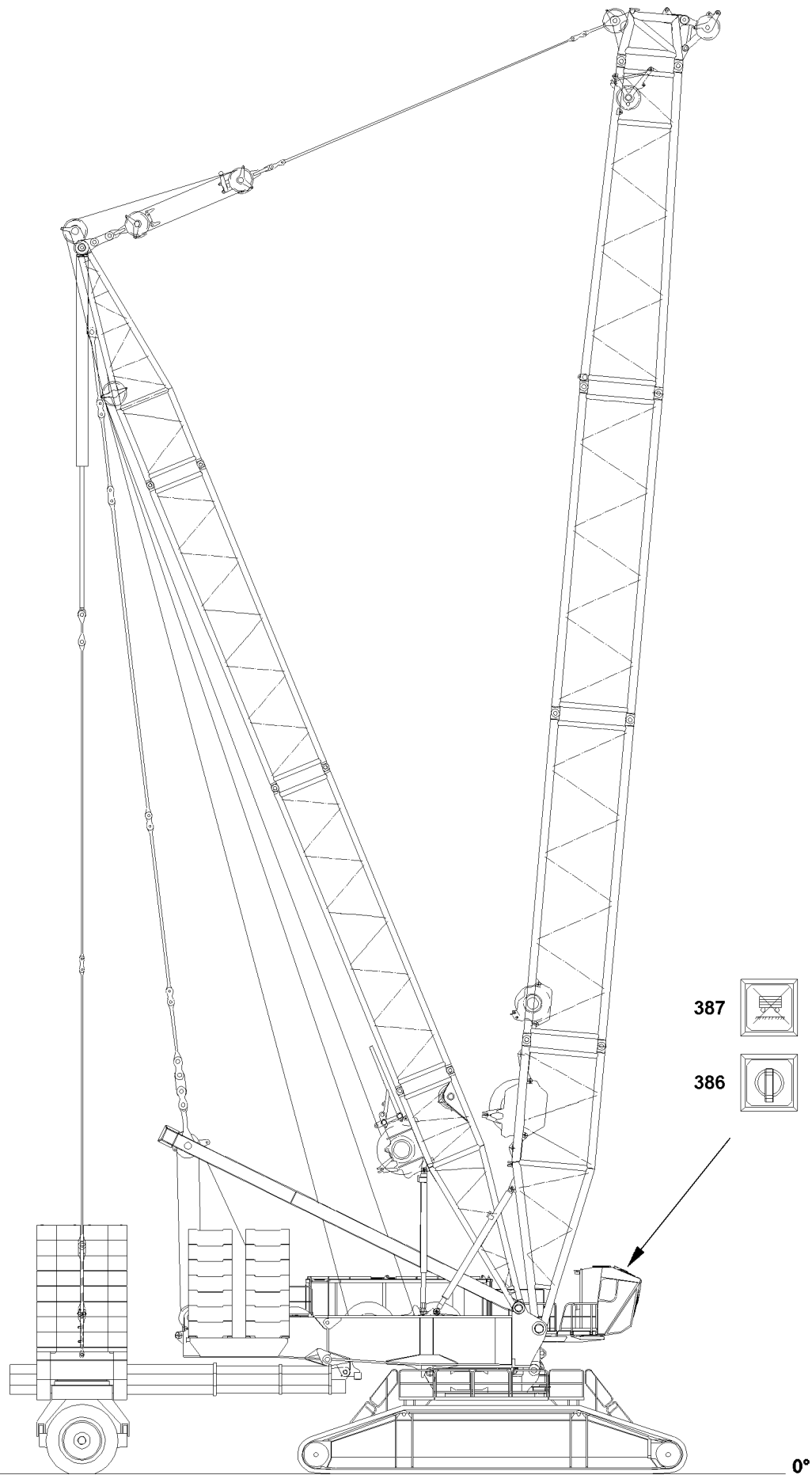


Fig.104026

LWE/LR 11350-007/19005-01-02/en

5 Driving with the ballast trailer

5.1 Procedure



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 the 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 the 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 cylinder is fully extended or retracted when driving in the 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 the end position!

5.1.1 Pressure monitoring in the 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!

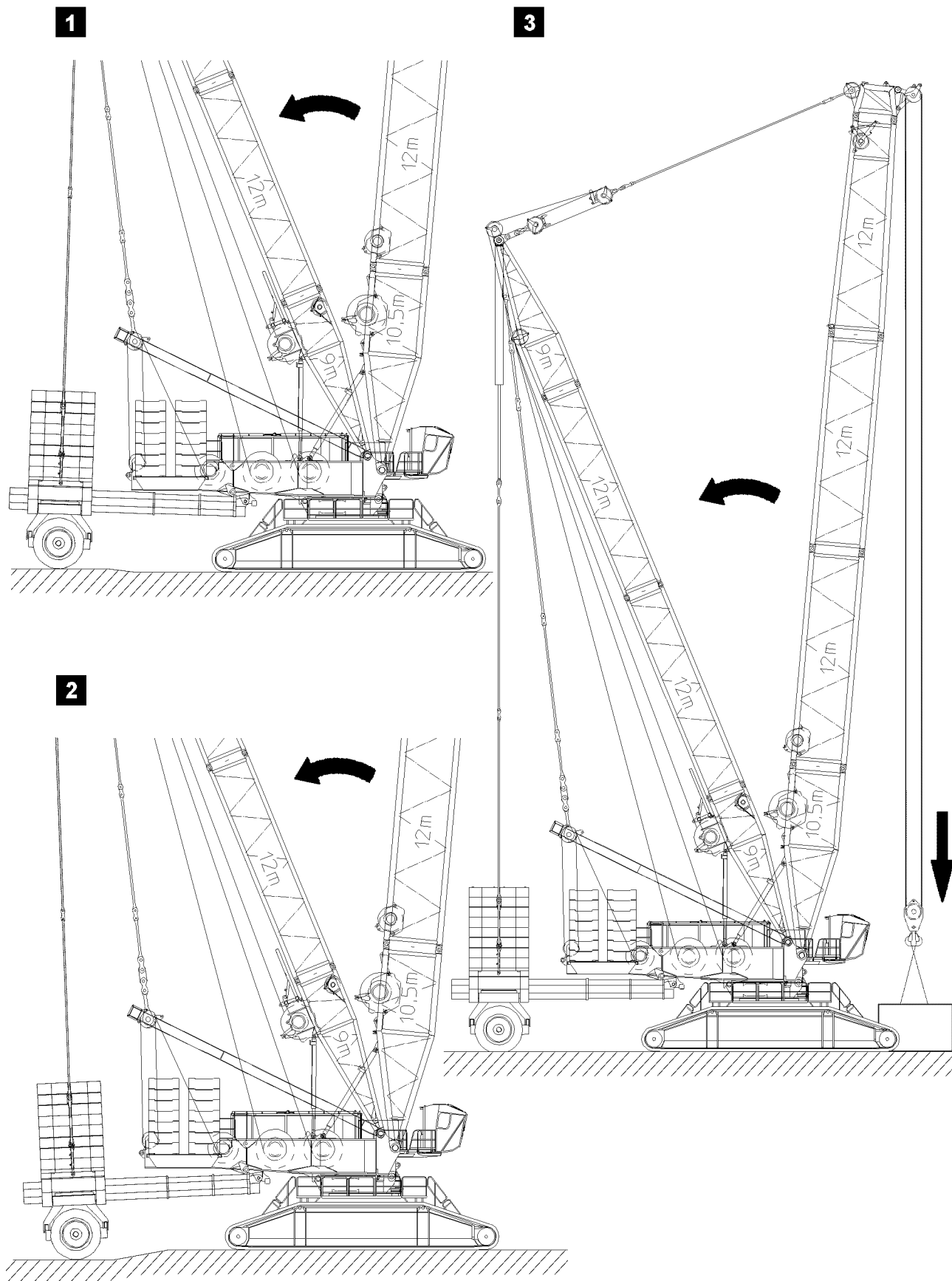


Fig.104091

LWE/LR 11350-007/19005-01-02/en

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, in certain cases the movement of the entire crane system to the rear can cause the relapse cylinders to mechanically latch in the block position!

5.2.2 Relapse cylinder block position

During normal crane operation without bypass of the overload protection, a block position is not possible. Should a block position still occur, the movement is shut 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 a 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 danger of reaching the block position in the relapse cylinders. The same danger 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 Crawler driving and Turning 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 danger 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 Crawler driving and Turning 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“.

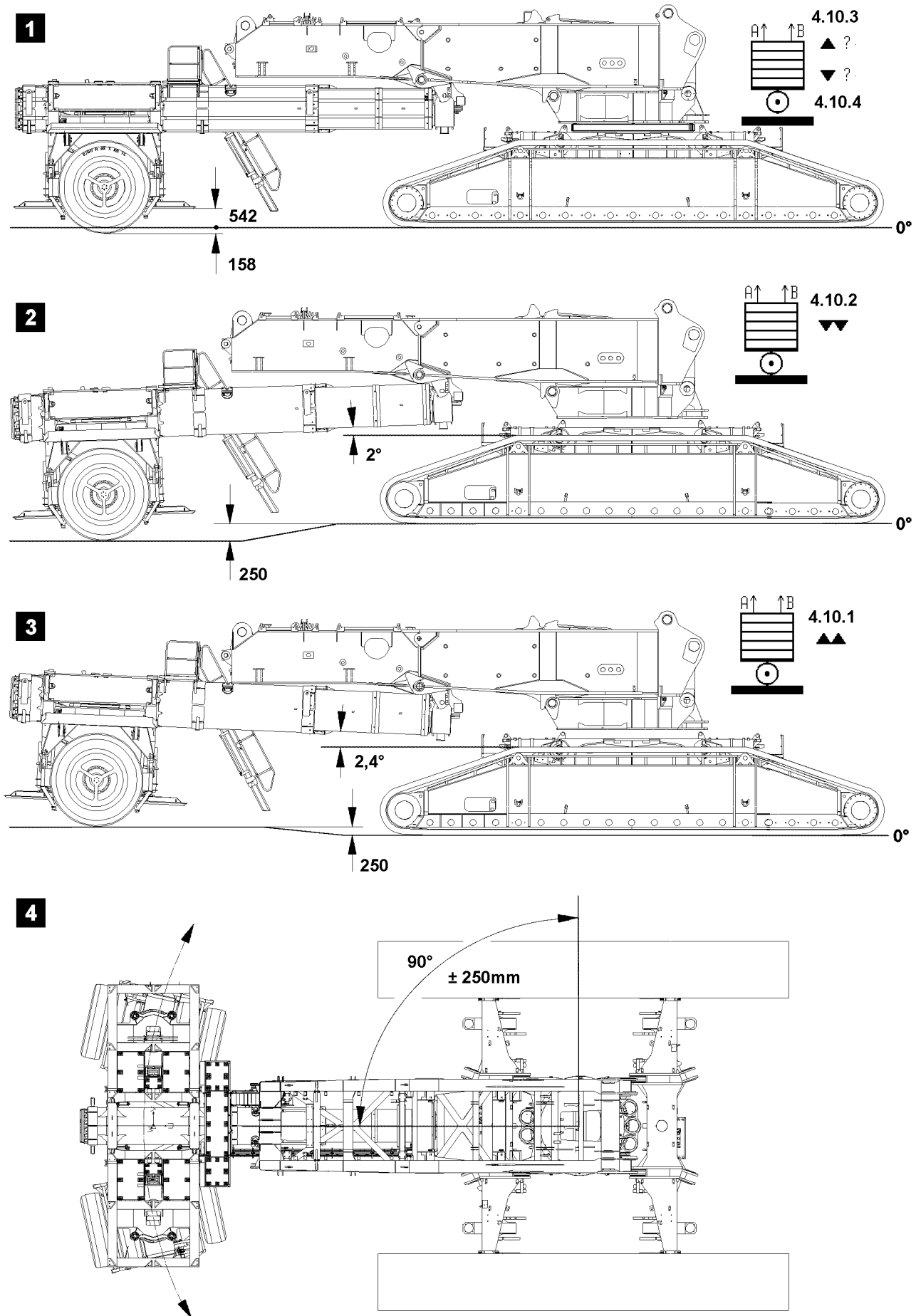


Fig.107455

LWE/LR 11350-007/19005-01-02/en

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 the 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 pipe is parallel to the lower edge of the turntable.

Illustration 2

Limit switch actuation at 2° incline downward:

- The icon **4.10.2**, block position **downward** appears.
- Shut-offs, see the crane operating instructions chapter 4.02.

Illustration 3

Limit switch actuation at 2.4° incline upward:

- The icon **4.10.1**, block position **top** appears.
- Shut-offs, see the 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 chapter 4.02!

NOTICE

Damage to the 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 the block position **on the bottom and top!**

The ballast trailer and the turntable will be damaged!

- ▶ Replace defective limit switches immediately!
- ▶ Check the function!

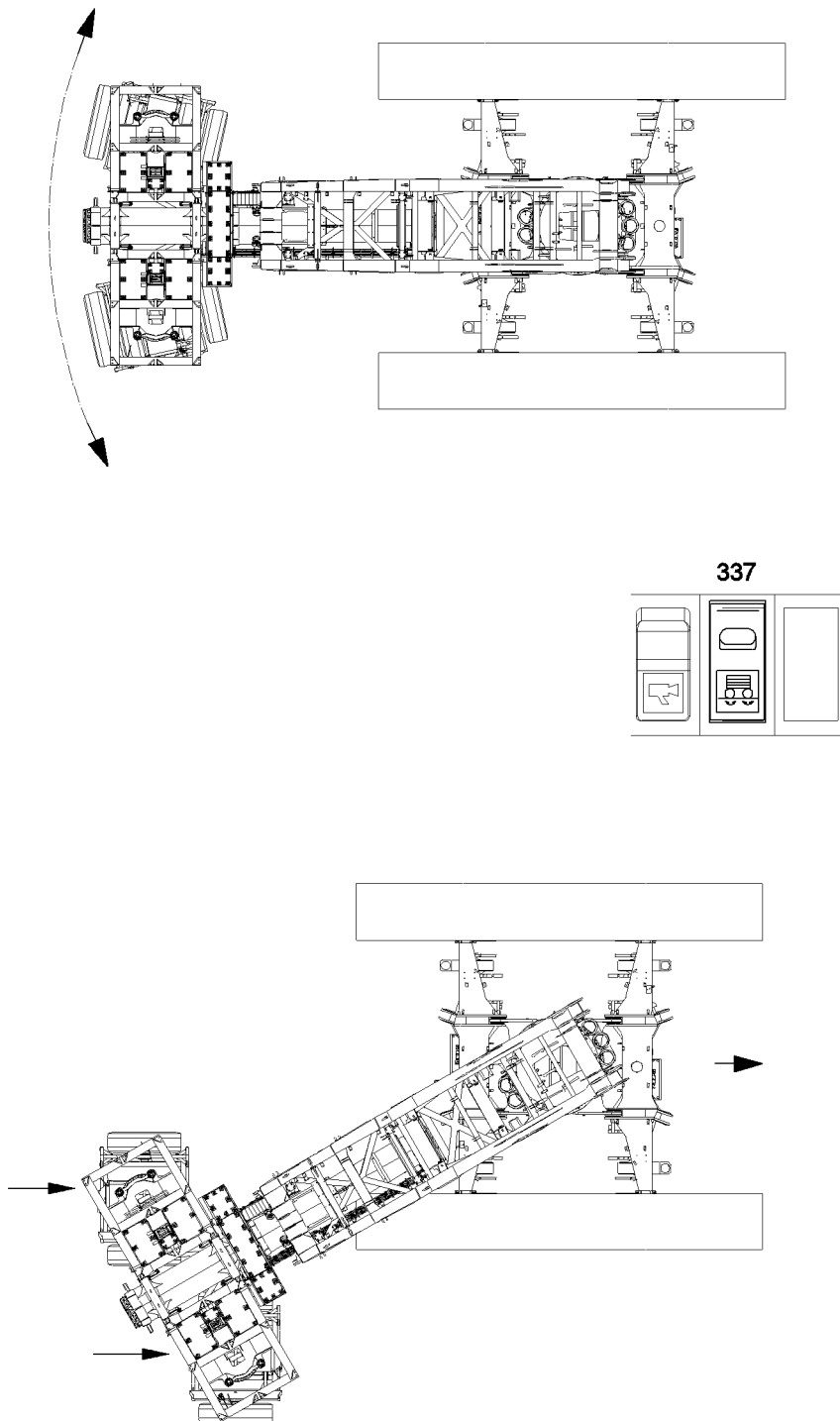


Fig.106376

LWE/LR 11350-007/19005-01-02/en

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 the circular and parallel driving mode!
 - ▶ The additional drive may be required when driving over uneven ground!
-

If the road surface is level, no additional drive is required.

Add the drive only when no turning / travel movement occurs when the control lever is deflected.

Turn the drive on with the switch **337** in the crane cab.



Note

- ▶ Turn the drive off as soon as the uneven ground has been passed!
 - ▶ Turn the drive off with the switch **337** in the crane cab.
-

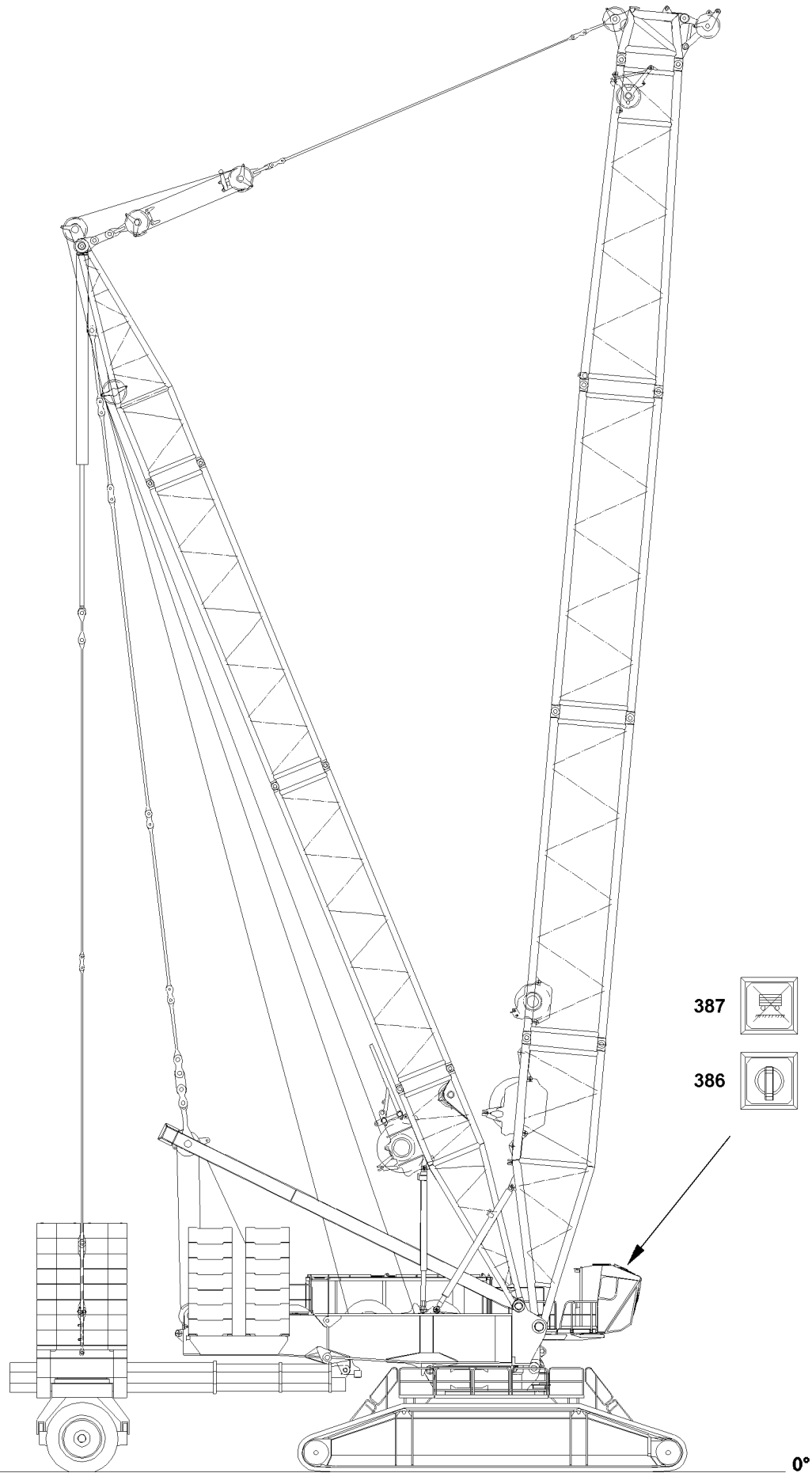


Fig.104026

LWE/LR 11350-007/19005-01-02/en

5.4 Key button „Ballast trailer lifted off“

During „crawler driving“ and when the 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 „crawler driving“ if driving with the **ballast trailer lifted off** (constant visual check), the „Ballast trailer lifted off“ key button **386** must be turned on.



DANGER

Danger of accident!

If the ballast trailer is lifted off the ground when driving the crawler - towing operating mode, there is the danger that the wind turns the turntable when „driving the crawler“, for that reason, the „Ballast trailer lifted off“ key button **386** 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 travel gear, the slewing gear brake can slip. The slewing gear will not be damaged!
- ▶ If the wheels of the ballast trailer are not in the towing position, the ballast trailer or the crane will be damaged!



Note

- ▶ When the „Ballast trailer lifted off“ function is turned on, the warning light in the button **387** blinks, it is possible to turn the crane superstructure or to drive the crane even though the wheels of the ballast trailer are not set to 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**. In addition, the ballast trailer icon on LICCON monitor 1 indicates a suspended state.

To turn off „Ballast trailer lifted off“, the button **387** must be pressed. The warning light in the button **387** turns off. The LICCON monitor shows the derrick ballast icon on the ground.

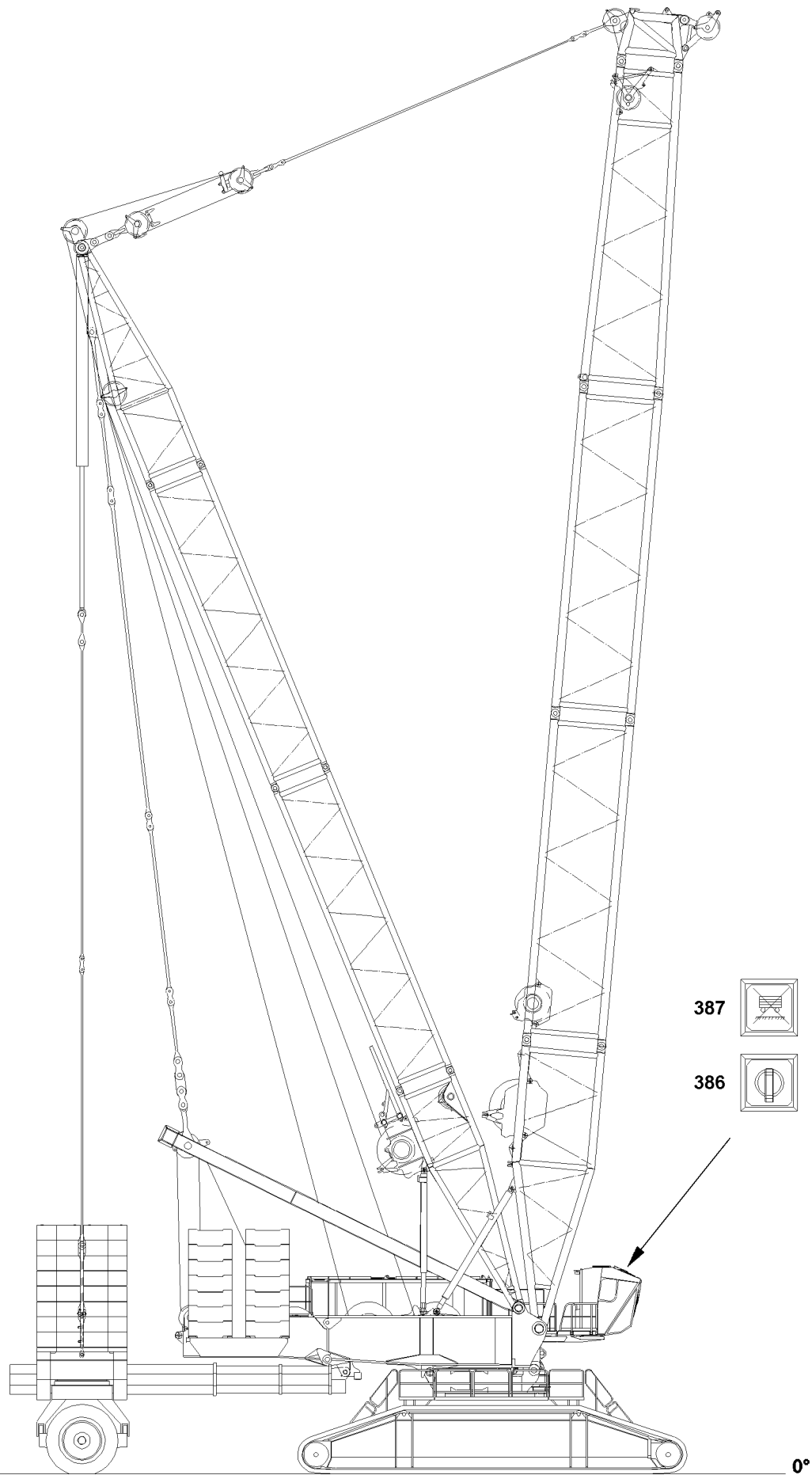


Fig.104026

LWE/LR 11350-007/19005-01-02/en

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**“. 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**“. 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 danger of accident 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!

The ballasted ballast trailer is still standing on the ground with 1 t.

1. With key button **386** not actuated „**Ballast trailer not lifted**“. The slewing gear brake opens when driving the crawler. The wind can turn the superstructure and the load starts to swing.



DANGER

Danger of accident!

- ▶ There is an increased danger of accident due to collision!

or

2. With key button **386** actuated „**Ballast trailer lifted**“. The slewing gear brake remains closed when driving the crawler. When driving the crawler in a curve, the ballast trailer tires or the slewing brake will slip.

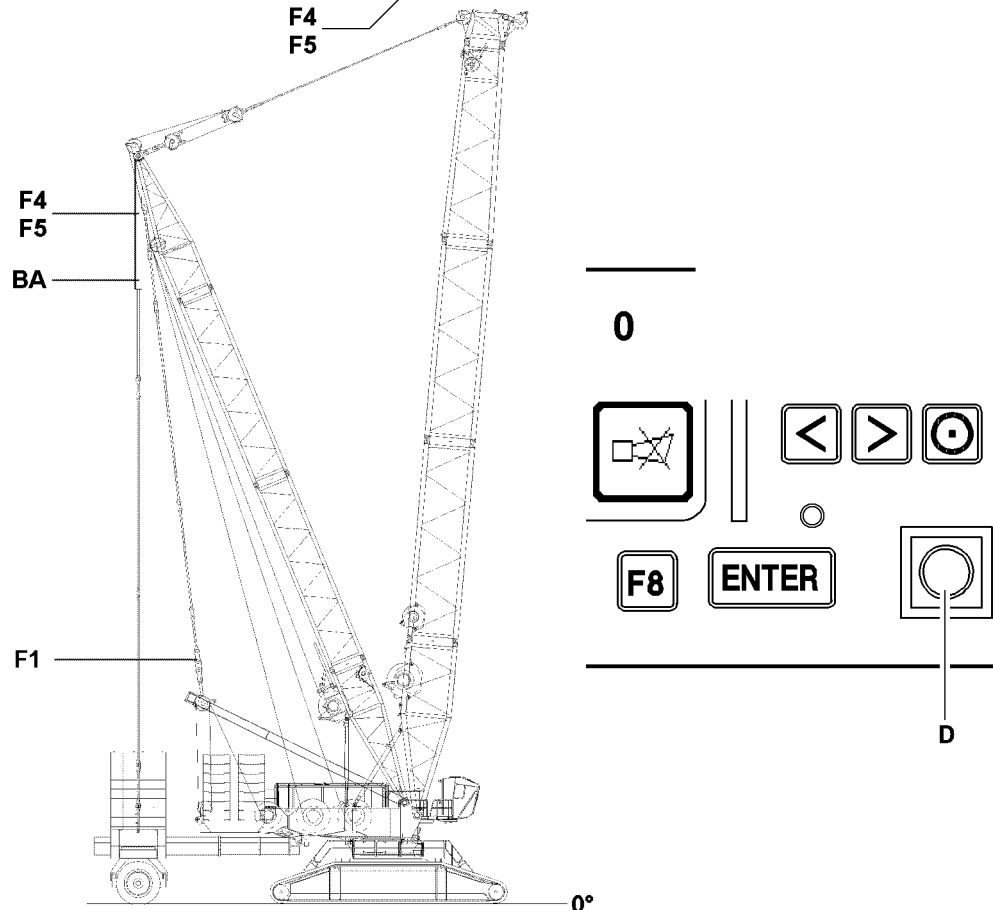
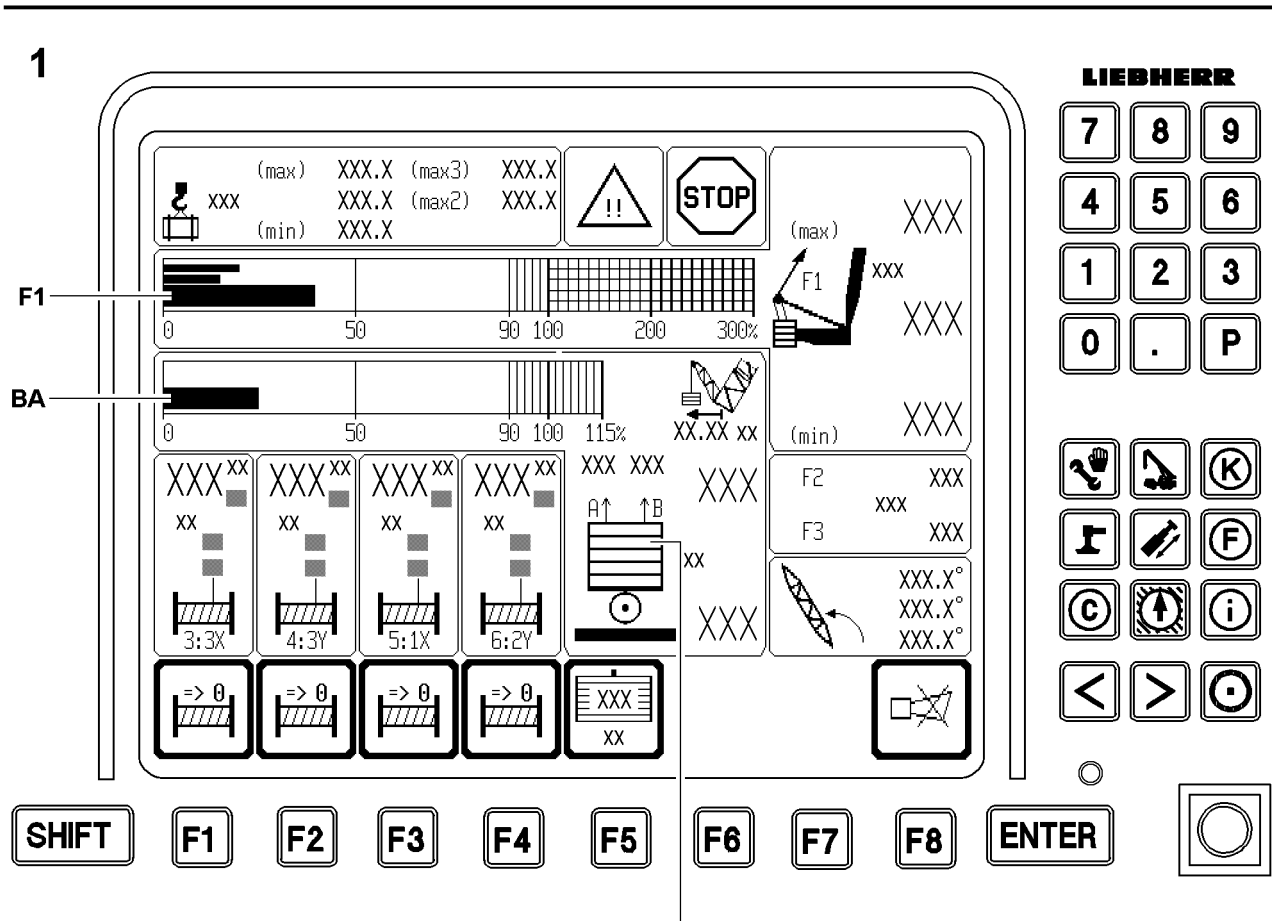


Fig.112904

LWE/LR 11350-007/19005-01-02/en

6 Crane operation with the derrick ballast

6.1 LICCON overload protection

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 the ballast trailer are generally described as the **derrick ballast!**
- ▶ The fixed compensation weight that 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 the operating position.

6.1.1 Presettings

- ▶ Set 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!

Adjust the derrick ballast, see chapter 4.03.



DANGER

Danger of accident!

The set derrick ballast must correspond to the actual derrick ballast weight added!

- ▶ Incorrect entry of the ballast weight can result in dangerous operational situations!
- ▶ Check the settings.

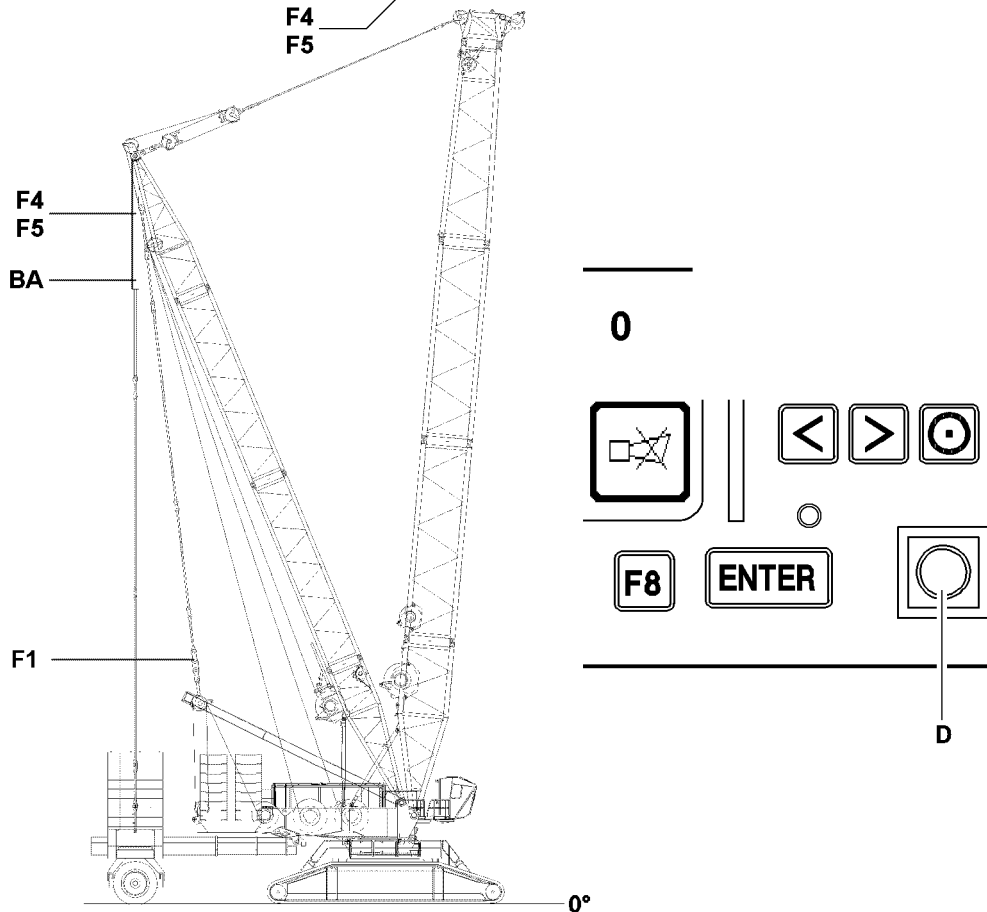
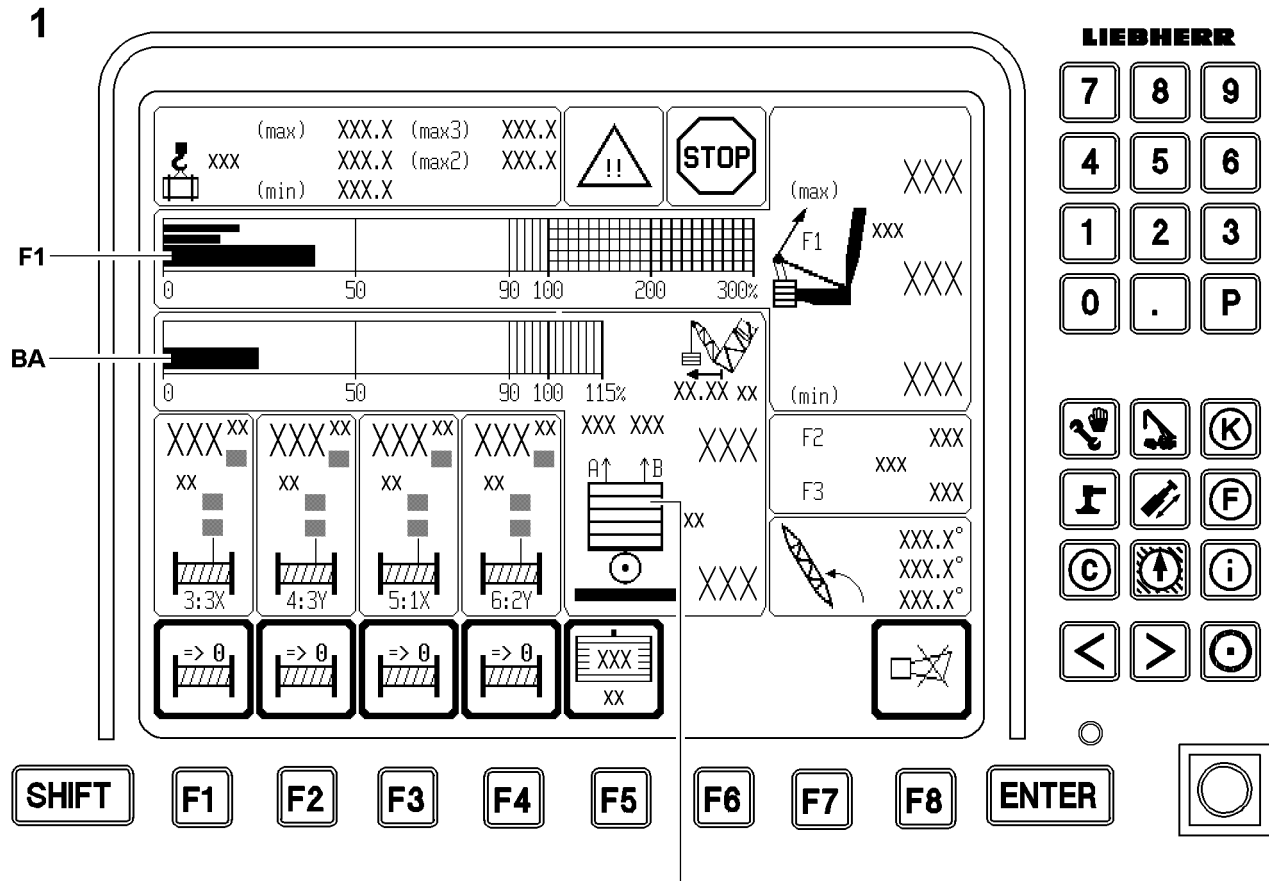


Fig.112904

LWE/LR 11350-007/19005-01-02/en

6.1.2 Crane operation



Note

- ▶ For crane operation with derrick ballast, the data in 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!

When turning, 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.

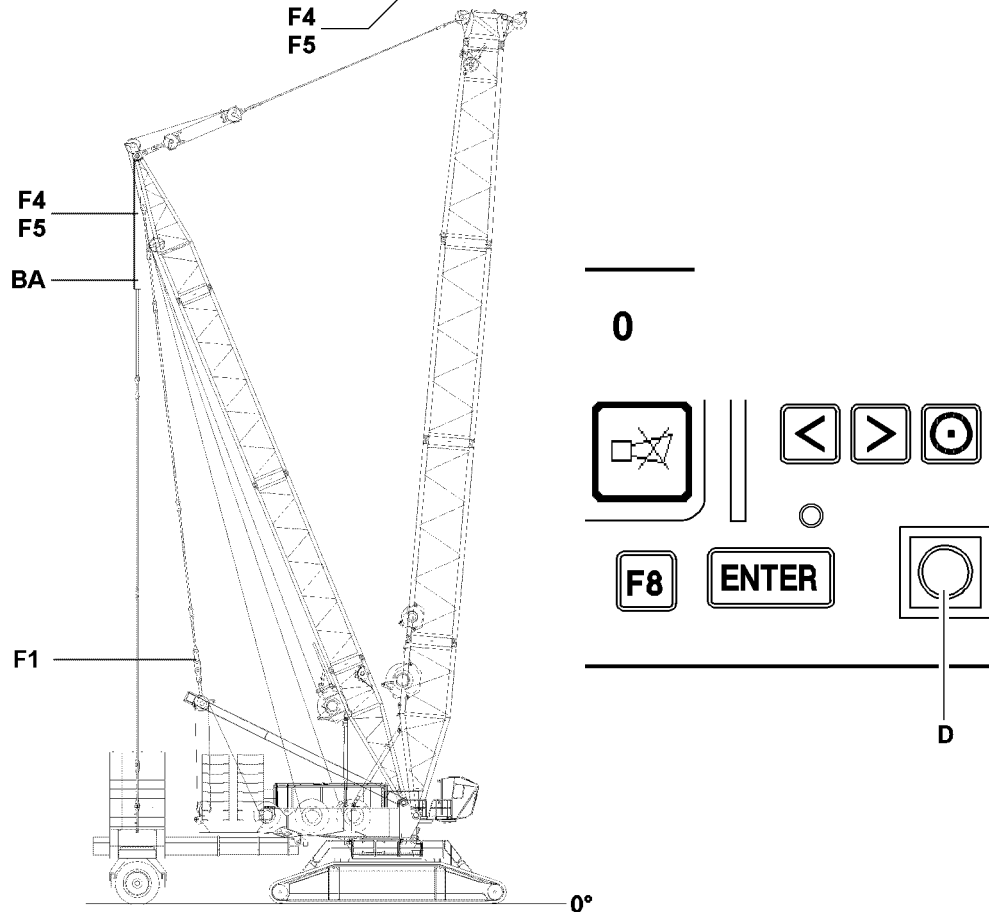
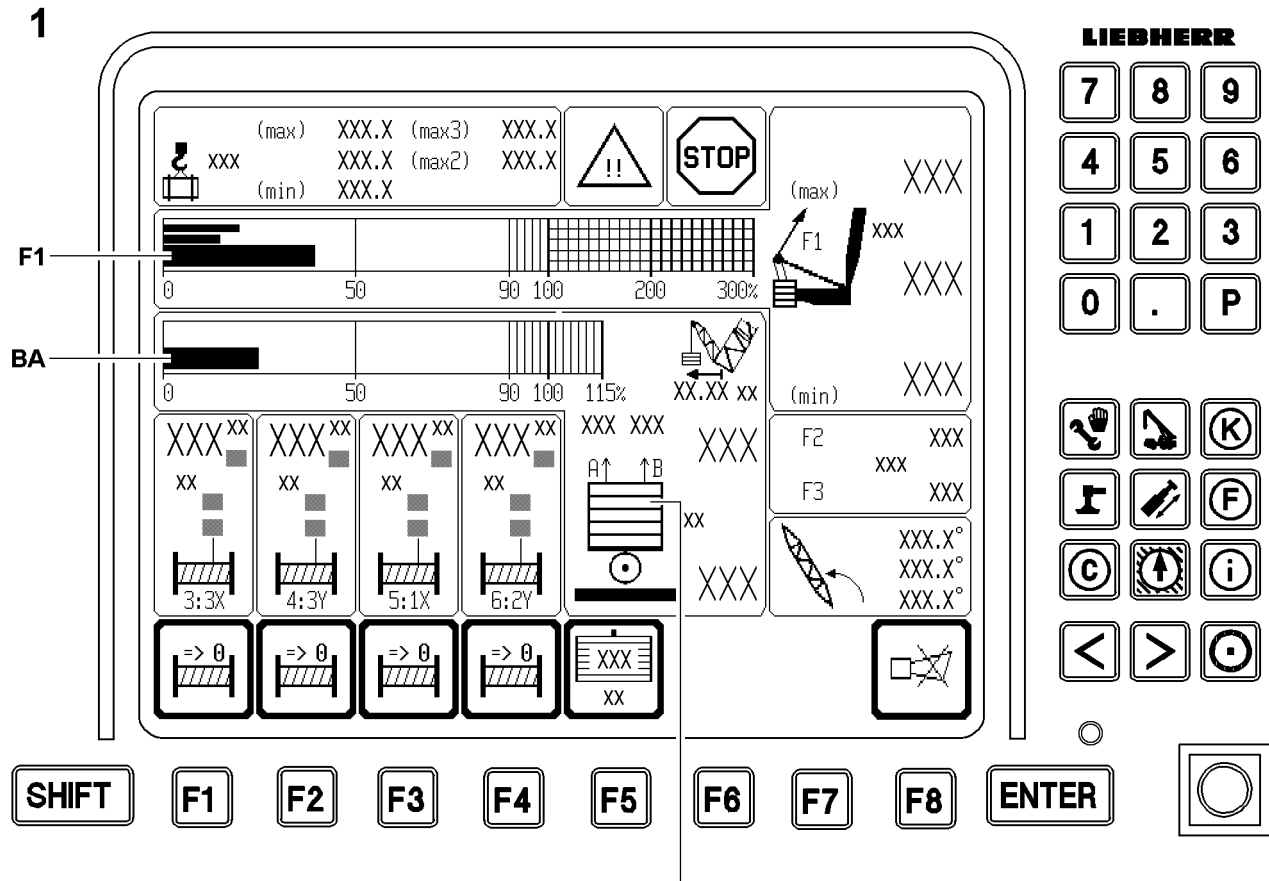


Fig.112904

LWE/LR 11350-007/19005-01-02/en

6.2 Safety instructions



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 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 accident 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 picking up 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 picking up 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!

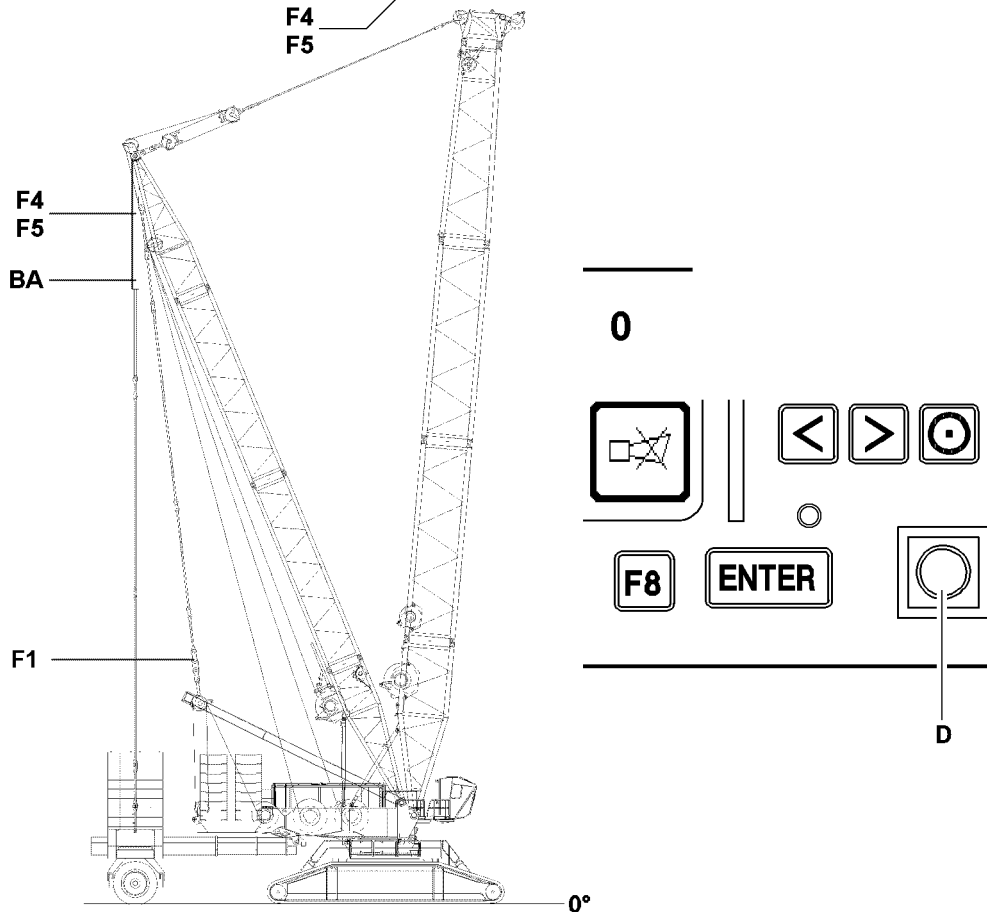
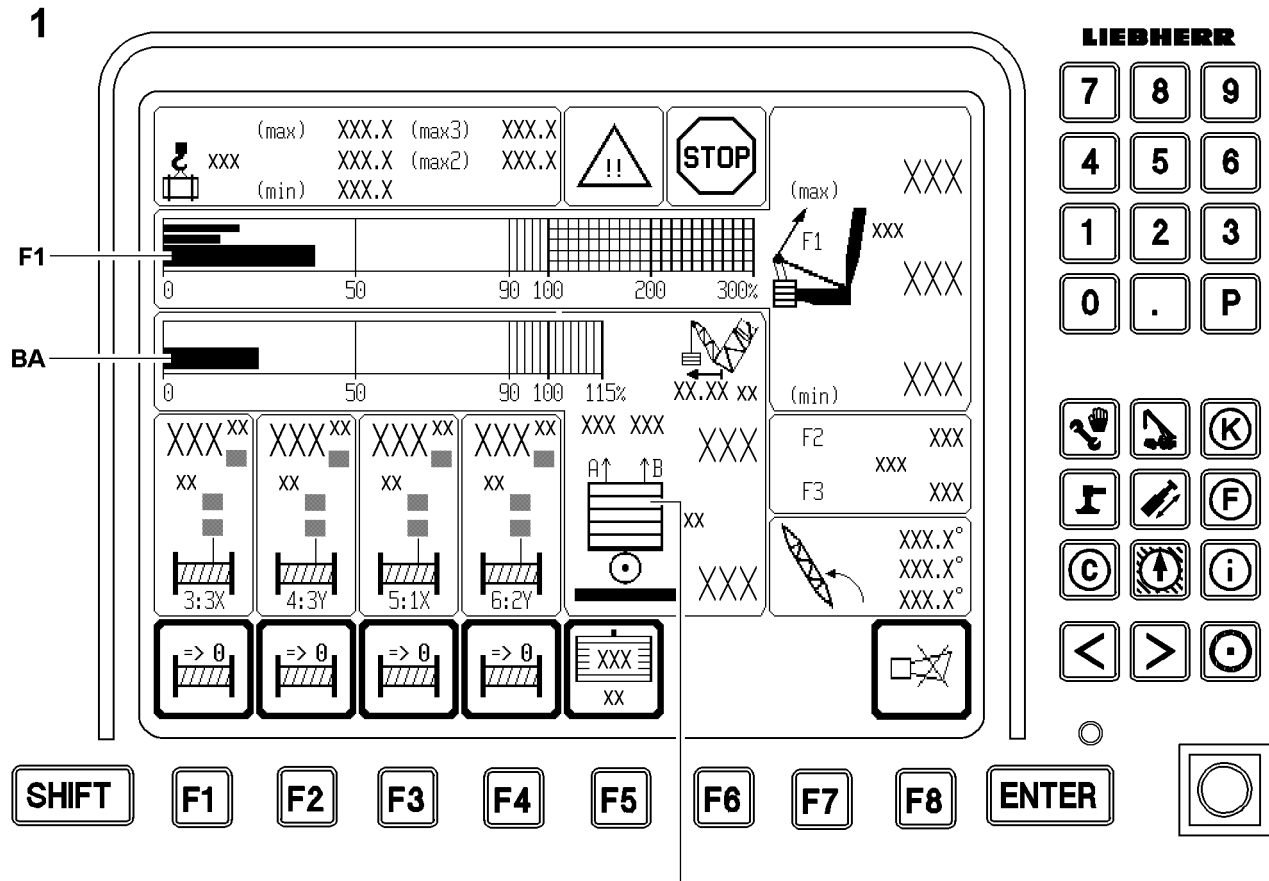


Fig.112904

LWE/LR 11350-007/19005-01-02/en

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 rods from the derrick head to the SA-frame (F1) and the derrick ballast (F4/5).



Note

► See chapter 4.02!

6.3.1 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 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 based on four pressure sensors, which are installed on the pull cylinders and shown in the LICCON as individual forces.

The pulled ballast is calculated from the forces of the individual guying, which means the part of the ballast pulled up by the guying. The remaining part is laying on the ground. The ballast utilization results from the pulled ballast and the placed ballast. This is shown on LICCON monitor 1 with a utilization bar (BA) in percent.

Pull cylinder on the block



DANGER

The crane can topple over!

By completely retracting one or both pull cylinders (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 extending one or two pull cylinder completely (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!

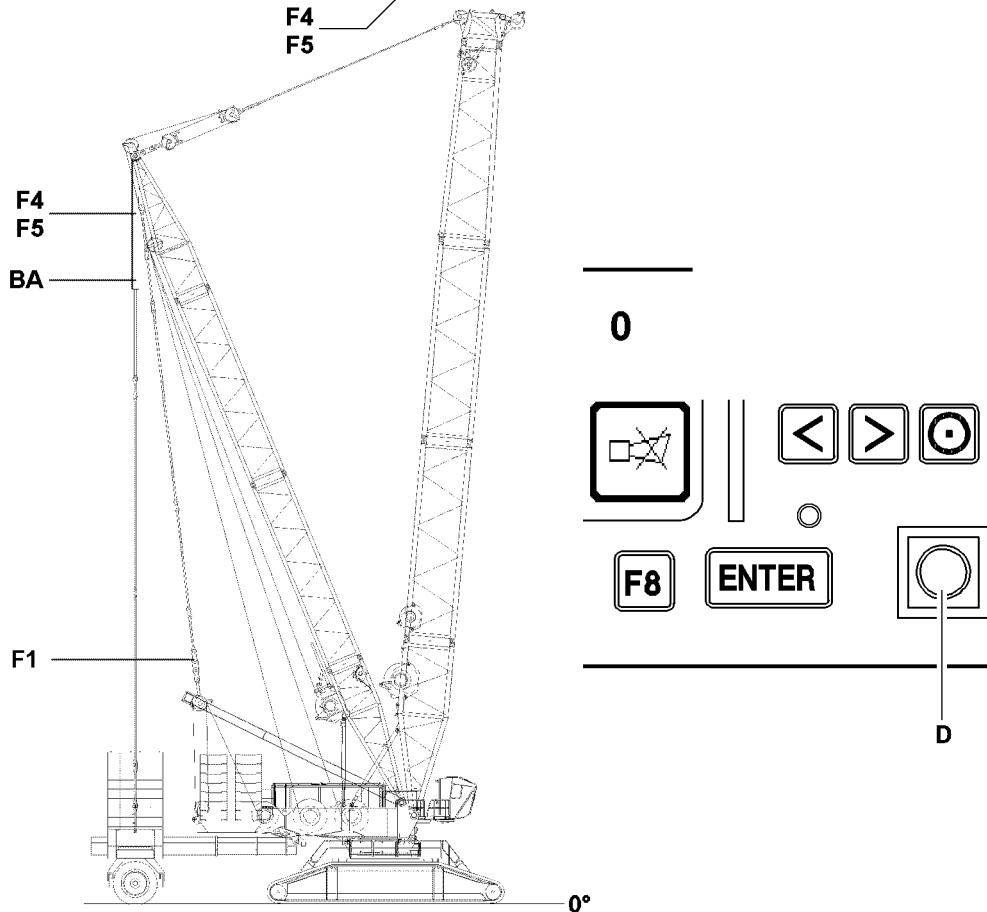
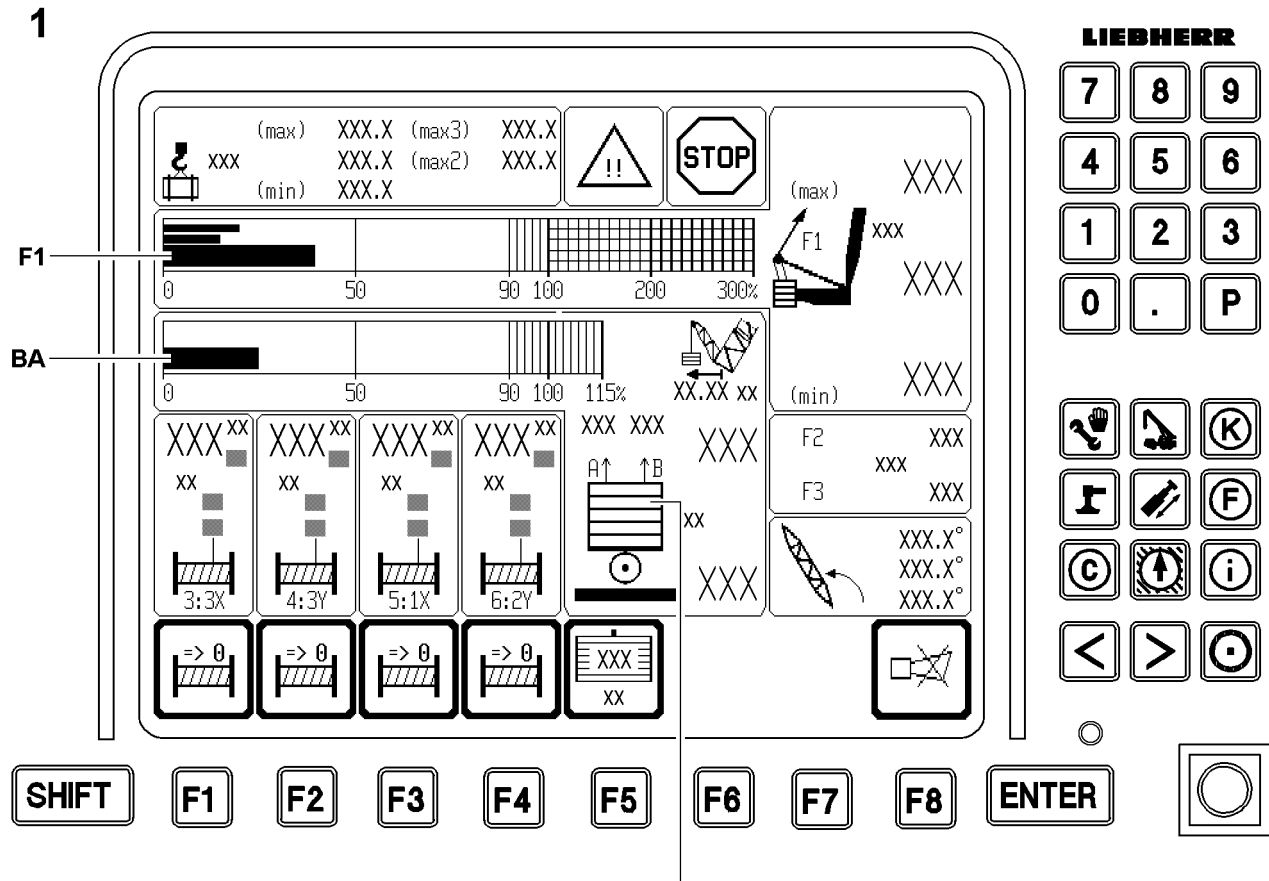


Fig.112904

LWE/LR 11350-007/19005-01-02/en

6.3.3 Monitoring of minimum force F1

If more than 50 percent of the set derrick ballast is being pulled (ballast utilization bar > 50 percent) and the minimum force $F1_{\min}$ (test point 1) is fallen below, all crane movements that **increase load torque** are turned off.



DANGER

Danger of accident!

It is prohibited to fall below the minimum force $F1_{\min}$ (test point 1) if more than 50 % of the derrick ballast is pulled. If this is not observed, in case of slack guying from test point 1 (F1) and **derrick ballast on the ground**, the derrick ballast can suddenly lift off the ground due to the increased load moment and the boom system can suddenly move forward! This causes the load to swing back and forth too much, which could damage the boom and the crane!

▶ Do not fall below the minimum force - $F1_{\min}$!

If more than 90 % of the set derrick ballast is being pulled (ballast utilization bar greater than 90 %) and the force drops below the minimum value $F1_{\min}$ (test point 1) fall below, all crane **movements that increase the load moment** and all **crane movements that decrease the load moment** are turned off. This also turns off the „spooling out“ movement of the winch.



DANGER

Danger of accident!

It is prohibited to fall below the minimum force $F1_{\min}$ (test point 1) if more than 90 % of the derrick ballast is pulled. If this is not observed and the load torque is decreased when the guying is slack in 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 move backwards! As a result, the relapse cylinders can be pressed on the block and be overloaded. There is the danger that the relapse cylinders on the boom and D-boom will be 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 pressing the set up key **D**, the test point 1 - minimum force ($F1_{\min}$) is reduced by several tons, this permits reversing the movement and retreating 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 moment increasing movement may be continued with the set up key **D**!



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 accident!

Personnel can be severely injured or killed!

▶ The crane driver bears the complete and sole responsibility when bypassing the LICCON overload protection!

After a shut-off via $F1_{\min}$, the force F1 on test point 1 must be increased by a movement. If the derrick ballast is suspended, this can be achieved by setting down the ballast.

If the set up key **D** is already pressed and the F1 force continues to drop below the minimum force $F1_{\min}$ which was reduced by the set up key **D**, the $F1_{\min}$ shut-off can no longer be passed.

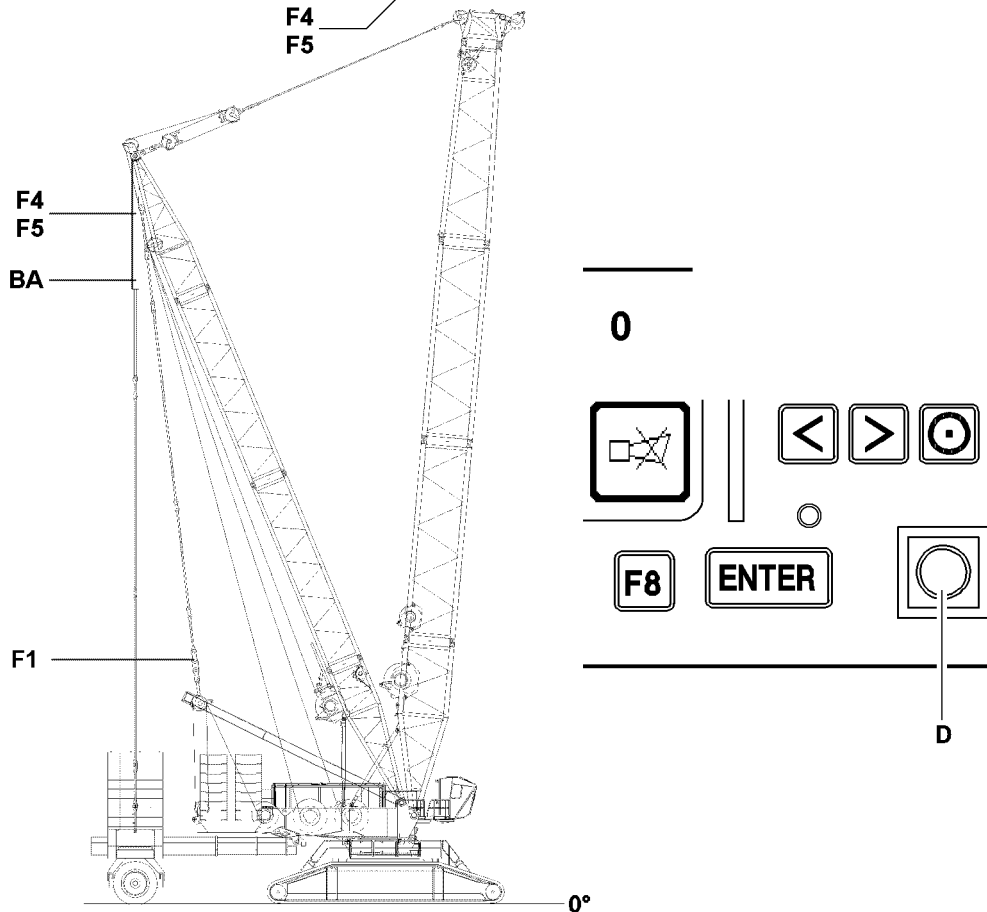
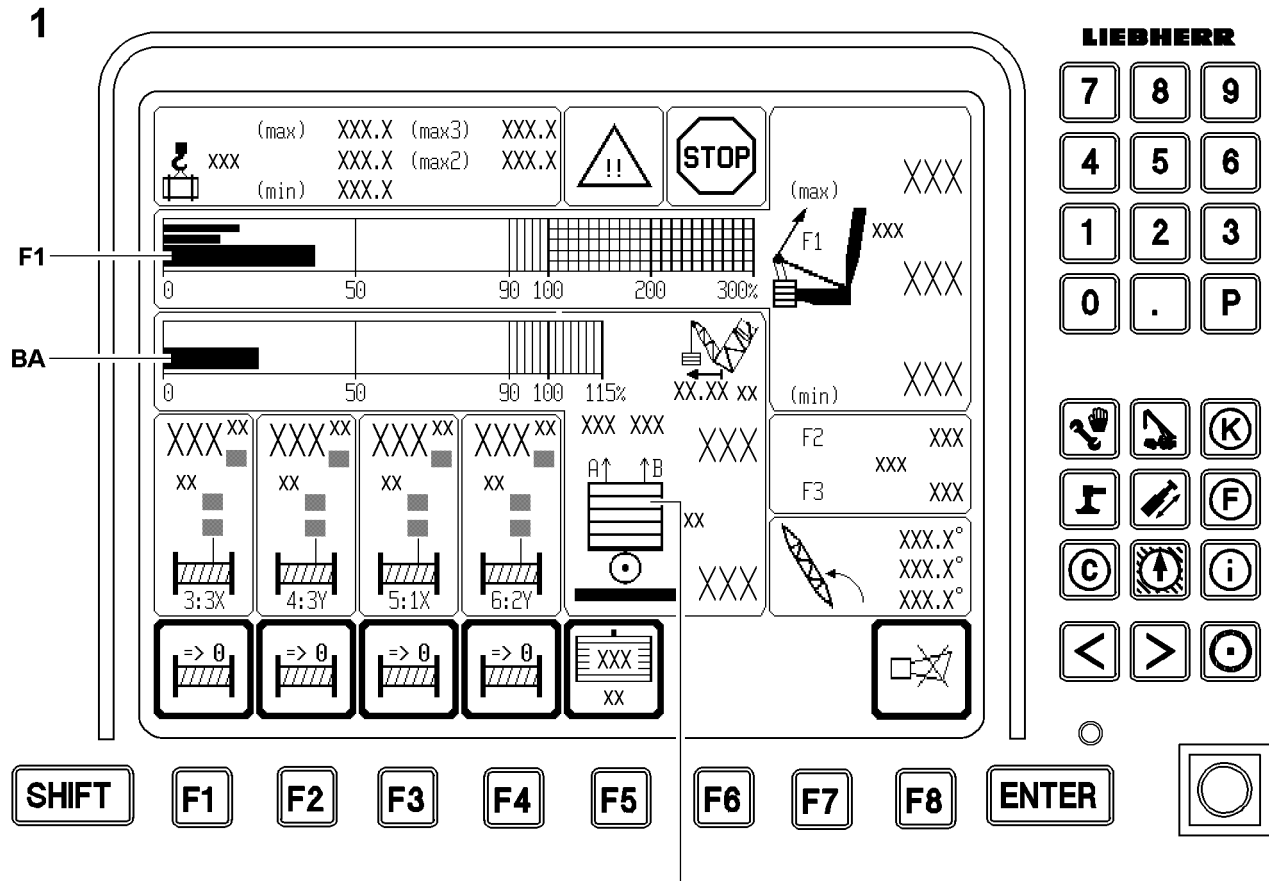


Fig.112904

LWE/LR 11350-007/19005-01-02/en

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 displayed on LICCON monitor 0. The current utilization of the crane results from the load utilization bar (1) on LICCON monitor 0.

If the load utilization bar reaches 90 %, an advance warning is given in the form of a „notice icon“ and a „SHORT HORN“ on LICCON monitor 0.

At 100 % on the load utilization bar, the shut-off of all load moment increasing movements occurs with the „stop icon“ and the acoustical warning „HORN“ 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 displayed on LICCON monitor 1. When $F1$ is greater than $F1_{\max\text{-shut-off value}}$, a shut-off of all movements that could increase load torque occurs with the stop icon and the acoustic warning „HORN“ by LICCON monitor 1.



Note

- ▶ The maximum load can be safely monitored by the „LICCON overload protection“ itself!
- ▶ The „ $F1_{\max}$ -monitoring“ is an additional monitoring function which 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 „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. To ensure that the maximum load can always be lifted, 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: $F1_{\max\text{-operation shut-off value}} = F1_{\max\text{-operation}} + F1_{\text{addition for shut off}}$ (see chapter 4.02). The $F1_{\text{addition for shut-off}}$ is selected such that $F1_{\max\text{-operation shut-off}}$ should normally never happen. This shut-off provides an additional safety, particularly in cases with „max-load“ smaller „max3-load“. For example, if the load weighing is far too low due to a sensor failure, then a load would be pulled which would be greater than the maximum permissible load without shut off of the LICCON overload protection. The crane could be overloaded. In this particular case, with the „max-load“ smaller than the „max3-load“, 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!

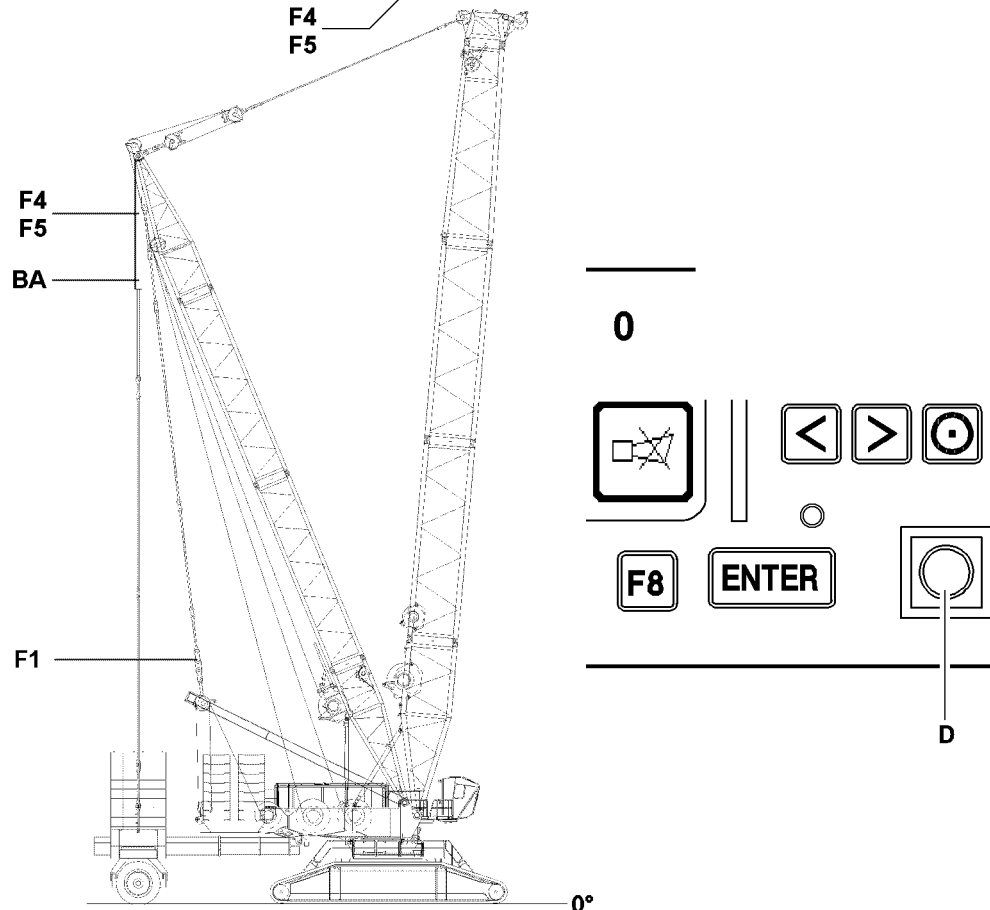
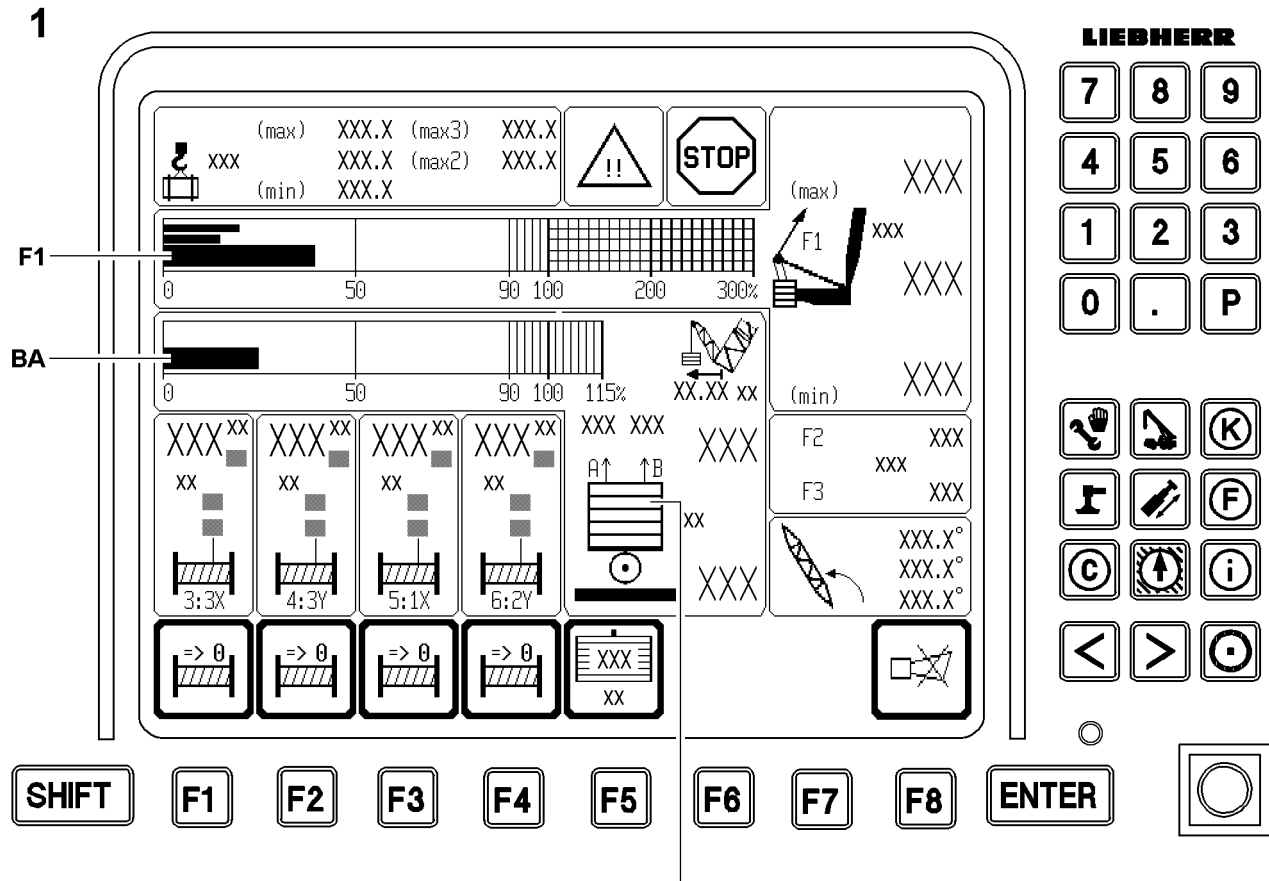


Fig.112904

LWE/LR 11350-007/19005-01-02/en

**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**

Danger of accident!

- ▶ Measuring point 1-Operation-Maximum force not only depends on the set up 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!

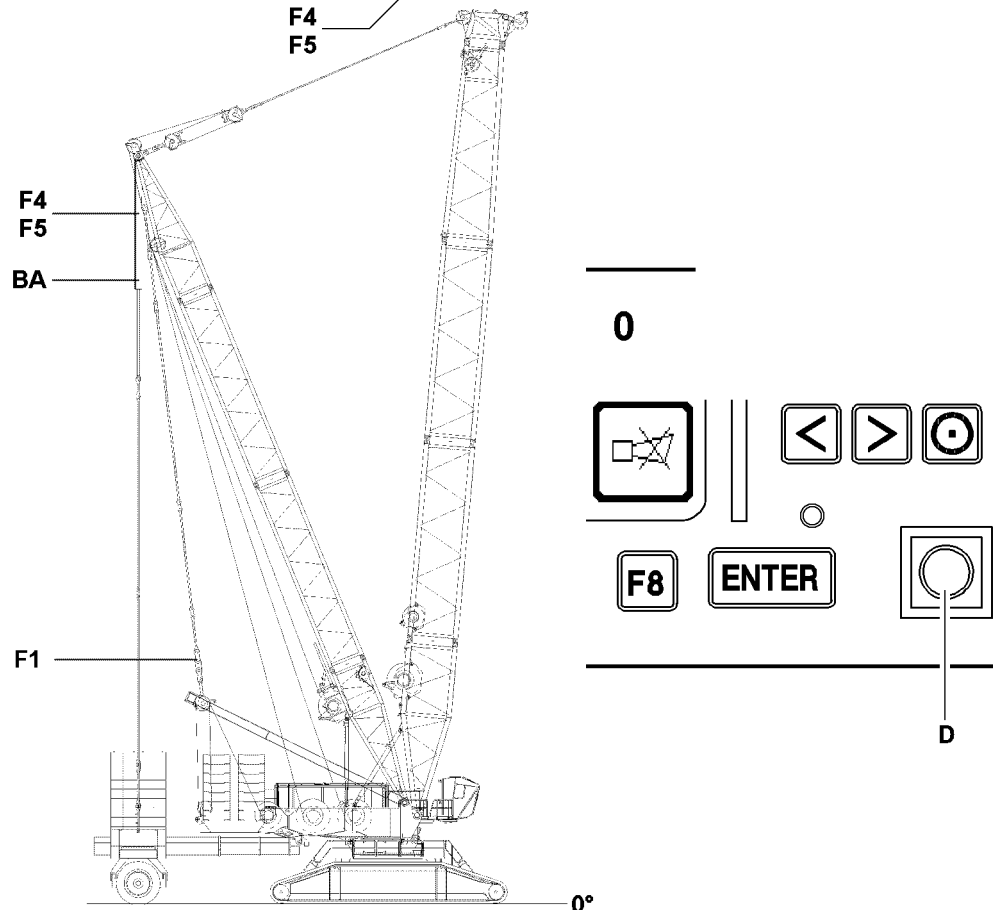
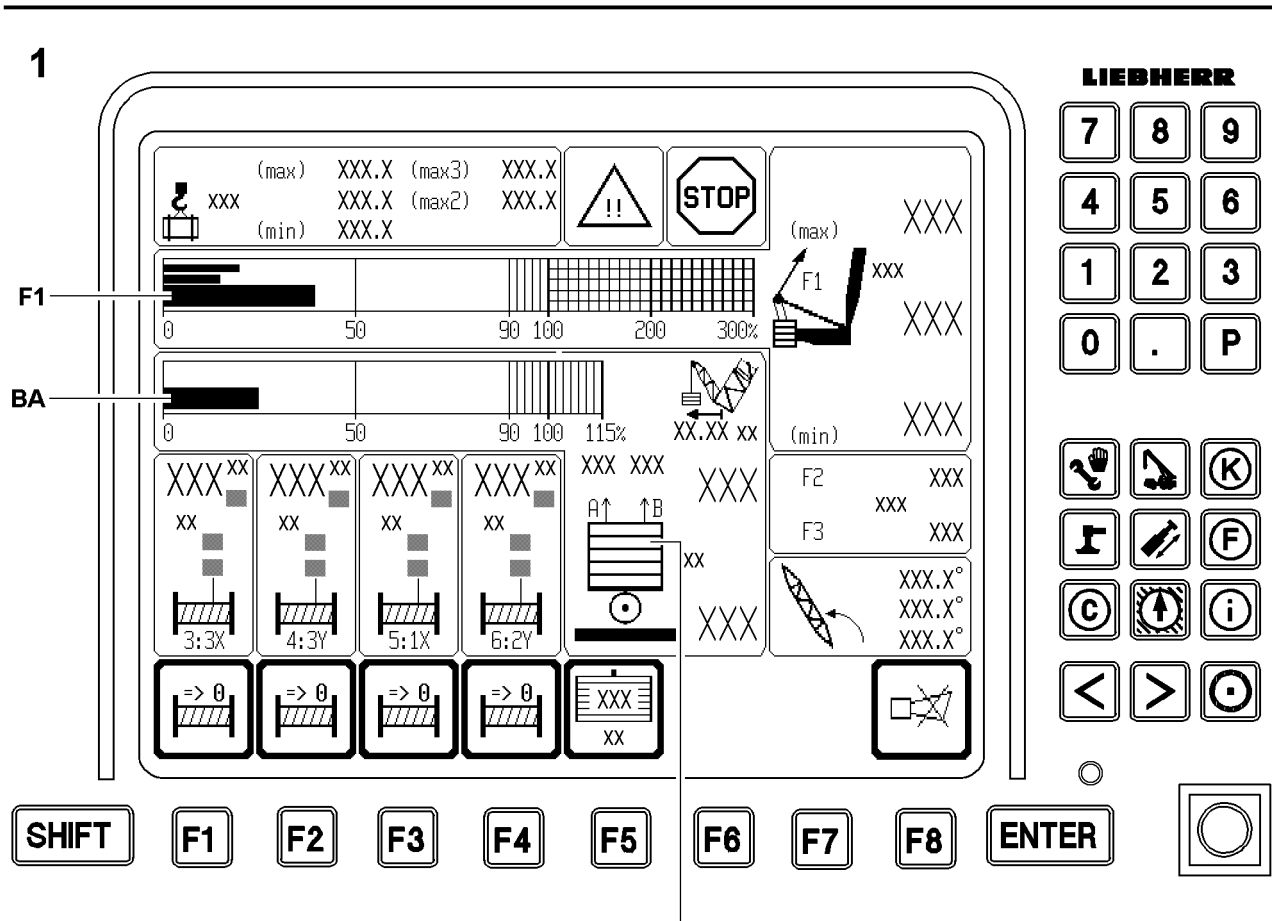


Fig.112904

LWE/LR 11350-007/19005-01-02/en

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:

- The „maximum load capacity in the current operating condition („**max-load**““ is obtained, 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 than 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 of the current crane equipment („**max2 load**““ is reached when the „utilization bar of the crane“ **1** is at 100 percent **and** the „derrick ballast utilization bar display“ **BA** is greater than or equal to 100 percent (the current derrick ballast is completely lifted off the ground), and the derrick ballast input value and the ballast weighing are correct.
This is the case when the „current load“ and the „max2-load“ reach 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 of the current set up configuration with optimum derrick ballast“ („**max3-load**““ is obtained when the „crane utilization bar“ **1** is at 100 % **and** the „derrick ballast utilization bar display“ **BA** is at 100 % (the optimal derrick ballast is placed and completely lifted off the ground), and the derrick ballast input value and the ballast weighing are correct.
This is the case when the „current load“ and the „max3-load“ reach 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 capacity 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“.

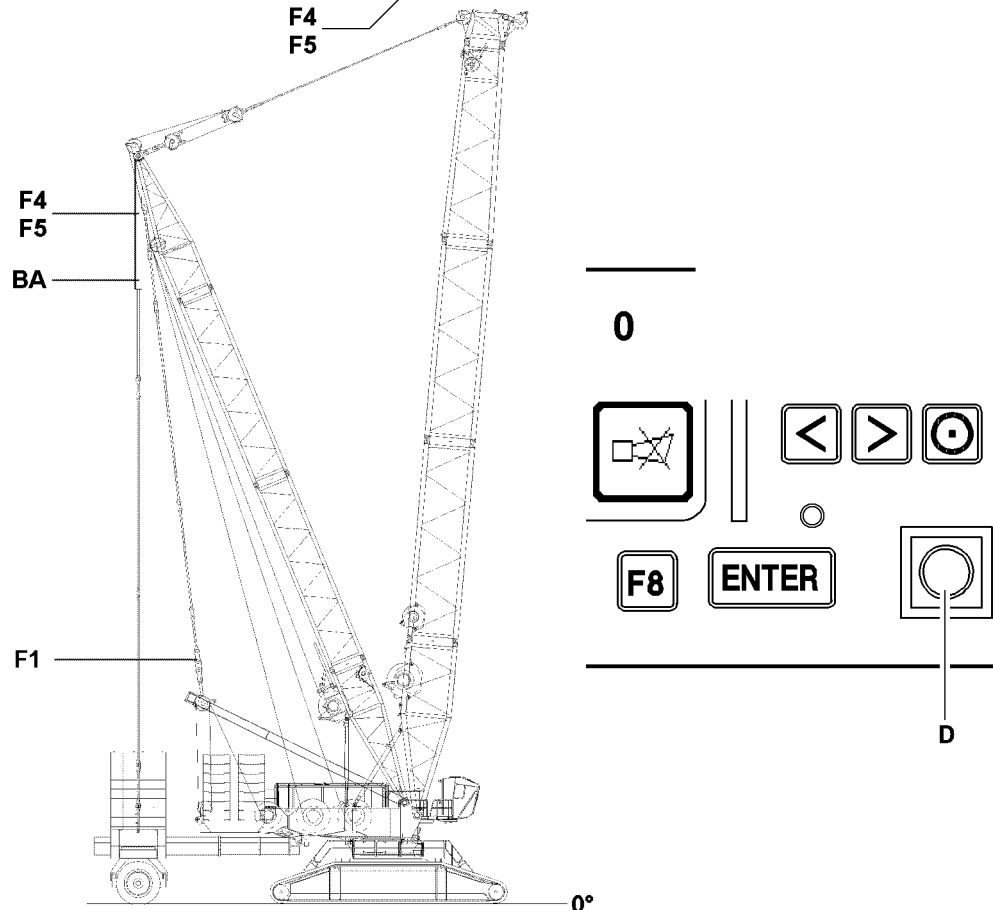
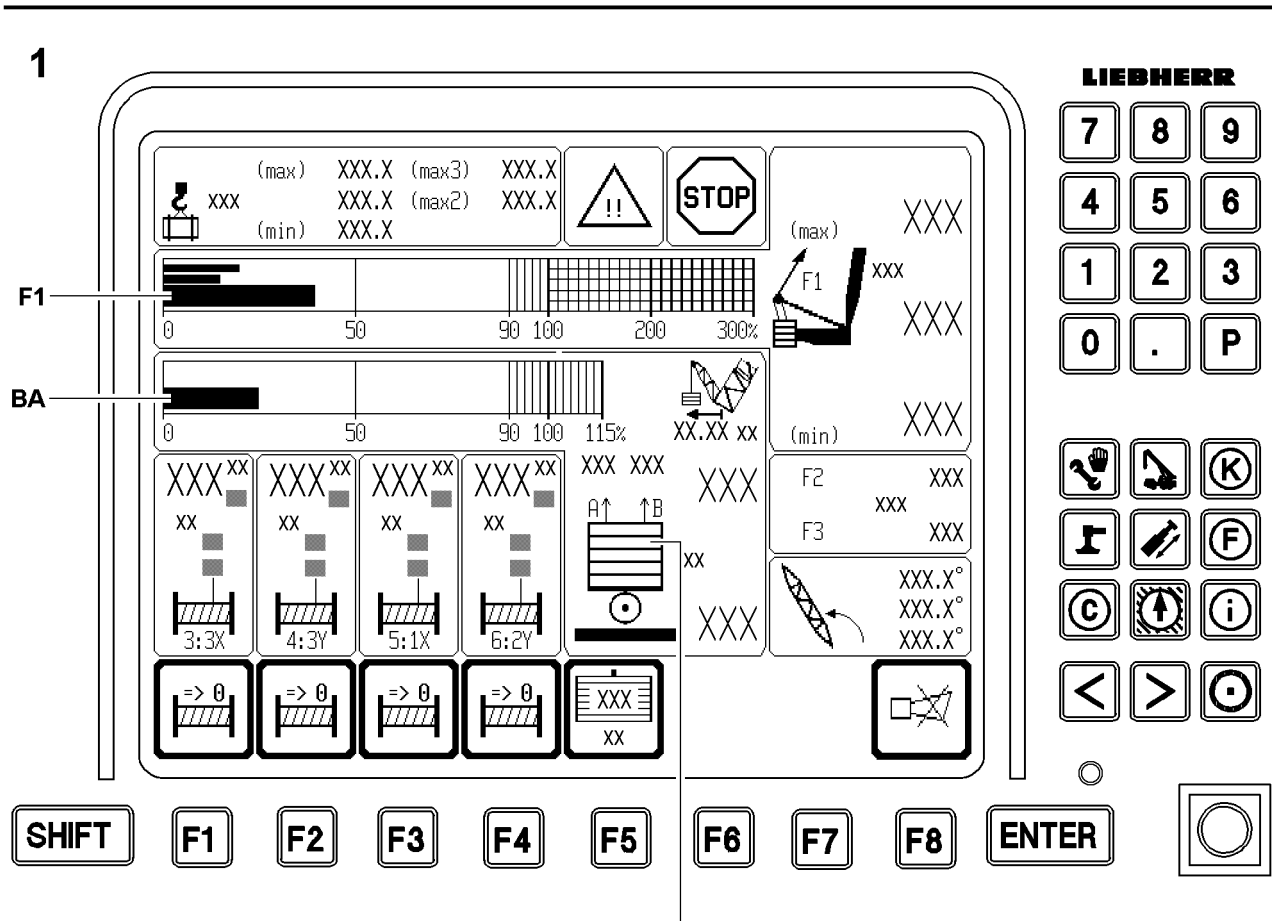


Fig.112904

LWE/LR 11350-007/19005-01-02/en

**Note**

- ▶ The maximum permissible load momentum can be exceeded with the set up key **D** on LICCON monitor 0, see chapter 4.20.
- ▶ $F1_{\text{max-assembly}}$ (Assembly max. force in test point 1) cannot be bypassed.

**WARNING**

Assembly with turned on set up key!

When the set up key **D** 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 severely injured or killed!

This could result in significant property damage!

- ▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
- ▶ When the set up key **D** is turned on, only load moment reducing crane movements may be carried out until a permissible operating and load range!
- ▶ Press the set up key **D** only when the set up configuration was correctly entered in the LICCON computer system!
- ▶ The set up key **D** must be turned off immediately after reaching the permissible load range!
- ▶ The crane operator carries complete and sole responsibility for his actions if the LICCON overload protection is exceeded!
- ▶ Crane operation with the set up key **D** turned on is strictly prohibited!

**Note**

- ▶ The „Lift derrick ballast“ or „Lower derrick ballast“ movement requires utmost attention by the crane operator!

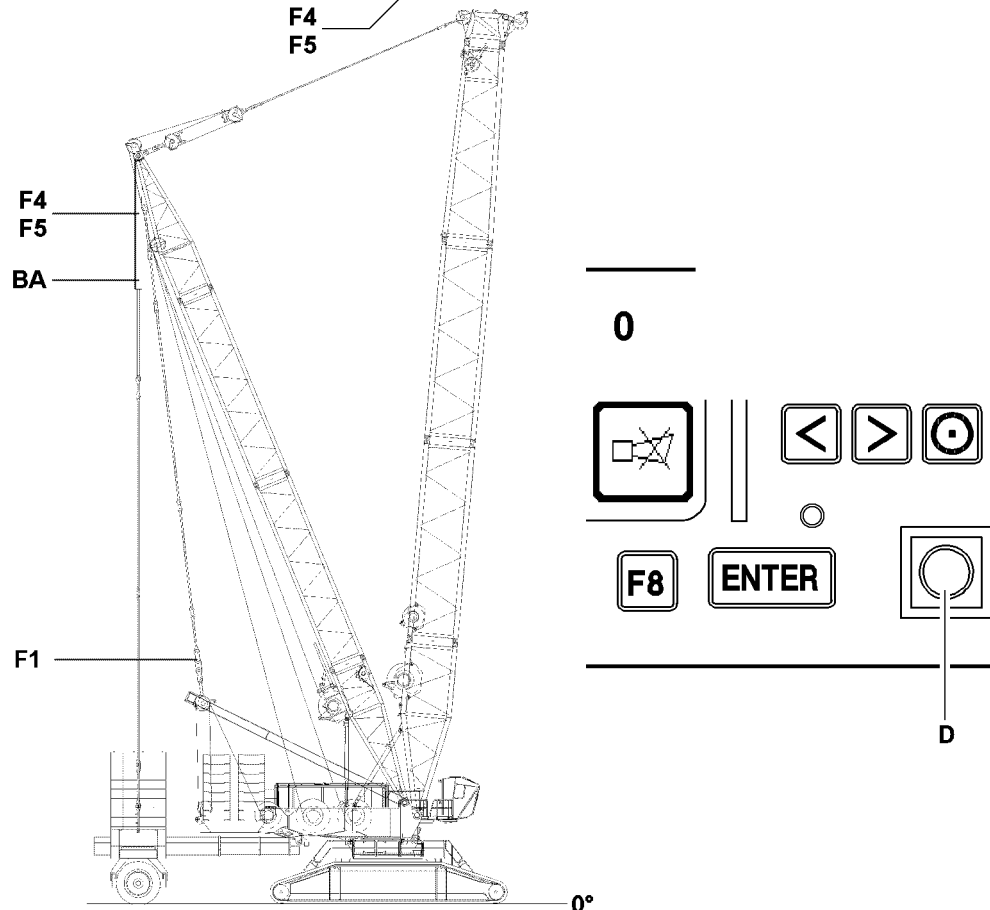
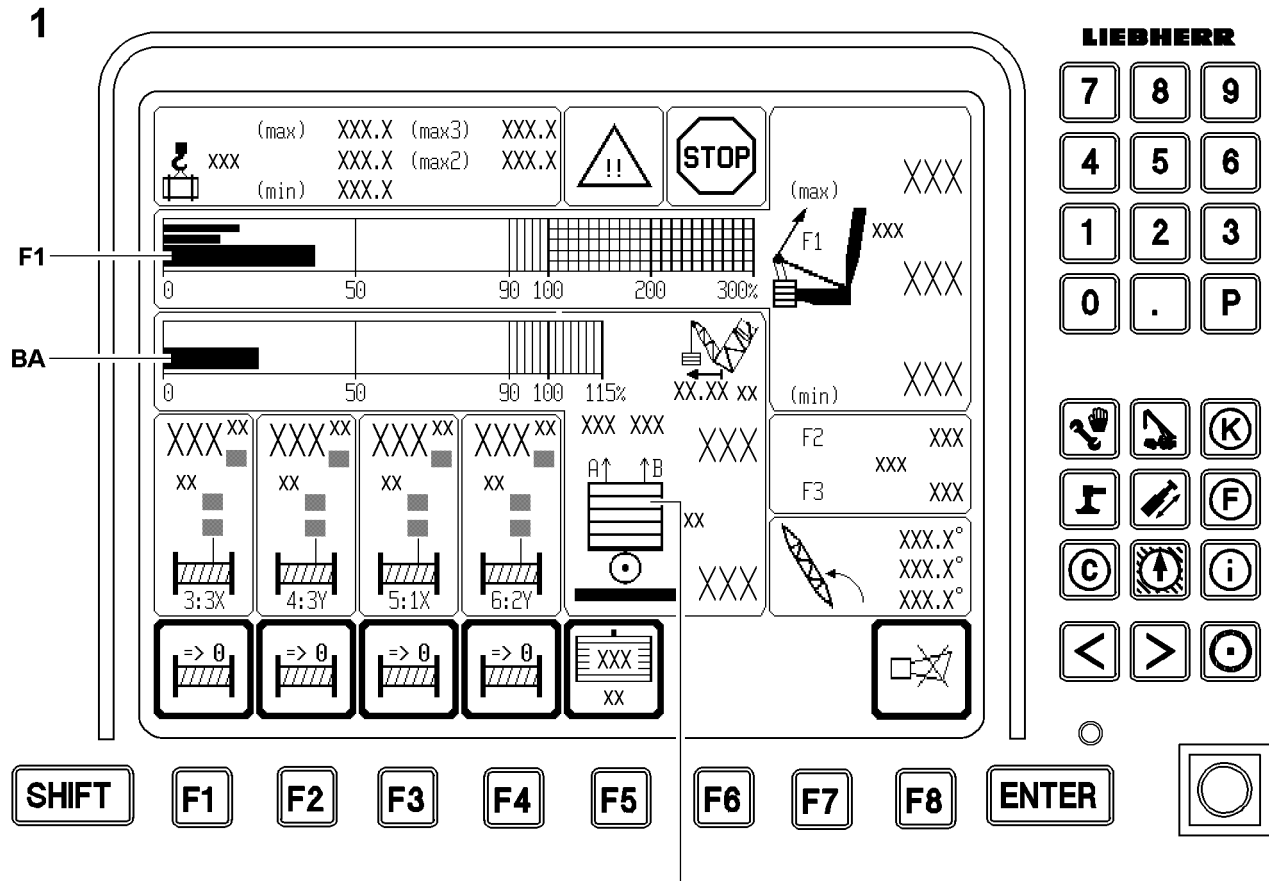


Fig.112904

LWE/LR 11350-007/19005-01-02/en

6.5 Checking the length sensor values 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 driver 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 driver may not rely blindly on the derrick ballast radius measurement, but he must think for himself and check, if the measurement is still working correctly.



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 accident!
-

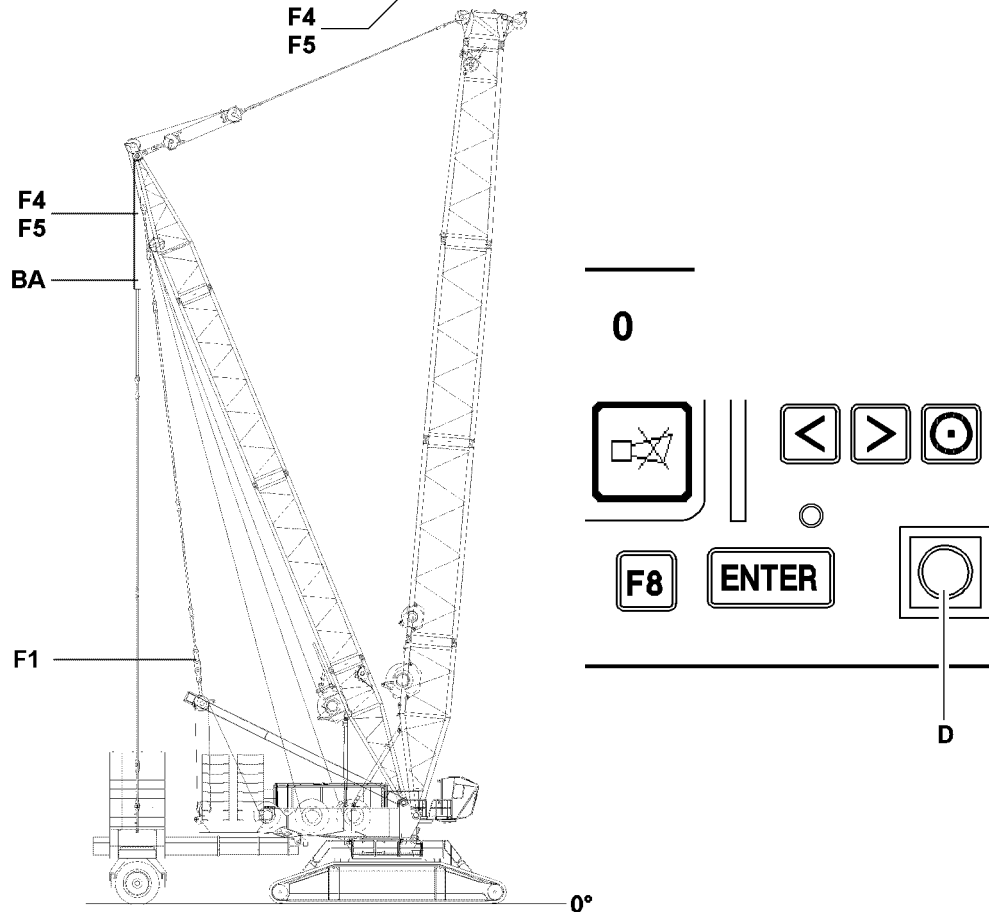
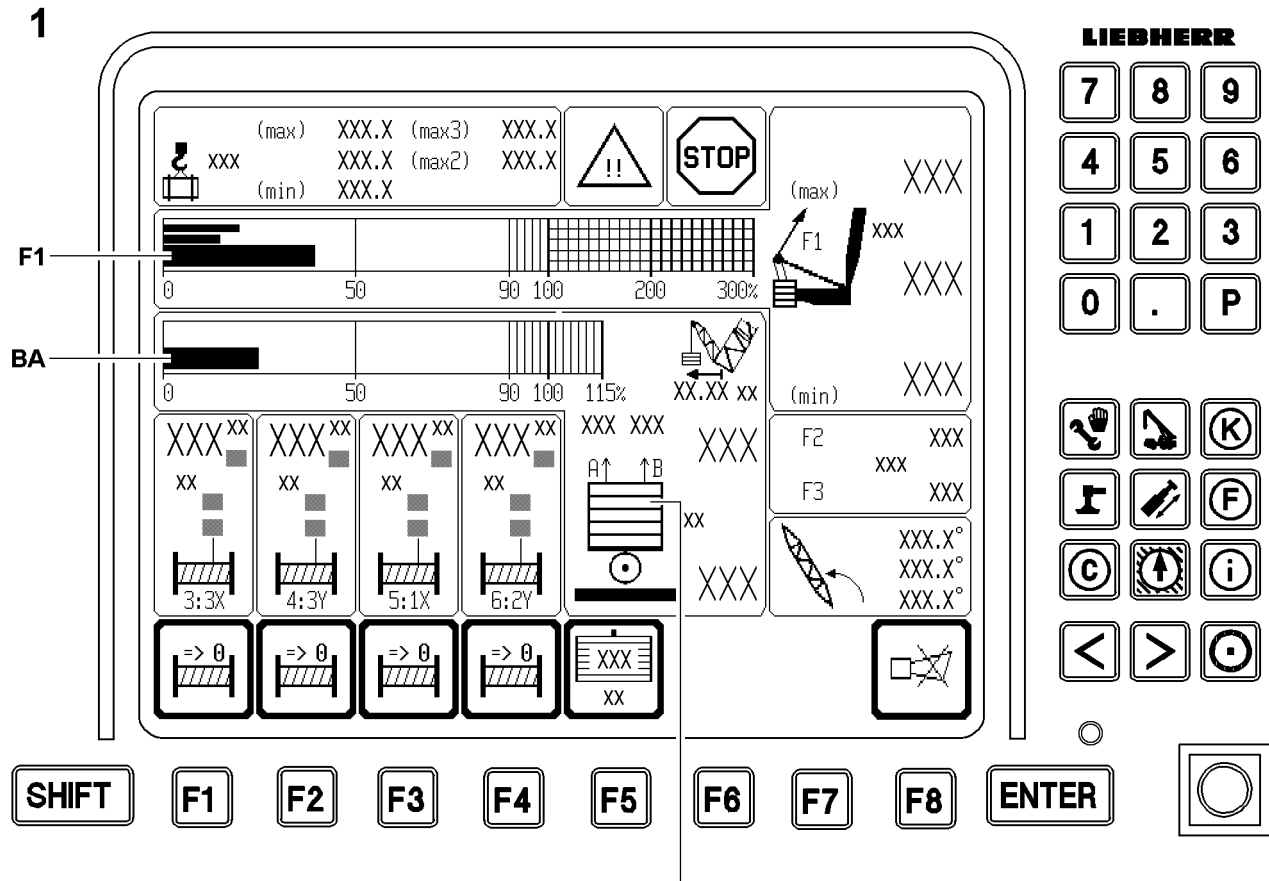


Fig.112904

LWE/LR 11350-007/19005-01-02/en

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 is monitored on LICCON monitor 1.



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 guying A and B are shown and compared on LICCON monitor 1. If the difference exceeds a permissible value, an acoustic warning is issued and the two force values blink. However **none of the movements are shut off**.

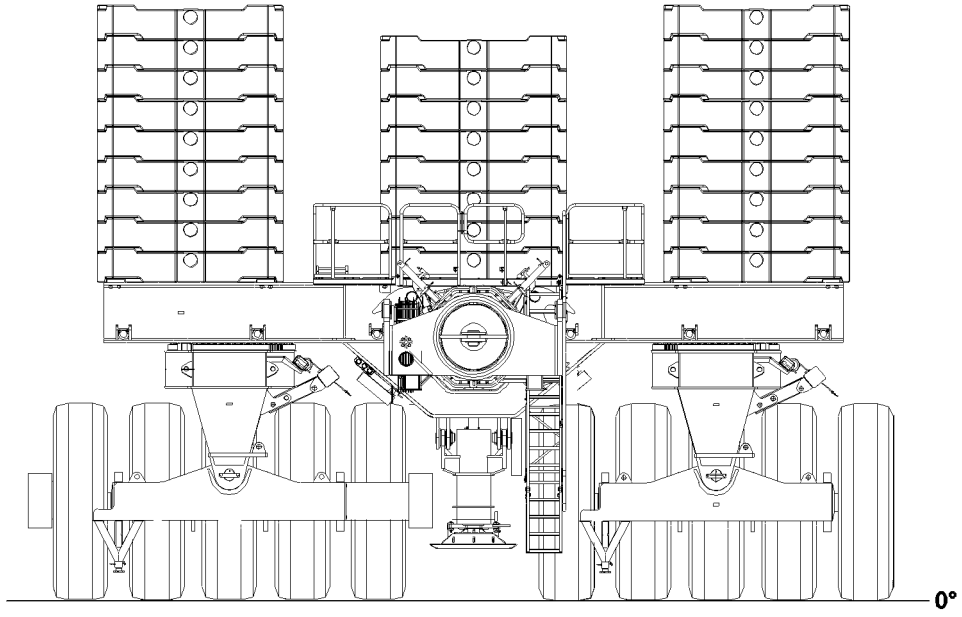
If the difference of the forces of the derrick ballast guying A and B exceeds the specified limit value, then this can have various causes:

- Picking up 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.

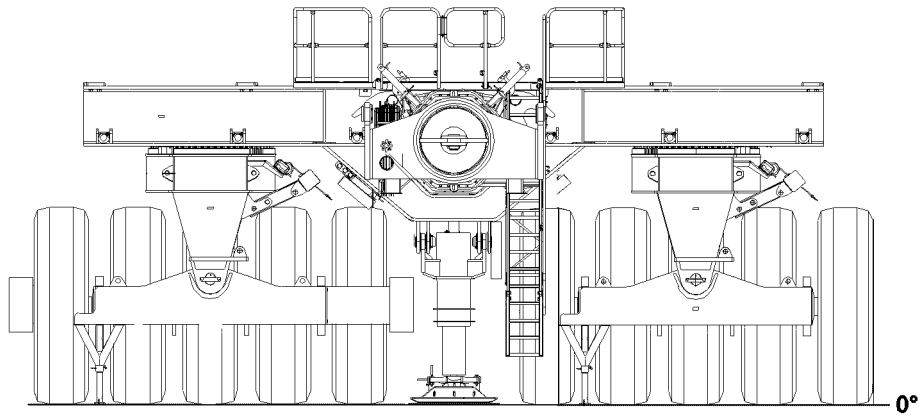
The crane driver must recognize the correct cause and take countermeasures:

- 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 „Lift derrick ballast“ or „Lower derrick ballast“ 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 the sensor values are implausible: Check whether the ballast weighing pressure sensors or inputs are faulty. If necessary, detach the sensor or replace the CPU.

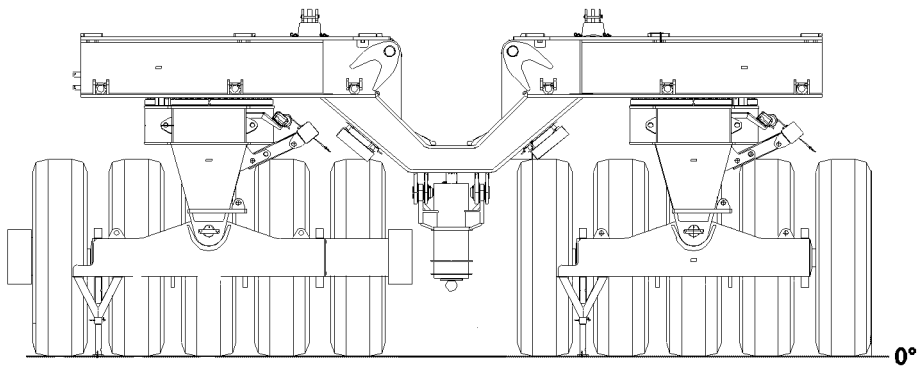
1



2



3



4

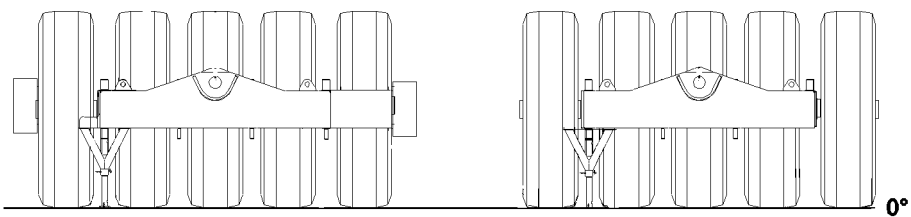


Fig.107174

LWE/LR 11350-007/19005-01-02/en

7 Disassembling



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- ▶ For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.



WARNING

The components can fall down!

If the components are not pinned and secured correctly, then they can fall down.

Death, severe bodily injuries, property damage.

- ▶ Insert or unpin both pins on the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the components or within the entire danger zone during the pinning and unpinning procedure of the ballast trailer.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.
- ▶ It is prohibited to lean the ladder against the component being disassembled.



WARNING

Danger of impact / crushing!

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

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

Death, severe bodily injuries, property damage.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ Make sure that the crane is horizontally aligned.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

Make sure that the following prerequisites are met:

- The placement surface for the derrick ballast must be level, horizontal and of sufficient load bearing capacity.
- The hydraulic, telescopeable guide on the ballast trailer is telescoped in all the way.
- The derrick radius and the ballast radius are identical.
- An auxiliary crane and a 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 differential forces in the D-guying on the LICCON monitor!
- ▶ 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!

If the ballast trailer is unpinned 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 the 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**

- Take 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.

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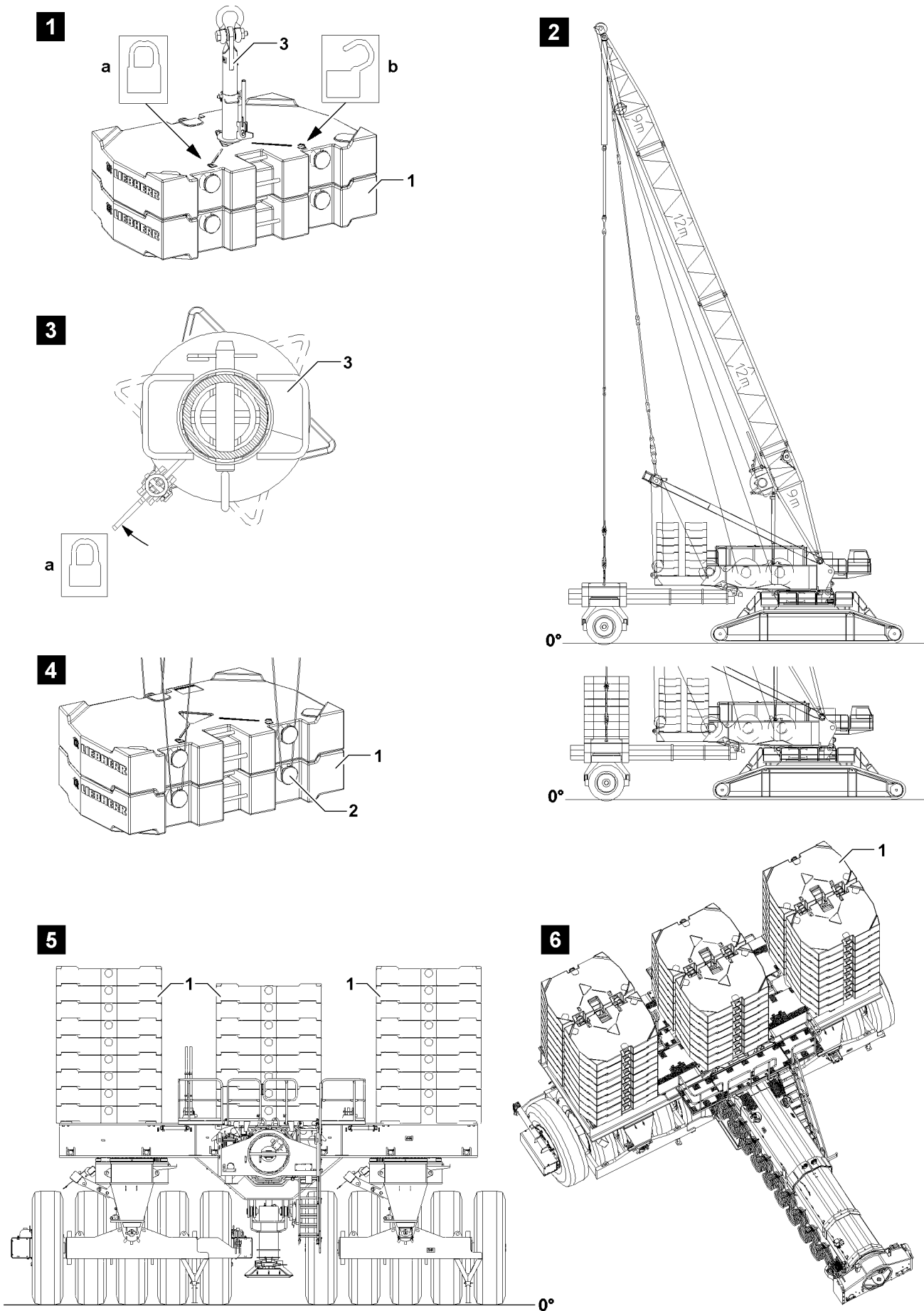


Fig.109594

LWE/LR 11350-007/19005-01-02/en

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, telescopic guide on the ballast trailer is telescoped in all the way.



DANGER

Danger of accident!

If more than the specified loads are lifted with the receptacle stud **3** or the ropes via the bits **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 retract / extend!

Make sure that the following prerequisite is met for lifting with the receptacle stud **3**:

- The receptacle stud **3** must be in position **a**: The „receptacle stud **3** must be 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.

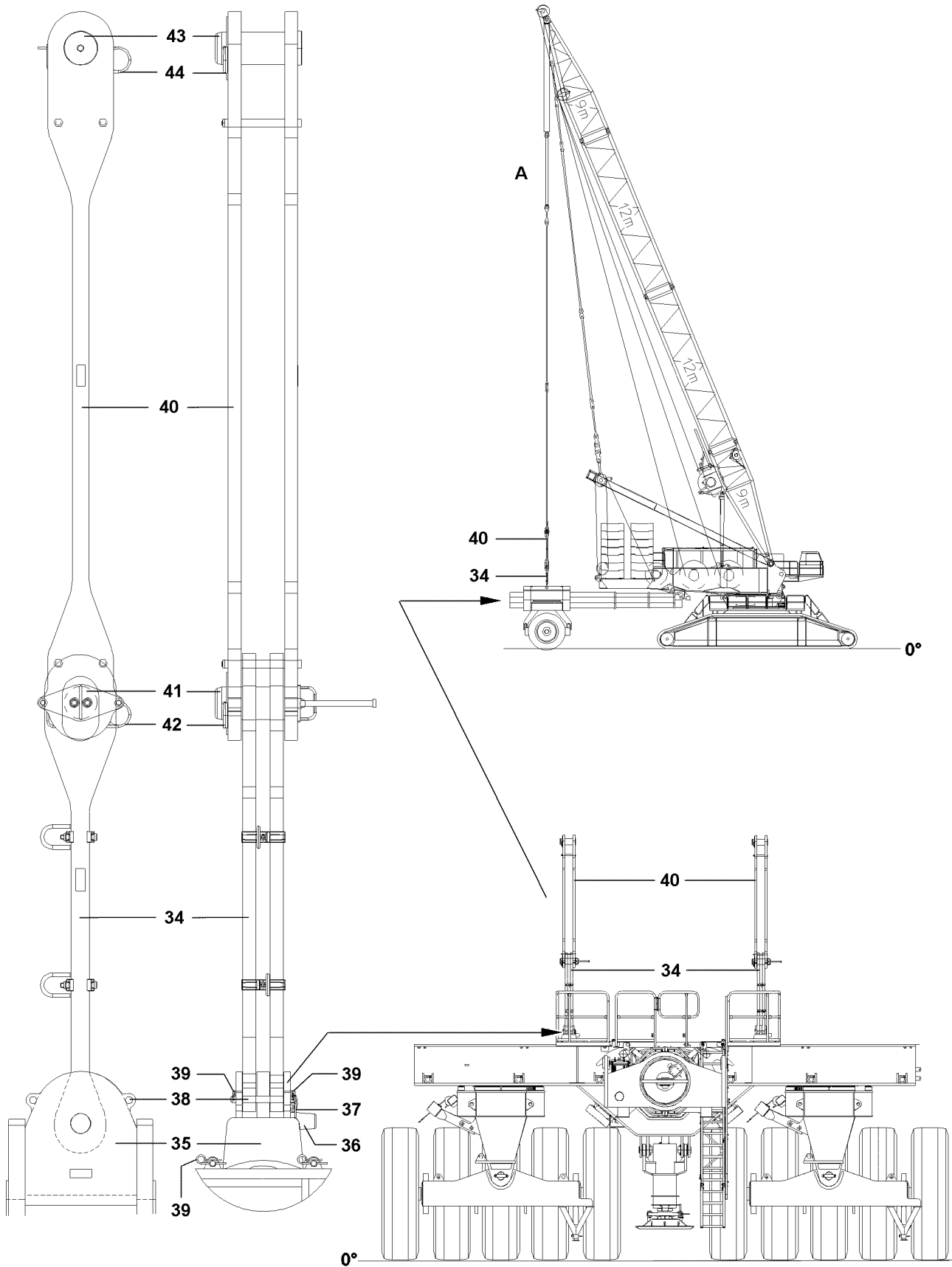


Fig.103786

LWE/LR 11350-007/19005-01-02/en

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 rods hang vertically.
- An auxiliary crane is attached to the guy rod **34**.
- The guy rods are relieved by extending the cylinders.
- The hydraulic, telescopic guide on the ballast trailer is telescoped in all the way.



DANGER

Danger of accident due to oscillation of the D-guy rods!

The D-guy rods must hang vertically before disassembly!

- ▶ 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** that 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**.

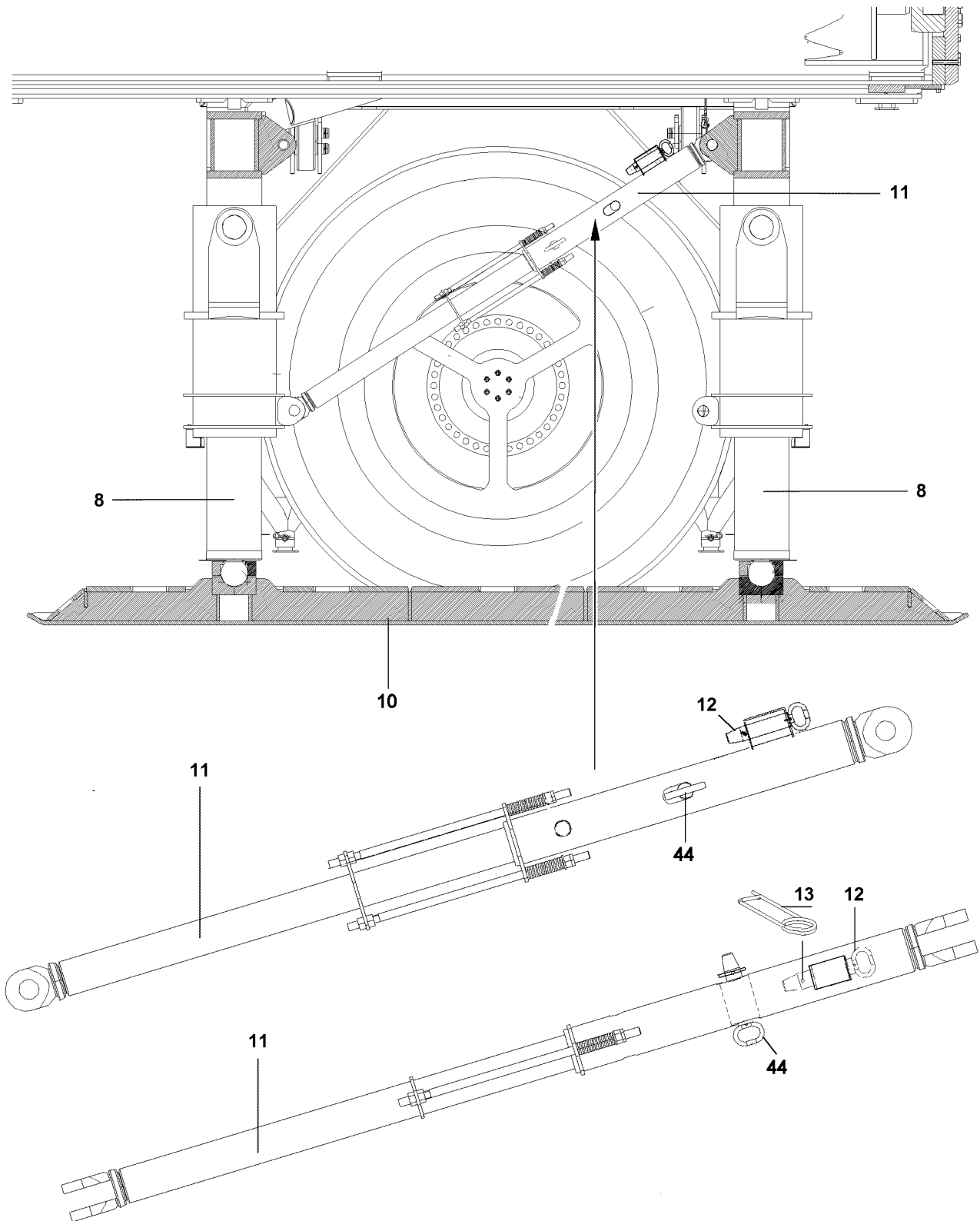


Fig.106860

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 are disassembled.
 - The crane is horizontally aligned.
 - 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 retract into the receptacle of the support plate **10**.



Note

▶ For assembling the support plates, see section „Assembly of support plate“!

▶ Visually inspect the extended support cylinder.

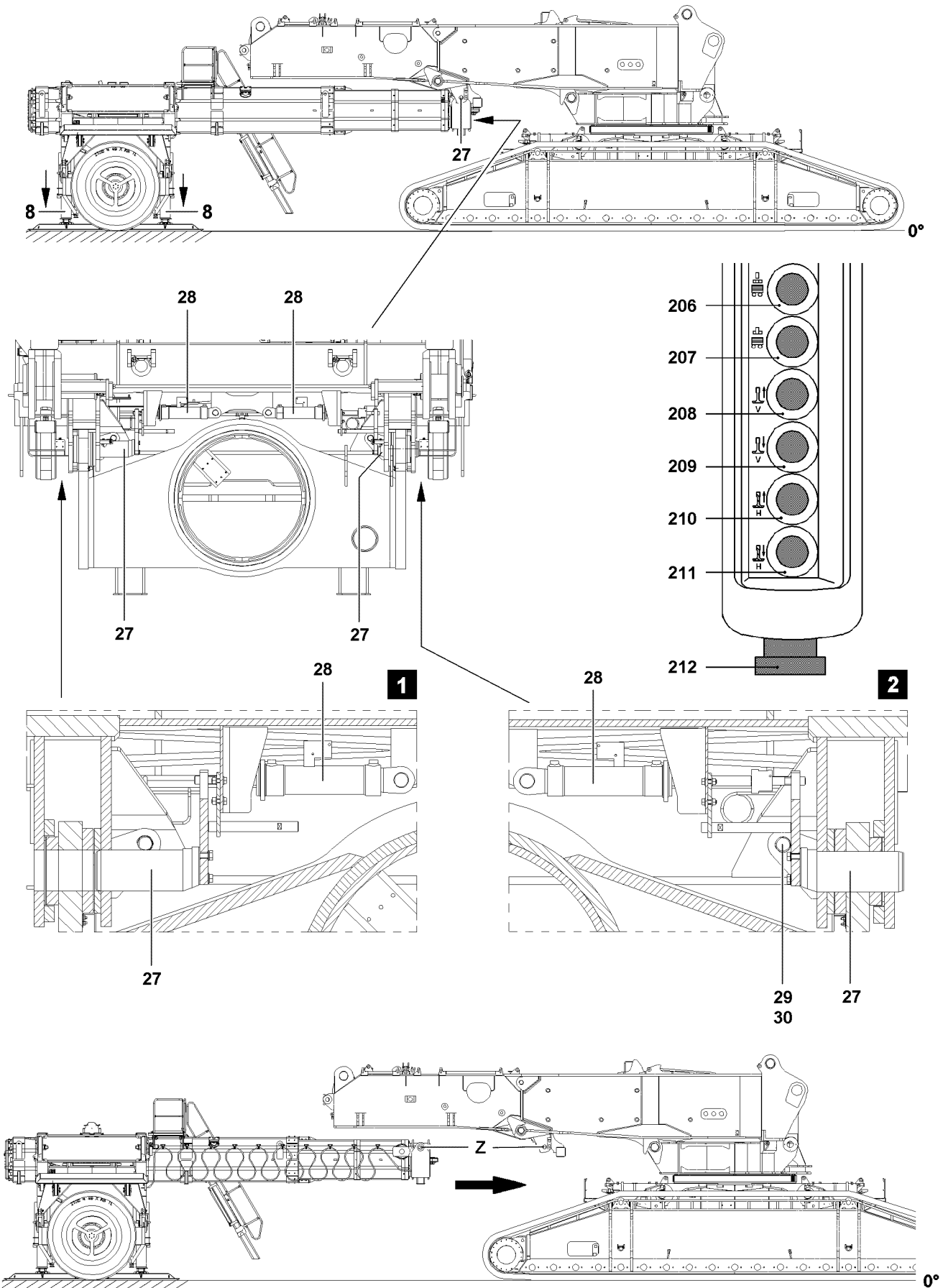


Fig.106912

LWE/LR 11350-007/19005-01-02/en

7.5 Unpinning 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.

Fig.195219

LWE/LR 11350-007/19005-01-02/en

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.

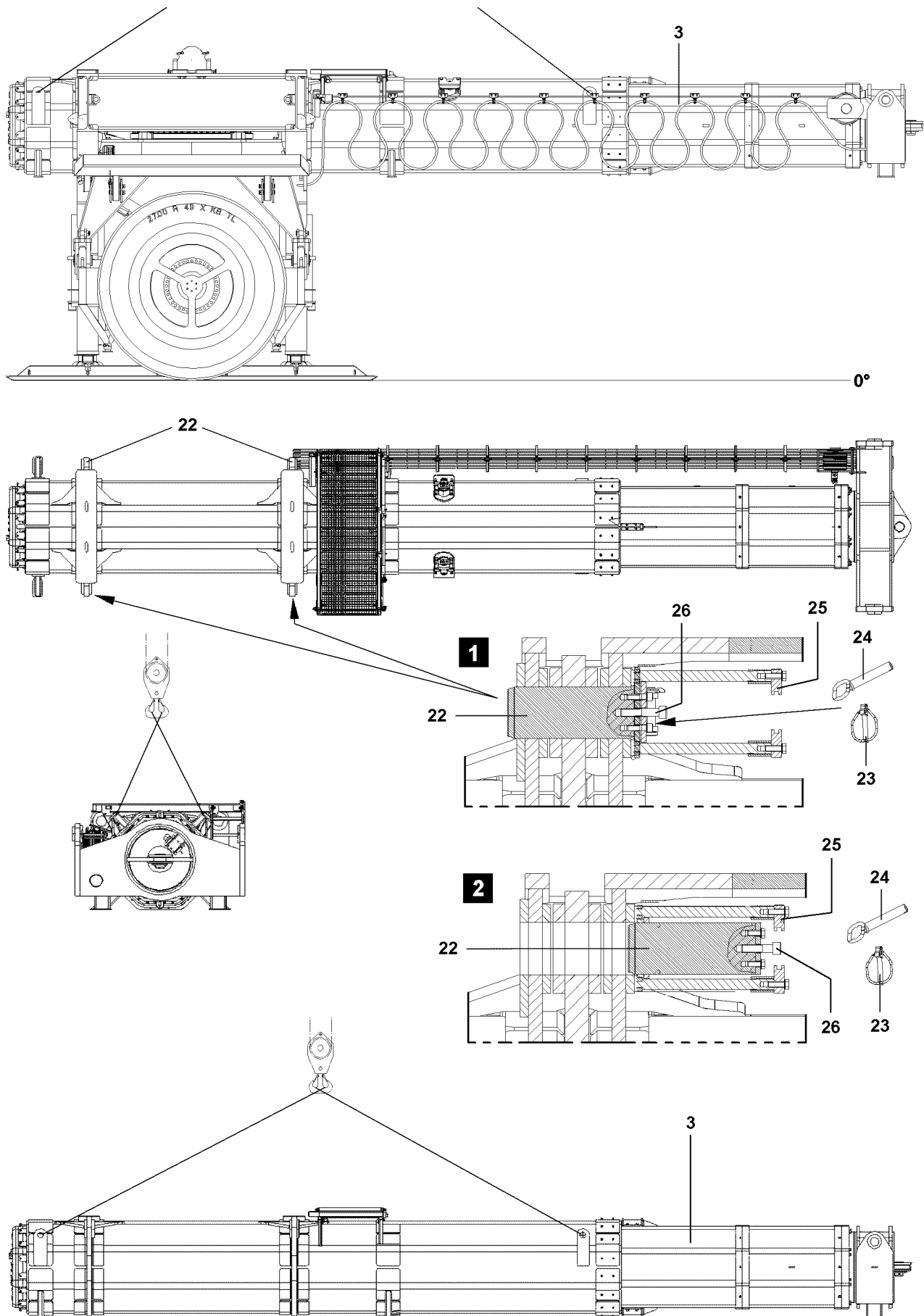


Fig.104041

LWE/LR 11350-007/19005-01-02/en

7.6 Disassembling the guide from the ballast frame

Make sure that the following prerequisites are met:

- The ballast trailer is supported with the support cylinders **8** and aligned horizontally.
- 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!

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 safety if the ballast trailer is not assembled on the turntable, see 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**!
-

7.6.1 Disassembling the guide

- ▶ Attach the guide **3** to the auxiliary crane.
- ▶ Unpin the guide **3** in 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.

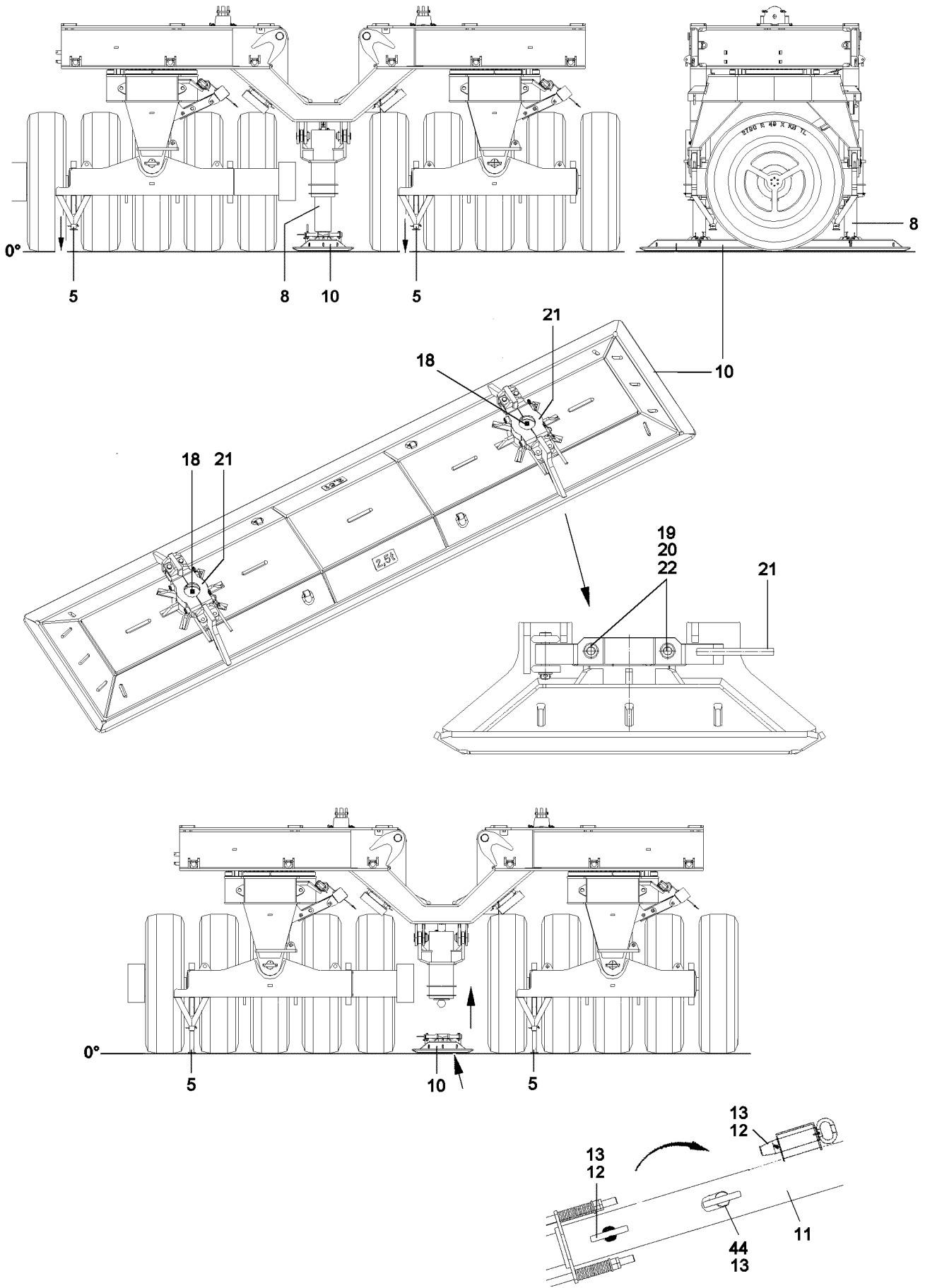


Fig.107175

LWE/LR 11350-007/19005-01-02/en

7.7 Disassembling the support plate

**Note**

- ▶ The wheel sets are not equipped with their own brake system!

**DANGER**

Danger of accident due to the wheel sets tipping!

When the wheel sets are not secured with chocks 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 disassembled.
- The wheel sets are secured with chocks.
- The ballast trailer is supported by 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**.
- ▶ Drive the piston rod of the support cylinder **8** out of the receptacle **18** using the pin pulling device.
- ▶ Retract the support cylinders **8** completely.

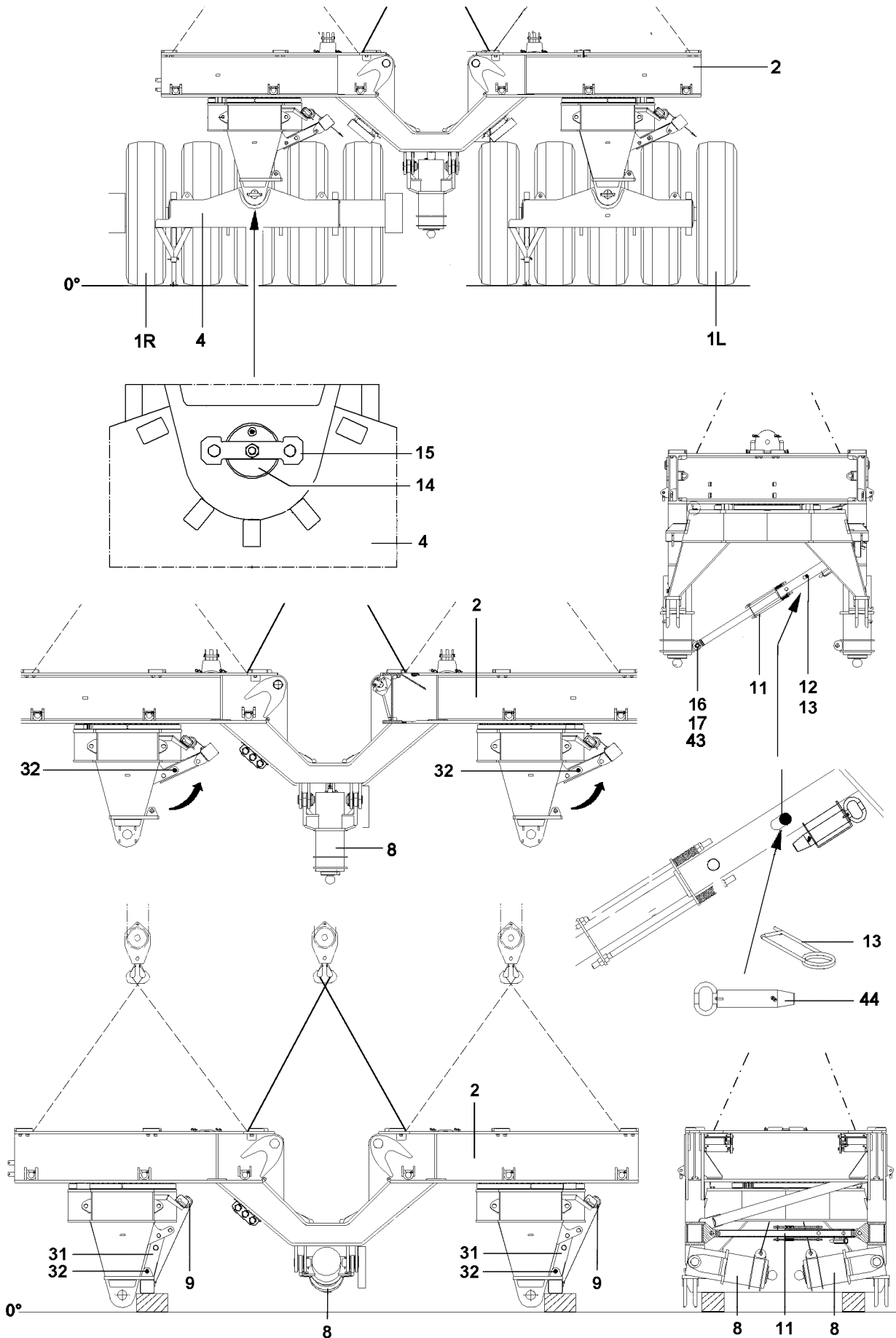


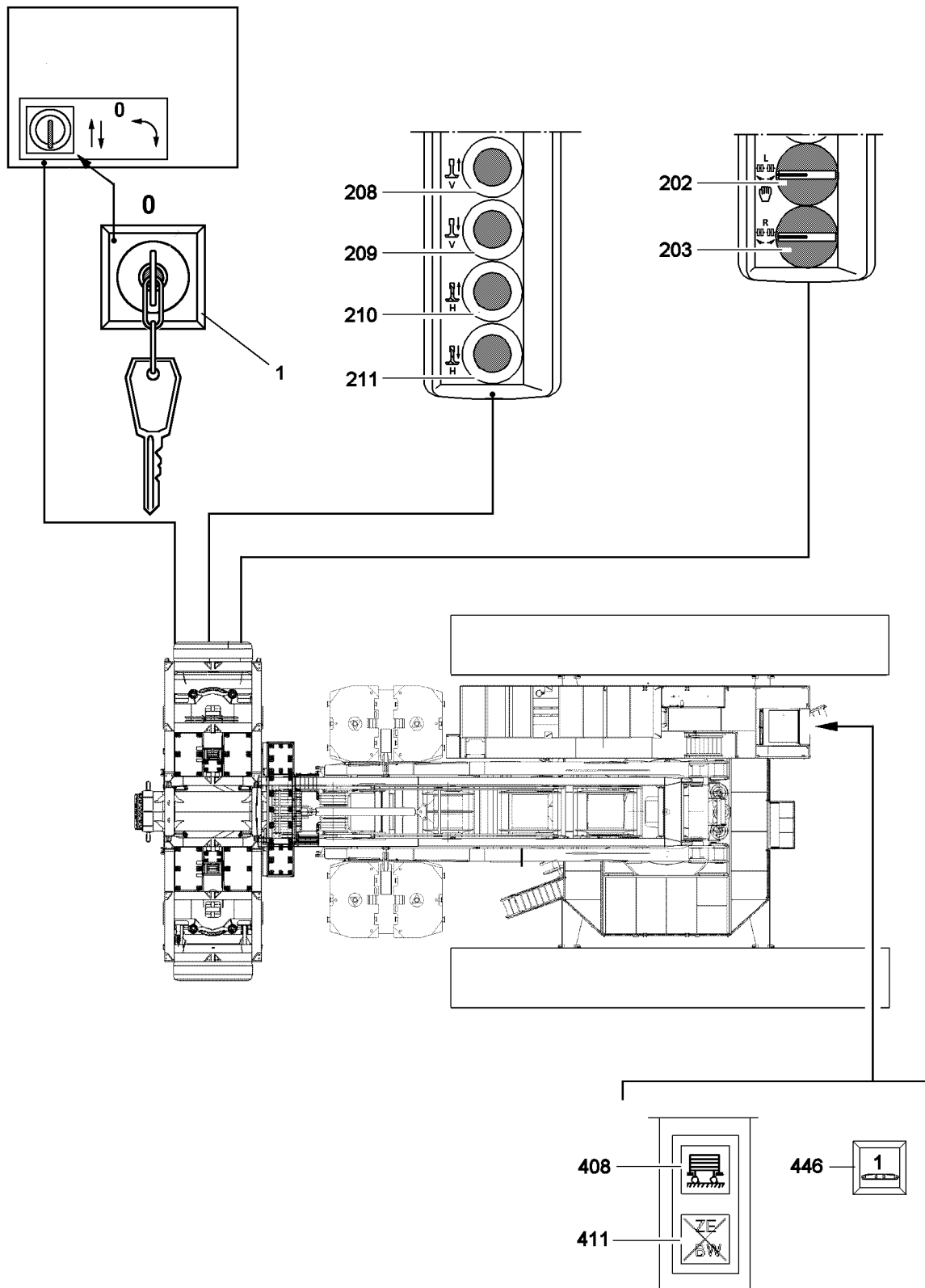
Fig.107176

LWE/LR 11350-007/19005-01-02/en

7.8 Disassembling the ballast frame on the wheel sets

Make sure that the following prerequisites are met:

- The wheel sets are secured with chocks and mechanically supported.
 - The ballast frame is attached to 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 swing it away.
 - ▶ Connect the rope of the rope winch **9** to 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**.
 - ▶ Attach the grip hoist or the auxiliary crane to the strut **11** and tension. Unpin the strut **11** on the support cylinder at the bottom. Loosen the spring retainer **17**, remove the washer **43** and unpin the pin **16**.
 - ▶ Pull the strut **11** up into transport position and repin.
 - ▶ Attach the grip hoist or the auxiliary crane to the support cylinder **8** and tension.
 - ▶ Pull the support cylinder **8** into transport position and fasten with chains.
 - ▶ Lower the ballast frame onto the support.



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Fig.104960

8 Emergency operation

8.1 Emergency operation of the 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 towing and circular travel signals can no longer be sent from the ballast trailer control to the crane control.

By actuating the key switch **1** in the control cabinet 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 „towing“ and „circular driving“ signal 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!
-

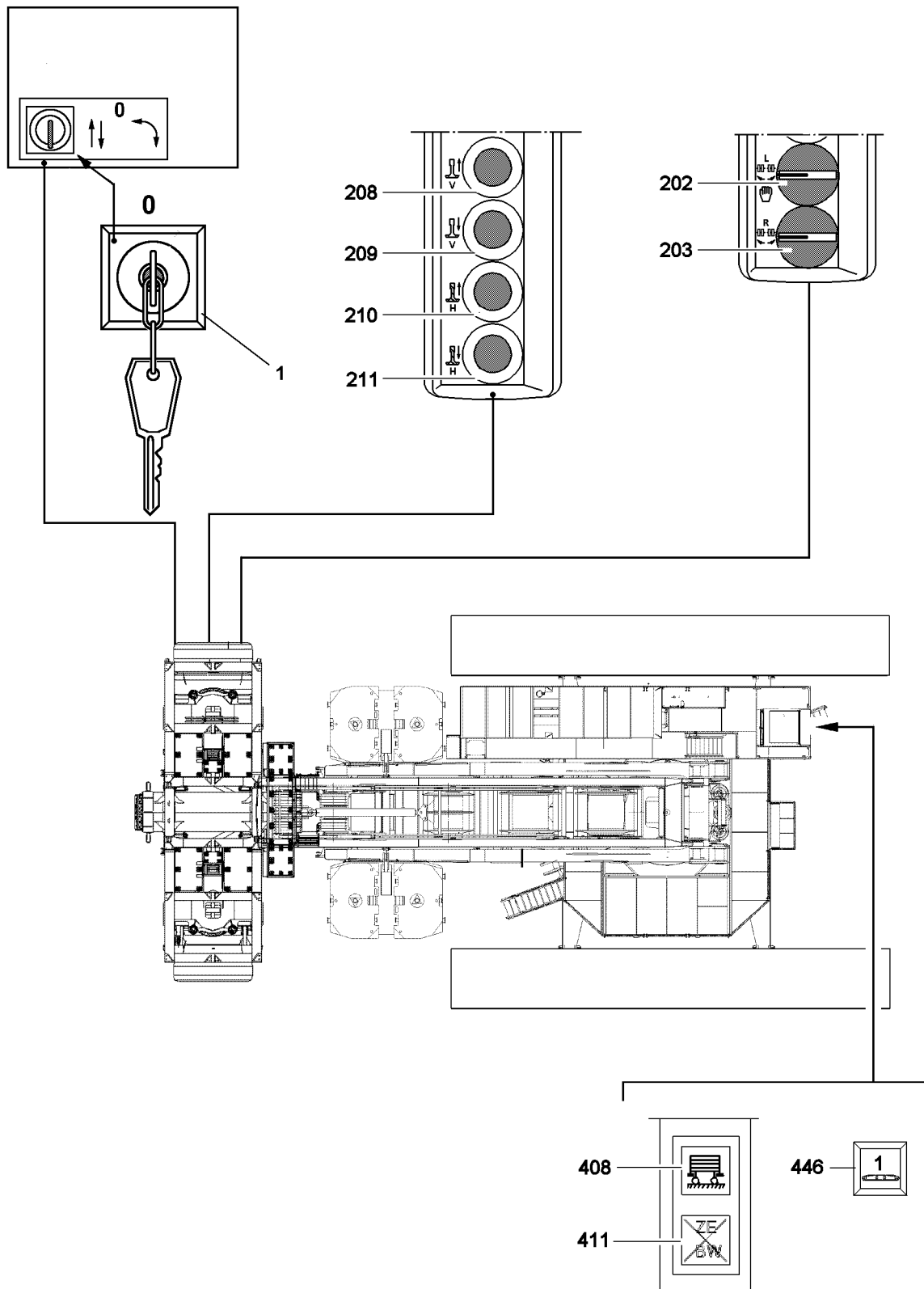


Fig.104960

8.2 Emergency operation - towing

Make sure that the following prerequisites are met:

- The ballast trailer is properly assembled.
- Crawler operation is turned on. The 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 the button **209** and button **211**, extend the support cylinders in the front and rear and relieve the wheels.
- ▶ Set the axles to the 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** illuminates, the supports are retracted!
- ▶ Checking the settings

8.2.2 Towing

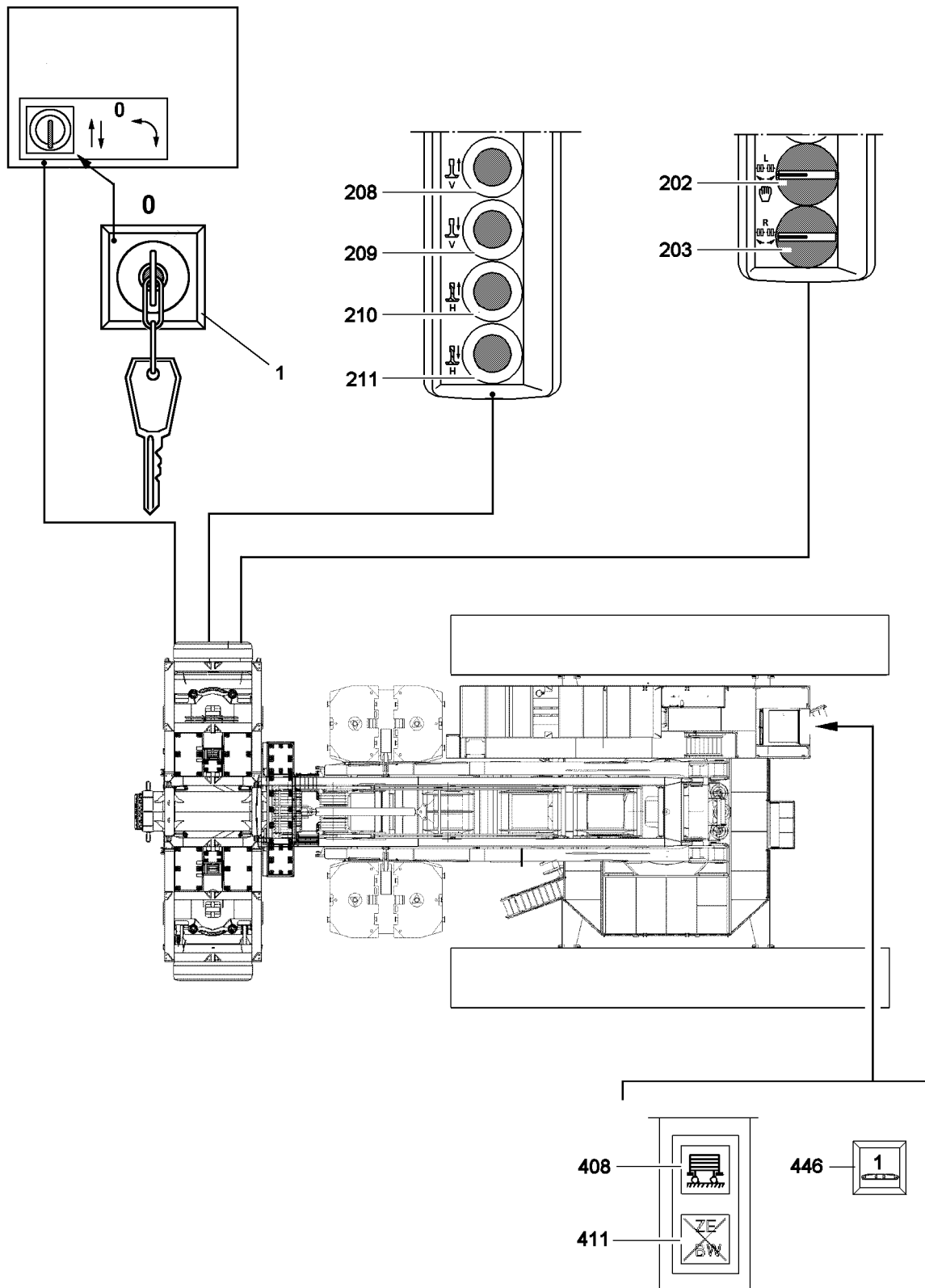
Make sure that the following prerequisite is met:

- The wheel sets are in the towing position.



Note

- ▶ Monitor the wheel position of the wheel sets constantly while driving!
- ▶ If the tires become excessively deformed, readjust the wheel position!



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Fig.104960

8.3 Emergency operation - circular travel

Make sure that the following prerequisites are met:

- The ballast trailer is properly assembled.
- Crawler operation is turned on. The 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 the button **209** and button **211**, extend the support cylinders in the front and rear and relieve the wheels.
- ▶ Set the axles to the 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** illuminates, 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 the 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 Ballast trailer maintenance intervals / maintenance instructions



Note

- ▶ See chapter 7.02.50 and chapter 7.04.50.

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5.36 Derrick ballast - suspended ballast

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| 5 | Crawler operation with derrick ballast | 47 |
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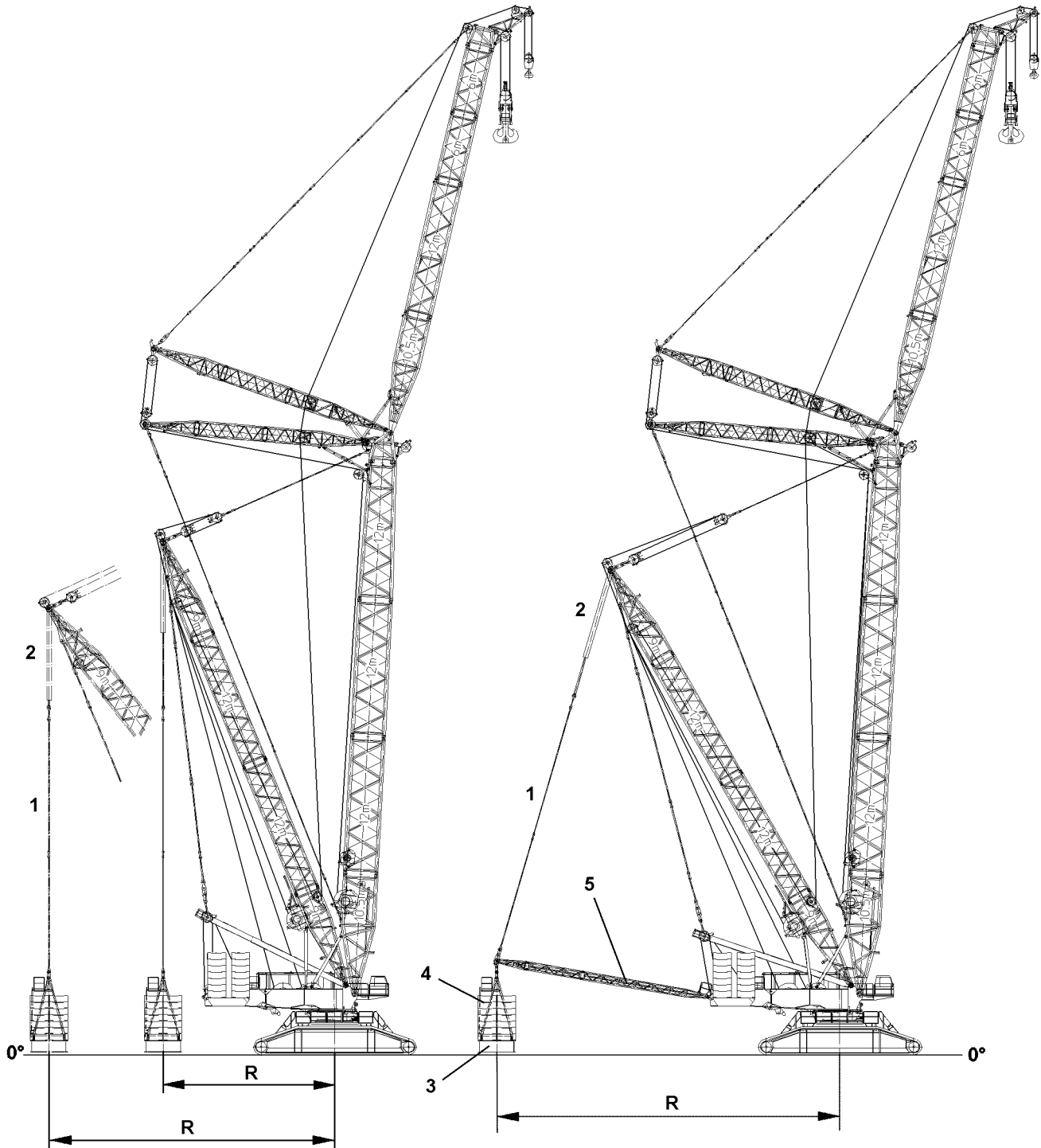


Fig.102167

LWE/LR 11350-007/19005-01-02/en

1 General

1.1 Description

The required derrick ballast radius **R** is set by adjusting the derrick boom 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 installed 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 crane operation with the hydraulic cylinders **2** in the guying **1**.

For crane operation with derrick ballast, see Crane operating instructions, chapter 4.02.

1.2 Component overview - Derrick ballast

The components for crane operation with derrick ballast are:

| Position | Component |
|----------|--------------------|
| 1 | Guying |
| 2 | Hydraulic cylinder |
| 3 | Ballast pallet |
| 4 | Ballast plates |
| 5 | Guide |

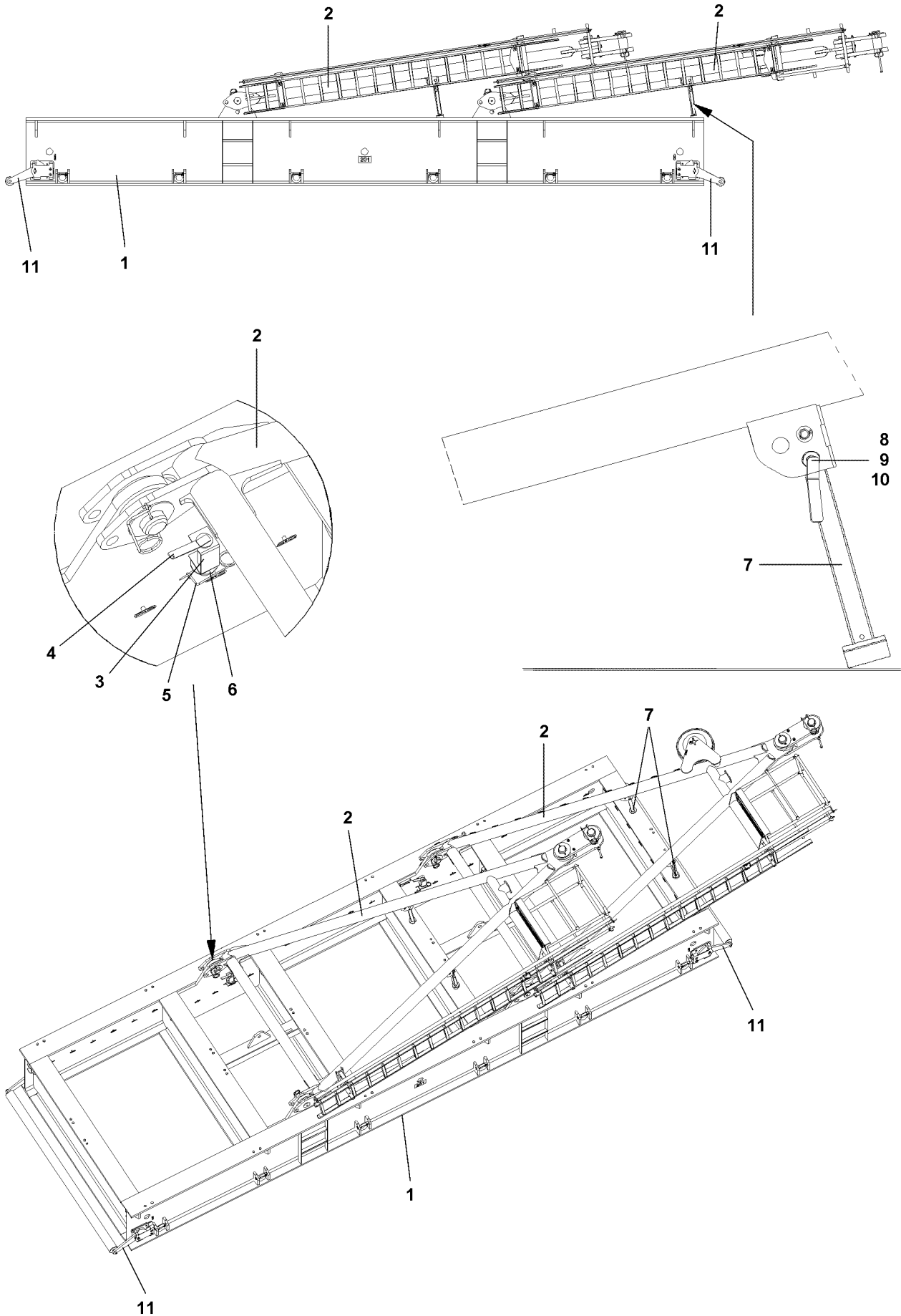


Fig.104126

LWE/LR 11350-007/19005-01-02/en

1.3 Component overview - Ballast pallet

The components for the ballast pallet are:

| Components | |
|------------|--------------------------------|
| 1 | Ballast pallet |
| 2 | Erection rack |
| 3 | Receptacle 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 |

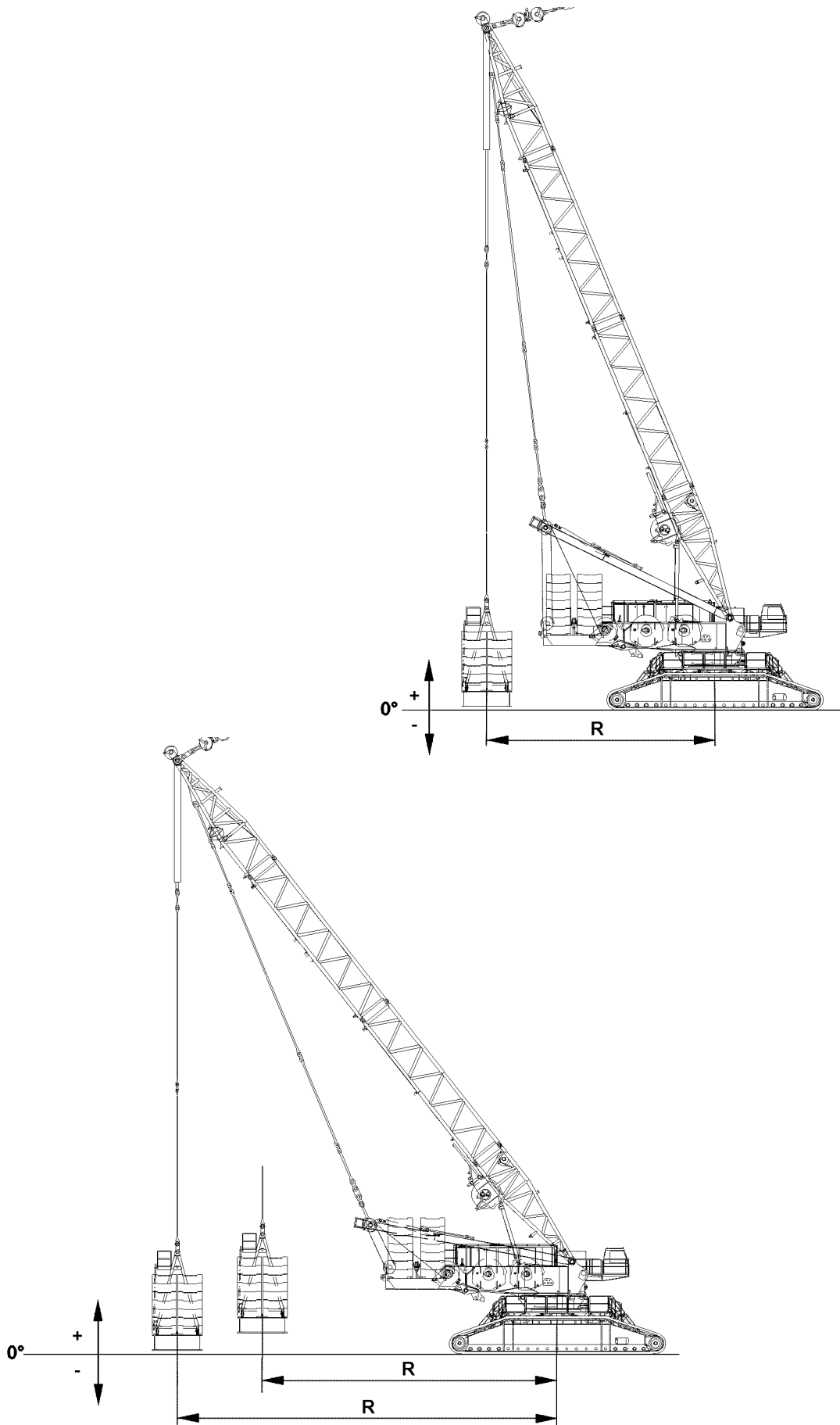


Fig.104127

LWE/LR 11350-007/19005-01-02/en

2 Derrick radii

2.1 Derrick ballast without guide


Note

► No guide is installed between the turntable and the ballast pallet.

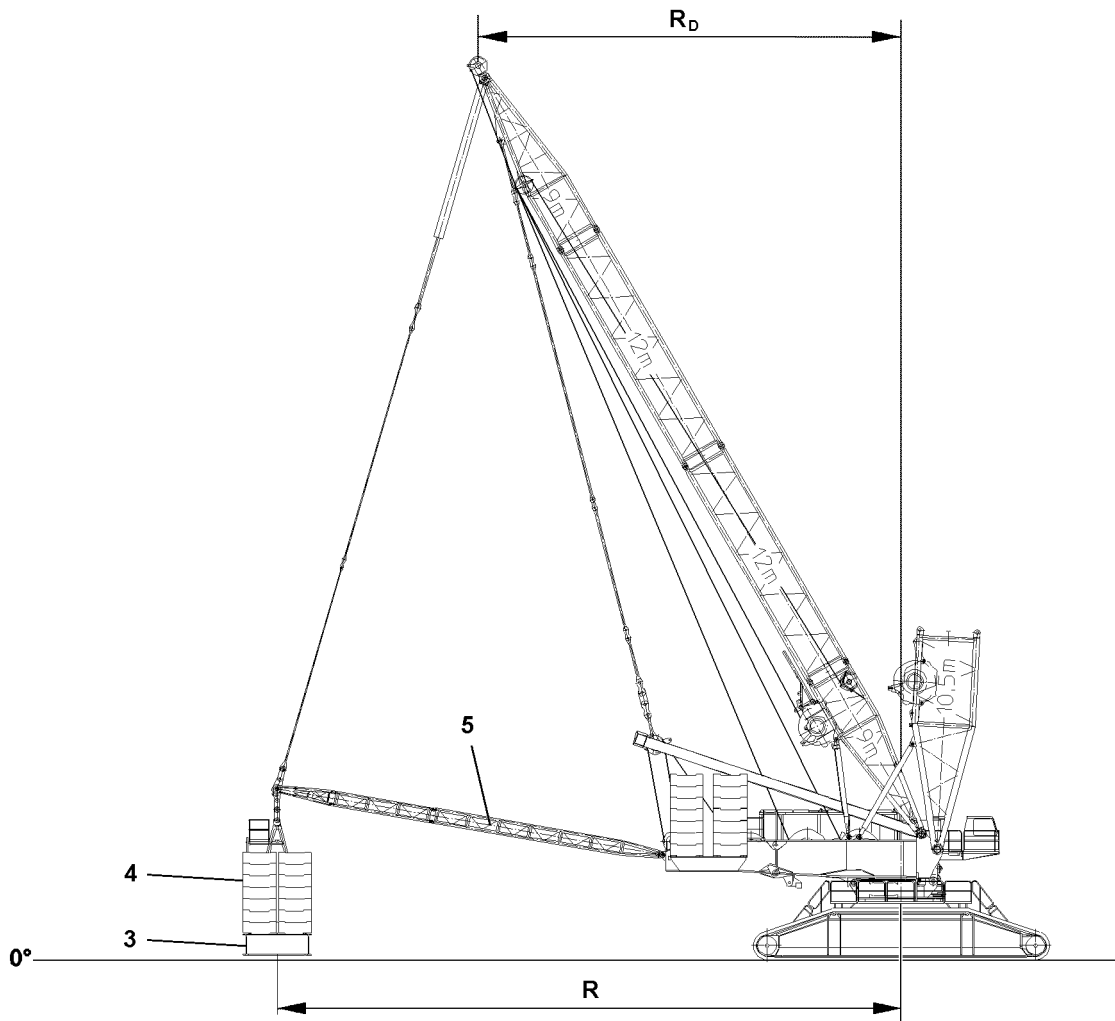
2.1.1 Derrick ballast lifting heights with respect to the base of the crawler

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 |



LWE/LR 11350-007/19005-01-02/en

Fig.120840

2.2 Derrick ballast with guide



Note

- ▶ One guide **5** is installed between the turntable and the ballast pallet **3**.
- ▶ The derrick ballast radius **R** and the derrick boom radius **RD** 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 **RD** is 20 m.

| Radius R = 30 m / R _D = 20 m | |
|---|---------|
| Above base | +4.85 m |
| Below base | -2.30 m |

Fig.195219

LWE/LR 11350-007/19005-01-02/en

3 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 could 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 for the crane, 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 assembled or disassembled, 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.
- ▶ Pin or unpin both pins laying in a horizontal, i.e. **left** and **right**.
- ▶ Secure the pins in the storage locations and in the receptacles.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.
- ▶ It is prohibited to lean a ladder against the component being disassembled.



WARNING

Danger of impact / crushing!

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

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

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.

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The boom and the derrick are installed on the turntable.
- The boom and the derrick are in crane operating position.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- An auxiliary crane is available.

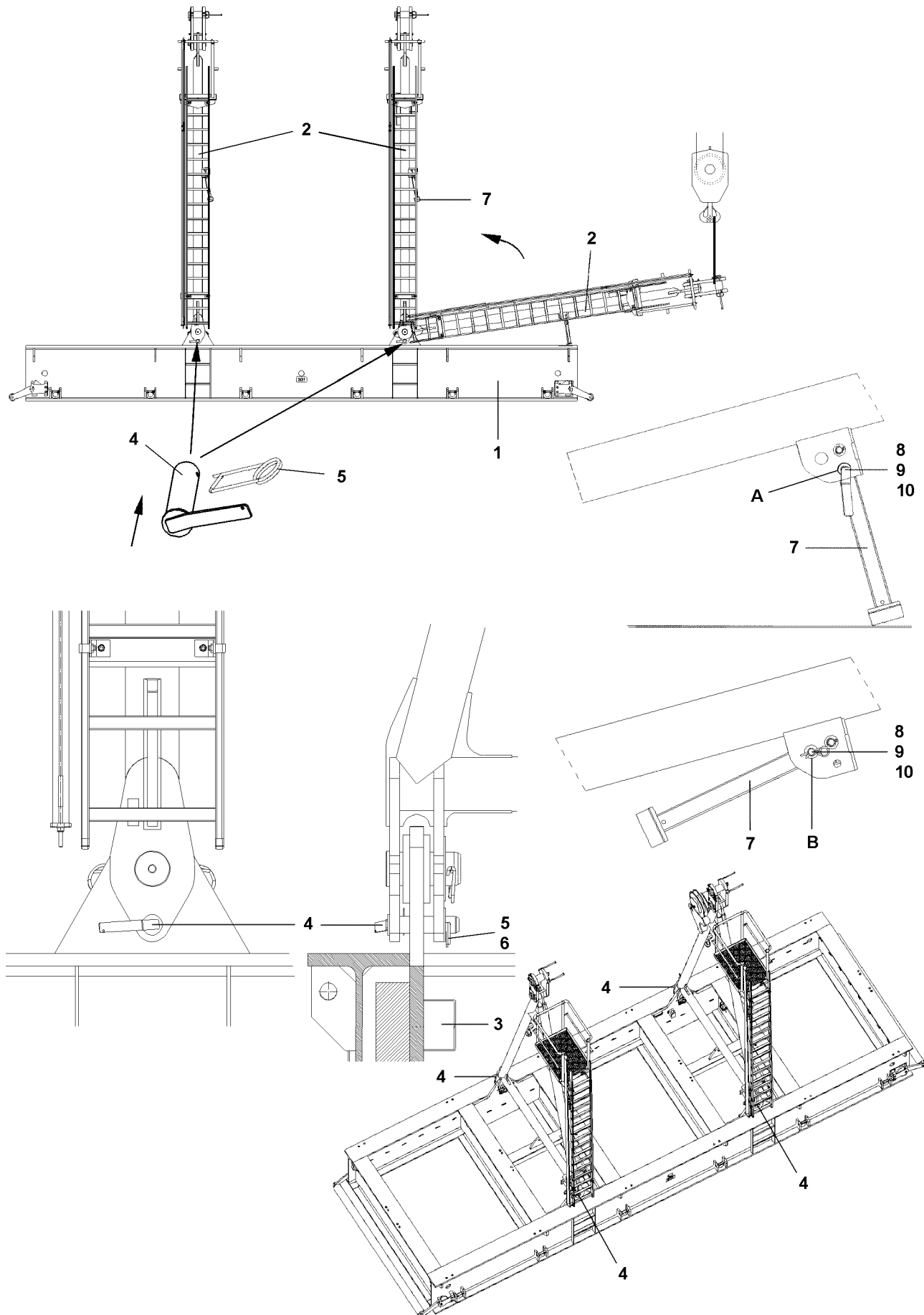


Fig.104125

LWE/LR 11350-007/19005-01-02/en

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 Setting the ballast pallet in the assembly position

- ▶ Set the derrick to the required radius.
- ▶ Hang the ballast pallet **1** on the auxiliary crane and position it within the slewing range of the crane under the guy rods on the derrick.



Note

- ▶ Set down the ballast pallet **1** for easier assembly of the guy rods, in lengthwise direction of the turntable.

- ▶ Align the ballast pallet **1** horizontally.

3.1.2 Setting up the erection racks

- ▶ Hang erection rack **2** on the auxiliary crane.
- ▶ Remove the spring retainer **9** and washer **10**, unpin the pin **8** from the bore **A**.
- ▶ Fold in the transport support **7** and pin on the erection rack.
- ▶ Pin and secure the pin **8** in the bore **B**.
- ▶ Set the erection rack **2** vertically with 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 with four retaining pins **4**. Only then may the auxiliary crane be removed.
- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks.
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

- ▶ 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**.

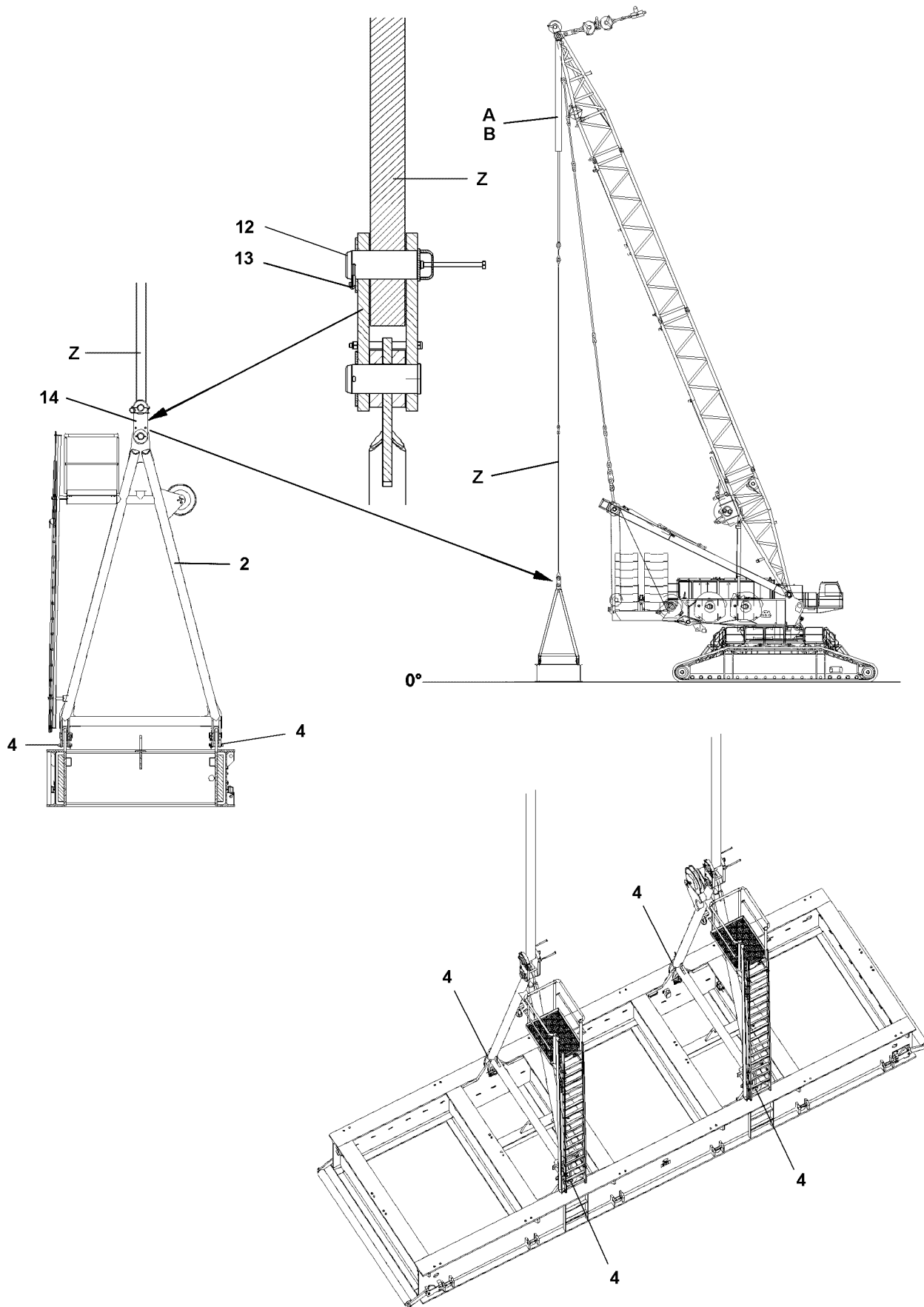


Fig.104128

3.1.3 Assembling the guy rods on the ballast pallet without a guide

Make sure that the following prerequisites are met:

- The guy rods hang above the brackets of the erection racks.
- The erection racks are erected and secured with 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** on 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.

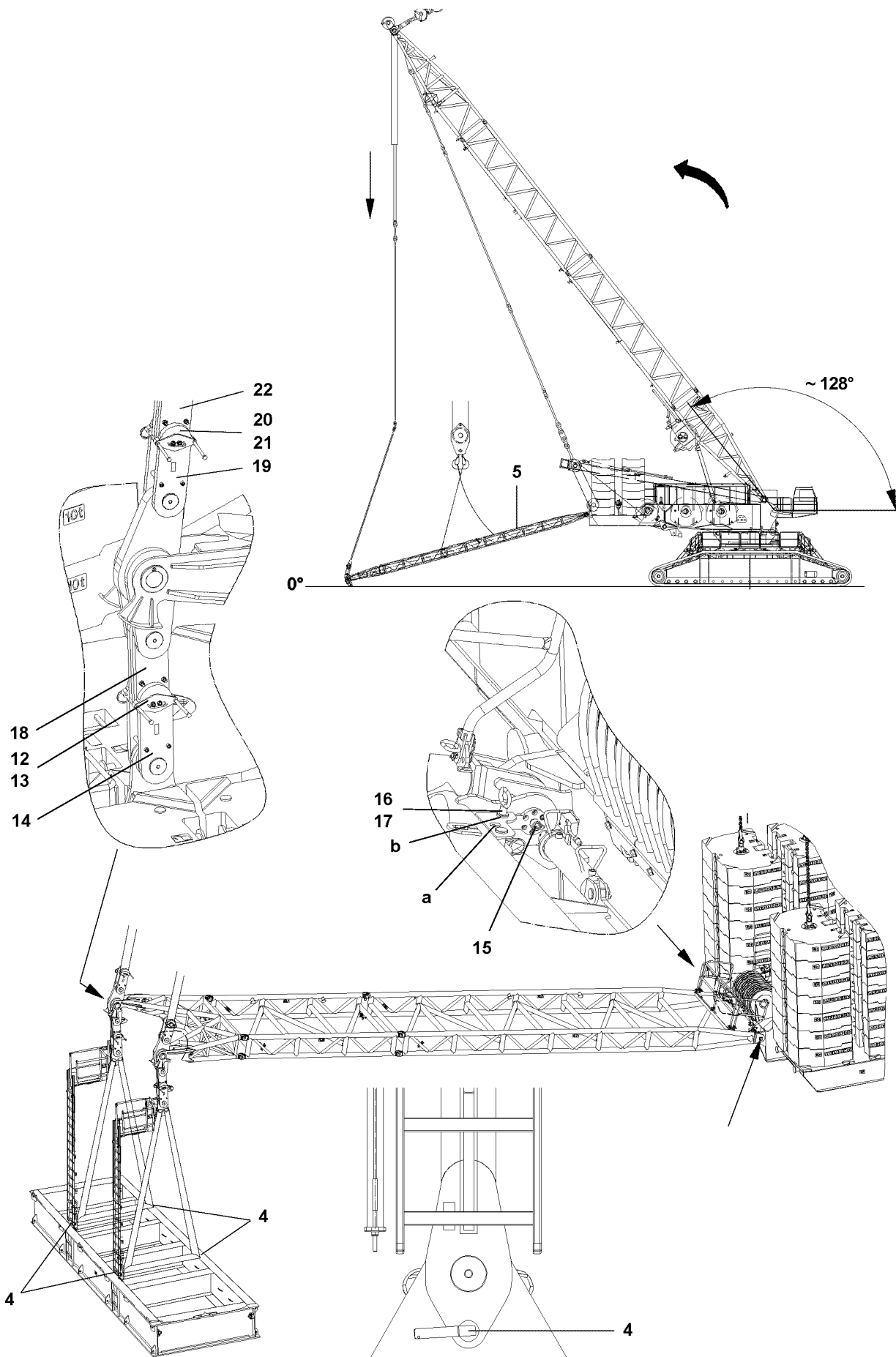


Fig.104129

LWE/LR 11350-007/19005-01-02/en

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 erected and secured with four retaining pins **4**.



Note

- ▶ First pin the guide **5** on the turntable.

- ▶ Hang the guide **5** on the auxiliary crane and swing it to the pin points on the turntable and fasten in position.
- ▶ Pin the guide **5** on both sides on the turntable with 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** until it is placed on the ground.
- ▶ Luff down the derrick to the rear to maximum radius, the electric shut off takes place at approximately R 25.6 m , approximately corresponding to 128°.
- ▶ Extend the hydraulic cylinder and pin and secure the guy rods **22** on the bracket **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 R 20 m.
- ▶ Swing the guide **5** over the pin points on the ballast pallet.
- ▶ Pin the bracket **18** on the 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.

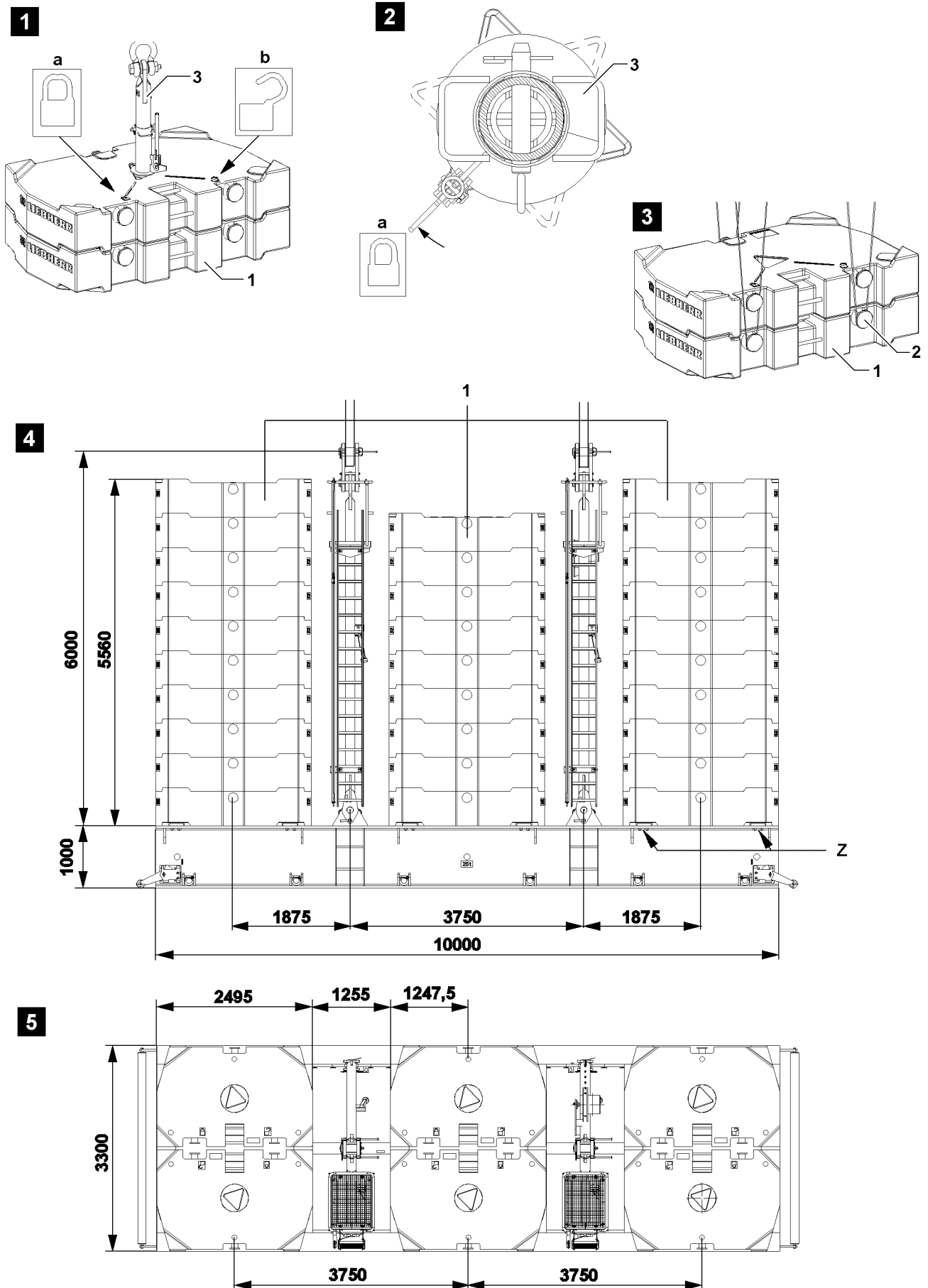


Fig.109595

LWE/LR 11350-007/19005-01-02/en

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 with retaining pins.
- The ballast pallet is pinned and secured to the guying.



DANGER

Danger 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 may 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** may not exceed a maximum of 20 t.



DANGER

Danger of accident!

If more than the specified loads are lifted with the receptacle stud **3** or the ropes via the bits **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.

Make sure 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**.

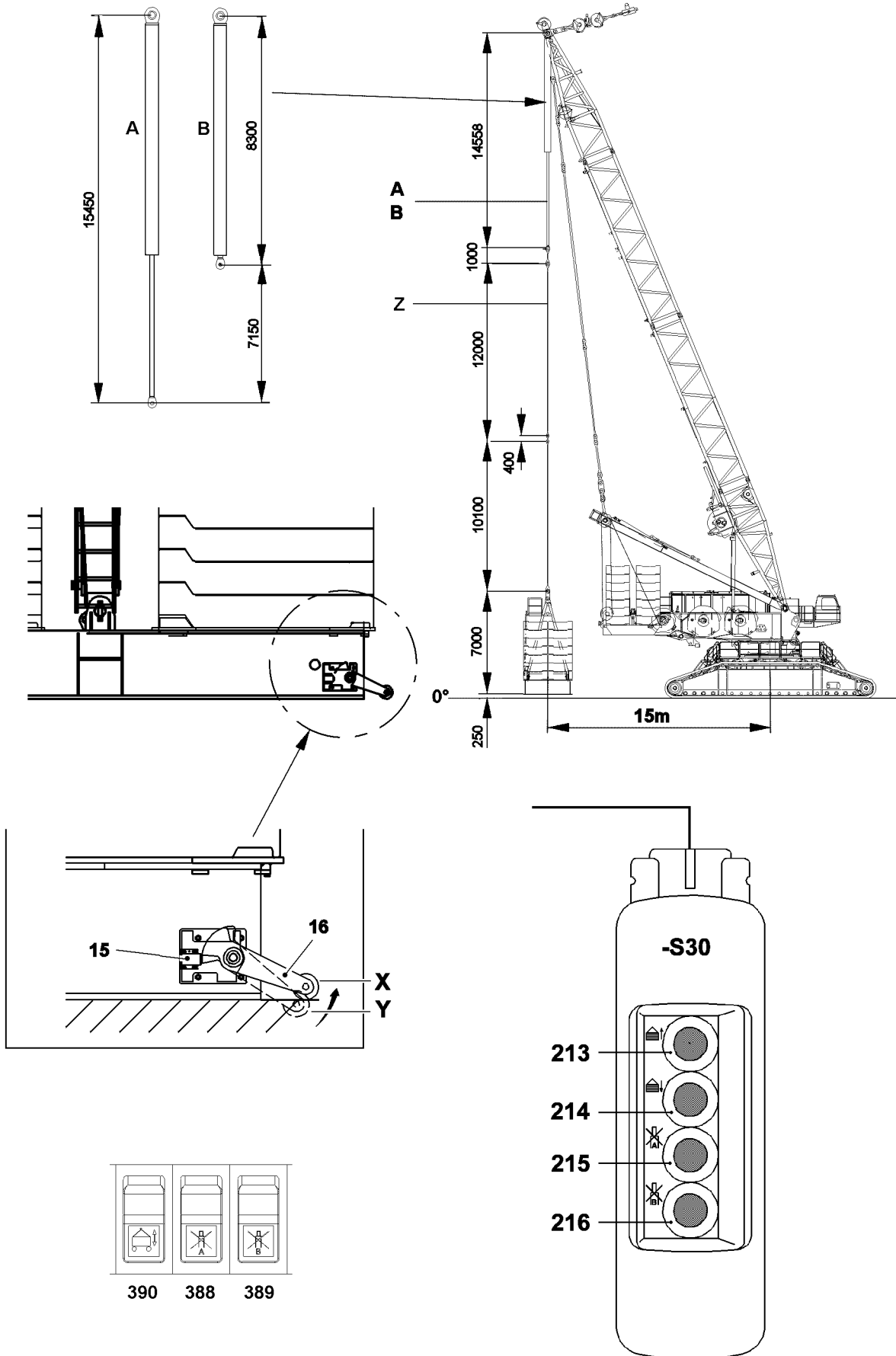


Fig.104258

3.1.6 Establishing the electrical connection from the suspended ballast to the turntable

**Note**

▶ Establish the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

▶ Establish the electrical connections.

3.1.7 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 of the cable drum is plugged in on the turntable.
- The ground contact rollers must move easily.

**DANGER**

Danger 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.

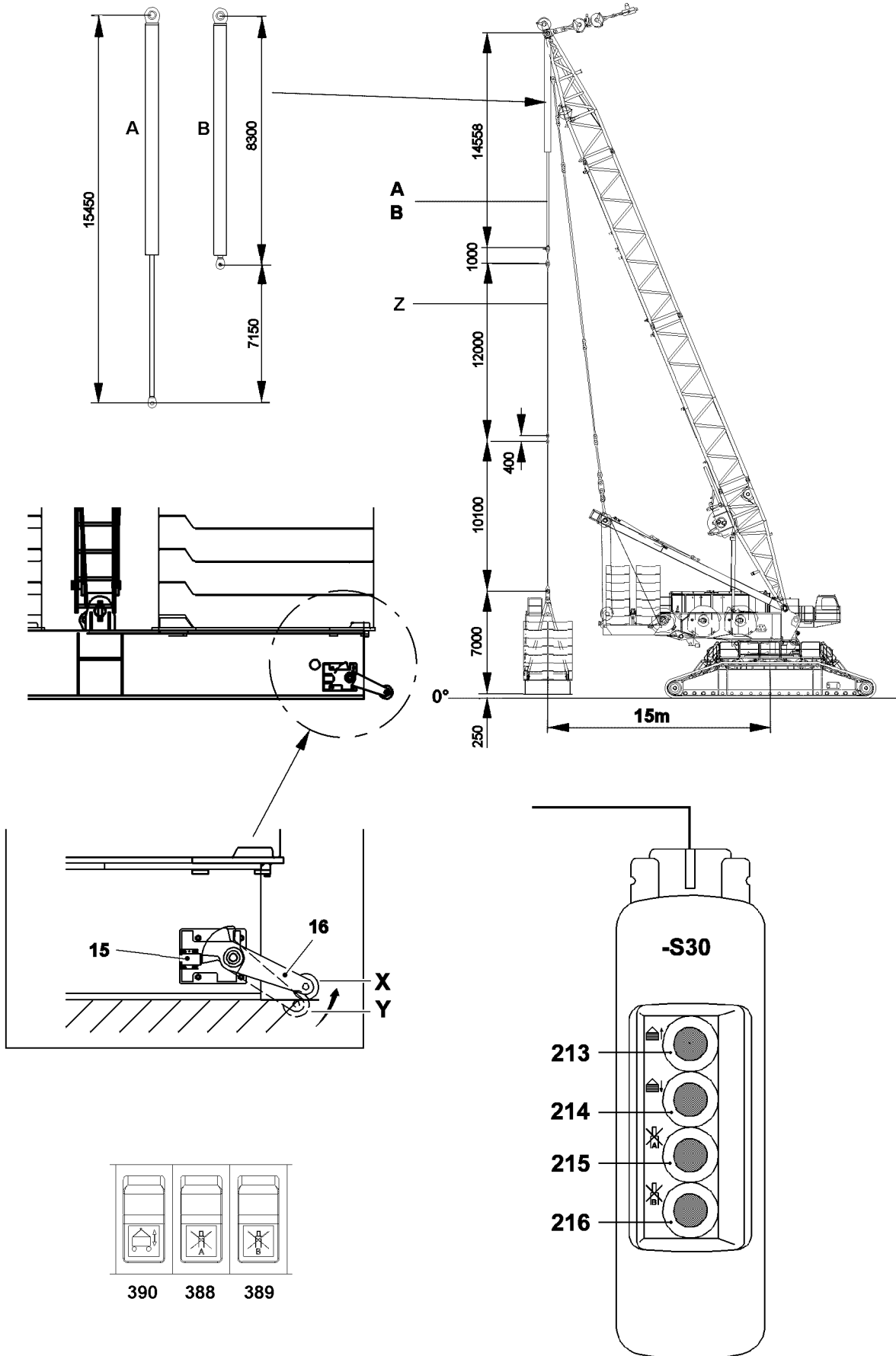


Fig.104258

LWE/LR 11350-007/19005-01-02/en

3.1.8 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 off 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 the derrick ballast by more than 250 mm off 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 bearing 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.

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

Danger of accident!

- ▶ The control panel may only be used for assembly.
- ▶ During crane operation, the crane operator may **not** use the control panel to lift or lower the derrick ballast, since the monitors cannot be seen there.
- ▶ Lifting and lowering during crane operation may **only** be carried out from the cab.
- ▶ When lifting or lowering make sure that the difference of the forces in the ballast guyings is not too large.
- ▶ The LICCON shows both forces and will issue a warning if the difference is too large.
- ▶ See section „Differential force monitoring of ballast guying“.

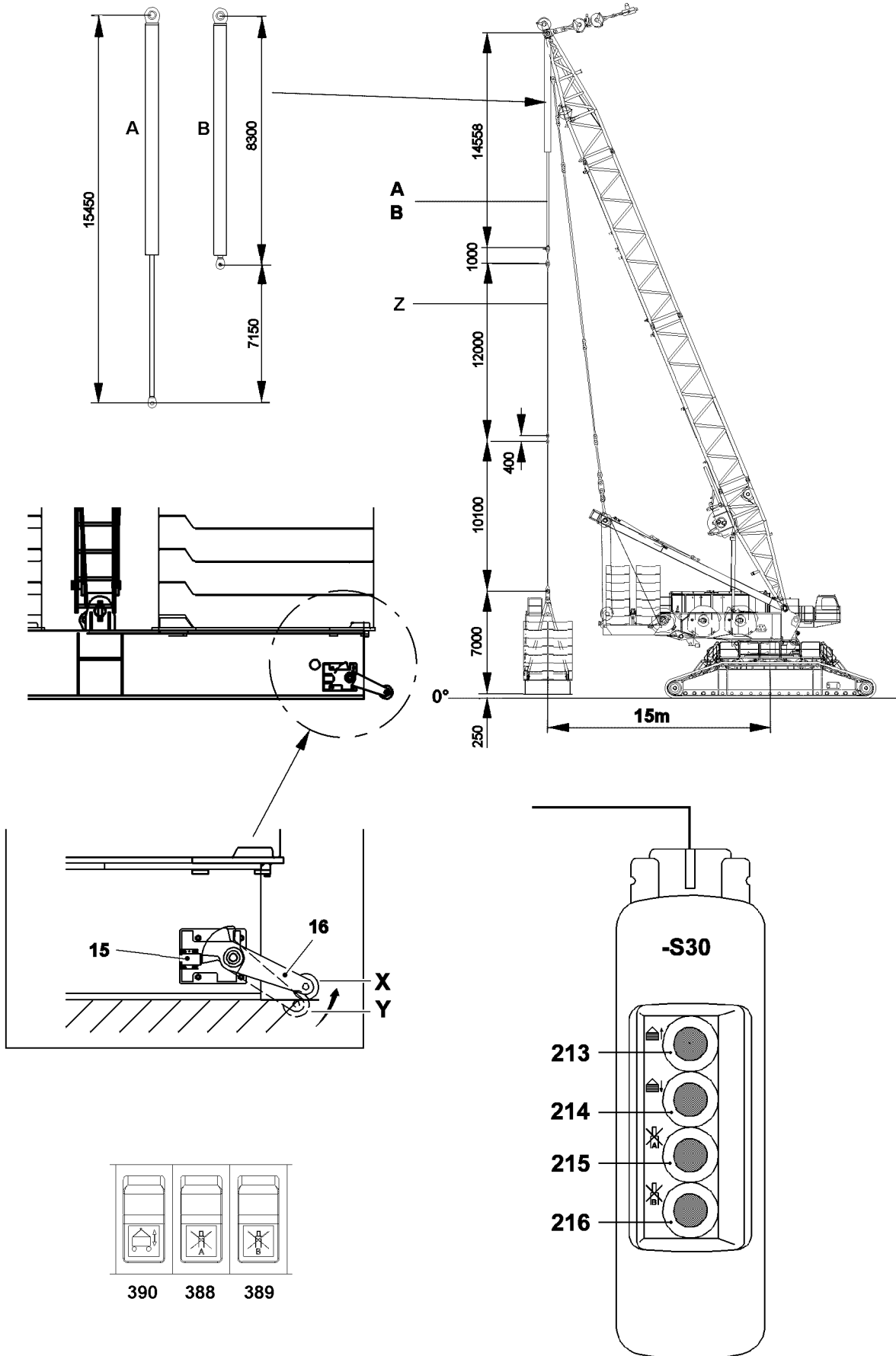


Fig.104258

LWE/LR 11350-007/19005-01-02/en

**DANGER**

Danger of accident!

- ▶ When lifting or lowering the derrick ballast, pay attention to the 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 ballast trailer level to $\pm 0.3^\circ$.
- ▶ With a ballast utilization of less than 90 %, the level sensor regulates the ballast trailer level to $\pm 2.5^\circ$. This makes it possible to set the derrick ballast down up 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.
 - 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.

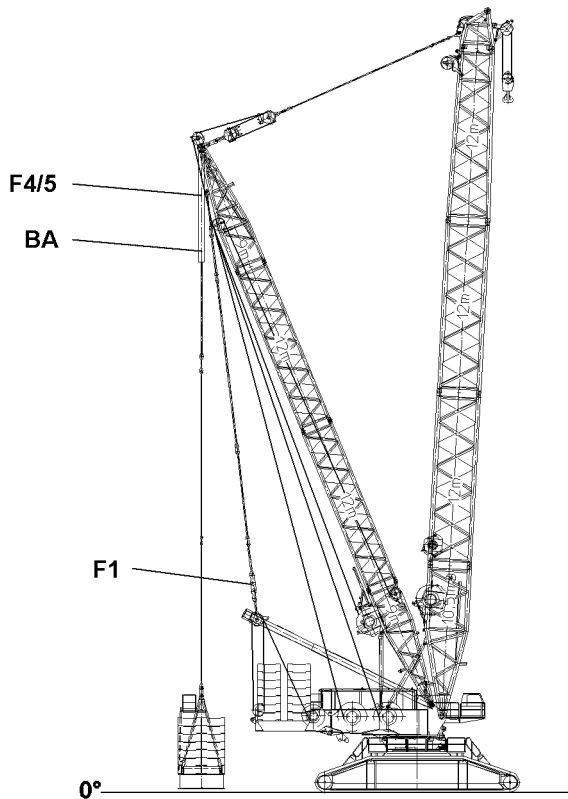
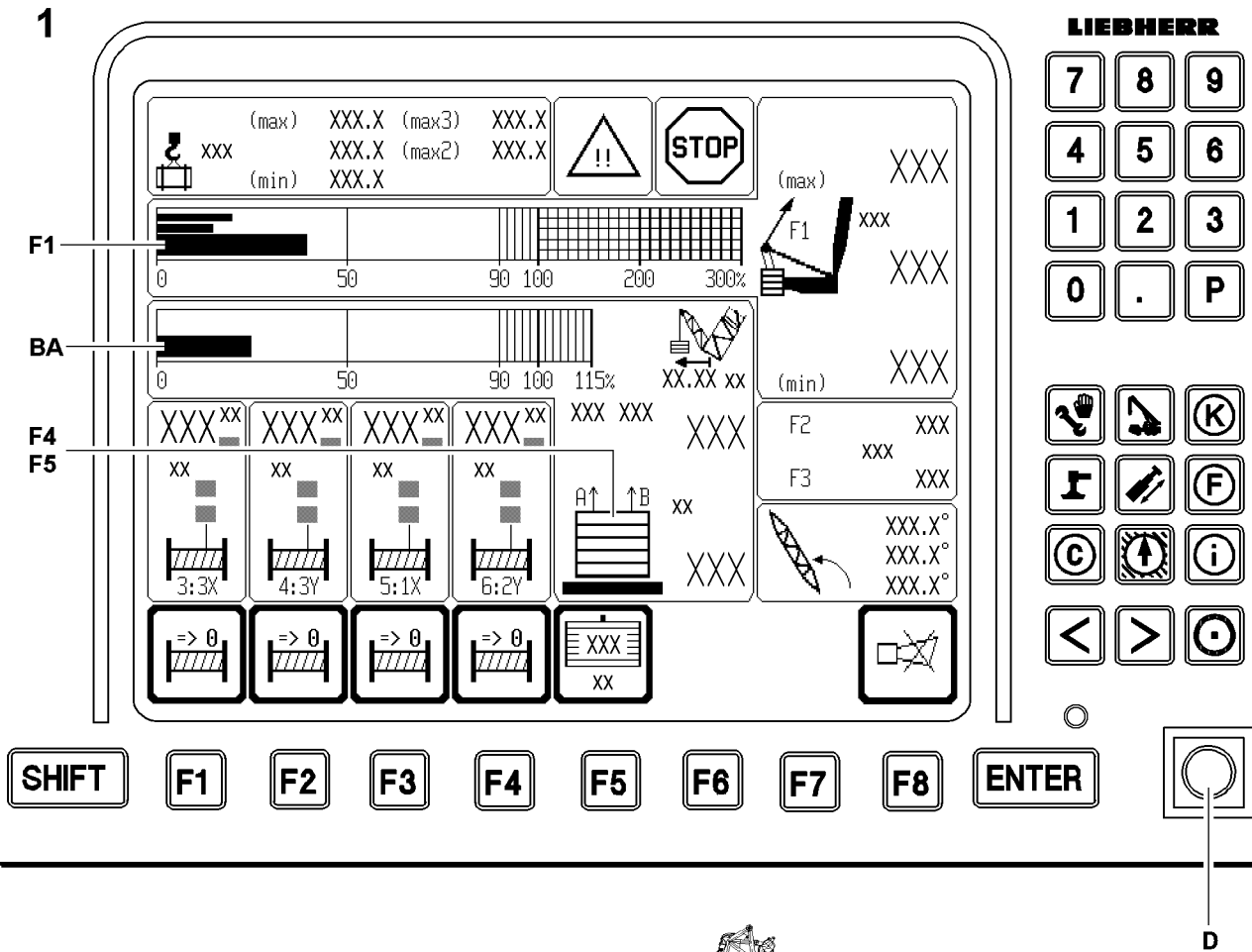


Fig.112891

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

Make sure that the following prerequisites are met:

- The required derrick ballast according the load chart is placed and exactly entered and confirmed in the LICCON.
- 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.
-

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 operating situations.
-
- ▶ Check the settings.

