LIEBHERR

Crawler crane with telescopic boom

LTR 1100

LTR 1100-005
ab Muli 21

Operating instructions

BAL-No.: 17506-04-02

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Works-Number	
Date	

ORIGINAL OPERATING MANUAL

The operating manual is part of the crane!

It must always be available within reach!

The regulations for crane operation must be observed!

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Foreword

General

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

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

Any problems, which could affect safety must be fixed immediately.
Modifications on the crane may only be made with written approval by Liebherr-Werk Ehingen GmbH.

Data recording device

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

– Date and time of day
– Entered configuration of the crane
– Actual load
– Percentage of utilization of the crane
– Working radius
– Main boom angle, luffing jib angle
– Total telescopic boom length, length of each telescopic section
– Every actuation of bypass devices

The recorded data can be read with a respective software.

Safety and warning notes

Safety and warning notes are directed to all persons who work with the crane.
The terms **DANGER**, **WARNING**, **CAUTION** and **ATTENTION** used in the crane documentation are intended to point out certain rules of conduct to all persons working with the crane.

Warning signs	Signal word	Explanation
	**DANGER**	Designates a dangerous situation which will lead to death or serious injury if it is not prevented [1].
	**WARNING**	Designates a dangerous situation which could lead to death or serious injury if it is not prevented [1].
	**CAUTION**	Designates a dangerous situation which could lead to slight or medium injury if it is not prevented [1].
	CAUTION	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 these operating instructions to indicate useful information and tips to all persons working with the crane.

Sign	Signal word	Explanation
	**Note**	Designates useful information and tips.

Crane documentation

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

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

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

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

WARNING
Danger of accident due to incorrect operation of the crane!
Incorrect operation of the crane can lead to accidents!
Personnel can be killed or seriously injured!
This could result in property damage!
- ▶ Only authorized and trained expert personnel are permitted to work on the crane.
- ▶ The crane documentation is part of the crane and must be accessible on the crane.
- ▶ The crane documentation and on-site regulations and specifications (such as accident prevention regulations) must be observed.

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

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

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

WARNING
Outdated version of crane documentation!
If subsequently supplied information, updates and addenda to the crane documentation are not observed and added, there is a danger of accidents!
Personnel can be killed or seriously injured!
This could result in property damage!
- ▶ Observe and add all subsequently supplied information, updates and addenda for the crane documentation.
- ▶ Make sure that all affected persons always know and understand the latest version of the crane documentation.

WARNING
Crane documentation is not understood!
If parts of the crane documentation are not understood and the tasks are carried out on or with the crane, then there is a danger of accidents!
Personnel can be killed or seriously injured!
This could result in property damage!
- ▶ In case of questions regarding the crane documentation, before carrying out the respective task, contact Liebherr Service.

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

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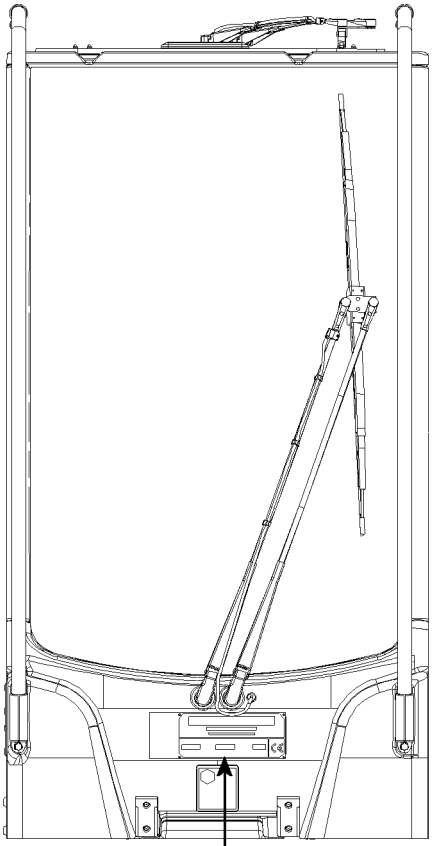

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LIEBHERR
WERK EHINGEN GMBH
D-89582 EHINGEN/DONAU
type
n°d'usine
annee de construction
Werk-Nr.
Baujahr
Type
Works No.
Year of manufacture
Manufactured in Germany
CE

2


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

B110001

CE marking

The CE marking is a mark according to EU laws:

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

Destined use

The destined use of the crane consists solely in vertical lifting and lowering of free and non-adhered loads, whose weight and center of gravity are known.
To do so, a hook or hook block approved by Liebherr must be reeved on the hoist rope and it may only be operated within the permissible crane configurations.
Driving with the crane, with or without an attached load is only permissible if a corresponding driving or load chart is available. The set up configurations intended for it and the safety conditions must be observed according to the corresponding crane documentation.
Any other use or any other exceeding utilization is **not** destined use.
Destined use also includes the adherence of the required safety guidelines, conditions, prerequisites, set up conditions and working steps in the crane documentation (for example: Operating instructions, load charts, erection and take down charts, job planner).
The manufacturer is **not** liable for damages, which are caused by non-destined use or improper use of the crane. Any associated risk it is carried solely by the owner, the operator and the user of the crane.

Non-destined use

Non -destined use is:

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

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

- Attaching a stuck load for which the weight and center of gravity are not known and which is released first, for example with a cutting torch.
- Letting persons drive along outside the driver's cab.
- Transporting personnel in the crane cab while driving.
- Transporting personnel with the lifting equipment and on the load.
- Transporting of persons with work baskets (cherry pickers), if the national regulations of the responsible work safety organization are not observed.
- Transporting loads on the chassis.
- Two hook operation without auxiliary equipment.
- Extended material handling operation.
- Crane operation on a barge if the conditions are not determined and the written release by **Liebherr Werk Ehingen GmbH** is not present.

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

Safety 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 is not working or not working correctly.

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

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

Equipment and spare parts

WARNING
Danger to life if original equipment parts are **not** used!
If the crane is operated with equipment parts, which are **not** original, then the crane can fail and cause fatal accidents!
Crane components can be damaged!
▶ Operate the crane only with original equipment parts!
▶ Crane operation with equipment parts, which do **not** belong to the crane is prohibited!
▶ If there is any doubt about the origin of equipment parts, contact Liebherr Service!

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

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

Definition of directional data for mobile cranes

Driving forwards: Driving with the driver's cab on the front.
Driving in reverse: Driving with the taillights of the crane chassis on the front.
Front, **rear**, **right**, **left** in the **driver's cab** refer to the crane chassis. The driver's cab is always in the front.
Front, **rear**, **right**, **left** in the **crane operator's cab** refer to the superstructure. Front is always in direction of the placed down boom.

Definition of directional data for crawler cranes

Driving forwards: Driving forward from the view of the crane operator seated in the crane cab. Turntable in 0° or 180° position.
Driving in reverse: Driving backward from the view of the crane operator seated in the crane cab. Turntable in 0° or 180° position.
Front, **rear**, **right**, **left** always orient themselves on the **crawler track** from the position of the chain tension devices. The chain tension devices on the crawler track are always on the front.
Front, **rear**, **right**, **left** refer to the direction of view of the crane operator seated in the **crane cab**. Front is always in direction of the placed down boom.

Optional equipment and functions

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

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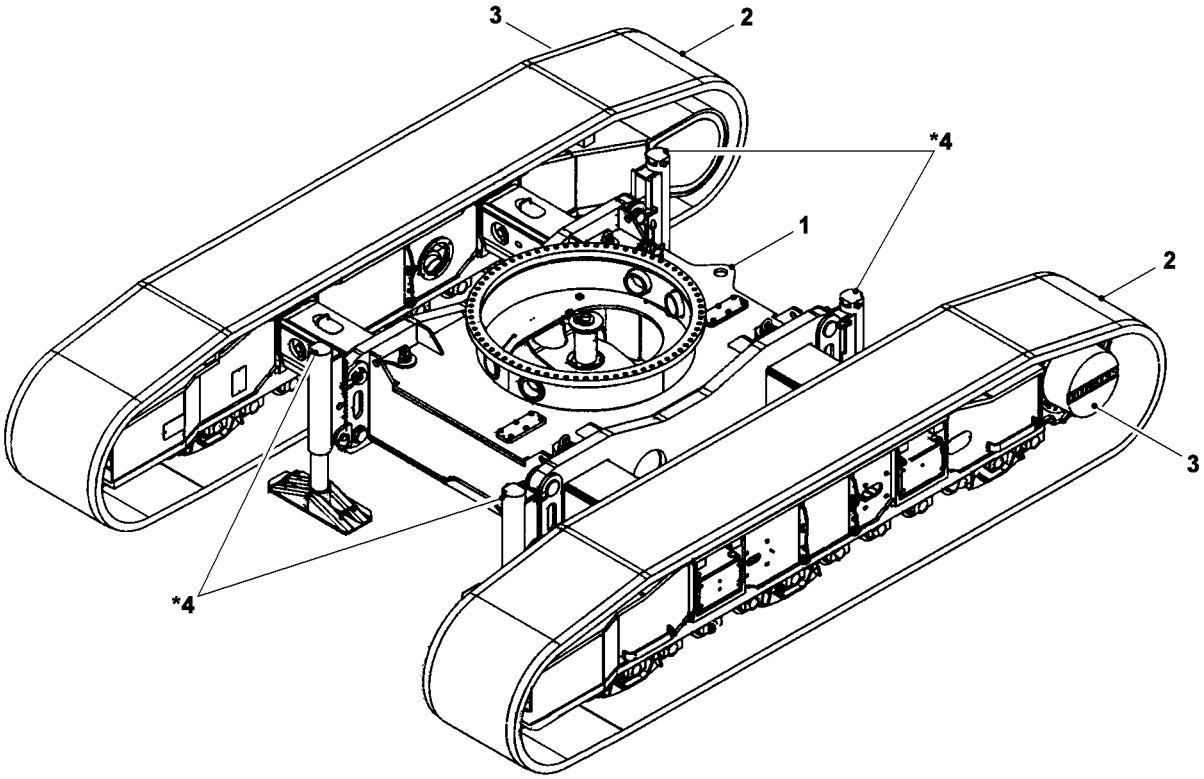
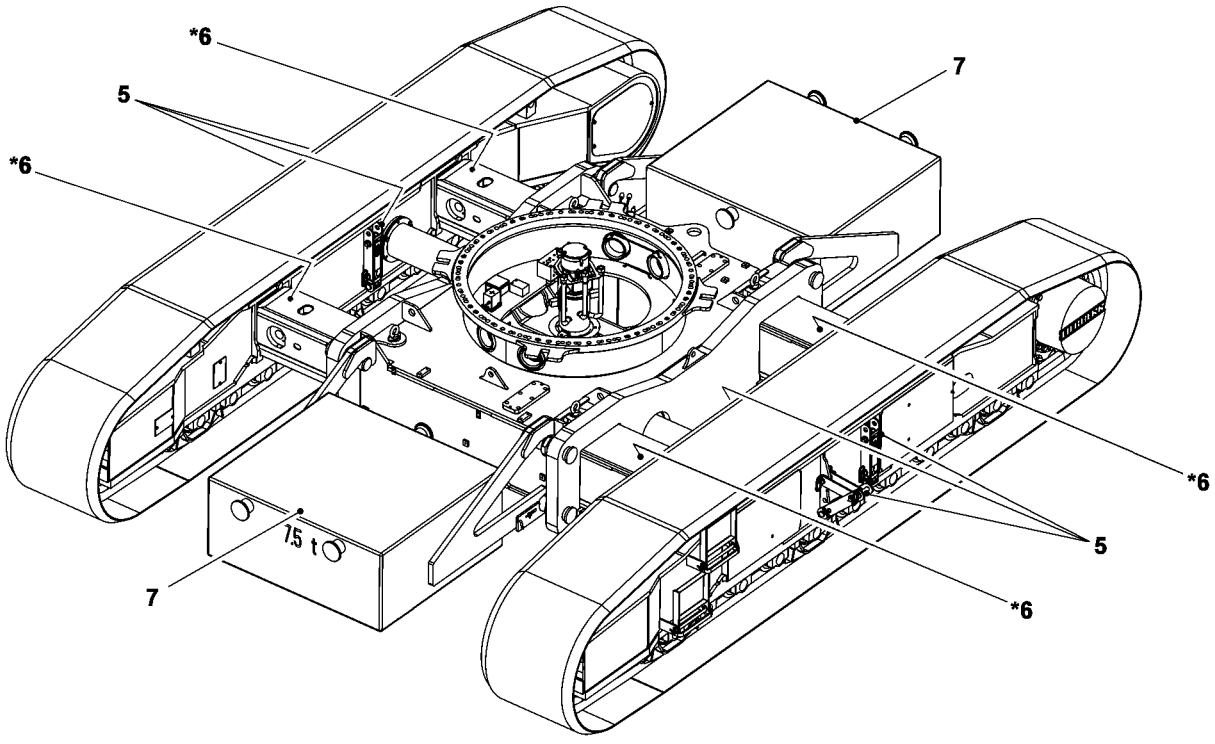
1.00 Description of crane





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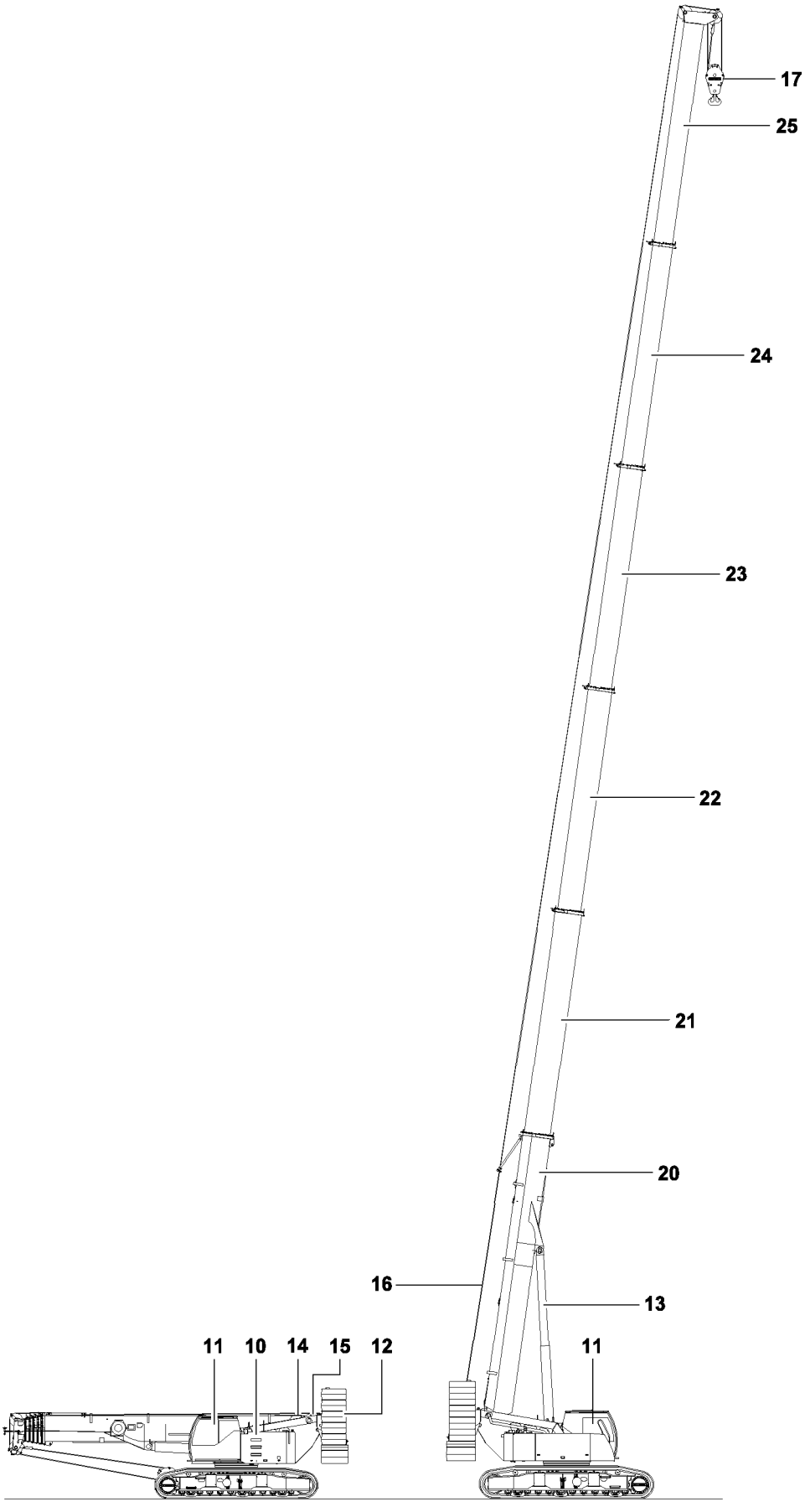
1 Crane components

1.1 Crawler travel gear

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



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10 Crane engine
11 Crane cab
12 Counterweight
13 Luffing cylinder • for telescopic boom adjustment
14 Winch 1
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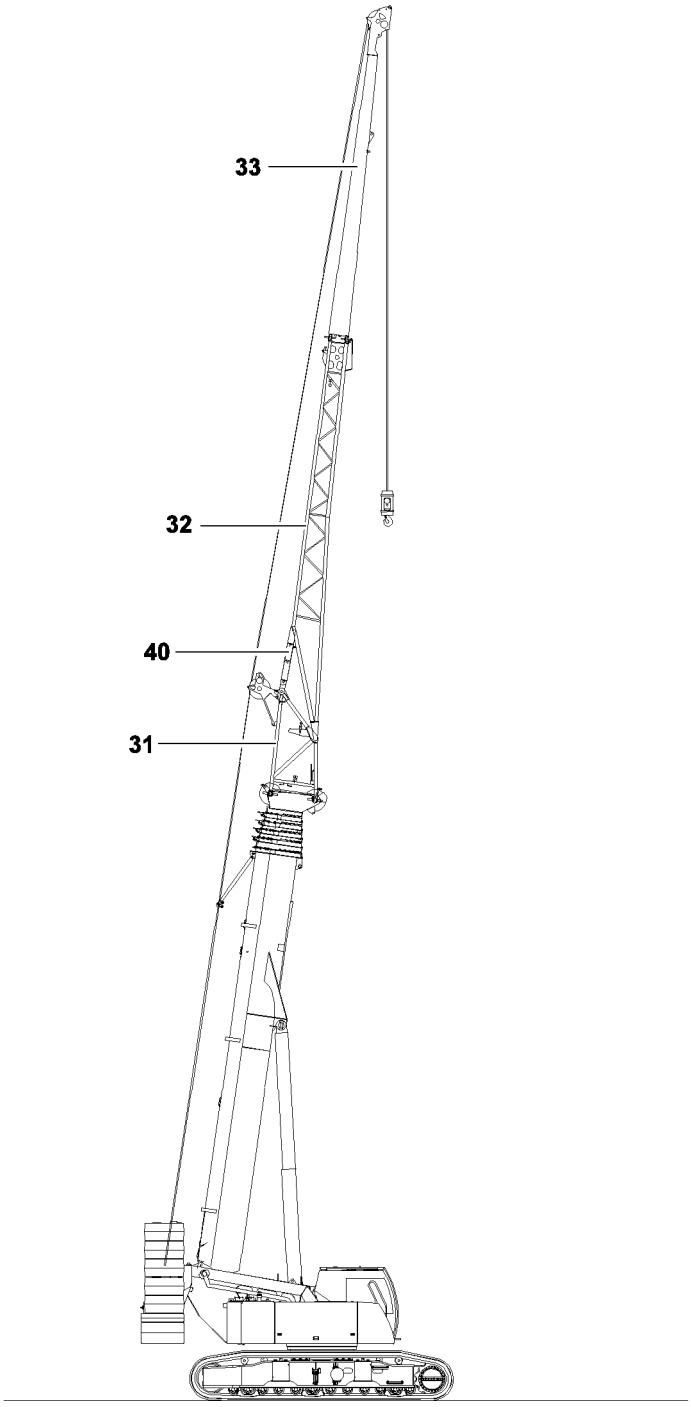
16 Hoist rope
17 Hook block

1.3 Telescopic boom (T)

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



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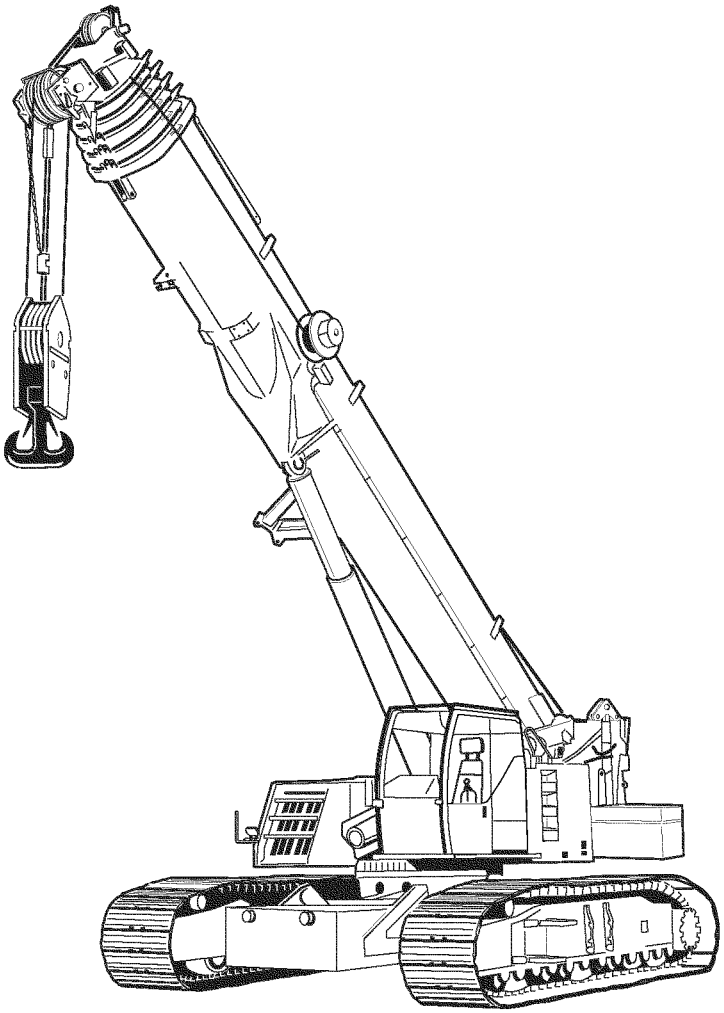
2 Auxiliary boom

2.1 Folding jib (TK)*

31 Adapter
32 Articulated piece
33 Head piece

2.2 Hydraulically adjustable folding jib (TNZK)*

31 Adapter
32 Articulated piece
33 Head piece
40 Adjusting cylinder



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1 Crawler travel gear

1.1 Frame

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

1.2 Hydraulic track width adjustment

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

1.3 Tracks

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

1.4 Travel drive

Per crawler carrier, a hydraulic travel drive consisting of an axial piston motor, planetary gear with spring-loaded hydraulically-releasable travel brake. The crawler chains can be controlled synchronously as well as independently and counterrotating.
Travel speed: 0 - 2.8 km/hr

1.5 Central ballast

15.0 t, hook blocks at 7.5 t, mounting on the crawler center section

2 Crane superstructure

2.1 Frame

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

2.2 Travel / crane engine

4-cylinder Diesel, manufactured by Liebherr, model D 934 L A6, water-cooled.
Performance: 129 KW at 1800 rpm
Maximum torque: 815 Nm at 1500 rpm
Exhaust emissions according to guidelines per 97/68/EG Stage IIIA and EPA/CARB Tier 3
Fuel tank: 727 l

2.3 Crane drive

Diesel hydraulic with 2 axial piston adjustment pumps with servo control and power control
1 gear double pump, open, regulated oil circuits
Hydraulic drive in a compact design is flanged directly onto the Diesel engine, complete drive assembly encased for noise reduction

2.4 Control

Electric “Load-Sensing” control, 4 working movements simultaneously controllable
2 self-centring 4-way manual control levers
The crawler travel gear is actuated via 2 two-way controllable foot pedals.
Crawler travel gear and crane superstructure can be driven at the same time.

2.5 Hoist gear

Axial piston fixed displacement motor
Liebherr rope winch with integrated planetary gear and spring-loaded retaining brake

2.6 Luffing gear

1 differential cylinder with safety check valves

2.7 Slewing gear

Axial piston fixed displacement motor, planetary gear, spring-loaded retaining brake

2.8 Crane driver's cab

Steel construction, fully galvanized, powder-coated, with safety glass, operating and control elements, comfort features.
Crane cab can be tilted backwards.

2.9 Safety systems

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

2.10 Telescopic boom

Dent and distortion-resistant design made from high-strength, close-grained structural steel with oval boom profile, 1 pivot section and 5 telescopic sections. All telescopic sections are hydraulically extendable independent of each other. Rapid-cycle telescoping system “Telematik”
Boom length: 11.5 m to 52.0 m

2.11 Counterweight

Counterweight 26 t

2.12 Electrical system

Modern data bus technology

3 Additional equipment

3.1 Folding jib

10.8 m to 19.0 m long, can be installed below 0°, 20° or 40° to the telescopic boom
Hydraulic cylinder for stepless adjustment of folding jib from 0° to 40°

3.2 Auxiliary boom

2.9 m

3.3 Winch 2

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

3.4 Additional counterweight

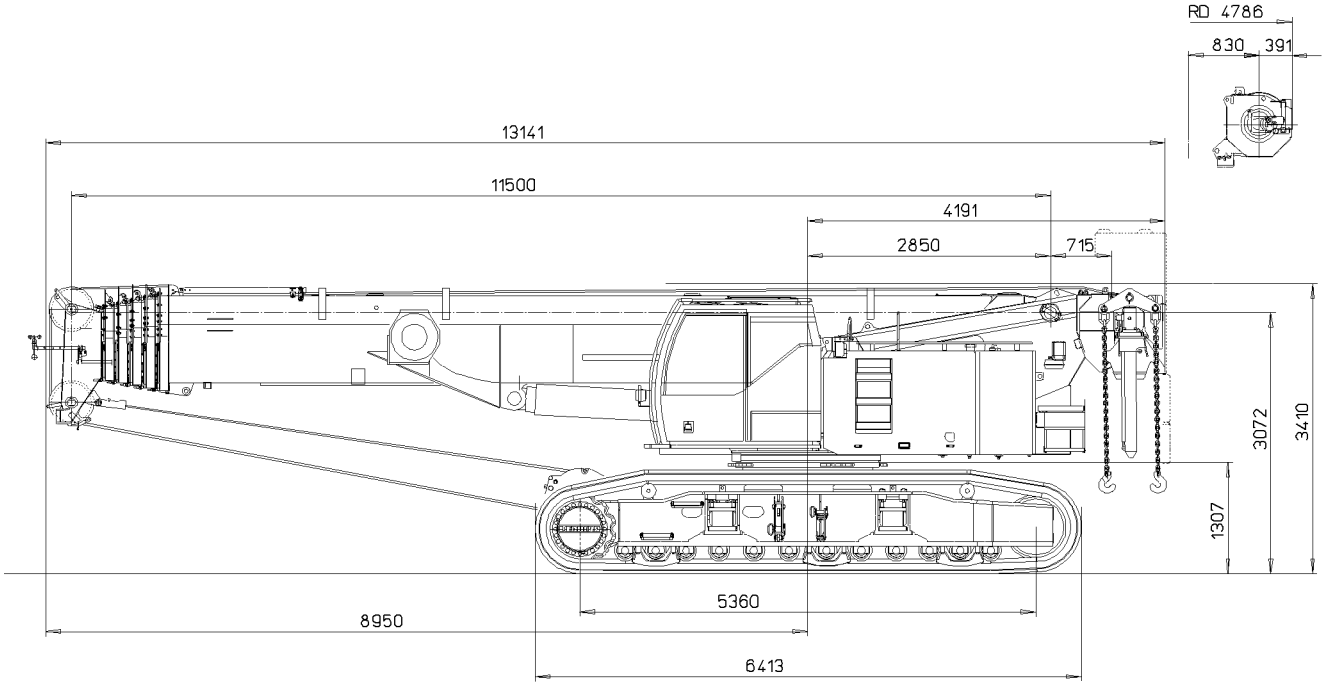
6.0 t for a total counterweight of 32 t

3.5 Jack-up cylinder

For crawler removal
Flatbed vertical height: 1.1 m
Flatbed width: 3.0 m

3.6 Base plates

900 mm flat bottom plates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391
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4191
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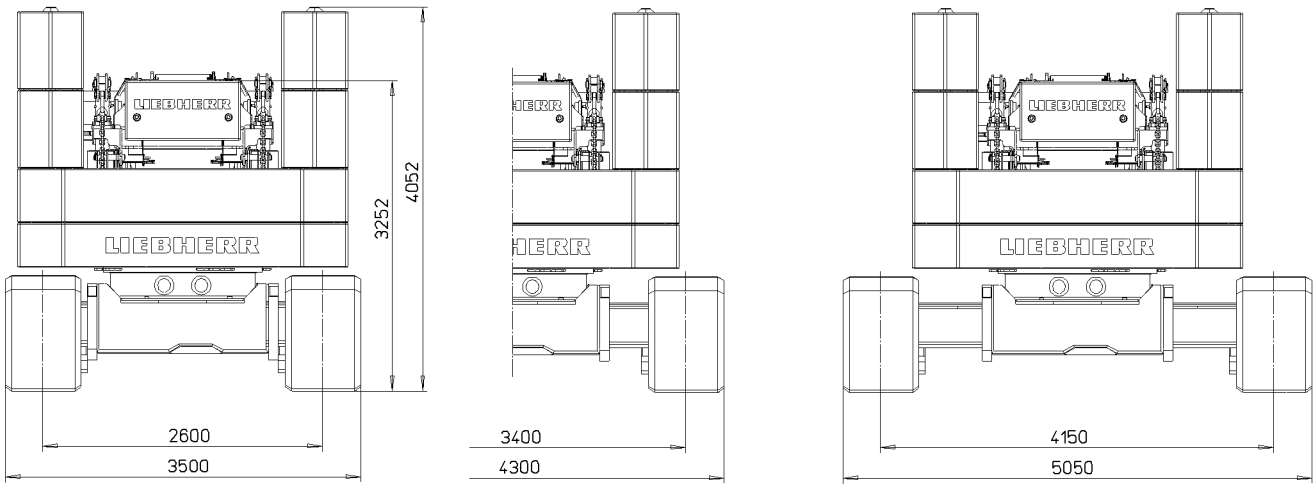
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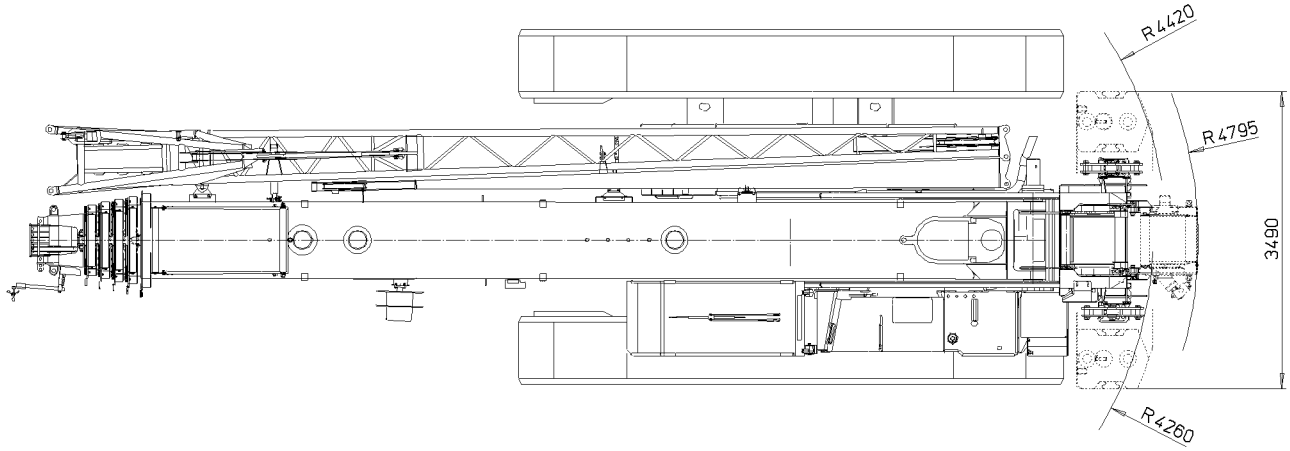
R4420
R4795
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R4260

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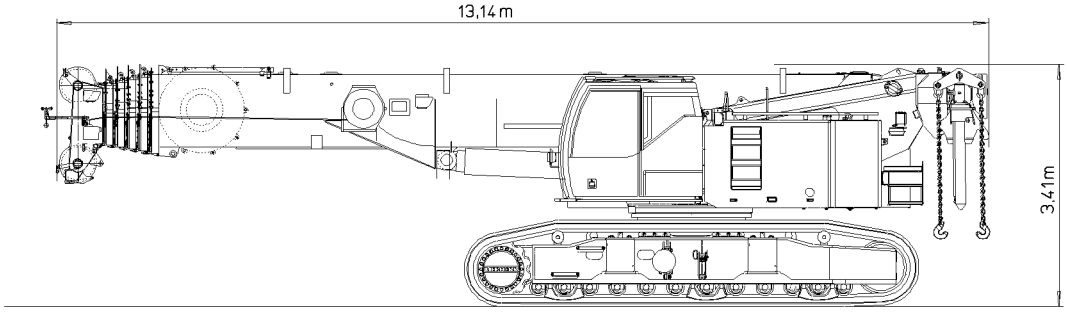
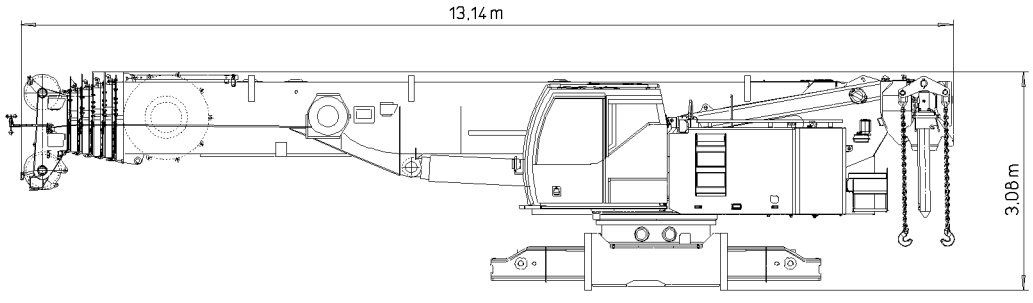
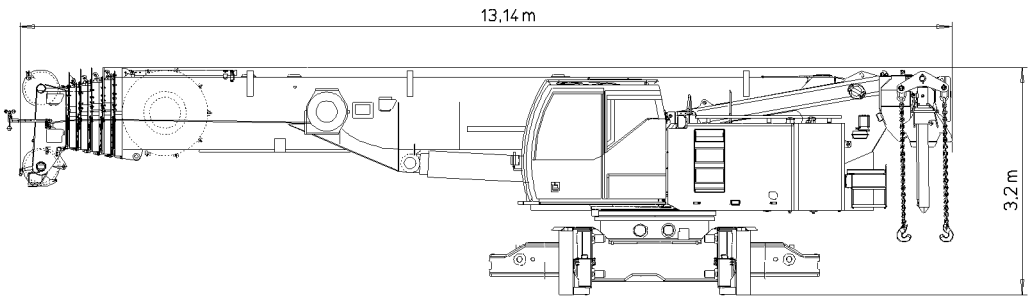
52,6 t



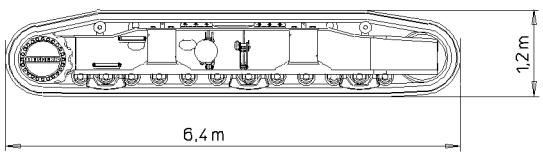
35,2 t

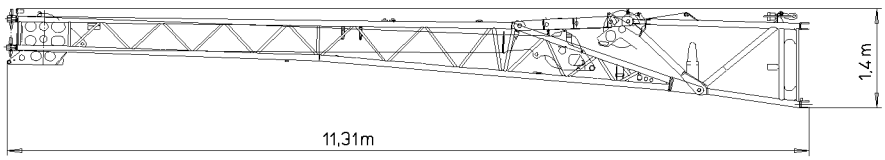


36,6 t

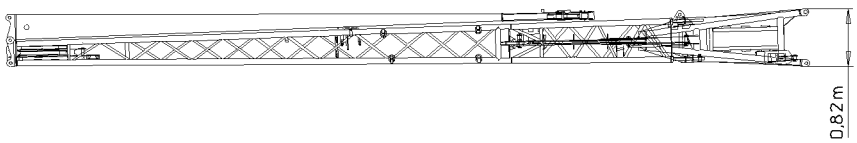


9,9 t





1,67 t (1,8 t)



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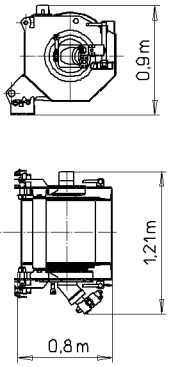
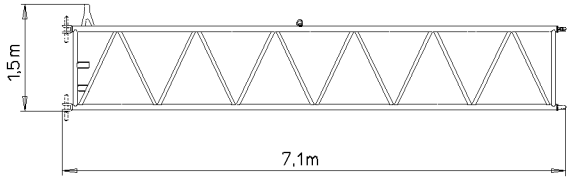
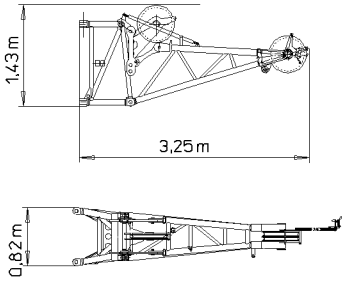
1,3 t



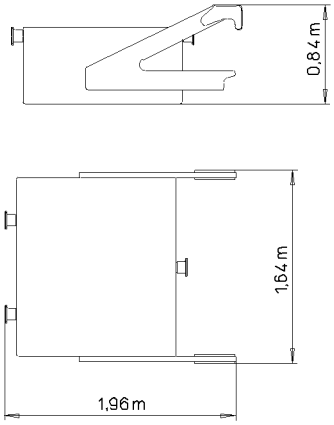
2x 6, 75 t (6,85 t)



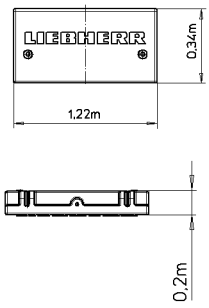
0,6 t



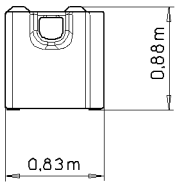
2x 7,5 t



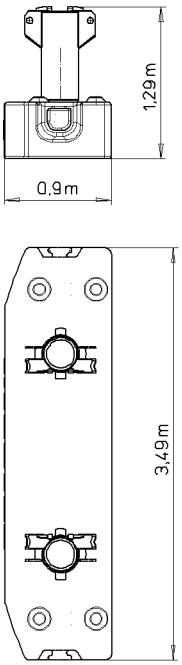
0,9 t



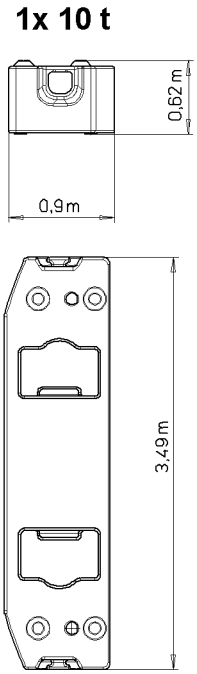
2x 3 t

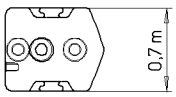


1x 10 t

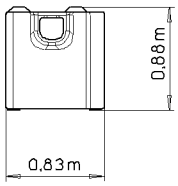


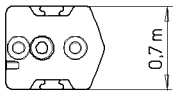
1x 10 t





2x 3 t





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1 Dimensions

See illustrations.

2 Weights

2.1 Crane

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

2.2 Load tackle

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

3 Crane data

Crane data	
Total propelling force	660 kN
Maximum ground pressure with nominal load	1550 kN/m^2
Total weight with 32 t counterweight, 15 t central ballast and 3-roller hoook block	approx: 102 t

4 Vibrations

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

5 Speeds

5.1 Driving speeds

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

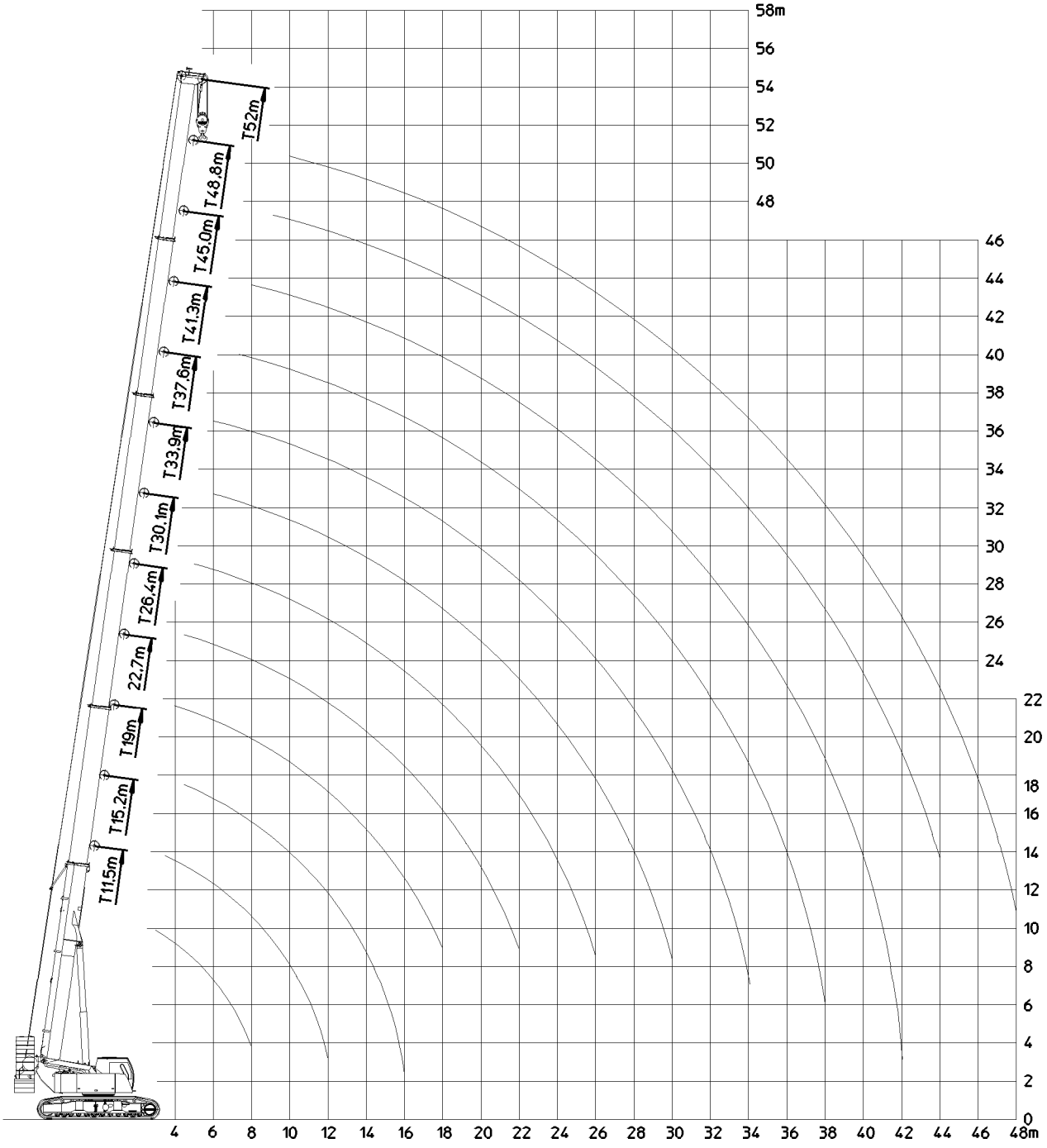
5.2 Crane speeds

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

6 Rope diameter

Type of rope	Rope diameter
Hoist rope 1	21 mm
Hoist rope 2	21 mm

7 Lifting heights



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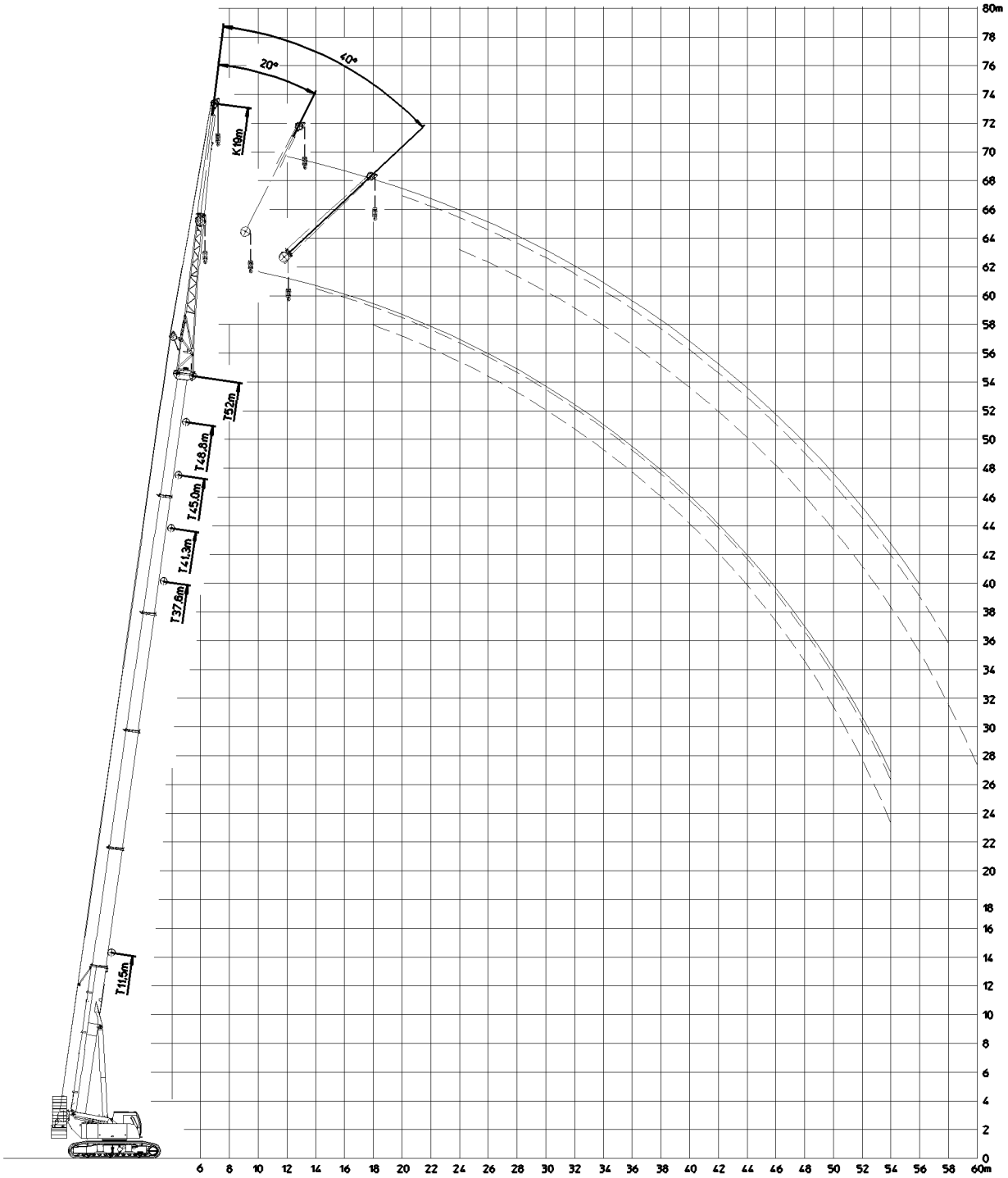
Telescopic boom (T)



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Telescopic boom with folding jib (TK)

2.00 Safety

B195219

1 Crane operation planning

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

DANGER
Missing information increases the risk of accidents!
Crane operation may not be possible or improvisation can result if a crane operator does not have all the required data.
▶ A crane operator must have exact data before starting any work!

The crane operator must obtain or receive the necessary information in a timely fashion before driving to the work site. In particular:
– type of crane operation
– height and width clearance measurements
– electrical transmission lines (including voltages)
– space restrictions at the work site
– movement restrictions caused by buildings
– weight and dimensions of the load(s) to be hoisted
– required hoisting height and boom projection
– ground bearing capacity at the work site

Based on the above information, the crane operator must assemble the equipment required to operate the crane:
– hook block / load hook
– auxiliary boom
– fastening equipment
– counterweight

B195219

1 General

Note

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

1.1 Danger zone of crane

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

WARNING

Do not stay in danger zone!

Personnel within the danger zone cane be hit by falling loads or components!

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

Fatal or severe injuries can be the result!

▶ Warn any personnel within the danger zone with the warning device of the crane!

▶ After the warning is issued, wait and ensure that no personnel remains within the danger zone!

▶ If required, block off the danger zone with a safety distance!

1.2 Danger of crushing when closing the windows

WARNING

Danger of crushing!

Never close the windows carelessly or uncontrolled. Significant crushing injuries can occur!

▶ During closing, watch the windows as it moves up!

▶ Make sure that no personnel or objects are wedged in!

1.3 Exhaust systems and other crane components with high temperatures

WARNING

Danger of burns!

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

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

▶ Let the components cool off before touching them!

▶ Proceed with special caution near heated crane components!

1.4 Movement on the crane

WARNING

Danger of slipping and falling!

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

Personnel can be severely injured or killed!

The crane can be damaged!

- ▶ Step on the walkways and steps by taking the present conditions into account!
- ▶ Step or place a load only on the approved walkways and steps!
- ▶ Observed the signage!
- ▶ Replace damaged safety signs (warning signs) immediately!

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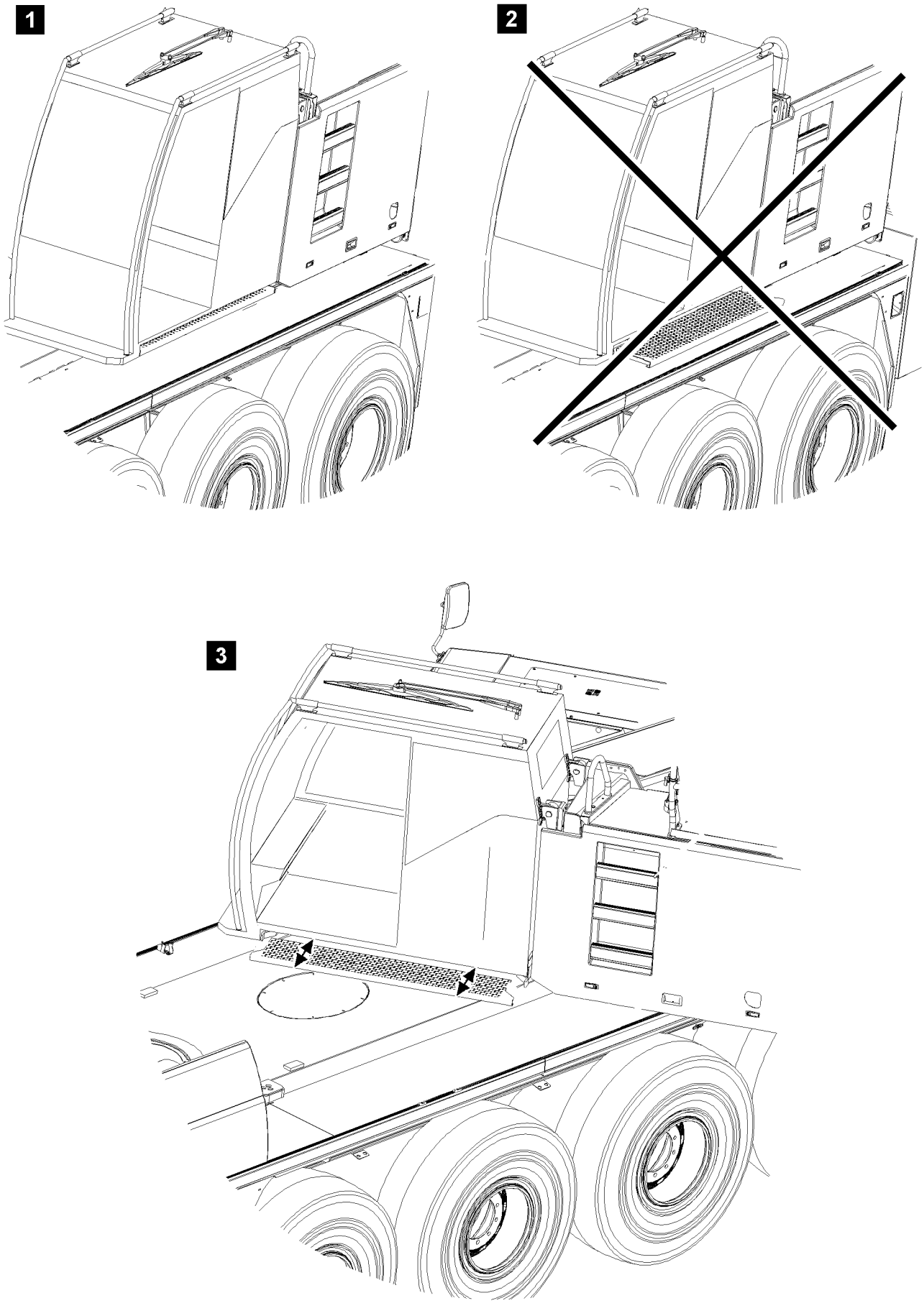

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1.5 Crane operator's cab with retractable / extendable step

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

See illustration **1**.
Before entering / exiting the crane operator's cab, the following prerequisites must be met:
– The crane superstructure is aligned in length axis of the crane chassis.
– The step under the crane operator's cab is moved in.
– The crane operator's cab with incline adjustment is in 0° position.

WARNING
Risk of falling!
If the crane superstructure is aligned in length axis of the crane chassis and the step is moved out, see illustration **2**, then there is a danger of falling when entering / exiting!
Personnel can be severely injured or killed!
▶ Set up a suitable access, such as a ladder or pedestal, to ensure safe entry into the crane operator's cab!
▶ When exiting the crane operator's cab in position crane superstructure in length axis crane chassis, always move the step in completely!

1.5.2 Entering / exiting a swung crane superstructure

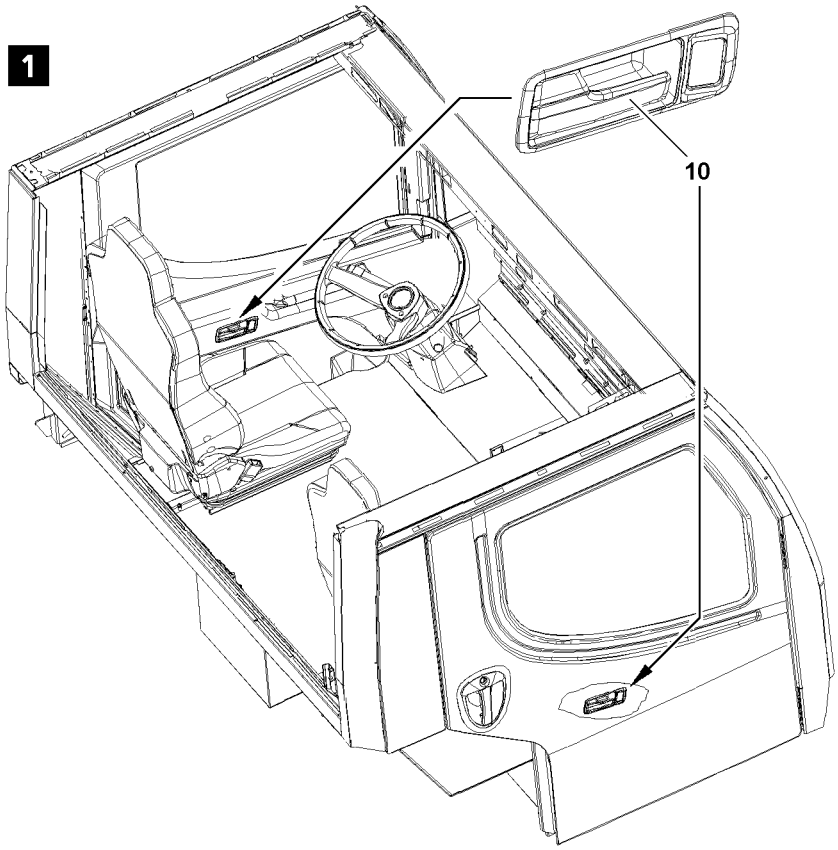
See illustration **3**.
Before entering / exiting the crane operator's cab, the following prerequisites must be met:
– The crane superstructure is swung to the point where a safe access to the crane chassis is ensured.
– For the crane operator's cab with incline adjustment, the crane operator's cab is in 0° position.

Note
▶ Use extendable step!
▶ The extended step allows comfortable entry into the crane operator's cab as well as safe exit from the crane operator's cab to the crane chassis!

1.6 Crane operator's cab with incline adjustment

WARNING
Risk of falling!
If the crane operator's cab cannot be swung from an inclined position (for example 20° position) to the 0° position, for example due to a problem, then utmost caution must be used when entering / exiting the crane operator's cab!
There is a danger of falling. Personnel can be severely injured or killed!
▶ For safety reasons, we recommend to take advantage of outside help!
▶ If necessary, have pedestals or other suitable entry aids set up to ensure safe exit from the crane operator's cab!

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



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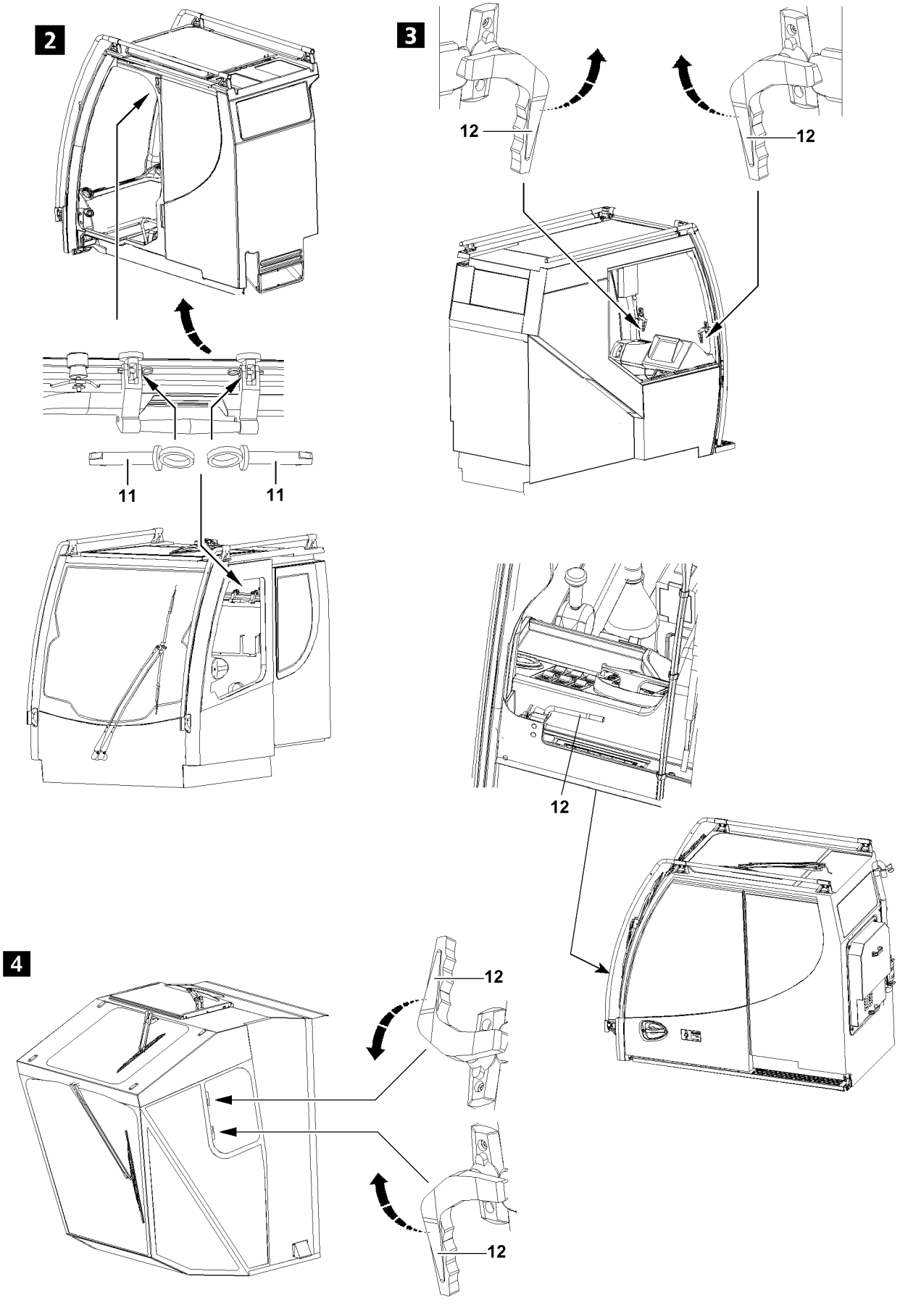
2 Emergency exit

2.1 Emergency exit - driver's cab

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

Note

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



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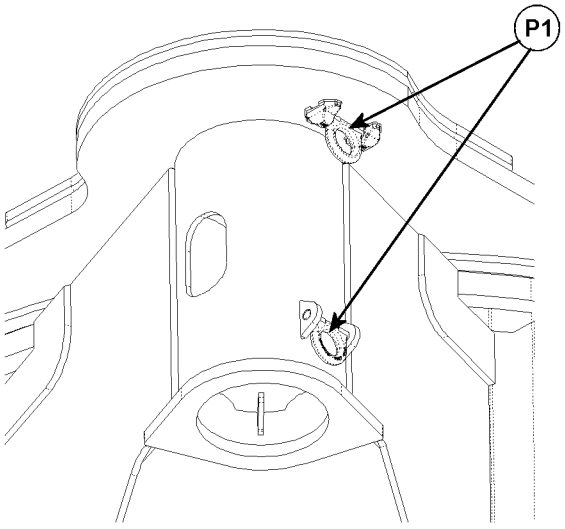
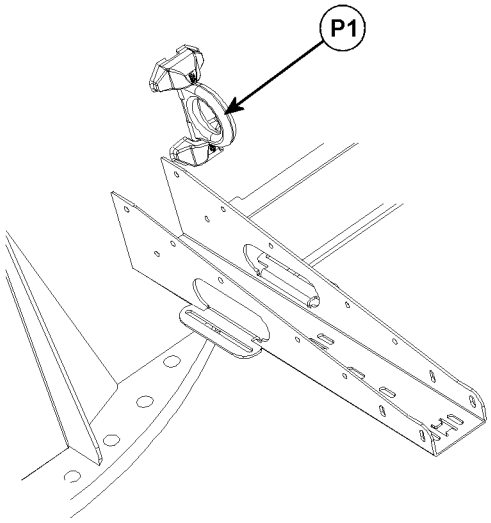
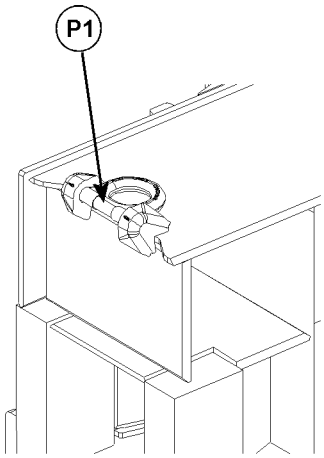
2.2 Emergency exit - crane operator's cab

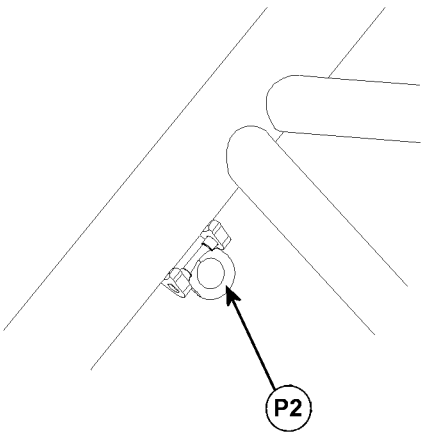
WARNING
Risk of falling!
If it is not possible to safely leave the crane operator's cab through the door or to reset the crane operator's cab from inclined position to horizontal position, then the crane operator can fall from the crane operator's cab during the emergency exit and be severely injured!
- ▶ Be especially careful when exiting at emergency exit!
- ▶ If the crane operator's cab cannot be exited safely, use outside aid!

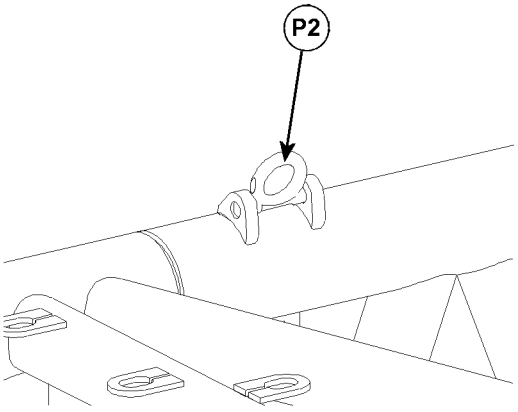
In case of an emergency, if it is not possible to leave the crane operator's cab through the door, the crane operator's cab can be exited through one of the following openings, depending on the model:
- **Roof window**, see illustration **2**: Pull the pins **11** on the left and right and open the roof window upward.
- **Rear window**, see illustration **2**: Pull the pins **11** on the left and right and open the rear window upward.
- **Front window**, see illustration **3**: Unlock the left and right handles **12** and open the front window.
- **Side window**, see illustration **4**: Unlock the top and bottom handles **12** and open the side window.

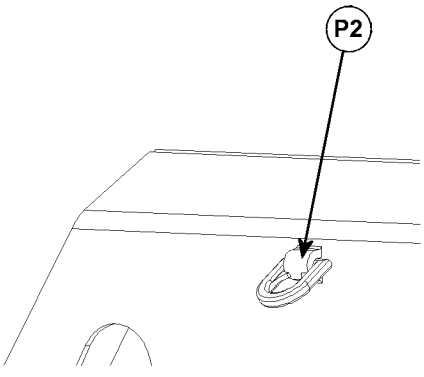












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3 Checking the rigging and fastening points

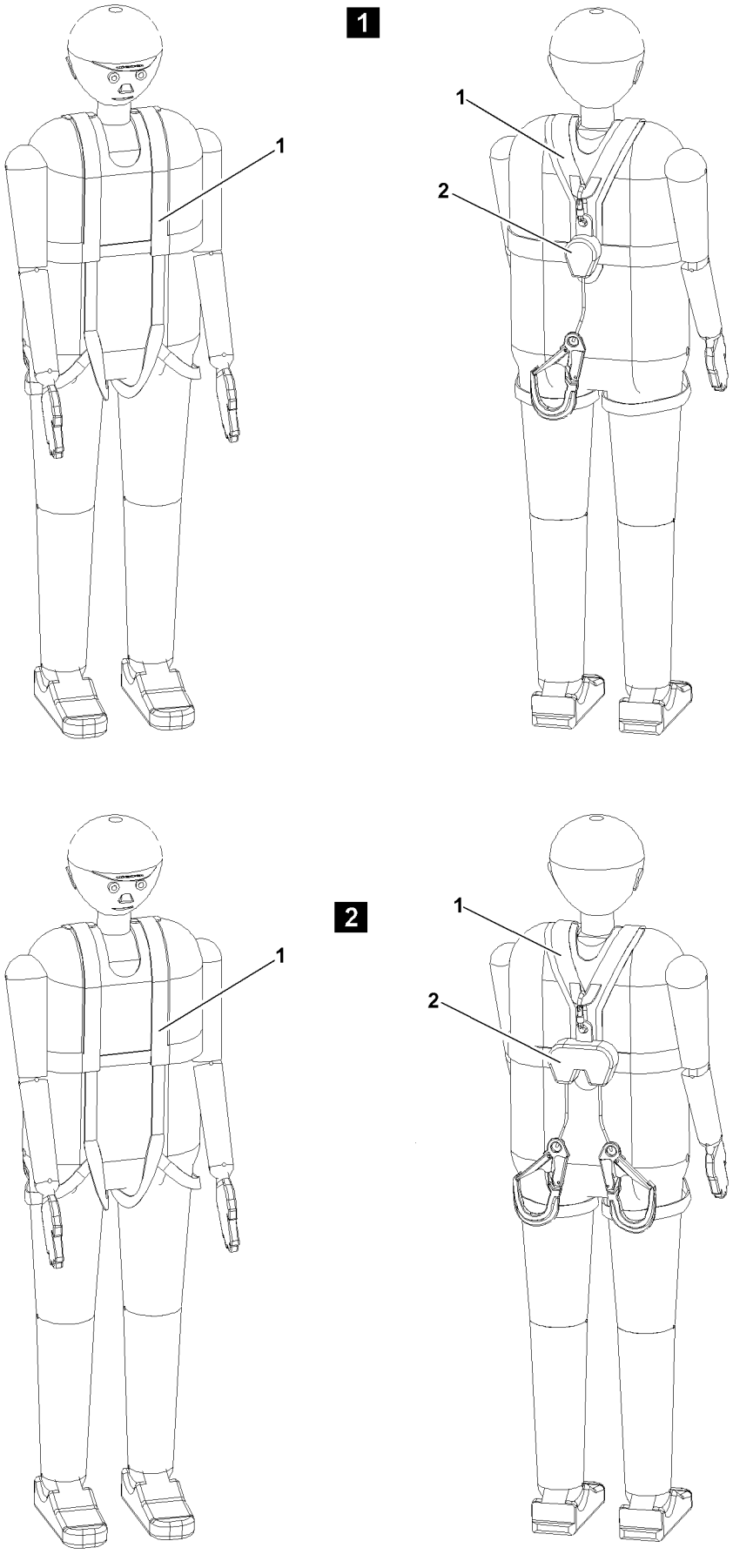
The rigging and fastening points are marked as follows:
P1: Rigging points.
P2: Fastening points.

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

– Completeness of rigging points **P1** and fastening points **P2**.
– Distortion of carrying parts.
– Mechanical damage such as severe nicks.
– Changes in diameter due to wear.
– Significant corrosion (pitting).
– Cracks on carrying parts.
– Cracks or other damage on the welding seam.

WARNING
Risk of accident!
When using rigging and fastening points which are not operationally safe, severe personnel damage and property damage can occur!

▶ Have rigging and fastening points, which are not operationally safe replaced with new rigging and fastening points by authorized and trained expert personnel!
▶ When hooking and unhooking the rigging and fastening equipment, handle carefully to avoid crushing, sheering, catch and impact points!
▶ Eliminate damage of rigging and fastening equipment due to sharp edged stress loads!



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4 Personal protective equipment

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

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

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

WARNING
Risk of fatal injury!
Even personal protective equipment does not provide 100 % protection!
A helmet can protect against small falling objects, but not against falling loads!
Personnel can be killed or seriously injured!
- ▶ Always remain aware of your surroundings and behave in a safe manner!
- ▶ Standing under suspended loads is prohibited!

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

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

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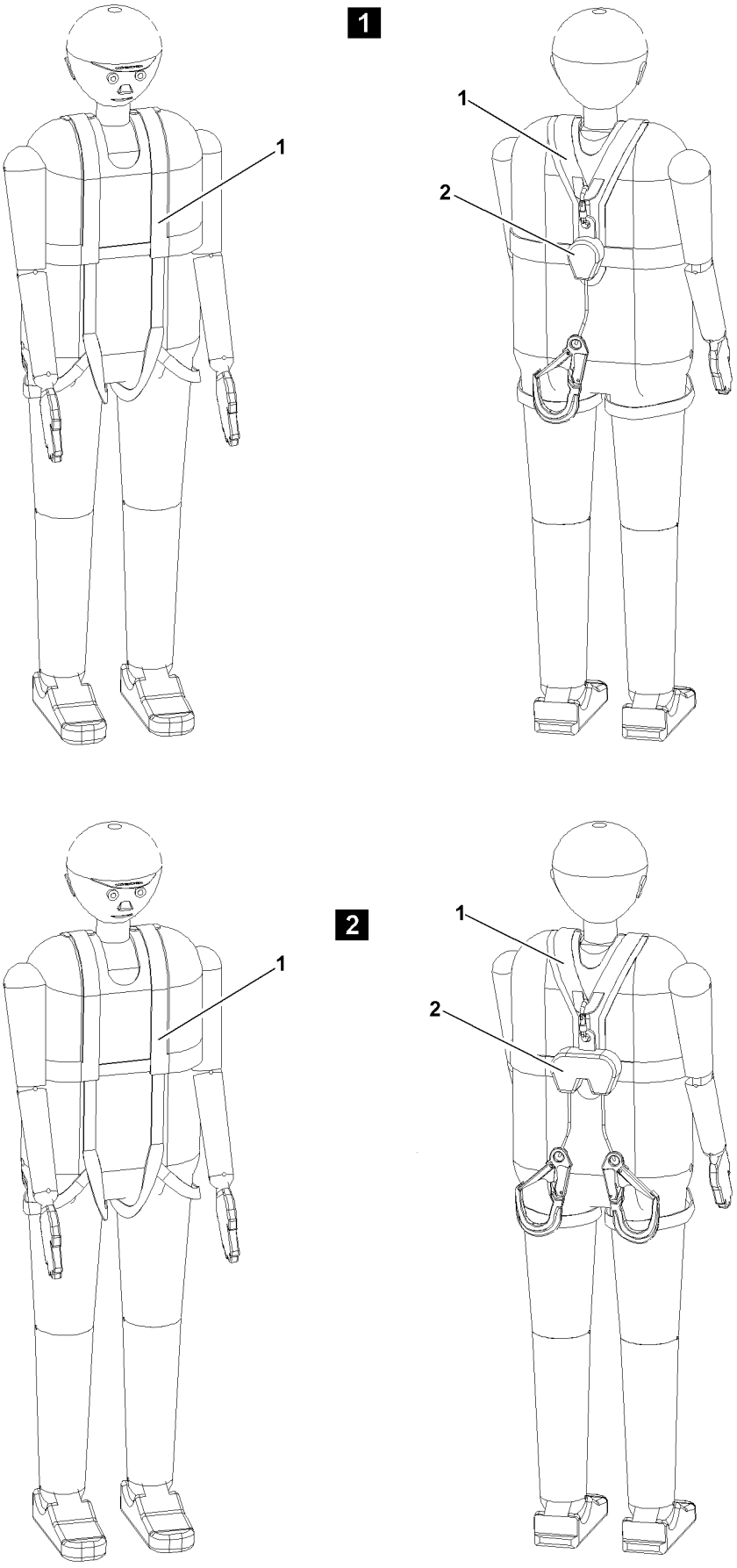

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4.1 Supplied fall arrest system (safety harness and height safety equipment)

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

Note

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

Part of the category “Aids for working aloft” are, for example:

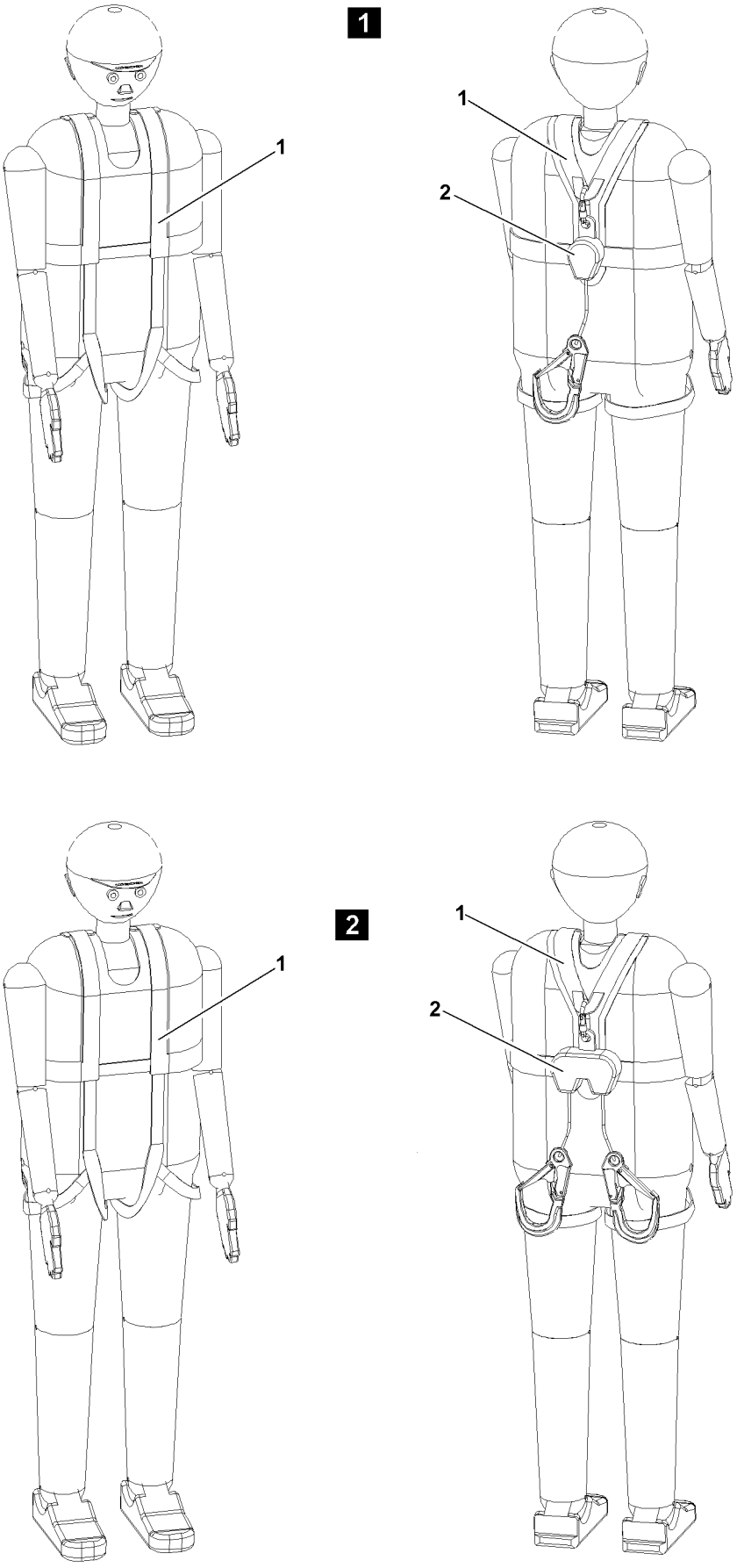
– Lifting platforms
– Scaffolding
– Auxiliary cranes

WARNING

Risk of falling!

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

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



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

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

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

Height safety equipment with two belt straps are intended for cranes with catwalks, which are equipped with two ropes as fastening device on the left and right hand side of the catwalk. For example lattice sections, lattice booms, possibly telescopic booms or assembly units. Use the supplied height safety equipment with two extendable belt straps and snap hooks (**EN 362 Class A**) with links.

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

7 Securing the assembly personnel against falling

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

7.1 Working on the telescopic boom head

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

7.2 Working on the auxiliary boom

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

7.3 Walking on the telescopic boom

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

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

7.4 Access to lattice sections or booms

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

Changing from ladder to catwalk:
– Before changing over, the assembly personnel must hook at least one snap hook of the fall arrest system on a safety rope and secure themselves against falling.

7.5 Walking on lattice sections or booms

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

7.6 Working on lattice sections or booms

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

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

7.7 Descending from lattice sections or booms

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

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

8 Rescuing the assembly personnel

The height rescue system, consisting of the rappelling rescue device, is an evacuation and rescue device. With the height rescue system, one or more persons can rappel down in an oscillating procedure from a higher to a lower location with limited speed. In addition, one person can be pulled up by a helper from a lower to a higher location.

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

8.1 First aid measures after rescue

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

9 Documentation

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

10 Identification

Every personal protective equipment or other equipment must be marked clearly and permanently in the language of the user country.
If the identification is no longer legible, then the personal protective equipment must be handed to an expert for inspection.

11 Requirements for the crane operator

11.1 General

The crane operator's primary responsibility is to use and operate the crane in a manner that is safe for both himself and others.
The following important safety guidelines will help you achieve this.
Many crane accidents are caused by incorrect crane operation.

WARNING
Danger due to operating error!
▶ In the interest of both yourself and others, make sure you understand how your crane operates and familiarize yourself with all the risks associated with the work to be done.

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

- Not paying careful attention while working, for example:
  - Slewing too quickly
  - Stopping the load too quickly
  - Angular pulling
  - Slack rope formation
- Overloading
- Driving too fast with a load or equipment on an uneven roadway
- Attaching the load incorrectly
- Unsuitable operation; especially angular pulling, breaking away stuck loads
- Wind action on suspended loads
- Mistakes when driving on a road, for example:
  - Overspeeding the engine when driving downhill
  - Driving with turned on differential lock
- Crashing into bridges, roofs or high voltage wires due to insufficient headroom
- Inadequate support; support base, support under the support plates
- Mistakes during assembly or disassembly of booms

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

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

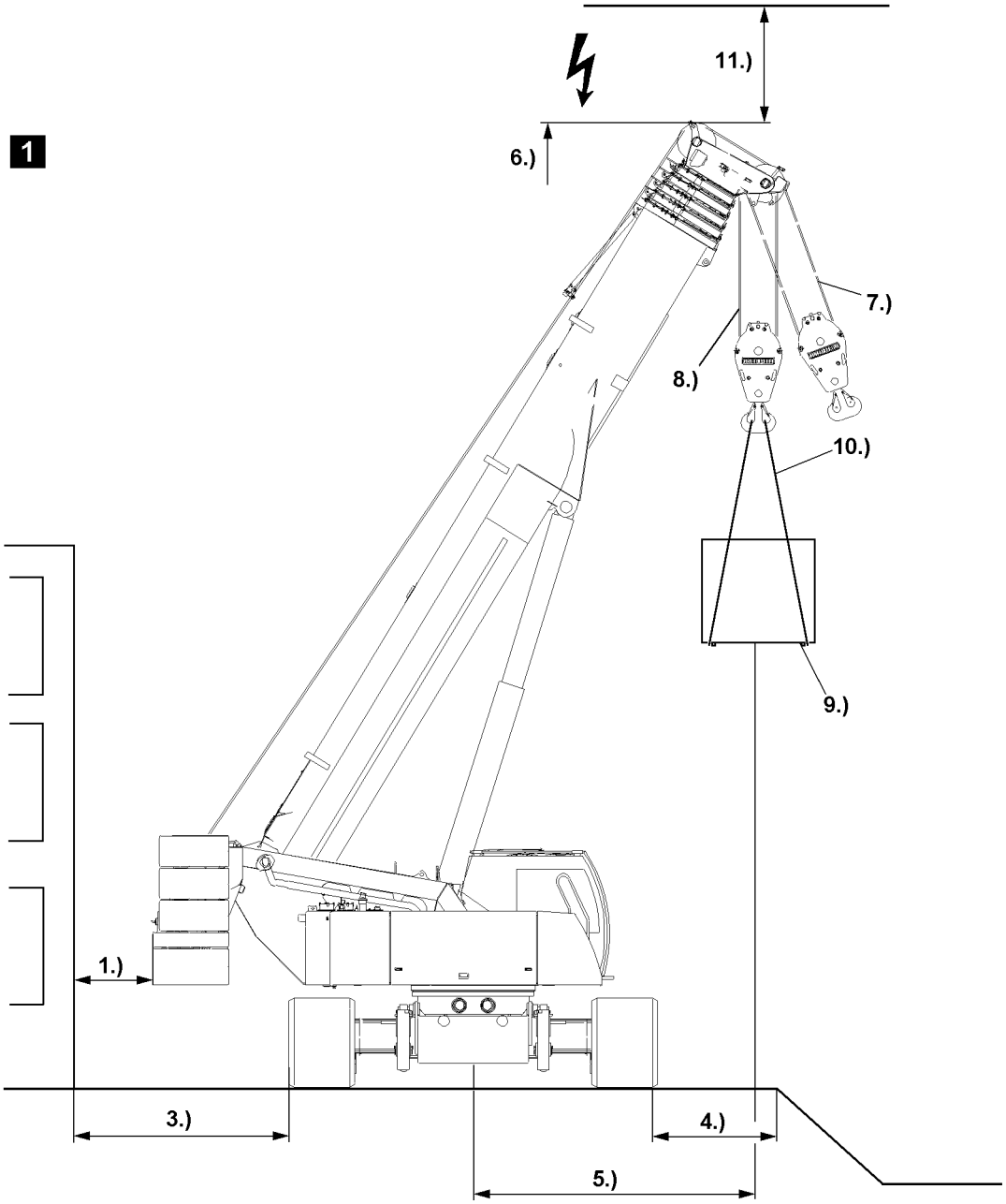
11.2 Working on the crane superstructure or boom

WARNING
Risk 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!

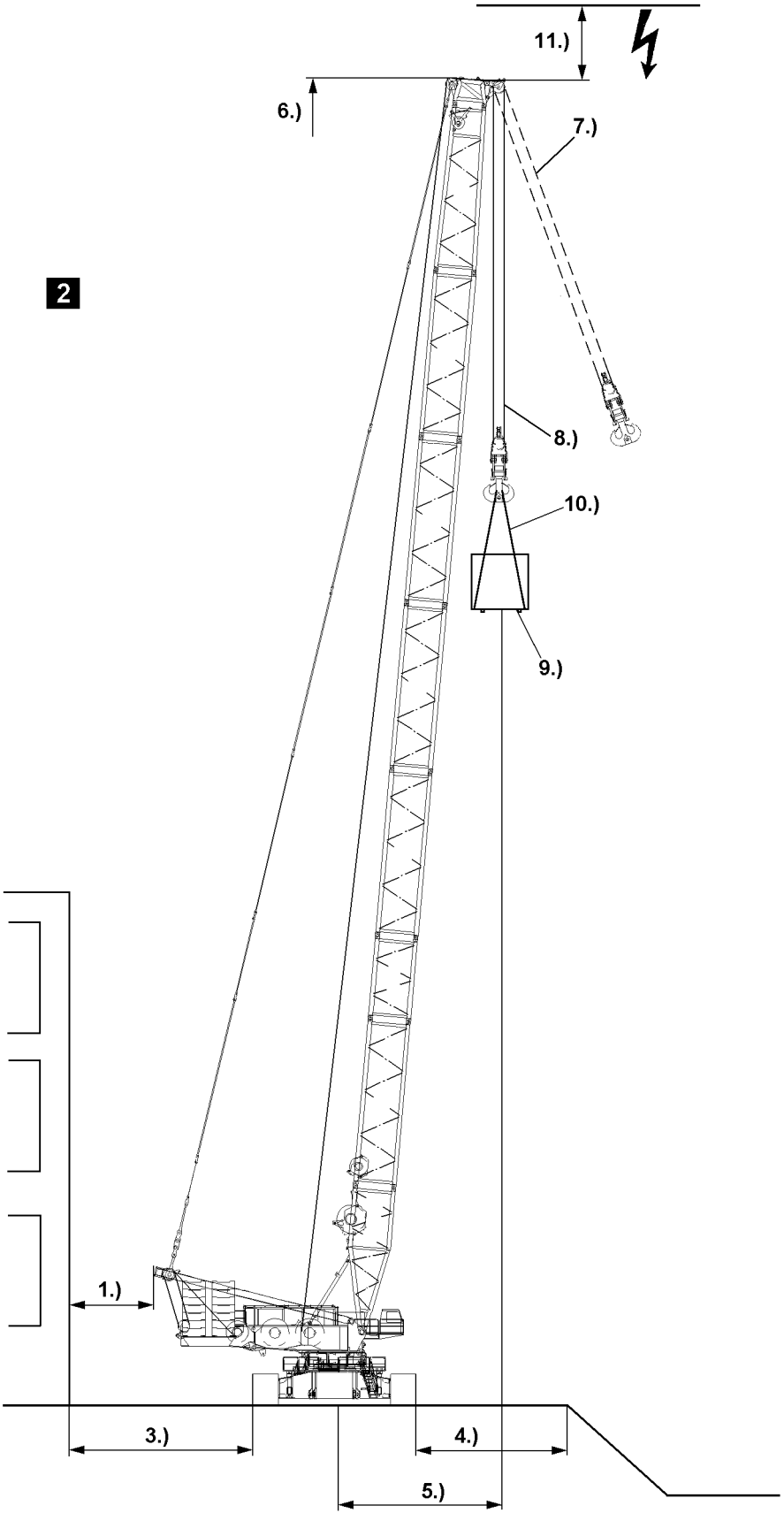
▶ For all work on the crane where there is a danger of falling, suitable safety measures must be taken!
▶ The crane superstructure or boom may not be accessed without suitable aids!
▶ Suitable aids are, for example: Lifting platforms, scaffoldings, ladders, assembly platforms, auxiliary crane.
▶ If railing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

11.3 Obligations of the crane operator

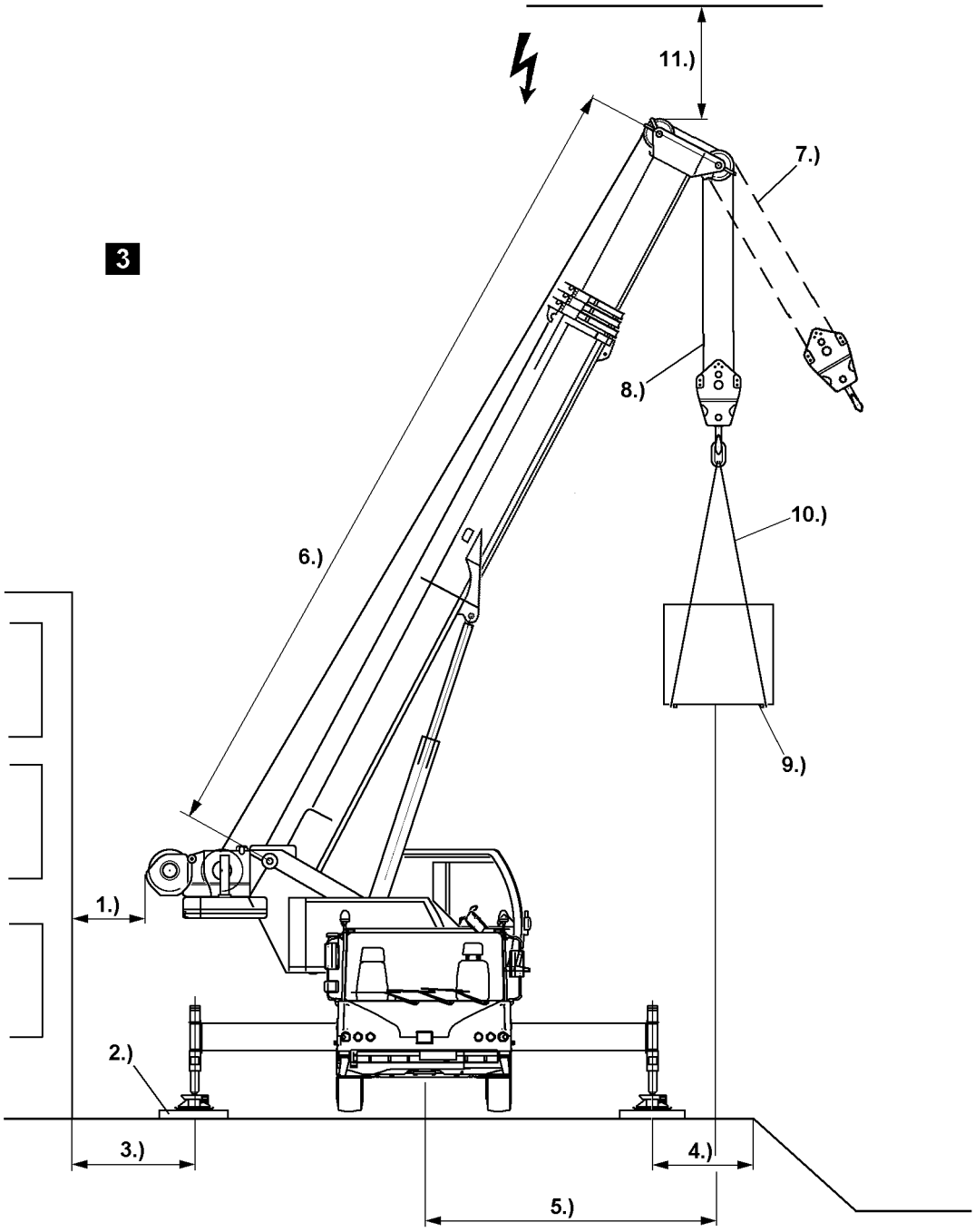
1.) Before starting to work, the crane operator must check the brake function and the emergency shut off devices. He must monitor the condition of the crane for obvious defects. On wireless controlled cranes, he must check the assignment of control unit and crane.
2.) The crane operator must cease crane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



B104101 *Example for crawler crane with telescopic boom*



B104102 *Example for crawler crane with lattice mast boom*



B104103 *Example for mobile cranes*

12 Selecting the location, illustrations 1 to 3

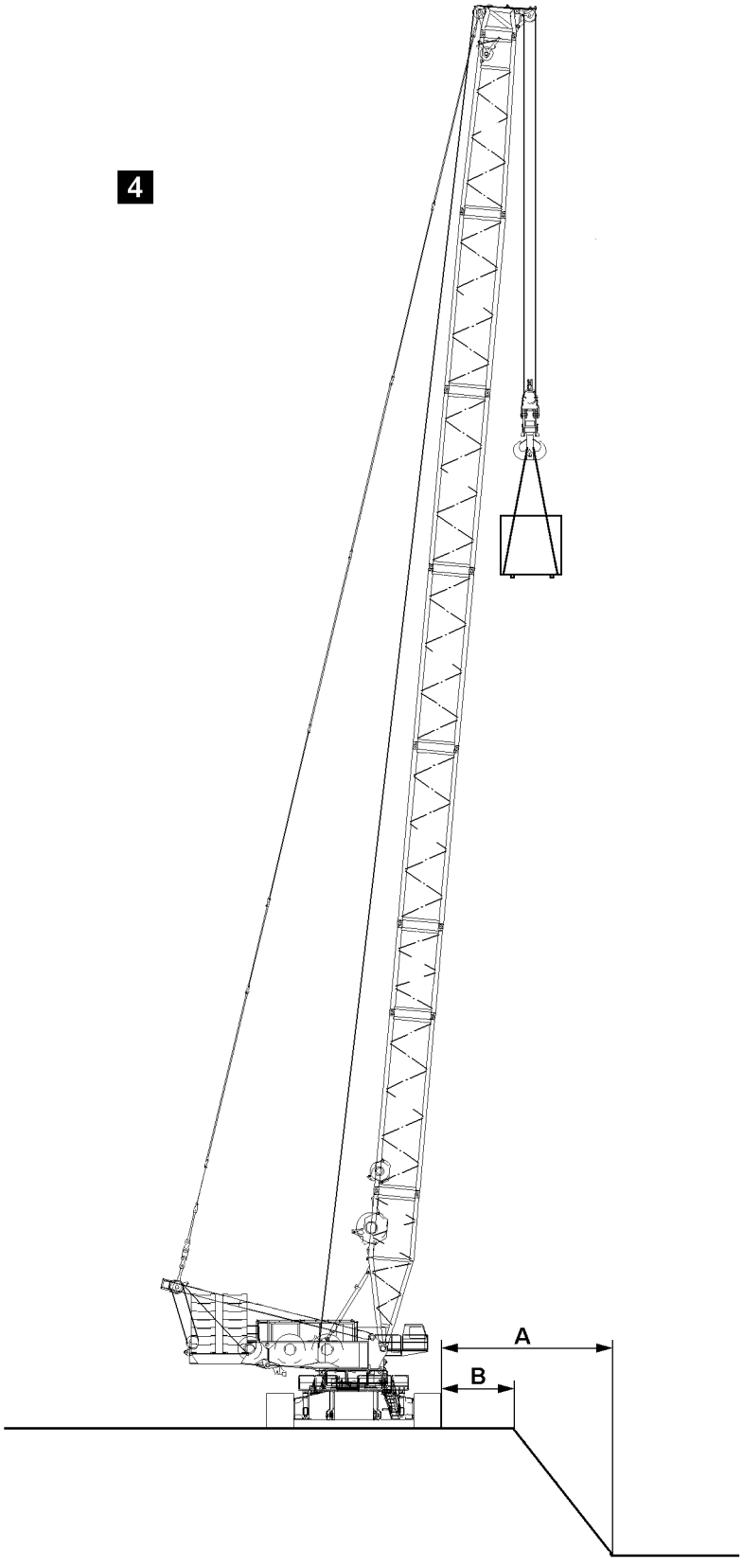
It is very important to choose an appropriate location for crane operation in order to minimize accident risks.

DANGER
Risk of accidents due to ground with **insufficient** load bearing capacity!
If the crane is supported or driven on ground with **insufficient** load bearing capacity, then the crane can topple over and kill personnel!

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

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

1.) Select the placement location in such a way that crane movements can be carried out without collision, and that the outrigger supports can be extended to the support base stipulated in the load charts.
Make sure that no personnel is injured or killed!
Always keep a safety distance of 0.5 m. If this is not possible, block the danger zone off.
2.) On mobile cranes:
Support the crane correctly and support the support plates according to the load bearing capacity of the ground on the placement location.
3.) Keep a safety distance to basements or similar.
4.) Keep a safety distance to slopes or similar.
5.) Keep the radius to as low as possible.
6.) Select the correct boom length to the load case.
7.) Angular pull is prohibited!
8.) Select the correct reeving of the hoist rope to the load case.
9.) Bear in mind the weight and the wind exposure surface of the load.
10.) Select tackle according to the weight of the load, the type of attachment and the incline angle.
11.) Keep sufficient distance to electrical overhead wiring.



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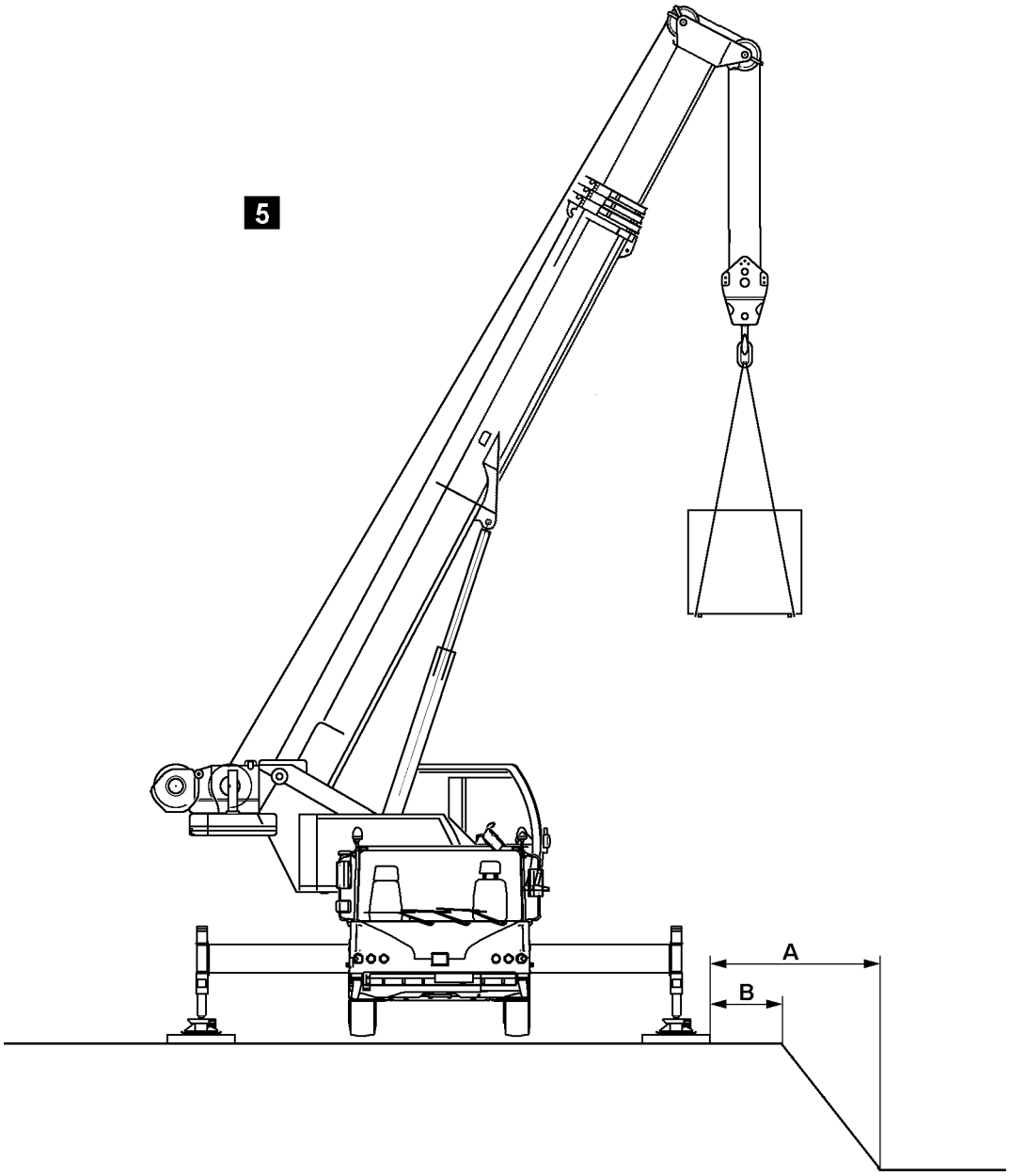
Example for crawler cranes



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Example for mobile cranes

13 Slopes and excavations, illustrations 4 and 5

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

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

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

14 Permissible ground pressures

Permissible ground pressures		
Soil type		[N/cm^2]
1.	Organic ground:	
	Peat, sludge, muck	0
2.	Uncompacted fill:	
	Construction debris	0 to 10
3.	Non-cohesive ground:	
	Sand, gravel, rocks and mix	20
4.	Cohesive soil:	
	a) Clayed silt, mixed with topsoil	12
	b) Silt, consisting of poor clay and coarse clay	13
	c) Plastic clay, consisting of potter's clay and fill	
	Solid	9
	Semi-solid	14
	Solid	20
	d) Mixed granular ground, clay to sand, gravel and rocky areas	
	Solid	15
	Semi-solid	22
	Solid	33
5.	Rock in evenly solid condition:	

Permissible ground pressures		
Soil type		[N/cm²]
a)	Brittle, with traces of decomposition	150
b)	Not brittle	400

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

14.1 Permitted ground pressure for crawler cranes

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

WARNING
The crane can topple over!
If the crane is not properly supported, the crane can topple over and fatally injure personnel!
▶ The foundation support must be large enough for the ground conditions and constructed from solid materials, such as wood or steel plates!

14.2 Permitted ground pressure for mobile cranes

When the crane is supported, the support cylinders transmit significant forces to the ground.
In any case, the ground must be able to safely withstand this pressure. If the support pad area is inadequate, the support pads must be supported from below according to the load bearing capacity of the ground.
The required support area can be calculated from the load bearing capacity of the ground and the crane support force.

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

WARNING
The crane can topple over!
If the crane is not properly supported, the crane can topple over and fatally injure personnel!
▶ Only strong materials may be used for the support pad bases; for example properly dimensioned wooden timbers!
▶ In order to ensure that pressure is evenly distributed over the base surface, the support plates must be positioned in the center of the support base!

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

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

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

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

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

Note

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

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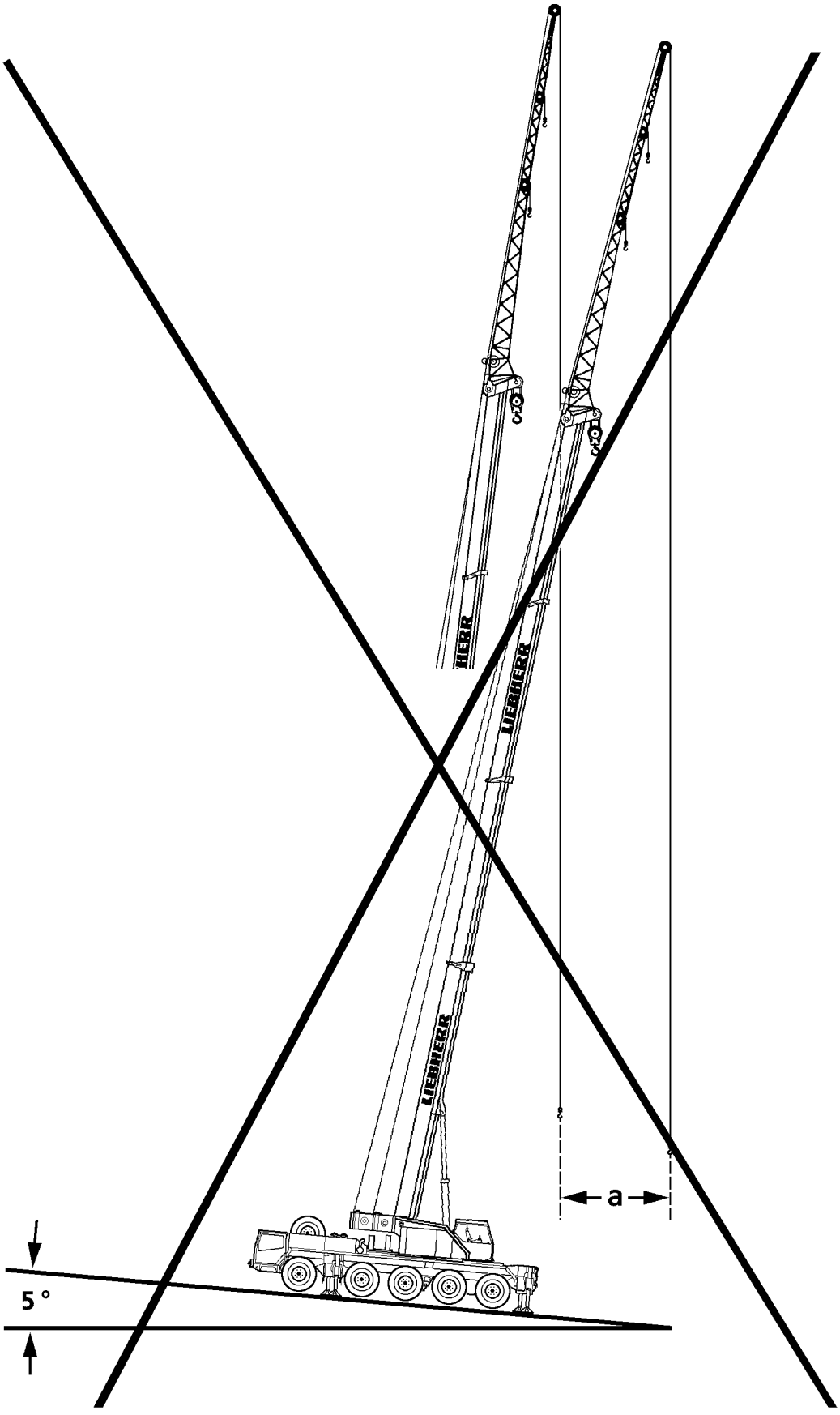

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General example

15 Supporting

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

It is absolutely essential that the crane be supported exactly in accordance with the load charts to ensure safe crane operation.
The match of the sliding beams placement surfaces must be observed to ensure proper force transfer between the sliding beams.
The crane may only be supported in these extension conditions.

WARNING
Danger of tipping over!
If only the load side sliding beams are extended, the crane can tip over when turning or setting down the load!
- ▶ Move all 4 sliding beams and support cylinders out according to the data in the load chart!
- ▶ In intermediate positions between the support bases supporting is prohibited!
- ▶ Pin sliding beams to support base according to the load chart!
- ▶ Fully insert and secure the pins!

WARNING
Risk of tipping the crane due to incorrectly extending the sliding beams!
The load suspended on the hook causes tension and deformation of the hoist rope and telescopic boom. The same applies for operation with lattice jib and guy ropes. If the load is dropped from the fastening ropes or if the fastening or hoist rope breaks in this situation, a sudden relief occurs. The boom snaps back quickly. This can cause the crane to topple over.
Despite previous assumption, it might become necessary to swing the load to the opposite side. This can cause the crane to topple over.
When turning from the vehicle longitudinal direction, the crane can topple over due to the boom or counterweight momentum.
- ▶ It is imperative that all 4 sliding beams and support cylinders are extended according to the load chart specifications!

15.1 Crane alignment

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

DANGER
The crane can topple over due to the incline position!
If the crane is positioned at an incline and if the boom is turned towards the slope, then the boom radius is increased as a result!
It is possible that the slewing gear can no longer hold the crane superstructure and, in extreme cases, the crane can topple over!
Personnel can be severely injured or killed!
▶ It is imperative to align the crane horizontally before starting crane operation!
If the horizontal alignment of the crane has to be readjusted:
▶ Set the load down on the ground before readjusting the crane!

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

16 Checking the safety measures

– The placement location has been selected in such a way that the crane can be operated with the least possible boom radius.
– The load bearing capacity of the ground is adequate.
– There is sufficient distance to excavations and slopes.
– It has been ensured that there are no live electrical wires within the working range of the crane.
– There are no obstacles which will hinder required crane movements.
– The crane is horizontally aligned.
– On mobile cranes:
  • The axle suspension is blocked.
  • All four sliding beams and support cylinders have been extended according to the support base given in the load chart.
  • The sliding beams are secured with pins to prevent them from moving.
  • The support plates are pinned and secured in the operating position.
  • The axles are relieved, which means the tires do not touch the ground.

17 Endangering air traffic

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

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

18 Grounding

18.1 Grounding the crane

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

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

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

18.2 Grounding the load

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

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

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

19 Consideration of wind conditions

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

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

Assembly / crane conditions	Reference for permissible wind speed
Erection and take down of various boom configurations	Wind speed chart
Crane operation	Load chart
Crane operation when permissible wind speed according to load chart is exceeded	Wind speed chart
Interruption of crane operation when crane remains equipped	Wind speed chart
Crane out of operation, when crane remains equipped	Wind speed chart

WARNING
Risk of accident!
The wind hitting the crane and the load can cause an increase of the support force! As a result, the permissible ground pressure can be exceeded!
▶ Take measures in order not to 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!
▶ Note the following: The wind speed on the boom may be higher than it is near the ground!
▶ Always observe the national valid regulations!

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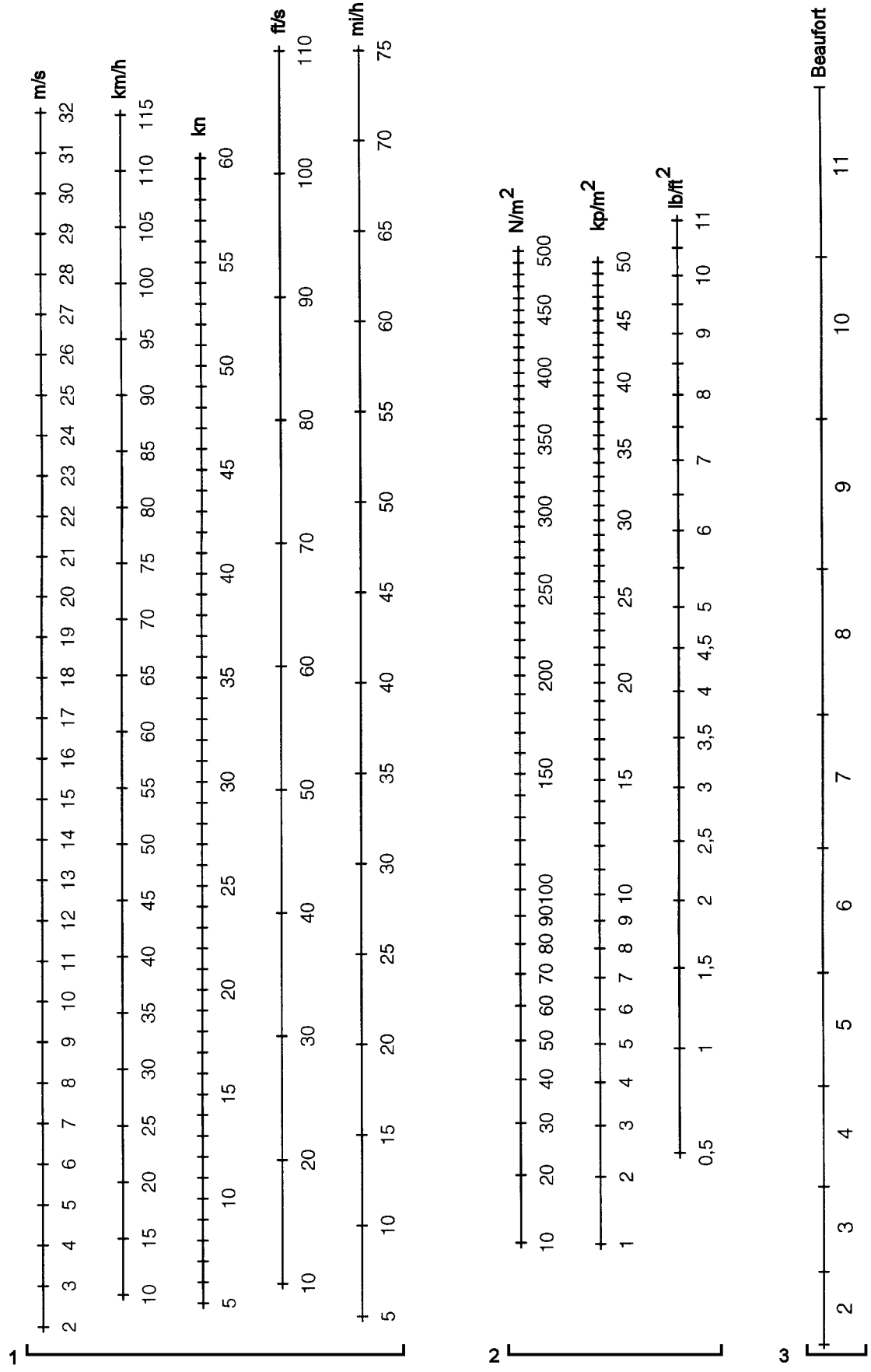

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1 Wind speeds 2 Dynamic pressure 3 Wind velocity

19.1 Conversion chart for wind velocity and dynamic pressure

Note

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

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

19.2 Conversion chart for wind force

Note

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

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

Wind force		Wind speed		Effect of the wind
Beaufort	Description	[m/s]	[km/h]	Inland
4	Moderate breeze	5.5 to 7.9	20 to 28	Swirls up dust and loose paper, moves twigs and thin branches
5	Fresh breeze	8.0 to 10.7	29 to 38	Small deciduous trees begin to sway, whitecaps form at sea
6	Strong breeze	10.8 to 13.8	39 to 49	Thicker branches move; telephone lines begin to whistle, umbrellas are difficult to use
7	Near gale	13.9 to 17.1	50 to 61	Entire trees swaying; difficult to walk into wind
8	Gale force wind	17.2 to 20.7	62 to 74	Breaks branches off trees, impedes walking in open areas considerably
9	Gale	20.8 to 24.4	75 to 88	Minor damage to property (chimney caps and roofing tile are blown off)
10	Severe storm	24.5 to 28.4	89 to 102	Trees are uprooted, significant damage to property
11	Violent storm	28.5 to 32.6	103 to 117	Extensive, widespread storm damage
12	Hurricane	32.7 and more	118 and more	Major destruction

19.3 Wind influences during erection and take down

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

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

19.4 Wind influences in crane operation

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

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

Note

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

Depending on crane application, for example:

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

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

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

WARNING

The crane can topple over!

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

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

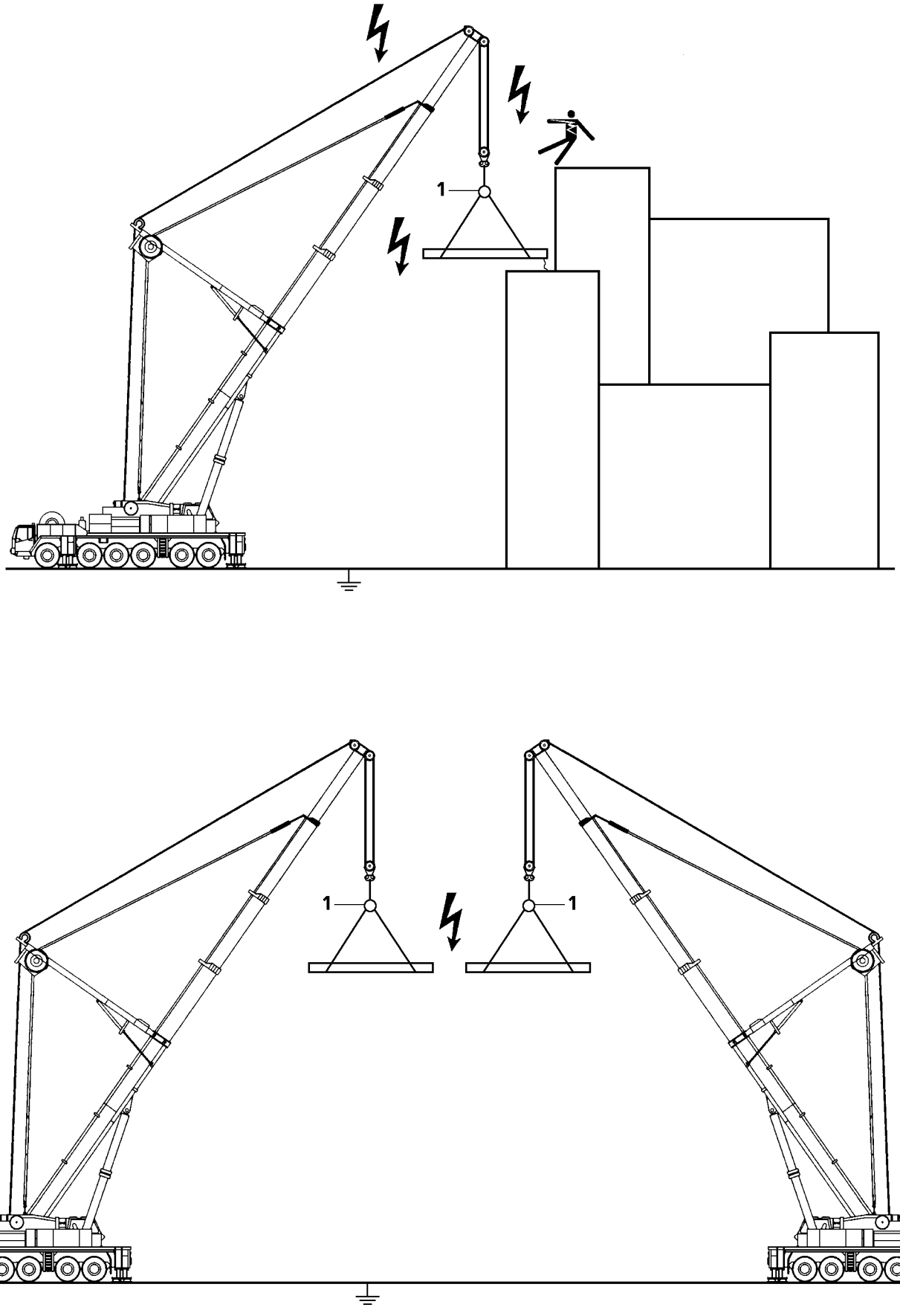
19.5 Wind influences when the “Crane is not in service”

WARNING

The crane can topple over!

If the crane is taken out of service in configured condition and the expected wind speeds are larger than the maximum permissible wind speeds according to the wind chart, then the crane can topple over and fatally injure personnel!

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



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General example

20 Working in the vicinity of transmitters

Strong electromagnetic fields are likely to be present if the construction site is close to a transmitter. Electromagnetic fields can expose people and objects to direct and indirect risks, such as:

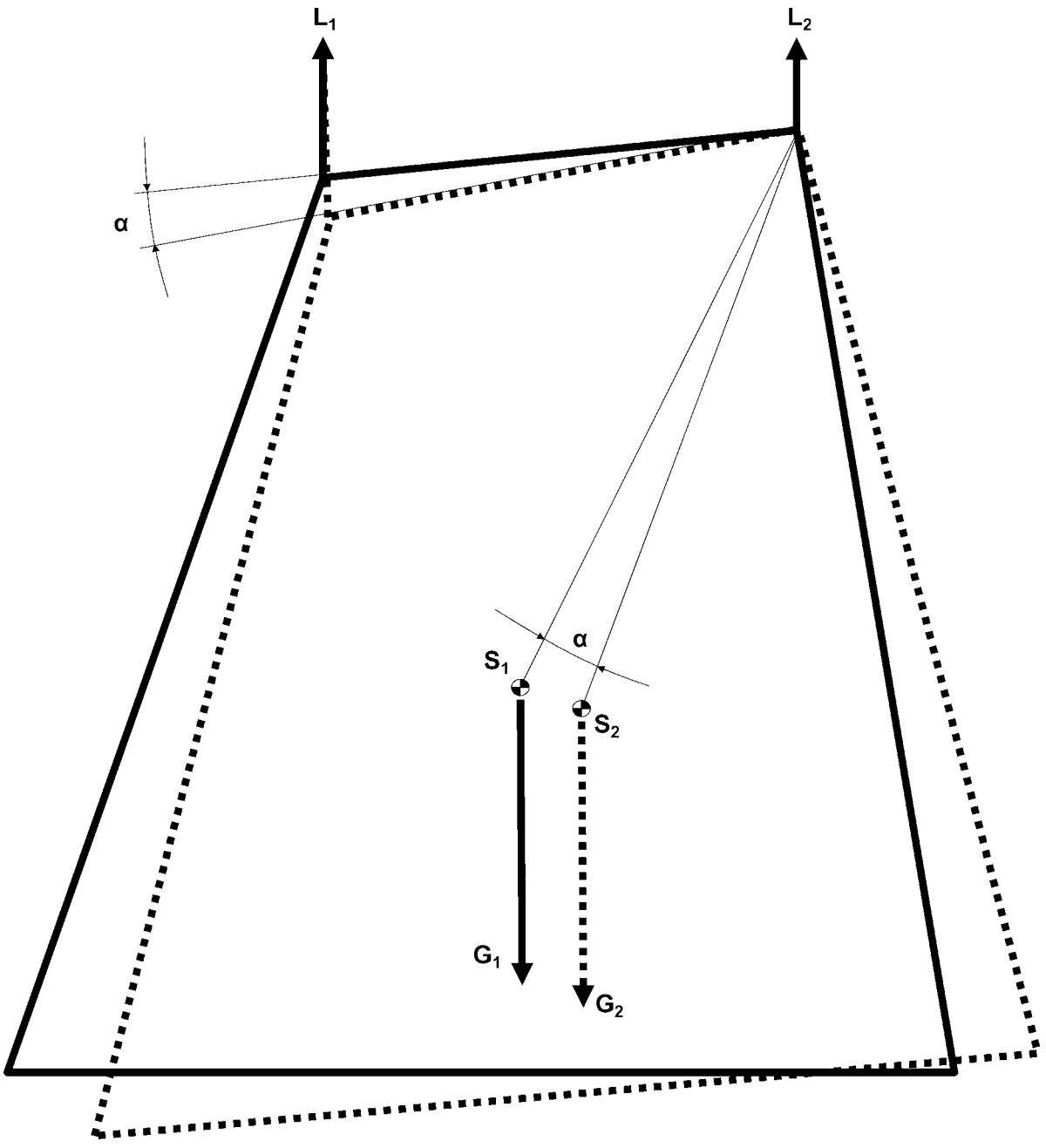
– Effect on human organs due to temperature increase.
– Combustion and ignition caused by temperature increases.
– Sparks or arcing.

DANGER
Risk due to electromagnetic fields!

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

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

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



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L_1 = Load on crane 1
L_2 = Load on crane 2
α = Angle of incline position
S_1 = Center of gravity of load
S_2 = Center of gravity of load at incline position

21 Dangers when working together with several cranes

21.1 Joint lifting of a load with two cranes

Before lifting a load jointly with two cranes, the operator of the cranes or a representative of the operator must determine the work sequence and assign a responsible supervisory person for the operation. The responsible supervisory person must monitor the operation.

Note

- ▶ The total weight and the center of gravity of the load must be known exactly!
- ▶ Carry out the job planning in detail and with care!

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

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

WARNING

Danger of tipping and overload of load carrying components!

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

Personnel can be killed or seriously injured!

- ▶ Observe the national valid standards, regulations and accident prevention guidelines!
- ▶ Determine the utilization degree of the cranes in operation, depending on the complexity of the load lift!
- ▶ Plan for sufficient safety reserves!
- ▶ Utilize the load values given in the load chart manual for the used crane configuration to no more than the utilization degree of maximum 80 %!

In drawing is shown how the center of gravity for the load changes if the load is lifted or lowered unevenly. Already a slight incline of the load can cause the crane to be overloaded!
If the load on crane 1 **(L_1)** is lowered, the load on crane 2 **(L_2)** increases. As a result, crane 2 can be overloaded as a result of the load reduction of crane 1, without any action of its own!

21.2 Working ranges of several cranes overlap

WARNING

Risk of collision!

If the working ranges of several cranes overlap, there is a danger of collision!

Personnel can be injured or killed!

Significant property damages can result!

- ▶ The contractor or his representative must determine the work sequence in detail in advance!
- ▶ The contractor or his representative must ensure flawless communication between crane operators!
- ▶ The crane operators must ensure through calm operating mode, that no collisions occur due to uncontrolled movements! The crane operators must have been trained and instructed accordingly.

If the communication between the crane operators is not ensured by sound or visual connection, then suitable measures must be taken, such as using radio communication, guides or similar.

Note

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

22 Hand signals for guidance

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

WARNING
Risk of accident due to standing under swaying loads!
- ▶ Always keep loads in sight!
- ▶ Standing under swaying loads is not permissible!

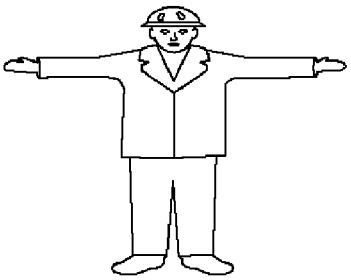
If this is not possible, the crane operator may only operate the crane if he is signed by an assigned guide.
The operator may be guided by hand signals or a two-way radio. It must be ensured that there are no misunderstandings.

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

22.1 General hand signals

22.1.1 Start operation

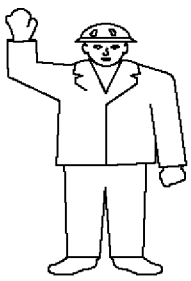
(follow my instructions)



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

22.1.2 Stop

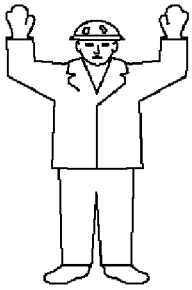
(normal stop)



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

22.1.3 Emergency stop

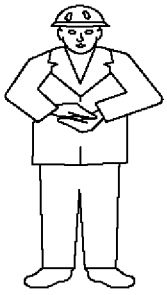
(quick stop)



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

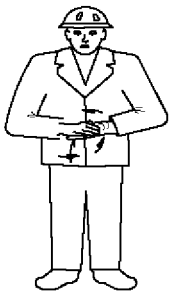
22.1.4 End operation

(no longer follow my instructions)



Fold hands together at chest height in front of body.

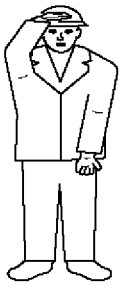
22.1.5 Inching gear or very slow movement



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

22.2 Vertical movements

22.2.1 Show the vertical distance



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

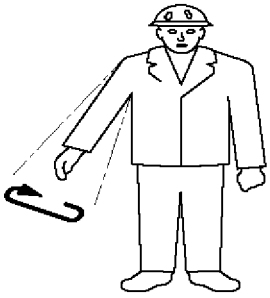
22.2.2 Lift / lower a load with even speed

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

22.2.3 Lift slowly

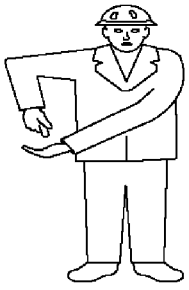
Give lift signal with one hand, the other palm is not moving and positioned over the hand, which gives the signal.

22.2.4 Lower the load while stationary



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

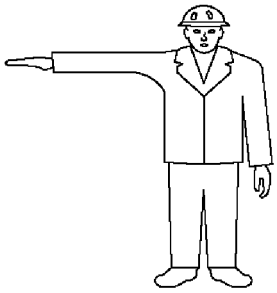
22.2.5 Lower slowly



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

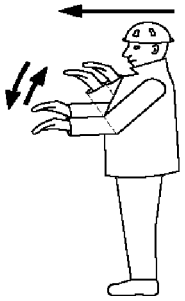
22.3 Horizontal movements

22.3.1 Move / swing in given direction



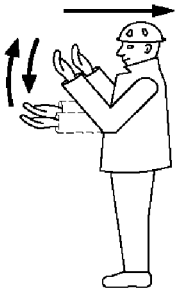
Hold stretched out arm horizontally into the desired direction, with the hand open and the palm pointing down.

22.3.2 Move away from me



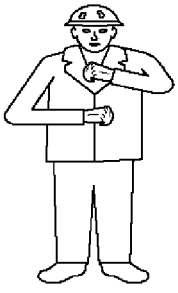
Stretch out both arms simultaneously with forearms in front, with both hands open and the palms pointing down. Move the forearms repeatedly between the horizontal and vertical position up and down.

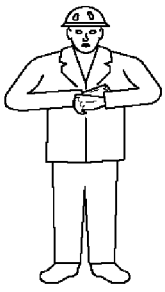
22.3.3 Move toward me



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

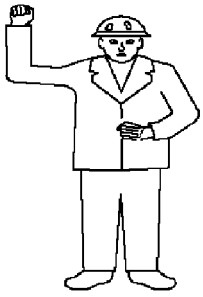
22.3.4 Move both track chains





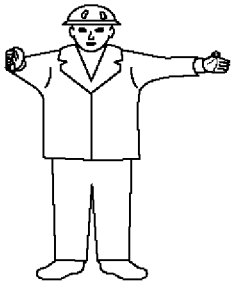
Turn both fists around each other in front of the body in direction of the movement (forward or reverse).

22.3.5 Move one track chain



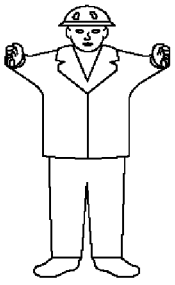
Lift one fist to show blockage of chain on one side. Turn the other fist vertically in front of the body to signal movement of the opposite chain.

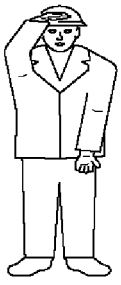
22.3.6 Show the horizontal distance



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

22.3.7 Transfer (between two cranes or two hooks)



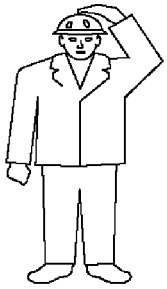


Hold both arms stretched out to the front, parallel and horizontally and turn by 90° in direction of the transfer.

WARNING
Danger of toppling the crane!
- ▶ Make sure that the load carrying capacity of the individual crane or hook is sufficient even if the transfer of the load is suddenly asymmetric!

22.4 Machine related movements

22.4.1 Lift with main winch

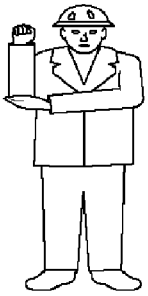


Place on hand on your head and hold the other arm on the side of the body.
After this signal all other hand signals apply only for the main winch.

Note

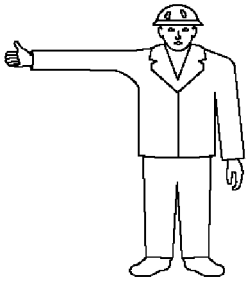
- If two or more main winches are present, then the signaller can show the number of the crane by pointing to it or signal with one finger.

22.4.2 Lift with auxiliary winch



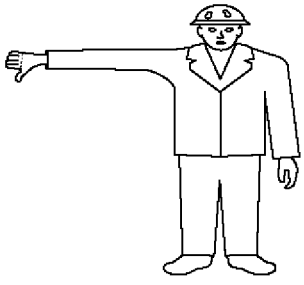
Hold one forearm vertically with closed hand and touch the elbow of this arm with the other hand.
After this signal all other hand signals apply only for the auxiliary winch.

22.4.3 Lift the boom



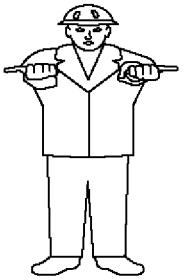
Hold one arm horizontally with thumb directed upward.

22.4.4 Lower the boom



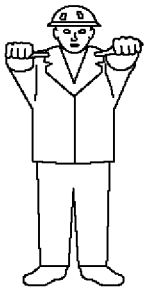
Hold one arm horizontally with thumb directed downward.

22.4.5 Extend the boom



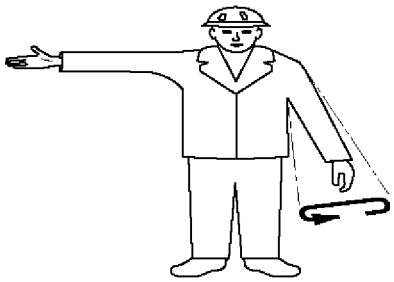
Hold both hands (with closed fists) stretched out to the front, with both thumbs directed away from each other.

22.4.6 Retract the boom



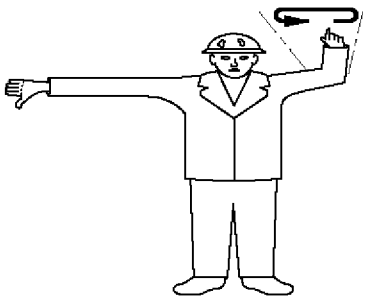
Hold both hands (with closed fists) stretched out to the front, with both thumbs directed toward each other.

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



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

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



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

23 Crane operation with a load

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

Make sure that the following prerequisites are met:
- The load moment limiter must be set according to the current crane configuration.
- The loads given in the load chart may not be exceeded.
- The crane may never be subjected with a load which exceeds those specified in the load charts.
- The weight, center of gravity and dimensions of the load to be lifted must be known.
- Load carriers, lifting equipment and tackle must be in accordance with specified requirements.

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

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

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

23.1 Counterweight

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

WARNING
The crane can topple over!
If the counterweight is not attached in accordance with the load chart, the crane can topple over and fatally injure personnel!
- ▶ Install the counterweight in accordance with the load chart!

23.2 Hoist gear, hoist rope

The lifting capability of the crane depends on the pull force of the hoist gear and the number of possible hoist rope reevings. When using a single strand, the crane can only lift a load that is pulled by the hoist gear.
If the load to be lifted is heavier than the pull force if the hoist gear, then the hoist rope must be reeved as needed according to the principle of a pulley between the pulley head on the boom and the hook block.
When reeving, carefully observe the load chart specifications and the operating instructions.

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

23.3 Crane operation

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

High accident risk exists if:

1.) The load torque limiter is not set in accordance with the current crane configuration and is therefore not able to provide proper protection.
2.) The load torque limiter is defective or taken out of operation.
3.) The hoist limit switches are defective or not functioning.
4.) On crawler cranes:
The angle sensor and the force test brackets are not functioning.
5.) On mobile cranes:
The sliding beams of the hydraulic supports are not extended to the dimensions specified in the load chart.
6.) On crawler cranes:
The crawlers are not supported with stable base material sufficiently large for the ground conditions.
7.) On mobile cranes:
The support plates are not supported with stable base materials sufficiently large for the ground conditions.
8.) If the load is pulled at an angle.
Angular pulling to the side is particularly dangerous, because the boom has only minimal lateral moment of resistance.
It is prohibited to pull a load at an angle.
9.) Load attached during disassembly is too heavy and is freely suspended on the crane after release.
10.) The load hook is used to break away stuck loads.
Even if the weight of a stuck load does not exceed the permissible load capacity, the crane can topple over backwards if the load is suddenly released due to the tension of the boom, which can cause it to jerk back violently.
11.) When working when the wind is excessively strong.
Observe the data given in the load chart.
12.) The crane is not aligned horizontally and the load is swung toward the slope.
13.) If improper crane movements cause the suspended load to swing like a pendulum.
14.) The loads and radii specified in the load charts are exceeded.
15.) When working in the vicinity of power lines which are not isolated by electrical engineers or if the hazardous area is not covered of fenced off.
If it is not possible to take such measures, a sufficient safety distance must be maintained:

Nominal voltage	Minimum distance
Up to 1 kV	1 m
More than 1 kV to 110 kV	3 m
More than 110 kV to 220 kV	4 m
More than 220 kV to 380 kV	5 m
If nominal voltage is unknown	5 m

WARNING
Danger of current transfer!
If the crane becomes electrified despite having taken all necessary precautions, proceed as follows:
- ▶ Remain calm!
- ▶ Do not leave the crane operator's cab!
- ▶ Warn people outside: Stay in place and do not touch the crane!
- ▶ Move the crane out from the danger zone!

24 Lifting of personnel

24.1 Destined use

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

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

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

24.2 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!

24.2.1 Legal prerequisites

Make sure that the following prerequisites are met:

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

24.2.2 Prerequisites for crane equipment and accessories

Make sure that the following prerequisites are met:

- 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!

24.2.3 Inspection before operation

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

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

24.2.4 Prerequisites for operation with lifting cage (cherry picker)

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

- The rope pull is limited to 50 % of the maximum rope pull!
- The crane is utilized with 50 % of its maximum load capacity of the valid load chart!

25 Crane operation in case of thunderstorms

In weather conditions, which can include lightning:

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

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

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

26 Safety instructions for external power supply (230 V AC)

A potential hazard exists when feeding a crane with an external supply from a low voltage distribution system (230 V AC).
In particular, the following conditions pose an electrical hazard: touching a crane with open grounds (caused by the mechanical stress on flexible supply cables or the service connection), loose terminal connections, high wire or contact resistance, mixed up conductors, defective or missing protective equipment (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 an isolation transformer.

27 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.

28 Interruption of crane operation.

28.1 Interrupting crane operation

WARNING
Crane is not supervised!
Situations during interruption of crane operation may occur which could cause the crane to become unsafe if left unsupervised!
The crane can topple over, personnel can be severely injured or killed!
- ▶ Always keep the crane under control!

If the crane can **not** be constantly kept under control:
- ▶ Take the equipment and the boom down!

If the crane is in equipped status:
- ▶ Do not leave the crane!

If wind conditions are present, which are above the permissible values of the wind speed chart:
- ▶ Do not leave the crane!

If crane operation with a set up crane is interrupted:
- ▶ Make sure measures are initiated in time by trained, qualified personnel to bring the crane into a safe condition if anything happens!

If an erroneous function of a crane movement is recognized during crane operation (change of cylinder stroke):
- ▶ The boom must be placed down completely, check the cylinder for internal and external leaks!

WARNING
Set up crane is not supervised!
If the set up crane is left during interruption of crane operation, situations may occur which could cause the crane to become unsafe!
The crane can topple over, personnel can be severely injured or killed!
If the construction site has limited space:
- ▶ The decision not to take the boom down while the crane is unsupervised can only be made by an authorized and qualified crane operator, who is familiar with the construction site!
- ▶ Make sure that no danger can occur for the crane and its surroundings should something unforeseen happen!
- ▶ Make sure for the duration of the interruption of crane operation, that the predicted wind speeds do not exceed the permissible values for the respective set up configuration, see wind speed chart!

If the predicted wind speeds are above the permissible values:
- ▶ Place the boom and the equipment completely down on the ground in time before the permissible wind speeds occur, telescope the telescopic boom in and luff down to 0°!
- ▶ To telescope the telescopic boom in / position the boom and the auxiliary boom, see Crane operating instructions and the wind speed chart!
- ▶ The boom on the crane may only be placed down if the predicted wind speeds according to the wind speed charts are less than the maximum permissible wind speeds during assembly and disassembly!
- ▶ Place the load completely on the ground and unhook from the crane hook!
- ▶ Lift the hook block into the highest position!
- ▶ Remove the fastening ropes from the hook!
- ▶ Make sure that all measures were taken to keep the crane in a safe condition if something happens!

▶ Make sure that access to the crane and operation for unauthorized personnel is excluded: Lock the driver's cab and the crane operator's cab!

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

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

29 Resumption of crane operation.

29.1 Resuming crane operation

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

WARNING
Risk of accident!
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.

▶ Check operating mode settings and reset, if necessary.

30 Ending crane operation

30.1 Ending crane operation

Before the crane operator may leave the crane, the following prerequisites must be met:
▶ Place the load fully on the ground and unhook from the crane hook.
▶ On cranes with telescopic boom:
  Telescope the telescopic boom all the way in and place the boom down.
▶ On cranes with lattice mast boom:
  Put down lattice mast boom and disassemble if necessary.
▶ Bring the control lever (master switch) to 0-position.

- ▶ Apply the parking brake on the crane chassis.
- ▶ Turn the engine off and pull the ignition key.
- ▶ Lock the crane operator's cab.
- ▶ Secure the crane to prevent unauthorized use.
- ▶ On mobile cranes:
  Make sure that the driver's cab is not occupied. Lock the driver's cab. Secure the crane to prevent it from rolling off unintentionally, see section “Parking the vehicle”.

31 Turning / driving in reverse

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

32 Parking the vehicle

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

WARNING
Danger of accidents if the vehicle rolls off!
If the following points are disregarded by the crane driver, then personnel can be fatally injured.
- ▶ It is prohibited to park the vehicle at a slope or an incline of more than 18 %.
- ▶ The parking brake must always be applied when parking the vehicle.
- ▶ The ground on which the vehicle is parked must be level and have adequate load-bearing capacity.

Make sure that the following prerequisites are met:
- – The vehicle is standing on level ground with sufficient load bearing capacity.
- – The parking brake is applied.

WARNING
The vehicle can roll off uncontrollably!
Under the following conditions, the vehicle must be secured against rolling away by using the specified number of wheel chocks or wedges, in addition to the parking brake:
- ▶ The vehicle is parked on a slope or an incline!
- ▶ The vehicle is defective, particularly if the brake system is defective!

- If all the specified wheel chocks are not placed directly behind the corresponding wheel, the vehicle may roll off uncontrollably and personnel can be fatally injured.
- All specified wheel chocks must be placed in such a way that they act against the downdrift force!
- Place all specified wheel chocks tightly directly under the wheel!
- Place all specified wheel chocks tightly so that they have an immediate braking action and keep the vehicle in parking position!

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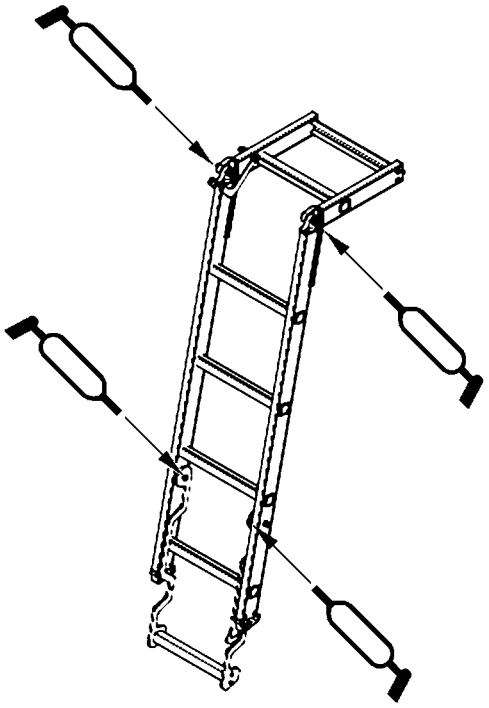

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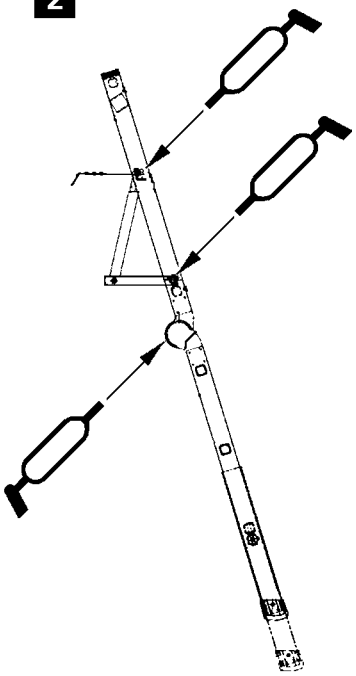

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33 Safety guidelines for ladders

33.1 General

The ladders have been built according to the present level of technology and recognized safety technical regulations. Despite that, during their use dangers to life and physical condition of the user and / or third parties can occur. The ladders may only be used in a flawless technical condition and according to their missions as well as with constant awareness of safety and dangers. Changes on the structure may only be made with written approval of the manufacturer.
The ladders are exclusively designated for the entry and exit of personnel.
Any other use is not as intended.
The manufacturer is **not** liable for damages, which are caused by unintended use or improper usage.

WARNING
Risk of falling!
If the following safety guidelines are not observed, personnel can fall down and be killed or severely injured!
- ▶ Observe and adhere to the installation and safety guidelines for ladders!
- ▶ Observe and adhere to the safety signs on the ladders!
- ▶ Install and secure the ladders properly!
- ▶ Do not use damaged ladders and replace them immediately!
- ▶ Repairs on ladders may only be carried out by authorized expert workshops!

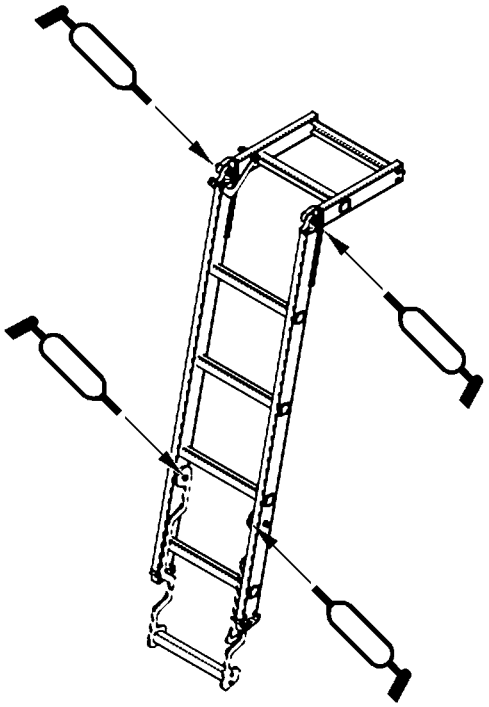
Before using the ladders, make sure that the following prerequisites are met:
- – The ladders are hung and secured in the intended locations.
- – The ladders are complete and not damaged (visual inspection).
- – The legs of the ladders are not worn.
- – Check the screws for tight seating and connection.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

Before starting to drive / before transport, ensure that the following prerequisite is met:
- – The ladders are tightly locked and secured in the intended transport retainers.

33.2 Maintenance

Note
- ▶ Grease joints and pivot points on the ladders regularly and check them for easy movement, see illustration **1** and illustration **2**!
- ▶ Remove any dirt on the ladders!
- ▶ The ribbing on the rungs must be clear!

1



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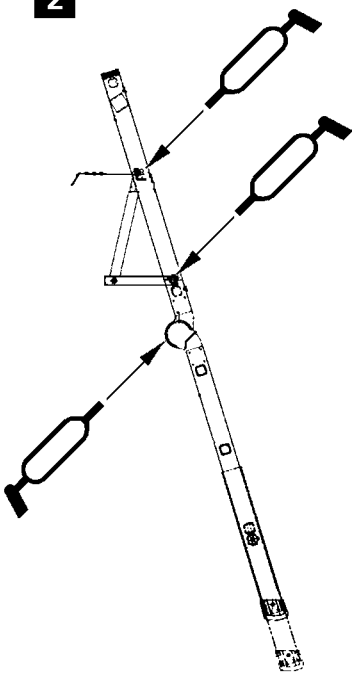

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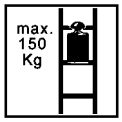
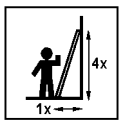
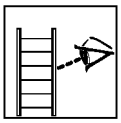
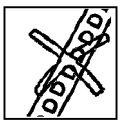
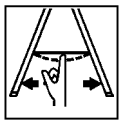
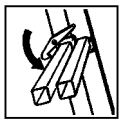
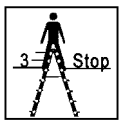
33.3 Safety signs on the ladders

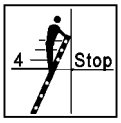
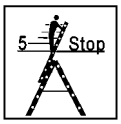
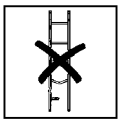
Note

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

Sign	Explanation
	Read the operating instructions.
	Maximum load.
	Correct set up angle.
	Set up on level ground.
	Avoid leaning out to the side.
	Eliminate any contaminants on the ground.
	Set up on solid ground.

Sign	Explanation
	Ladder overhang over the set up point.
	It is not permitted to step off to the side from the ladder.
	Only one person on every accessible bracket.
	Visual inspection of the ladder before use.
	Do not use the ladder as a bypass.
	Do not stand on the top step.
	Check the legs of the ladder.
	When transporting the ladder, be aware of any danger due to overhead wires.
	Pay attention to correct set up direction.

Sign	Explanation
	Face the ladder when climbing up or down the ladder.
	Before use, pay attention that the stepladder opens completely.
	Make sure the upper end of the ladder is placed correctly.
	Make sure that the safety strut engages.
	Maximum number of users on the ladder.
	Before use, make sure it is safely engaged.
	Correct access.
	When climbing the ladder, wear suitable shoes.
	Stepladders: Access the ladder, without railing, to no more than the third step from the top.

Sign	Explanation
	Leaning ladders: Access to no more than the fourth step from the top.
	Universal ladders: Access to no more than the fifth step from the top.
	Access the ladder only when sober.
	Eliminate damaged ladders immediately.
	Total weight of the ladder.
	Illustration of ladder type with maximum length.
	Secure the upper / lower end of the ladder.

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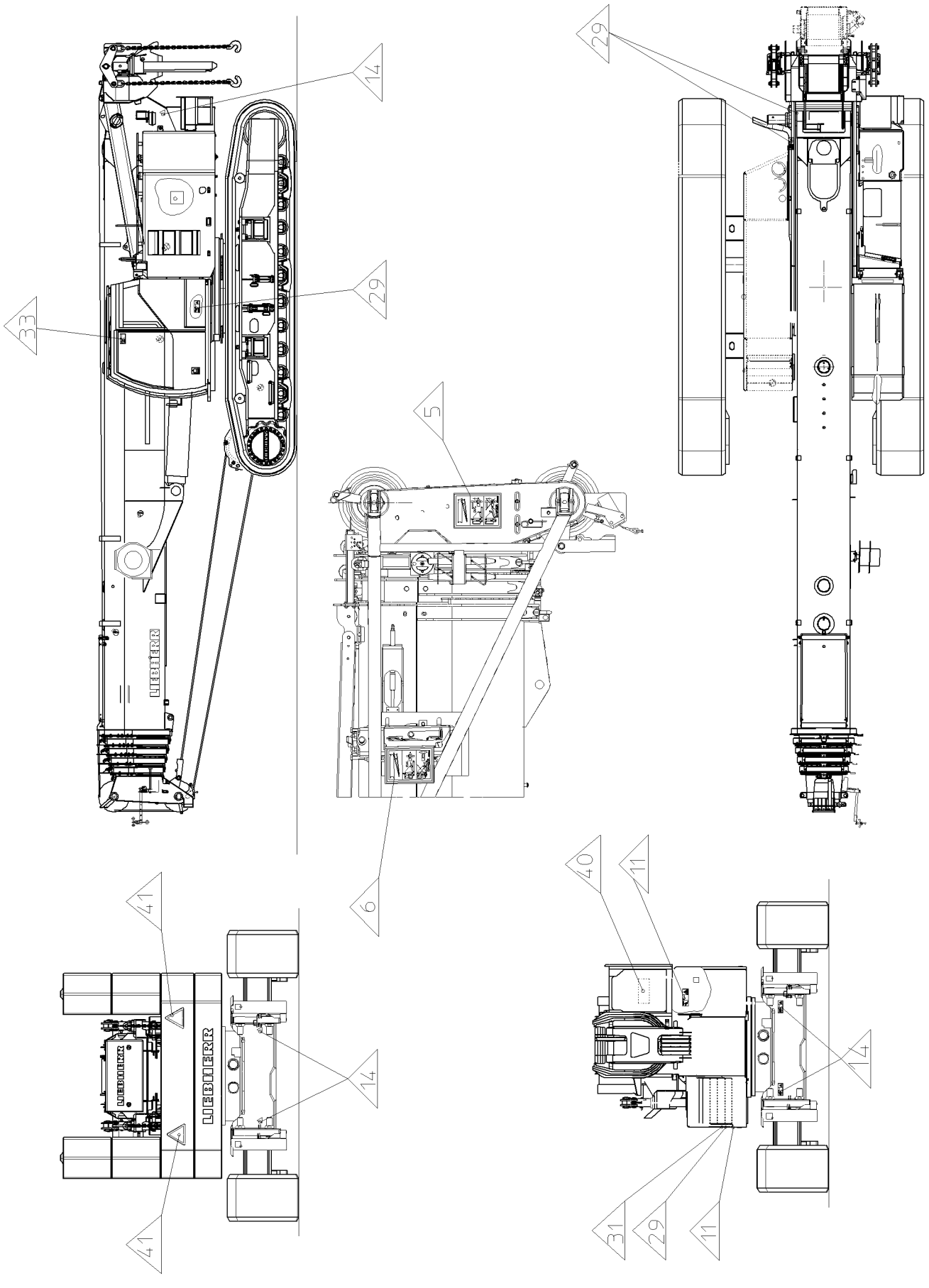

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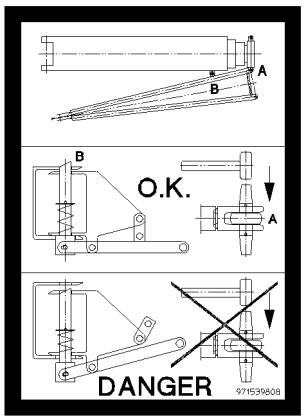
1 Warning signs

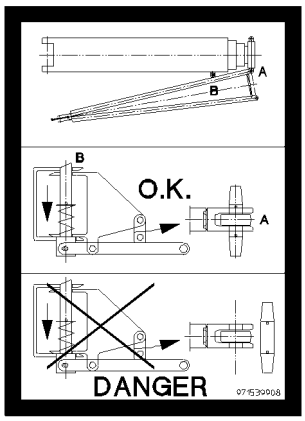
Note
- ▶ Warning signs are safety signs, which warn of a risk or danger.
- ▶ For that reason, all warning signs on the crane must be complete and always legible.
- ▶ Replace damaged warning signs immediately.

1.1 Warning notes to unpin the auxiliary boom on the pulley head (position 5)



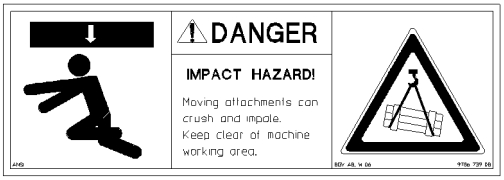
DANGER
Danger of fatal injury!
If the auxiliary boom is not locked correctly to the pivot section, it can fall down.
Personnel can be severely injured or killed!
- ▶ Unpinning the auxiliary boom on the pulley head is prohibited!

1.2 Warning notes to unlock the auxiliary boom (position 6)



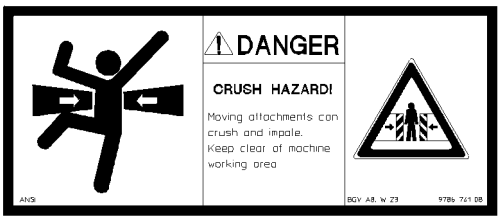
DANGER
Danger of fatal injury!
If the auxiliary boom is not locked correctly to the pulley head, it can fall down.
Personnel can be severely injured or killed!
- ▶ Unpinning the auxiliary boom on the pivot section is prohibited!

1.3 Warning of suspended load (position 11)



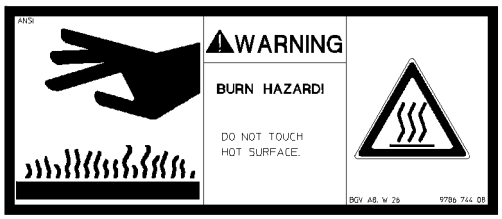
DANGER
Risk of fatal injury under suspended load!
- ▶ Standing under suspended loads is prohibited!
- ▶ Keep away from the working range of the machine!

1.4 Warning of crushing danger (position 14)



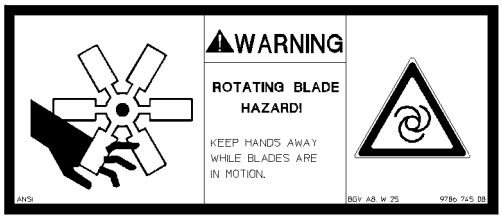
DANGER
Danger of fatal injury!
- ▶ It is prohibited for anyone to remain in areas, where there is a crushing danger!
- ▶ Keep away from the working range of the machine!

1.5 Danger of burns (position 29)



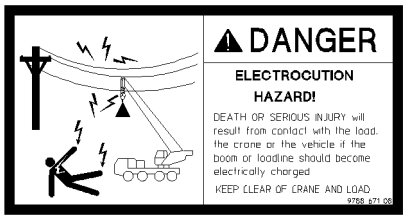
WARNING
Danger of burns!
- ▶ Do not touch hot surfaces!

1.6 Warning of rotating parts (position 31)



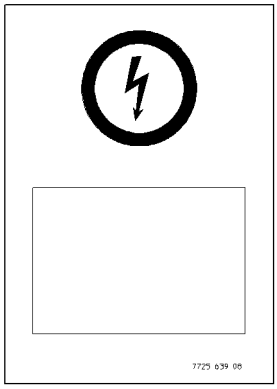
WARNING
Rotating parts!
Rotating parts can cause finger and hand injuries.
▶ Do not place any body parts into the danger zone!

1.7 Warning of fatal electric shock (position 33)



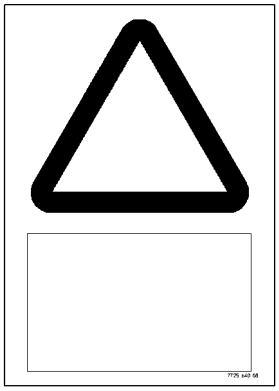
DANGER
Danger of fatal injury due to electrical shock!
If the boom or the hoist rope is under electric current, then death or severe injuries can occur if anyone touches the crane, the vehicle or the load!
▶ Keep away from the crane and the load!

1.8 Warning of high voltage (position 40)



Note
▶ Only for certain countries!

1.9 Slewing range (position 41)



Note

▶ Only for certain countries!

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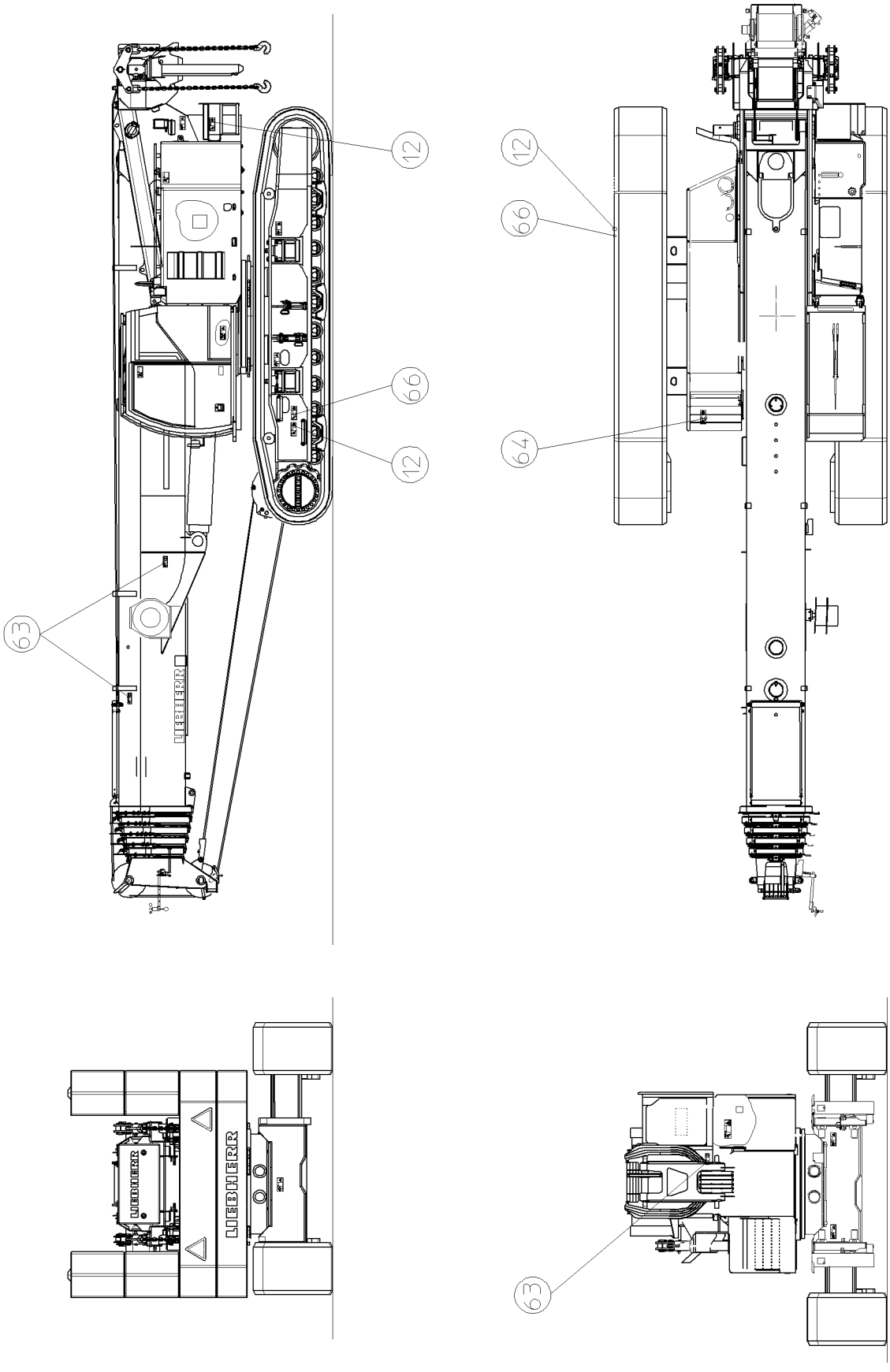


B110785

2 Command and prohibition signs

2.1 Command signs

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

2.1.1 Use personal protective equipment (position 63)

DANGER
Danger of falling!
- ▶ Use a personal protective equipment!

2.2 Prohibition signs

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

2.2.1 Access for unauthorized personnel prohibited (position 12)

DANGER
Danger of fatal injury!
If the crane is accessed by unauthorized personnel, life threatening injuries can occur!
- ▶ Access is strictly prohibited during crane operation!

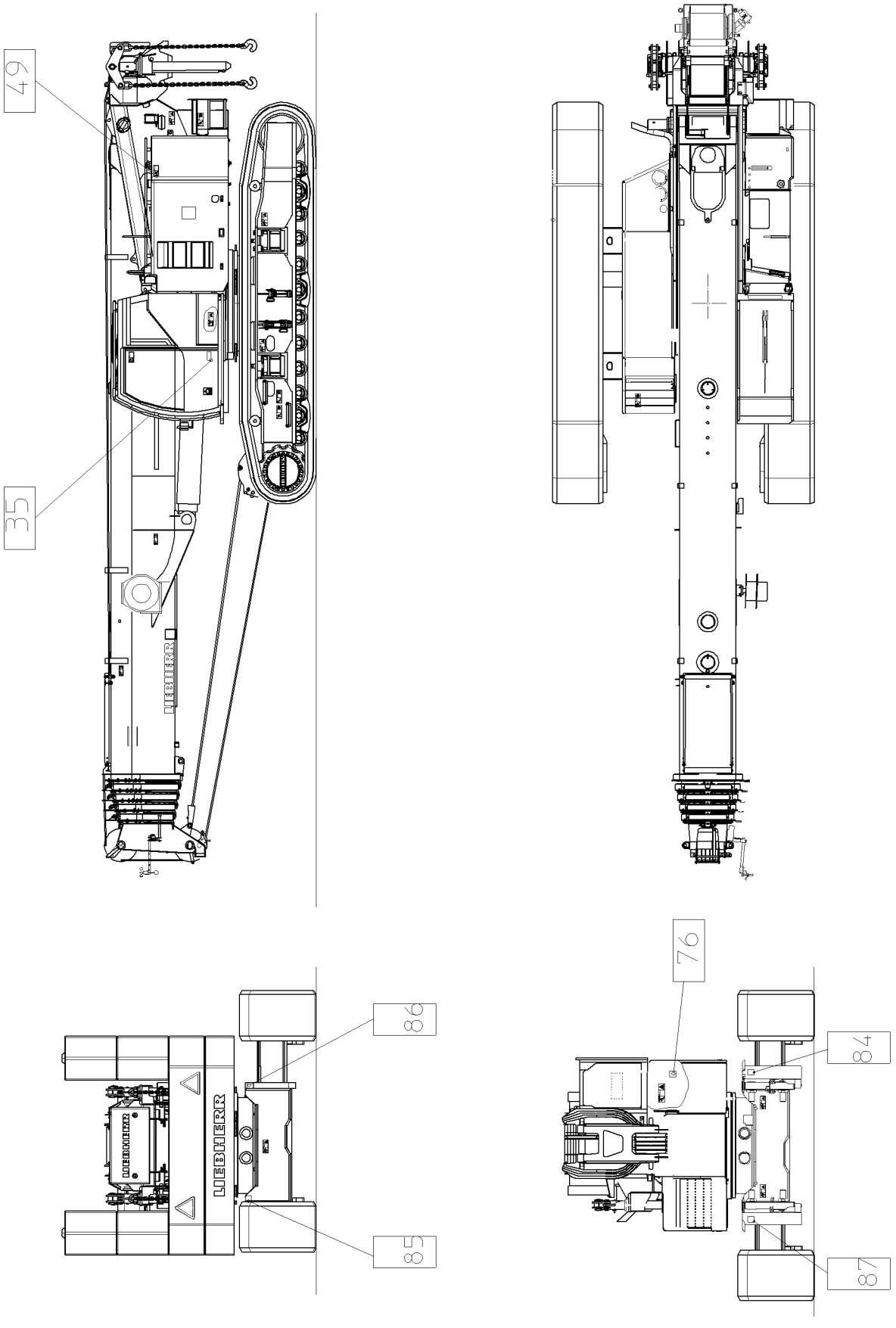
2.2.2 Access to the area is prohibited (position 64)

WARNING
Danger of injury!
If the prohibited area is accessed, injuries can occur.
▶ Do not access the area!

2.2.3 Access prohibited (position 66)

WARNING
Danger of falling!
If the crane is accessed by unauthorized personnel, life threatening injuries can occur.
▶ Do not climb on the crane!

blank page!

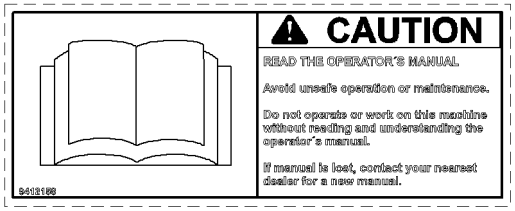


B110786

3 Notice signs

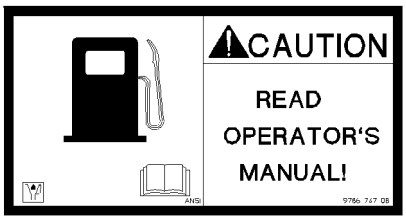
Note
- ▶ Notice signs are signs, which provide additional information in text and symbol form.
- ▶ For that reason, all notice signs on the crane must be complete and always legible.
- ▶ Replace damaged notice signs immediately.

3.1 Read the operating instructions (position 35)



CAUTION
Read and observe the operating instructions!
- ▶ Avoid unsafe operation and dangerous maintenance!
- ▶ The crane may only be operated if the contents of the operating instructions have been read and understood!
- ▶ If the operating instructions are lost, request a new manual from your nearest dealer!

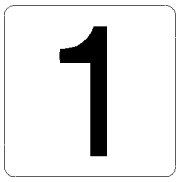
3.2 Notice sign for refueling (position 49)



CAUTION
Property damage to the engine!
If the crane is refueled with fuel not specified in the operating instructions, then engine damage can occur.
- ▶ Observe the operating instructions!

3.3 Warranted maximum sound output level (position 76)

3.4 Identification of support cylinder “1” (position 84)

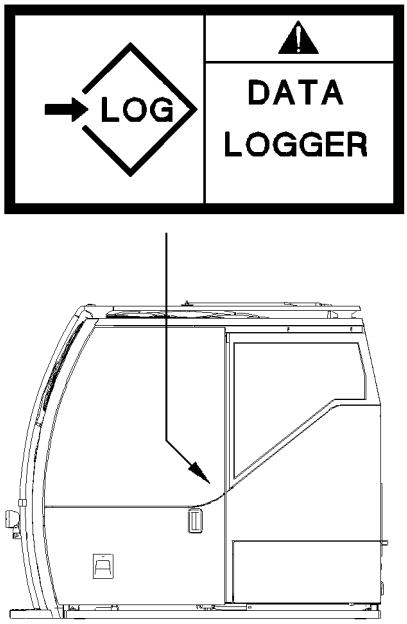


3.5 Identification of support cylinder “2” (position 85)

3.6 Identification of support cylinder “3” (position 86)

3.7 Identification of support cylinder “4” (position 87)

3.8 Notice sign for data logger


LOG
DATA
LOGGER


3
DANGER
FALL HAZARD!
Wear safety belt.
ANSI
BGV A8, M 09
9786 748 08

B112104

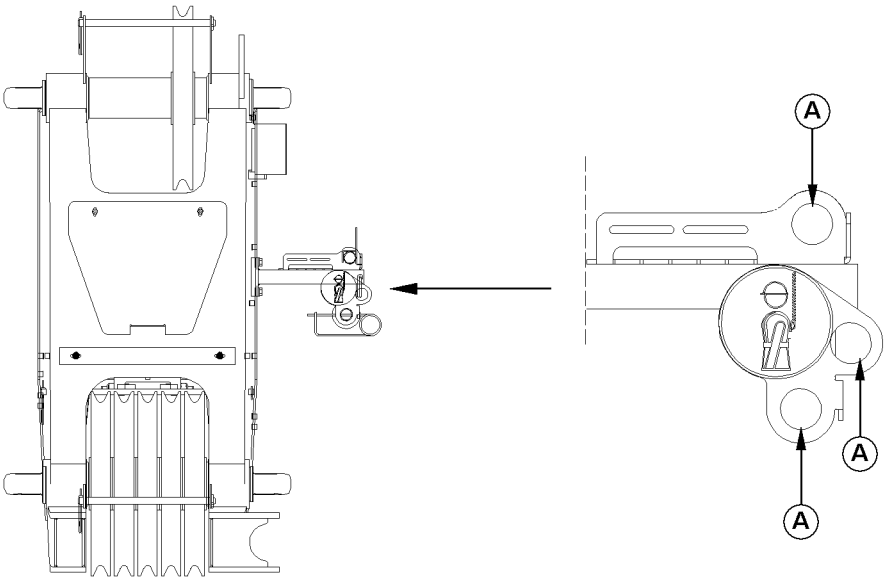
1 Personal protective equipment

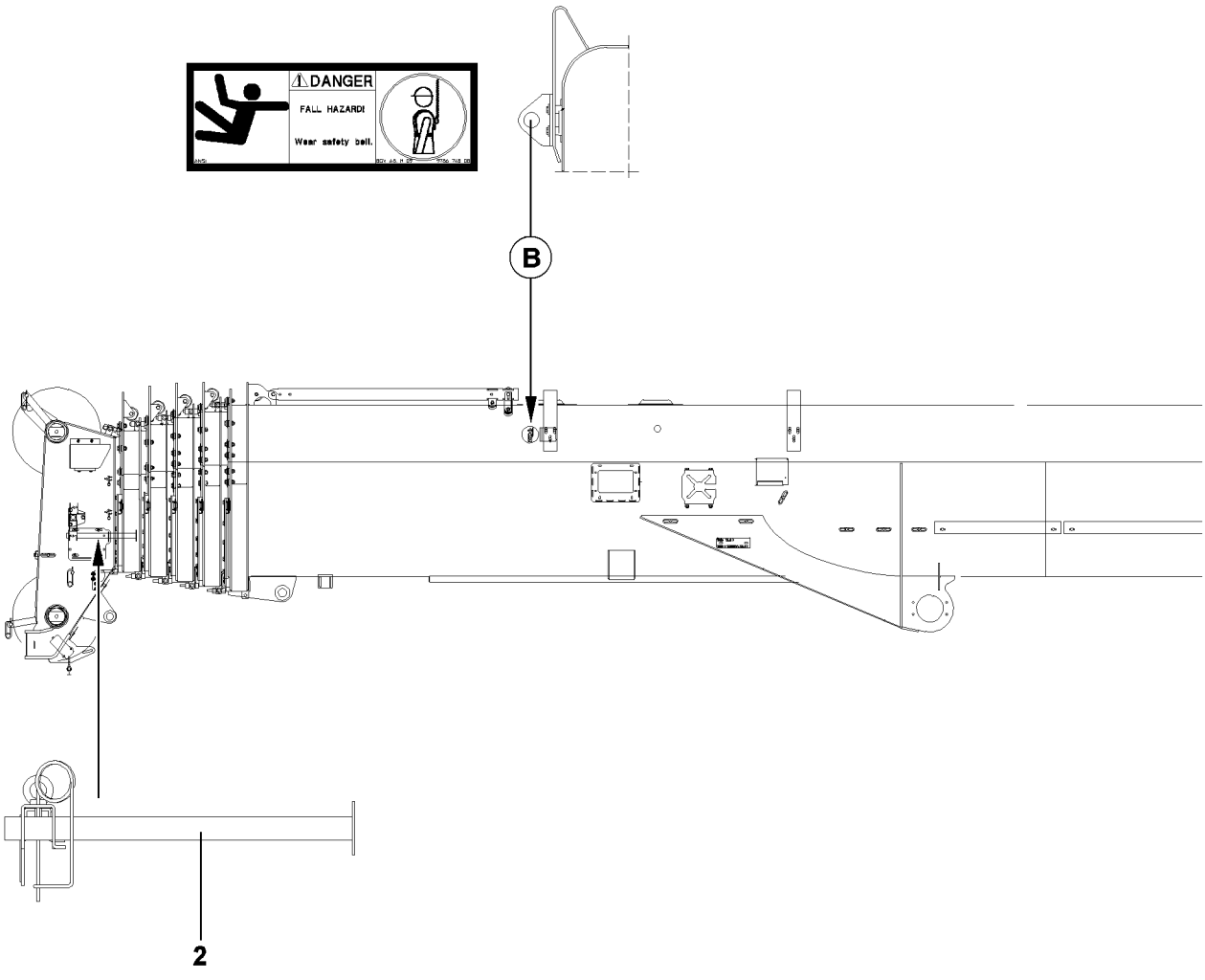
WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

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

Note

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





B114004

2 Fastening points

2.1 Fastening points on the telescopic boom

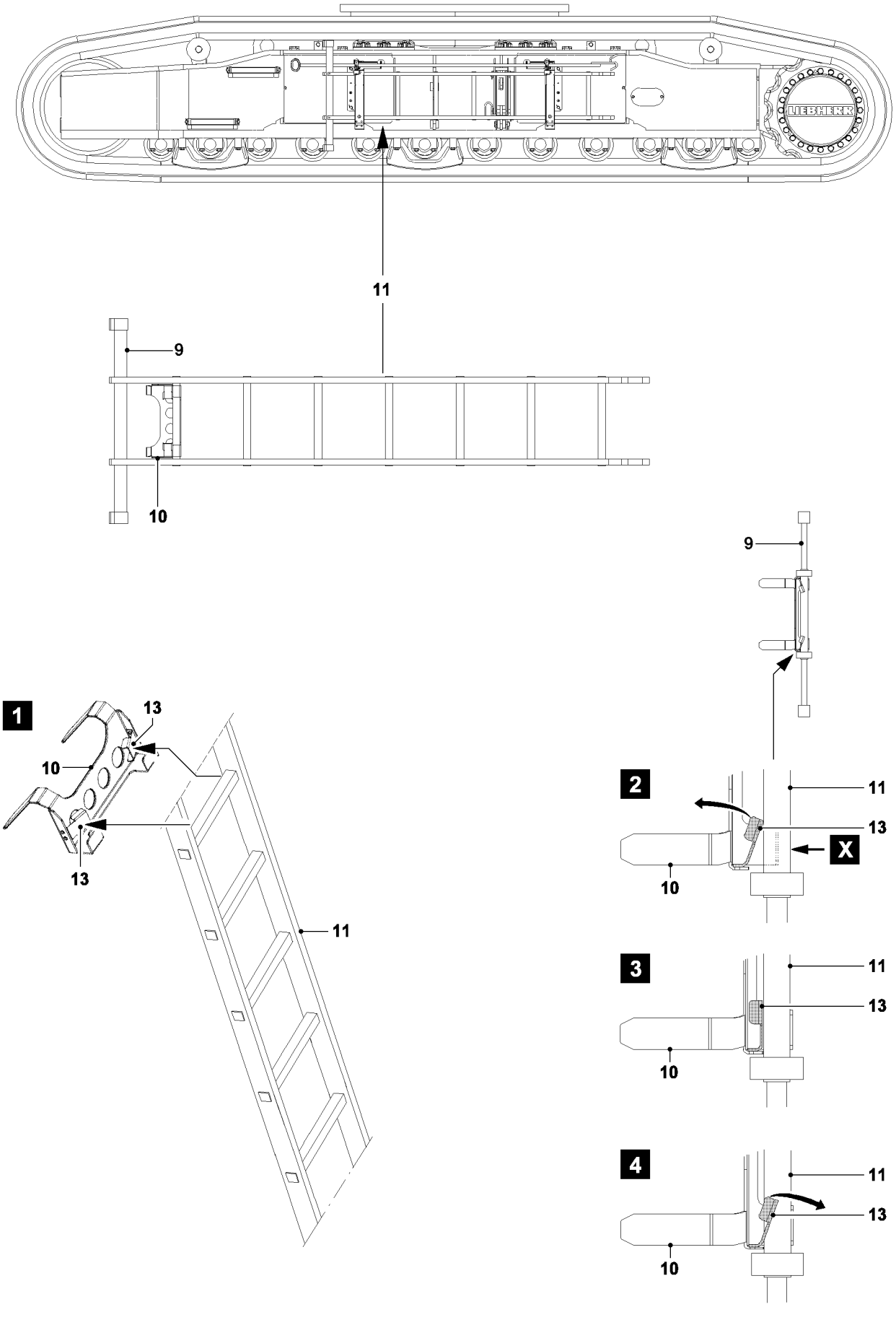
Fastening points **A** and fastening point **B** are installed on the telescopic boom.

DANGER
When working aloft, there is a danger of falling!
If the following notes are not observed, the assembly personnel could fall and suffer life-threatening injuries!

- ▶ Before any assembly / disassembly work and maintenance work on the crane superstructure and the telescopic boom, the assembly personnel must wear the approved safety harnesses and protective equipment.
- ▶ For assembly / disassembly work, the ladder **with hook device** is engaged on pipe **2**, see also section “Installing hook device on ladder”.
- ▶ The assembly personnel must secure itself with approved safety belts on fastening point **A** or fastening point **B** to prevent falling.

DANGER
Danger of damage!

- ▶ Never hang loads or objects on fastening points **A** or fastening point **B**.



B102964

3 Attachment points on folding jib

Note

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

3.1 Using the ladder

DANGER

Danger of accident!

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

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

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

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

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

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

3.2 Installing the hook device on the ladder

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

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

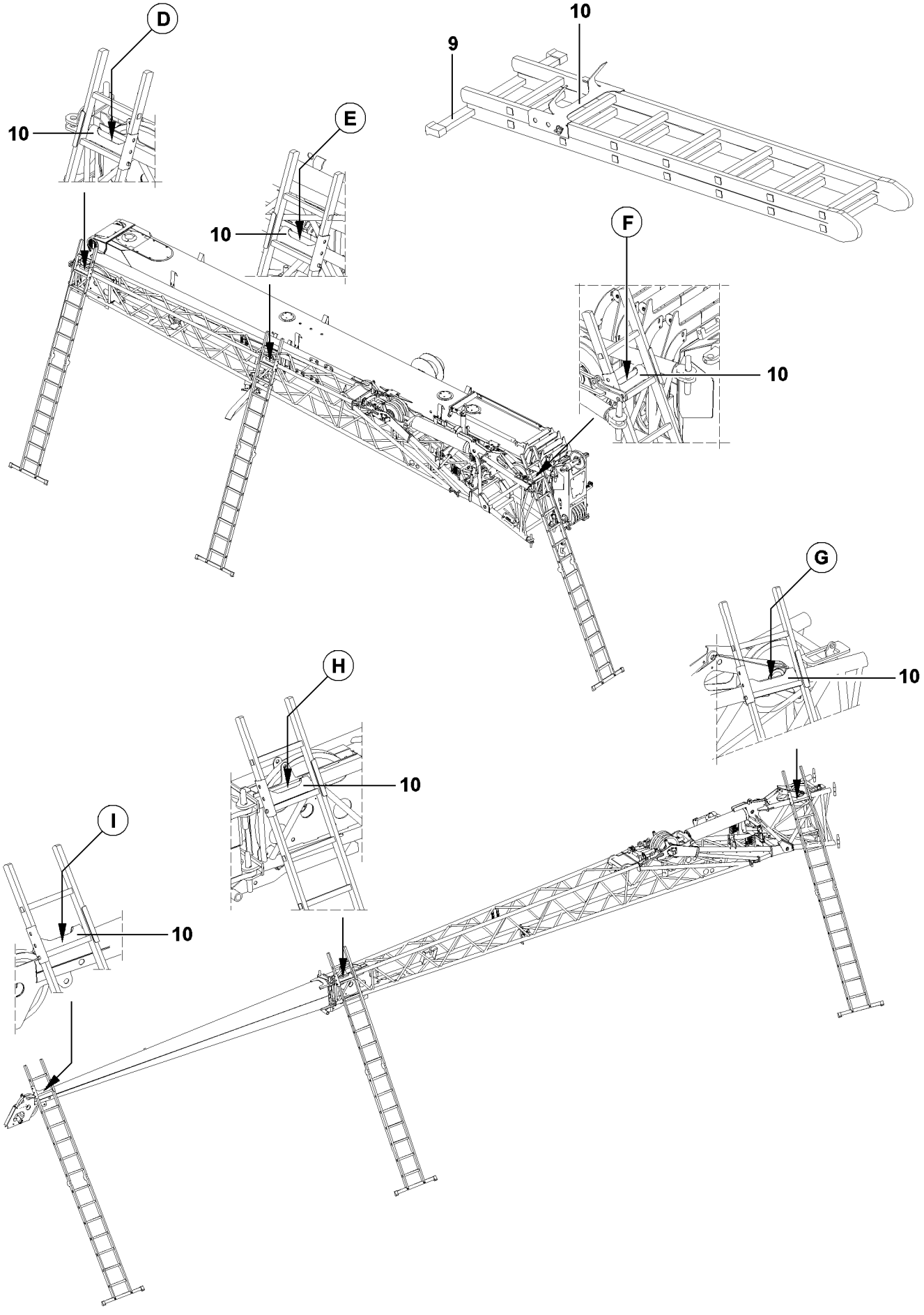
Result:

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

▶ Push the hook device **10** “upward”.

Result:

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


D
10
E
10
10
9
F
10
G
10
H
10
I
10
B198022

3.3 Fastening points on folding jib / folding jib extension

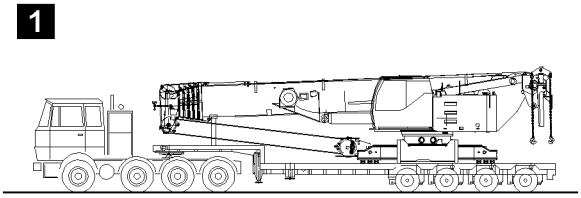
DANGER
When working aloft, there is a danger of falling!
If the following notes are not observed, the ladder can tip and the assembly personnel can fall from the ladder and sustain life-threatening injuries!

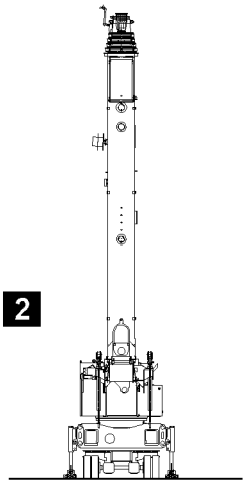
- ▶ For all assembly / disassembly work on the folding jib and the folding jib extension, use the ladder with cross brace **9** and hook device **10**, see section “Installing the hook device on the ladder”.
- ▶ Hang the ladder with hook device **10** on the corresponding hook point and set it up stable.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

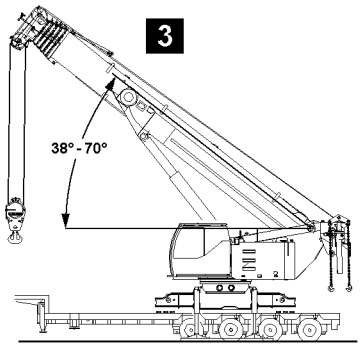
For assembly / disassembly work on the folding jib and the folding jib extension, note the following fastening points for the ladder:

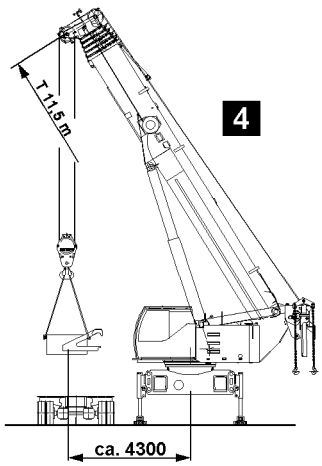
- Fastening point **D**
- Fastening point **E**
- Fastening point **F**
- Fastening point **G**
- Fastening point **H**
- Fastening point **I**

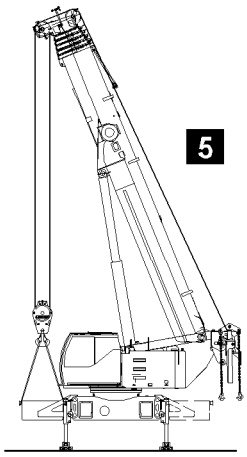
3.00 Crane chassis operation











B103767

1 Assembling the crane

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

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

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

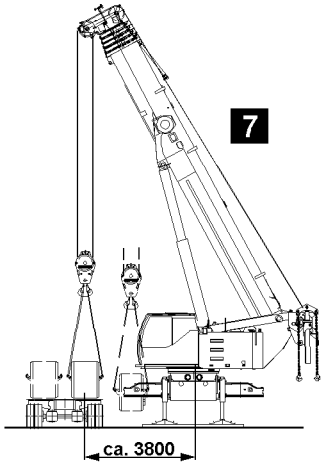
1.1 Short description of assembly procedure

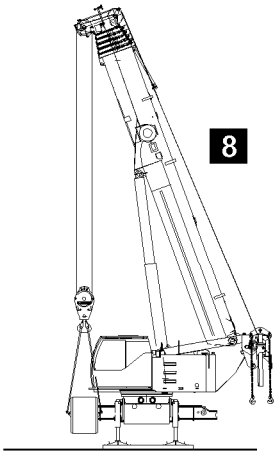
Note
- ▶ The short description of the assembly procedure is only intended as an overview. In addition, the complete assembly description must be read and understood!

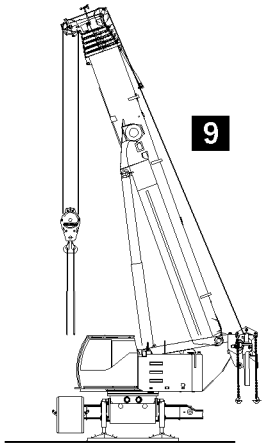
Preparatory work
- ▶ Swing the hatch consoles into their operating position and pin them in place.
- ▶ Place and align the support plates under the support cylinders, illustration 2.

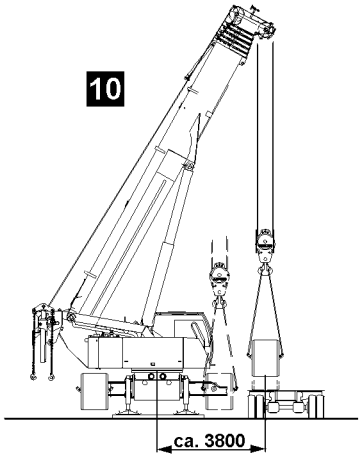
DANGER
Risk of tipping when the auxiliary boom is in its transport position at the side of the telescopic boom!
If the telescopic boom, with the auxiliary boom installed on the side of the telescopic boom is not luffed up to an angle range of 38° to 70° before supporting, then the crane can topple forward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

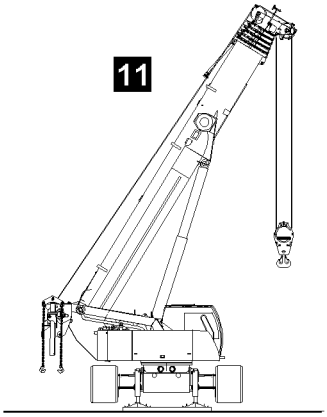
- ▶ Support the crane and remove the transport vehicle, illustration 3.
- ▶ Level out the crane and install the central ballast, see **chapter 3.03** and illustrations 4 and 5.

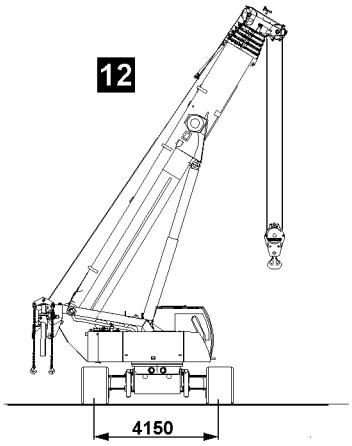


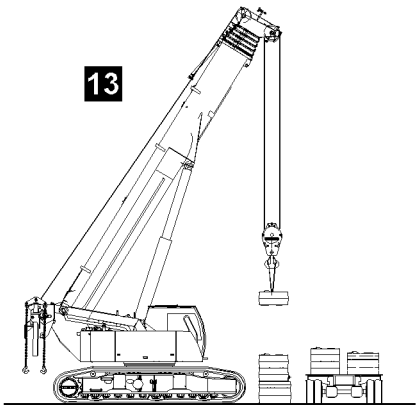


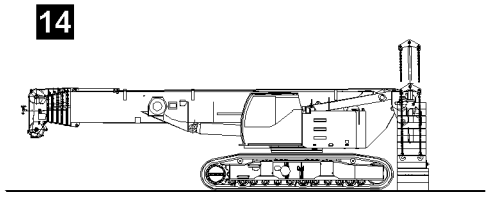












B199152

Install the first crawler carrier, illustrations 7 and 8

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

Install the second crawler carrier, illustration 10

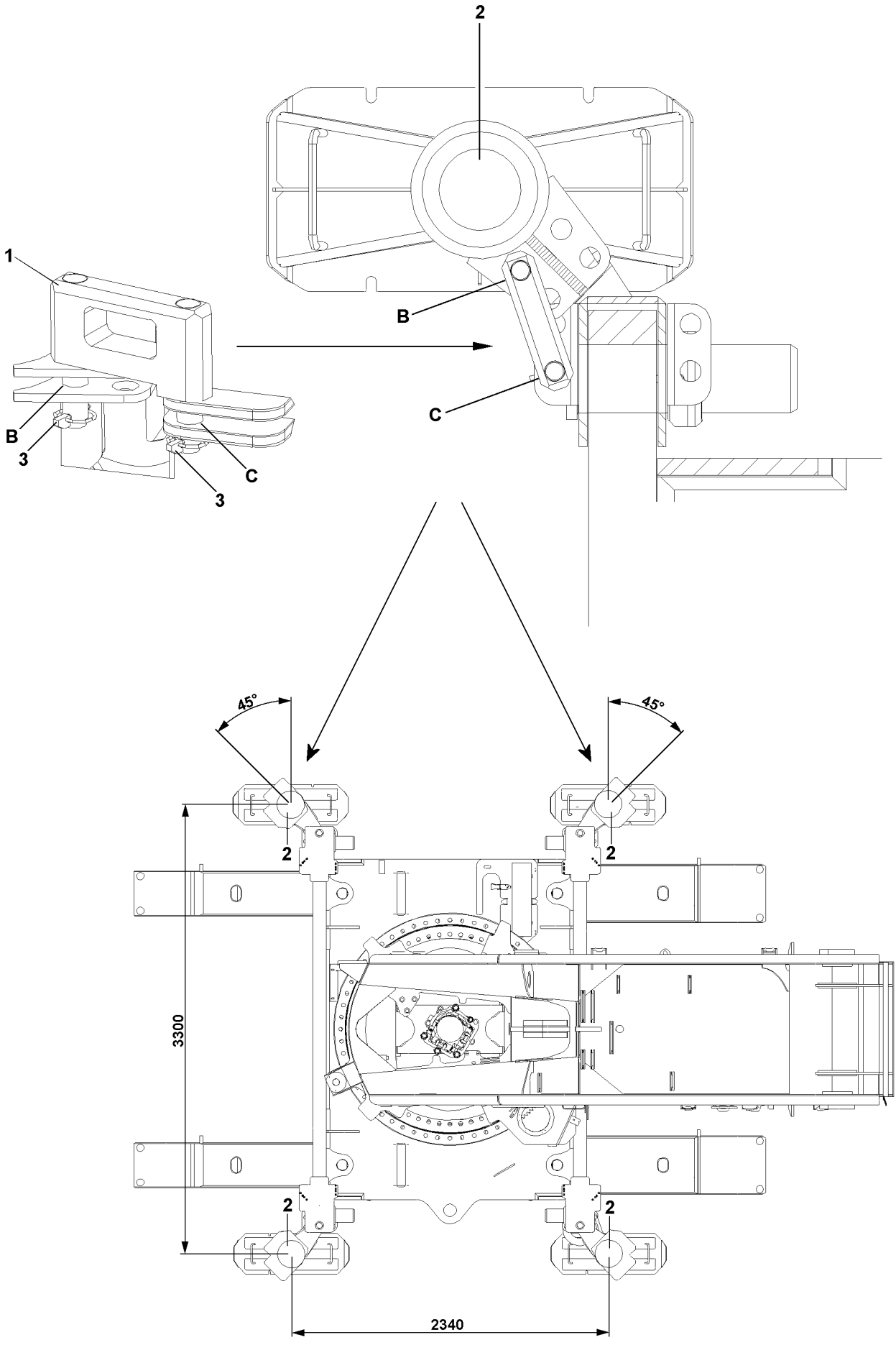
- Check and prepare the pinning points for the crawler carrier.
- Attach the supplied assembly suspension to the folded out transport retainers.
- Position the crawler carrier on the beams of the crawler center section.
- Slide the crawler carrier as far along the beam as possible.
- Clamp the crawler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

Retract the support cylinders, illustrations 11 and 12

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

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

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



B104729

1.2 Pinning the support cylinders in assembly position

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

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

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

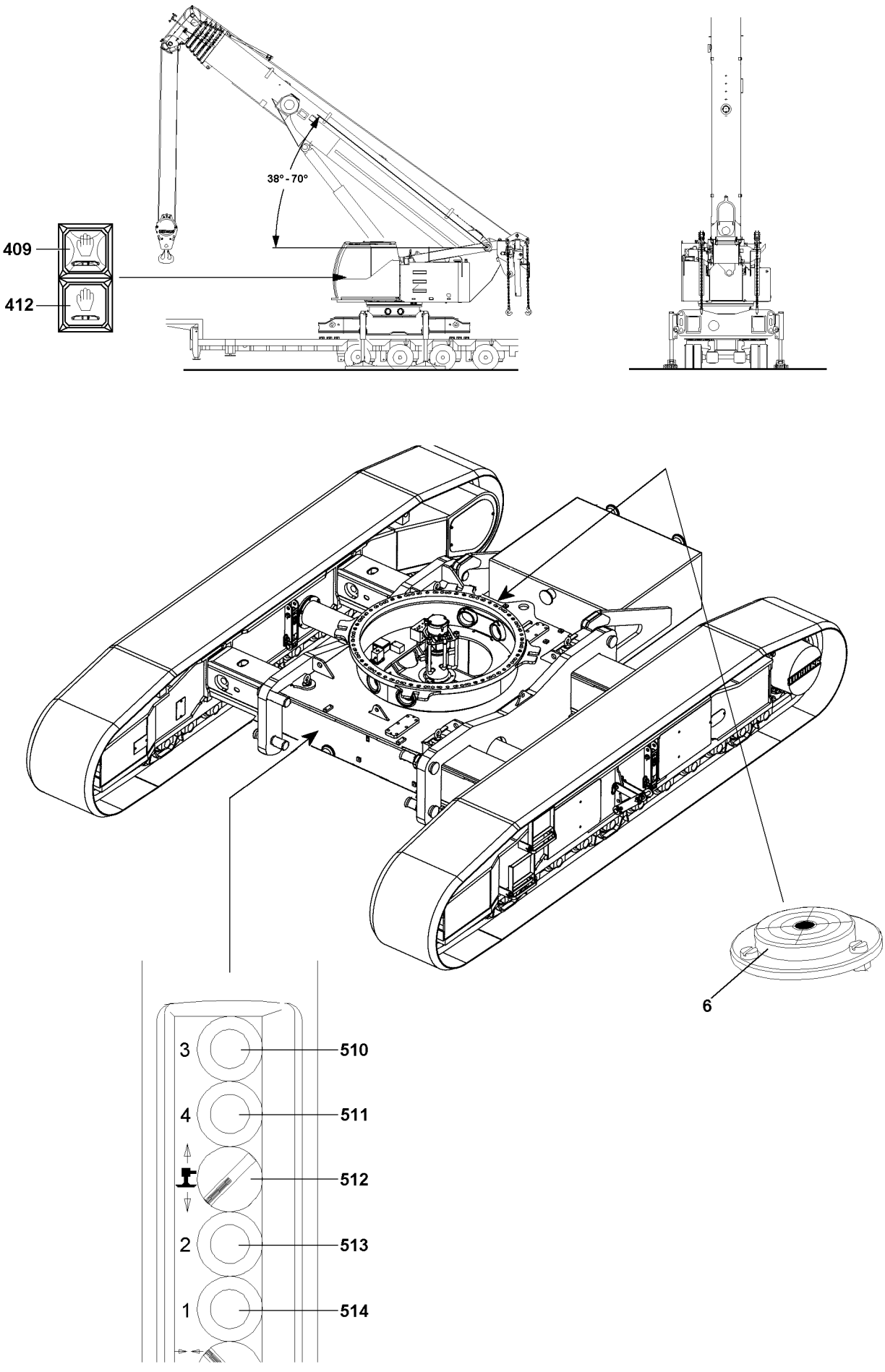
Also pin the other support cylinders **2**.
▶ Pin all four support cylinders **2** in assembly position support base 2340 mm x 3300 mm.

1.3 Placing and aligning the support plates

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

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

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



B103768

1.4 Supporting the crane

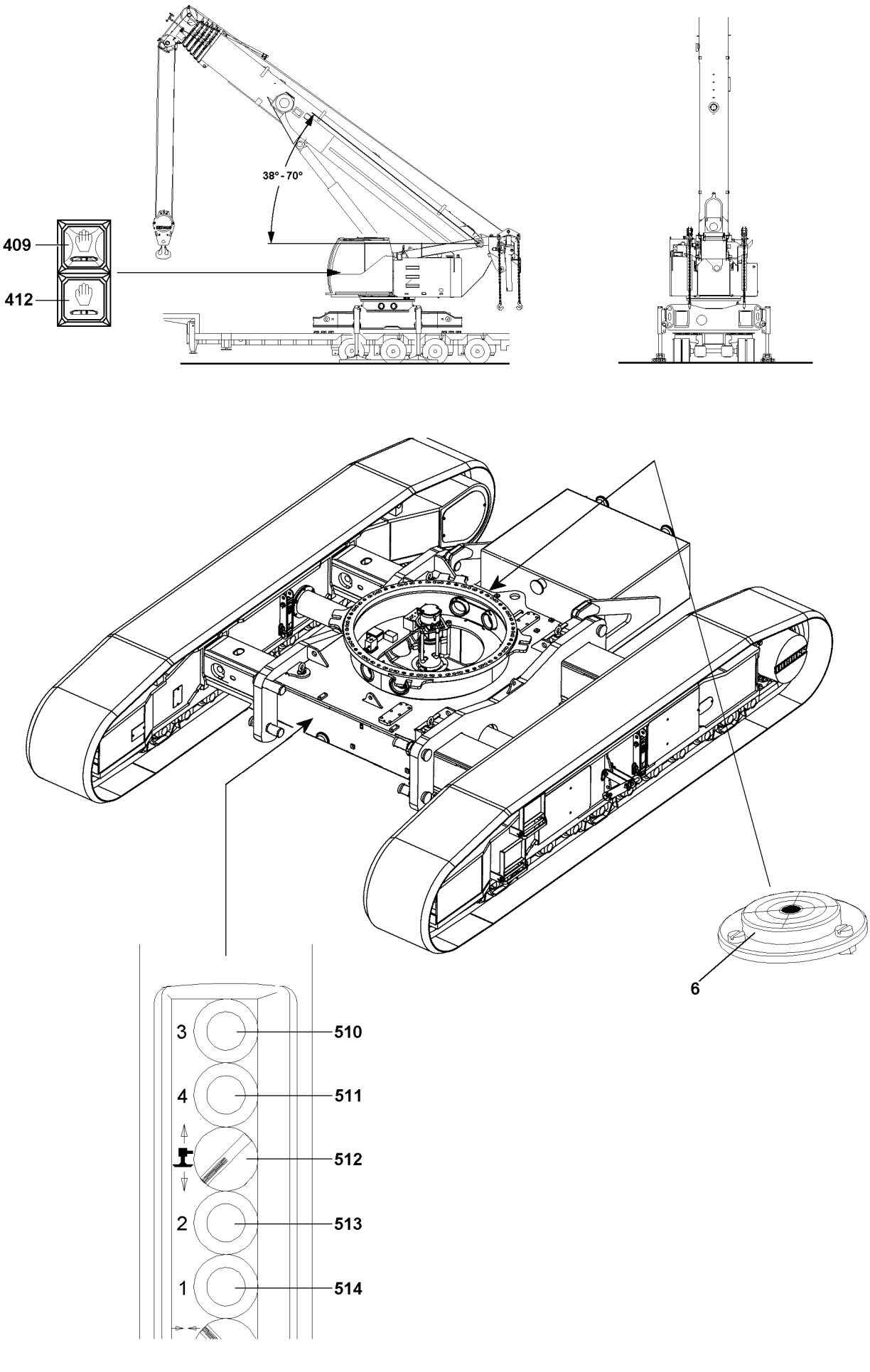
Make sure that the following prerequisites are met:
- The engine is running.
- The folding brackets with the support cylinders are pinned in the operating position.
- The LICCON overload protection has been set according to the load chart.
- The crane has been set down on the transport vehicle.
- The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

1.4.1 Preparatory work

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

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

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



B103768

1.4.2 Supporting the crane with the control panel

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

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

▶ Move the switch **512** downward.

Result:

– Extend support cylinder is preselected.

DANGER

The crane can topple over!

If the crane is not aligned horizontally, it may tip over and fatally injure personnel!

▶ Ensure that crane is level.

▶ The maximum permitted deviation from the horizontal position of the crane is 0.3° (0.5%).

▶ Press the corresponding button and extend all support cylinders just above the support plates.

▶ Precisely align the support plates under the support cylinders.

▶ Monitor the sight gauge **6** on the crane chassis.

▶ Lower all support cylinders into the support plates.

▶ Slowly lift and level out the crane until the desired support height is reached.

▶ Check the distance between the crawler center section and the transport vehicle (at least a hand's width).

▶ Remove the underlay timber beneath the beams.

DANGER

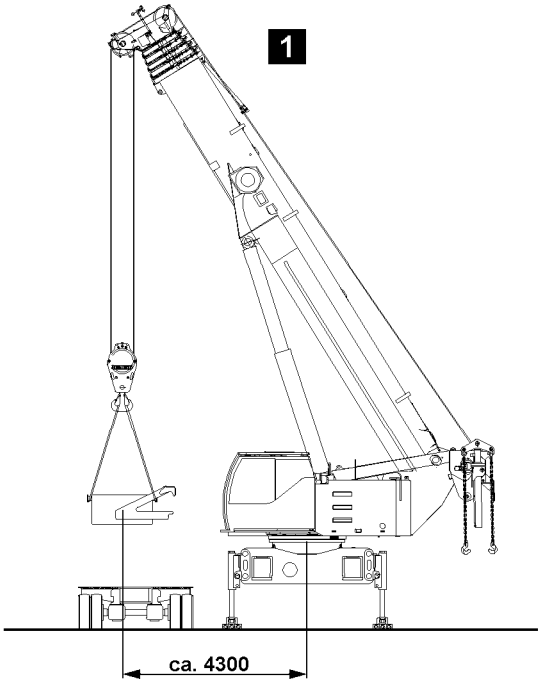
The crane can topple over!

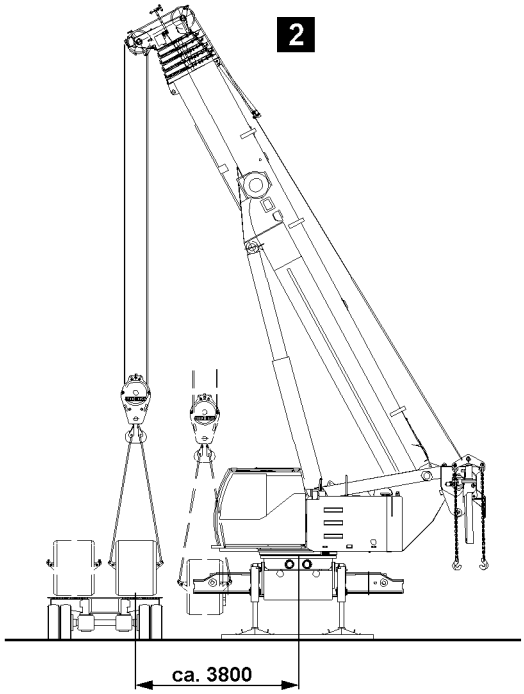
When driving out the transport vehicle, the support cylinder may be caught which could cause the crane to topple over!

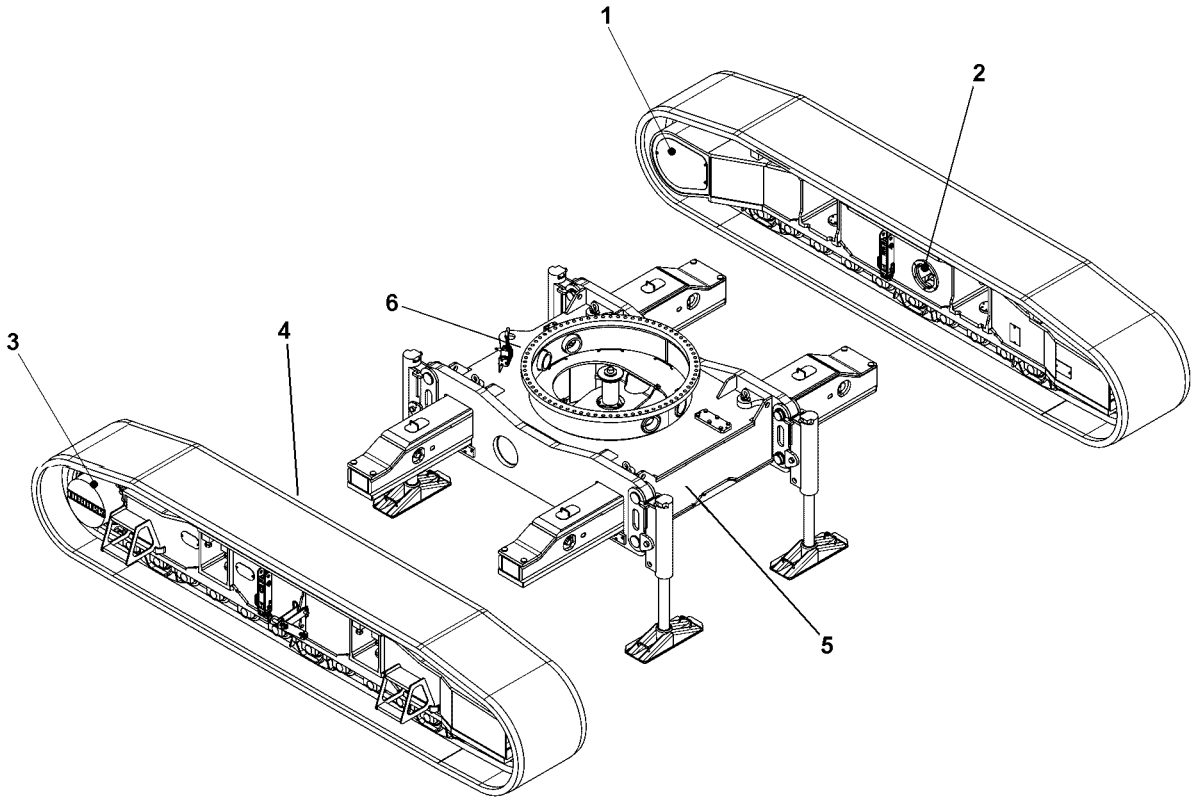
▶ An assistant must guide the transport vehicle!

▶ The transport vehicle should not catch any of the support cylinders!

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







B102931

1.5 Installing the central ballast, illustration 1

Make sure that the following prerequisites are met:
- The crane is supported and horizontally aligned.
- The LICCON overload protection has been set according to the load chart.
- The hook block weighs maximum 0.5 t.
- The maximum permitted distance between the center of the slewing ring and the central ballast on the transport vehicle is 4300 mm

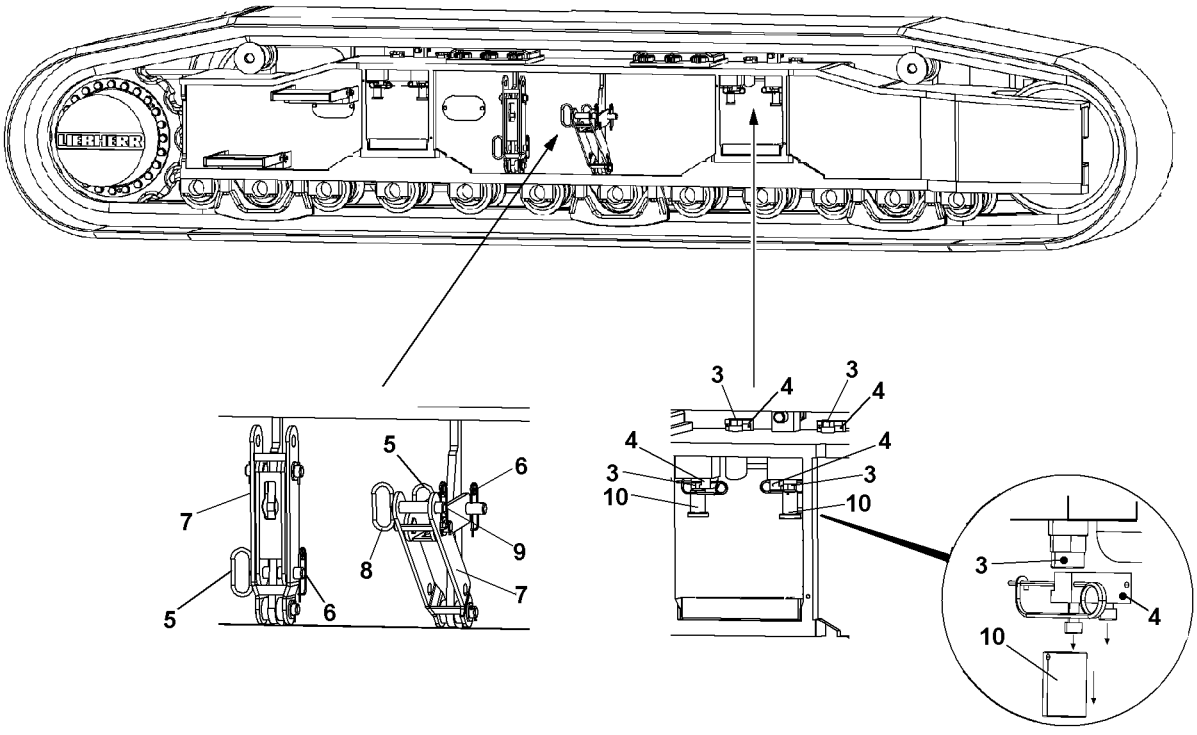
▶ Install the central ballast to both sides, see detailed description in chapter 3.03.

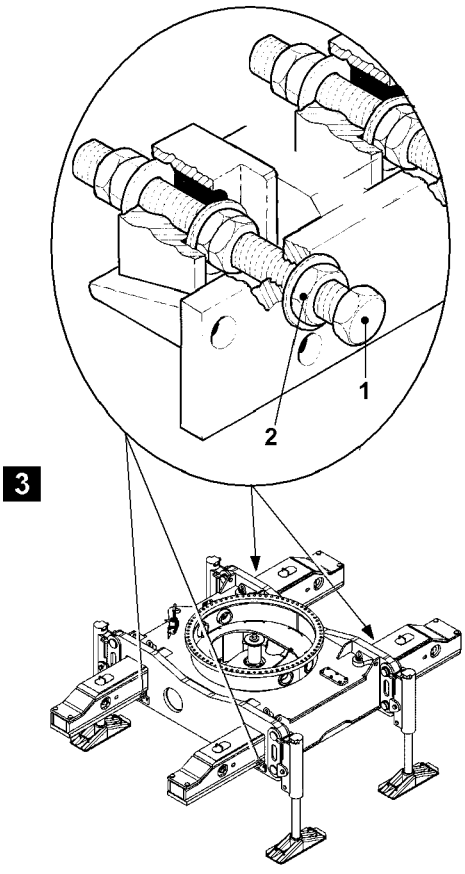
▶ Set the LICCON overload protection according to the load chart and the installed central ballast.

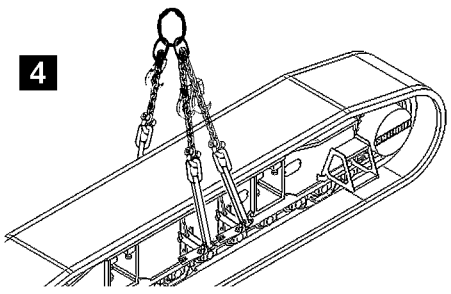
1.6 Installing the crawler carrier, illustration 2

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

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







B104732

1.6.1 Preparing the crane, illustration 3

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

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

1.6.2 Preparing the first crawler carrier

Make sure that the following prerequisites are met:

– the safety strips **4** have been removed
– the front clamping screws **3** are screwed in
– the rear clamping screws **3** have been unscrewed

- ▶ Clean the beam receptacles.

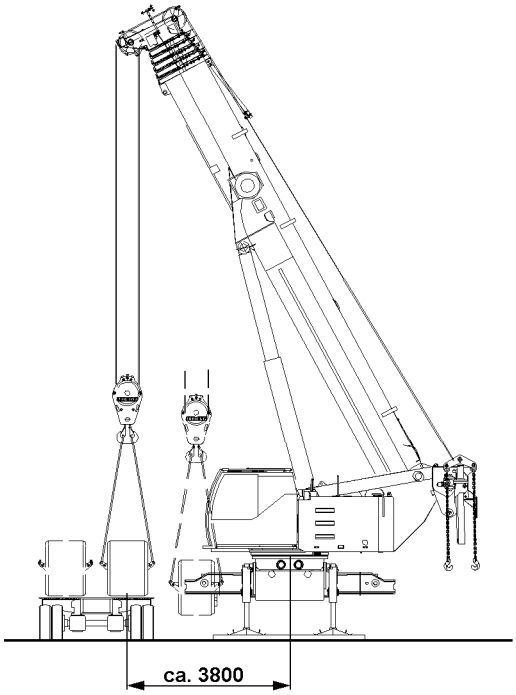
Three transport retainers **7** are installed to the crawler carriers. The transport retainers **7** must be swung out and pinned.

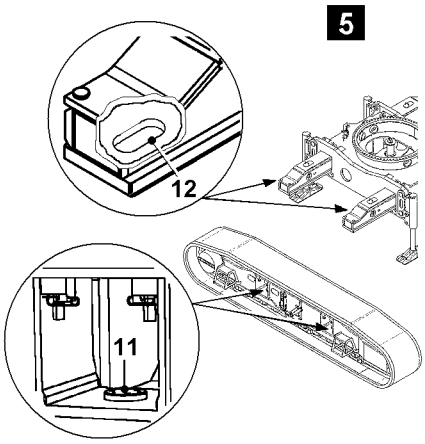
- ▶ Release and unpin the pin **5**.
- ▶ Swing out the transport retainers **7** and pin in the upper bore on the crawler carrier using the pins **5**.
- ▶ Secure the pin **5** with spring retainer **6**.
- ▶ Release and unpin the pin **8**.

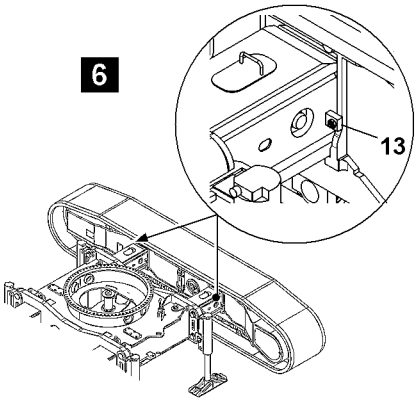
CAUTION
Damage to the crawler carrier!

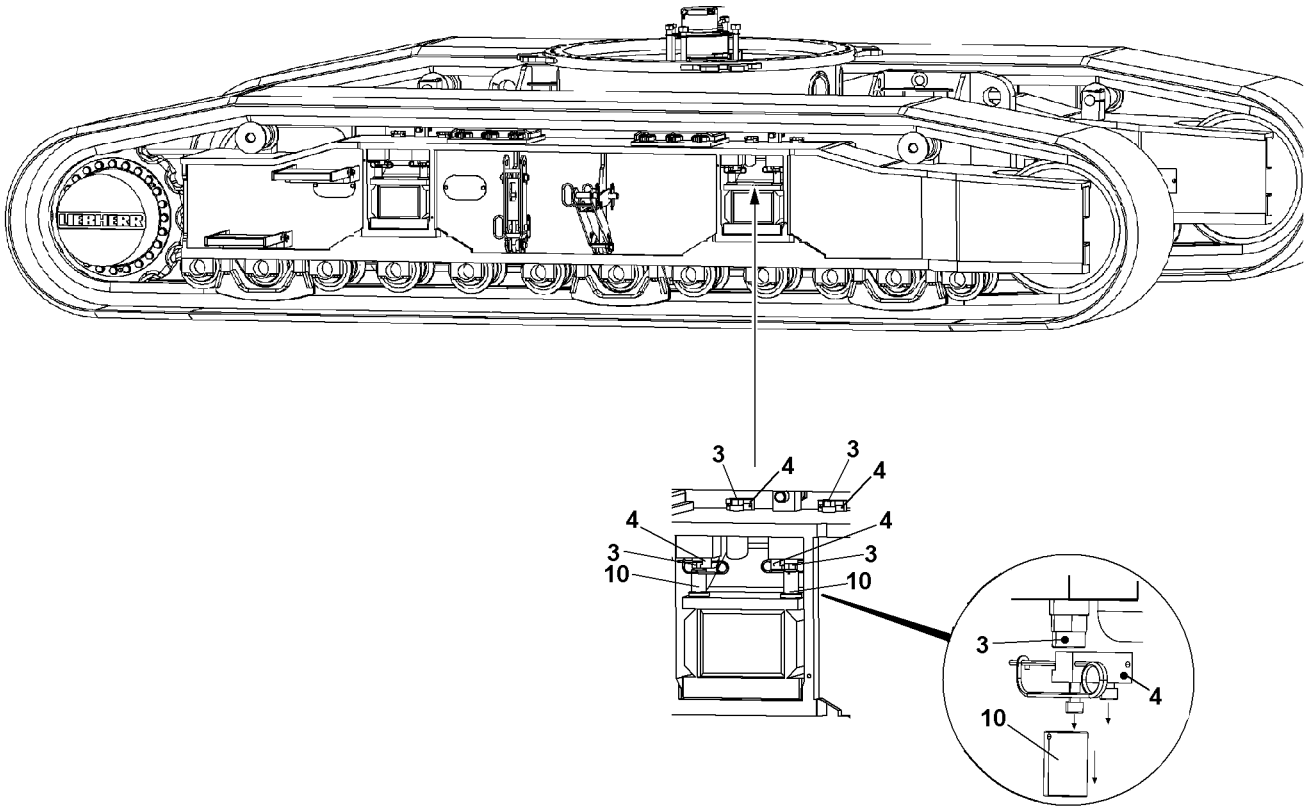
- ▶ Attach the assembly suspension in such a way that the crawler carriers are not damaged, see illustration **4**.

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









B199206

1.6.3 Assembling the first crawler carrier

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

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

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

DANGER

Persons may become crushed or trapped!

▶ Do not stand between the crawler carrier and the crawler center section while the crawler carrier is being installed!

▶ Lift the crawler carrier from the transport vehicle and drive away the transport vehicle.

▶ Precisely align the beam receptacles with the beams on the crane.

CAUTION

Risk of damage to the beams and beam receptacles!

The beams and beam receptacles may become damaged if you try to physically correct a misaligned crawler carrier!

▶ Slowly slide on the crawler carrier step-by-step!

▶ If the crawler carrier begins to twist, slide it slightly backwards and re-align!

▶ Thread the wedges **11** in the beam guides into the wedge notches **12** on the underside of the beams, illustration 5.

▶ Alternately raise and lower the crawler carrier to carefully slide it onto the beam.

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

▶ Slide the crawler carrier along the beam to the end-position **13**, illustration 6.

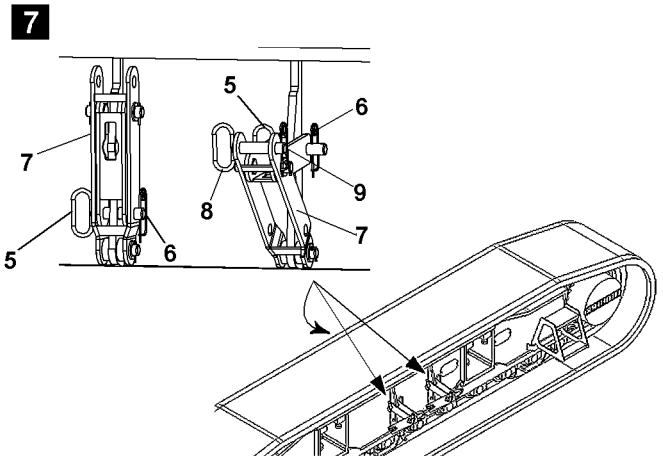
▶ Clamp the crawler carrier to both beams:

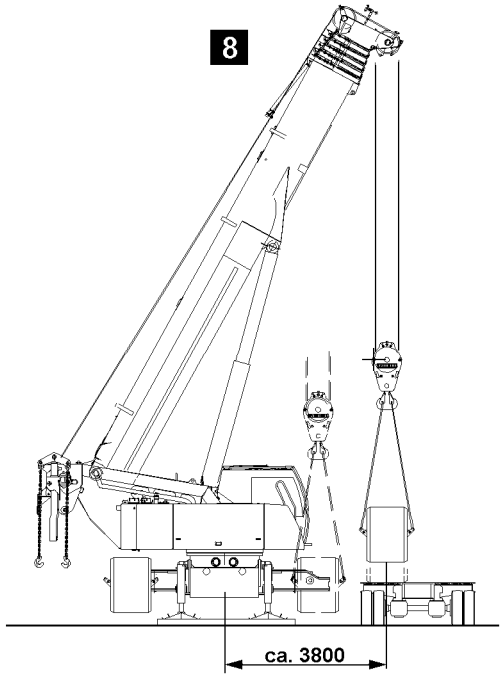
▶ Unscrew the front clamping screws **3** and clamp the sliding beams with spacers **10**.

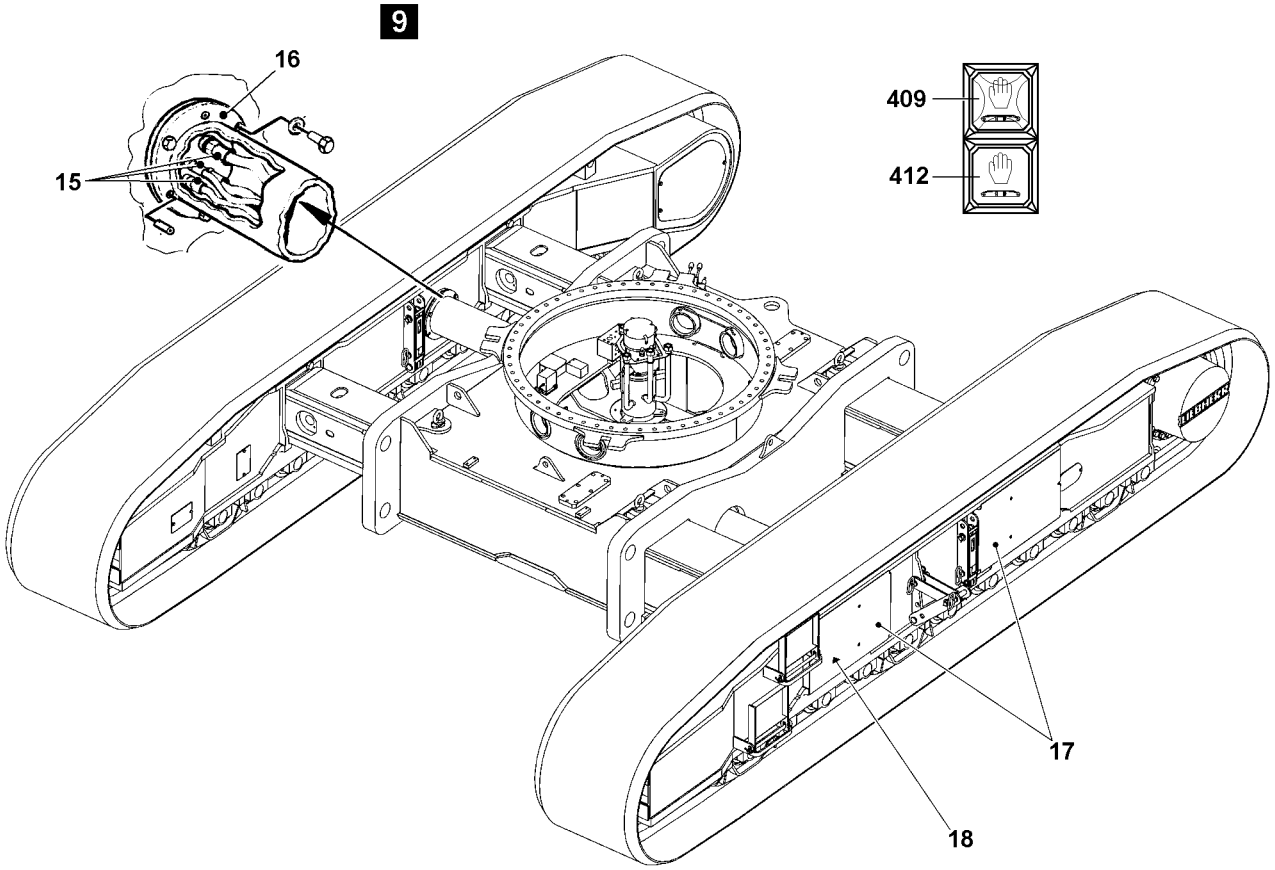
▶ Screw in the rear clamping screws **3** and clamp the beams.

▶ Secure the clamping screws **3** with safety strips **4**.

▶ Check that the beams are clamped at all four clamping points secured with safety strips **4**.







B199207

1.6.4 Folding in the transport retainers, illustration 7

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

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

1.6.5 Installing the second crawler carrier, illustration 8

The procedure for installing the second crawler carrier is identical to that for the first.
▶ Install the second crawler carrier.
▶ Move the support cylinders in completely.
▶ Place the support plates in the holders.

1.7 Establishing the hydraulic connections, illustration 9

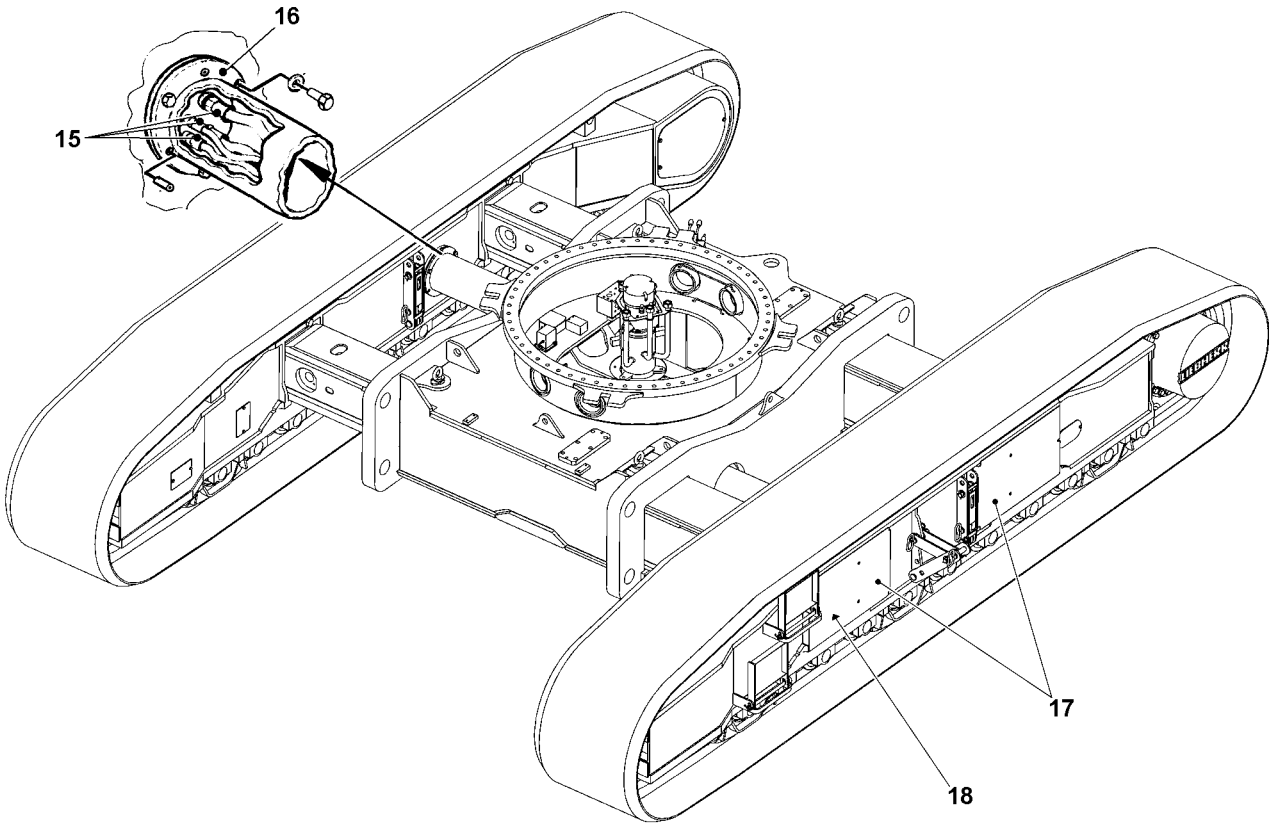
Make sure that the following prerequisite is met:
– Both crawler carriers are properly assembled.

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

The engine must be turned off before connecting and disconnecting any hydraulic lines.
All matching hydraulic connections are labelled.
▶ Establish the hydraulic connections **15** for the crawler drives.
▶ Screw the protective pipes **16** to the crawler carriers.
▶ Establish the hydraulic connections **18** to the track adjustment cylinder.
▶ Screw on the protective cover **17**.
▶ Press the button **412**.

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

▶ Try and test all vehicle movements.



B199139

2 Disassembling the crane

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

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

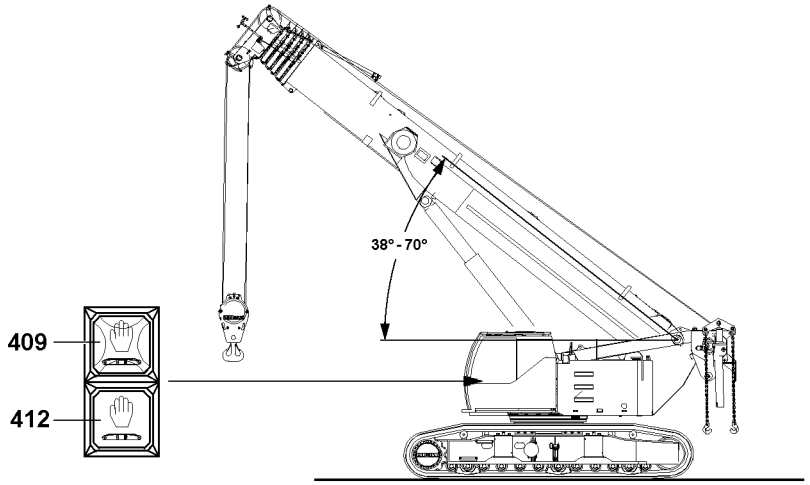
Note
▶ The crawlers can only be assembled or disassembled on wide track.

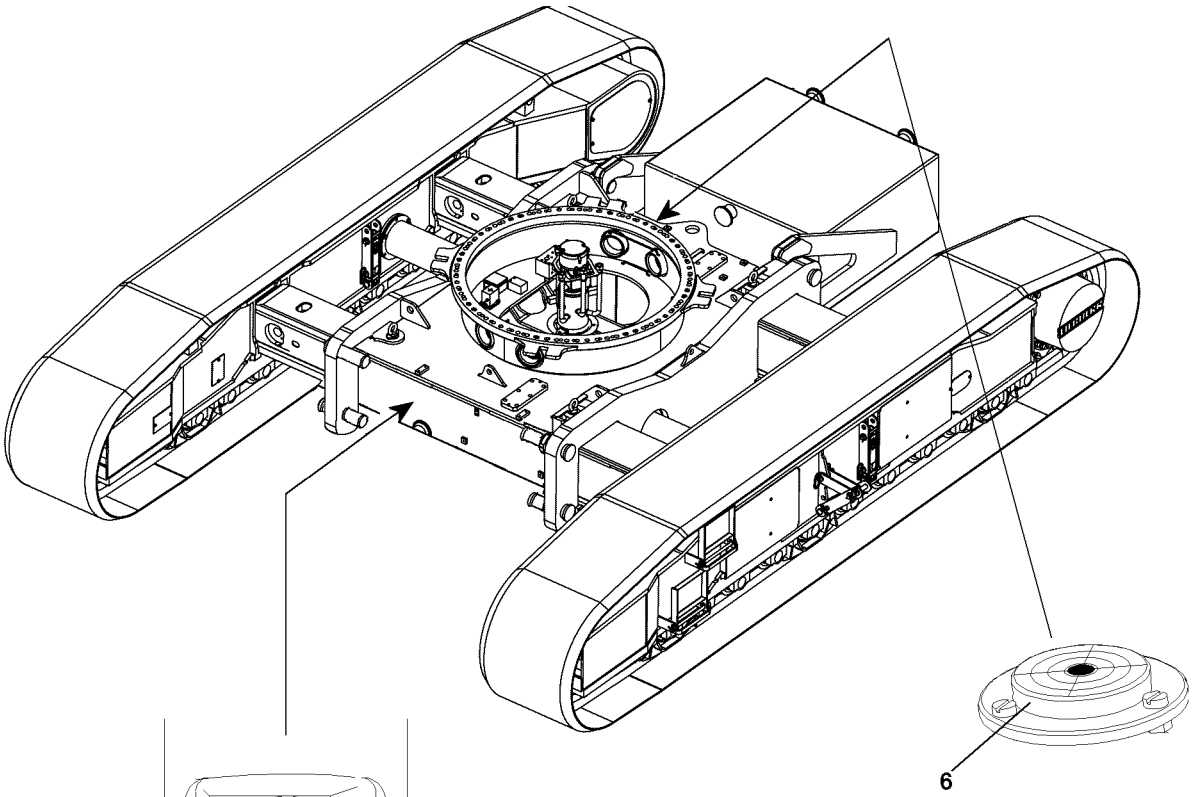
2.1 Disconnecting the hydraulic connections

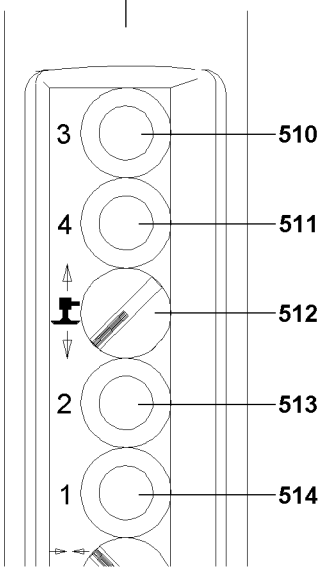
DANGER
Risk of accident when connecting the hydraulic connections!
Any movement of the crane when installing the hydraulic connections can cause fatal injury to the assembly personnel.
▶ It is prohibited to operate the pedals on the vehicle when installing the hydraulic connections!
▶ It is prohibited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

▶ Remove the protective cover **17**.

The engine must be turned off before connecting and disconnecting any hydraulic lines.
▶ Remove the hydraulic connections **18** to the track adjustment cylinder.
▶ Protect hydraulic connections **18** with caps from contamination.
▶ Release the protective pipes **16** on the crawler carriers.
▶ Disconnect the hydraulic connections **15** for the crawler drives.
▶ Protect hydraulic connections **15** with caps from contamination.







B103769

2.2 Supporting the crane

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

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

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

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

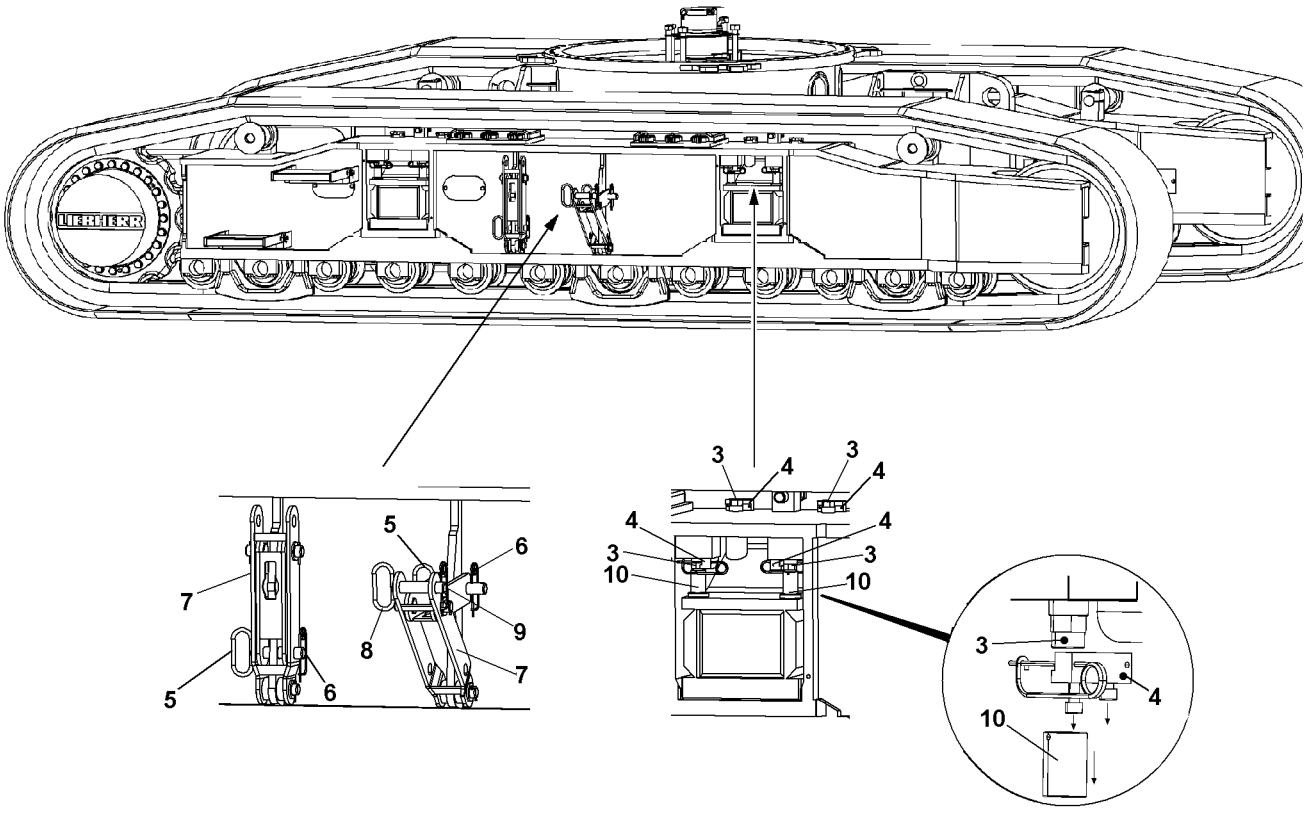
Button	Support cylinder
510	Left front
511	Left rear
513	Right front
514	Right rear

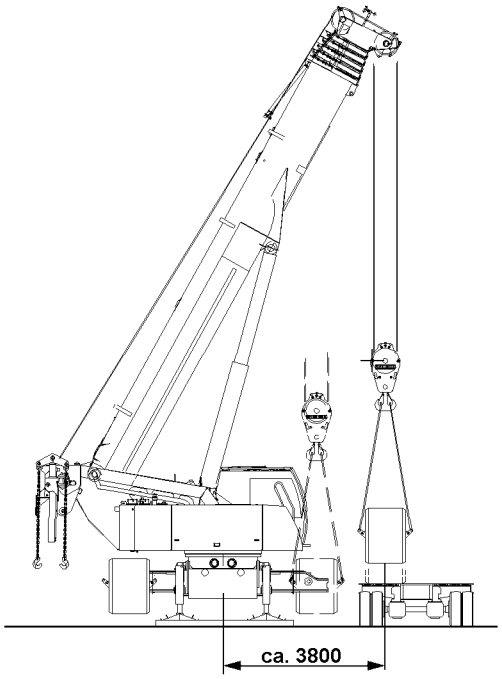
▶ Move the switch **512** downward.

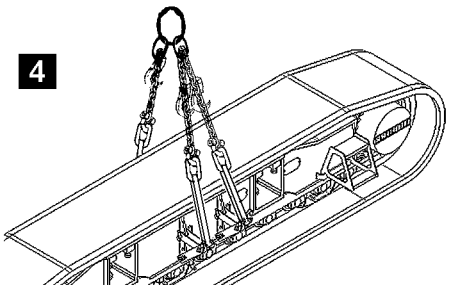
Result:
- Extend support cylinder is preselected.

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

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







B104733

2.3 Disassembling the crawler carrier

Make sure that the following prerequisites are met:

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

2.3.1 Disassembling the first crawler carrier

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

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

CAUTION

Damage to the crawler carrier!

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

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

CAUTION

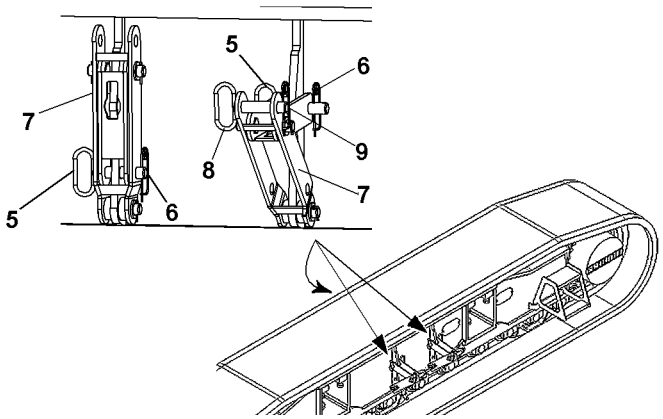
Risk of damage to the beams and beam receptacles!

The beams and beam receptacles may become damaged if you try to physically correct a misaligned crawler carrier!

- ▶ Slowly remove the crawler carrier step-by-step!

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

1



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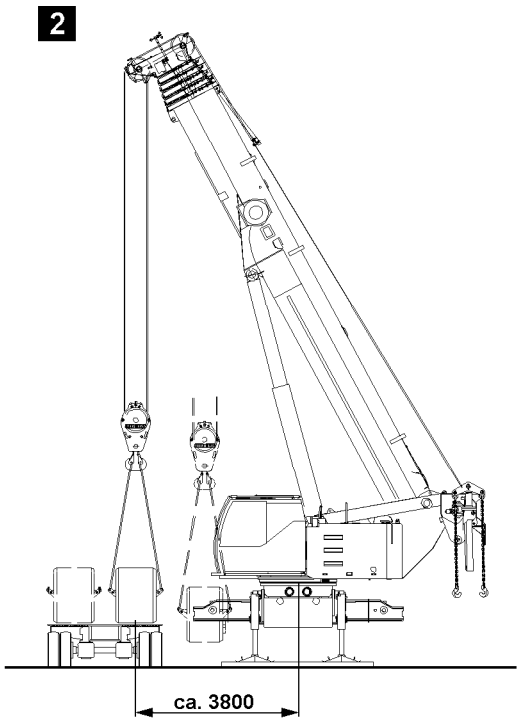

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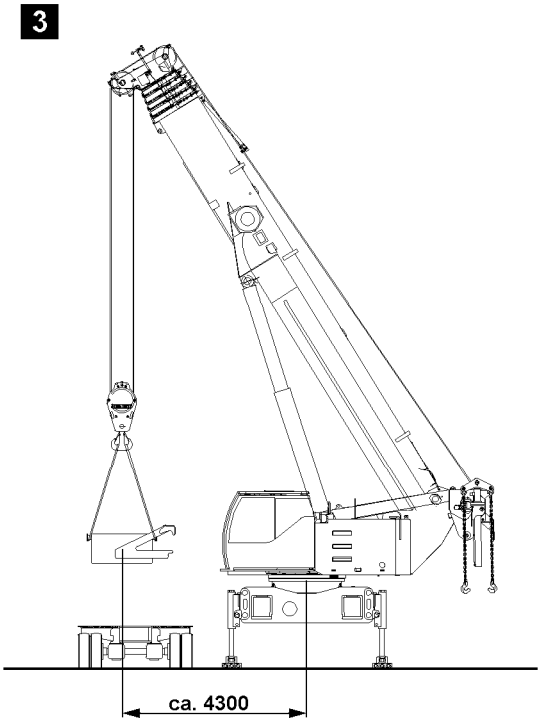


B102929

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

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

2.3.2 Folding in the transport retainers, illustration 1

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

2.3.3 Disassembling the second crawler carrier, illustration 2

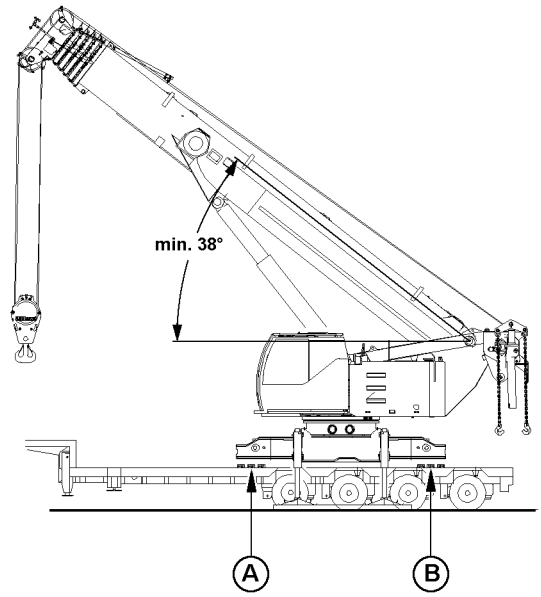
The procedure for disassembling the second crawler carrier is identical to that for the first.
▶ Disassemble the second crawler carrier.

2.4 Disassembling the central ballast, illustration 3

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

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

4



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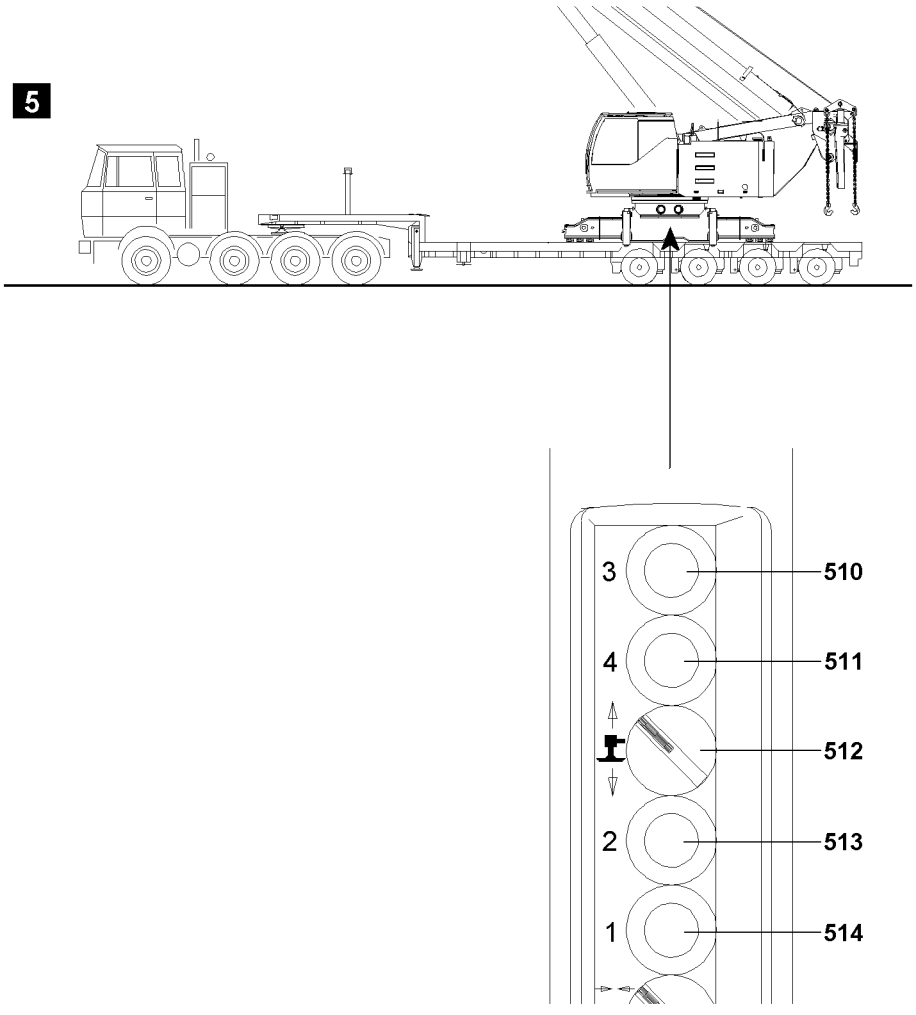


B102930

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

Make sure that the following prerequisites are met:

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

Note

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

DANGER

The crane can topple over!

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

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

▶ Carefully drive the transport vehicle under the supported crane.

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

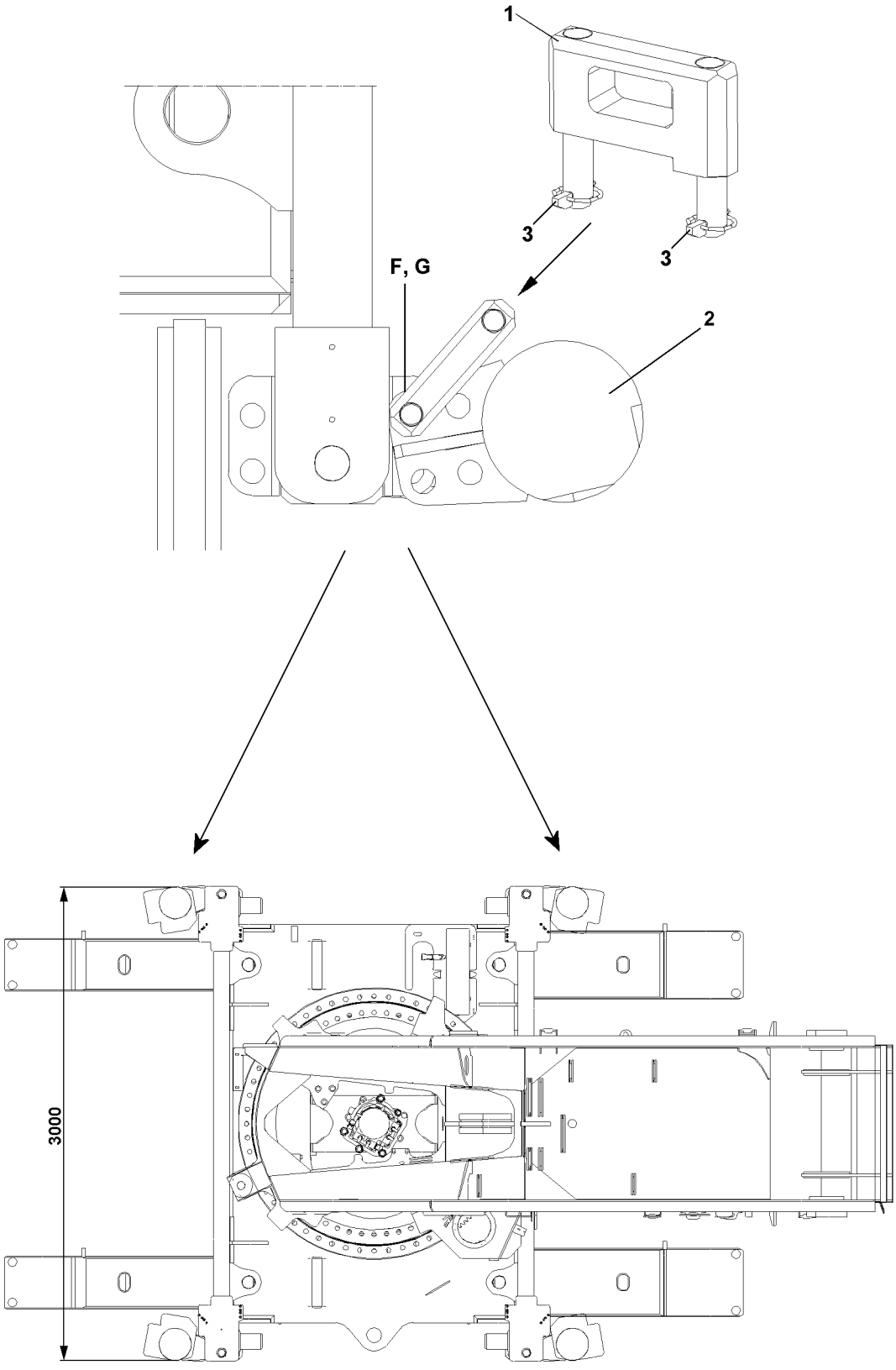
Button	Support cylinder
510	Left front
511	Left rear
513	Right front
514	Right rear

▶ Move the switch **512** upward.

Result:

– Support cylinder retraction is preselected.

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



B104730

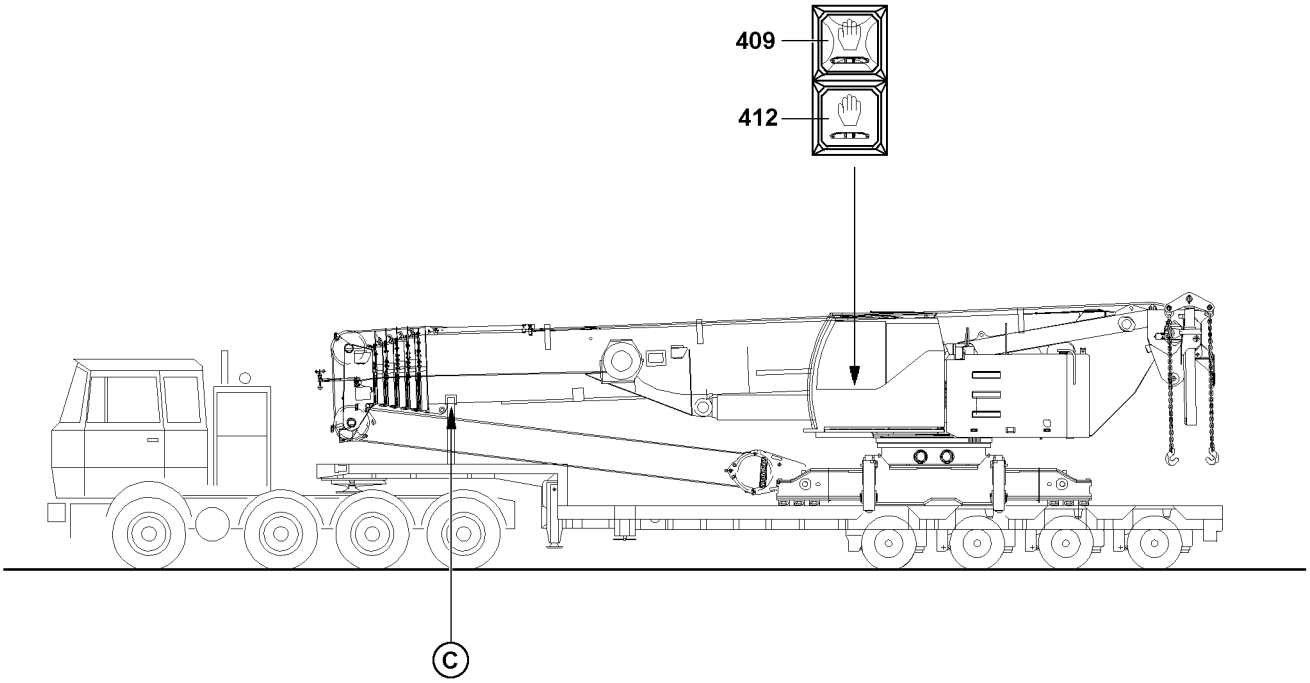
2.6 Pinning the support cylinders in transport position

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

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

Also pin the other support cylinders **2**.
▶ Pin all four support cylinders **2** in their transport position.

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



B199146

2.7 Securing the crane properly on the transport vehicle

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

▶ Lock the crane superstructure with the crane chassis.

Note

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

▶ Luff down the telescopic boom and place it on the support base.

▶ Fasten the hook block to the crawler center section and lightly tension the hoist rope.

▶ Secure the ballast assembly chains to avoid uncontrolled swinging.

▶ Press the button **412**.

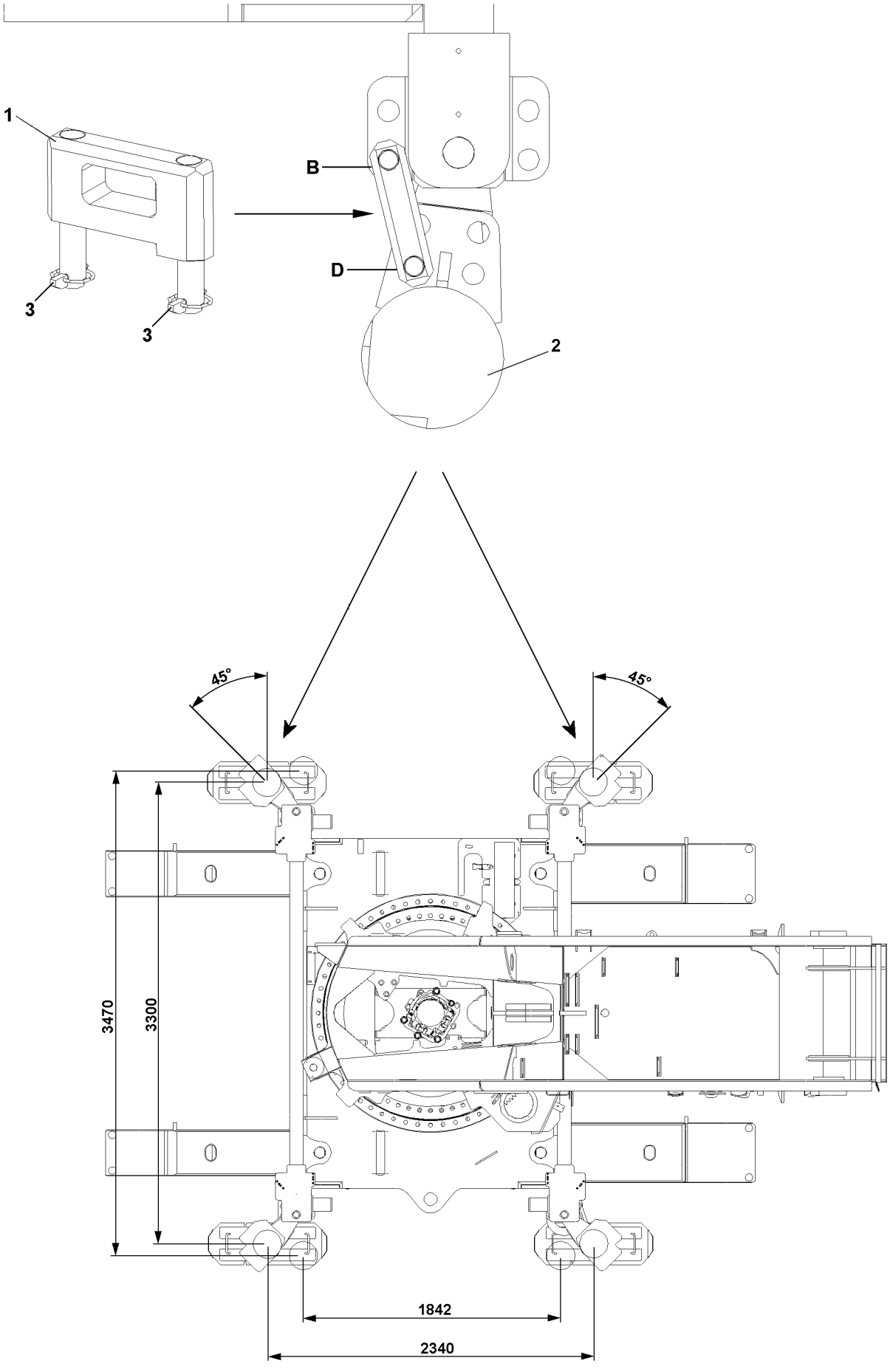
Result:
- The indicator light **409** turns off.
- The support pressure has been turned off.

WARNING

Falling crane if insufficiently secured!

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

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



B104731

3 Unloading / loading the crane with extra wide transport vehicle

3.1 Unloading the crane with extra wide transport vehicle

Make sure that the following prerequisites are met:

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

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

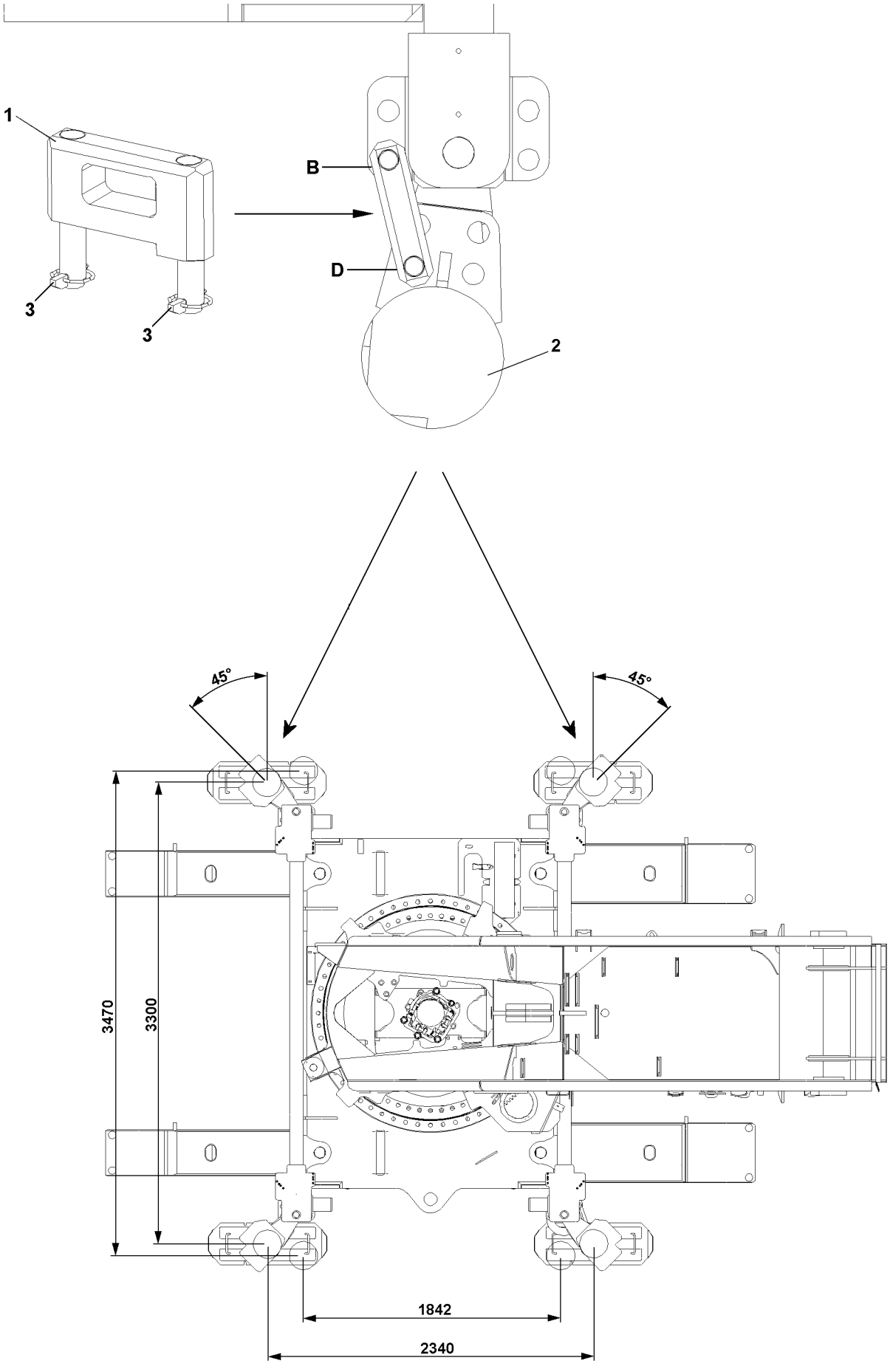
DANGER
The crane can topple over!
If the crane superstructure is turned with a support base of 1842 mm x 3470 mm, the crane can topple over and fatally injure personnel!
▶ Turning the crane superstructure at a support base of 1842 mm x 3470 mm is prohibited!
▶ The crane may only be supported at a support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

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

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

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

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



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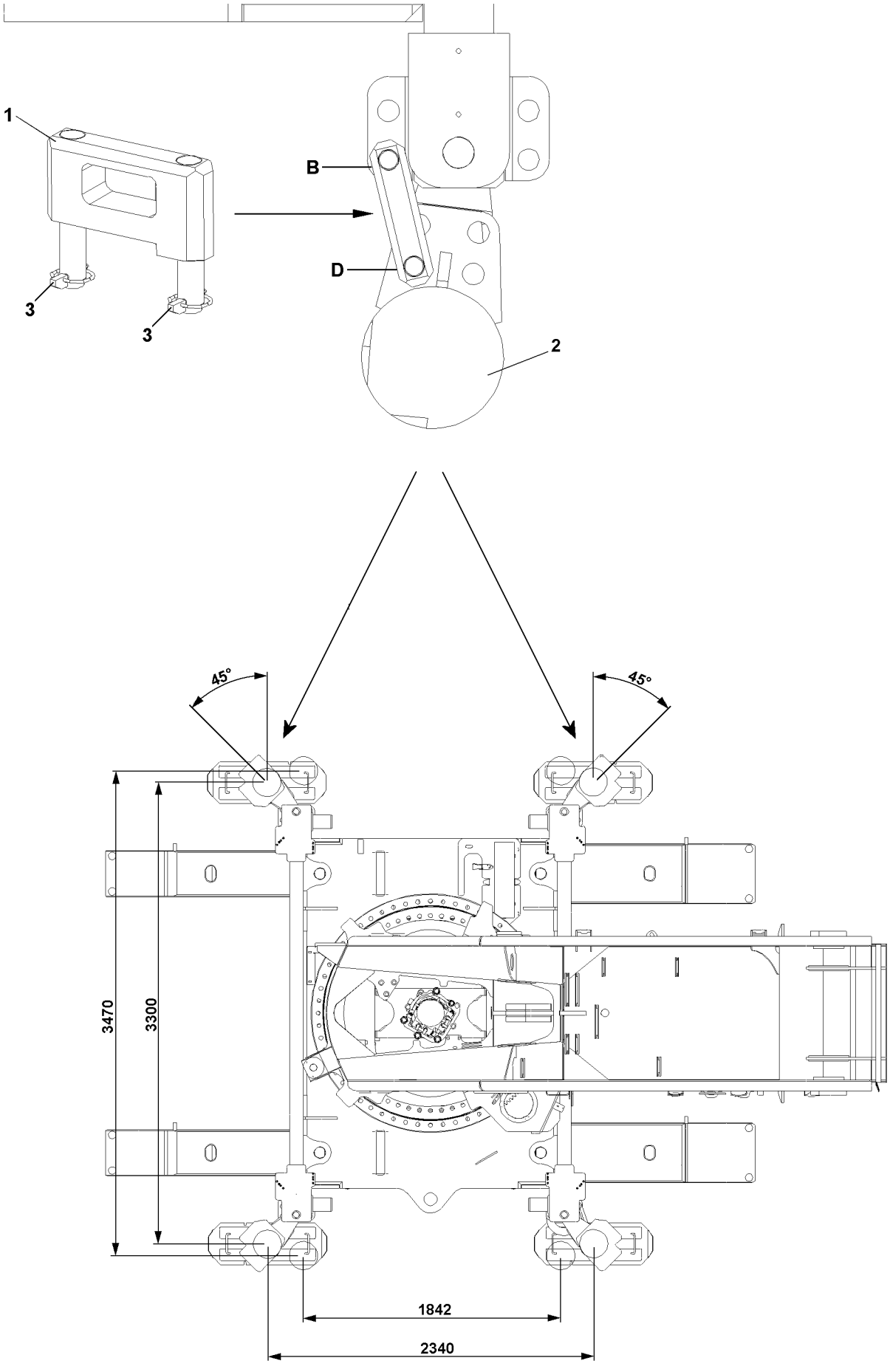
DANGER
The crane can topple over!
If the crane is not properly and safely supported, the crane can topple over and fatally injure personnel!
▶ Support the crane properly and safely to prevent it from tipping over.

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



B104731

3.2 Loading the crane with extra wide transport vehicle

Make sure that the following prerequisites are met:

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

DANGER
The crane can topple over!
If the crane superstructure is turned with a support base of 1842 mm x 3470 mm, the crane can topple over and fatally injure personnel!

- ▶ Turning the crane superstructure at a support base of 1842 mm x 3470 mm is prohibited!
- ▶ The crane may only be supported at a support base of 1842 mm x 3470 mm for unloading / loading of extra wide transport vehicles!
- ▶ Assembly operation is only permitted at a support base of 2340 mm x 3300 mm!

DANGER
The crane can topple over!
If the crane is not properly and safely supported, the crane can topple over and fatally injure personnel!

- ▶ Support the crane properly and safely to prevent it from tipping over.

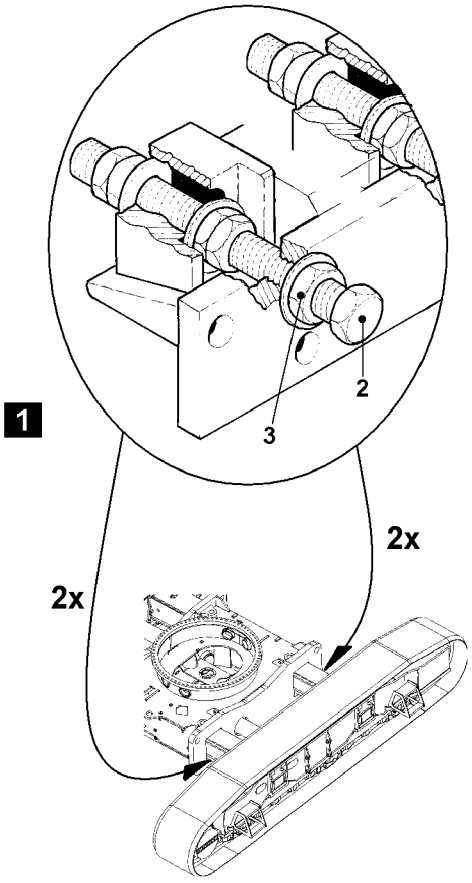
- ▶ Support the crane properly and safely to prevent it from tipping over.
- ▶ Retract the support cylinders and carefully lower the crane onto the support.
- ▶ Release and unpin the straight retaining bracket **1**.
- ▶ Swing out the support cylinder **2**.
- ▶ Pin the straight retaining brackets **1**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

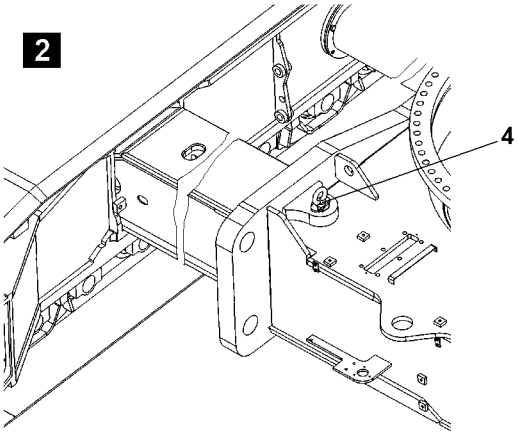
Also pin the other support cylinders **2**.

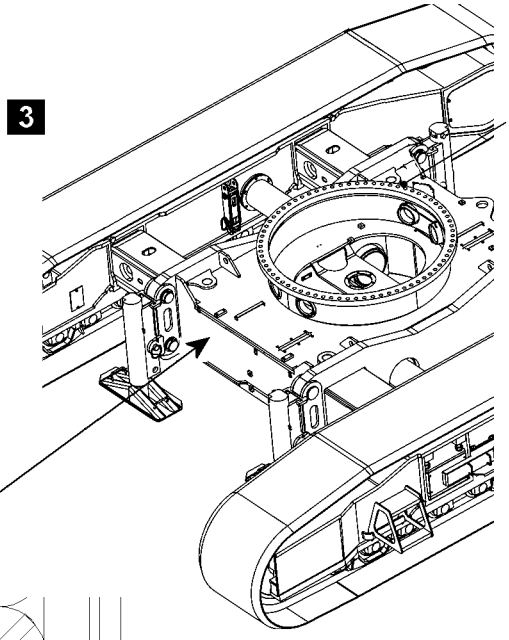
DANGER
Risk of tipping when the auxiliary boom is in its transport position at the side of the telescopic boom!
If the telescopic boom, with the auxiliary boom installed on the side of the telescopic boom is not luffed up to an angle range of 38° to 60° before supporting, then the crane can topple over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

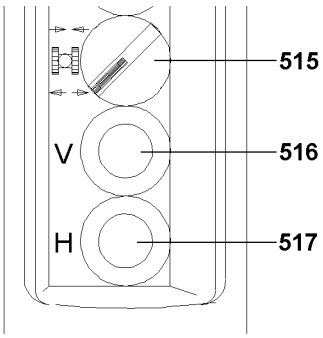
- ▶ Luff the telescopic boom with the auxiliary boom installed on the side of the telescopic boom to an angle range of 38° to 60° before supporting the crane!

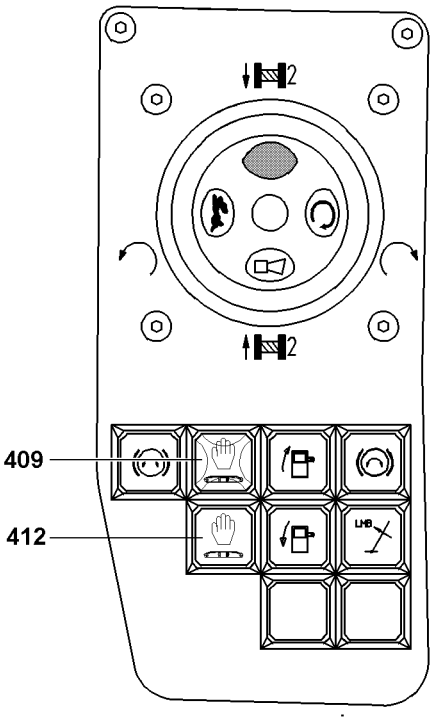
- ▶ Support all four support cylinders **2** on support base 1842 mm x 3470 mm.
- ▶ Carefully drive the extra wide transport vehicle under the supported crane.
- ▶ Retract the support cylinders and place the crane on the extra wide transport vehicle.
- ▶ Disassemble the crane as described in the chapter.

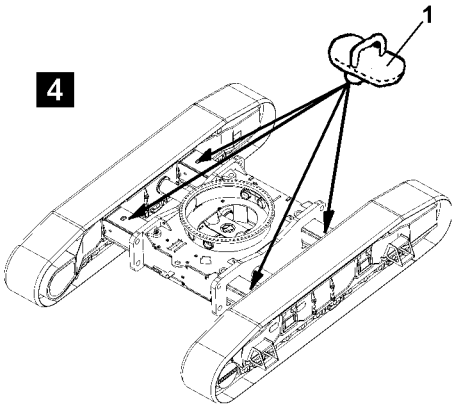












B102925

4 Adjusting the track width

4.1 General

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

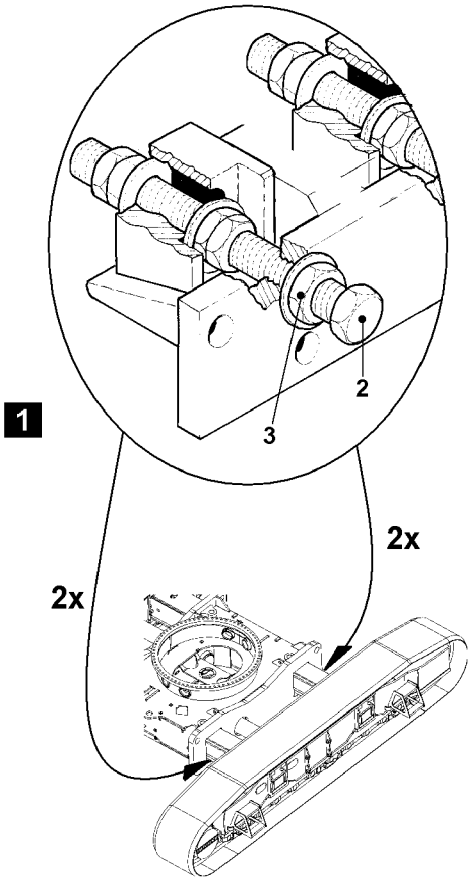
Make sure that the following prerequisites are met:
- – The crane is horizontally aligned and standing on level and smooth ground.
  The crawler carriers should not sink into the ground, or get caught by obstacles such as boulder edges when changing the track.
- – All loads and lifting equipment have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

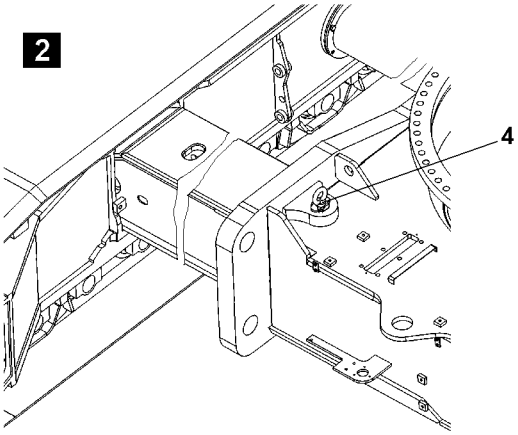
Note
- ▶ It is not possible to remove the crawler carrier, counterweight and central ballast in narrow track operation.
- ▶ The crawler carrier should always be completely converted before starting on the other crawler carrier!

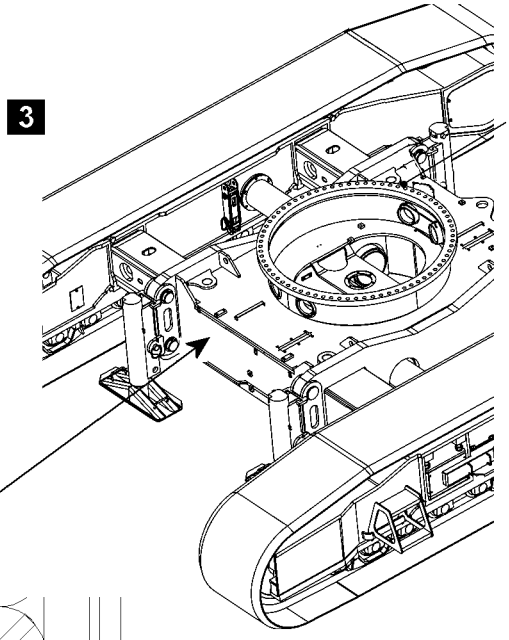
4.2 Tasks of the assistants

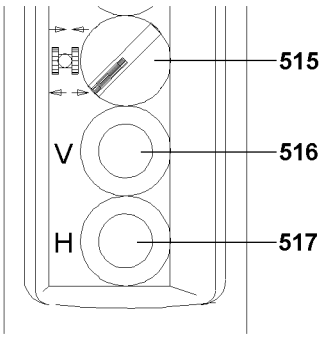
Assistant at the front of the chassis:
- ▶ Loosens the front pins **4** on the beams, illustration 2.
- ▶ Monitors the front track adjustment and maintains direct eye contact with the machine operator.
- ▶ Relays instructions from the machine operator to the assistant at the rear and vice-versa.
- ▶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

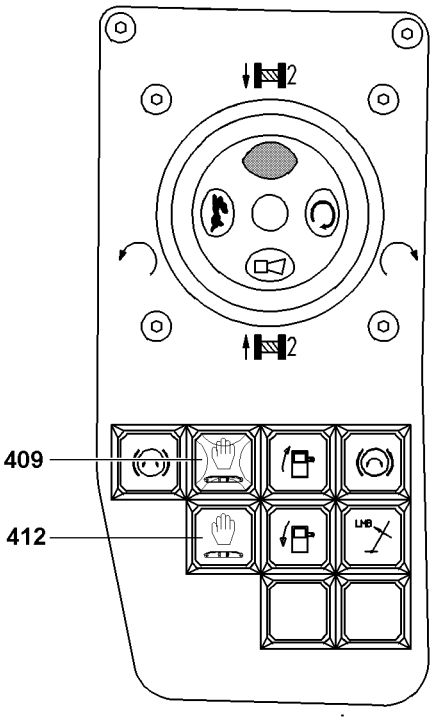
Assistant at the rear of the chassis:
- ▶ Loosens the rear pins **4** on the beams, illustration 2.
- ▶ Monitors the rear track adjustment and maintains direct eye contact with the front assistant.
- ▶ Gives / takes instructions from the front assistant.
- ▶ Once the track has been adjusted, the rear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

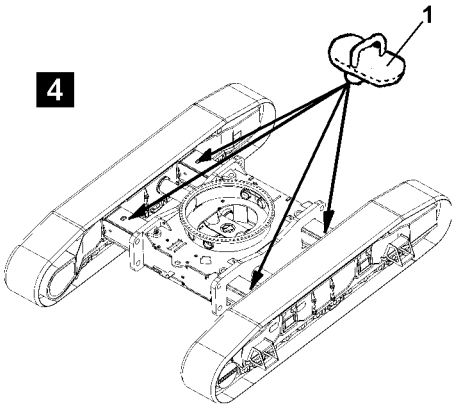












B102925

4.3 Increasing the track width

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

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

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

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

This is made easier if both wedge screws are loosened by the same amount (not too much).
▶ First loosen the nut **3** and then turn the screw **2** clockwise to remove the wedge, illustration 1.
▶ Pull the front and rear pins **4** on the left crawler center section, illustration 2.
▶ Press the button **412**.
Result:
– The indicator light **409** lights up.
– The crawler track adjustment has been turned on.

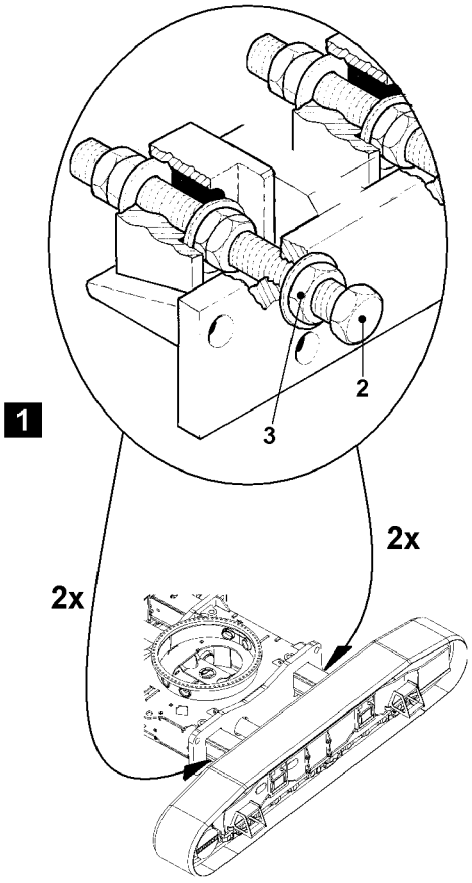
▶ Move the switch **515** downward.
Result:
– Track width enlarging is preselected.

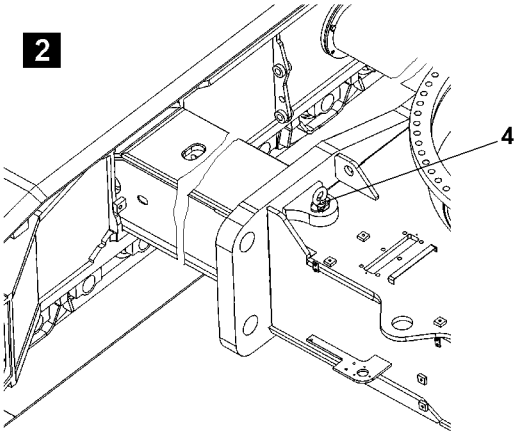
▶ Press the button **516** for “track adjustment front” and the button **517** for “track adjustment rear” and push the crawler carriers out to the outer pin points of the sliding beams, illustration 3.
▶ Insert the front and rear pins **4** into the left crawler center section, illustration 2.

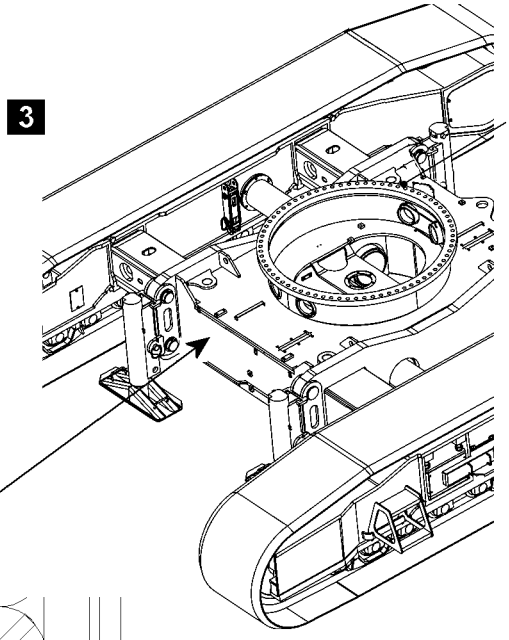
The right crawler carrier can be slid in identically as the left crawler carrier.

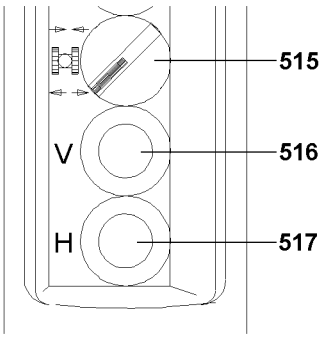
CAUTION
Hydraulic hoses may break off!
The right crawler carrier does not have a mechanical end-stop.
▶ Do not slide out the right crawler carrier beyond the specified distance (wide track)!

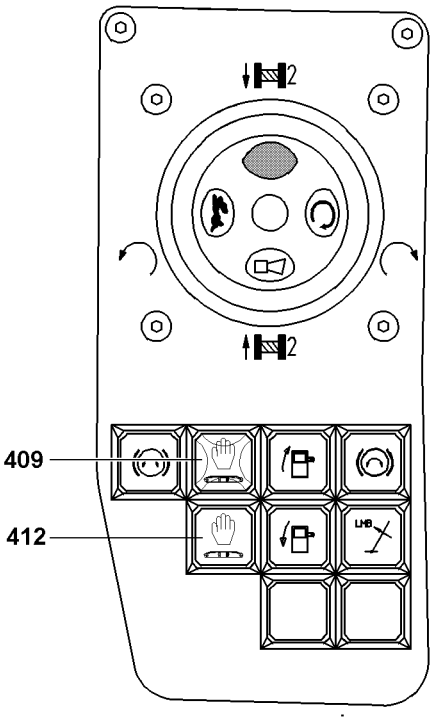
▶ Slide out the right crawler carrier and pin using pin **4**, illustration 2.

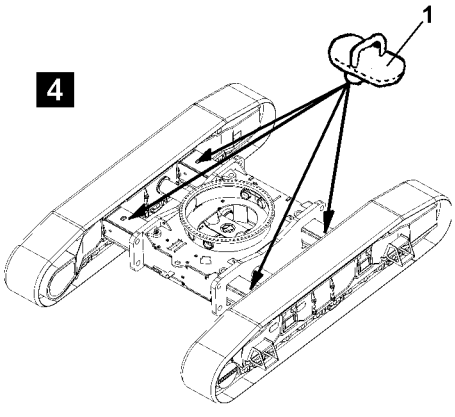












B102925

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

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

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

▶ When wedging each of the beams:
Tighten the nut **3**.

▶ Attach the cover **1** to the beams, illustration 4.

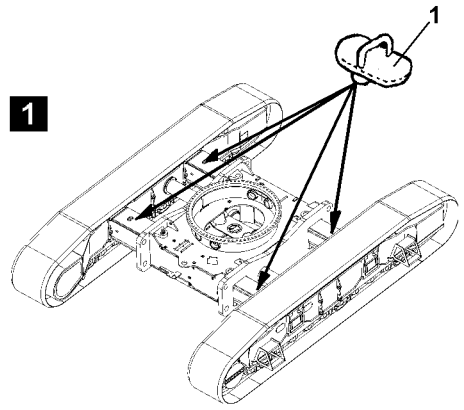
▶ Check all eight screws **2** and if necessary tighten and secure.

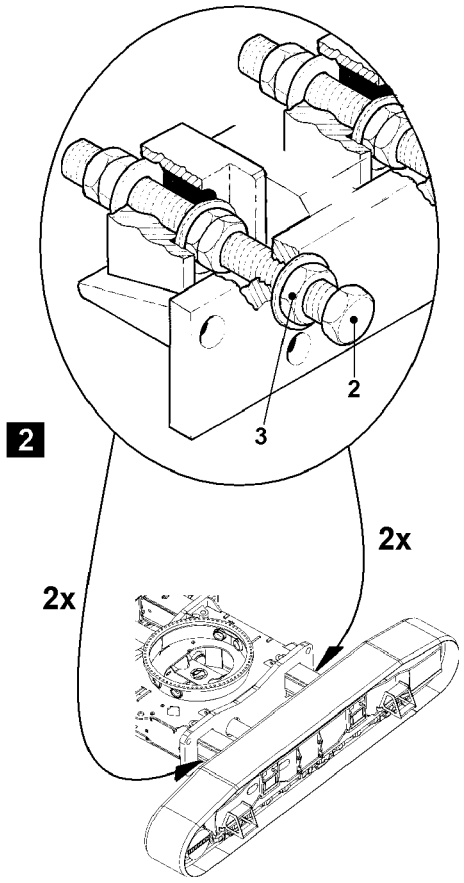
▶ After sliding out the crawler carrier:
Grease any exposed sliding surfaces on the beams.

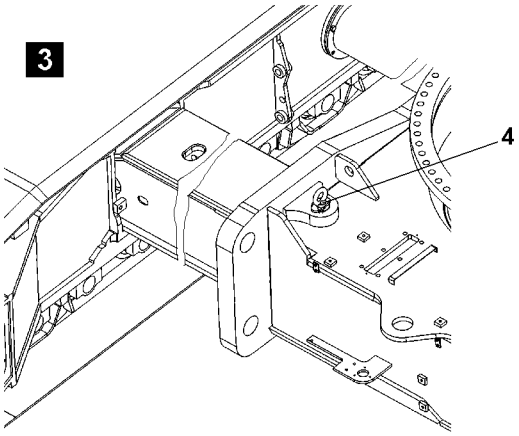
▶ Press the button **412** again.

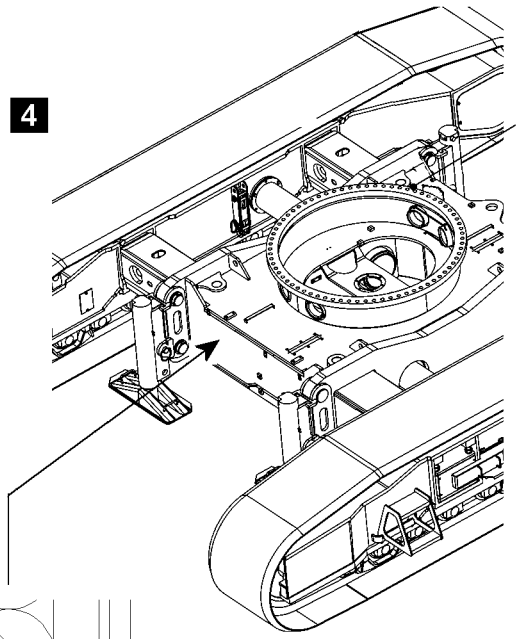
Result:

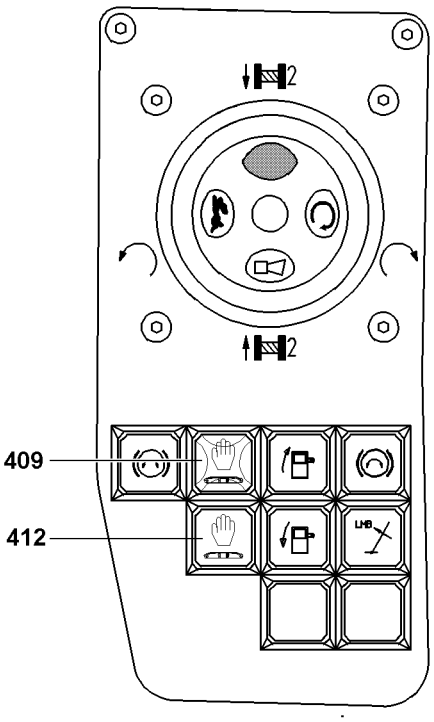
– The indicator light **409** turns off.
– The crawler track adjustment has been turned off.

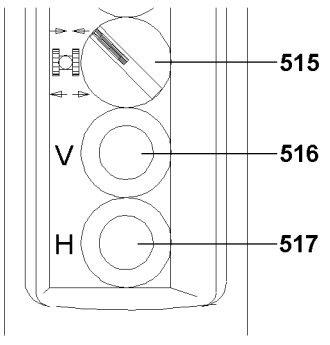












B102926

4.4 Reducing track width

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

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

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

▶ Remove the cover **1** from the beams, illustration 1.
▶ If necessary:
Clean any of the exposed sliding surfaces on the beams.
▶ Remove both beam wedges at the **right front** and **right rear** of the crawler center section:

This is made easier if both wedge screws are loosened by the same amount (not too much).
▶ First loosen the nut **3** and then turn the screw **2** clockwise to remove the wedge, illustration 2.
▶ Pull the front and rear pins **4** on the right crawler center section, illustration 3.
▶ Press the button **412**.

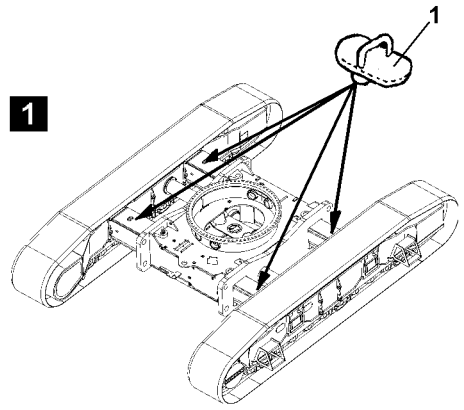
Result:
– The indicator light **409** lights up.
– The crawler track adjustment has been turned on.

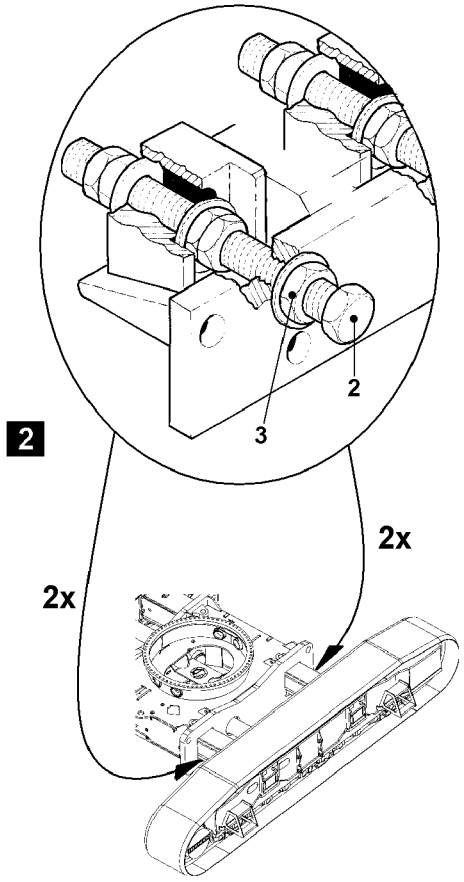
▶ Move the switch **515** upward.

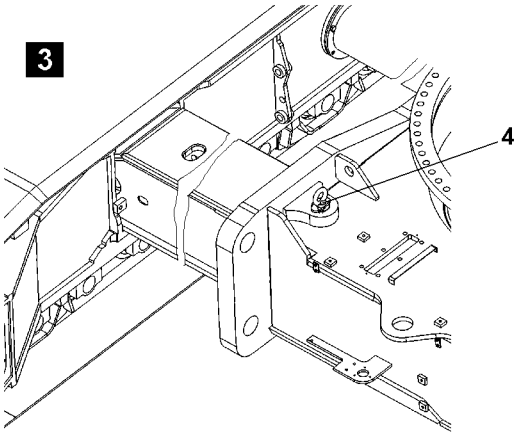
Result:
– Retract track width is preselected.

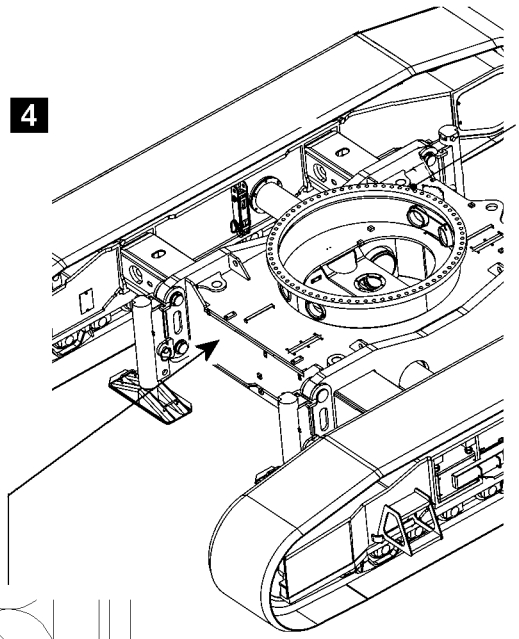
▶ Press the button **516** for “track adjustment front” and the button **517** for “track adjustment rear” and push the crawler carriers in to the inner pin points of the sliding beams, illustration 4.
▶ Insert the front and rear pins **4** into the right crawler center section, illustration 3.

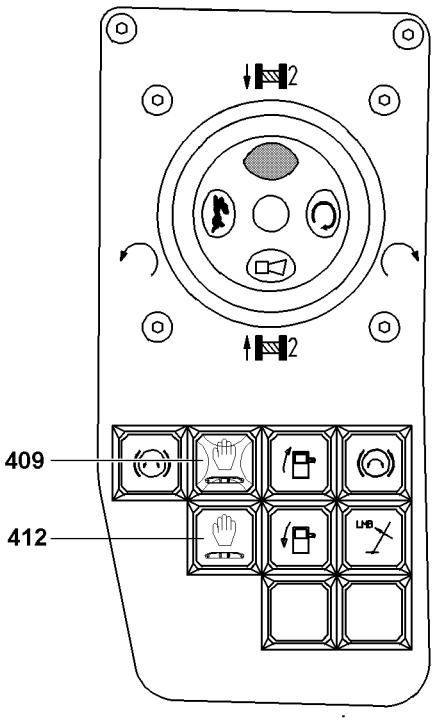
The left crawler carrier can be slid in the same way as the right crawler carrier.
▶ Slide in the left crawler carrier and pin using pins **4**, illustration 3.

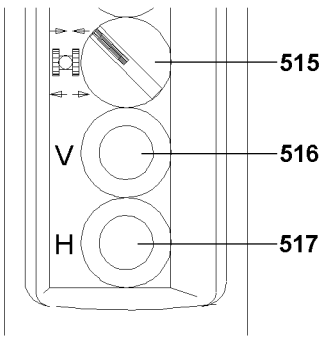












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▶ Wedge the beams on the left and right crawler carriers:

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

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

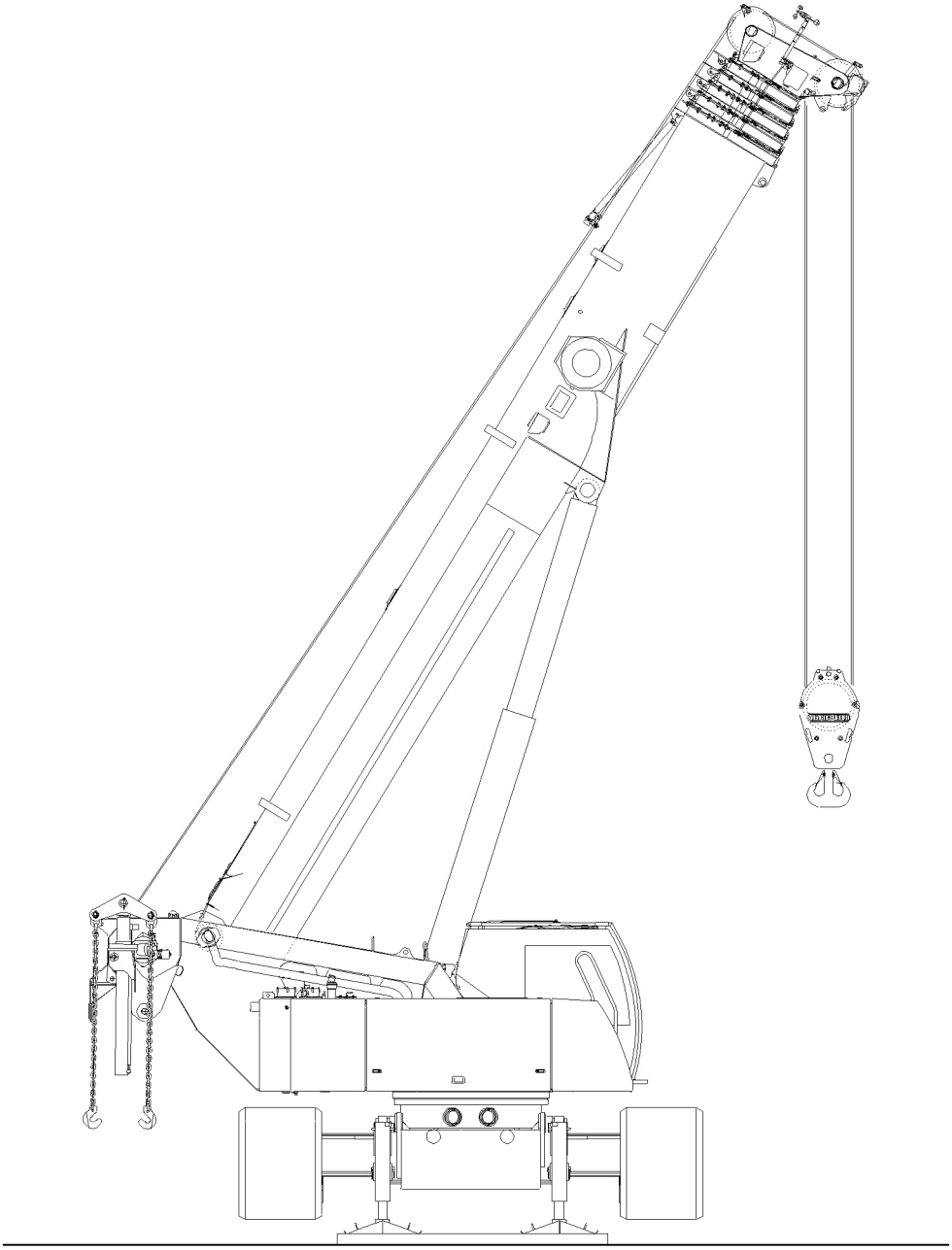
▶ When wedging each of the beams:
Tighten the nut **3**.

▶ Check all eight screws **2** and if necessary tighten and secure.

▶ Press the button **412** again.

Result:

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



B103678

4.5 Supporting the equipped crane without load

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

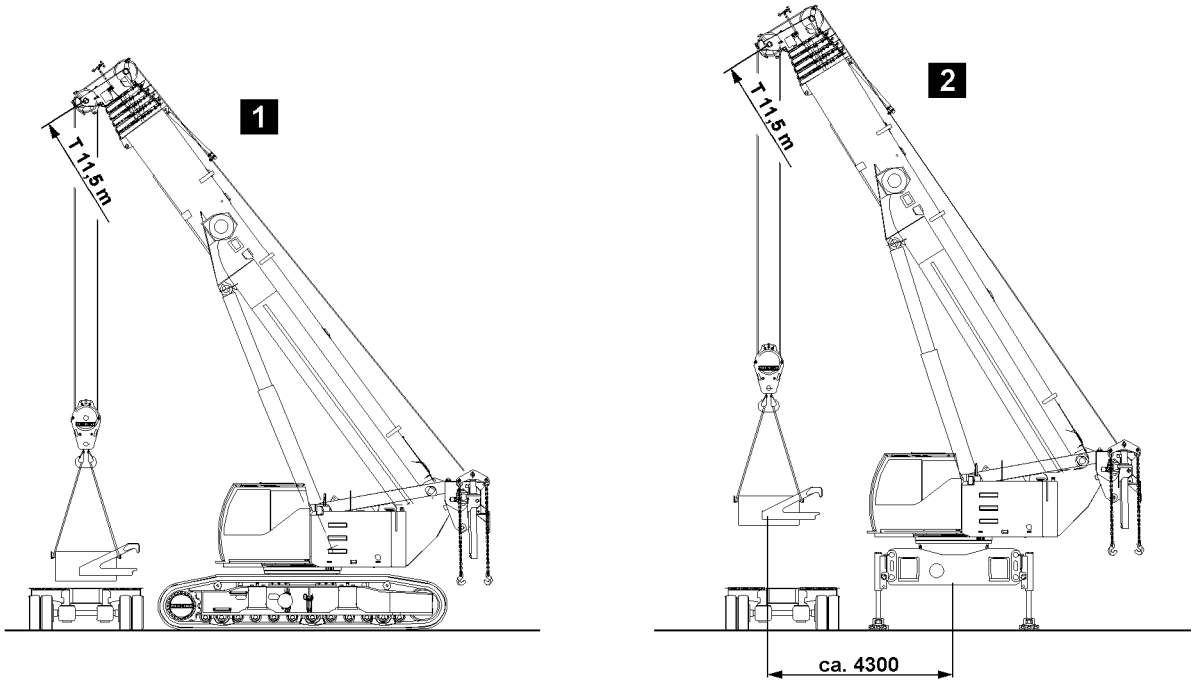
– The crane is standing on wide track 4.15 m **or** reduced track 3.40 m.
– The crane superstructure is locked to the crane chassis, in travel direction to the front or rear (0° or 180°).
– The support base 2.34 m x 3.30 m (45°) **or** 1.84 m x 3.47 m (0°) is set.
– The ground is horizontal (maximum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

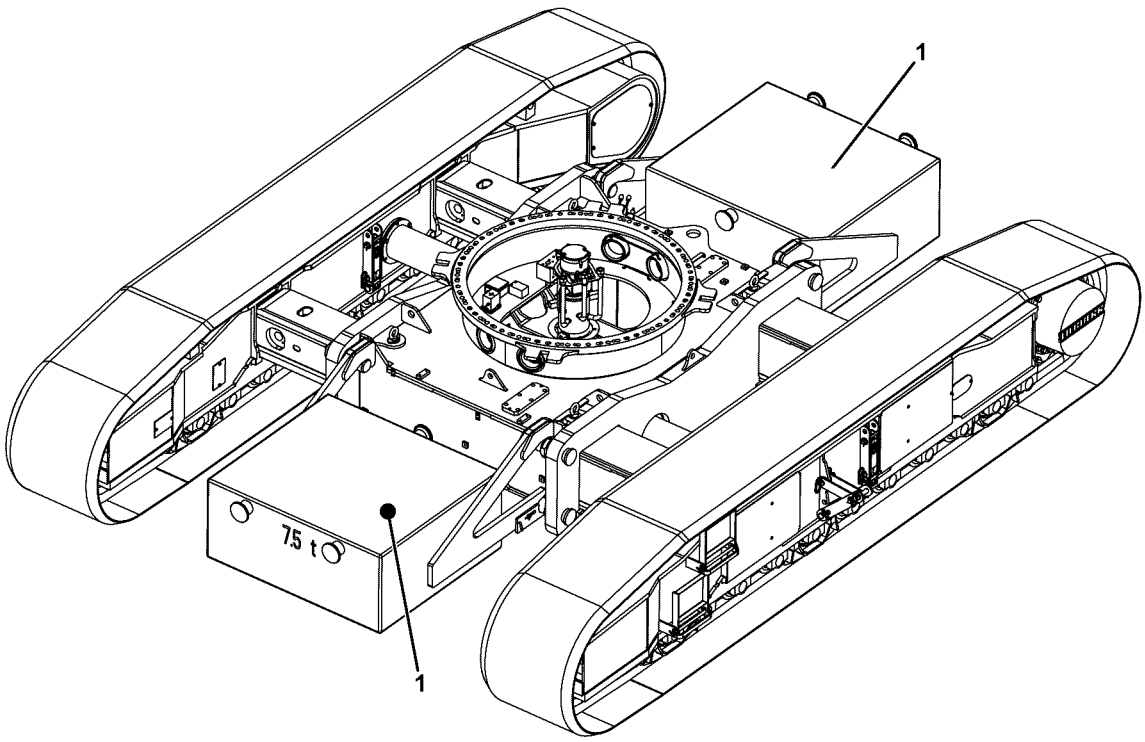
DANGER
The crane can topple over!
If the prerequisites are not strictly observed, the crane can topple over and fatally injure personnel or the support cylinders can be overloaded!
▶ Adhere to the prerequisites exactly!
▶ Support the crane only according to the data in the chart, “permissible angle window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

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

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

Lift the crane only until all track rollers are cleared.
▶ Support the crane and ensure it is level.
▶ Set the desired track, see section “Assembling the crane”.





B199148

1 Fitting/removing the central ballast

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

Note

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

1.1 Possible central ballast combinations

DANGER

Crane can topple over!

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

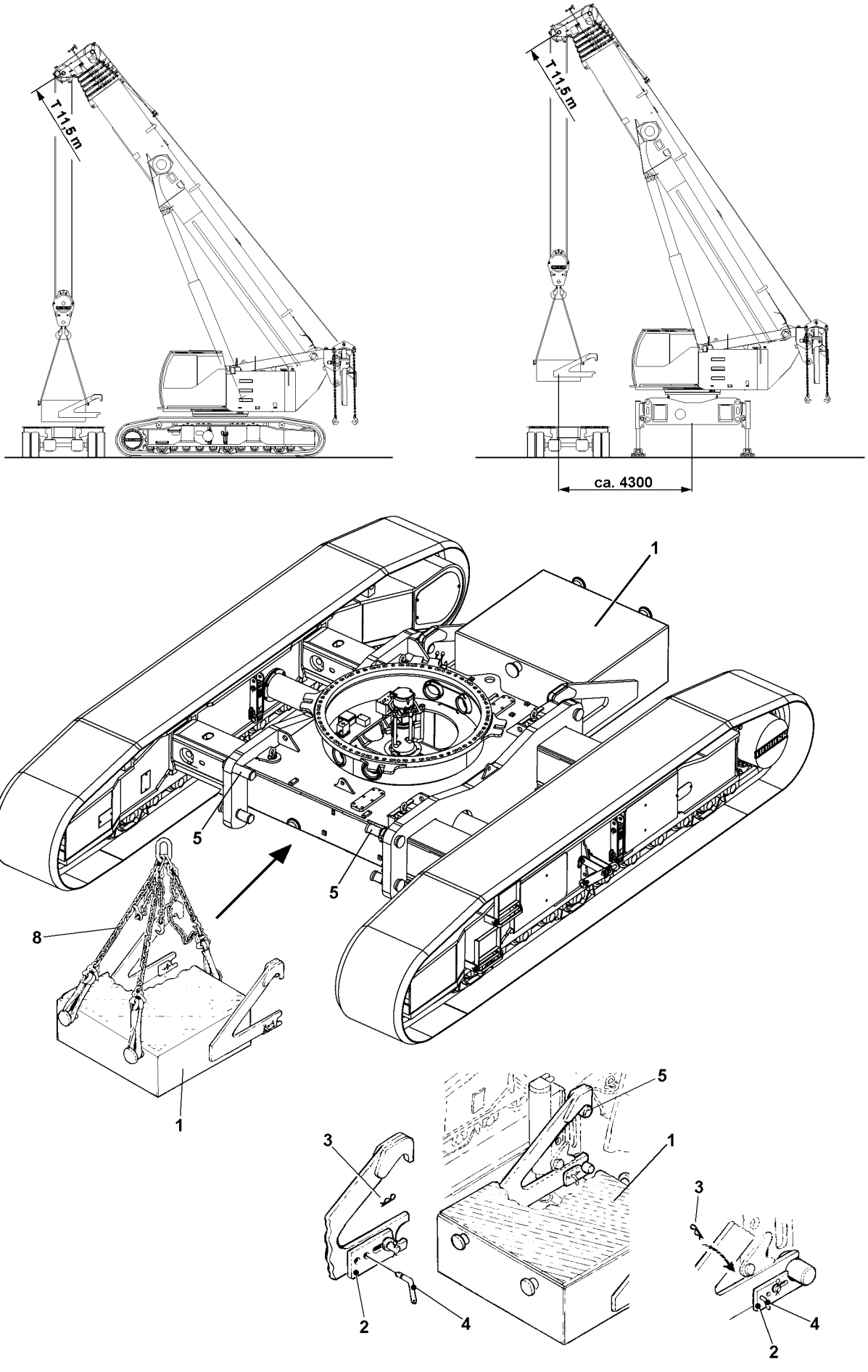
▶ Use the central ballast as specified in the load chart!

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

The following central ballast combinations are possible:

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

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



B199149

1.2 Fitting the central ballast

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

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

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

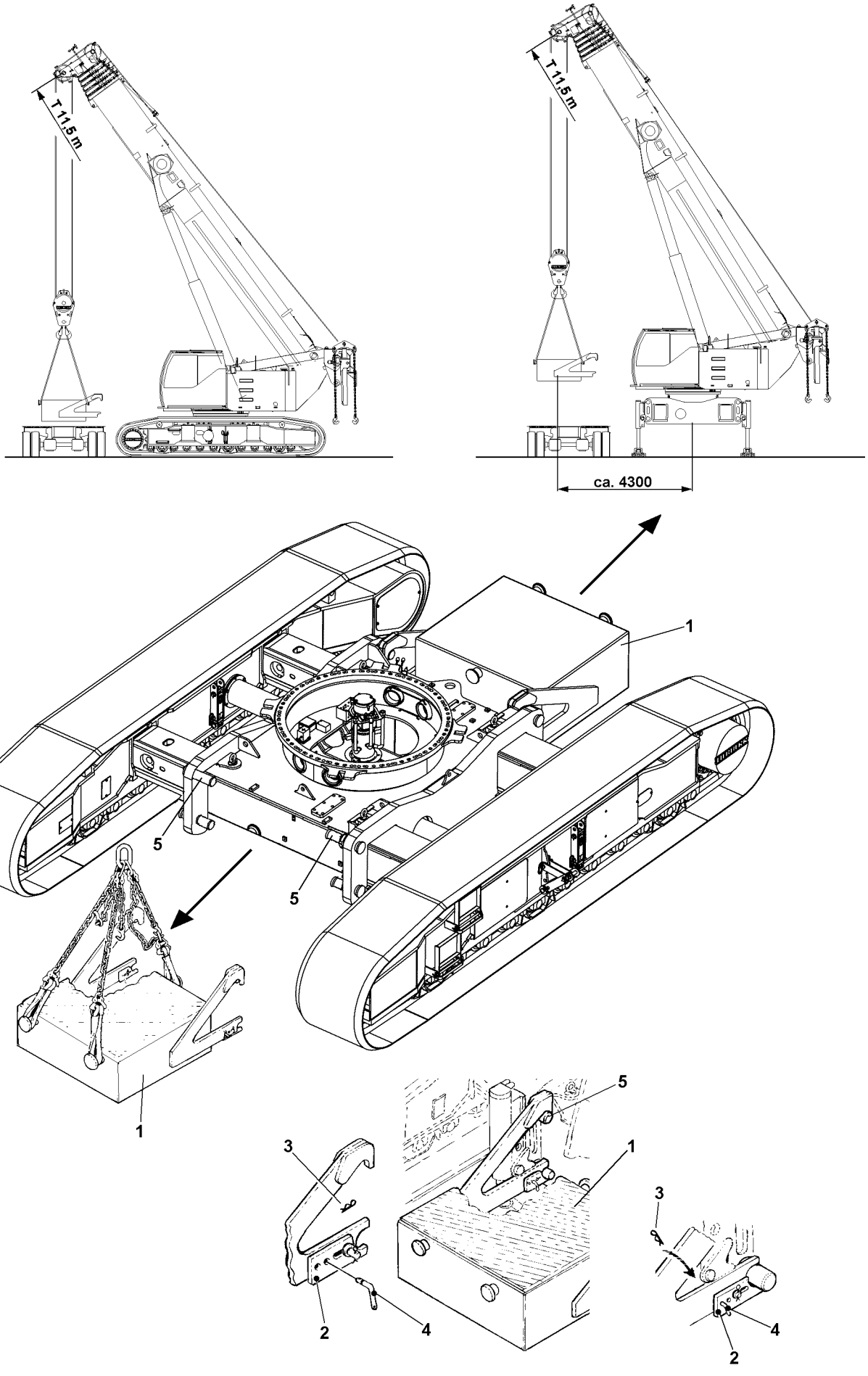
Note
- ▶ Ensure that the ballast block **1** is hanging horizontally.
- ▶ Ensure that the safety mechanism **2** has been reset.

- ▶ Lift the ballast block **1**.

CAUTION
Damage to the engine radiator!
The ballast blocks **1** could collide with the engine radiator during positioning!
- ▶ At installation of the ballast blocks **1**, watch out for the engine cooler!

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

The second ballast block **1** is fitted in an identical manner to the first ballast block **1**.
- ▶ Fit the second ballast block **1** the same way as the first ballast block **1**.



B199150

1.3 Removing the central ballast

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

Note

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

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

CAUTION

Damage to the engine radiator!

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

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

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

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

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


WARNING
LASHING POINT!
NOT FOR LIFTING.
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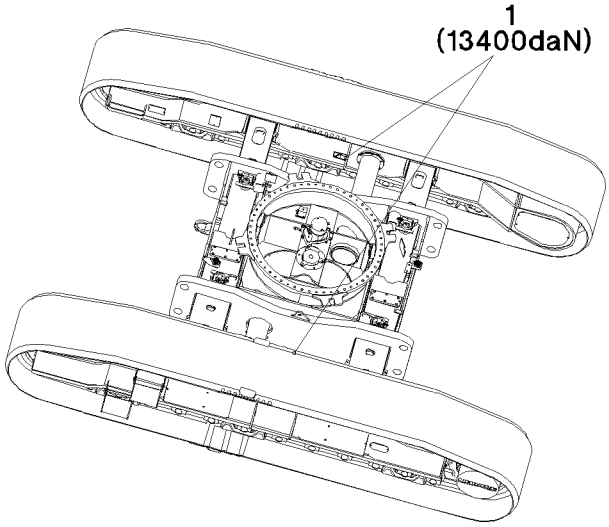
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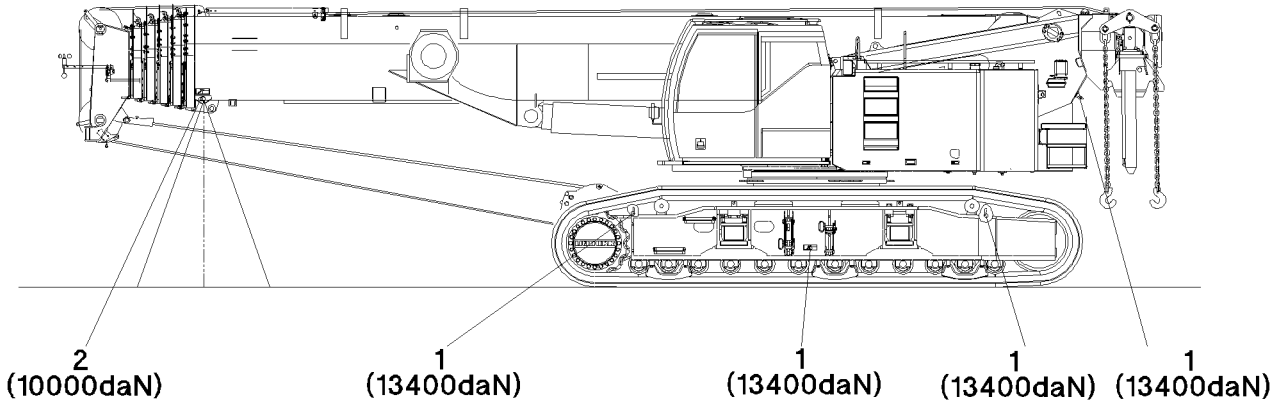
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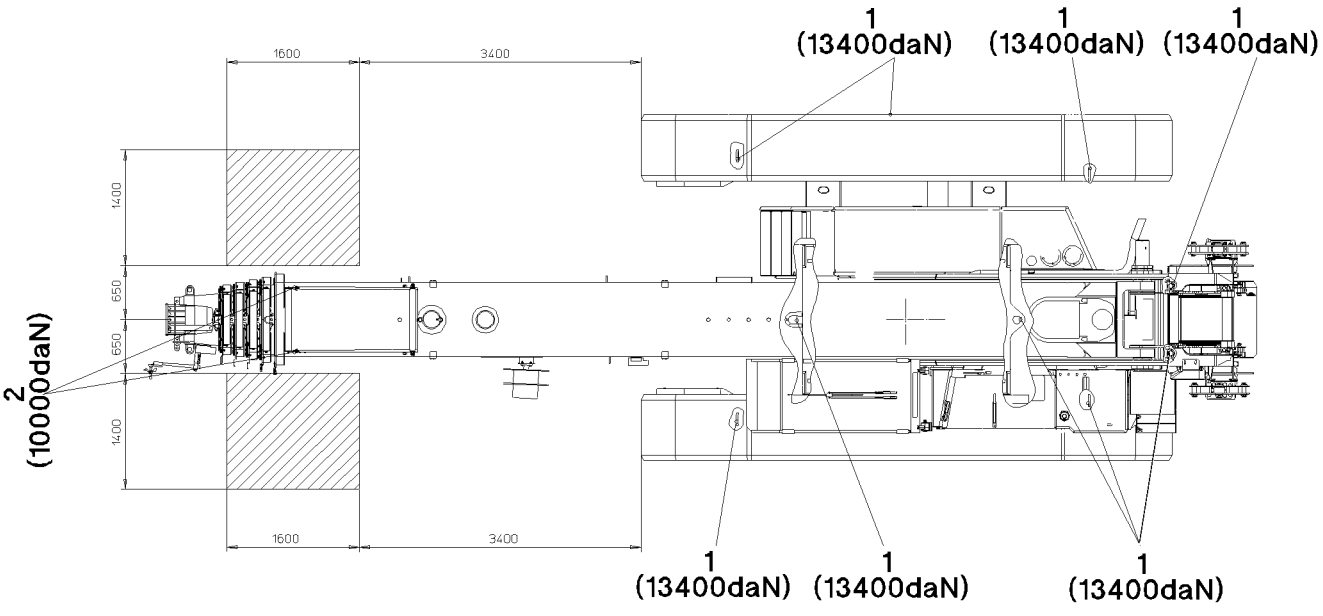
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B114889

1 Transporting the crane

1.1 Checking the rigging points

Before every operation and at regular intervals, check the rigging points for cracks of the welding seam, significant corrosion, wear and distortion.
The inspection criteria are:

- Completeness of 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.

WARNING
Danger of accident!
When using rigging points which are not operationally safe, severe personnel damage and property damage can occur!

- ▶ Have rigging points which are not operationally safe replaced with new rigging points by authorized and trained expert personnel!
- ▶ When hooking and unhooking the rigging (such as rigging chain), handle carefully to avoid crushing, sheering, catch and impact points!
- ▶ Eliminate damage of rigging due to sharp edged stress!


WARNING
LASHING POINT!
NOT FOR LIFTING.
9786 874 08
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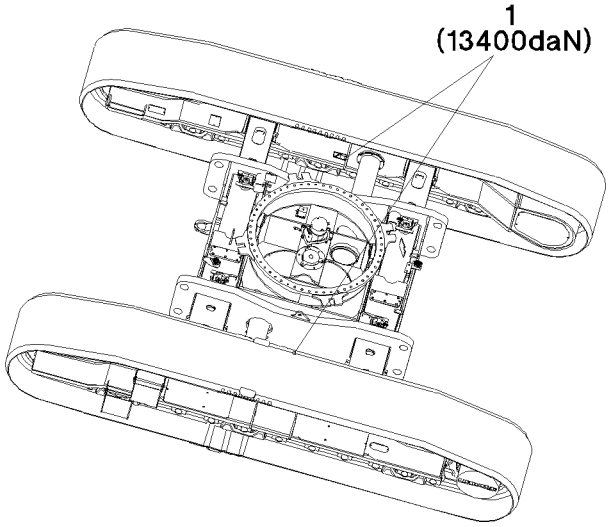
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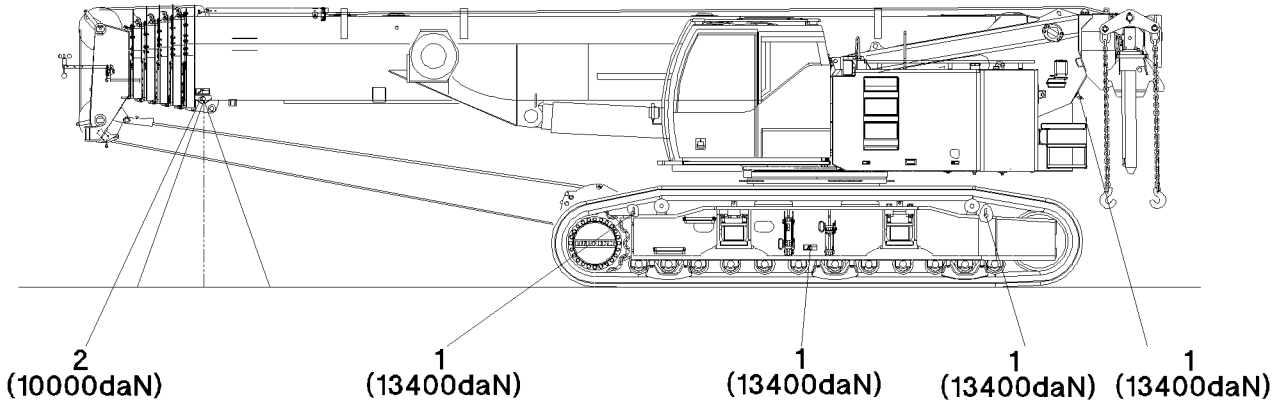
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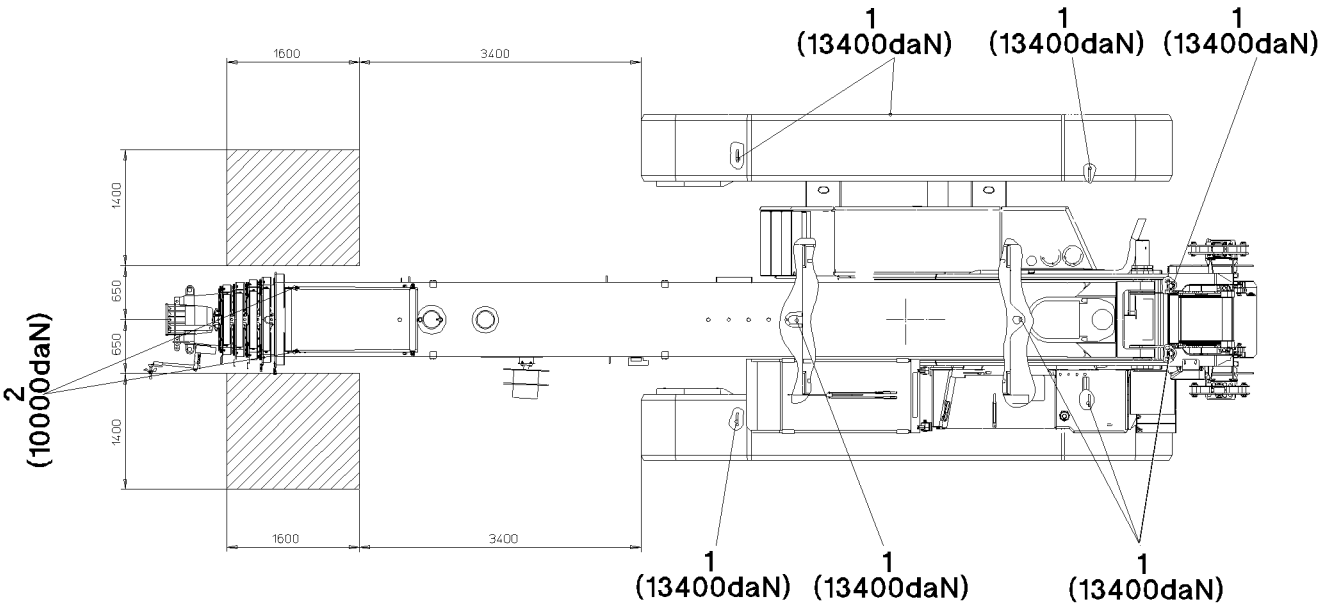
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B114889

1.2 Transporting the crane safely

Observe the following notes for safe crane transport:
- Use a suitable transport vehicle for the transport.
- Before transport, clean the tracks to obtain the best possible friction to the transport surface.
- When driving on the transport vehicle, check the easy movement of the crane with the aid of a guide to avoid hitting too hard.
- Make sure that the transport location is level and horizontal.
- Rig and secure the crane on the provided rigging eyehooks **1** and rigging points **2**.
- Close the crane cab and all cover doors.

NOTICE
Damage to crane!
The rigging eyehooks **1** and the rigging points **2** may only be used to rig the crane. The rigging eyehooks **1** and the rigging points **2** may not be used to lift the crane and to lift loads.
▶ Use the rigging eyehooks **1** and rigging points **2** only to rig the crane.

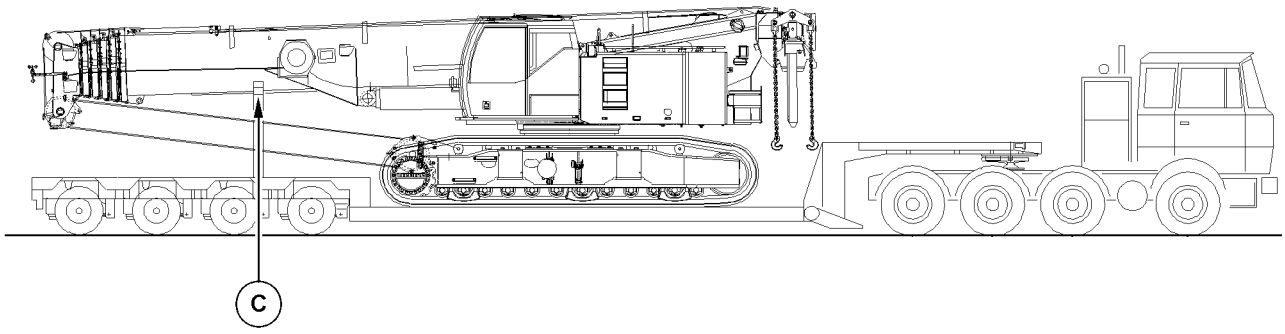
- Secure the crane on the rigging eyehooks **1** (13400 daN maximum nominal load) according to the illustration, permissible load and valid regulations for loading and load retention.
  Use suitable rigging with sufficient capacity.
- Secure the telescopic boom on the marked rigging points **2** (10000 daN maximum nominal load) by taking the specified rigging area according to the illustration, permissible load and valid regulations for loading and load retention into account.

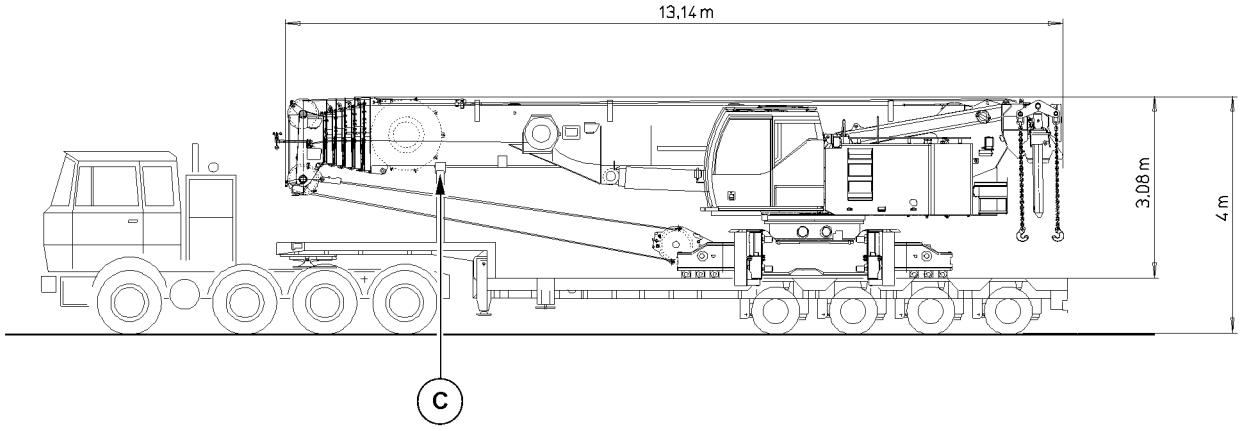
Permissible tension surface on the ground for the rigging points **2**.
- Use suitable rigging with sufficient capacity.

1.3 Securing the crane

DANGER
The crane can topple over!
If the crane is not properly secured on the transport location, then the crane can topple over uncontrolled!
Personnel can be killed or injured!
▶ Secure the crane to prevent it from toppling!
▶ Use tension belts or tension chains according to the illustration, permissible load and the valid regulations for loading and load retention.
▶ Attach tension belts or tension chains on the rigging eyehooks **1** and rigging points **2** according to the illustration!
▶ Observe angles, radii and tension surfaces according to the illustration!

The rigging points **2** are marked with the sign **3**.
▶ Secure the crane with tension belts or tension chains on the rigging eyehooks **1**.
▶ Secure the telescopic boom with tension belts or tension chains by observing the marked tension area on the rigging points **2**.
▶ Attach the tension belts or tension chains on the transport vehicle.





B114890

2 Securing the crane properly on the transport vehicle

2.1 Rigging and securing the crane

Make sure that the following prerequisites are met:

– The counterweight has been removed.

WARNING

The counterweight can fall down!

If the counterweight remains installed on the turntable while transporting the crane, the counterweight receptacles can fail and the counterweight can fall down!

Personnel can be killed!

Significant property damage can result!

▶ Transporting the crane with an installed counterweight is prohibited!

▶ Only transport crane with disassembled counterweight!

– The crane has been set down on the transport vehicle.

– When the crawlers are removed:
  The beams are supported on both ends with wooden planks.

– The crane superstructure is locked with the crane chassis.

– The telescopic boom is luffed down and has been set down on the support.

Note

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

– The hook block is attached on the crawler center section and the hoist rope is slightly tensioned.

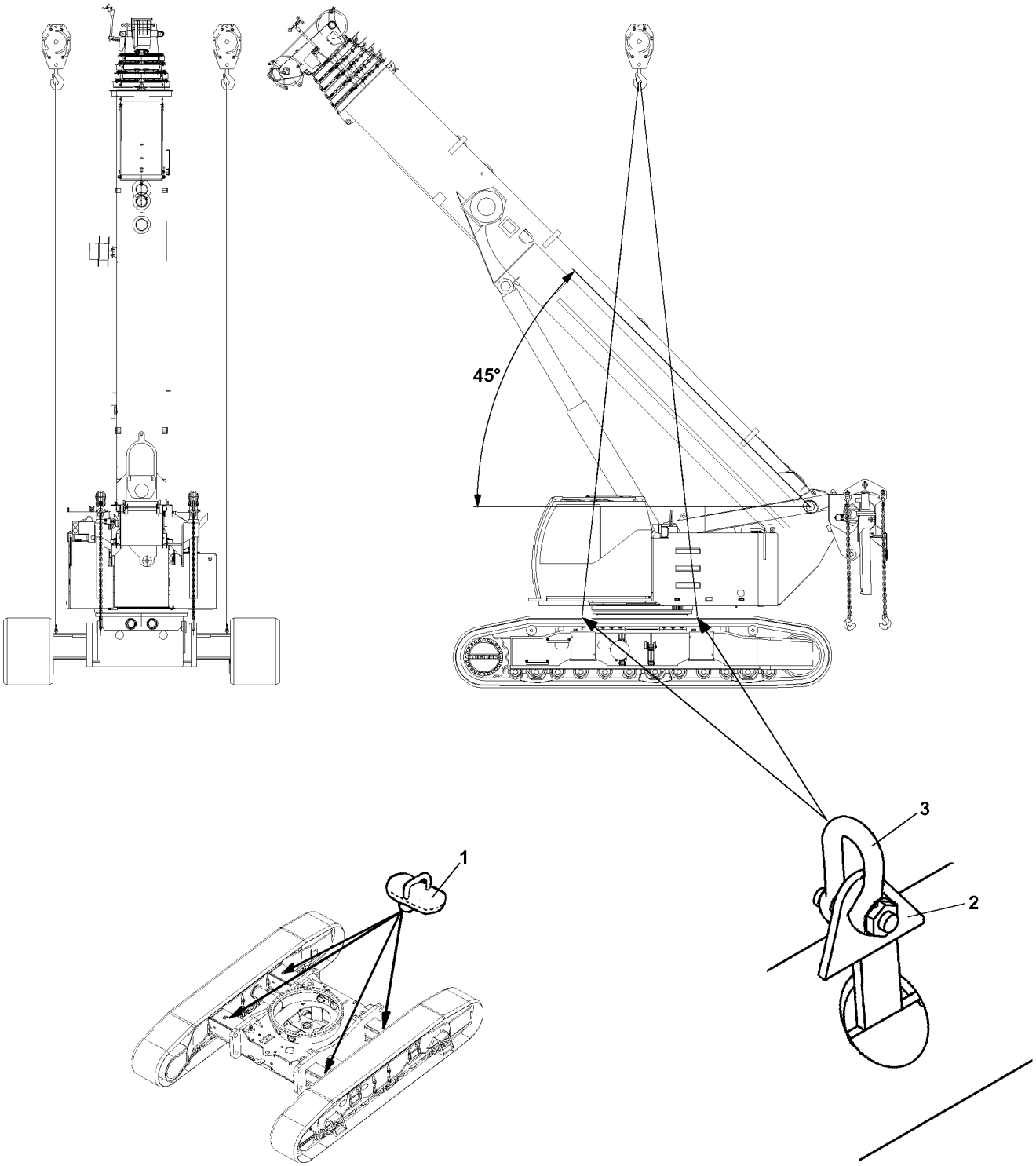
– The ballast assembly chains have been secured to prevent them from swinging back and forth.

WARNING

Falling crane if insufficiently secured!

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

▶ Properly rig and secure the crane on the transport vehicle.



B199223

3 Loading the crane with auxiliary cranes

3.1 Weight of components

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

3.2 Attaching the crane

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

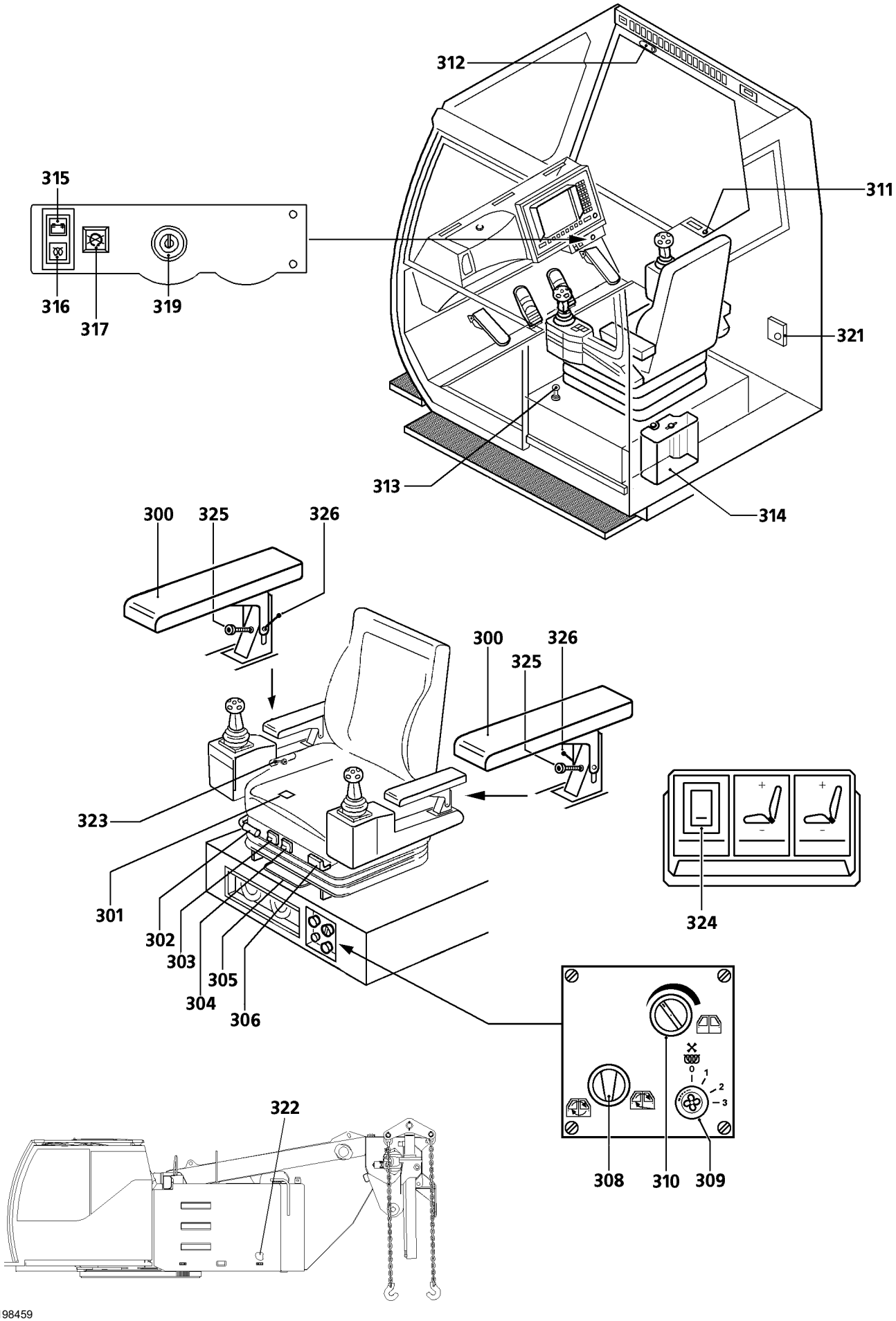
DANGER
The crane can tip over!
If the prerequisites are not observed, or the telescopic boom is not luffed up to 45° before loading, the center of gravity of the crane changes, which can cause the crane to tip over.
▶ Observe the prerequisites and luff the telescopic boom up to 45° before loading!

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

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

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

4.00 Operation of crane superstructure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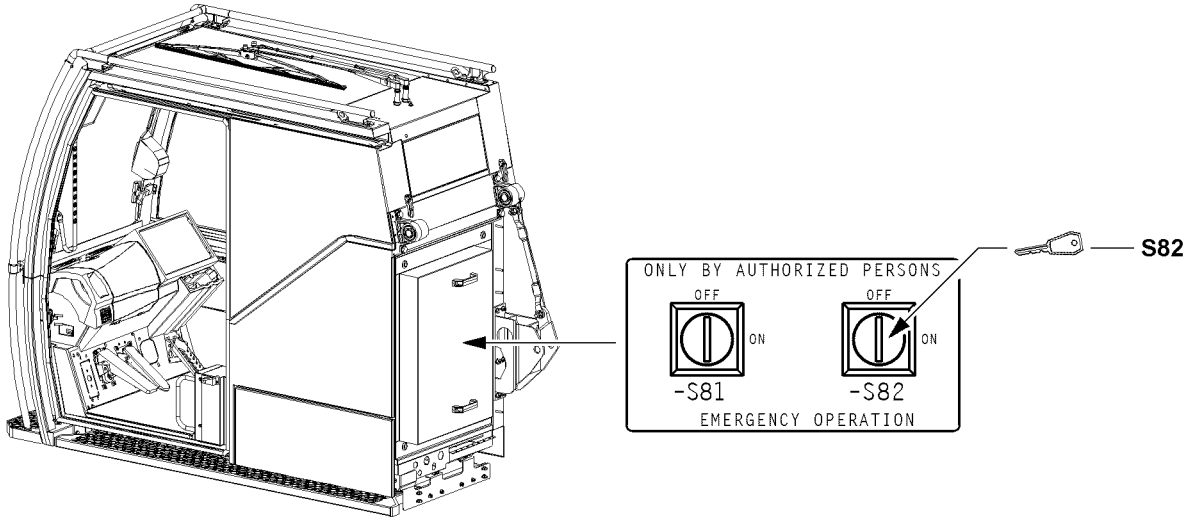
1 Operating and control instruments

1.1 General operating elements

300	Armrest	
301	Seat contact switch	
302	Hand lever	• Adjustment of seat cushion incline
303	Button	• Lumbar support in lower part of backrest
304	Button	• Lumbar support in upper part of backrest
305	Hand lever	• Lock for horizontal seat adjustment
306	Hand lever	• Backrest incline adjustment
307	Regulator knob*	• Climate control system
308	Rotary switch	• Switching between fresh air / recirculated air
309	Rotary switch	• Blower 3-stage
310	Regulator knob	• Temperature Cab heater
311	Socket 24 V	
312	Cab lighting	
313	Latch	• Step retainer Pull handle and hold: Step unlocked. Release and engage the handle: Step locked.
314	Reservoir	• Windshield washer fluid
315	Charge indicator light	• Engine
316	Indicator light	• Engine preheating, flame start system
317	Button	• Stand-by mode **Note:** Pressing the button **317** will turn off the engine, but the LICCON remains turned on.
319	Ignition switch	• Engine
321	Thermostat*	• Auxiliary heater
322	Battery master switch	
323	Lock screw	• Adjusting the control platform in lengthwise direction
324	Switch*	• Seat heater
325	Set screw	• Adjustment of armrest incline
326	Locking lever	• Armrest height adjustment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ONLY BY AUTHORIZED PERSONS
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EMERGENCY OPERATION

B112906

1.2 Operating elements switch cabinet

S82 Key switch • LMB emergency operation


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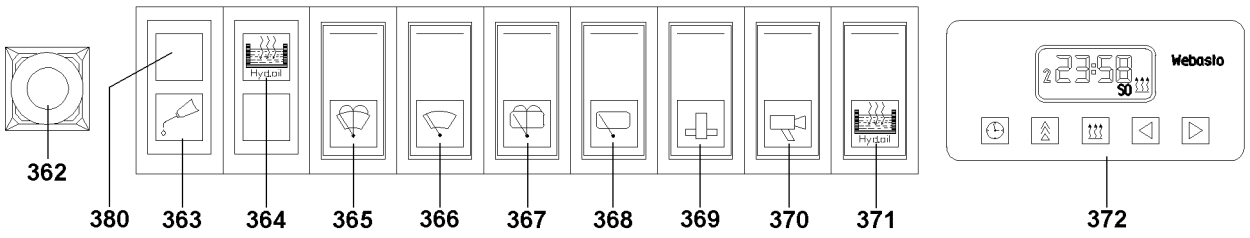
1.3 Control elements Roof console

341	Operating hour meter - Superstructure	
342	Indicator light*	• Air conditioning system is turned on
343	Indicator light	• Tele pinning **Note:** The indicator light **343** tele pinning is only needed when the telescopic boom must be manually pinned.
345	Switch	• Instrument panel illumination
346	Switch	• Extend / retract the step Actuated on top: The step is extended. Actuated on the bottom: The step is retracted.
347	Switch*	• Aircraft warning light, on the boom head or the single and double folding jib
348	Button*	• Height adjustment working floodlight, boom pivot section
349	Switch*	• Working floodlight on the boom pivot section
350	Switch*	• Working floodlight on the boom pivot section or the boom head
351	Switch*	• Working floodlight, cab roof rear and front
352	Switch	• Working floodlight for hoist winch and mirror heater
353	Switch	• Working floodlight on cab front
354	Switch*	• Climate control system
355	Indicator light*	• Auxiliary heater turned on
356	Switch*	• Auxiliary heater
357	Sign	• Function of 2 positions of switch **358** in emergency operation

358	Button	• For emergency operation, with 2 switch positions
		• Position 2 (actuated on top):
		  • Hoist up
		  • Turn left
		  • Telescope the telescope in
		  • Luff the boom up
		• Position 0 (center position):
		  • Off
		• Position 1 (actuated on the bottom):
		  • Hoist down
		  • Turn right
		  • Telescope the telescope out
		  • Luff the boom down

359	Switch	• Manual pressure boost for emergency operation
360	Switch	• Telescoping • Position 2 (actuated on top): Unpin the telescope in manual operation • Position 0 (center position): Pin the telescope or lock the telescoping cylinder for manual operation or automatic pinning “OK” • Position 1 (actuated on the bottom): Unpin the telescoping cylinder in manual operation
361	Sign	• Function of 3 positions of switch **360**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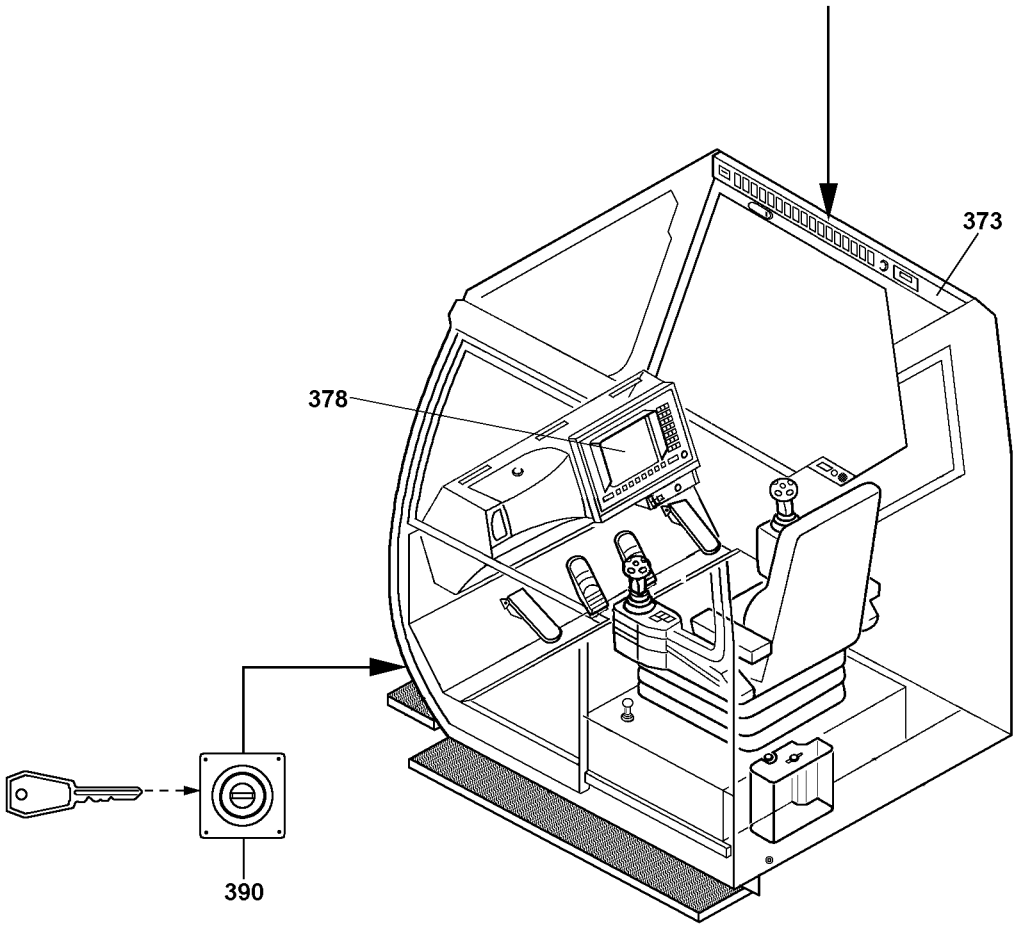
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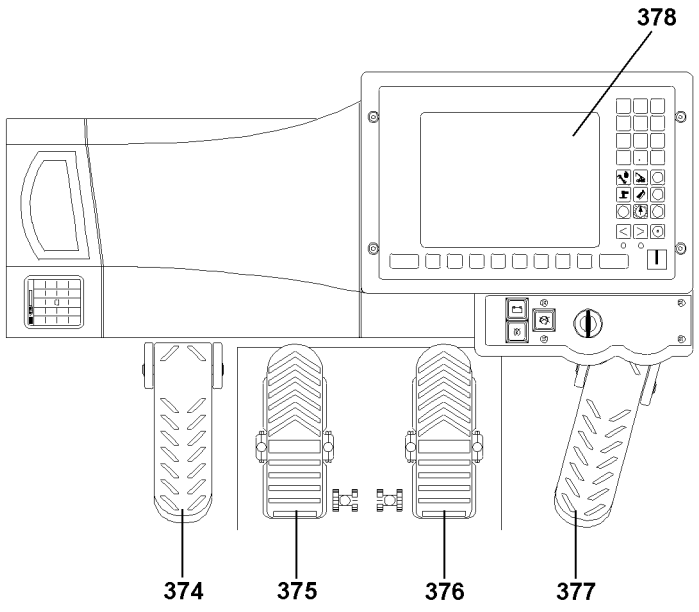
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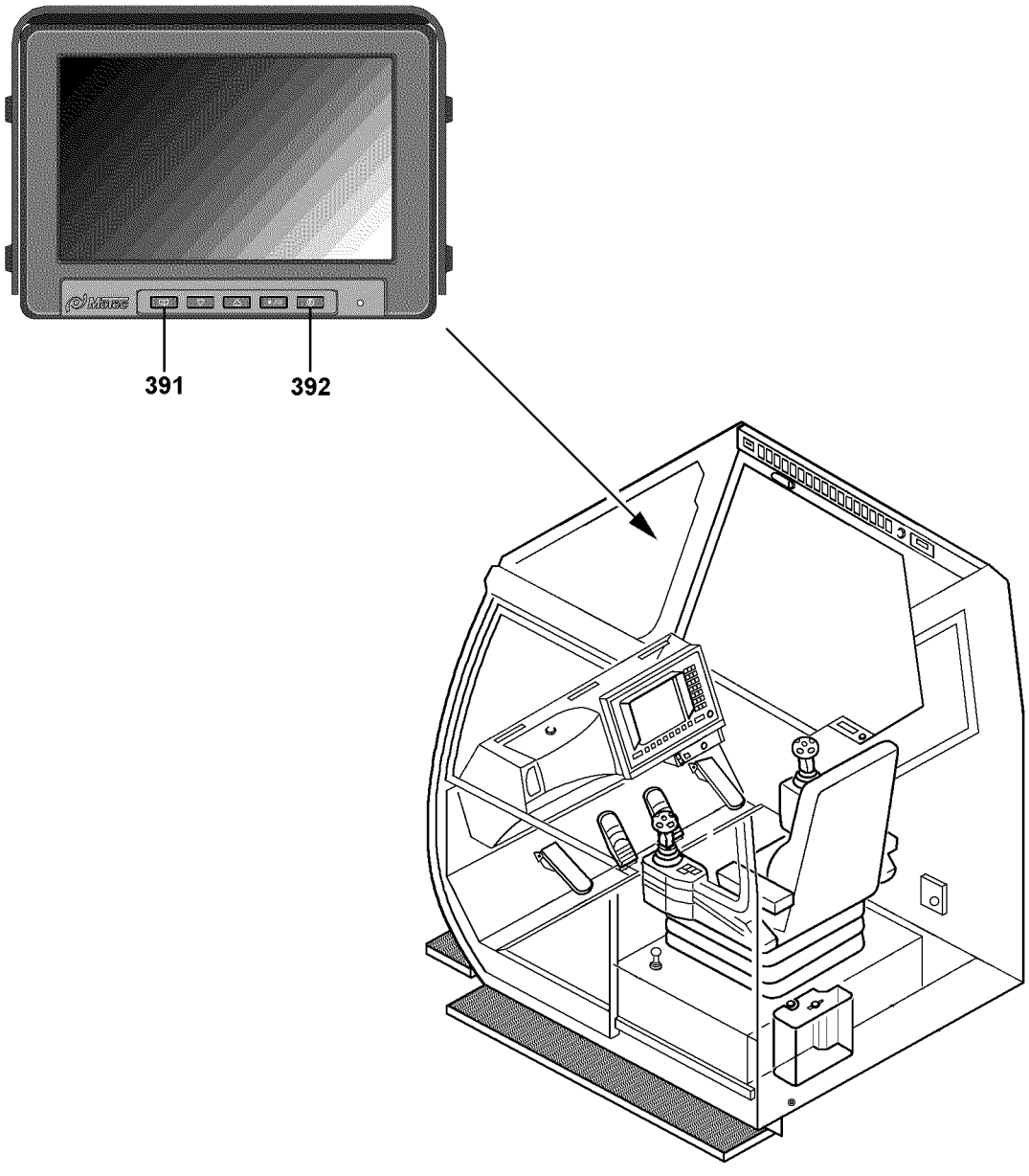
362	EMERGENCY OFF switch	
363	Indicator light	• Central lubrication system
364	Indicator light	• Hydraulic oil preheating is turned on
365	Button	• Windshield washer system front window
366	Switch	• Windshield wiper - front window, 2 stages: 1 intermittent, 2 wipe.
367	Button	• Windshield washer system - roof window
368	Switch	• Windshield wiper - roof window, 2 stages: 1 intermittent, 2 wipe.
369	Button	• Lock / unlock crane superstructure lock
370	Switch	• Turn on camera illumination
371	Switch	• Turn on hydraulic oil preheating
372	Timer for auxiliary heater*	With the following displays: • Time and day of the week • Fault in auxiliary heater • Air temperature • Preselection of heater operation
373	Buzzer	• Ballasting cylinder fully retracted/extended
374	Pedal	• Slewing gear brake
375	Master switch foot pedal left MS4	• Crawler track left
376	Master switch foot pedal right MS5	• Crawler track right
377	Pedal	• Engine regulation
378	LICCON monitor	
379	Operating hour meter - Chassis	• **Note:** The operating hour meter - chassis **379** is located in the control cabinet.
380	Warning light	• Problem in central lubrication system
390	EMERGENCY OFF switch*	



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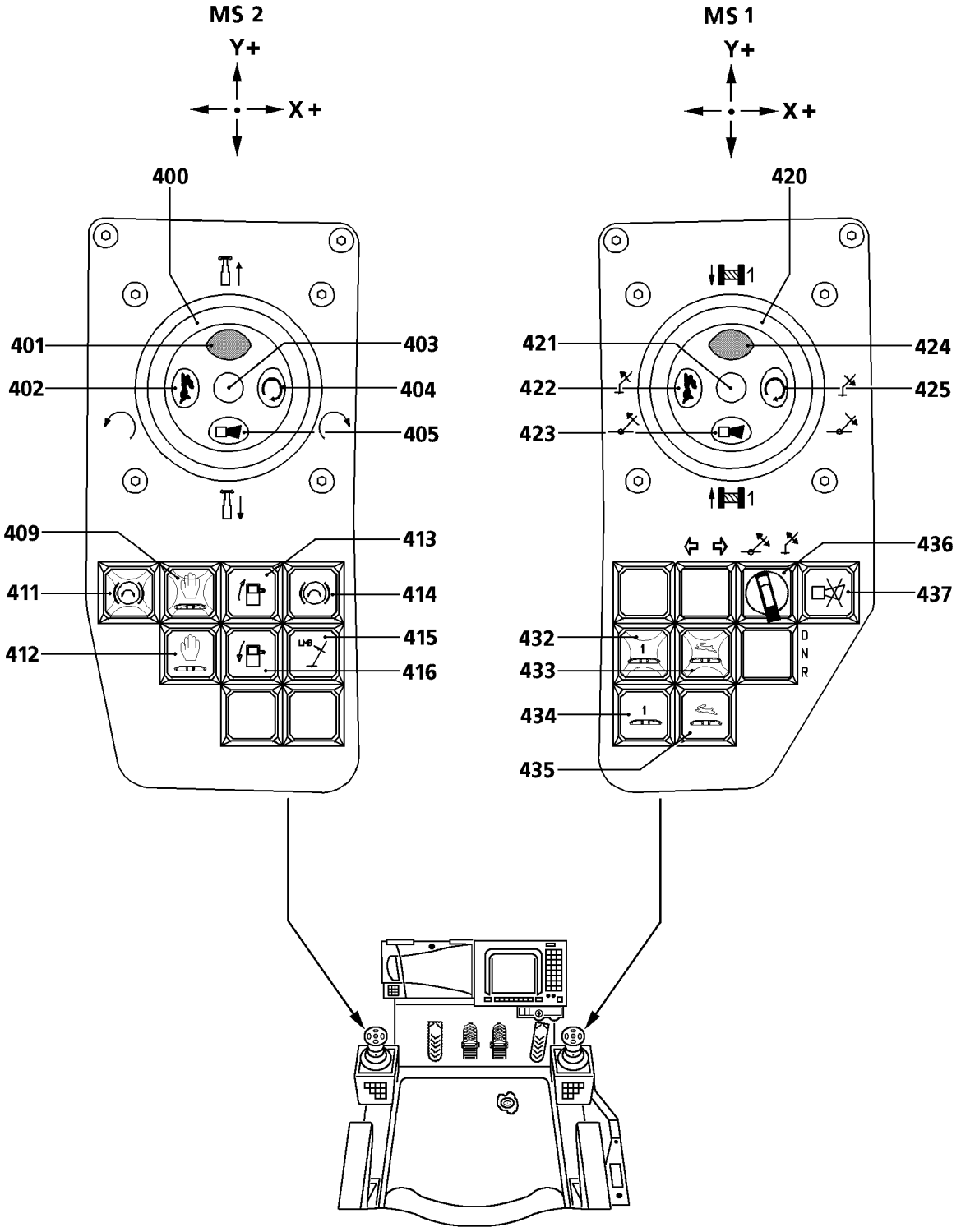
1.4 Operating elements on camera - monitor

Note

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

391 Button • Menu
392 Button • On / Off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409
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412
413
414
415
416
MS 1
Y+
X+
420
421
422
423
424
425
436
437
432
433
434
435
D
N
R

B198461

1.5 Operating elements on control console (machines with one winch)

Control console, left:

400 Master switch left (MS 2).

Telescoping gear

- Move the master switch **400** in direction Y+ (forward): Telescope out.
- Move the master switch **400** in direction Y- (backward): Telescope in.

Slewing gear:

- Move the master switch **400** in direction X+ (to the right): The slewing gear turns to the right.
- Move the master switch **400** in direction X- (to the left): The slewing gear turns to the left.

401 Button

- Bypass of the seat contact switch **Or** if the seat contact switch is actuated: Addition of the vibration sensor **403**.

402 Button

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

403 Vibration sensor

- Winch turn counter, (Vibrator) Winch 1

404 Button

- Lock the engine regulation of superstructure engine

  Note:
  Pressing the button **404** will lock the engine regulation in its current position.

405 Button

- Horn

409 Indicator light

- Support **and** track adjustment of crawler is added

411 Indicator light

- Slewing gear parking brake is turned off

412 Indicator light

- Addition of support **and** track adjustment of crawler

413 Button

- Swing the crane cab up

414 Button

- Turn the “slewing gear brake” off / on

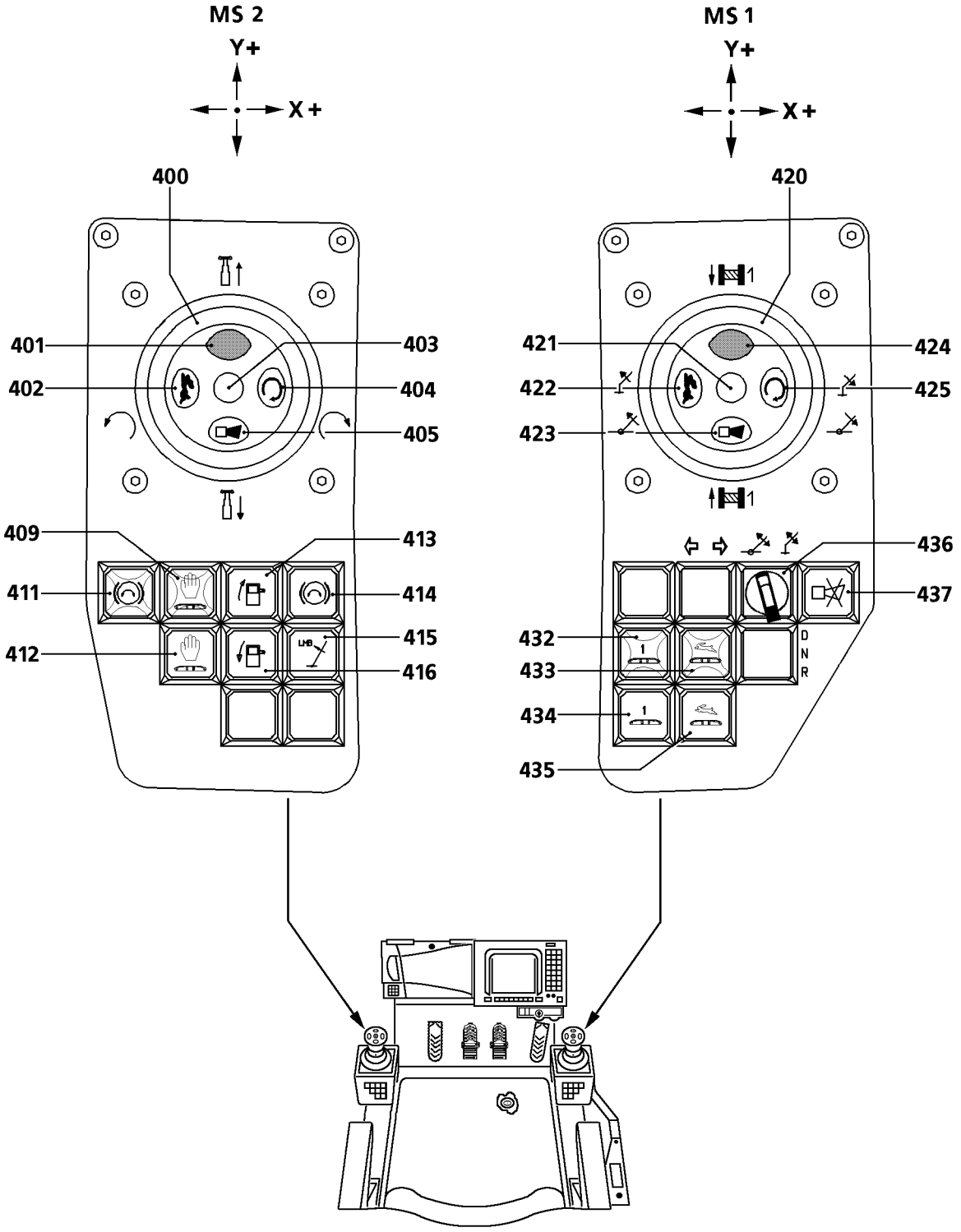
415 Button

- Exceedance of overload protection, used to luff in with suspended load.

  DANGER
  The exceedance may only be carried out if the overload was caused by luffing down at freely suspended load and the crane operator is absolutely certain that luffing up the load will take it out of the overload range.

416 Button

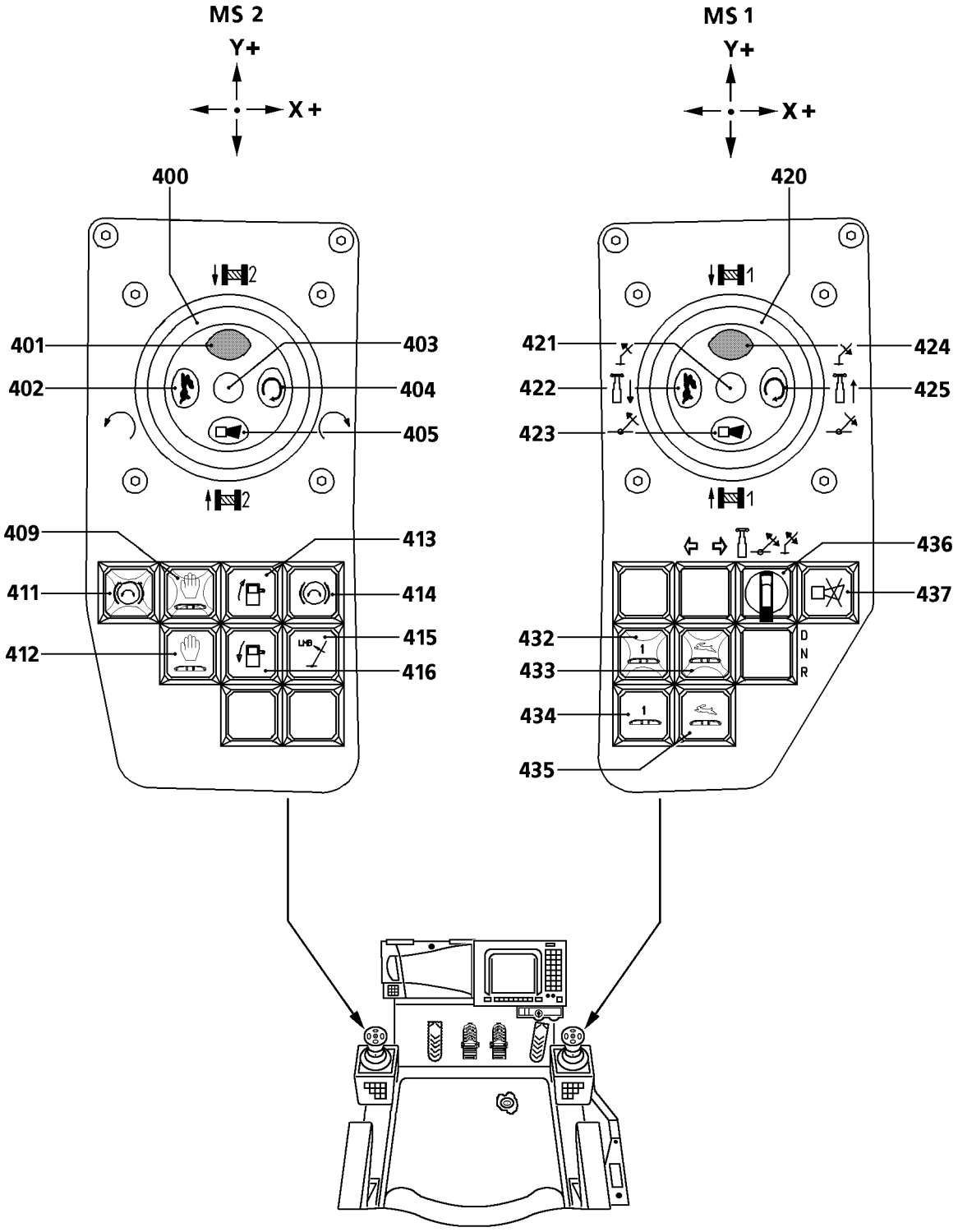
- Swing the crane cab down


MS 2
Y+
X+
400
401
402
403
404
405
409
411
412
413
414
415
416
MS 1
Y+
X+
420
421
422
423
424
425
436
437
432
433
434
435
D
N
R

B198461

Control console, right:

420 Master switch - right (MS 1).	**Winch 1:** • Move the master switch **420** in direction Y+ (forward): Winch 1 spools out and the load is lowered. • Move the master switch **420** in direction Y- (backward): The winch 1 spools up and the load is raised. **Luffing gear - telescopic boom:** Rotary switch **436** in left position: • Move the master switch **420** in direction X+ (to the right): The telescopic boom is luffed down. • Move the master switch **420** in direction X- (to the left): The telescopic boom is luffed up. **Luffing folding jib*:** Rotary switch **436** in right position: • Move the master switch **420** in direction X+ (to the right): The folding jib is luffed down. • Move the master switch **420** in direction X- (to the left): The folding jib is luffed up.
421 Vibration sensor	• Winch turn sensor, (vibrator) winch 1
422 Button	• Adding rapid gear crane operation (winch 1 and luffing up) • Adding rapid gear crawler operation
423 Button	• Horn
424 Button	• Bypass of the seat contact switch **Or** if the seat contact switch is actuated: Addition of the vibration sensor **421**.
425 Button	• Lock the engine regulation of superstructure engine **Note:** Pressing the button **425** will lock the engine regulation in its current position.
432 Indicator light	• The indicator light **lights up**: Crawler operation is added The indicator light **does not light up**: Crawler operation is **not** added
433 Indicator light	• The indicator light **lights up**: Rapid gear crawler operation is added The indicator light **does not light up**: Creeper gear is added
434 Button	• Addition of crawler operation **Note:** Crane operation is turned on automatically.
435 Button	• Change over creeper gear / rapid gear
436 Rotary switch	• Operating mode preselection for master switch **420** • Left position: Luffing the telescopic boom • Right position: Luffing the folding jib
437 Button	• Turn the acoustic warning (bell on turntable) off


MS 2
Y+
X+
400
401
402
403
404
405
409
411
412
413
414
415
416
MS 1
Y+
X+
420
421
422
423
424
425
432
433
434
435
436
437
D
N
R

B198462

1.6 Operating elements on the control console (cranes with two winches)*

Control console, left:

400 Master switch left (MS 2).

Winch 2

- Move the master switch **400** in direction Y+ (forward): The winch 2 spools out and the load is lowered.
- Move the master switch **400** in direction Y- (backward): The winch 2 spools up and the load is raised.

Slewing gear:

- Move the master switch **400** in direction X+ (to the right): The slewing gear turns to the right.
- Move the master switch **400** in direction X- (to the left): The slewing gear turns to the left.

401 Button

- Bypass of the seat contact switch **Or** if the seat contact switch is actuated: Addition of the vibration sensor **403**.

402 Button

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

403 Vibration sensor

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

404 Button

- Lock the engine regulation of superstructure engine

  Note:

  Pressing the button **404** will lock the engine regulation in its current position.

405 Button

- Horn

409 Indicator light

- Support **and** track adjustment of crawler is added

411 Indicator light

- Slewing gear parking brake is turned off

412 Indicator light

- Addition of support **and** track adjustment of crawler

413 Button

- Swing the crane cab up

414 Button

- Turn the “slewing gear brake” off / on

415 Button

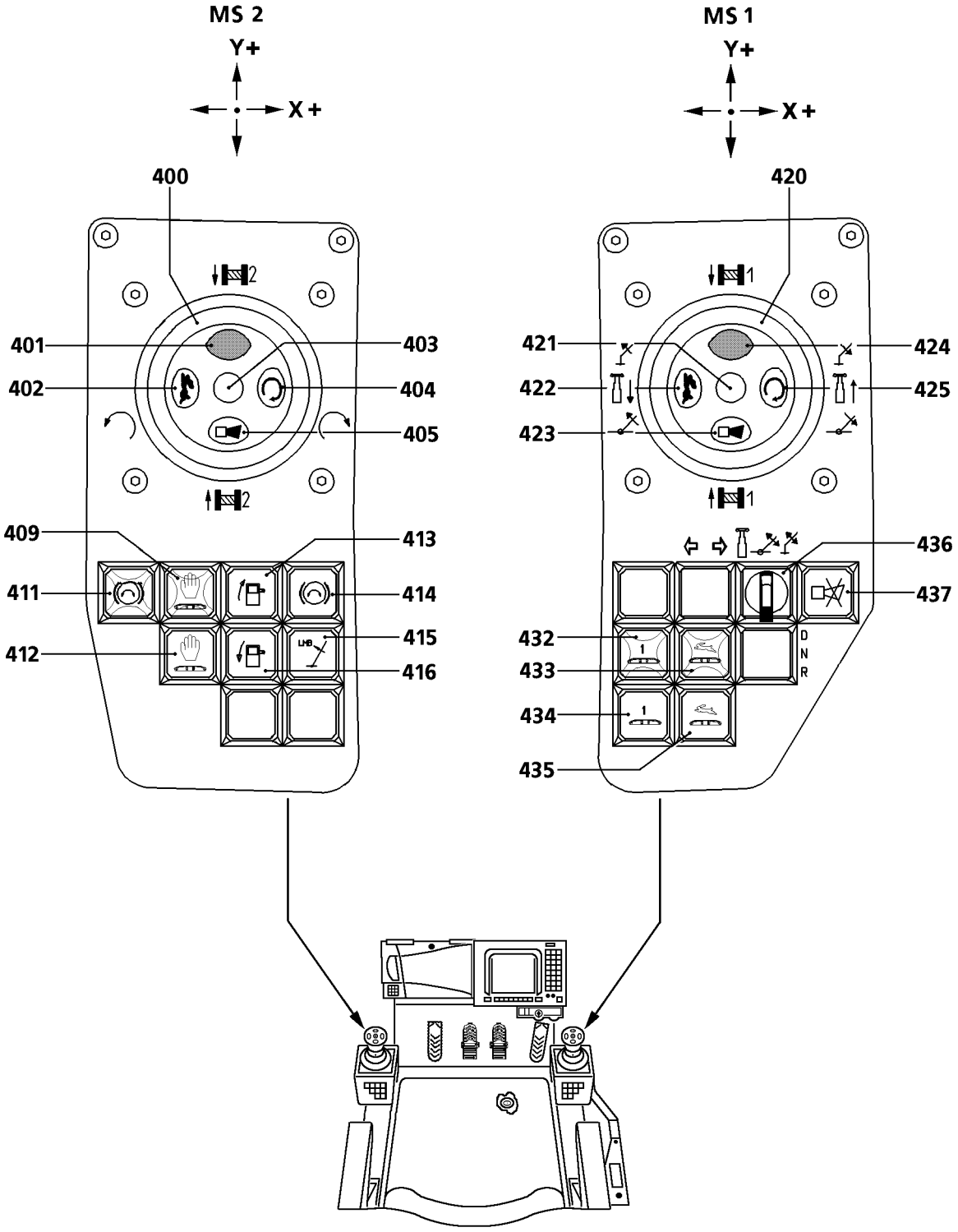
- Exceedance of overload protection, used to luff in with suspended load.

  DANGER

  The exceedance may only be carried out if the overload was caused by luffing down at freely suspended load and the crane operator is absolutely certain that luffing up the load will take it out of the overload range.

416 Button

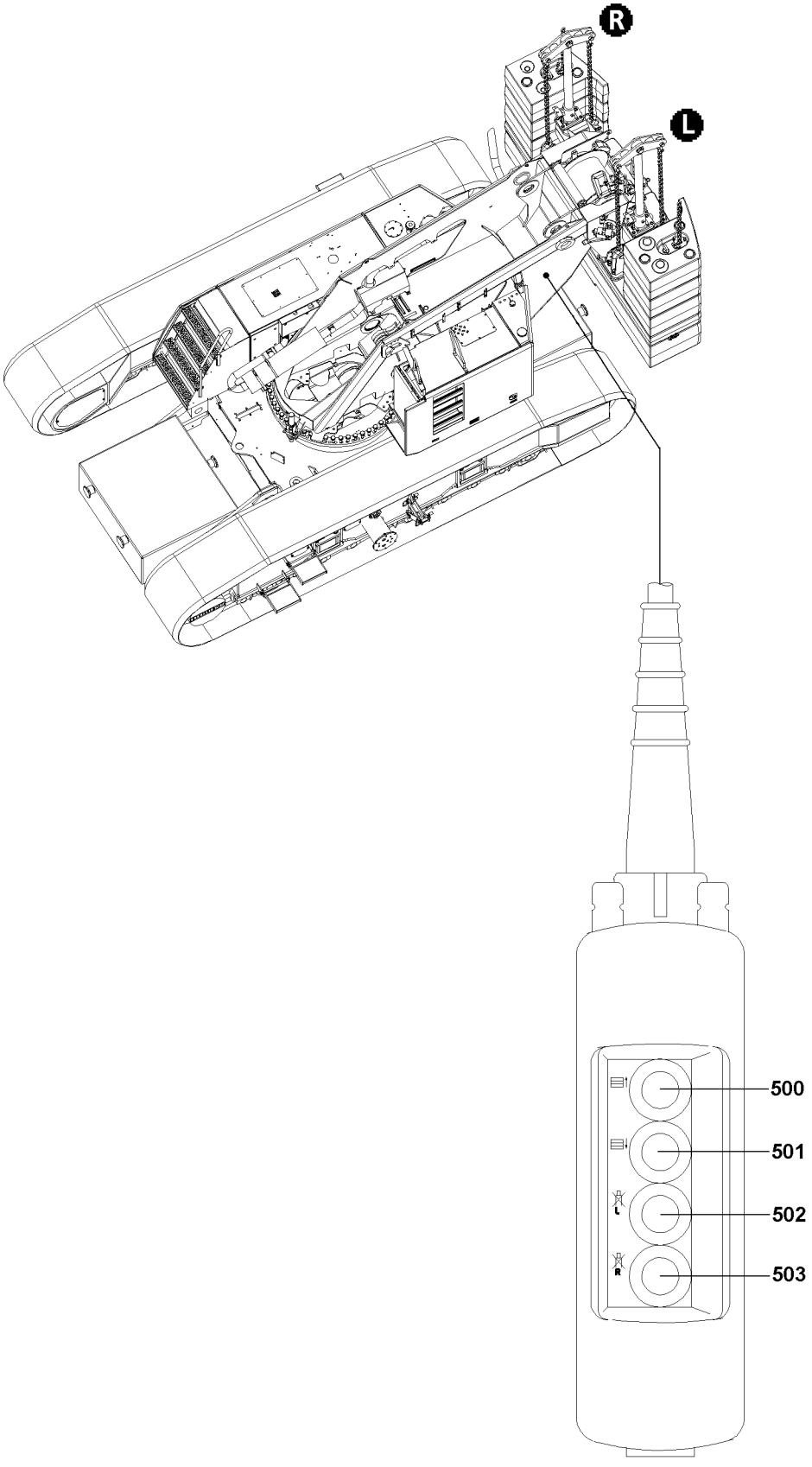
- Swing the crane cab down


MS 2
Y+
X+
400
401
402
403
404
405
409
411
412
413
414
415
416
MS 1
Y+
X+
420
421
422
423
424
425
432
433
434
435
436
437
D
N
R

B198462

Control console, right:

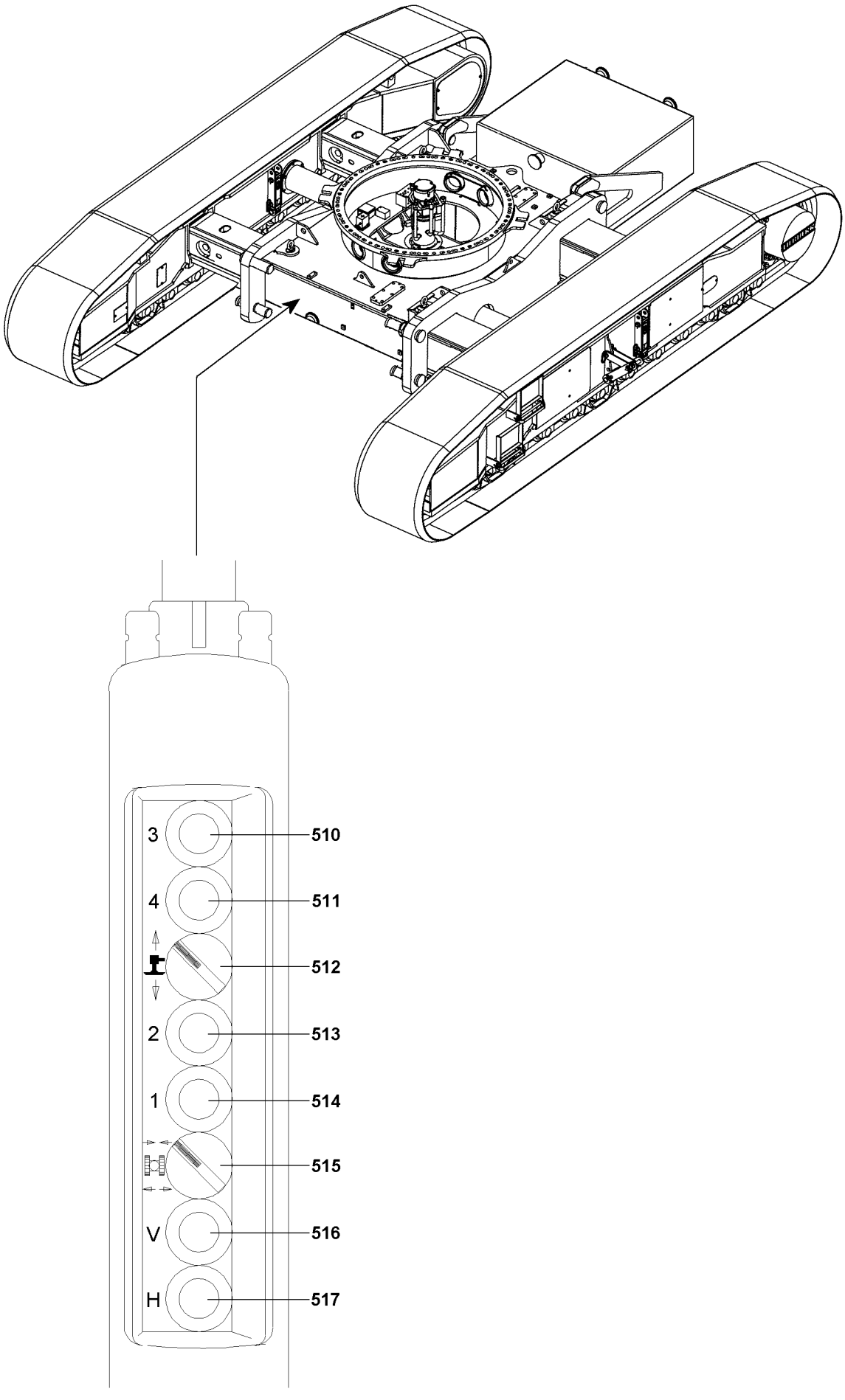
420 Master switch - right (MS 1).	**Winch 1:** • Move the master switch **420** in direction Y+ (forward): Winch 1 spools out and the load is lowered. • Move the master switch **420** in direction Y- (backward): The winch 1 spools up and the load is raised. **Telescoping gear:** Rotary switch **436** in left position: • Move the master switch **420** in direction X+ (to the right): Telescope out. • Move the master switch **420** in direction X- (to the left): Telescope in. **Luffing the telescopic boom:** Rotary switch **436** in center position: • Move the master switch **420** in direction X+ (to the right): The telescopic boom is luffed down. • Move the master switch **420** in direction X- (to the left): The telescopic boom is luffed up. **Luffing folding jib*:** Rotary switch **436** in right position: • Move the master switch **420** in direction X+ (to the right): The folding jib is luffed down. • Move the master switch **420** in direction X- (to the left): The folding jib is luffed up.
421 Vibration sensor	• Winch turn sensor, (vibrator) winch 1
422 Button	• Adding rapid gear crane operation (winch(es) and luffing up) • Adding rapid gear crawler operation
423 Button	• Horn
424 Button	• Bypass of the seat contact switch **Or** if the seat contact switch is actuated: Addition of the vibration sensor **421**.
425 Button	• Lock the engine regulation of superstructure engine **Note:** Pressing the button **425** will lock the engine regulation in its current position.
432 Indicator light	• The indicator light **lights up**: Crawler operation is added The indicator light **does not light up**: Crawler operation is **not** added
433 Indicator light	• The indicator light **lights up**: Rapid gear crawler operation is added The indicator light **does not light up**: Creeper gear is added
434 Button	• Addition of crawler operation **Note:** Crane operation is turned on automatically.
435 Button	• Change over creeper gear / rapid gear
436 Rotary switch	• Operating mode preselection for master switch **420** • Left position: Telescoping gear • Center position: Luffing the telescopic boom • Right position: Luffing the folding jib.
437 Button	• Turn the acoustic warning (bell on turntable) off



B198611

1.7 Control panel - Ballasting

500 Button	• Retract the ballasting cylinder, lift the counterweight
501 Button	• Extend the ballasting cylinder, lower the counterweight
502 Button	• Block the ballasting cylinder on the left
503 Button	• Block the ballasting cylinder on the right



B102820

1.8 Control panel - Crane chassis

510	Button	• Retract or extend left front support cylinder
511	Button	• Retract or extend left rear support cylinder
512	Rotary switch	• Retract or extend preselected support cylinder
513	Button	• Retract or extend right front support cylinder
514	Button	• Retract or extend right rear support cylinder
515	Rotary switch	• Increase / decrease preselected track width
516	Button	• Increase / decrease front track width
517	Button	• Increase / decrease rear track width

B197731

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. In addition, many of the illustrations show the maximum configuration of the LICCON monitor with icons. In normal crane operation, an identical display will **not** appear on the LICCON monitor.

The LICCON computer system is a computer system for controlling and monitoring mobile cranes. In addition to the overload protection (Load moment limitation = **LMB**) there are a number of application programs that can be used for controlling and monitoring the crane movements.
Currently the LICCON computer system includes the following application programs:
– “Set up” program
– “Crane operation” program
– “Telescoping” program
– “Working range limitation* ” program
– “Control parameter” program
– “Engine monitoring” program

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

1.1 Overload protection (load moment limiter)

The overload protection is carried out on the LICCON monitor. 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 luffing cylinder, which is measured by pressure sensors.
The **boom momentum** is calculated with data from the angle sensors (boom angle), the length sensors (boom length) and from crane data (boom weights) for the set operating mode.
The **boom radius** is calculated with data from the angle sensors (boom angle), the length sensors (boom length) and from geometry data for the set operating mode. This also takes into account the boom flexation due to its own weight and the weight of the load.
The actual load is calculated from the total load, the boom momentum and the boom radius.

1.1.2 Maximum load according to load chart and reeving

Crane data such as load charts, boom weights and geometry data are stored in the central data memory of the LICCON computer system.
The “maximum load according to the load chart and reeving” is constantly determined for the set crane configuration, for the set reeving and for the calculated radius, based on the load charts.

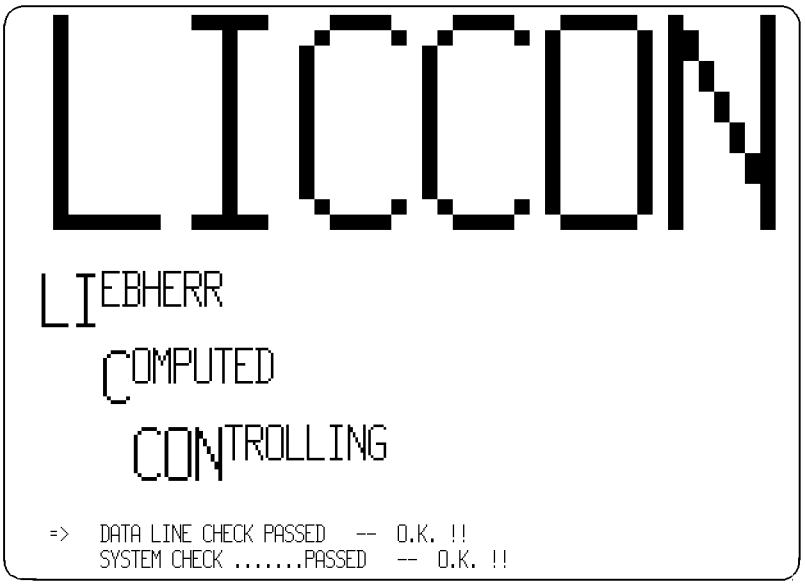
1.1.3 Comparison

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

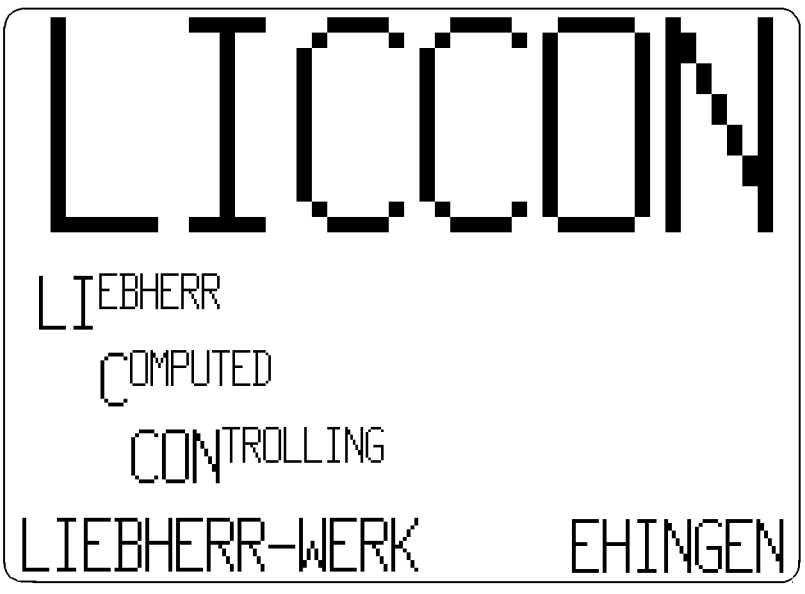
1


LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK .....

2


LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK .....PASSED -- O.K. !!

3


LICCON
LIEBHERR
COMPUTED
CONTROLLING
LIEBHERR-WERK EHINGEN

B197620

2 LICCON computer system boot up

After it is turned on, the LICCON computer system performs a self test.
First the connections from the microprocessor CPU (CPU 0) to the monitor are checked. If no error is found during the test, the monitor shows this image:

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

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

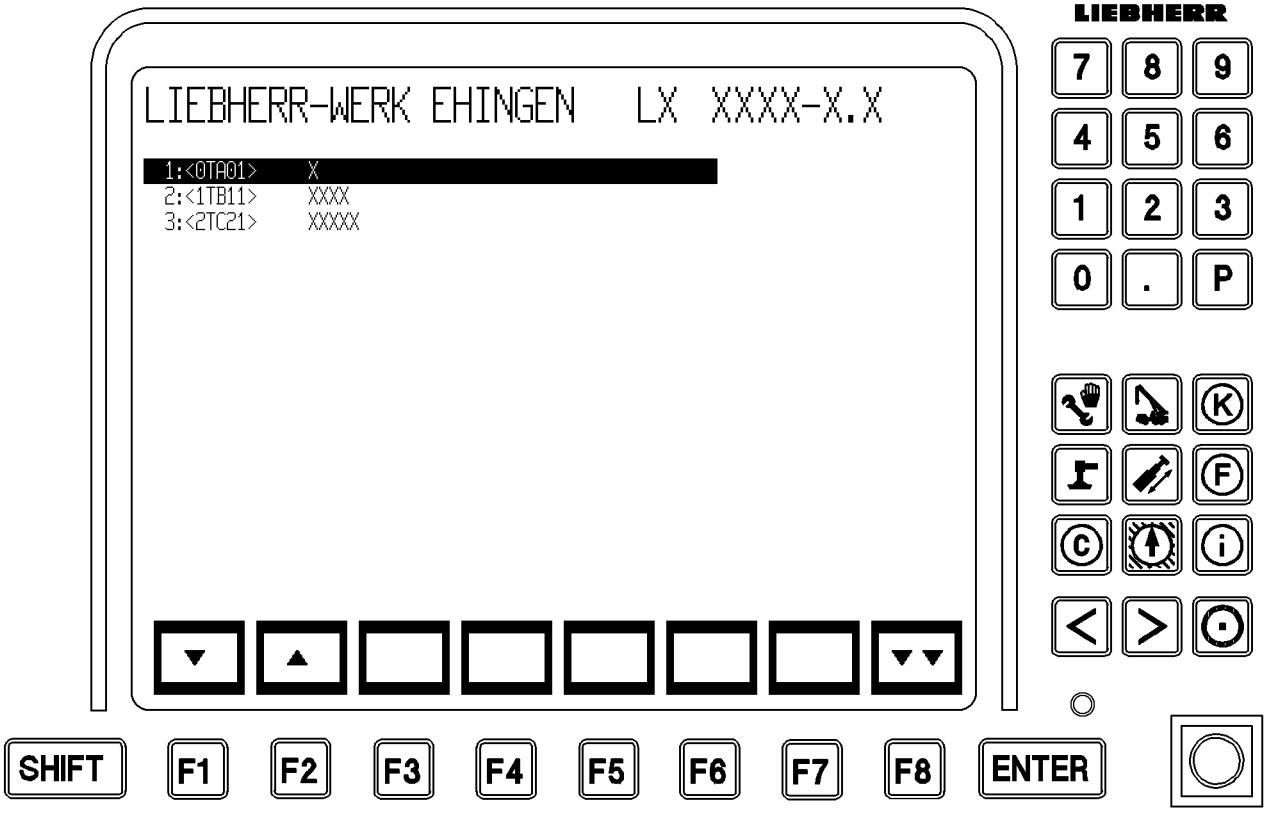
```
=>  DATA LINE CHECK PASSED   --  O.K. !!
    SYSTEM CHECK .......PASSED   --  O.K. !!
```

Subsequently the general initialization screen appears on the monitor momentarily:

```
LIEBHERR-WERK      EHINGEN
```

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

If the start procedure has run successfully, it switches automatically to the “Set up” program.


LIEBHERR
LIEBHERR-WERK EHINGEN LX XXXX-X.X
1:<0TA01> X
2:<1TB11> XXXX
3:<2TC21> XXXXX
7
8
9
4
5
6
1
2
3
0
.
P
K
F
C
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B198728

2.1 Operating mode preselection on the LICCON computer system

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

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

Note
▶ The operating mode preselection screen is skipped if the crane only has one level (for example: only tele operation) - without optional equipment. In this case, the system changes directly into 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.

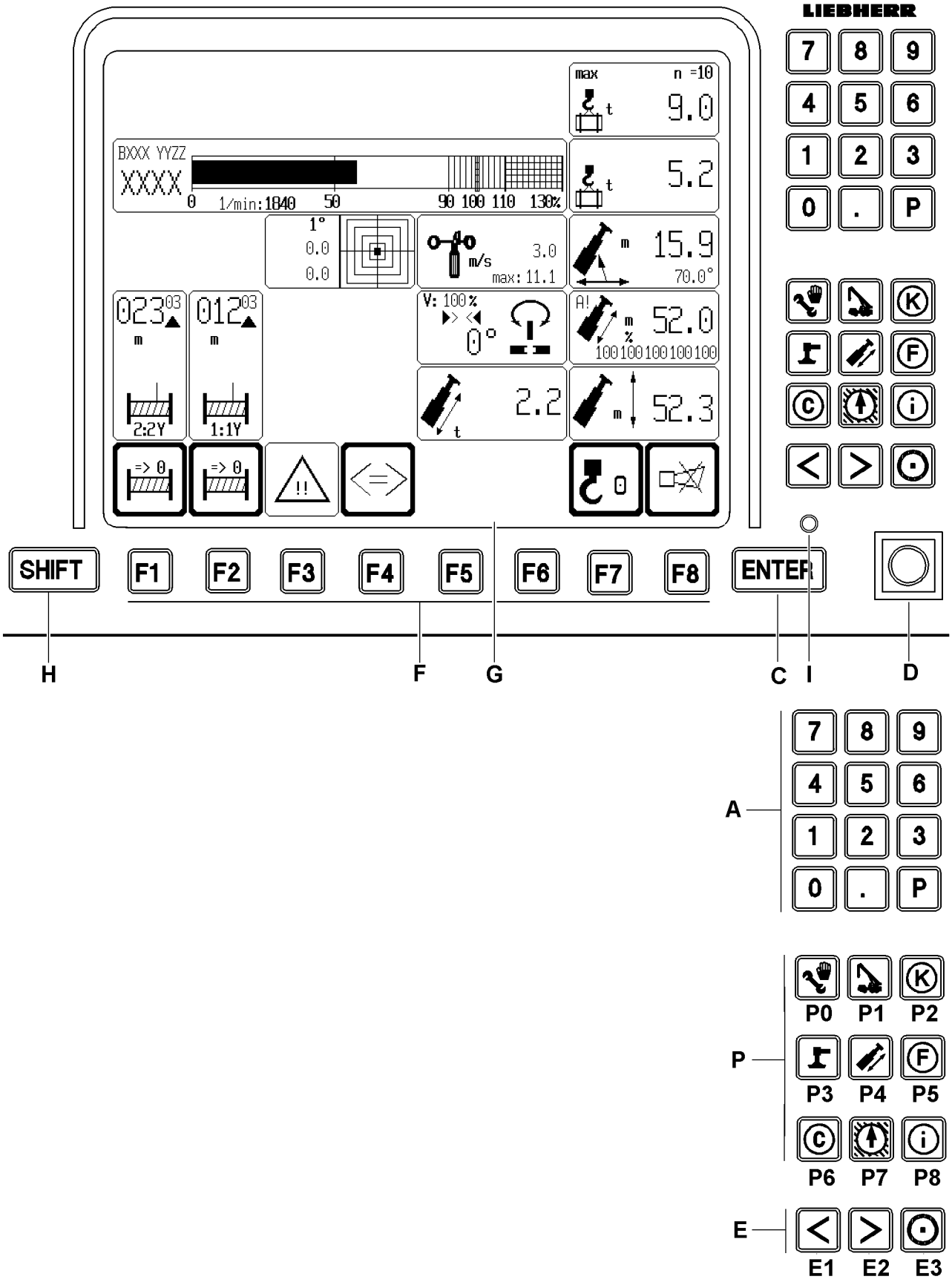
When the operating mode preselection screen appears, press function key **“F1”** or **“F2”** within 3 s.
Result:
– The operating mode selection screen is retained until the settings are confirmed by pressing either **“F8”** or **“ENTER”** .

Note
▶ If the crane operator does **not** press one of the two function keys **“F1”** or **“F2”** within 3 s, then the system selects the operating mode which was active before the LICCON computer system was turned off and the corresponding set up screen appears automatically.

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

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

Press **“F8”** or **“ENTER”** .
Result:
– The selected operating mode is accepted by the LICCON computer system and the corresponding configuration screen is displayed.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
max n =10
9.0
5.2
BXXX YYZZ
XXXX
0 1/min:1840 50 90 100 110 130%
1°
0.0
0.0
3.0
max: 11.1
15.9
70.0°
023 03
012 03
m
2:2Y
1:1Y
V: 100%
0°
A!
52.0
100 100 100 100 100
2.2
52.3
=> 0
!!
0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
F
G
C
I
D
A
P
P0 P1 P2
P3 P4 P5
P6 P7 P8
E
E1 E2 E3

B198612

3 Operating elements of the LICCON computer system

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

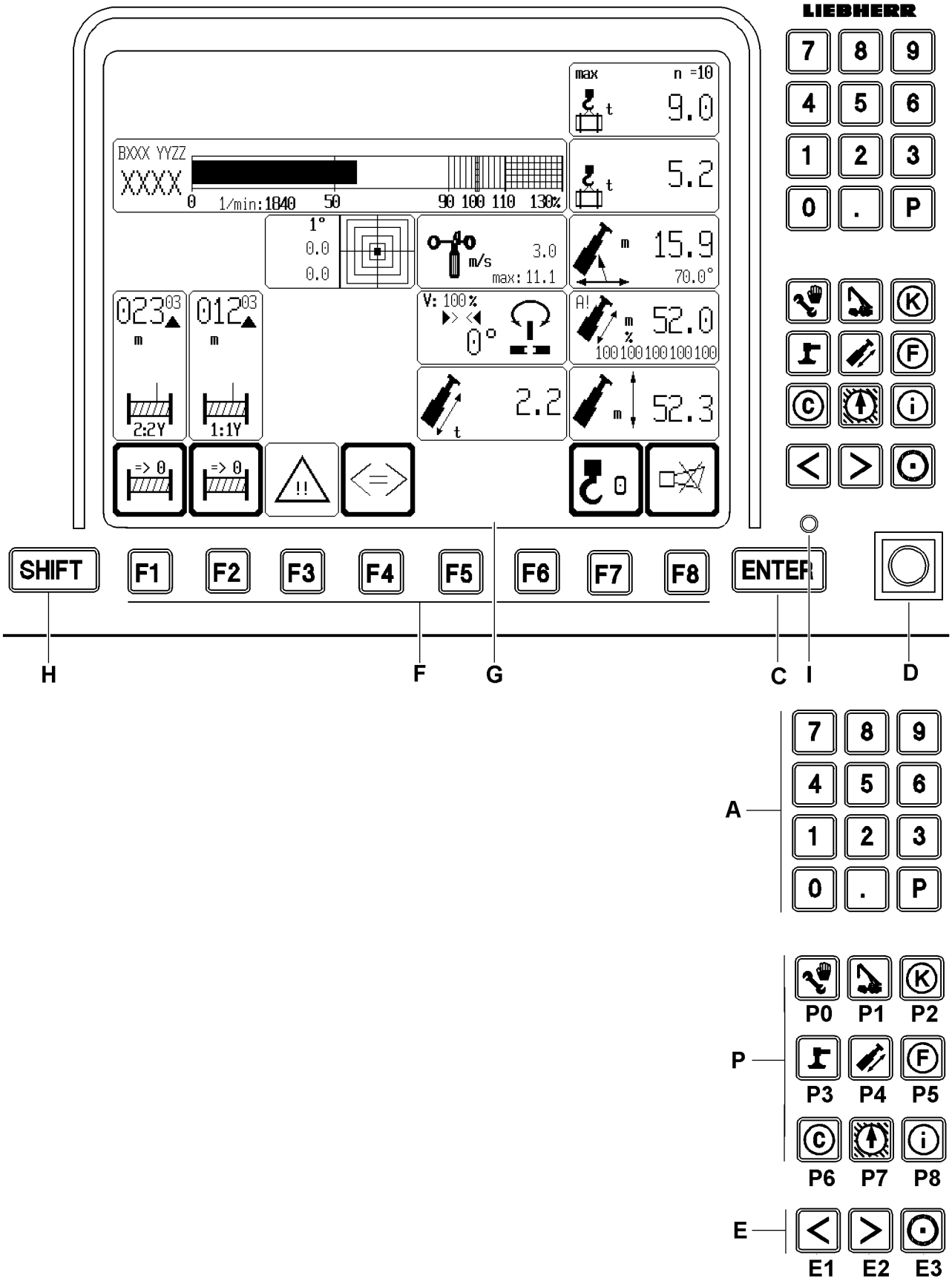
A	Keypad	
P	Program keys	• Selection of the individual LICCON programs
P0	Set up	• **SHIFT** and **P0:** Engine monitoring.
P1	Operation	
P2	Crane acceptance	• Correction coefficients (for LIEBHERR personnel only)
P3	Support	
P4	Telescoping	
P6	Control parameter	
P7	Working range limitation*	
P8	Test system	
C	Input key “ENTER”	• 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!

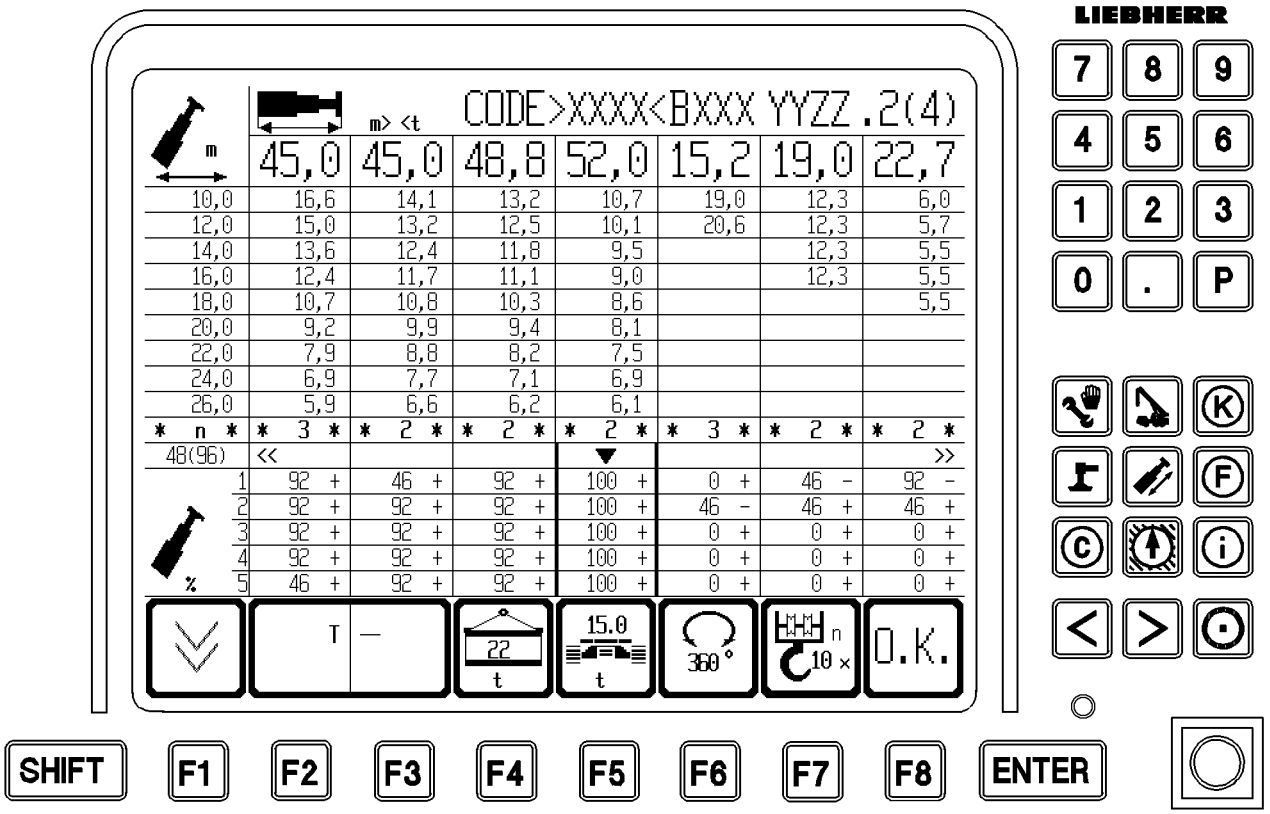
Note

▶ By 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!


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
H F G C I D
A
P
P0 P1 P2
P3 P4 P5
P6 P7 P8
E
E1 E2 E3

B198612

E	Special function keys	• Monitor brightness adjustment • **E3** and **E1**: Turn background illumination on / off. • **E3** and **E2**: Brightness adjustment in three stages. • Additional functions of the special function keys are program-dependent and are further explained in the descriptions of the individual LICCON programs
F	Function keys	• The function keys should always be used in conjunction with the function key icon line displayed on the monitor
G	Monitor	• Display of the individual programs (example: “Operation” program)
H	SHIFT key	• Second-level key assignments, for example “Supervisor function”
I	LED displays	• Monitor supply voltage present


LIEBHERR
m> <t CODE>XXXX<BXXX YYZZ .2(4)
45,0 45,0 48,8 52,0 15,2 19,0 22,7
10,0 16,6 14,1 13,2 10,7 19,0 12,3 6,0
12,0 15,0 13,2 12,5 10,1 20,6 12,3 5,7
14,0 13,6 12,4 11,8 9,5 12,3 5,5
16,0 12,4 11,7 11,1 9,0 12,3 5,5
18,0 10,7 10,8 10,3 8,6 5,5
20,0 9,2 9,9 9,4 8,1
22,0 7,9 8,8 8,2 7,5
24,0 6,9 7,7 7,1 6,9
26,0 5,9 6,6 6,2 6,1
* n * * 3 * * 2 * * 2 * * 2 * * 3 * * 2 * * 2 *
48(96) << >>
1 92 + 46 + 92 + 100 + 0 + 46 - 92 -
2 92 + 92 + 92 + 100 + 46 - 46 + 46 +
3 92 + 92 + 92 + 100 + 0 + 0 + 0 +
4 92 + 92 + 92 + 100 + 0 + 0 + 0 +
5 46 + 92 + 92 + 100 + 0 + 0 + 0 +
%
T
22
t
15.0
t
360°
n
10 x
O.K.
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

B102822

4 “Set up” program

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

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. Only when the computer system is started for the first time or after a loss of data occurred in the memory, for example due to a cold start (change of battery or CPU or power pack), will the first valid operating mode, the first valid set up configuration and the reeving number “0” appear on set up screen.