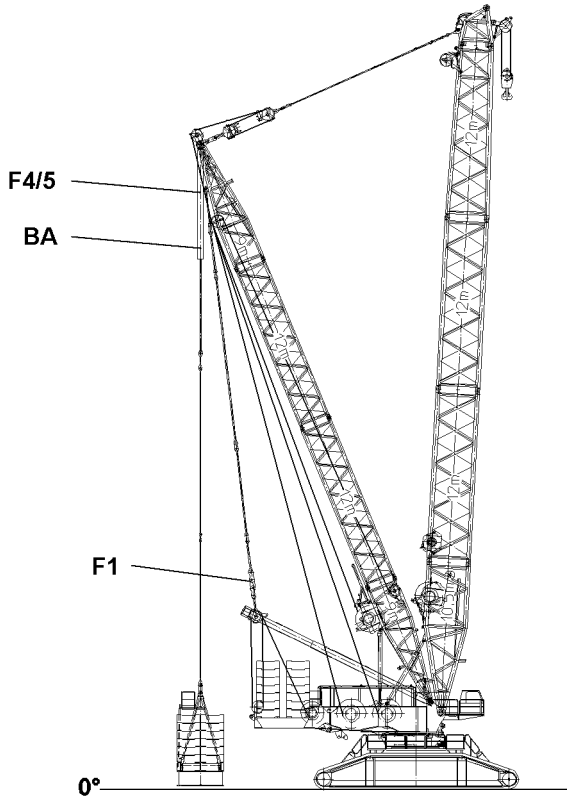
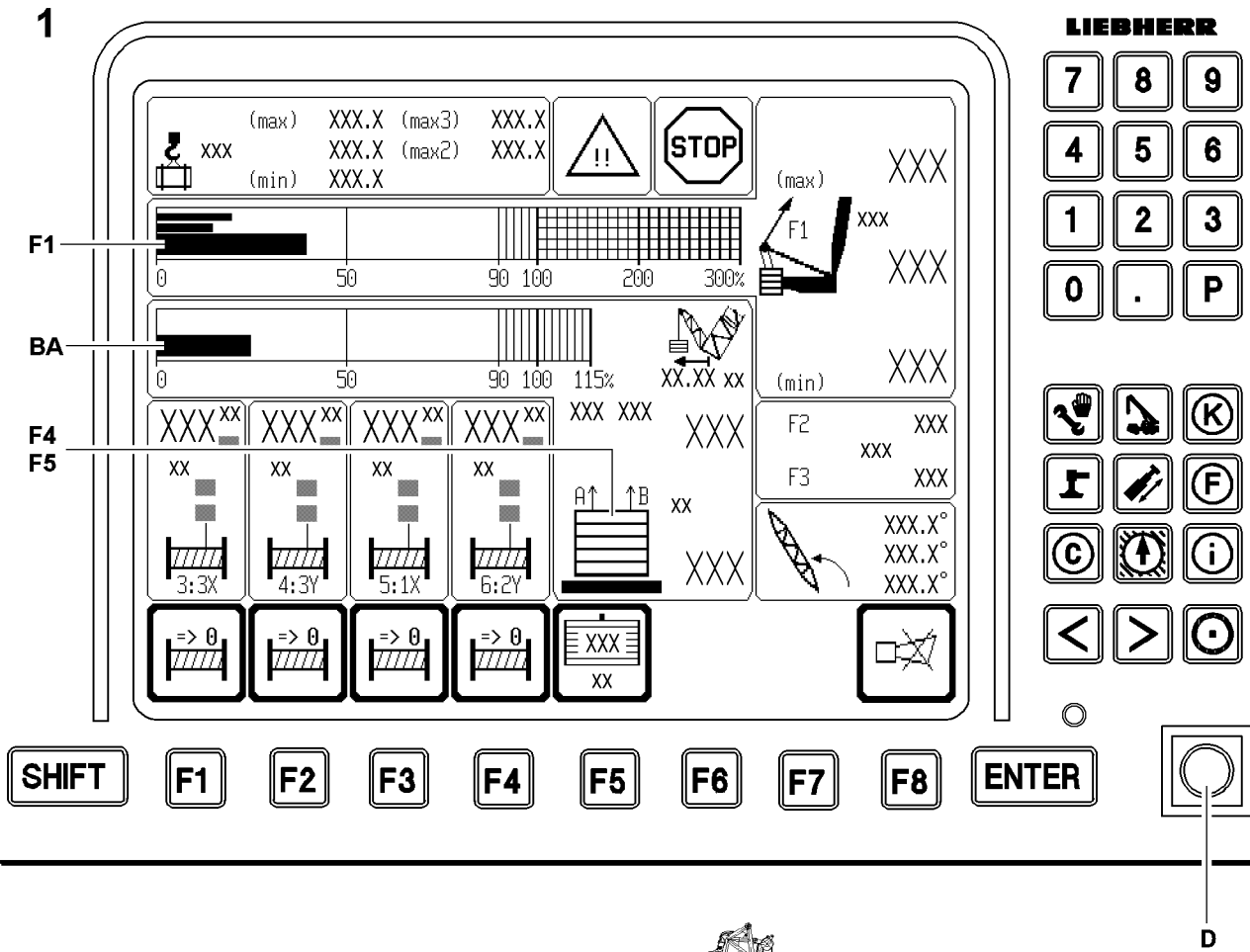


Fig.112891

4.2 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.

**WARNING**

Danger of toppling the crane!

The jerky execution / braking of turning maneuvers can cause the load or suspended derrick ballast to swing.

This can cause the boom to break or the crane to topple over.

Personnel can be severely injured or killed.

- ▶ There may be no persons or obstacles within the slewing range of the crane and the derrick ballast.
- ▶ While turning, a guide must watch the main boom, D-boom and derrick ballast for a danger of collision.
- ▶ The turning movement or braking must be initiated extremely carefully when turning with a load and suspended derrick ballast.

**Note**

- ▶ For crane operation observe the sections „Lifting the derrick ballast off the ground“ and „Difference force monitoring of the derrick ballast guying“.

- ▶ Monitor the extension condition of the pull cylinders and the incline of the derrick ballast.

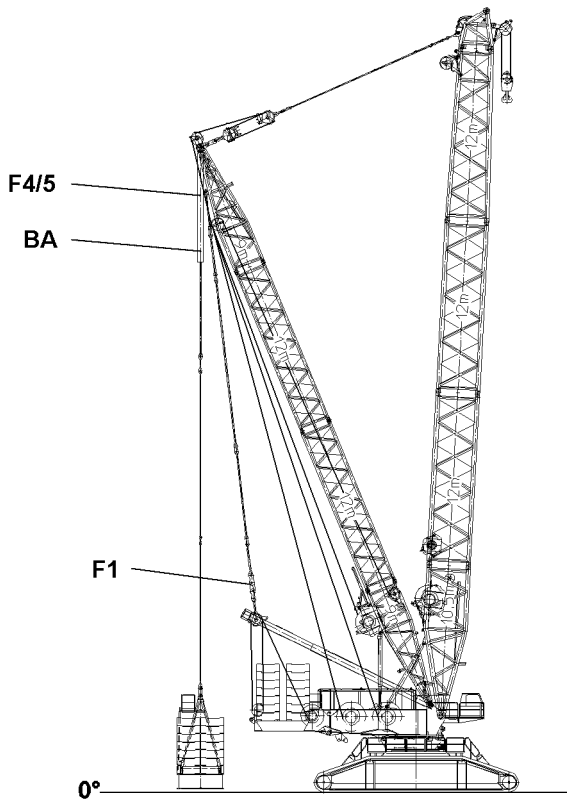
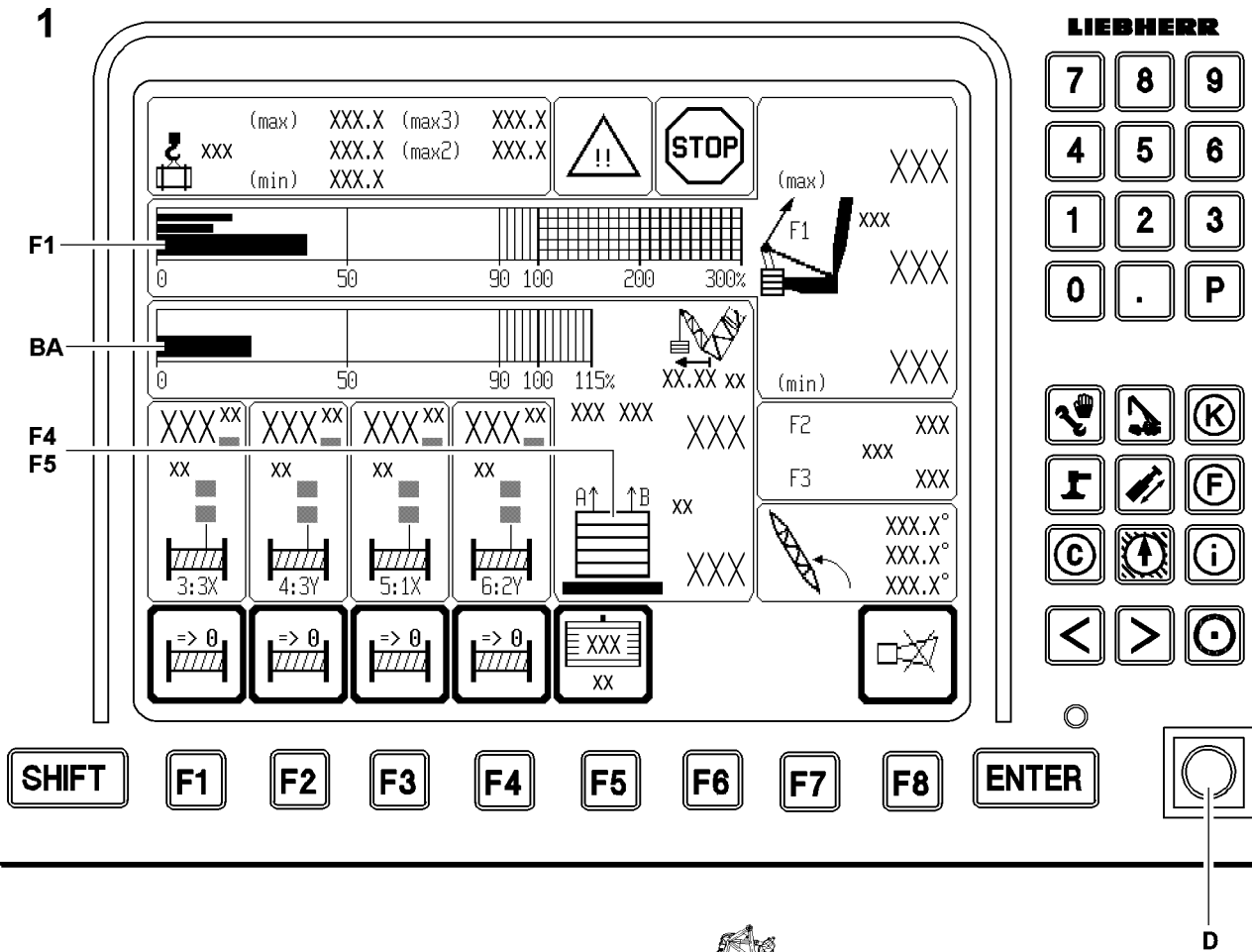


Fig.112891

4.3 Safety guidelines



Note

- ▶ The test points must be checked for function before crane operation.
- ▶ The weight of the load being lifted must be known.
- ▶ The placement surface of the derrick ballast should not be no more than maximum 0.25 m above - or 0.25 m below the level of the crane base.
- ▶ The placement surface on which the derrick ballast is placed after load lifting has been completed must be level, horizontal and of sufficient load bearing capacity in order to safely support the weight.



CAUTION

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 should not be any obstacles in the slewing area of the crane, derrick ballast and load.
- ▶ The lifting of the derrick ballast must be supervised 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 when lifting with ballast plates and 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 slack.
- ▶ This could cause uncontrolled movements of the boom system and an accident.

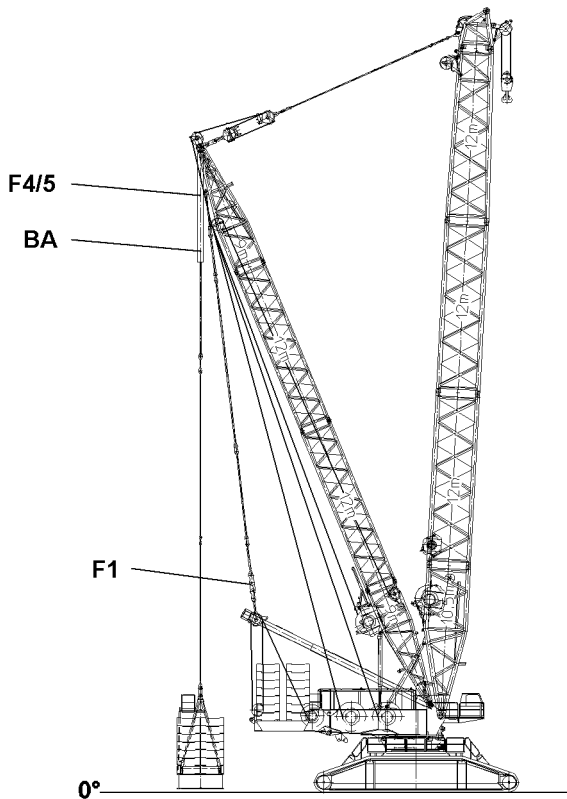
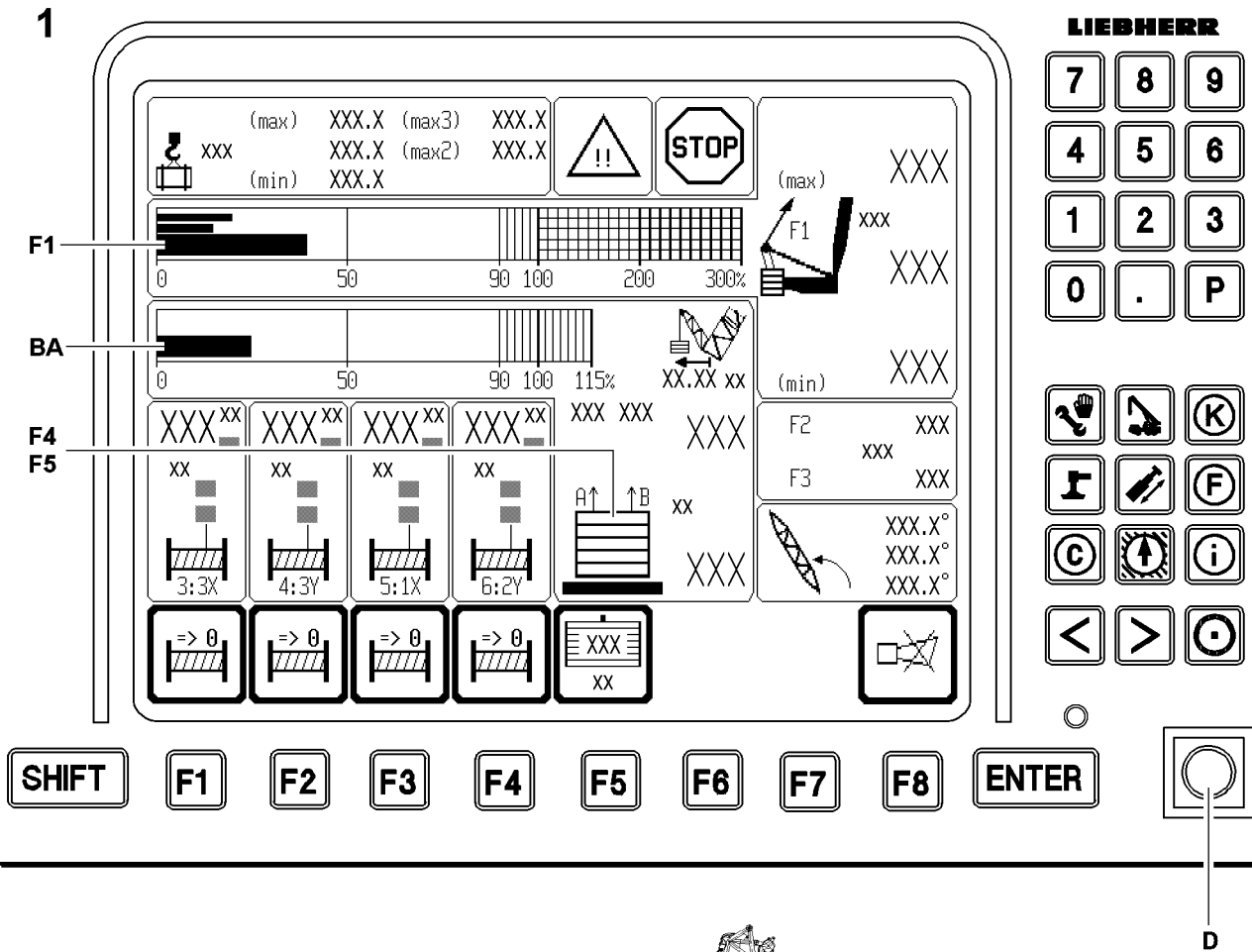


Fig.112891

4.4 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.

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 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.

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 laying 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 must be carefully monitored on the LICCON monitor.
- ▶ Potentially occurring error messages must be observed.



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.

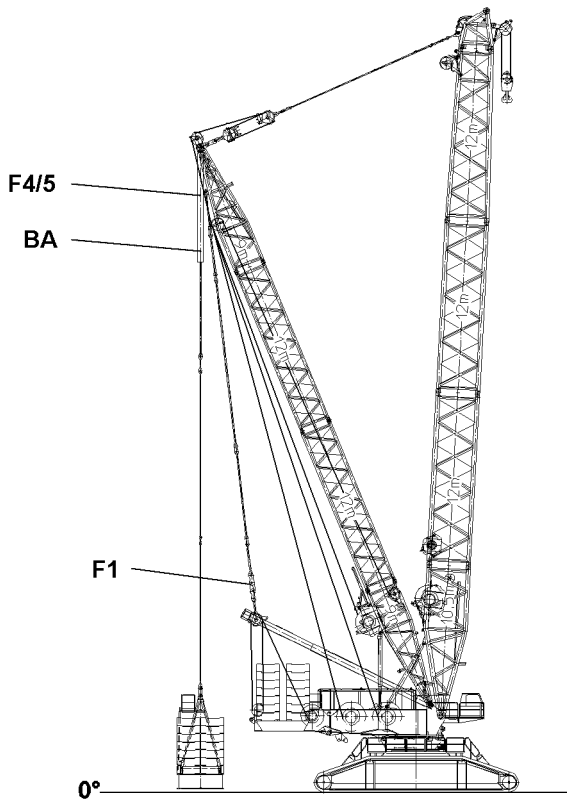
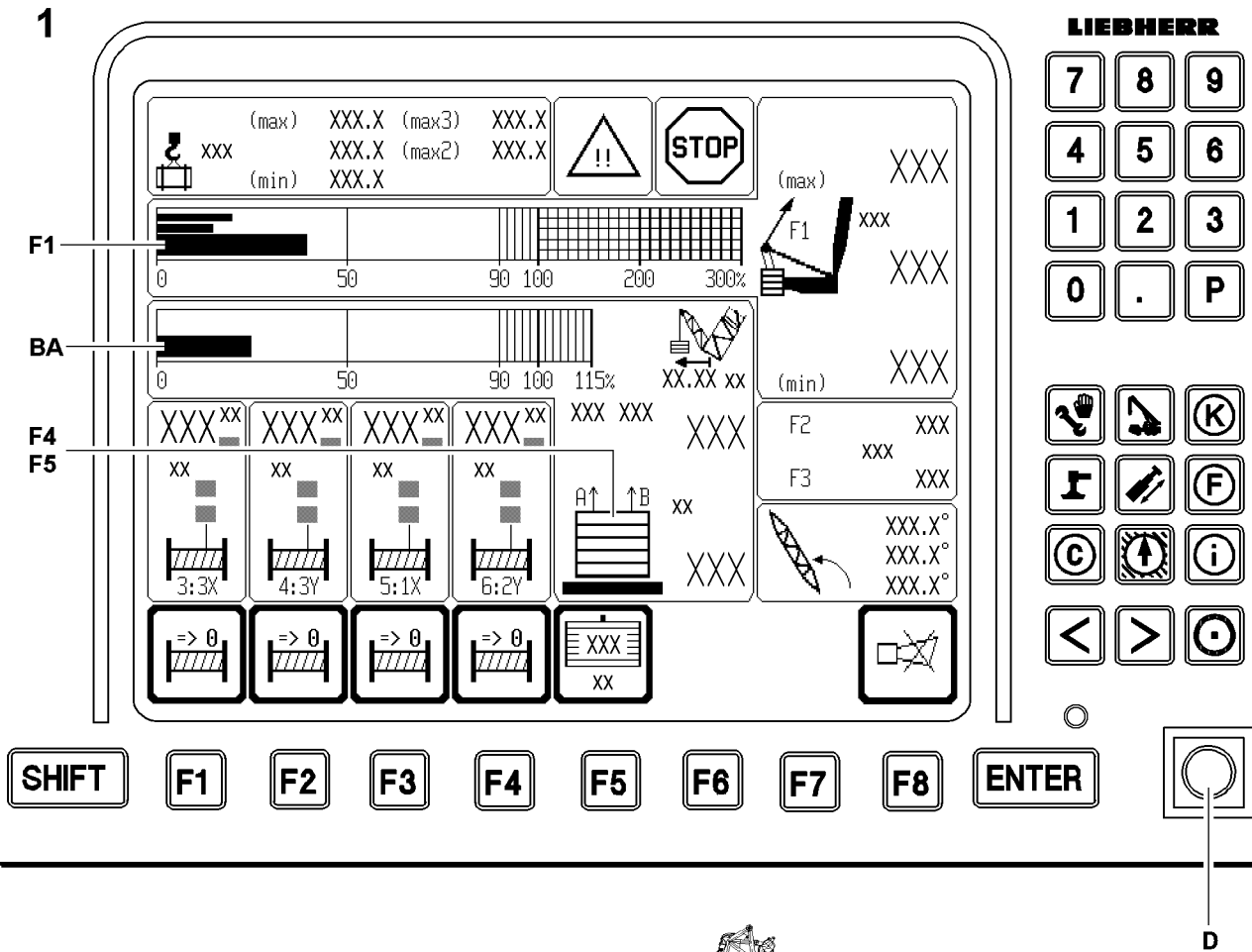


Fig.112891

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 $F1_{\min}$ (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 slack tension 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), then all crane **movements that increase the load torque** and all **crane movements that decrease the load torque** are turned off. This also turns the „spooling out“ movement of the winch off.



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 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 move backwards. As a result, the relapse cylinders can be pressed on block and be overloaded. There is the danger that the relapse cylinders on the boom and D-boom will be 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 activating the assembly operation, the test point 1 - minimum force ($F1_{\min}$) is reduced by a few tons, this allows one to reverse the movement 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 in assembly operation.



DANGER

Danger of accident!

If the LICCON overload protection is exceeded, 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 his actions if the LICCON overload protection is exceeded.

After shut off via $F1_{\min}$ the force $F1$ on test point 1 must be increased by a movement. If the derrick ballast is suspended, this can be achieved by setting down the ballast.

If the assembly operation is already activated and the $F1$ -force continues to drop below the minimum force $F1_{\min}$ which was reduced in assembly operation, then the $F1_{\min}$ shut off can no longer be bypassed.

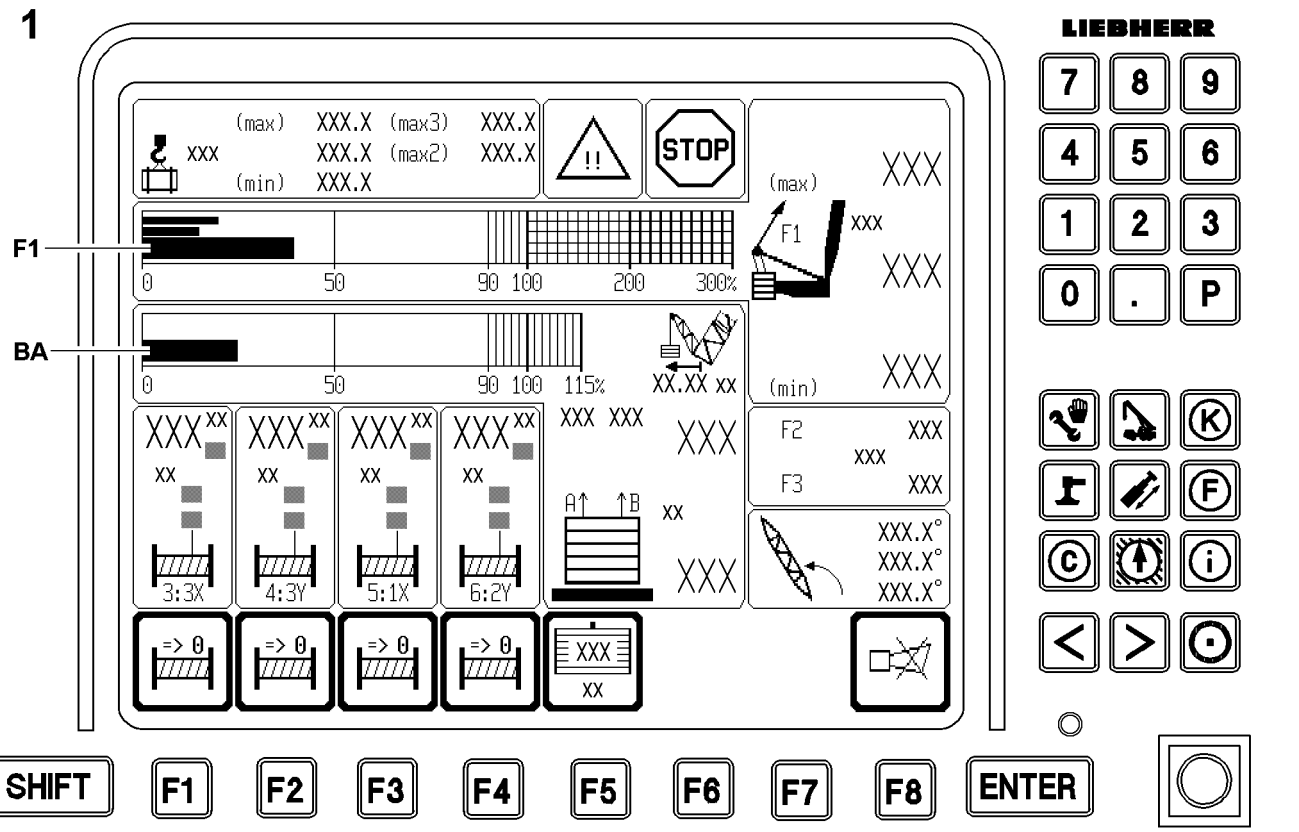
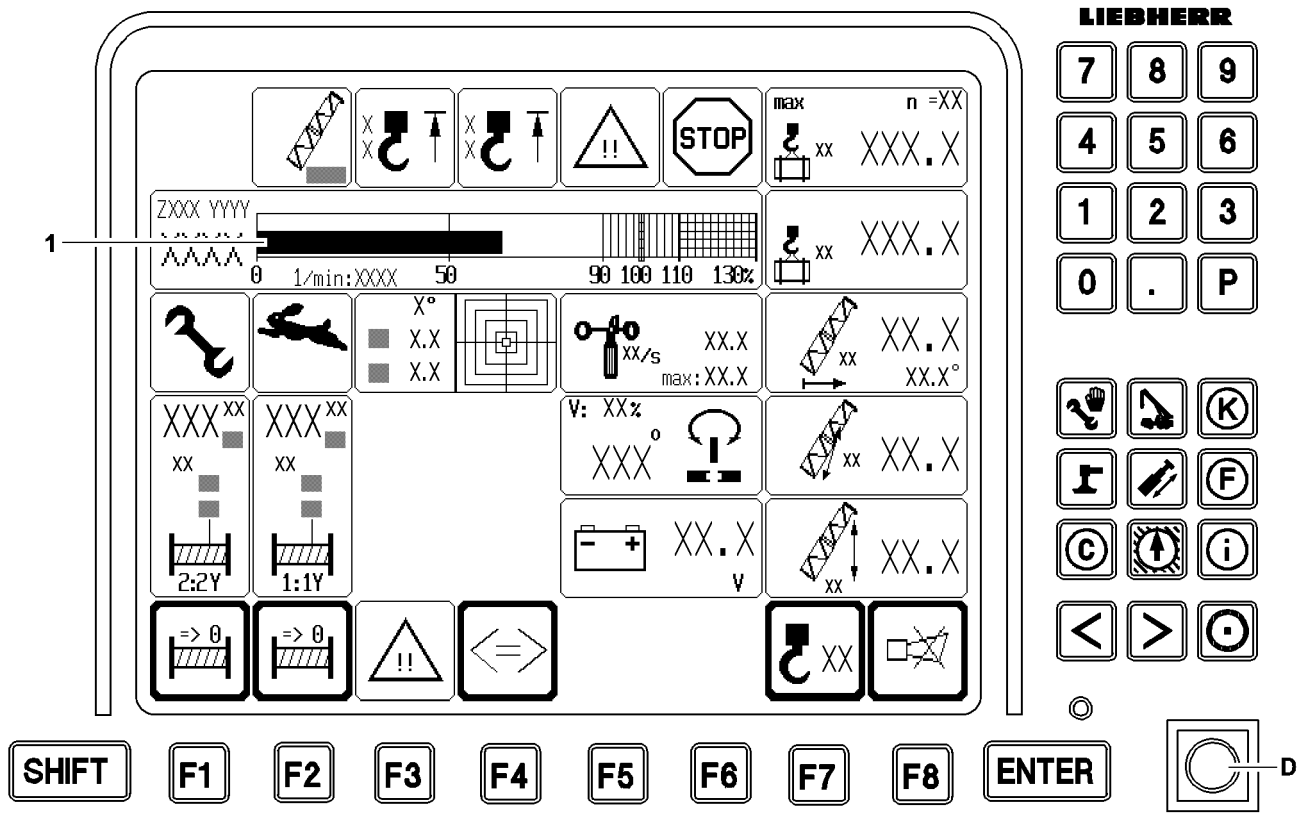


Fig.112890

LWE/LR 11350-007/19005-01-02/en

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 torque 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“.

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 $F1_{max-shut\ off\ value}$ 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 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“ greater than 100 percent) $F1_{actual}$ 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 $F1_{actual} / F1_{max}$ greater than 100 %. Shut off will only occur at $F1_{actual} / F1_{max\ operation\ shut\ off\ value}$. For this crane, the following applies: $F1_{max\ operation\ shut\ off\ value} = F1_{max\ operation} + F1_{addition\ for\ shut\ off}$ (also see Crane operating instructions, chapter 4.02). The $F1_{addition\ for\ shut\ off}$ is selected such that $F1_{max\ operation\ shut\ off}$ may normally never come about. This shut off provides an additional safety, particularly in cases with „max-load“ smaller „max3-load“. For example, if the load weighing is far too low due to a sensor failure, then a load would be pulled which would be greater than the maximum permissible load without shut off of the LICCON overload protection. The crane could be overloaded. In this particular case, with the „max-load“ smaller than the „max3-load“, with $F1_{max}$ larger $F1_{max\ operation\ shut\ off\ value}$ the $F1_{max\ shut\ off}$ 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 $F1_{max\ operation\ shut\ off}$ can protect the crane from overload in certain cases.
- ▶ Make sure that the load weighing and the shut off function reliably on the maximum load.

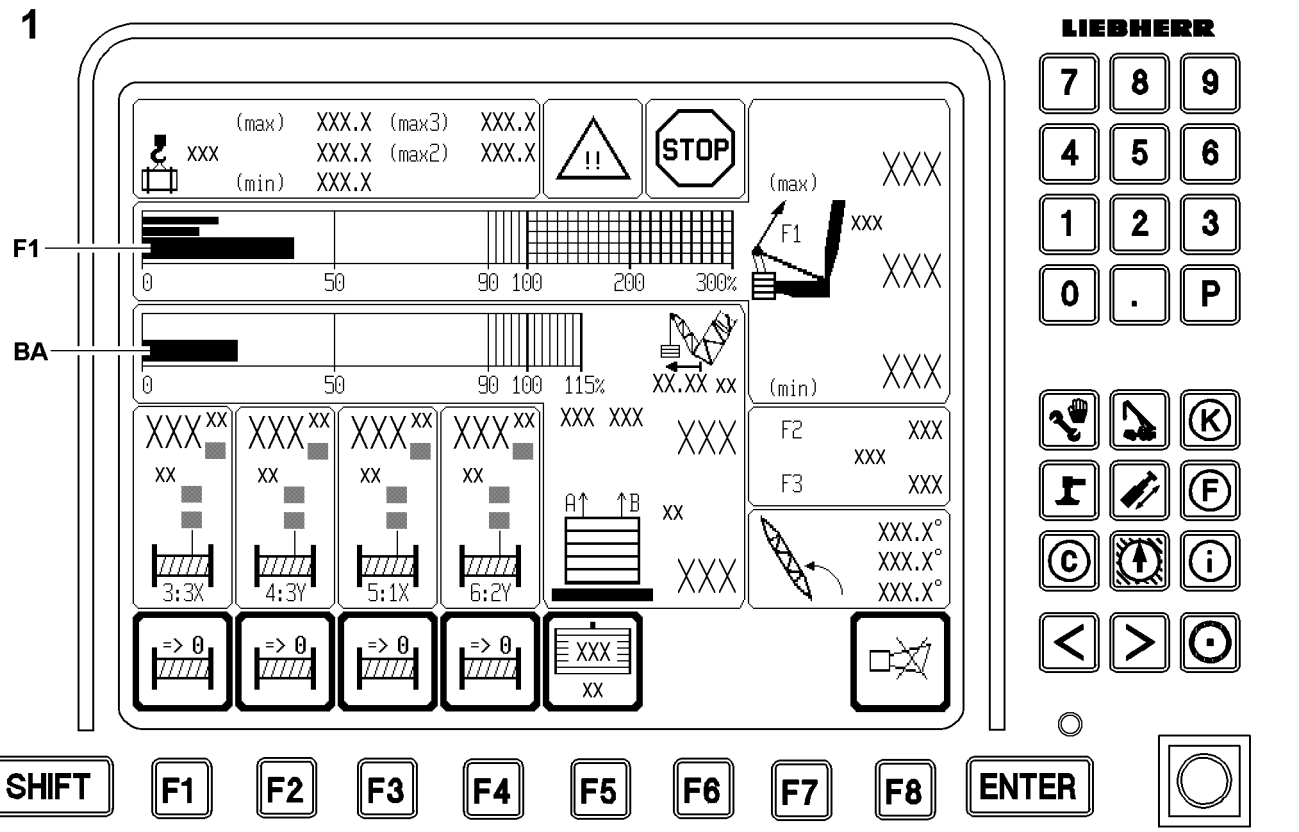
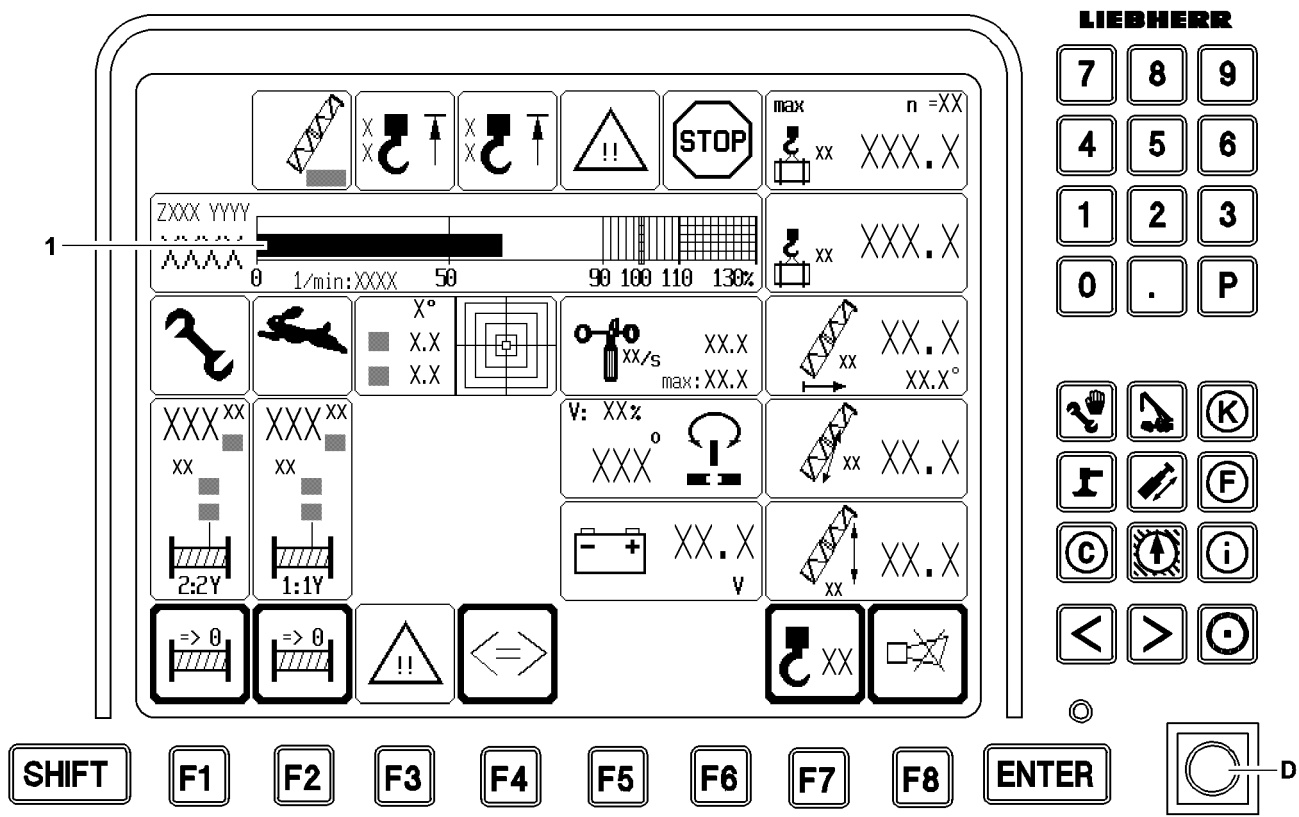


Fig.112890

LWE/LR 11350-007/19005-01-02/en

**DANGER**

The crane can topple over!

In cases with „max-load“ = „max3-load“, the $F_{1_{max}}$ -shut off value does not offer protection. The $F_{1_{max}}$ shut off value is so high that the crane will probably topple over or be damaged before the shut off value is reached.

- ▶ Carefully monitor the displays on the LICCON monitor.

**WARNING**

Danger of accident!

- ▶ The test point 1-Operation-Maximum force not only depends on the current set up configuration but also on the force measured with the pressure sensors in the pull cylinders.
- ▶ If the pulled derrick ballast is larger, then the maximum permissible $F_{1_{max}}$ force is generally reduced and vice versa.
- ▶ It is therefore important to carefully monitor the ballast weighing and the value for the pulled derrick ballast to ensure that this value is even 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.

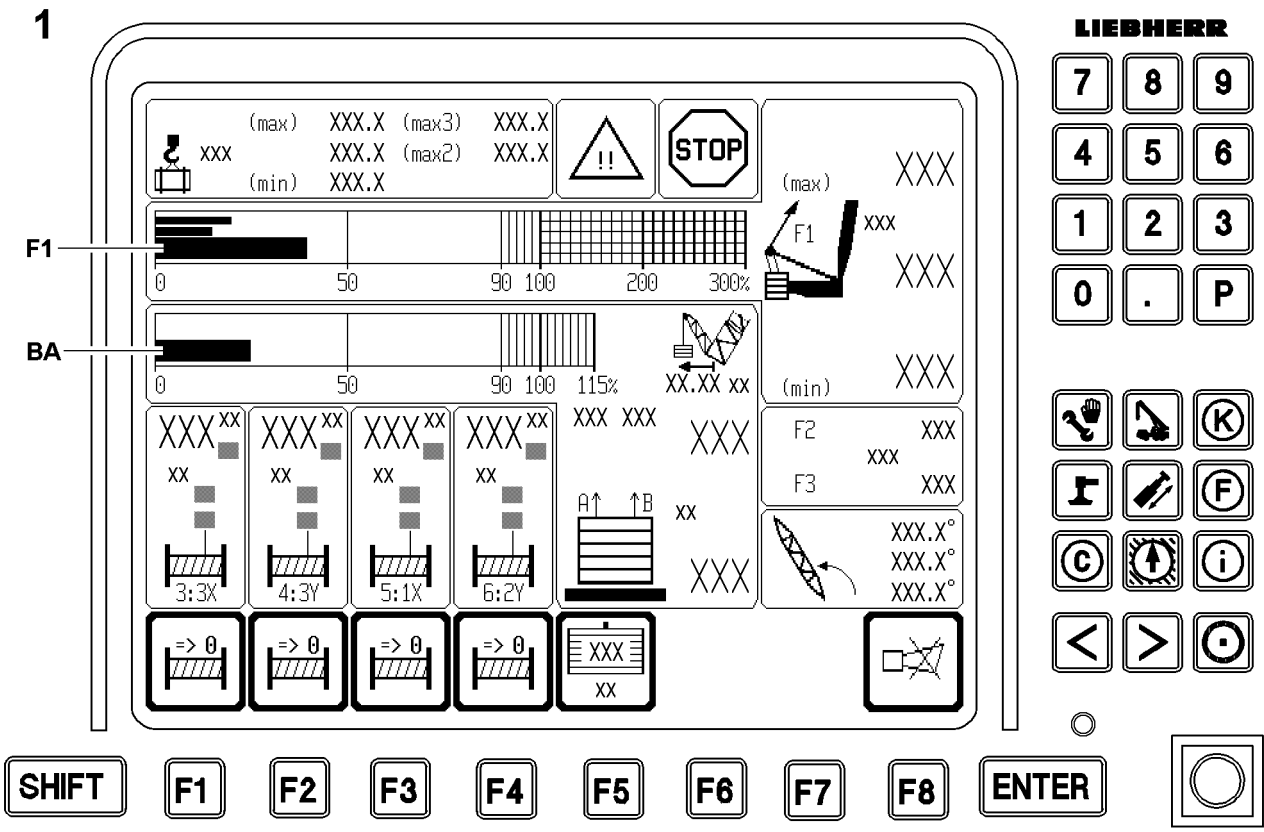
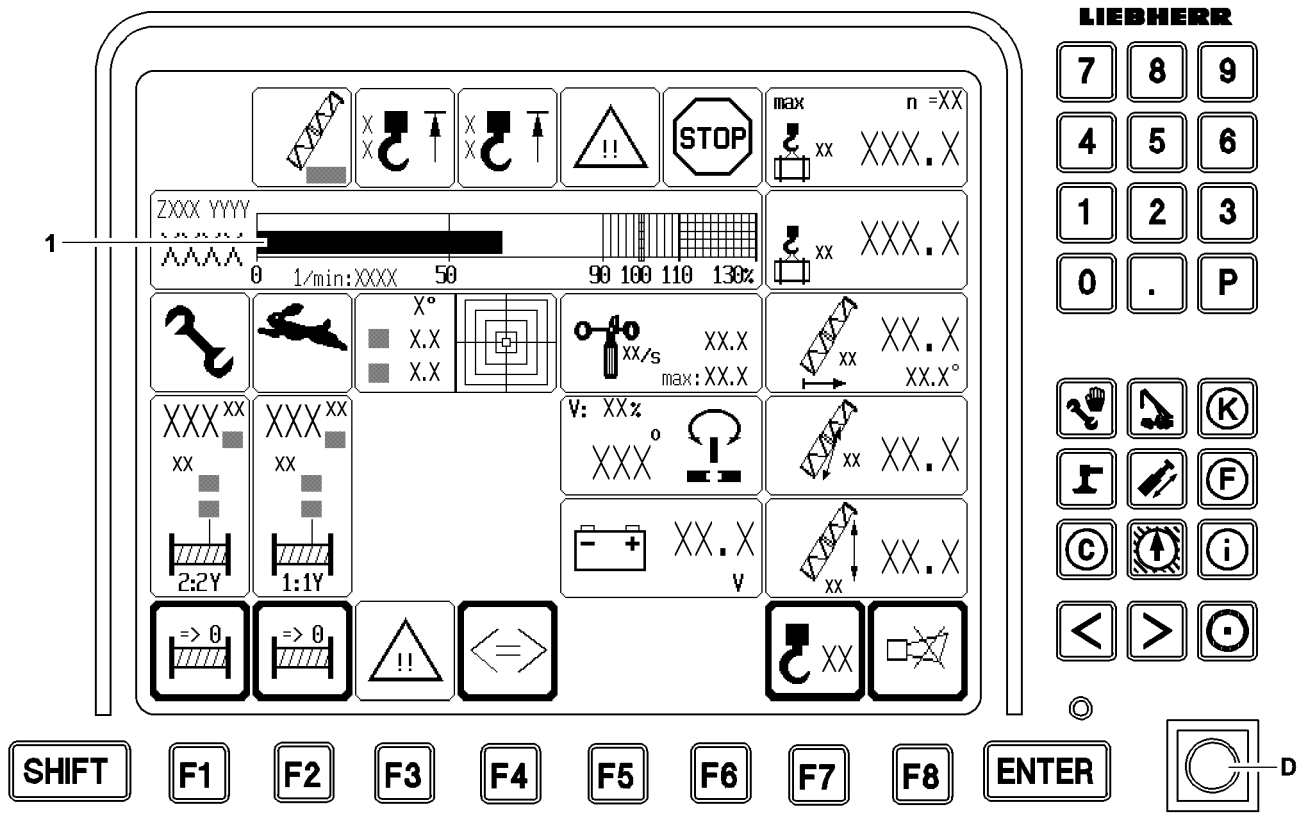


Fig.112890

LWE/LR 11350-007/19005-01-02/en

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:

- The „maximum load capacity in the current operating condition („**max-load**““ is obtained, 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 capacity of the current crane equipment“ („**max2-load**““ is obtained 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 weighing 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 capacity of the current set up configuration with optimum derrick ballast“ („**max3-load**““ is obtained 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 weighing 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 optimum 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

- ▶ 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 for:

- „Current load“ equal to „max-load“.
- „Current load“ equal to „max2-load“.

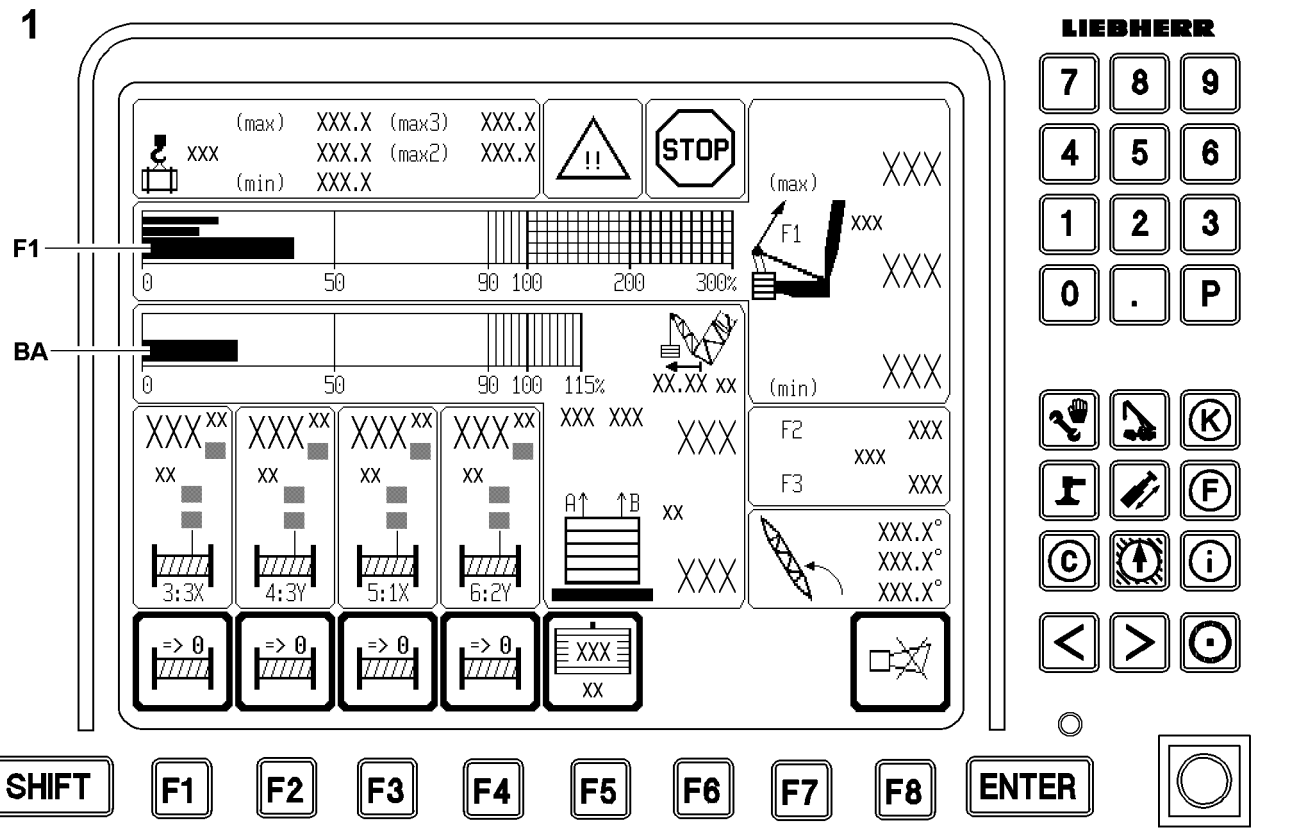
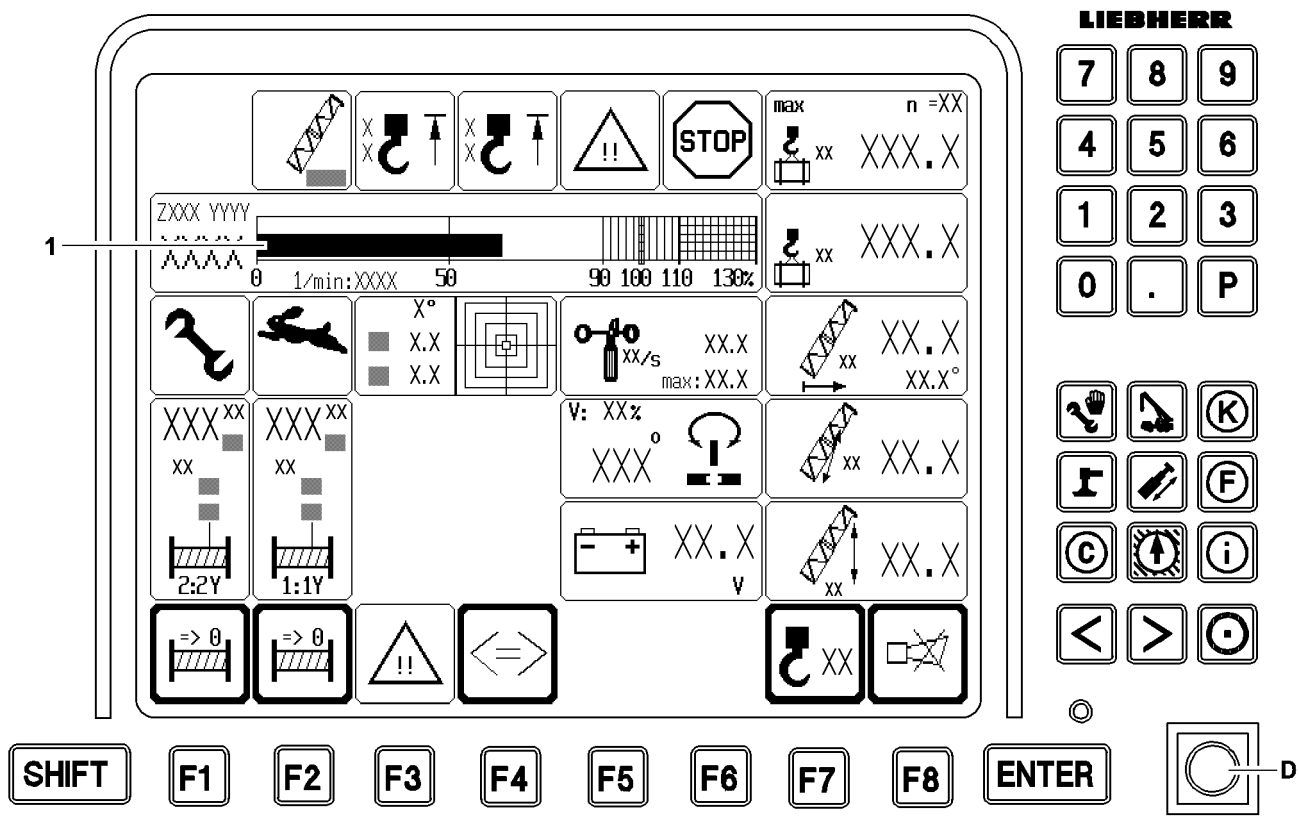


Fig.112890

LWE/LR 11350-007/19005-01-02/en

Activating assembly operation / bypass of the LICCON overload protection

- Activate assembly operation, see Crane operating instructions, chapter 4.02.

**WARNING**

The crane can topple over!

When the assembly operation is activated, 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 severely injured or killed.

This could result in high property damage.

- ▶ The assembly operation may only be actuated by persons who know the effects of a bypass.
- ▶ When the assembly operation is activated, only load torque reducing crane movements may be carried out until a permissible operating and load range.
- ▶ Actuate the assembly operation only when the set up status was correctly entered into the LICCON computer system.
- ▶ Turn the assembly operation off immediately after reaching the permissible load range.
- ▶ The crane operator alone is responsible completely for his actions during bypass of LICCON overload protection.
- ▶ Crane operation with the assembly operation turned on is strictly prohibited.

**Note**

- ▶ The movement „Derrick ballast up“ or „Derrick ballast down“ requires utmost attention by the crane operator.

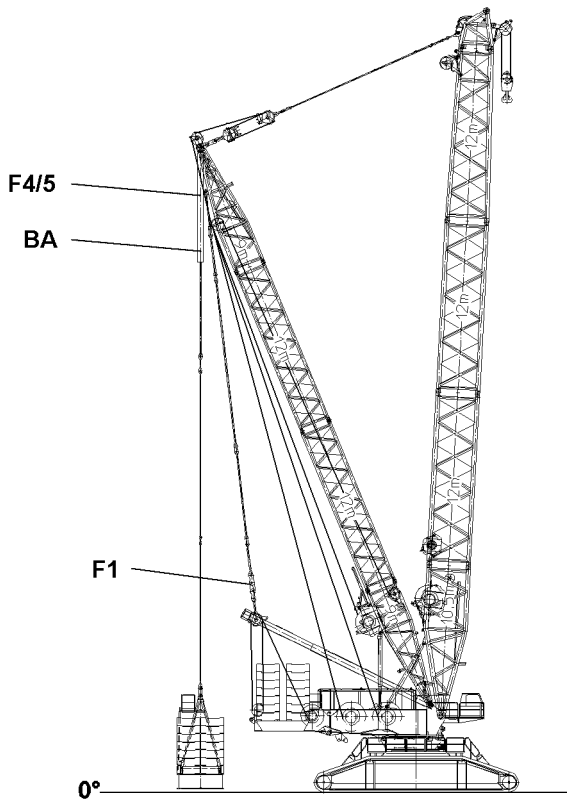
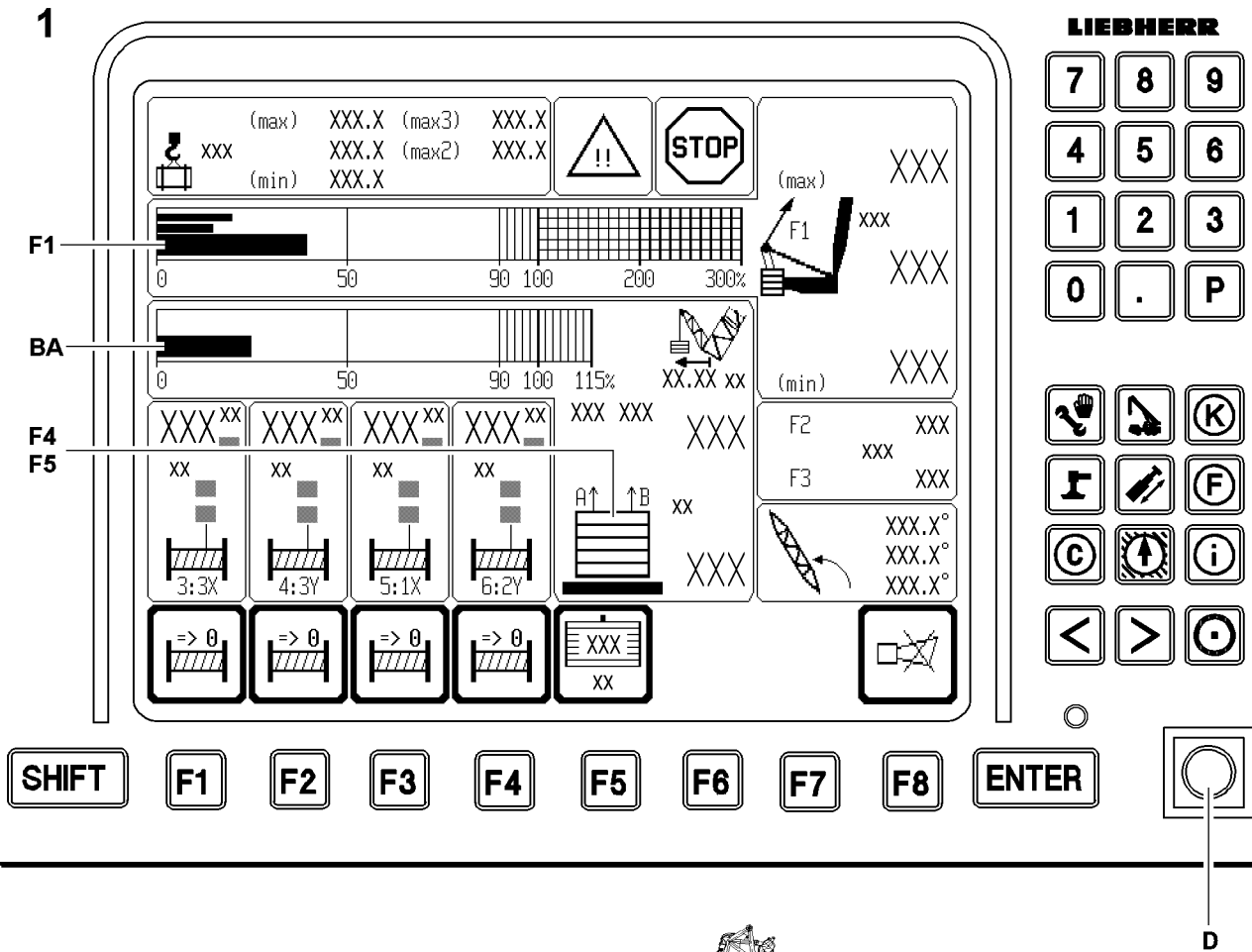


Fig.112891

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

Danger of accident!

Large differences between these forces can damage the derrick end section and other crane components.

► There is a 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 acoustic 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 one-sided.
- 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.
- The following measure is permitted only if the ground is only slightly uneven:
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.
- 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.

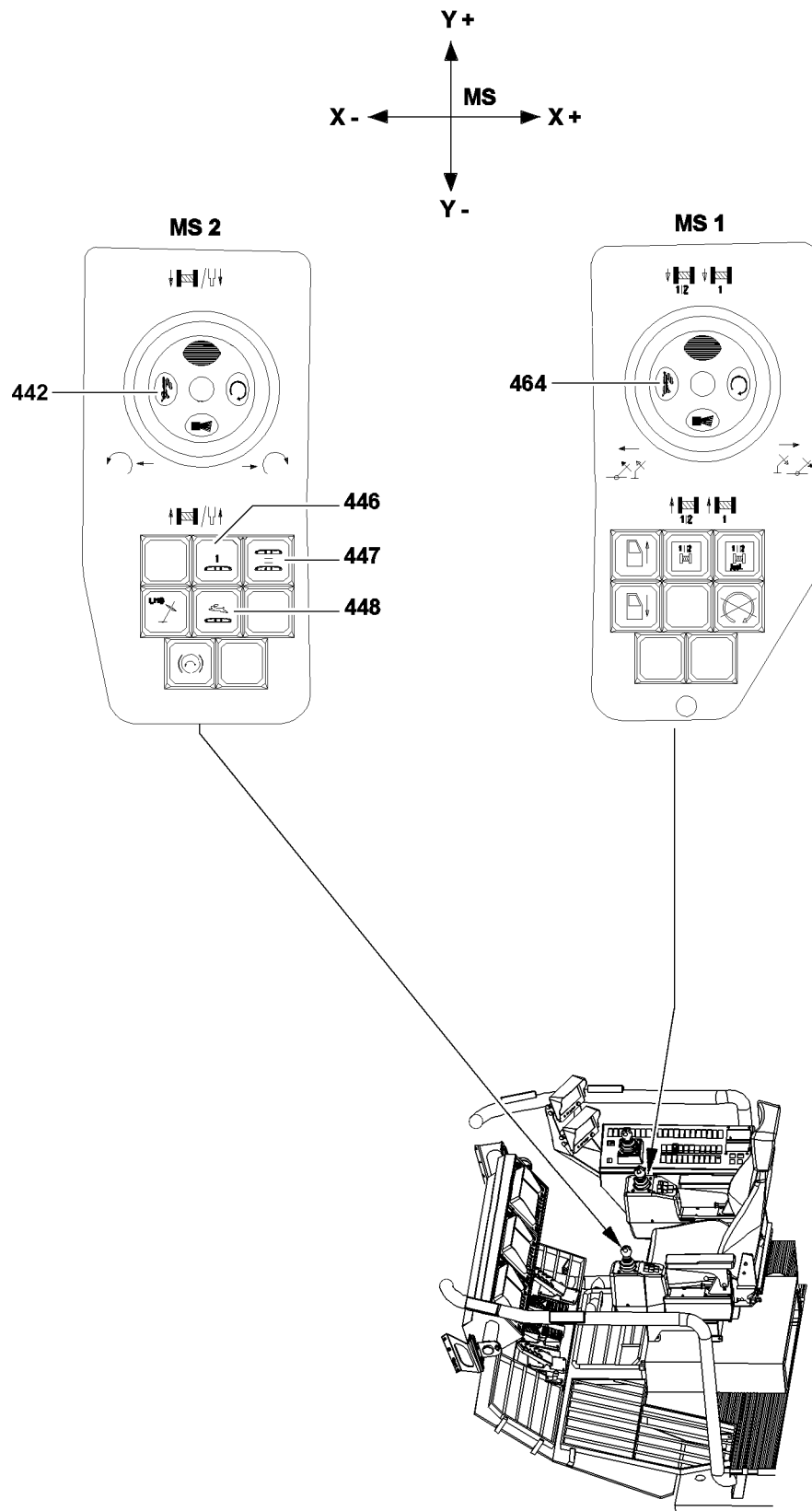


Fig.112896

LWE/LR 11350-007/19005-01-02/en

5 Crawler operation with derrick ballast

5.1 Driving the crawler

Driving with raised, suspended derrick ballast.

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The driven route is level and horizontal.
- The derrick ballast has been lifted off the ground.
- The derrick ballast icon on LICCON monitor 1 is shown in 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 the Crane operating instructions, chapter 4.10 must be observed.
- ▶ Crawler driving is released when all 4 ground contact rollers are **not in contact with the ground**.
- ▶ The crawler operation is engaged with the button **446**.



DANGER

Danger 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 travel range must 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 test point F1.
- ▶ Steering maneuvers are prohibited.
- ▶ Uphill or downhill travel is prohibited.
- ▶ If this is not observed there is a danger of accident.

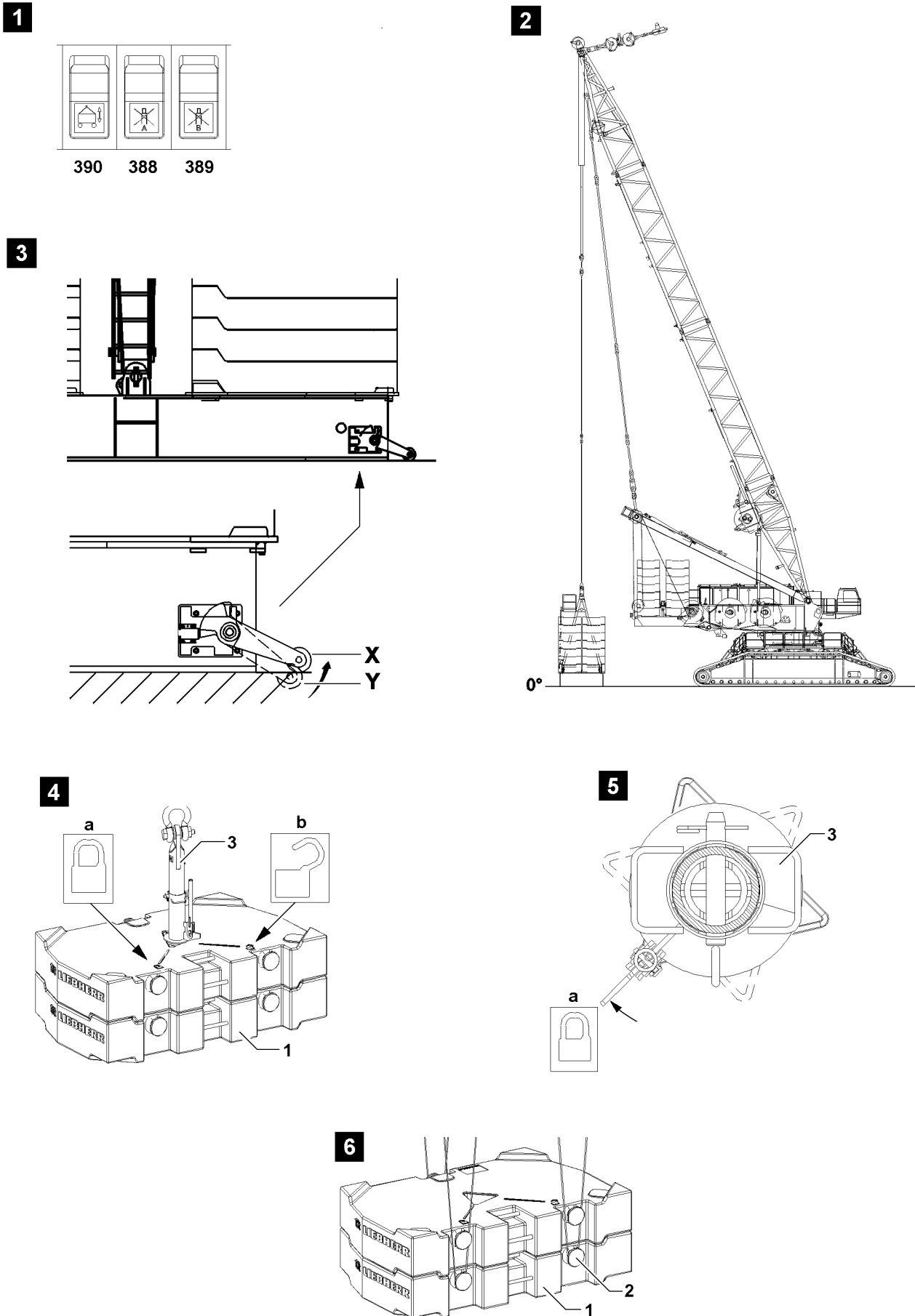


Fig.109596

LWE/LR 11350-007/19005-01-02/en

6 Disassembly

6.1 Setting down the ballast pallet



DANGER

Danger of accident!

The placement surface for the ballast pallet must be level, horizontal and of sufficient load bearing capacity, otherwise the ballast pallet can tip over.

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 LICCON monitor 1.
- ▶ It is strictly prohibited for anyone to stand under the ballast pallet or within the entire danger zone during the set down procedure.

The set down procedure of the ballast pallet is identical for both derrick ballast variations - regardless of **with** or **without** 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.

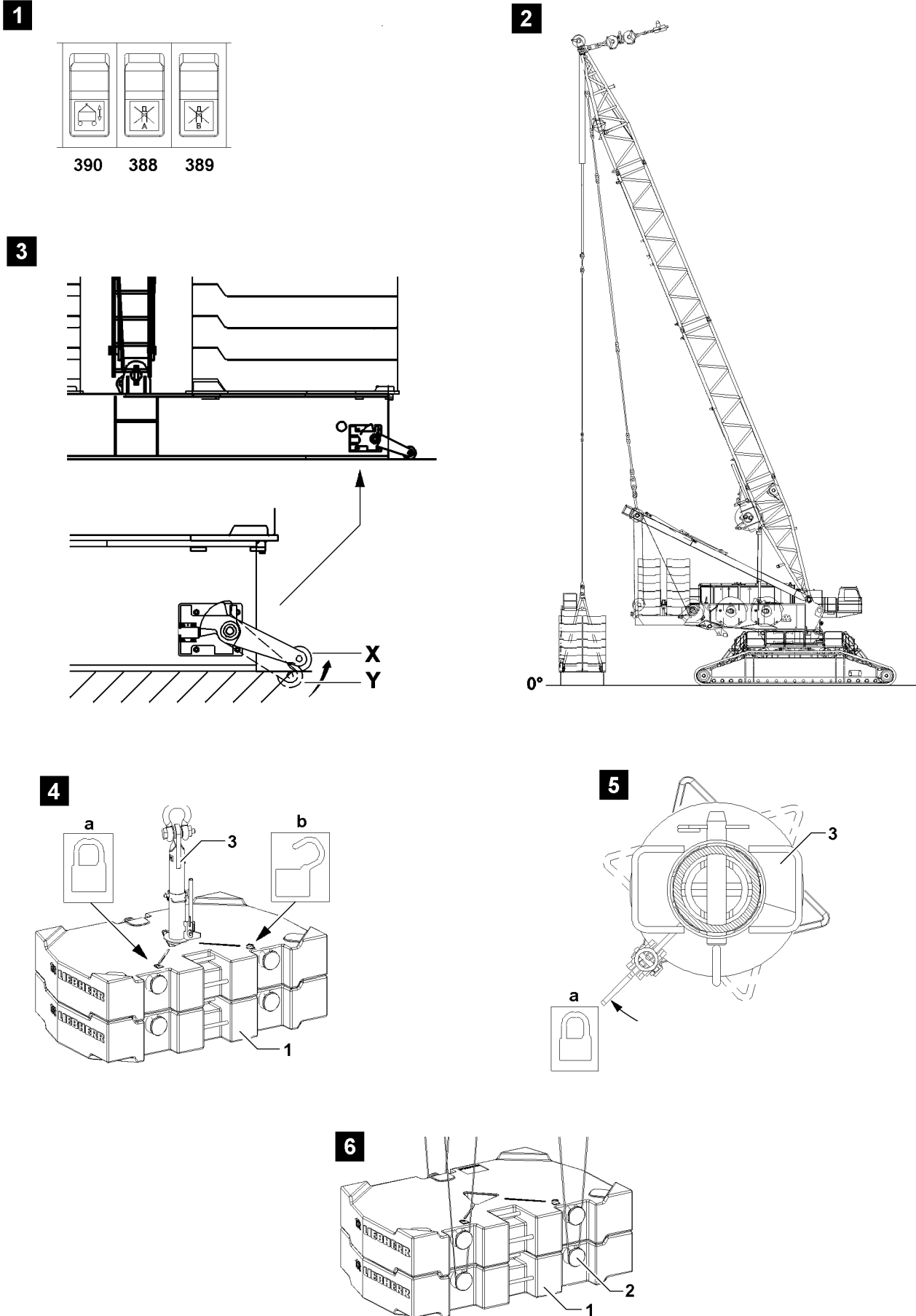


Fig.109596

LWE/LR 11350-007/19005-01-02/en

6.2 Removing the ballast plates



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 **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.

Make sure 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.

6.3 Disconnecting the electrical connections



Note

- ▶ Disconnect the electrical connections from the suspended ballast to the turntable.
- ▶ Disconnect all electrical connections from the suspended ballast to the turntable and store the plug and cable properly.

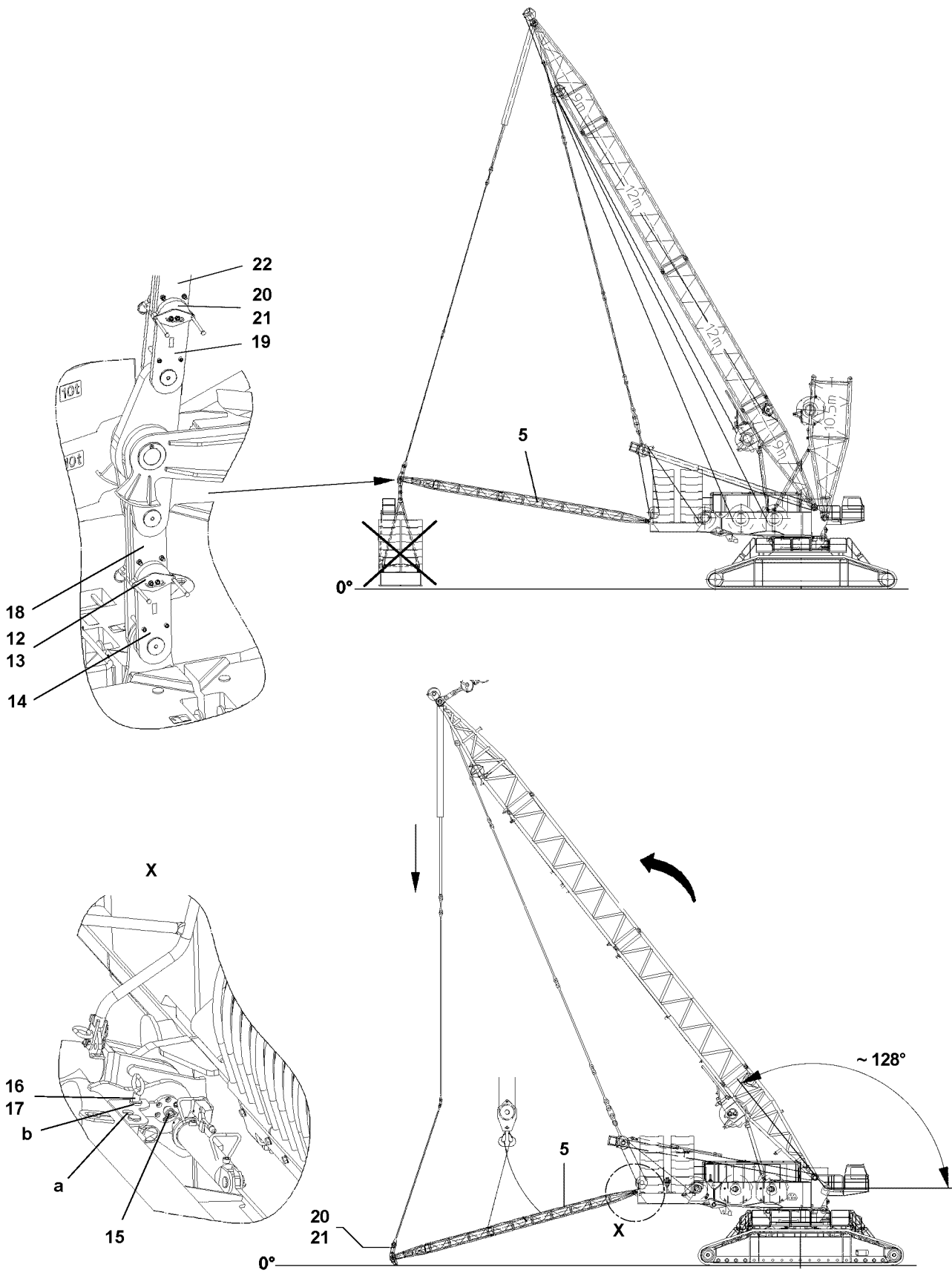


Fig.104151

LWE/LR 11350-007/19005-01-02/en

6.4 Disassembly of the derrick ballast guide

Make sure that the following prerequisites are met:

- The electrical connections from the suspended ballast to the turntable are disconnected and properly stored.
- The guide is still pinned and secured to the derrick guying and erection racks.



DANGER

Danger of accident at disassembly of the guying!

Before unpinning the guide from the erection racks, secure the erection racks using the 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 down erection racks“.

- ▶ Remove the ballast pallet or swing the turntable.
- ▶ Luff down the derrick to the rear to maximum radius, the electric shut off takes place at approximately R 25.6 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

Danger of accident!

Guy rods swing away suddenly during unpinning.

- ▶ Secure the guy 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**.

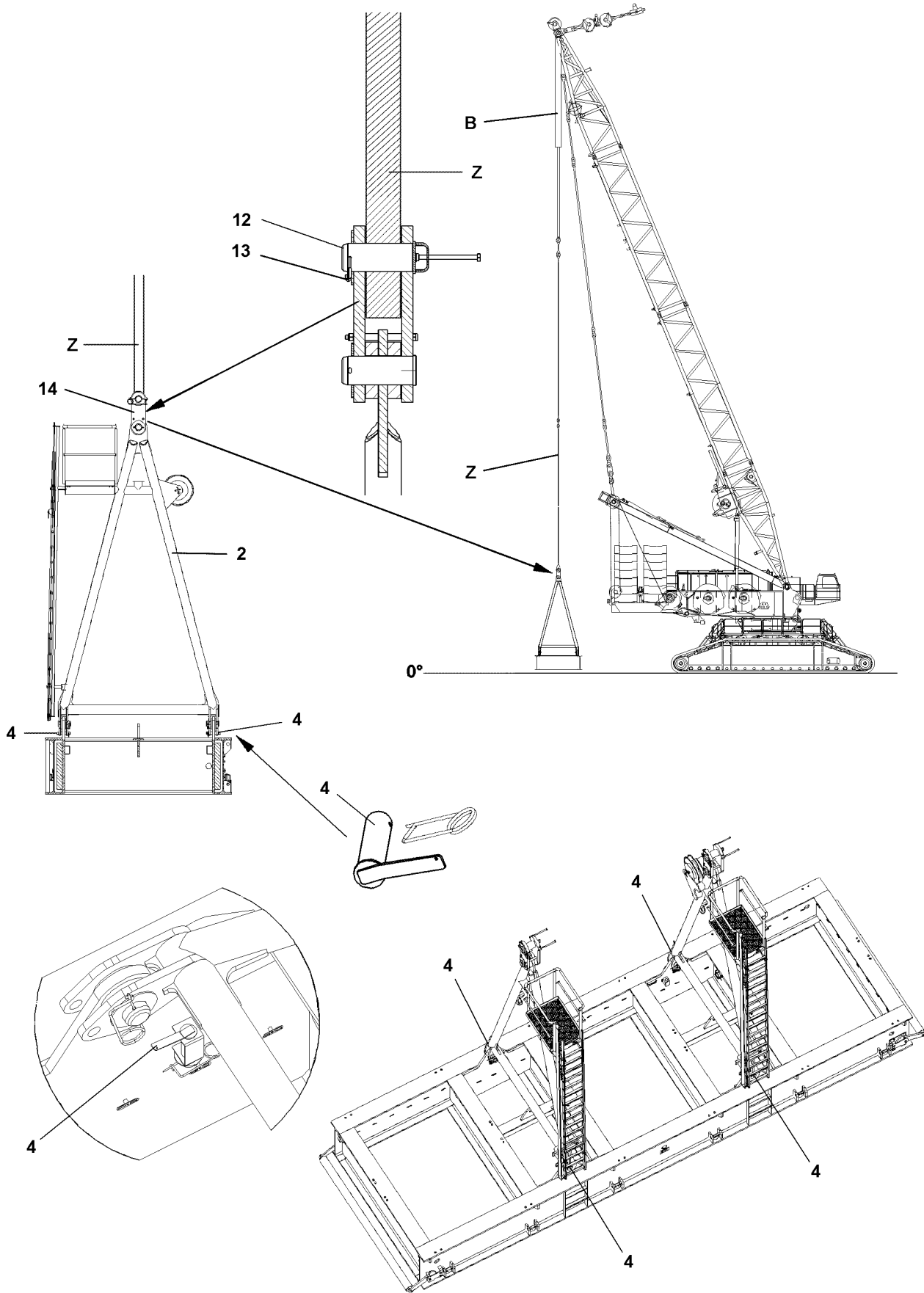


Fig.102172

LWE/LR 11350-007/19005-01-02/en

6.5 Disassembly of guy rods on ballast pallet

The description of the disassembling procedure applies only to the derrick ballast **without** guide.



DANGER

Danger of accident at disassembly of the guying!

If the erection racks are not secured with the four retaining pins before unpinning, the erection racks tip over.

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.

Make sure that the following prerequisite is met:

- The erection racks are secured with four retaining pins **4** to prevent them from tipping.

- ▶ Fasten the auxiliary crane on the erection rack.
- ▶ Unpin the guy rods **Z** on the brackets **14**.
- ▶ Remove the spring retainer **13** and unpin the pin **12**.

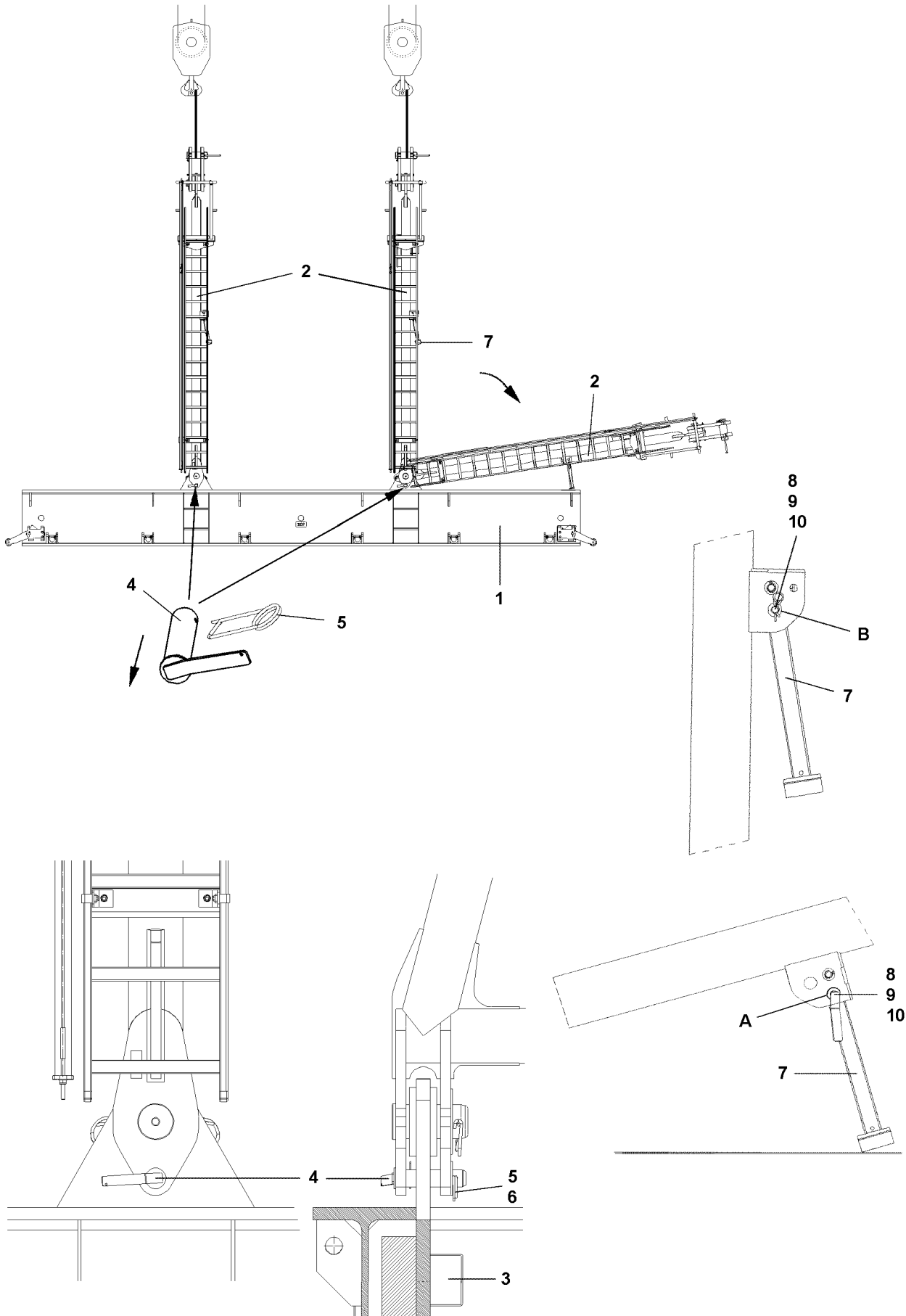


Fig.104150

LWE/LR 11350-007/19005-01-02/en

6.6 Placing down the erection racks

Make sure that the following prerequisites are 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

Danger of accidents 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 bore **B** and insert in bore **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**.

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5.38 S/SL-boom

| | | |
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| 2 | Assembling the S-boom | 9 |
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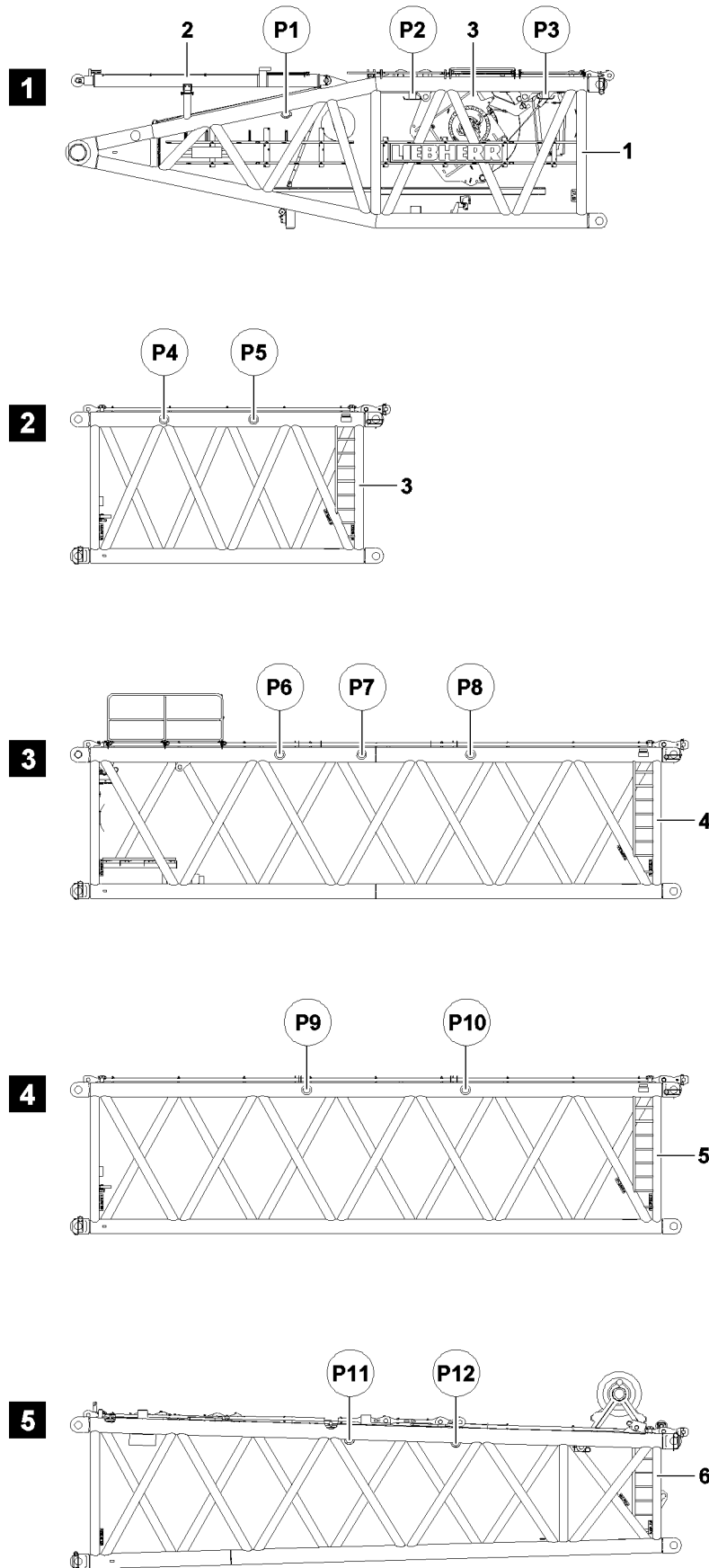


Fig.112587

LWE/LR 11350-007/19005-01-02/en

1 Components and fastening points

1.1 Components S-pivot section

| Position | Component | Weight ¹⁾ |
|----------|---------------------------------|----------------------|
| 1 | S-pivot section with winch 5 | 48.40 t |
| 2 | S-pivot section without winch 5 | 26.20 t |

1) The stated weights are approximate.

1.2 Fastening points of S-lattice sections

1.2.1 Fastening points on the S-pivot section

1 Illustration

| Fastening points | |
|------------------|--|
| P1 and P2 | for D-pivot section without winch 5 |
| P1 and P3 | for D-pivot section with winch 5 |

1.2.2 Fastening points on S-intermediate section 6 m

2 Illustration

System dimension: **3227.20** or **3227.30**

| Fastening points | |
|------------------|----------------------------|
| P4 and P5 | S-intermediate section 6 m |

1.2.3 Fastening points on S-intermediate section for winch 6

3 Illustration

System dimension: **3227.30**

| Fastening points | |
|------------------|---|
| P7 and P8 | S-intermediate section without winch 6 |
| P6 and P7 | S-intermediate section with winch 6 |

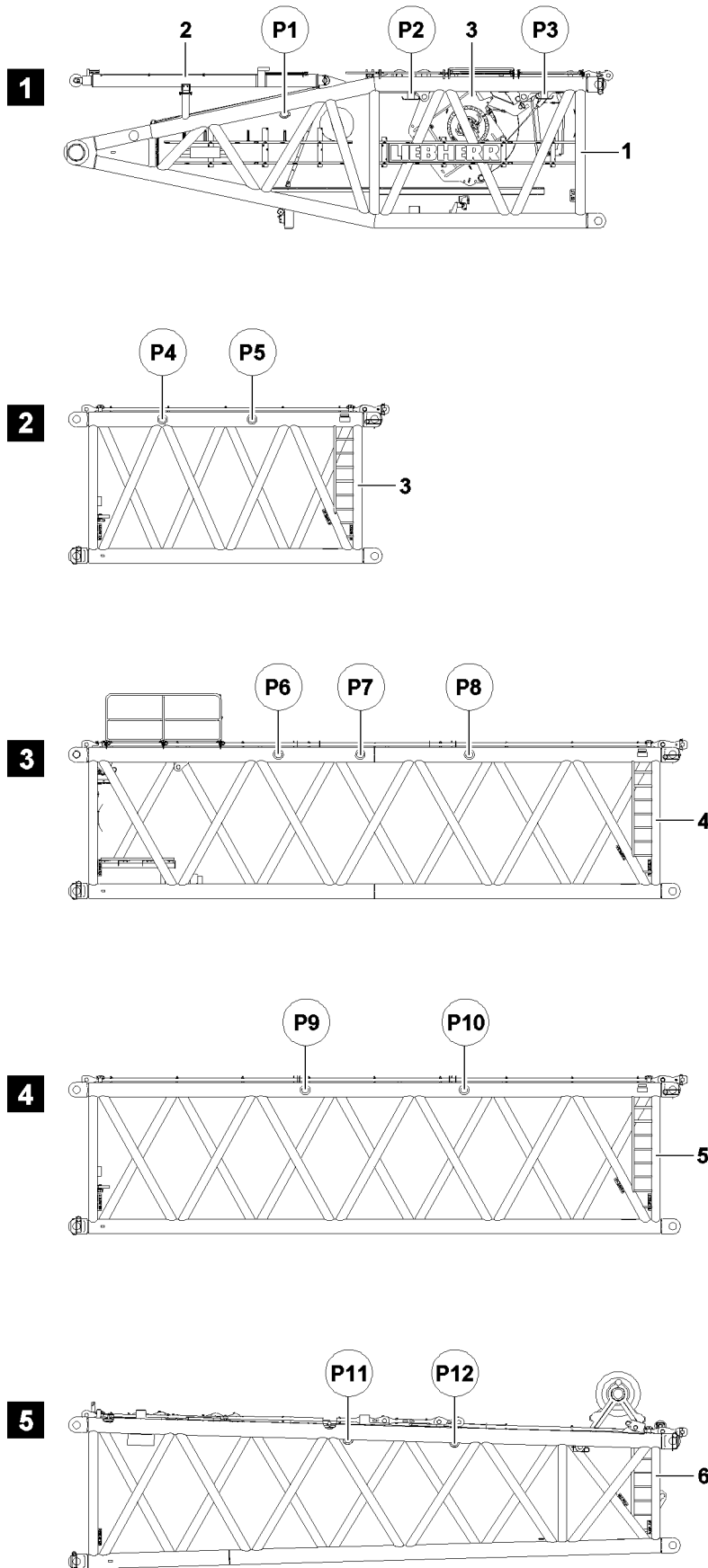


Fig.112587

1.2.4 Fastening points on S-intermediate section

4 Illustration

System dimension: **3227.20** or **3227.30**

| Fastening points | |
|------------------|------------------------|
| P9 and P10 | S-intermediate section |

1.2.5 Fastening points on S-adapter

5 Illustration

| Fastening points | |
|------------------|-----------|
| P11 and P12 | S-adapter |

W-guy rods on S-adapter

The W-guy rods are placed and secured for transport on the S-adapter. In S/SL-operation, the W-guy rods must be removed.



WARNING

Falling W-guy rods!

If the W-guy rods are not removed on the S-adapter, then they can fall down in S/SL-operation!

Personnel can be killed or severely injured!

► Remove the W-guy rods on both sides!

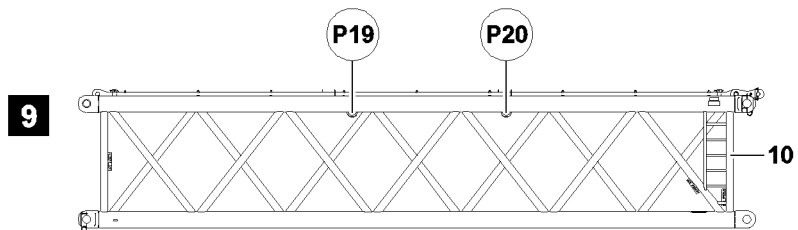
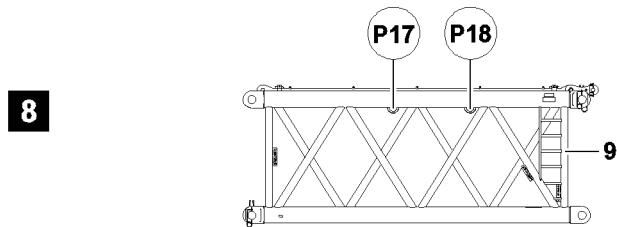
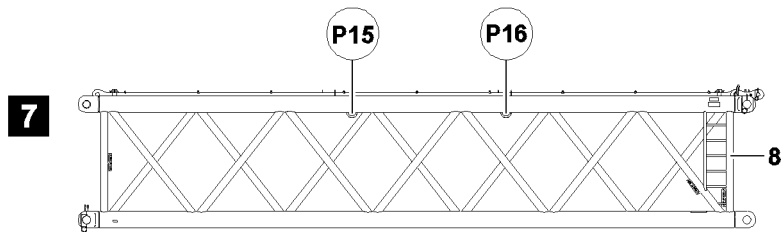
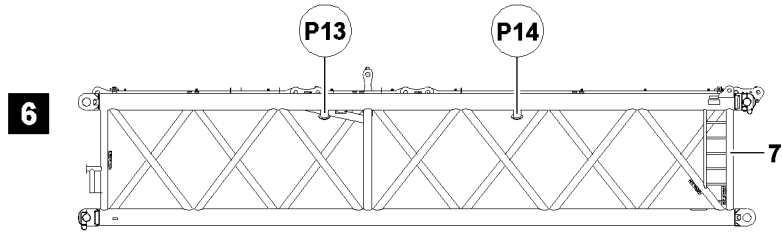


Fig.112884

1.3 Fastening points of Li-lattice sections

1.3.1 Fastening points on Li-intermediate section 12 m

6 Illustration

System dimension: **2621.20**

| Fastening points | |
|------------------|------------------------------|
| P13 and P14 | Li-intermediate section 12 m |

1.3.2 Fastening points on Li-intermediate section 12 m

7 Illustration

System dimension: **2621.10**

| Fastening points | |
|------------------|------------------------------|
| P15 and P16 | Li-intermediate section 12 m |

1.3.3 Fastening points on Li-intermediate section 6 m

8 Illustration

System dimension: **2621.10**

| Fastening points | |
|------------------|-----------------------------|
| P17 and P18 | Li-intermediate section 6 m |

1.3.4 Fastening points on Li-intermediate section 12 m

9 Illustration

System dimension: **2621.08**

| Fastening points | |
|------------------|------------------------------|
| P19 and P20 | Li-intermediate section 12 m |

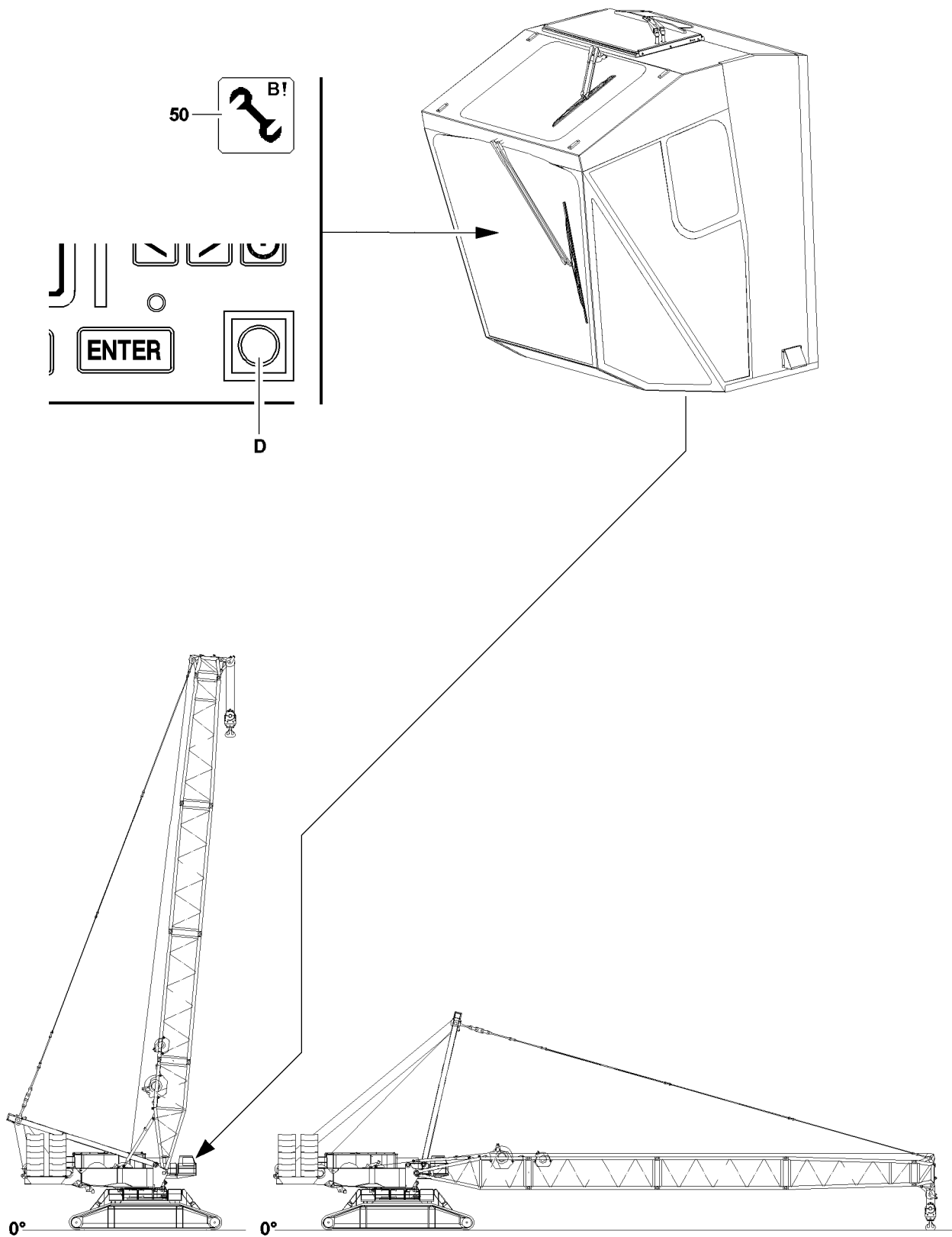


Fig.112882

2 Assembling the S-boom



Note

- ▶ The assembly is described on the example of the S-boom.



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!



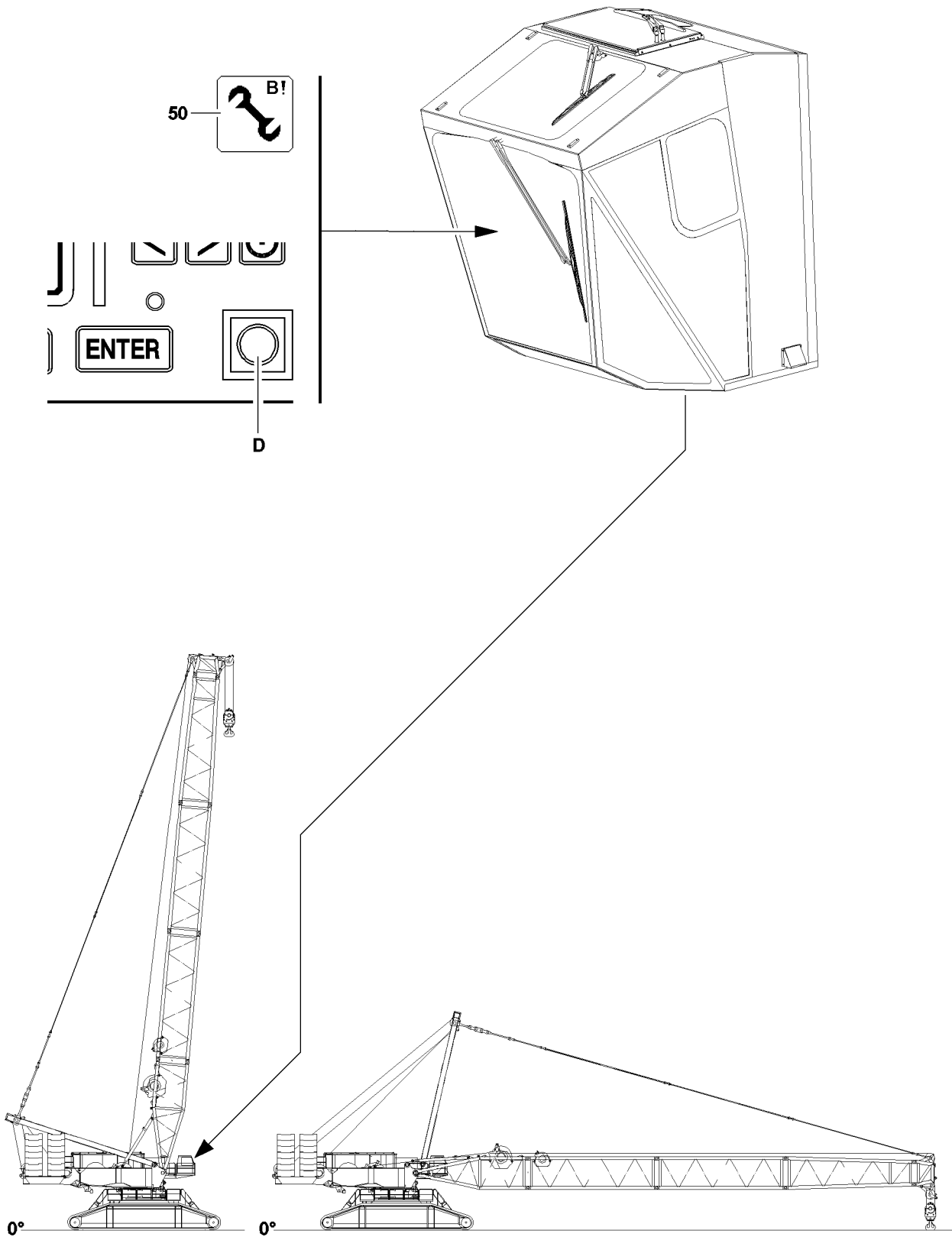
WARNING

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!



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Fig.112882

**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!

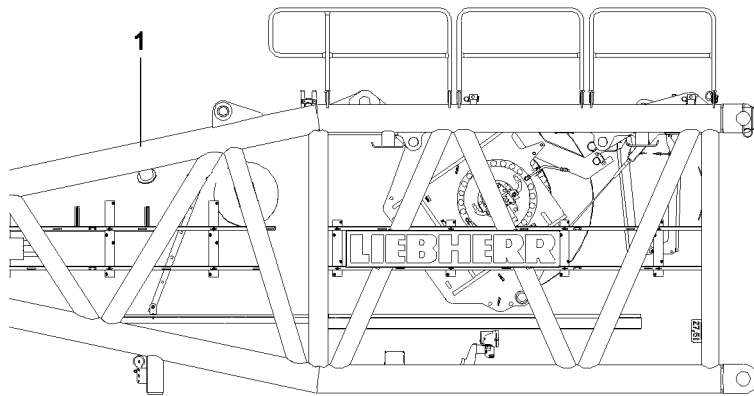


Fig.112776

2.1 Assembling the railing on the S-pivot section



WARNING

Risk 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 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!

- ▶ Assemble the railings properly.

2.2 Assembling the catwalk / assembly platform on the S-pivot section



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: Assemble the catwalk!
- ▶ The catwalk may only be accessed when it is pinned and secured in operating position, check visually!



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.

2.2.1 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!

2.2.2 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!

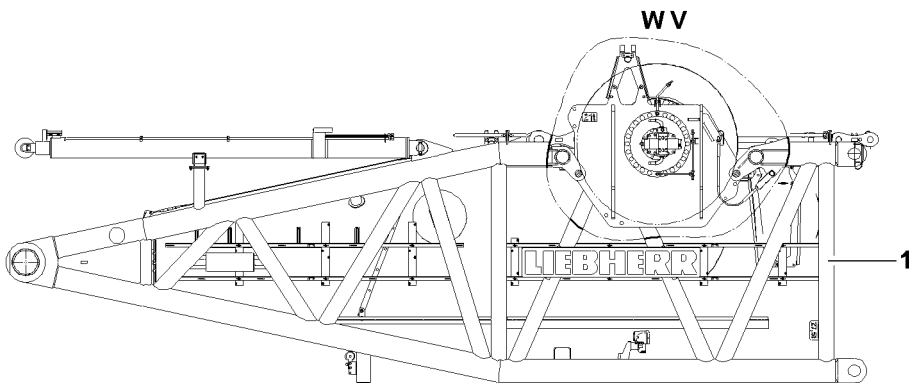
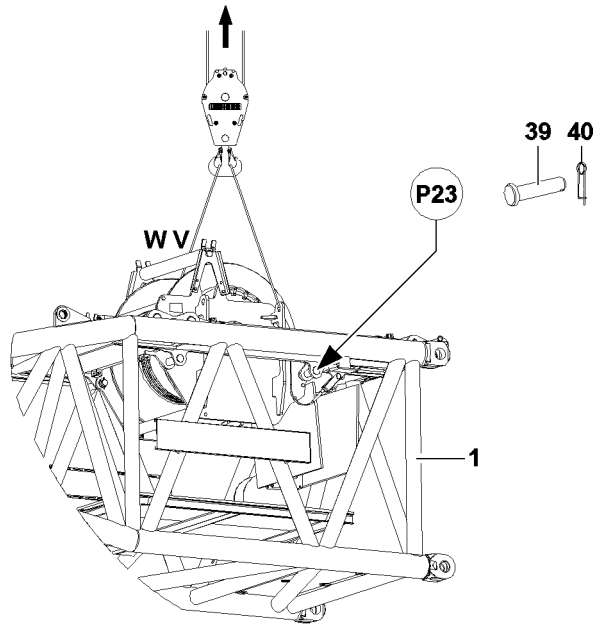
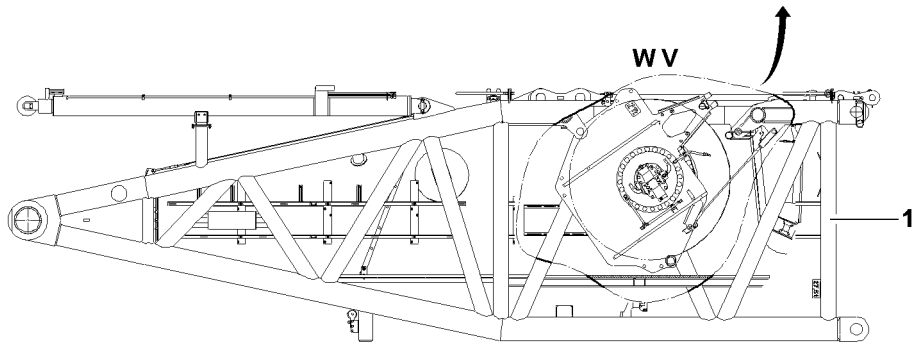


Fig.112777

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2.3 Assembling winch 5 on the S-pivot section

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** at point **P23** with pin **39** and secure with spring retainer **40**.

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 to winch 5 **W V**.
- ▶ Establish the hydraulic connections to winch 5 **W V**.

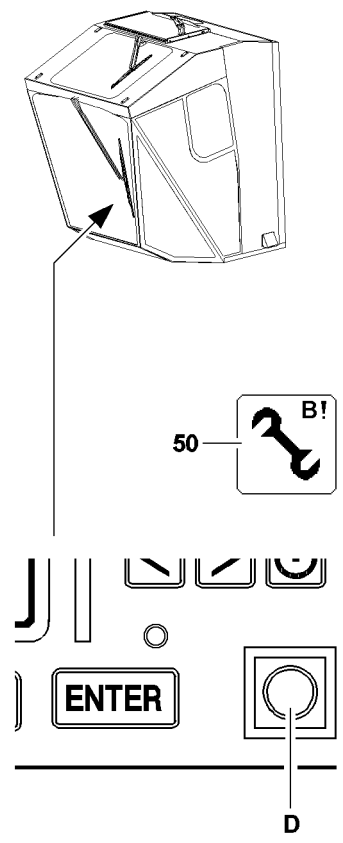
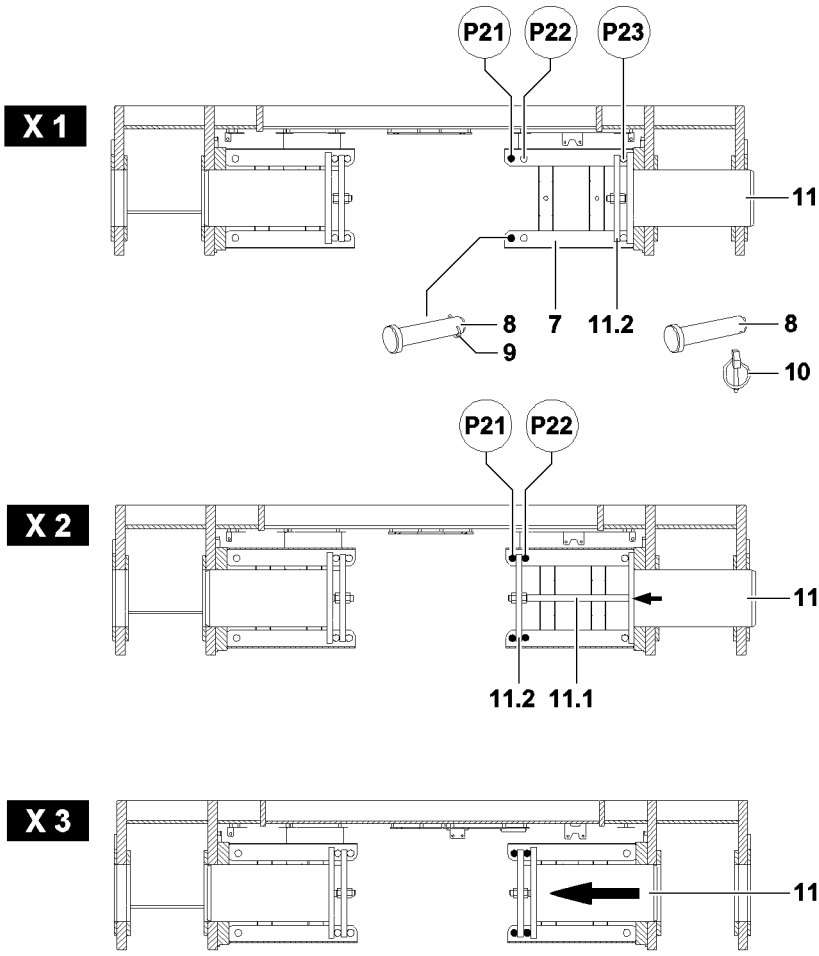
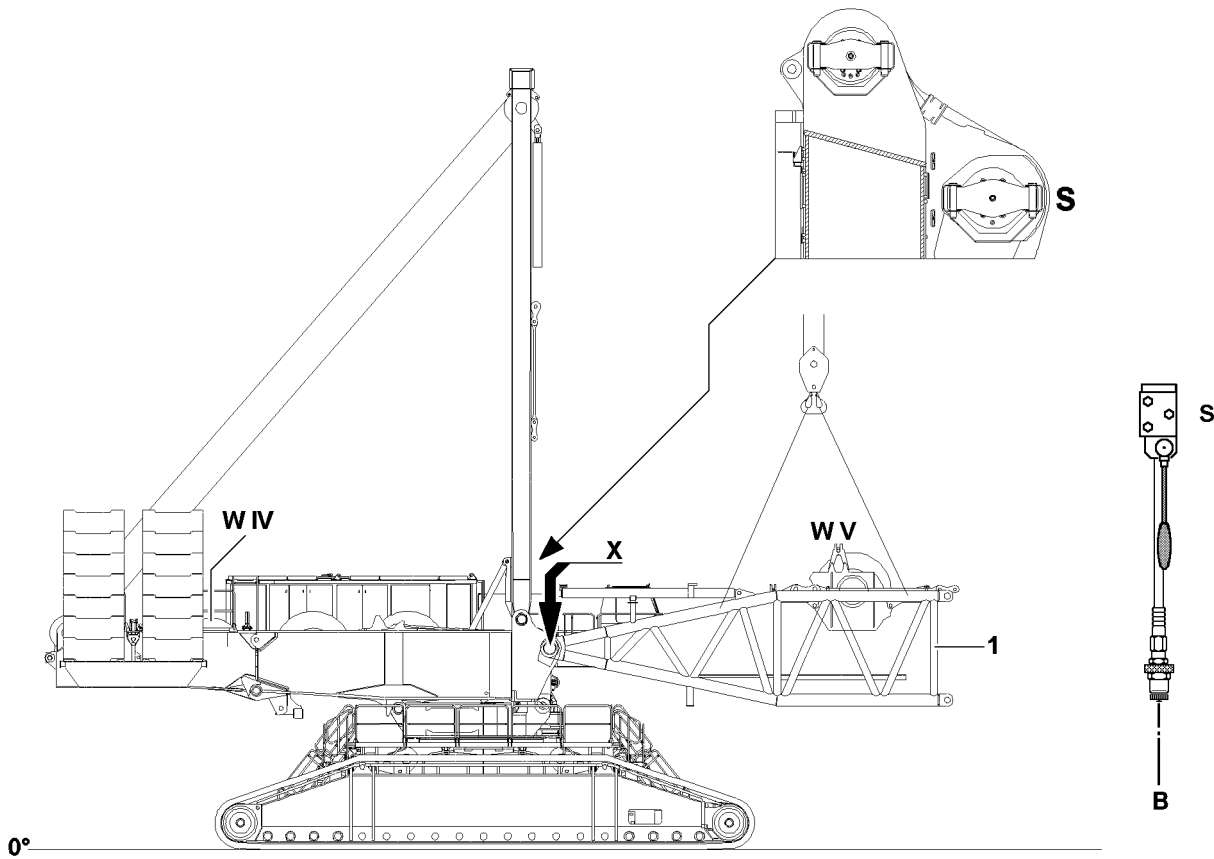


Fig.112883

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2.4 Assembling the S-boom



Note

- ▶ For arrangement of intermediate sections of boom system, see Crane operating instructions, chapter 5.03!!

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- An auxiliary crane is available.
- An assembly scaffolding / work platform is available.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.

2.4.1 Turning the turntable into assembly position



WARNING

The crane can tip over!

If the specifications in the erection and take down charts as well as in the load charts are not observed, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side before installation!
- ▶ Make sure that the specifications in the erection and take down charts are observed!



Note

- ▶ If the turntable is turned to the side for the assembly of the boom, then boom and lattice sections must be supported, depending on the ground condition!

- ▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side.

2.4.2 Exceeding the LICCON overload protection for assembly



WARNING

Assembly with turned on set up key!

When the set up key 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 severely injured or killed!

This could result in high property damage!

- ▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
- ▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with the set up key **D** turned on is strictly prohibited!

- ▶ Turn the set up key **D** to the right.

Result:

- The LICCON overload protection is exceeded.
- The assembly icon **50** appears in the LICCON monitor.

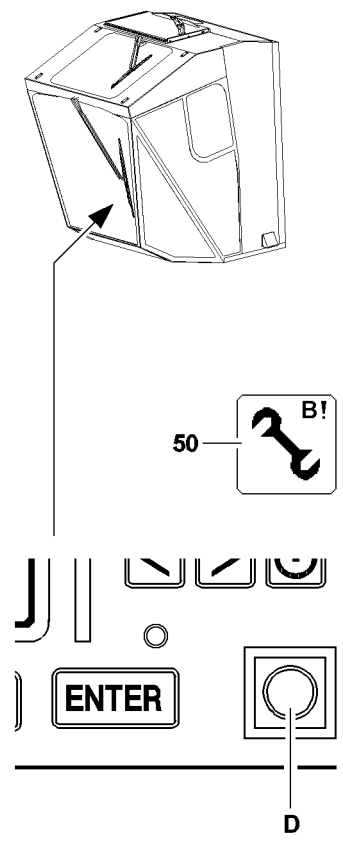
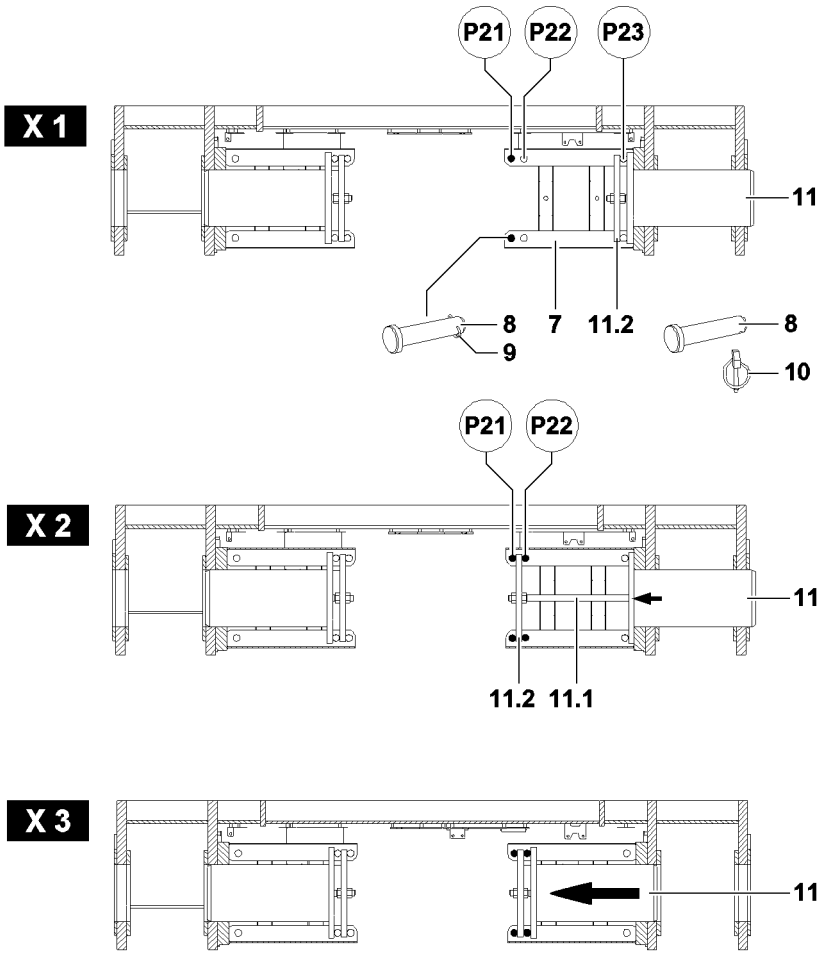
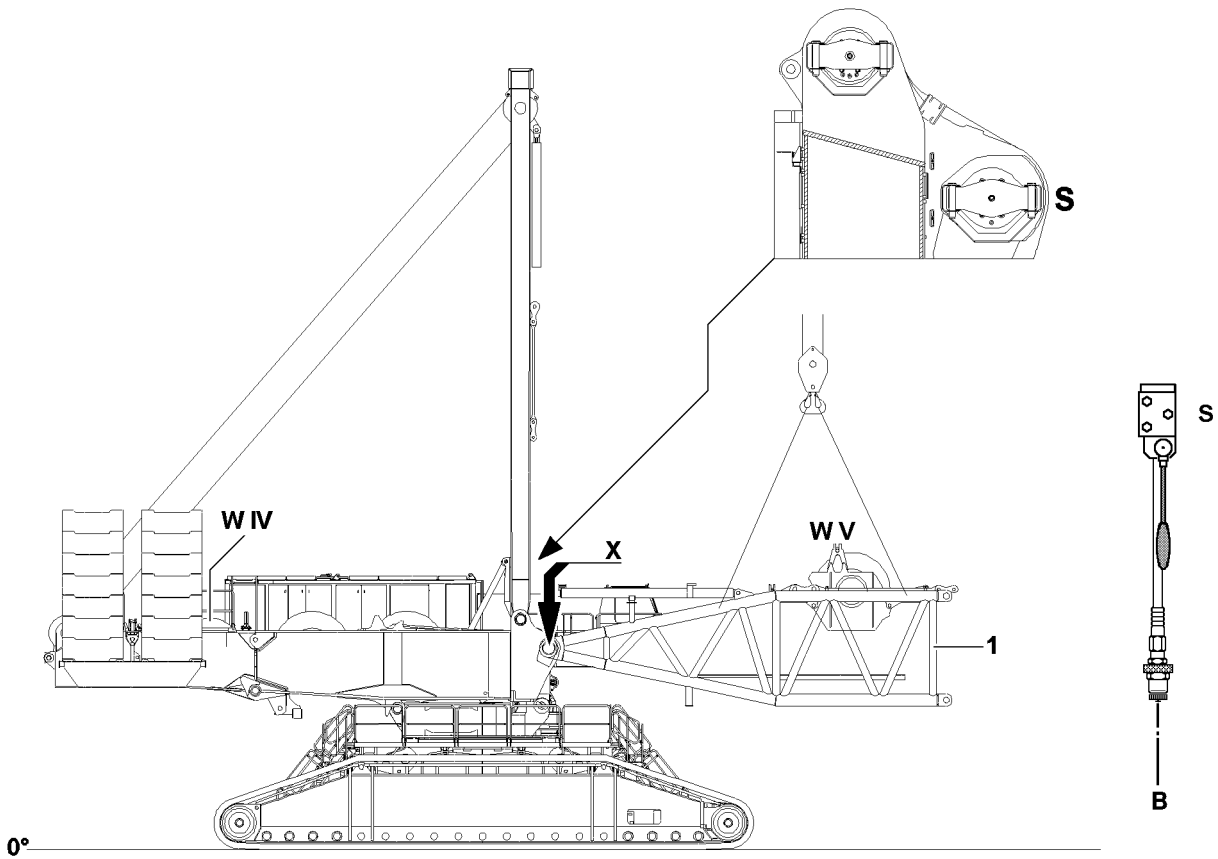


Fig.112883

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2.5 Pinning the S-pivot section on the turntable



WARNING

Danger due falling components!

If the components are not properly pinned and secured, pins can loosen up by themselves and cause components to fall off!

Personnel can be severely injured or killed!

- ▶ Support the S-boom during assembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be inspected regularly, see Crane operating instructions, chapter 8.15!

Make sure that the following prerequisites are met:

- The SA-frame is erected to the vertical.
- The connecting pins **11** are completely pinned on both sides on the turntable, see illustration / view **X1**.
- The pins **8** are pinned on both sides on the guide **7** at point **P21** and are secured with cotter pins **9**.



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 assembly, see section „Fastening points“!

- ▶ 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

- ▶ 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.



Note

- ▶ The hand lever **S** and the hydraulic connections **B** for the pin pulling device are on the left side of the turntable!

- ▶ Establish the hydraulic connections from the connecting pins **11** to the turntable, see Hydraulic diagram.
- ▶ Move the hand lever **S** and extend the piston rod **11.1** until the plate **11.2** touches on the stop pins **8** at point **P21**, illustration / view **X2**.
- ▶ Insert the additional pins **8** on both sides on points **P22** and secure with linch pins **10**, see illustration / view **X2**.

Result:

- The plate **11.2** is „tensioned“ between the pins **8** at point **P21** and point **P22**.
- ▶ Move the hand lever **S** and unpin the connecting pin **11** until the connecting pin **11** touches on the pins **8** on point **22**, illustration / view **X3**.

Result:

- The S-pivot section can be swung in to the pin bores on the turntable.

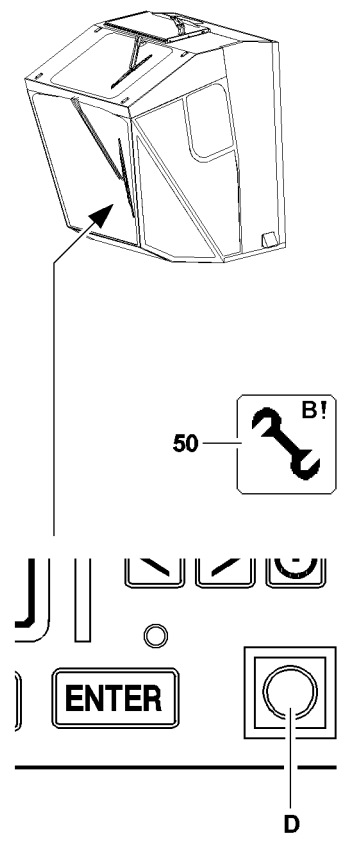
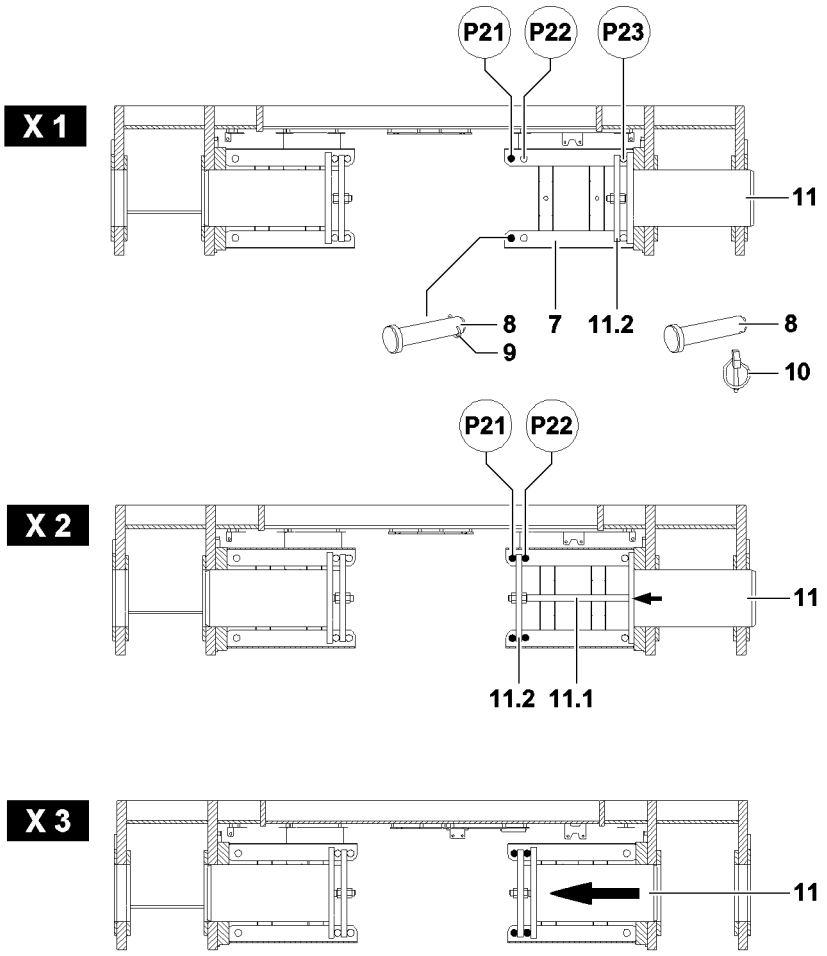
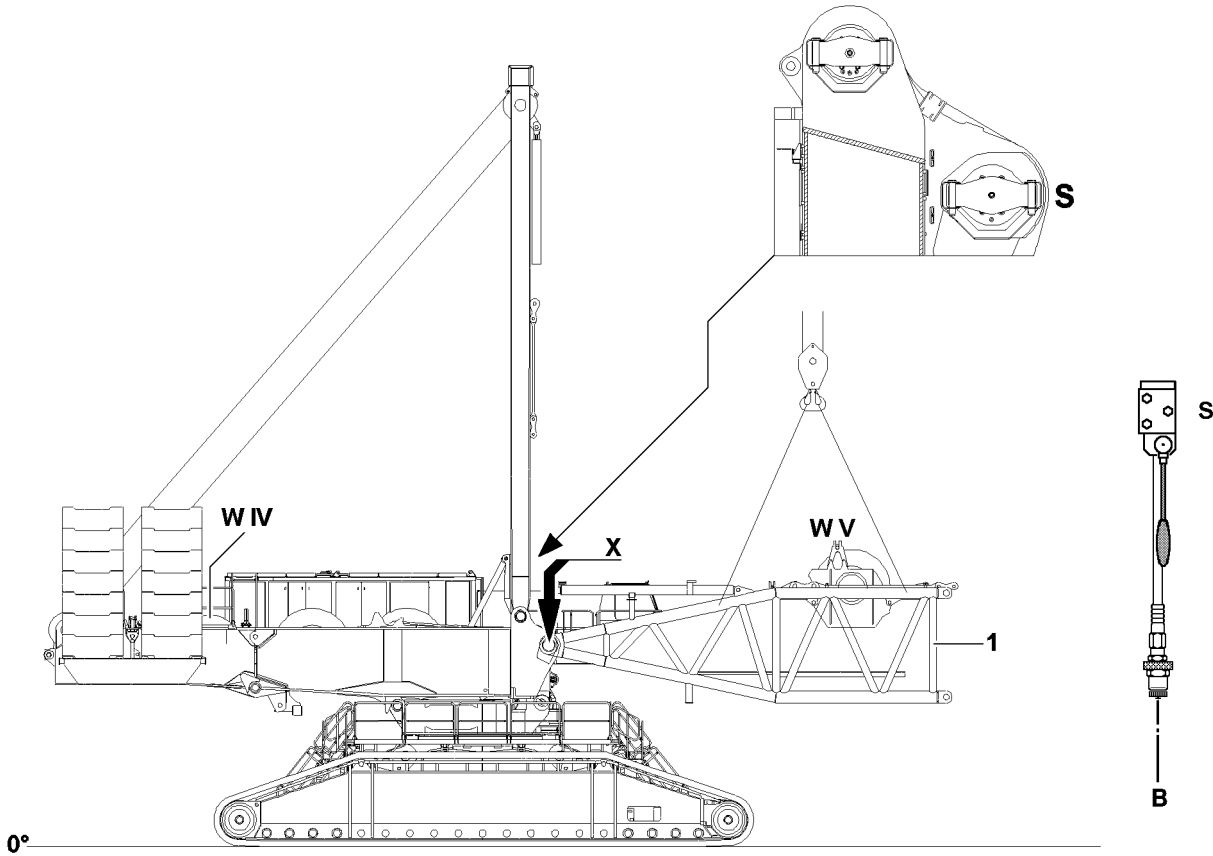


Fig.112883

LWE/LR 11350-007/19005-01-02/en

- ▶ Hang the S-pivot section **1** onto the auxiliary crane and swing in to the pin points on the turntable.

When the pin points of the S-pivot section **1** align with the pin points of the turntable:

- ▶ Pin the S-pivot section **5** on both sides with the pin pulling device: Move the hand lever **S** and insert the connecting pins **11** completely on both sides.
- ▶ Secure the connecting pins **11**: Release the pins **8** on both sides at point **P22** and unpin, then pin on both sides at point **P23** and secure with linch pin **10**, illustration / view **X1**.
- ▶ Move the hand lever **S** and move the piston rod **11.1** of connecting pins **11** all the way in.

Result:

- The connecting pins **11** are completely pinned.

NOTICE

Damage to the S-pivot section!

When the installed S-pivot section is placed on the ground, the S-pivot section can be damaged!

- ▶ Before placing the S-pivot section down on the ground, make sure that the S-pivot section cannot collide with the crane components during the take down procedure!
- ▶ Slowly 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.

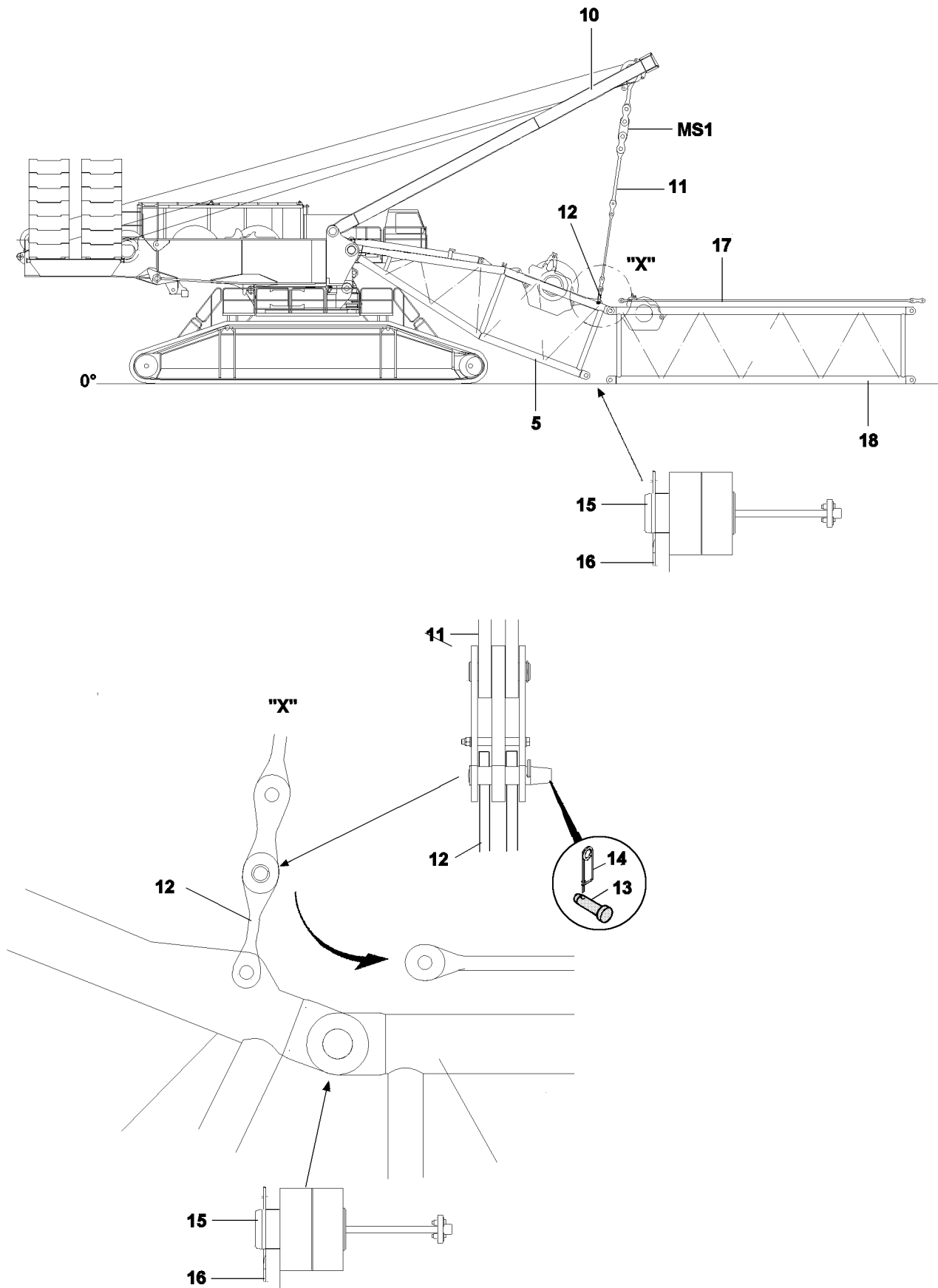


Fig.199415

LWE/LR 11350-007/19005-01-02/en

2.6 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 components 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**.
- ▶ Loosen the transport retainers for the guy rods **17** on the lattice components.
- ▶ 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

- ▶ Assemble and secure the S-guy rods according to the supplied rod plans. The numbering on the rod plans 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**:

- ▶ S 90 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 monitor 1. Record the displayed ACTUAL force.
- ▶ When **unpinning** at the same ACTUAL force on test point **MS1**, tension the guying on the SA-frame **10**!

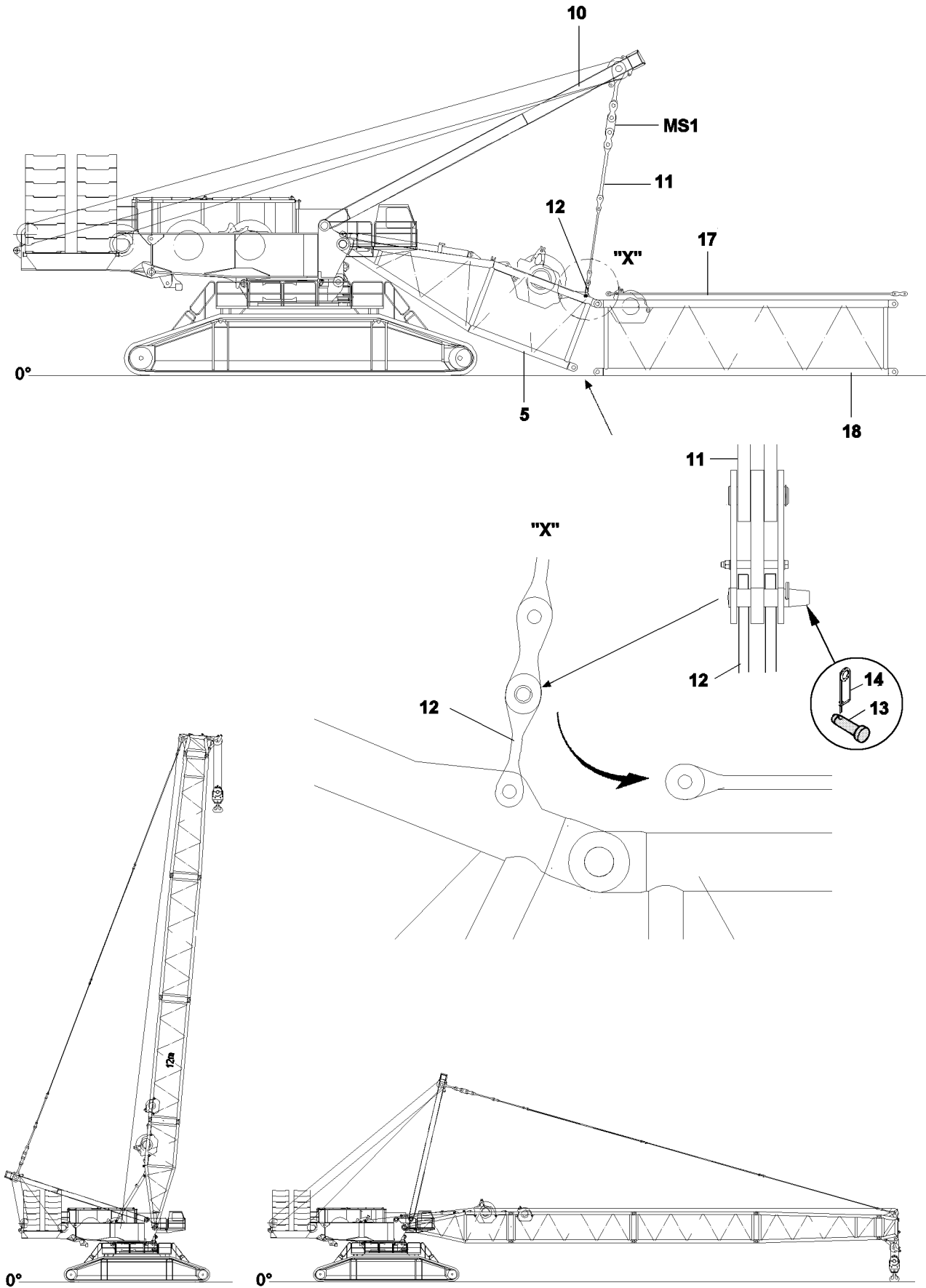


Fig.199420

LWE/LR 11350-007/19005-01-02/en

- ▶ 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 the S-boom guying.

**WARNING**

Unutilized guy rods on boom!

If guy rods are on the lattice sections which are not required for crane operation, then there is a risk of accidents!

Personnel can be severely injured or killed!

- ▶ Non-required guy rods must be removed from the lattice sections, see Crane operating instructions, chapter 5.01!
- ▶ Remove non-required guy rods from the lattice sections.

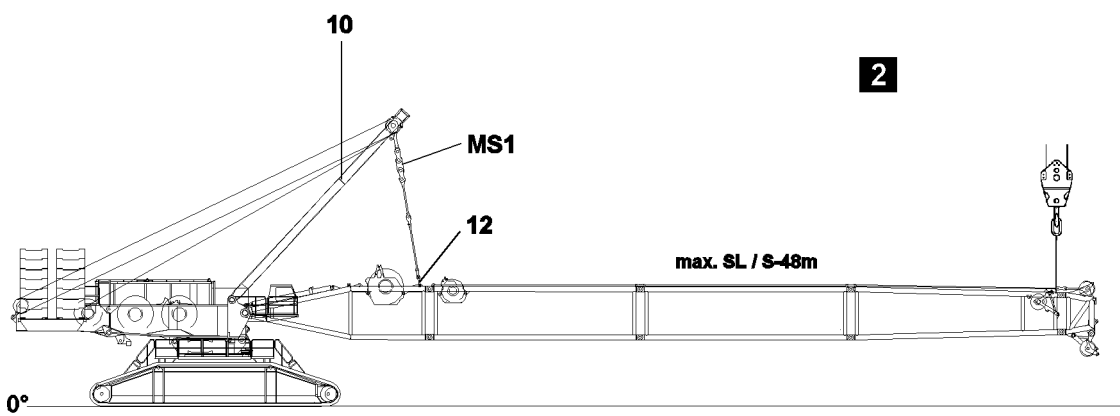
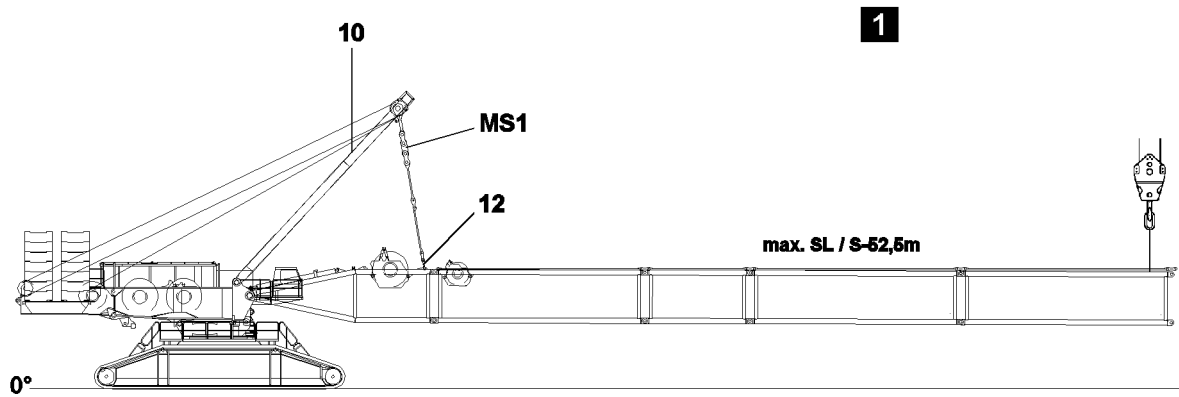


Fig.199943

LWE/LR 11350-007/19005-01-02/en

2.7 Assembling the S/SL-boom in flying mode



Note

- ▶ For arrangement of intermediate sections of boom system, see Crane operating instructions, chapter 5.03!!

2.7.1 Assembling the S/SL boom in flying mode - 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 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/SL 52.5 m without end section with assembled S-guy rods and WA-frame 2 guy rods.

2.7.2 Assembling the S/SL boom in flying mode - illustration 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 **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 S 48 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.

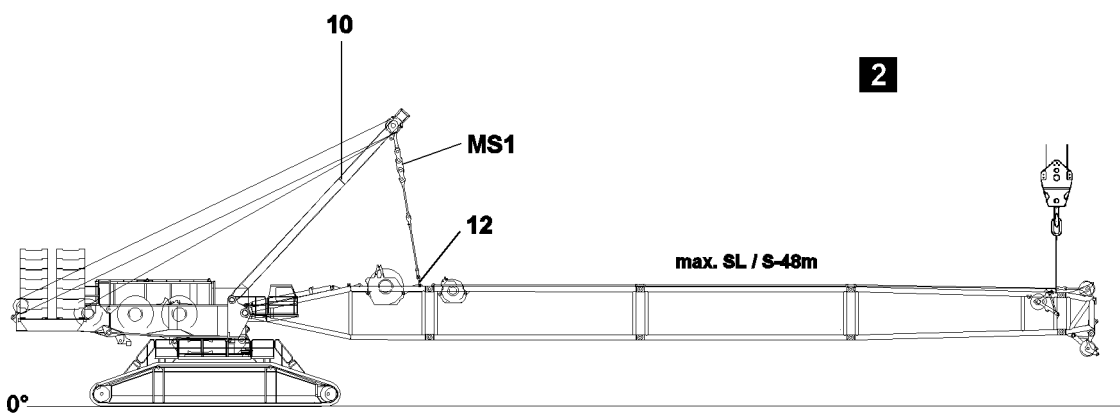
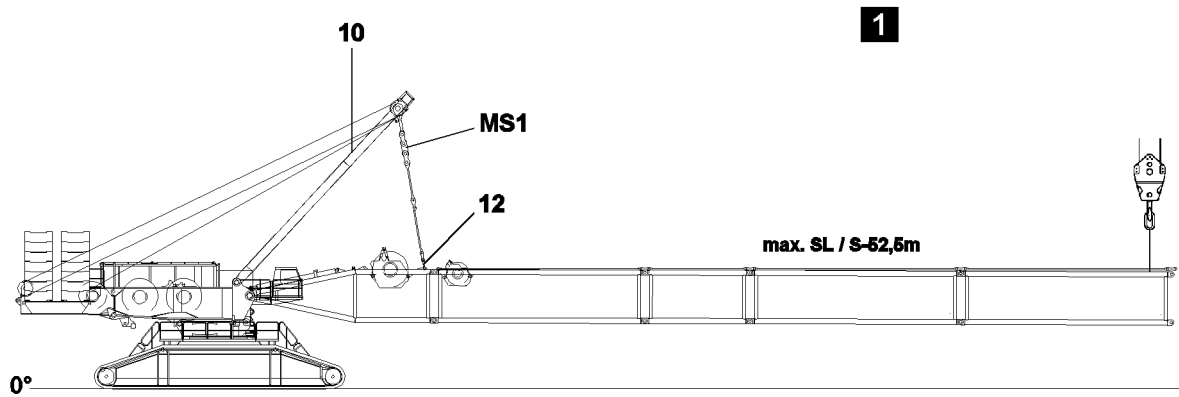


Fig.199943

2.7.3 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.



WARNING

Unutilized guy rods on boom!

If guy rods are on the lattice sections which are not required for crane operation, then there is a risk of accidents!

Personnel can be severely injured or killed!

- ▶ Non-required guy rods must be removed from the lattice sections, see Crane operating instructions, chapter 5.01!
-
- ▶ Remove non-required guy rods from the lattice sections.

2.8 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 S-boom, use the Electric wiring diagram!

Make sure that the following prerequisites are met:

- The S-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.

2.9 Establishing the hydraulic connections

When hydraulic lines are connected and disconnected with quick-release couplings, make ensure that the coupling procedure is being performed correctly.



DANGER

Risk 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-release 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 and disconnecting. Turn the engine off and wait for short time.
- ▶ Assembling coupling components (sleeve and connector) by using hand-tightened nut.
- ▶ Connect coupling components.

2.10 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.

2.10.1 Wind speed sensor

- ▶ Test the movement and the function of the wind speed sensor.

2.10.2 Airplane warning light

- ▶ Turn the airplane warning light on, see Crane operating instructions, chapter 4.01.
- ▶ Check the function visually.

2.10.3 Hoist limit switch

- ▶ Actuate the hoist limit switch manually on the pulley head.

Result:

- The hoist winch turns off in upward movement.
- The hoist top icon on the LICCON monitor 0 blinks.

2.10.4 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.

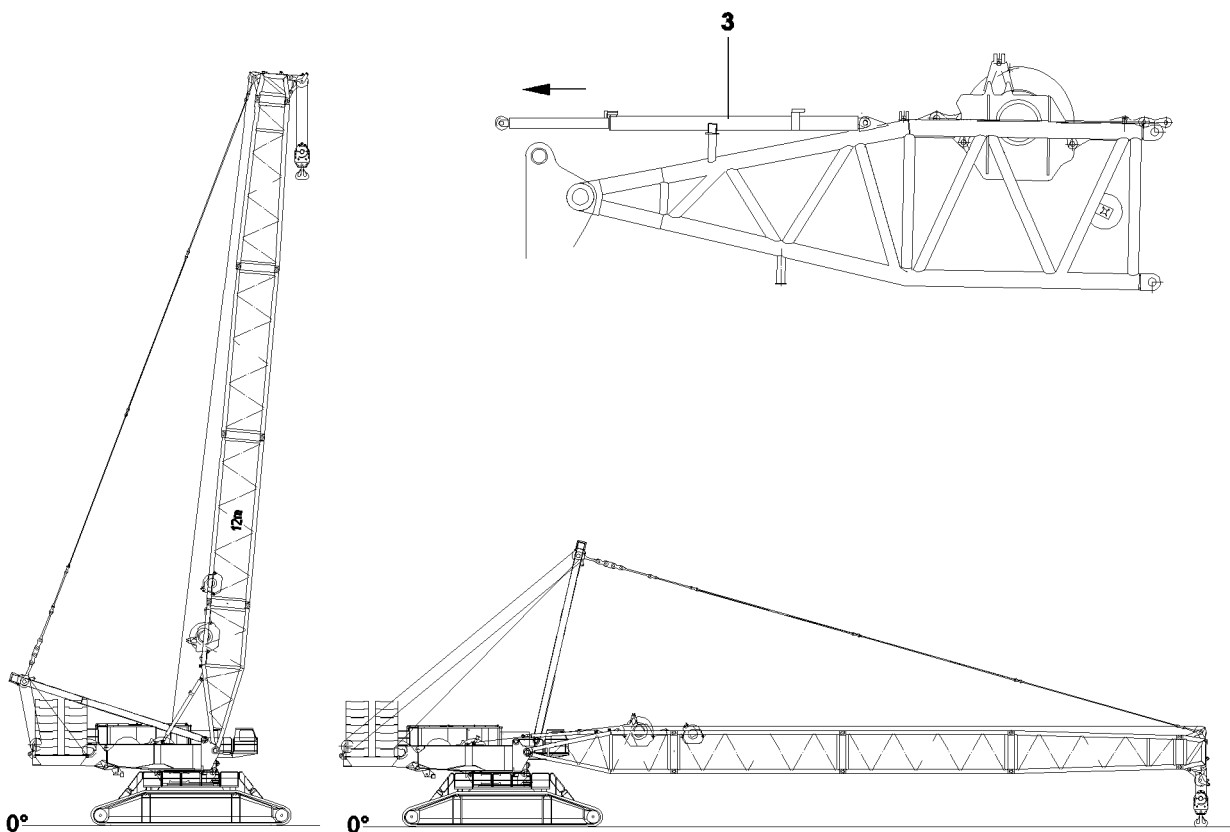
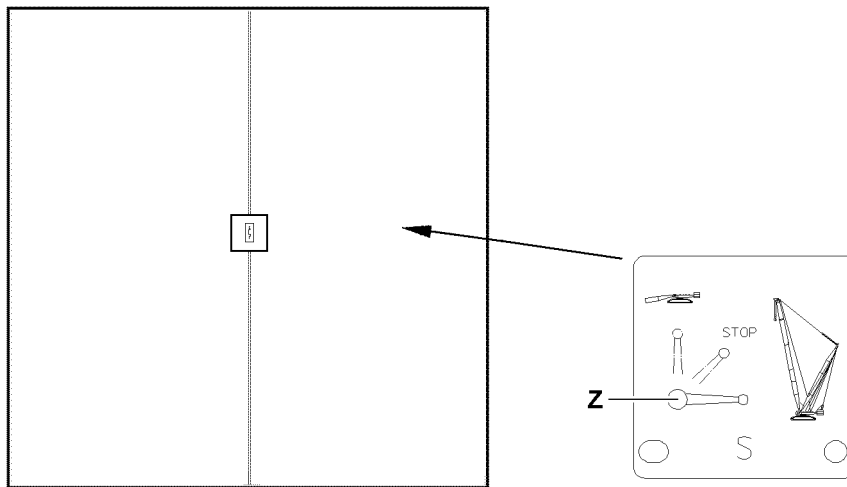


Fig.112885

LWE/LR 11350-007/19005-01-02/en

2.11 Erecting the boom



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!

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!

- ▶ Observe the safety technical notes, see Crane operating instructions, chapter 5.01!
- ▶ Extend the S-relapse cylinders before erecting the boom combination!
- ▶ Do not allow slack cable to build up on the control winch!



WARNING

Falling hoist rope!

If the hoist rope is not reeved with the respective length over the S-boom before the erection procedure, then it can fall backward due to its own weight!

Personnel can be severely injured or killed!

- ▶ Reeve in the hoist rope with sufficient length on the S-boom before the erection process!
- ▶ The hoist rope must be constantly monitored during erection!
- ▶ Do not step into the danger zone!

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.
- 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 exceeded.
- The assembly icon is visible on the LICCON monitor.
- No personnel is within the danger zone.

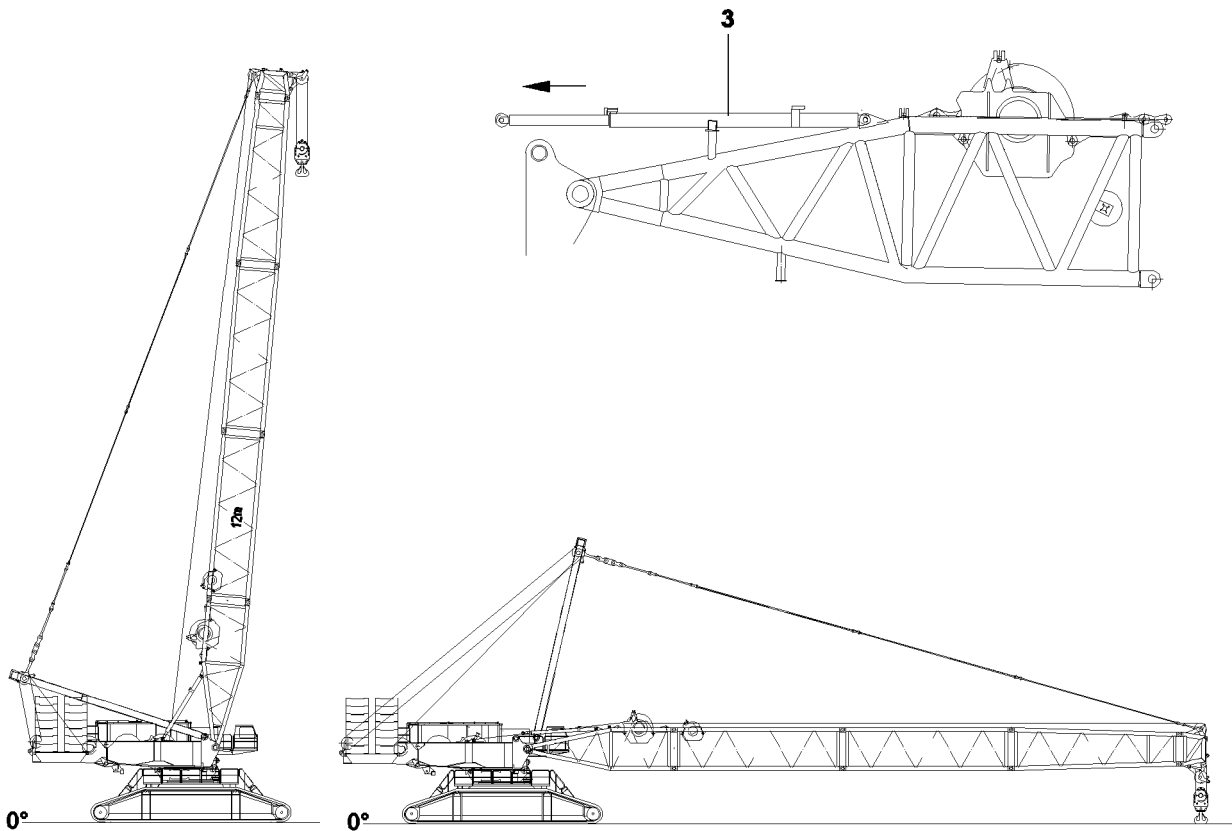
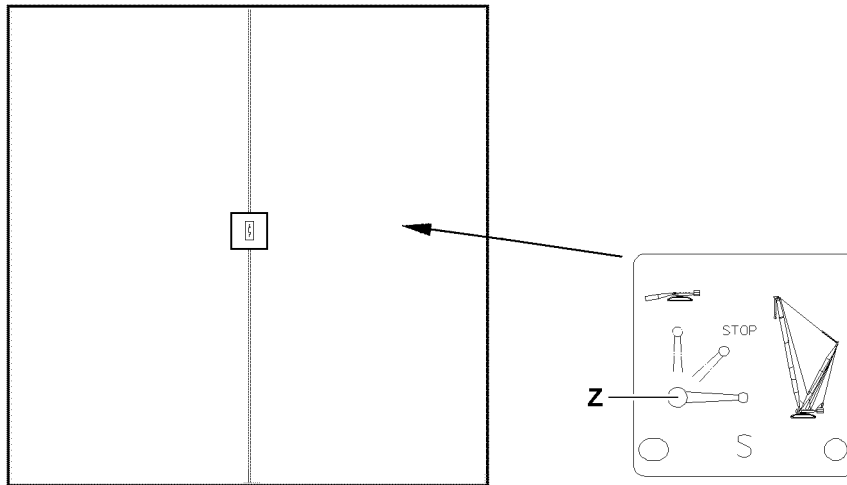


Fig.112885

LWE/LR 11350-007/19005-01-02/en

2.11.1 Extending the S-relapse cylinder



WARNING

The crane can topple over!

If the S-relapse cylinders are not extended before erecting the boom, then the 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 S-relapse cylinders before erecting the S-boom!
- ▶ Secure the ball valve **Z** during crane operation to prevent inadvertent actuation!

| Ball valve positions | |
|----------------------|---|
| Position | Function |
| Horizontal | Crane operation, extend the piston rod |
| Vertical | 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.
- ▶ Move the ball valve **Z** into horizontal position.

Result:

- The piston rods of the S-relapse cylinders **3** extend.



Note

- ▶ The ball valve **Z** is secured by closing the cabinet door and removing the key!

When the piston rods of the S-relapse cylinders **3** are fully extended:

- ▶ Close the cabinet door and pull the key.
- ▶ Hand the key to an authorized person.

LIEBHERR

xx> <xx CODE >XXXX< ZXXX YYYY.1(3)

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

LIEBHERR

ZXXX YYYY
XXXX

1/min: XXXX 50 90 100 110 130%

XX.X XX.X
max: XX.X

v: XX%

XX.X XX.X

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

Fig.112775

LWE/LR 11350-007/19005-01-02/en

2.11.2 Erection procedure



DANGER

The crane can topple over!

- ▶ It is prohibited to turn the crane superstructure while erecting the boom!
- ▶ Adhere to the 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 over the S-boom 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 S-boom before the erection process!
 - ▶ The hoist rope must be constantly monitored during erection!
 - ▶ Do not step into the danger zone!
-
- ▶ Reeve in the hoist rope properly and secure on the rope fixed point, 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 crane operation with exceeded LICCON overload protection, the crane can topple over!

There is then no additional protection against crane overload!

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!
- ▶ Crane operation with deactivated LICCON overload protection is prohibited!



Note

- ▶ When the lowest operating position of the boom is reached, the LICCON overload protection is activated!
 - ▶ In the maximum load icon appears a load number in „t“ instead of the display „???“!
-
- ▶ Luff the 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.

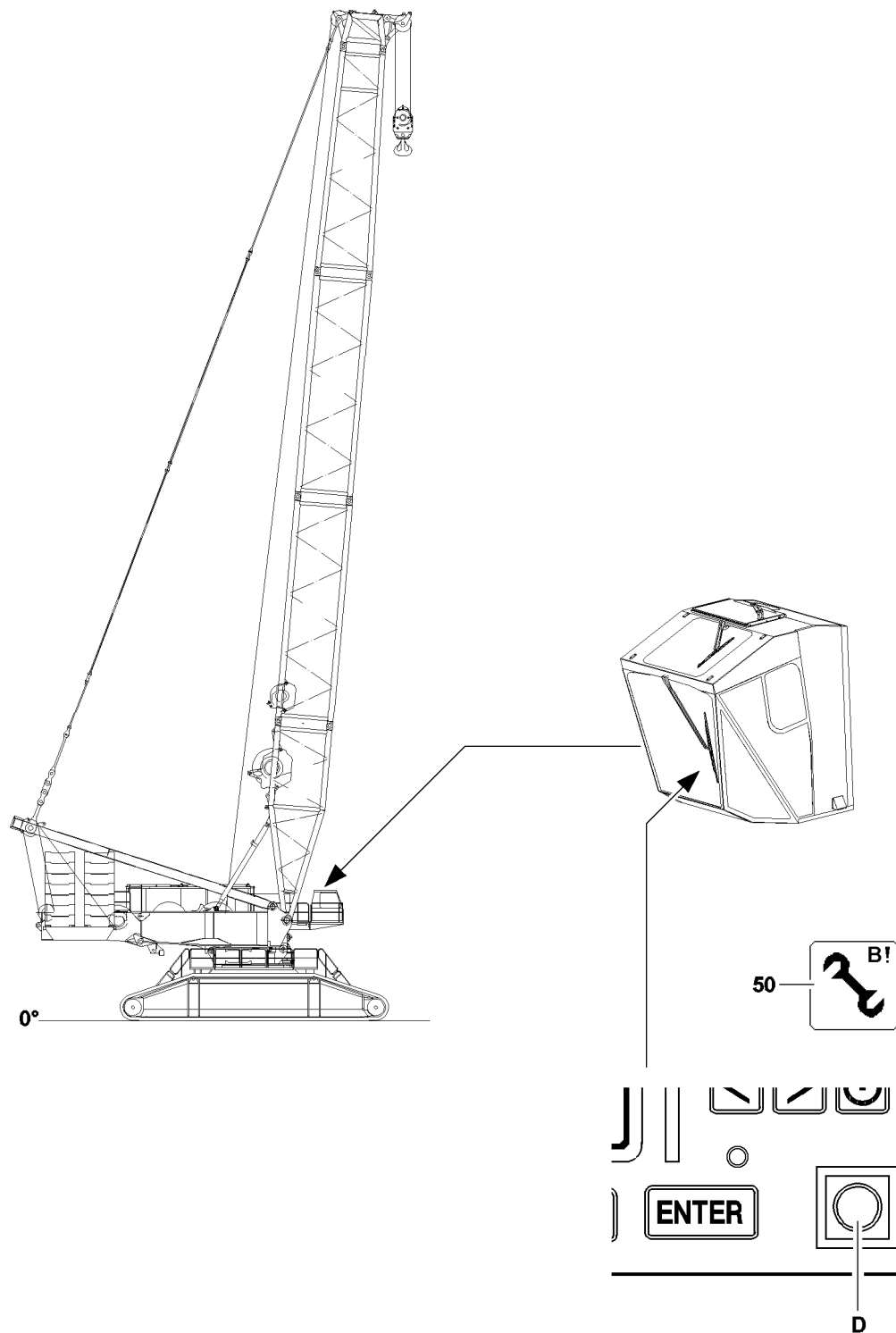


Fig.112887

LWE/LR 11350-007/19005-01-02/en

3 Operating the crane

3.1 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.

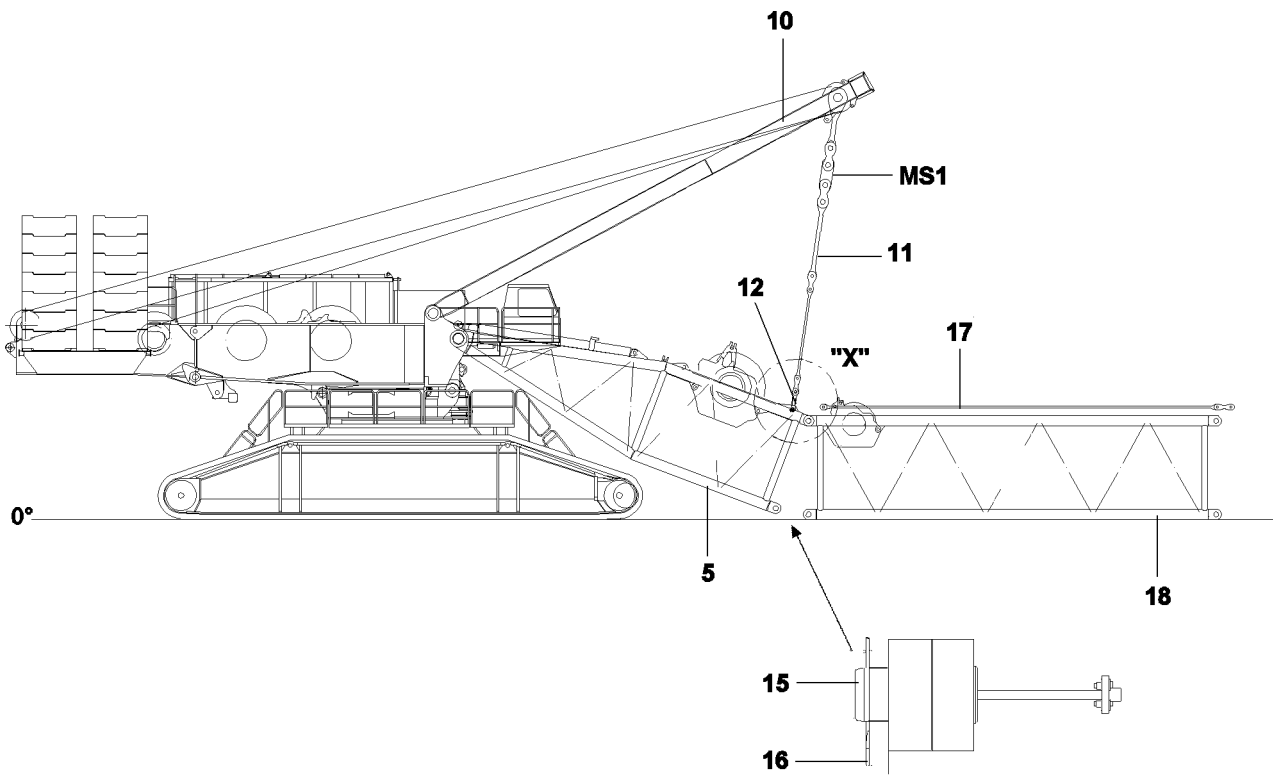
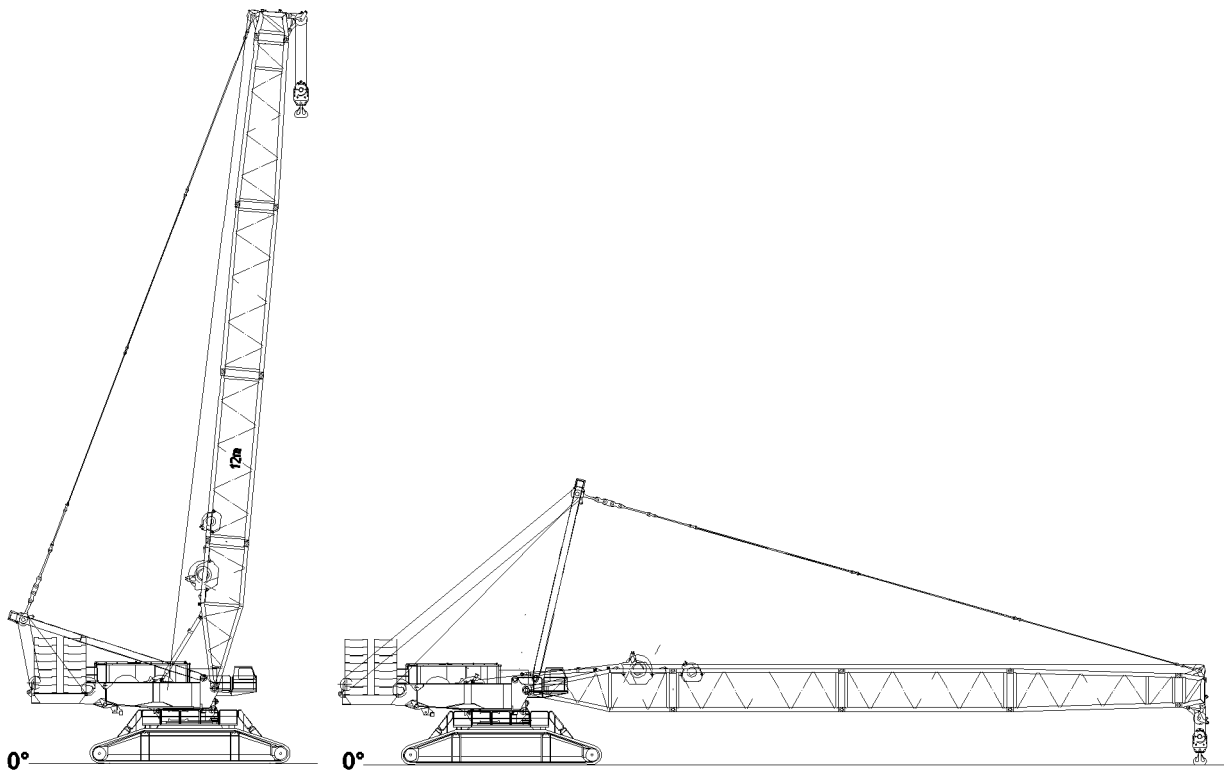
**WARNING**

The crane can topple over!

- ▶ 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!

3.1.1 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.



LWE/LR 11350-007/19005-01-02/en

Fig.199422

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!



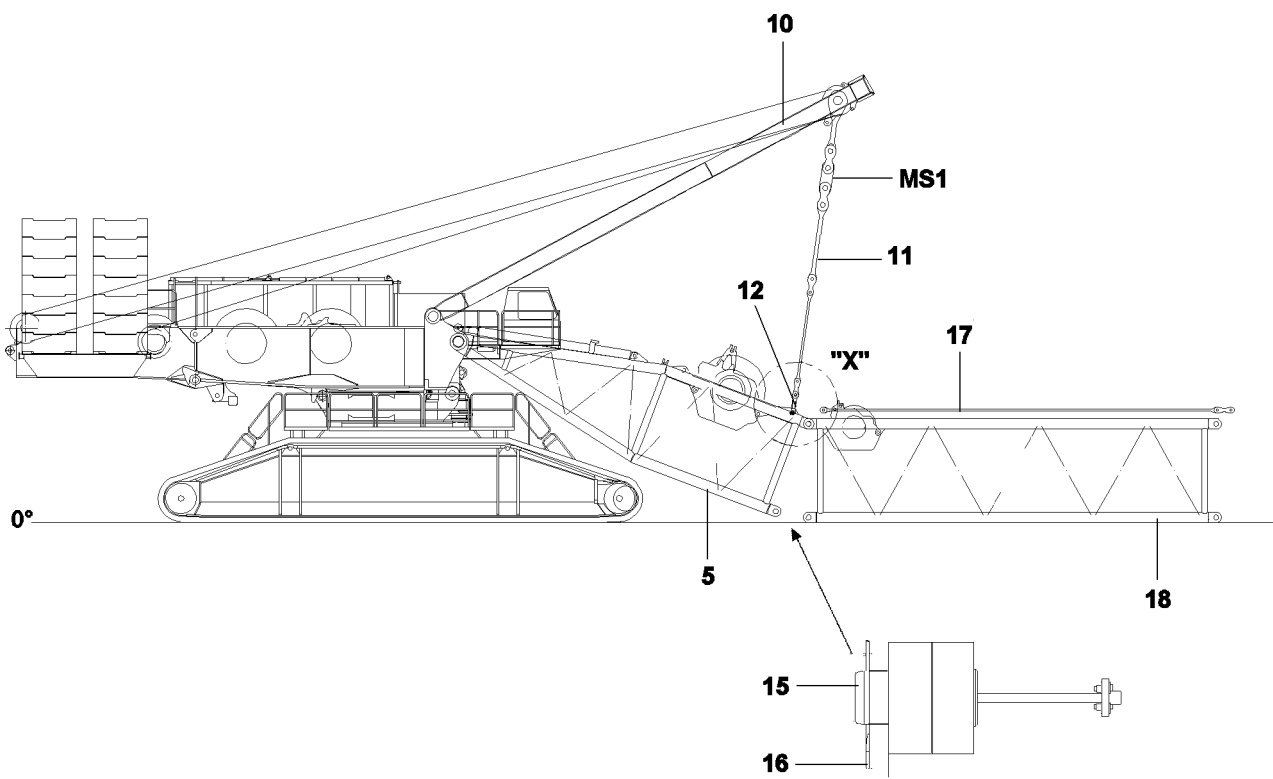
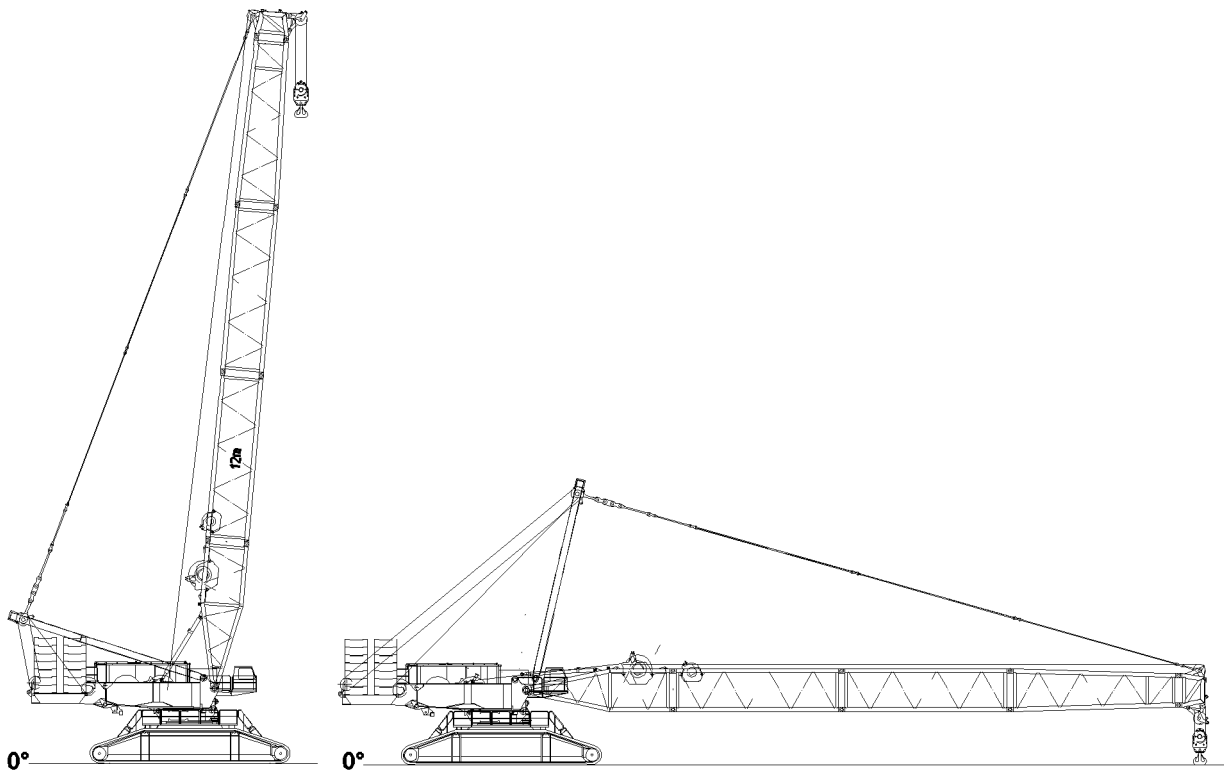
WARNING

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!



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Fig.199422

**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!

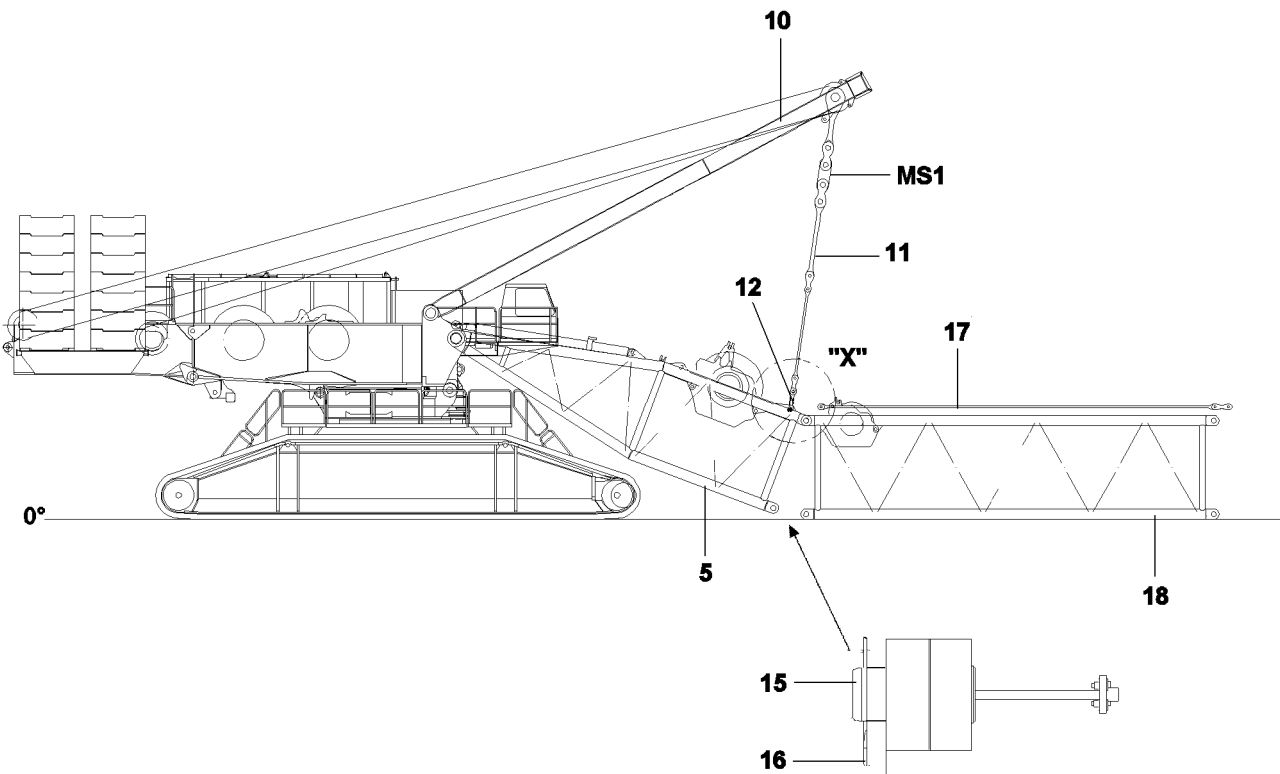
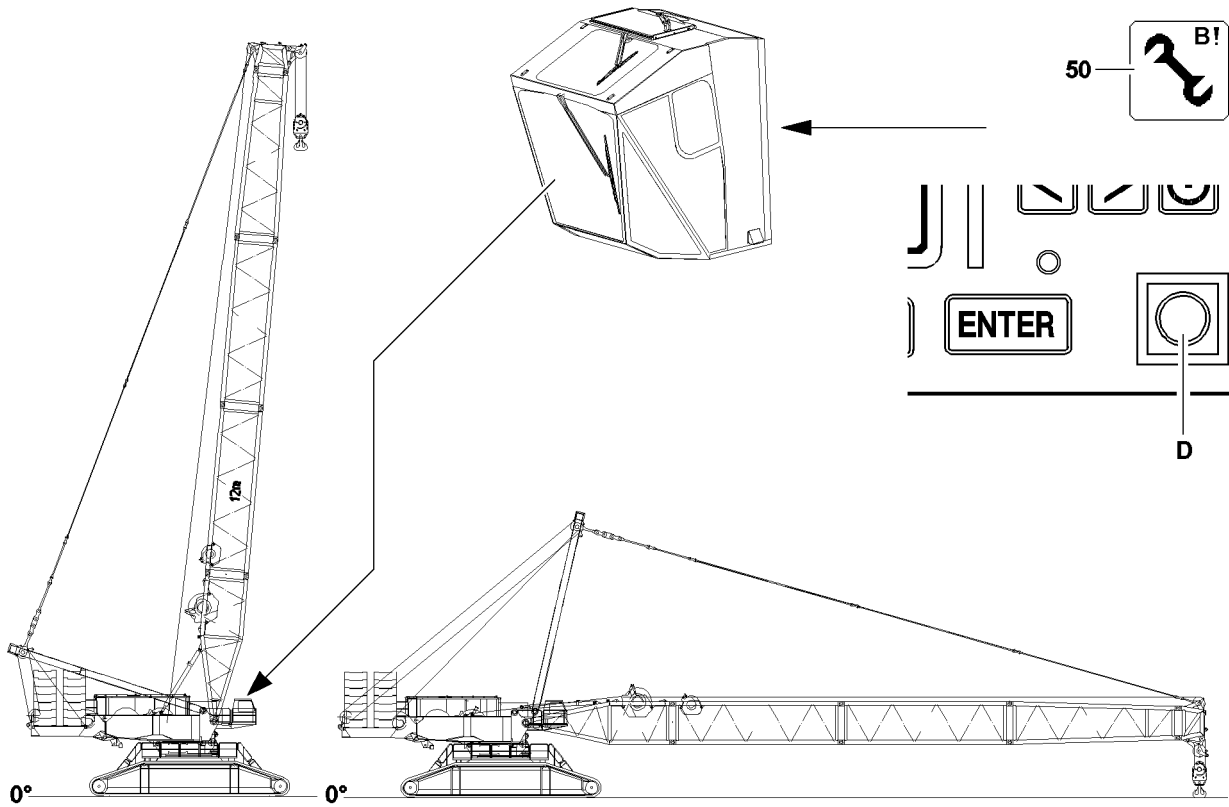


Fig.112888

LWE/LR 11350-007/19005-01-02/en

4.1 Taking the S-boom down



WARNING

The crane can topple over!

If the following conditions are not met before taking down the S-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 SA-frame must remain in operating position until the S-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 S-boom is reached!
 - ▶ When the lowest operating position of the S-boom is reached, the load display in the maximum load icon turns off and instead of the load display appears the display „??“!
 - ▶ In the crane operating screen appear alarm functions!
- ▶ Luff the S-boom down to the **lowest** operating position.

Result:

- The luff down movement is turned off.
- The „STOP“ icon appears on the LICCON monitor.
- The horn icon appears on the LICCON monitor.

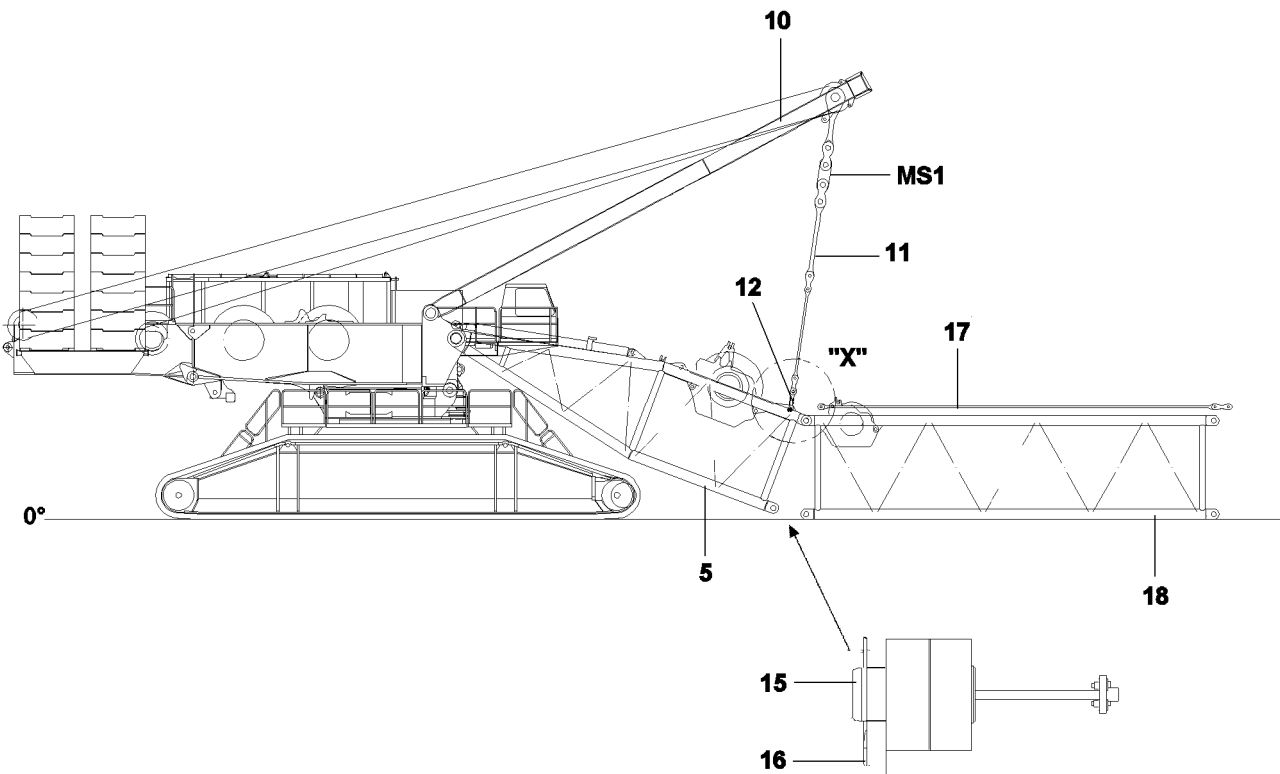
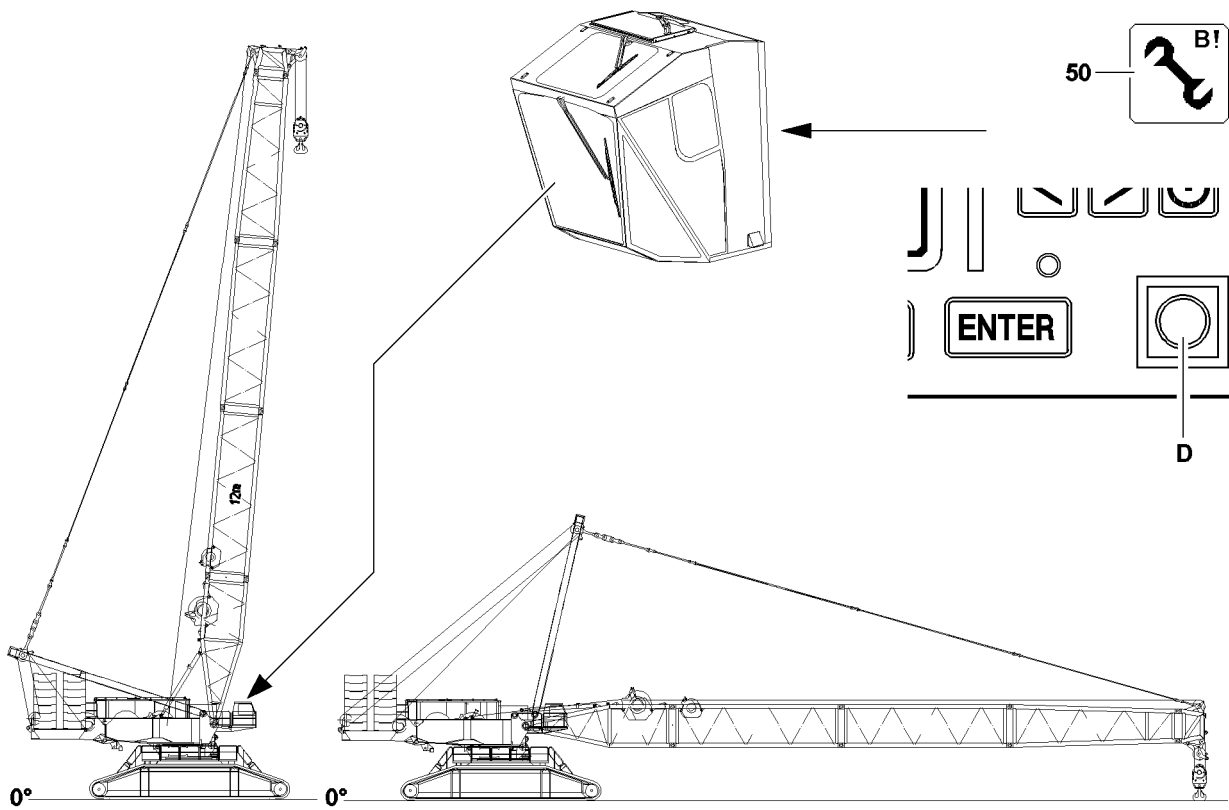


Fig.112888

LWE/LR 11350-007/19005-01-02/en

**WARNING**

Assembly with turned on set up key!

When the set up key 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 severely injured or killed!

This could result in high property damage!

- ▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
- ▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with the set up key **D** turned on is strictly prohibited!

- ▶ Turn the set up key **D** to the right.

Result:

- The LICCON overload protection is deactivated.
- The assembly icon **50** appears on the LICCON monitor.
- ▶ At the same time, spool the hoist winch out and 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/SL-boom down until the 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 S-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 cam limit switch can change!

A new adjustment by **Liebherr Service** is required!

- ▶ Stop the winch in time, with sufficient rope reserve!
- ▶ Do not overspool the winch!

- ▶ Spool the hoist rope up.

Fig.195219

LWE/LR 11350-007/19005-01-02/en

4.2 Disconnecting the electrical connections

Make sure that the following prerequisite is met:

- The S-boom is placed on the support.

NOTICE

Damage to cable drum or cable!

If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the S-end section, then the cable drum or the cable can be significantly damaged!

- ▶ Spool the cable drum up after unplugging!
-
- ▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
 - ▶ Disconnect the electrical connections and store the plug and cable properly.

4.3 Disconnecting the hydraulic connections

When hydraulic lines are connected and disconnected with quick-release couplings, make ensure that the coupling procedure is being performed correctly.



DANGER

Risk 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-release 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 and disconnecting. Turn the engine off and wait for short time.
 - ▶ Assembling coupling components (sleeve and connector) by using hand-tightened nut.
 - ▶ Connect coupling components.

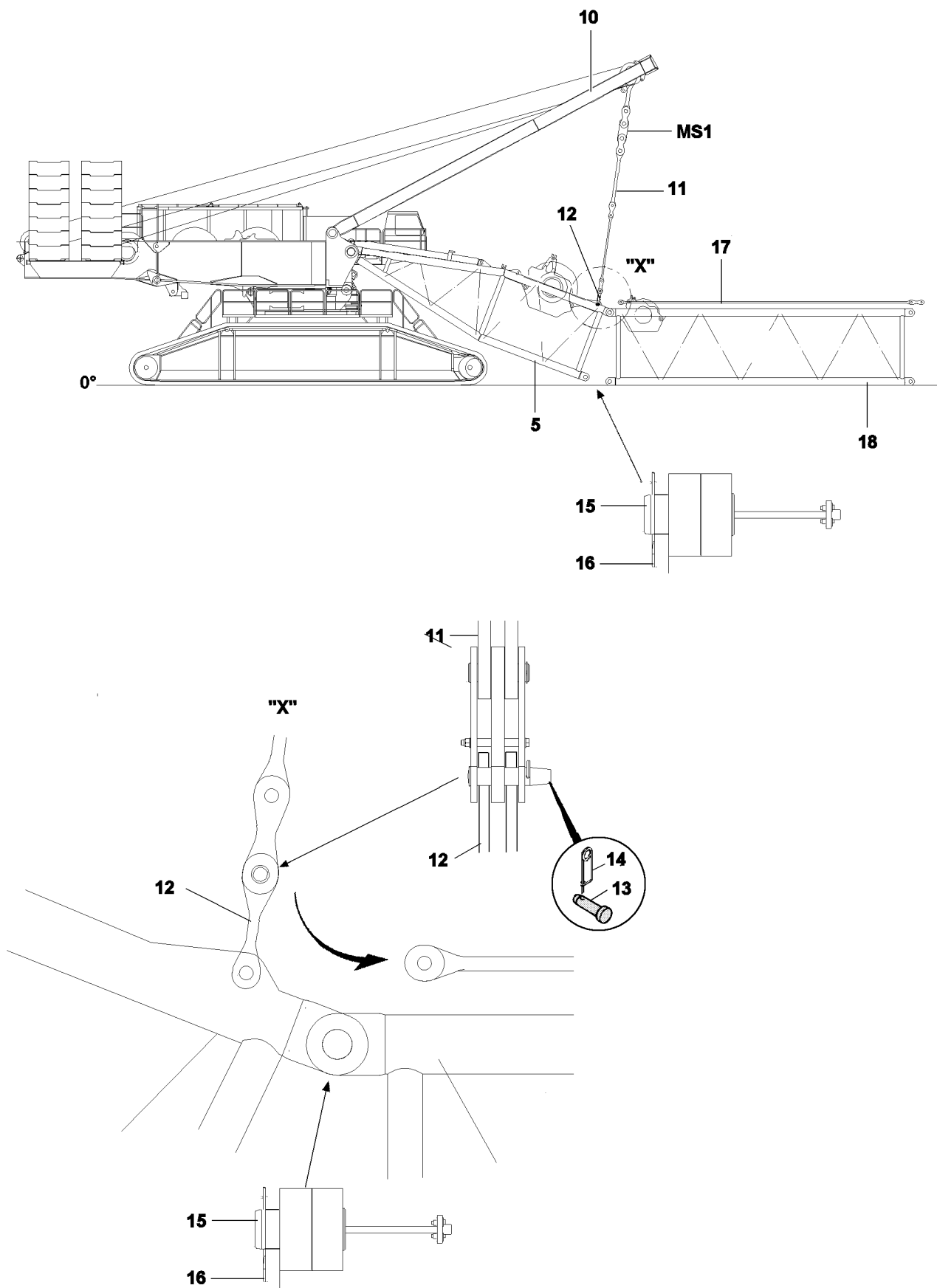


Fig.199415

LWE/LR 11350-007/19005-01-02/en

4.4 Disassembling the S-boom



DANGER

The boom can suddenly fold down!

If the following conditions are not met prior to dismantling the boom, the boom can fold down and fatally injure people!

- ▶ Support the S-boom during disassembly with suitable materials!
- ▶ The guy rods must be pinned and secured on the brackets prior to 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**.
 - ▶ Deposit and secure guy rods **17** before transporting on the S-lattice components.



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**:

- ▶ S 90 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 unpin on both sides **below**: 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.
 - ▶ For this, refer the ACTUAL force at the measuring point measured and recorded during the assembly (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 components and dismantle.

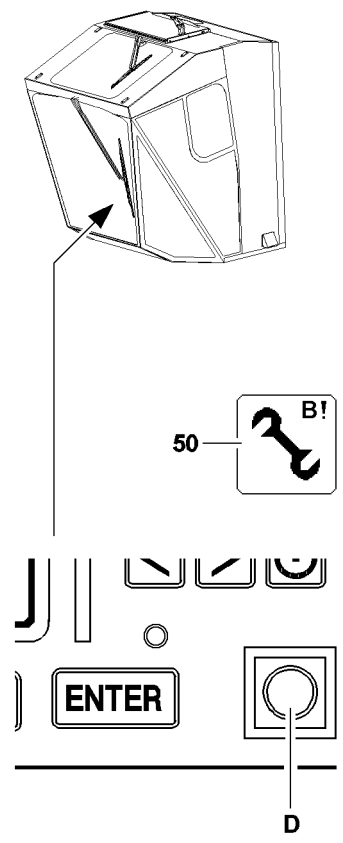
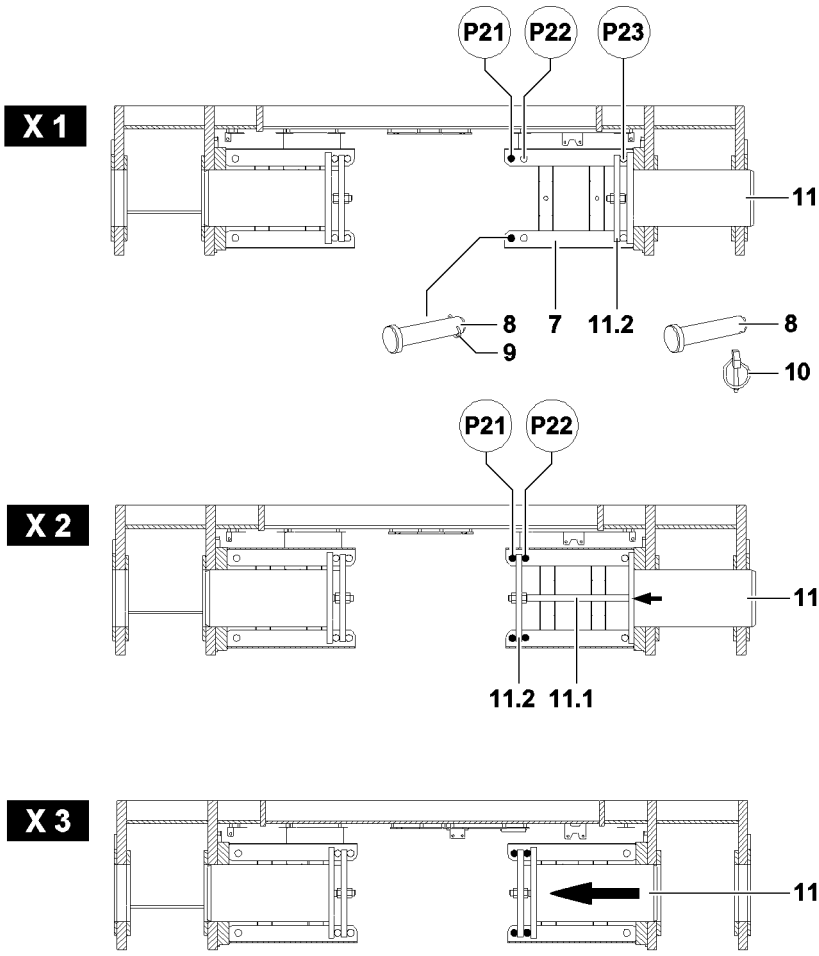
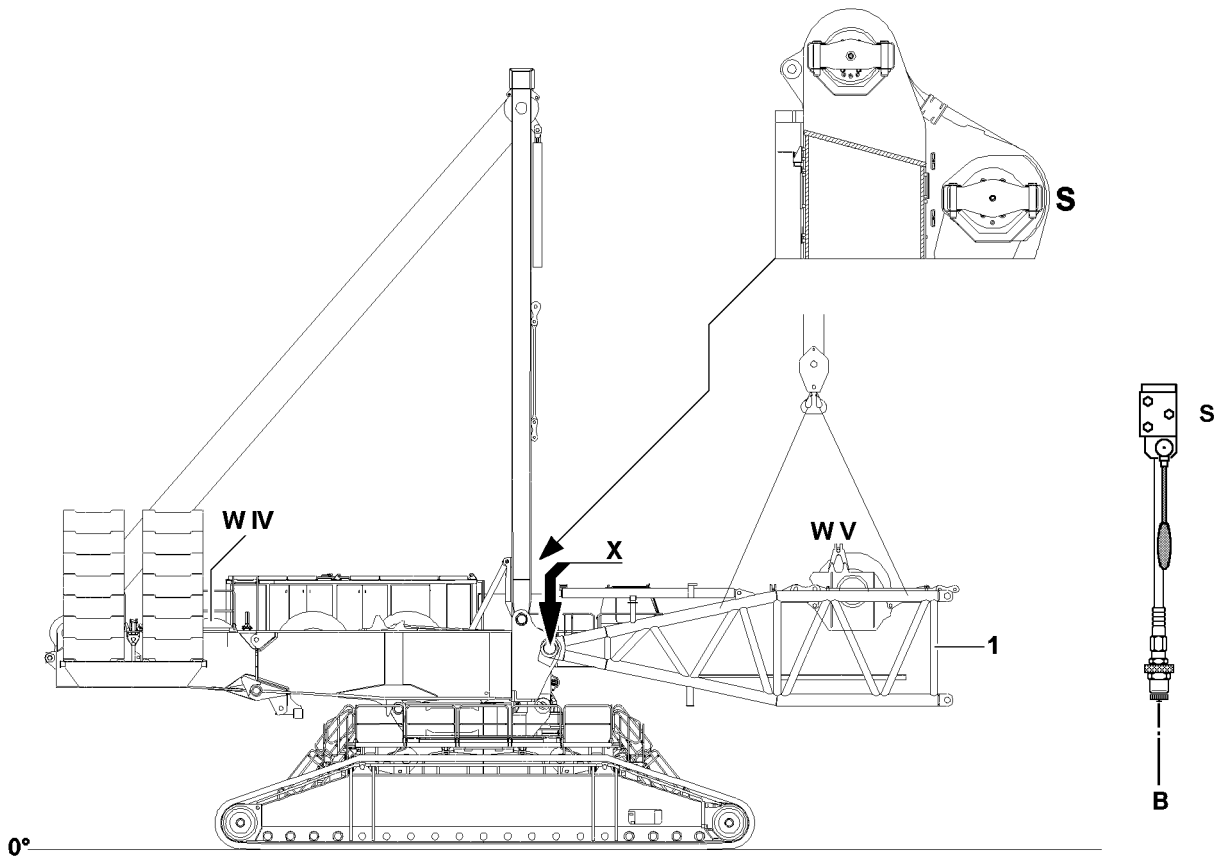


Fig.112883

LWE/LR 11350-007/19005-01-02/en

4.5 Unpinning the S-pivot section on the turntable



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 assembly, see section „Fastening points“!

- ▶ Attach the S-pivot section **1** on the auxiliary crane.
- or
- ▶ Lift the S-pivot section **1** with the auxiliary crane to the horizontal.



Note

- ▶ The hand lever **S** and the hydraulic connections **B** for the pin pulling device are on the left side of the turntable!