Using the “Set up” program, the crane operator can set the current operating mode, the current configuration state of the crane and the reeving number of the hoist rope.
In addition, in the “Set up” program he can also see all the load chart programmed into LICCON.

4.1 Setting the operating mode and set up configuration

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

Using the function keys:

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

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

Result:

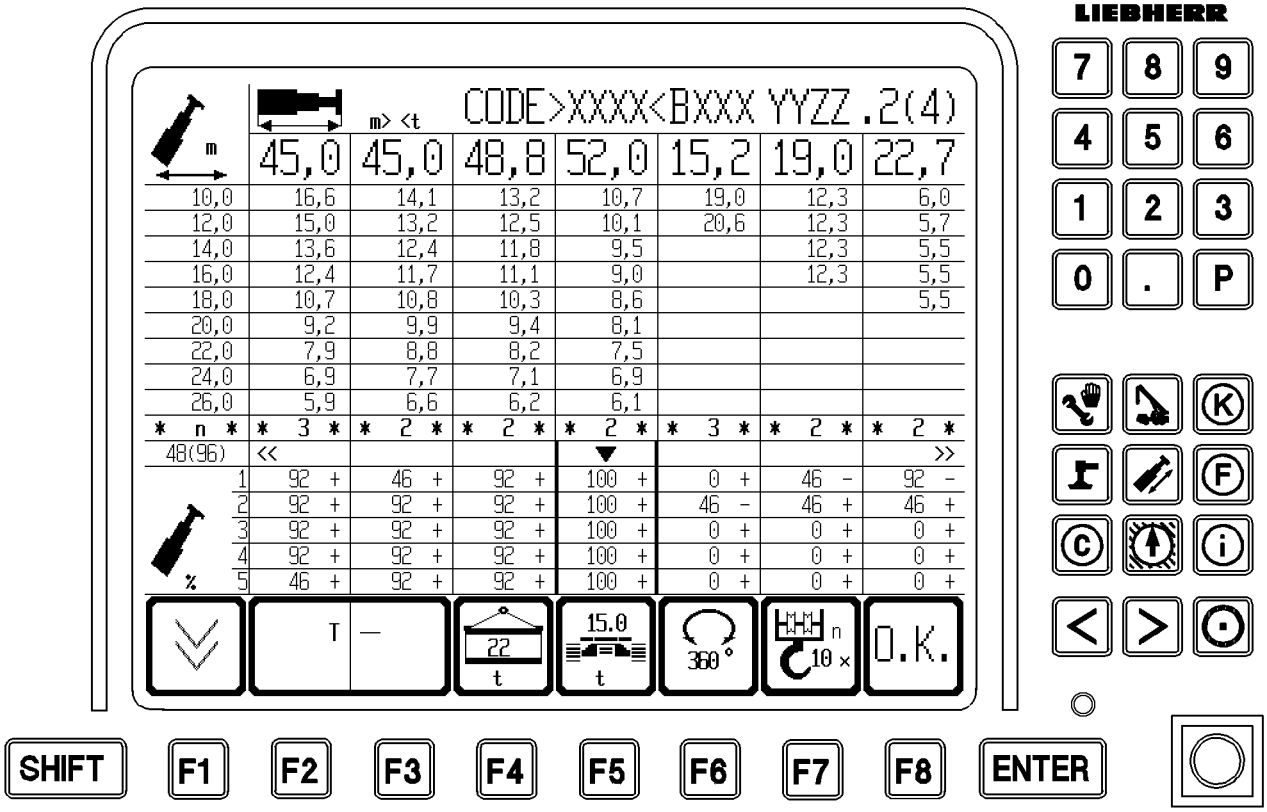
– The data of the selected load chart can be viewed.

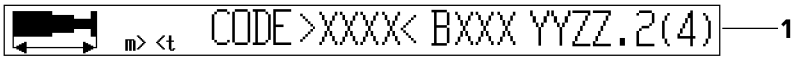
Using a 4-digit short code:

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

Result:

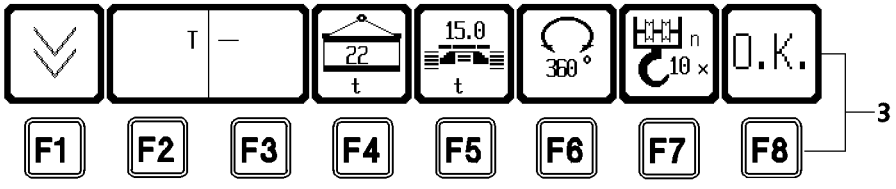
– The data of the selected load chart can be viewed.





m	45,0	45,0	48,8	52,0	15,2	19,0	22,7
10,0	16,6	14,1	13,2	10,7	19,0	12,3	6,0
12,0	15,0	13,2	12,5	10,1	20,6	12,3	5,7
14,0	13,6	12,4	11,8	9,5		12,3	5,5
16,0	12,4	11,7	11,1	9,0		12,3	5,5
18,0	10,7	10,8	10,3	8,6			5,5
20,0	9,2	9,9	9,4	8,1			
22,0	7,9	8,8	8,2	7,5			
24,0	6,9	7,7	7,1	6,9			
26,0	5,9	6,6	6,2	6,1			
* n *	* 3 *	* 2 *	* 2 *	* 2 *	* 3 *	* 2 *	* 2 *
48(96)	<<			▼			>>
% 1	92 +	46 +	92 +	100 +	0 +	46 -	92 -
% 2	92 +	92 +	92 +	100 +	46 -	46 +	46 +
% 3	92 +	92 +	92 +	100 +	0 +	0 +	0 +
% 4	92 +	92 +	92 +	100 +	0 +	0 +	0 +
% 5	46 +	92 +	92 +	100 +	0 +	0 +	0 +

2



B102823

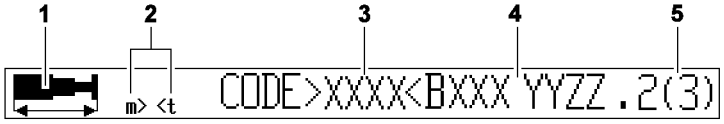
4.2 “Set up” program areas

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

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

Note

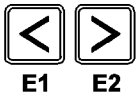
▶ The monitor illustrations in this chapter are only examples. The numerical values in the individual icons and charts do not have to necessarily match the crane exactly. The programmed load charts for the crane are binding.



B197624

4.2.1 General information line

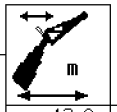
1 “Telescopic boom length” icon	• The icon is identical for all operating modes
2 Abbreviations	• For the programmed length units (LE) and weight units (GE) Possible length units are [m] and [ft] Possible weight units are [t] and [lbs]
3 4-digit short code	• It is located next to the text “CODE” inside angled brackets • Each short code uniquely identifies a crane configuration. The valid set up configuration and their associated short code numbers for the crane can be found in the load chart manual of the crane.
4 Organization number	• For internal Liebherr load chart administration
5 Page number	• Relates to the currently displayed part of the load chart • Separated from the organization number with “.” • The total number of pages in this load chart is in parentheses



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

1

2



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

3

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

4

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

5

1(27)	▼						>>

6

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

7

8

B198615

4.2.2 Display area of load chart values

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

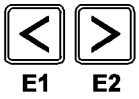
2 “Boom radius” icon
- Operating mode dependent
- In [m] or [ft]
- Maximum 9 lines of radius values
- Vertical axis of load value field

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

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

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

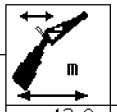
6 Line for special displays
- If a load chart consists of more than 7 columns, it cannot be fully displayed due to the size of the monitor. In that case, marking arrows in the first or the seventh field indicate that there are additional columns to the left or right of the displayed chart. They can be shown by pressing the key **E1** or the key **E2**.
  As supporting information, the currently selected column number and the number of columns in the chart are shown.
  e.g. 1 (27) means the first of 27 columns.
- **Note:**
  Using the key combination **SHIFT** and **E1** or **SHIFT** and **E2**, you can, where possible, scroll left or right by seven load chart columns (corresponds to 1 page). The marking for selecting a telescope target is placed in the center.



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

1

2



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

3

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

4

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

5

1(27)	▼						>>

6

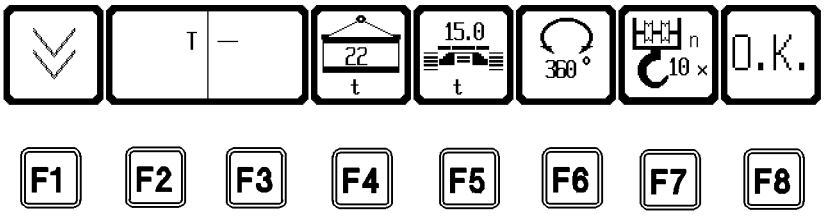
1	92 +	46 +	92 +	100 +	0 +	46 -	92 -
2	92 +	92 +	92 +	100 +	46 -	46 +	46 +
3	92 +	92 +	92 +	100 +	0 +	0 +	0 +
4	92 +	92 +	92 +	100 +	0 +	0 +	0 +
5	46 +	92 +	92 +	100 +	0 +	0 +	0 +

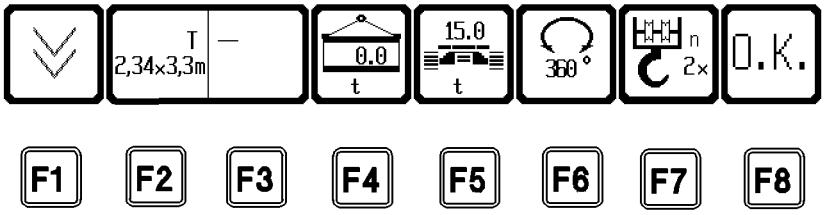
7

8

B198615

7 Extension condition of telescopic sections	• In percent [%] • The first column contains the “Boom length” icon [%]. Next to that are 5 lines for the extension condition of the telescopic sections. The number in the icon column describes the corresponding telescopic section (highest number = outermost telescopic section). The value in the boom length column displays the extension condition of the telescope in percentages, which must be maintained for the corresponding boom length. The status indicator “+” next to the percentage boom status value means that the corresponding telescopic section must be pinned. The status indicator “-” next to the percentage boom status value means that the corresponding telescopic section can be telescoped up as far as the percentage value of the boom status under load (as in the load chart).
8 Mark for selecting telescope target	• The special function key **E1** or the special function key **E2** can be used to move the mark to the left or right (see Crane operating instructions, chapter 4.05)


T
22
t
15.0
t
360°
n
10 x
O.K.
F1
F2
F3
F4
F5
F6
F7
F8


T
2,34x3,3m
0.0
t
15.0
t
360°
n
2x
O.K.
F1
F2
F3
F4
F5
F6
F7
F8

B102847

4.2.3 The function key line

The function key line consists of function keys **F1** to **F8** and the function key icon bar above it. The function keys correspond to the various function key icons above them.
Various functions are indicated by the function key icons, or they may refer to the following changes:

– Operating mode
– Set up condition

Not all function keys have to be assigned icons on the LICCON monitor. This depends on the program selection.
Pressing a function key changes the appearance of the icon above, its meaning, or its textual content.

F1 Vertical paging
- Depending on the size of the monitor, up to 9 load chart lines can be displayed at once. If a chart consists of more than 9 lines, 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 Support base
- Turn the support base for the assembly / disassembly of the crane on or off (if present).
- Example:
  2.34 x 3.3m.

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

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

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

SHIFT and **F3**
- Previous accessory status

F4 Counterweight (superstructure)
- Adjustment option for the current counterweight, which must be on the superstructure in order to achieve the values in the current chart.
- Example:
  “22 t ” = total weight of 22 t

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

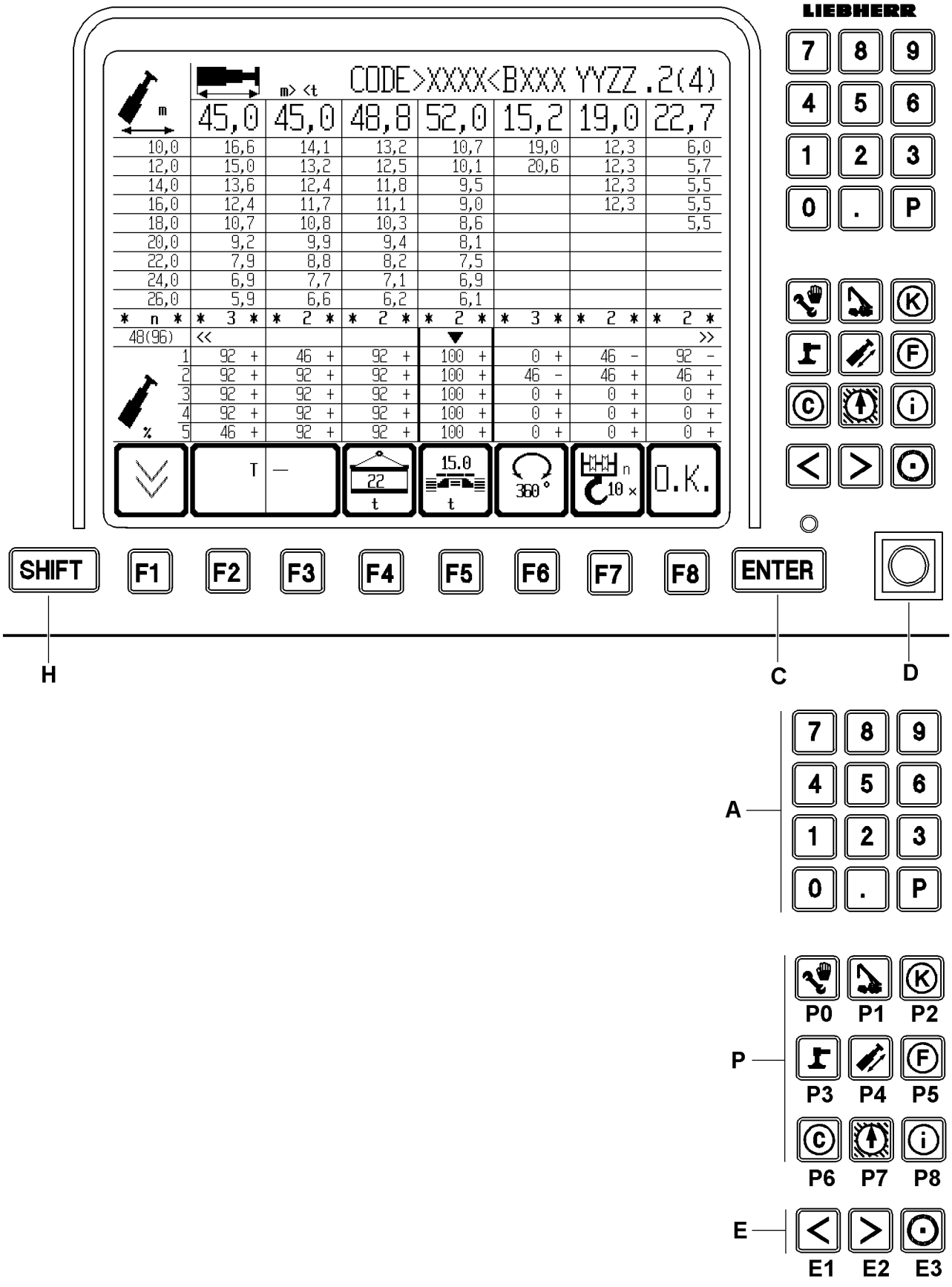
F6 Slewing range - Superstructure
- 360° working range: Unlimited rotation is possible.
- 0° working range: Toward the rear (locked).

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

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

F8 Function key
- Confirmation of selected set up configuration
  Prerequisites:
  The configuration mode setting must be completed, i.e. a valid short code is displayed and load capacity values are in the chart field.
  The external conditions for this configuration state, if specified, must be fulfilled (e.g. locking the superstructure).
  The crane may not be utilized by more than 20 % in the previous set up configuration and the load suspended on the hook may not be heavier than 0.5 t. Switching to the “Crane operation” program can otherwise only be done using the program key **P1**. In that case, the newly entered set up configuration is not accepted.
  If the crane is equipped with sliding beam monitoring*, the sliding beams must be extended to the support base specified in the selected load chart.
  If these preconditions are met, then the “O.K.” key confirms that the chosen configuration state and the selected reeving are correct and transfers the parameters to the “Crane operation” program.
  Note:
  Make sure that after switching to the crane operating screen, the chosen set up configuration (short code) and the hoist rope reeving(s) have been accepted.
- Display of operating errors from the “Set up” program.
  Operating errors which are created in the “Set up” program are displayed in the icon above the function key **F8** and 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 is displayed in documentary form. The operating error will not be saved.
  Operating errors are always shown on top in the error stack.

blank page!


LIEBHERR
m> <t
CODE>XXXX<BXXX YYZZ .2(4)
45,0 45,0 48,8 52,0 15,2 19,0 22,7
10,0 16,6 14,1 13,2 10,7 19,0 12,3 6,0
12,0 15,0 13,2 12,5 10,1 20,6 12,3 5,7
14,0 13,6 12,4 11,8 9,5 12,3 5,5
16,0 12,4 11,7 11,1 9,0 12,3 5,5
18,0 10,7 10,8 10,3 8,6 5,5
20,0 9,2 9,9 9,4 8,1
22,0 7,9 8,8 8,2 7,5
24,0 6,9 7,7 7,1 6,9
26,0 5,9 6,6 6,2 6,1
* n * * 3 * * 2 * * 2 * * 2 * * 3 * * 2 * * 2 *
48(96) << >>
1 92 + 46 + 92 + 100 + 0 + 46 - 92 -
2 92 + 92 + 92 + 100 + 46 - 46 + 46 +
3 92 + 92 + 92 + 100 + 0 + 0 + 0 +
4 92 + 92 + 92 + 100 + 0 + 0 + 0 +
5 46 + 92 + 92 + 100 + 0 + 0 + 0 +
%
T
22
t
15.0
t
360°
10 x
n
O.K.
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
C
D
A
P
P0 P1 P2
P3 P4 P5
P6 P7 P8
E
E1 E2 E3

B102848

4.2.4 Other operating elements

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

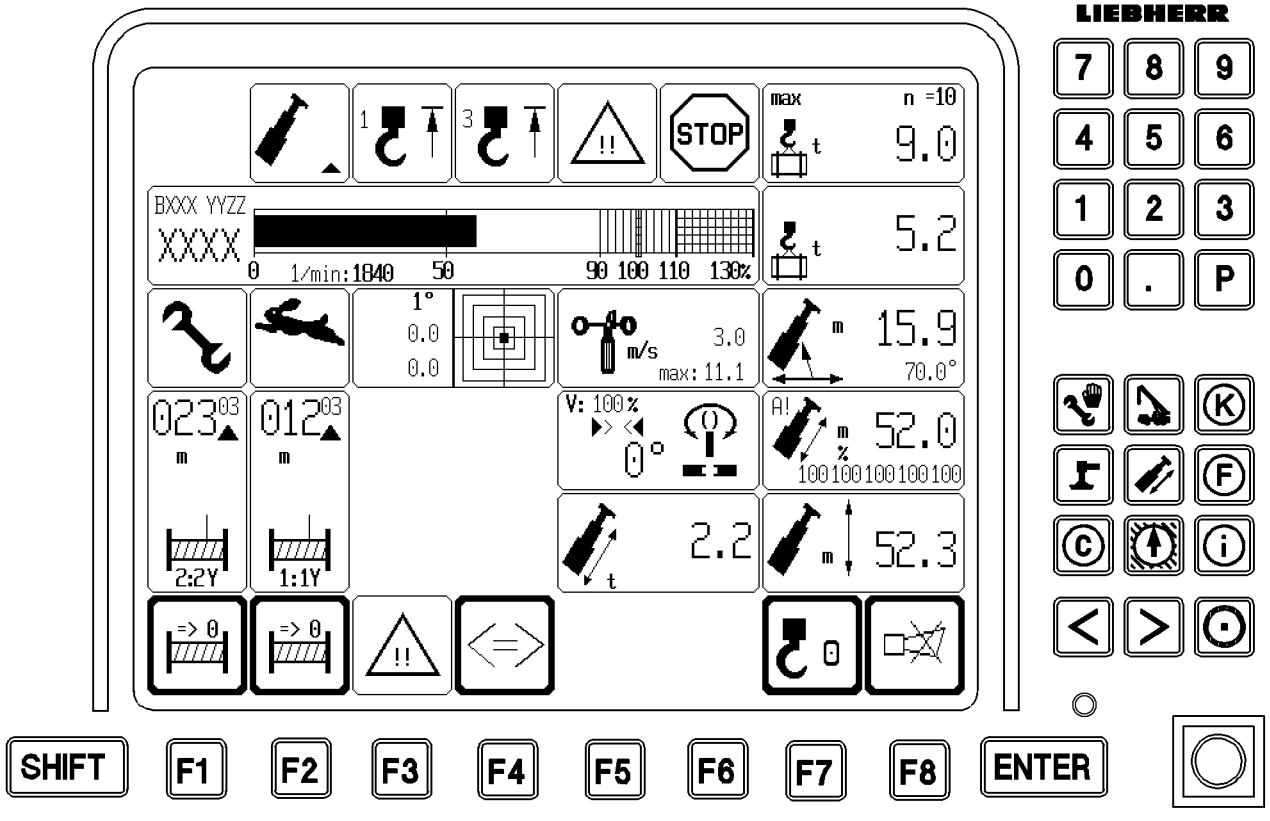
P Program keys
- Selection among the individual programs. The settings in the set up program are discarded and the set up configuration and reeving most recently confirmed with the **O.K.** key will continue to be used.
  A program currently running **cannot** be called again using its program key.

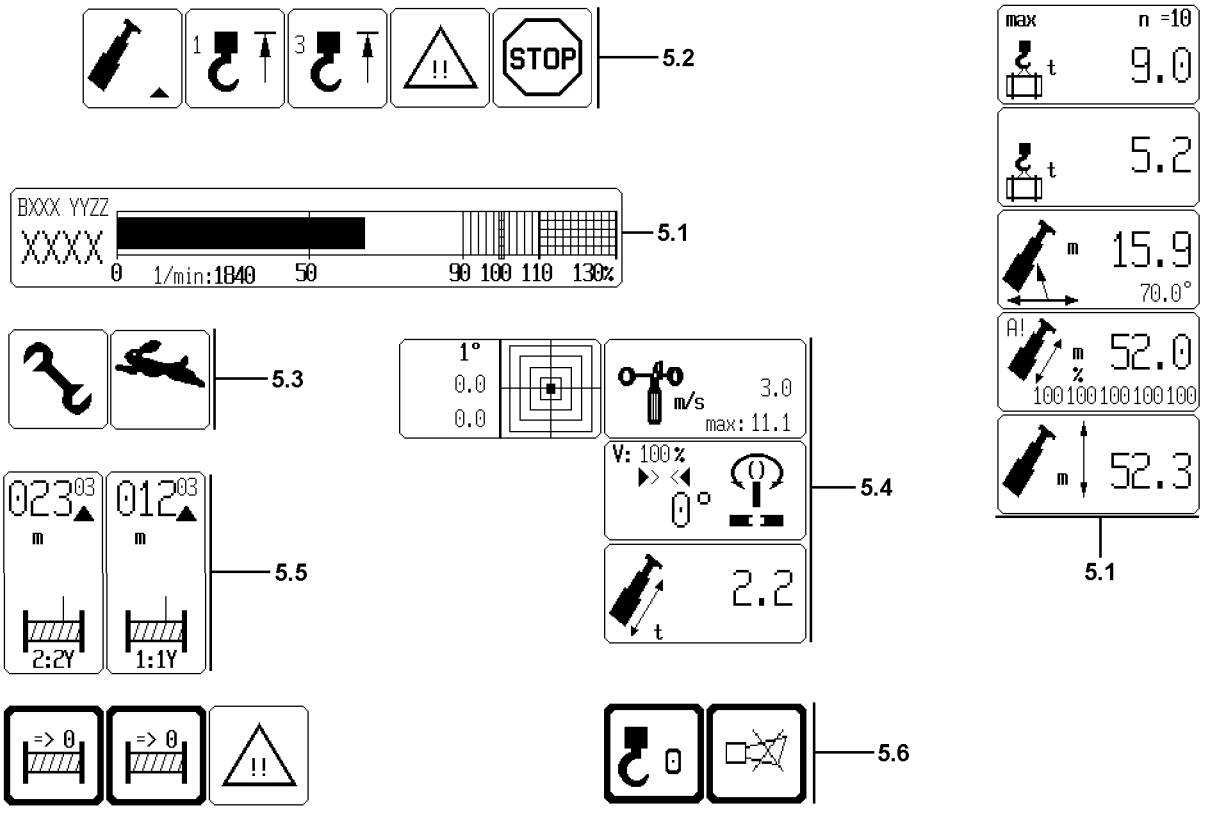
C Input key “ENTER”
- Confirmation of input both for short codes as well as for any change in the set up configuration via the function keys
- Key **Enter** after entering the short code, the code is searched for in all stored load charts. If the matching load chart has been programmed, it will be displayed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

D Set up key
- Has no function in the “Set up” program

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

H SHIFT key
- For example Supervisory function


LIEBHERR
STOP
max n =10
9.0
5.2
BXXX YYZZ
XXXX
0 1/min:1840 50 90 100 110 130%
1°
0.0
0.0
m/s 3.0
max: 11.1
15.9
70.0°
V: 100%
0°
A!
52.0
100 100 100 100 100
023 03
012 03
m
2:2Y
1:1Y
2.2
52.3
=> 0
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


5.2
5.1
5.3
5.4
5.5
5.6
max n =10
9.0
5.2
15.9
70.0°
52.0
100 100 100 100 100
52.3
BXXX YYZZ
XXXX
0 1/min:1840 50 90 100 110 130%
m/s 3.0
max: 11.1
V: 100%
0°
2.2
023 03
012 03
2:2Y
1:1Y
=> 0

B111638

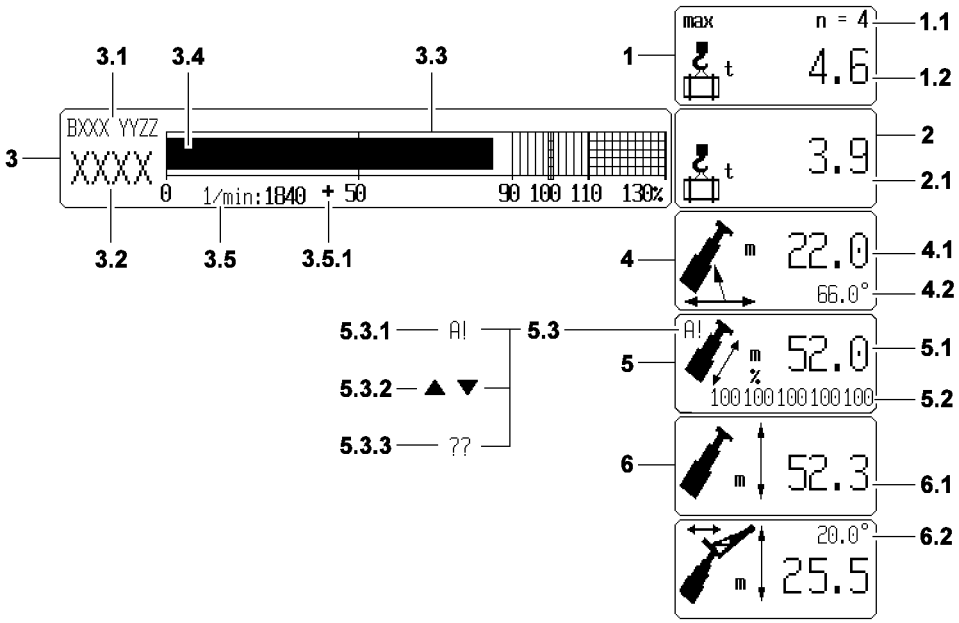
5 “Crane operation” program

The LICCON program “Crane operation” assists the crane driver by displaying clearly on the monitor the data needed for operating the crane. An acoustic signal accompanies all critical displays. Depending on the equipment, a range of other icons may also be turned on as additional displays, either as required by the crane operator or automatically in the event of a problem.
It also alerts the crane operator to imminent overload conditions. In the event of overload and many error conditions, which could be hazardous, the system shuts off.
The monitor is divided into six areas in the “Crane operation” program:

– Crane geometry and load information **5.1**
– Alarm functions **5.2**
– Special functions **5.3**
– Monitored auxiliary functions **5.4**
– Winch display **5.5**
– Function key line **5.6**

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!


max
n = 4
1
t
4.6
1.1
1.2
3.1
3.4
3.3
BXXX YYZZ
3
XXXX
0
1/min:1840
+ 50
90 100 110 130%
3.9
2
2.1
3.2
3.5
3.5.1
4
m
22.0
4.1
66.0°
4.2
5.3.1
A!
5.3
A!
5
m
%
52.0
5.1
100100100100100
5.2
5.3.2
5.3.3
??
6
m
52.3
6.1
20.0°
6.2
m
25.5

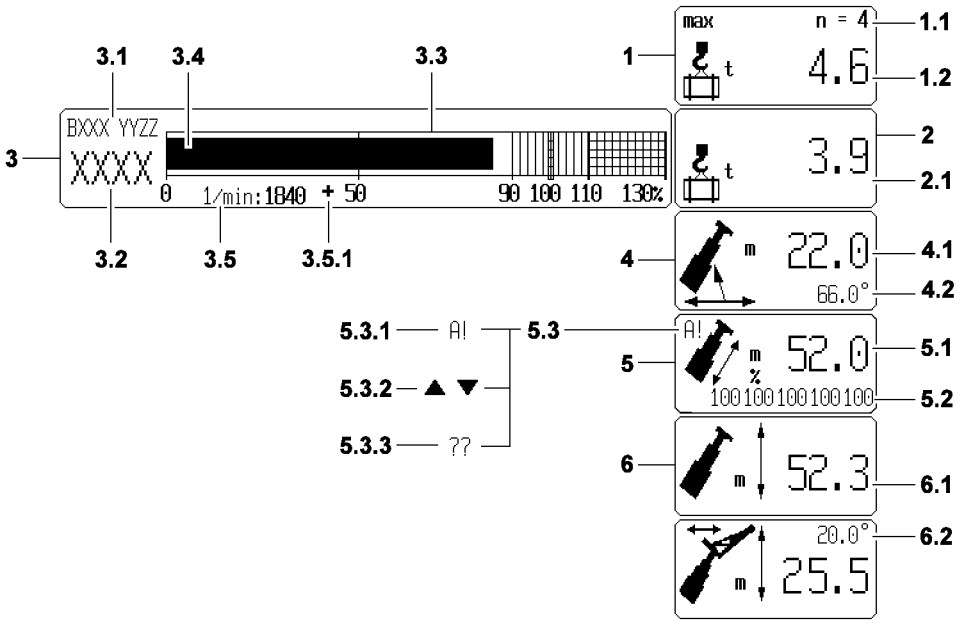
B198619

5.1 Crane geometry and load information

1	“Maximum load” icon	• In [t] or [lbs]
1.1	Reeving number of hoist rope	• n = reeving number of hoist rope that is reeved at the pulley head selected via the load chart (previously selected in the “Configuration” program).

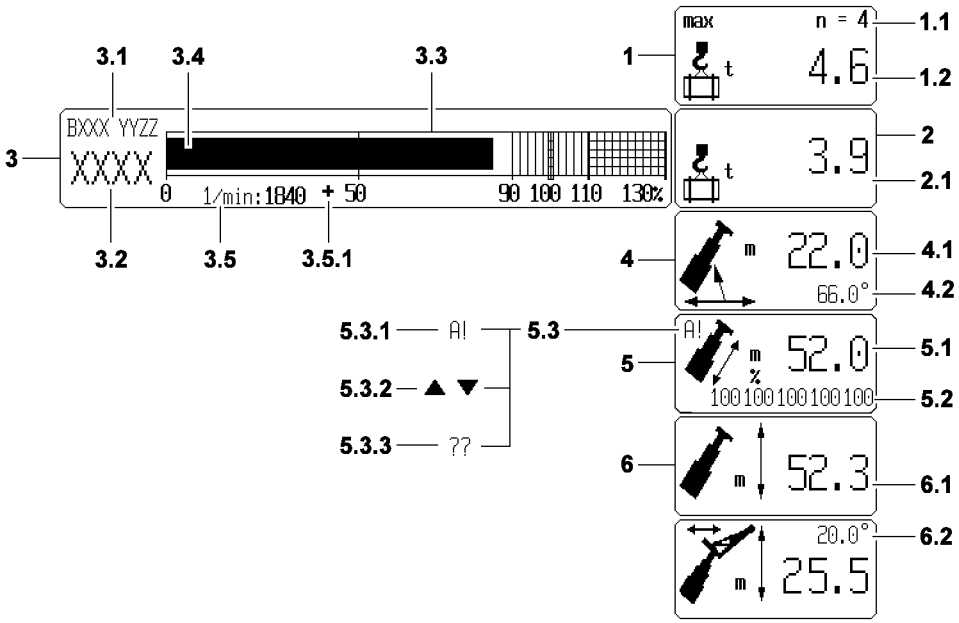
1.2	Maximum load according to load chart and reeving	• In [t] or [lbs]
		• It depends on:
		  • The selected operating mode
		  • The selected set up configuration (load chart)
		  • The boom radius
		  • The hoist rope reeving
		  • **Note:**
		  “? ? ? . ?” if a value in the load chart cannot be accessed,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

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


max
n = 4
1
1.1
1.2
4.6
t
2
2.1
3.9
3
BXXX YYZZ
XXXX
0
1/min:1840
+ 50
90 100 110 130%
3.1
3.4
3.3
3.2
3.5
3.5.1
4
4.1
4.2
22.0
66.0°
m
5.3.1
A!
5.3
5.3.2
5.3.3
??
5
5.1
5.2
52.0
100100100100100
%
6
6.1
6.2
52.3
20.0°
25.5

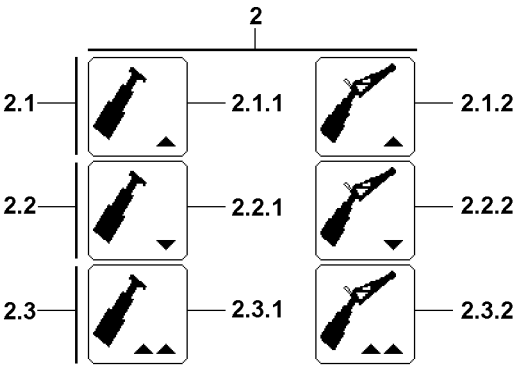
B198619

3	"Dynamic utilization bar display" icon	
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 90 % utilization: **Advance warning.** • Marking at 100 % utilization: **STOP shut off.**
3.4	Utilization bar of crane	• According to load chart and reeving **Note:** The utilization bar is the measurement for the current utilization of the crane.
3.5	Engine speed	• In [rpm] • **Note:** "????" is displayed for an invalid rpm value (for approximately 10 seconds). A fixed rpm is set in the event of a problem. The digital display blinks, and an error message is displayed.
3.5.1	Engine rpm lock	• The engine rpm can be locked on the master switch. If the engine rpm has been locked, the icon "+" appears behind the rpm display.
4	"Boom radius" icon	
4.1	Radius	• In [m] or [ft] Identifies the horizontal center of gravity distance of the load (on the load hook selected by the operating mode) from the center of rotation of the superstructure, measured on the ground. This also takes into account the boom flexation due to its own weight and the suspended weight of the load. • **Note:** "? ? ? . ?" is displayed, if geometrical data or sensor values are missing, so that the radius cannot be calculated.
4.2	Main boom angle to the horizontal	• In [°] • **Note:** "? ? ? . ?" is displayed, when the geometrical data or the sensor values are missing, so that the main boom angle cannot be calculated.


max
n = 4
t
4.6
1.1
1.2
3.9
2
2.1
BXXX YYZZ
XXXX
0
1/min:1840
+ 50
90 100 110 130%
3.1
3.4
3.3
3.2
3.5
3.5.1
3
1
22.0
66.0°
4.1
4.2
4
5.3.1
A!
5.3
5.3.2
5.3.3
??
5
52.0
100100100100100
5.1
5.2
6
52.3
6.1
20.0°
25.5
6.2

B198619

5	“Main boom length” icon	
5.1	Length of main boom	• In [m] or [ft]
5.2	Extension condition of individual telescopic sections	• In [%] Sequence: Telescope 1 to telescope 5 from left to right
5.3	TELEMATIC	• Special functions in “Crane operation” program. **Note:** In the “Main boom length” icon all the information required is displayed to enable an experienced crane operator to telescope the telescopic boom to a desired length without switching to the “Telescoping” program.
5.3.1	Preselected telescoping target reached	
5.3.2	Nominal deflection direction of master switch	• Request: Telescope in = down arrow • Request: Telescope out = arrow up
5.3.3	Error in system	
6	“Pulley head height” icon	
6.1	Pulley head height	• In [m] or [ft] • Identifies the vertical distance from the crane base to the selected pulley head axle, for which the displayed maximum load applies. • **Note:** “? ? ? . ?” is displayed, when the geometric data or the sensor values are missing, so that the pulley head height cannot be calculated.
6.2	Angle of hydraulically adjustable folding jib (**TNZK**)*	• In [°] • The display is in the form of the relative angle between the telescopic boom head and the folding jib. • **Note:** “? ? ? . ?” is displayed, when the geometry data or the sensor values are missing, so that the angle of the hydraulically adjustable folding jib cannot be calculated.



B104778

5.2 Alarm functions

The limit ranges of the crane movements are monitored. The crane operator is alerted that the limits have been reached when the following blinking icons are shown.

5.2.1 Boom limitation

2 “Boom limitation” icon

- The luffing range of the boom is limited upward as well as downward. This icon appears if an end position determined by the load chart is reached when luffing the boom or when luffing up the boom is disabled by a proximity switch.

Shut off of upper / lower limit angle

2.1 Arrow pointing up

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

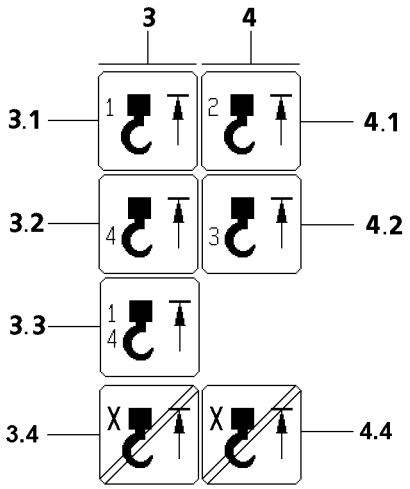
2.2 Arrow pointing down

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

Shut off Steep boom*

2.3 Double arrow pointing up

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



B110788

5.2.2 Hoist top limit switch HES1 and HES4*

3 "Hoist top on HES1 / HES4* icons"

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

3.1 HES1

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

3.2 HES4*

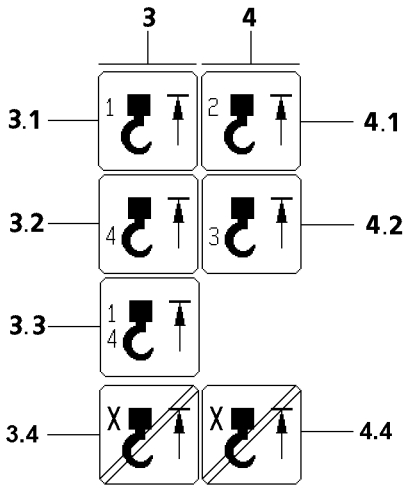
- Installation location: Telescopic boom head, left* or boom nose*
  Bus address: 24
  Switch: -S931
- The icon appears if:
  - The hook block runs against the HES4 at the left telescopic boom head* or on the boom nose*.
  - HES4 is not active, although it must be present on the bus.
  - HES4 has an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

3.3 HES1 and HES4*

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

3.4 "Hoist top on boom bypassed" icon

- The icon appears when the "Hoist top shut off" is bypassed.



B110788

5.2.3 Hoist top limit switch HES2* and HES3*

4 Icons “Hoist top at HES2* / HES3* ”

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

4.1 HES2*

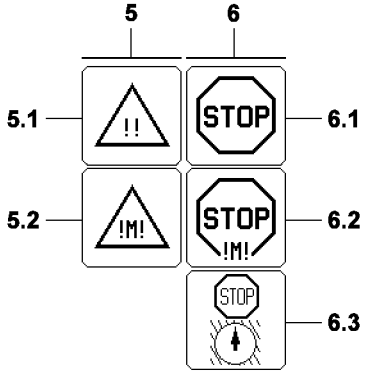
- Installation location: Single folding jib* or auxiliary boom*
  Bus address: 27
  Switch: -S940
- The icon appears if:
  - The hook block moves against HES2 on the single folding jib* or on the auxiliary boom*.
  - HES2 is not active, although it must be present on the bus.
  - HES2 has an internal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

4.2 HES3*

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

4.4 “Hoist top on boom bypassed” icon

- The icon appears when the “Hoist top shut off” is bypassed.



B197632

5.2.4 Load chart capacity, exceeded, Working range limitation*

5 “Advance warning” icon

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

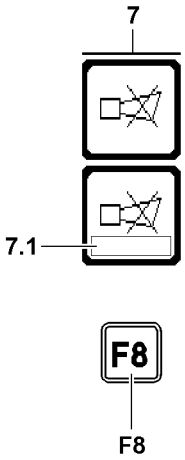
5.2 Engine monitoring
- If a warning event occurs in the engine monitoring system, the “Engine monitoring advance warning” icon is displayed on the LICCON monitor.

6 “STOP” icon

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

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

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



B111270

5.2.5 Acoustic warning on the LICCON monitor

Acoustic warnings on the LICCON monitor are indicated by the warning sound “Horn”.
The warning sound “Horn” is divided into two categories:

– “Horn” is a beeping sound of a duration of approximately 0.5 seconds, which is repeated in a second cycle.
– “Short horn” is a beeping sound of a duration of approximately 0.1 seconds, which is repeated in a second cycle.

7 Horn icon

- When the horn icon is shown in the LICCON monitor, any acoustic signals which will occur can be shut off 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 there in documentary form.

Acoustic signal “Horn”

1.) Sounds in addition to the visual display of an error message in field **7.1** in case of operational errors are found, which lead to a shut off of a crane movement.
Operational errors are:
- Overload
- Boom outside the angle range of the load chart
- Boom outside radius range of the load chart
- Extension condition of telescopic sections not in accordance with the load chart

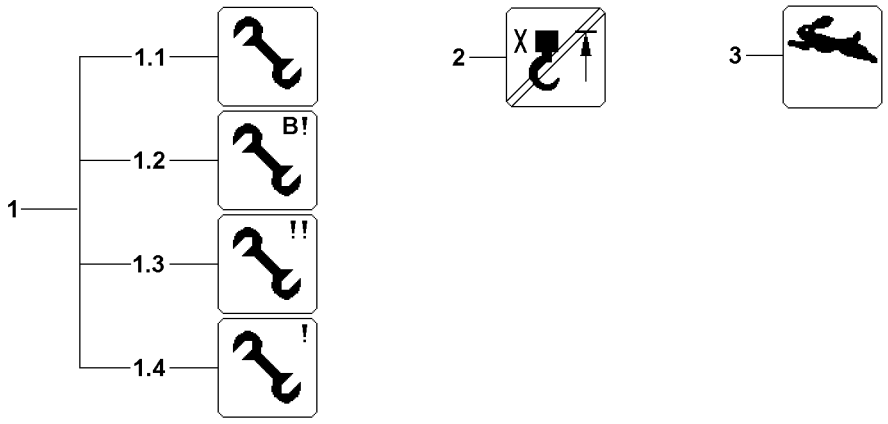
2.) In case of application errors with error number (LICCON Error Code LEC). For example sensor errors, which occur due to insufficient sensor signals or a defective sensor.
The following sensors are monitored:
- Hoist limit switch
- Length sensors
- Angle sensors
- Pressure sensors
- Wind sensor
- Battery voltage
- Inductive sensors

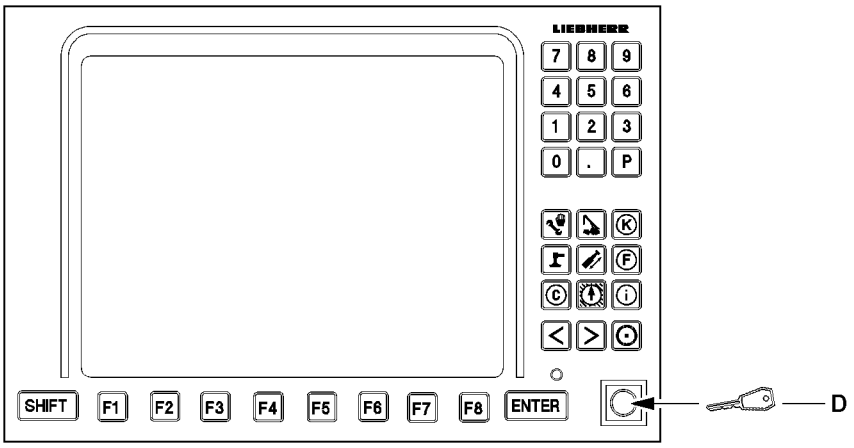
Acoustic signal “Short horn”

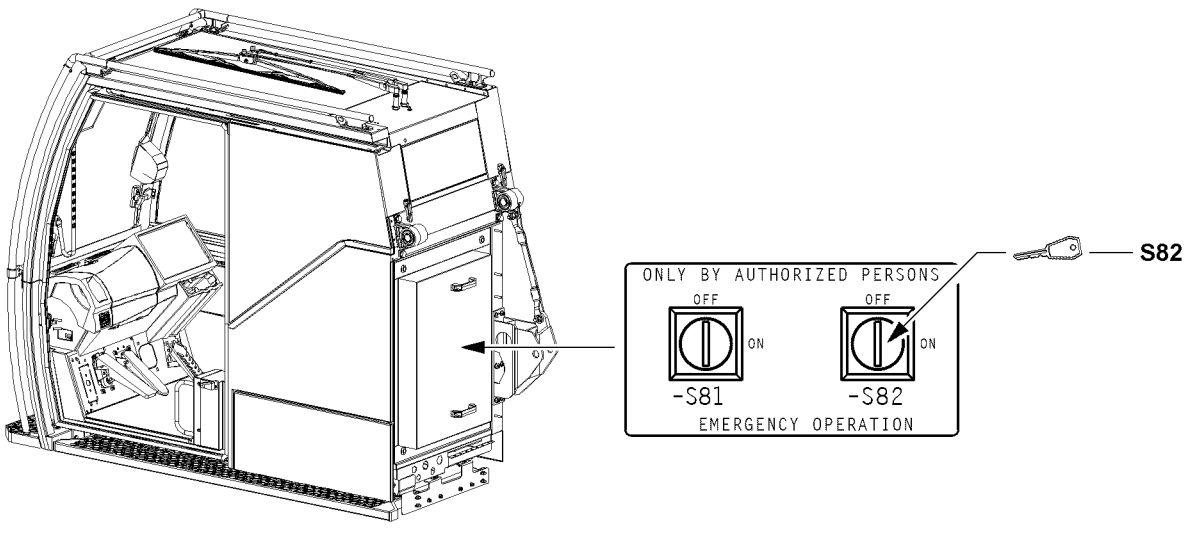
Sounds in addition to the visual display of error messages without an error number and which do not lead directly to crane movement shut off by the LICCON overload protection.
Monitored error messages are:
- Maximum permissible wind speed exceeded (only for activated wind sensor*).
- Maximum or minimum support force exceeded (only with active support force monitoring*).
- 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!


1
1.1
1.2
B!
1.3
!!
1.4
!
2
3


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


ONLY BY AUTHORIZED PERSONS
OFF
ON
-S81
OFF
ON
-S82
EMERGENCY OPERATION
S82

B112695

5.3 Special functions

Note
Double function set up key!
If the crane has **no** CE-mark (EN13000:2010 not active), 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!

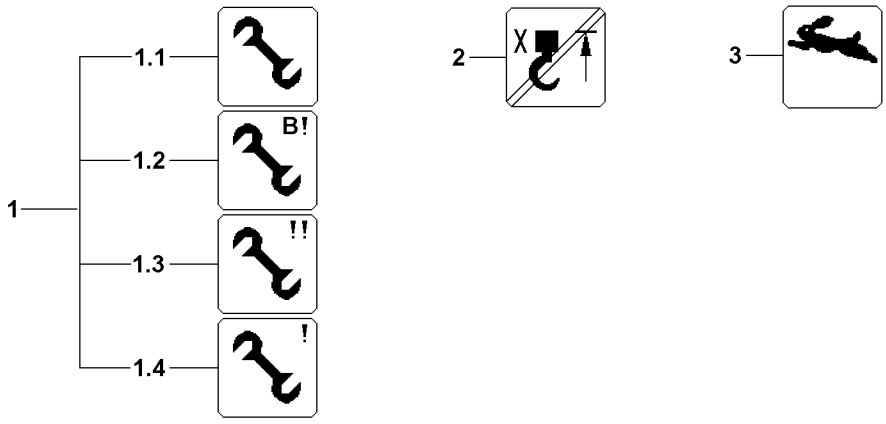
Note
▶ The various icons **1** are shown on the same position in the LICCON monitor, depending on the operating mode. Two icons **1** cannot appear simultaneously.
▶ For operation and specifications for using the set up key **D**, see Crane operating instructions, chapter 4.04, chapter 4.20 and chapter 7.15.

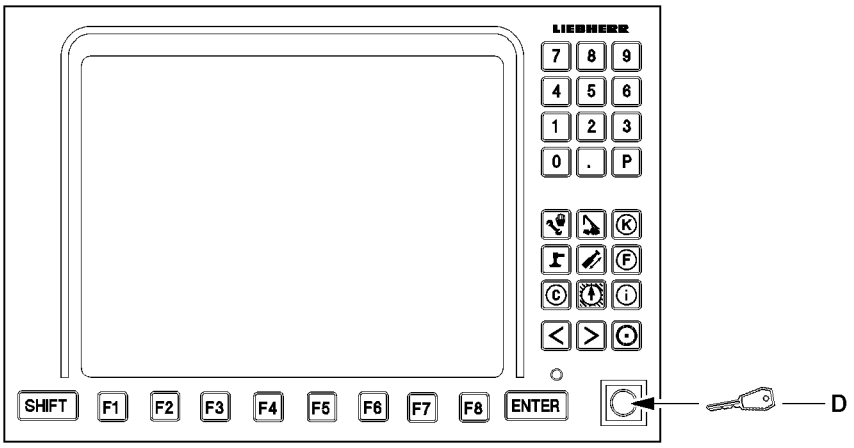
5.3.1 Exceeding the shut off limits of the LICCON overload protection

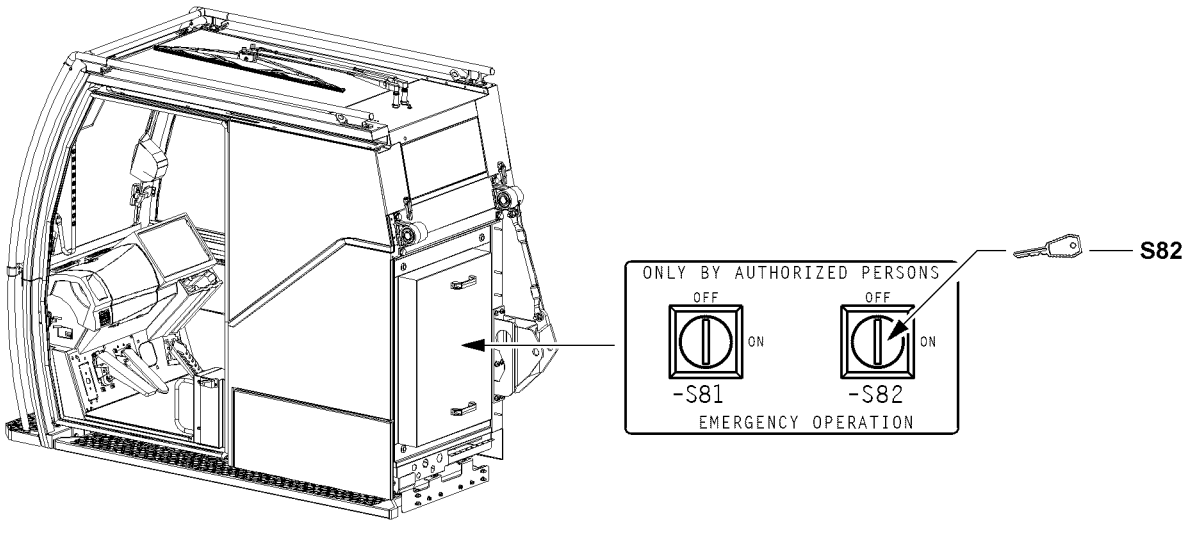
1.1 Exceeding the shut off limits of the LICCON overload protection	• The icon blinks: • When the shut off limits of the LICCON overload protection are bypassed via the set up key **D**. • **Note**: The Crane operation program is locked, meaning, no other program can be turned on via the program keys.

5.3.2 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!


1
1.1
1.2
B!
1.3
!!
1.4
!
2
3


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


ONLY BY AUTHORIZED PERSONS
OFF
ON
-S81
OFF
ON
-S82
EMERGENCY OPERATION
S82

B112695

5.3.3 Emergency operation LICCON overload protection (according to EN 13000:2010)

1.3 LMB emergency operation activated	• The icon appears: • when the emergency operation LICCON overload protection (LMB emergency operation) is activated via the keyed button **S82**. • **Note**: The Crane operation program is locked, meaning, no other program can be turned on via the program keys.

5.3.4 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 engaged by the set up key **D**!

▶ Only crane without CE-mark: If the emergency operation LICCON overload protection is needed, actuate the keyed button **S82** or the set up key **D**!

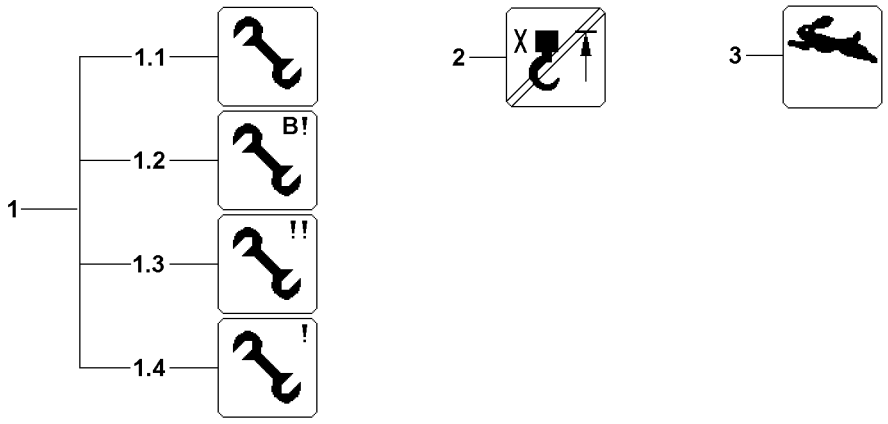
1.3 LMB emergency operation activated	• Icon appears: • when the LMB emergency operation is activated by the keyed button **S82** or the set up key **D**. • **Note**: Depending on the reason for the LMB emergency operation, the icon for no load chart available **1.2** can also appear. • **Note**: The Crane operation program is locked, meaning, no other program can be turned on via the program keys.

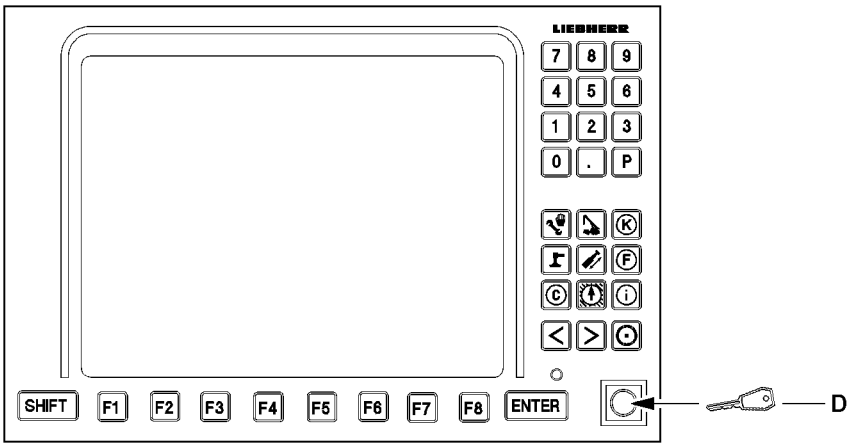
5.3.5 Additional emergency operating modes

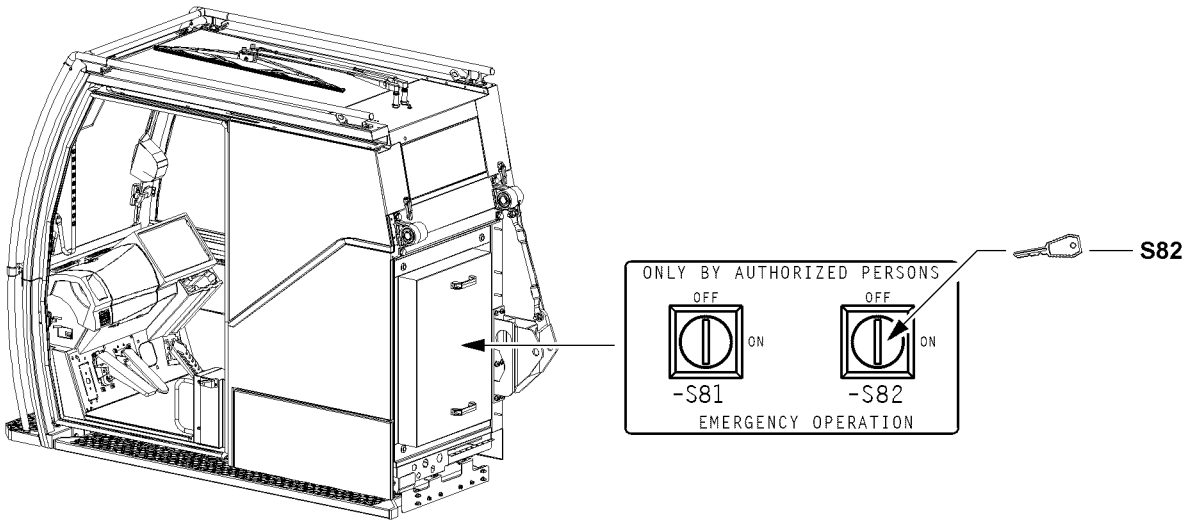
WARNING
Erroneous operation of the crane!
If one of the icons for additional emergency operating modes **1.4** appears, then there is a risk of accidents due to erroneous operation of the crane!
Personnel can be killed or injured!
This could result in property damage!

▶ Deactivate additional operating modes **1.4** again or contact Liebherr Service and coordinate further procedure.

1.4 Additional emergency operating modes	• Appear if additional emergency operating modes were activated


1
1.1
1.2
B!
1.3
!!
1.4
!
2
3


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


ONLY BY AUTHORIZED PERSONS
OFF
ON
-S81
OFF
ON
-S82
EMERGENCY OPERATION
S82

B112695

5.3.6 Bypass “Hoist top”

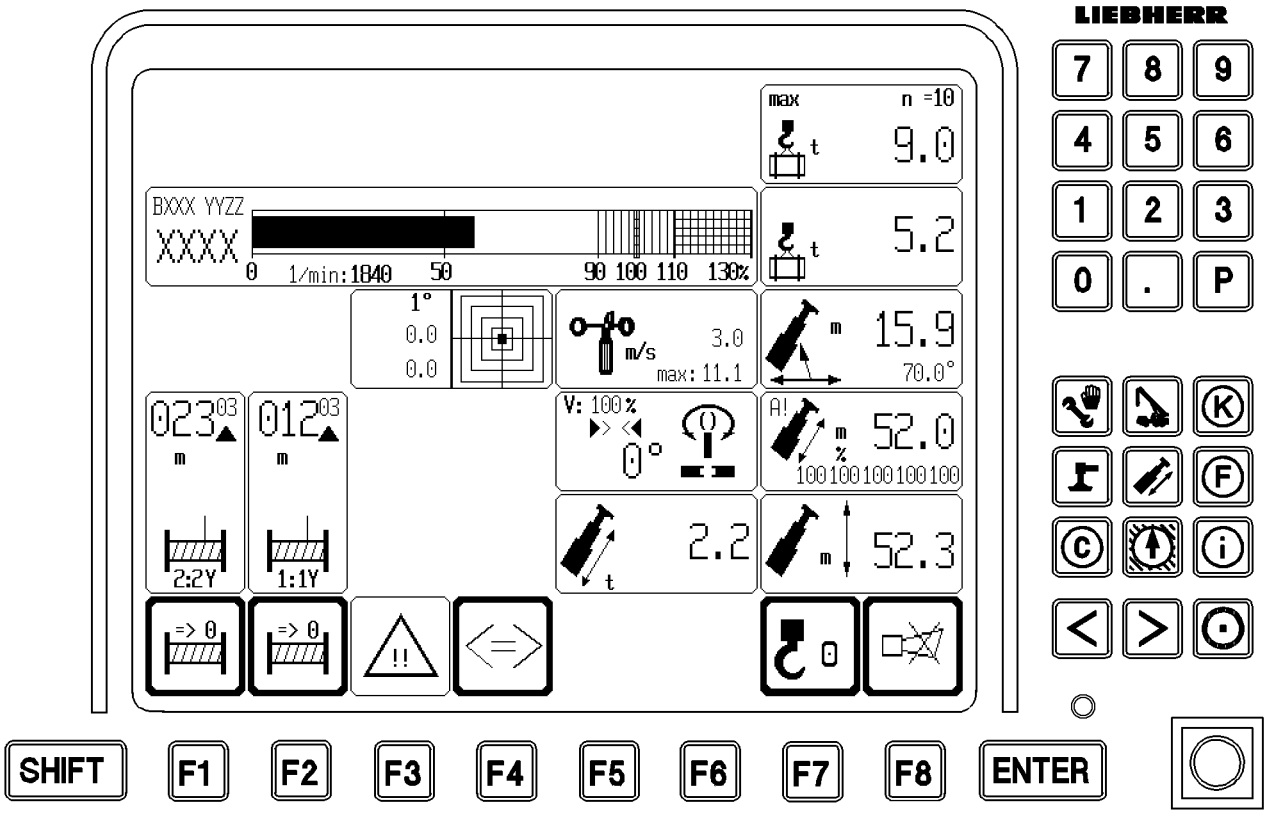
2 Bypass “Hoist top”

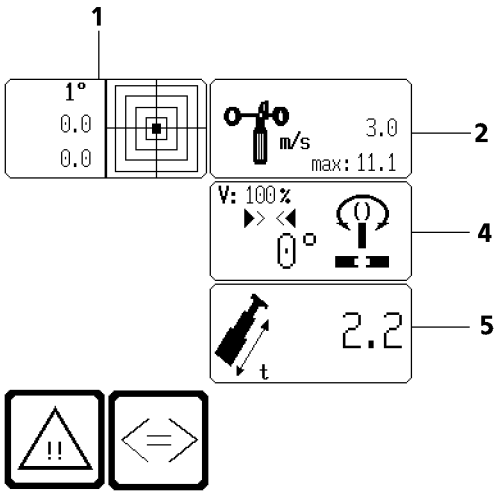
- The icon appears:
  - When the shut off “hoist top” is bypassed via the set up key **D**
  - **Note**:
    The Crane operation program is locked, meaning, no other program can be turned on via the program keys.

5.3.7 Fast mode (Rapid gear)

3 “Rapid gear” icon

- The icon appears if the rapid gear is enabled during a crane movement
- This is possible for the following crane movements:
  - Lift / lower hoist gears (winches)
  - Luff the boom up


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
max
n =10
9.0
5.2
BXXX YYZZ
XXXX
0
1/min:1840
50
90 100 110 130%
1°
0.0
0.0
3.0
max: 11.1
15.9
70.0°
023 03
m
2:2Y
012 03
m
1:1Y
V: 100%
0°
A!
52.0
100 100 100 100 100
2.2
52.3
=> 0
=> 0
!!
0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


1
1°
0.0
0.0
3.0
max: 11.1
2
V: 100%
0°
4
2.2
5
!!

B111639

5.4 Monitored auxiliary functions

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

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

5.4.1 Auxiliary functions for crane operation

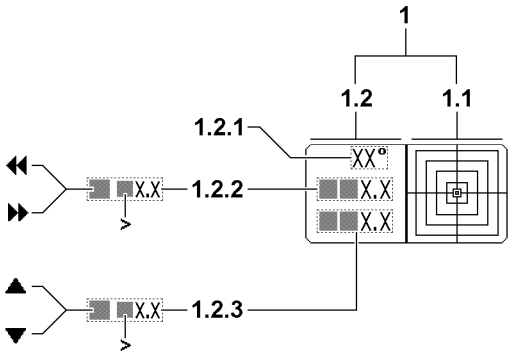
Using the function key **F3**, you can show the icons for the monitored auxiliary functions. Since not all icons of the auxiliary functions fit on one page (at maximum assignment), they are split over two pages. The icons on page 2 (if available) can be shown with the function key **F4**.

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

Page 2:
Not assigned

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

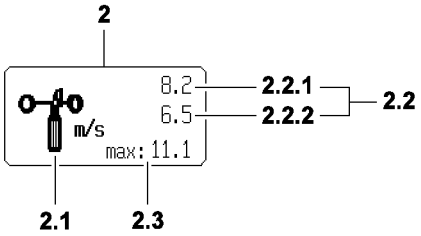
- Monitored auxiliary functions **turned off F3**:
- Error in one function on page 1:
  Icon is displayed on page 1.
- Error in one function on page 2:
  Icon is displayed on page 2.
- Error in one function on page 1 and 2:
  Icon is displayed on page 1 and icon over **F4** blinks (= indicates an error in a function on page 2).
- Monitored auxiliary functions **turned on F3**:
- No error:
  Optional icons (customer request) are displayed.
  If there are also optional icons on page 2, the icon “Change page” of the **F4** key is activated (= indication for switching option).
- Error in one function on page 1:
  Icon has been previously displayed.
- Error in one function on page 2:
  Icon “Change page” blinks (= indication regarding an error of a function on the other page).
- Error in one 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).



B113445

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 incline of the crane to the horizontal in 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 incline.
1.2.2 Lateral direction	• Incline of crane in lateral direction in [°] • The double arrow shows the direction of the incline • If the “larger than symbol” appears, then the crane is inclined further than can be shown!
1.2.3 Longitudinal direction	• Incline of crane in longitudinal direction in [°] • The arrow shows the direction of the incline • If the “larger than symbol” appears, then the crane is inclined further than can be shown!



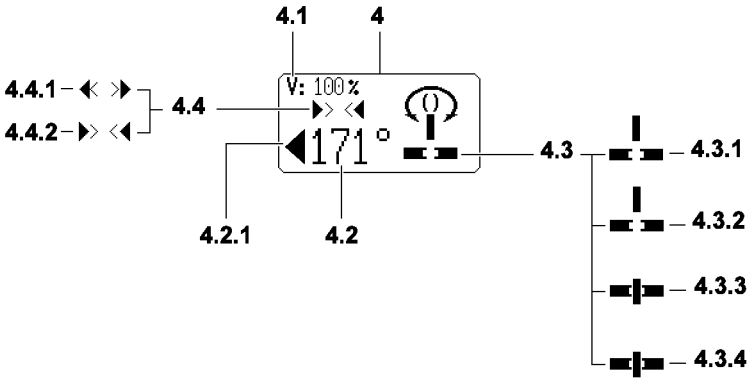
B197637

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
2.1	“Wind speed” icon	• In [m/s] or [ft/s]
2.2	Current wind speeds	
2.2.1	Current wind speed WG	• In crane operation with equipment / accessories: **TK**, **TNZK**. • **Note:** If several wind sensors are attached to the LSB bus, the location of the wind sensor determines the corresponding display in the icon “Wind speed”. The priority depends on the location of the wind sensor, from “outside” (accessory) to “inside” (telescopic boom). The wind speed of the “exterior” wind sensor is displayed in **2.2.1** and the wind speed of the “interior” wind sensor is displayed in **2.2.2**. **Note:** If only one wind sensor is installed and connected to the LSB bus, the wind speed is displayed in **2.2.1**.
2.2.2	Current wind speed WG	• If two wind sensors are installed and connected to the LSB bus, the wind speed of the “inner” wind sensor is displayed in **2.2.2**.

Note

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

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



B111648

4 “Slewing range” icon

4.1 Maximum rotation speed
- V: [%]
- Identifies the current (selected) “maximum rotation speed” of the slewing gear with a fully deflected master switch, relating to the maximum attainable rotation speed of the slewing gear at a preselected speed of 100 %.
  This value may be selected in fixed percentage stages in the LICCON program “Control parameter”.

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

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

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

4.3 Status of lock between superstructure and chassis

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

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

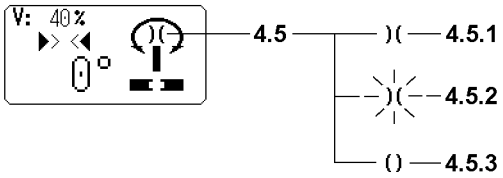
4.3.3 Lock is static
- Locking pin bottom, ±5° in length axle: Superstructure pinned in length axle.

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

4.4 Slewing gear operating mode

4.4.1 Flexible slewing gear* “freely rotating”

4.4.2 Flexible slewing gear* “fixed”



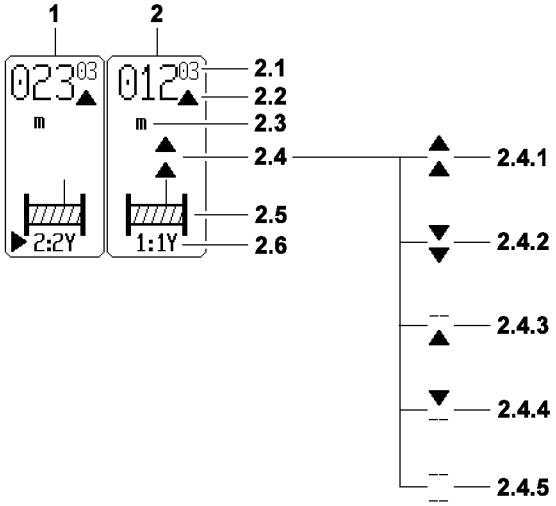
B111636

4.5	“Slewing gear brake opened” icon	
4.5.1	The “slewing gear brake opened” icon appears static	• Slewing gear brake opened
4.5.2	The “slewing gear brake opened* ” icon appears blinking	• Slewing gear brake opened and crawler travel gear actuated (only for option “Driving with opened slewing gear”) **Note:** Driving with opened slewing gear is optional.
4.5.3	“Slewing gear brake closed” icon	• Slewing gear brake closed

B197640

5 “Telescopable load” icon

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



B197641

5.5 “Winch display” icon

1 “Winch2” icon

- The meanings for the icons for winch1 and winch2* are the same, and are explained at the icon “winch1” **2**.

2 “Winch 1” icon

2.1 Travelled distance

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

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

Legend:

- s_{Hk} = correct hook path
- s_{Ha} = displayed hook path
- n_e = selected reeving
- n_t = actual reeving
- The hook path calculation only works accurately if the load is suspended freely and is not luffed during the lifting procedure. Not taken into account are flexation and rope expansion.
- **Note:**
  The length display (hook path display) is only accurate and the layer sheer is only taken into account correctly if the winch has been calibrated and no interruptions of the CPU power supply have occurred (cold start). The hook path display is calibrated by spooling the rope up or out until the calibration switch reacts.

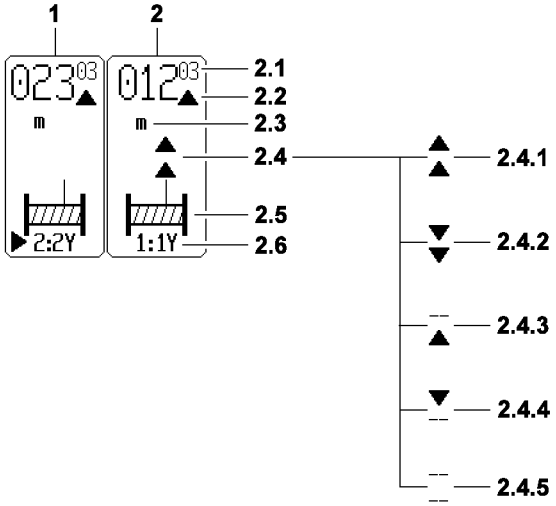
2.2 Direction of hook movement

The arrows on the length value show the direction of the hook movement in relation to the zero point:

- Arrow pointing up: Hook has moved upward from the zero point.
- Arrow pointing down: Hook has moved down from the zero point.

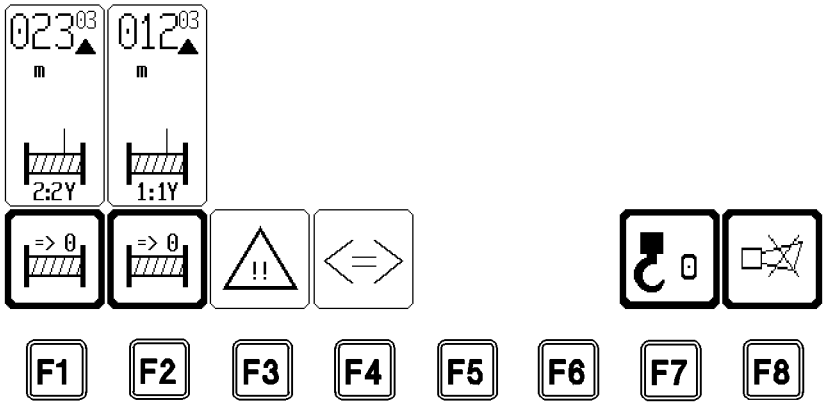
2.3 Length unit for hook path display

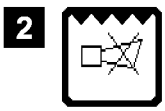
- In [m] or [ft]



B197641

2.4	Winch status display	• There are five winch status icons (all blinking):
2.4.1	Spool out	
2.4.2	Spool up	
2.4.3	Spooled out	• Spooling out is blocked
2.4.4	Spooled up	• Spooling up is blocked
2.4.5	Winch is deactivated or unplugged	• Spooling up and spooling out are blocked (via “Control parameter” program). • **Note:** If no winch status icon appears, the activated winch is inactive and is neither spooled up nor spooled out.
2.5	Winch icon	• (with rope end for winch status icon)
2.6	Winch number with master switch number and master switch operating direction	• Example: 1 : 1 Y. First digit: Winch number. Second digit: Master switch number. Letter: Master switch operating direction.





B197642

5.6 The function key line

The function key line consists of function keys **F1** to **F8** and the function key icon bar above it. The function keys correspond to the various function key icons above them.
The function key icons may trigger a function or they change their appearance when a key is pressed (function keys) and thereby their definition.
Not all function keys have icons assigned to them. This depends on the “active” program selection.
Pressing a function key changes the appearance of the icon above, its meaning, or its textual content.

Note

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

5.6.1 Crane operation

F1 Function key
- Zero point for hook travel display winch 2
- Pressing the function key **F1** causes the “set winch display to zero” icon to appear, i.e. the winch 2 hook path display in the winch icon above is set to “000.00” when the key is pressed. The path measurement begins here.

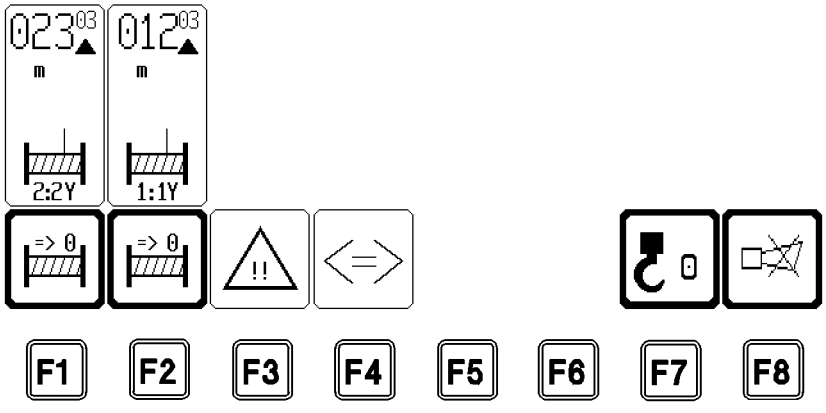
F2 Function key
- Zero point for hook travel display winch 1
- Pressing the function key **F2** causes the “Set winch display to zero” icon to appear, i.e. the winch1 hook path display in the winch icon above is set to “000.00” when the key is pressed. The path measurement begins here.

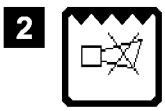
F3 Function key
- Turn monitoring icons on or off
- The function key **F3** can be used to turn all the monitored auxiliary functions in the crane on or off.
- The appearance of the icon changes according to the status:
  - “thick border” = auxiliary function icons turned off
  - “thin border” = auxiliary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

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

F5 Function key
- Not assigned

F6 Function key
- Not assigned





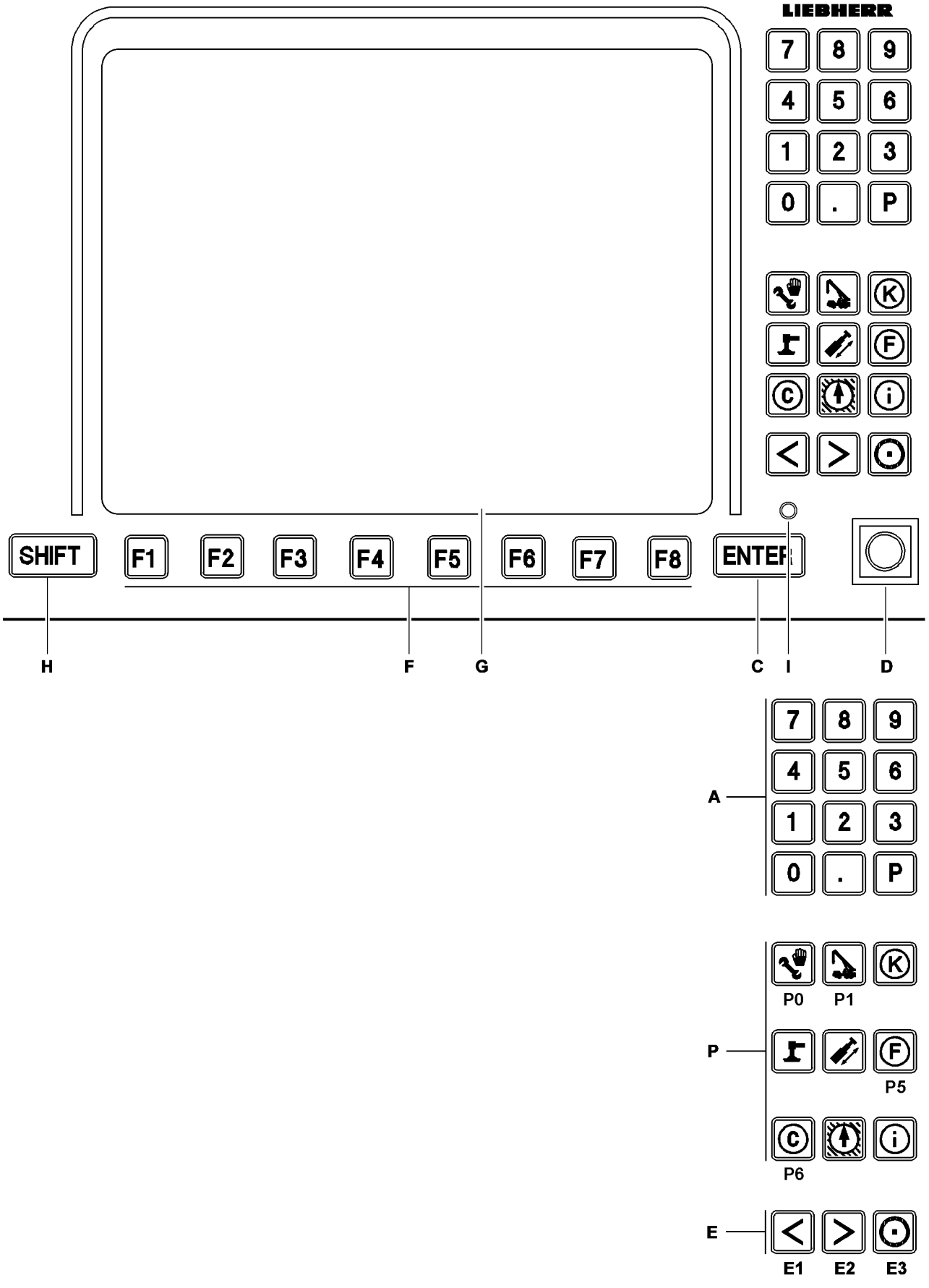
B197642

F7 Function key

- Taring
- When the function key **F7** is pressed, the actual load display is set to “zero”. At the same time, the word “net” appears in the icon of the actual load display. This function, for example, makes it possible to eliminate the weights of the hoist rope, load carriers, lifting and 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.
- The taring is cancelled by one of the following three actions:
  - By pressing the function key **F7** again.
  - By telescoping the boom by more than 3 LE (dm or 1/10 ft.).
  - By luffing by more than ±4°.

F8 Function key

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


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
H F G C I D
A
P0 P1
P5
P6
P
E
E1 E2 E3

B105208

5.7 Other operating elements

The following functions are assigned to the other operating elements of the display and operating unit of the LICCON computer system in program “Crane operation”.

A Keypad

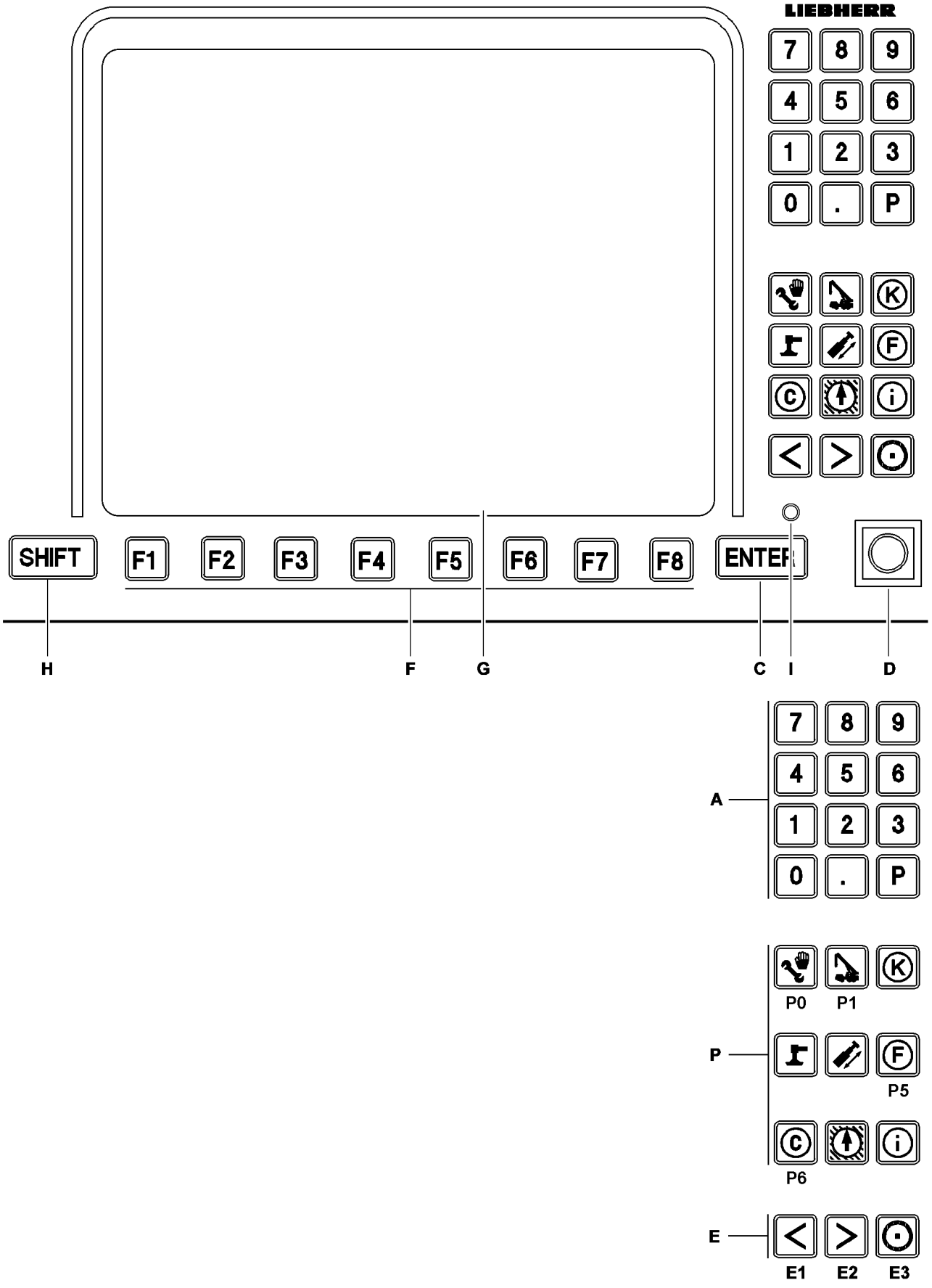
- Keys “0” to “9” and “P” have no function in the “Crane operation” program.
- “SHIFT” and “.” keys
  Using key “.”, the so-called test pattern function is turned on and off, meaning that all available symbols appear on the LICCON monitor with an incorrect display value.
  Note:
  The monitored auxiliary functions, however, must be opened in the desired page if they are to appear in the test screen. The test screen display may be held by pressing the “SHIFT” key and “.”, otherwise the normal operating screen will appear after 10 seconds or after pressing the key “.” again.

P Program keys

- The program keys are used to select individual programs. However, the appropriate program-specific features (for example, switching from “Set up” to “Crane operation” using the “O.K.”) must always be observed.
  Note:
  The program currently running **cannot** be called up again using its program key.
  The programs can only be called up with their program key when the set up key was not actuated before.

C Enter key

- No function in “Crane operation” program


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
H F G C I D
A
P0 P1
P
P5
P6
E
E1 E2 E3
B105208

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 actuating the set up key **D**, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available!

- **Bypass of the hoist top shut off**
  If the hook block contacts the hoist limit switch weight during its upward movement, the hoist limit switch is triggered. The crane movement “spool up winches” and others are turned off. This shut off can be bypassed by the set up key **D** in the “right touching” position. To do so, chapter 4.20 in the Crane operating instructions must be observed!

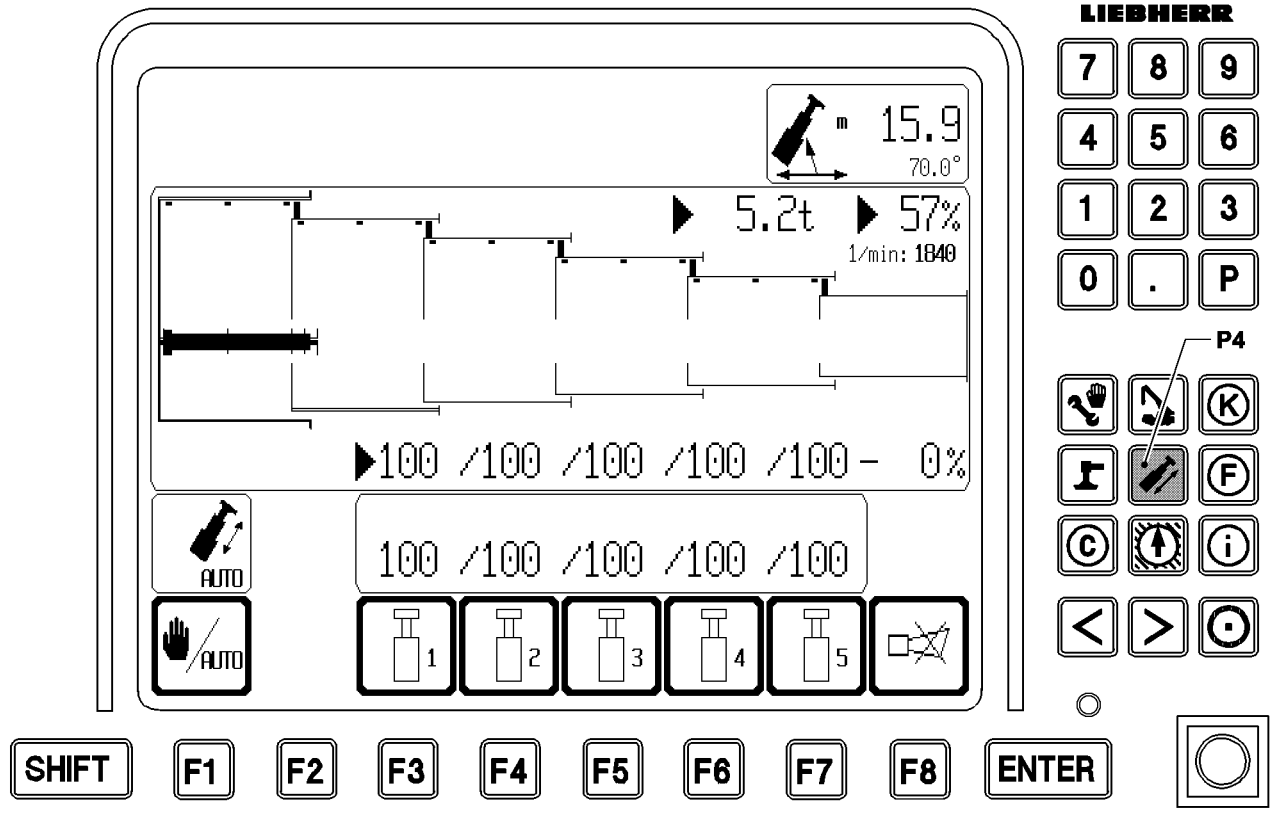
E Special function keys

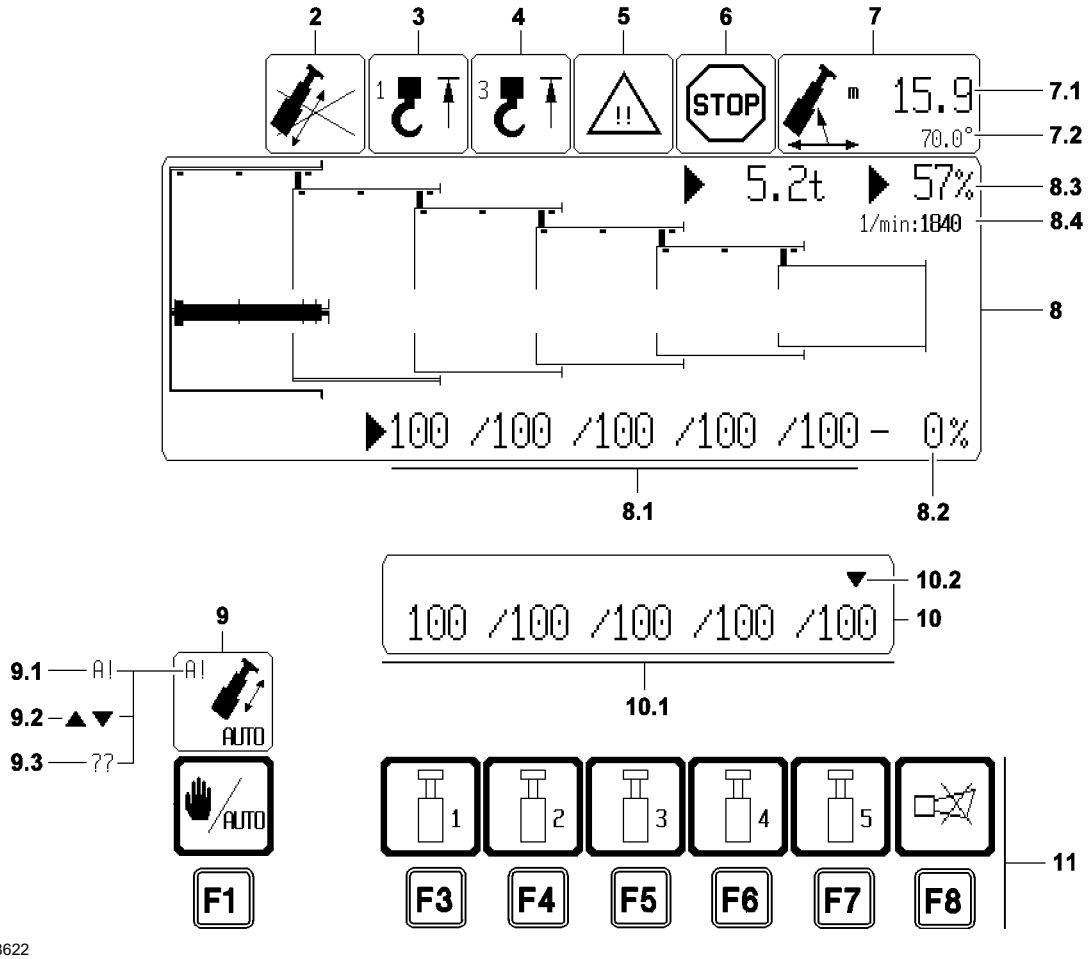
- Monitor brightness adjustment (see section “Control elements of the LICCON computer system”)

Note
▶ Additional functions of the special function keys **E** are program-dependent and are further explained in the description of the individual LICCON programs!

H “SHIFT” key

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


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
P4
m 15.9
70.0°
5.2t 57%
1/min: 1840
100 /100 /100 /100 /100 - 0%
100 /100 /100 /100 /100
AUTO
1 2 3 4 5
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


2 3 4 5 6 7
STOP
m 15.9
70.0°
7.1
7.2
5.2t 57%
1/min:1840
8.3
8.4
8
100 /100 /100 /100 /100 - 0%
8.1
8.2
10.2
100 /100 /100 /100 /100
10
10.1
9
9.1 A!
9.2 ▲▼
9.3 ??
AUTO
F1
F3 F4 F5 F6 F7 F8
11

B198622

6 “Telescoping” program

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

6.1 Starting the program

▶ Press program key **P4**.

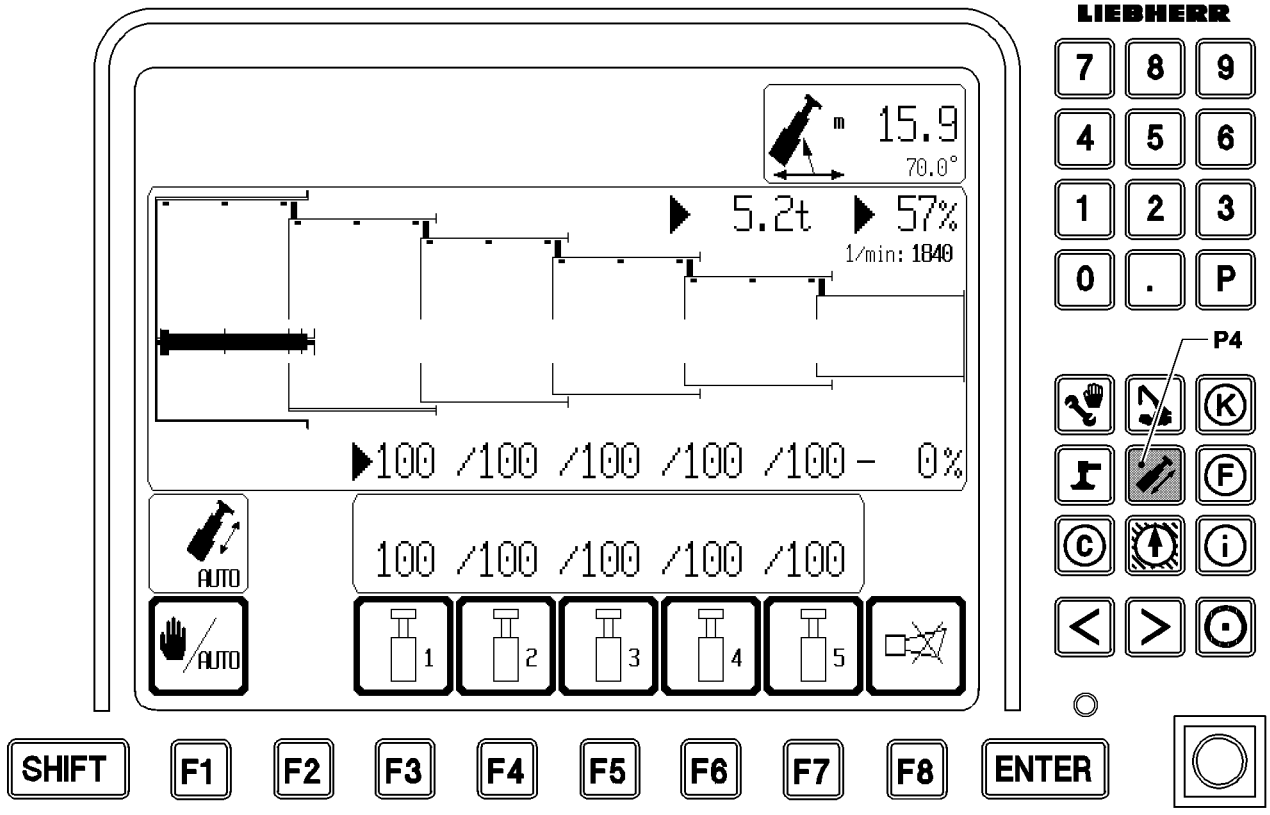
or

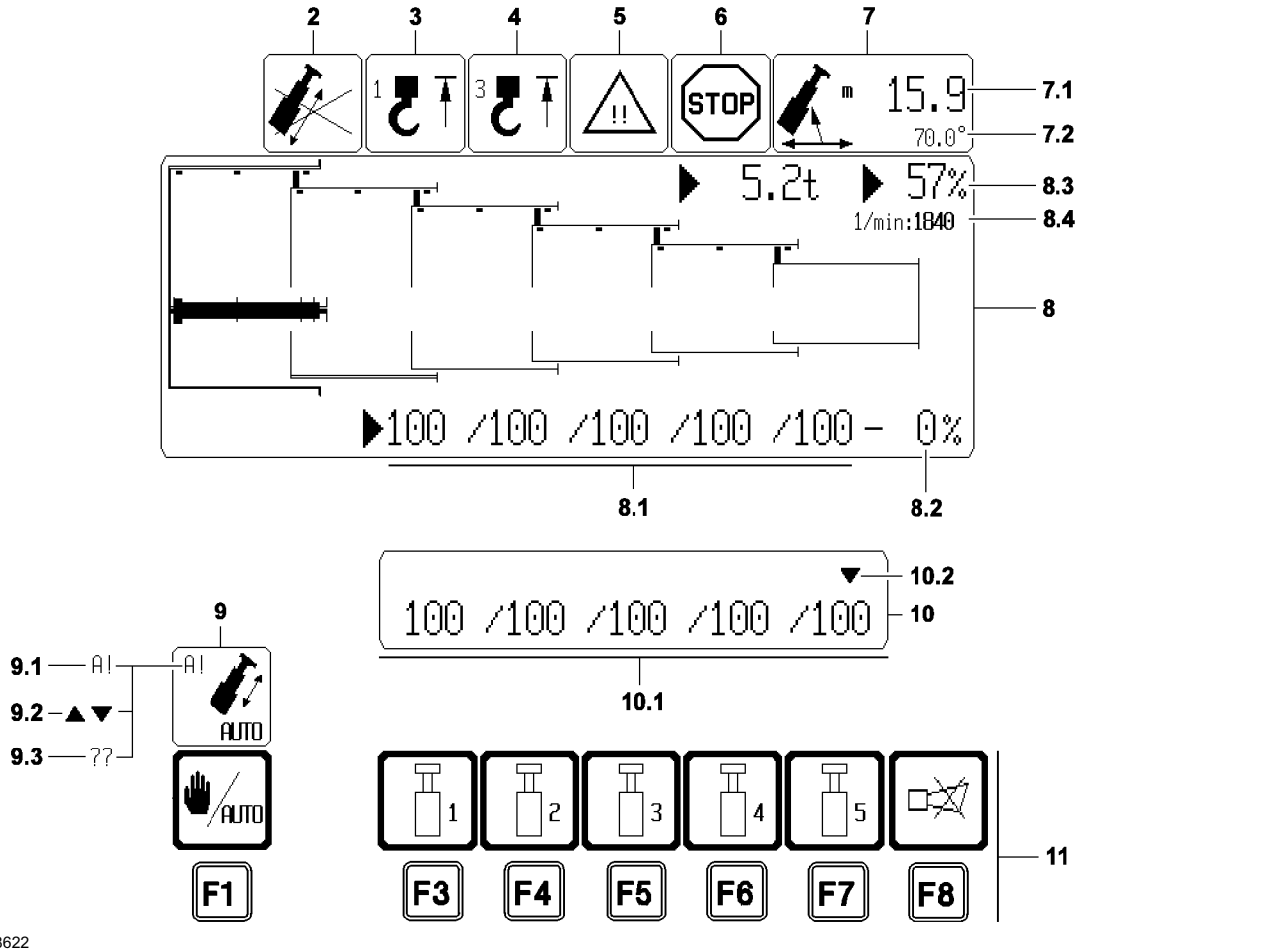
- Automatic start from “Crane operation” program when telescoping target (A!) **9.1** is reached and telescoping at master switch.

6.2 User interface

For a description of icons 2 to 7, see section “Alarm functions” in the “Crane operation” program.

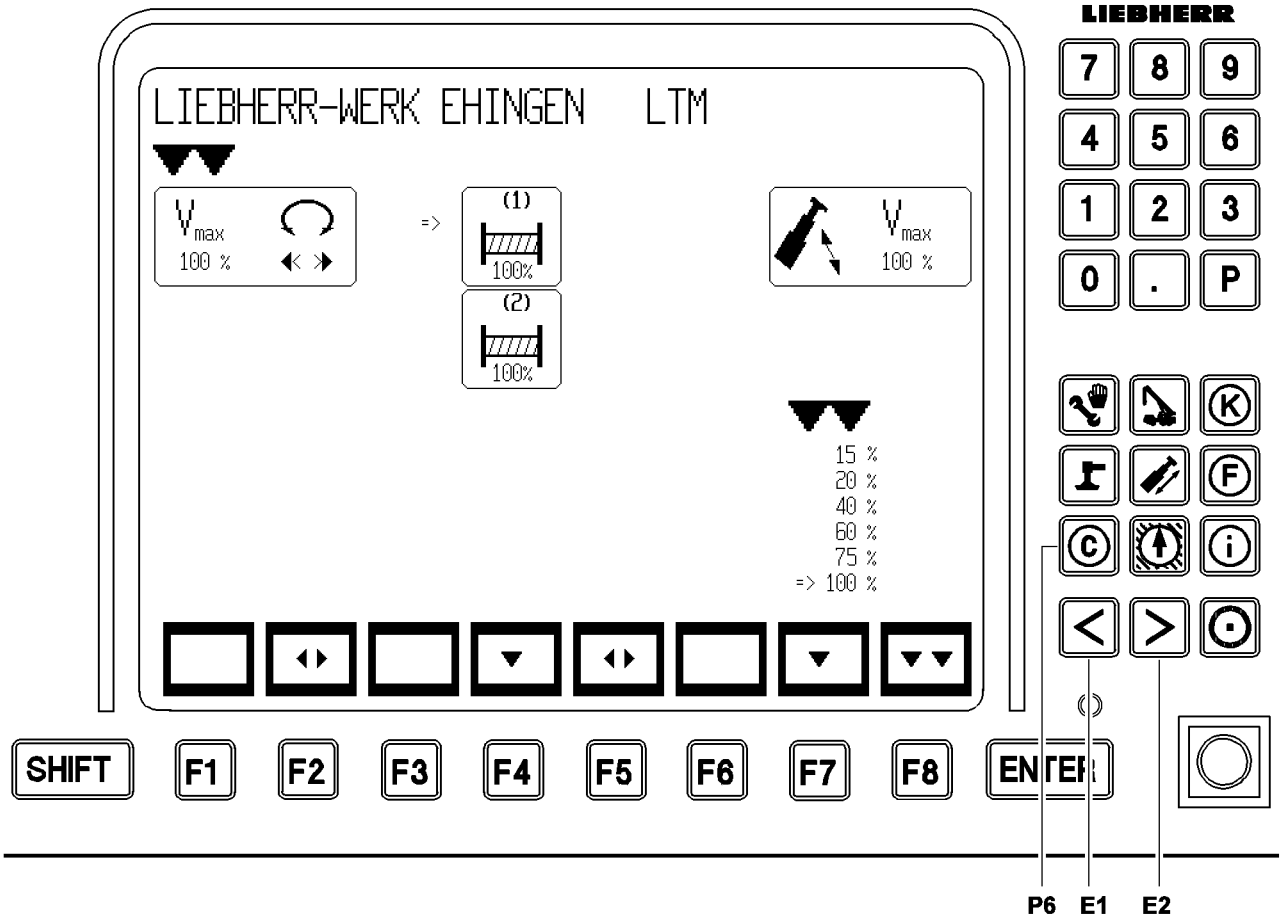
2	Preventing further telescoping processes in relation to the telescoping cylinder	• Due to exceeding the expected load in the unpinned state • **Note:** This is the same program-specific illustration of the same topic as in section “Telescopable load”.
3	“Hoist top” on HES1 and / or HES4 icon	
4	“Hoist top” icon at HES2 or HES4	
5	“Advance warning” icon	
6	“STOP” icon	
7	“Boom radius” icon	
7.1	Radius	• In [m] or [ft]
7.2	Main boom angle to the horizontal	• In [°]
8	“Stylized illustration of the telescopic boom” icon	
8.1	Current extension condition of telescopes 1 - 5	• In [%]
8.2	Current extension condition of telescoping cylinder	• In [%]
8.3	Display of actual load and utilization of crane in percentages	• In [t] or [kips] and in [%]
8.4	Engine speed	• In [rpm]

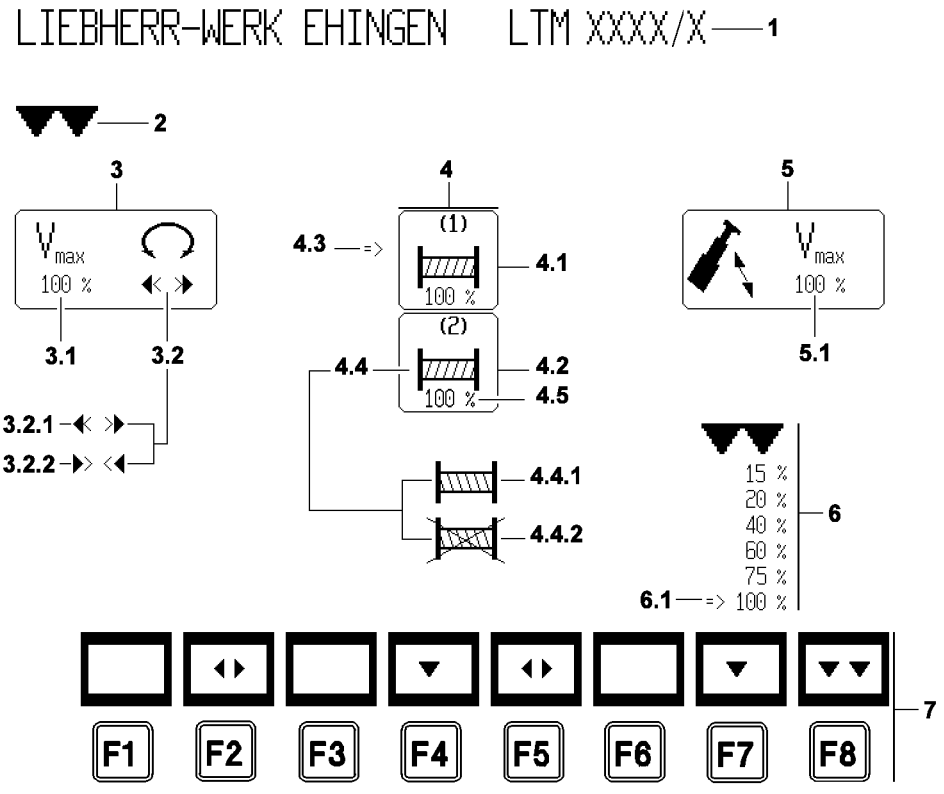

LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
P4
m 15.9
70.0°
5.2t 57%
1/min: 1840
100 /100 /100 /100 /100 - 0%
100 /100 /100 /100 /100
AUTO
1 2 3 4 5
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


2 3 4 5 6 7
STOP
m 15.9
70.0°
7.1
7.2
5.2t 57%
1/min:1840
8.3
8.4
8
100 /100 /100 /100 /100 - 0%
8.1
8.2
10.2
100 /100 /100 /100 /100
10
10.1
9
9.1 A!
9.2 ▲▼
9.3 ??
AUTO
1 2 3 4 5
11
F1 F3 F4 F5 F6 F7 F8

B198622

9	“Automatic telescoping mode” icon	
9.1	Preselected telescoping target reached	
9.2	Nominal deflection direction of master switch	Request: • Telescope in = down arrow • Telescope out = arrow up
9.3	Error in system	
10	“Selected telescoping targets of telescopes 1 - 5” icon	
10.1	Target selection for telescopes 1 - 5	
10.2	Blinking marker (arrow)	• To the selected telescoping target • As a warning in the event of incorrect operation, target already reached, or enter new target
11	Function key line	
F1	Function key	• Switch between automatic operation and manual telescoping
F3	Function key	• Target selection Telescope 1
F4	Function key	• Target selection Telescope 2
F5	Function key	• Target selection Telescope 3
F6	Function key	• Target selection Telescope 4
F7	Function key	• Target selection Telescope 5
F8	Function key	• Press once: Turn the acoustic signal off. • Press twice: Fields that are displayed visually in the “Horn” icon are automatically displayed in the error determination display.


LIEBHERR
LIEBHERR-WERK EHINGEN LTM
Vmax
100 %
(1)
100%
(2)
100%
15 %
20 %
40 %
60 %
75 %
=> 100 %
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
P6
E1
E2


LIEBHERR-WERK EHINGEN LTM XXXX/X
1
2
3
4
5
Vmax
100 %
3.1
3.2
3.2.1
3.2.2
4.3
(1)
100 %
4.1
(2)
4.4
4.2
100 %
4.5
4.4.1
4.4.2
5.1
15 %
20 %
40 %
60 %
75 %
6
6.1
=> 100 %
7
F1
F2
F3
F4
F5
F6
F7
F8

B197645

7 “Control parameter” program

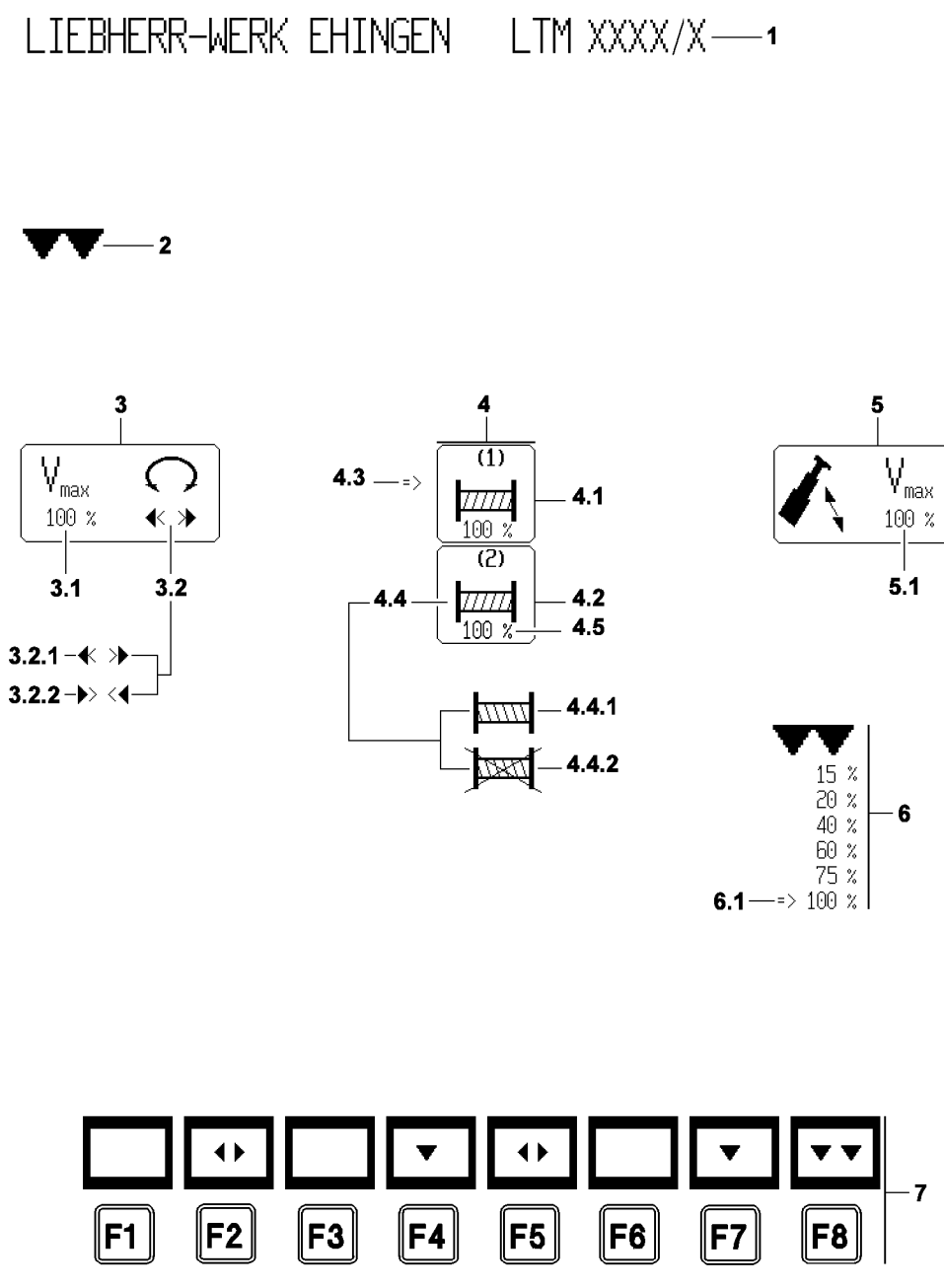
The “Control parameter” program offers the following possibilities:
– Preselection of maximum rotation speed of slewing gear.
– Selection between “freely rotating slewing gear” and “fixed slewing gear”.
– Preselection of the maximum winch rotation speed and activation / deactivation of winch 1 and winch 2*.
– Preselection of the maximum luffing speed of the telescopic boom.

During the “control parameter” program the set up key **D** is monitored. If the set up key **D** is operated during the program, then the program is immediately switched back to the “Operation” program.

DANGER
Danger of accident!
▶ **Never** change the maximum speeds or the activation / de-activation of the winches during a crane movement.

7.1 Starting the program

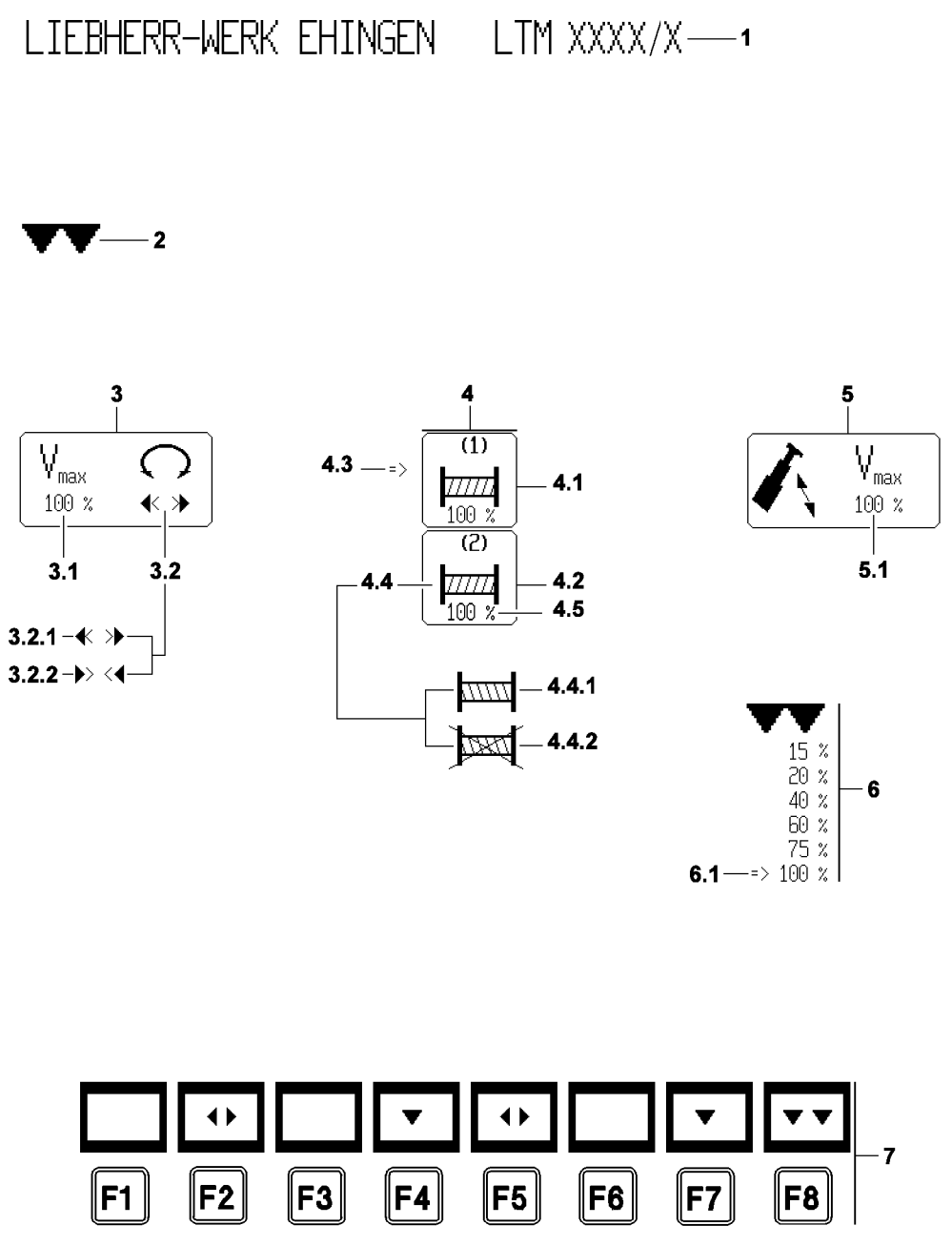
▶ Press program key **P6**.


LIEBHERR-WERK EHINGEN LTM XXXX/X
1
2
3
Vmax
100 %
3.1
3.2
3.2.1
3.2.2
4
(1)
4.3
4.1
100 %
(2)
4.4
4.2
100 %
4.5
4.4.1
4.4.2
5
Vmax
100 %
5.1
15 %
20 %
40 %
60 %
75 %
6
6.1
100 %
F1
F2
F3
F4
F5
F6
F7
F8
7

B197732

7.2 User interface

1	Crane type	
2	Selector	• Double arrow pointing down • For selecting icons
3	“Slewing gear” icon	
3.1	“Maximum slewing speed” icon	• V_{max} in [%]
3.2	Slewing gear operating mode	• Changing operating mode using the function key **F2** (see chap. 4.05, “Crane operation”)
3.2.1	Flexible slewing gear “freely rotating / coasting”	
3.2.2	Flexible slewing gear “fixed”	
4	“Winch” icon group	
4.1	Winch 1	
4.2	Winch 2	
4.3	Selector	• Arrow to the right • For selecting winches
4.4	Winch icon	
4.4.1	Winch activated	
4.4.2	Winch deactivated	
4.5	Speed	• In [%] • See value field with selector
5	“Maximum luffing speed” icon	• V_{max} in [%]
6	Value field with selector	• The percentage values relate to the speed with maximum deflection of the manual control lever, always in relation to the maximum achievable speed of the drive, with 100 % preselected speed. Five stages may be preselected.
7	Function key line	
F2	Function key	• Operating mode selection for slewing gear*
F4	Function key	• Winch selection
F5	Function key	• Activation or deactivation of selected winches
F7	Function key	• Selection of percentage value for respective speed in value field
F8	Function key	• Switch back to “Crane operation” program and transfer parameters
8	Input key “**ENTER** ”	• Accept selected speed setting to the preset functions
9	Special function keys	
E1	Special function key	• Moves the selector **2** for selecting icons to the left
E2	Special function key	• Moves the selector **2** for selecting icons to the right


LIEBHERR-WERK EHINGEN LTM XXXX/X
1
2
3
Vmax
100 %
3.1
3.2
3.2.1
3.2.2
4
(1)
4.3
4.1
100 %
(2)
4.4
4.2
100 %
4.5
4.4.1
4.4.2
5
Vmax
100 %
5.1
15 %
20 %
40 %
60 %
75 %
6
6.1
100 %
F1
F2
F3
F4
F5
F6
F7
F8
7

B197732

7.3 Changing the maximum rotation speed of slewing gear

DANGER
Danger of accident!
- ▶ During crane operation with load, always adhere to the maximum rotation speeds depending on boom length and operating modes (according to load charts)!
- ▶ The greater the boom length, the heavier the equipment and the greater the load, the smaller the set “maximum rotation speed”.
- ▶ **Never** deflect the master switch for the slewing gear to the stop at maximum load.

▶ Using the special function key **E1** or special function key **E2**, select the “maximum rotation speed” icon **3.1**.

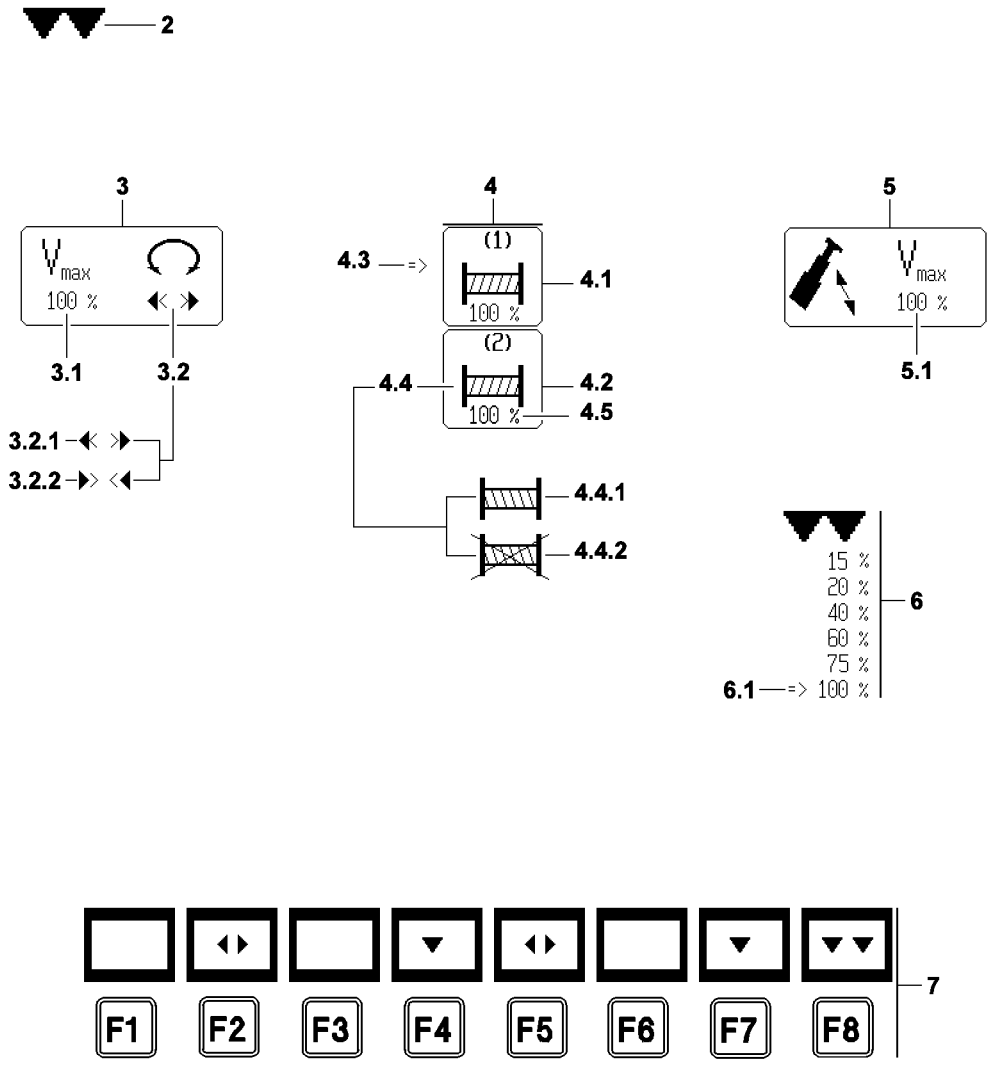
Result:
– Selector (double arrow down) **2** appears above the icon.

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

Result:
– Selector (arrow to right) **6.1** shows the selected percentage value.

▶ Use the “Enter” key **8** to confirm the selected maximum rotation speed.

Result:
– The value of the maximum rotation speed will be accepted.


LIEBHERR-WERK EHINGEN LTM XXXX/X
1
2
3
Vmax
100 %
3.1
3.2
3.2.1
3.2.2
4
(1)
4.3
4.1
100 %
(2)
4.4
4.2
100 %
4.5
4.4.1
4.4.2
5
Vmax
100 %
5.1
15 %
20 %
40 %
60 %
75 %
6
6.1
100 %
F1
F2
F3
F4
F5
F6
F7
F8
7

B197732

7.4 Winches

7.4.1 Changing the maximum rotation speed

▶ Using the special function key **E1** or special function key **E2**, select the icon group winches **4**.

Result:

– Selector (double arrow down) **2** appears above the icon group.

▶ Using the function key **F4**, select the icon for winch 1 or winch 2.

Result:

– Selector (arrow to right) **4.3** shows the selected winch.

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

Result:

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

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

Result:

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

7.4.2 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.

▶ Using the function key **F4**, select the icon for winch 1 or winch 2*.

Result:

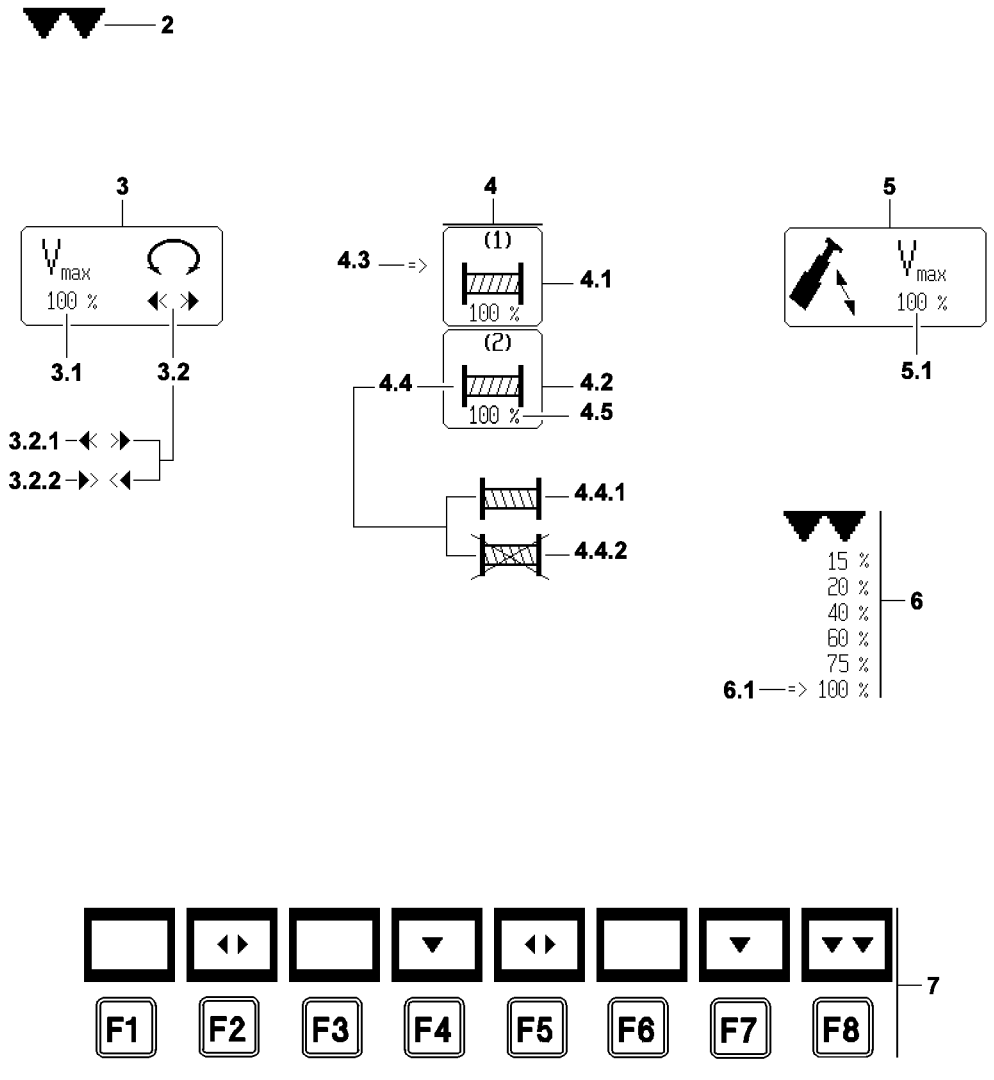
– Selector (arrow to right) **4.3** shows the selected winch.

▶ Using the function key **F5**, activate or deactivate the selected winch.

Result: The winch icon in the icon changes the appearance:

– Winch icon crossed out = winch deactivated **4.4.2**.

– Winch icon not crossed out = winch activated **4.4.1**.


LIEBHERR-WERK EHINGEN LTM XXXX/X
1
2
3
Vmax
100 %
3.1
3.2
3.2.1
3.2.2
4
(1)
4.3
4.1
100 %
(2)
4.4
4.2
100 %
4.5
4.4.1
4.4.2
5
Vmax
100 %
5.1
15 %
20 %
40 %
60 %
75 %
6
6.1
100 %
F1
F2
F3
F4
F5
F6
F7
F8
7

B197732

7.5 Changing the maximum luffing speed

▶ Using the special function key **E1** or special function key **E2**, select the “Maximum luffing speed” icon **5**.

Result:

– Selector (double arrow down) **2** appears above the icon.

▶ Select the maximum luffing speed in [%] with function key **F7**.

Result:

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

▶ Use the “Enter” key **8** to confirm the selected maximum luffing speed.

Result:

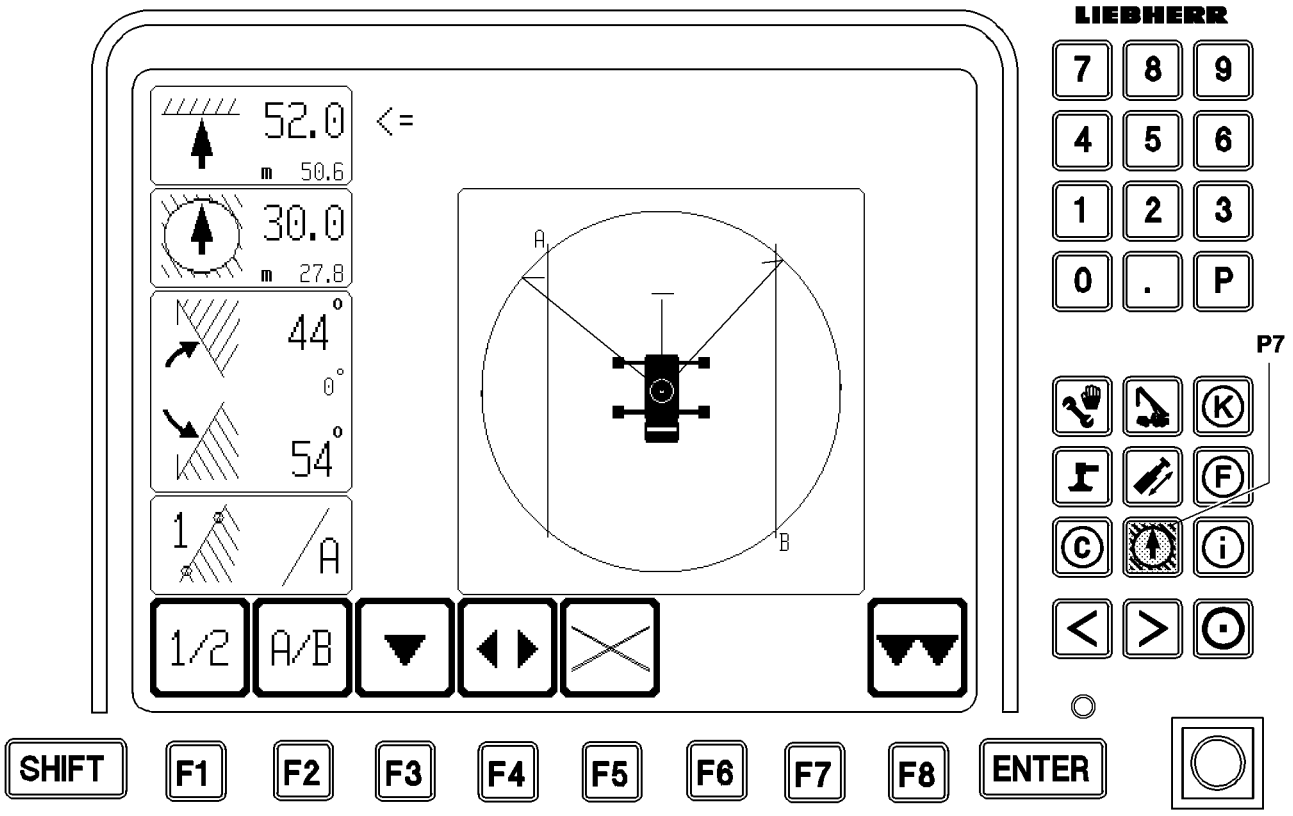
– The value of the maximum luffing speed will be accepted.

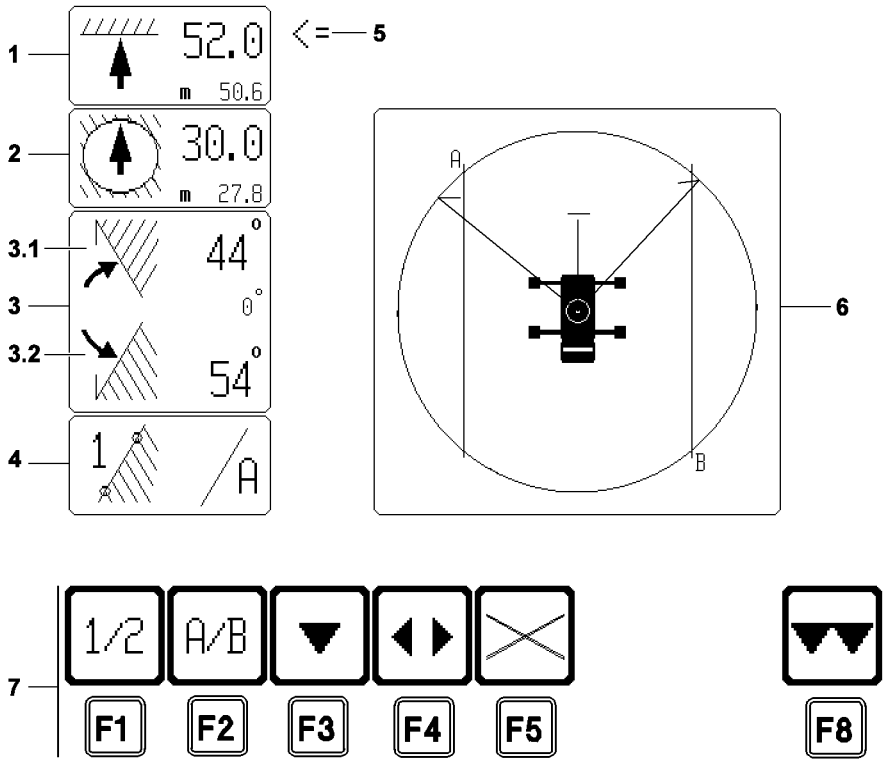
7.6 Switching back to the “Crane operation” program

▶ Press function key **F8**.

Result:

– The parameters previously confirmed using the “Enter” key **8** will be accepted.


LIEBHERR
52.0
m 50.6
30.0
m 27.8
44°
0°
54°
1
A
1/2
A/B
7
8
9
4
5
6
1
2
3
0
.
P
P7
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


1
52.0
m 50.6
5
2
30.0
m 27.8
3.1
44°
3
0°
3.2
54°
4
1
A
6
7
1/2
A/B
F1
F2
F3
F4
F5
F8

B197646

8 The “Working range limitation” program*

A detailed description of operating range limitation can be found in the separate operating instructions for “Working range limitation”.

8.1 Starting the program

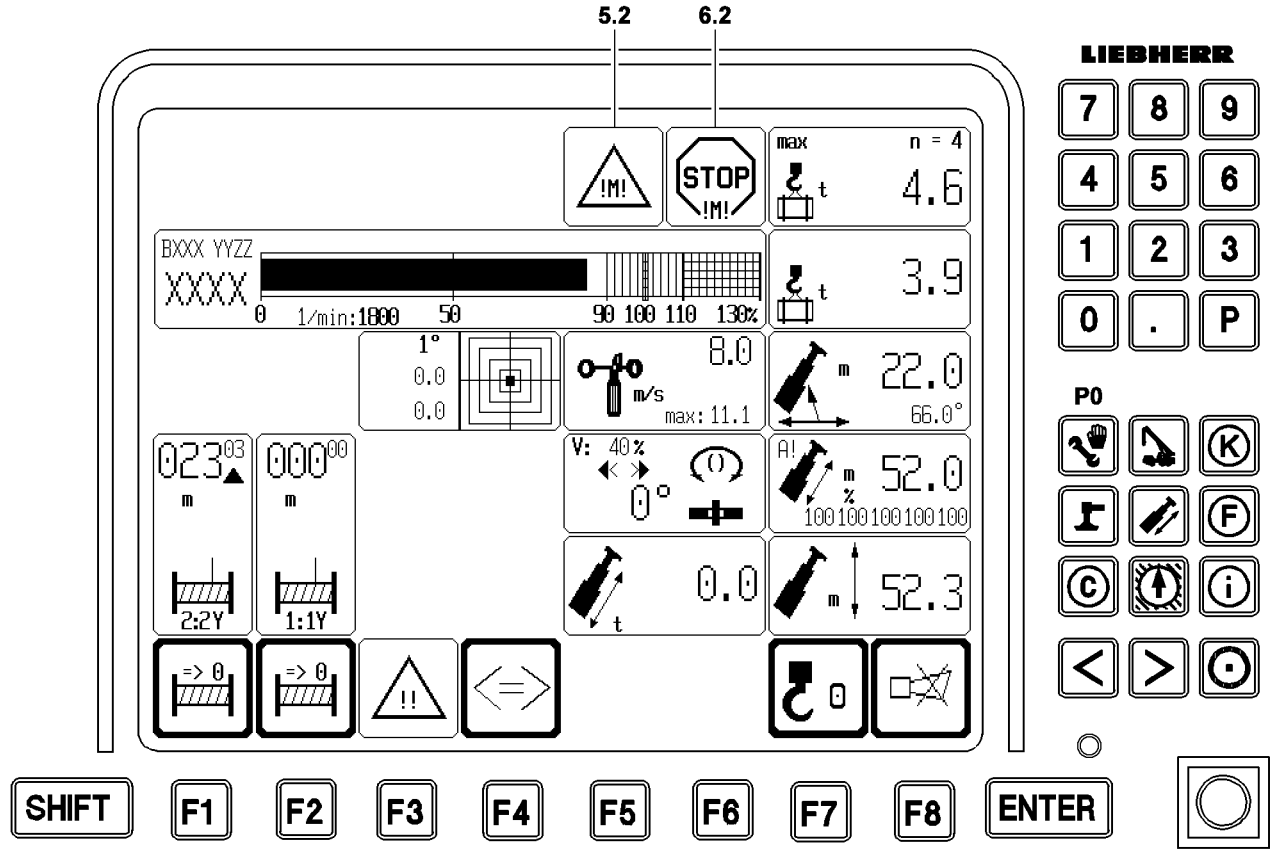
▶ Press program key **P7**.

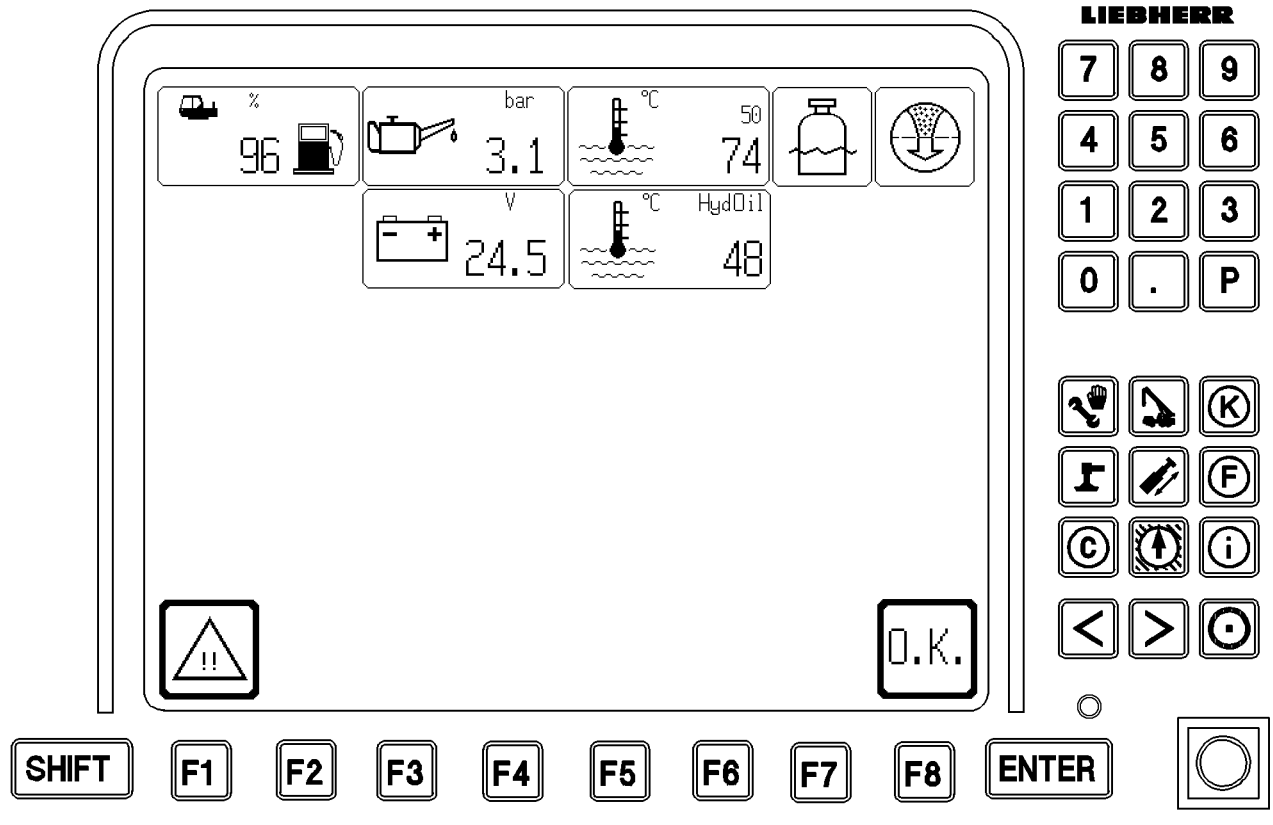
8.2 User interface

1	“Limitation of pulley head height” icon	
2	“Radius limitation” icon	
3	“Slewing limit stop” icon	
3.1	Right slewing limit stop	
3.2	Left slewing limit stop	
4	“Edge limit with edge and point selection” icon	• The limit function icons are shown crossed out if they are inactive
5	Function selector	• For selecting limiting functions
6	“Graphic display of programmed limits” icon	
7	Function key line	
F1	Function key	• Select point 1 or 2 of selected edge A or B
F2	Function key	• Selection of edge A or B that is being programmed
F3	Function key	• The function selector is moved down by one limit function
F4	Function key	• The limit function selected with the function selector changes its status. If previously active, it will now be inactive when the function key **F4** is pressed, and vice versa. An inactive limit function is identified by a crossed out icon. If the function selector shows a slewing limit to the left or the right, then both limits will always be switched. **Note:** For the edge limit, only the preselected edge will be switched. The edge that is not displayed can be active or inactive at the same time.
F5	Function key	• All limit functions become inactive
F8	Function key	• Exit the program and return to the “Crane operation” program

8.3 Displays in “Crane operation” program

If a programmed working range limiter is activated, this condition is indicated in the “Crane operation” program by an alternative STOP icon in the position of the normal LMB STOP icon (see section “Alarm functions” in “Crane operation” program).


5.2
6.2
LIEBHERR
STOP
!M!
max
n = 4
4.6
3.9
XXXX
8.0
m/s
max: 11.1
22.0
66.0°
52.0
52.3
0.0
P0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
96
bar
3.1
74
24.5
HydOil
48
O.K.
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B111649

9 The “Engine monitoring” program

In the “Engine monitoring” program, all relevant data for the engine are shown, such as engine oil pressure, coolant temperature etc. In case of a problem, the system switches back automatically from “Crane operation” or “Telescoping” programs.

9.1 Starting the program

The program starts automatically:

▶ Once if a STOP event takes place during crane operations (at least one master switch is deflected or activated). The engine monitoring screen is displayed for 3 seconds and then automatically reverts to the crane operating screen.

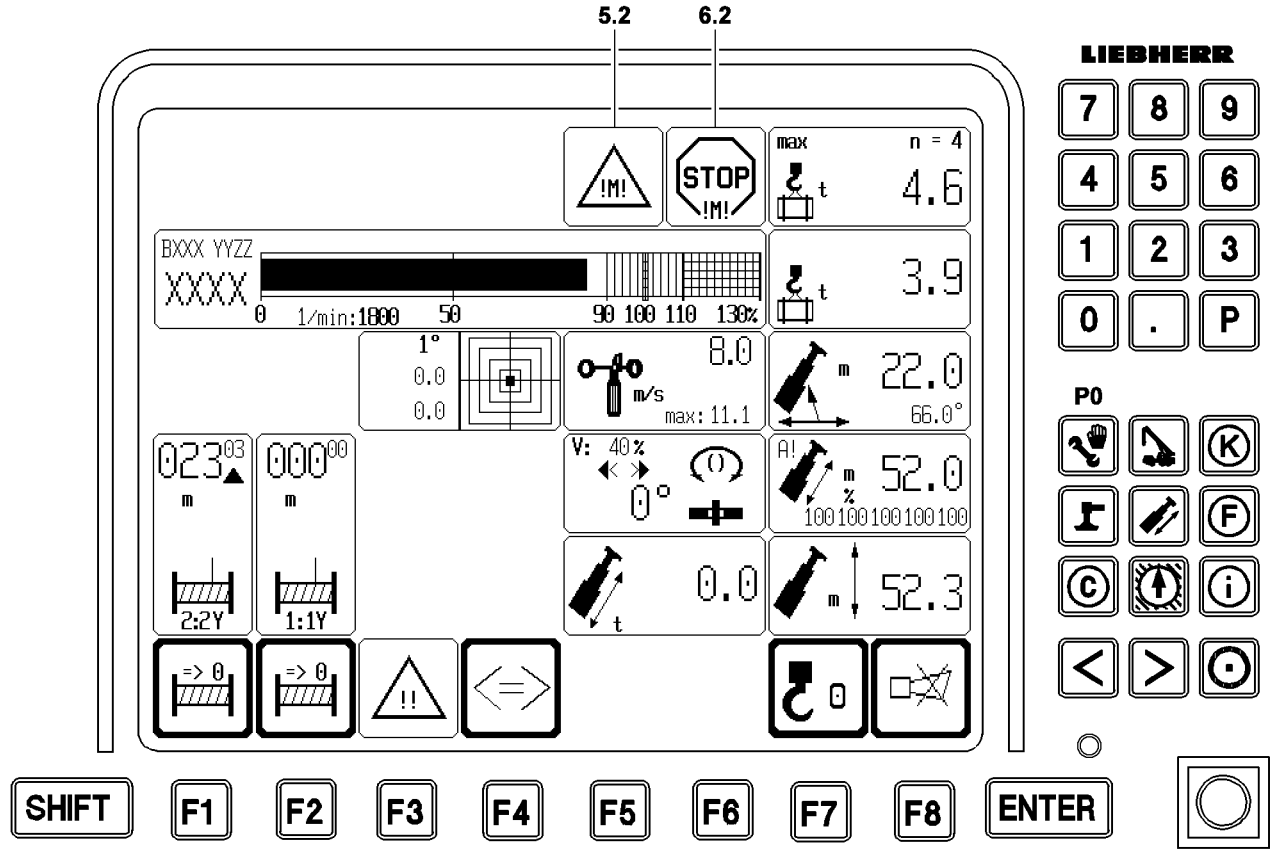
or

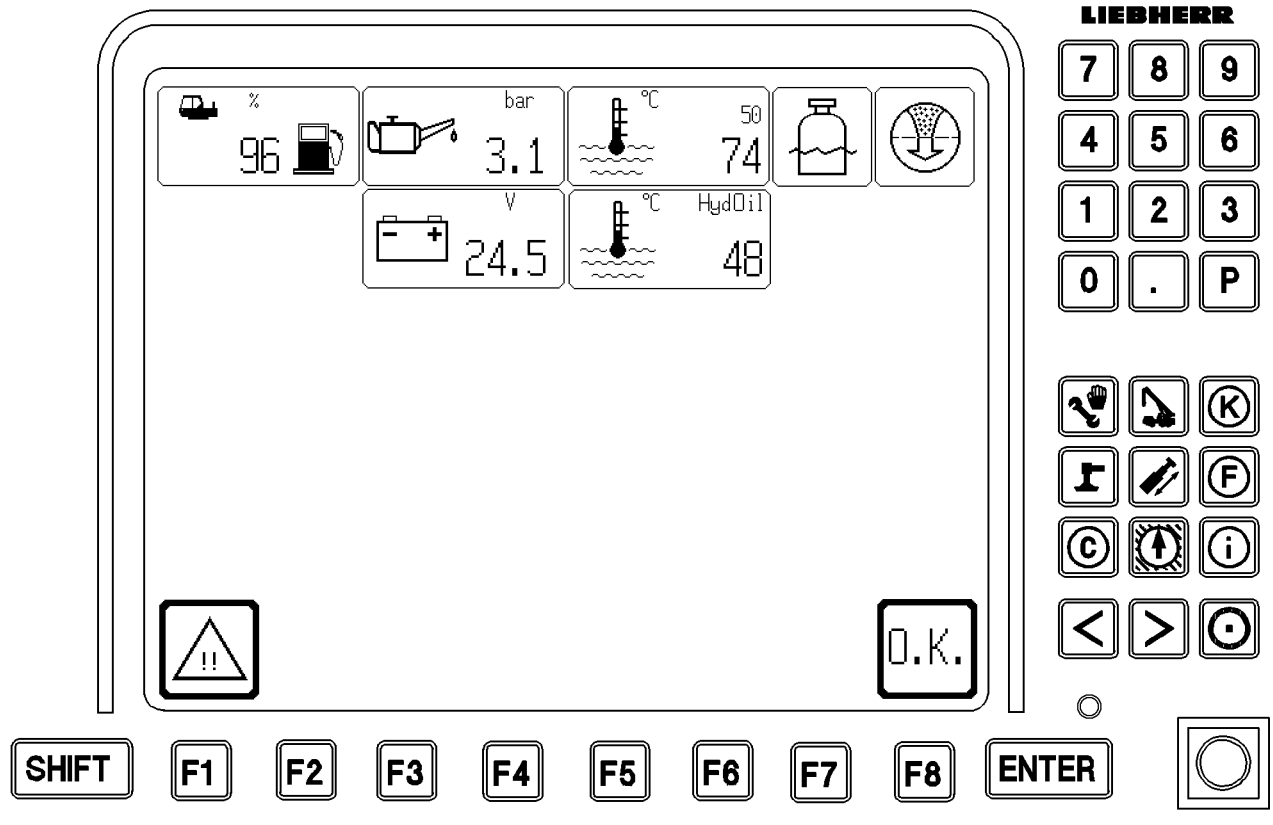
- At an advance warning, warning or STOP event during the start-up of the LICCON computer system.

This is how you start the program at the prompt:

In that case the engine monitoring screen is retained, and all **load torque increasing** crane movements are locked or turned off.

▶ Press the key combination **SHIFT** and **P0** (Set up).


5.2
6.2
LIEBHERR
STOP
!M!
max
n = 4
4.6
3.9
8.0
m/s
max: 11.1
22.0
66.0°
52.0
52.3
0.0
P0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

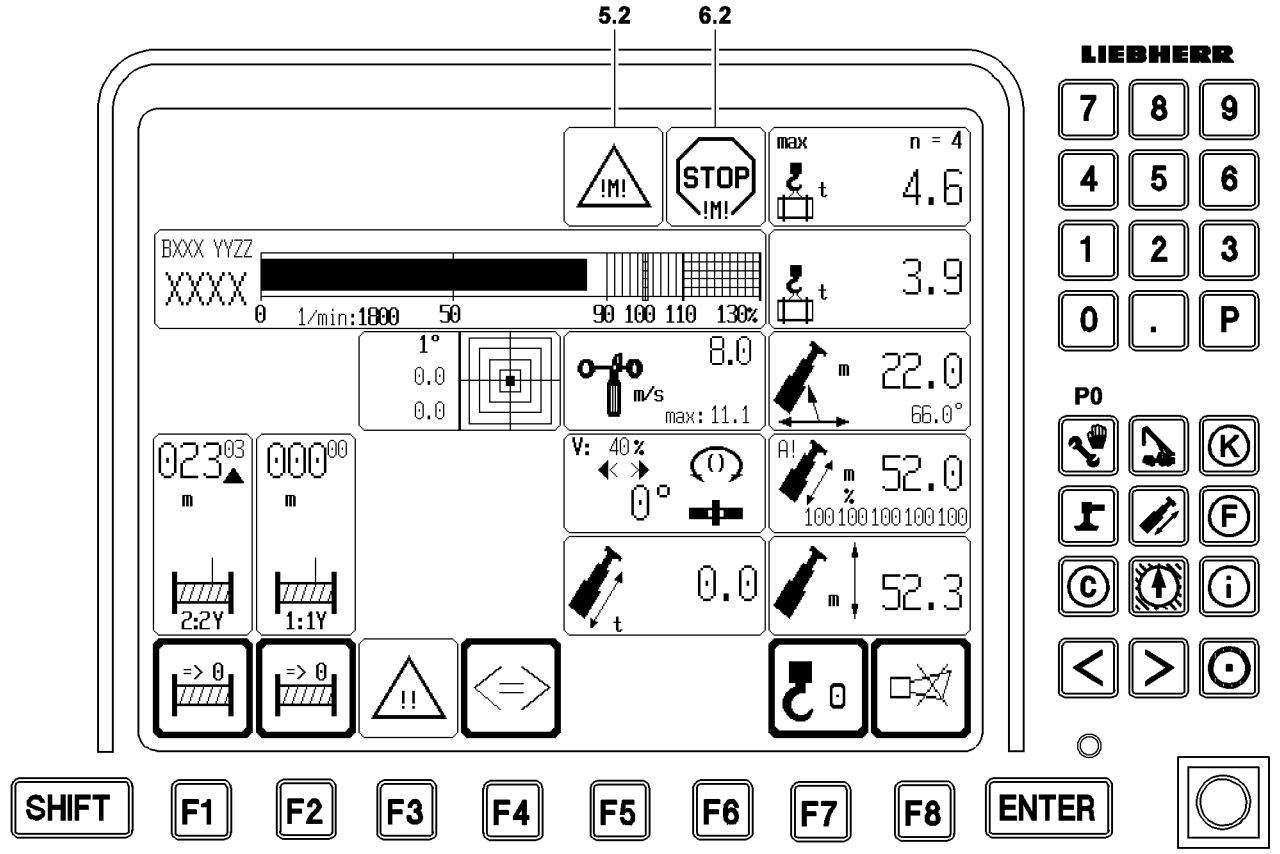

LIEBHERR
96
bar
3.1
74
24.5
HydOil
48
O.K.
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

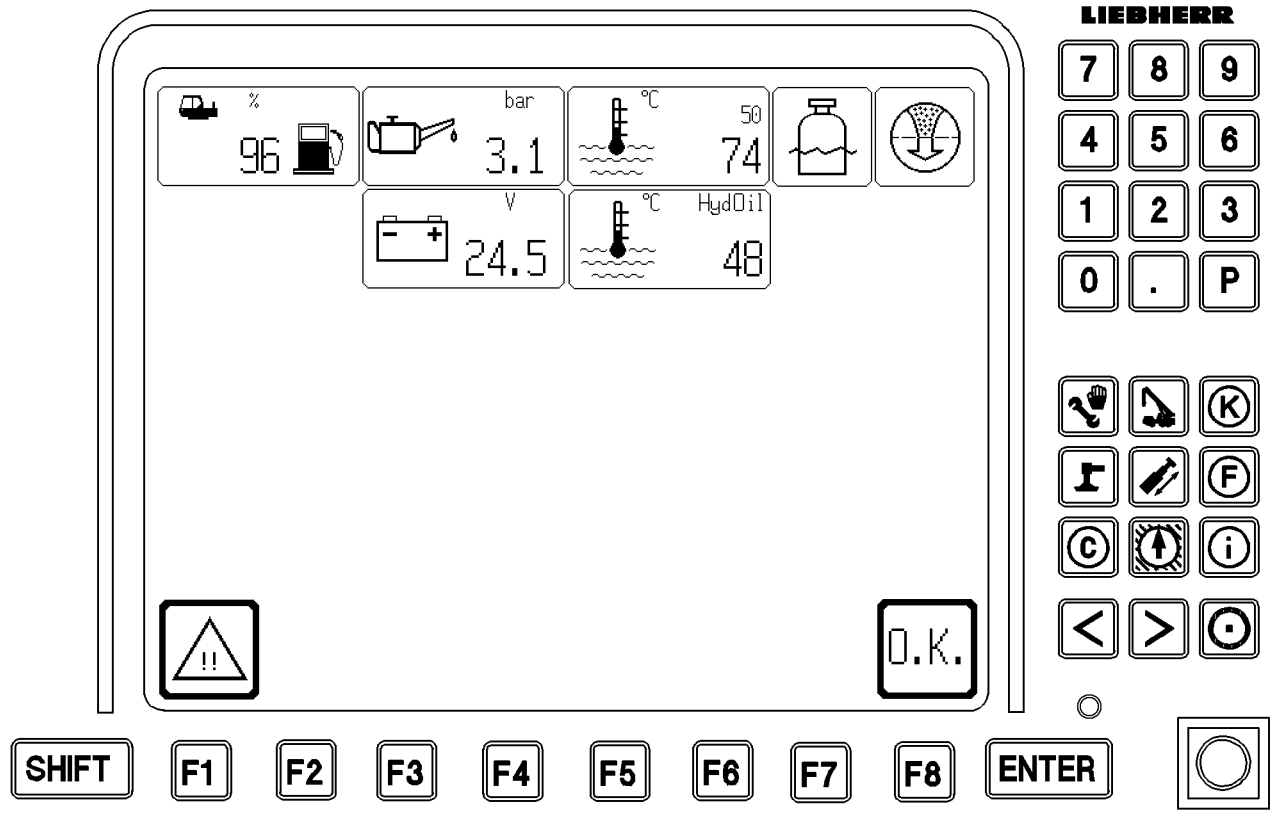
B111649

9.2 Possible engine monitoring advance warning, warning and STOP events

Events	Advance warning	Warning 5.2	STOP 6.2
Engine oil pressure (display value) missing		x	
Erroneous engine oil pressure (display value)		x	
Engine oil pressure warning active			x
Coolant / charge air temperature (display value) missing		x	
Erroneous coolant / charge air temperature (display value)		x	
Coolant / charge air temperature warning active			x
Coolant level warning active			x
Hydraulic oil temperature (display value) too high		x	
Air filter monitoring		x	
Battery voltage (display value) missing	x		
Erroneous battery voltage (display value)	x		
Battery voltage not between 16 V and 36 V	x		
Fuel reserve (display value) missing	x		
Erroneous fuel reserve (display value)	x		
Fuel reserve (display value) 5 % or less	x		
Fuel reserve (display value) 1 % or less		x	
Fuel reserve (display value) 0 %			x

If the system automatically switches to the “Engine monitoring” program when an engine STOP event occurs, there is an option for retaining the engine monitoring screen within 3 seconds (retaining the engine monitoring screen is achieved by pressing the function key **F1**). Switch back to the crane operating screen using the function key **F8** (OK) or the program key **P1** (Crane operation). If the engine monitoring screen is **not** retained, then after 3 seconds the system switches back automatically to the “Crane operation” program.


5.2
6.2
LIEBHERR
STOP
!M!
max
n = 4
4.6
3.9
XXXX
1/min:1800
8.0
m/s
max: 11.1
22.0
66.0°
52.0
52.3
0.0
P0
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
96
3.1
74
24.5
48
HydOil
O.K.
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B111649

9.3 Retaining the engine monitoring screen

The automatic change over to the engine monitoring screen can only take place from the “Crane operation” or “Telescoping” programs.

If you confirm a monitoring event in the engine monitoring screen with the function key **F8**, then there will be **no** automatic change over to the engine monitoring screen for the same event.

On switching back to the “Crane operation” program, the STOP icon **6.2** or the Advance warning icon **5.2** appears. There is no indication about advance warnings in the “Crane operation” or “Telescoping” programs.

WARNING

There is a danger of severe damage to the engine if STOP events are ignored!

If other programs are used for extended periods of time, for example the “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!

▶ Press function key **F1**.

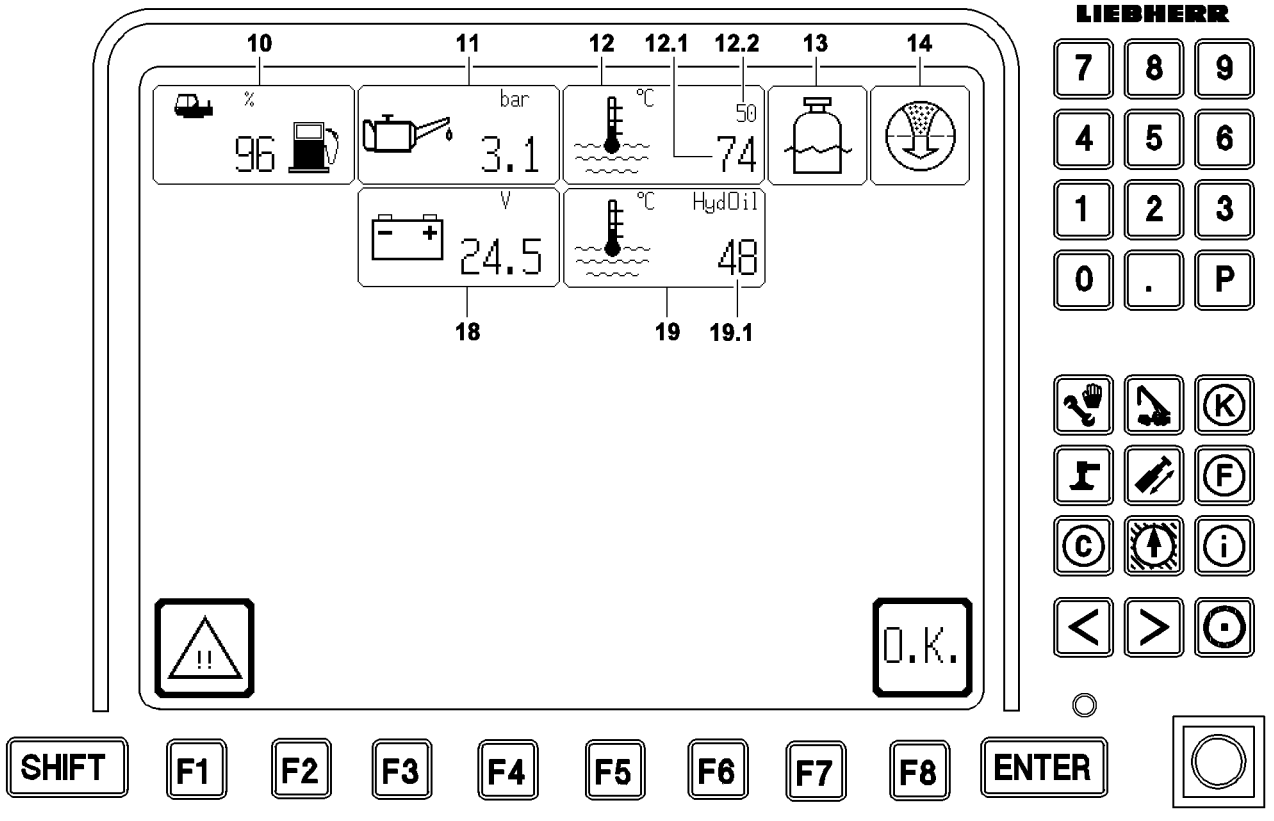
Result:

– Icon frames are displayed with a thin border.
– All load moment increasing crane movements will be turned off or blocked.

▶ Press function key **F8**.

Result:

– System switches back to the “Crane operation” program.
– The block of the load moment increasing crane movements will be lifted.
– The warning or STOP icon is faded into the “Crane operation” program.


LIEBHERR
10
11
12
12.1
12.2
13
14
%
96
bar
3.1
°C
50
74
V
24.5
°C
HydOil
48
18
19
19.1
!!
O.K.
7
8
9
4
5
6
1
2
3
0
.
P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B198624

9.4 Engine monitoring icons

9.4.1 Engine

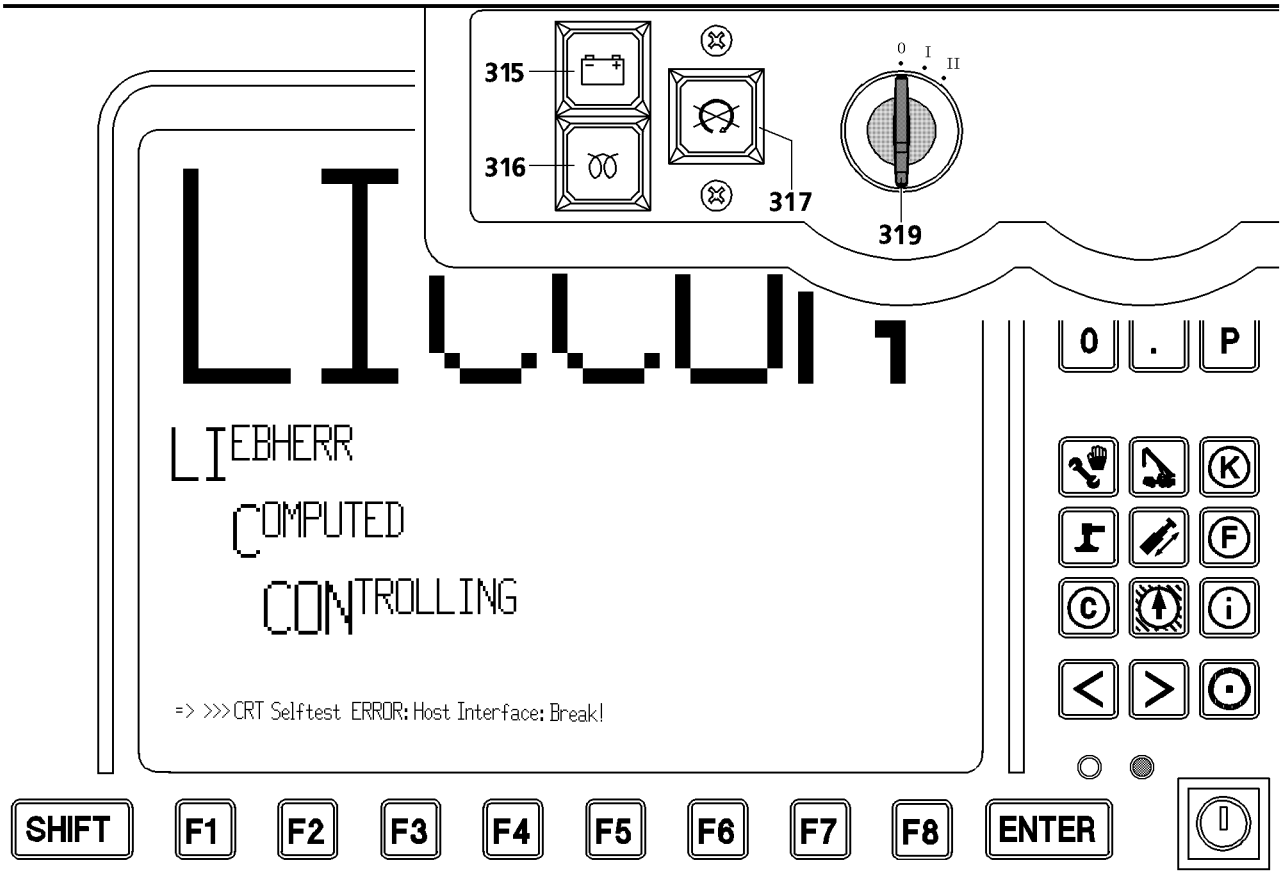
10	Tank contents	• In [%] Icon blinks if the fuel reserve is less than 10 %
11	Oil pressure	• In [bar] Numeric display in icon blinks if the engine oil pressure is too low.
12	Coolant / charge air temperature	• In [°C]
12.1	Coolant temperature	• Numeric display blinks if the coolant temperature is too 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
18	Auxiliary function - Battery voltage	• In [V] Numeric display in icon blinks if the operating voltage is less than 16 volts or above 36 volts
19	Hydraulic oil temperature	• In [°C]
19.1	Hydraulic oil temperature	• Numeric display blinks if the hydraulic oil temperature is too high

9.5 Function key line

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

The function keys **F2** - **F7** are **not** used.


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
STANDBY
..... OFF !
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


315
316
317
319
0 I II
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> >>>CRT Selftest ERROR: Host Interface: Break!
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

B194896

10 LICCON computer system in stand-by mode

10.1 Starting LICCON computer system in stand-by mode

There are two ways of achieving stand-by mode with the LICCON computer system.

Starting the LICCON computer system without engine:

▶ Turn the ignition key **319** to position “I” and leave it there.

Result:

– The LICCON computer system runs and the monitor shows the set up screen, or alternatively for a stop / warning / advance warning, the engine monitoring screen.

▶ Press function key **F8** (O.K.).

Result:

– System switches to the “Crane operation” program.

Turning off the engine with the engine stop key:

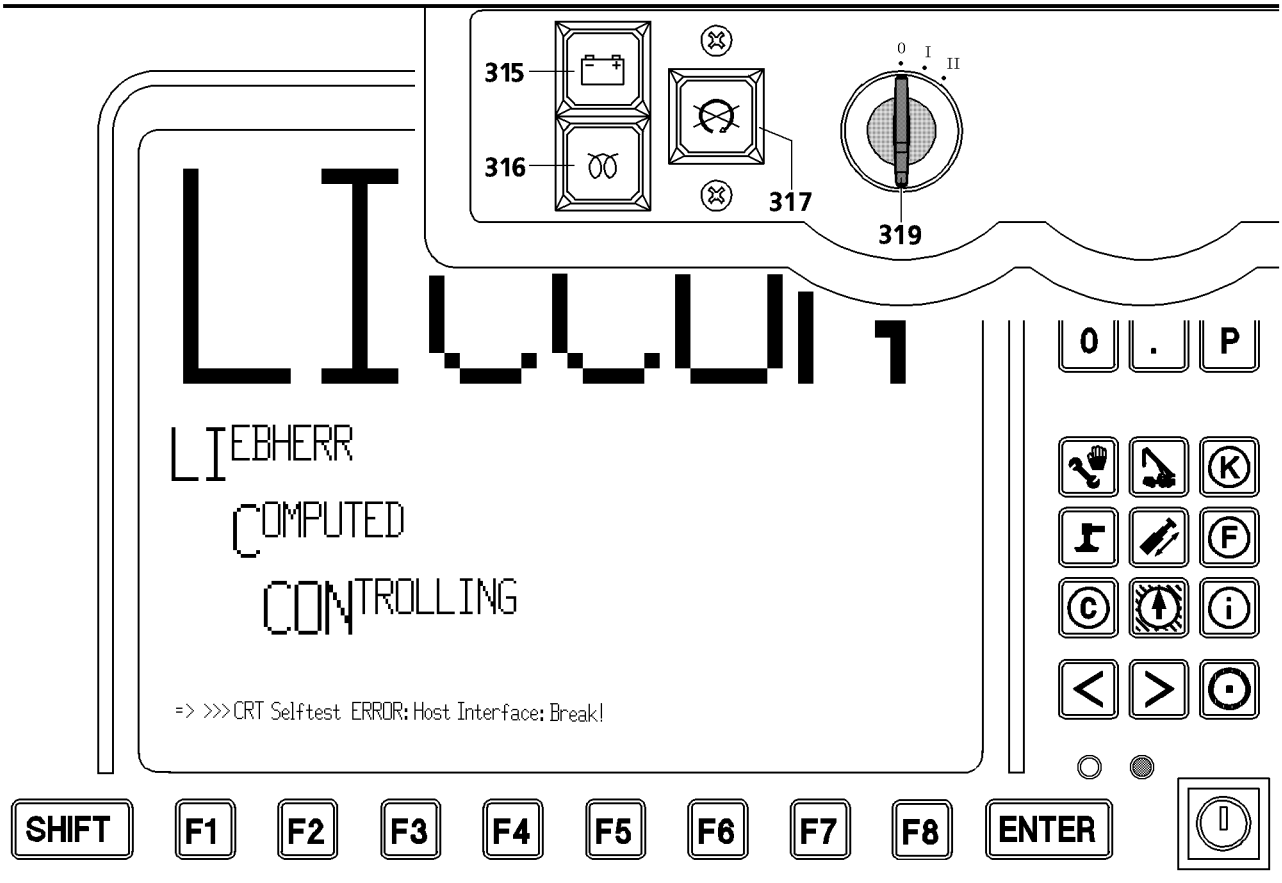
▶ Press the button **317**.

▶ Leave the ignition key **319** in position “I”.

Result:

– The engine is turned off.


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
STANDBY
..... OFF !
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


315
316
317
319
0 I II
LIEBHERR
COMPUTED
CONTROLLING
=> >>>CRT Selftest ERROR: Host Interface: Break!
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

B194896

10.2 Active stand-by operation / alarm

The operating programs and the monitor displays function exactly the same as in the turn-on procedure for the LICCON computer system with engine start (crane operation).

No crane movements are possible. If a crane movement is selected anyway, a message appears on the LICCON monitor.

Example: **Control turning shut off, the crane engine is not running.**

The duration of the stand-by operation is 15 minutes, of which 3 minutes are the stand-by alarm. Operating the LICCON computer system during stand-by operation automatically extends the stand-by time.

▶ In **stand-by operation no** keys are pressed on the monitor.

Result:

– The stand-by alarm (horn) is reached after 12 minutes.
– This screen appears on the monitor: **STANDBY** (see illustration).

▶ Now press any key on the LICCON monitor.

Result:

– System switches back to the interrupted program.
– The stand-by time is extended by 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 self test: ERROR: Host Interface: Break!** (see illustration) and the control lights **315**, **316** and **317** blink. In this case, this is not an error message from the LICCON computer system, the error message appears only on the monitor because the connection between the monitor and the CPU is broken.

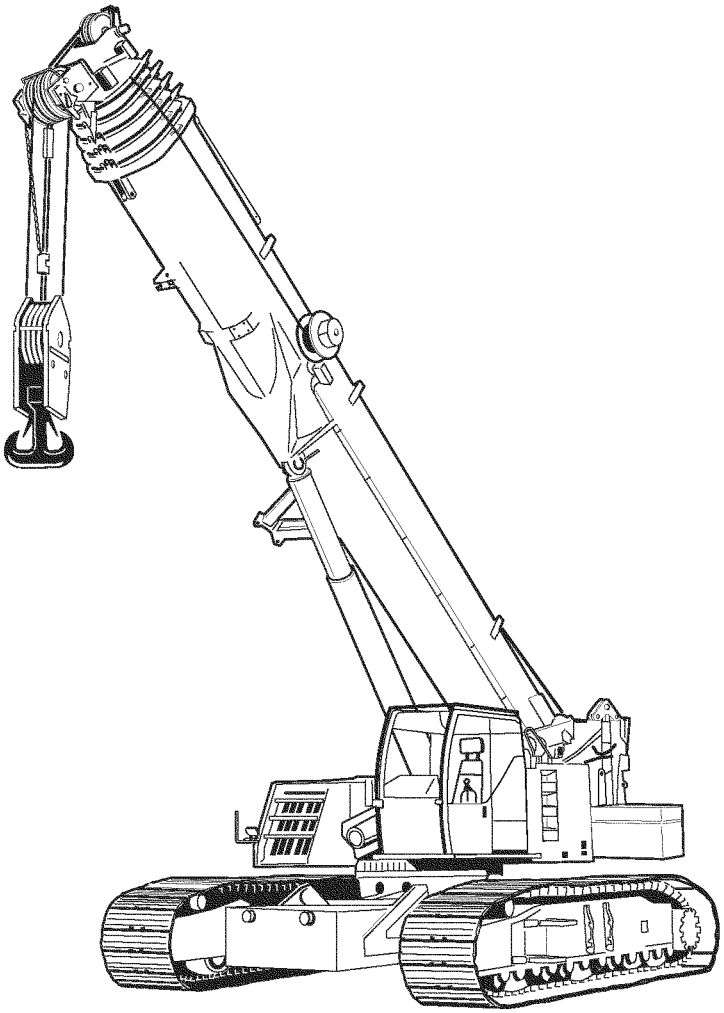
10.3 Start prevention

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

▶ Return the ignition switch **319** first to position “0”.
▶ Turn the ignition switch **319** to position “I” (note the preheating time).
▶ Turn the ignition switch **319** briefly to position “II”.

Result:

– The engine starts.



B198625

1 Checks before start up

Various checks must be performed every time before operating the crane.
If an item is low or lacking during an inspection, then it must be refilled or brought to normal status before operating the crane.
If the inspection shows a very dirty filter, then it must be replaced before operating the crane.

Note
▶ For detailed description of fill quantities, service items and lubricants, see chapter 7.06 and chapter 7.07 in the Crane operating instructions!

WARNING
Heated crane components!
When the engine is running, crane components can heat up significantly! This applies especially to exhaust systems, the engines, the coolant circuit and the respective gears in the crane!
Touching heated crane components can cause severe injuries!
▶ Carry out the checks before starting the crane, when the crane components are cold!
▶ Let already heated components cool off before checking!
▶ Proceed with special caution near heated crane components!

1.1 Checking the general condition of the crane

WARNING
Danger of accident due to falling parts!
Loose parts, such as pins, spring retainers or ice, which are on the boom or crane can fall down during crane operation and hit personnel!
Personnel can be killed or seriously injured!
▶ Before starting crane operation, make sure that there are no loose parts on the boom and crane!

▶ Check the crane for visible damage before starting crane operation.
▶ Carry out a function test of available safety devices.
▶ Make sure that the crane is standing on level, load bearing ground.
▶ Make sure that the crane is horizontally aligned.
▶ Make sure that the gear ring of the rotary connection is clean and greased.
▶ Make sure that the air supply to the oil and water cooler is clear.
▶ Make sure that side covers are closed and locked.
▶ Make sure that no persons or objects are within the danger zone of the crane.
▶ Make sure that the cable / rope drum and the limit switches are free of snow and ice.
▶ Make sure that there are no loose parts on the boom and the crane.

1.2 Checking the coolant level

WARNING
Danger of injury due to scalding of the skin!
▶ Check the coolant level only when the engine is cold.

▶ Check the coolant level.

If the coolant level is too low:
▶ Add coolant, see Crane operating instructions, chapter 7.05.

1.3 Checking the oil level and filters

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

1.4 Checking the central lubrication system

The grease container must be filled at all times with sufficient lubricant.

- ▶ Check the grease container.

If the lubricant level is too low:

- ▶ Add lubricant, see Crane operating instructions, chapter 7.05.

1.5 Checking the window cleaning fluid

NOTICE
Frozen window cleaning fluid!
If the window cleaning fluid is not frost resistant, then the windshield washer system can freeze during the cold time of the year!
Failure of the windshield washer system is the result!
The windshield washer system can be damaged!

- ▶ Change the window cleaning fluid in time to a frost resistant type!

- ▶ Before the start of the cold season:
  Empty the container for the window cleaning fluid and refill it with a commercially available, frost resistant window cleaning fluid.

1.6 Checking the fuel level

WARNING
Danger of fire and explosion!

- ▶ Turn the auxiliary heater* off approx. 3 min before refueling the fuel tank!
- ▶ Before refueling the fuel tank, turn the engine off!

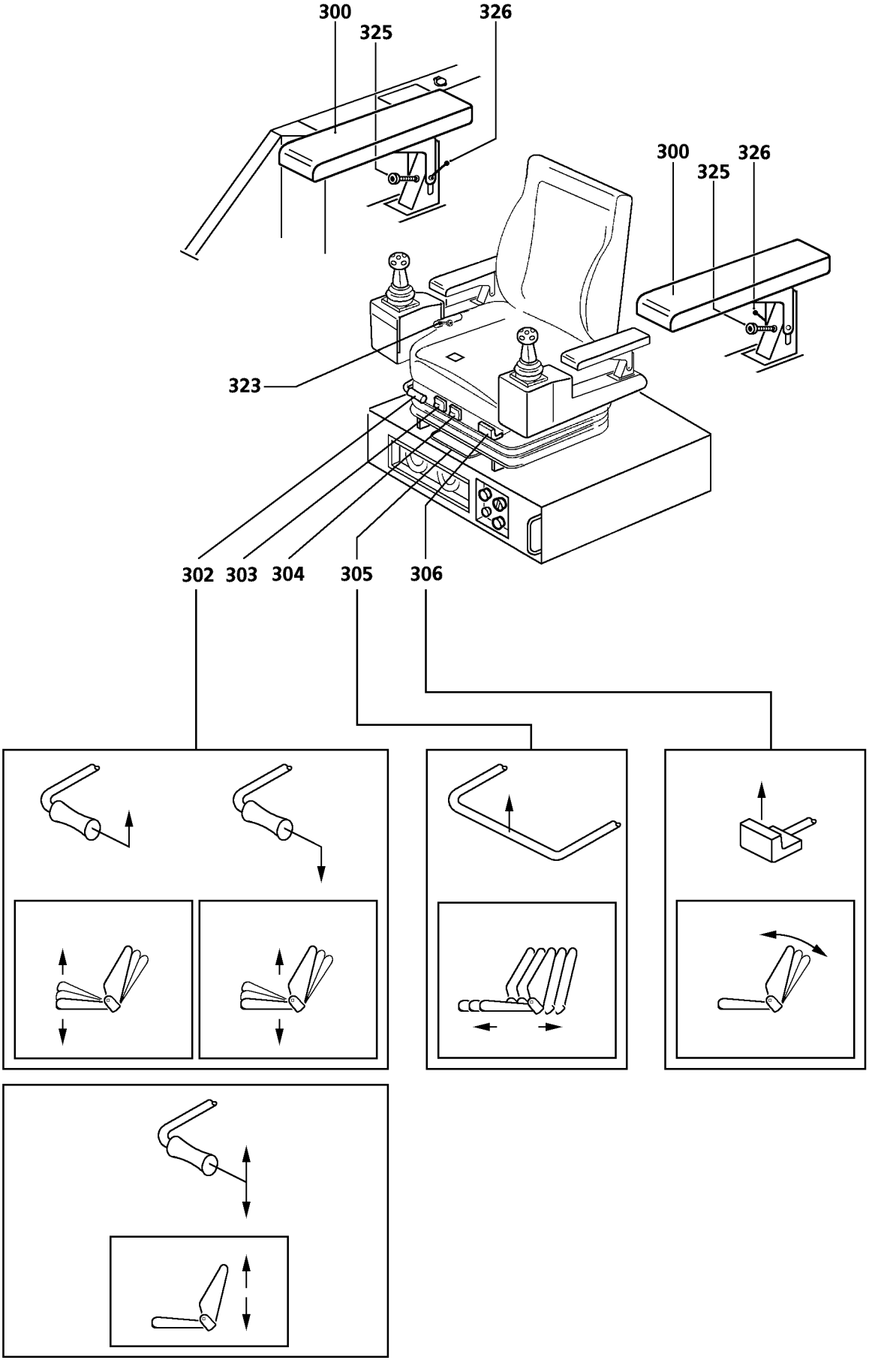
Note
If the fuel tank has been run dry, then the fuel system must be bled / vented.

- ▶ Do not run the fuel tank dry!

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

- ▶ Check the tank content on the LICCON monitor, see Crane operating instructions, chapter 4.02.

blank page!



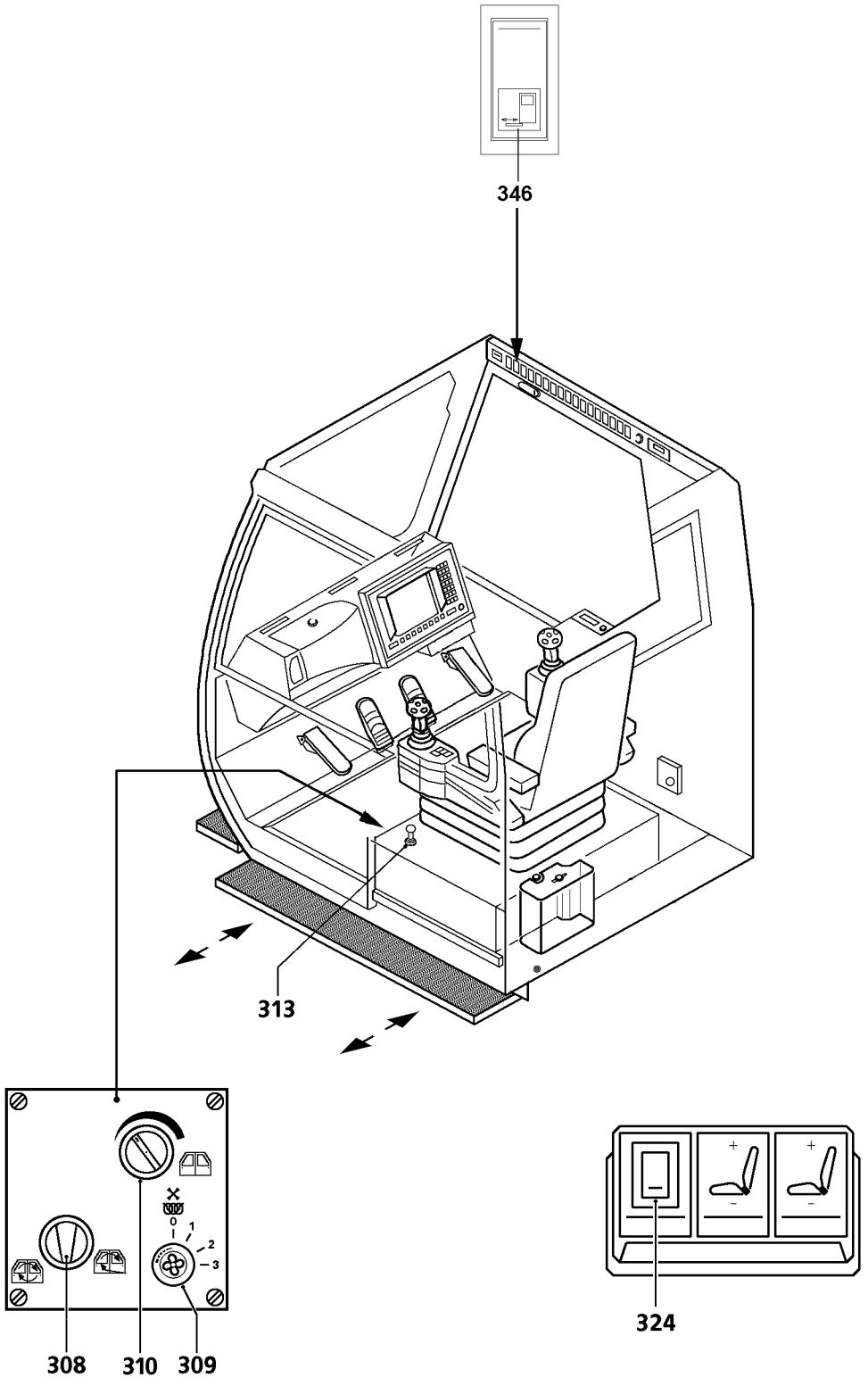
B197017

2 Work station - Crane operator's cab

2.1 Adjusting the crane operator's seat

The crane operator's seat can be adjusted to suit different body sizes.

- With the lever **302** adjust the seat incline.
- With the lever **302** adjust height of seat.
- With the button **303** adjust the pneumatic lumbar support in lower part of backrest.
- With the button **304** adjust the pneumatic lumbar support in upper part of backrest.
- Unlock the horizontal seat adjustment with the bar **305**.
- With the lever **306** adjust the angle of the backrest.
- Clamping screw **323** to adjust joystick support.
- Set with adjusting screw **325** to adjust angle of armrests.
- Set with lever **326** to adjust height of armrests.



B102849

2.2 Footboard / step

In order to make it easier for the crane operator to enter and leave the crane, the crane cab footboard can be extended or retracted.
When you have finished working with the crane, retract the footboard again and secure it in the end position.

2.2.1 Extending the step

- ▶ Swing the left armrest upward.
- ▶ Pull the latch **313** and press the button **346** on top.

Result:

– The step is extended.

- ▶ Release the latch **313** as soon as the step extends.
- ▶ Extend the step until the latch engages again.

2.2.2 Retracting the step

- ▶ Swing the armrest upward.
- ▶ Pull the latch **313** and press the button **346**.

Result:

– The step is retracted.

- ▶ Release the latch **313** as soon as the step retracts.
- ▶ Retract the step until it again locks into place.

2.3 Turning the seat heater* on

- ▶ Actuate the switch **324**.

2.4 Turning the heater / ventilation on

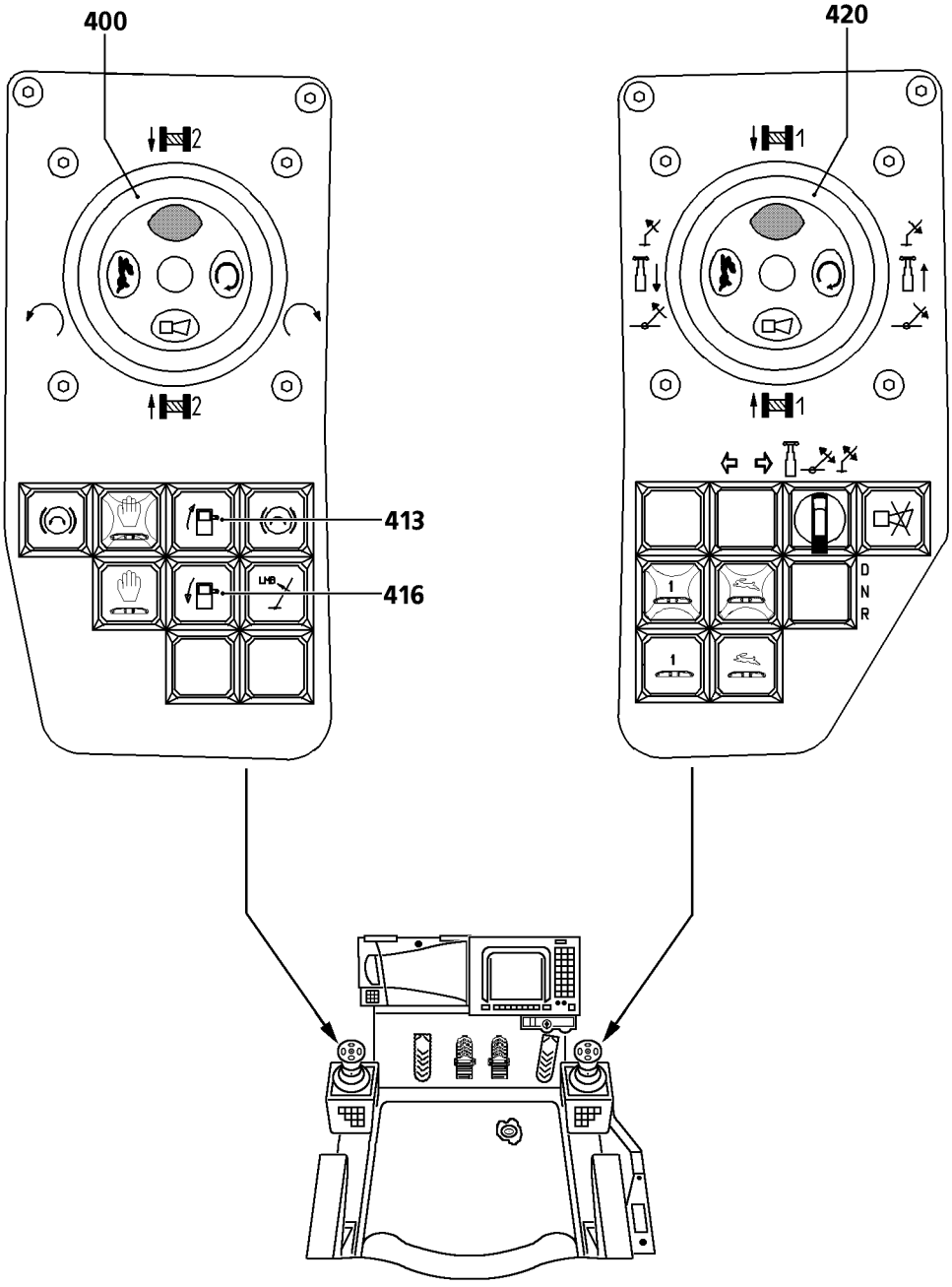
The crane operator's cab can be heated or ventilated, depending on the desired temperature. The control elements for the heater / ventilation are underneath the crane operator's seat. For a detailed description see Chapter 6.01.

2.4.1 Heating

- ▶ Set the knob **308** to recirculated air.
- ▶ Turn on the fan with the rotary switch **309**.
- ▶ Regulate the temperature with the knob **310**.

2.4.2 Ventilation

- ▶ Move the knob **308** to fresh air operation.
- ▶ Turn on the fan with the rotary switch **309**.



B198627

2.5 Tilting the crane operator's cab

To give the crane driver a better field of vision, the cab can be tilted upwards.
When the cab is tilted, the cab doors will open more quickly and hit the backstop. For that reason, hold the door by the handle and open slowly.
When you have finished working with the crane, set it to horizontal.

CAUTION
Danger of accident!
▶ If the cab is tilted, it is prohibited to stand on the step!

2.5.1 Tilting the cab upward

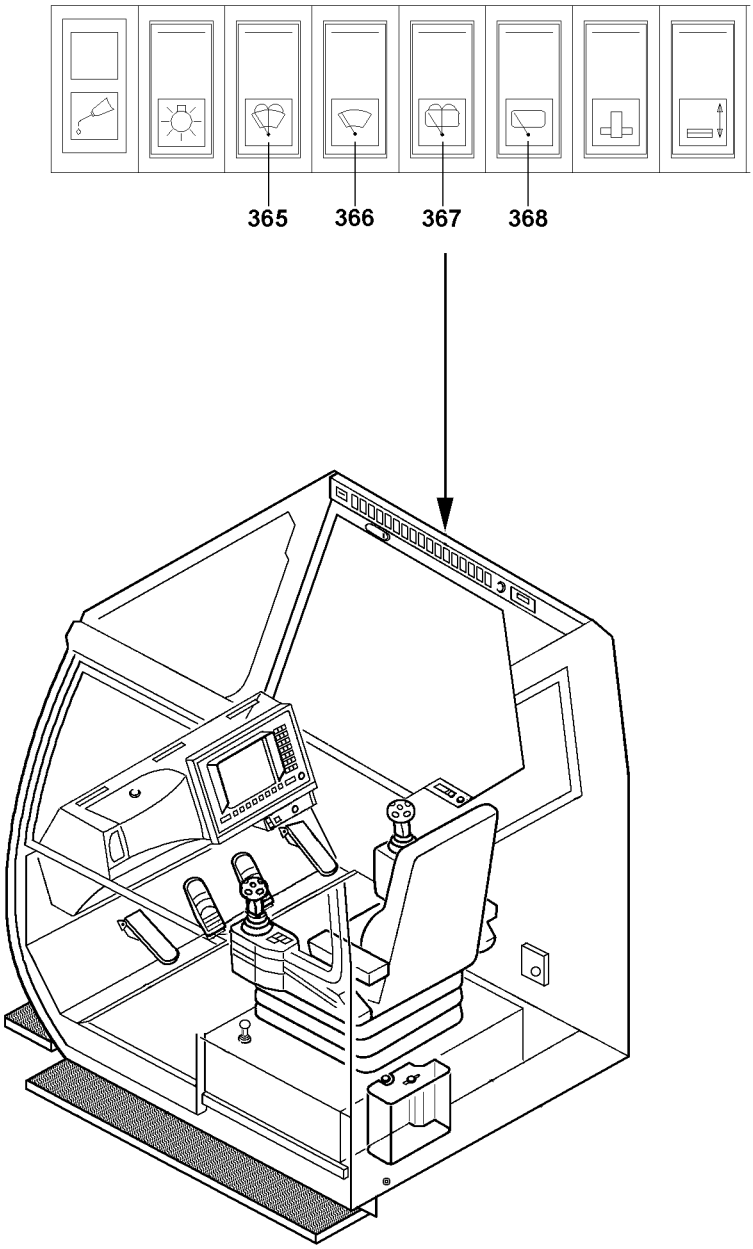
▶ Press the button **413**.

Result:
– The cab swings upward.

2.5.2 Setting the cab to horizontal position

▶ Press the button **416**.

Result:
– The cab swings downward.



B102850

2.6 Operating the windshield wiper / windshield washer system

2.6.1 Operating the windshield wiper

The windshield wipers for the front and the roof window are operated with a 2-stage switch (first stage - intermittent, second stage - continuous wipe).

▶ To activate the windshield wiper on the front window:
Actuate the switch **366**.

or

To activate the windshield wiper on the roof window:

- Actuate the switch **368**.

2.6.2 Operating the windshield washer system

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

▶ To activate the windshield washer system for the front window:
Press the button **365**.

or

To activate the windshield washer system for the roof window:

- Press the button **367**.

2.7 Opening the front window

WARNING
Danger of injuring hands if they become trapped!
▶ Be careful with your hands when closing the front window.

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

▶ To open from inside, just push on the front window.

or

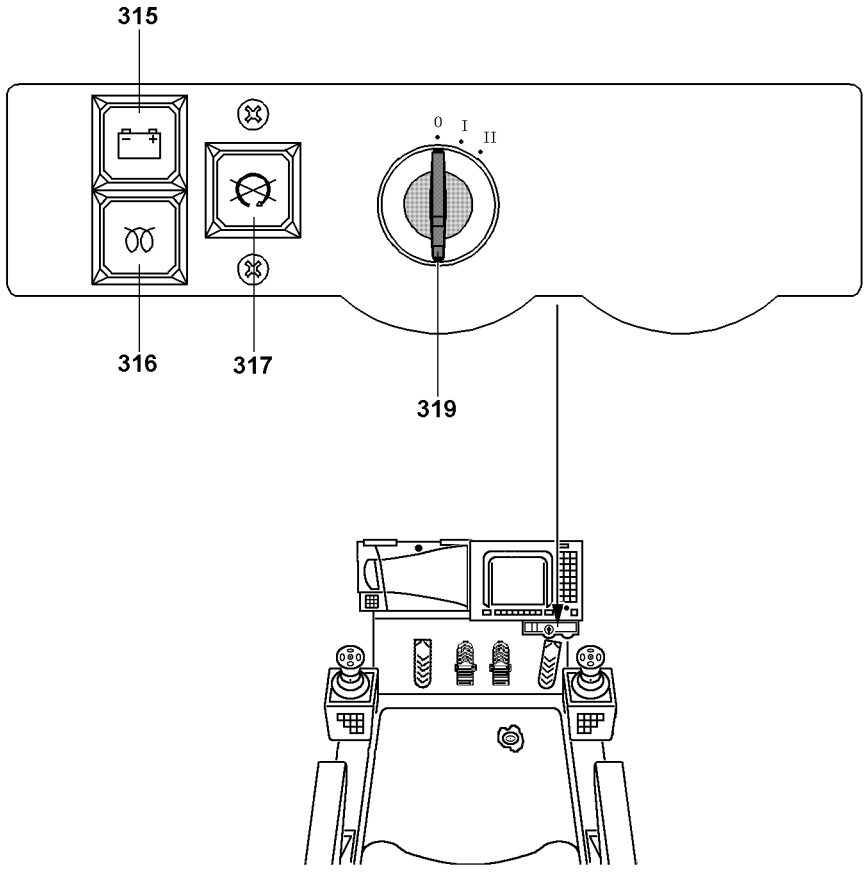
If you only want to partly open the window:

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

2.8 Checking the horn

Note
Use of horn!
▶ Only use the horn in dangerous situations to maintain its warning effect.

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



B198629

3 Starting and stopping the engine

The engine can only be subjected to a full load after the operating temperature has been reached.
Make sure that the following prerequisite is met:
– The battery master switch has been turned on.

3.1 Starting the engine

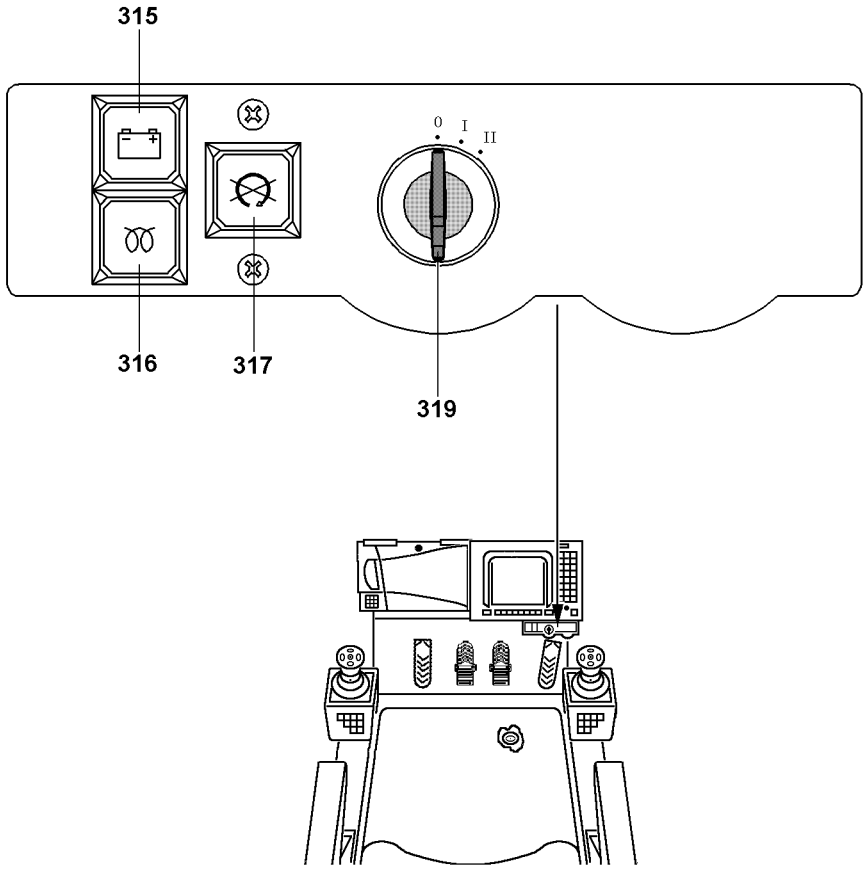
▶ Turn the ignition switch **319** to position “I”.

Result:
– The indicator light **316** blinks.
– The indicator light **315** lights up.
The engine is ready to start.

CAUTION
Danger of property damage!
▶ Only start the engine if the control light **315** is on, and the control light **316** is flashing.

▶ Turn the ignition switch **319** to position “II”.
▶ Start the engine.

Troubleshooting
The engine does not start after a maximum of 10 seconds.
▶ Wait for 1 minute. The starter can be operated three times for 10 seconds per attempt with a pause in between of one minute each time.



B198629

3.2 Starting the engine with flame starting device

To improve the cold start process and the warm-up phase, the engine is equipped with a flame-start system.
The flame start system turns off automatically if:

– The engine is not start when it is ready.
– The engine is started while the control light **316** is illuminated.
– The coolant temperature reaches 20 °C while the engine is running.

WARNING
Functionality of the battery in the cold season.
The starting capacity of the battery is considerably reduced in cold temperatures: For example, at a temperature of -10 °C it has only 66 % of its normal capacity.
▶ After the engine has been turned off, store batteries in a heated room, if possible.

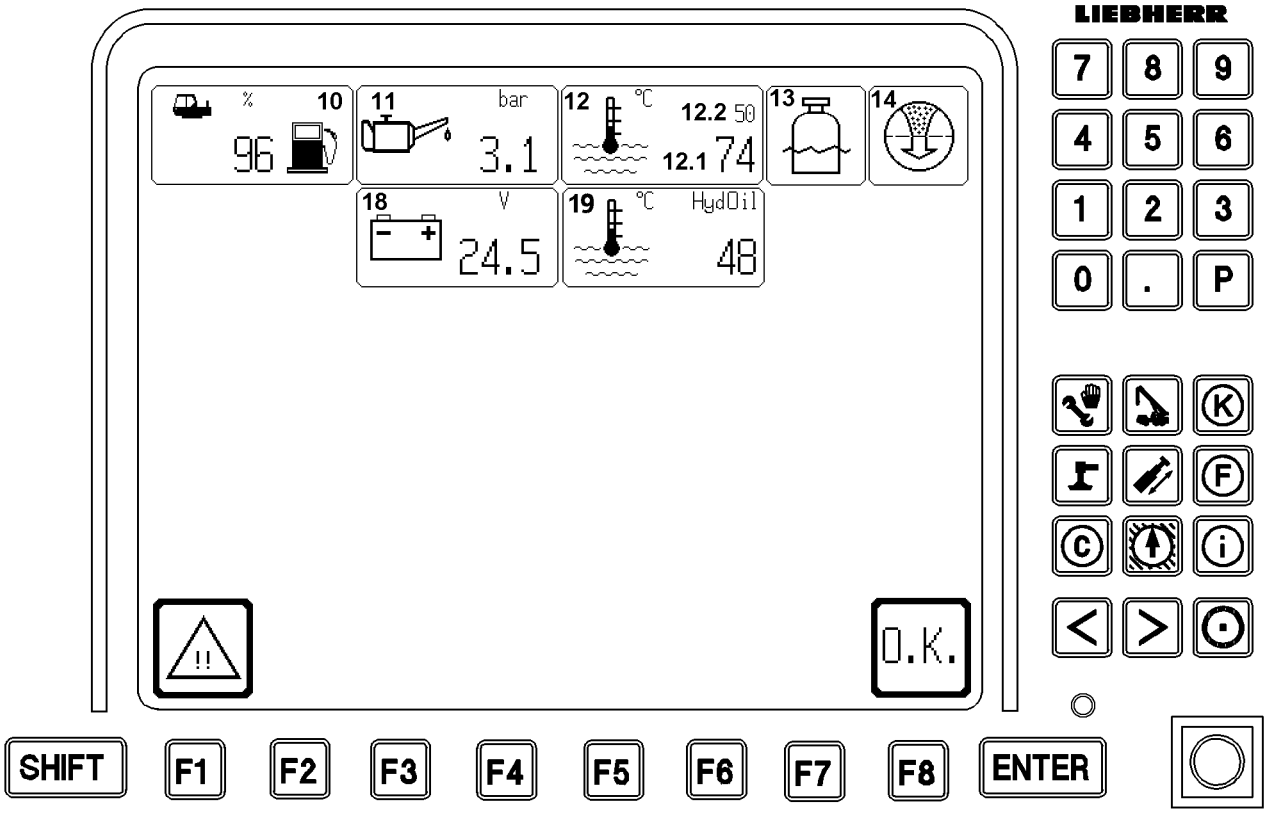
▶ Turn the ignition switch **319** to position “I”.

Result:

– The indicator light **316** lights up first and then starts to blink after a short time.
The engine is ready to start.

▶ Turn the ignition switch **319** to position “II”.
▶ Start the engine.

Troubleshooting
The control light **316** flashes?
The control unit has identified a defect with the flame starting device.
▶ Remedy the problem.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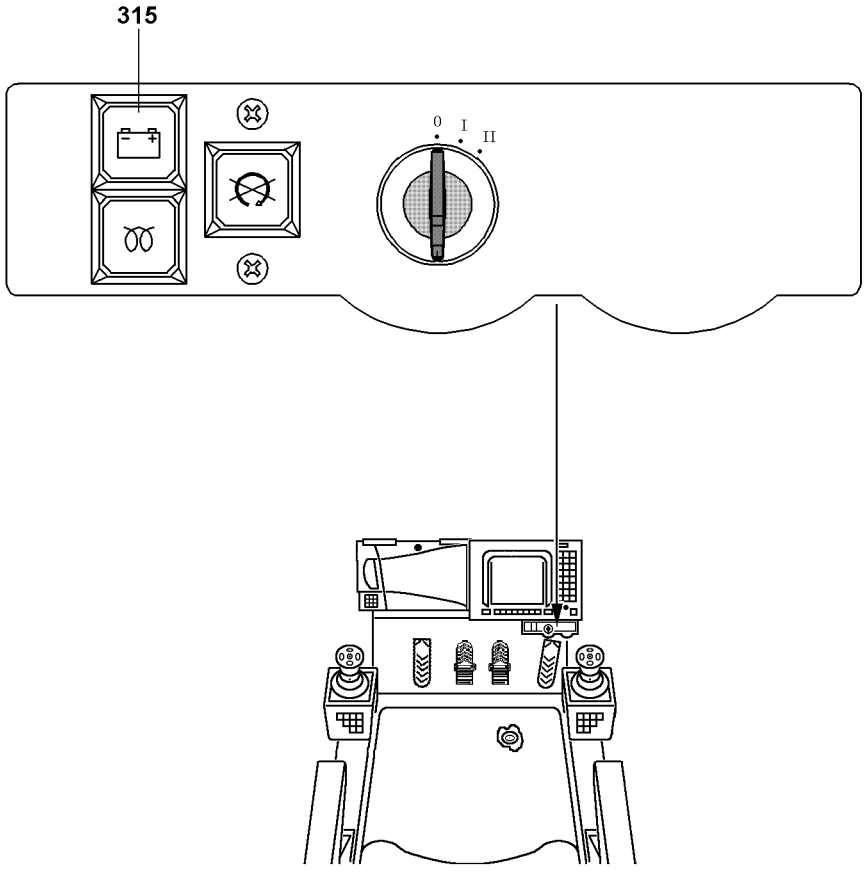
315
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B198630

3.3 Checking the instruments after starting the engine

As soon as a stable voltage is present with the engine running, the electric crane control and the LICCON computer system are turned on automatically. A self-test of the microprocessor system follows and after a few seconds the set up screen appears on the monitor.

3.3.1 Checking the instruments on LICCON monitor

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

- ▶ Check the indicator light **315**.
- ▶ Check the icon **11** “Engine oil pressure” on the LICCON monitor.

Troubleshooting

Does the numerical display for the engine oil pressure in the icon **11** blink after approximately 10 seconds or does it start to blink during crane operation?

The engine oil pressure is too low. The engine can be damaged as a result of insufficient oil pressure.

- ▶ Turn the engine off immediately and determine the cause.

- ▶ Check the numerical display for the coolant temperature in the icon **12.1**.

Troubleshooting

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

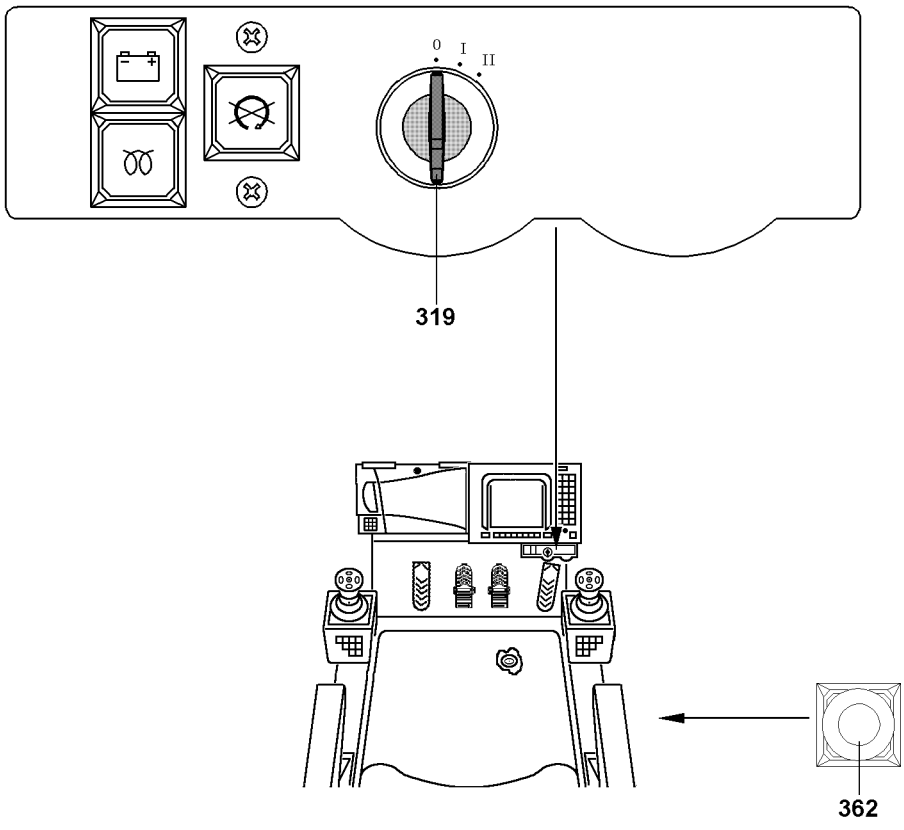
The coolant temperature is too high. Excessive coolant temperature can lead to engine damage.

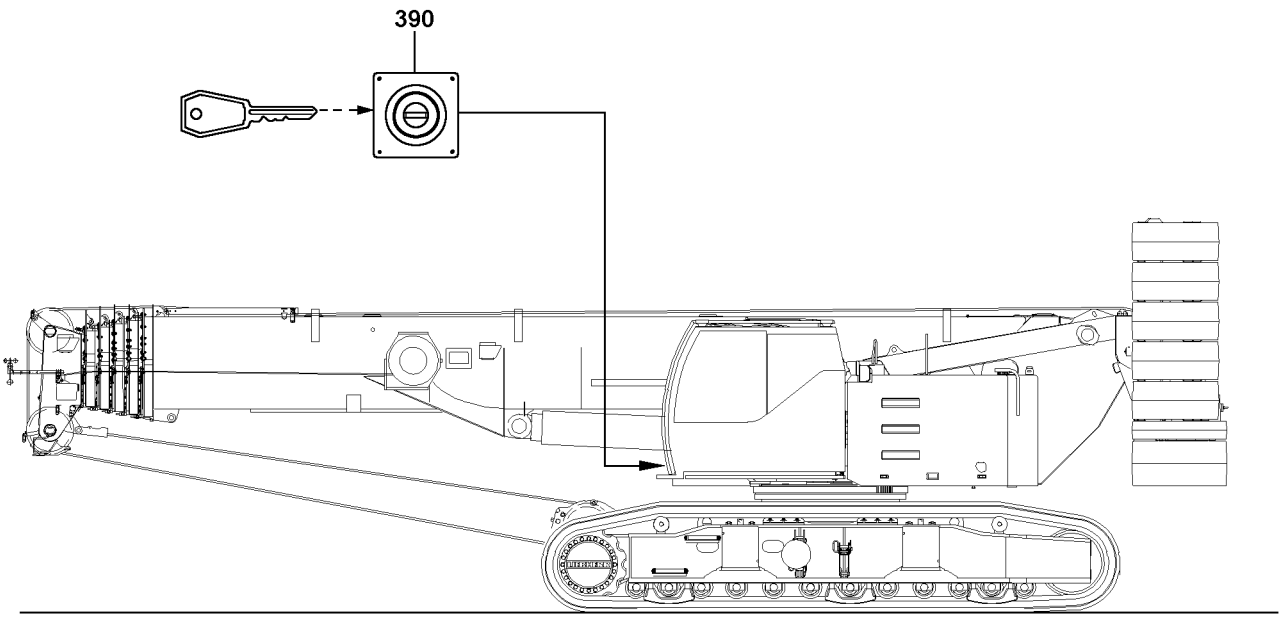
- ▶ Turn the engine off immediately.

- ▶ Check the icon **10** for “Fuel content”.
- ▶ Check the icon **19** for “Hydraulic oil temperature”.
- ▶ Check the icon **12.2** for “Charge air temperature”.
- ▶ Check the icon **13** for “Coolant level”.
- ▶ Check the icon **14** for “Air filter”.
- ▶ Check the icon **18** for “Battery voltage”.

3.4 Engine monitoring

Refer to chapter 4.02, section Engine monitoring.





B102851

3.5 Turning the engine off

3.5.1 Turning the engine off

If the crane has been operated at full engine output or with very high coolant temperatures (above 95 °C), let the engine run without a load for 1-2 minutes at low idle speed.

▶ Turn the ignition switch **319** back to the stop.

▶ Pull the ignition switch **319** off and store in a safe place.

3.5.2 Turning the engine off in the event of danger

CAUTION

Operating the emergency off switch

▶ Only use the emergency off switch **390** or the emergency off switch **362** in case of serious emergency. Use of the emergency off switch **390** or the emergency off switch **362** in normal situations is prohibited!

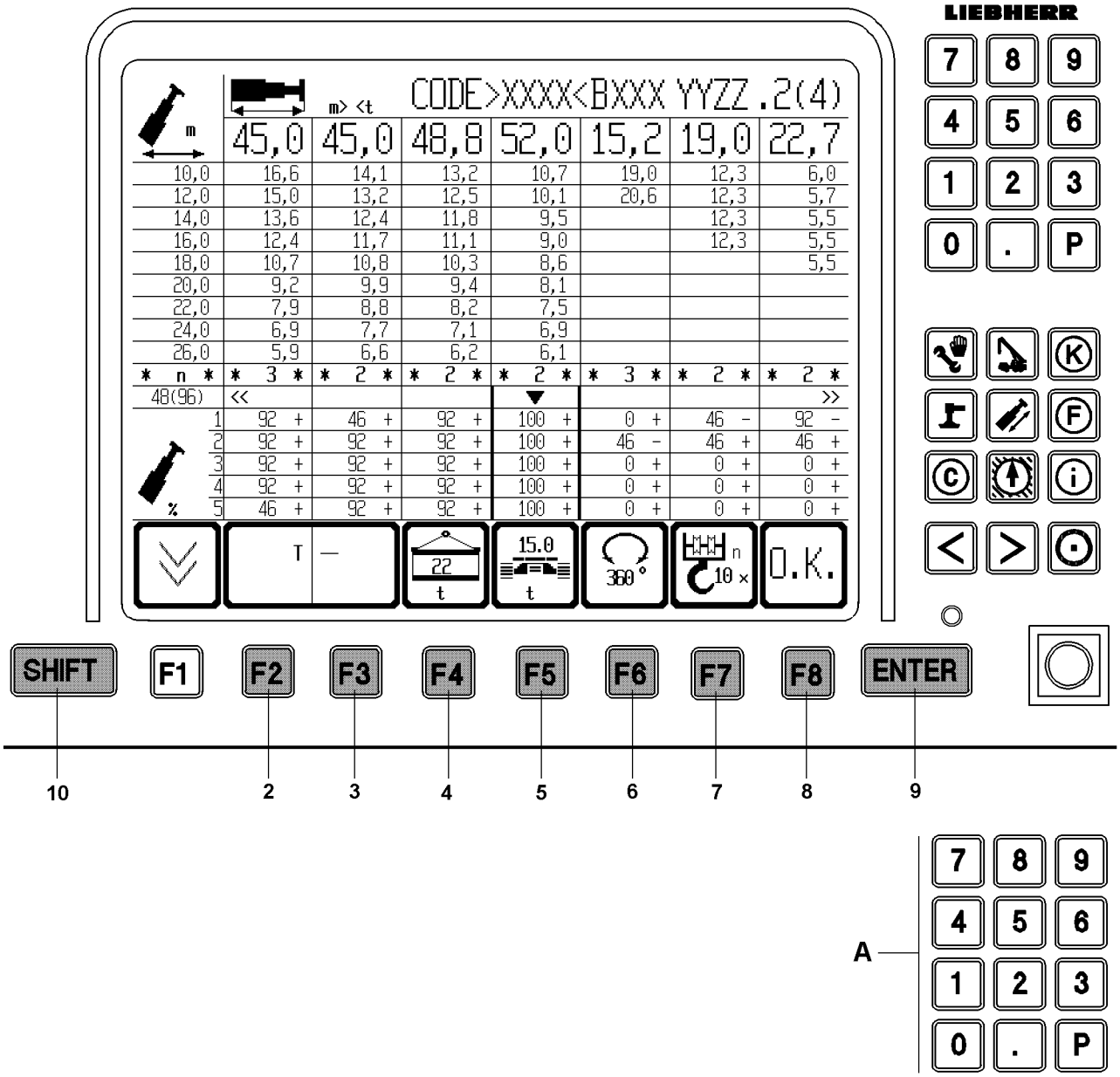
▶ Press the emergency off switch **390**.

or

■ Press the emergency off switch **362**.

Result:

– The crane will be turned off immediately.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m> <t
CODE>XXXX<BXXX YYZZ .2(4)
45,0 45,0 48,8 52,0 15,2 19,0 22,7
10,0 16,6 14,1 13,2 10,7 19,0 12,3 6,0
12,0 15,0 13,2 12,5 10,1 20,6 12,3 5,7
14,0 13,6 12,4 11,8 9,5 12,3 5,5
16,0 12,4 11,7 11,1 9,0 12,3 5,5
18,0 10,7 10,8 10,3 8,6 5,5
20,0 9,2 9,9 9,4 8,1
22,0 7,9 8,8 8,2 7,5
24,0 6,9 7,7 7,1 6,9
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B102853

4 LICCON computer system after engine start

The LICCON computer system is only operational when the engine is running.

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 chapter 4.02.

▶ Wait for the boot up phase.

Result:

– The set up screen appears on the LICCON monitor.

Normally, the most recently set equipment configuration and reeving number will be displayed.

If a master switch is moved away from the zero position during the boot up phase, then the function circuit of the electrical safety chain is interrupted.

▶ In this case:
Turn the engine and ignition off and start again.

Troubleshooting

An error message appears on the LICCON monitor?

▶ Turn the engine and ignition off and start again.

▶ The LICCON computer system automatically displays the error determination screen.

Troubleshooting

The LICCON monitor does not show the most recently set set up configuration and reeving number?

If there has been a data loss in the memory (cold start), then the first valid set up configuration appears in the set up screen. The reeving number is set to “0”.

▶ Set the set up configuration and reeving number again.

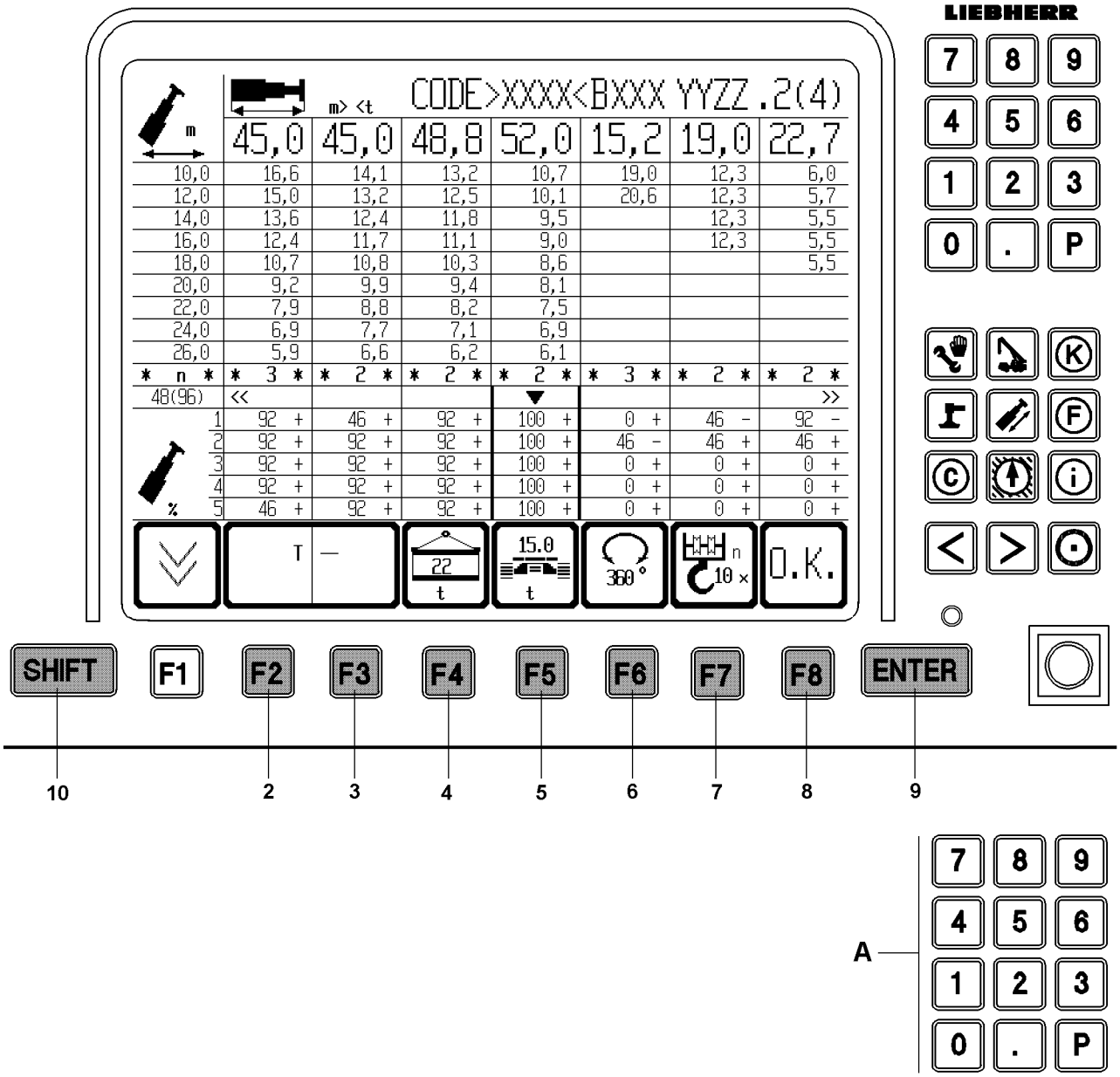
4.2 Taking over the previously selected set up configuration and hoist rope reeving

Check in the operating screen if the correct short code and the correct reeving number have been set.

▶ If the settings on the operating screen are correct:
Press function key “F8” **8**.

Result:

– The “Set up” program is terminated and the adjusted parameters are accepted for the newly started “Operation” program.


LIEBHERR
m> <t
CODE>XXXX<BXXX YYZZ .2(4)
45,0 45,0 48,8 52,0 15,2 19,0 22,7
10,0 16,6 14,1 13,2 10,7 19,0 12,3 6,0
12,0 15,0 13,2 12,5 10,1 20,6 12,3 5,7
14,0 13,6 12,4 11,8 9,5 12,3 5,5
16,0 12,4 11,7 11,1 9,0 12,3 5,5
18,0 10,7 10,8 10,3 8,6 5,5
20,0 9,2 9,9 9,4 8,1
22,0 7,9 8,8 8,2 7,5
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B102853

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 function key “F2” **2** until the desired main geometry status is selected.
- ▶ Press function key “F3” **3** until the desired accessory status is selected.
- ▶ Press function key “F4” **4** until the desired superstructure counterweight status is selected.
- ▶ Press function key “F5” **5** until the desired chassis central ballast status is selected.
- ▶ Press function key “F6” **6** until the desired slewing area of the superstructure is selected.
- ▶ Press the “Enter” **9** key.
- ▶ Check the set load chart.

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**.
- ▶ Press “ENTER” **9**.

Result:

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

For a more detailed description of the “Configuration” program, see chapter 4.02.

- ▶ Check the set load chart.

4.3.3 Setting a new hoist rope reeving

- ▶ Press function key “F7” **7** until the desired reeving number is selected.

or

- ■ Press function keys “SHIFT” **10** and “F7” **7** until the desired reeving number is selected.

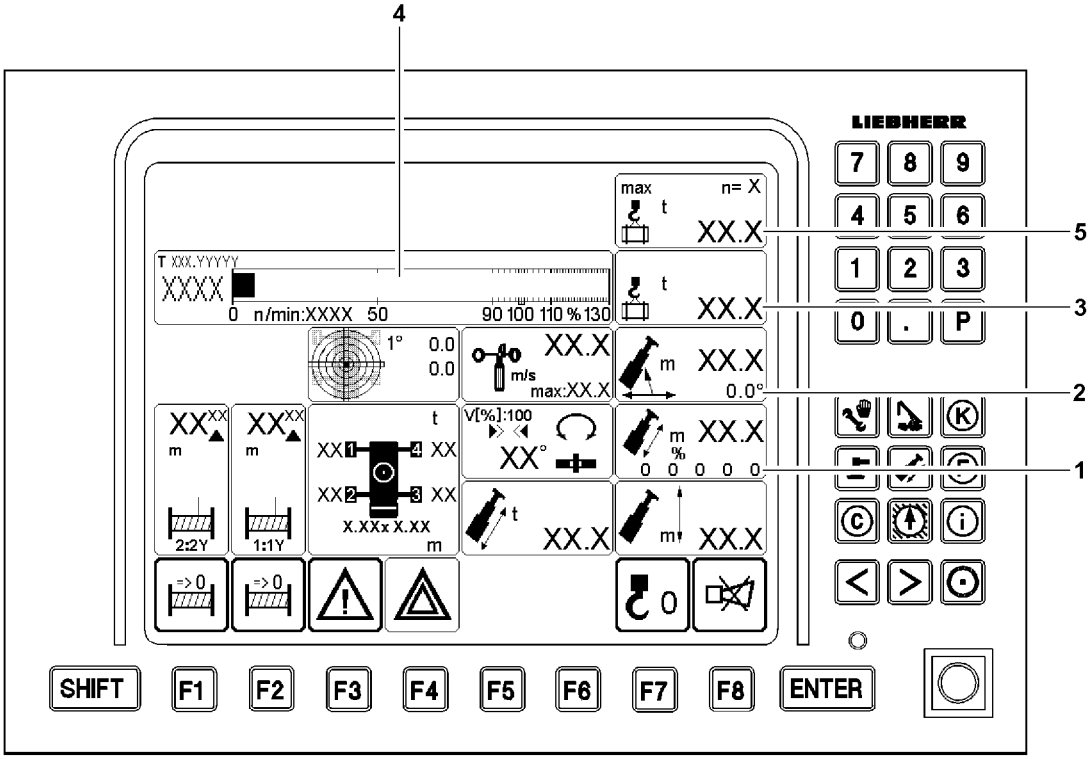
4.3.4 Checking and accepting the new set up configuration and hoist rope reeving

- ▶ If the settings on the set up screen are correct:
  Press function key “F8” **8**.

Result:

– The “Set up” program is terminated and the adjusted parameters are accepted for the newly started “Operation” program.

- ▶ Check if the correct short code and the correct reeving number have been set on the operating screen.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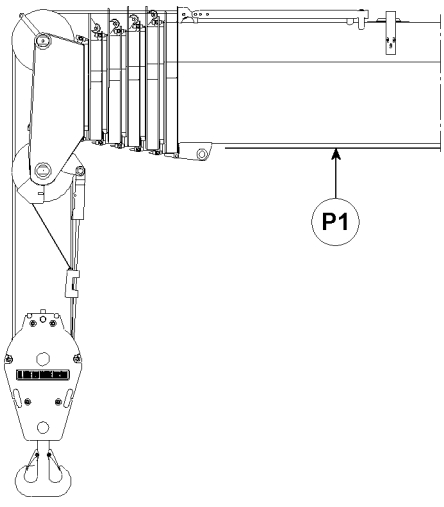

P1

B112697

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 from 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 properly supported and horizontally aligned.
- There is no load on the hook.

Note
- ▶ The horizontal alignment of the telescopic boom can be checked with a spirit level on point **P1**.

When the telescopic boom is completely telescoped in and horizontally aligned, the LICCON computer system must show the following:
- Display Extension status telescopes **1**: all values on 0 %
- Display Telescopic boom angle **2**: 0°

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 properly supported and horizontally aligned.

The respective displayed values must be plausible:
- Actual load display **3**
- Utilization bar **4** (ratio of value Actual load display **3** to maximum load value **5**)
- Example:
  Value Actual load display **3** is 40 t.
  Maximum load value **5** is 80 t.
  Utilization bar **4** 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: length sensor, 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!

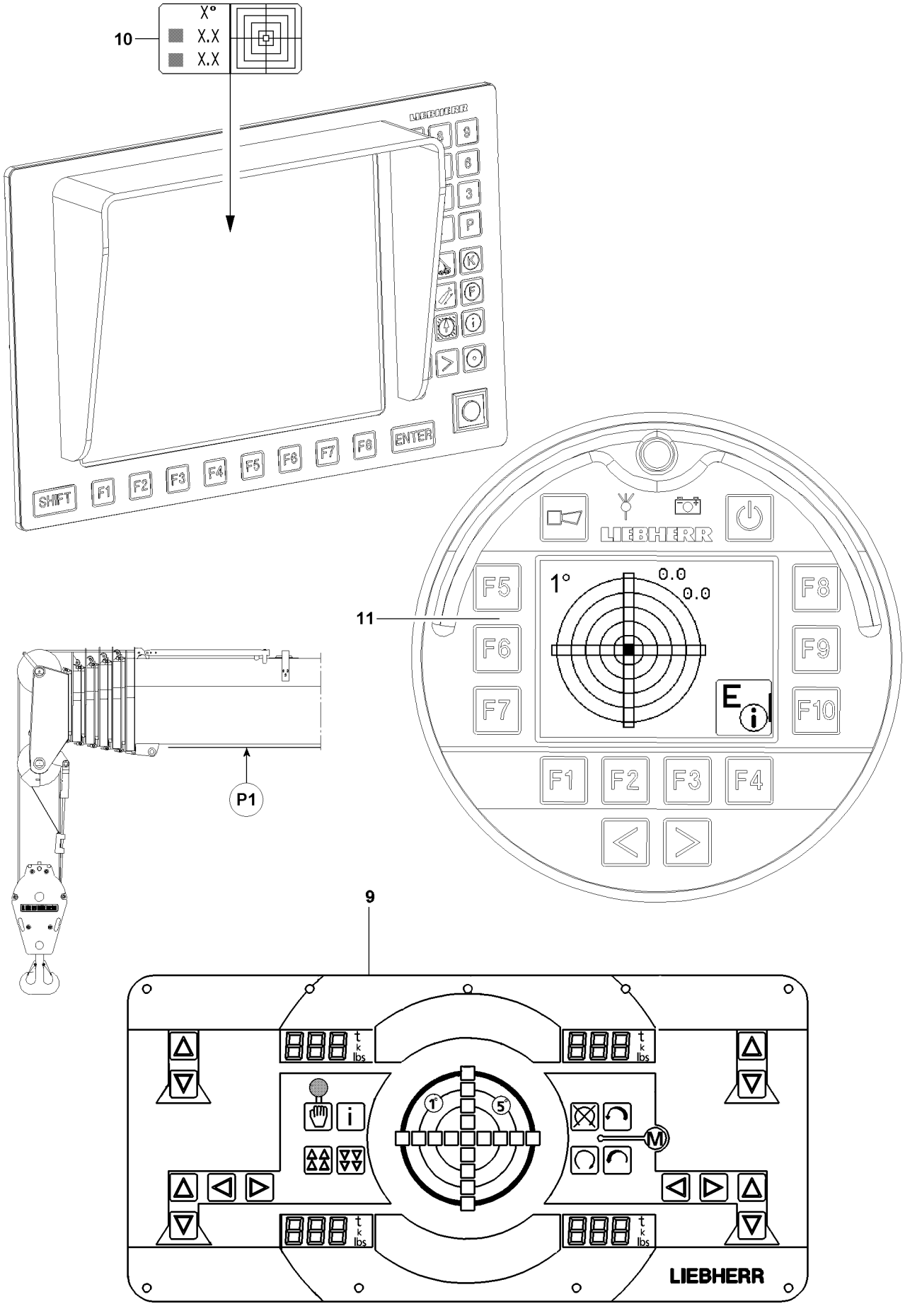
Personnel can be killed or seriously injured!

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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5 Safety devices on the crane

5.1 Leveling instruments

To ensure the working safety of the crane, the crane must be aligned horizontally on level ground with sufficient load bearing capacity. Alignment of the crane, see Crane operating instructions, chapter 3.05.
The current values are displayed continuously in the leveling instruments, see Crane operating instructions, chapter 4.02 and chapter 5.31.
The maximum permissible deviation from the horizontal position of the crane is ± 0.5 % (± 0.3°).

WARNING
The crane can topple over!
If the leveling instruments are defective, there is a danger that the crane is not horizontally aligned!
A crane which is not horizontally aligned can topple over!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ It is imperative that the crane is aligned in horizontal direction!

Note
▶ To level the crane, the support control unit **9 or** the Bluetooth Terminal™ (BTT) **11** is available.
▶ The various leveling instruments depend on the crane type.

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 3.05 and 4.02.

5.1.2 Leveling instrument in the BTT

The incline of the crane is shown in the Incline display menu **11** graphically as well as numerically, see Crane operating instructions, chapter 3.05 and 5.31.

5.1.3 Leveling instruments on the chassis with support control unit

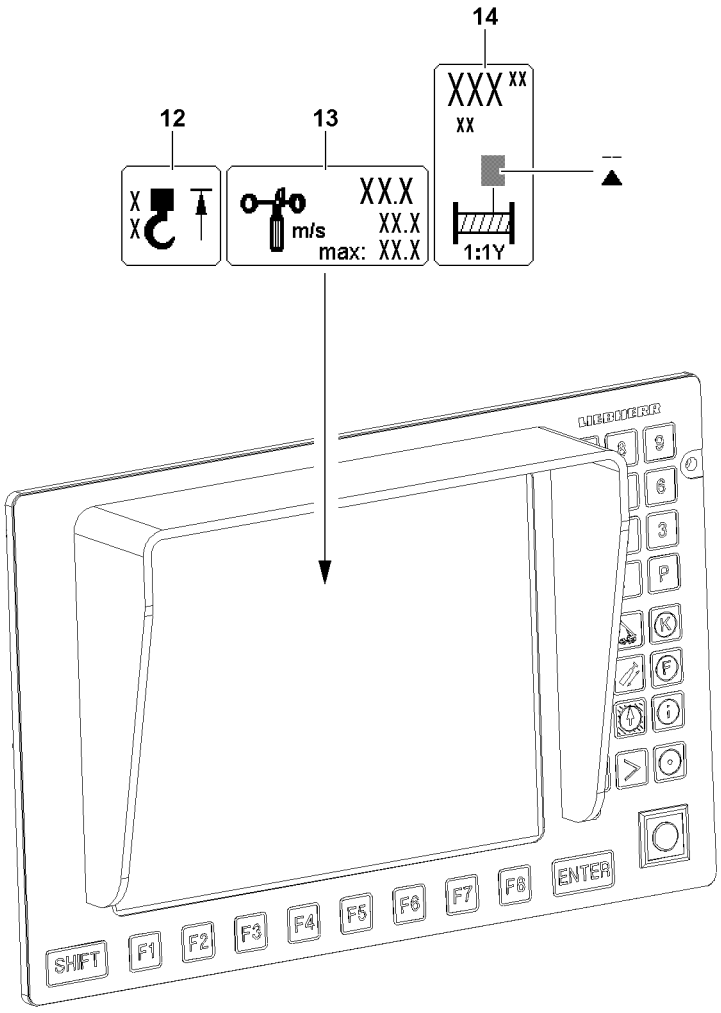
For leveling with the support control unit **9**, one support control unit **9** with an electronic incline display is installed on each of the two sides of the vehicle, see Crane operating instructions, chapter 3.01 and chapter 3.05.

5.1.4 Quick test Leveling instrument

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

For horizontally aligned crane:
– The telescopic boom must be aligned horizontally at telescopic boom angle 0° over the entire slewing range of the turntable.

Note
▶ The horizontal alignment of the telescopic boom can be checked with a spirit level on point **P1**.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5.2 Acoustic and optical warning devices

Note

▶ Overview of acoustic and optical warnings, see Crane operating instructions, chapter 4.20.

– The acoustic and optical warning devices must be functioning and operational.
– Take care of any possible detriments in function, such as snow on the warning lights.

5.3 Hoist limit switch “Hoist top”

The hoist limit switch is intended to prevent the hook block from running against the boom head.
Before every crane application, the function of the hoist limit switch must be checked by running against the switch weight with the hook block.
For installation purposes and in emergency cases, the hoist limit switch can be bypassed, see Crane operating instructions, chapter 4.20.

WARNING

Falling load and property damage!
If the hoist limit switch is defective, there is the danger that the hook block or the load hook is pulled against the pulley head!
Falling load and property damage can result!
Personnel can be severely injured or killed!

▶ Crane operation without or with defective hoist limit switch is prohibited!
▶ Repair or replace a defective hoist limit switch!

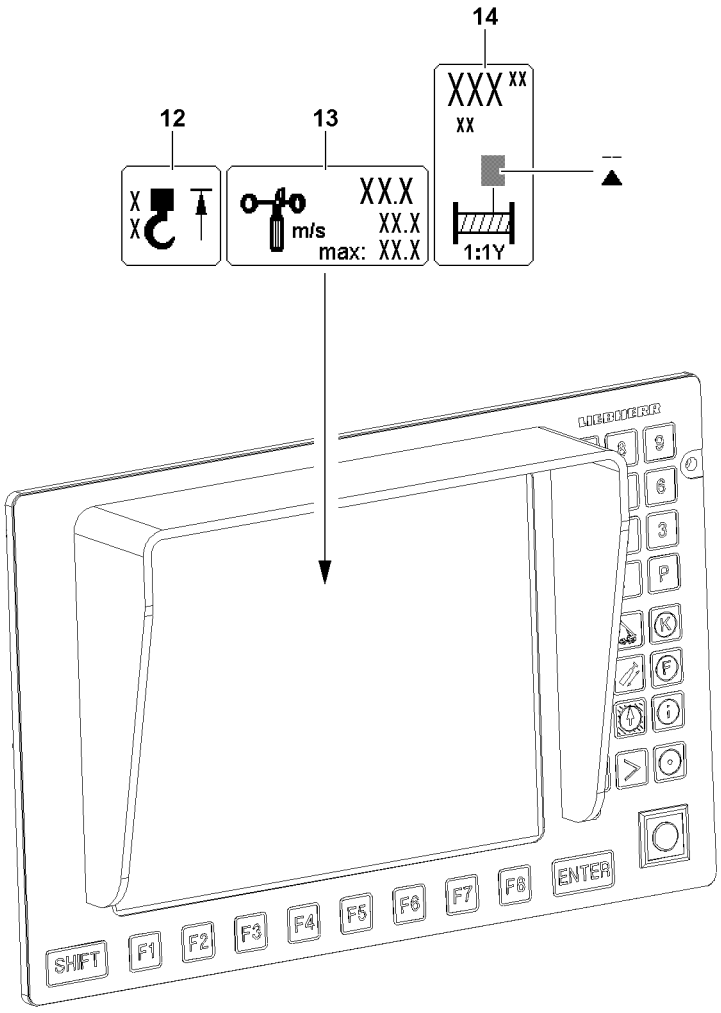
The hoist limit switch must actuate when the hoist limit switch weight is lifted by the load hook / hook block:

– When the hoist limit switch is actuated, the icon **12** “Hoist top” appears in the operating screen. The crane movements “Spool up winch”, “Luff telescopic boom down” and “Telescope the telescopic boom out” 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.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5.4 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.

5.4.1 Quick test Wind speed sensor

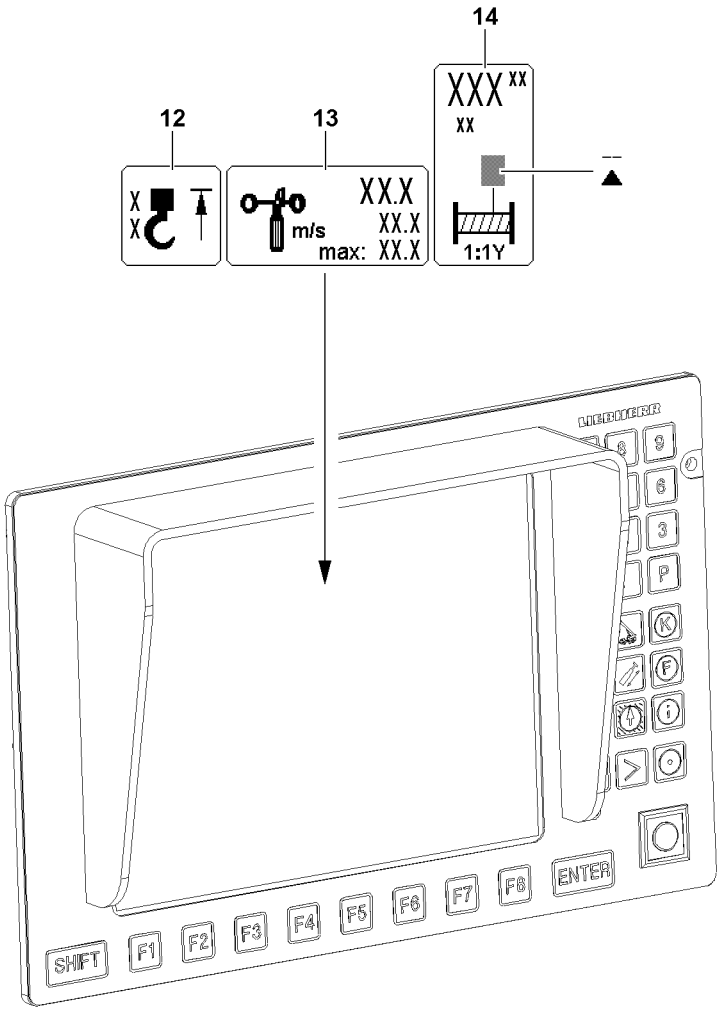
When blowing in the cups:
- – The wind speed sensor must start to move.
- – An actual value must be shown in the icon **13** “Wind speed”.

5.5 Limit switch winch spooled out

The limit switches for the winches are adjusted at the factory. If used properly, the winches will not need readjustment.

Note
Minimum rope coils on the shut off point!
For the winches, a minimum of three rope coils are set for each drum.
- ▶ The shut off must occur **before** reaching the third minimum rope coil.

WARNING
The load can fall off!
If the limit switch “Winch spooled out” does not turn off **before** three minimum rope coils are reached, then there is the danger, when it is further spooled out, that the rope mounting locks are ripped out and the load falls down!
Falling load can cause the crane to sway and / or topple over!
Personnel can be severely injured or killed!
This could result in property damage!
- ▶ Crane operation with an incorrectly or non-adjusted winch is strictly prohibited!
- ▶ If the winch falls below the three minimum rope coils per winch, have it readjusted by **Liebherr Service**!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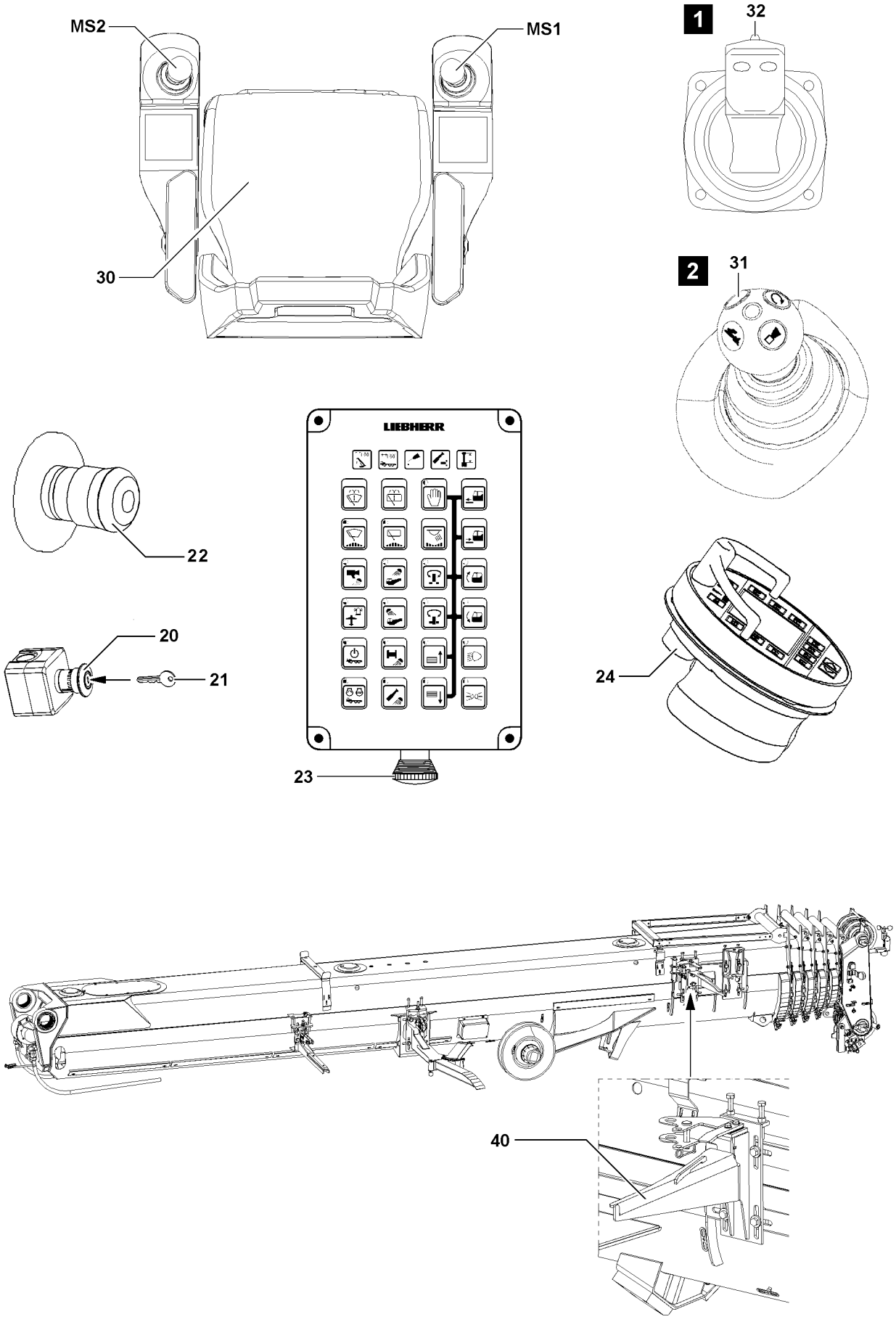
WARNING
The load can fall off!
If the rope is not spooled up or out properly, then the adjustment of the limit switch “Winch spooled out” is changed!
If the adjustment of the limit switch “Winch spooled out” has changed, then the minimum rope coils are fallen below!
The load call fall down!
Falling load can cause the crane to sway and / or topple over!
Personnel can be severely injured or killed!
This could result in property damage!
- ▶ **Never** pull the end of rope underneath the winch by spooling up the rope winch!
- ▶ **Never** pull the rope from the “stationary” winch!
- ▶ If you suspect that the limit switch “Winch spooled out” is not adjusted correctly: Check the shut off without a load on the hook!

The limit switch “Winch spooled out” must shut off when the minimum rope coils for the winch are reached:
– When the minimum rope coil for the winch is reached, then the display “Winch spooled out” appears in the Winch icon **14**, see illustration. The crane movement “Spool winch out” is shut off.

5.5.1 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.



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5.6 EMERGENCY STOP switch / EMERGENCY OFF switch

If an EMERGENCY STOP switch / EMERGENCY OFF switch is actuated, then every carried out movement can be stopped immediately.

WARNING
Defective EMERGENCY STOP switch / EMERGENCY OFF switch!
If the crane is operated with a defective EMERGENCY STOP switch / EMERGENCY OFF switch, then the 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!

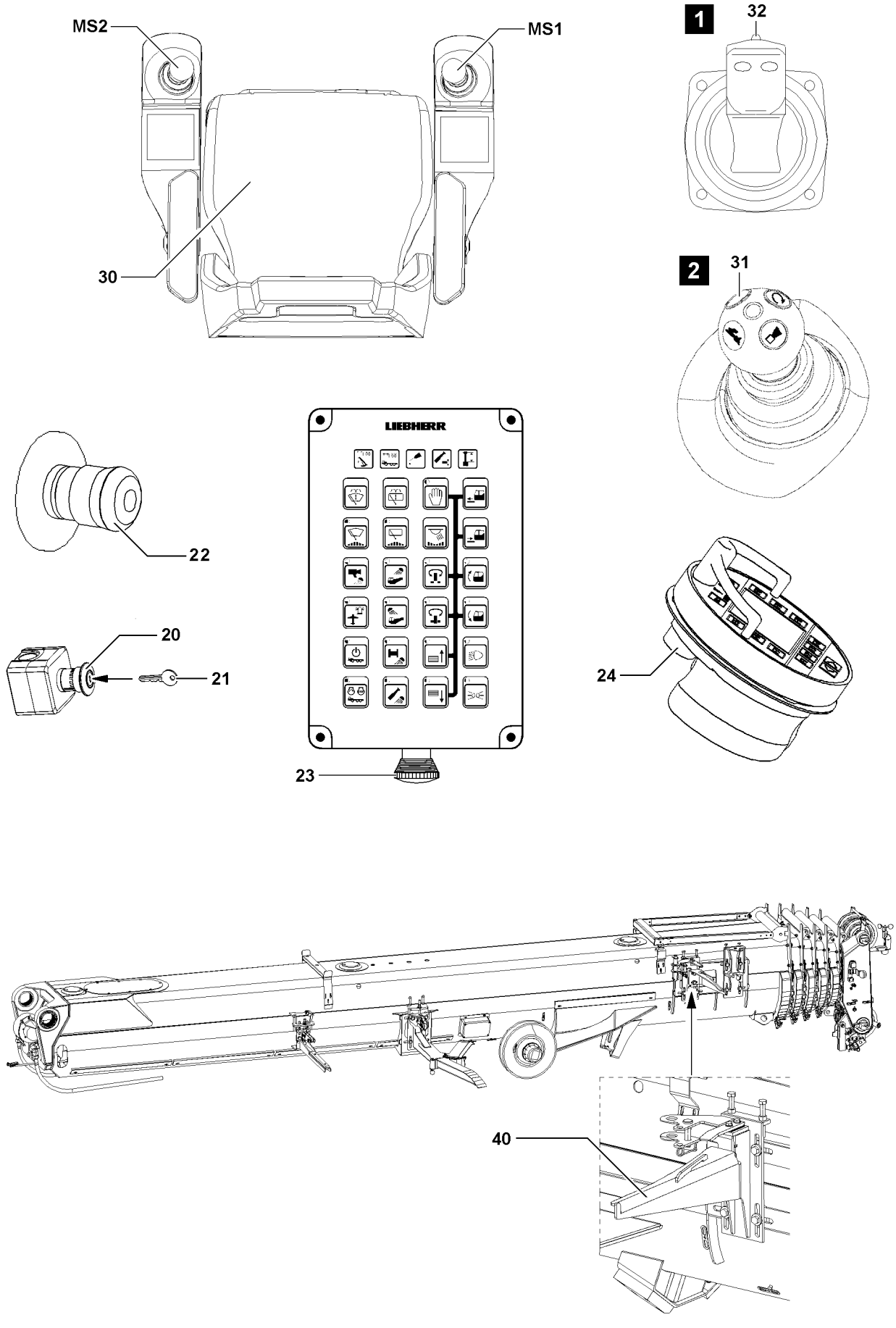
NOTICE
Operational actuation of the EMERGENCY STOP switch / EMERGENCY OFF switch
Actuation of the EMERGENCY STOP switch / EMERGENCY OFF switch causes the crane movement to shut off abruptly!
Abrupt shut off of the crane movement can cause the load to swing!
Swinging loads can cause accidents!
- ▶ Do 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:
- – 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 **22**, the release is obtained by turning and unlocking the knob and subsequently turning the ignition “Off - On” momentarily.
- – After actuation of the switch **23**, the release is obtained by turning and unlocking the knob and subsequently turning the ignition “Off - On” momentarily.
- – After actuation of the switch **24**, the release is obtained by turning and unlocking the knob and subsequently turning the ignition “Off - On” momentarily.

Note
- ▶ The switch **24** on the BTT is only activated when working with the BTT.

5.6.1 Quick test EMERGENCY STOP switch / EMERGENCY OFF switch

After actuation of the EMERGENCY STOP switch / EMERGENCY OFF switch:
- – The crane movements must be shut off.
- – 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.



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5.7 Control release

The control release can be made by various buttons:
– Seat contact button **30**
– Button **31** on master switch **MS1** and **MS2** (all except LTM1500-8.1)

or
– Button **32** on master switch **MS1** and **MS2** (only LTM1500-8.1)

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.
The button **31** or button **32** bypass the seat contact button **30** if it becomes necessary for the operator to work standing up.

5.8 Catch bar

Note
▶ Only for cranes with folding jib.

The catch bar **40** on the telescopic boom pivot section is a mechanical safety device!

WARNING
Danger of fatal injuries due to toppling folding jib!
Due to incorrectly installed, damaged or non-existing catch bar **40** on the telescopic boom pivot section, the folding jib can fall down - in case of an installation error!
Personnel can be hit and killed or seriously injured!
This could result in property damage!
▶ Before folding jib assembly make sure that the catch bar **40** has been installed properly on the telescopic boom pivot section and that it is not damaged!
▶ The catch bar **40** is a mechanical safety device. For that reason, it is prohibited to change the catch bar **40** and its installation in any way!

5.9 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 luffing cylinder and the support cylinders.
– Check valves
  • Control and secure the flow direction.

5.10 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!

5.11 Limit switch Telescopic boom

On the telescopic boom, the limit switches monitor the “steepest position” and the “lowest position”.

5.12 Limit switch Luffing accessories

Note

▶ Only for cranes with luffing accessories

For operation with luffing accessories (for example a luffing lattice jib) limit switches monitor the “steepest position” and the “lowest position”.

5.13 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!

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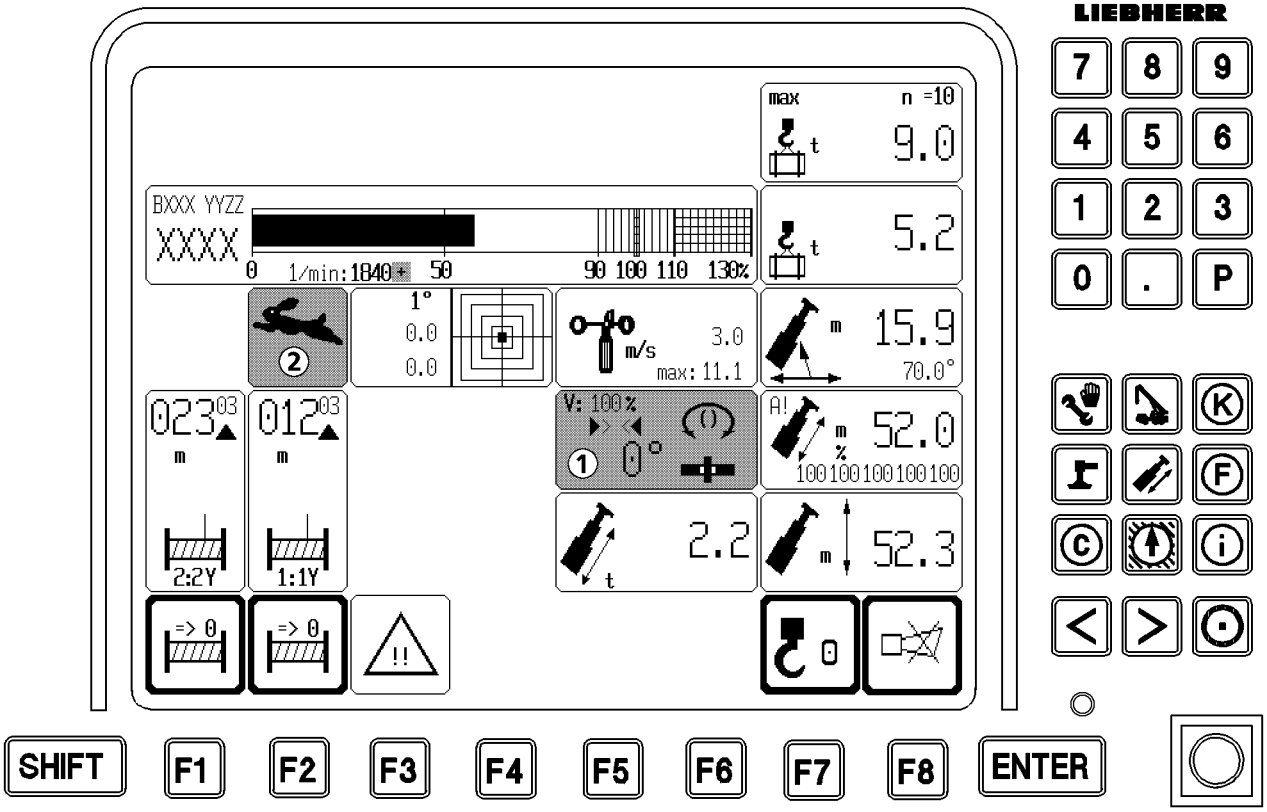
LIEBHERR
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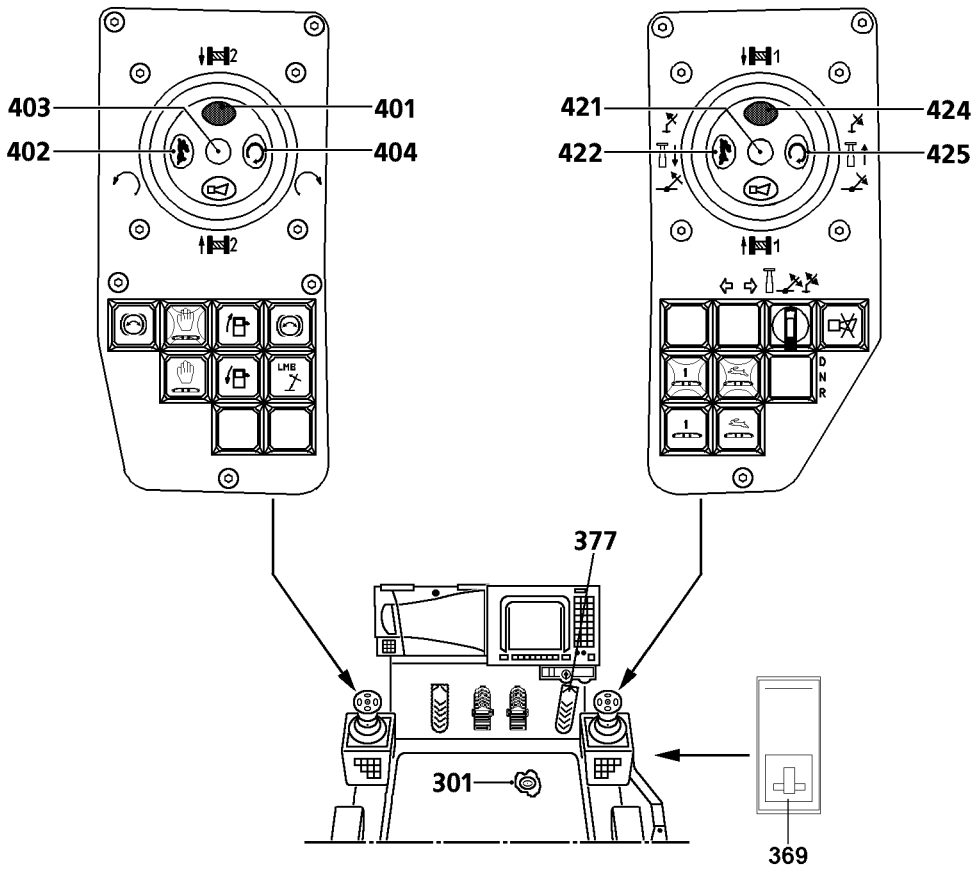
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369

B111650

1 General

Make sure that the following prerequisites are met:
- The crane is aligned in horizontal direction.
- The counterweight is attached and secured according to the data in the load chart.
- The ground is able to carry the weight of the crane, the load and the load tackle.
- The central ballast is attached and secured according to the data in the load chart.
- The hook block is correctly reeved as shown in reeving plan.
- The crane engine is running.
- All safety devices have been adjusted according to the data in the load chart.
- There are no persons or objects in the danger zone.
- The crawlers are pushed out, pinned and wedged to a track width as specified in the load chart.

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

DANGER
Risk of accident!
- ▶ In order to protect the crane and reduce the danger of accidents always use the master switch slowly and sensitively.
- ▶ Ensure that there are no obstacles in the working range of the crane and that there are no persons within the danger zone.

1.1 Superstructure

1.1.1 Locking the superstructure

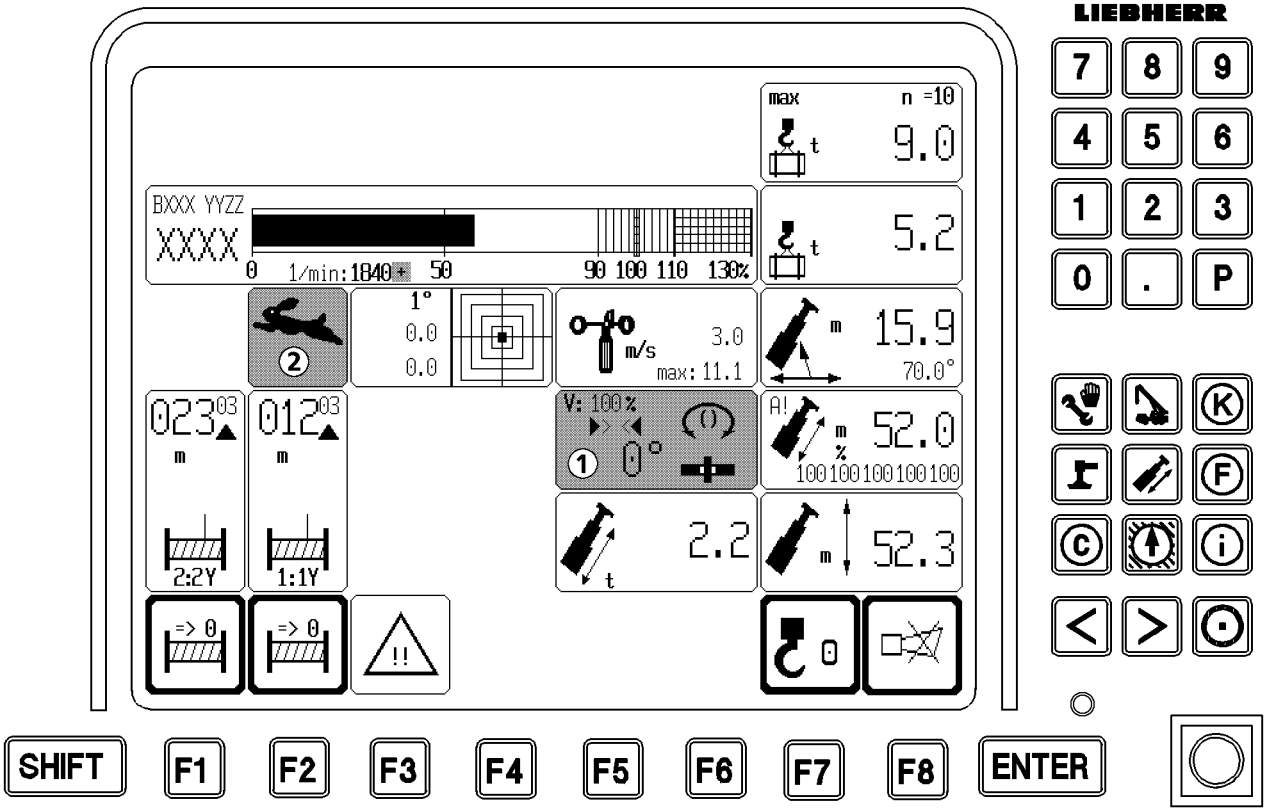
▶ Press the button **369**.

Result:
- The locking mechanism of the superstructure is locked.
  The icon **1** appears on the LICCON monitor.

1.1.2 Releasing the superstructure locking mechanism

▶ Once the superstructure is locked:
Press the button **369** again.

Result:
- The locking mechanism of the superstructure is unlocked.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
max n =10
9.0
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70.0°
52.0
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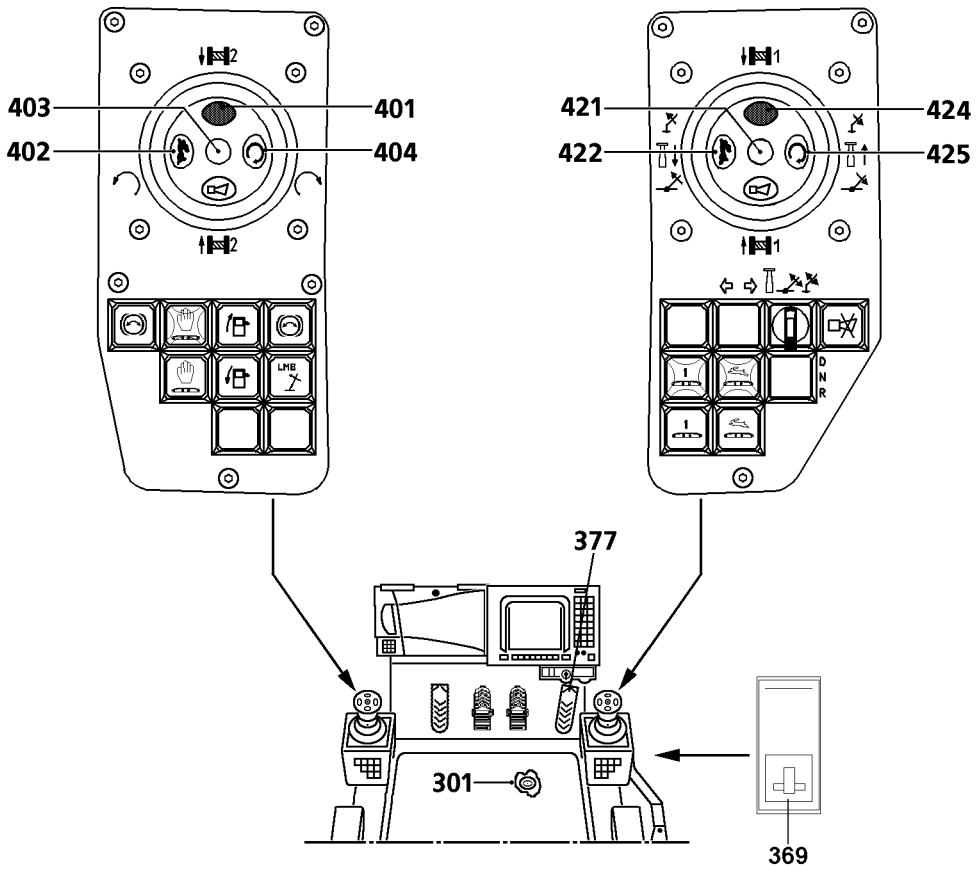
3.0
max: 11.1
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER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1.2 Engine RPM

1.2.1 Locking the engine RPM

Locking engine RPM relieves the crane operator if he needs to work for an extended period with constant RPM. The engine control can be locked in any position.

▶ Press the pedal **377** down for the engine regulation until the desired RPM is reached.

▶ Press the button **404**.

or

■ Press the button **425**.

Result:

– The pedal **377** is locked.

– The “+” symbol appears on the monitor.

1.2.2 Releasing the engine rpm lock

▶ If the engine rpm is locked:
Press the button **404** again.

or

■ Press the button **425** again.

Result:

– The lock is released.

– The “+” symbol extinguishes on the monitor.

1.3 Rapid gear “crawler operation and crane operation”

1.3.1 Adding rapid gear “crawler operation and crane operation”

Using the button **402** or the button **422** will increase the speed of the crane movement for “luffing up” and “lift / lower”.

DANGER

Accident hazard in the event of one to three strand reeving!

▶ Do **not** turn the rapid gear on if the crane is loaded to more than 50 % of its maximum permitted load carrying capacity for the respective radius.

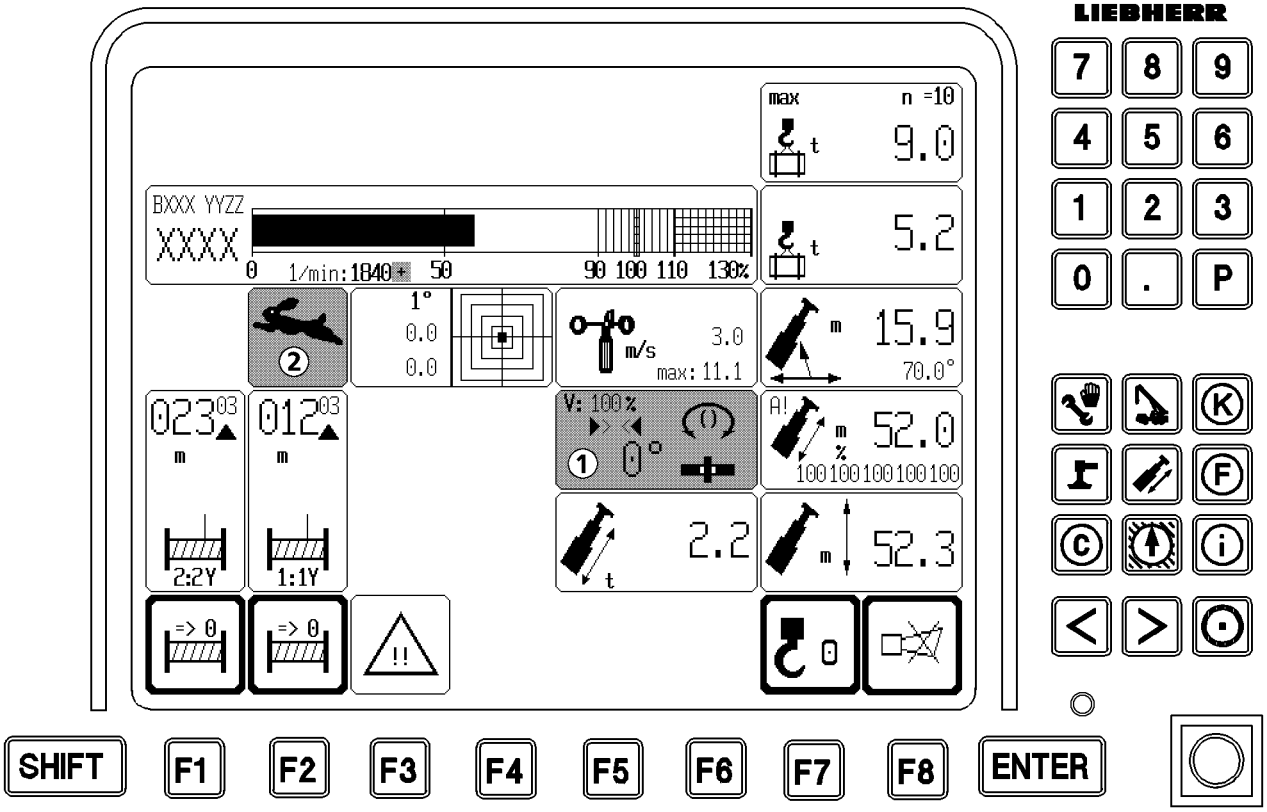
▶ Press the button **402**.

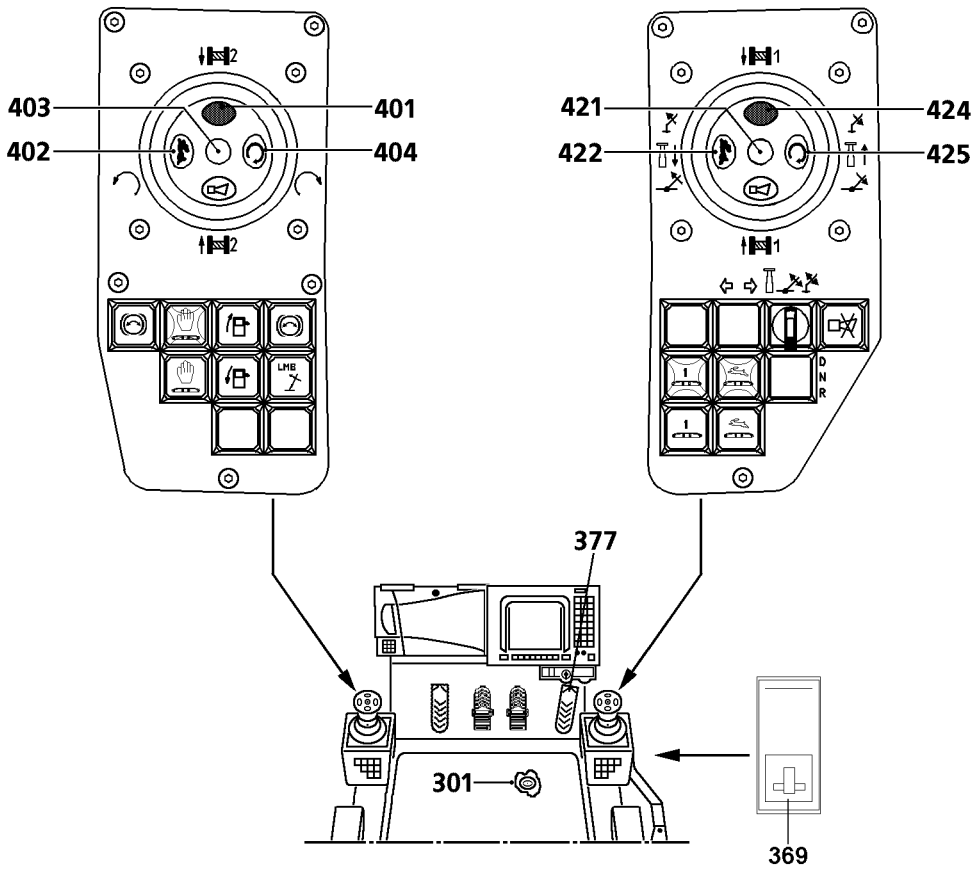
or

■ Press the button **422**.

Result:

– The rapid gear “crawler operation and crane operation” is added.
The icon **2** appears on the LICCON monitor.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
max n =10
9.0
5.2
15.9
70.0°
52.0
2.2
52.3
3.0
max: 11.1
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


403
401
402
404
421
424
422
425
377
301
369

B111650

1.3.2 Turning off rapid gear “crawler operation and crane operation”

▶ When the rapid gear “crawler operation and crane operation” is added:
Press the button **402** again.

or

■ Press the button **422** again.

Result:

– The rapid gear “crawler operation and crane operation” is turned off.
The icon **2** turns off on the LICCON monitor.

1.4 Vibration sensor

By adding the vibration sensor, a crane movements can be detected by vibration of the master switch.
Make sure that the following prerequisite is met:

– The seat contact switch **301** is activated.

1.4.1 Winch 1

▶ Press the button **424**.

Result:

– The vibration sensor **421** is turned on.

▶ When the vibration sensor **421** is turned on:
Press the button **424** again.

Result:

– The vibration sensor **421** is turned off.

1.4.2 Winch 2 or slewing gear

If winch 2 and the slewing gear are operated, the vibration sensor **403** will react to the first deflecting movement.

▶ Press the button **401**.

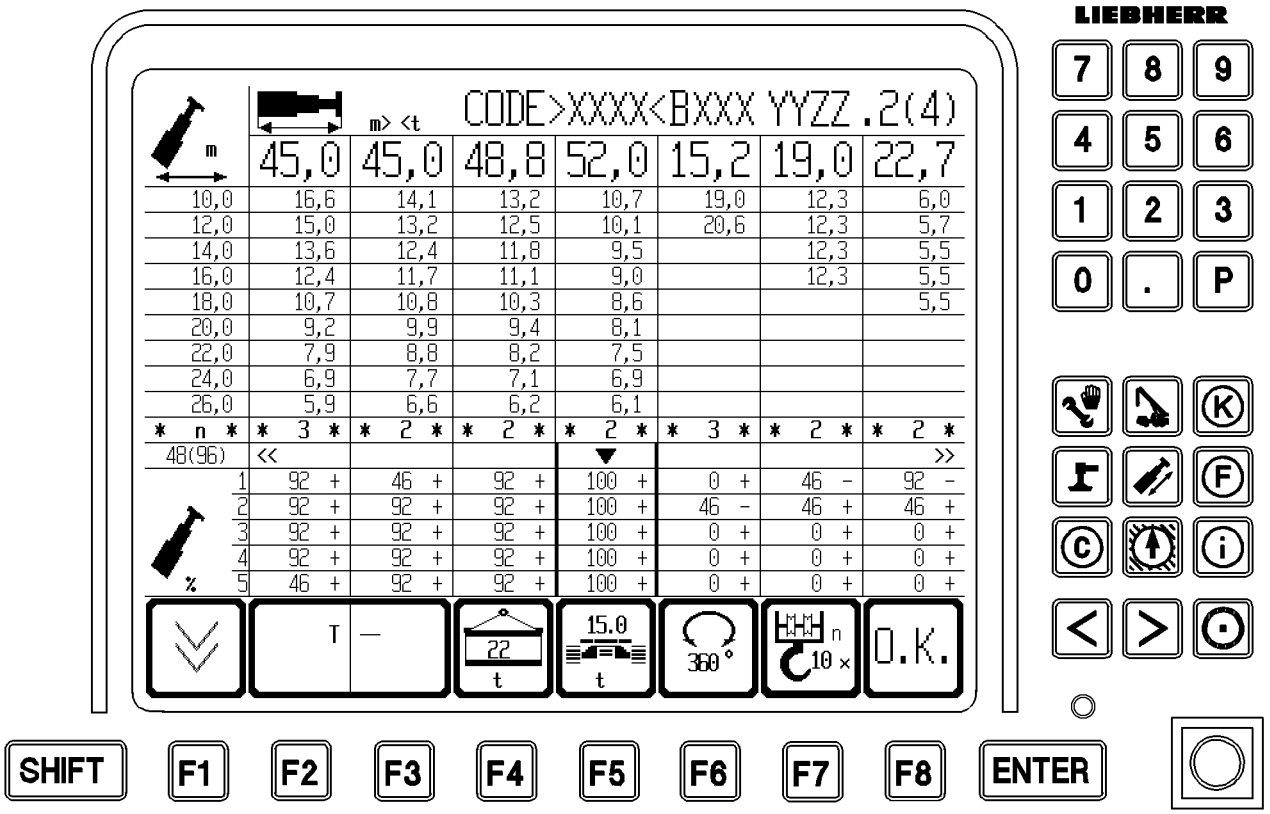
Result:

– The vibration sensor **403** is turned on.

▶ When the vibration sensor **401** is turned on:
Press the button **401** again.

Result:

– The vibration sensor **403** is turned off.


LIEBHERR
m> <t
CODE>XXXX<BXXX YYZZ.2(4)
45,0 45,0 48,8 52,0 15,2 19,0 22,7
10,0 16,6 14,1 13,2 10,7 19,0 12,3 6,0
12,0 15,0 13,2 12,5 10,1 20,6 12,3 5,7
14,0 13,6 12,4 11,8 9,5 12,3 5,5
16,0 12,4 11,7 11,1 9,0 12,3 5,5
18,0 10,7 10,8 10,3 8,6 5,5
20,0 9,2 9,9 9,4 8,1
22,0 7,9 8,8 8,2 7,5
24,0 6,9 7,7 7,1 6,9
26,0 5,9 6,6 6,2 6,1
* n * * 3 * * 2 * * 2 * * 2 * * 3 * * 2 * * 2 *
48(96) << >>
1 92 + 46 + 92 + 100 + 0 + 46 - 92 -
2 92 + 92 + 92 + 100 + 46 - 46 + 46 +
3 92 + 92 + 92 + 100 + 0 + 0 + 0 +
4 92 + 92 + 92 + 100 + 0 + 0 + 0 +
5 46 + 92 + 92 + 100 + 0 + 0 + 0 +
%
T
22
t
15.0
t
360°
n
10 x
O.K.
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B102854

2 LICCON computer system

See chapter 4.02.

2.1 The crane engine is running.

Make sure that the following prerequisites are met:
– The batteries are charged by the alternator.
– A stable voltage is present.

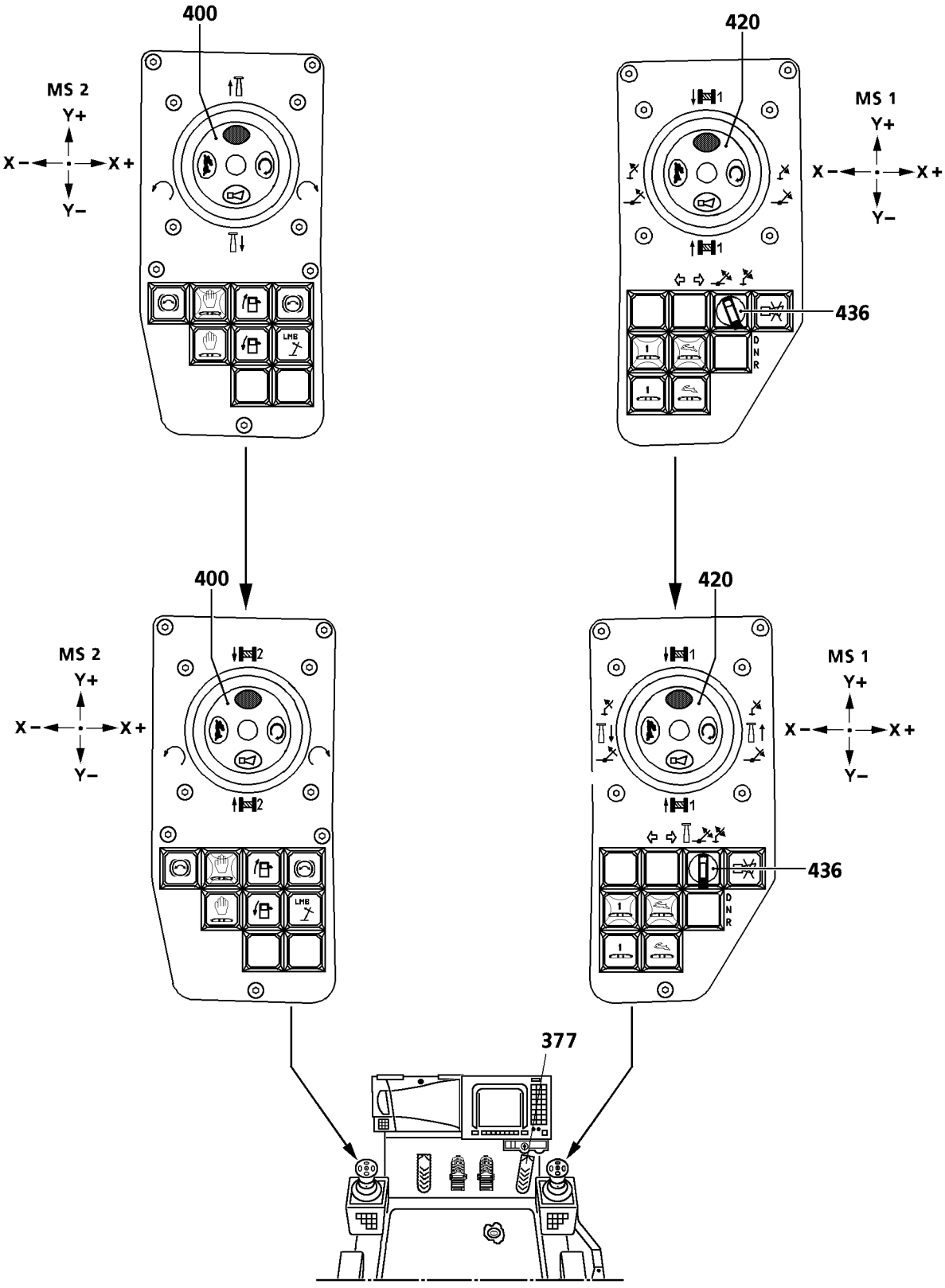
The electric crane control system and the LICCON computer system are turned on automatically. A self test of the LICCON computer system follows.
▶ Await the self test.

Result:
– After a few seconds the configuration screen appears on the monitor.

Troubleshooting
The configuration screen does not appear on the monitor?
A fault was detected during the self test of the LICCON computer system.
▶ See chapter 4.02.

2.2 Stand-by mode

No crane movements are possible. See chapter 4.02.



B198637

3 Luffing

Speed of crane movement “Luffing” is controlled by the deflection of master switch 1 **420** and by the pedal **377** of the engine control.

DANGER
Crane can be damaged or topple over!
▶ If an attempt to lift a load with the hoist gear causes the LICCON overload protection to turn off, then the load may not be lifted by luffing up the boom.

3.1 Luffing the telescopic boom

In the “Control Parameter program”, it is possible to preselect the maximum luffing speed of the telescopic boom.
See chapter 4.02, section “Control Parameter”.

3.1.1 Luffing the telescopic boom on cranes with one winch

Make sure that the following prerequisite is met:
– The rotary switch **436** is at position left “luffing telescopic boom”.
– The seat contact switch is activated.

▶ Deflect the master switch 1 **420** in direction X-.

Result:
– The telescopic boom is luffed up.

▶ Deflect the master switch 1 **420** in direction X+.

Result:
– The telescopic boom is luffed down.

3.1.2 Luffing the telescopic boom on cranes with two winches

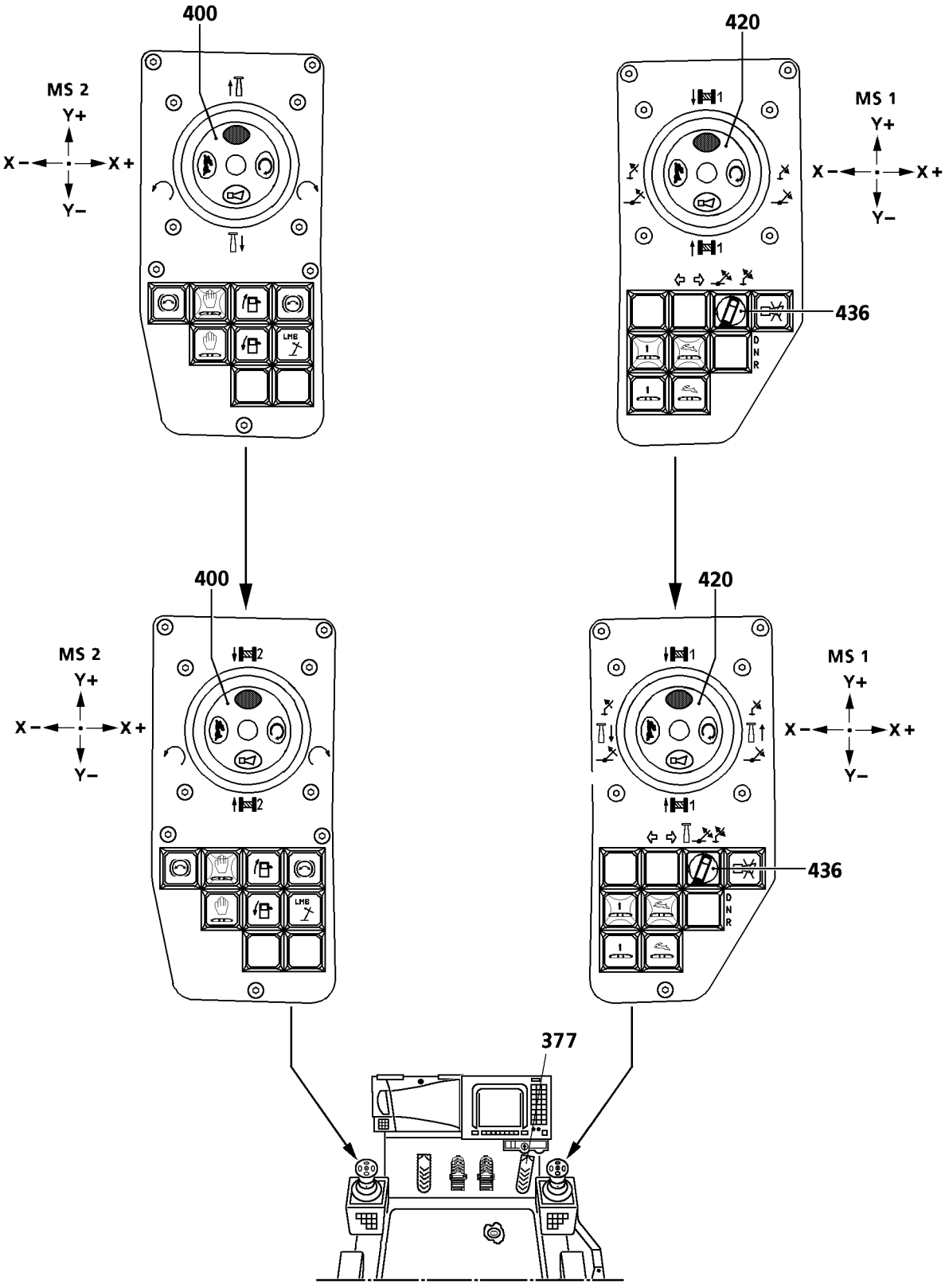
Make sure that the following prerequisite is met:
– The rotary switch **436** is at center position “luffing telescopic boom”.
– The seat contact switch is activated.

▶ Deflect the master switch 1 **420** in direction X-.

Result:
– The telescopic boom is luffed up.

▶ Deflect the master switch 1 **420** in direction X+.

Result:
– The telescopic boom is luffed down.



B198638

3.2 Luffing the folding jib*

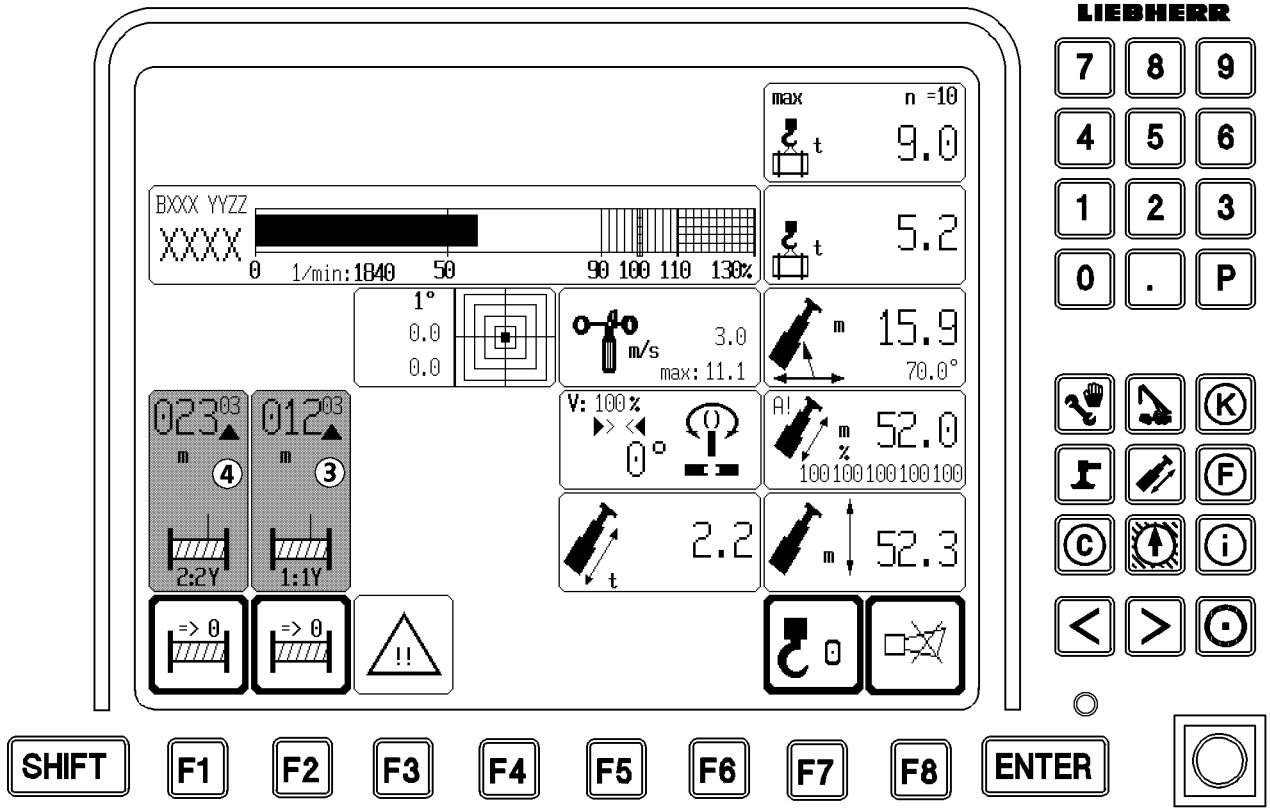
Make sure that the following prerequisite is met:
- The rotary switch **436** is set to position right “luff folding jib”.
- The seat contact switch is activated.
- Operating mode hydraulically adjustable folding jib has been selected on the LICCON.

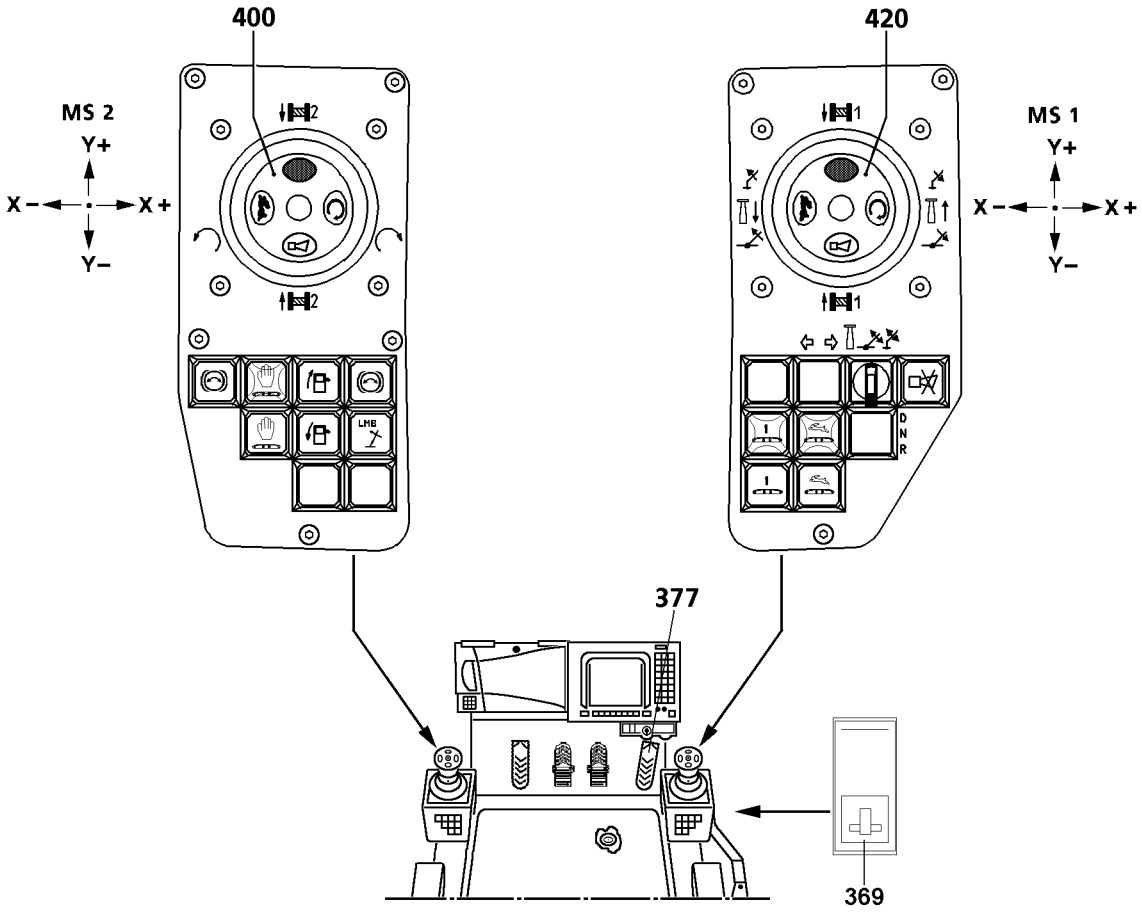
▶ Deflect the master switch 1 **420** in direction X-.

Result:
- Folding jib is luffed up.

▶ Deflect the master switch 1 **420** in direction X+.

Result:
- Folding jib is luffed down.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
max n =10
9.0
5.2
15.9
70.0°
52.0
2.2
52.3
3.0
max: 11.1
1/min: 1840
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


400
420
MS 2
MS 1
Y+
X−
X+
Y−
377
369

B111651

4 Lifting / lowering

CAUTION
Danger of damaging the hoist rope when spooling up and/or spooling out!
▶ Do not allow slack cable to build up.

Speed of crane movement “Lifting” is controlled by the deflection of the respective master switch and by the pedal **377** of the engine control.
In the “Control Parameter” program, it is possible to preselect the maximum winch speed. It is also possible to deactivate or activate the individual winches.
See chapter 4.02, section “Control Parameter”.

4.1 Lifting / lowering winch 1

The winch icon **3** shows that winch 1 is turning, even when because of multiple reeving and low speed, no hook movement is visible.
Make sure that the following prerequisite is met:
– The seat contact switch is activated.

▶ Deflect master switch 1 **420** in direction Y+.
Result:
– Winch 1 spools out and the load is lowered.

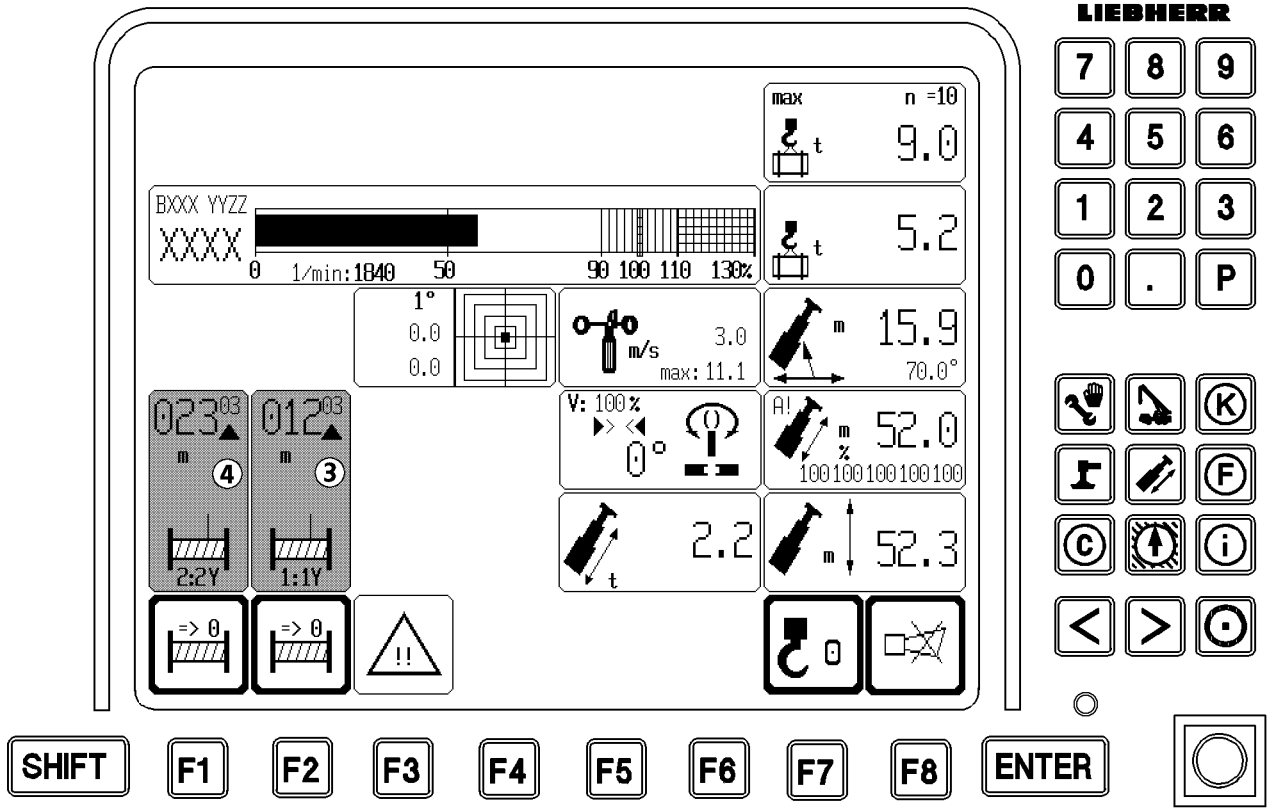
▶ Deflect master switch 1 **420** in direction Y-.
Result:
– Winch 1 spools up and the load is lifted.

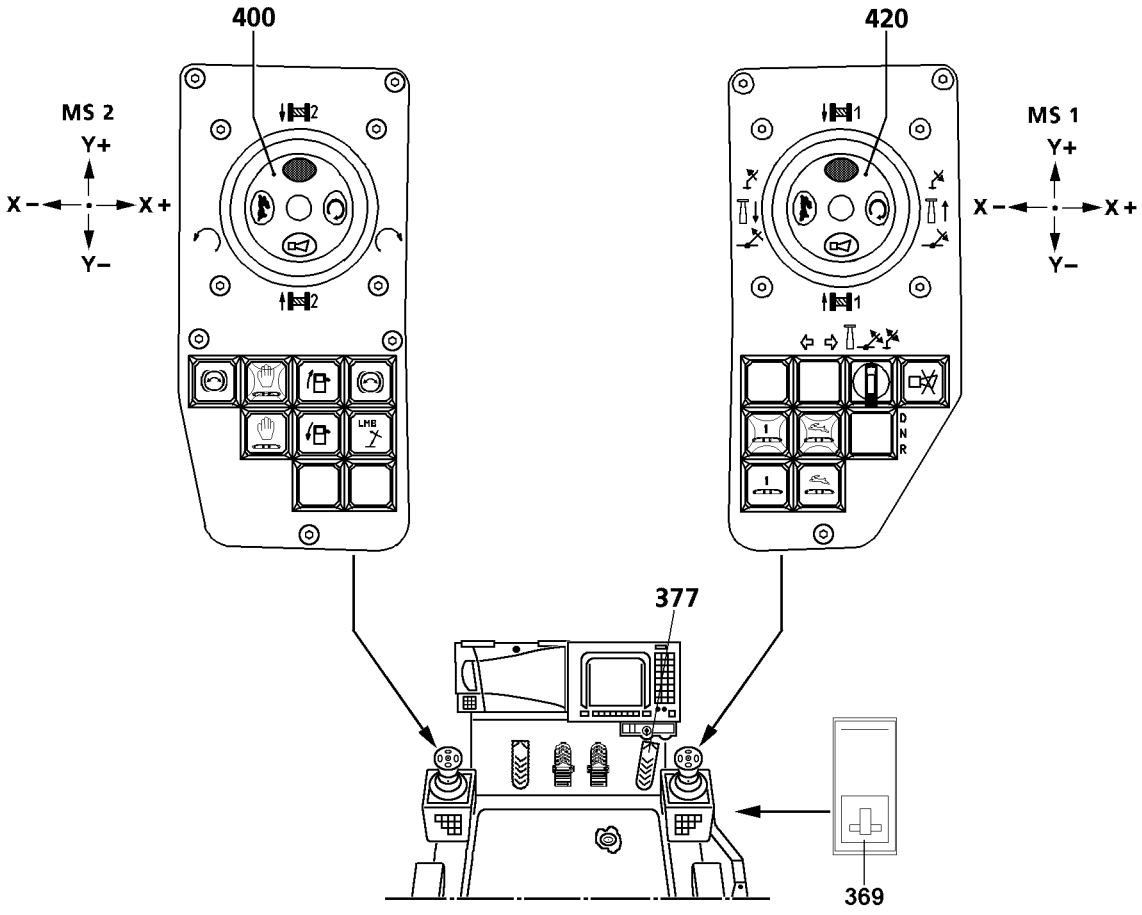
4.2 Lifting / lowering winch 2

The winch icon **4** shows that winch 2 is turning, even when because of multiple reeving and low speed, no hook movement is visible.
Make sure that the following prerequisite is met:
– The seat contact switch is activated.

▶ Deflect master switch 2 **400** in direction Y+.
Result:
– Winch 2 spools out and the load is lowered.

▶ Deflect master switch 2 **400** in direction Y-.
Result:
– Winch 2 spools up and the load is lifted.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
max n =10
9.0
5.2
15.9
70.0°
52.0
2.2
52.3
3.0
max: 11.1
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


400
420
MS 2
MS 1
Y+
X−
X+
Y−
377
369

B111651

5 Turning

The speed of the “turning” crane movement is controlled via the deflection of master switch 2 **400** and via the pedal **377** of the engine regulation.

NOTICE
Damage to crane!
If the crawler travel gear is added while turning the crane, the crane can be damaged!
▶ Adding the crane travel gear while turning the crane is prohibited!

5.1 Turning the crane superstructure

Make sure that the following prerequisite is met:
– The crane superstructure must be unpinned before initiating the turning movement.

WARNING
Risk of fatal injury!
If there are any persons on the crawler travel gear during turning or in any other danger zone of the crane, then these persons can be killed or severely injured!
▶ It is prohibited for personnel to remain in the danger zone!
▶ Make sure that there are no obstacles within the working range of the crane!
▶ Give a short warning signal (horn) before initiating a crane movement!
▶ When turning with a load, initiate and slow down the turning maneuver extremely sensitively!

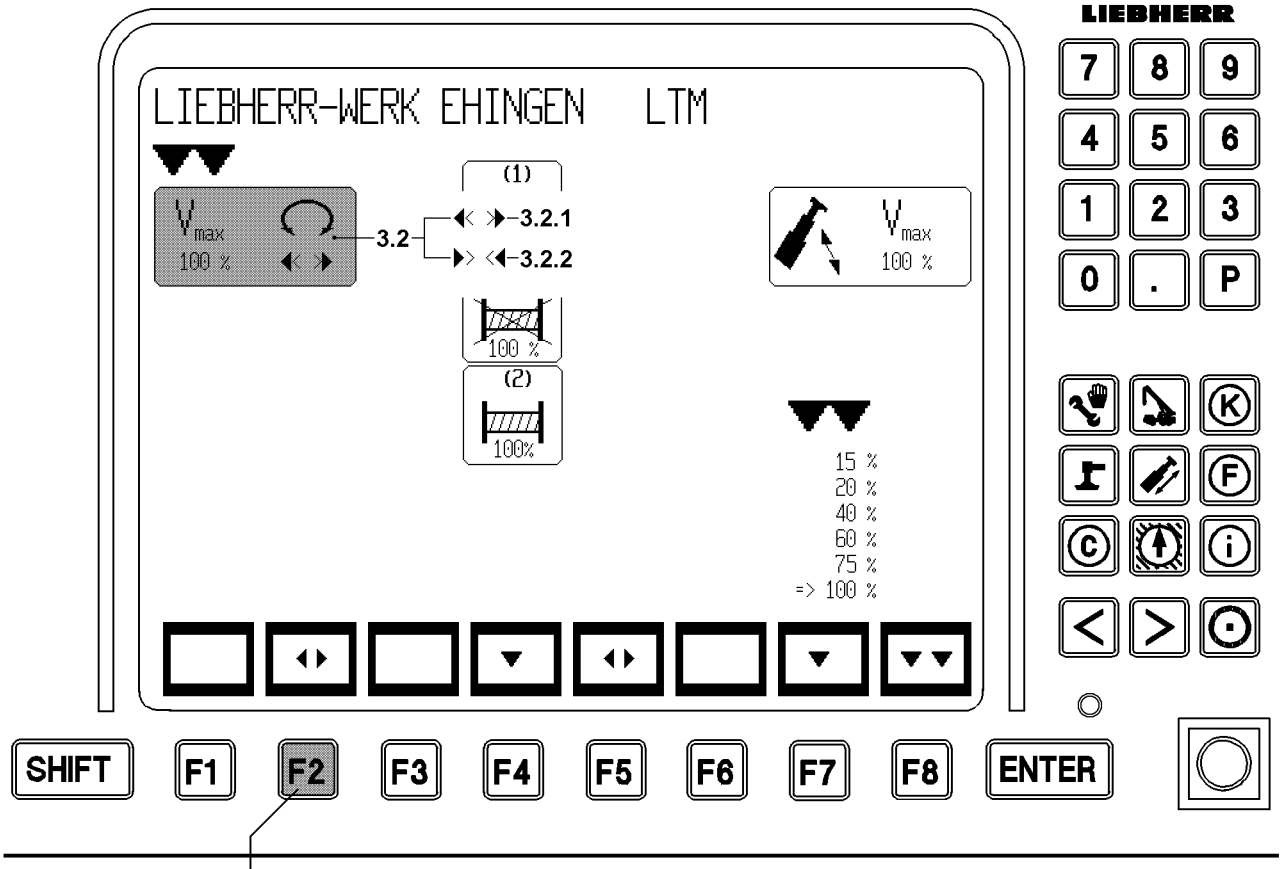
▶ Deflect the master switch 2 **400** in direction X+.
Result:
– The crane superstructure turns to the right.

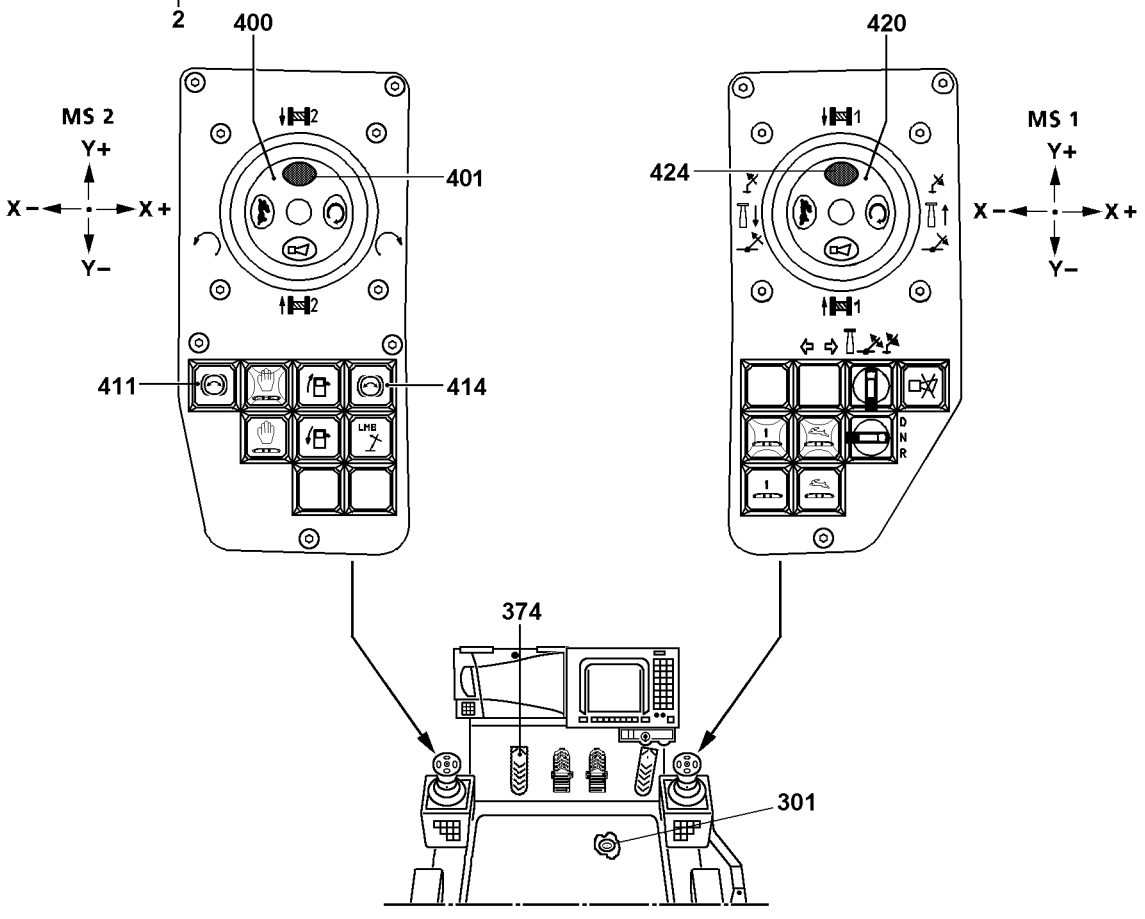
▶ Deflect the master switch 2 **400** in direction X-.
Result:
– The crane superstructure turns to the left.

5.2 Preselection of slewing speed

The load chart manual gives the maximum slewing speeds in percentages. The maximum permissible slewing speeds can be set on the LICCON monitor in adjustment window “Speed reduction master switch”, see Crane operating instructions, chapter 4.02. Always move at slower speed with a longer boom and a heavier load.

WARNING
The crane can topple over!
If the following instructions are not observed, life threatening situations could arise even causing the crane to topple over.
▶ The boom length values and the operating mode that are specified in the load chart must **never** be exceeded during crane operation!
▶ The maximum slewing speed may not be modified when executing a crane movement.


LIEBHERR
LIEBHERR-WERK EHINGEN LTM
(1)
3.2
3.2.1
3.2.2
100 %
(2)
100%
15 %
20 %
40 %
60 %
75 %
=> 100 %
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


2
400
401
411
414
MS 2
Y+
X−
X+
Y−
420
424
MS 1
374
301

B104736

5.3 Slewing gear, General

With this slewing gear it is possible to select between “freely rotating / coasting” and “fixed” slewing gear. Switching over takes place in the “Control Parameter program” using function key “F2” **2** and can only be carried out while the crane is stationary. If the “slewing gear is freely rotating” icon **3.2.1** is displayed, and if the “slewing gear is fixed” icon **3.2.2** is displayed. See chapter 4.02, section “Control Parameter program”.

The slewing gear cannot be switched to “freely rotating / coasting slewing gear” if:

– The crawler travel gear is added.
– The radio remote control is being used.
– The working range limiter is active.
– Charts that have not been approved are selected.

Note

▶ In the above cases the “freely rotating / coasting slewing gear” can be pre-selected in the adjustment window “Speed reduction master switch”, but the function is not applied to the “Crane operation” program.

5.3.1 Freely rotating slewing gear (open)

DANGER

Danger of accident in inclined position!

If the “freely rotating slewing ear” is turned on in inclined position, then the crane superstructure turns uncontrolled to the side and can topple over!

Personnel can be severely injured or killed!

▶ In inclined position, crane operation with “freely rotating slewing gear” is prohibited!
▶ Never release the parking brake in inclined position!
▶ In inclined position, “only crane operation with fixed slewing gear” is permissible!

To be able to operate the “freely rotating slewing gear”:

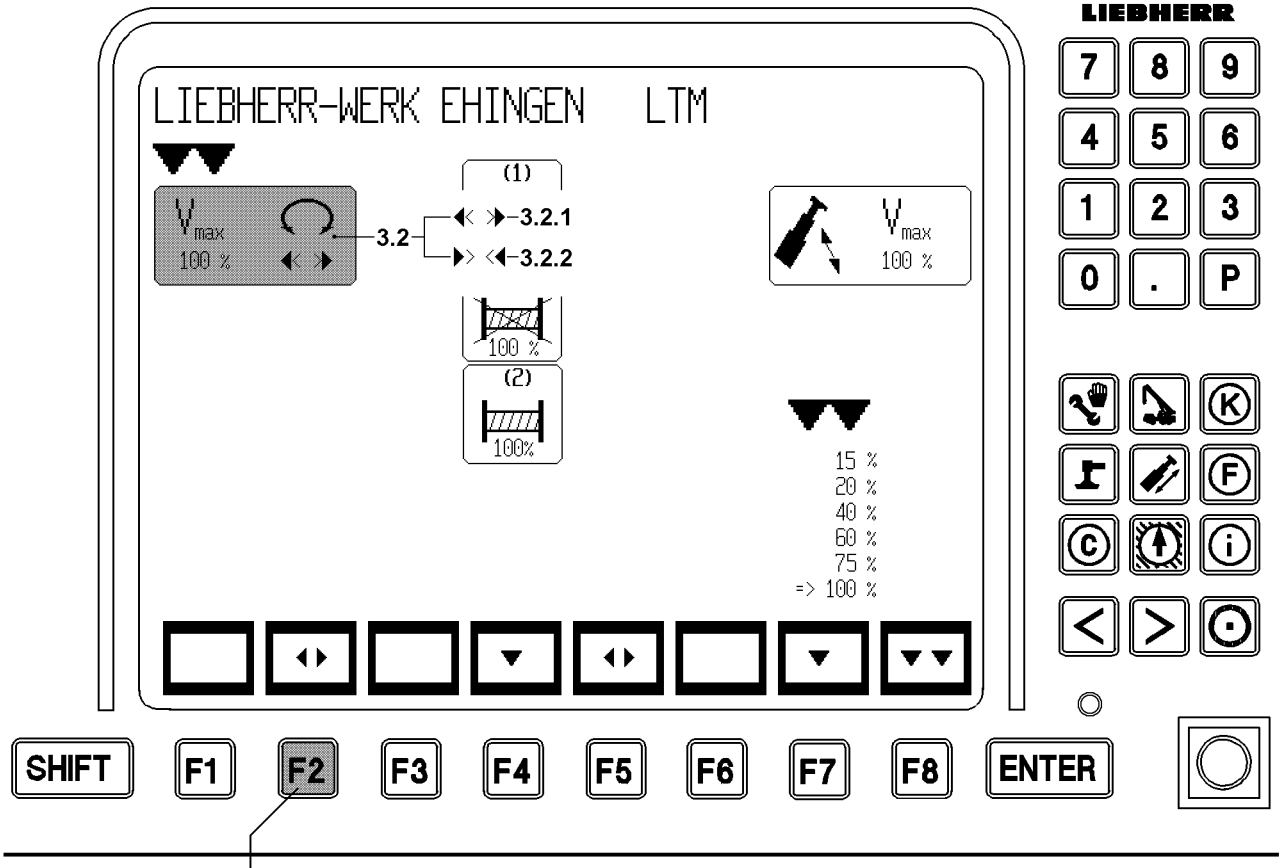
– The “parking brake for the slewing gear” must be **released**.
– The indicator light **411** lights up.

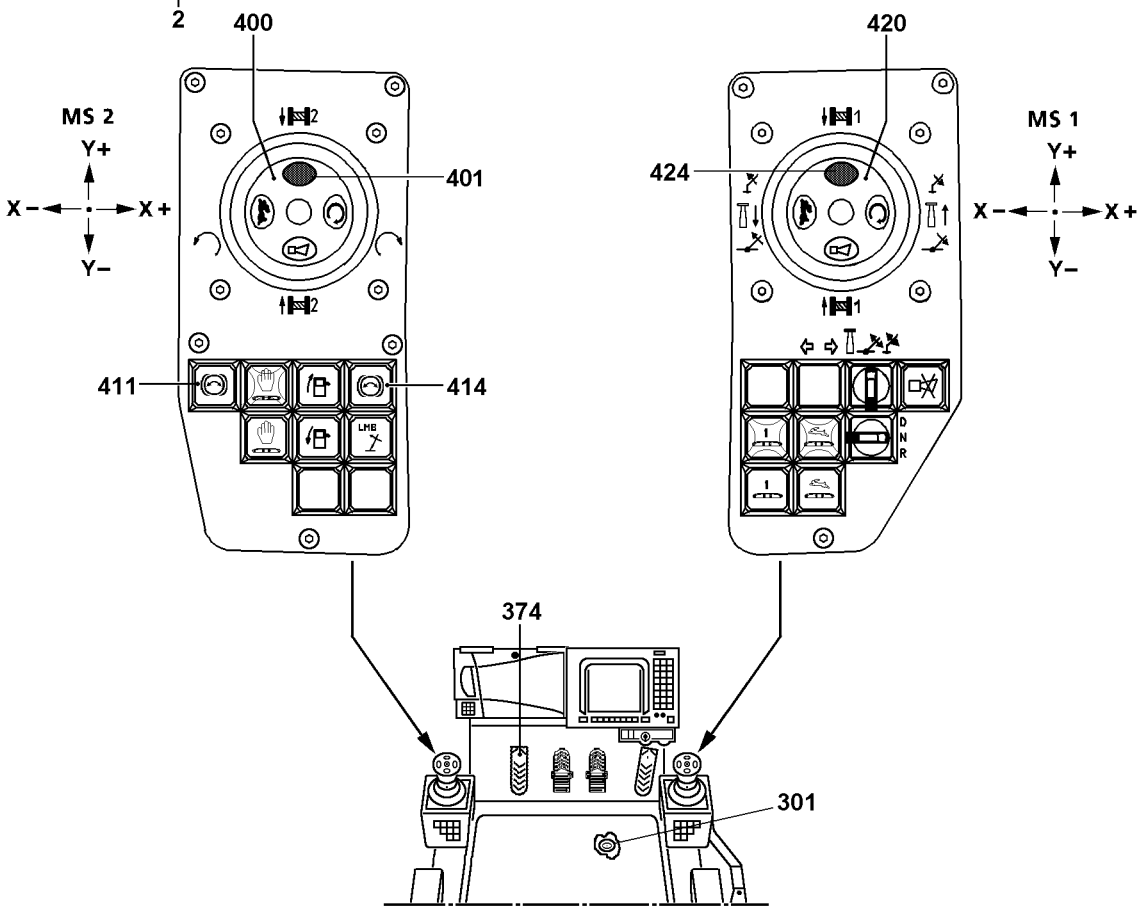
NOTICE

Uncontrolled turning of the slewing gear!

As long as the “parking brake of the slewing gear” is **released**, the slewing gear can turn in an uncontrolled manner due to wind, incline position or diagonal pull!

▶ In this case, apply the “parking brake of the slewing gear” with button **414**. For more information, see section “Parking brake - Slewing gear”.


LIEBHERR
LIEBHERR-WERK EHINGEN LTM
(1)
3.2
3.2.1
3.2.2
100 %
(2)
100%
15 %
20 %
40 %
60 %
75 %
=> 100 %
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


2
400
401
411
414
MS 2
Y+
X-
X+
Y-
420
424
MS 1
374
301

B104736

5.3.2 Fixed slewing gear

The “fixed slewing gear” can be operated with the parking brake **released** or **engaged**.
For more information see section “Switching parking brake on/off”.

Note

- Once the parking brake is **released**, it **remains released**, regardless of whether the slewing gear is actuated using the master switch **400** or if it is not actuated. This is to prevent a sudden stop.
- If the parking brake is **engaged**, it is released as soon as the master switch **400** is deflected. The parking brake **engages** again as soon as the master switch **400** is moved to the neutral position and the slewing gear is **no longer** actuated.

NOTICE

Uncontrolled turning of the slewing gear!
As long as the “parking brake of the slewing gear” is **released**, the slewing gear can turn in an uncontrolled manner due to wind, incline position or diagonal pull!

- In this case, apply the “parking brake of the slewing gear” with button **414**.

5.3.3 Foot brake - Slewing gear

The “freely rotating” and the “fixed slewing gear” can also be slowed down with the pedal **374**.

Note

- The slewing gear brake must be carefully actuated with pedal **320**!
- The harder the pedal **320** is actuated, the greater the braking force!

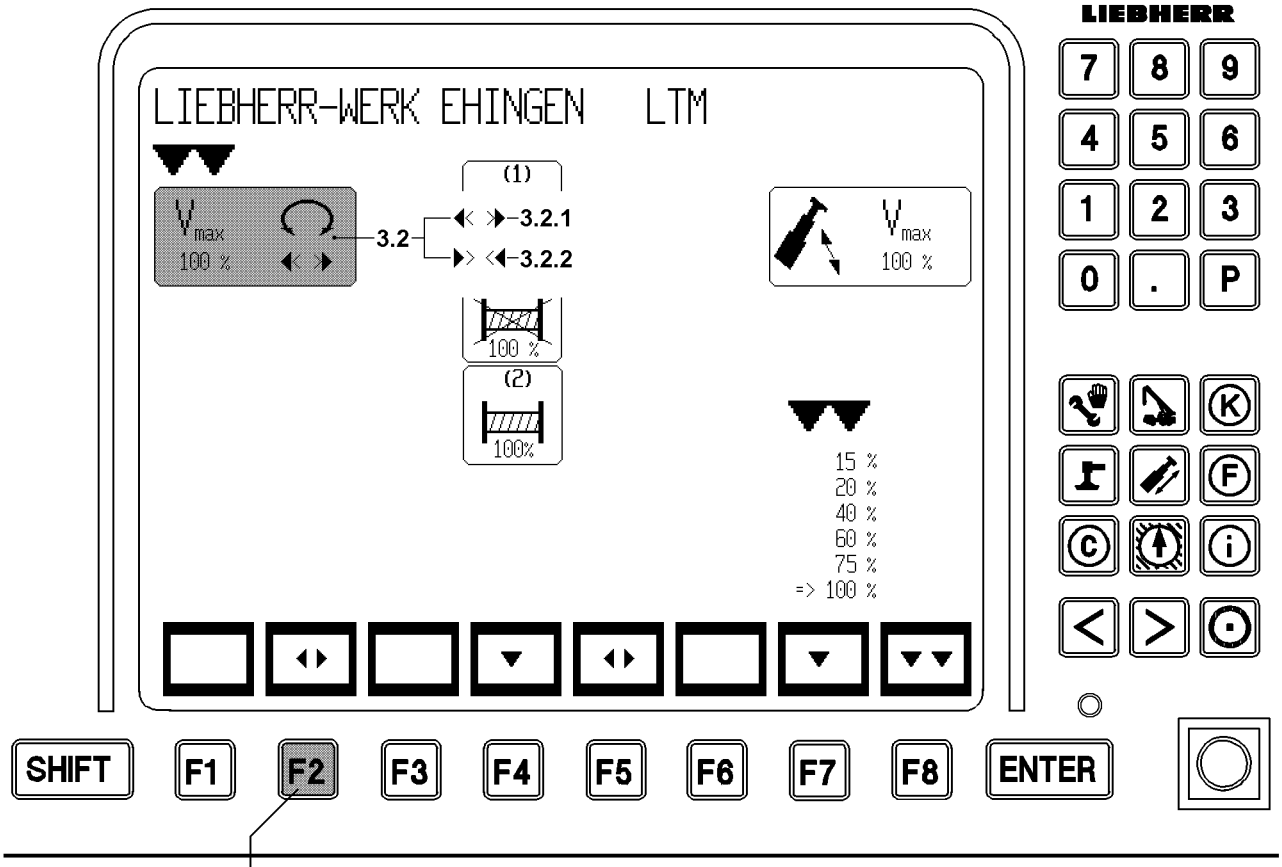
- Carefully actuate the foot brake with the pedal **374**.

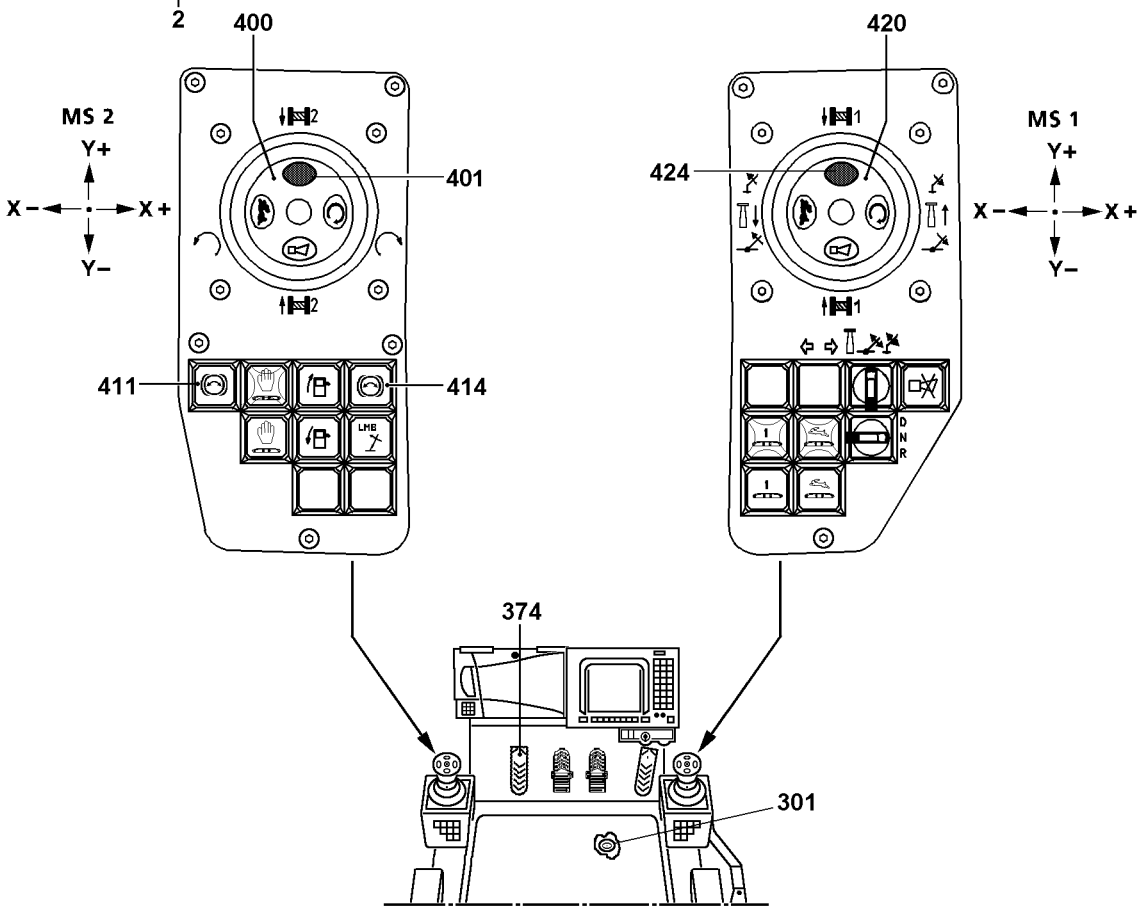
NOTICE

Increased brake lining wear!

- The pedal **374** must not be operated for long periods with simultaneous actuation of a turning movement.

- Do not actuate the pedal **374** for an extended period of time.


LIEBHERR
LIEBHERR-WERK EHINGEN LTM
(1)
3.2
3.2.1
3.2.2
100 %
(2)
100%
15 %
20 %
40 %
60 %
75 %
=> 100 %
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


2
400
401
411
414
MS 2
Y+
X−
X+
Y−
420
424
MS 1
374
301

B104736

5.4 Parking brake - Slewing gear

The “parking brake of the slewing gear” can be **applied or released** with “freely rotating” and “fixed” slewing gear using the button **414**.

The indicator light **411** shows if the “parking brake slewing gear” is released or applied.

5.4.1 Releasing the parking brake

Make sure that the following prerequisites are met:

– The “parking brake slewing gear” is **applied**.
– The indicator light **411 does not** light up.
– The seat contact button **301** or bypass seat contact switch **401** or seat contact switch **424** are actuated.
– The engine is running.
– The crawler travel gear is not added.

▶ Press the button **414**.

Result:

– The parking brake is **released**.
– The indicator light **411** lights up.

5.4.2 Applying the parking brake

Make sure that the following prerequisites are met:

– The parking brake is **released**.
– The indicator light **411** lights up.

▶ Press the button **414**.

or

■ Turn the engine off.

or

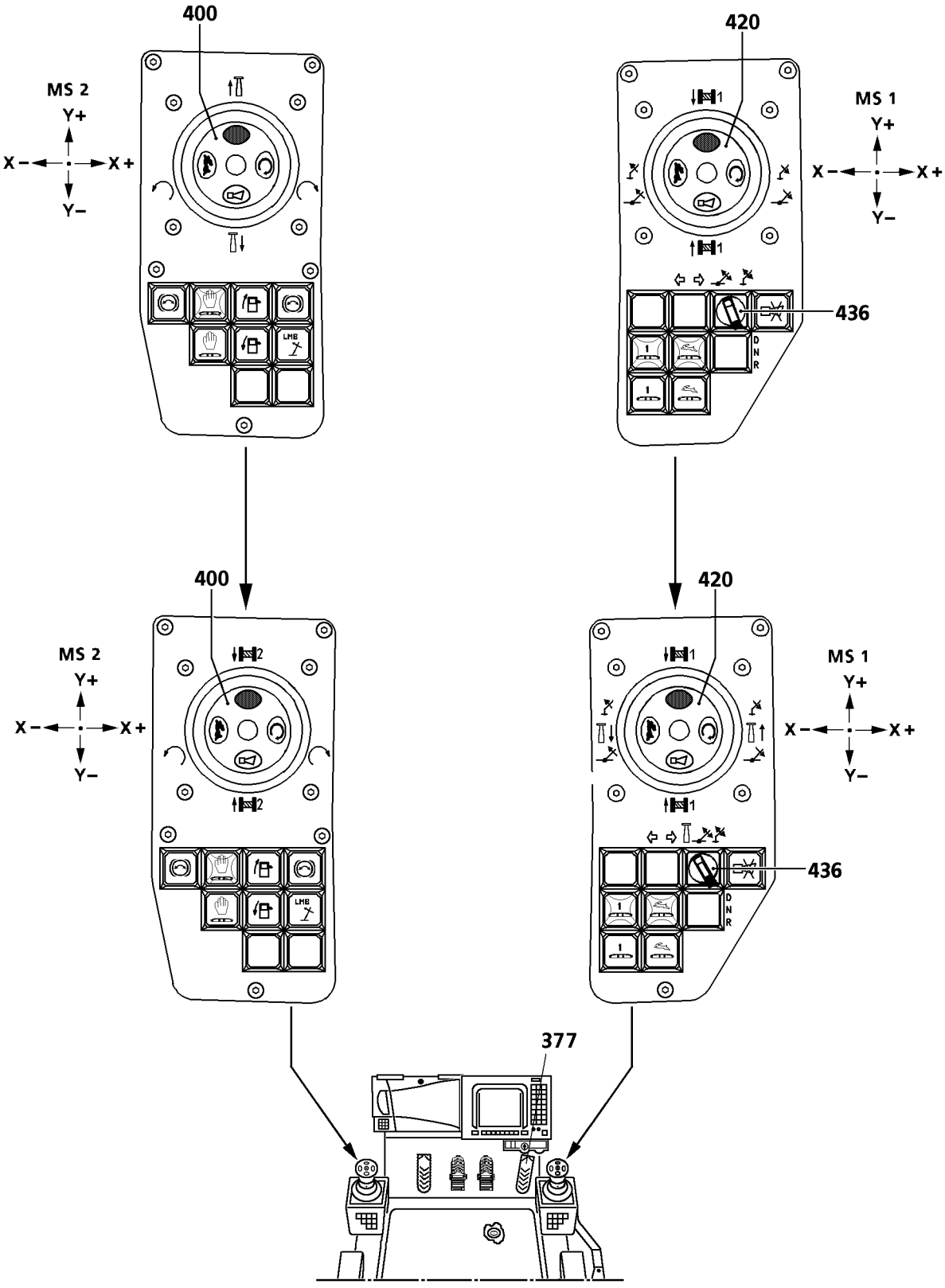
■ Do no longer actuate seat contact button **301** or bypass seat contact switch **401** or seat contact switch **424**.

or

■ Adding the crawler travel gear

Result:

– The parking brake is **applied**.
– The indicator light **411** turns off.



B198641

6 Telescoping

6.1 Control of crane movement “Telescoping”

6.1.1 Cranes with one winch

Speed of crane movement is controlled by the deflection of the master switch **400** and by the pedal of the engine control **377**.

▶ Move the master switch **400** in direction Y+ (forward).

Result:

– The telescopic boom is telescoped out.

▶ Move the master switch **400** in direction Y- (backward).

Result:

– The telescopic boom is telescoped in.

6.1.2 Cranes with two winches*

Speed of crane movement is controlled by the deflection of the master switch **420** and by the pedal **377** of the engine control.

Make sure that the following prerequisite is met:

– the rotary switch **436** is at position left “telescoping”

▶ Move the master switch **420** in direction X+ (toward the right).

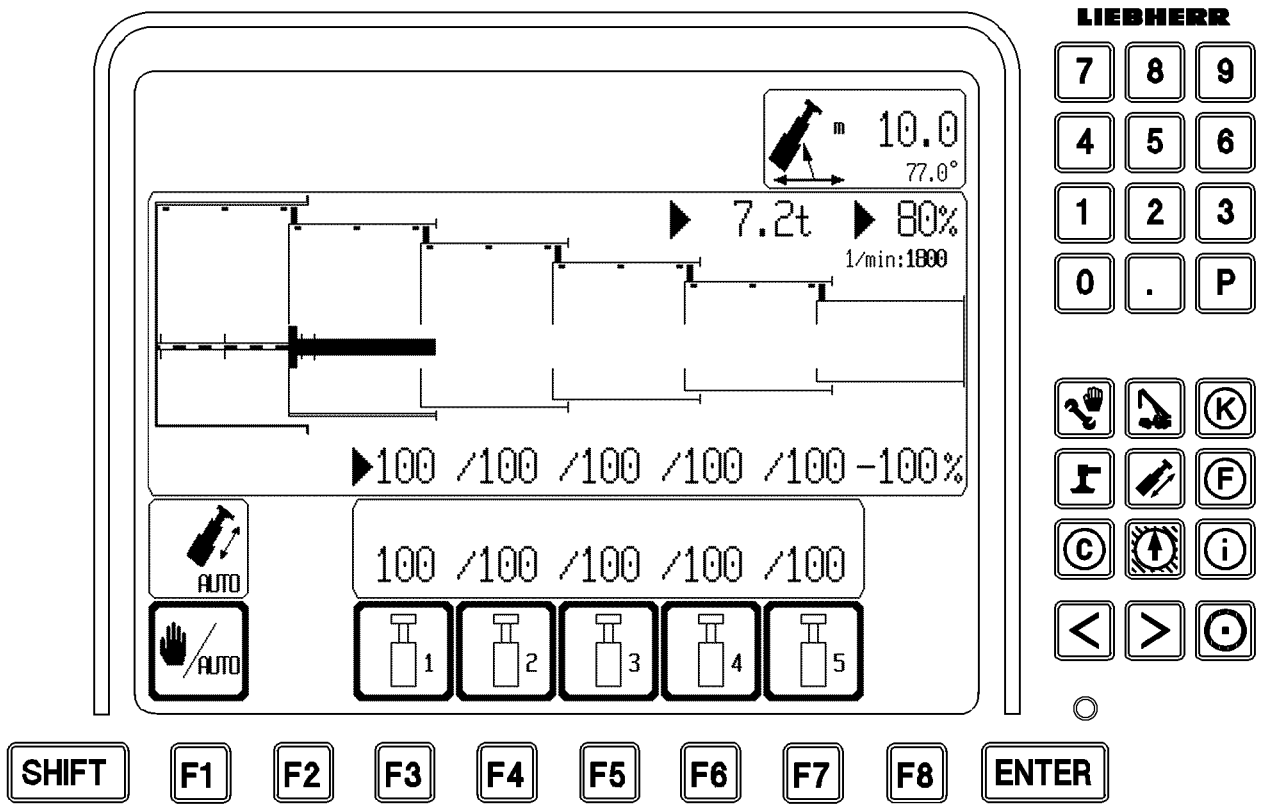
Result:

– The telescopic boom is telescoped out.

▶ Move the master switch **420** in direction X- (toward the left).

Result:

– The telescopic boom is telescoped in.


LIEBHERR
m 10.0
77.0°
7.2t
80%
1/min:1800
100 /100 /100 /100 /100 -100%
AUTO
100 /100 /100 /100 /100
AUTO
1
2
3
4
5
7
8
9
4
5
6
1
2
3
0
.
P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

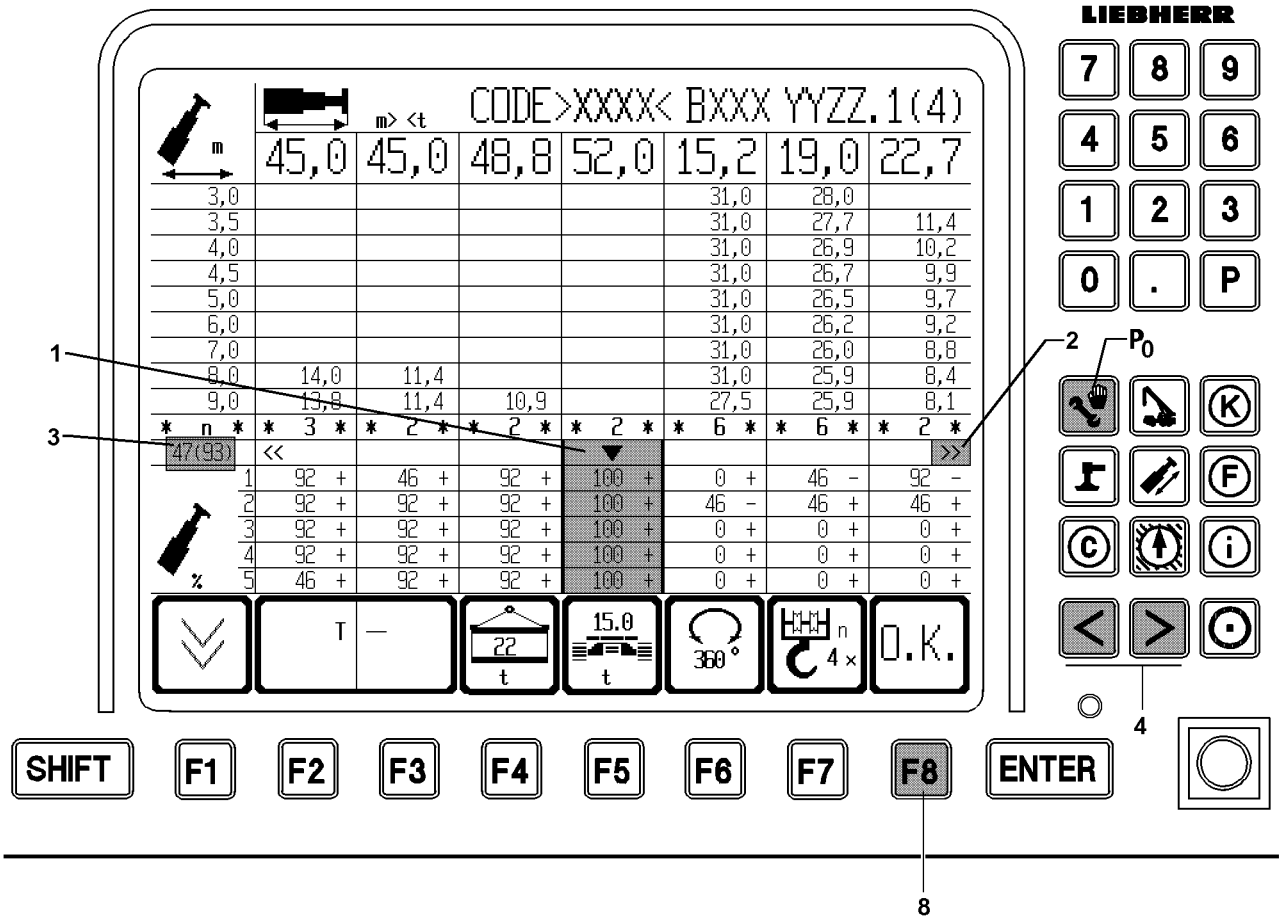
B196273

6.2 General

The “Telematik” automatic telescopic boom control system consists of:
– The dual action telescoping cylinder
– The hydraulically operated gripper pinning
– The hydraulically operated boom pinning

The gripper and boom pins are mechanically interlinked, in other words the telescope section can only be unpinned when at the same time the gripper is locked with this telescope section.
In the LICCON telescoping screen the crane operator can see, in dynamic graphics, the pinning state of the telescopic boom, the position of the individual telescopes in relation to each other, and the extension status of the telescoping cylinder.
Thanks to the automatic telescoping procedure, the crane operator can easily telescope the telescoping boom, as he does not have to concern himself with the pinning or unpinning of the telescoping cylinder or the telescope. The LICCON telescoping control system therefore makes possible very straightforward telescoping, only the desired telescoping targets need to be entered into the system.
The LICCON telescoping control system decides the sequence in which the individual telescopes will be moved in order to achieve the desired end state. After setting the desired telescoping targets, all telescoping movements, as well as locking and unlocking, are carried out fully automatically.
The following procedures are carried out by the system:
– Locking and unlocking of the telescoping cylinder
– Pinning and unpinning of the telescopes
– Sequence for the telescopes to be telescoped in order to achieve the desired end state

This automatic process will however only be carried out as long as the master switch is operated.
The master switch determines the direction and the speed of the telescoping movement. In this way the crane operator has continuous control over the crane.
The direction of the cylinder movement is set by the LICCON computer system.
If the telescopic boom is lengthened, with the result that currently unreachable telescopes must be moved, then they must first be retracted until the last telescope to be moved is reached. In this case, in order to lengthen the telescopic boom (telescope out), telescoping in must first take place.
The LICCON computer system displays the direction in which the next telescoping must be done. The master switch must also be pressed to correspond to this direction setting. In this way the connection between the direction of movement of the appropriate master switch and the telescope continues.
In this way it is possible to move to a telescoping target automatically without an operating screen. It is therefore also not essential to keep watching the LICCON monitor all the time.
If the direction needs to be changed by the master switch, the telescopic boom remains stationary if the current direction is to be maintained. This also means that the master switch must be moved in the other direction. If there is no further movement in the other direction, this means that the telescoping target has been reached. This state is displayed visually on the operating screen. If the master switch is still being pressed, then after 3 to 5 seconds, the system switches to the telescoping screen.


LIEBHERR
CODE>XXXX< BXXX YYZZ.1(4)
m> <t
m
45,0 45,0 48,8 52,0 15,2 19,0 22,7
3,0 31,0 28,0
3,5 31,0 27,7 11,4
4,0 31,0 26,9 10,2
4,5 31,0 26,7 9,9
5,0 31,0 26,5 9,7
6,0 31,0 26,2 9,2
7,0 31,0 26,0 8,8
8,0 14,0 11,4 31,0 25,9 8,4
9,0 13,8 11,4 10,9 27,5 25,9 8,1
* n * * 3 * * 2 * * 2 * * 2 * * 6 * * 6 * * 2 *
47(93)
<<
>>
1 92 + 46 + 92 + 100 + 0 + 46 - 92 -
2 92 + 92 + 92 + 100 + 46 - 46 + 46 +
3 92 + 92 + 92 + 100 + 0 + 0 + 0 +
4 92 + 92 + 92 + 100 + 0 + 0 + 0 +
5 46 + 92 + 92 + 100 + 0 + 0 + 0 +
%
T
22
t
15.0
t
360°
4 x
O.K.
7 8 9
4 5 6
1 2 3
0 . P
P0
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
1
2
3
4
8

B102855

6.3 Selecting the telescoping target

There are two options for selecting the telescoping target:

1.) Target selection through the configuration screen

2.) Target selection through the telescoping screen

6.3.1 Target selection through the configuration screen

▶ Press the program key **P0**.

Result:

– The configuration screen appears on the LICCON monitor.

▶ Using the arrow keys **4**, move the cursor **1** to the left or the right into the column corresponding to the desired telescopic boom length.

As supporting information, the currently selected column number **3** and the number of columns in the table are shown. For example, 47(93) means 47 of 93 columns.
The status indicator (±) on the left next to the percentage extension condition value means:

– "**+**" the corresponding telescopic section must be pinned.

– "**-**" the corresponding telescopic section can be telescoped up to the percentage value of the extension status value under load (according to the load chart).

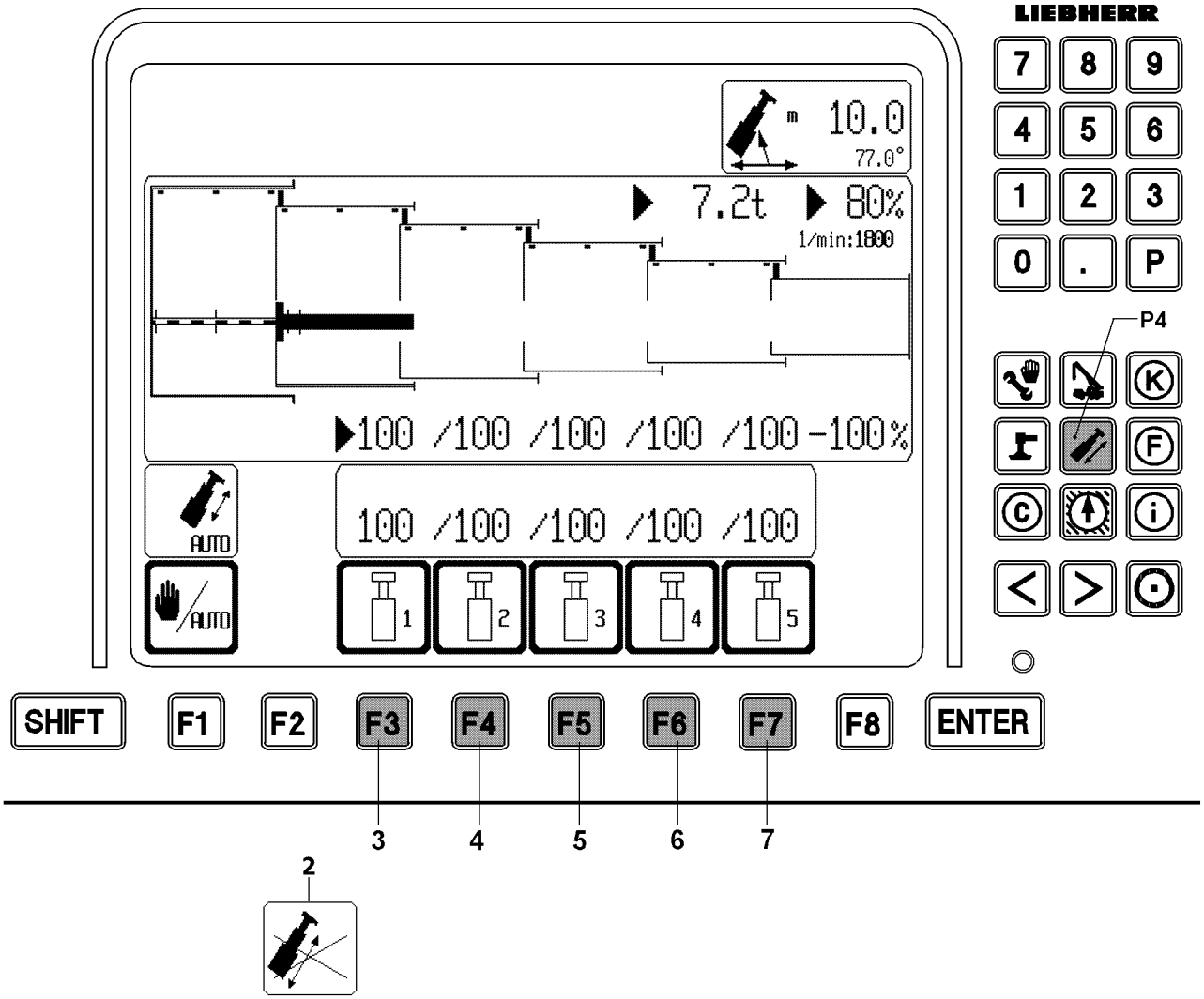
The double arrow **2** at the left and/or right edge of this line points to additional columns in either direction.
If the cursor **1** touches an edge marked with arrows, the next movement in this direction will display the next load chart column(s).
The cursor **1** itself will be set on the next column, if possible in the middle.
A change in the telescoping target is only possible if the master switch is at neutral.
If no cursor appears in the configuration screen, this means that on the telescoping screen a boom configuration that is not supported in the tables was selected and perhaps even started!

▶ Press function key "F8" **8**.

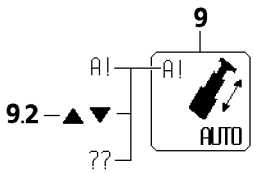
Result:

– The selected telescoping target will be activated.

– The selected column for the telescoping target concerned will be marked in bold along the side.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
P4
m 10.0
77.0°
7.2t 80%
1/min:1800
100 /100 /100 /100 /100 -100%
AUTO
100 /100 /100 /100 /100
1 2 3 4 5
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
3 4 5 6 7

2


9
A!
A!
9.2
AUTO
??

B196275

6.3.2 Target selection through the telescoping screen

▶ Press the program key **P4**.

Result:

– The telescoping screen appears on the LICCON monitor.

The selection of the telescoping target is achieved by pressing the function key assigned to the telescope concerned several times. After every key press, the intended extension status of the associated telescope changes to the next percentage value where there is a hole for pins.
In contrast to the configuration screen, the telescoping length is displayed immediately as a target, without further confirmation, as soon as the function key is pressed. No confirmation is required, as the assigned function keys do not have any other functions.
The appearance of a direction arrow in the automatic icon **9.2** immediately after a change in the telescoping target can be interpreted as feedback.
If the blinking icon **2** appears on the LICCON monitor, then:

– The telescoping sections cannot be unpinned.
– The unpinned load is exceeded.
– No load chart present.

▶ Press function key “F3” **3**.

Result:

– The following appears on telescope 1: 0%, 46%, 92% or 100%.

▶ Press function key “F4” **4**.

Result:

– The following appears on telescope 2: 0%, 46%, 92% or 100%.

▶ Press function key “F5” **5**.

Result:

– The following appears on telescope 3: 0%, 46%, 92% or 100%.

▶ Press function key “F6” **6**.

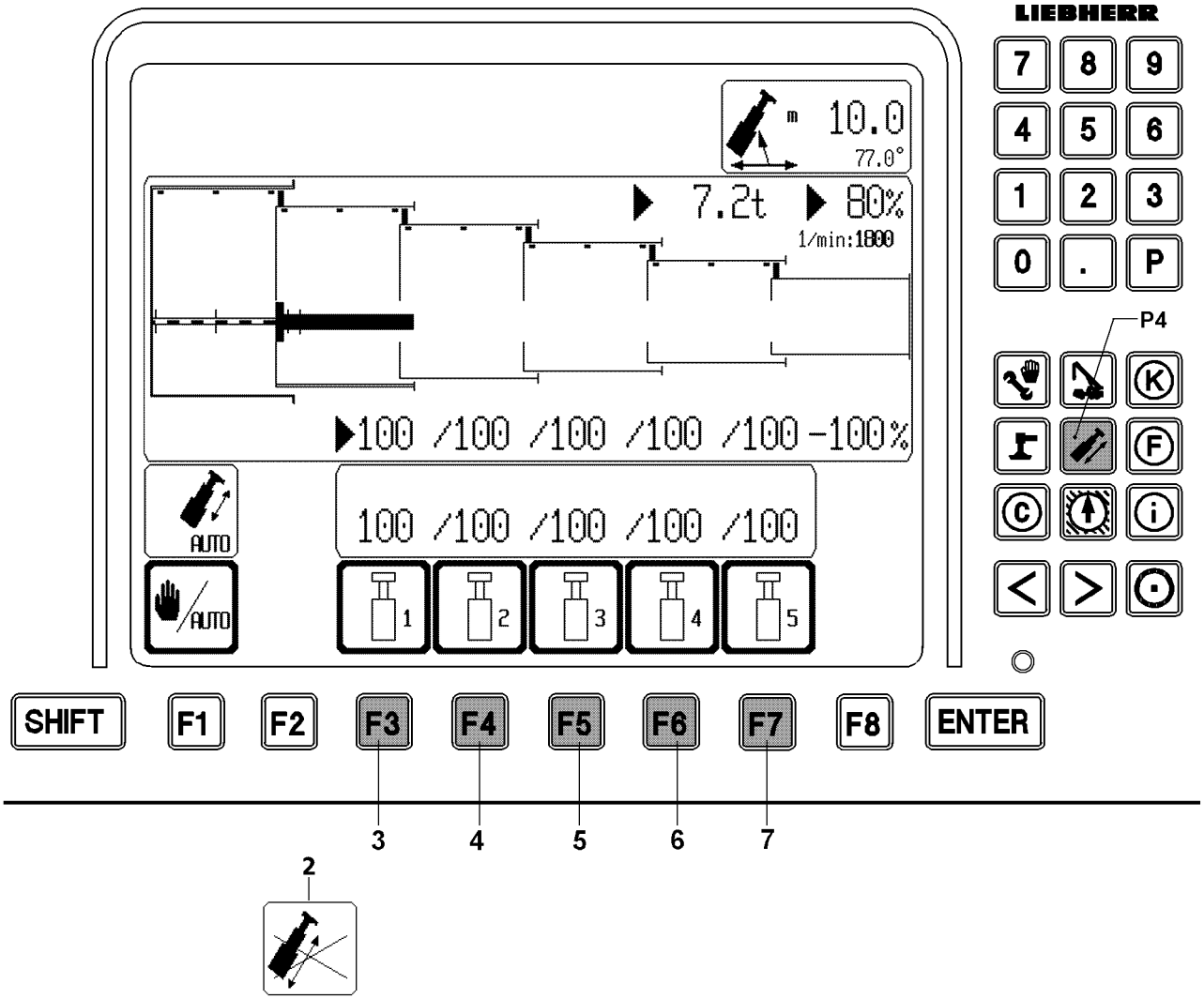
Result:

– The following appears on telescope 4: 0%, 46%, 92% or 100%.

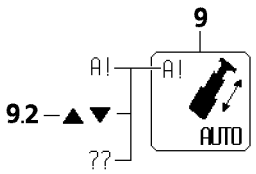
▶ Press function key “F7” **7**.

Result:

– The following appears on telescope 5: 0%, 46%, 92% or 100%.


LIEBHERR
m 10.0
77.0°
7.2t
80%
1/min:1800
100 /100 /100 /100 /100 -100%
AUTO
AUTO
100 /100 /100 /100 /100
1
2
3
4
5
7 8 9
4 5 6
1 2 3
0 . P
P4
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
3
4
5
6
7

2


9
A!
A!
AUTO
9.2
??

B196275

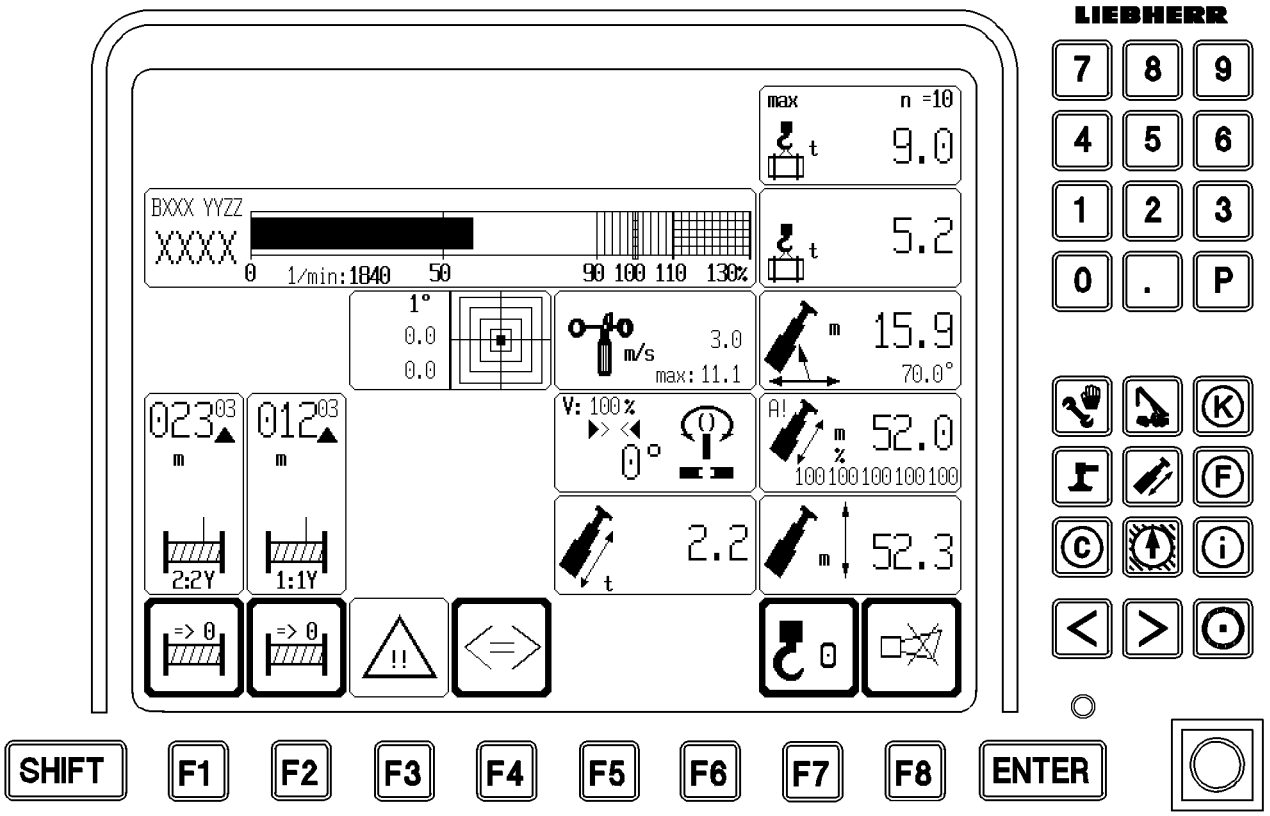
6.4 Telescoping to the selected target

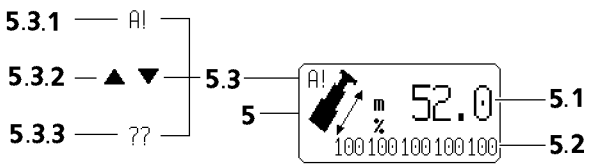
If the desired telescoping target is set, then the direction in which the master switch must be deflected is displayed on the operating screen and on the telescoping screen.

If the master switch is moved against the specified direction, the telescope remains stationary. The specified direction remains visible as a an error criteria.

If the set telescoping target has been reached, then the telescopic boom remains stationary, regardless of any movements of the master switch, and the markings on the set telescoping target begin to blink. The target has thus been reached.

- ▶ If the arrow **9.2** up appears in the automatic icon **9**:
  Telescope the telescopic boom out.
- ▶ If the arrow **9.2** down appears in the automatic icon **9**:
  Telescope the telescopic boom in.


LIEBHERR
max n =10
9.0
5.2
BXXX YYZZ
XXXX
0 1/min:1840 50 90 100 110 130%
1°
0.0
0.0
3.0
max: 11.1
15.9
70.0°
023 03
012 03
m
2:2Y
1:1Y
V: 100%
0°
A!
52.0
100 100 100 100 100
2.2
52.3
=> 0
!!
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


5.3.1 A!
5.3.2 ▲ ▼
5.3.3 ??
5.3
5
A!
52.0
100 100 100 100 100
5.1
5.2

B111652

6.5 Telescoping with the operating screen

The telescoping system is designed so that an experienced crane driver can telescope without the telescoping screen, in other words using just the operating screen.
The crane driver receives information about the direction in which the master switch must be moved from the arrow **5.3.2** in the icon **5**.
If the crane operator attempts further telescoping once the telescoping target has been reached, then there is an automatic changeover from the operating screen to the telescoping screen. If the master switch is still being deflected, then the markings on the set telescoping target blink. This means that the telescoping target has been reached.

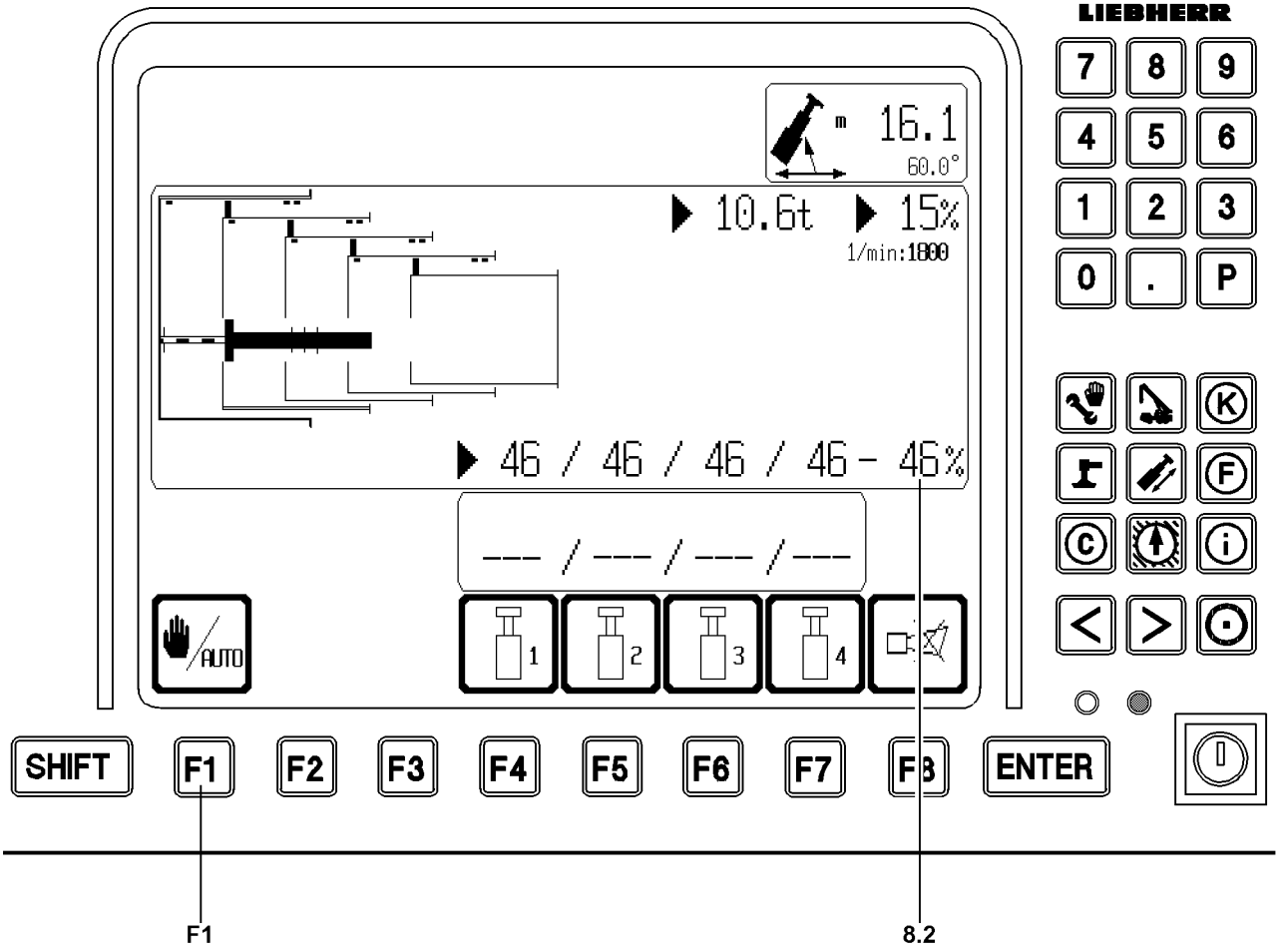
- ▶ If the arrow **5.3.2** up appears in the icon **5**:
  Telescope the telescopic boom out.
- ▶ If the arrow **5.3.2** down appears in the automatic icon **5**:
  Telescope the telescopic boom in.

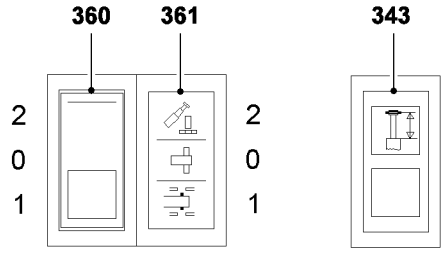
Once the telescoping target is reached, icon A! **5.3.1** appears.

- ▶ Press the master switch for another 3 seconds or so until the telescope is resting on the pin.

6.6 Aborting telescoping

Telescoping can be aborted at any time.
The pins, the telescoping cylinder and the telescopes remain where they were, in the last state they were in when the master switch was still being pressed.
If desired, a new telescoping target can be set and telescoped to automatically.
It is also possible to proceed manually by switching over to manual operation.


LIEBHERR
16.1
60.0°
10.6t
15%
1/min:1800
46 / 46 / 46 / 46 - 46%
--- / --- / --- / ---
AUTO
1
2
3
4
7
8
9
4
5
6
1
2
3
0
.
P
K
F
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
F1
8.2


360
361
343
2
0
1
2
0
1

B104761

6.7 Manually telescoping the telescopic boom

Manual telescoping is regarded as an exception mode, as automatic mode makes it possible to reach any chosen extension state.
In manual telescoping, pinning and unpinning of the telescoping cylinder, and telescoping, must be carried out manually.
The marking on the telescoping screen will indicate in which telescope the pinning equipment of the telescoping cylinder is currently located.
The proximity to a telescope pin bore can be determined on the telescoping screen to an accuracy of 1%.

6.7.1 Activating manual telescoping operation

▶ Press the function key **F1**.

Result:

– Manual telescoping operation is now activated.

6.7.2 Unpinning the telescoping section

▶ Change over switch **360** from position **0** to position **2**.

Result:

– Unpinning the telescoping section will be preselected.

▶ Move the master switch for the telescopic boom forwards until the telescopic section is unpinned.

Result:

– The unpinned telescoping section is displayed on the telescoping screen.

6.7.3 Telescoping and pinning the telescoping section

▶ Operate the master switch. Telescope the telescopic section.

▶ Change over switch **360** from position **2** to position **0**.

Result:

– Pinning the telescoping section will be preselected.

▶ Continue to move the master switch in the same direction until the locking pin latches in audibly.

Result:

– The telescoping section is pinned.

6.7.4 Unpinning the telescoping cylinder

Before carrying out any other steps, please ensure that the locking pin has latched in audibly.

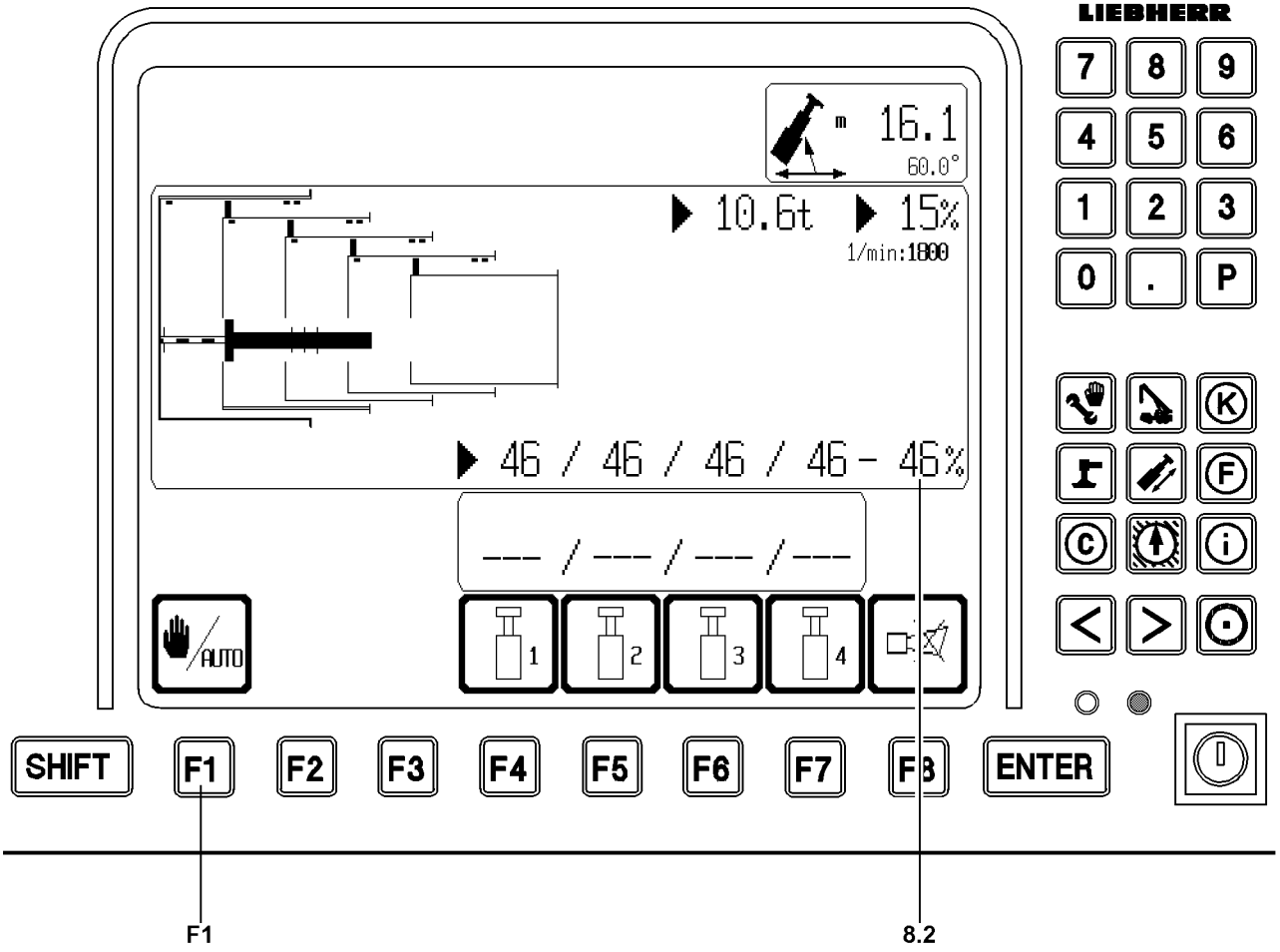
▶ Move the master switch for the telescopic boom forwards until the locking pins of the telescoping cylinder are released.

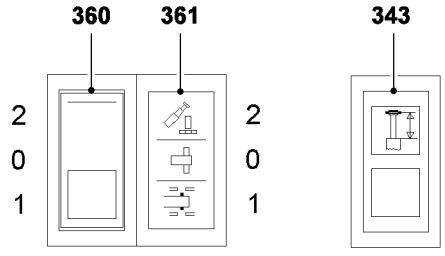
▶ Do not operate the master switch again.

▶ Change over switch **360** from position **0** to position **1**.

Result:

– The telescoping cylinder will be unpinned.
– The telescoping screen displays the unpinned telescoping cylinder.


LIEBHERR
16.1
60.0°
10.6t
15%
1/min:1800
46 / 46 / 46 / 46 - 46%
--- / --- / --- / ---
AUTO
1
2
3
4
7
8
9
4
5
6
1
2
3
0
.
P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
F1
8.2


360
361
343
2
0
1
2
0
1

B104761

6.7.5 Telescoping and pinning the telescoping cylinder

The position of the telescoping cylinder is indicated by the image shown on the monitor and in icon **8.2**.

▶ Telescope the telescoping cylinder until it reaches the pinning position.

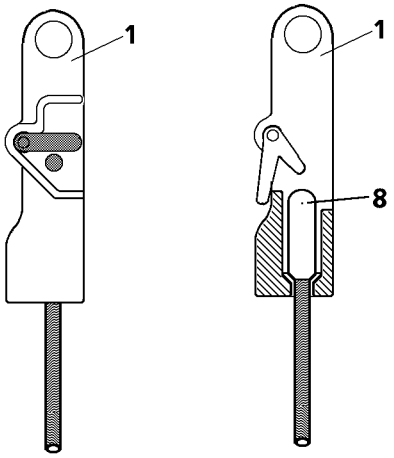
CAUTION
Risk of damage to the tele locking!
▶ Only pin the telescoping cylinder when it is in the pinning position!
▶ Pin the telescoping cylinder only when the indicator light **343** lights up!
▶ The locking pins must latch in audibly!

▶ Change over switch **360** from position **1** to position **0**.

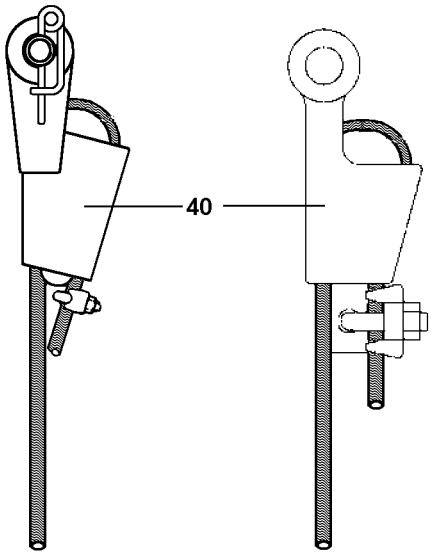
Result:
– Pinning the telescoping cylinder will be preselected.

▶ Continue telescoping the telescoping cylinder in the same direction and pin the telescoping cylinder.

1



2



B108118

1 Wire ropes and rope end connections

1.1 Wire ropes

Please check if a **rotating resistant** or a **non-rotating** rope is required for the application. The type of rope that is selected then determines the required type of rope end connections, see Crane operating instructions, chapter 8.04.

Note

▶ The correct choice and use of wire rope and rope end connections are decisive preconditions for proper and accident-free crane operation!

DANGER

Danger of serious personnel injury and equipment damage!

▶ **Never** use rotation-resistant ropes with a rotating rope end connection!

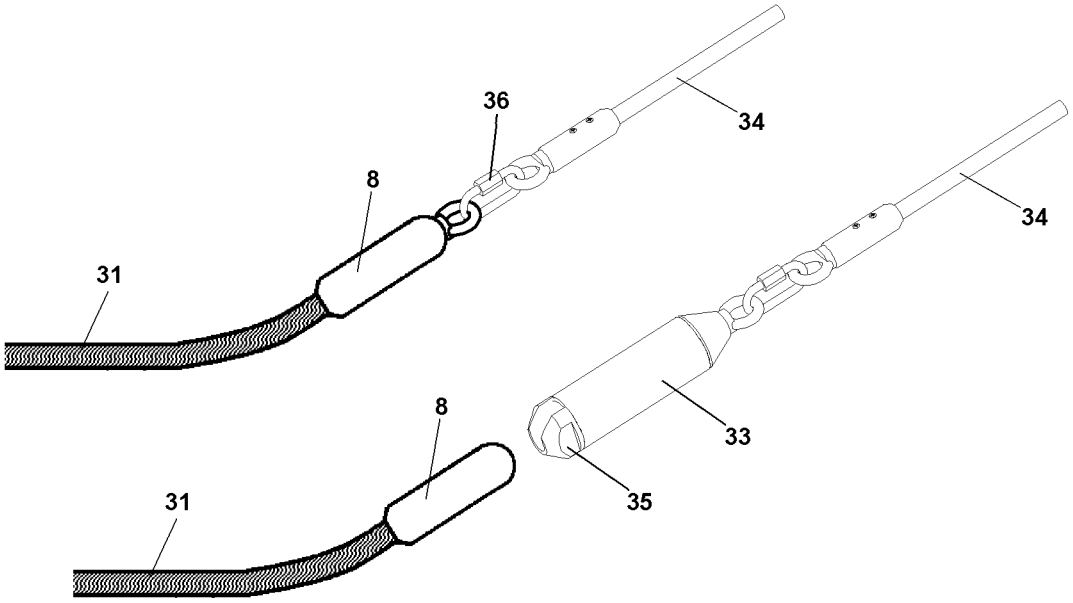
▶ **Never** install a twist compensator / swivel!

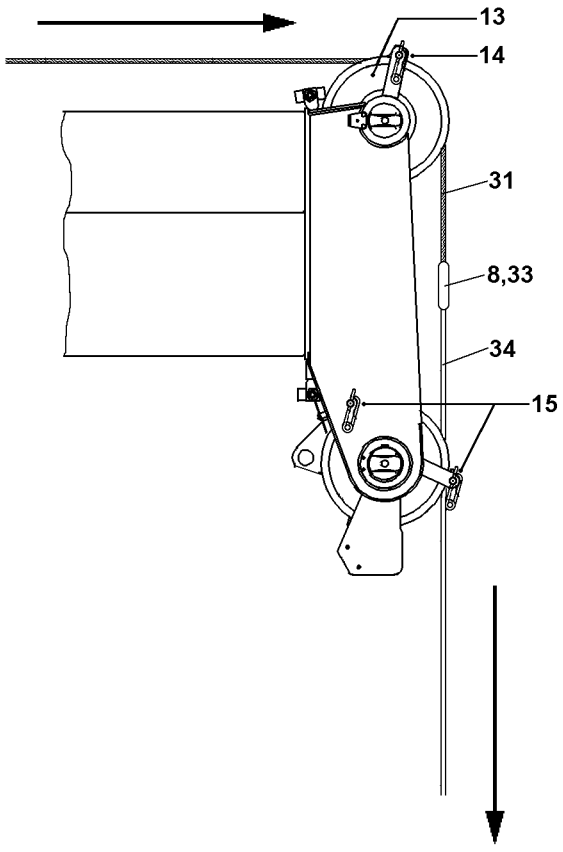
1.2 Rope end connections

Rope end connections are grouped into:

– Rope end connections with rope clamp **8**
  For that, use a rope lock **1**, see illustration **1**.

– Rope end connections without rope clamp
  For that, use a wedge lock **40**, see illustration **2**.





B110411

2 Reeving the hoist rope with the auxiliary reeving rope

WARNING
Risk of falling!
The assembly personnel, due to an erroneous operation of the crane function or slip on the telescopic boom, can fall and be killed!
- ▶ The telescopic boom may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling!
- ▶ If retaining ropes are present on the telescopic boom, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the telescopic boom on the left and right with both snap hooks and secure themselves in case of falls. See crane operating instructions, chapter 2.04 and chapter 2.06!
- ▶ Without appropriate safety measures, it is **strictly** prohibited to step on the telescopic boom!
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
- ▶ Carry out all assembly work from a safe place!

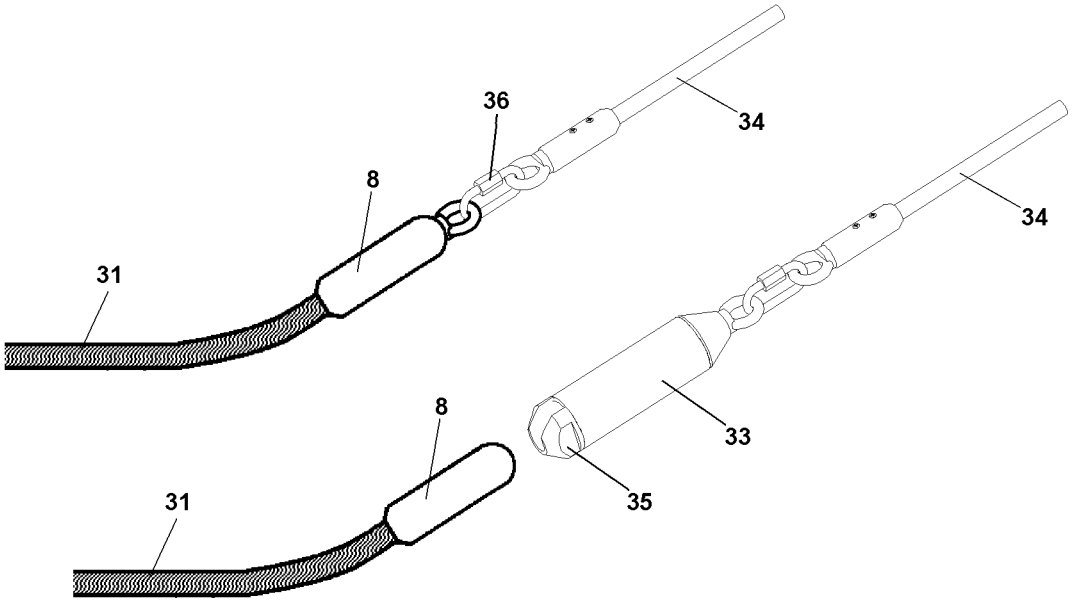
2.1 Reeving procedure

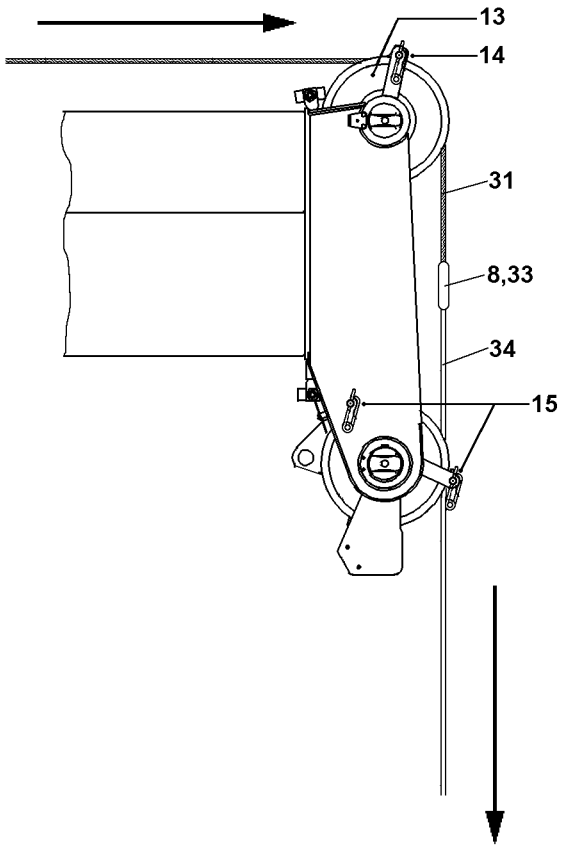
Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The telescopic boom is fully telescoped in.
- The telescopic boom has been luffed to the rear or the side.
- The telescopic boom is luffed down in 0° position.

- ▶ Wear approved fall arrest system and protective equipment, see Crane operating instructions, chapter 2.04.
- ▶ Install the hook device on the ladder, see Crane operating instructions, Chapter 2.06.

WARNING
Risk of falling!
- ▶ Hang the ladder in such a way onto the hoist gear and on the telescopic boom that it cannot fall over! See Crane operating instructions, chapter 2.06.

- ▶ If no railing is installed on the crane superstructure:
  Hang the ladder on the hoist gear and set it up safely, see Crane Operating instructions, Chapter 2.06.
- ▶ If a railing is installed on the crane superstructure:
  Set the railing on the crane superstructure into assembly / disassembly position, see Crane operating instructions, chapter 2.06.
- ▶ Secure the assembly personnel from falling: Hook assembly personnel with fall arrest system on the respective fastening points, see Crane operating instructions, chapter 2.06.





B110411

With the auxiliary reeving rope **34**, the hoist rope **31** can be reeved safely.

- When **a** intake sleeve **33** is installed on the auxiliary reeving rope **34**:
  Connect the auxiliary reeving rope **34** with the hoist rope **31**: Slide the intake sleeve **33** onto the locking clamp **8** and close off with the sleeve plug **35**.
- When **no** intake sleeve **33** is installed on the auxiliary reeving rope **34**:
  Connect the auxiliary reeving rope **34** with the hoist rope **31**: Open the chain lock **36**, connect it with the eyehook of the lock clamp **8** and close the chain lock **36**.
- Place the auxiliary reeving rope **34** forward over the pulley head.
- Hang the ladder on the telescopic boom and set it up safely, see Crane Operating instructions, Chapter 2.06.
- Secure the assembly personnel from falling: Hook assembly personnel with fall arrest system on the respective fastening points, see Crane operating instructions, chapter 2.06.
- Remove the rope retaining pipe **14** and rope retaining pipe **15** on the pulley head.
- Place the auxiliary reeving rope **34** over the upper rope pulley **13**.

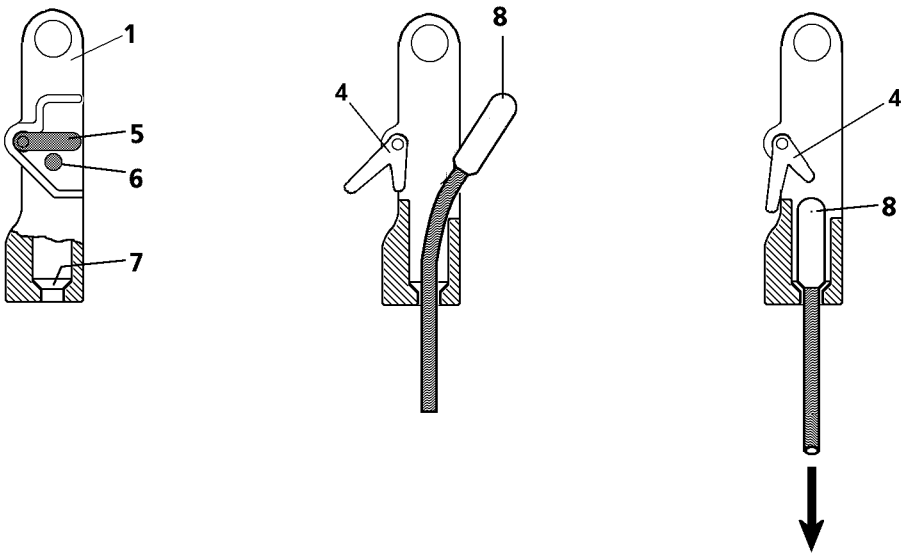
NOTICE

Danger of slack rope formation!

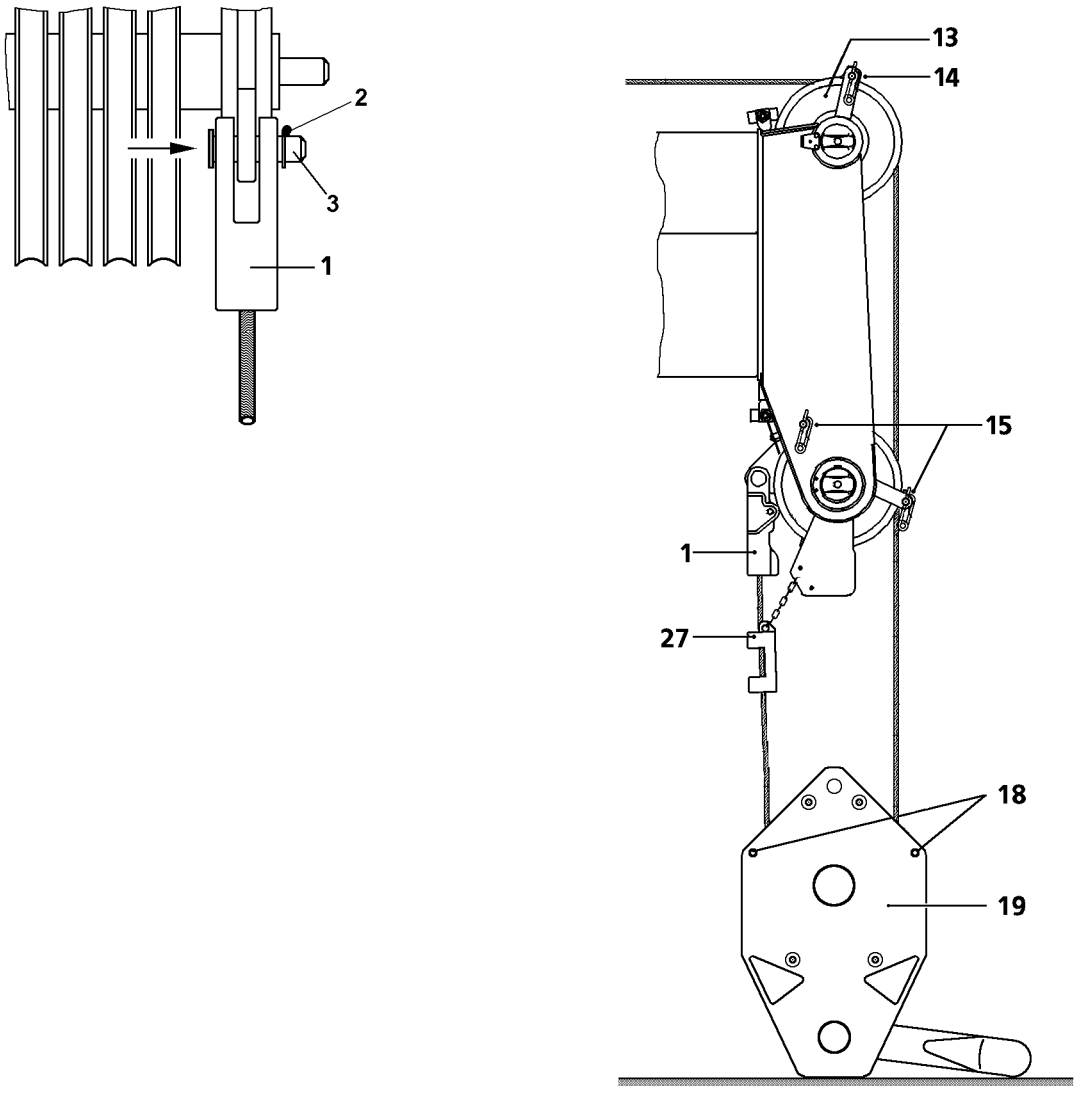
If the auxiliary reeving rope **34** is not held tight when spooling the winch out, slack rope can form on the hoist rope **31**!

- Hold the auxiliary reeving rope **34** tight!

- Slowly spool out the winch by deflecting the master switch and pull the auxiliary reeving rope **34** with the hoist rope **31** over the upper rope pulley **13**.
- Detach the auxiliary reeving rope **34** on the hoist rope **31** and reeve the hoist rope **31** into the hook block.
- Insert and secure the rope retaining pipe **14** and the rope retaining pipe **15** on the pulley head.



1



B108124

3 Reeving the hook block in and out

3.1 Reeving in the hook block

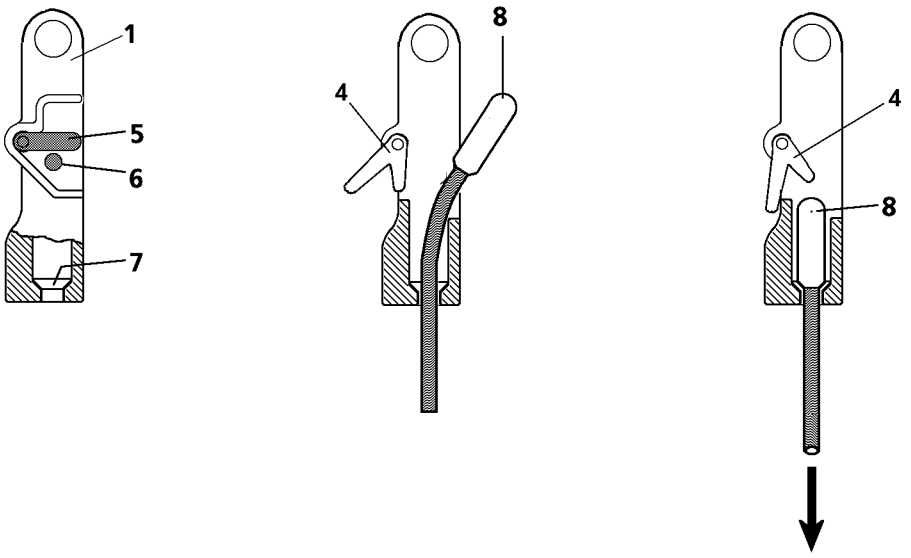
3.1.1 Preparing the hook block

NOTICE
Damage to the hoist rope!
An incorrectly reeved hoist rope or the incorrect selection of the rope fixed point can cause the hook block not to hang vertically and thus cause damage to the hoist rope!
- ▶ Always carry out the reeving of the hoist rope according to the reeving plan!
- ▶ The rope fixed point on the hook block is to be selected in such a way that the last strand runs parallel to the remaining rope strands, as much as possible!

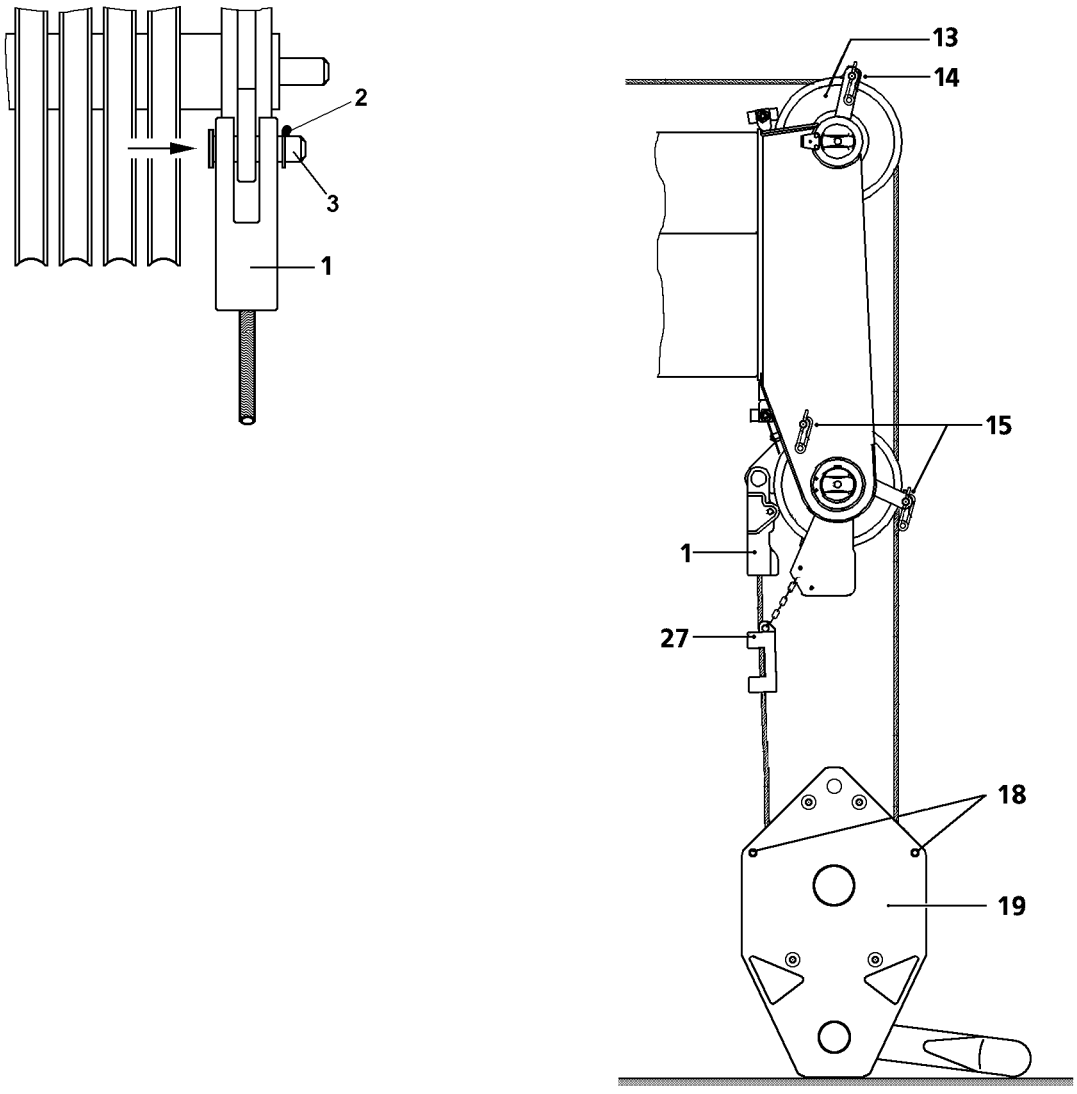
- ▶ Place the required hook block under the pulley head of the telescopic boom.
- ▶ At the hook block **19**, remove the spring retainers **18** for both rope retaining pins and pull them both out.

WARNING
Risk of falling!
The assembly personnel, due to an erroneous operation of the crane function or slip on the telescopic boom, can fall and be killed!
- ▶ The telescopic boom may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling!
- ▶ If retaining ropes are present on the telescopic boom, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the telescopic boom on the left and right with both snap hooks and secure themselves in case of falls. See crane operating instructions, chapter 2.04 and chapter 2.06!
- ▶ Without appropriate safety measures, it is **strictly** prohibited to step on the telescopic boom!
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
- ▶ Carry out all assembly work from a safe place!

- ▶ Reeve in the hoist rope, see section “Reeving the hoist rope with the auxiliary reeving rope”.
- ▶ Insert the rope retaining pipes again and secure with spring retainers.



1



B108124

3.1.2 Fastening the hoist rope

NOTICE
Damage to the hoist rope!
If the pin **3** has been assembled incorrectly, the hoist rope may rub against the pin **3** or on the linch pin **2**.
▶ Always insert the pins **3** from “inside to outside” and secure from the outside, see fig. **1**.

▶ The rope lock **1** must be pinned in either at the pulley head or on the hook block and secured with linch pins **2**, depending on reeving.
▶ Push the retaining pin **6** on the rope lock **1** in, move the lever **5** “downward” and hold it in this position.

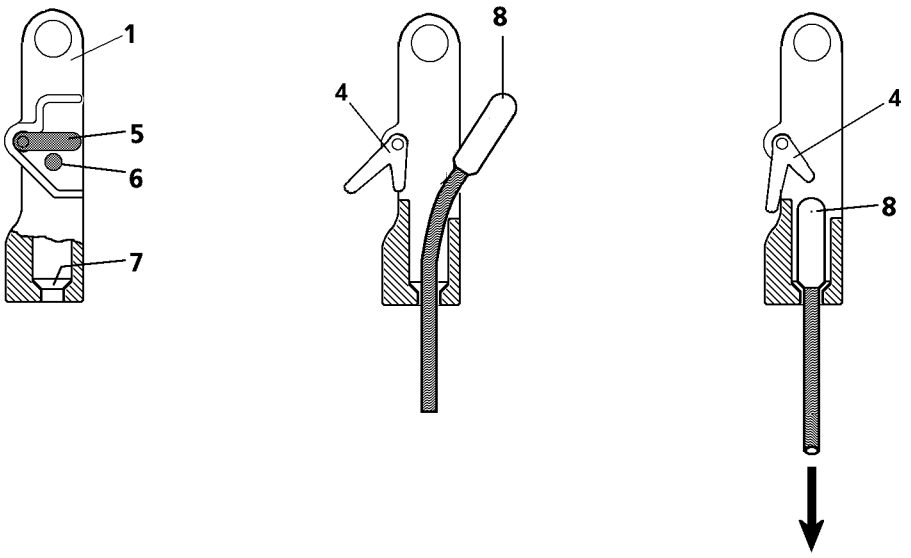
Result:
– The latch **4** will be swivelled downward.

▶ Attach the rope end with the locking clamp **8** in the rope lock and pull the rope firmly “downward” (in direction of arrow), until the locking clamp **8** is placed in the cone **7**.

WARNING
Danger of accident due to incorrect mounting of locking clamp!
▶ The locking clamp **8** must touch on the cone **7** after hanging it into the rope lock **1** and must be secured by the latch **4**!

▶ Release the lever **5**.

Result:
– The lever **5** returns to the initial position and is locked by the retaining pin **6**.



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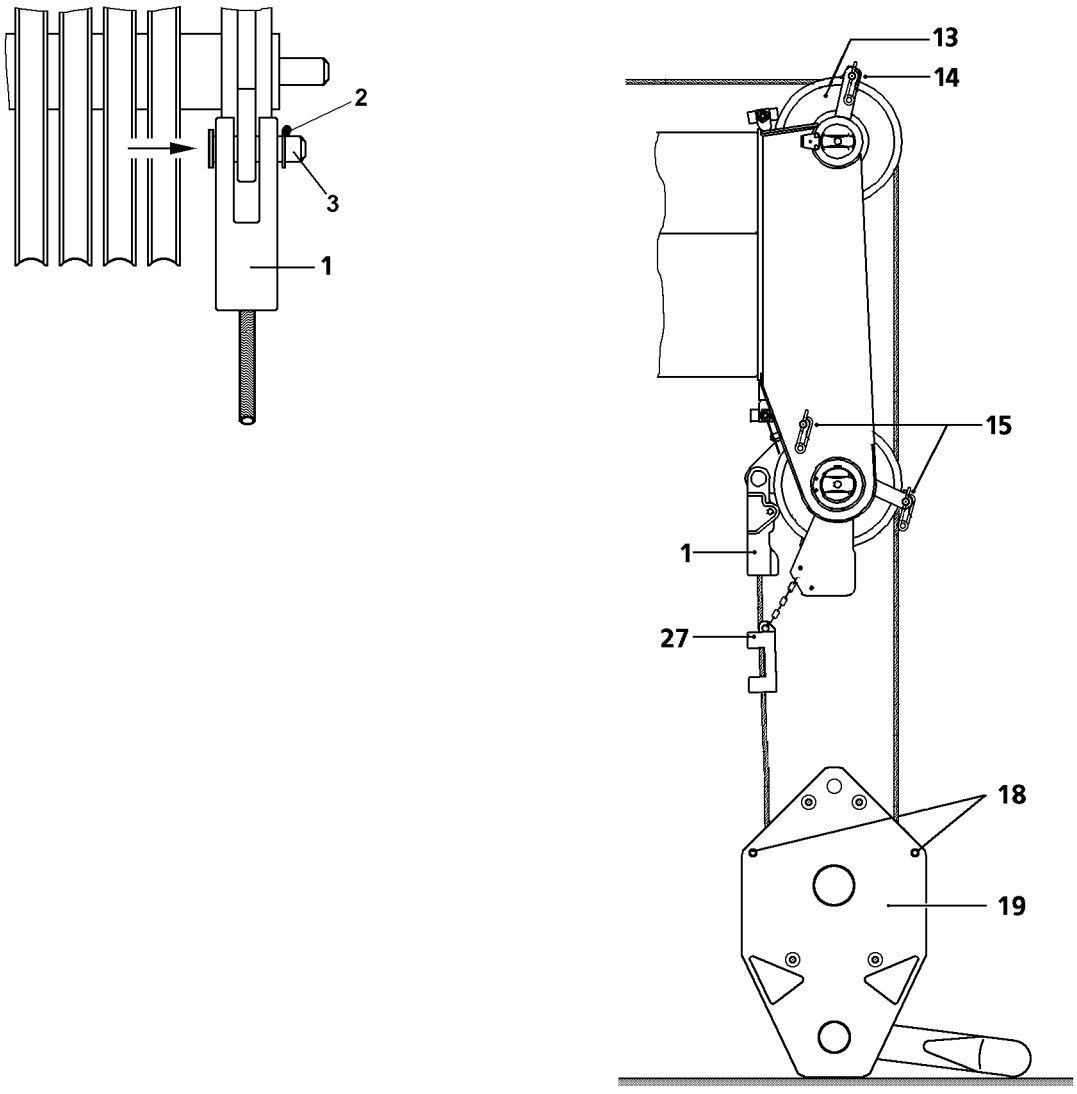


B108124

3.2 Unreeving the hook block

Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The telescopic boom is fully telescoped in.
- The telescopic boom has been luffed to the rear or the side.
- The telescopic boom is luffed down in 0° position.
- The ground is level and of sufficient load carrying capacity.

3.2.1 Lowering the hook block

WARNING
Crushing of hands!
When guiding the hook block by hand, hands or fingers can be crushed!
When unreeving the hook block, it can topple over!
- ▶ Use the handles in the safe area of the hook block!
- ▶ Make sure the hook block is safely positioned!

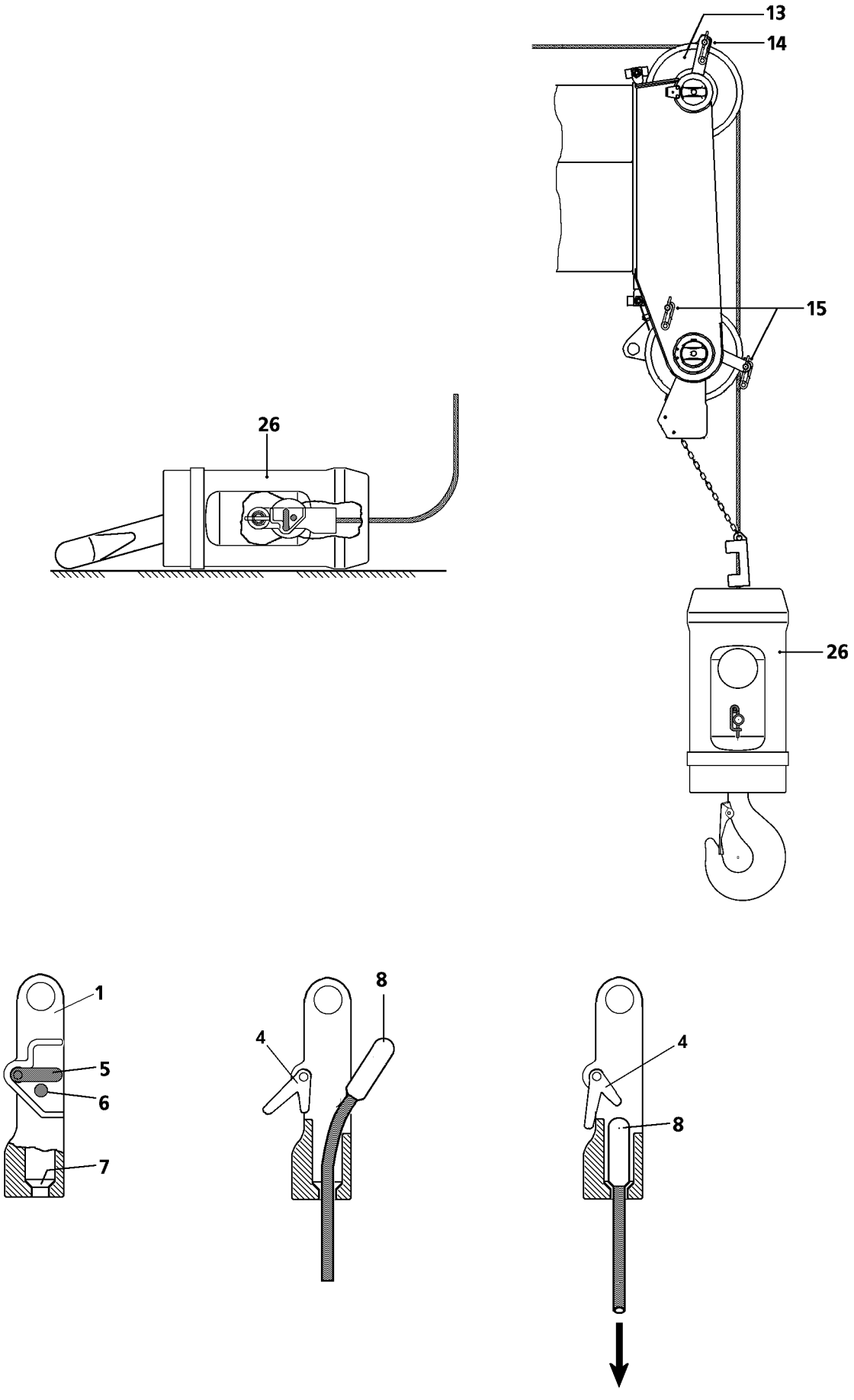
- ▶ Lower the hook block and set it on the ground.
- ▶ Remove the hoist limit switch weight, see section “Removing the hoist limit switch weight”.