- ▶ Establish the hydraulic connections from the connecting pins **11** to the turntable, see Hydraulic diagram.
- ▶ Move the hand lever **S** and extend the piston rod **11.1** until the plate **11.2** touches on the stop pins **8** at point **P21**, illustration / view **X2**.
- ▶ Insert the additional pins **8** on both sides on points **P22** and secure with linch pins **10**, see illustration / view **X2**.

Result:

- The plate **11.2** is „tensioned“ between the pins **8** at point **P21** and point **22**.

NOTICE

Danger of property damage!

When unpinning the connecting pins **11**, the pins **8** or the guides **7** can be damaged!

- ▶ Make sure that the pins **8** are unpinned at point **P23** when unpinning the connecting pins **11**!

- ▶ Move the hand lever **S** and unpin the connecting pin **11** until the connecting pin **11** touches on the pins **8** on point **P22**, illustration / view **X3**.

Result:

- The S-pivot section can be swung out from the turntable with the auxiliary crane.
- ▶ Swing the S-pivot section **1** out with the auxiliary crane and place it down.
- ▶ Remove the auxiliary crane.

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5.39 LD/SLD/SD-boom combination

| | | |
|---|---------------------------------|----|
| 1 | Components and fastening points | 3 |
| 2 | Assembling the SLD/SD-boom | 7 |
| 3 | Operating the crane | 45 |
| 4 | Disassembling the SLD/SD-boom | 47 |

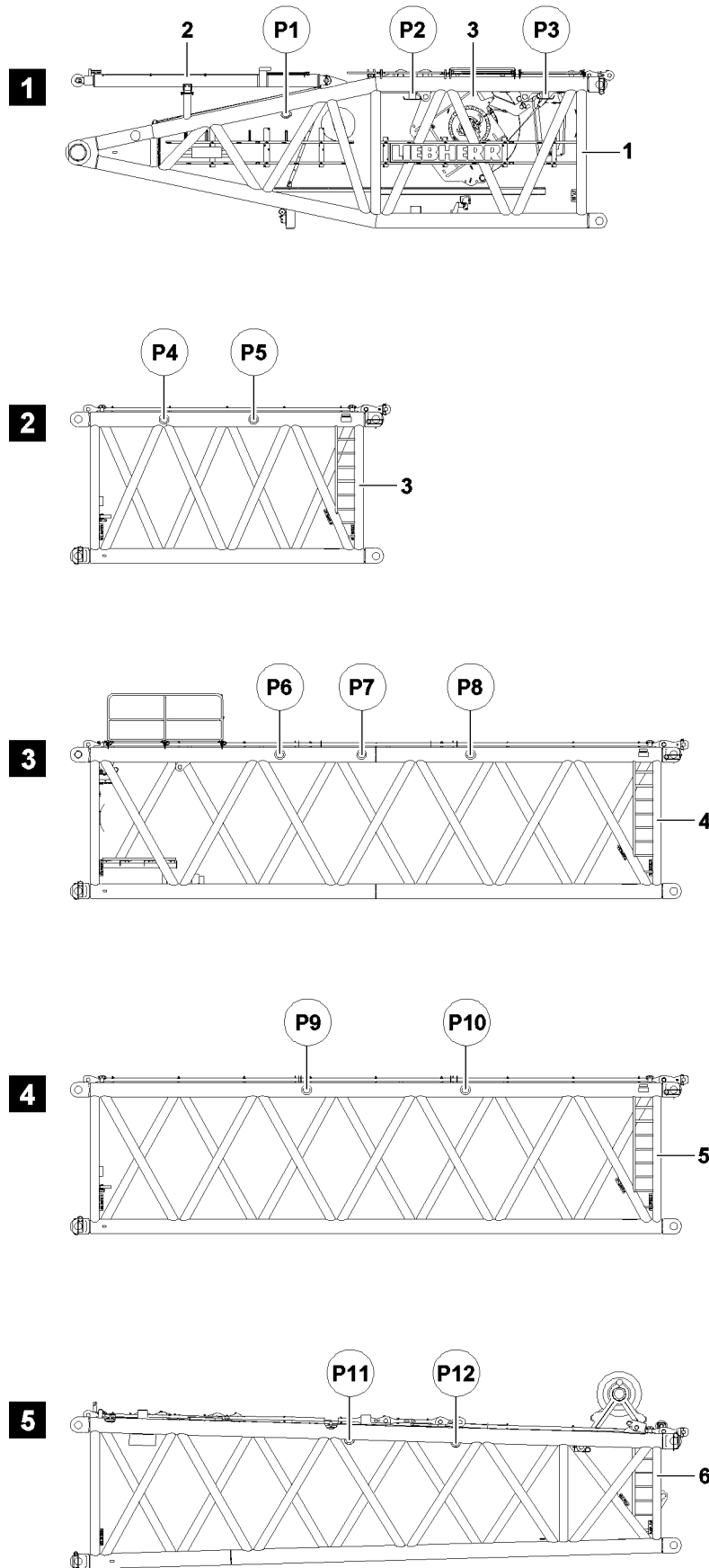


Fig.112587

LWE/LR 11350-007/19005-01-02/en

1 Components and fastening points



Note

- The weights of the respective components are listed in the Crane operating instructions, chapter 1.03!

1.1 Components S-pivot section

| Position | Component |
|----------|---------------------------------|
| 1 | S-pivot section with winch 5 |
| 2 | S-pivot section without winch 5 |

1) The stated weights are approximate.

1.2 Fastenings points of the S-lattice sections

1.2.1 Fastening points on the S-pivot section

1 Illustration

| Fastening points | |
|------------------|--|
| P1 and P2 | for D-pivot section without winch 5 |
| P1 and P3 | for D-pivot section with winch 5 |

1.2.2 Fastening points on S-intermediate section 6 m

2 Illustration

| Fastening points | |
|------------------|----------------------------|
| P4 and P5 | S-intermediate section 6 m |

1.2.3 Fastening points on S-intermediate section for winch 6

3 Illustration

| Fastening points | |
|------------------|---|
| P7 and P8 | S-intermediate section without winch 6 |
| P6 and P7 | S-intermediate section with winch 6 |

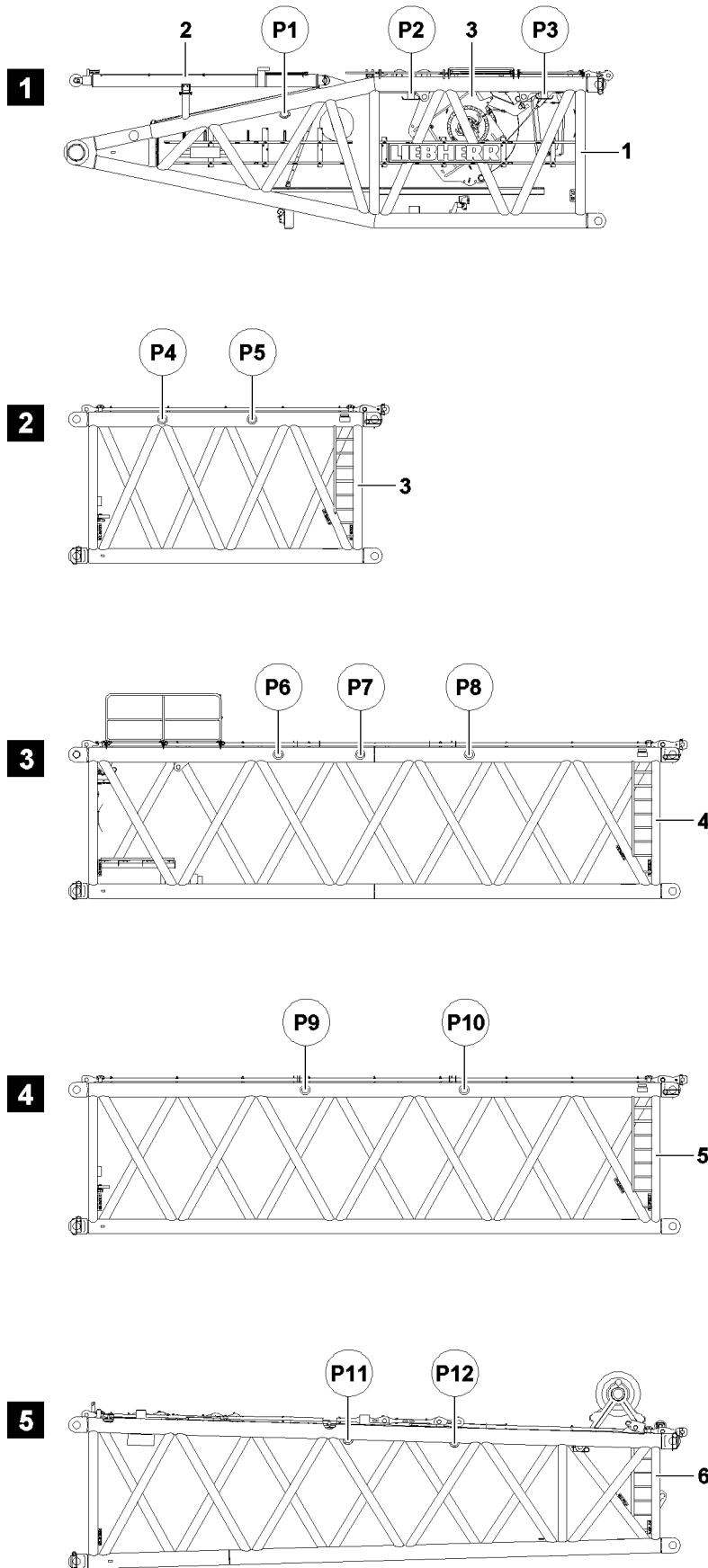


Fig.112587

LWE/LR 11350-007/19005-01-02/en

1.2.4 Fastening points on S-intermediate section

4 Illustration

| Fastening points | |
|------------------|------------------------|
| P9 and P10 | S-intermediate section |

1.2.5 Fastening points on S-adapter

5 Illustration

| Fastening points | |
|------------------|-----------|
| P11 and P12 | S-adapter |

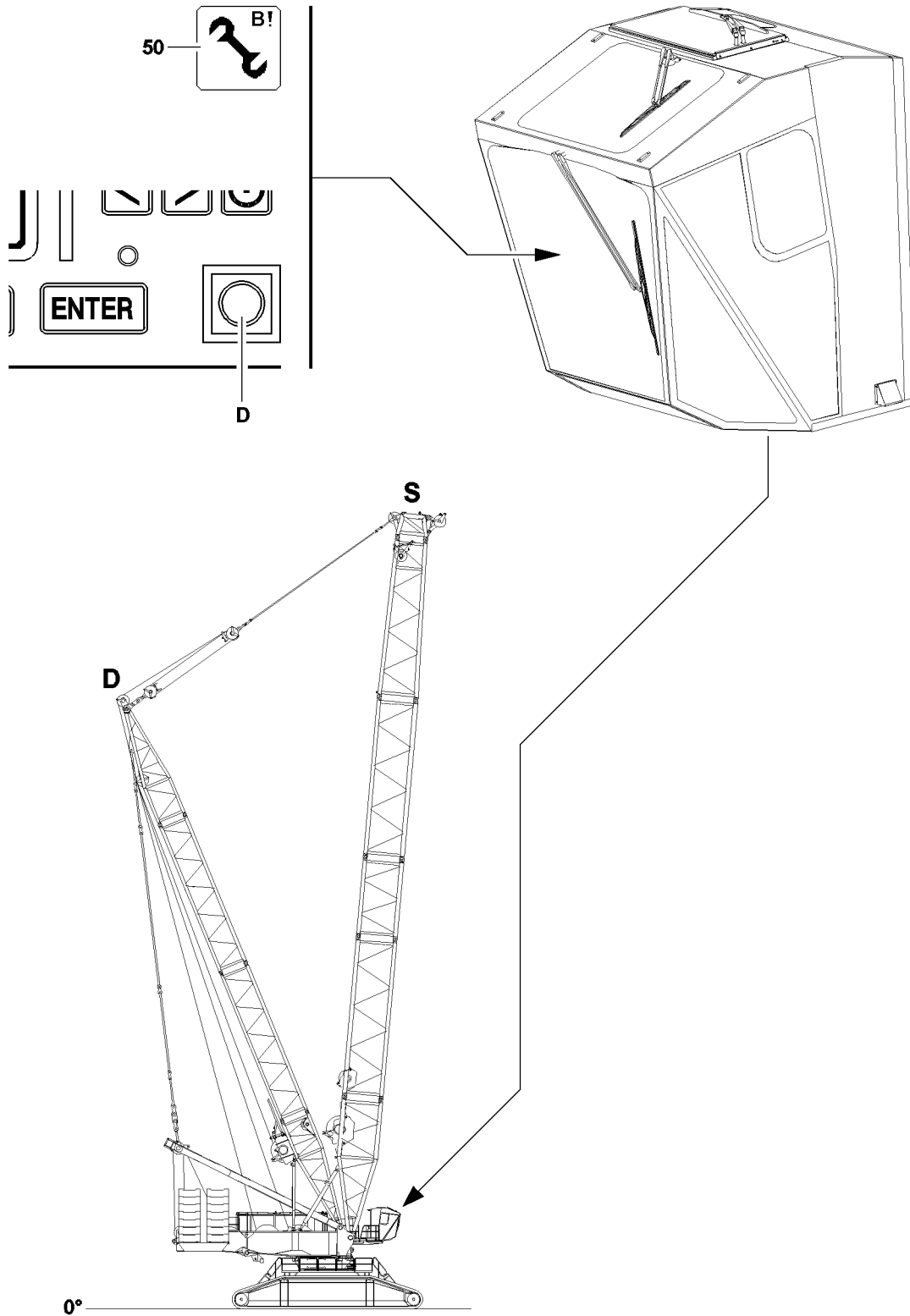


Fig.112588

LWE/LR 11350-007/19005-01-02/en

2 Assembling the SLD/SD-boom



Note

- ▶ The assembly is described on the example of the S-boom.



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 catch 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!

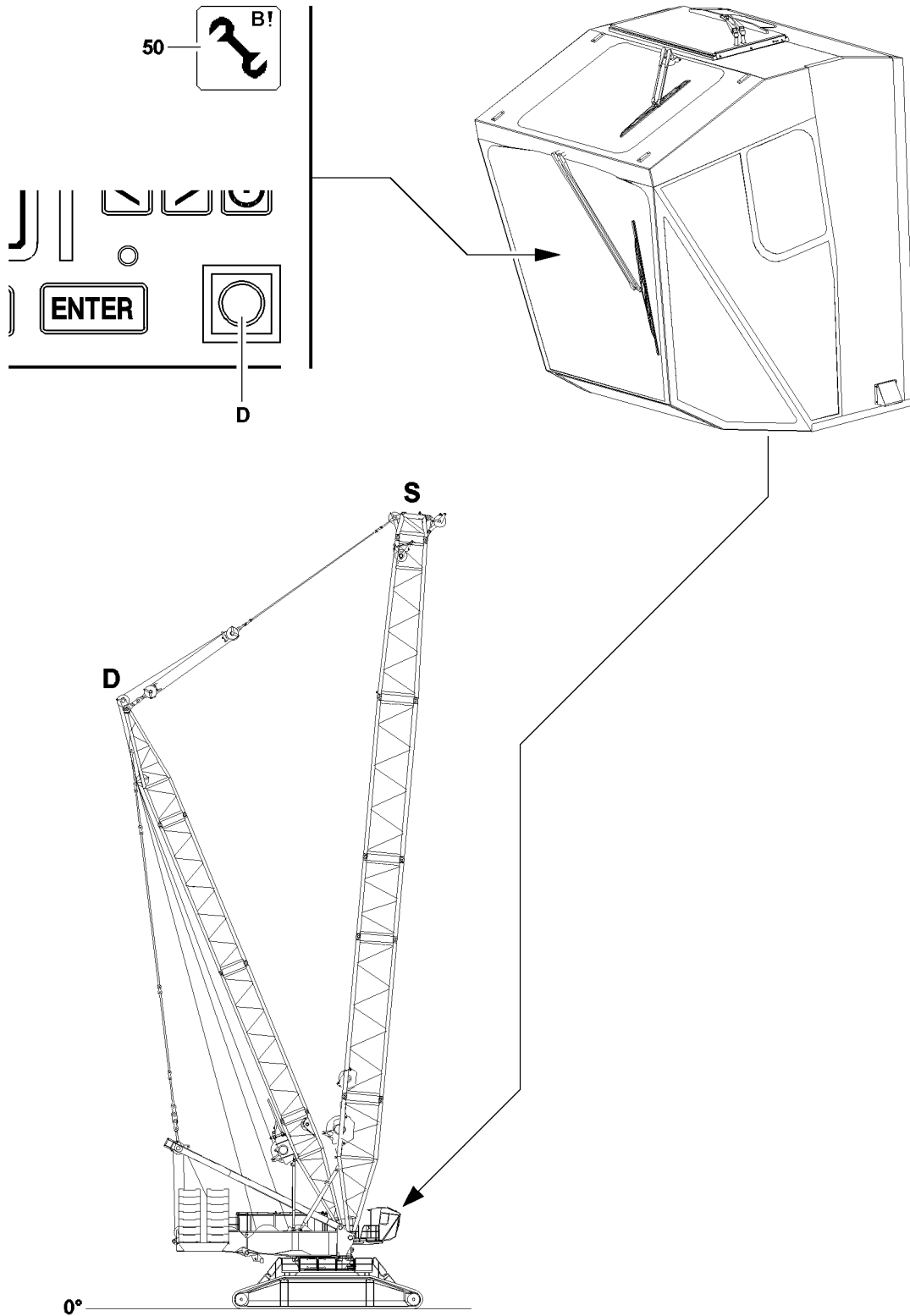


Fig.112588

**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!

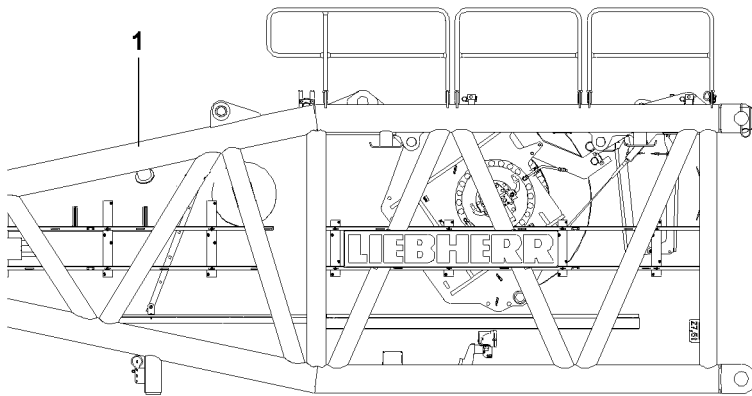


Fig.112776

2.1 Assembling the railing on the S-pivot section



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 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!
- ▶ Assemble the railings properly.

2.2 Assembling the catwalk / assembly platform on the S-pivot section



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: Assemble the catwalk!
- ▶ The catwalk may only be accessed when it is pinned and secured in operating position, check visually!



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.

2.2.1 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!

2.2.2 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!

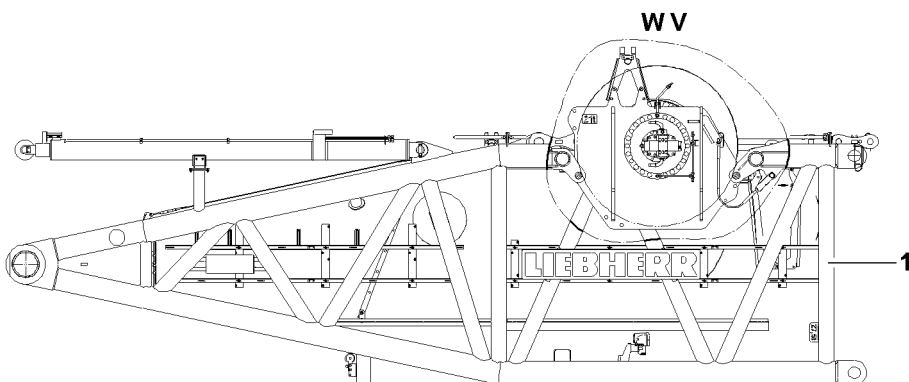
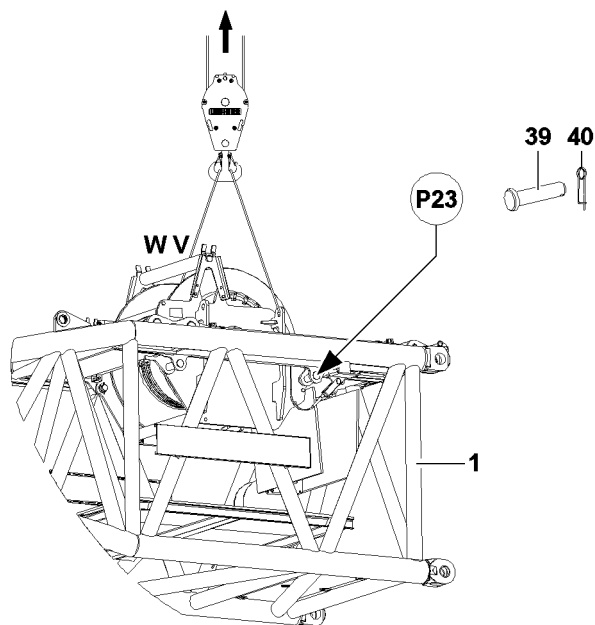
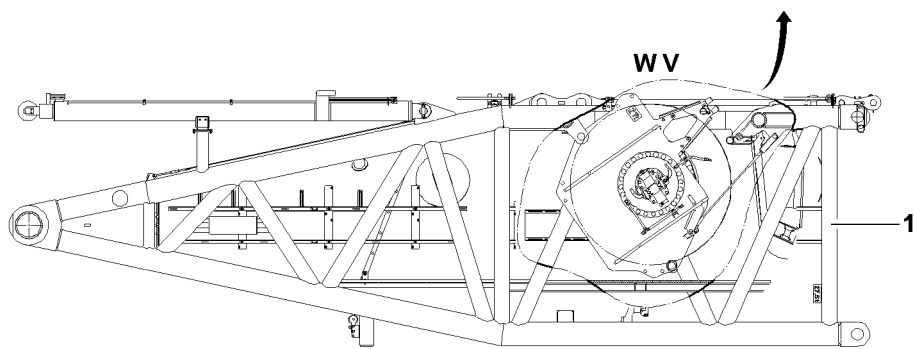


Fig.112777

LWE/LR 11350-007/19005-01-02/en

2.3 Assembling winch 5 on the S-pivot section

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** at point **P23** with pin **39** and secure with spring retainer **40**.

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 to winch 5 **W V**.
- ▶ Establish the hydraulic connections to winch 5 **W V**.

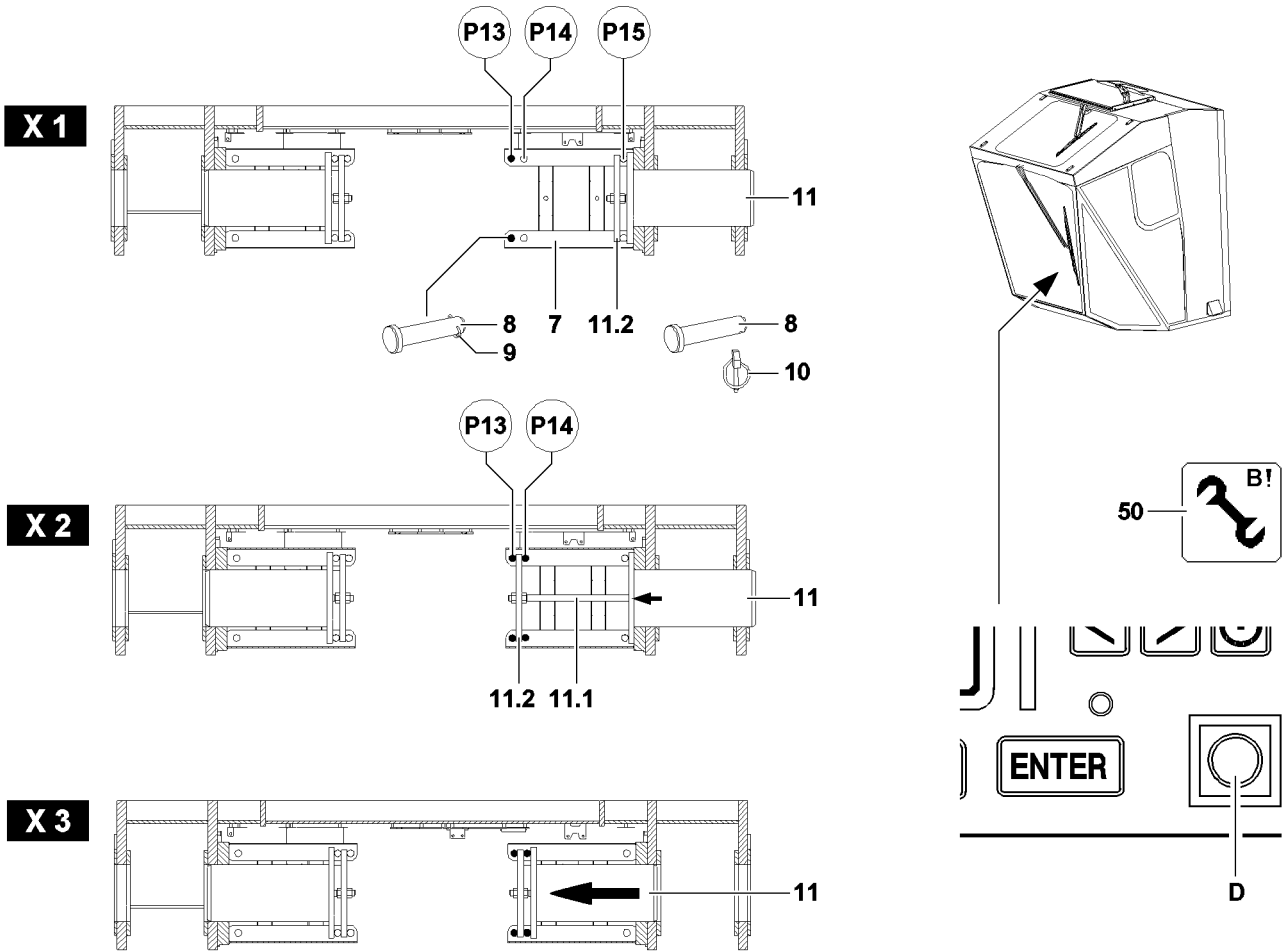
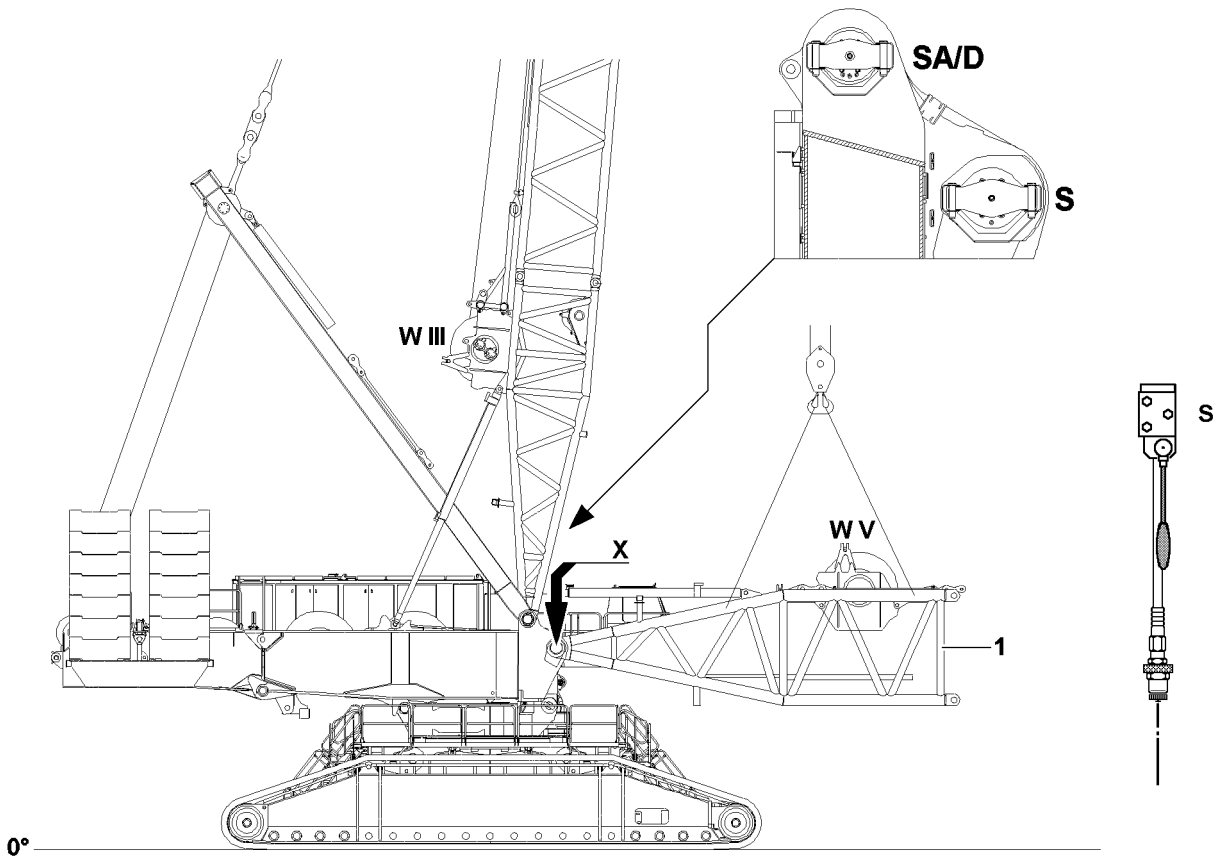


Fig.112763

LWE/LR 11350-007/19005-01-02/en

2.4 Assembling the SLD/SD-boom

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- An auxiliary crane is available.
- An assembly scaffolding / work platform is available.
- The counterweight has been installed on the turntable according to the load chart.
- The 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.

2.4.1 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!



Note

- ▶ If the turntable is turned to the side for the assembly of the boom, then boom and lattice sections must be supported, depending on the ground condition!

- ▶ Turn the turntable into assembly position, see „Erection and take down charts“.

2.4.2 Deactivating the LICCON overload protection for assembly



WARNING

Assembly with turned on set up key!

When the set up key is engaged, the LICCON overload protection is deactivated!

In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

This could result in high property damage!

- ▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
- ▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with the set up key **D** turned on is strictly prohibited!

- ▶ To activate assembly operation: Turn the set up key **D** to the right.

Result:

- The LICCON overload protection is deactivated.
- The assembly icon **50** appears in the LICCON monitor.

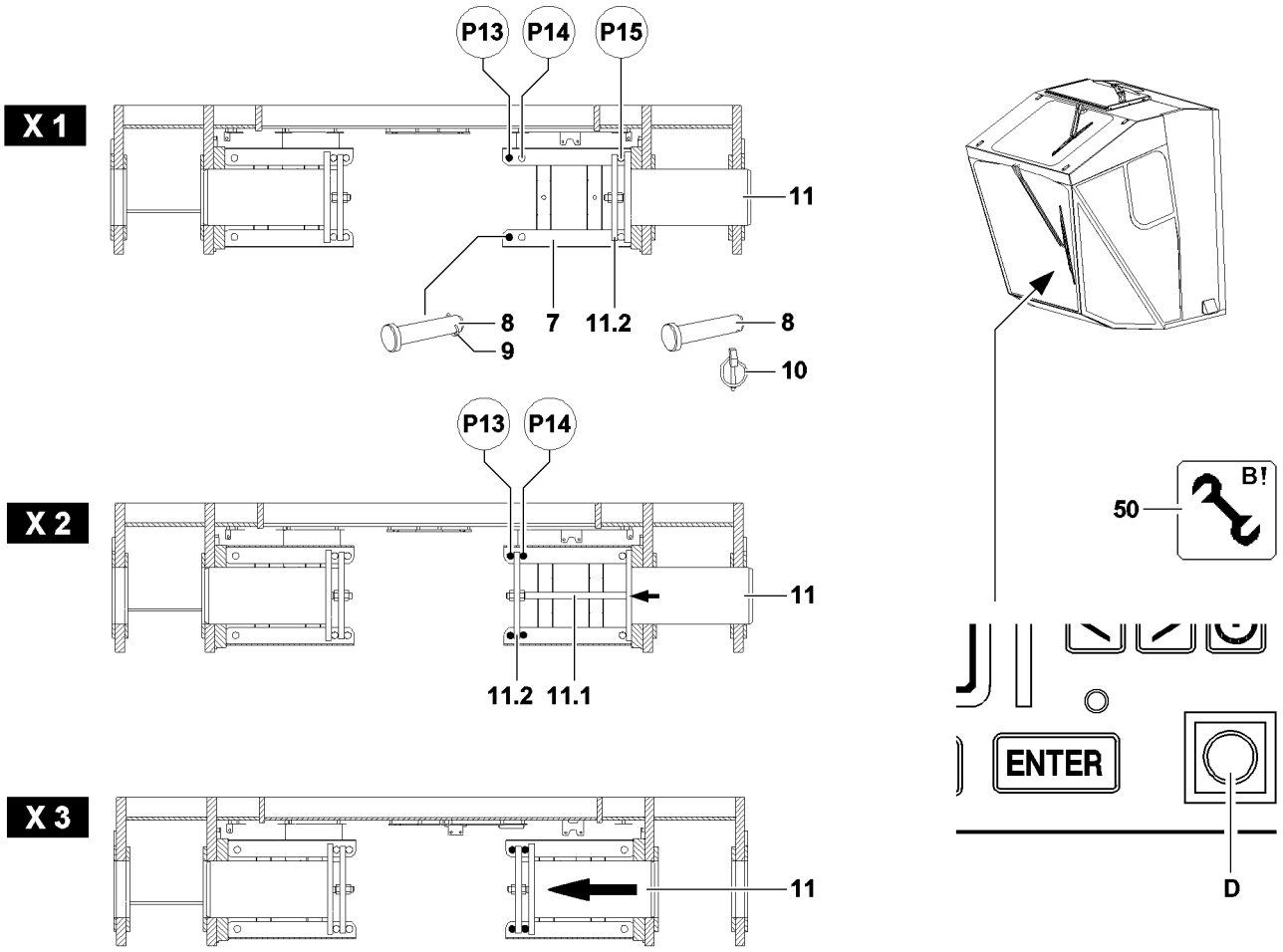
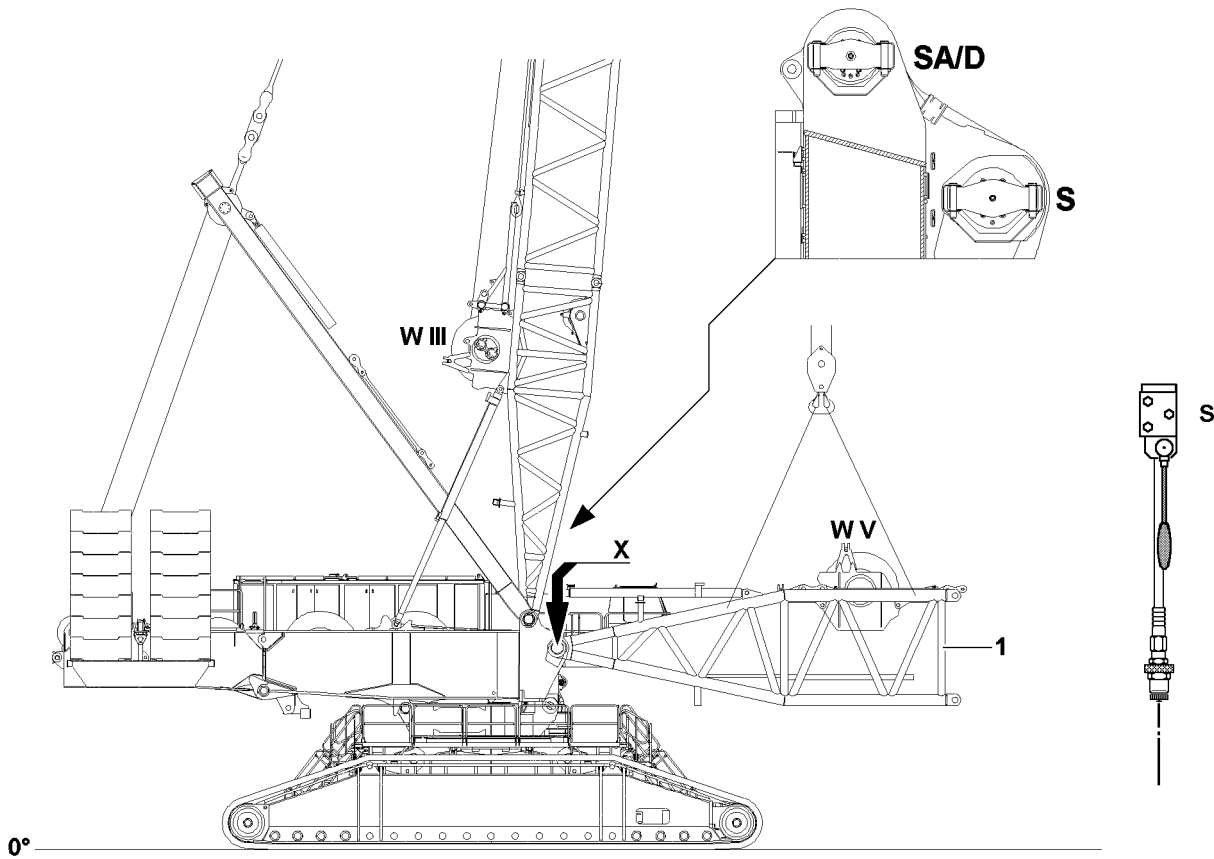


Fig.112763

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2.4.3 Pinning the S-pivot section on the turntable



Note

- ▶ For arrangement of intermediate sections of boom system, see Crane operating instructions, chapter 5.03!!



WARNING

General danger notes!

- ▶ Support the main boom during assembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be inspected regularly, see Crane operating instructions, chapter 8.15!

Make sure that the following prerequisite is met:

- The connector pins **11** on the turntable are unpinned.



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 assembly, see section „Fastening points“!
- ▶ 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
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, the S-pivot section can fall down!
Personnel can be severely injured or killed!

- ▶ Secure the connector pins **11** 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!

When the installed S-pivot section is placed on the ground, the S-pivot section can be damaged!

- ▶ Before placing the S-pivot section down on the ground, make sure that the S-pivot section cannot collide with the crane components during the take down procedure!
- ▶ Slowly 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.

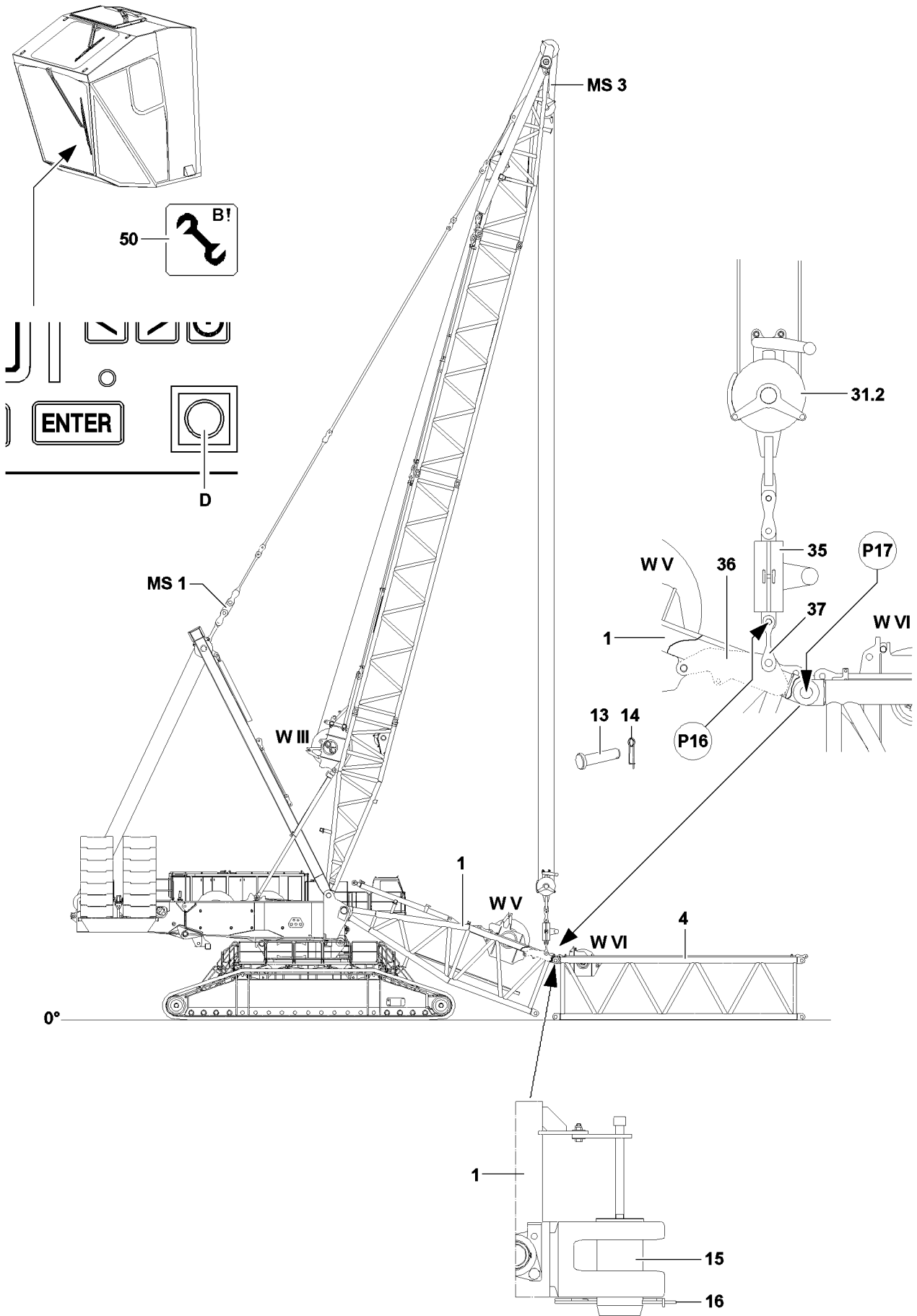


Fig.112764

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2.4.4 Pinning the upper pulley block on the S-pivot section

To be able to „close“ the S-boom combination after assembly, it is necessary to luff the D-boom down to the front and to lower and pin the upper pulley block to the brackets **37** 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.
 - Winch 5 is installed in operating position.
 - The catwalk is in operating position (only if winch 5 is not present), see Crane operating instructions, chapter 2.06.
- ▶ Luff the D-boom down to the front until the upper pulley block **31.2** hangs freely with the assembly weight **35** over the bracket **37** on the S-pivot section **1**.

Pin the assembly weight **35** on the bracket **37** at point **P16**.

- ▶ Insert the pin **13** on both sides at point **P16** and secure with spring retainer **14**.
- ▶ Carefully spool up winch 3 **W III** until the control rope of winch 3 **W III** is slightly tensioned.

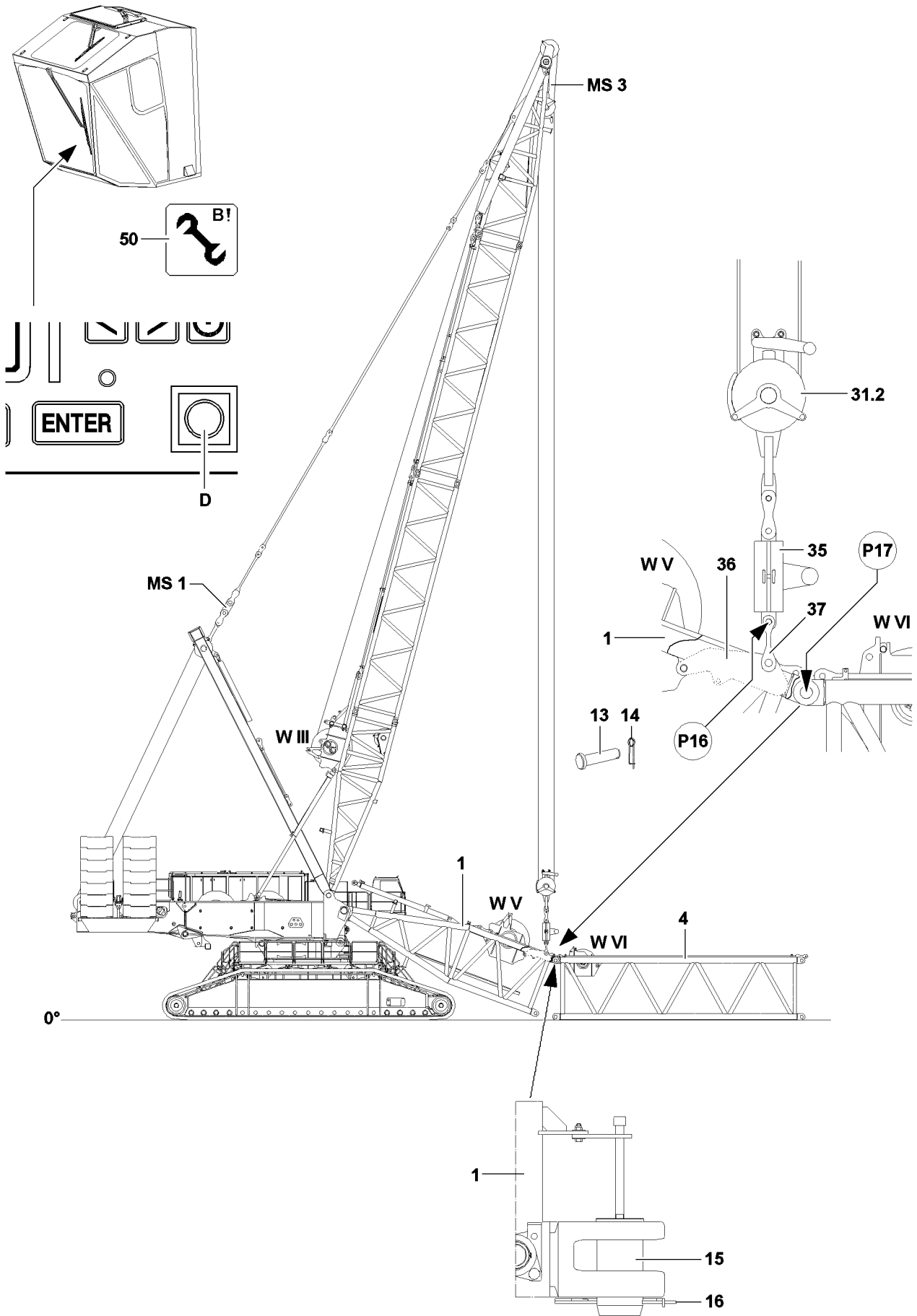


Fig.112764

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2.4.5 Assembling the S-intermediate sections on the S-pivot section



Note

- ▶ If the crane is operated with a boom nose after boom assembly, then the S-intermediate section for winch 6 must be installed directly connecting to the S-pivot section.

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 upper pulley block **31.2** is pinned and secured with the bracket **37** on the guy point **P16**.
- The auxiliary crane is removed.



Note

- ▶ The S-intermediate sections are pinned with the pin pulling device, see Crane operating instructions, chapter 5.30!
- ▶ Support the S-intermediate sections from below for easier assembly / disassembly!



WARNING

General danger notes!

- ▶ All pins are to be secured after assembly of the S-intermediate sections with the intended safety elements!

Pin the S-intermediate section **4** on the S-pivot section **1** at point **P17**.

- ▶ Attach the S-intermediate section **4** on the auxiliary crane and align on the S-pivot section **1**, see section „Fastening points of the S-lattice sections“.

When the pin bores on the S-pivot section **1** and on the S-intermediate section **4** „on top“ (point **P17**) align:

- ▶ Insert the pin **15** with the pin pulling device from the inside to the outside and secure with spring retainer **16**.

Assemble the main boom to the required length and pin and secure the S-intermediate sections „on top“ and „bottom“.

- ▶ Insert the pin **15** from the inside to the outside and secure with spring retainer **16**.



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 **MS 1** may not exceed 136 t during the „closing procedure“.
- ▶ The maximum permissible total force on test point 3 **MS 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 SL/S-boom combination may **not** lift off the ground during the „Closing procedure“!



Note

- ▶ The actual forces on test point 1 **MS 1** and test point 3 **MS 3** are shown on LICCON monitor 1.

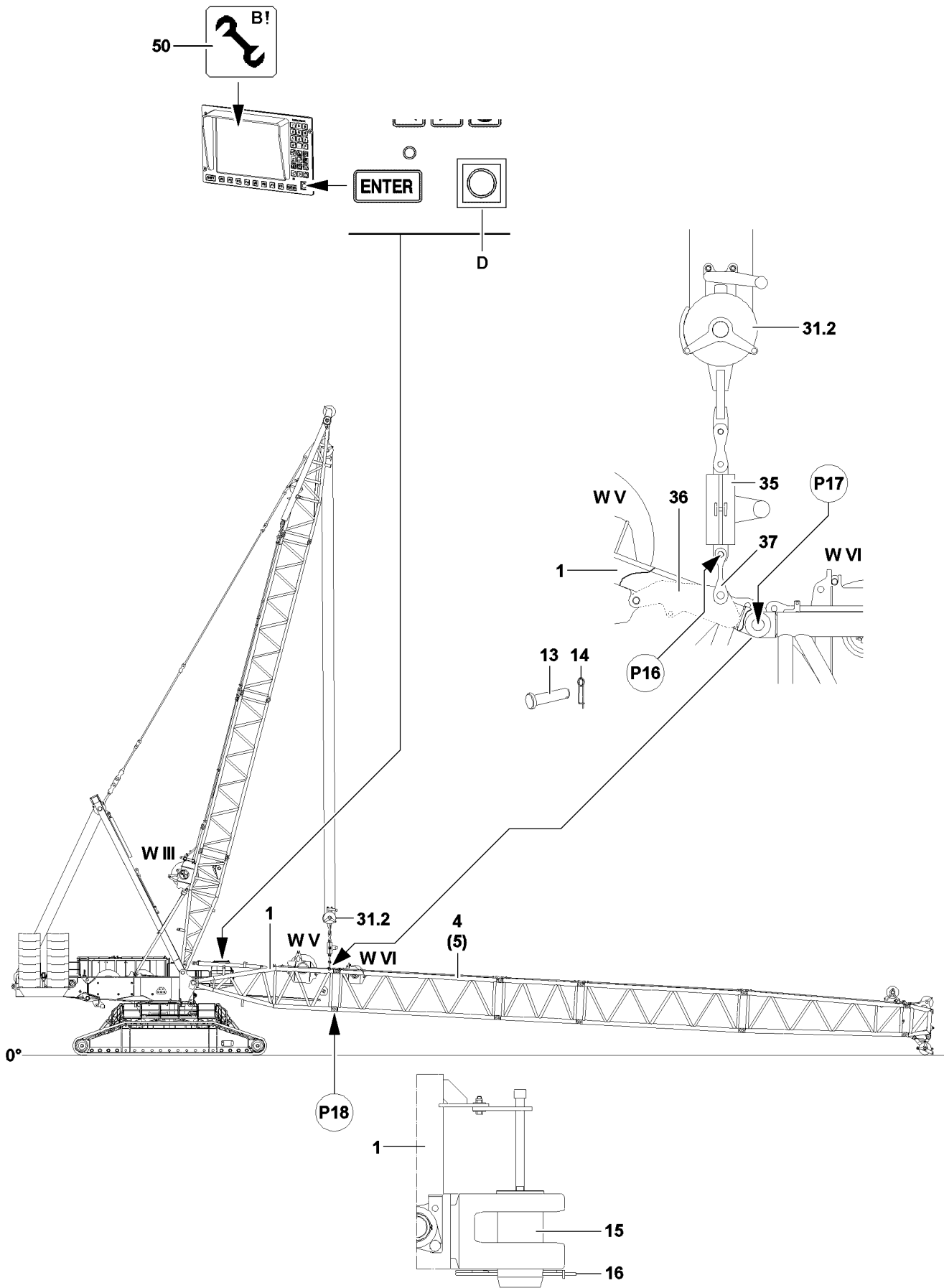


Fig.112765

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When the SL/S-boom combination is assembled to the desired length:

- ▶ Lift the S-pivot section **1** with the upper pulley block **31.2** until the pin bores on the „bottom“ align at point **P18**.
- ▶ Insert the pin **15** from the inside to the outside and secure with spring retainer **16**.



WARNING

Mortal danger due to folding down of boom!

By unpinning the assembly weight **35** on the bracket **37** on the S-pivot section **1**, the boom can suddenly fold down if the boom is not pinned at point **P18** „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 **35** on the bracket **37** only when it is ensured that the S-pivot section **1** is safely pinned and secured on the „bottom“ with the S-intermediate section **4**!

When the S-boom system is „closed“:

- ▶ Slowly lower the upper pulley block **31.2** until the brackets **37** are relieved.
- ▶ Unpin the brackets **37** assembly weight **35** on both sides at point **P16**: Release and unpin the pin **13**.

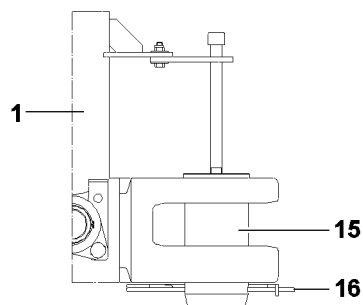
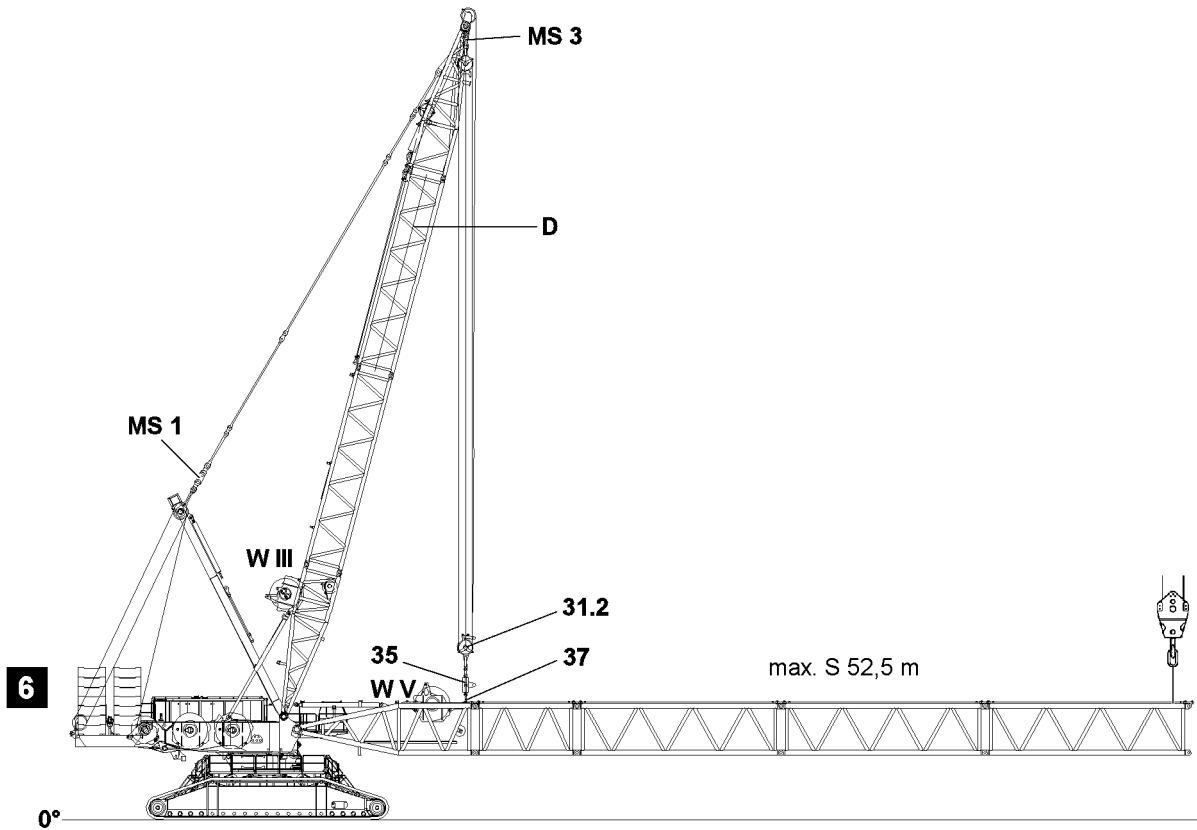


Fig.112766

2.5 Assembling the SLD/SD-boom in flying mode

If spatial prerequisites on the job site are limited for the assembly of the SL/S-boom, or if they are limited by buildings or similar, then the boom can be assembled in flying mode.



Note

- ▶ Weights of the individual lattice sections, see Crane operating instructions, chapter 1.03.
- ▶ For arrangement of intermediate sections of boom system, see Crane operating instructions, chapter 5.03!!

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- An assembly scaffolding / work platform is available.
- The LICCON overload protection has been set according to the data in the load chart.

2.5.1 Maximum permissible boom length - illustration 6



DANGER

General danger notes!

- ▶ Support the main boom during assembly and disassembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be inspected regularly, see Crane operating instructions, chapter 8.15.



DANGER

Damage to crane!

If the following conditions are not met, the crane can topple over or be significantly damaged! Personnel can be severely injured or killed!

- ▶ Do not exceed the maximum permissible total force on test point 1 **MS1**.
- ▶ Do not exceed the maximum permissible total force on test point 3 **MS3**.
- ▶ A minimum counterweight must be installed on the turntable.
- ▶ For the flying S-boom assembly, do not exceed the maximum permissible boom length.

| Maximum permissible system length at maximum permissible total forces on test points: | | | | |
|---|-----------------------------------|--|---------------------------------|--------------|
| Permissible total force test point MS1 of 195 t. | | | | |
| Permissible total force test point MS3 of 200 t. | | | | |
| Boom system | Maximum permissible system length | Equipment | DB _{min} ¹⁾ | Illustration |
| S(D) | 52.5 m | - without end section - with S- and WA-frame 2 guy rods | 200 t | 6 |

1) This counterweight must be at least installed on the turntable for „Flying assembly“.

- ▶ Observe and adhere to the data in the chart overview.

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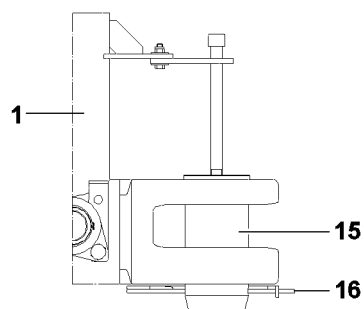
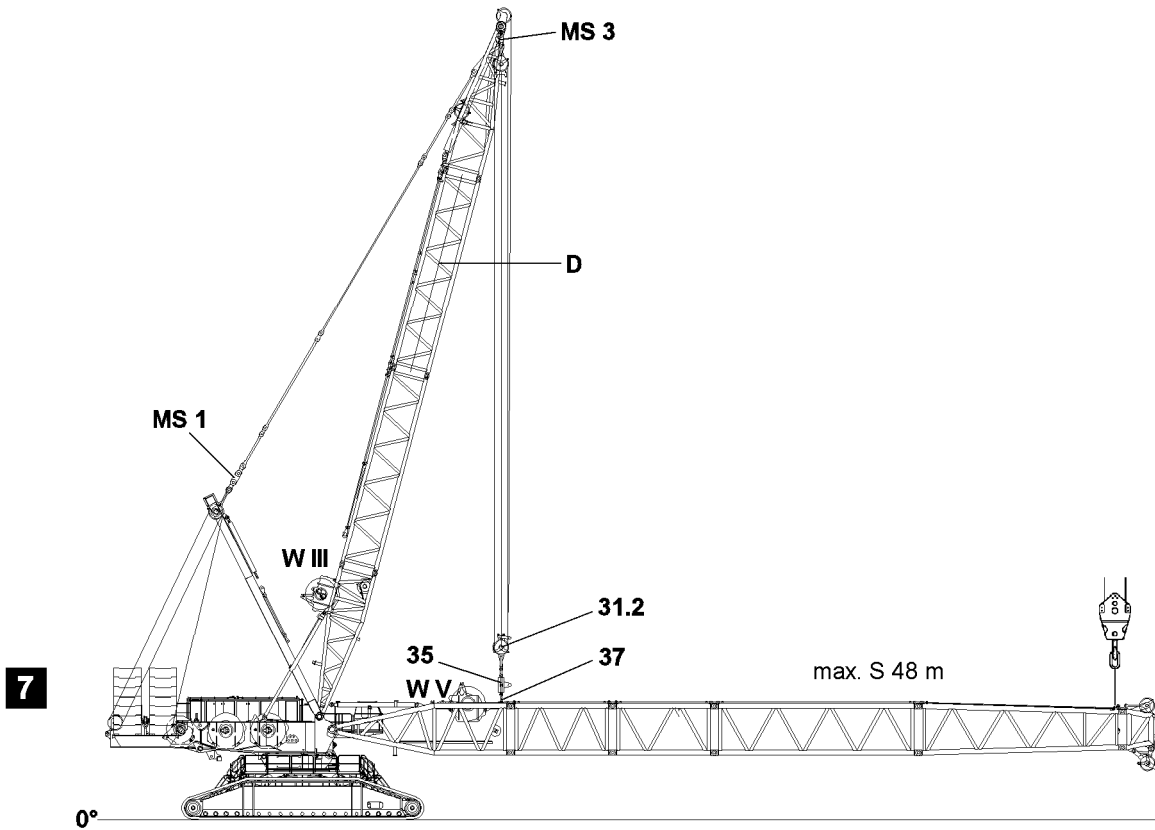


Fig.112767

2.5.2 Maximum permissible boom length - illustration 7



DANGER

General danger notes!

- ▶ Support the main boom during assembly and disassembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be inspected regularly, see Crane operating instructions, chapter 8.15.



DANGER

Damage to crane!

If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!

- ▶ Do not exceed the maximum permissible total force on test point 1 **MS1**.
- ▶ Do not exceed the maximum permissible total force on test point 3 **MS3**.
- ▶ A minimum counterweight must be installed on the turntable.
- ▶ For the flying main boom assembly, do not exceed the maximum permissible boom length.

| Maximum permissible system length at maximum permissible total forces on test points: | | | | |
|---|-----------------------------------|---|---------------------------------|--------------|
| Permissible total force test point MS1 of 270 t. | | | | |
| Permissible total force test point MS3 of 280 t. | | | | |
| Boom system | Maximum permissible system length | Equipment | DB _{min} ¹⁾ | Illustration |
| S(D) | 48.0 m | - with end section - without hook block - with S- and WA-frame 2 guy rods | 200 t | 7 |

1) This counterweight must be at least installed on the turntable for „Flying assembly“.

- ▶ Observe and adhere to the data in the chart overview.

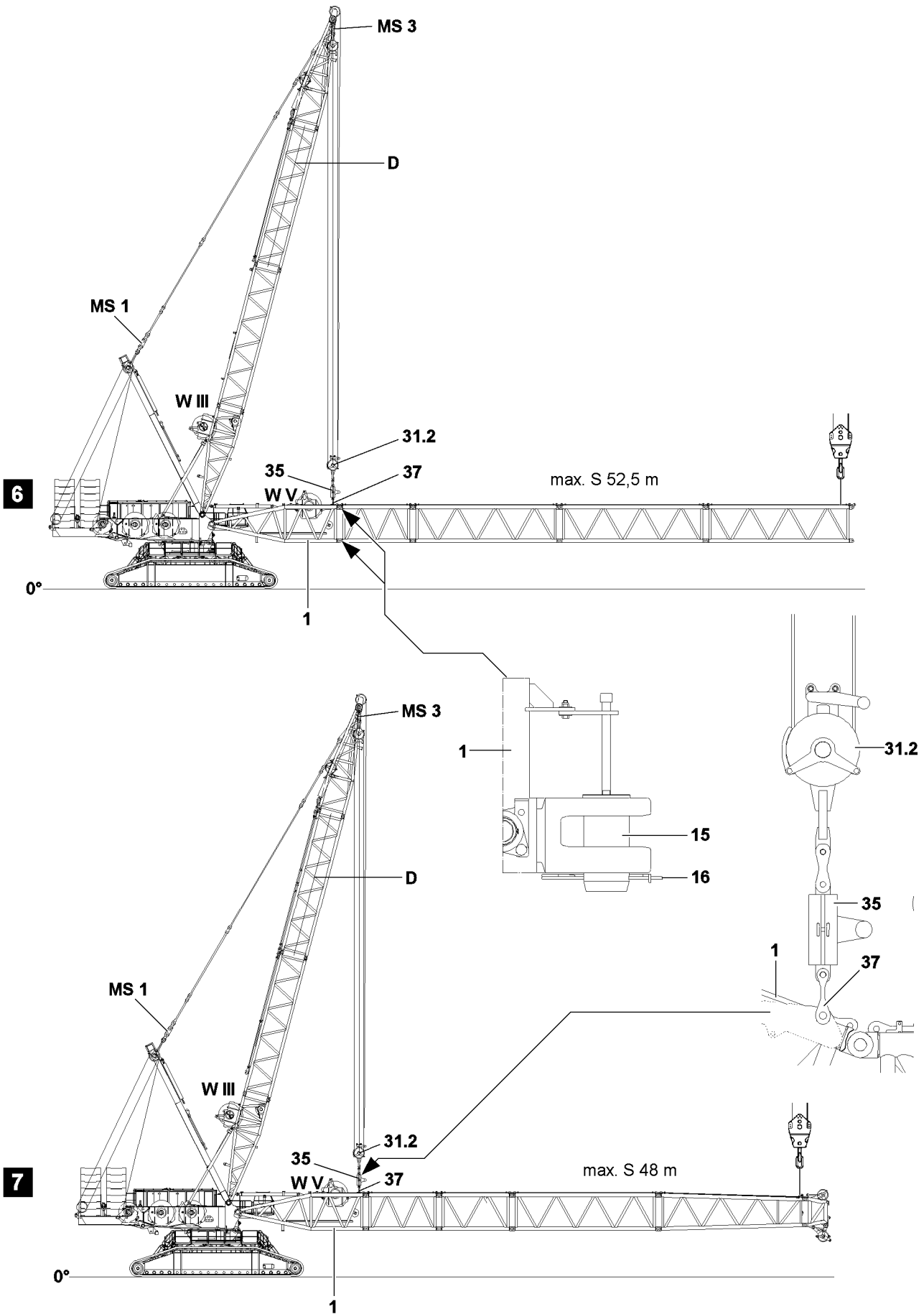


Fig.112769

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2.5.3 Assembling the S-intermediate sections in flying mode on the S-pivot section

In „Flying mode“ assembly, the intermediate sections can be pinned and secured with the auxiliary crane individually or as a preassembled unit on the S-pivot section.



WARNING

Impermissible boom lengths!

If impermissible boom lengths are assembled on the crane, significant property damage can occur on the crane!

Personnel can be severely injured or killed!

- ▶ The maximum permissible boom lengths for the „Flying assembly“ may not be exceeded!
- ▶ The data in the erection and take down charts as well as the load charts must be observed!

Make sure that the following prerequisites are met:

- The S-pivot section is pinned and secured on the turntable.
- The S-pivot section is horizontally tensioned.
- The counterweight is placed according to the specifications.
- An auxiliary crane is available.



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 intermediate sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
 - ▶ Before unpinning: Support crane components and boom!
 - ▶ Secure the pins in the bearing points and in the receptacles!
 - ▶ It is prohibited to lean a ladder against the crane section which is being disassembled!
-
- ▶ Attach the S-intermediate sections or preassembled boom unit on the auxiliary crane.
 - ▶ Lift the S-intermediate sections or the preassembled boom unit with the auxiliary crane and position on the S-pivot section **1**.

When the pin points between the S-pivot section **1** and the S-intermediate section **or** the S-pivot section **1** and pre-assembled boom unit align on „top“ and „bottom“:

- ▶ Insert the pins **15** „on top“ and „bottom“ and secure with spring retainer **16**.

When the pins between the S-pivot section **1** and the S-intermediate section **or** the S-pivot section **1** and pre-assembled boom unit are properly pinned and secured „top“ and „bottom“:

- ▶ Lower the boom on the support base.
- ▶ Remove the auxiliary crane.

When the boom is safely placed on the support or held by an auxiliary crane:

- ▶ Slowly lower the upper pulley block **31.2** until the brackets **37** are relieved.
- ▶ Release and unpin the brackets **37** on the assembly weight **35**.



Note

- ▶ Assembly of guy rods, see section „Assembling the guy rods“!

Fig.195219

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2.6 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.

2.7 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.

2.8 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.

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, see Crane operating instructions, chapter 4.01.
- ▶ Check the function visually.

2.8.3 Hoist limit switch

- ▶ Actuate the hoist limit switch manually on the pulley head.

Result:

- The hoist winch turns off in upward movement.
- The hoist top icon on the LICCON monitor 0 blinks.

2.8.4 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 hoist limit switch is actuated manually.
- The spool up function of winch 4 (control winch) turns off.
- The icon „Boom limitation“ appears on the LICCON monitor 0.

2.8.5 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 icon „Boom limitation“ appears on the LICCON monitor 0.

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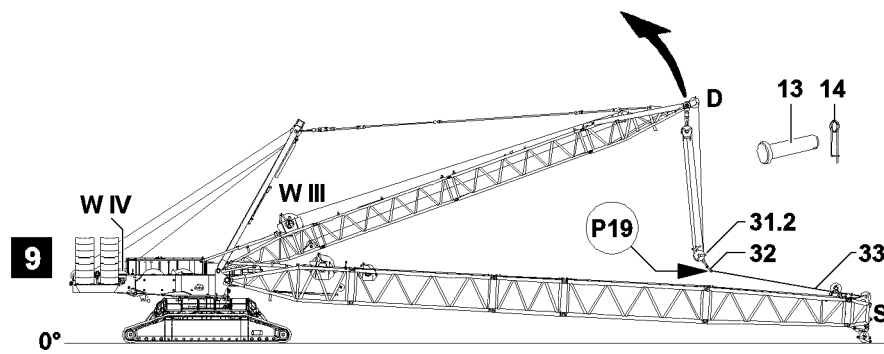
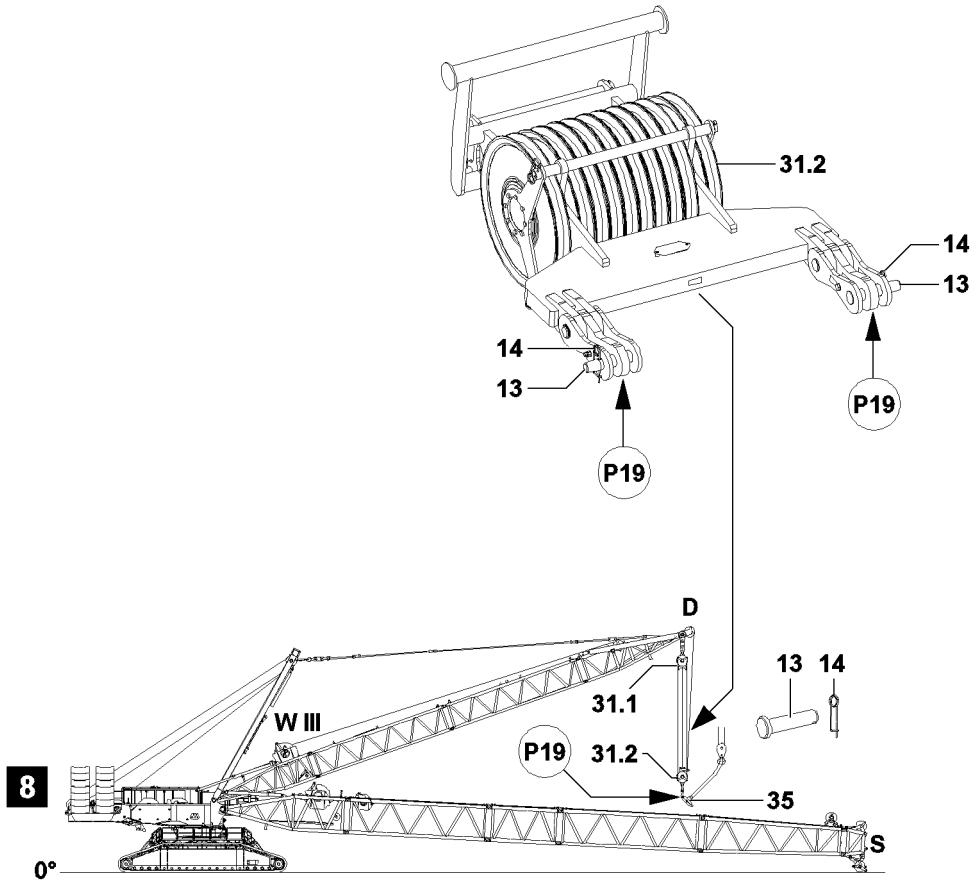


Fig.112771

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2.9 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 pin connections have been secured.
- The upper pulley block **31.2** is unpinned on the S-pivot section **1**.

- ▶ Luff the D-boom down to the front.
- ▶ Lower the upper pulley block **31.2** to the boom: Spool out winch **3 W III**.
- ▶ Attach the assembly weight **35** onto the auxiliary crane.

When the assembly weight is safely held by the auxiliary crane:

- ▶ Release and unpin the assembly weight **35** on the upper pulley block **31.2** at point **P19**.
- ▶ Remove the assembly weight **35** 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/L-intermediate sections are pinned and secured together starting from the brackets on the fixed point of the respective end section!

- ▶ Pin and secure the guy rods for the intermediate sections according to the Rod plan.
- ▶ Pin and secure the guy rods on the upper pulley block **31.2**.

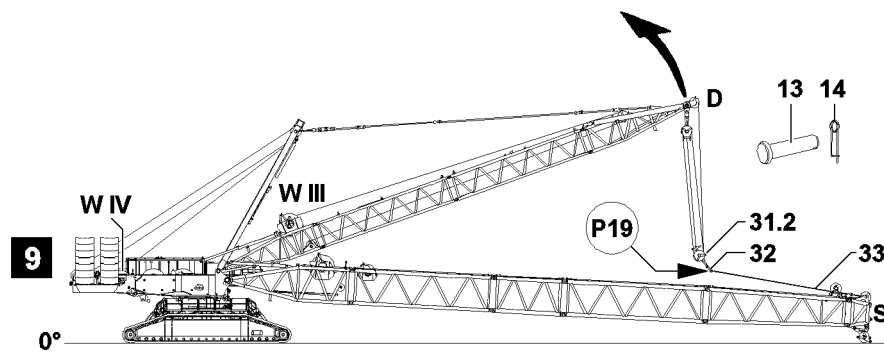
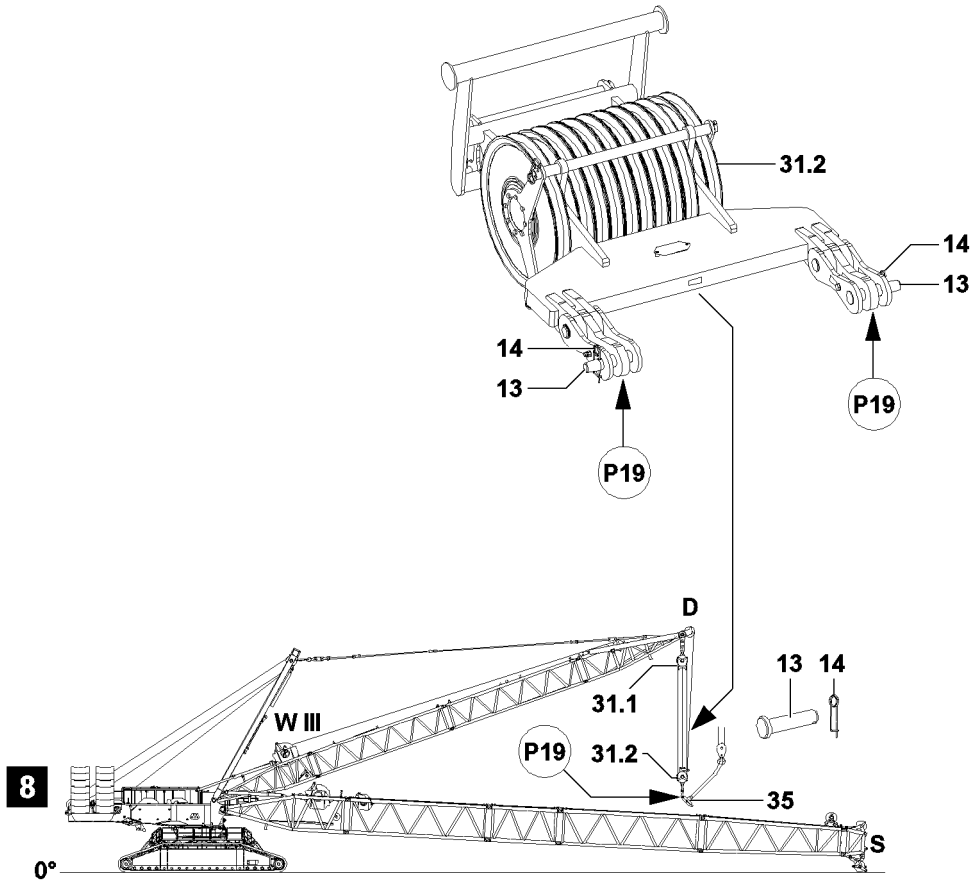


Fig.112771

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**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 with the upper pulley block **31.2**:

- ▶ 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.

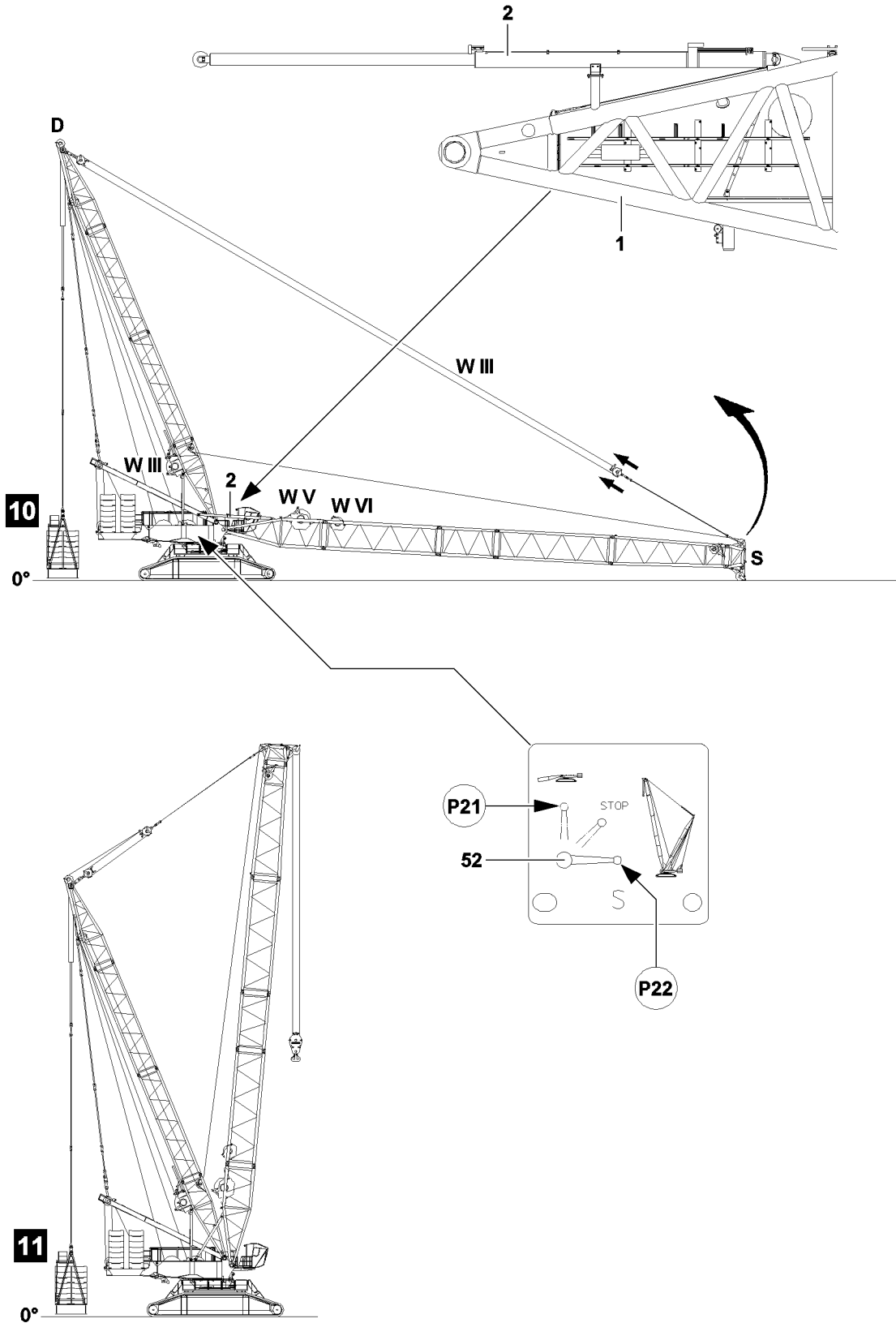


Fig.112772

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2.10 Erecting the 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!

- ▶ Observe the safety technical notes, see Crane operating instructions, chapter 5.01!
- ▶ Extend the relapse retainer of the main boom before erecting the boom combination!
- ▶ Do not allow slack rope to form 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.
- 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.

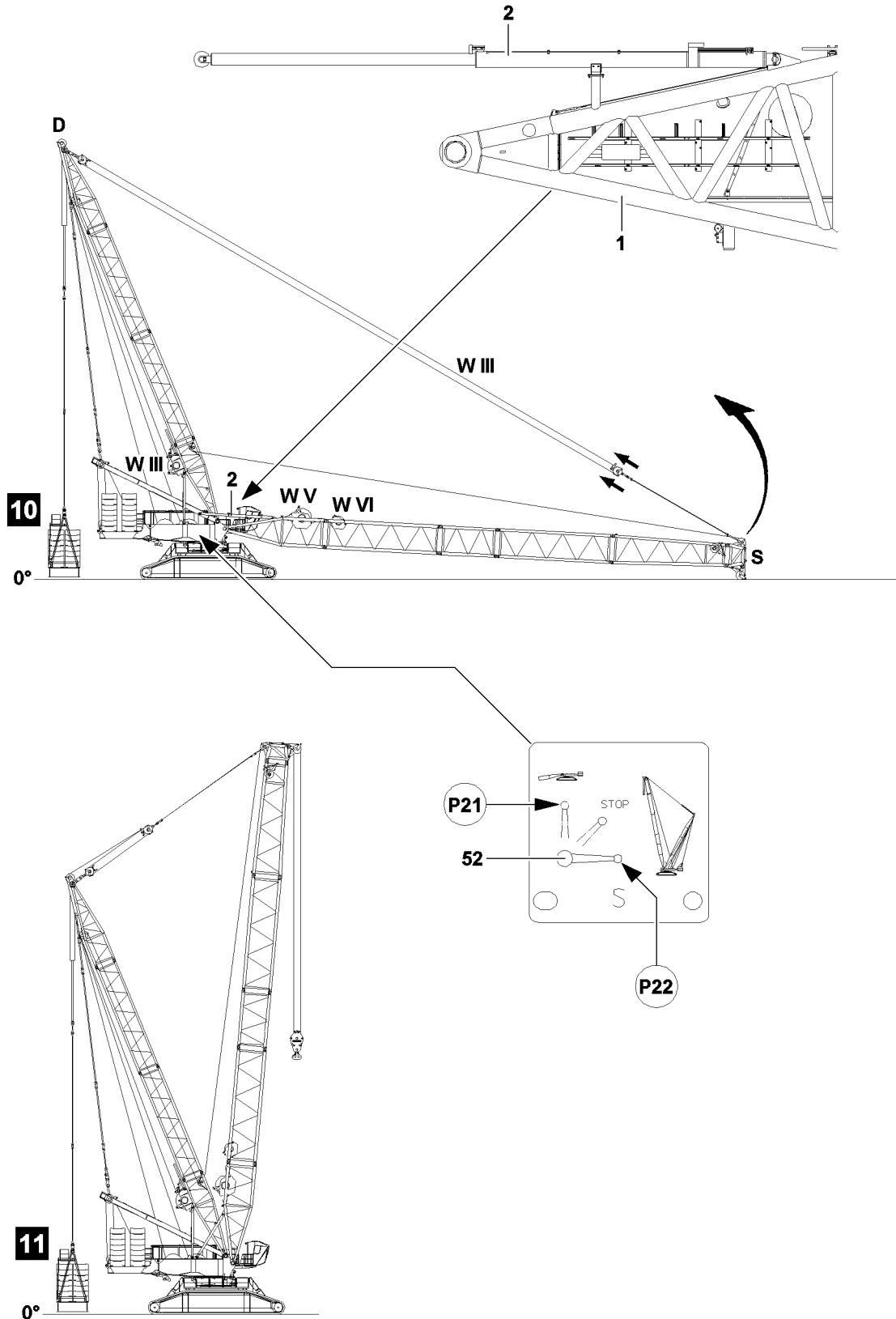


Fig.112772

2.10.1 Extending the relapse cylinders of the main boom



WARNING

The crane can topple over!

If the relapse cylinders for the main boom are not extended before erecting the boom, then the 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 retainer of the main boom before erecting the boom combination!
- ▶ Secure the ball valve **52** during crane operation to prevent inadvertent actuation!

| Ball valve positions | |
|----------------------|---|
| Position (P) | Function |
| 22 | Crane operation, extend the piston rod |
| 21 | 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 **52** to position **P22**.

Result:

- The piston rods of the relapse cylinders **2** of the main boom extend.



Note

- ▶ The ball valve **52** is secured by closing the cabinet door and removing the key!

When the piston rods of the relapse cylinders **2** of the main boom are fully extended:

- ▶ Close the cabinet door and pull the key.
- ▶ Hand the key to an authorized person.

2.10.2 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 main boom



WARNING

The crane can topple over!

In crane operation with deactivated LICCON overload protection, the crane can topple over!

There is then no additional protection against crane overload!

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!
- ▶ Crane operation with deactivated LICCON overload protection is prohibited!



Note

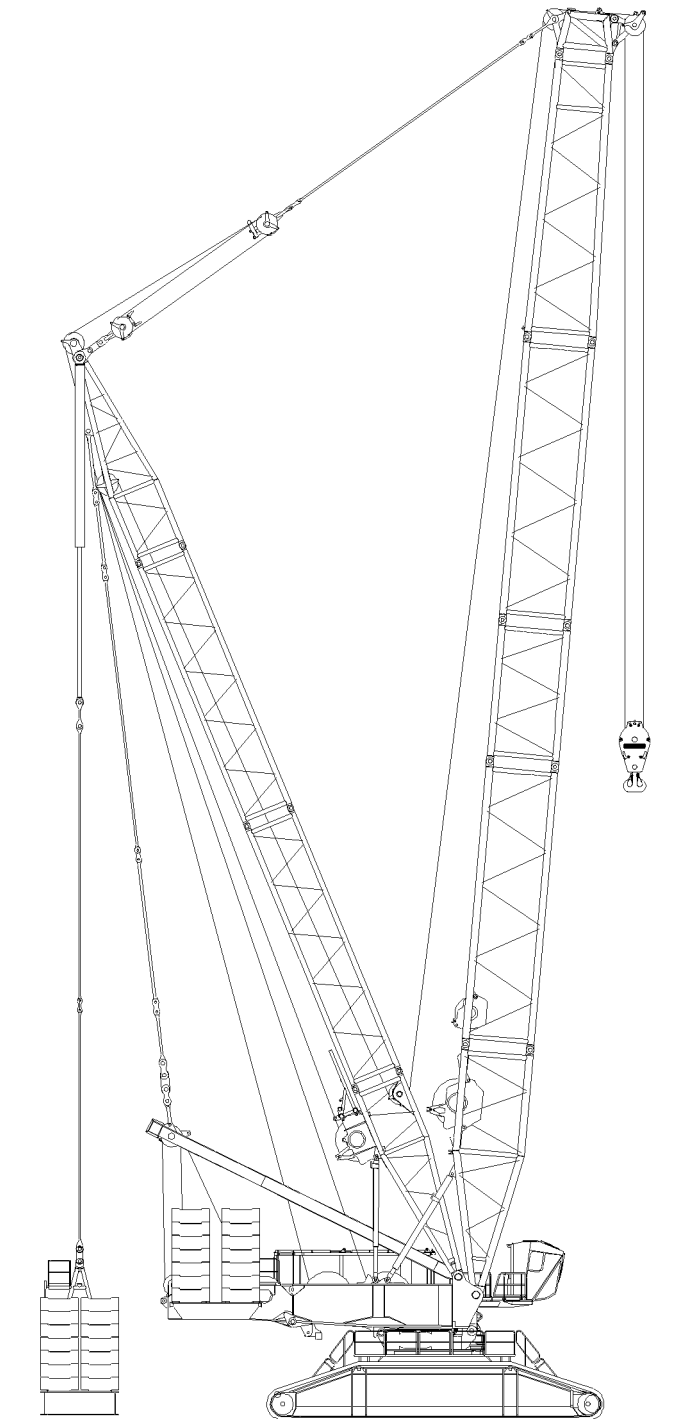
- ▶ When the lowest operating position of the boom is reached, the LICCON overload protection is activated!
 - ▶ In the maximum load icon appears a load number in „t“ instead of the display „???“!
-
- ▶ Luff the boom up to the lowest operating position.

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.



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Fig.112774

3 Operating the crane

3.1 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!

- ▶ 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!

3.1.1 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.

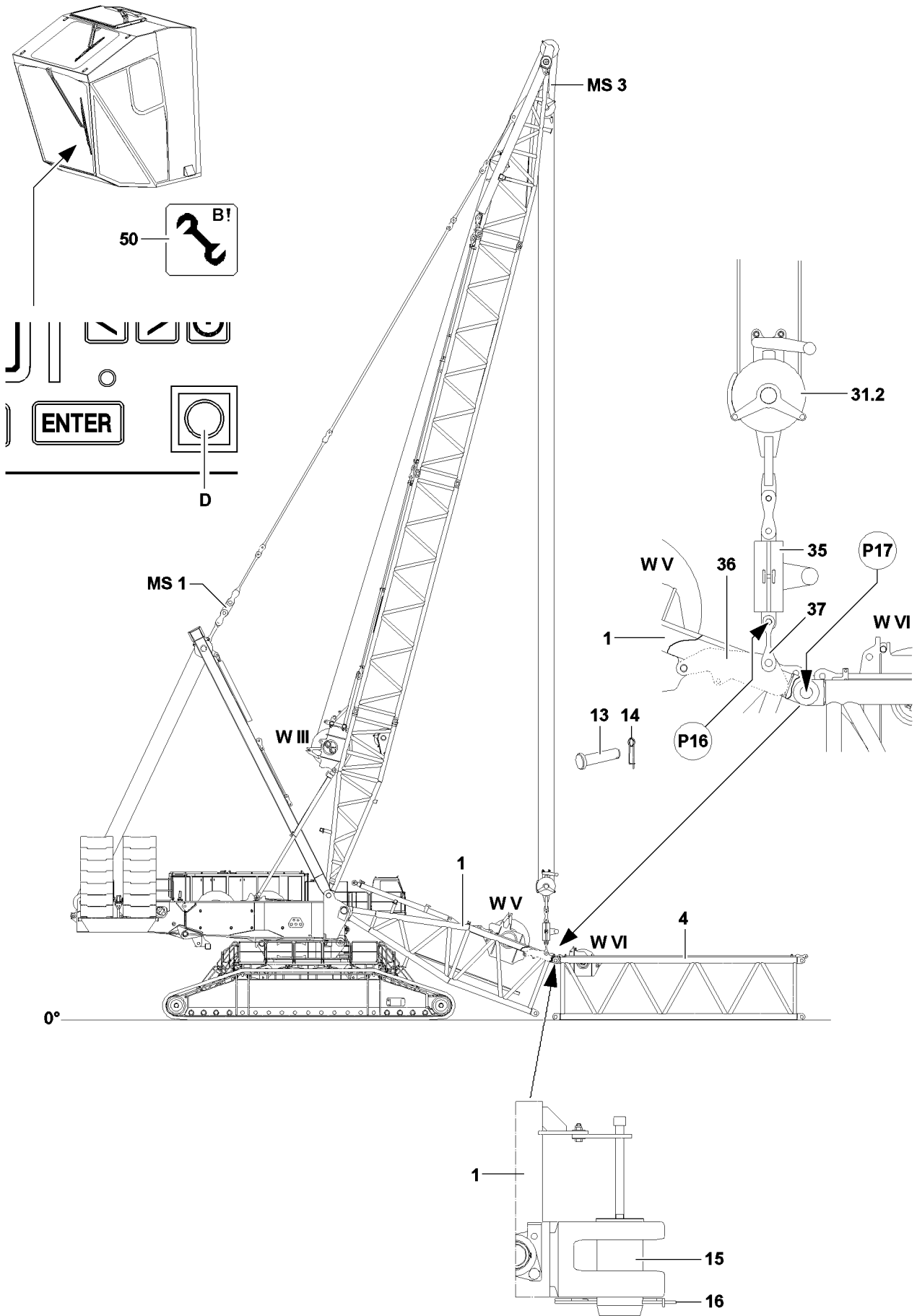


Fig.112764

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4 Disassembling the SLD/SD-boom



Note

- ▶ The disassembly is described on the example of the S-boom!



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 catch 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.
- ▶ 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

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel!

- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right!**
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being disassembled!



WARNING

Danger of impact / crushing!

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

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

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!

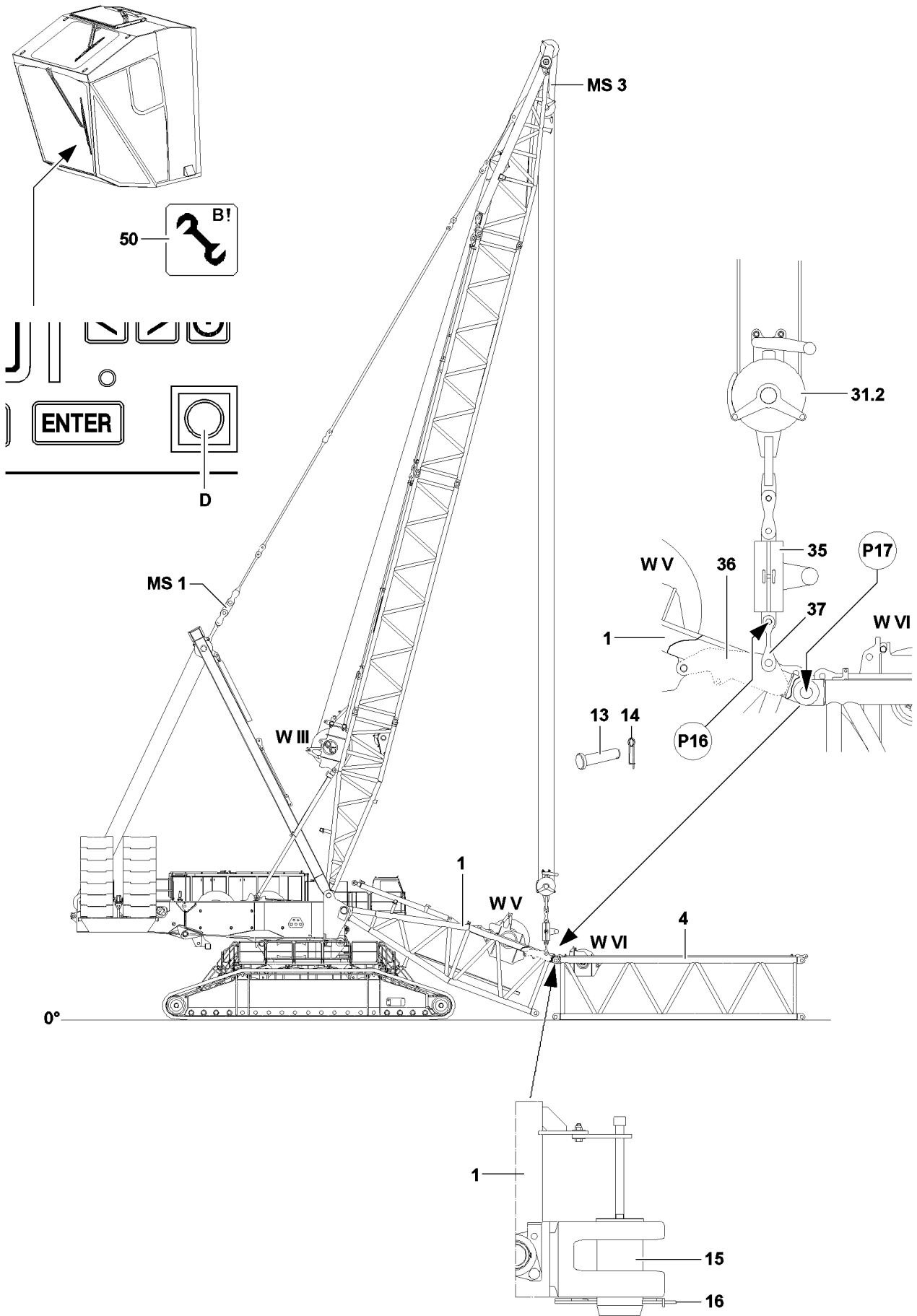


Fig.112764

4.1 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“.

4.2 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 S-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 boom down to the **lowest** operating position.

Result:

- The luff down movement is turned off.
- The „STOP“ icon appears on the LICCON monitor.
- The horn icon appears on the LICCON monitor.

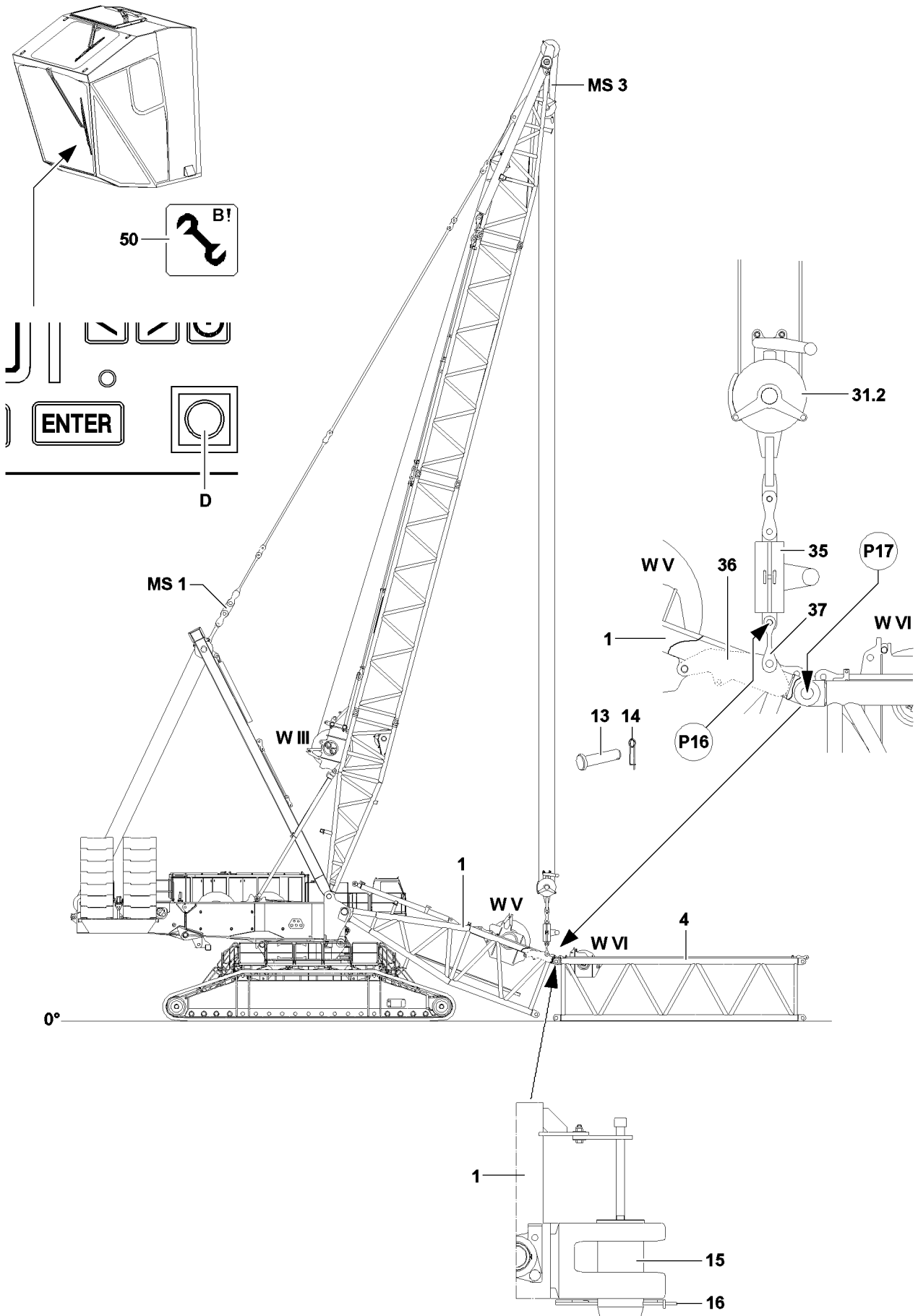


Fig.112764

LWE/LR 11350-007/19005-01-02/en

**WARNING**

Assembly with turned on set up key!

When the set up key is engaged, the LICCON overload protection is deactivated!

In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

This could result in high property damage!

- ▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
- ▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with the set up key **D** turned on is strictly prohibited!

- ▶ Turn the set up key **D** to the right.

Result:

- The LICCON overload protection is deactivated.
- The assembly icon **50** 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 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

Overspoiled winch!

If the hoist rope is pulled under the winch when spooling up, then the adjustment of the cam limit switch can change!

A new adjustment by **Liebherr Service** is required!

- ▶ Stop the winch in time, with sufficient rope reserve!
- ▶ Do not overspool the winch!

- ▶ Spool the hoist rope up.

Fig.195219

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4.3 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 of the cable drum is not properly spooled up on the cable drum after unplugging the S-end section, then the cable drum or the cable can be significantly damaged!

- ▶ Spool the cable drum up after unplugging!
-
- ▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
 - ▶ Disconnect the electrical connections and store the plug and cable properly.

4.4 Disconnecting the hydraulic connections

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



DANGER

Danger of accident due to loss of pressure or leakage!

Incorrectly coupled or self-loosening quick-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.

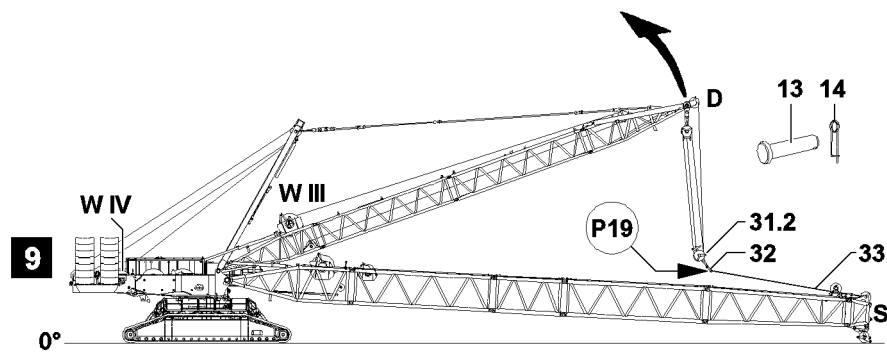
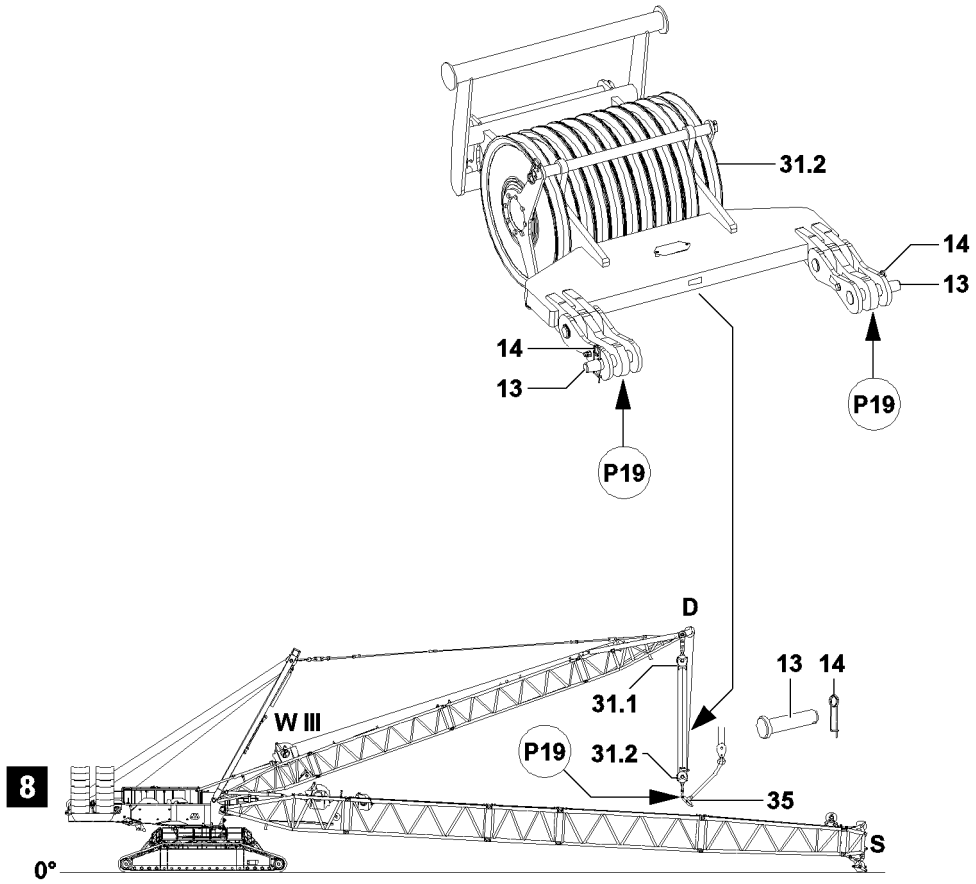


Fig.112771

LWE/LR 11350-007/19005-01-02/en

4.5 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 boom).

▶ Unpin the upper pulley block **31.2** on the S-guy rods.

▶ Place the S-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 **31.2** over the intermediate sections, rather guide them with the auxiliary crane!

▶ Make sure when erecting the D-boom, that the upper pulley block **31.2** 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 up winch 3 **W III** at the same time.

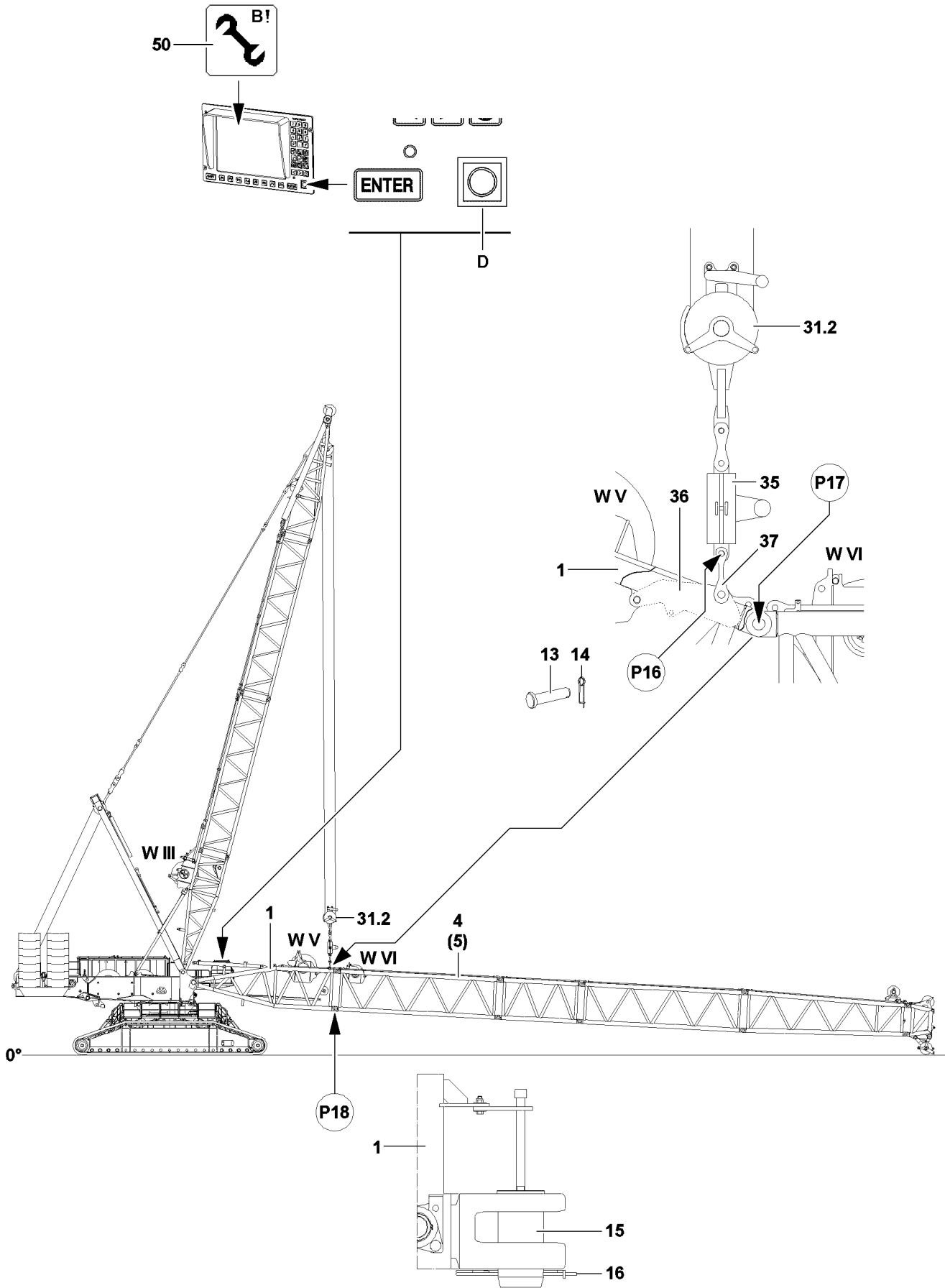


Fig.112765

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4.6 Disassembling the main boom



WARNING

The boom can suddenly fold down!

If the following conditions are not met before disassembling the boom, the 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 have been disassembled and placed in the transport retainers.
- The guy rods are placed in the transport retainers and secured.
- ▶ Lower the upper pulley block **31.2** until it is over the brackets **37** on the S-pivot section **1**.
- ▶ Swing the assembly weight **35** with the auxiliary crane in to the upper pulley block **31.2**.
- ▶ Pin the assembly weight **35** on the upper pulley block **31.2** and secure.
- ▶ Pin the assembly weight **35** on the brackets **37** at point **P16** and secure: Use pin **13** and spring retainer **14**.



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 **MS1** may **not** be exceeded!
- ▶ The maximum permissible total force on test point **MS3** 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 actual forces on the test point 1 **MS1** and on the test point 3 **MS 3** are shown on the LICCON monitor 1!
- ▶ 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!

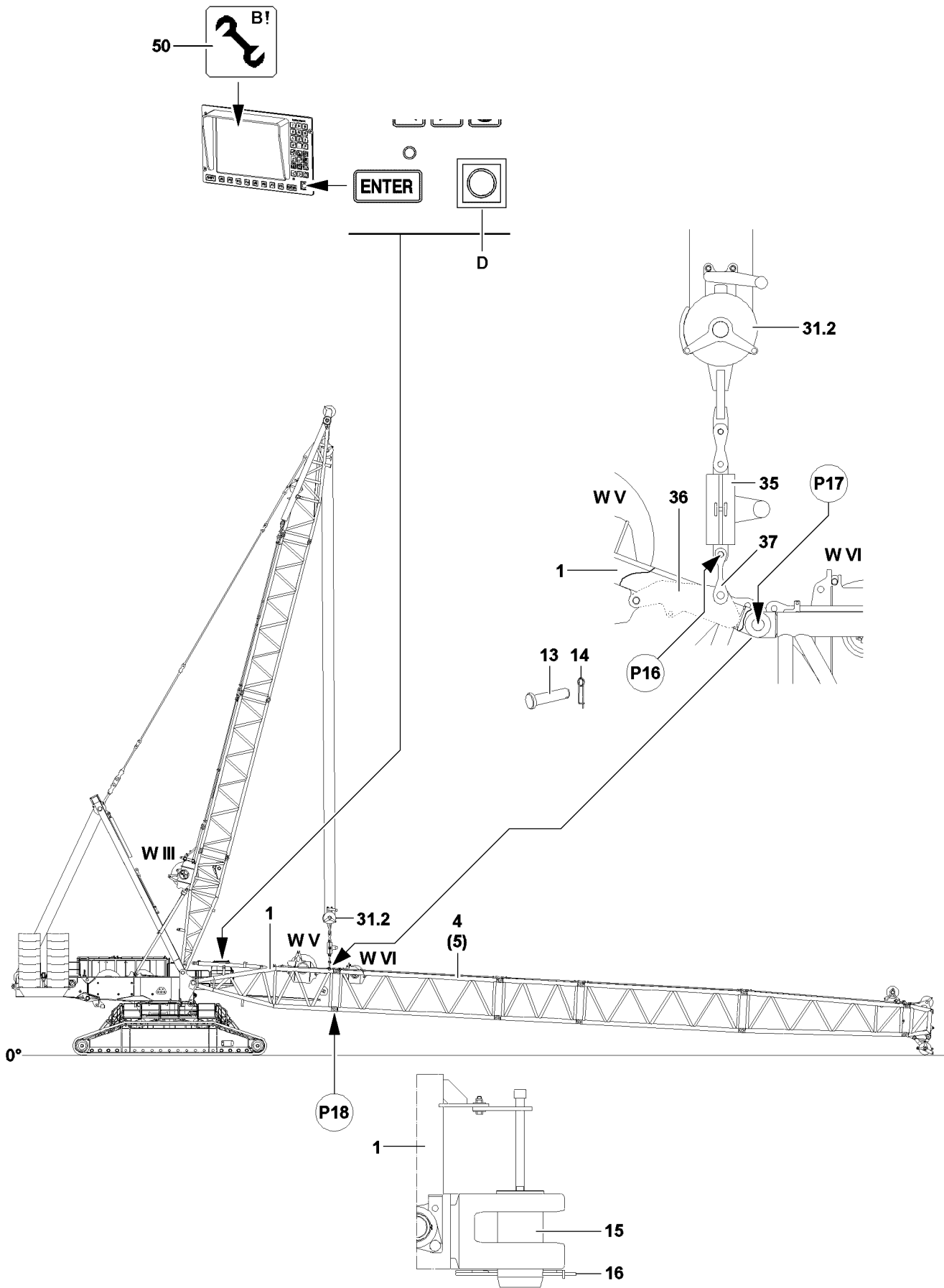


Fig.112765

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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!

- ▶ Reassemble long booms to the required length for flying disassembly!
- ▶ Do not exceed the maximum permissible total forces!

-
- ▶ Lift the main boom from the supporting base or off the ground by spooling up winch 3.

When the main boom has been lifted off the ground and is safely held by winch 3:

- ▶ Unpin the S-pivot section **1** and S-intermediate section **4** at point **P18** on both sides: Release and unpin the pin **15**.

When the pins **15** are unpinned at point **P18**:

- ▶ Carefully place the main boom down on the ground.

When the main boom is laying on the ground:

- ▶ Unpin the S-pivot section **1** and S-intermediate section **4** at point **17** on top on both sides: Release and unpin the pin **15**.
- ▶ Unpin the S-intermediate sections and remove with the auxiliary crane.
- ▶ Unpin the assembly weight **35** on the brackets **37**: Release and unpin the pin **13**.

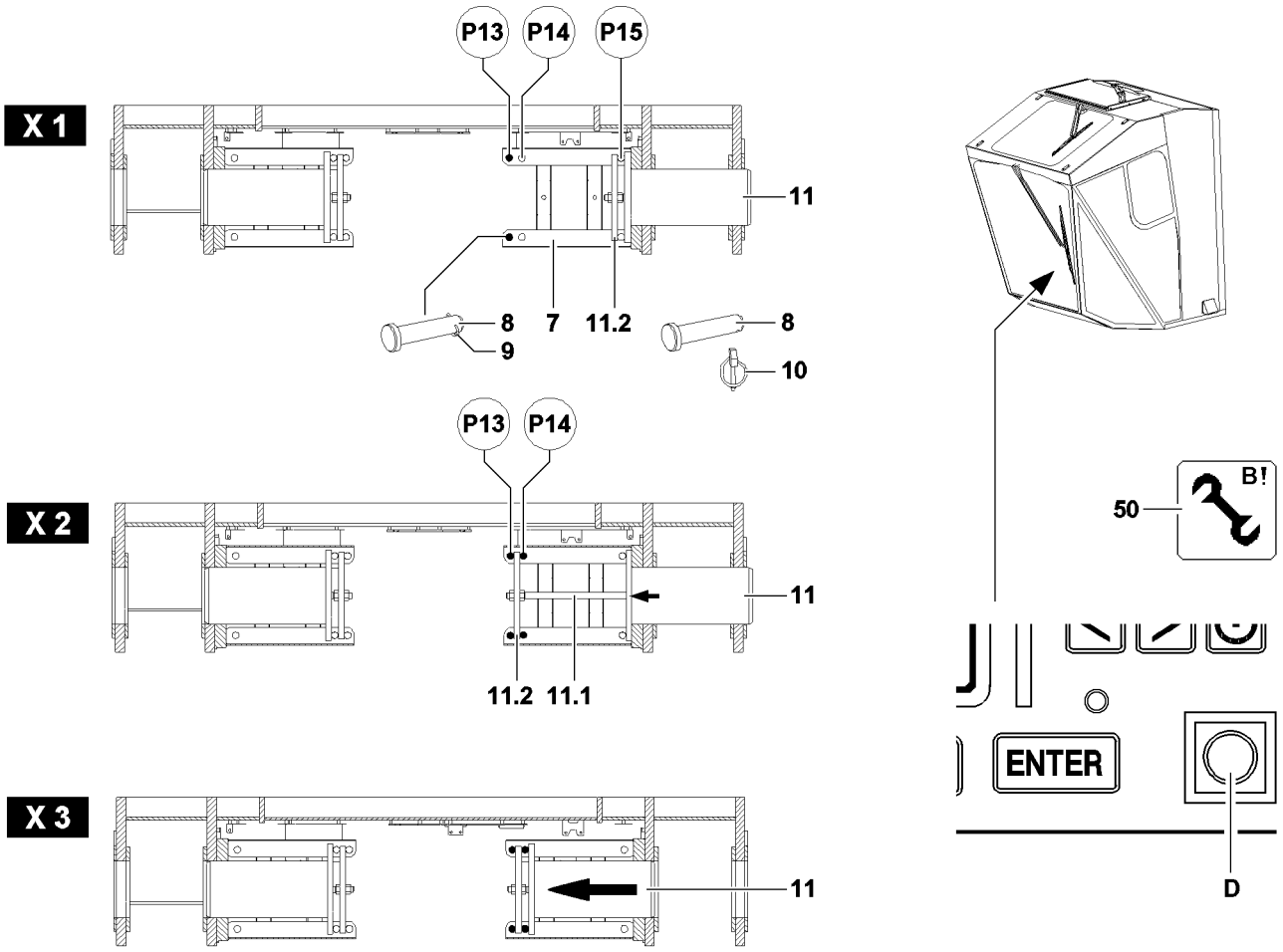
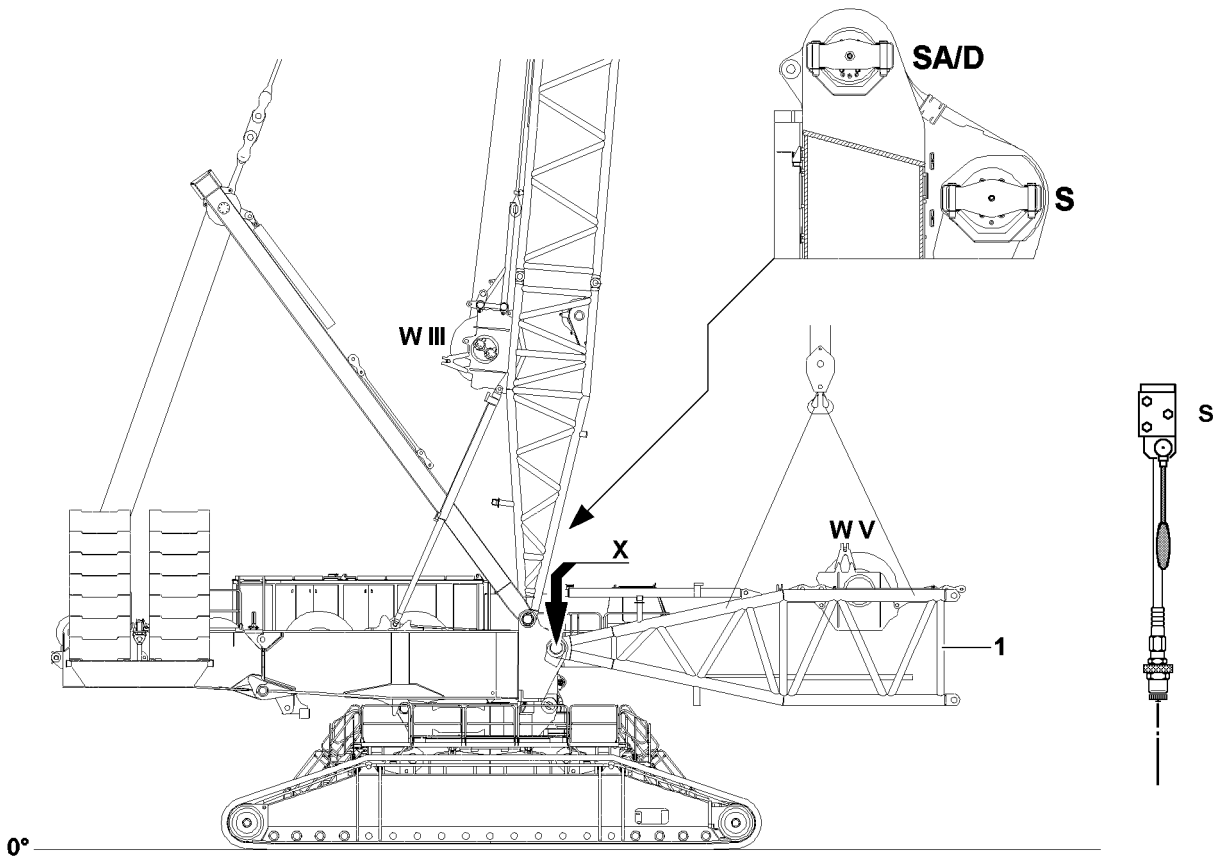


Fig.112763

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4.7 Unpinning the S-pivot section on the turntable



WARNING

General danger notes!

- ▶ 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“!

- ▶ Attach the S-pivot section **1** on the fastening points **P1** and fastening points **P2** on the auxiliary crane.

or

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!

- ▶ Make sure that the S-pivot section **1** is safely held by the auxiliary crane before unpinning the pins **11**!

- ▶ 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 **11** 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!

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5.44 PD-boom combination

| | | |
|---|---------------------|----|
| 1 | Components | 3 |
| 2 | Fastening points | 3 |
| 3 | Assembly PD-boom | 11 |
| 4 | Operating the crane | 73 |
| 5 | Disassembly PD-boom | 75 |

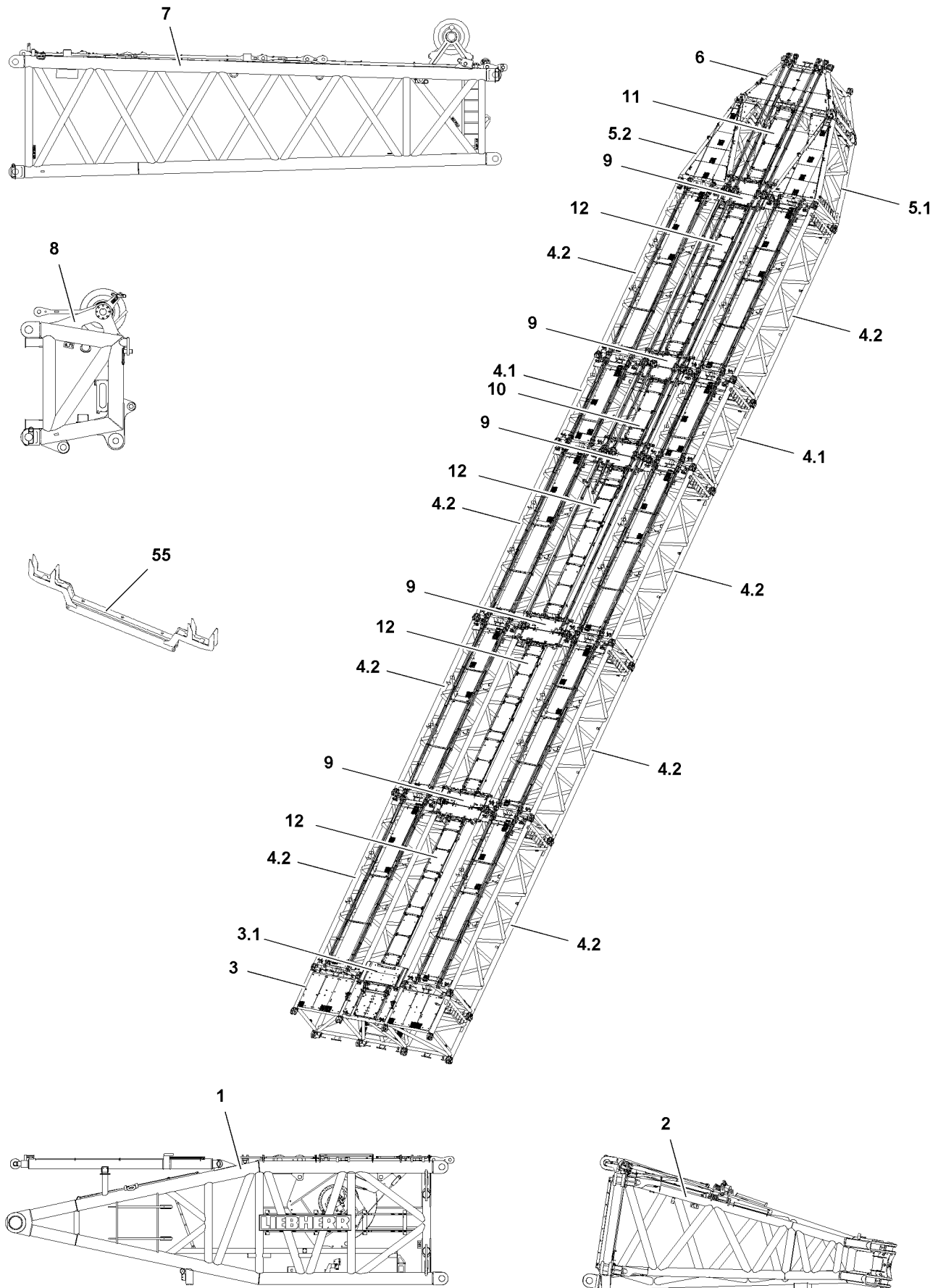


Fig.117192

LWE/LR 11350-007/19005-01-02/en

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

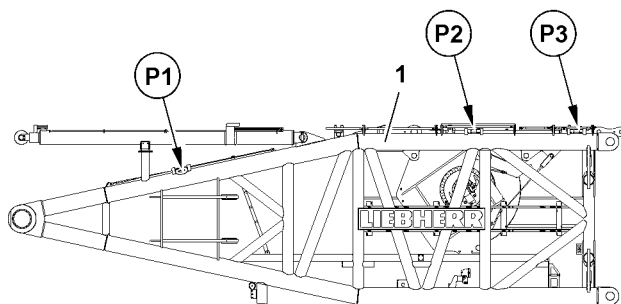


Fig.114722: Fastening points S-pivot section

| 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

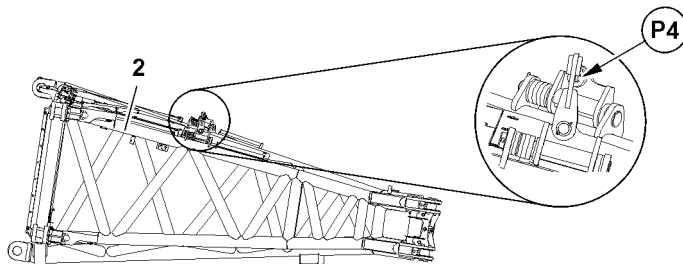


Fig.114723: Fastening points lower P-adapters

| Fastening points | |
|------------------|---|
| P4 | Lower P-adapter left and lower P-adapter right |

2.3 Fastening points cross carrier

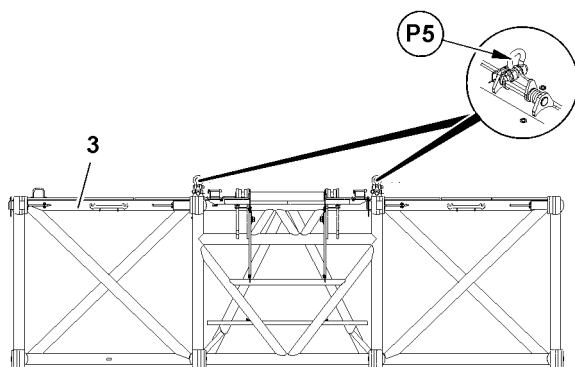


Fig.114724: Fastening points cross carrier

| Fastening points | |
|------------------|---------------|
| P5 | Cross carrier |

2.4 Fastening points S-intermediate section 6 m

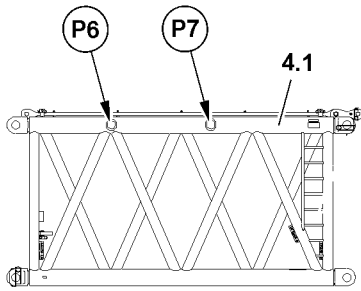


Fig.114725: Fastening points S-intermediate section 6 m

| Fastening points | |
|------------------|----------------------------|
| P6 and P7 | S-intermediate section 6 m |

2.5 Fastening points S-intermediate section 12 m

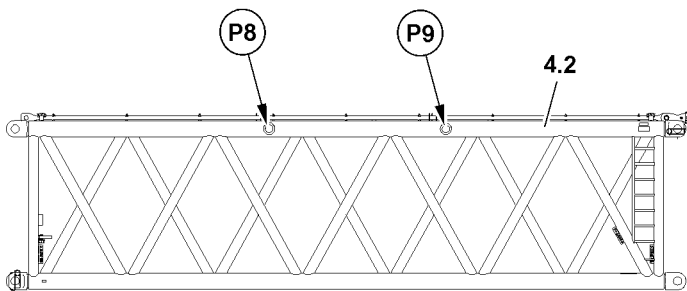


Fig.114726: Fastening points S-intermediate section 12 m

| Fastening points | |
|------------------|-----------------------------|
| P8 and P9 | S-intermediate section 12 m |

2.6 Fastening points upper P-adapters

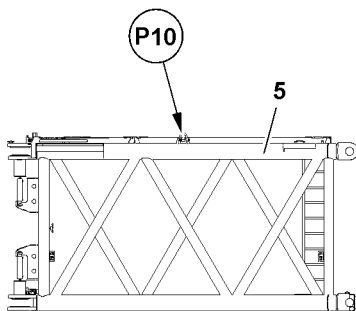


Fig.114727: Fastening points upper P-adapters

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| Fastening points | |
|------------------|---|
| P10 | Upper P-adapter left and upper P-adapter right |

2.7 Fastening points - cross bar

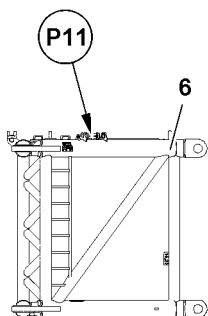


Fig.114728: Fastening points - cross bar

| Fastening points | |
|------------------|------------|
| P11 | Cross beam |

2.8 Fastening points S-adapter

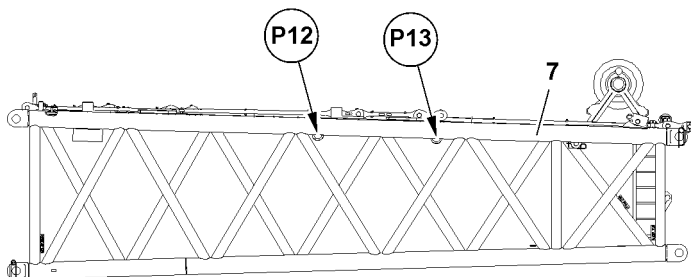


Fig.114729: Fastening points S-adapter

| Fastening points | |
|------------------|-----------|
| P12 and P13 | S-adapter |

2.9 Fastening points SW-end section

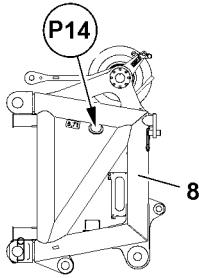


Fig.114730: Fastening points SW-end section

| Fastening points | |
|------------------|----------------|
| P14 | SW-end section |

2.10 Fastening points bridge „lateral“

NOTICE

Damage of fastening points!

- ▶ Transport maximum two bridges 9 together.

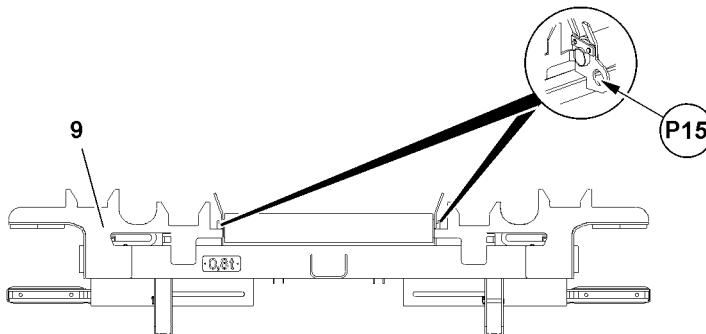


Fig.114731: Fastening points bridge

| 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.

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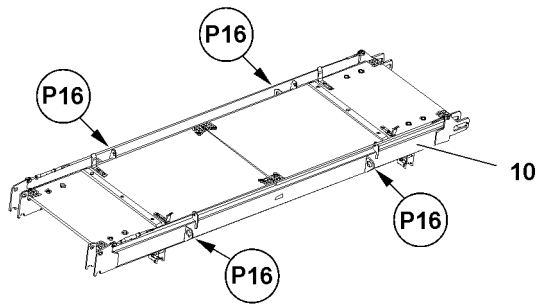


Fig.117193: Fastening points bridge

| 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.

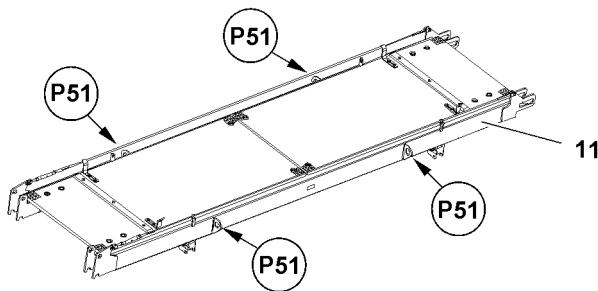


Fig.117194: Fastening points bridge

| 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.

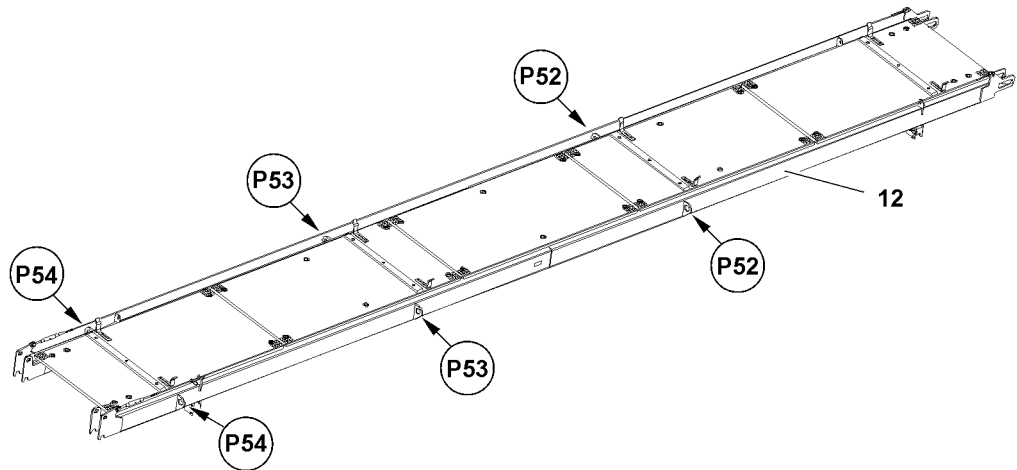


Fig.117195: Fastening points bridge

| 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.

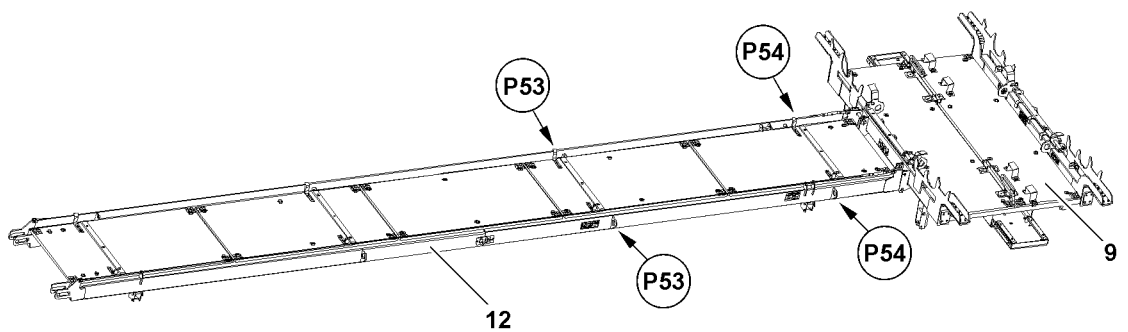


Fig.117203: Fastening points bridge preassembled

| Fastening points | |
|------------------|---|
| P53 + P54 | For assembly bridge „lengthwise“ and „lateral“ preassembled |

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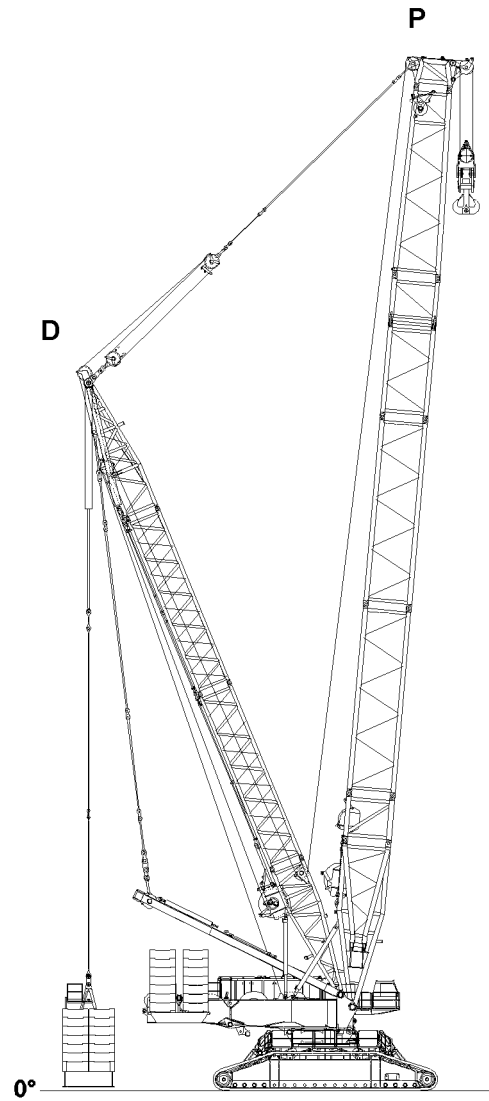


Fig.117196

LWE/LR 11350-007/19005-01-02/en

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

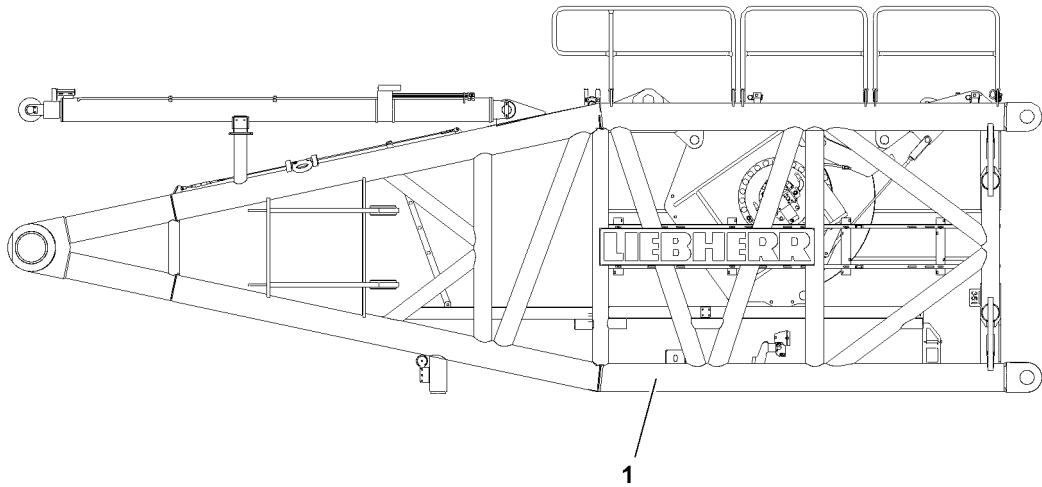


Fig.115416: Assembling the railing on the S-pivot section



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.
-

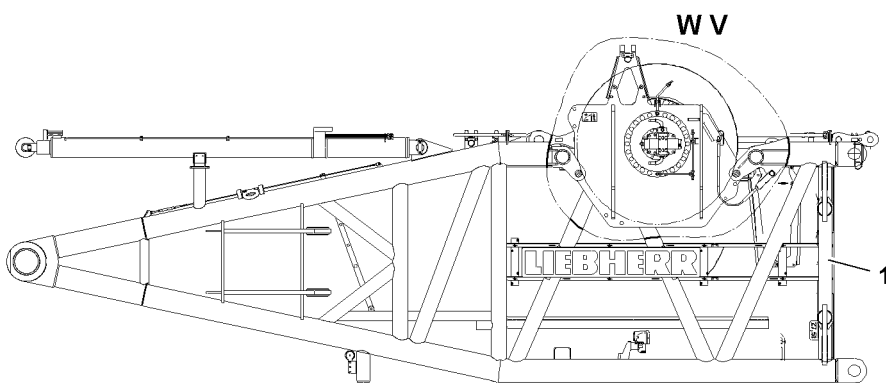
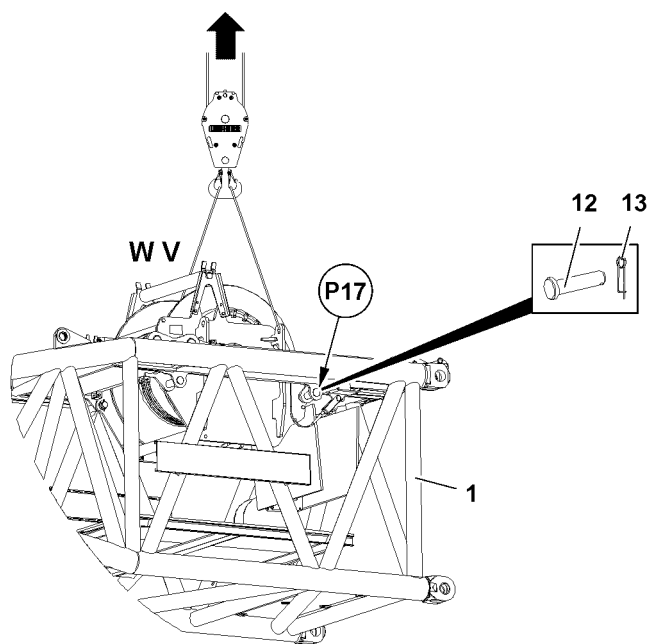
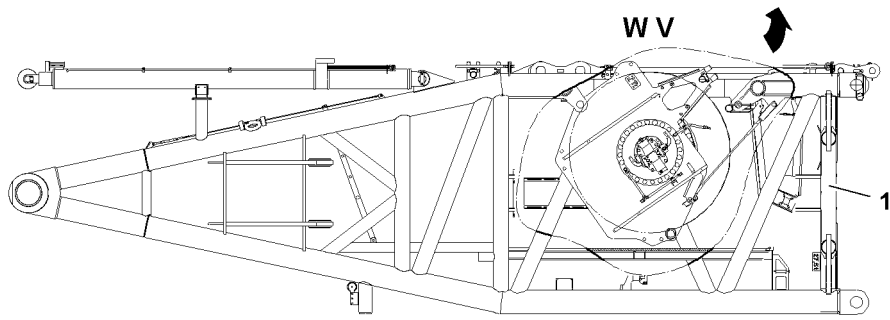


Fig.114735

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3.3 Installing winch 5 **W V** 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**.

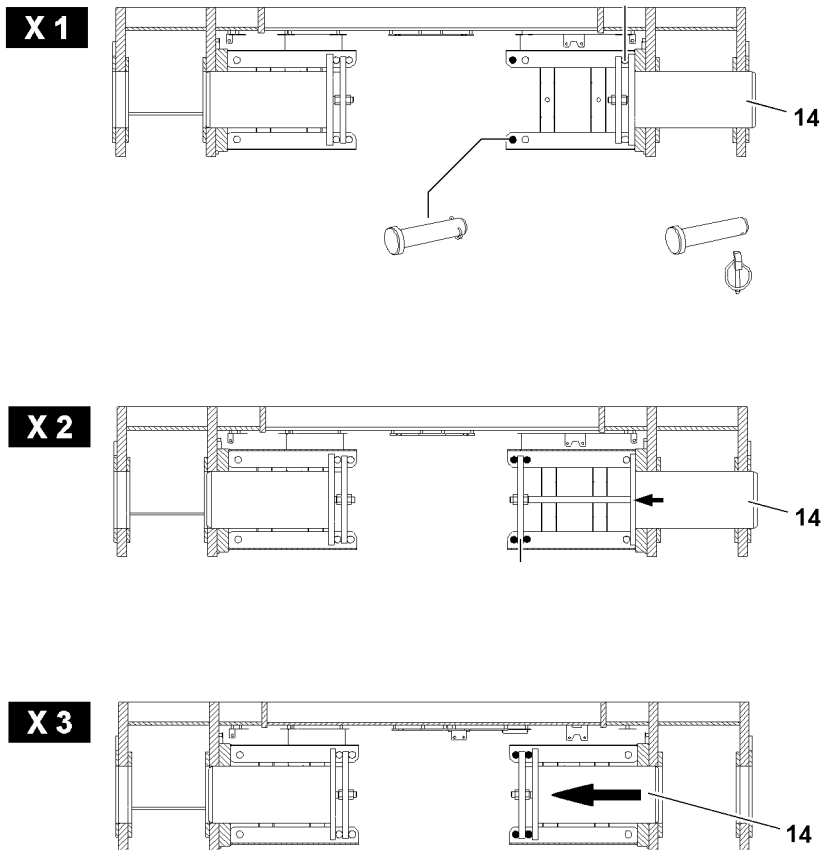
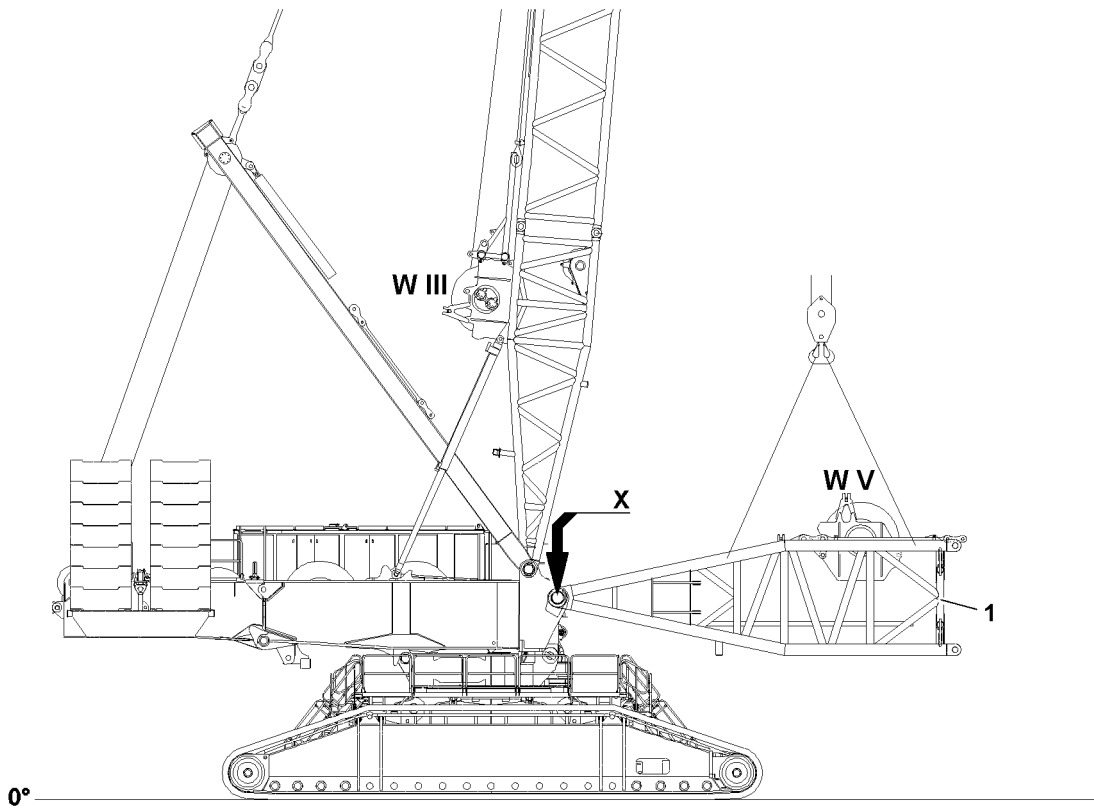


Fig.117197

LWE/LR 11350-007/19005-01-02/en

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.

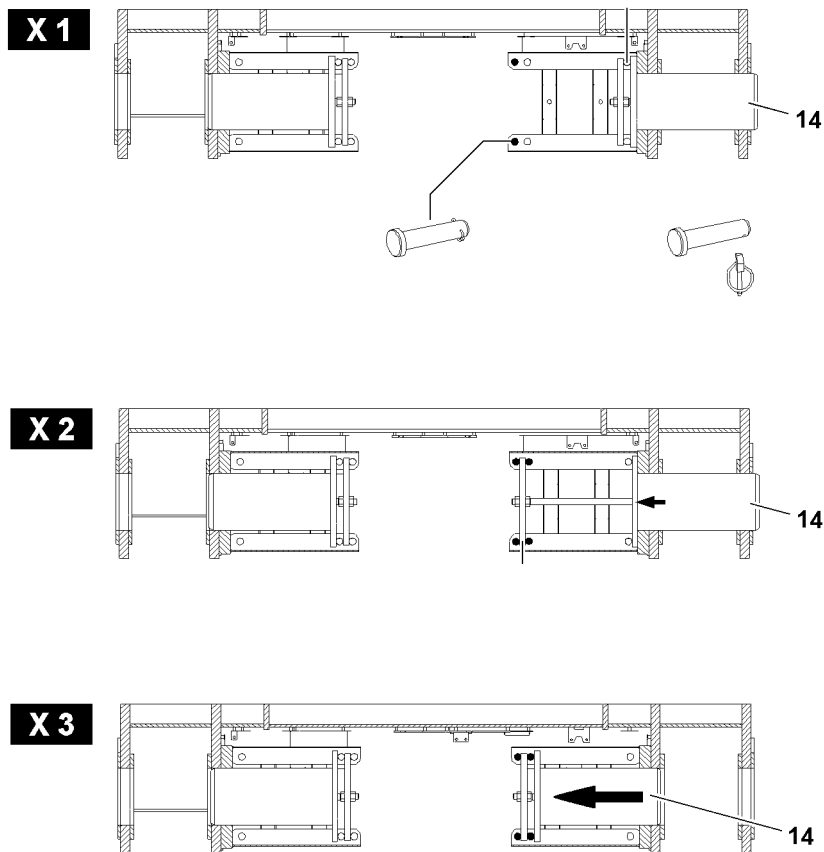
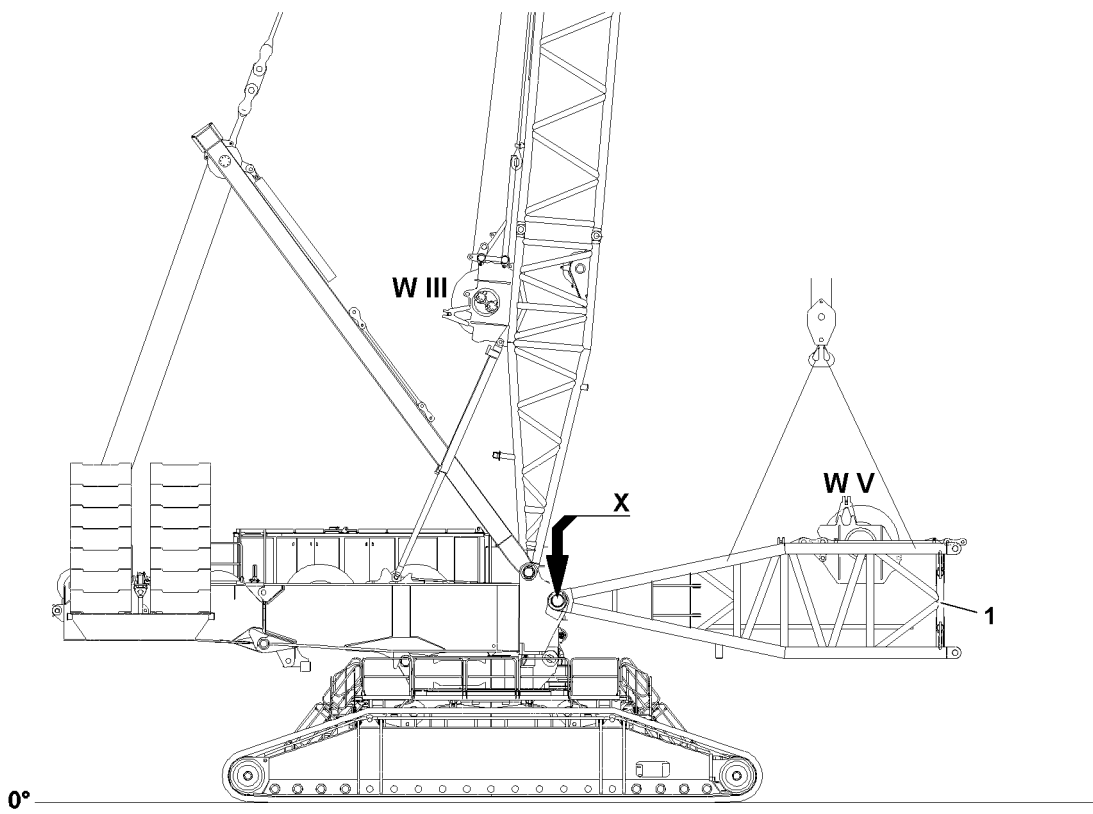


Fig.117197

LWE/LR 11350-007/19005-01-02/en

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.

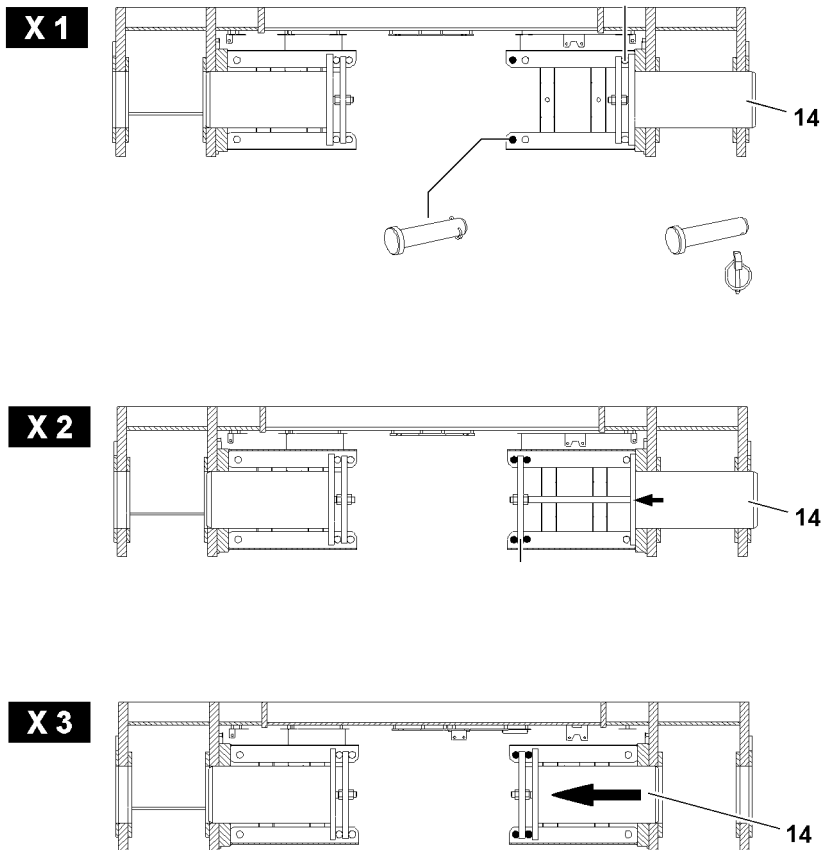
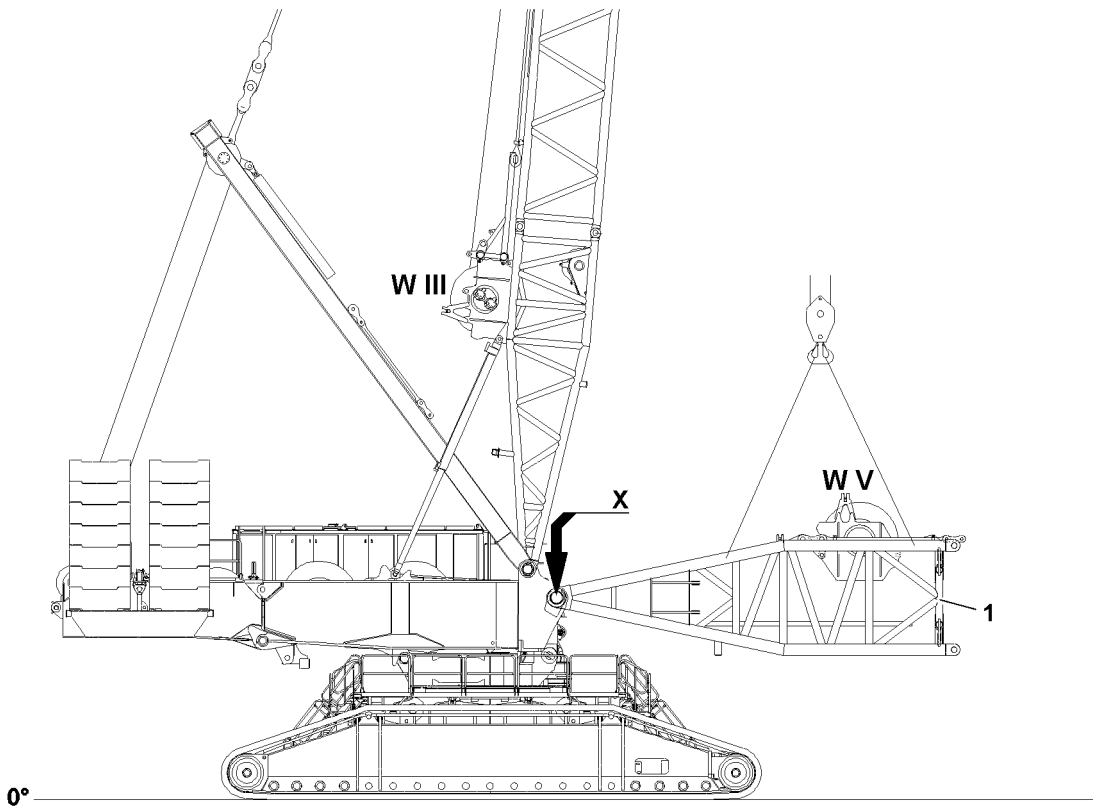


Fig.117197

LWE/LR 11350-007/19005-01-02/en

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.

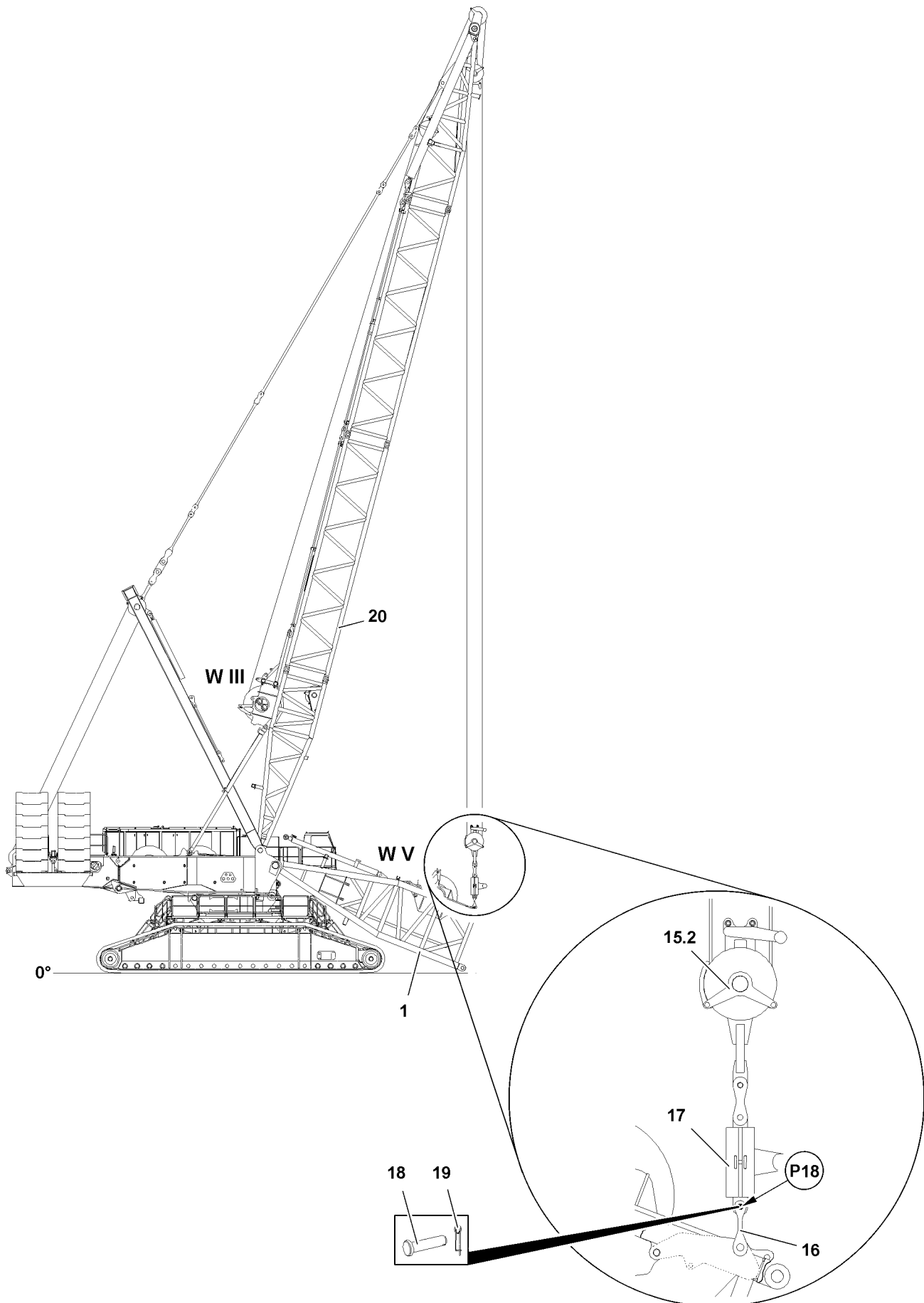


Fig.114737

LWE/LR 11350-007/19005-01-02/en

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.

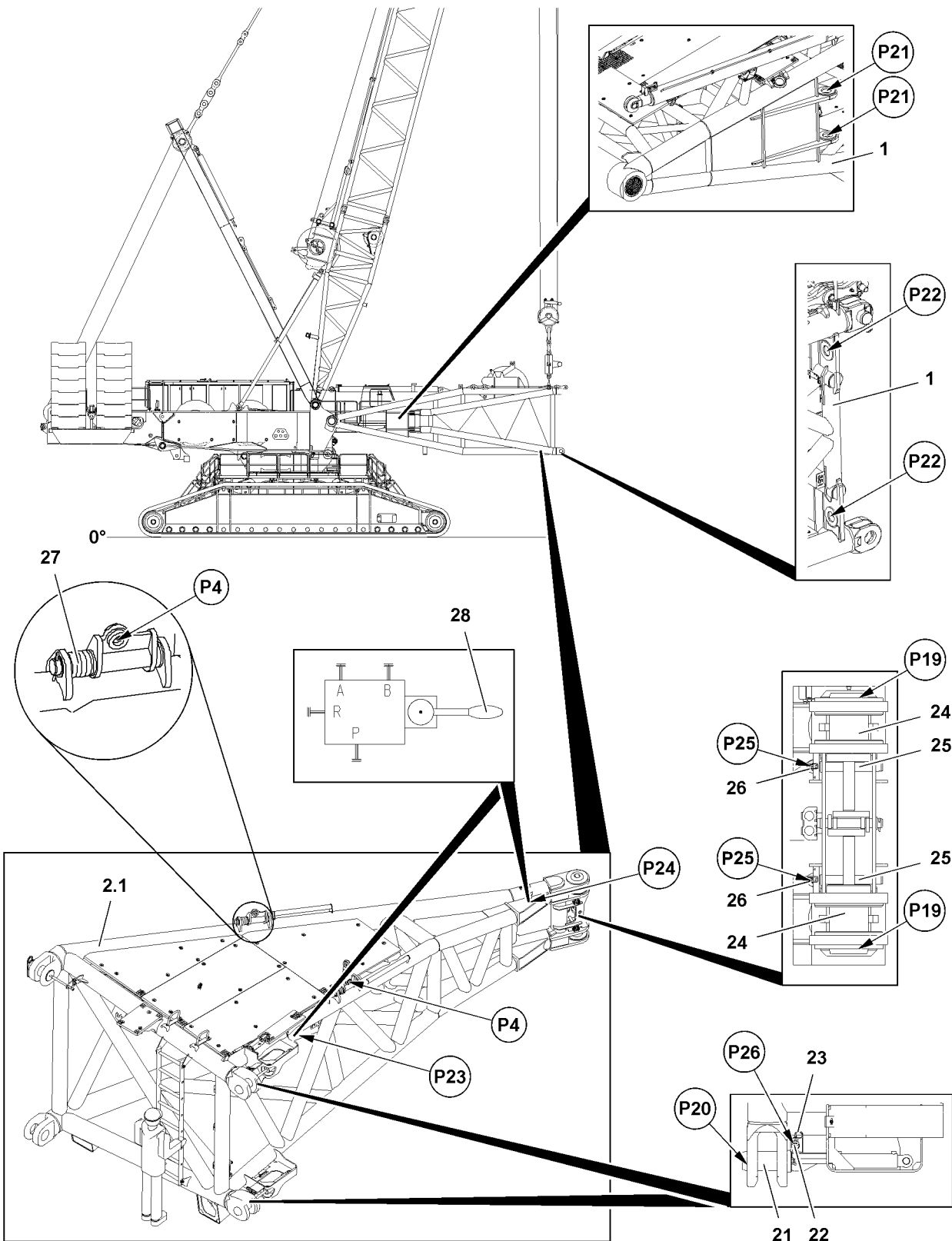


Fig.114738

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.

Problem remedy

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**.

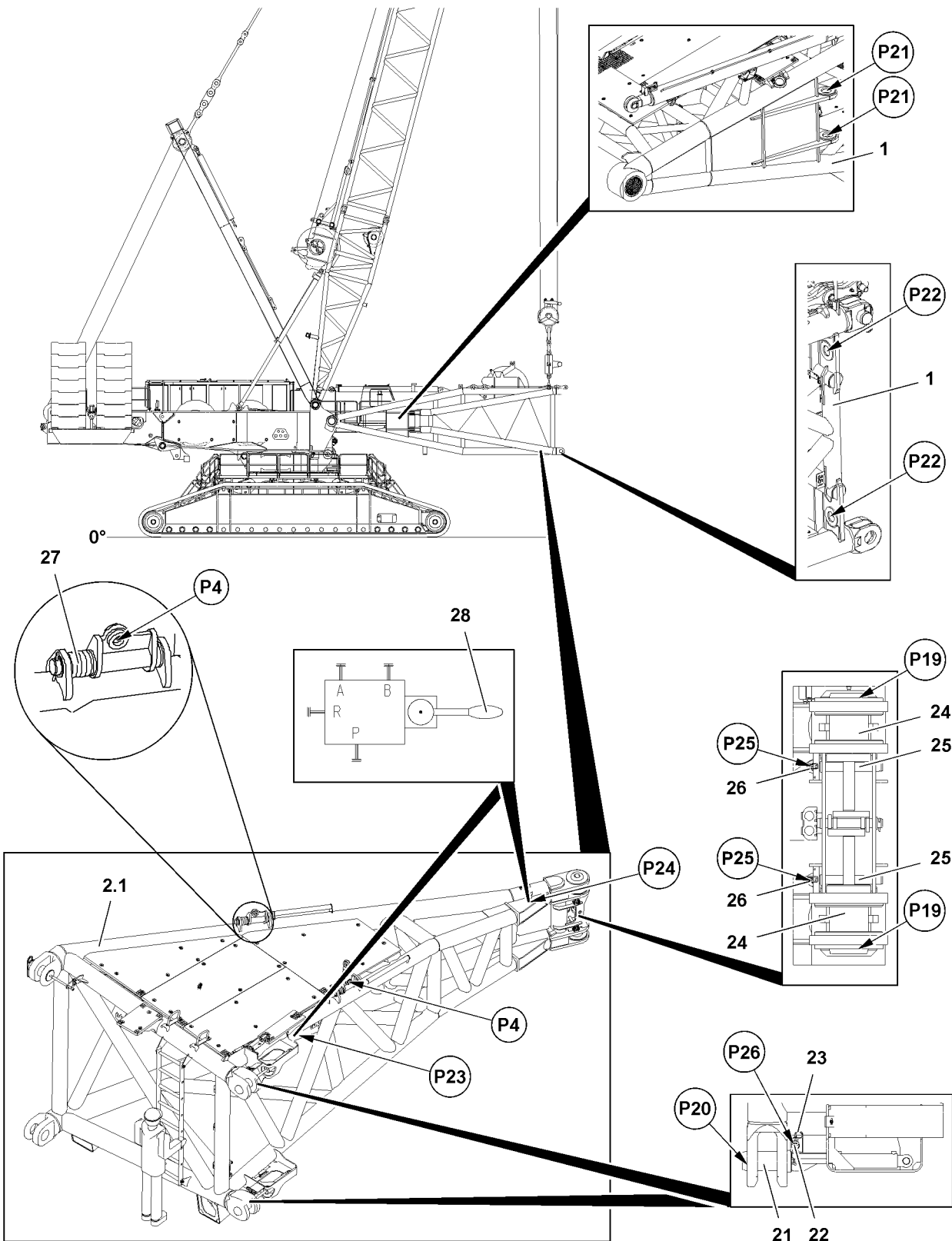


Fig.114738

- ▶ 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.

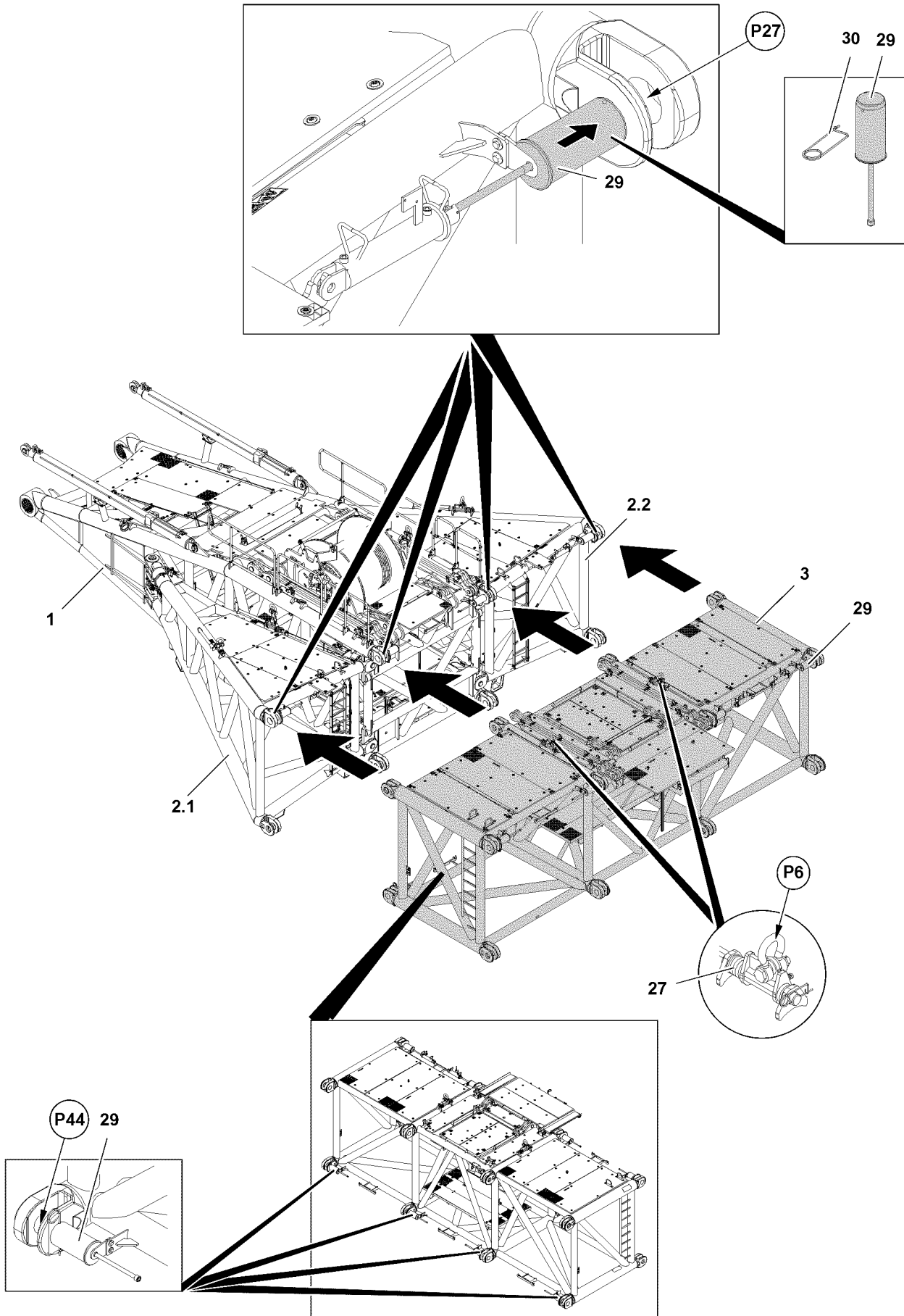


Fig.117198

LWE/LR 11350-007/19005-01-02/en

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.

Problem remedy

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.

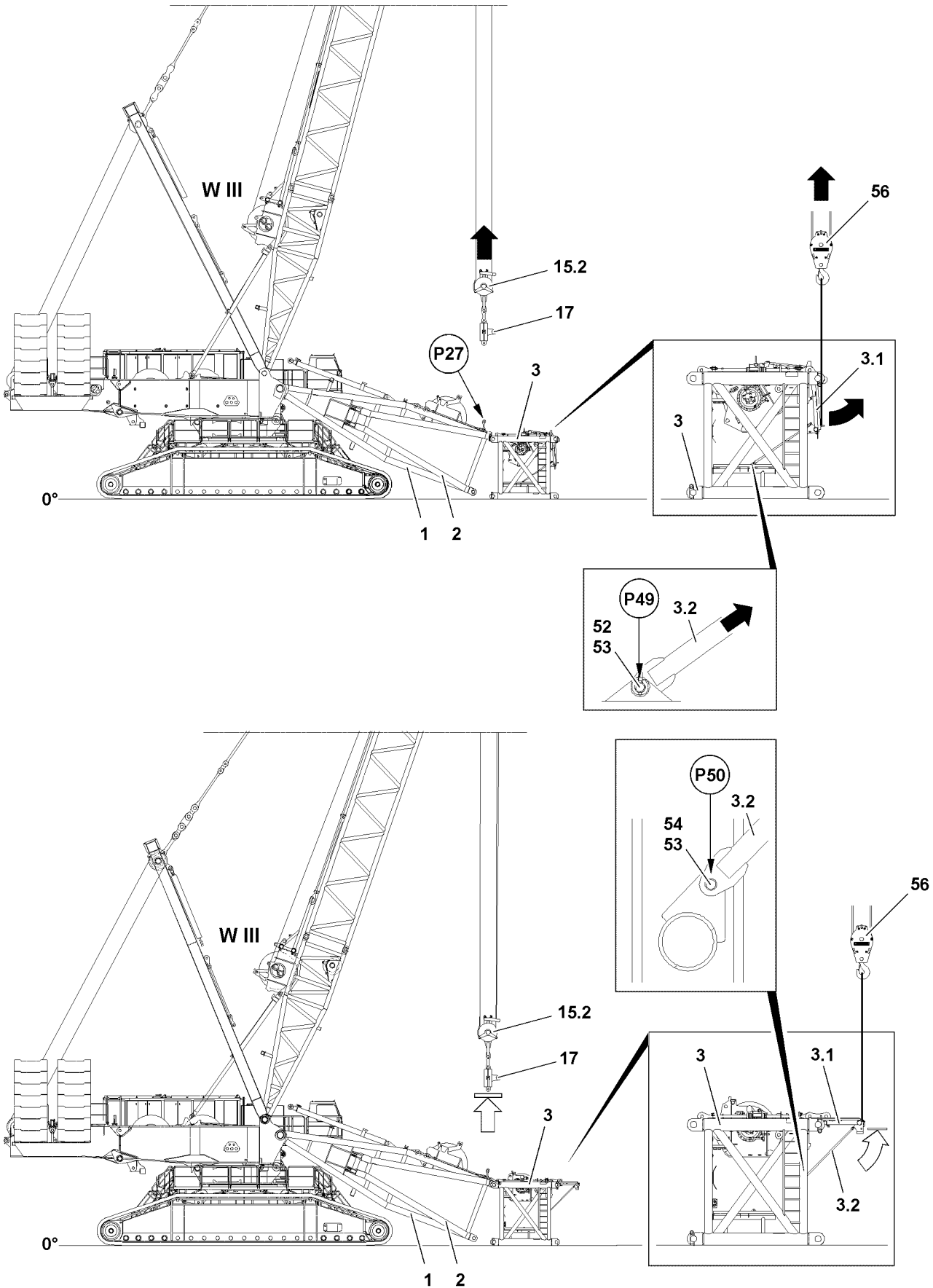


Fig.117201

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.

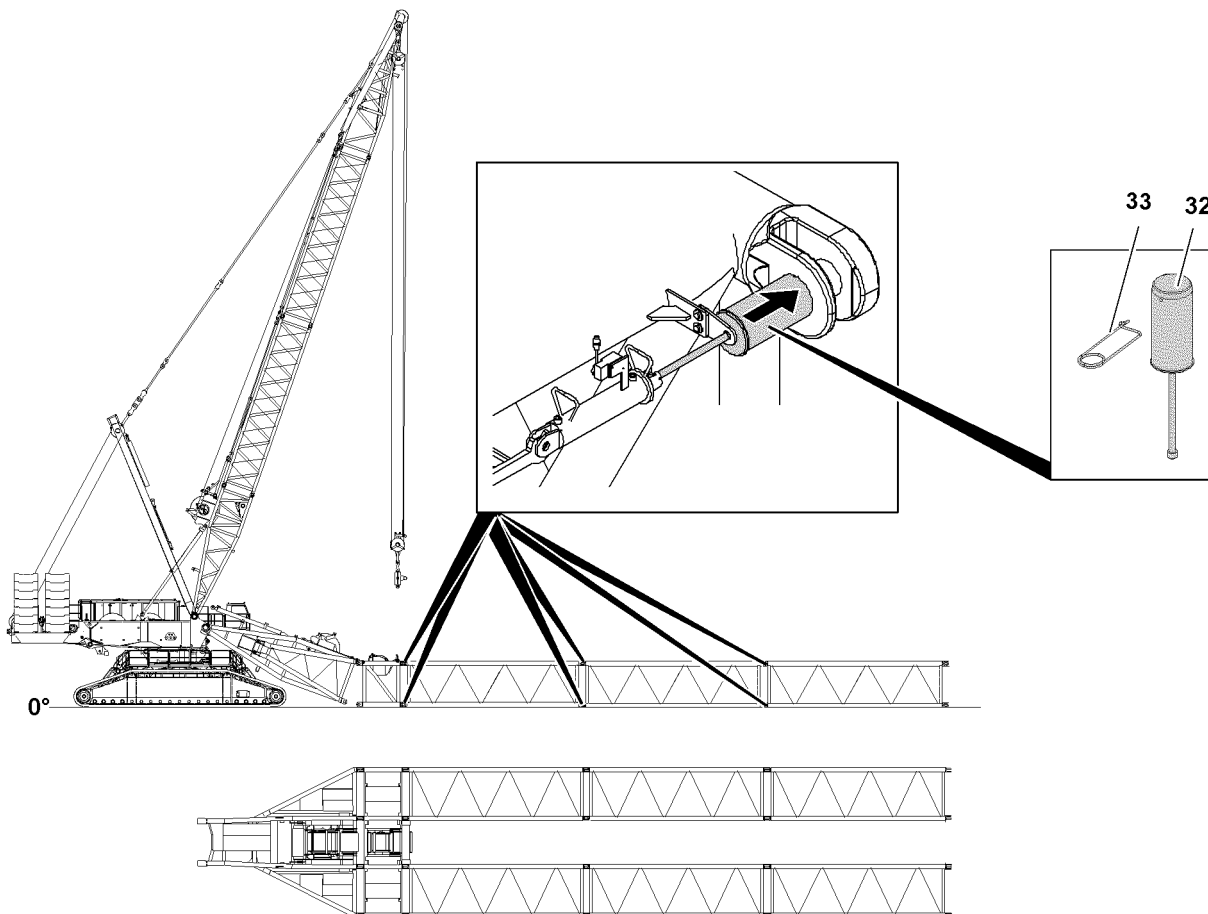
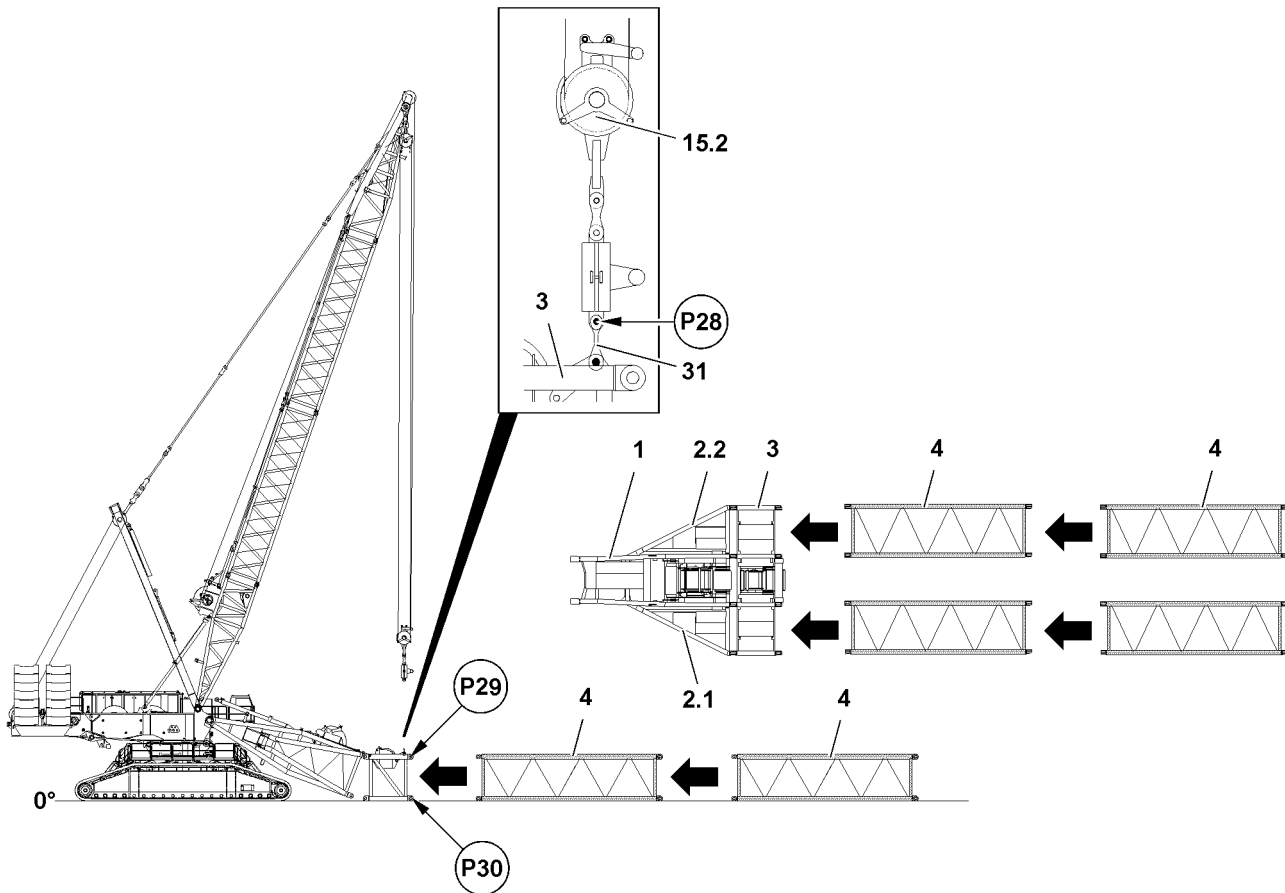


Fig.117199

LWE/LR 11350-007/19005-01-02/en

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.

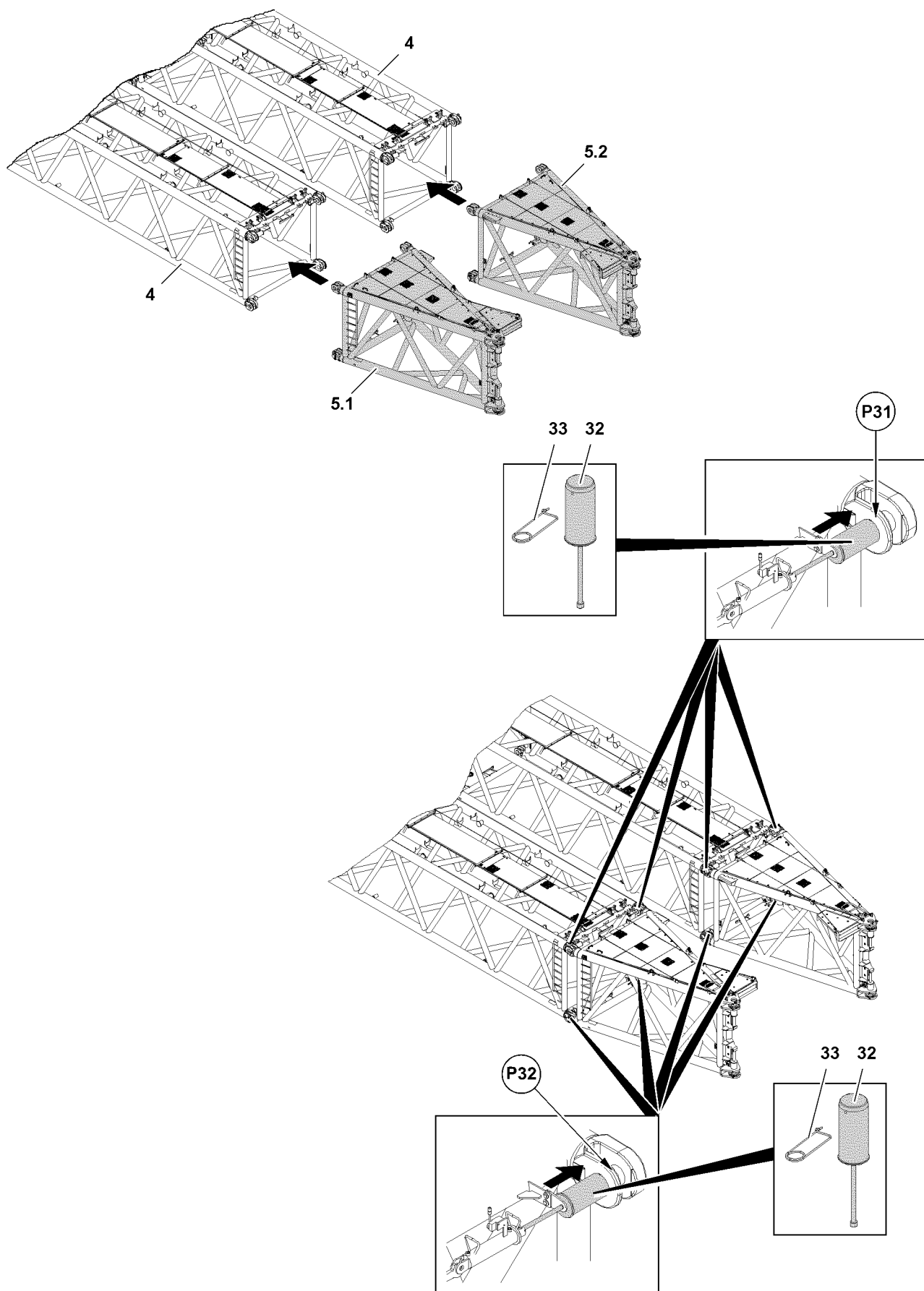


Fig.114589

LWE/LR 11350-007/19005-01-02/en

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

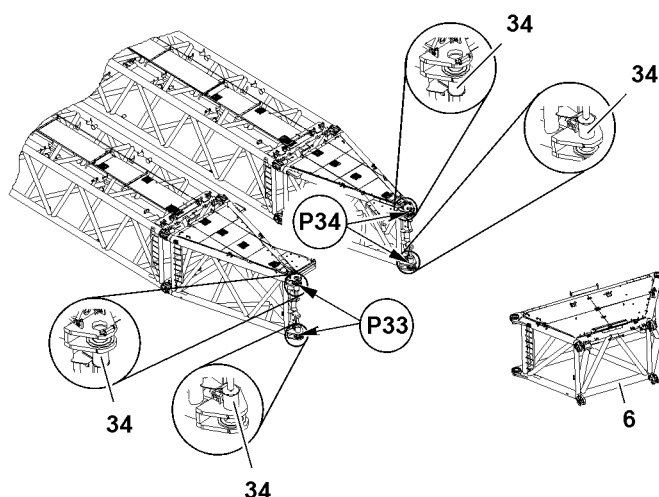


Fig.114590: Installing the cross beam

**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**.

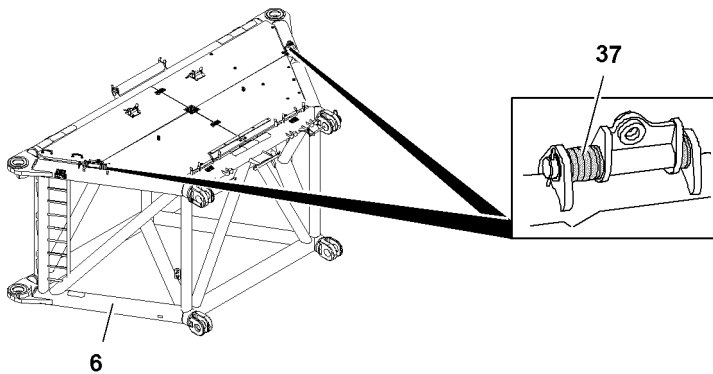


Fig.114591: Install - fasten the cross beam

- ▶ 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.

Problem remedy

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**.

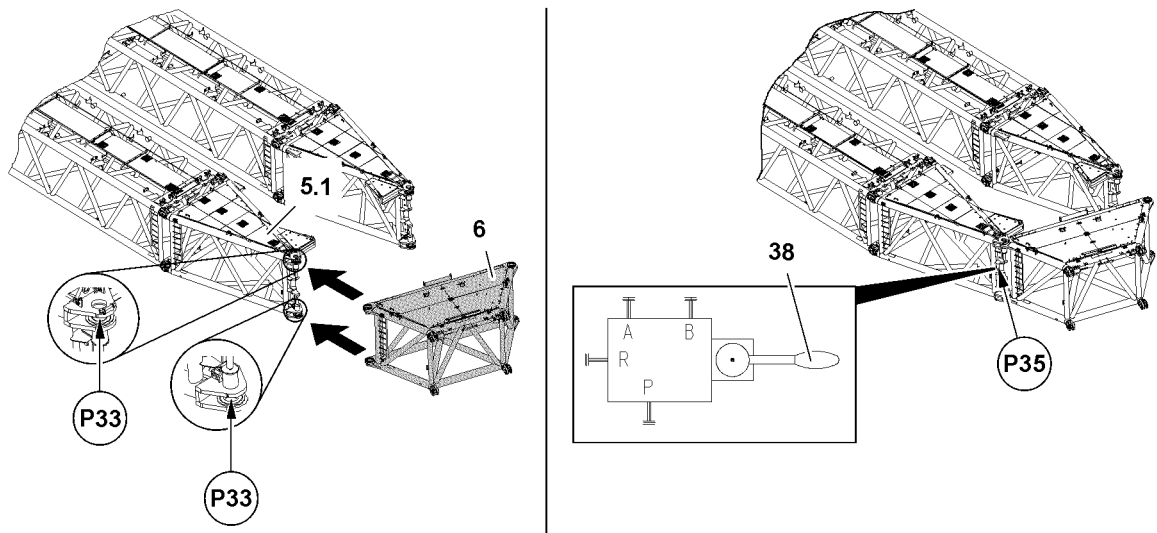


Fig.114592: Install the cross beam - position the cross beam on the right

- ▶ 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.

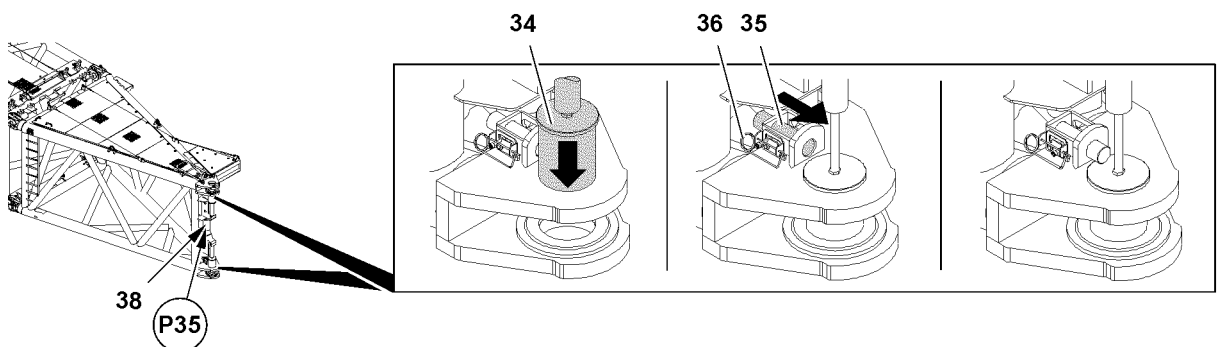


Fig.114593: Install the cross beam - pin the cross beam on the right



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.

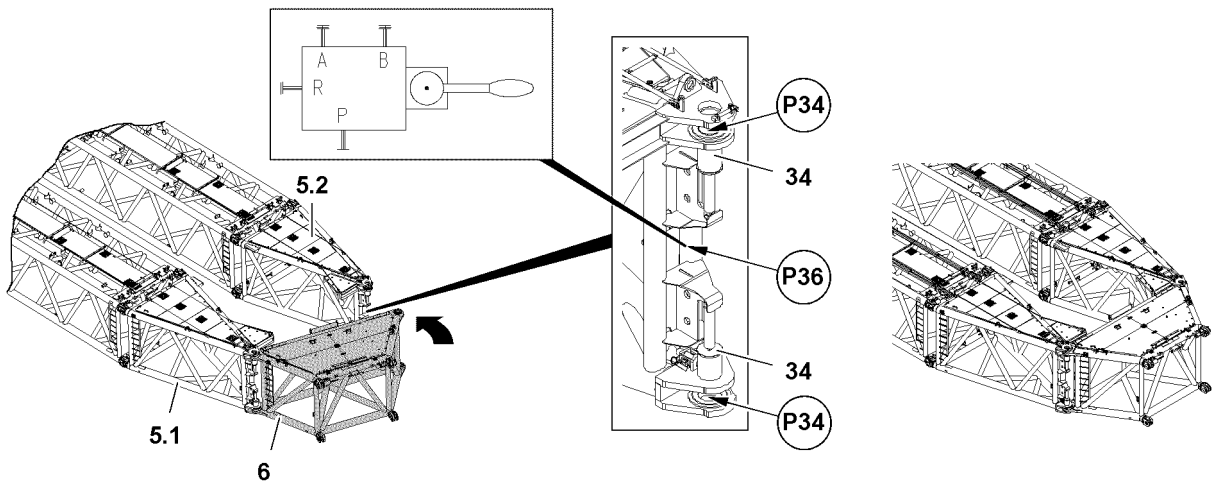


Fig. 114594: Install the cross beam - position the cross beam on the left

- ▶ 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.

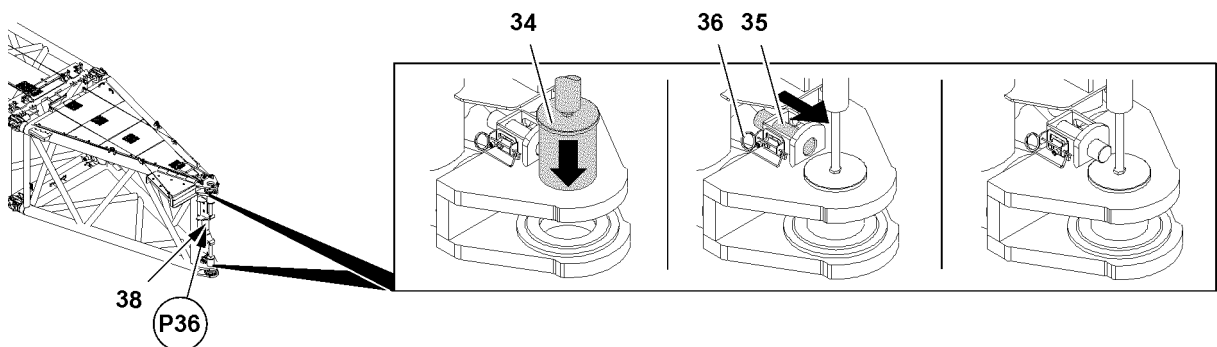


Fig. 114595: Install the cross beam - pin the cross beam on the left



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

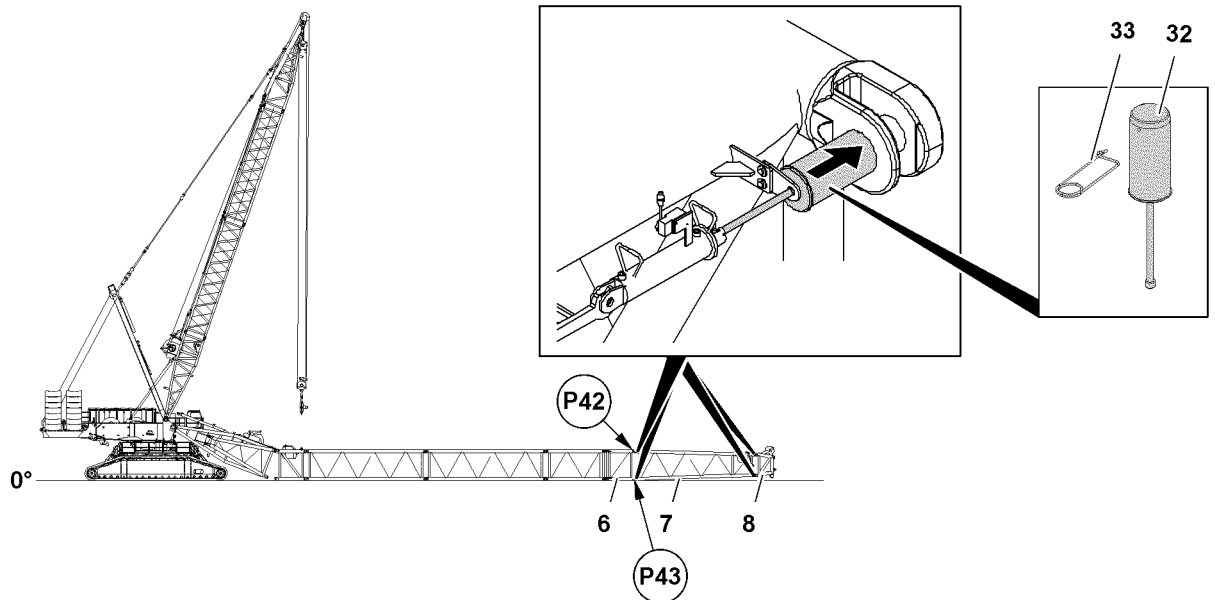


Fig.117450: Install the lattice section on the cross beam - install the lattice sections

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**.

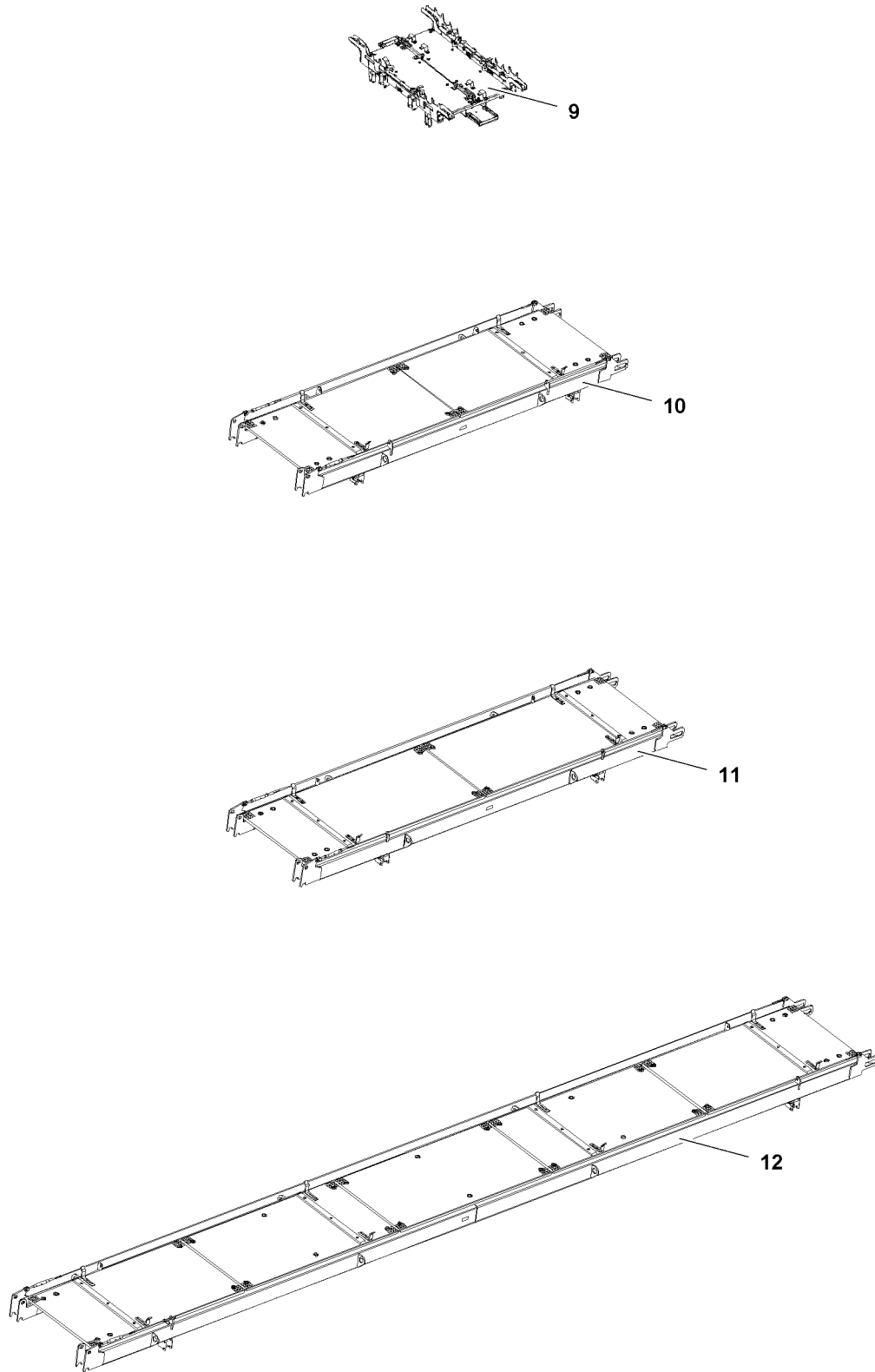


Fig.117313

LWE/LR 11350-007/19005-01-02/en

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“.

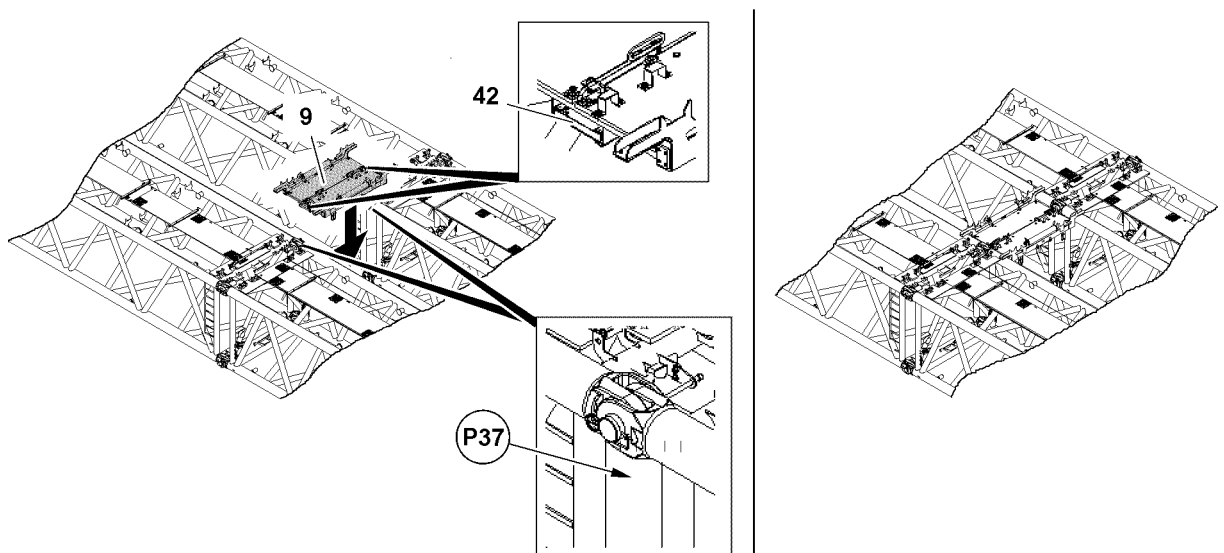


Fig.114596: Position the bridge „lateral“ — Install the bridge „lateral“

- ▶ Position the bridge 9 in such a way that the sliding section 42 can be extended between the lattice sections on point P37.

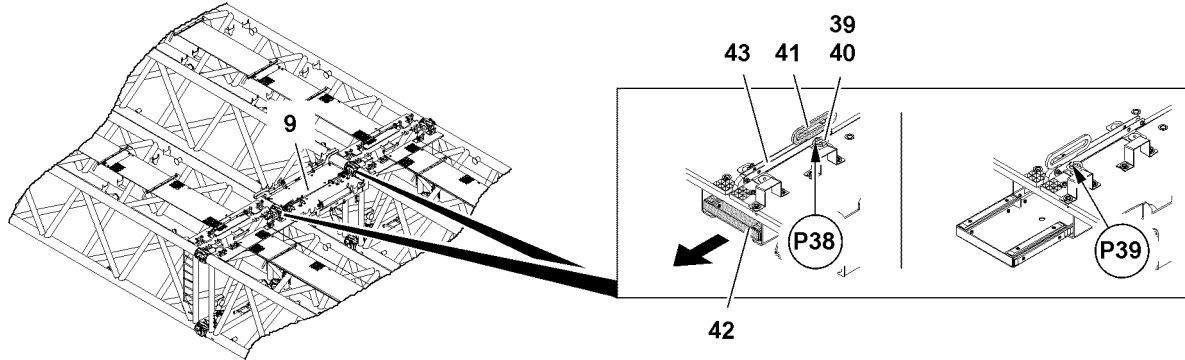


Fig.114597: Install the bridge „lateral“ — Secure the bridge „lateral“

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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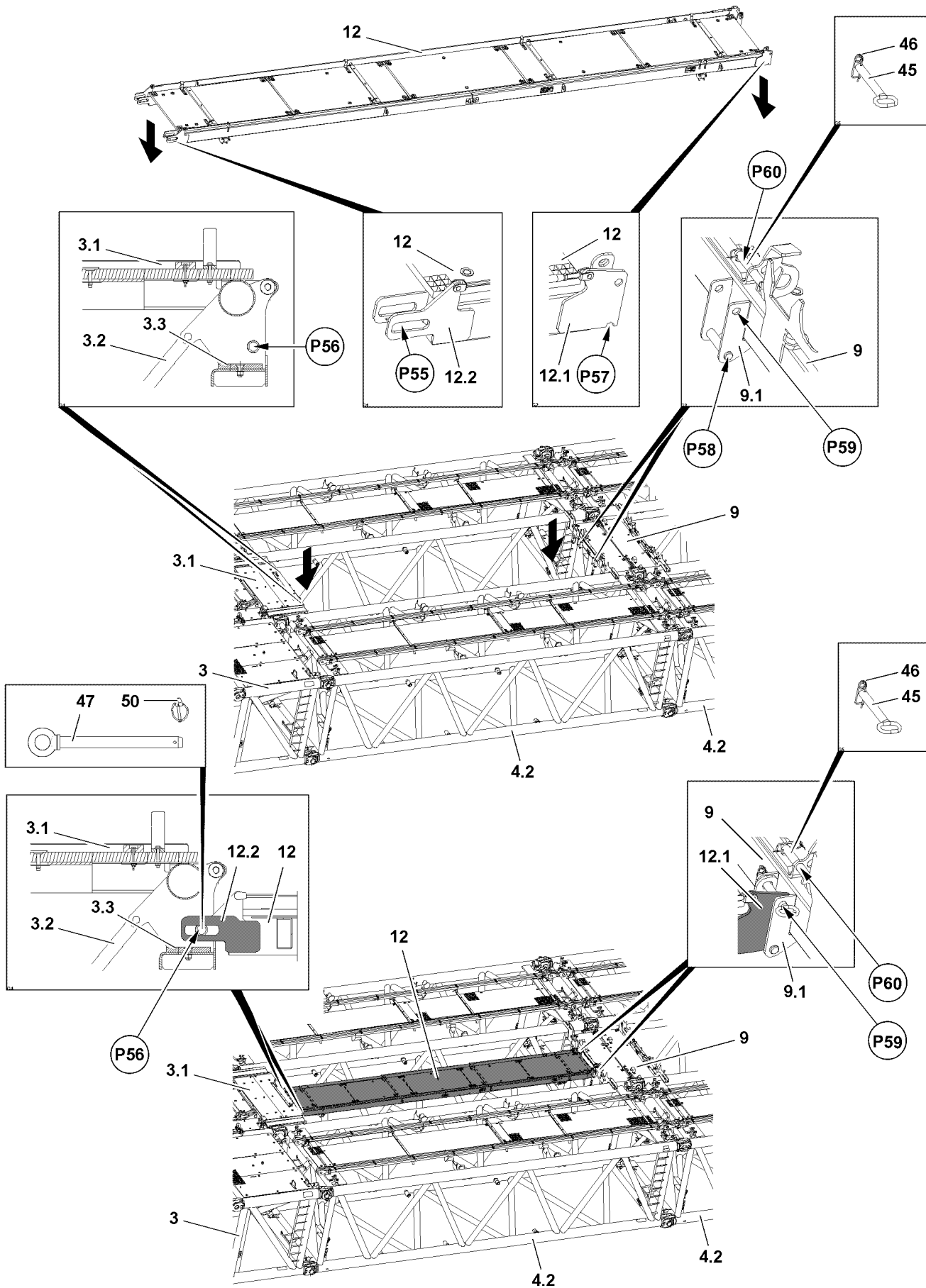


Fig.117204

LWE/LR 11350-007/19005-01-02/en

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**.

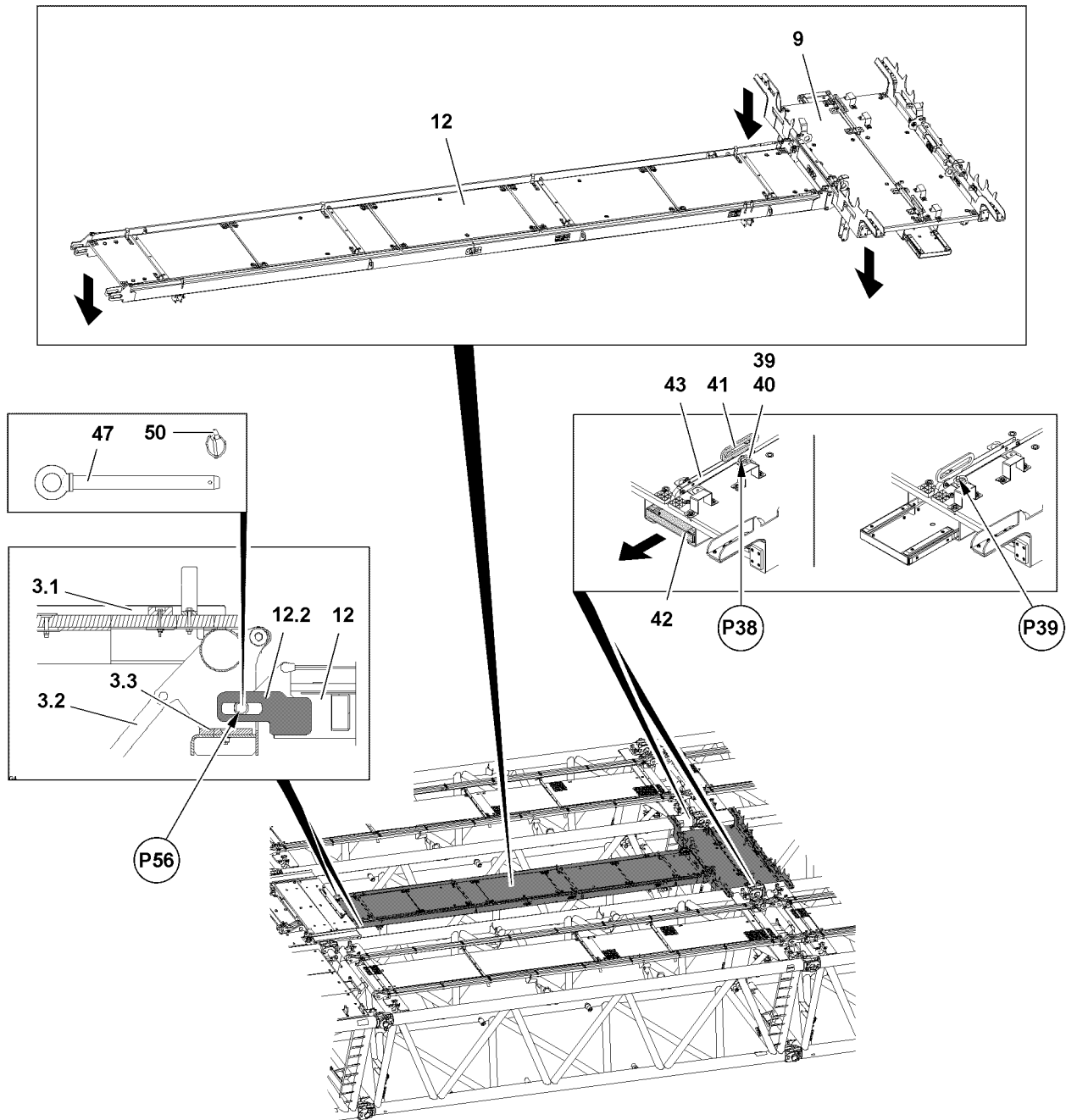


Fig.117311

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**.

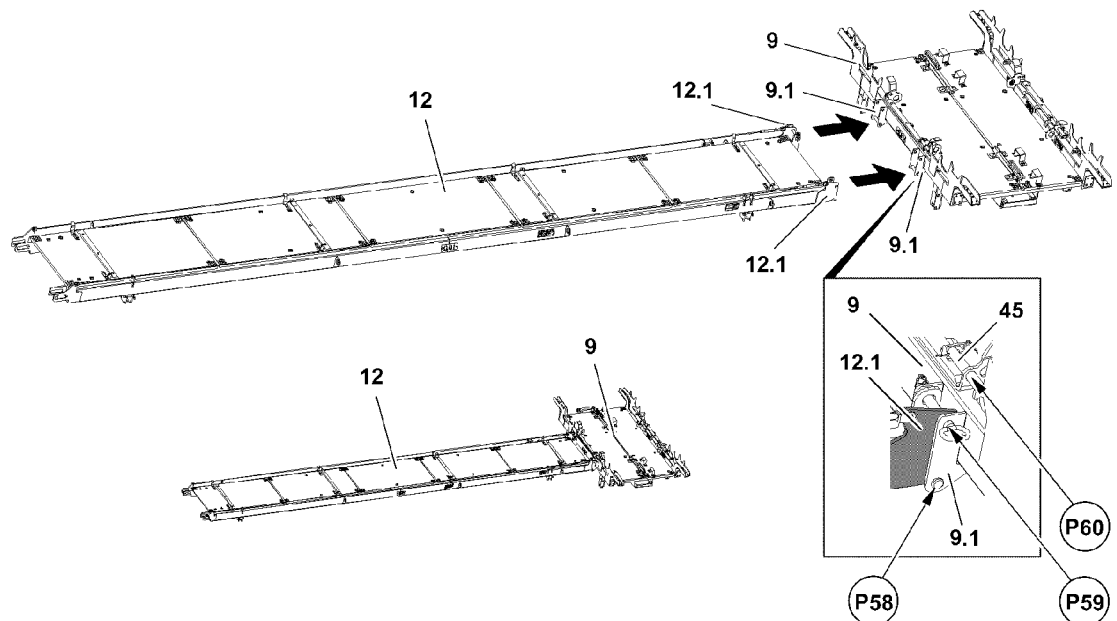


Fig.117310

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.

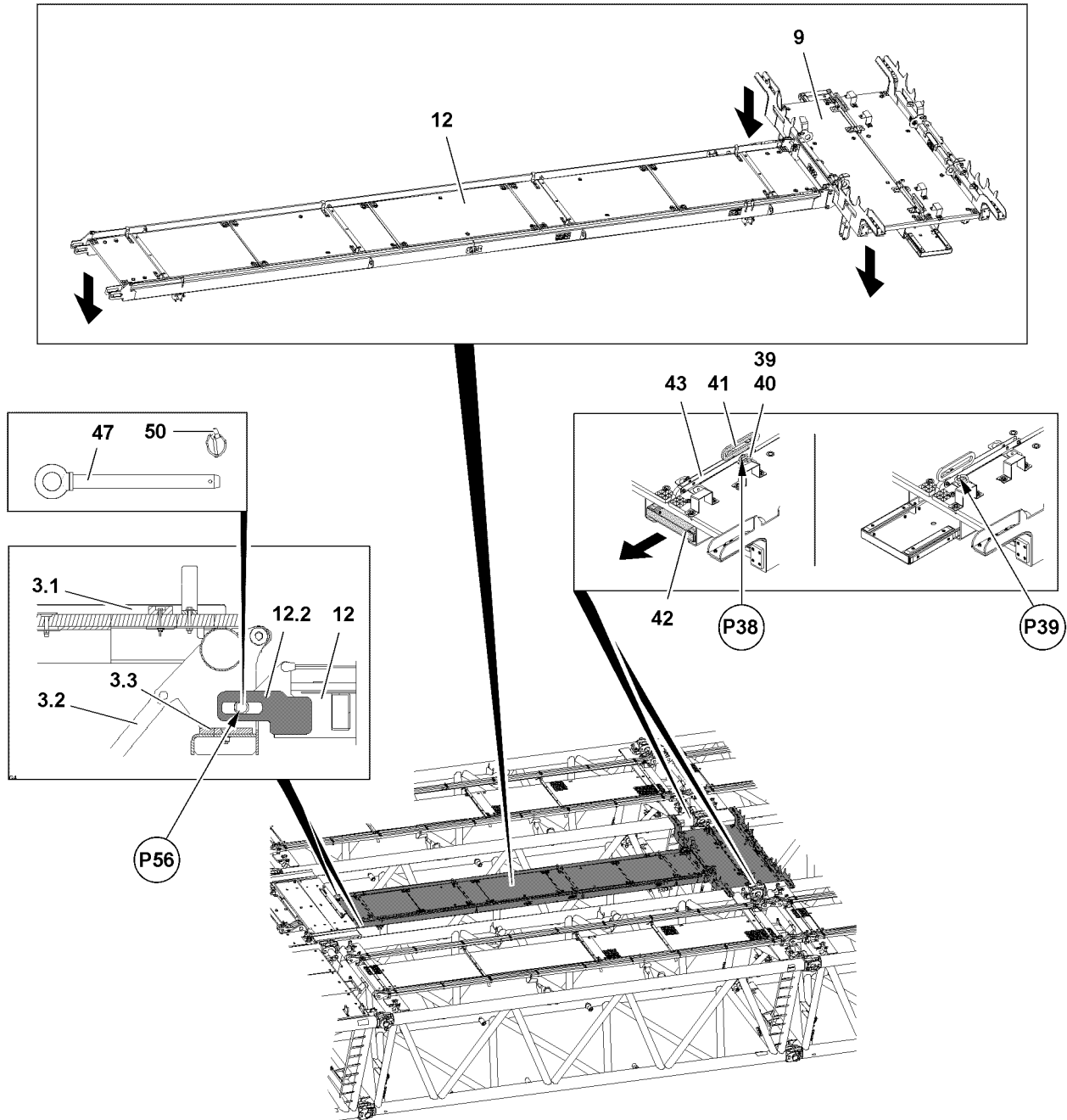


Fig.117311

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.

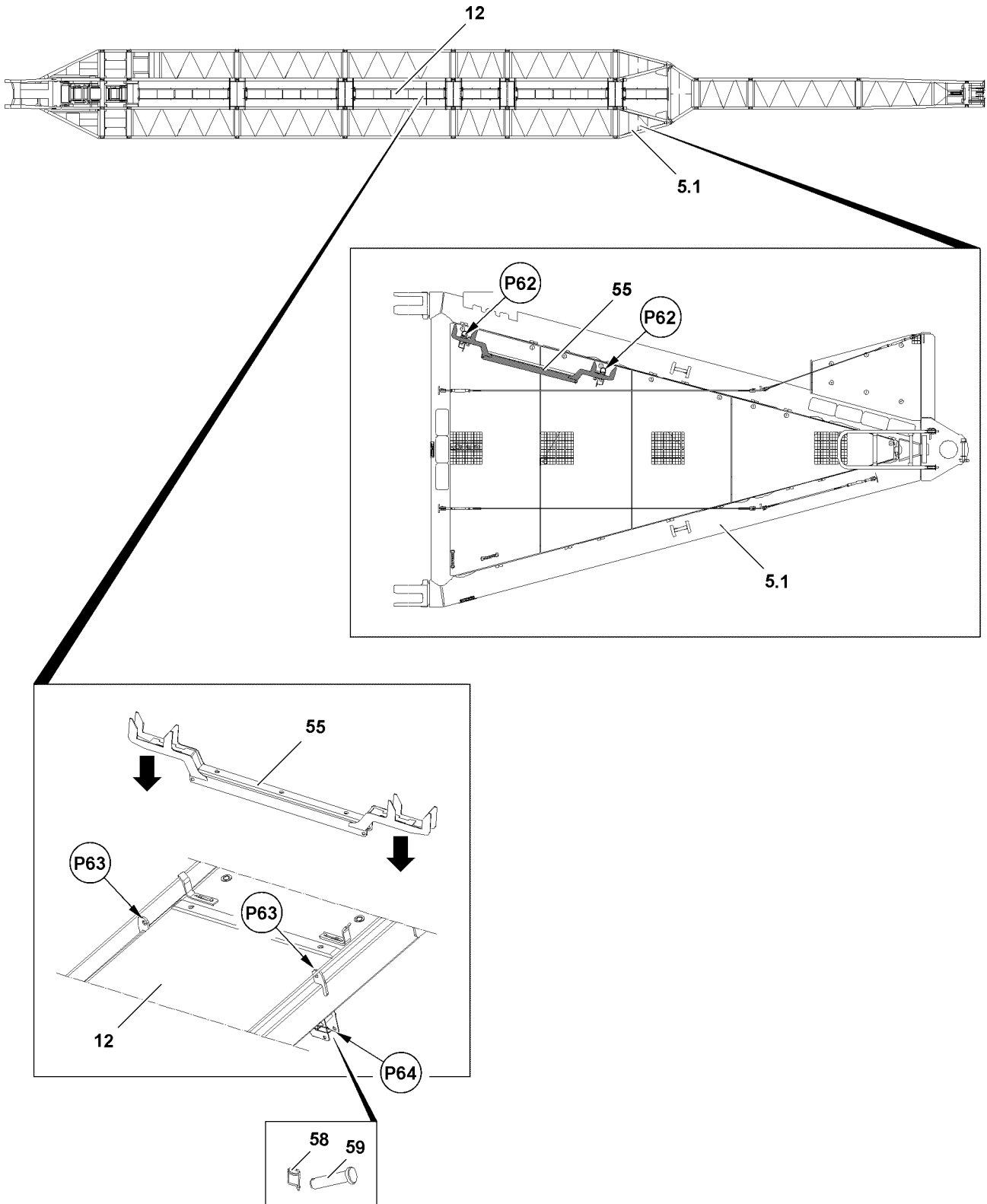


Fig.117460

LWE/LR 11350-007/19005-01-02/en

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**.

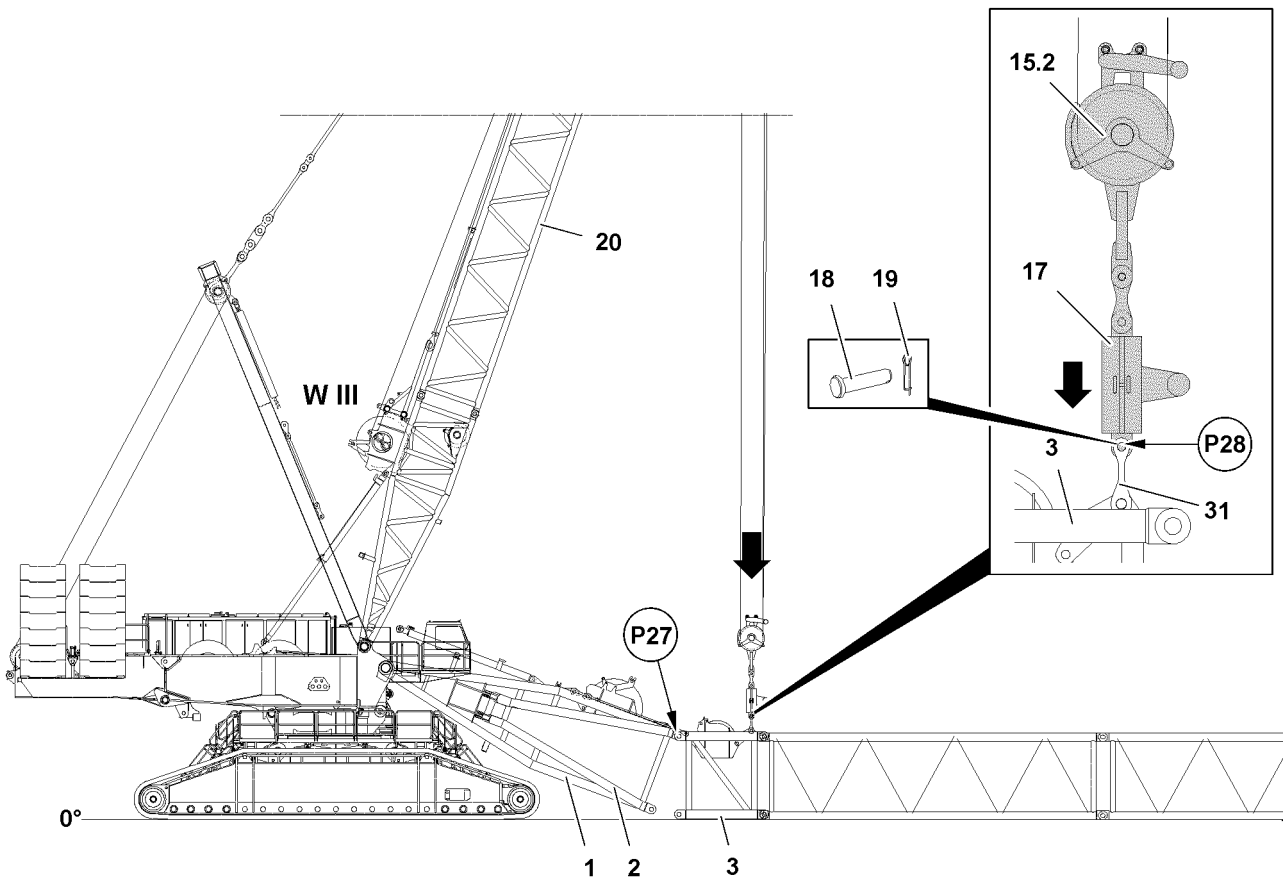
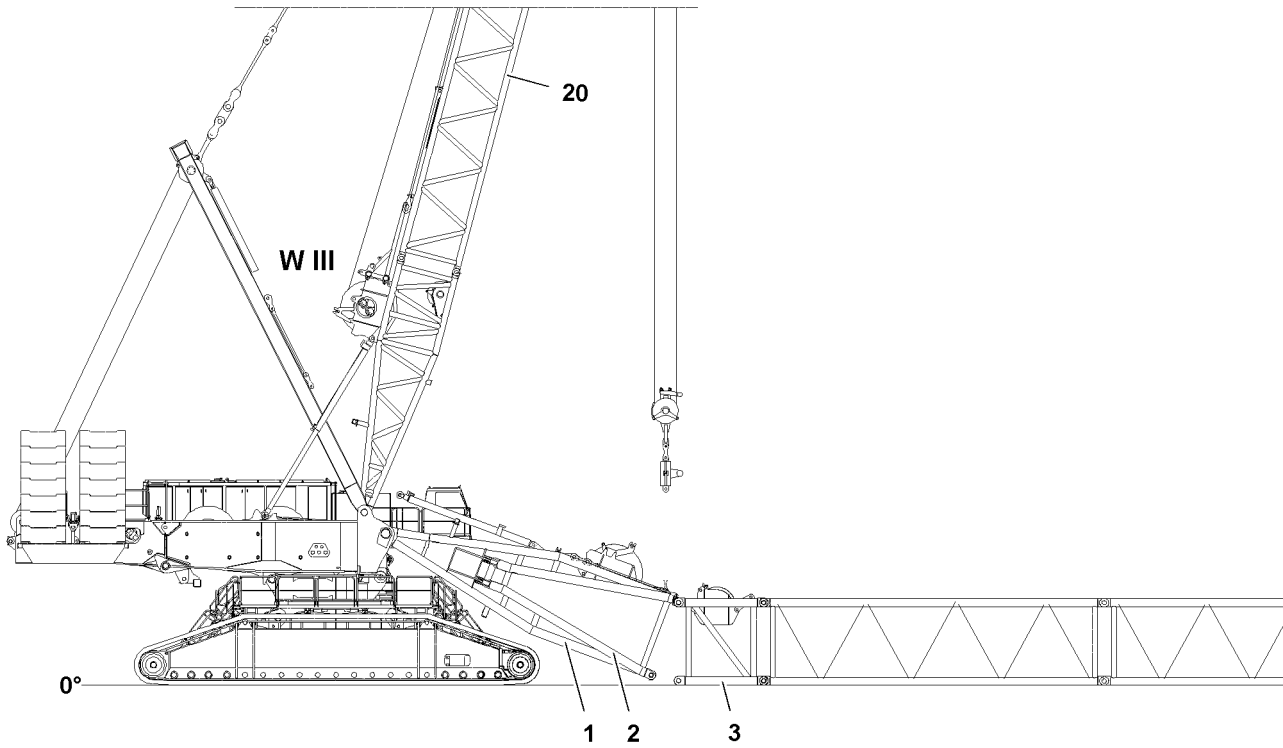


Fig.117202

LWE/LR 11350-007/19005-01-02/en

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

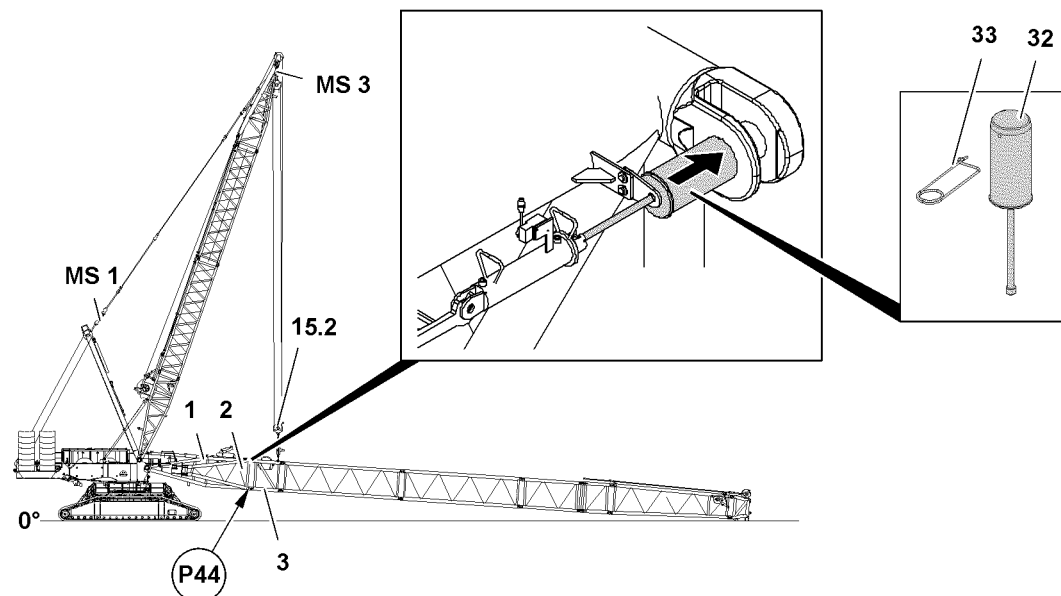


Fig.114601: Install the lattice sections on the cross beam - close the boom

**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 210 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**.

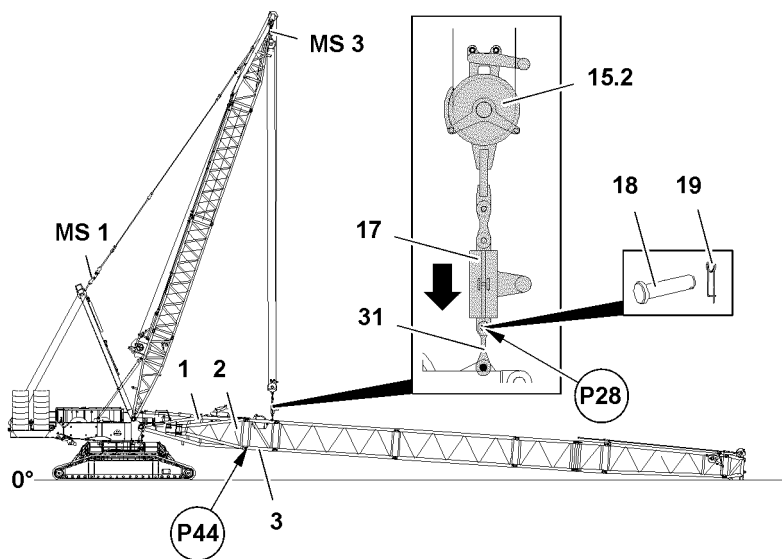


Fig.114602: Install the lattice sections on the cross beam - remove the assembly weight on the lattice section

**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.

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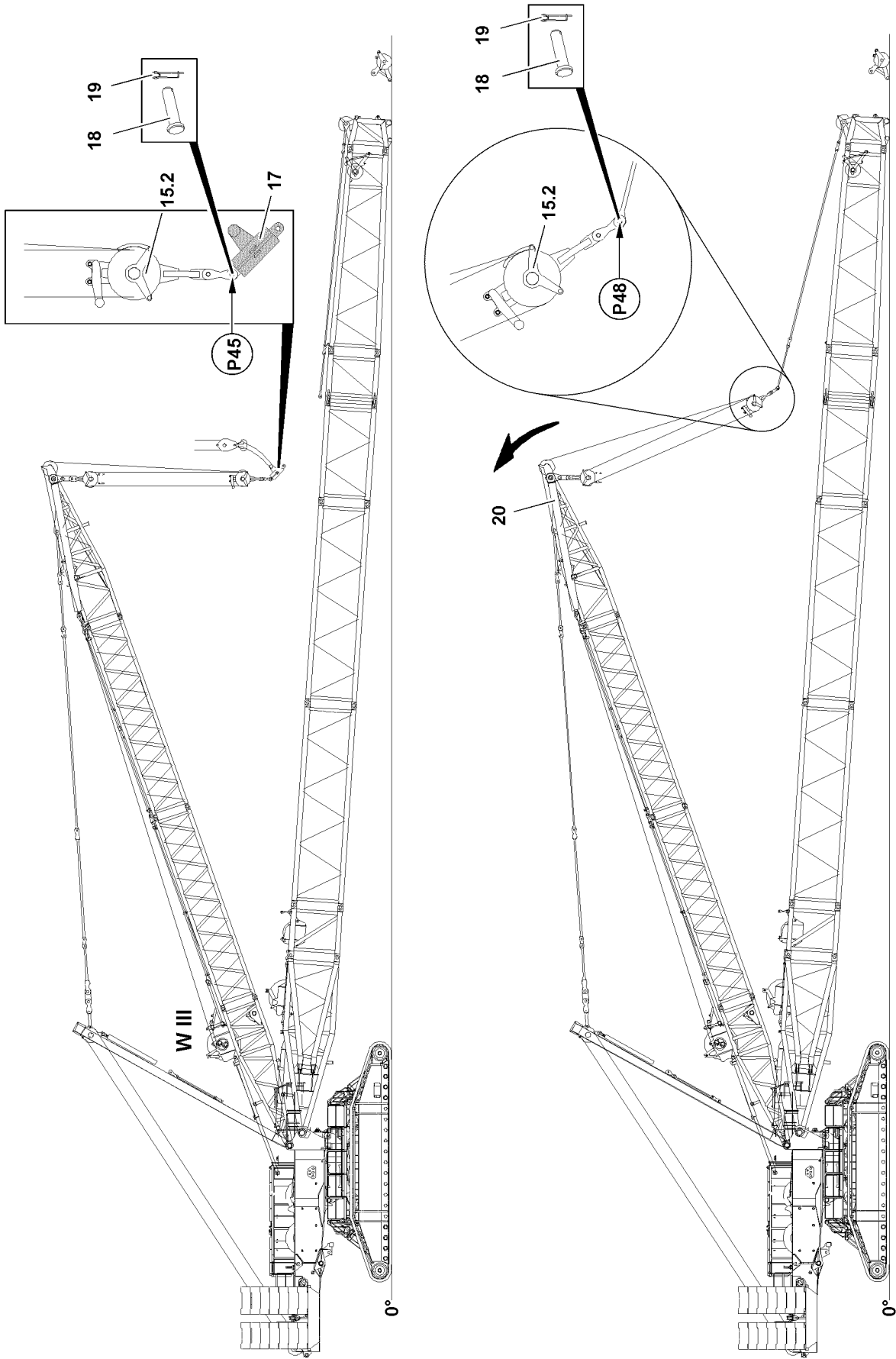


Fig.115391

LWE/LR 11350-007/19005-01-02/en

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**.

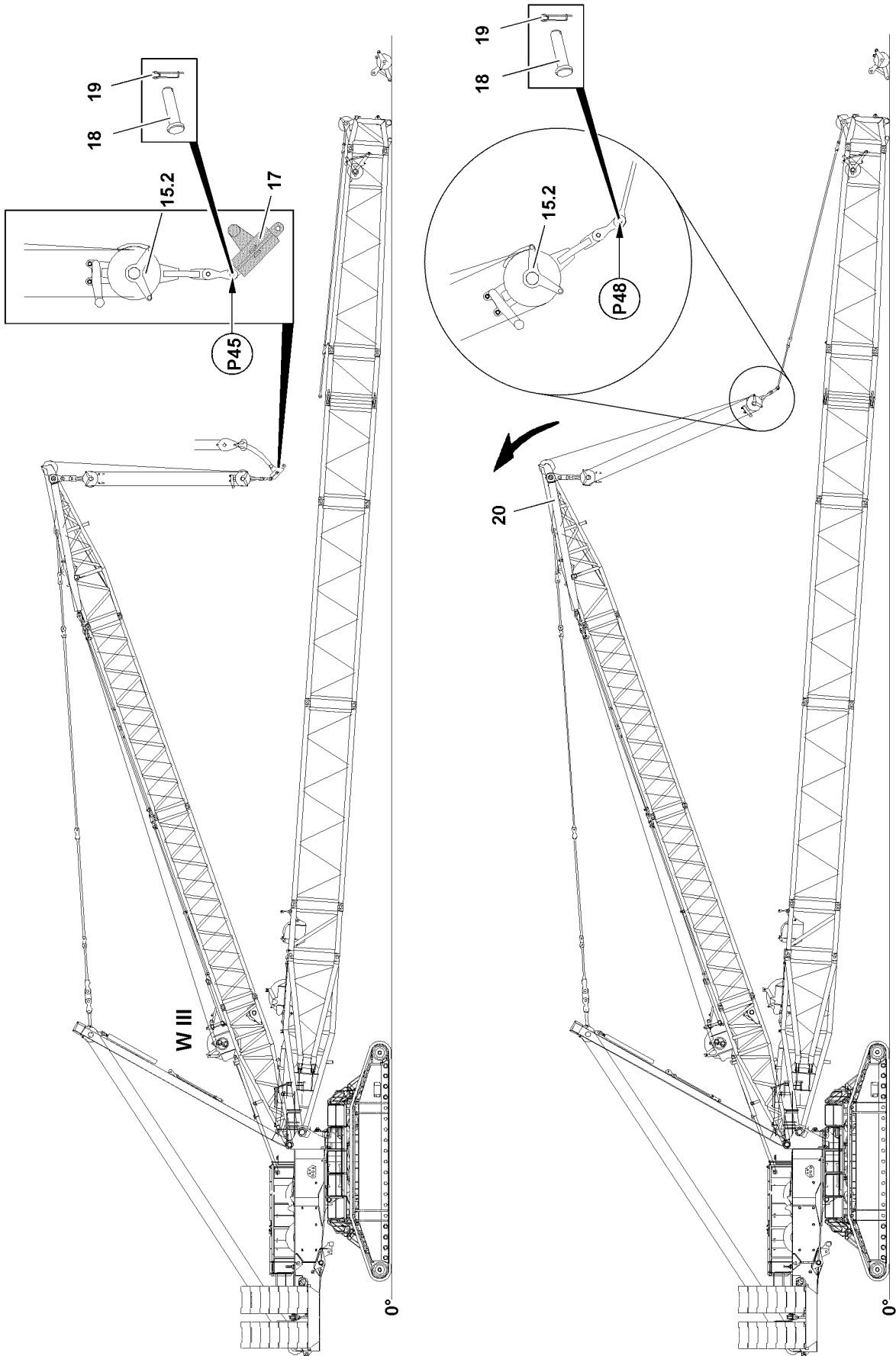


Fig.115391

LWE/LR 11350-007/19005-01-02/en

**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.

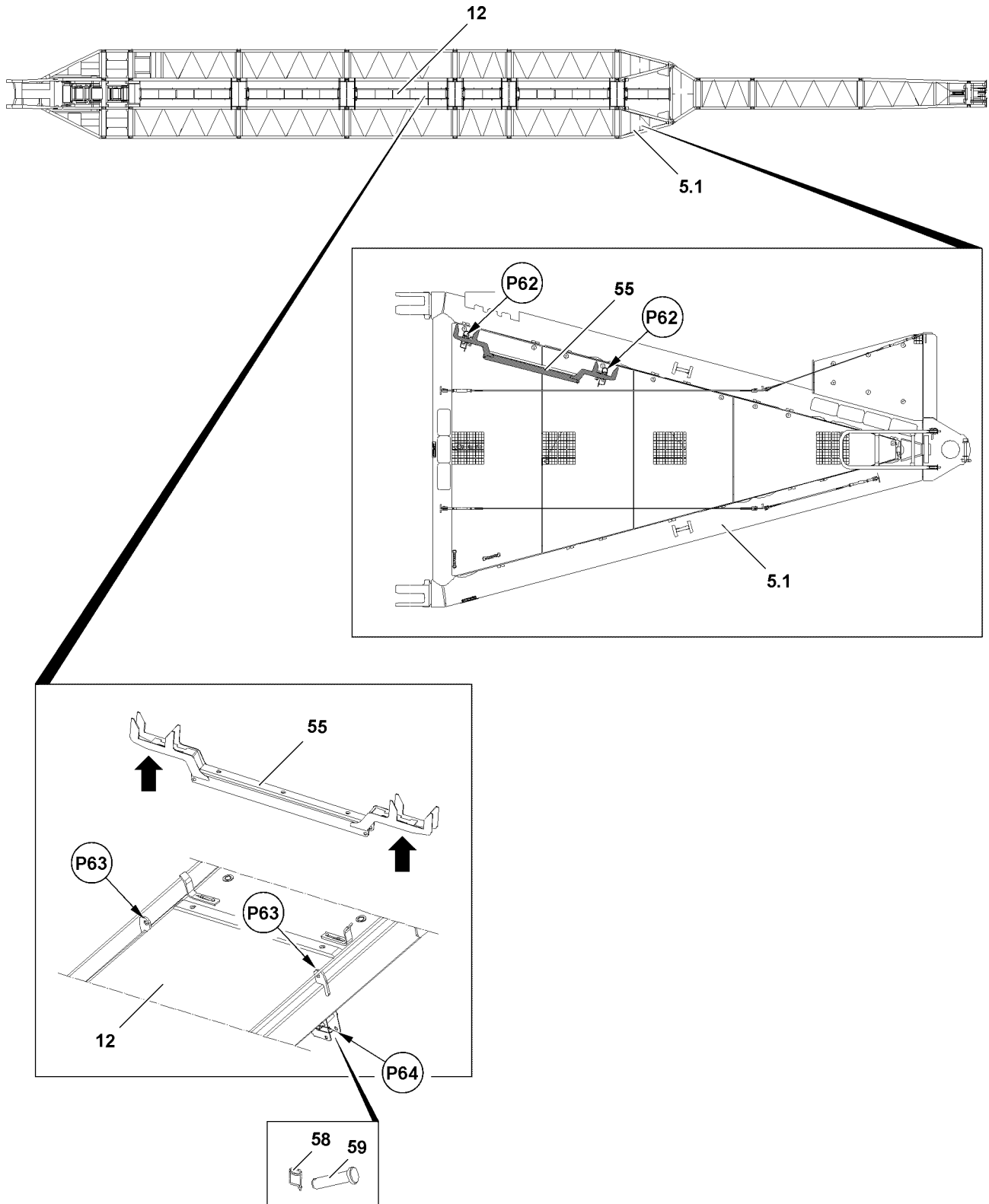


Fig.117461

LWE/LR 11350-007/19005-01-02/en

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.

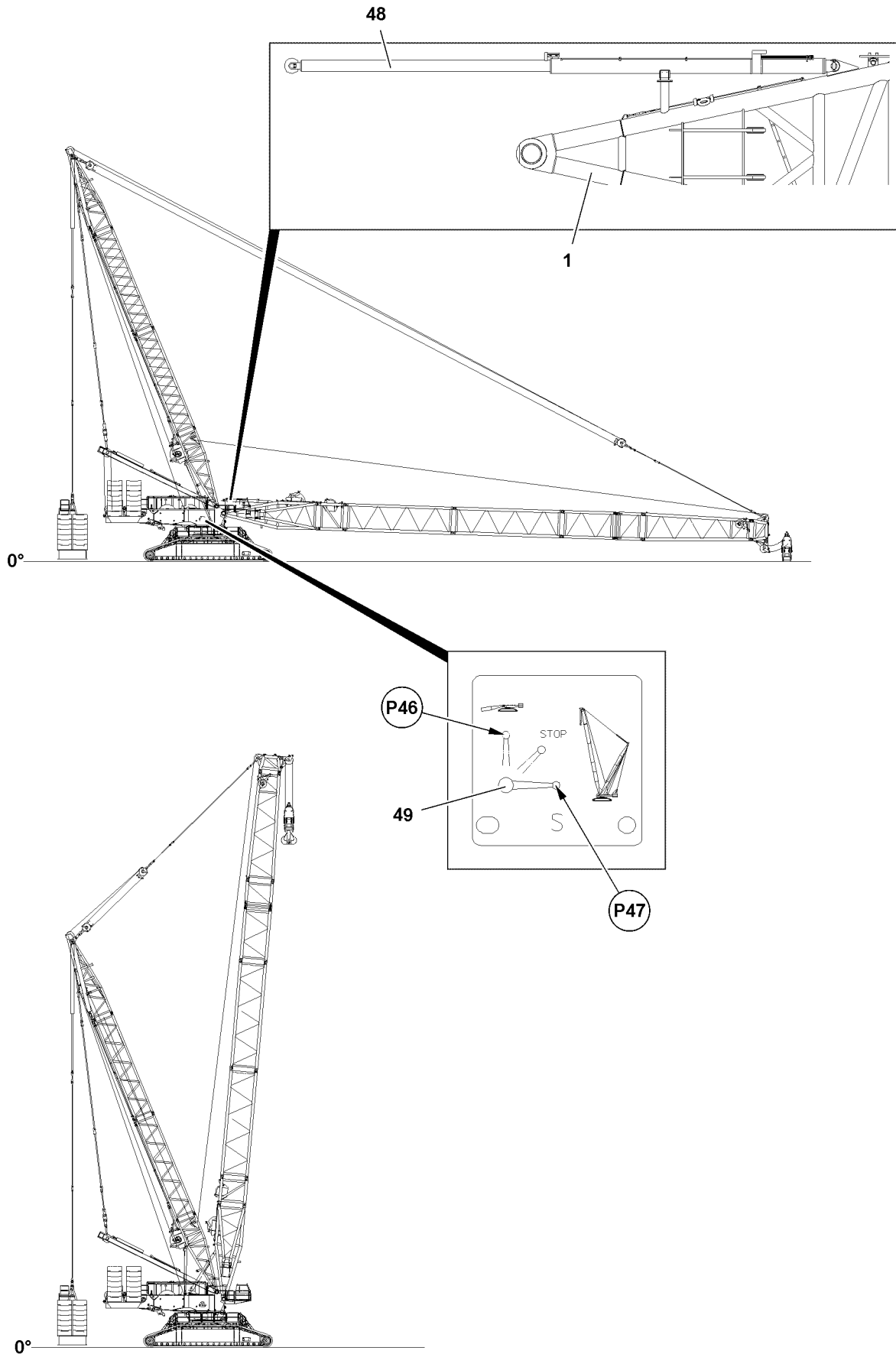


Fig.115392

LWE/LR 11350-007/19005-01-02/en

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.

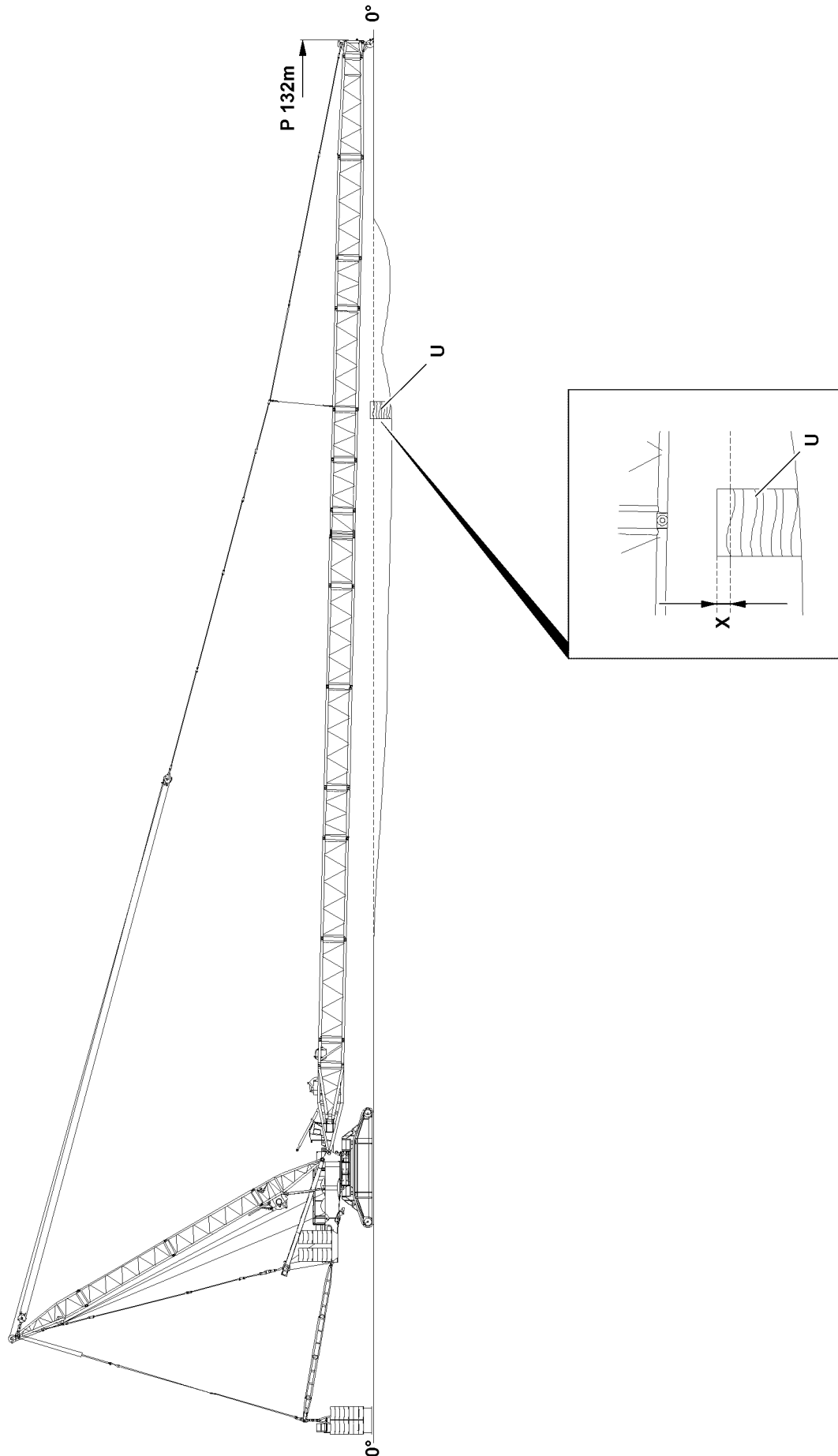


Fig.117451

LWE/LR 11350-007/19005-01-02/en

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 |
|-------------|------------------|
| P 126 m | 65 cm |
| P 132 m | 55 cm |
| P 138 m | 40 cm |
| P 144 m | 30 cm |
| P 150 m | 20 cm |

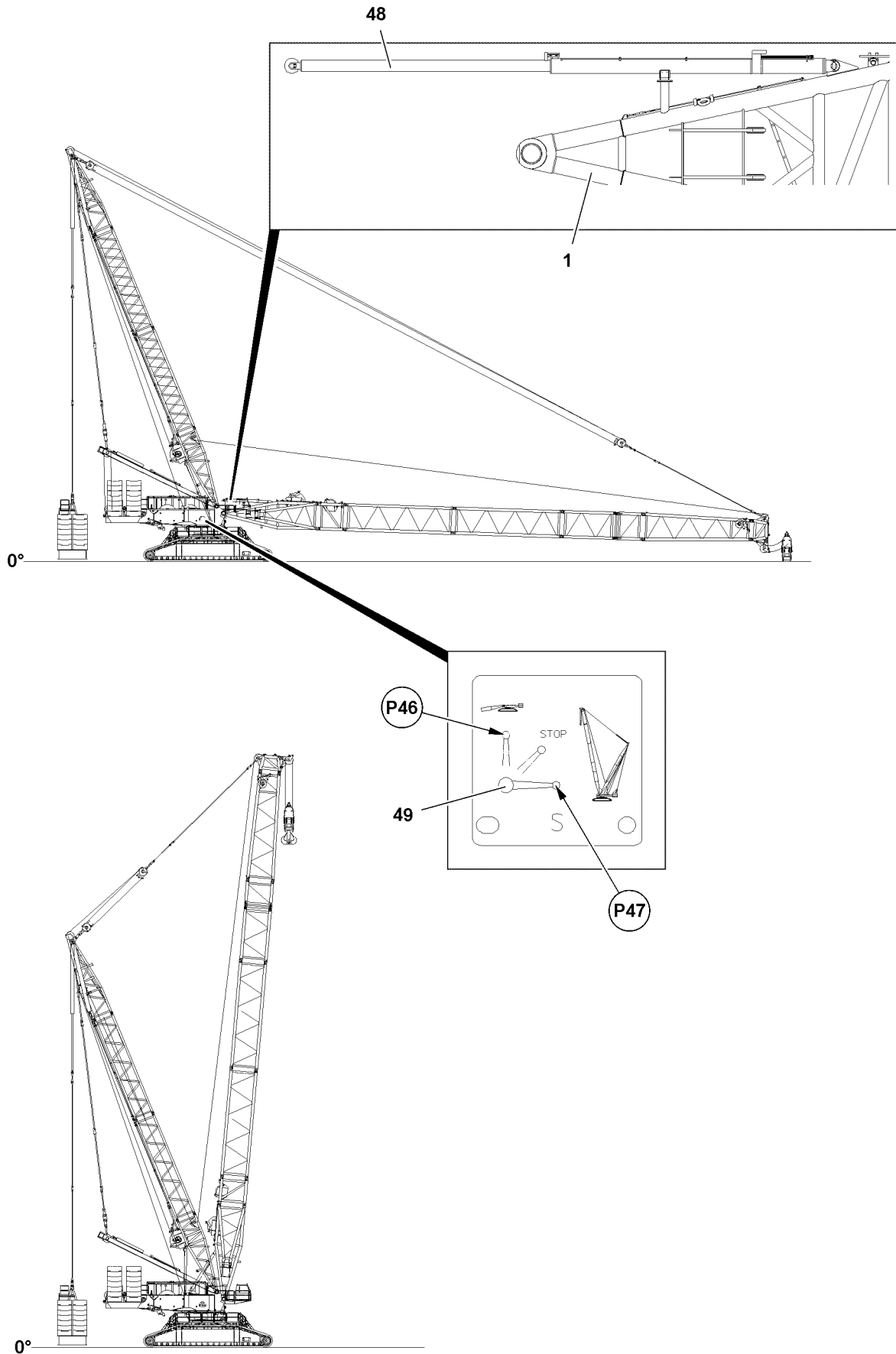


Fig.115392

LWE/LR 11350-007/19005-01-02/en

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.

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Fig.112775

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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.

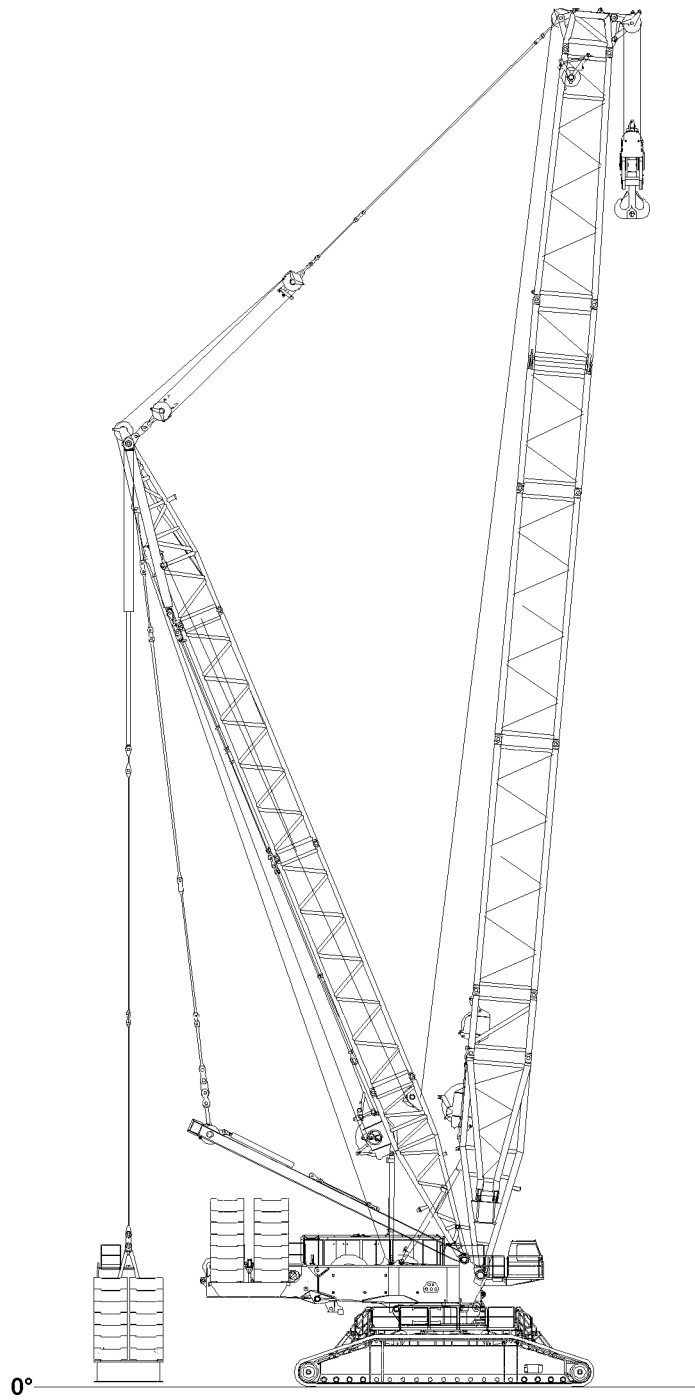


Fig.115393

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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**

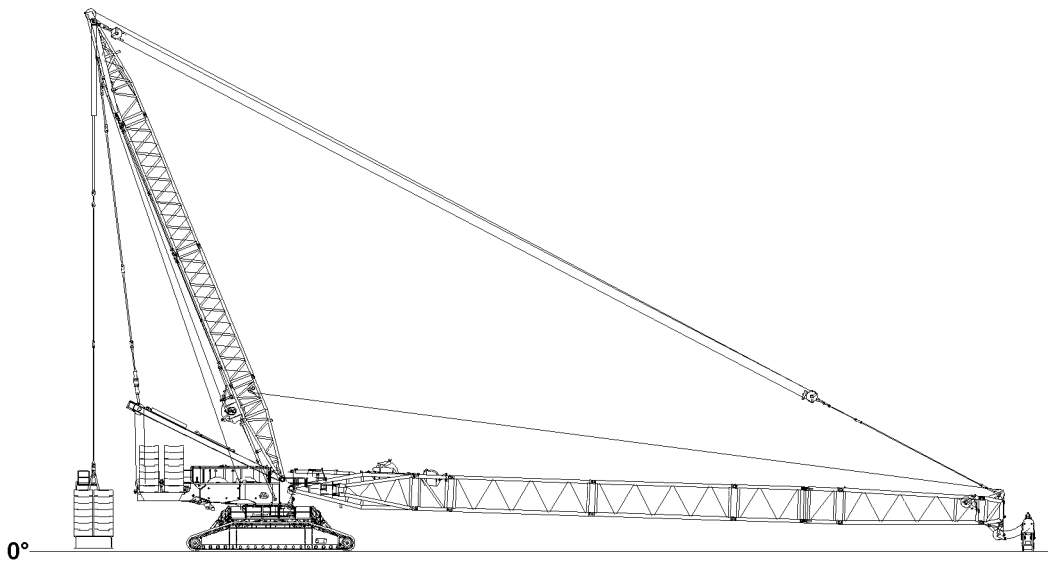
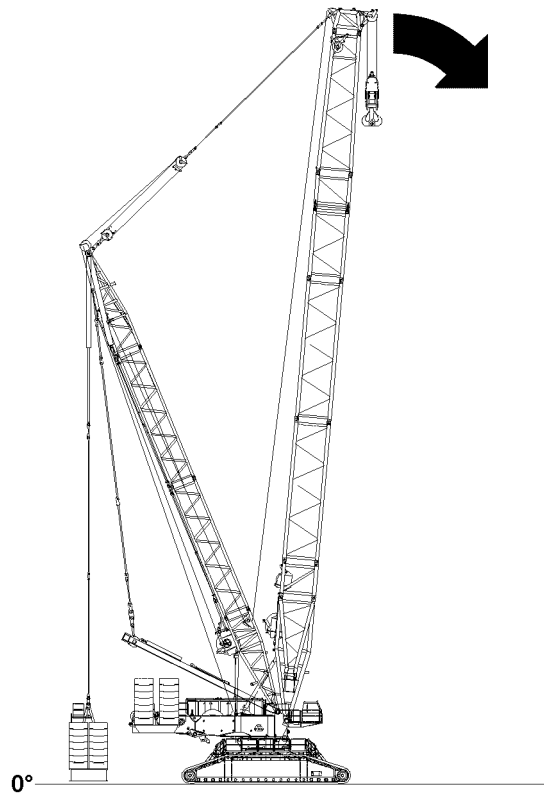
The crane can topple over!

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.



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Fig.115394

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

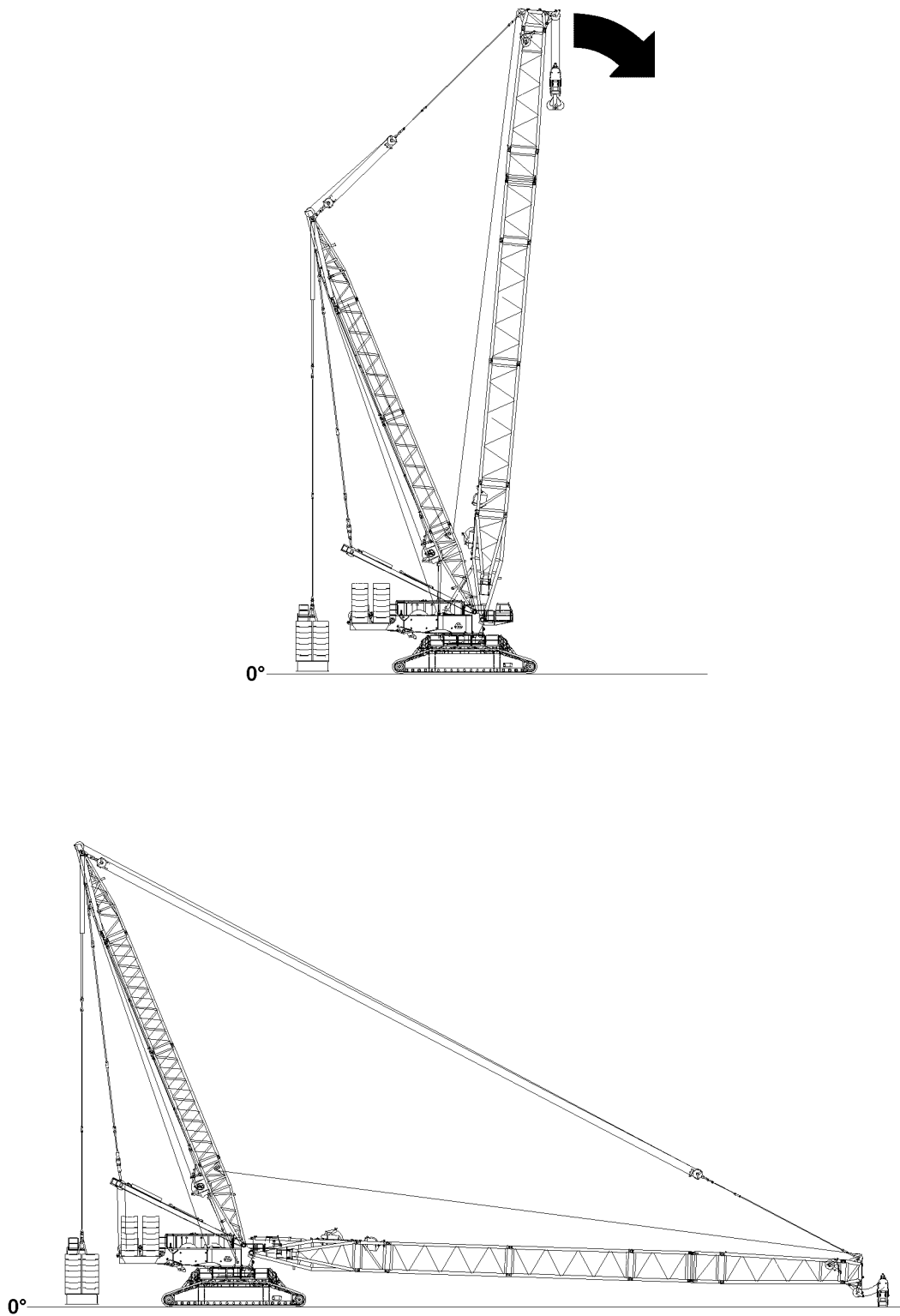
Danger of impact / crushing!

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!



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Fig.115394

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!

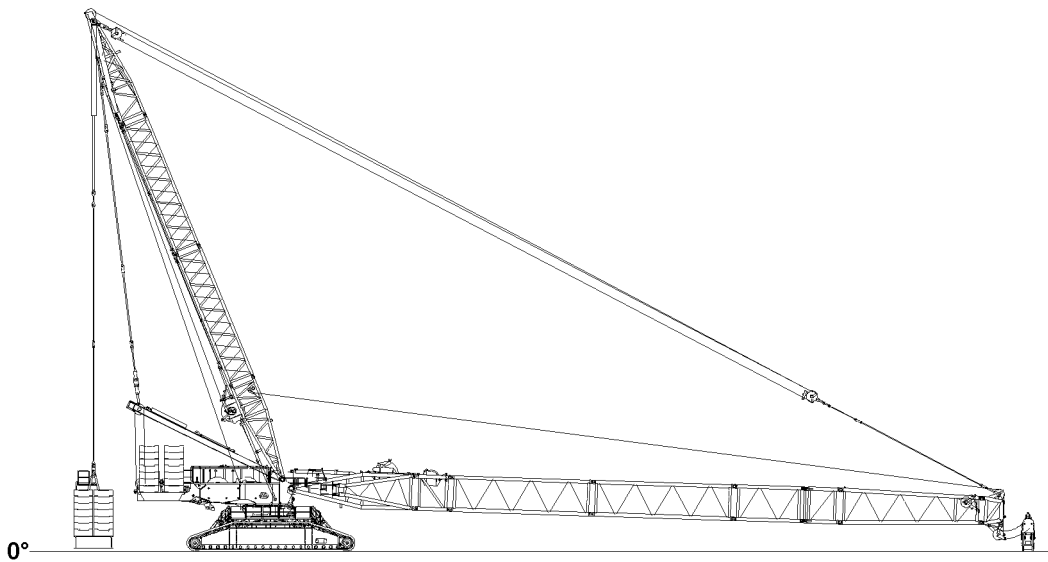
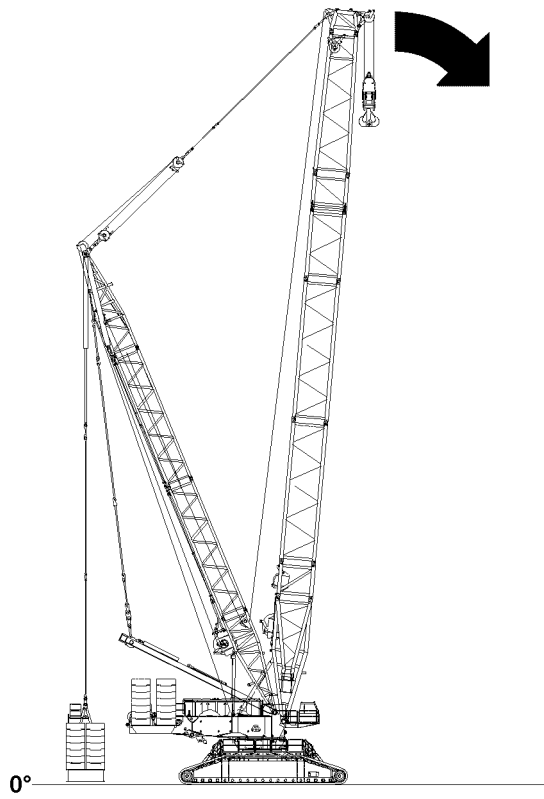
▶ When the lowest operating position of the main boom is reached, the load display in the maximum load icon turns off and instead of the load display appears the display „???“!

▶ 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.



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Fig.117312

**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.

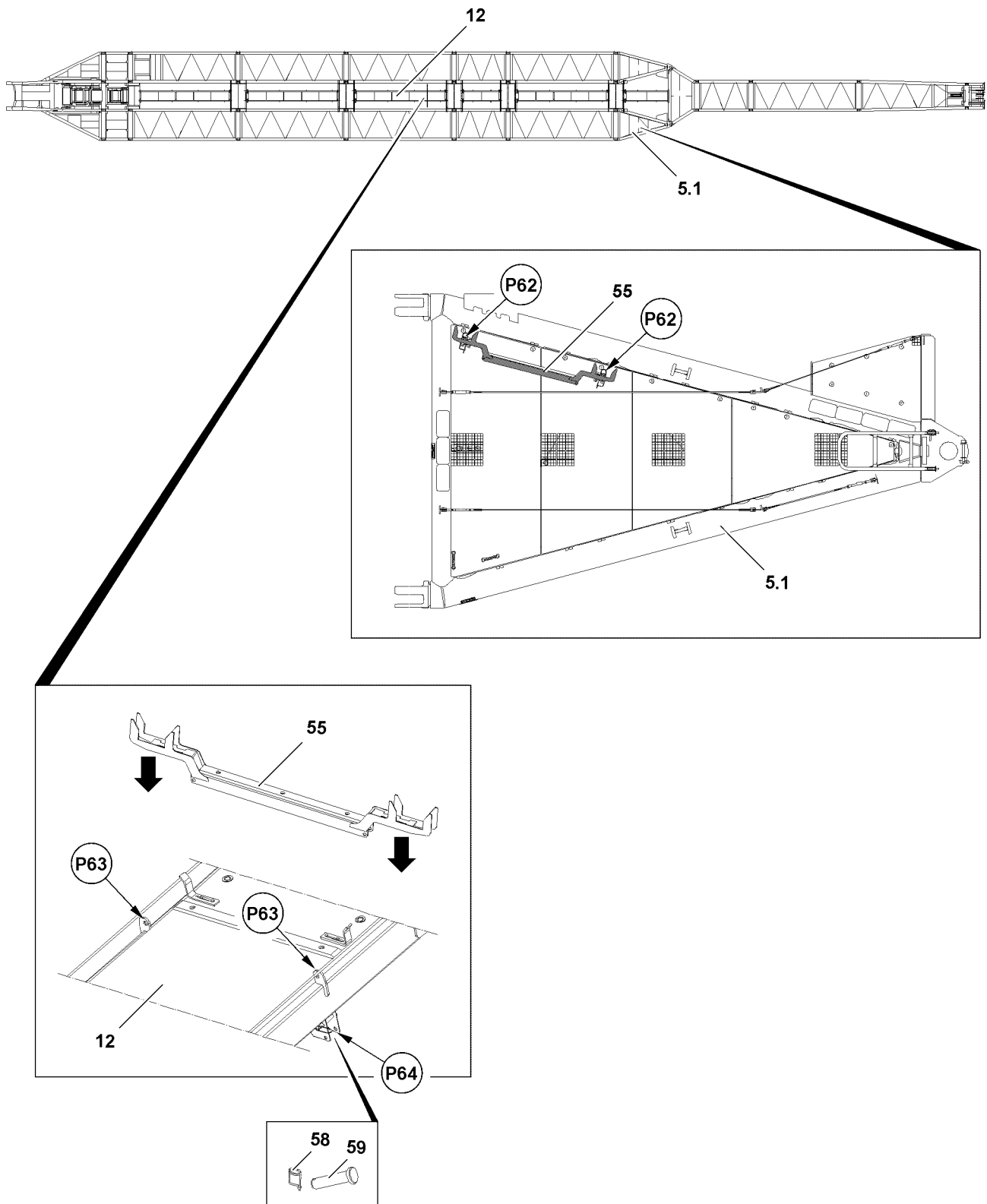


Fig.117460

LWE/LR 11350-007/19005-01-02/en

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**.

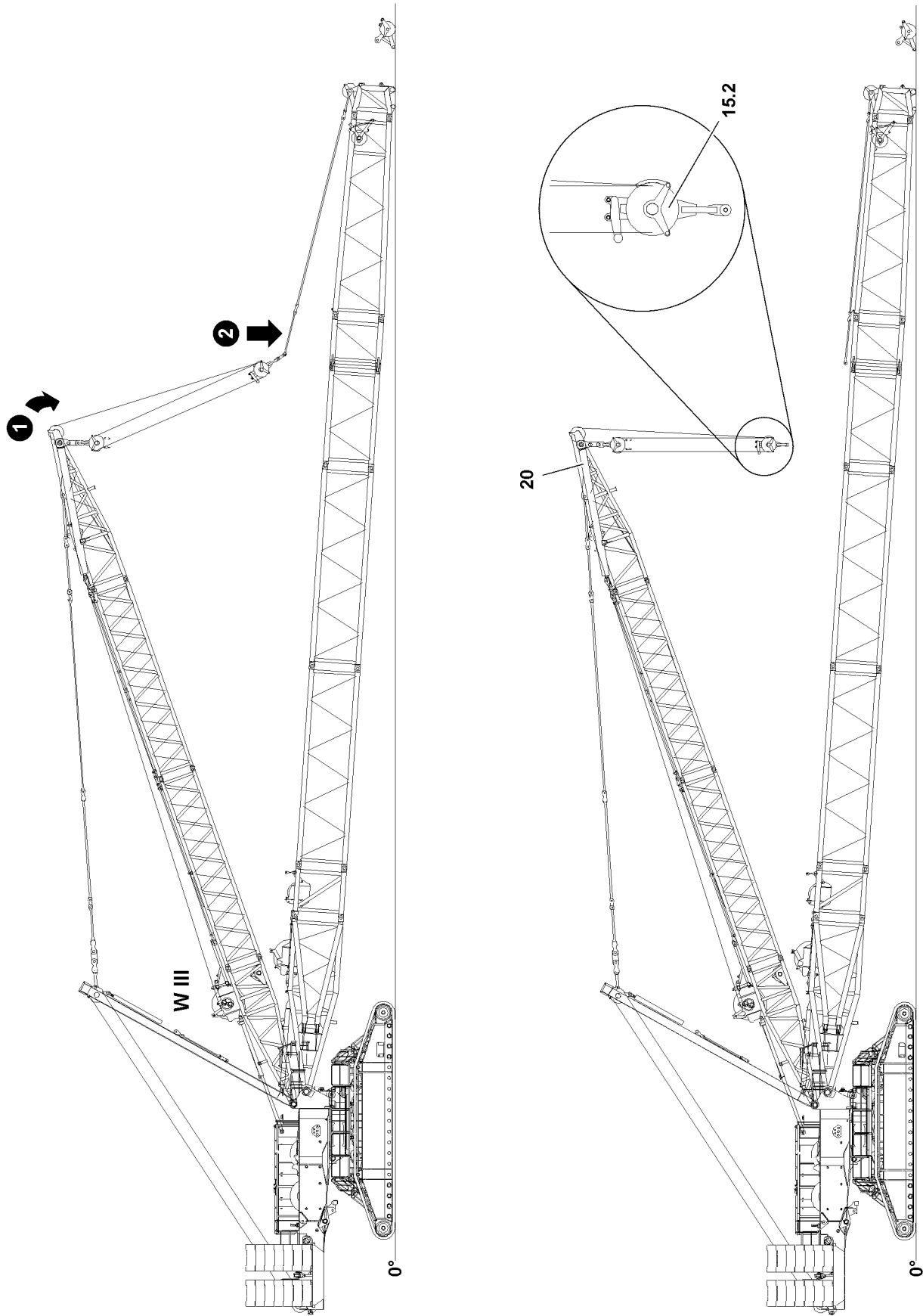


Fig.115396

LWE/LR 11350-007/19005-01-02/en

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.

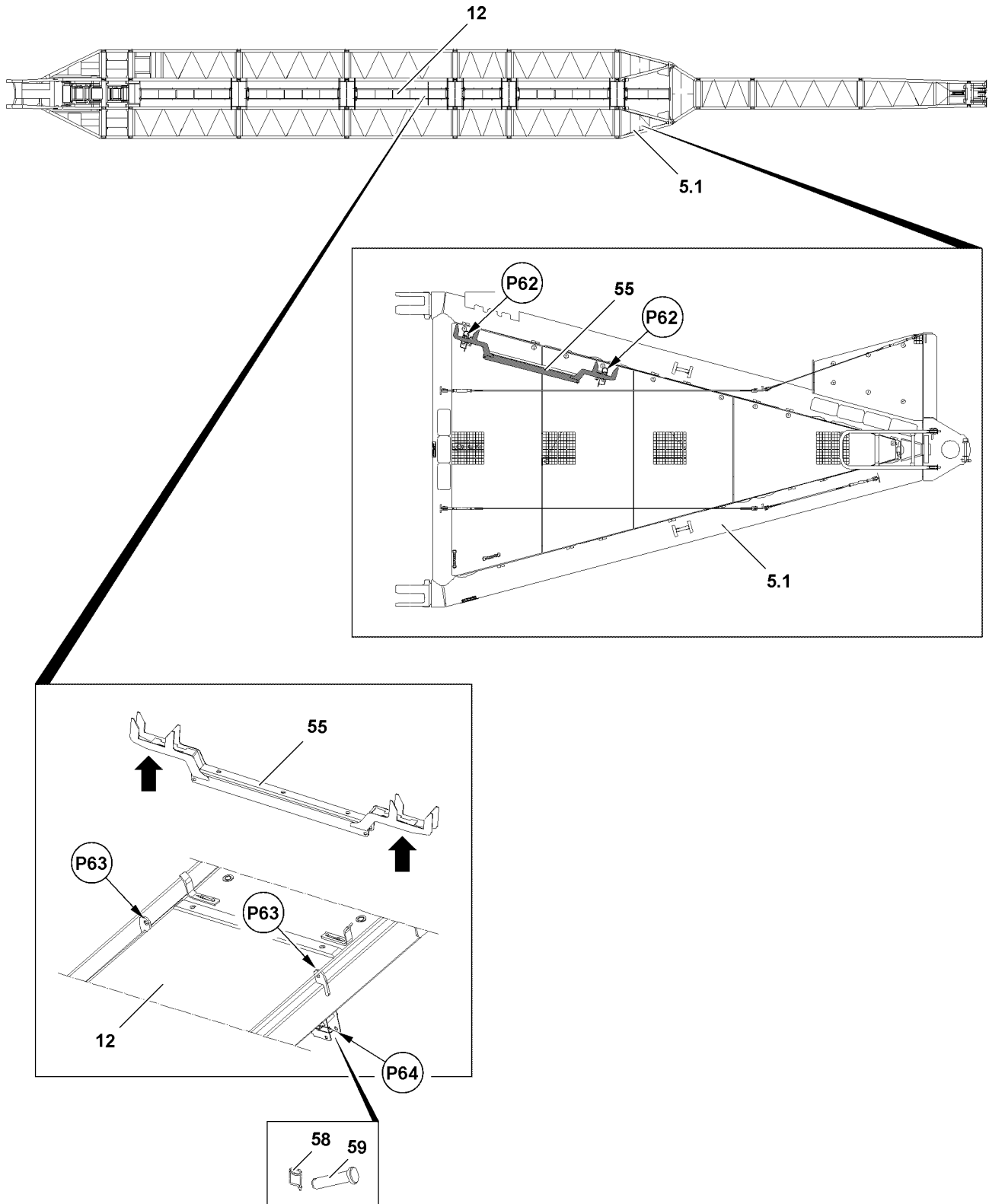


Fig.117461

LWE/LR 11350-007/19005-01-02/en

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

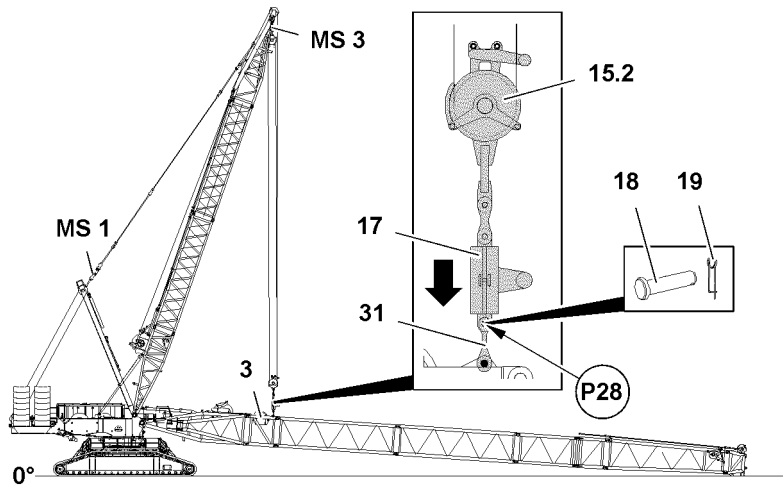


Fig.115397: Open the boom - install the upper pulley block on the cross carrier



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**.

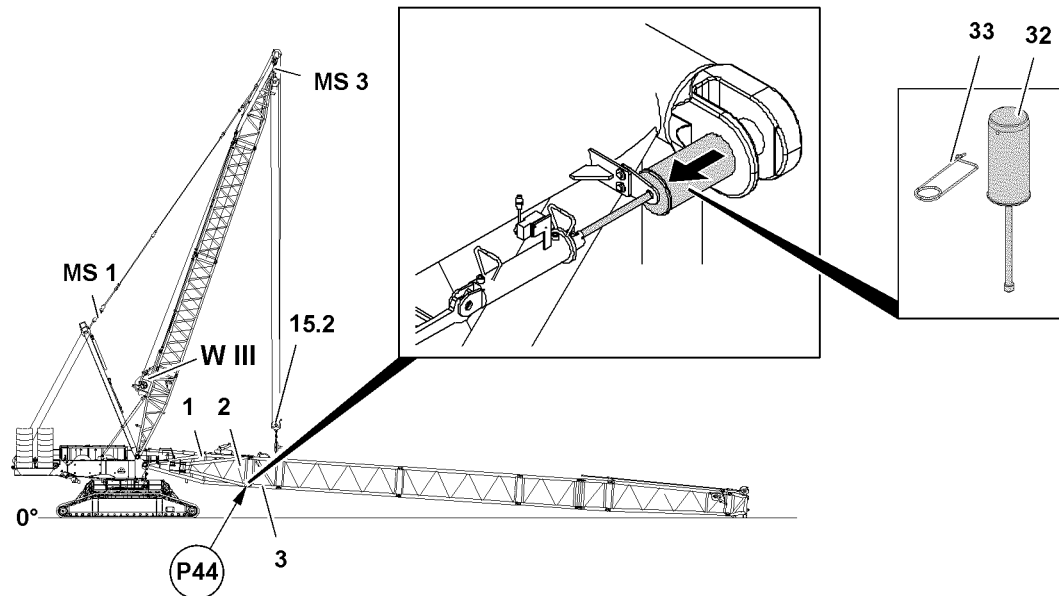


Fig.115398: Open the boom - release the lower pin connection



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 210 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.

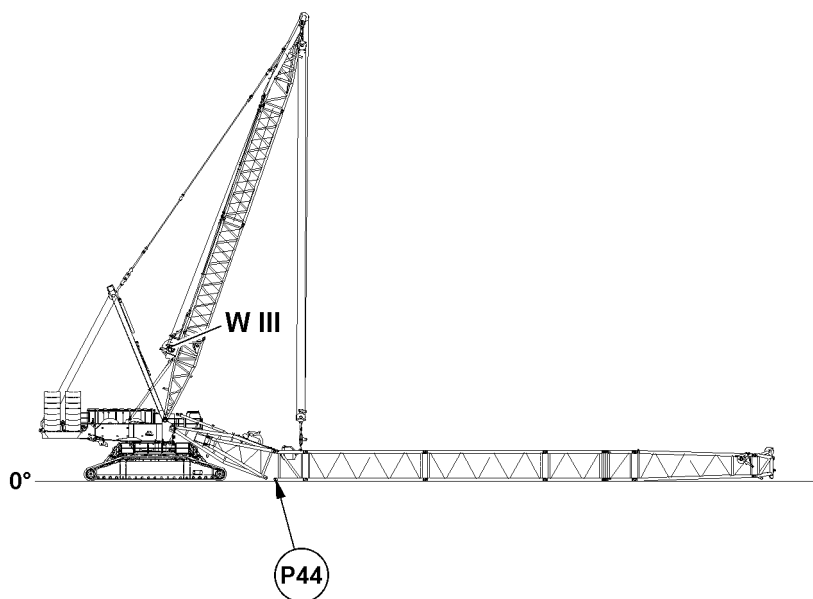


Fig.117314: Open the boom - place the boom on the ground

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.

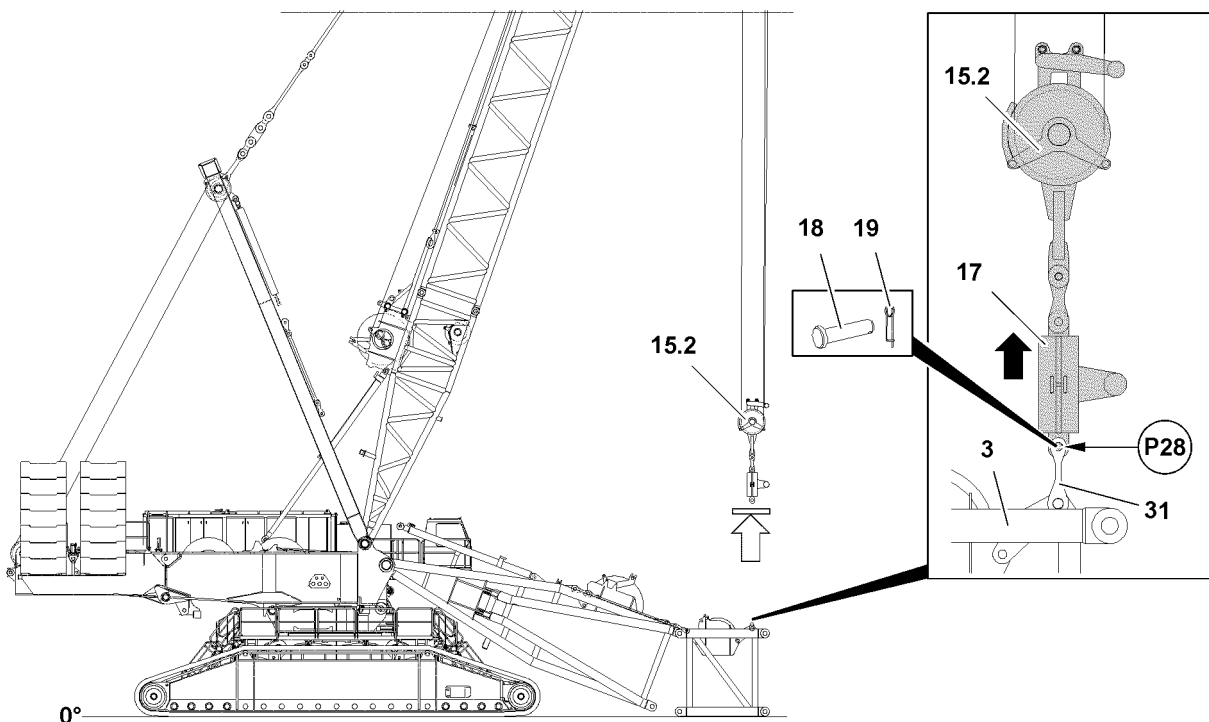


Fig.117434: Removing the upper pulley block on the cross carrier

- 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

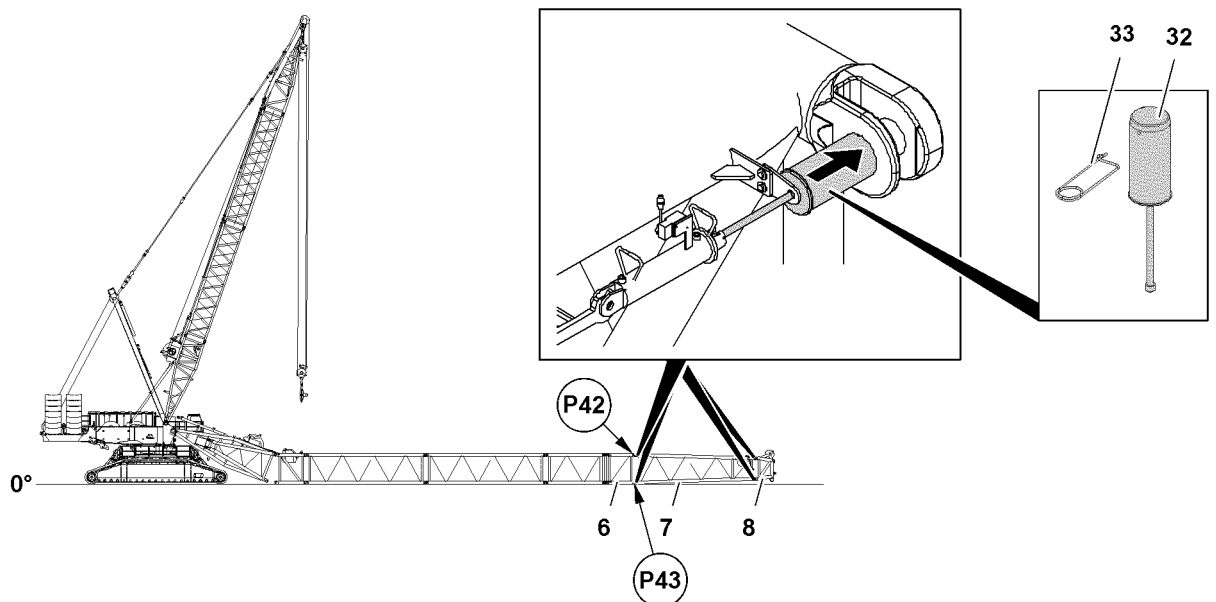


Fig.117435: Removing the lattice sections on the cross beam

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.

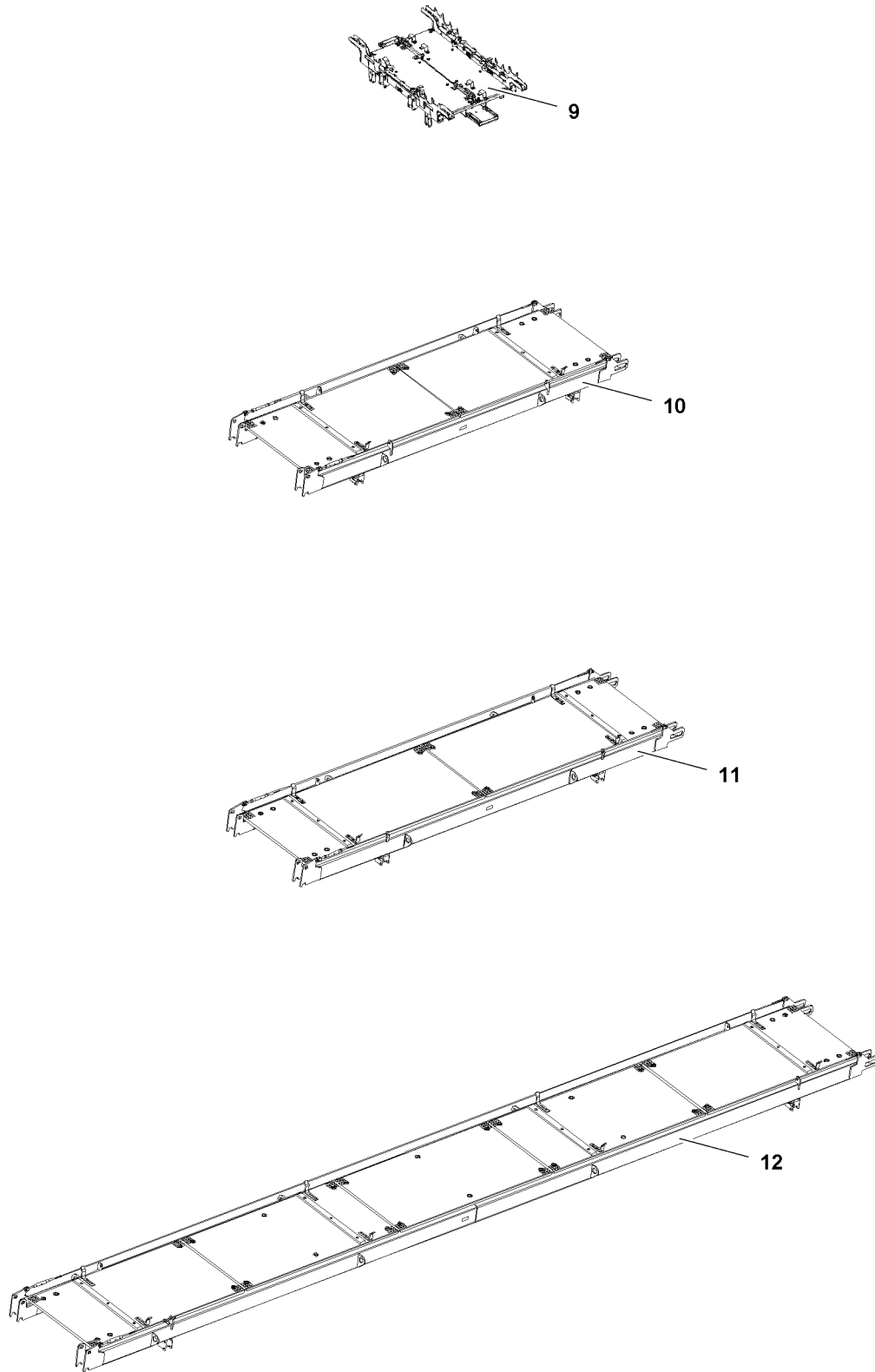


Fig.117313

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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.

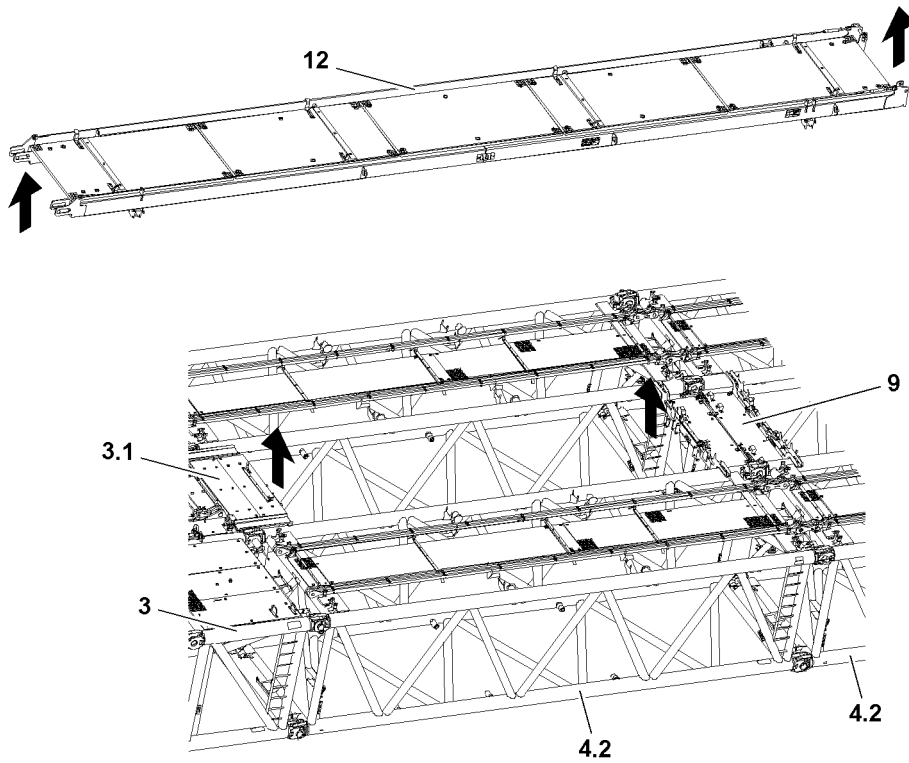
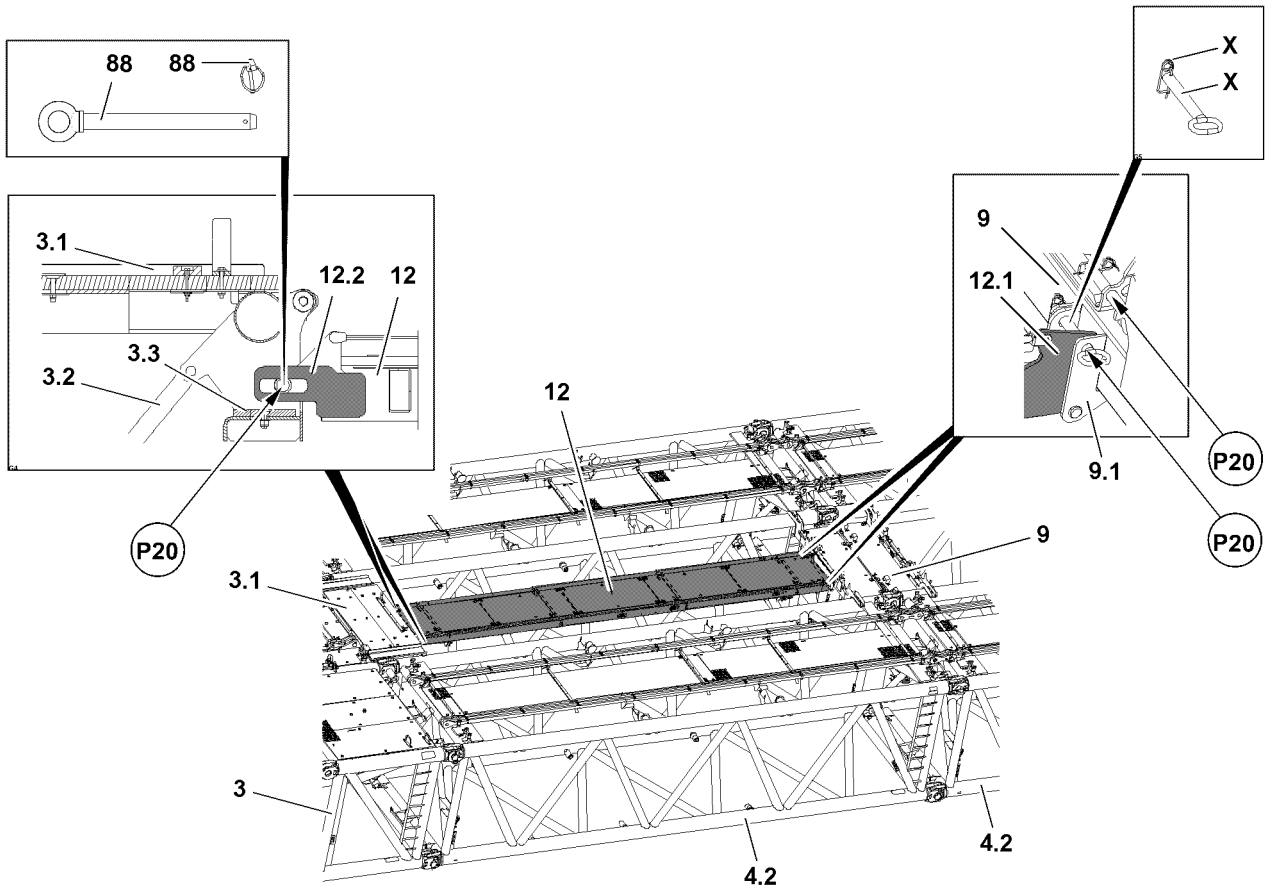


Fig.117436

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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“

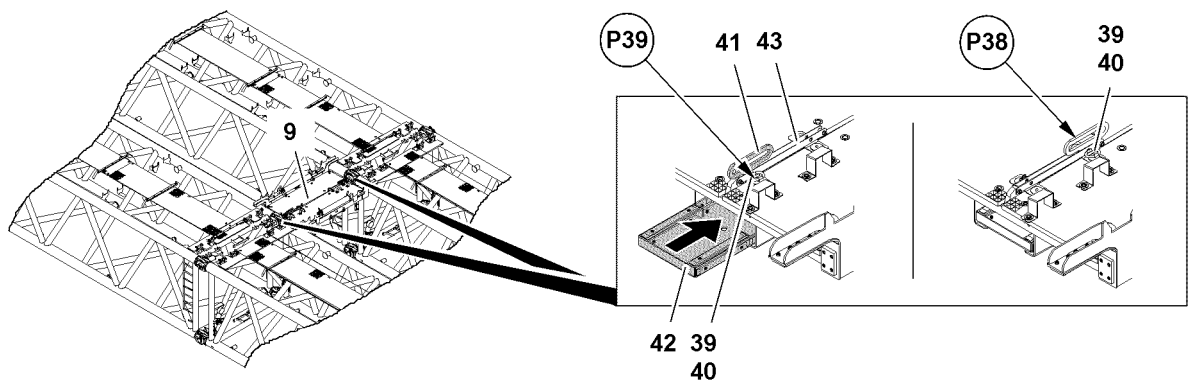


Fig.115402: Remove the bridge - release the bridge



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**.

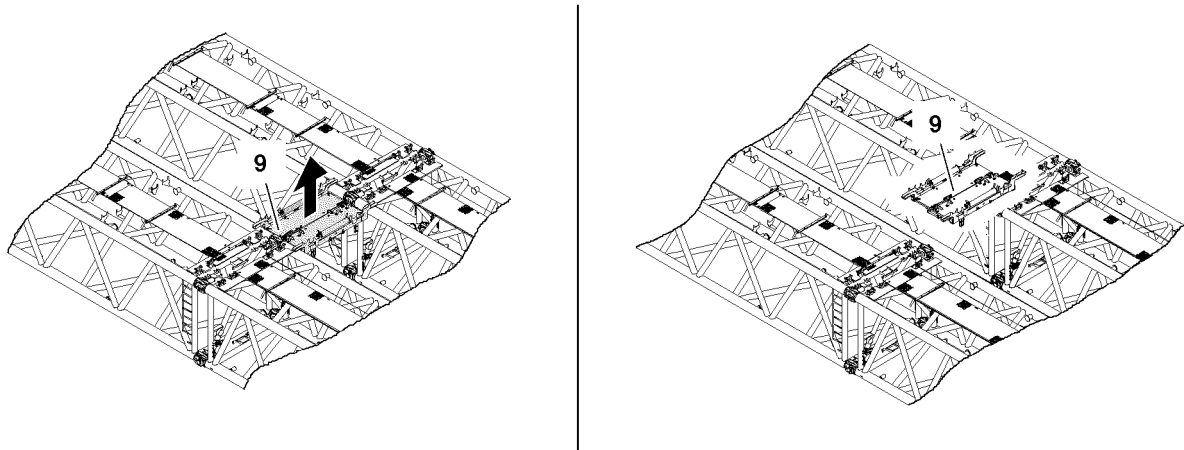


Fig.115403: Remove the bridge - fasten and remove the bridge

- ▶ 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.

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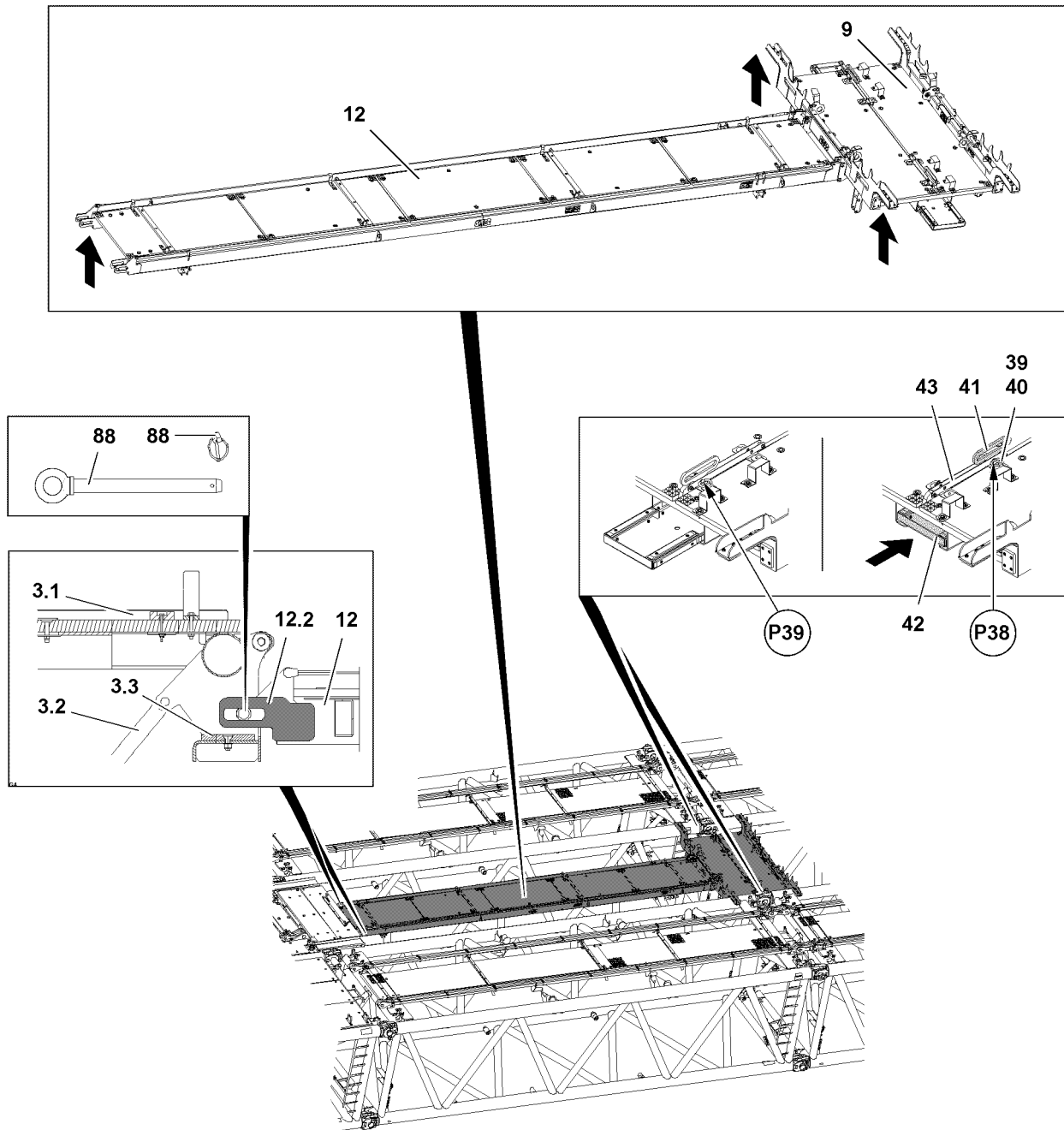


Fig.117439

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.

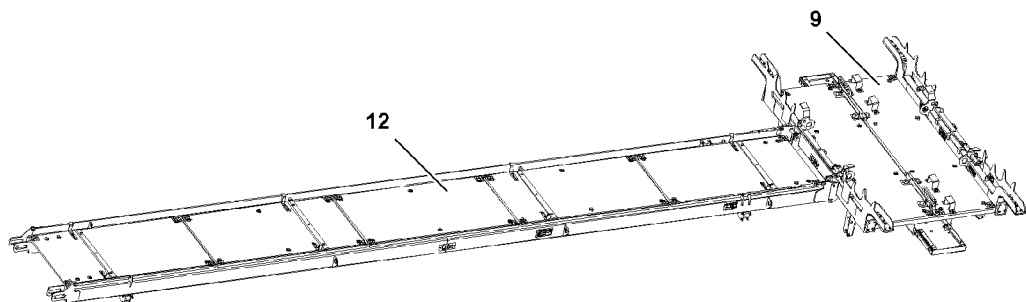


Fig.117437

- ▶ 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.

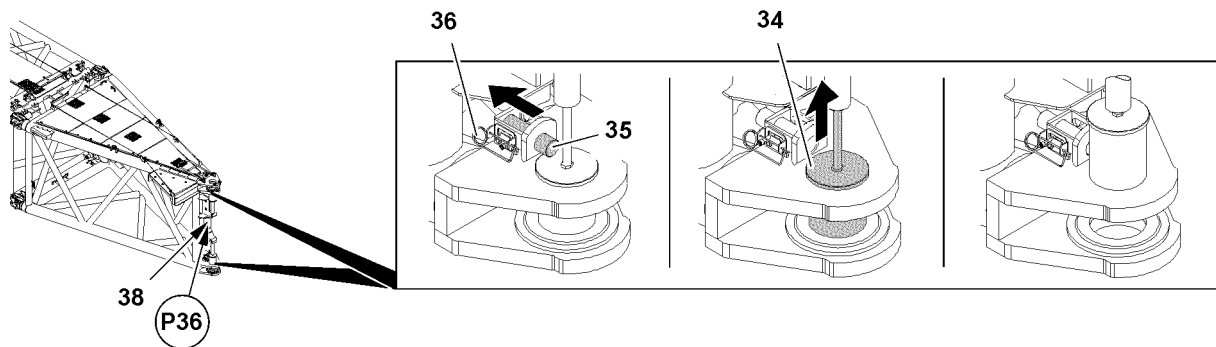


Fig.115404: Remove the cross beam - remove the left retaining pin

- ▶ 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.

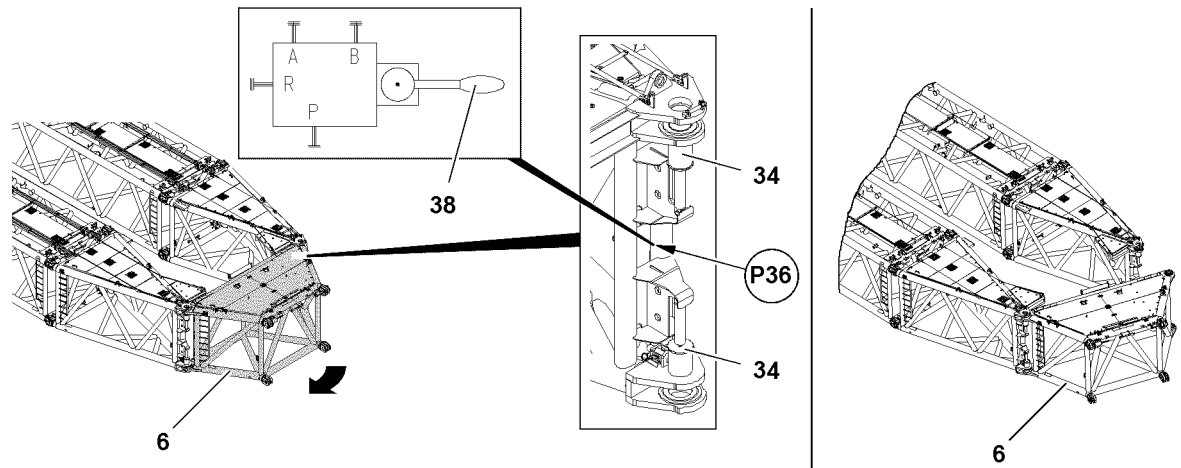


Fig.117440: Remove the cross beam - unpin the cross beam on the left

- ▶ 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 unpinned.
- ▶ 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.

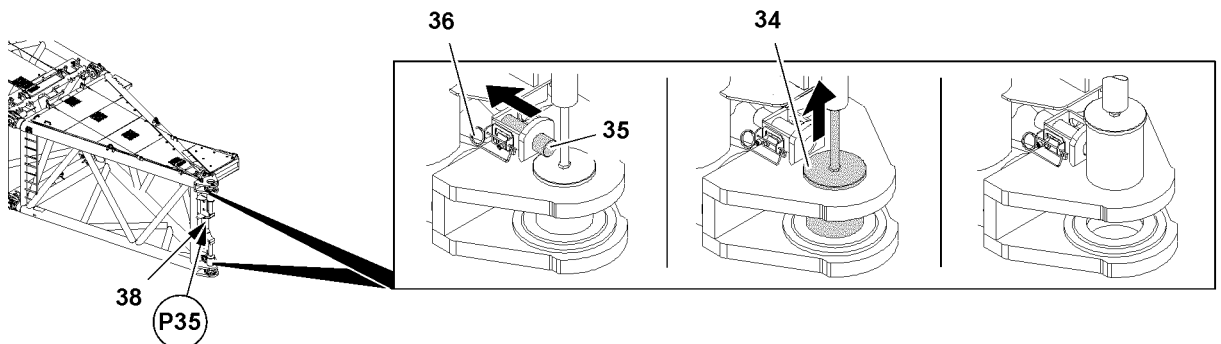


Fig.115406: Remove the cross beam - remove the right retaining pin

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.

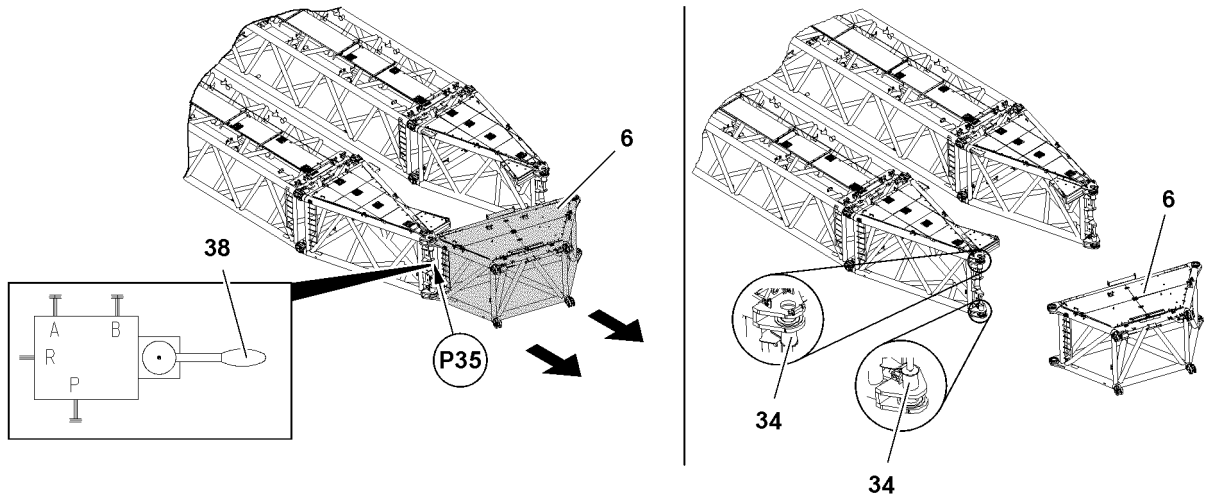


Fig.117441: Remove the cross beam - unpin the cross beam on the right

- ▶ 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 unpinning.
- ▶ 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

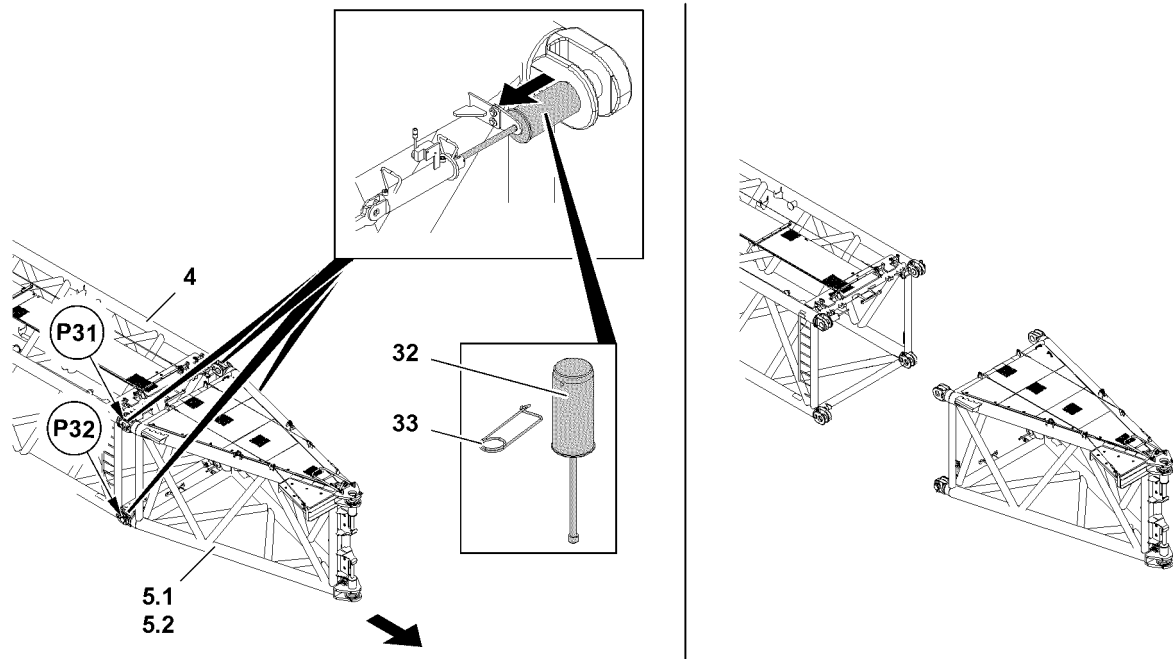


Fig.115408: Removing the upper P-adapters

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.

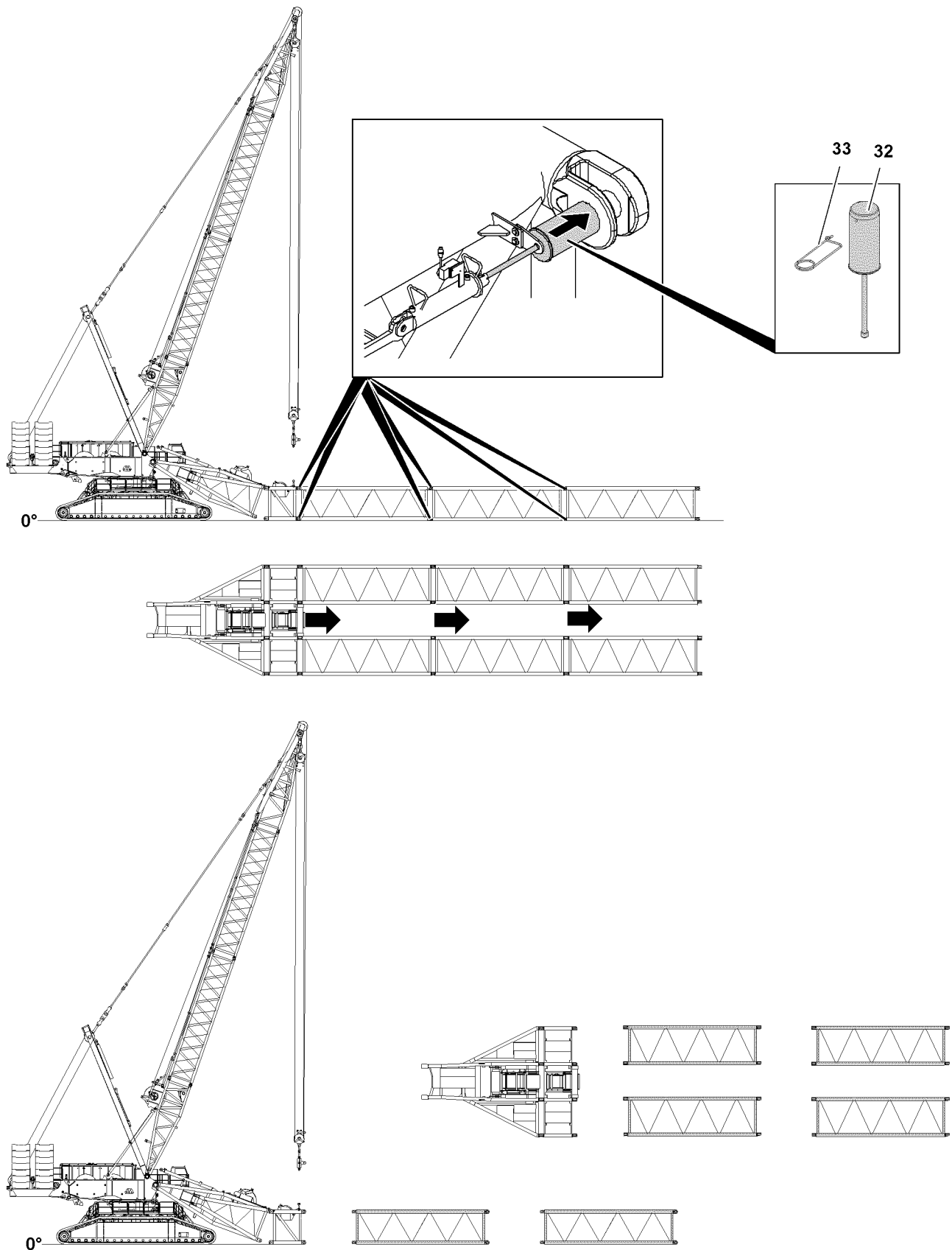


Fig.117438

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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.

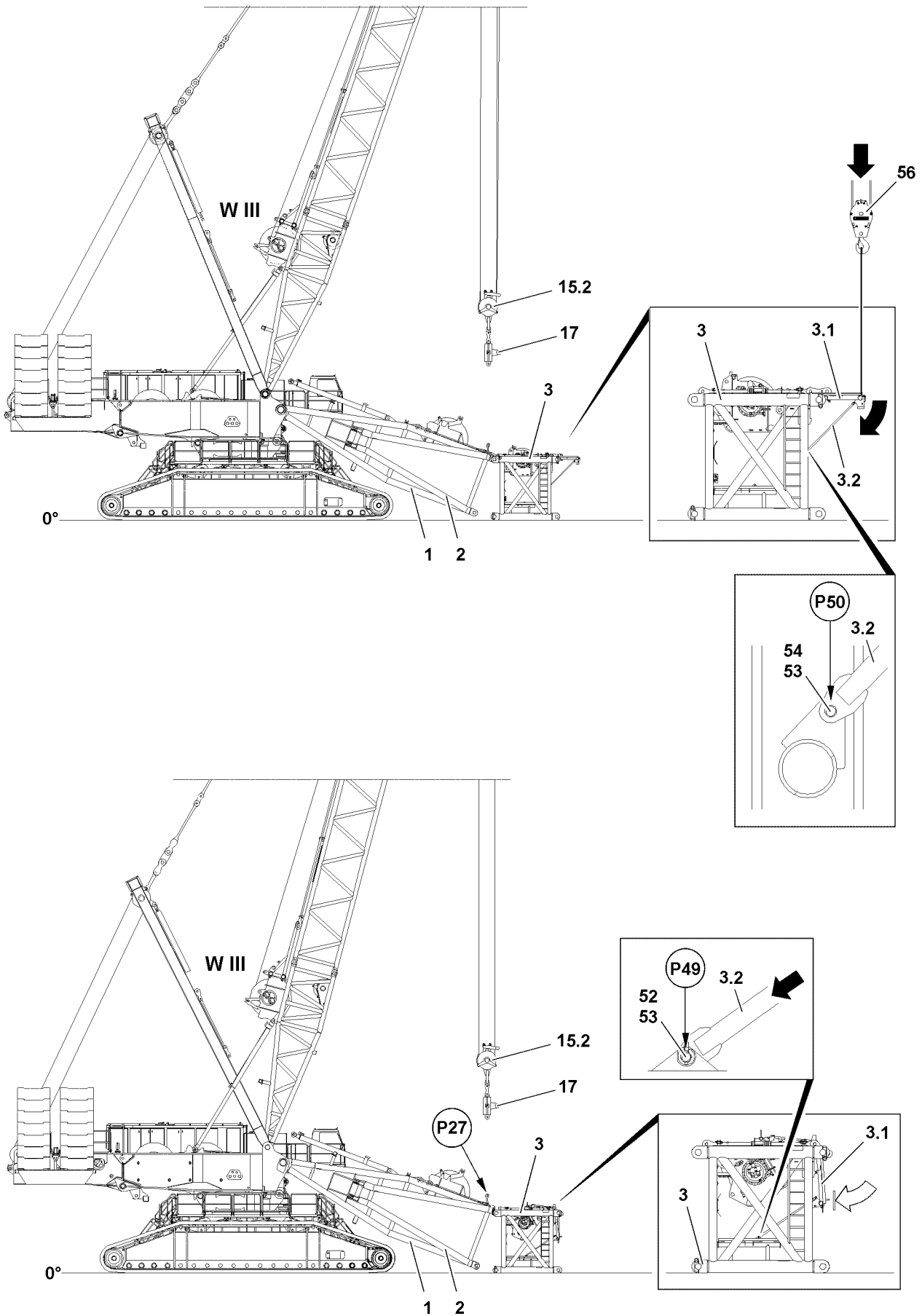


Fig.117458

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

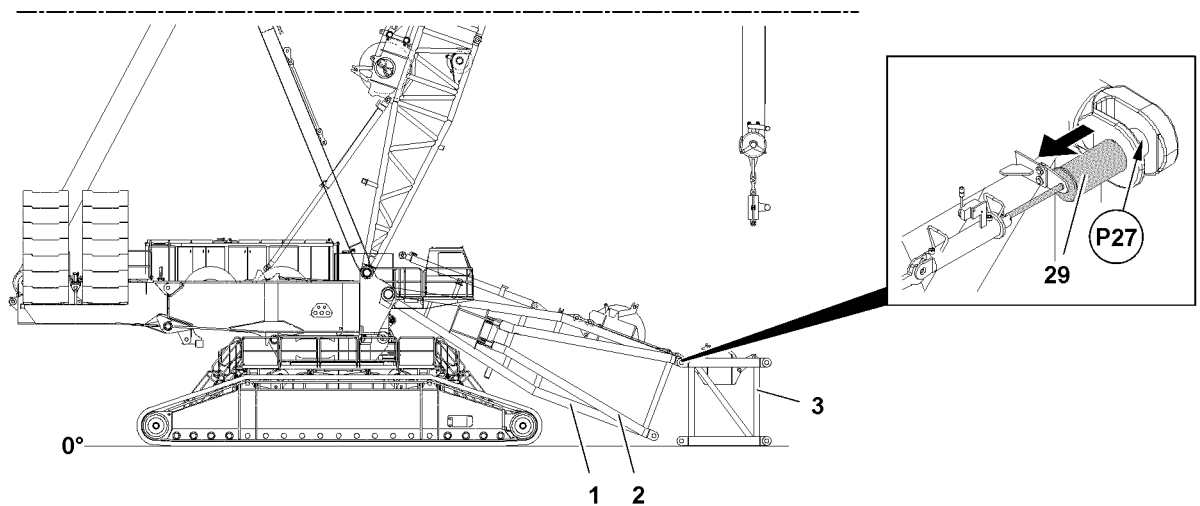


Fig.115411: Removing the cross carrier

▶ 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

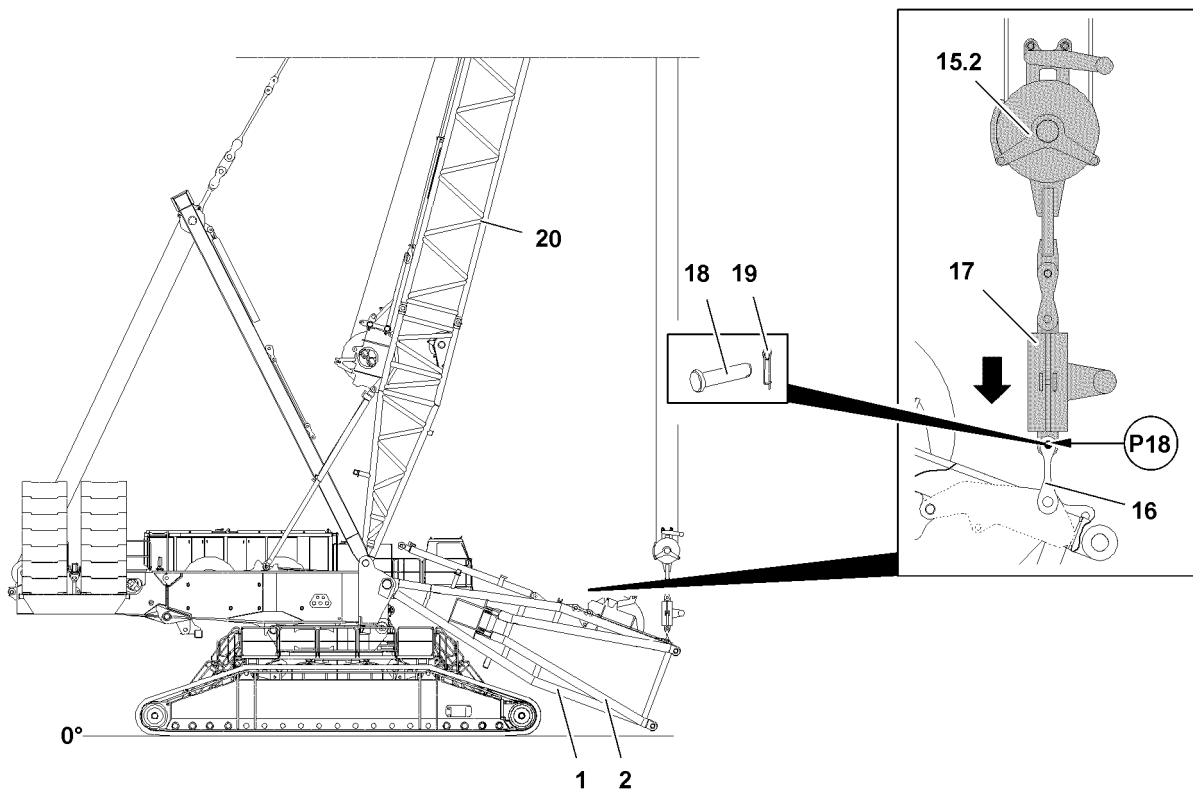


Fig.115412: Pinning the upper pulley block on the S-pivot section

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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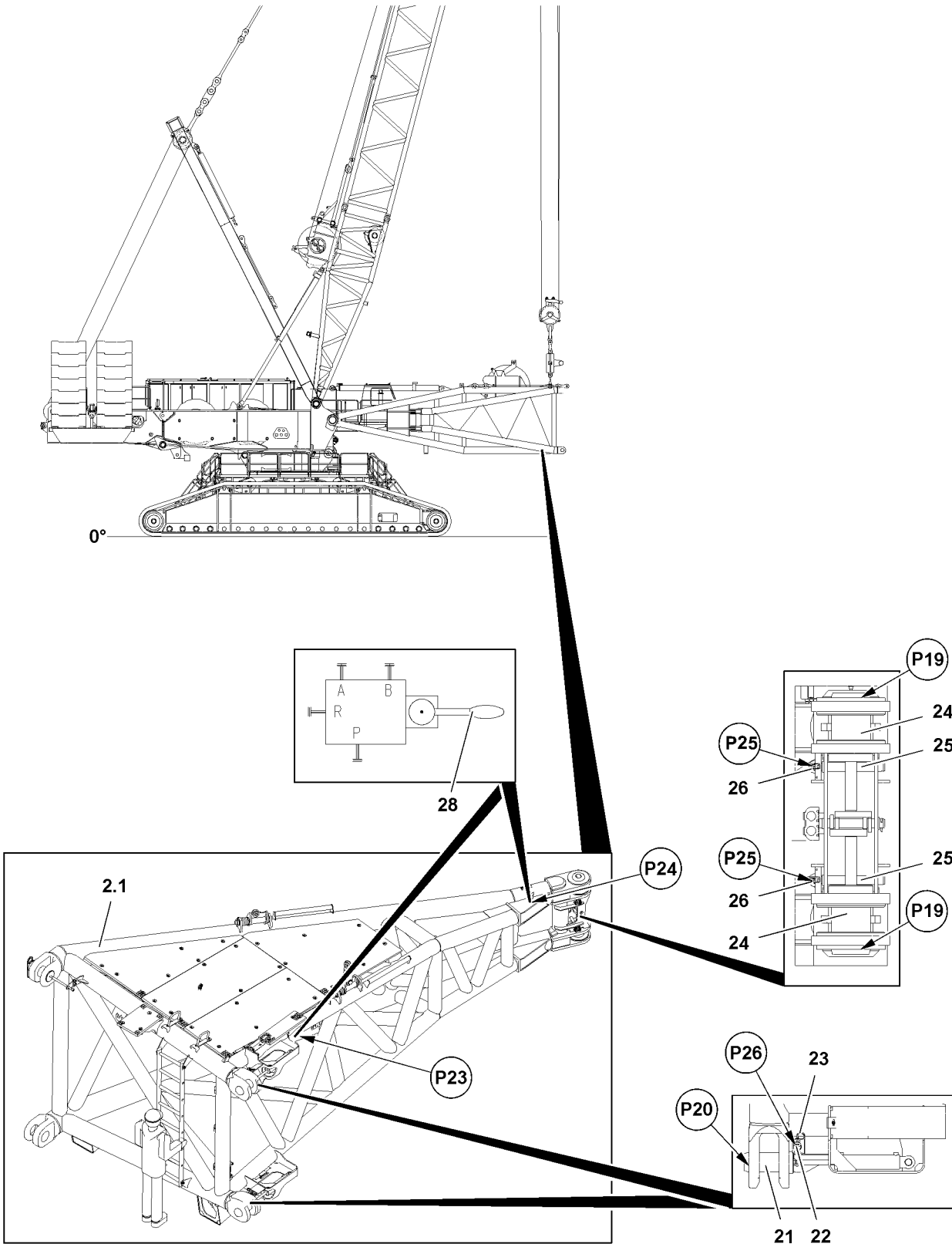


Fig.115413

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

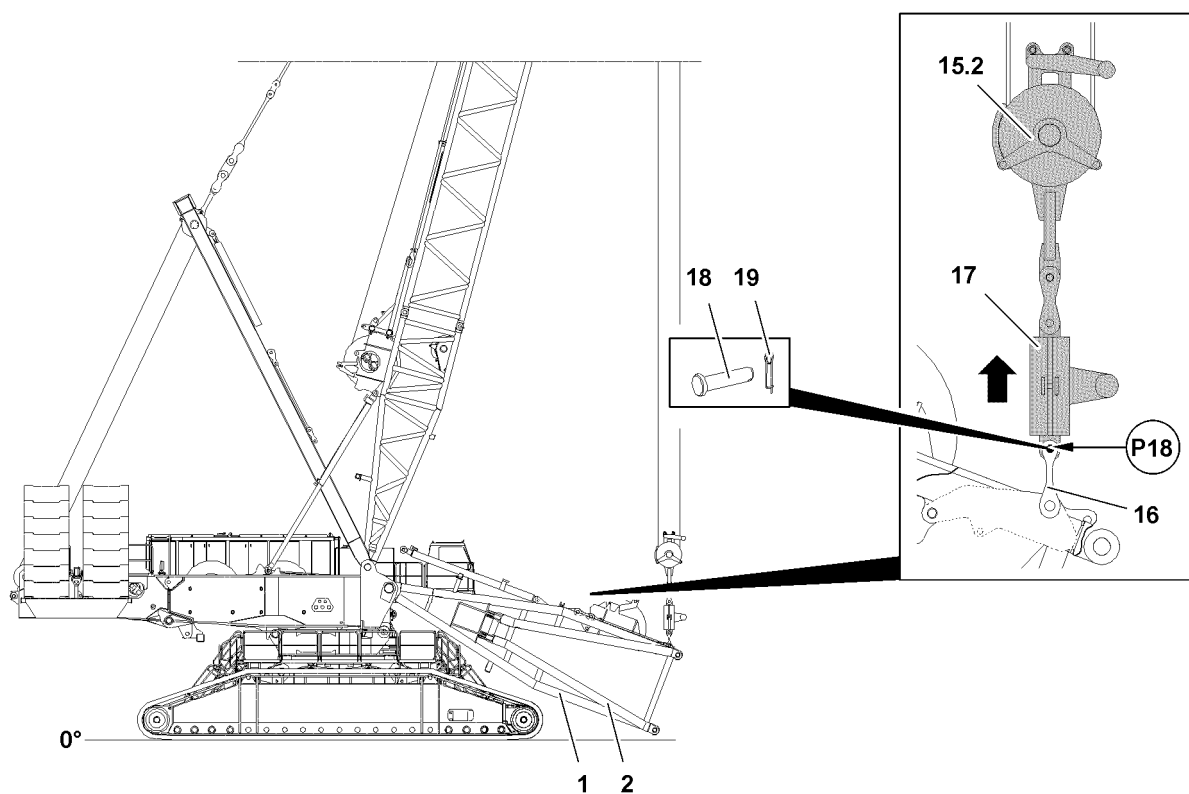


Fig.115414: Unpinning the upper pulley block on the S-pivot section

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 unpinning.

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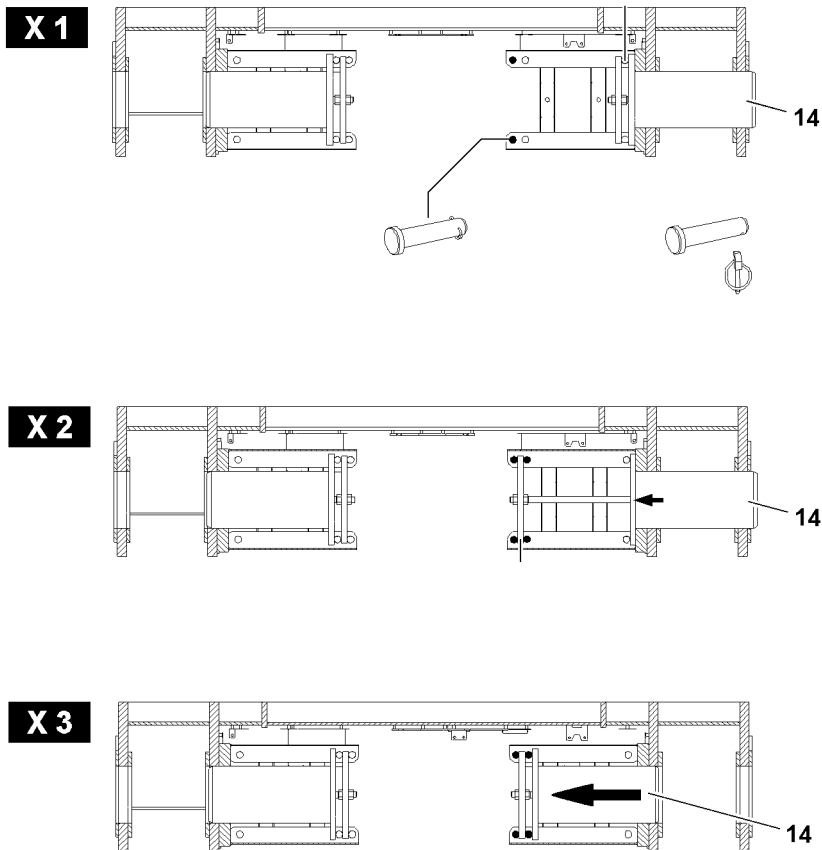
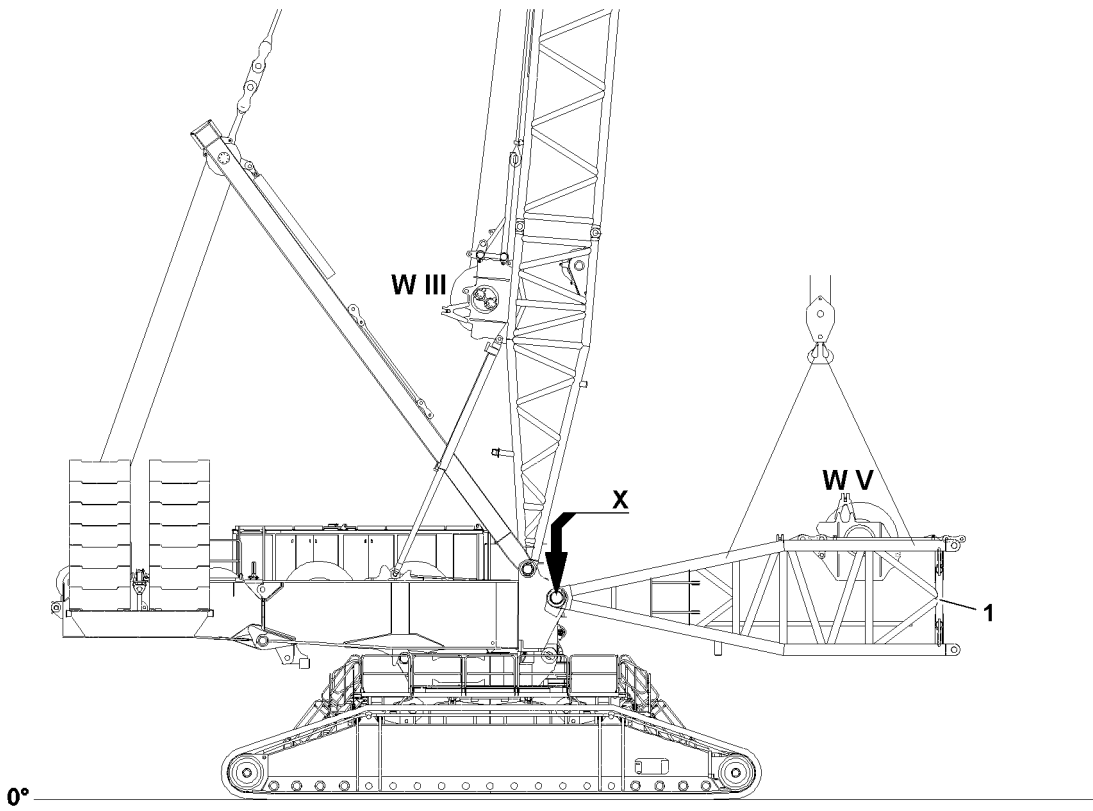


Fig.117197

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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!

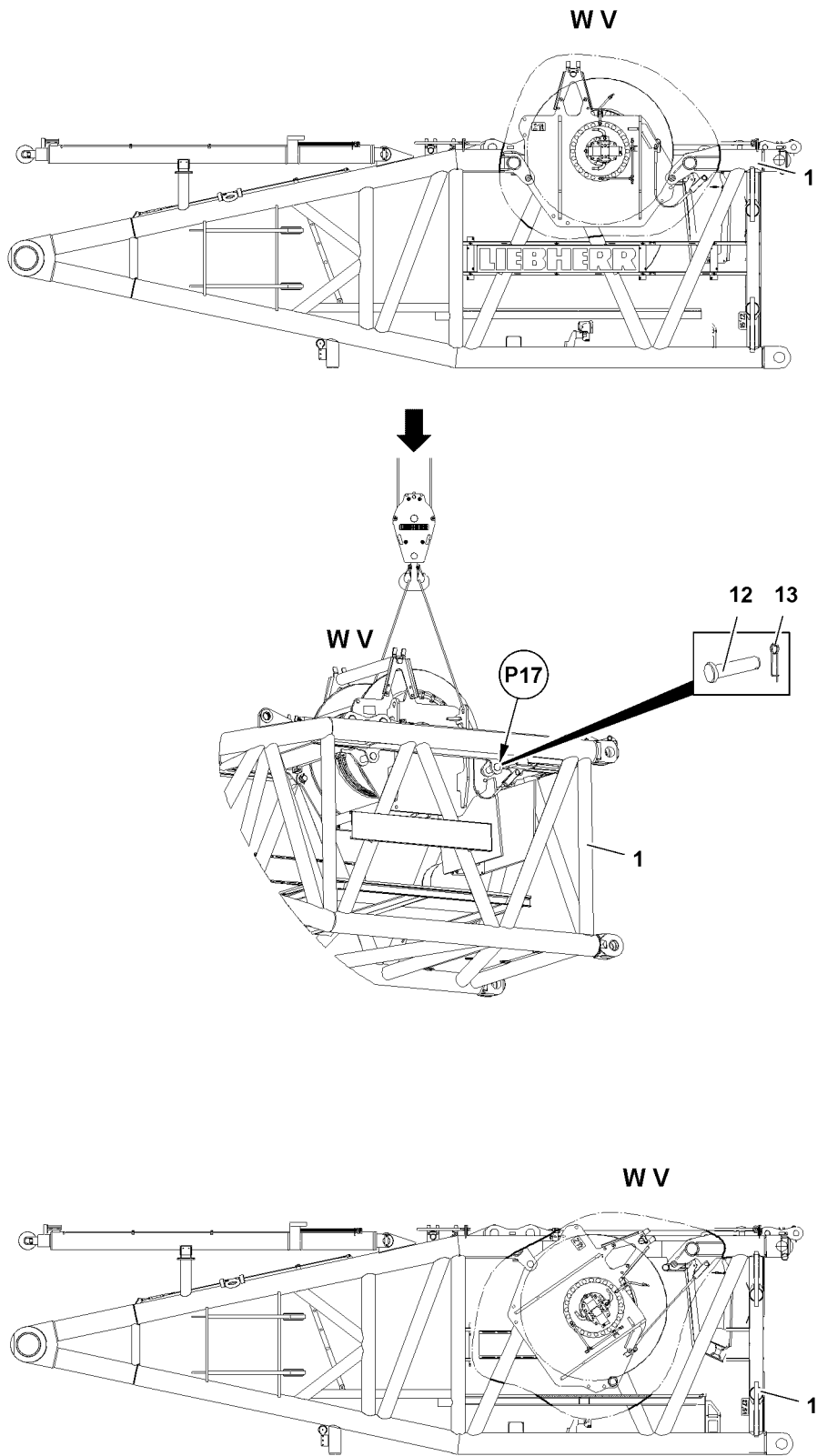


Fig.115415

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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.

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5.61 Roller cart

| | | |
|---|---------------------------------|---|
| 1 | Components | 3 |
| 2 | Fastening points Pulley cart | 4 |
| 3 | Assembly variations Pulley cart | 4 |
| 4 | Assembly | 5 |
| 5 | Disassembly | 7 |

Fig.195219

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1 Components

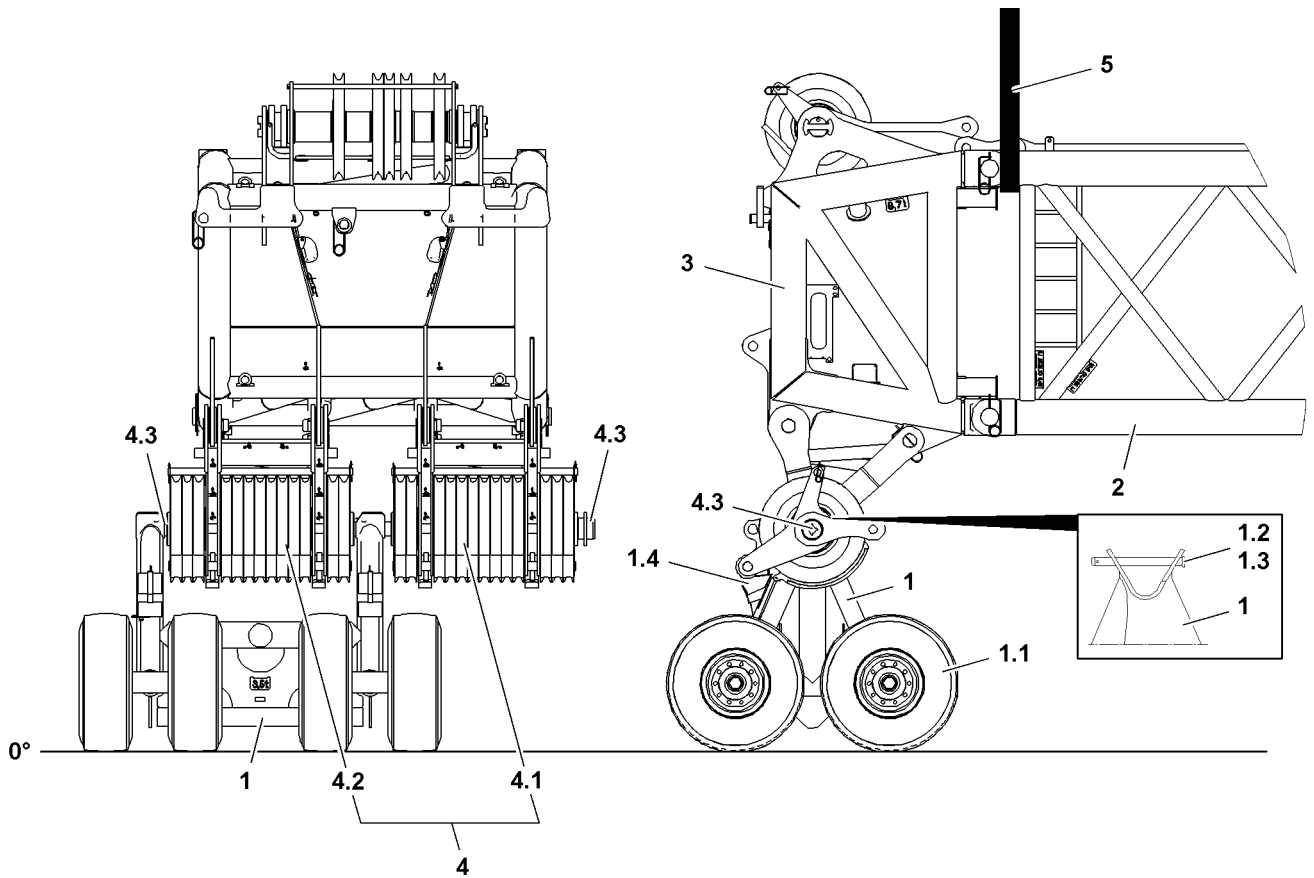


Fig.121584: Components on pulley carts and boom head

| | Description |
|-----|-------------------------|
| 1 | Pulley cart |
| 1.1 | Tires |
| 1.2 | Retaining pin |
| 1.3 | Spring retainer |
| 1.4 | Wedge |
| 2 | LI-intermediate section |
| 3 | SW-end section |
| 4 | Pulley sets |
| 4.1 | Pulley set left |
| 4.2 | Pulley set right |
| 4.3 | Axle Pulley set |
| 5 | Fastening equipment |

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2 Fastening points Pulley cart



Note

- The fastening points (point **P1** and point **P2**) are to be used solely for handling the pulley cart with the auxiliary crane.

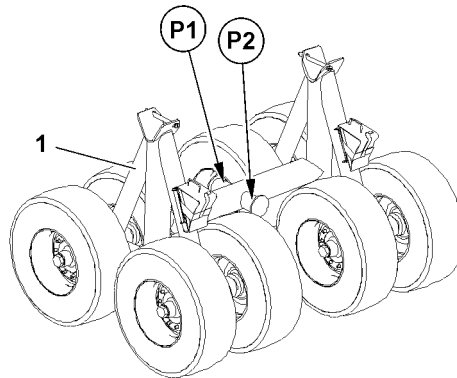


Fig.121585: Fastening points Pulley cart

| Fastening points | |
|------------------|----------------------------------|
| P1 + P2 | Transport / Handling pulley cart |

3 Assembly variations Pulley cart

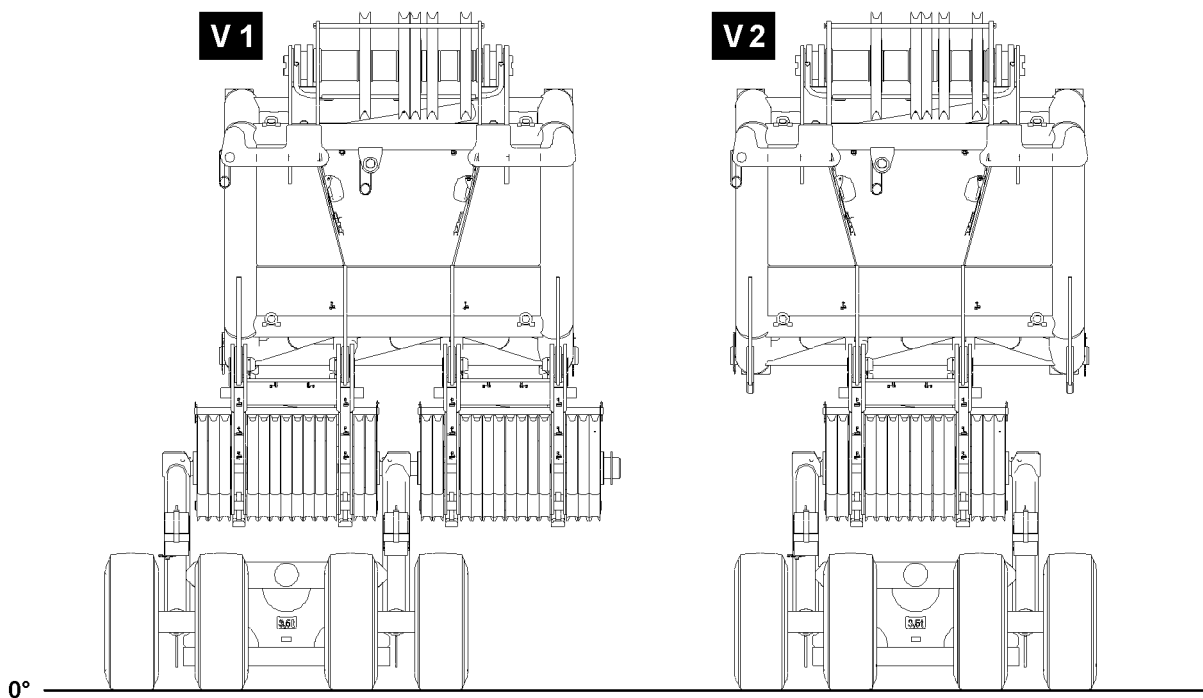


Fig.121631: Pulley cart assembly on the boom

| Pulley cart assembly | |
|---|--|
| Variation 1 V1 | Variation 2 V2 |
| Pulley cart assembly with two installed pulley sets on the boom end section | Pulley cart assembly with one installed pulley set on the boom end section |

4 Assembly

4.1 Placing the W-lattice jib into the pulley cart



WARNING

Danger of accident during assembly / disassembly of pulley cart!

At assembly / disassembly of the pulley cart, limbs can be crushed or severed.

Personnel can be severely injured or killed.

- ▶ Make sure that no personnel are between the pulley cart and the W-lattice jib during assembly / disassembly work.
- ▶ Make sure that the pulley cart is secured at set down to prevent it from rolling off.
- ▶ Make sure that the danger notes in the Crane operating instructions chapter 5.01 are observed.

NOTICE

Damage to boom - lattice sections!

If the W-lattice jib is fastened incorrectly and lifted, then boom - lattice sections can be severely damaged.

Expensive and extensive repairs can result.

- ▶ Make sure that the W-lattice jib is solely fastened on the intended locations, observe Crane operating instructions, chapter 5.01.
- ▶ Make sure that the W-lattice jib is **not** fastened and lifted on the bits of the boom end section or the bits of the intermediate sections.

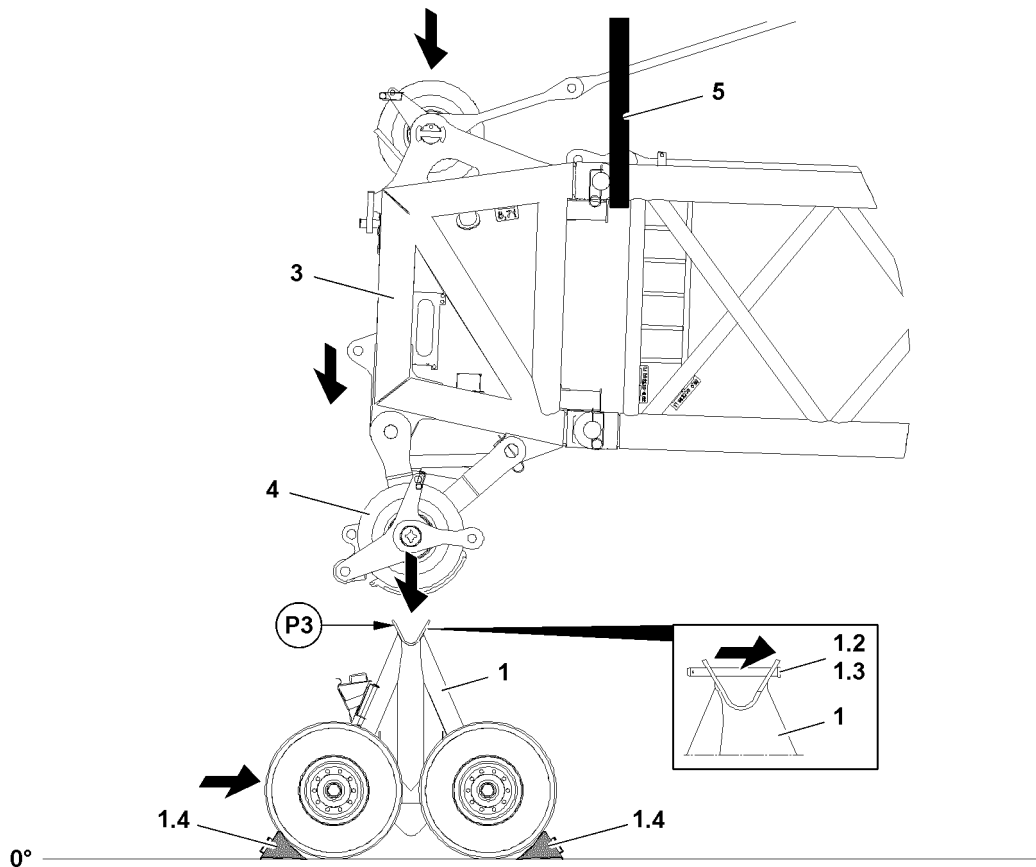


Fig.121591: Lattice jib lifted and pulley cart positioned under the boom end section

Make sure that the following prerequisites are met:

- The pulley set / the pulley sets **4** are properly installed on the boom end section **3**
- The fastening equipment is properly positioned on the W-lattice jib.
- The W-lattice jib is properly fastened on the auxiliary crane and lifted off the ground.
- The retaining pins **1.2** are unpinned on the receptacles of the pulley cart **1** at point **P3**.

- ▶ Place the pulley cart **1** below the pulley set / the pulley sets **4** on the boom end section **3**.
- ▶ Secure the pulley cart **1** properly with wedges **1.4** to prevent it from rolling off.

When the pulley cart **1** is properly positioned and secured to prevent it from rolling off:

- ▶ Slowly lower the W-lattice jib with the auxiliary crane until the axles **4.3** of the pulley set / the pulley sets are laying in the receptacles of the pulley cart **1**.
- ▶ Secure the pulley cart on the pulley set / the pulley sets: Insert the retaining pins **1.2** on both sides on the receptacle at point **P3** and secure with spring retainer **1.3**.

When the pulley cart is properly pinned and secured on the pulley set / the pulley sets:

- ▶ Remove the wedges **1.4**.

5 Disassembly

5.1 Lift the W-lattice jib from the pulley cart



WARNING

Danger of accident during assembly / disassembly of pulley cart!

At assembly / disassembly of the pulley cart, limbs can be crushed or severed.

Personnel can be severely injured or killed.

- ▶ Make sure that no personnel are between the pulley cart and the W-lattice jib during assembly / disassembly work.
- ▶ Make sure that the pulley cart is secured at set down to prevent it from rolling off.
- ▶ Make sure that the danger notes in the Crane operating instructions chapter 5.01 are observed.

NOTICE

Damage to boom - lattice sections!

If the W-lattice jib is fastened incorrectly and lifted, then boom - lattice sections can be severely damaged.

Expensive and extensive repairs can result.

- ▶ Make sure that the W-lattice jib is solely fastened on the intended locations, observe Crane operating instructions, chapter 5.01.
- ▶ Make sure that the W-lattice jib is **not** fastened and lifted on the bits of the boom end section or the bits of the intermediate sections.

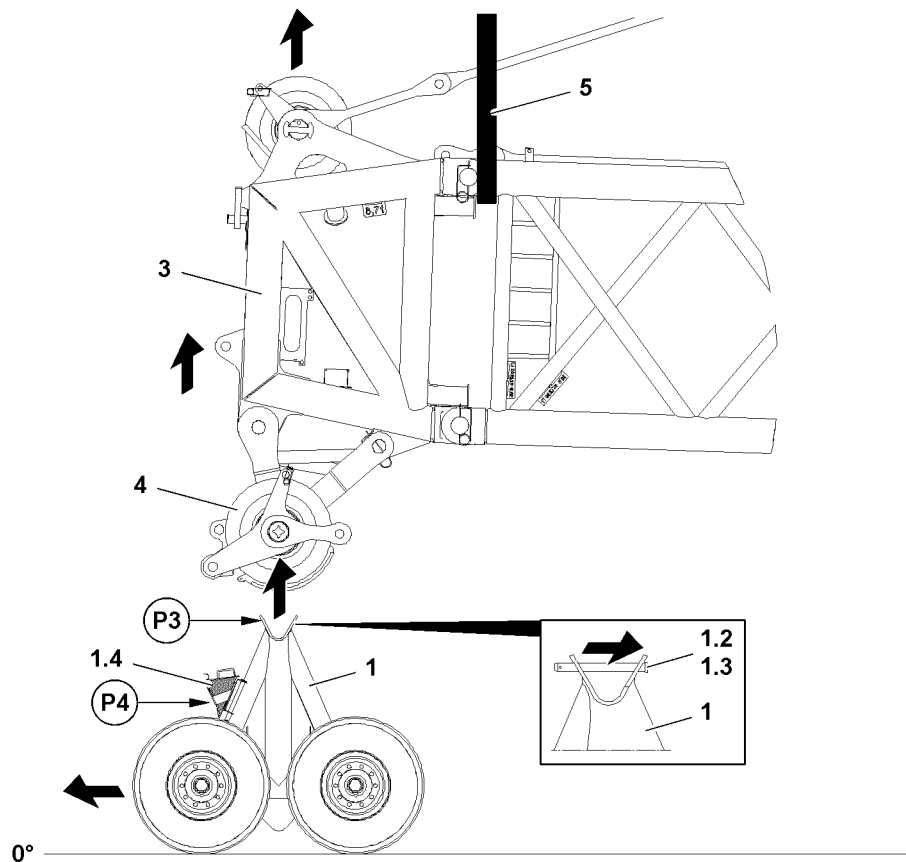


Fig.121632: Lift the lattice jib and remove the pulley cart

Make sure that the following prerequisites are met:

- The boom system is completely placed down.
- the boom end section is placed in the pulley cart and secured.
- The fastening equipment is properly positioned on the W-lattice jib.
- The W-lattice jib is properly fastened on the auxiliary crane.

▶ Secure the pulley cart with wedges to prevent it from rolling off.

When the pulley cart is secured to prevent it from rolling off:

▶ Unpin the retaining pins **1.2** on the receptacles of the pulley cart **1** at point **P3**.

When the retaining pins **1.2** are removed on the receptacles of the pulley cart **1**:

- ▶ Slowly lift the W-lattice jib with the auxiliary crane until the axles **4.3** of the pulley set / the pulley sets are lifted from the receptacles on the pulley cart **1**.
- ▶ Remove the wedges on the pulley cart and store them in the transport retainers on the pulley cart.

When the W-lattice jib is lifted out of the receptacles on the pulley cart:

- ▶ Remove the pulley cart **1** under the boom end section and secure it to prevent it from rolling off.
- ▶ Insert the retaining pin **1.2** on both sides on the pulley cart at point **P3** and secure.

When the pulley cart is removed under the boom end section:

- ▶ Place the W-lattice jib with the auxiliary crane on the ground.

6 Auxiliary equipment

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6.01 Heater / engine preheating

1 Heating the crane cab

3

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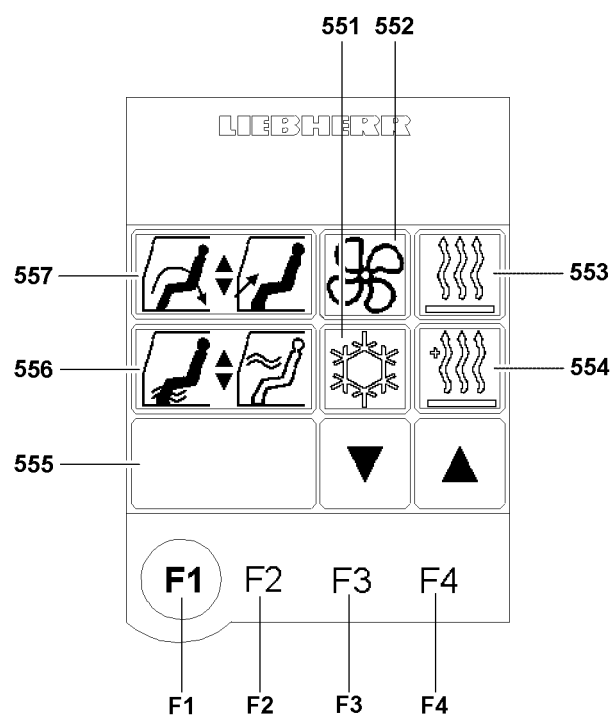


Fig.107379

1 Heating the crane cab

The cab can be heated with three independent heaters:

- Engine-dependent heater
- Engine-independent auxiliary heater with engine pre-heating, at ambient temperatures down to -40°C, WEBASTO; Thermo 90 ST*
- Engine-independent auxiliary heater for cab preheating, at ambient temperatures 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 „Climate control 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 Menu „Climate control settings“

2.1 General

The „Climate control settings“ menu is accessed - with the ignition turned on - by pressing the function key **F1** on the touch display.



Note

- ▶ The „Climate control settings“ menu is removed automatically after 30 sec. if no settings are changed during this time.

If the crane ignition is turned off, the LICCON computer system and the touch display also turn themselves off. The settings made in the „Climate control settings“ menu are retained.



Note

- ▶ If the auxiliary heater has been programmed, the settings are saved when the ignition is turned „OFF“.
-

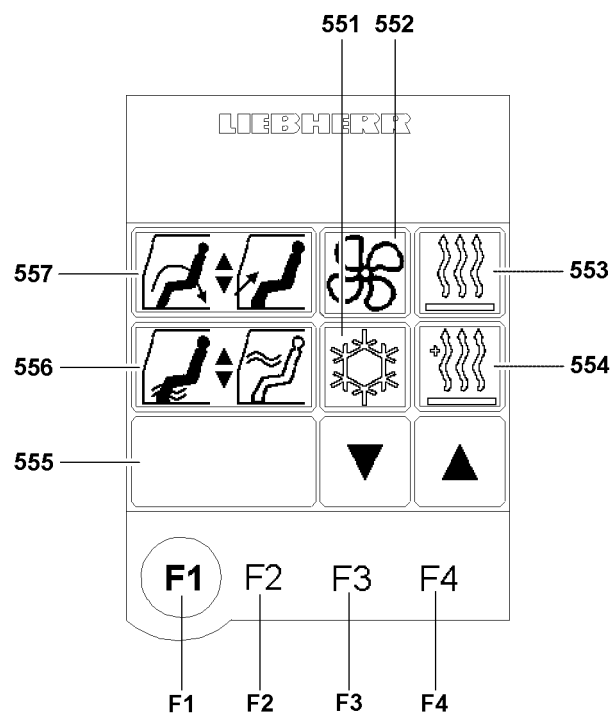


Fig.107379

LWE/LR 11350-007/19005-01-02/en

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:

- **557** Recirculating air / fresh air
 - Function selection
- **556** Air distribution „up“ / „down“
 - Function selection
- **555** Status display
 - Display function

The status display **555** shows the following, depending on the selected function:

- The adjustment ratios between the overhead area and the floorboard area for recirculating air / fresh air.
- The adjustment ratios for air distribution.
- The temperature setting in manual heating mode.
- The temperature setting in AUTOMATIC heating mode.
- Climate control system „ON“.
- Climate control system „OFF“.
- The programming display for auxiliary heater.
- **551** Air conditioning system
 - Function selection
- **552** Fan / blower
 - Function selection
- **553** Heater
 - Function selection
- **554** Auxiliary heater
 - Function selection

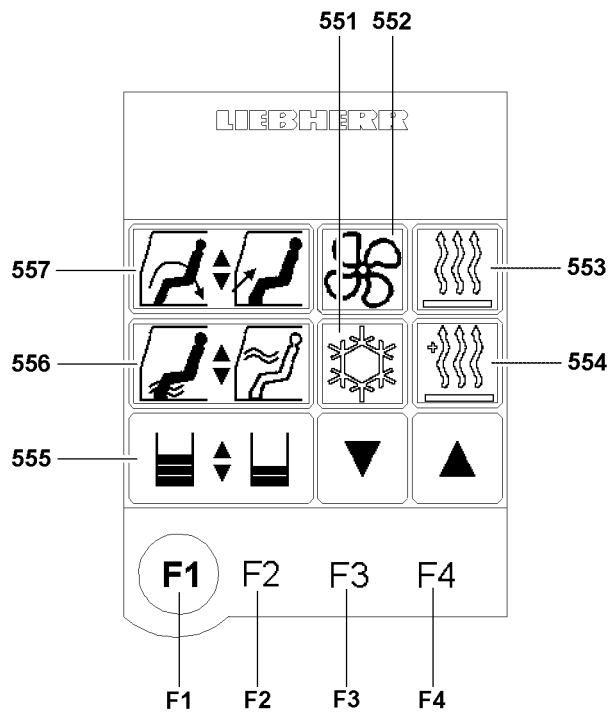


Fig.107380





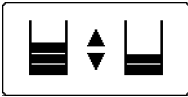



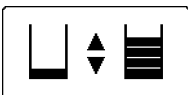



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2.3 Adjusting the recirculating air / fresh air

The „recirculating 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 „recirculating air“ and „fresh air“.

The adjustment rate between „recirculating air / fresh air“ is changed with the function key **F3** and the function key **F4**.

| Adjustment rates for recirculating air / fresh air | | | |
|---|-------------------|-----------|---|
| Status display | Recirculating air | Fresh air | Icon display |
|  | 5 | 0 |  <i>Fresh air „OFF“</i> |
|  | 4 | 1 |  |
|  | 3 | 2 |  |
|  | 2 | 3 |  |
|  | 1 | 4 |  |
|  | 0 | 5 |  <i>Recirculating air „OFF“</i> |

- ▶ Select „Recirculating air / fresh air“ **557** function by „touching“.

Result:

- The „Recirculating 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 „recirculating air“ and „fresh air“.

- ▶ Press the function key **F3**.

Result:

- The „proportion of circulating air“ is reduced, the „proportion of fresh air“ increases at the same time.

- ▶ Press the function key **F4**.

Result:

- The „proportion of fresh air“ is reduced, the „proportion of circulating air“ increases at the same time.

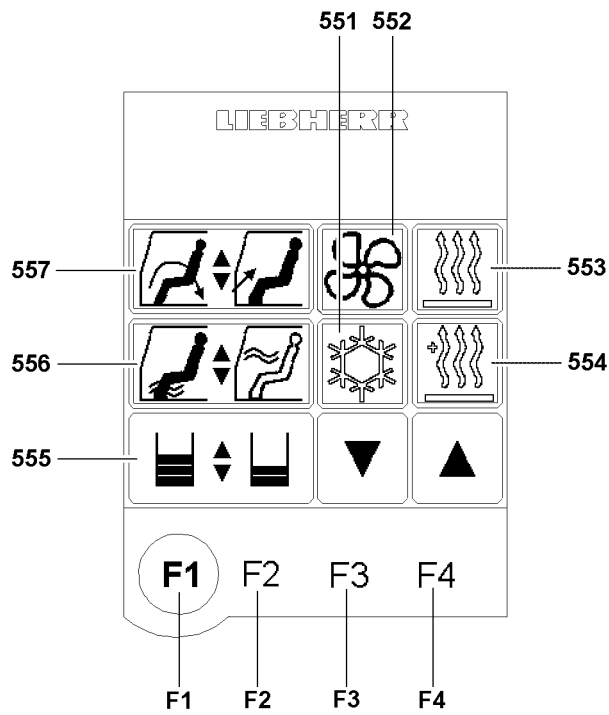


Fig.107380

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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 | „Down“ | „Up“ | Icon display |
| | 5 | 0 | Up „OFF“ |
| | 4 | 1 | |
| | 3 | 2 | |
| | 2 | 3 | |
| | 1 | 4 | |
| | 0 | 5 | Down „OFF“ |

- ▶ 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 air on the „bottom“ is reduced, the proportion of air on the „top“ increases at the same time.

- ▶ Press the function key **F4**.

Result:

- The proportion of air „on the top“ is reduced, the proportion of air „on the bottom“ increases at the same time.

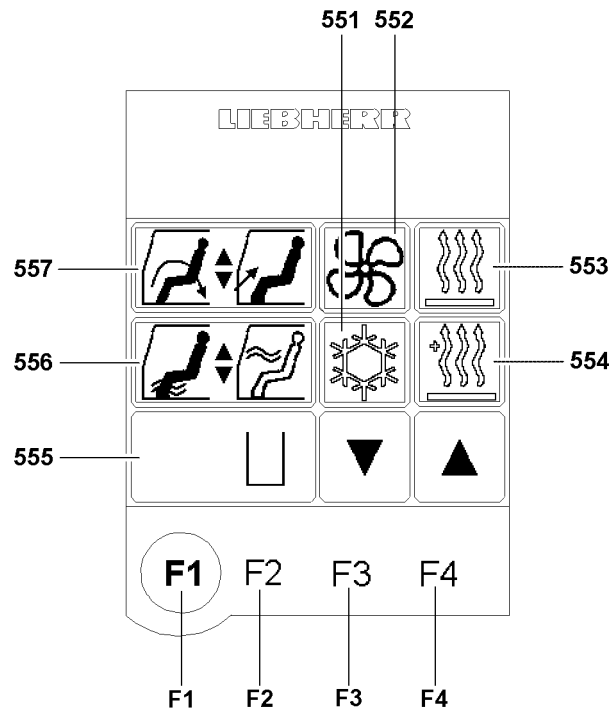


Fig.107381

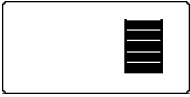

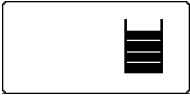

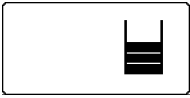







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2.5 Fan / blower adjustment

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 stage“ | | |
|---|-------|---|
| Status display | Stage | Icon display |
|  | 5 |  |
|  | 4 |  |
|  | 3 |  |
|  | 2 |  |
|  | 1 |  |
|  | 0 |  <i>Fan „OFF“</i> |

- ▶ Select „fan / blower **552**“ by „touch“.

Result:

- The „fan / blower“ icon is then surrounded with a black border.
- In the current status display **555**, the „fan“ / „blower stage“ is shown as a bar display.

- ▶ Press the function key **F3**.

Result:

- The „fan“ / „blower stage“ is reduced.

- ▶ Press the function key **F4**.

Result:

- The „fan“ / „blower stage“ is increased.

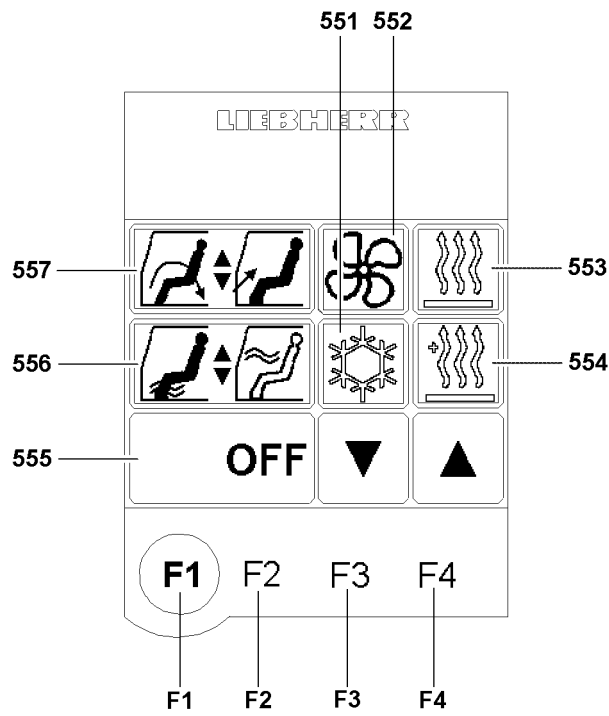


Fig.107382

2.6 Climate control system operation

The „Climate control system“ function is selected by „touching“ the icon **551** in the left touch display.





The status of the climate control 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 climate control system turns itself on automatically if the „AUTO“ heating mode is activated.

| Air conditioning system | | |
|---|--------|---|
| Status display | Status | Icon display |
|  | „OFF“ |  |
|  | „ON“ |  |

Make sure that the following prerequisites are met before starting up the climate control system:

- The air intake opening for recirculated air operation is clear.
- All windows and the cab door are closed.
- The recirculating air / fresh air adjustment rate is 5:0.

- ▶ Select „Climate control system **551**“ function by „touching“.

Result:

- The „Climate control system“ icon is then surrounded with a black border.
- The switching status of the climate control 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 the 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].

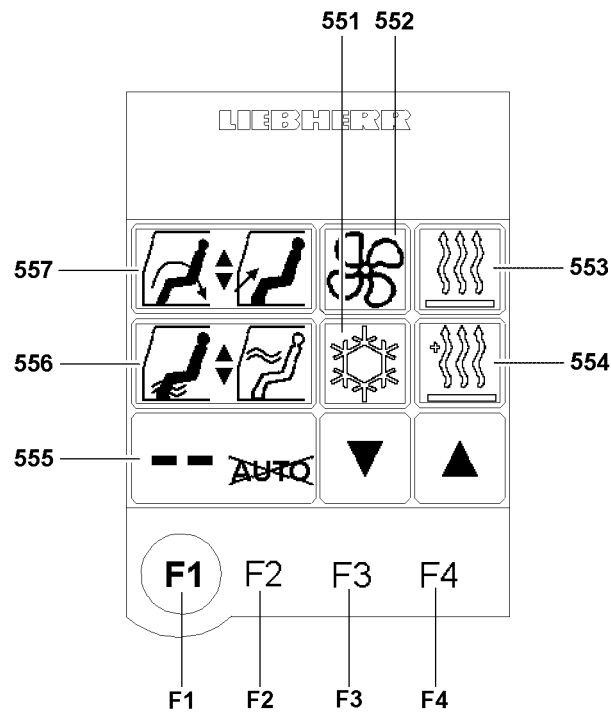


Fig.107383

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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 status of the heater 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 driver for temperature adjustment.

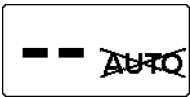

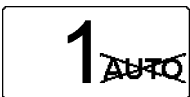



With the function key **F3**, the temperature stages can be reduced from stage 16 in increments until „Heater OFF“.



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 | Status | Stage | Icon display |
|  | „OFF“ | -- |  Heater „OFF“ |
|  | „ON“ | 1 |  |
|  | „ON“ | 16 |  |

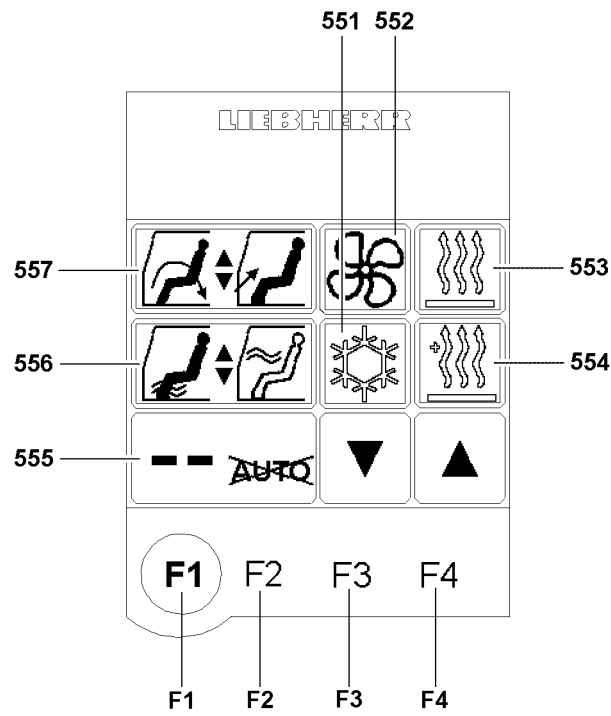


Fig.107383

LWE/LR 11350-007/19005-01-02/en

- ▶ Select the „heater **553**“ function by „touching“.

Result:

- The „heater“ icon is then surrounded with a black border.
- The status display **555** contains 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 warm air supply into the cab is reduced accordingly.

- ▶ Press the function key **F4**.

Result:

- The „temperature stages“ are increased incrementally by one stage.
- The amount of warm air supply into the cab is increased.

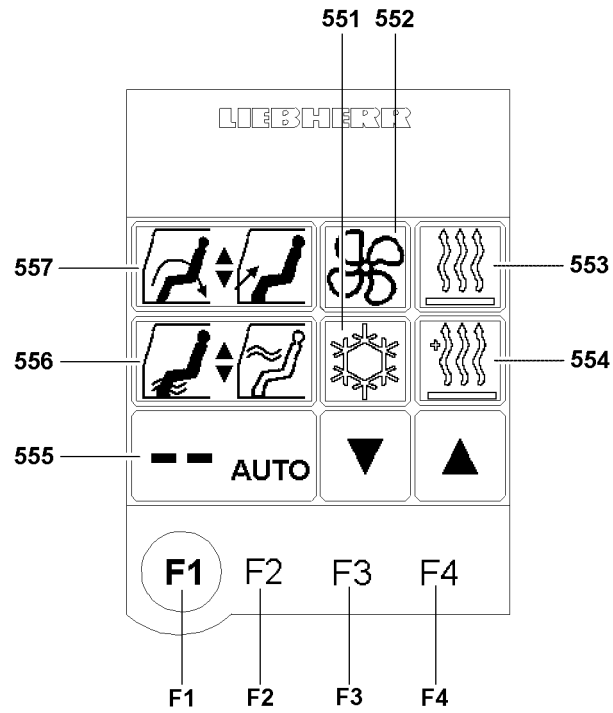


Fig.107401

LWE/LR 11350-007/19005-01-02/en

2.7.3 AUTO heating mode

If heating mode „AUTO“ is selected, the climate control 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 driver 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 „Heater 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 | Status | Temperature in [°C] or [°F] | Icon display |
|  | „OFF“ | — |  <i>Heater „OFF“</i> |
|  <i>Minimum value</i> | „ON“ | 15 |  |
|  <i>Maximum value</i> | „ON“ | 30 |  |

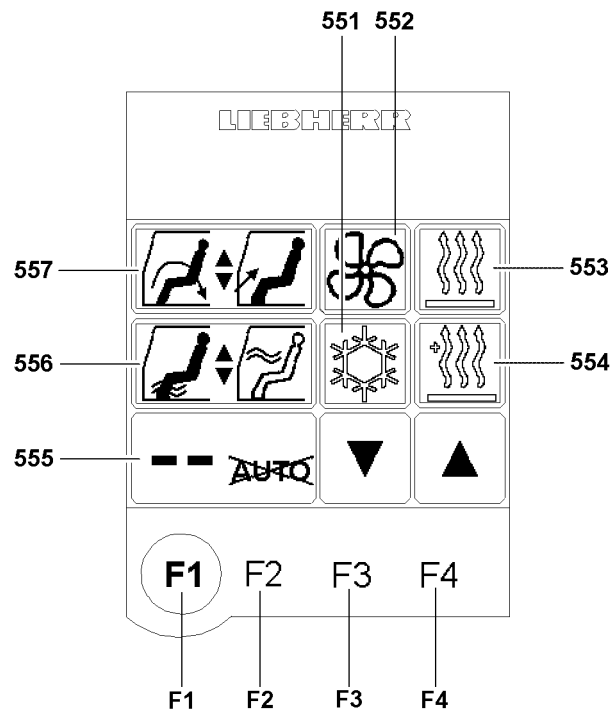


Fig.107383

LWE/LR 11350-007/19005-01-02/en

- ▶ Select the „heater **553**“ function by „touching“.

Result:

- The „heater“ icon is then surrounded with a black border.
- The status display **555** contains the current status of the „heater“.

- ▶ Press the function key **F2**.

Result:

- Change from „MANUAL“ heating mode to „AUTO“ heating mode.

- ▶ Press the function key **F3**.

Result:

- The „temperature setting“ is reduced in stages in 1 °C increments.
- The amount of warm air supply into the cab is regulated 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 warm air supply into the cab is regulated according to the current temperature setting.

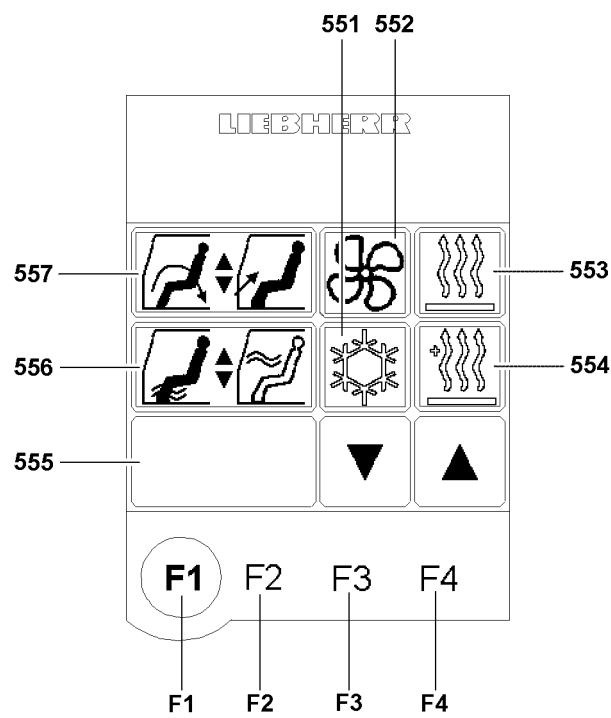


Fig.107379

2.8 Procedure for fogged windows

2.8.1 General

A certain order must be followed to clear the windows quickly for subsequent crane operation.

The settings can be made manually or semi-automatically.

2.8.2 Adjusting the settings manually in the „Climate control settings“ menu

- ▶ Set the air distribution **556** to maximum level „up“ - stage 5.
- ▶ Open the air vents.
- ▶ Set recirculating air **557** to maximum level - stage 5.
- ▶ Set the fan / blower **552** to maximum level - stage 5.
- ▶ Set the climate control system **551** to „ON“.
- ▶ Set the 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 „Climate control settings“ menu

- ▶ Set the heater **553** to „AUTO“ heating mode.
- ▶ Set the air distribution **556** to maximum level „up“ - stage 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.
-

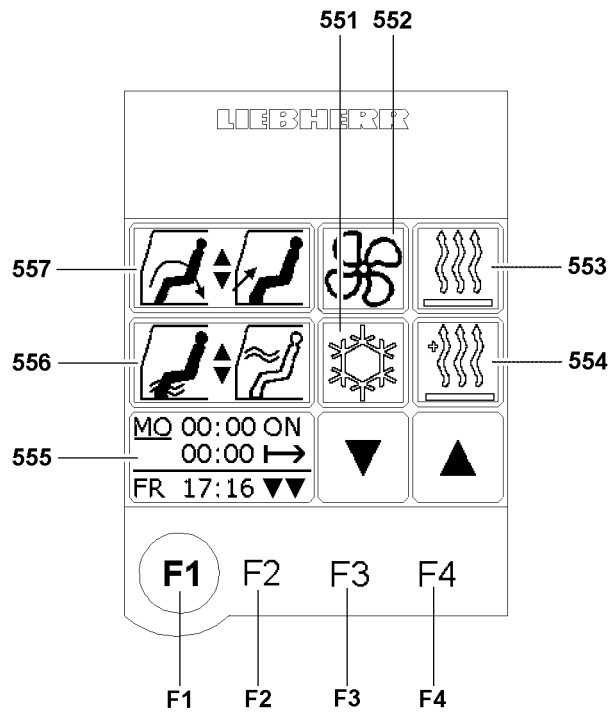


Fig.107385

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 as auxiliary heater at low ambient temperatures, if the engine-dependent heater is insufficient.

At ambient temperatures of below $-20\text{ }^{\circ}\text{C}$, 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 heater 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 aggregates with service fluids for winter operation, as specified in the lubrication chart!



DANGER

Danger of poisoning and suffocation in enclosed areas!

- ▶ Only operate the engine-independent auxiliary heater in enclosed areas such as garages or workshops only if an exhaust system is used, even in „Programming mode“.



DANGER

Danger of explosion!

In areas where combustible fumes or dust could form, e.g. in the vicinity of storage areas for fuel, coal, wood dust or grain or similar and in the vicinity of filling stations or tank farms, there is a danger of explosion.

- ▶ Turn the auxiliary heater off.

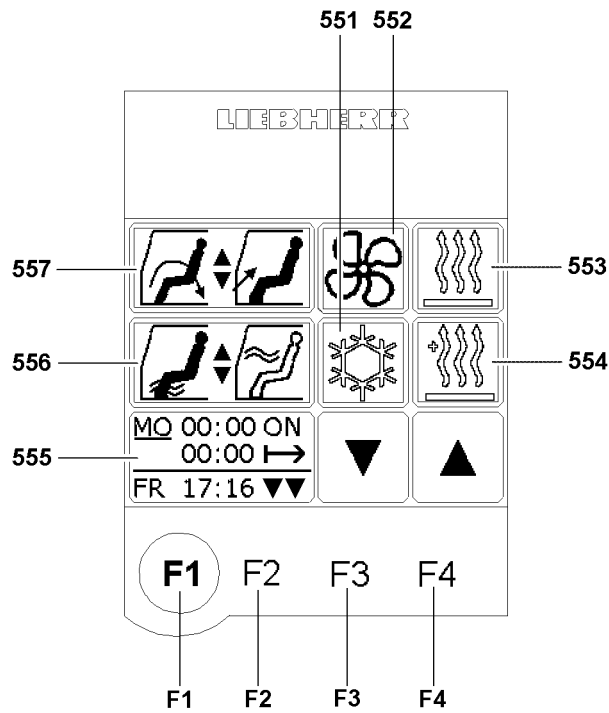


Fig.107385

LWE/LR 11350-007/19005-01-02/en

2.9.2 Adding the engine-independent auxiliary heater manually

The engine-independent auxiliary heater can be added manually in driving or crane operation mode. The auxiliary heater, icon **554**, must be selected and turned on.

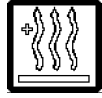


If the auxiliary heater is in the „OFF“ state, pressing function key **F4** once adds the cab auxiliary heater.

Pressing the function key **F4** again turns engine preheating auxiliary heater on.



Note

► If the auxiliary heater is added for engine pre-heating, then the crane cab is **not** heated.

| Manual auxiliary heater | | | |
|--|------------------------|------------------------|---|
| Status display | Function key F4 | Function key F3 | Icon display |
| <div style="border: 1px solid black; padding: 2px;"> MO 06:45 ON 00:30 → <hr/> FR 17:16 OFF </div> | ▲ (F4) | --- |  Auxiliary heater „OFF“ |
| <div style="border: 1px solid black; padding: 2px;"> MO 06:45 ON 00:30 → <hr/> FR 17:16 ON </div> | ▲ (F4) | ▼ (F3) |  Auxiliary heater - cab „ON“ |
| <div style="border: 1px solid black; padding: 2px;"> MO 06:45 ON 00:30 → <hr/> FR 17:16 ON_≈ </div> | ▲ (F4) | ▼ (F3) |  Auxiliary heater - engine pre-heating „ON“ |

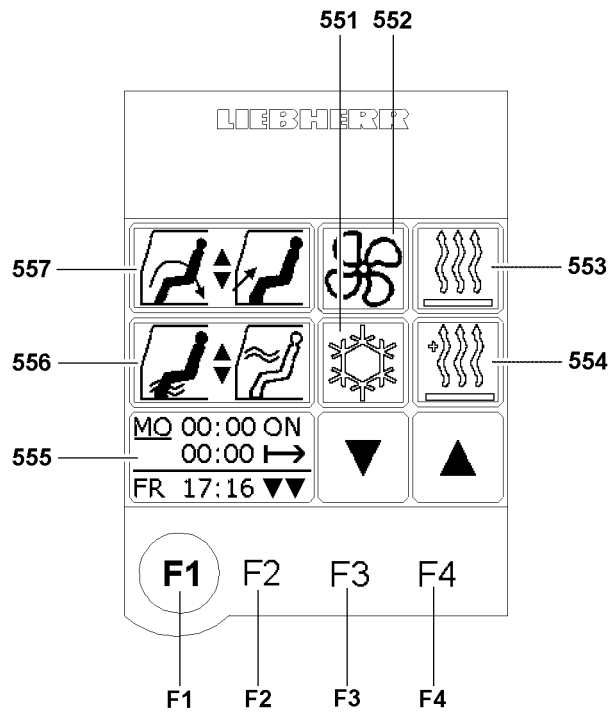


Fig.107385

LWE/LR 11350-007/19005-01-02/en

Engaging 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.
- Depending on the setting, the crane cab or the engine is heated.



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.
- Whenever the auxiliary heater is turned off, a shut off delay occurs.
- ▶ Turn the battery master switch off if the crane is temporarily not being used.

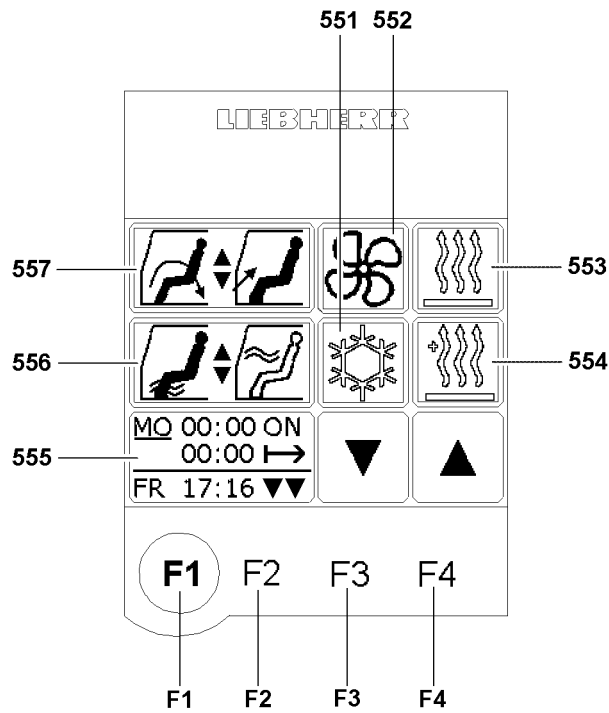


Fig.107385

LWE/LR 11350-007/19005-01-02/en




2.9.3 Adding the engine-independent auxiliary heater 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 auxiliary heater programming to two days, since there is a risk of the battery discharging extremely quickly at minus temperatures.

| Auxiliary heater programmed | | | |
|--|-----------------|-----------------|--|
| Status display | Function key F4 | Function key F3 | Icon display |
| <div style="border: 1px solid black; padding: 2px; width: fit-content;"> MO 06:45 ON 00:30 → FR 17:16 OFF </div> | ▲ (F4) | --- |  Auxiliary heater „OFF“ |
| <div style="border: 1px solid black; padding: 2px; width: fit-content;"> MO 06:45 ON 00:30 → FR 17:16 ☉ </div> | ▲ (F4) | ▼ (F3) |  Cab auxiliary heater |
| <div style="border: 1px solid black; padding: 2px; width: fit-content;"> MO 06:45 ON 00:30 → FR 17:16 ☉⚡ </div> | --- | ▼ (F3) |  Auxiliary heater - engine preheating |

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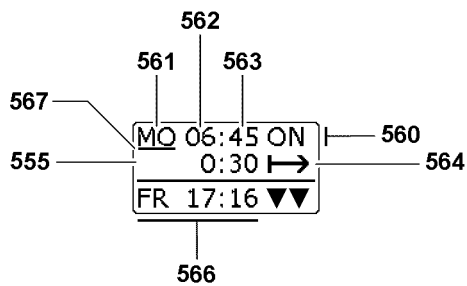
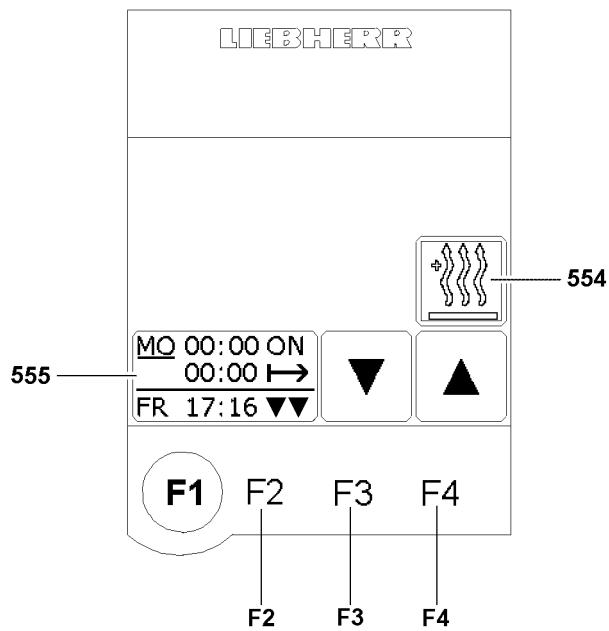
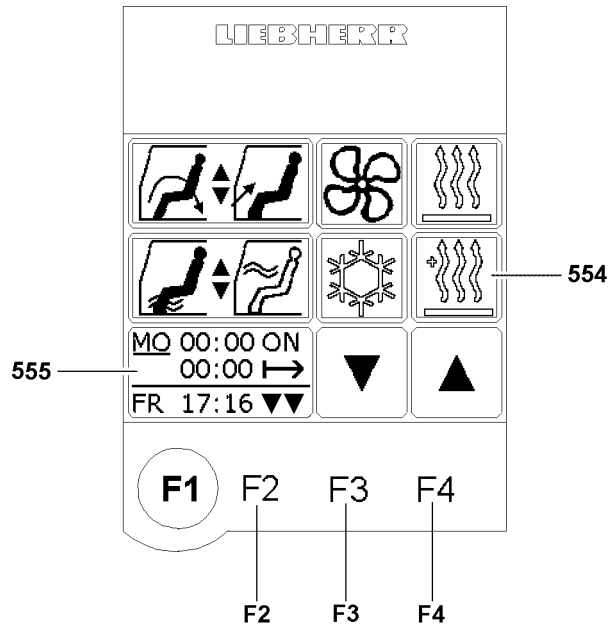


Fig.107384

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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** contains 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 for engine preheating) is identical in both cases.

Make sure that the following prerequisites are met **before** the auxiliary heater is programmed:

- The desired temperature for the heater has been set.
- The fan / blower is set to stage 0 („OFF“).
- The desired programming mode, cab heater („clock“) or engine preheating („clock with wave“) has been set.

- ▶ Press the function key **F2**.

Result:

- The auxiliary heater programming interface is displayed, illustration 2.
- In the status display **555** appears the cursor **567** under the editable input value.



Note

- ▶ The cursor **567** is positioned on 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 programming **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** for 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 programming for the auxiliary heater is complete.
- ▶ Select the auxiliary heater **554** by „touching“.

Result:

- The programmed settings are taken over.
- The „Climate control settings“ menu is displayed.
- The auxiliary heater starts to operate when the programmed turn on time for the heater operation is reached and turns the heater operation off again when the selected turn on duration has expired.
- The auxiliary heater runs in automatic regulating operation, depending on the heater setting in „manual“ or „AUTO“.

**Note**

- ▶ The auxiliary heater programming must be manually reset to „zero“ after the programmed heating period. Otherwise, the auxiliary heater is turned on automatically according to the programming.

Resetting the auxiliary heater programming

To reset the auxiliary heater programming, proceed as described in „Auxiliary heater programming“.

- ▶ Reset the values in the status display **555** to „zero“.

Result:

- The programming is turned off.

**Note**

- ▶ The programming can be manually changed at any time or it can be turned off altogether.

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 must be carefully bled.

- ▶ Fill the coolant via the expansion tank of the engine cooling circuit as specified in the lubrication 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 up.

When no more air bubbles appear in the expansion tank:

- ▶ Set the heater to „cold“.

Result:

- The heater circuit will be bled.
- ▶ Check the expansion tank for air bubbles.

Result:

- The heater circuit is bled as soon as no more air bubbles rise up.