3.2.2 Detaching the hoist rope

- ▶ Push in retaining pin **6** on the rope lock **1** move the lever **5** downward and hold it in this position.

Result:
- The latch **4** is moved to the side and the locking clamp **8** is released.

- ▶ Push the hoist rope up and detach the locking clamp **8**.
- ▶ At the hook block **19**, remove the spring retainers **18** for both rope retaining pins and pull both rope retaining pins out, see section “Reeving the hoist rope with the assembly winch”
- ▶ On the pulley head remove the spring retainers on the rope retaining pipe **14** and on the rope retaining pipe **15** and pull the rope retaining pipes out, see section “Reeving the hoist rope with the auxiliary reeving rope”
- ▶ Unreeve the hoist rope from the hook block and the pulley head.
- ▶ Insert the rope retaining pipes again and secure with spring retainers.



B108125

4 Securing and removing the load hook*

4.1 Securing the load hook*

4.1.1 Assembling the load hook*

- ▶ Place the load hook under the pulley head of the telescopic boom.
- ▶ At the pulley head remove the spring retainers on the rope retaining pipe **14** and on the rope retaining pipe **15** and pull the rope retaining pipe out.

WARNING
Risk of falling!
The assembly personnel, due to an erroneous operation of the crane function or slip on the telescopic boom, can fall and be killed!

- ▶ The telescopic boom may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling!
- ▶ If retaining ropes are present on the telescopic boom, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the telescopic boom on the left and right with both snap hooks and secure themselves in case of falls. See crane operating instructions, chapter 2.04 and chapter 2.06!
- ▶ Without appropriate safety measures, it is **strictly** prohibited to step on the telescopic boom!
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
- ▶ Carry out all assembly work from a safe place!

- ▶ Place the hoist rope over the upper rope pulley **13**, see section “Reeving the hoist rope with the auxiliary reeving rope”.
- ▶ Insert the rope retaining pipe **14** and the rope retaining pipe **15** and secure with spring retainers.
- ▶ Pin the rope lock **1** in the load hook **26** and secure with spring retainers.

4.1.2 Fastening the hoist rope

- ▶ Push the retaining pin **6** into the rope lock **1**, move the lever **5** sideways and hold it in this position.

Result:

– The latch **4** is moved to the side.

- ▶ Hang in the rope end with the locking clamp **8** in the rope lock and pull the rope firmly in the direction of the arrow, until the locking clamp **8** contacts the cone **7**.

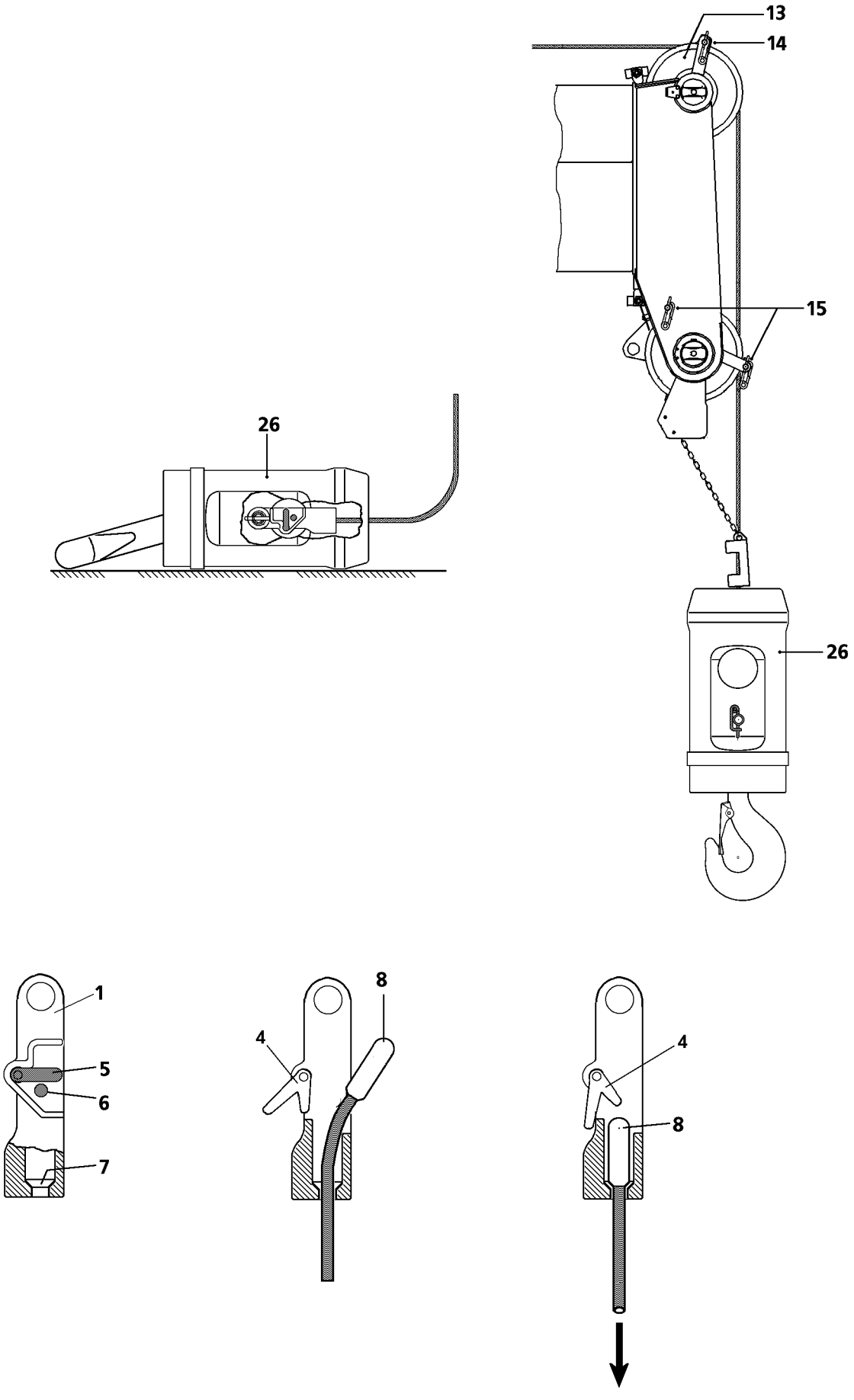
WARNING
Danger of accident due to incorrect mounting of locking clamp!

- ▶ The locking clamp **8** must touch on the cone **7** after hanging it into the rope lock **1** and must be secured by the latch **4**!

- ▶ Release the lever **5**.

Result:

– The lever **5** returns to the initial position and is locked by the retaining pin **6**.



B108125

4.2 Removing the load hook*

Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The telescopic boom is fully telescoped in.
- The telescopic boom has been luffed to the rear or the side.
- The telescopic boom is luffed down in 0° position.
- The ground is level and of sufficient load carrying capacity.

4.2.1 Lowering the load hook

WARNING
Crushing of hands!
When guiding the load hook by hand, hands or fingers can be crushed!
The load hook could roll away!
▶ Make sure the load hook is safely positioned!

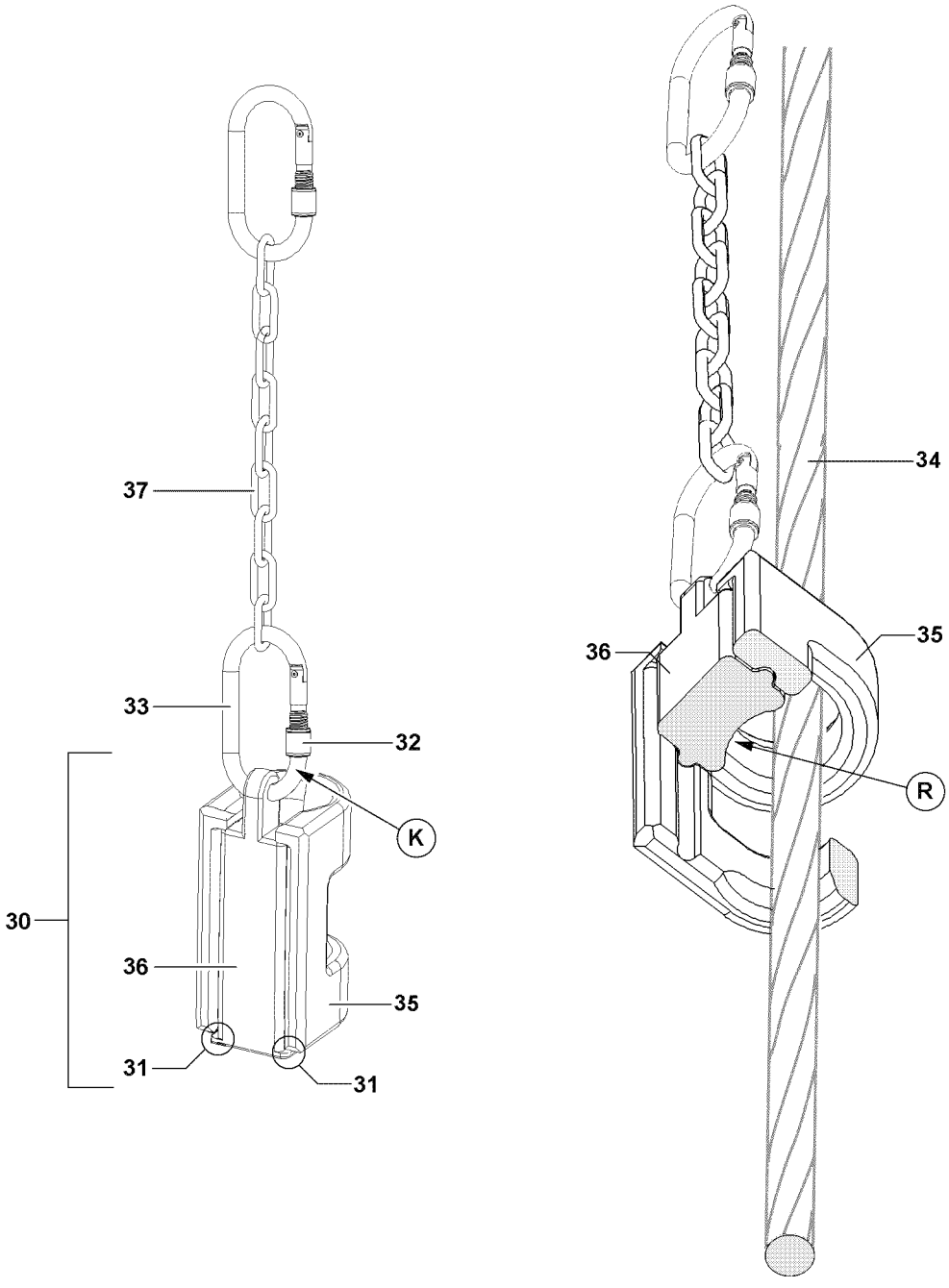
▶ Place the load hook **26** on the ground.
▶ Remove the hoist limit switch weight, see section “Removing the hoist limit switch weight”.

4.2.2 Detaching the hoist rope

▶ Push the retaining pin **6** into the rope lock **1**, move the lever **5** sideways and hold it in this position.

Result:
- The latch **4** is moved to the side and the locking clamp **8** is released.

▶ Push the hoist rope in the direction of the load hook and detach the locking clamp **8**.
▶ At the pulley head remove the spring retainers on the rope retaining pipe **14** and on the rope retaining pipe **15** and pull the rope retaining pipe out, see section “Reeving the hoist rope with the assembly winch”.
▶ Unreeve the hoist rope from the pulley head.
▶ Insert the rope retaining pipes again and secure with spring retainers.



B106127

5 Attaching / removing the hoist limit switch weight

5.1 Attaching the hoist limit switch weight

The hoist limit switch weight **30** consists of 2 parts, which are pushed into each other:
– The weight **35**.
– The carrier section **36**.

▶ Loosen and open the screw retainer **32**.

WARNING
The hoist limit switch can fall down!
If the hoist limit switch weight is incorrectly assembled, components can fall down!
Personnel can be severely injured or killed!
▶ Do not replace the snap hook **33** with other parts, such as a shackle or similar!
▶ When detaching or attaching the hoist limit switch weight **30** make sure that the weight **35** and the carrier section **36** do not fall down!
▶ Make sure that the curvature **R** of the carrier section **36** points to the hoist rope **34**!
▶ Make sure that the stubs **31** of the carrier section **36** touch on the weight **35**!
▶ Make sure that the screw retainer **32** can be turned to be closed from top to bottom, point **K**!

The attachment of the hoist limit switch weight **30** depends on the position of the rope fixed point.

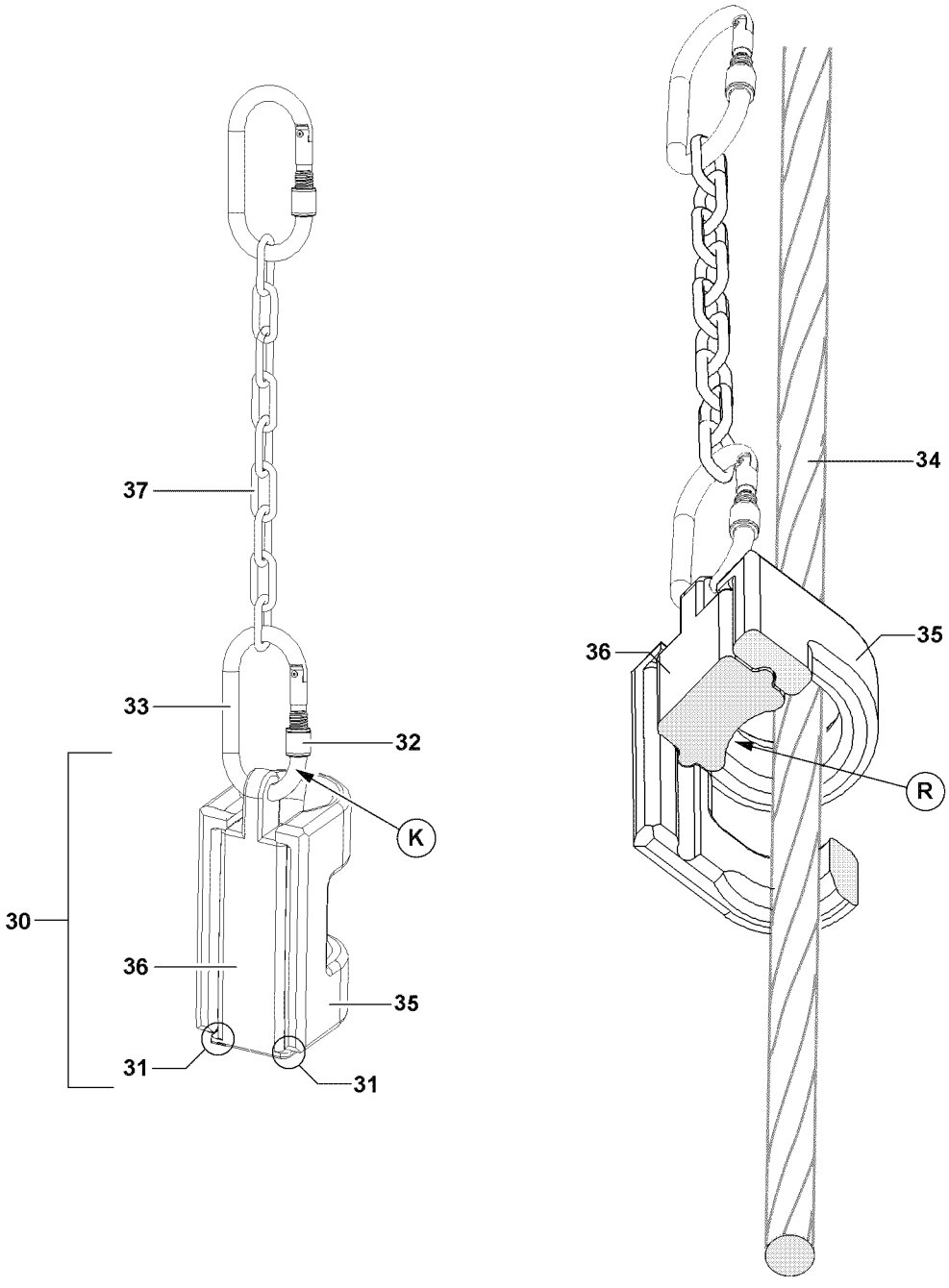
Rope fixed point on the pulley head:
– In the event of multiple hoist rope reeving, the hoist limit switch weight **30** must always be laid around the “stationary rope strand”, in other words around the rope strand that leads directly to the cable lock.

Rope fixed point on hook block:
– The hoist limit switch weight **30** is laid around the outer strand which shows the least diagonal pull, i.e. the one with the smallest angle between the hanging hoist limit switch weight and the hoist rope.

Note
▶ The chain **37** must be attached in full length during crane operation and may not be shortened.

▶ Push the weight **35** with one hand on the hoist rope **34** and hold.
▶ With the other hand, guide the carrier section **36** behind the hoist rope **34** and under the weight **35**. The curvature **R** of the carrier section **36** must point to the hoist rope **34**.
▶ Push the weight **35** on the carrier section **36**.
▶ Hang in the hoist limit switch weight **30** with the carrier section **36** in the snap hook **33**.

The snap hook **33** must be secured with the screw retainer **32**.
▶ Close the screw retainer **32** on the snap hook **33**.

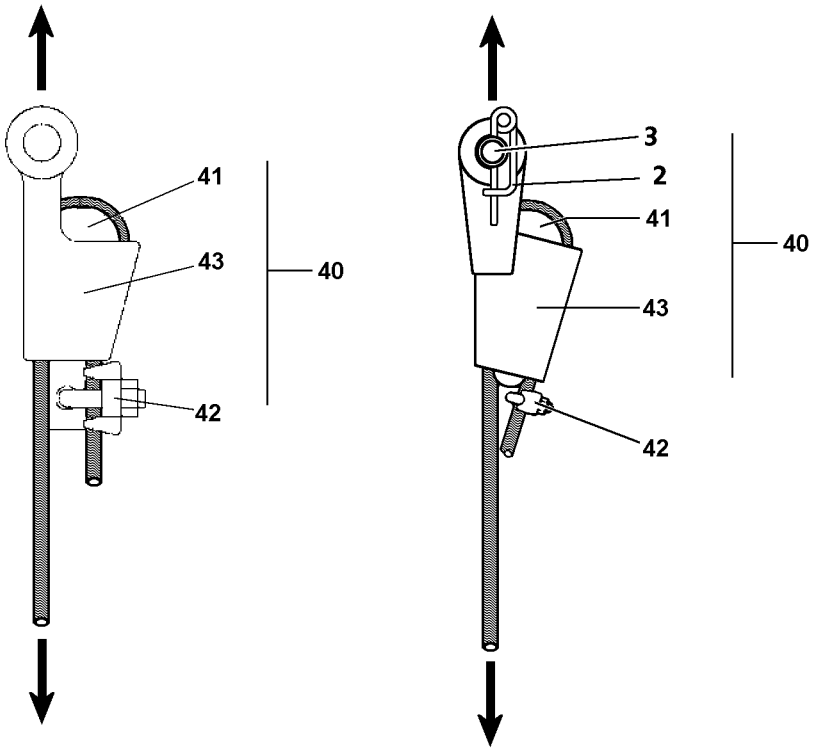


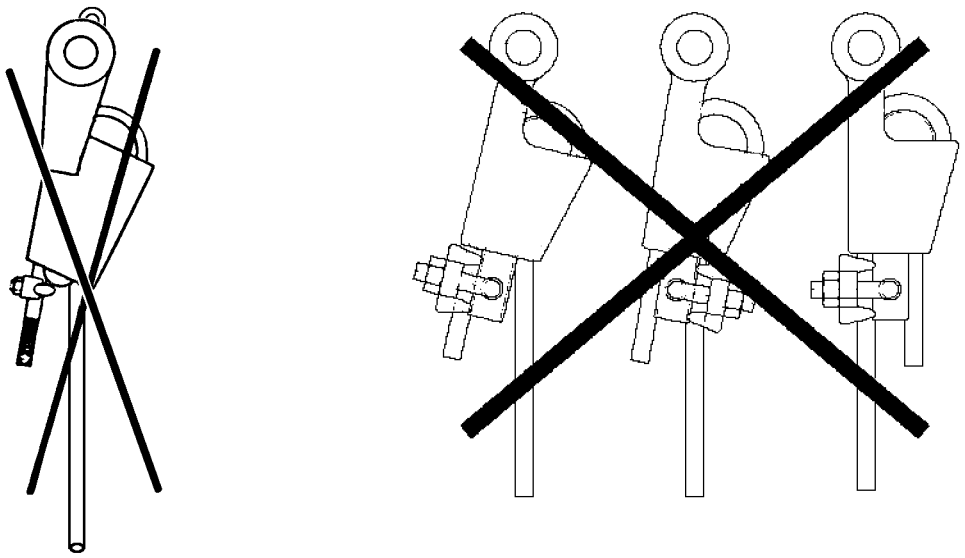
B106127

5.2 Removing the hoist limit switch weight

WARNING
The hoist limit switch can fall down!
If the hoist limit switch weight is incorrectly removed, components can fall down!
Personnel can be severely injured!
- When detaching or attaching the hoist limit switch weight **30** make sure that the weight **35** and the carrier section **36** do not fall down!
- It is prohibited for anyone to remain in the danger zone!

- Release and open the screw retainer **32** on the snap hook **33**.
- Detach the hoist limit switch weight **30** from the snap hook **33**.
- Hold the weight **35** with one hand and with the other hand, push the carrier section **36** from the weight **35**.
- Store the weight **35** and carrier section **36** safely.





B108119

6 Assembling / disassembling the wedge lock

Make sure that the following prerequisites are met:
– The rope clamp is cut off on the hoist rope.
– The hook block or the load hook are ready for assembly.

6.1 Installing the wedge lock

WARNING
Danger of fatal accidents due to falling load!
If an incorrect wedge lock **40** is used or if the wedge lock **40** is incorrectly assembled, the hoist rope can rip off or the hoist rope can be pulled through the wedge lock **40**!
The hook block and the load can fall down and kill personnel!
- ▶ Use only a wedge lock **40** approved by Liebherrwerk Ehingen!
- ▶ Assembling the wedge lock **40** correctly!
- ▶ Place the hoist rope with the wedge **41** into the housing **43** in such a way that the rope strand runs in the pull axle of the wedge lock **40**!
- ▶ The dead end of the rope must be secured by the clamp **42** to prevent it from being pulled through!
- ▶ It is prohibited for personnel to remain in the danger zone!

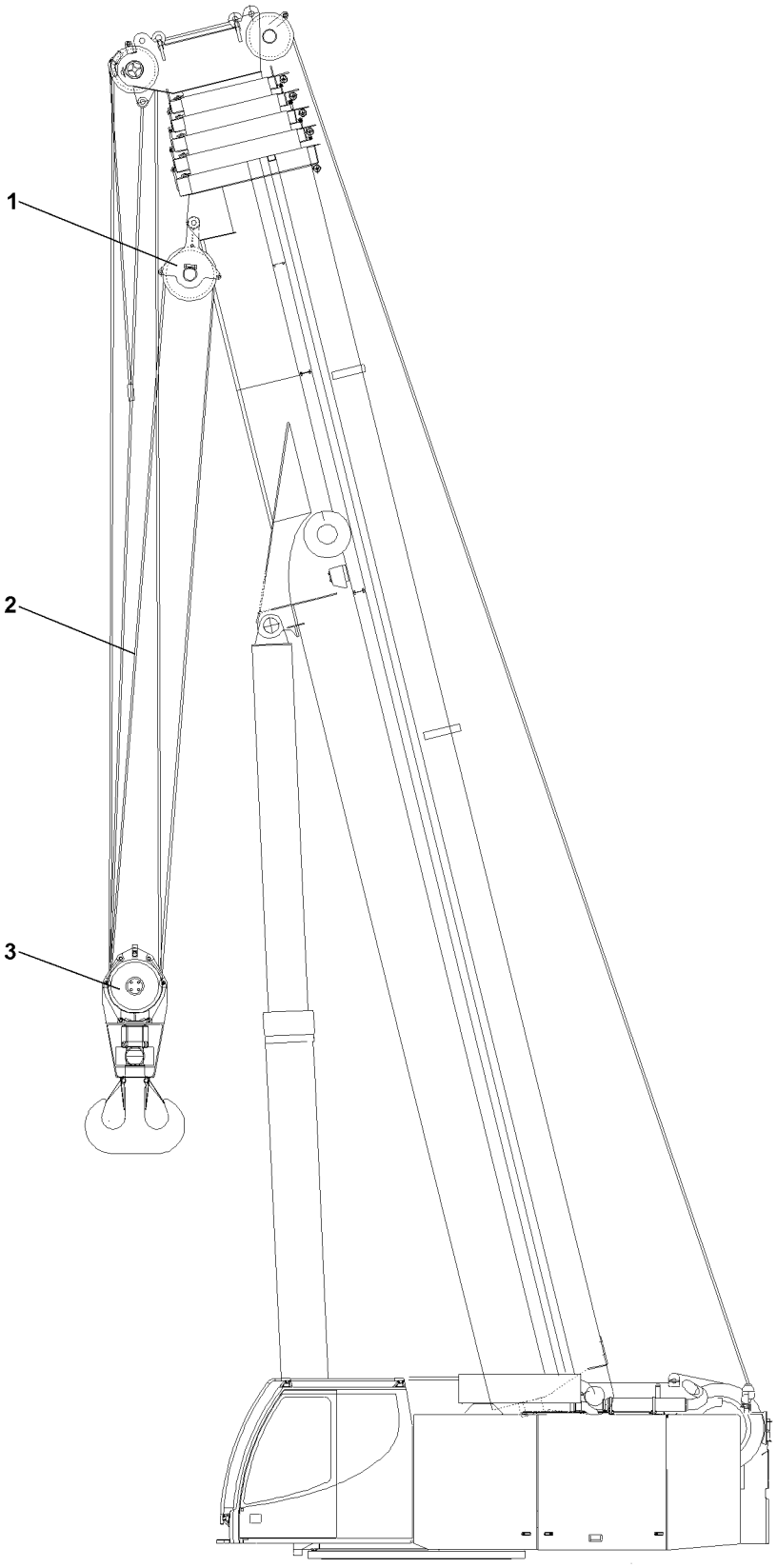
- ▶ Take a matching wedge lock **40** from the tool box.
- ▶ Place the hoist rope with the wedge **41** into the housing **43**.
- ▶ If possible, assemble the clamp **42** through the wedge **41** on the dead end of the rope.

NOTICE
Damage to the hoist rope!
If the pin **3** has been assembled incorrectly, the hoist rope may rub against the pin **3** or on the linch pin **2**.
- ▶ Always insert the pins **3** from “inside to outside” and secure from the outside.

- ▶ Pin and secure the wedge lock **40** on the fixed point of the pulley head or that of the hook block or on the load hook, depending on the reeving plan.

6.2 Disassembling the wedge lock

- ▶ Unpin the wedge lock **40** on the fixed point.
- ▶ Remove the clamp **42** and pull the hoist rope with the wedge from the housing.
- ▶ Store the wedge lock **40**.



B108222

7 Crane operation with auxiliary block* on the telescopic boom

7.1 Crane operation with auxiliary block*

For crane operation with auxiliary block **1**, the following prerequisites are required:
– The TY guying has been disassembled (if present).
– The working floodlights on the telescopic boom have been disassembled.

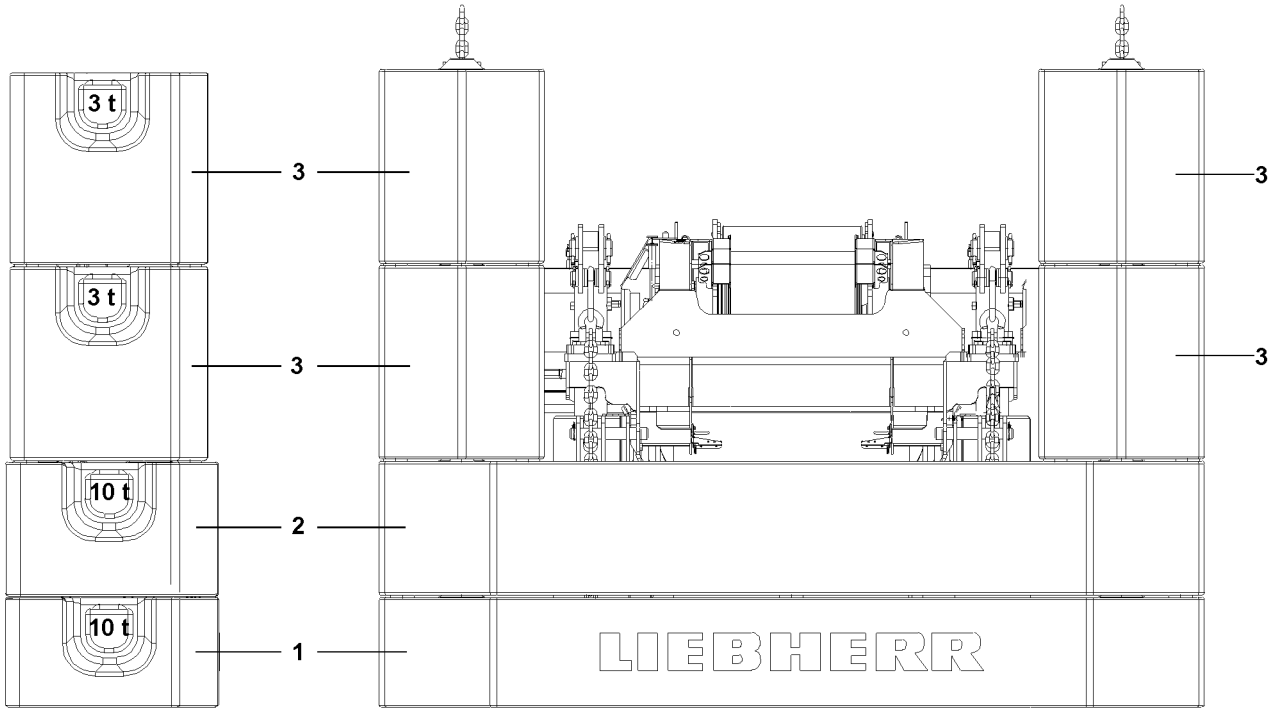
Note
▶ For crane operation with auxiliary block **1** on the telescopic boom, move only to the radius ranges, which are present in the load chart!

NOTICE
Damage of hook block, auxiliary block or hoist rope!
If the following notes are not observed, the hook block **3**, the hoist rope **2** or the auxiliary block **1** can be damaged!
If the hoist limit switch chain on the hoist limit switch weight is too short, the hook block **3** can run on the auxiliary block **1** when spooling up the hoist rope **2** and damage it severely.
▶ Before crane operation with auxiliary block **1**, assemble the longer hoist limit switch chain!
▶ Before crane operation with auxiliary block **1**, remove the rope protection pipes on the hook block **3**!
▶ When the hook block **3** is on the ground, ensure that the hoist rope **2** remains in the pulleys!
▶ For operation with auxiliary block **1**, do **not** telescope the telescopic boom out and run only the radii ranges, which are specified in the load chart!

▶ Carry out crane operation with auxiliary block **1** carefully.

8 Rope reeving

Note
▶ For reeving plans, see Crane operating instructions, chapter 4.15!



B102814

1 General

1.1 Counterweight combinations

The counterweight plates are marked with their own weights.

DANGER
Crane can topple over!
If a different counterweight than the one listed in the load chart is used, the crane may be damaged or topple over.
▶ Counterweight must be attached according to the data in the load chart!

The following counterweight combinations are possible:

Counterweight	Combination	Individual weight
0	no counterweight	0

Counterweight	Combination	Individual weight
10	Base plate **1**	10

Counterweight	Combination	Individual weight
16 t	Base plate **1**	10 t
	2x counterweight plate **3**	3 t

Counterweight	Combination	Individual weight
20 t	Base plate **1**	10 t
	Counterweight plate **2**	10 t

Counterweight	Combination	Individual weight
22 t	Base plate **1**	10 t
	4x counterweight plate **3**	3 t

Counterweight	Combination	Individual weight
26 t	Base plate **1**	10 t
	Counterweight plate **2**	10 t
	2x counterweight plate **3**	3 t

Counterweight	Combination	Individual weight
32 t	Base plate **1**	10 t
	Counterweight plate **2**	10 t
	4x counterweight plate **3**	3 t

1.2 Checking the counterweight plates

DANGER
Risk of accident from damaged counterweights!
If damaged counterweights are ballasted, the stable seating of the counterweights can no longer be ensured.
▶ Replace damaged counterweights immediately!

Before assembly or disassembly of the counterweight plates, perform a visual check for damage and foreign matter.

1.3 Taking on permissible telescopic boom angle at counterweight

Make sure that the following prerequisites for the stability to the ballast side on the crawlers are met:
– the telescopic boom is fully telescoped in, T-11.5
– there is no load on the hook

DANGER
Crane can topple over!
If the permissible telescopic boom angles are not abided by, the crane can tip to the rear and cause fatal injury to personnel!
▶ Observe the permissible telescopic boom angle when taking on counterweight!

1.3.1 Permissible telescopic boom angle at wide track 4.15 m

At 0°, 90°, 180° and 270°.

Counterweight on super-structure	Central ballast	Permissible telescopic boom angles
32 t	15 t	-2° to 70.4°
26 t	15 t	-2° to 81°
22 t	15 t	-2° to 82°
20 t	15 t	-2° to 82°
16 t	15 t	-2° to 82°
10 t	15 t	-2° to 82°
0 t	15 t	-2° to 82°
0 t	0 t	-2° to 82°

1.3.2 Permissible telescopic boom angle at reduced track 3.40 m

At 90° and 270°.

Counterweight on super-structure	Central ballast	Permissible telescopic boom angles
32 t	15 t	-2° to 45.2°
26 t	15 t	-2° to 61.9°
22 t	15 t	-2° to 70.4°
20 t	15 t	-2° to 73.1°
16 t	15 t	-2° to 81°
10 t	15 t	-2° to 82°
0 t	15 t	-2° to 82°
0 t	0 t	-2° to 82°

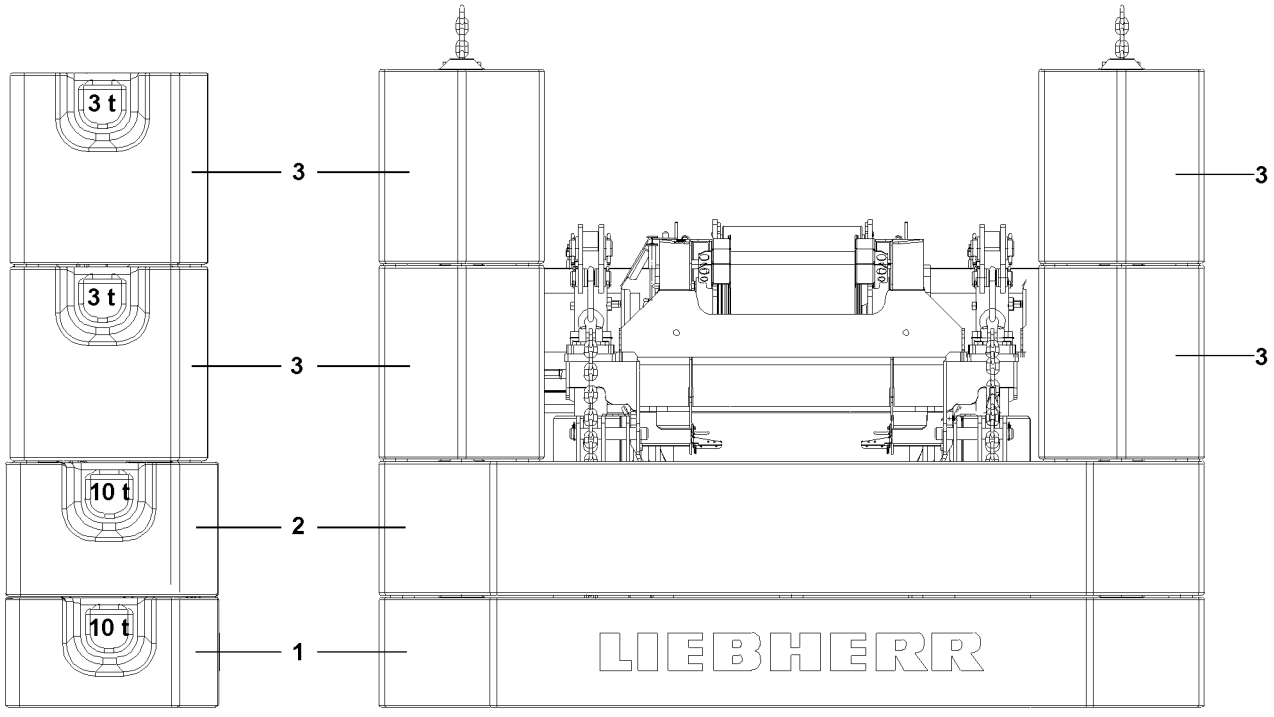
1.3.3 Permissible telescopic boom angle at retracted track 2.60 m

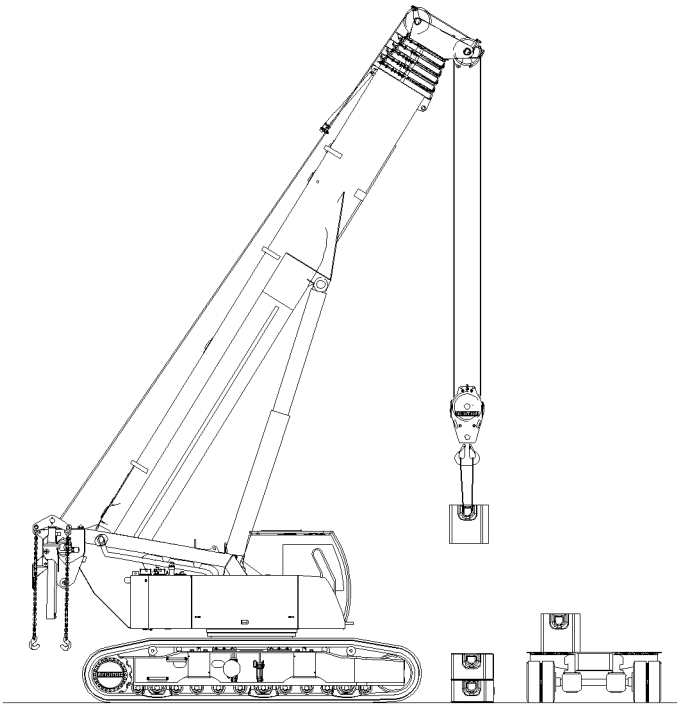
At 90° and 270°.

Counterweight on super-structure	Central ballast	Permissible telescopic boom angles
–	–	–
–	–	–
22 t	15 t	-2° to 45.2°
20 t	15 t	-2° to 52.4°
16 t	15 t	-2° to 61.9°
10 t	15 t	-2° to 75.8°
0 t	15 t	-2° to 82°
0 t	0 t	-2° to 82°

1.4 Permissible incline for ballasting

DANGER
Crane can topple over!
If the incline for ballasting is larger than +/- 1°, the crane can topple over and fatally injure personnel!
▶ Do not exceed nor fall below an incline of +/- 1° for ballasting!





B102815

2 Assembly

2.1 General

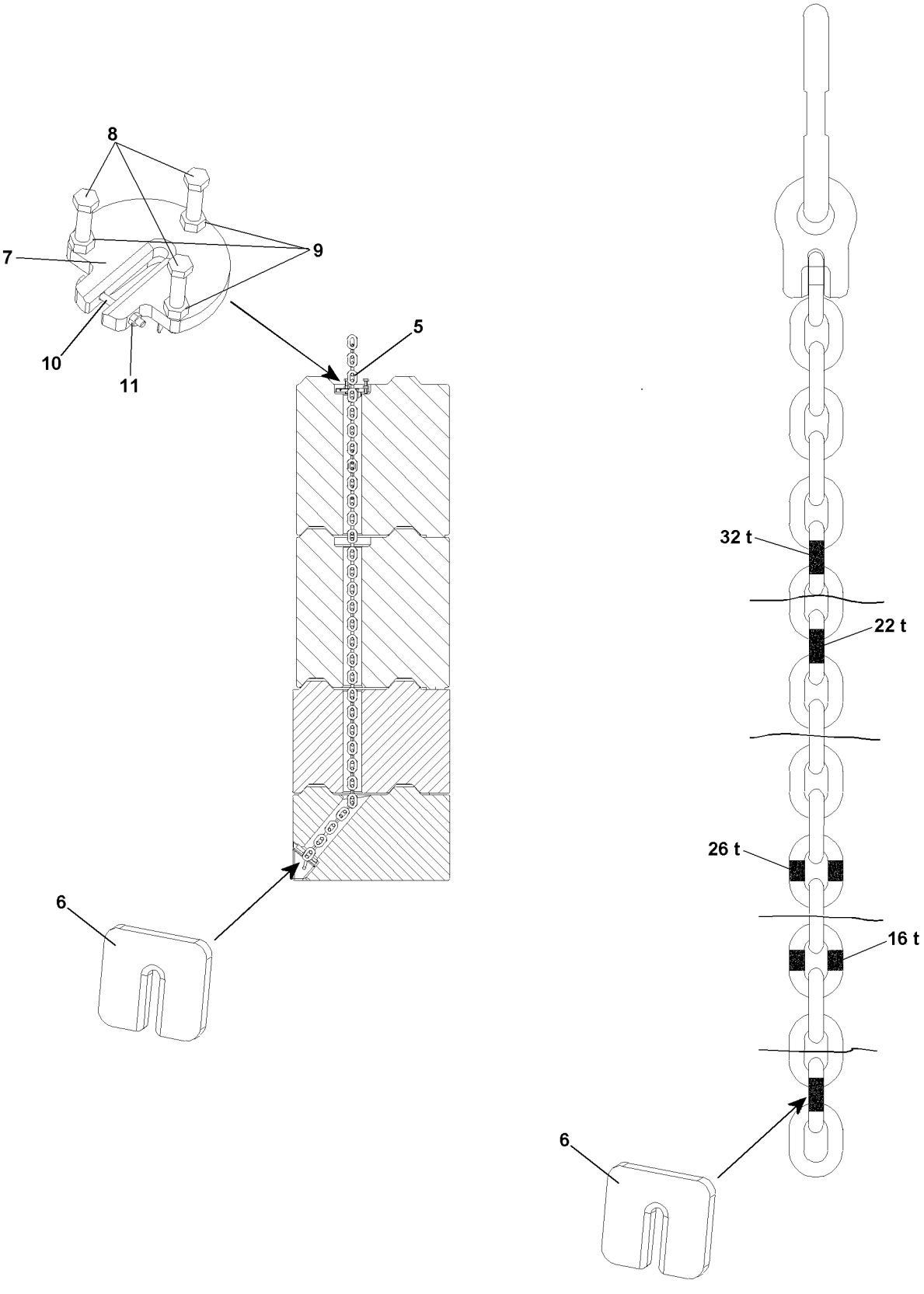
Ensure that the following preconditions are met:
- the crane is aligned in horizontal direction
- the central ballast is installed
- the crane with installed crawler carriers is operational as assembly crane
- the transport vehicle with the counterweight plates is in the immediate vicinity of the crane
- the ground is level and of sufficient load carrying capacity

DANGER
Collapsing substrate!
For assembly or disassembly of the counterweight, make sure that the ground is of sufficient load carrying capacity, otherwise the counterweight can sink in and topple over.
▶ If ground gives way, select assembly location with sufficient load bearing capacity!

2.2 Unloading the base plate and the counterweight

DANGER
Crane can topple over!
Before the boom is raised, the LICCON overload protection must be set according to the valid load chart! The boom lengths and boom radii specified in the load chart may not be exceeded during ballasting!
▶ The data in the load charts must be strictly observed!

▶ Set the LICCON overload protection according to the load chart.
▶ Hang the base plate **1** on the suspension bitts.
▶ Lift the base plate **1** with the own crane and set in down on the assembly location.
▶ Unload the remaining counterweight plates, align and stack them on top of each other.



B103203

2.3 Securing the counterweight

DANGER
Danger of accident when tensioning the counterweight plates!
An increased accident hazard exists, if the following notes are not observed!
- ▶ To pretension, use only supplies safety chains **5**, chain receptacles **6** and retaining plates **7**!
- ▶ For larger ballasting, use a non-skid ladder to thread the safety chains **5**!
- ▶ Secure the counterweights before starting to use the crane!

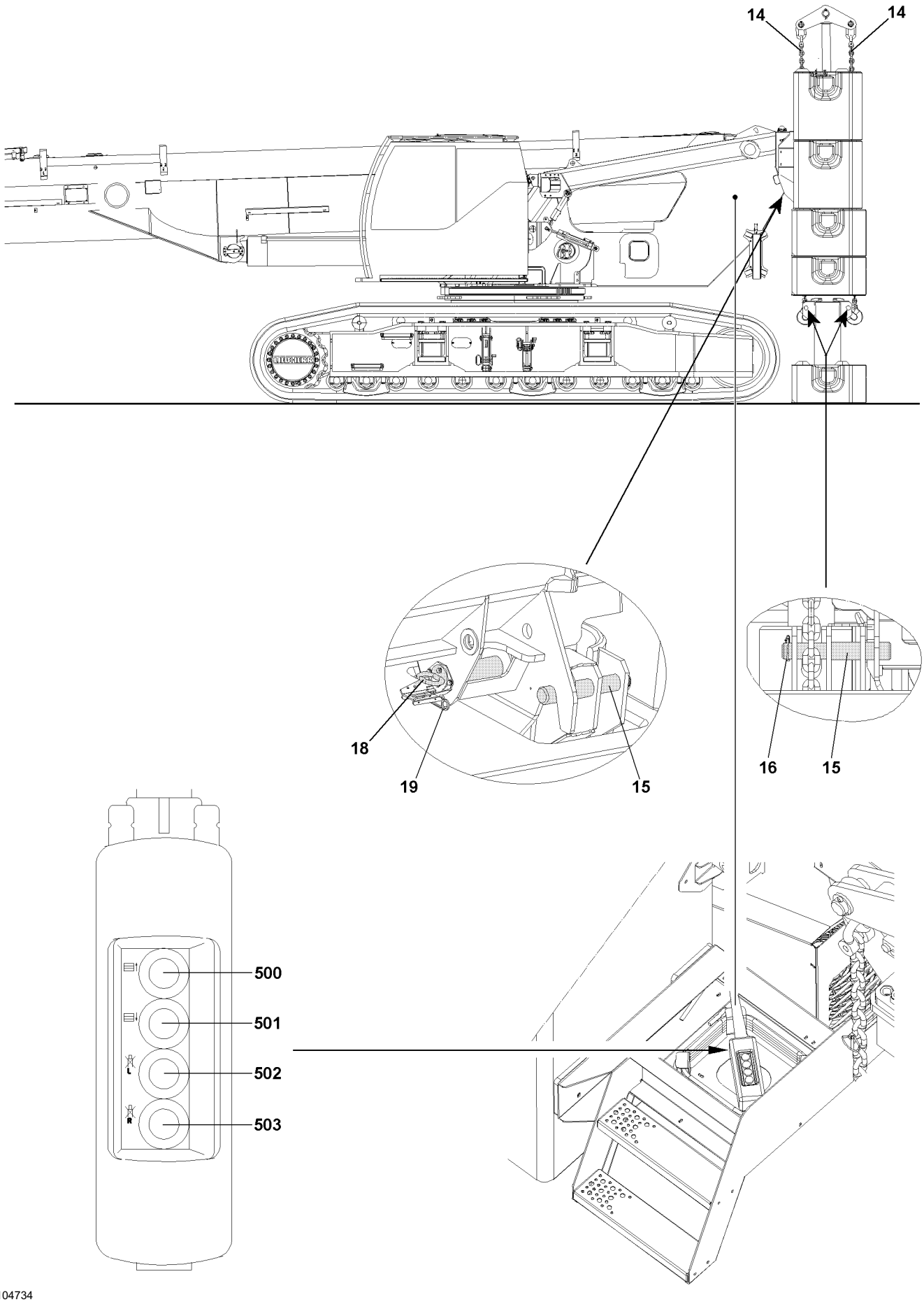
Red and blue marks are applied to the safety chains **5**. The chain receptacles **6** and retaining plates **7** must be attached on these marks. For various counterweight combinations, chain links with different marks must be used to attach the retaining plates **7**.
Chain links with the following marks must be used:
- – To attach the chain receptacles **6**, the lowest chain links with a red mark.
- – To attach the retaining plates **7** for the 16 t counterweight, the lower chain links with a blue mark.
- – To attach the retaining plates **7** for the 26 t counterweight, the lower chain links with a red mark.
- – To attach the retaining plates **7** for the 22 t counterweight, the upper chain links with a blue mark.
- – To attach the retaining plates **7** for the 32 t counterweight, the upper chain links with a red mark.

- ▶ Push the retaining plates **7** on both sides on the marked chain links onto the safety chains **5**.
- ▶ Secure the retaining plates **7** on both sides with screws **10**.
- ▶ Secure the screws **10** with nuts **11**.

The crane can be used to lift and link the safety chains **5**.
- ▶ Link the safety chains **5** on both sides from the top to the bottom through the counterweight assembly.
- ▶ Push the chain receptacles **6** on both sides on the lowest red mark onto the safety chains **5**.

Note
- ▶ The tensioning screws **8** of the retaining plates **7** must be tightened with a tightening torque of 63 Nm.

- ▶ Tension the safety chains **5** with tensioning screws **8** and then counter with nuts **9**.



B104734

2.4 Taking up the counterweight

Ensure that the following preconditions are met:
- the crane is aligned in horizontal direction
- the central ballast is installed
- the respective counterweight has been placed and secured on the base plate
- the pins **15** to engage the ballast assembly chains **14** are pinned and secured with linch pins **16**
- the crane superstructure is mechanically locked with the crane chassis
- the telescopic boom is fully telescoped in
- the telescopic boom is luffed to a permissible telescopic boom angle, see paragraph “Taking on permissible telescopic boom angle at counterweight”
- a guide for reverse travel is available

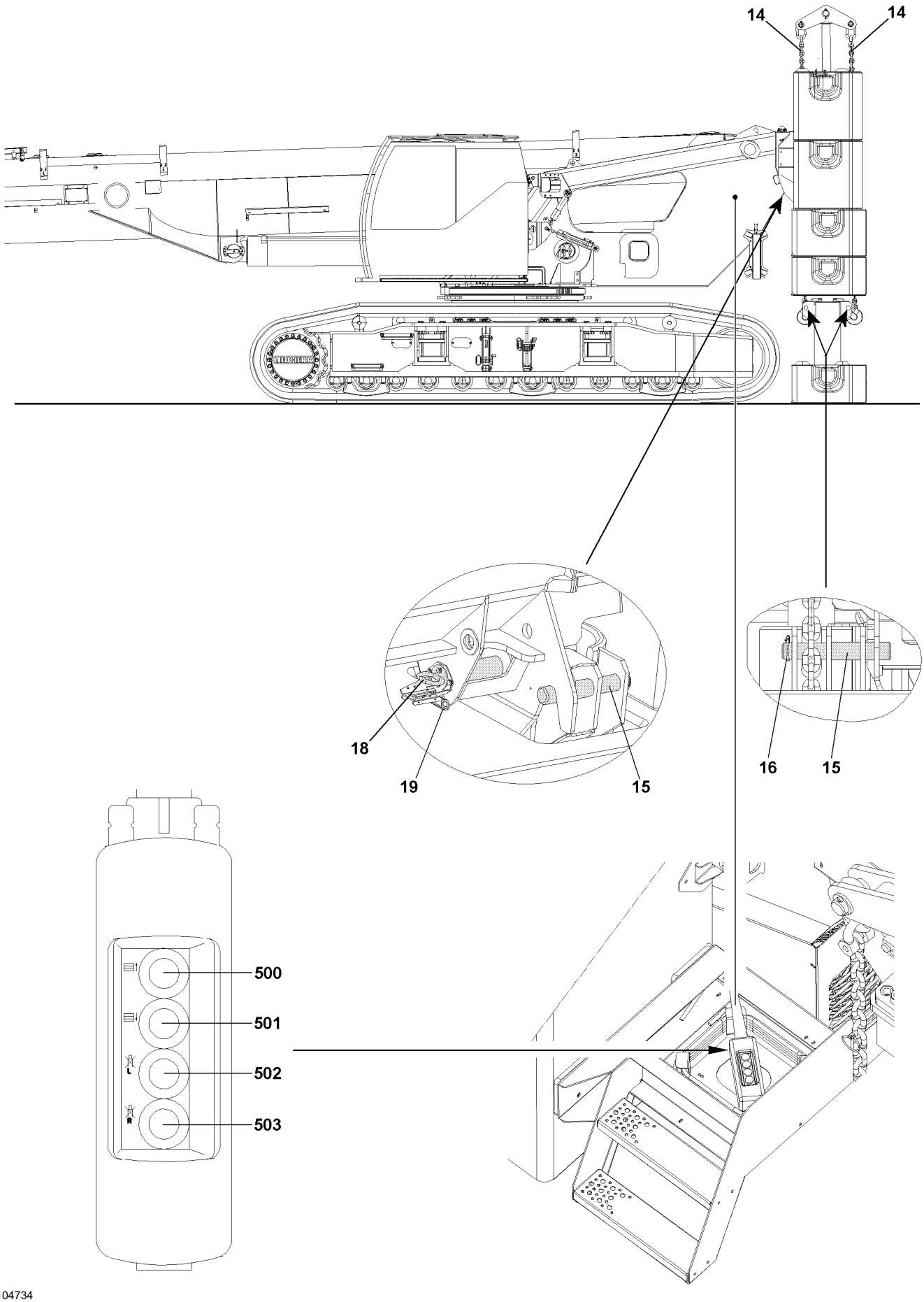
CAUTION
The counterweight may oscillate when pulled up!
If the crane is not aligned in lengthwise or crosswise direction exactly over the counterweight, then oscillating movements can occur when the counterweight is lifted, which in turn can cause damage to the ballasting cylinders or the crane.
▶ Align the crane exactly over the counterweight!

The crane is aligned exactly if the ballast assembly chains **14** are above the corresponding pins **15** on the base plate.
▶ Move the crane backwards with the turntable between the ballasting stacks until the ballast assembly chains **14** are above the corresponding pins **15**.
▶ Press button **501** and fully retract the ballasting cylinders.
▶ Engage the ballast assembly chains **14** on the pins **15**.
▶ Release safety springs **19** and unpin pins **18** on both sides.

DANGER
Counterweight can fall down!
Due to an assembly error, the counterweight could fall down and fatally injure personnel!
▶ As long as the counterweight is not properly pinned and secured on the turntable, it is prohibited for anyone to remain under the counterweight as well as within the complete danger zone!

▶ Press the button **500** and evenly tension the ballast assembly chains **14**.
▶ Press the button **500** and lift the counterweight a little off the ground and let it stop swinging.
▶ Press the button **500** and slowly extend the ballasting cylinders all the way.

Troubleshooting
The counterweight is hanging unevenly on the turntable!
If the counterweight is hanging unevenly on the turntable, then the uneven position can be equalized by blocking the corresponding ballasting cylinder.
▶ Press the button **502** and block the ballasting cylinder on the left.
▶ **or**, press the button **503** and block the ballasting cylinder on the right.
▶ Equalize the uneven position by extending or retracting the corresponding ballasting cylinder.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503
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2.5 Pinning the counterweight to the turntable

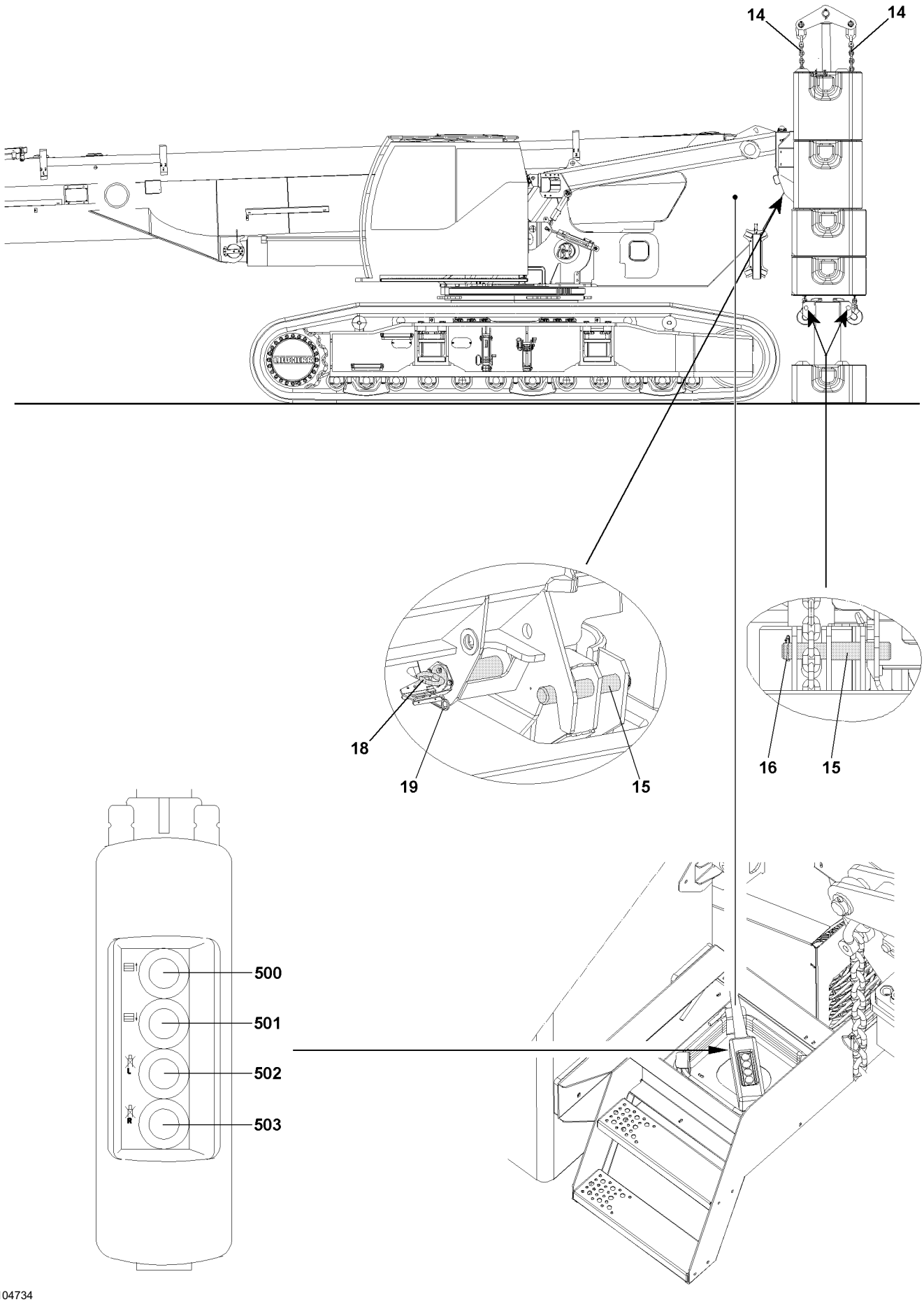
Ensure that the following preconditions are met:
– the counterweight is horizontally aligned
– the pin points on the turntable and the counterweight align

DANGER
Counterweight can fall down!
Due to an assembly error, the counterweight could fall down and fatally injure personnel!
▶ As long as the counterweight is not properly pinned and secured on the turntable, it is prohibited for anyone to remain under the counterweight as well as within the complete danger zone!

▶ Pin the pins **18** on both sides and secure with safety springs **19**.
▶ Check if the pins **18** are fully inserted and secured with safety springs **19**.
▶ Press the button **501** and fully retract the ballasting cylinders.

Troubleshooting
The pin **18** cannot be inserted.
The pin points on the turntable and the counterweight are not aligned.
▶ Unpin the other pin **18**.
▶ Lower the counterweight a little and raise it again.
▶ Align the pin points on the turntable and the counterweight exactly until they align.

Note
▶ After assembly, the ballast assembly chains **14** remain engaged on the pins **15** and rest on the base plate.



B104734

3 Disassembly

3.1 General

Ensure that the following preconditions are met:
- the crane is aligned in horizontal direction
- the crane superstructure is aligned in lengthwise direction to the crawler carriers
- the central ballast is installed
- the ballast assembly chains **14** are engaged on all four pins **15**
- the telescopic boom is fully telescoped in
- the telescopic boom is luffed to a permissible telescopic boom angle, see paragraph “Permissible telescopic boom angles”
- the ground is level and of sufficient load carrying capacity

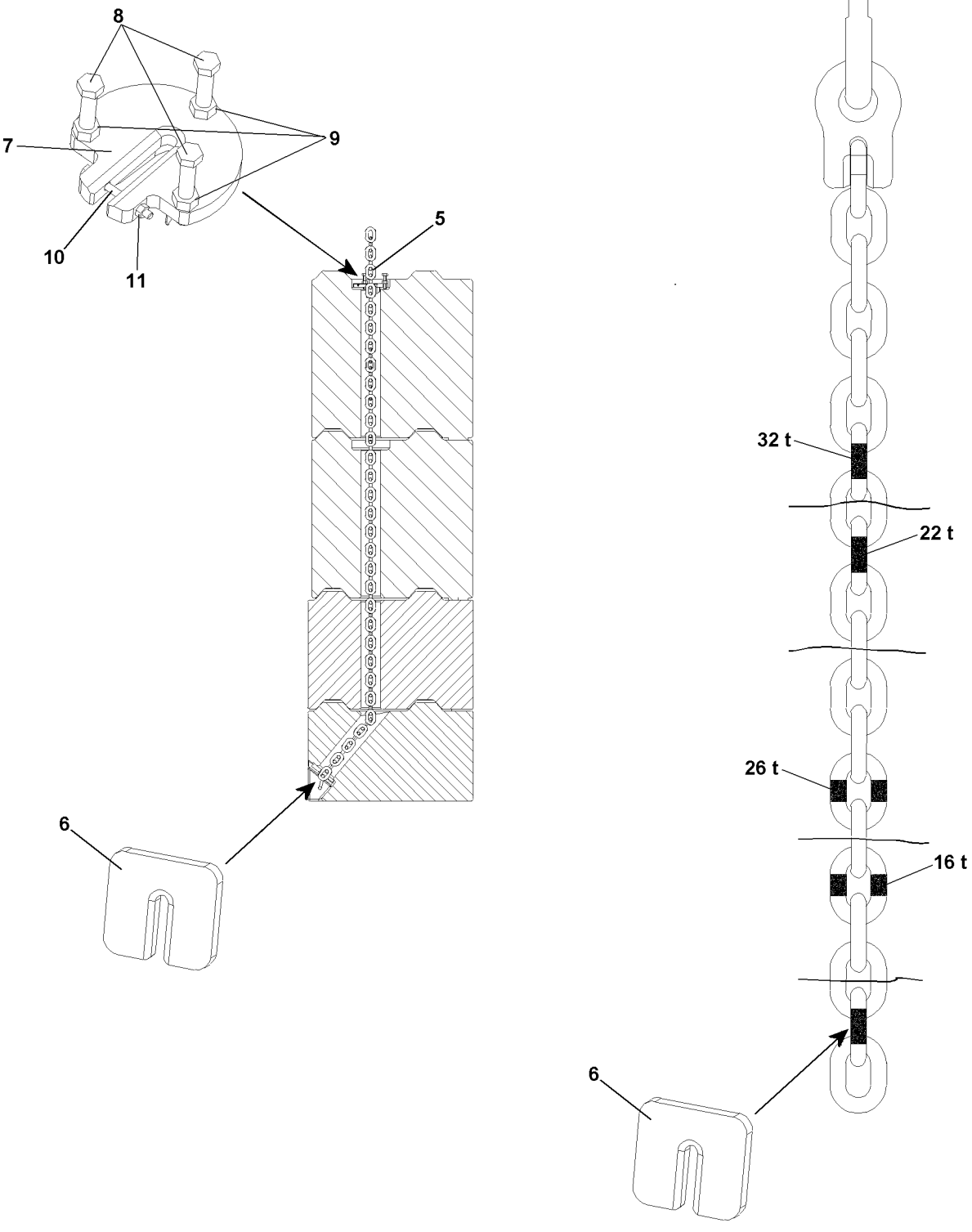
DANGER
Collapsing substrate!
For assembly or disassembly of the counterweight, make sure that the ground is of sufficient load carrying capacity, otherwise the counterweight can sink in and topple over.
▶ If ground gives way, select assembly location with sufficient load bearing capacity!

3.2 Placing the counterweight down

For the lift of the ballasting cylinder to be sufficient, the counterweight must be properly supported from below by 100 mm to 200 mm.
▶ Establish proper support for the counterweight.
▶ Press the button **500** and slowly extend the ballasting cylinder.
▶ Tension the ballast assembly chains **14** evenly until the pin points of the counterweight and the turntable align.

DANGER
Counterweight can fall down!
Due to a disassembly error, the counterweight could fall down and fatally injure personnel!
▶ The ballast assembly chains **14** must be engaged on all four pins **15** and must be tensioned!
▶ During and after loosening the counterweight, it is prohibited for anyone to remain under the counterweight as well as within the complete danger zone!

▶ Release safety springs **19** and remove pins **18** all the way on both sides.
▶ Press the button **501** and slowly and evenly retract the ballasting cylinders and carefully lower the counterweight.
▶ When the counterweight has been lowered to the ground:
Press button **501** and fully retract the ballasting cylinders.
▶ Disengage the ballast assembly chains **14** from the pins **15**.
▶ Drive the crawler crane away from the counterweight.



B103203

3.3 Releasing and loading the counterweight

DANGER
Danger of accidents when releasing the safety chains!
▶ For larger ballasting, use a non-skid ladder to disengage the safety chains **5**!

▶ Loosen the nuts **9** and unscrew the tensioning screws **8** a little.
▶ Release the chain receptacles **6** on both sides.
▶ Pull out the retaining chains **5** through the top.
▶ Loosen the nuts **11** and unscrew the screws **10** on the retaining plates **7**.
▶ Remove the retaining plates **7** on the safety chains **5**.
▶ Store the safety chains **5**, chain receptacles **6** and retaining plates **7**.
▶ Adjust LICCON overload retainer as per load chart.

DANGER
Crane can topple over!
The boom lengths and radii specified in the load chart may not be exceeded. If this is not observed, the crane can topple over fatally injure personnel!
▶ The boom lengths and radii noted in the load chart must be strictly observed!

▶ Place counterweight plates onto the transport vehicle.

B195219

1 Technical safety instructions for working with a load

For more information, see chapter 2.04.

WARNING
The crane can topple over!
For steep boom positions, for which no loads are specified in the load charts there is a risk of the crane superstructure toppling when turning “backward”, i.e. towards the counterweight side! There is a particular danger if the support base has been reduced and supported with the sliding beams retracted!
Personnel can be severely injured or killed!
▶ The radii specified in the load chart must be observed!

WARNING
Danger of accident due to erroneous operation!
If the reeving number on the pulley head is less than the reeving number set on the LICCON computer system and if the load is lifted with the luffing gear, it can result in an overload of the hoist rope, as a result, the hoist rope can rip, causing the load to drop!
Personnel can be severely injured or killed!
▶ Always comply with the reeving numbers specified in the load chart for maximum loads!
▶ The reeving on the pulley head and the reeving set on the LICCON computer system must match, otherwise crane operation is prohibited!

DANGER
Danger of fatal accidents due falling load!
If the required number of three coils is fallen below (for example due to a technical defect), the hoist rope is ripped from the winch drum and the load falls down.
Personnel can be severely injured or killed!
▶ The crane operator must ensure that there are always at least three windings on the winch drum!

Always comply with the maximum loads specified in the load chart.
The weight of the hook block according the load chart must be taken into account.
For the lift, use the hook block which is suited best for the existing equipment configuration in connection with the load chart.
Initiate all crane movements carefully and also use the brakes carefully during crane movements. That way you can avoid a swinging or pendulum motion in the suspended load.

2 Checks before starting to work with the crane

Before starting work with the crane, the crane operator must carry out a further inspection to satisfy himself about the crane's operational safety:

– Check that the crane is properly supported and level.
– Check that all values in the load chart that apply to the current equipment configuration have been entered and met.
– Ensure that there are no people or objects in the crane danger zone.

WARNING
Danger of accidents when turning the crane superstructure!
By turning the crane superstructure in restricted space conditions on the job site, especially in the rear area of the counterweight and towards the chassis, personnel can be crushed and severely injured or killed!

▶ Give a short warning signal (horn) before starting a slewing movement!
▶ Ensure before starting any slewing movement that there are no people or objects in the danger zone!

2.1 Visual check for damage

WARNING
Risk of accident!
If the crane is operated despite existing defects, personnel can be severely injured or killed!

▶ In the event of deficiencies that threaten operational safety, stop crane operation immediately!

The following deficiencies threaten the crane's operational safety:

– Damage to load-bearing parts of the crane design, such as booms, supports etc.
– Failure of the hoist gear brake and consequent slipping of the load
– Functional failures in the crane control system
– Functional failures in the indicator and warning lights
– Damage to the hoist ropes
– Functional failures in the safety devices
– Leakages on safety relevant components of the crane hydraulic

Inform the appropriate supervisor about the deficiencies on the crane and also inform your relief when crane operators are changed.

2.2 Telescopic boom distortion because of sunshine on one side

A temperature difference occurs between the side facing the sun and the side facing away from the sun for cranes with telescopic boom. This causes telescopic boom side distortion, which can reduce the load-bearing capacity of the telescopic boom. For example, a temperature difference between the two boom sides of 30 °C and a boom length of 60 m results in a length difference caused by the temperature difference between the two sides of the telescopic boom of approximately 22 mm. Particularly with narrow boom parts, this causes the profiles to bend sideways!
If the maximum load carrying capacity is being fully utilized, particularly when a telescopic boom extension such as a lattice jib, luffing lattice jib or folding jib is being used, then in must be ensured through a visual inspection before picking up the load that the boom is not showing signs of side deformation due to one-sided sun exposure.

WARNING
Risk of accident because of component overloading!
If the telescopic boom has become distorted because of one-sided sun exposure this can cause component overload and therefore accidents!

▶ Turn crane so that both sides of the boom are brought to about the same temperature, therefore preventing side deformation due to temperature differences!

3 Crane movement - Telescoping

If the telescopic boom is telescoped, particularly with the auxiliary boom or telescopic boom extension, before the telescoping procedure, ensure that:

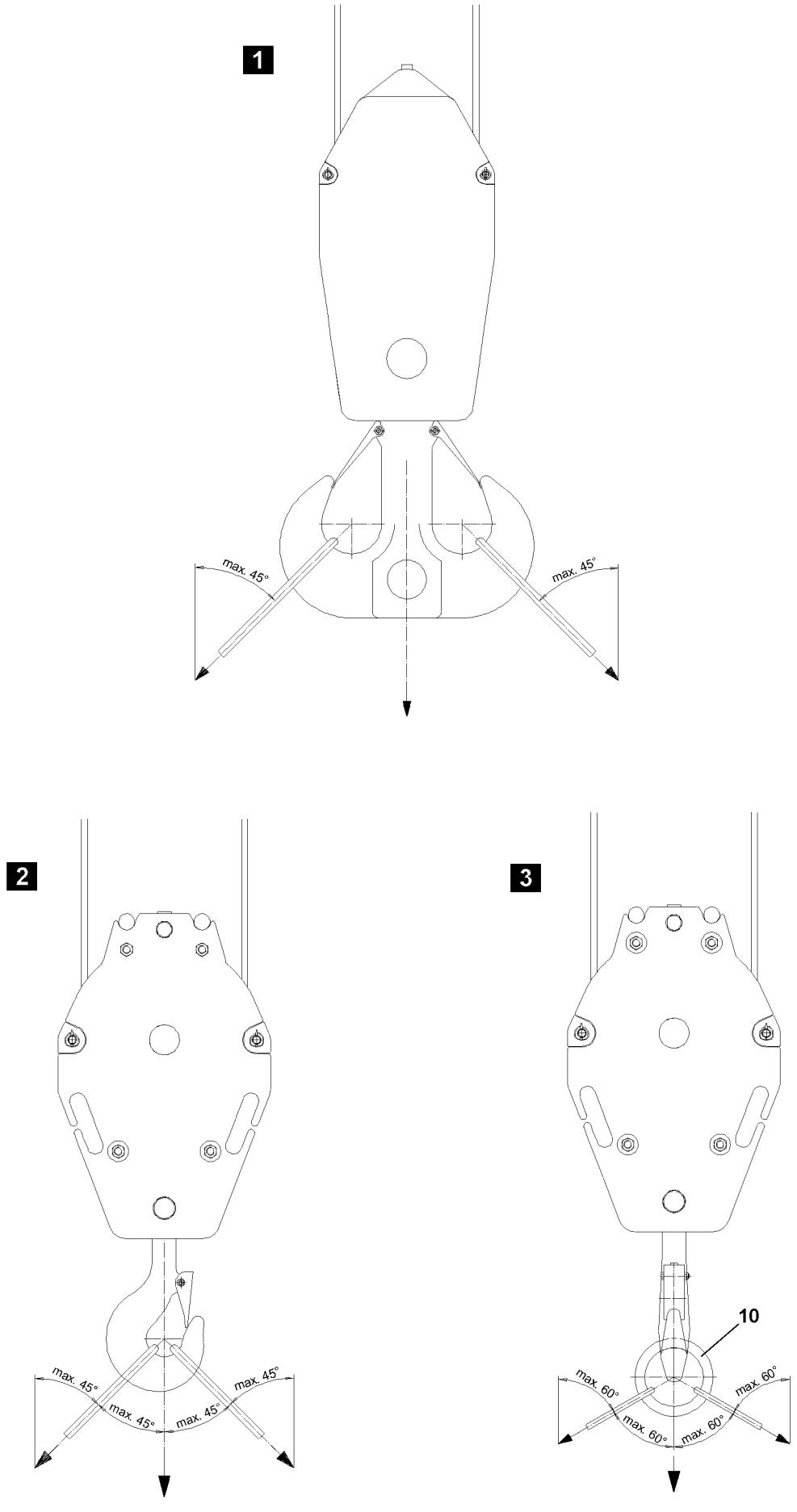
– The crane is properly supported and horizontally aligned.
– The telescopic boom is evenly warmed up by solar radiation.
– There is no strong side wind.

WARNING

Damage of the telescopic boom or the hoist rope!

If these 3 factors are not adhered to, damage of the telescopic boom or the hoist rope can occur and lead to accidents!

▶ Support the crane properly and align it horizontally!
▶ Keep both sides of the boom at about the same temperature!
▶ Telescope only to the permissible wind speed according to the load chart!
▶ If the actual wind speed is higher than the permissible wind speed noted on the load chart, telescoping is prohibited!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2
max. 45°
max. 45°
max. 45°
max. 45°
3
10
max. 60°
max. 60°
max. 60°
max. 60°

B112108

4 Taking on a load

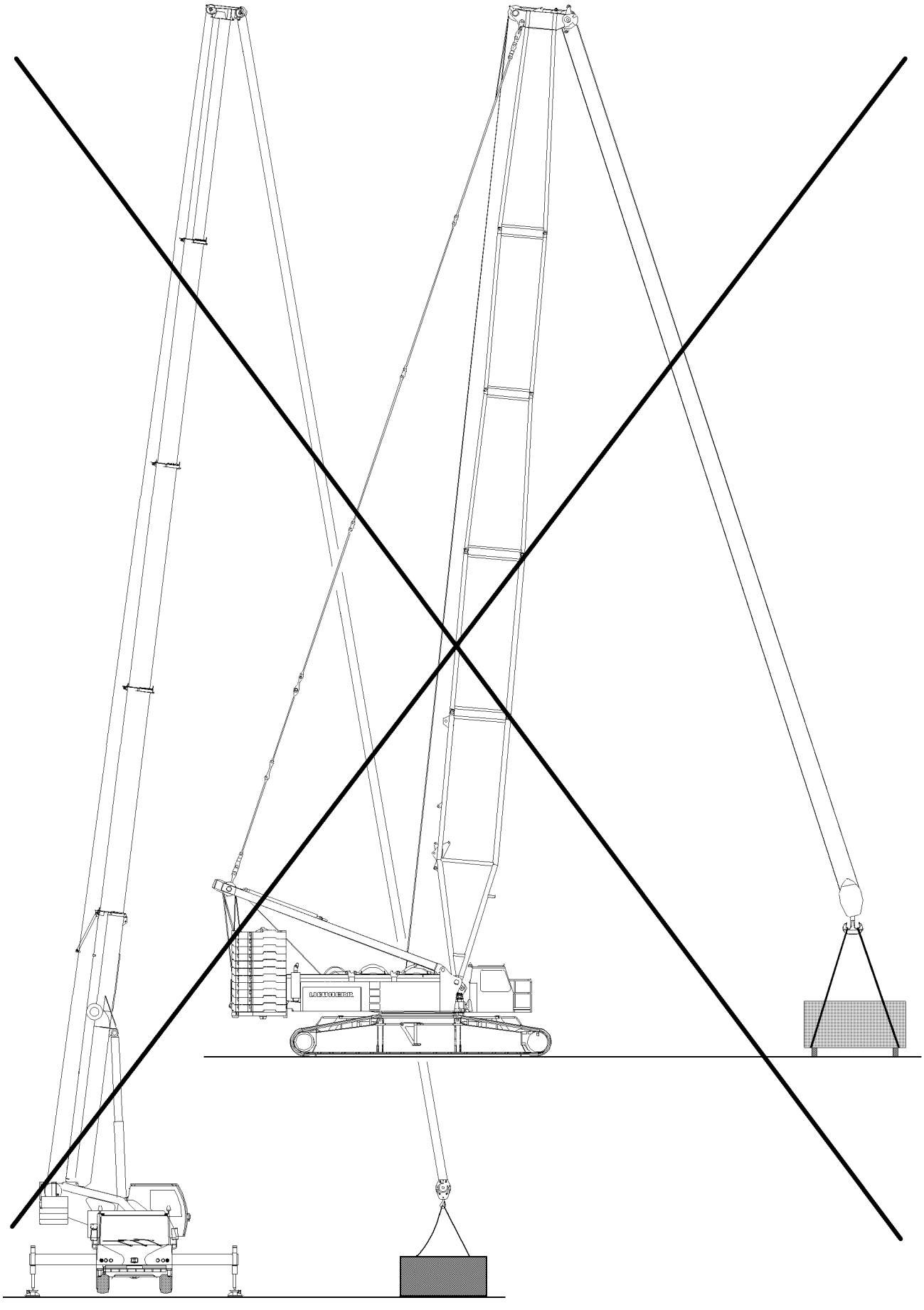
The crane must always be operated in such a way that its load-bearing parts are not destroyed or damaged and its stability is ensured.
Make sure that the following prerequisites are met:
– The crane is supported and horizontally aligned.
– The LICCON overload protection has been set according to the load chart.
– The counterweight is installed according to the load chart.
– The hook block or the load hook is correctly reeved.

4.1 Attaching the load

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over and cause fatal injuries!
This could result in high property damage!
▶ Observe own weight of the load tackle!
▶ Observe own weight of the load tackle!
▶ The maximum permissible incline of the strands fastened on single or double hooks in the hook jaws is 45°! See illustration **1** and illustration **2**.
If necessary for the single hook:
▶ Use fastening equipment with a suspension link **10**! The maximum permissible incline in this case is 60°! See illustration **3**.
▶ Load a single and double hook symmetrically! A maximum deviation of ±3° from the direction of the center of gravity is permissible!
If necessary:
▶ Use crossbars or two cranes for taking up the load!

4.2 Transporting the hook block

WARNING
Risk of accident!
If a hook block is fastened incorrectly for transport, personnel can be injured!
▶ Fasten the hook block for transport on the fixed point in the center!
▶ Fastening the complete hook block on the auxiliary weights is prohibited!



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4.3 Lifting the load

WARNING
Danger of crushing for people in the load zone!
If personnel are located between the load to be lifted and a possible interfering edge (such as a wall of a building or similar) when the load is lifted, personnel can be severely injured or killed!
- ▶ Before lifting the load it must be ensured that there are no persons within the danger zone!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ It is prohibited for anyone to be under the load! Keep a safety distance!
- ▶ Swinging of the load is prohibited!
- ▶ Exercise extreme caution when lifting a load!

WARNING
The crane can topple over!
If an attempt to lift a load above the hoist gear causes the LICCON overload protection to turn off, then the load may not be lifted by luffing up the boom. This leads to overloading and toppling of the crane!
Personnel can be severely injured or killed!
- ▶ Do not lift the load by luffing up the boom from the ground!

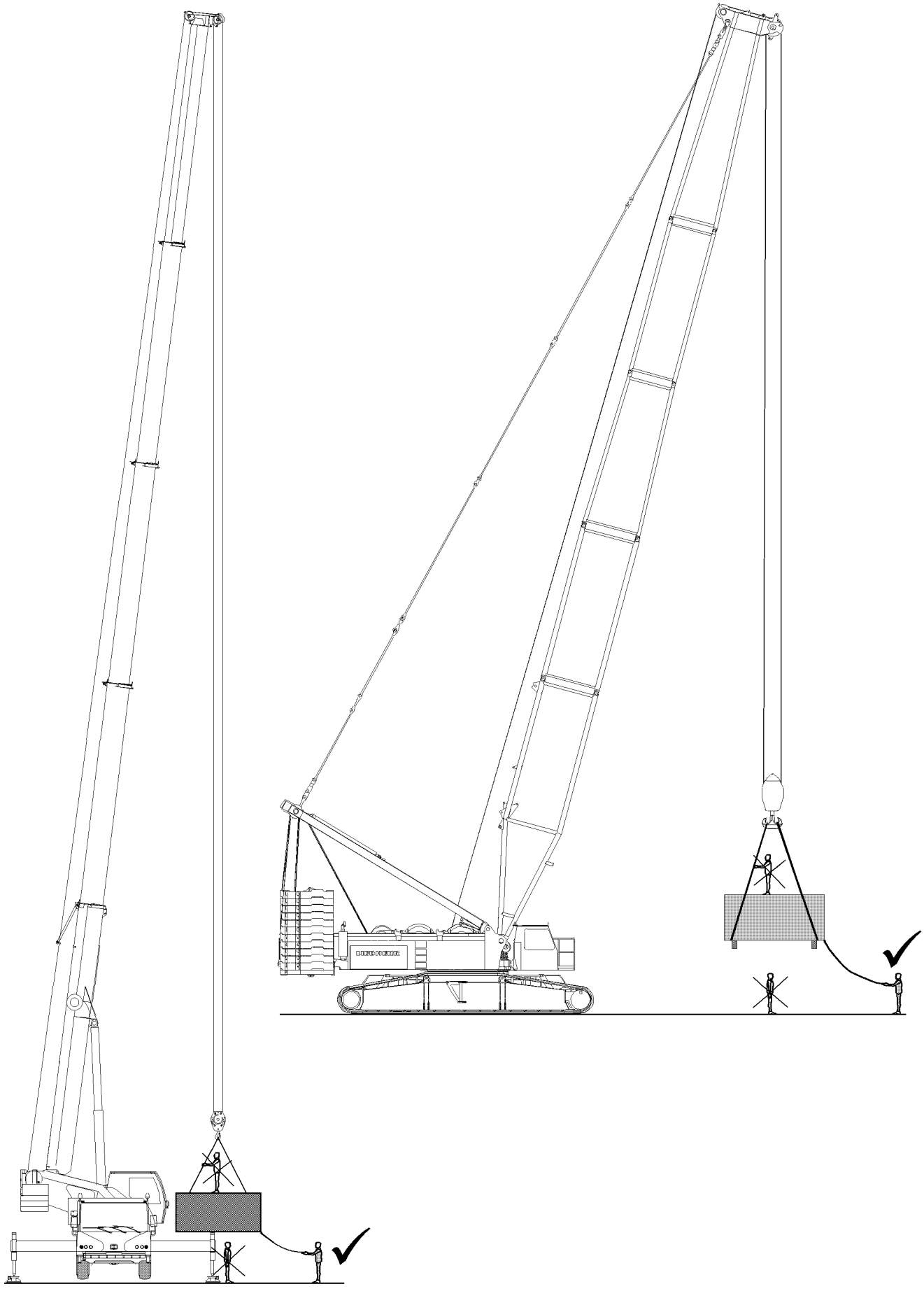
Note
When using the assembly winch* observe the following:
- ▶ Use the assembly winch* only for assembly and not for lifting loads!
- ▶ Lifting of loads with the auxiliary winch is prohibited!

If the fastening rope is manually attached by an assistant to the load to be lifted:
- – Make sure that the assistant's hands are not crushed by the tightened ropes between the load and the fastening rope.
- – Make sure that the assistant's body parts (hands, legs etc.) are not crushed by a swaying movement of the load during lifting.

4.4 Angular pulling

WARNING
The crane can topple over!
Angular pulling can destroy the crane or cause it to topple over!
Personnel can be severely injured or killed!
- ▶ Attach (hang) the hook block always vertically over the center of gravity of the load to be lifted!
- ▶ Do not use the slewing gear to pull and set up loads!
- ▶ Angular pull is prohibited!

The crane is designed only to lift loads vertically. During angular pulling, regardless of whether this is done in the same direction as the boom or laterally, horizontal forces are generated in addition to the vertical forces, for which the boom is not designed.



B102717

4.5 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-bearing capacity is not just limited by stability, but in many cases a load-bearing component breaks when the crane is overloaded **before** the crane topples over. Particularly components that are susceptible to buckling such as the telescopic boom may fail suddenly **without showing signs of distortion beforehand** if the crane is overloaded.

WARNING
Danger of accidents for cranes with luffing cylinders!
When the luffing cylinder is on block position, the overload protection is not functioning!
▶ Crane operation at block position of luffing cylinders is prohibited!

5.1 General

A suspended load must always be kept under control. A fundamental requirement for this is the safe and delicate control of the crane's functions.

WARNING
Risk of accident due to swaying loads!
A swaying load can damage the crane and cause it to topple!
▶ All crane movements must be executed slowly and delicately!
▶ Initiate all crane movements slowly!
▶ Apply the brakes slowly in all crane movements!
▶ Crane operation with swaying loads is prohibited!

NOTICE
Damage of rope pulleys!
▶ Place down hook blocks, booms, folding jibs, auxiliary booms and boom noses in such a way that the rope pulleys do not lie on the ground and are damaged!

5.2 Guiding the load

The use of guide ropes is recommended to help the crane operator to manage the load more precisely and to prevent the load from swaying. This will prevent undesirable movements of the load and consequent damage.

5.3 Danger of being crushed!

WARNING
Risk of fatal injury!
Extreme care is needed when lowering a load! Mortal danger exists for personnel in the immediate area of the load being lowered!
Personnel can be severely injured or killed!
▶ Standing under a suspended loads is strictly prohibited!

5.4 Working in the vicinity of electricity transmission lines

DANGER
Risk of accident!
Failure to observe the following notes can lead to damage!
▶ Note the following points carefully!

If there are electricity transmission lines in the immediate vicinity of the building site, these must be switched off by qualified electricians. If this is not possible, the danger area must be covered over or cordoned off. If even these measures cannot be carried out, the following safety distances must be maintained:

Nominal voltage	Minimum distance
Up to 1 kV	1 m
1 kV to 110 kV	3 m
110 kV to 220 kV	4 m
220 kV to 380 kV	5 m
Rated voltage not known	5 m

If the crane becomes electrified despite having taken all necessary precautions, proceed as follows:
– Remain calm!
– Stay inside the crane driver's cab!
– Warn anyone who is outside and advise them to remain stationary and not to touch the crane!
– Move the crane away from the danger zone!

5.5 Ram work or pulling sheet piles

Vibration can be transmitted to the supporting steel structure of the crane during ram work or when pulling sheet piles with the crane. This vibration can cause premature fatigue of the material and therefore cracks in the supporting steel structure.

DANGER
Important instructions for “ram work” or “pulling sheet piles”!
If the crane is used for ram work or pulling sheet piles, then the following instructions must be followed. Failure to follow the instructions can result in damage to the crane.
▶ The ramming equipment may not pass on vibrations into the boom!
▶ When pulling sheet piles, the maximum pull force of the crane is limited according to the load chart! Restricting the maximum pull force via the crane overload protection **only** is prohibited! The pull force must be additionally checked by measuring.

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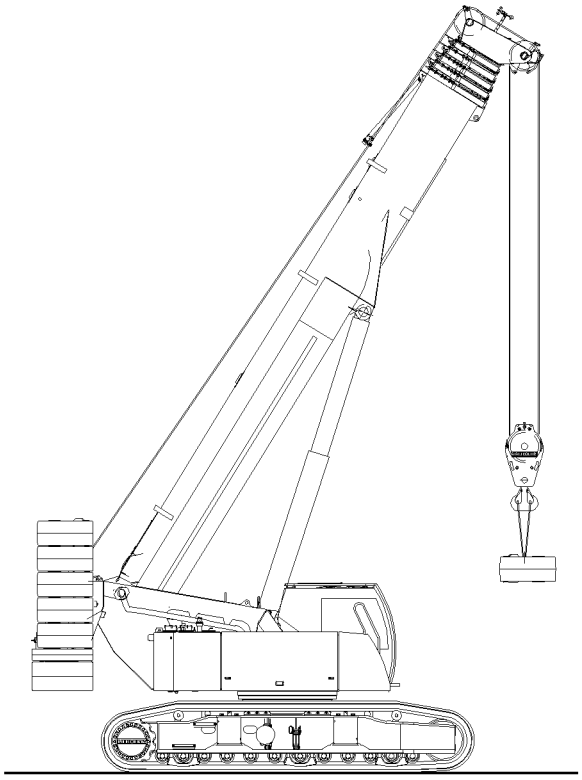
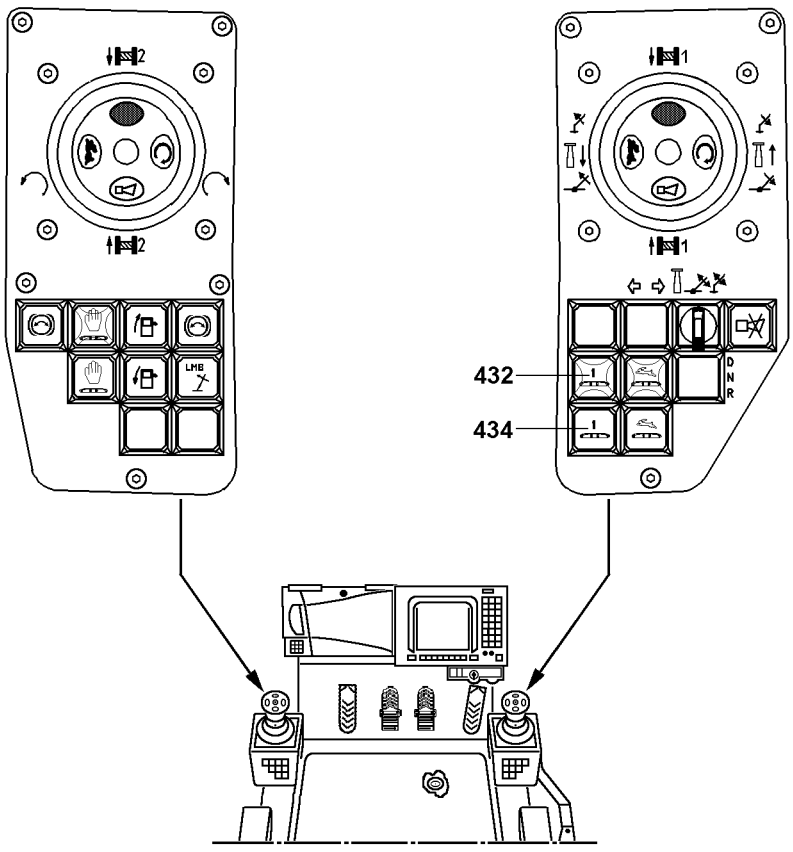




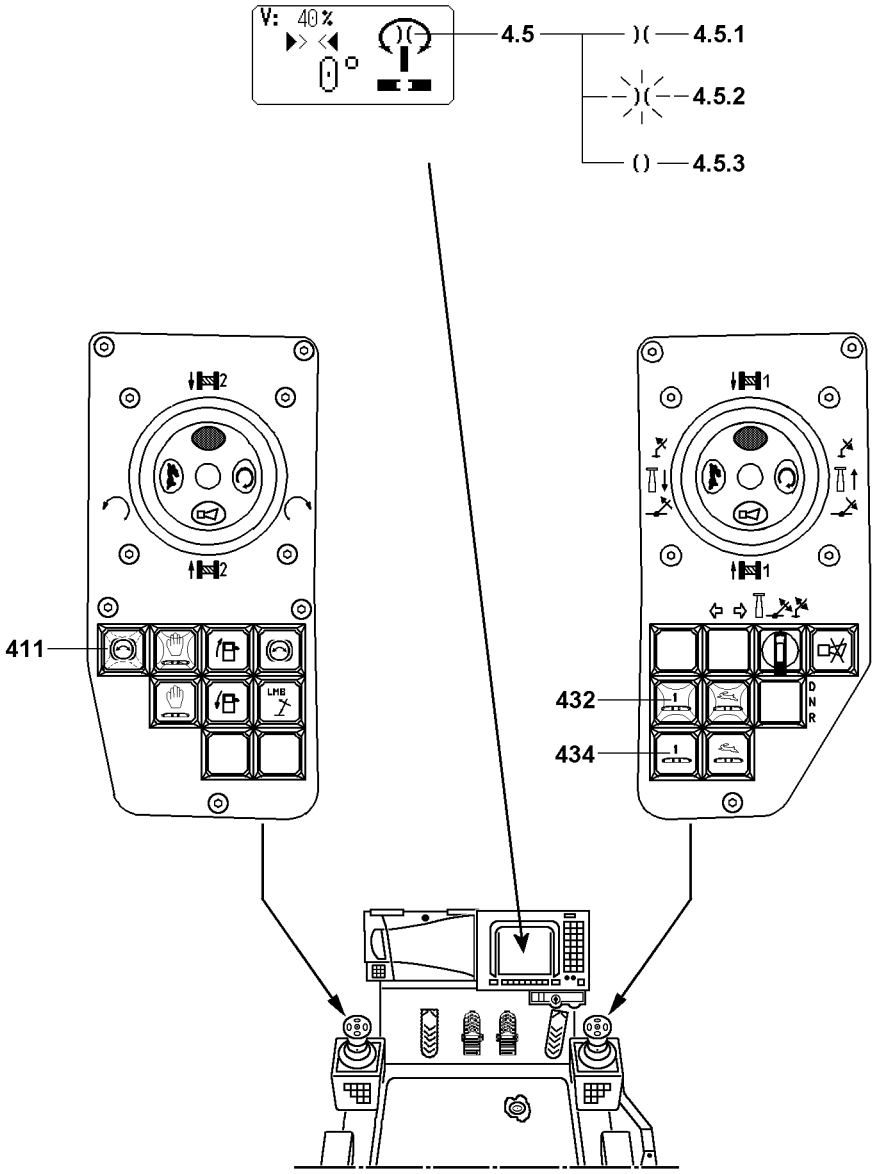
B198657

1 Crawler operation

Make sure that the following prerequisites are met:
– The ground is able to carry the weight of the crane, the load and the load tackle.
– The engine is running.
– There are no persons or objects in the danger zone.
– The crawlers are pushed out, pinned and wedged to a track width as specified in the load chart.

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

Note
▶ The danger zone should be monitored by cameras or a guide when driving or turning the crane!



B111637

1.1 Activating crawler operation

Crane operation is turned on automatically. Use the button **434** to turn the crawler operation on or off.

Note

This crane can be driven with open slewing gear as an option. To do so, it is imperative that the following notes and danger notes are observed!

- ▶ If the crawler travel gear is not added at non-activated slewing gear and open slewing gear brake, then the slewing gear brake closes one time. When the slewing gear is closed, the slewing gear brake remains closed.
- ▶ If the slewing gear brake is opened when the crawler travel gear is not actuated, then the icon **4.5.1** appears on the LICCON monitor and the indicator light **411** lights up.
- ▶ If the slewing gear brake is opened in active option “driving with opened slewing gear” and the crane is driven with the crawler travel gear, then the warning “slewing gear brake opened” appears blinking as icon **4.5.2**.
- ▶ If the slewing gear brake is closed, then the icon **4.5.3** appears.

WARNING

Danger of accident in inclined position!

When the slewing gear brake is open, the crane superstructure can turn uncontrolled to the side and topple over when it is in inclined position!

Personnel can be severely injured or killed!

- ▶ In inclined position, crane operation or crawler operation or with opened slewing gear is prohibited!
- ▶ In inclined position, the slewing gear brake must be closed!

▶ Press the button **434**.

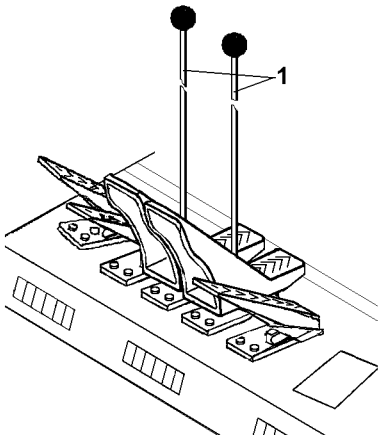
Result:

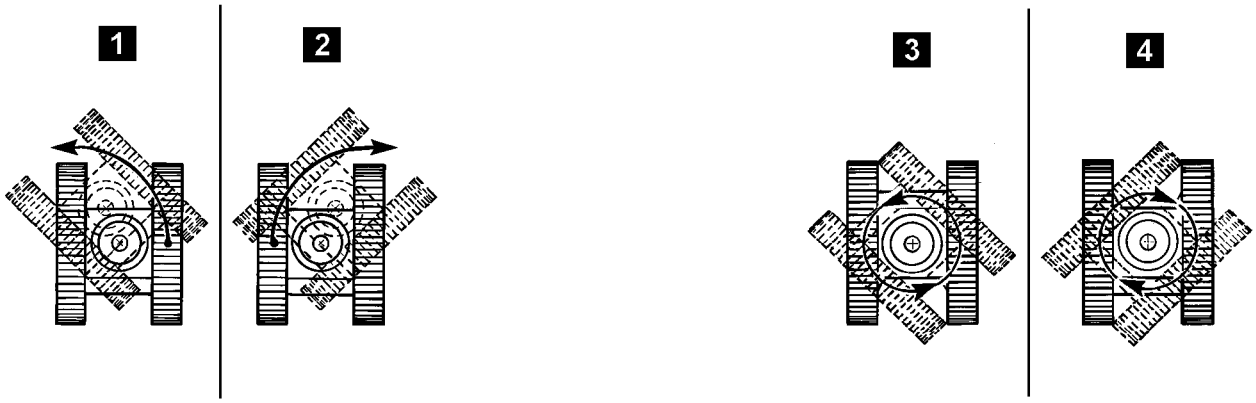
– The indicator light **432 lights up**.
Crawler operation **and** crane operation are activated.

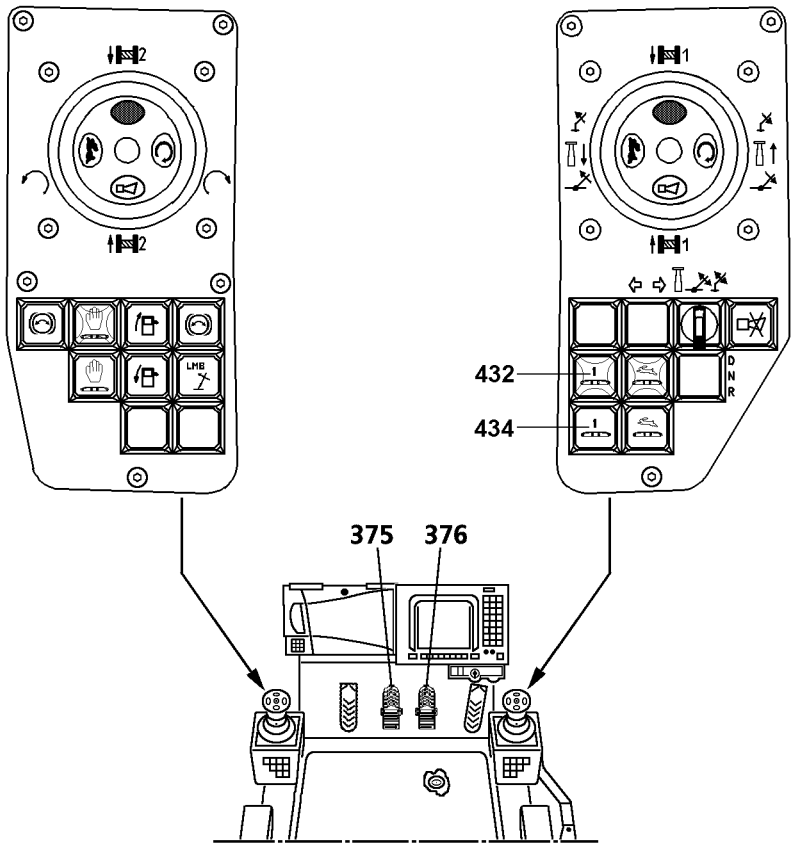
▶ If the crawler operation is to be turned off:
Press the button **434** again.

Result:

– The indicator light **432** does **not light up**.
The crawler operation is turned off, crane operation remains on.







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1.2 Driving the crawler

Make sure that the following prerequisites are met:
– The crane is switched to crawler operation.
– The indicator light **432** lights up.

Special hand levers **1** can be screwed to the foot rockers. These hand levers **1** are used for delicate driving maneuvers. The operation is identical to that for the foot rockers.
The driving direction is relative to the position of the crane superstructure. If the crane superstructure is turned past 90°, the forward / reverse travel direction changes. When pedal **375** or **376** is operated, and the crane slews beyond 90°, the driving direction will be maintained until the relevant pedal is set to zero. This means that the new driving direction will only become active once the pedal is no longer pressed.

▶ Move the left foot rocker MS4 **375** forward

Result:
– The left track moves forward.

▶ Move the left foot rocker MS4 **375** backward

Result:
– The left track moves backward.

▶ Move the right foot rocker MS5 **376** forward

Result:
– The right track moves forward.

▶ Move the right foot rocker MS5 **376** backward

Result:
– The right track moves backward.

▶ To drive the crawler crane forward:
Move the left foot rocker MS4 **375** and the right foot rocker MS5 **376** forward.

▶ To drive the crawler crane backward:
Move the left foot rocker MS4 **375** and the right foot rocker MS5 **376** backward.

Note

▶ Protect the travel gear by always using the maximum possible turning radius and avoid turning backward!

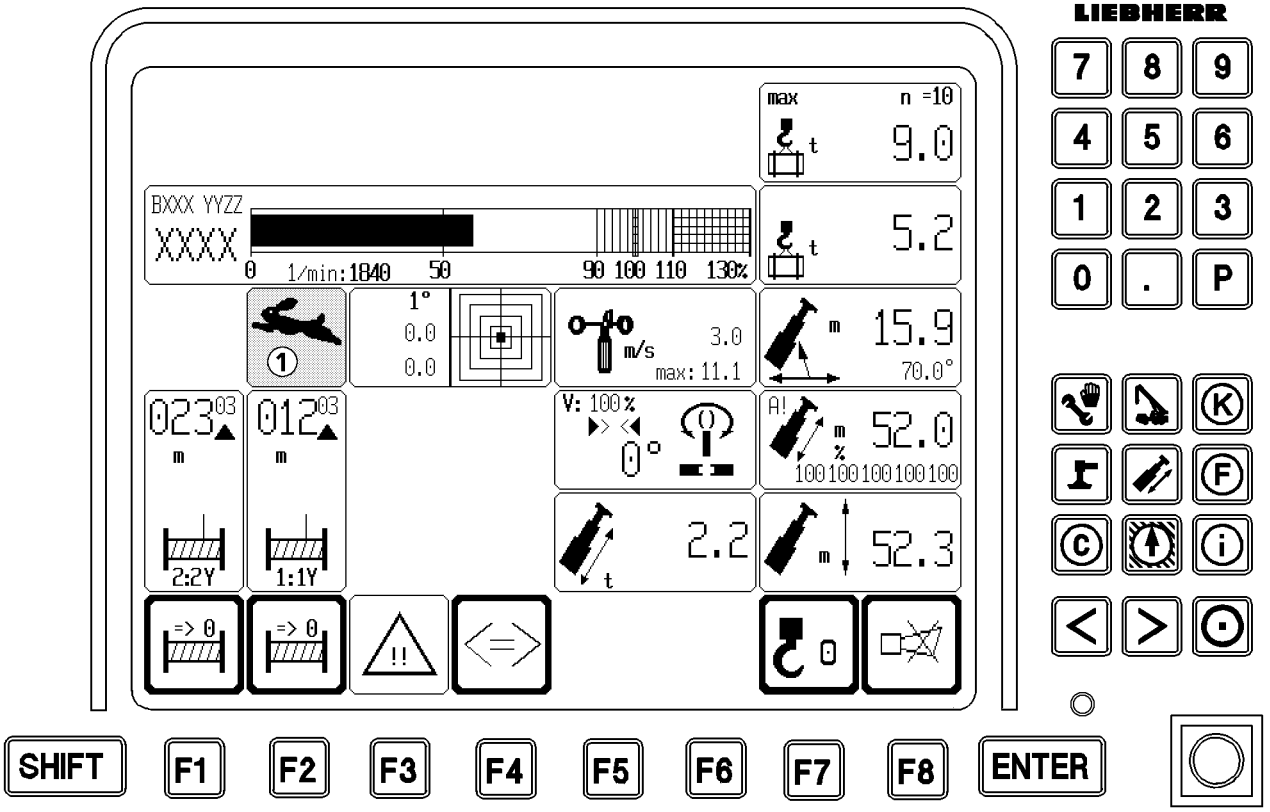
▶ Protect the travel gear by avoiding counterrotation turns!

▶ To drive the crawler crane toward the left:
Move the right foot rocker MS5 **376** forward, illustration 1.

▶ To drive the crawler crane toward the right:
Move the left foot rocker MS4 **375** forward, illustration 2.

▶ To counterrotate the crawler crane to the left:
Move the right foot rocker MS5 **376** forward and the left foot rocker MS4 **375** backward, illustration 3.

▶ To counterrotate the crawler crane to the right:
Move the left foot rocker MS4 **375** forward and the right foot rocker MS5 **376** backward, illustration 4.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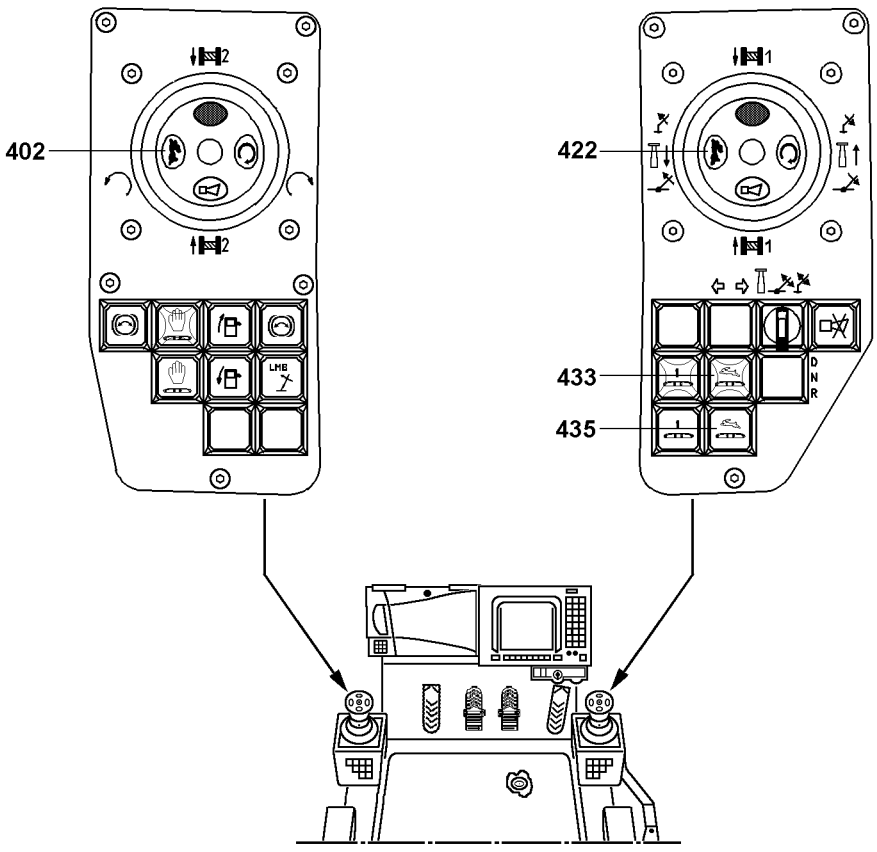
402
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435
B111653

1.3 Selecting the travel speed

This crawler crane has 4 possible speeds:

1.) Speed stage 1
Creeper gear is activated.

2.) Speed stage 2
Rapid gear “for crane and crawler operation” is activated.

3.) Speed stage 3
Rapid gear for “Crawler operation” is activated.

4.) Speed stage 4
Rapid gear “for crane and crawler operation” **and** “crawler operation” is activated.

▶ To select speed stage 1:
Do **not** press the button **435** and the button **402** and the button **422**.

Result:

– The creeper gear has been turned on.
– The icon **1** does **not** appear on the monitor.
– The indicator light **433** does **not** light up.

▶ To select speed stage 2:
Press button **402** or button **422**.

Result:

– The rapid gear “for crane and crawler operation” is activated.
– The icon **1** appears on the monitor.

▶ To select speed stage 3:
Press the button **435**.

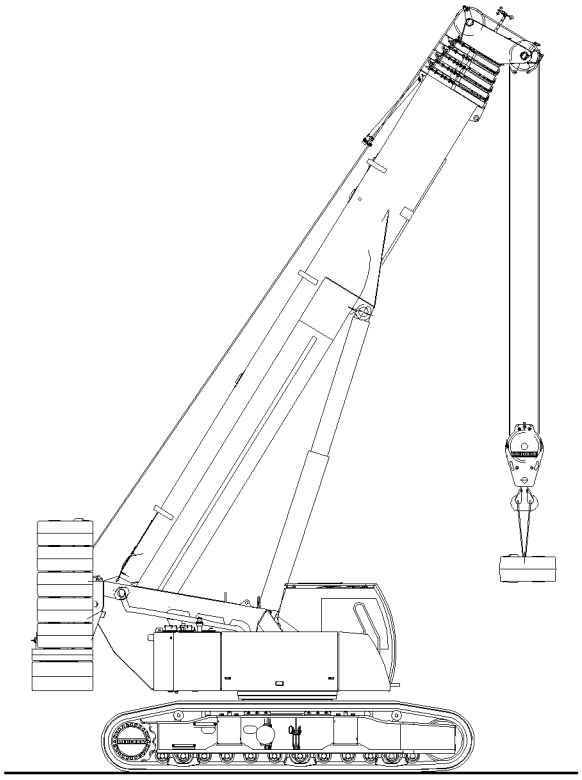
Result:

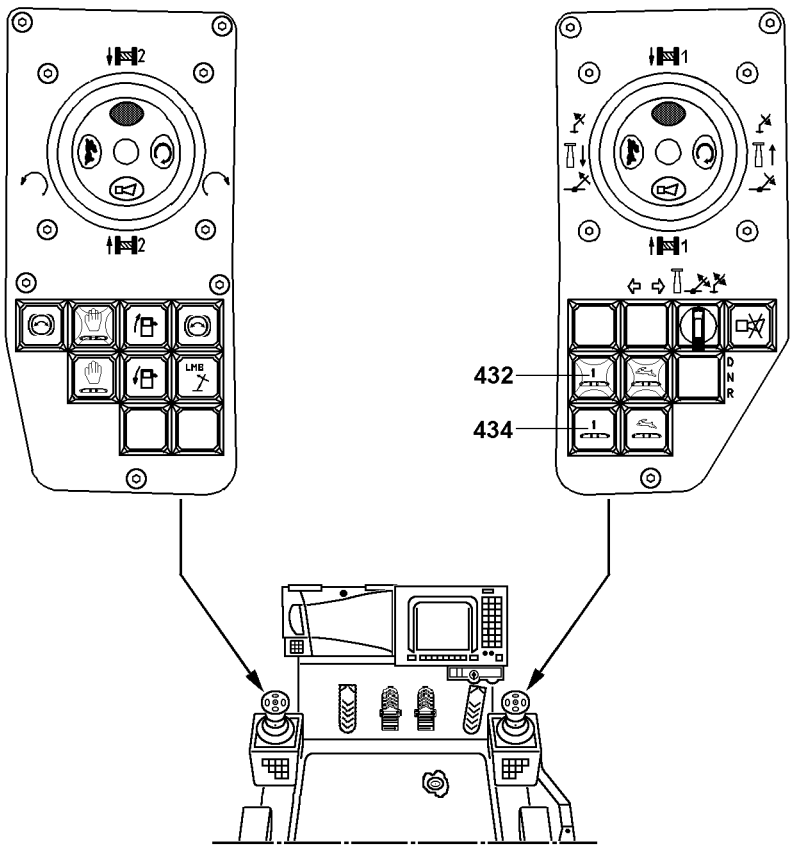
– The rapid gear for “Crawler operation” is activated.
– The indicator light **433** lights up.

▶ To select speed stage 4:
Press button **435** and button **402** or button **422**.

Result:

– The rapid gear “for crane and crawler operation” **and** “crawler operation” is activated.
– The icon **1** appears on the monitor.
– The indicator light **433** lights up.





B198657

1.4 Steerability of the crawler

The steerability of the crawler depends on the following conditions:

– The friction conditions under the chains.
  Panels underneath, sand or gravel improve the steerability of the crane.
– The levelness of the ground.
  Steering is not possible if the crawler track is only making contact with the ground on the front and rear!
– The load-bearing capability of the ground.
  Steerability is significantly restricted if the crawler track sinks into the ground!
– The position of the overall center of gravity.
  If the overall center of gravity of the crane and load is in the center of the crane, then steering is hard or not possible at all!

1.5 Driving with an attached load

DANGER
The crane can topple over!
The crane can be driven with the loads given in the load charts, providing the following conditions are met.

- ▶ The ground may not exceed the maximum incline according to the load chart!
- ▶ The ground must be able to safely take on the ground pressures, which were calculated with the job planner!
- ▶ Only drive at the lowest possible speed!
- ▶ Avoid jerky driving movements!
- ▶ The attached load must be secured to prevent it from swinging!
- ▶ Carry out any steering movements with utmost caution!

Note
For all driving conditions, the ratio between the front and rear or the rear and the front ground pressures must be greater than 0.3.

- ▶ A : B must be greater than 0.3.

A = maximum ground pressure of the track which has the lower load of the two tracks
B = maximum ground pressure of the track which has the higher load of the two tracks

1.6 Driving the crawler crane without a load with the equipment in place on an uphill / downhill slope

The maximum climbing ability of the crawler crane is limited by the following criteria:
- The location of the center of gravity for the complete crawler crane
- The friction coefficient between roadway and track pads
- The transit between the horizontal and the incline
- The maximum incline / slope of 25°
- The maximum side incline 1°

Make sure that the following prerequisites are met:
- The ground has sufficient load carrying capacity and has sufficient traction to prevent the crane from slipping.
- The counterweight is secured on the turntable with a round steel chain.
  See chapter 4.07.
- The telescopic boom is set with the aid of the job planner in such a way that the center of gravity is in the center of the crawler travel gear.
- The telescopic boom is set with the aid of the job planner even when extending and retracting into the uphill / downhill slope and telescoped out in as flat a position as possible that the center of gravity is in the center of the crawler travel gear.
- The medium oil level in the engine is available.

WARNING
The crane can topple over!
If the following conditions for driving the crawler crane on an incline are not met, then the crane can topple over and fatally or severely injure personnel!
- ▶ The turntable must be aligned parallel to the crawler carriers and must be mechanically locked with the crane chassis!
- ▶ The side slope may be no more than max. 1° !
- ▶ Avoid jerky driving movements!
- ▶ Slow driving speed, all movements and delay maneuvers must be initiated with extreme caution and at the least possible speed!
- ▶ The transfer from the horizontal into an uphill slope and from the uphill slope into the horizontal must be made evenly, i.e. there may be no edges which can cause the crane to topple over. The incline change must be made continuously!
- ▶ The ground pressures which will occur must be determined with the job planner before driving!
- ▶ The ground must be sufficiently load bearing and have sufficient traction to prevent the track pads or the crane from slipping!
- ▶ The ground must be able to safely take on the ground pressures, which were calculated with the job planner!
- ▶ The friction coefficient between the roadway and the ground must be large enough to take on the occurring drive forces. Slippery ground can cause the crane to slip off to the side and therefore lead to an impermissible side slope position!

Note
- ▶ The telescopic boom must be telescoped in before driving and luffed down until the tracks are evenly subjected to the load.
- ▶ If there is a large counterweight on the superstructure, it might be necessary to first telescope the telescopic boom out below a flat angle to obtain a suitable distribution of ground pressure for driving the crane.

Note
For all driving conditions, the ratio between the front and rear or the rear and the front ground pressures must be greater than 0.3.
▶ A : B must be greater than 0.3.

A = maximum ground pressure of the track which has the lower load of the two tracks
B = maximum ground pressure of the track which has the higher load of the two tracks

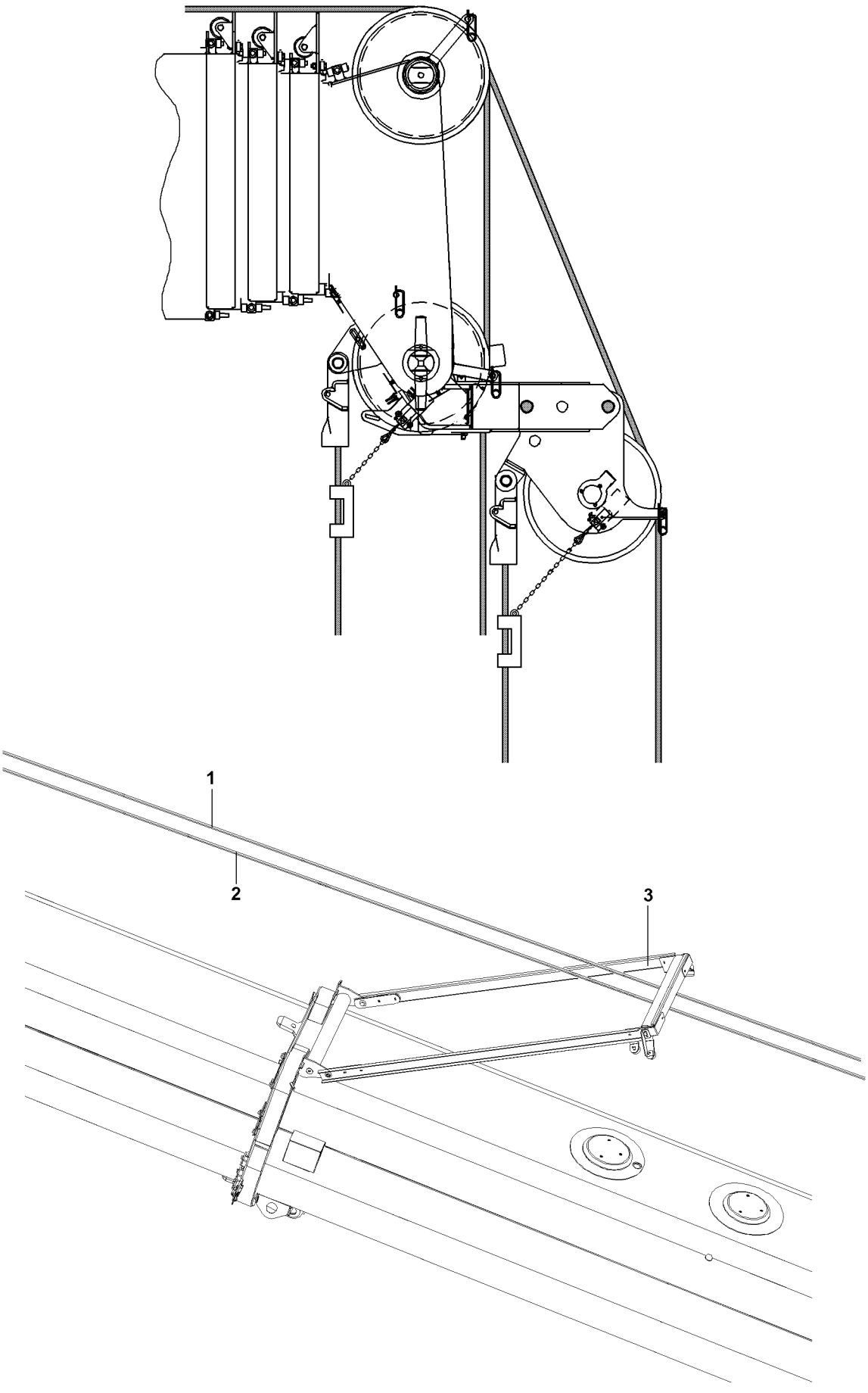
1.6.1 Calculation of required length for transfers

The required length **L** for transfers results from the existing uphill angle **α** and the length of the crawlers **LC**.

– L = Required length of transfers
– α= Angle of uphill slope in degrees
– LC = Length of tracks between drive wheels and change over wheels

Calculation example

Given:
α= 10°
LC = 5.36 m
Wanted:
L = ?
Formula:
L = 0.5 * α* LC
Result:
L = 0.5 * 10 * 5.36 m = 26.8 m



B108770

1 General

In 2-hook operations there is a difference between:

1.) Operations with a boom nose* on the telescopic boom
2.) Operations with a boom nose* on the lattice jib
3.) Operations with a boom extension (folding jib, auxiliary boom, luffing jib)

1.1 Operations with a boom nose* on the telescopic boom

NOTICE
Danger of damage on the hoist ropes!
When reeving in, the hoist rope **1** and hoist rope **2** must be guided through the bracket **3** on the telescopic boom!
▶ Guide the hoist rope **1** and hoist rope **2** through the bracket **3** on the telescopic boom.

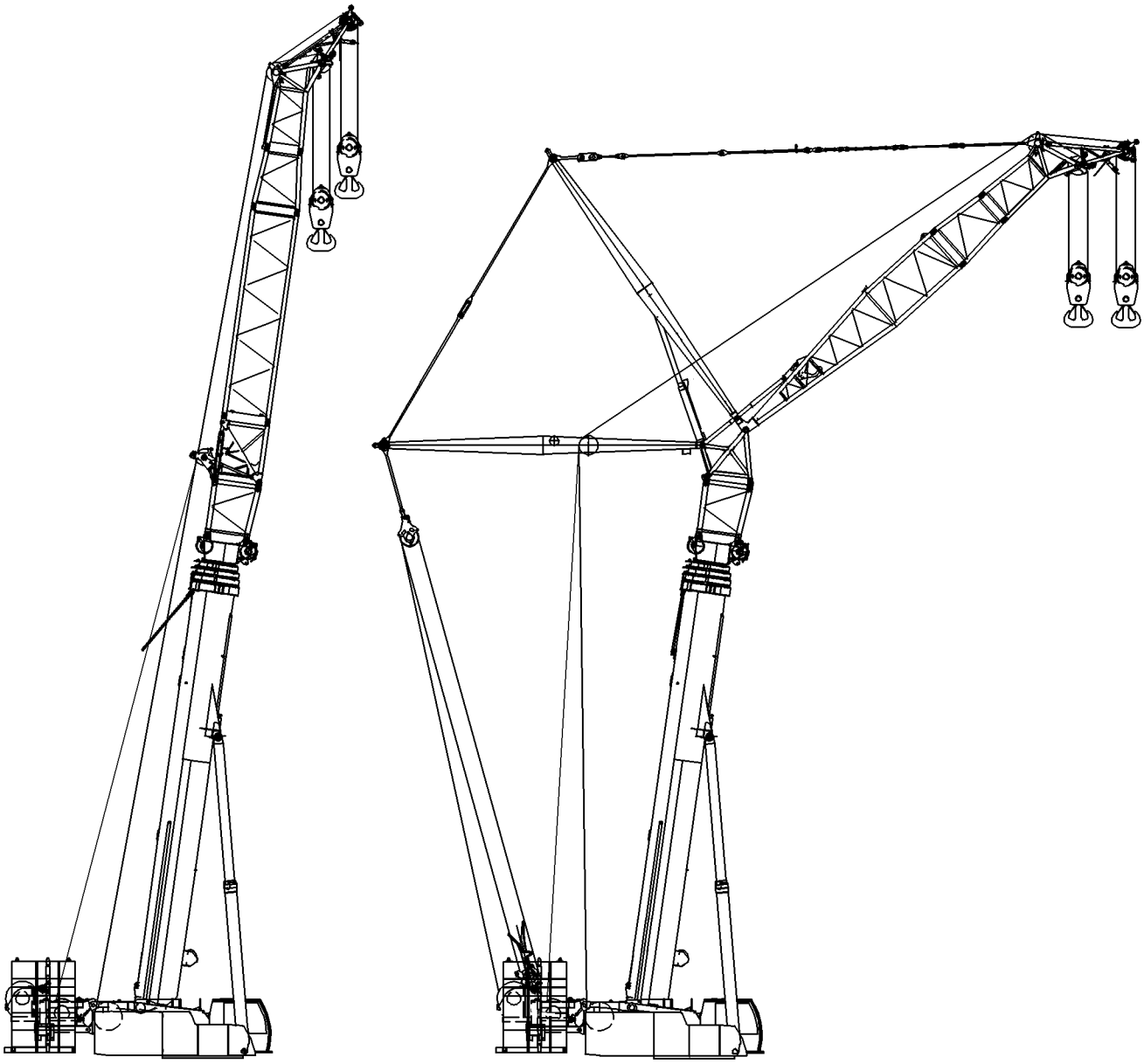
This option is set up for rapid hoists over the boom nose, whereby the hook block reeved on the telescopic boom can remain reeved.
No special loading tables are available for boom nose operations. The boom nose is generally run in the telescopic boom operating mode.

DANGER
Danger of accidents because of imprecise radius and load displays.
▶ When operating with the boom nose, the overload protection radius and load display is not precise, because the boom nose is not taken into account in the boom geometry.

▶ Set the operating mode of the telescopic boom to overload protection.

DANGER
Danger of accidents because of overloading the hoisting gear or the hoisting cable!
Overload protection is only achieved when the reeving on the telescopic boom is equal to, or greater than, the reeving on the mast boom.
▶ Set the overload protection to the smaller reeving of the two hooks.

The weight of the hook blocks (load hook), the boom nose and the lifting accessories must be added to the load to be lifted.
Setting this to the smaller reeving of the two hooks ensures that the crane cannot be overloaded.
▶ Enter the cable reeving that corresponds to the actual reeving on the mast nose.



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1.2 Operations with a boom nose* on the lattice jib

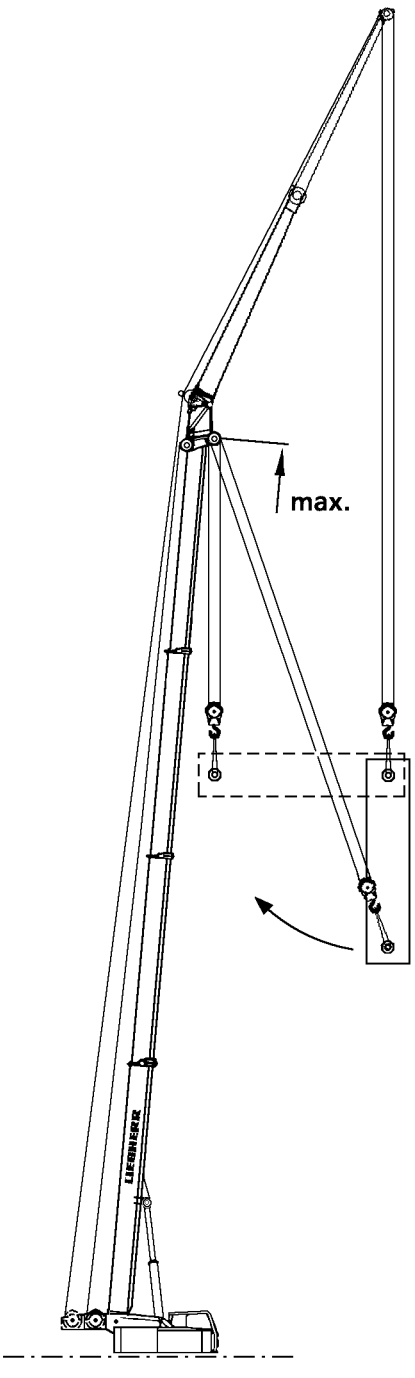
This option is set up for rapid hoists over the boom nose, whereby the hook block reeved on the lattice jib can remain reeved.
No special loading tables are available for boom nose operations. The boom nose is generally extended in the lattice jib operating mode.

DANGER
Danger of accidents because of imprecise radius and load displays.
▶ When operating with the boom nose, the overload protection radius and load display is not precise, because the boom nose is not taken into account in the boom geometry.

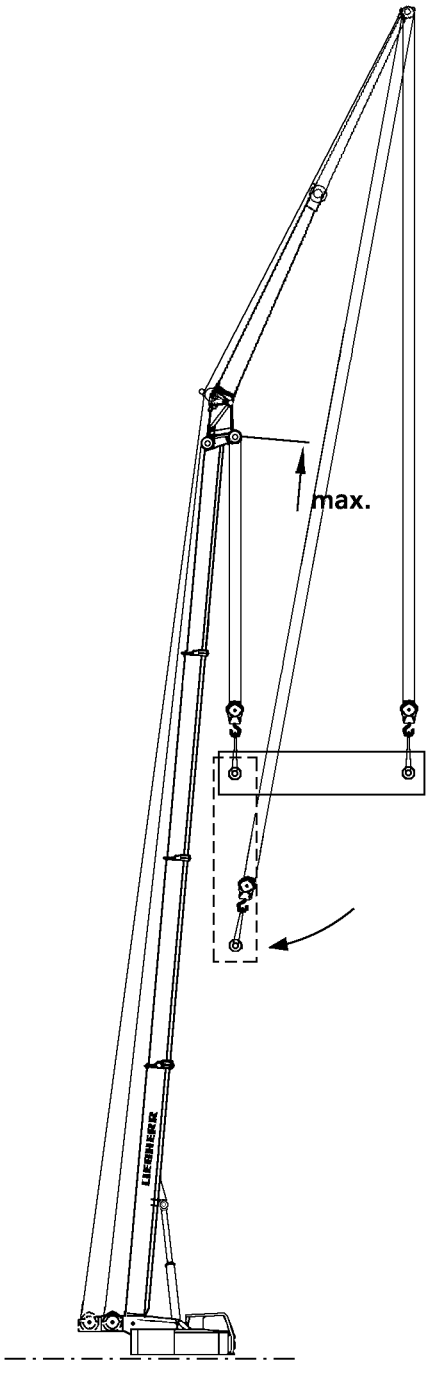
▶ Set the operating mode of the lattice jib to overload protection.

DANGER
Danger of accidents because of overloading the hoisting gear or the hoisting cable!
Overload protection is only achieved when the reeving on the lattice jib is equal to, or greater than, the reeving on the mast boom.
▶ Set the overload protection to the smaller reeving of the two hooks.

The weight of the hook blocks (load hook) and the lifting accessories must be added to the load to be lifted.
Setting this to the smaller reeving of the two hooks ensures that the crane cannot be overloaded.
▶ Enter the cable reeving that corresponds to the actual reeving on the mast nose.



Va. 1



Va. 2

B180647

1.3 Operations with a boom extension (folding jib, auxiliary boom, luffing jib)

This option is set up for turning loads during the simultaneous operation of both sets of hoisting gear.

Note
Raising the load
- ▶ The load must always be raised or lowered using the weakest component (folding jib, auxiliary boom, luffing jib) initially at 100%

- ▶ In “2-hook operations” with a boom extension (folding jib, auxiliary boom, luffing jib), the overload protection must be set to the operating mode boom extension (folding jib, auxiliary boom, luffing jib).

DANGER
Risk of accident by overloading the hoisting gear or hoisting cable!
- ▶ The reeving on the boom must be equal to or greater than the reeving on the boom extension (folding jib, auxiliary boom, luffing jib).

- ▶ Enter the reeving that corresponds to the existing reeving on the boom extension (folding jib, auxiliary boom, luffing jib) into the overload protection.

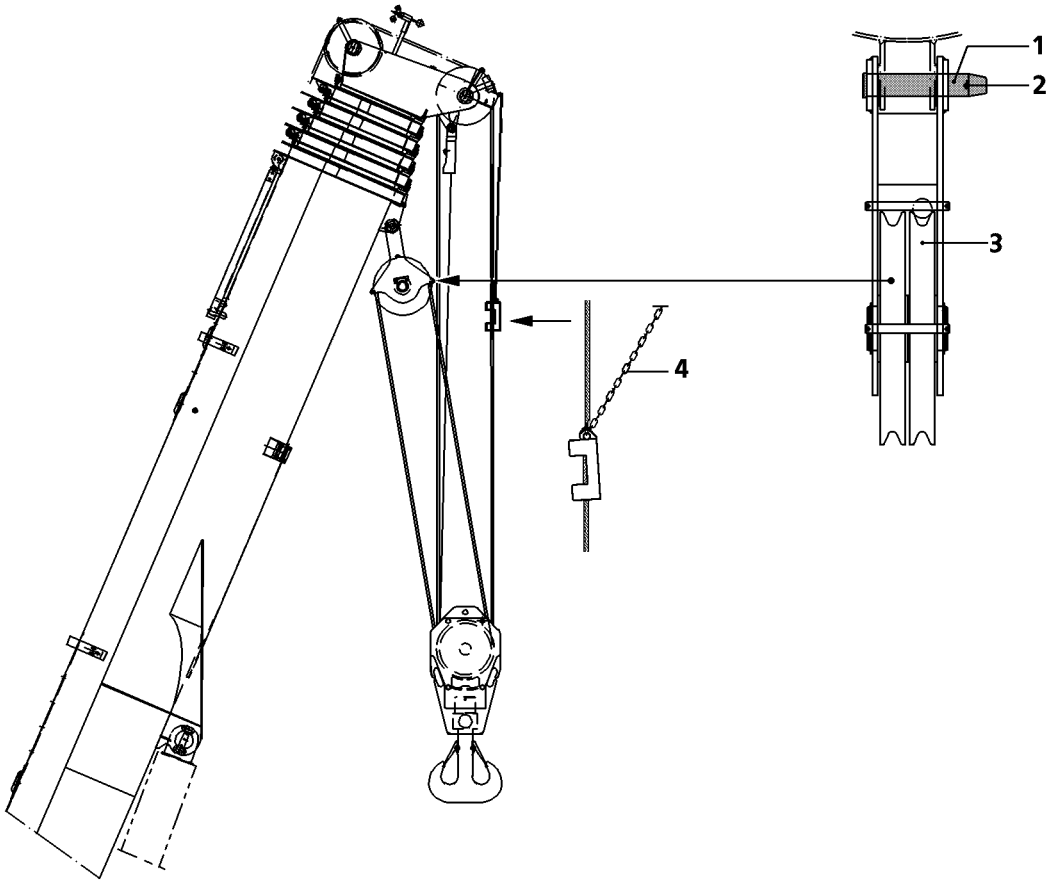
In this case, the maximum permissible total load corresponds to the maximum permissible load in the corresponding loading table for operating with the boom extension (folding jib, auxiliary boom, luffing jib).
The weight of the hook blocks (load hook) and the lifting accessories must be added to the load to be lifted.

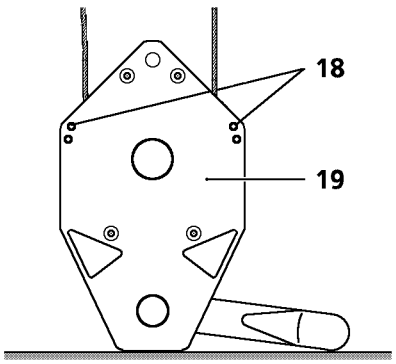
Note
Radius display
- ▶ The radius is displayed, depending on the boom extension (folding jib, auxiliary boom, luffing jib) entered.
- ▶ The load-bearing capacity for each hook in “2-hook operations” is the permissible load in the corresponding loading table for operating with a boom extension (folding jib, auxiliary boom, luffing jib).
- ▶ In 2-hook operations, the total load is the permissible load in the corresponding loading table for operating with a boom extension (folding jib, auxiliary boom, luffing jib).

DANGER
Risk of accident from overloading individual components on the crane!
- ▶ Lifting a load with two hooks is only permissible if done as shown in the illustrations Va. 1 and Va 2.

DANGER
Danger of accidents
- ▶ If both hooks are loaded, it is forbidden to lower the boom!
- ▶ In those circumstances, safety cover from the overload protection is not available.
- ▶ This is why the load must always be picked up at the maximum radius.

As soon as the inner hook is pulled, the overload protection load display is wrong!
- ▶ If a load is raised as shown in Va. 1, the load must first be fully lifted to 100% with the hook furthest away.





B110783

1 Reeving plans

1.1 Assembling the auxiliary equipment*

- ▶ Affix the auxiliary pulleys **3** on the intended bores.
- ▶ Insert the pins **1**.
- ▶ Secure pins **1** with spring retainers **2**.

1.2 Operation with auxiliary block on the telescopic boom*

NOTICE

Damage of auxiliary device!

If the following notes are not observed, the hook block, the hoist rope or the auxiliary pulley block can be damaged!

For operation with auxiliary pulley block on the telescopic boom, do **not** telescope out and run only the radii ranges, which are specified in the load chart.

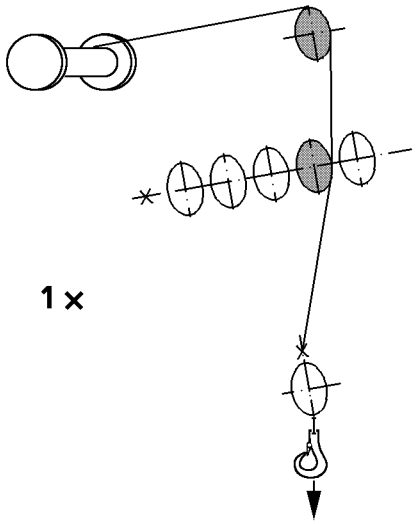
Before operation with the auxiliary pulley block, the rope guard pins on the hook block must be removed!

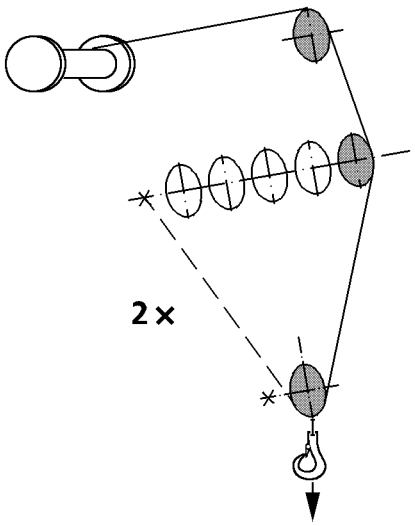
When the hook block is on the ground, it must be ensured that the ropes remain in the pulleys!

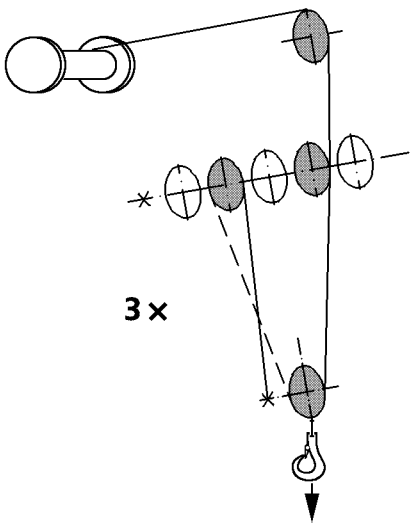
If the limit switch chain **4** on the hoist limit switch weight is set too short, then the hook block can run onto the auxiliary device when the hoist rope is spooled up and damage it severely.

- ▶ Do not telescope out!
- ▶ On the hook block **19**, remove the spring retainers **18** and pull out the rope guard pin!
- ▶ Check if all ropes are in the pulleys.
- ▶ Before operation with the auxiliary device, set the limit switch chain **4** on the hoist limit switch weight to maximum length.

- ▶ Check if all prerequisites have been met.







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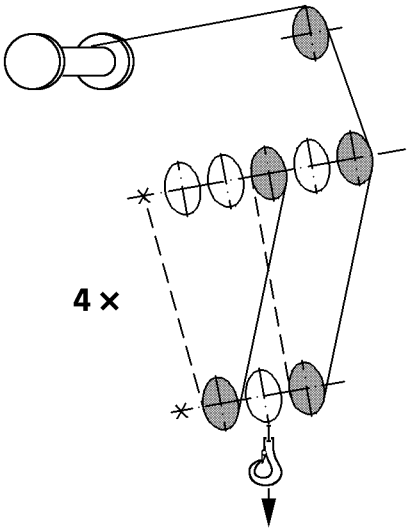
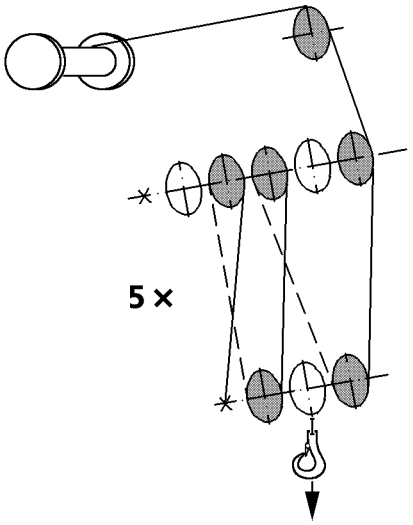
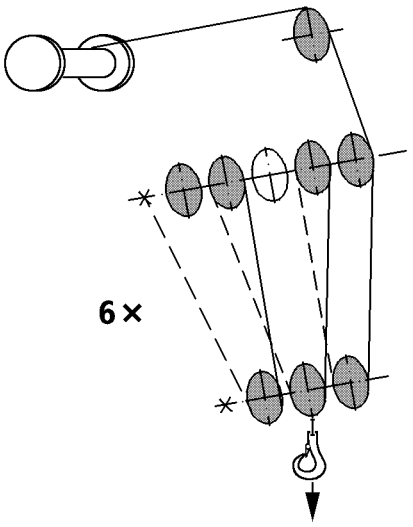
1.3 Reeving in, T-operation

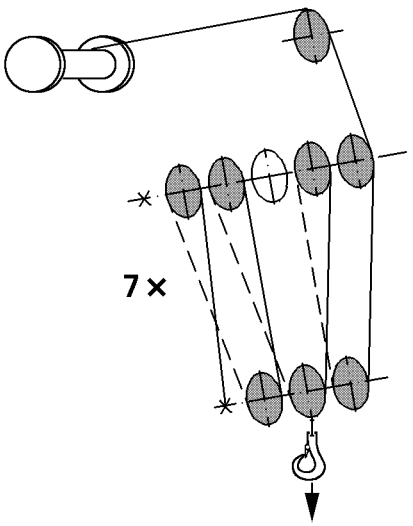
1.3.1 1-pulley hook block / load hook

Reeving	Rope fixed point
1x	On the hook block or on the load hook fixed point
2x	On pulley head
3x	On hook block









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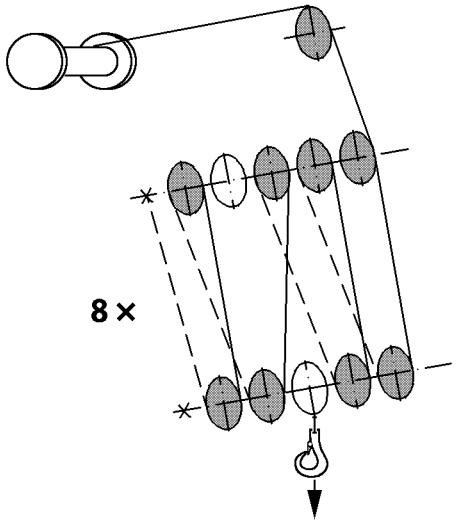
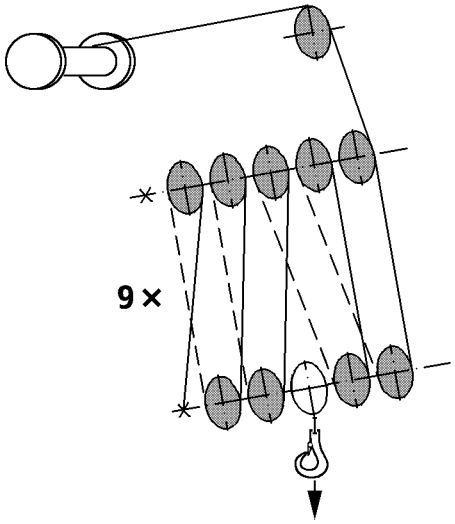
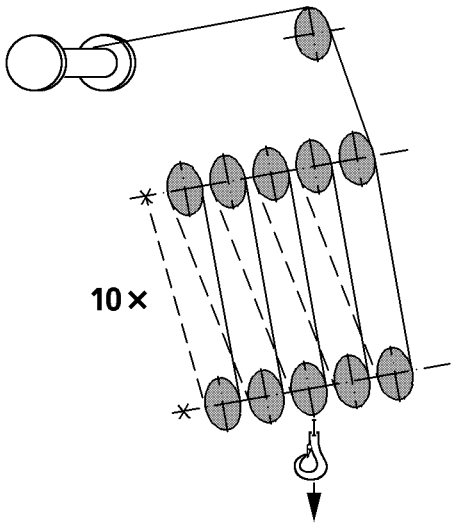
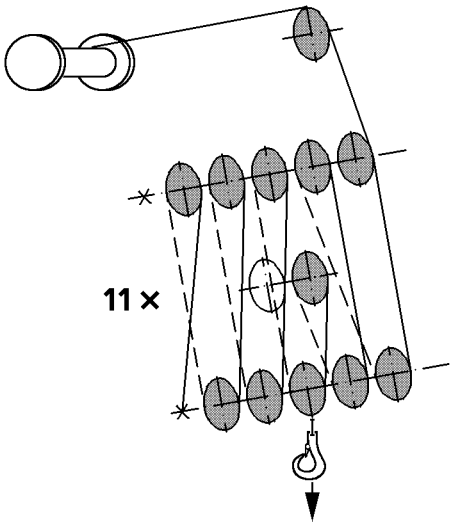
1.3.2 3-pulley hook block

Reeving	Rope fixed point
4x	On pulley head
5x	On hook block
6x	On pulley head
7x	On hook block









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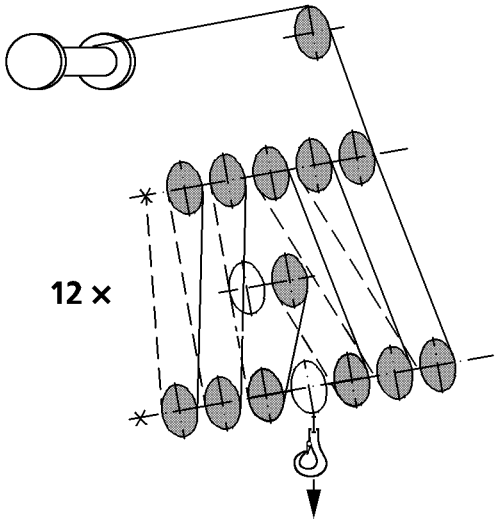
1.3.3 5-pulley hook block

Reeving	Rope fixed point
8x	On pulley head
9x	On hook block
10x	On side of pulley head
11x	On hook block



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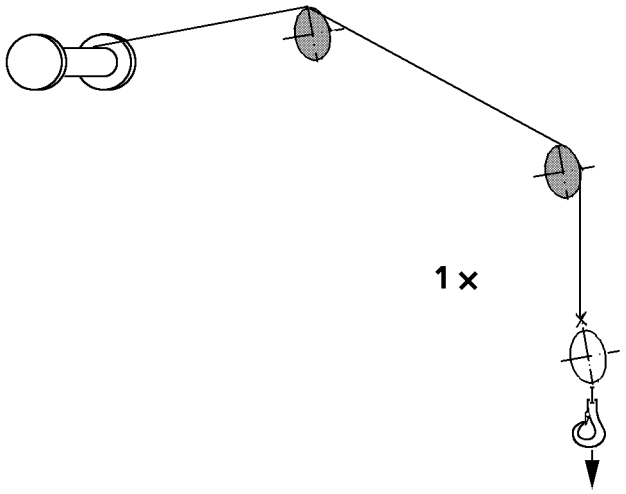
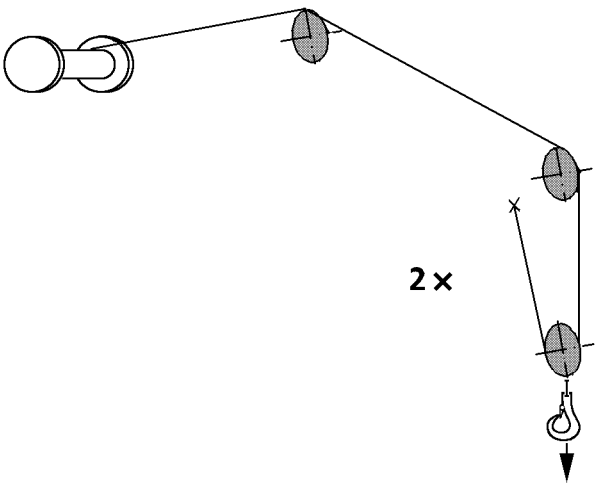
1.3.4 7-pulley hook block

Reeving	Rope fixed point
12x	On pulley head





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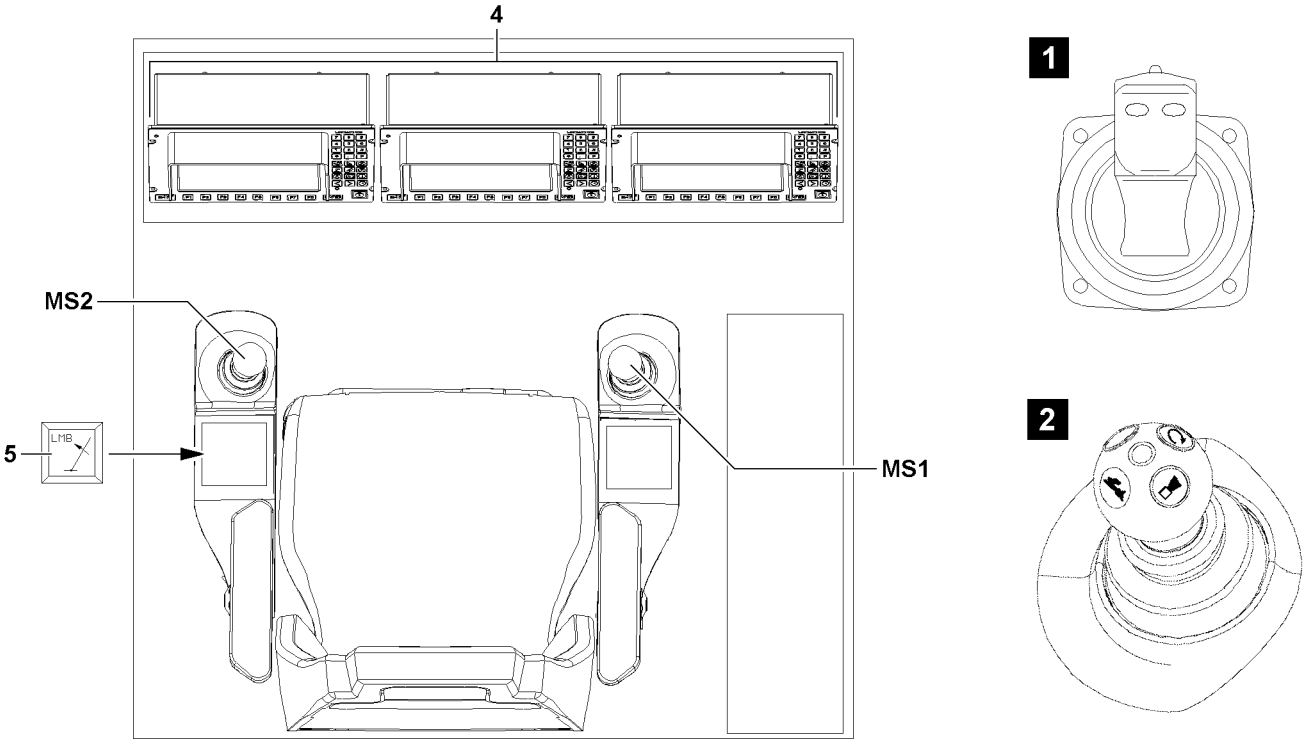
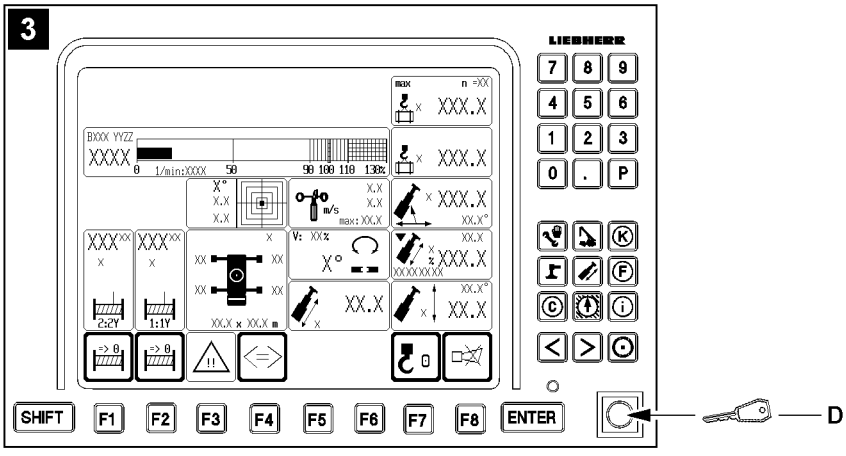
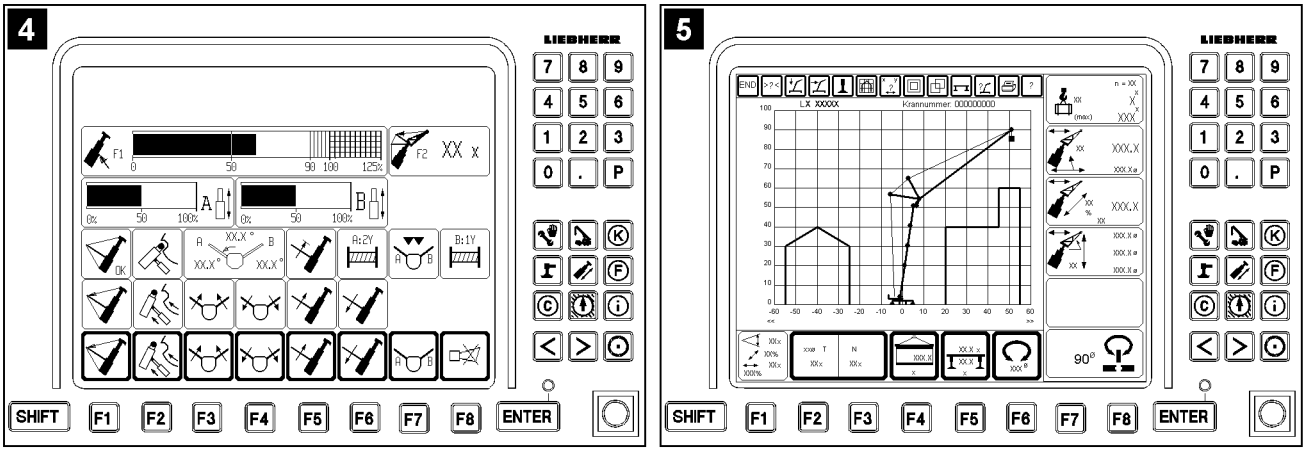
1.4 Reeving in, TK/TNZK operation

Reeving	Rope fixed point
1x	On the hook block or on the load hook fixed point
2x	On pulley head


4
MS2
5
LMB
MS1
1
2


3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


4
5
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B111215

1 General

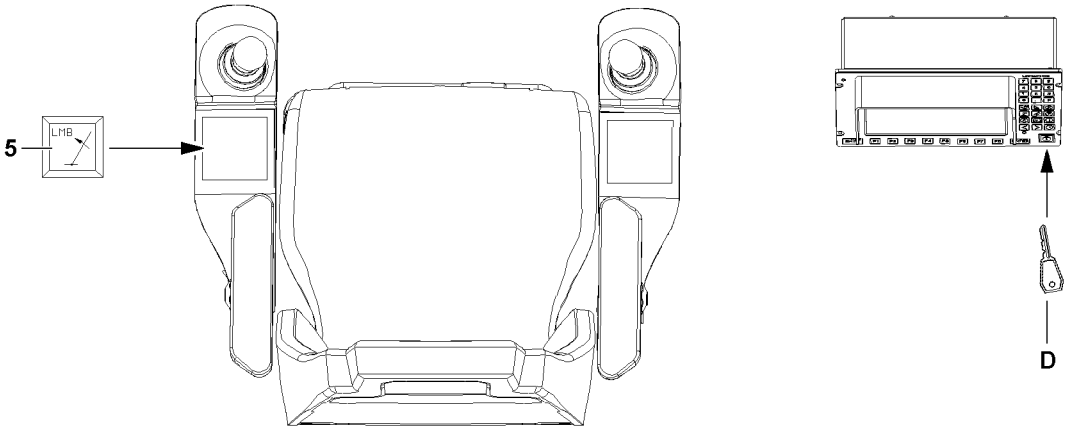
To operate the crane, two manually operated master switches are available.
– Master switch **MS1**
  • Right control console
– Master switch **MS2**
  • Left control console

To monitor the crane, depending on the crane type, up to 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)
– LICCON monitor, illustration **4**
  • User interface for operation with TY (only for crane types with second monitor)
– LICCON monitor, illustration **5**
  • User interface for “LICCON Job planner” (only for crane types with three monitors)

Equipment in the crane cab		
Crane type	**Manually actuated master switches**	**LICCON monitors**
LTM 1090-4.1	two (version illustration **2**)	one
LTM 1130-5.1	two (version illustration **2**)	one
LTM 1160-5.1	two (version illustration **2**)	one
LTM 1200-5.1	two (version illustration **2**)	one
LTM 1220-5.2	two (version illustration **2**)	one
LTM 1250-6.1	two (version illustration **2**)	one
LTM 1400-7.1	two (version illustration **2**)	one
LTM 1500-8.1	two (version illustration **1**)	two
LTM 11200-9.1	two version (illustration **2**)	two
LTR 1100	two (version illustration **2**)	one
LTR 11200	two (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

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).



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
– Allowance of individual, limited crane movements after LML-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.

WARNING

Danger of accident due to function “Exceedance of shut off limits of the LICCON overload protection”!

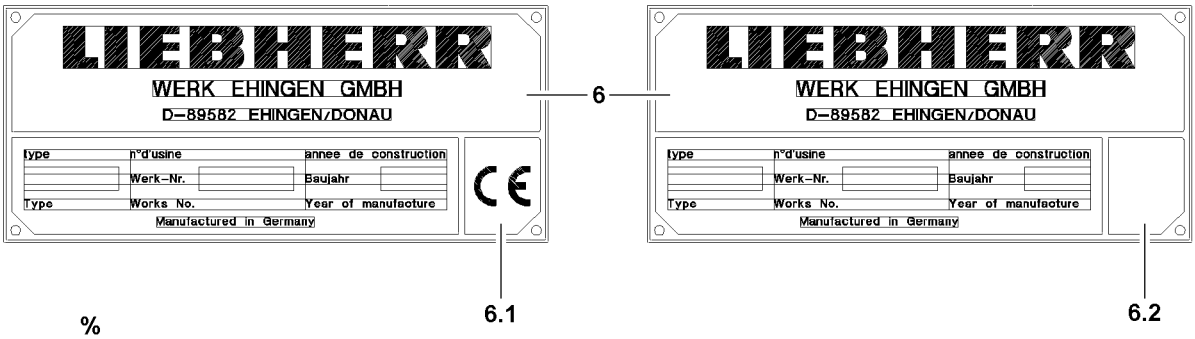
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload!

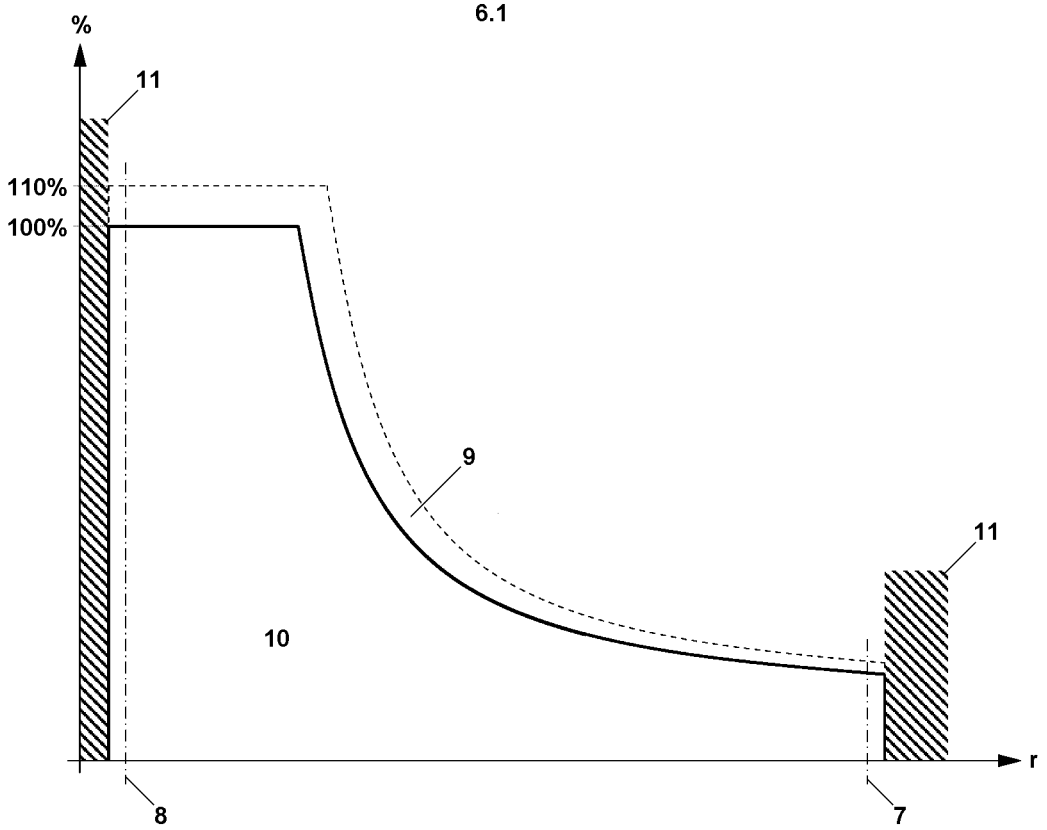
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over!

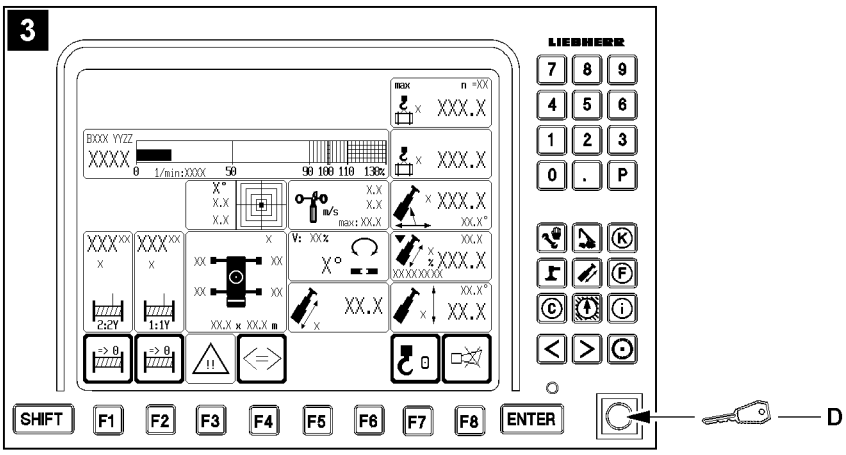
Personnel can be severely injured or killed!

▶ 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 “Exceedance of shut off limits of the LICCON overload protection” is only permissible in emergencies and for assembly purposes!
▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the function “exceedance of shut off limits of the LICCON overload protection”!
▶ The function “Exceedance of shut off limits of the LICCON overload protection” requires the presence of an authorized person and must be performed with utmost caution!
▶ Crane operation with activated function “Exceedance of shut off limits of the LICCON overload protection” is prohibited!

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!


LIEBHERR
WERK EHINGEN GMBH
D-89582 EHINGEN/DONAU
type
n°d'usine
annee de construction
Werk-Nr.
Baujahr
Type
Works No.
Year of manufacture
Manufactured in Germany
6
6.1
6.2


%
11
110%
100%
9
11
10
r
8
7


3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D

B111217

2 Instructions for resuming crane movements for cranes with CE mark

WARNING
Risk 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!

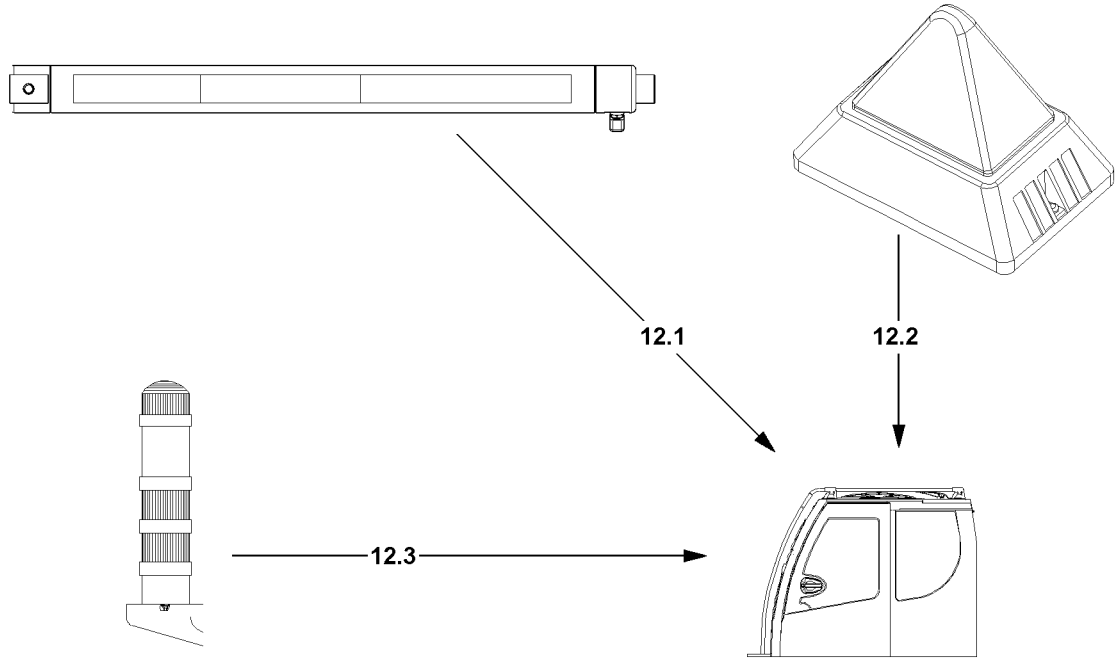
Note
- Check the data tag **6** to determine if your crane has a CE mark!
- The following section applies to a crane with CE mark, see data tag **6.1**!
- If your crane does not have a CE mark, see data tag **6.2**, then you must observe the description in section “Instructions for resuming a crane movement for cranes without CE mark”!

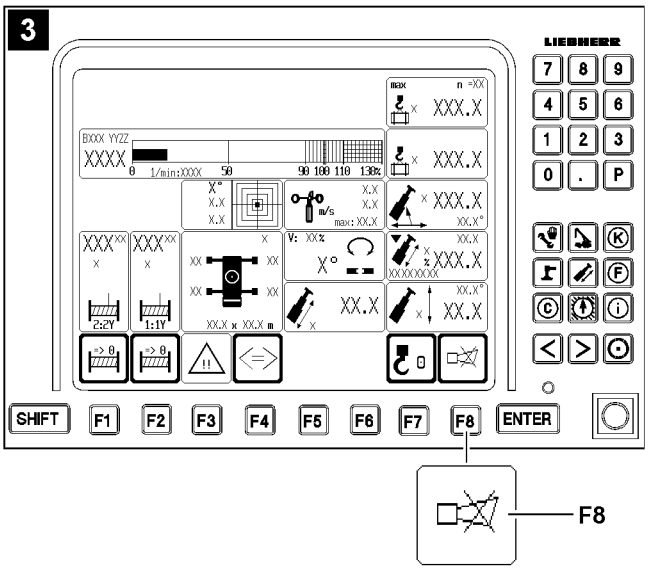
2.1 Overview load chart for cranes with CE mark

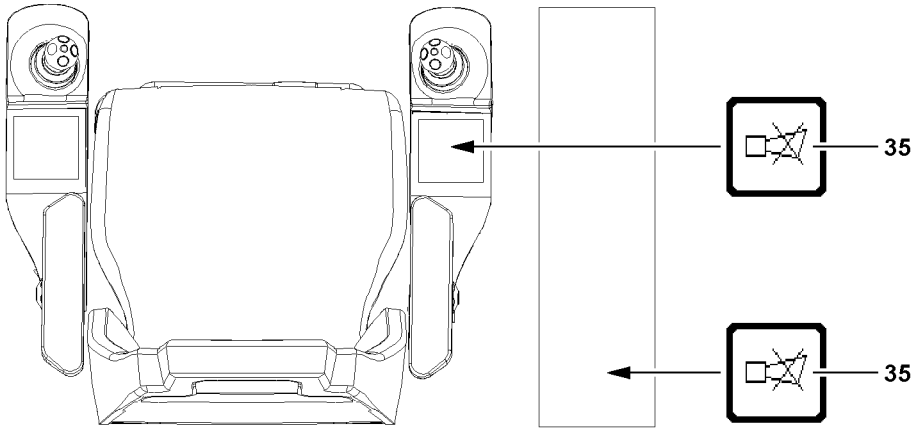
Axle	Description
r	Radius boom (Working radius)
%	Utilization of the crane in percentages

Position	Description
7	Lower limit angle load chart
8	Upper limit angle load chart
9	Utilization up to 110% with reduced working speed
10	Area “Load chart available”
11	Area “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!


12.1
12.2
12.3


3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
F8


35
35

B111218

2.2 Overview of acoustic / visual warnings for cranes with CE mark

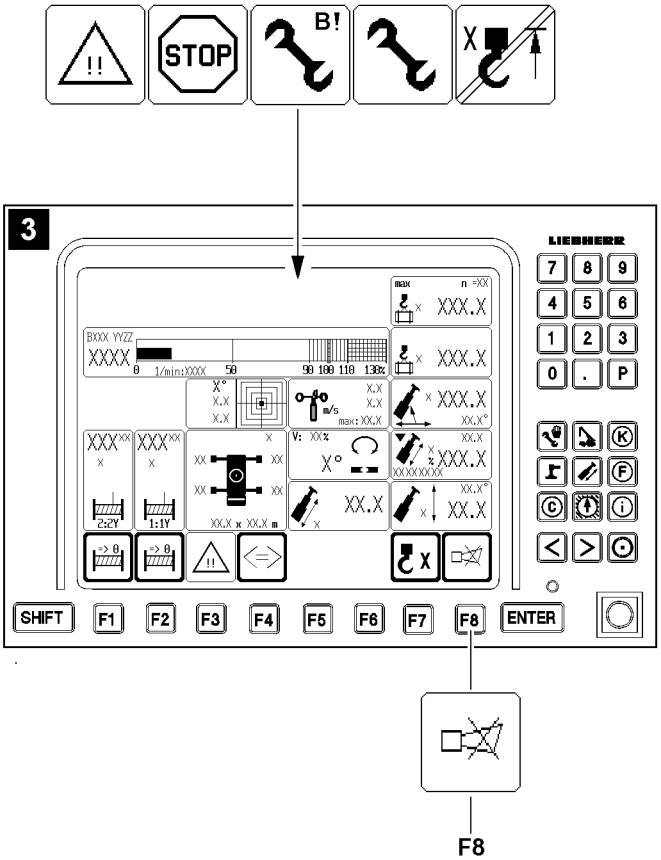
- Depending on the crane type, either a warning light **12.1** or a flashing beacon **12.2** or a combination of flashing beacon **12.2** and warning light* **12.3** are installed.
- The acoustic warnings within the crane operator's cab are turned off by pressing the button **F8** on the LICCON monitor 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 “Case number key” is 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”

Case number key	
Description Case	**Case num-ber**
Utilization of crane from 0 % to 89 %	**Case 001**
Utilization of crane from 90 % to 100 %	**Case 002**
Utilization of crane over 100 %	**Case 003**
Shut off of crane movements - LML Stop	**Case 004**
Luffing in with suspended load	**Case 005**
Participating sensor (LML) defective	**Case 006**
Exceeding the shut off limits of the LICCON overload protection	**Case 010**
Bypass of shut off hoist top	**Case 011**
Bypass of shut off boom / luffing down the attachment, “load chart available”	**Case 016**
Bypass of shut off boom / luffing down the attachment, “no load chart available”	**Case 018**
Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures, “no load chart available”	**Case 020**



B111219

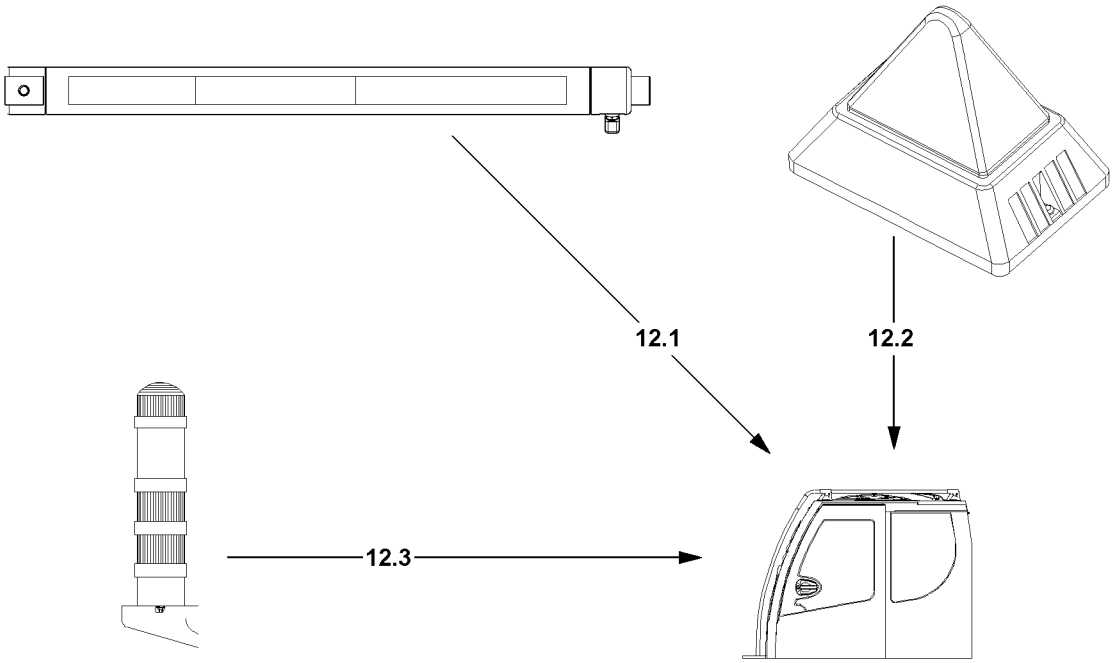
2.2.2 Acoustic / visual warnings within the crane operator's cab

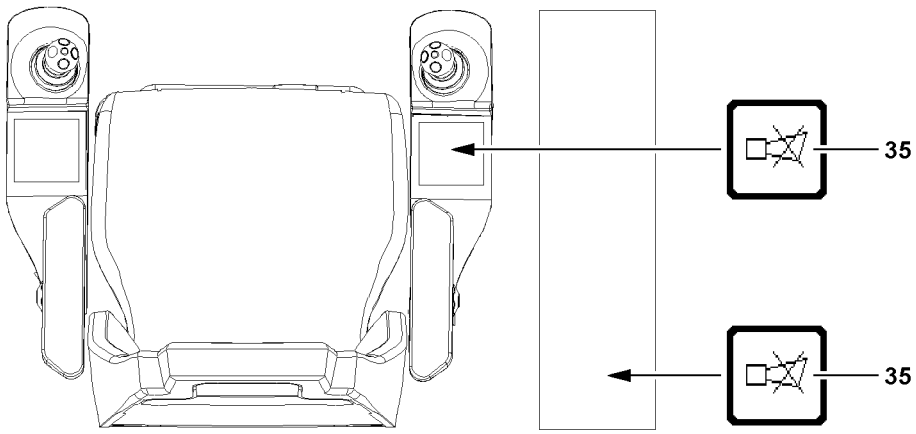
Acoustic / visual warnings on the LICCON monitor									
Case number	**Acoustic warning LICCON monitor at utilization of crane**			**Visual warning LICCON monitor**					
	Short sound	**Long sound**	**Long sound**	**Utilization of crane**		**Occurrence**			
	From 90 %	**Above 100 %**	**always**	**From 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

X[2] = can be turned off immediately on the LICCON monitor key **F8**

cannot be bypassed[5] = contact Liebherr Service



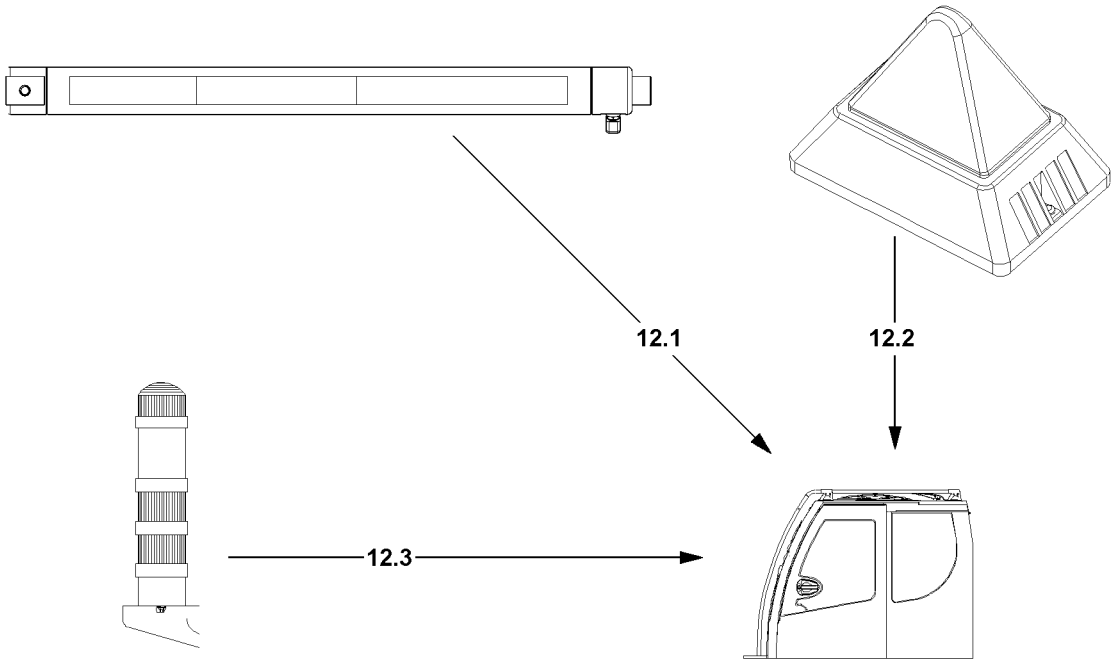


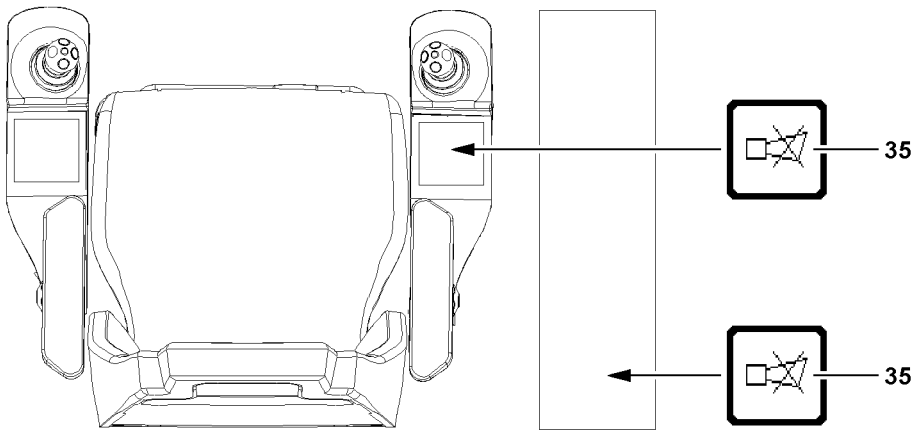
B111220

2.2.3 Acoustic / visual warnings outside the crane operator's cab

Warning light 12.1					
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**		
		Signal turntable	**Green**	**Yel-low**	**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
O^1 = warning light **12.1** lights up
O^2 = warning light **12.1** blinks
X^1 = can be shut off by momentarily pressing the button **35** on the right control console or the right instrument panel, effective at the earliest after five seconds





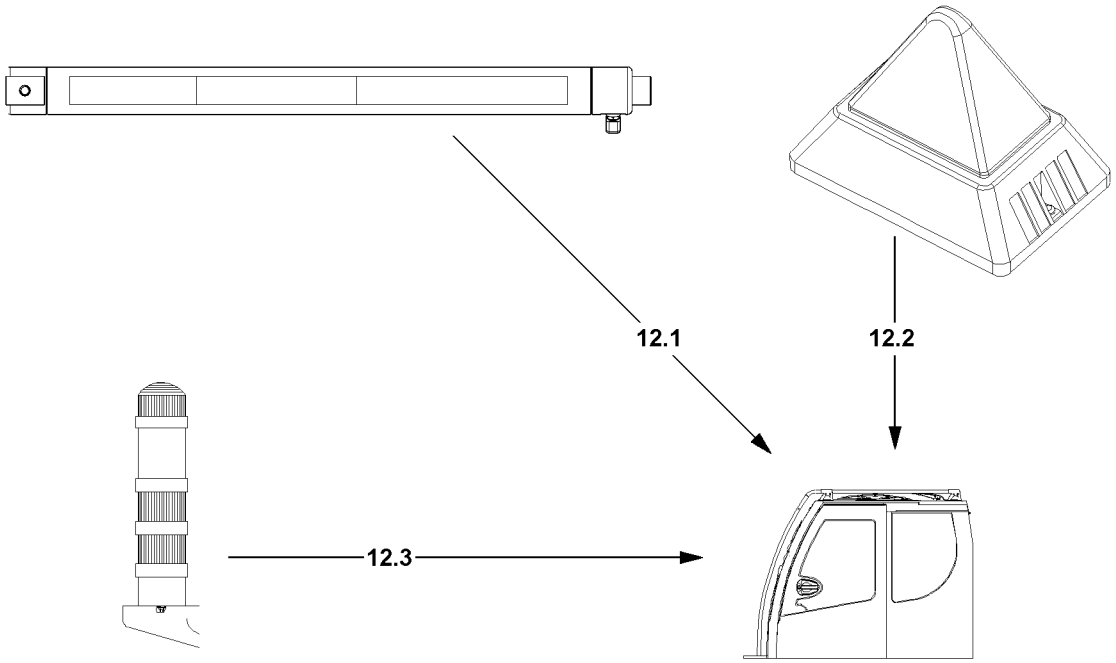
B111220

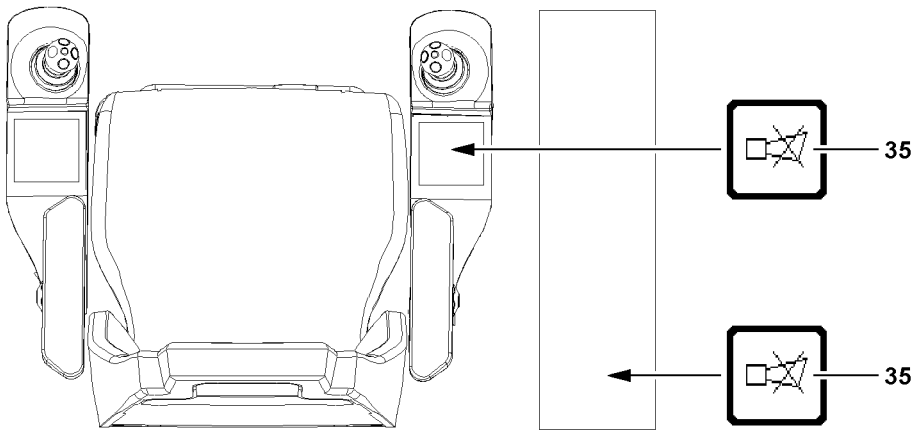
Flashing beacon 12.2			
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**
		Signal turntable	**Red**
Case 003	Above 100 %	X^1	O^2
Case 004	-		O^2
Case 005	Above 100 %	X^1	O^2
Case 006	-		O^2
Case 010	Above 110 %	X^1	O^2
Case 011	Above 110 %	X^1	O^2
Case 016	Above 110 %	X^1	O^2
Case 018	No value available		O^2
Case 020	No value available		O^2

O = cannot be turned off

O^2 = flashing beacon **12.2** blinks

X^1 = can be shut off by momentarily pressing the button **35** on the right control console or the right instrument panel, effective at the earliest after five seconds





B111220

Warning light 12.3					
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**		
		Signal turntable	**Green**	**Yel-low**	**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
O^1 = warning light **12.3** lights up
O^2 = warning light **12.3** blinks
X^1 = can be shut off by momentarily pressing the button **35** on the right control console or the right instrument panel, effective at the earliest after five seconds

B195219

2.3 Shut off 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 respective sections.

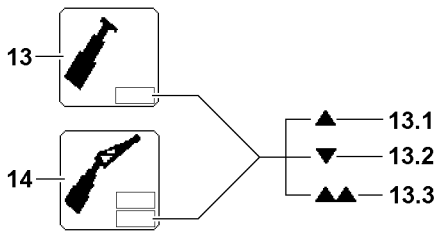
Note

- ▶ For detailed description of the individually listed icons, 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 telescopic boom up / down
- Shut off Luffing the attachment up / down
- Shut off Spooling the winch up / out
- Shut off hoist top
- Shut off Telescoping the telescopic boom out (limit length)
- Shut off Telescoping the telescopic boom in (limit length)
- Shut off Crane movement with danger of tipping to the rear*
- Shut off Luffing cylinder (pressure too high)
- Shut off due to error message

2.3.1 Shut off Luffing the telescopic boom up / down



In icon **13** or icon **14** (lower field) arrow **13.1** or arrow **13.2** blink and the LICCON overload protection has shut off the crane movement.
“Luffing the telescopic boom up” (arrow **13.1**) or “Luffing the telescopic boom down” (arrow **13.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded or fallen below.
If the double arrow **13.3** appears blinking in the icon **13** or icon **14** (lower field), then the telescopic boom was luffed up to just before the block position of the luffing cylinder. The shut off “Boom steep” has shut the crane movement “Luffing the telescopic boom up” off.

The arrow **13.1** blinks and the crane movement “luffing the telescopic boom up” was turned off:

- ▶ Luff the telescopic boom down.

Result:

- Crane operation is possible again.

The arrow **13.2** blinks and the crane movement “luffing the telescopic boom down” was turned off:

- ▶ Luff the telescopic boom up.

Result:

- Crane operation is possible again.

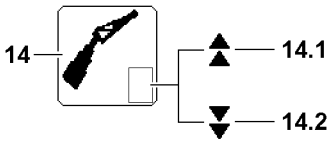
The double arrow **13.3** blinks and the crane movement “luffing the telescopic boom up” was turned off:

▶ Luff the telescopic boom down.

Result:

– Crane operation is possible again.

2.3.2 Shut off Luffing the attachment up / down



In the icon **14** (upper field) the double arrow **14.1** or double arrow **14.2** blink and the LICCON overload protection has shut off the crane movement.
“Luffing the attachment up” (double arrow **14.1**) or “Luffing the attachment down” (double arrow **14.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded or fallen below.

The double arrow **14.1** blinks and the crane movement “luffing the attachment up” was turned off:

▶ Luff the attachment down.

Result:

– Crane operation is possible again.

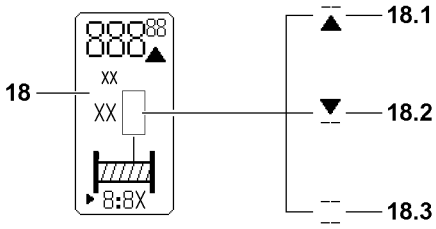
The double arrow **14.2** blinks and the crane movement “luffing the attachment down” was turned off:

▶ Luff the attachment up.

Result:

– Crane operation is possible again.

2.3.3 Shut off spooling the winch up / out



In the icon **18**, the line / arrow **18.1**, arrow / line **18.2** or line / arrow **18.3** blink and the LICCON overload protection has shut off the crane movement.
“Spooling the winch out” (line / arrow **18.1**) or “spooling the winch up” (arrow / line **18.2**) was shut off because the upper / lower limit angle of the rope for the selected winch was exceeded or fallen below.
If line / line **18.3** appears blinking in the icon **18**, then the affected winch is deactivated.

The line / arrow **18.1** blinks and the crane movement “spooling the winch out” was turned off:

▶ Spool the winch up.

Result:

– Crane operation is possible again.

The line / arrow **18.2** blinks and the crane movement “spooling the winch up” was turned off:

▶ Spool the winch out.

Result:

– Crane operation is possible again.

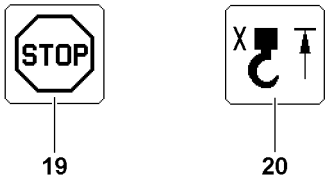
Line / line **18.3** blinks and the winch is deactivated:

▶ Activate the winch, see Crane operating instructions, chapter 4.02.

Result:

– Crane operation is possible again.

2.3.4 Shut off hoist top



The icon **19** and Hoist top icon **20** appear in the LICCON monitor and the LICCON overload protection has turned off crane movement.

Spooling the hoist winch up was turned off because the hook block or the load hook has run against a hoist limit weight during the upward movement and the affected hoist limit switch was triggered.

Note

▶ After shut off of spooling the hoist winch up (hoist top), the crane movements “telescoping the boom out”, “luffing the boom down”, “luffing the attachment down” and possibly additional movements which have an effect on the length of the hoist rope are also shut off. This should minimize the risk that the crane can be damaged due to erroneous operation.

▶ Spool the hoist winch out.

Result:

– Crane operation is possible again.

2.3.5 Shut off Telescoping the telescopic boom out (limit length)

In the “horn” icon, illustration **1** appears an error message, an acoustic signal sounds, the LICCON overload protection has interrupted the crane movement “Telescoping the telescopic boom out” and, depending on crane type, the double arrow in the icon **23** additionally blinks.

The crane movement “Telescoping the telescopic boom out” was shut off because the **limit length** of the selected load chart has been exceeded.

▶ Telescope the telescopic boom in.

Result:

– Crane operation is possible again.

2.3.6 Shut off Telescoping the telescopic boom in (limit length)

In the “horn” icon, illustration **1** appears an error message, an acoustic signal sounds, the LICCON overload protection has interrupted the crane movement “Telescoping the telescopic boom in” and, depending on crane type, the double arrow in the icon **23** additionally blinks.
The crane movement “Telescoping the telescopic boom in” was shut off because the **limit length** of the selected load chart has been fallen below.

▶ Telescope the telescopic boom out.

Result:

– Crane operation is possible again.

2.3.7 Shut off Crane movement with danger of tipping to the rear

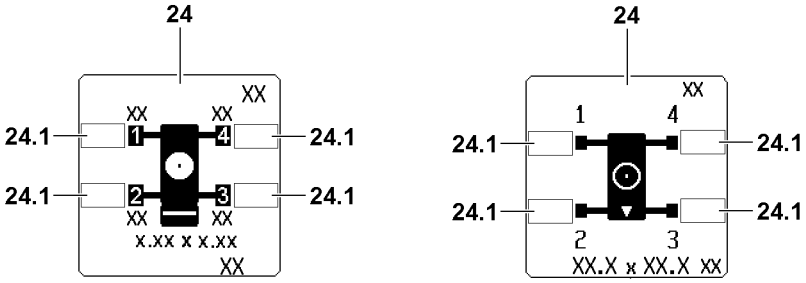
Note

▶ Applies only for cranes with support force monitoring*.

WARNING

Danger of tipping over!
When reaching the programmed minimum / maximum support force limits there is **no** automatic shut off of crane movements!
Exception: When the two supports with the lowest forces are in boom direction, then some crane movements which increase the “danger of tipping to the rear” significantly are turned off!

▶ If there is a “danger of tipping to the rear”, luff the boom down carefully until the support limit forces are again within the minimum / maximum values!



Icon **24** (depending on the crane similar as on the left or right illustration) is shown in the LICCON monitor with blinking values in both fields **24.1** of the supports with the lowest forces, an acoustic signal sounds and the LICCON overload protection has turned off the crane movement.
Crane movements which increase the “danger of tipping to the rear” significantly were turned off.

▶ Luff the boom down carefully until the support limit forces are again within the minimum / maximum values and no value in the fields **24.1** blinks any longer.

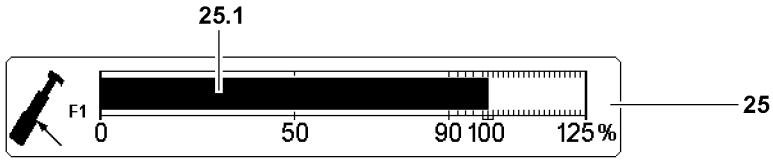
Result:

– Crane operation is possible again.

2.3.8 Shut off Luffing cylinder (pressure too high)

Note

▶ Applies only for certain crane types with respective display in the second LICCON monitor.



In the icon **25** (luffing cylinder pressure) the utilization bar **25.1** reaches the 100% mark and the LICCON overload protection has shut off the crane movement.
All further movements, which directly lead to an increase of the luffing cylinder pressure are shut off.

▶ Lower the luffing cylinder pressure by lowering the load.

or

■ Initiate an alternative crane movement, which lowers the luffing cylinder pressure.

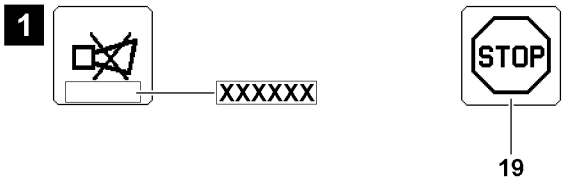
Result:

– Crane operation is possible again.

In assembly operation:
Make sure that the specifications in the erection / take down charts are observed.

▶ Lower the luffing cylinder pressure by reducing the load, for example by getting support from an auxiliary crane.

2.3.9 Shut off due to error message



An error message appears in the “horn” icon, illustration **1**, the icon **19** appears in the LICCON monitor and the LICCON overload protection has turned the crane movement off.

▶ Determine existing errors with the LICCON error code from the field in illustration **1**, see Diagnostics manual.

▶ Remedy the error.

▶ If the error cannot be remedied:
Contact LIEBHERR Service.

Troubleshooting

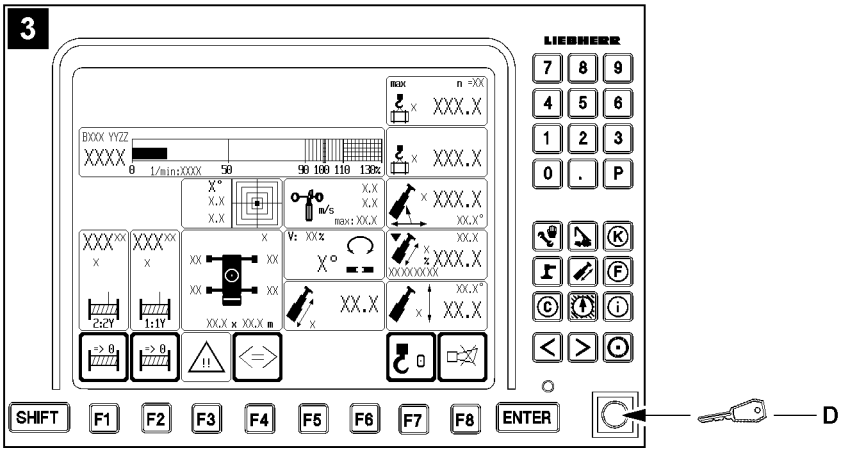
The erection of the crane, for example after assembly on a new job site or with another equipment configuration, is not possible due to an error message?

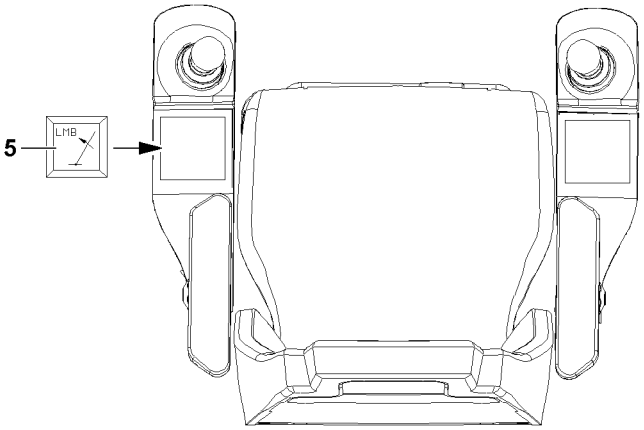
▶ As the first step, make sure that all electrical connections have been made.

▶ Check if all sensors or dummy plugs with integrated electric have been connected properly.

Note

▶ If there is a defect on a participating sensor (LML), then the crane can no longer be operating in normal operating condition. Contact Liebherr Service and fix / replace the sensor.





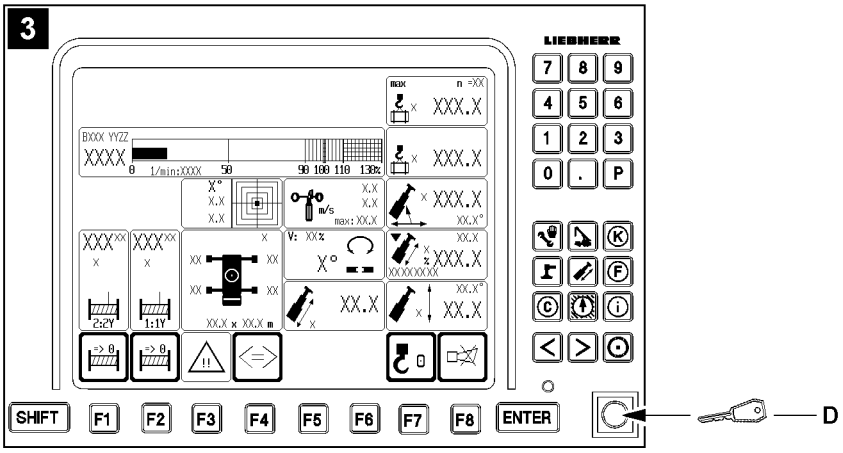
B111221

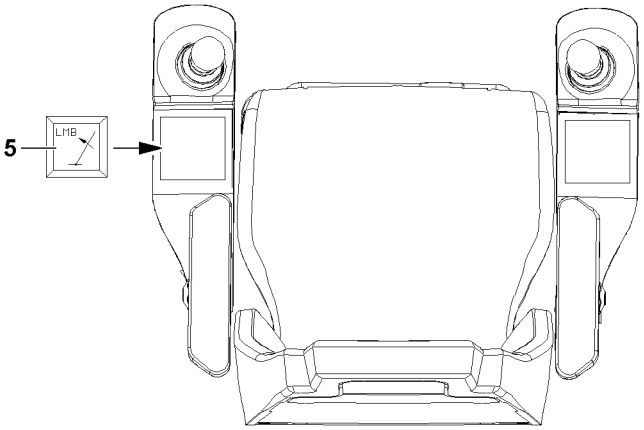
2.4 Shut off of crane movement: LML-STOP by LICCON overload protection

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 “Exceedance of shut off limits of the LICCON overload protection” is only permissible in emergencies and for assembly purposes!
- ▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the function “exceedance of shut off limits of the LICCON overload protection”!
- ▶ The function “Exceedance of shut off limits of the LICCON overload protection” requires the presence of an authorized person and must be performed with utmost caution!
- ▶ Crane operation with activated function “Exceedance of shut off limits of the LICCON overload protection” is prohibited!

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!





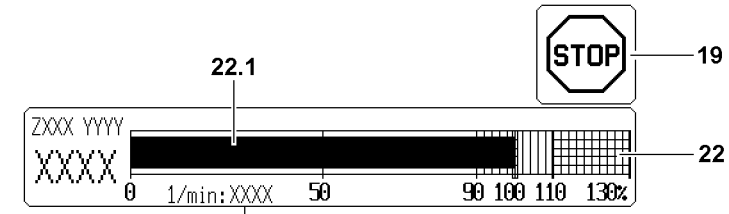
B111221

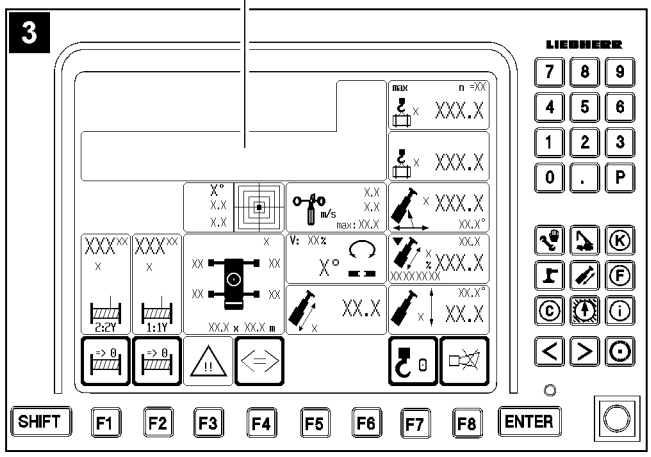
WARNING
Failure of hoist gear!
If a load is lifted by luffing the boom up, after the hoist gear has been shut off by the load moment limiter when trying to lift the load, then the hoist gear can be overloaded and fail!
This could result in serious accidents!
Personnel can be severely injured or killed!
- ▶ Actuate the button **5** “luffing in with suspended load” only if the LICCON overload protection reports no overload on the hoist gear with freely suspended load, the load is not reduced by luffing up and the minimum radius is not fallen below!

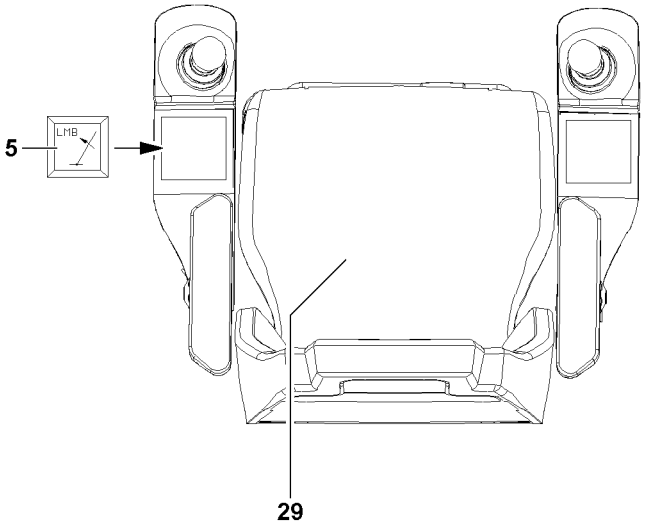
Note
- ▶ If the set up key **D** is actuated in the area “load chart available”, then the working speed is reduced!
- ▶ If the set up key **D** is actuated in the area “no load chart available”, then the working speed is not reduced!

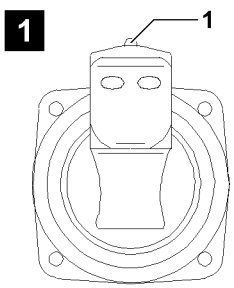
There are two possibilities to exceed the shut off limits of the LICCON overload protection after LML-STOP:
- – With button **5** “luffing in with suspended load” in the left control console
- – With the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**

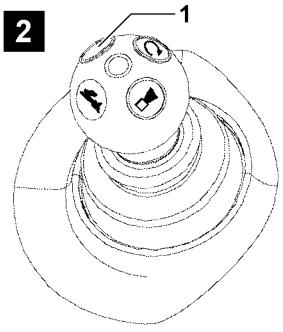
NOTICE
Danger of mix up!
The function “Exceedance of shut off limits of LICCON overload protection” can only be activated with the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**!
The key switches on the other monitors are not assigned with this function!
- ▶ Do not mix up the set up key **D** with the other key switches!
- ▶ In case of mix up: Deactivate the activated function!


STOP
19
22.1
ZXXX YYYY
XXXX
22
0
1/min:XXXX
50
90 100 110 130%


3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


5
LMB
29


1
1


2
1

B111222

2.4.1 Luffing in with suspended load

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment.
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 prerequisites are met:
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.

Note
▶ If the load is reduced by luffing up, then the button **5** “luffing in with suspended load” is 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.

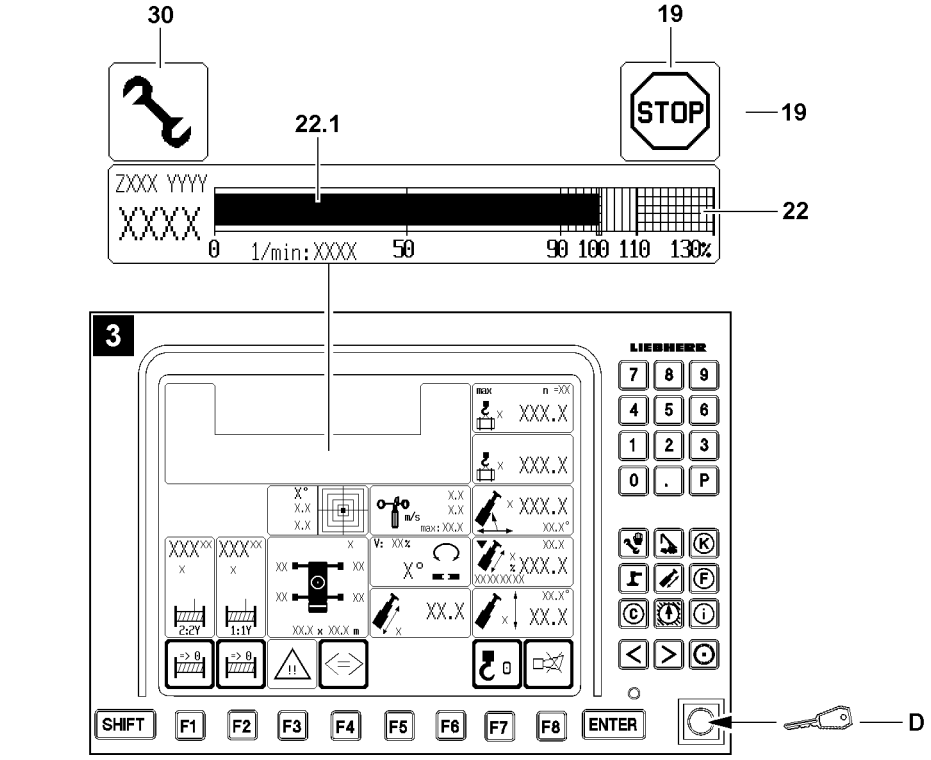
▶ Luff the load in.