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6.05 Emergency take down

| | | |
|---|---|----|
| 1 | Emergency operation | 3 |
| 2 | Emergency operation with assembly plate Variation 1 (V1) | 9 |
| 3 | Emergency operation of slewing gear(s) with assembly plate Variation 1 (V1) | 15 |
| 4 | Emergency operation with assembly plate(s) Variation 2 (V2) | 19 |
| 5 | Emergency operation slewing gear(s) with assembly plate(s) Variation 2 (V2) | 29 |
| 6 | Emergency operation of winch 4 (W IV) on the LR1600/2 and LR1600/2-W | 33 |
| 7 | Ending emergency operation | 37 |

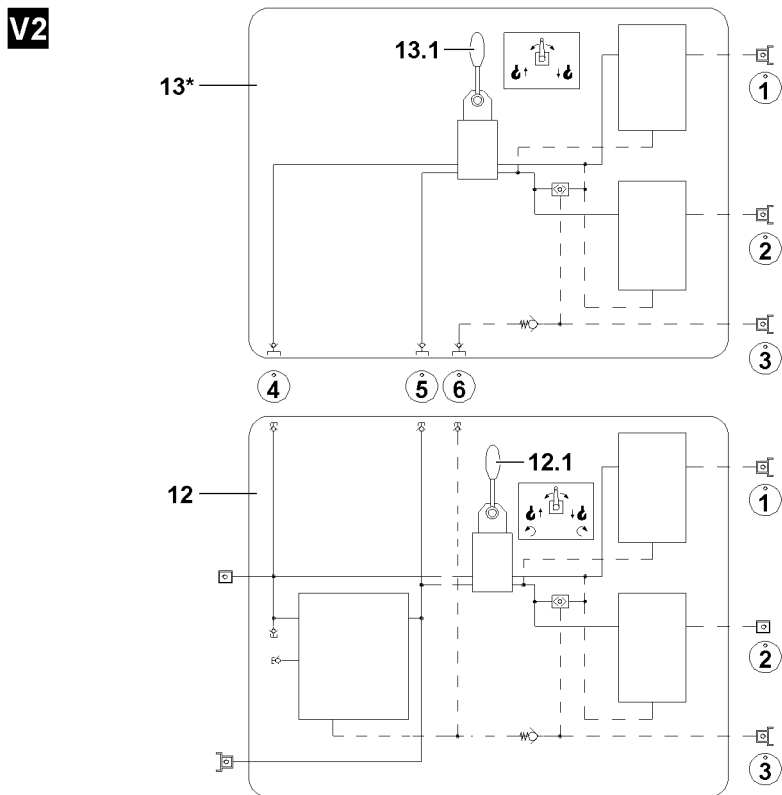
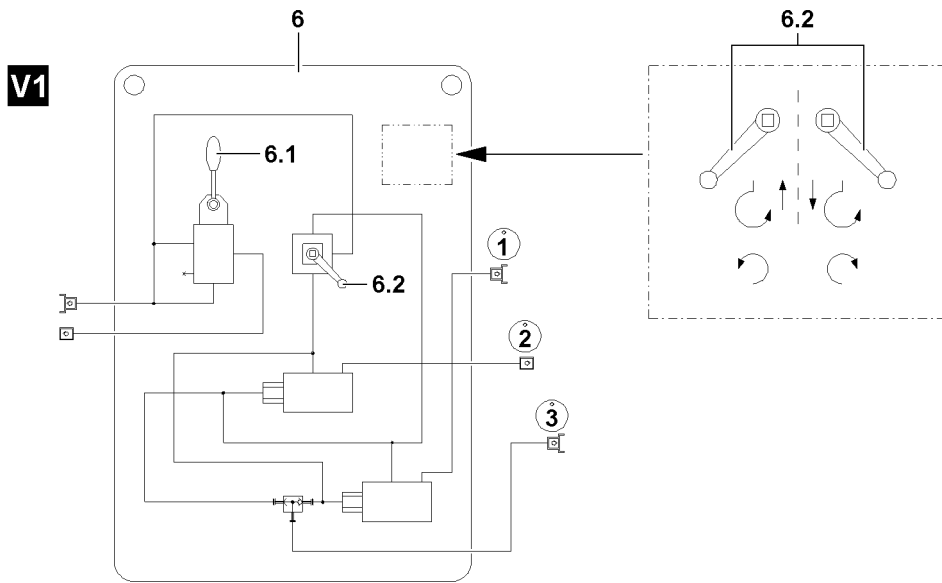


Fig.109407

LWE/LR 11350-007/19005-01-02/en

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) | Variation 2(V2) |
|--------------------------|------------------------------|------------------------------|
| | each in individual operation | 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)

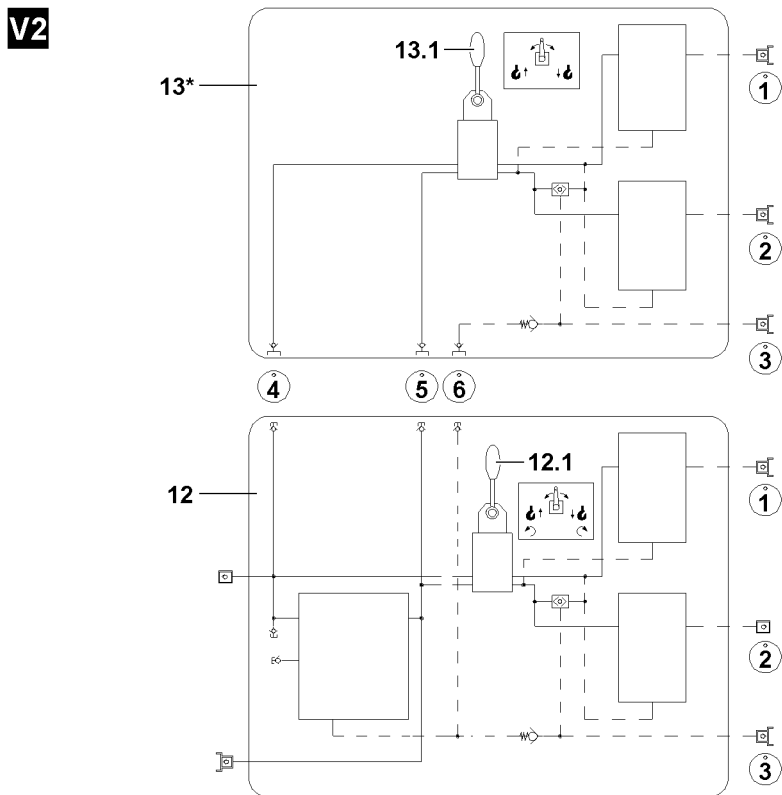
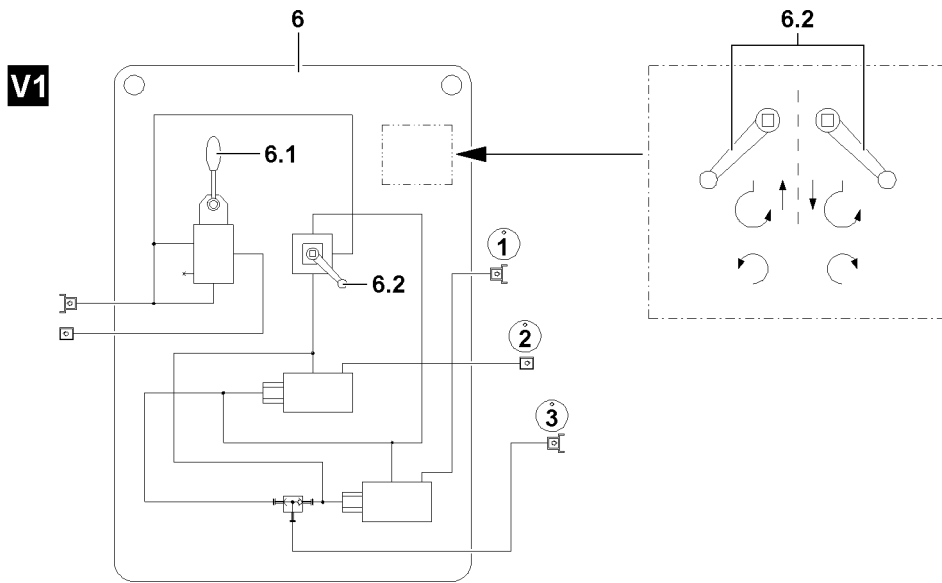


Fig.109407

LWE/LR 11350-007/19005-01-02/en

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!

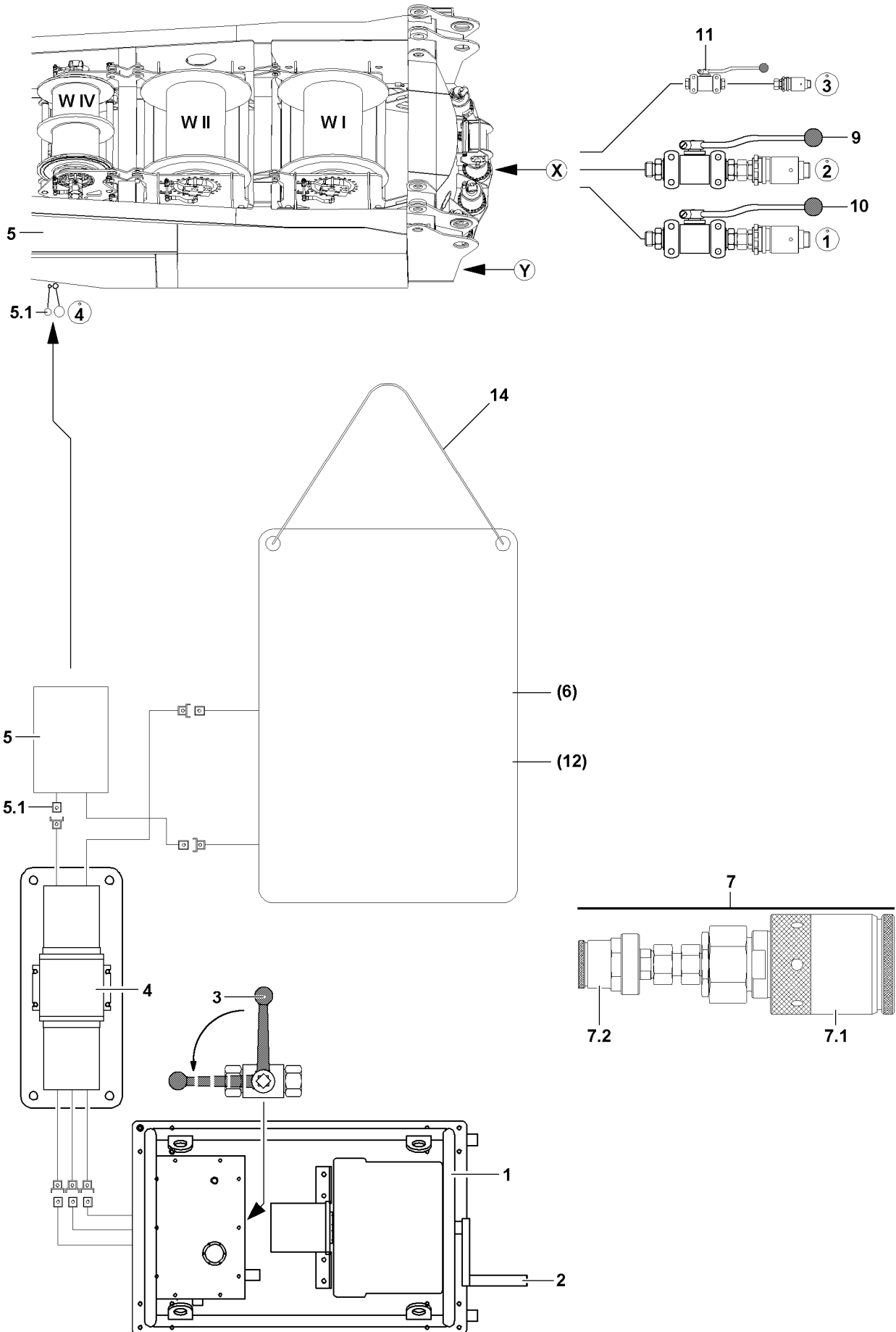


Fig.109408

LWE/LR 11350-007/19005-01-02/en

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**.

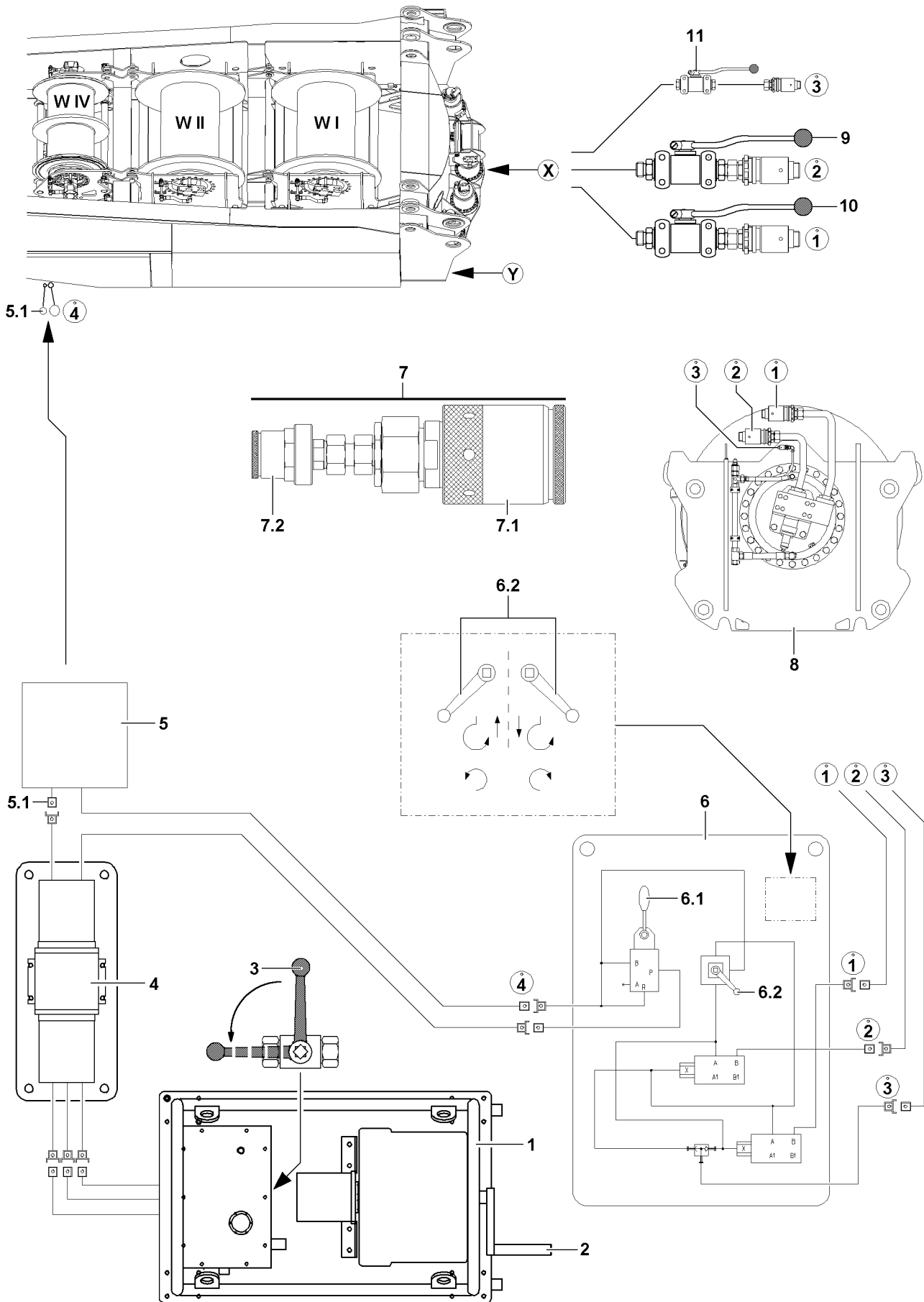


Fig.108301

LWE/LR 11350-007/19005-01-02/en

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!

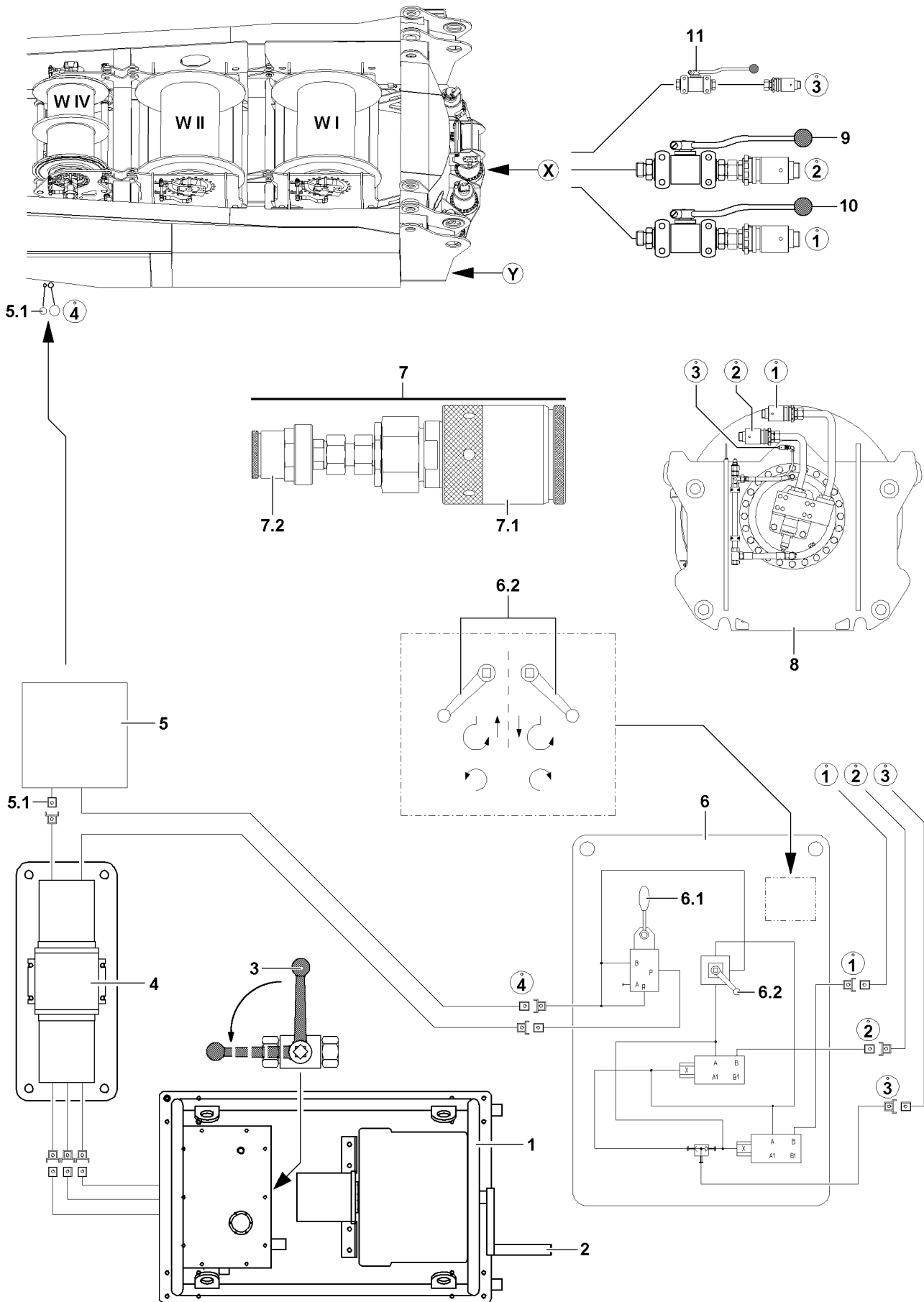


Fig.108301

LWE/LR 11350-007/19005-01-02/en

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**.

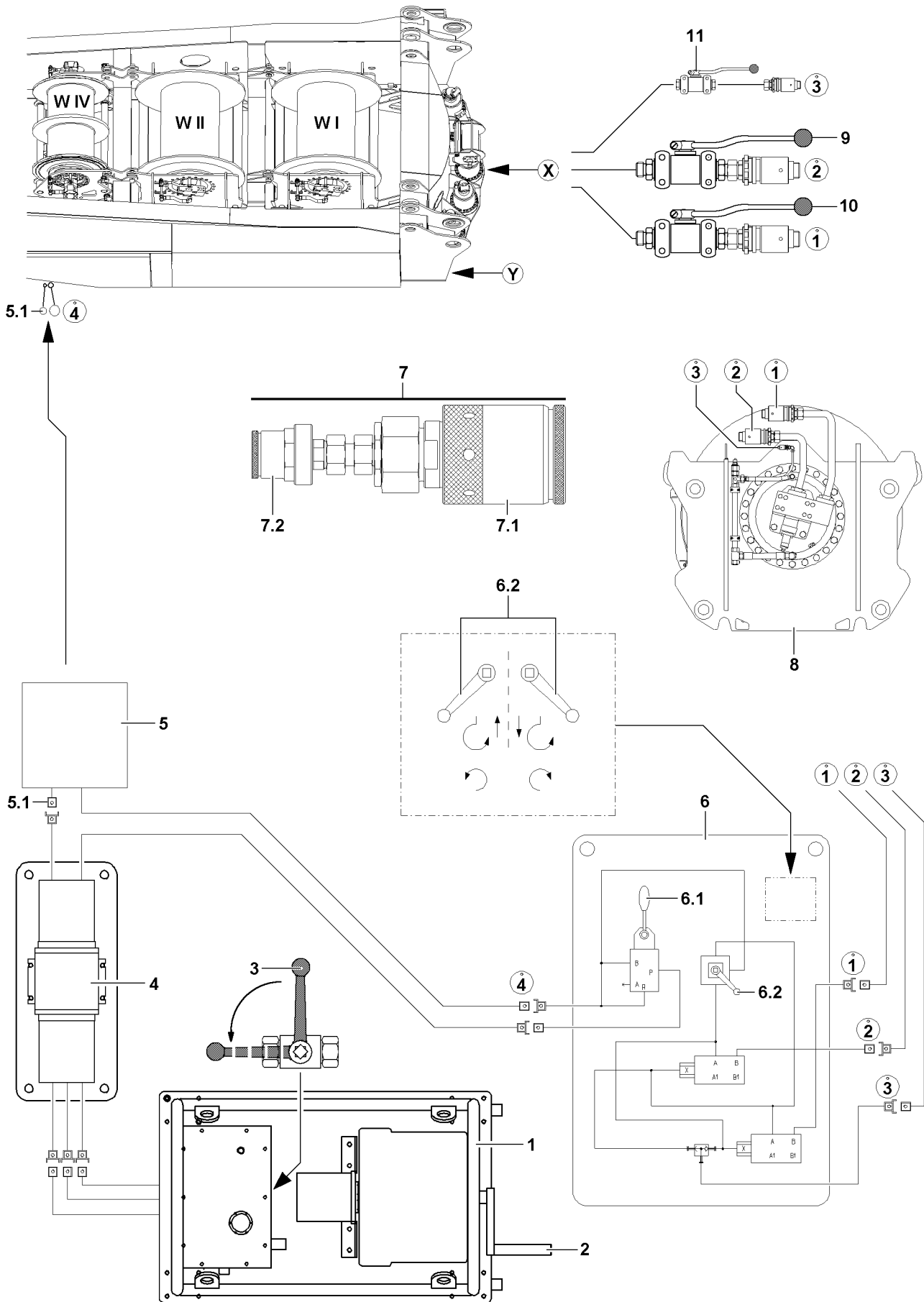


Fig.108301

LWE/LR 11350-007/19005-01-02/en

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.

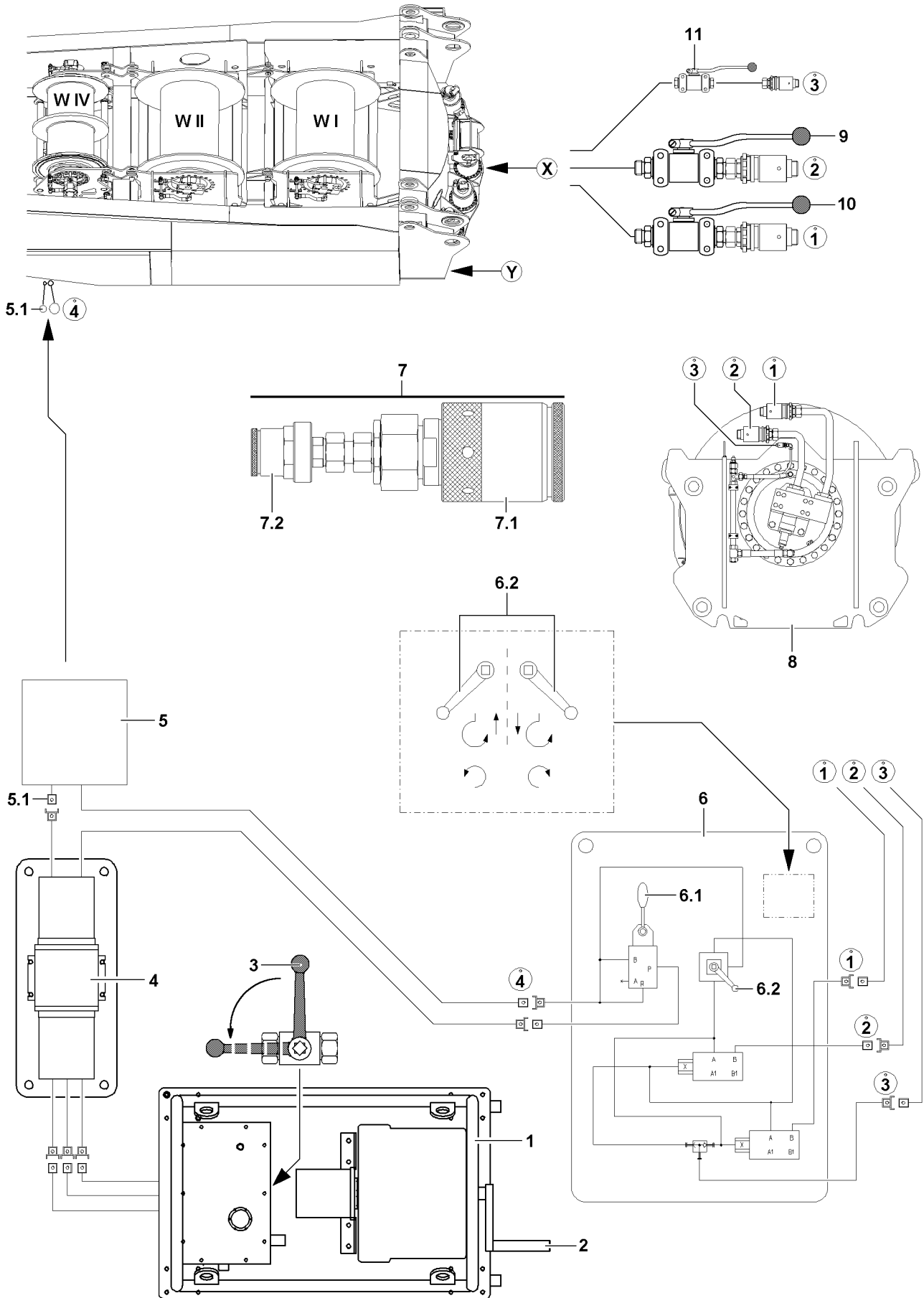


Fig.108301

LWE/LR 11350-007/19005-01-02/en

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.

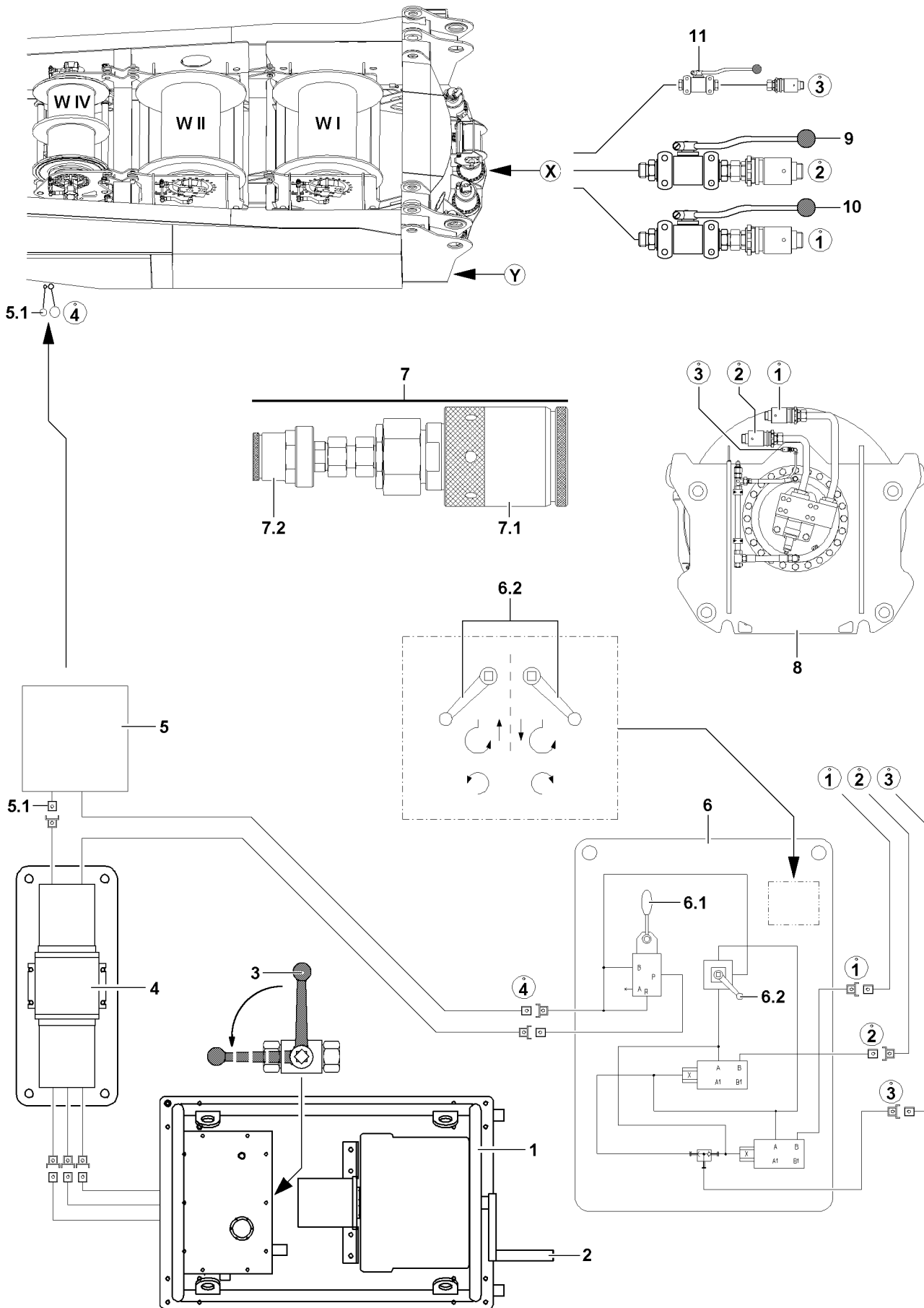


Fig.108301

LWE/LR 11350-007/19005-01-02/en

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.

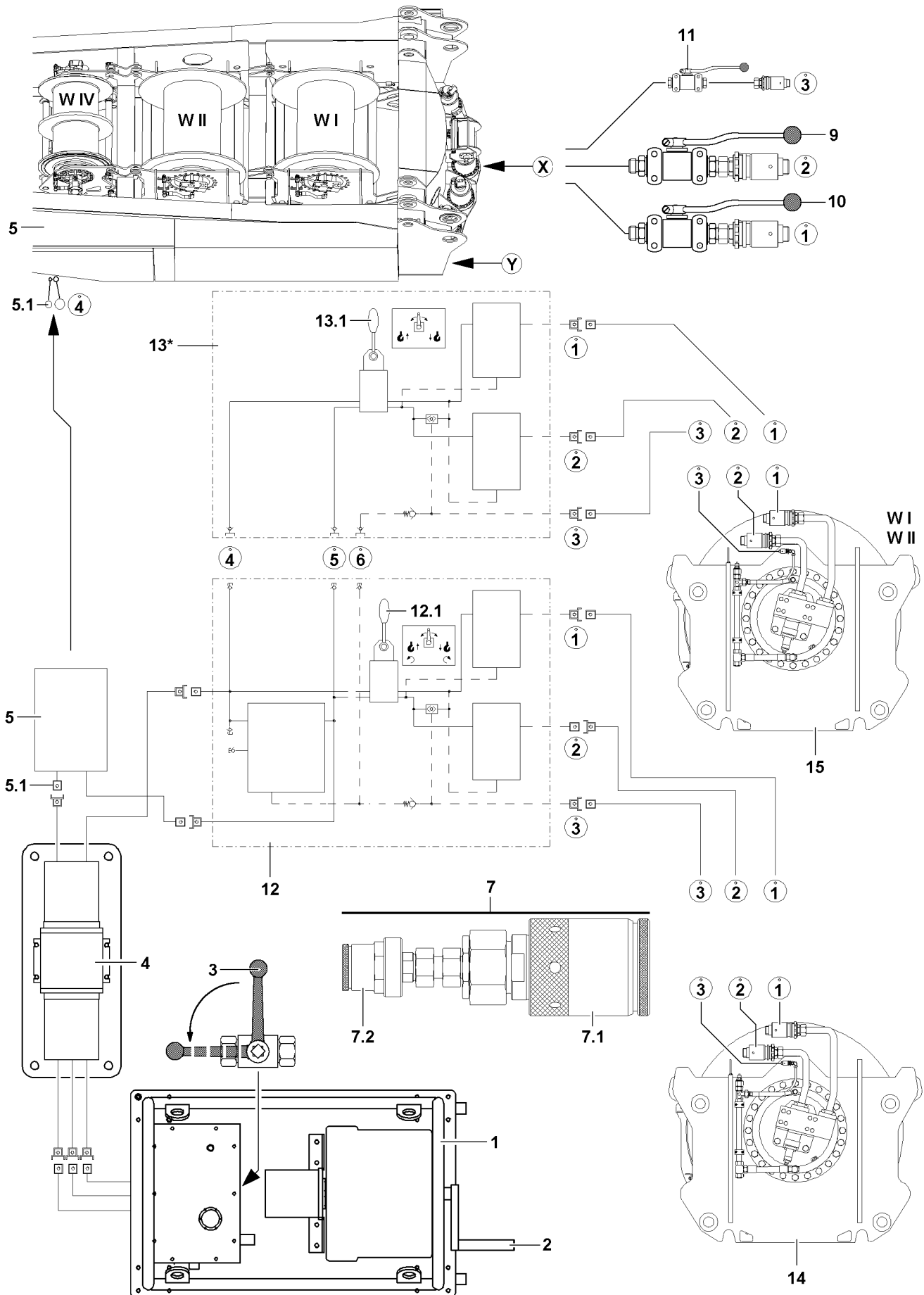


Fig.109393

LWE/LR 11350-007/19005-01-02/en

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||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“!

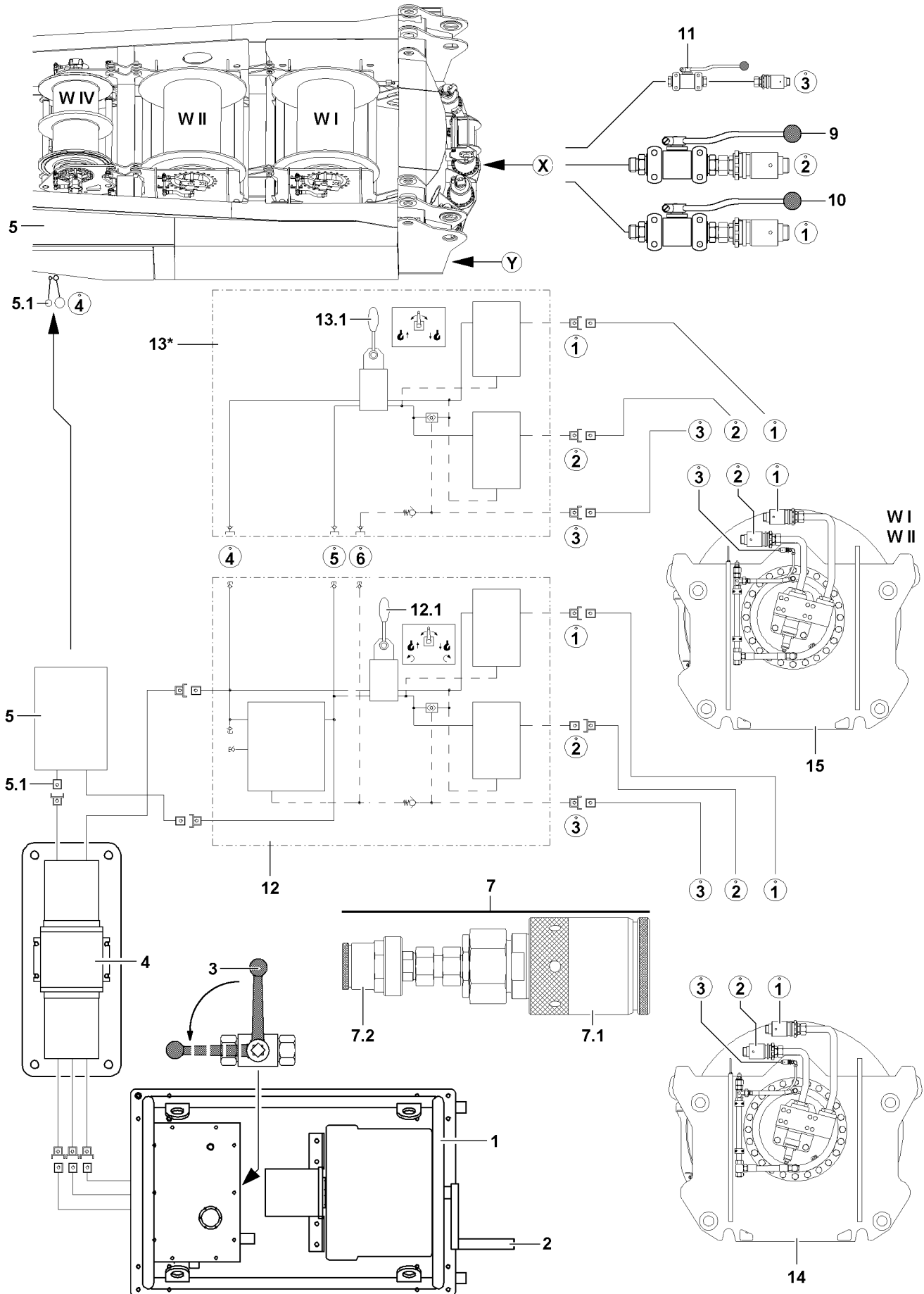


Fig.109393

LWE/LR 11350-007/19005-01-02/en

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.

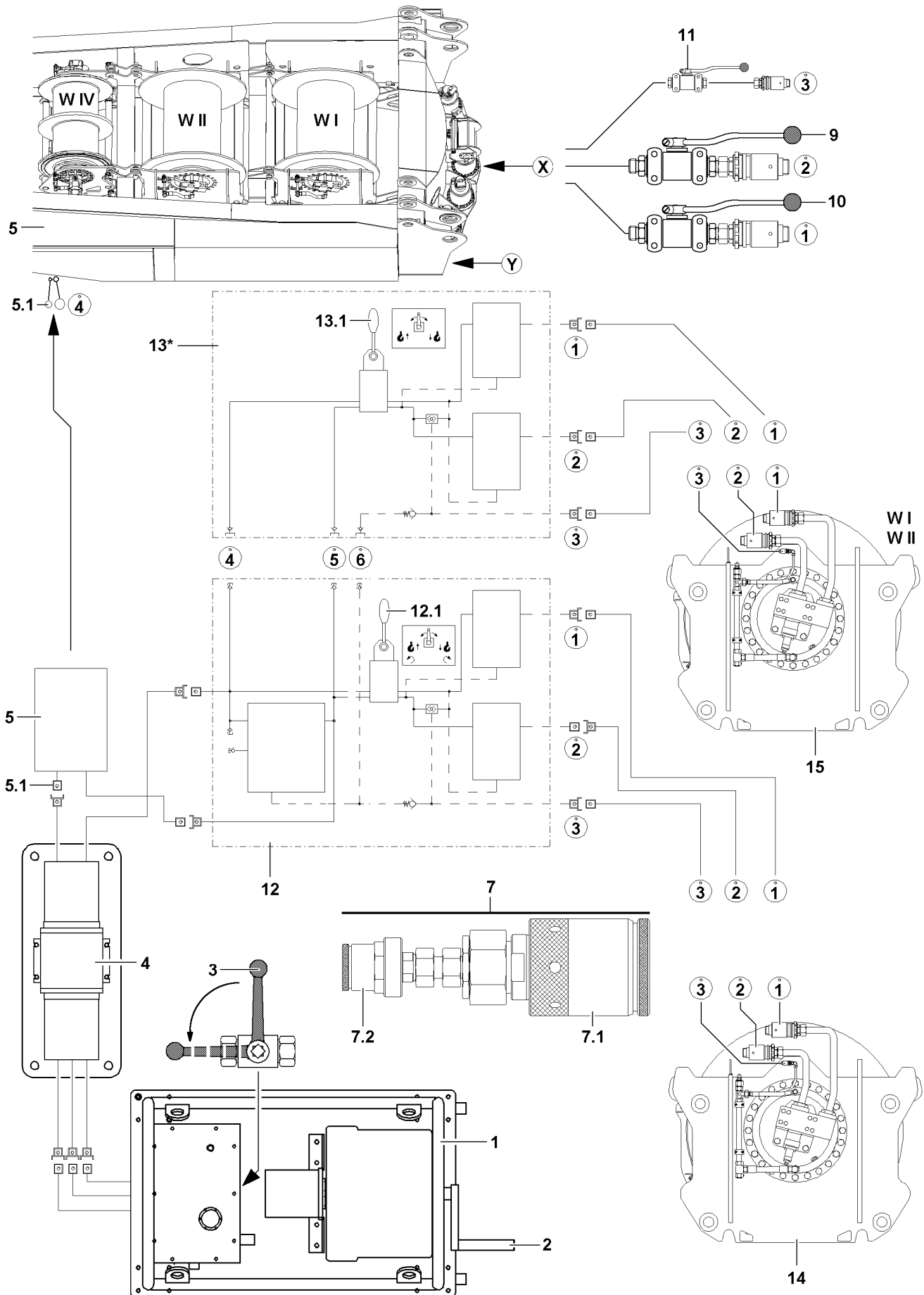


Fig.109393

LWE/LR 11350-007/19005-01-02/en

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!

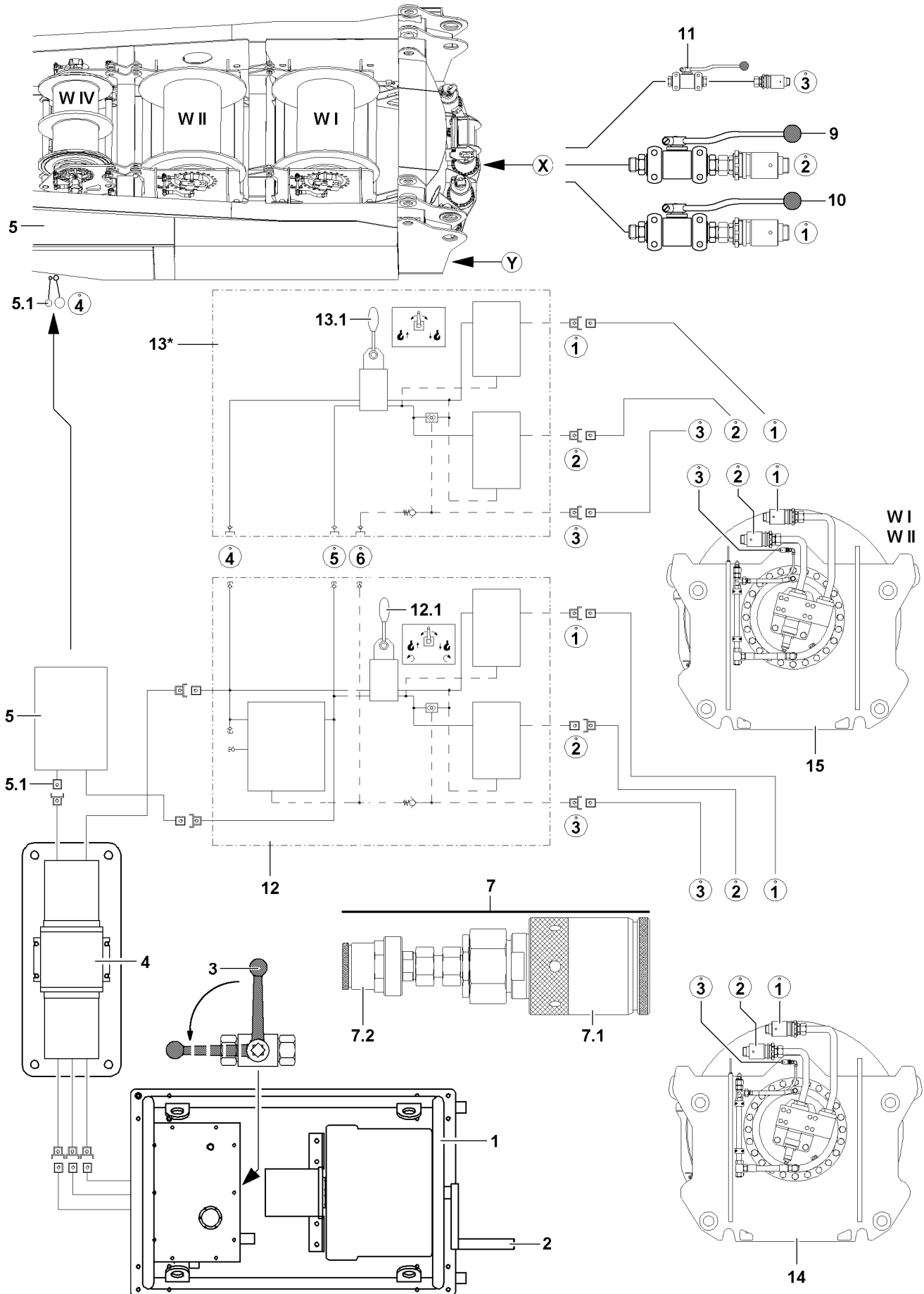


Fig.109393

LWE/LR 11350-007/19005-01-02/en

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.

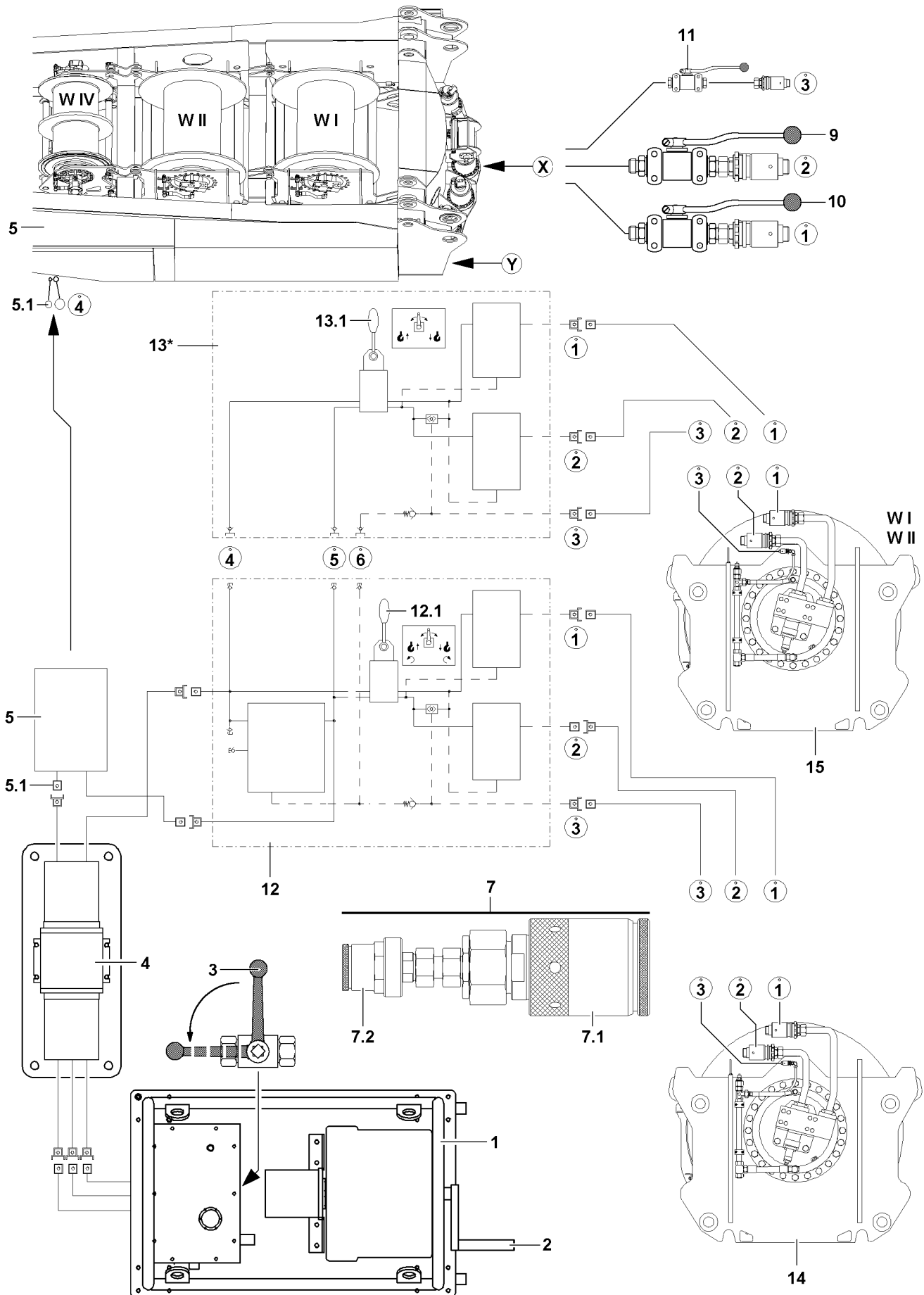


Fig.109393

LWE/LR 11350-007/19005-01-02/en

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.

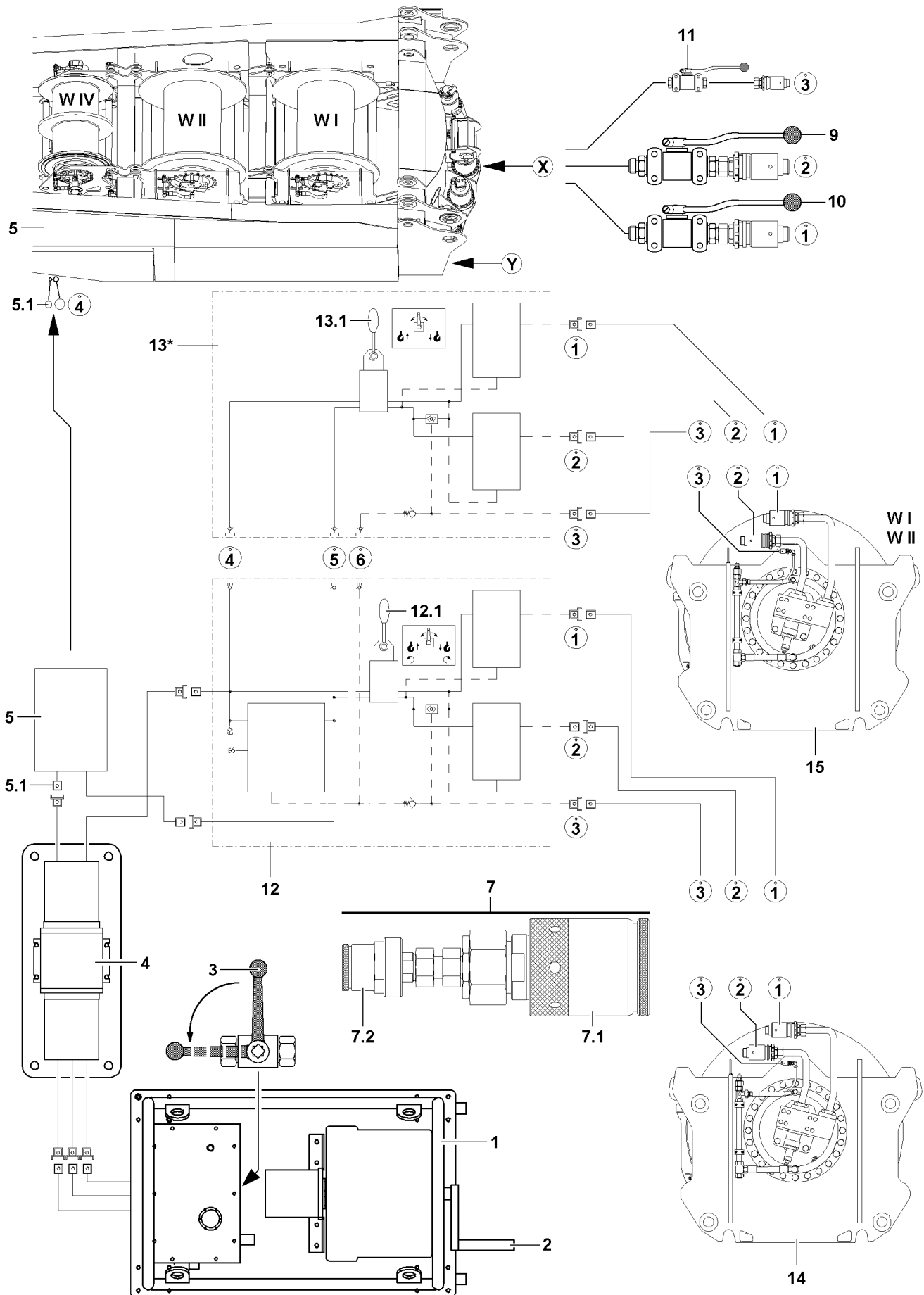


Fig.109393

LWE/LR 11350-007/19005-01-02/en

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.

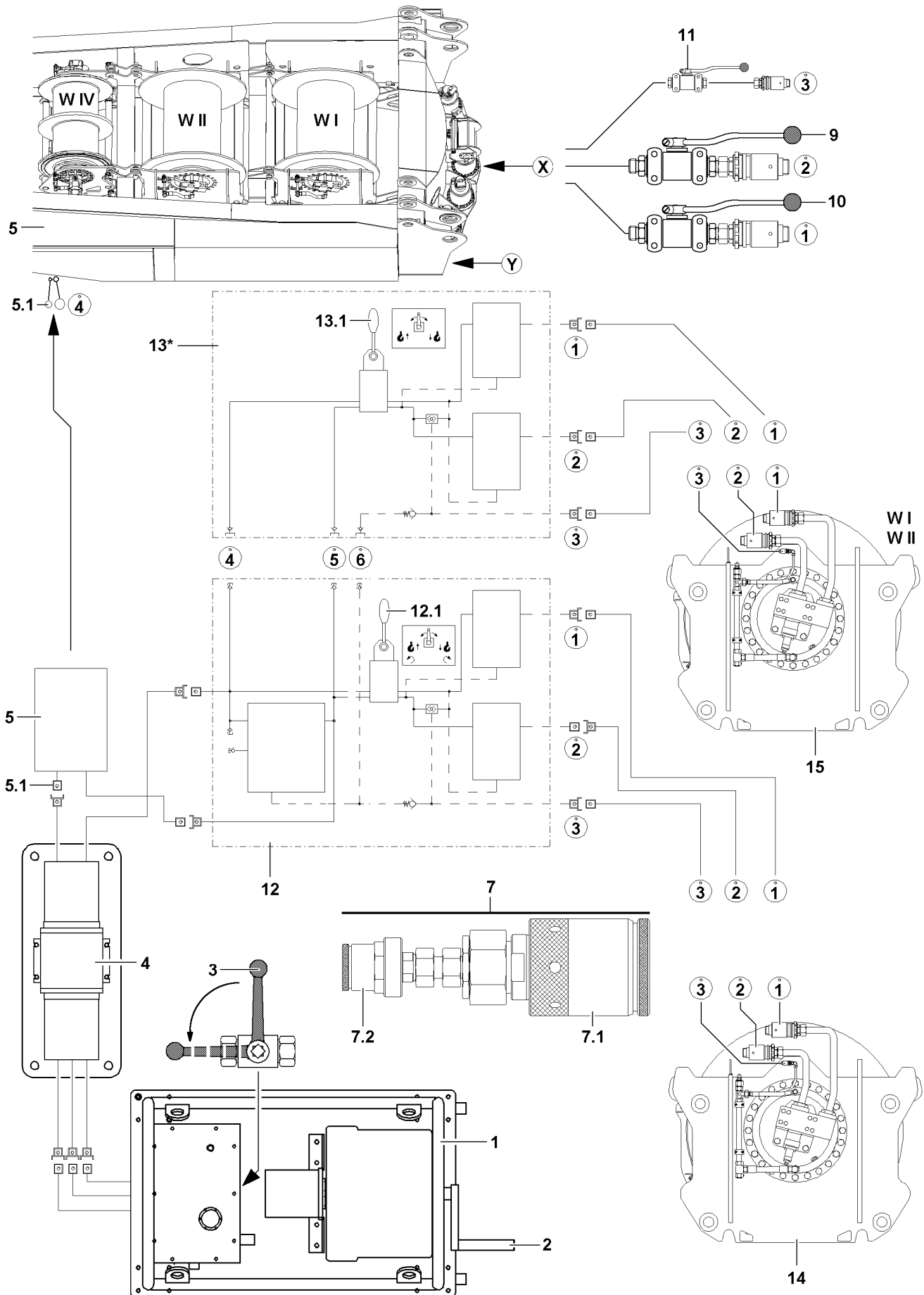


Fig.109393

LWE/LR 11350-007/19005-01-02/en

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.

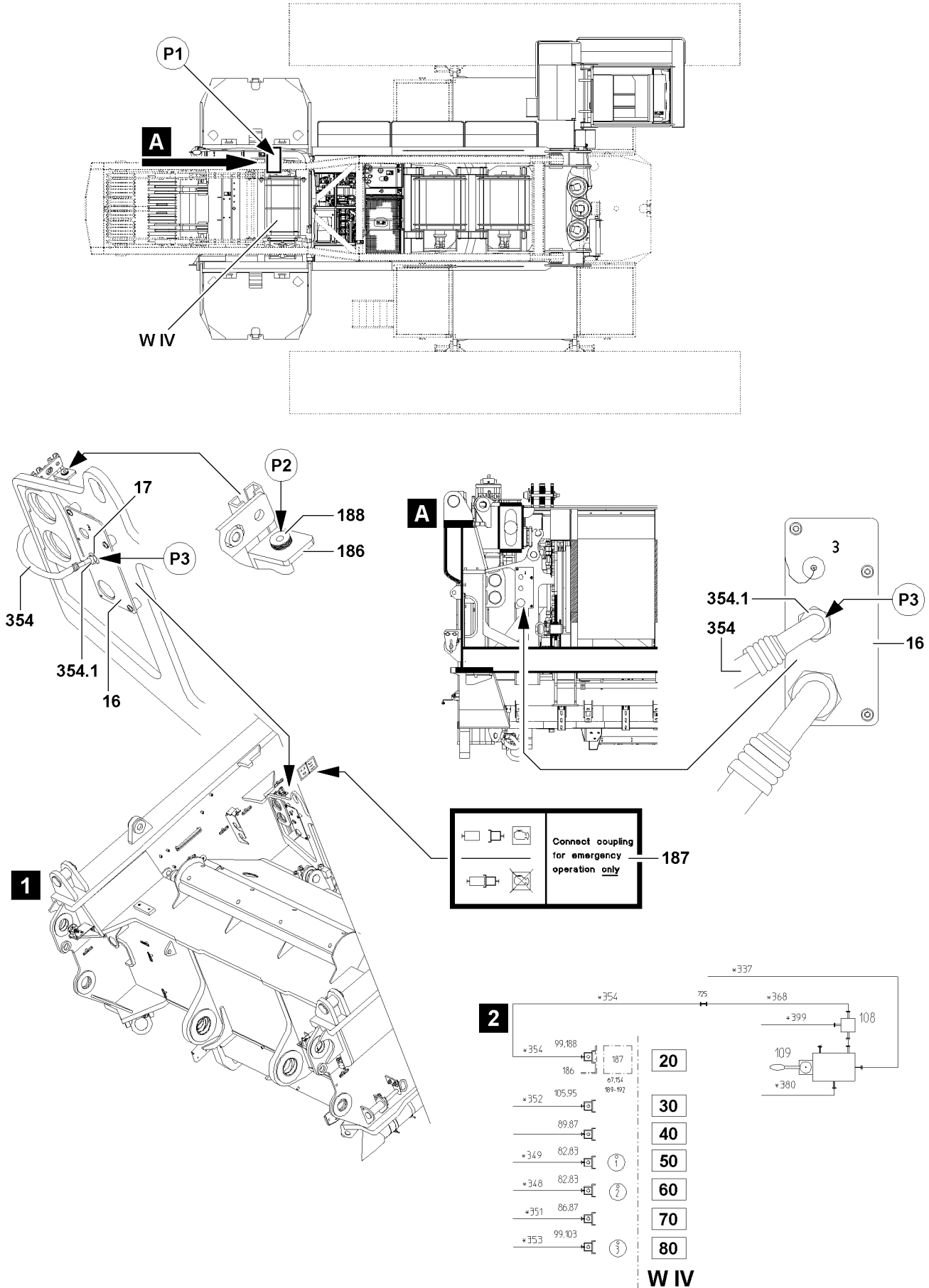


Fig.112453

LWE/LR 11350-007/19005-01-02/en

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“!

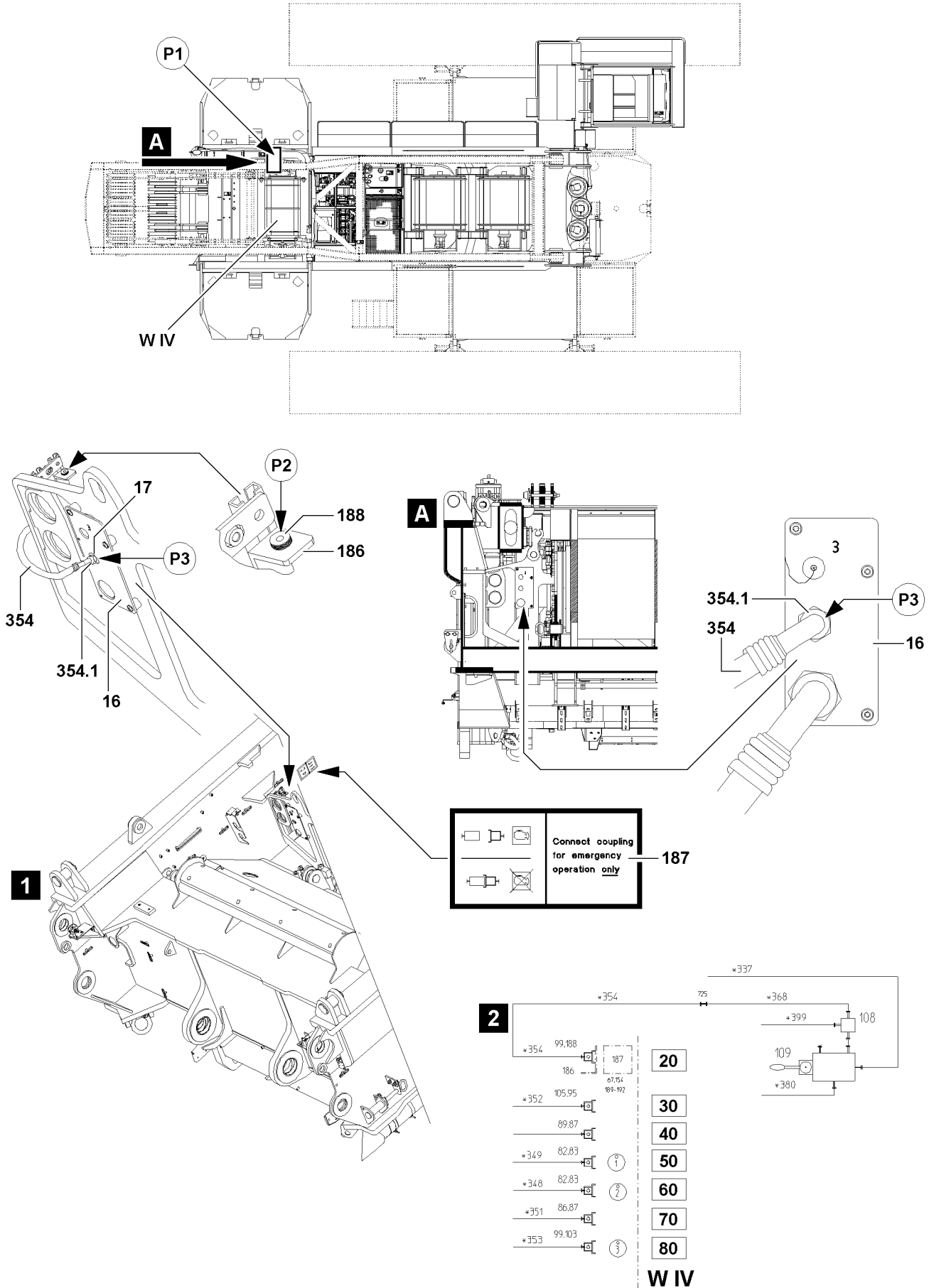


Fig.112453

LWE/LR 11350-007/19005-01-02/en

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**.

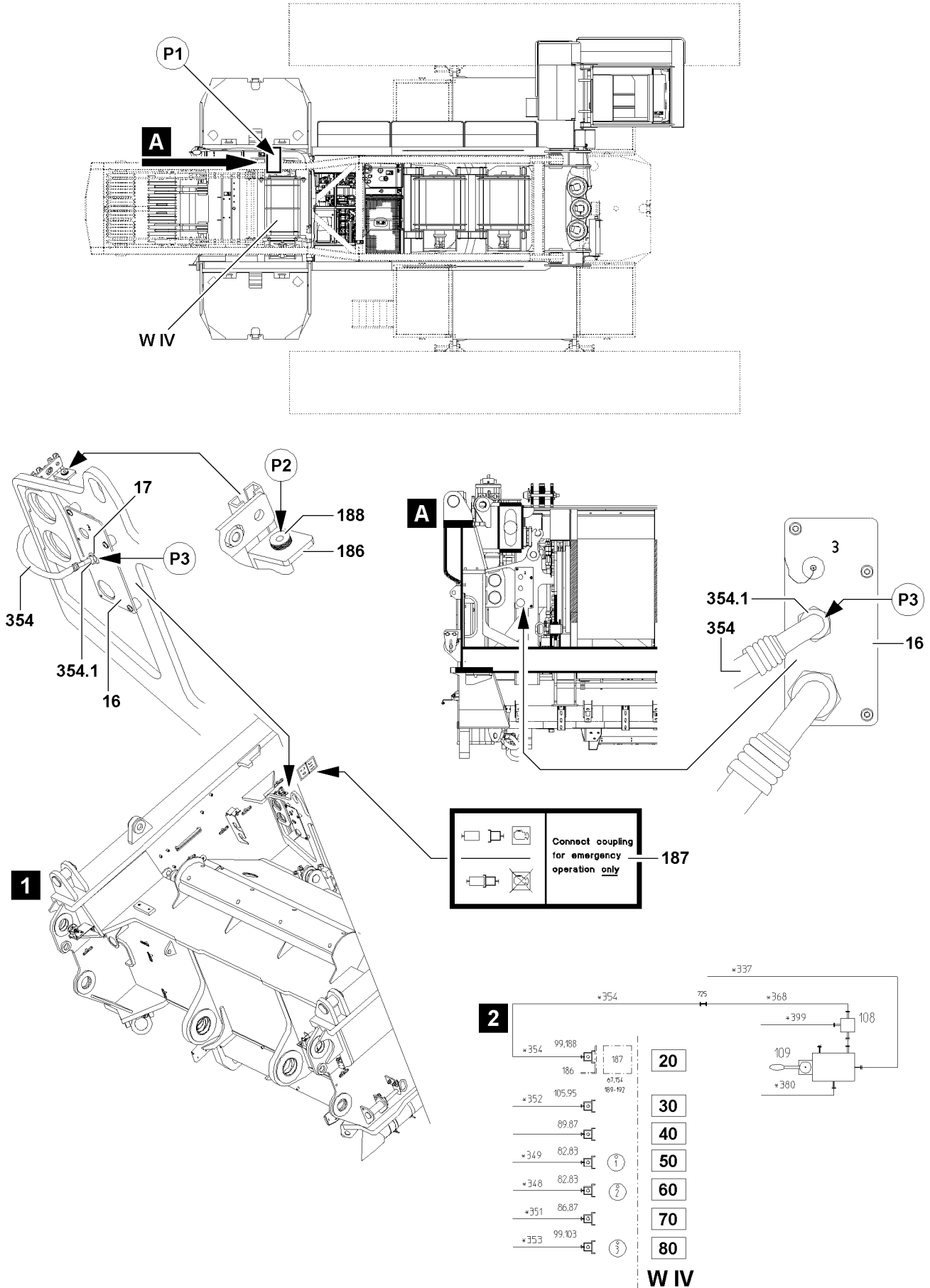


Fig.112453

LWE/LR 11350-007/19005-01-02/en

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.

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7 Maintenance and service

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7.01 Maintenance and service - General

| | | |
|---|-------------------------------|----|
| 1 | Technical safety instructions | 2 |
| 2 | Warranty and coverage | 6 |
| 3 | Liebherr Service | 6 |
| 4 | Taking an oil sample | 7 |
| 5 | Taking care of the crane | 8 |
| 6 | Storage | 13 |
| 7 | Disposal | 14 |

1 Technical safety instructions



WARNING

Maintenance instructions **not** adhered to!

Death, severe injury, increased wear and failure of components.

- ▶ Observe the following listed safety instructions and the generally applicable safety rules.
- ▶ Adhere to the maintenance intervals.
- ▶ Carry out only applicable maintenance tasks.
- ▶ Repair and maintenance tasks are to be carried out carefully.
- ▶ For aggregates and components: Follow the operating instructions of the manufacturer.

1.1 Description of intervals and tasks



Note

- ▶ Fill quantities and descriptions of service items and lubricants are specified in the Service fill.

The maintenance intervals and scope of maintenance are described in several chapters.

For crane maintenance, observe the following chapters:

- Crane operating instructions, chapter 7.02: Maintenance intervals - Crane chassis ¹⁾
- Crane operating instructions, chapter 7.02.50: Maintenance intervals Ballast trailer*¹⁾
- Crane operating instructions, chapter 7.03: Maintenance intervals - Crane superstructure ¹⁾
- Crane operating instructions, chapter 7.03.50: Maintenance intervals - Crane boom ¹⁾
- Crane operating instructions, chapter 7.04: Maintenance instructions - Crane chassis ²⁾
- Crane operating instructions, chapter 7.04.50: Ballast trailer maintenance instructions ²⁾
- Crane operating instructions, chapter 7.05: Maintenance instructions - Crane superstructure ²⁾
- Crane operating instructions, chapter 7.05.50: Crane boom maintenance instructions ²⁾
- Crane operating instructions, chapter 7.06: Fill quantities, lubrication plan
- Crane operating instructions, chapter 7.07: Operating fluids and lubricants

¹⁾ These chapters contain a list of maintenance intervals for all maintenance tasks.

²⁾ For aggregates, observe and adhere to additionally to the instructions of the manufacturer.

1.2 Definition of „Checking“

The action of „Checking“ includes all required task in connection with the maintenance, for example:

- Determining a specified value
- Cleaning
- Adjusting
- Refilling
- Replacing

1.3 Maintenance intervals

Use the following rules for interval determination:

- Carry out maintenance and inspection tasks on the crane chassis after reaching the specified driven mileage, operating hours or calendar intervals. The interval that occurs first is the deciding factor.
- Carry out maintenance and inspection tasks on the crane superstructure after reaching the specified operating hours or calendar intervals. The interval that occurs first is the deciding factor.
- The maintenance intervals complement each other. If a higher interval is coming up, then carry out the tasks according to the lower interval also.

1.4 Securing against start up



WARNING

Impermissible travel or crane operation during maintenance or repair tasks!
Death, severe injury, severe property damage.

- ▶ Make sure that travel and crane operation is not possible during maintenance and repair tasks.
- ▶ Show clearly with signs that maintenance or repair tasks are being carried out on the mobile crane.
- ▶ Use signs which show without a doubt that travel operation and crane operation are prohibited.
- ▶ Adhere to the national regulations regarding tagging on mobile crane and signs.
- ▶ Turn the engine on the crane superstructure and the crane chassis off.
- ▶ Apply the „parking brake crane chassis“.

If possible:

- ▶ Lock the driver's cab and the crane cab.
- ▶ Hand the ignition key from the crane superstructure and the crane chassis to an authorized person.

1.5 Personnel



WARNING

Unauthorized and untrained expert personnel!

Improper maintenance, personal injury, property damage.

- ▶ Observe and follow the personnel requirements for the respective maintenance task.

If there are no personnel requirements:

- ▶ The crane operator can perform the maintenance task.
- ▶ Have the repair tasks performed exclusively by authorized and trained expert personnel.
- ▶ Make sure that only authorized persons are in the danger zone.

Maintenance tasks may only be carried out by expert, authorized and trained employees.

An expert is someone who possesses the required expert knowledge for performing a certain task. Requirements regarding the technical qualification depends on the type of task.

Requirements regarding the technical qualification of a person:

- Corresponding professional training.
- Professional experience or a currently performed corresponding professional activity.
- Participation in training to keep the expert knowledge up to date.

1.6 Securing against falls



WARNING

Personnel is **not** secured against falls!

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

- ▶ For all tasks on the crane where there is a danger of falling, take suitable safety measures.
- ▶ The crane superstructure or the boom may **not** be accessed without suitable aids.
- ▶ Suitable aids are, for example: Lifting platforms, scaffoldings, ladders, assembly platforms, auxiliary crane.
- ▶ If railings are present on the crane superstructure, then they must be swung into operating position and secured for all tasks. See the Crane operating instructions, chapter 2.06.
- ▶ Only step on such aids with clean shoes.
- ▶ Keep aids clean, free of snow and ice.
- ▶ If tasks cannot be carried out using these aids or from the ground, then the maintenance personnel must be protected from falling using approved fall arrest systems. See the Crane operating instructions, chapter 2.04.
- ▶ It is prohibited to step on the driver's cab or cab roof and specially marked surfaces. See the Crane operating instructions, chapter 2.05.

**WARNING**

Dirty slip-resistant mats!

Fall

- ▶ Keep slip-resistant mats clean and free of snow and ice!
- ▶ Only step on slip-resistant mats with clean shoes!
- ▶ Replace or renew missing or damaged slip-resistant mats!

1.7 Preventing fires

**WARNING**

Excess fuel, excess oil in engine compartment during operation!

Death, severe injury, fire damage.

- ▶ Check the diesel engine after repairs and Service tasks but also in regular intervals for leaking oil and fuel.
- ▶ Fix the leaks. Replace damaged components.
- ▶ Do **not** spill service fluids.

**WARNING**

Disregard of general safety regulations during tasks on the fuel system or on the electrical system!

Severe burns, fire damage.

- ▶ Disconnect the battery from the power supply.
- ▶ Do **not** smoke.
- ▶ Do **not** work near open flames.
- ▶ Keep a functioning fire extinguisher ready.

**WARNING**

Sound insulation mats are contaminated with fuel, engine oil, gear oil, hydraulic oil or solvents!

The sound insulation mats can ignite. Severe burns, fire damage.

- ▶ Remove any polluted sound insulation mats **immediately** and **replace immediately** with **Original Liebherr spare parts**.

If there are sound insulation mats in the chassis near the starter:

- ▶ **Immediately remove** any sound insulation mats located in an area of 0.5 m around the starter and **do not replace them**

If there are sound insulation mats in the superstructure in the engine compartment flap:

- ▶ **Immediately remove** the sound insulation mats and **do not replace them**.
- ▶ Also observe and adhere to the section „Sound insulation mats“.

1.8 Protecting against burns

**WARNING**

Hot surfaces!

Severe burns.

- ▶ Let any components to be maintained or inspected cool off.
- ▶ Let hot components cool off.
- ▶ Avoid contact with hands and skin.
- ▶ Wear personal protective equipment and suitable protective gloves.

**WARNING**

Hot service fluids!

Severe burns.

- ▶ Let hot service fluids cool off.
- ▶ Avoid contact with hands, skin and eyes.
- ▶ Wear safety goggles.
- ▶ Wear personal protective equipment and suitable protective gloves.

**WARNING**

Electric short circuit!
Severe burns.

- ▶ Prevent short circuits in the electrical system, especially on the battery.
- ▶ Replace or change missing or defective protective insulation.

1.9 Protecting from scalding

**WARNING**

Cooling system is pressurized!
When the coolant reservoir is opened, hot coolant can escape explosively.
Severe scalding.

When the engine is warm:

- ▶ Do **not** open the cover of the coolant reservoir.
- ▶ To protect face, hands and arms from hot steam of hot coolant, cover the cap with a large rag when opening.

1.10 Rotating parts

**WARNING**

Rotating parts, ignition system on running engine!
The cooler fan can turn on suddenly.
Death, severe injury.

- ▶ Proceed especially careful.
- ▶ Do **not** reach into rotating parts.
- ▶ Never reach into the cooler fan when the engine is warm.

1.11 Using suitable operating fluids

NOTICE

Diesel filled in the urea tank or vice versa!
Destruction of the diesel engine or the exhaust aftertreatment system.

- ▶ Keep the urea solution absolutely pure.
- ▶ Do not reuse pumped out urea solution.

**WARNING**

Operating fluids **not** suitable for ambient temperature!
Death, severe injuries, property damage.

- ▶ Adjust the operating fluids in time to the ambient temperatures.
- ▶ Only use service fluids approved by Liebherr-Werk Ehingen GmbH. See chapter 7.07.

1.12 Replacing damaged crane components

**WARNING**

Damaged crane components **not** replaced!
Death, severe injury, failure of components.

- ▶ Maintain crane components according to the data in the maintenance intervals, the maintenance guidelines and the chart for service items and lubricants.
- ▶ Replace damaged crane components immediately.

1.13 After replacement of components

Type of oil, see data tag and supplied „Service fill“.

The following instructions must be observed when replacing components such as the engine, transmission or axle:



WARNING

Maintenance of a replaced component **not** carried out!

- ▶ Before start up, be sure to refill with the correct type of oil to the center of the minimum / maximum mark.
- ▶ Carry out first maintenance. See chapter „Maintenance intervals“.
- ▶ Adhere to regular maintenance intervals.
- ▶ Follow the break-in instructions. See the Crane operating instructions, chapter 2.02.

1.14 Tire size

When changing certain tire sizes, the mobile crane must be modified.

Contact Liebherr customer service to change the following tire sizes:

- From 385/95 R 25 to 445/95 R 25
- From 385/95 R 25 to 525/80 R 25
- From 445/95 R 25 to 385/95 R 25
- From 525/80 R 25 to 385/95 R 25

2 Warranty and coverage

NOTICE

Maintenance intervals and maintenance guidelines **not** adhered to, impermissible lubricants used!
Damage, failure of crane components.

The warranty for the respective crane component is voided.

- ▶ Maintain crane components according to the data in the maintenance intervals, the maintenance guidelines and the chart for service items and lubricants.

NOTICE

Not using Original Liebherr spare parts and **not** using Original Liebherr Service items!

In the event that replacement parts are used that are **not** Original Liebherr replacement parts and **not** Original Liebherr service items and lubricants, Liebherr-Werk Ehingen GmbH disclaims all liability for system functionality as well as for the parts.

- ▶ Use exclusively Original Liebherr spare parts.



Note

- ▶ Original Liebherr replacement parts have been tested for crane operation and may be used without risking safety.

The buyer is entitled to warranty or coverage only:

- when exclusively Original Liebherr spare parts are used.
- when Liebherr Service items and Liebherr lubricants are used for the Liebherr crane.

3 Liebherr Service

Liebherr mobile cranes, whether truck-mounted, mobile or crawler cranes - are technically advanced products, which prove their worth daily even under tough conditions.

The high technical standards of these cranes provide functional security, resistance to failure and ease of maintenance.

Liebherr is continuously developing the drive and control components. The combination of well proven units and modern manufacturing methods produces cranes that are safe to operate and easy to maintain.

Several hundred cranes are built every year for the international market, supported by international service.

Liebherr's „After Sales Service“ plays an important role at Liebherr in ensuring operational readiness and high crane availability.

With Liebherr, Service begins when the crane is handed over. Your crane operators will be professionally trained in line with their level of knowledge and we devote much time to this.

We also train your workshop staff in all crane-specific matters, because we know that they can deal with more than just minor repairs themselves. Often there are specialists who can quickly and reliably carry out crane repairs.

We have special service advisers available who will solve any problems you may have. This phone contact saves time and money. You should take advantage of it as soon as possible.

Our service technicians are specialists with years of experience, who can be deployed from local support points. Naturally these experts have specialized knowledge and special tools.

But before you call these specialists, it is worth making use of the facilities for getting advice mentioned above.

4 Taking an oil sample



Note

- ▶ Liebherr recommends taking oil samples for the gears, engines and hydraulic system in regular intervals.
- ▶ Based on the trend analysis of the oil analysis results, changes can be determined in the lubricity of the oil and increased component wear.



WARNING

Tasks on components and operating fluids at operating temperature!
Burns.

- ▶ Carry out all tasks with utmost caution.
- ▶ Wear protective clothing.

Make sure that the following prerequisites are met:

- Oil has a normal operating temperature.
- ▶ Always take oil in the same location.
- ▶ Take oil always according to the same method.
- ▶ Do **not** take oil right after an oil change.
- ▶ Do **not** take oil immediately after larger amounts of oil have been added.



Note

Recommendation:

- ▶ Fill oil into original laboratory sample containers.
- ▶ Fill oil exclusively in a clean and dry sample container.

5 Taking care of the crane

5.1 Washing the crane

In order to ensure a consistent surface quality, the crane must be washed regularly. See the maintenance intervals, chapter 7.02, chapter 7.03, chapter 7.03.50. Clean the crane in particular after contact with highly corrosive materials or highly adherent contaminants.

Highly adherent contaminants are:

- Residual road salt
- Oils, grease and fuel
- Insect remains
- Rust film
- Tar splashes, concrete splatter

Check the crane for corrosion and paint damage. See the maintenance intervals, chapter 7.02, chapter 7.03, chapter 7.03.50. If detected, have corrosion and paint damage removed by authorized and trained service personnel.

NOTICE

Impermissible cleaning agent!

Damage to the surface.

- ▶ Do not use aggressive cleaning agents.
 - ▶ Do not use scouring cleaning agents.
 - ▶ Do not use a phosphate based cleaner.
 - ▶ Do not use solvents or cleaning agents that contain solvents.
 - ▶ Only use cleaning agents with a pH value that is less than / equal to 12.
 - ▶ Make sure that the cleaning agent and water ratio of 3% is not exceeded.
 - ▶ Rinse with clear water (not salt water).
-

Make sure that the following prerequisites are met:

- The crane is switched off and secured against unauthorized start up.
- The crane has cooled down.
- The battery master switch is turned off.

5.1.1 High pressure cleaner

The water jet of a circular jet nozzle can cause damage to the tyres or parts of the travel gear that cannot be seen exteriorly.

NOTICE

High pressure cleaner with circular jet nozzle used!

Damaged components could fail unexpectedly.

- ▶ Do not use a high pressure cleaner with a circular jet nozzle.
 - ▶ Replace damaged components.
-



CAUTION

Hot steam and water pressure!

Burns.

- ▶ Wear personal protective equipment.
-

Do **not** expose the following components to a water jet:

- Inside of the driver's cab and cab
- Electric motor
- Electrical plug connections, line drums and power distributor
- Control units
- Transmitter
- Relay circuit boards and fuse circuit boards
- Hydraulic block

- Intake manifolds for combustion air
- Seals
- Bellows
- Gear shafts
- Retracted sliding beams
- Sealing lips on slewing ring connections
- Radial shaft sealing rings on winches
- Slewing gears
- Hoist rope, control rope, assembly rope
- Piston rods
- Slip-resistant mats
- Signs
- Overflow container on the equipment
- Generator
- Lighting
- Wind speed sensor / airplane warning light
- Bearing on the rope pulleys
- Carrier rollers
- Swivel joints
- Pin points
- Head camera inclusive of the transmitter and receiver unit
- Hand pump on the folding jib

The crane can be cleaned with the high pressure cleaner. The water pressure, minimum distance and water temperature are specified in the following chart:

| Washing painted surfaces | | |
|--------------------------|------------------|-------------------|
| Water pressure | Minimum distance | Water temperature |
| maximum 150 bar | 30 cm to 40 cm | 60 °C |

Adjusting the high pressure cleaner

| Washing surfaces covered with film | | |
|------------------------------------|------------------|-------------------|
| Water pressure | Minimum distance | Water temperature |
| maximum 150 bar | 80 cm | 60 °C |

Adjusting the high pressure cleaner

| Washing surfaces protected against corrosion with Carlofon 81 | | |
|---|------------------|-------------------|
| Water pressure | Minimum distance | Water temperature |
| maximum 30 bar | 30 cm to 40 cm | 40 °C |

Adjusting the high pressure cleaner

Clean electrical systems, cables, cable harnesses and sound insulation mats with low pressure.

- ▶ Before cleaning, cover all openings.
- ▶ Wash the crane and equipment with a high pressure cleaner.
- ▶ Lubricate the crane and equipment.



Note

Environmental pollution!

- ▶ Dispose of auxiliary and cleaning materials contaminated with oil according to national and international regulations and directives.
- ▶ Only direct cleaning water through the oil separator of the drainage system.

5.1.2 Exhaust system

NOTICE

Ingress of water, steam or cleaning substances into the AGN-module!

Sensors and electric components for the exhaust aftertreatment can be destroyed, the coating of the catalytic converter can be washed off.

- ▶ Before cleaning, let the AGN system cool down (surface temperature 50 °C).
- ▶ Before cleaning, cover all openings.
- ▶ Make sure that **no** fluids and **no** dirt gets into the tailpipe opening of the AGN module.
- ▶ During cleaning, maintain a sufficient distance from the tailpipe opening.

5.1.3 Sound insulation mats

NOTICE

Improper cleaning (tools or cleaning methods)!

Sound insulation mats can be destroyed or damaged.

- ▶ Remove severe contamination with suitable tools, for example with soft plastic scrapers.
- ▶ Do **not** use tools with sharp edges.
- ▶ Use high pressure cleaners **exclusively** with extreme caution and with a sufficient distance to the sound insulation mats and with low water pressure.
- ▶ Do **not** use solvents for cleaning.

If sound insulation mats are contaminated with fuel, engine oil, gear oil, hydraulic oil or solvents:

- ▶ Observe and adhere to the section „Preventing fires“.

5.1.4 Slip-resistant mats



WARNING

Heavily worn slip-resistant mats!

People can slip and fall down from the crane.

- ▶ Replace heavily worn slip-resistant mats.
- ▶ Do **not** wax slip-resistant mats.

- ▶ Before every access: Check the slip-resistant mats for slip resistance and cleanliness.
- ▶ If dirty: Clean the slip-resistant mats with a brush with hard plastic bristles.
- ▶ For cleaning the surfaces, use commercially available cleaners.
- ▶ Flush with water.

5.1.5 Driver's cab and crane cab



Note

- ▶ The steering wheel, center console, instrument panel cover, floor covering and dirty upholstery in the driver's cab and the crane cab should only be cleaned with warm water mixed with dishwashing detergent.
- ▶ Keep the driver's cab and crane cab free from trash.

5.1.6 Ladders

- ▶ Remove any dirt on the ladders.
- ▶ Make sure that the grooves on the rungs are free of dirt.

5.2 Protecting the crane against corrosion

NOTICE

Aggressive environmental conditions!
Crane components can corrode and be damaged.
▶ Protecting the crane against corrosion

The corrosion protection agent **Carlofon 81** must be reapplied regularly according to wear. See the maintenance intervals, chapter 7.02, chapter 7.03, chapter 7.03.50.

The corrosion protection agent **Metacorin 822** must be reapplied regularly according to wear on the mechanically machined, blank surfaces. See the maintenance intervals, chapter 7.02, chapter 7.03, chapter 7.03.50.

The corrosion protection agent **Liebherr Cylinder Protect** must be reapplied regularly on the chrome-plated piston rods. See the maintenance intervals, chapter 7.02, chapter 7.03, chapter 7.03.50.



WARNING

Improper corrosion protection!
Injury to the respiratory system, suffocation.
▶ Wear a respirator mask.

NOTICE

Improper corrosion protection!
Damage to the crane.
▶ Make sure that crane corrosion protection is carried out only by authorized and trained service personnel.
▶ Make sure that the inspection and reconditioning intervals are not exceeded.

Make sure that the following prerequisites are met:

- A sufficient quantity of corrosion protection agent is available.
- Appropriate tools and aids are available.
- The crane is switched off and secured against unauthorized start up.
- The crane has cooled down.
- The battery master switch is turned off.
- Protective equipment is worn.

5.2.1 Crane

- ▶ Wash the crane thoroughly with a high pressure cleaner.
- ▶ Let the crane dry.

If corrosion or paint damage is found:

- ▶ Remove the corrosion and paint damage.

The following surfaces must be masked prior to corrosion protection:

- Walking surfaces and stepping surfaces
- Vents on brake valves and control valves
- Vents and drains on electrical equipment
- Mechanically machined, blank surfaces
- Piston rods



WARNING

Walking surfaces and stepping surfaces **not** masked!
Personnel can slip and fall down.
▶ Mask walking surfaces and stepping surfaces prior to corrosion protection.

- ▶ All surfaces that should **not** be corrosion protected should be masked.
- ▶ Protect the crane against corrosion with **Carlofon 81**.
- ▶ Remove the masking.

- ▶ Protect mechanically machined, blank surfaces against corrosion with **Metacorin 822**.
- ▶ Lubricate the crane.

5.2.2 Cylinders

If the chrome-plated piston rods are not retracted for a longer period of time, the chrome-plated piston rods must be protected against corrosion by applying **Liebherr Cylinder Protect**.

Application temperatures of **Liebherr Cylinder Protect**:

- Possible application temperatures: Between -20 °C and +45 °C.
- Optimal application temperatures: Between -10 °C and +30 °C.

Liebherr-Werk Ehingen GmbH recommends the first-time application of anti-corrosion agent, in the case of:

- Aggressive influences such as a high salt content in the ambient air:
 - After 24 hours without cylinder movement.
- Normal environmental conditions:
 - At least after 1 week without cylinder movement.



Note

- ▶ Only use **Liebherr Cylinder Protect** as corrosion protection for cylinders with chrome-plated piston rods.
- ▶ Do **not** apply corrosion protection to piston rods with NiL35 coating.

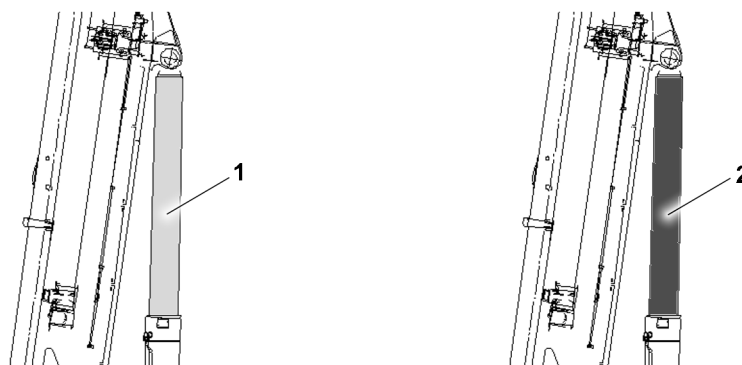


Fig.156557: Piston rods

1 Chrome-plated piston rod

2 Piston rod with NiL35 coating

Piston rods with a NiL35 coating appear darker than chrome-plated piston rods and can therefore be optically differentiated.

Before applying the anti-corrosion agent, the surface of the piston rod must be carefully wiped off with a clean cloth. The surface must be free of visible dirt. The use of an additional cleaner is not required.

- ▶ Clean the surface of the piston rod.
- ▶ Shake the spray can well before use. Apply the anti-corrosion agent evenly on the piston rod.
- ▶ Until a sufficient protective film has formed on the piston rod: Wait approx. 30 to 60 minutes.

When the **Liebherr Cylinder Protect** must be reapplied:

- ▶ Clean the surface of the piston rod again.

The piston rod must **not** be cleaned again when putting the hydraulic cylinder back into service.

When the hydraulic cylinder is put back into operation:

- ▶ Remove the anti-corrosion agent from the scraper.

5.3 Protecting the crane against corrosion for storage



Note

- ▶ When storing the crane, contact the Service department at Liebherr-Werk Ehingen GmbH.

5.4 Protecting the crane against corrosion for shutdown



Note

► Before shutting down the crane, contact the Service department at Liebherr-Werk Ehingen GmbH.

6 Storage

If the conditions in this section are observed, the crane can be stored as long as necessary.

6.1 Storage conditions

► Store the crane in a dry hall.

6.2 Decommissioning

Make sure that the following prerequisites are met:

- The crane is carefully washed.
- Corrosion and paint damage on the crane have been removed.
- Worn or damaged components have been replaced.

In the case of cranes with the battery master switch in the chassis and superstructure, both battery master switches must be turned off.

► Turn the battery master switch off.

In the case of cranes with a superstructure engine and a chassis engine, the batteries in the chassis and superstructure must be removed.

► Remove the batteries properly.

6.3 Maintenance

In the case of cranes with a fuel tank in the chassis and superstructure, both fuel tanks must be filled.

- Fill up the fuel tank completely.
- Apply approved lubricants in all lube points.
- Replace all service fluids.
- Check the crane for leaking fluids.

If fluids are leaking from the crane:

► fix the leak.

In the case of cranes with a superstructure engine and a chassis engine, both engines must be started once a month.

► Start the engine once a month.

The specified maintenance interval must be observed even if the crane is in storage.

► Service the crane according to the maintenance interval.

6.4 Returning to service

NOTICE

Impermissible start up!

Damage to the crane.

- Make sure that the crane is supplied with approved lubricants.
- Make sure that the oil levels are correct.
- Only operate the crane in a perfect condition.

In the case of cranes with a superstructure engine and a chassis engine, the batteries must be installed in the chassis and superstructure.

- ▶ Install the batteries properly.
- ▶ Turn on the battery master switch.
- ▶ Put the crane in operation.

7 Disposal

7.1 Operating fluids and lubricants



WARNING

Operating items and lubricants are dangerous waste products!

- ▶ Dispose of operating fluids and lubricants separately.
- ▶ Service items and lubricants may **not** be disposed of in the ground, bodies of waters, wastewater systems, sewers or in the groundwater.
- ▶ Dispose of operating items and lubricants in an environmentally safe manner.
- ▶ When disposing operating items and lubricants observe and follow the valid regulations of the relevant authorities.

Service items and lubricants are:

- Fuels
- Coolant
- Urea
- Engine oils, gear oils
- Hydraulic fluids
- Brake fluids
- Window washer concentrate
- Greases

7.2 Batteries



WARNING

Batteries contain harmful substances!

- ▶ Do **not** dispose of batteries in regular household trash.
- ▶ Collect batteries separately and send them for environmentally safe disposal.
- ▶ Leave batteries at a qualified workshop or at a collection points for used batteries.

7.3 Disposing of the machine

After the end of its service life, the crane must be made unusable by cutting the load bearing crane structures, and in particular the steel structures. This can be done by means of flame cutting.

After the machine's service life has ended:

- ▶ Make the machine unusable.
- ▶ Separate the metals and send them for recycling.

If the counterweights are made of concrete:

- ▶ Brake the steel parts out of the counterweight. Dispose of the concrete or recycle it.

Rope pulleys and bearing shoes in the boom are made out of PA6.

Due to the markings on the plastic parts, it is possible to dispose of them properly.

- ▶ Separate the plastic parts and send them for recycling.

7.02 Maintenance intervals - Crawler chassis

1 Maintenance and inspection schedule

3

Fig.195219

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1 Maintenance and inspection schedule



Note

- ▶ Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor.
- ▶ The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also.
- ▶ The operating hour meter of the crawler travel gear is the determining factor for the operator hour intervals.
- ▶ The „crawler travel gear“ operating hour meter* is located in the control cabinet.

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|-------------------------------------|--------------------------|-------|--------|--------------------|--------|----------|--|------|
| | 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 | |
| Rigging and fastening points | | | | | | | | |
| | | | | X ²⁾ | | | Check condition and mounting | □ |
| | | | | | | X | Check for continued suitability by expert | |

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| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|-------------------------|--------------------------|-------|--------|--------------------|---------------|---------------|--|------|
| | 10 h | 100 h | 1000 h | Daily | Weekly | Annually | | |
| Travel gear | | | | | | | | □ |
| | | X | | | | | Check for leaks | |
| | X | | | | | | Grease the sprocket bearing if it is not lubricated via the central lubrication system | |
| | | X | | | | | Check the tightness of the mounting screws | |
| | | 500 h | | | | | Check the gear oil via oil analysis | |
| 200 h | | | 1000 h | | | Every 4 years | Change the gear oil | |
| Crawler carrier | | | | | | | | □ |
| | | X | | | | | Check track rollers, carrier rollers with oil lubrication for leaks | |
| | X | | | | | | Grease the track rollers, carrier rollers if it is not lubricated via the central lubrication system | |
| | X | | | | Every 4 weeks | | Check the wear on the roll off surfaces of the track rollers / carrier rollers, replace the track rollers / carrier rollers if necessary | |
| | X | | | | Every 4 weeks | | Check for wear on the glide rails | |
| | | | | | | X | Grease guide rails on sliding section | |
| | | | | | | X | Lubricate the consoles | |
| | | | | | Every 4 weeks | | Lubricate the connector pins between crawler carrier and crawler center section or crawler carrier and cross carriers | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|--|--------------------------|-------|--------|--------------------|---------------|-----------------|--|--------------------------|
| | 10 h | 100 h | 1000 h | Daily | Weekly | Annually | | |
| Crawler chain | | | | | | | | <input type="checkbox"/> |
| | | X | | | | | Check the connector pin retainer | |
| | | X | | | | | Check for damage | |
| | X | | | | Every 4 weeks | | Check the chain tension, retension the track chain if necessary | |
| | X | | | | | | Check the wear on the bores of the track pads, replace track pads if necessary | |
| | X | | | | | | Check the wear on the connector pins of the track pads, replace pins if necessary | |
| | X | | | | Every 4 weeks | | Check the wear on the roll off surfaces of the track pads / track rollers, replace track pads if necessary | |
| | | | | | Every 4 weeks | | Check the wear on the sprocket wheels and the transport cams of the track pads | |
| Assembly support | | | | | | | | <input type="checkbox"/> |
| | | | | | X | | Check the hydraulic cylinder for leaks | |
| | | | | | | X | Check support beam for ease of movement, grease | |
| | | | | | | X | Lubricate the bearing points of the support beams | |
| | | | | | | X | Check sight gauge, adjust if necessary | |
| Crane support | | | | | | | | <input type="checkbox"/> |
| | | | | | X | | Check the hydraulic cylinder for leaks | |
| | | | | | | X | Check support beams for ease of movement, grease | |
| | | | | | | X | Lubricate the struts | |
| | | | | | | X | Lubricate the mounting pins on the struts | |
| | | | | | | X | Lubricate the support pad bearing | |
| Concrete ballast plates / concrete catwalks (central ballast) (only LR1500) | | | | | | | | |
| | | | | X | | | Check for damage | |
| | | | | | | X ⁴⁾ | Have an authorized inspector check that the fastening points are fit tightly and for continued suitability | |

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| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|-----------------------------------|--------------------------|-------|--------|--------------------|------------------------------|----------|--|------|
| | 10 h | 100 h | 1000 h | Daily | Weekly | Annually | | |
| Pin connections | | | | | | | | |
| | | | | | Every 2 months ³⁾ | | Check the retainer of the pin connections | □ |
| | | | | | Every 2 months ³⁾ | | Check the pins and / or connector elements for damage, visual inspection | |
| | | | | | Every 2 months ³⁾ | | Check the retaining elements for damage, visual inspection | |
| Rotary connection | | | | | | | | |
| | | | X | | | | Lubricate (grease lubrication) | □ |
| Hydraulic cylinder | | | | | | | | |
| | | | | | X | | Check for leaks | □ |
| Hydraulic hose lines | | | | | | | | |
| | | | | X | | | Check for leaks and damage | □ |
| | | | | | | X | Have safe working condition checked by expert | |
| Central lubrication system | | | | | | | | |
| | | | | | Every 6 months ¹⁾ | | Carry out intermediate lubrication (with central lubrication system with control unit) | □ |
| | | X | | | | | Check for correct function | |
| | 8 h | | | X | | | Check the lubricant level | |

- 1) if the crane is not moved: every 3 months
2) before every start up: perform a visual inspection
3) also for cranes used for a long period of time
4) and at each assembly / disassembly

7.02.50 Maintenance intervals - Ballast trailer

1 Maintenance and inspection schedule

3

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Fig.195219

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1 Maintenance and inspection schedule



Note

- ▶ Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor!
- ▶ The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also!

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|-------------------------------------|--------------------------|-------|--------|--------------------|--------|---------------|--|------|
| | 10 h | 100 h | 1000 h | Daily | Weekly | Annually | | |
| Fall protection equipment | | | | | | | | |
| | | | | | | X | Check protection points | |
| | | | | | | X | Check safety ropes | |
| | | | | | | X | Check the ladders for technically immaculate condition | |
| | | | | | | X | Check railings, steps and pedestals for safe function | |
| | | | | | | X | Check catwalks and open mesh flooring for safe function | |
| Ballast trailer surface | | | | | | | | |
| | | | | | X | | Check accessible surfaces for cleanliness | |
| | | | | | | X | Check accessible surfaces for completeness and slip resistance | |
| | | | | | | X | Check labels for completeness and legibility | |
| Rigging and fastening points | | | | | | | | |
| | | | | X ²⁾ | | | Check condition and mounting | |
| | | | | | | X | Check for continued suitability by an authorized inspector, inspection expert | |
| Tires | | | | | | | | |
| | | | | | X | | Check for external damage and distortion | |
| | | | | | X | | Check the tire pressure | |
| | X | | | | | | Check lug nuts for tight seating, retighten if necessary | |
| | | | | | | Every 5 years | Replace tires; have further service life confirmed by a tire manufacturer expert | |
| Axle link | | | | | | | | |
| | | | | | | X | Lubricate | |
| Hydraulic cylinder | | | | | | | | |
| | | | | | X | | Check for leaks | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|-----------------------------------|--------------------------|-------|--------|--------------------|------------------------------|---------------|--|------|
| | 10 h | 100 h | 1000 h | Daily | Weekly | Annually | | |
| Hydraulic hose lines | | | | | | | | |
| | | | | X | | | Check for leaks and damage | |
| | | | | | | X | Check for a safe condition by an authorized inspector, inspection expert | |
| Travel drive | | | | | | | | |
| | | | | | | X | Check the mounting screws for tight seating | |
| | | | | | X | | Check for leaks | |
| | | | | | | X | Check the oil level | |
| | | | | | | Every 5 years | Change the gear oil if necessary | |
| Slewing gear | | | | | | | | |
| | | | | | | X | Check the mounting screws for tight seating | |
| | | | | | X | | Check for leaks | |
| | | | | | | X | Check the oil level | |
| | | | | | | Every 5 years | Change the gear oil if necessary | |
| Central lubrication system | | | | | | | | |
| | | | | X | | | Check grease supply of central lubrication system. Fill the reservoir if the grease supply has dropped below 1/4 of the reservoir content. | |
| | | | | | | X | Check for correct function | |
| Pin connections | | | | | | | | |
| | | | | | Every 2 months ³⁾ | | Check the retainer of the pin connections | |
| | | | | | Every 2 months ³⁾ | | Check the pins and / or connector elements for damage, visual inspection | |
| | | | | | Every 2 months ³⁾ | | Check the retaining elements for damage, visual inspection | |
| Emergency control | | | | | | | | |
| | | | | | | X | Check for correct function | |

²⁾ before every start up: checking visually

³⁾ also for cranes used for a long period of time

7.03 Maintenance intervals - Crane superstructure

1 Maintenance and inspection schedule

2

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1 Maintenance and inspection schedule



Note

- ▶ Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor!
- ▶ The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also!

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|--|--------------------------|-------|--------|--------------------|--------|----------|---|--------------------------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Safety systems | | | | | | | | <input type="checkbox"/> |
| | | | | | | X | Personal protective equipment Follow the instructions of the manufacturer | |
| | | | | | | X | Height rescue system Follow the instructions of the manufacturer | |
| Fall protection equipment | | | | | | | | <input type="checkbox"/> |
| | | | | | | 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 | | | | | | | | <input type="checkbox"/> |
| | | | | | X | | Check accessible surfaces for cleanliness | |
| | | | | | | X | Check accessible surfaces for completeness and slip resistance | |
| | | | | | | X | Check labels for completeness and legibility | |
| Rigging and fastening points | | | | | | | | <input type="checkbox"/> |
| | | | | X ²⁾ | | | Check condition and mounting | |
| | | | | | | X | Check for continued suitability by an authorized inspector, inspection expert | |
| Load handling equipment and assembly aids | | | | | | | | <input type="checkbox"/> |
| | | | | X ²⁾ | | | Check for cracks, damage, wear and distortion | |
| | | | | | | X | Check for continued suitability by an authorized inspector, inspection expert | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|--|--------------------------|-------|--------|--------------------|---------------|---------------|---|------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Fastening equipment and load securing devices | | | | | | | | |
| | | | | X ²⁾ | | | Observe and adhere to the manufacturer's instructions | ☐ |
| | | | | X ²⁾ | | | Check the grommets and cable laid fastening rope for damage, operational safety, proper identification. Take-down criteria, see chapter 8.01 | |
| | | | | | | X | Have the fastening equipment checked by an authorized person, authorized inspector | |
| Fire extinguishing system | | | | | | | | |
| | | | | | | X | Carry out a visual inspection of the system For all other maintenance tasks, observe the instructions of the fire extinguisher manufacturer. | ☐ |
| | | | | | | Every 5 years | Replace trigger elements and extinguisher tank. | |
| Diesel engine | | | | | | | | |
| | | | | X | | | Check the oil level For all other maintenance tasks, observe the instructions of the engine manufacturer | ☐ |
| Cooling system | | | | | | | | |
| | | | | X | | | Check the coolant level in the expansion tank | ☐ |
| | | | 6000 h | | | Every 4 years | Replace the coolant if filled with Liebherr Antifreeze OS Mix | |
| | | | 3000 h | | | Every 2 years | Replacing the coolant | |
| SCR Exhaust aftertreatment | | | | | | | | |
| | | | 4500 h | | | Every 2 years | Replace foam and filter element of urea pump | ☐ |
| Heating-air conditioning device | | | | | | | | |
| | | | | | Every 4 weeks | | Operate the climate control system for 15 min and check the function | ☐ |
| | | | | | | X | Replacing the filter insert | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|---|--------------------------|-------|--------|--------------------|------------------------------|------------------|---|------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Cab auxiliary heater*, Engine preheating auxiliary heater* | | | | | | | | □ |
| | | | | X | | | Check the fill level of the fuel container | |
| | | | | X | | | Check the fill level in the expansion tank | |
| | | | | | Every 4 weeks ⁸⁾ | | Operate the auxiliary heater for 15 min and check the function | |
| | | | | | X ⁹⁾ | | Operate the auxiliary heater for 15 min and burn-off the burner | |
| | | | | | | X ¹²⁾ | Have the water heater checked by an authorized and trained service technician | |
| | | | | | | X ¹²⁾ | Have the air heater checked by an authorized and trained service technician | |
| | | | | | | Every 2 years | Have the fluid in the heating system replaced by an authorized and trained service technician | |
| | | | 3000 h | | | | Have the burner of the heating system replaced by an authorized and trained service technician | |
| | | | | | | Every 10 years | Have the heat exchanger of the heater replaced by an authorized and trained service technician | |
| Air filter | | | | | | | | □ |
| | | | | | X | | Check monitoring device | |
| | | | | | | X | Clean, change the filter insert Observe the instructions of the engine manufacturer | |
| Slewing ring connection | | | | | | | | □ |
| | X | | | | | | Lubricate the gears | |
| | | | | | | X ¹⁾ | Lubricating the slewing ring connection | |
| | | | | | Every 6 months ¹⁾ | | Drain water on the water drain bores of the slewing ring connection (only LTM 11200-9.1, LTR 11200) | |
| 250 h | | | 1500 h | | | X | Check the tightness of the mounting screws | |
| | | | | | | X | Checking the tilt play | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|--------------------------|--------------------------|-------|----------------------|--------------------|----------------------------------|-----------------|--|------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Winches | | | | | | | | |
| 250 h | | | X | | | X | Check the tightness of the mounting screws | □ |
| | | | | X | | | Check for leaks | |
| | | | | | X ⁶⁾ | | Check the oil level | |
| 250 h | | | 3000 h | | | Every 4 years | Change the gear oil | |
| | | | 1500 h ⁴⁾ | | | X ⁴⁾ | Lubricate the space between V-ring / winch bearing (only for winches with a winch bearing that is lubricated with a grease fitting) | |
| | | | 200 h | | | X | Check the condition of the tooth flanks; determining factor are the operating hours of the winch (only for winches with gear ring drive) | |
| | | | | | | X | Check the remaining theoretical service life by an authorized inspector | |
| | | | | | | Every 4 years | Check the remaining theoretical utilization life by an inspection expert | |
| Winch brakes | | | | | | | | |
| | | | | X | | | Check for leaks | □ |
| | | | | | | X | Check for correct function | |
| Relapse supports | | | | | | | | |
| | | | | | Every 3 months ^{5), 6)} | | Lubricating the bearings | □ |
| X ^{2), 6)} | | | | | | | Check the oscillation guard for easy movement | |
| Relapse cylinder | | | | | | | | |
| X ^{2), 6)} | | | | | X | | Check for leaks | □ |
| | | | | | Every 3 months ^{5), 6)} | | Lubricating the bearings | |
| X ^{2), 6)} | | X | | | | X | Check pretension pressure (nitrogen) | |
| X ^{2), 6)} | | X | | | | X | Check the oil quantity | |
| Pneumatic springs | | | | | | | | |
| X ^{2), 5), 6)} | | X | | | | X | Check for correct function | |

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| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|--|--------------------------|-----------------|--------|--------------------|---------------------|---------------|--|------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| A-frame | | | | | | | | □ |
| | | X | | | | | Lubricate the bearing | |
| X ^{2), 6)} | | | | | | X | Check the lever for the limit switch on the A-frame 3 for easy movement and reset of spring | |
| X ^{2), 6)} | | | | | | X | Check the rods with guide rail on the A-frame 2 and A-frame 3 for easy movement and distortion | |
| Counterweight frame | | | | | | | | □ |
| | | | | | | X | Check the cylinder stroke of the locking pin on the swinging arms (only LTM 1450-8.1) | |
| Counterweight | | | | | | | | □ |
| 1000 km | | or 10,000 km | | | | X | Check tightening torque of mounting screws | |
| Concrete ballast plates (ballast container) (only LR 13000) | | | | | | | | □ |
| | | | | X | | | Check for damage | |
| | | | | | | Every 5 years | Check by licensing agency | |
| Ballasting | | | | | | | | □ |
| | X | | | | | X | Lubricating the bearings | |
| | | | | | | X | Check the swing play (only LTM 11200-9.1) | |
| | | | | | | X | Check the braid ropes (only LTM 11200-9.1) | |
| Press on pulleys of rope winches | | | | | | | | □ |
| | X | | | | | X | Grease guides | |
| Rope pulleys | | | | | | | | □ |
| | | | | | X ^{5), 6)} | | Check groove base for cleanliness | |
| | | | X | | | X | Check for wear, damage, cracks and easy movement | |
| | | | 3000 h | | | Every 3 years | Lubricate the bearings | |
| Carrier rollers | | | | | | | | □ |
| | | | | X ²⁾ | | | Check for damage and distortion | |
| | | | X | | | X | Check for wear, damage and easy movement | |
| | | | X | | | X | Check the tightness of the mounting screws | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|---|--------------------------|-------|--------|--------------------|------------------------------|-----------------|---|------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Crane cab | | | | | | | | |
| | | | | X | | | Check instruments for function | □ |
| | | | | X | | | Check indicator lights for function | |
| | | | | | | X | Replace the filter insert for switch cabinet ventilation | |
| | | | | X | | | Check fluid level in expansion tank of engine regulation | |
| | | X | | | | X | Check the sliding or incline device for function | |
| | | X | | | | X | Lubricate the bearings of the sliding or incline device | |
| | | X | | | | X ⁷⁾ | Check the lift device (telescope arm) for function | |
| | | X | | | | X ⁷⁾ | Lubricate the bearings of the lift device and telescope arm | |
| Window washing bays, camera washing bays | | | | | | | | |
| | | | | X | | | Check the fluid level in the reservoir for the washing bays | □ |
| Overload protection | | | | | | | | |
| | | | | X | | | Check for correct function | □ |
| | | X | | | | X | Check length sensor for function | |
| | | X | | | | X | Check length sensor rope for damage | |
| Remote diagnostics device | | | | | | | | |
| | | | | | | X | Check for correct function | □ |
| | | | | | | X | Check the validity of the SIM card | |
| Electrical system | | | | | | | | |
| | | | | | | X | Cable connections | □ |
| | | | | | Every 6 months ³⁾ | | Service the batteries | |
| | | | | | Every 6 months ³⁾ | | Empty the acid collection container | |
| | | | | | | X ⁵⁾ | Replace the interior compartment filter of the switch cabinet ventilation | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|------------------------------|--------------------------|--------------|--------|--------------------|-------------------------------|---------------|--|------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Fuel system | | | | | | | | □ |
| | | | | X | | | Check for leaks | |
| | | | | | | X | Check condition and mounting | |
| | | | | | | X | Drain off water and sediments | |
| | | | | | | X | Clean preliminary filter for auxiliary fuel pump | |
| | Every 50 h | | | | | | Check fuel preliminary filter, drain off water if necessary | |
| | | Every 1000 h | | | | | Replace the fuel preliminary filter | |
| Slewing gear | | | | | | | | □ |
| 250 h | | | X | | | X | Check the tightness of the mounting screws | |
| | | | | X | | | Check for leaks | |
| | | | | | X | | Check the oil level | |
| 250 h | | | 3000 h | | | Every 4 years | Change the gear oil | |
| Slewing gear brakes | | | | | | | | □ |
| | | | | X | | | Check for leaks | |
| | | | | | | X | Check for correct function | |
| Turntable lock | | | | | | | | □ |
| | | X | | | | X | Grease | |
| | | X | | | | X | Check for correct function | |
| Bearings | | | | | | | | □ |
| | | | | | | X | Checking the retaining elements | |
| Pin connections | | | | | | | | □ |
| | | | | | Every 2 months ¹⁰⁾ | | Check the retainer of the pin connections | |
| | | | | | Every 2 months ¹⁰⁾ | | Check the pins and / or connector elements for damage, visual inspection | |
| | | | | | Every 2 months ¹⁰⁾ | | Check the retaining elements for damage, visual inspection | |
| Pump distributor gear | | | | | | | | □ |
| | | | | X | | | Check for leaks | |
| | | | | | X | | Check the oil level | |
| 500 h | | | 1500 h | | | X | Change the gear oil | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|--|--------------------------|-----------------|--------|--------------------|---|-----------------|--|------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Miter gear crane drive | | | | | | | | |
| | | | | | X | | Check for leaks | □ |
| | X | | | | | | Check mounting | |
| 100 h | | | 1500 h | | | X | Oil change | |
| Hydraulic hose lines | | | | | | | | |
| | | | | X | | | Check for leaks and damage | □ |
| | | | | | | X | Check for a safe condition by an authorized inspector, inspection expert | |
| Hydraulic system | | | | | | | | |
| | | | | X | | | Check the oil level | □ |
| | | | | | X | | Check for leaks | |
| 250 h | | X | | | | X | Replace the servo pressure and replenishing pressure filter inserts | |
| 250 h | | X | | | | X | Replace return filter inserts (only for cranes with open hydraulic circuit) | |
| 250 h | | X | | | | X | Replace bleeder filter of hydraulic tank | |
| 500 h | | | X | | | X | Check hydraulic oil, required degree of purity: 20/18/15 Take an oil sample and have it checked by the oil supplier | |
| | | | | | | | | |
| Hydraulic cylinder | | | | | | | | |
| | | | | | X | | Check for leaks | □ |
| | | | | | Every 3 months <small>5), 6)</small> | | Lubricating the bearings | |
| Hydraulic pressure accumulator (nitrogen) | | | | | | | | |
| | | X ⁴⁾ | | | | X ⁴⁾ | Check pretension pressures | □ |
| Hydraulic coupling system LIKUFIX | | | | | | | | |
| | | | | X ^{2) 6)} | | | Check for leaks, dirt and lubricate the guides | □ |
| Compressed air system | | | | | | | | |
| | | | | | X | | Check for leaks | □ |
| | | | | | X | | Check operating pressure | |
| | | | | | X | | Check shut off pressure | |
| | | | | | X | | Check operation of automatic drain valve | |
| | | | | | | X | Replace air dryer granular cartridges | |
| | | | | | | X | Clean air dryer preliminary filter | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|--|--------------------------|-------|--------|--------------------|------------------------------|-------------------------------|--|------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Central lubrication system | | | | | | | | □ |
| | | | | | Every 6 months ¹⁾ | | Carrying out an intermediate lubrication | |
| | | X | | | | | Check for correct function | |
| | | | | | X | | Check the grease container fill level | |
| Emergency control | | | | | | | | □ |
| | | | | | | X | Check for correct function | |
| Suspended ballast | | | | | | | | □ |
| | | | | | | X | Check the fall protection equipment | |
| | | | | | | X | Check frame, suspension and guide section for distortion and cracks | |
| Crane superstructure | | | | | | | | □ |
| | | | | | X ¹¹⁾ | | Wash the crane superstructure | |
| | | | | | | Every 6 months ¹¹⁾ | Check the crane superstructure for corrosion and paint damage | |
| Crane superstructure, protected against corrosion | | | | | | | | □ |
| | | | | | | Every 6 months | Check the corrosion protection for wear, and if necessary reapply protection | |
| | | | | | | Every 2 months | Check the corrosion protection on mechanically machined, blank surfaces for wear and reapply the corrosion protection if necessary | |
| | | | | | | Every 3 months | Check the corrosion protection on the chrome-plated piston rods for wear, and if necessary reapply the corrosion protection | |

- 1) if the crane is not moved: every 3 months
2) before every start up: Perform a visual inspection
3) in hot climate zones: every 3 months
4) observe maintenance instructions - crane superstructure, chapter 7.05
5) and as necessary
6) and during assembly
7) in Great Britain: every 6 months
8) outside of the heating period
9) during the heating period
10) also for cranes used for a long period of time
11) each time after the crane is used if possible
12) before and after every heating period

7.03.50 Maintenance intervals - Crane boom

1 Maintenance and inspection schedule

3

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Fig.195219

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1 Maintenance and inspection schedule



Note

- ▶ Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor!
- ▶ The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also!

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|--|--------------------------|-------|--------|--------------------|--------|----------|---|------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Safety systems | | | | | | | | |
| | | | | | | X | Personal protective equipment Follow the instructions of the manufacturer | □ |
| | | | | | | X | Height rescue system Follow the instructions of the manufacturer | |
| Fall protection equipment | | | | | | | | |
| | | | | | | X | Check protection points | □ |
| | | | | | | X | Check safety ropes | |
| | | | | | | X | Check the ladders for technically immaculate condition | |
| | | | | | | X | Check railings, steps and pedestals for safe function | |
| | | | | | | X | Check catwalks and open mesh flooring for safe function | |
| Surface of crane boom | | | | | | | | |
| | | | | | X | | Check accessible surfaces for cleanliness | □ |
| | | | | | | X | Check accessible surfaces for completeness and slip resistance | |
| | | | | | | X | Check labels for completeness and legibility | |
| Rigging and fastening points | | | | | | | | |
| | | | | X ²⁾ | | | Check condition and mounting | □ |
| | | | | | | X | Check for continued suitability by an authorized inspector, inspection expert | |
| Load handling equipment and assembly aids | | | | | | | | |
| | | | | X ²⁾ | | | Check for cracks, damage, wear and distortion | □ |
| | | | | | | X | Check for continued suitability by an authorized inspector, inspection expert | |

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| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|--|--------------------------|-------|--------|--------------------|----------------------------------|---------------|---|--------------------------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Fastening equipment and load securing devices | | | | | | | | <input type="checkbox"/> |
| | | | | X ²⁾ | | | Observe and adhere to the manufacturer's instructions | |
| Lattice sections | | | | | | | | <input type="checkbox"/> |
| | | | | | | X | Check cracks, damage and distortion | |
| | | | | | | X | Check protection points | |
| | | | | | | X | Check safety ropes | |
| | | | | | | X | Check railings and pedestals for safe function | |
| | | | | | | X | Check catwalks and open mesh flooring for safe function | |
| X ⁶⁾ | | | | | | X | Grease the lube points of lattice sections | |
| Guy rods | | | | | | | | <input type="checkbox"/> |
| | | | | | | X | Check for cracks, damage and distortion by an authorized person | |
| | | | | | | Every 4 years | Check cracks, damage and distortion by an authorized inspector | |
| | | | | | | X | Checking the retaining elements | |
| | | | | | | X | Check labels for completeness and legibility | |
| X ⁶⁾ | | | | | | X | Lubricate the lube points of guy rods | |
| Fiber guy ropes | | | | | | | | <input type="checkbox"/> |
| | | | | | Every 3 months ⁷⁾ | | Check braid and intermediate layers for damage and distortion | |
| | | | | | Every 3 months ⁷⁾ | | Check rope end connections for cracks, damage and distortion | |
| | | | | | Every 3 months ⁷⁾ | | Check rope grommet transitions for damage and distortion | |
| Relapse supports | | | | | | | | <input type="checkbox"/> |
| | | | | | Every 3 months ^{5), 6)} | | Lubricating the bearings | |
| X ^{2), 6)} | | | | | | | Check the oscillation guard for easy movement | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|--|--------------------------|-----------------|--------|--------------------|----------------------------------|-----------------|--|--------------------------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Relapse cylinder | | | | | | | | <input type="checkbox"/> |
| X ^{2), 6)} | | | | | X | | Check for leaks | |
| | | | | | Every 3 months ^{5), 6)} | | Lubricating the bearings | |
| X ^{2), 6)} | | X | | | | X | Check pretension pressure (nitrogen) | |
| X ^{2), 6)} | | X | | | | X | Check the oil quantity | |
| Hydraulic hose lines | | | | | | | | <input type="checkbox"/> |
| | | | | X | | | Check for leaks and damage | |
| | | | | | | X | Check for a safe condition by an authorized inspector, inspection expert | |
| Hydraulic cylinder | | | | | | | | <input type="checkbox"/> |
| | | | | | X | | Check for leaks | |
| | | | | | Every 3 months ^{5), 6)} | | Lubricating the bearings | |
| Hydraulic pressure accumulator (nitrogen) | | | | | | | | <input type="checkbox"/> |
| | | X ⁴⁾ | | | | X ⁴⁾ | Check pretension pressures | |
| Rope pulleys | | | | | | | | <input type="checkbox"/> |
| | | | | | X ^{5), 6)} | | Check groove base for cleanliness | |
| | | | X | | | X | Check for wear, damage, cracks and easy movement | |
| | | | 3000 h | | | Every 3 years | Lubricate the bearings | |
| Carrier rollers | | | | | | | | <input type="checkbox"/> |
| | | | | X ²⁾ | | | Check for damage and distortion | |
| | | | X | | | X | Check for wear, damage and easy movement | |
| | | | X | | | X | Check the mounting screws for tight seating | |
| Auxiliary guying | | | | | | | | <input type="checkbox"/> |
| | | | | | | X ⁶⁾ | Check the rope connection between the guy point and the lattice section | |
| | | | | | | X ⁶⁾ | Check cracks, damage and distortion | |

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| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|-------------------------|--------------------------|-------|--------|--------------------|------------------------------|---------------|--|--------------------------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Pin connections | | | | | | | | <input type="checkbox"/> |
| | | | | | Every 2 months ⁸⁾ | | Check the retainer of the pin connections | |
| | | | | | Every 2 months ⁸⁾ | | Check the pins and / or connector elements for damage, visual inspection | |
| | | | | | Every 2 months ⁸⁾ | | Check the retaining elements for damage, visual inspection | |
| Crane ropes | | | | | | | | <input type="checkbox"/> |
| | | | | X | | | Check for damage and distortion | |
| | | | | | Monthly ⁵⁾ | | Check, grease by expert personnel | |
| | | | | | | X | Check by an authorized inspector | |
| | | | | | | Every 4 years | Check by an inspection expert | |

| First maintenance after | Operating hour intervals | | | Calendar intervals | | | Work to be carried out | O.K. |
|-------------------------|--------------------------|-------|--------|--------------------|------------------------------|---------------|--|------|
| | 250 h | 500 h | 1000 h | Daily | Weekly | Annually | | |
| Hook blocks | | | | | | | | |
| | | | | X ³⁾ | | | Check of the load hook for distortion, wear, damage and cracks by the crane operator | □ |
| | | | X | | | X | Check rope pulleys for distortion, wear, damage and cracks | |
| | | | 3000 h | | | Every 3 years | Lubricate rope pulley bearings | |
| | 100 h | | | | Every 3 months ⁵⁾ | | Lubricate pressure bearings | |
| | 100 h | | | | Every 3 months ⁵⁾ | | Lubricate radial bushing | |
| | 100 h | | | | Every 3 months ⁵⁾ | | Lubricate suspension of hook beam | |
| | | | | | Every 6 months ⁵⁾ | | Replace batteries on incline sensor | |
| | | | | | | X | Load hook: Check distance dimension (y) | |
| | | | | | | X | Check of the load hook for distortion, wear, damage and cracks by an authorized person | |
| | | | | | | Every 4 years | Check of the load hook for distortion, wear, damage and cracks by an inspection expert | |

²⁾ before every start up: checking visually

³⁾ before starting crane operation: checking visually

⁴⁾ observe maintenance instructions - crane superstructure, chapter 7.05

⁵⁾ and as necessary

⁶⁾ and during assembly

⁷⁾ by authorized and trained expert personnel with boom taken down and before every erection procedure

⁸⁾ also for cranes used for a long period of time

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7.04 Maintenance instructions - Crane chassis

| | | |
|---|---|----|
| 1 | Servicing the travel gear | 3 |
| 2 | Servicing the central lubrication system of the crawler carrier | 11 |
| 3 | Servicing the track chain | 17 |
| 4 | Ladders | 29 |

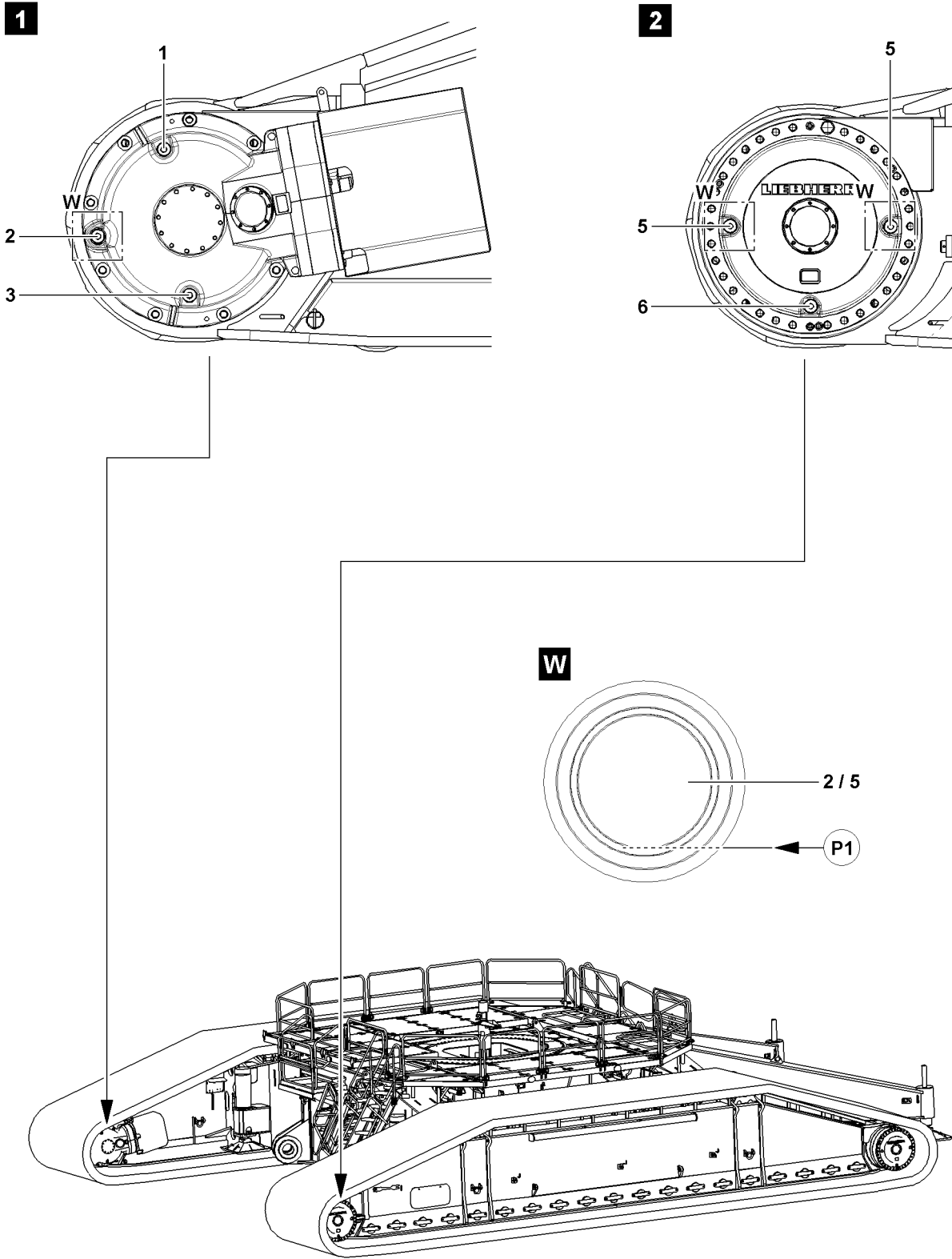


Fig.110052

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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 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 the gear must be checked independently of each other.

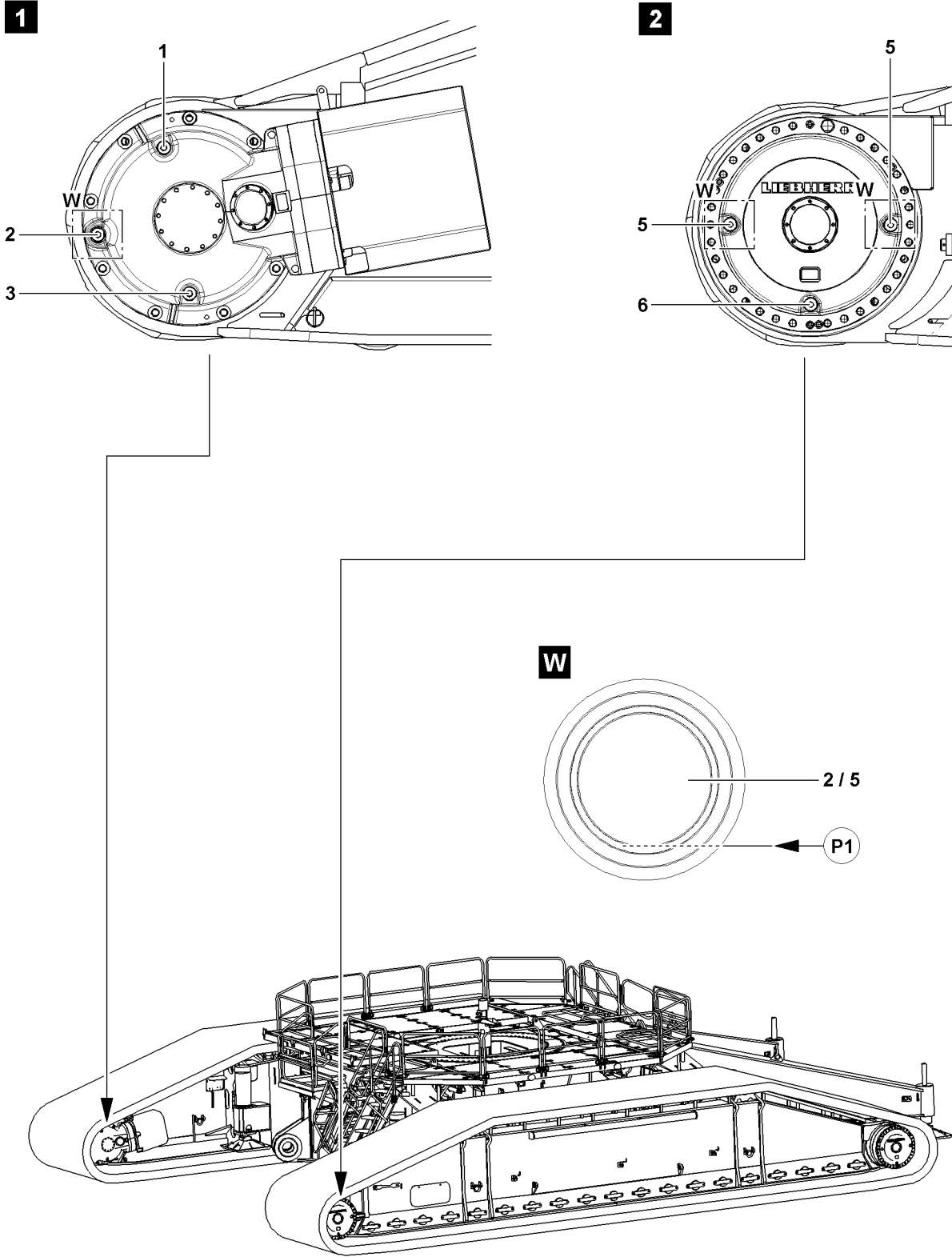


Fig.110052

LWE/LR 11350-007/19005-01-02/en

1.1 Checking for leaks

- ▶ Check visually to ensure that the travel gears do not leak.

1.2 Checking the 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 at 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.

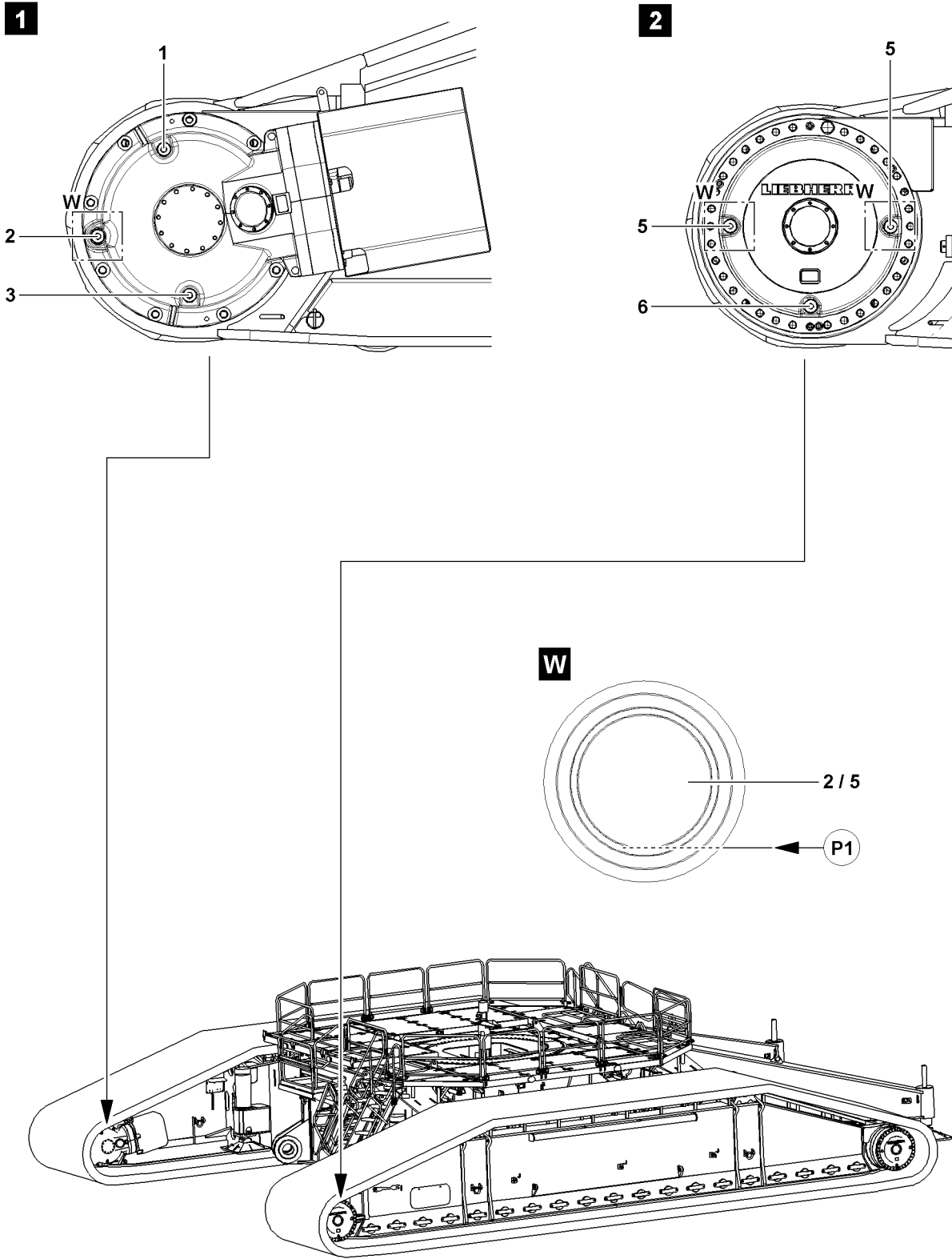


Fig.110052

LWE/LR 11350-007/19005-01-02/en

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 used 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.

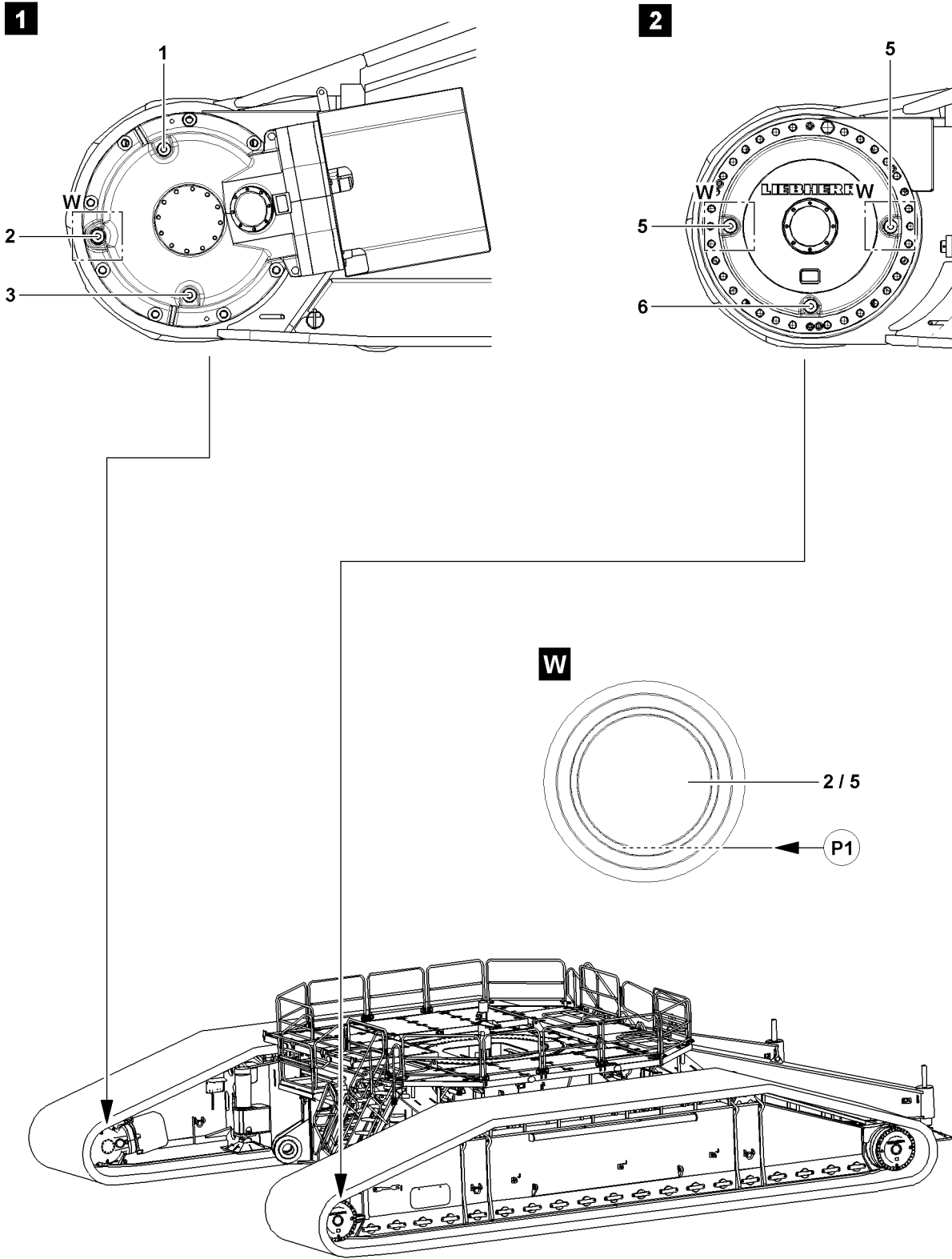


Fig.110052

LWE/LR 11350-007/19005-01-02/en

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 used 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.

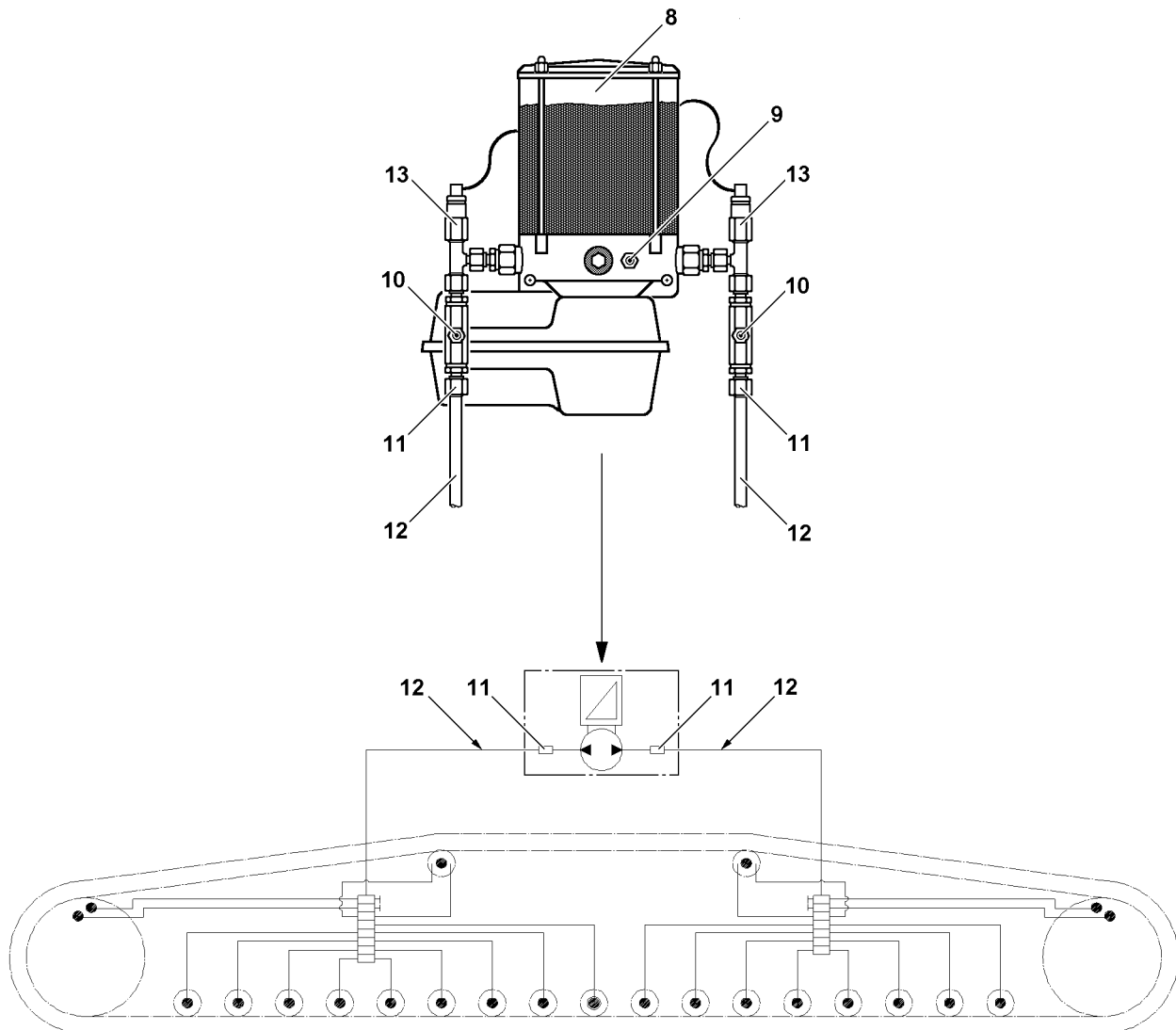


Fig.110102

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
 - Fill 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** with an external grease pump via the grease fitting **9**.

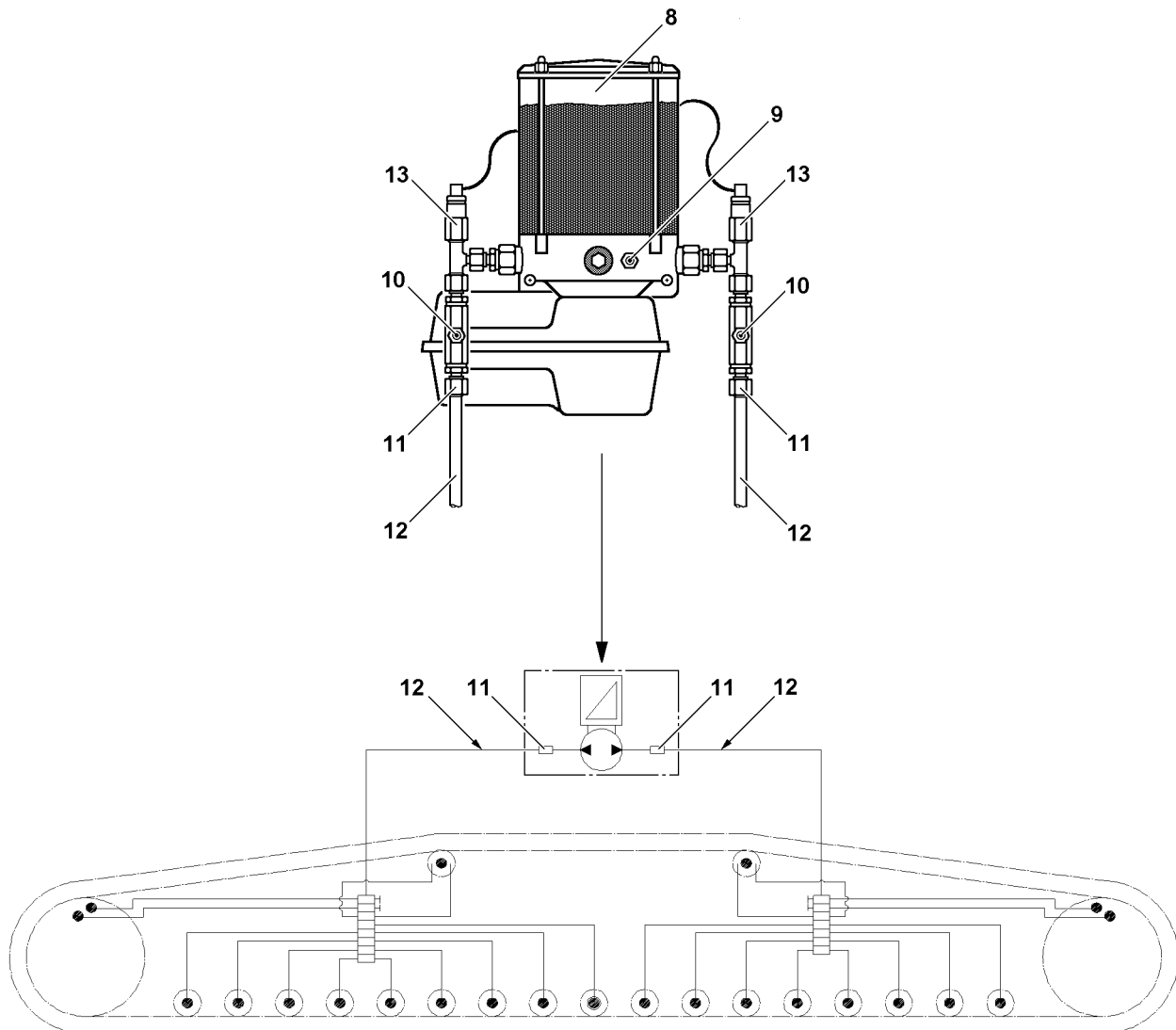


Fig.110102

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 diagram.

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** with 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**.
 - ▶ Reconnect the main line **12**.
 - ▶ Actuate the foot rocker / manual control lever again until grease emerges again on at least one of the lube points in the bled lubrication circuit.

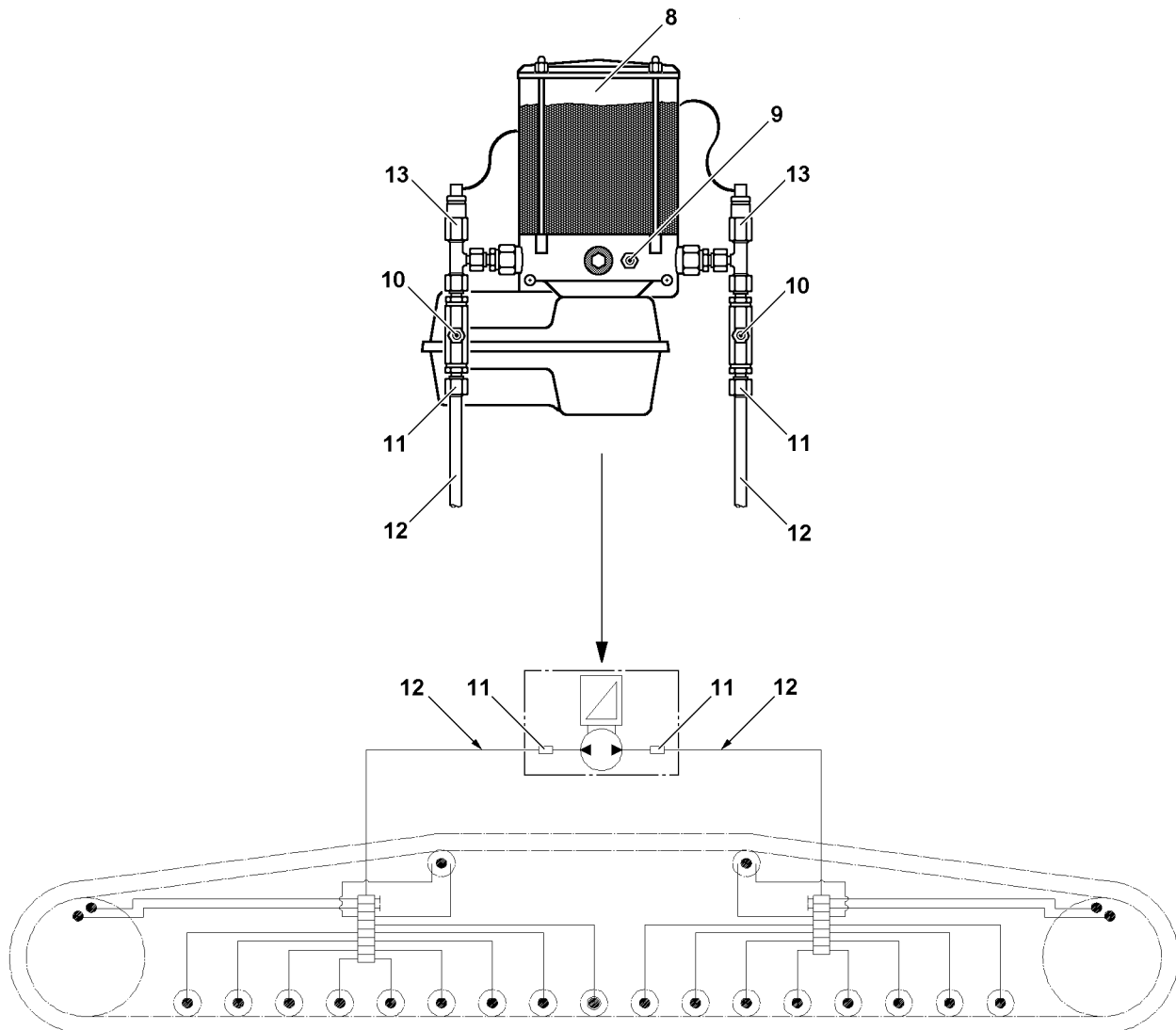


Fig.110102

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** with 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 every 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**.
- ▶ Reconnect the main line **12**.
- ▶ Actuate the grease pump again until grease emerges again on at least one of the lube points in the bled lubrication circuit.

2.3 Bleeding repaired lubrication lines

NOTICE

Insufficient lubrication!

If there is air in the lubrication 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.

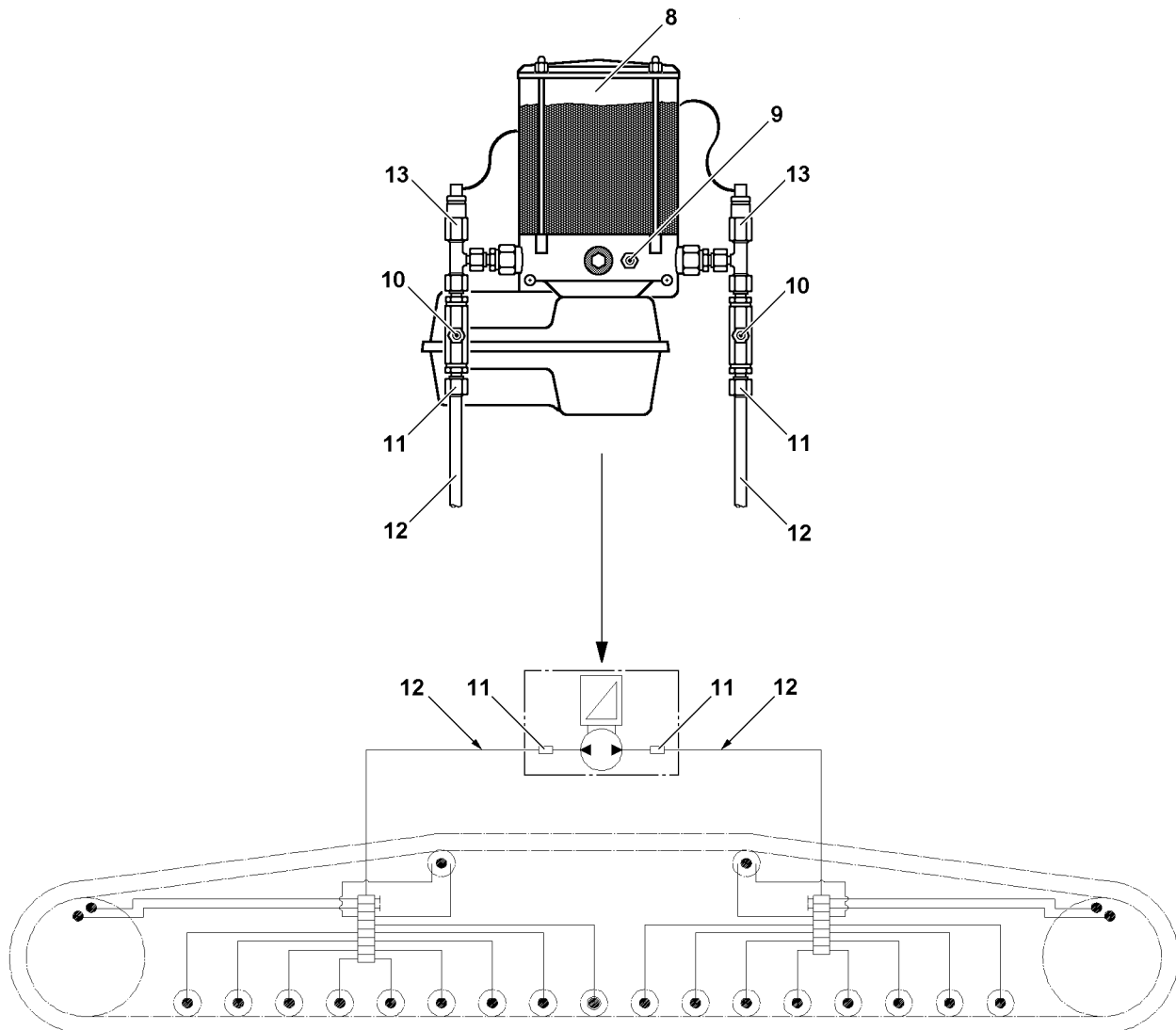


Fig.110102

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 | High system pressure, low ambient temperature | Check the system / bearing points, if no damage is found: grease intermediately once or twice, if necessary ¹⁾ |
| Grease escapes at the 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.

3 Servicing the track chain



Note

► The illustrations in this chapter are examples and may not apply exactly to your crane.

In crawler operation, the components of the crawler travel gear are subject to wear caused by operation.

In order to continuously guarantee safe and effective crane operation, components must be checked at the specified maintenance intervals and replaced if necessary, see the Crane operating instructions, chapter 7.02.



WARNING

Maintenance interval exceeded!

Failure to observe the specified maintenance intervals can lead to increased crane failure time as well as to damage on the crawler travel gear.

Death, severe bodily injuries, property damage.

- Make sure that the maintenance intervals in the Crane operating instructions chapter 7.02 are observed.
- The crane operator is responsible for complying with the maintenance intervals, properly performing the specified maintenance tasks as well as initiating the corresponding measures as a result of the inspection results.

3.1 Tensioning the track chain

The track chain must be retensioned at the latest when three track pads **2** at point **P2** are laying flat on the glide rails **1.1** on the crawler carrier **1**.

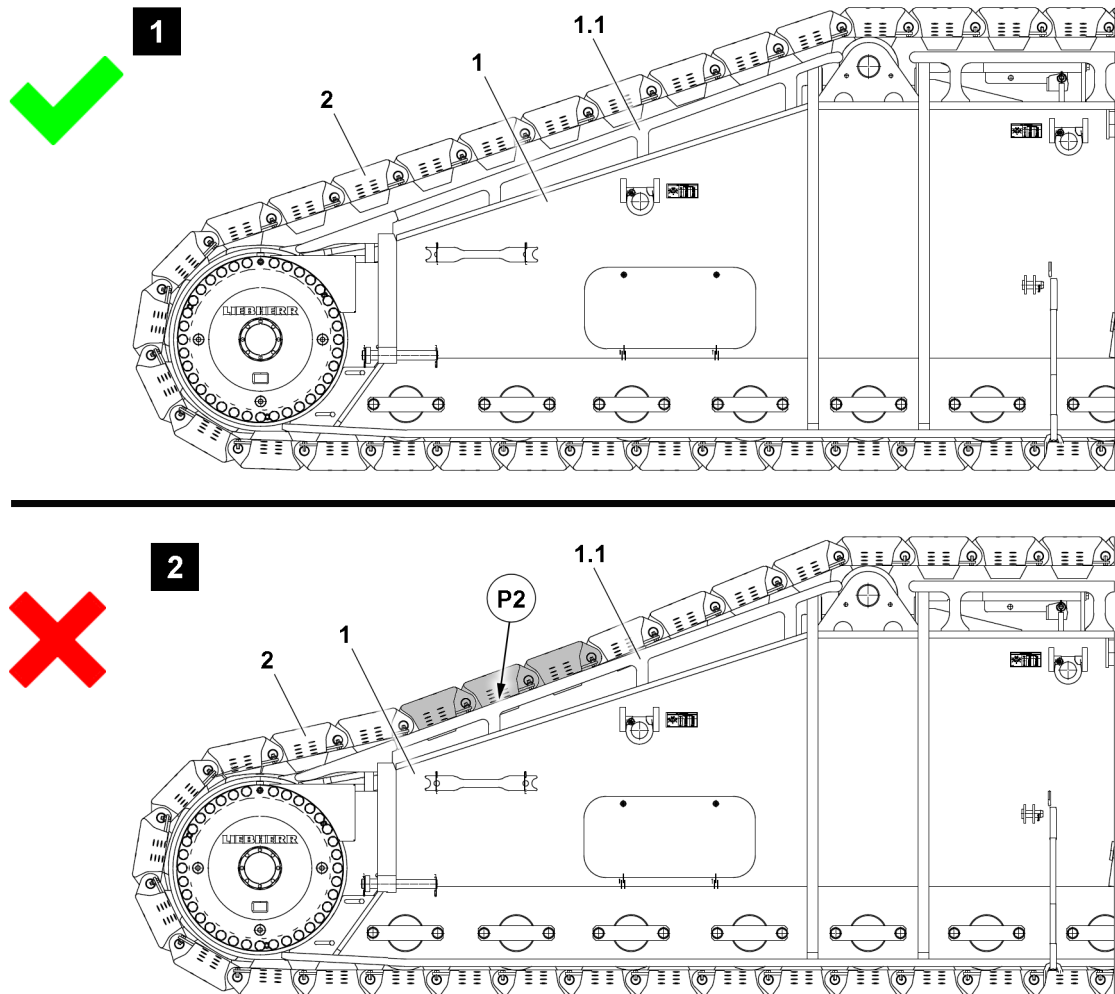


Fig.128242: Chain tension OK, illustration 1 // Track chain too slack, illustration 2

NOTICE

Damage to the track chain!

If the chain tension is not checked within the specified maintenance intervals, the track chain or the steel structure of the crawler carrier can be damaged.

- ▶ Observe and adhere to the maintenance intervals, see the Crane operating instructions, chapter 7.02.
- ▶ If **three** of the track pads **2** of the track chain lie flat on the glide rails **1.1** on the crawler carrier **1** (see point **P2**), then the track chain must be retensioned **immediately**.

The following applies in the case of crawler carriers **1** without glide rails **1.1** or with worn glide rails **1.1**:

- ▶ Make sure that the track pad cams never come into contact with the base steel structure of the crawler carrier. Always retension the track chain early on.

The following applies:

- ▶ The crane driver bears full responsibility for damage resulting from a non-tensioned track chain.

NOTICE

Glide rails worn!

If the glide rails on the crawler carriers are worn to the extent that the remaining material can be deformed or could break under the weight of the track chain, this could result in capital property damage to the crawler travel gear.

- ▶ Retension the track chain early on.
- ▶ Make sure that worn glide rails are replaced early on, please contact Customer Service at LIEBHERR-Werk Ehingen GmbH.

**Note**

- ▶ By extending the tension cylinder integrated in the crawler carrier **14** the sliding section **17** of the crawler carrier is moved in the direction of the arrow.
- ▶ The chain tension is held by spacer plates **16**.

NOTICE

Foreign matter in track chains!

Foreign matter in the track chains and on the travel drive can cause damage.

- ▶ Before tensioning the track chains, check the track chains and the travel drives for foreign particles, such as rocks, and clean them, if necessary.

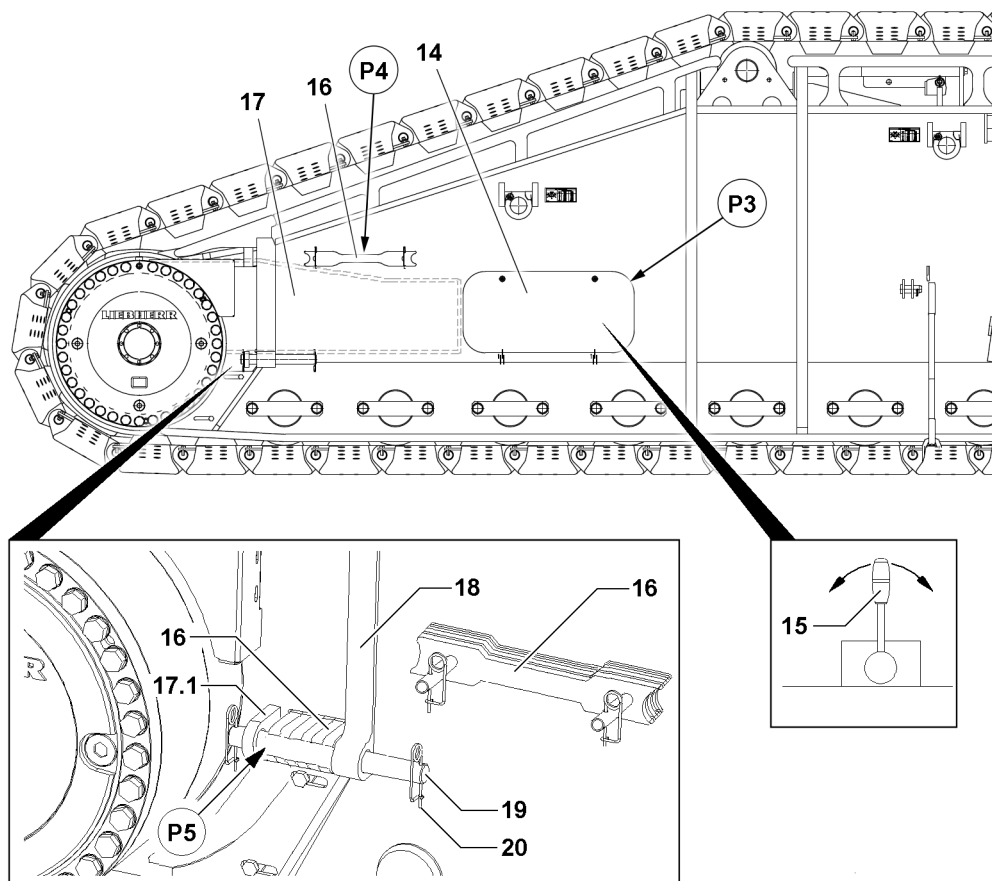


Fig.127105: Tensioning the track chain

Make sure that the following prerequisites are met:

- The crane is in horizontal position.
- The hydraulic aggregate is available.

3.2 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.

Death, severe bodily injuries, property damage.

- ▶ 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 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.

3.2.1 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 knurled nut.
- ▶ Tighten the quick couplings by hand: Rotate the knurled nut until it reaches a tangible, fixed stop position.
- ▶ Establish the hydraulic connections, see Hydraulic diagram.
- ▶ Add the pressure supply.

3.2.2 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 couplings.
- ▶ Close the maintenance hatch on point **P3**.

3.3 Carrying out the tension procedure

- ▶ Extend the tension cylinder **14** completely by actuating the hand lever **15**.

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 sliding section **17.1** and the crawler carrier **18**.
- ▶ Secure the spacer plates **16** with pin **19** and spring retainer **20**.



WARNING

Danger of crushing!

When releasing the tension cylinder **14**, body parts, such as: Fingers, hands and arms can be crushed or severed.

- ▶ When relieving the tension cylinder **14**, any work on the crawler carrier is prohibited.

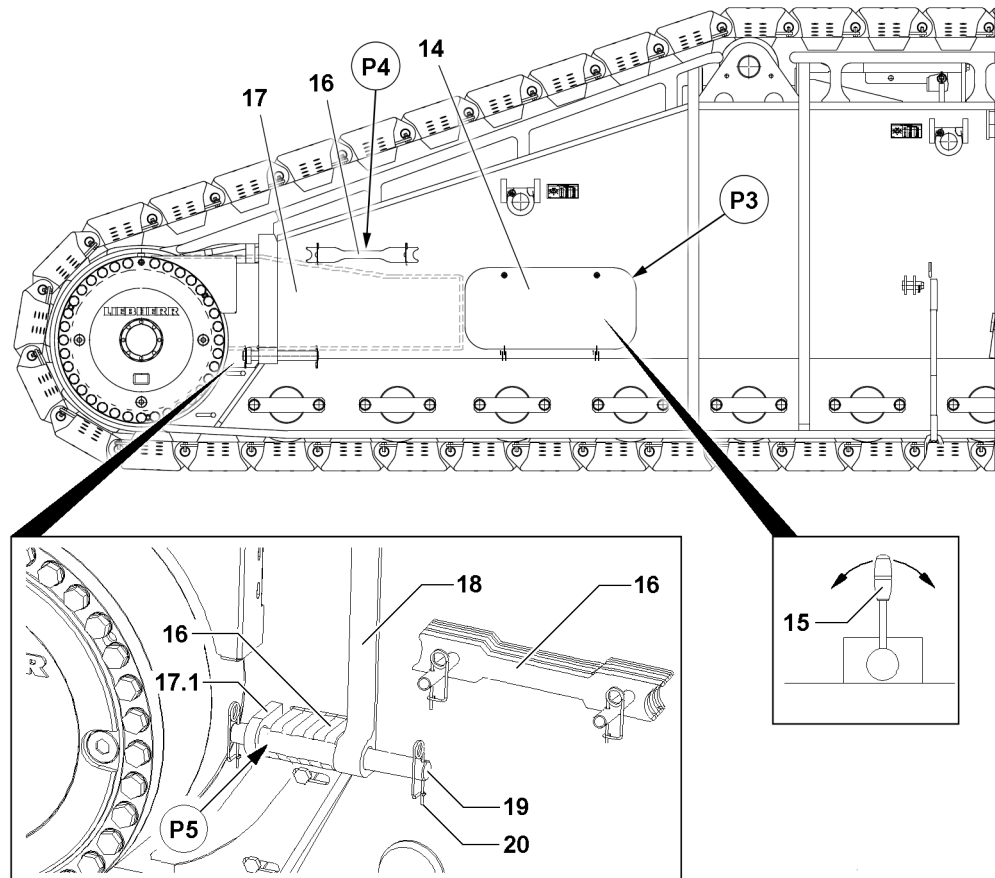


Fig.127105: Tensioning the track chain

- ▶ Relieve the tension cylinder **14** by actuating the hand lever **15**.
- ▶ After the tension procedure, drive the crawler back and forth about one crawler length in operating mode „Straight forward travel“.

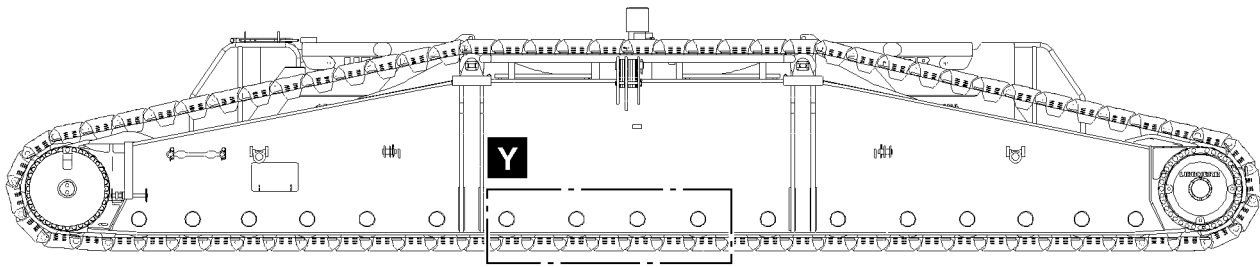
Result:

- 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**.

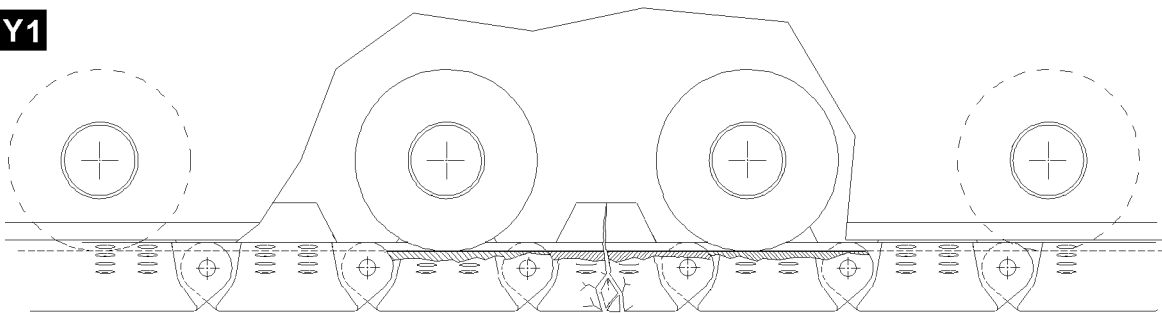


Note

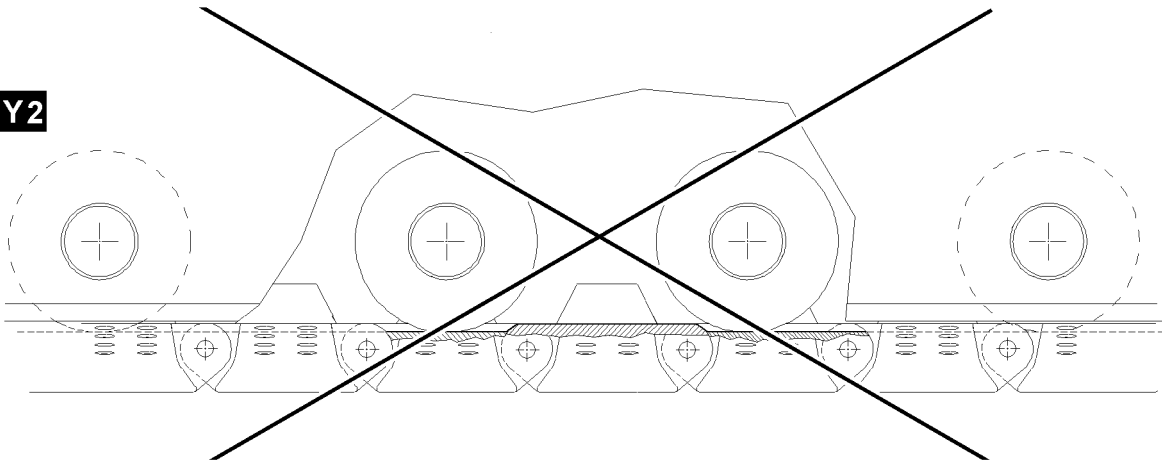
- ▶ If necessary, repeat the tension procedure of the track chain and insert additional spacer plates **16**.
- ▶ If the lift on the tension cylinder **14** is no longer sufficient to tension the track chain, then trained expert personnel must remove one track pad.



Y1



Y2



Y3

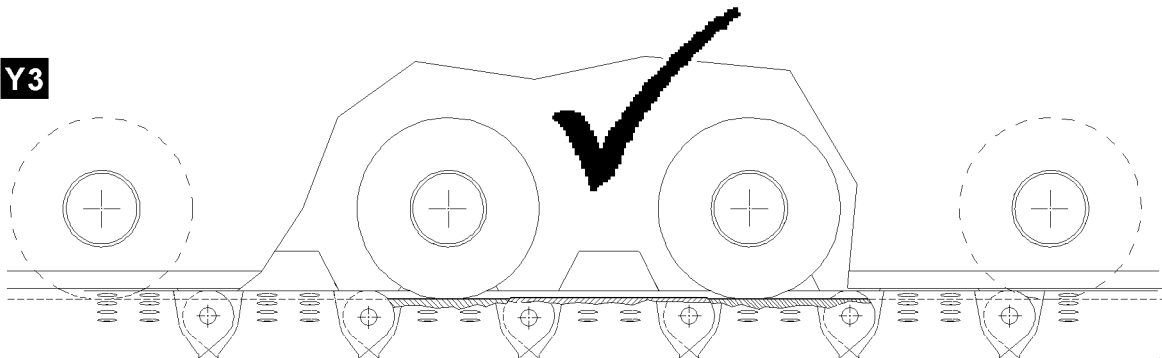


Fig.109917

LWE/LR 11350-007/19005-01-02/en

3.4 Checking wear on the track chain



WARNING

Track chain can be ripped off!

If the wear limit on the track pads **21**, pins **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**, pins **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** that 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** that 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**, pin **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

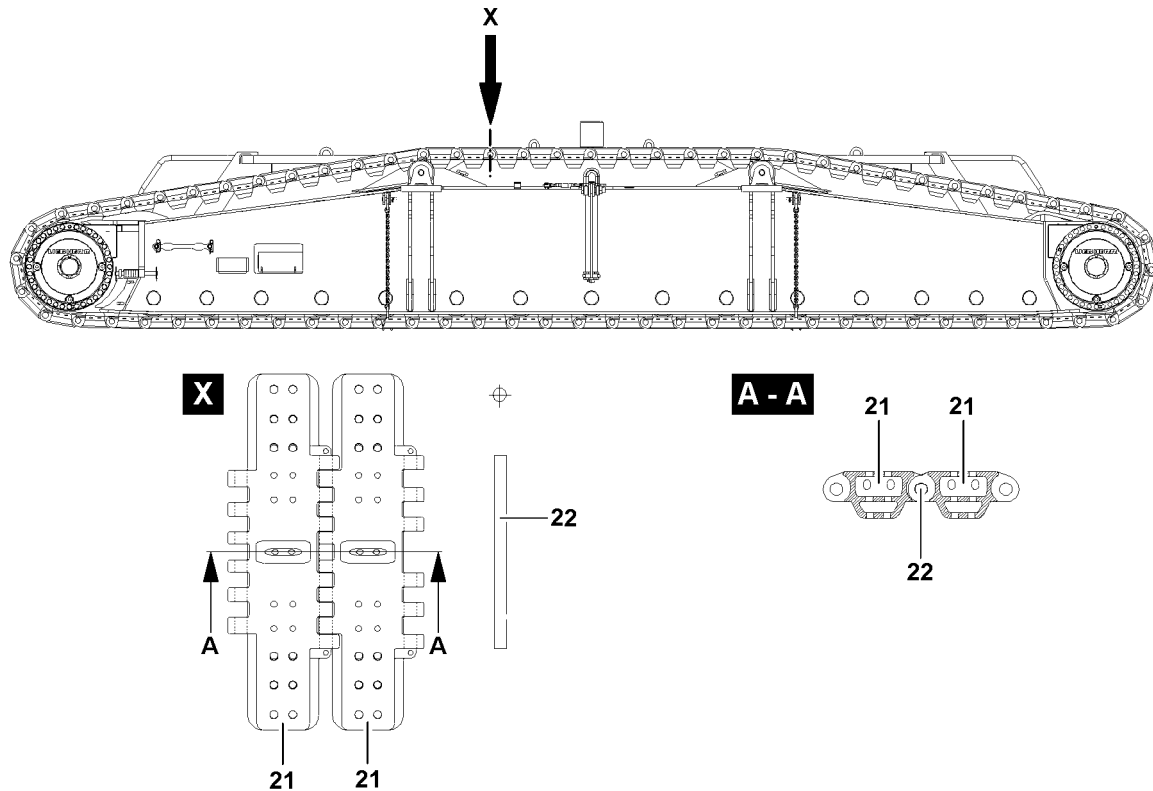


Fig.108536

3.4.1 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 reached, 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 pin diameter must be made within the specified intervals.
- ▶ If one pin **22** falls below the minimum permissible dimension, then it must be replaced with a new pin **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 pins **22**.

| Wear limit bore for the track pad | |
|--|-------|
| Initial diameter | 53 mm |
| Maximum permissible upper limit | 56 mm |

| Pin wear limit | |
|--|-------|
| Initial diameter | 50 mm |
| Maximum permissible minimum dimension | 49 mm |

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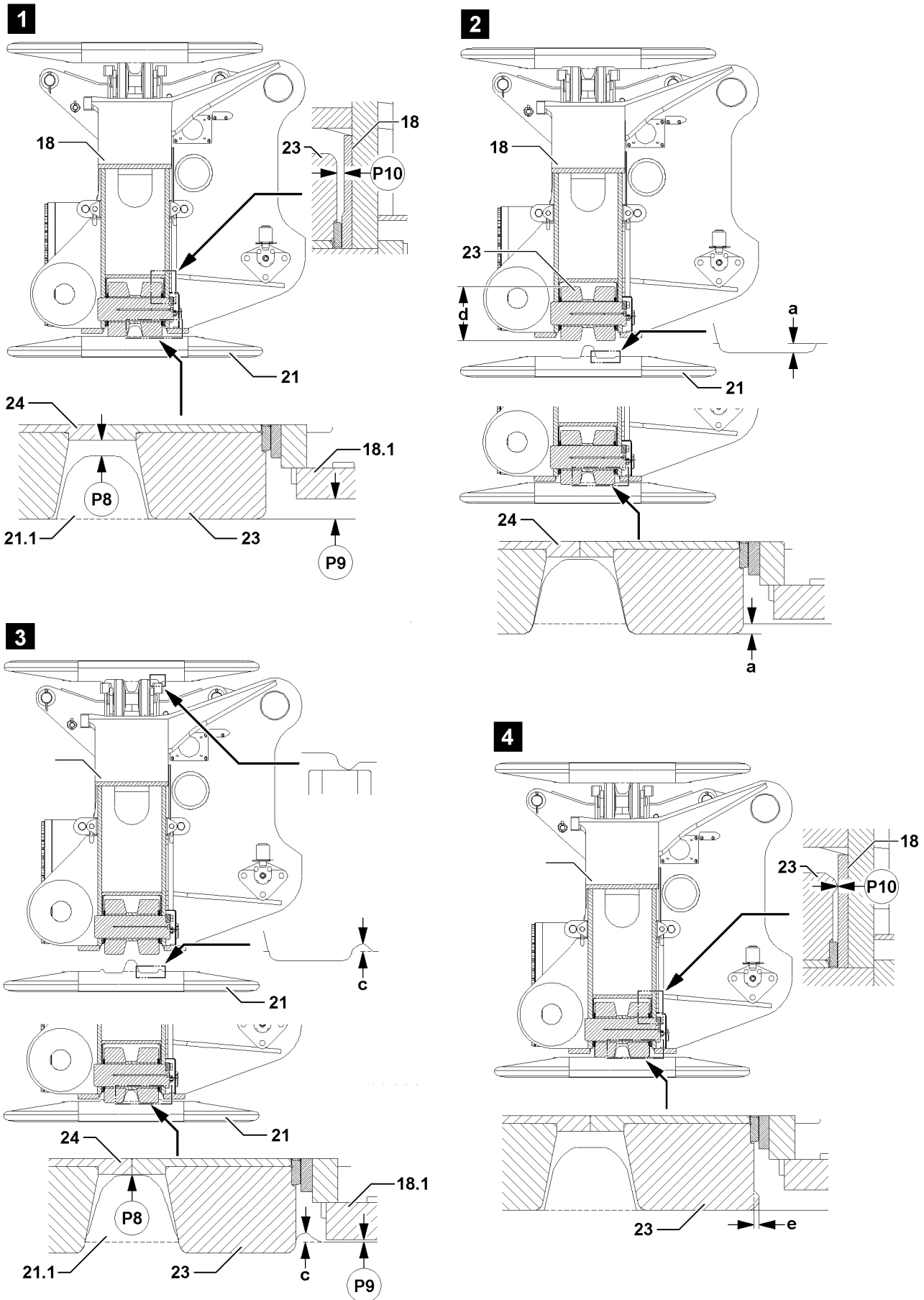


Fig.109882

LWE/LR 11350-007/19005-01-02/en

3.4.2 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 pads **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 transport cams **21.1** and track roller body **24**
- On point **P9** between the track pad **21** and base belt **18.1**
- On point **P10** between the track rollers **23** and crawler carrier **18**

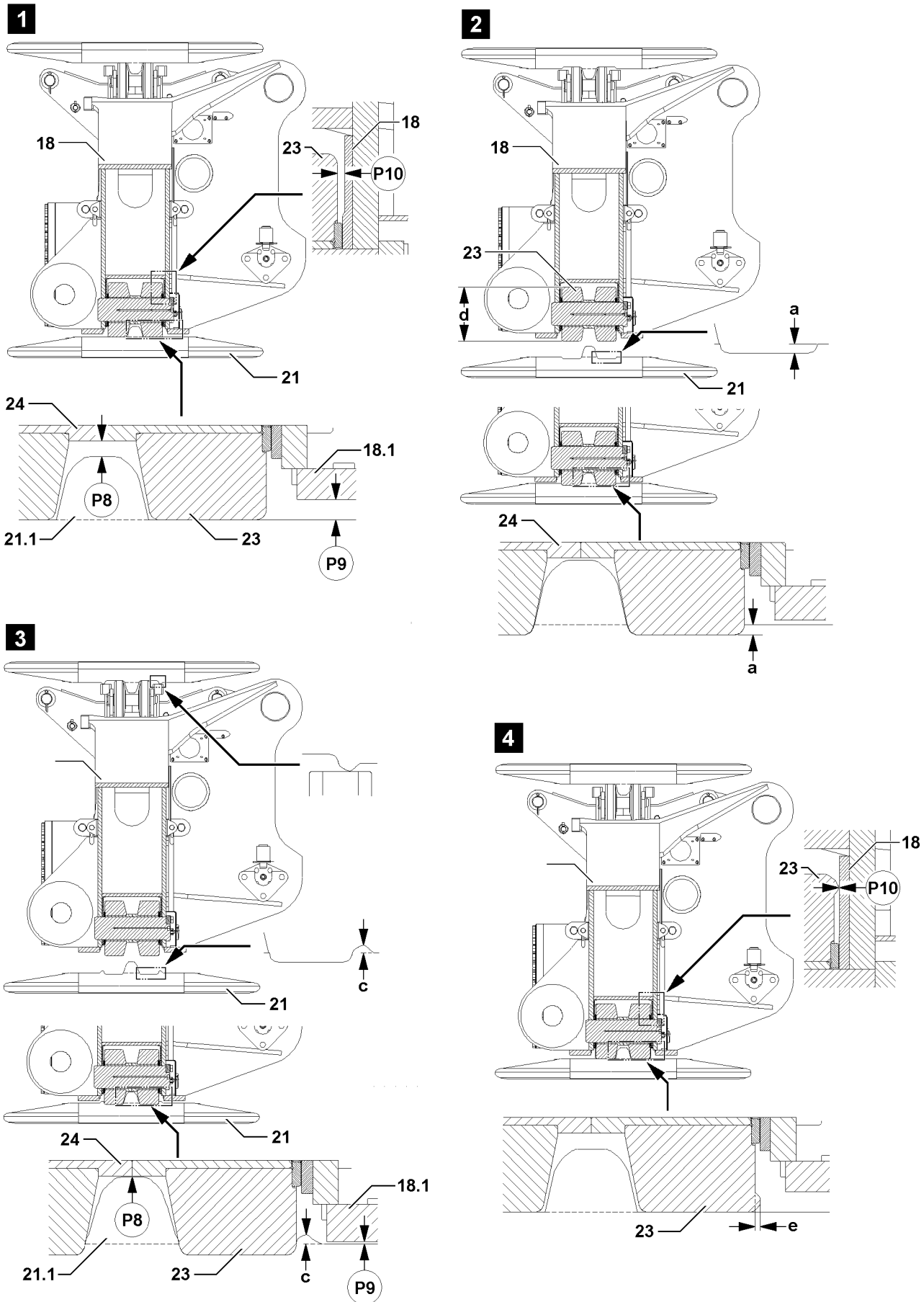


Fig.109882

LWE/LR 11350-007/19005-01-02/en

| 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 track systems: If the bulge is larger than 3 mm , **grind the 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 that 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**.

4 Ladders



Note

- ▶ The following listed ladders are examples and may not match your crane exactly.



WARNING

Danger of falling!

If the following safety notes are **not** observed, personnel can fall down.

Death, severe bodily injuries, property damage.

- ▶ Observe and adhere to the installation and safety guidelines for ladders.
- ▶ Observe and adhere to the safety signs on the ladders.
- ▶ Install and secure the ladders properly.
- ▶ Do **not** use damaged ladders and replace them immediately.
- ▶ Repair the ladder exclusively through authorized service facilities.

4.1 Lubricating ladders

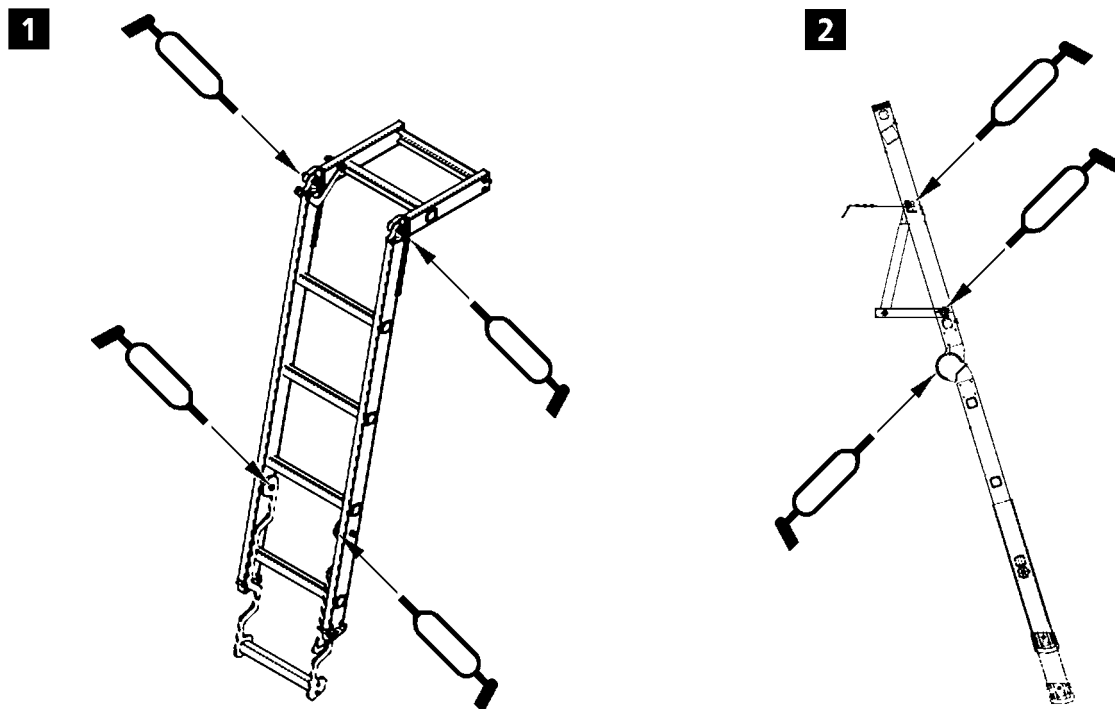


Fig.109766

- ▶ Grease joints and pivot points on the ladders regularly and check them for easy movement, see illustration 1 and illustration 2.
- ▶ Repairs and maintenance work on the ladder must be made by expert personnel.

7.05 Maintenance instructions - Crane superstructure

| | | |
|---|------------------------------|----|
| 1 | Crane engine | 3 |
| 2 | Pump distributor gear | 7 |
| 3 | Hydraulic system | 9 |
| 4 | Central lubrication system | 17 |
| 5 | Slewing ring connection | 22 |
| 6 | Winches | 25 |
| 7 | Slewing gear | 33 |
| 8 | Electrical system - Lighting | 33 |

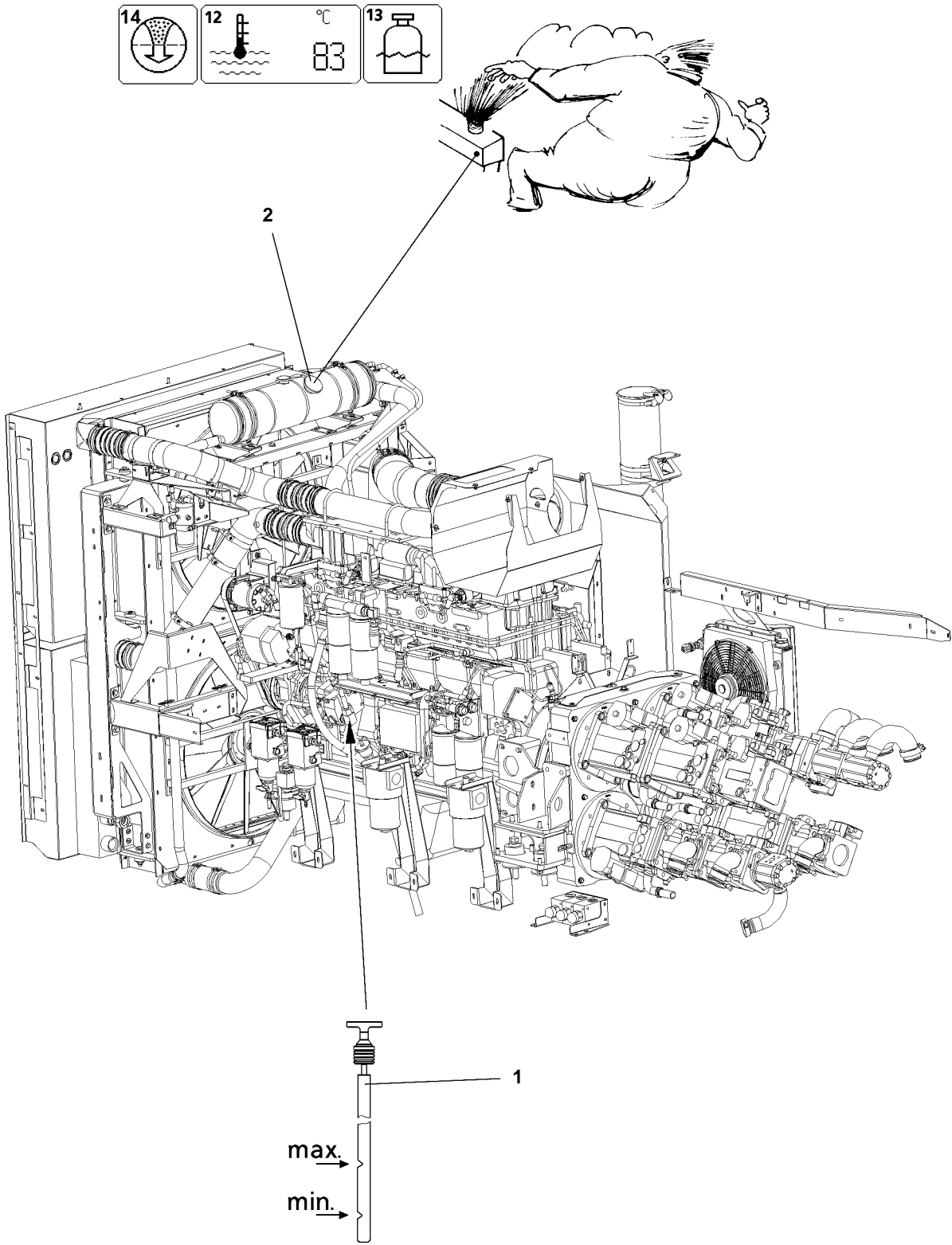


Fig.102652

LWE/LR 11350-007/19005-01-02/en

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“!

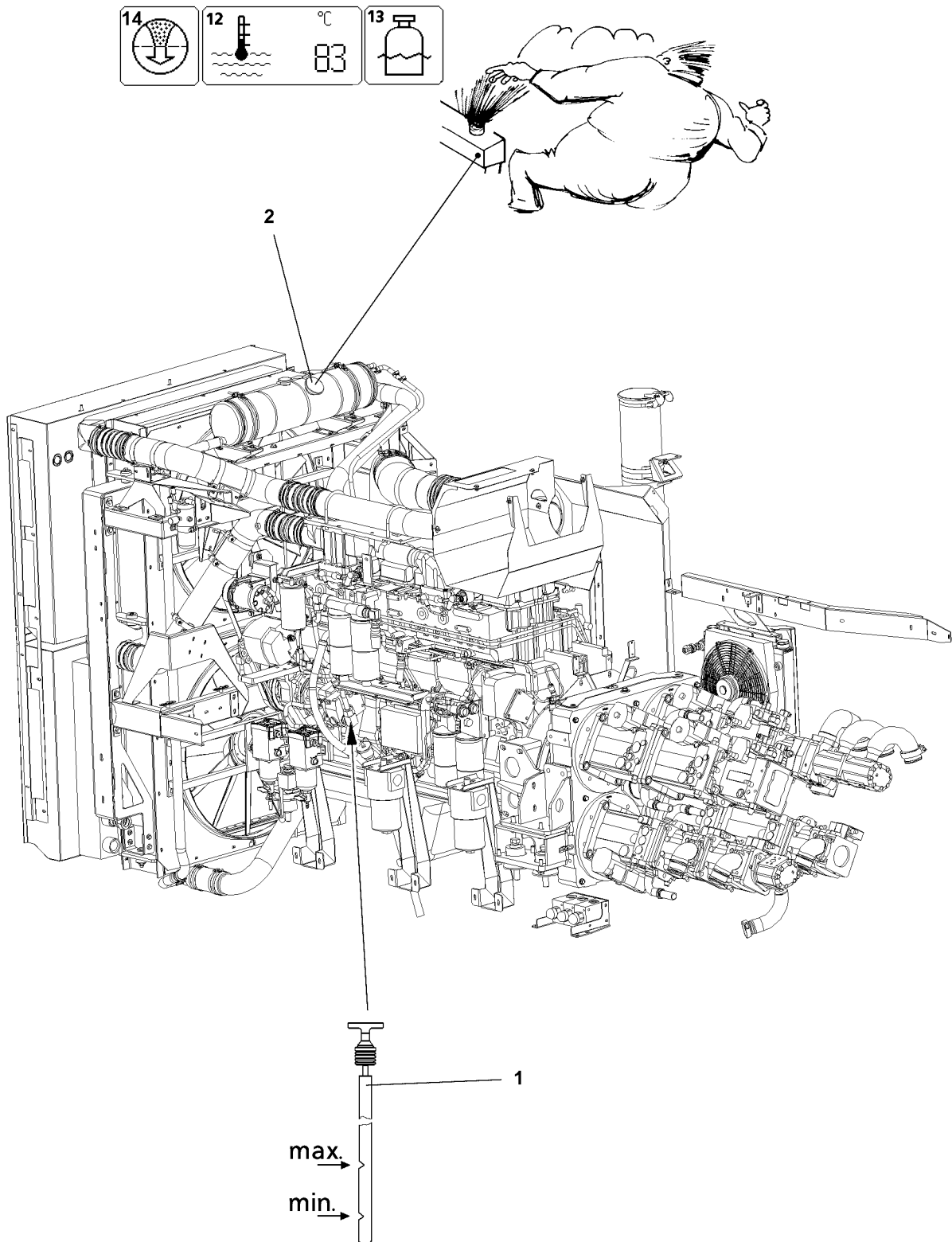


Fig.102652

LWE/LR 11350-007/19005-01-02/en

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.

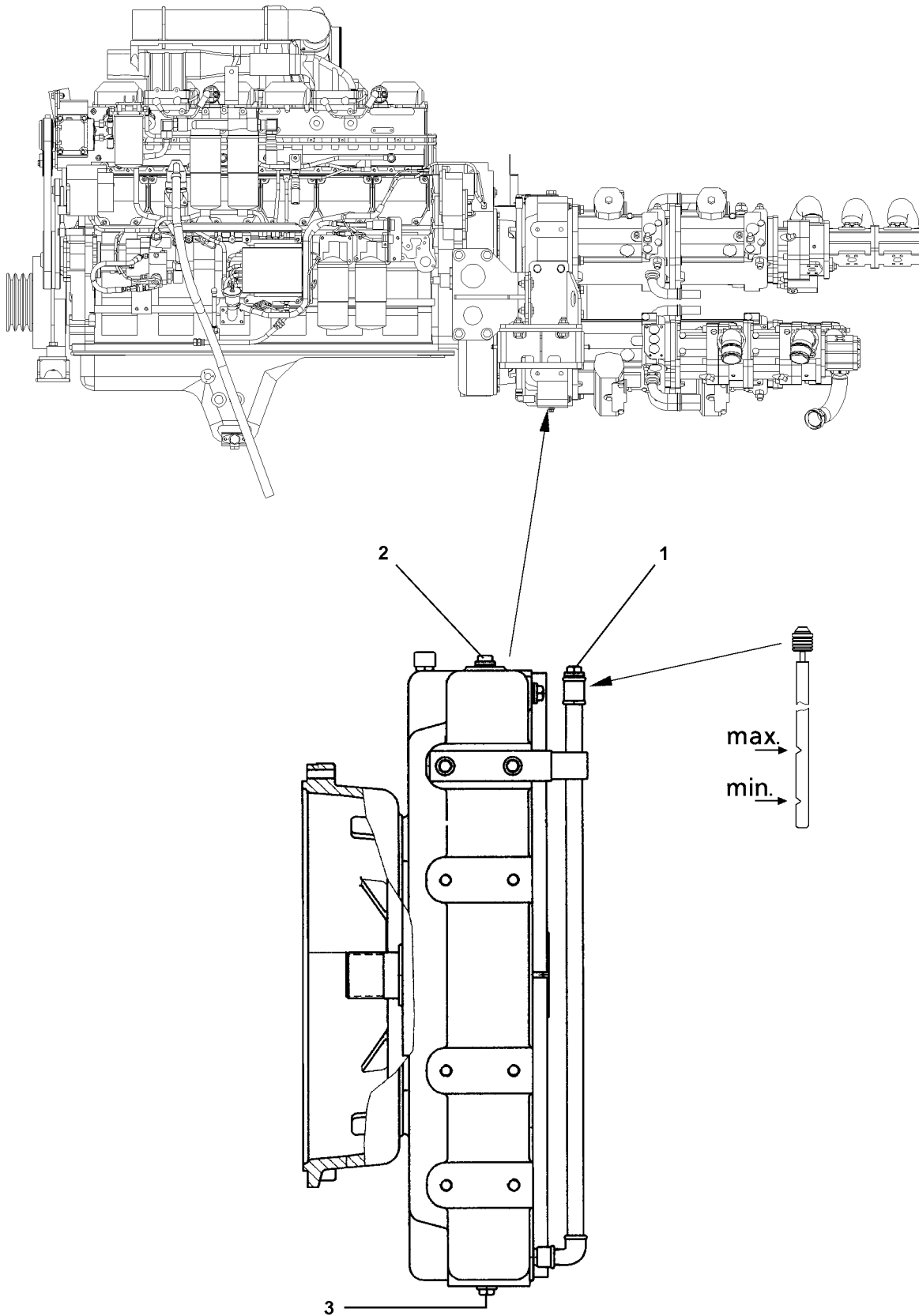


Fig.102653

LWE/LR 11350-007/19005-01-02/en

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.

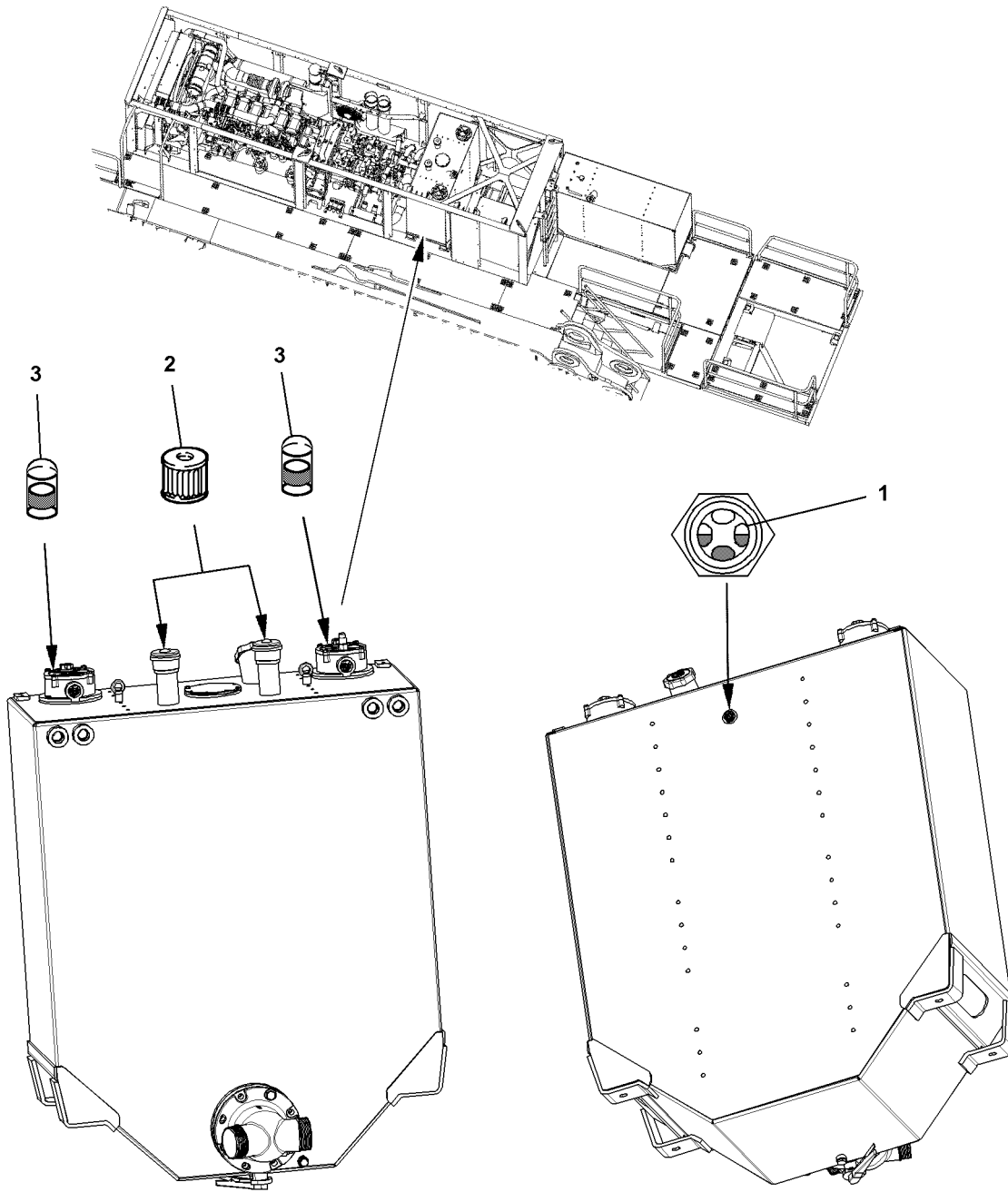


Fig.102654

LWE/LR 11350-007/19005-01-02/en

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.

Problem remedy

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.