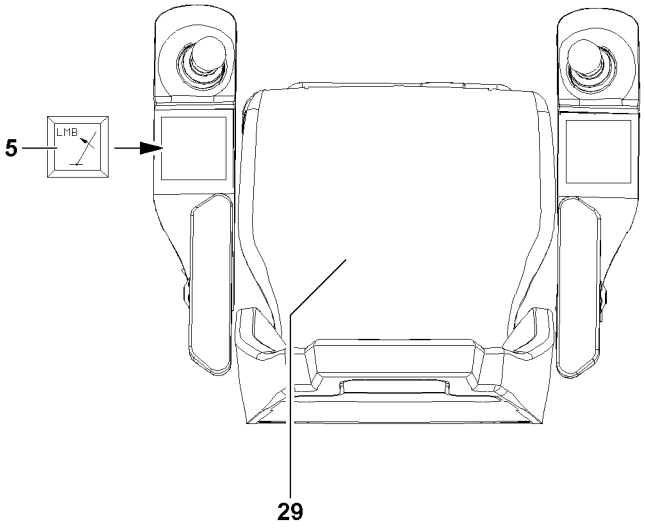
Result:
– If the crane reaches a normal operation status (utilization below 100 % and no active shut off) then the icon **19** turns off, normal crane operation is possible again.

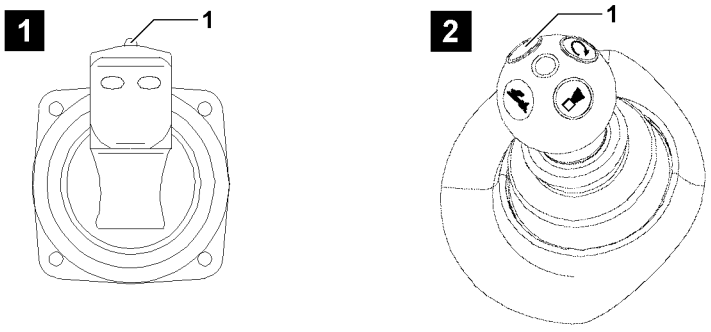
The function “luffing in with suspended load” is also deactivated:
– When the function key **5** “luffing in with suspended load” is not longer actuated
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If the standby mode on the LICCON monitor is active
– In case of defect of an associated sensor (LML)
– 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.


30
19
STOP
19
22.1
22
ZXXX YYYY
XXXX
0
1/min:XXXX
50
90 100 110 130%
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


5
LMB
29


1
1
2
1

B111223

2.4.2 Exceedance of the maximum permissible load moment

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment.
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 configuration button **D** in the “right touching” position.

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 pressed): Crane is in normal operation.
– Position to right (touching): The maximum permissible load moment (100%) can be exceeded, the assembly icon **30** in the LICCON monitor blinks.

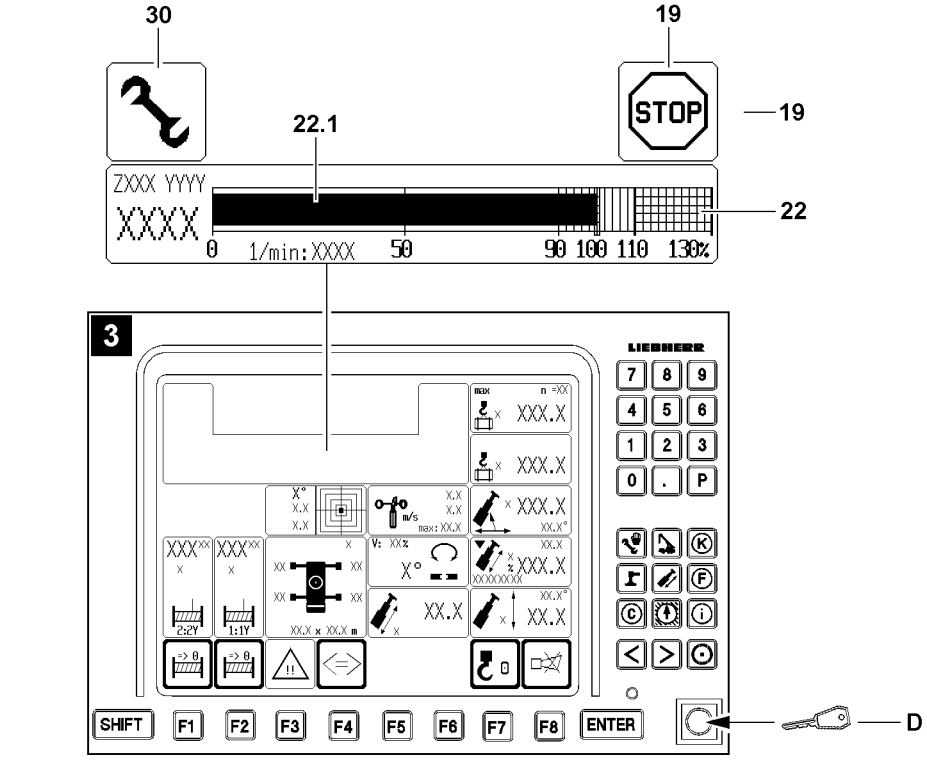
Make sure that the following prerequisites are met:
– With the button **5** “Luffing in with suspended load” no normal operating condition (utilization below 100% and no active shut off) can be reached.
– The master switches and the set up key **D** are **not** actuated.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
– Radio operation* is not active.
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– The utilization of 110 % has not been reached and a load chart is available.

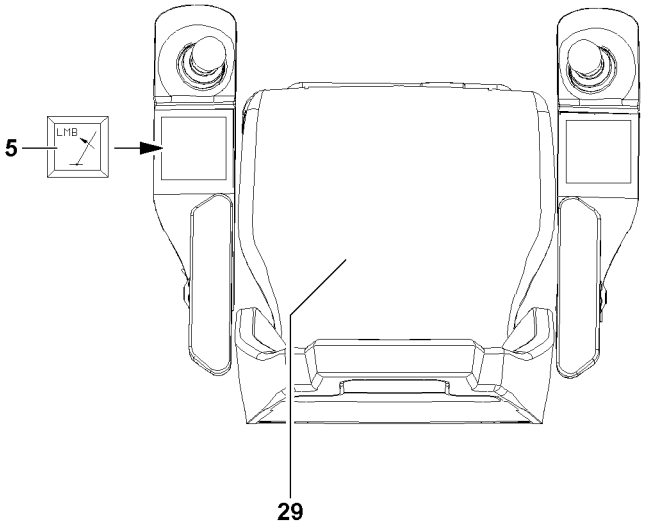
▶ Turn the set up key **D** to the right (touching).

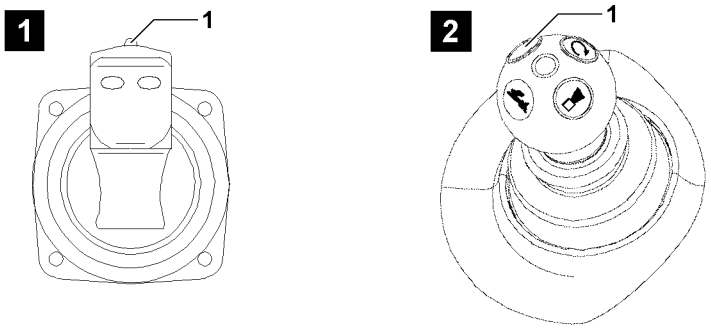
Result:
– The LICCON overload protection is inactive.
– The assembly icon **30** in the LICCON monitor blinks.
– The working speed in the area “load chart available” is reduced for all functions.

Troubleshooting

When it is not possible to exceed the maximum permissible load moment by actuating the set up key **D**?
▶ Contact LIEBHERR Service.


30
19
STOP
19
22.1
22
ZXXX YYYY
XXXX
0
1/min:XXXX
50
90 100 110 130%
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


5
LMB
29


1
1
2
1

B111223

▶ 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:

– If the set up key **D** is pressed again.
– If all master switches are in neutral position for 10 seconds (with load chart available)
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If the standby mode on the LICCON monitor is active
– If radio operation* is activated
– At engine stop
– During shut off transition hoist top clear / not clear
– During transition boom not steep / steep
– During transition lower limit angle clear / not clear
– During transition upper limit angle clear / not clear
– In case of defect of an associated sensor (LML)
– When the maximum value Test point 1 (value F1) is reached
– When a utilization of 100% is reached

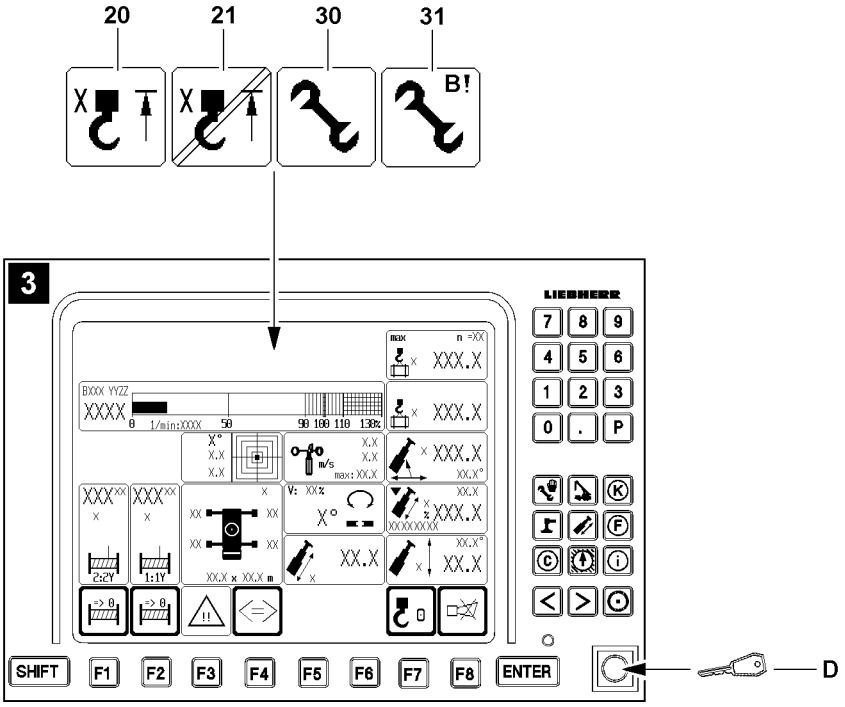
Note

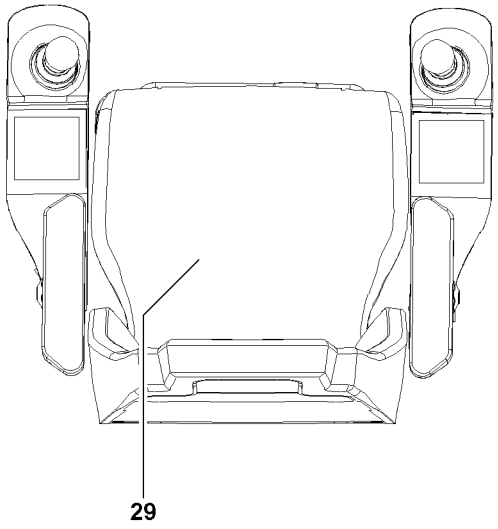
▶ The function “exceedance of shut off limits of the LICCON overload protection” is only turned off when the assembly icon **30** in the LICCON monitor turns off.
▶ If the function “exceedance of shut off limits of the LICCON overload protection” does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

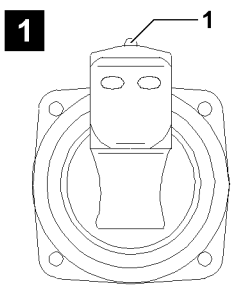
The function “exceedance of shut off limits of the LICCON overload protection” has / was shut off:

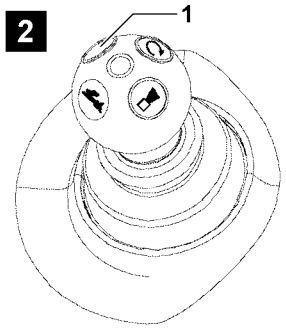
– The assembly icon **30** in the LICCON monitor turns off.
– The working speed is reduced until all master switches are in zero position at the same time.

▶ 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.


20
21
30
31
B!
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


29


1
1


2
1

B111224

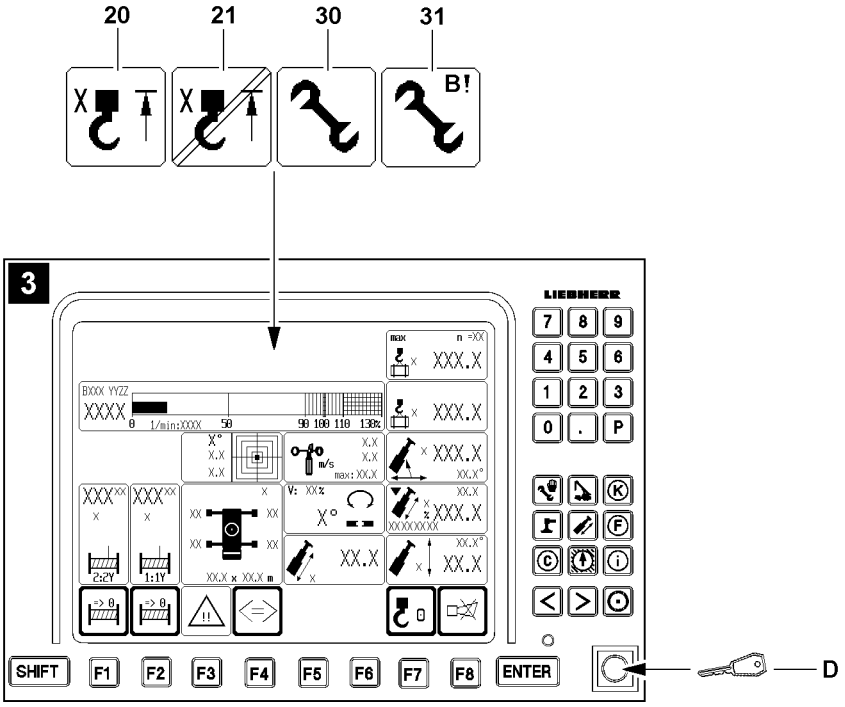
2.5 Bypass of the hoist top shut off

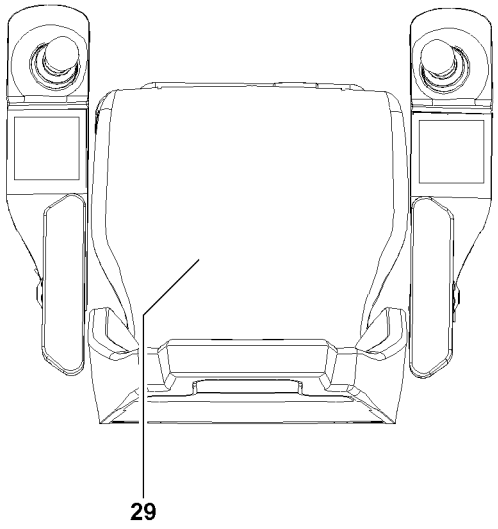
WARNING
Improper use of the function “bypass of hoist top shut off”!
- ▶ The function “bypass of hoist top shut off” may never be used to increase the lifting height during crane operation!

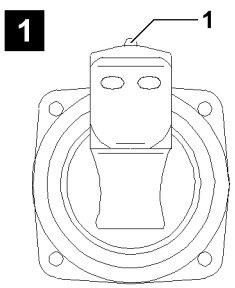
WARNING
Property damage and falling load!
If the function “bypass of hoist top shut off” is activated, there is the danger that the hook block or the load hook is pulled against the pulley head!
This danger exists especially when the hoist winch is continued to be spooled up and for crane movements which have an influence on the hoist rope, for example telescoping or luffing the boom, the attachment 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!

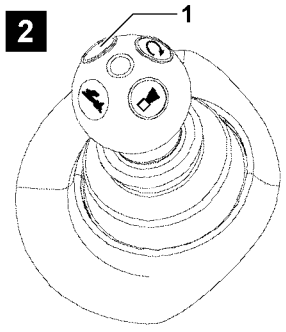
Note
- ▶ The activation of the function “bypass of hoist top shut off” is only possible if the hoist limit switch was touched and the hoist top shut off has occurred.
- ▶ If the hoist limit switch is triggered when the set up key **D** is actuated (function “exceedance of shut off limits of the LICCON overload protection” is active, the assembly icon **30** or the assembly icon **31** blink), 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 are actuated.
- – The master switches are **not** deflected.
- – The crane engine is running.
- – The radio operation* is not active.
- – The standby mode on the LICCON monitor is not active.


20
21
30
31
B!
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


29


1
1


2
1

B111224

▶ Turn the set up key **D** to the right (touching).

Result:

– The assembly icon **30** or the assembly icon **31** (assembly operation) in the LICCON monitor blink.
– 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 (also two hook operation).

▶ Carry out a crane movement with bypassed hoist limit switches with upmost caution and by taking the safety guidelines into account.

The function “bypass of the hoist top shut off” turns off:

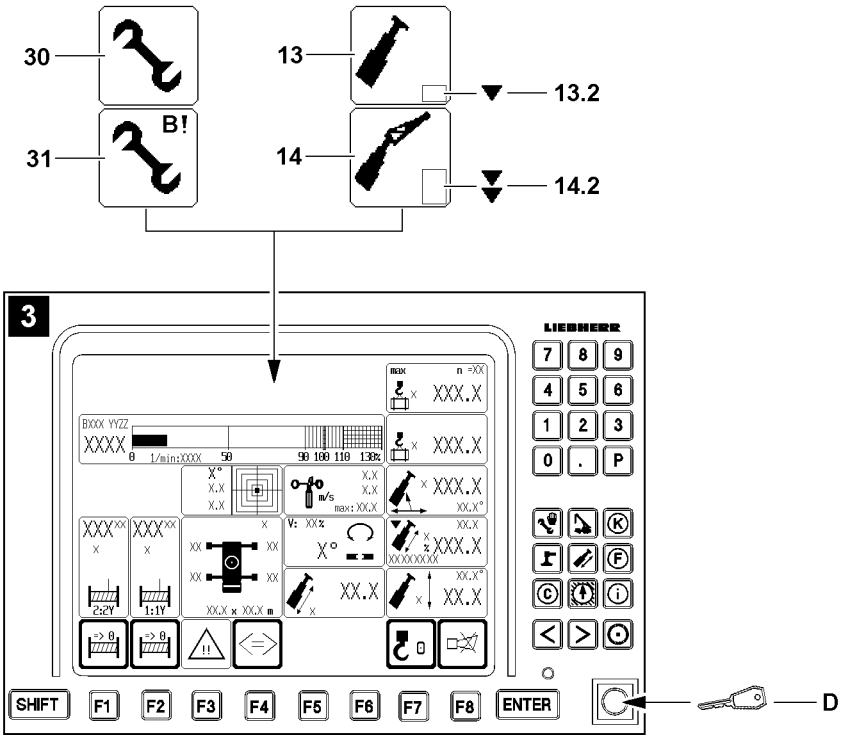
– If the set up key **D** is pressed again
– When no master switch is deflected for 10 seconds
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If there is no longer a shut off of a hoist limit switch
– If the stand by mode on the LICCON monitor is active
– If the radio operation* is active
– At engine stop

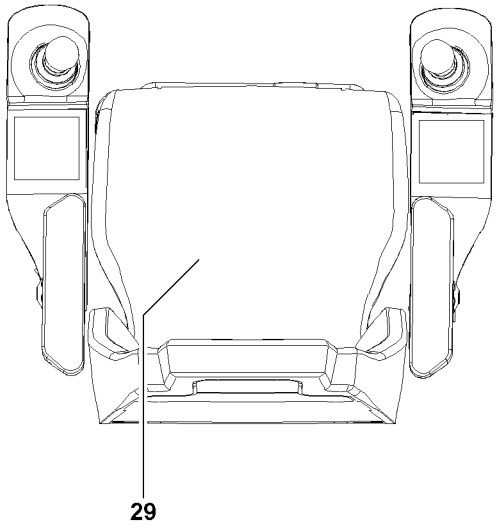
The function “bypass of the hoist top shut off” has / was turned off:

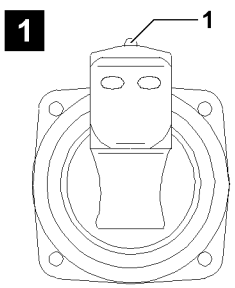
– The assembly icon **30** or the assembly icon **31** (assembly operation) in the LICCON monitor turn off.
– The icon **21** on the LICCON monitor turns off.
– The working speed is reduced until all master switches are in zero position at the same time.

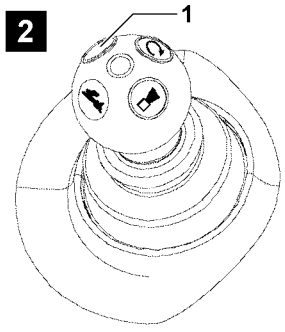
▶ Make sure that the assembly icon **30** or the assembly icon **31** (assembly operation) as well as the icon **21** no longer appear in the LICCON monitor.

▶ Carry out the crane movements in such a way that no repeated hoist top shut off occurs.


30
31
B!
13
13.2
14
14.2
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


29


1
1


2
1

B111233

2.6 Bypass of shut off luffing the telescopic boom / attachment down

WARNING
Increased danger of accidents due to bypass of shut off luffing the telescopic boom / attachment down!
When the shut off luffing the telescopic boom / attachment down is bypassed, then the LICCON overload protection as a whole is deactivated or limited.
When the shut off luffing the telescopic boom / attachment down is bypassed and the telescopic boom and / or the attachment is further luffed down, then there is no load chart available any longer!
Crane operation with bypassed shut off luffing the telescopic boom / attachment down is prohibited, since severe accidents can result!
Personnel can be severely injured or killed!
- ▶ Activate the bypass of the shut off luffing the telescopic boom / attachment 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 icon **13** or icon **14** the arrow **13.2** or double arrow **14.2** blink 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 are actuated.
- – The master switches are **not** deflected.
- – The crane engine is running.
- – The radio operation* is not active.
- – The standby mode on the LICCON monitor is not active.

▶ Turn the set up key **D** to the right (touching).

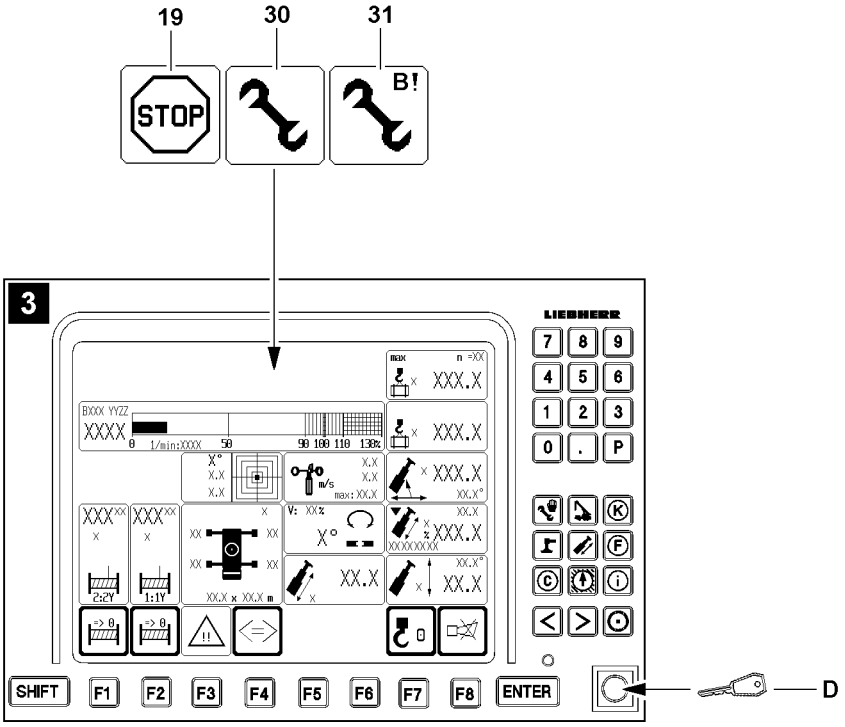
Result:
- – The assembly icon **30** in the LICCON monitor blinks.
- – The function “exceedance of shut off limits of the LICCON overload protection” is activated and has bypassed the shut off luffing the telescopic boom / attachment down.

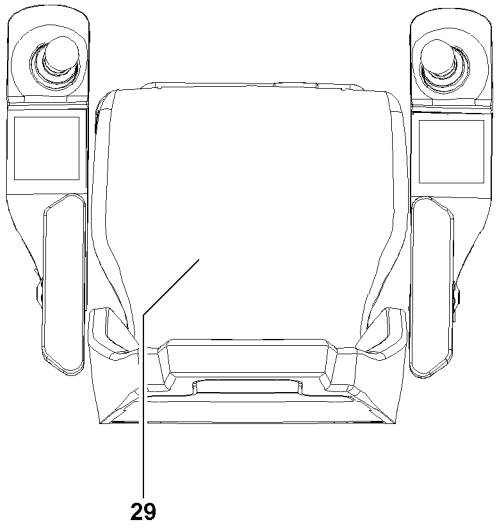
Note
▶ When leaving the area “load chart available”, the assembly icon **30** turns off and the assembly icon **31** appears.

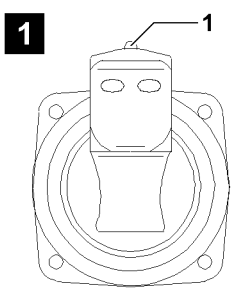
The bypass of the shut off luffing the telescopic boom / attachment down turns off:
- – If the set up key **D** is pressed again
- – When no master switch is deflected for 10 seconds
- – When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
- – When an area with existing load chart is reached
- – If the stand by mode on the LICCON monitor is active
- – If the radio operation* is active
- – At engine stop

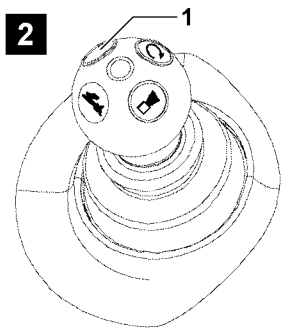
The bypass of the shut off luffing the telescopic boom / attachment down has / was turned off:
- – The assembly icon **31** or the assembly icon **30** in the LICCON monitor turns off.
- – The working speed is reduced until all master switches are in zero position at the same time.

▶ Make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.


19
30
31
STOP
B!
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


29


1
1


2
1

B111225

2.7 Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures (assembly operation)

Note

- ▶ If the crane is in the area “no load chart available”, there is a shut off of crane operation by the LICCON overload protection and 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!

Make sure that the following prerequisites are met:

- The master switches and the set up key **D** are **not** actuated.
- Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
- Radio operation* is not active.
- The crane engine is running.
- The standby mode on the LICCON monitor is not active.
- The erection / take down charts are adhered to.
- The configuration status has been entered correctly into the LICCON computer system.

▶ Turn the set up key **D** to the right (touching).

Result:

- The assembly icon **30** appears in the area “load chart available”.
- The assembly icon **31** appears in the area “no load chart available”.
- The erection / take down procedures can be carried out.

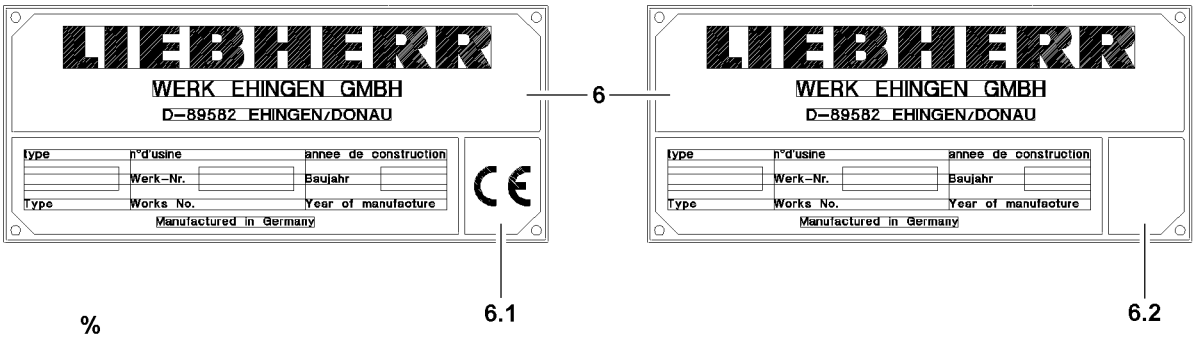
The function “exceedance of shut off limits of the LICCON overload protection” turns off:

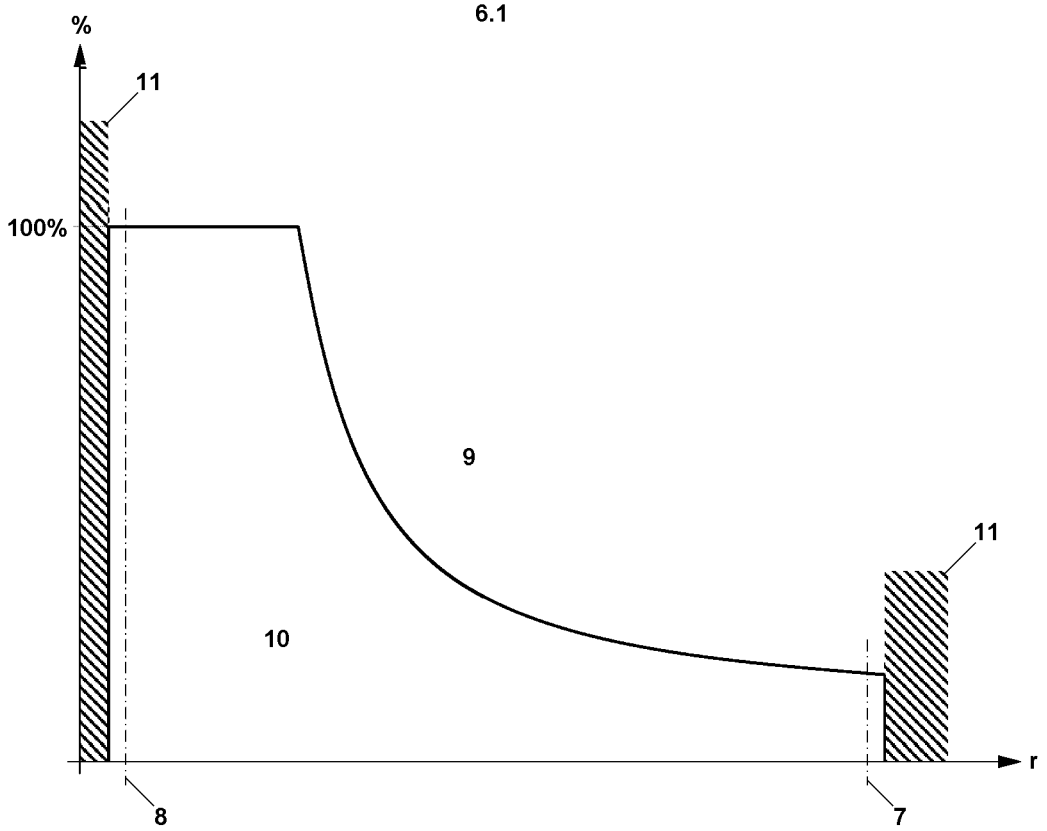
- If the set up key **D** is pressed again
- When all master switches are for 10 seconds after actuation of the set up key **D** in neutral position (with “load chart available”)
- When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
- At engine stop
- When an area with existing load chart is reached (erection procedure)

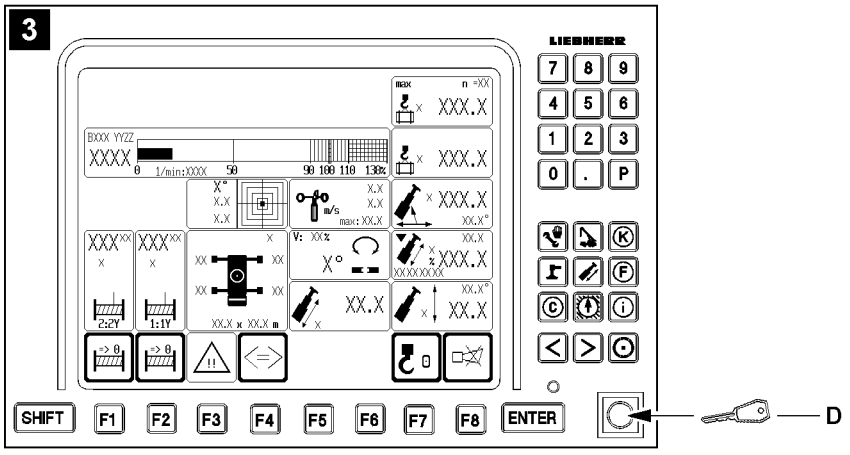
The function “exceedance of shut off limits of the LICCON overload protection” has / was shut off:

- 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.


LIEBHERR
WERK EHINGEN GMBH
D-89582 EHINGEN/DONAU
type
n°d'usine
annee de construction
Werk-Nr.
Baujahr
Type
Works No.
Year of manufacture
Manufactured in Germany
6
6.1
6.2


%
11
100%
9
11
10
r
8
7


3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D

B111226

3 Instructions for resuming crane movements for cranes without CE mark

WARNING
Risk 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!

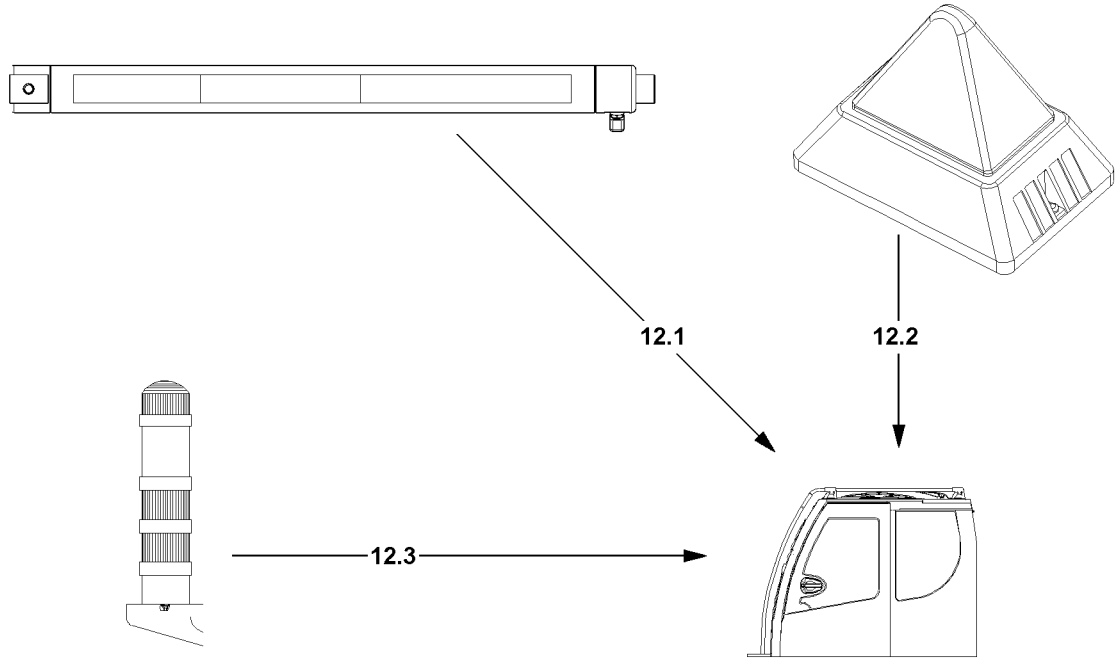
Note
- Check the data tag **6** to determine if your crane has a CE mark!
- The following section applies to a crane without CE mark, see data tag **6.2**!
- If your crane does have a CE mark, see data tag **6.1**, then you must observe the description in section “Instructions for resuming a crane movement for cranes with CE mark”!

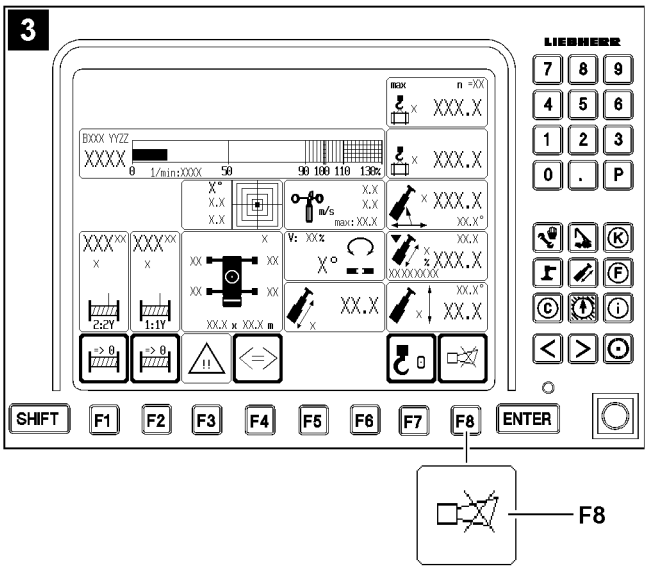
3.1 Overview load chart for cranes without CE mark

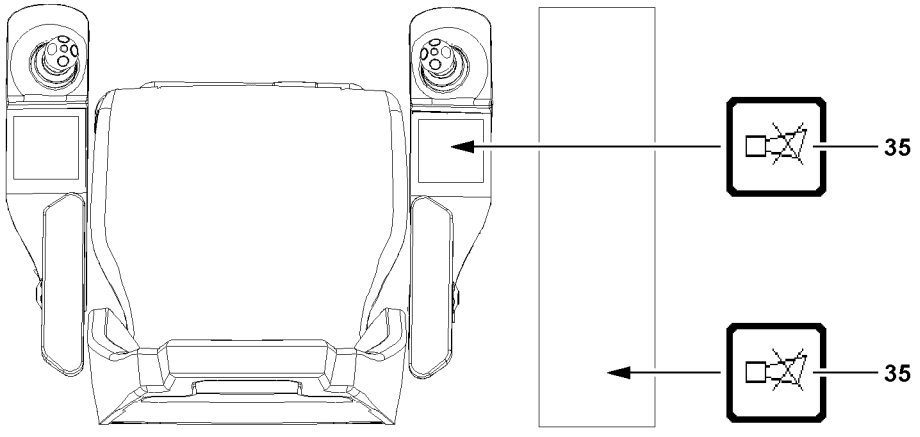
Axle	Description
r	Radius boom (Working radius)
%	Utilization of the crane in percentages

Position	Description
7	Lower limit angle
8	Upper limit angle
9	Area “Exceeding the overload protection”
10	Area “Load chart available”
11	Area “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!


12.1
12.2
12.3


3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
F8


35
35

B111218

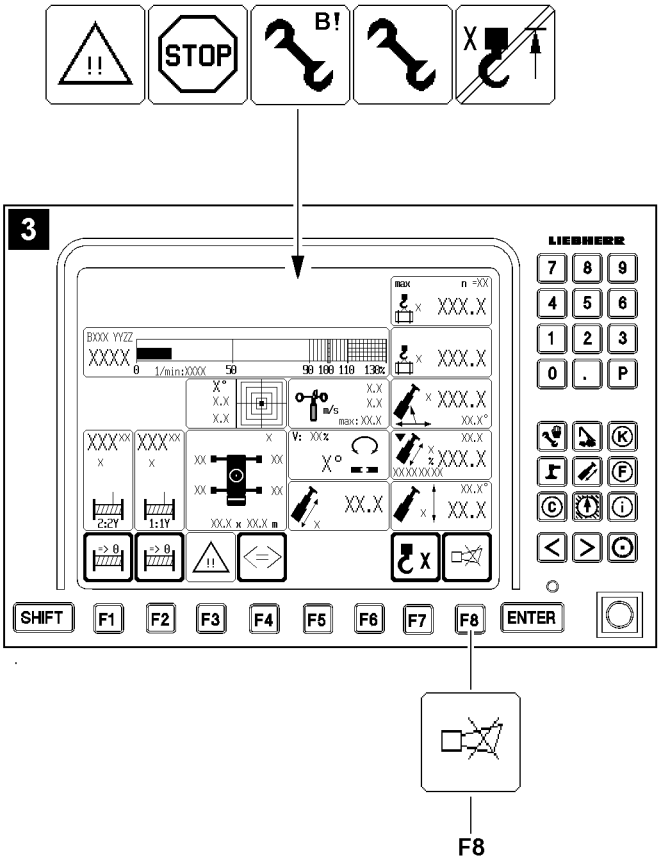
3.2 Overview of acoustic / visual warnings for cranes without CE mark

– 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 “Case number key” is 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”

Case number key	
Description Case	**Case num-ber**
Utilization of crane from 0 % to 89 %	**Case 001**
Utilization of crane from 90 % to 100 %	**Case 002**
Utilization of crane over 100 %	**Case 003**
Shut off of crane movements - LML Stop	**Case 004**
Luffing in with suspended load	**Case 005**
Participating sensor (LML) defective	**Case 006**
Exceeding the shut off limits of the LICCON overload protection	**Case 010**
Bypass of shut off hoist top	**Case 011**
Bypass of shut off boom / luffing down the attachment, “load chart available”	**Case 016**
Bypass of shut off boom / luffing down the attachment, “no load chart available”	**Case 018**
Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures, “no load chart available”	**Case 020**



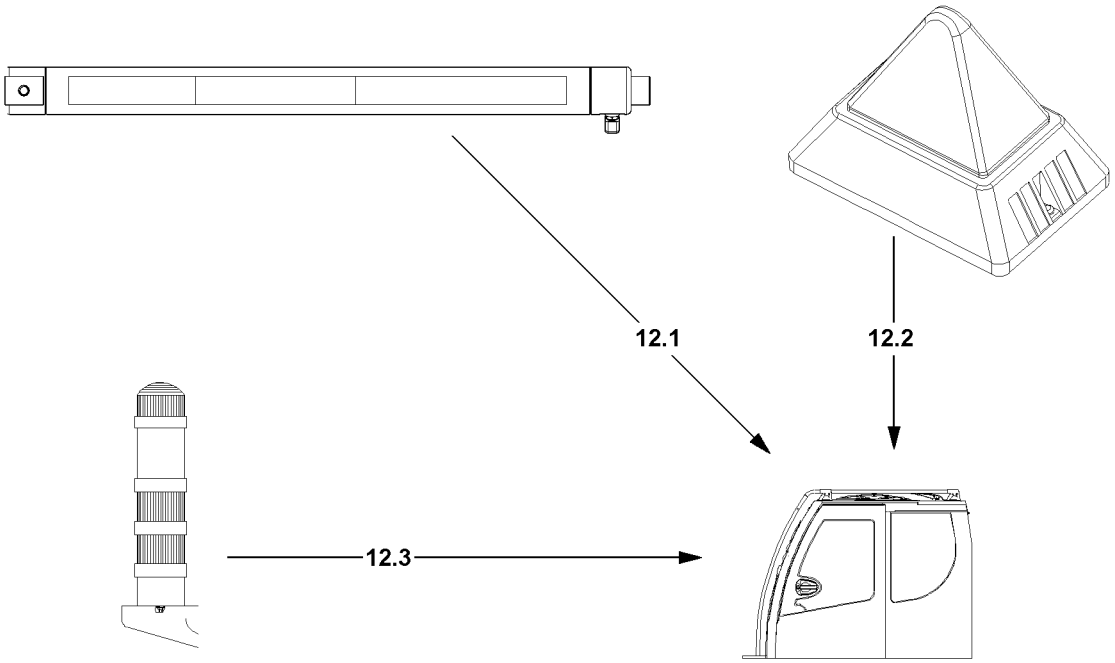
B111219

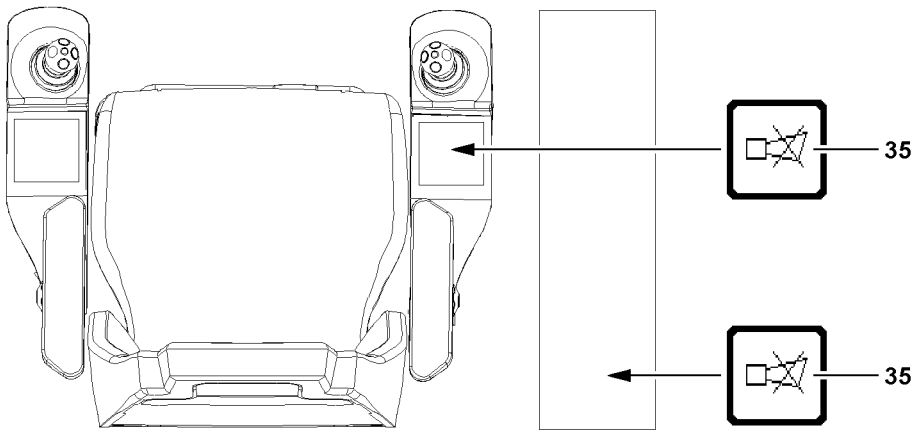
3.2.2 Acoustic / visual warnings within the crane operator's cab

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		O	
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

X[2] = can be turned off immediately on the LICCON monitor key **F8**



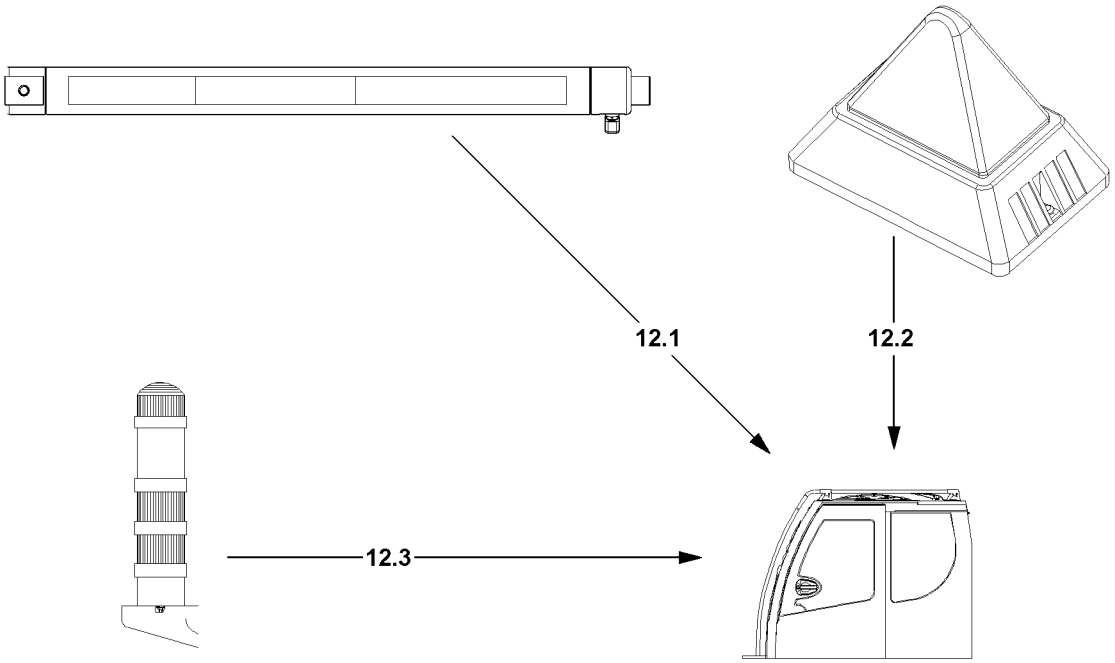


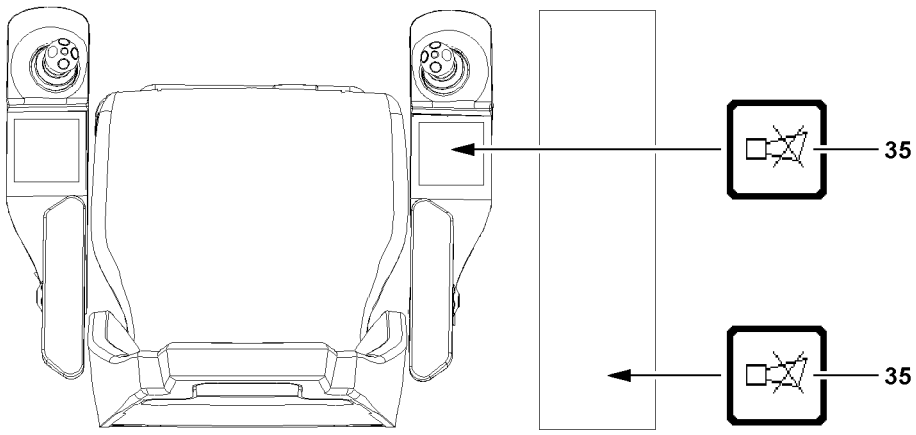
B111220

3.2.3 Acoustic / visual warnings outside the crane operator's cab

Warning light 12.1					
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**		
		Signal turntable	**Green**	**Yel-low**	**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 100 % to 110 %			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
O^1 = warning light **12.1** lights up
O^2 = warning light **12.1** blinks
X^1 = can be shut off by momentarily pressing the button **35** on the right control console or the right instrument panel, effective at the earliest after five seconds

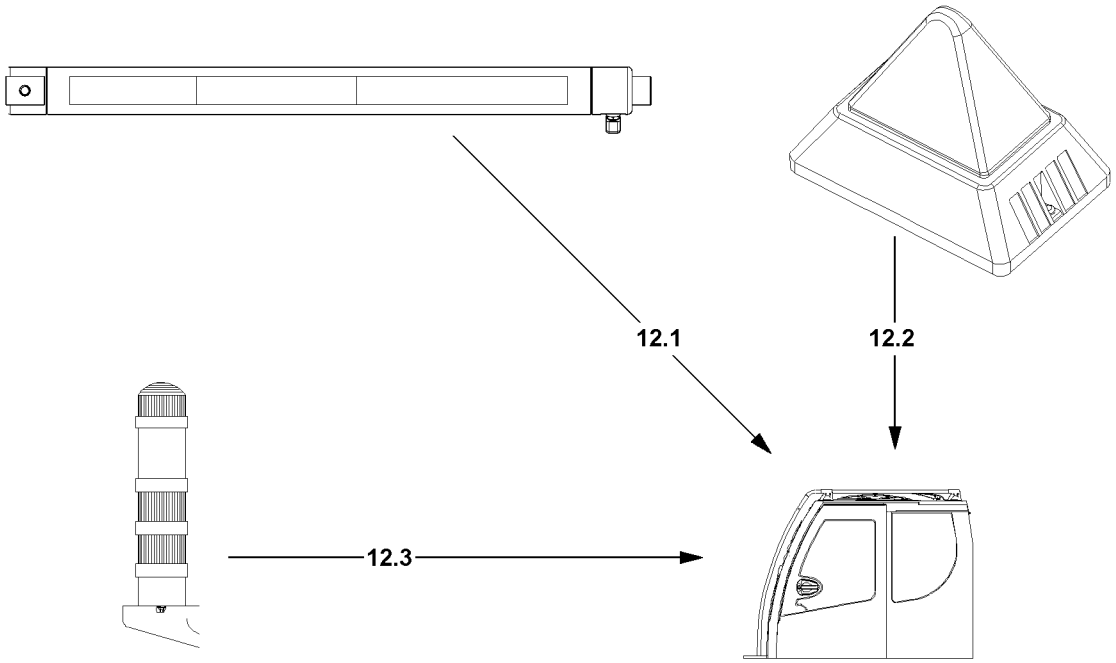


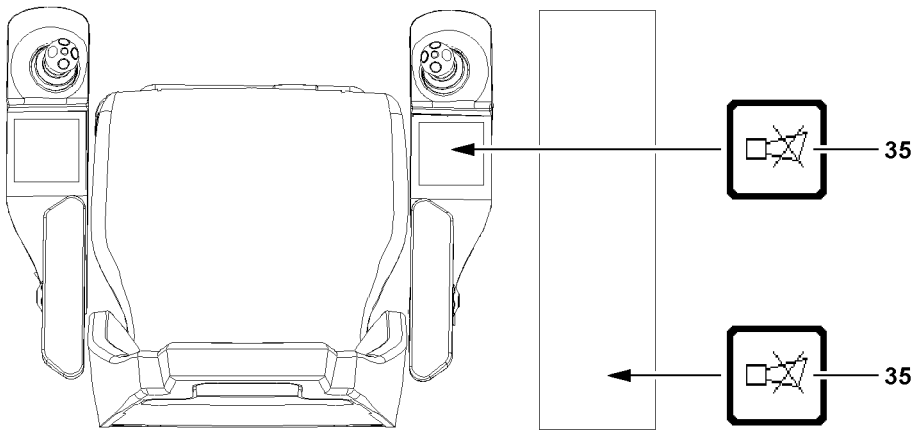


B111220

Flashing beacon 12.2			
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**
		Signal turntable	**Red**
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
O[2] = flashing beacon **12.2** blinks
X[1] = can be shut off by momentarily pressing the button **35** on the right control console or the right instrument panel, effective at the earliest after five seconds





B111220

Warning light 12.3					
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**		
		Signal turntable	**Green**	**Yel-low**	**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
O^1 = warning light **12.3** lights up
O^2 = warning light **12.3** blinks
X^1 = can be shut off by momentarily pressing the button **35** on the right control console or the right instrument panel, effective at the earliest after five seconds

B195219

3.3 Shut off 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 respective sections.

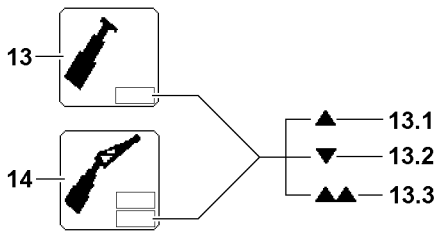
Note

- ▶ For detailed description of the individually listed icons, 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 telescopic boom up / down
- Shut off Luffing the attachment up / down
- Shut off spooling the winch up / out
- Shut off hoist top
- Shut off Telescoping the telescopic boom out (limit length)
- Shut off Telescoping the telescopic boom in (limit length)
- Shut off Crane movement with danger of tipping to the rear*
- Shut off Luffing cylinder (pressure too high)
- Shut off due to error message

3.3.1 Shut off Luffing the telescopic boom up / down



In icon **13** or icon **14** (lower field) arrow **13.1** or arrow **13.2** blink and the LICCON overload protection has shut off the crane movement.
“Luffing the telescopic boom up” (arrow **13.1**) or “Luffing the telescopic boom down” (arrow **13.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded or fallen below.
If the double arrow **13.3** appears blinking in the icon **13** or icon **14** (lower field), then the telescopic boom was luffed up to just before the block position of the luffing cylinder. The shut off “Boom steep” has shut the crane movement “Luffing the telescopic boom up” off.

The arrow **13.1** blinks and the crane movement “luffing the telescopic boom up” was turned off:

- ▶ Luff the telescopic boom down.

Result:

- Crane operation is possible again.

The arrow **13.2** blinks and the crane movement “luffing the telescopic boom down” was turned off:

- ▶ Luff the telescopic boom up.

Result:

- Crane operation is possible again.

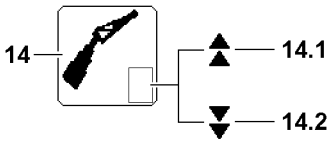
The double arrow **13.3** blinks and the crane movement “luffing the telescopic boom up” was turned off:

▶ Luff the telescopic boom down.

Result:

– Crane operation is possible again.

3.3.2 Shut off Luffing the attachment up / down



In the icon **14** (upper field) the double arrow **14.1** or double arrow **14.2** blink and the LICCON overload protection has shut off the crane movement.
“Luffing the attachment up” (double arrow **14.1**) or “Luffing the attachment down” (double arrow **14.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded or fallen below.

The double arrow **14.1** blinks and the crane movement “luffing the attachment up” was turned off:

▶ Luff the attachment down.

Result:

– Crane operation is possible again.

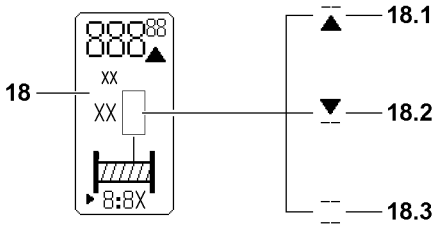
The double arrow **14.2** blinks and the crane movement “luffing the attachment down” was turned off:

▶ Luff the attachment up.

Result:

– Crane operation is possible again.

3.3.3 Shut off spooling the winch up / out



In the icon **18**, the line / arrow **18.1**, arrow / line **18.2** or line / arrow **18.3** blink and the LICCON overload protection has shut off the crane movement.
“Spooling the winch out” (line / arrow **18.1**) or “spooling the winch up” (arrow / line **18.2**) was shut off because the upper / lower limit angle of the rope for the selected winch was exceeded or fallen below.
If line / line **18.3** appears blinking in the icon **18**, then the affected winch is deactivated.

The line / arrow **18.1** blinks and the crane movement “spooling the winch out” was turned off:

▶ Spool the winch up.

Result:

– Crane operation is possible again.

The line / arrow **18.2** blinks and the crane movement “spooling the winch up” was turned off:

▶ Spool the winch out.

Result:

– Crane operation is possible again.

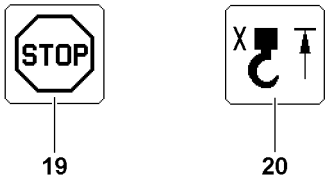
Line / line **18.3** blinks and the winch is deactivated:

▶ Activate the winch, see Crane operating instructions, chapter 4.02.

Result:

– Crane operation is possible again.

3.3.4 Shut off hoist top



The icon **19** and Hoist top icon **20** appear in the LICCON monitor and the LICCON overload protection has turned off crane movement.

Spooling the hoist winch up was turned off because the hook block or the load hook has run against a hoist limit weight during the upward movement and the affected hoist limit switch was triggered.

Note

▶ After shut off of spooling the hoist winch up (hoist top), the crane movements “telescoping the boom out”, “luffing the boom down”, “luffing the attachment down” and possibly additional movements which have an effect on the length of the hoist rope are also shut off. This should minimize the risk that the crane can be damaged due to erroneous operation.

▶ Spool the hoist winch out.

Result:

– Crane operation is possible again.

3.3.5 Shut off Telescoping the telescopic boom out (limit length)

In the “horn” icon, illustration **1** appears an error message, an acoustic signal sounds, the LICCON overload protection has interrupted the crane movement “Telescoping the telescopic boom out” and, depending on crane type, the double arrow in the icon **23** additionally blinks.

The crane movement “Telescoping the telescopic boom out” was shut off because the **limit length** of the selected load chart has been exceeded.

▶ Telescope the telescopic boom in.

Result:

– Crane operation is possible again.

3.3.6 Shut off Telescoping the telescopic boom in (limit length)

In the “horn” icon, illustration **1** appears an error message, an acoustic signal sounds, the LICCON overload protection has interrupted the crane movement “Telescoping the telescopic boom in” and, depending on crane type, the double arrow in the icon **23** additionally blinks.
The crane movement “Telescoping the telescopic boom in” was shut off because the **limit length** of the selected load chart has been fallen below.

▶ Telescope the telescopic boom out.

Result:

– Crane operation is possible again.

3.3.7 Shut off Crane movement with danger of tipping to the rear

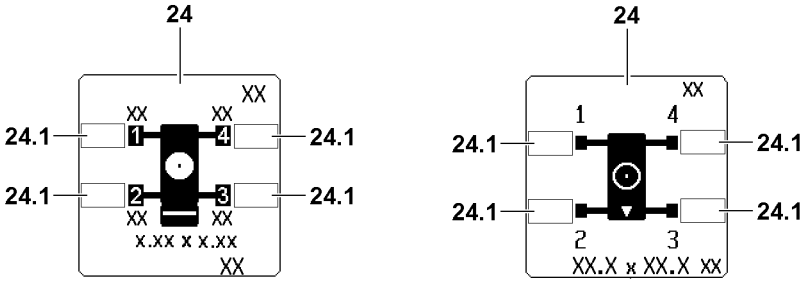
Note

▶ Applies only for cranes with support force monitoring*.

WARNING

Danger of tipping over!
When reaching the programmed minimum / maximum support force limits there is **no** automatic shut off of crane movements!
Exception: When the two supports with the lowest forces are in boom direction, then some crane movements which increase the “danger of tipping to the rear” significantly are turned off!

▶ If there is a “danger of tipping to the rear”, luff the boom down carefully until the support limit forces are again within the minimum / maximum values!



Icon **24** (depending on the crane similar as on the left or right illustration) is shown in the LICCON monitor with blinking values in both fields **24.1** of the supports with the lowest forces, an acoustic signal sounds and the LICCON overload protection has turned off the crane movement.
Crane movements which increase the “danger of tipping to the rear” significantly were turned off.

▶ Luff the boom down carefully until the support limit forces are again within the minimum / maximum values and no value in the fields **24.1** blinks any longer.

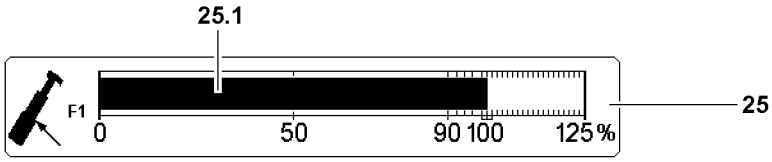
Result:

– Crane operation is possible again.

3.3.8 Shut off Luffing cylinder (pressure too high)

Note

▶ Applies only for certain crane types with respective display in the second LICCON monitor.



In the icon **25** (luffing cylinder pressure) the utilization bar **25.1** reaches the 100% mark and the LICCON overload protection has shut off the crane movement.
All further movements, which directly lead to an increase of the luffing cylinder pressure are shut off.

▶ Lower the luffing cylinder pressure by lowering the load.

or

■ Initiate an alternative crane movement, which lowers the luffing cylinder pressure.

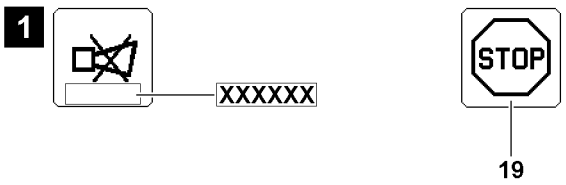
Result:

– Crane operation is possible again.

In assembly operation:
Make sure that the specifications in the erection / take down charts are observed.

▶ Lower the luffing cylinder pressure by reducing the load, for example by getting support from an auxiliary crane.

3.3.9 Shut off due to error message



An error message appears in the “horn” icon, illustration **1**, the icon **19** appears in the LICCON monitor and the LICCON overload protection has turned the crane movement off.

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!

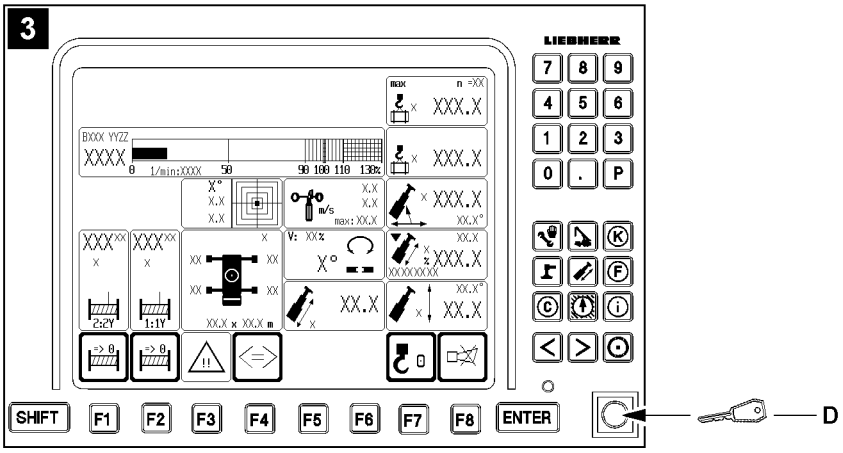
▶ If there is a defect on a participating sensor (LML), then the crane may not be operated further!
▶ Fix / replace the sensor before starting crane operation again!

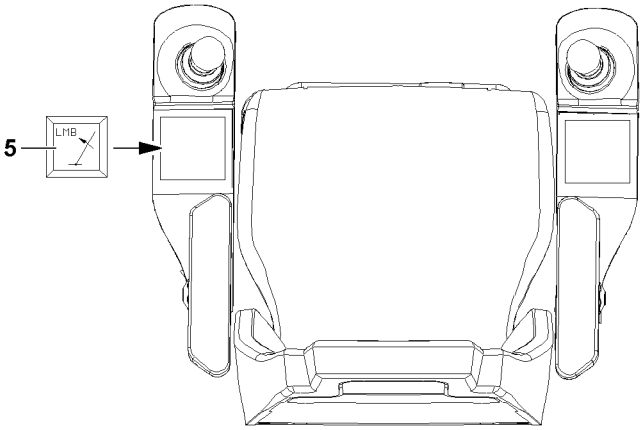
▶ Determine existing errors with the LICCON error code from the field in illustration **1**, see Diagnostics manual.
▶ Remedy the error.

Troubleshooting
The erection of the crane, for example after assembly on a new job site or with another equipment configuration, is not possible due to an error message?

▶ As the first step, make sure that all electrical connections have been made.
▶ Check if all sensors or dummy plugs with integrated electric have been connected properly.

▶ If the error cannot be remedied:
Contact LIEBHERR Service.





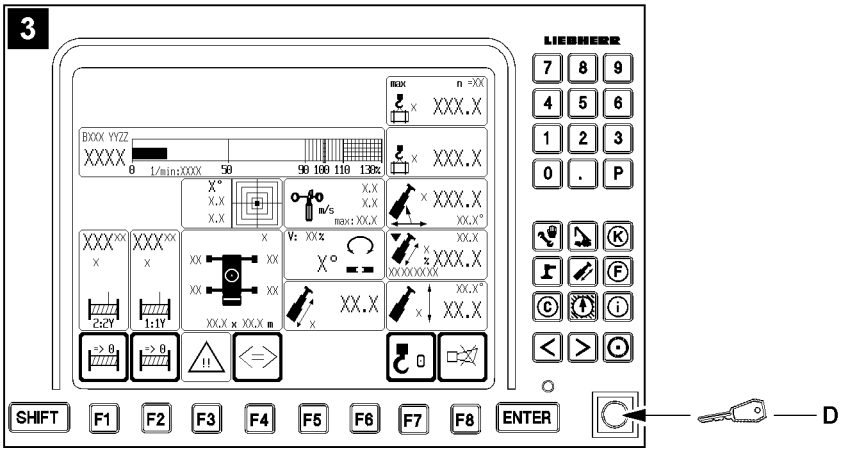
B111221

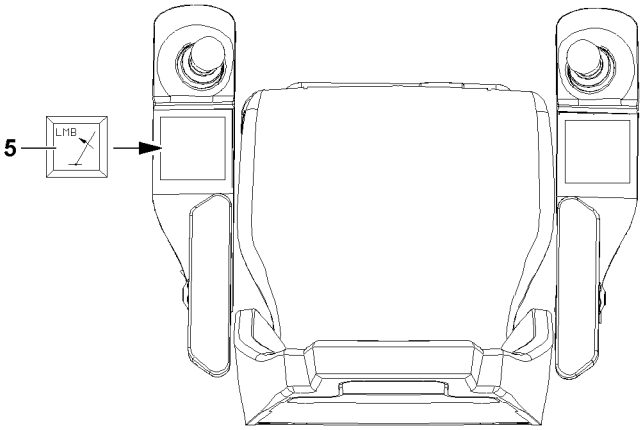
3.4 Shut off of crane movement: LML-STOP by LICCON overload protection

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 “Exceedance of shut off limits of the LICCON overload protection” is only permissible in emergencies and for assembly purposes!
- ▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the function “exceedance of shut off limits of the LICCON overload protection”!
- ▶ The function “Exceedance of shut off limits of the LICCON overload protection” requires the presence of an authorized person and must be performed with utmost caution!
- ▶ Crane operation with activated function “Exceedance of shut off limits of the LICCON overload protection” is prohibited!

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!





B111221

WARNING

Failure of hoist gear!

If a load is lifted by luffing the boom up, after the hoist gear has been shut off by the load moment limiter when trying to lift the load, then the hoist gear can be overloaded and fail!

This could result in serious accidents!

Personnel can be severely injured or killed!

▶ Actuate the button **5** “luffing in with suspended load” only if the LICCON overload protection reports no overload on the hoist gear with freely suspended load, the load is not reduced by luffing up and the minimum radius is not fallen below!

There are two possibilities to exceed the shut off limits of the LICCON overload protection after LML-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**

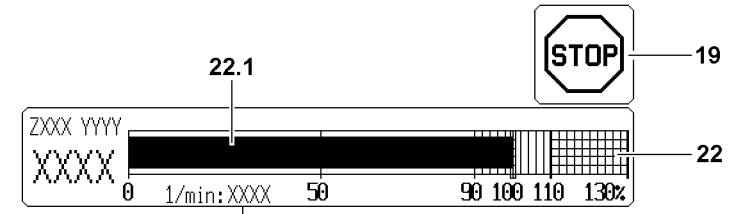
NOTICE

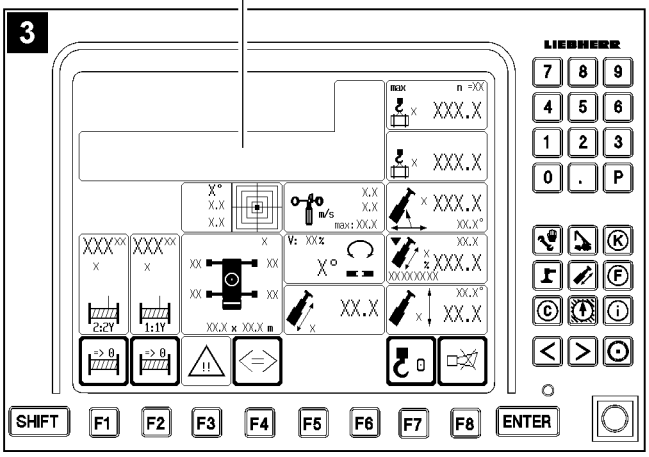
Danger of mix up!

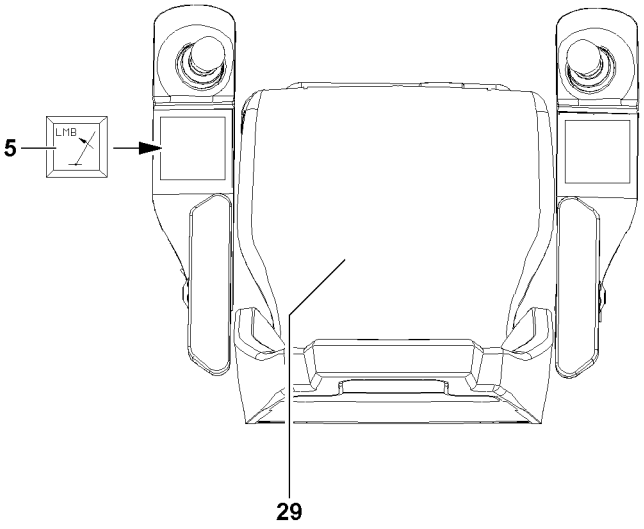
The function “Exceedance of shut off limits of LICCON overload protection” can only be activated with the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**!

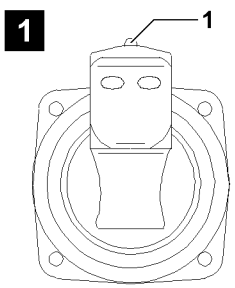
The key switches on the other monitors are not assigned with this function!

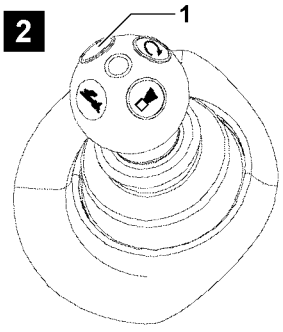
▶ Do not mix up the set up key **D** with the other key switches!
▶ In case of mix up: Deactivate the activated function!


STOP
19
22.1
ZXXX YYYY
XXXX
22
0
1/min:XXXX
50
90 100 110 130%


3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


5
29


1
1


2
1

B111222

3.4.1 Luffing in with suspended load

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment.
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 prerequisites are met:
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.

Note
▶ If the load is reduced by luffing up, then the button **5** “luffing in with suspended load” is 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.

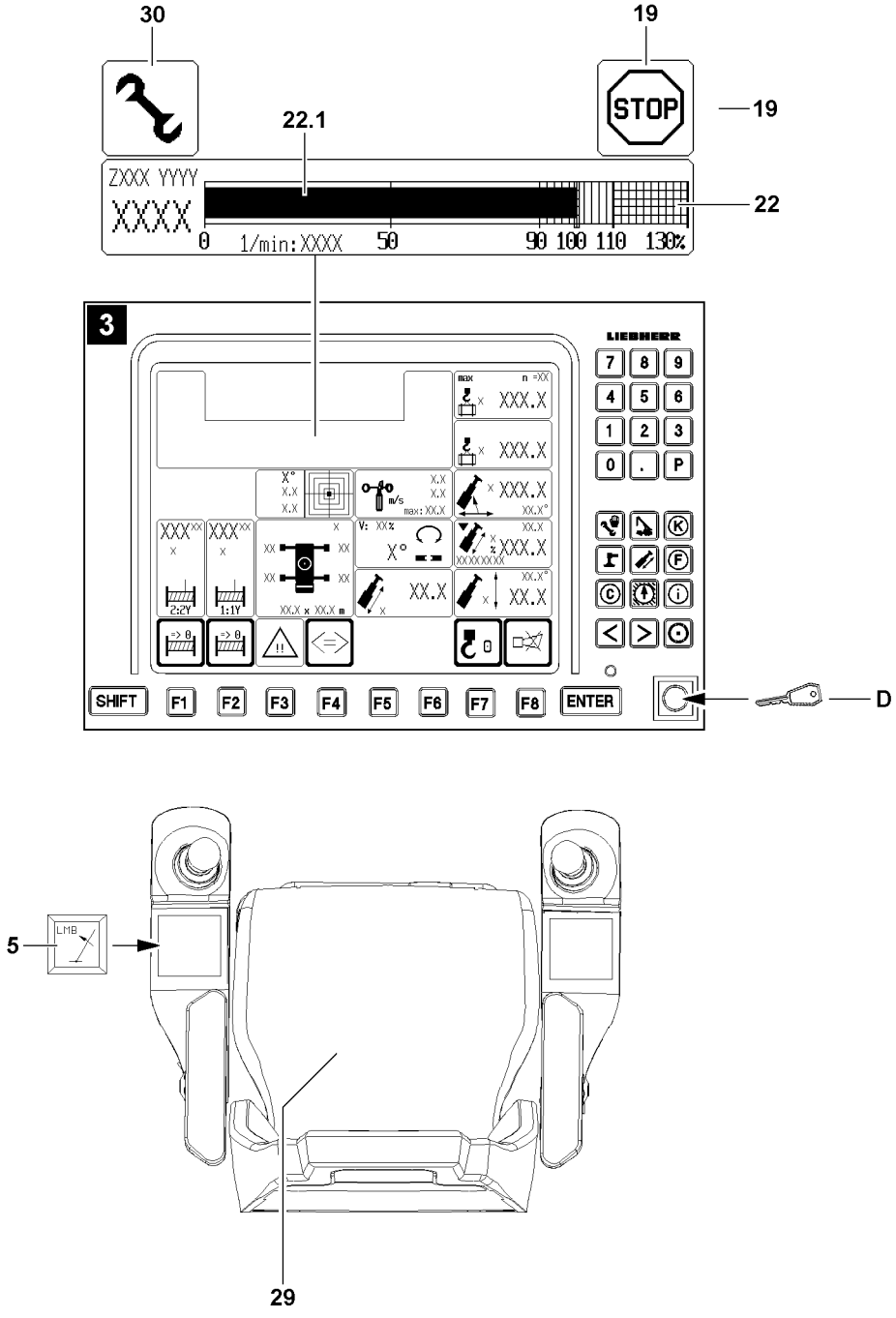
▶ Luff the load in.

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 also deactivated:
– When the function key **5** “luffing in with suspended load” is not longer actuated
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If the standby mode on the LICCON monitor is active
– 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.


30
19
STOP
19
22.1
22
ZXXX YYYY
XXXX
0
1/min:XXXX
50
90 100 110 130%
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D
5
LMB
29
1
1
2
1

B111223

3.4.2 Exceedance of the maximum permissible load moment

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment.
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 configuration button **D** in the “right touching” position.

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 pressed): Crane is in normal operation.
– Position to right (touching): The maximum permissible load moment (100%) can be exceeded, the assembly icon **30** in the LICCON monitor blinks.

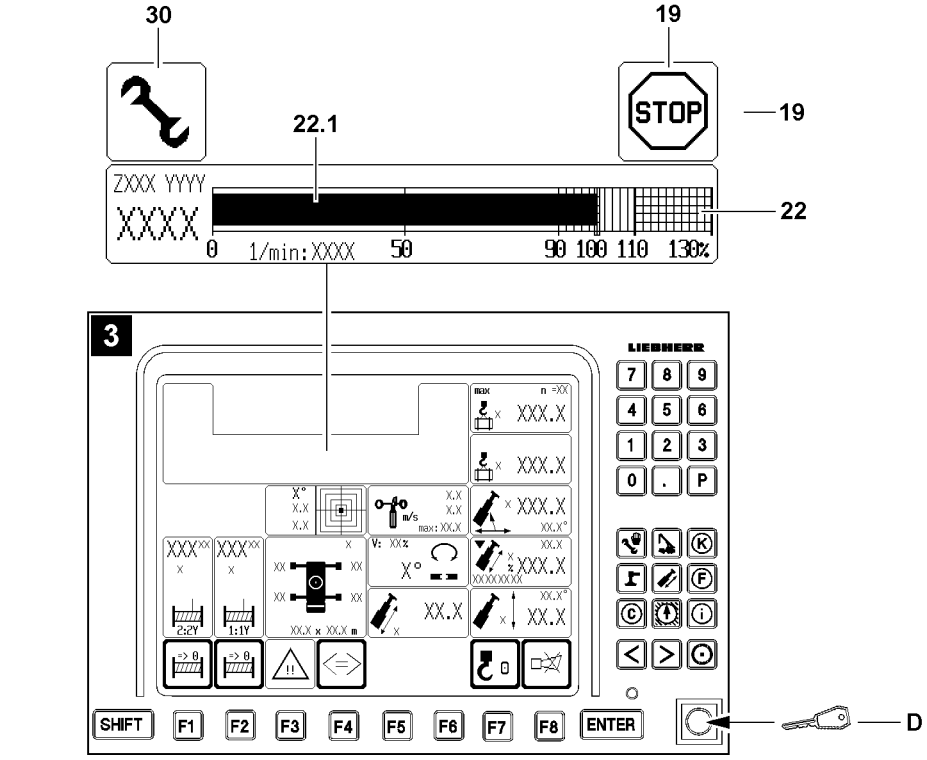
Make sure that the following prerequisites are met:
– With the button **5** “Luffing in with suspended load” no normal operating condition (utilization below 100% and no active shut off) can be reached.
– The master switches and the set up key **D** are **not** actuated.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
– Radio operation* is not active.
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.

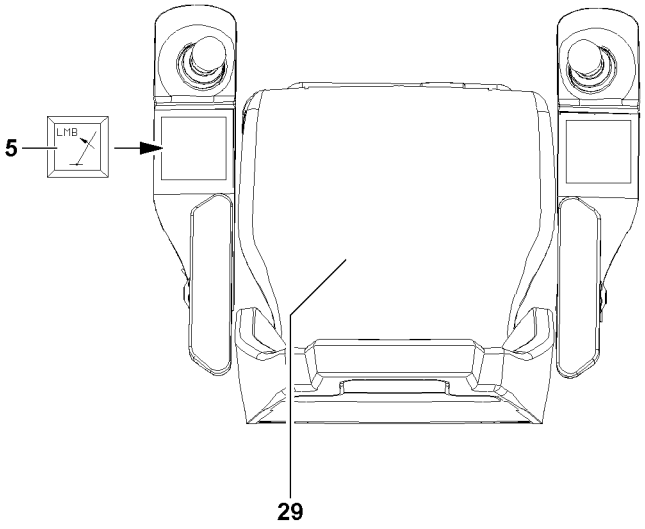
▶ Turn the set up key **D** to the right (touching).

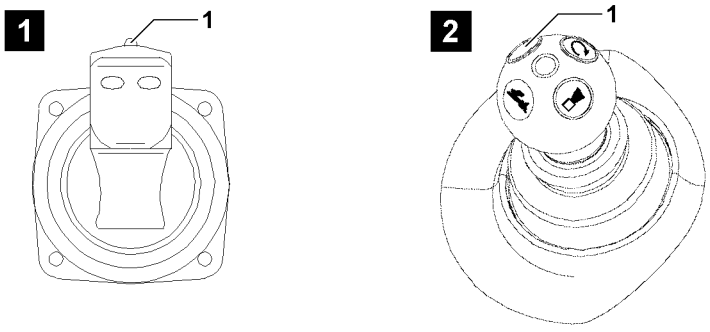
Result:
– The LICCON overload protection is inactive.
– The assembly icon **30** in the LICCON monitor blinks.

Troubleshooting

When it is not possible to exceed the maximum permissible load moment by actuating the set up key **D**?
▶ Contact LIEBHERR Service.


30
19
STOP
19
22.1
22
ZXXX YYYY
XXXX
0
1/min:XXXX
50
90 100 110 130%
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


5
LMB
29


1
1
2
1

B111223

▶ 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:

– If the set up key **D** is pressed again
– If all master switches are in neutral position for 10 seconds (with load chart available)
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If the standby mode on the LICCON monitor is active
– If radio operation* is activated
– At engine stop
– During shut off transition hoist top clear / not clear
– During transition boom not steep / steep
– During transition lower limit angle clear / not clear
– During transition upper limit angle clear / not clear
– When the maximum value Test point 1 (value F1) is reached

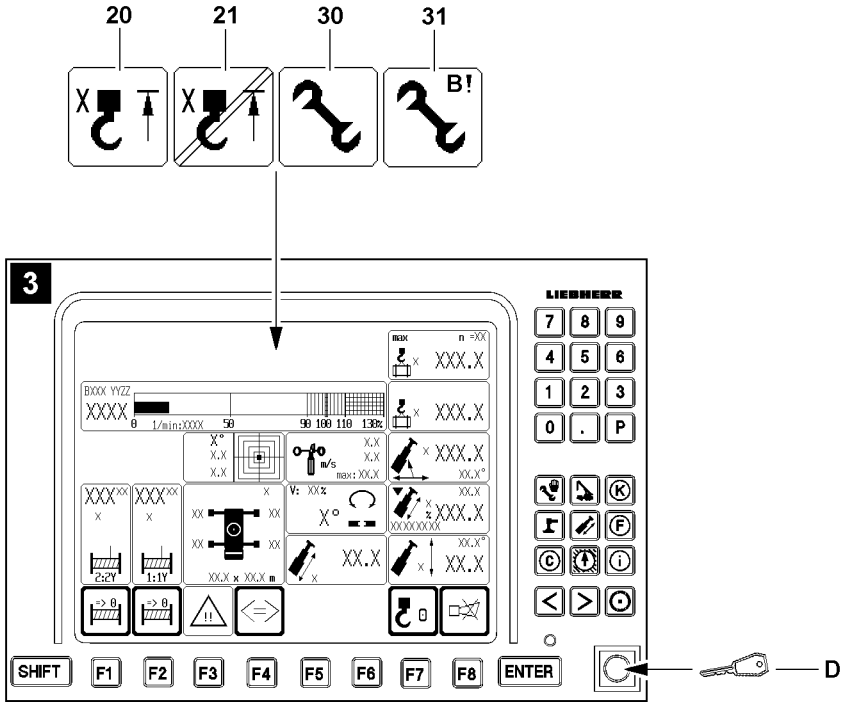
Note

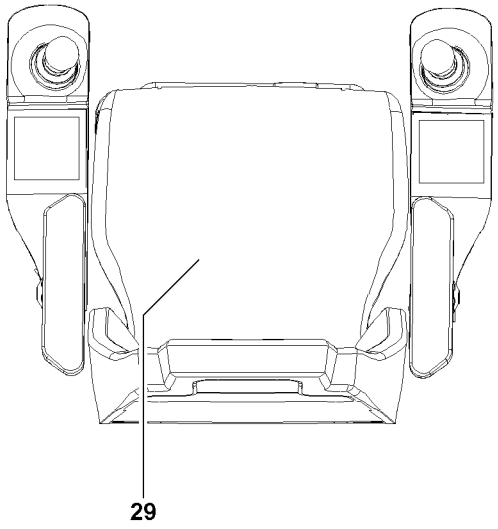
▶ The function “exceedance of shut off limits of the LICCON overload protection” is only turned off when the assembly icon **30** in the LICCON monitor turns off.
▶ If the function “exceedance of shut off limits of the LICCON overload protection” does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

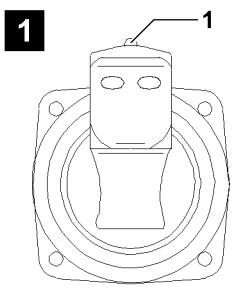
The exceedance of the shut off limits of the LICCON overload protection has / was shut off:

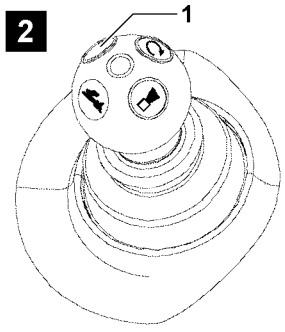
– The assembly icon **30** in the LICCON monitor turns off.

▶ 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.


20
21
30
31
B!
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


29


1
1


2
1

B111224

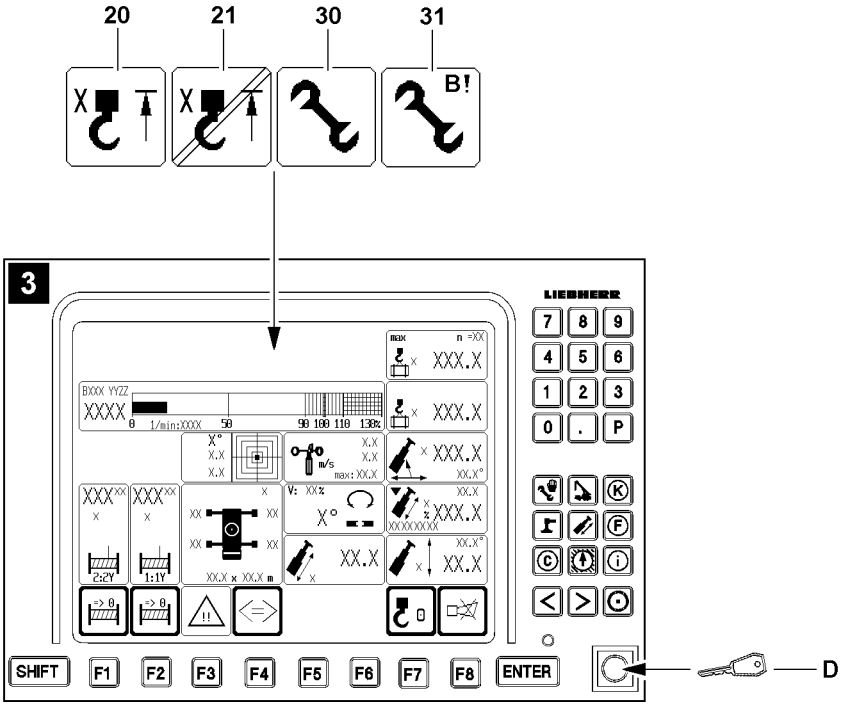
3.5 Bypass of the hoist top shut off

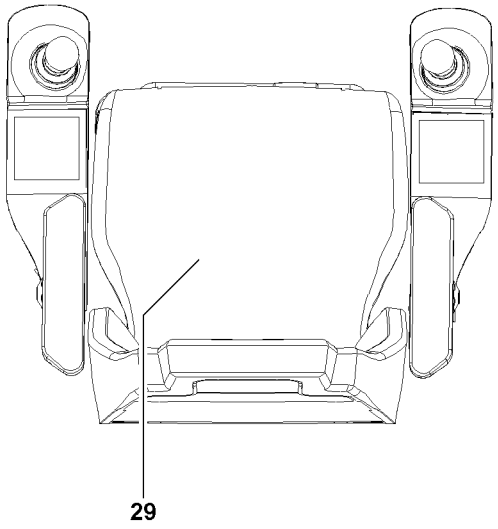
WARNING
Improper use of the function “bypass of hoist top shut off”!
- ▶ The function “bypass of hoist top shut off” may never be used to increase the lifting height during crane operation!

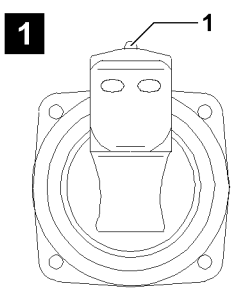
WARNING
Property damage and falling load!
If the function “bypass of hoist top shut off” is activated, there is the danger that the hook block or the load hook is pulled against the pulley head!
This danger exists especially when the hoist winch is continued to be spooled up and for crane movements which have an influence on the hoist rope, for example telescoping or luffing the boom, the attachment 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!

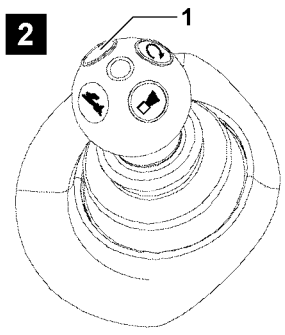
Note
- ▶ The activation of the function “bypass of hoist top shut off” is only possible if the hoist limit switch was touched and the hoist top shut off has occurred.
- ▶ If the hoist limit switch is triggered when the set up key **D** is actuated (function “exceedance of shut off limits of the LICCON overload protection” is active, the assembly icon **30** or the assembly icon **31** blink), 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 are actuated.
- – The master switches are **not** deflected.
- – The crane engine is running.
- – The radio operation* is not active.
- – The standby mode on the LICCON monitor is not active.


20
21
30
31
B!
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


29


1
1


2
1

B111224

▶ Turn the set up key **D** to the right (touching).

Result:

– The assembly icon **30** or the assembly icon **31** (assembly operation) in the LICCON monitor blink.
– The Hoist top icon **20** in the LICCON monitor changes to the icon **21**.
– All hoist limit switches are bypassed (also two hook operation).

▶ Carry out a crane movement with bypassed hoist limit switches with upmost caution and by taking the safety guidelines into account.

The function “bypass of the hoist top shut off” turns off:

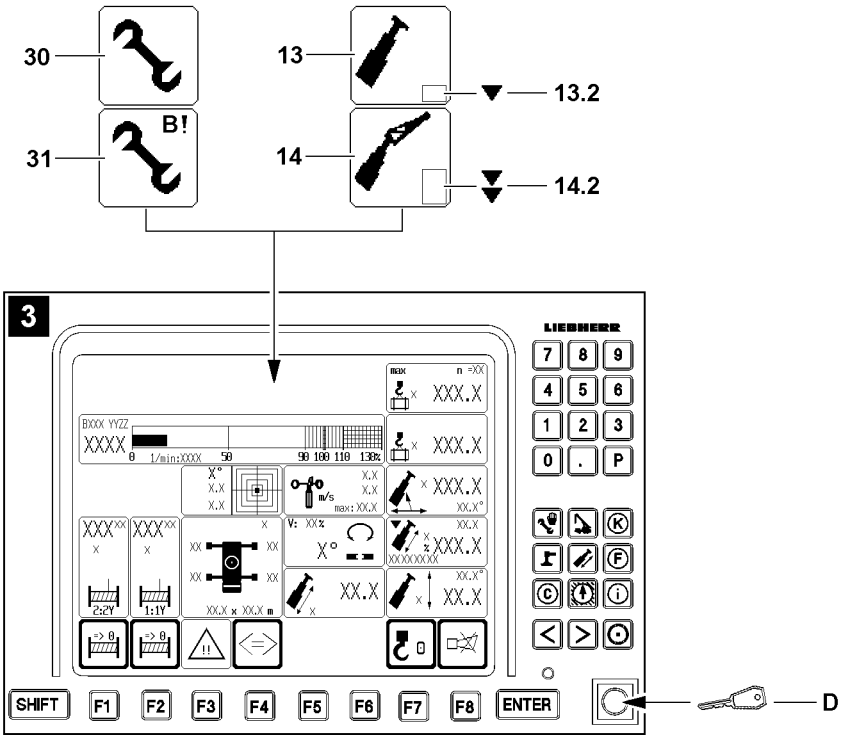
– if the set up key **D** is pressed again
– When no master switch is deflected for 10 seconds
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If there is no longer a shut off of a hoist limit switch
– If the stand by mode on the LICCON monitor is active
– 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.


30
31
B!
13
13.2
14
14.2
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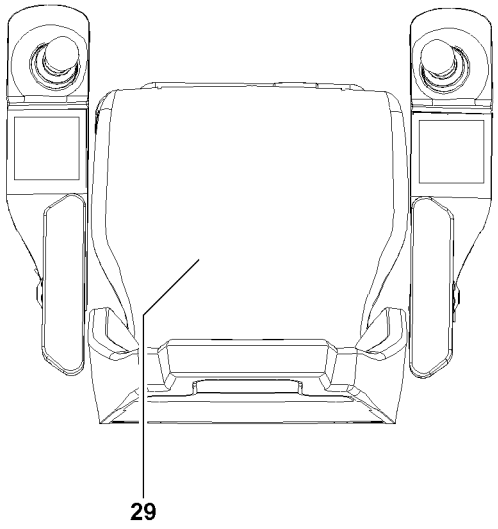
D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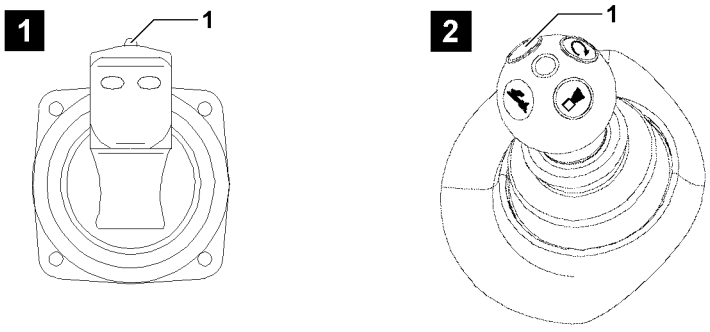
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B111233

3.6 Bypass of shut off luffing the telescopic boom / attachment down

WARNING
Increased danger of accidents due to bypass of shut off luffing the telescopic boom / attachment down!
When the shut off luffing the telescopic boom / attachment down is bypassed, then the LICCON overload protection as a whole is deactivated or limited.
When the shut off luffing the telescopic boom / attachment down is bypassed and the telescopic boom and / or the attachment is further luffed down, then there is no load chart available any longer!
Crane operation with bypassed shut off luffing the telescopic boom / attachment down is prohibited, since severe accidents can result!
Personnel can be severely injured or killed!
- ▶ Activate the bypass of the shut off luffing the telescopic boom / attachment 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 icon **13** or icon **14** the arrow **13.2** or double arrow **14.2** blink 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 are actuated.
- – The master switches are **not** deflected.
- – The crane engine is running.
- – The radio operation* is not active.
- – The standby mode on the LICCON monitor is not active.

▶ Turn the set up key **D** to the right (touching).

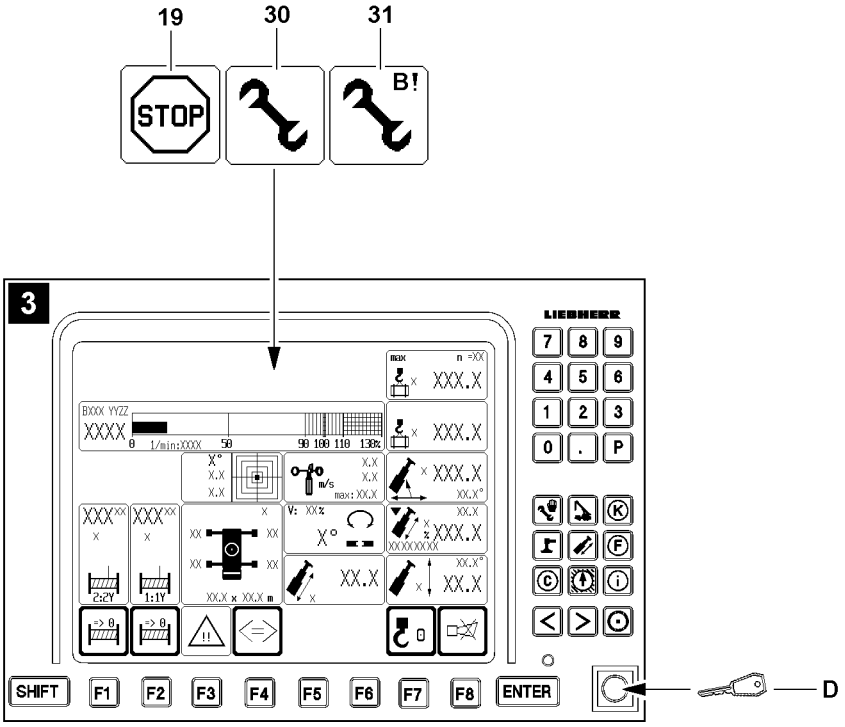
Result:
- – The assembly icon **30** in the LICCON monitor blinks.
- – The function “exceedance of shut off limits of the LICCON overload protection” is activated and has bypassed the shut off luffing the telescopic boom / attachment down.

Note
▶ When leaving the area “load chart available”, the assembly icon **30** turns off and the assembly icon **31** appears.

The bypass of the shut off luffing the telescopic boom / attachment down turns off:
- – if the set up key **D** is pressed again
- – When no master switch is deflected for 10 seconds
- – When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
- – When an area with existing load chart is reached
- – If the stand by mode on the LICCON monitor is active
- – If the radio operation* is active
- – At engine stop

The bypass of the shut off luffing the telescopic boom / attachment 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.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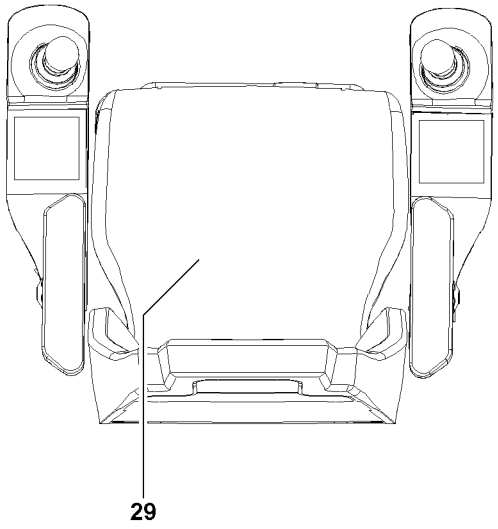
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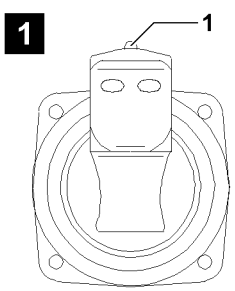
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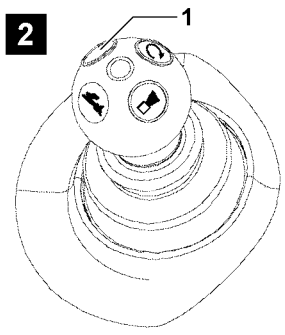
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3.7 Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures (assembly operation)

Note

- ▶ If the crane is in the area “no load chart available”, there is a shut off of crane operation by the LICCON overload protection and 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!

Make sure that the following prerequisites are met:

– The master switches and the set up key **D** are **not** actuated.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
– Radio operation* is not active.
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– The erection / take down charts are adhered to.
– The configuration status has been entered correctly into the LICCON computer system.

▶ Turn the set up key **D** to the right (touching).

Result:

– The assembly icon **30** appears in the area “load chart available”.
– The assembly icon **31** appears in the area “no load chart available”.
– The erection / take down procedures can be carried out.

The exceedance of the shut off limits of LICCON overload protection turns off:

– if the set up key **D** is pressed again
– When all master switches are for 10 seconds after actuation of the set up key **D** in neutral position (with “load chart available”)
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– At engine stop
– When an area with existing load chart is reached (erection procedure)

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.

5.00 Equipment

B195219

1 Checking the retaining elements

Retaining elements are used to secure the pins. Due to mechanical damage / distortion, the function of the retaining elements can be compromised. In addition, the spring force of the retaining elements can be reduced significantly. Do not re-use retaining elements if there is insufficient spring force. The pin retainer must be secured with a correctly **functioning** retaining element.

WARNING
Failure of retaining element!
If the spring force of the retaining element is not sufficient or in case of mechanical damage / distortion, the retaining element can fail!
If the correct retention of the pin is no longer ensured, then the pin can unpin by itself! Accidents with bodily injuries / property damage can result!
▶ Use exclusively **functioning** retaining elements in proper condition.

2 Rope pulleys

WARNING
Danger of crushing due to rotating rope pulleys!
Arms and legs can be caught and crushed or severed between the rope pulley and the rope due to rotating rope pulleys!
▶ It is prohibited to touch the ropes or rope pulleys during operation!
▶ Adhere to the safety distance to ropes and rotating rope pulleys!

3 Checking the ropes

WARNING
Danger of accident!
▶ The ropes must be checked by an expert before assembly and checks must be performed at regular intervals in order to detect possible damage or wear and tear at an early stage. See Crane operating instructions, chapter 8.04.

The ropes must be removed immediately if any of the following damage is detected:
– Breakage of a strand
– Wire breaks
– Broken wire nests
– Reduction in the rope diameter by 10 % or more of the nominal size
– Rope deformations

3.1 Placing the hoist / control ropes

In order to guarantee safety and operating characteristics, only original Liebherr replacement parts or parts approved by Liebherr may be used.

NOTICE
Damage of hoist / control rope!
If a hoist / control rope is placed with worn rope pulleys, damage can occur!
▶ The rope pulleys must be checked before placing a rope. See Crane operating instructions, chapter 8.01!
▶ Replace worn or damaged rope pulleys!

NOTICE
If the following notes are not observed, the cam limit switch / winch turn sensor must be readjusted.
- When the hoist rope is spooled up, the end of the hoist rope must remain in front of the winch and may not be pulled over the winch.
- Never pull the hoist rope ends under the winch by spooling the winch up!
- Never pull the hoist rope off from the “stationary” winch.
- The winch turn sensor must also be readjusted, if it is determined during operation or when changing the hoist rope that the winch does not turn off when the minimum rope coils are reached.

3.1.1 Cranes with cam limit switch

The cam limit switch is adjusted at the factory that it turns off before the minimum rope coils are reached (three hoist rope coils on the winch).

WARNING
Risk of accident due to falling load!
If the following instructions are not observed, the hoist rope end attachment may be torn out causing the load to topple.
- If a new hoist rope is used, the cam limit switch must be reset!
- The cam limit switch must be adjusted so that it turns off when only 3 hoist rope coils remain on the winch!

3.1.2 Cranes with winch turn sensor

The winch turn sensor is adjusted at the factory that it turns off before the minimum rope coils are reached (four hoist rope coils on the winch). If used properly, the winch turn sensor will not need readjustment.

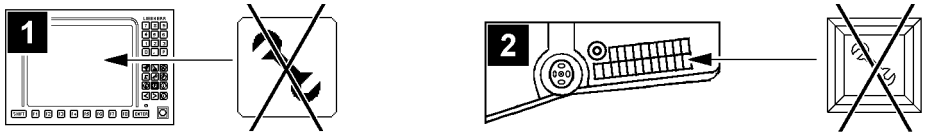
WARNING
Risk of accident due to falling load!
If the following instructions are not observed, the hoist rope end attachment may be torn out causing the load to topple.
- If a new hoist rope is placed, the winch turn sensor must be checked!
- The winch turn sensor must be set to turn off when only 4 hoist rope coils remain on the winch!

4 Control measures

WARNING
The crane can topple over!
If the control measures are not carried out before crane operation, then accidents can occur. The crane can be overloaded, topple over or be damaged!
Personnel can be killed or injured!
- Crane operation with safety devices which are **not** functioning correctly is strictly prohibited!
- Start crane operation only after all safety devices have been checked and are functioning correctly!
- Start crane operation only if the overload protection has been set according to the data in the load chart!
- Start crane operation only if the crane is properly supported and horizontally aligned!

WARNING
Interruption of crane operation!
If the following specifications for interruption of crane operation are not observed, accidents can occur.

- ▶ If the crane operator leaves the crane cab even if for just a short time, the crane must be secured to prevent unauthorized access.
- ▶ Before starting to work again with the crane, the crane operator is obligated to check the operating mode settings and to reset them, if necessary.



Make sure that the following prerequisites are met:
– The overload protection is not bypassed.
– No assembly operation is activated.
– Crane operation can be carried out with minimum boom radius.

4.1 General control measures before crane operation

– Make sure that no visible damage is visible on the crane.
– Make sure that there are no loose parts on the boom, crane chassis and crane superstructure.
– Make sure that the cable / rope drum and the limit switches are free of snow and ice.
– Make sure that the gear ring of the rotary connection is clean and greased.
– Make sure that the air supply to the oil and water cooler is clear.
– Make sure that the step, ladders and pedestals are in the correct position for crane operation.
– Make sure that all tool boxes, compartments, coverings, covers and cabinet doors are closed.
– Make sure that no persons or objects are within the danger zone of the crane.
– Make sure that the crane is standing on level, load bearing ground.
– Make sure that the crane is sufficiently supported depending on the load case and the ground conditions.
– Make sure that there is sufficient distance to excavations and slopes.
– Make sure that no obstacles are within the working range of the crane, which obstruct the required crane movements.
– Make sure that the crane has sufficient distance to live power lines.
– Make sure that the LICCON overload protection is set according to the data in the load chart.
– Make sure that the overload protection is set according to the actual set up configuration of the crane.
– Make sure that the electrical connections, the connector plug, the pull release, the cables and the protective insulation function. Replace missing or defective parts.
– Make sure that the cable routings on the electrical connections are seated tightly. If necessary, tighten loose screw connections.
– Make sure that the existing safety devices are functioning.
– Make sure that the overload protection is functioning.
– Make sure that the hoist limit switches are functioning.
– Make sure that the limit switch boom “steepest position” is functioning.
– Make sure that the wind speed sensor easily moves and is functioning.

4.2 Additional controls for cranes with crane support

– Make sure that the folding / sliding beams are secured with pins to prevent them from sliding.
– Make sure that the support plates are secured in the operating position.
– Make sure that the crane is properly supported.
– Make sure that the crane is horizontally aligned.
– Make sure that the axle suspension is blocked (mobile crane).
– Make sure that the tires have no contact to the ground (mobile crane).
– Make sure that the track chains are secured to prevent them from sagging (crawler crane).

4.3 Additional controls for freestanding crane operation (on tires)

– Make sure that all prerequisites for freestanding crane operation are met.
– Make sure that sufficient tire pressure is in all tires for crane operation on tires.
– Make sure that the ground is sufficiently level for crane operation on tires.

4.4 Additional controls for cranes with derrick boom

– Make sure that the shut off via the limit switch - derrick is functioning.
– Make sure that the entire swing range of the suspended ballast / ballast trailer is free of personnel and obstacles.

4.5 Additional controls for cranes with luffing auxiliary boom / accessories

– Make sure that the shut off via the limit switch luffing auxiliary boom / accessories “steepest position” is functioning.
– Make sure that the shut off via the limit switch luffing auxiliary boom / accessories “lowest position” is functioning.
– Make sure that the shut off via the limit switch flap in “steepest position” position is functioning.
– Make sure that the pendulum of the mechanical relapse retainer moves easily over the entire swing range and is functioning.

4.6 Additional controls for certain crawler cranes

For existing crawler assembly key button:
– Make sure that the crawler assembly key button is turned off.

5 Dangerous conditions without shut off

5.1 Block position of relapse cylinders when setting down the load

NOTICE
Damage to boom or relapse cylinder!
If the block position of the relapse cylinders is triggered by the boom or the derrick with attached, freely suspended load, then there is a danger of damaging the boom or the relapse cylinders when setting down the load onto the ground! By setting down the load, the crane is relieved, which causes the boom system to move to the rear.
There is no shut off of the hoist gear down function!
▶ Actuate the opposite direction of movement which caused the block position and eliminate the block position!

6 Transporting components

WARNING
Danger of accident!
- If any components are transported on an auxiliary vehicle, then they must be properly secured. If necessary, transport these components on supports or using a special transport device.

6.1 Transporting lattice sections

WARNING
Danger of accident!
- If the lattice sections are pushed into each other for transport, the lattice sections must be safely rigged on the transport vehicle and secured on at least two independent points.

7 Pneumatic springs for assembly support of components

Pneumatic springs are installed on various crane components to simplify the installation of these components.

WARNING
Danger of crushing!
Defective pneumatic springs no longer provide the supporting properties on the movable components!
Due to falling components, personnel can be killed or severely injured!
High risk of accident!
- Always check pneumatic springs for damage before actuating the corresponding components!
- Do not use components with defective pneumatic springs! Replace defective pneumatic springs immediately!
- Make sure that no persons or objects are in the movement range of the moving components which is supported by the pneumatic spring!
- It is strictly prohibited to remain or place any objects in the movement or other danger zone of the moving crane components which are supported by the pneumatic spring!

8 Manual rope winches for assembly support of components

Manual rope winches are installed on various components to simplify the installation or removal of these components.

WARNING
Danger of crushing!
Defective manual rope winches no longer provide the supporting action on the movable components!
Due to falling components, personnel can be killed or severely injured!
High risk of accident!
- Always check manual rope winches for external and functional damage before actuating the respective components!

- ▶ Check the rope of the manual rope winch for damage!
- ▶ At least two rope coils must always remain on the rope drum!
- ▶ Do not use components with defective manual rope winches! Replace defective manual rope winches!
- ▶ It is strictly prohibited for personnel or objects to remain within the movement range of the components, which are supported by the manual rope winch!
- ▶ It is prohibited for personnel or objects to remain within the danger zone of the moveable components!

9 Weights

Note

- ▶ The weight of each component is specified in the chapter 1.03 or the respective chapter in the Crane operating instructions or is stated on the tag attached to the corresponding component!
- ▶ If components are pushed into one another (for example intermediate sections) or folded together (for example the folding jib), then the total weight is given by the sum of the individual components!

NOTICE

False estimation of weights

- ▶ Contact the Service department at **Liebherr-Werk Ehingen GmbH** if the weight of the respective component is not stated on the tag or in the Crane operating instructions!
- ▶ Use an auxiliary crane with sufficient load carrying capacity including judicious reserve!

10 Guy rods

WARNING

Boom can break off!

The arrangement of the guy rods for the boom or boom systems is stipulated in the rod plan! If the arrangement of the guy rods according to the rod plan is not observed, the crane can collapse, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Always carry out the arrangement of the guy rods according to the rod plan!
- ▶ If an auxiliary guying is required for a certain boom length, then it must always be installed according to the rod plan on the position defined in the rod plan!

WARNING

Unutilized guy rods on boom!

If guy rods are on the lattice sections which are not used for operation, then there is a risk of accidents!

Unused guy rods can loosen up and fall down!

Personnel can be severely injured or killed!

The load chart is invalid!

The load display of the LICCON computer system shows an incorrect value!

The weight of the boom is too large for erection!

- ▶ Disassemble and remove the guy rods which are not needed on the transport retainers before erecting the boom!

Note

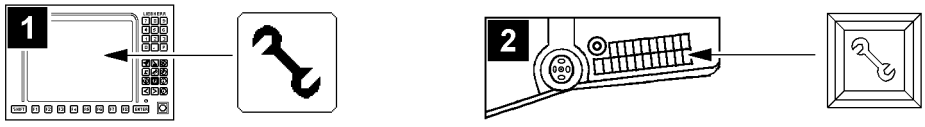
- ▶ Inspection and maintenance of guy rods, see Crane operating instructions, chapter 8.15!

11 Auxiliary guying

The auxiliary guying is of significant importance for safe crane operation.
The auxiliary guying is a deciding factor in relieving the boom, or the boom system during erection and take down as well as during crane operation.

WARNING
The crane can topple over!
If the auxiliary guying is not installed or not installed on the position specified in the rod plan, then the crane can collapse, the boom can break off or the crane can topple over!
- ▶ If an auxiliary guying is specified in the rod plan for the required boom length, then it must be installed on the respective position!
- ▶ Make sure that the auxiliary guying is always completely installed and that all pins are properly pinned and secured!

12 Bypassing the overload protection



– 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 accident risk when bypassing the overload protection!
As section 4.2.6.3.2 of EN 13000 does not put the requirements of appendix 1 of the EC machinery directive 89/37/EC into concrete terms, the overload protection has not been designed according to this definition.
Proper and destined use of the crane is ensured due to the construction of the overload protection system and observance of the information in the Crane operating instructions. All **sensibly foreseeable erroneous operations** of the crane have been taken into consideration.
Prohibited crane operation with bypassed overload protection – with the aim of increasing the maximum load capacity of the crane above the rated value in the load chart, or to extend the designated working range of the crane – does not constitute a **sensibly foreseeable erroneous operation**, rather **a deliberate improper use with high risk of accident**!
The possible risks and consequences of such deliberate improper use are detailed in the Crane operating instructions.
Such deliberate improper use can neither be prevented by means of the constructive design, nor by means of information in the Crane operating instructions!
- ▶ Bypass the overload protection only according to the Crane operating instructions!
- ▶ Exceed the shut off limits of the overload protection only according to the Crane operating instructions!
- ▶ Any other use of the crane with bypassed overload protection than that described in the Crane operating instructions is prohibited!

12.1 Bypassing the overload protection

If the maximum permissible load moment is exceeded, the overload protection turns all load moment increasing crane movements off.
This shut off can be bypassed or exceeded various ways by:
– exceeding the shut off limits (utilization more than 100 % or leaving the load chart).
– activating an assembly operation.
– activating an emergency operation.

The displays of the LICCON overload protection remain functioning in as far as all associated sensors and limit switches are active and a load chart is available.

WARNING
Increased accident risk when bypassing the overload protection!
If the overload protection is bypassed, there is no additional protection against crane overload!
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!
Personnel can be killed!
This could result in high property damage!
▶ It is only permitted to bypass the overload protection for assembly or in emergencies!
▶ The bypass of the overload protection may only be carried out by persons who are aware of the effects of their acts!
▶ Bypassing the overload protection requires the presence of a person authorized by the crane operator and must be performed with utmost caution!
▶ Crane operation with bypassed overload protection is strictly prohibited!

12.1.1 Bypassing the LICCON overload safety device

Note
▶ Applies only for cranes with LICCON overload protection!

Depending on the crane version, one or more operating elements are available to bypass the overload protection:
– Button in the control console.
– Key button on the LICCON monitor.
– Key button in the instrument panel.
– Key button in the switch cabinet.
– Sensor for transponder on the cab.

▶ Actuate the respective operating element.

Result:
– The LICCON overload protection is bypassed / inactive.
– The “Assembly” icon appears on the LICCON monitor.
– Depending on the circumstances, acoustical and / or optical warning signals (blinkers, flashing lights, bells and horns).

▶ If the LICCON overload protection is to be reactivated:
No longer actuate the respective operating element or reset.

Result:
– The LICCON overload protection is active.
– The “Assembly” icon no longer appears on the LICCON monitor.
– The acoustical and / or optical warning signals which were triggered by the bypass are turned off again.

12.1.2 Bypassing the PAT overload protection

Note
▶ Applies only for cranes with PAT overload protection!

▶ Actuate the bypass key button and turn the PAT overload protection off.

Result:
– The PAT overload protection is bypassed / inactive.

▶ Actuate the bypass key button and turn the PAT overload protection on.

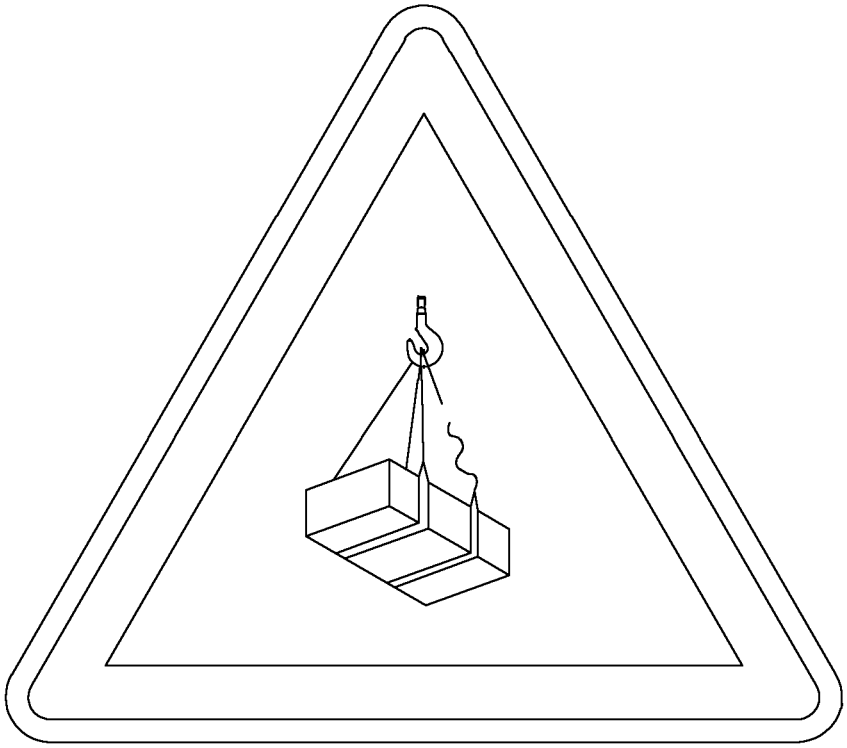
Result:
– The PAT overload protection is active.

13 Bypassing the hoist top shut off

Note
▶ Applies only for cranes with hoist limit switch!

If the hook block contacts the hoist limit switch weight during its upward movement, the hoist limit switch is triggered. The crane movements “Spool up winches”, “Luff boom down” and “Telescope telescopic boom out” are turned off. The shut off can be bypassed.

WARNING
Danger of accidents due to bypass of Hoist top shut off!
When bypassing the hoist top shut off, there is a risk that the hook block may be pulled against the pulley head when continuing to lift or luffing down the boom. This may damage the pulleys and cause the loads to fall!
▶ The bypass of the hoist top shut off in crane operation with a load may only be carried out by a person authorized by the crane operator with the aid of a “Guide”. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block and the boom head.
▶ Carry out all crane movements with maximum care and minimum speed.




DANGER
IMPACT HAZARD!
Moving attachments can crush and impale.
Keep clear of machine working area.

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14 Assembly / disassembly

WARNING
Risk of fatal injury due to incorrect assembly or disassembly!
The assembly / disassembly of components may never be performed by untrained personnel. Incorrect assembly / disassembly can result in death or severe injuries!
- ▶ Assembly and disassembly may only be carried out by authorized and trained expert personnel!
- ▶ For assembly / disassembly of individual components, also refer to the chapters relating to those components!
- ▶ The boom combinations must be assembled according to the separately supplied rod plans!
- ▶ The winch use is regulated in the master switch assignment in the Electric wiring diagram. The winches may only be operated according to this master switch assignment specified in the Electric wiring diagram.
- ▶ Transport all separately transported components close to the ground using appropriate auxiliary cranes and fastening equipment and connect them safely (correctly) to the crane.

WARNING
Failure of auxiliary winch
- ▶ Only use the auxiliary winch (assembly or reeving winch) for assembly and not to lift loads!
- ▶ Lifting of loads with the auxiliary winch is prohibited!

WARNING
Danger of impact and crushing!
There is a risk of impact and crushing when standing in the vicinity of suspended loads moving sideways.
- ▶ During assembly / disassembly no one may be in the dangerous area around or underneath the suspended load before the load has been secured!

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

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids!
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06!
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the specified fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04!
- ▶ The fall arrest system must be fastened on the fastening and hook points as well as on the safety ropes. For safety points, see Crane operating instructions, chapter 2.06!
- ▶ Only step on the aids, ladders and catwalks with clean shoes!
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice!
- ▶ It is prohibited to walk on the telescopic or an auxiliary boom without suitable protective devices!

14.1 Assembly / disassembly of booms

WARNING
The crane can topple over!
Angular pull can overload the crane. Overload can cause destruction of the crane or cause it to topple over.
- ▶ The hook block must always be attached vertically over the center of gravity of the load to be lifted!
- ▶ Angular pull is prohibited!

WARNING
Danger of accident at assembly / disassembly of booms!
The disassembling of unsecured or unsupported booms may result in fatal injury or mutilation.
- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins on unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ The railing at assembly and disassembly of booms must be horizontal!
- ▶ Do not lean the ladder against the component being disassembled!

WARNING
Risk of accident due to distorted pins!
Angular pulling or excessive / low hoisting force of the auxiliary crane may result in distortion of the pins.
Distorted parts can suddenly detach themselves when the pins are unpinned. This represents a fatal injury risk to assembly personnel.
- ▶ When the pins are unpinned, the “lifting force” of the crane must be adapted to the “weight” of the parts being lifted!
- ▶ Do **not** remove difficult to remove pins by force!
- ▶ Remove the reason for the distortion!

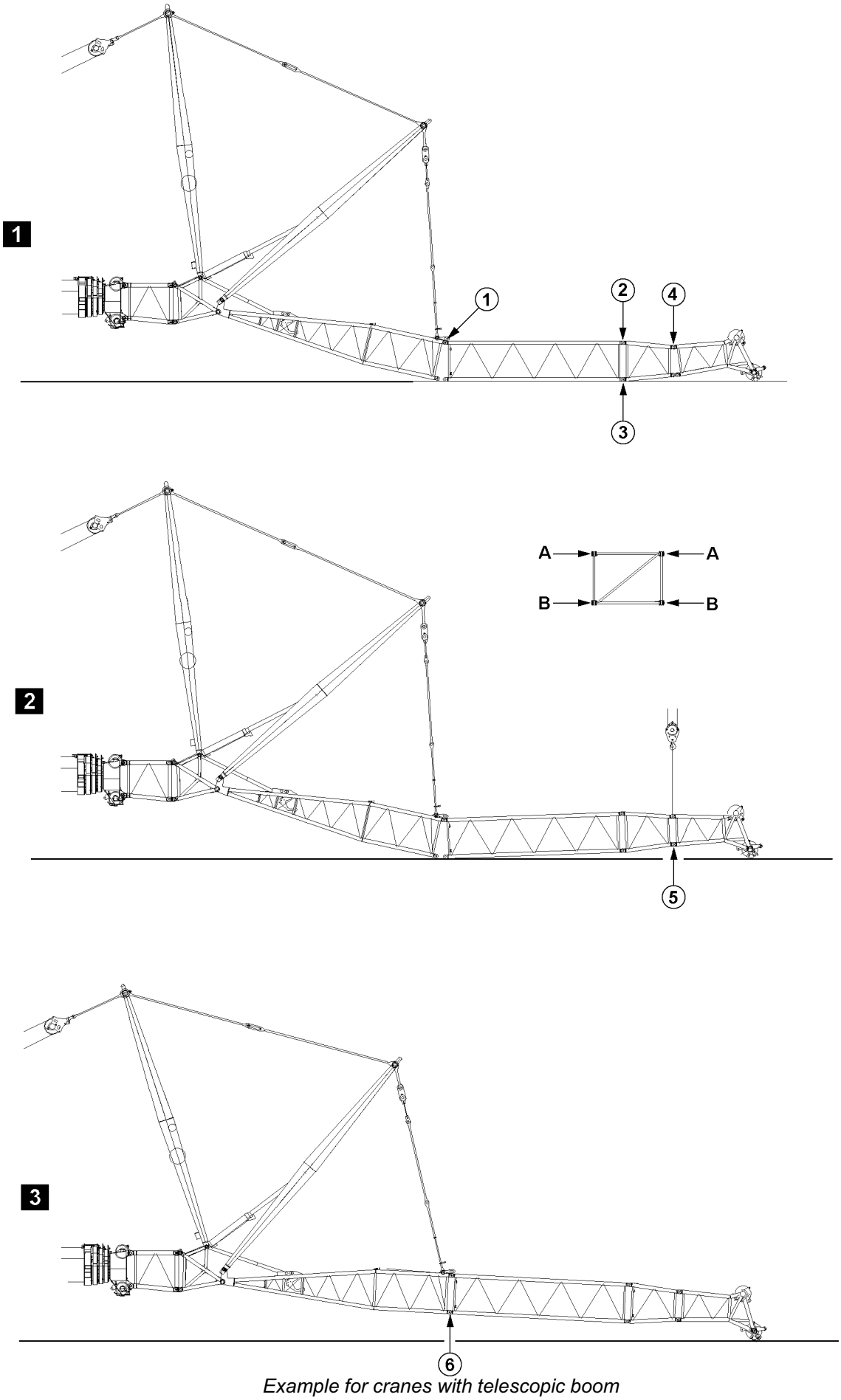
WARNING

If the following specifications are not observed, accidents can result:

- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**!
- ▶ Pin the lower collar pins **from the inside to the outside** and unpin from the **outside to inside**!
- ▶ Insert and unpin horizontally installable double cone pins from the **outside to inside**!
- ▶ Insert and unpin vertically installable double cone pins from **top to bottom**!

Make sure that the following prerequisites are met:

- – If parts of the equipment (for example lattice sections) are not in contact with the ground during assembly / disassembly, then they must be supported with suitable, stable materials.
- – Select the height of the support so that the parts of the equipment are not in contact with the ground.
- – Place the parts of the equipment with rope pulleys down in such a way that the rope pulleys are not damaged.
- – During disassembly make sure that the auxiliary crane can lift the load vertically.
- – Have an auxiliary crane with sufficient load carrying capacity available to be able to hold the load at a respective radius.



B197718

Example for cranes with telescopic boom

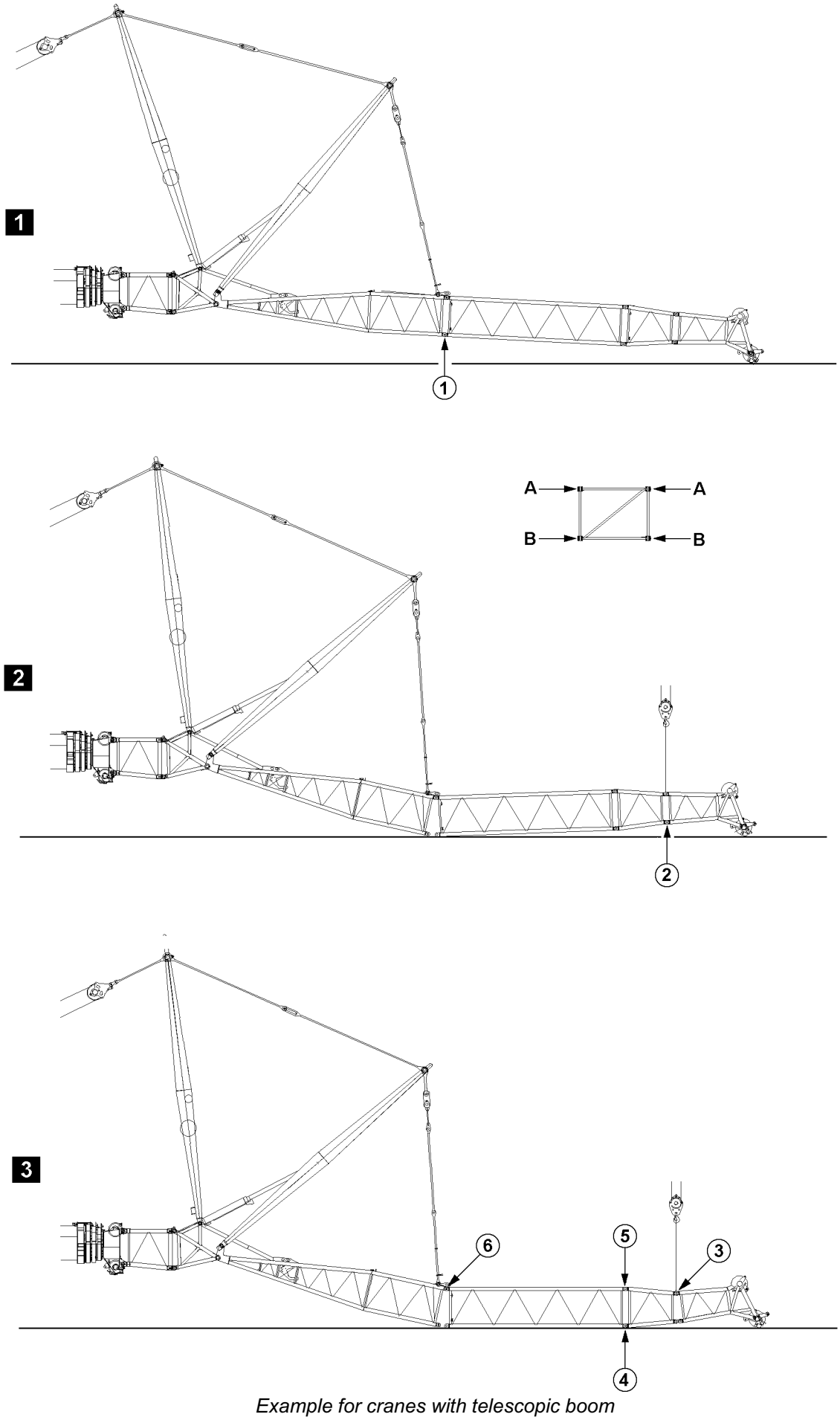
14.2 Assembly of lattice sections for telescopic cranes

14.2.1 Assembly of lattice sections for guyed auxiliary boom with an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk 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. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

- ▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **A**) at point **2**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **B**) at point **3**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **A**) at point **4**, illustration **1**.
- ▶ Lift the end section with the auxiliary crane, illustration **2**.
- ▶ Pin and secure pins at both sides (level **B**) at point **5**, illustration **2**.
- ▶ Lift the lattice sections, illustration **3**.
- ▶ Pin and secure pins at both sides (level **B**) at point **6**, illustration **3**.



B197719

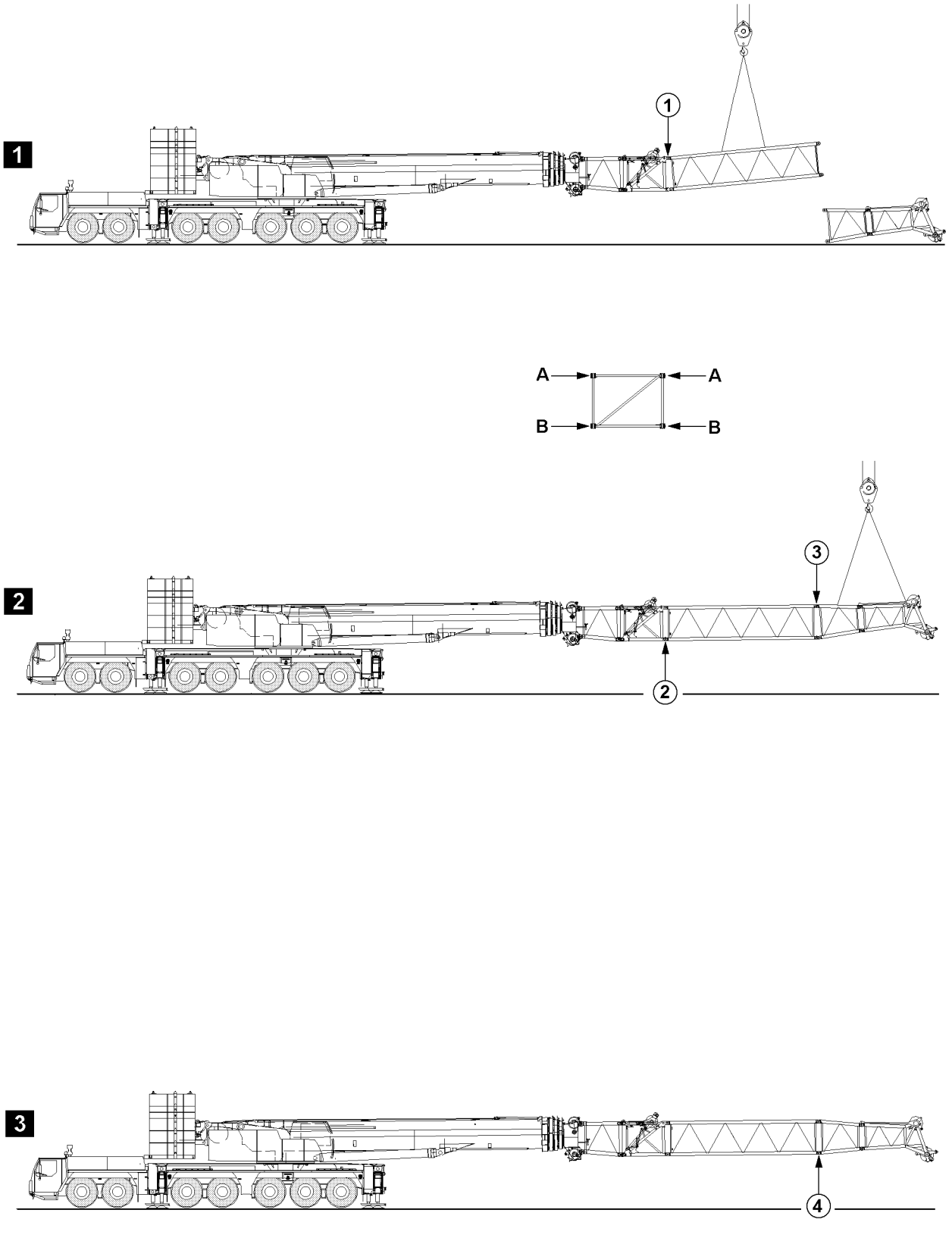
Example for cranes with telescopic boom

14.2.2 Disassembly of lattice sections for guyed auxiliary boom with an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

- ▶ Luff the auxiliary boom down until the end section touches the ground slightly, illustration **1**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **1**, illustration **1**.
- ▶ Completely remove the lattice sections, illustration **2**.
- ▶ Lift the end section with the auxiliary crane, illustration **2**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **2**, illustration **2**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **3**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **4**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **5**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **6**, illustration **3**.



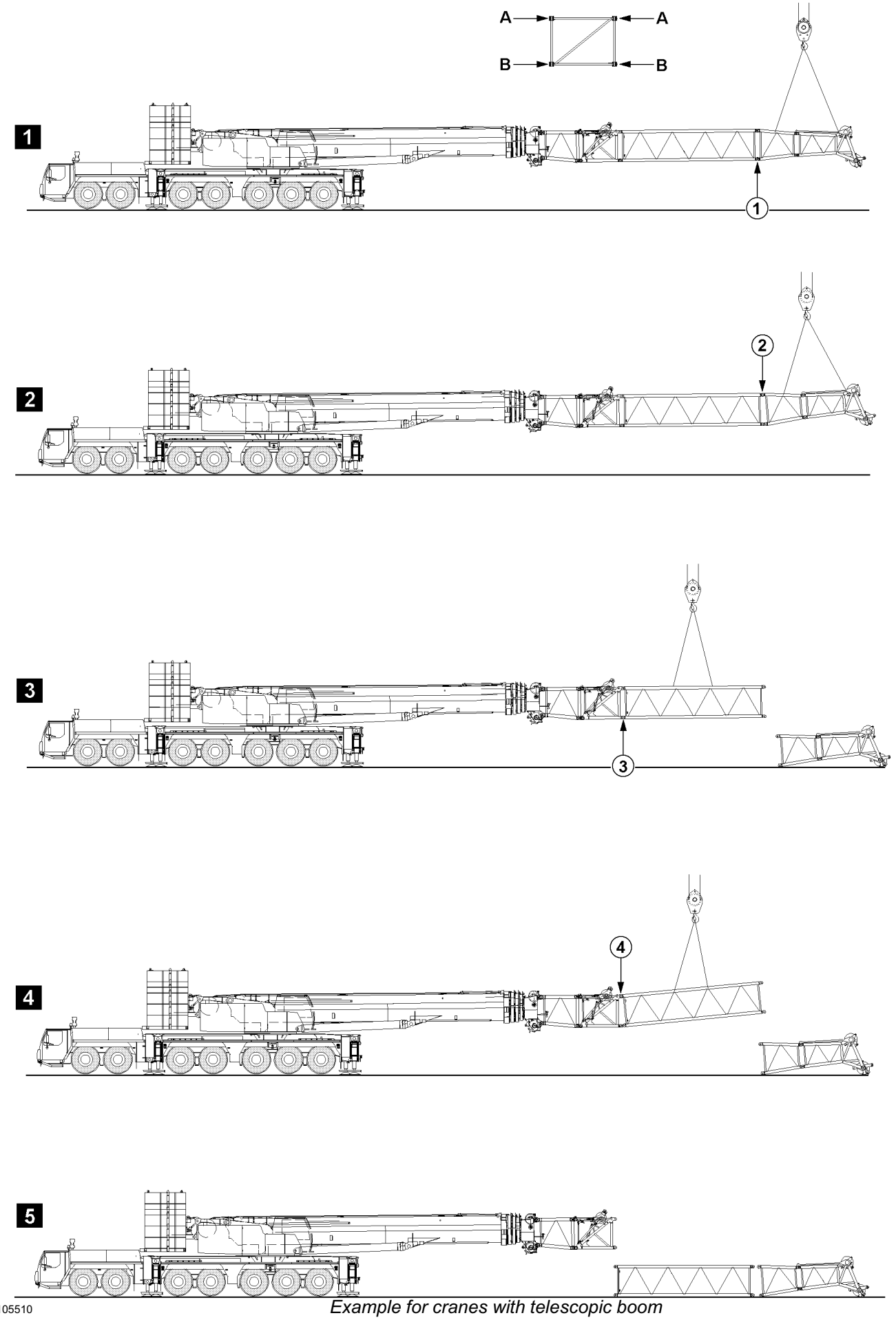
B197705 *Example for cranes with telescopic boom*

14.2.3 Assembly of lattice sections on self-supporting auxiliary booms using an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk 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. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

- ▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **B**) at point **2**, illustration **2**.
- ▶ Pin and secure pins at both sides (level **A**) at point **3**, illustration **2**.
- ▶ Pin and secure pins at both sides (level **B**) at point **4**, illustration **3**.



B105510

Example for cranes with telescopic boom

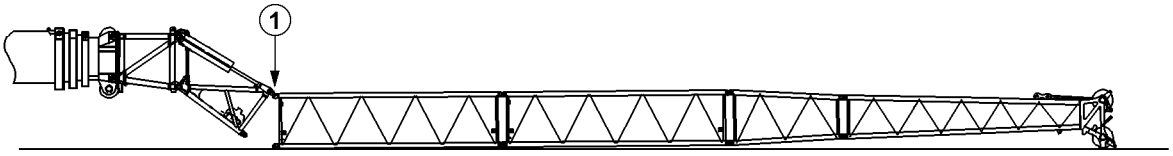
14.2.4 Disassembly of lattice sections on self-supporting auxiliary booms using an auxiliary crane

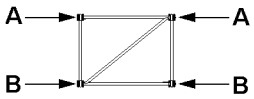
The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

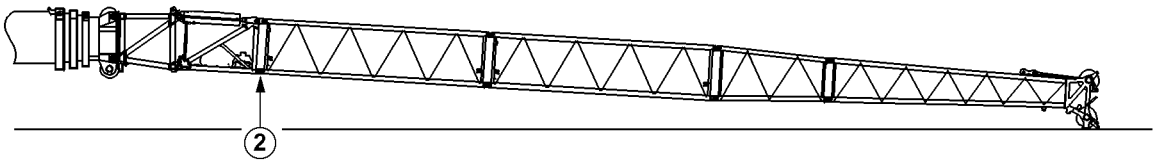
- ▶ Release and unpin the pins at both sides (level **B**) at point **1**, illustration **1**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **2**, illustration **2**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **3**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **4**, illustration **4**.

1

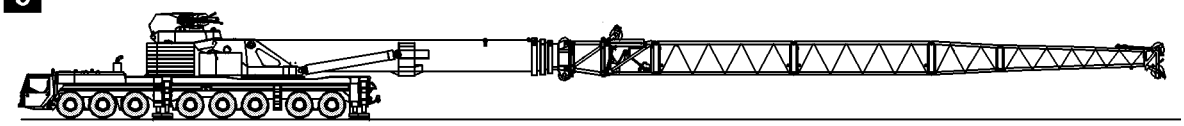




2



3



B197712

Example for cranes with telescopic boom

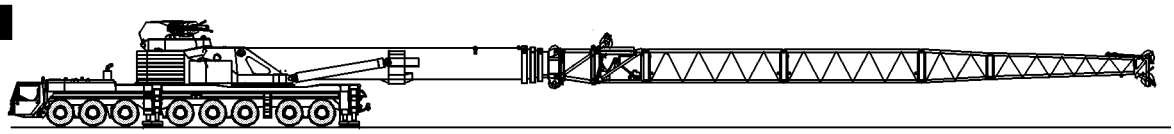
14.2.5 Assembly of lattice sections on self-supporting auxiliary booms, without auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

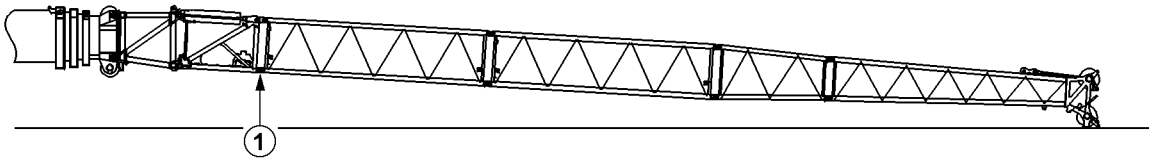
WARNING
Risk of fatal injury when assembling auxiliary booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

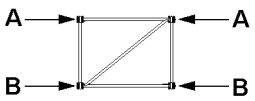
For cranes with hydraulic angle adjustment and self-supporting auxiliary boom, the assembly / disassembly of additional lattice sections may be performed using the crane itself.
In order to do so, proceed as follows.
▶ Assemble the lattice sections to the required length.
▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
▶ Luff the auxiliary boom up 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**.

1

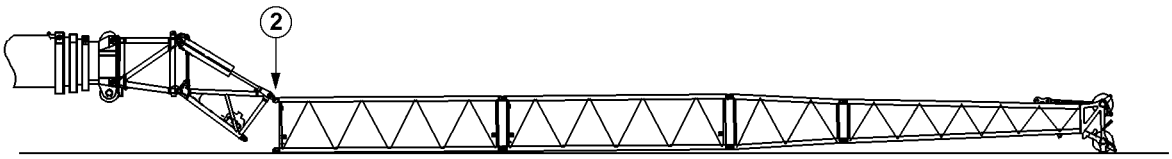


2





3



B197713 *Example for cranes with telescopic boom*

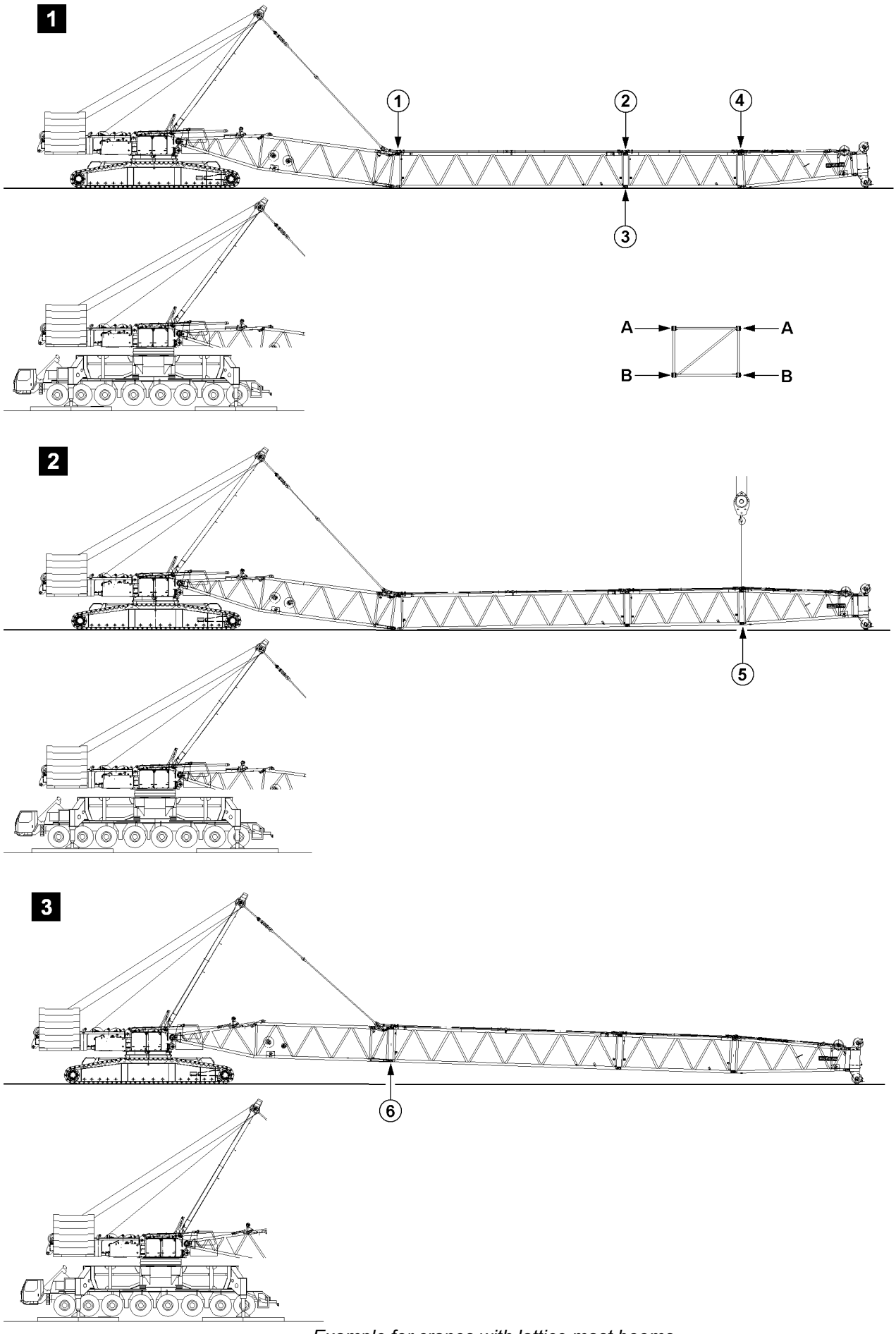
14.2.6 Disassembly of lattice sections on self-supporting auxiliary booms, without auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

For cranes with hydraulic angle adjustment and self-supporting auxiliary boom, the assembly / disassembly of additional lattice sections may be performed using the crane itself.
In order to do so, proceed as follows.

▶ Luff the auxiliary boom down until the end section touches the ground slightly, illustration **2**.
▶ Release and unpin the pins at both sides (level **B**) at point **1**, illustration **2**.
▶ Luff the auxiliary boom down until the lattice sections to be removed are laying completely on the ground, illustration **3**.
▶ Release and unpin the pins at both sides (level **A**) at point **2**, illustration **3**.
▶ Completely remove the auxiliary boom.



B197710 *Example for cranes with lattice mast booms*

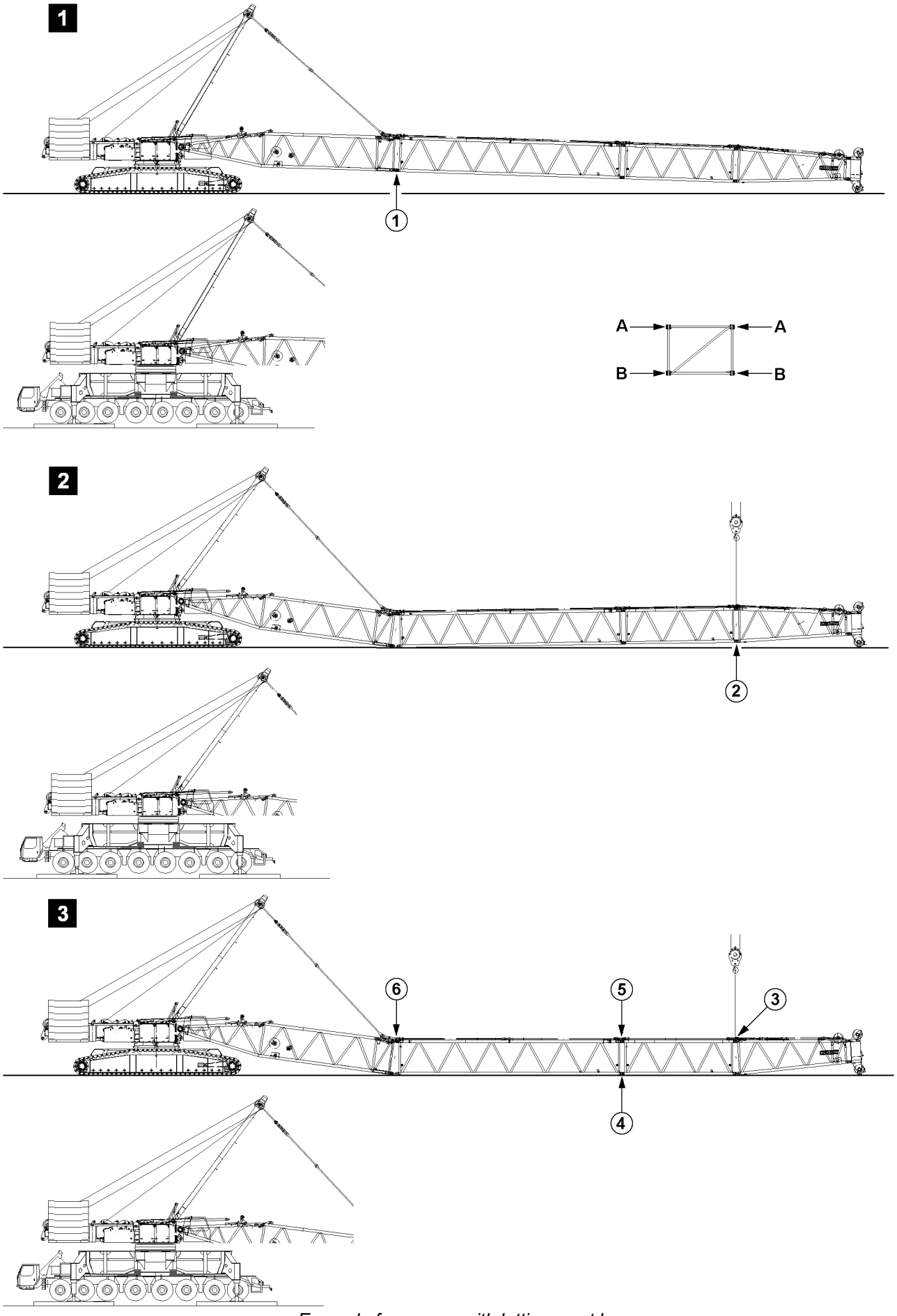
14.3 Assembly of lattice sections for lattice mast cranes

14.3.1 Assembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when assembling booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

- ▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **A**) at point **2**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **B**) at point **3**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **A**) at point **4**, illustration **1**.
- ▶ Lift the end section with the auxiliary crane, illustration **2**.
- ▶ Pin and secure pins at both sides (level **B**) at point **5**, illustration **2**.
- ▶ Lift the lattice sections, illustration **3**.
- ▶ Pin and secure pins at both sides (level **B**) at point **6**, illustration **3**.



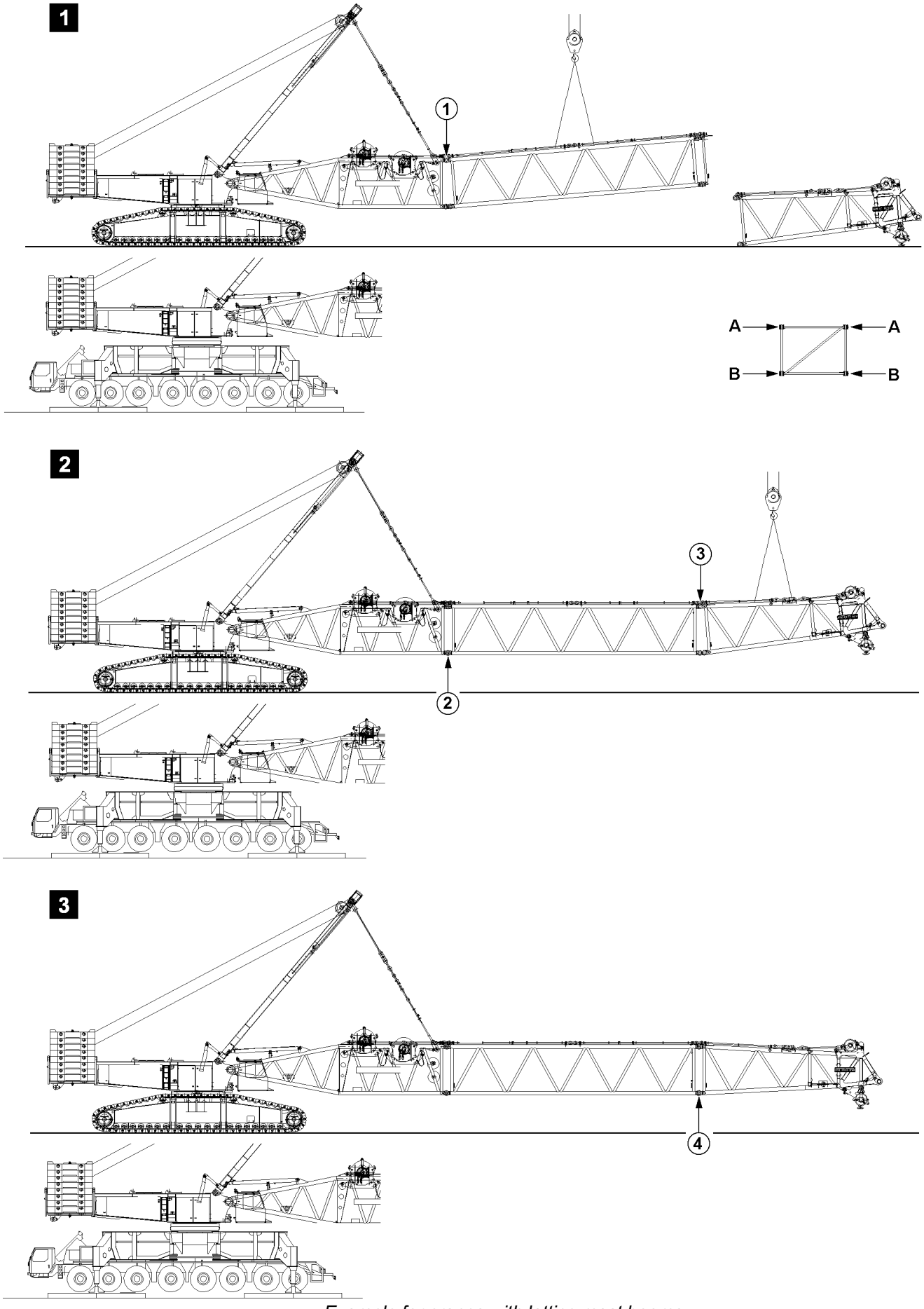
B197711 *Example for cranes with lattice mast booms*

14.3.2 Disassembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling booms!
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

- ▶ Luff the boom down until the end section touches the ground slightly, illustration **1**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **1**, illustration **1**.
- ▶ Completely remove the lattice sections, illustration **2**.
- ▶ Lift the end section with the auxiliary crane, illustration **2**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **2**, illustration **2**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **3**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **4**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **5**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **6**, illustration **3**.



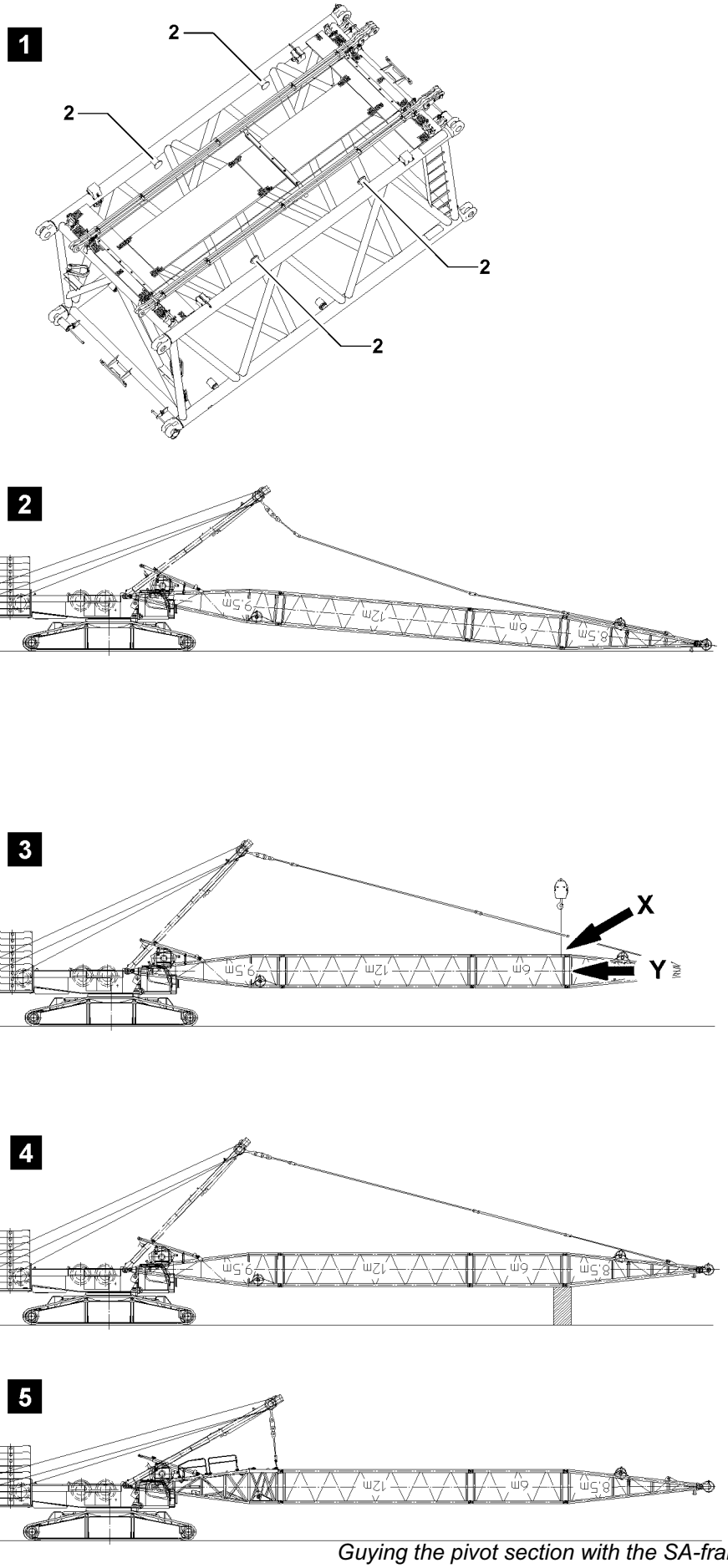
B198182 *Example for cranes with lattice mast booms*

14.3.3 Flying assembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when assembling booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down. This can result in life-threatening injuries to personnel.
- ▶ Pins must be pinned in the order specified!

- ▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **B**) at point **2**, illustration **2**.
- ▶ Pin and secure pins at both sides (level **A**) at point **3**, illustration **2**.
- ▶ Pin and secure pins at both sides (level **B**) at point **4**, illustration **3**.



B111448 *Guying the pivot section with the SA-frame*

14.3.4 Flying disassembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.
The flying disassembly of lattice sections can be used on:
– Derrick boom
– Main boom

Ensure that the following prerequisite is met:
– Before guying the pivot section, secure the boom properly to prevent it from falling down!

Guying the pivot section in flying mode with the SA-frame

▶ Place the boom on the ground, see illustration **2**.

or

WARNING
Lattice section incorrectly attached!
If the fastening equipment is attached on the bitts **2** when securing the boom, then the bitts will be overloaded! The lattice section will be damaged. The boom can fall down! Personnel can be severely injured or killed!
If the auxiliary crane is used to secure the boom for flying disassembly:
▶ Do **not** fasten the lattice section on the bitts **2**, see illustration **1**!
▶ Attach the fastening equipment in the area of point **P1** on both sides on the lattice section, see detail **X**!
▶ Make sure that the long fastening equipment is used, so that the angle between the cross section of lattice section and guyed fastening equipment is at least 60°, see detail **Y**!

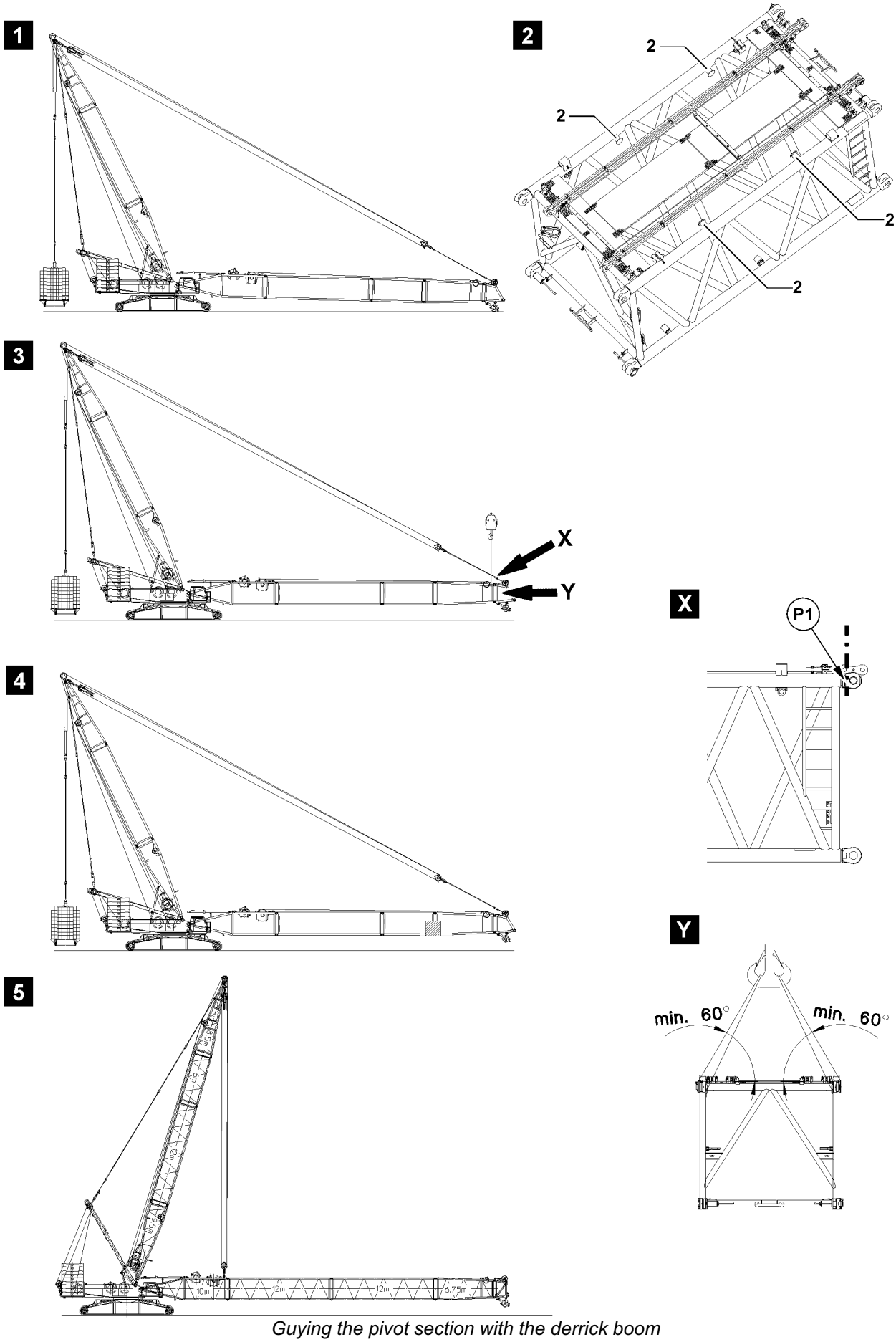
■ Secure the boom with the auxiliary crane, see illustration **3**.

or

WARNING
Falling boom!
If the boom is not properly and securely supported from below, then the boom can fall down!
▶ Support the boom properly and safely with suitable material!

■ Support the boom, see illustration **4**.
Result:
– The guy rods can be disassembled.

▶ Place down, secure and disassemble the guy rods.
▶ Pin and secure the guy rods SA-frame on the pivot section.
▶ Tighten the guy rods SA-frame until the boom is in horizontal position.
Result:
– Pivot section is guyed in flying mode with the SA-frame, see illustration **5**.
– The lattice sections can be disassembled in flying mode.



B111449 *Guying the pivot section with the derrick boom*

Guying the pivot section in flying mode with the derrick boom

▶ Place the boom on the ground, see illustration **1**.

or

WARNING
Lattice section incorrectly attached!
If the fastening equipment is attached on the bitts **2** when securing the boom, then the bitts will be overloaded! The lattice section will be damaged. The boom can fall down! Personnel can be severely injured or killed!
If the auxiliary crane is used to secure the boom for flying disassembly:
▶ Do **not** fasten the lattice section on the bitts **2**, see illustration **2**!
▶ Attach the fastening equipment in the area of point **P1** on both sides on the lattice section, see detail **X**!
▶ Make sure that the long fastening equipment is used, so that the angle between the cross section of lattice section and guyed fastening equipment is at least 60°, see detail **Y**!

■ Secure the boom with the auxiliary crane, see illustration **3**.

or

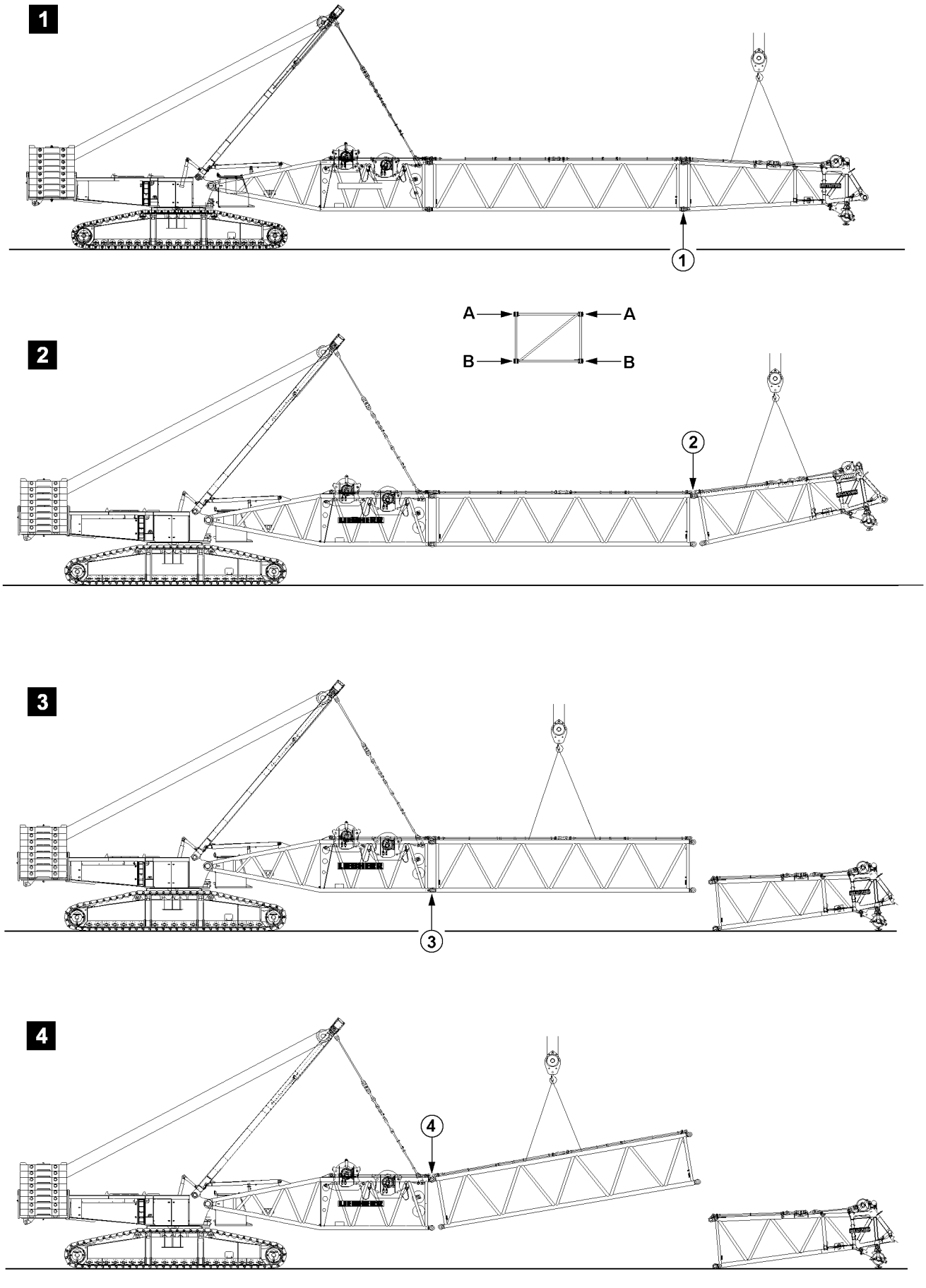
WARNING
Falling boom!
If the boom is not properly supported from below, then the boom can fall down!
▶ Support the boom properly and safely with suitable material!

■ Support the boom, see illustration **4**.

Result:
– The guy rods can be disassembled.

▶ Place down, secure and disassemble the guy rods.
▶ Pin and secure the pulley block on the pivot section.
▶ Tighten the control rope until the boom is in horizontal position.

Result:
– Pivot section is guyed in flying mode with the SA-frame, see illustration **5**.
– The lattice sections can be disassembled in flying mode.



B105511

Example for cranes with lattice mast booms

Unpinning the lattice components

WARNING
Risk of fatal injury when disassembling booms!
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

▶ Release and unpin the pins at both sides (level **B**) at point **1**, illustration **1**.
▶ Release and unpin the pins at both sides (level **A**) at point **2**, illustration **2**.
▶ Release and unpin the pins at both sides (level **B**) at point **3**, illustration **3**.
▶ Release and unpin the pins at both sides (level **A**) at point **4**, illustration **4**.

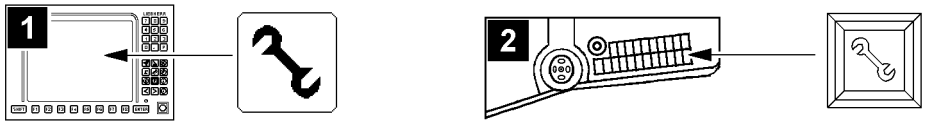
14.4 Bypass for assembly and disassembly

Depending on the crane version, the “Bypass at assembly and disassembly” is activated by:
– The set up button (key button) on the LICCON monitor.
– The assembly key button in the instrument panel.

WARNING
High risk of accident in crane operation with activated “Bypass at assembly and disassembly”!
At activated “Bypass at assembly and disassembly” the overload protection and possible the hoist limit switches are bypassed!
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!
Personnel can be killed!
This could result in high property damage!
▶ The activation of the “Bypass at assembly and disassembly” is only permissible for assembly and disassembly purposes!
▶ All other usage of the “Bypass at assembly and disassembly” other than as described in the operating instructions is prohibited!
▶ The “Bypass at assembly and disassembly” may only be activated by persons who are aware of the consequences of a bypass!
▶ Crane operation with activated “Bypass at assembly and disassembly” is strictly prohibited!
▶ The “Bypass at assembly and disassembly” must be deactivated immediately after assembly and disassembly work!
▶ The crane operator or a person authorized by him must make sure that no misuse of the bypass device is possible (remove the key and store it safely, if necessary)!

14.4.1 Activating the Bypass at assembly and disassembly

Note
▶ Applies only for cranes with LICCON overload protection.
▶ Indicator light “Assembly” is only present in the instrument panel for certain crane types.



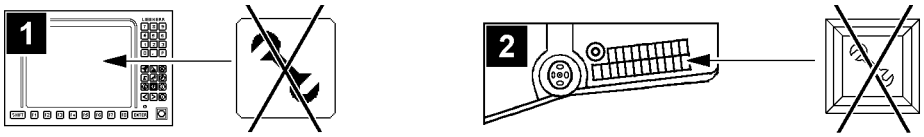
– Illustration **1**: LICCON monitor (only certain crane types).
– Illustration **2**: Indicator light “Assembly” in instrument panel crane cab (only certain crane types).

▶ Actuate the respective operating element.

Result:
– The LICCON overload protection is bypassed / inactive and the “Bypass at assembly and disassembly” is activated.
– The “Assembly” icon appears in the LICCON monitor and / or the indicator light “Assembly” in the instrument panel lights up.
– Depending on the circumstances, acoustical and / or optical warning signals (blinkers, flashing lights, bells and horns).

14.4.2 Bypass at assembly and disassembly

Note
▶ Applies only for cranes with LICCON overload protection.
▶ Indicator light “Assembly” is only present in the instrument panel for certain crane types.

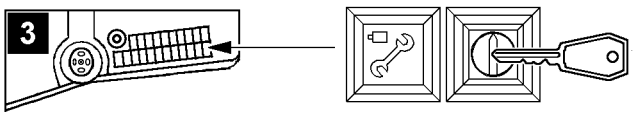


▶ No longer actuate the respective operating element or reset.

Result:
– The LICCON overload protection is active and the “Bypass at assembly and disassembly” is deactivated.
– The “Assembly” icon turns off in the LICCON monitor and / or the indicator light “Assembly” in the instrument panel no longer lights up.
– The acoustical and / or optical warning signals which were triggered by the bypass are turned off again.

14.5 Bypassing during crawler assembly

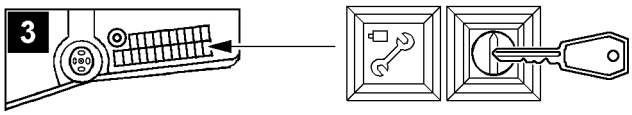
Note
▶ Applies only for cranes with crawler assembly key button.



– Illustration **3**: Crawler assembly key button and indicator light

Ensure that the following prerequisite is met:
– The LICCON overload protection is bypassed / inactive and the “Bypass at assembly and disassembly” is activated.

WARNING
High risk of injury in case of actuated crawler assembly key button!
Operating the crawler assembly key button bypasses the overload protection! No shut off at overload will occur in assembly mode or in crane operations!
In the event of deliberate misuse, the crane can topple over!
Personnel can be killed!
This could result in high property damage!
▶ The crawler assembly key button may only be actuated for assembly tasks!
▶ All other usage of the crawler assembly key button other than as described in the operating instructions is prohibited!
▶ Operating the crane with the crawler assembly key button enabled is strictly prohibited!



▶ Actuate the crawler assembly key button.

Result:

– The LICCON overload protection is inactive.
– The indicator light “Crawler assembly” lights up.

▶ If the bypass at crawler assembly is to be turned off:
Turn the crawler assembly off by pressing the off button.

Result:

– The indicator light in the button turns off.

14.6 Assembling / disassembly of hydraulic lines

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

WARNING
Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious accidents due to component failure!
Personnel can be severely injured or killed!
▶ Check the quick-release couplings after installation for correct connection.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before releasing the hydraulic lines, the hydraulic oil can escape with high pressure!
Personnel can be severely injured or killed!
▶ Release the pressure in the hydraulic system before releasing. Interrupt the pressure supply and wait for a short time.

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

14.7 Assembly / disassembly of electrical lines

NOTICE
Danger of damage of electrical connections!
If the following measures are not adhered to, the electrical connections can be damaged!
▶ Do not plug in the plug connection or unplug them under tension!
▶ Do not pinch or crush electrical connections!
When pulling the cable out:
▶ Hold the plug and not the cable. Do not pull on the cable to release the plug connection!
▶ Relieve the electrical connections in operating condition!
▶ In case of defective or faulty electrical lines, contact Service at Liebherr-Werk Ehingen!

NOTICE
Corroding of plug connections!
The plug connections are only protected when plugged in. If the plug connections are not plugged in, then the contact surfaces can corrode!
- ▶ Always plug or screw the plug connections together properly!
- ▶ Keep plug connections clean and dry! Clean contact surfaces provide the best signal transfer.

- ▶ If a pull release for the cable drum is present:
  Hang the pull release in on the fixed point and relieve the plug connections from the pull strain.
- ▶ After installing the plug connections:
  Check all plug connections for proper connection.
- ▶ If a plug connection is not properly connected:
  Plug or screw the plug connection together properly.
- ▶ After removing the plug connections:
  Protect the electrical connections with dust caps or place them in intended parking retainers.
- ▶ If locking brackets are present:
  Close the locking bracket.

15 Erection / take down

WARNING
The crane can topple over!
Due to an unforeseen occurrence, for example: Sudden strong wind or storm can lead to dangerous operating situations, up to toppling the crane!
Personnel can be severely injured or killed!
- ▶ The boom must be able to be placed down at any time with its current equipment!
- ▶ The required counterweight must always be in direct vicinity of the crane!
- ▶ The crane operator must ensure that the required counterweight is carried along when driving the crane with the equipment in place and that the boom can be placed down at any time!

WARNING
Danger of fatal injury!
- ▶ Incorrectly assembled or non-operational limit switches and falling parts (pins, spring retainers, ice etc.) can cause accidents!

15.1 Erection / take down for mobile cranes

Make sure that the following prerequisites are met:

- The crane is properly supported.
- The crane is aligned in horizontal direction.
- The counterweight has been installed on the turntable according to the load chart or the erection / take down charts.
- The derrick ballast (suspended ballast or ballast trailer ballast) is installed according to the load chart or the erection / take down charts.
- The telescopic boom is fully telescoped in.
- The boom has been installed according to the load chart and the Crane operating instructions.
- All limit switches have been correctly installed and are fully functional.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and prevented from jumping out with the rope retaining pins.
- No personnel is within the danger zone.
- There are no loose parts on the boom or the auxiliary boom.
- In winter, the telescopic boom, the auxiliary boom and their associated components (limit switches, cable drum, flashing beacon, wind speed sensor etc.) must be kept free of ice and snow.

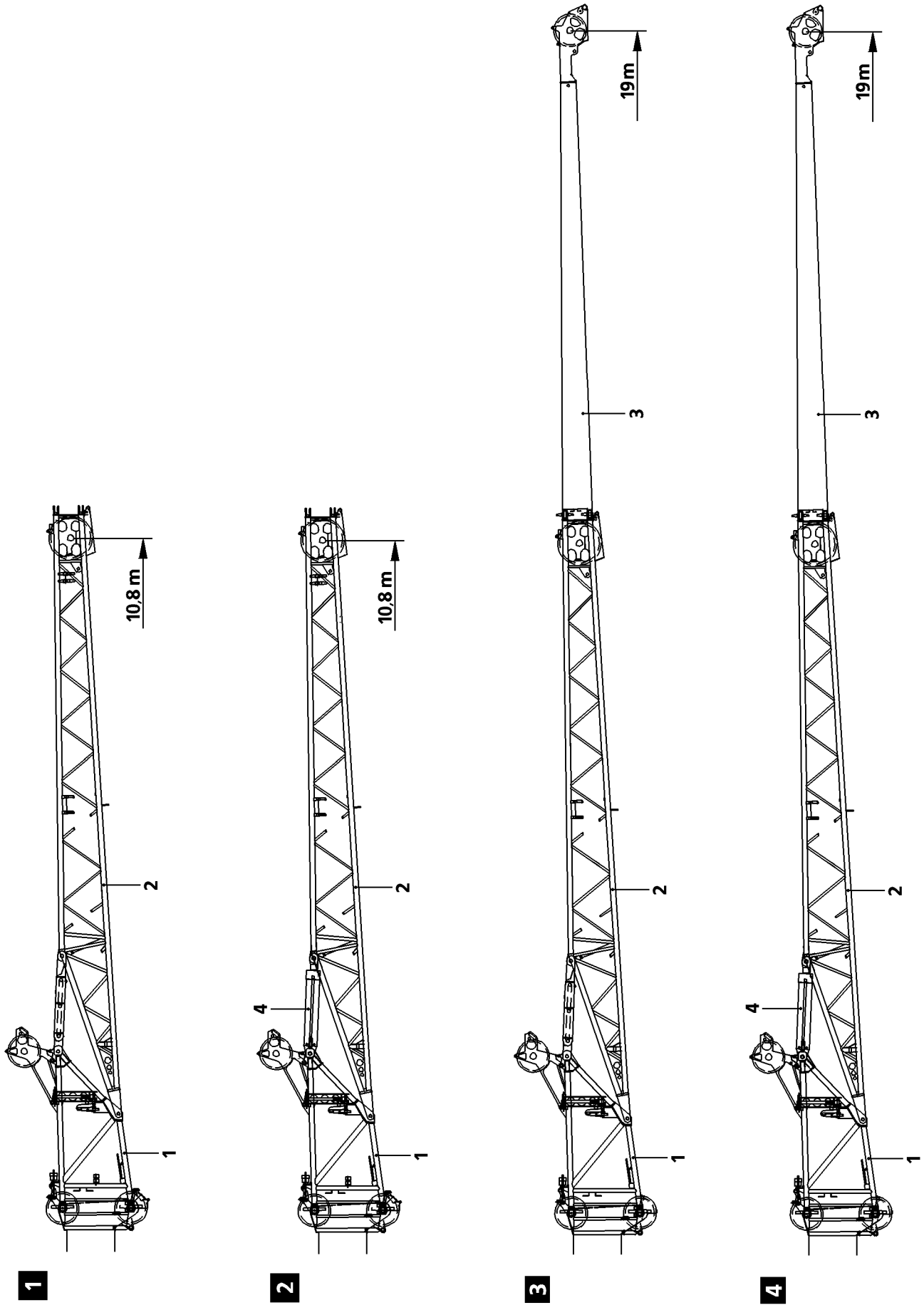
▶ Check if all prerequisites have been met.

15.2 Erection / take down for crawler cranes

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The crane is properly supported (cranes with support).
- The counterweight has been installed on the turntable according to the load chart.
- The central ballast has been attached according to the load chart.
- The counterweight is installed according to the load chart or the erection / take down charts.
- The derrick ballast (suspended ballast or ballast trailer ballast) is installed according to the load chart or the erection / take down charts.
- The boom has been installed according to the load chart and the Crane operating instructions.
- All limit switches have been correctly installed and are fully functional.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and prevented from jumping out with the rope retaining pins.
- No personnel is within the danger zone.
- There are no loose parts on the boom or the auxiliary boom.
- In winter, the boom, the auxiliary boom and their associated components (limit switches, cable drum, flashing beacon, wind speed sensor etc.) must be kept free of ice and snow.

▶ Check if all prerequisites have been met.



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1 General

The folding jib versions for TK operation (mechanical angle adjustment) and TNZK operation (hydraulic angle adjustment) can be self-assembled on the telescopic boom.
The folding jib can be operated as a single folding jib with a height of 10.8 m or as a double folding jib with a height of 19 m.
The folding jib with “mechanical angle adjustment” can be mounted on the telescopic boom from 0° to 20° or 40°.
A folding jib with “hydraulic angle adjustment” can be luffed under load from 0° to 40°.

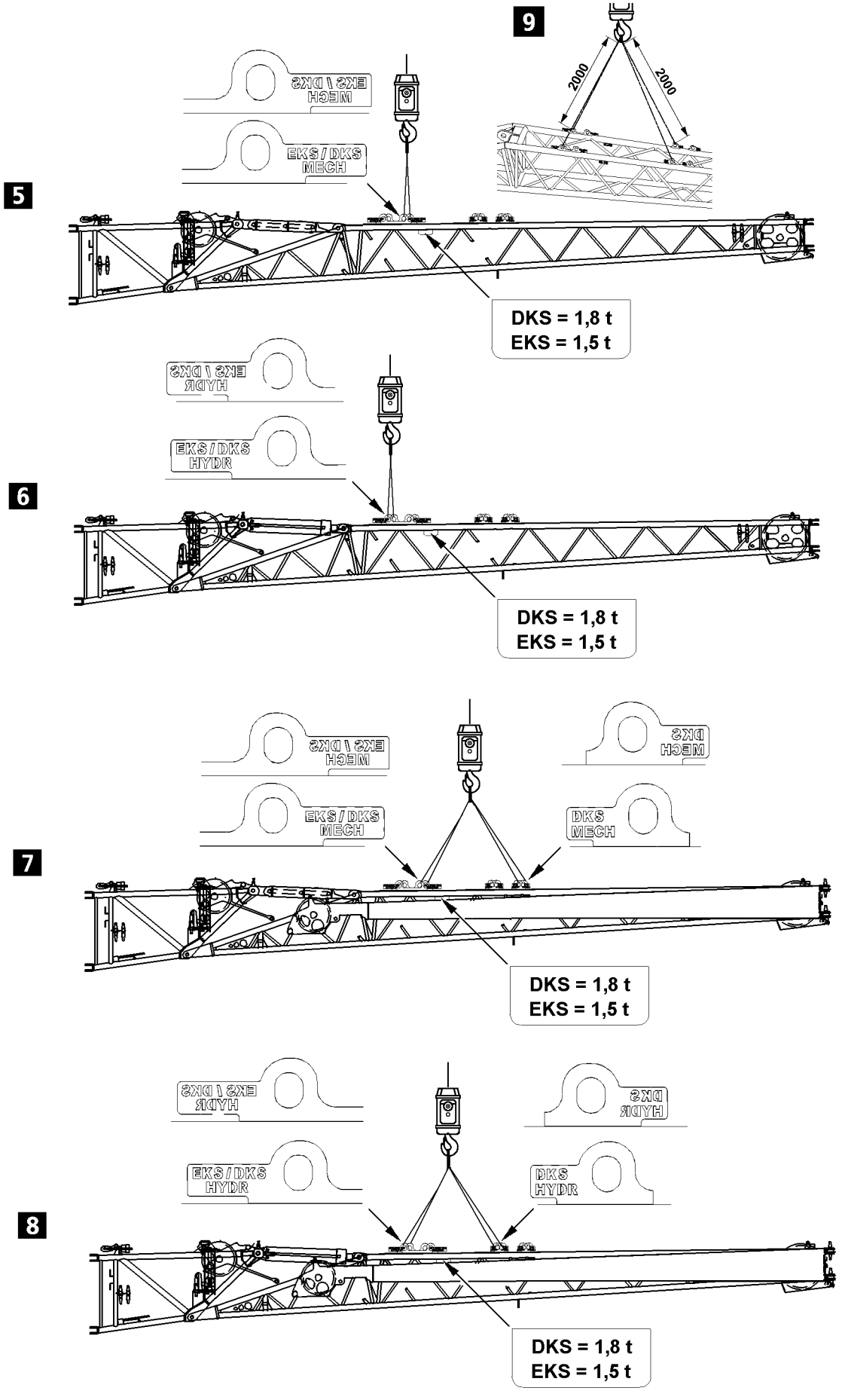
1.1 Folding jib variations

1.1.1 Single folding jib, see illustration 1 and 2

Position	Description	Length
1	Adapter	
2	Pivot section	
4	Control cylinder	
Length of single folding jib		10.8 m

1.1.2 Double folding jib, see illustration 3 and 4

Position	Description	Length
1	Adapter	
2	Pivot section	
3	End section	
4	Control cylinder	
Length of double folding jib		19 m


9
2000
2000
5
EKS / DKS MECH
EKS \ DKS MECH
DKS = 1,8 t
EKS = 1,5 t
6
EKS / DKS HYDR
EKS \ DKS HYDR
DKS = 1,8 t
EKS = 1,5 t
7
EKS / DKS MECH
EKS \ DKS MECH
DKS MECH
DKS = 1,8 t
EKS = 1,5 t
8
EKS / DKS HYDR
EKS \ DKS HYDR
DKS HYDR
DKS = 1,8 t
EKS = 1,5 t

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1.2 Fastening points

DANGER
Danger of accident due to incorrect attachment!
Life-threatening situations can arise if the folding jib is improperly or incorrectly attached!
- ▶ Attach the folding jib according to the fastening points shown on the signs!
- ▶ The folding jib may **not** be attached on the auxiliary crane in folded out position!
- ▶ Do **not** attach the pivot section and the end section separately and also **not** together!

CAUTION
Damage of fastening points!
If the fastening equipment is too short, then the fastening points on the folding jibs can be damaged!
- ▶ To attach the folding jib, tackle with a strand length of at least 2000 mm each must be used, see illustration **9**!

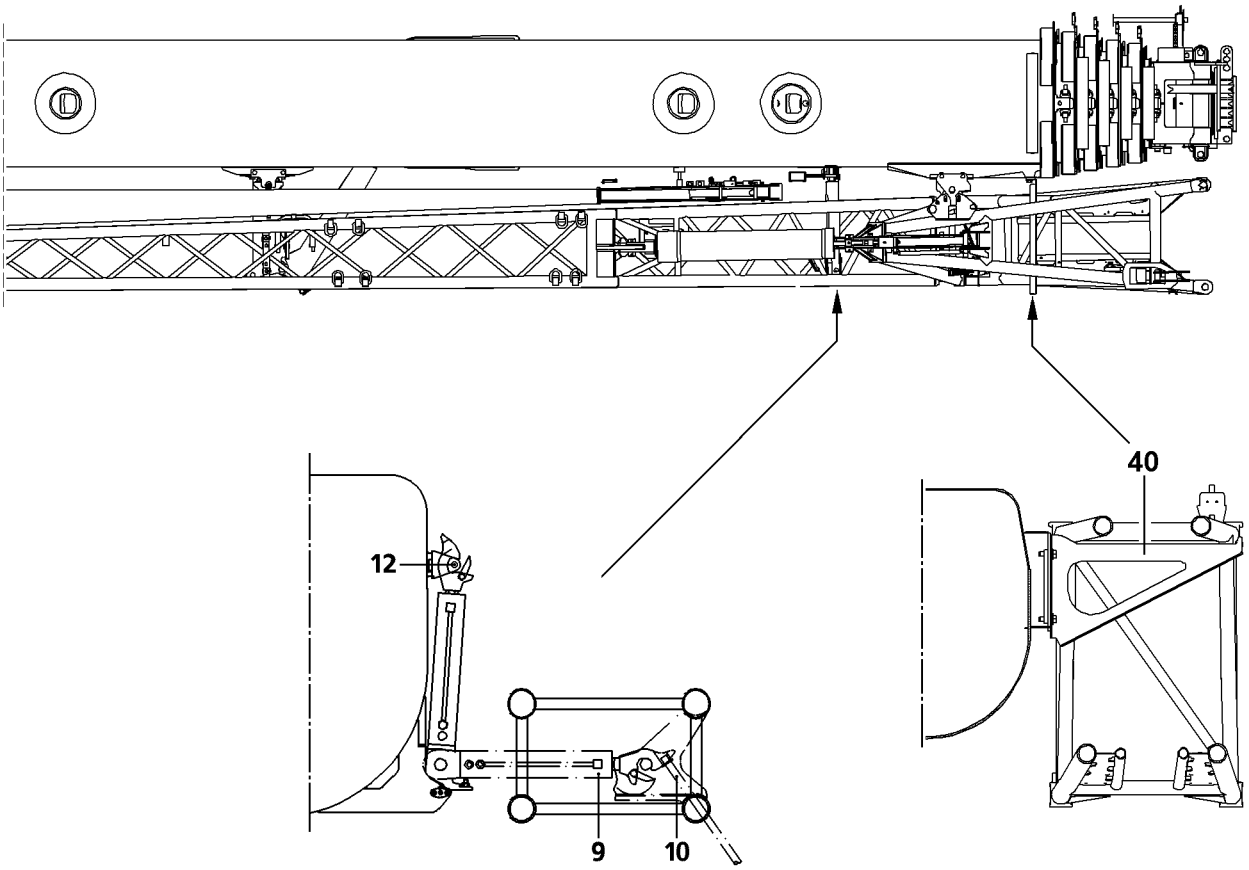
The end section, if also carried along, must be folded in and locked on the fastening points.
Various fastening eyes are installed on the folding jib for the different transport variations. The transport variations are differentiated in single or double folding jib or “mechanical angle adjustment” or “hydraulic angle adjustment”.
The appropriate fastening eye hooks / fastening points are marked with signs.

1.2.1 Single folding jib, see illustration 5 and 6

Description	Abbreviation	Weight
Single folding jib	EKS	1.5 t
Mechanical	MECH	
Hydraulic	HYDR	

1.2.2 Double folding jib, see illustration 7 and 8

Description	Abbreviation	Weight
Double folding jib	DKS	1.8 t
Mechanical	MECH	
Hydraulic	HYDR	



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2 Assembling the folding jib

In tele operation, the swing cylinder **9** can be folded up, if necessary, and secured with a pin **12**.

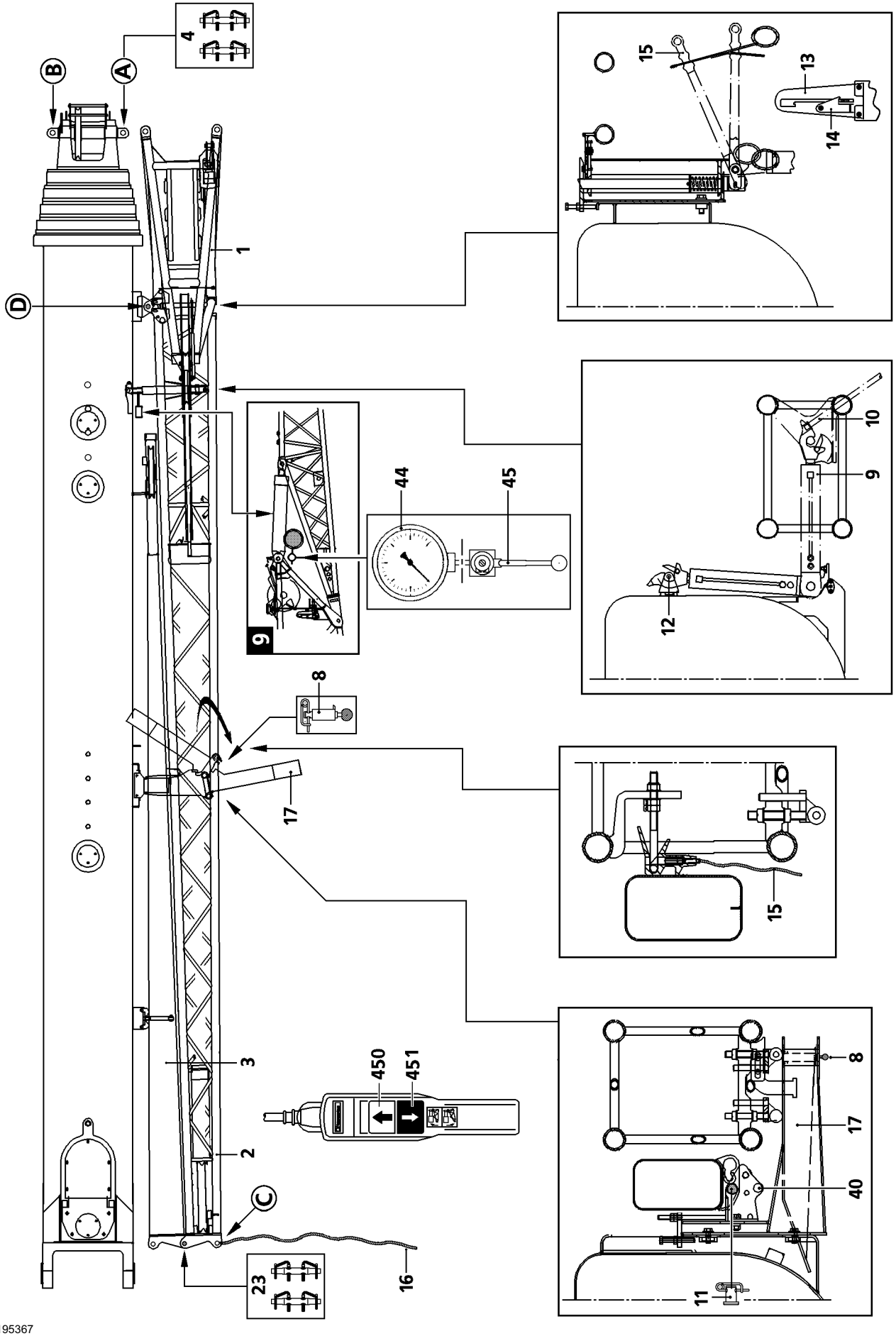
2.1 General

DANGER
Danger of fatal injuries due to falling folding jib!
As a result of improperly mounted, damaged or non-existing catch bar **40** on the telescopic boom pivot section, the folding jib – due to an assembly error – can fall down and cause fatal injuries.
- ▶ Before folding jib assembly, make sure that the catch bar **40** is properly mounted on the telescopic boom pivot section and that it is not damaged.
- ▶ The catch bar **40** is a mechanical safety device. For that reason, it is prohibited to change the catch bar **40** in any way.
- ▶ Standing under the folding jib during the swing procedure is prohibited!
- ▶ Standing in the swing range as well as in the folding area of the folding jib is prohibited!
- ▶ The folding jib must be secured by an auxiliary rope during the swinging process!

WARNING
Danger of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer 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 supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04!
- ▶ The supplied fall arrest system must be fastened on the fastening and attachment points as well as on the retaining 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!
- ▶ Do not step on the folding jib!

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 central ballast is installed on the crane chassis according to the load chart.
- – The telescopic boom is fully telescoped in.
- – The folding jib has been attached for transport on the telescopic boom pivot section.
- – The telescopic boom has been luffed down to the rear or the side in the 0° position.

DANGER
Danger of accident if the folding jib swings out by itself when it is unpinned!
If the telescopic boom is not in the 0° position, there is a danger of accidents if the folding jib swings out by itself when it is unpinned.
- ▶ Move the telescopic boom to 0° position.



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2.2 Reeving out the hoist rope on the telescopic boom head

In order to speed up subsequent reeving in of the hoist rope after assembling the folding jib, the hook block can be set down at a distance from the crane approximating to the subsequent distance of the telescoped in telescopic boom **with** assembled folding jib.

- ▶ Telescope the telescopic boom out to the respective length.
- ▶ Place the hook block on the ground.
- ▶ Disengage the hoist rope on the rope fixed point.
- ▶ For safety reasons, remove the hoist limit switch weight and the chain.

Note

- ▶ The hoist limit switch must be pulled mechanically and the operating rope must be attached to the telescopic boom head using the snap-hook when operating the folding jib.
- ▶ The telescopic boom may remain reeved in, if the hoist rope of winch 2 is used for the folding jib operation.

- ▶ Remove the rope retaining pipes on the pulley head and on the back pulley.
- ▶ Telescope the telescopic boom in again completely.

2.3 Important check before swinging out the hydraulic folding jibs (TNZK operation)

DANGER

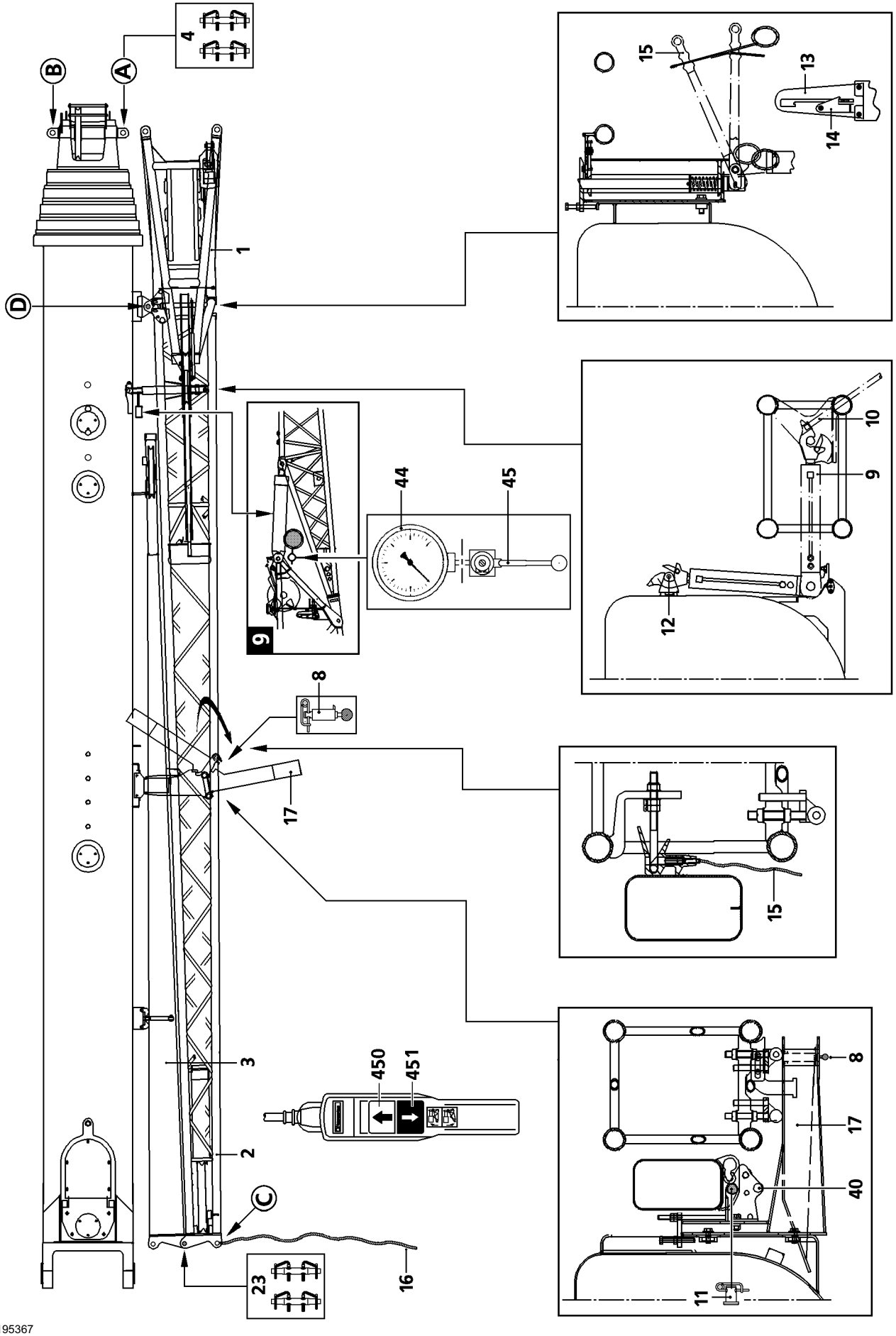
Danger of fatal injury if the folding jib involuntarily folds down!

When using hydraulic folding jibs (TNZK operation), before swinging the folding jib out, check if a pressure of 60 bar is shown on the pressure gauge **44**. If the pressure on the pressure gauge **44** is too low, fatal accidents can occur if the folding jib folds down by itself!

- ▶ It is **expressly prohibited** to swing out the folding jib with less than 60 bar on the pressure gauge **44**.

The ball valve **45** may only be actuated for maintenance work.

- ▶ If the pressure gauge **44** shows low pressure:
  Connect the hydraulic lines.
- ▶ Luff the folding jib up until a pressure of at least 60 bar is shown on the pressure gauge **44**.



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2.4 Assembly of the single folding jib carried on the crane

The end section **3**, which is not required, remains pinned to the telescopic boom during single folding jib operation.

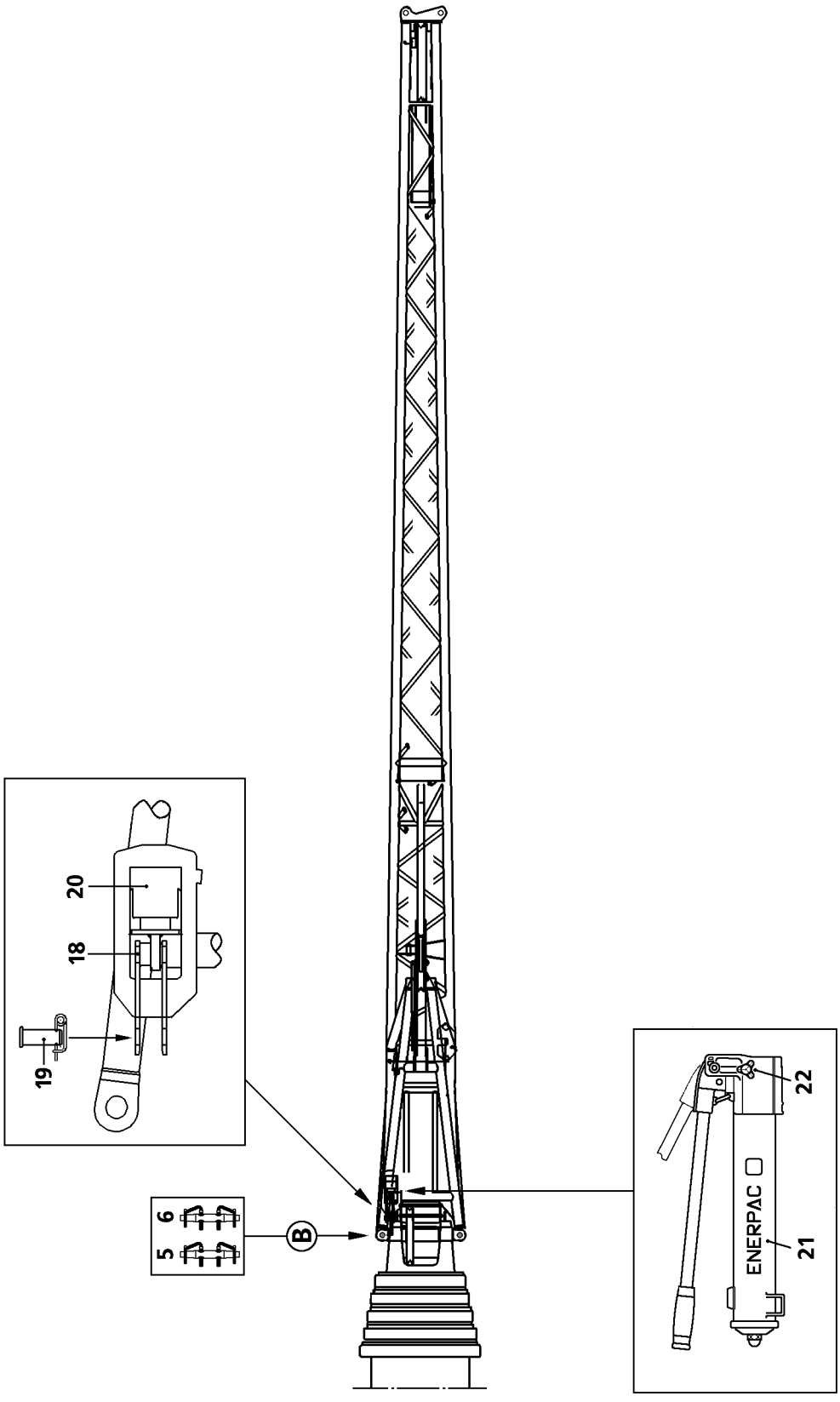
DANGER
Danger of fatal injury if the end section falls down!
During operation with the single folding jib, the end section **3** may not be unpinned from the telescopic boom. Otherwise there is a danger of accident due to falling end section **3**.
▶ Do not unpin the end section on the telescopic boom!