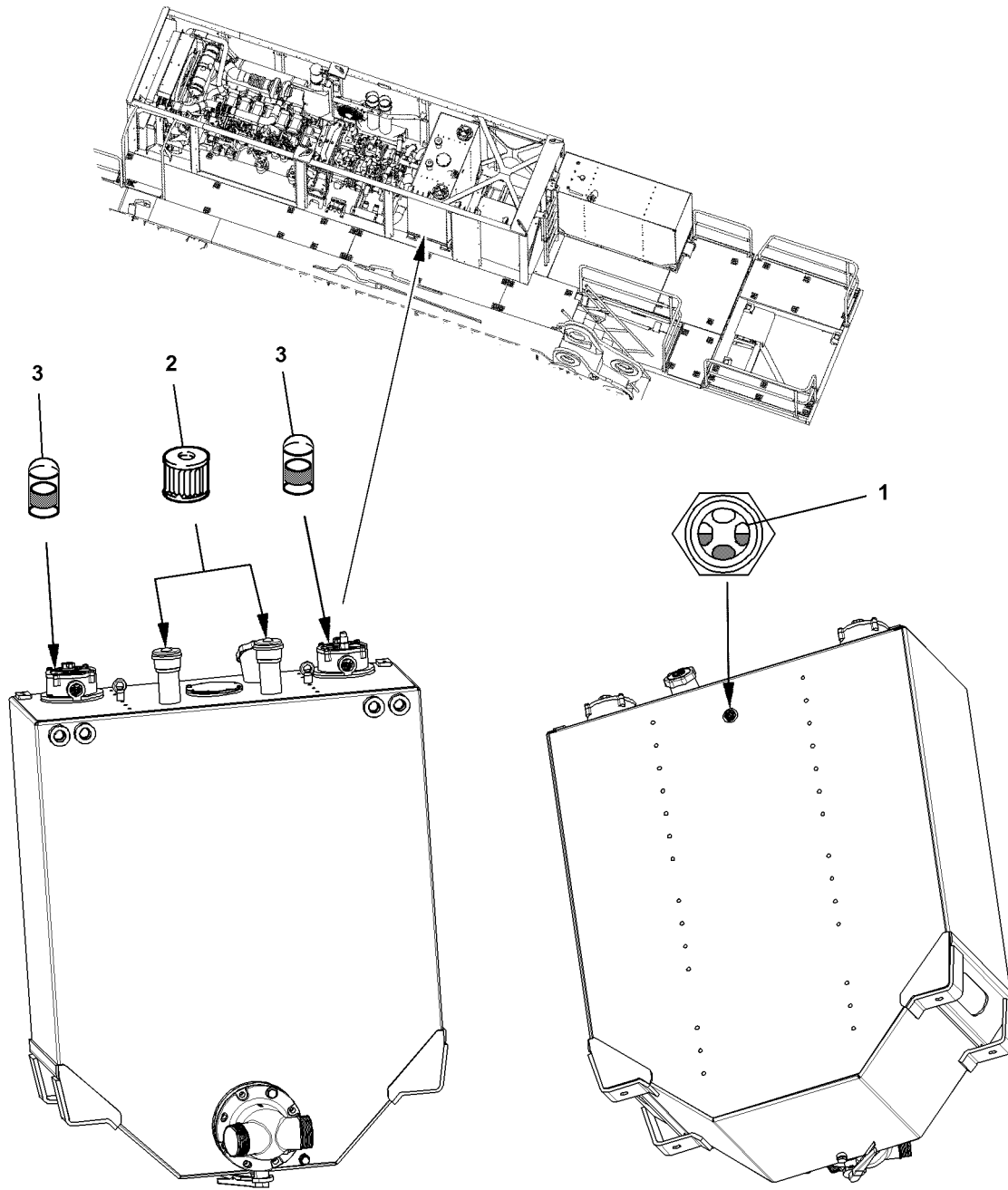


Fig.102654

LWE/LR 11350-007/19005-01-02/en

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.

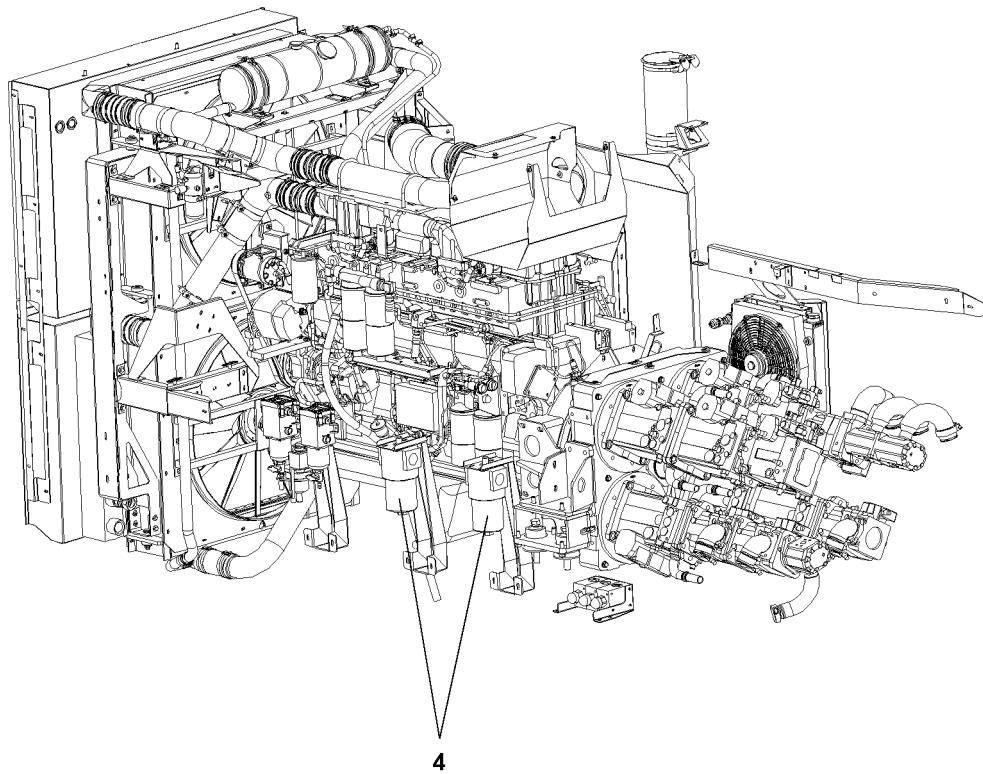


Fig.102655

LWE/LR 11350-007/19005-01-02/en

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.

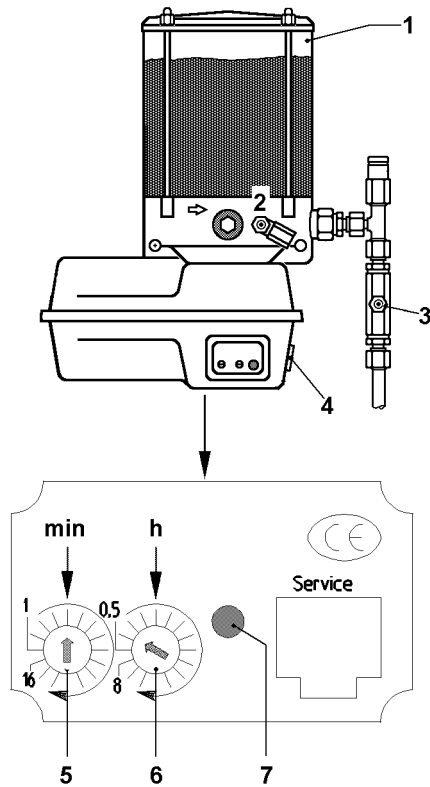
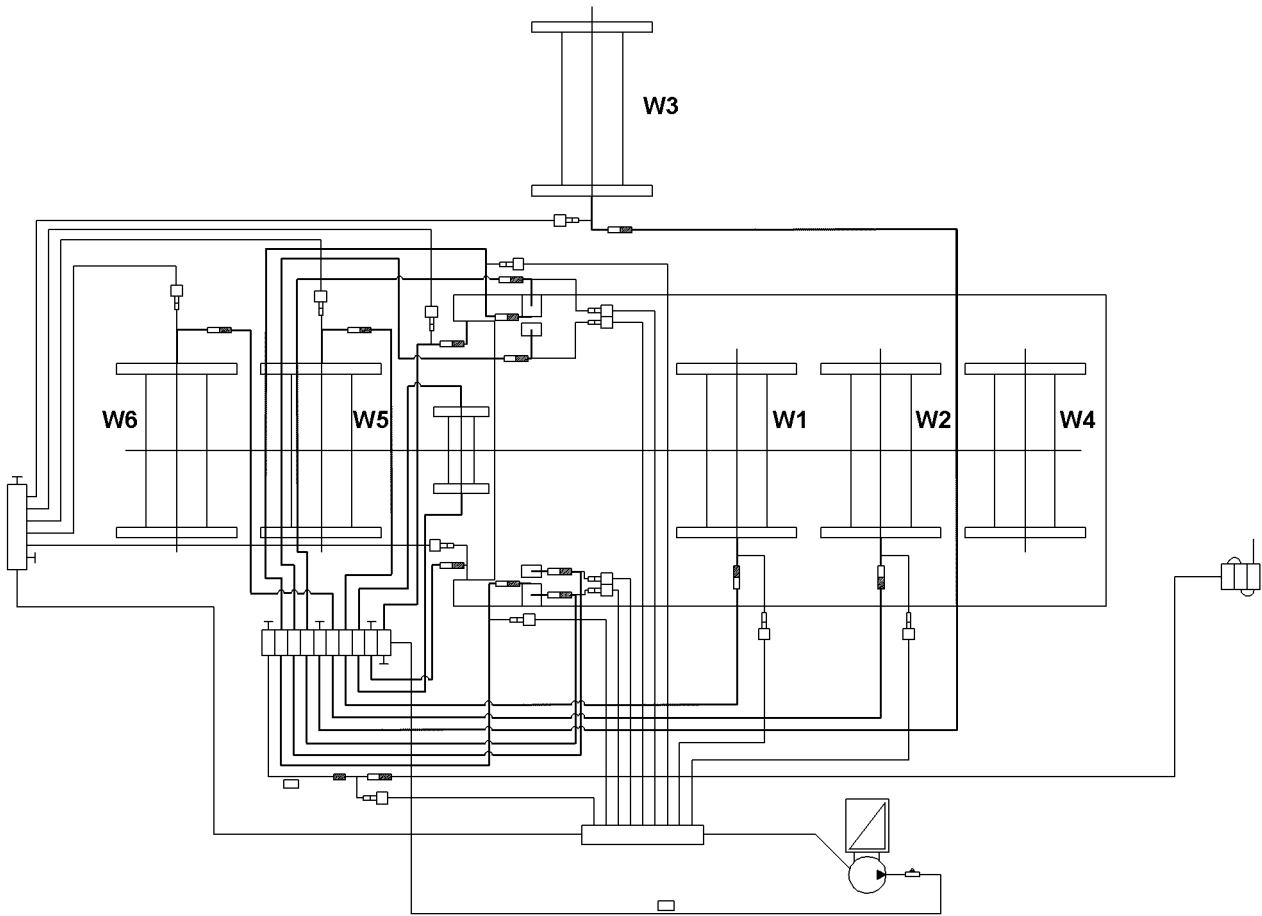


Fig.102656

LWE/LR 11350-007/19005-01-02/en

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

1 Grease container

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.

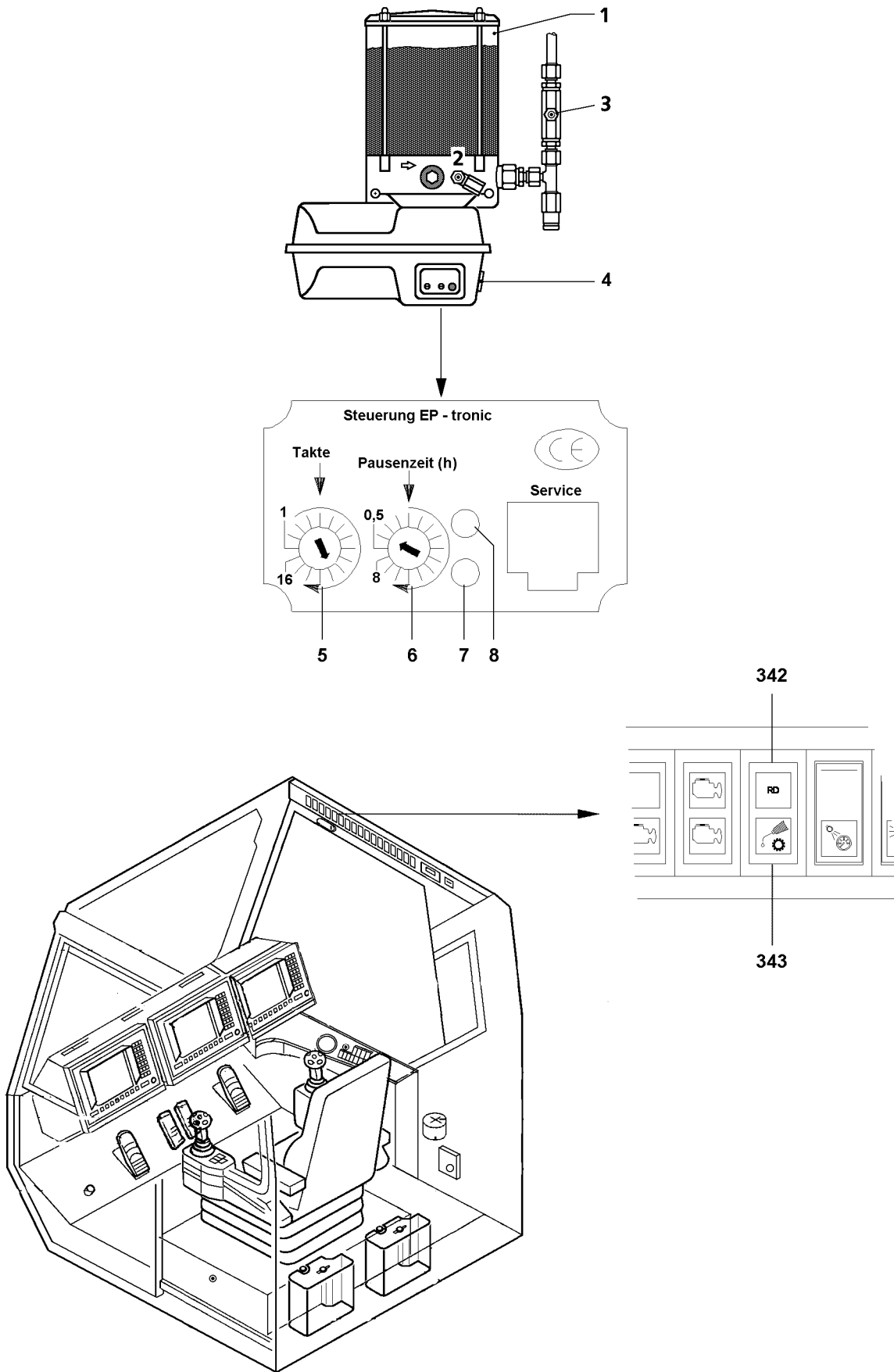


Fig.102499

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

1 Grease container

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.

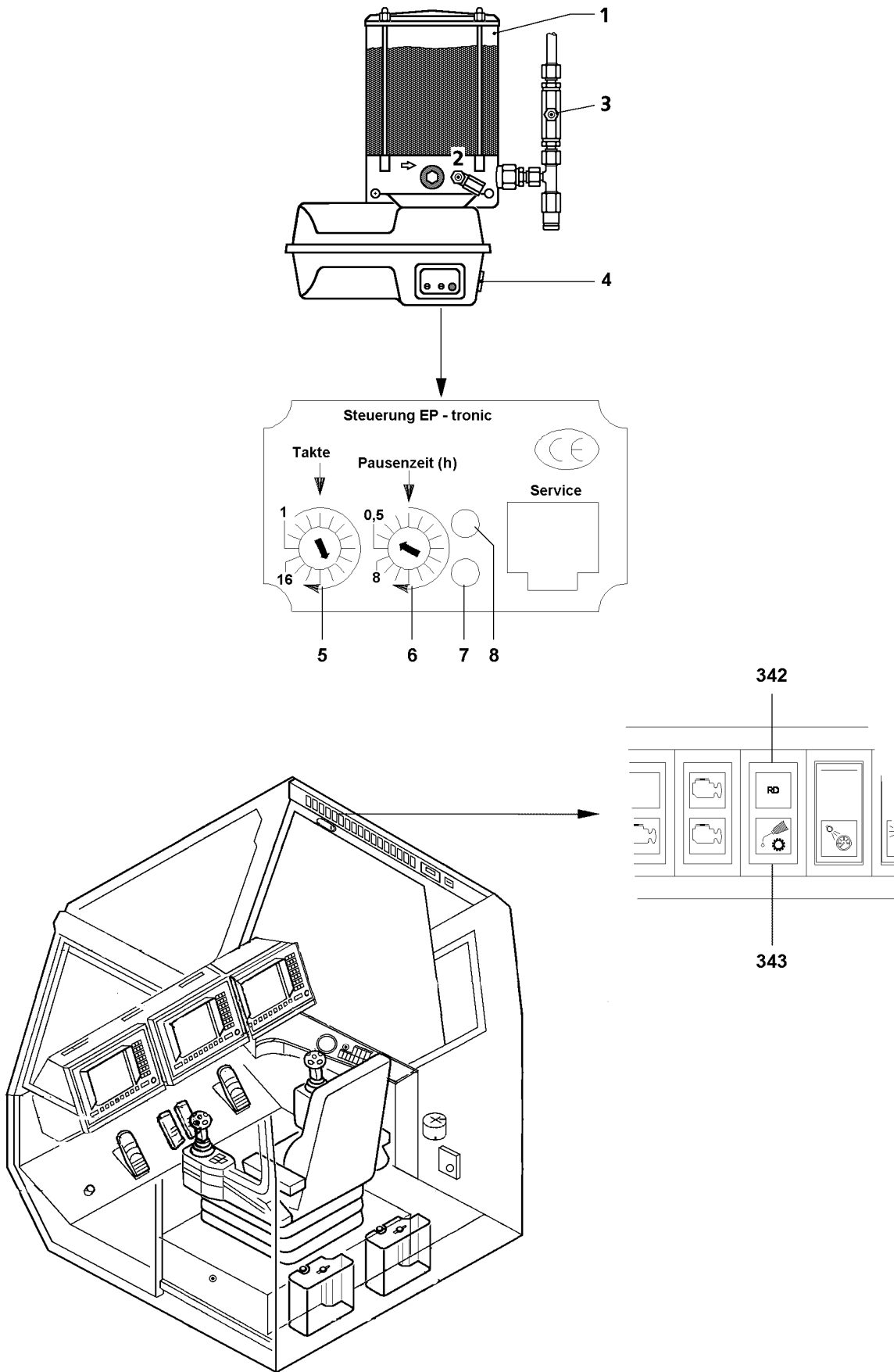


Fig.102499

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

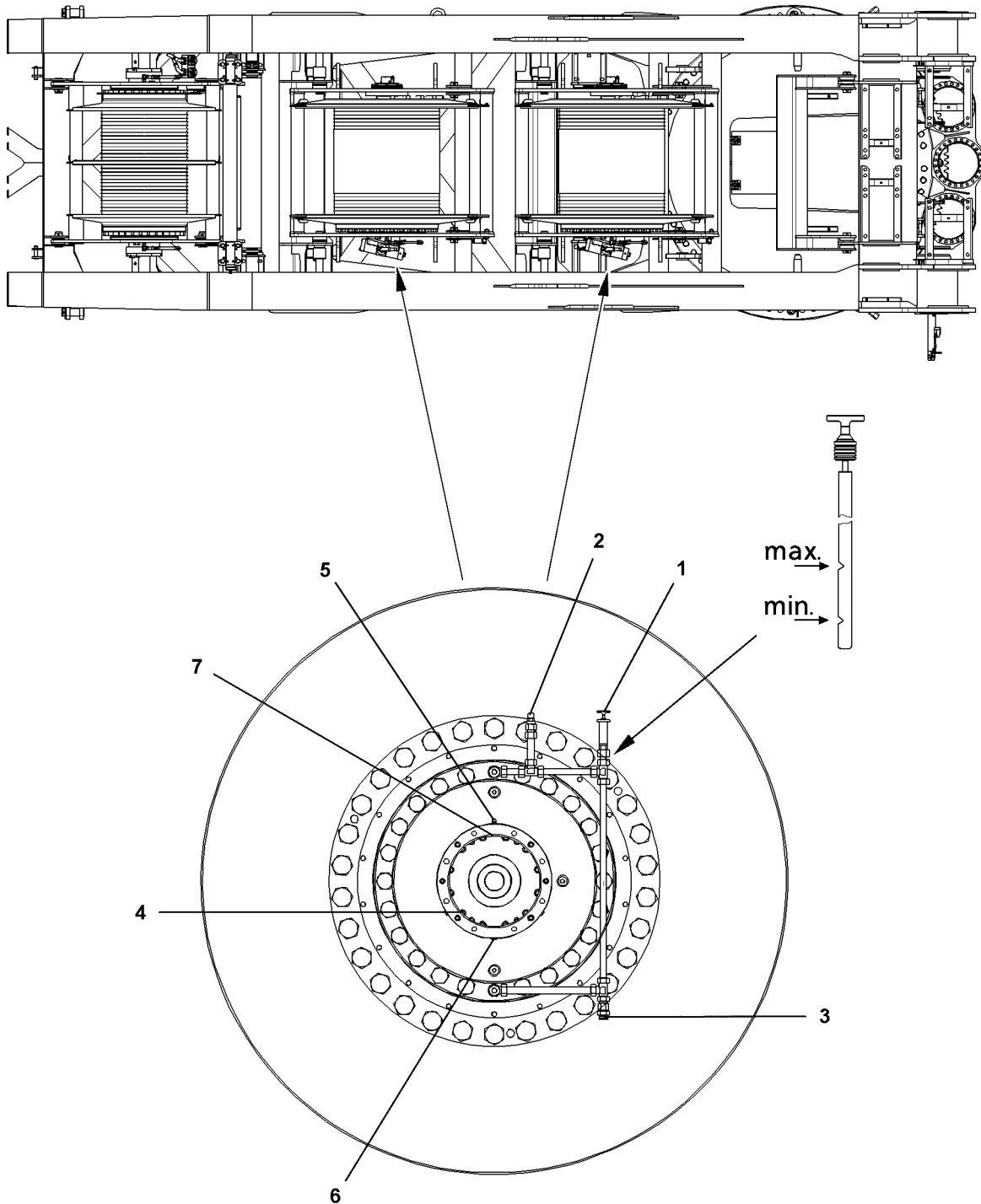


Fig.102657

LWE/LR 11350-007/19005-01-02/en

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

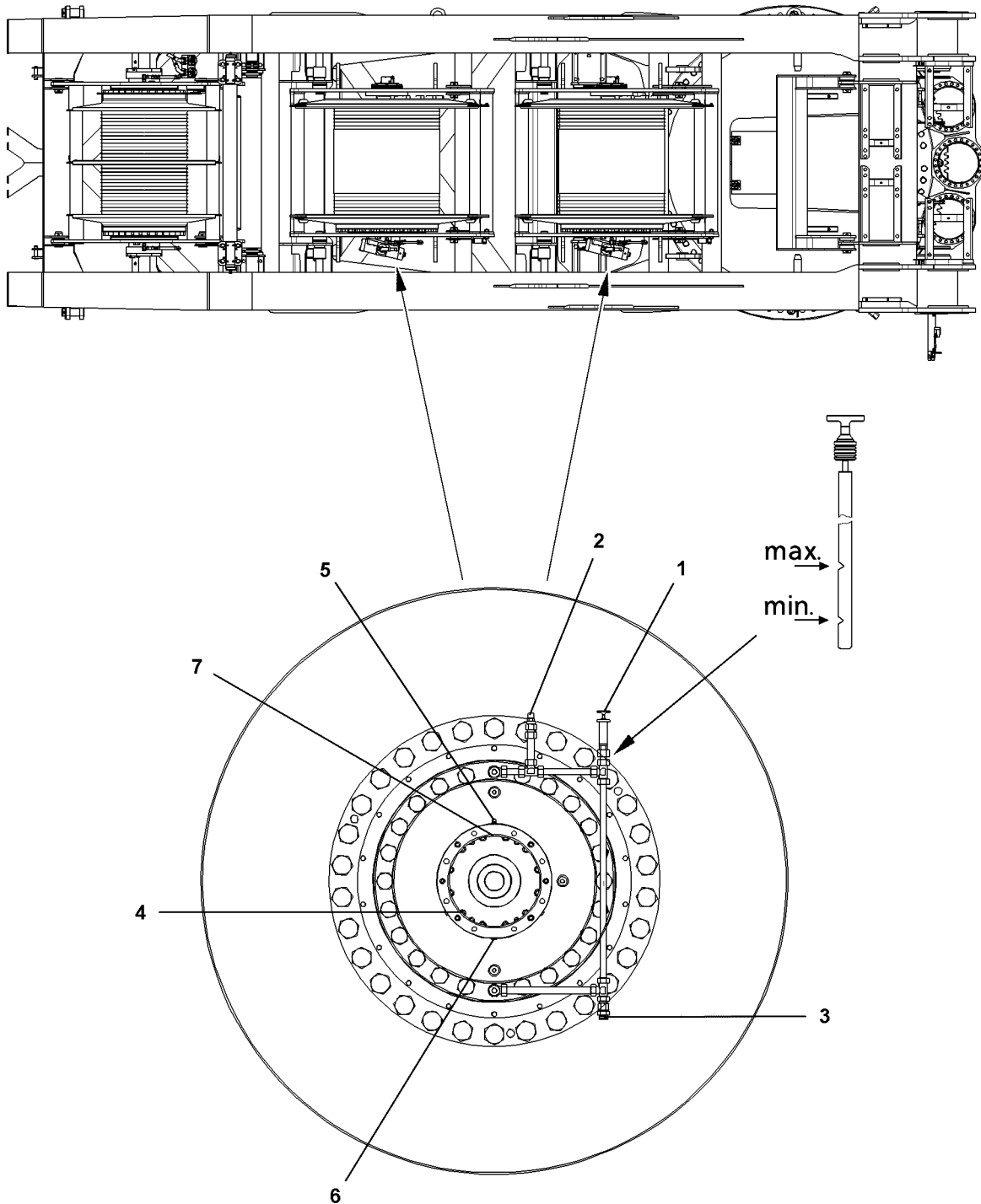


Fig.102657

LWE/LR 11350-007/19005-01-02/en

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.

2

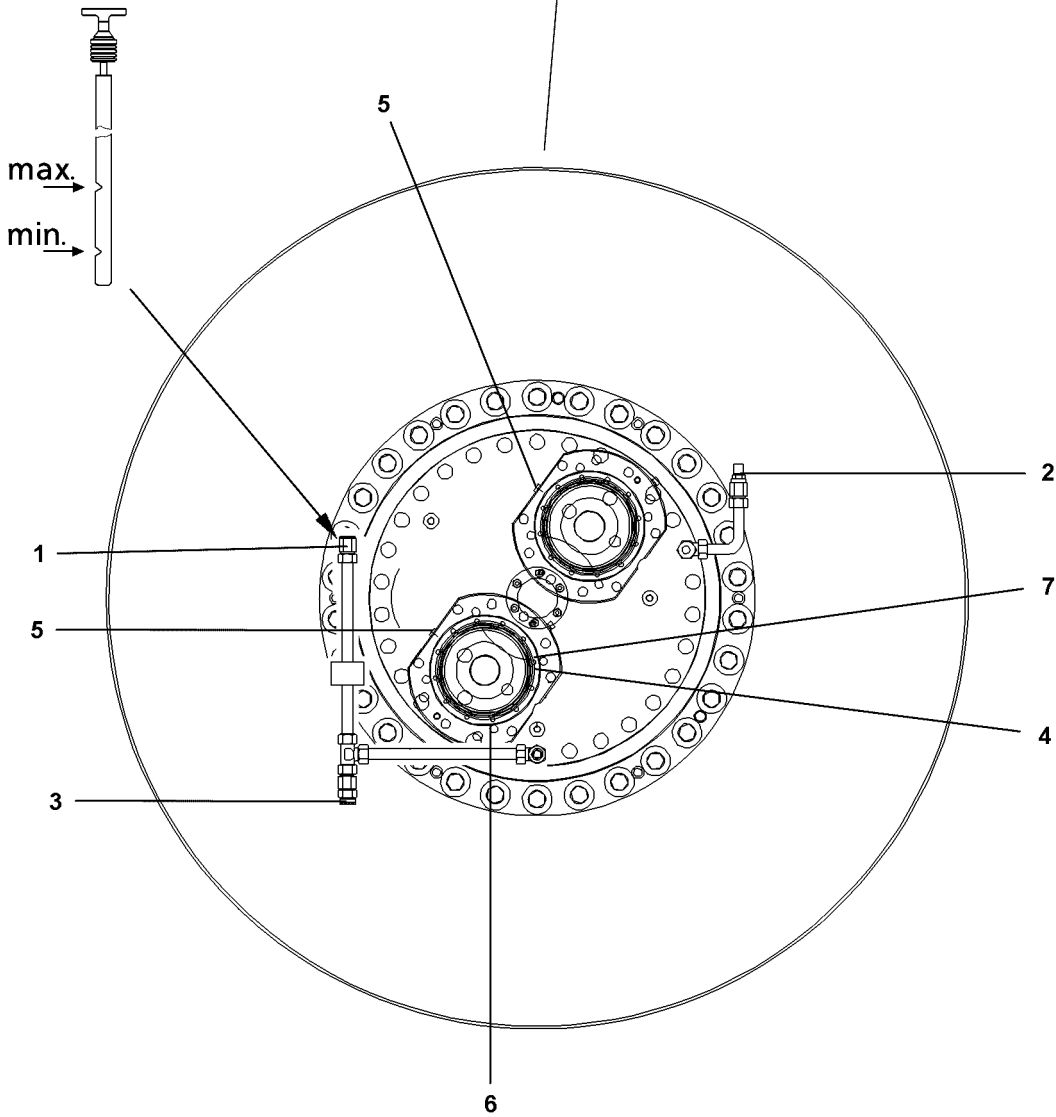
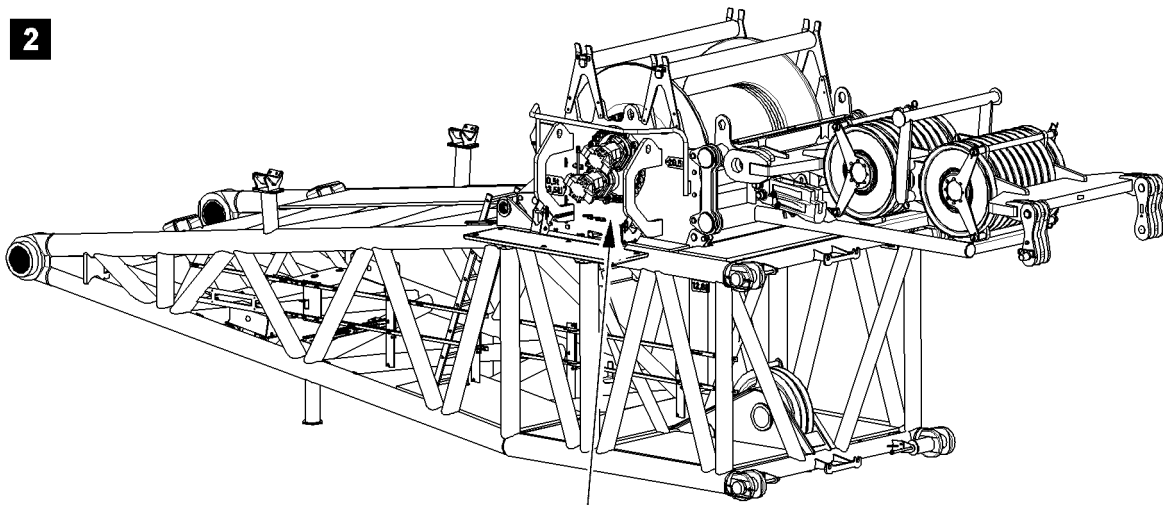


Fig.102658

LWE/LR 11350-007/19005-01-02/en

3

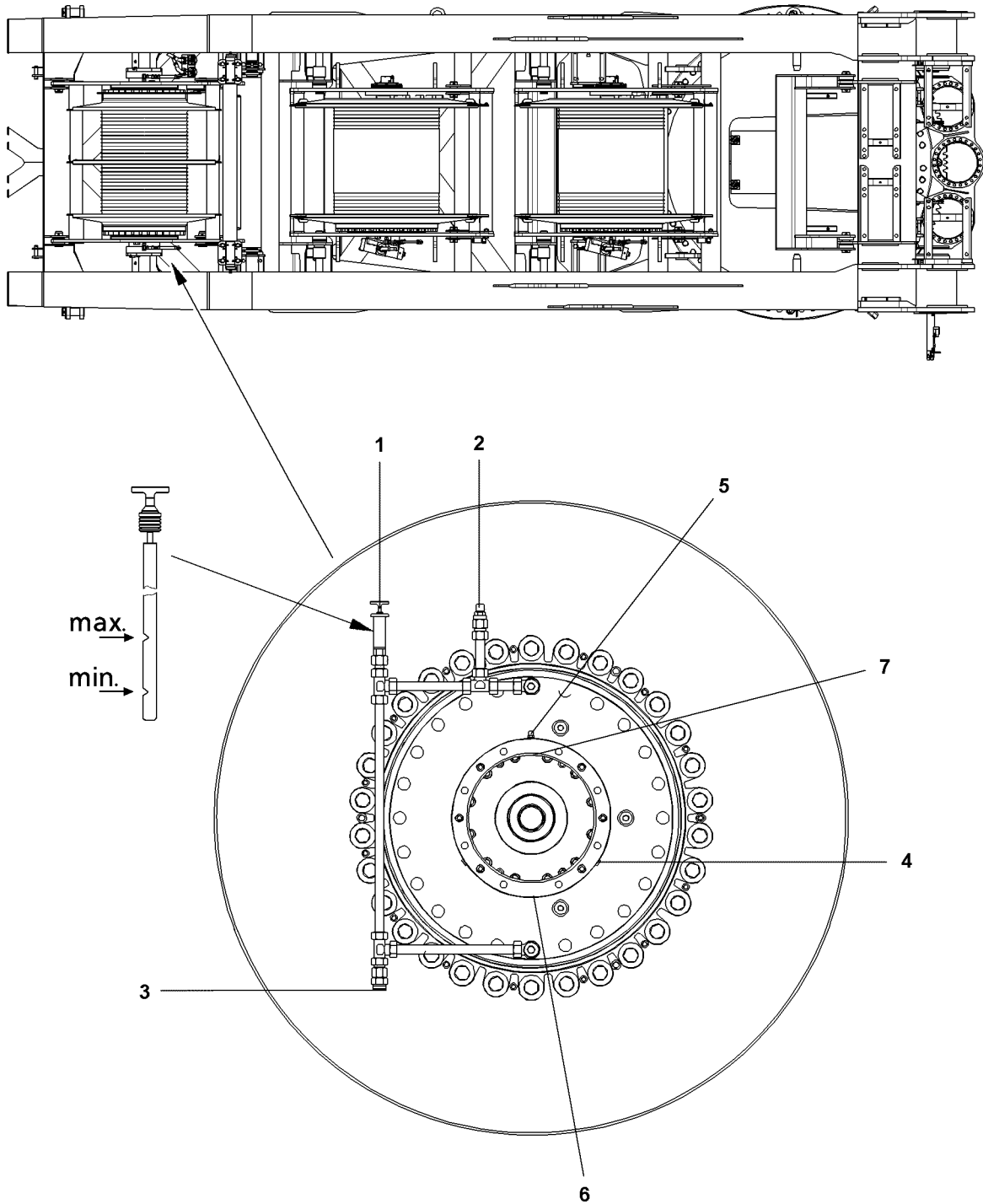


Fig.102659

LWE/LR 11350-007/19005-01-02/en

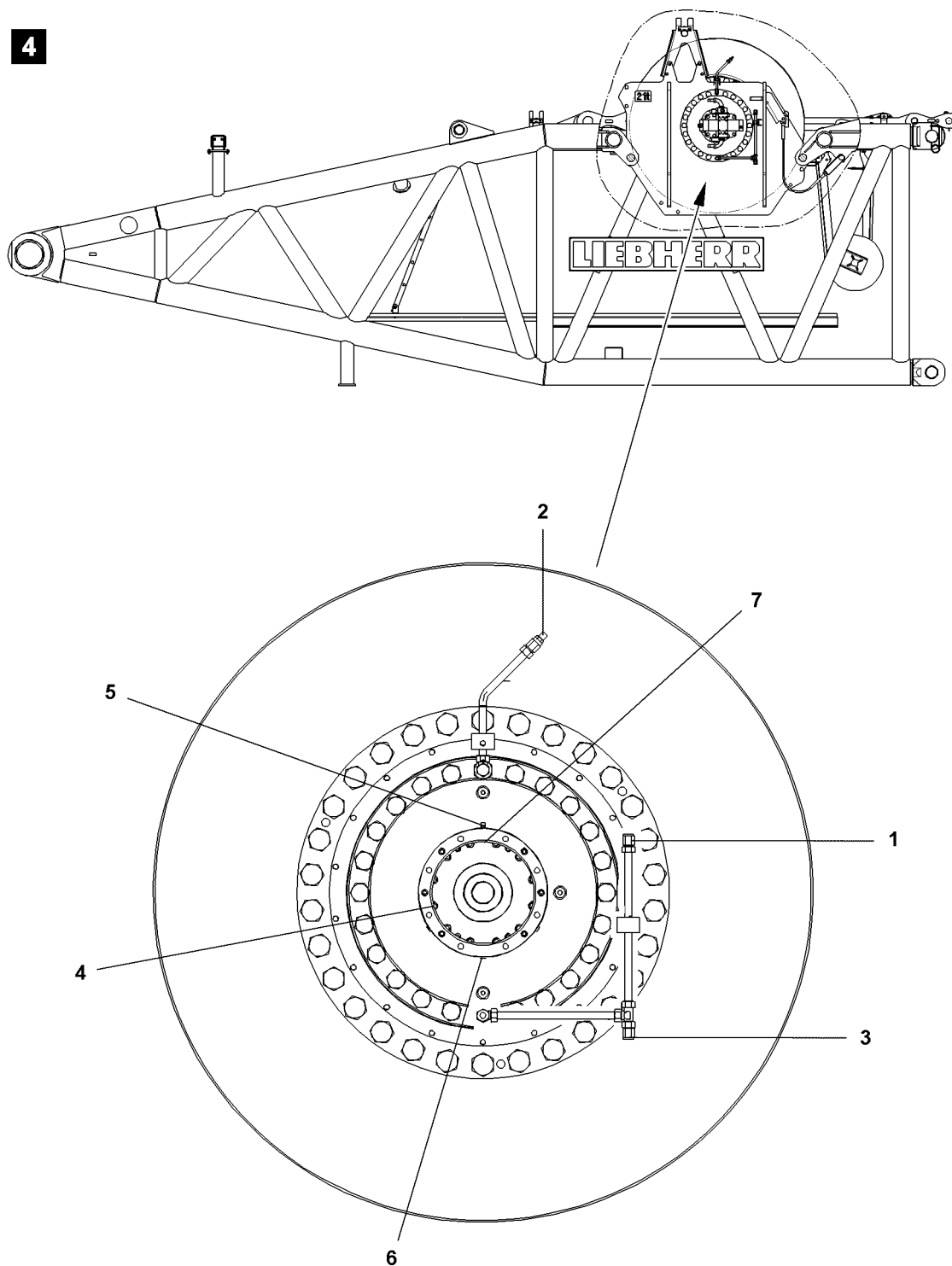
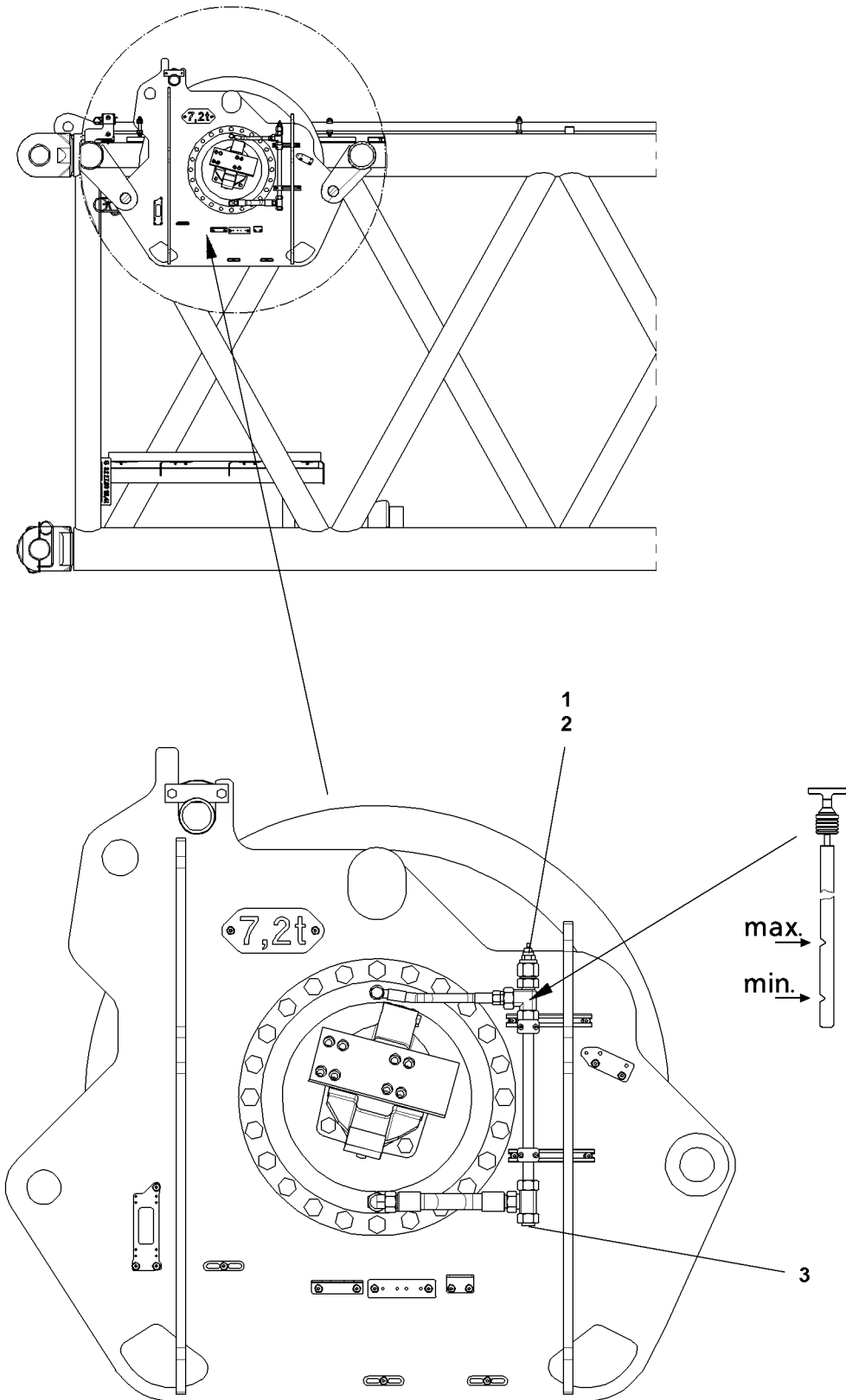


Fig.102660

5



LWE/LR 11350-007/19005-01-02/en

Fig.102661

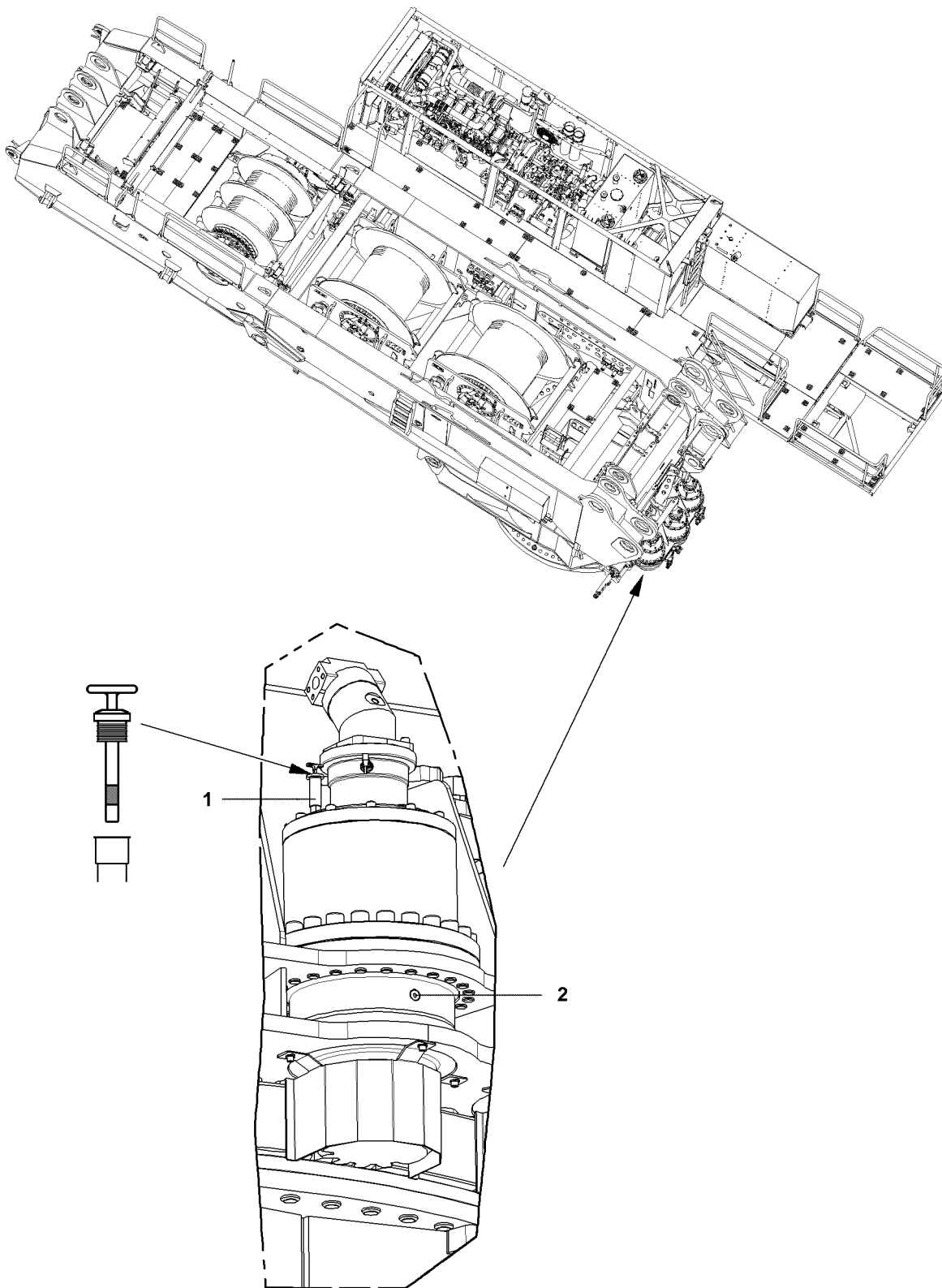


Fig.102666

LWE/LR 11350-007/19005-01-02/en

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).

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LWE/LR 11350-007/19005-01-02/en

7.05.50 Maintenance instructions - Crane boom

| | | |
|---|--------------------------------|---|
| 1 | Lattice mast boom | 3 |
| 2 | Rope pulleys and guide pulleys | 4 |
| 3 | Crane ropes | 4 |

Fig.195219

LWE/LR 11350-007/19005-01-02/en

1 Lattice mast boom



WARNING

Danger of falling!
Death, severe injuries.

- ▶ For all work on the crane where there is a danger of falling, suitable safety measures must be taken, see Crane operating instructions, chapter 2.06.



Note

- ▶ The following illustration is an example and may not exactly match to your crane.

1.1 Lubricating the pin bores on the lattice sections and guy rods

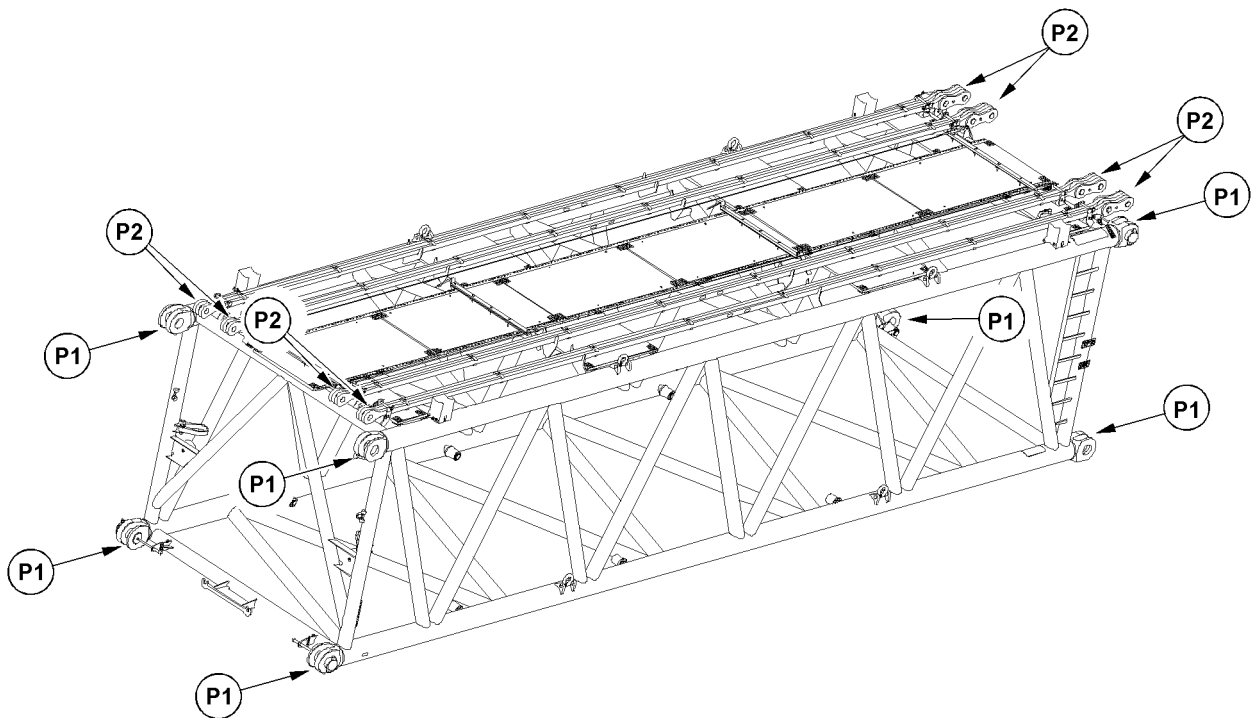


Fig.123861: Lube points on boom lattice sections and guy rods



Note

- ▶ For the pin bores on the lattice sections (points **P1**) and the guy rods (points **P2**), use special grease as lubricant. See Service fill and Crane operating instructions, chapter 7.07.
- ▶ Apply the grease on the pin bores over the entire circumference.
- ▶ The lubrication of the pin bores on the boom lattice sections and the guy rods is made before assembly or after disassembly.

Make sure that the following prerequisites are met:

- The lattice sections are not installed on the crane.
- The lattice sections are playing on a load bearing support on the ground.
- ▶ Grease the pin bores on the boom lattice sections and the guy rods.

2 Rope pulleys and guide pulleys

2.1 Check bearings for easy movement

Stiff or blocked rope pulleys or compensation pulleys wear rapidly and unevenly and cause serious rope abrasion.

Ineffective compensation pulleys can lead to irregular rope tension.

- ▶ Check the rope pulleys for proper movement in their bearings.

When rope pulleys are **not** easily moveable in their bearings:

- ▶ Fix the bearings.

2.2 Checking for mechanical damage

Ropes can cause mechanical damage, such as stress marks.

- ▶ Check guide pulleys and rope pulleys for mechanical damage.

3 Crane ropes

3.1 Personal protective equipment



WARNING

Injury due to wires and skin irritation due to lubricant!

- ▶ When working with ropes, always wear work gloves.



WARNING

Injuries if protective equipment is **not** worn!

- ▶ Wear hard hat, safety shoes and safety glasses.

3.2 Safe and problem-free operation



WARNING

Wear, overload, incorrect use, damage, improper maintenance!

Failure of ropes. Death, severe injuries, property damage.

- ▶ Prevent failure of ropes: Observe and adhere to the following notes.

Carry out the following measures to ensure safe and problem-free rope operation.

- Service ropes and rope end connections regularly according to the maintenance intervals.
- Check ropes and rope end connections regularly according to the inspection intervals.
- When it is determined that the ropes should be withdrawn from service, do **not** continue to use them further.
- Exclude contact of rope with components except rope drive elements.
- Exclude contact of rope with structural parts, power lines or other objects within the surrounding area.
- Avoid corrosive and chemical surroundings.
- Avoid excessive soiling.
- Avoid excessive heat influence.
- Ensure proper condition of all elements of rope drive.
- Ensure proper spooling formation on the rope drum.
- Use the entire rope length of hoist ropes.
- Avoid slack rope formation on the drum.
- Do **not** bring outer twists into the rope.
- Avoid shock relief of the rope, such as sudden set down of the load.

- Avoid **non-permissible** angular pull, for example by pulling the load at an angle.

3.3 Temperature operating limits

Adhere the temperature operating limits for steel ropes. The determining factors are wire material, lubricant, rope end connections. See Manufacturer's specifications.

3.4 Qualification Maintenance personnel

Make sure that the following prerequisites are met:

- The maintenance personnel is trained and instructed in maintenance tasks.
- The maintenance personnel is assigned (authorized) for the maintenance by the crane operator.

3.5 Damage on rope

Rope removal criteria: If severe damage reduces the operational safety, then the rope can reach the removal criteria.

This section provides an overview for possible damage on the rope. For clearer illustration, the distortions on the illustrations are exaggerated.

The displayed ropes show a condition, which is far above the removal criteria.

Damage on the rope causes uneven load distribution in the affected areas.

Damage on the rope is most often localized.

Typical examples for damage, which can be recognized during maintenance work:

- Broken strands
- Wire breaks
- Reduction of rope diameter
- Localized increase of rope diameter
- Corrosion
- Flattenings
- Corkscrew-like distortion
- Basket formation
- Protruding, distorted inlay or braiding
- Loop formation
- Kinking, rope loops (grommets) pulled closed
- Buckles
- Influence of heat or electrical voltage, such as arcing

3.5.1 Broken strands

A strand consists of several individual wires.

When a complete braid is broken, then the rope must be taken down.

3.5.2 Broken wire

Externally visible broken wires are the result of wear caused by operation.

Additional types of broken wires:

- Broken wire in the inside of the rope
- Broken wire in the strand valleys
- Broken wire on a rope connection

A broken wire does not endanger the safety of the rope.

3.5.3 Reduction of rope diameter

The rope diameter changes due to abrasion, settling and external influences.

Abrasion of cover wires of outer strands of rope due to frictional contact. Especially in those areas where ropes are in contact with the rope pulleys during start up or slow down of the load.

Wear is increased by lack of or incorrect lubrication and the effect of dust.

Abrasion reduces the tensile strength of steel ropes because the cross section of the steel is reduced.

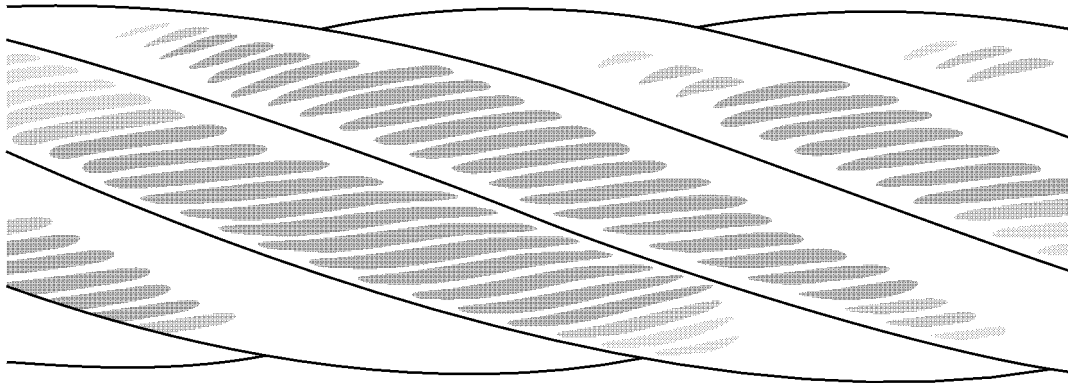


Fig.121001: External abrasion on the rope

When the rope diameter is reduced, the rope must be checked by **expert personnel for crane rope inspection**.

3.5.4 Localized increase of rope diameter

An increase, which occurs over a longer area of the rope can be caused by absorption of moisture in the fiber insert or due to corrosion in the inside of the rope.

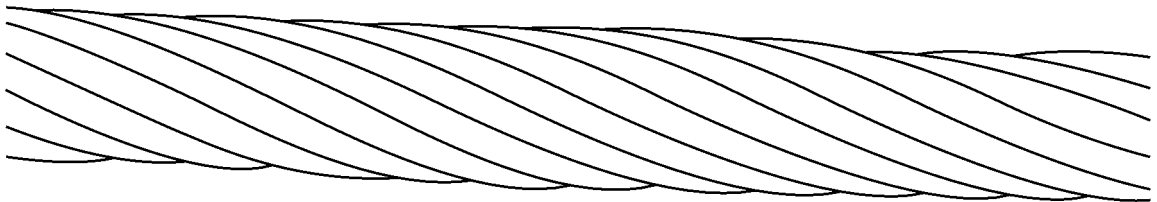


Fig.120992: Increase of rope diameter

When a localized increase of the rope diameter is present, then the rope must be checked by **expert personnel for crane rope inspection**.

3.5.5 Corrosion

Corrosion occurs due to insufficient lubrication, in maritime climates and in an atmosphere polluted by industrial fumes.

External corrosion is indicated by a rough wire surface. A superficial rust film can be wiped off.

Significant corrosion reduces the strength and elasticity of the rope due to the reduction of the rope diameter.

Inner corrosion is hard to detect.

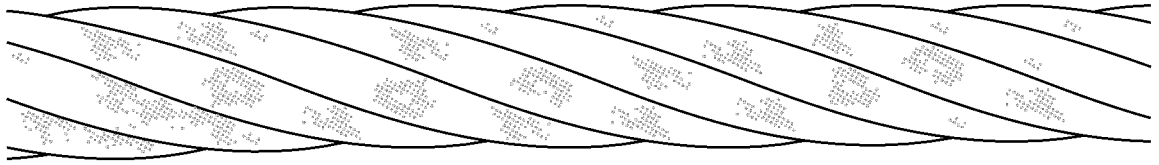


Fig.120994: External corrosion

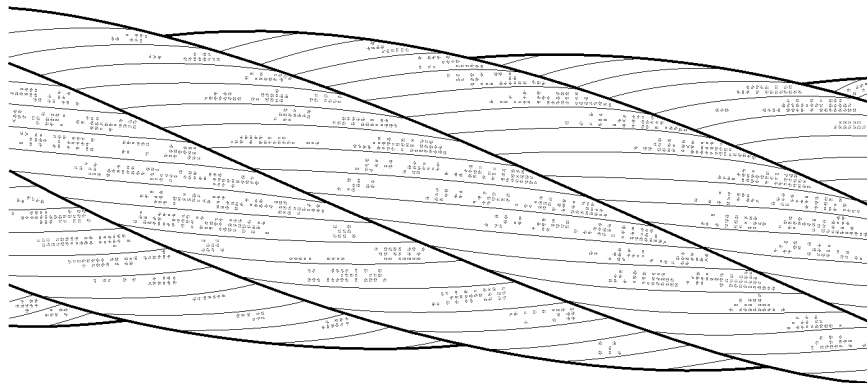


Fig.120995: Magnification of external corrosion for better depiction

When significant corrosion is present, the rope must be checked by **expert personnel for crane rope inspection**.

3.5.6 Flattening

Flattening occurs when the rope runs through the rope pulleys. In this area the rope wears quicker. Corrosion occurs faster on retaining ropes and guy ropes.

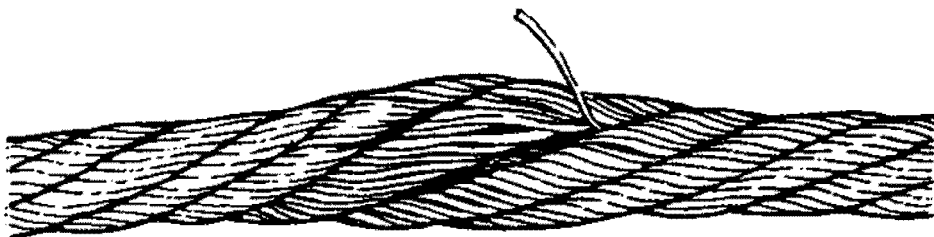


Fig.120997: Localized limited flattening, which leads to broken wires (single layer rope)

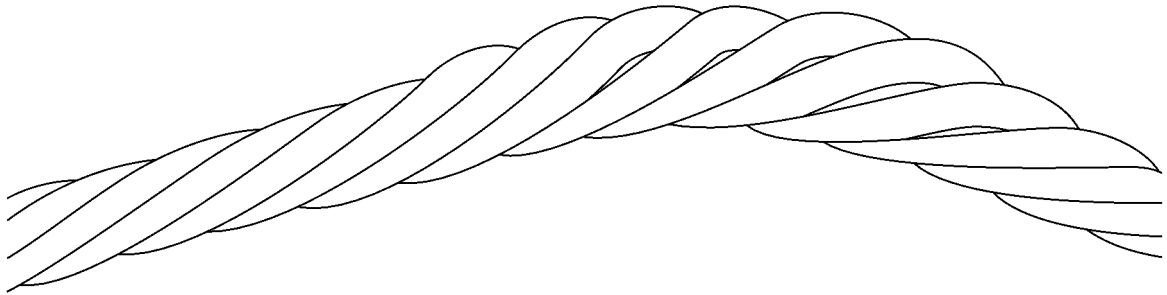


Fig.120996: Flattenings on multi layer spoolings

When flattening is present, the rope must be checked by **expert personnel for crane rope inspection**.

3.5.7 Corkscrew-like distortion

Distortion where the rope is in the form of a corkscrew along its longitudinal axis.

Corkscrew-like distortion causes rope wear, broken wires and bearing damage on rope pulleys.



Fig.120988: Corkscrew-like distortion

When corkscrew-like distortion is present, the rope must be checked by **expert personnel for crane rope inspection**.

3.5.8 Basket formation

This distortion occurs due to different layers between the outer strand layers and the inside of the rope.

Causes for basket formation are high angular pull angles during the run over the rope pulleys and run-in rope pulleys. Even load distribution over the entire cross section is not possible.

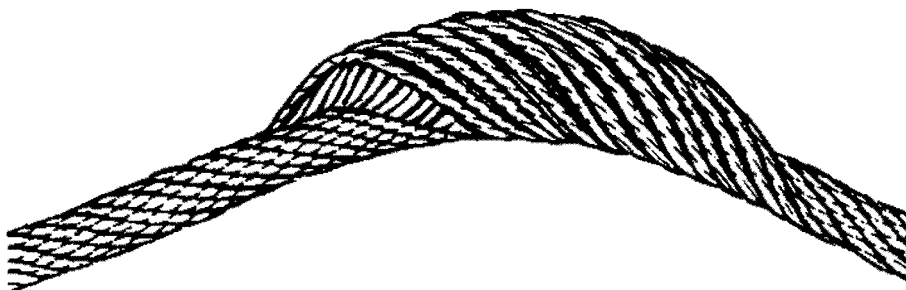


Fig.120989: Basket formation

When basket formation is present, then the rope must be taken down.

3.5.9 Protruding, distorted inlay, braiding

This distortion is a special form of basket formation: The insert or the core of the rope protrudes between the external braids or an external braid protrudes from the rope banding.

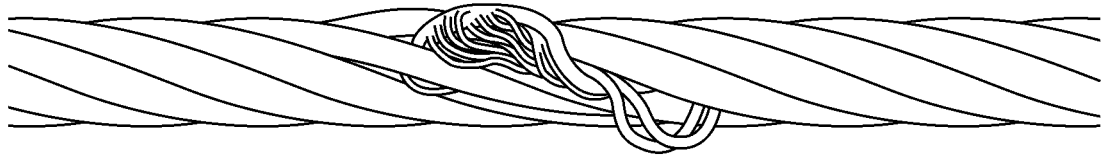


Fig.120990: Protrusion of an insert (rope single layer)



Fig.120991: Distorted or protruding strand

When the insert or a strand protrudes or is distorted, place the rope down. Have **expert personnel for crane rope inspection** check if the rope area with the distortion can be removed.

3.5.10 Loop formation

At loop formation individual wires protrude from the rope banding, when no broken wire ends can be seen.

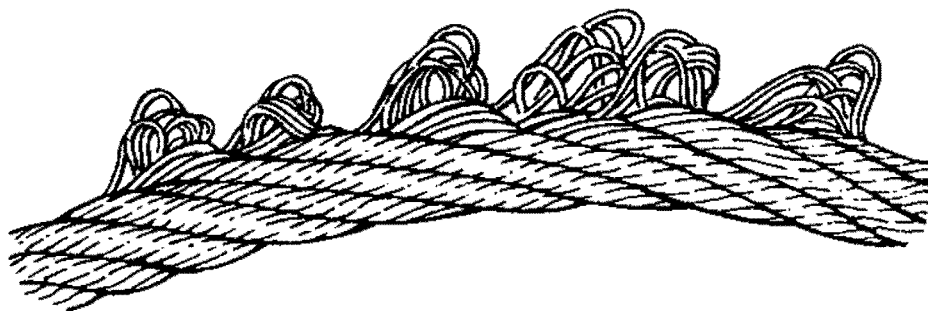


Fig.120993: Emergence of individual wires

When loop formation is present, take the rope down.

3.5.11 Kinking, rope loops (grommets) pulled closed

Deformation, where a loop has formed in the rope, without the possibility to rotate around its own axis during a load. The rope is subjected to more wear.

The rope is deformed. The strength remains only in part.

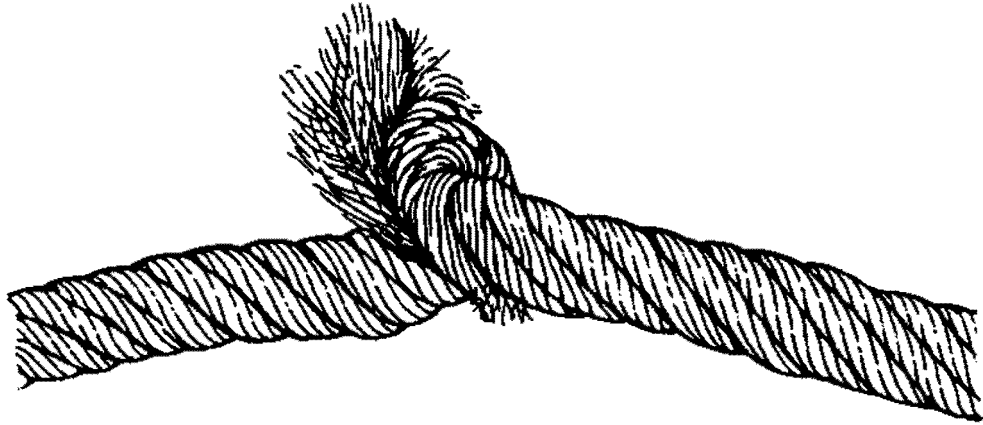


Fig.120998: Severe kinking or knots

When kinking or rope loops are present, place the rope down.

3.5.12 Buckles

Buckles are angular deformations. The rope was damaged due to external influences. Strong deformations of the rope cause stronger wear.

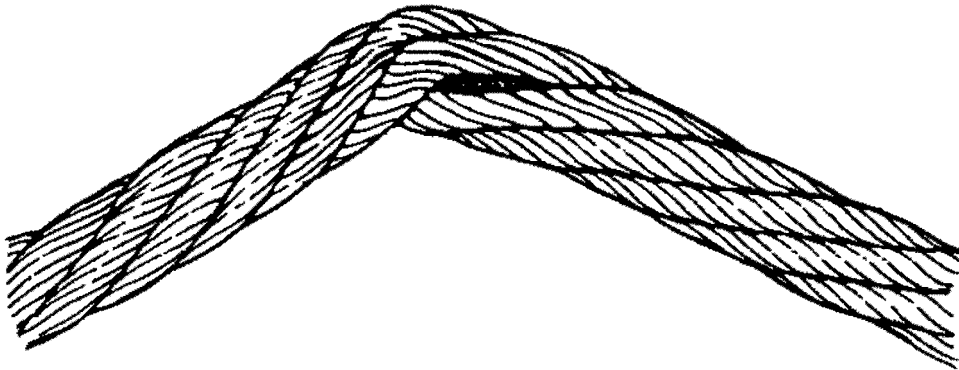


Fig.120999: Severe buckle

When buckles are present, take the rope down.

3.5.13 Effects of heat, arcs

Damage caused to the rope by welding work, for example.

Unusual heat impact is visible by tempering colors and loss of lubricant.

When heat impact has occurred on the rope, then the rope must be taken down.

3.6 Checking the ropes



WARNING

Operation with damaged rope!
Failure of rope. Death, severe injury, property damage.

When damage, wear and deformations are present:

- ▶ Have **expert personnel for crane rope inspection** determine if the rope has to be taken down.

The following sections describe the tasks for **daily visual inspection**.

The crane operator can carry out a daily visual inspection if he is sufficiently trained in the tasks and considered to be able to do so.

3.6.1 Intervals

Intervals and situations where the daily visual inspection must be made:

- Daily, before starting to work
- In case of change of the reeving of the crane rope due to
 - Transport
 - New reeving
 - Removal and installation

3.6.2 Areas

The rope must be checked over the entire length.

The following areas must be checked with special diligence:

- Rope end connections
- Safety coils and fixed point on the winch
- Areas of the rope which run through the hook block
- Areas of the rope which run over the rope pulleys or laying on the rope pulleys
- Areas of the rope which are spooled on the winch, especially cross over areas
- Areas of the rope which are laying above the compensation pulleys
- Areas of the rope which are subjected to abrasion due to external components
- All areas of the rope which are subjected to temperatures above 60°C

3.6.3 Documentation of rope condition

Every visible change of the wire rope must be documented in the crane records.

3.6.4 Checking the lubrication



WARNING

Missing lubrication!

Functional problems. Inner and outer corrosion.

- ▶ Lubricate the rope regularly.
- ▶ Make sure that the rope is lubricated all around.
- ▶ Select manual or automatic lubrication procedures.

The lubrication must be checked at least once a **month**.

When the rope shows signs of drying out:

- ▶ Lubricate the rope, see section „Lubricating the rope“.

3.6.5 Check for wear and distortion

- ▶ Check all visible parts of the rope for wear and distortion.
- ▶ Check the rope end connections and fixed points especially carefully for wear, damage, cracks and distortion.
- ▶ Check pressed together rope end connection for slipping and traces on the rope.



Note

- ▶ The maximum permissible number for broken wires over a certain rope length may not be exceeded.
- ▶ Determine the maximum permissible number of broken wires, see Crane operating instructions, chapter 8.04.
- ▶ Check the rope end connection and rope area near the rope end connection for broken wires.

When broken wires are present on the rope:

- ▶ Remove the broken wire, see section „Removing broken wires“.

When broken wires or damage is present on the rope end connection:

- ▶ Document visible changes of the rope condition.
- ▶ Have the rope checked by **expert personnel for crane rope inspection**.

When the rope can be shortened without reducing the operational safety:

- ▶ Shorten the rope, see section „Shortening the rope“.

3.6.6 Checking the rope drive for spooling problems

Lacking pretension of the rope on the winch can cause spooling problems in multi layer spooling.

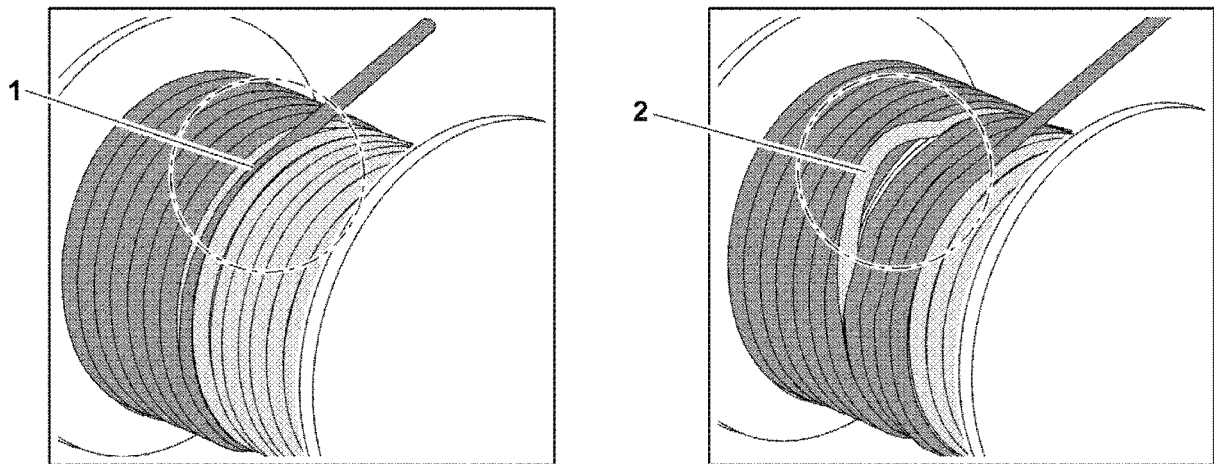


Fig.120967: Possible spooling problems on the rope winch

- 1** Cutting into the lower rope layers **2** Loop formation in the lower rope layers

- ▶ Check the spooling behavior of rope on the rope winch for cutting into the lower rope layers **1**.
- ▶ Check the spooling behavior of rope on the rope winch for loop formation in the lower rope layers **2**.

When spooling defects are found:

- ▶ Renew the pretension, see section „Renewing the pretension of hoist ropes“.
- ▶ Document visible changes of the rope condition.
- ▶ Have the rope checked by **expert personnel for crane rope inspection**.

3.6.7 Checking the position

- ▶ Check the correct position of the rope on the rope pulleys.

When the rope is **not** correctly laying on the rope pulley:

- ▶ Have the rope and rope pulley checked by **expert personnel for crane rope inspection**.

3.6.8 Checking for corrosion

A superficial „rust film“ can be wiped off.

- ▶ Do **not** clean the rope with solvents or cleaners.
- ▶ Clean the rope solely with a wire hand brush.
- ▶ Check rope for corrosion.

When the rope shows a rough surface:

- ▶ Document visible changes of the rope condition and have the rope checked by **expert personnel for crane rope inspection**.

If there is any uncertainty regarding the condition of the rope:

- ▶ Place the rope down or contact Liebherr Service.

3.6.9 Checking for flattenings

In the cross over area of the spooled up rope layers on the winch the rope is stressed more. The rope can be flattened as a result.

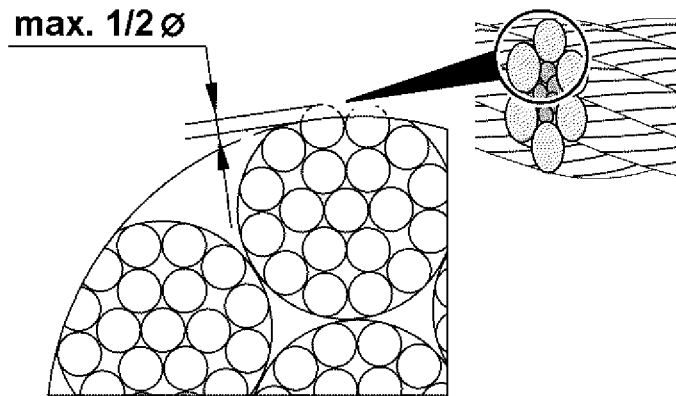


Fig.120966: Maximum flattening of wires on the outer strands

- ▶ Check the rope in the ascent zones of the rope spooling on the winch for flattenings.

When the outer braids are flattened more than half of the wire diameter:

- ▶ Document visible changes of the rope condition.
- ▶ Have the rope inspected by **expert personnel for crane rope inspection** or place the rope down.

When the rope can be shortened without reducing the operational safety:

- ▶ Shorten the rope on the rope drum fixed point, see section „Shortening the rope“.

3.7 Checking the control rope for distortions

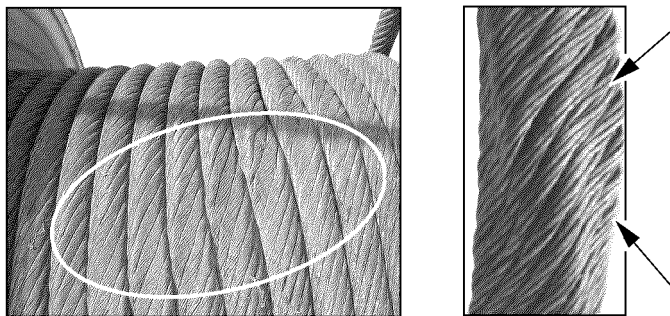


Fig.114002: Distortion on control ropes

- ▶ Check the first rope layer of the control rope for crushed areas and distortions.

When distortions are present:

- ▶ Have the rope checked by **expert personnel for crane rope inspection**.

3.8 Lubricating the rope



WARNING

Missing lubrication!

Functional problems. Inner and outer corrosion.

- ▶ Lubricate the rope regularly.
- ▶ Make sure that the rope is lubricated all around.
- ▶ Select manual or automatic lubrication procedures.

NOTICE

Too much or incorrect lubricant!

Excessive soiling. Wear on rope, on rope pulley and on winch. Recognition of take down criteria is impeded.

- ▶ Use lubricant, which is compatible with the rope and the original lubricant.

- ▶ Do **not** clean the rope with solvents or cleaners.
- ▶ Clean the rope solely with a wire hand brush.

Areas, which must be lubricated especially well are bending zones on winch and rope pulleys.

- ▶ Lubricate the rope.

3.9 Removing broken wires

NOTICE

Broken wires!

Damage of other components in crane operation, for example rope pulleys and compensation pulleys.

- ▶ Remove broken wires.

Make sure that the following prerequisite is met:

- Suitable pliers are on hand.

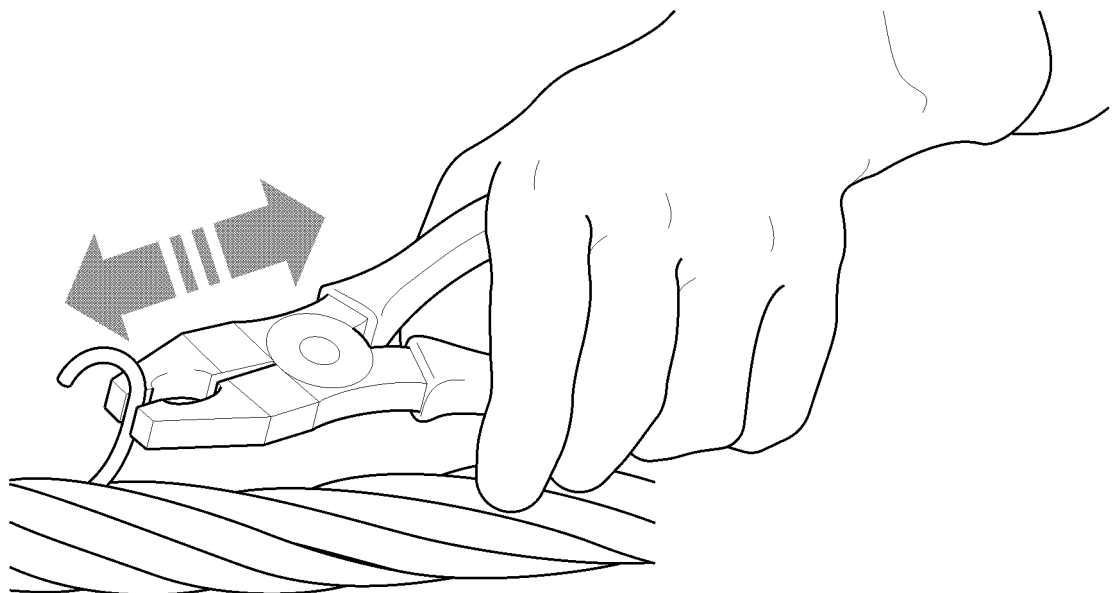


Fig.120979: Remove broken wire

- ▶ Grasp the wire on the upper end with pliers. Bend the wire back and forth until the wire breaks off in the braid valley.

The position of a broken wire is important for subsequent inspection. Individual broken wires are counted and are recorded later in the evaluation for withdrawal from service.

- ▶ Document the position of the broken wires in the crane record. Inspection checklist, see chapter 8.04.

3.10 Turning an extremely rotation-resistant hoist rope out



WARNING

Damage of rope due to incorrect procedure!

- ▶ Use extreme caution for the following procedures.
- ▶ Observe the following instructions exactly.

The cause for the turn-in of the hook block can have various reasons.

Check the crane for the following peculiarities:

- Scrub marks: Are hoist rope scrub marks present on the crane components? If scrub marks are present, check the hoist rope run and correct it.
- Rope pulleys: Did the groove diameter become too small?
 - Groove diameter dimensional stability must be present.
 - If this is not the case, the rope pulley must be replaced.
- Rope lubrication: Has the hoist rope been sufficiently lubricated? If the rope surface is dry, the hoist rope must be re-lubricated.

If the crane does not display other peculiarities, the hoist rope must be spun out.

The following sections describe two methods of how to spin out the hoist rope. The methods must be applied in the described sequence.

3.10.1 Spinning out with single strand reeving

- ▶ Reeve in the single strand hoist rope.
- ▶ Extend the boom to the maximal boom length and hook height.
- ▶ Lower hooks to approximately 1 m above the ground and allow the hoist rope to spin out.
- ▶ With an empty hook block, carry out one complete hoist cycle.
- ▶ Lower the hook again to approximately 1 m above the ground and allow the hoist rope to spin out again.
- ▶ Reeve the number of strands of hoist rope carefully and spin free where the twisting of the hook block is largest.
- ▶ Distribute the spin out to the entire rope length: Run at least two entire hoist cycles at maximum boom length and hook height.



Note

When the hook block continues to turn in:

- ▶ Spin the rope out, see section „Spinning out by turning the hook block out“.

3.10.2 Spinning out by turning out the hook block

Make sure that the following prerequisite is met:

- The hook block is reeved with the number of strands where the twisting is the largest.
- ▶ Extend the boom completely and lower the hook block.
- ▶ Attach a load of approximately 10 % of the nominal rope pull on the hook block.

Before lifting the load, a helper must rotate the twisted hook block to a straight position by hand until the rope strands no longer touch each other.

- ▶ Continue to turn the hook block by one entire turn.

Result:

- The rope strands touch again.

NOTICE

The hook block turns back under load in a straight position!

When the hook block turns back in a straight position:

- ▶ Release the hook block.
-
- ▶ Hold the hook block in the prescribed position until the load lifts off the ground.
 - ▶ Move the load until approximately 15 m before the uppermost hook position of the completely extended boom.
 - ▶ Lower load and set it down.

3.11 Renewing the pretension of hoist ropes

**WARNING**

Lacking pretension of the rope on the winch!

Excessive rope wear in the lower spooling layers, gap formation, rope cutting in.

When the lower rope layers on the winch are hardly used or **not**:

- ▶ Renew the pretension in the entire rope regularly.

Make sure that the following prerequisites are met:

- A reeving is selected where the entire rope length can be spooled.
- Clean spooling pattern on the drum at spooling.

**Note**

Recommendation!

- ▶ The rope application is the most economical when the entire rope length is utilized.

When only a part of the rope length is used for a longer period of time:

- ▶ Use a proportionally shorter rope.
-
- ▶ Spool the rope out until three safety coils.
 - ▶ Spool the rope up with a rope tensile force of 10 % of the maximum rope tensile force.

3.12 Shortening the rope

**WARNING**

Distortions and mechanical damage!

Operational safety significantly disturbed, uneven load distribution within the rope.

- ▶ Have the manufacturer check if the distorted and damaged area can be severed.

Visible form changes often occur localized or in short rope sections.

When a safe operation of the rope is ensured, a distorted and damaged area can be severed.

To shorten the rope there are different prerequisites:

- Rope shows flattenings
- Broken wires occur solely within the area of the rope end connection, the remaining rope is undamaged

**DANGER**

Minimum number of remaining coils on the winch fallen below!

Rope releases or rips off, falling load. Death, severe injury, property damage.

- ▶ Make sure, after shortening the rope that **at least three remaining coils** remain on the winch in all working positions of the crane.

Make sure that the following prerequisite is met:

- The rope was shortened by authorized and trained expert personnel.

Multi layer spooling: When the rope on the fixed point on the winch is shortened by half the winch diameter, then the service life of the rope increases significantly.

Empty page!

LWE/LR 11350-007/19005-01-02/en

7.06 Fill quantities, lubrication chart

| | | |
|---|----------------------|---|
| 1 | Fill quantities | 3 |
| 2 | Lubrication schedule | 4 |

Fig.195219

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1 Fill quantities



WARNING

Handling poisonous operating fluids and lubricants!
Poisoning, severe health damage.

When operating fluids are to be used, stored and disposed of:

- ▶ Observe and follow the printed instructions on the original containers.
- ▶ Store operating fluids exclusively in the closed original container.
- ▶ Keep children away from operating fluids. Keep operating fluids away from children.
- ▶ Dispose of operating items and lubricants in an environmentally safe manner.

NOTICE

Damage on aggregates due to impermissible additives!

- ▶ Make sure that **no** impermissible additives are added to the operating fluids.



Note

- ▶ Fill quantities and descriptions of service items and lubricants are specified in the Service fill.
- ▶ Fill the crane chassis, crane superstructure and equipment with the respective operating fluids.
- ▶ The specified fill quantities (change quantities) are orientation values. The marks on the dipsticks, inspection ports and sight gauges are decisive for filling.
- ▶ The equipment depends on the purchased scope of delivery.

On mobile cranes with truck chassis:

- ▶ Observe the maintenance intervals and maintenance notes of the truck chassis manufacturer.

NOTICE

Danger of property damage!

- ▶ Do **not** mix different oil products!
- ▶ Do **not** mix synthetic oils with mineral oils!
- ▶ Adhere to the data in the Service fill!

1.1 Diesel engine

- ▶ Check the engine oil. See Maintenance intervals and maintenance instructions.
- ▶ Adhere to the operating instructions of the engine manufacturer.

1.2 Coolant system

NOTICE

Property damage due to impermissible coolant!

- ▶ Do **not** mix different coolant products.
- ▶ Do **not** thin Liebherr-Fertig-Mix (Liebherr Ready Made Mix).

When adding coolant:

- ▶ Use exclusively the same coolant.

Coolants contain corrosion inhibitor - antifreeze fluid.

Add coolant only on the filler neck. See Service fill.



Note

If the coolant is changed:

- ▶ Contact the Service Dept. at Liebherr-Werk Ehingen GmbH for procedure.
- ▶ Empty the cooling system completely and flush.

In exceptional cases, the coolant can be supplemented with different coolants.

**Note**

Supplementing the coolant with different coolants:

- ▶ Contact the Service Dept. at Liebherr-Werk Ehingen GmbH for procedure.

- ▶ Check the coolant level. See Maintenance intervals and maintenance instructions.

1.3 Transmission

- ▶ Check the gear oil. See Maintenance intervals and maintenance instructions.

1.4 Hydraulic system

**Note**

- ▶ The oil level must be in the center of the hydraulic oil level sight gauge at 20 °C oil temperature.

At lower hydraulic oil temperature:

- ▶ Warm up the hydraulic oil.

At higher hydraulic oil temperature:

- ▶ Cool off the hydraulic oil.
- ▶ Retract all hydraulic cylinders completely, for example luffing cylinder, telescoping cylinder.

On vehicles with level regulation:

- ▶ Lower the vehicle completely with the level regulation.

- ▶ Check the hydraulic oil. See Maintenance intervals and maintenance instructions.

2 Lubrication schedule

**Note**

- ▶ Grease the crane chassis, crane superstructure and equipment with the respective lubricants. See Service fill.
- ▶ The equipment depends on the purchased scope of delivery.

On mobile cranes with truck chassis:

- ▶ Observe the maintenance intervals and maintenance notes of the truck chassis manufacturer.

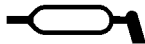


Fig.107729

**Note**

- ▶ Lube points are marked with a symbol.

7.07 Operating fluids and lubricants

1 Specified service fluids and lubricants for Liebherr cranes

3

Fig.195219

LWE/LR 11350-007/19005-01-02/en

1 Specified service fluids and lubricants for Liebherr cranes

| No. | Crane components | Ambient temperature for driving and crane operation | |
|-----|---|---|---|
| | | -20 °C to +50 °C | -40 °C to +30 °C |
| 1.1 | Diesel engine with Exhaust aftertreatment | LWE Id. No.: 11100934 Liebherr Motoroil 5W-30 low ash or: LWE Id. No.: 10663796 Liebherr Motoroil 10W-40 low ash LH-00-ENG _{LA} Observe the instructions of the engine manufacturer | LWE Id. No.: 11100934 Liebherr Motoroil 5W-30 low ash or: LWE Id. No.: 10663796 Liebherr Motoroil 10W-40 low ash LH-00-ENG _{LA} Observe the instructions of the engine manufacturer Below -20 °C with pre-heating |
| | | Note: To improve the cold start ability of the diesel engine at an ambient temperature below -10 °C we recommend the use of Liebherr Motoroil 5W-30 low ash, LWE Id. no.: 11100934 | |
| | | Note: For alternative oil specifications, see the separate engine manufacturer's operating instructions | |
| 1.2 | Diesel engine without Exhaust aftertreatment | LWE Id. No.: 10871536 Liebherr Motoroil 5W-30 or: LWE Id. No.: 861005308 Liebherr Motoroil 10W-40 LH-00-ENG Observe the instructions of the engine manufacturer | LWE Id. No.: 10871536 Liebherr Motoroil 5W-30 or: LWE Id. No.: 861005308 Liebherr Motoroil 10W-40 LH-00-ENG Observe the instructions of the engine manufacturer Below -20 °C with pre-heating |
| | | Note: To improve the cold start ability of the diesel engine at an ambient temperature below -10 °C , we recommend the use of Liebherr Motoroil 5W-30, LWE-Id no.: 10871536 | |
| | | Note: For alternative oil specifications, see the separate engine manufacturer's operating instructions | |
| 2 | Drive axle 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 |

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| No. | Crane components | Ambient temperature for driving and crane operation | |
|-----|--|--|---|
| | | -20 °C to +50 °C | -40 °C to +30 °C |
| 4.1 | Vehicle distributor gear KESSLER VG 1800, VG 2400, VG 2550, VG 2600, VG 2700, VG 3750, VG 3751 W 3750, W 3751 | LWE Id. No.: 861901008 Liebherr Gear Hypoid 90 EP SAE 90 and API GL 5 | LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 SAE 75W-90 and API GL 5 |
| 4.2 | Vehicle distributor gear with PTO for crane drive KESSLER VG 2700 with PTO VG 3751 with PTO | LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 SAE 75W-90 and API GL 5 | LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 SAE 75W-90 and API GL 5 |
| 4.3 | Vehicle distributor gear ZF Passau, STEYR PUCH VG 1200, VG 1600, VG 2000, VG 3800 | LWE Id. No.: 861901008 Liebherr Gear Hypoid 90 EP ZF TE-ML 19 | LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 ZF TE-ML 19 |
| 5 | Miter gear for crane drive | LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 SAE 75W-90 and API GL 5 | LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 SAE 75W-90 and API GL 5 |
| 6 | Offset gear (drop box) ZF Passau, STEYR PUCH | LWE Id. No.: 861901008 Liebherr Gear Hypoid 90 EP ZF TE-ML 19 | LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 ZF TE-ML 19 |
| 7.1 | Pump distributor gear filled with mineral gear oil | LWE Id. No.: 861901008 Liebherr Gear Hypoid 90 EP SAE 90 and API GL 5 | LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 SAE 75W-90 and API GL 5 |
| 7.2 | Pump distributor gear filled with synthetic gear oil | LWE Id. No.: 861901208 Liebherr Gear PG 220 CLP PG 220, DIN 51517-3 WARNING: May not be mixed with other oils! | LWE Id. No.: 10664125 Liebherr Gear PG 150 CLP PG 150, DIN 51517-3 WARNING: May not be mixed with other oils! |
| 7.3 | Pump distributor gear LTC 1055-3.1 | LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 SAE 75W-90 and API GL 5 | LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 SAE 75W-90 and API GL 5 |

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| No. | Crane components | Ambient temperature for driving and crane operation | |
|------|--|---|---|
| | | -20 °C to +50 °C | -40 °C to +30 °C |
| 8.1 | Powershift transmission ZF torque converter WG 120, WG 150, WG 180, WG 181, WG 200, WG 201 | LWE Id. No.: 861005308 Liebherr Motoroil 10W-40 ZF TE-ML 03 | LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ZF TE-ML 03 Below -20 °C run until warm according to the operating instructions |
| 8.2 | Powershift transmission ZF torque converter WG 251* ZF ERGOPOWER WG 210, WG 260, WG 310 * also for ambient temperatures above -10 °C | LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ZF TE-ML 03 | LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ZF TE-ML 03 Below -20 °C run until warm according to the operating instructions |
| 9 | Powershift transmission CLARK | LWE Id. No.: 861005308 Liebherr Motoroil 10W-40 SAE 10W-40 and ACEA E4 | LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ATF Dexron II D and ALLISON C4 Below -20 °C run until warm according to the operating instructions |
| 10 | Offset gear (drop box) ALLISON | LWE Id. No.: 861005308 Liebherr Motoroil 10W-40 SAE 10W-40 and API CF, ACEA E4 | LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ALLISON C4 Below -20 °C run until warm according to the operating instructions |
| 11.1 | Automatic transmission ALLISON CLBT 740, CLBT 750, CLBT 754, CLBT 755 HT 755, HD 4560 | LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ALLISON C4 | LWE Id. No.: 861903708 CASTROL Transynd ALLISON C4 Below -20 °C run until warm according to the operating instructions |
| 11.2 | Automatic transmission ZF | LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ZF TE-ML 14 | LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ZF TE-ML 14 Below -20 °C run until warm according to the operating instructions |

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| No. | Crane components | Ambient temperature for driving and crane operation | |
|------|---|--|---|
| | | -20 °C to +50 °C | -40 °C to +30 °C |
| 12.1 | Automatic transmission ZF AS-Tronic ZF TC-Tronic (basic gear) ZF TC-Tronic HD (basic gear) | LWE Id. No.: 10218305 ZF-Ecofluid M ZF TE-ML 02 | LWE Id. No.: 10218305 ZF-Ecofluid M ZF TE-ML 02 below -20 °C preheat the gear according to the operating instructions |
| 12.2 | Automatic transmission ZF TraXon ZF TraXon Torque (basic gear) | LWE Id. No.: 10218305 ZF-Ecofluid M ZF TE-ML 02 | LWE Id. No.: 10218305 ZF-Ecofluid M ZF TE-ML 02 below -20 °C preheat the gear according to the operating instructions |
| 13.1 | Torque converter coupling ZF TC HD | LWE Id. No.: 10218305 ZF-Ecofluid M ZF TE-ML 02 | LWE Id. No.: 10218305 ZF-Ecofluid M ZF TE-ML 02 below -20 °C preheat the gear according to the operating instructions |
| 13.2 | Torque converter coupling ZF TC 2 | LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ZF TE-ML 14 | LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ZF TE-ML 14 |
| 14 | Transmission ZF ECO-Split | LWE Id. No.: 10218305 ZF-Ecofluid M ZF TE-ML 02 | LWE Id. No.: 10218305 ZF-Ecofluid M ZF TE-ML 02 |
| 15 | Slewing gear | LWE Id. No.: 861901208 Liebherr Gear PG 220 CLP PG 220, DIN 51517-3 WARNING: May not be mixed with other oils! | LWE Id. No.: 861901208 Liebherr Gear PG 220 CLP PG 220, DIN 51517-3 WARNING: May not be mixed with other oils! |
| 16.1 | Rope winch | LWE Id. No.: 861901208 Liebherr Gear PG 220 CLP PG 220, DIN 51517-3 WARNING: May not be mixed with other oils! | LWE Id. No.: 861901208 Liebherr Gear PG 220 CLP PG 220, DIN 51517-3 WARNING: May not be mixed with other oils! |
| 16.2 | Rope winch (tooth flanks) LR 13000 | LWE Id. No.: 11000948 Liebherr Universal grease 9900 KPF2N-25, DIN 51502 | LWE Id. No.: 11000948 Liebherr Universal grease 9900 KPF2N-25, DIN 51502 |

| No. | Crane components | Ambient temperature for driving and crane operation | |
|------|---|--|--|
| | | -20 °C to +50 °C | -40 °C to +30 °C |
| 17 | Winch of Telescopic boom guying | LWE Id. No.: 861901208 Liebherr Gear PG 220 CLP PG 220, DIN 51517-3 WARNING: May not be mixed with other oils! | LWE Id. No.: 861901208 Liebherr Gear PG 220 CLP PG 220, DIN 51517-3 WARNING: May not be mixed with other oils! |
| 18.1 | Crane hydraulics Crane chassis and crane superstructure Observe exceptions, see 18.2 | LWE Id. No.: 861903508 Liebherr Hydraulic 37 | LWE Id. No.: 10293807 Liebherr Hydraulic Plus Arctic |
| 18.2 | Crane hydraulics Crane chassis and crane superstructure LTM 11200-9.1 LTR 11200 LR 13000, LR 11000, LR 1600/2, LR 1600/2-W LTC 1055-3.1 | LWE Id. No.: 10293807 Liebherr Hydraulic Plus Arctic | LWE Id. No.: 10293807 Liebherr Hydraulic Plus Arctic |
| 19 | Brake system if hydraulically actuated | LWE Id. No.: 861000108 DOT 4 SAE J 1703e | LWE Id. No.: 861000108 DOT 4 SAE J 1703e |
| 20 | Clutch actuator | LWE Id. No.: 861000108 DOT 4 SAE J 1703e | LWE Id. No.: 861000108 DOT 4 SAE J 1703e |
| 21 | King pin bearing Gear shaft if not maintenance-free | LWE Id. No.: 861301308 Liebherr Special grease 9610 Plus KP2K-20, DIN 51502 | LWE Id. No.: 10296825 Liebherr Universal grease Arctic KPFHC1N-60, DIN 51502 |
| 22.1 | Glide and roller bearing roller bearing joint | LWE Id. No.: 861301308 Liebherr Special grease 9610 Plus KP2K-20, DIN 51502 | LWE Id. No.: 10296825 Liebherr Universal grease Arctic KPFHC1N-60, DIN 51502 |
| 22.2 | Rope pulley bearing | LWE Id. No.: 10296825 Liebherr Universal grease Arctic KPFHC1N-60, DIN 51502 | LWE Id. No.: 10296825 Liebherr Universal grease Arctic KPFHC1N-60, DIN 51502 |
| 23 | Central lubrication system | LWE Id. No.: 861301308 Liebherr Special grease 9610 Plus KP2K-20, DIN 51502 | LWE Id. No.: 10296825 Liebherr Universal grease Arctic KPFHC1N-60, DIN 51502 |

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| No. | Crane components | Ambient temperature for driving and crane operation | |
|------|--|---|---|
| | | -20 °C to +50 °C | -40 °C to +30 °C |
| 24.1 | Slewing ring connection Roller bearing | LWE Id. No.: 861301308 Liebherr Special grease 9610 Plus KP2K-20, DIN 51502 | LWE Id. No.: 10296825 Liebherr Universal grease Arctic KPFHC1N-60, DIN 51502 |
| 24.2 | Slewing ring connection LR 13000 | LWE Id. No.: 11000948 Liebherr Universal grease 9900 KPF2N-25, DIN 51502 | LWE Id. No.: 10296825 Liebherr Universal grease Arctic KPFHC1N-60, DIN 51502 |
| 25.1 | Support plate with equalization | LWE Id. No.: 10877698 Loctite LB 8104 Silicone oil base WARNING: Do not use oils with another base! | LWE Id. No.: 10877698 Loctite LB 8104 Silicone oil base WARNING: Do not use oils with another base! |
| 25.2 | Glide shoes for cab guidance on vehicle frame LTC 1045-3.1 LTC 1050-3.1 | LWE Id. No.: 861303608 Liebherr Telescope grease 9613 Plus KP2K-30, DIN 51502 | LWE Id. No.: 861303608 Liebherr Telescope grease 9613 Plus KP2K-30, DIN 51502 |
| 26 | Sliding beam Plastic glide bearing Beam for track adjustment | LWE Id. No.: 861303608 Liebherr Telescope grease 9613 Plus KP2K-30, DIN 51502 | LWE Id. No.: 861303608 Liebherr Telescope grease 9613 Plus KP2K-30, DIN 51502 |
| 27.1 | Telescopic boom Plastic glide bearing Corner guide top | LWE Id. No.: 861303608 Liebherr Telescope grease 9613 Plus KP2K-30, DIN 51502 | LWE Id. No.: 861303608 Liebherr Telescope grease 9613 Plus KP2K-30, DIN 51502 |
| 27.2 | Telescopic boom Outer glide bearing Lower shell Inner glide bearing (only during assembly) | LWE Id. No.: 861303308 Liebherr Special grease 1336 KP2K-30, DIN 51502 Spray grease | LWE Id. No.: 861303308 Liebherr Special grease 1336 KP2K-30, DIN 51502 Spray grease |
| 27.3 | Telescopic boom LTC 1045-3.1 LTC 1050-3.1 | LWE Id. No.: 11651459 Bechem Berulub TCG 1 V | LWE Id. No.: 11651459 Bechem Berulub TCG 1 V |
| 27.4 | Telescopic boom LTM 1050-3.1 | LWE Id. No.: 10878154 Liebherr Sliding Paste TB 1 | LWE Id. No.: 10878154 Liebherr Sliding Paste TB 1 |

| No. | Crane components | Ambient temperature for driving and crane operation | |
|------|--|--|--|
| | | -20 °C to +50 °C | -40 °C to +30 °C |
| 28 | Boom lock | LWE Id. No.: 861301308 Liebherr Special grease 9610 Plus KP2K-20, DIN 51502 | LWE Id. No.: 10296825 Liebherr Universal grease Arctic KPFHC1N-60, DIN 51502 |
| 29 | Guide rail on Telescoping cylinder | LWE Id. No.: 861303308 Liebherr Special grease 1336 KP2K-30, DIN 51502 Spray grease | LWE Id. No.: 861303308 Liebherr Special grease 1336 KP2K-30, DIN 51502 Spray grease |
| 30 | Gear ring rotary connection Slewing gear drive pinion | LWE Id. No.: 861007708 Liebherr RHS-Fluid OGPF 0 S-20, DIN 51502 | LWE Id. No.: 861007708 Liebherr RHS-Fluid OGPF 0 S-20, DIN 51502 |
| | | or LWE Id. No.: 861301508 Liebherr gear protection RHY OGPF 2 S-30, DIN 51502 | or LWE Id. No.: 861301508 Liebherr gear protection RHY OGPF 2 S-30, DIN 51502 |
| 31 | Running rope | LWE Id. No.: 10173371 Liebherr WR-Lube SC Adhesive grease | LWE Id. No.: 10173371 Liebherr WR-Lube SC Adhesive grease |
| | | or LWE Id. No.: 10174262 Liebherr WR-Lube SC Adhesive grease | or LWE Id. No.: 10174262 Liebherr WR-Lube SC Adhesive grease |
| 32 | Radiator fluid Diesel engine and heating system | LWE Id. No.: 10871121 Liebherr Antifreeze OS Mix Pre-mixed corrosion inhibitor / antifreeze WARNING: May not be diluted and / or mixed with other corrosion inhibitors / anti-freeze! | LWE Id. No.: 10871121 Liebherr Antifreeze OS Mix Pre-mixed corrosion inhibitor / antifreeze WARNING: May not be diluted and / or mixed with other corrosion inhibitors / anti-freeze! |
| 33.1 | Travel gears Crawler crane | see data tag | see data tag |
| 33.2 | Travel gears telescope crawler crane | see data tag | see data tag |
| 34 | Recovery winch | See the data tag and manufacturer's specifications | See the data tag and manufacturer's specifications |
| 35 | Recovery winch rope | See the manufacturer's specifications | See the manufacturer's specifications |
| 36 | Steering uncoupling LTC 1045-3.1 LTC 1050-3.1 | LWE Id. No.: 10800345 Teflon Spray | LWE Id. No.: 10800345 Teflon Spray |

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| No. | Crane components | Ambient temperature for driving and crane operation | |
|-----|------------------|--|--|
| | | -20 °C to +50 °C | -40 °C to +30 °C |
| 37 | Pin connections | LWE Id. No.: 11000948 Liebherr Universal grease 9900 KPF2N-25, DIN 51502 | LWE Id. No.: 11000948 Liebherr Universal grease 9900 KPF2N-25, DIN 51502 |

7.15 Procedure in case of problems

| | | |
|---|--|----|
| 1 | Alignment in case of a problem | 3 |
| 2 | Carrying out error diagnostics | 7 |
| 3 | Measures in clear problem cases | 19 |
| 4 | Measures in case of defective components | 25 |

Fig.197077

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1 Alignment in case of a problem

This chapter provides support for the following questions:

- What to do in case of a problem?
- Which displays and component groups are relevant for error diagnostics?
- How can error diagnostics be carried out?
- How to proceed in case of error messages of the LICCON computer system?
- Which measures are to be taken for defective components?
- Which measures are to be taken in a clear case of a problem?
- Which data is important for communication with Liebherr Service?



WARNING

Erroneous or insufficient repair!

If a crane is not properly or insufficiently repaired, then this can result in accidents!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ The crane may only be repaired by authorized and trained expert personnel!



WARNING

Measures without the help of Liebherr Service!

Measures in case of a problem, which are carried out without consulting Liebherr Service can cause damage to the crane!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.



WARNING

Problems with a lifted load!

If a crane is checked, diagnosed or repaired with a lifted load, then there is a danger of accident!

During accidents, personnel could be killed or seriously injured!

This could result in property damage!

- ▶ If possible, set the load down!
- ▶ If possible, take the boom system down!
- ▶ If the load cannot be set down and / or the boom system cannot be taken down, secure a wide-ranging danger zone!



Note

- ▶ The display illustrations in this chapter are only examples. The display values may differ depending on the crane. In addition, some illustrations show a display with multiple icons. During normal crane operation, an identical display may **not** appear on the LICCON monitor.

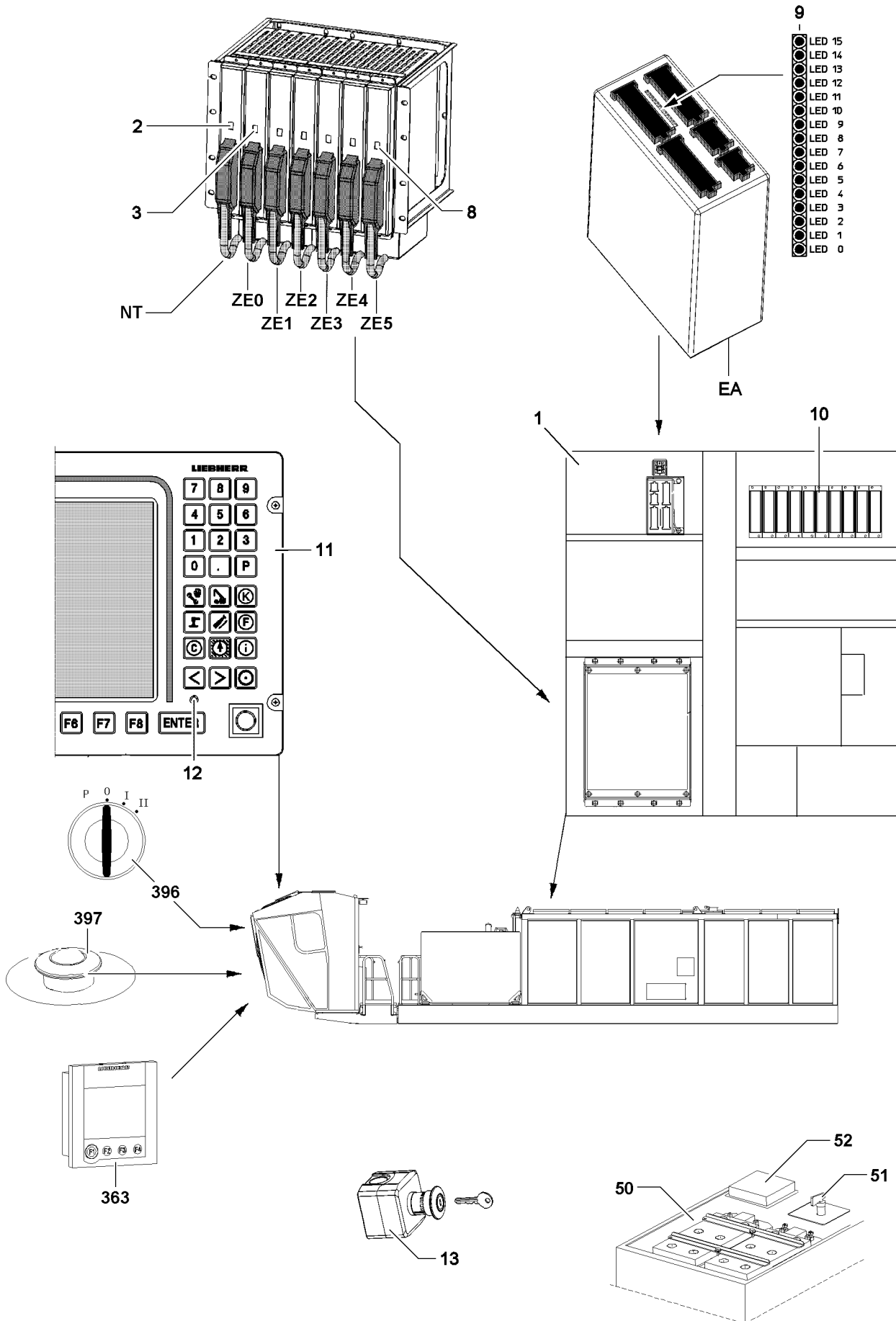


Fig.112965

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1.1 Overview of displays and component groups for error diagnostics

Various displays and component groups allow the crane driver:

- To localize error messages
- To prepare quicker and more precise communication with Liebherr Service
- To diagnose and remedy errors with the help of the „Diagnostics operating instructions“



Note

- If separate Operating instructions have been provided by the supplier as part of the delivery scope of the crane, then they must be observed!

| Position | Crane operator's cab |
|----------|--|
| 1 | Control cabinet |
| 2 | Power supply LED display |
| 3-8 | CPU0 to CPU5 LED displays |
| 9 | I/O module LED displays |
| 10 | Control cabinet fuses |
| 11 | LICCON monitor |
| 12 | LICCON monitor power supply LED displays |
| 13 | EMERGENCY STOP switch* (outside the crane operator's cab - illustration exemplary) |
| 50 | Battery box (illustration exemplary) |
| 51 | Battery master switch (illustration example) |
| 52 | Main fuses (illustration example) |
| 363 | Touch display |
| 396 | Ignition switch |
| 397 | EMERGENCY STOP switch in crane operator's cab |

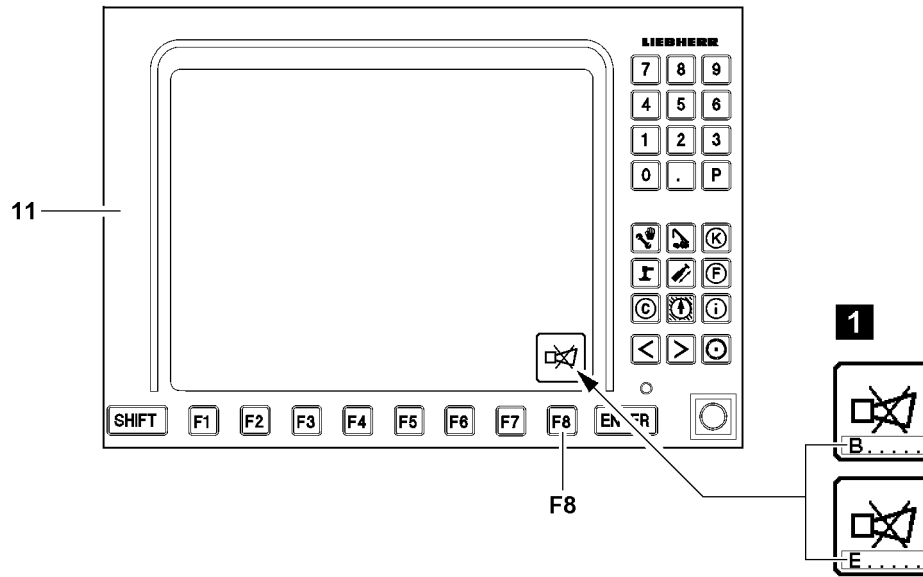


Fig.112963

1.2 Type of problem

Problems can be assigned to various error sources:

- Operating error
 - Displayed by error number / LEC: B.....
 - to be remedied by crane operator
- System error in the LICCON computer system
 - Displayed by error number / LEC: E.....
 - To be remedied by the crane operator / Liebherr Service.
- Errors in mechanics / components
 - To be remedied by the crane operator / Liebherr Service.
- Combination of error sources
 - To be remedied by the crane operator / Liebherr Service.



Note

LICCON Error Code Manual (LICCON error code list)

- ▶ All error numbers / LEC (LICCON Error Code) are listed in the „LICCON Error Code Manual“ (LICCON error code list).

2 Carrying out error diagnostics

The crane is monitored:

- By the LICCON computer system for operating / system errors
- By indicator lights.

If errors occur, error messages are issued and / or indicator lights light up.

Error messages appear in:

- The horn icon of LICCON monitor, see illustration 1

Indicator lights are located in view:

- In the Crane operator's cab
- On the components, for example in the control cabinet



WARNING

Danger of accident!

When carrying out the error diagnostics, there is a danger of accident!

During accidents, personnel could be killed or seriously injured!

This could result in property damage!

- ▶ Take the crane out of operation!
- ▶ In case of safety defects, secure the crane to prevent continued operation!
- ▶ The crane may only be inspected, diagnosed and repaired at a standstill and in a shut off condition!
- ▶ Inspections, error diagnostics and repairs, for which the crane must be in operation are only permissible with extreme caution and constant visual and voice contact between all involved personnel!
- ▶ Inspections, error diagnostics and repairs may only be carried out by expert or trained personnel!
- ▶ For inspections, error diagnostics and repairs of electrical devices on the crane, power must be turned off and ensured to remain so for the duration of the work!
- ▶ Test operation after a repair must be performed by the crane operator or in his presence!

**Note**

- ▶ Always observe error messages and illuminated indicator lights!
- ▶ For a detailed procedure in case of error messages, see the Diagnostics operating instructions, chapter 20.05.
- ▶ For an overview of indicator lights on the crane superstructure, see the Crane operating instructions, chapter 4.01.

Several possibilities exist for an error diagnostics:

- Without the help of Liebherr Service
- With the help of Liebherr Service: Error diagnostics by phone
- With the help of Liebherr Service: Remote diagnostics

2.1 Error diagnostics without the help of Liebherr Service

**WARNING**

Acting on your own authority!

If measures are carried out on your own authority in case of a problem, then this can result in damage to the crane!

Damage on the crane can cause erroneous functions and accidents!

Personnel can be severely injured or killed!

This could result in property damage!

- ▶ Observe and adhere to the notes and instructions in this chapter.
- ▶ Observe the Diagnostics operating instructions.
- ▶ In case of lack of clarity, contact Liebherr Service.
- ▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.

2.1.1 Error message on the LICCON monitor

After an error message is displayed on the LICCON monitor:

- ▶ Press the function key **F8**.

Result:

- The acoustic warning is turned off.

- ▶ Press the function key **F8** again.

Result:

- The error code is displayed on the LICCON monitor (error determination screen in the „test system“).
- In addition, all errors are listed in a separate error list (error text, cause, remedy).

Two different error types are differentiated in the error code:

- Operating errors - Error code starts with a „B“.
- System errors / application errors - Error code starts with an „E“.

If an error code starts with a „B“:

- ▶ Correct the operating error.

If an error code starts with an „E“:

- ▶ Call up the test system, see the Diagnostics operating instructions.

or

In case of lack of clarity:

Consult Liebherr Service.

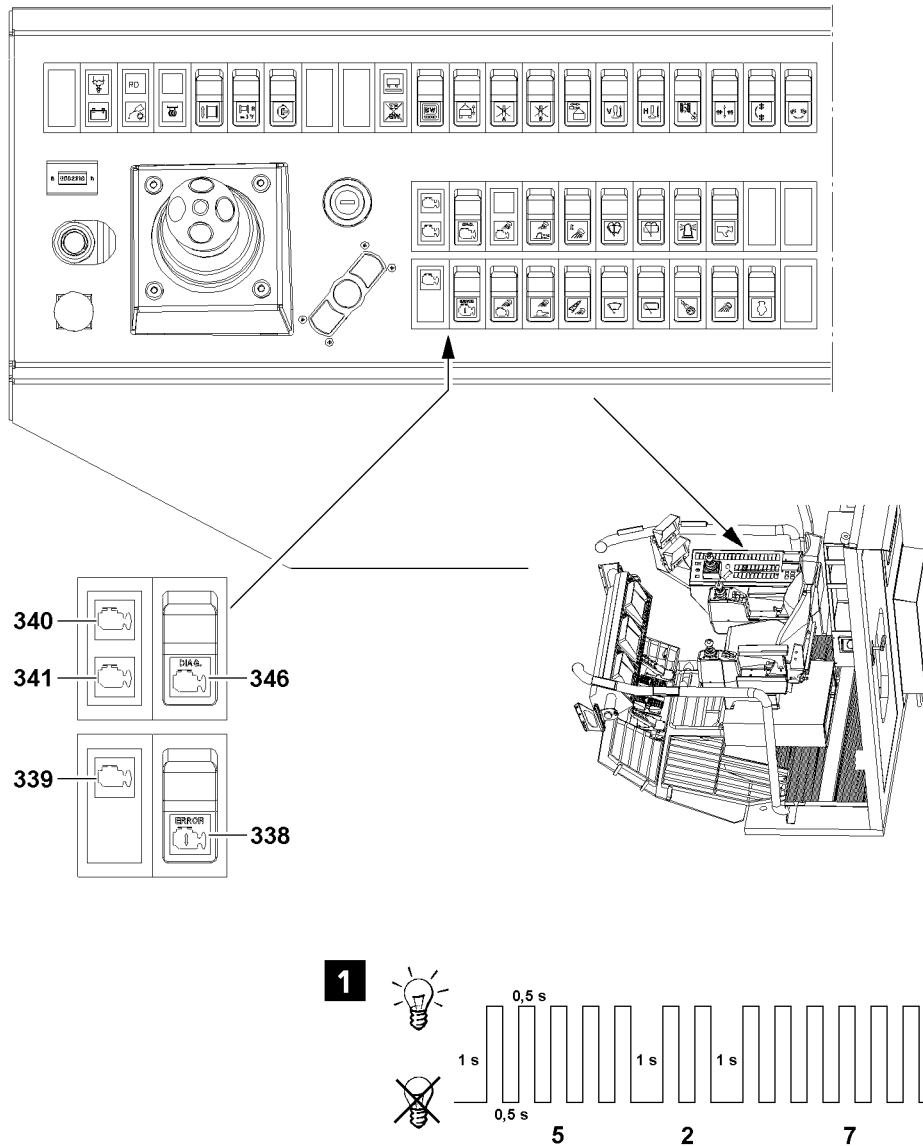


Fig.112967

2.1.2 Crane engine error messages

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 | Indicates excessively high fluid temperatures and excessively low fill levels |
| 340 | Red | Indicates severe errors on the crane engine Turn the crane engine off immediately! |
| 341 | Yellow | Indicates warnings on the crane engine |

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Structure of the blinker code



Note

► „Blinker code 527“ is explained as an example on the error code light **341**, see illustration 1.

- 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 signals 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.

Procedure in case of crane engine error messages



Note

As an example, the procedure is explained for an existing error message.

► An error message is shown on the crane engine 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 „Structure 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 no 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“.

Overview of crane engine error messages

| Blinker 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 | Injection timing control actuator does not react to the control changes. Discrepancy between measured and desired control pressure. | Adjustment dependent engine stop or RPM reduction or no effect. |
| 113 | 341 | Injection timing control actuator has short circuit to power supply. | No effect. The actuator 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. | The engine is turned off and cannot run. |
| 116 | 340 | The injection timing control pressure sensor has short circuit to power supply. More than 4.78 V on Pin 33. | Adjustment dependent engine stop or RPM reduction or no effect. |

| Blinker code | Position | Reason | Effect |
|--------------|----------|---|--|
| 117 | 340 | The injection timing control pressure sensor 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 | Fuel pump pressure sensor short circuit to power supply. More than 4.78 V on Pin 32. | No effect. Possible loss of power. |
| 119 | 341 | Fuel pump pressure sensor 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 sensor input not present on Pins 27, 28 or 37, 38. | No effect by controller. |
| 122 | 341 | High voltage on connection 35 (charge pressure sensor signal) found on the engine wiring harness. | Engine output is restricted to the setting without air supply. |
| 123 | 341 | Low voltage on connection 35 (charge pressure sensor signal) found on the engine wiring harness. | Engine output is restricted to the setting without air supply. |
| 131 | 340 | High voltage found on connection 29 gas pedal position signal of the wiring harness. | Adjustment dependent output and / or RPM reduction. |
| 132 | 340 | Low voltage found on connection 29 gas pedal position signal of the wiring harness. | Adjustment dependent output and / or RPM reduction. |
| 133 | 340 | High voltage found on connection 30 (gas pedal position signal at remote control) of the wiring harness. | Engine does not react to remote control of gas pedal. |
| 134 | 340 | Low voltage found on connection 30 (gas pedal position signal at remote control) of the wiring harness. | Engine does not react to remote control of gas pedal. |
| 135 | 341 | High signal voltage found on connection 24 in the switch circuit of the engine oil pressure sensor. | Preadjusted value for oil pressure is used. No protective function for oil pressure. |
| 141 | 341 | Low signal voltage found on connection 24 in the switch circuit of the engine oil pressure sensor. | Preadjusted value for oil pressure is used. No protective function for oil pressure. |
| 143 | 339 | The 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 found on connection 22 in the switch circuit of the engine coolant temperature sensor. | Preadjusted value for coolant temperature is used. No engine protection for coolant temperature. |
| 145 | 341 | Low signal voltage found on connection 22 in the switch circuit of the 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 signal), a frequency below the minimum value was found. | The engine does not react to changes in RPM frequency regulation. The engine is running at idling speed. |

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| Blinker code | Position | Reason | Effect |
|--------------|----------|---|--|
| 148 | 340 | On connection 17 of the engine wiring harness (throttle signal), a frequency above the maximum value was found. | The engine does not react to changes in RPM frequency regulation. The engine is running at idling speed. |
| 151 | 339 | The engine coolant temperature signal signals that the coolant temperature has increased past the critical limit to protect the engine. | Engine protection function with overheated coolant: In the case of an overheated engine, engine output is reduced so that the engine can cool down. |
| 153 | 341 | High signal voltage found on connection 23 in the switch circuit of the intake manifold temperature sensor. | Preadjusted value for intake air temperature is used. No engine protection for intake manifold temperature. |
| 154 | 341 | Low signal voltage found on connection 23 in switch circuit of the intake manifold temperature sensor. | 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 | Auxiliary oil reservoir oil level too low. | Centinel oil combustion is deactivated. |
| 221 | 341 | High signal voltage found on connection 34 in the switch circuit of the air pressure sensor. | Output and / or RPM reduction. |
| 222 | 341 | Low signal voltage found on connection 34 in the switch circuit of the 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 | Voltage too low 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 the 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. |
| 254 | 341 | Fuel shut-off solenoid valve voltage too low. | Engine possibly stalls or turns off badly. |

| Blinker code | Position | Reason | Effect |
|--------------|----------|--|---|
| 259 | 340 | Fuel shut-off solenoid valve blocked open. | No control measure. Engine turns off badly. |
| 261 | 339 | Fuel temperature too high. | Output and / or RPM reduction with possible engine shut-off if engine protection shut-off is activated. |
| 263 | 341 | More than 4.95 V found on connection 26 of the fuel temperature sensor. | The standard value is used for the fuel temperature. No protective function for fuel temperature. |
| 265 | 341 | Less than 0.21 V found on connection 26 of fuel temperature sensor. | The standard value is used for the fuel temperature. No protective function for fuel temperature. |
| 292 | 339 | Signal voltage of auxiliary temperature on Pin 27 is outside the specified limit value. | Output and / or RPM reduction with possible engine shut-off if 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. The actuator of the fuel pump is open or short circuited. | No actuation of engine control. Possible loss of power. |
| 318 | 341 | The actuator of the fuel pump is mechanically seized. | No actuation of engine control. Possible loss of power. |
| 343 | 341 | Engine control module has an internal error. | No actuation of engine control. Possible loss of power. The engine might not start. |
| 346 | 341 | Electrical connection to engine control module disconnected too quickly. | Engine data not properly saved when turned off. Saved files possibly 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. |
| 422 | 341 | Coolant level signal not correct. Incorrect voltage between Pin 14 and Pin 23. | No monitoring of coolant level. |
| 423 | 341 | The ignition timing control actuator 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 control, possible 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. |

| Blinker code | Position | Reason | Effect |
|--------------|----------|---|--|
| 441 | 341 | Low battery voltage, below 12 V. | Engine control can be disturbed resulting in irregularities. |
| 442 | 341 | Battery voltage too high, more than 38 V. | The engine control module could be damaged. |
| 451 | 340 | Injection quantity control pressure sensor 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 quantity control has short circuit to ground or to battery. Pin 3 or Pin 10 short circuited. | The actuator is partially or completely closed. Engine does not start or runs only at one rpm. Error code 514 is also generated. |
| 467 | 341 | Injection timing control pressure value is not correct. Discrepancy between "nominal" and "actual" value. | Adjustment dependent shut off or RPM reduction or no effect. |
| 468 | 341 | Injection quantity control pressure value 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. |
| 473 | 341 | Error in switch circuit of auxiliary oil tank oil level display. | Centinel, engine oil combustion is turned off. |
| 489 | 341 | Frequency signal of RPM from gear shows that the frequency is below a pre-programmed threshold value. | Output and / or RPM reduction depends on the measures set in programming. |
| 497 | 341 | Synchronous control is faulty. | Synchronous control is deactivated. |
| 498 | 341 | Engine oil level sensor has short circuit to voltage 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 | The fuel quantity control actuator 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 the additional output #2. Less than 17 V on Pin 1. | No actuation of engine control |
| 529 | 341 | Error in switch circuit of the additional output #3. Less than 17 V on Pin 9. | No actuation of engine control |
| 551 | 340 | Error in the switch circuit of idle control of gas pedal. | No actuation of engine control |
| 553 | 340 | Pressure in fuel quantity control circuit too high. | Shut-off solenoid valve is closed until pressure is normal again. Engine turns off also. |
| 554 | 341 | Error in fuel quantity control circuit. | Adjustment dependent output reduction. |

| Blinker code | Position | Reason | Effect |
|--------------|----------|--|--|
| 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 control. |
| 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 control. |

2.1.3 Calling up the test system



Note

- ▶ For calling up the test system, see the Diagnostics operating instructions!

2.1.4 Problems on the crane mechanics / components

- ▶ Determine the damage and remedy it properly using **original spare parts**.

2.1.5 Problems on pipes / hoses

Supply lines, return lines and control lines carry various media

- Pneumatic pipes / hoses
- Hydraulic pipes / hoses
- Pipes / hoses for fluids and gases

- ▶ Determine the damage and remedy it properly using **original spare parts**.

2.1.6 Problems in electrical connections of the crane

- If a component / component group no longer reacts, then the electrical connections may be interrupted.
- ▶ Check the error messages.
- ▶ Check the plug connections.
- ▶ Check the electrical connections visually.

Problem remedy

Is erection of the crane, for example after assembly at a new job site or with another set up configuration, not possible due to an error message?

- ▶ As the first step, make sure that all electrical connections have been made.
- ▶ Check if all sensors or dummy plugs with integrated electronics have been connected properly.

- ▶ Determine the damage and remedy it properly using **original spare parts**.
- or**

In case of lack of clarity:

Observe the Diagnostics operating instructions.

or

Consult Liebherr Service.

2.2 Error diagnostics with the help of Liebherr Service

2.2.1 Which data is required by Liebherr Service?

If the assistance of Liebherr Service is required, always provide the following information:

- Crane type
- Crane number
- Complete error number and any error message displayed on the LICCON monitor
- For certain errors: LED displays of power supply **NT** and CPUs **ZE**
- Application conditions of crane
- Action during which the error occurs
- Possibly frequency of error

2.2.2 Error diagnostics by phone

If there is any lack of clarity, contact Liebherr Service to determine the cause of the problem and further procedure.

- ▶ Contact Liebherr Service.
- ▶ Observe and adhere to the notes and instructions given by Liebherr Service.

2.2.3 Remote diagnostics*

The remote diagnostics makes it possible for Liebherr Service to check Liebherr cranes from a remote location in case of problems.

Make sure that the following prerequisite is met:

- The crane is equipped with the optional Remote diagnostics*.
- ▶ Contact Liebherr service by phone.
- ▶ Follow the instructions given by Liebherr Service to set up the remote diagnostics*.
- ▶ Keep the phone connection to Liebherr Service connected during remote diagnostics*.

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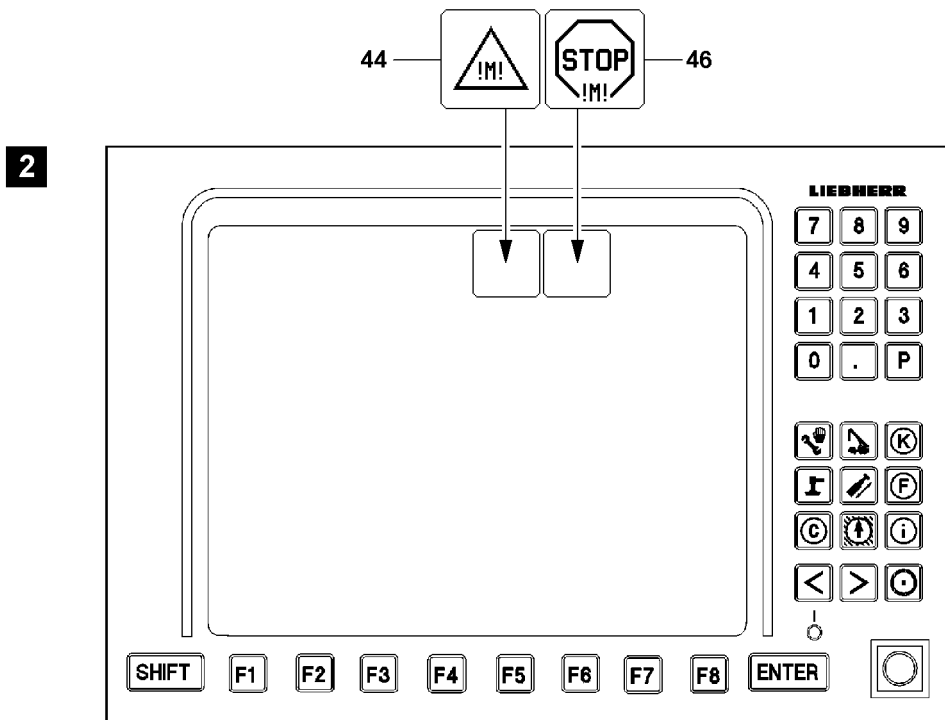
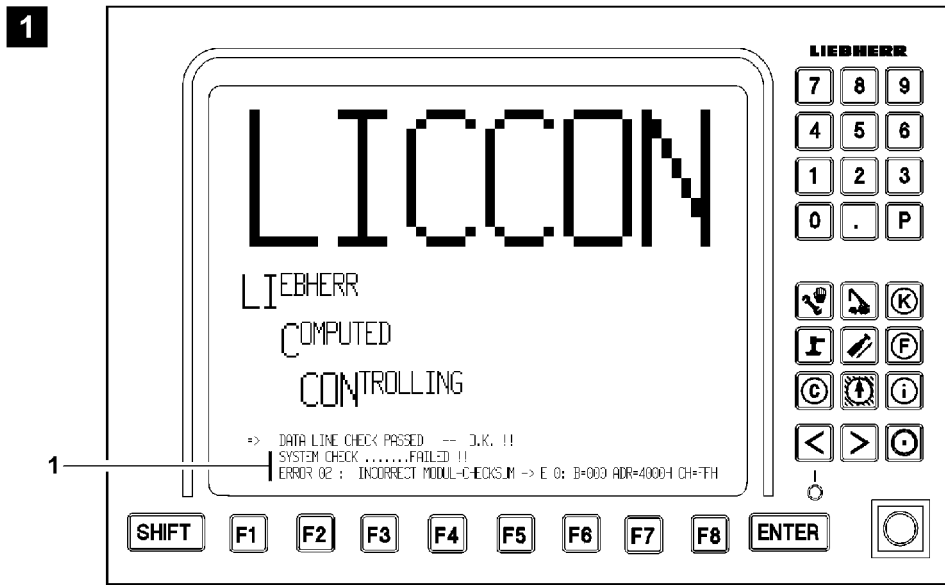


Fig.112959

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3 Measures in clear problem cases



Note

If a problem occurs, which is not described in this chapter:

- ▶ Contact Liebherr Service to determine the cause of the problem and the further procedure.

3.1 Remediating temporary errors during system start



Note

- ▶ While the LICCON computer system starts, temporary error messages **1** can occur, see illustration **1**.

Errors, which occur temporarily, can have various causes, for example:

- Fluctuations in the power supply
- Error message can be a subsequent error
- ▶ Turn the LICCON computer system off and restart it after waiting for at least 5 s.
- ▶ Repeat this procedure up to three times (wait 2 min after 3 start attempts).

If the same error display appears several times:

- ▶ Call up the test system, see the Diagnostics operating instructions.
- ▶ Contact Liebherr Service to determine the cause of the problem and the further procedure.

3.2 Monitoring function reports a problem



Note

- ▶ For a detailed description of monitoring functions, see the Crane operating instructions, chapter 4.02.

NOTICE

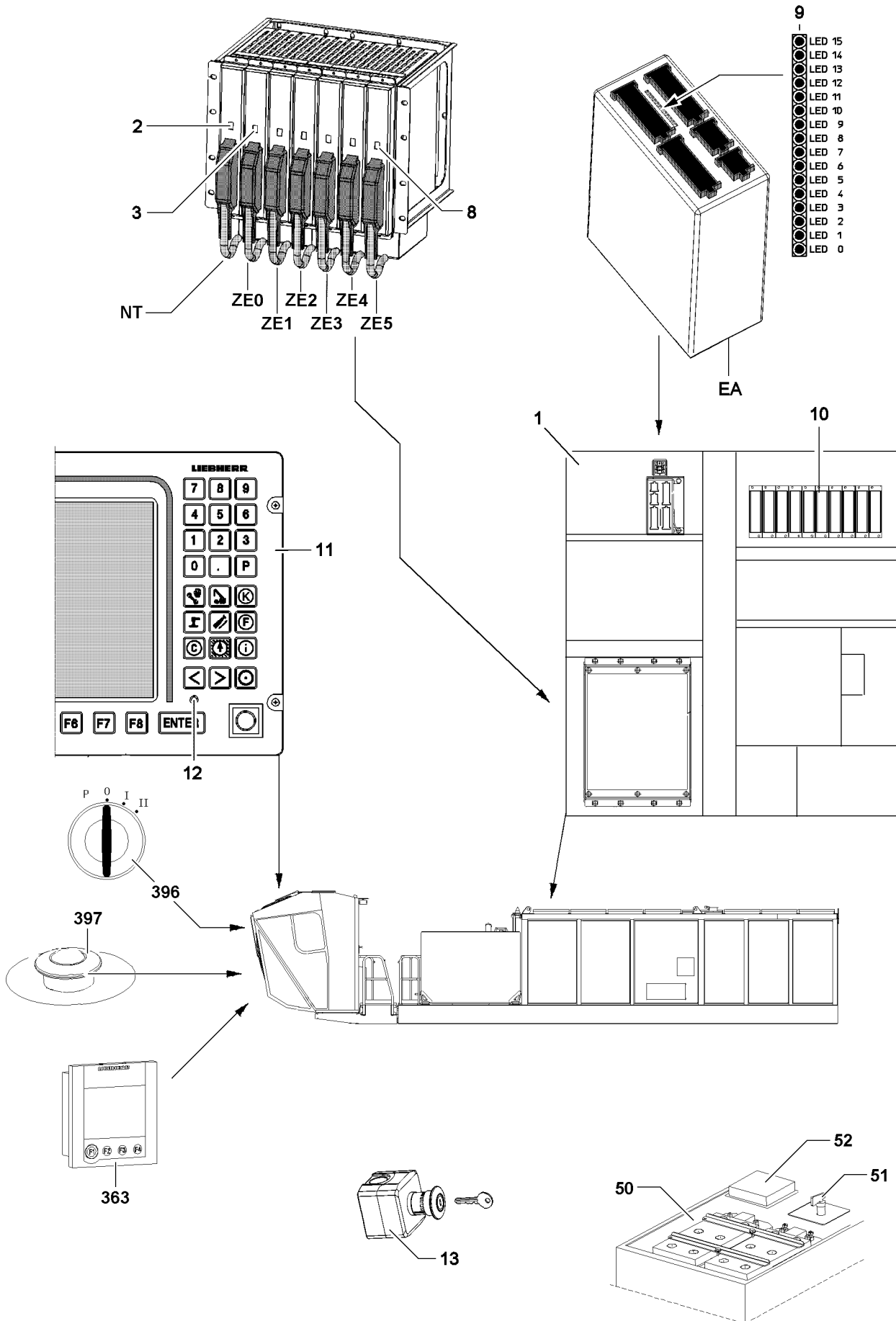
Danger of severe engine damage!

If the monitoring functions report a problem and / or warning occurrence, then you must react immediately and remedy the problem!

- ▶ React to problems and / or warning occurrences immediately and remedy the problem!
- ▶ If necessary, stop crane operation and turn the engine off!

The following alarm functions are indicated by blinking icons on the LICCON monitor illustration **2**:

- **44** Advance warning - engine
- **46** Engine stop
- ▶ If an „Advance warning - engine“ **44** or an „Engine stop“ **46** is triggered, react immediately.
- ▶ In case of an Engine stop **46**, stop crane operation and turn the engine off.
- ▶ Find the cause and remedy it.



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3.3 Engine does not start

Make sure that:

- There is sufficient fuel in the fuel tanks.
- There is sufficient voltage in the batteries.

3.3.1 Checking the EMERGENCY STOP switch

Make sure that no EMERGENCY STOP switch is actuated:

- **13** EMERGENCY STOP switch outside the crane operator's cab*
- EMERGENCY STOP switch **397** in crane operator's cab



Note

- ▶ When an EMERGENCY STOP switch is actuated, an error message appears on the LICCON monitor.
-

3.3.2 The engine does not start?

No EMERGENCY STOP switch is actuated:

- ▶ 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 the further procedure.

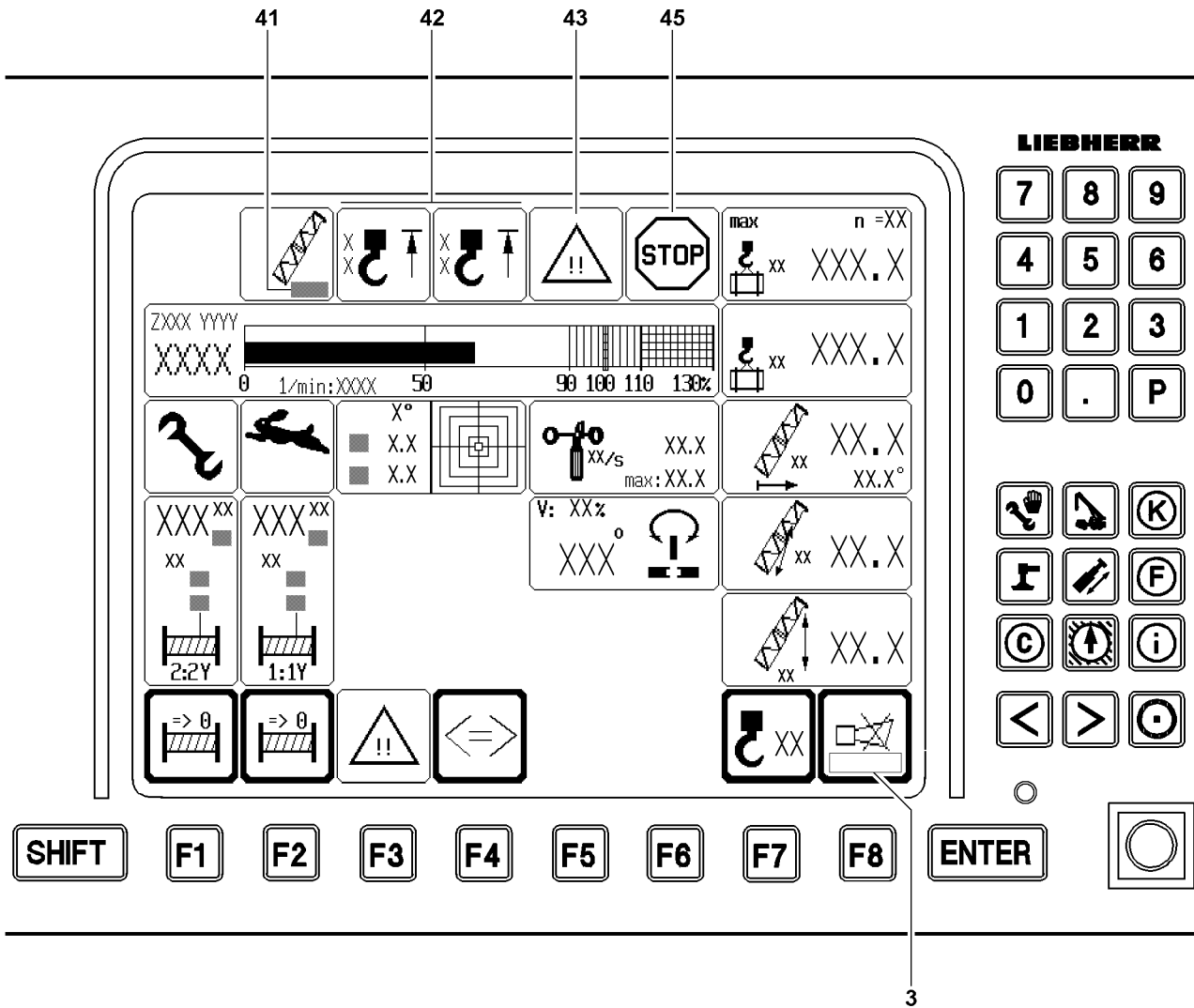


Fig.112964

3.4 LICCON monitor

3.4.1 Operating errors: Did an alarm function occur?



Note

- ▶ For the crane movement shut-off procedure, see the Crane operating instructions, chapter 4.20.
 - ▶ For a detailed description of alarm functions, see the Crane operating instructions, chapter 4.02.
 - ▶ In case of an alarm function, an error message **3** with an LICCON error code appears at the same time.
-

The following alarm functions are indicated by blinking icons on the LICCON monitor:

- **41** Boom limitation
- **42** Hoist top limit switch
- **43** Advance warning
- **45** LMB stop

The limit ranges of the crane movements are monitored by:

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

If the limit ranges for these sensors are exceeded, the crane movements are turned off (LMB-STOP).

- ▶ Correct the operating error.

Fig.197077

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4 Measures in case of defective components



WARNING

Impairment of crane safety!

When using non-original spare parts, crane safety can be impaired!

Changed or manipulated components can fail!

Safety relevant components can malfunction!

The crane license as well as the manufacturer's warranty will become void!

Danger of accident!

Personnel can be severely injured or killed!

This could result in property damage!

- ▶ Use only original spare parts or spare parts approved by Liebherr Werk Ehingen!
- ▶ Leave installed original parts unchanged!

Make sure that the following prerequisites are met:

- Error diagnostics has been carried out.
- Defective component has been determined.

4.1 Failure of hydraulics, electrics or engine



Note

If the crane is equipped with the optional „Hydraulic emergency control*“, then the crane can be taken down in case of failure of the crane hydraulics, crane electrics or crane engine.

- ▶ For hydraulic emergency control, see the Crane operating instructions, chapter 6.05.

- ▶ Take the crane down with the hydraulic emergency control* and repair it, contact Liebherr Service if necessary.

or

If the crane does not have a „Hydraulic emergency control*“

Secure the crane and danger zone wide-ranging.

4.2 Defective power supply (NT)

- ▶ Replace the power supply with a functioning power supply.



Note

- ▶ For instruction for the replacement of a defective power supply, see the Diagnostics operating instructions.

4.3 Defective Central processing unit (CPU)

- ▶ Replace the CPU with a functioning CPU.



Note

- ▶ For instruction for the replacement of a defective Central Processing Unit (CPU), see the Diagnostics operating instructions.

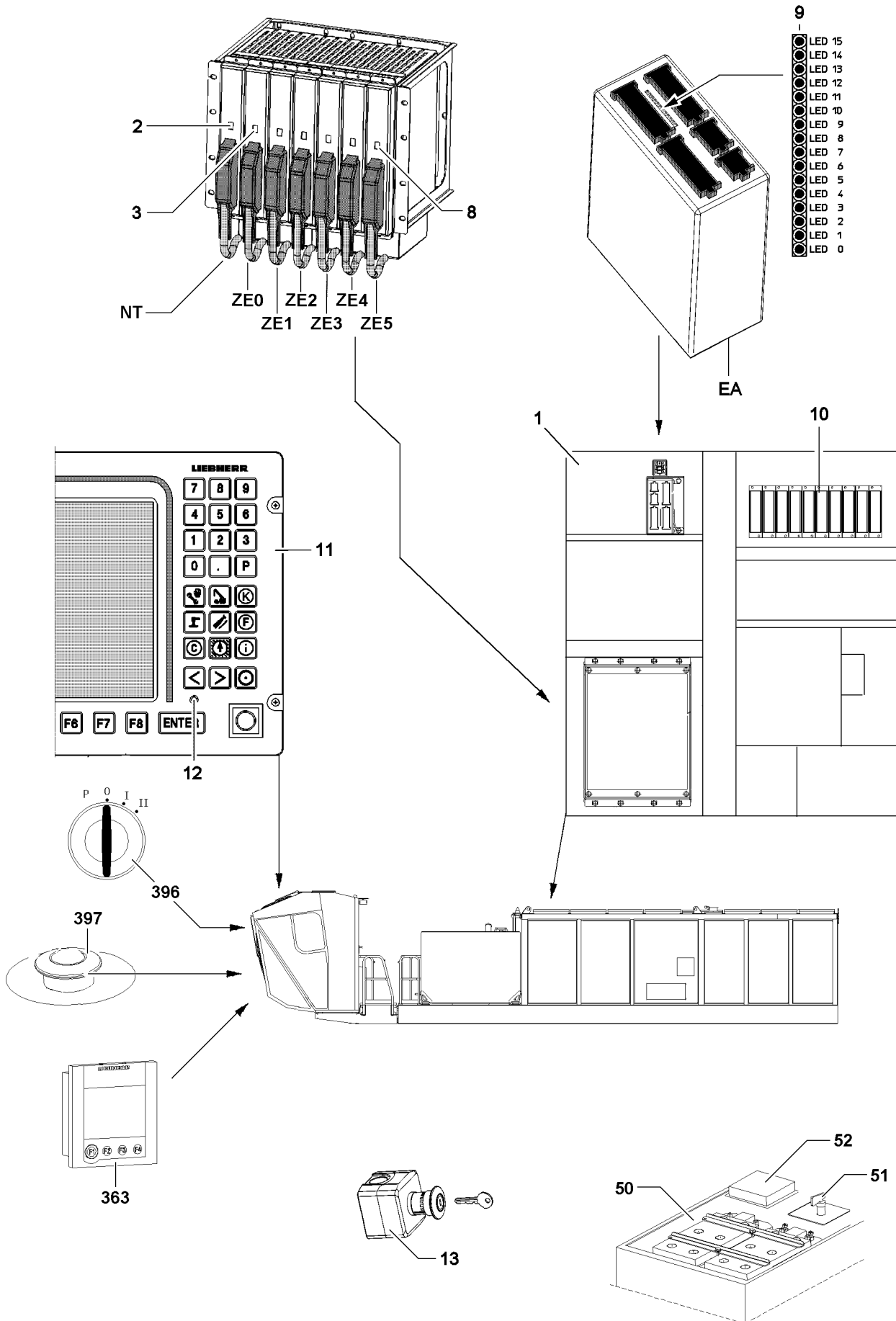


Fig.112965

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4.4 Replacing a defective fuse

If a fuse is defective, then it must be replaced.

Make sure that the following prerequisites are met:

- Battery master switch **51** is in position **0**.
- Ignition switch **396** is in position **0**.
- A spare fuse of the same size and strength is available.

Fuses are located:

- **10** In the control cabinet fuse box
- In the battery box **50** (Main fuses **52**)
- Directly on the individual components.

- ▶ Replace a defective fuse
- ▶ Check the function.

Problem remedy

The same fuse fails again?

- ▶ Continue troubleshooting, contact Liebherr Service if necessary.
 - ▶ Never bypass a defective fuse or replace it with a stronger fuse.
-

4.5 The LICCON monitor remains dark

If the LICCON monitor **11** does not turn on after turn on:

- ▶ See section Monitor errors in the Diagnostics operating instructions.

If the problem cannot be remedied:

- ▶ Contact Liebherr Service to determine the cause of the problem and the further procedure.

4.6 The touch display remains dark

If the Touch display **363** does not turn on after turning the ignition on:

- ▶ Check the error messages.

If the problem cannot be remedied:

- ▶ Contact Liebherr Service to determine the cause of the problem and the further procedure.

4.7 Defective sensors

4.7.1 General

Depending on the classification of the sensor, crane operation with defective sensor:

- Can be continued without restriction.
- Can be continued with restriction.
- Can be continued only in LMB emergency operation.



WARNING

Limited warning functions!

If there is a defect on an involved sensor (LMB) and the crane is continued to be operated by bypassing the sensor or otherwise, then the warning functions and the shut-offs of the LICCON overload protection are deactivated / limited!

- ▶ If there is a defect on an involved sensor (LMB), then the crane may be operated further only in emergency cases!
 - ▶ Fix / replace the sensor before starting crane operation again!
-

Certain crane functions are also monitored with two sets of sensors.

If a defective sensor is shown:

- ▶ Replace / repair the defective sensor.

4.8 Defective limit switch

Depending on the classification of the limit switch, crane operation with defective limit switch:

- Can be continued without restriction.
- Can be continued with restriction.
- Can be continued only in LMB emergency operation.

Certain crane functions are monitored with two sets of limit switches.



WARNING

Limited warning functions!

If one of the double version limit switches is not OK and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited!

- ▶ The crane can only be operated in an emergency after failure of a double version limit switch!

If a defective limit switch is shown:

- ▶ Replace / repair the defective limit switch.

4.9 Bypassing the overload protection

To bring the crane into a safe condition after failure of a component required for the overload protection, it can be necessary to bypass the overload protection.



DANGER

Bypass of overload protection!

If the overload protection is bypassed, there is no further protection against crane overload!

In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ The bypass of the overload protection is only permitted in emergency cases!
- ▶ The bypass may only be carried out by persons who are aware of the effects of their acts regarding the bypass of the overload protection!
- ▶ Bypassing the overload protection requires the presence of an authorized person and must be performed with utmost caution!
- ▶ Missing values must be monitored manually and must match the load chart.
- ▶ Crane operation with bypassed overload protection is prohibited!



WARNING

Bypassed overload protection!

If the overload protection is bypassed, crane movements are no longer monitored!

The crane can be overloaded and collapse!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Only carry out crane movements within the range of the load chart as well as the erection / take-down charts!

As a rule, all specifications in the load chart must be adhered to strictly:

- The exact weight of the load, including load handling equipment, must be known.
- The boom status and the boom geometry must be known.
- The boom length and boom radius must be measured manually.
- All values must match the values in the respective load chart.



Note

- ▶ Depending on the configuration of the crane, the overload protection of the crane is bypassed various ways, see the following sections.

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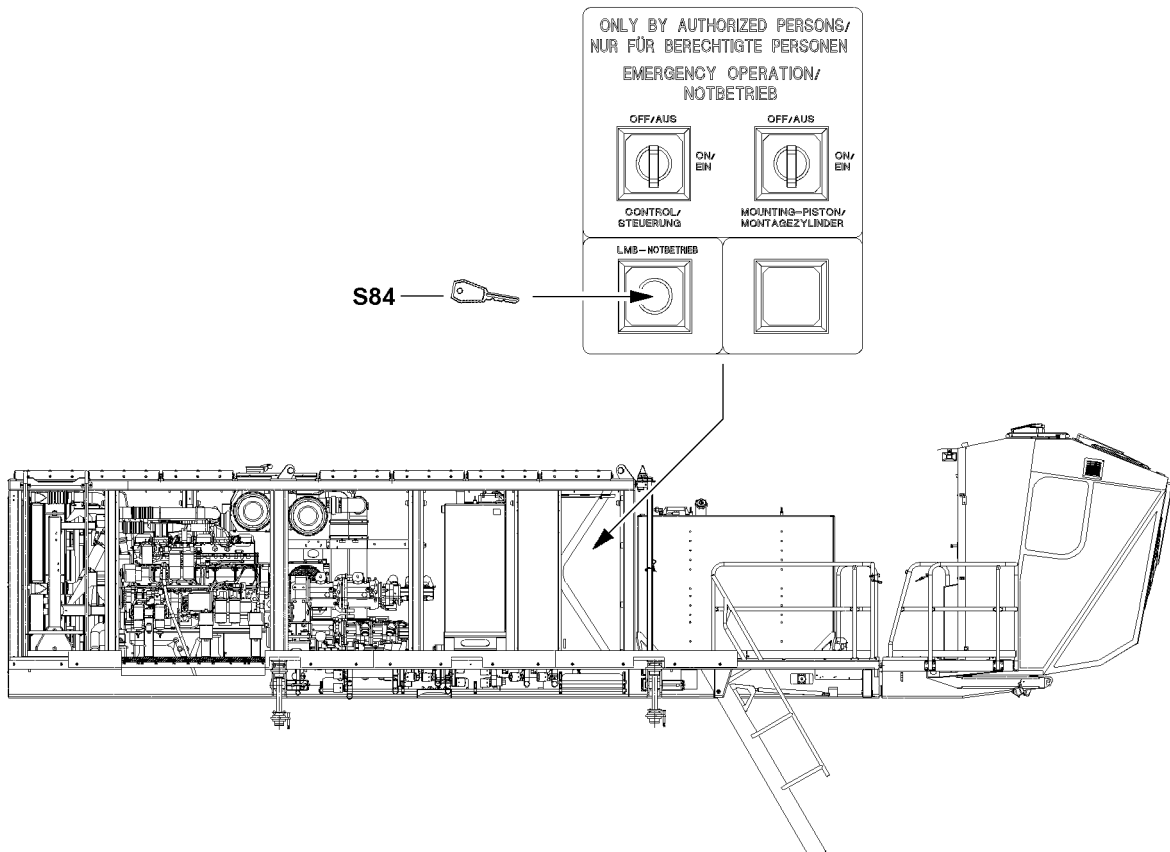
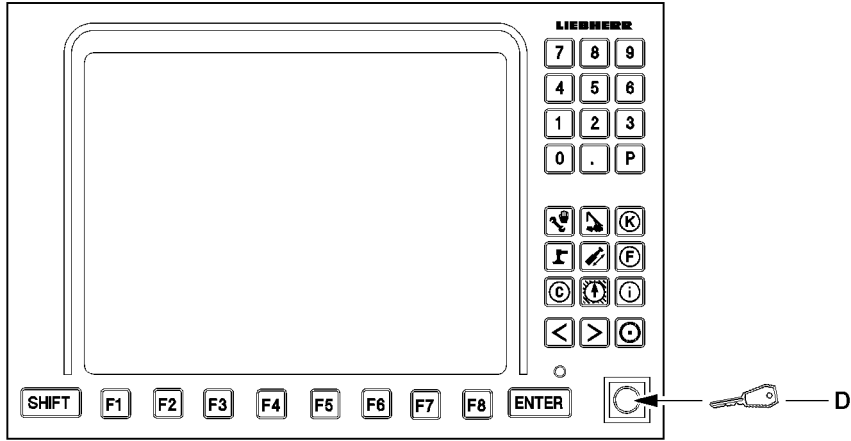


Fig.112966

4.9.1 Bypassing the overload protection: Failure of the overload protection



Note

- ▶ Does **not** apply for cranes with CE-mark and configuration according to EN 13000:2010!
- ▶ For a description of the set up button **D**, see the Crane operating instructions, chapter 4.02!

- ▶ Press the set up button **D**:

Result:

- The overload protection is bypassed.
- The crane is in emergency operation.

To turn the bypass of overload protection off:

- ▶ Press the set up key **D** again.

Result:

- The bypass of the overload protection is turned off.

4.9.2 Bypassing the overload protection: Failure of overload protection (according to EN 13000:2010)



Note

- ▶ Applies **only** for cranes with configuration according to EN 13000:2010!
- ▶ For the location and description of the bypass device outside the crane operator's cab, see the Crane operating instructions, chapter 4.01 and chapter 4.02.

The bypass of the overload protection can be carried out with the restriction, that:

- The bypass is automatically reset when the engine is turned off.
- The bypass is automatically reset after no later than 30 minutes.
- The bypass of the overload protection limits the working speed to no more than maximum 15 %.

The bypass is made with:

- **S84** key switch
- ▶ Actuate the key switch **S84**.

Result:

- The overload protection is bypassed.
- The crane is in emergency operation.

To turn the bypass of overload protection off:

- ▶ Actuate the key switch **S84** again.

Result:

- The bypass of the overload protection is turned off.

4.10 Ending the load hoist to avert emergency situations

When the crane movements must be carried out manually (for example with the optional „Hydraulic emergency control*“).

**WARNING**

Crane operation without overload protection!

If the LICCON overload protection is no longer functioning properly because of one or more errors, then there is a danger of accident if crane operation is continued!

Due to operation of the crane with failed LICCON overload protection, the crane can be overloaded and collapse!

Personnel can be killed or seriously injured!

This could result in property damage!

- ▶ Crane operation without overload protection is only permissible in emergency cases!
- ▶ Crane operation without overload protection may only be carried out by persons who know the effects of their actions regarding crane operation without overload protection!
- ▶ Crane operation without overload protection requires the presence of an authorized person and must be performed with utmost caution!
- ▶ Missing values must be monitored manually and must match the load chart.
- ▶ Do not restart regular crane operation again until the overload protection is functioning again!

Ending the load hoist to avert emergency situations:

- Before continuing the load hoist, contact the nearest Liebherr customer service center or Liebherr-Werk Ehingen.

If this is not possible, then the load hoist can be completed with utmost caution, as follows:

- All values that are needed for determining the set up configuration and the associated load chart must be measured and / or manually determined.

As a rule, all specifications in the load chart must be adhered to strictly:

- The exact weight of the load, including load handling equipment, must be known.
- The boom status and the boom geometry must be known.
- The boom length and boom radius must be measured manually.
- All values must match the values in the respective load chart.

8 Inspections of cranes

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8.01 Periodic crane inspections

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| 2 | Inspecting load bearing crane structures, especially steel structures | 4 |
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| 4 | Checking the safety ropes and anchor points | 81 |
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1 General information

This crane was tested at the manufacturer's facilities prior to shipment in accordance with the valid ISO, FEM and DIN Standards and DGUV 52 (DGUV 309-001).

The safety level achieved during initial start up may not be attainable during operation.

Examples of the root cause of such deviations include; e.g., wear and tear, corrosion, effects of external forces, changes in the environment and changes to the mode of operation.

The operator is responsible for taking the necessary steps to ensure that the level of safety is maintained.

Periodic inspections are regulated nationally in the BetrSichV.

The crane operator is therefore obligated to have the crane inspected by an **authorized inspector**, at intervals depending on the operational conditions but at least once per year, from the first day of vehicle registration.

Certain conditions of use require however shorter inspection intervals or tests.

Conditions of use, the shorter inspection intervals or inspections between the regular inspections require:

- High utilization of the crane and / or a greater number of load cycles.
- Ramming work and pulling work, see chapter 4.08.
- Operation at low temperatures, see chapter 2.08.
- Lifting of personnel, see chapter 2.04.
- Situations during which the crane was exposed to sudden loads.

When equipment parts were used for other cranes: Make sure that the inspections and inspection intervals are observed also for the replaced equipment parts.

The operator specifies an authorized inspector and assigns him to perform the tests and maintenance required nationally and by Liebherr-Werk Ehingen GmbH to ensure further, safe and reliable crane operation:

- Carry out the inspection tasks required by Liebherr-Werk Ehingen GmbH.
- Additional national inspection intervals must be monitored by the crane operator.

Every 4 operating years, in the 13th operating year and thereafter at least annually, from the first day of vehicle registration, the crane must be inspected by an **inspection expert**.

Periodic inspection are principally a visual inspection, where the inspector (either type) appraises the condition of the crane and its components.



WARNING

There is danger of weakening the supporting components when major changes or repairs are made to the crane!

- ▶ In this case, the operator must have the crane reinspected by an inspection expert before putting it back in service!

In addition, all respective local and national regulations also apply.

Authorized inspector

Authorized inspectors are those persons who through their professional training, their professional experience and their recent professional activity have the necessary knowledge for the inspection of work equipment.

Authorized inspector for pressure containers

Authorized inspector for pressure containers are authorized inspectors who additionally:

- Have relevant technical professional training.
- Have at least one year of experience with the manufacture, assembly, operation or maintenance of the equipment or components to be inspected in accordance with BetrSichV.
- Keep their knowledge about pressure-related hazards up to date by participating in training or instruction, in particular with regard to the following topics:
 - Design and manufacturing processes

- Equipment and safeguarding concepts
- Assembly, installation and operation / use
- Intended use
- Risk assessment
- Inspections, inspection periods, inspection procedures including assessment of the results
- Relevant influences and damage symptoms found in practice

Inspection expert

Inspection experts are authorized inspectors who also:

- Have completed training as an engineer or have equivalent knowledge and experience in the subject area with which their activities are involved.
- Have at least three years of experience in the design, construction, maintenance or inspection of cranes, of which at least half a year were involved in the inspection activities of an inspection expert.
- Possess sufficient knowledge of the relevant regulations and rules.
- Have the necessary facilities for inspection and documentation.
- Keep their professional knowledge up to date.

To ensure the high safety standard of the crane, it is recommended, no later than the 12th year, in the 20th year, in the 26th year and then every 4 years, to have the crane undergo a **general inspection** by an **inspection expert**. At that time, in addition to the usual scope of inspection, all load carrying parts of the crane - the complete steel structure with all welding seams as well as all components and connecting devices - are to be subjected to a complete visual inspection. The following procedural notes for repeat inspections are to be observed for that.

The purpose of the inspections is to avoid accidents by detecting deficiencies early on. Any deficiencies found by the inspector must be documented, corrected and subsequently reinspected.

A number of important examples of items that are particularly important during the periodic crane inspections are listed in the following. We wish to advise that the **authorized inspectors** or **inspection experts** take sole responsibility for the crane inspections that they carry out.



Note

- ▶ The inspection may not be solely limited to the following positions shown in the sample component illustrations. Rather the **entire** crane structure must be subjected to a careful inspection!

In the Crane operating instructions, chapter 8.90 is a checklist to assist the inspector during the periodic inspections of Liebherr mobile and crawler cranes.

If the inspector has any questions they should be directed through the Service Department of Liebherr-Werk Ehingen GmbH to the technical departments.



WARNING

Danger of accident!

- ▶ Adhere to the following inspection guidelines and intervals.

2 Inspecting load bearing crane structures, especially steel structures

2.1 Basic principles and procedure



DANGER

Danger of fatal injury!

The crane structures, particularly steel constructions, have to be checked by an **authorized inspector** or **inspection expert** at least once a year. If this is not the case, they could fail and cause fatal injury or seriously damage the crane!

- ▶ Crane structures, particularly steel constructions must be checked by an **authorized inspector** or an **inspection expert** at least once a year!
- ▶ Shorten the inspection intervals when the crane is subjected to above-average load spectrums, for example during handling operation 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.

In the case of an electrolyte process, such as corrosion in combination with water, atomic hydrogen is created, which leads to hydrogen induced corrosion with resulting cracks in high tensile fine grain construction steel.

If disassembly and assembly work on the crane is required to carry out the inspections, then they must be carried out by taking the manufacturer's data into account or in coordination with the crane manufacturer.

We would like to point out that the framework of mobile cranes is designed for a limited number of stress work cycles. This also determines the utilization or service life of the framework. The service life is not determined solely by the number of stress cycles. It also depends on the loads (load spectrum) applied during the time in operation.

Liebherr mobile and crawler cranes are designed for specific characteristics and movements, such as constant deployment of drive forces, only occasional operation and load conditions according to EN 13000.

Liebherr mobile and crawler cranes are designed for assembly operation and, according to grouping in class A1 according to ISO 4301-1, they can only take on a limited number of work cycles ($N = 63000$) with a collective class $Q_1 = \text{light}$ ($k_p = 0.125$).

Example of a load collective according to grouping in collective class $Q_1 = \text{light}$ ($k_p = 0.125$).

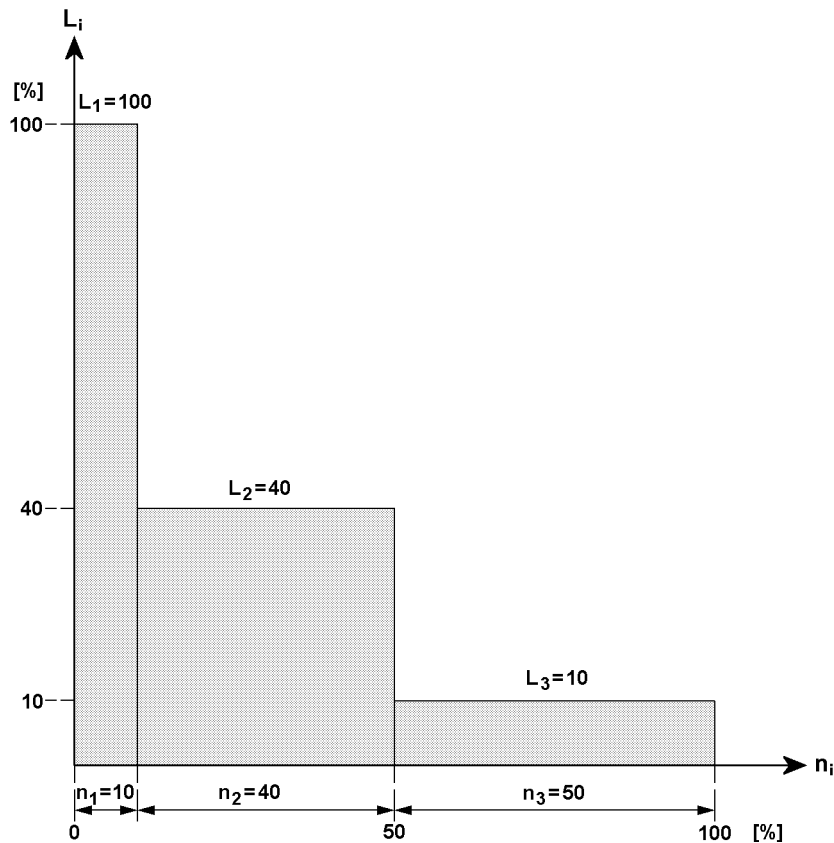


Fig.104716

L_i : Load proportion in relation to maximum load [%]

n_i : Load cycles in relation to maximum number [%]

**Note**

- ▶ The service life of Liebherr mobile and crawler cranes can be drastically reduced, for example when used in magnet, grapple or handling operations!
- ▶ Repeated inspection of crane structure, especially the steel structure and the welding seams must then be carried out in shorter intervals than specified.

For that reason, the steel structures and the welding joints must be subjected to a visual intensive inspection by the **authorized inspector** or **inspection expert** during the specified periodic inspections.

If any damage (such as cracks or suspicion of cracks) are apparent on any part of the steel structure, the total extent of the damage must be determined by qualified specialists using appropriate material testing methods, such as magnetic crack detection, ultrasound or x-rays. Thereafter, the qualified personnel must determine whether or not the damaged area can be repaired by welding or by other means.

The following diagrams are samples of the load-bearing welding structures. The welding joints or seams or steel structural zones that require inspection may be present more than once and in various forms. The joints or zones must be inspected all around at the locations identified by arrows.

**Note**

- ▶ The scope and extent of all inspections remain the sole responsibility of the inspectors!
- ▶ The scope and results of tests should be documented to permit reproducibility. This documentation forms part of the crane records and should be safely stored during the entire service life of the crane!
- ▶ The following diagrams are provided to assist the inspector. The illustrations are only examples and are not necessarily 100 % complete!

2.2 Repair welding

Defects such as cracks or permanent deformation on load-bearing steel components must be immediately reported to the Service Department at **Liebherr-Werk Eningen GmbH**.

The defect must immediately be appraised by an inspection expert according to standard welding technology rules. The inspection expert must immediately ascertain if the crane can continue to be safely operated due to danger of accident until a repair welding is performed.

Repair welding may solely be made in consultation and under the instructions of the Customer Service at **Liebherr-Werk Eningen GmbH** by authorized and trained expert personnel.



WARNING

Repair welding **not** according to regulations!

Death, severe bodily injuries, property damage.

- ▶ Contact Customer Service at **Liebherr-Werk Eningen GmbH**.
 - ▶ Coordinate the procedure for repair welding with **Liebherr-Werk Eningen GmbH**.
-



Note

Exclusion of liability!

For repair welding, which were not carried out by personnel from **Liebherr-Werk Eningen GmbH** or by authorized personnel from **Liebherr-Werk Eningen GmbH**, **Liebherr-Werk Eningen GmbH** excludes any liability, for system functionality as well as for the parts.

- ▶ Have repair welding made solely by personnel of **Liebherr-Werk Eningen GmbH** or by personnel authorized by **Liebherr-Werk Eningen GmbH**.
-

2.3 Examples of test points

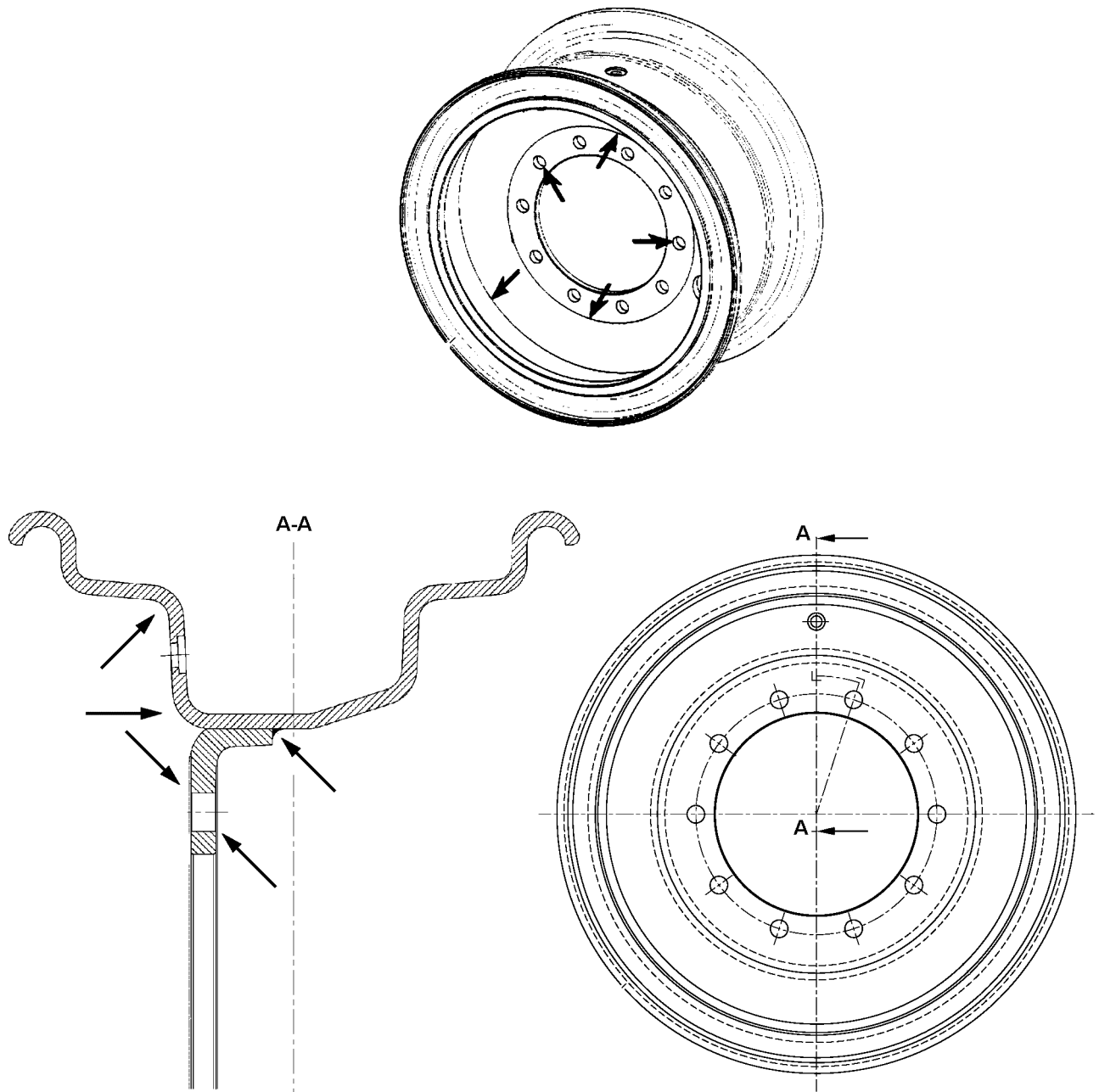


Fig.118052: Example of a 1-part disk wheel

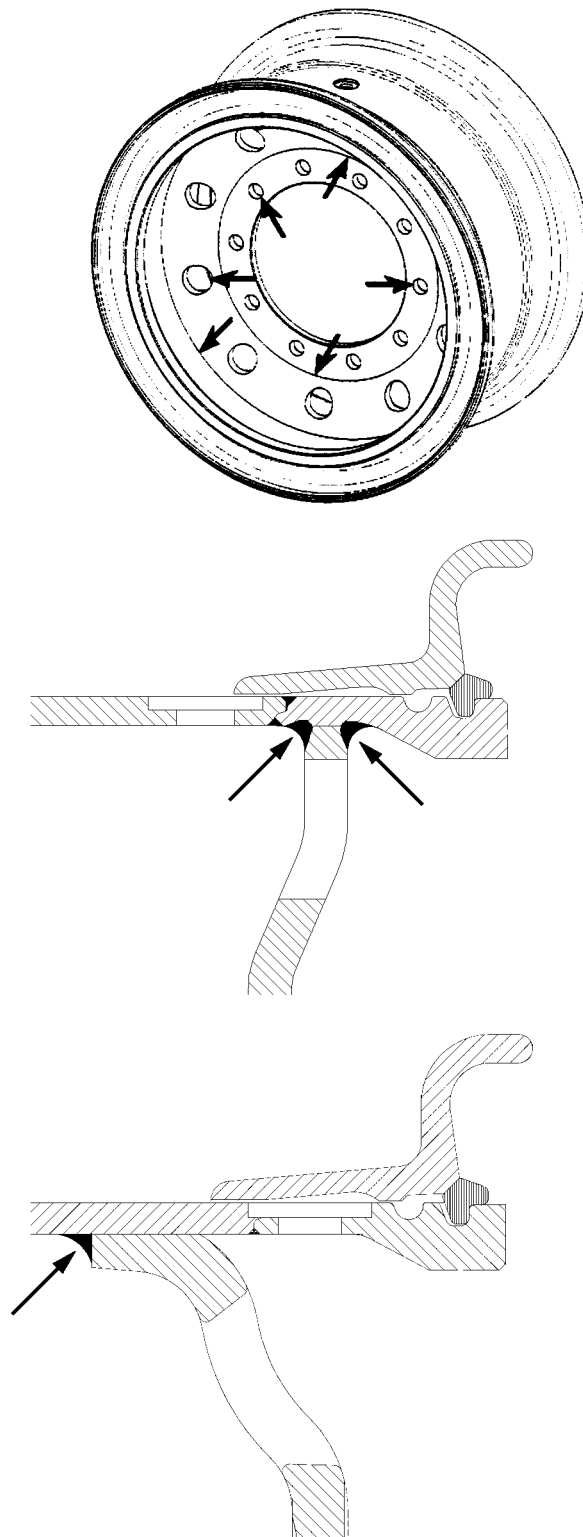
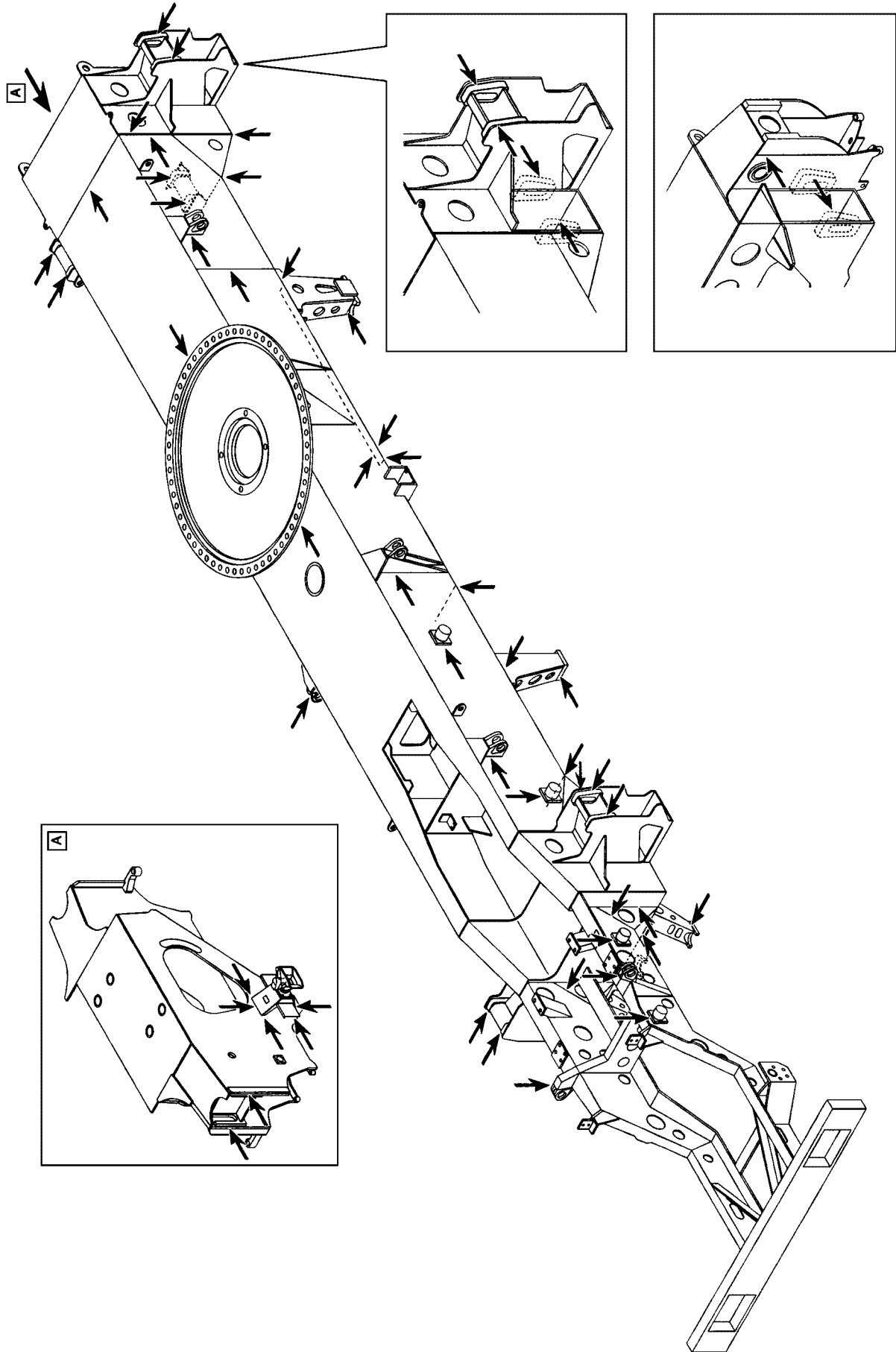


Fig.118053: Example of a 3-part disk wheel



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Fig.185046: Example of a vehicle frame

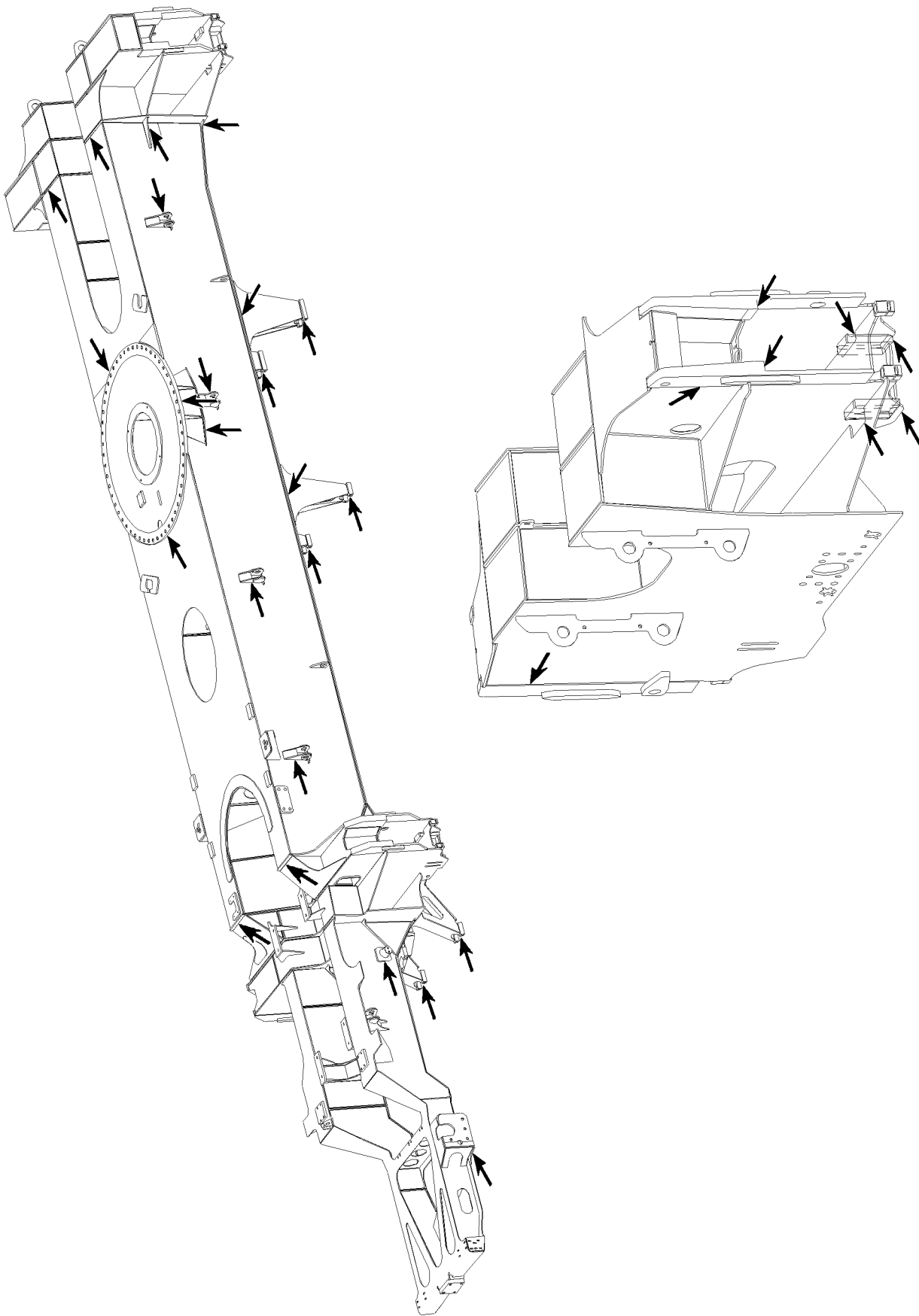
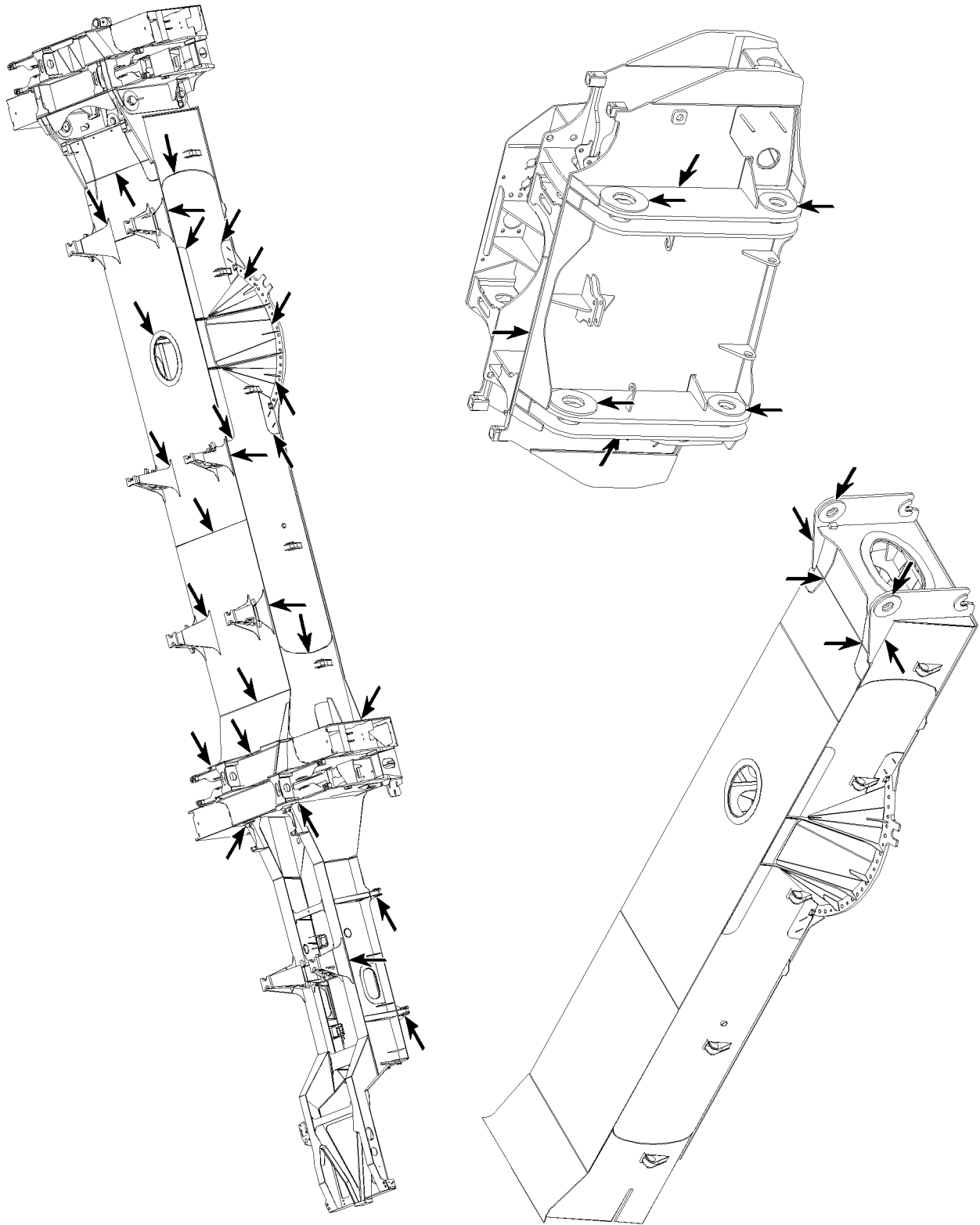


Fig.105702: Example of a vehicle frame



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Fig.105719: Example of a vehicle frame

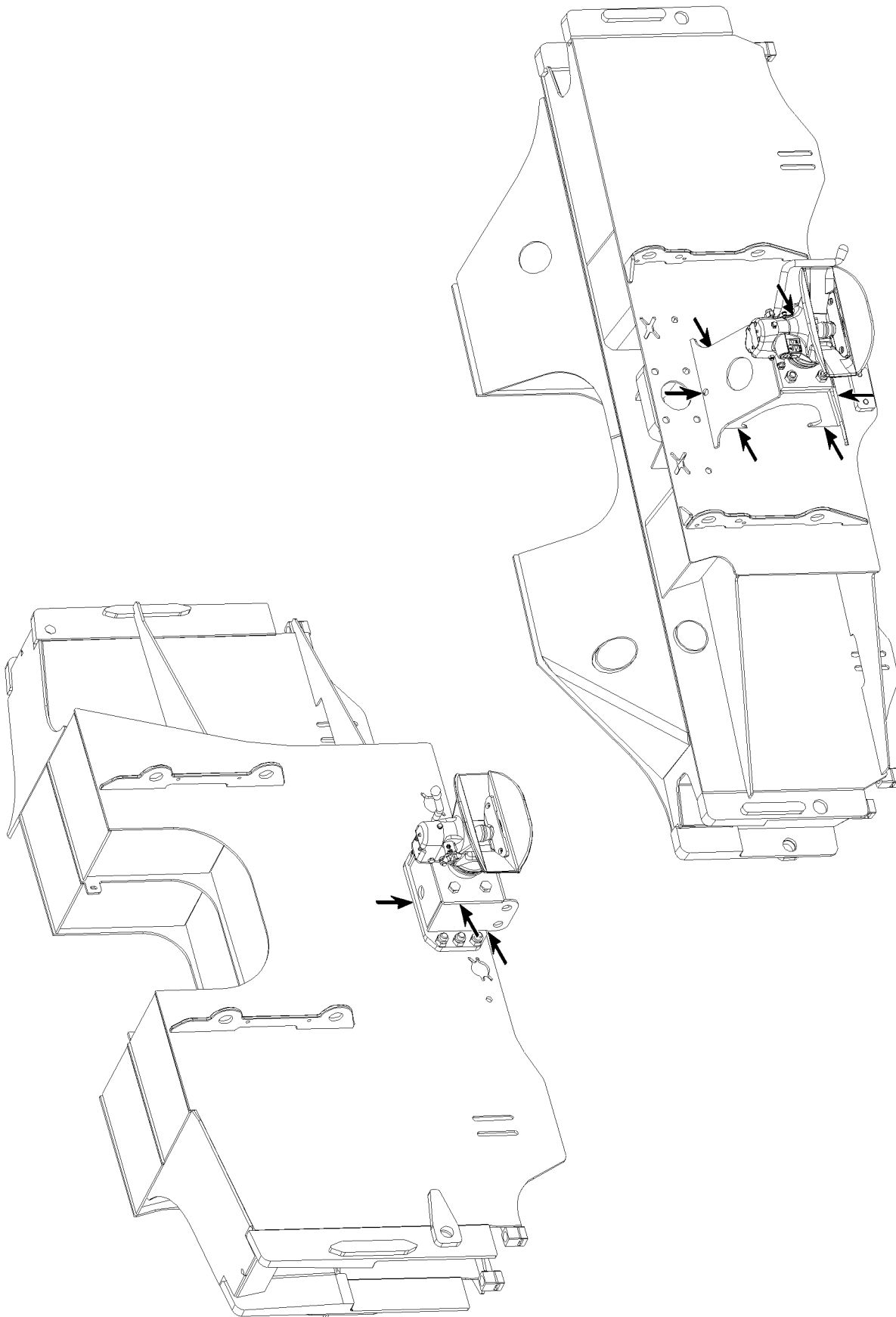
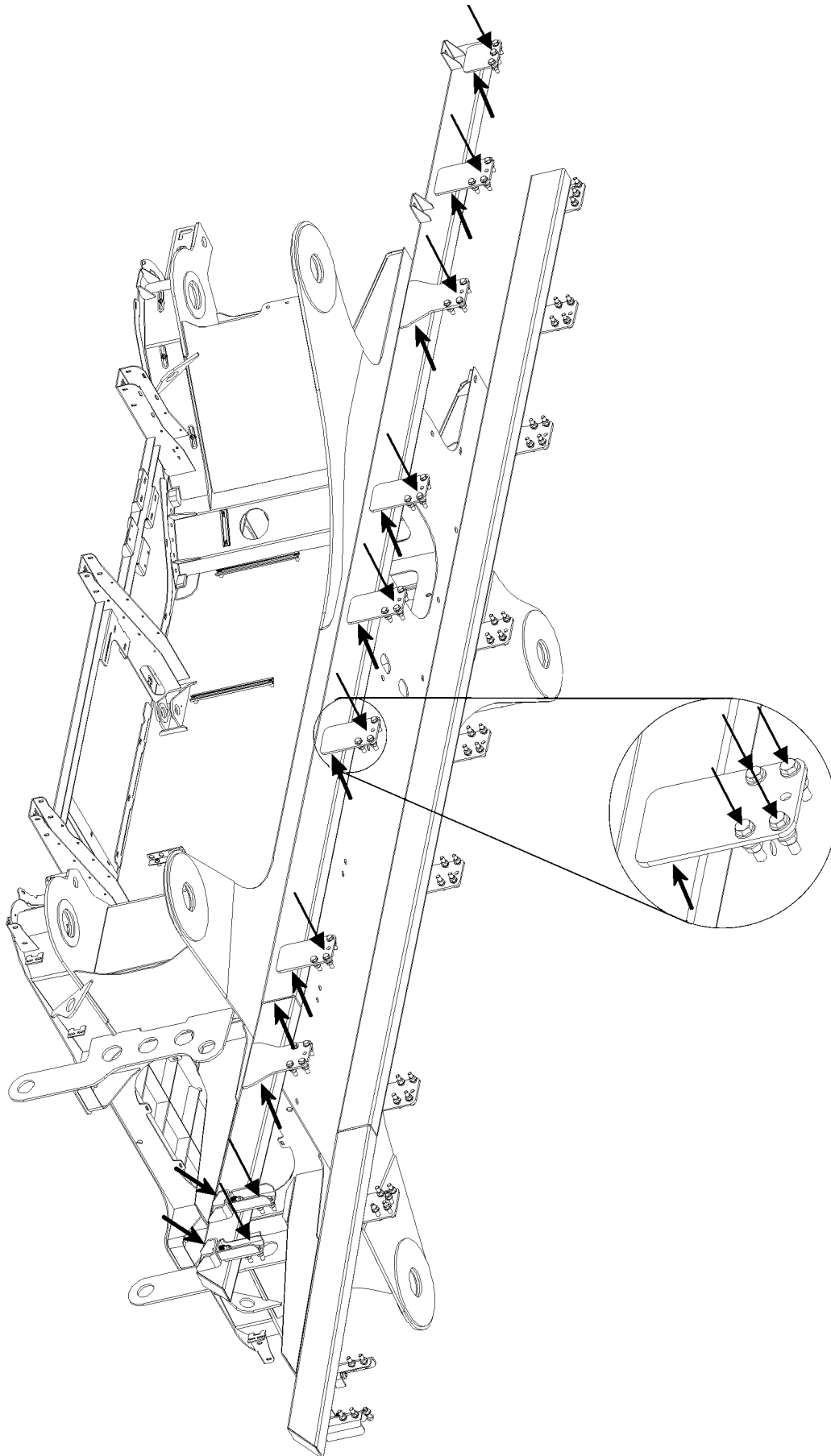


Fig.105687: Example of tow coupling

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Fig.113940: Example of an intermediate frame

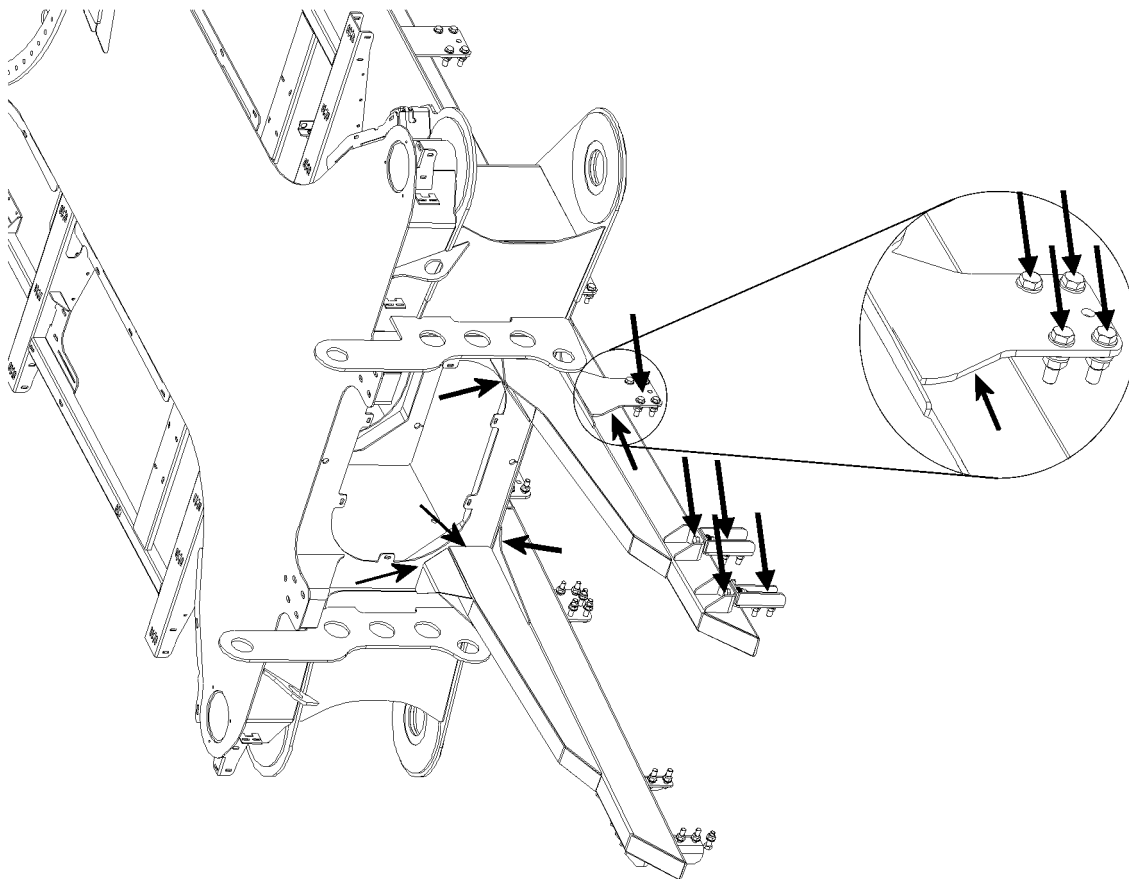
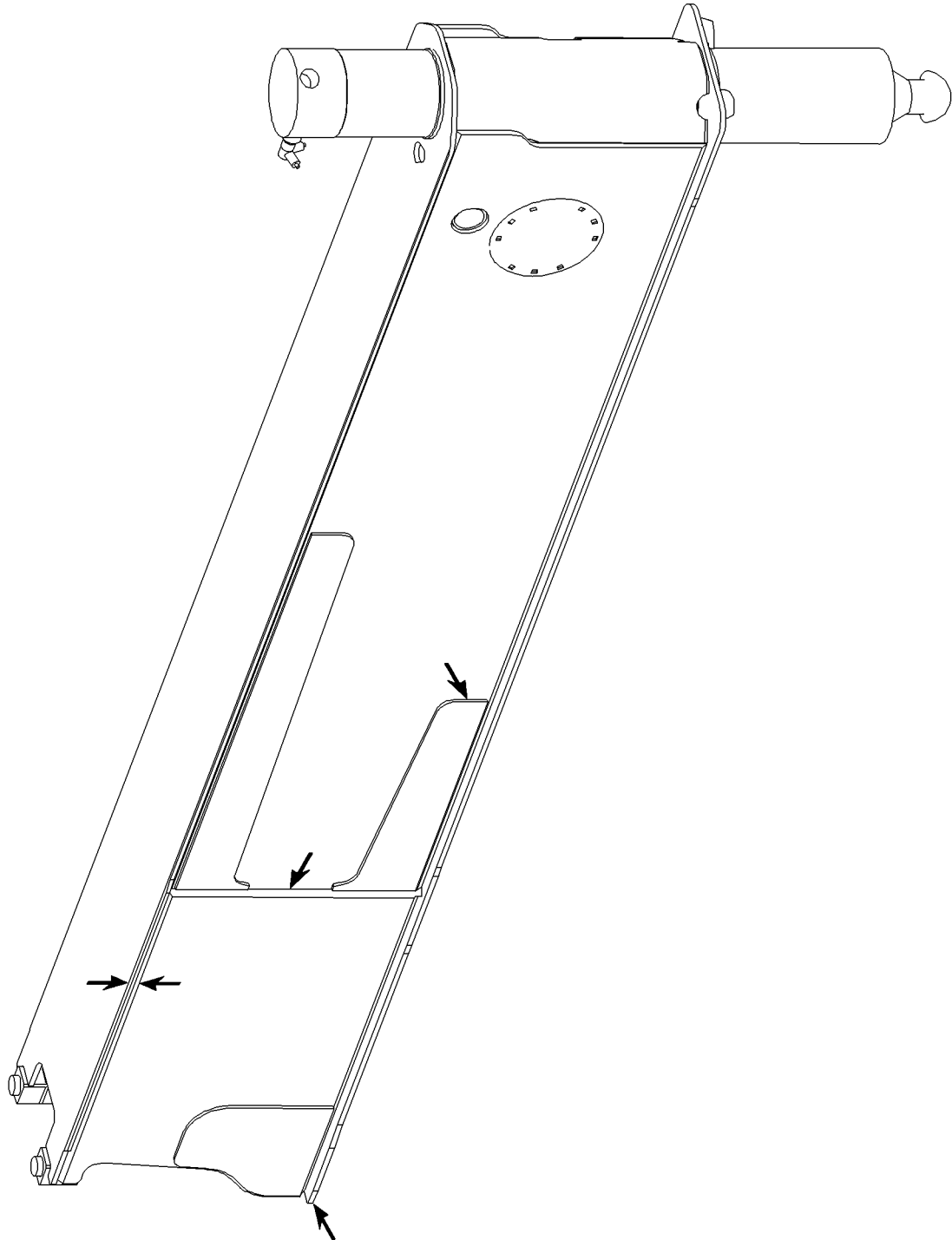


Fig.114000: Example of an intermediate frame



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Fig.105698: Example of a sliding beam

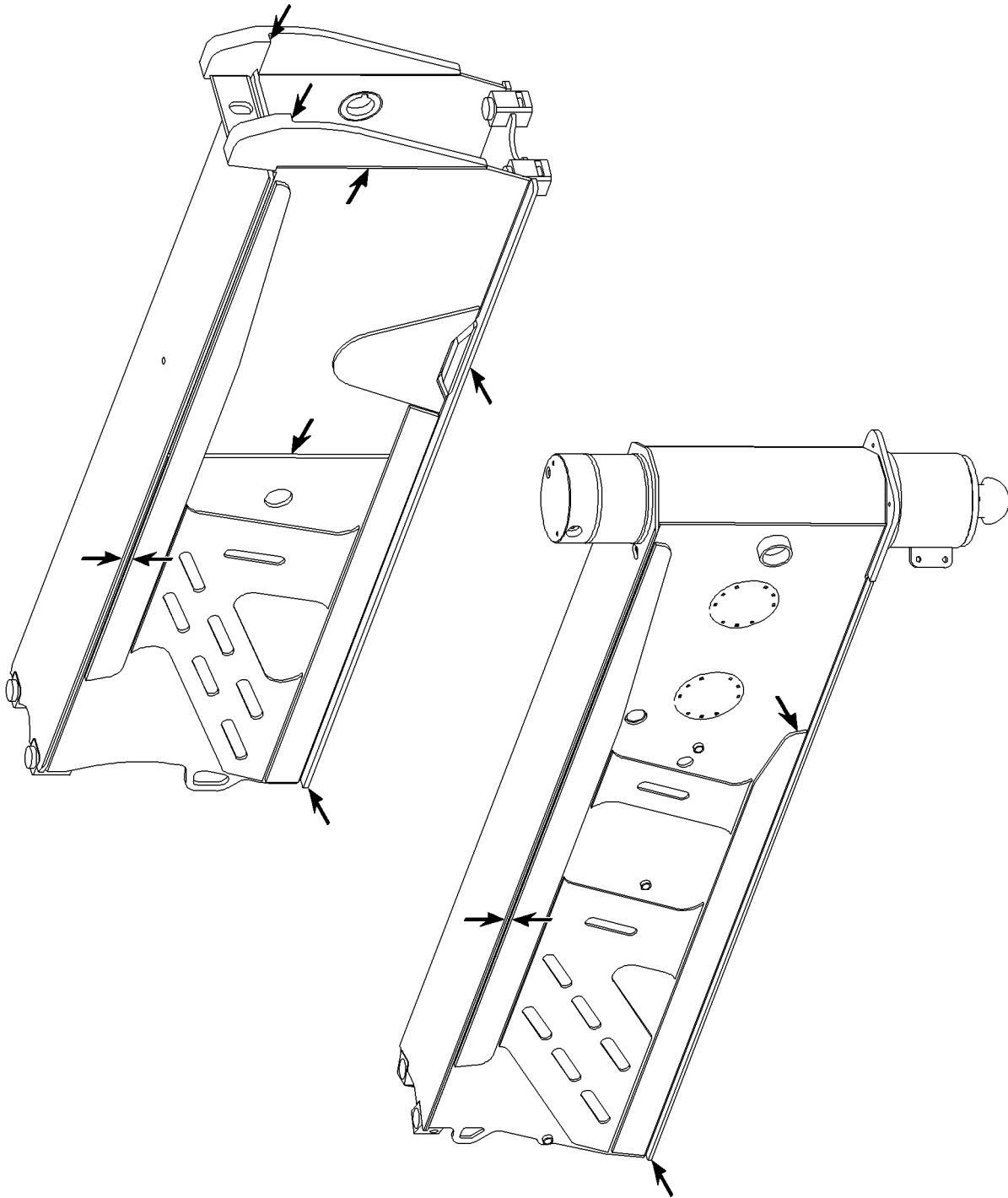
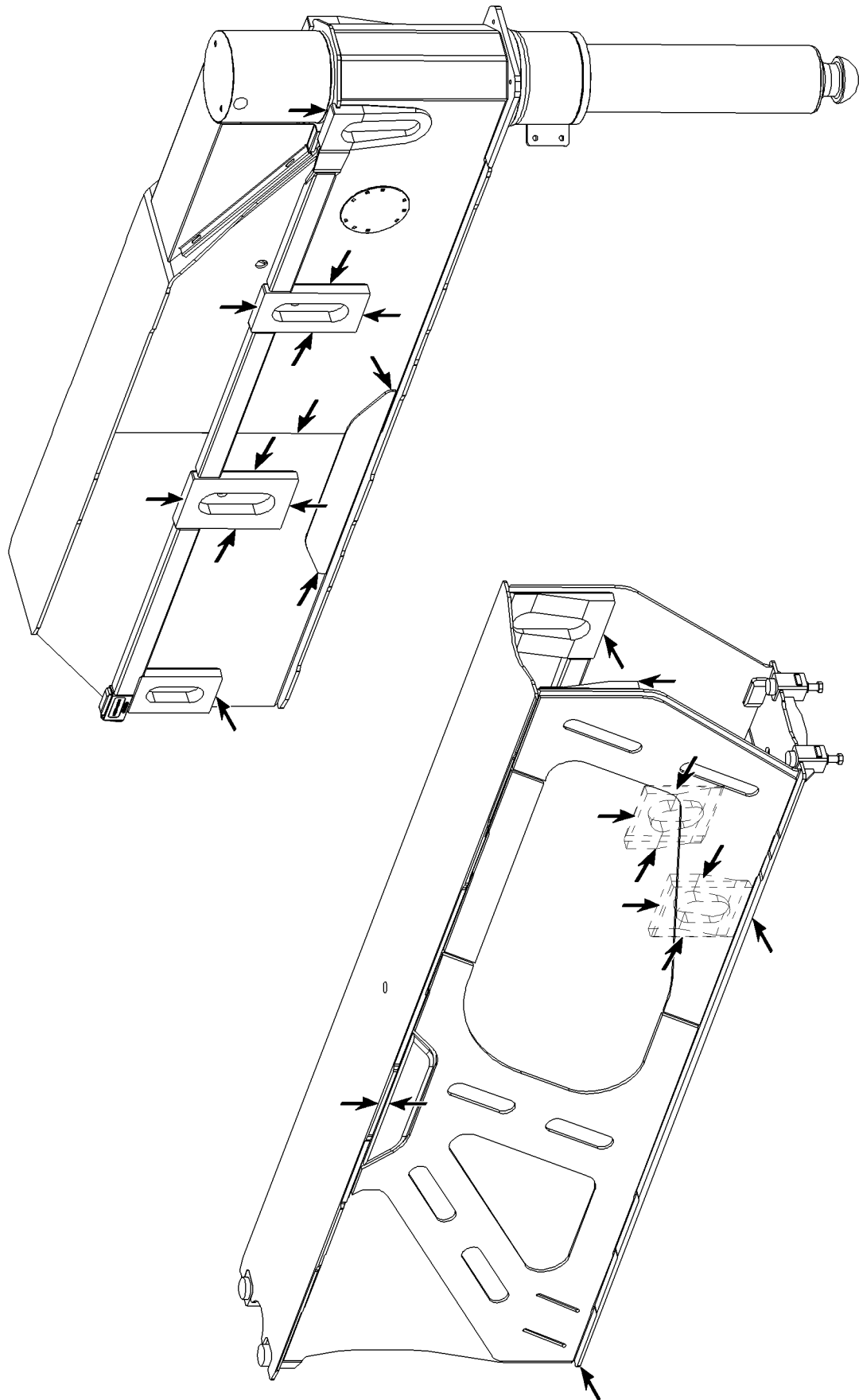


Fig.105717: Example of a sliding beam



LWE/LR 11350-007/190005-01-02/en

Fig.105718: Example of a sliding beam

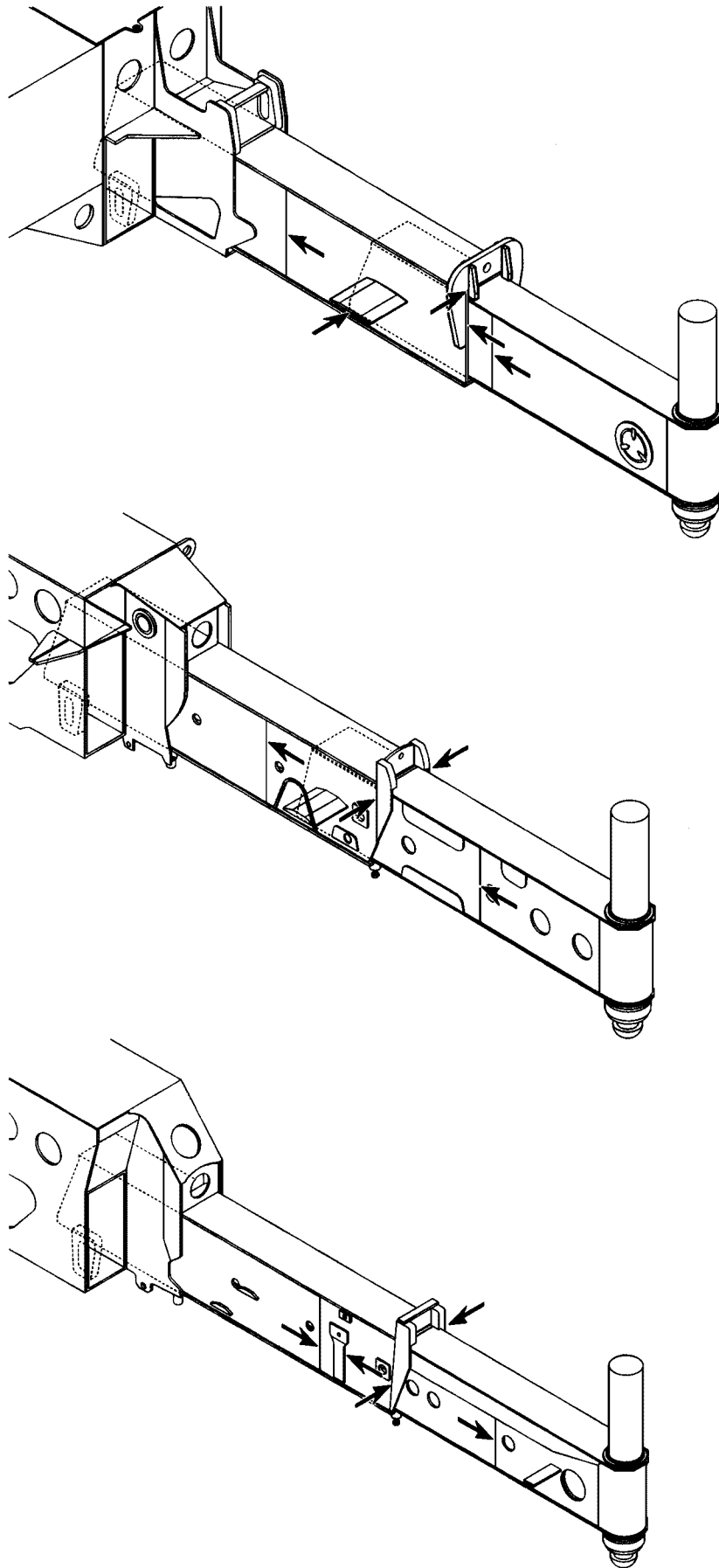
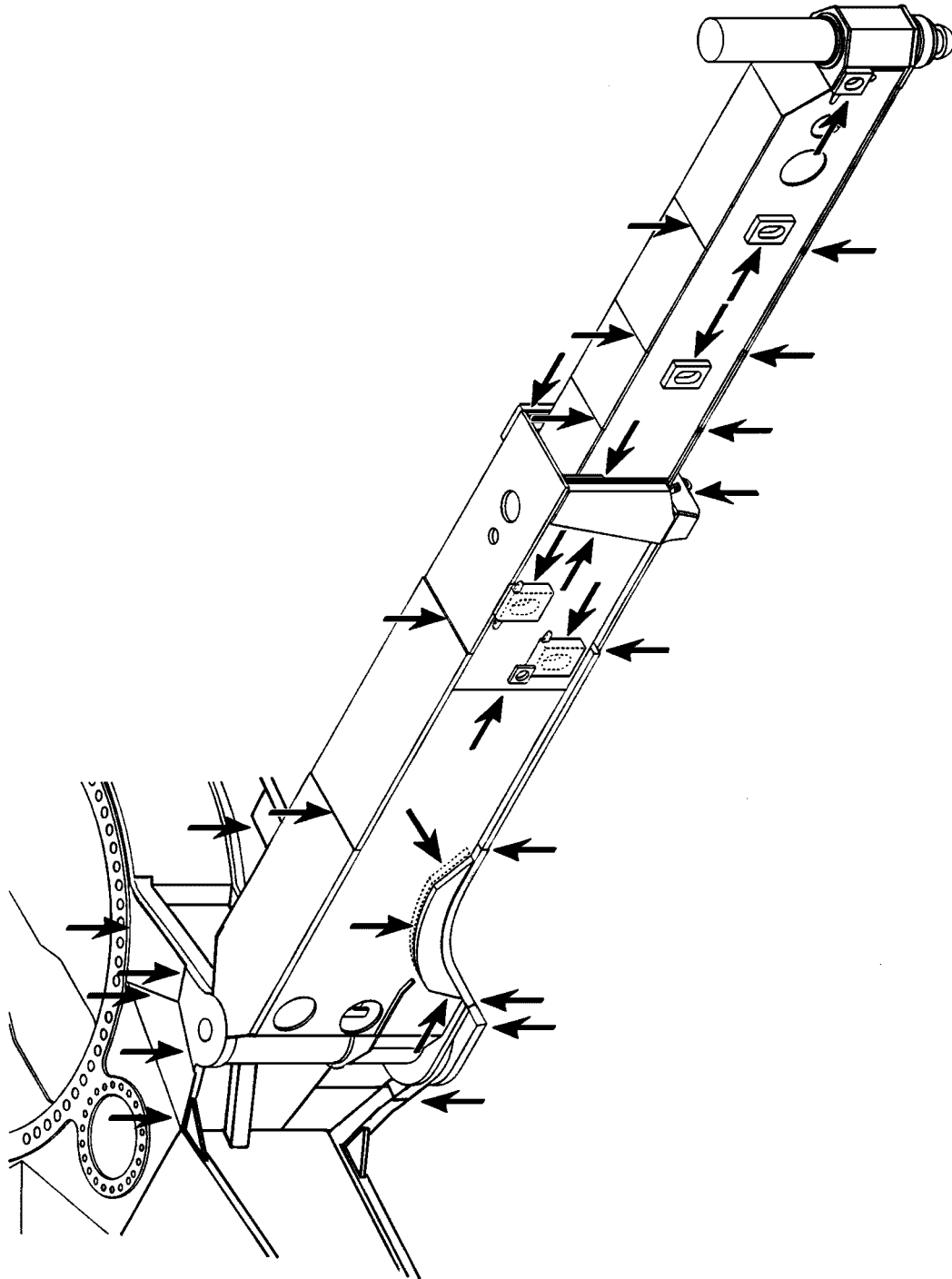


Fig.185047: Example of a sliding beam

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LWE/LR 11350-007/19005-01-02/en

Fig.185060: Example of a swinging sliding beam

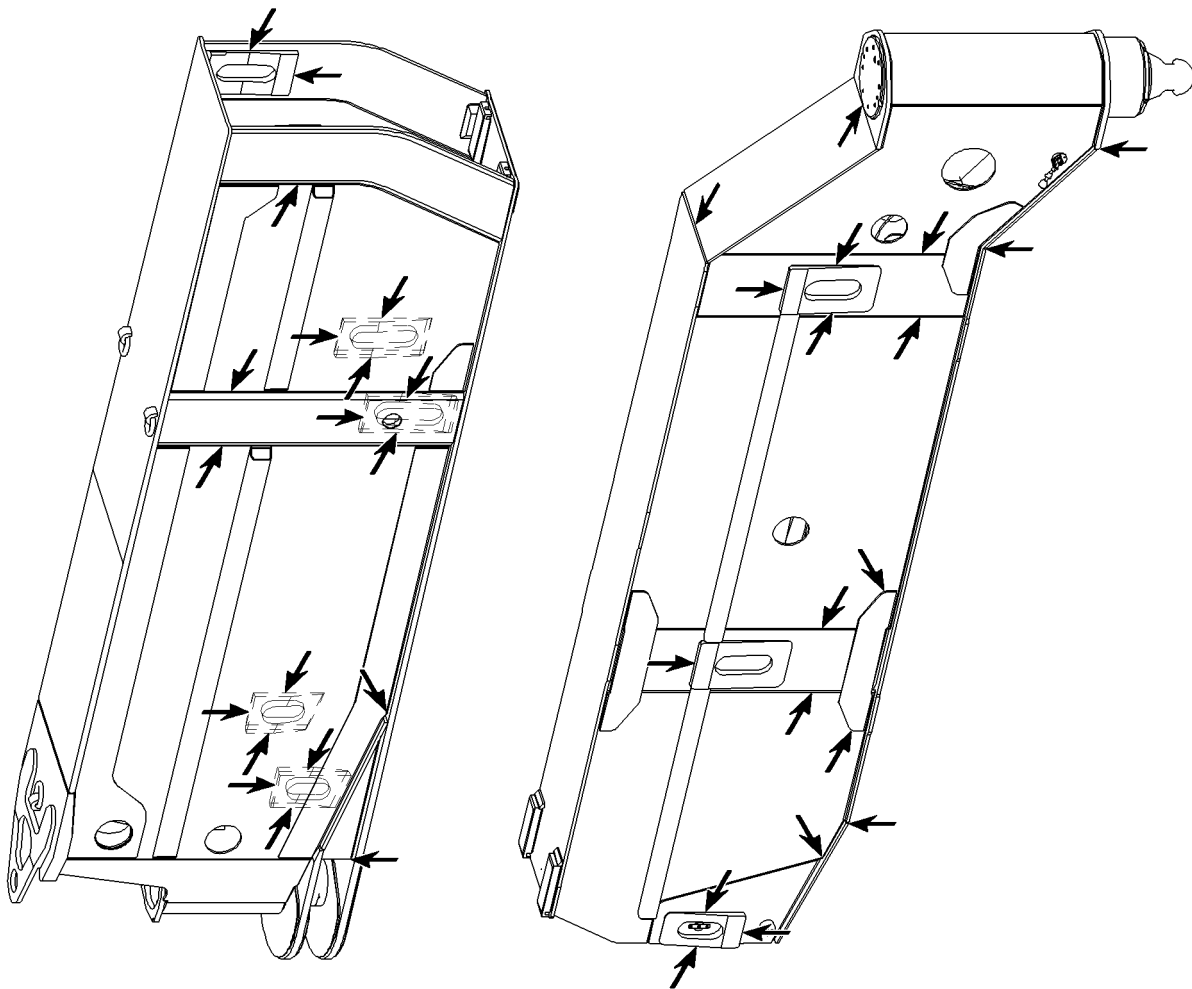
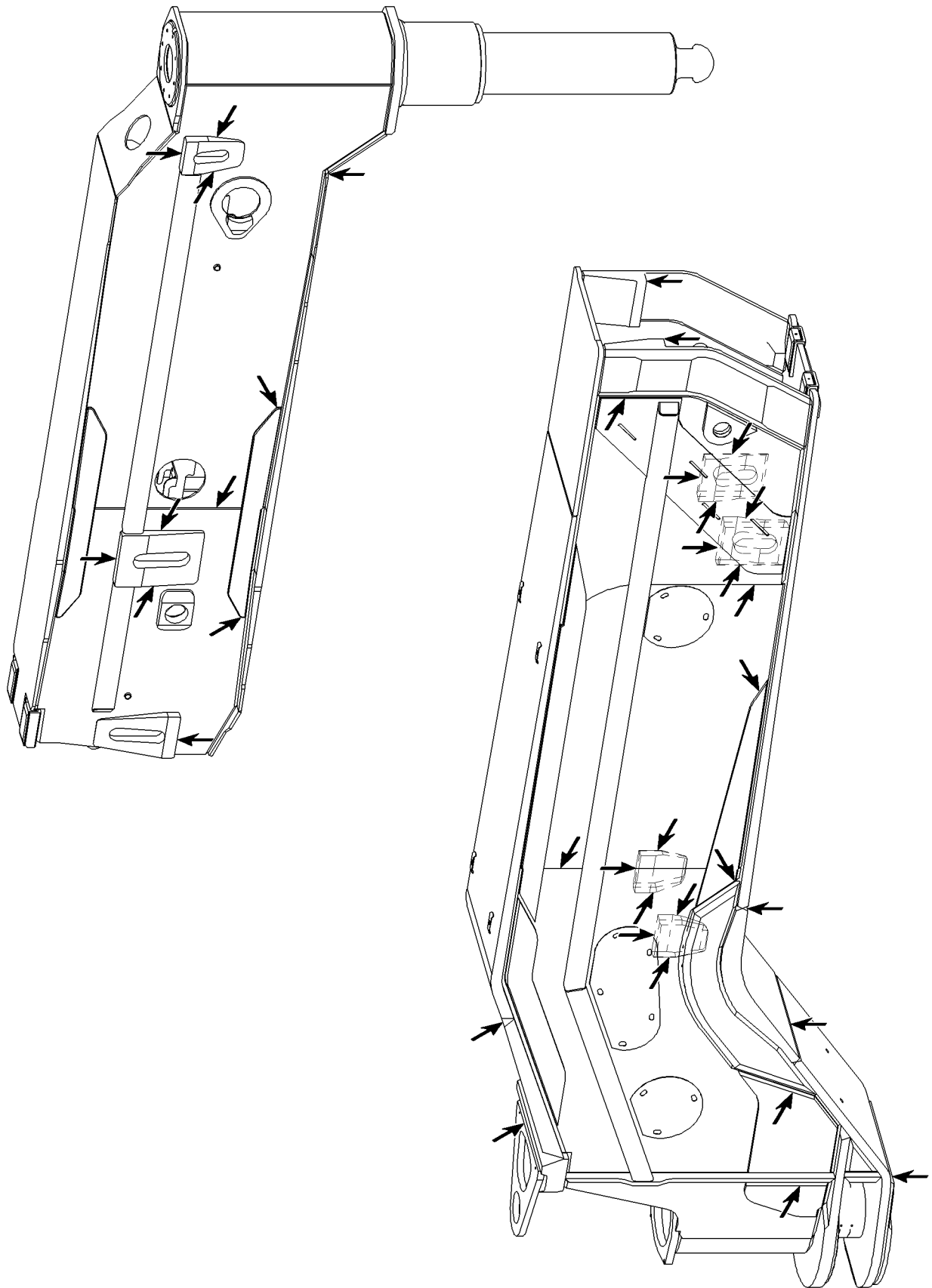


Fig.105690: Example of a swinging sliding beam



LWE/LR 11350-007/190005-01-02/en

Fig.105704: Example of a swinging sliding beam

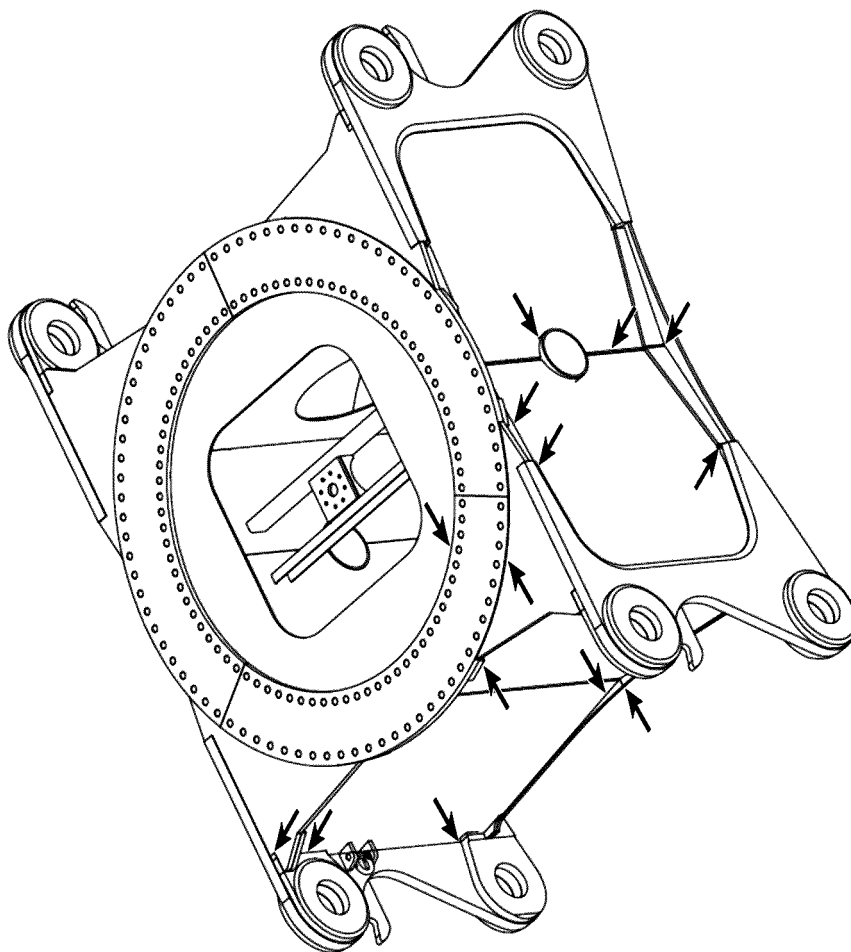
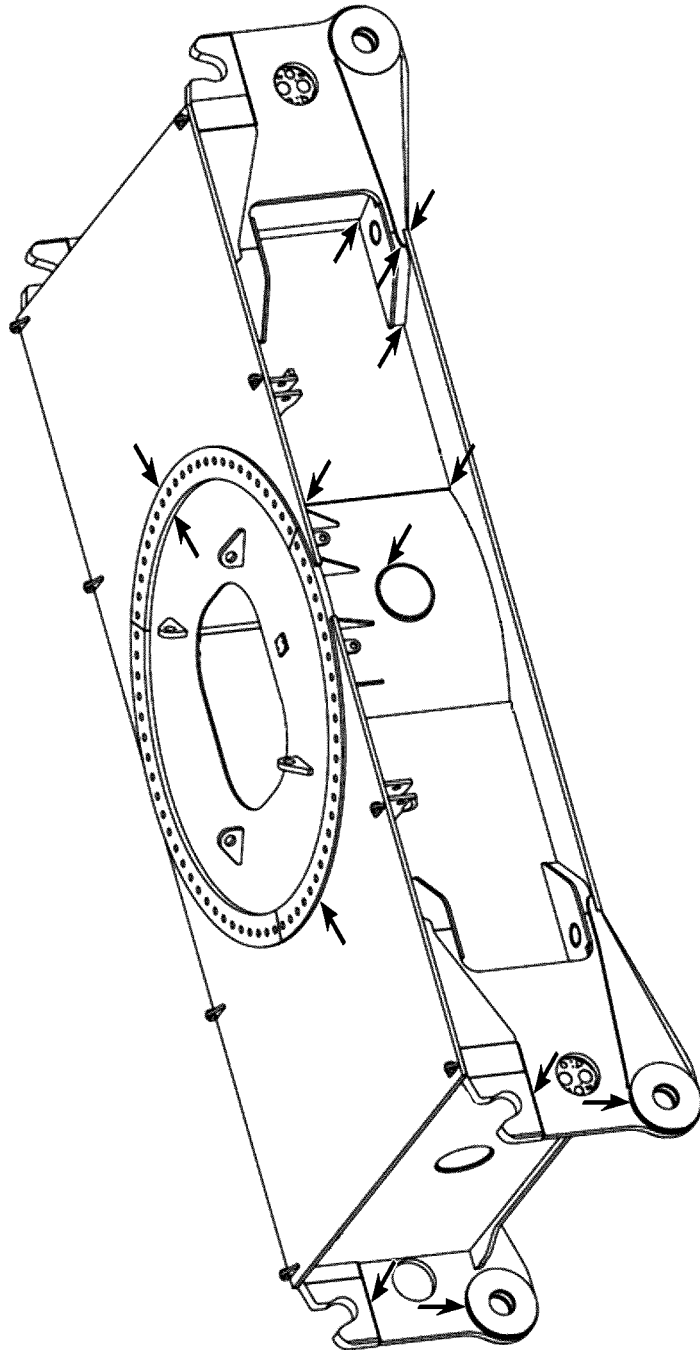


Fig.105725: Example of a crawler center section

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LWE/LR 11350-007/190005-01-02/en

Fig.105726: Example of a crawler center section

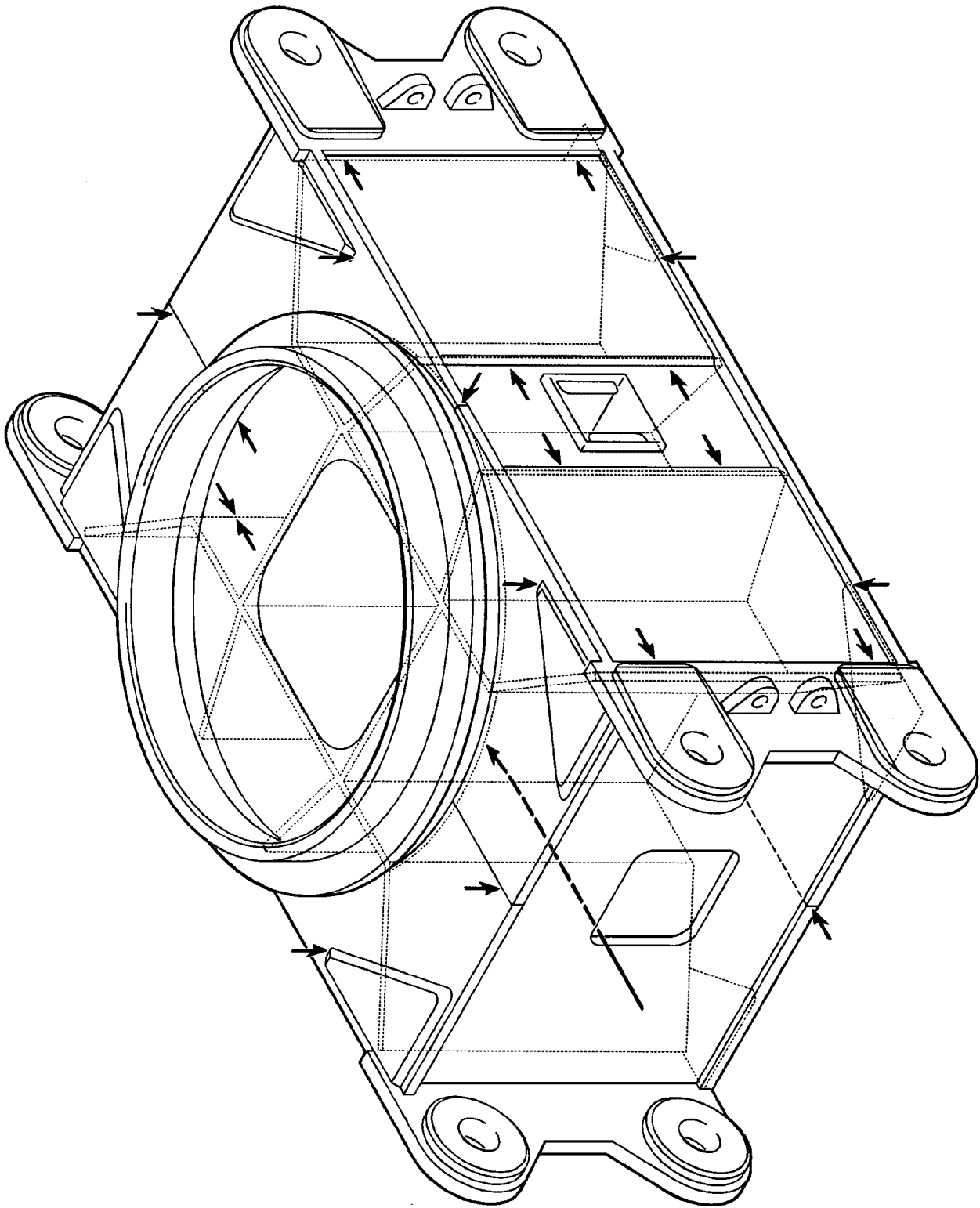
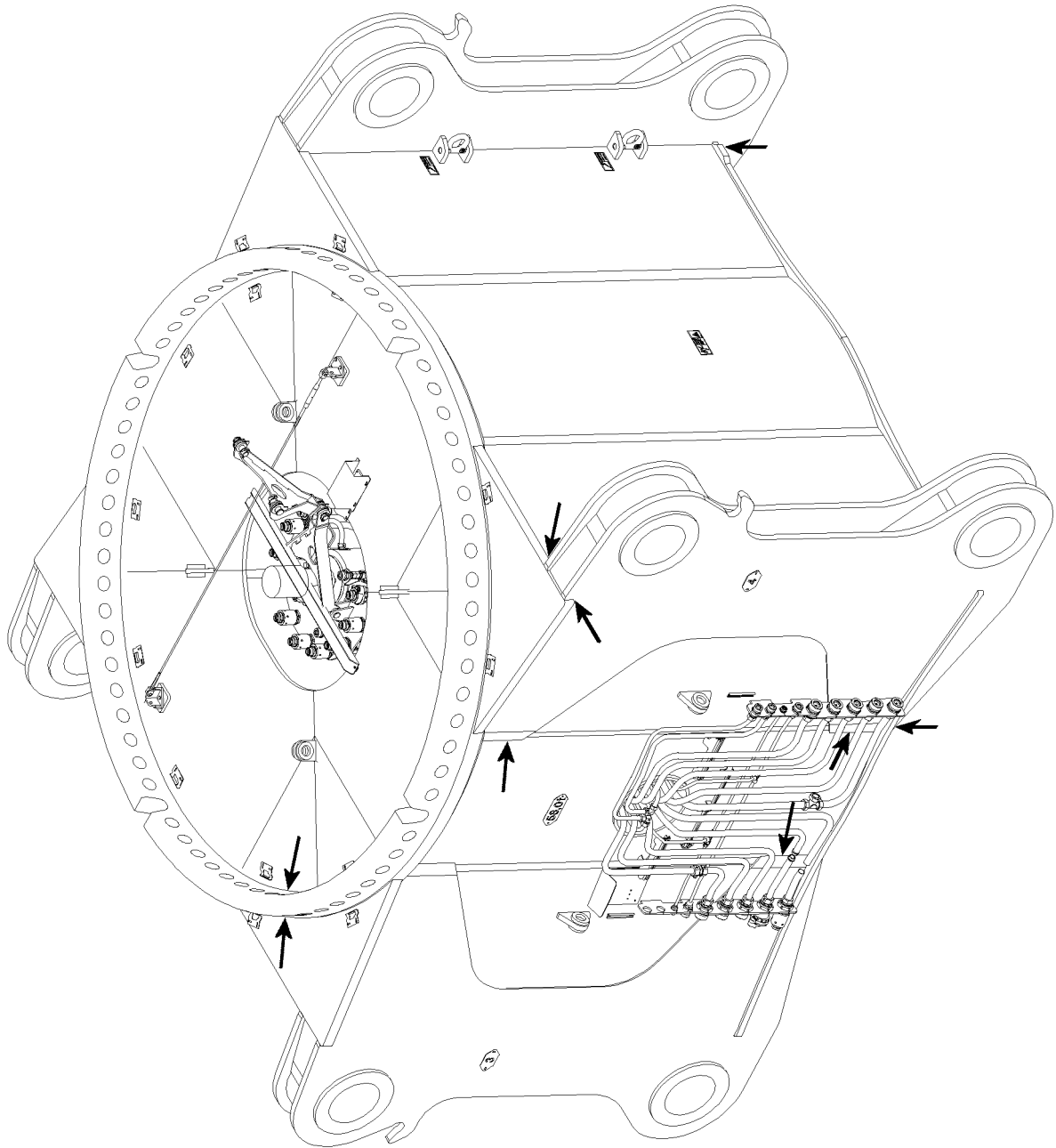


Fig.187347: Example of a crawler center section

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LWE/LR 11350-007/190005-01-02/en

Fig.115920: Example of a crawler center section

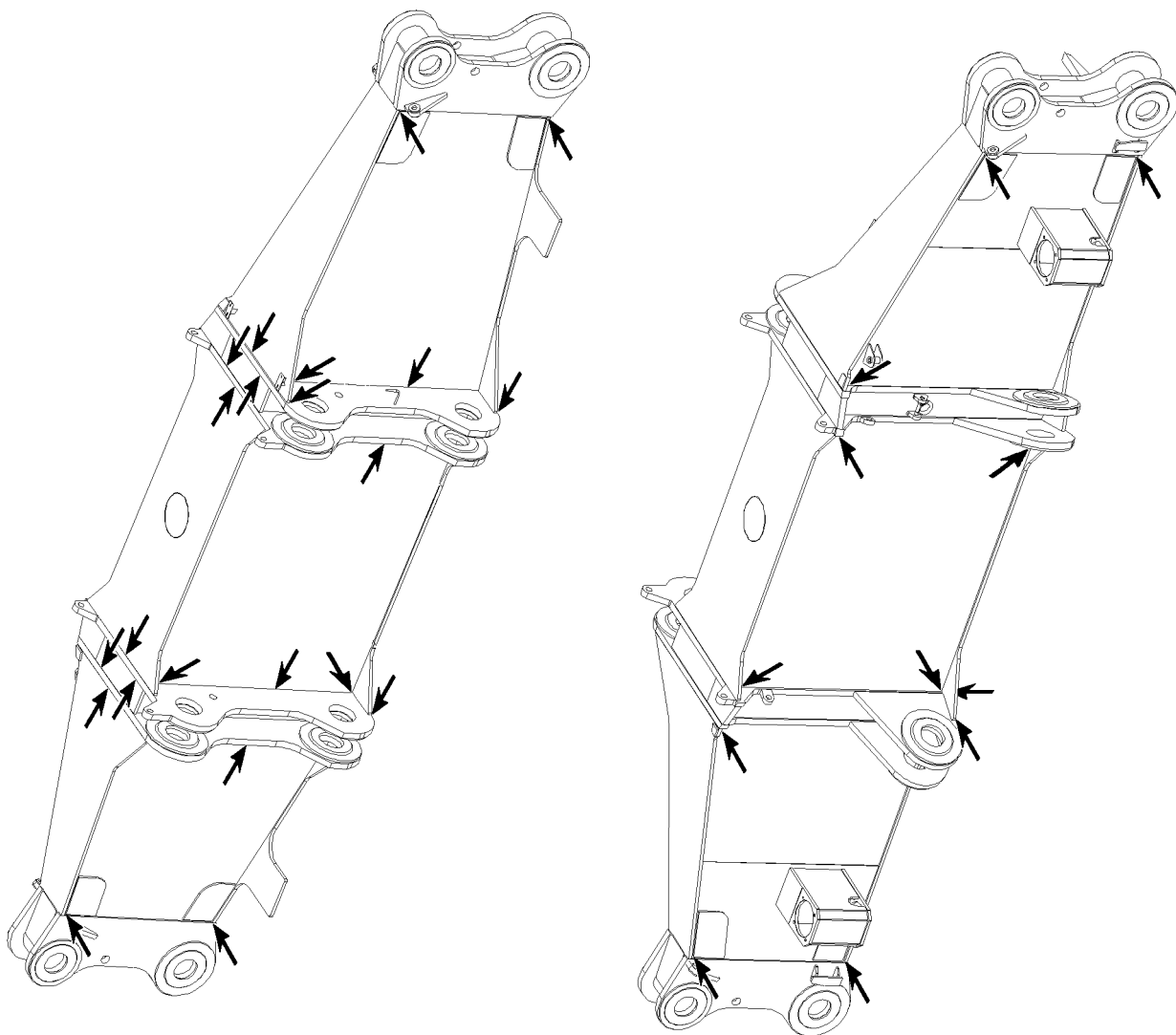
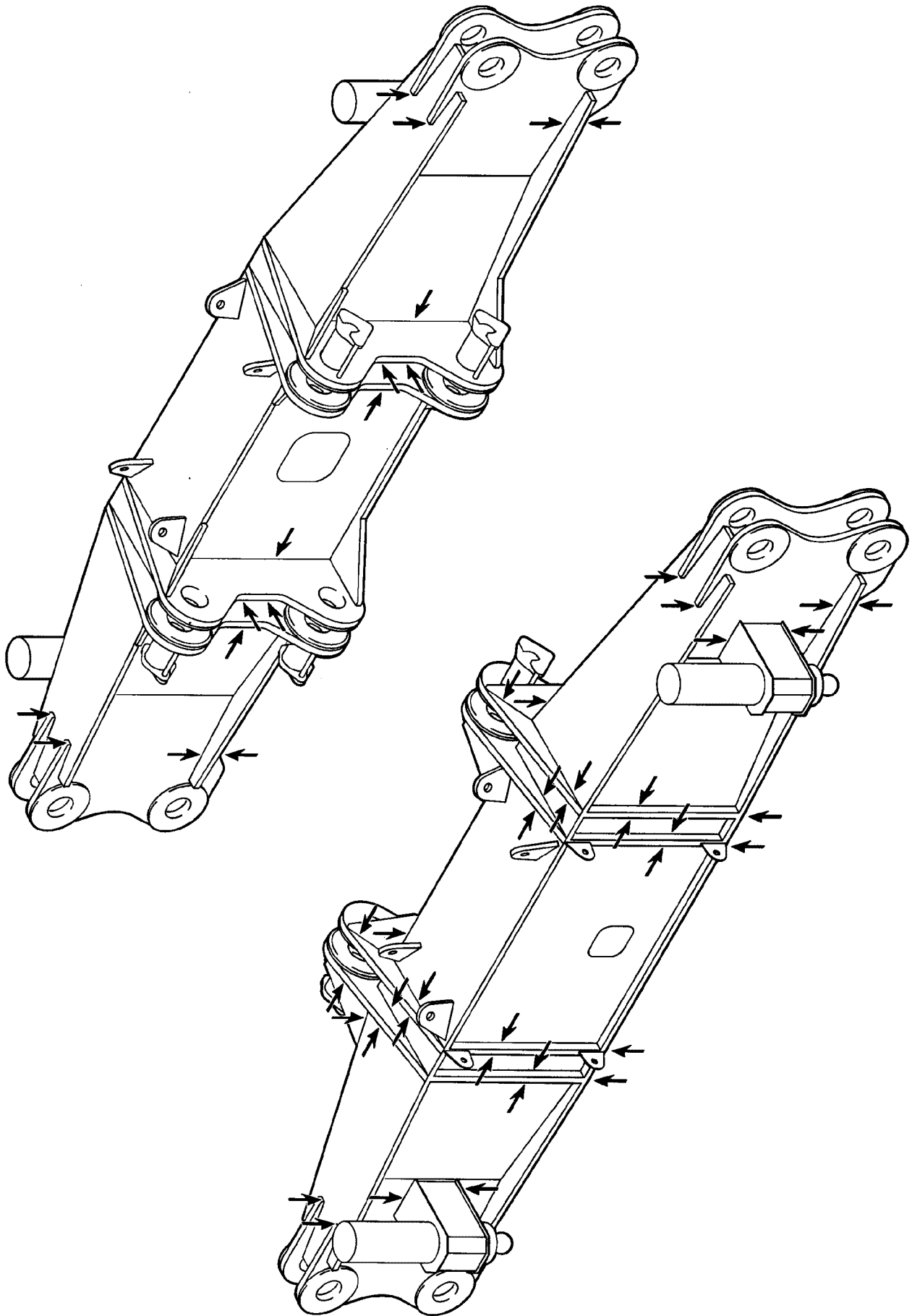


Fig.105727: Example of a cross carrier



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Fig.187348: Example of a cross carrier

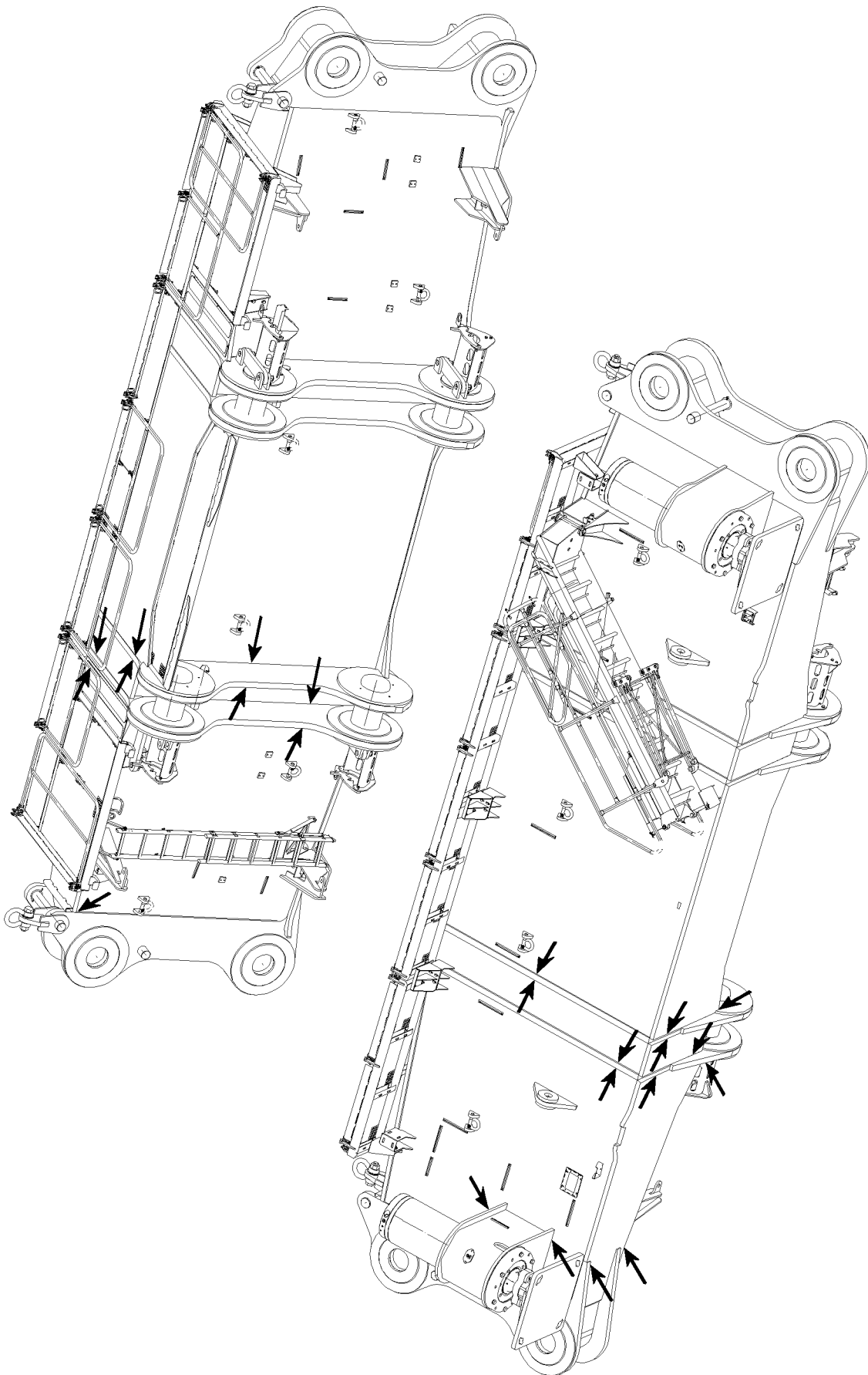
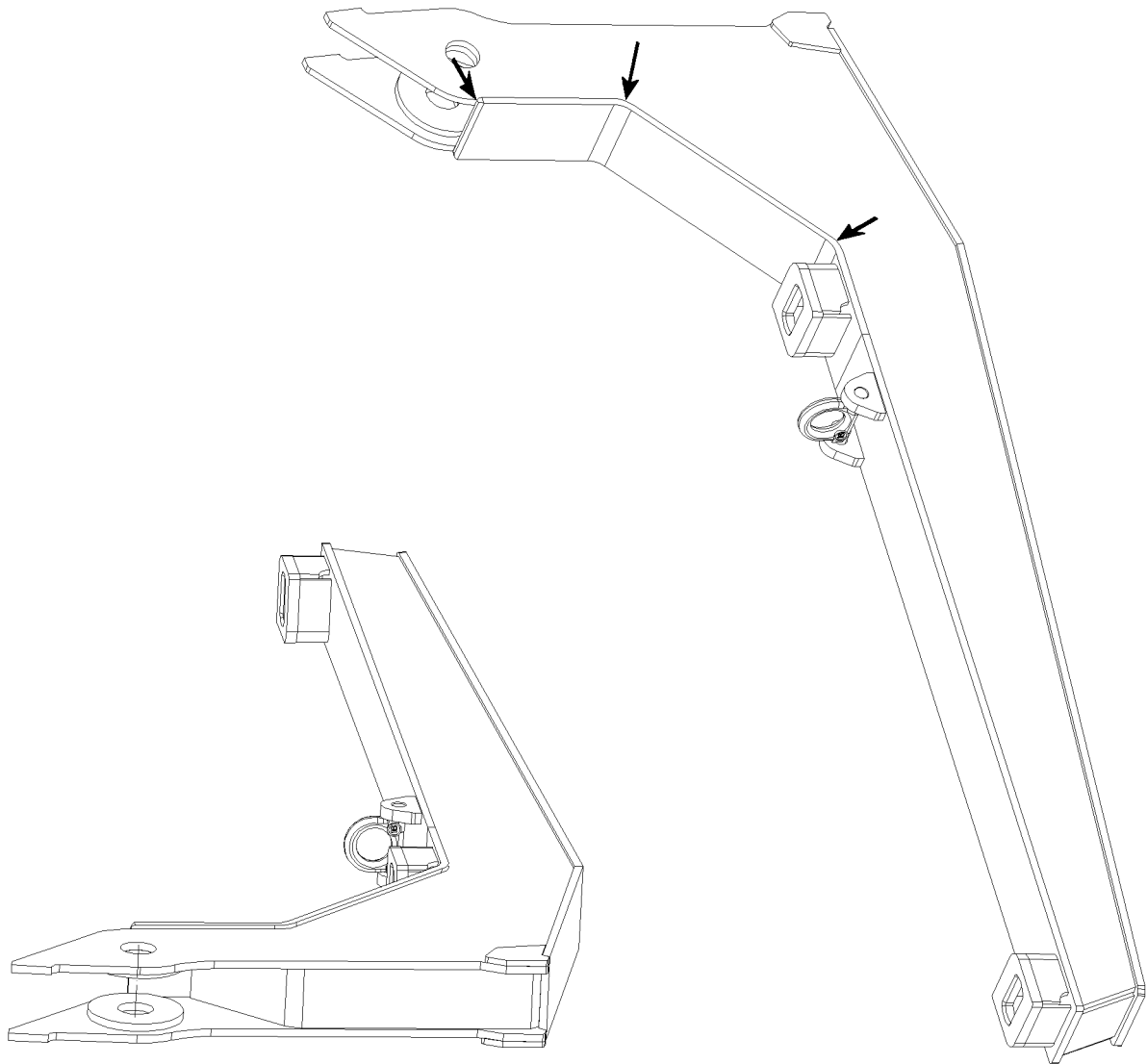


Fig.115921: Example of a cross carrier

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LWE/LR 11350-007/19005-01-02/en

Fig.115919: Example of carrier for central ballast

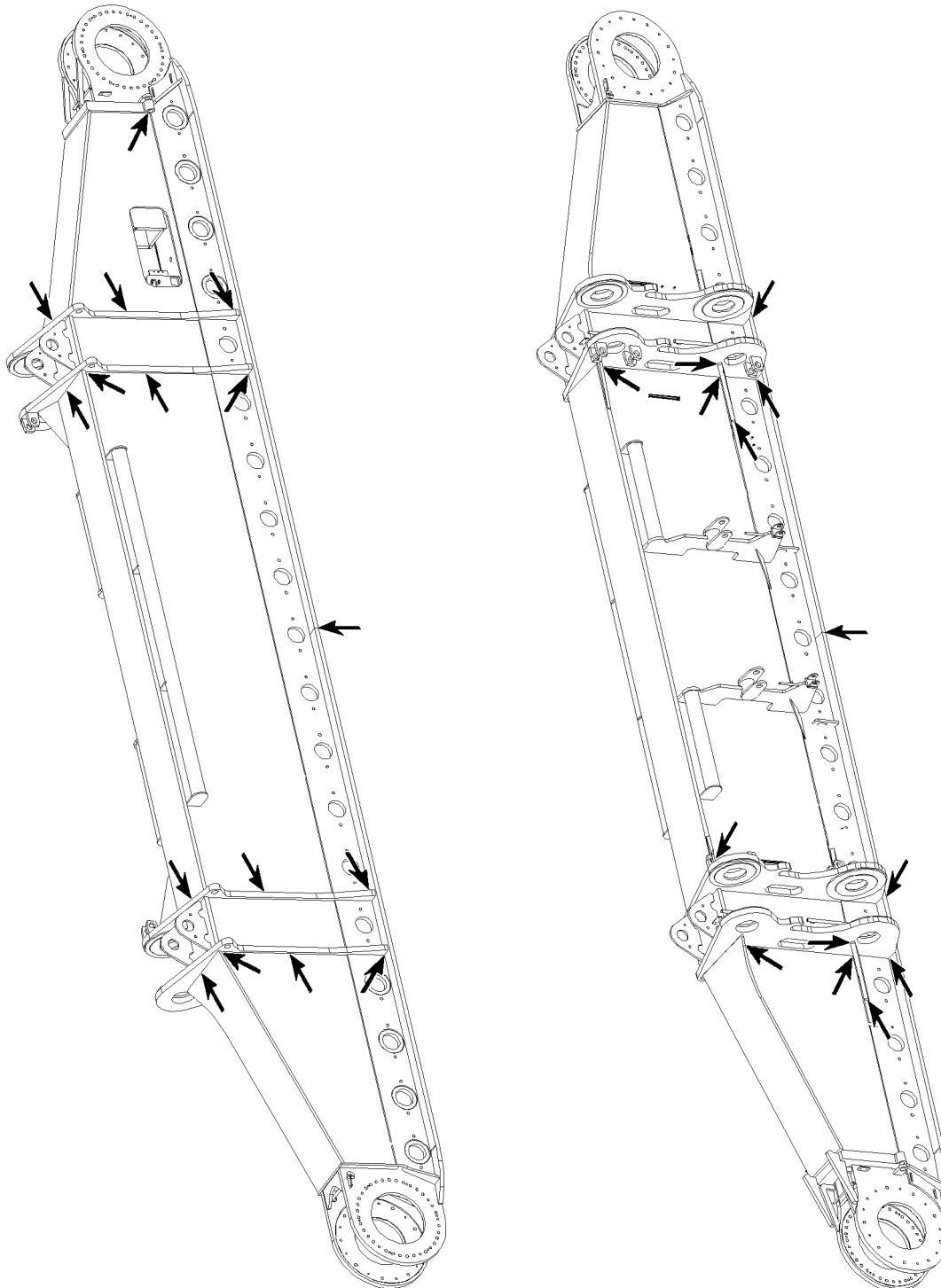
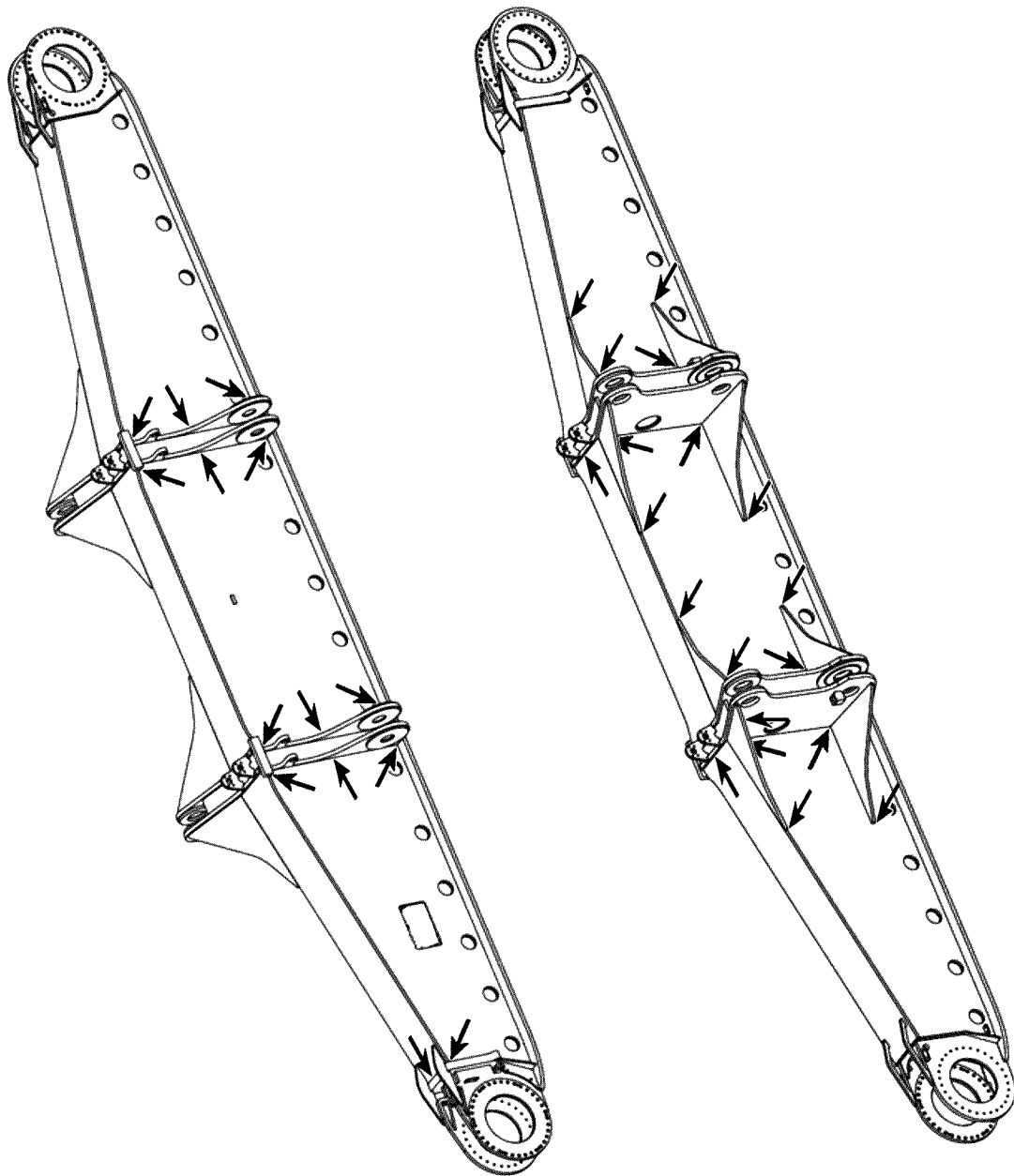


Fig.105728: Example of a crawler carrier

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LWE/LR 11350-007/190005-01-02/en

Fig.105729: Example of a crawler carrier

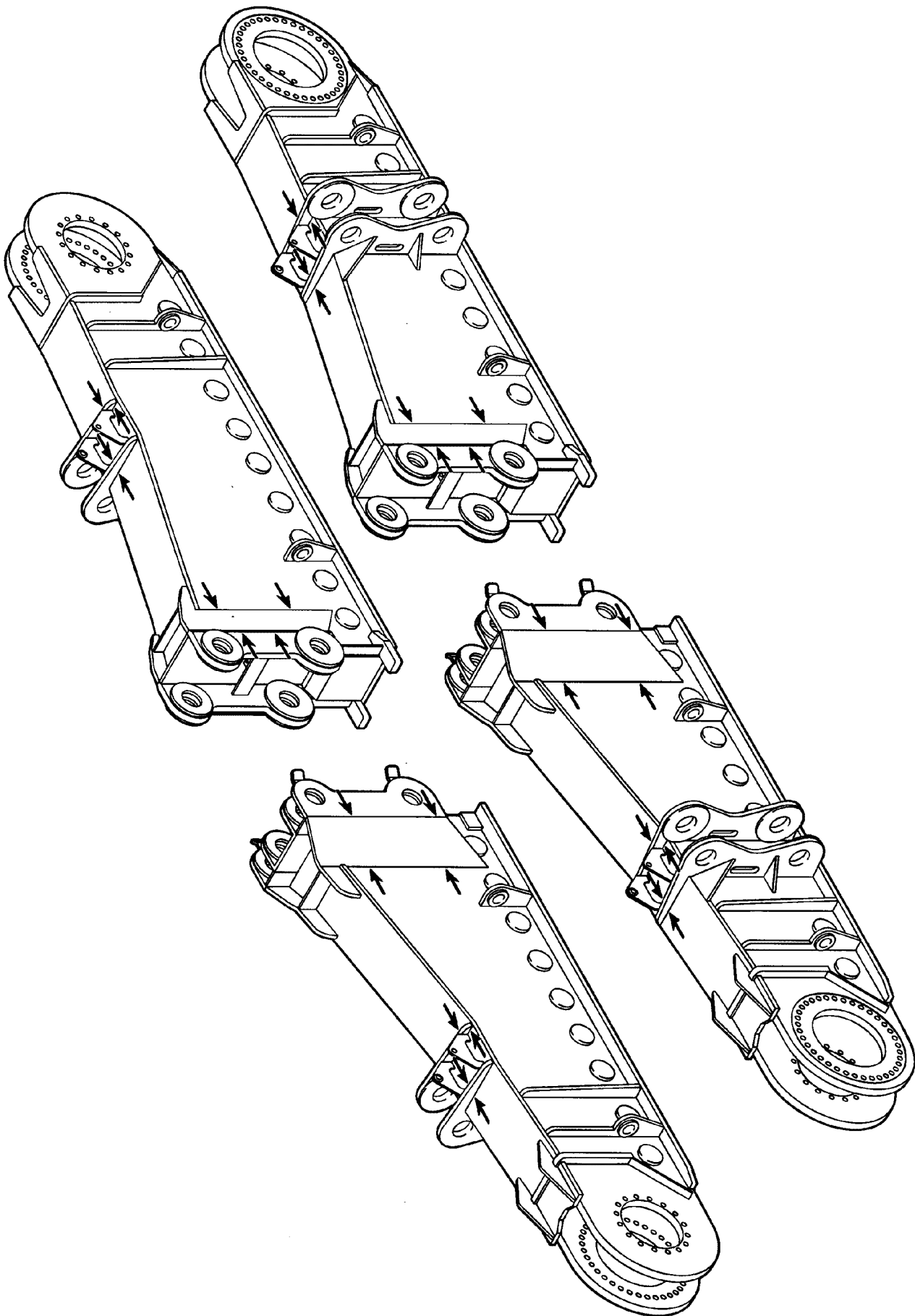
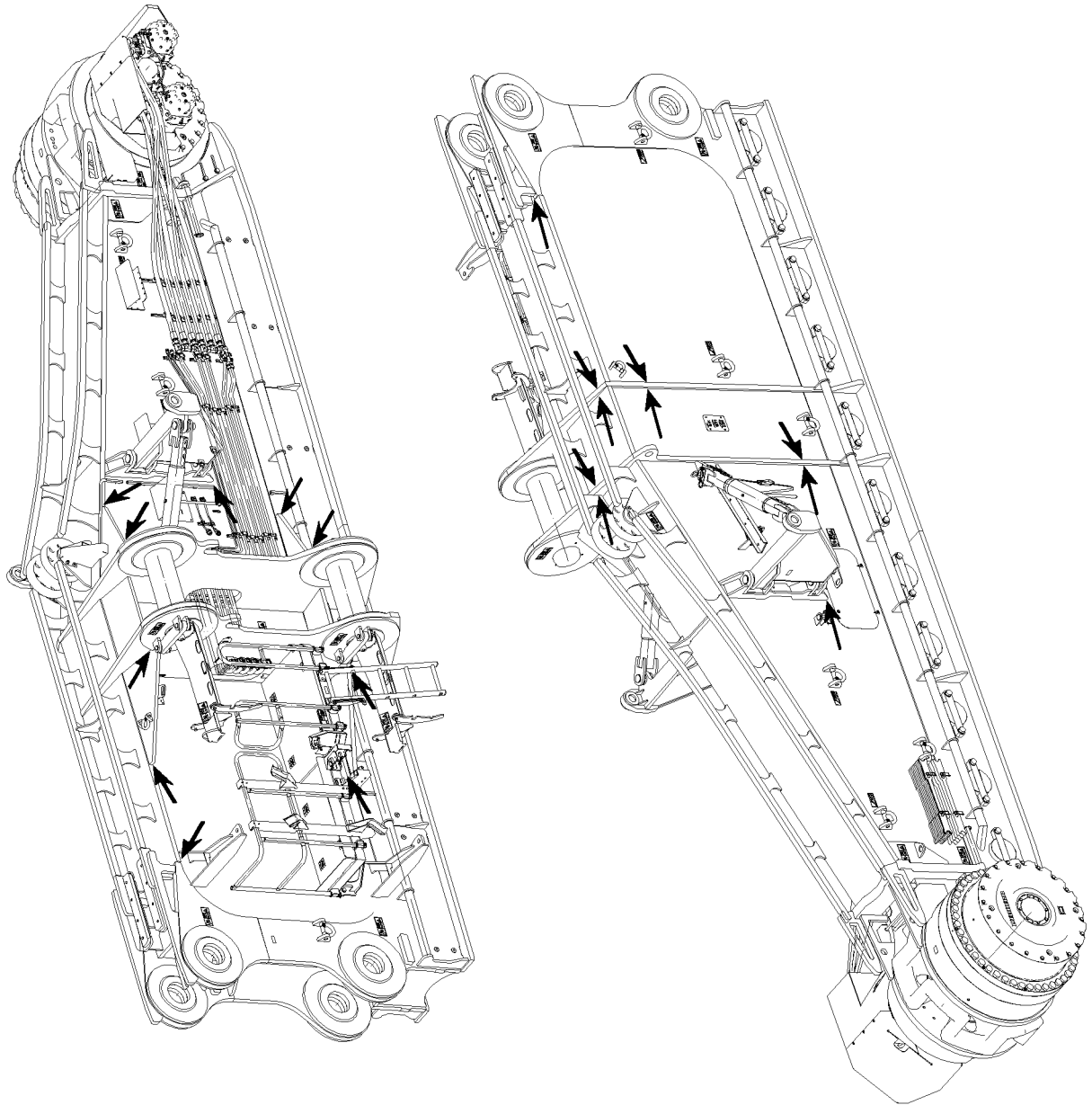


Fig.187349: Example of a crawler carrier



LWE/LR 11350-007/19005-01-02/en

Fig.115917: Example of a crawler carrier

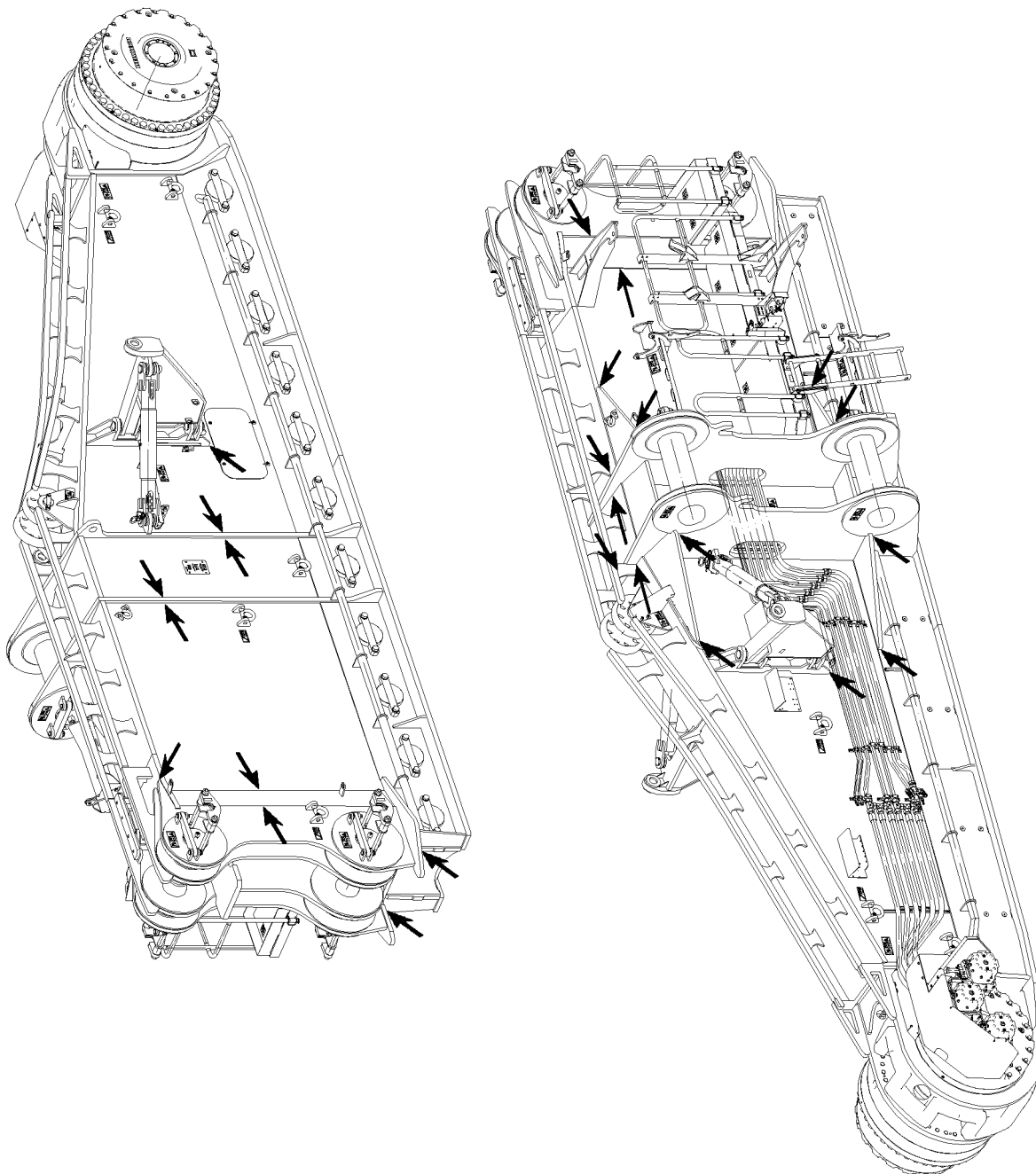
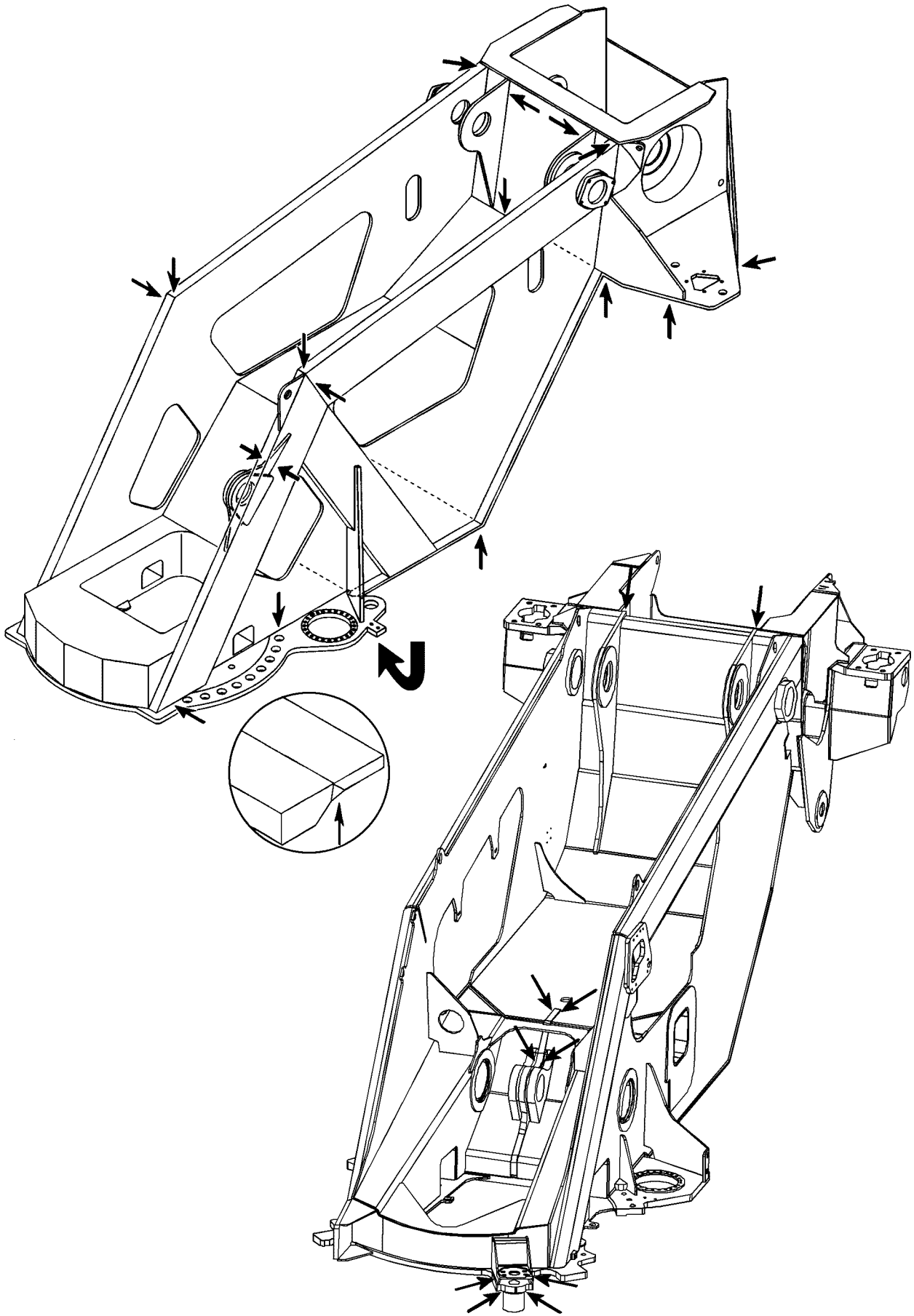


Fig.115918: Example of a crawler carrier

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LWE/LR 11350-007/190005-01-02/en

Fig.185048: Example of a turntable frame

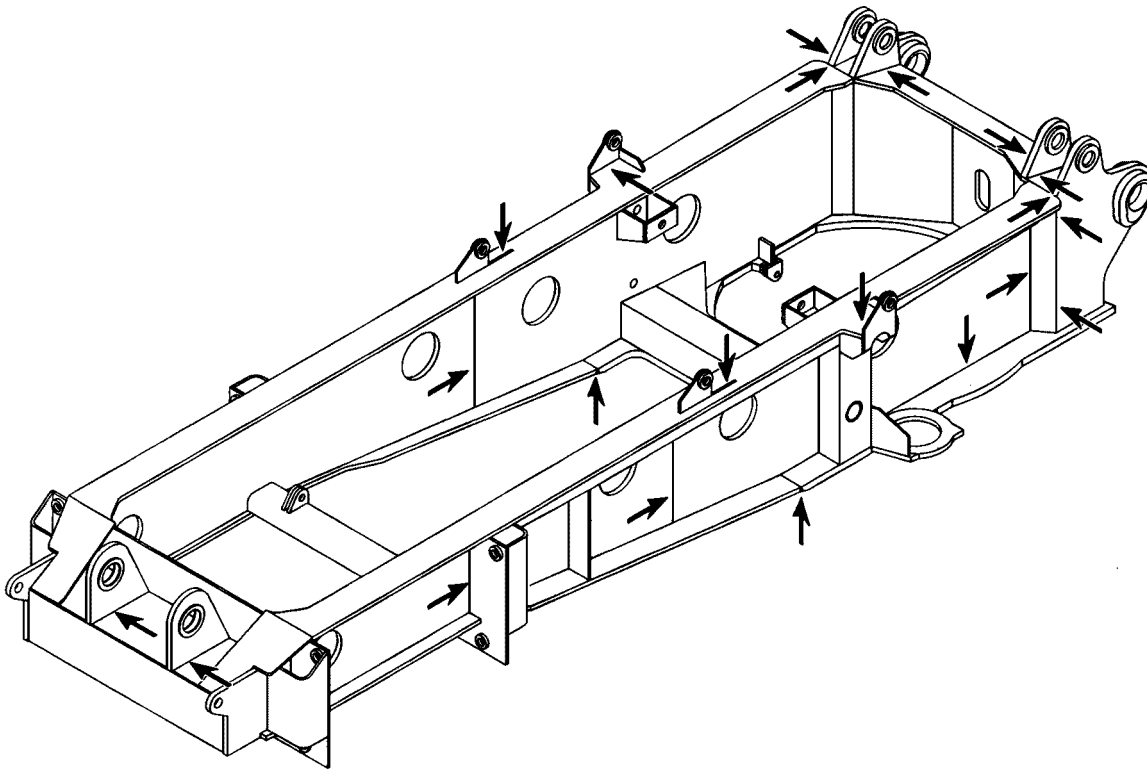


Fig.185049: Example of a turntable frame

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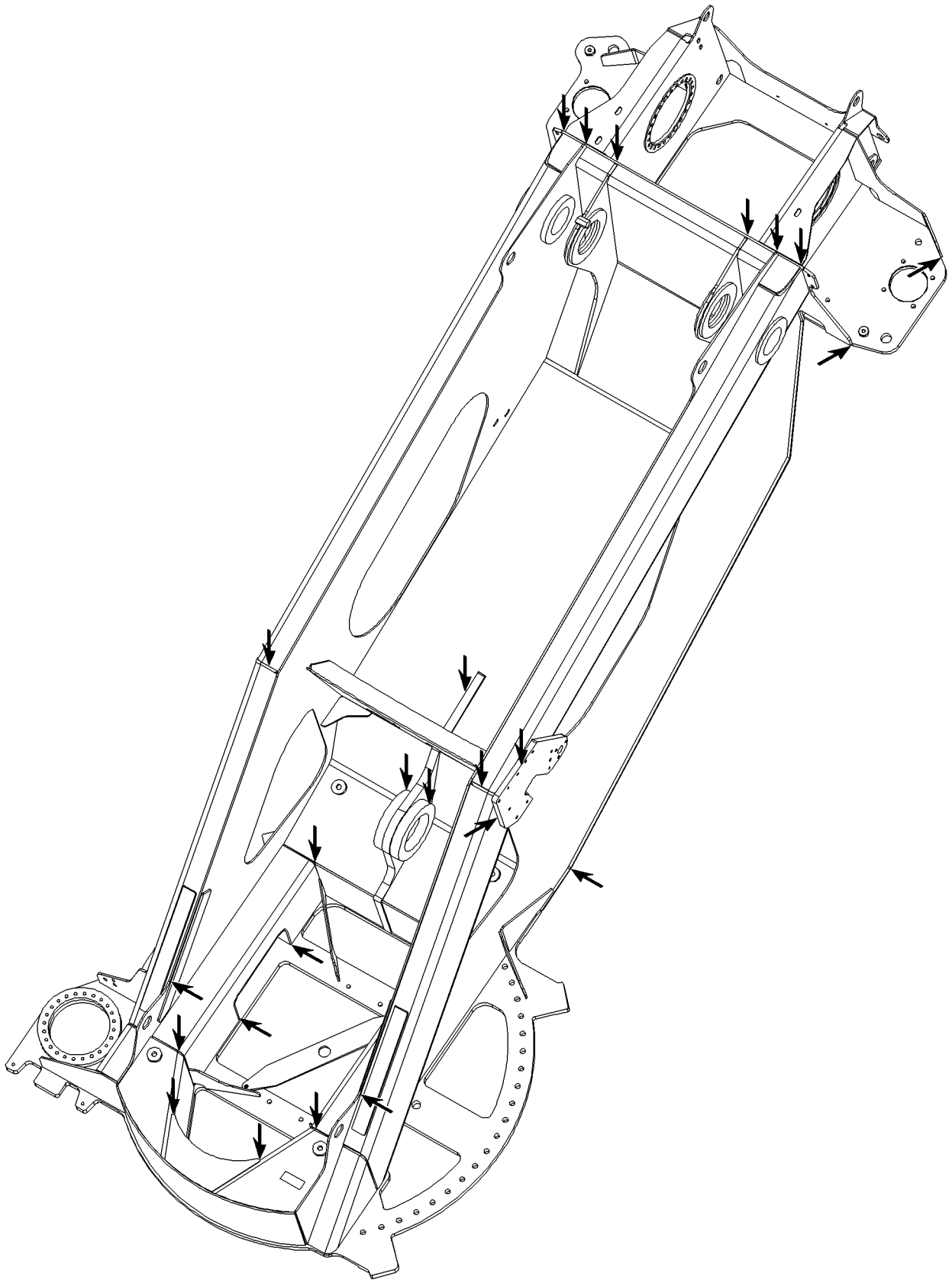


Fig.105700: Example of a turntable frame

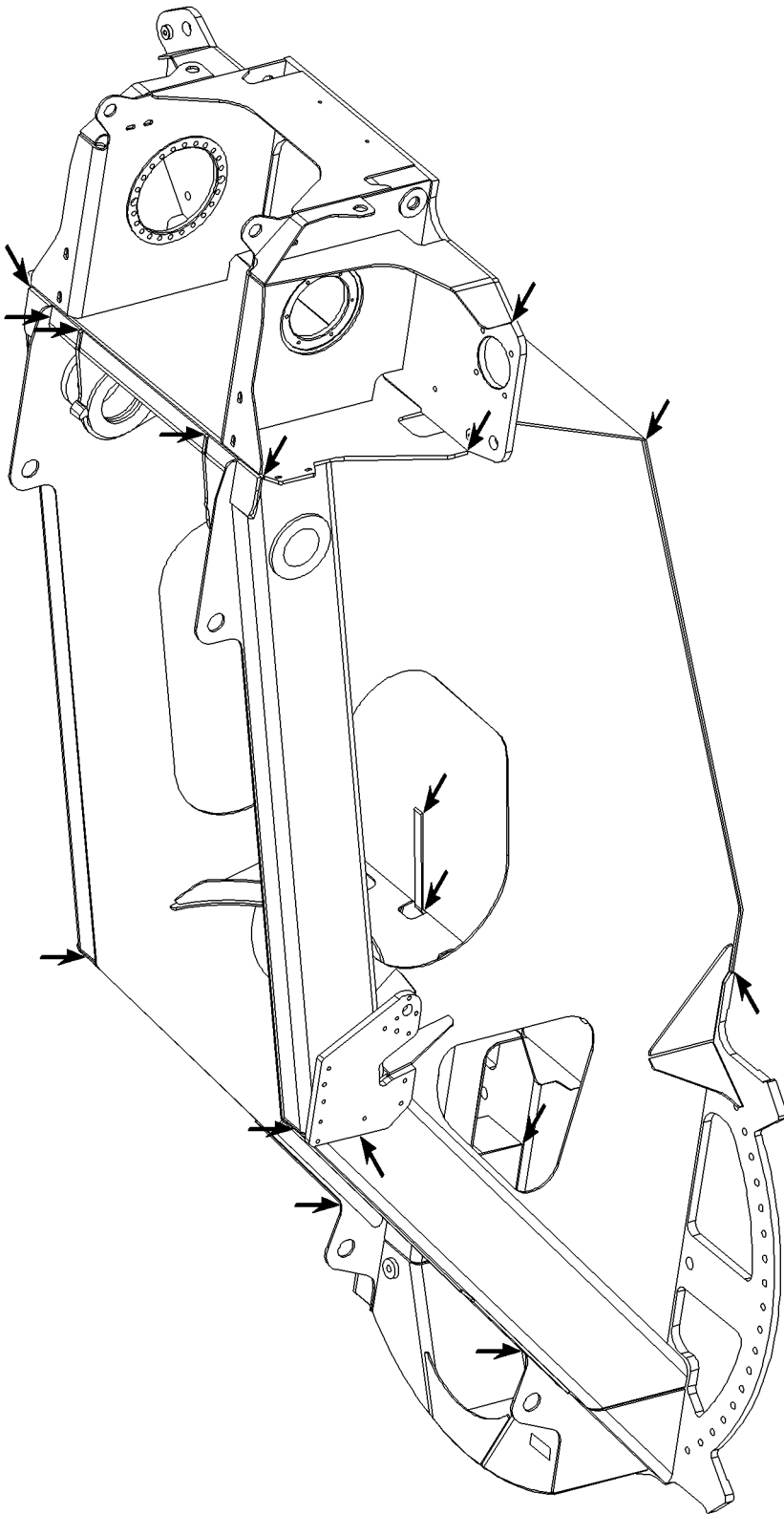
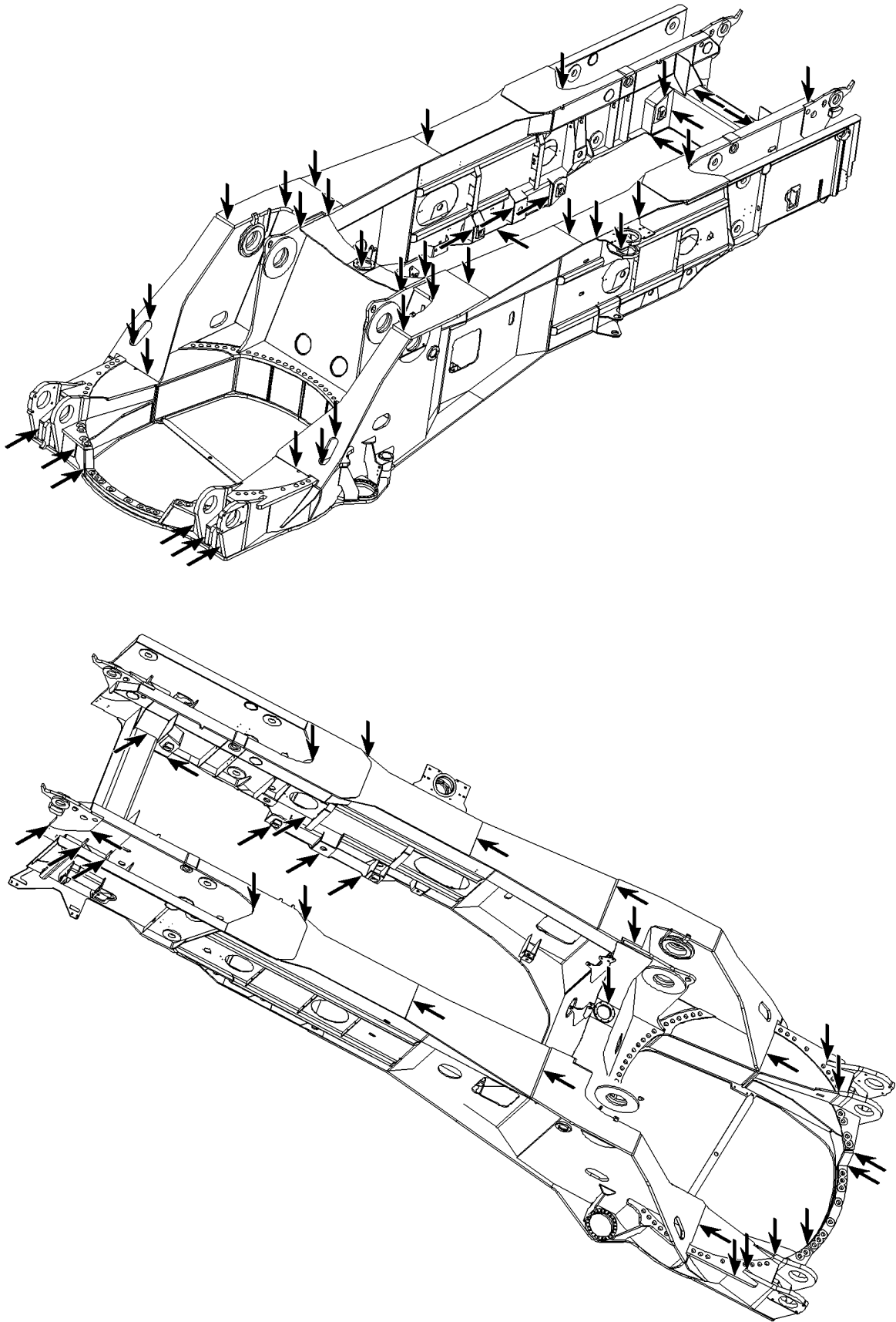


Fig.105701: Example of a turntable frame



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Fig.105706: Example of a turntable frame

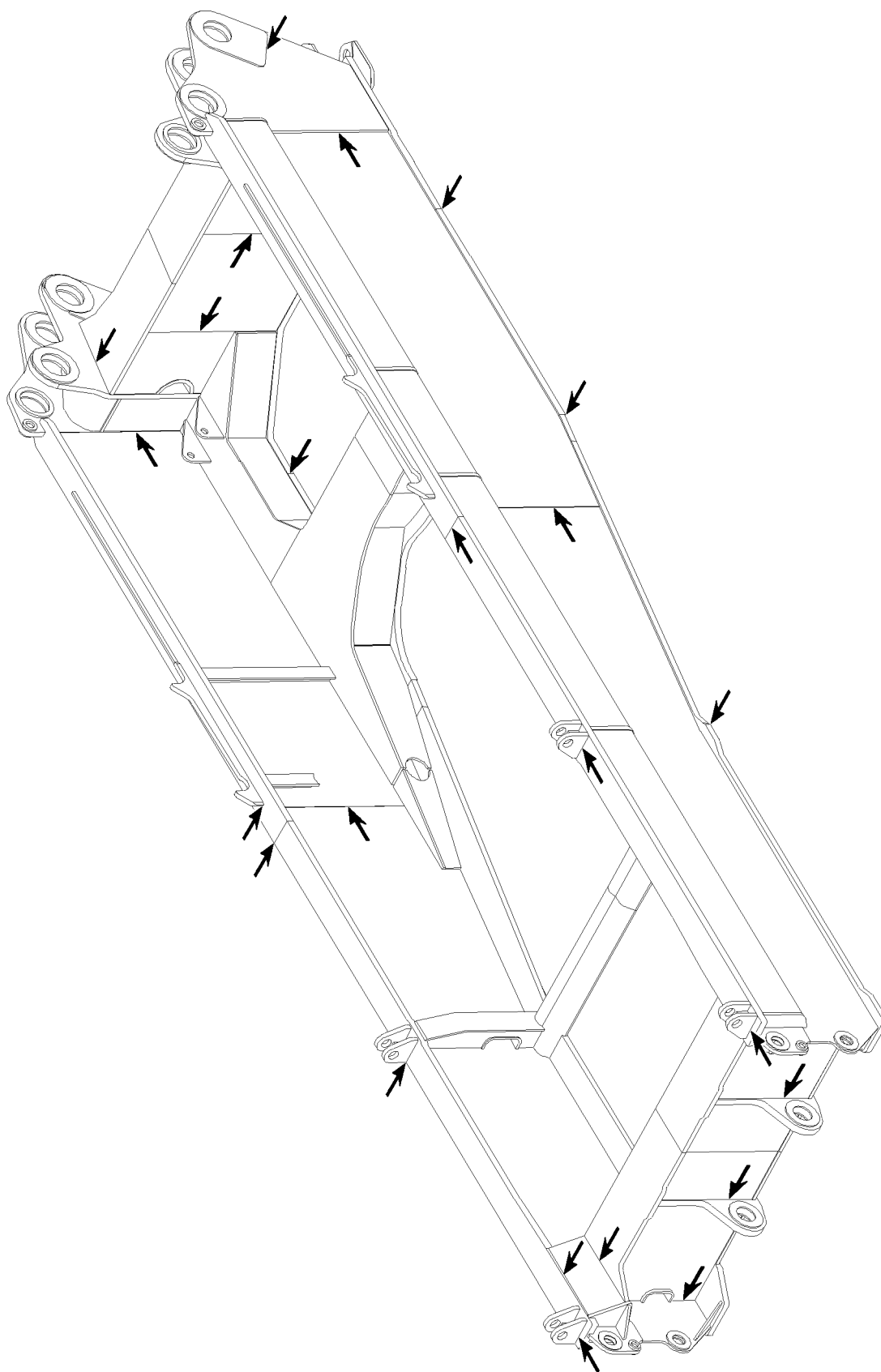
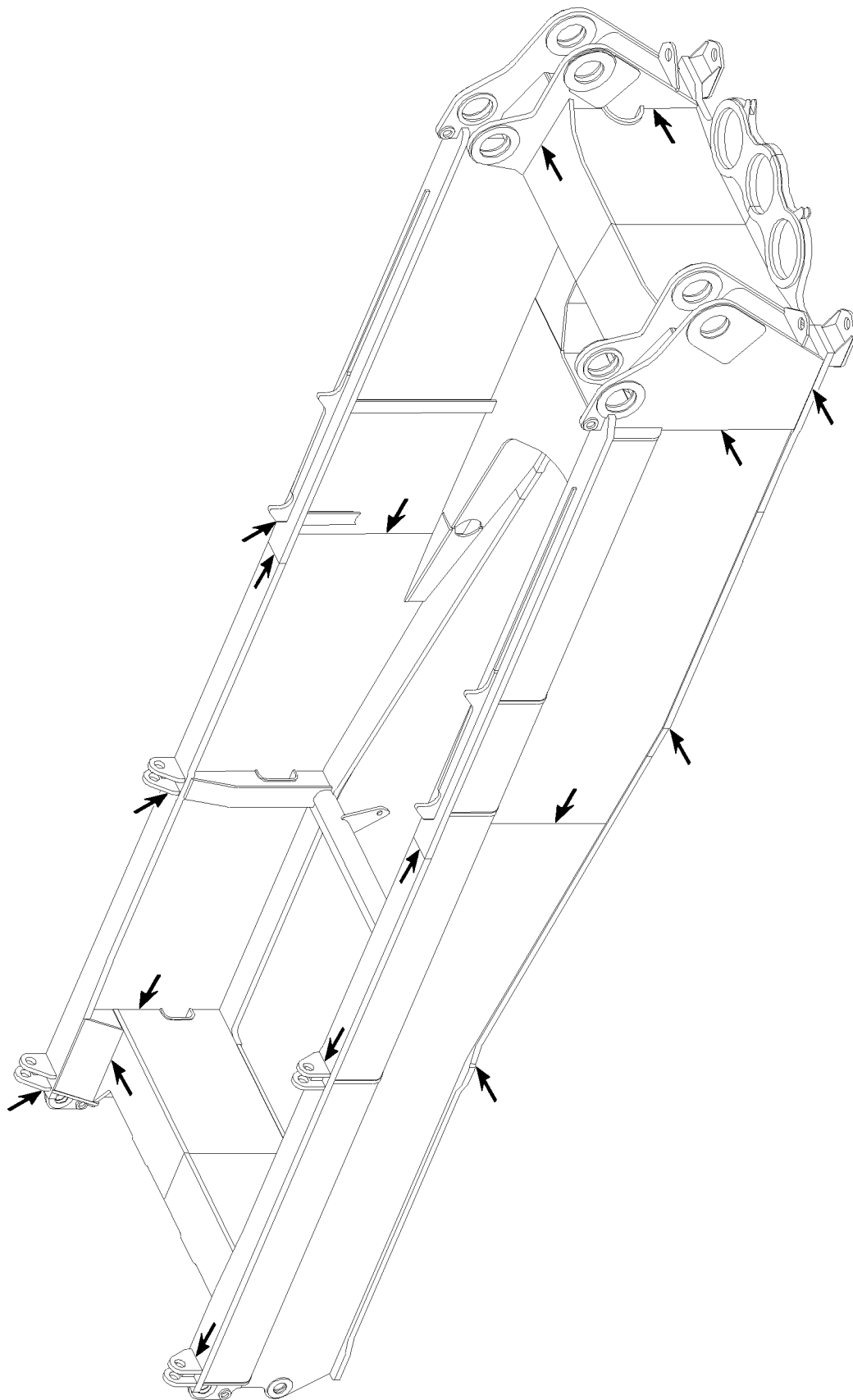


Fig.105694: Example of a turntable frame



LWE/LR 11350-007/19005-01-02/en

Fig.105695: Example of a turntable frame

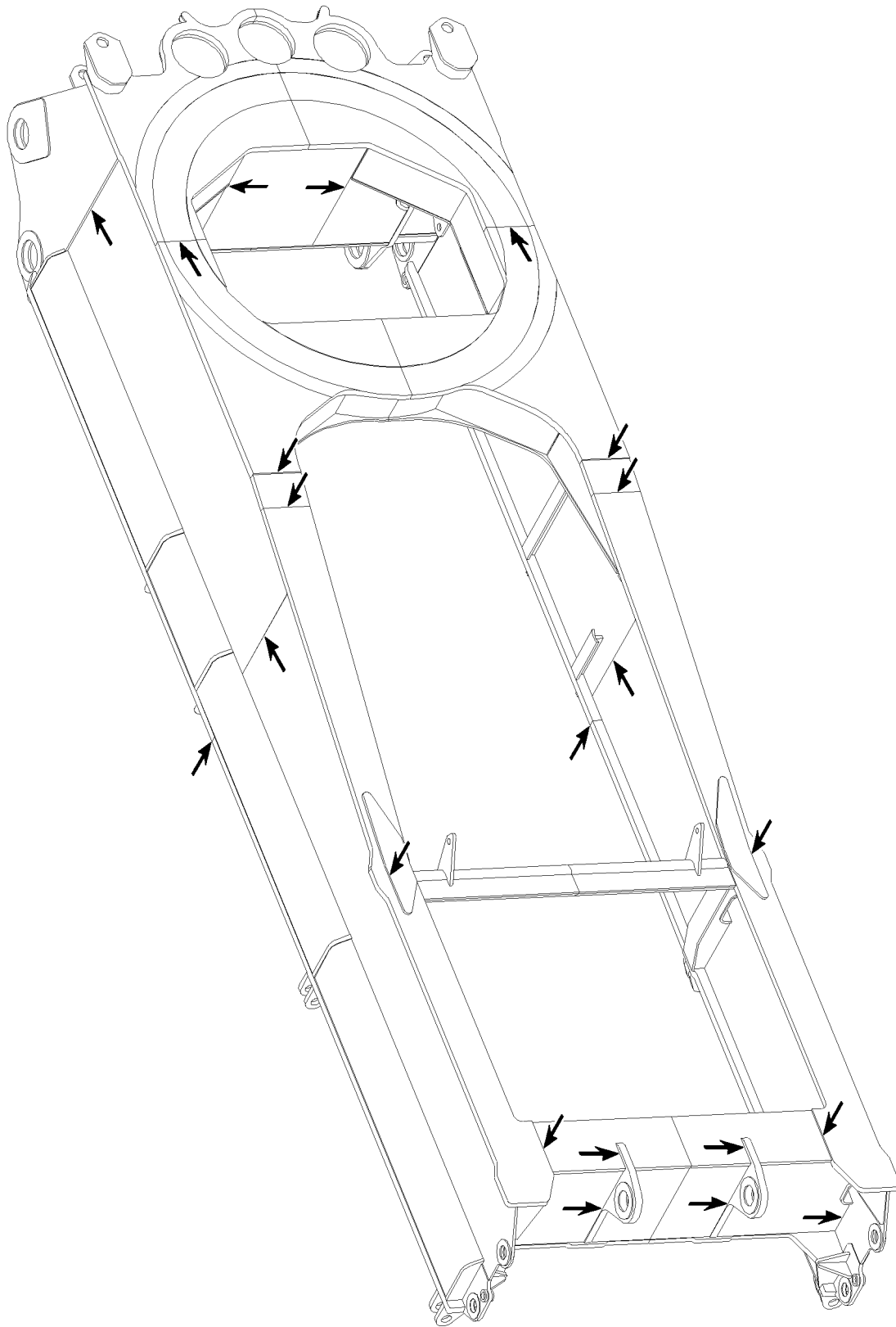
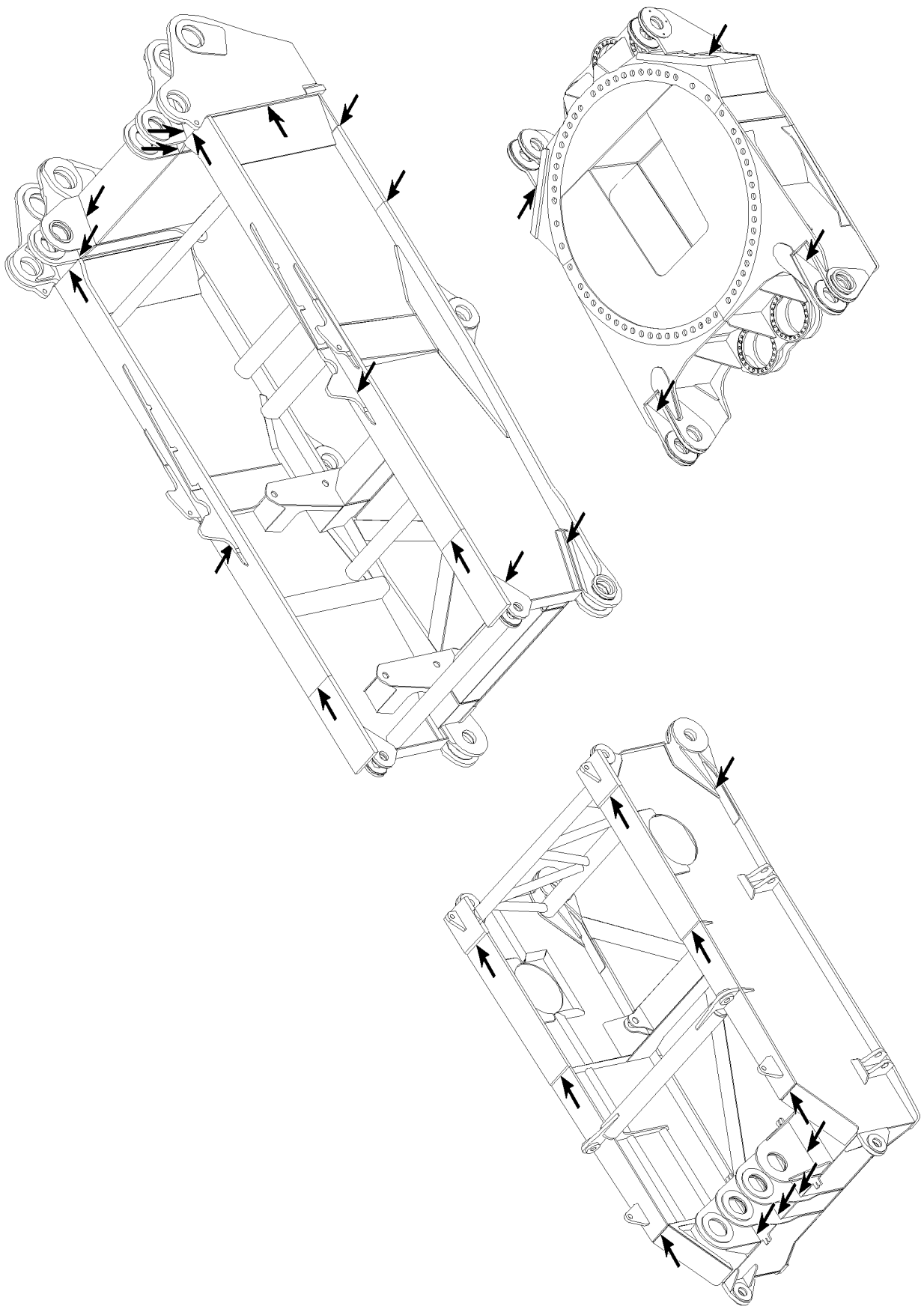


Fig.105696: Example of a turntable frame

LWE/LR 11350-007/19005-01-02/en



LWE/LR 11350-007/19005-01-02/en

Fig.105691: Example of a turntable frame

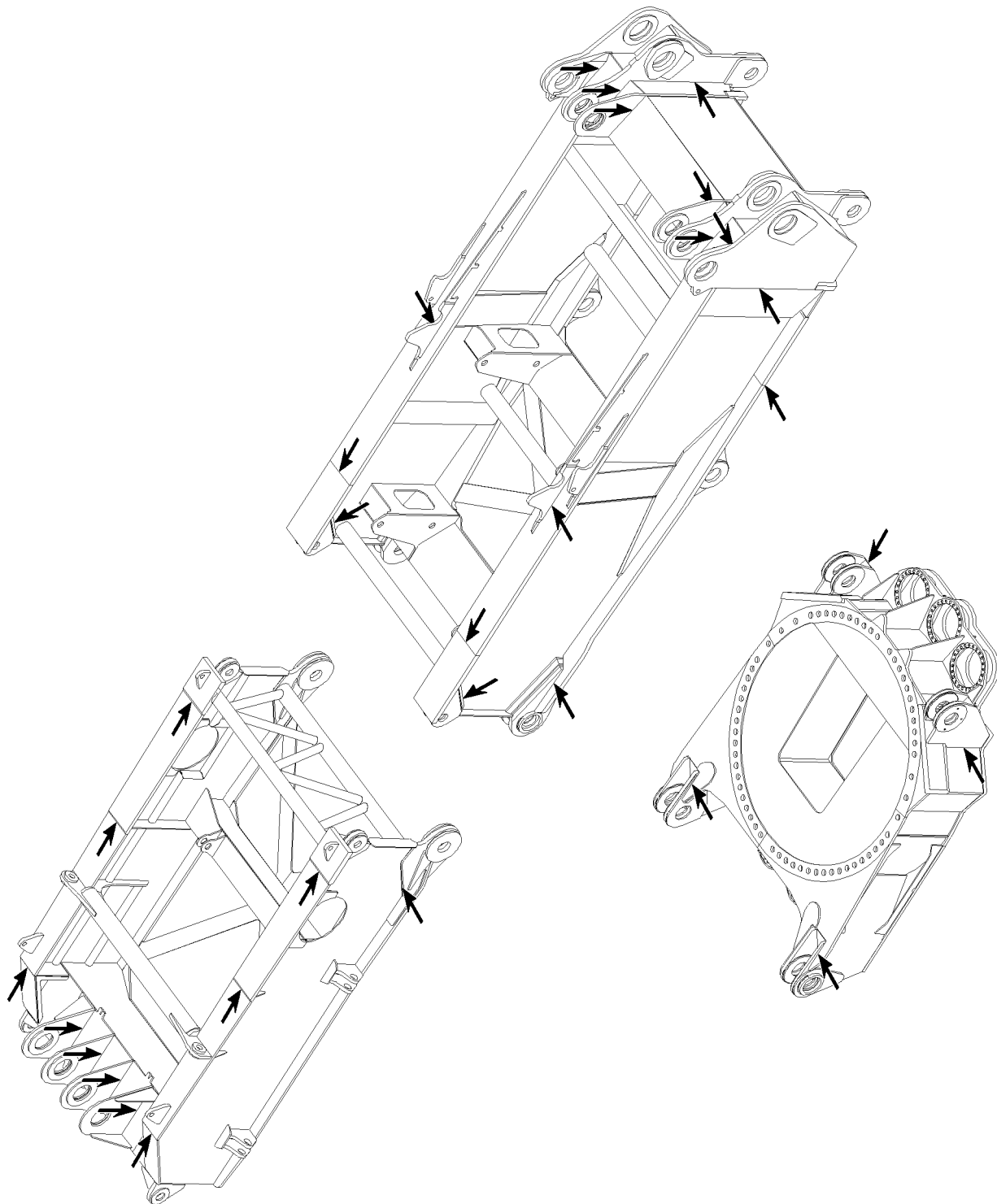
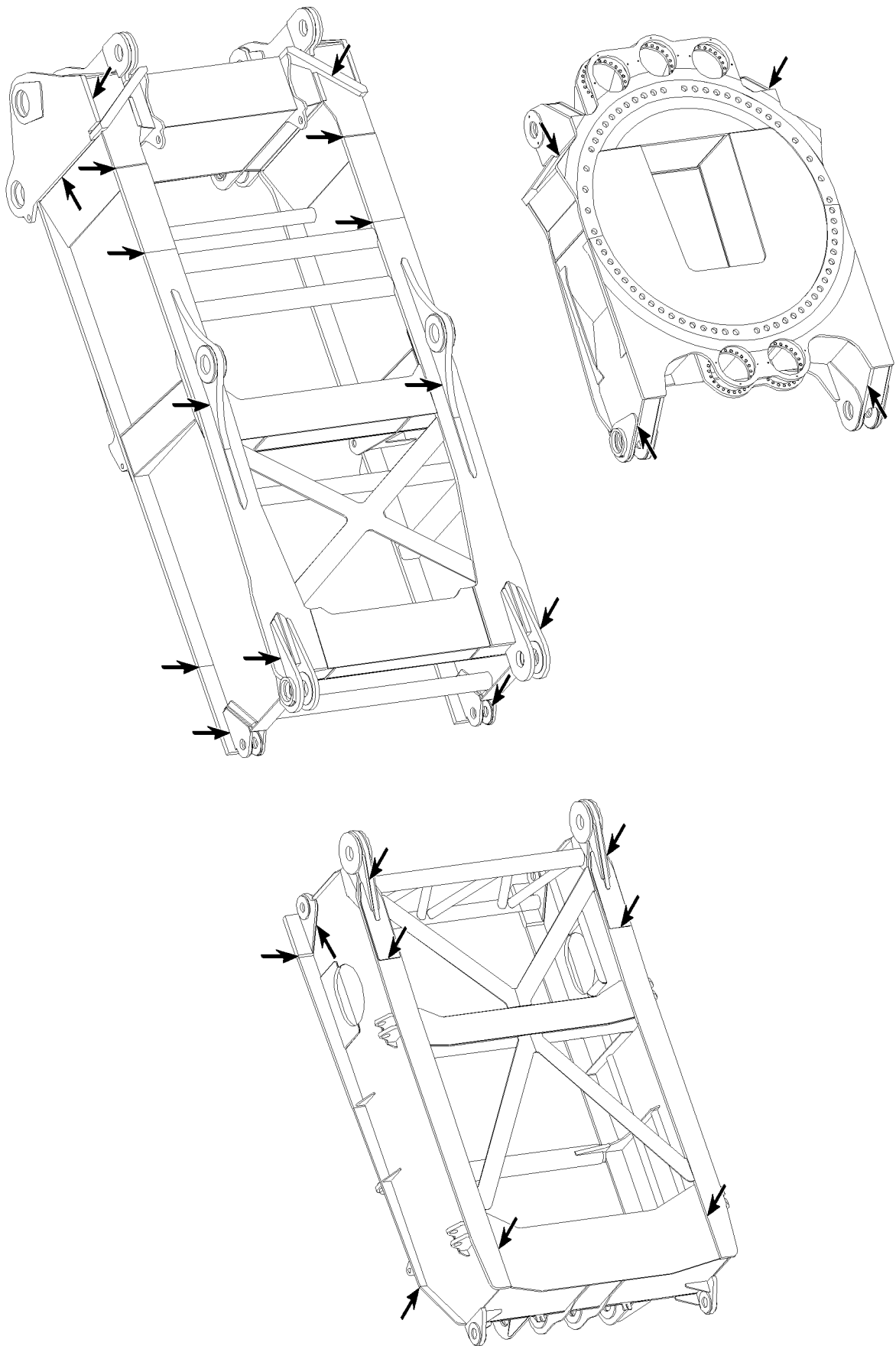


Fig.105692: Example of a turntable frame



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Fig.105693: Example of a turntable frame

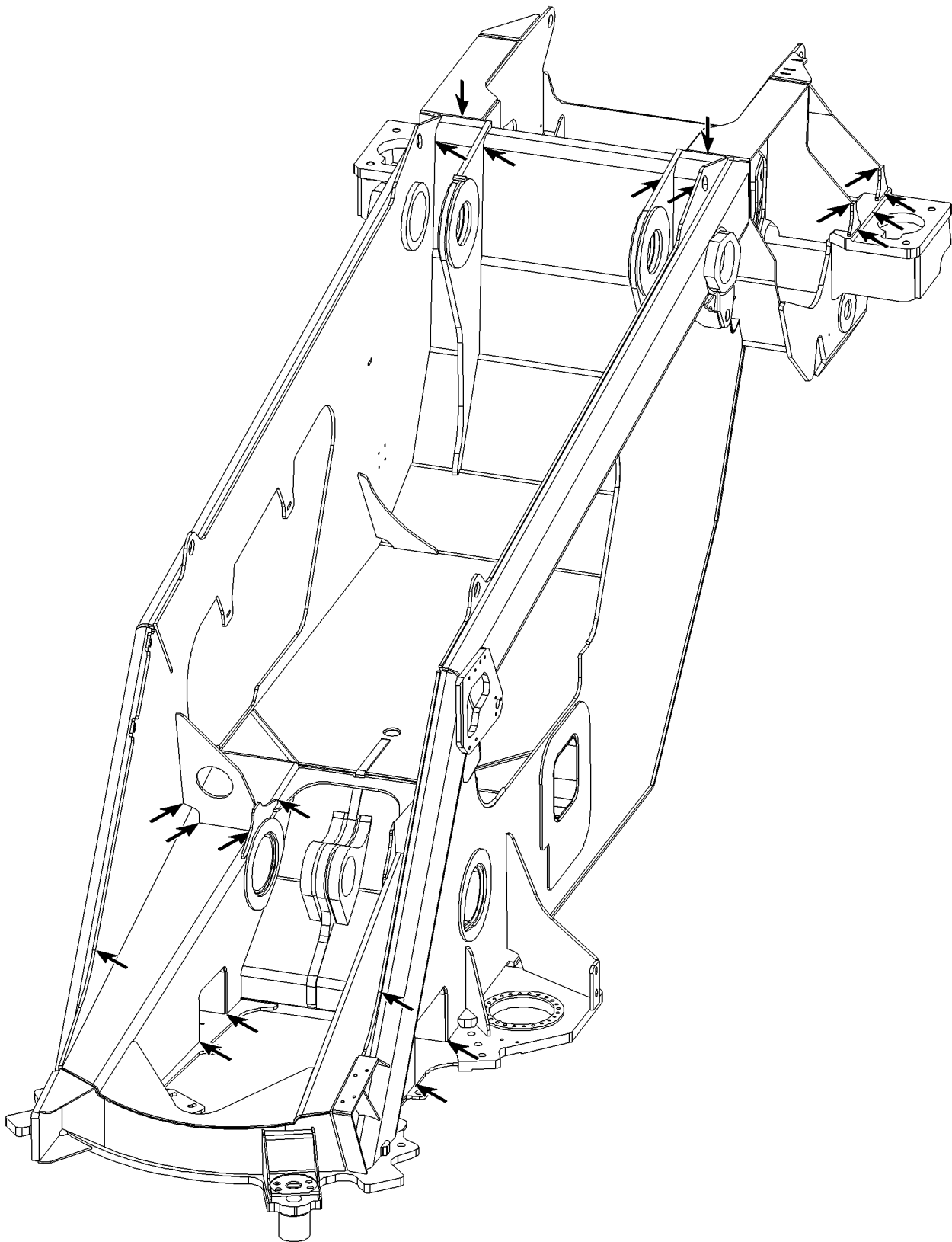
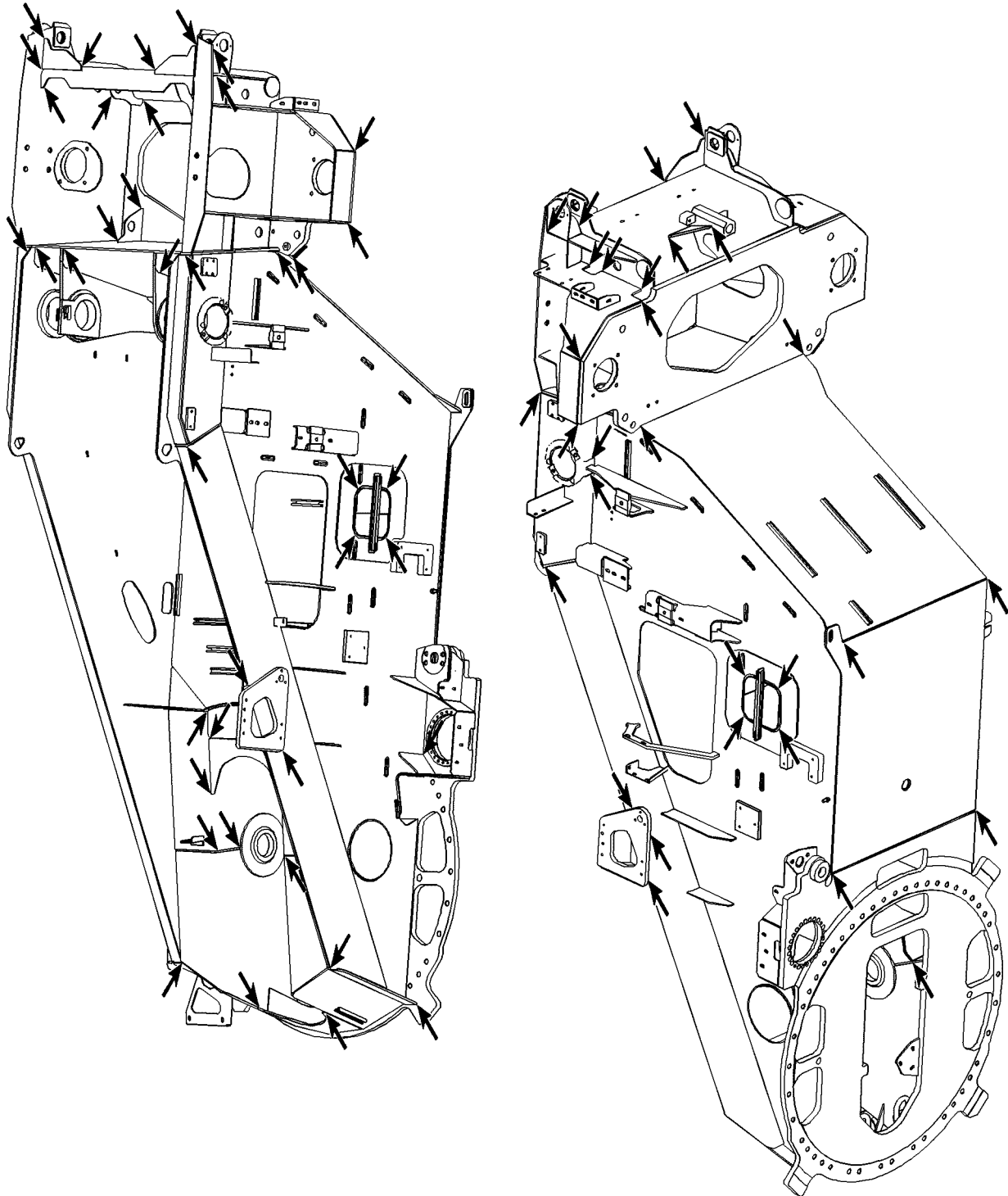


Fig.105722: Example of a turntable frame



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Fig.105932: Example of a turntable frame

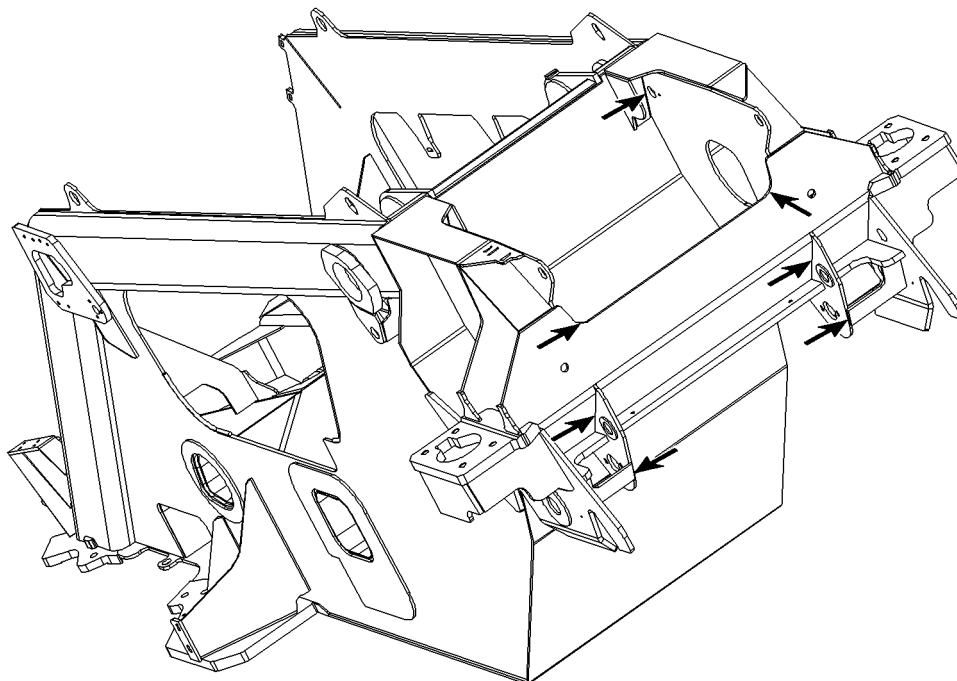
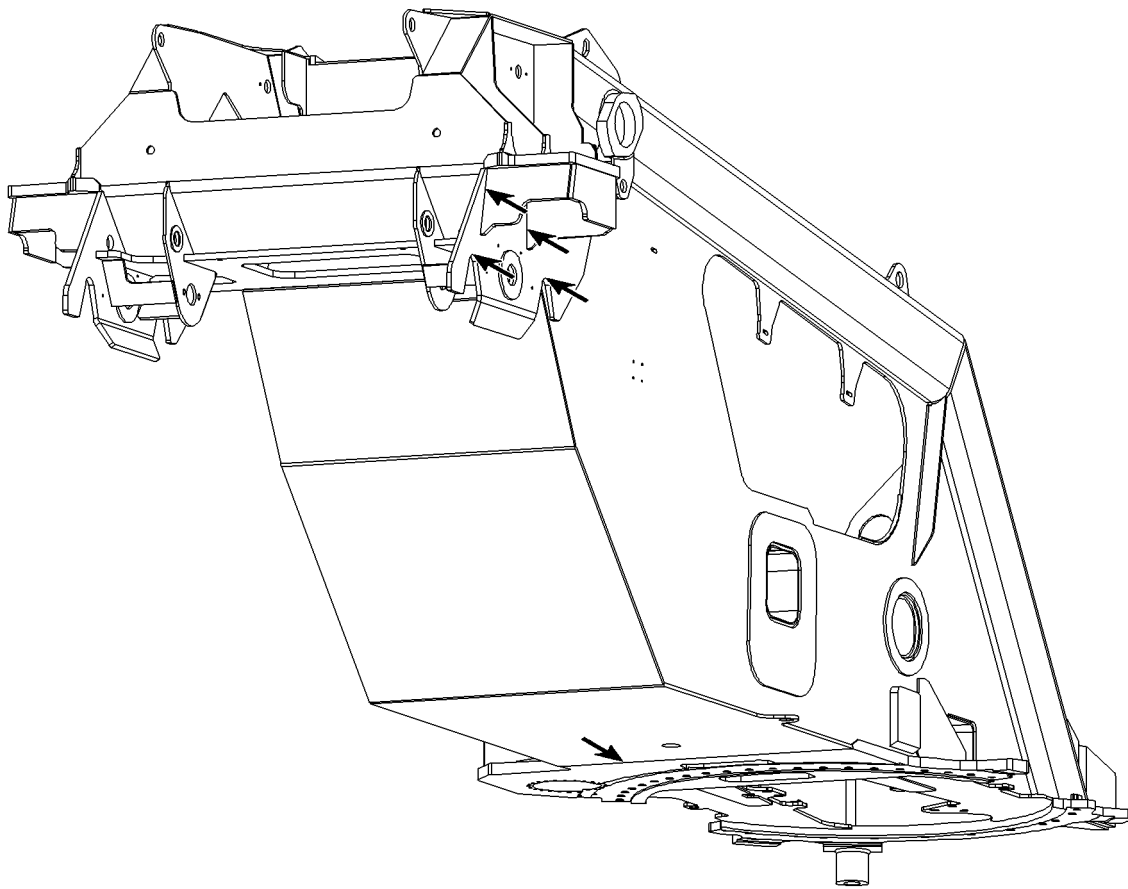
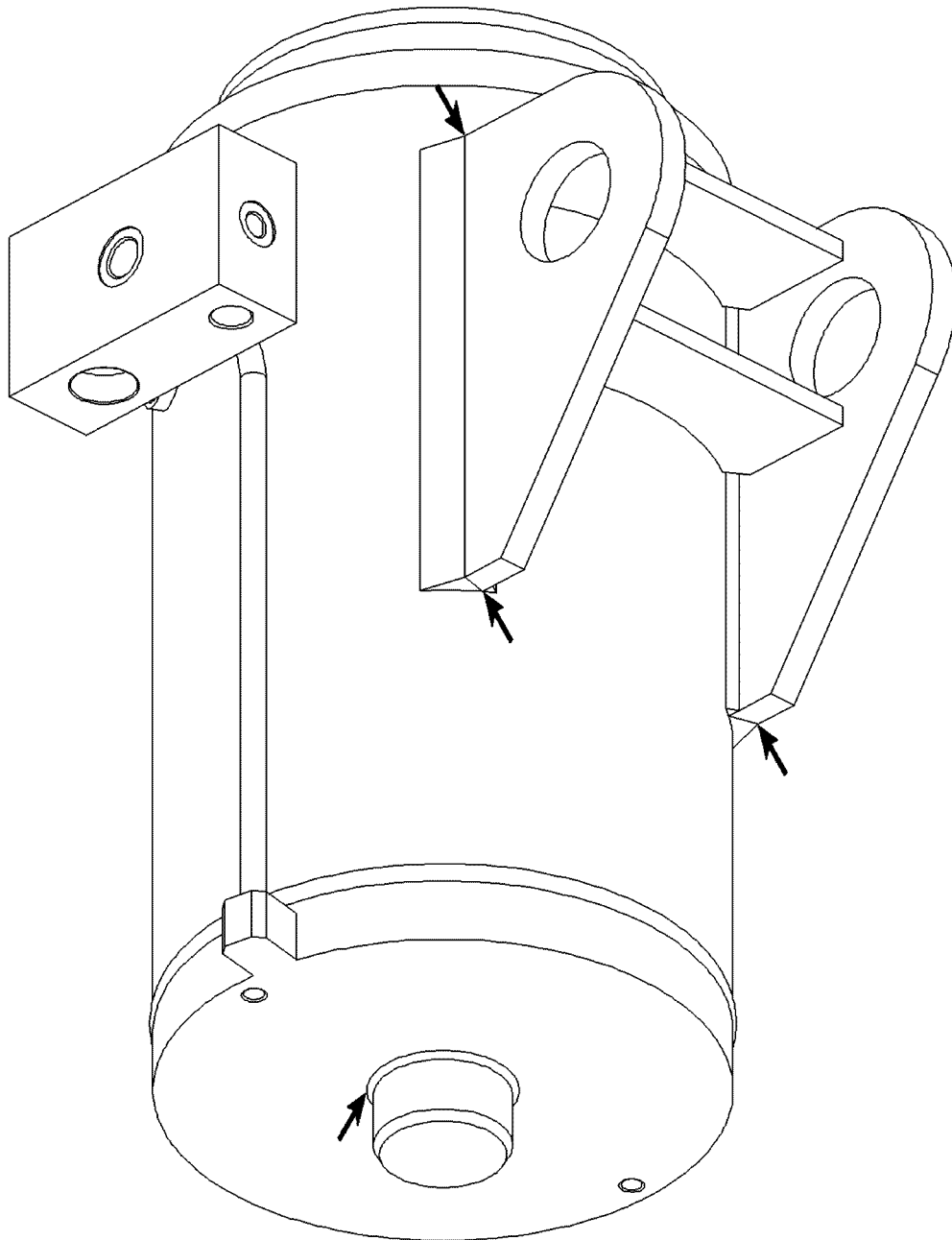


Fig.105723: Example of a turntable frame



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Fig.105801: Example of a ballast cylinder

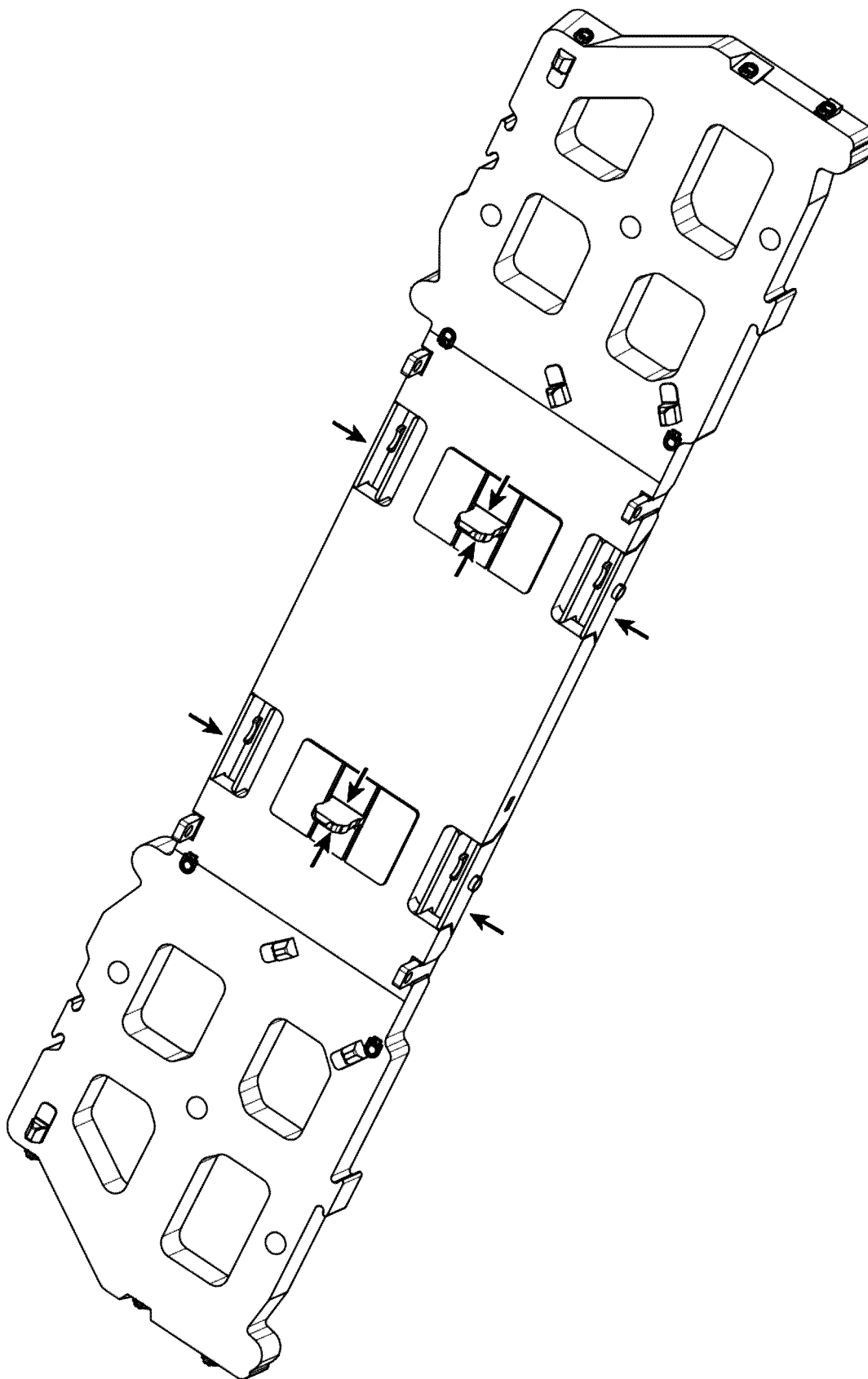
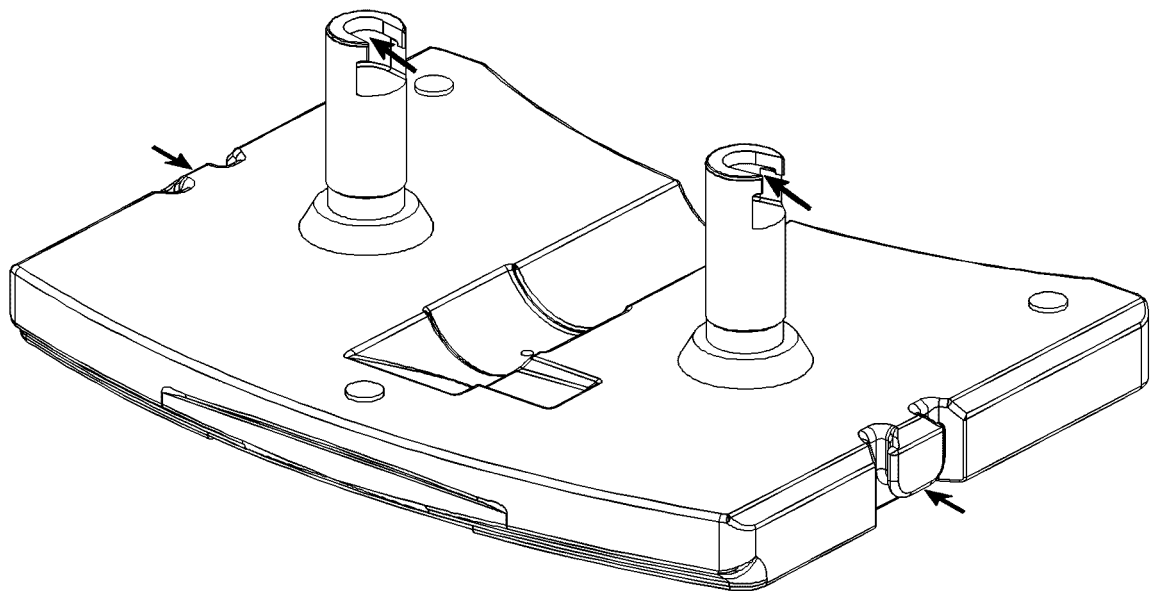
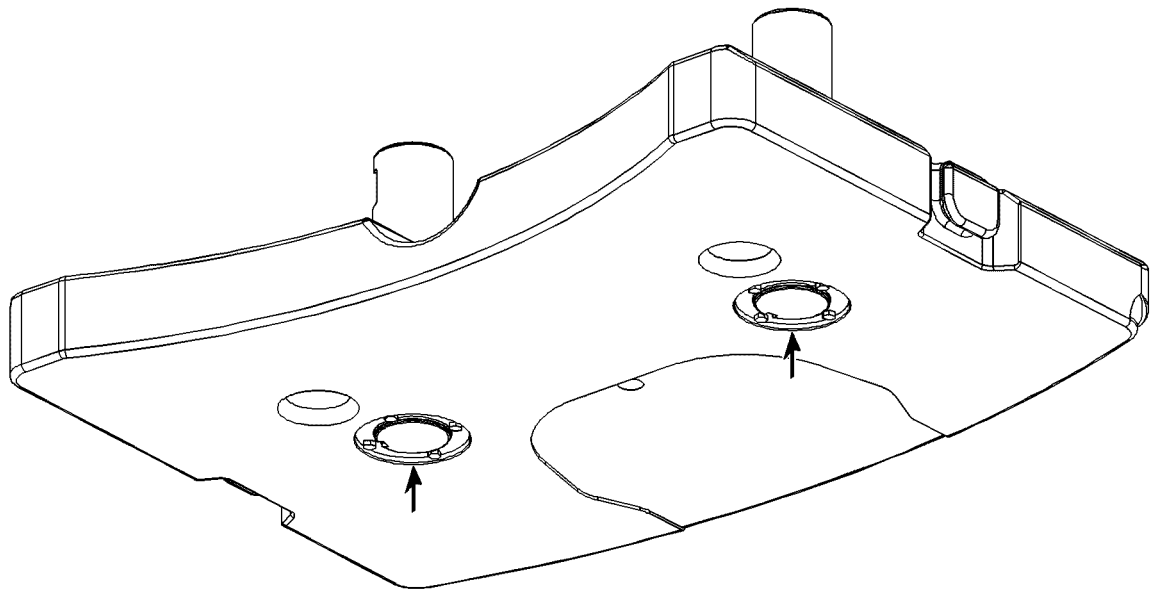


Fig.105705: Example of mounting plate

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LWE/LR 11350-007/190005-01-02/en

Fig.105807: Example of base plate

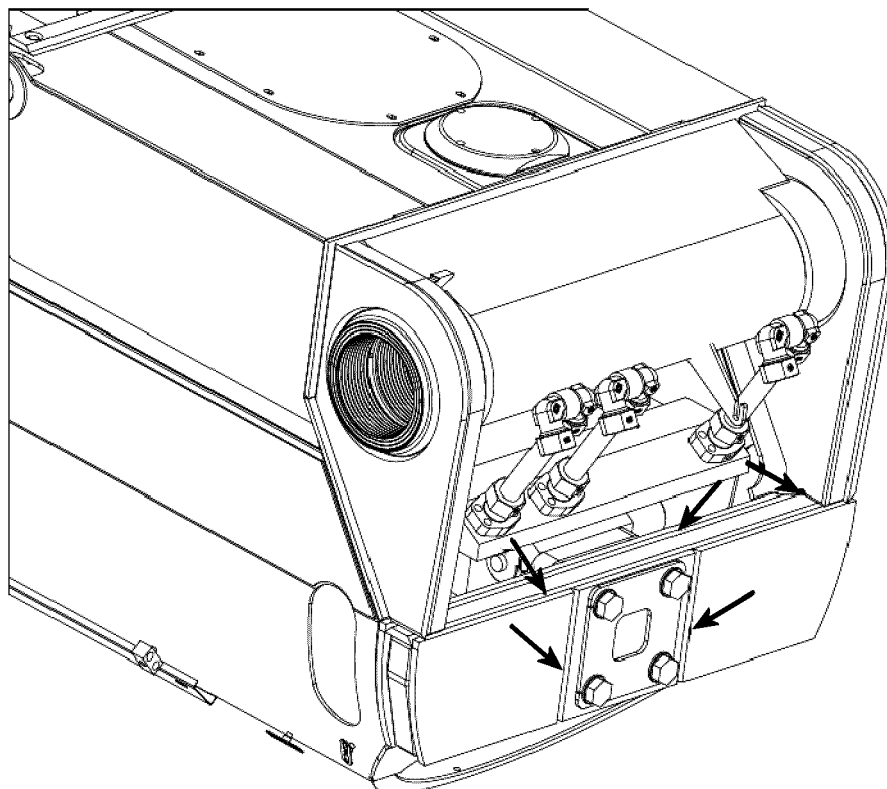
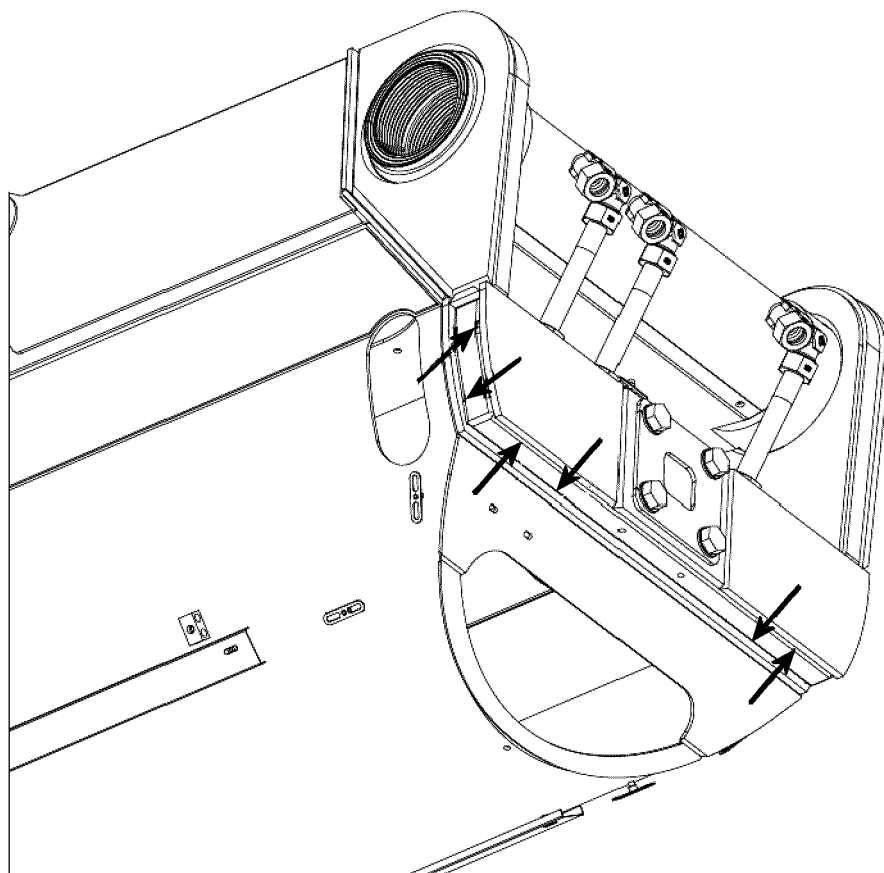
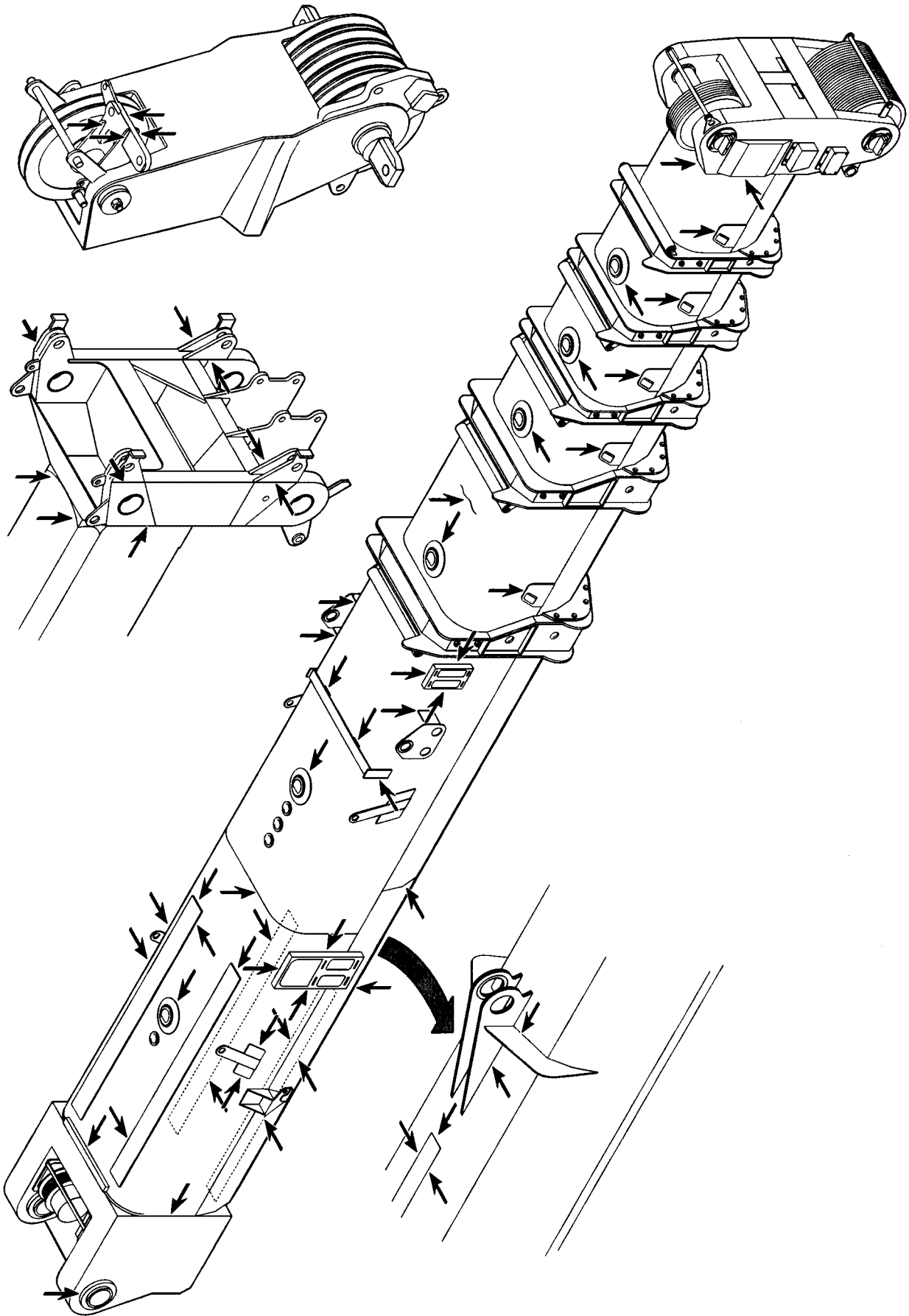


Fig.120273: Example of pivot section

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LWE/LR 11350-007/19005-01-02/en

Fig.185050: Example of a telescopic boom

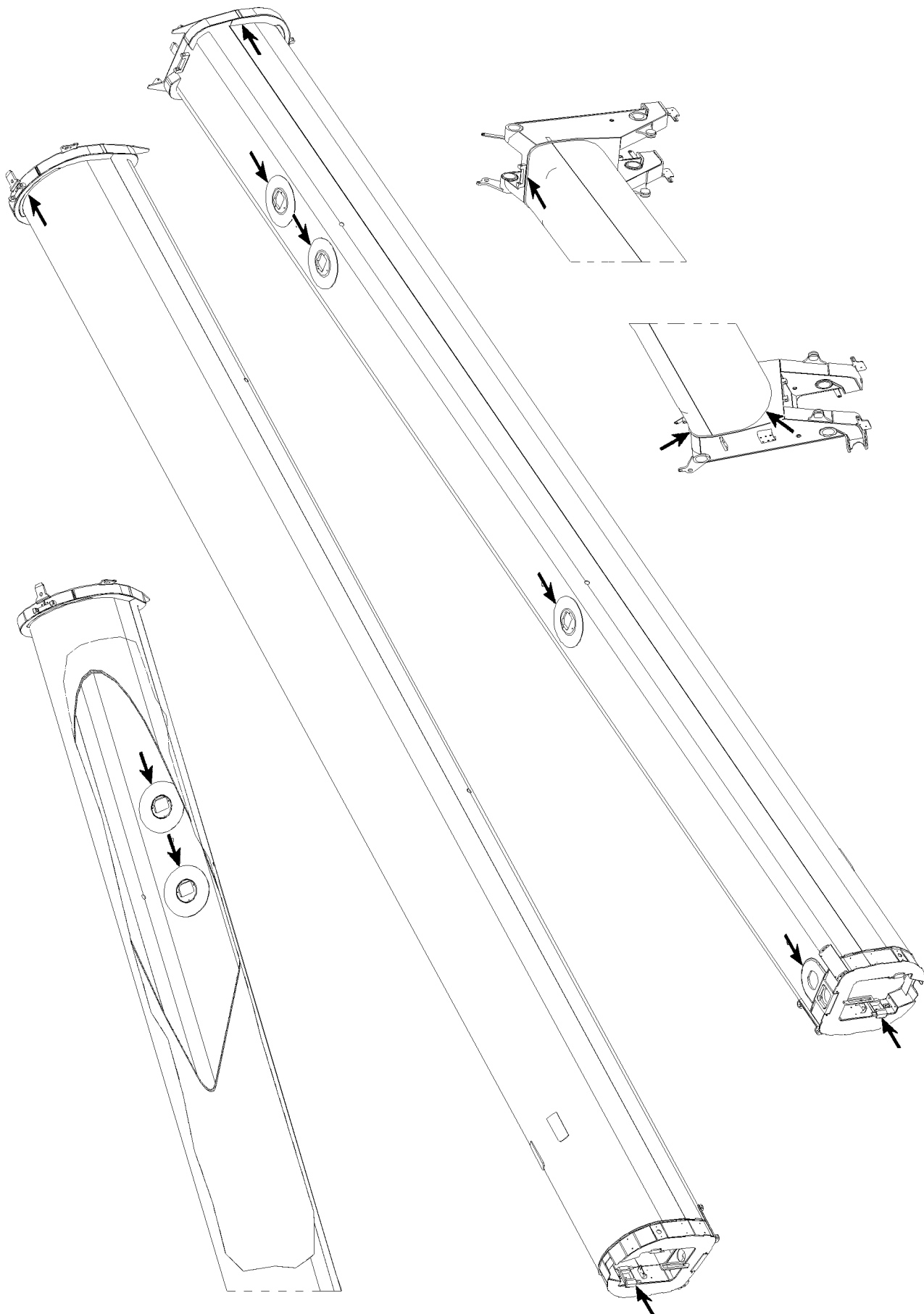
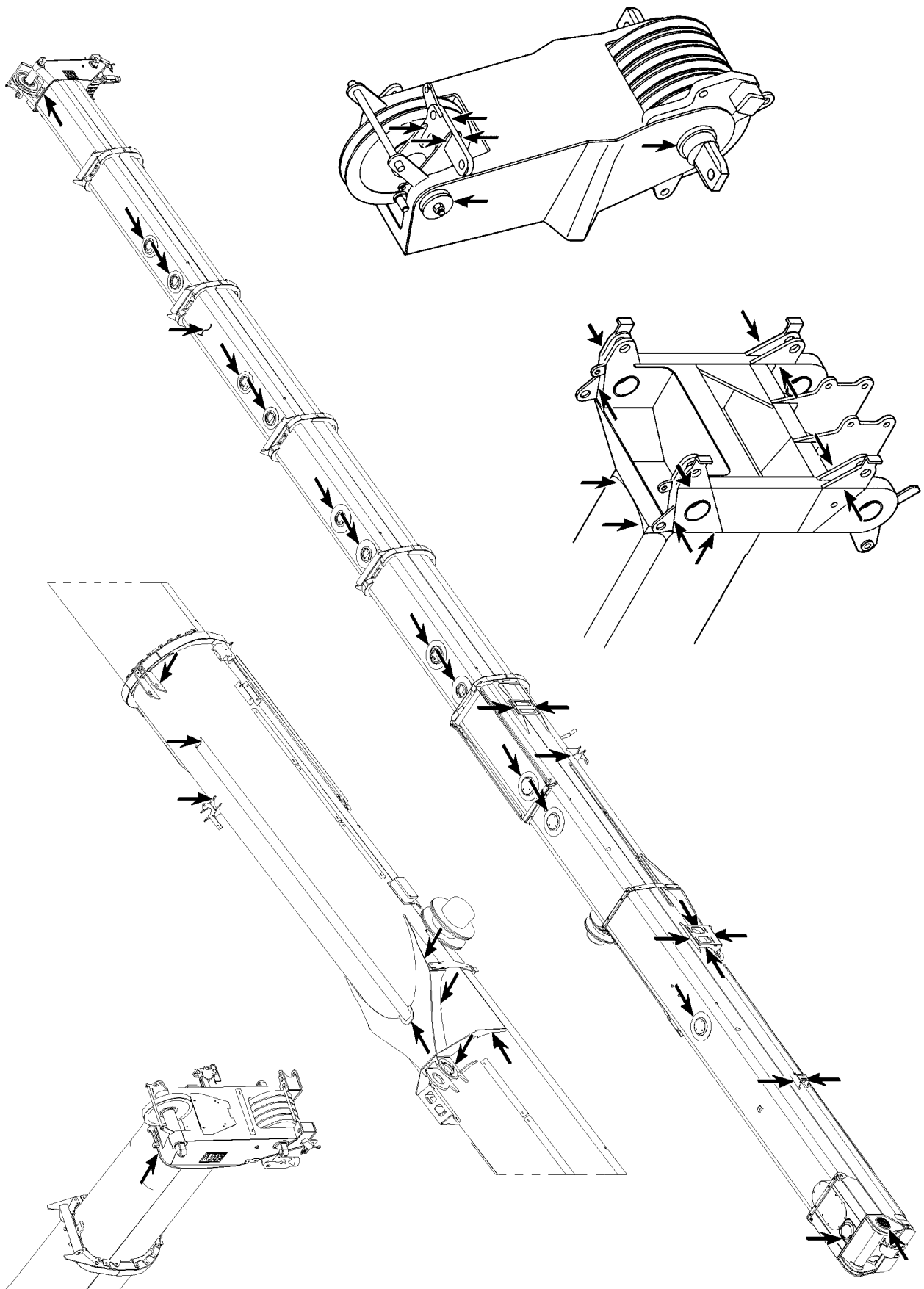


Fig.105710: Example of a telescopic boom

LWE/LR 11350-007/19005-01-02/en



LWE/LR 11350-007/19005-01-02/en

Fig.105711: Example of a telescopic boom

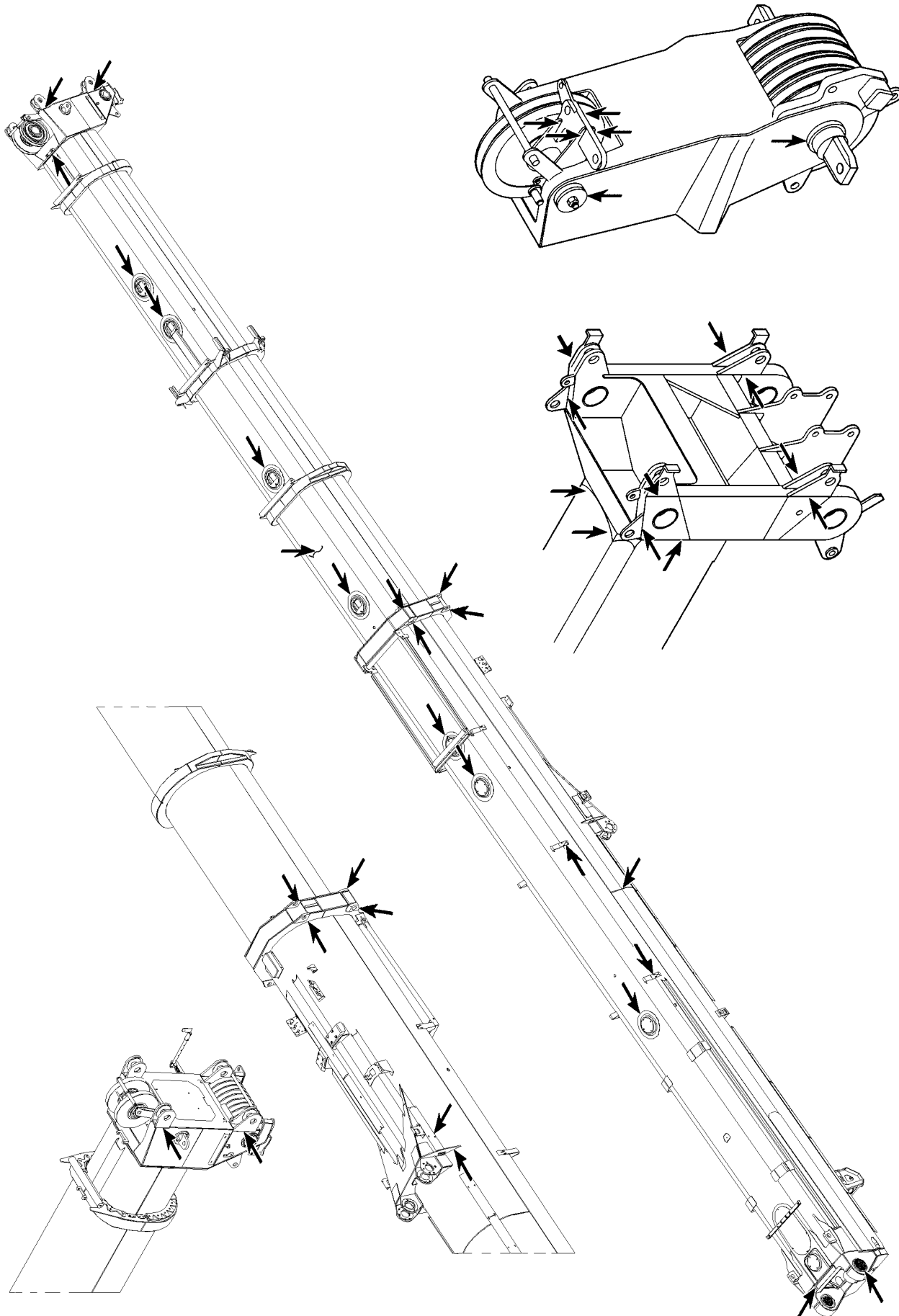
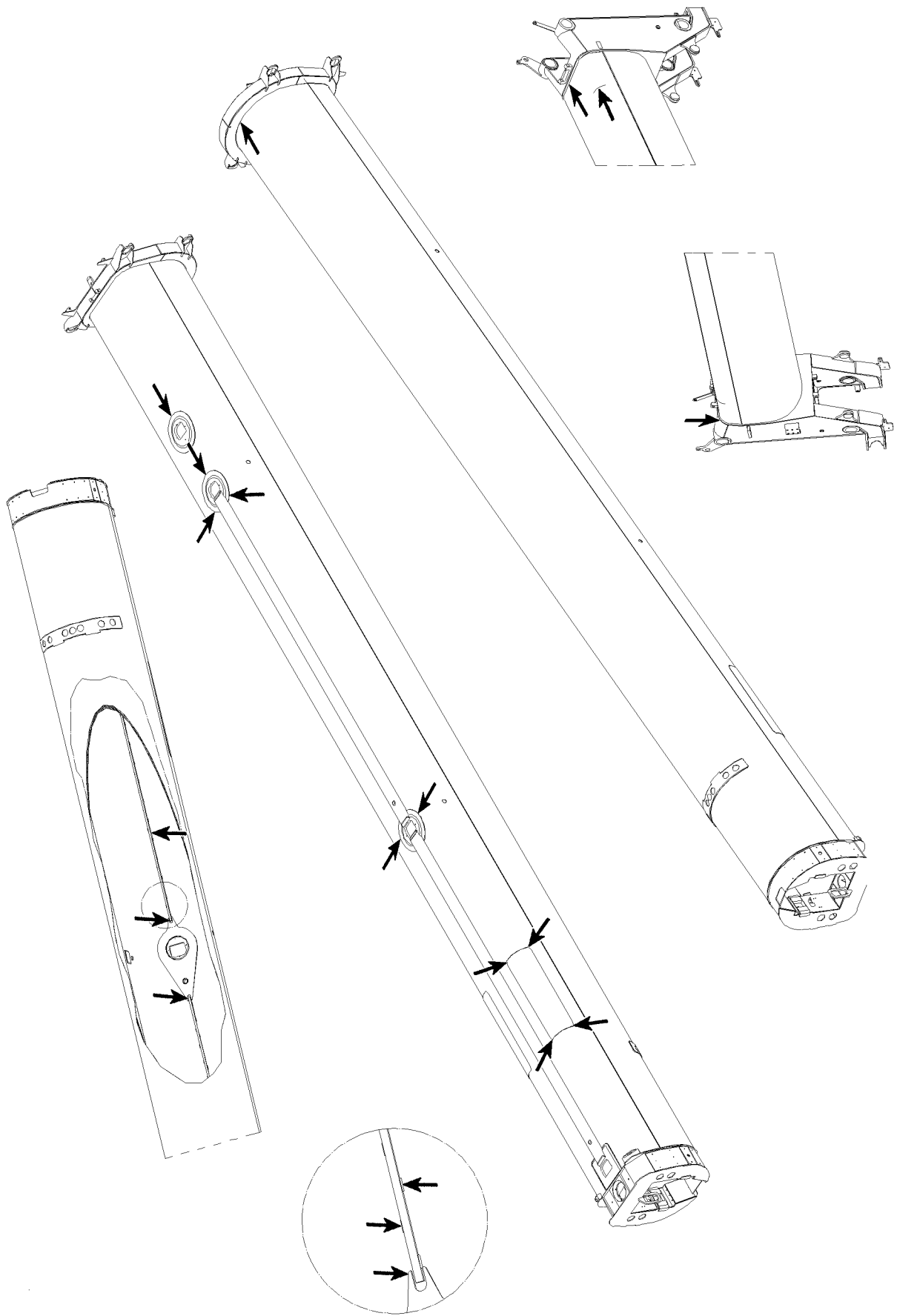


Fig.105720: Example of a telescopic boom

LWE/LR 11350-007/19005-01-02/en



LWE/LR 11350-007/19005-01-02/en

Fig.105721: Example of a telescopic boom

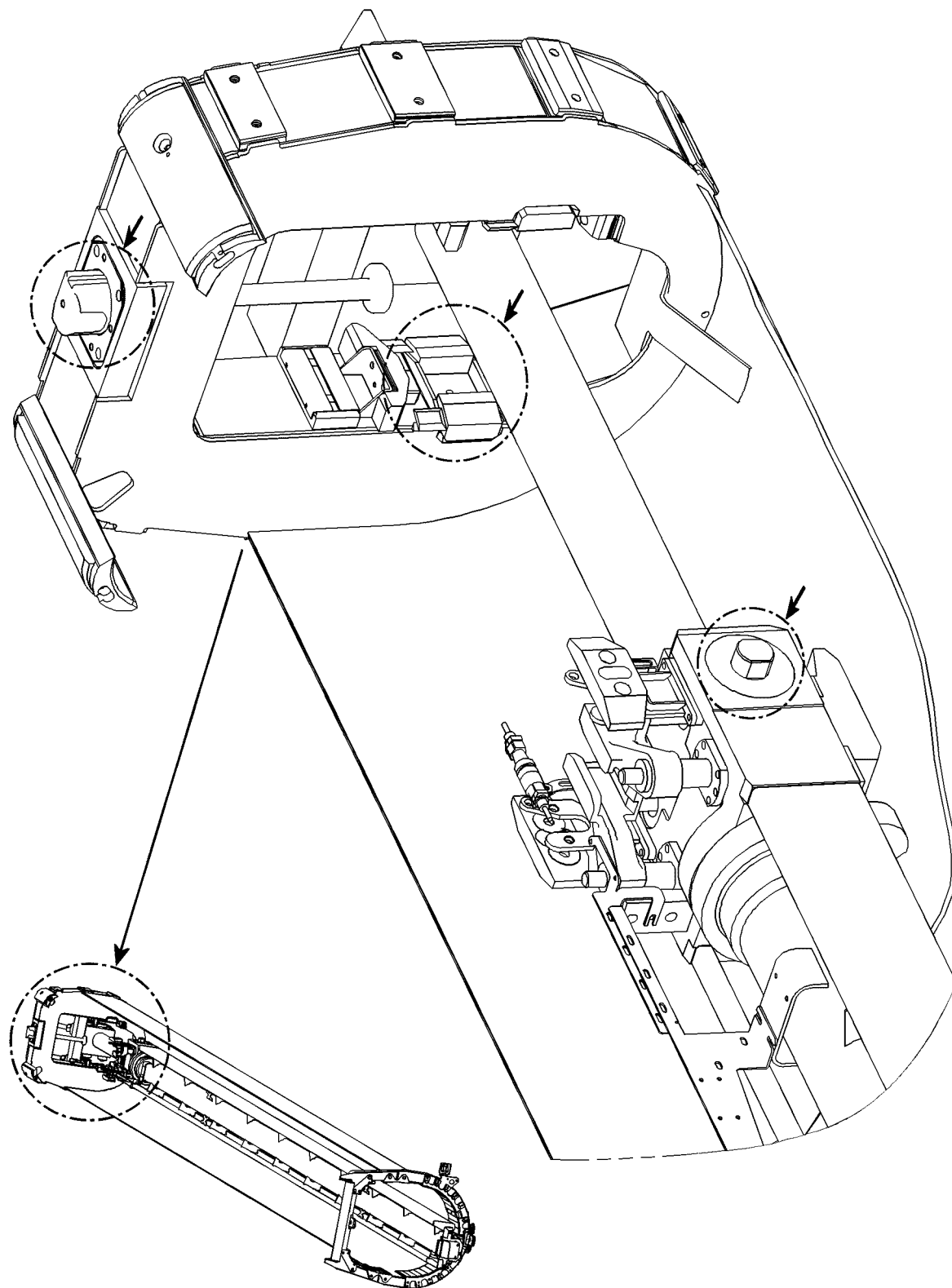
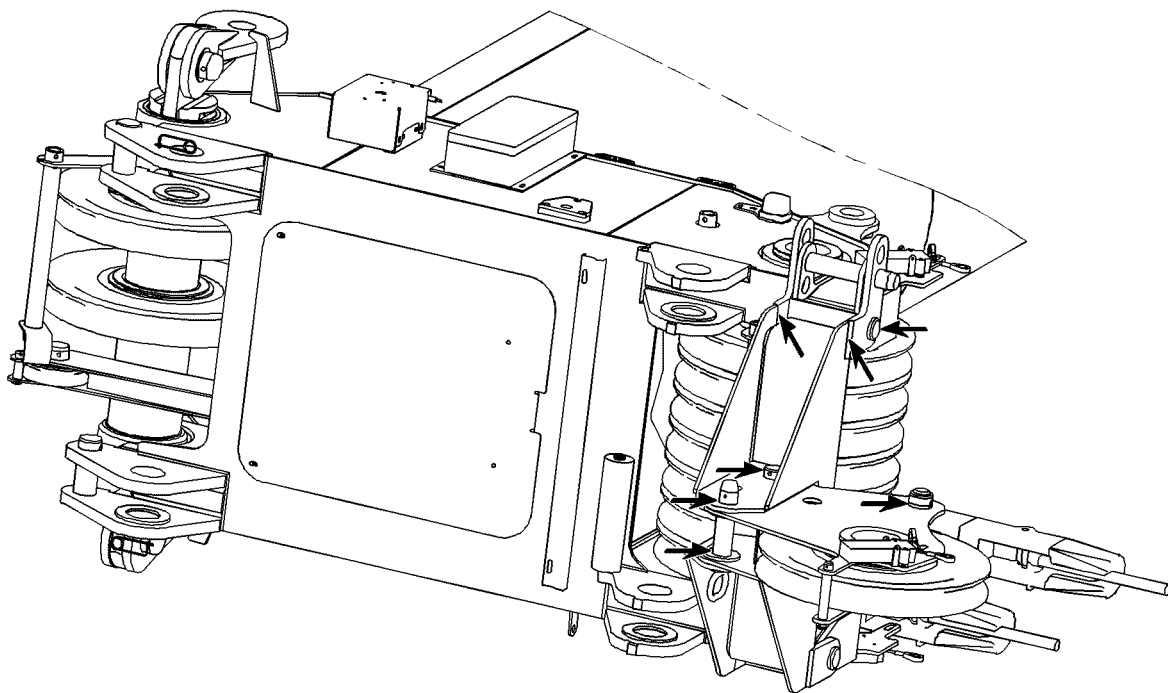
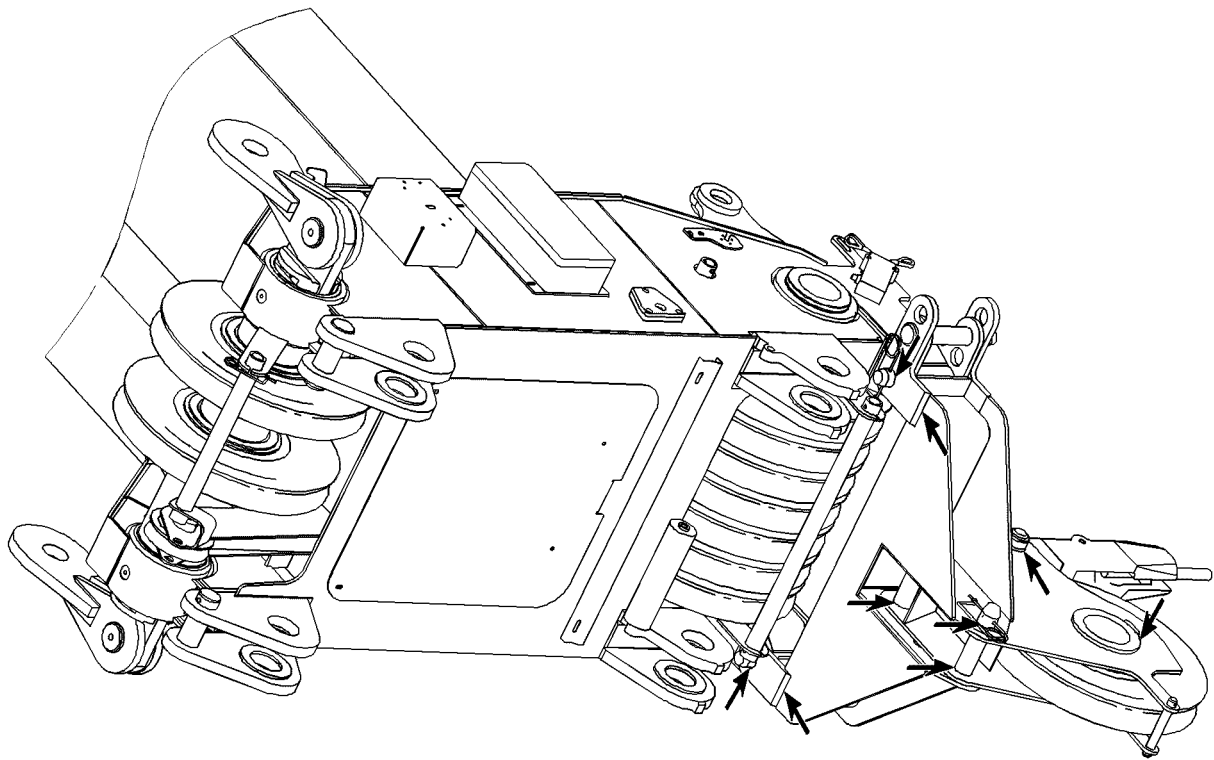


Fig.105891: Example of push out mechanics telescopic boom

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LWE/LR 11350-007/190005-01-02/en

Fig.105892: Example of boom nose

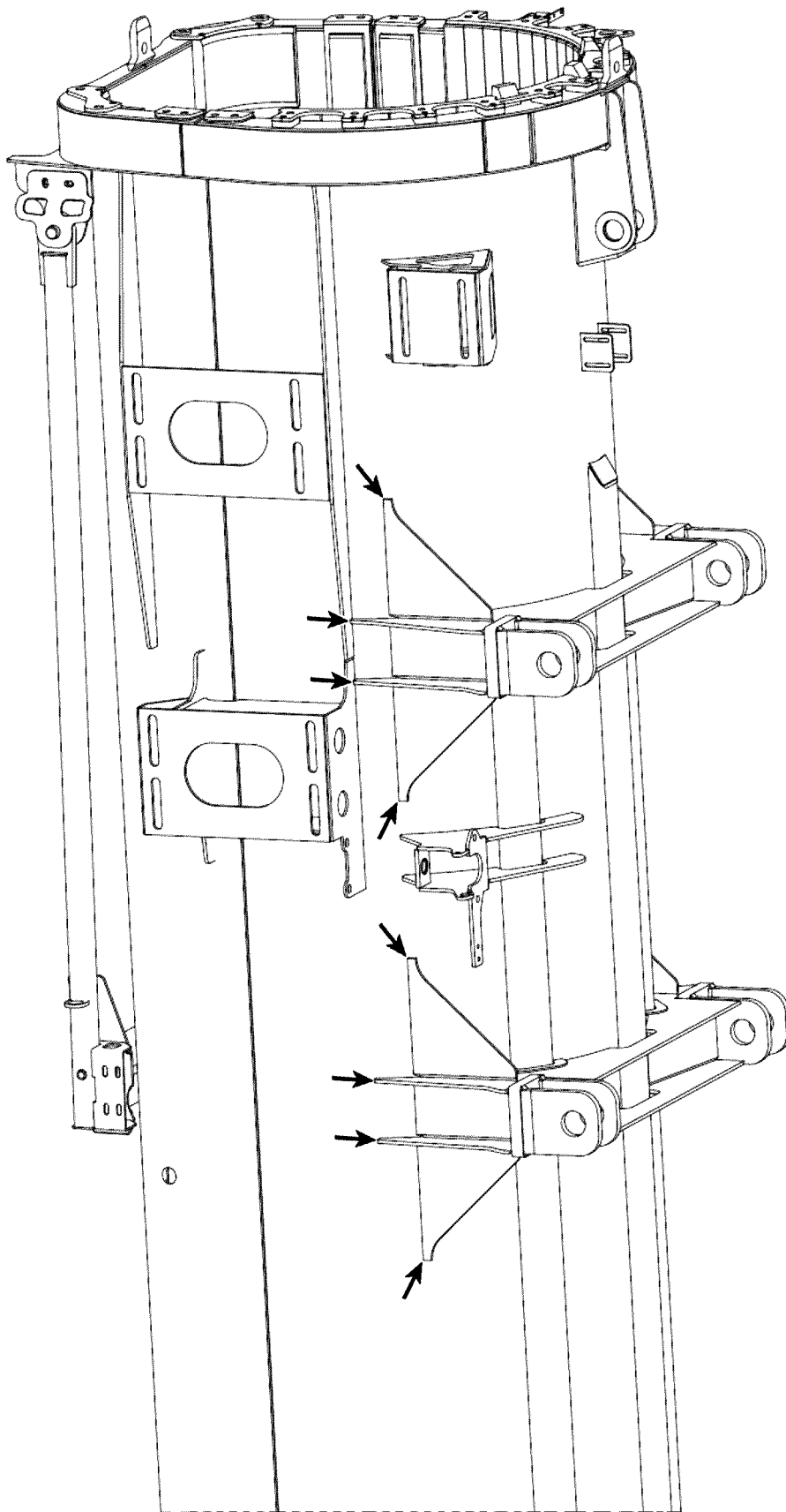
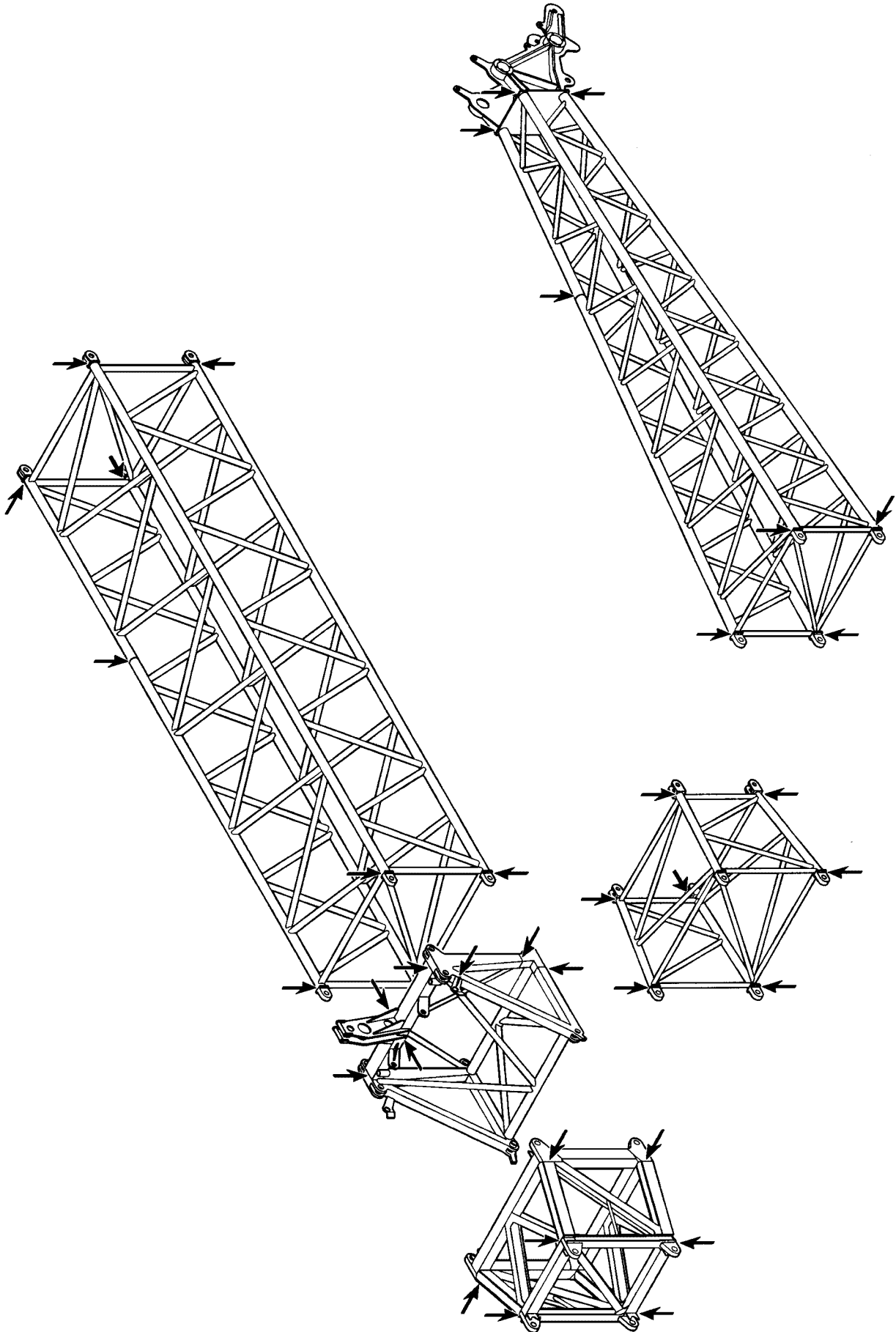


Fig.105689: Example of dolly console

LWE/LR 11350-007/19005-01-02/en



LWE/LR 11350-007/19005-01-02/en

Fig.185051: Example of lattice jib

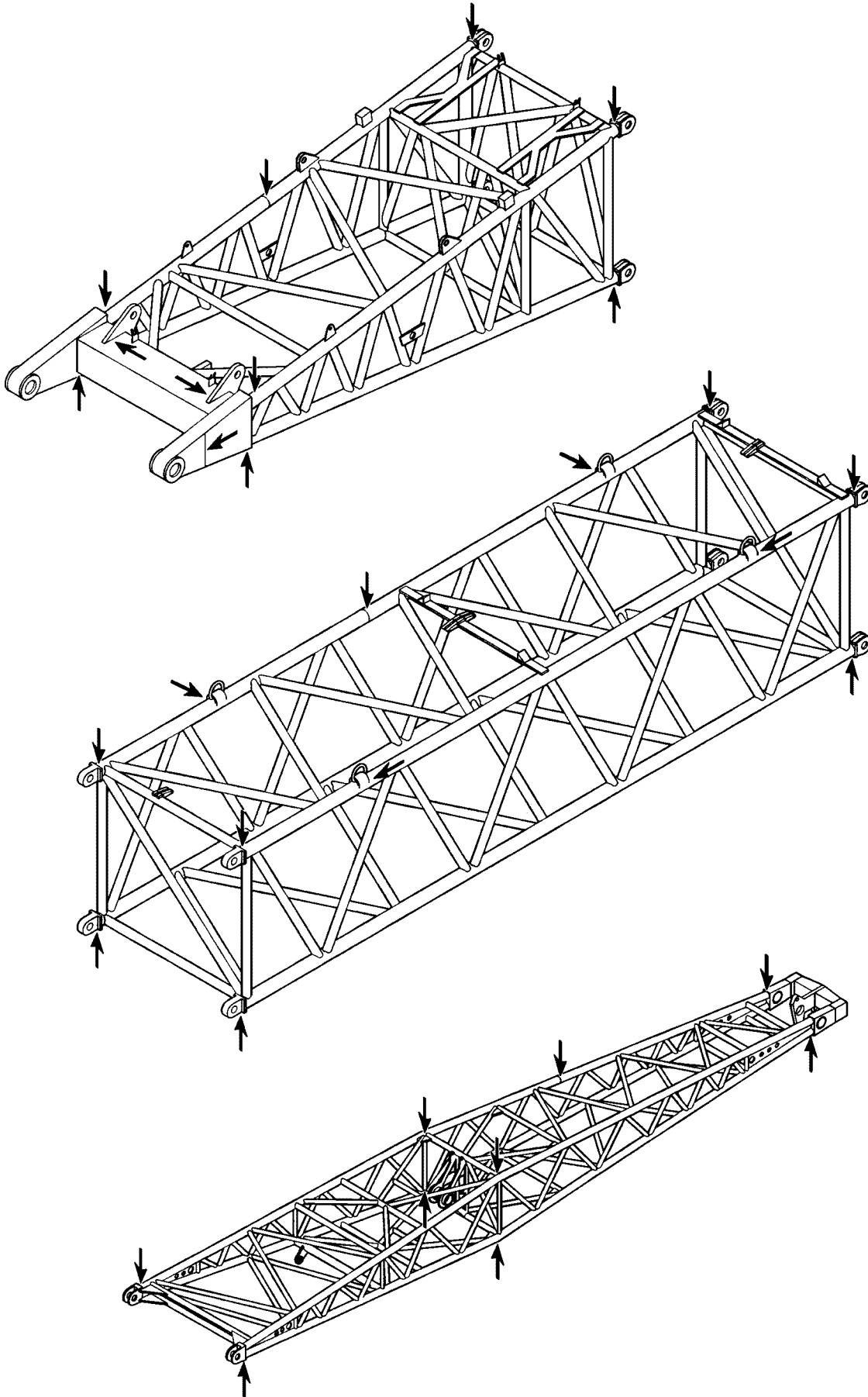
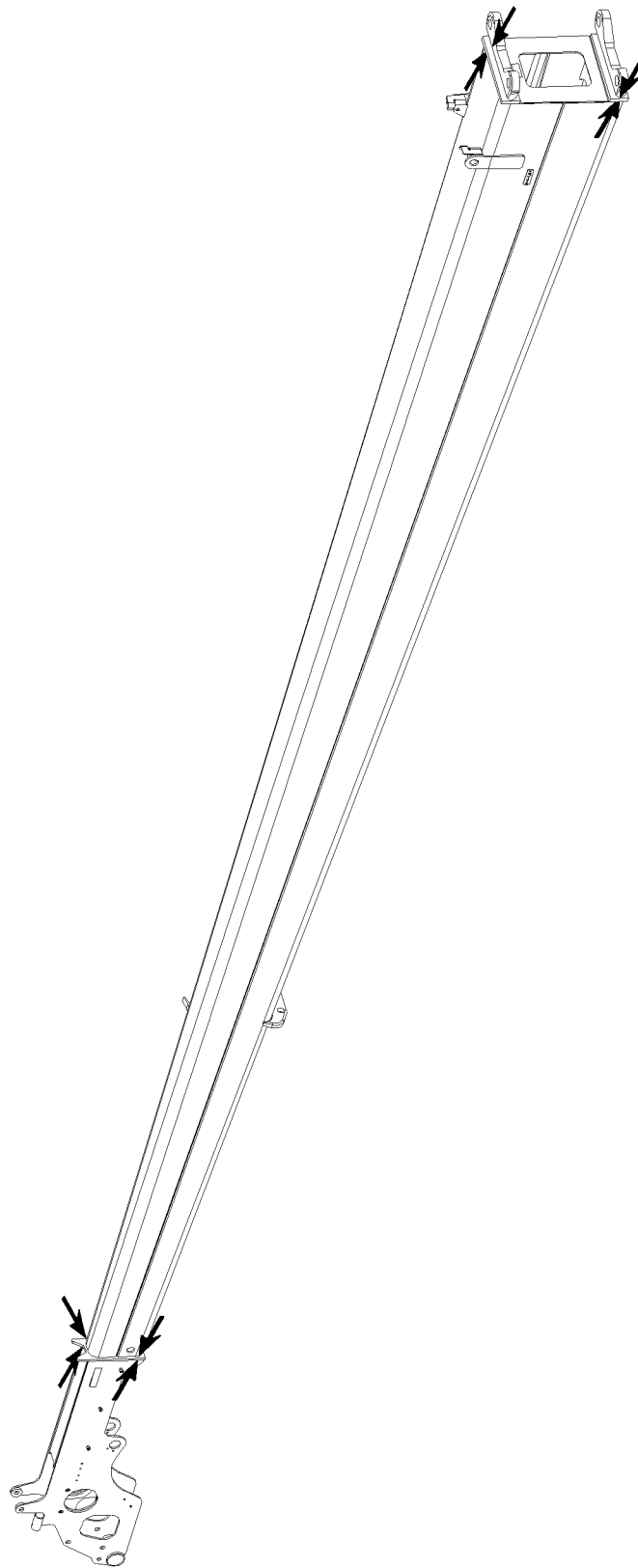


Fig.185052: Example of NA / WA-frame

LWE/LR 11350-007/19005-01-02/en



LWE/LR 11350-007/19005-01-02/en

Fig.105713: Example of an end section

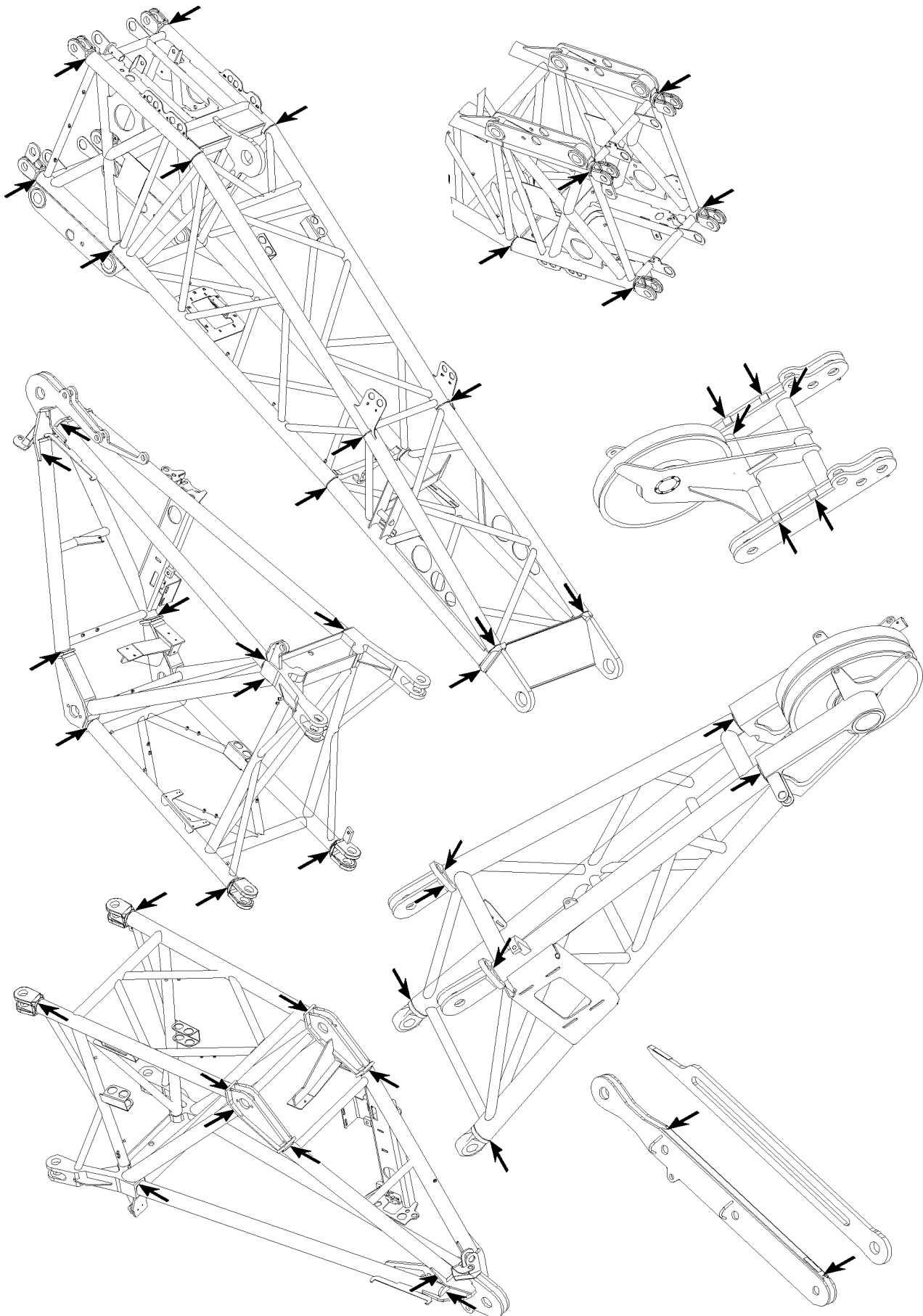
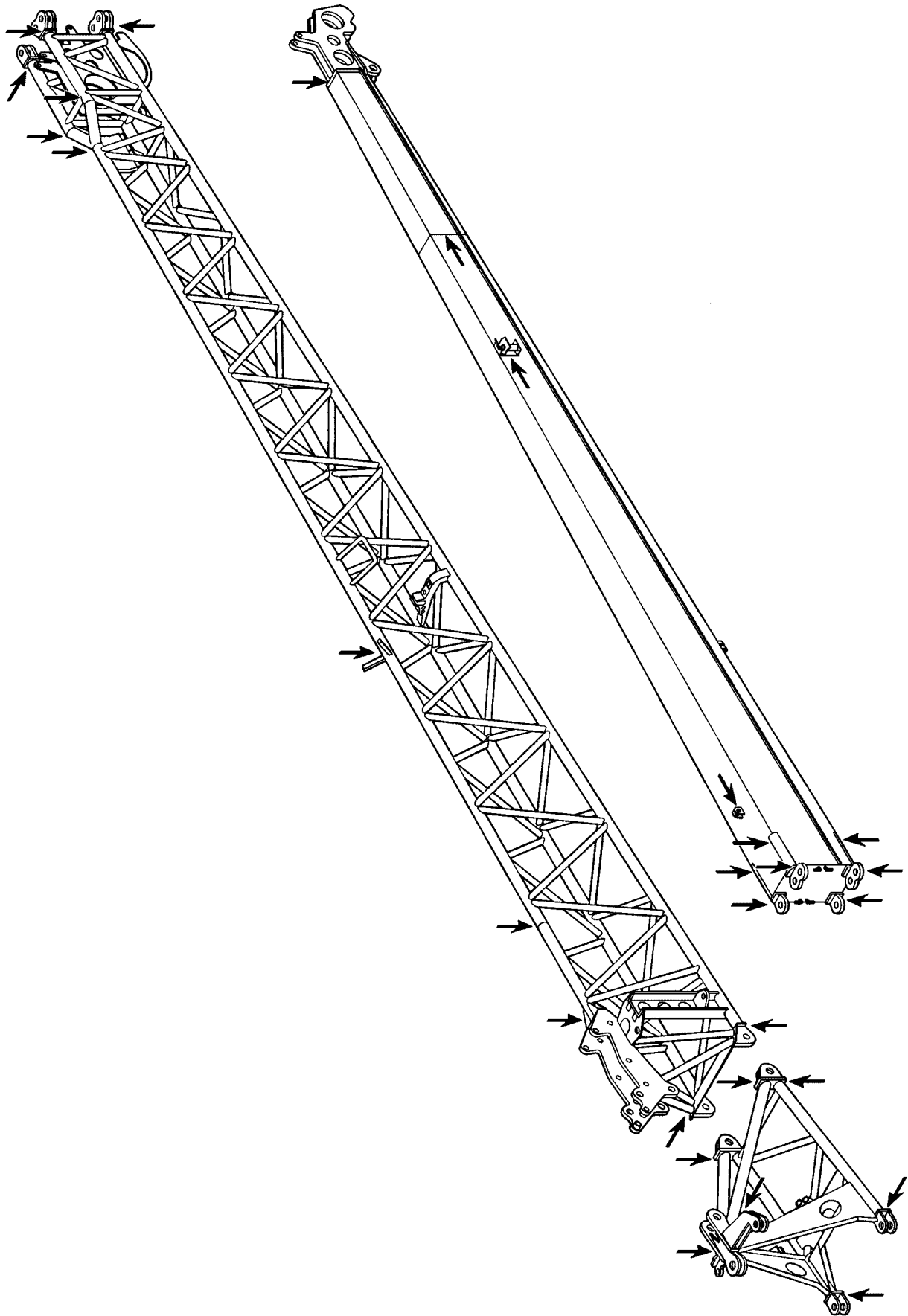


Fig.105836: Example of pivot section, adapter and boom nose

LWE/LR 11350-007/19005-01-02/en



LWE/LR 11350-007/190005-01-02/en

Fig.185058: Example of a folding jib

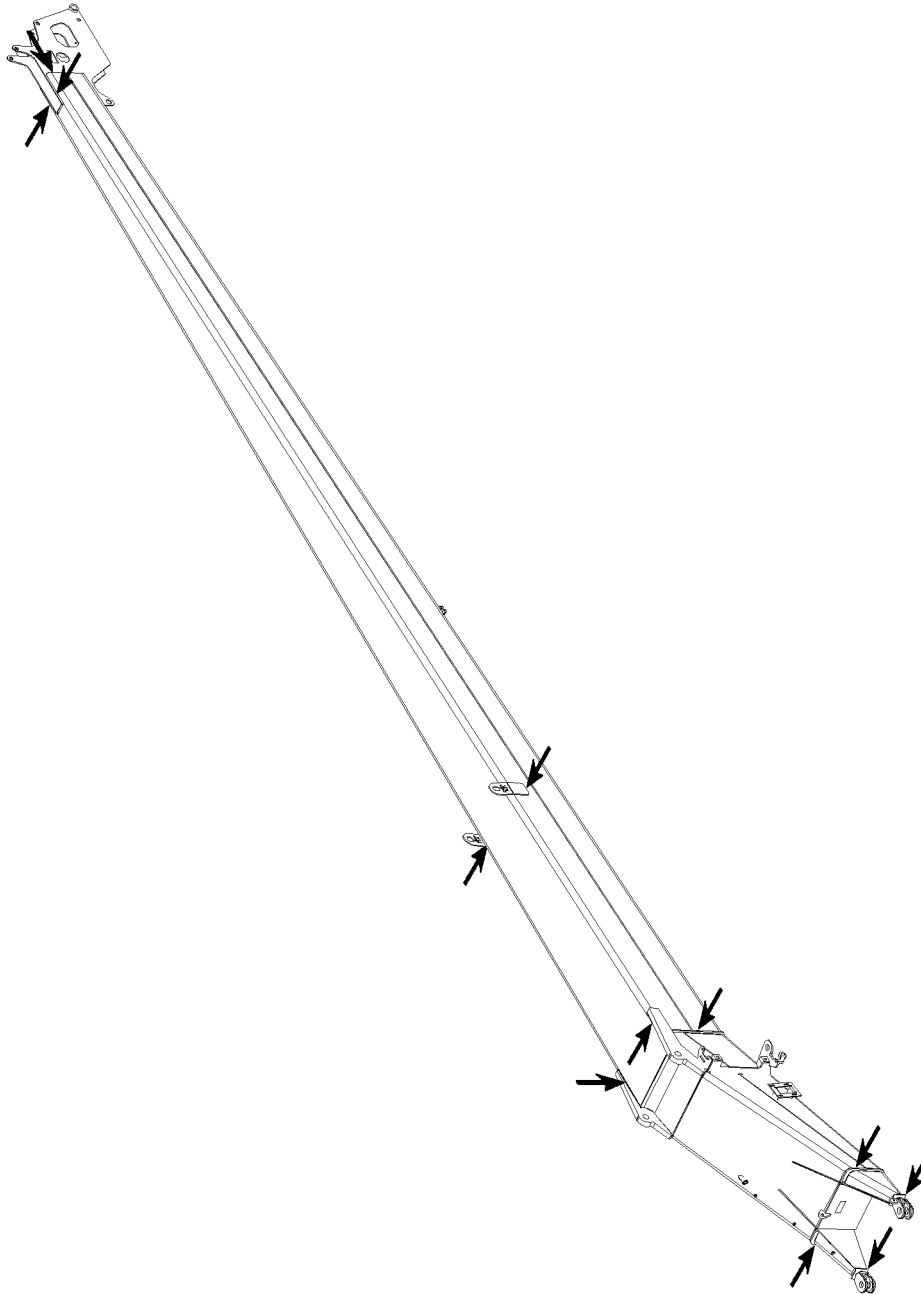
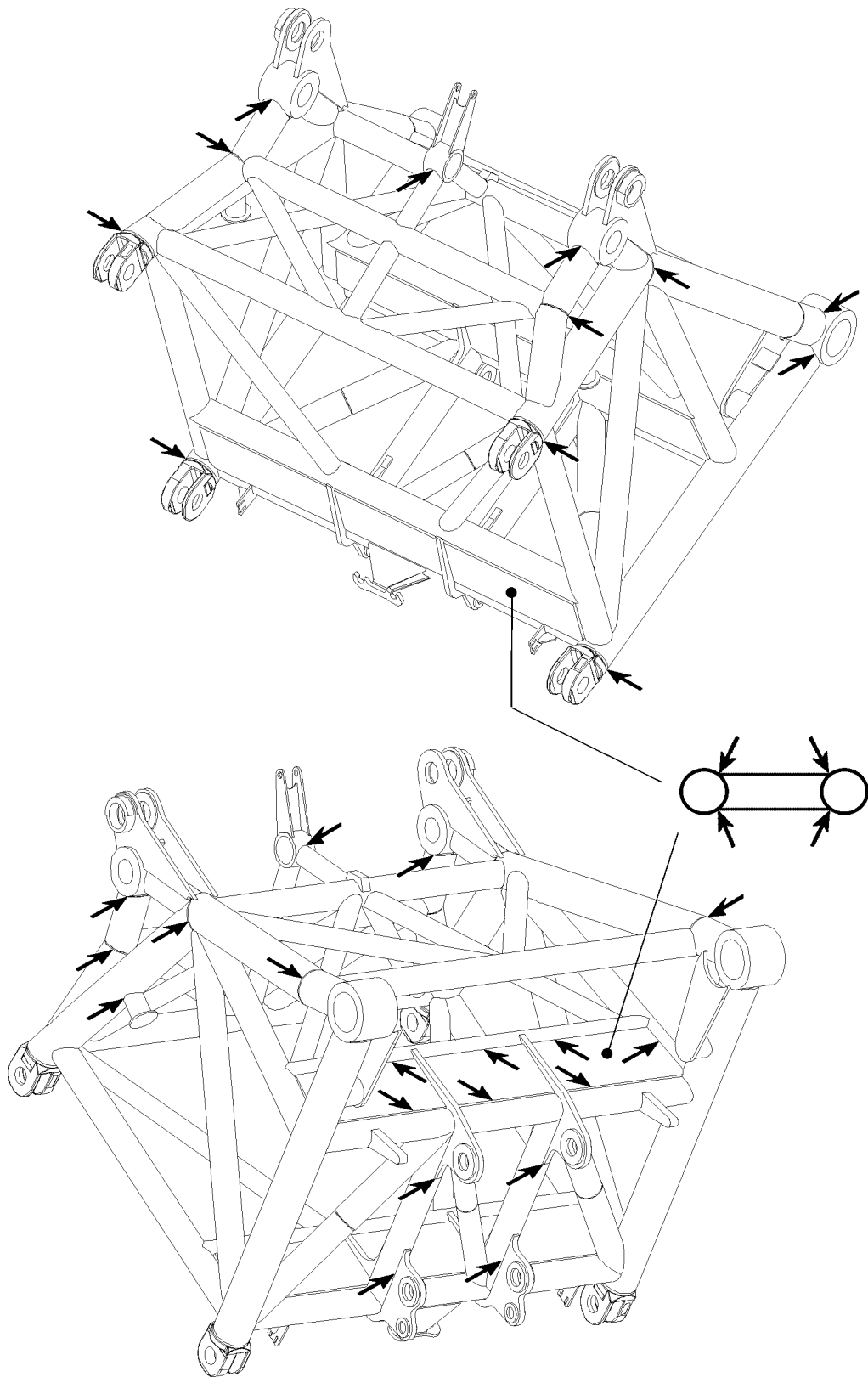


Fig.105697: Example of a folding jib

LWE/LR 11350-007/19005-01-02/en



LWE/LR 11350-007/19005-01-02/en

Fig.105732: Example of W-connector head

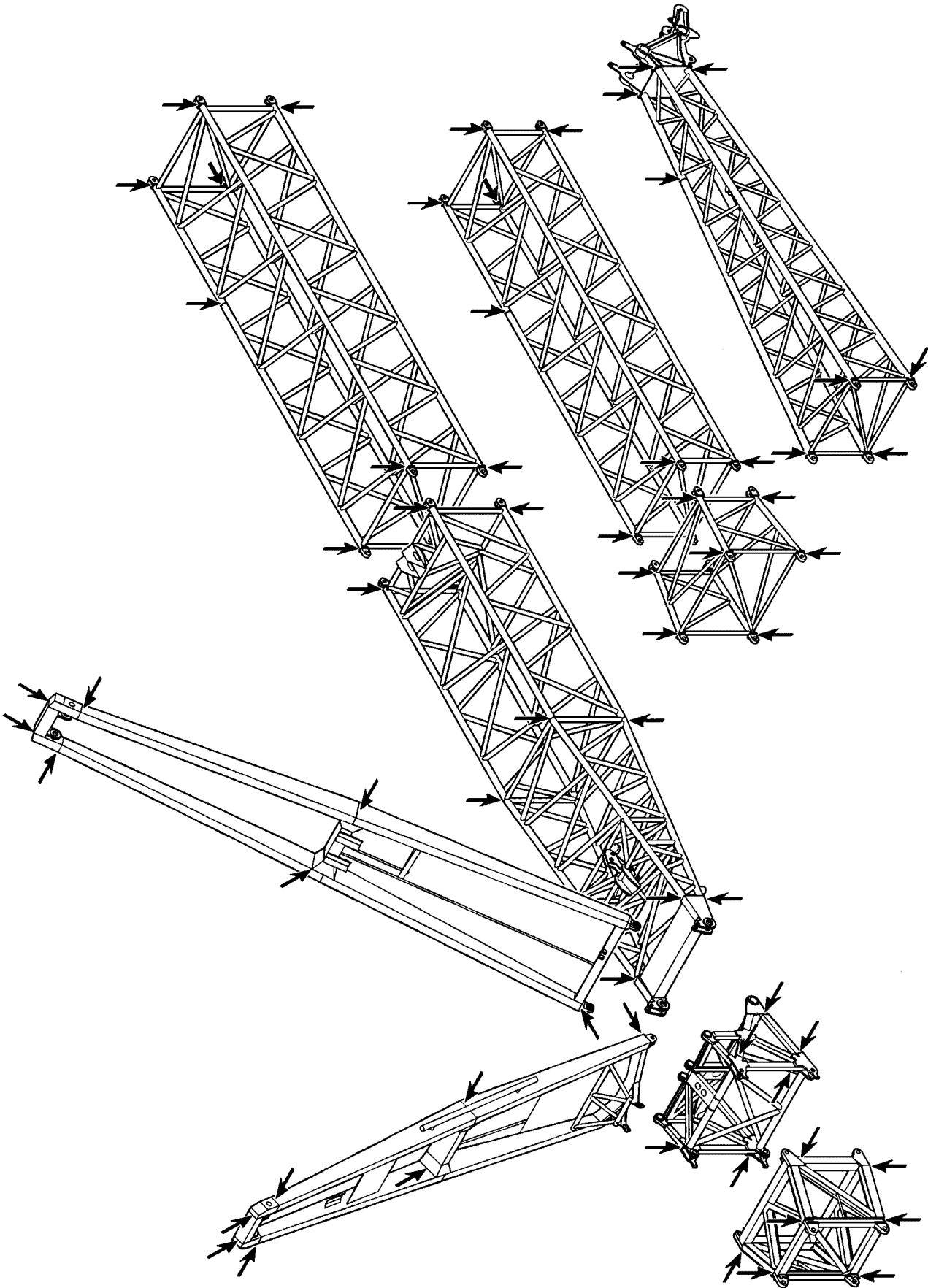
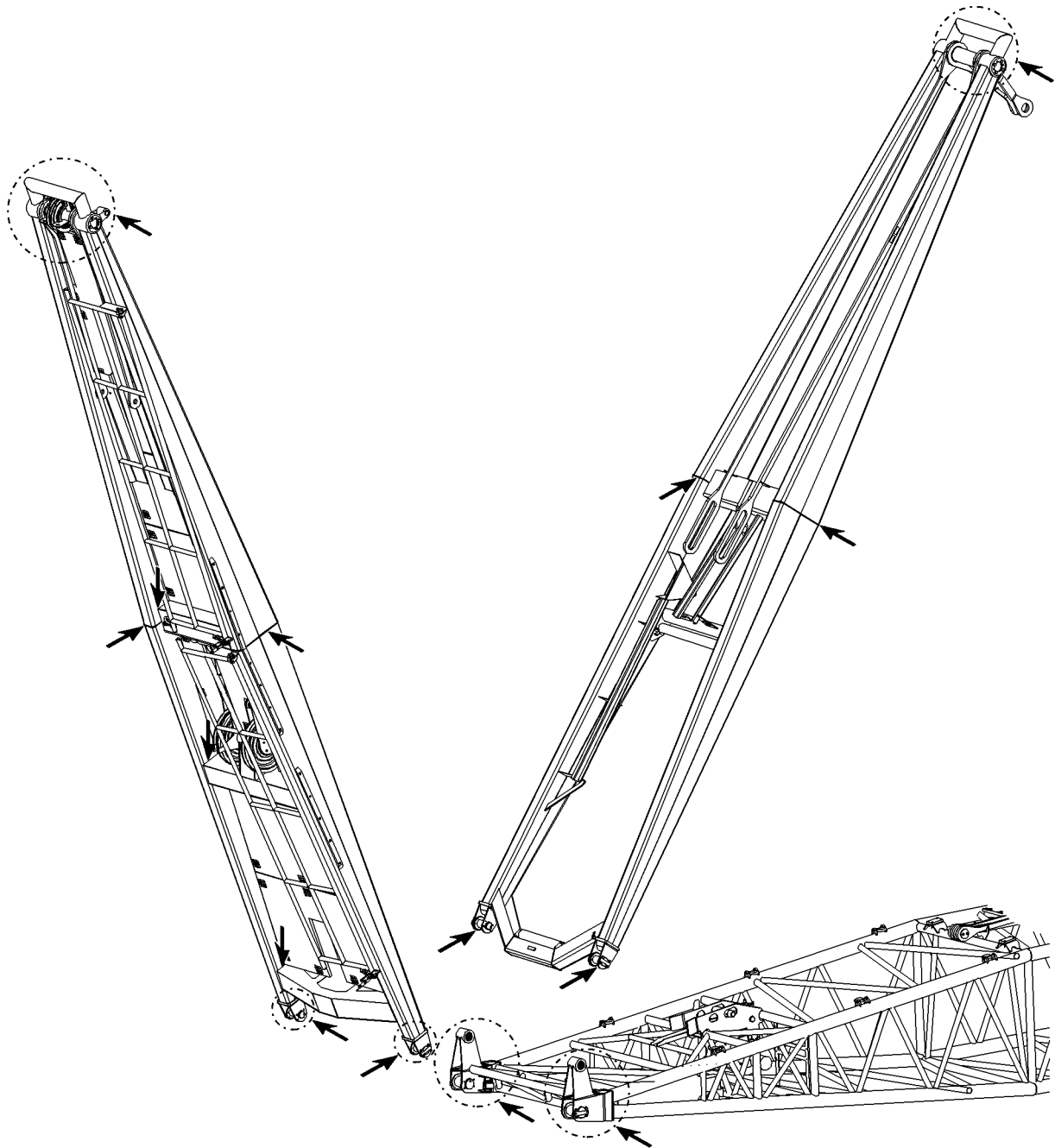


Fig.185053: Example of assembly unit with lattice jib



LWE/LR 11350-007/190005-01-02/en

Fig.105838: Example of NA frames

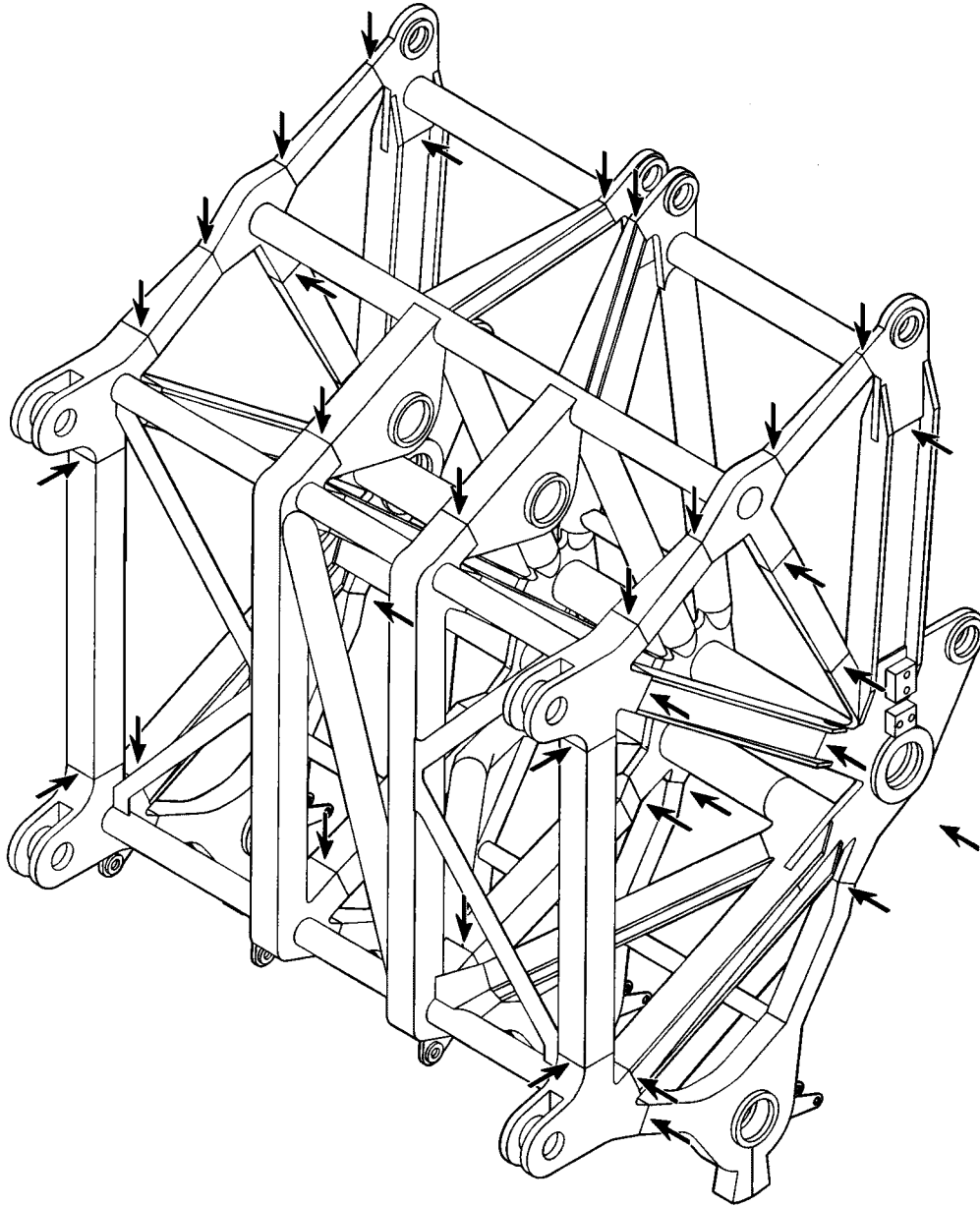
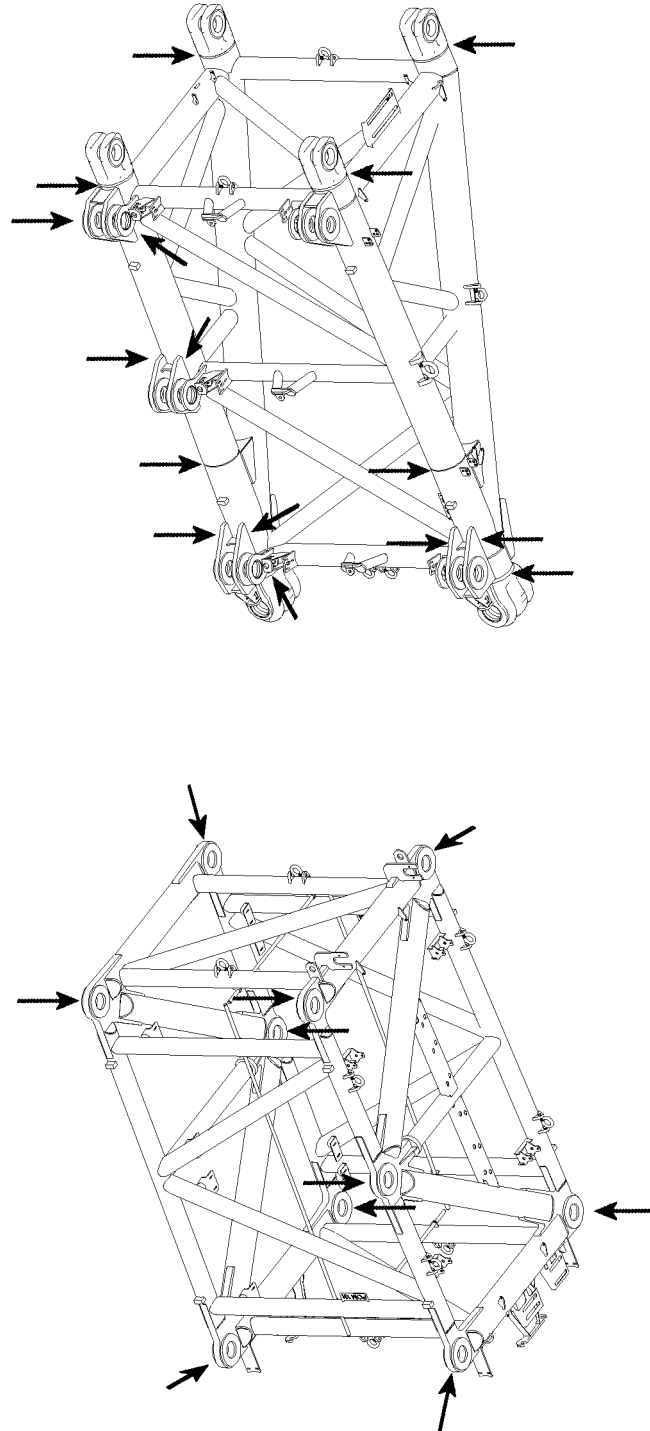


Fig.185054: Example of pulley head

LWE/LR 11350-007/19005-01-02/en



LWE/LR 11350-007/19005-01-02/en

Fig.116609: Example of P-adapter

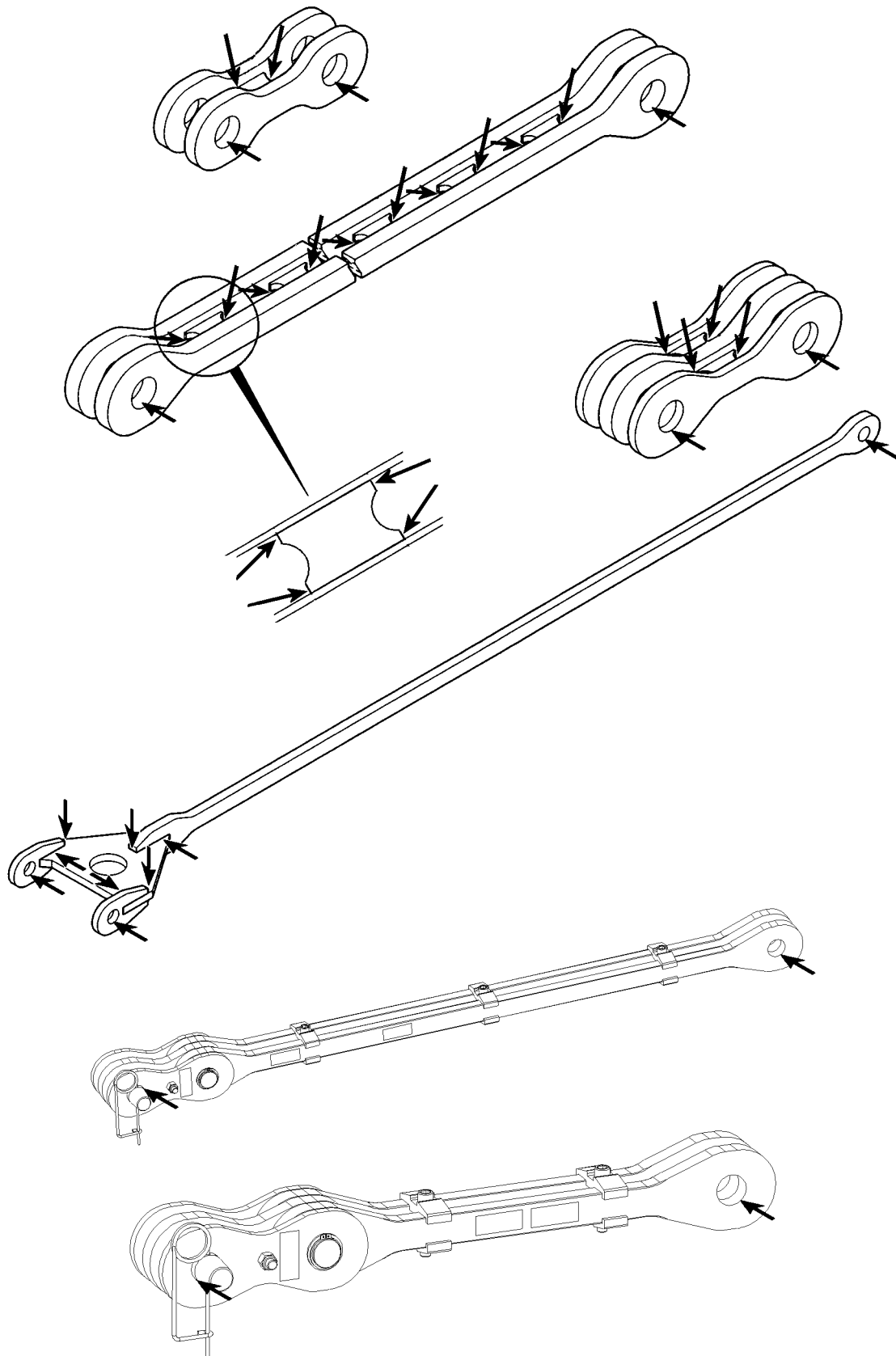
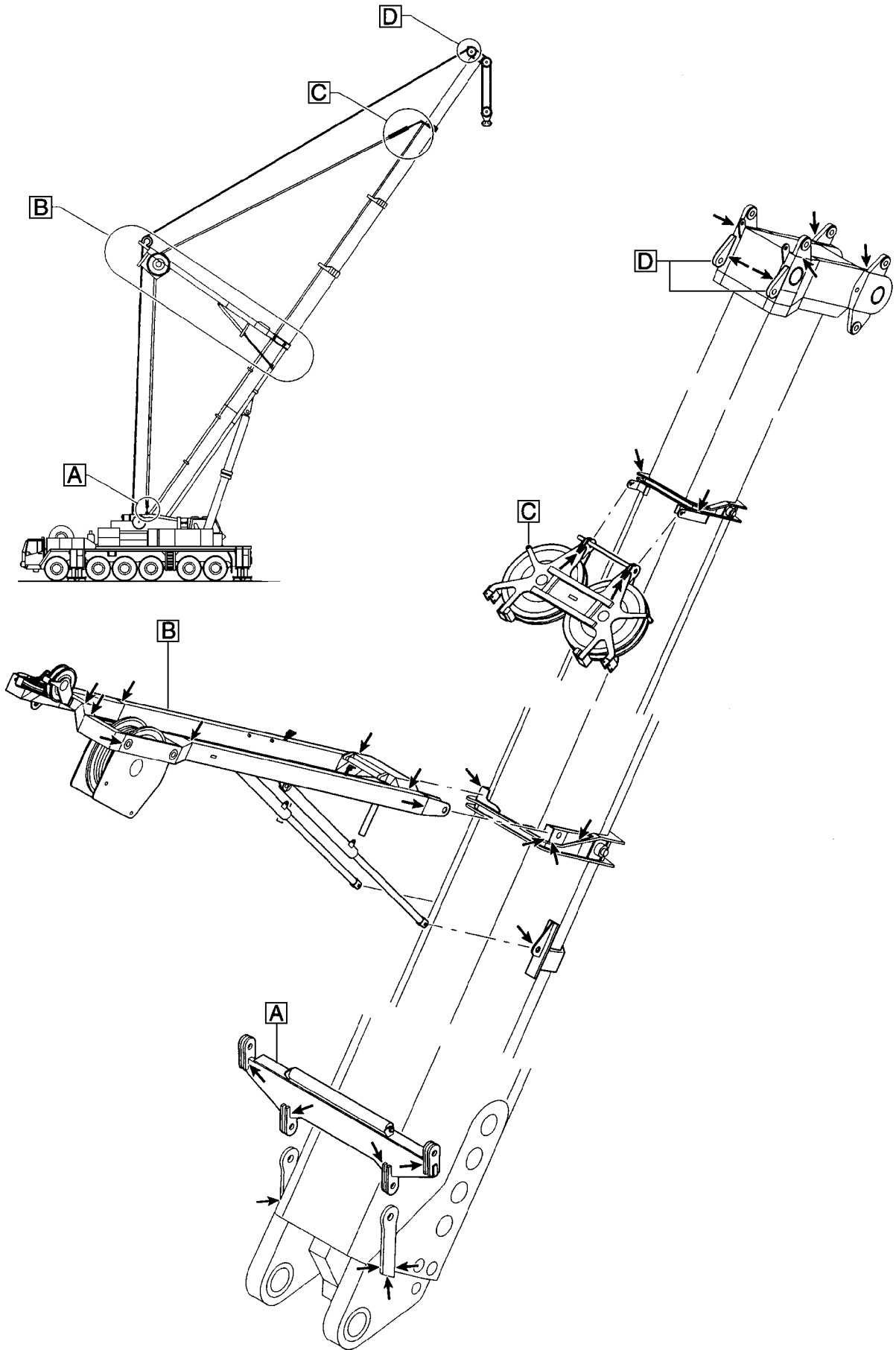


Fig.154111: Example of guy rods



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Fig.185059: Example of TA-guying

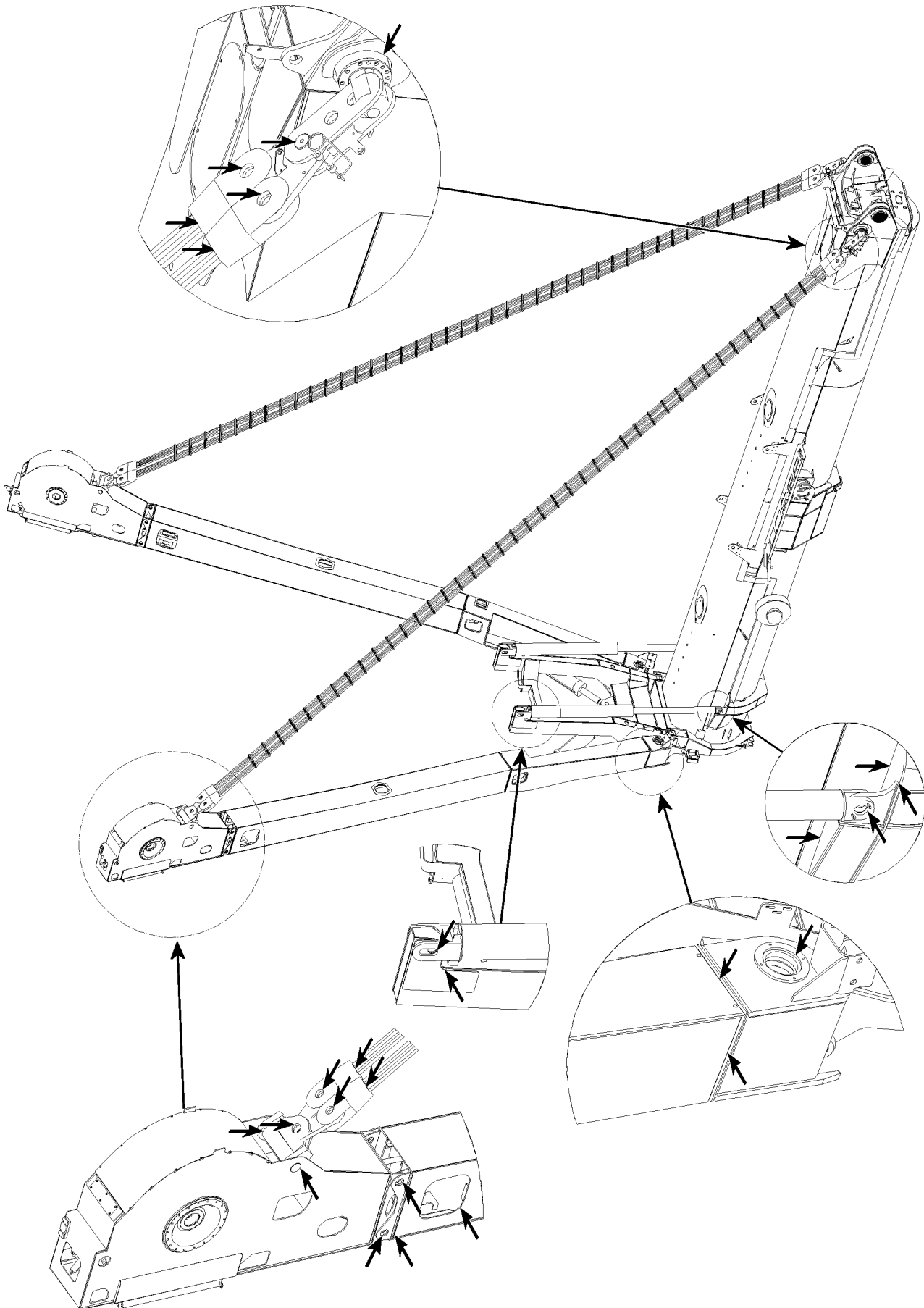
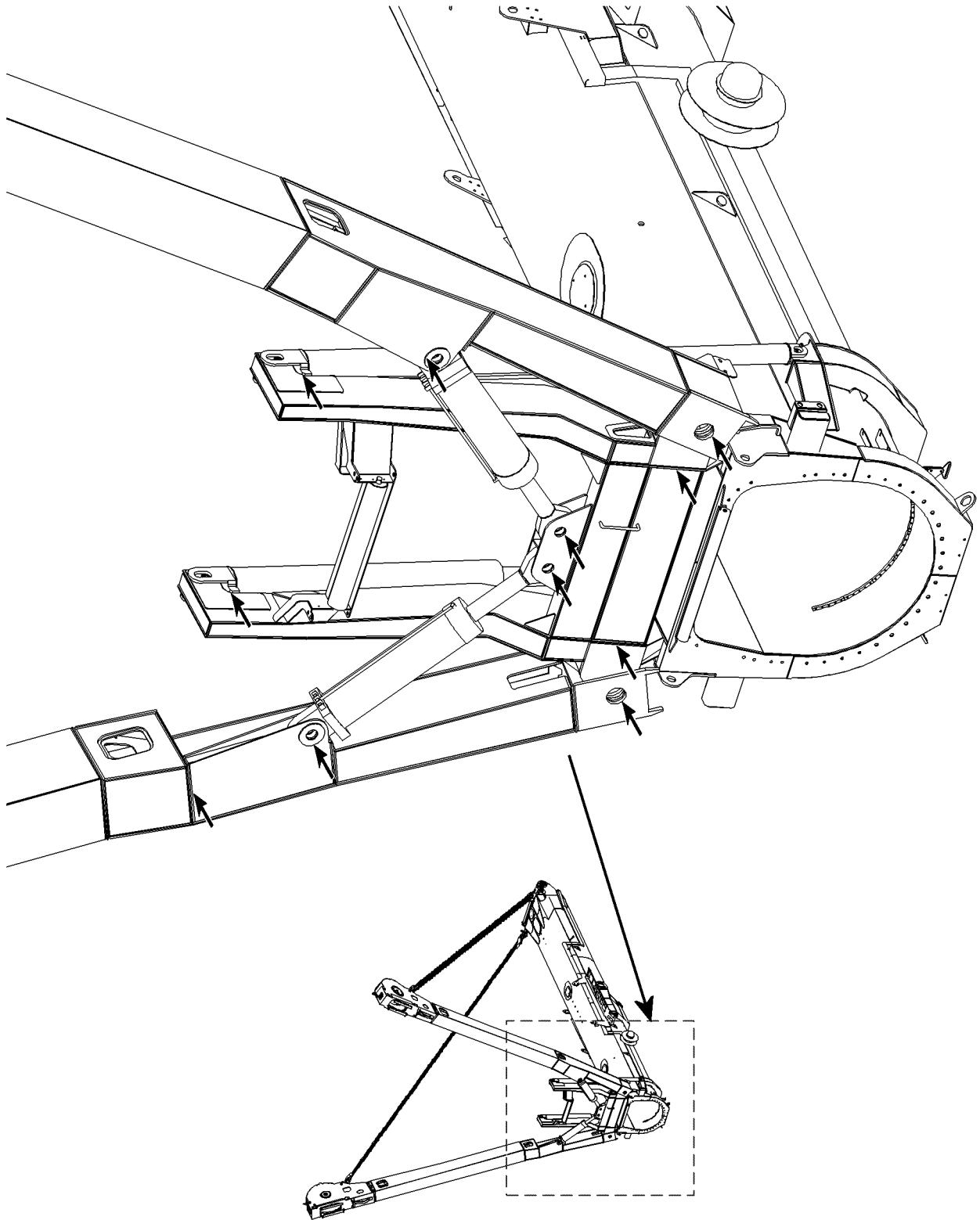


Fig.105707: Example of TY-guying

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LWE/LR 11350-007/190005-01-02/en

Fig.105708: Example of TY-guying

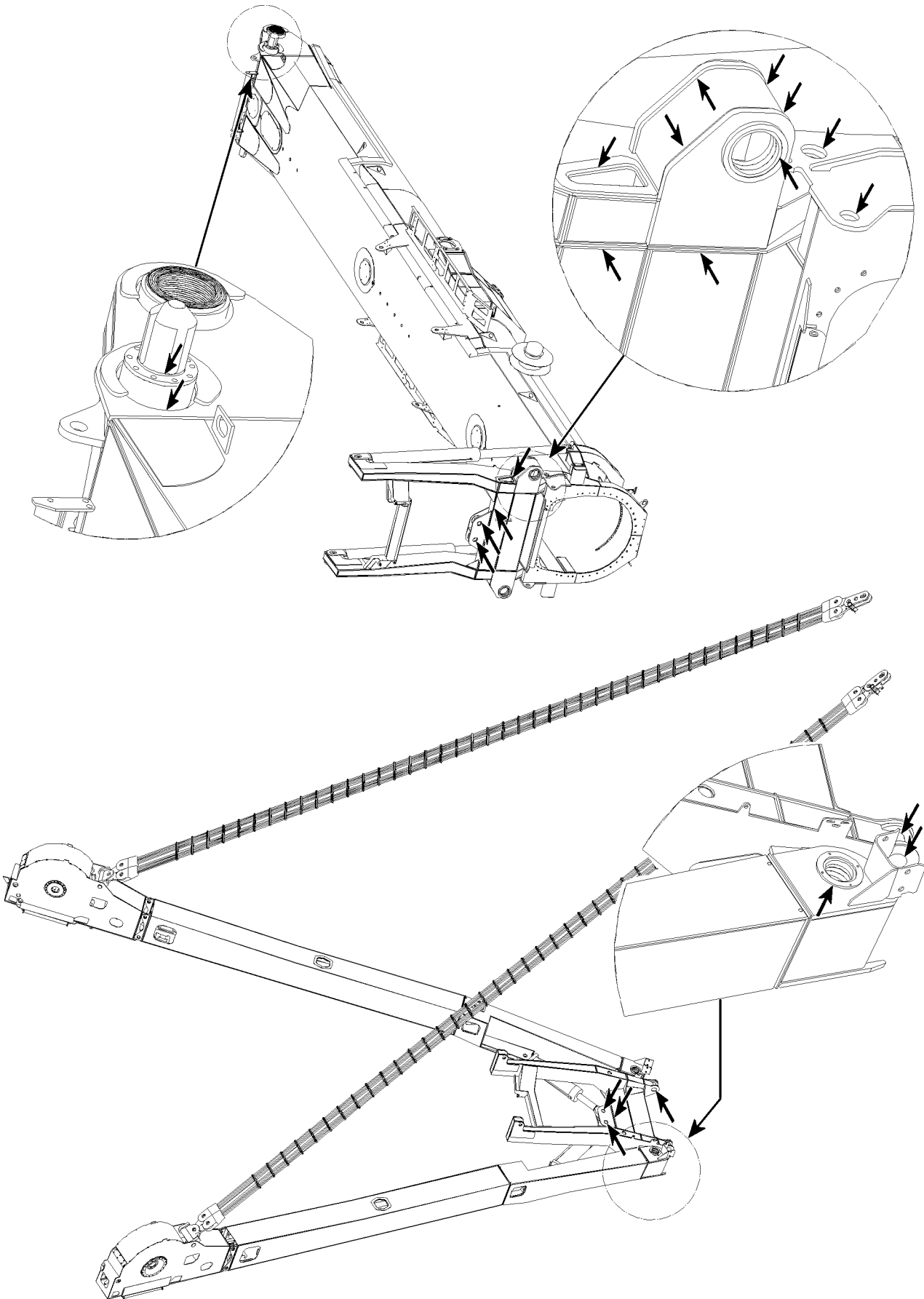


Fig.105709: Example of TY-guying

LWE/LR 11350-007/19005-01-02/en

2.4 Rigging and fastening points

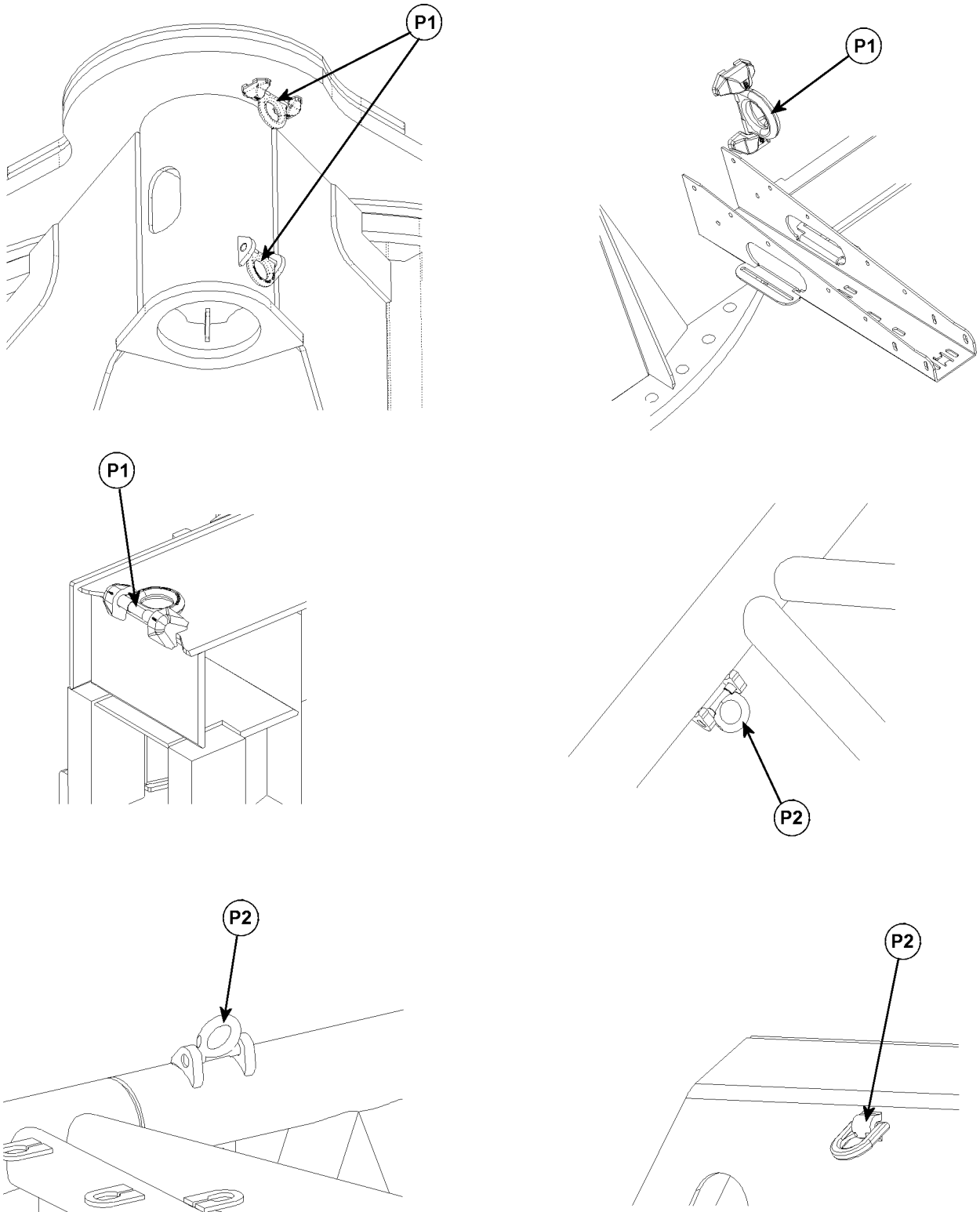


Fig.121160: Examples of rigging points and fastening points

P1 Rigging points

P2 Fastening points

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**WARNING**

Unsafe rigging point or fastening point!