When swinging the folding jib support **17** in and out, ensure that the spring pin **8** is unlocked with one hand and that the folding jib support **17** is moved overhead with the other hand.
▶ Release and unpin the spring pin **8**.
▶ Swing the folding jib support **17** out until the spring pin **8** reengages.

With “hydraulic folding jibs” (TNZK operation), the hydraulic line must be disconnected before swinging out the folding jib.
▶ If a hydraulic folding jib is carried along:
Disconnect the hydraulic line to hydraulic cylinder (illustration 9).
▶ Attach the auxiliary rope **16** on point **C**.
▶ If a double folding jib is carried along:
Release and unpin the pin **23**.
▶ If a double folding jib is carried along:
Pull the nylon rope **15** and loosen the lock between the end section **3** and the pivot section **2**.
▶ Start the crane engine.
▶ Press button **451** and swing the folding jib out with the swing cylinder until it can be pinned at point **A**.
▶ Insert the pins **4** on top and bottom on point **A** and secure.

DANGER
Danger of fatal injury due to toppling folding jib!
Special retaining clips must be used to secure the pins **4**. The use of spring pins or spring retainers on the pins **4** is not permitted. The folding jib may only be unlocked at point **D**, when the pins **4** are pinned and secured at the top and bottom at point **A**.
▶ Pin and secure pins **4** at point **A** on top and bottom.

▶ Swing the safety bracket **14** with assembly rod **10** to the side.
▶ Push lever **15** with assembly rod **10** upwards and latch into the platform.
▶ Press button **451** and swing the folding jib with the swing cylinder all the way out.
▶ Unlock the swing cylinder **9** with assembly rod **10**.



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DANGER
Danger of fatal injuries due to falling folding jib!
The folding jib could fall down due to an assembly error.
- ▶ Standing under the folding jib during the swing procedure is prohibited!
- ▶ Standing in the swing range as well as in the folding area of the folding jib is prohibited!

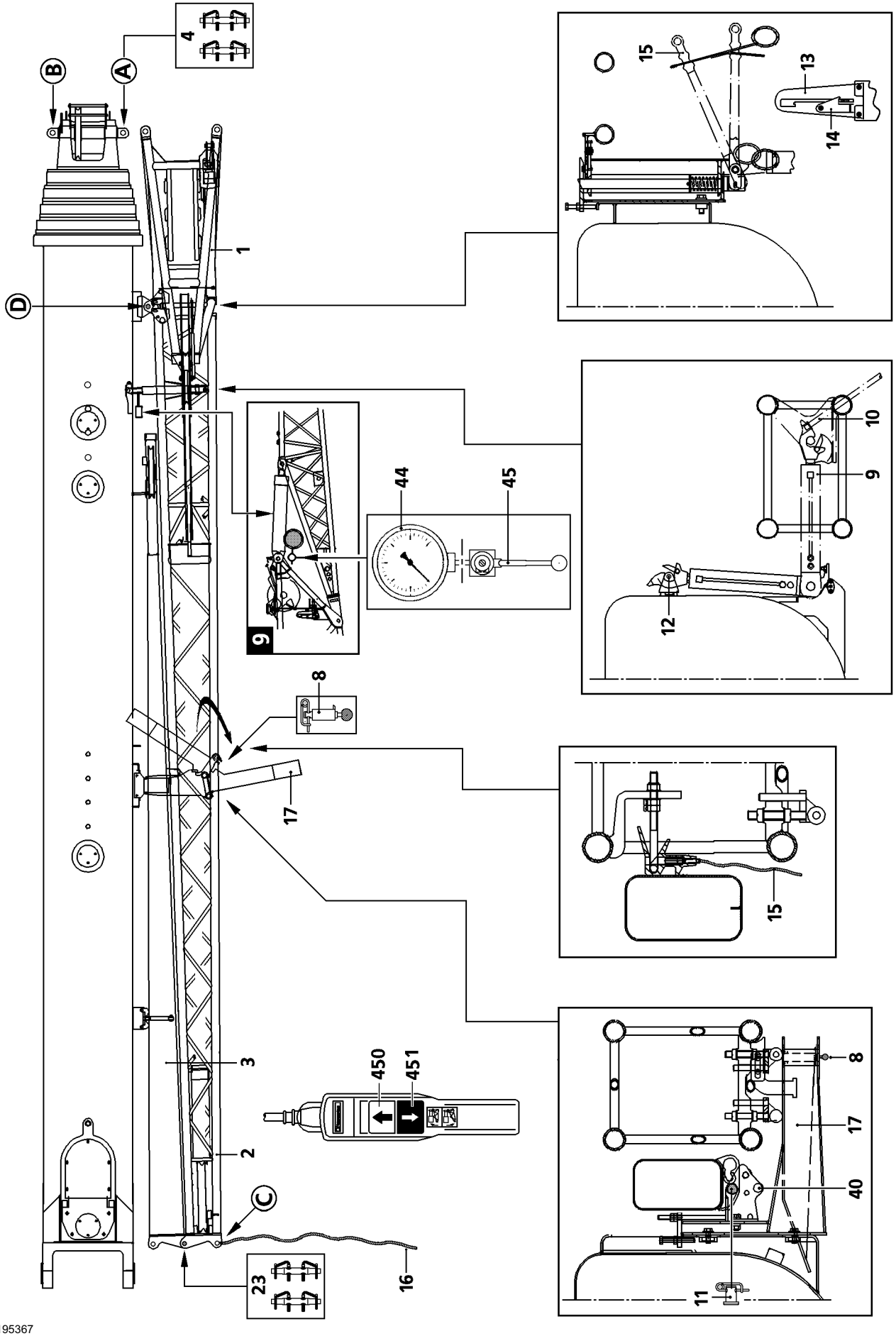
▶ Swing the pivot section **2** with the auxiliary rope by 180° until it can be pinned on top and bottom at point **B**.

DANGER
Danger of accident!
- ▶ The use of spring pins or retaining springs is prohibited on pins **5** and pins **6**!
- ▶ To secure the pin **5** and the pin **6**, use the special retaining clips.

▶ Pin and secure the pin **5** on the bottom at point **B**.

In order to pin on top at point **B**, the hydraulic / mechanical assembly aid **20** must be used.
- ▶ Release the pin **19** and unpin from bore **18**.
- ▶ Pin and secure the assembly aid **20** to the towing bracket with pin **19**.
- ▶ Close the knob **22** on the hand pump **21**.
- ▶ Extend the hydraulic cylinder of the assembly aid **20** by operating the hand pump **21** until the bore is aligned at the opening of the folding jib and the telescopic boom.
- ▶ Pin and secure the pin **6** on top on point **B**.
- ▶ Open the knob **22**.

Result:
– The hydraulic cylinder of the assembly aid **20** returns to the starting position and the pin is released.



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2.5 Assembly of the double folding jib carried on the crane

2.5.1 Assembly of pivot section

When swinging the folding jib support **17** in and out, ensure that the spring pin **8** is unlocked with one hand and that the folding jib support **17** is moved overhead with the other hand.

- ▶ Release and unpin the spring pin **8**.
- ▶ Swing the folding jib support **17** out until the spring pin **8** locks again.

With “hydraulic folding jibs” (TNZK operation), the hydraulic line must be disconnected before swinging out the folding jib.

- ▶ If a hydraulic folding jib is carried along:
  Disconnect the hydraulic line to hydraulic cylinder (illustration 9).
- ▶ Attach the auxiliary rope **16** on point **C**.
- ▶ Release and unpin pins **11** and insert into bore **40**.
- ▶ Press button **451** and swing the folding jib out with the swing cylinder until it can be pinned at point **A**.
- ▶ Pin upper and lower pins **4** at point **A** and secure.

DANGER
Danger of fatal injury due to toppling folding jib!
Special retaining clips must be used to secure the pins **4**. The use of spring pins or spring retainers on the pins **4** is not permitted. The folding jib may only be unlocked at point **D**, when the pins **4** are pinned and secured at the top and bottom at point **A**.

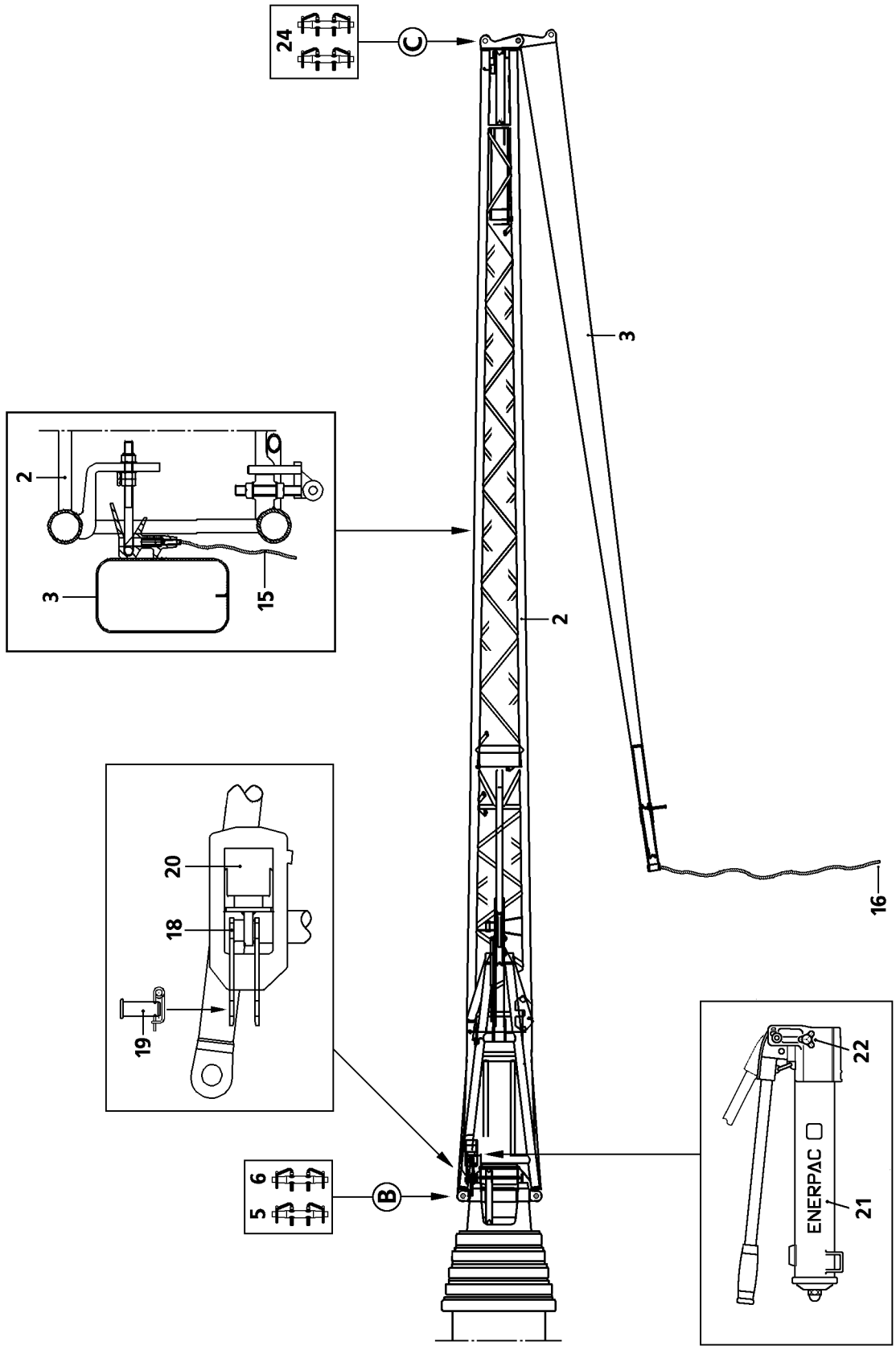
- ▶ Pin and secure pins **4** at point **A** on top and bottom.

- ▶ Swing the safety bracket **14** with assembly rod **10** to the side.
- ▶ Push lever **15** with assembly rod **10** upwards and latch into the platform.
- ▶ Press button **451** and swing the folding jib with the swing cylinder all the way out.
- ▶ Unlock the swing cylinder **9** with assembly rod **10**.

DANGER
Danger of fatal injury due to toppling folding jib!
It is prohibited to stand under the folding jib during the swing operation, since the folding jib could topple if it was incorrectly installed.

- ▶ No persons or objects may be within the swing range and the folding range of the telescopic boom and folding jib.

- ▶ Swing the folding jib with the auxiliary rope **16** by 180° until it can be pinned at the top and bottom at point **B**.



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2.5.2 Assembly of the pivot section, continued

DANGER
Danger of accident!
- ▶ The use of spring pins or spring retainers is prohibited on pins **5** and pins **6**!
- ▶ Special safety clips must be used to secure pins **5** and pins **6**.

▶ Pin and secure the pin **5** on the bottom at point **B**.

In order on top on point **B**, the hydraulic / mechanical assembly aid **20** must be used.
- ▶ Release the pin **19** and unpin from bore **18**.
- ▶ Pin and secure the assembly aid **20** to the towing bracket with pin **19**.
- ▶ Close the knob **22** on the hand pump **21**.
- ▶ Extend the hydraulic cylinder of the assembly aid **20** by operating the hand pump **21** until the bore is aligned at the opening of the folding jib and the telescopic boom.
- ▶ Pin and secure the pin **6** on top on point **B**.
- ▶ Open the knob **22**.

Result:
– The hydraulic cylinder of the assembly aid **20** returns to the starting position and the pin is released.

2.5.3 Assembly of end section

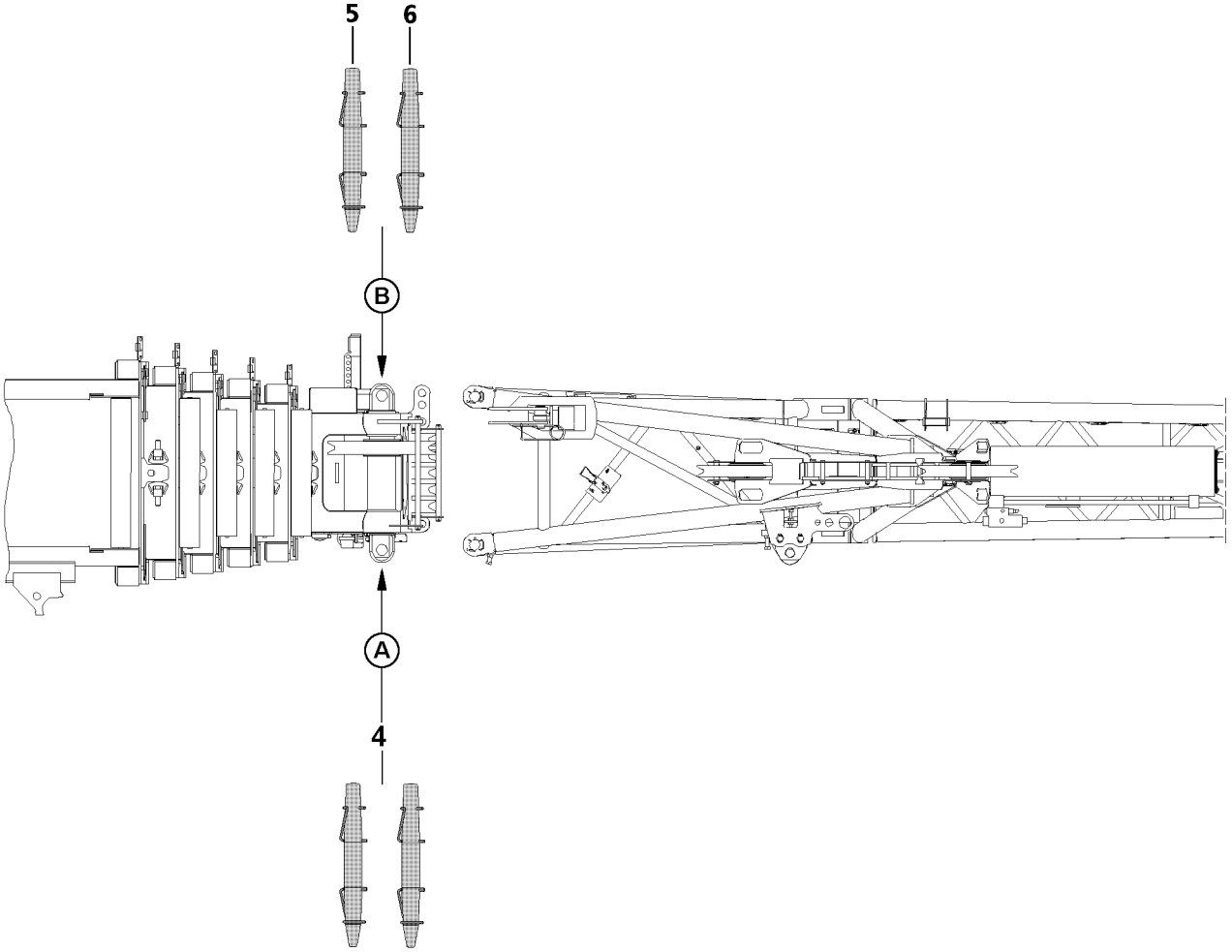
- ▶ Remove the auxiliary rope **16** on point **C** and attach on the end section **3**.
- ▶ Pull the nylon rope **15** to release the locking mechanism between the end section **3** and the pivot section **2**.

CAUTION
The end section can swing out unintentionally!
- ▶ Hold the end section with the auxiliary rope during the unlocking procedure to prevent the end section from swinging out unintentionally.

▶ Swing the end section **3** forward by 180° until it can be pinned at point **C**.

DANGER
Danger of fatal injury due to toppling folding jib!
It is prohibited to stand under the folding jib during the swing operation, since the folding jib could topple if it was incorrectly installed.
- ▶ No persons or objects may be within the swing range and the folding range of the telescopic boom and folding jib.

- ▶ Pin and secure pins **24** at top and bottom using safety clips.
- ▶ Remove the auxiliary rope.



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2.6 Assembling the separately transported folding jib on the crane

2.6.1 Assembling the separately transported folding jib for crane operating position

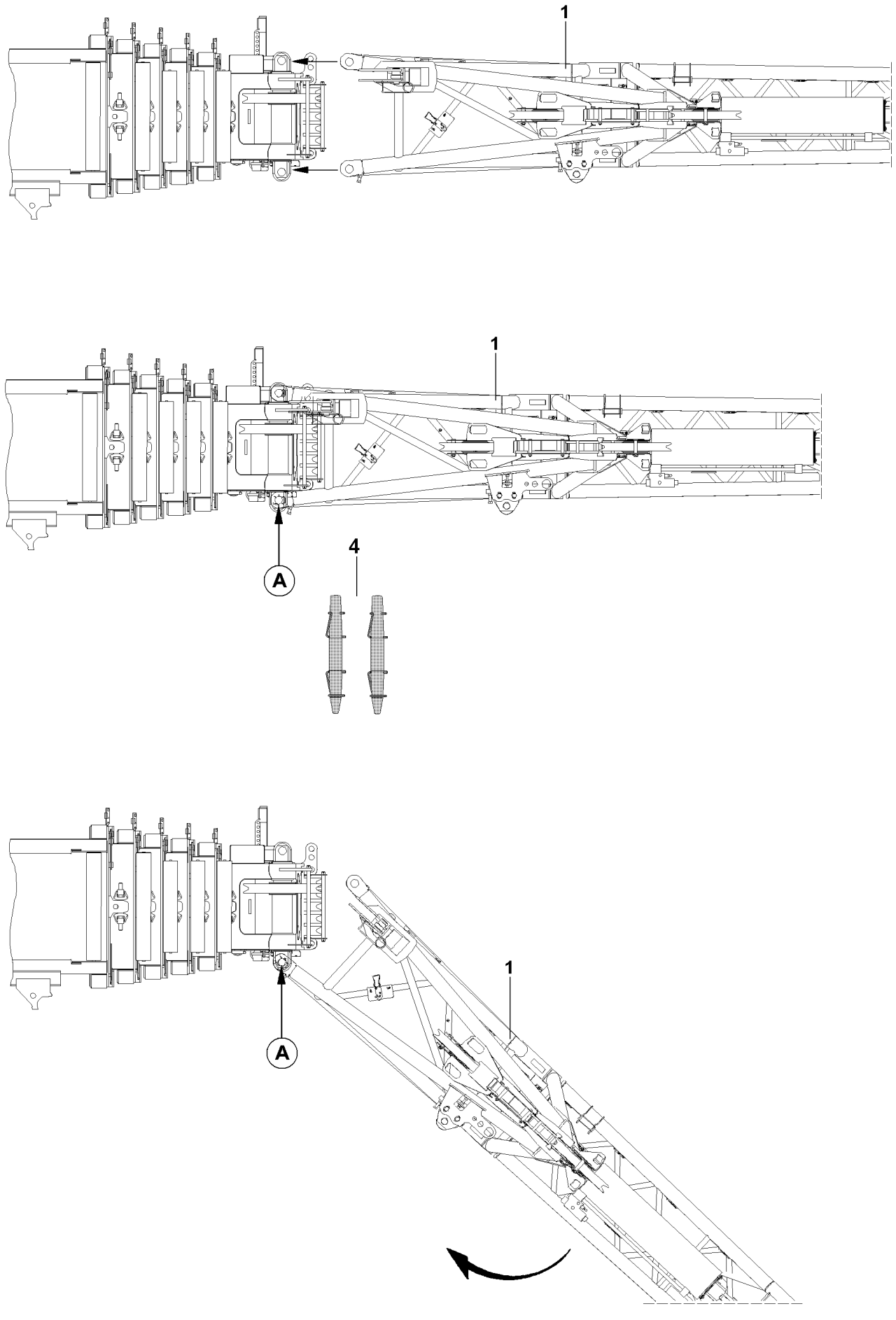
For description of fastening points, see section “Fastening points”.

- ▶ Attach the auxiliary crane to the respective fastening points of the folding jib.
- ▶ Lift the folding jib with the auxiliary crane and insert it into the pin points on the telescopic boom.

DANGER
Danger of accident!

- ▶ The use of spring cotters or spring retainers is prohibited at pins **4**, **5** and **6**!
- ▶ Use the special safety clips to secure pins **4**, **5** and **6**.

- ▶ Pin the folding jib to telescopic boom:
- ▶ Pin and secure the pin **4** on top on point **A**.
- ▶ Pin and secure the pin **5** on top on point **B**.
- ▶ Pin and secure the pin **4** on the bottom at point **A**.
- ▶ Pin and secure the pin **6** on the bottom at point **B**.
- ▶ For more information concerning the double folding jib assembly, see section “Assembly of the end section”.



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2.6.2 Assembling the separately transported folding jib for transport position

An auxiliary crane must be available for the assembly of the separate folding jib **1**.
Make sure that the following prerequisites are met:

– The crane is properly supported and horizontally aligned.
– The telescopic boom is fully telescoped in.
– The telescopic boom is in travel direction in 0° position.

DANGER
Danger of accident from involuntary swinging out of the folding jib when removing the fastening equipment!
If the telescopic boom is not in 0° position, a risk of accident exists due to involuntary swinging out of the folding jib when the fastening equipment is removed.

▶ Move the telescopic boom to 0° position.

▶ Attach the auxiliary crane to corresponding fastening points on folding jib, see section “Fastening points”.

CAUTION
Risk of property damage!
If the following notes are not observed, the folding jib can move uncontrolled and as a result, damage can occur in the area of the telescopic boom and the driver’s cab.

▶ Carry out auxiliary crane movements only with utmost care and the least possible acceleration.
▶ The folding jib must be secured with an auxiliary rope during the assembly procedure!

▶ Lift the folding jib with the auxiliary crane and guide it into pin points on the telescopic boom head.

DANGER
Danger of accident!

▶ The use of spring pins or spring retainers is prohibited on the pins **4**!
▶ Special retaining clips must be used to secure the pins **4**.

▶ Pin the folding jib to telescopic boom:
▶ Pin and secure pins **4** on top and on the bottom at point **A**.

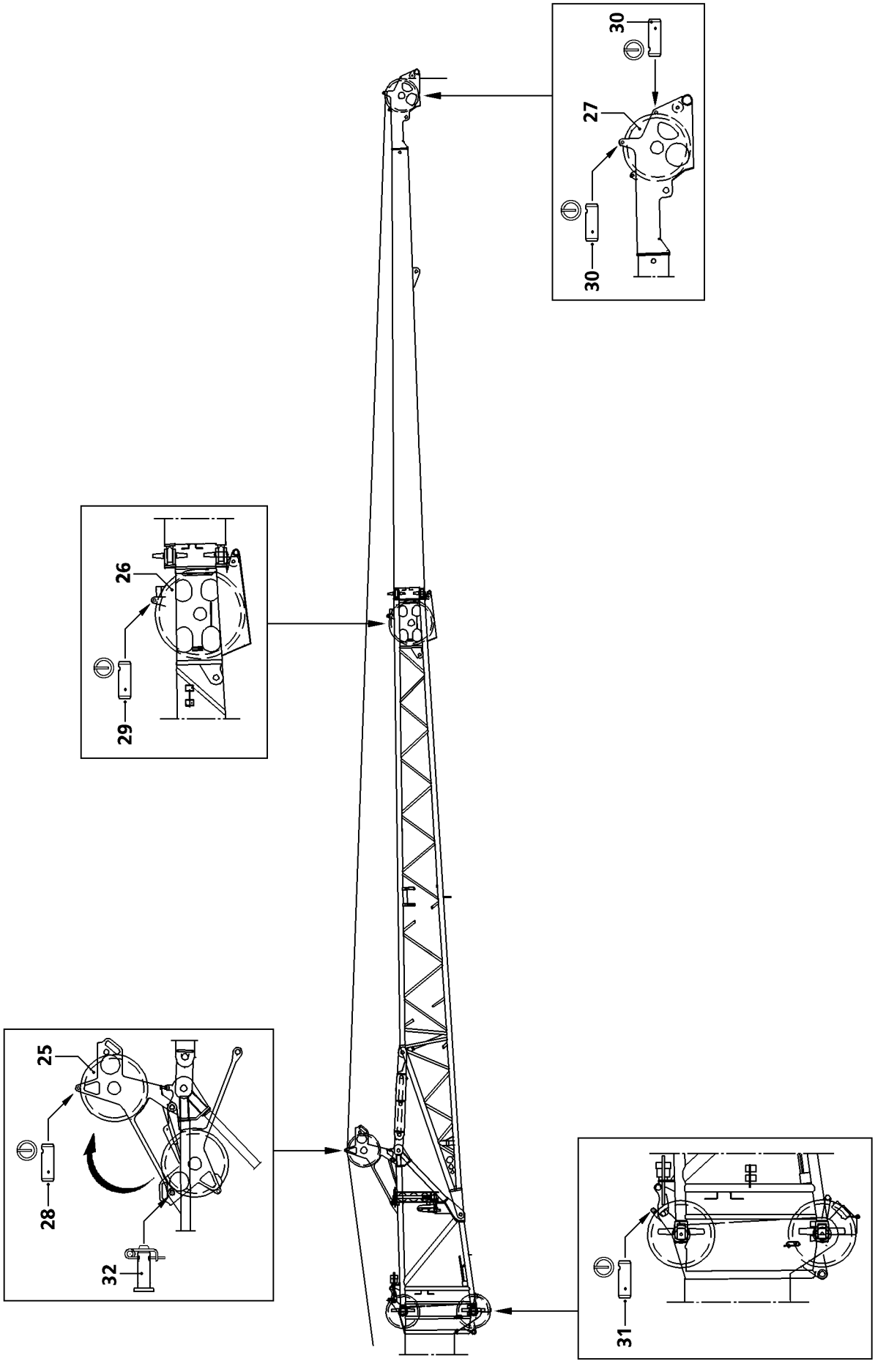
DANGER
Danger of fatal injuries due to falling folding jib!
Due to improperly pinned folding jib on the telescopic boom, life threatening or even fatal injuries can occur.

▶ Before removing the auxiliary crane, make sure that the folding jib is pinned and secured on point **A** on top and bottom.

▶ Remove the auxiliary crane.

Note

▶ For further procedure to fold the folding jib onto the telescopic boom or in transport position, refer to section “Removing the folding jib”.



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3 Reeving in the hoist rope

DANGER
Risk of falling from folding jib!
When walking on the folding jib, for example to reeve the hoist rope in or out, there is a risk of slipping and falling from the folding jib.
▶ Do not step on the folding jib!

3.1 Swinging the rope guide pulley into operating position

▶ Release and unpin the pin **32**.
▶ Swing rope guide pulley **25** into operating position.
▶ Pinning rope guide pulley **25** into operating position: Insert and secure pin **32**.

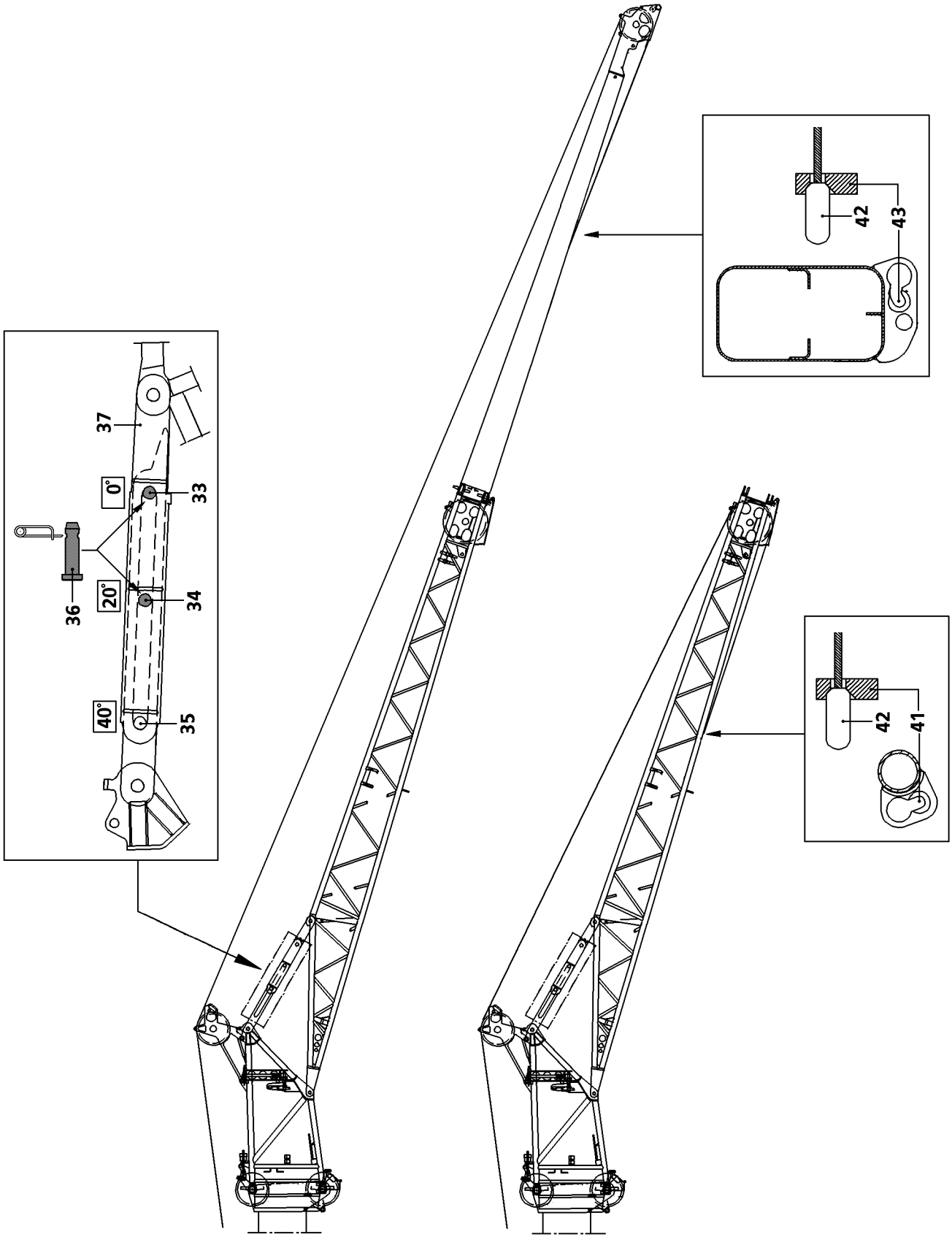
3.2 Reeving in the hoist rope

▶ Release and unpin the rope retaining pin **28** and rope retaining pin **29**.
▶ For operation with double folding jib:
Release and unpin the rope retaining pins **30**.
▶ Place hoist rope over the rope guide pulley **25** and over the end pulley **26** at 10.8 m or over the end pulley **27** at 19 m.
▶ Insert the rope retaining pin again and secure with linch pins.

CAUTION
Damage to the hoist rope!
If the rope retaining pin **29** is pinned in during operation with the double folding jib, the slack hoist rope may scrape against the rope retaining pin **29** and become damaged.
▶ **Do not** insert the rope retaining pin **29** during double folding jib operation!

▶ Reeve in the load hook or hoist rope.
▶ Attach the hoist limit switch weight.

Note
▶ During folding jib operation with the hook block reeved to the telescopic boom, the load is reduced by the weight of the reeved-in hook block.



B194017

4 Changing over mechanical folding jib from 0° to 20° or 40°

There are 3 ways of changing the mechanical folding jib to 20° or 40°:

1.) Changing the folding jib with the hoist rope.
2.) Changing the folding jib by supporting it
3.) Changing the folding jib with hook block or load hook

Make sure that the following prerequisites are met:

– The crane is aligned in horizontal direction.
– The telescopic boom is fully telescoped in.
– The folding jib is attached as a straight extension in the 0° position.
– The telescopic boom has been luffed to the rear or the side.

4.1 Changing the folding jib with the hoist rope.

CAUTION

Danger of damage to the folding jib and the hoist rope!

If the telescopic boom is telescoped out or luffed down as long as the hoist rope is tightened on the assembly fixed point, the hoist rope and the folding jib may be damaged.

▶ Do not telescope out or luff down the telescopic boom with the hoist rope attached on the fixed assembly point!

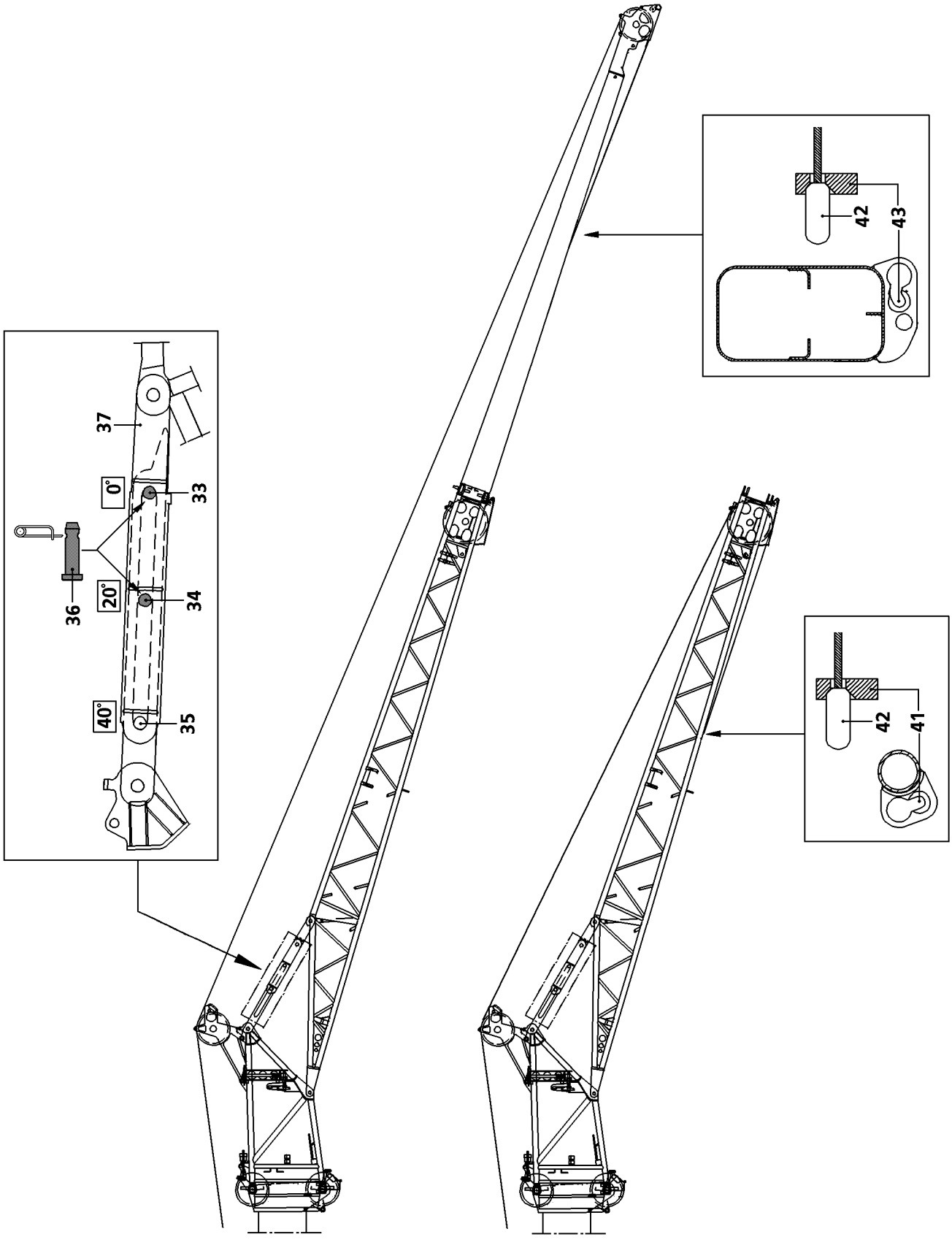
4.1.1 Preparatory work

▶ Unreeve the hoist rope on the lock.
▶ Remove the hoist limit switch weight.
▶ For operation with double folding jib:
Guide the press fitting **42** into the assembly fixed point **43**.

or

For operation with single folding jib:

■ Guide the press fitting **42** into the assembly fixed point **41**.
▶ Tighten the hoist rope by **carefully deflecting** the appropriate master switch.



B194017

4.1.2 Changing the angle with the hoist rope

You can operate the folding jib in three different angles. The required angle is set with the pin **36**. In the “Basic setting”, immediately after assembling the folding jib, the folding jib is in the 0° position.

DANGER
Danger of fatal injury!
Danger of accident if folding jib is allowed to suddenly “fold downward”!
- ▶ Ensure that **before unpinning** the pin **36**, the hoist rope is taut and that the folding jib is actually held in position by the hoist rope.
- ▶ Unpinning the retaining pins **35** at the 40° pin bores is **prohibited**!

Angle setting 20°

- ▶ Release the pin **36** and unpin from the 0° bore **33**.
- ▶ Insert the pin **36** into the 20° bore **34** and secure.

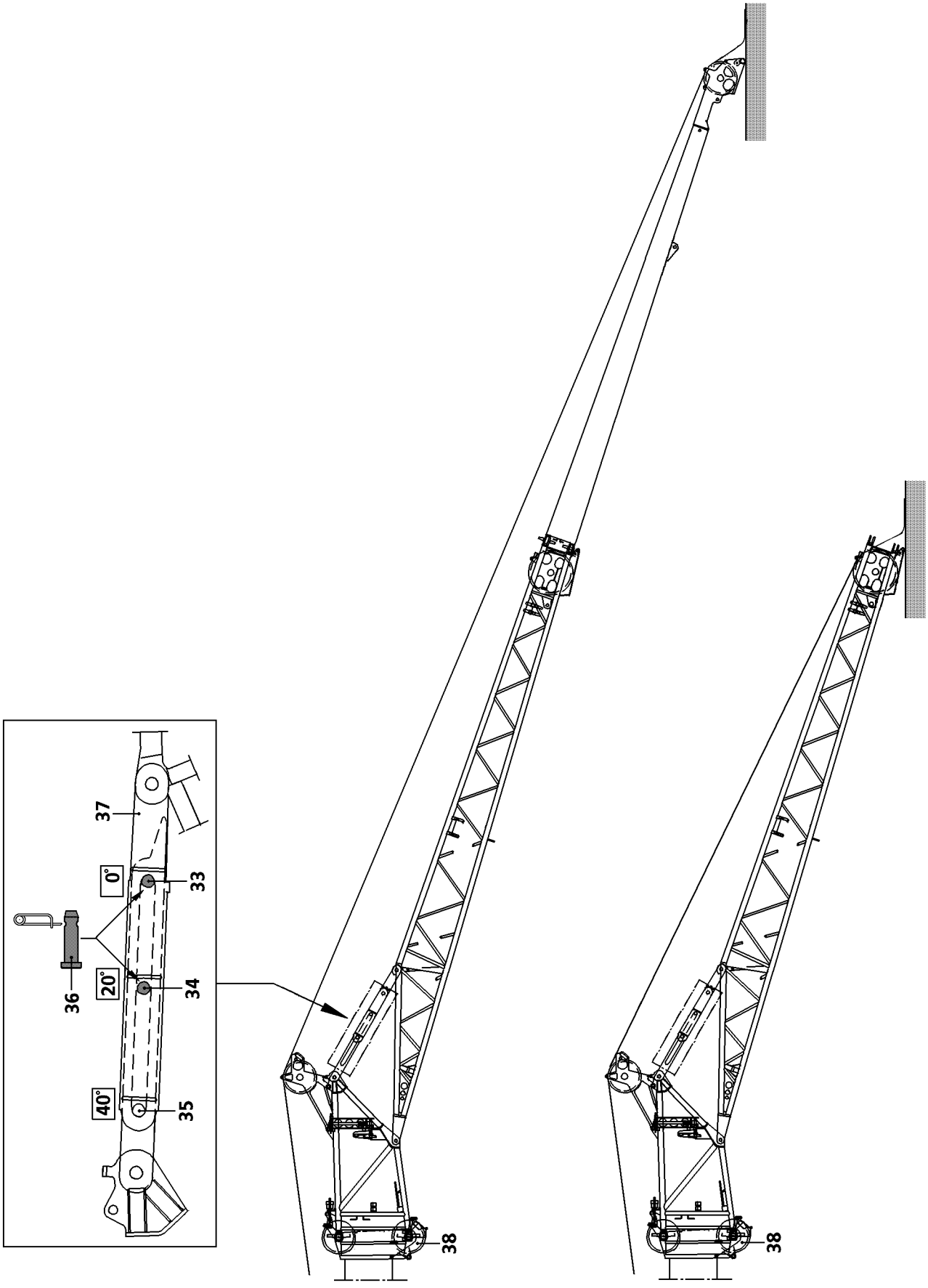
Angle setting 40°

- ▶ Release the pin **36** and unpin from the 0° bore **33**.
- ▶ Insert the pin **36** into the pin receptacle and secure.

Positioning the folding jib

Make sure that the pin **36** is properly pinned in and secured for the required angle setting.
- ▶ Spool the hoist rope out by carefully moving with the corresponding master switch and simultaneously luffing the telescopic boom up.

Result:
- – The pull bracket **37** places itself against the respective pin in the selected angle setting.
- – The folding jib is held by the respective pins.



B190763

4.2 Changing the folding jib by supporting it

4.2.1 Preparatory work

Note

▶ The folding jib can lie on the ground or must be properly supported, if necessary.

CAUTION

Danger of property damage!

▶ When laying down the folding jib, make sure that the folding jib is **not** laid on the rope pulley. Otherwise it will be damaged. Also make sure that the hoist rope is **not** damaged.

▶ Completely luff down the telescopic boom until the folding jib lies the ground.

4.2.2 Changing angle with folding jib supported

You can operate the folding jib in three different angles. The required angle is set with the pin **36**. In the “Basic setting” - immediately after assembling the folding jib - the folding jib is in the 0° position.

DANGER

Danger of fatal injury!

Danger of accident if folding jib is allowed to suddenly “fold downward”!

▶ Make sure that **before unpinning** the pin **36**, the folding jib is lying on the ground or on a proper and secure support.

▶ Unpinning the retaining pins **35** at the 40° pin bores is **prohibited**!

Angle setting 20°

▶ Release the pin **36** and unpin from the 0° bore **33**.

▶ Insert the pin **36** into the 20° bore **34** and secure.

Angle setting 40°

▶ Release the pin **36** and unpin from the 0° bore **33**.

▶ Insert the pin **36** into the pin receptacle and secure.

Positioning the folding jib

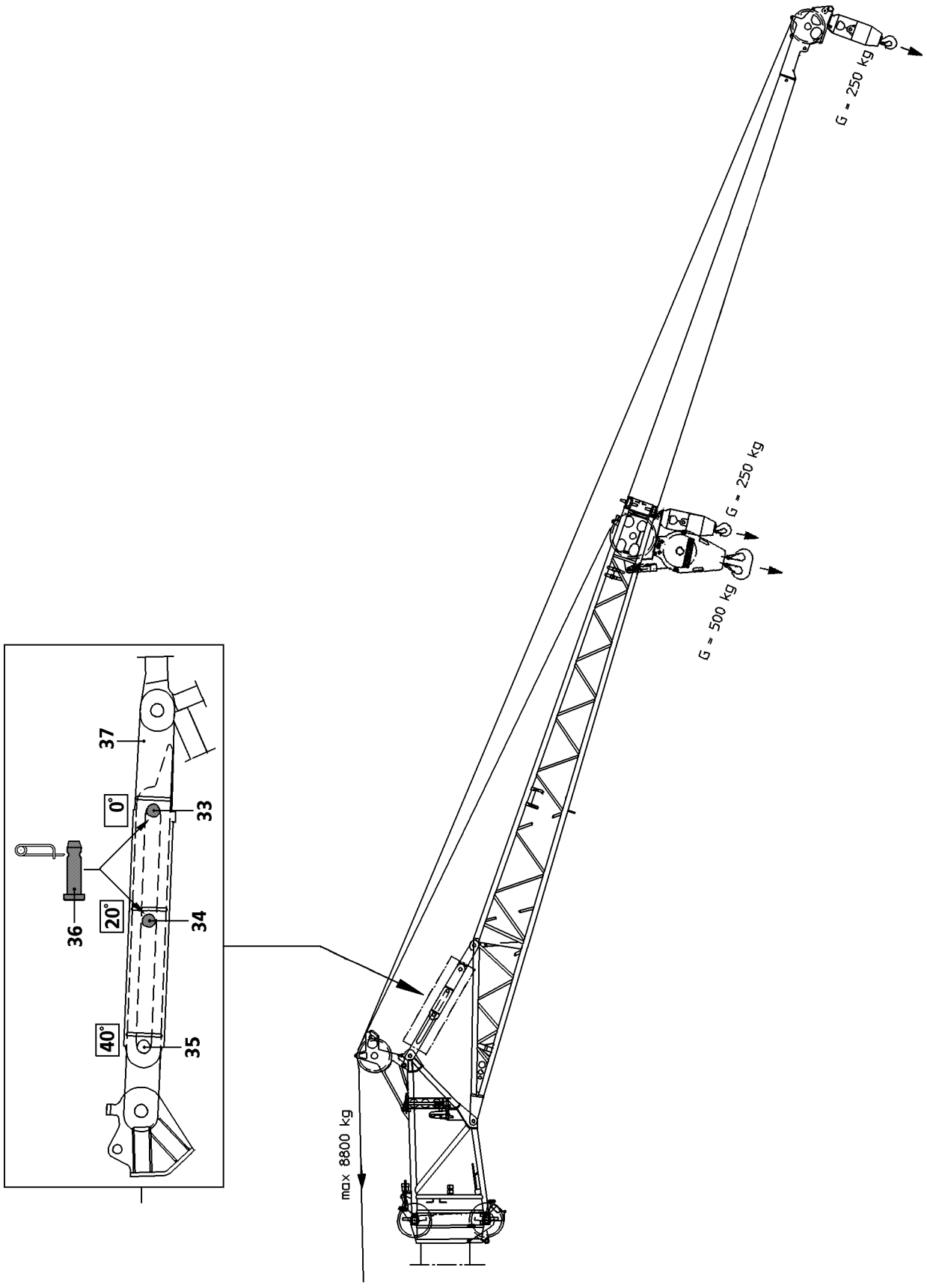
Make sure that the pin **36** is properly pinned in and secured for the required angle setting.

▶ Luff up the telescopic boom slowly and carefully.

Result:

– The pull bracket **37** places itself against the respective pin in the selected angle setting.

– The folding jib is held by the respective pins.



B194442

4.3 Changing the folding jib with hook block or load hook

On a single folding jib, the change over can be carried out with 1–roller (G = 450 kg) or 3–roller hook block (G = 500 kg) or with load hook (G = 450 kg).

For a double folding jib, the change over may only be done with a load hook (G=450 kg).

CAUTION

Damage to load hook!

Change over with a load hook is **not** possible for a rope lock “with a swirl”!

▶ Use a rope lock “without a swirl”!

4.3.1 Preparatory work

▶ Remove the hoist limit switch weight with chain.

▶ Bypass “the hoist top shut-off” on the LICCON.

CAUTION

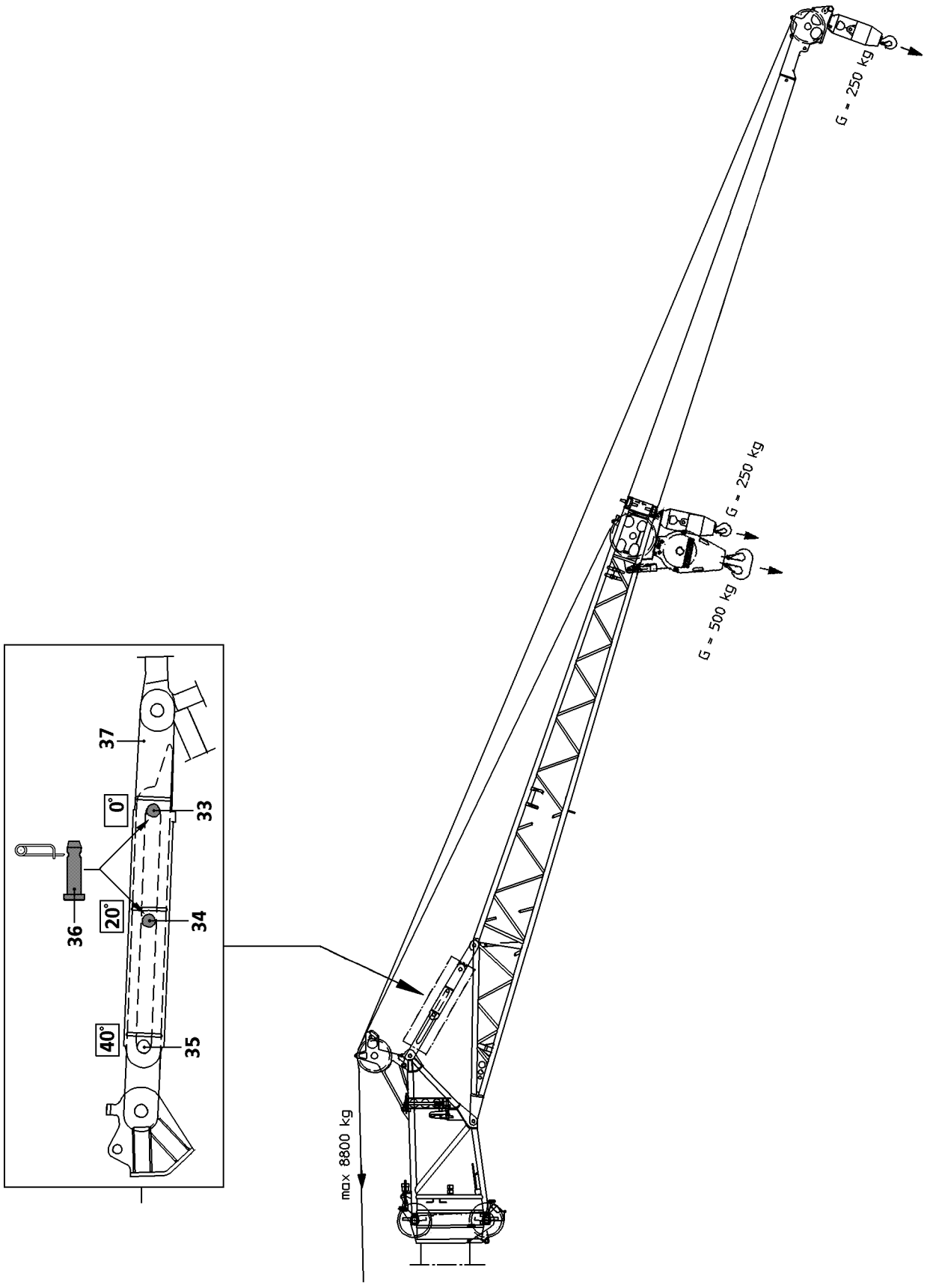
Danger of damage to the folding jib and the hoist rope!

If the telescopic boom is telescoped out or luffed down as long as the hook block / load hook is on the stop of the folding jib, the hoist rope and the folding jib can be damaged.

▶ Do not telescope out or luff down the telescopic boom with the hook block / load hook on the stop of the folding jib!

▶ By **delicately moving** the corresponding master switch, move the hook block or the load hook carefully to the stop of the folding jib and tension the hoist gear (maximum permissible rope pull 8800 kg).

▶ End the bypass of the “hoist top shut off”.



B194442

4.3.2 Changing the angle with the hook block / load hook

You can operate the folding jib in three different angles. The required angle is set with the pin **36**. In the “Basic setting”, immediately after assembling the folding jib, the folding jib is in the 0° position.

DANGER
Danger of fatal injury!
Danger of accident if folding jib is allowed to suddenly “fold downward”!
- ▶ Make sure, **before unpinning** the pin **36**, that the folding jib is secured against falling down by the hook block or the load hook!
- ▶ Unpinning the retaining pins **35** on the 40° pin bores is **prohibited**!

Angle setting 20°

- ▶ Release the pin **36** and unpin from the 0° bore **33**.
- ▶ Insert the pin **36** into the 20° bore **34** and secure.

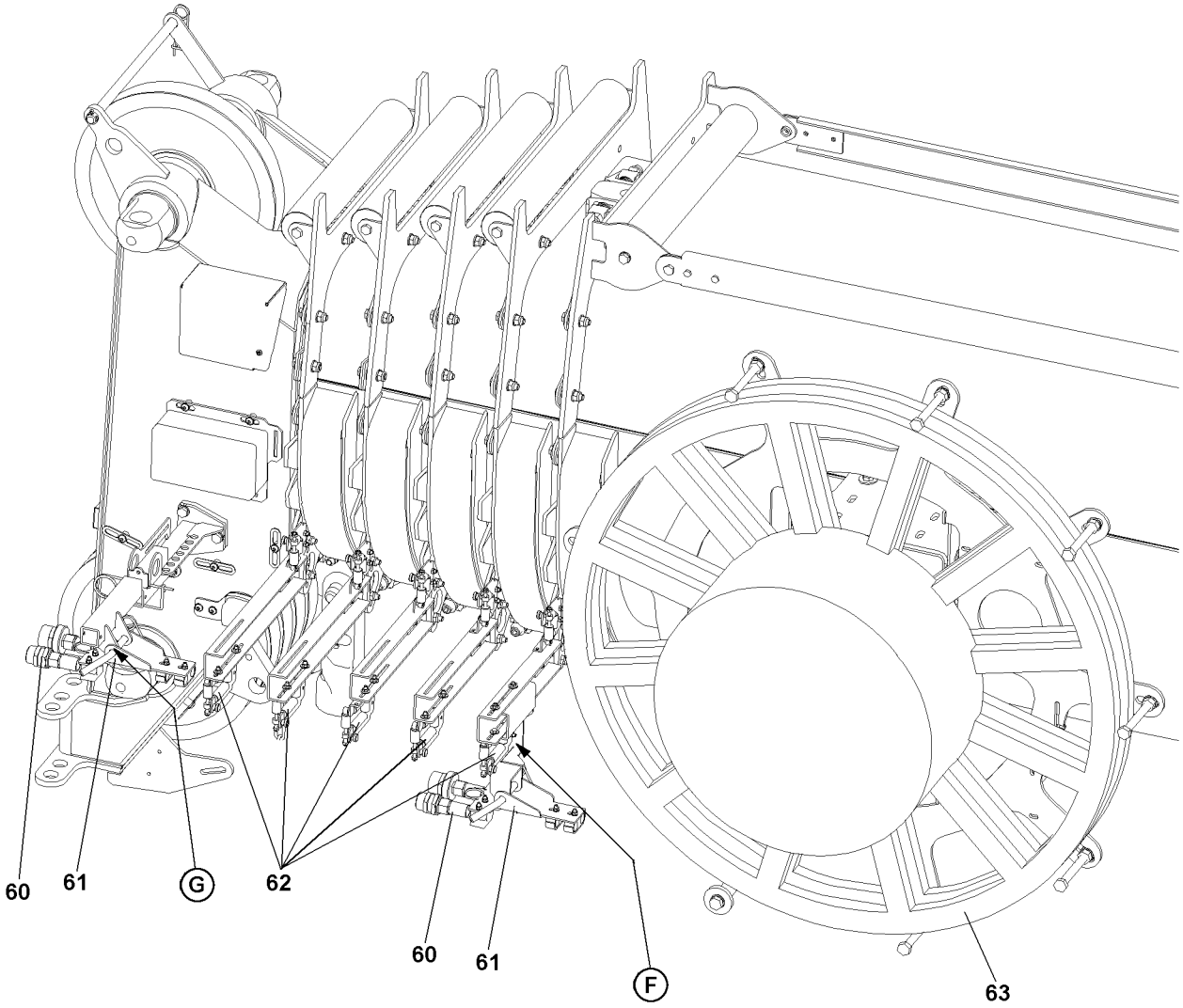
Angle setting 40°

- ▶ Release the pin **36** and unpin from the 0° bore **33**.
- ▶ Insert the pin **36** into the pin receptacle and secure.

Positioning the folding jib

Make sure that the pin **36** is properly pinned in and secured for the required angle setting.
- ▶ Spool the hoist rope out by carefully moving with the corresponding master switch and simultaneously luffing the telescopic boom up.

Result:
- – The pull bracket **37** places itself against the respective pin in the selected angle setting.
- – The folding jib is held by the respective pins.



B197047

5 Hydraulic connections

5.1 Establishing the hydraulic connections

A hydraulic connection to the folding jib only needs to be made if the folding jib is hydraulic (TNZK operation). Hydraulic lines cannot be incorrectly connected due to the different diameters of the hydraulic connections.

- For operation with a hydraulic folding jib:
  Establish the hydraulic connections to the hose couplings **60** at point **G**.
- After operation with a hydraulic folding jib:
  Protect the connections from contamination.

5.2 Installing the hose couplings in operating or neutral position

The hydraulic supply to the folding jib is made via the hose drum **63** on the telescopic boom. During longer periods of telescopic boom operation the bracket **61** should be assembled with the hose couplings **60** in neutral position point **F**. This avoids having to spool the hydraulic hoses up and out unnecessarily.

CAUTION
Danger of accident due to rebounding hydraulic hoses!
The hydraulic hoses are under spring tension. If the removed bracket **61** is released, it snaps back against the hose drum **63** due to the spring force. This can cause injury to assembly personnel or damage the hose drum **63**.

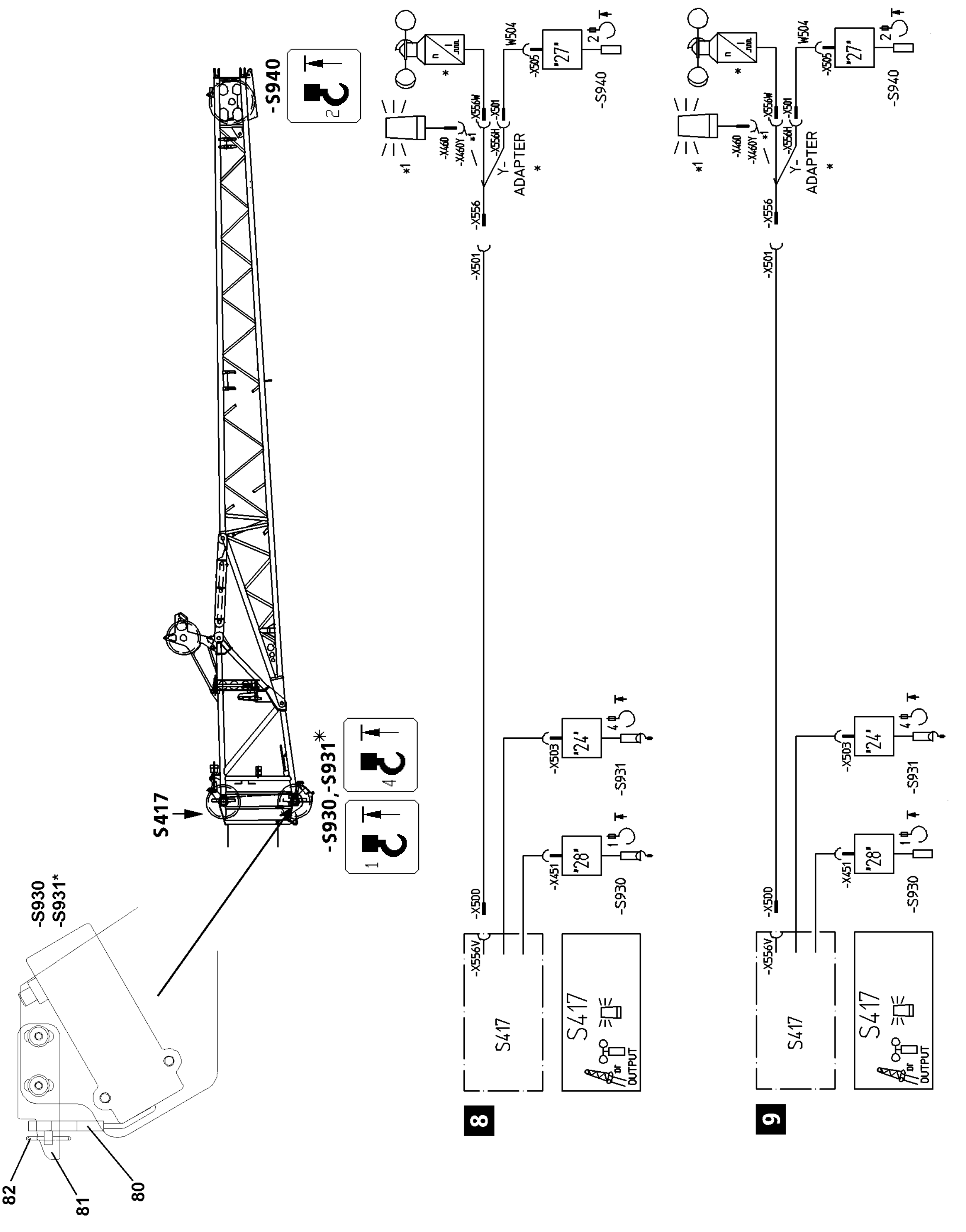
- Do not allow removed bracket **61** to snap back!
- Hold the removed bracket **61** and then reinstall it!

5.2.1 Assembling the hose couplings in operating position

- Remove the bracket **61** with the hose couplings **60** at point **F**.
- Place the hydraulic hoses in the guides **62**.
- Properly install the bracket **61** with hose couplings **60** at point **G**.
- Secure the hydraulic hoses in the guides **62**.

5.2.2 Installing the hose couplings in neutral position

- Release the hydraulic hoses in the guides **62**.
- Remove the bracket **61** with the hose couplings **60** at point **G**.
- Remove the hydraulic hoses from the guides **62**.
- Properly install the bracket **61** with hose couplings **60** at point **F**.


-S930
-S931*
S417
-S930,-S931*
-S940
80
81
82
-X501
-X556
Y-ADAPTER
-X556W
-X460
-X460Y
W504
-X505
"27"
-X503
"24"
-X451
"28"
-X500
-X556V
OUTPUT
8
9

B111654

6 Electrical connections

6.1 Actuating the hoist limit switch mechanically

If you are not working in “two hook mode” with the folding jib, then the hoist limit switch **-S930/-S931** that is not required must be actuated mechanically.

- ▶ Remove the hoist limit switch weight and chain.
- ▶ Pull the hoist limit switch rope **80**, hang in on the fixed point **81** and secure with locking pin **82**.

6.2 Electrical connections on the single folding jib

6.2.1 Single hook operation, see illustration 8

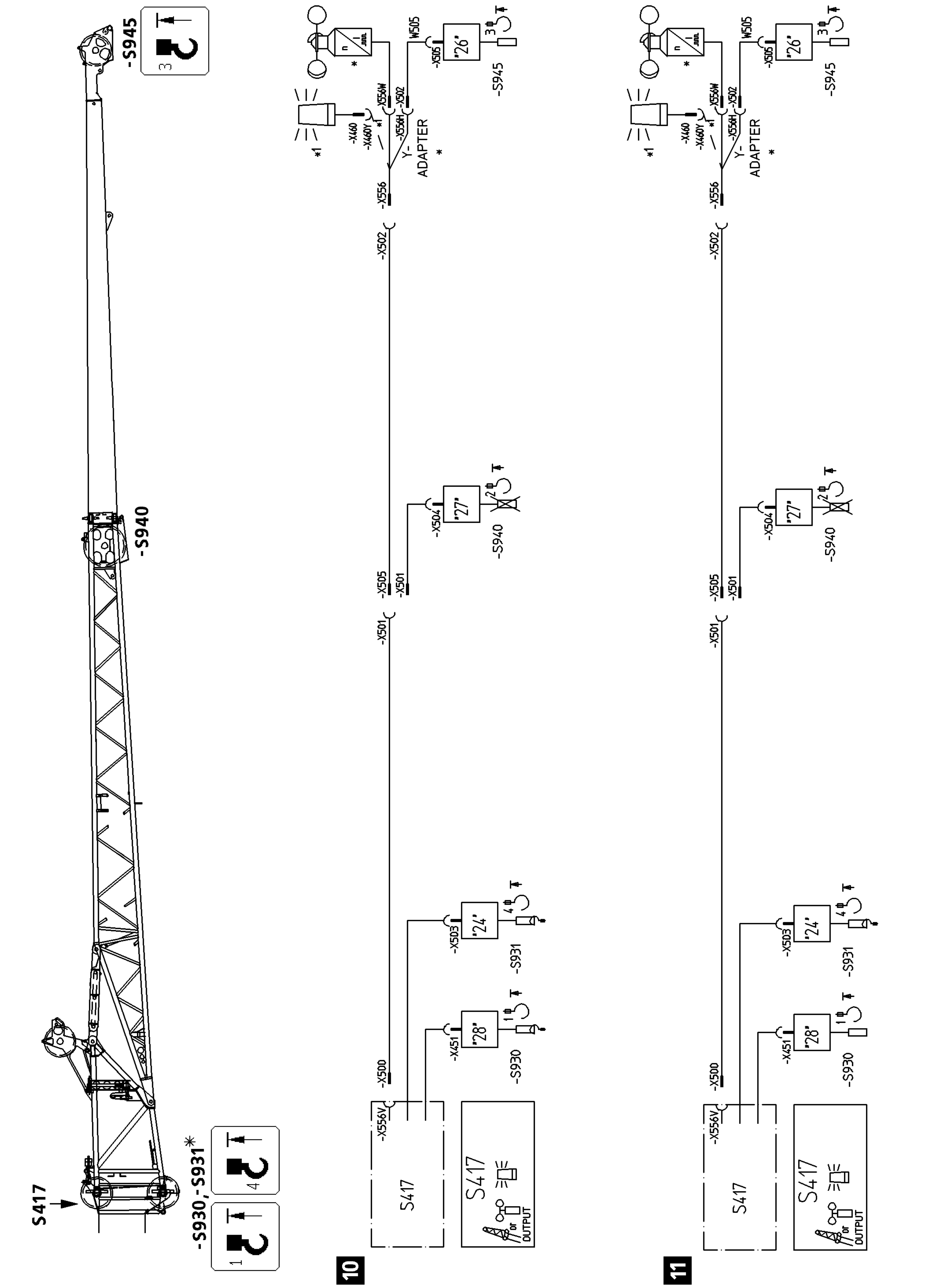
CAUTION
Danger of property damage!
- ▶ Only the hoist limit switch **S940** on the single folding jib is active.

- ▶ Actuate the hoist limit switch **-S930** mechanically.
- ▶ Actuate the hoist limit switch* **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the adapter **-X556** into the socket **-X501**.
- ▶ Insert the hoist limit switch **-S940** with the cable plug **-X501** into the socket **-X556H**.
- ▶ Insert the wind speed sensor* with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon* with the cable plug **-X460** into the socket **-X460Y**.

6.2.2 Two hook operation, see illustration 9

CAUTION
Danger of property damage!
- ▶ The hoist limit switch **S930** at the telescopic boom and the hoist limit switch **S940** at the single folding jib are active!

- ▶ Actuate the hoist limit switch* **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the adapter **-X556** into the socket **-X501**.
- ▶ Insert the hoist limit switch **-S940** with the cable plug **-X501** into the socket **-X556H**.
- ▶ Insert the wind speed sensor* with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon* with the cable plug **-X460** into the socket **-X460Y**.


-S945
3
-S940
S417
-S930,-S931*
1
4
10
11
-X556
-X502
-X556W
-X556H
-X460
-X460Y
*1
Y-
ADAPTER
*
W505
-X505
"26"
-X504
"27"
2
-X501
-X503
"24"
-S931
-X451
"28"
-S930
-X500
-X556V
OUTPUT

B194019

6.3 Electrical connections on the double folding jib

6.3.1 Single hook operation, see illustration 10

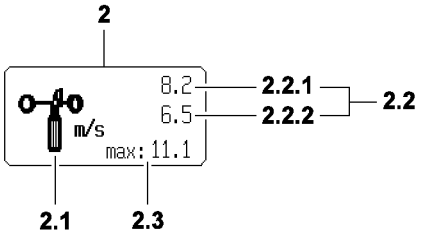
CAUTION
Danger of property damage!
- ▶ Only the hoist limit switch **S945** at the dual folding jib is active. The hoist limit switch **S940** on the single folding jib is unplugged.

- ▶ Actuate the hoist limit switch **-S930** mechanically.
- ▶ Actuate the hoist limit switch* **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the cable plug **-X505** into the socket **-X501**.
- ▶ Insert the adapter **-X556** into the socket **-X502**.
- ▶ Insert the hoist limit switch **-S945** with the cable plug **-X502** into the socket **-X556H**.
- ▶ Insert the wind speed sensor* with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon* with the cable plug **-X460** into the socket **-X460Y**.

6.3.2 Two hook operation, see illustration 11

CAUTION
Danger of property damage!
- ▶ The hoist limit switch **S930** at the telescopic boom and the hoist limit switch **S945** at the dual folding jib are active! The hoist limit switch **S940** on the single folding jib is unplugged.

- ▶ Actuate the hoist limit switch* **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the cable plug **-X505** into the socket **-X501**.
- ▶ Insert the adapter **-X556** into the socket **-X502**.
- ▶ Insert the hoist limit switch **-S945** with the cable plug **-X502** into the socket **-X556H**.
- ▶ Insert the wind speed sensor* with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon* with the cable plug **-X460** into the socket **-X460Y**.



B197654

6.4 Function check

Make sure that the following prerequisites are met:
– All electrical connections have been made.
– The LICCON computer system is running.

6.4.1 Wind sensor

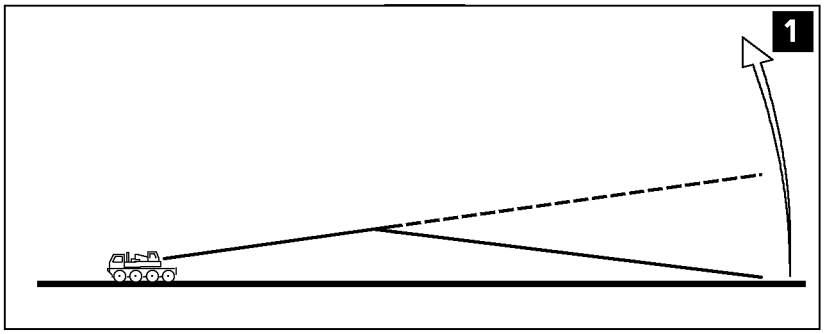
Check movement and operation by manually operating the wind sensor at the “Wind speed” **2.2** symbol element.

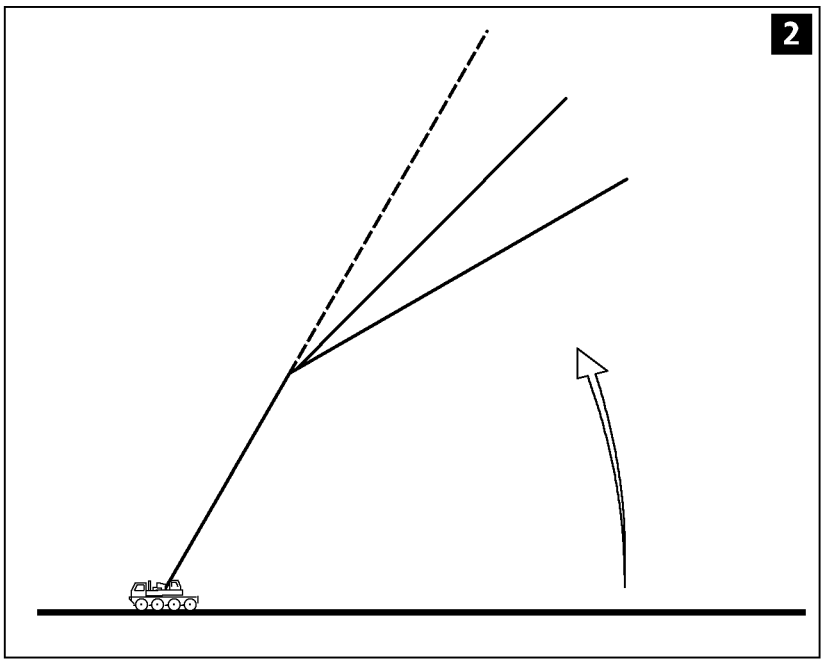
CAUTION
Danger of equipment damage!
▶ Re-check the operation of the wind sensor after every attachment.

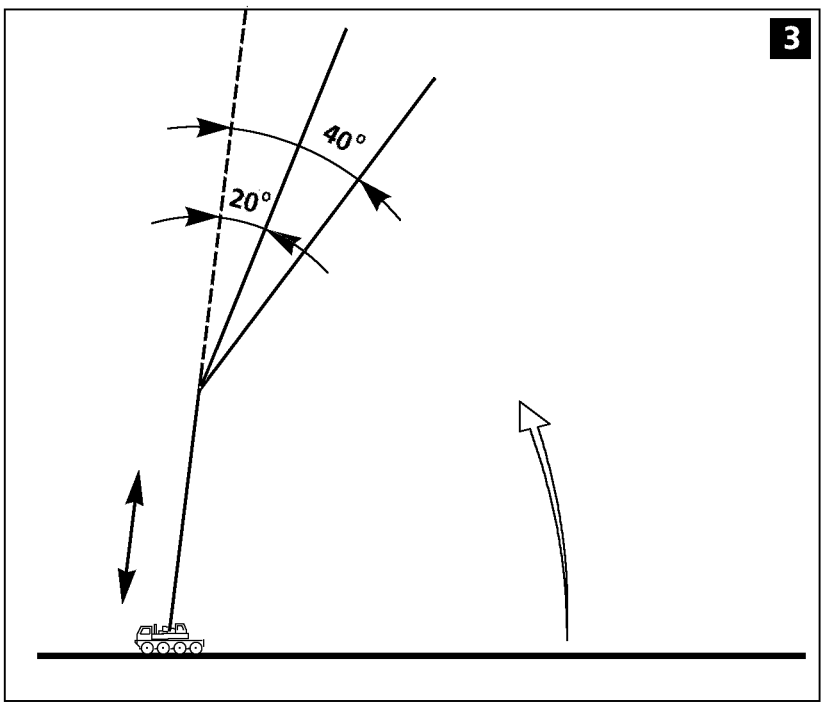
6.4.2 Hoist limit switch

Manually operate all active hoist limit switches - the relevant “Hoist top” symbol element must appear on the LICCON monitor. The hoist winch must switch off.

Note
▶ When replacing or changing the hoist limit switch (HES), the relevant HES must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB).







B185908

7 Erection

7.1 Preparatory work

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 central ballast is installed on the crane chassis according to the load chart.
- The telescopic boom is fully telescoped in.
- The folding jib has been assembled according to the load chart and the operating instructions.
- All limit switches have been correctly installed and are fully functional.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and is secured with the rope retaining pins to prevent it from jumping out.
- There are no loose parts on the telescopic boom or the folding jib.
- The telescopic boom, the folding jib and its components (limit switches, airplane warning light, wind speed sensor etc.) must be free of snow and ice in the winter.

DANGER
Danger of accident!
Incorrectly fitted or non-operational limit switches and falling parts (pins, spring-loaded safety pins, ice etc.) can cause injuries!

▶ Install all limit switches, pins and spring pins properly.

▶ Check if all prerequisites have been met.

7.2 Erection procedure

DANGER
Danger of fatal injury!
The radii specified in the load chart may not be exceeded or fallen below, even if there is no load on the hook! If this regulation is not observed, the crane can topple over.

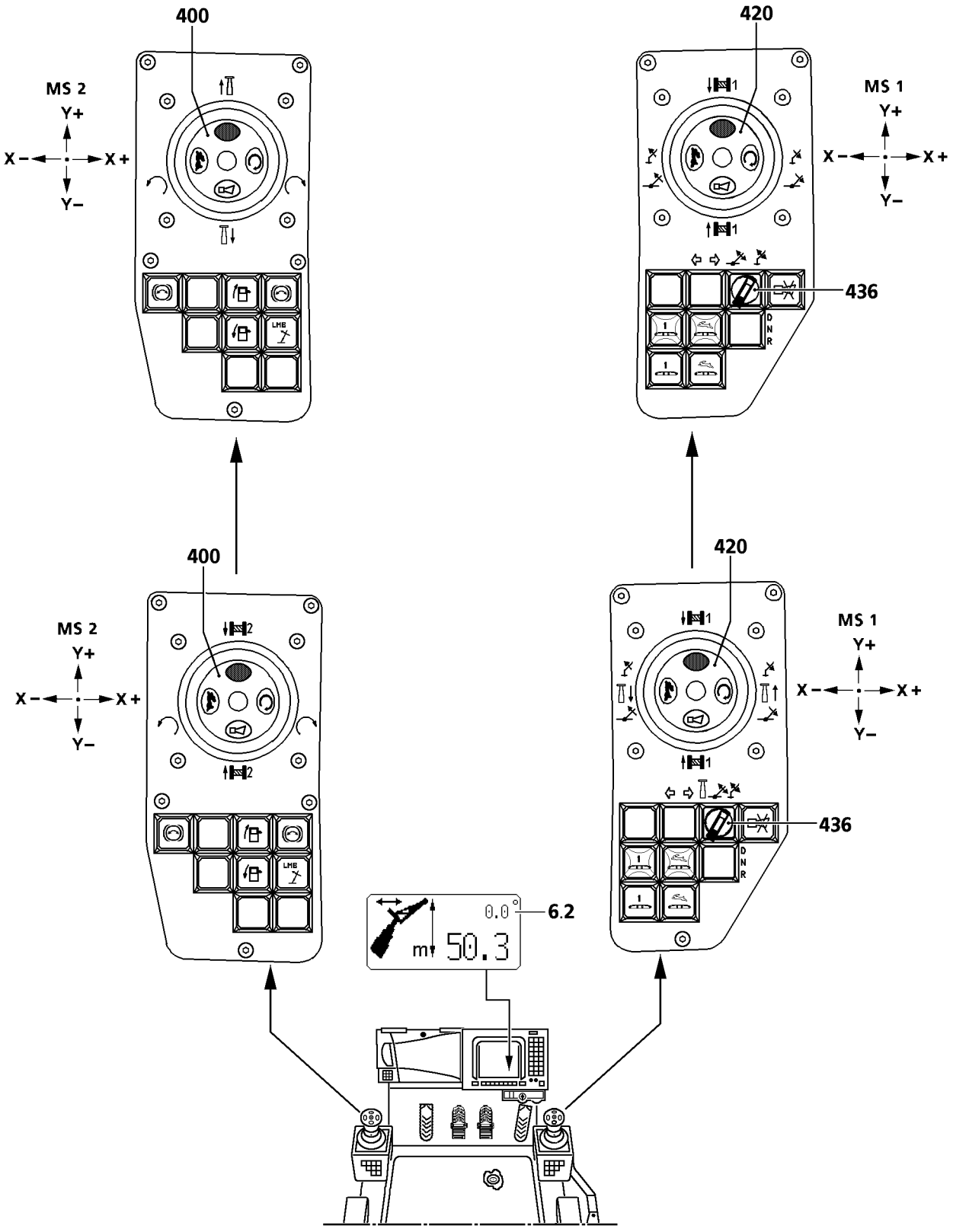
▶ Compare and check the settings on the LICCON computer system with the actual configuration status!

For adjustment of the LICCON overload protection, refer to chapter 4.02.

▶ Set and confirm the LICCON overload protection according to the required set up configuration.

▶ Luff the telescopic boom up with the folding jib attached until the LICCON signals the release.

▶ Telescope the telescopic boom out to the values specified in the load chart.


400
MS 2
Y+
X−
X+
Y−
LMB
420
MS 1
Y+
X−
X+
Y−
436
D
N
R
400
MS 2
Y+
X−
X+
Y−
LMB
420
MS 1
Y+
X−
X+
Y−
436
D
N
R
0.0°
6.2
m
50.3

B198648

8 Adjusting the folding jib angle for the hydraulic folding jib

The adjustment range of the folding jib lies between 0° and 40° to the telescopic boom. It is possible to luff the hydraulically adjustable folding jib under load.

DANGER
The crane can topple over!
The crane can topple over if the maximum load carrying capacity of the crane is exceeded.
- ▶ The specifications in the load charts must be adhered to!
- ▶ The load charts for the hydraulically adjustable folding jib are only valid for angles of 0°, 20° and 40°!
- ▶ For the adjustment angles between the nominal angles of 0°, 20° and 40°, the maximum load carrying capacity will be determined by the LICCON computer system shown on the LICCON monitor.

Make sure that the following prerequisites are met:
– All hydraulic connections have been made.
– All electrical connections have been made.
– The engine is running.
– The operating mode **TNZK** has been set and confirmed on the LICCON computer system.

8.1 Angle display for folding jib

The folding jib angle **6.2** is shown on the LICCON monitor as the relative angle between the telescopic boom pulley head and the folding jib.

8.2 Luffing with hydraulic folding jib

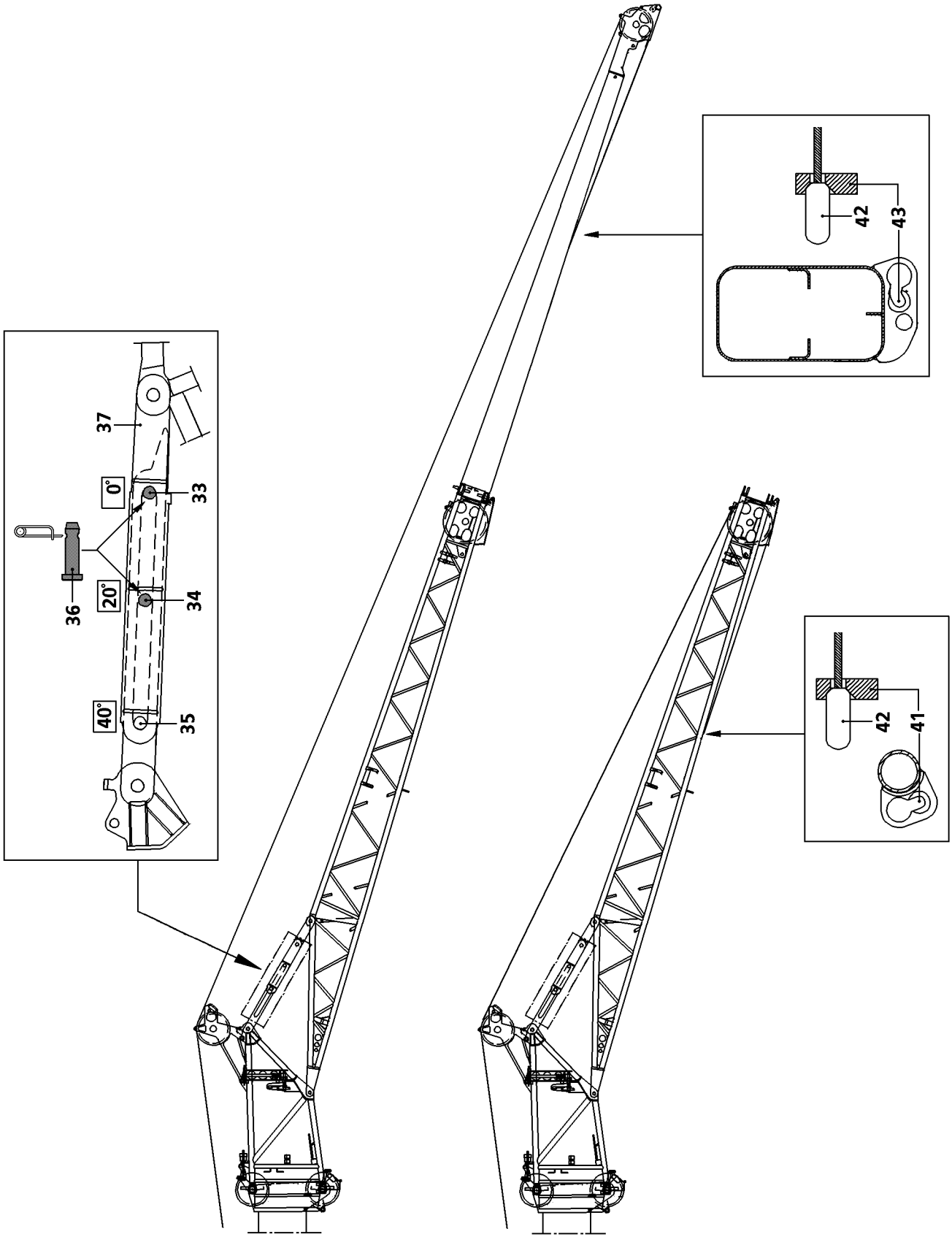
Ensure that the following preconditions are met:
– The rotary switch **436** is set to position right “luff folding jib”.

▶ If the folding jib is to be luffed down:
Move master switch 1 **420** to the right in direction X+.

Result:
– The hydraulic folding jib is luffed down.

▶ If the folding jib is to be luffed up:
Move master switch 1 **420** to the left in direction X-.

Result:
– The hydraulic folding jib is luffed up.



B194017

9 Changing over mechanical folding jib from 20° or 40° to 0°

There are 3 ways of changing the mechanical folding jib to 0°:

1.) Changing the folding jib with the hoist rope.
2.) Changing the folding jib by supporting it
3.) Changing the folding jib with hook block or load hook

Make sure that the following prerequisites are met:

– The crane is aligned in horizontal direction.
– The telescopic boom is fully telescoped in.
– The folding jib is installed at an angle of 20° or 40°.
– The telescopic boom has been luffed to the rear or the side.

9.1 Changing the folding jib with the hoist rope.

9.1.1 Preparatory work

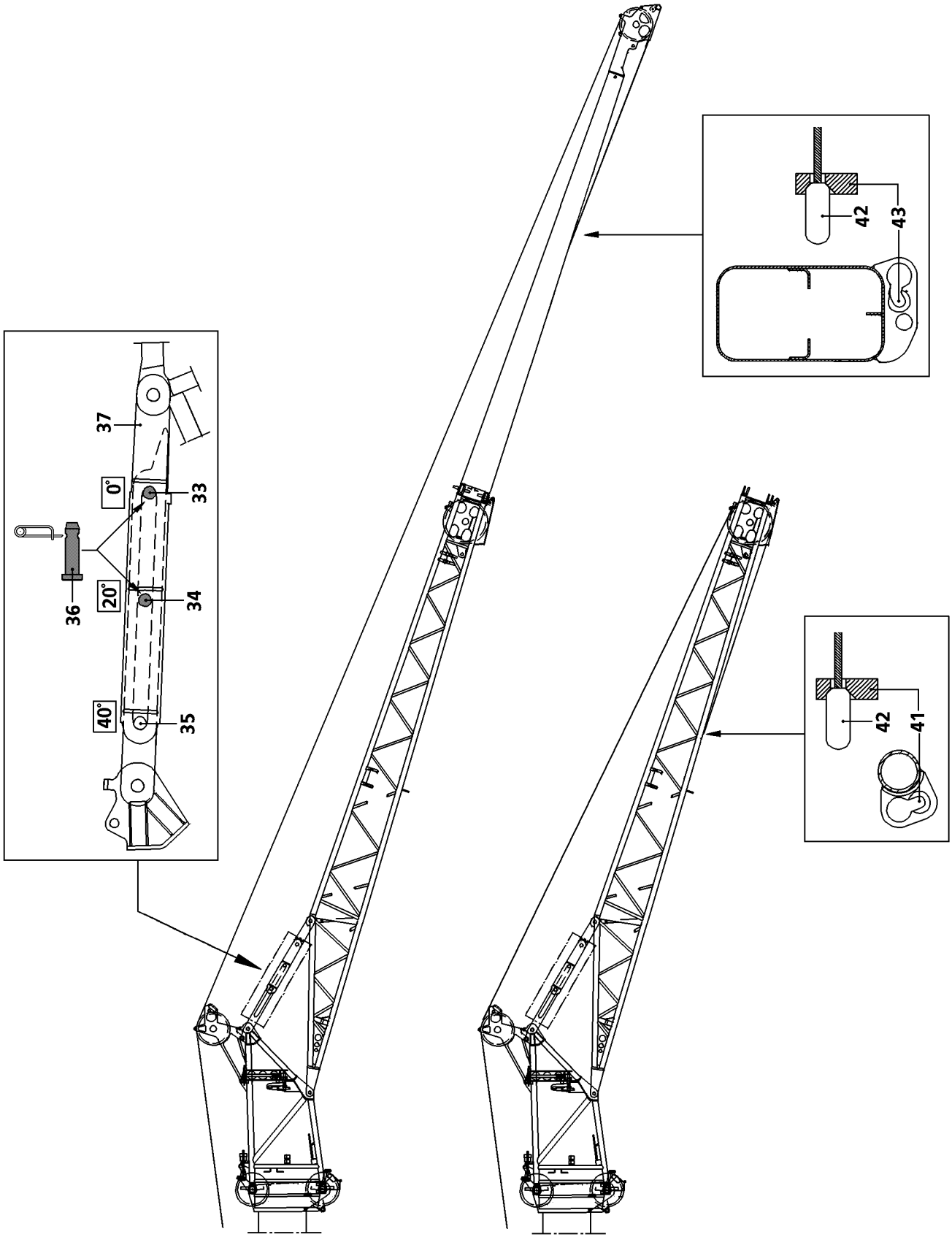
▶ Lower the telescopic boom until the hook block can be reeved out on the end section of the folding jib.
▶ Reeve out the hoist rope onto the hook block.
▶ Remove the hoist limit switch weight.

CAUTION
Danger of damage to the folding jib and the hoist rope!
If the telescopic boom is telescoped out or luffed down as long as the hoist rope is tightened on the assembly fixed point, the hoist rope and the folding jib may be damaged.
▶ Do not telescope out or luff down the telescopic boom with the hoist rope attached on the fixed assembly point!

▶ For operation with double folding jib:
Guide the press fitting **42** into the assembly fixed point **43**.

or

For operation with single folding jib:
■ Guide the press fitting **42** into the assembly fixed point **41**.
▶ Tighten the hoist rope by **carefully deflecting** the appropriate manual control lever.



B194017

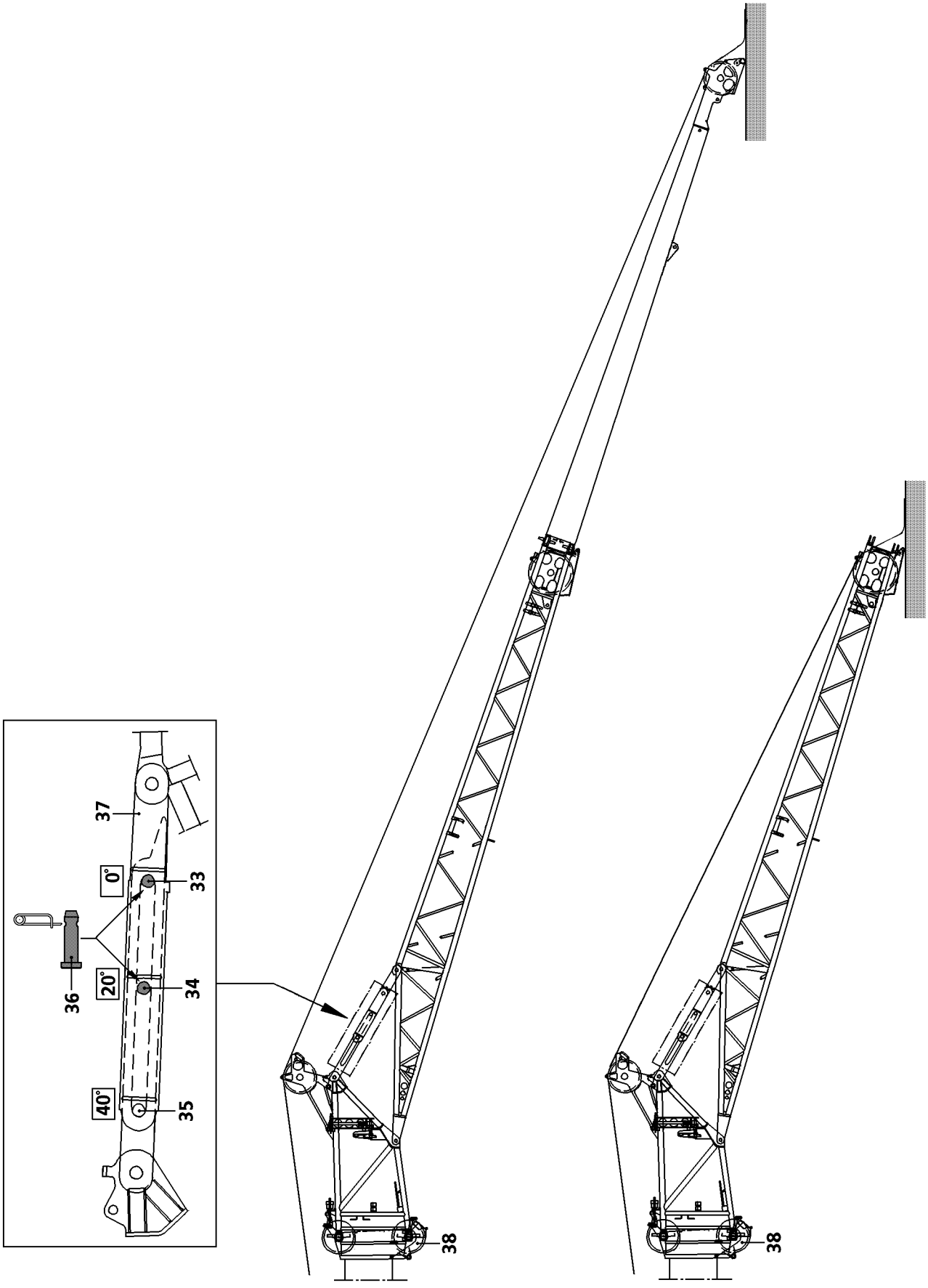
9.1.2 Changing the angle with the hoist rope

CAUTION
Danger of damage to the folding jib and the hoist rope!
- ▶ As soon as the folding jib has reached the 0° position (stop at pull bracket), the “Lifting” and “Luffing” movement must be stopped immediately.

- ▶ Luff down telescopic boom and simultaneously spool up the hoist rope so that the pivot section of the folding jib is always kept at the same height, approx. 1.0 m - 1.5 m, above the ground until the 0° position (stop on pull bracket) has been reached.

DANGER
Danger of fatal injury!
Danger of accident if folding jib is allowed to suddenly “fold downward”!
- ▶ Ensure that **before unpinning** the pin **36**, the hoist rope is taut and that the folding jib is actually held in position by the hoist rope.
- ▶ Unpinning the retaining pins **35** at the 40° pin bores is **prohibited**!

- ▶ Release the pins **36** and unpin from the 20° bore **34 or** remove from the transport retainer.
- ▶ Insert the pin **36** into the 0° bore **33** and secure.
- ▶ Disconnect the hoist rope on the assembly fixed point.



B190763

9.2 Changing the folding jib by supporting it

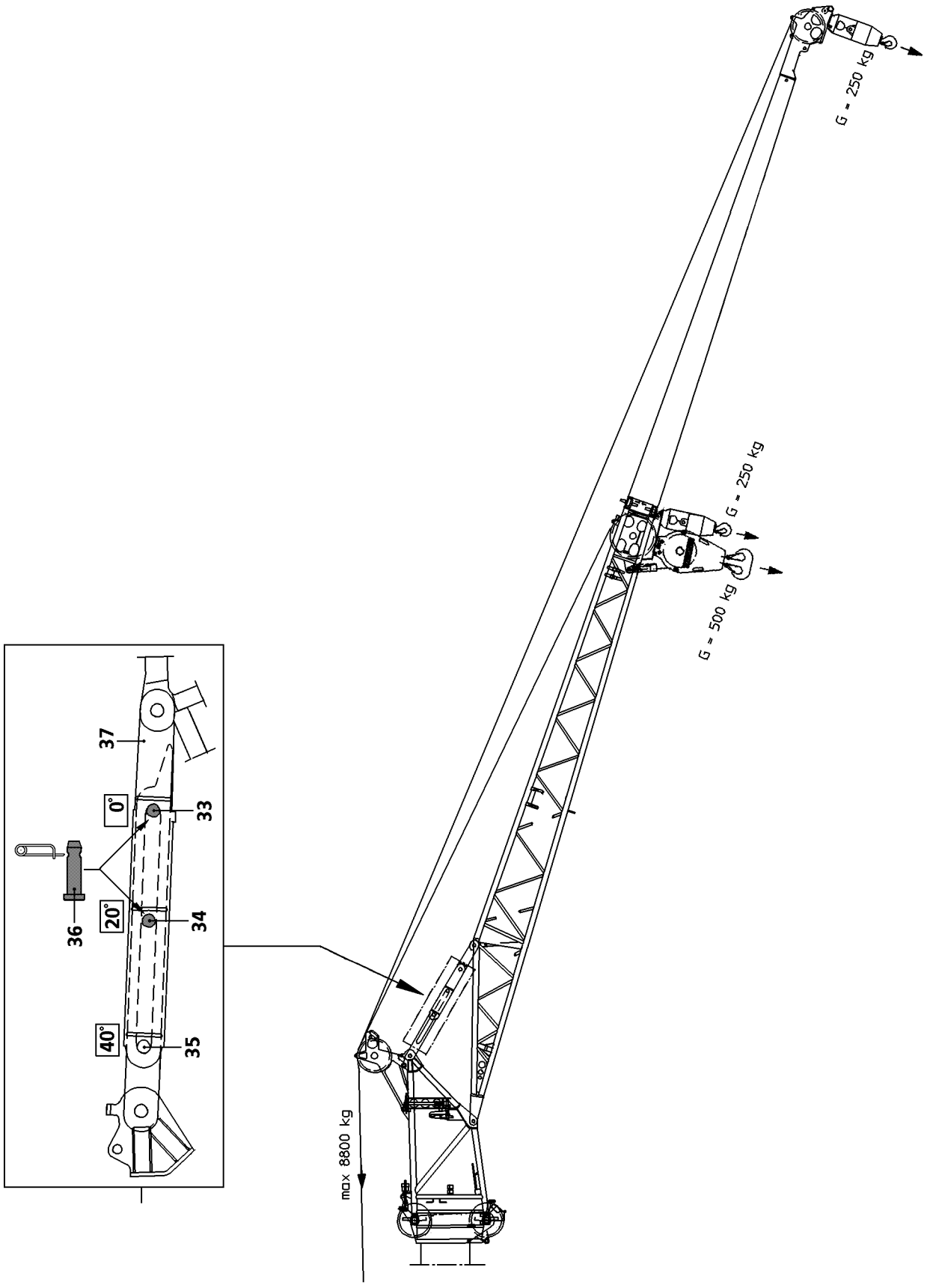
- ▶ Luff the telescopic boom down until the hook block can be unreeved.
- ▶ Remove the lock and hoist limit switch weight.

CAUTION
Danger of property damage!
- ▶ When laying down the folding jib, make sure that the folding jib is **not** laid on the rope pulley. Otherwise it will be damaged. Also make sure that the hoist rope is **not** damaged.
- ▶ Make sure that the ground is firm and even, so that the folding jib does not sink into the ground when it is lowered.

- ▶ Luff the telescopic boom down completely until the folding jib lies on the ground.
- ▶ Continue to luff down the telescopic boom carefully until the 0° position (stop at pull bracket) is reached.

DANGER
Danger of fatal injury!
Danger of accident if folding jib is allowed to suddenly “fold downward”!
- ▶ Make sure that **before unpinning** the pin **36**, the folding jib is lying on the ground or on a proper and secure support.
- ▶ Unpinning the retaining pins **35** at the 40° pin bores is **prohibited**!

- ▶ Release the pins **36** and unpin from the 20° bore **34 or** remove from the transportation retainer.
- ▶ Insert the pin **36** into the 0° bore **33** and secure.



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9.3 Changing the folding jib with hook block or load hook

On a single folding jib, the change over can be carried out with 1–roller (G = 450 kg) or 3–roller hook block (G = 500 kg) or with load hook (G = 450 kg).

For a double folding jib, the change over may only be done with a load hook (G=450 kg).

CAUTION

Damage to load hook!

Change over with a load hook is **not** possible for a rope lock “with a swirl”!

▶ Use a rope lock “without a swirl”!

▶ Remove the hoist limit switch weight with chain.

▶ Bypass “the hoist top shut-off” on the LICCON.

CAUTION

Danger of damage to the folding jib and the hoist rope!

If the telescopic boom is telescoped out or luffed down as long as the hook block / load hook is on the stop of the folding jib, the hoist rope and the folding jib can be damaged.

▶ Do not telescope out or luff down the telescopic boom with the hook block / load hook on the stop of the folding jib!

▶ By **delicately moving** the corresponding master switch, move the hook block or the load hook carefully to the stop of the folding jib and tension the hoist gear (maximum permissible rope pull 8800 kg).

▶ End the bypass of the “hoist top shut off”.

CAUTION

Danger of damage to the folding jib and the hoist rope!

▶ As soon as the folding jib has reached the 0° position (stop at pull bracket), the “Lifting” and “Luffing” movement must be stopped immediately.

▶ Luff down telescopic boom and simultaneously spool up the hoist rope so that the pivot section of the folding jib is always kept at the same height, approx. 1.0 m - 1.5 m, above the ground until the 0° position (stop on pull bracket) has been reached.

DANGER

Danger of fatal injury!

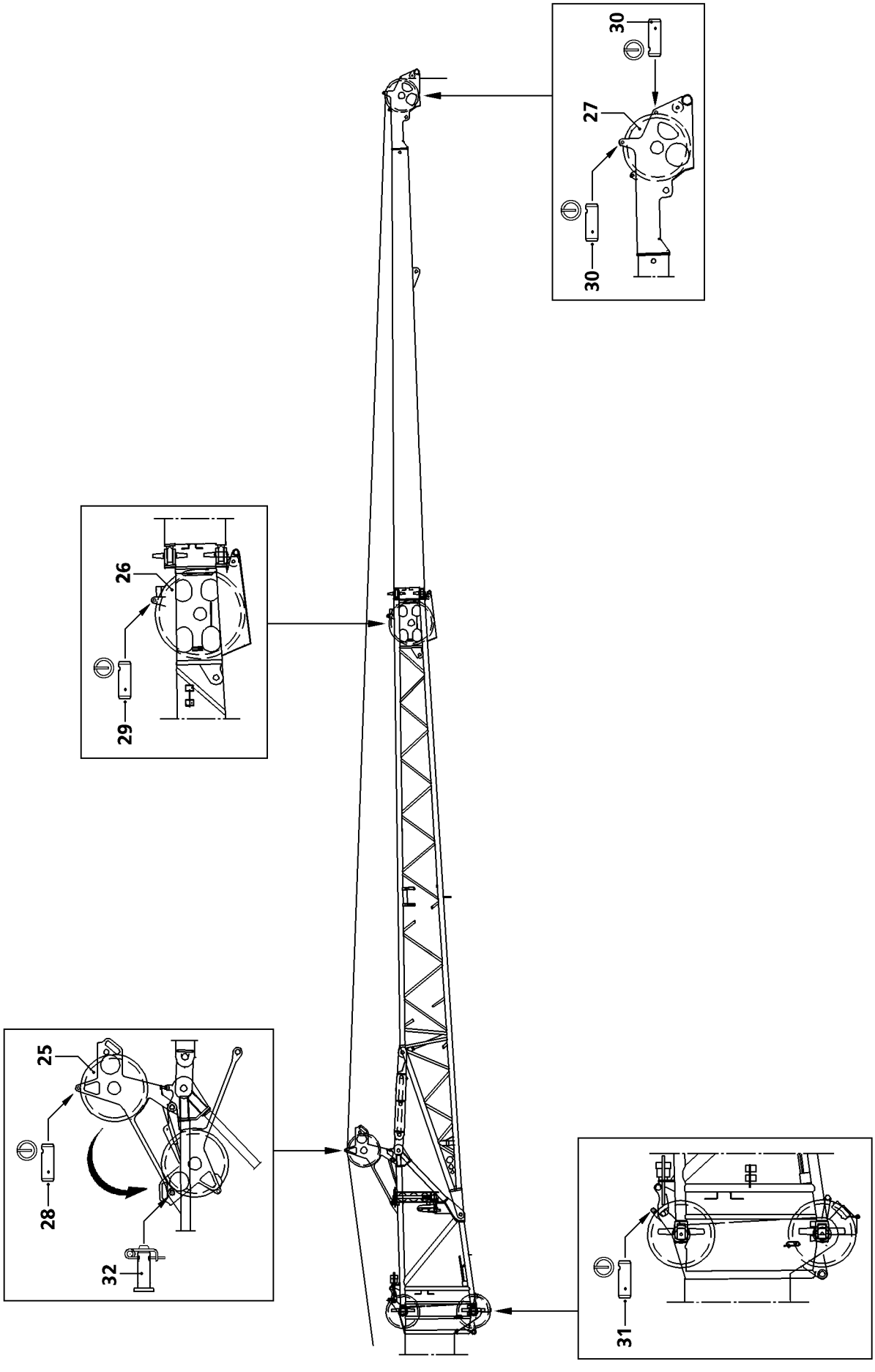
Danger of accident if folding jib is allowed to suddenly “fold downward”!

▶ Make sure, **before unpinning** the pin **36**, that the folding jib is secured against falling down by the hook block or the load hook!

▶ Unpinning the retaining pins **35** on the 40° pin bores is **prohibited**!

▶ Release the pins **36** and unpin from the 20° bore **34 or** remove from the transport retainer.

▶ Insert the pin **36** into the 0° bore **33** and secure.



B190766

10 Unreeving the hoist rope

DANGER
Risk of falling from folding jib!
When walking on the folding jib, for example to reeve the hoist rope in or out, there is a risk of slipping and falling from the folding jib.
▶ Do not step on the folding jib!

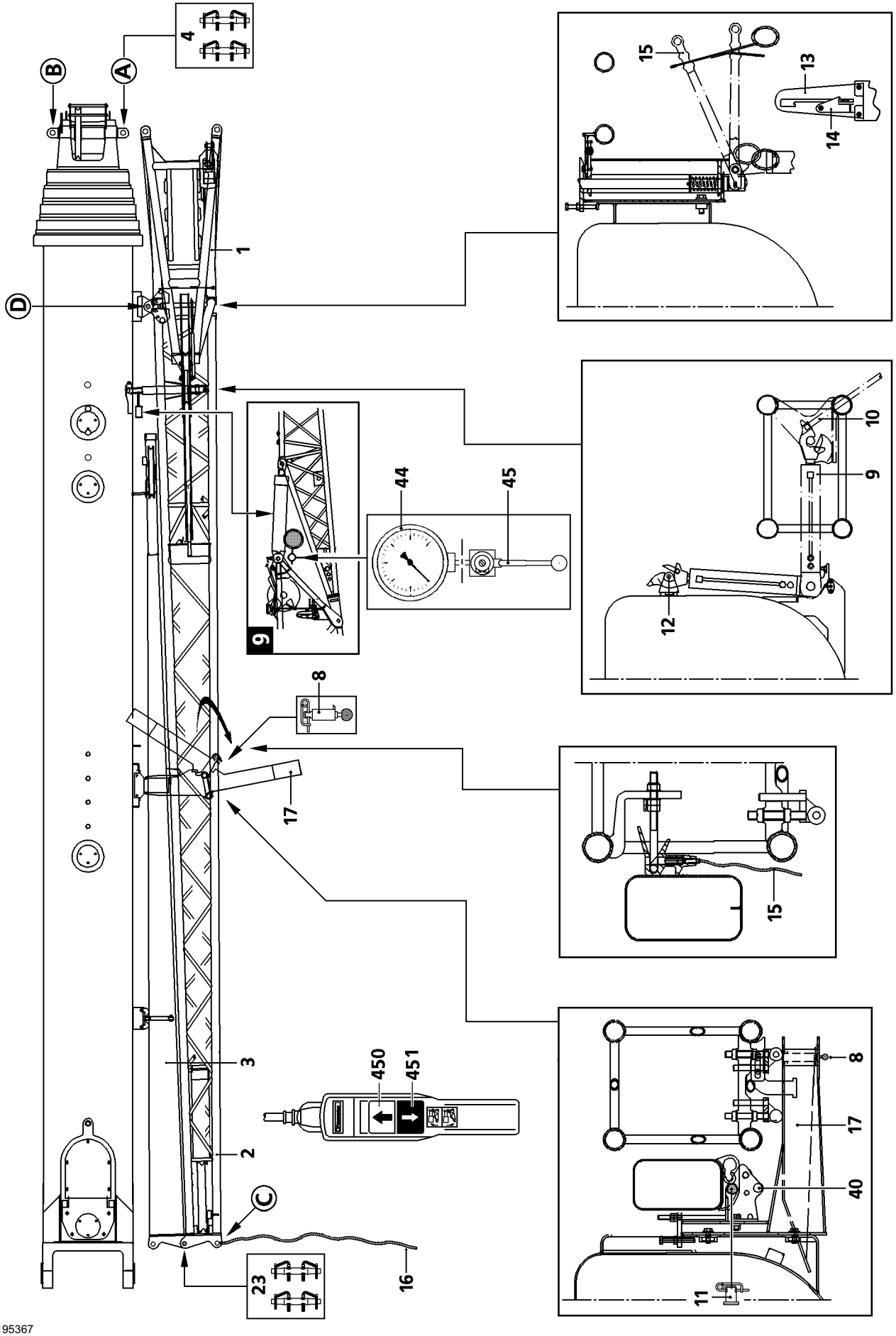
Make sure that the following prerequisites are met:
– The telescopic boom is telescoped in.
– The hook block / load hook has been placed on the ground.
– The hoist rope is detached on the rope fixed point.
– The hoist limit switch weight and the chain have been removed.

10.1 Unpinning / pinning the rope retaining pin

▶ Release and unpin the rope retaining pin **28** and rope retaining pin **29**.
▶ For operation with double folding jib:
Release and unpin the rope retaining pin **30**.
▶ Spool the hoist rope up.
▶ Repin the rope retaining pin **28**, rope retaining pin **29** and rope retaining pin **30** and secure with linch pins.

10.2 Swinging the rope guide pulley into transport position

▶ Release and unpin the pin **32**.
▶ Swing the rope guide pulley **25** into transport position.
▶ Pin the rope guide pulley **25** with pin **32** and secure.



B195367

11 Removing the folding jib

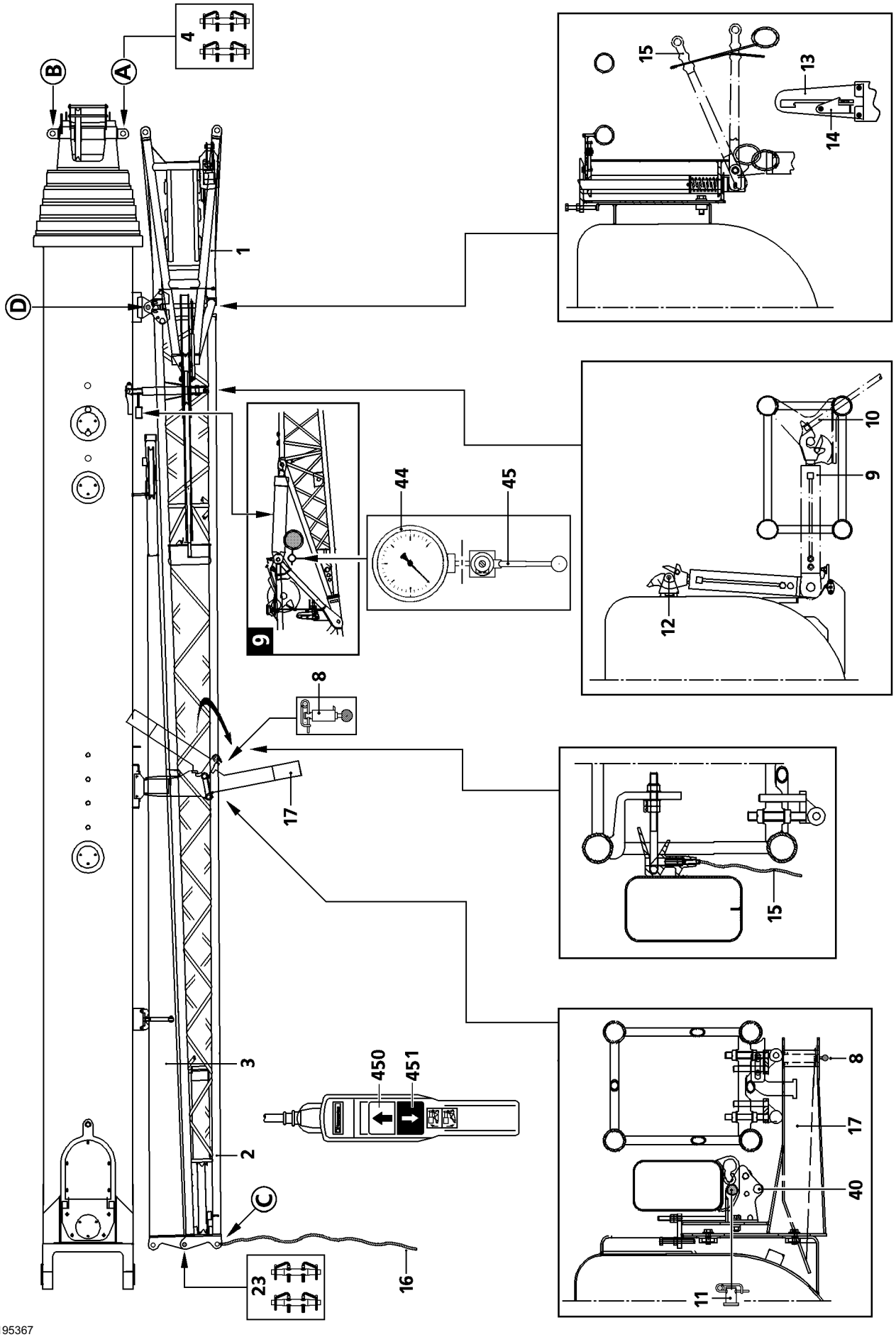
11.1 General

DANGER
Danger of fatal injuries due to falling folding jib!
The folding jib may topple due to a disassembly error.
- ▶ Standing under the folding jib during the swing procedure is prohibited!
- ▶ Standing in the swing range as well as in the folding area of the folding jib is prohibited!
- ▶ The folding jib must be secured with an auxiliary rope during the swing procedure!

WARNING
Danger of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer 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 supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04!
- ▶ The supplied fall arrest system must be fastened on the fastening and attachment points as well as on the retaining 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!
- ▶ Do not step on the folding jib!

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 central ballast is installed on the crane chassis according to the load chart.
- – The telescopic boom is fully telescoped in.
- – The folding jib is in the 0° position.
- – The electrical / hydraulic connections on the folding jib have been released.
- – The rope guide pulley has been folded from the operating position into transport position.
- – The telescopic boom has been luffed down to the rear or the side in the 0° position.

DANGER
Danger of accident if the folding jib swings out by itself when it is unpinned!
The telescopic boom must be in 0° position, otherwise there is a risk of accidents if the folding jib swings out by itself when it is unpinned.
- ▶ Move the telescopic boom to 0° position.



B195367

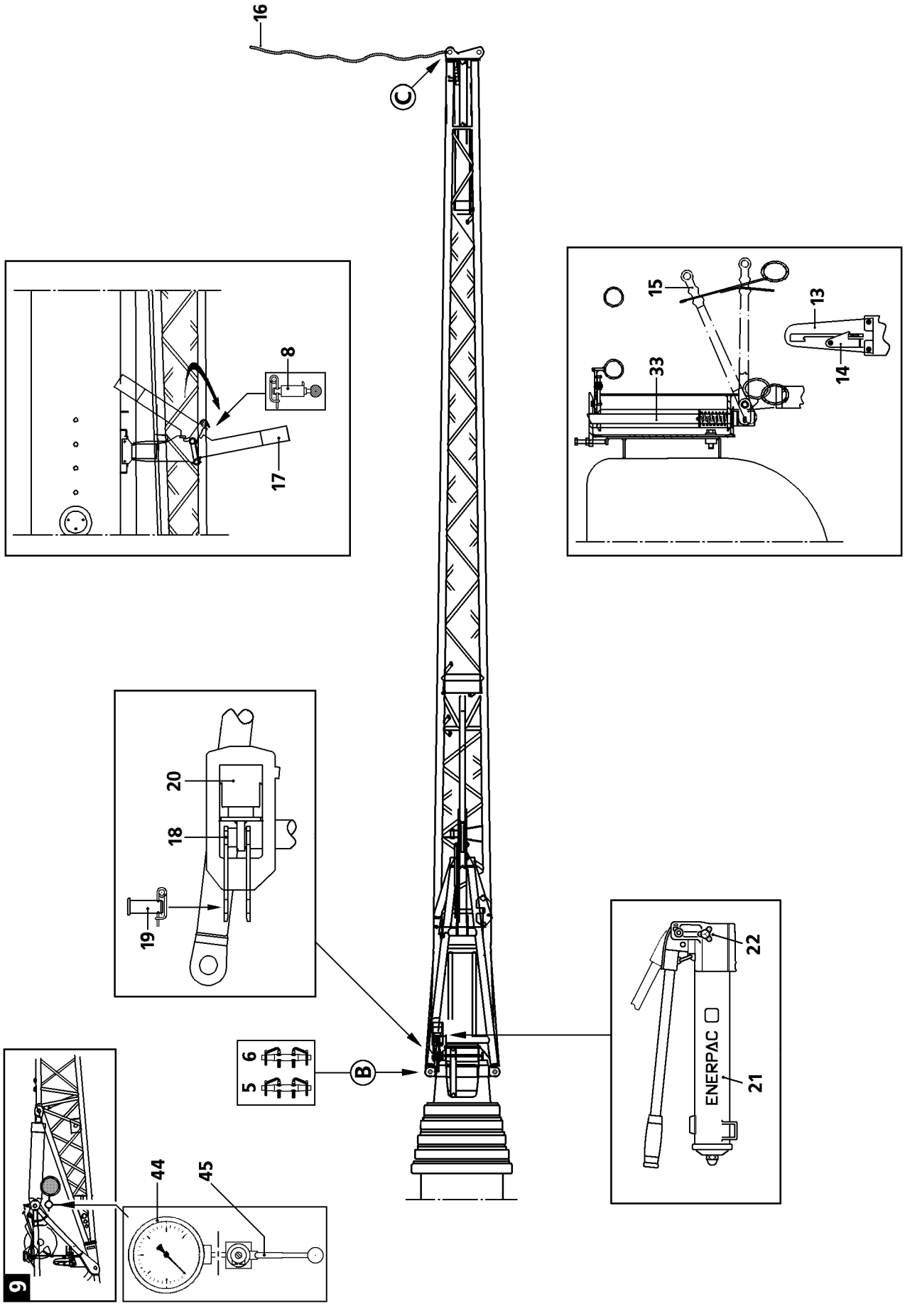
11.2 Preparatory work before swinging in hydraulic folding jibs

Prior to swinging in the hydraulic folding jib*, the folding jib must be completely luffed up and held on block for approximately 15 seconds. This causes the hydraulic reservoir to fill.

▶ For operation with a hydraulic folding jib:
Luff the folding jib up and move to the block.

Result:

– The pressure gauge **44** then must show 200 to 250 bar.



B195373

11.3 Removing the single folding jib carried on the crane

- ▶ Disengage the lever **15** with the assembly rod from the link **13** and pull downward.
- ▶ Attach the auxiliary rope **16** on point **C**.

When swinging the folding jib support **17** in and out, ensure that the spring pin **8** is unlocked with one hand and that the folding jib support **17** is moved overhead with the other hand.

- ▶ Release and unpin the spring pin **8**.
- ▶ Swing out the folding jib support **17** until the spring pin **8** engages again.

In order to unpin on top of point **B**, the hydraulic / mechanical assembly aid **20** must be used.

- ▶ Close the knob **22** on the hand pump **21**.
- ▶ Extend the hydraulic cylinder of the assembly aid **20** by operating the hand pump **21** until the pin **6** can be unpinned.
- ▶ Release and unpin the pin **6** on top.
- ▶ Open the rotary knob **22** on the hand pump **21**.

Result:

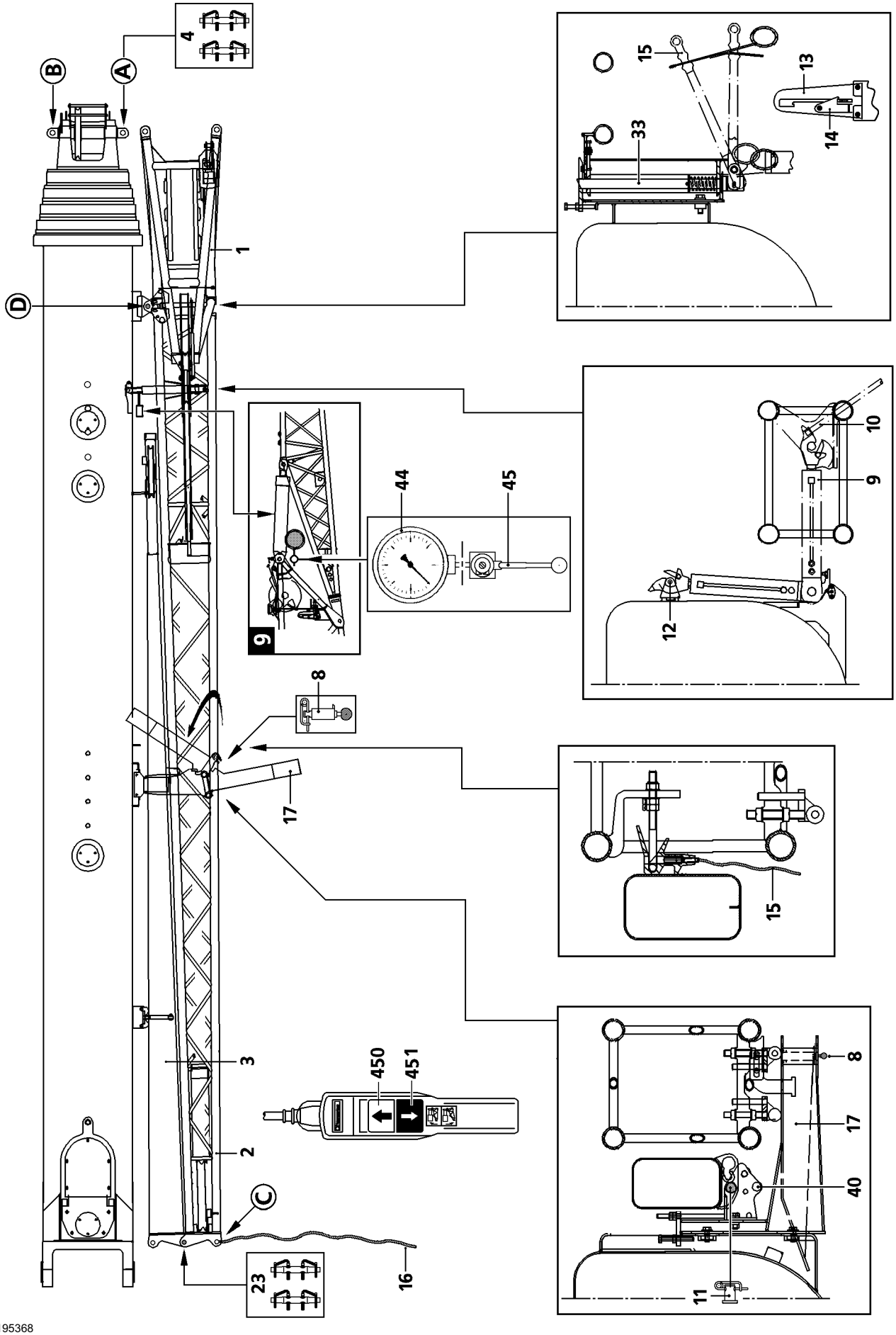
– The hydraulic cylinder of the assembly aid **20** returns to the starting position.

- ▶ Unpin the pins **19** and insert into bore **18** and secure.

DANGER
The folding jib may swing out involuntarily!
When removing the pin **5**, the folding jib can swing out unintentionally.
In order to prevent the folding jib from swinging out by itself:

- ▶ Hold the folding jib with the auxiliary rope!
- ▶ Do not lean the ladder against the folding jib!

- ▶ Release the pin **5** on the bottom and unpin.



B195368

DANGER
Danger of fatal injuries due to falling folding jib!
The folding jib may topple due to a disassembly error.
- ▶ Standing under the folding jib during the swing procedure is prohibited!
- ▶ Standing in the swing range as well as in the folding area of the folding jib is prohibited!

- ▶ Swing the folding jib backward until the swing cylinder **9** is locked to the folding jib.
- ▶ Start the crane engine.
- ▶ Press button **450** and swing in the folding jib with the swing cylinder until the lock **33** engages audibly.
- ▶ Check if the lock **33** is engaged properly.

DANGER
Danger of fatal injury when unpinning the pins **4**!
If the pins **4** are unpinned before the lock **33** has engaged, then the folding jib will fall down and possibly cause fatal injury to the assembly personnel.
- ▶ The pins **4** may not be unpinned until the lock **33** has engaged and the manual lever **16** has been secured with the safety bracket **15**.

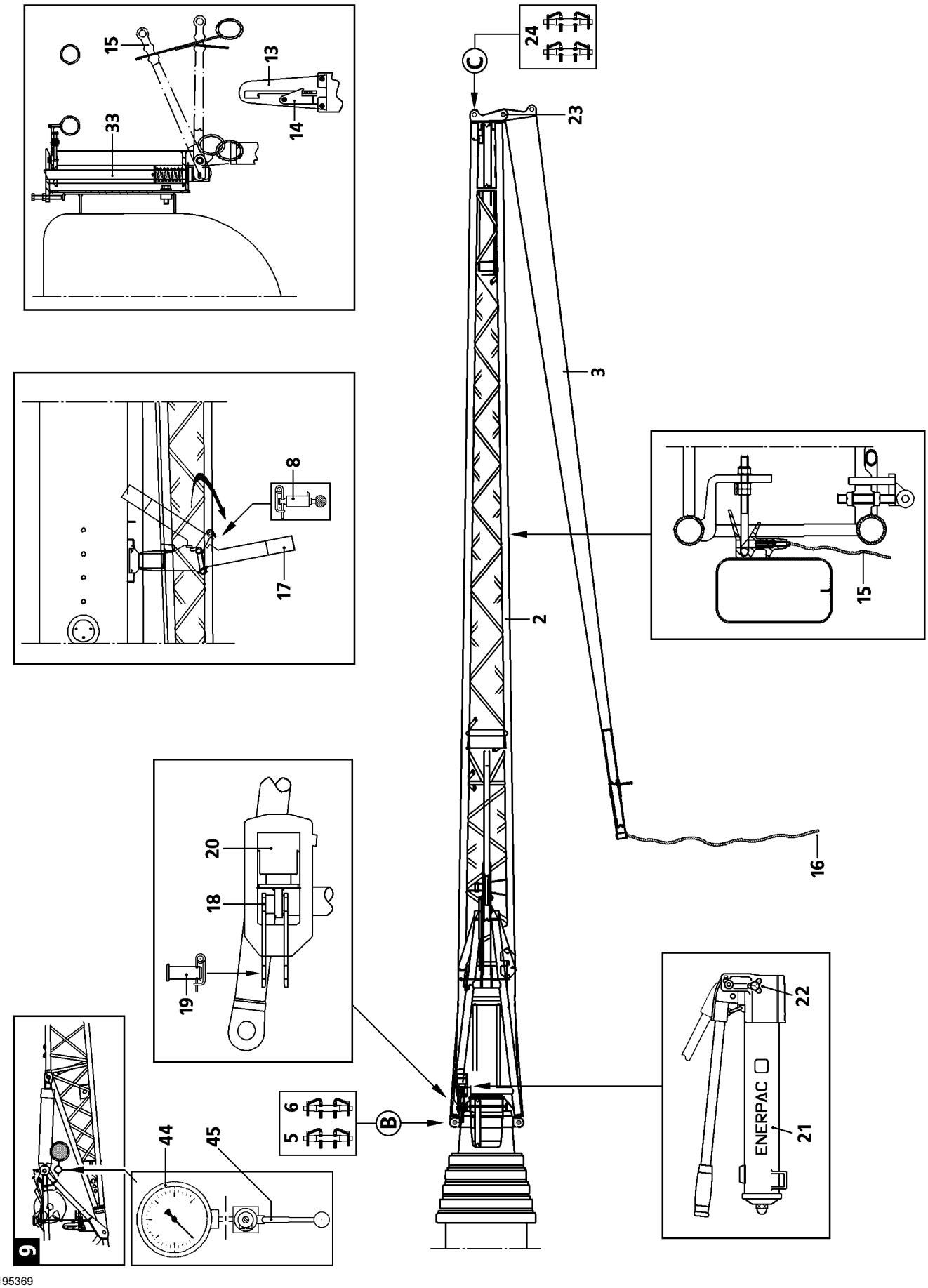
- ▶ Secure the manual lever **15** with the safety bracket **14**.
- ▶ Release the pin **4** at point **A**, unpin and insert into transport retainer.
- ▶ Press button **450** and swing the folding jib with swing cylinder in all the way.

Result:
– When transporting the double folding jib, the pivot section **2** is locked with the end section **3**.

- ▶ If a double folding jib is carried along:
  Insert and secure pin **23**.

When swinging the folding jib support **17** in and out, ensure that the spring pin **8** is unlocked with one hand and that the folding jib support **17** is moved overhead with the other hand.
- ▶ Unpin the spring pin **8** and swing in the folding jib support **17** until the spring pin **8** engages.
- ▶ Secure the spring pin **8**.
- ▶ If a hydraulic folding jib is carried along:
  Connect the hydraulic line to the hydraulic cylinder (illustration 9).
- ▶ Remove the auxiliary rope **16**.

On hydraulic folding jibs, an overflow tank is installed on the hydraulic cylinder. The overflow tank must be emptied when it is full. Even if the folding jib is not transported on the crane.
- ▶ For operation with a hydraulic folding jib:
  Empty the overflow tank on the hydraulic cylinder.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B195369

11.4 Removing the double folding jib carried on the crane

11.4.1 Removing the end section

▶ Attach the auxiliary rope **16** on the end section.

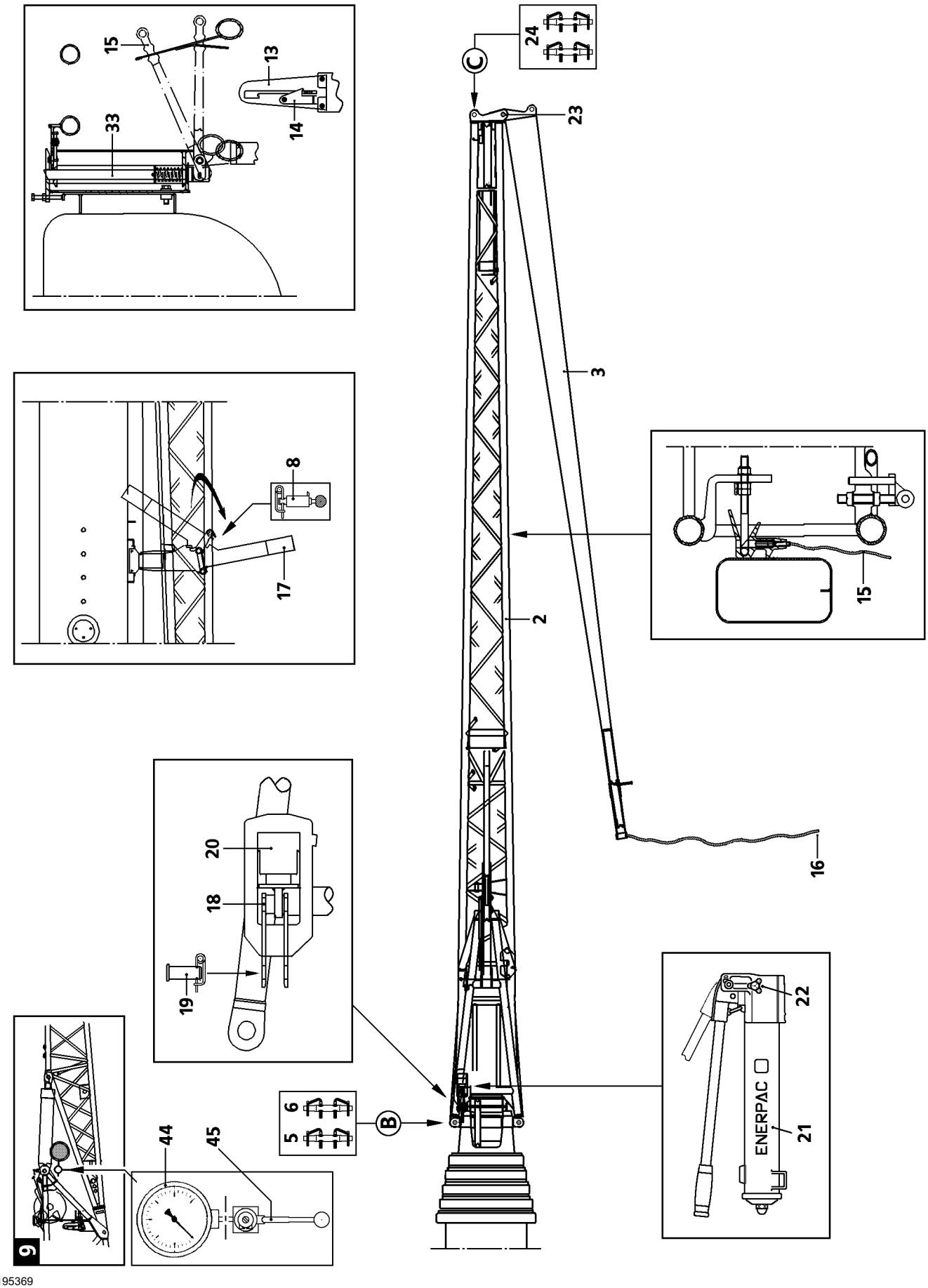
DANGER
The folding jib may swing out involuntarily!
When removing the pins **24**, the folding jib may swing out unintentionally.
In order to prevent the folding jib from swinging out by itself:
▶ Hold the folding jib with the auxiliary rope!
▶ Do not lean the ladder against the end section **3**!

▶ Release and unpin the pin **24**.

DANGER
Danger of fatal injuries due to falling folding jib!
The folding jib may topple due to a disassembly error.
▶ Standing under the folding jib during the swing procedure is prohibited!
▶ Standing in the swing range as well as in the folding area of the folding jib is prohibited!
▶ The pins **23** must remain pinned.

▶ Swing in the end section **3** until the end section **3** is locked to the pivot section **2**.
▶ Check if the end section **3** and the pivot section **2** are properly locked.
▶ Remove the auxiliary rope **16** from the end section **3** and attach on point **C**.
▶ Disengage the lever **15** with the assembly rod from the link **13** and pull downward.

When swinging the folding jib support **17** in and out, ensure that the spring pin **8** is unlocked with one hand and that the folding jib support **17** is moved overhead with the other hand.
▶ Release and unpin the spring pin **8**.
▶ Swing out the folding jib support **17** until the spring pin **8** engages again.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B195369

11.4.2 Disassembly of the pivot section

In order to unpin on top of point **B**, the hydraulic / mechanical assembly aid **20** must be used.

- ▶ Close the knob **22** on the hand pump **21**.
- ▶ Extend the hydraulic cylinder of the assembly aid **20** by operating the hand pump **21** until the pin **6** can be unpinned.
- ▶ Release and unpin the pin **6** on top.
- ▶ Open the knob **22** on the hand pump **21**.

Result:

– The hydraulic cylinder of the assembly aid **20** returns to the starting position.

- ▶ Unpin the pins **19** and insert into bore **18** and secure.

DANGER

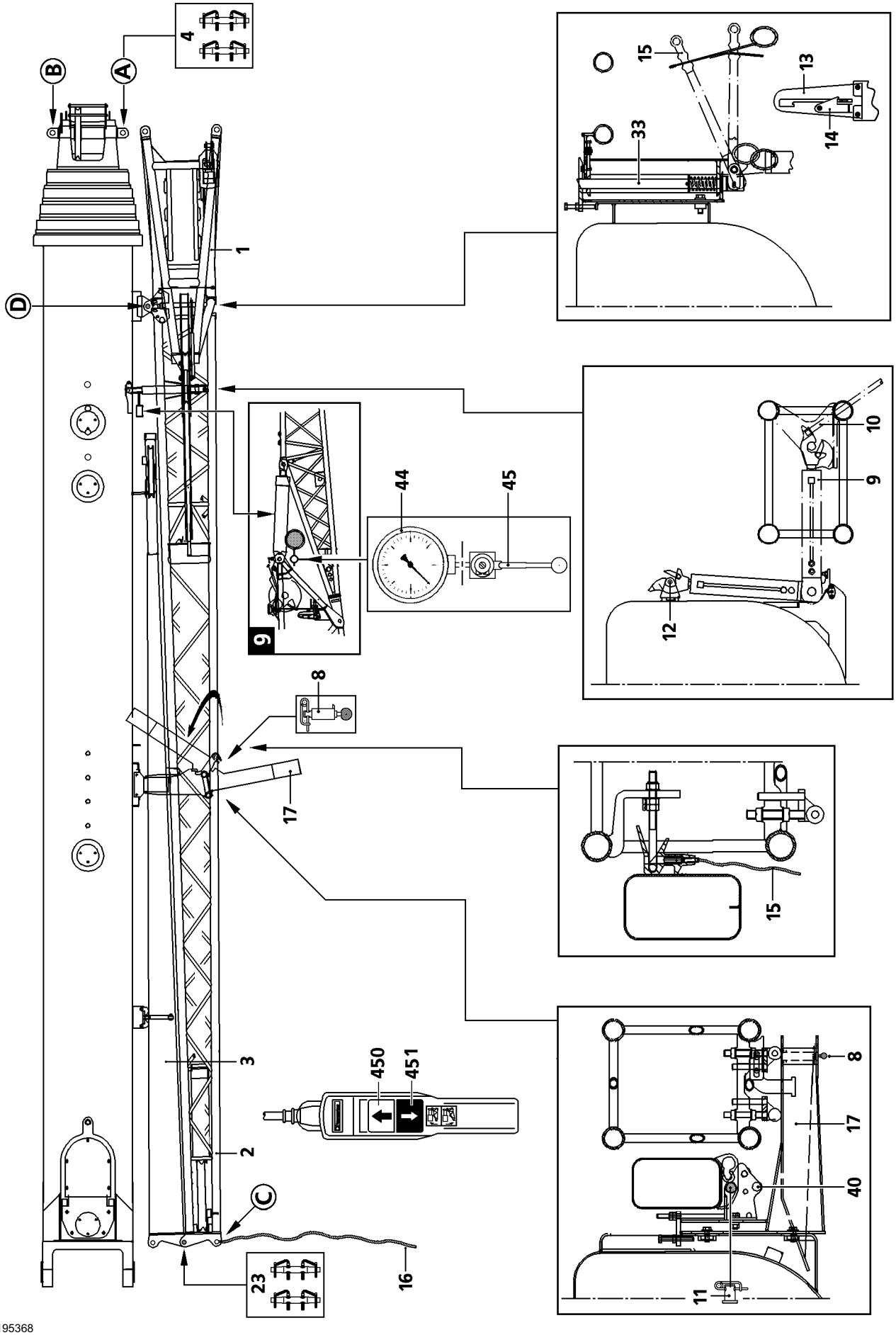
The folding jib may swing out involuntarily!

When removing the pin **5**, the folding jib can swing out unintentionally.

In order to prevent the folding jib from swinging out by itself:

- ▶ Hold the folding jib with the auxiliary rope!
- ▶ Do not lean the ladder against the folding jib!

- ▶ Release the pin **5** on the bottom and unpin.



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DANGER
Danger of fatal injuries due to falling folding jib!
The folding jib may topple due to a disassembly error.
- ▶ Standing under the folding jib during the swing procedure is prohibited!
- ▶ Standing in the swing range as well as in the folding area of the folding jib is prohibited!

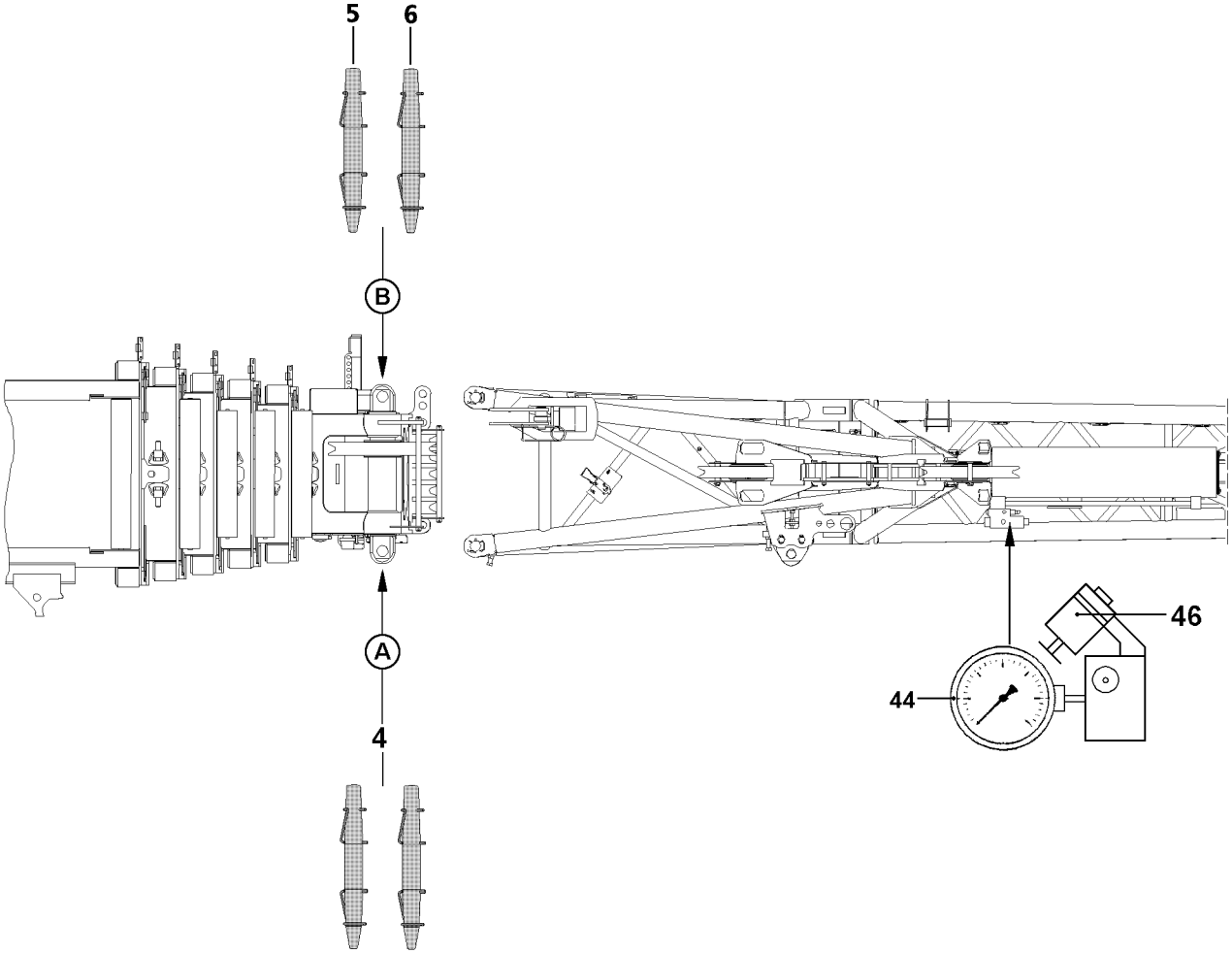
- ▶ Swing the folding jib backward until the swing cylinder **9** is locked to the folding jib.
- ▶ Start the crane engine.
- ▶ Press button **450** and swing in the folding jib with the swing cylinder until the lock **33** engages audibly.
- ▶ Check if the lock **33** is engaged properly.

DANGER
Danger of fatal injury when unpinning the pins **4**!
If the pins **4** are unpinned before the lock **33** has engaged, then the folding jib will fall down and possibly cause fatal injury to the assembly personnel.
- ▶ The pins **4** may not be unpinned until the lock **33** has engaged and the manual lever **16** has been secured with the safety bracket **15**.

- ▶ Secure the manual lever **15** with the safety bracket **14**.
- ▶ Release the pin **4** at point **A**, unpin and insert into transport retainer.
- ▶ Press button **450** and swing the folding jib with swing cylinder in all the way.
- ▶ Unpin the pin **11** from bore **40**, pin the folding jib with pin **11** and secure.

When swinging the folding jib support **17** in and out, ensure that the spring pin **8** is unlocked with one hand and that the folding jib support **17** is moved overhead with the other hand.
- ▶ Unpin the spring pin **8** and swing in the folding jib support **17** until the spring pin **8** engages.
- ▶ Secure the spring pin **8**.
- ▶ If a hydraulic folding jib is carried along:
  Connect the hydraulic line to the hydraulic cylinder (illustration 9).
- ▶ Remove the auxiliary rope **16**.

On hydraulic folding jibs, an overflow tank is installed on the hydraulic cylinder. The overflow tank must be emptied when it is full. Even if the folding jib is not transported on the crane.
- ▶ For operation with a hydraulic folding jib:
  Empty the overflow tank on the hydraulic cylinder.



B103467

11.5 Disassembly of the separately transported folding jib

Make sure that the following prerequisite is met:

– The end section is locked with the pivot section.
  See section “Disassembly of the end section”.

For description of fastening points, see section “Fastening points”.

DANGER
Danger of accident due to incorrect attachment!
Life-threatening situations can arise if the folding jib is improperly or incorrectly attached!

- ▶ Attach the folding jib according to the fastening points shown on the signs!
- ▶ The folding jib may **not** be attached on the auxiliary crane in folded out position!
- ▶ Do **not** attach the pivot section and the end section separately and also **not** together!

- ▶ Attach the auxiliary crane to the respective fastening points of the folding jib.

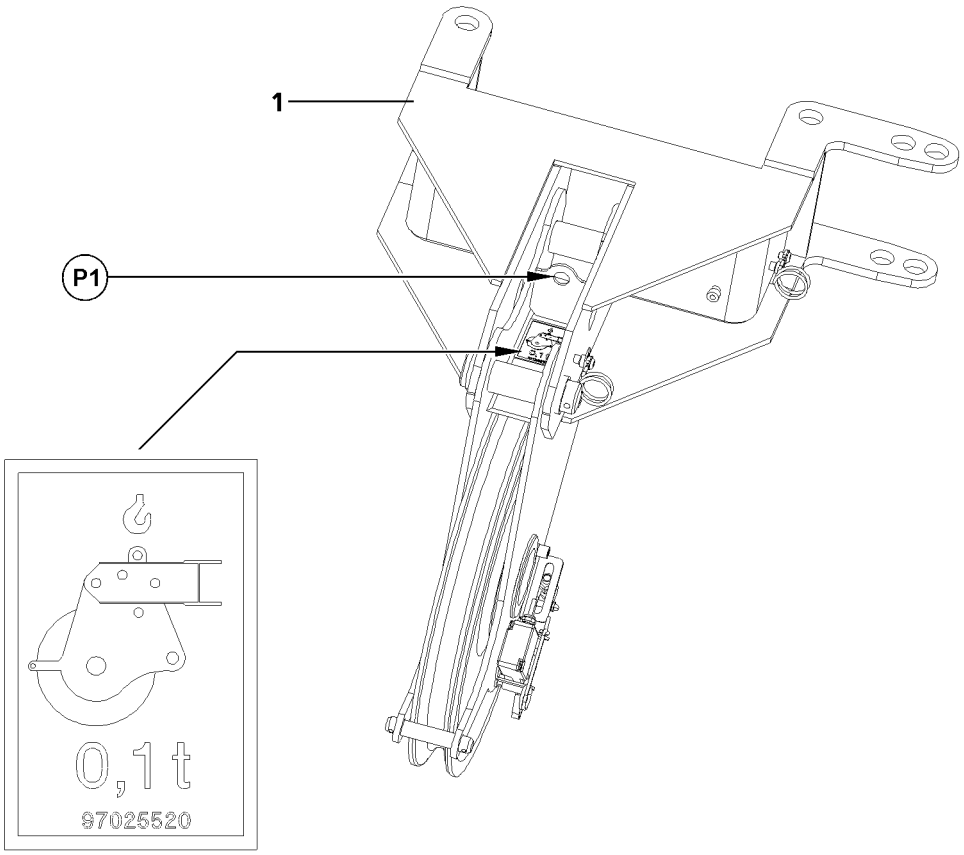
DANGER
Danger of accident when disassembling the folding jib!
Failing to comply with the following conditions may result in fatal injury to the assembly personnel during disassembly.

- ▶ Do not allow anyone to stand under the folding jib when the pins are knocked out!
- ▶ Attach the auxiliary crane so that no angular pull occurs!
- ▶ Only lift a weight with the auxiliary crane that corresponds to the weight of the folding jib that is being removed!
- ▶ The folding jib may suddenly release due to distortion!
- ▶ Do not remove the folding jib until it has been secured with the auxiliary crane to prevent it from falling!
- ▶ Do not lean the ladder against the folding jib!

- ▶ Tighten the fastening ropes until the folding jib is secured to prevent it from falling.
- ▶ Unpin the folding jib from the telescopic boom:
- ▶ Release the pin **4** on top on point **A** and unpin.
- ▶ Release the pin **5** on top on point **B** and unpin.
- ▶ Release the pin **4** on the bottom on point **A** and unpin.
- ▶ Release the pin **6** on the bottom on point **B** and unpin.
- ▶ Place the folding jib onto the transport vehicle.

On hydraulic folding jibs, an overflow tank **46** is installed on the hydraulic cylinder. The overflow tank **46** must be emptied when it is full. Even if the folding jib is not transported on the crane.

- ▶ For operation with a hydraulic folding jib:
  Empty the overflow tank **46** on the hydraulic cylinder.



B114083

1 General

Operation with the boom nose **1** is set up for rapid lifting via the boom nose **1**, whereby the hook block can remain reeved on the telescopic boom.

Position	Description	Weight
1	Boom nose	0.1 t

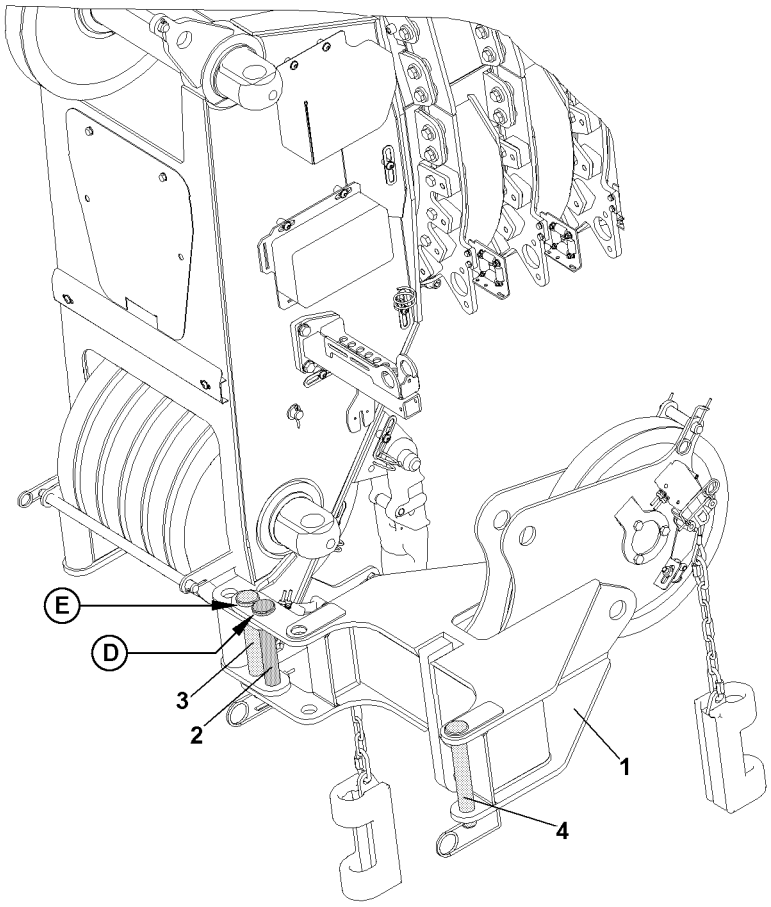
Note
Load charts
▶ No special load charts are available for operation with boom nose **1**. The boom nose **1** is generally run in the telescopic boom operating mode. However, the load is reduced by the weight of the boom nose **1** and the lifting and fastening equipment that is used.

1.1 Fastening point

A fastening point **P1** is installed on the boom nose **1**.
The fastening point **P1** is marked with a tag.

WARNING
Danger of accident!
Life-threatening situations can arise if the boom nose **1** is improperly or incorrectly attached!
▶ At assembly / disassembly, fasten the boom nose **1** properly on the fastening point **P1**!

1



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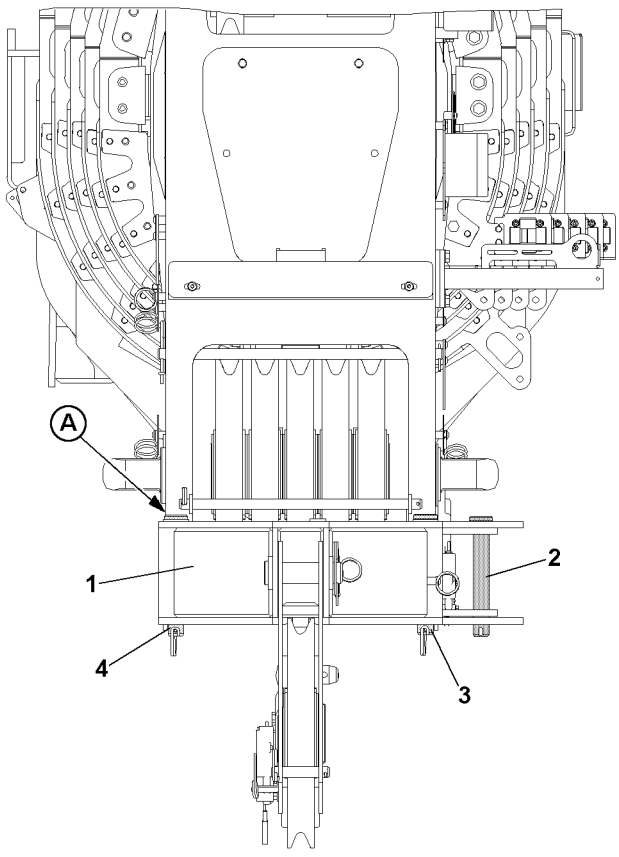

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2 Assembly

2.1 Installing the boom nose on the telescopic boom, illustration 1

WARNING
Danger of crushing!
During assembly, hands can be crushed due to swing movements of the boom nose **1**!
▶ Make sure that the boom nose **1** is not swinging back and forth during installation!

▶ Attach the boom nose **1** on the auxiliary crane, see section “Fastening point”.

DANGER
The boom nose can fall down!
If the boom nose **1** is unhooked from the auxiliary crane before the boom nose **1** is pinned, then the boom nose **1** can fall down and kill or severely injure personnel!
▶ Do not detach the auxiliary crane until the boom nose **1** is properly installed and secured!

▶ Install the boom nose **1** on the telescopic boom: Pin the swing pin **2** on point **D** and secure with spring retainer.
▶ Insert the pin **3** on point **E** and secure with spring retainer.
▶ Detach the auxiliary crane.

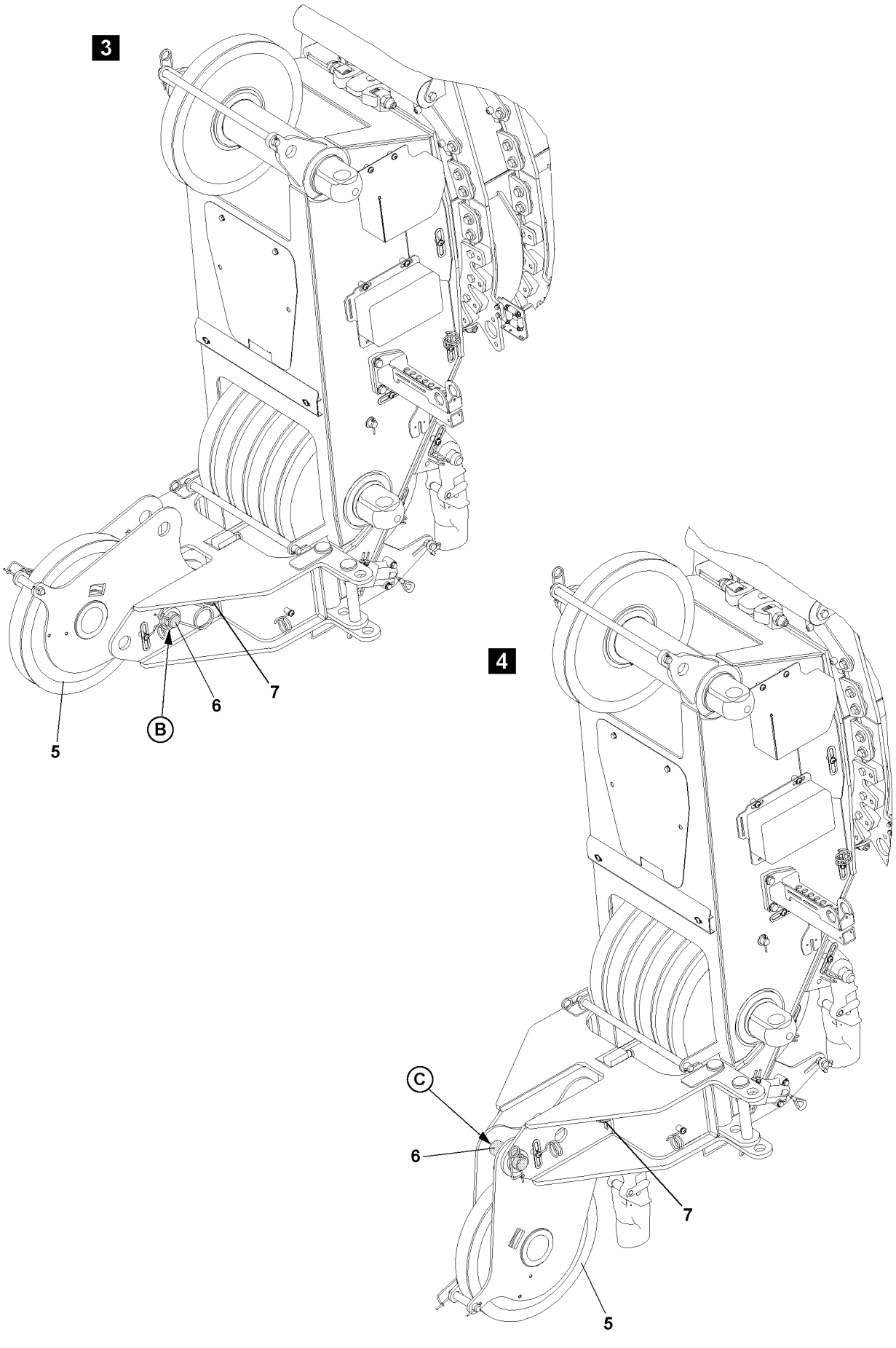
2.2 Swinging the boom nose into operating position, illustrations 1 and 2

DANGER
Risk of accident if the boom nose falls down!
If the swing pin **2** is unpinned the boom nose **1** will fall down.
▶ Never unpin the swing pin **2**!

▶ Release the pin **3** and the pin **4** and unpin.

CAUTION
Danger of crushing fingers!
Fingers could be crushed between the telescopic boom and the boom nose **1** when the boom nose **1** is swivelled.
▶ Do not put fingers between the boom nose **1** and the telescopic boom!

▶ Swing the boom nose **1** by 180° until the pin **4** can be pinned on point **A**.
▶ Insert and secure pin **3**.
▶ Insert and secure pin **4**.



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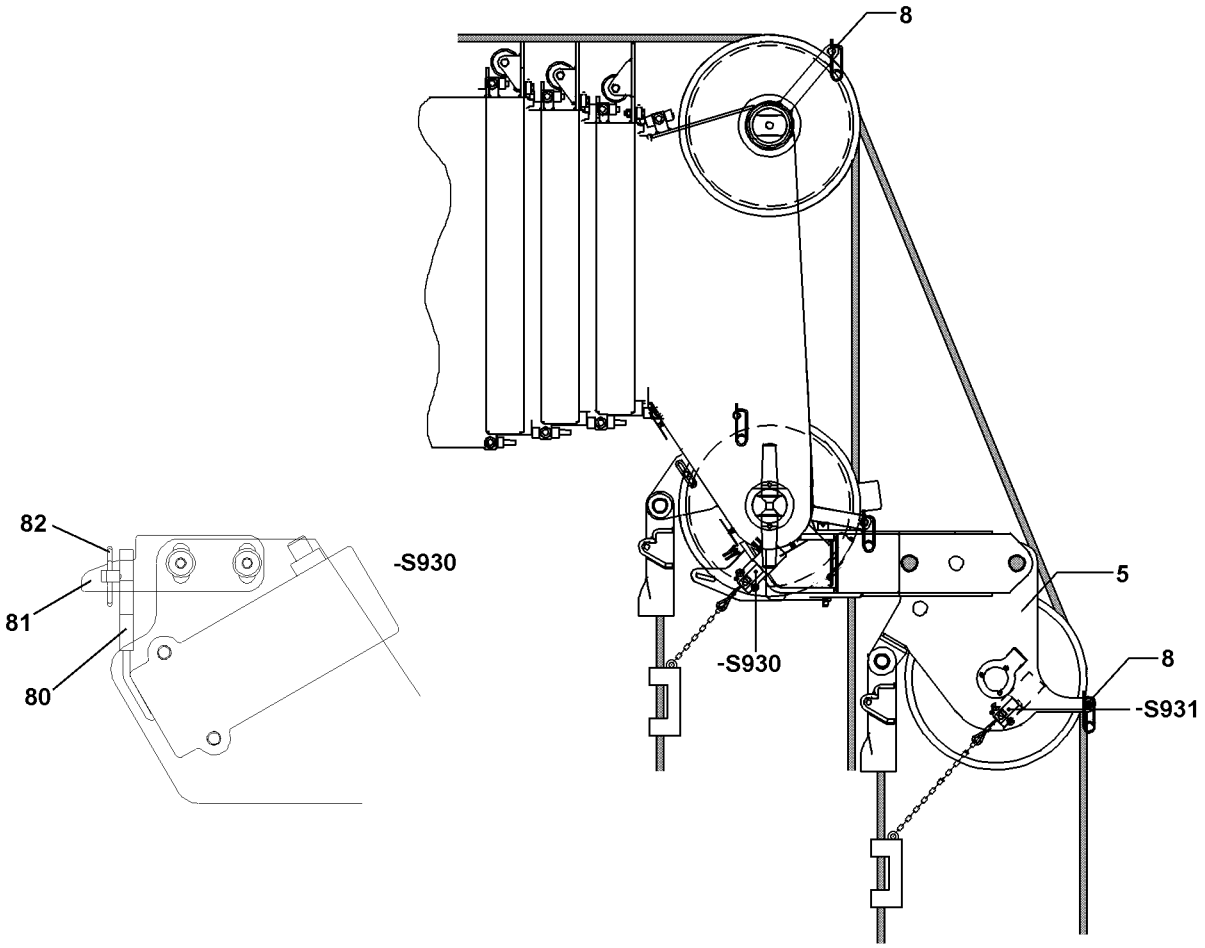
2.3 Folding the rope pulley into operating position, illustrations 3 and 4

DANGER
Risk of accident from cable pulley falling down!
If the swing pin **7** is unpinned, the rope pulley **5** will fall down.
▶ Never unpin the swing pin **7**!

▶ Release the pin **6** on point **B** and unpin.

CAUTION
Danger of crushing fingers!
Fingers can be crushed when the rope pulley **5** is moved.
▶ Do not crush your fingers when the rope pulley **5** folds down!

▶ Fold the rope pulley **5** down until it can be pinned at point **C**.
▶ Pin and secure the pin **6**.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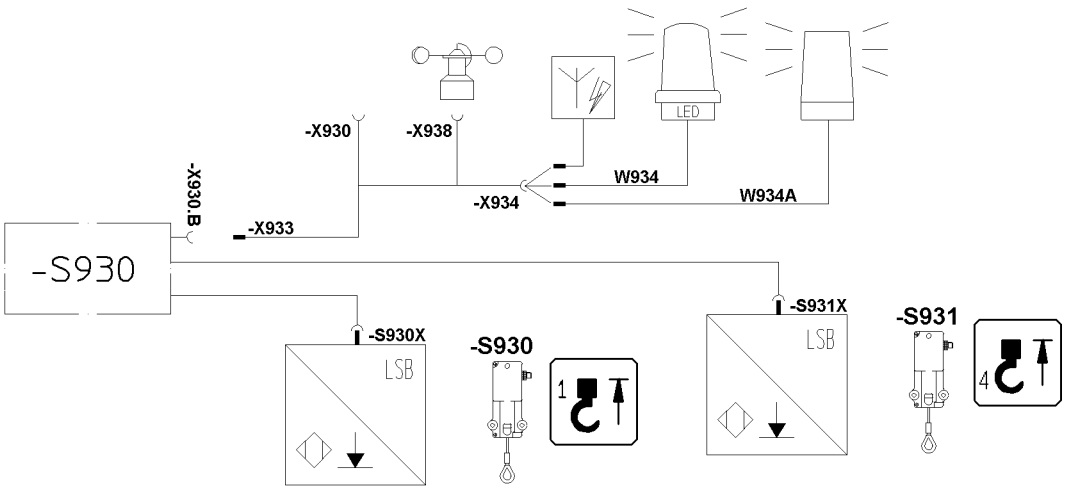
8
-S931


-X930
-X938
LED
W934
-X934
W934A
-X930B
-X933
-S930
-S930X
LSB
-S930
1
-S931X
LSB
-S931
4

B111655

2.4 Reeving in the hoist rope

Can be reeved in a maximum of 2 times on the boom nose.

- ▶ Release and unpin the rope retaining pipes **8**.
- ▶ Place the hoist rope over the end pulley on the telescopic boom and over the rope pulley **5**.
- ▶ Pin the rope retaining pipes **8** and secure.
- ▶ Reeve in the load hook or hook block.
- ▶ Attach the hoist limit switch weight.

2.5 Hoist limit switch

The hoist limit switch **-S930**, the airplane warning light* and the wind sensor* remain attached on the telescopic boom head.

- ▶ If the hoist limit switch **-S931** is attached to the telescopic boom:
  Remove the hoist limit switch **-S931** from the telescopic boom and assemble to the boom nose.

2.6 Single hook operation

If you are working in “single hook mode”, the hoist limit switch **-S930** that is not required must be operated manually.

- ▶ Remove the hoist limit switch weight and chain.
- ▶ Pull the hoist limit switch rope **80**, hang in on the fixed point **81** and secure with locking pin **82**.

Result:

– The hoist limit switch **-S930** is operated manually.

2.7 Two hook operation

During two hook operation the hoist limit switch **-S930** on the telescopic boom and the hoist limit switch **-S931** on the boom nose are active!

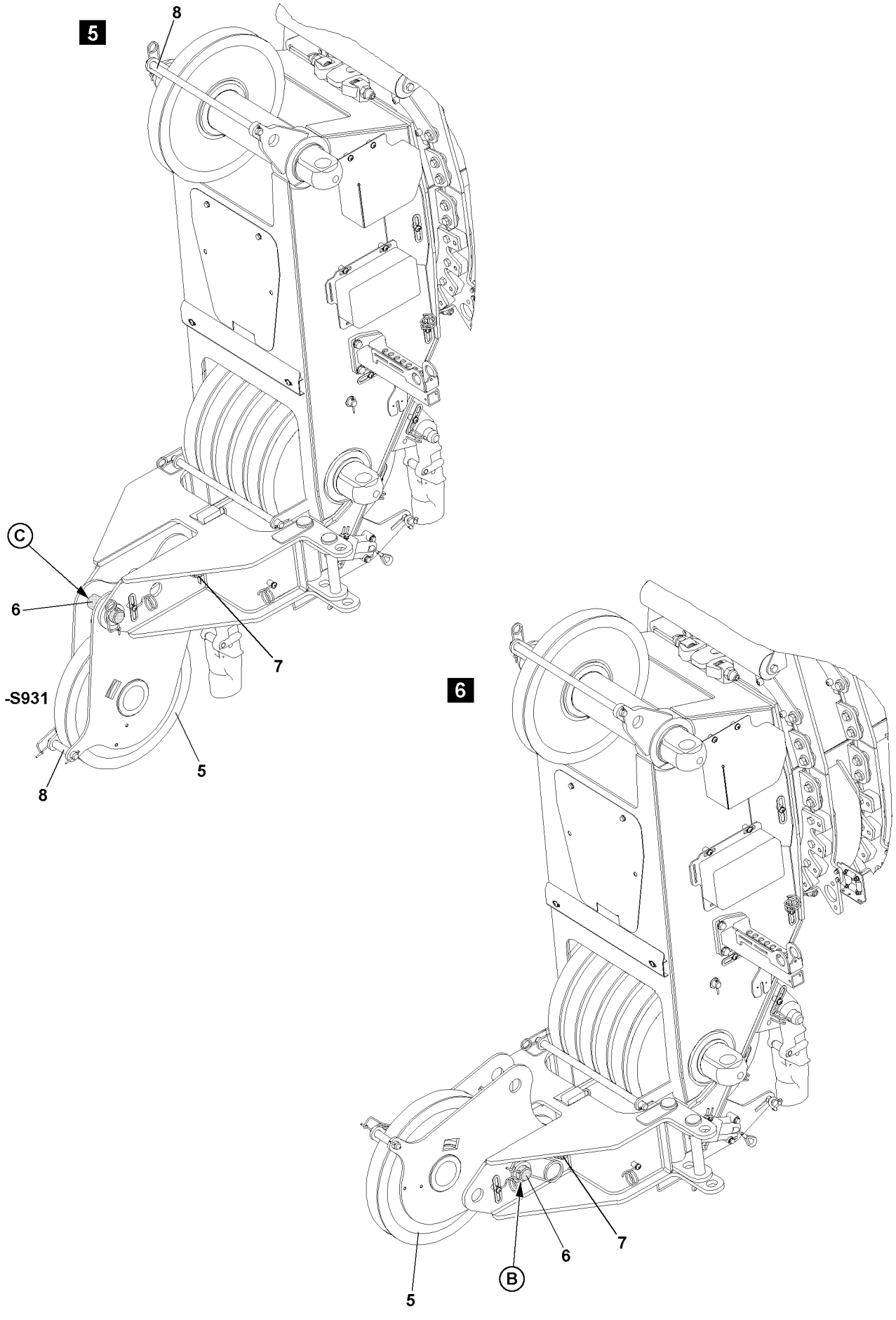
2.8 Function check

The function check **must** be performed by the operator before lifting a load.
The following checks must be performed.

- ▶ Check that the hoist limit switch, wind sensor* and airplane warning light* connections are properly connected.
- ▶ Check wind sensor* operation on LICCON monitor.
- ▶ Check the function of the airplane warning light*.

Check the movement of hoist limit switches. The following steps are required to perform these checks.

- ▶ Actuate the hoist limit switch manually.
- ▶ Check that “Hoist top” icon is displayed on LICCON monitor for main boom or boom nose.
- ▶ Check that hoist winch switches off correctly.



B197012

3 Disassembly

3.1 Folding the rope pulley to transport position, illustrations 5 and 6

- ▶ Remove the hoist limit switch weight.
- ▶ Reeve out the load hook / hook block to boom nose.
- ▶ Release and unpin the rope retaining pipes **8**.

Do not pull hoist rope beneath the winch when reeling in.

- ▶ Spool the hoist rope up.

Note

- ▶ During operation **without** the boom nose, you must use the hoist limit switch **-S931** as an additional hoist limit switch for the telescopic boom **or** mechanically pull the hoist limit switch **-S931** and attach it to the rope fixed position with a shackle.

DANGER

Risk of accident from cable pulley falling down!

If the swing pin **7** is unpinned, the rope pulley **5** will fall down.

- ▶ Never unpin the swing pin **7**!

- ▶ Release the pin **6** on point **C** and unpin.

CAUTION

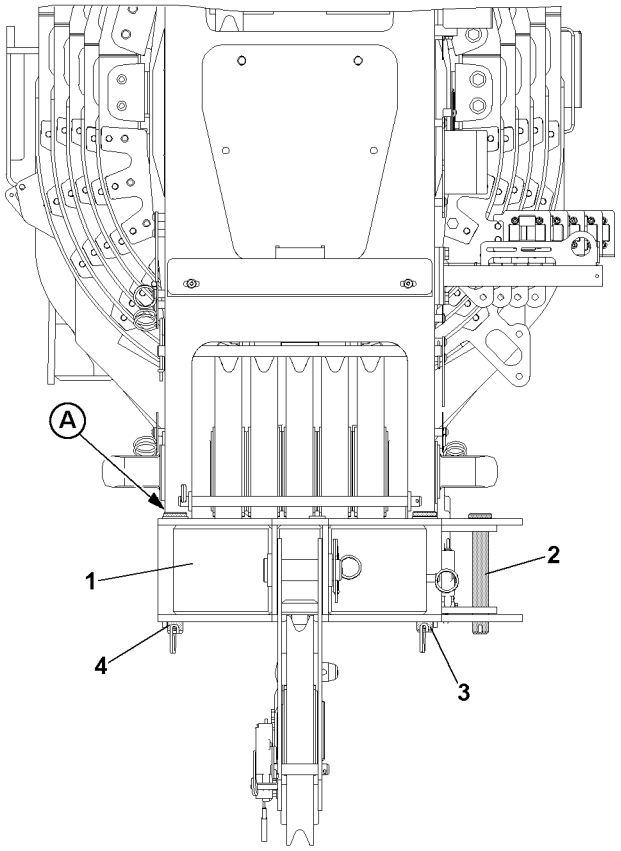
Danger of crushing fingers!

Fingers can be crushed when the boom nose is folded.

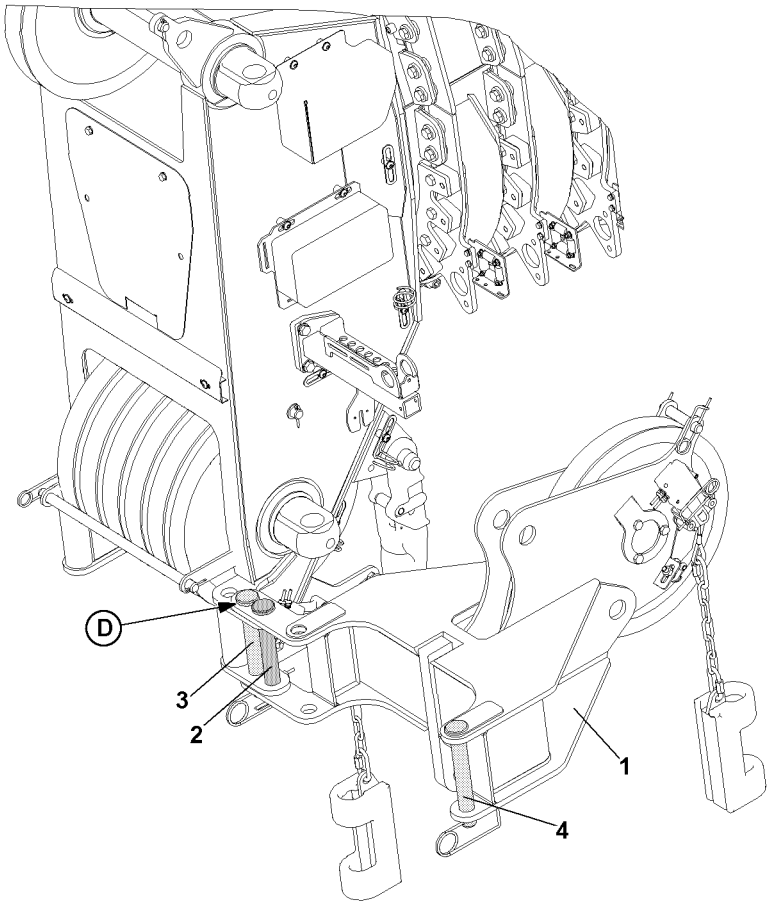
- ▶ Do not crush your fingers when the rope pulley **5** folds up!

- ▶ Move the rope pulley **5** up until it can be pinned at the point **B**.
- ▶ Insert and secure pin **6**.

7



8



B197013

3.2 Swinging the boom nose into transport position, illustrations 7 and 8

DANGER
Risk of accident if the boom nose falls down!
If the swing pin **2** is unpinned, the boom nose will fall down.
▶ Never unpin the swing pin **2**!

▶ Release the pin **3** and the pin **4** and unpin.

CAUTION
Danger of crushing fingers!
Fingers could be crushed between the telescopic boom and the boom nose when the boom nose is swivelled.
▶ Do not put fingers between the boom nose and the telescopic boom!

▶ Swing the boom nose **1** by 180° until the pin **3** can be pinned on point **D**.
▶ Insert and secure pin **3**.
▶ Pin the pin **4** on the boom nose and secure.

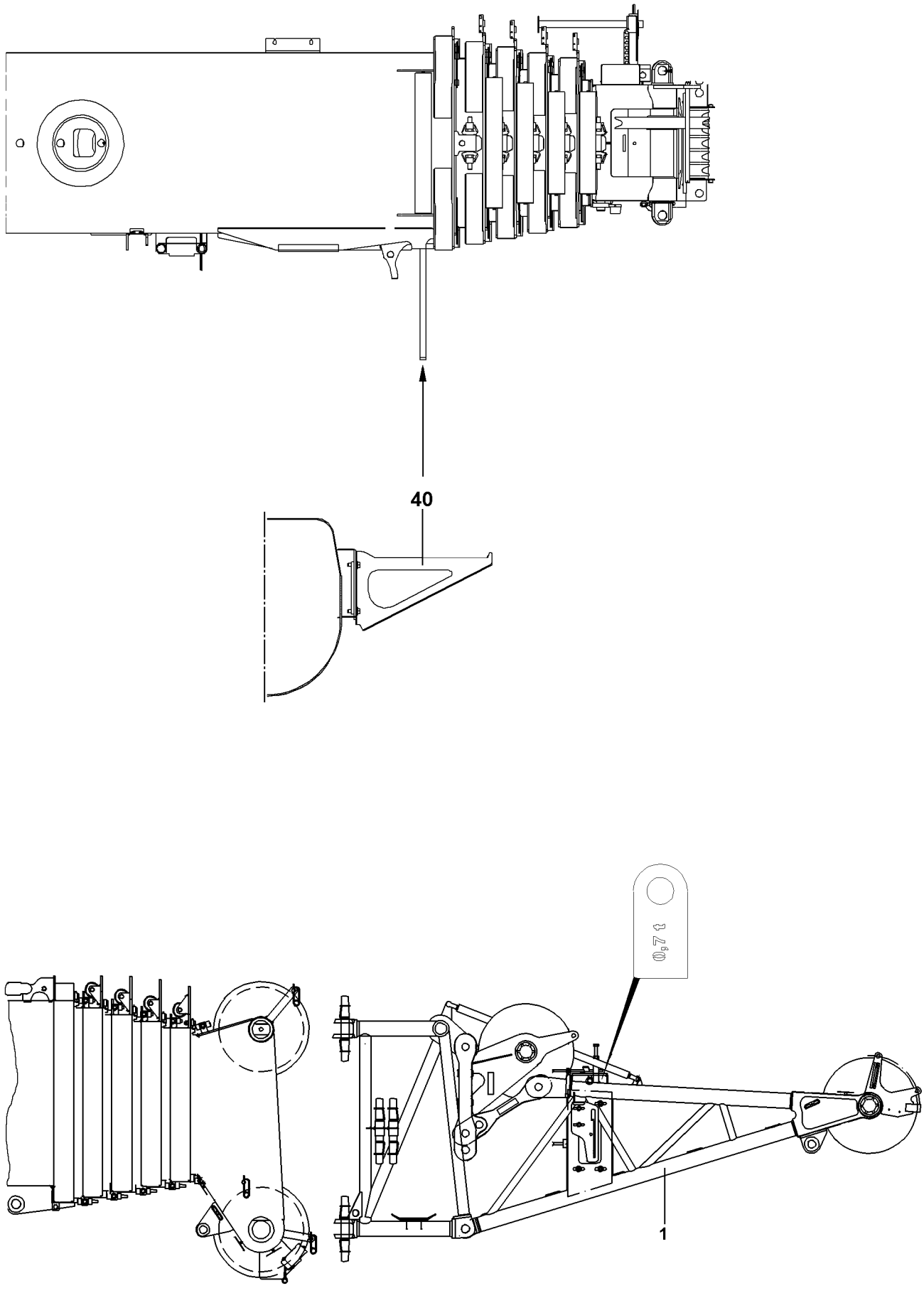
3.3 Removing the boom nose from the telescopic boom

DANGER
Risk of accident if the boom nose falls down!
If the swing pin **2** is unpinned before the boom nose **1** is secured with the auxiliary crane, then the boom nose **1** can fall down and kill or severely injure personnel!
▶ Unpin the swing pin **2** only when the boom nose **1** is secured with the auxiliary crane!

▶ Attach the boom nose **1** on the auxiliary crane, see section “Fastening point”.

WARNING
Danger of crushing!
During disassembly, hands can be crushed due to swing movements of the boom nose **1**!
▶ Make sure that the boom nose **1** is not swinging back and forth during removal!

Remove the boom nose **1**:
▶ Release the swing pin **2** and the pin **3** and unpin.
▶ Use the auxiliary crane to place the boom nose **1** onto the transport vehicle.
▶ Detach the auxiliary crane.



B103741

1 General

CAUTION
The auxiliary boom can collide with the catch bar **40** for the single / double folding jib!
▶ Remove the catch bar **40** before installing the auxiliary boom.

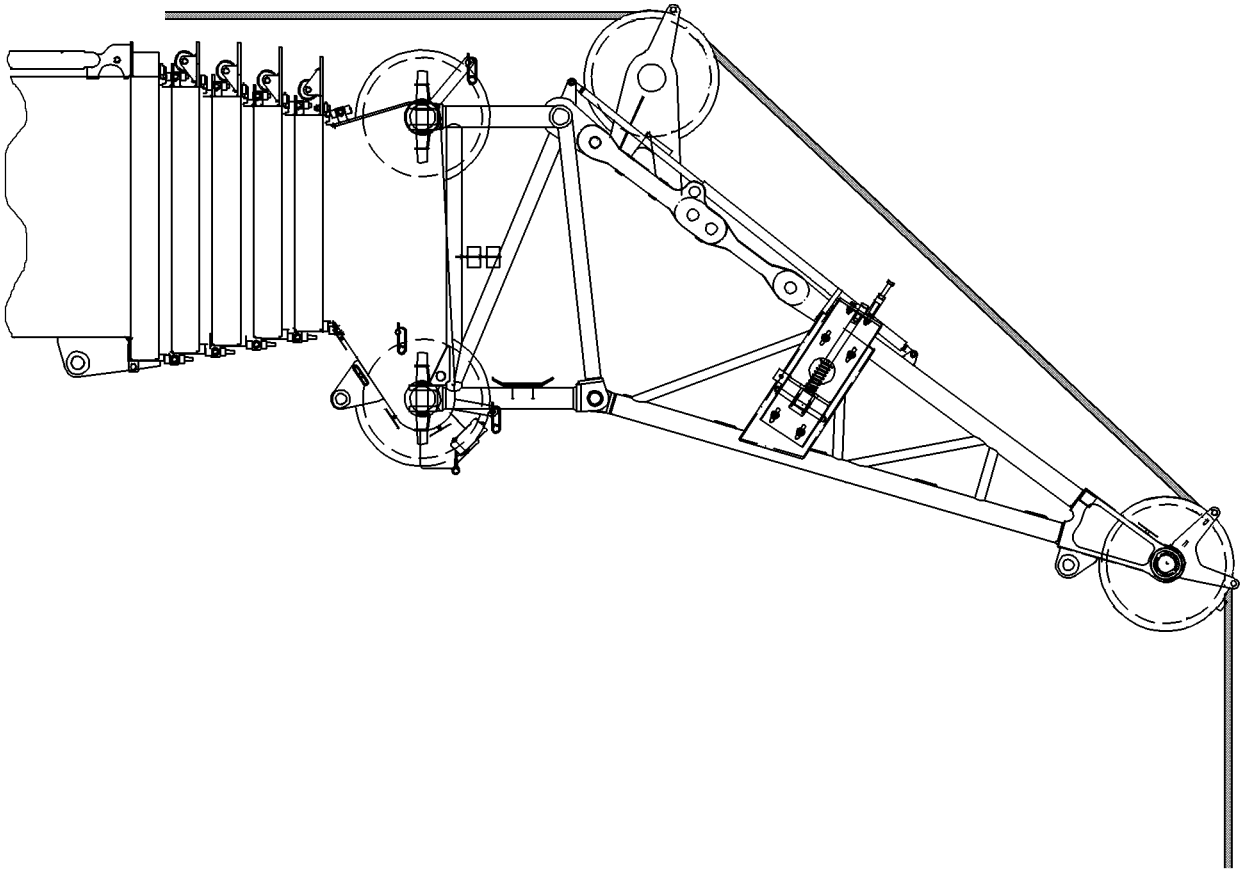
DANGER
Danger of fatal injuries due to toppling folding jib!
As a result of improperly assembled, damaged or non-existing catch bar **40** on the telescopic boom pivot section, “the folding jib” – due to an assembly error – can fall down and cause fatal injuries.
▶ Make sure that the catch bar **40** is property installed again and not damaged “before assembling the single or the double folding jib”, see “chapter 5.02”.

The auxiliary boom can be self-assembled on the telescopic boom.

DANGER
Danger of accident when driving with the auxiliary boom!
▶ Before being driven on roads, the auxiliary boom must always be brought to the transportation position and mechanically secured.
▶ Make sure that the auxiliary boom is properly secured before driving the crane on public roads.

1.1 Components overview

Position	Description	Length	Weight
1	Auxiliary boom	2.9 m	0.7 t



B192467

2 Assembly of the auxiliary boom

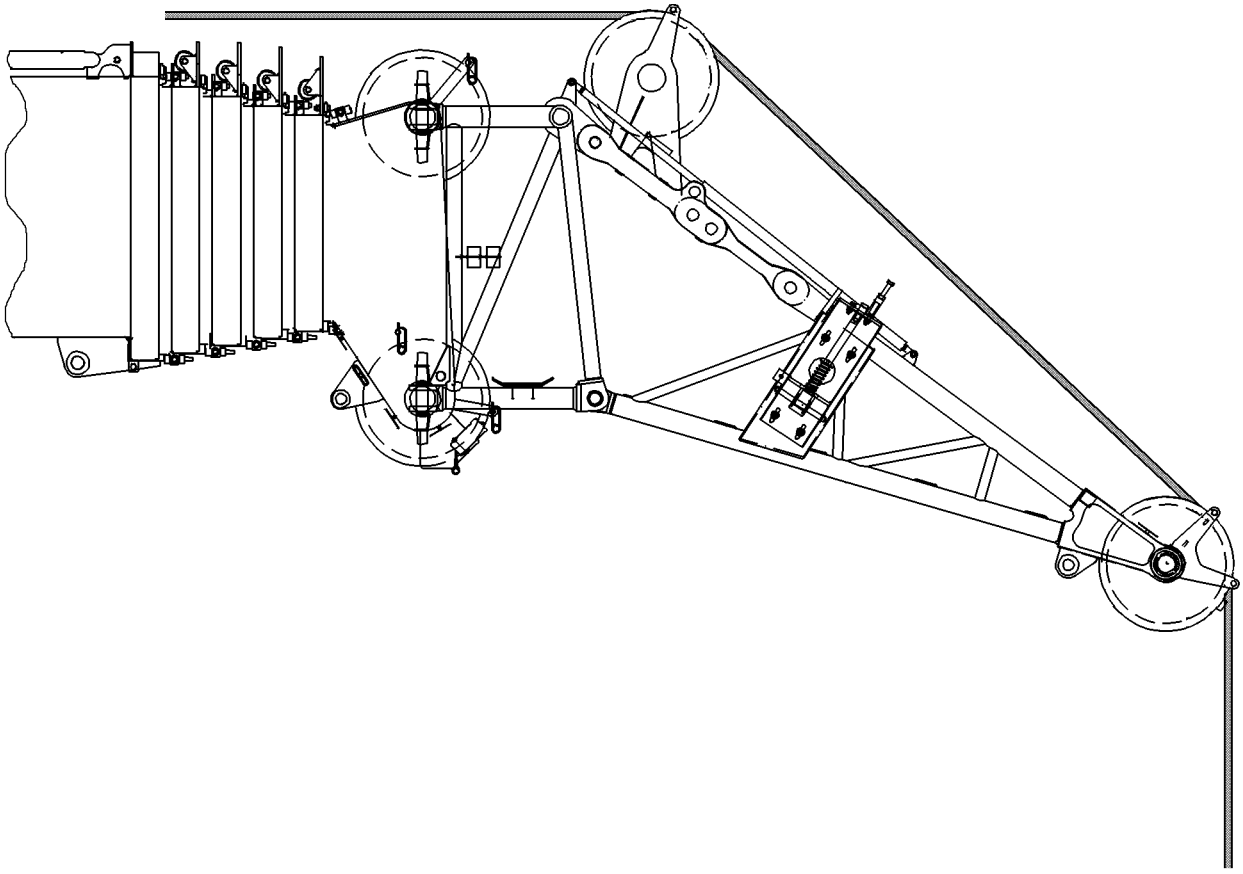
2.1 General

DANGER
Danger of fatal injury due to toppling auxiliary boom!
Due to an assembly error, the auxiliary boom could fall down.
- ▶ Standing under the auxiliary boom during the swing operation is prohibited!
- ▶ It is prohibited for anyone to remain within the swinging area or the folding area of the auxiliary boom!
- ▶ The auxiliary boom must be secured by an auxiliary rope during the swing process!

DANGER
Danger of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening injuries.
- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out using these aids or from the ground, the assembly personnel must be protected from falling using suitable means (such as safety harnesses)!
- ▶ Do not walk on the telescopic boom or auxiliary boom!

Make sure that the following prerequisites are met:
- – The crane is properly supported and horizontally aligned.
- – The counterweight has been installed to the turntable according to the load chart.
- – The telescopic boom is fully telescoped in.
- – The auxiliary boom is attached on the telescopic boom pivot section for transport.
- – The telescopic boom has been luffed down to the rear or the side in the 0° position.

DANGER
Danger of accident from involuntary swinging out of the auxiliary boom when it is unpinned!
If the telescopic boom is not in the 0° position, a risk of accident exists due to involuntary swinging out of the auxiliary boom when it is unpinned.
- ▶ Move the telescopic boom to 0° position.



B192467

2.2 Reeving out the hoist rope on the telescopic boom head

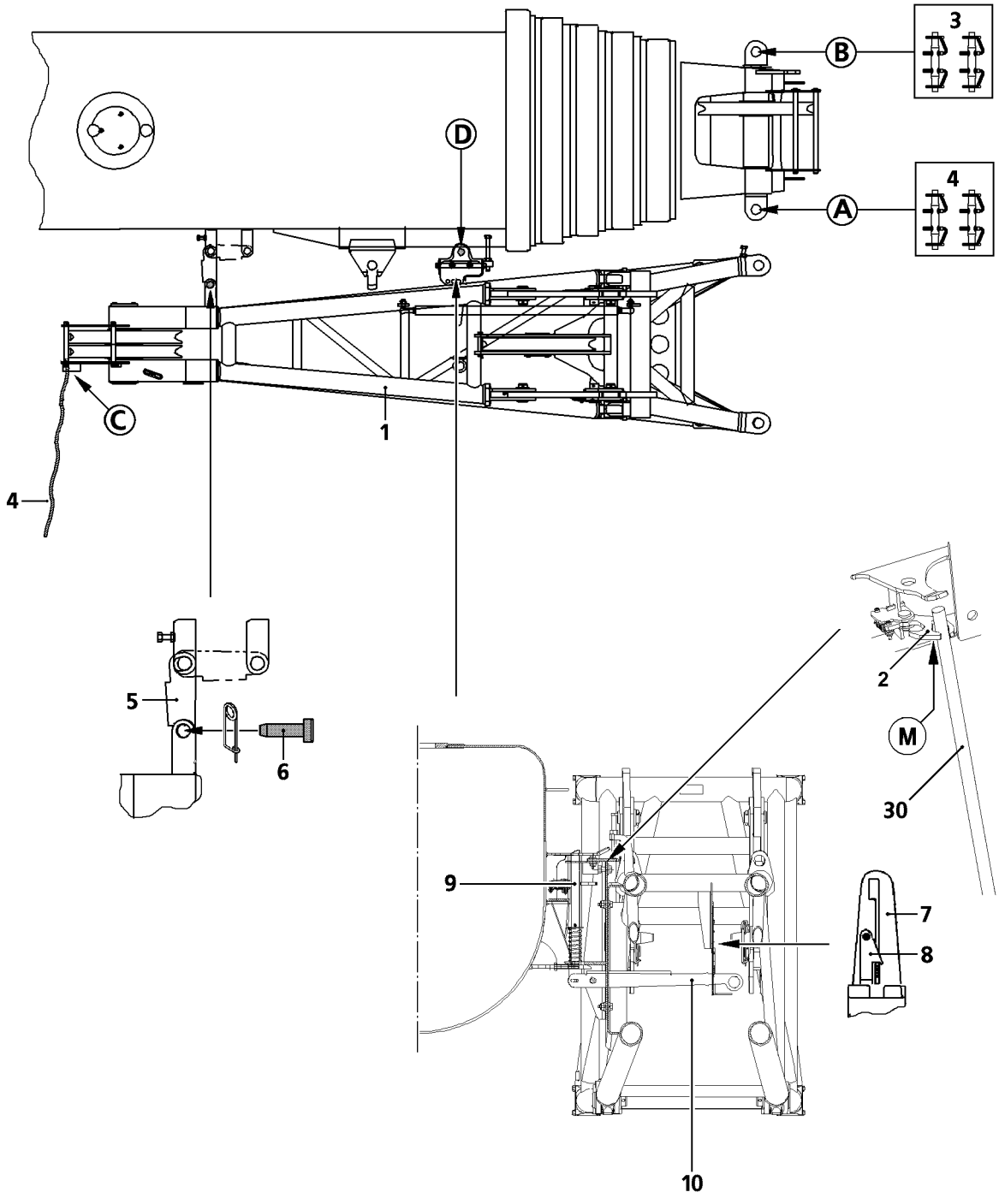
In order to speed up the subsequent reeving in of the hoist rope after assembling the auxiliary boom, the hook block can be put down at a distance from the crane approximating to the subsequent distance of the telescoped in telescopic boom **with** assembled auxiliary boom.

- ▶ Telescope the telescopic boom out to the respective length.
- ▶ Place the hook block on the ground.
- ▶ Disengage the hoist rope on the rope fixed point.
- ▶ Disassemble the hoist limit switch weight and the chain for safety reasons.

Note

- ▶ The hoist limit switch must be pulled mechanically and the operating cable must be attached to the telescopic boom head with the snap hook when operating the auxiliary boom.
- ▶ The telescopic boom may remain reeved in, if the hoist rope of winch 2 is used for auxiliary boom operation.

- ▶ Remove the rope retaining pipes on the pulley head and on the back pulley.
- ▶ Telescope the telescopic boom in again all the way.



B107338

2.3 Swinging the auxiliary boom into operating position

- ▶ Attach the auxiliary rope **4** at point **C**.
- ▶ Release and unpin the pin **6**.
- ▶ Swivel auxiliary boom **1** out until it can be pinned at point **A**.
- ▶ Insert the pins **4** at the top and at the bottom at point **A** and secure.

DANGER
Danger of fatal injury due to toppling auxiliary boom!
Special retaining clips must be used to secure the pins **4**. The use of spring pins or spring retainers on the pins **4** is not permitted. The auxiliary boom may only be released at point **D** if the pins **4** are pinned and secured at the top and bottom at point **A**.

- ▶ Pin and secure pins **4** at point **A** at top and bottom.

- ▶ Swing the safety bracket **8** with the assembly rod to the side.
- ▶ Push the lever **10** with the assembly rod up and latch into the bracket **7**.

Note

- ▶ Open the catch claw **2** with the special assembly rod **30** from the ground.

- ▶ Guide the assembly rod **30** from below in point **M** and leverage the catch claw **2** on the side in direction of the boom head.

Result:

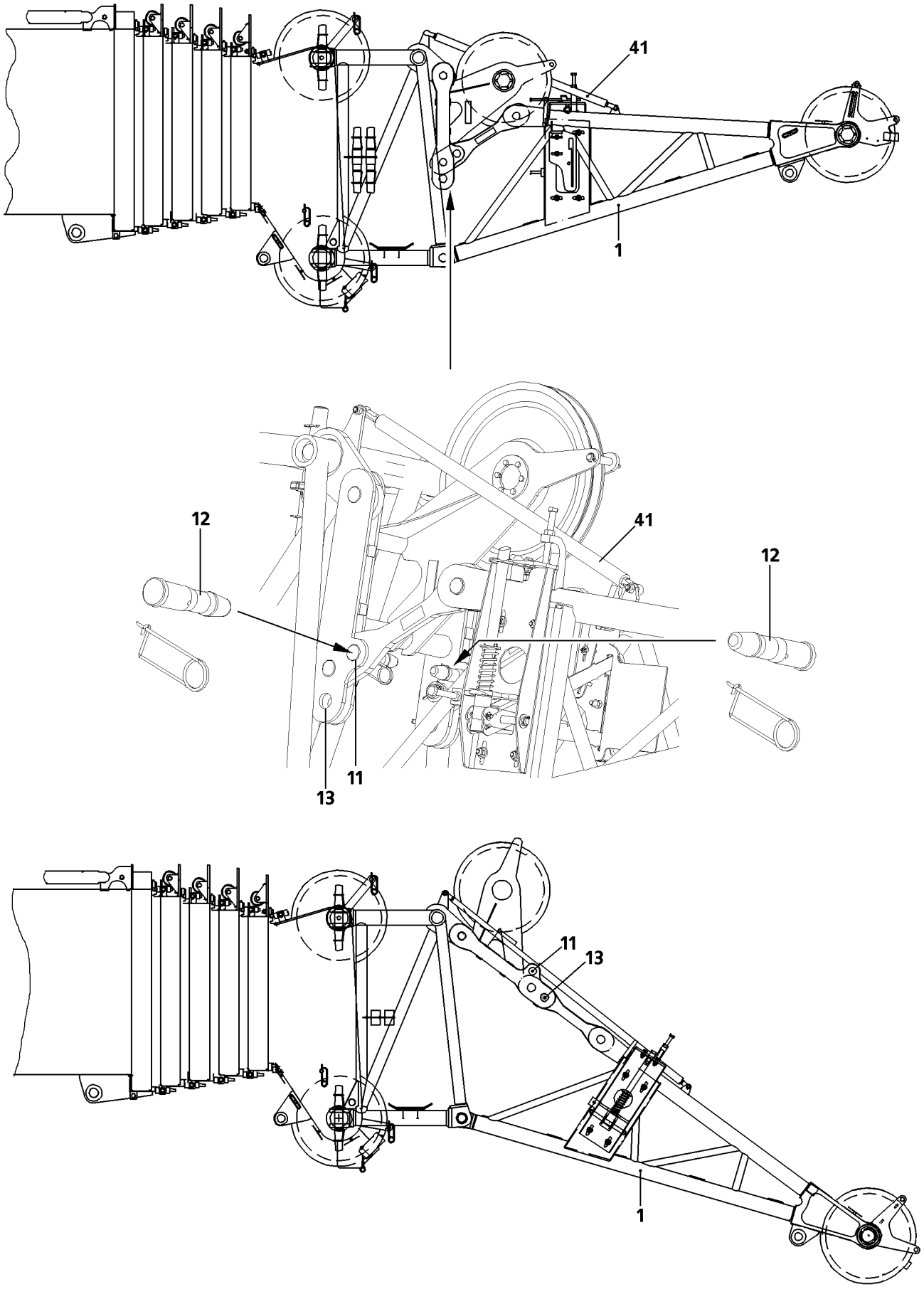
– The catch claw **2** opens and the auxiliary boom **1** is leveraged from the console of the transport retainer.

- ▶ Swing the auxiliary boom **1** out from the catch claw **2**.
- ▶ Swing the auxiliary boom **1** with the auxiliary rope **4** by 180 ° until it can be pinned at point **B** at the top and bottom.

DANGER
Risk of accident!

- ▶ The use of spring cotters or spring retainers is prohibited on the pins **3**!
- ▶ Special retaining clips must be used to secure the pins **3**.

- ▶ Insert the pins **3** at the top and at the bottom at point **B** and secure.
- ▶ Remove the auxiliary rope **4**.



B104953

2.4 Folding the auxiliary boom into operating position

DANGER
Danger of fatal injury in case of defective pneumatic spring!
The pins **12** are easy to remove when the pneumatic spring **41** is working correctly.
If the pneumatic spring **41** is **defective**, the pins **12** can **not** be removed!
Defective pneumatic springs **41** no longer provide the supporting properties on the movable components on the auxiliary boom **1**!
If the pneumatic spring **41** is defective, the auxiliary boom **1** can fall down and fatally or seriously injure personnel!
There is an increased danger of accidents!

- ▶ Before unpinning the pin **12** and before actuation, check the pneumatic spring **41** for external damage!
- ▶ Do not use auxiliary boom **1** with defective pneumatic spring **41**! Replace defective pneumatic springs **41**!
- ▶ If the pneumatic spring **41** is defective, support the auxiliary boom **1** from below or hang it on an auxiliary crane.
- ▶ It is strictly prohibited for personnel or objects to remain within the movement range of the auxiliary boom **1**!
- ▶ It is prohibited for personnel or objects to remain within the danger zone of the moveable components!

DANGER
Danger of fatal injury due to toppling auxiliary boom!
Before unpinning the pins **12** it must be ensured that no persons or objects are in the danger zone, particularly beneath the auxiliary boom.

- ▶ Do not unpin pins **12** until all persons and objects have been removed from the danger zone!

- ▶ Unpin the pins **12** on both sides from the bores **11**.
- ▶ Fold the auxiliary boom **1** down until the bores align.

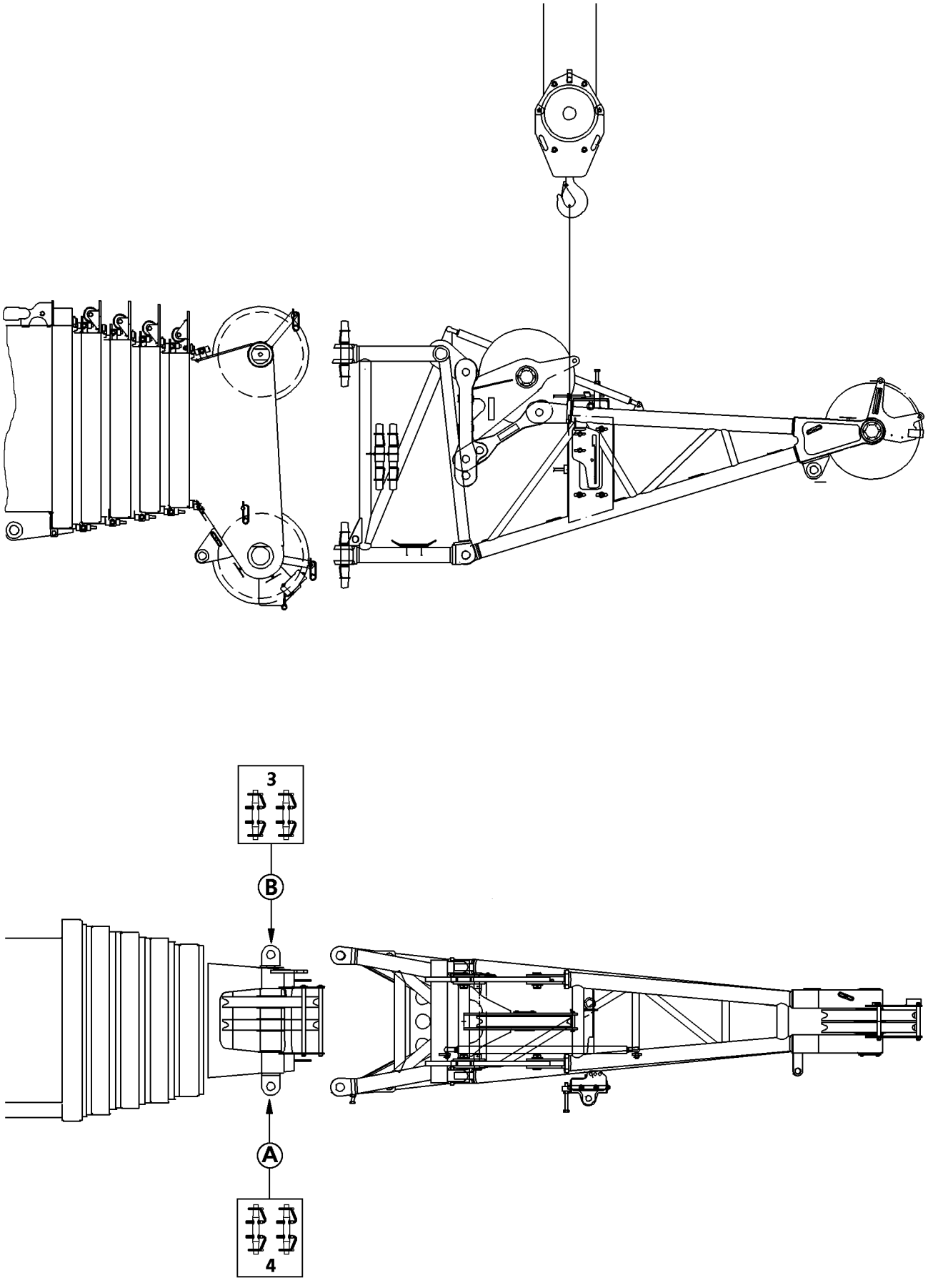
Note

- ▶ The folding procedure is simplified if a hook block is reeved in.
- ▶ The rope retaining pins must be unpinned before the folding procedure, see paragraph “Reeving the hoist rope”.
- ▶ Lift the hook block to the point where the bores align.