The mobile crane or component can rip free and fall down.

When a rigging point or fastening point is not safe for operation:

- ▶ Have the rigging point or fastening point replaced by authorized and trained expert personnel.
- ▶ Avoid damage on the rigging device due to sharp-edged exposure.

Make sure that the following damage does **not** occur:

- Crushing points
- Shearing points
- Catch points
- Impact points

Inspection criteria:

- Completeness of the rigging point.
- Distortion of carrying parts.
- Mechanical damage such as severe nicks.
- Changes in diameter due to wear.
- Significant corrosion (pitting).
- Cracks on carrying parts.
- Cracks or other damage on the welding seam.

Check the rigging points **P1** and fastening points **P2** before every start up and at regular intervals.

2.5 Inspecting the lattice sections

**Note**

- ▶ The illustration is only an example and is valid for all lattice sections!
- ▶ Check all diagonal and frame pipe connections!
- ▶ Check all bores of the fork - finger connections!

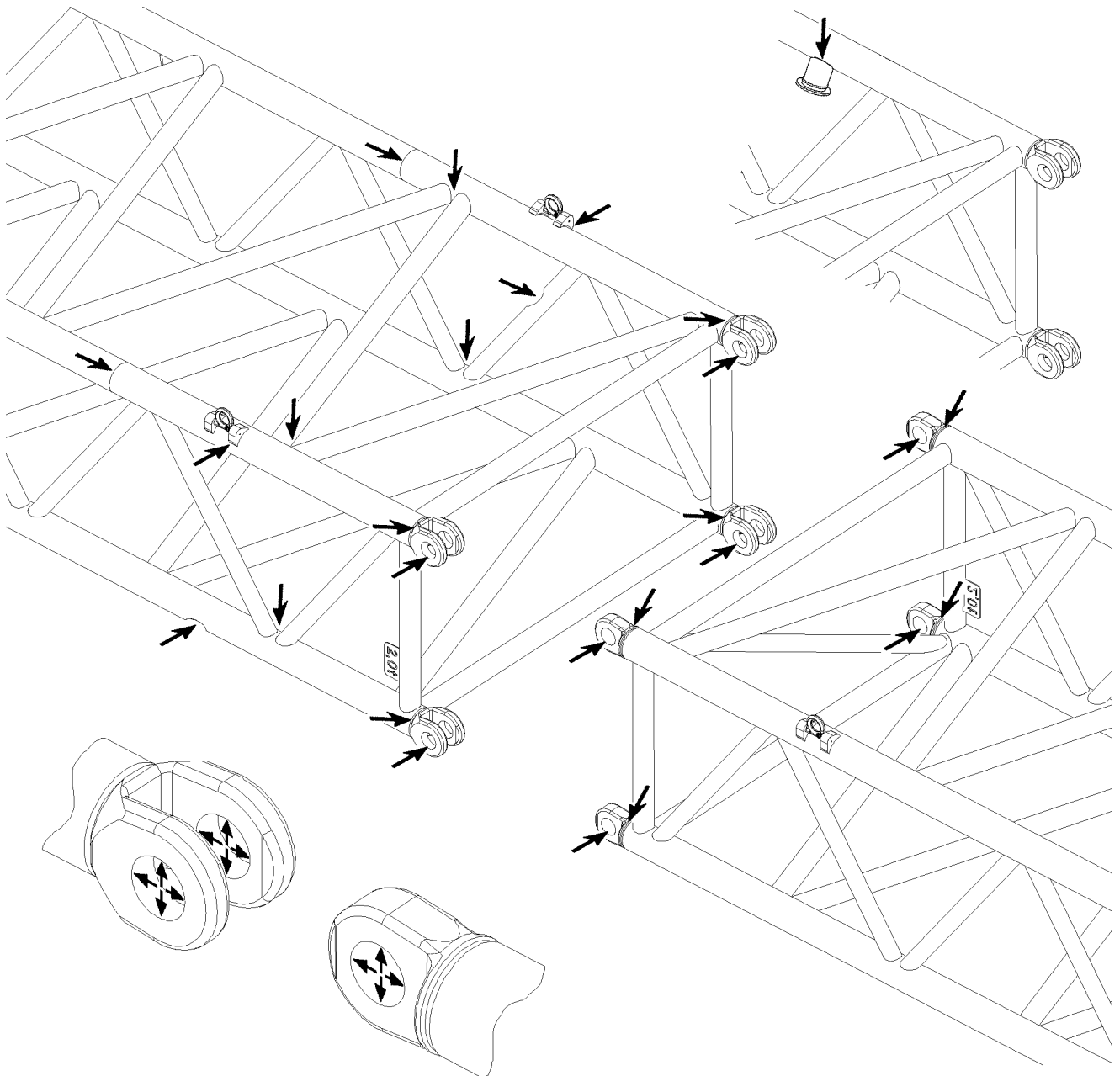


Fig.121023: Example of lattice sections

3 Inspecting the locking system of the telescopic boom

3.1 For cranes with pneumatic boom locking system

- For inspection of function, see chapter 8.11.
- For inspection of pin wear pattern, see chapter 8.11.
- For inspection of wear, see chapter 8.11.
- For inspection of safety control, see chapter 8.11.

3.2 For cranes with the Telematik telescopic boom system

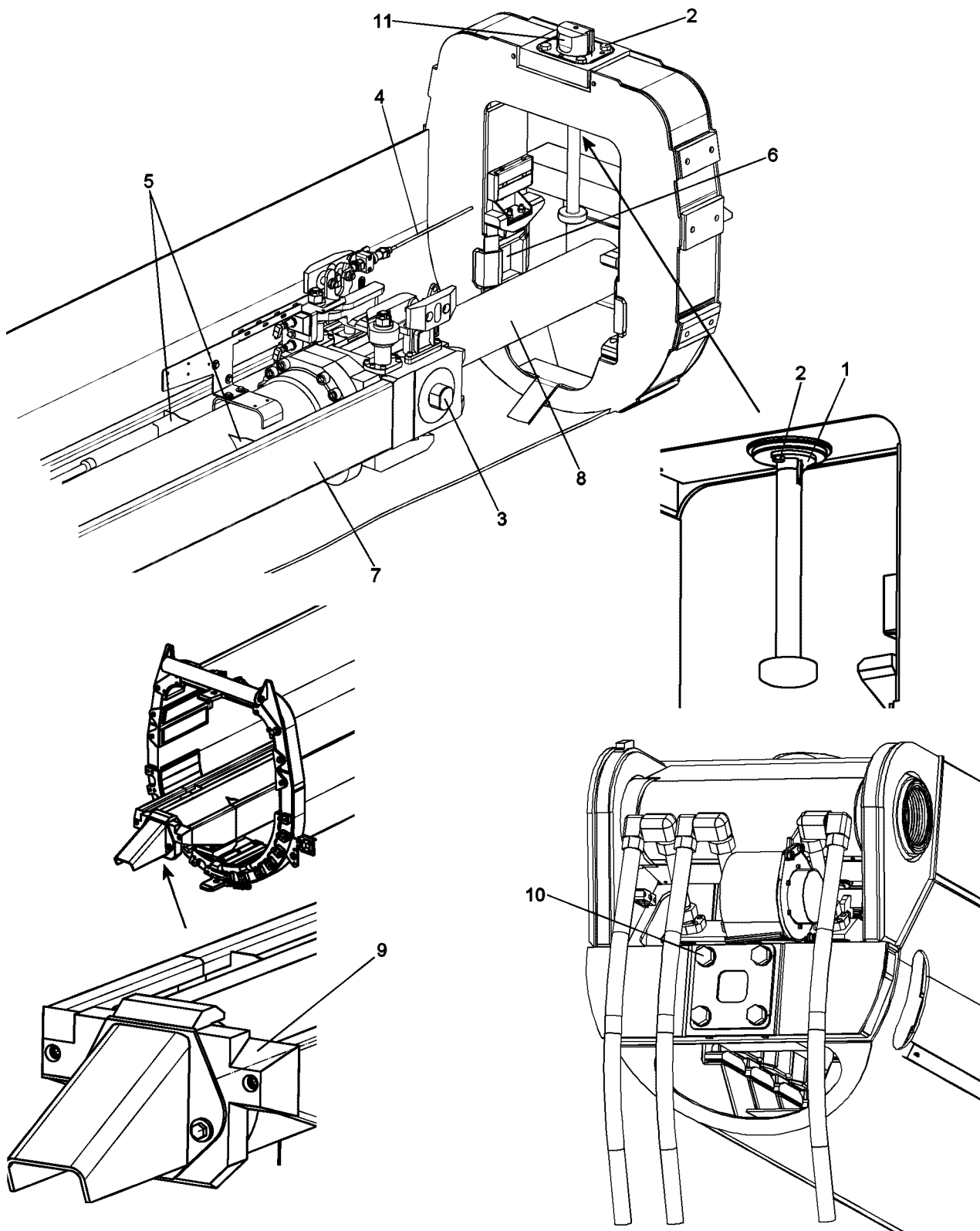


Fig.109286

- Inspection of the pull knob safety **1** and all mounting screws **2** for tight seating
- Inspection of twist guards of cylinder pinning **3** and the telescopic boom pinning **11**
- Inspection of the length sensor rope **4** for damage
- Inspection of the cylinder barrel in the area of all welding seams **5** for crack formation
- Inspection of the locking pockets **6** for damage

- Grease the guide rail 7
- In case of leakage: Inspection of the piston rod 8 for grooves
- Inspection of the wear pattern on the cylinder pinning 3 and the telescopic boom pinning 11
- Inspection of guide rail 7 for distortion of contour
- Inspection of plastic guide 9 on cylinder bottom for damage
- Inspection of all mounting screws 10 on the push out cylinder for tight seating

4 Checking the safety ropes and anchor points

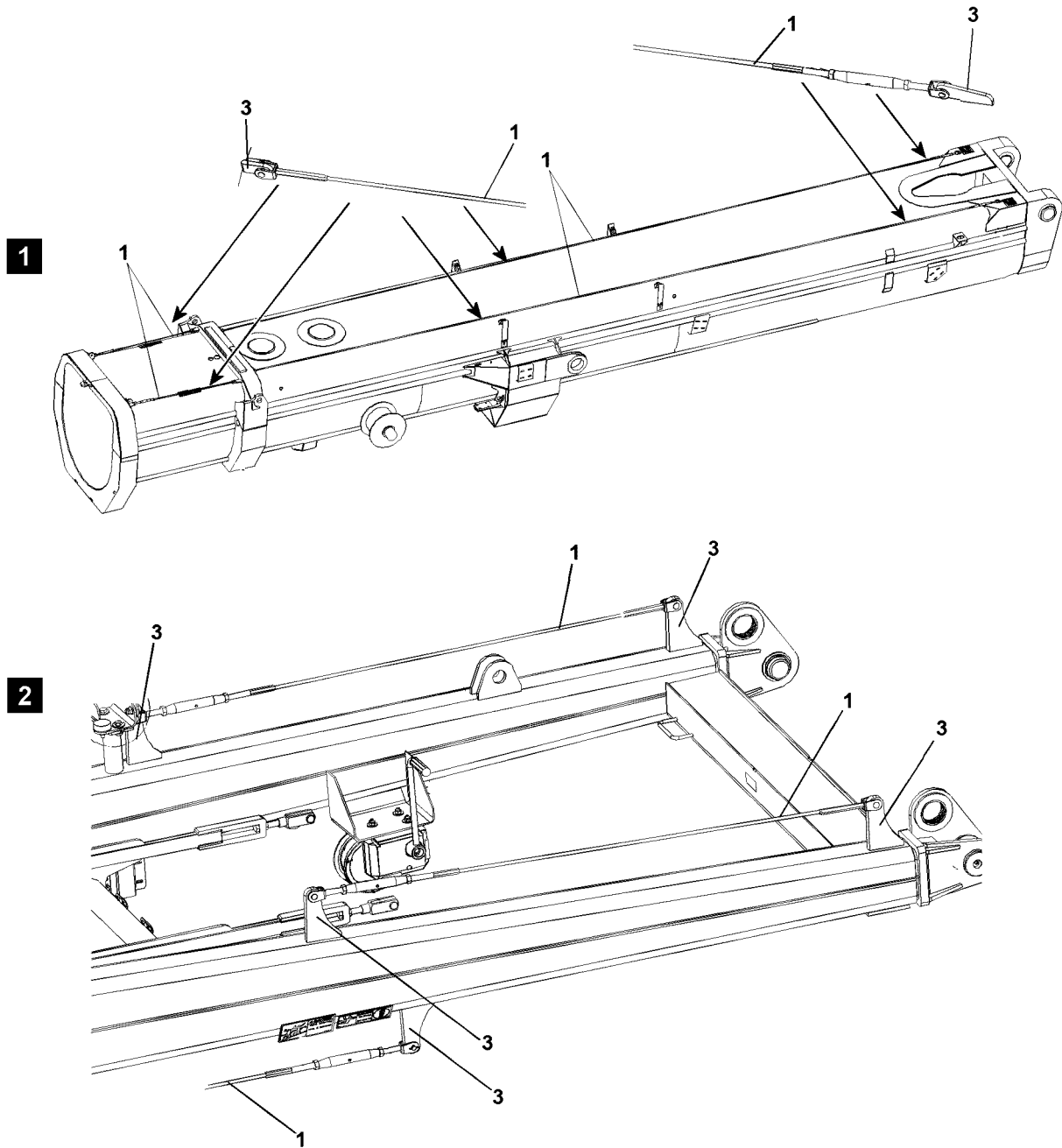


Fig.127130

**WARNING**

Danger of falls due to damaged safety ropes or anchor points!

The safety ropes **1** and anchor points **3** must be checked **at least once a year** by **authorized inspectors** for safety and damage!

If any defects are found on the safety ropes **1** or anchor points **3** during the inspections, then the safety ropes **1** or anchor points **3** must be replaced immediately by authorized and trained specialists! If this is not observed, assembly personnel could be killed or fatally injured during a fall!

- ▶ The rope pretension on the safety ropes must be 800 N !
- ▶ Have damaged safety ropes **1** or anchor points **3** replaced immediately by trained expert personnel!

**Note**

Document the inspections in writing!

- ▶ The scope and results of tests should be documented to permit reproducibility. This documentation forms part of the crane records and should be safely stored during the entire service life of the crane.

4.1 Checking of rope pretension on telescopic booms, illustration 1

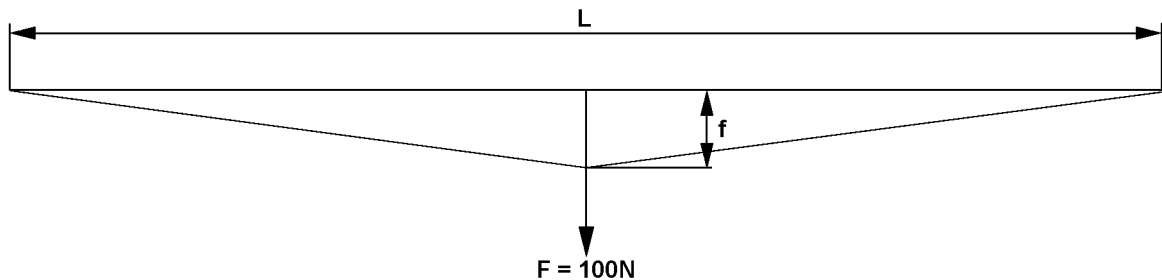


Fig.112738

The rope pretension must be 800 N. This can be checked with the aid of a spring balance, which is pulled centered on the safety rope. If the specified deflection (f) depending on the rope length (L) according to the following charts results for the raised load $F = 100\text{ N}$ 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 |

4.2 Inspecting the rope pretension on lattice sections, illustration 2

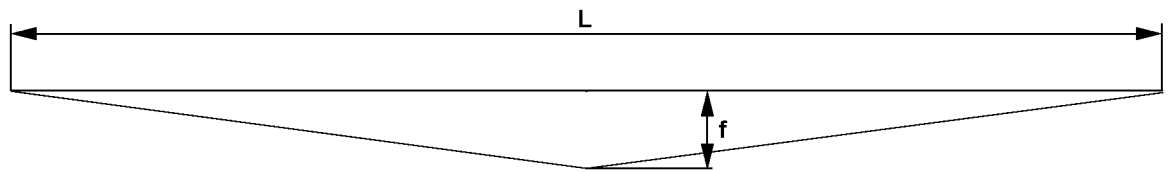


Fig.117747

The rope pretension is 800 N , if a sag (f) according to the chart is present on the safety rope according to the rope length (L).

| Rope pretension is 800 N if: | | | | | |
|------------------------------|-------|-------|-------|-------|-------|
| Rope length (L) | 1.0 m | 1.5 m | 2.0 m | 2.5 m | 3.5 m |
| Deflection (f) | 0 | 1 mm | 2 mm | 3 mm | 6 mm |

| Rope pretension is 800 N if: | | | | | |
|------------------------------|-------|-------|-------|--------|--------|
| Rope length (L) | 5.5 m | 7.5 m | 9.5 m | 11.5 m | 13.5 m |
| Deflection (f) | 15 mm | 28 mm | 45 mm | 66 mm | 90 mm |

5 Inspecting the load handling equipment and assembly aids



WARNING

Load handling equipment and / or assembly aids **not** inspected!
Death, severe bodily injuries, property damage.

► Inspect load handling equipment and / or assembly aids at least once a year.

The recurring inspection of the load handling equipment and / or assembly aids must be carried out once a year.

The inspections of load handling equipment and / or assembly aids must be recorded.

The welding seams must be subjected to a visual inspection.

Check load handling equipment and assembly aids for:

- Damage
- Wear
- Cracks

Replace damaged, worn or ripped load handling equipment and assembly aids immediately.

Repairs on load handling equipment and assembly aids may solely be made in consultation and under the instructions of the Customer Service at **Liebherr-Werk Ehingen GmbH** by authorized and trained expert personnel.



Note

- Document the scope of the inspection and the results in writing and comprehensibly.
- Save the documentation as a part of the crane records for the entire service life of the crane.

6 Inspecting of fastening equipment



WARNING

Fastening equipment **not** inspected!
Death, severe bodily injuries, property damage.

- ▶ Check the fastening equipment at least once a year.

The inspections of the fastening equipment must be recorded.

The welding seams must be subjected to a visual inspection.

Inspect the fastening equipment according to the specifications of the corresponding regulations and standards.

Replace damaged, worn or ripped fastening equipment immediately.



Note

- ▶ Document the scope of the inspection and the results in writing and comprehensibly.
- ▶ Save the documentation as a part of the crane records for the entire service life of the crane.

6.1 Grommets and cable laid fastening rope

Observe and comply with the manufacturer's operating instructions.



WARNING

Damaged grommets and cable laid fastening rope used!
The fastening ropes can fail. The load can fall down.

- ▶ Do **not** use grommets and cable laid fastening rope with a corresponding number of wire breaks.
- ▶ Do **not** use grommets and cable laid fastening rope with a corresponding amount of damage.

Do **not** use grommets and cable laid fastening rope if there is one of the following numbers of wire breaks:

- Wire breaks of more than 10 wires along a length of 3D
- Wire breaks of more than 15 wires along a length of 6D
- Wire breaks of more than 40 wires along a length of 30D

Do **not** use grommets and cable laid fastening rope in the case of the following damage:

- Strong rope distortion
- Rotary distortion
- Kinks, bends, basket formation
- Corrosion
- Corrosion of the zinc coating
- Opening of the splice
- Loosening or opening of the rope bond
- Displacement of the rope bond from its original position
- Lack of identification

7 Inspecting the diaphragm reservoir



Note

- ▶ The national regulations for pressurized container inspection must be observed!

The inspection of the diaphragm reservoir for specified gas pressure must be carried out by an **authorized inspector**, see chapter 7.04 and chapter 7.05.

8 Inspecting the relapse cylinders



WARNING

Fatal accidents due to defective relapse cylinders!
 Loss of oil or corrosion can damage the relapse cylinders!
 Safe crane operation is no longer ensured!
 ► Crane operation with defective relapse cylinders is prohibited!

8.1 Pressure testing the relapse cylinders

The relapse cylinders must be inspected annually by an **authorized inspector**. The purpose of the inspections is to avoid accidents by detecting deficiencies early on.

8.2 Checking the gas pressure and oil fill before start up



WARNING

Fatal accidents due to defective relapse cylinders!
 Loss of oil or corrosion can damage the relapse cylinders!
 Safe crane operation is no longer ensured!
 ► Before every start up: Carry out a visual inspection for leaks, damage and corrosion on the relapse cylinders.
 ► If any defects are found, the relapse cylinders must be inspected by the cylinder manufacturer!

The gas pressure and the oil fill must be checked by an **authorized inspector** for pressure containers.

8.3 Inspecting the safety controls on the relapse cylinders

Inspecting the interlocking system or limit switches on the relapse cylinders and the boom A-frames, see chapter 8.12.

9 Inspecting the rope pulleys

9.1 Checking for damage and cracks



DANGER

Danger of accident in case of damage or cracks!
 ► Replace rope pulley immediately!

Check the entire rope pulley assemblies for damage and cracks once a year.

If rope pulleys are subjected to any impacts (e.g., with buildings) or are otherwise overloaded, they must be visually inspected for damage or cracks immediately.

9.2 Checking the groove diameter

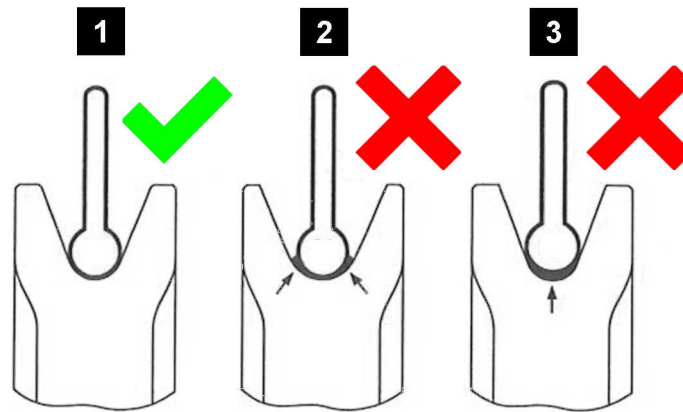


Fig.154258: Checking the groove diameter

- | | | | |
|---|--------------------------|---|----------------------------|
| 1 | Groove diameter ok | 3 | Groove diameter too narrow |
| 2 | Groove diameter too wide | | |

NOTICE

Worn rope pulleys!

The functionality and service life of the rope is reduced. Damage on rope.

- ▶ Before placing the rope, check the groove diameter of rope pulleys.

Visible wear on rope pulleys:

- Reduced groove diameter
- Negative impressions of the rope profile in the groove

Make sure that the following tools are available:

- Groove caliber

Make sure that the following prerequisites are met:

- All components to be inspected are cleaned.
- The rope does **not** obstruct the inspection of the components.



Note

- ▶ The actual groove diameter **must** be larger than the actual diameter of the rope!

The groove diameter of rope pulleys and winches must be at least 6 % larger than the nominal rope diameter.

Check the rope pulleys with a groove caliber for wear. When wear exists on the rope grooves: Fix the rope pulleys or replace.

10 Inspecting the carrier rollers

10.1 Performing a visual inspection



DANGER

Damaged carrier rollers!

Breakage and falling components. Death, severe bodily injuries, property damage.

- ▶ Carry out a visual inspection according to the maintenance intervals.
- ▶ Replace the carrier roller immediately.

The visual inspection must be carried out according to the following criteria:

- Wear

- Damage
- Cracks

Visible wear on carrier rollers:

- Negative imprints of the rope profile on the circumference of the carrier rollers
- Lead-in tracks

10.2 Checking the depth of the lead-in tracks



DANGER

Worn carrier rollers!

Breakage and falling components. Damage to ropes. Death, severe bodily injuries, property damage.

- ▶ Check the depth of the lead-in tracks.
- ▶ Replace worn carrier rollers immediately.

Make sure that the following prerequisites are met:

- All components to be inspected are cleaned.
- The rope does **not** obstruct the inspection of the components.

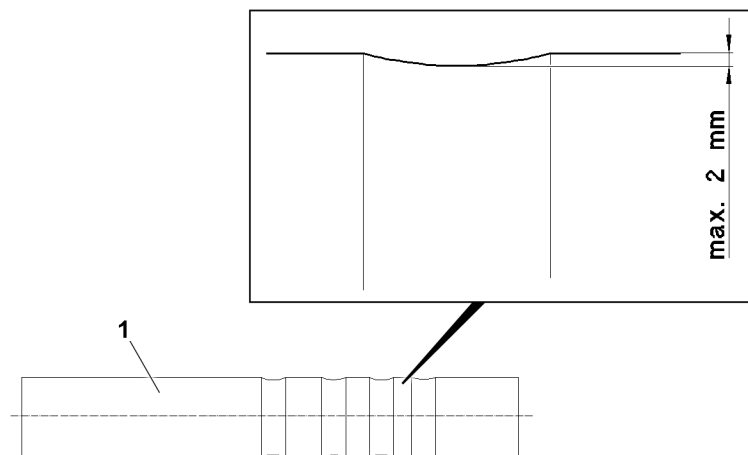


Fig.124864: Permissible depth of the lead-in tracks

1 Carrier roller

The depth of the lead-in tracks may be maximum 2 mm.

10.3 Checking bearings for easy movement

Stiff or blocked carrier rollers wear unevenly and cause serious rope abrasion.

Ineffective carrier rollers can lead to irregular rope tension.

Tasks to check the carrier rollers:

- Check the carrier rollers for proper movement in their bearings.
- When carrier rollers are **not** easily moveable in their bearings: Fix the bearings.

10.4 Checking the tightening torque

The tightening torque of screws must be checked according to maintenance interval.

11 Inspecting the extension conditions of sliding beams

The extension conditions of the sliding beams must be inspected annually by an **authorized inspector**.

Check the extension conditions on every sliding beam:

- Check if the position 0 % of the LICCON display matches the actual condition of the sliding beam.
- Check if the position 100 % of the LICCON display matches the actual condition of the sliding beam.

12 Inspecting the function of the overload protection

Position the longest boom at minimum and maximum radius: Check the load indicator, using the hook block as a test load.

The display reading may not deviate by more than 10 % off the true load value at these two extreme positions.

Measure the indicated radius for the longest boom at its minimum radius and at a boom angle of 45°.

The display readings may not deviate more than 10 % from the measured boom radius.

13 Inspecting the pin connections



WARNING

Pin connections **not** inspected!

Death, severe bodily injuries, property damage.

- ▶ Check the pin connections at least once a year.

The periodic inspection of all pin connections must be carried out once a year.

The inspections of the pin connection must be recorded.

Check the pin connections for:

- Properly secured pin connections
- Damage to the pins and / or connector elements
- Damage to the retaining elements

Replace damaged pins immediately.

Immediately replace damaged, bent or broken retaining elements.

Only replace damaged pins with identical pins.

Only replace damaged retaining elements with identical retaining elements.



Note

- ▶ Document the scope of the inspection and the results in writing and comprehensibly.
- ▶ Save the documentation as a part of the crane records for the entire service life of the crane.

14 Inspecting the slewing ring connection

14.1 Checking the tilt play

The wear of the slewing ring connection is determined by measuring the tilt play with the ring installed.

The permissible tilt play depends on the type of slewing ring connection.



WARNING

The tilt play of the slewing ring connection is too large!
If the permissible tilt play is exceeded, then safe crane operation is **no** longer possible.
Death, severe bodily injuries, property damage.

When the permissible tilt play is exceeded:

- ▶ Replace the slewing ring connection.

The determination of the tilt play must be carried out according to the **test instructions** of **Liebherr-Werk Ehingen GmbH**.

Request the test instructions and permissible tilt play: Contact Liebherr Service.

15 Inspecting the mounting of the load bearing equipment

15.1 Checking the tightness of the mounting screws

The mounting screws must be checked for a tight fit during the annual crane inspection.

The mounting screws are pre-stressed at the factory, so that no loosening of the screw connections will occur during normal crane operation.

The screw connection may become overloaded and the mounting screws may be permanently stretched if the crane is overloaded or if the load is pulled free. The mounting screws must be checked immediately for a tight fit after an overload.

Check the tightening torque of the mounting screws of load bearing equipment for a tight fit:

- Slewing ring connection
- Winches
- Slewing gears
- Transmission
- Trailer coupling

If a mounting screw can be tightened, then the mounting screw is loose. Follow the instructions in section „Checking the mounting screws for damage“.

15.2 Checking the mounting screws for damage

Completely unscrew the loose mounting screws and check in detail for damage.

Completely unscrew the adjacent mounting screws and check in detail for damage.

Replace the mounting screw if any of the following damage is present:

- The mounting screw is stretched by more than 2 % (in relation to its original length).
- Cracks, permanent deformation or other damage is visible on the mounting screw.
- The mounting screw is uneven.
- There is pitting.
- The thread is hard to move.

If there is **no** damage, reuse the checked mounting screws (expansion screws) a maximum of two times.

16 Inspecting the tele extension with eccentric, illustration 1

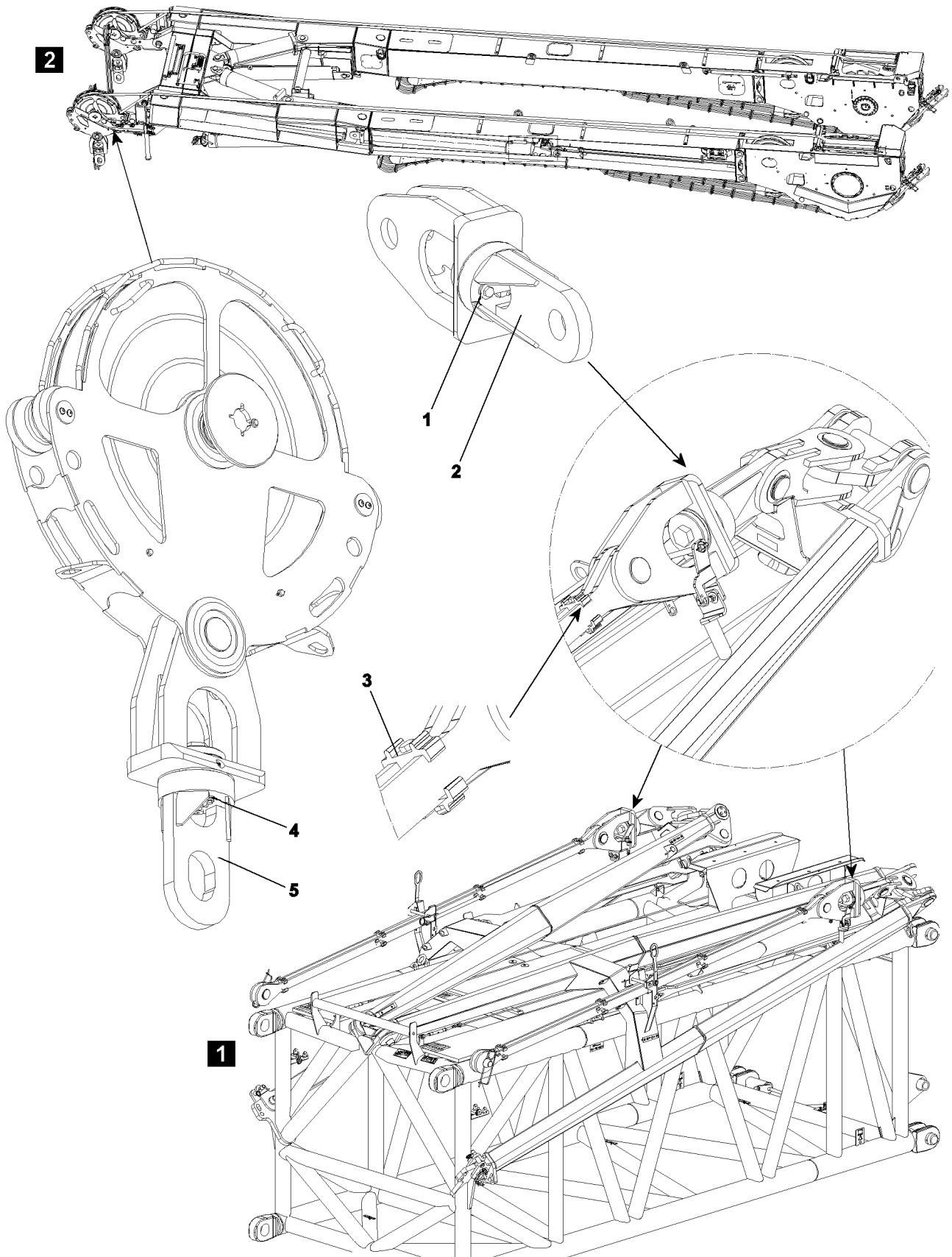


Fig.109096

LWE/LR 11350-007/19005-01-02/en

- Inspection of anti-rotation device **1** for damage and loose screw connection.
- Inspection of swivel **2** for easy turnability.
- Inspection of all clamps **3** for damage and function.

17 Inspecting the change over pulleys, illustration 2

- Inspection of anti-rotation device **4** for damage and loose screw connection.
- Inspection of swivel **5** for easy turnability.

18 Inspecting the oil and fuel tanks

Visually check the oil and fuel tanks at least once a year for leaks and safe mounting.

Repairs may only be carried out by authorized and trained specialists.

Improper repairs; e.g., welding, hard or soft soldering is not permitted, particularly if the Service department at Liebherr-Werk Ehingen GmbH has not been consulted!

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8.03 Inspecting of winches

| | | |
|---|---|---|
| 1 | Inspecting the hoist and retracting winches | 3 |
| 2 | Inspection of the auxiliary reeving winch, recovery winch and spare wheel winch | 5 |
| 3 | Monitoring the winches | 5 |

Fig.195219

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1 Inspecting the hoist and retracting winches

The hoist and retracting winches are designed in sealed planetary gear version. These gears are sized for long service life and the drive shafts and gears are designed for endurance.

Even though the hoist and retracting winches are designed for long life, an external visual inspection is not adequate, since their life can be significantly affected by bad maintenance (insufficient oil), using oil that does not meet specification requirements, defective seals, improper operation or overloading.

The annual inspection must therefore be carried out by an **expert** in accordance with the following specification.

The winches must be inspected by an **authorized inspector** every four years after the initial license.

Within the territorial validity of the BGV D6, after the 10th year in operation, counted from the first day of initial license, when the theoretical service life is not over, the winches must be checked annually by an **authorized inspector**.

1.1 Checking the groove diameter



WARNING

Worn winches!

Damage of flanged disks, high rope wear, operational problems. Broken rope, falling load.

► Before placing the rope, check the groove diameter of winches.

Visible wear on winches:

- Reduced groove diameter.
- Mechanical damage, for example scrub marks or scouring on flanged disks

Make sure that the following tools are available:

- Groove caliber

Make sure that the following prerequisites are met:

- All components to be inspected are cleaned.
- The rope does **not** obstruct the inspection of the components.



Note

► The groove radius may **not** be smaller than the actual diameter of the rope.

The groove diameter of rope pulleys and winches must be at least 6 % larger than the nominal rope diameter.

Check winches with a groove caliber for wear. When wear is present: Fix the winch or replace.

1.2 Inspection intervals

At least once a year, see Crane operating instructions, chapter 7.03.

1.3 Checking the oil level

Check the oil level with the dipstick.

For hoist and retracting winches **without** a dipstick, we recommend that the oil is drained and the amount compared to the specified oil quantity.

1.4 Evaluating oil color

Assume that the oil has been overheated if it is black and / or a burnt oil smell is detected. Change the oil.

1.5 Checking for solid foreign substances

In general, the oil must be analyzed by a qualified laboratory.

For simple testing, the following procedure can be used:

- Drip the used oil on a specified filter fleece.
- Visual inspection with a magnifying glass may reveal coarse particles.
- If coarse particles are found: Have the components of the oil analyzed by a qualified laboratory.

NOTICE

Danger of property damage!

- ▶ Repairs may only be carried out by an authorized and trained expert personnel.
 - ▶ Replace damaged parts and change the gear oil.
-

1.6 Visual inspection for leaks

The gears must be checked for leaks, since oil losses - in addition to polluting the environment - can lead to gear failure.

1.7 Checking the gear brakes

Check the brakes each time the gears are inspected.



WARNING

Condition of gear and brakes incorrectly transmission evaluated!

The load can fall down, death, property damage.

- ▶ Only qualified personnel with specialized knowledge may be used to evaluate gears and brakes.
-

In order to do so, proceed as follows:

- Make sure that the hoist rope is sufficiently pretensioned, in particular in the lower layer of the winch. See chapter 4.08.
- Attach a load, which creates the maximum rope pull in the uppermost layer of the coil with 1 strand, and raise it just off the ground by luffing it up.
- Block the winch brake:
 - For cranes with LICCON 1: „Release the winch brake“ by unplugging the valve plug from the valve.
 - For cranes with LICCON 2: By activating the setting program for blocking the winch brake.
- Activate the winch in the lowering direction.

The brake may **not** slip during the test, which means that the winch may **not** turn.



WARNING

The brake slips and the winch turns!

The load can fall down, death, property damage.

- ▶ Stop crane operation.
 - ▶ Contact Customer Service at Liebherr-Werk Ehingen GmbH.
-

1.8 Documenting the completed inspection

The results of the annual inspections and maintenance work, including the steps taken, must be documented by the competent or authorized inspector, including attachments from the inspection labs and qualified service companies if applicable.

This documentation must be filed in the crane inspection log under the heading "Periodic inspections".

2 Inspection of the auxiliary reeving winch, recovery winch and spare wheel winch

The inspection of the auxiliary reeving winch, recovery winch and spare wheel winch regarding scope and content is made according to the manufacturer's instructions.

- Check the auxiliary reeving winch, recovery winch and spare wheel winch according to the manufacturer's instructions.
- Request data about the service life of the auxiliary reeving winch, recovery winch and spare wheel winch from the respective manufacturer.

3 Monitoring the winches

3.1 Theoretical service life

The designer of your crane used a theoretical total operating time when designing and sizing the winches. This resulted in the theoretical service life of the equipment.

The winches of your crane are classified according to ISO 4301/1 as follows:

| Winches | Classification |
|-----------------------------|----------------|
| Power train group: | M3 |
| Load spectrum: | L1 |
| Load spectrum factor Km: | 0.125 |
| Theoretical service life D: | 3200 h |



Note

► The „theoretic service life“ is not equal to the real (true) service life of a winch!

The actual service life of the winch is affected by many additional outside factors; for example:

- Overloads caused by unapproved use of the crane.
- Inadequate maintenance: Oil is not changed in a timely manner
- Improper operation:
 - Extreme acceleration or deceleration of the load
 - Load falling into the ropes
- Maintenance errors:
 - Using the wrong type of oil
 - Too much or too little oil
 - Contamination during oil change
- Assembly errors during repair and maintenance
- **Undetected** leaks
- Incorrectly set safety equipment
- Hidden damage from accidents
- Extreme environmental conditions:
 - Low or high temperatures
 - Aggressive atmosphere
 - Dust and dirt

3.2 Used proportion of the theoretical service life

The crane operator is obligated to carry out an inspection of the crane at least once a year.

At this time, the actually used part of the theoretical service life must also be calculated. If necessary, the crane operator must contract an authorized inspector.

For the determination of the used part of the theoretical service life, the actual operating conditions (load spectrum) and the hoist gear operating hours for each inspection interval are to be determined. The operator is responsible for the documentation in the crane inspection log.

3.2.1 Determining the operating conditions (load spectrum)

The load spectrum of the crane is divided into groups, please refer to ISO 4301/1.

Select one of the following load spectrums and record it in the crane inspection log for the respective inspection interval based on the actual operating conditions. A more precise determination of the load spectrum is permissible.

Load spectrum class: Light L1

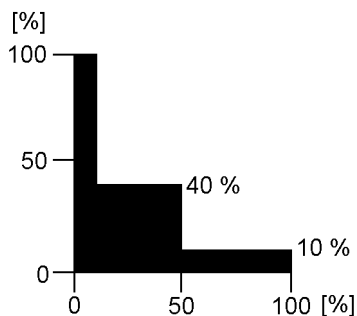


Fig.195234: Graphic illustration Load spectrum L1

Definition:

Power train or parts thereof are subjected to maximum stress only in exceptional cases, but normally only operate at very light loads.

Operating time rates:

- 10 % of the time at maximum load (dead load and 1/1 working load)
- 40 % of the time with dead load and 1/3 working load
- 50 % of the time only with dead load

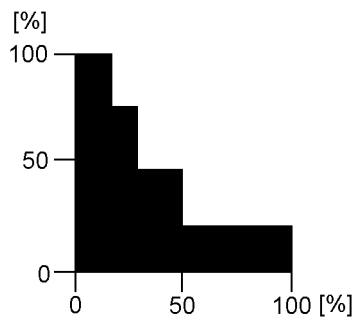
Factor of load spectrum:

$K_m = 0.125$



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*Fig.195235: Graphic illustration Load spectrum L2***Definition:**

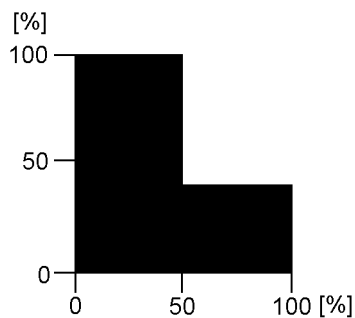
Power train or parts thereof are subjected to maximum load relatively often, but normally only operate at light load.

Operating time rates:

- 1/6 of the time at maximum load (dead load and 1/1 working load)
- 1/6 of the time with dead load and 2/3 working load
- 1/6 of the time with dead load and 1/3 working load
- 50 % of the time only with dead load

Factor of load spectrum:

$$K_m = 0.25$$

Load spectrum class: Heavy L3*Fig.195236: Graphic illustration Load spectrum L3***Definition:**

Power train or parts thereof are frequently subjected to maximum load and normally operate at medium load.

Operating time rates:

- 50 % of the time at maximum load (dead load and 1/1 working load)
- 50 % of the time only with dead load

Factor of load spectrum:

$$K_m = 0.5$$

Load spectrum class: Very heavy L4

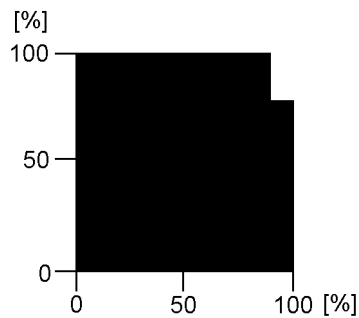


Fig.195237: Graphic illustration Load spectrum L4

Definition:

Power train or parts thereof are regularly subjected to near maximum loads.

Operating time rates:

90 % of the time at maximum load (dead load and 1/1 working load)

10 % of the time only with dead load

Factor of load spectrum:

$K_m = 1$

3.2.2 Determining the effective operating hours T_i

The effective operating hours calculated as follows must be entered into the crane inspection log for the respective inspection interval.

There are four different scenarios:

1. Operating hour meter installed on every winch.
If an operating hour meter is installed on every winch in your crane, the effective operating hours T_i can be read directly during each inspection.
2. Operating hour meter installed for the overall crane drive.
The winch proportion of the total superstructure operating hours must be estimated.
For cranes used in assembly operations, the operating time for the hoist winches can be estimated generally at 20 % of the total operating hours of the superstructure.
3. One operating hour meter is used for both the crane engine and the crane drive.
The winch proportion of the total crane operating hours must be estimated.
For cranes used in assembly operations, the operating time for the superstructure can be estimated at 60 % of the total operating hours of the crane. If the hoist winch proportion is estimated at 20 % of the superstructure operating hours (see previous item), then the result in relation to the **total** operating hours of the crane is: 12 %.
4. No operating hour meter is available.
In this case, the operator must estimate and document the actual operating hours of the winch.
The approximate percentages stated above normally apply to main hoist winches. For auxiliary hoist winches or boom control winches, the proportion of the total operating hours can be significantly less and should therefore be estimated by the operator.

3.2.3 Determining the used proportion of the theoretical service life

For an inspection interval i (max. 1 year), the actually used proportion S_i of the theoretical Service life is derived from the formula:

$$S_i = \frac{K_{m_i}}{K_m} \times T_i$$

Fig.195230

| 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 section on „Theoretical service life“), then the winch may only be operated after conducting a general overhaul.

A general overhaul of the winch is required not later than 10 years after start up.

The general overhaul must be arranged by the operator and carried out by the manufacturer or the manufacturer's authorized representatives and must be documented in the inspection log. After the 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 service life calculation by signing the crane inspection log at each authorized inspection interval.

In such a case, the authorized crane inspector must thoroughly inspect the winch. This comprises at least:

- External visual inspection (leaks damage, deformation, etc.).
- Oil check, especially for metal residues.
- Load test at minimum and maximum rope pull 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 before the end of the 12th operating year and annually thereafter.

3.3 Example

According to the manufacturer's operating instructions, a crane with a separate operating hour meter for the travel drive and the crane drive is classified as follows:

- Power train group: M3
- Load spectrum: Light L1
- Factor of load spectrum: $K_m = 0.125$
- Theoretical service life: $D = 3200$ h

Actual usage proportion S of the theoretical service life is calculated using the individual inspection intervals as follows:

3.3.1 First inspection (first year)

The crane was used for assembly work during the past year:

Load spectrum L1, in other words $Km_1 = 0.125$.

The superstructure operating hour meter indicates 800 h. The winch was operated about 20 % of the time; i.e. $T_1 = 160$ h.

The actual usage proportion S of the theoretical service life at the time of the first inspection is therefore:

$$S_1 = \frac{0,125}{0,125} \times 160 \text{ h} = 160 \text{ h}$$

Fig.195231

Remaining theoretical service life:

$$D_1 = 3200 \text{ h} - 160 \text{ h} = 3040 \text{ h}$$

The above values are recorded in the crane inspection log.

3.3.2 Second inspection (second year)

The crane was used at a harbor for unloading work:

Load spectrum L3, in other words $Km_2 = 0.5$.

The superstructure operating hour meter indicates 2000 h ; i.e., this means that during this period: 2000 h – 800 h = 1200 h (800 h were used during the first year of operation)

The winch was operated about 40 % of the time; i.e. $T_2 = 480$ h.

The actual usage proportion S_2 of the theoretical service life at the time of the second inspection is therefore:

$$S_2 = \frac{0,5}{0,125} \times 480 \text{ h} = 1920 \text{ h}$$

Fig.195232

Remaining theoretical service life:

$$D_2 = 3040 \text{ h} - 1920 \text{ h} = 1120 \text{ h}$$

3.3.3 Third inspection (third year)

The crane was used for assembly work and occasionally at a harbor for unloading work:

Load spectrum L2, in other words $Km_3 = 0.25$.

The superstructure operating hour meter indicates 3000 h ; i.e., this means that during this period: 3000 h – 2000 h = 1000 h (2000 h were used during the first two years of operation)

The winch was operated about 30 % of the time; i.e. $T_3 = 300$ h.

The actual usage proportion S_3 of the theoretical service life at the time of the third inspection is therefore:

$$S_3 = \frac{0,25}{0,125} \times 300 \text{ h} = 600 \text{ h}$$

Fig.195233

Remaining theoretical service life:

$$D_3 = 1120 \text{ h} - 600 \text{ h} = 520 \text{ h}$$

3.4 Chart for determining the theoretically remaining service life

Chart 1 includes an example.

The remaining theoretical service life is to be documented in chart 2.

Chart to determine the remaining theoretical service life of winch No. 1 (Main hoist winch)

Crane type: LTM 1050
 Fabrication No.: 0010 540 08
 Put in service: 12345
 Serial number of winch according to data tag: 0815
 Last general overhaul performed on:
 Configuration data of winch (see Operating Manual):
 Drive gear group: M 3
 Load collective: L 1
 Factor of load collective Km: 0.125
 Theoretical service life D: 3200 hrs.

S_i = Used part of theoretical service life since last inspection
 D_i = Remaining theoretical service life
 D_{i-1} = Remaining theoretical service life after previous inspection
 Km = Factor of load collective, which was taken for calculation of winch.
 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 crane operating hours | Operating hours of super-structure | 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 $D_i = \frac{S_i}{Km_i} \times T_i$ | Remaining theoretical service life $D_i = D_{i-1} - S_i$ | Name of inspector | Signature | Remarks | Name of expert | Signature |
|---|--|--|---------------------------|-----------------------------|------------------------------------|--|--------------------------|--|---|--|-------------------|-----------|---------|----------------|-----------|
| (*) 0 | 10.06.90 | - | - | - | 0 | 0 | 0 | 0 | 0 | 3200 | | | | | |
| 1 | 05.06.91 | L1 | 0,125 | - | 800 | 800 | - | 160 (20% of 800) | 160 | 3040 | Müller | | | | |
| 2 | 20.05.92 | L3 | 0,5 | - | 2000 | 1200 | - | 480 (40% of 1200) | 1920 | 1120 | Huber | | | | |
| 3 | 18.05.93 | L2 | 0,25 | - | 3000 | 1000 | - | 300 (30% of 1000) | 600 | 520 | Maier | | | | |
| 4 | | | | | | | | | | | | | | | |

CAUTION: Perform general overhaul at least once every 10 years! In case of deviation, see guidelines in this chapter.
 General overhaul last performed on :

Fig.121551-en: Table 1

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Chart to determine the remaining theoretical service life of winch No.

- Crane type:
 - Fabrication No.:
 - Put in service:
 - Serial number of winch according to data tag:
 - Last general overhaul performed on:
 - Configuration data of winch (see Operating Manual): M.....
 - Drive gear group: L.....
 - Load collective:
 - 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 crane operating hours | Operating hours of super-structure | 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_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] | [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 :

Fig.121552-en: Table 2

8.04 Inspection of crane wire ropes

| | | |
|----|--|----|
| 1 | Crane ropes | 3 |
| 2 | Importance of inspection | 3 |
| 3 | Personal protective equipment | 3 |
| 4 | Qualification Inspection personnel | 3 |
| 5 | Unscheduled inspection | 3 |
| 6 | Intervals | 4 |
| 7 | Areas | 4 |
| 8 | Documenting inspection results | 5 |
| 9 | Wire ropes and rope end connections | 5 |
| 10 | Degree of severity | 8 |
| 11 | Abbreviations Rope diameter | 8 |
| 12 | Distortions and mechanical damage | 8 |
| 13 | Removal criteria Overview | 8 |
| 14 | Checking for broken strands | 10 |
| 15 | Determining the number of broken wires | 10 |
| 16 | Checking the rope end connection | 15 |
| 17 | Checking of rope diameter | 15 |
| 18 | Corrosion | 18 |
| 19 | Corkscrew-like distortion | 20 |
| 20 | Basket formation | 21 |
| 21 | Protruding, distorted insert or strand | 22 |
| 22 | Loop formation | 23 |
| 23 | Kinking or rope loops pulled closed | 24 |
| 24 | Buckles | 25 |
| 25 | Effects of heat, arcs | 26 |
| 26 | Combined degree of severity | 26 |
| 27 | Flattenings | 26 |
| 28 | Current checklist | 29 |

Fig.195219

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1 Crane ropes

This chapter applies, for example, for the following crane ropes:

- Hoist ropes
- Control ropes for the boom system
- Control ropes of the telescopic boom with rope mechanism: Pull-out ropes and return ropes
- Guy ropes for boom system

2 Importance of inspection

Rope removal criteria: If severe damage reduces the operational safety, then the rope has reached the removal criteria.

The importance of regular inspections is demonstrated by:

- Evaluation of operational safety of ropes
- Determination of rope removal criteria
- Determination of next inspection

3 Personal protective equipment



WARNING

Wires and lubricant!

Severe injury and skin irritation.

- ▶ When working with ropes, always wear work gloves.



WARNING

Protective equipment **not** worn!

Severe injuries.

- ▶ Wear hard hat, safety shoes and safety glasses.

4 Qualification Inspection personnel

Make sure that the following prerequisites are met:

- Inspection personnel are **expert personnel for crane rope inspection**.
- **Expert personnel for crane rope inspection:**
 - Are trained in the inspection of crane ropes according to **DIN ISO 4309** and have practical experience in the evaluation of rope removal criteria.
 - Have practical experience in the evaluation of rope removal criteria according to **DIN ISO 4309**.
- The inspection personnel is assigned (authorized) for the maintenance by the crane operator.

5 Unscheduled inspection

In the following situations the rope must be inspected:

- After unusual strain
- If non visible damage is suspected
- When a rope or the rope end connection is damaged
- When the rope has been placed again after disassembly
- When the rope has been out of service for longer than three months

6 Intervals

Intervals for crane inspection:

- according to determination by **expert personnel for crane rope inspection**
- or **at least once a year**



Note

- ▶ Shortening the inspection interval: The older a rope is the more frequently will wire breaks occur.

Determining factors for determination of inspection intervals are:

- Legal regulations in the country where the crane is operated
- Climate conditions under which the rope drive is utilized
- Power train group
- Results of previous inspections on current or comparable machine and under comparable operating conditions
- Frequency and type of use of a rope
- Service life of rope

7 Areas



WARNING

Broken wires and distortions on ropes in cross over areas!

Rope performance can be greatly reduced. Rope breakage. Death, severe injuries, property damage.

- ▶ Check rope cross over areas especially diligently.

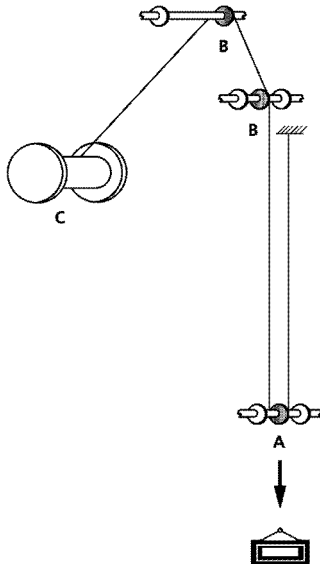


Fig.120969: Important inspection areas for multi layer spooled up ropes

- | | |
|--|---|
| <p>A Rope sections, which run in the area of the load rise into the lower rope pulleys (the load is raised here).</p> <p>B Rope intake on the first rope pulley in the area of the load rise</p> | <p>C Rope sections, which are subjected in the cross over areas to the strongest effects (maximum deflection angle).</p> |
|--|---|

The rope must be checked over the entire length.

The following areas must be checked with special care:

- Rope end connections
- Safety coils and fixed point on the winch
- Areas of the rope which run through the hook block.
- Areas of the rope that run over the rope pulleys or lay on the rope pulleys.
- Areas of the rope that are spooled on the winch, especially cross over areas.
- Areas of the rope which are laying above the compensation pulleys.
- Areas of the rope which are subjected to abrasion due to external components.
- All areas of the rope that are subjected to temperatures above 60 °C.

8 Documenting inspection results



Note

- ▶ Document the results of the inspections in an inspection checklist.
- ▶ Form for an inspection checklist, see section „Current checklist“.

9 Wire ropes and rope end connections



WARNING

Wire rope with impermissible rope end connection!

The wire rope can fail. The load can fall down.

Death, severe bodily injuries, property damage.

- ▶ Select the permissible rope type for the respective application.
- ▶ Select the permissible rope end connection for the respective rope type.
- ▶ Observe and adhere to the warning display on the lock.

| Wire rope application | Rope type |
|---------------------------------|-----------------------------|
| Hoist rope | Rotation-resistant rope |
| Guy rope or control rope | Non-rotation resistant rope |
| Auxiliary rope or assembly rope | Non-rotation resistant rope |

Rope type depending on the application

The type of rope that is selected determines the corresponding rope end connections.

9.1 Rotation-resistant ropes with rope end connections

Use rotation-resistant ropes as **hoist ropes**.

Rotation-resistant ropes are special ropes that produce extremely little torque and twisting at the rope end connection when they are under strain.

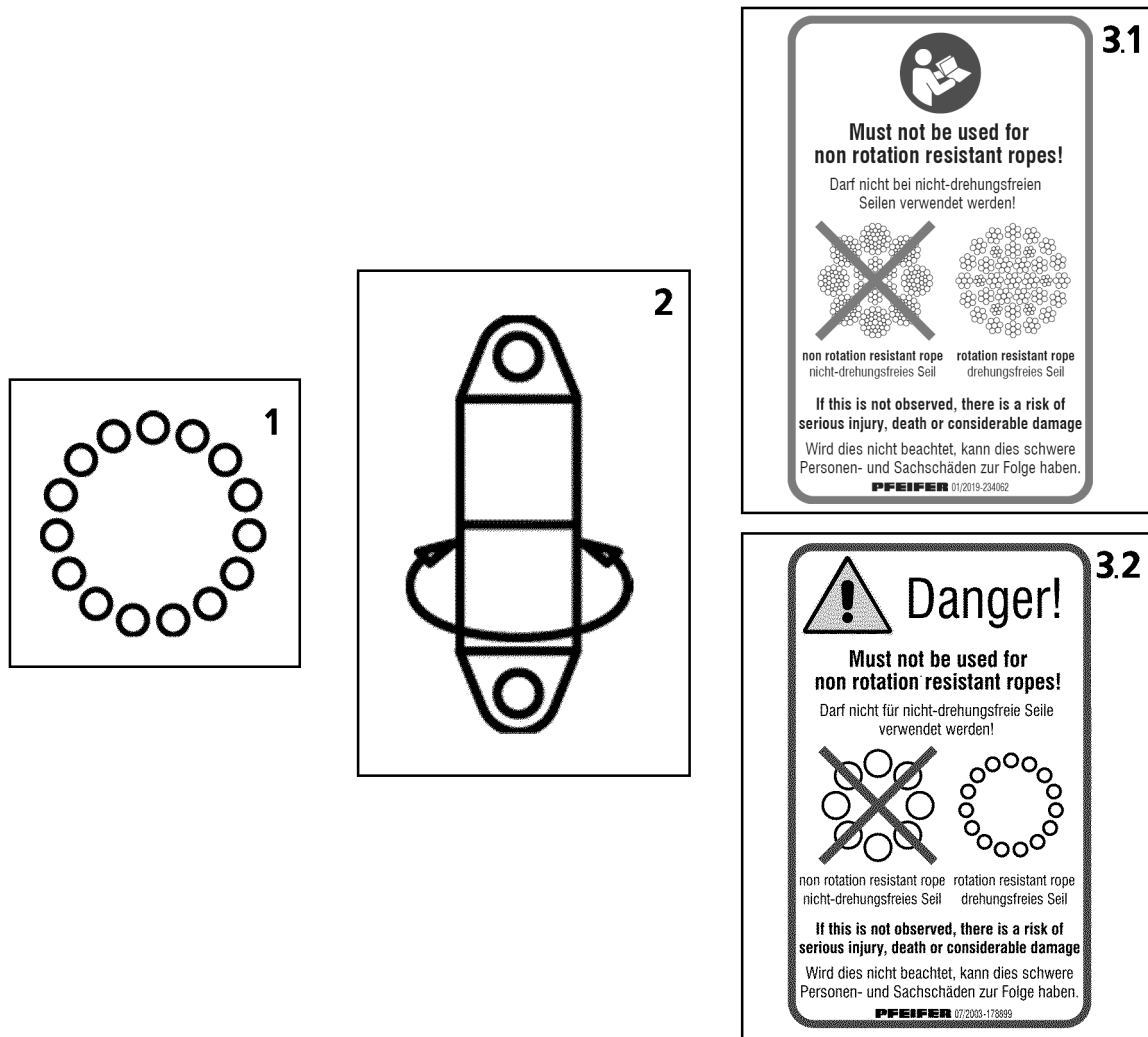


Fig.154083: Symbols for rotation-resistant ropes with rope end connections

- | | | | |
|---|-------------------------------------|-----|--|
| 1 | Rotation-resistant rope symbol | 3.1 | Variation 1: Warning display on the PFEIFER lock |
| 2 | Rotating rope end connection symbol | 3.2 | Variation 2: Warning display on the PFEIFER lock |

Typical rotation-resistant rope structures are wire ropes with 15 to 18 outer strands. Rotation-resistant ropes are symbolically depicted with 15 outer strands (circles), see illustration 1.

9.1.1 Non-rotating rope end connection



Note

- ▶ In the case of a rotation-resistant ropes, Liebherr recommends the use of a lock **without** a swivel or a wedge lock. This can reduce the stress on the hoist ropes.

9.1.2 Rotating rope end connection



Note

- ▶ In the case of rotation-resistant ropes, Liebherr recommends **not** using a lock **with** a swivel and **not** to use a twist compensator / swivel.

To reduce a problematic turning behavior, the following rope end connections can be used in an individual case and after consultation with Liebherr customer service:

- Lock **with** swivel

- Twist compensator / swivel

9.2 Non-twisting ropes with rope end connections



WARNING

Wire rope with impermissible rope end connection!

The wire rope can fail. The load can fall down.

Death, severe bodily injuries, property damage.

- ▶ Use a lock **without** a swivel or a wedge lock.
- ▶ **Never** use a lock **with** a swivel with non-twisting rope.
- ▶ **Never** use a twist compensator / swivel with a non-twisting rope.

Use non-twisting ropes as **guy ropes** or **control ropes**, **auxiliary ropes** or **assembly ropes**.

Non-twisting ropes generate high torque levels on the rope end connection under strain. For this reason, the rope ends must be protected from twisting using an appropriate rope end connection to prevent the wire rope from unscrewing under strain.

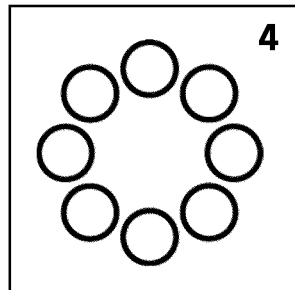


Fig.154084: Symbols for non-twisting ropes with rope end connections

4 Non-twisting rope symbol

5.2 Variation 2: Warning display on the PFEIFER lock / wedge lock

5.1 Variation 1: Warning display on the PFEIFER lock / wedge lock

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Typical non-twisting rope structures are wire ropes with eight or ten outer strands. Non-twisting ropes are symbolically depicted with eight outer strands (circles), see illustration 4.

Only use non-twisting ropes with the following **non-twisting** rope end connections:

- Lock **without** swivel
- Wedge lock

A non-rotating rope end connection is also the mounting of the rope on the fixed point of the winch drum.

10 Degree of severity

The deciding factor for the removal criteria is which removal criteria are present and to which degree they occur.

When various removal criteria are **not** present to a full degree, then the removal criteria must be evaluated as a total entity. For every individual removal criteria a degree of severity must be determined (percentage value).

For a certain rope section the sum of individual degrees of severity results in a **combined degree of severity**, see section „Combined degree of severity“.

When the combined degree of severity is more than 100 %, then the rope must be taken down.

11 Abbreviations Rope diameter

| Abbreviations | Description |
|---|--|
| Rope nominal diameter d | Rope diameter, identification of rope |
| Reference diameter d_{ref} | Measured rope diameter of a straight rope section, directly after placing the rope |
| 6d | Length of 6-fold rope nominal diameter |
| 30d | Length of 30-fold rope nominal diameter |

Abbreviations Rope diameter

12 Distortions and mechanical damage



WARNING

Distortions and mechanical damage!

Operational safety significantly disturbed, uneven load distribution within the rope.

- ▶ Have the manufacturer check if the distorted and damaged area can be severed.

Visible form changes often occur localized or in short rope sections.

When a safe operation of the rope is ensured, a distorted and damaged area can be severed.

13 Removal criteria Overview

The following chart provides an overview between removal criteria and the respective method for inspection. The degree is described, when the removal criteria is reached.

The removal criteria is described in detail in the subsequent sections.

**Note**

When the rope for parallel operation has reached the removal criteria:

- ▶ Often, both ropes must be replaced. The new rope has a larger diameter and other elongation characteristics.

| Removal criteria | Degree for removal criteria | Inspection method |
|---|---|---|
| Broken strands | One strand is broken | Visual check |
| Broken wires on ropes, which run over rope pulleys and are spooled in multiple layers | Maximum number of broken wires reached, see Section Determining the number of broken wires | Count |
| Broken wire in the strand valleys | Two or more broken wires in strand valleys, on the contact points of two neighboring strands within an angular length (corresponds approx. to 6d) | Count |
| Broken wires in the area of the rope end connection | Two or more broken wires, according to decision of expert personnel for crane rope inspection | Visual inspection, test with marlin spike |
| Broken wire nests | On occurrence | Visual check |
| Reduction rope diameter at even diameter reduction | Maximum reduction of rope diameter reached | Measurement, calculation |
| Localized increase of rope diameter | Maximum increase of rope diameter reached | Measurement |
| Significant corrosion | Surface of rope is significantly affected or rust film emerges, according to decision of expert personnel for crane rope inspection | Visual check |
| Corkscrew-like distortion | Maximum permissible distortion reached | Measurement, calculation |
| Basket formation | On occurrence | Visual check |
| Wires or bunches of wires protruding from the rope | On occurrence, if more than one wire protrudes from the rope | Visual check |
| Flattenings | Larger than half of the diameter of the outer strand, according to decision of expert personnel for crane rope inspection | Visual check |
| Loop formation | Loops on several wires | Visual check |
| Kinking or remaining distortion | On occurrence | Visual check |
| Buckles or contusions | On occurrence, according to decision of expert personnel for crane rope inspection | Visual check |

| Removal criteria | Degree for removal criteria | Inspection method |
|---|---|---|
| Heat influence, electric voltage | Bluish discoloration, broken or melted wires | Visual check |
| Damage on rope end connections: Material cracks, deformation, wear, corrosion, traces of slipping between the locking clamp and rope | According to decision of expert personnel for crane rope inspection | Visual inspection |
| Combined degree of severity | Degree of severity 100 % or above, according to decision of expert personnel for crane rope inspection | Calculation of individual degrees of severity |

Removal criteria Overview

14 Checking for broken strands

A strand consists of several individual wires.

If a complete strand is broken:

- ▶ Take the rope down.

15 Determining the number of broken wires

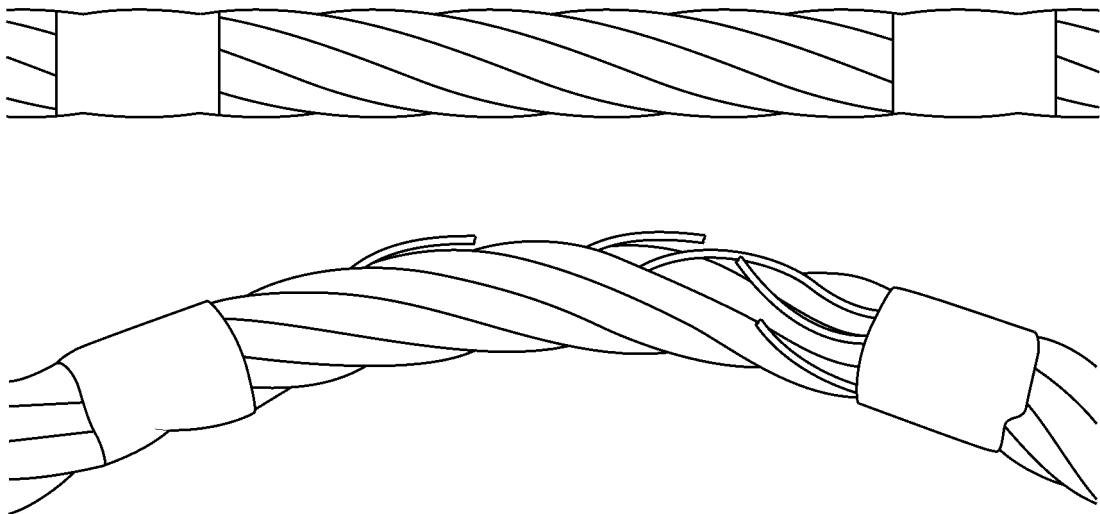


Fig.120980: Determine broken wires by bending

By bending the rope, broken wires can be recognized better.

Make sure that the following prerequisites are met:

- The rope is clean.
- Inspection checklist is on hand.

15.1 Scattered occurring broken wires

The following different rope types each have their own chart for the permissible number of broken wires:

- Single layer and parallel roped ropes

- Rotation resistant ropes

The charts in this section are valid exclusively for **scattered occurring broken wires**.

15.1.1 Wire break increase rate

The wire break increase rate is an increase of broken wires, which can skyrocket with increasing use of the rope.

- Include the inspection checklists for the previous inspection and use it to draw a conclusion for the wire break rate increase.

15.1.2 Single layer and parallel roped ropes

| Rope category number RCN | Total number of load carrying wires in the outer strand layer of rope ¹ n | Number of visible outer wire breaks ² | | | | | |
|--------------------------|---|---|-----------------------------------|----------------------------------|-----------------------------------|---|-----------------------------------|
| | | Rope sections, which run over steel pulleys and / or wind up on a single layer spooling drum (coincidental distribution of broken wires) | | | | Rope sections, which wind up on a multi layer drum ³ | |
| | | Class M1 to M4, or class unknown ⁴ | | | | All classes | |
| | | Lang lay | | Even lay | | Lang lay and even lay | |
| | | Over a length of 6d ⁵ | Over a length of 30d ⁵ | Over a length of 6d ⁵ | Over a length of 30d ⁵ | Over a length of 6d ⁵ | Over a length of 30d ⁵ |
| 01 | $n \leq 50$ | 2 | 4 | 1 | 2 | 4 | 8 |
| 02 | $51 \leq n \leq 75$ | 3 | 6 | 2 | 3 | 6 | 12 |
| 03 | $76 \leq n \leq 100$ | 4 | 8 | 2 | 4 | 8 | 16 |
| 04 | $101 \leq n \leq 120$ | 5 | 10 | 2 | 5 | 10 | 20 |
| 05 | $121 \leq n \leq 140$ | 6 | 11 | 3 | 6 | 12 | 22 |
| 06 | $141 \leq n \leq 160$ | 6 | 13 | 3 | 6 | 12 | 26 |
| 07 | $161 \leq n \leq 180$ | 7 | 14 | 4 | 7 | 14 | 28 |
| 08 | $181 \leq n \leq 200$ | 8 | 16 | 4 | 8 | 16 | 32 |
| 09 | $201 \leq n \leq 220$ | 9 | 18 | 4 | 9 | 18 | 36 |
| 10 | $221 \leq n \leq 240$ | 10 | 19 | 5 | 10 | 20 | 38 |
| 11 | $241 \leq n \leq 260$ | 10 | 21 | 5 | 10 | 20 | 42 |
| 12 | $261 \leq n \leq 280$ | 11 | 22 | 6 | 11 | 22 | 44 |

| Rope category number RCN | Total number of load carrying wires in the outer strand layer of rope ¹ n | Number of visible outer wire breaks ² | | | | | |
|-----------------------------|---|---|--------------------------------------|-------------------------------------|--------------------------------------|---|--------------------------------------|
| | | Rope sections, which run over steel pulleys and / or wind up on a single layer spooling drum (coincidental distribution of broken wires) | | | | Rope sections, which wind up on a multi layer drum ³ | |
| | | Class M1 to M4, or class unknown ⁴ | | | | All classes | |
| | | Lang lay | | Even lay | | Lang lay and even lay | |
| | | Over a length of 6d ⁵ | Over a length of 30d ⁵ | Over a length of 6d ⁵ | Over a length of 30d ⁵ | Over a length of 6d ⁵ | Over a length of 30d ⁵ |
| 13 | 281 ≤ n ≤ 300 | 12 | 24 | 6 | 12 | 24 | 48 |
| | n > 300 | 0.04 x n | 0.08 x n | 0.02 x n | 0.04 x n | 0.08 x n | 0.16 x n |

Note: Ropes with outer strands in the Seale type, number of wires per strand 19 or less (for example 6 × 19 Seale), are classified in this chart as two lines over the line, which would be defined due to the number of load carrying wires in the outer strands.

Number of visible broken wires (reached or exceeded) for removal criteria is reached, for **single-layer** and **parallel roped ropes** according to **DIN ISO 4309**

- 1) For the purpose of this international standard, fill wires are not considered to be load carrying wires and are not included in the value for n.
- 2) A broken wire has two ends (counted as one wire).
- 3) The values apply for damage in the cross over areas and the layers of coils due to deflection angles (not for rope sections, which run only over rope pulleys and do not spool up on the winch).
- 4) For ropes on drive gears of groups M5 to M8 twice the number of broken wires listed can be used.
- 5) d = Rope nominal diameter

- ▶ Check the rope over the entire length for visible broken wires.

When visible broken wires are scattered present:

- ▶ On the point of a broken wire, mark the rope sections on a length of 30d in both directions.
- ▶ Count visible broken wires in the marked rope sections and record them.
- ▶ Take the RCN (Rope category number) from the manufacturer's documentation of the rope.

When the make for single layer and parallel roped ropes is **not** listed in the chart:

- ▶ Determine the total number of load carrying wires in the rope: Add all wires in the strands of the outer layer, do **not** count fill wires.
- ▶ Compare the number of broken wires of each marked rope section 30d with the number of broken wires in the chart.

When the number of visible broken wires is smaller than listed in the chart:

- ▶ Within the rope section with the most broken wires: Mark the rope section with the most broken wires on a length of 6d.
- ▶ Count visible broken wires in the marked rope sections 6d and record them.
- ▶ Compare the number of broken wires of the marked rope section with the number of broken wires in the chart.

When the number of visible broken wires is equal to or larger than that listed in the chart:

- ▶ Take the rope down.
- ▶ Enter the results in the inspection checklist.

15.1.3 Rotation resistant ropes

| Rope category number RCN | Total number of load carrying wires in the outer strands of rope ¹ n | Number of visible outer wire breaks ² | | | |
|-----------------------------|--|---|-----------------------------------|---|-----------------------------------|
| | | Rope sections, which run over steel pulleys and / or wind up on a single layer spooling drum (coincidental distribution of broken wires) | | Rope sections, which wind up on a multi layer drum ³ | |
| | | Over a length of 6d ⁴ | Over a length of 30d ⁴ | Over a length of 6d ⁴ | Over a length of 30d ⁴ |
| 21 | 4 strands n ≤ 100 | 2 | 4 | 2 | 4 |
| 22 | 3 or 4 strands n ≥ 100 | 2 | 4 | 4 | 8 |
| | At least 11 strands in the outer layer | | | | |
| 23-1 | 71 ≤ n ≤ 100 | 2 | 4 | 4 | 8 |
| 23-2 | 101 ≤ n ≤ 120 | 3 | 5 | 5 | 10 |
| 23-3 | 121 ≤ n ≤ 140 | 3 | 5 | 6 | 11 |
| 24 | 141 ≤ n ≤ 160 | 3 | 6 | 6 | 13 |
| 25 | 161 ≤ n ≤ 180 | 4 | 7 | 7 | 14 |
| 26 | 181 ≤ n ≤ 200 | 4 | 8 | 8 | 16 |
| 27 | 201 ≤ n ≤ 220 | 4 | 9 | 9 | 18 |
| 28 | 221 ≤ n ≤ 240 | 5 | 10 | 10 | 19 |
| 29 | 241 ≤ n ≤ 260 | 5 | 10 | 10 | 21 |
| 30 | 261 ≤ n ≤ 280 | 6 | 11 | 11 | 22 |
| 31 | 281 ≤ n ≤ 300 | 6 | 12 | 12 | 24 |
| | n > 300 | 6 | 12 | 12 | 24 |

Note: Ropes with outer strands in Seale type, number of wires in each strand 19 or less (for example 18 × 19 Seale - WSC), are classified in this chart as two lines over the line, which would be defined due to the number of load carrying wires in the outer strands.

*Number of visible broken wires (reached or exceeded) is achieved in the rope removal criteria, for **rotation-resistant** ropes according to **DIN ISO 4309***

1) For the purpose of this international standard, fill wires are not considered to be load carrying wires and are not included in the value for n.

2) A broken wire has two ends (counted as one wire).

3) The values apply for damage in the cross over areas and the layers of coils due to deflection angles (not for rope sections, which run only over rope pulleys and do not spool up on the drum).

4) d = Rope nominal diameter

- ▶ Check the rope over the entire length for visible broken wires.

When visible broken wires are scattered present:

- ▶ On the point of a broken wire, mark the rope sections on a length of 30d in both directions.
- ▶ Count visible broken wires in the marked rope sections and record them.
- ▶ Take the RCN (Rope category number) from the manufacturer's documentation of the rope.

When the make for rotation-resistant ropes is **not** listed in the chart:

- ▶ Determine the total number of load carrying wires in the rope: Add all wires in the strands of the outer layer, do **not** count fill wires.

- ▶ Compare the number of broken wires of each marked rope section 30d with the number of broken wires in the chart.

When the number of visible broken wires is smaller than listed in the chart:

- ▶ Within the rope section with the most broken wires: Mark the rope section with the most broken wires on a length of 6d.
- ▶ Count visible broken wires in the marked rope sections 6d and record them.
- ▶ Compare the number of broken wires of the marked rope section with the number of broken wires in the chart.

When the number of visible broken wires is equal to or larger than that listed in the chart:

- ▶ Take the rope down.
- ▶ Enter the results in the inspection checklist.

15.2 Broken wire in the strand valleys

The broken wires in these areas point to the fact that the condition in the inside of the rope is deteriorating.

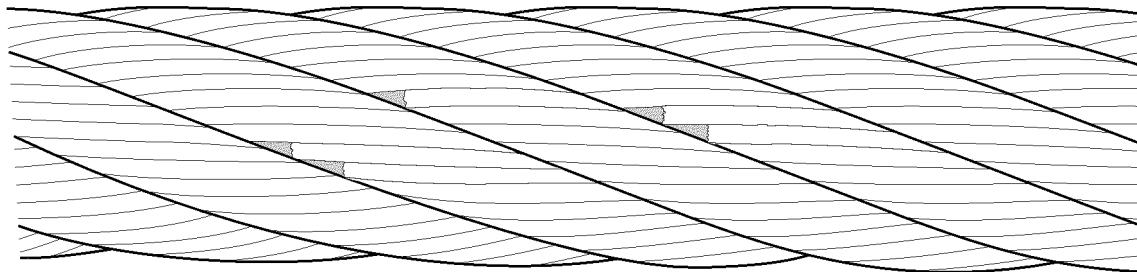


Fig.121005: Broken wire in the strand valleys

When two or more broken wires occur within a 6d long rope section:

- ▶ Take the rope down.

15.3 Broken wires on rope end connections

- ▶ Check the area near the rope end connections and carefully check for broken wires.

Loose wires are a sign of broken wires in the rope end connection.

- ▶ Use a marlin spike to check for loose wires.

When broken wires are near a rope end connection and two or more wires are affected:

- ▶ Take the rope down.

or

When the remaining rope lengths fulfil the minimum number of remaining coils in all operating positions:

Shorten the rope, see chapter 7.05.50.

- ▶ Attach the rope end connection.

15.4 Broken wires in rope sections, which are not spooled up on the winch

When the broken wires are concentrated on one or two strands, the removal criteria can be present at fewer broken wires as noted in the chart (rope section in the length of 6d).

- ▶ Have the rope removal criteria determined by **expert personnel for crane rope inspection**.

15.5 Broken wire nests

When broken wires are very close to each other or when the broken wires are concentrated on one strand, then the rope must be taken down, even at fewer broken wires than noted in the chart (rope section 6d).

- ▶ Have the rope removal criteria determined by **expert personnel for crane rope inspection**.

16 Checking the rope end connection

The removal criteria are evaluated by the **expert personnel for crane rope inspection**.

Check for broken wires, see section „Broken wires on rope end connections“.

16.1 Pressed rope end connection

Example of a pressed rope end connection: Locking clamp.

- ▶ Check the rope end connections for signs of possible slipping between the locking clamp and the wire rope.
- ▶ Check the rope end connections for material cracks.
- ▶ Check rope end connections for corrosion, deformation and wear.

16.2 Enlarged rope end connection

Example of an enlarged rope end connection: Locking cast sleeve.

- ▶ If present: Remove the beam.
- ▶ Check rope end connections for corrosion, deformation and wear.

If the rope connection is on a flat rope:

- ▶ Check the cone setting, see chapter 8.04.10.

16.3 Detachable rope end connection

Example of a detachable rope end connection: Wedge lock.

- ▶ Check that the rope end connections are fit tightly and correctly installed.
- ▶ Check the wire rope inside and at the outlet of the rope end connection. Check the rope according to the removal criteria in this chapter.

17 Checking of rope diameter

17.1 Even reduction of rope diameter



WARNING

Spooling problems due to reduced rope diameter!

- ▶ Take the rope down even when the removal criteria according to **DIN ISO 4309** has not yet been reached.

The values in this section do **not** apply for rope sections, which were damaged in cross over areas due to multi layer spooling on a winch.

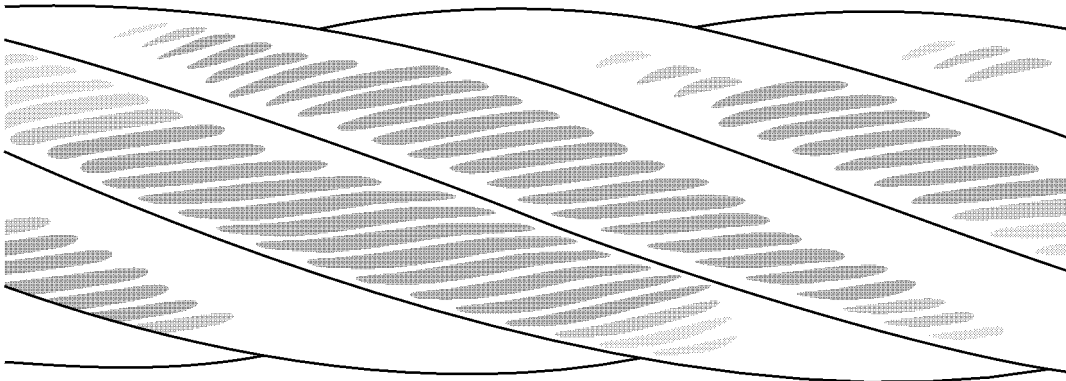


Fig.121001: External abrasion on the rope

The rope diameter changes due to abrasion, settling and external influences.

Abrasion of cover wires of outer strands of rope due to frictional contact. Especially in those areas where ropes are in contact with the rope pulleys during start up or slow down of the load.

Wear is increased by lack of or incorrect lubrication and the effect of dust.

Abrasion reduces the tensile strength of steel ropes because the cross section of the steel is reduced.

Additional possible causes for reduction of rope diameter:

- Wear in the inside of the rope
- Wear of fiber insert
- Breakage of a steel insert
- Broken inner strands

This section is valid solely for the following ropes:

- Ropes, which wind up on single layer winches
- Ropes, which run through a steel rope pulley

$$d_v = \frac{d_{ref} - d_m}{d} \times 100 \%$$

Fig.121372: Formula Reduction of rope diameter

d_v = even reduction of rope diameter

d_{ref} = rope diameter, which was determined before placement

d_m = measured rope diameter

d = rope nominal diameter: Take value from inspection checklist

The following chart applies exclusively for ropes, which wind up on single layer winches and / or run through a steel rope pulley.

| Rope type | Even reduction of diameter d_v (in percentages of rope nominal diameter d) | Classification of degree of severity | |
|-------------------------------------|--|--------------------------------------|------------|
| | | Description | % |
| | Less than 6 % | — | 0 |
| Single layer rope with fiber insert | 6 % and above, but less than 7 % | Light | 20 |
| | 7 % and above, but less than 8 % | Medium | 40 |
| | 8 % and above, but less than 9 % | High | 60 |
| | 9 % and above, but less than 10 % | Very high | 80 |
| | 10 % and above | Rope removal criteria | 100 |

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| Rope type | Even reduction of diameter d_v (in percentages of rope nominal diameter d) | Classification of degree of severity | |
|--|--|--------------------------------------|------------|
| | | Description | % |
| Single layer rope with steel insert or parallel roped rope | Less than 3.5 % | — | 0 |
| | 3.5 % and above, but less than 4.5 % | Light | 20 |
| | 4.5 % and above, but less than 5.5 % | Medium | 40 |
| | 5.5 % and above, but less than 6.5 % | High | 60 |
| | 6.5 % and above, but less than 7.5 % | Very high | 80 |
| | 7.5 % and above | Rope removal criteria | 100 |
| Rotation-resistant rope | Less than 1 % | — | 0 |
| | 1 % and above, but less than 2 % | Light | 20 |
| | 2 % and above, but less than 3 % | Medium | 40 |
| | 3 % and above, but less than 4 % | High | 60 |
| | 4 % and above, but less than 5 % | Very high | 80 |
| | 5 % and above | Rope removal criteria | 100 |

Degree of severity and removal criteria depending on rope type and even diameter reduction according to DIN ISO 4309

The medium value from the smallest and the largest measured diameter results in the value for d_m .

- ▶ Measure rope diameter on several locations and calculate measured diameter d_m .
- ▶ Calculate even reduction d_v of rope diameter with formula.
- ▶ Read the degree of severity in the chart, depending on the rope type.
- ▶ Document the degree of severity in the inspection checklist.

When the degree of severity has reached 100 %:

- ▶ Take the rope down.

17.2 Localized reduction of rope diameter

Localized reductions of rope diameter point to the fact that a rope insert may have failed, for example.

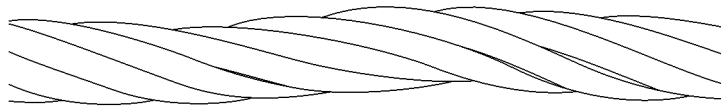


Fig. 120983: Localized reduction of rope diameter

- ▶ Check the rope for localized reduction of rope diameter.

When a localized reduction of the rope diameter is found:

- ▶ Take the rope down.

17.3 Localized increases of rope diameter

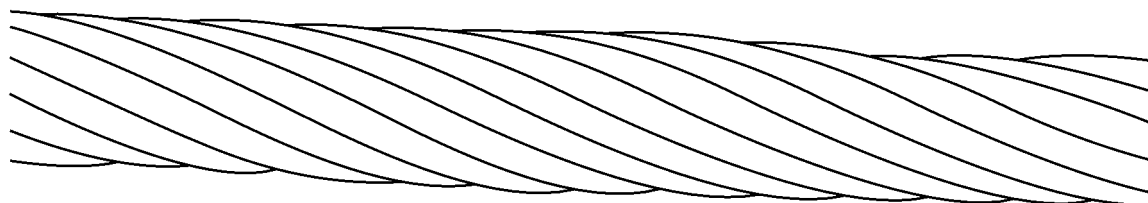


Fig. 120992: Localized increase of rope diameter

An increase over a longer area of the rope can be caused by absorption of moisture in the fiber insert or due to corrosion in the inside of the rope.

| Rope insert | Maximum increase of rope diameter during operation |
|-------------|--|
| Steel | 5 % |
| Fiber | 10 % |

- ▶ Check the rope for increases in rope diameter.

When the increases exceed the maximum values:

- ▶ Take the rope down.

18 Corrosion

Corrosion occurs due to insufficient lubrication, in maritime climates and in an atmosphere polluted by industrial fumes.

External corrosion is indicated by a rough wire surface. A superficial rust film can be wiped off.

Significant corrosion reduces the strength and elasticity of the rope due to the reduction of the rope diameter.

Inner corrosion is hard to detect.

Do **not** use solvents to clean the rope.

Make sure that the following prerequisite is met:

- Rope is cleaned (wiped and brushed).

18.1 External corrosion

The various types of corrosion are classified and noted with the classification for removal criteria in percentages:

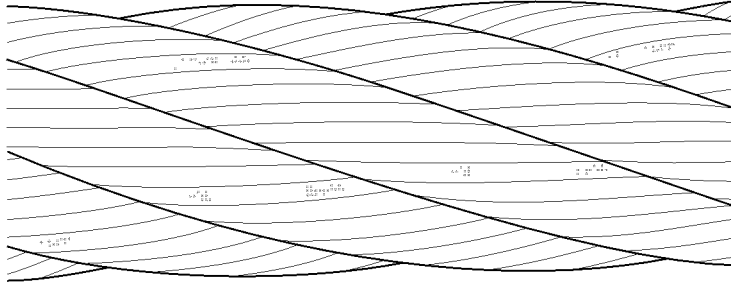


Fig.120984: Surface light corrosion: Classification 0 % of removal criteria

Superficial light corrosion (rust film) can be wiped off.

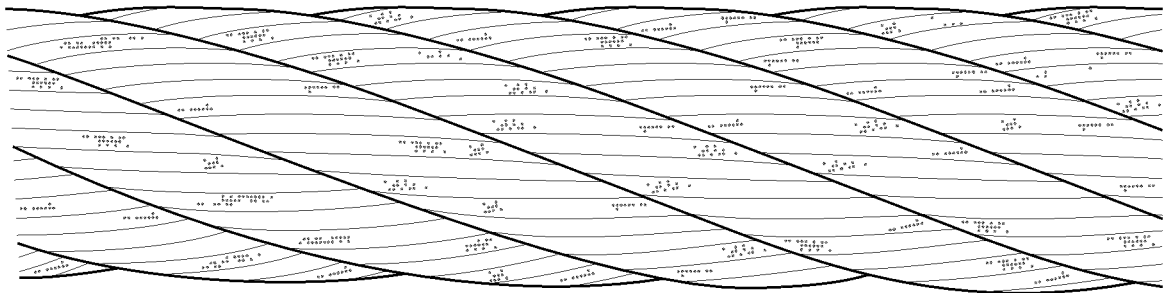


Fig.120985: Surface feels rough: Classification 20 % of removal criteria

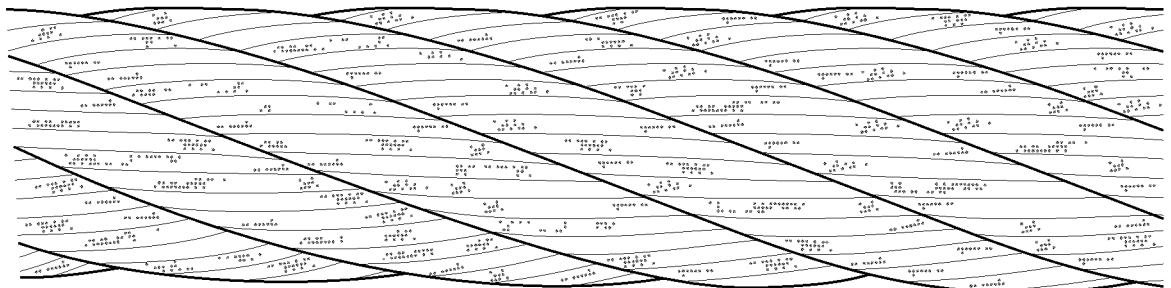


Fig.120986: Surface feels very rough: Classification 60 % of removal criteria

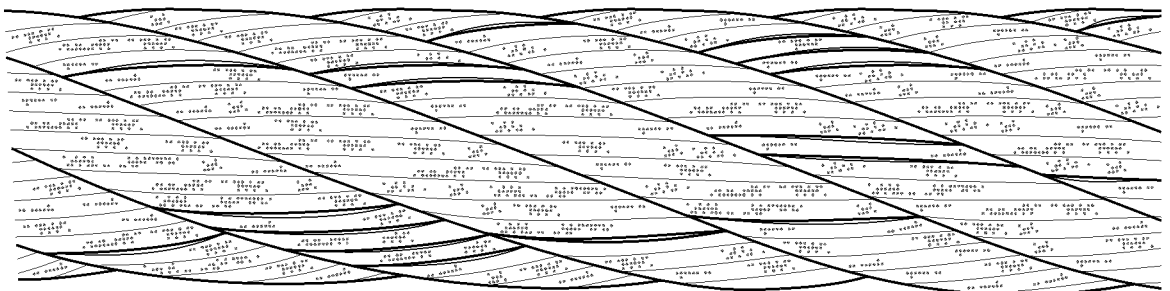


Fig.120987: Surface very decayed, spaces between individual wires can be easily recognized: Classification 100 % of removal criteria

When 100 % of removal criteria is reached:

- ▶ Take the rope down.

18.2 Internal corrosion

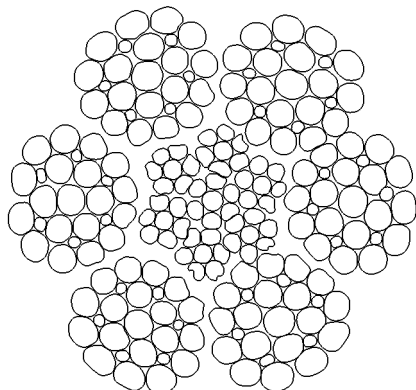


Fig.120982: Corrosion in the inside of the rope

Internal corrosion is present when clearly visible corrosion particles migrate between the valleys of the outer strands: Classification 100 % removal criteria.

When internal corrosion is found:

- ▶ Have the rope removal criteria evaluated by **expert personnel for crane rope inspection** or take the rope down.

18.3 Friction corrosion

Friction corrosion occurs as a type of brown powder, which migrates from the inside of the rope to the outside: Classification 100 % of removal criteria.

- ▶ Check the rope diligently for friction corrosion.

If friction corrosion is found:

- ▶ Have the rope removal criteria evaluated by **expert personnel for crane rope inspection** or take the rope down.

19 Corkscrew-like distortion



Fig.120988: Corkscrew-like distortion

Distortion where the rope is in the form of a corkscrew along its longitudinal axis.

Effects of corkscrew-like distortion:

- Irregular rope drive
- Rope wear
- Broken wire
- Bearing damage on rope pulleys

If the distortion is very pronounced, then other components can be affected in their function when the affected rope section runs through in crane operation.

- Check the entire rope for corkscrew-like distortion.

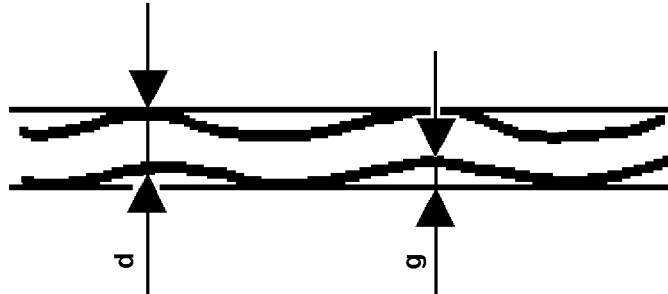


Fig.123988: Example for corkscrew-type distortion

d Rope nominal diameter **g** Distance

| Rope section | Conditions for removal criteria, formula |
|---|--|
| Straight rope section, which does not run through or around a rope pulley or spool up on a winch | $g \geq \frac{1}{3} \times d$ |
| Straight rope section, which runs through or around a rope pulley or spools up on a winch | $g \geq \frac{1}{10} \times d$ |

When corkscrew-like distortion is present:

- Determine the rope nominal diameter **d** and distance **g** on the rope.
- Check the removal criteria with the formula.

When the removal criteria is reached:

- Take the rope down.

20 Basket formation

This distortion occurs due to different layers between the outer strand layers and the inside of the rope.

Causes for basket formation are high angular pull angles during the run over the rope pulleys and run-in rope pulleys. Even load distribution over the entire cross section is not possible.

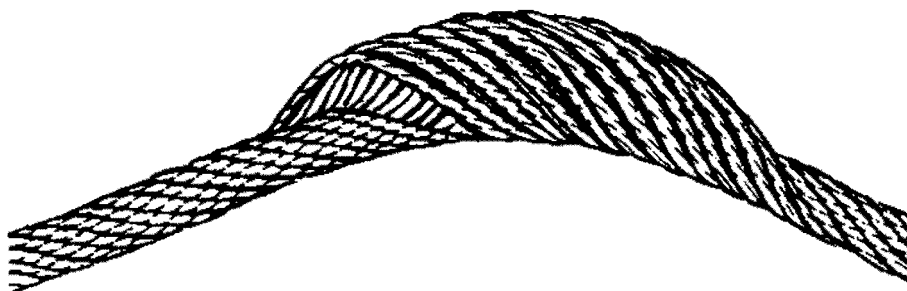


Fig.120989: Basket formation

► Check the entire rope for basket formation.

When basket formation is present:

► Take the rope down.

21 Protruding, distorted insert or strand

This distortion is a special form of basket formation. The insert or the core of the rope protrudes between the outer strands or an outer strand protrudes from the rope banding.

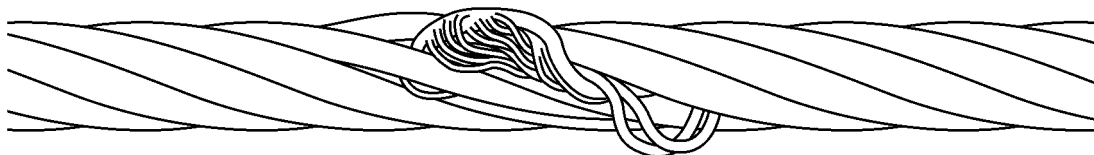


Fig.120990: Protrusion of an insert (rope single layer)



Fig.120991: Distorted or protruding strand

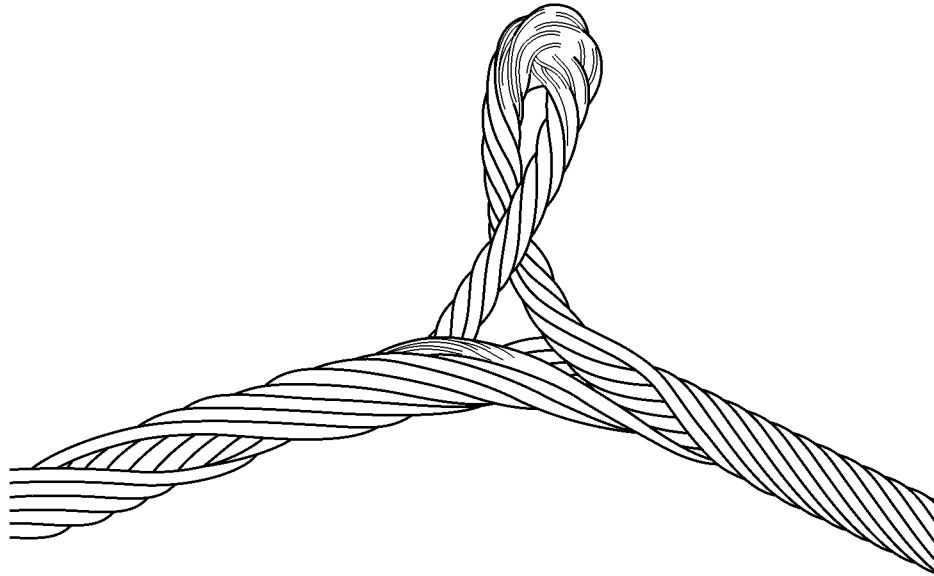


Fig.121373: Protrusion of rope insert on rotation-resistant rope

When the insert or a strand protrudes or is distorted, take the rope down. Have authorized inspector for crane rope inspection check if the rope area with the distortion can be removed.

- ▶ Check the entire rope for protruding, distorted insert or strand.

When protruding, distorted insert or braid is present:

- ▶ Take the rope down.
- ▶ Have **expert personnel for crane rope inspection** check if the rope area with the distortion can be removed.

22 Loop formation

At loop formation individual or several wires protrude from the rope and bulge upward (bird-caging).

These areas are most often on the opposite side of the rope pulley groove.

Make sure that the following prerequisite is met:

- There are **no** broken wire ends present.

If only a core wire of the rope insert protrudes through the outer strands, then the rope does not have to be taken down when:

- The wire can be removed.
- The wire does not disturb other elements of the rope drive.

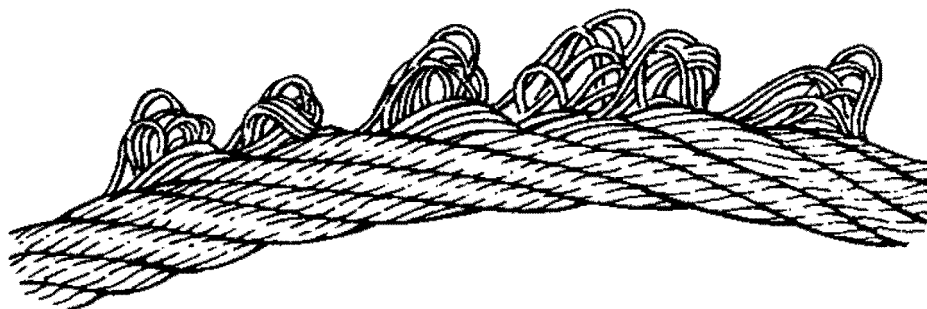


Fig.120993: Emergence of individual wires

► Check rope for loop formation.

When solely a core wire protrudes:

► Remove the core wire.

When several wires are affected from the loop formation:

► Take the rope down.

23 Kinking or rope loops pulled closed

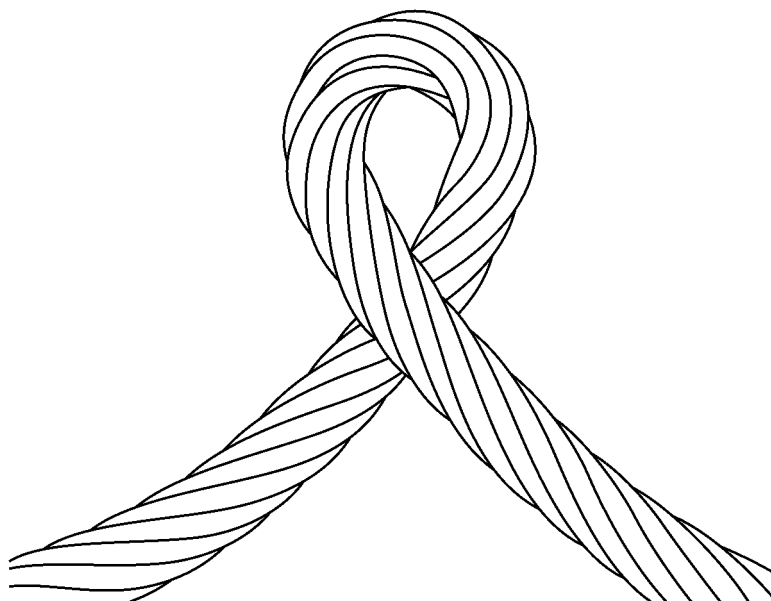


Fig.121007: Kinking or rope loop pulled closed

At this deformation a loop has formed in the rope, without the possibility to rotate around its own axis during a load. The rope is subjected to significant wear.

The rope is significantly distorted. The strength remains only in part.

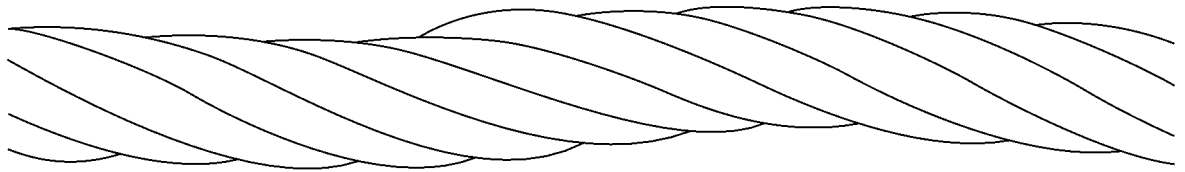


Fig.121002: Positive Kinking

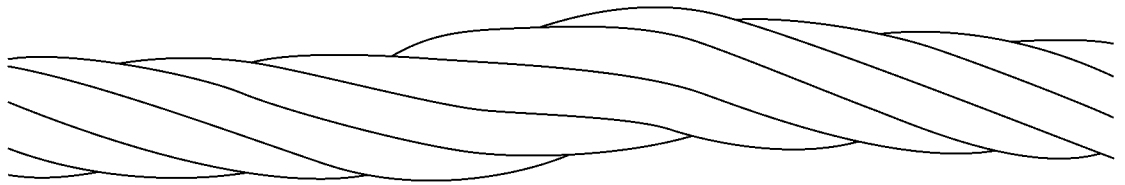


Fig.121003: Negative Kinking

- ▶ Check the rope for kinking or rope loops pulled closed.

When kinking or rope loops pulled closed occur:

- ▶ Take the rope down.

24 Buckles

Buckles are angular deformations. The rope was damaged due to external influences. Strong deformations of the rope cause stronger wear.

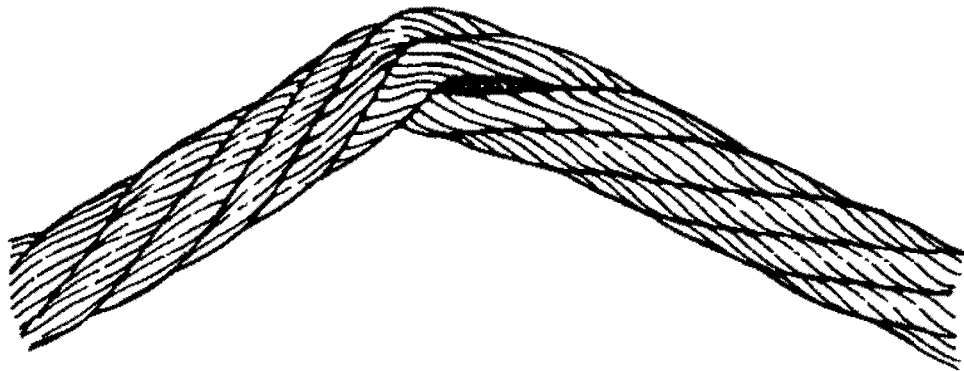


Fig.120999: Severe buckle

A buckle is a serious matter if a fold is visible on the underside of the rope.

When buckles are present:

- ▶ Have the rope inspected by **expert personnel for crane rope inspection**.

When a distortion and degree of severity permits further operation:

- ▶ Shorten the inspection interval.

When the removal criteria is reached:

- ▶ Take the rope down.

25 Effects of heat, arcs

Damage caused to the rope by welding work, for example.

Exceptional thermal effect is visible through tempering colors, the loss of lubricant and by localized melting of wires.

When thermal effect has occurred on the rope:

- ▶ Take the rope down.

26 Combined degree of severity



Note

- ▶ For a method to determine the effect of a combined degree of severity and damage to the rope, see **DIN ISO 4309**.

When the condition of the rope deteriorates, then often a combination of various causes occurs.

To determine the degree of severity, the **expert personnel for crane rope inspection** must:

- take different damage within a rope section into account
- evaluate the entire effect of the damage and the distortions
- decide about the operational safety of the rope
- evaluate if inspection intervals must be adjusted
- decide if the rope must be taken down

When the combined degree of severity is more than 100 %, then the rope must be taken down.

27 Flattenings

Effects of flattenings on the rope:

- Rope sections with flattenings, which move **over the rope pulleys** tend to higher wear and a higher number of broken wires.
- Rope pulleys can be damaged.
- Flattenings on **stationary ropes** (guy ropes boom) promote quicker corrosion, especially in the areas where the outer strands have opened.

Flattened rope sections must be checked in shorter intervals for broken wires and corrosion.

27.1 Shorting the intervals

- ▶ Check the entire rope for flattenings.

When flattenings are present on stationary ropes:

- ▶ Shorten the intervals for rope inspection.

When it is **not** possible to shorten the intervals for the rope inspection:

- ▶ Take the rope down.

27.2 Improper mechanical damage

An improper mechanical damage occurs, for example, when the rope is trapped.

- ▶ Take the rope down immediately or shorten it, see chapter 7.05.50.

27.3 Operational transverse pressure

Operational transverse pressure causes flattenings, for example in the incline range of multi layer spooling.

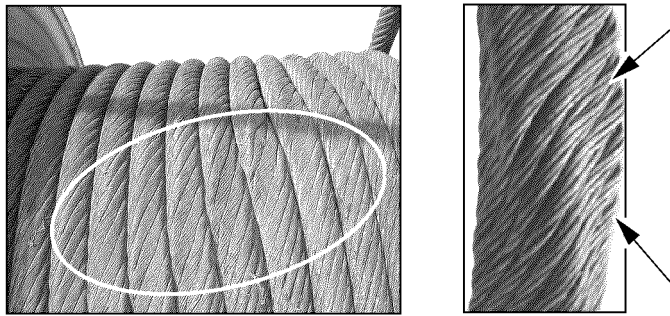


Fig.114002: Flattenings

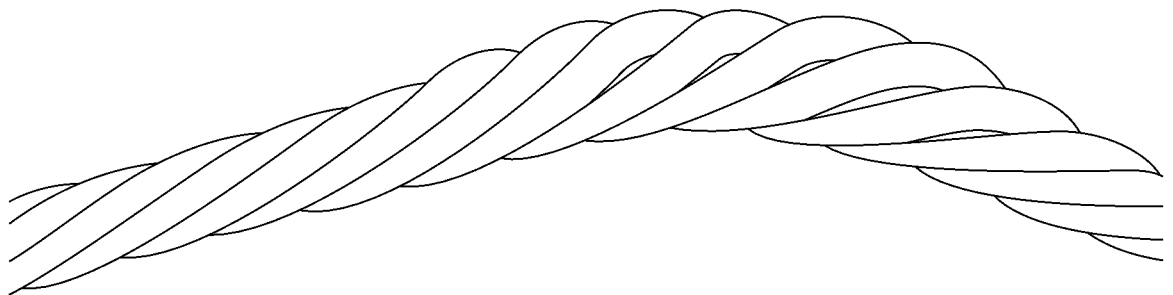


Fig.120996: Flattenings on multi layer windings

- ▶ Check the first rope layer of the winches for crushed areas and distortions.

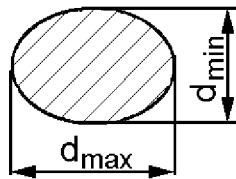


Fig.121006: Largest and smallest diameter on the distortion area

$$V = \frac{d_{\max} - d_{\min}}{d} \times 100 \%$$

Fig.121374: Formula to calculate the distortion

V Rope distortion in percentages

d_{ma} Largest diameter of distortion area

x

d Rope nominal diameter

d_{mi} Smallest diameter of distortion area

n

When distortions are present:

- ▶ Determine the number of broken wires See section „Determining the number of broken wires“.

When the number of permissible broken wires is exceeded:

- ▶ Take the rope down.
- ▶ Calculate the distortion V with the formula and document it in the inspection checklist.

When distortion V is larger than 5 %:

- ▶ Check the rope before every assembly and erection procedure.

When distortion V is larger than 10 %:

- ▶ Document the degree of severity of 50 % in the inspection checklist.

When distortion V is larger than 20 %:

- ▶ The degree of severity of 100 % is reached: Take the rope down.

28 Current checklist

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| Crane and use: | | RCN ³⁾ : | | Installation date: | | | | | | | | | | | | | | | | | |
|------------------------------------|----------|---|-------------------------------|---|-----------|--|---------------------|---------------------------------------|----------------------------------|-----------|----|-----|------------------------------|----------------------|------------------------------|----------------------|--|--|--|--|--|
| Rope application: | | Nominal diameter: | | Take-down date: | | | | | | | | | | | | | | | | | |
| Brand name: | | <input type="radio"/> Right hand <input type="radio"/> Left hand | | Minimum tensile strength | | | | | | | | | | | | | | | | | |
| Make ¹⁾ : | | <input type="radio"/> Lang's lay <input type="radio"/> Ordinary lay | | Permissible number of visible external broken wires | | | | | | | | | | | | | | | | | |
| Direction of lay ¹⁾ : | | <input type="radio"/> IWRC <input type="radio"/> FC <input type="radio"/> WSC | | Datum diameter | | | | | | | | | | | | | | | | | |
| Intermediate layer ¹⁾ : | | <input type="radio"/> Bare <input type="radio"/> Galvanized | | Permissible diameter reduction: 6d: 30d: | | | | | | | | | | | | | | | | | |
| Wire surface ¹⁾ : | | Rope end connections: | | | | | | | | | | | | | | | | | | | |
| Date | JJ/MM/TT | Number in length of | Visible external broken wires | | Corrosion | Diameter | Damage, deformation | Combined severity level ²⁾ | Name of expert for the wire rope | Signature | | | | | | | | | | | |
| | | | 6d | 30d | | | | | | | 6d | 30d | Severity level ²⁾ | Position in the rope | Severity level ²⁾ | Position in the rope | | | | | |
| | | | | | | Measured Actual reduction to datum diameter Position in the rope Severity level ²⁾ | | | | | | | | | | | | | | | |

1) Check where applicable.
 2) State extent of damage; slight or 20%; medium or 40%; high or 60%; very high or 80%; take-down or 100%
 3) RCN = Rope Category Number

Fig.121370-en: Form for current checklist

8.05 Inspection of load hooks

| | | |
|---|------------------------|---|
| 1 | Safety instructions | 3 |
| 2 | Inspection intervals | 3 |
| 3 | Checking the load hook | 3 |

Fig.195219

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1 Safety instructions

**WARNING**

The load hook did **not** pass the inspection!
The load hook can rip. The fastened load can fall down.
Death, severe bodily injuries, property damage.

If the load hook did **not** pass the inspection:

- ▶ Replace the load hook with the hook nut.
- ▶ Contact Customer Service at Liebherr-Werk Ehingen GmbH.

**WARNING**

Incorrect remedy of defects!

The load hook can rip. The fastened load can fall down.
Death, severe bodily injuries, property damage.

- ▶ Have defects remedied by authorized, trained expert personnel.

**WARNING**

Welds on the load hook!

The load hook can rip. The fastened load can fall down.
Death, severe bodily injuries, property damage.

- ▶ Do **not** weld the load hook, to repair defects, for example.

2 Inspection intervals

To detect defects in time and avoid accidents, observe the following instructions:

- Have the load hook checked as required, however **at least once a year** by an authorized inspector.
- Observe the national regulations concerning the inspection of load hooks.

3 Checking the load hook

The following points must be documented in the crane inspection log:

- Performance of the inspections
- Defects and damage
- Measures for remedying the defects and damage

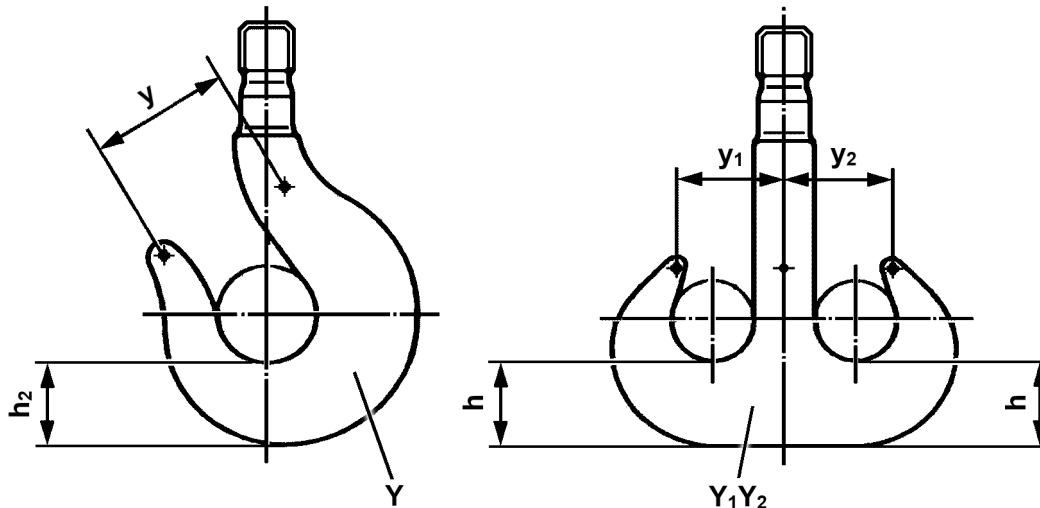


Fig.149076: Description of measured distances on the load hook

3.1 Checking the load hook for distortion

3.1.1 Hook shaft

If a distortion is visible on the hook shaft:

- ▶ Replace the load hook with the hook nut.

3.1.2 Hook mouth

The expansion of the hook jaw may be maximum 10 % in reference to the respective initial dimension.

The initial dimensions are indicated on the load hook, see chapter 2.05.10:

- Single hook: Initial dimension Y
- Double hook: Initial dimension Y_1Y_2

- ▶ Single hook: Distance y between the punch marks.
- ▶ Double hook: Measure the distance y_1 and distance y_2 between the punch marks.

When the expansion of the hook jaw is 10 % greater than the initial dimensions:

- ▶ Replace the load hook with the hook nut.

When the expansion of the hook jaw less than or equal to 10% of the initial dimensions:

- ▶ Follow the instructions in section „Checking the load hook for surface cracks“.

3.2 Checking the load hook for surface cracks

Make sure that the following prerequisites are met:

- Distortion is present.

Inspection is required in all points where distortion is present, mainly on the hook jaw.

If it is **not** possible to check the installed load hook:

- ▶ Remove the load hook: Contact Customer Service at Liebherr-Werk Ehingen GmbH.
- ▶ Prior to the inspection: Put the surfaces into a state in which surface cracks can be detected correctly.
- ▶ Check the load hook for surface cracks using a suitable procedure.

An authorized inspector must decide if the surface cracks can be repaired.

When the surface cracks have been repaired:

- ▶ Check if the load hook dimensions lie within the permissible tolerances. Contact Customer Service at Liebherr-Werk Ehingen GmbH.

When the surface cracks are **not** permissible:

- ▶ Replace the load hook with the hook nut.

3.3 Checking the hook body for wear

3.3.1 Hook base

The wear on the hook base may be maximum 5 % in reference to the respective initial dimension:

- Single hook: Initial dimension h_2
- Double hook: Initial dimensions h

The respective initial dimensions are provided in the following chart:

| Hook number | Single hook h_2 [mm] | Double hook h [mm] |
|-------------|---------------------------|-------------------------|
| 4 | 67 | — |
| 5 | 75 | — |
| 6 | 85 | 75 |
| 8 | 95 | 85 |
| 10 | 106 | 95 |
| 12 | 118 | 106 |
| 16 | 132 | 118 |
| 20 | 150 | 132 |
| 25 | 170 | 150 |
| 32 | — | 170 |
| 40 | — | 190 |
| 50 | — | 212 |
| 63 | — | 236 |
| 80 | — | 265 |
| 100 | — | 300 |
| 125 | — | 335 |
| 160 | — | 375 |
| 200 | — | 425 |
| 250 | — | 475 |
| 320 | — | 530 |
| 400 | — | 600 |

Initial dimensions for wear on the hook base, single hooks and double hooks

- ▶ Single hook: Measure the initial dimension h_2 .
- ▶ Double hook: Measure the initial dimensions h .

When the wear on the hook base is 5 % greater than the initial dimension:

- ▶ Replace the load hook with the hook nut.

3.3.2 Surfaces

Surfaces with wear must be connected smoothly with the adjacent surfaces.

- ▶ Check surfaces with wear for sharp edges, grooves or other surface errors.

An authorized inspector must decide if the surface errors can be repaired.

When the surface errors have been repaired:

- ▶ Check if the load hook dimensions lie within the permissible tolerances. Contact Customer Service at Liebherr-Werk Ehingen GmbH.

When the wear is **not** permissible:

- ▶ Replace the load hook with the hook nut.

3.4 Checking the double hook for damage

Visible damage indicate **improper** fastening of the load.

Relevant areas for the inspection:

- Lower area on the hook shaft
- On every hook: Transition area from the hook shaft to the hook jaw

- ▶ Check the load hook for visual damage.

An authorized inspector must decide if the damage can be repaired.

When the damage has been repaired:

- ▶ Check if the load hook dimensions lie within the permissible tolerances. Contact Customer Service at Liebherr-Werk Ehingen GmbH.

When the damage is **not** permissible:

- ▶ Replace the load hook with the hook nut.

3.5 Checking the load hook for corrosion

Depending on the overall condition of the load hook, an inspection expert must decide if the hook thread must be checked for corrosion nicks.

If the hook thread must be checked:

- ▶ Determine the Liebherr ID no. and manufacturer of the load hook, see chapter 2.05.10.
- ▶ Request the assembly instructions for the load hook: Contact Customer Service at Liebherr-Werk Ehingen GmbH.
- ▶ Remove the load hook: Contact Customer Service at Liebherr-Werk Ehingen GmbH.
- ▶ Disassemble the hook nut according to the manufacturer's assembly instructions.
- ▶ Check the hook thread, hook nut and machines surfaces on the hook shaft for corrosion.

An inspection expert must decide if the corrosion nicks can be repaired.

When the corrosion nicks have been repaired:

- ▶ Check if the dimensions of the hook thread and the hook shaft lie within the permissible tolerances. Contact Customer Service at Liebherr-Werk Ehingen GmbH.

If an **impermissible** axial play is suspected on the hook nut:

- ▶ Contact Customer Service at Liebherr-Werk Ehingen GmbH.

When the corrosion is **not** permissible:

- ▶ Replace the load hook with the hook nut.

If the load hook passed the inspection:

- ▶ Follow the instructions in the section „Assembling the hook nut“.

3.6 Assembling the hook nut

Make sure that the following prerequisites are met:

- The hook shaft, hook thread and hook nut fulfill all test criteria.
- The axial bearing is free of damage and turns easily.

If the axial bearing does **not** turn easily:

- ▶ Clean the axial bearing and replace the lubricant.
- or**
- ▶ Replace the axial bearing.

If the axial bearing is damaged:

- ▶ Replace the axial bearing.

Before the assembly of the hook nut: Corrosion protection must be applied between the thread sides.

- ▶ Grease the threads of the hook nut.
- ▶ Assemble the hook nut according to the manufacturer's assembly instructions.

The type of sealing after assembly must correspond to equivalent to the sealing before the inspection.

- ▶ Seal the transition between the hook thread and the hook nut thread.
- ▶ Install the load hook.

3.7 Checking the retaining elements

- ▶ Check if the twist guard of the hook nut (axle retainer) is tightened.
- ▶ Check if the twist guard of the hook nut functions.
- ▶ Check the function of the hook guard.

If the retaining element did **not** pass the inspection:

- ▶ Contact Customer Service at Liebherr-Werk Ehingen GmbH.

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8.06 Inspection of hydraulic hose lines

| | | |
|---|--|---|
| 1 | Safety guidelines | 3 |
| 2 | Inspection intervals | 3 |
| 3 | Checking the end of the service life | 3 |
| 4 | Inspecting the hydraulic hose lines for damage | 4 |
| 5 | Inspecting the hydraulic hose lines for leaks | 5 |
| 6 | Documenting the inspection | 5 |
| 7 | Replacing hydraulic hose lines | 5 |

Fig.195219

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1 Safety guidelines



WARNING

Damaged and leaky hydraulic hose lines!
Fire, accidents, death, severe injury, property damage.

If leaky areas are found:

- ▶ Have these leaky areas inspected immediately by authorized and trained expert personnel and remedied.

If damage is found:

- ▶ Have the hydraulic hose lines replaced exclusively by authorized and trained expert personnel.

If it is determined that the service life is over:

- ▶ Have the hydraulic hose lines replaced exclusively by authorized and trained expert personnel.

Make sure that the following prerequisite is met:

- A **competent person for hydraulic hose lines** inspects the hydraulic hose lines.

A **competent person for hydraulic hose lines** has the following knowledge:

- Knowledge and experience in hydraulic and mechanics
- Knowledge of all requirements regarding valid standards:
 - ISO 8331
 - ISO 2230
 - ISO 1402
 - ISO/TR
 - EN 853 to EN 857
 - National regulations
- **or:** Knowledge of all requirements regarding the valid German standards, for example:
 - DIN 20066:202-10
 - BGR 237 Feb 2008, BG-Regulation

2 Inspection intervals

The inspection of hydraulic hose lines must be carried out in the following intervals:

- when the crane is **up to 10 years** old, at least one inspection every twelve months
- when the crane is **older than 10 years**, at least one inspection every six months

3 Checking the end of the service life

Hydraulic hose lines have a limited service life.

When hydraulic hose lines are properly stored, installed and used, then the manufacturer guarantees a service life of at least 10 years.

The life expectancy of hydraulic hose lines can deviate significantly from the noted service life of hydraulic hose lines.



Note

Special case: Active rear axle steering!

- ▶ The life expectancy of hydraulic hose lines is six years, including a storage period of maximum two years.

The life expectancy of a hydraulic hose line depends on various factors:

- Environmental influences, for example: Temperature, humidity, corrosive air
- Use

- Working cycles
- Number of bending cycles
- Friction
- Fluid

The following factors reduce the life expectancy significantly:

- Heat
- Repeated bending under pressure

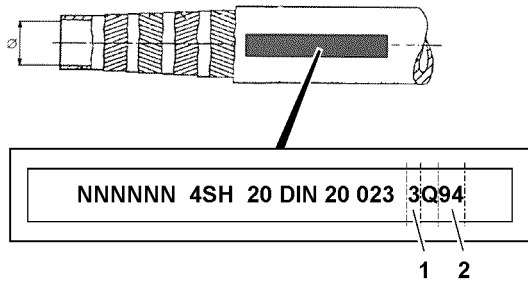


Fig.120159: Example for identification of hydraulic hose lines

The manufacturing date is marked on the fixtures or fittings.

- ▶ Read the quarter **1** of manufacture.
- ▶ Read the year **2** of manufacture.

When the life expectancy of a hydraulic hose line has been exceeded, then a **competent person** can decide **not** to replace the hydraulic hose line. Document the decisions, see section „Documenting the inspection“.

When the end of the service life is determined:

- ▶ Have the hydraulic hose lines replaced exclusively by authorized and trained expert personnel.

4 Inspecting the hydraulic hose lines for damage

Hydraulic hose lines must be replaced when one of the following damage is present:

- Damage on outer surface, such as chafe marks, cuts and cracks
- Brittleness due to aging of outer layer (cracks)
- Distortion, such as splitting of hose layers, bubbles, crushed areas, kinks, rotational stress
- Leakages
- Damage or distortion of hose fixtures or hose fitting (seal is endangered)
- Movement between hose and hose line, hose working itself loose from the fixture or the fitting
- Requirements for installation **not** observed
- Corrosion of fixture or fitting (solidness or function of fitting is endangered)

When the hydraulic hose line is **not** completely accessible:

- ▶ Remove the hydraulic hose line.

When the hydraulic hose line is protected with a protective hose:

- ▶ Check the hose protection for abrasion. Abrasion on a hose protective hose can indicate abrasion on the hydraulic hose line.
- ▶ Check hydraulic hose lines for distortion in pressureless and pressurized status and during bending.

When the hydraulic hose line is slightly damaged, then a **competent person** can decide **not** to replace the hydraulic hose line. Document the decisions, see section „Documenting the inspection“.

If damage is found:

- ▶ Have the hydraulic hose lines replaced exclusively by authorized and trained expert personnel.

5 Inspecting the hydraulic hose lines for leaks

- ▶ Check the crane for escaped hydraulic oil.
- ▶ Check the crane for leaks by visually checking the ground under the crane.

When the hydraulic system leaks:

- ▶ Have these leaks inspected immediately by authorized and trained expert personnel and remedied.
or
Contact Liebherr Service.

6 Documenting the inspection

Make sure that the following prerequisite is met:

- A **competent person for hydraulic hose lines** documents noticeable observations.

The following data about hydraulic hose lines is documented:

- Installation location
- Condition
- Date
- Time
- ▶ Document noticeable observations comprehensibly.

When the life expectancy of a hydraulic hose line has been exceeded or if the hydraulic hose line is slightly damaged, then a **competent person** can decide **not** to replace the hydraulic hose line.

When the hydraulic hose line is **not** replaced:

- ▶ Document decisions and replacements comprehensibly.
- ▶ Document the date for the next inspection comprehensibly.

7 Replacing hydraulic hose lines

To ensure maximum safety, sealing and service life, the following guidelines apply for replacement of hydraulic hose lines.



WARNING

Impermissible spare parts!

Death, severe injury, property damage.

- ▶ Do **not** use repaired or used hydraulic hose lines.
- ▶ Use exclusively Original Liebherr spare parts.
- ▶ Use exclusively hydraulic hose lines according to manufacturer's specification (including fixtures, rubber piece goods and manufacturing process).

NOTICE

Routing of hydraulic hose lines changed!

Abrasion. Incorrect bending radius. Stress. Shortened service life.

- ▶ Keep the routing of hydraulic hose lines.
- ▶ Inspect the hydraulic hose lines according to intervals.

- ▶ Adhere to the hose bending radii according to the manufacturer's specifications.
- ▶ Ensure the routing of hydraulic hose lines according to manufacturer's specifications (pressureless and pressurized condition).
- ▶ Ensure the distance between lines and structures.

If necessary:

- ▶ Check moving parts in the area of hydraulic hose lines.

When the hydraulic hose line is installed in straight direction:

- ▶ Ensure a sag of the hose.
- ▶ Avoid mechanical tension and twisting of the hose during installation.
- ▶ Fasten the hydraulic hose line according to manufacturer's specification.
- ▶ Do not cross hydraulic hose lines for high pressure and low pressure.
- ▶ Keep hydraulic hose lines away from hot components.

When hydraulic hose lines are in a surrounding with high temperatures:

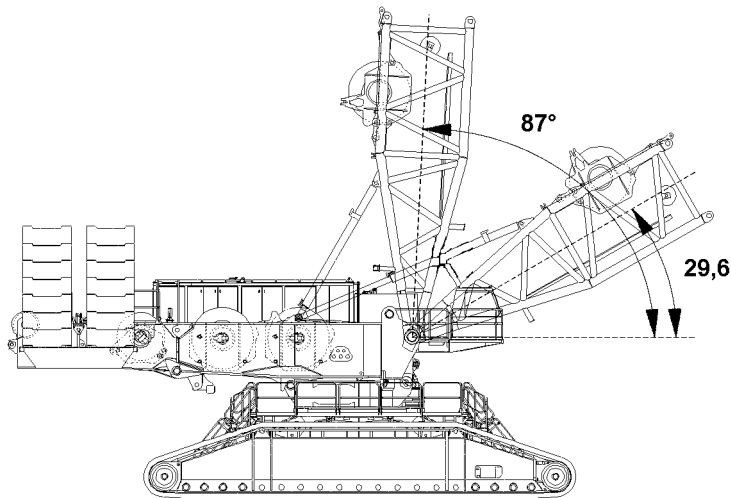
- ▶ Install protective insulation according to manufacturer's specifications.

8.12 Inspection of safety controls on the relapse supports

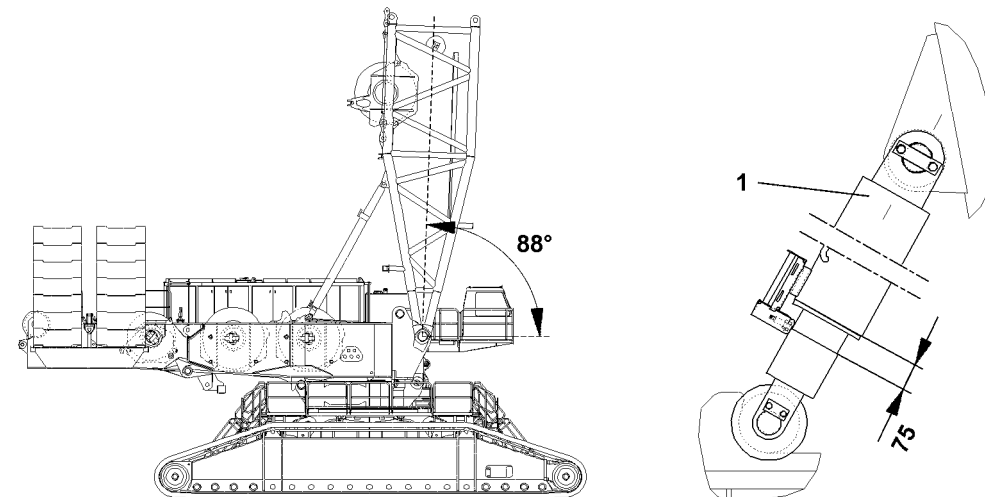
1 S-boom relapse retainer

3

1



2



3

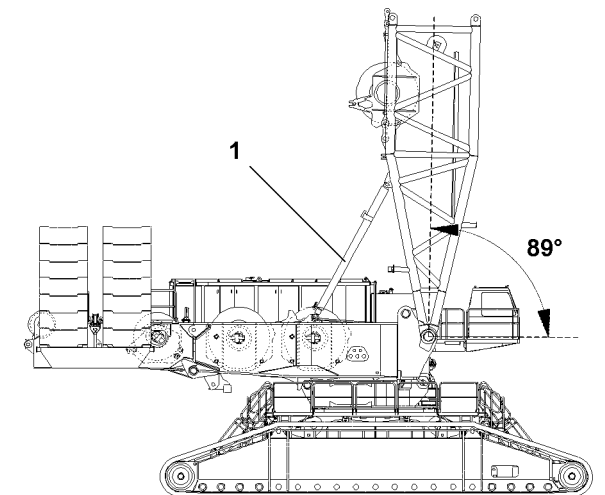


Fig.102289

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 |

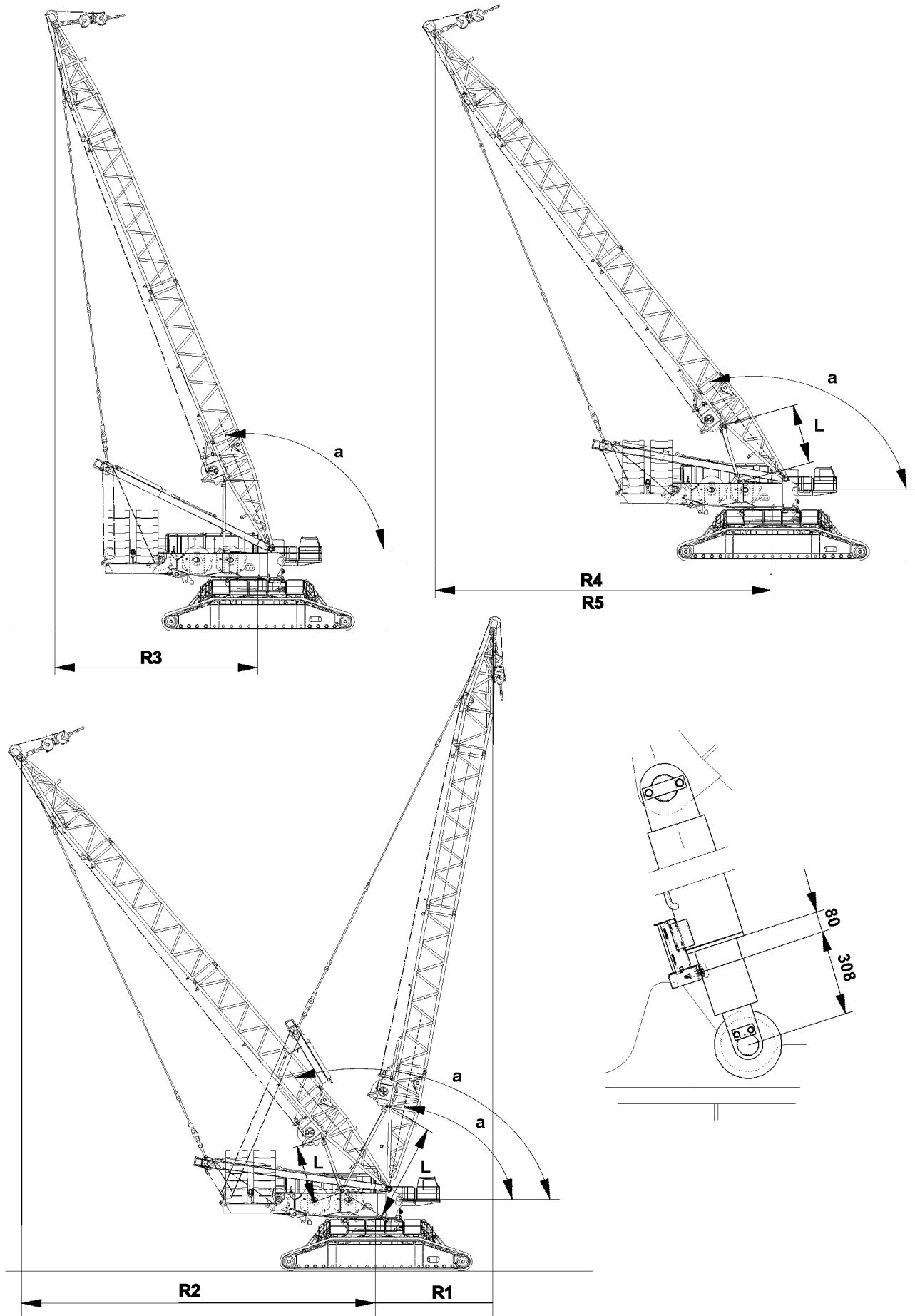


Fig.104754

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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 |

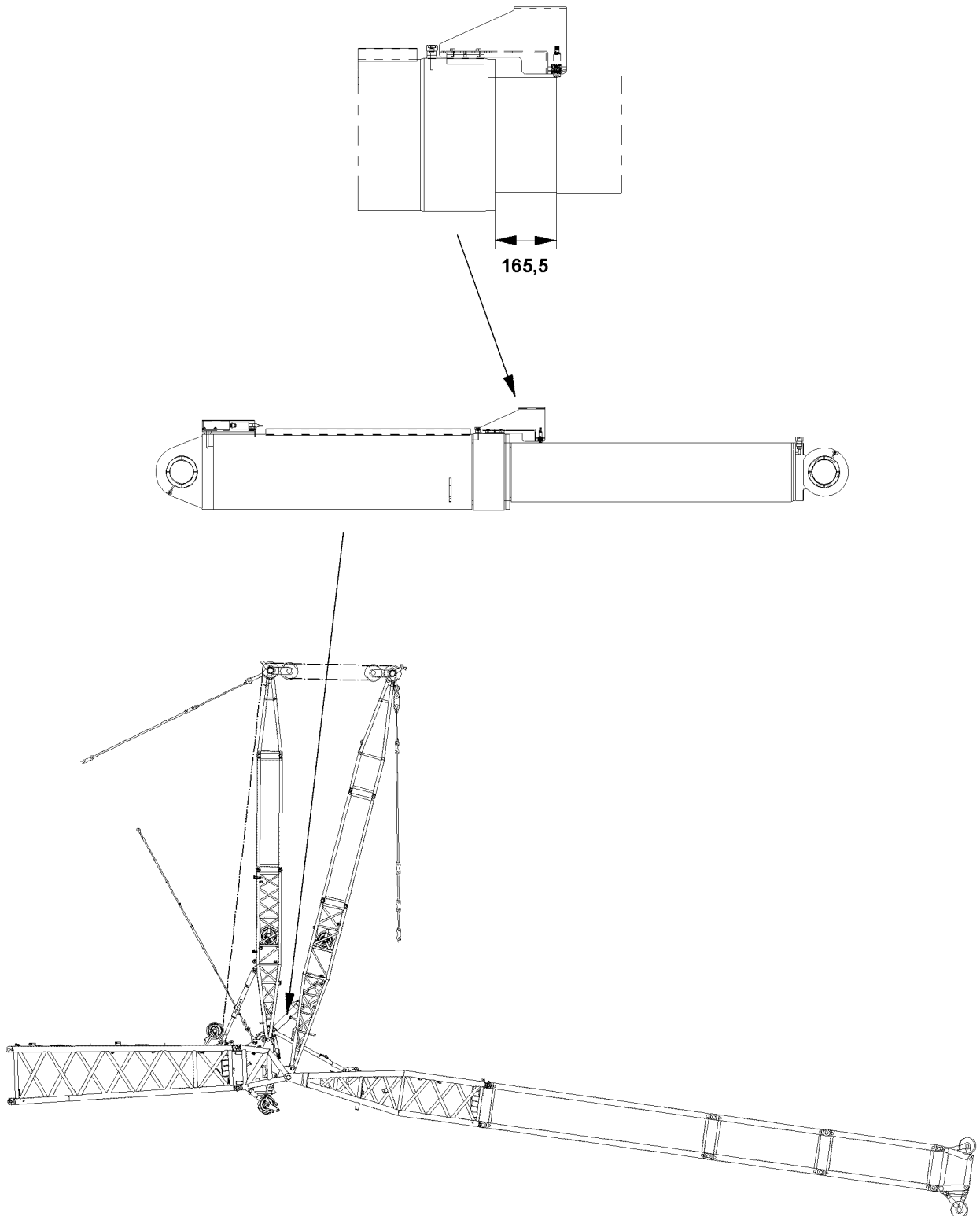


Fig.102344

LWE/LR 11350-007/19005-01-02/en

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.

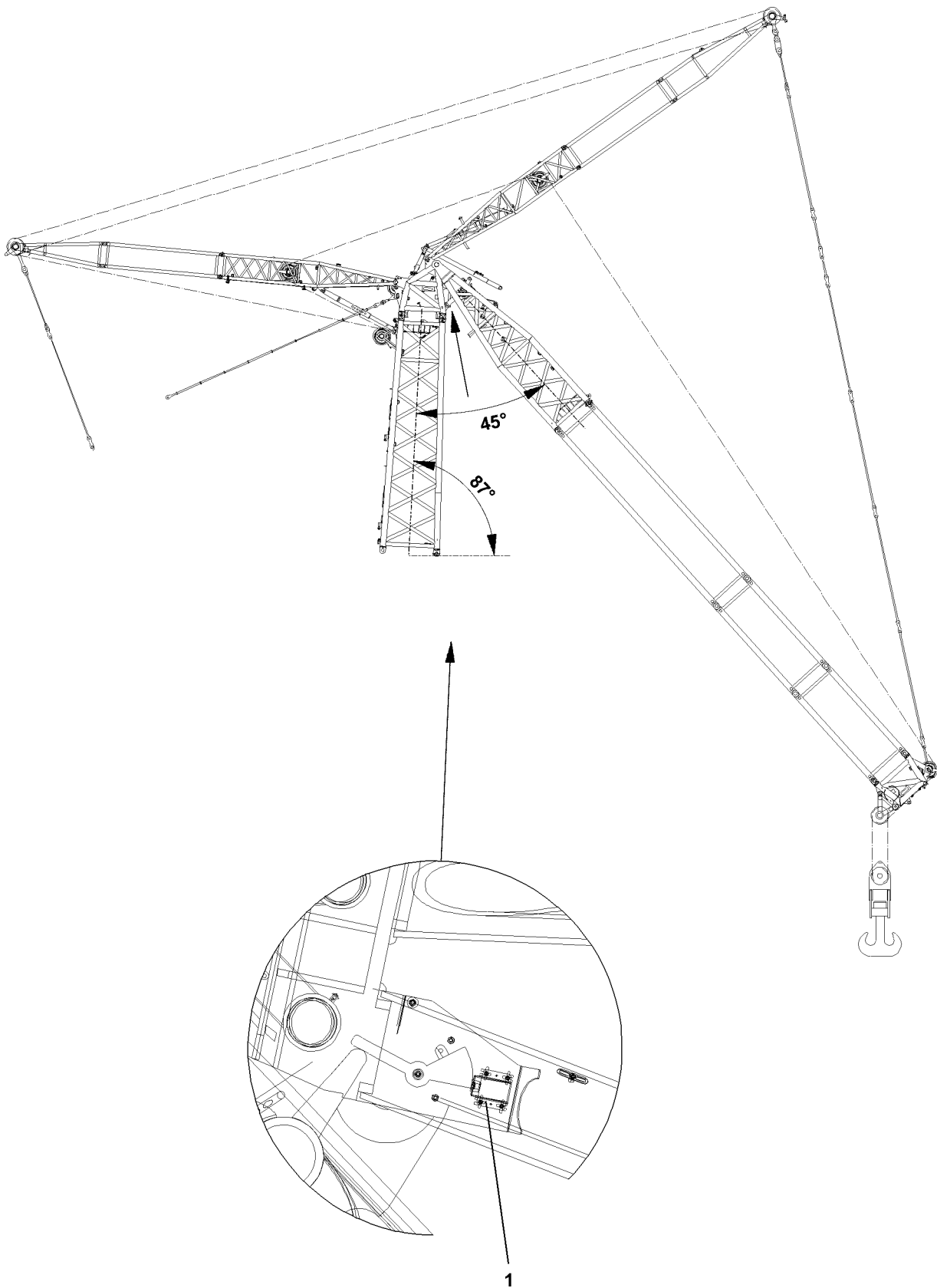


Fig.102345

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.

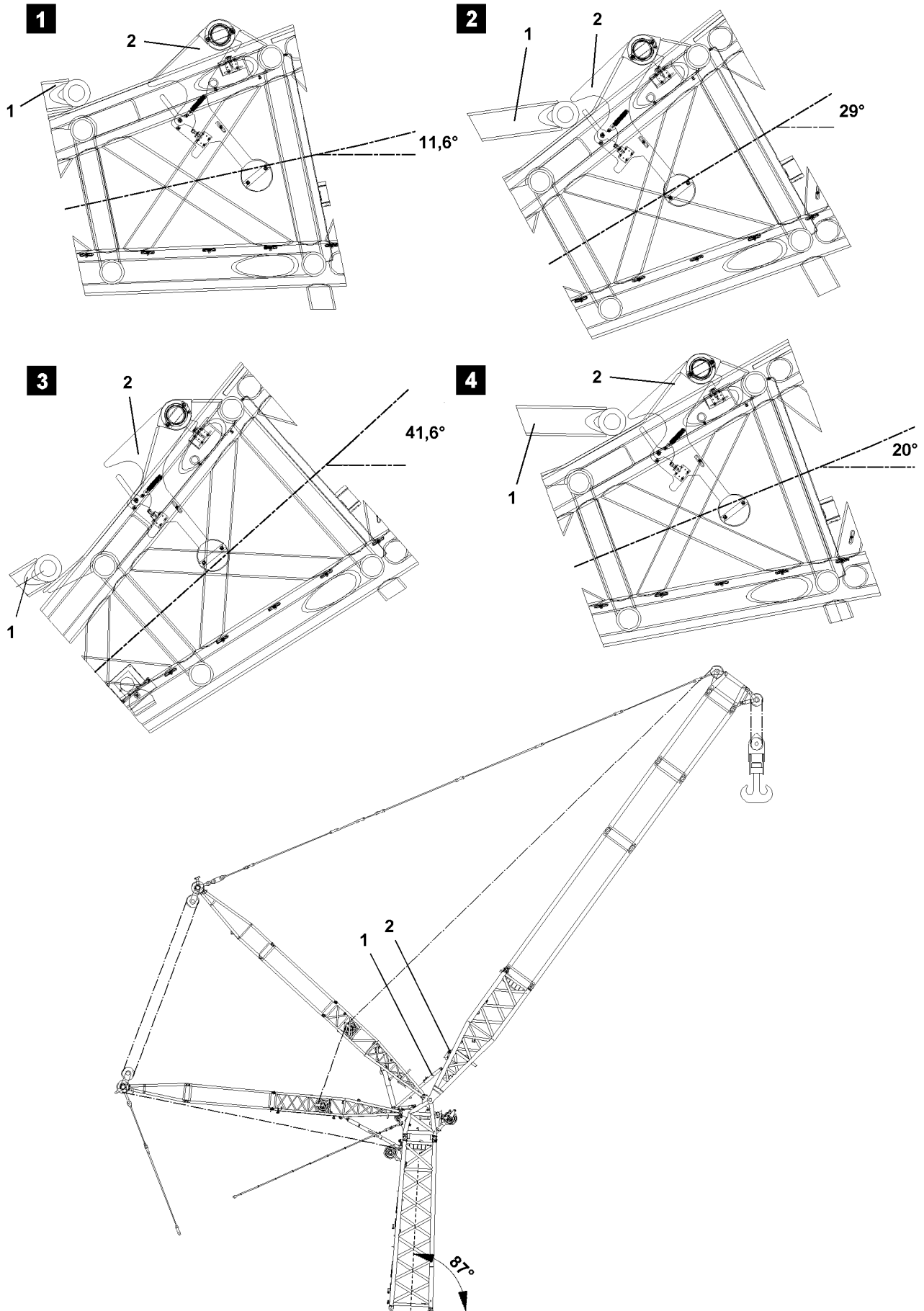


Fig.102346

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

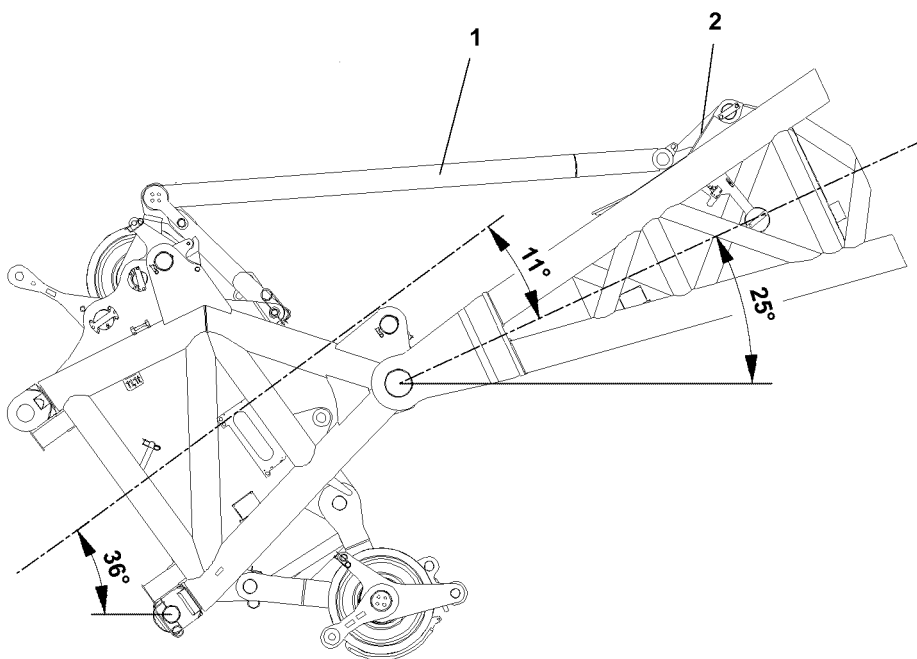
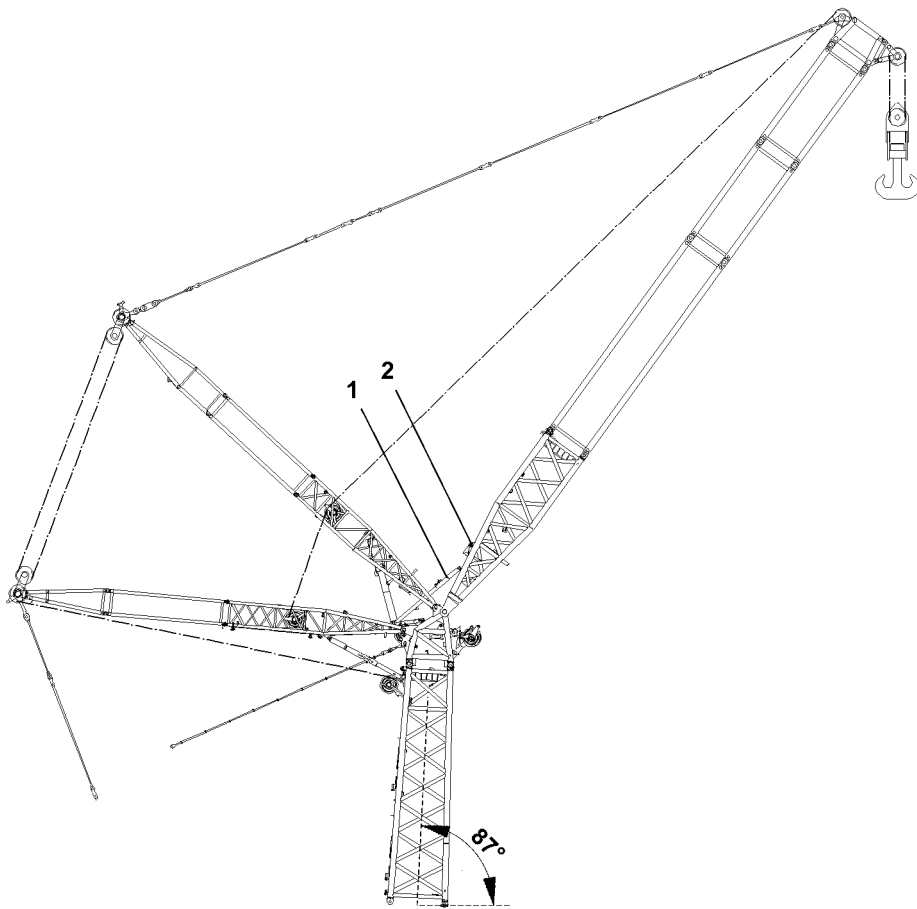


Fig.102347

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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!
-

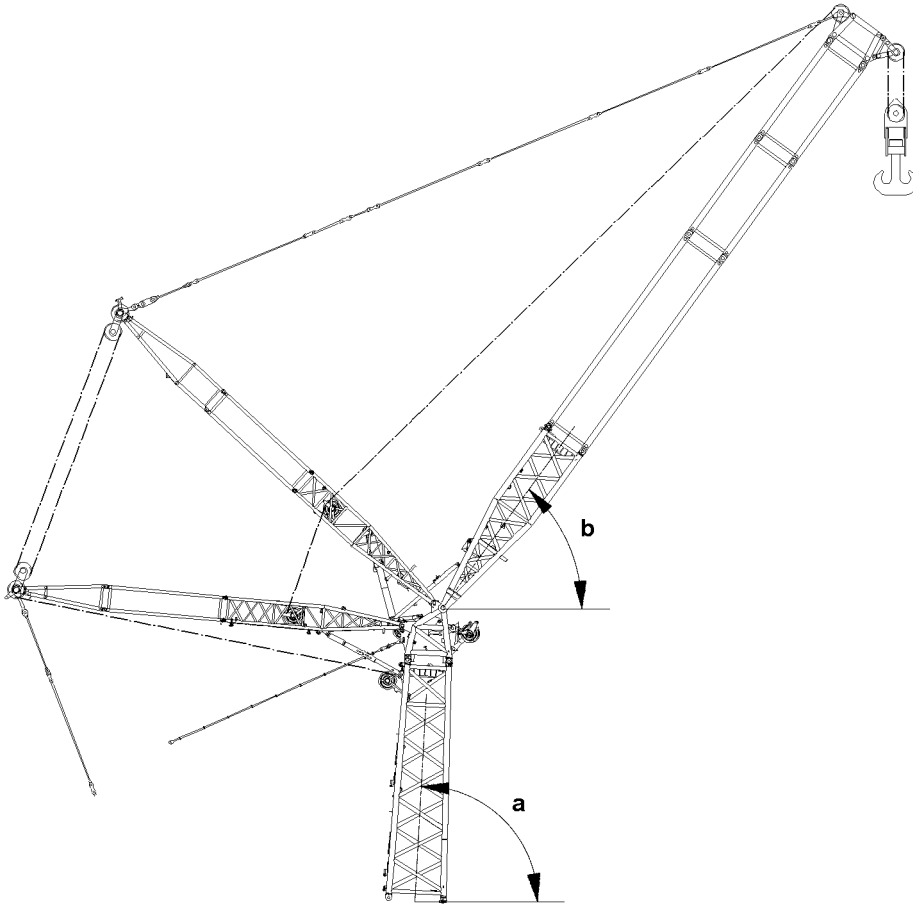
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8.14 Inspection of accumulator pressure in relapse cylinder

1 Checking jib stop cylinder pressure

3



| | bar |
|-----------|--------|
| RP S(L) | 220 |
| RP D | 220 |
| RP W1(N1) | 300 |
| RP W2(N2) | |
| min:max | 92 380 |

Fig.102348

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 angle α ° | Lattice jib angle 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 angle (α) ° | Lattice jib angle (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 |

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8.15 Inspection of guy rods

| | | |
|---|-----------------------|---|
| 1 | Safety guidelines | 3 |
| 2 | Inspection intervals | 3 |
| 3 | Checking the guy rods | 3 |

Fig.195219

LWE/LR 11350-007/19005-01-02/en

1 Safety guidelines



WARNING

Damaged guy rods!

Accident. Death, severe injury, property damage.

▶ Crane operation with damaged guy rods **1** is prohibited.

▶ Replace damaged guy rods **1**.

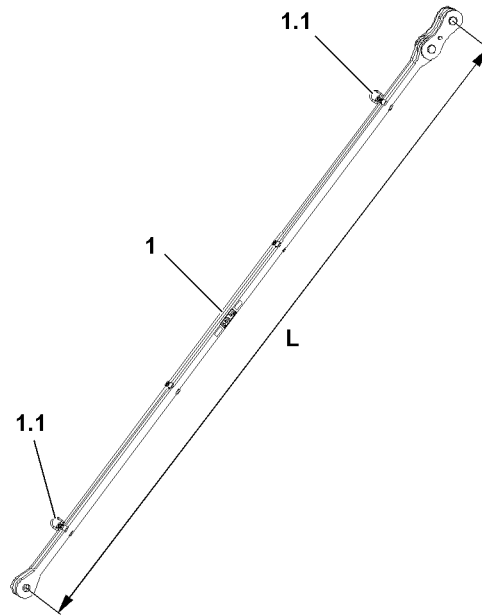


Fig.123845: Guy rod

Make sure that the following prerequisites are met:

- **Authorized and trained expert personnel** checks the guy rods **1**.
- A checklist for documentation of the inspection is on hand

2 Inspection intervals

The inspection of the guy rods **1** must be carried out in the following intervals:

- One inspection of the guy rods every 12 months by an expert.
- One inspection of the guy rods every four years by an authorized inspector.

After a load rip-off or overload of the crane:

- immediate inspection of guy rods by an expert

3 Checking the guy rods

3.1 Inspection



Note

▶ All inspections of the guy rods **1** must be documented.

The guy rods must be inspected in removed condition.

**WARNING**

The guy rods **1** can be ripped off!

If a damaged guy rod **1** is used further, it can rip off in crane operation.

Death, severe injury, property damage.

- ▶ Crane operation with damaged guy rods is prohibited.
- ▶ Repairs on guy rods **1** (for example: through welding) are prohibited.
- ▶ Replace damaged guy rods immediately.
- ▶ If one of the following stated damage is found, then the guy rods **1** may no longer be used.

3.2 Cracks and dents

- ▶ Check the guy rods **1** thoroughly through a visual inspection for cracks and dents.

Problem remedy

Damage to guy rods is not clearly evidenced through a visual inspection?

- ▶ Check the respective areas of the guy rods thoroughly, for example with a magnetic particle test.
- ▶ If damage is found: Replace the guy rods **1** immediately.

3.3 Elongation

**Note**

- ▶ The initial dimension **L** of the guy rods **1** refers to the bore spacing of the pin bores.
- ▶ The initial dimension **L** of the guy rods **1** is listed in the separate rod plan.
- ▶ Check the elongation of the guy rods **1** by measuring the guy rods.

**WARNING**

The guy rods can be ripped off!

The permissible elongation of the guy rods **1** may be a maximum of 0.2 %, for example 14 mm , at an initial dimension **L** of 7000 mm.

Death, severe injury, property damage.

- ▶ If the maximum permissible elongation is reached or exceeded: Replace the guy rods **1** immediately.
- ▶ If an elongation of the guy rods of more / equal to 0.2 % of the initial dimension **L** is proven: Replace the guy rods **1** immediately.

3.4 Wear

- ▶ Check the bores, pins and pin retainers for signs of wear.
- ▶ If respective wear is present in the stated areas: Replace the guy rods **1** immediately.

3.5 Ductile deformation

- ▶ If a guy rod **1** shows any ductile deformation: Replace the guy rod **1** immediately.

3.6 Paint / coating

- ▶ The guy rods **1** must be checked for paint damage or corrosion.
- ▶ If damage is present on the paint finish / coating: Repair the paint / coating of the guy rods **1** expertly.

NOTICE

Danger of property damage!

- ▶ Never store guy rods **1** in or near aggressive media, for example: Seawater.
- ▶ Always store the guy rods **1** properly and outside of aggressive media.

3.7 Fastening points

- ▶ Check the fastening points **1.1** of the guy rods **1** for damage.
- ▶ Replace damaged fastening points **1.1**.

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8.17 Inspection of ladders

| | | |
|---|---------------------------------|---|
| 1 | Safety instructions | 3 |
| 2 | Inspection intervals | 3 |
| 3 | Inspecting the ladders | 3 |
| 4 | Inspection sheet and check list | 3 |

Fig.195219

LWE/LR 11350-007/19005-01-02/en

1 Safety instructions



WARNING

Damaged ladders!
Accident. Death, severe injury, property damage.

If damage is found:

- ▶ Have ladders repaired by authorized and trained expert personnel.

If it is determined that the ladder cannot be repaired:

- ▶ Scrap the ladder immediately.

Make sure that the following prerequisite is met:

- **Authorized and trained expert personnel** inspects the ladders.

The authorized and trained expert personnel has the following expertise:

- Knowledge, experience and abilities in repairing ladders
- Is familiar with the necessary prerequisites as determined by the contractor for the inspection of ladders
- Has the knowledge about the type, scope and intervals for the required inspections as determined by the contractor

2 Inspection intervals

The inspection of ladders must be carried out in the following intervals:

- The contractor determines the **required** intervals
- But there must be at least one inspection every **12 months**

Intervals depend on:

- Operating conditions
- Frequency of use
- Operational demands during use
- Frequency and severity of defects found during previous inspections

3 Inspecting the ladders

Make sure that the following prerequisites are met:

- Ladder inspection sheets are on hand. For blank form, see section „Inspection form for the inspection of ladders and steps“.
- Check lists are on hand. For a blank form, see section „Check list for the inspection of ladders and steps“.
- ▶ For every ladder and every step: Enter the data in the ladder inspection form.
or
Get the ladder inspection form for ladders or steps.
- ▶ Check the ladders and steps according to the check list and document the results.
- ▶ Collect the ladder inspection forms and check lists in the crane documentation.

4 Inspection sheet and check list

A sample inspection form and check list for the inspection of ladders and steps are shown below.

4.1 Inspection form for the inspection of ladders and steps

| Ladder inspection form | |
|-------------------------------------|-------------------------------------|
| Inventory no. of the ladder / step | |
| Location / installation location | |
| Ladder type | Multi-purpose ladder |
| | Stepladder |
| | Leaning ladder |
| | Leaning ladder with transition |
| | Vertical ladder |
| | Vertical ladder with transition aid |
| | Platform ladder |
| | Step |
| | Other |
| Ladder material | Aluminum |
| | Plastic |
| | Steel |
| | Stainless steel |
| Number of rungs / steps | |
| Ladder length / ladder shortened to | |
| Manufacturer / dealer | |
| Article / type number | |
| Date of purchase | |
| Date of selection | |
| Name of authorized inspector | |
| Next inspection | |

Inspection form for the inspection of ladders and steps

Fig.151627-en

4.2 Check list for the inspection of ladders and steps

Ensure the recording of the systematic inspection of ladders and steps:

- Summarize the following checklist for an inspection book.

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| Inspection criteria | 1. Inspection | | 2. Inspection | | 3. Inspection | | 4. Inspection | | 5. Inspection | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No |
| 1. Operating instructions (decal on the ladder) Present and legible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Beams and rungs / stringers and steps Loose connections Damage, cracks, breaks, wear Dents, kinks Exposed fibers of glass-fiber reinforced plastic Paint / glaze significantly damaged (if applicable) Tie rod loose or damaged (if applicable) Platform loose or damaged (if applicable) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Ladder locks (if applicable) Belts, chains, bracing damaged Hinge spreader damaged | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Fixtures Hinges, articulations, locks damaged or loose Sliding parts are well lubricated Locking elements do not engage | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Feet and accessories Feet, tips, caps missing or damaged Cross beam, feet extension defective | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Other defects | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Result of the inspection The ladder is OK and can be used The ladder may only be used after it is repaired The ladder must be replaced DATE, SIGNATURE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sent for repair to: DATE, SIGNATURE | | | | | | | | | | |
| Repair / ladder replaced: DATE, SIGNATURE | | | | | | | | | | |

Fig.14994-en

8.90 Inspection chart for cranes

1 Inspection chart for recurring inspections of Liebherr cranes

3

LWE/LR 11350-007/19005-01-02/en

Fig.195219

LWE/LR 11350-007/19005-01-02/en

1 Inspection chart for recurring inspections of Liebherr cranes

The following is a checklist to assist the inspector during the periodic inspections of Liebherr mobile and crawler cranes.

| | |
|---|----------------------|
| Company: | Inspector: |
| Crane manufacturer: Liebherr | Crane type: |
| Serial number: | Stock number: |
| Year of construction: | Date: |
| Inspector's signature for No. 1 to 22: | |

| 1. inspection category: Crane document | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Crane inspection log | | | | | | |
| Operating and installation instructions | | | | | | |
| Crane control log | | | | | | |
| Load chart manual | | | | | | |
| Job planner | | | | | | |

| 2. inspection category: Signs / identification | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Factory tag | | | | | | |
| Load data | | | | | | |
| Operating instruction label | | | | | | |
| Prohibition and command signs | | | | | | |
| Other safety signs | | | | | | |

| 3. inspection category: Travel gear ¹ | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Frame ² | | | | | | |
| Supports ³ | | | | | | |
| Axles | | | | | | |
| Wheels | | | | | | |
| Tires | | | | | | |
| Storage | | | | | | |
| Transmission | | | | | | |
| Universal drive shaft | | | | | | |
| Leaf springs / springs | | | | | | |
| Shock absorbers | | | | | | |

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| 3. inspection category: Travel gear ¹ | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Steering | | | | | | |
| Brakes | | | | | | |
| Hydraulic axle suspension | | | | | | |

| 4. inspection category: Chassis ¹ | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Coverings | | | | | | |
| Accessible surfaces | | | | | | |
| Counterweight holders ² | | | | | | |
| Towing devices | | | | | | |
| Accesses, ladders | | | | | | |
| Holding devices, handles | | | | | | |
| Platforms, railings | | | | | | |
| Retainer for hook block ² | | | | | | |
| Boom support ² | | | | | | |

| 5. inspection category: Chassis - driver's cab ¹ | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Doors | | | | | | |
| Windows / windshields | | | | | | |
| Window wiper | | | | | | |
| Mirrors | | | | | | |
| Seat | | | | | | |
| Heater | | | | | | |
| Ventilation | | | | | | |
| Sound absorber | | | | | | |
| Trip recorder | | | | | | |
| First aid kit | | | | | | |
| Spare bulbs | | | | | | |
| Hazard warning triangle | | | | | | |
| Safety vest | | | | | | |

| 6. inspection category: Chassis - drive ¹ | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Combustion engine | | | | | | |
| Exhaust system | | | | | | |
| Fuel tank | | | | | | |

| 6. inspection category: Chassis - drive ¹ | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Urea tank | | | | | | |
| Fuel container | | | | | | |
| Filter | | | | | | |
| Sound absorber | | | | | | |
| Engine mount | | | | | | |
| Oil levels | | | | | | |
| Fuel lines | | | | | | |
| Urea lines | | | | | | |
| Fuel lines | | | | | | |

| 7. inspection category: Chassis - hydraulics ¹ | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Oil container | | | | | | |
| Filter with maintenance indicator | | | | | | |
| Pumps | | | | | | |
| Motors | | | | | | |
| Valves | | | | | | |
| Lines | | | | | | |
| Hoses | | | | | | |
| Cylinders | | | | | | |
| Pressure limiting valves | | | | | | |

| 8. inspection category: Chassis - compressed air system ¹ | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Compressor | | | | | | |
| Filter | | | | | | |
| Air tanks | | | | | | |
| Valves | | | | | | |
| Lines | | | | | | |
| Hoses | | | | | | |
| Cylinders | | | | | | |

| 9. inspection category: Chassis - electrical system ¹ | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Motors | | | | | | |
| Generators | | | | | | |
| Battery | | | | | | |

| 9. inspection category: Chassis - electrical system ¹ | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Switches / buttons | | | | | | |
| Lines | | | | | | |
| Fuses | | | | | | |
| Resistors | | | | | | |
| Lighting | | | | | | |
| Brake lights | | | | | | |
| Blinkers | | | | | | |
| Tail lights | | | | | | |
| Working lights | | | | | | |
| Signaling systems | | | | | | |
| Indicator lights | | | | | | |
| Battery switch | | | | | | |
| Limit switches: Transmission, steering, drive train | | | | | | |
| Support pressure indicator ² | | | | | | |

| 10. inspection category: Chassis - control systems ¹ | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Engine regulation | | | | | | |
| Transmission | | | | | | |
| Couplings | | | | | | |
| Circuits | | | | | | |
| Brakes | | | | | | |
| Steering | | | | | | |
| Control displays | | | | | | |
| Engine shut off line | | | | | | |
| Control of supports ² | | | | | | |
| Axle suspension | | | | | | |
| Crane leveling | | | | | | |
| Rear axle steering | | | | | | |

| 11. inspection category: Superstructure | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Frame | | | | | | |
| Coverings | | | | | | |
| Treads | | | | | | |
| Storage | | | | | | |

| 11. inspection category: Superstructure | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Counterweights | | | | | | |
| Relapse retainer | | | | | | |
| Slewing ring connection: Tilt play | | | | | | |
| Slewing ring connection: Mounting screws | | | | | | |
| Slewing ring connection: Gears | | | | | | |
| Slewing gear: Mounting screws | | | | | | |
| Slewing gear: Gears | | | | | | |

| 12. inspection category: Superstructure - crane operator's cab | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Doors | | | | | | |
| Windows / windshields | | | | | | |
| Window wiper | | | | | | |
| Mirrors | | | | | | |
| Seat | | | | | | |
| Heater | | | | | | |
| Ventilation | | | | | | |
| Muffler | | | | | | |
| Joystick for working functions | | | | | | |
| Gear shifts | | | | | | |
| Retainer: Crushing / shear locations | | | | | | |

| 13. inspection category: Superstructure - Retaining and protection devices | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Accesses, ladders | | | | | | |
| Handles | | | | | | |
| Coverings | | | | | | |
| Covers | | | | | | |
| Hatches | | | | | | |
| Treads | | | | | | |

| 14. inspection category: Superstructure - drive train | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Combustion engine | | | | | | |
| Exhaust system | | | | | | |
| Fuel tank | | | | | | |
| Urea tank | | | | | | |

| 14. inspection category: Superstructure - drive train | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Fuel container | | | | | | |
| Filter | | | | | | |
| Sound absorber | | | | | | |
| Engine mount | | | | | | |
| Fuel lines | | | | | | |
| Urea lines | | | | | | |
| Fuel lines | | | | | | |

| 15. inspection category: Superstructure - hydraulic system | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Oil container | | | | | | |
| Filter | | | | | | |
| Pumps | | | | | | |
| Motors | | | | | | |
| Valves | | | | | | |
| Lines | | | | | | |
| Hoses | | | | | | |
| Cylinders | | | | | | |
| Pressure limiting valves | | | | | | |
| Lowering brake valves | | | | | | |
| Brake control: Hoist gear | | | | | | |
| Brake control: Slewing gear | | | | | | |

| 16. inspection category: Superstructure - electrical system | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Motors | | | | | | |
| Generators | | | | | | |
| Batteries | | | | | | |
| Switches / buttons | | | | | | |
| Lines | | | | | | |
| Fuses | | | | | | |
| Resistors | | | | | | |
| Lighting | | | | | | |
| Signal lights | | | | | | |

| 17. inspection category: Superstructure - control systems | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Engine regulation | | | | | | |
| Transmission | | | | | | |
| Flexible couplings | | | | | | |
| Circuits | | | | | | |
| Engine shut off line | | | | | | |
| Control displays | | | | | | |

| 18. inspection category: Superstructure - rope drives | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Winch 1 ³ | | | | | | |
| Winch 2 ³ | | | | | | |
| Winch 3 ³ | | | | | | |
| Winch 4 ³ | | | | | | |
| Winch 5 ³ | | | | | | |
| Winch 6C ³ | | | | | | |
| Winch 6 ³ | | | | | | |
| Assembly winches ³ | | | | | | |
| Rope pulleys | | | | | | |
| Rope end connection | | | | | | |
| Rope for winch 1 | | | | | | |
| Rope for winch 2 | | | | | | |
| Rope for winch 3 | | | | | | |
| Rope for winch 4 | | | | | | |
| Rope for winch 5 | | | | | | |
| Rope for winch 6C | | | | | | |
| Rope for winch 6 | | | | | | |
| Rope for assembly winches | | | | | | |
| Guy ropes | | | | | | |

| 19. inspection category: Superstructure - hook | | | | | | |
|--|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Pulleys | | | | | | |
| Rope guards on pulleys | | | | | | |
| Axle support | | | | | | |
| Load hook | | | | | | |
| Load hook mounting | | | | | | |
| Hook retention | | | | | | |

| 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 torque limiter | | | | | | |
| Angle indicator: Boom | | | | | | |
| Angle indicator: Luffing jib | | | | | | |
| Angle indicator: Slewing gear | | | | | | |
| Safety equipment: Control | | | | | | |
| Working range limitation | | | | | | |
| Pressure sensor | | | | | | |
| Speed sensor | | | | | | |
| Wind sensor | | | | | | |
| Sliding beam monitoring | | | | | | |
| Support pressure indicator | | | | | | |
| Incline indicator | | | | | | |
| Length indicator: Boom radius, boom length | | | | | | |
| Emergency off system | | | | | | |
| Engine stop | | | | | | |

| 21. inspection category: Boom | | | | | | |
|------------------------------------|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Weld structure | | | | | | |
| Rope pulleys | | | | | | |
| Change over pulleys feed mechanism | | | | | | |
| Luffing cylinder | | | | | | |
| Telescoping cylinder | | | | | | |
| Boom extension ropes | | | | | | |
| Boom retraction ropes | | | | | | |
| Boom bearings | | | | | | |
| Boom pinning | | | | | | |
| Guy rods | | | | | | |
| Guy ropes | | | | | | |

| 21. inspection category: Boom | | | | | | |
|-------------------------------|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Control ropes | | | | | | |
| Guide ropes | | | | | | |
| Safety ropes | | | | | | |
| Relapse cylinders | | | | | | |
| Pin connections | | | | | | |

| 22. inspection category: Equipment | | | | | | |
|---|---|---|---|---|---|----------|
| Component to be inspected | A | B | C | D | E | Comments |
| Weld structure | | | | | | |
| Rope pulleys | | | | | | |
| Relapse cylinder | | | | | | |
| Relapse support | | | | | | |
| Oscillation guard | | | | | | |
| A-frame bearings | | | | | | |
| Pinning of components | | | | | | |
| Guy rods with pinning | | | | | | |
| Rods with guide rail on A-frame 2 and A-frame 3 | | | | | | |
| All limit switches with switch mechanism | | | | | | |
| Pin connections | | | | | | |

Inspection chart for periodic inspections of Liebherr mobile and crawler cranes

Inspection criteria:

- A = Present / complete
- B = Condition / maintenance
- C = Function
- D = Repair / replace
- E = Re-inspection required

Evaluation:

- Satisfactory = x
- Unsatisfactory = -
- Not required = 0

Comments:

- ¹ Inspection of the crane carrier vehicle road worthiness is also fulfilled if it has already been certified by the road traffic department certification authority. For cranes that are not certified for use on public roads, an expert or authorized inspector must conduct the required tests to validate the vehicle's road worthiness.
- ² These inspections must be carried out by an authorized inspector even if it has passed the road traffic department test and is certified.
- ³ Inspection of the winches with respect to the actually used proportion of their service life.

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90 Appendix

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90.01 Preface to the appendix

1 Foreword

3

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Fig.195219

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1 Foreword

This crane may only be used in a flawless technical condition and according to its mission as well as with constant awareness of safety and dangers. Any problems, which could affect safety, must be fixed immediately.



Note

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

1.1 Change to the operating instructions

Changes to the operating instructions are received in the form of chapters. The chapter to be replaced must be removed from the operating instructions and replaced with the new chapter in the same location.

When you receive a change to the operating instructions:

- ▶ Remove the chapter to be replaced from the operating instructions.
- ▶ File the new chapter in the same location in the operating instructions.
- ▶ Destroy the replaced chapter.
- ▶ Fill out the change confirmation form in chapter 90.05 of the operating instructions.

1.2 Update to the operating instructions

Updates to the operating instructions, which you receive in the circular as Customer information, must be filed in the operating instructions in chapter 90.05.



Fig.113870: Customer information decal

When you receive an update to the operating instructions:

- ▶ Attach the decals **1**, which are enclosed in the customer information to the footer of the respective chapter. See the following example.



Note

Example: Update to the operating instructions!

If there is an update that concerns the operating instructions, chapter 2.04:

- ▶ Attach the decal **1** in the footer of chapter 2.04.
- ▶ File the update in chapter 90.05 of the operating instructions.
- ▶ Fill out the update confirmation form in chapter 90.05 of the operating instructions.

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90.05 Update confirmation

| | | |
|---|--------------------------|---|
| 1 | Change confirmation form | 3 |
| 2 | Update confirmation | 3 |
| 3 | Customer information | 4 |

Fig.195219

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3 Customer information

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