- ▶ Fit the pins **12** on both sides in bores **13** from “outside to inside” and secure with spring retainers.

Before starting to use the auxiliary boom **1**, the auxiliary boom **1** must be folded down and pinned.

- ▶ Check if the auxiliary boom **1** has been pinned as described in the operating instructions.



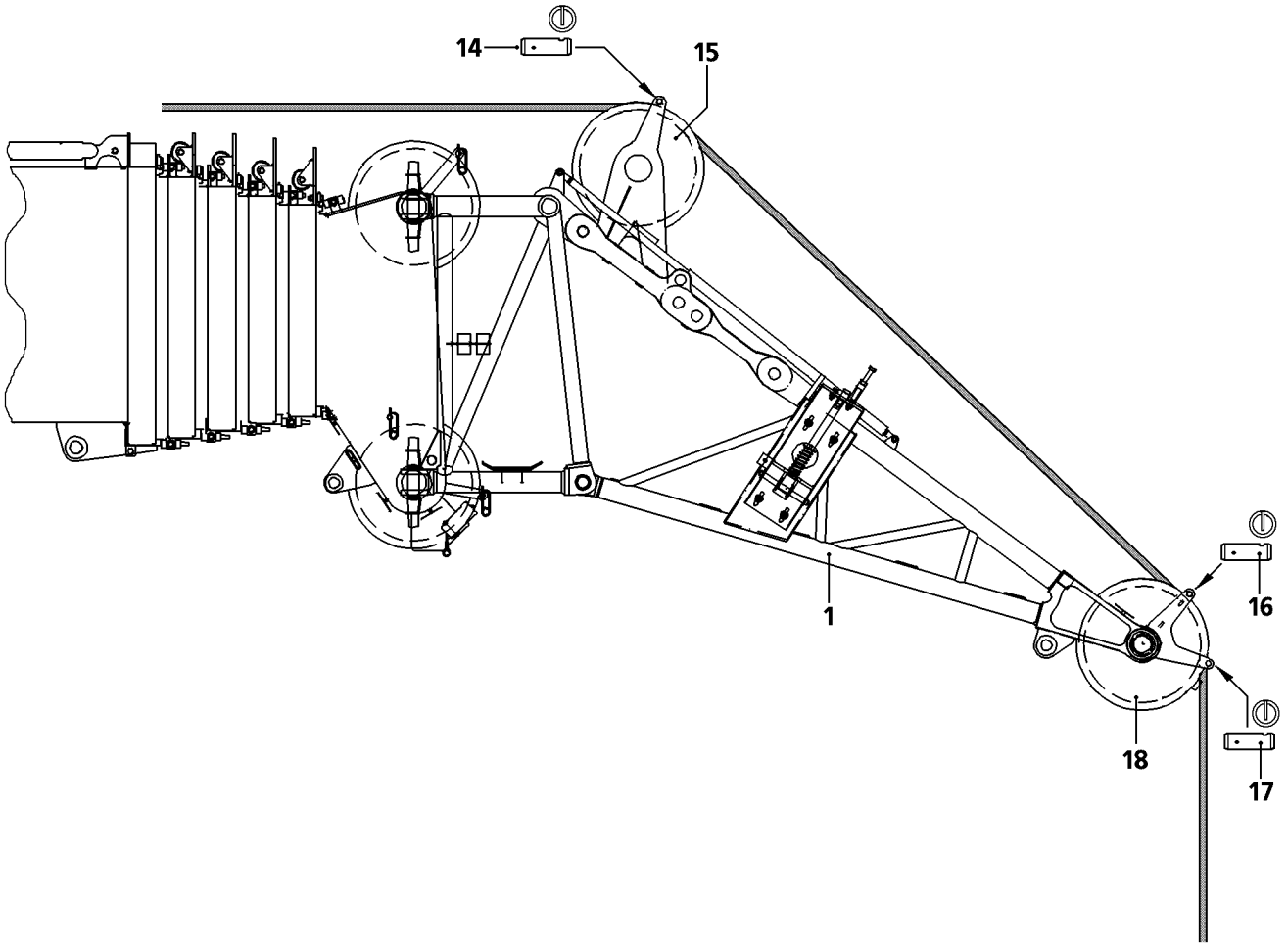
B192473

2.5 On-the-fly assembly of the auxiliary boom

- ▶ Hang the auxiliary boom on the auxiliary crane and guide in the fork heads on the telescopic boom.

DANGER
Risk of accident!
- ▶ The use of spring cotters or spring retainers is prohibited on pins **3** and pins **4**!
- ▶ To secure the pin **3** and the pin **4**, use the special retaining clips.

- ▶ Pin auxiliary boom to telescopic boom:
- ▶ Pin and secure pins **4** on top and on the bottom at point **A**.
- ▶ Pin and secure pins **3** on top and on the bottom at point **B**.
- ▶ For rest of assembly see section “Folding end section to operating position”.



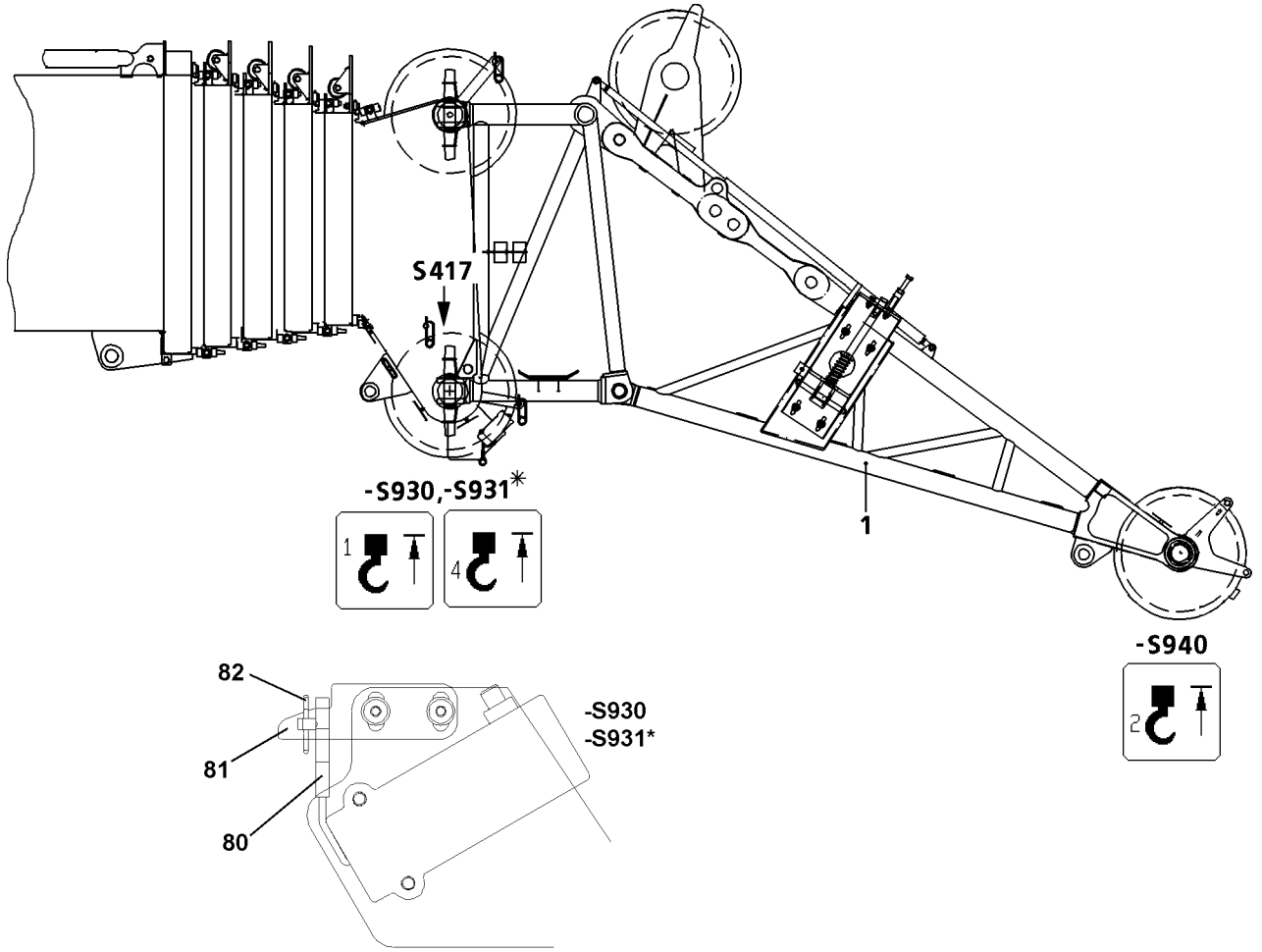
B192470

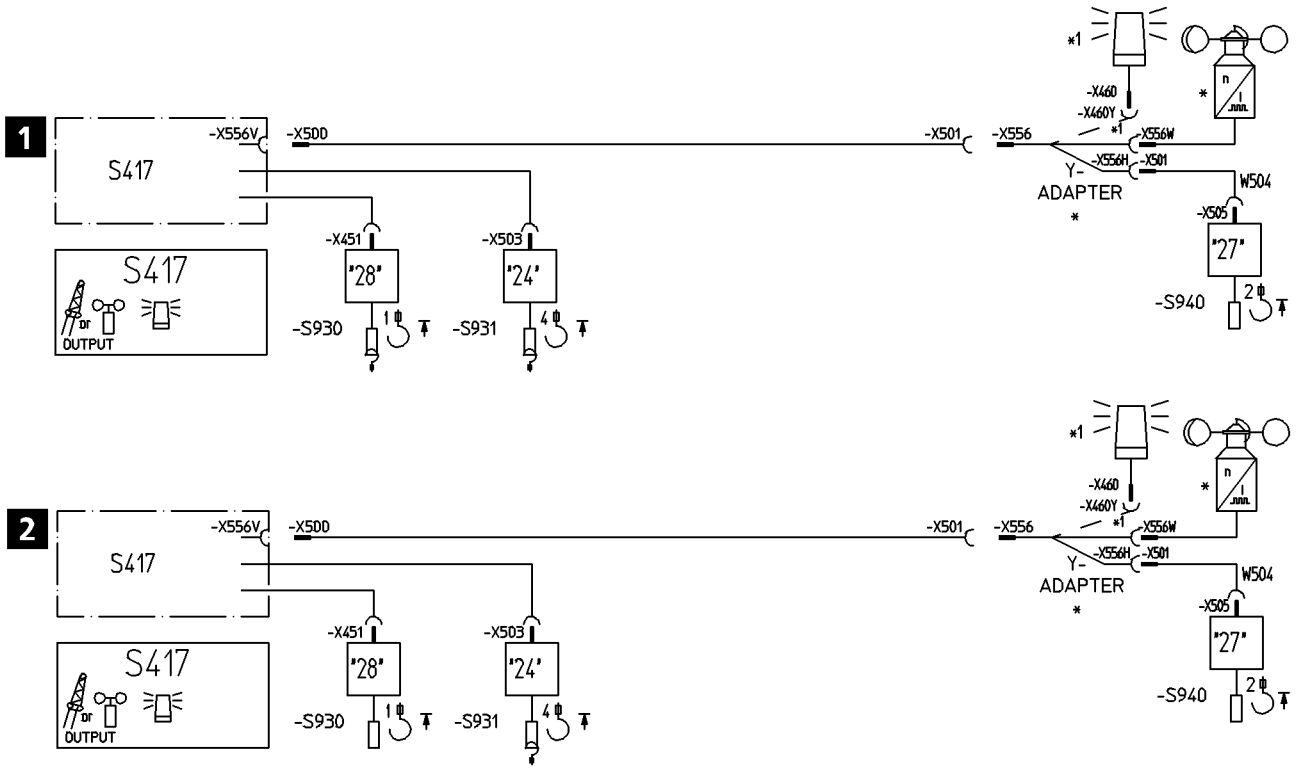
2.6 Reeving in the hoist rope

- ▶ Release and unpin rope retaining pin **14**, rope retaining pin **16** and rope retaining pin **17**.
- ▶ Run hoist rope over rope guide pulley **15** and main pulley **18**.
- ▶ Insert the rope retaining pin again and secure with linch pins.
- ▶ Reeve in the load hook or hook block.
- ▶ Attach the hoist limit switch weight.

Note

- ▶ The weight of the hook block that is reeved into the telescope boom must be deducted from the load during auxiliary boom operations with the hook block reeved into the telescope boom.


S417
-S930,-S931*
1
4
1
-S940
2
82
81
80
-S930
-S931*


1
S417
-X556V
-X500
-X501
-X556
-X451
-X503
"28"
"24"
-S930
-S931
S417
DI
OUTPUT
*1
-X460
-X460Y
*1
-X556W
-X556H
-X501
Y-
ADAPTER
*
W504
-X505
"27"
-S940
2
2
S417
-X556V
-X500
-X501
-X556
-X451
-X503
"28"
"24"
-S930
-S931
S417
DI
OUTPUT
*1
-X460
-X460Y
*1
-X556W
-X556H
-X501
Y-
ADAPTER
*
W504
-X505
"27"
-S940
2

B111656

2.7 Electrical connections on auxiliary boom

2.7.1 Actuating the hoist limit switch mechanically

If you are working in “single hook mode” when using the auxiliary boom, the hoist limit switch **-S930/-S931** that is not required must be operated manually.

- ▶ Remove the hoist limit switch weight and chain.
- ▶ Pull the hoist limit switch rope **80**, hang in on the fixed point **81** and secure with locking pin **82**.

2.7.2 Electrical connections

Single hook operation, illustration 1

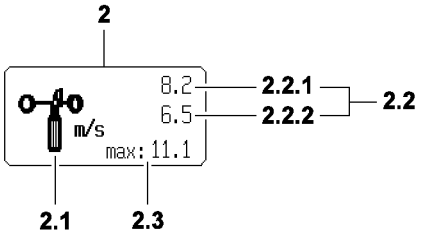
Only the hoist limit switch **S940** at the auxiliary boom is active during single hook operation.

- ▶ Actuate the hoist limit switch **-S930** mechanically.
- ▶ If installed on the telescopic boom:
  Actuate the hoist limit switch* **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the adapter **-X556** into the socket **-X501**.
- ▶ Insert the hoist limit switch **-S940** with the cable plug **-X501** into the socket **-X556H**.
- ▶ Insert the wind speed sensor* with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon* with the cable plug **-X460** into the socket **-X460Y**.

Two hook operation, illustration 2

During two hook operation the hoist limit switch **S930** on the telescopic boom and the hoist limit switch **S940** on the auxiliary boom are active!

- ▶ If installed on the telescopic boom:
  Actuate the hoist limit switch* **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the adapter **-X556** into the socket **-X501**.
- ▶ Insert the hoist limit switch **-S940** with the cable plug **-X501** into the socket **-X556H**.
- ▶ Insert the wind speed sensor* with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon* with the cable plug **-X460** into the socket **-X460Y**.



B197637

2.7.3 Function check

Make sure that the following prerequisites are met:
– All electrical connections have been made.
– The LICCON computer system is running.

Wind sensor

CAUTION
Danger of accidents due to toppling of the crane!
The wind speed can no longer be determined if a defective wind sensor is installed.
▶ Check the function of the wind sensor every time it is installed.

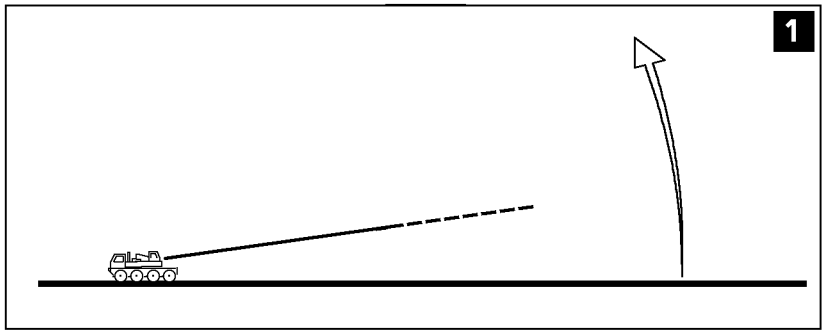
▶ Manually actuate the wind sensor.

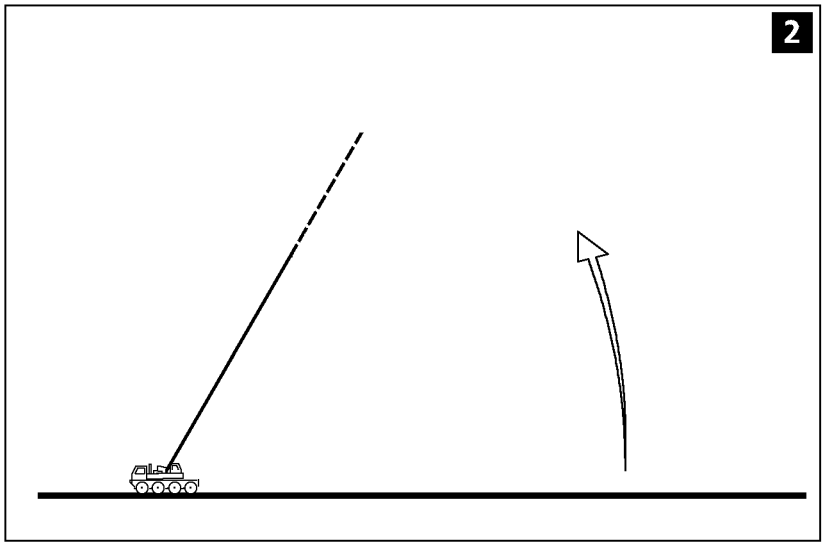
Result:
– The icon element “Wind speed” **2.2** appears on the monitor.

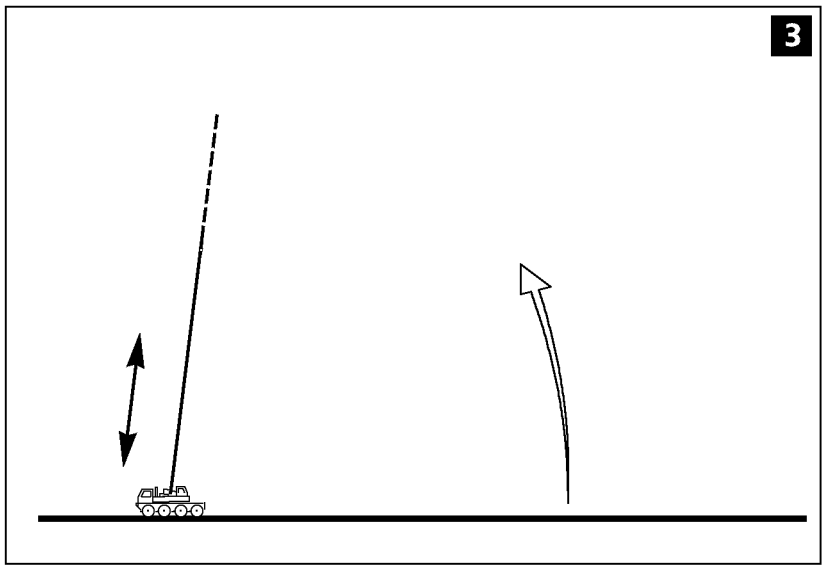
Hoist limit switch

▶ Actuate all active hoist limit switches manually.

Result:
– The appropriate icon element “Hoist top” appears on the monitor.
– The winch turns off.







B192389

3 Erection

3.1 Preparatory work

Make sure that the following prerequisites are met:

- The crane is properly supported and horizontally aligned.
- The counterweight has been installed to the turntable according to the load chart.
- The telescopic boom is fully telescoped in.
- The auxiliary boom has been assembled according to the load chart and the operating instructions.
- All limit switches have been correctly assembled and are fully functional.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the cable pulleys and is secured with the rope retaining pins to prevent it from jumping out.
- There are no loose parts on the telescopic boom or the auxiliary boom.
- The telescopic boom, the auxiliary boom and their components (limit switches, flight warning lamp, anemometer etc.) must be free of snow and ice in the winter.

DANGER
Risk of accident!
Incorrectly assembled or non-operational limit switches and falling parts (pins, spring pins, ice etc.) can cause injuries!

▶ Assemble all limit switches, pins and cotter pins properly.

▶ Check if all prerequisites have been met.

3.2 Erection procedure

DANGER
Danger of accidents due to toppling of the crane!
The radii specified in the load chart may not be exceeded or fallen below, even if there is no load on the hook! If this regulation is not observed, the crane can topple over.

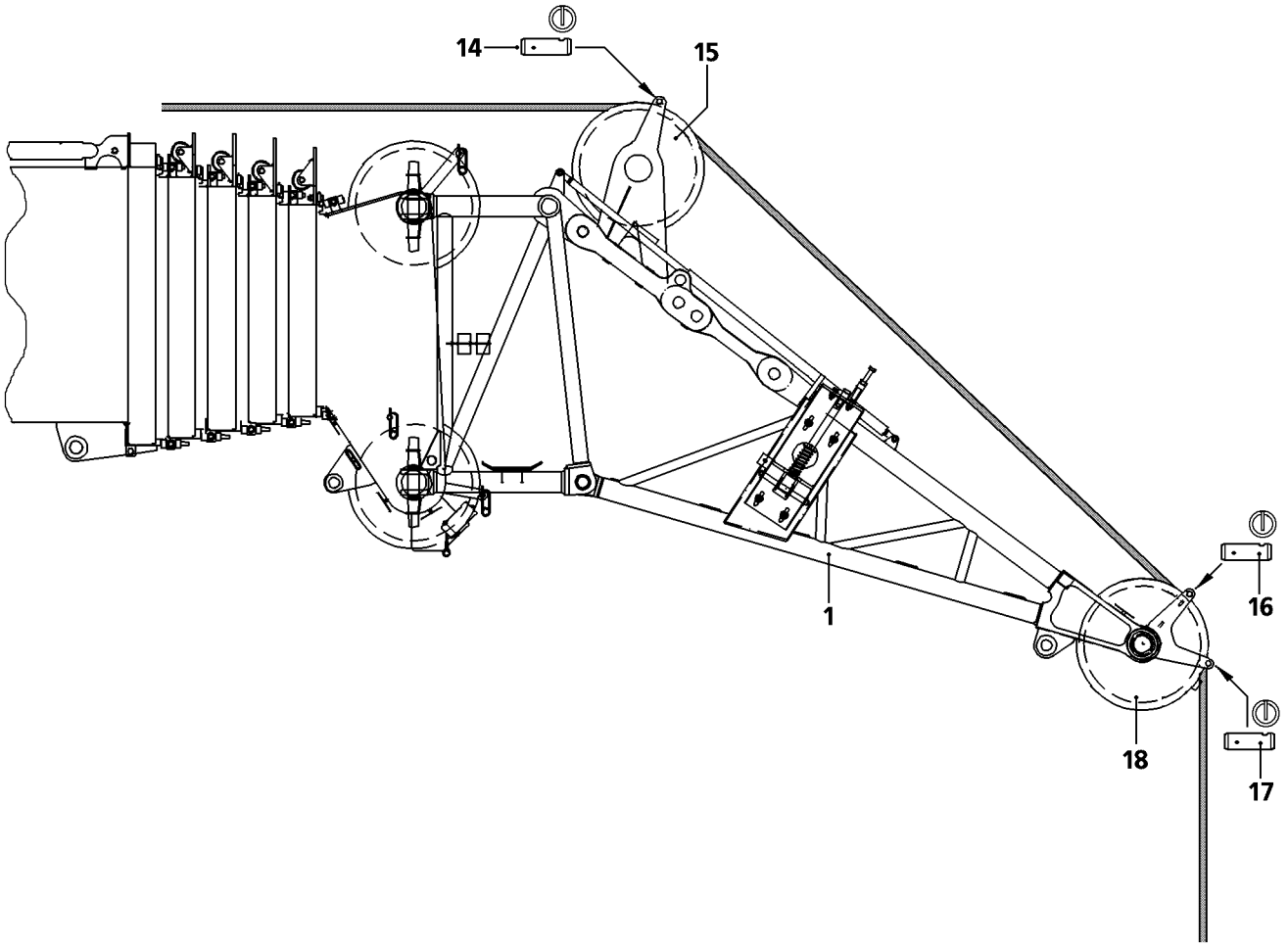
▶ Compare and check the settings on the LICCON computer system with the actual configuration status!

Adjustment of the LICCON overload protection, refer to chapter 4.02.

▶ Set and confirm the LICCON overload protection according to the required set up configuration.

▶ Luff the telescopic boom up with installed auxiliary boom until the LICCON issues the release.

▶ Telescope the telescopic boom out to values specified in load chart.



B192470

4 Disassembling the auxiliary boom

4.1 General

DANGER
Danger of fatal injury due to toppling auxiliary boom!
The auxiliary boom may topple if it is incorrectly disassembled.
- ▶ Standing under the auxiliary boom during the swing operation is prohibited!
- ▶ The auxiliary boom must be secured by an auxiliary rope during the slewing process!
- ▶ Never stand beneath the auxiliary boom during disassembling!

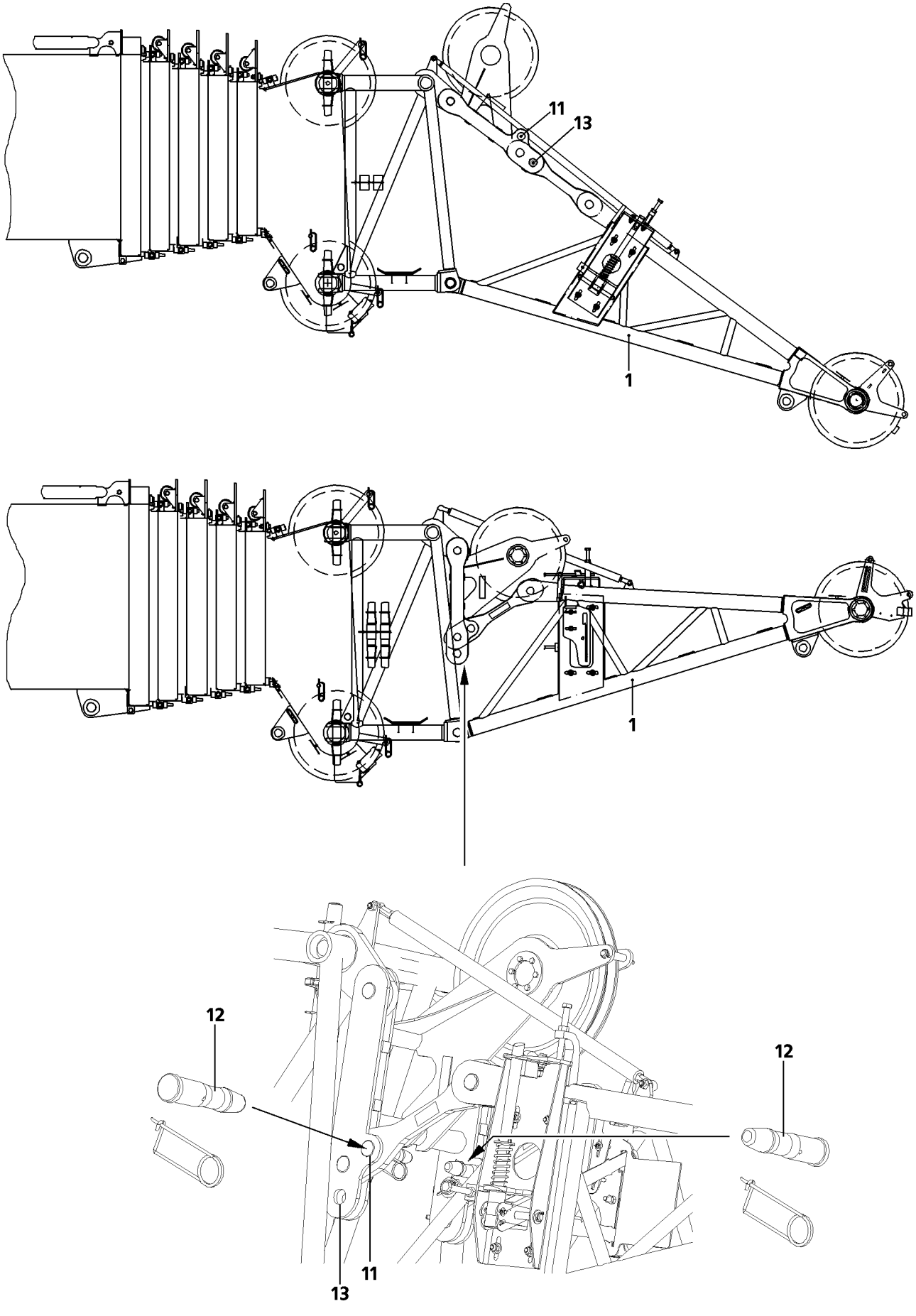
DANGER
Danger of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening injuries.
- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out using these aids or from the ground, the assembly personnel must be protected from falling using suitable means (such as safety harnesses)!
- ▶ Do not walk on the telescopic boom or auxiliary boom!

Make sure that the following prerequisites are met:
- – The crane is properly supported and horizontally aligned.
- – The counterweight has been installed to the turntable according to the load chart.
- – The telescopic boom is fully telescoped in.
- – The electrical connections at the auxiliary boom have been released.
- – The telescopic boom has been luffed down to the rear or the side in the 0° position.

DANGER
Danger of accident from involuntary swinging out of the auxiliary boom!
The telescopic boom must be in the 0° position, otherwise there is a risk of accident from involuntary auxiliary boom movements when the pins are undone on the telescopic boom.
- ▶ Move the telescopic boom to 0° position.

4.2 Unreeving the hoist rope

- ▶ Release and unpin rope retaining pin **14**, rope retaining pin **16** and rope retaining pin **17**.
- ▶ Spool up the hoist rope.
- ▶ Repin the rope retaining pin **14**, rope retaining pin **16** and rope retaining pin **17** and secure with linch pins.



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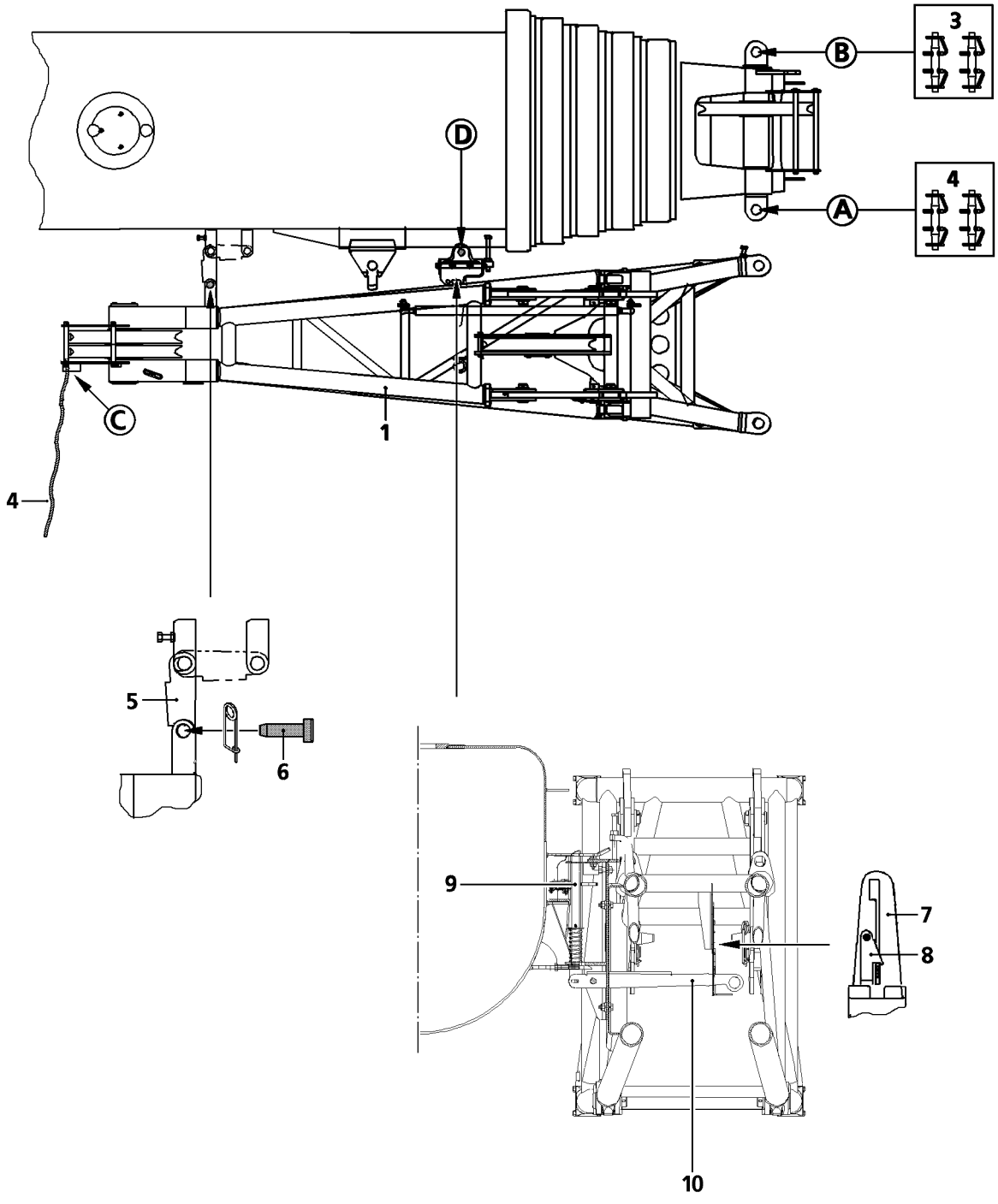
4.3 Folding the auxiliary boom into transport position

DANGER
Risk of accident!
Before the auxiliary boom **1** may be swung into transport position, the auxiliary boom **1** must be folded up into transport position and pinned.
Before unpinning the pins **12** it must be ensured that no persons or objects are in the danger zone, particularly beneath the auxiliary boom.

- ▶ Do not unpin pins **12** until all persons and objects have been removed from the danger zone!
- ▶ Insert pins **12** from the “outside to the inside”.

- ▶ Release the pins **12** on both sides and unpin them from the bores **13**.
- ▶ Fold the auxiliary boom **1** up in transport position until the bores align.
- ▶ Fit the pins **12** on both sides in bores **11** from “outside to inside” and secure with spring retainers.



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4.4 Swivelling the auxiliary boom into the transport position

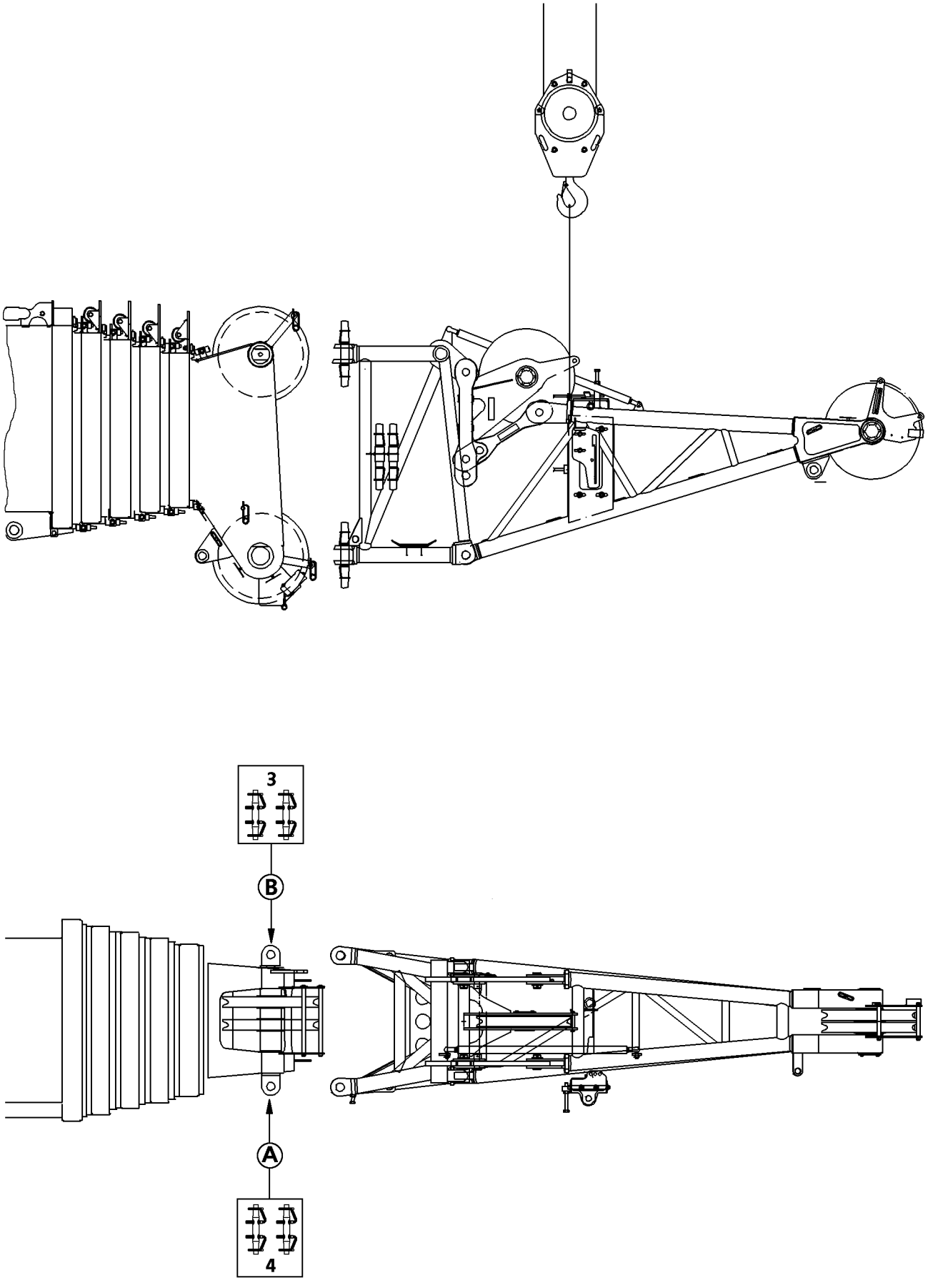
▶ Attach the auxiliary rope **4** at point **C**.

DANGER
The auxiliary boom may swing out involuntarily!
While unpinning the pin **3**, the auxiliary boom may swing out unintentionally.
In order to prevent the auxiliary boom from involuntarily swinging out:
▶ Hold down auxiliary boom using the auxiliary rope **16**!
▶ Do not lean the ladder against the auxiliary boom!

▶ Release and unpin the pin **3**.
▶ Disengage the lever **10** with the assembly rod from the bracket **7** and pull downward.
▶ Swing in auxiliary boom **1** with auxiliary rope **16** until locking **9** audibly engages.
▶ Perform a visual inspection.
▶ Secure the lever **10** with the safety bracket **8**.

DANGER
Danger of accident from auxiliary boom falling down!
If the pins **4** are unpinned before the lock **9** is engaged and secured with the safety bracket **8**, the auxiliary boom will fall down!
▶ Unpin the pins **4** only if the lock **9** is engaged and secured with the safety bracket **8**.

▶ Release and unpin the pin **4**.
▶ Swing the auxiliary boom **1** in until the pin **6** can be pinned.
▶ Pin the auxiliary boom **1** with the telescopic boom: Insert and secure pin **6**.
▶ Remove the auxiliary rope **4**.



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4.5 Removing the separately transported auxiliary boom

Make sure that the following prerequisites are met:

– The auxiliary boom is folded in operating position.

▶ Attach the auxiliary crane on the fastening point of the auxiliary boom.

DANGER

Danger of accident when removing the auxiliary boom!

Failing to comply with the following conditions may result in fatal injury to the assembly personnel during disassembly.

▶ When knocking out the pins, no personnel may remain under the auxiliary boom!

▶ Attach the auxiliary crane so that no diagonal pull occurs!

▶ Match the “hoisting power” of the auxiliary crane to the “weight” of the auxiliary boom!

▶ The auxiliary boom may detach suddenly because of distortion!

▶ Do not remove auxiliary boom until it has been secured with the auxiliary crane to prevent it from falling!

▶ Do not lean the ladder against the auxiliary boom!

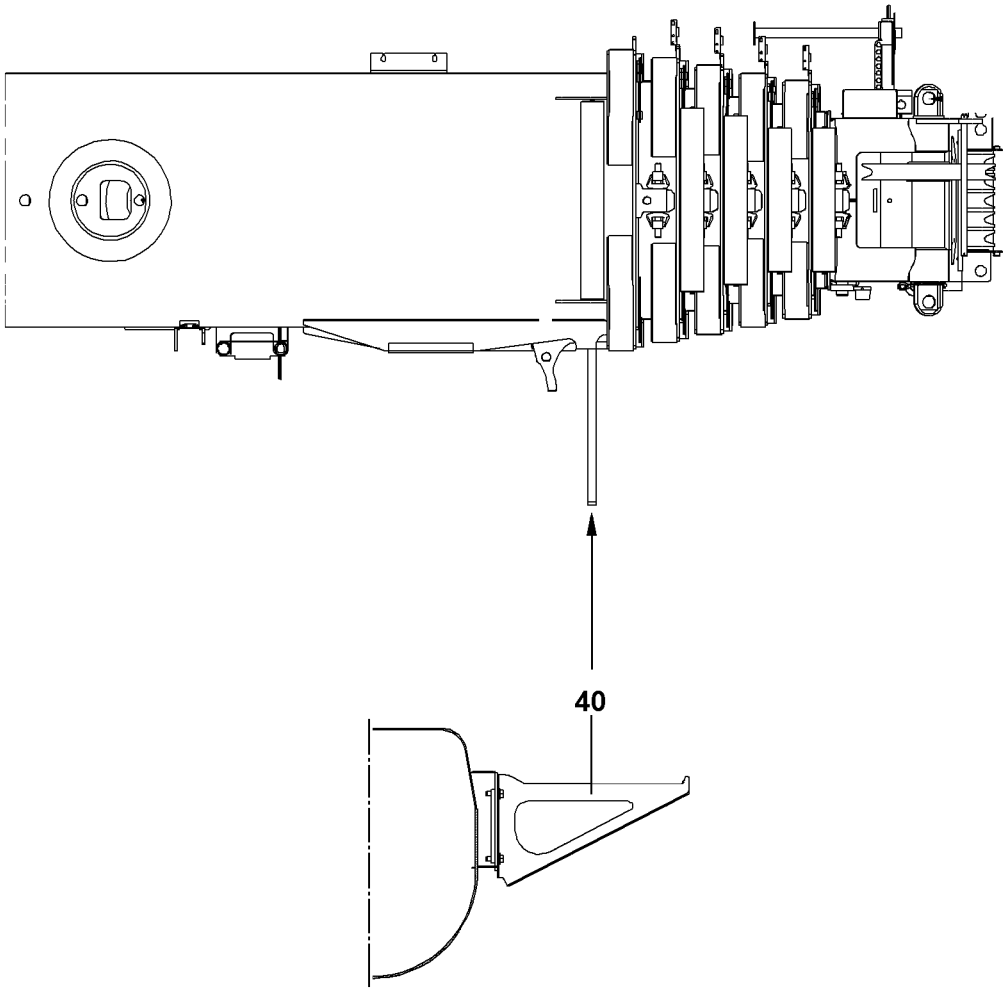
▶ Tighten the ropes so that auxiliary boom is prevented from falling.

▶ Unpinning the auxiliary boom from the telescopic boom:

▶ Release and unpin pins **4** at the top and at the bottom at point **A**.

▶ Release and unpin pins **3** at the top and at the bottom at point **B**.

▶ Place the auxiliary boom onto the transport vehicle.



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4.6 Assembling the catch bar on the telescopic boom pivot section

DANGER
Danger of fatal injuries due to toppling folding jib!
As a result of improperly assembled, damaged or non-existing catch bar **40** on the telescopic boom pivot section, the folding jib – due to an assembly error – can fall down and cause fatal injuries.

- ▶ After the auxiliary boom is removed from the telescopic boom, the catch bar **40** must be re-assembled properly.
- ▶ Make sure that the catch bar **40** property is properly assembled again and not damaged “before assembling the single or the double folding jib”, see also “chapter 5.02”.

- ▶ Install the catch bar **40** properly on the telescopic boom pivot section.

B195219

1 Minimum required hook block weight

WARNING
Falling components and hook block!
If the chosen hook block weight is not large enough. then the hoist rope pulls the hook block between the boom head and the winch from a certain hoisting height suddenly upward. As a result, the boom head and the hook block can be damaged. Damaged components and the hoist rope between the boom head and the winch can fall down.
If slack rope forms between the winch and the boom head when spooling the winch out, then the hook block can suddenly fall down.
Personnel can be severely injured or killed!
- ▶ Calculate the minimum required hook block weight before lifting the load!
- ▶ Select the weight of the hook block depending on the calculation!

If the weight of the hook block is not sufficient:
- ▶ Select a heavier hook block or increase the weight of the hook block with fastening items, load tackle, auxiliary weights or modification kits!

NOTICE
Rope damage due to insufficient weight of the hook block!
If the hook block is operated with a higher reeving than is required by the load on the respective boom length, the minimum required hook block weight increases.
If the hook block weight is too low to tighten the hoist rope sufficiently, spooling problems may occur on the winches when lowering and lifting the hook block due to slack rope formation. Rope damage can result.
If no minimum system-related hoist reeving is required for the operating mode:
- ▶ Reeve the hook block at the minimum depending on the maximum rope pull and the weight of the load to be lifted!

If the weight of the hook block is not sufficient:
- ▶ Select a heavier hook block or increase the weight of the hook block with fastening items, load tackle, auxiliary weights or modification kits!

Note
Recommendation for selection of hook block weight!
If the maximum load capacity for the respective boom configuration is not exceeded by an additional weight increase of the hook block:
- ▶ Increase the minimum required hook block weight additionally by at least 10%!

If an additional weight increase of the hook block due to the maximum load capacity for the respective boom configuration is not possible:
- ▶ Lower the hook block only with utmost caution!

Note
Observe the permissible hook block weights for erection and take down of the boom system!
If the permissible hook block weight for erection and take down of the boom system is exceeded due to the own weight increase of the hook block, then the boom system cannot be erected or taken down with this hook block weight.
- ▶ Observe the permissible hook block weights for erection and take down in the erection and take down charts!

If the permissible hook block weight for erection and take down is exceeded:
- ▶ Remove auxiliary weights for the erection and take down of the boom system!

1.1 Calculating the minimum required hook block weight

$$G = L \times M \times N \times F$$

Formula to determine the minimum required hook block weight

Abbreviation	Description	Unit
G	Minimum required hook block weight	kg
L	Overall boom length	m
M	Rope weight	kg/m
N	Reeving	-
F	Factor	-

Explanation of variables to calculate the minimum required hook block weight

1.2 Determining the rope weight for the rope diameter

Rope diameter	Rope weight M
13 mm	0.85 kg/m
15 mm	1.12 kg/m
17 mm	1.45 kg/m
19 mm	1.81 kg/m
21 mm	2.24 kg/m
23 mm	2.67 kg/m
25 mm	3.09 kg/m
28 mm	3.94 kg/m
30 mm	4.46 kg/m
32 mm	5.09 kg/m
38 mm	7.21 kg/m
40 mm	7.99 kg/m
52 mm	13.50 kg/m

Rope diameter and rope weight

1.3 Determining the factor for reeving

Reeving N	Factor F
1	1,31
2	1,34
3	1,36
4	1,39
5	1,41
6	1,44
7	1,46

Reeving N	Factor F
8	1,49
9	1,52
10	1,54
11	1,57
12	1,60
13	1,63
14	1,65
15	1,68
16	1,71
17	1,74
18	1,77
19	1,80
20	1,83
21	1,87
22	1,90
23	1,93
24	1,96
25	2,00
26	2,03
27	2,06
28	2,10
29	2,13
30	2,17

Reeving and factor

1.4 Calculation examples

1.4.1 Calculating the required hook block weight for crane operation with 1 hoist rope winch in single operation with single hook block

Crane configuration:

– Length of main boom: 70 m
– Length of auxiliary boom: 28 m
– Rope diameter: 28 mm
– Reeving: 12 rope strands

Variables for calculation:

L = overall boom length = 98 m
M = rope weight for rope diameter 28 mm = 3.94 kg/m
N = reeving = 12
F = Factor for 12 rope strands = 1.60

Calculation:

G = **L** x **M** x **N** x **F**
G = 98 m x 3.94 kg/m x 12 x 1.60
G = 7414 kg
The minimum required hook block weight must be 7414 kg and must be increased additionally by at least 10 % (741 kg) to 8155 kg. The maximum load capacity for the respective boom configuration may not be exceeded by the additional weight increase of the hook block.

1.4.2 Calculating the required hook block weight for crane operation with 2 hoist rope winches in parallel operation with double hook block

Crane configuration:

– Length of main boom: 70 m
– Length of auxiliary boom: 28 m
– Rope diameter: 28 mm
– Reeving: 2 x 8 rope strands

Variables for calculation:

L = overall boom length = 98 m
M = rope weight for rope diameter 28 mm = 3.94 kg/m
N = reeving = (2 x 8)
F = Factor for 8 rope strands = 1.49

Calculation:

G = **L** x **M** x (**2** x **N**) x **F**
G = 98 m x 3.94 kg/m x (2 x 8) x 1.49
G = 9205 kg
The minimum required hook block weight must be 9205 kg and must be increased additionally by at least 10 % (921 kg) to 10126 kg. The maximum load capacity for the respective boom configuration may not be exceeded by the additional weight increase of the hook block.

2 Procedure in case of slack rope

2.1 Lowering the hook block if slack rope forms

If the hook block can no longer be lowered due to slack rope formation, then the following steps must be carried out.

2.1.1 Spooling op loose hoist rope

▶ Spool up loose hoist rope between the boom head and the wind carefully onto the winch.

Note

▶ A slight rope slack must remain between the boom head and the winch!

2.1.2 Luffing the boom down

NOTICE

Risk of collision!

When luffing the boom down, the hoist rope length can shorten and pull the hook block against the boom head.

▶ Monitor the distance of the hook block to the boom head!

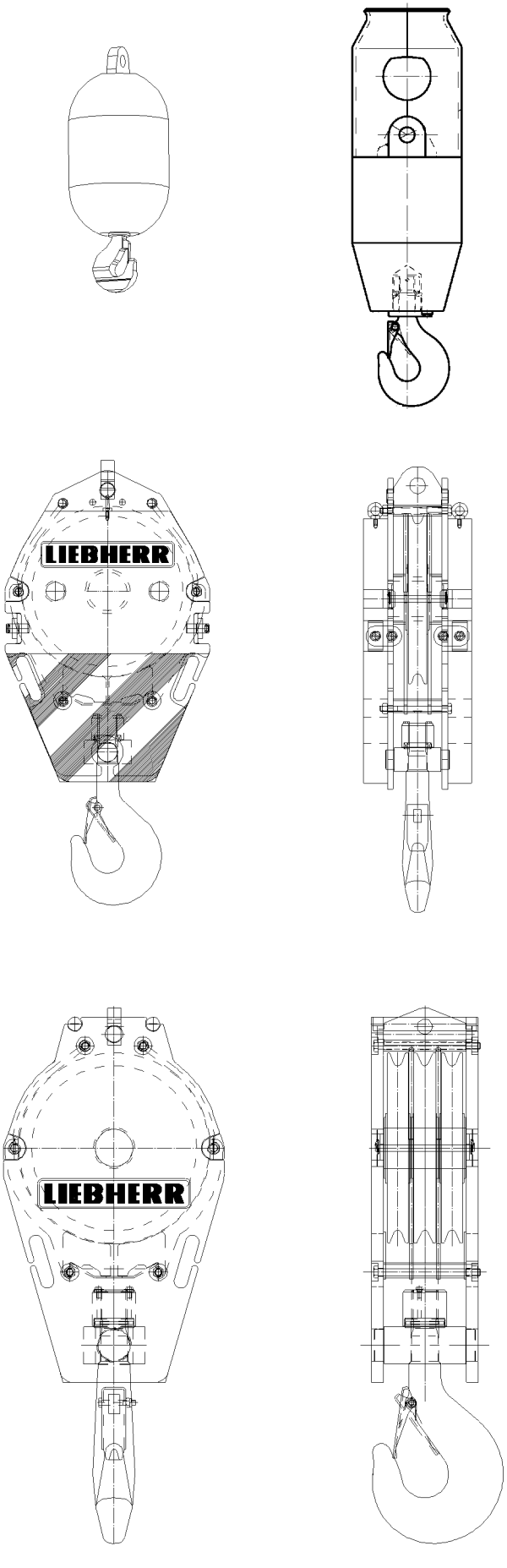
▶ Luff the boom down carefully.

Result:

– The hoist rope between the boom head and the winch is tensioned.

2.1.3 Lowering the hook block

▶ Lower the hook block carefully with the hoist gear.



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3 Hook block overview

3.1 Handling of hook blocks

Note

- For the load hooks and hook blocks approved for this crane type refer to the separate load chart manual!
- The hook blocks shown in this chapter are only examples and can differ from your hook block in type and number of rope pulleys. The different assembly and disassembly procedures are therefore only an example of the description for a number of different hook blocks!

DANGER

Hook block weights!

If the data in the erection and take down charts as well as the load charts are not observed, dangerous situations up to toppling of the crane can occur!

Personnel can be severely injured or killed, in addition, high property damage can result!

- Observe the data in the erection and take down charts!
- The specifications in the load charts must be adhered to!
- The crane operator bears the sole and full responsibility for the adherence to the data in the erection and take down charts as well as the load charts!

Differently sized hook blocks can be used for various loads.

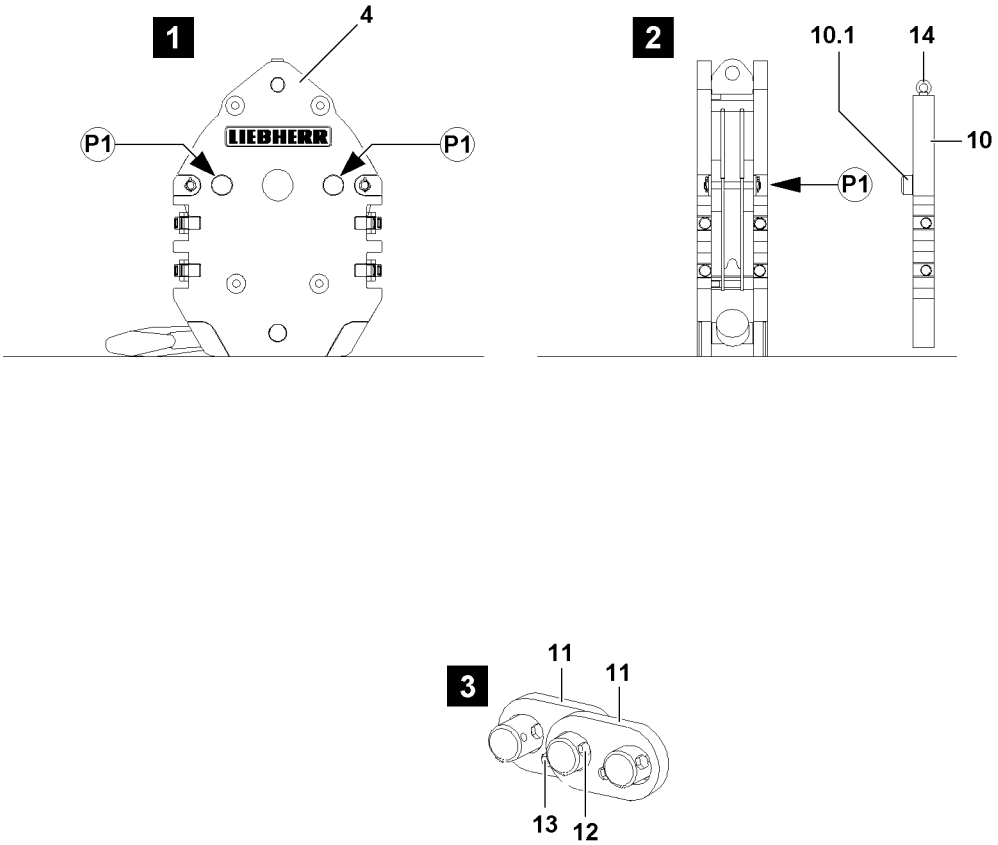
NOTICE

Rope damage due to insufficient hook block weight!

If the hook block weight is too low to tighten the hoist rope sufficiently, spooling problems may occur on the winches when lowering and lifting the hook block due to slack rope formation!

The hoist rope can be damaged!

- In order to prevent spooling problems on the winches, the hook block weight may be increased with auxiliary weights, if necessary!
- If problems develop in the assembly and set up conditions due to the weight increase of the hook block, auxiliary weights must be removed again!



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4 Installing the single blocks

4.1 Installing the auxiliary weights

Note

▶ Each auxiliary weight's own weight is marked on the auxiliary weight!

WARNING

Toppling of hook block!

If the auxiliary weights are installed one-sided, the hook block can topple over!

Personnel can be severely injured or killed!

▶ The auxiliary weights may only be installed **individually** and alternately on the left and right on the hook block!

▶ When the required auxiliary weight is installed on the hook block, the difference between the left and right side may never be more than one auxiliary weight!

▶ Asymmetrical installation of auxiliary weights is prohibited!

▶ Do not exceed the maximum permissible own weight of the hook block! The maximum permissible own weight is engraved on ballastable hook blocks. See “Engraving WT max.”.

Make sure that the following prerequisite is met:

– The hook block is placed on the ground.

WARNING

Falling auxiliary weights!

If the auxiliary weights are not properly installed on the hook block, then they can fall down during installation or in crane operation!

Personnel can be severely injured or killed!

▶ Standing under a suspended auxiliary weight is prohibited!

▶ Make sure that the auxiliary weights are properly installed and secured!

▶ Crane operation with insufficiently secured auxiliary weights is prohibited!

▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.

WARNING

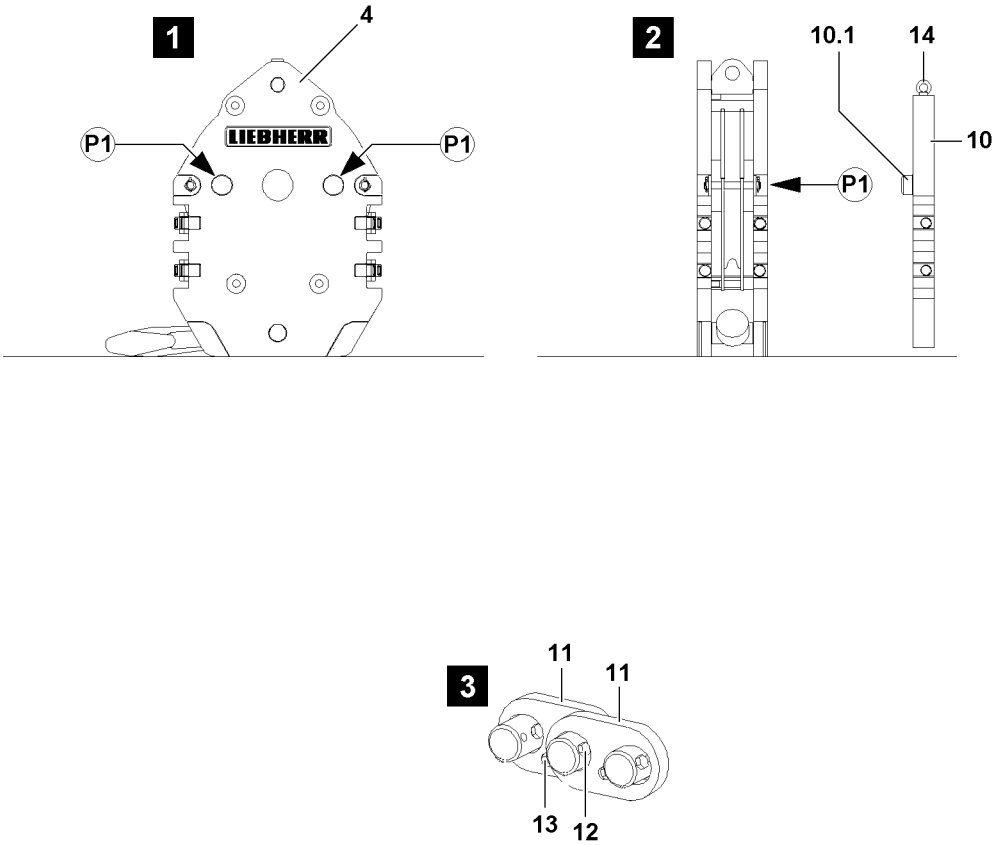
Danger of crushing!

When swinging the auxiliary weights to the hook block, personnel can be severely injured or killed!

Fingers, hands and arms can be crushed or severed!

▶ It is prohibited for anyone to remain between the hook block and the auxiliary weight!

▶ Swing auxiliary weights in to the hook block with utmost caution and at the least possible speed!



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- ▶ Align the auxiliary weight **10** on the hook block.
- ▶ Move the centering pin **10.1** of the auxiliary weight into the centering bores **P1** on the hook block.

WARNING
Falling auxiliary weights!
If all mounting brackets **11** are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ Never remove all mounting brackets **11** of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets **11** alternately!

- ▶ Install the mounting brackets **11** on the side and connect the hook block with the auxiliary weight **10**, illustration **3**.
- ▶ Secure the mounting brackets **11** with screws **12** and lock nuts **13**, illustration **3**.

Note
- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

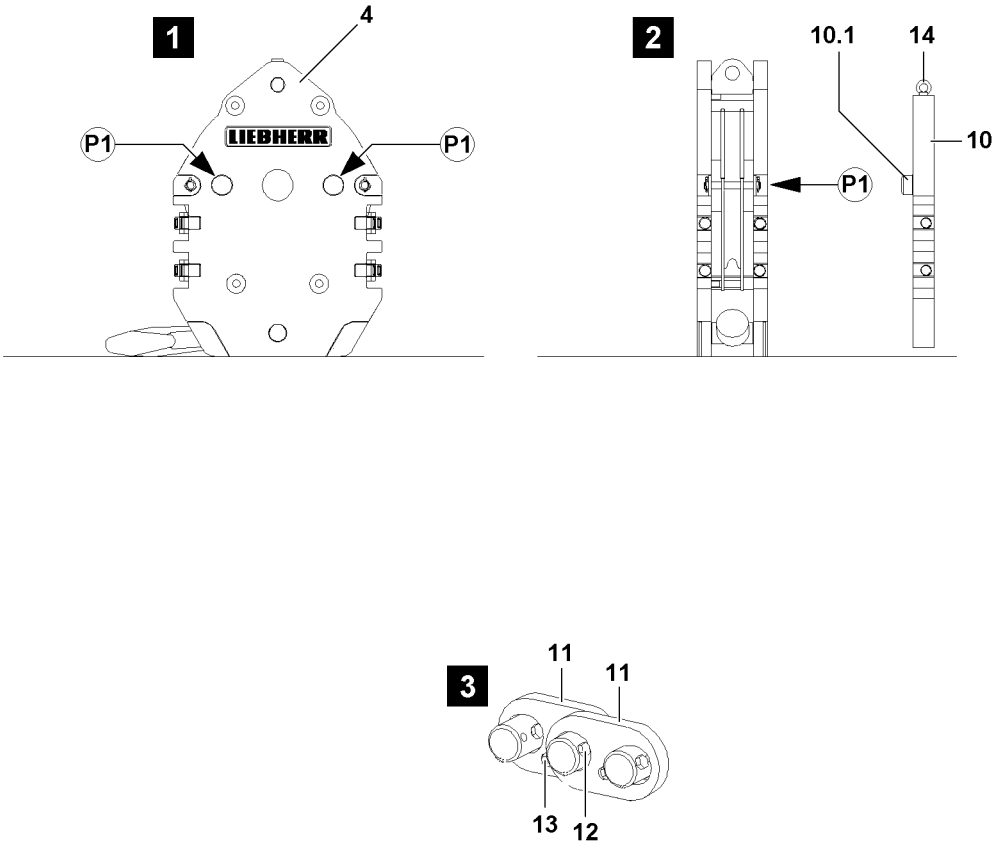
WARNING
Falling auxiliary weights!
The auxiliary weights can fall down by removing the auxiliary crane!
Personnel can be severely injured or killed!
- ▶ Remove the auxiliary crane only when it is ensured that the auxiliary weight **10** is properly secured with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly installed and secured:
  Remove the auxiliary crane.

4.2 Preparing the hook block for crane operation

Note
- ▶ The reeving of the hook blocks is described in chapter 4.06 of the Crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

- ▶ Reeve the hoist rope according to the instructions in chapter 4.06 of the Crane operating instructions and the reeving plans!



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5 Removing the single blocks

5.1 Preparing the hook block for removal

Note
- ▶ The unreeving of the hook blocks is described in chapter 4.06 of the Crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

Make sure that the following prerequisites are met:
- – The ground is sufficiently load bearing to take on the weight of the hook block and the auxiliary weights safely.
- – The ground is level and horizontal.

- ▶ Lower the hook block completely to the ground.
- ▶ When the hook block was placed down on the ground properly:
  Unreeve the hoist rope according to chapter 4.06 of the Crane operating instructions!

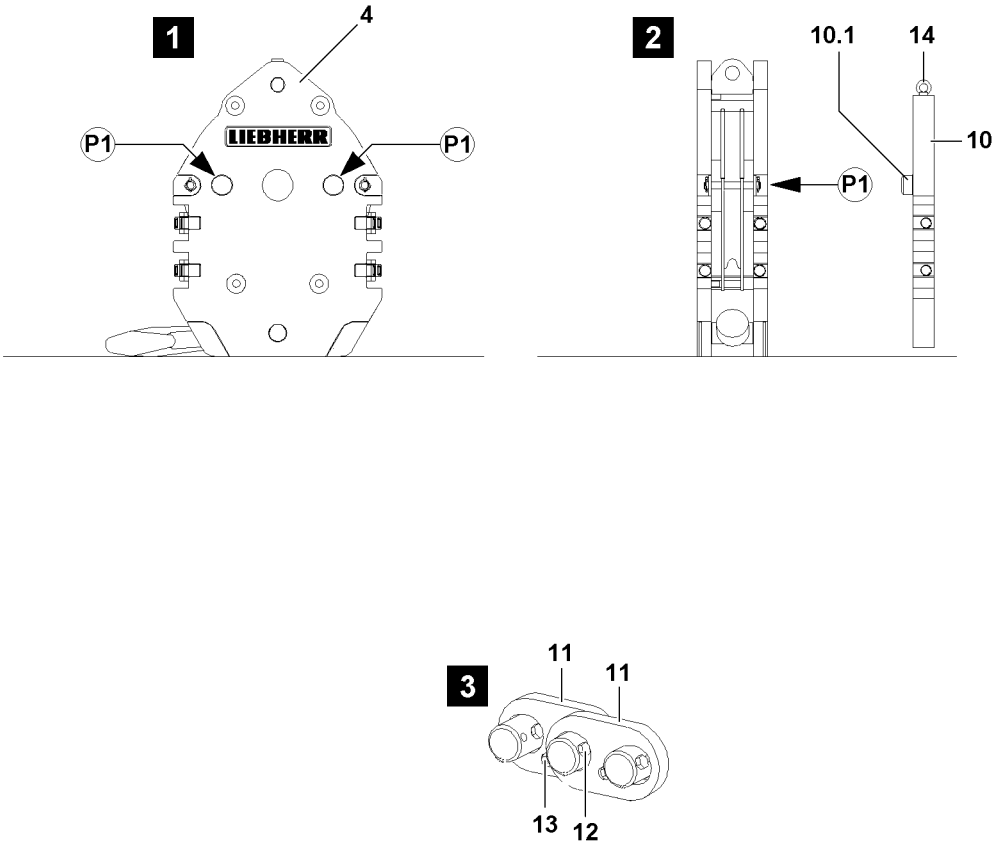
5.2 Removing the auxiliary weights

Note
- ▶ Each auxiliary weight's own weight is marked on the auxiliary weight!

WARNING
Toppling of hook block!
If the auxiliary weights are removed one-sided, the hook block can topple over!
Personnel can be severely injured or killed!
- ▶ The auxiliary weights may only be removed **individually** and alternately on the left and right on the hook block!
- ▶ The difference between the left and the right side at removal of the auxiliary weights may never be more than one auxiliary weight!
- ▶ Asymmetrical removal of auxiliary weights is prohibited!

WARNING
Falling auxiliary weights!
If the auxiliary weights on the pulley block are not properly removed, then they can fall down at removal!
Personnel can be severely injured or killed!
- ▶ Standing under a suspended auxiliary weight is prohibited!

- ▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.
- ▶ Tension the tackle carefully.



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WARNING
Oscillating auxiliary weights!
During the removal of the auxiliary weights, the auxiliary weights can start to swing back and forth!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Make sure that the auxiliary weight which is being removed is properly attached on the auxiliary crane before releasing the mounting brackets!
- ▶ Angular pull is prohibited!

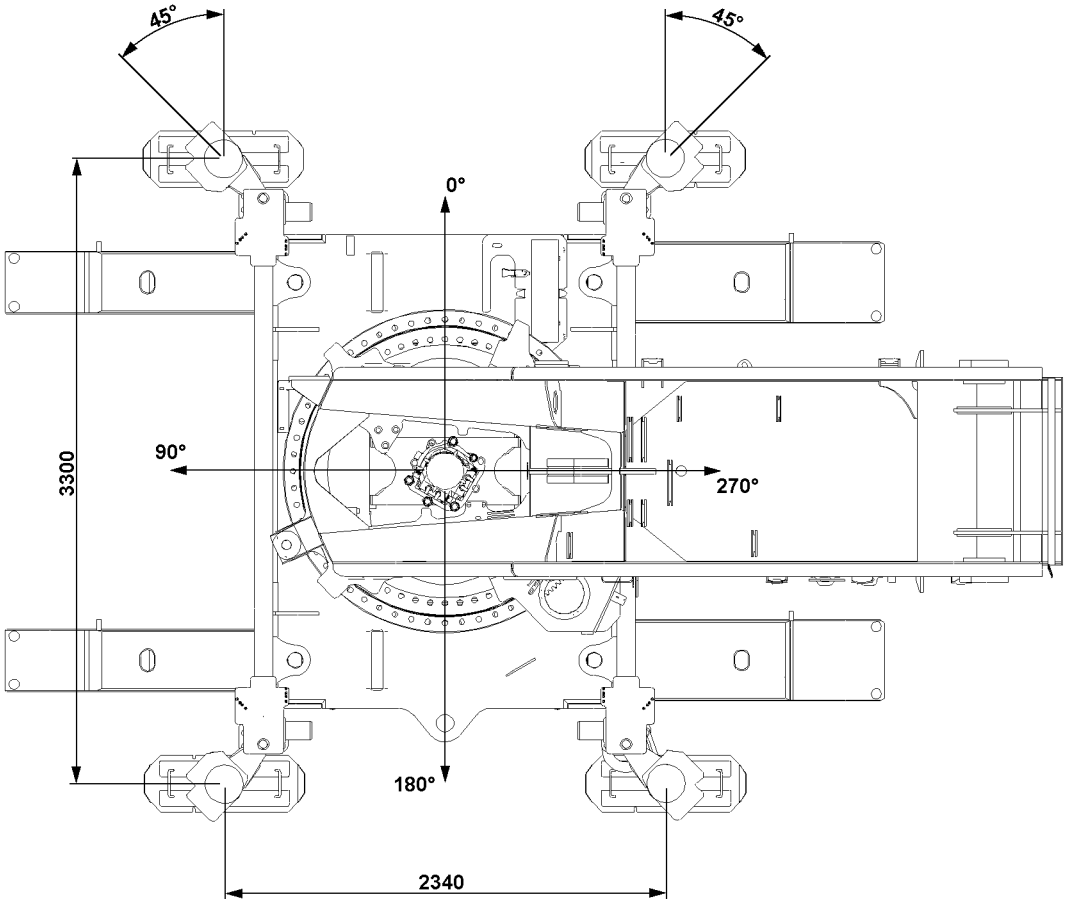
- ▶ When the tackle is tensioned on the auxiliary weight:
  Release the screw connection on the mounting brackets of the outermost auxiliary weight and remove the screws.

WARNING
Falling auxiliary weights!
If all mounting brackets **11** are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ Never remove all mounting brackets **11** of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets **11** alternately!

- ▶ Pull the mounting brackets **11** off to the side.

WARNING
Falling auxiliary weights!
If additional auxiliary weights which are being removed are released, then these auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure, before removing the outermost auxiliary weight, that the other auxiliary weights are secured with the mounting brackets **11**!

- ▶ If additional mounting brackets **11** must be removed to release the outermost auxiliary weight: Reinstall the mounting brackets **11** again immediately, so that only the auxiliary weight which is being removed is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the hook block.
- ▶ Place the auxiliary weight onto the ground.
- ▶ Remove the auxiliary crane.
- ▶ Remove additional auxiliary weights as described above.



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1 General

DANGER
Overload or toppling the crane!
- ▶ Do not reeve a larger hook block than the one that is required to lift the maximum load specified in the load chart!
- ▶ Observe the data in the erection and take-down charts!

2 Erection and take-down chart for T operation

2.1 For support base 2.34 m x 3.30 m

DANGER
Overload or toppling the crane!
- ▶ Erection / taking down is only permitted with support base **2.34 m x 3.30 m** !
- ▶ Fit winch 2 or the replacement ballast to the turntable prior to erection / taking down!
- ▶ Depending on the state, either the folding jib or auxiliary boom are folded in the “transportation position” at the side of the articulated piece, see erection and take-down chart!

The telescopic boom T-11.5 (0/0/0/0/0) can be fully luffed down to reeve in the hook block onto support **2.34 m x 3.30 m** (hatch consoles 45 °) without crawlers, without central ballast and without turntable ballast, however, when using winch 2 or replacement ballast, observe the data given on the erection and take-down chart.

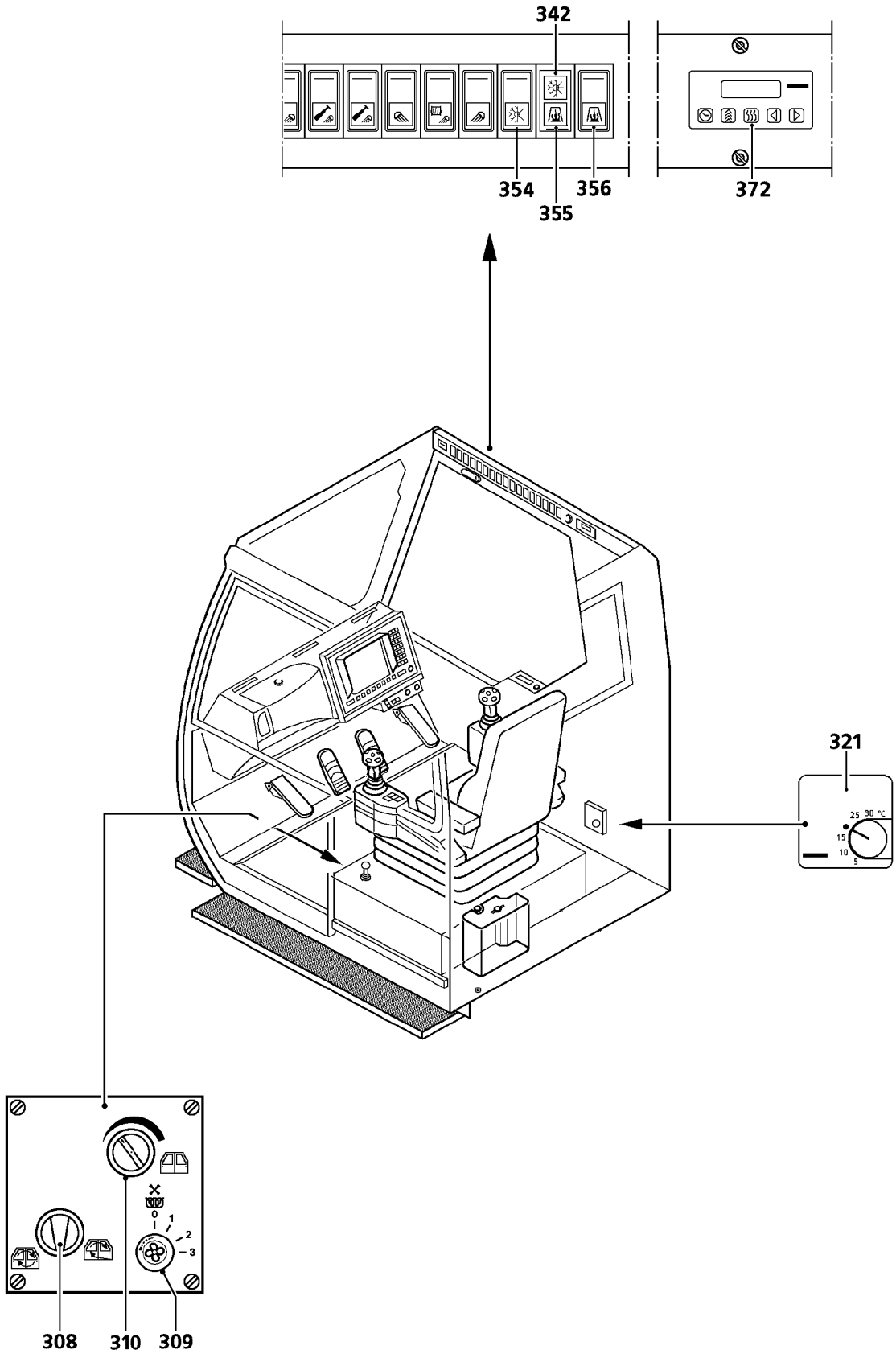
Boom position, T operation		
	Maximum hook block weight	
Folding jib or auxiliary boom at side of articulated piece in “transportation position”	**Boom in driving direction of crawler 0 ° or 180 °**	**Boom vertical to the crawler direction 90 ° or 270 °**
no	1.24 t	0.70 t
Auxiliary boom	1.24 t	0.45 t
Single folding jib	1.24 t	0 t
Dual folding jib	1.24 t	0 t

2.2 For wider track 4.15 m

The telescopic boom can be fully luffed down as far as the specified distances (LICCON-monitoring). Additional assembly parts (auxiliary boom without the like) may not be mounted in the process.

Counterweight	Boom position 360° for wider track 4.15 m
32 t / 15 t	T-52.0
26 t / 15 t	T-52.0
22 t / 15 t	T-48.8
20 t / 15 t	T-41.3
16 t / 15 t	T-37.6
10 t / 15 t	T-33.9
0 t / 15 t	T-19.0
0 t / 0 t	T-15.2

6.00 Additional equipment



B198741

1 Heating the crane operator's cab

The cab can be heated with three independent types of heat:
– Engine-dependent heater
– Engine-independent auxiliary heater with engine preheating, at ambient temperatures of up to -40 °C, WEBASTO; Thermo 90 S*
– Engine-independent auxiliary heater with engine preheating, at ambient temperatures of less than -40 °C, WEBASTO; DBW 2020*, Air Top 5000*

The individual adjustment of the heater (for both engine-dependent and engine-independent auxiliary heaters*) is carried out with the control elements under the crane operator's seat as well as via switches and indicator lights on the instrument panel.

CAUTION
Risk of damage to the heater control units* when carrying out electrical welding work on the crane!
▶ Remove the negative and positive cables from the vehicle and crane superstructure batteries and apply the positive cable respectively to the vehicle ground.

1.1 Heater operation

1.1.1 Adjusting the temperature

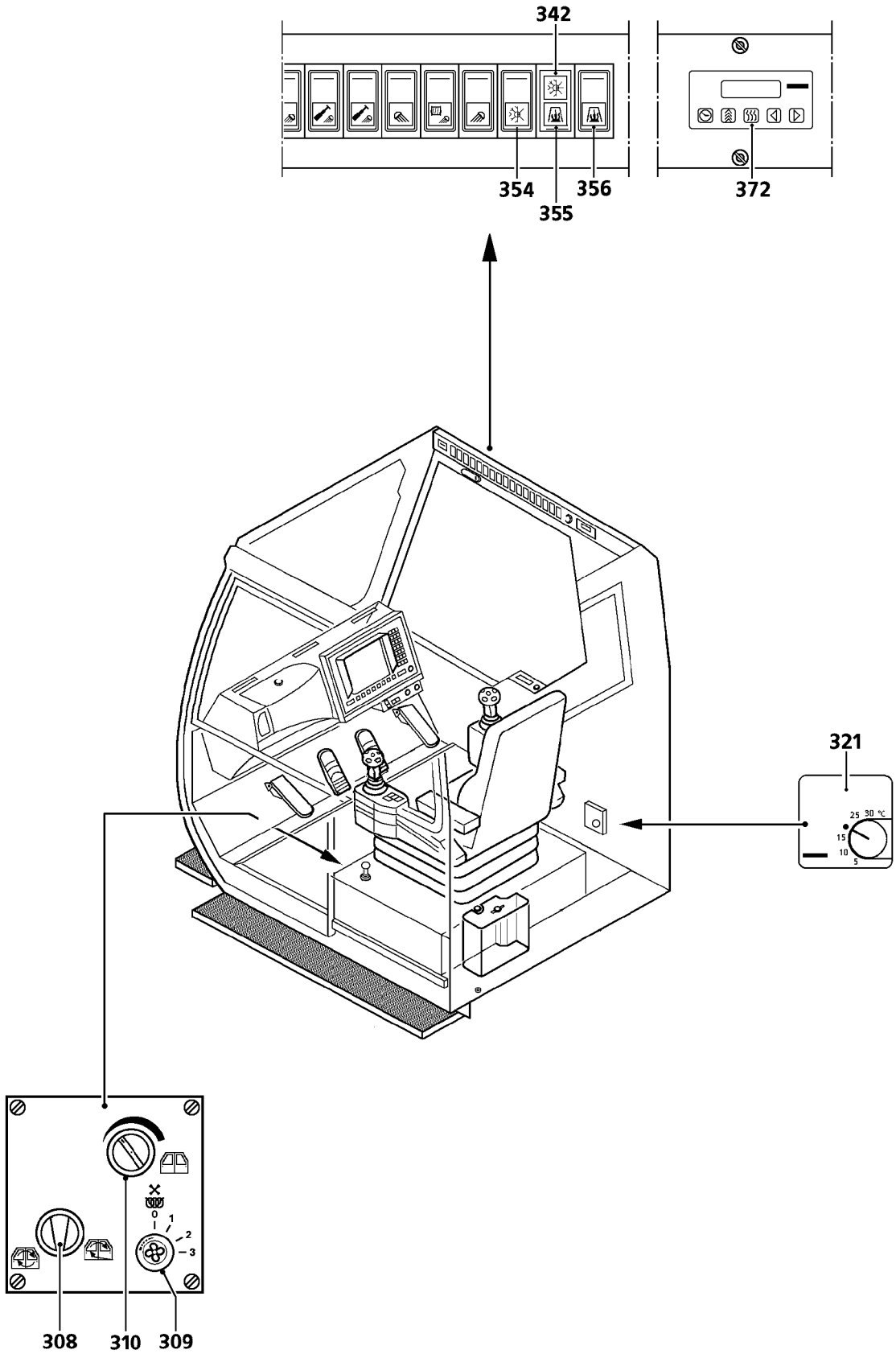
The cab is heated with the engine coolant.
▶ Adjust the regulating valve **310**.

1.1.2 Adjusting the ventilation

▶ Set 3-level fan switch **309**.
Result:
– The air volume will be regulated.

1.1.3 Adjusting the recirculating air / fresh air

▶ Actuate the changeover switch **308**.



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1.2 Operating the engine-independent auxiliary heater*

The engine-independent auxiliary heater is used to heat the cab when the engine is turned off and as auxiliary heater* at low ambient temperatures, if the engine-dependent heating is insufficient.
In summer run the auxiliary heater* once a month for approx. 15 to 20 minutes.

1.2.1 Start up

WARNING
Risk of explosion!
In areas where combustible fumes or dust could form, such as in the vicinity of storage areas for fuel, coal, wood dust or grain storage or similar and in the vicinity of filling stations or tank depots, there is a risk of explosion.
- ▶ Turn the auxiliary heater off on locations where combustible vapors or dust can form.
- ▶ Turn the auxiliary heater* off approx. 3 min before refueling the fuel tank!
- ▶ Before refueling the fuel tank, turn the engine off!

WARNING
Risk of poisoning and suffocation in enclosed areas!
If the auxiliary heater is operated in closed rooms, there is a danger of poisoning and suffocation!
Personnel can be killed or seriously injured!
- ▶ Do not operate the auxiliary heater in closed rooms.
- ▶ If the auxiliary heater must be operated in closed rooms, the exhaust gases must be suctioned off via an exhaust suction system.

NOTICE
Risk of damage to auxiliary heater!
- ▶ Fill the auxiliary heater in time with operating fluids for winter operation!

- ▶ Set the regulating valve **310** to “warm”.
- ▶ Actuate the switch **356**.

Result:
- – The function control on the switch **356** lights up.
- – The indicator light **355** lights up.

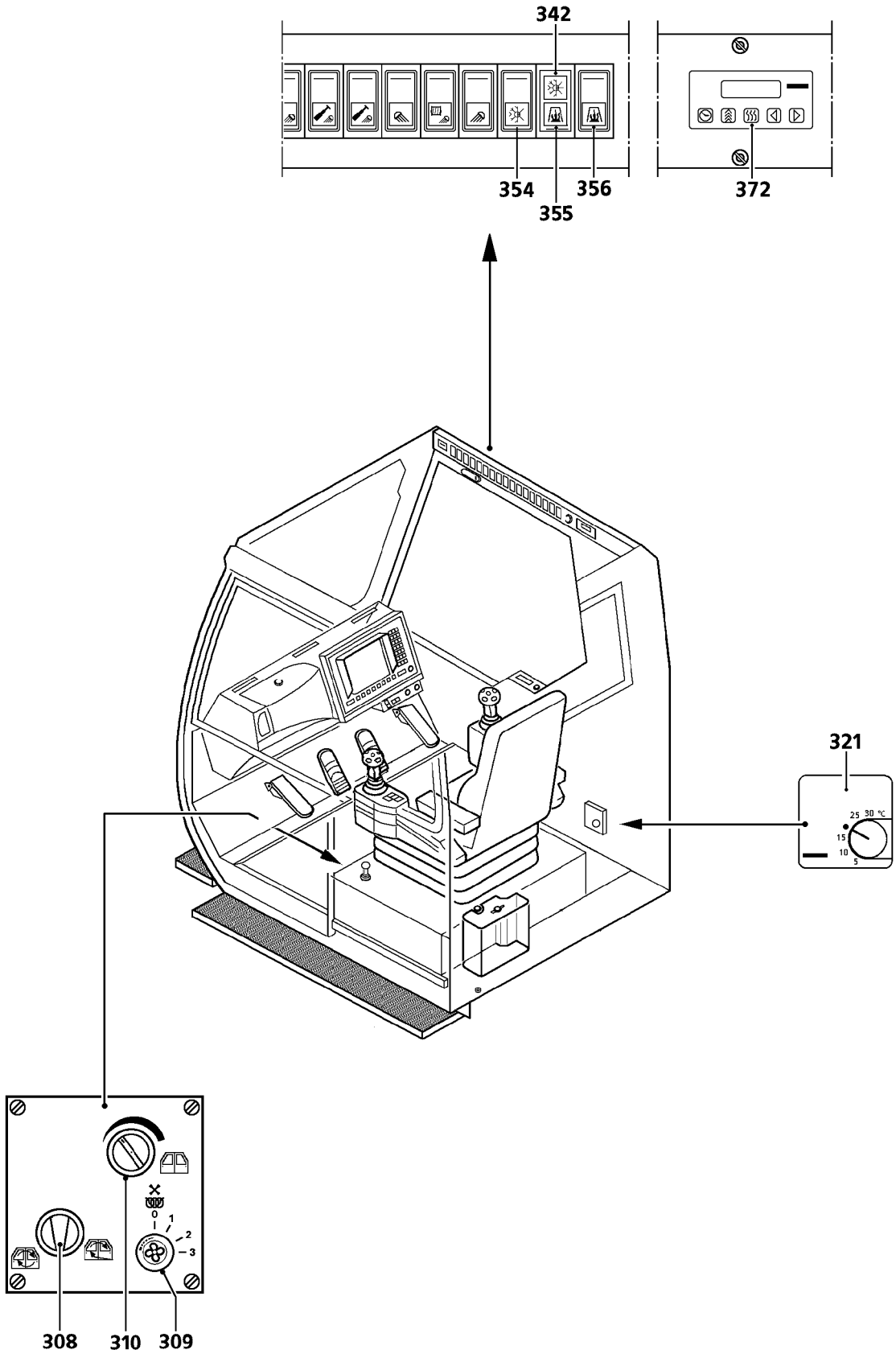
1.2.2 Turning off

- ▶ Actuate the switch **356**.

Result:
- – The function control on the switch **356** turns off.
- – Each time the auxiliary heater is turned off, it continues to run up to 150 seconds longer.

CAUTION
Danger of property damage!
- ▶ Turn the battery master switch off only when the heater shut off delay is over.

- – Once the shut off delay is ended:
  The indicator light **355** turns off.



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1.2.3 Operation with timer*

For a detailed description of the timer **372** refer to the enclosed manufacturer's operating instructions.

▶ Set the required turn-on time, temperature and duration of heater operation on the timer **372**.

▶ Open or close the air vents, as desired.

Result:

– Upwards or downwards air distribution will be selected.

▶ Set the regulating valve **310** to “warm”.

1.2.4 Operating the thermostat*

Make sure that the following prerequisite is met:

– The regulating valve **310** is set to “warm”.

▶ Turn the thermostat **321** to the desired temperature.

1.2.5 Venting the system

When draining off the engine coolant, the contents of the heating system will also be drained because the engine and heater operate as one circuit. When refilling the system, it must be carefully bled.

▶ Fill the coolant via the equalizing reservoir of the engine cooling circuit as specified in the lubricant chart.

▶ Start the engine, see Crane operating instructions, chapter 4.03.

▶ Set the regulating valve **310** to “warm”.

▶ Check the expansion tank for air bubbles.

Result:

– The engine is bled as soon as no more air bubbles rise up.

▶ Once no more air bubbles appear in the expansion tank:
Set the regulating valve **310** to “cold”.

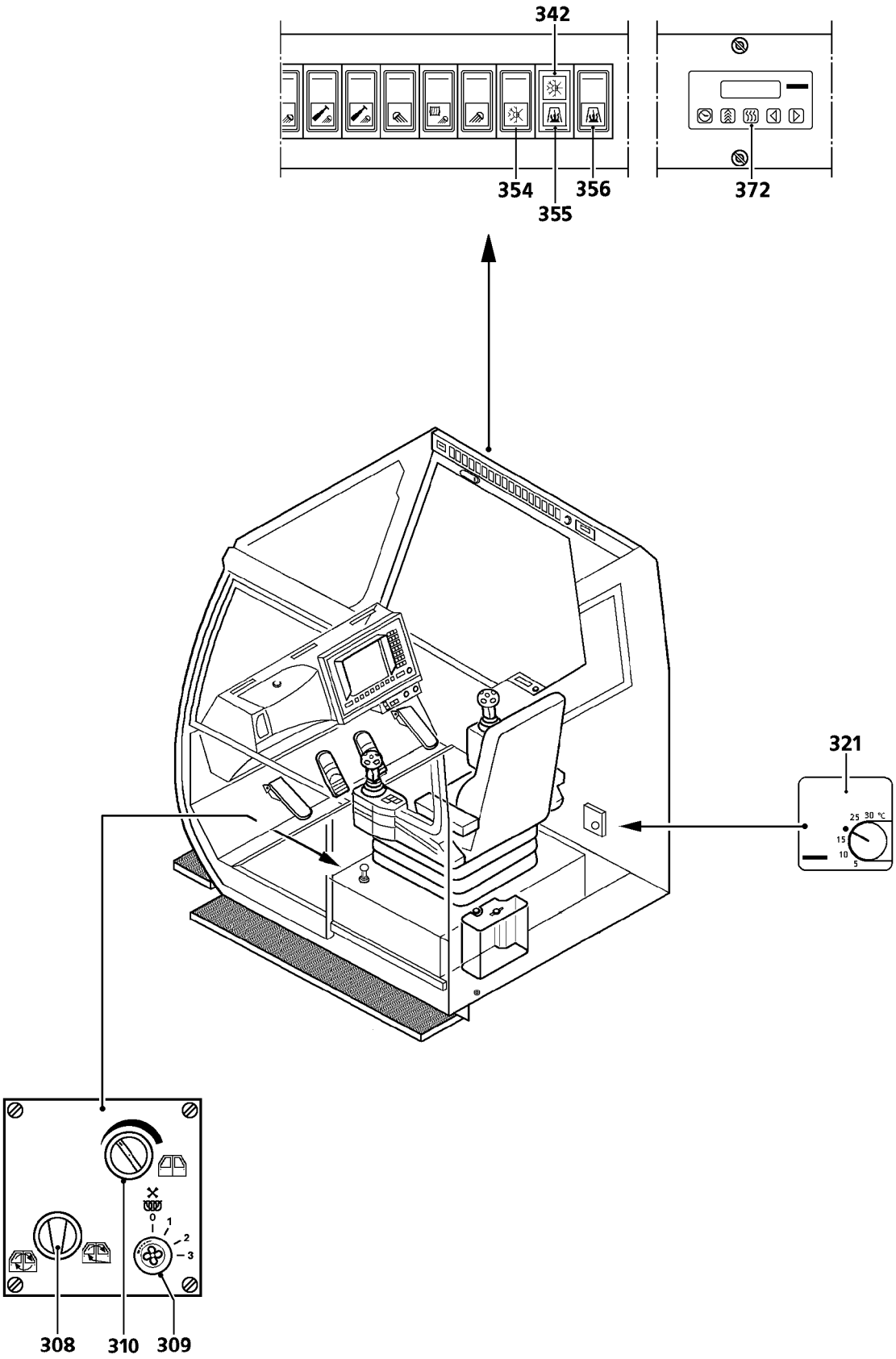
Result:

– The heater circuit will be bled.

▶ Check the expansion tank for air bubbles.

Result:

– The heater circuit is bled as soon as no more air bubbles rise up.



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1.3 Operating the engine-independent auxiliary heater for engine preheating*

At ambient temperatures of under -20 °C, the crane engine must be preheated using engine preheating which is operated with diesel fuel.

1.3.1 Start up

WARNING
Risk of explosion!
In areas where combustible fumes or dust could form, such as in the vicinity of storage areas for fuel, coal, wood dust or grain storage or similar and in the vicinity of filling stations or tank depots, there is a risk of explosion.
- ▶ Turn the auxiliary heater off on locations where combustible vapors or dust can form.
- ▶ Turn the auxiliary heater* off approx. 3 min before refueling the fuel tank!
- ▶ Before refueling the fuel tank, turn the engine off!

WARNING
Risk of poisoning and suffocation in enclosed areas!
If the auxiliary heater is operated in closed rooms, there is a danger of poisoning and suffocation!
Personnel can be killed or seriously injured!
- ▶ Do not operate the auxiliary heater in closed rooms.
- ▶ If the auxiliary heater must be operated in closed rooms, the exhaust gases must be suctioned off via an exhaust suction system.

NOTICE
Risk of damage to auxiliary heater!
- ▶ Fill the auxiliary heater in time with operating fluids for winter operation!

- ▶ Set the regulating valve **310** to “cold”.
- ▶ Actuate the switch **356**.

Result:
- – The indicator light **355** lights up.
- – Engine preheating is turned on.

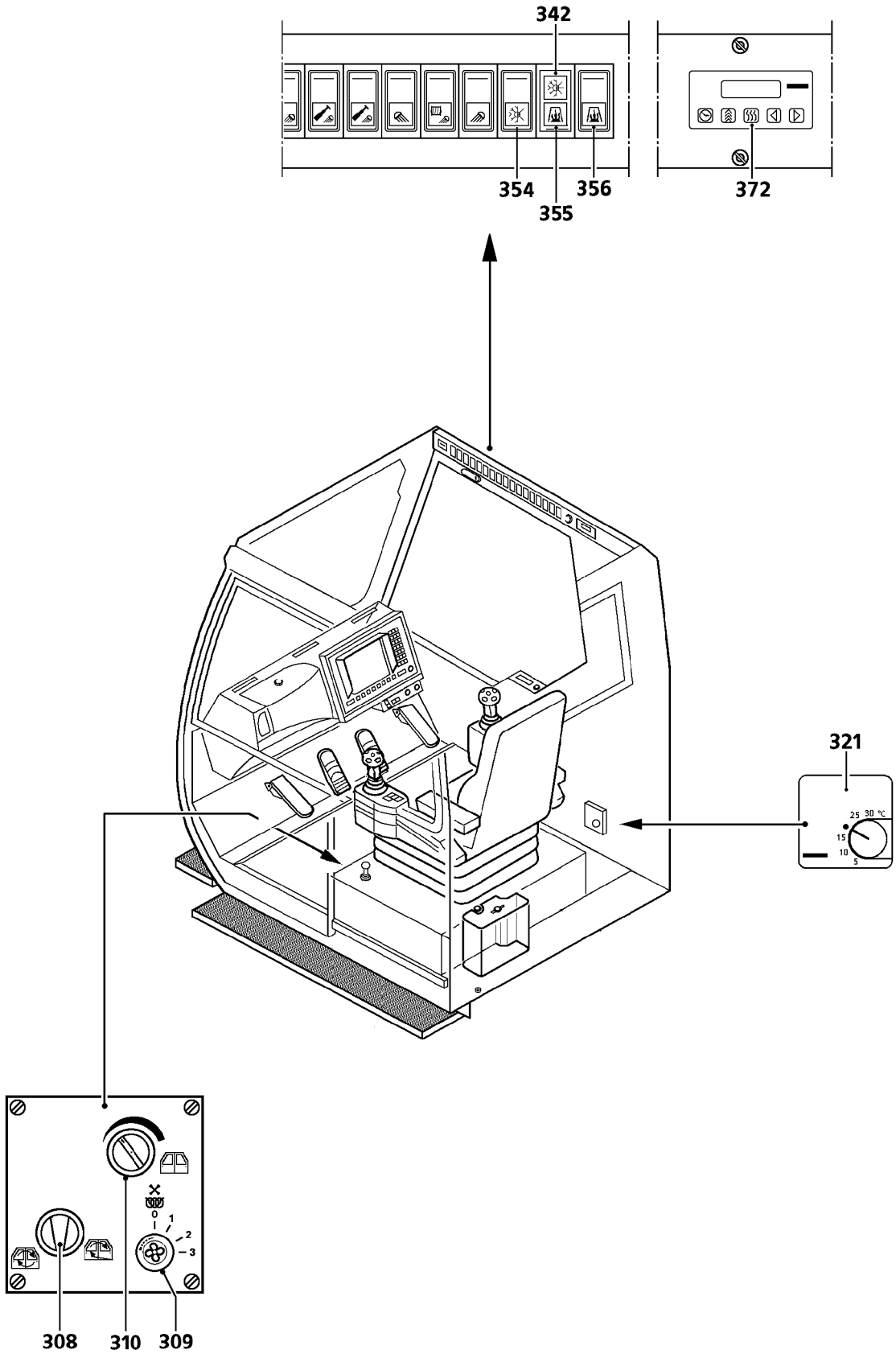
1.3.2 Turning off

- ▶ Actuate the switch **356**.

Result:
- – The indicator light **355** turns off.
- – Engine preheating is completed.

CAUTION
Danger of property damage!
- ▶ Turn the battery master switch off only when the heater shut off delay is over.

- – A shut off delay of the engine preheating will run up to 150 seconds.



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1.3.3 Starting up with timer*

For a detailed description of the timer* **372** refer to the enclosed manufacturer's operating instructions.

▶ Turn the battery master switch **15** on.

▶ Set the regulating valve **310** to “cold”.

▶ Use the timer* **372** to turn the engine preheating on.

Result:

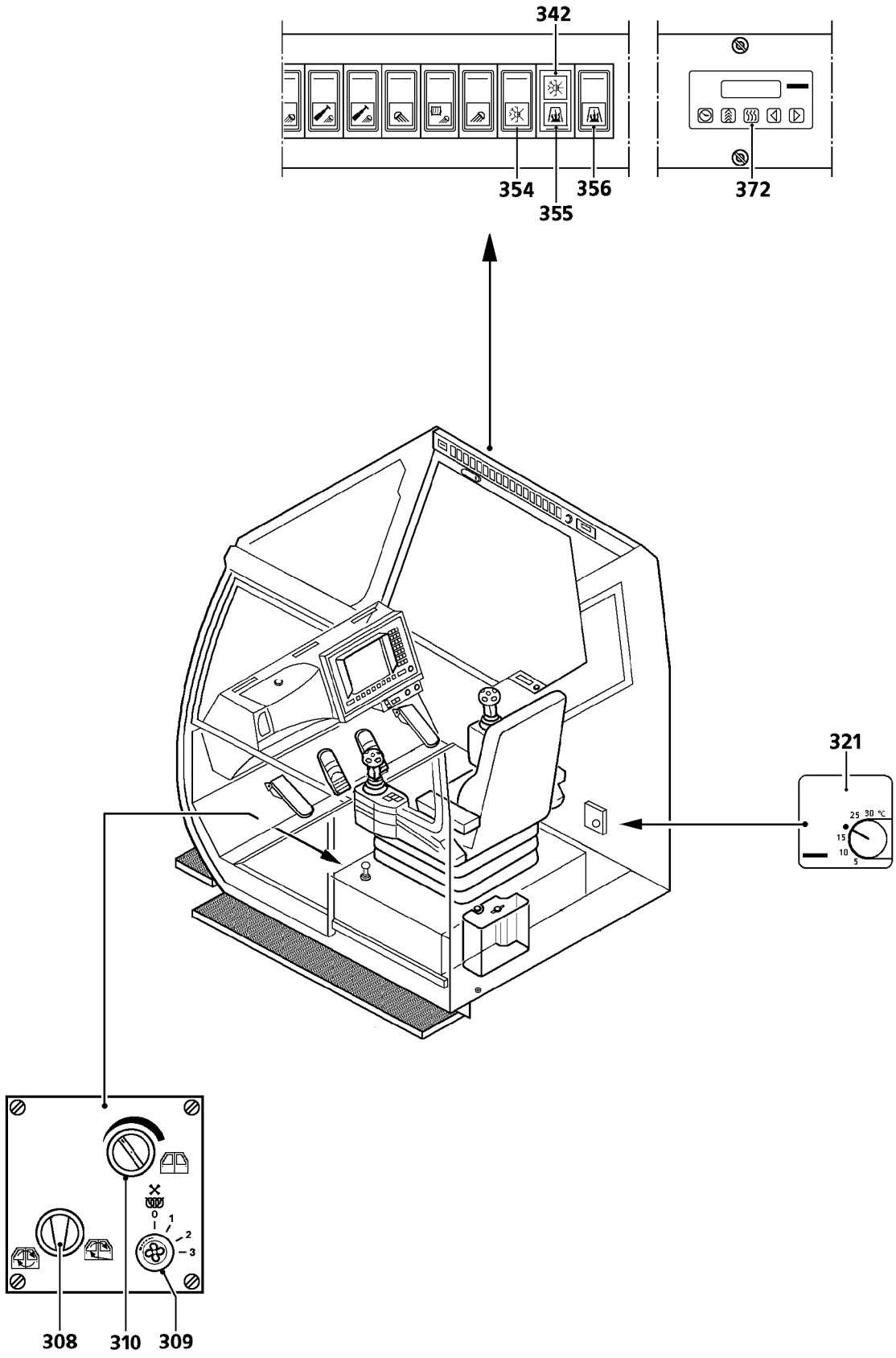
– The prerun of the engine preheating system turns on and runs for approx. 10 to 25 seconds.
– The engine preheating starts after 10 to 25 seconds.
– The engine preheating runs in automatic regulating mode.

1.3.4 Turning off with timer*

▶ When the preheating period is over:
Turn the timer off* **372**.

Result:

– Engine preheating is completed.



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1.4 Climate control system operation*

The climate control system is a combination of heater and ventilation system as well as an air conditioning system, which is used to dehumidify and cool the air in the crane cab.
Please note:

– In air conditioning operation, the humidity in the crane cab is decreased. This prevents the windows from fogging up.
– In case of high outside humidity and high outside temperatures, condensation can drip from the evaporator of the air conditioning system and form a puddle under the mobile crane. This is normal and no sign of leaks.

WARNING
Injuries to persons and property damage!

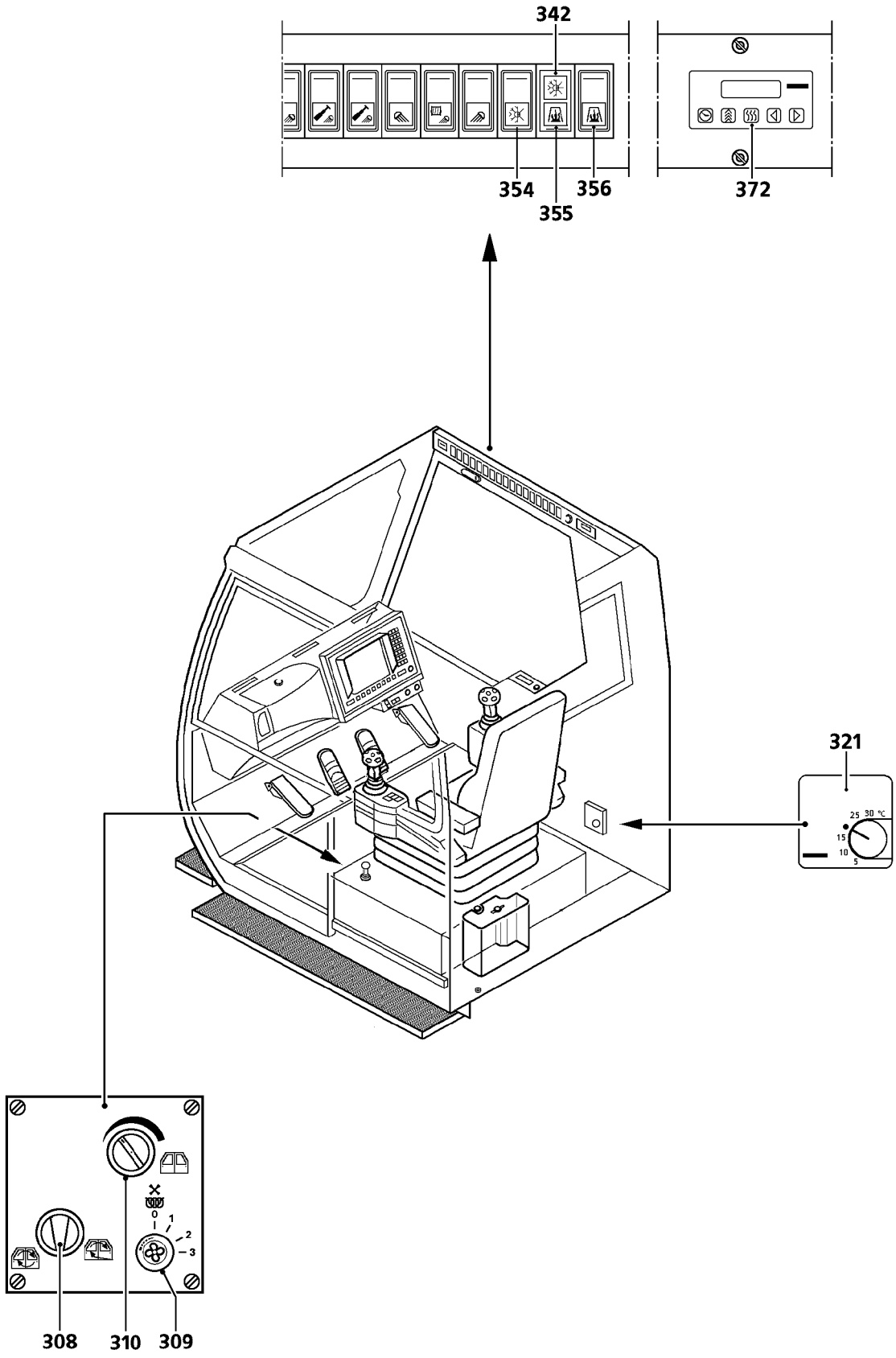
- ▶ If the climate control system is turned off and in air circulation operation, the windows can fog up!
- ▶ Do not expose personnel to very low temperatures!
- ▶ Repair work on the climate control system and maintenance work on the cooling circuit must be carried out solely by a Service technician from Liebherr-Werk Ehingen!

Note

- ▶ In order not to compromise the heater or cooling output and to prevent the windows from fogging up, the air intake must be clear of ice, snow and contaminants.
- ▶ The climate control system works best if the windows and doors are closed. However, if the crane operator's cab is heated up too much due to sun rays when the mobile crane is at a standstill, then the cool off procedure can be accelerated by opening the windows or doors for a short time.
- ▶ Do not cover up the air circulation intake with clothing or other objects!

The maximum cooling output is reached when:

– Windows and cab door are closed.
– All air vents are open.
– The change over switch **308** is set to air circulation.
– The blower switch **309** is set to maximum power.
– The regulating valve **310** is set to low temperature.



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1.4.1 Operating the climate control system

Make sure that the following prerequisites are met:
– The battery master switch is turned on.
– The engine is running.

▶ Actuate the switch **354**.

Result:
– The indicator light **342** lights up.
– The air conditioning system* is turned on and ready to operate.

▶ Turn on the fan with the rotary switch **309**.
▶ Adjust temperature with the regulating valve **310**.
▶ Open or close the air vents, as desired.

Troubleshooting
The temperature from the air vents is not noticeably below the ambient temperature?
The air circulation or the fresh air filter or evaporator are dirty.
▶ Check the air circulation and fresh air filter for contaminants and clean or replace, as necessary.
▶ Check the evaporator for contaminants and clean, if necessary.

▶ If none of these measures are helpful, contact Liebherr-Werk Ehingen customer service!

1.4.2 Turning the climate control system off

▶ Turn the switch **354** off.

Result:
– The indicator light **342** turns off.
– The climate control system* is turned off.

2 Bleeding the heating system

When draining off the engine coolant, the contents of the heating system will also be drained because the engine and heater operate as one circuit. When refilling the system, it must be carefully bled.

2.1 Bleeding the heating system without engine independent auxiliary heater

▶ Fill the coolant via the expansion tank of the engine cooling system for the superstructure as specified in the lubrication chart.
▶ Start the crane engine.
▶ Set the heater for the crane cab to “warm”.
▶ Check the expansion tank for air bubbles.

Result:
– The engine is bled as soon as no more air bubbles rise up.

▶ Once no more air bubbles appear in the expansion tank:
Set the crane cab heater to “cold”.

Result:
– The heating circuit will be bled.

▶ Check the expansion tank for air bubbles.

Result:
– The heating circuit is bled as soon as no more air bubbles rise up.

2.2 Bleeding the heating system with engine independent auxiliary heater

The procedure is as in section “Bleeding the heating system without engine independent auxiliary heater”.

3 Maintaining the engine independent heater

Note

▶ The maintenance guidelines of the heater manufacturer remain valid and binding!

If an engine independent heater (auxiliary heater) is installed on the crane, maintenance must be carried out in regular intervals.

WARNING

Danger of accident!

On locations, where flammable vapors or dust can form (for example on gas stations), there is a danger of explosion when operating the engine independent heater!

▶ Do not operated the engine independent heater in case of a danger of explosion!

▶ Do not breathe in the exhaust of the engine independent heater!

The maintenance of the engine independent heater includes:

– Monthly: Function test.
– Before every heating period: Checks.
– According to the specification of the heater manufacturer: Replacing components of the heater.
– After fuel tank was empty: Bleed the fuel line.

3.1 Perform function tests

Operate the engine independent heater once a month for at least 10 minutes.
Make sure that the following prerequisites are met:

– The crane is outside or a sufficient exhaust suction is ensured.
– The location has been selected in such a way that there is no danger of explosion when operating the engine independent heater.
– Combustion air infiltration and exhaust emission of the heater are free of foreign particles.
– Pollen filter / dust filter of the heater are continuous (if present).
– Heating circuit is bled.
– Fuel line is bled.
– Heating circuit is completely cold.
– The crane engine is turned off.

▶ Turn the engine independent heater and heater blower on.

Result:

– The circulation pump starts.
– The combustion air blower starts.
– After maximum four minutes an exhaust emission on the exhaust pipe is noticeable.
– The engine independent heater runs: The heating circuit starts to warm up.

▶ Check the heat effect on the air vents of the vehicle.

▶ Engine preheating* (Engine must be off!): Check if the engine temperature increases.

3.2 Checks to be performed

Before every heating period, carry out the following checks.
Make sure that the following prerequisites are met:

– The heater and the heating circuit are completely cold.
– A function check was completed successfully.
– In the error stack of the heater **and** in the error stack of the LICCON computer system are no error messages listed for the heater.

Note
The error stack of the heater can only be read by expert personnel.
▶ Contact Customer Service at Liebherr-Werk Ehingen.

▶ Clean the heater externally (avoid water infiltration).
▶ Check the electrical connections for contact corrosion and tight seating.
▶ Check the exhaust and combustion air line for damage and free passage.
▶ Check the fuel line and fuel filter (if installed separately) for leaks and cracks.
▶ Replace the fuel filter (if installed separately).
▶ Check the circulation pump for leaks.
▶ Check the heating circuit for leaks and cracks.
▶ Check the anti-corrosion / antifreeze in the heating circuit (specification: 50 % anti-corrosion fluid / antifreeze).

3.3 Replacing components of the heater.

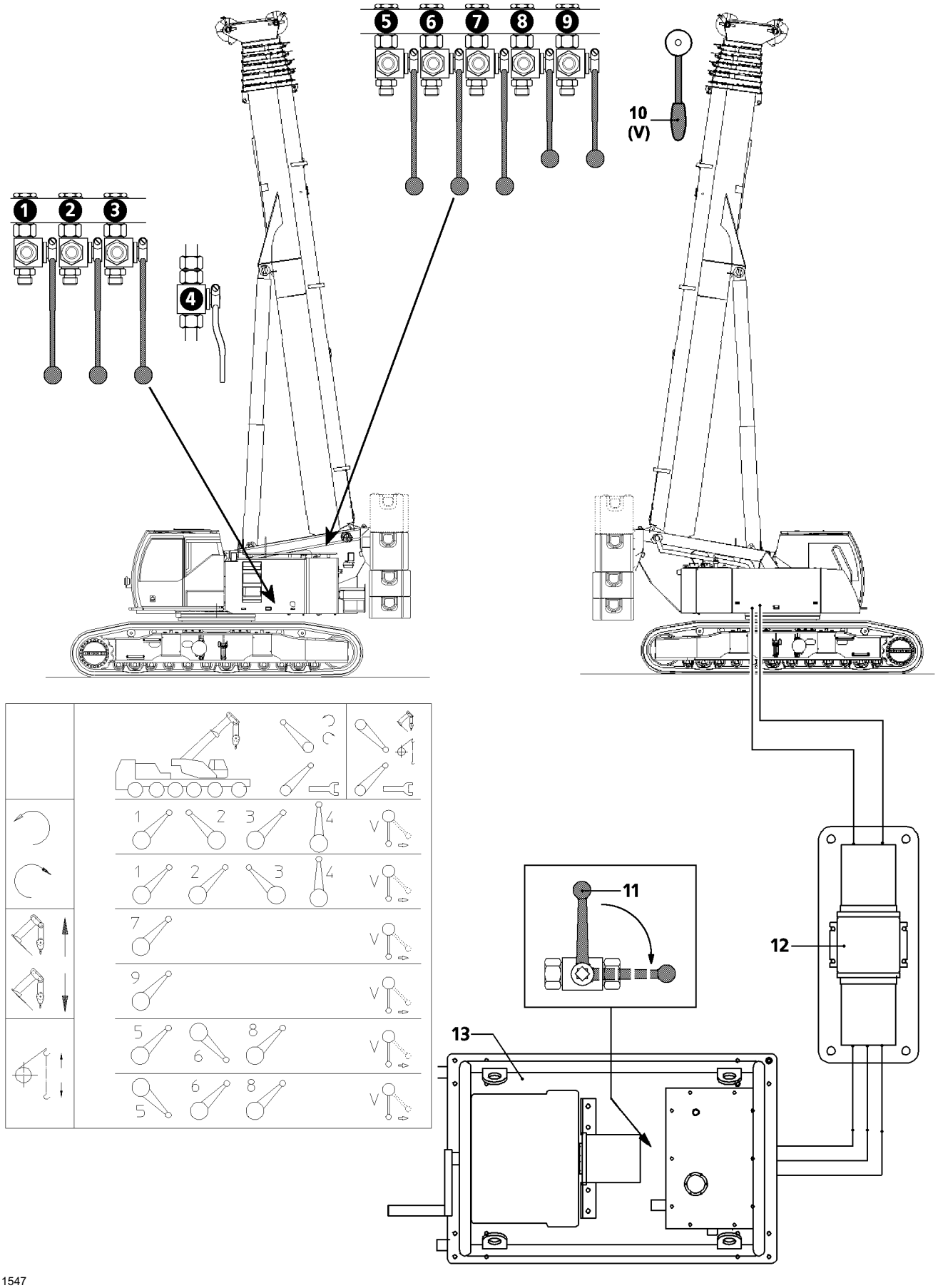
The heater manufacturer specifies time frames, after which the components of the heater must be replaced.

– No later than after 3000 operating hours, the burner of the heater must be replaced.
– No later than after 10 years, the heat exchanger of the heater must be replaced.

3.4 Bleed the fuel line.

If the fuel tank of the engine independent heater was run dry, then it is possible that the fuel line must be bled.
In addition, it may be possible that a new start must be carried out on the control unit of the engine independent heater.

Note
New start of the control unit of the engine independent heater.
▶ Contact Customer Service at Liebherr-Werk Ehingen and coordinate the procedure.



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1 Emergency control*

To be able to take down the crane in case of failure of the crane hydraulic, the crane electrical system or the engine, ball valves and a manual lever **10** are installed on the superstructure. Via the ball valves, the corresponding crane movement can be preselected and carried out by deflecting the hand lever **10**.

1.1 General

DANGER
Increased risk of accident during emergency operation!
The crane movements are no longer monitored by LICCON in emergency operation.
- ▶ Observe all notes and danger notes as described in chapter 6.02.
- ▶ Emergency operation and particularly luffing down of the telescopic boom may only be carried out in accordance with the information in the load chart.
- ▶ If possible, set down the load first.
- ▶ All crane movements must be carried out with extreme caution and slowly.

- – For “emergency operation”, change over the respective ball valves (see following section or the emergency operation tag on the crane superstructure).
- – Several movements cannot be carried out at the same time.
- – The ball valves must always be changed over completely into the corresponding switch position.

1.2 Ball valve positions during emergency operation

1.2.1 Turning the turntable to the left

- ▶ Switch the ball valve **1**, ball valve **3** and ball valve **4** into emergency operation position.
- ▶ Switch the ball valve **2** into crane operating position.

1.2.2 Turning the turntable to the right

- ▶ Switch the ball valve **1**, ball valve **2** and ball valve **4** into emergency operation position.
- ▶ Switch the ball valve **3** into crane operating position.

1.2.3 Luffing the telescopic boom up

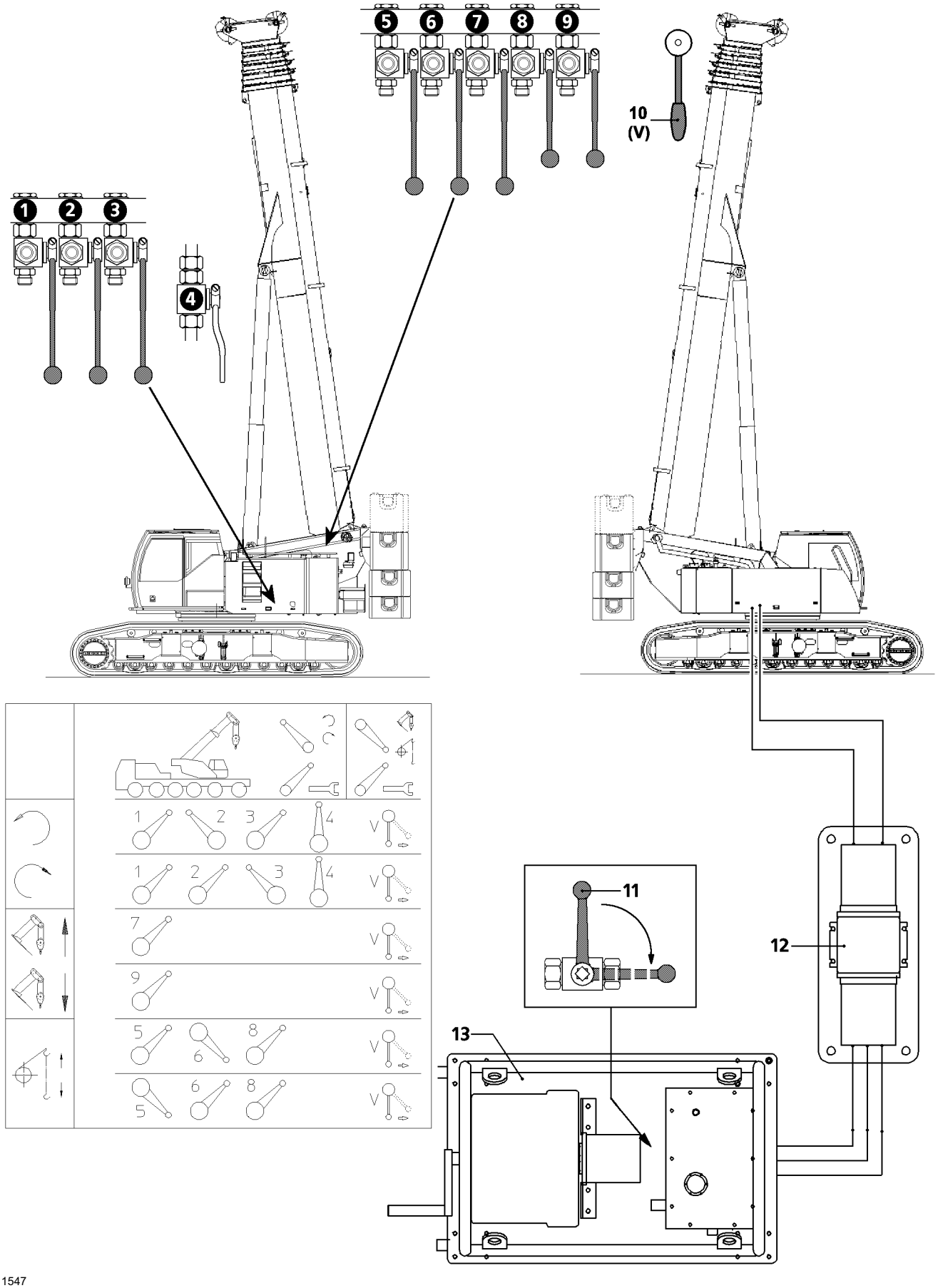
- ▶ Switch the ball valve **7** into emergency operation position.

1.2.4 Luffing the telescopic boom down

- ▶ Switch the ball valve **9** into emergency operation position.

1.2.5 Raising the hoist gear

- ▶ Switch the ball valve **5** and ball valve **8** into emergency operation position.
- ▶ Switch the ball valve **6** into crane operating position.



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1.2.6 Lowering the hoist gear

- ▶ Switch the ball valve **6** and ball valve **8** into emergency operation position.
- ▶ Switch the ball valve **5** into crane operating position.

1.3 Emergency operation with emergency operation unit

In cranes with one motor the superstructure can be supplied with power with the aid of the emergency operation unit **13** and a hydraulic transformer **12**.

1.3.1 Preparing the crane for emergency operation

- ▶ Remove the dummy plugs on the hydraulic connections.

The different diameters of the hydraulic lines prevent incorrect piping.

- ▶ Establish the hydraulic connections from the emergency operation aggregate **13** to the transformer **12**.
- ▶ Make the hydraulic connections between the transformer **12** and the superstructure and the chassis.

1.3.2 Emergency operation unit

- ▶ Start the emergency operation unit **13**.
- ▶ Move the ball valve **11** to emergency operation.

Note

- ▶ The engine RPM can be adjusted using a separate RPM regulator on the emergency operation unit **13**.

1.3.3 Emergency control

- ▶ Refer to the previous section or to the emergency operations tag on the crane superstructure to select the ball valves (1 - 9) for the appropriate crane movement.

Moving the hand lever **10** determines the speed of the each crane movement.

- ▶ Operate the hand lever **10** and carry out the respective crane movement carefully.

1.3.4 Ending emergency operation

DANGER

Risk of accident!

- ▶ After “emergency operation”, make sure to change the ball valves over to crane operating position.

- ▶ Change all ball valves to “crane operation”.
- ▶ Turn the emergency operation unit **13** off and close the ball valve **11**.
- ▶ Disconnect the hydraulic lines and screw in dummy plugs.

7.00 Service and maintenance

B195219

1 Liebherr Service

Liebherr mobile cranes, whether truck-mounted, mobile or crawler cranes - are technically advanced products, which prove their worth daily even under tough conditions.
The high technical standards of these cranes provide functional security, resistance to failure and ease of maintenance.
Liebherr is continuously developing the drive and control components. The combination of well proven units and modern manufacturing methods produces cranes that are safe to operate and easy to maintain.
Several hundred cranes are built every year for the international market, supported by international service.
Liebherr's “After Sales Service” plays an important role at Liebherr, in ensuring operational readiness and high crane availability.
With Liebherr, service begins when the crane is handed over. Your crane operators will be professionally trained in line with their level of knowledge, and we devote much time to this.
We also train your workshop staff in all crane-specific matters, because we know that they can deal with more than just minor repairs themselves. Often there are specialists who can quickly and reliably carry out crane repairs.
We have special service advisers available who will solve any problems you may have. This phone contact saves time and money. You should take advantage of it as soon as possible.
Our service technicians are specialists with years of experience, who can be deployed from local support points. Naturally these experts have specialized knowledge and special tools.
But before you call these specialists, it is worth making use of the facilities for getting advice mentioned above.
Check the antislip coverings before stepping on them regarding their antislip properties and cleanliness. If dirty, clean antislip coverings with a strong brush to retain the antislip properties. For cleaning the surfaces, use commercially available cleaners. Flush with water.

2 General specifications

Note
Customers claims for warranties and refunds!
The buyer only has a claim to warranties and possible refund if only original Liebherr replacement parts, Liebherr service items and Liebherr lubricants are used for the Liebherr crane!
▶ Only original Liebherr replacement parts have been tested for crane operational use, and may be used without risking safety!

Note
Exclusion of liability!
In the event that replacement parts are used that are **not** original Liebherr replacement parts and **not** original Liebherr service items and lubricants, Liebherr-Werk Ehingen GmbH disclaims all liability for system functionality as well as for the parts!
▶ Use only Original Liebherr spare parts!

WARNING
Danger of fatal injury due to damaged crane components!
If crane components, which were damaged, for example due to maintenance errors, are not replaced immediately, personnel can be fatally injured!
▶ Maintain mobile crane components according to the data in the maintenance intervals, the maintenance notes and the lubrication chart!
▶ Replace damaged crane components immediately!

NOTICE
Damage of crane components!
If mobile crane components are not maintained according to the maintenance intervals and maintenance guidelines in the individual chapter, or if other lubricants are used than specified in the lubrication chart, the respective crane components can be damaged and/or functionally fail!
The warranty for the respective crane components are voided!
▶ Maintain mobile crane components according to the data in the maintenance intervals, the maintenance notes and the lubrication chart!

What does “checking” mean
The term “checking” includes all required work,such as:
– Determining a specified value
– Cleaning
– Adjusting
– Refilling
– Replacing

3 Cleaning and care of the crane

3.1 Care instructions for sound insulation (soundproofing)

Sound insulation in the area of engines and other noise sources is an integral part of the total construction. It is your task to limit the noise generation of vehicles and the sound level in the workplace to the legally specified values in connection with sound insulation and the design of the equipment. They are therefore an integral part for the construction permits for the machines. They may not be removed, and if damaged, they must be replaced by original Liebherr replacement parts.
From a construction point of view, they have been designed to be maintenance-free. They have been equipped with surfaces that repel dirt, oil and water. They are very flame-resistant and some of them, depending on application, are fireproof.
For these reasons, these parts need minimal care. Any small dirt deposits can be disregarded, as the acoustic effectiveness of the parts is not reduced.

NOTICE
Sound insulation (soundproofing) damage!
By using unsuitable tools or cleaning methods, sound insulation can be destroyed or damaged during cleaning!
▶ Remove severe contamination with suitable tools, for example with soft plastic scrapers!
▶ Do not use tools with sharp edges!
▶ Only use steam cleaners with extreme care and with a sufficient distance to the sound insulation and with low water pressure!
▶ Do **not** use **solvents** for cleaning!

WARNING
Impurities from solvents or foreign substances!
For example, if sound insulation is polluted by solvents, motor oils, gear oils, hydraulic oils or fuels, such substances can ignite and significantly detrimentally change the fire performance of the sound insulation!
▶ If such contamination of the sound insulation occurs, **remove immediately** and replace it immediately with **original parts**!

3.2 Care instructions for the driver's cab and the crane cab

Note

- The steering wheel, center console, instrument panel cover, floor covering and dirty upholstery in the driver's cab and the crane cab should only be cleaned with warm water mixed with dishwashing detergent!
- Do not use any scouring agents!

4 Measures for work interruption or transport

4.1 Hydraulic cylinder

NOTICE

Corrosion danger to the hydraulic cylinders!

When using cranes under aggressive environmental conditions, for example at places with maritime climates and particularly salty air, hydraulic cylinders can corrode and thereby be destroyed or severely damaged!

Expensive and extensive repairs can result!

If the crane is taken out of operation for an extended period of time:

- Disassemble the crane!
- Fully retract all crane hydraulic cylinders! If the hydraulic cylinders can not be completely retracted, protect exposed areas of the piston rod from corrosion, for example by applying grease!
- Grease any exposed areas on the piston rods, for example on luffing cylinders and ballasting cylinders, especially carefully!

5 Maintenance work on the crane superstructure or boom

WARNING

Danger of falling!

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

- For all work on the crane where there is a danger of falling, take suitable safety measures!
- The crane superstructure or boom may not be accessed without suitable aids!
- Suitable aids are, for example: Lifting platforms, scaffoldings, ladders, assembly platforms, auxiliary crane.
- If railing are present on the crane superstructure, then they must be swung into operating position and secured for all work, see Crane operating instructions, chapter 2.06!
- Only step on such aids with clean shoes!
- Keep aids clean and free of snow and ice!
- If the work cannot be carried out with such aids nor from the ground, then the maintenance personnel must secure themselves with approved fall arrest systems to avoid falling, see Crane operating instructions, chapter 2.04!
- It is prohibited to step on the driver's cab or cab roof and specially marked surfaces, see Crane operating instructions, chapter 2.05!

6 Maintenance and inspection guidelines

Note

- ▶ Carry out the maintenance and inspection work on the crane chassis according to operating hours or kilometers driven!
- ▶ Carry out the maintenance and inspection work on the crane superstructure according to operating hours!

Observe the following chapters for maintenance and inspection of the crane:

– Chapter 7.02: Maintenance intervals - Crane chassis [1)]
– Chapter 7.03: Maintenance intervals - Crane superstructure [1)]
– Chapter 7.04: Maintenance guidelines - Crane chassis [2)]
– Chapter 7.05: Maintenance guidelines - Crane superstructure [2)]
– Chapter 7.06: Fill quantities, lubrication chart
– Chapter 7.07: Service items and lubricants

[1)] These chapters contain a list of service intervals for all maintenance work. Only the relevant work is to be carried out.
[2)] For individual components, the manufacturer's specifications must be observed.

WARNING

Danger of accidents during maintenance and inspection of crane components!
During maintenance and inspection work on crane components, there exists increased danger of accidents if maintenance and inspection guidelines are not observed!
Personnel can be severely injured or killed!

- ▶ Observe and adhere to the following listed warning notes and the generally applicable safety rules!

6.1 Warning notes

6.1.1 Preparatory work

WARNING

Fatal injury when driving or operating the crane during maintenance, inspection or repair work!
If the mobile crane is operated during maintenance, inspection or repair work, then personnel can be killed or severely injured!
This could result in high property damage!

- ▶ During maintenance, inspection or repair work, it is strictly prohibited to drive or operate crane!
- ▶ Show clearly with signs that maintenance, inspection or repair work is being carried out on the mobile crane!
- ▶ Use signs which show without a doubt that it is prohibited to drive and operate the crane! The national regulations regarding labeling on mobile cranes and on the signs must be observed!
- ▶ Carry out maintenance, inspection or repair work only with authorized and trained expert personnel.
- ▶ It is prohibited for unauthorized personnel to remain in the danger zone!

- ▶ Turn the engine on the crane superstructure and the crane chassis off!
- ▶ Apply the “parking brake crane chassis”.
- ▶ If possible:
  Lock the driver's cab and the crane cab.
- ▶ Hand the ignition key from the crane superstructure and the crane chassis to an authorized person.

6.1.2 Warning notes on risk of burns

WARNING
Risk of burns during maintenance or inspection work!
While carrying out maintenance or inspection work, you can get severe burns on hot surfaces of the crane components! This applies especially for the exhaust system or the travel gear!
- ▶ Let any components to be maintained or inspected cool off!
- ▶ Do not spill any service fluids over the hot components!
- ▶ Avoid short circuits in the electrical system, especially on the battery!
- ▶ Replace or change missing or defective protective insulation!

6.1.3 Warning notes for rotating parts

WARNING
Risk due to rotating parts!
If inspection work must be carried out while the engine is running, a significant danger exists due to rotating parts and the ignition system!
Personnel can be severely injured!
- ▶ Proceed especially careful!
- ▶ Never reach into rotating parts!
- ▶ Never reach into the cooler fan when the engine is warm! The cooler fan could turn on suddenly!

6.1.4 Warning notes for scalding risk

WARNING
Risk of scalding during maintenance or inspection work!
The cooling system is under pressure!
When the coolant reservoir is opened, hot coolant can escape explosively!
The most severe scalding on the entire body can result!
When the engine is warm:
- ▶ Do not open the cover of the coolant reservoir!
- ▶ To protect face, hands and arms from hot steam of hot coolant, cover the cap with a large rag when opening!

6.1.5 Warning notes on fire danger

DANGER
Danger of fire!
When working on fuel systems or on electrical systems, an increased danger of fire exists if the general safety rules are not observed!
Personnel can be severely injured or killed!
This can result in increased property damage!
- ▶ Disconnect the battery from the power supply!
- ▶ Do not smoke!
- ▶ Do not work near open flames!
- ▶ Keep a functioning fire extinguisher ready!

6.1.6 Improper maintenance

NOTICE
Damage of components!
In case of incorrect maintenance, severe functional defects and damage on the components can occur!
- ▶ Add correct and sufficient service fluids during maintenance!
- ▶ For all maintenance work, observe utmost cleanliness to prevent dirt from entering the inside of the components!
- ▶ Check components for leaks!
- ▶ Have leaking components sealed immediately and properly!

6.2 Checking the battery voltage

Note
If a crane is taken “out of service” and a user, such as the airplane warning light is turned on:
- ▶ Check the battery voltage in regular intervals. If necessary, recharge the battery.

6.3 Checking the antislip coverings

Check the antislip coverings before stepping on them regarding their antislip properties and cleanliness. If dirty, clean antislip coverings with a strong brush to retain the antislip properties. For cleaning the surfaces, use commercially available cleaners. Flush with water.

WARNING
Danger of falling!
If the following measures are not observed, personnel can fall down and be killed or severely injured!
- ▶ Keep antislip coverings clean and free of snow and ice!
- ▶ Only step on antislip coverings with clean shoes!
- ▶ Replace or renew missing or damaged antislip coverings!

6.4 Refueling

WARNING
Danger of fire!
Fuel is easily flammable and can cause fatal accidents in case of fire or open flames!
This could result in high property damage!
- ▶ Before refueling, turn the auxiliary heater or the engine preheating off!
- ▶ Fire, open flames and smoking are prohibited during the refueling procedure!

WARNING
Danger of poisoning!
Fuel is poisonous and hazardous to health!
- ▶ Do not allow for fuel to come in contact with skin, eyes or clothing!
- ▶ Do not breathe in fuel vapors!
- ▶ Keep children away from fuel!

If persons did come in contact with fuel:
- ▶ In case of eye contact, flush out the eyes immediately and consult a physician if necessary!
- ▶ Clean affected skin areas with clear water!

If fuel was swallowed:
- ▶ Go to a physician immediately!

NOTICE
Engine damage!
When using incorrect fuel, the engine and the fuel system can be severely damaged!
- ▶ Do not use gasoline on vehicles with Diesel engine!
- ▶ Do not mix Diesel fuel with gasoline!

If you have added incorrect fuel inadvertently:
- ▶ Do not turn the ignition on, have the fuel tank and fuel lines emptied completely by qualified expert personnel!

6.5 Refueling fuel tanks*

Note
- ▶ See danger notes in section “Refueling”.

6.6 Add Urea solution

WARNING
Skin irritation and eye injuries!
Urea can cause skin irritation and eye injuries at contact!
- ▶ Do not allow for Urea to come in contact with skin, eyes or clothing!

If persons did come in contact with Urea:
- ▶ In case of eye contact, flush out the eyes immediately and consult a physician if necessary!
- ▶ Clean affected skin areas with clear water!

If Urea was swallowed:
- ▶ Flush the mouth with a lot of water! Then drink a lot of water and consult a physician, if necessary!

WARNING
Irritation of eyes and mucous membranes!
If the Urea tank cover is opened at high temperatures, ammonia vapors can emerge! If ammonia vapors are breathed in, then it can cause burning eyes, nose, throat and coughing!
- ▶ Do not breathe in ammonia vapors!

NOTICE
Danger of corrosion!
If Urea is spilled during refueling, affected surfaces can corrode!
- ▶ Flush affected areas immediately with lots of water!
- ▶ Do not overfill the tank!

If possible:
- ▶ Refuel on a gas pump with nozzle!

B195219

1 Crane chassis maintenance and inspection schedule

Note

- ▶ Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor!
- ▶ The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also!

First maintenance after	Operating hour intervals or calendar intervals			Calendar intervals			Work to be carried out
	500 h 3 months	1000 h 6 months	2000 h	Daily	Weekly	Annually	
Safety systems							
						X	Personal protective equipment Follow the instructions of the manufacturer
						X	Height rescue system Follow the instructions of the manufacturer
Fall protection equipment							
						X	Check protection points
						X	Check safety ropes
						X	Check the ladders for technically immaculate condition
						X	Check railings, steps and pedestals for safe function
						X	Check catwalks and open mesh flooring for safe function
Crane surface							
					X		Check accessible surfaces for cleanliness
						X	Check accessible surfaces for completeness and slip resistance
						X	Check labels for completeness and legibility
Crawler travel gear							

First maintenance after	Operating hour intervals or calendar intervals			Calendar intervals			Work to be carried out
	500 h 3 months	1000 h 6 months	2000 h	Daily	Weekly	Annually	
	X				X		Check the track components (chain links, chain pitch, chain bushings, track pads, track rollers, carrier rollers) for wear
	X				X		Check that carrier rollers, track rollers, idlers for leaks
	X				X		Check idlers
	X				X		Check the idler guides for signs of wear
	X					X	Clean, grease sliding surfaces on sliding section
					X		Clean crawler track
	X				X		Check screws, nuts and mounting pins for tight seating
	X				X		Check hydraulic cylinders (support cylinder, track adjustment cylinder) for leaks and tight seating
Travel gear							
	X						Check the oil level
		X				X	Carry out an oil analysis
500 h		X[2)]					Oil change
	X				X		Check the mounting screws for tight seating
	X				X		Sprocket and travel gear motor: Check the mounting screws for tight seating
	X				X		Check the gear and hydraulic connections for leaks
						X	Have the hydraulic hoses checked for safe working condition by expert
Track chain							
	10 h			X			Check for damage and correct mounting
	10 h			X			Check the chain tension, retension if necessary [1), 3)]

First maintenance after	Operating hour intervals or calendar intervals			Calendar intervals			Work to be carried out
	500 h 3 months	1000 h 6 months	2000 h	Daily	Weekly	Annually	
Nitrogen tensioner							
						X	Check pre-tension pressure for the nitrogen tensioner
Central lubrication system							
	10 h						Check grease supply of central lubrication system
Hydraulic hose lines							
				X			Check for leaks and damage
						X	Have safe working condition checked by expert

[1] Earlier if necessary
[2] Carry out an oil analysis: Depending on the results of analysis, change oil
[3] Tension the track chain, see chapter 7.04

B195219

1 Crane superstructure maintenance and inspection schedule

Note

- ▶ Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor!
- ▶ The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also!

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
Safety systems							
						X	Personal protective equipment Follow the instructions of the manufacturer
						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
Diesel engine							
				X			Checking the oil level For all other maintenance tasks, observe the instructions of the engine manufacturer
				X			Check the coolant level in the expansion tank

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
						Every 2 years	Replace coolant
Engine independent heater							
				X			Check the fluid level in the expansion tank
					Monthly		operate for 10 minutes with cold engine and lowest fan setting
						X	Carry out service work before and after every heating period
						Every 2 years	Replace the fluid for the heating system
Air filter							
					X		Check monitoring device
						X	Clean, change the filter insert Observe the instructions of the engine manufacturer
Slewing ring connection							
	X						Lubricate the gears
						X[1)]	Lubricate the slewing ring connection
250 h			X			X	Check the mounting screws for tight seating
						X	Check the tilt play
Rope winches							
				X			Check for leaks
					X		Checking the oil level
250 h						X	Check the mounting screws for tight seating
						X	Check condition of gear oil
			3000 h			Every 4 years	Replace the gear oil
						X	Check the remaining theoretical utilization life by a technical expert
						Every 4 years	Check the remaining theoretical utilization life by authorized specialist
Hoist gear brakes							
				X			Check for leaks

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
Lattice sections							
						X	Check cracks, damage and distortion
						X	Check protection points
						X	Check safety ropes
						X	Check railings and pedestals for safe function
						X	Check catwalks and open mesh flooring for safe function
Guy rods							
						X	Check for cracks, damage and distortion by a technical expert
						Every 4 years	Check for cracks, damage and distortion by an authorized inspector
						X	Checking the retaining elements
Relapse supports							
		X				X	Lubricate bearings
X[2), 6)]							Check the oscillation guard for easy movement
Relapse cylinder							
X[2), 6)]					X		Check for leaks
X[2), 6)]		X				X	Check pretension pressure (nitrogen)
X[2), 6)]		X				X	Check the oil quantity
Pneumatic springs							
X[2), 5), 6)]		X				X	Check for correct function
A-bracket							
		X					Lubricate bearing
X[2), 6)]						X	Check the lever for the limit switch on the A-frame 3 for easy movement and reset of spring
X[2), 6)]						X	Check the rods with guide rail on the A-frame 2 and A-frame 3 for easy movement and distortion
Counterweight							

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
1,000 km		or 10,000 km				X	Check tightening torque of mounting screws
Ballasting							
	X					X	Lubricate bearings
Press on pulleys of rope winches							
	X					X	Grease guides
Rope pulleys							
			X			X	Check for wear, damage, cracks and easy movement
			X			X	Lubricate
Crane ropes							
				X			Check cracks, damage and distortion
					Monthly		Check, grease by expert personnel
						X	Check by technical expert
						Every 4 years	Check by authorized inspector
Hook blocks							
		X				X	Grease hook
						X	Check distance dimension (y)
Crane operator's cab							
				X			Check instruments for function
				X			Check indicator lights for function
						X	Replace filter insert in water heater
				X			Check fluid level in expansion tank of engine control
Crane cab, extendable or inclinable							
		X				X	Check for correct function
		X				X	Lubricate bearings
Overload protection							
				X			Check for correct function
		X				X	Check length sensor for function

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
		X				X	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[3)]	Check cable connections and battery acid levels
Fuel system							
				X			Check for leaks
						X	Check condition and mounting
						X	Drain off water and sediments
Slewing gear							
				X			Check for leaks
					X		Checking the oil level
250 h						X	Check the mounting screws for tight seating
			4000 h			Every 4 years	Replace the gear oil
Turntable locking mechanism							
		X				X	Lubricate
		X				X	Check for correct function
Bearings							
						X	Checking the retaining elements
Pump distributor gear							
				X			Check for leaks
					X		Checking the oil level
500 h			X			X	Replace the gear oil
Hydraulic hose lines							
				X			Check for leaks and damage
						X	Check for safe condition by expert
Hydraulic system							
				X			Checking the oil level
					X		Check for leaks

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
250 h		X				X	Replace the servo pressure and replenishing pressure filter inserts
250 h		X				X	Replace return filter inserts (only for cranes with open hydraulic circuit)
250 h		X				X	Replace bleeder filter of hydraulic tank
500 h			X			X	Check hydraulic oil, required degree of purity: 20/18/15 Take oil sample and have it tested by oil supplier
Hydraulic cylinder							
					X		Check for leaks
Hydraulic pressure accumulator (nitrogen)							
		X[4)]				X[4)]	Check pretension pressures
Air pressure system							
					X		Check for leaks
					X		Check operating pressure
					X		Check shut off pressure
					X		Check operation of automatic drain valve
						X	Replace air drier granular cartridges
						X	Clean air drier preliminary filter
Central lubrication system							
		X					Check for correct function
					X		Check the grease container fill level
Emergency control							
						X	Check for correct function
Telescopic boom with rope mechanism							
						X	Check telescopic boom for distortions and cracks
	X					X	Grease the sliding surfaces of the telescopic boom bearing
	X					X	Lubricate change over pulleys of telescoping mechanism

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
	X					X	Check mounting screws on change over pulleys for tight seating
250 h		X					Check, adjust rope mechanism
			20000 h			Every 10 years	Disassemble and check the boom
Telematik telescopic boom system							
						X	Check telescopic boom system for distortion, damage and cracks
						X	Check hydraulic components for leaks and damage
		X				X	Check telescoping cylinder for proper condition
						X	Check pull knob retainer and mounting screws for tight seating
						X	Check mounting screws of push out cylinder for tight seating
						X	Check twist guard of cylinder pinning and telescopic boom pinning
		X				X	Check push out gripper for proper condition
		X				X	Check locking pins and locking bores for proper condition
		X				X	Check inner and outer sliding surfaces for proper condition
						X[5)]	Lubricate the gliding surfaces
						X[5)]	Grease guide rails on telescope cylinder
			20000 h			Every 10 years	Disassemble and check the boom
Telescopic boom guying							
						X	Check for distortions and cracks

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
					Every 3 months [5), 6)]		Lubricate grease fitting on the TA / TY-guying
				X			Check guy winch for leaks
					Every 6 months		Check the oil level on the guy winch
250 h		X				X	Check the mounting screws for tight seating
						X[4]	On LTM 1400-7.1: Check rope connection between guy rope and auxiliary rope
						Every 4 years	Replace gear oil of guy winch
Derrick ballast							
						X	Check frame, suspension and guide section for distortion and cracks

[1)] every 3 months if the crane is not moved
[2)] carry out a visual inspection before every start up
[3)] in hot climates 2 x a year
[4)] note chapter 7.05, Crane superstructure maintenance instructions
[5)] and as necessary
[6)] during assembly

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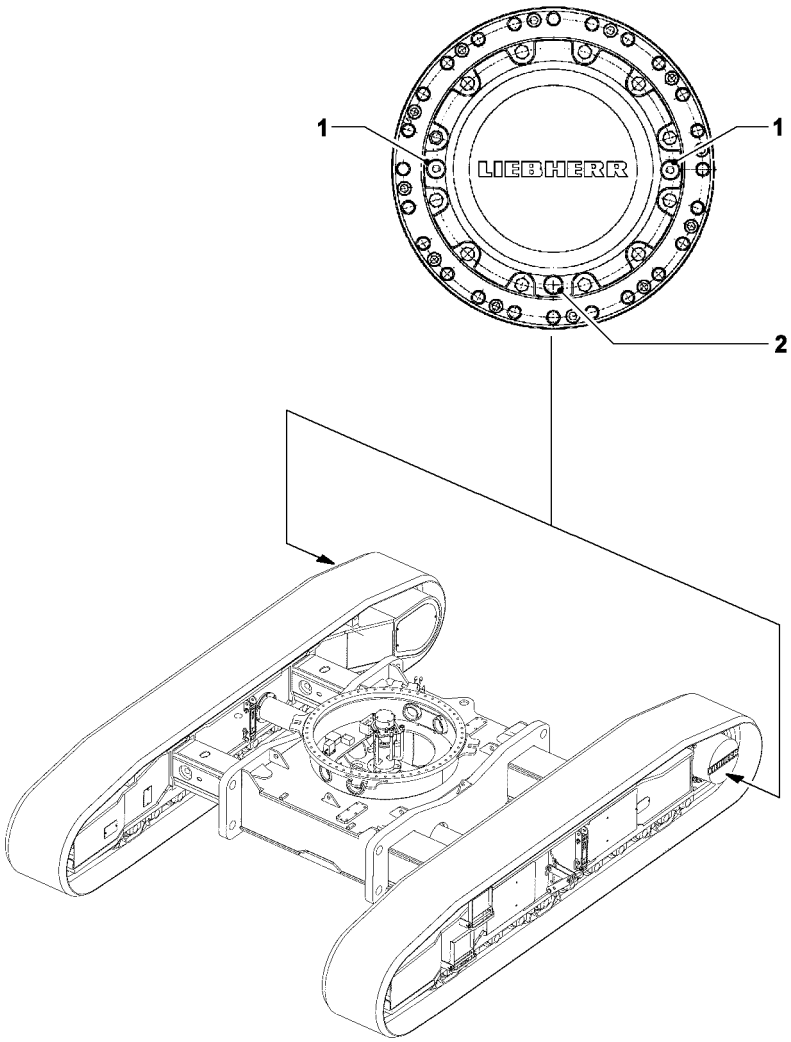


B198739

1 Travel gear transmission

CAUTION
Danger of transmission damage!
▶ Maintain extreme cleanliness during all work on the travel gear transmission, to prevent dirt from entering the transmission.

1.1 Gear oil

1.1.1 Checking the oil level

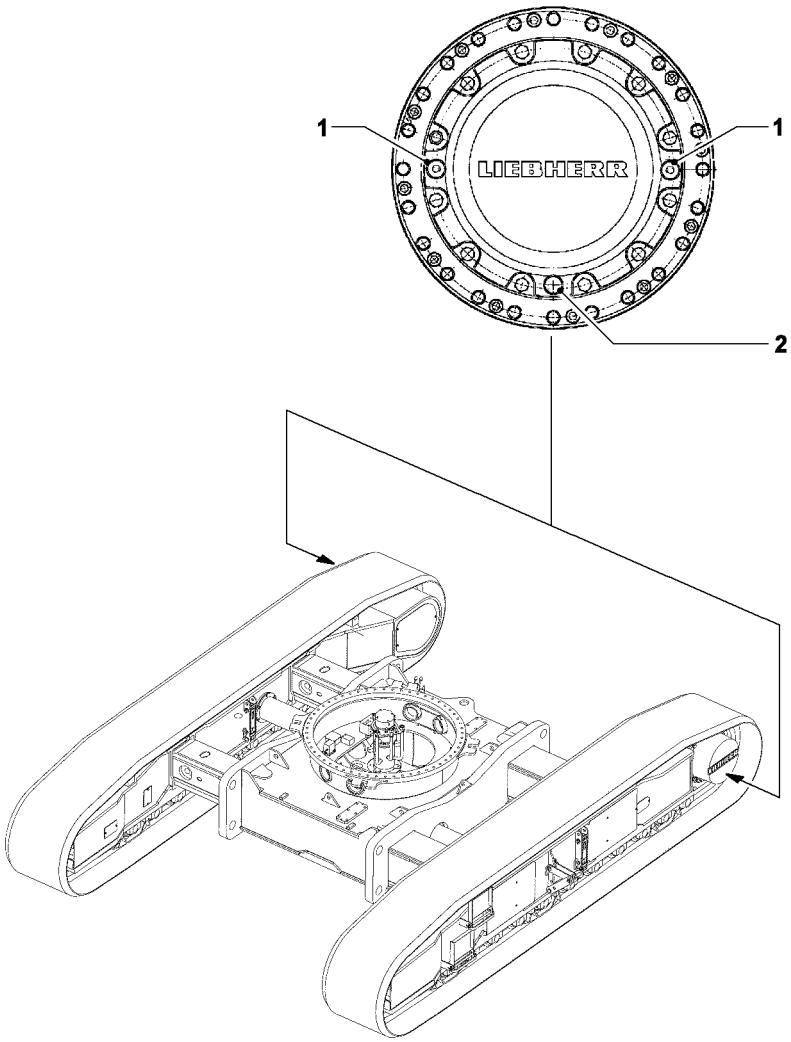
Ensure that the following prerequisites are met:
– the crane is horizontal
– the travel gear transmission must be stationary
– the **LIEBHERR** text on the travel gear transmission is horizontal

Note
▶ In order to get a reliable oil level check, make sure that the travel gear transmission is stationary for at least two minutes before you start to check the oil level. This ensures that the oil has returned to the oil chamber completely.

▶ Carefully unscrew the oil level screw **1**.
▶ If oil runs out of the inspection opening **1**, or the oil level is up to the lower edge of the inspection opening **1**, then the oil level in the travel gear transmission is correct.

CAUTION
Danger of gear damage!
▶ If the fluid level has dropped below the inspection opening **1**, it is essential to top up the transmission fluid as shown in the lubrication chart until the fluid level is again up to the lower edge of the inspection opening.

▶ Screw in the oil level screw **1** and tighten.



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1.1.2 Changing the oil

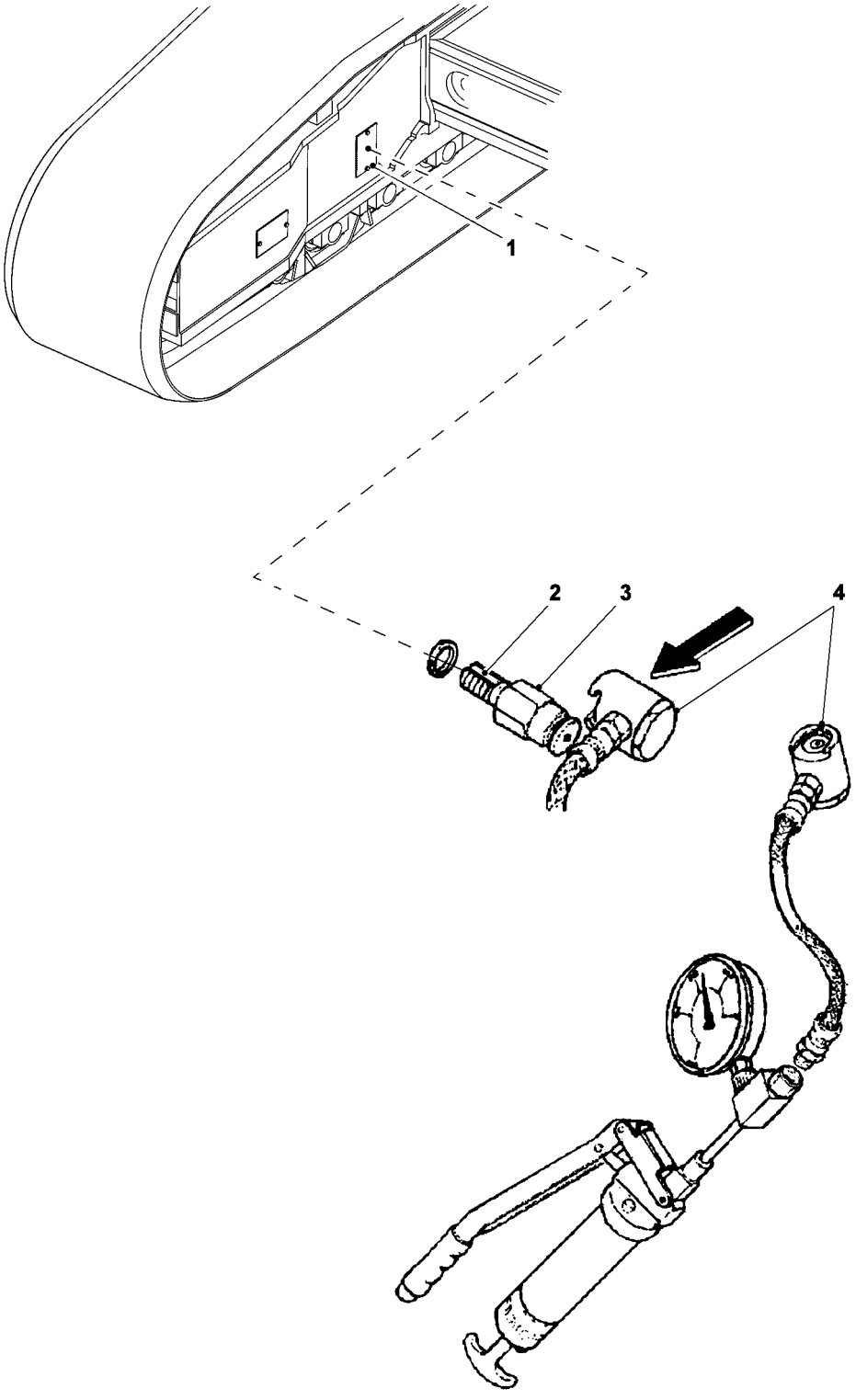
Ensure that the following prerequisites are met:
- the crane is horizontal
- the travel gear transmission must be stationary
- the **LIEBHERR** text on the travel gear transmission is horizontal
- travel gear transmission at operating temperature
- an oil collecting container is ready to hold “used oil”

Note
- ▶ When selecting the oil collecting container, make sure that the oil collecting container is of sufficient size to hold all the used oil.
- ▶ Filling quantity of the travel gear transmission, see chapter 7.06.

- ▶ Unscrew the oil level screw(s) **1** for bleeding.
- ▶ Remove the oil drain plug **2** and drain oil into a suitable container.

Note
- ▶ Let the travel gear transmission run completely at idling speed.

- ▶ Clean the oil drain plug **2** and the sealing surfaces.
- ▶ Install the oil drain plug **2** with new seal and tighten.
- ▶ Top up with oil as shown in the lubrication chart using the oil level screw **1** until the oil level “is up to the edge” of the hole or starts to overflow.
- ▶ Screw in oil level screw(s) **1** with new gasket and tighten.



B198740

2 Crawler travel gear

The caterpillar tracks must be tensioned by means of clamping cylinders that are extended with a lever grease gun.
To slacken the caterpillar tracks, reduce the pressure in the clamping cylinder.

2.1 Tensioning the caterpillar track

Ensure that the following prerequisites are met:
– the crane is horizontal
– the lever grease gun with pressure gauge is to hand

2.1.1 Tensioning procedure

▶ Unscrew the cover **1** on the inside of the crawler carrier.
▶ Attach the hose **4** of the lever grease gun to the lubricating nipple **3** of the clamping cylinder up to the stop position (push).
▶ Activate the lever grease gun until the pressure gauge shows a pressure of about **160 bar** to **180 bar** .

Result:
– The caterpillar track will be tensioned.

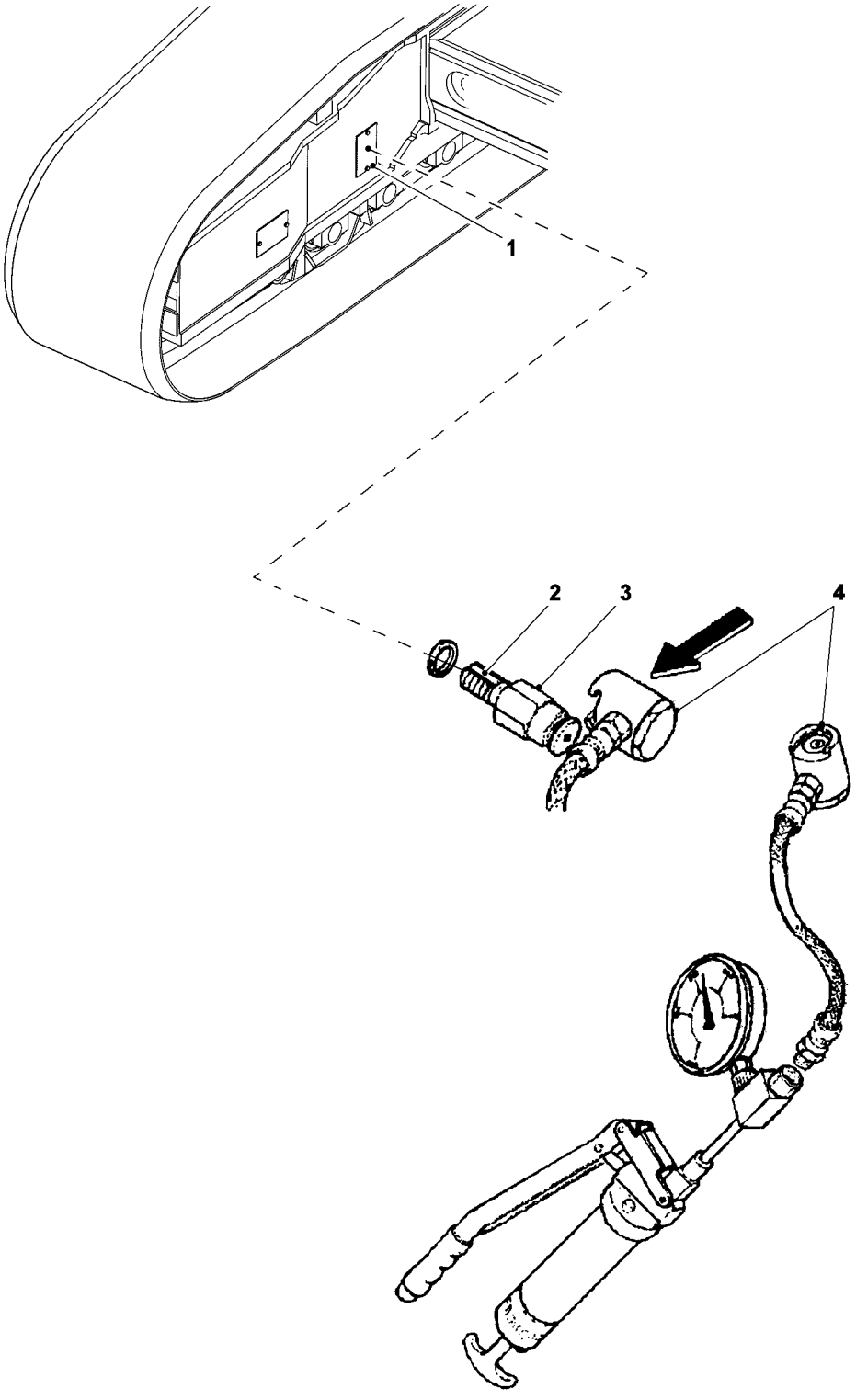
▶ Remove the pressure hose **4** from the lubricating nipple

Troubleshooting
The pressure hose **4** does not detach from the lubricating nipple **3**?
The pressure in the pressure hose **4** is too high.
▶ Carefully loosen the pressure hose **4** on the lever grease gun, so that the pressure in the pressure hose is reduced.

▶ Remove the pressure hose **4** from the lubricating nipple **3**.
▶ Screw back the cover **1** on the inside of the crawler carrier.
▶ After the tensioning procedure, drive the caterpillar track by about one track length straight ahead forwards and backwards.

Result:
– The tension in the lower track area evens out.

Note
▶ If necessary, repeat the tensioning procedure on the caterpillar track.



B198740

2.2 Slackening the caterpillar track

WARNING
Risk of injury due to excess pressure!
Incorrect procedures when slackening the caterpillar track can lead to severe injuries to the face and especially the eyes from grease shooting out.
- ▶ When loosening the lubricating nipple, do not look straight into the opening.
- ▶ The steps for the slackening procedure described below must be adhered to.

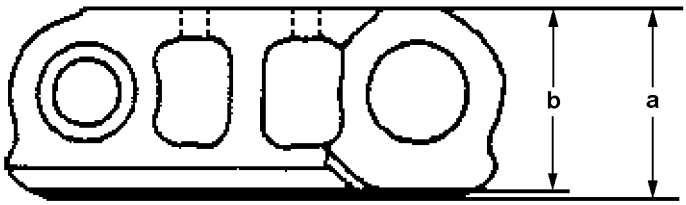
2.2.1 Slackening procedure

- ▶ Unscrew the cover **1** on the inside of the crawler carrier.
- ▶ Loosen the lubricating nipple **3** with extreme caution.
- ▶ Unscrew the lubricating nipple **3** carefully 2 or 3 thread turns, until grease can extrude from the groove **2**.
- ▶ Tighten the lubricating nipple **3** again.
- ▶ Screw back the cover **1** on the inside of the crawler carrier.

2.3 Wear and tear data about the crawler track travel gear

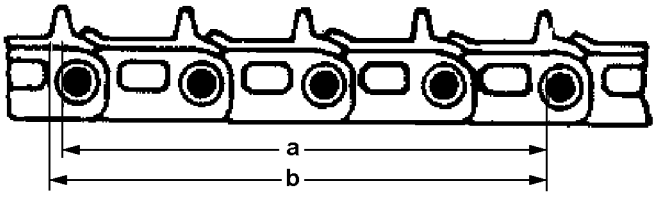
CAUTION
Damage to the crawler chassis!
If components are not replaced when reaching the wear limit, the crawler chassis can be badly damaged!
- ▶ Components that have reached the wear limit must be replaced by new components!

2.3.1 Chain link



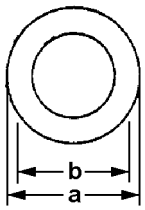
Component	Dimensions	
	new	Wear limit
	a	b
Chain link	126 mm	110 mm

2.3.2 Chain separator



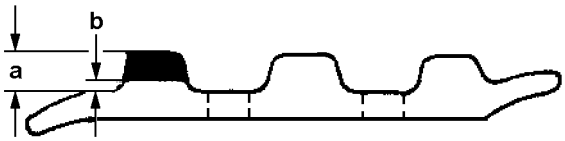
Component	Dimensions	
	new	Wear limit
	a	b
Chain separator	866 mm	883 mm

2.3.3 Chain bush



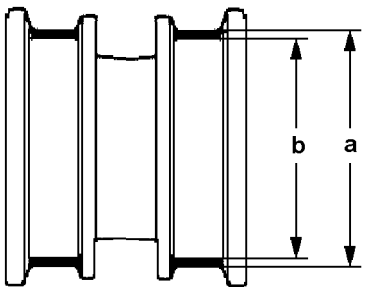
Component	Dimensions	
	new	Wear limit
	a	b
Chain bush	Ø 71,42 mm	Ø 64.5 mm

2.3.4 Support plate



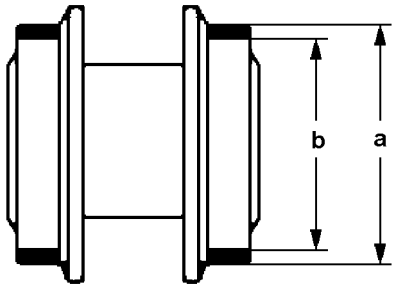
Component	Dimensions	
	new	Wear limit
	a	b
Base plate	26.5 mm	12 mm

2.3.5 Roller



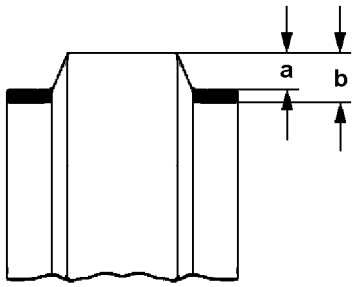
Component	Dimensions	
	new	Wear limit
	a	b
Roller	Ø 200 mm	Ø 184 mm

2.3.6 Support roller

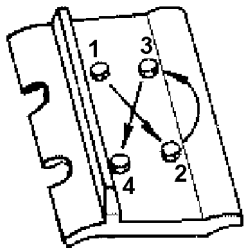


Component	Dimensions	
	new	Wear limit
	a	b
Support roller	Ø 140 mm	Ø 125 mm

2.3.7 Leading wheel



Component	Dimensions	
	new	Wear limit
	a	b
Leading wheel	24.5 mm	30 mm



2.4 Fitting the base plates

The screws used to attach the base plates must be retightened 50 operating hours after the base plates were fitted.

The regular maintenance intervals for the screws are given in chapter 7.02.

The tightening torque is 1000 Nm.

- ▶ Tighten the screws in the order given on the diagram.

2.5 Checking pre-tension pressure in nitrogen clamp

The crawler carriers are equipped with nitrogen clamps. Although the nitrogen clamps do not require any maintenance, check the pre-tension pressures once a year.

The pre-tension pressure in the nitrogen reservoirs must be 180 bar.

DANGER

Danger of explosion!

- ▶ The pressure in the nitrogen cylinder must be less than the maximum permitted operating pressure of the reservoir or the pressure gauge. Otherwise fit a pressure reducer between the cylinder and the filling device.
- ▶ Do not use air or oxygen to fill the nitrogen clamp!
- ▶ The pre-loading pressure in the nitrogen clamps must always be checked by authorized and trained personnel using appropriate equipment! The national pressurized container regulations most also be complied with!

- ▶ Check the pre-tension pressure in the nitrogen reservoirs using a testing and filling device and correct if necessary.

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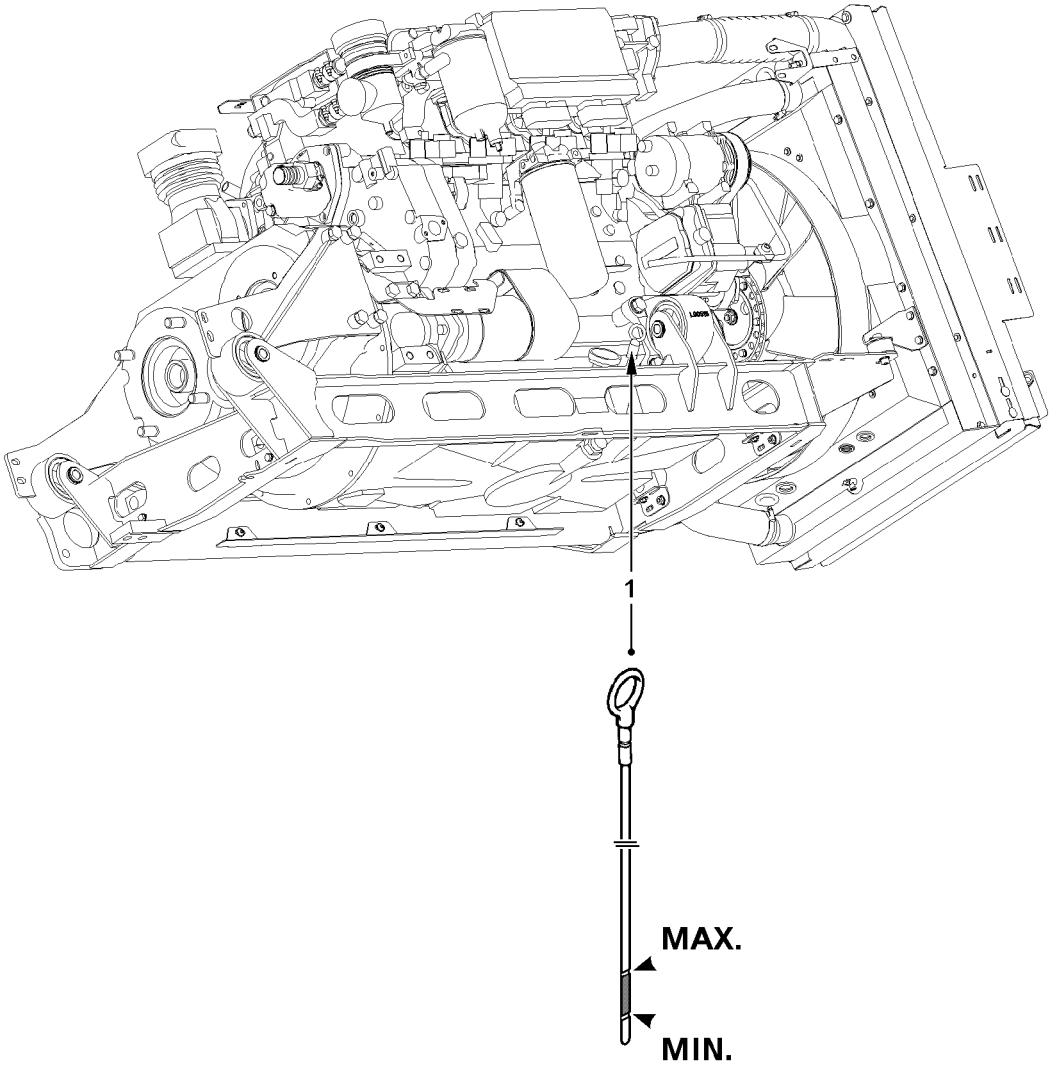


B198426

1 Crane engine

Never step on fuel lines during maintenance or repair work in the engine area!

DANGER
Danger of fire!
- ▶ Make sure that the engine area is kept free of diesel fuel.
- ▶ Extreme cleanliness is vital, particularly during filter changes and bleeding. Wipe up any spilled fuel!
- ▶ When replacing the filter, it is recommended to put down cleaning rags before removing the filter in order to absorb fuel.

1.1 Engine oil

1.1.1 Checking the oil level

Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The engine is turned off and the oil has collected in the oil pan.

- ▶ Remove the dipstick **1** and wipe it off.
- ▶ Reinsert the dipstick **1** and pull it out again.

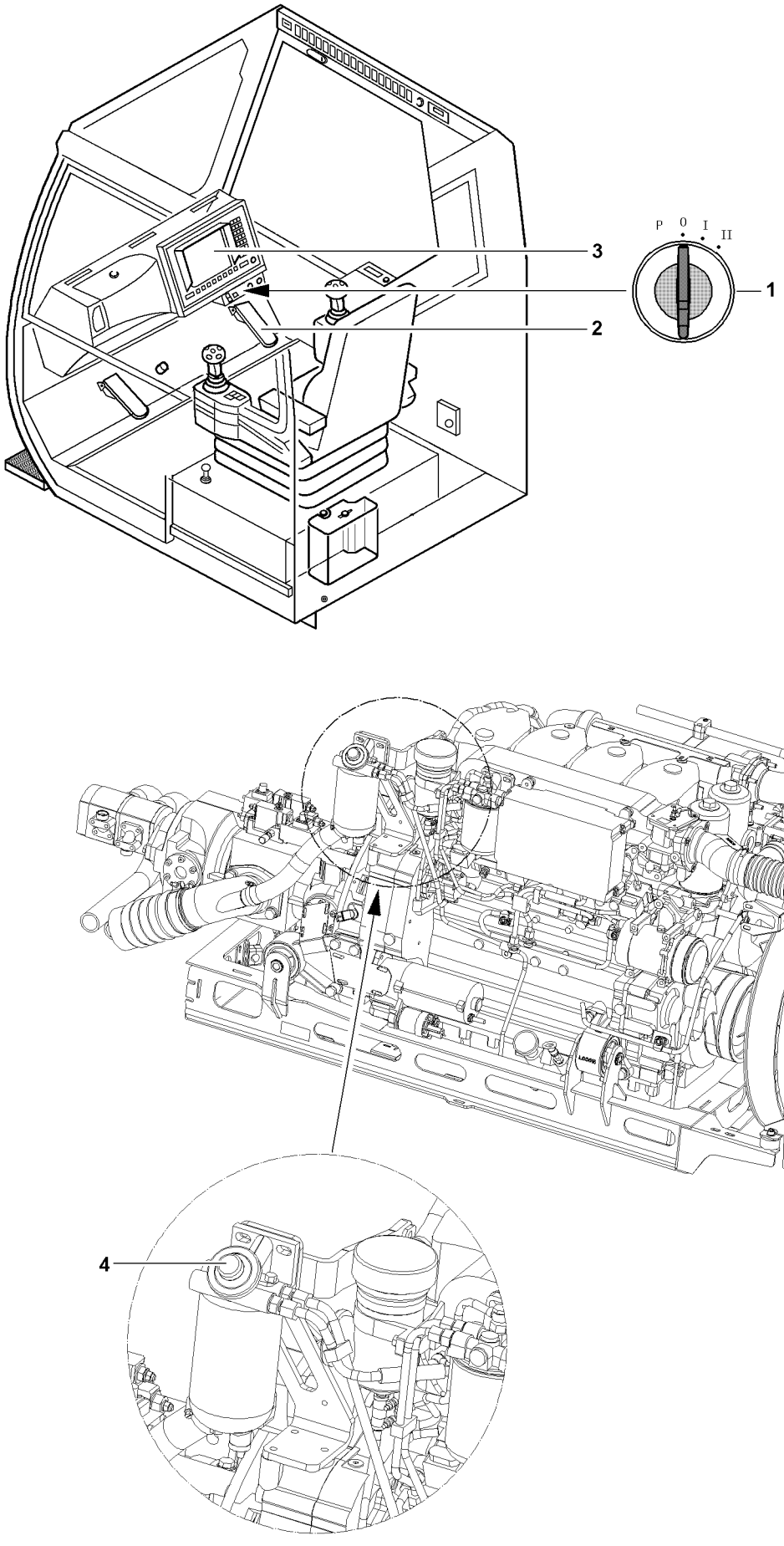
The oil level must be between the min. and max. marks on the dipstick **1**.
- ▶ Check the oil level.

CAUTION
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

Refer to the separate operating instructions for “LIEBHERR Diesel engines”.



B110284

1.2 Bleeding the injection lines

Note

▶ Two persons are required to bleed the injection lines!

Make sure that the following prerequisites are met:

– The diesel engine in the chassis is turned off.
– The diesel engine in the superstructure is turned off.
– The ignition switch in the crane operator's cab is in the “0 position” (OFF).
– The diesel engine in the superstructure is easily accessible.

DANGER

Danger of falling!

During the bleeding process of the injection lines, the assembly personnel must be protected from falling with suitable aids, depending on the turntable position. If this is not observed, assembly personnel could fall and suffer life-threatening injuries.

▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (scaffolding, ladders, etc.)! The height above which assembly / maintenance work must be carried out with aids depends on national regulations. The national regulations must be adhered to!

1.2.1 Activating the bleeding function

The bleeding function is activated from the crane operator's cab.

A high injection rate is required to bleed the injection lines on the diesel engine. It is therefore necessary to operate the manual feed pump **4** on the diesel engine during the bleeding process.

▶ Turn the ignition on in the crane operator's cab: Turn the ignition switch **1** to “position I”.
▶ When the ignition is turned on:
Floor the engine regulation **2** within 10 s.
▶ Repeat this step within the next 10 s: Release the engine regulation **2** and floor it again.
▶ To activate the bleeding function: Repeat this procedure five times.

Result:

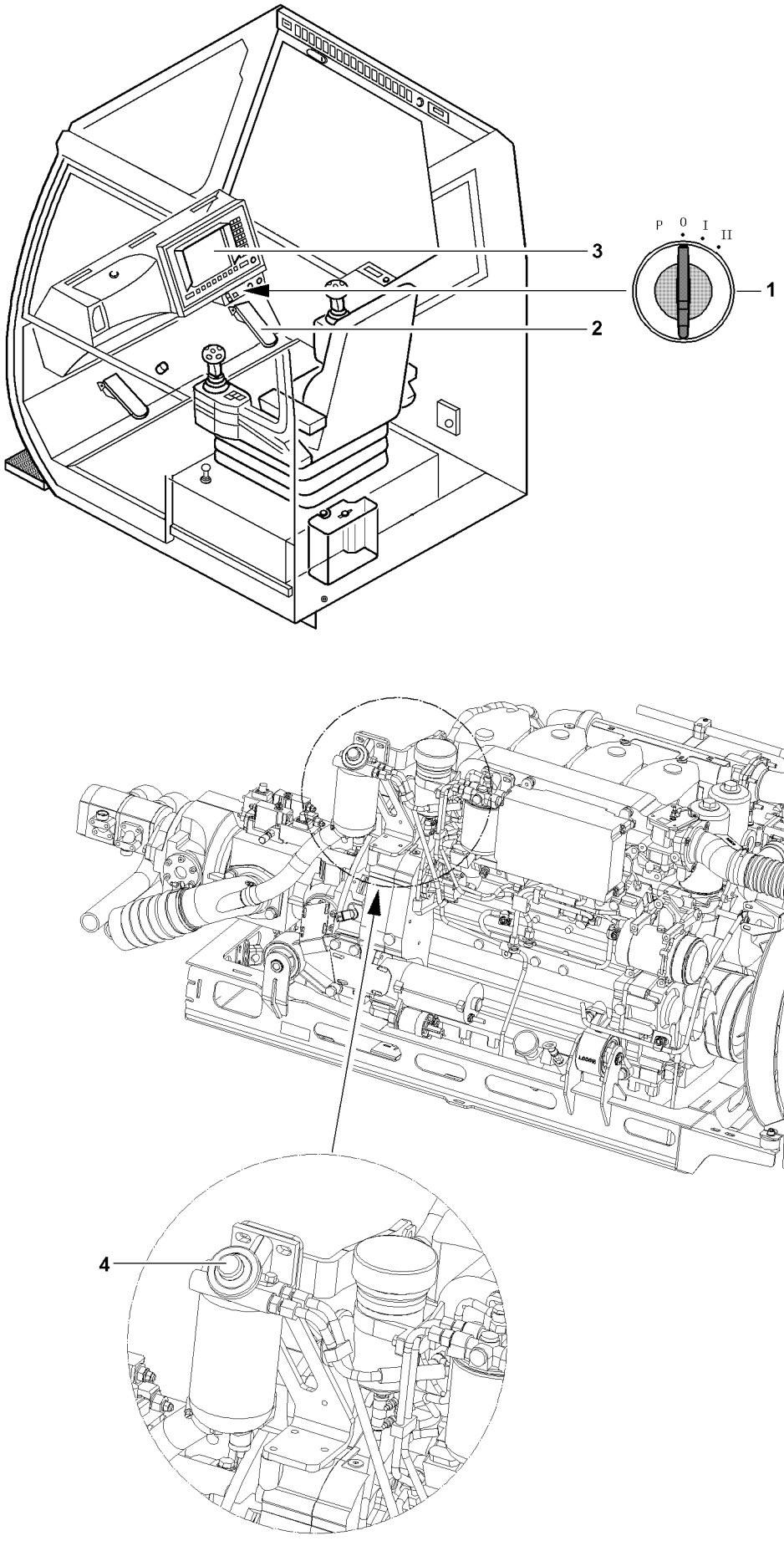
– The bleeding function is now activated.
– The LICCON monitor **3** displays an operating error message with the text: “Bleeding function activated”.

Troubleshooting

If the LICCON monitor **3** does not display an operating error message with the text: “Bleeding function activated”?

The bleeding function has not been correctly carried out or the specified time has been exceeded.

▶ Turn the ignition off: Turn the ignition switch **1** to “position 0”.
▶ Repeat the procedure according to the description.



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1.2.2 Carrying out the bleeding procedure

Note

▶ Do **not** operate the engine regulation during the bleeding procedure!

Make sure that the following prerequisites are met:
– The bleeding function is activated.
– The operating error message is displayed on the LICCON monitor.

Pump the manual feed pump **4** to operate it during the entire engine start procedure (approx. 20 s).

▶ Turn the ignition switch **1** in the crane operator's cab to “position II” and hold it for approx. 20 s in “position II”.

▶ When the ignition switch **1** is actuated:
Immediately pump the manual feed pump **4** for approx. 20 s and at least as long as the ignition switch is being turned.

Result:
– The injection lines are bled.
– The diesel engine starts up and runs at low idle speed after a successful bleeding procedure.
– The bleeding function will be deactivated.
– The system switches over to normal operation.

Troubleshooting

The injection lines are not bled and the diesel engine does not run at low idle speed?
The ignition switch **1** was not operated long enough or the manual feed pump **4** was used incorrectly.

▶ Hold the ignition switch **1** for 20 s in “position II”.

▶ Continuously pump the manual feed pump **4**.

Note

▶ The starter block is deactivated if the bleeding function has been activated. Several starting attempts can be made without turning the “ignition OFF”.

1.2.3 Deactivating the bleeding function

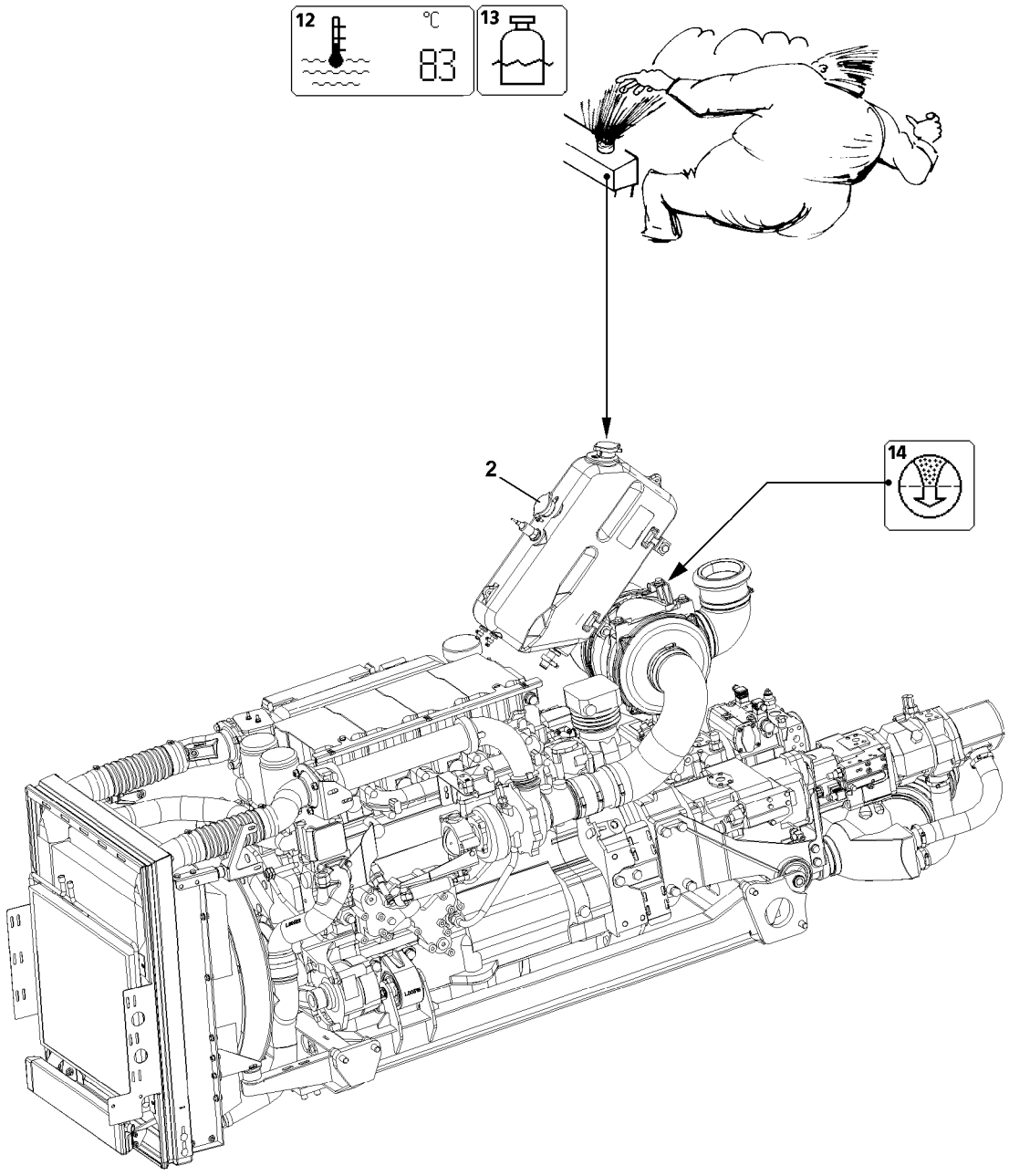
Note

▶ The bleeding function is automatically deactivated after successfully bleeding the injection lines or when the ignition is turned off.

Once the injection lines have been successfully bled, the diesel engine is regulated by the engine electronic to low idle speed after a short period and the bleeding function is automatically deactivated.

▶ Turn the ignition off: Turn the ignition switch to “position 0”.

Result:
– The diesel engine is turned off.
– The bleeding function is deactivated.



B198427

1.3 Engine coolant

The coolant level is monitored by the LICCON computer system. If the coolant level is too low the “Low coolant level” **13** icon appears on the LICCON monitor.
The crane's engine coolant temperature can be read on the LICCON monitor in [°] on the “Engine coolant temperature” icon.

DANGER
Danger of skin burns!
▶ The engine must be cold when checking the coolant.

▶ Turn the cap **2** on the filler neck of the water cooler expansion tank to the 1st notch.
▶ Release excess pressure.
▶ Remove the cap **2**.
▶ Check the coolant level.

Add coolant as specified in the lubrication chart only on the filler neck of the water cooler expansion tank.
▶ Add coolant to overflow level if necessary.

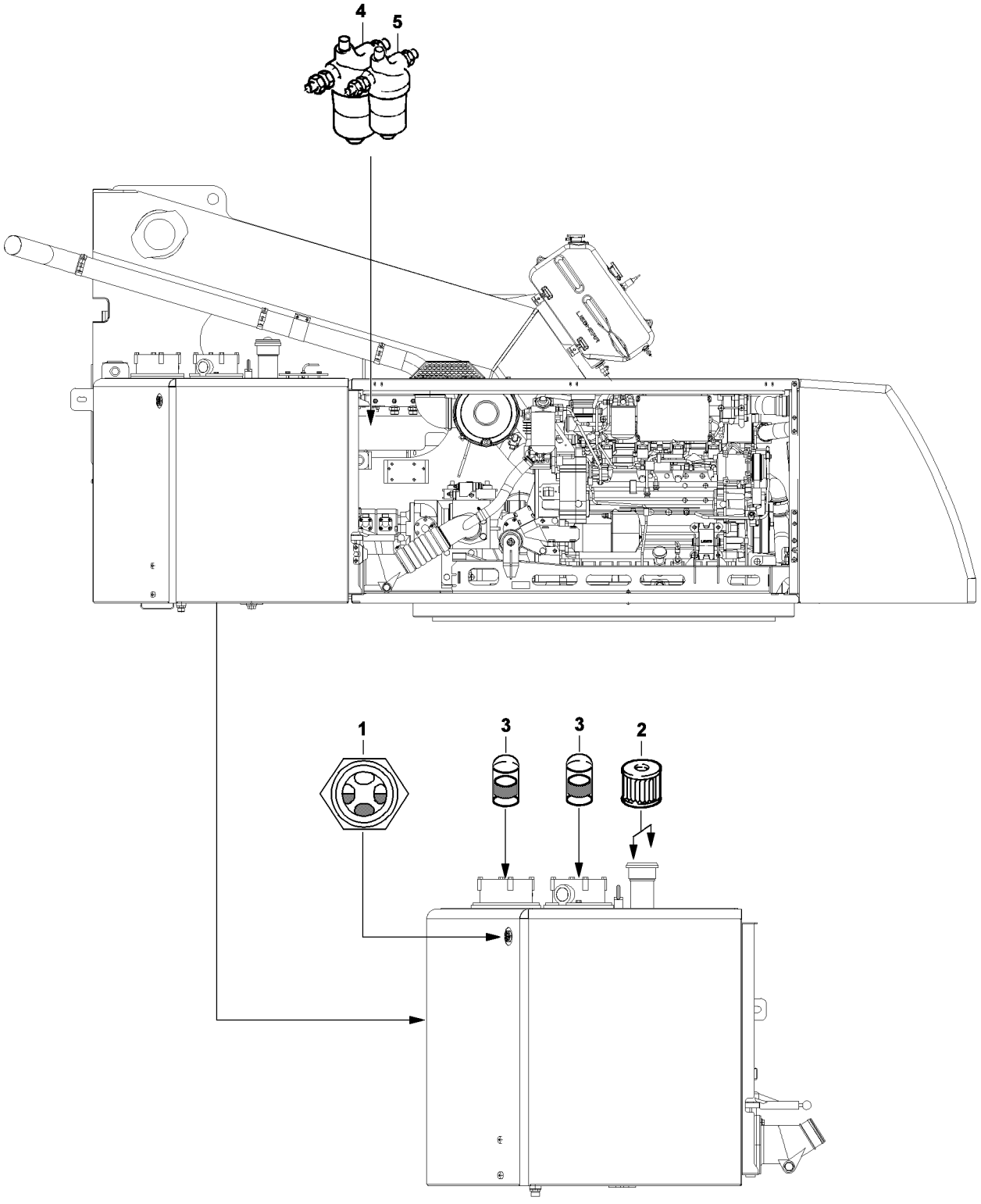
1.4 Air filter

The air filters are monitored by the LICCON computer system. If the vacuum increases in the intake line due to dirty filter units, the “Air filter contaminated” **14** icon is displayed on the LICCON monitor.
▶ If the “Air filter contaminated” **14** icon appears:
Clean or replace the filter insert.

1.5 Diesel particle filter*

DANGER
Danger of igniting the diesel particle filter*!
▶ The diesel particle filter* may only be regenerated under the supervision of operating personnel!

Carry out the operation and maintenance of the diesel particle filter* according to the separate operating instructions of the diesel particle filter* manufacturer.



B199439

2 Hydraulic system

CAUTION
Damage to the hydraulic system!
If the hydraulic system is contaminated when working on the hydraulic system, then the hydraulic system can be damaged and fail.
- ▶ Always keep up most cleanliness when working on the hydraulic system!
- ▶ This applies especially for filter changes, refilling of hydraulic oil or changing of components!

2.1 Hydraulic tank

2.1.1 Checking the oil level

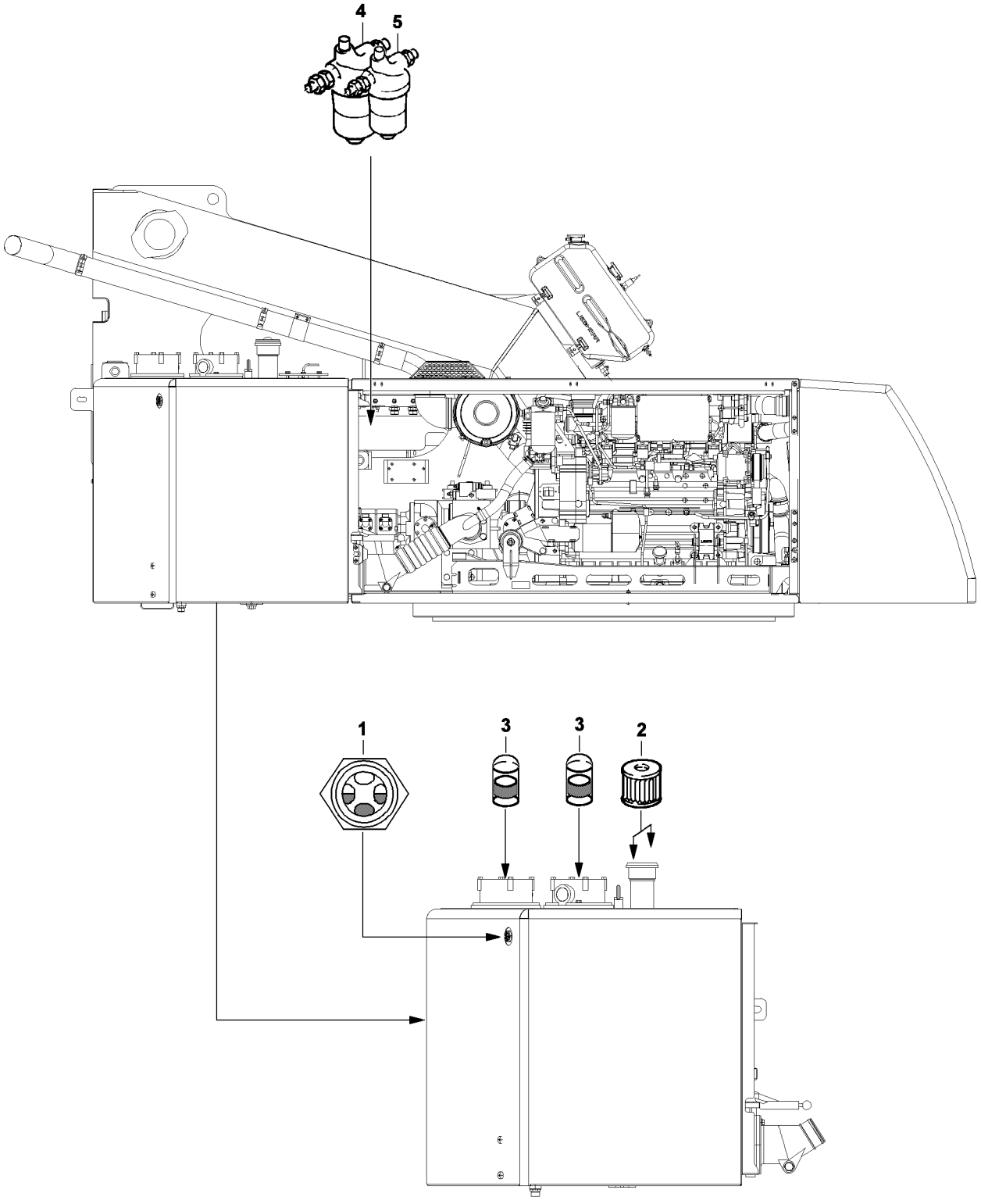
Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The luffing cylinder and the telescoping cylinder are fully retracted.

The oil level must be in the center of the oil level sight gauge **1**.
- ▶ Check the oil level on the oil level sight gauge **1** of the hydraulic oil tank.

Troubleshooting
No oil is visible in the oil level sight gauge **1**?
- ▶ Add oil as specified in the lubrication chart with a fine-mesh strainer until the oil level is visible in the center of the oil level sight gauge **1**.

2.1.2 Checking the vent / breather filter

- ▶ Open the cover with the turn lock.
- ▶ Check filters **2** for impurities (visual inspection).
- ▶ In the event of heavy contamination:
  Replace the filters **2**.
- ▶ Close the cover with the turn lock again.
- ▶ Start the engine.
- ▶ Slowly run through all crane movements.
- ▶ Check the oil level again and add oil if necessary.



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2.1.3 Return filter

The return filters **3** are equipped with a maintenance indicator. If the red mark is visible when the oil is at operating temperature, then the filter insert must be replaced.

- ▶ Unscrew 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.
- ▶ Place both filter covers and tighten.
- ▶ Start the engine and check the filters for leaks.
- ▶ Check the oil level and add oil if necessary.

2.2 Pressure filters in the crane hydraulic

The pressure filter **4** and pressure filter **5** are equipped with a maintenance indicator. If the red bar indicator is visible when the oil is at operating temperature, then the filter cartridge must be replaced.

- ▶ Turn off the engine.
- ▶ 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.
- ▶ Install a new filter cartridge and tighten.
- ▶ Start the engine and check for leaks.
- ▶ Slowly run through all crane movements.

Result:

– This bleeds the hydraulic system.

- ▶ Check the oil level again and add oil if necessary.

2.3 Diaphragm reservoirs

Various diaphragm reservoirs are installed in the hydraulic system. The pretension pressures are specified in the hydraulic circuit diagram as well as on the individual diaphragm reservoirs. The pretension pressure must be measured separately in each diaphragm reservoir.

CAUTION

Risk of damaging the hydraulic system!

If the outside temperature fluctuates considerably, e.g. after transport to extremely hot or cold countries or in countries with considerable differences between the summer and winter temperatures, the gas accumulator pressures may change.

- ▶ Check the gas accumulator pressures and correct if necessary.

Make sure that the following prerequisite is met:

– The crane engine is turned off.
  This relieves the diaphragm reservoir at the fluid side.

DANGER
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, if necessary.

2.4 Hydraulic hose lines

The hydraulic hoses 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
Note
▶ The applicable national regulations must also be complied with!

2.4.1 Checking the hydraulic hoses within area of responsibility of the German employer's liability insurance associations

At least once a year, an **expert** must inspect the hydraulic hoses to ensure they are in operationally 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.

2.4.2 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 later (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.

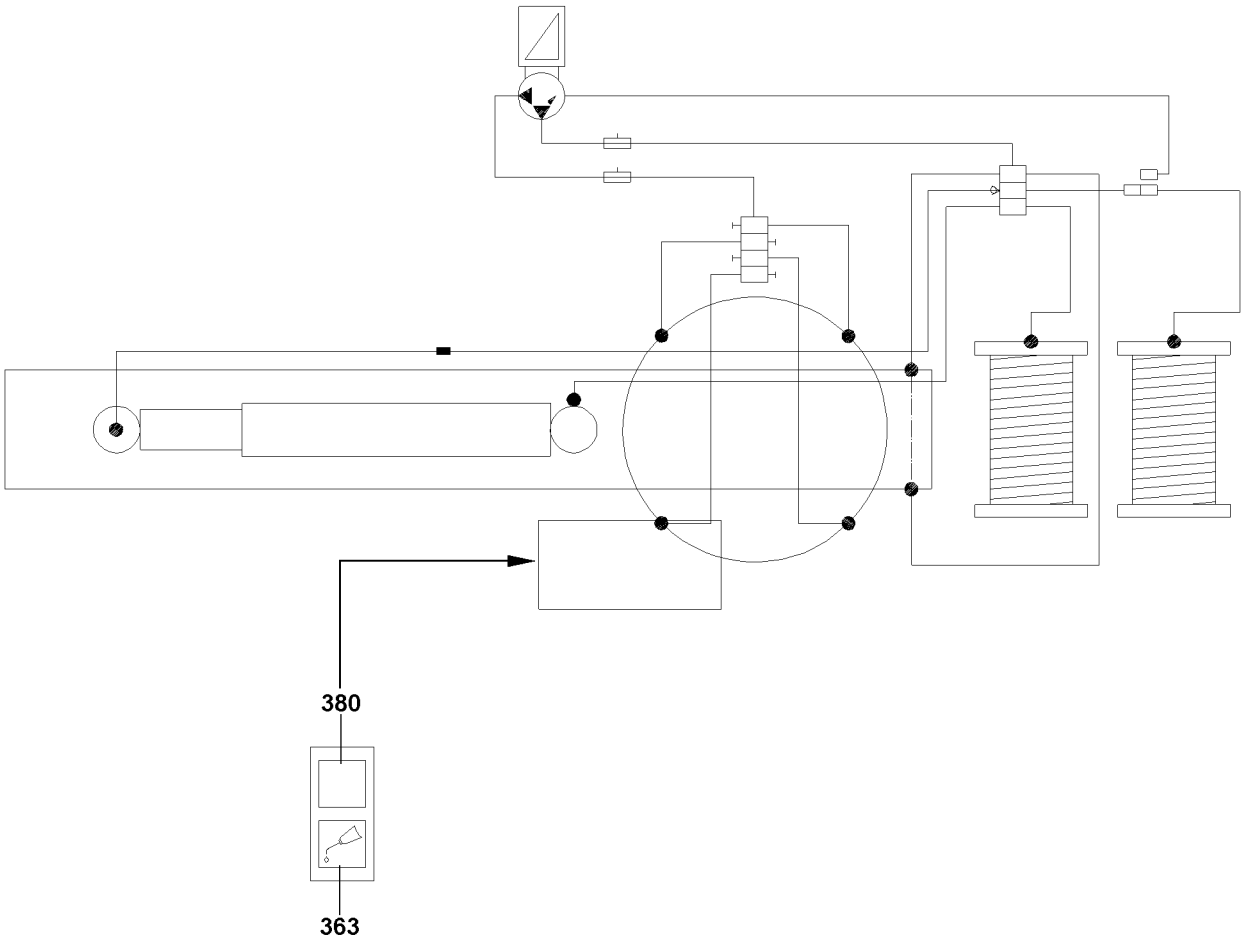
2.4.3 Maintenance of hose lines

- 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 as a part of a hose line may not be reinstalled in hose lines.
- Always use original Liebherr spare parts when replacing hoses and hose lines.
- Always ensure that the hoses are routed free of torsion. If high pressure hoses are being used, attach screw 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 ½ the outer diameter of the hose to other parts. The clearance may never be less than 10 to 15 mm.

2.4.4 Replacing the hose lines

DANGER
Risk of fire or accident!
Failure to replace hose systems at appropriate intervals can cause serious injury to persons, death or damage to property.
▶ Replace hose lines according to 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 line may not exceed six years, including a storage period of a maximum of two years (pay attention to 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.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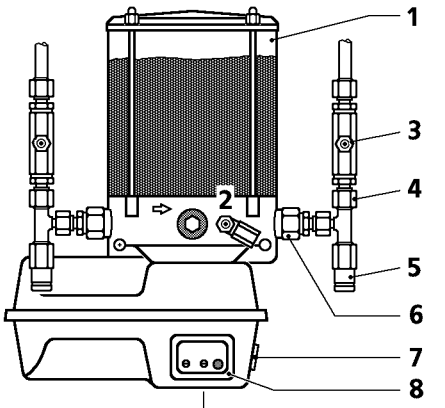
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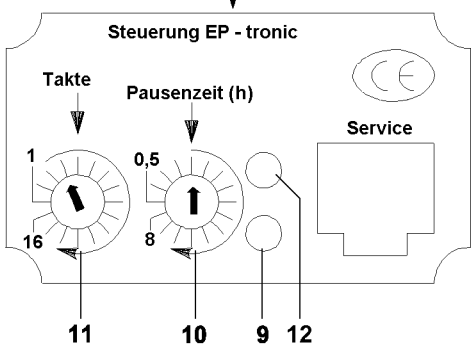
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3 Central lubrication system

The crane superstructure is equipped with a central lubrication system. All lubricating points (refer to the guide on the left), the roller slewing ring, the bearing of the telescopic boom articulation piece, the bearings of the luffing cylinder and the hoisting winches are automatically supplied with the correct grease quantity.
If the crane has not been moved for more than 3 months, then it must be lubricated every 3 months with an external grease pump until grease emerges from all grease points. Then the relevant crane movement must be repeated several times and the lubrication procedure must be carried out again.
– Cycle number: 4 cycles
– Break period: 2.5 h

Note
▶ Cleaning is permitted in washing bays or with steam cleaners!

3.1 Components of the system

– Grease container **1**
– Grease fitting **2**: Filling the central lubrication pump.
– Grease fitting **3**: Filling the lube lines.
– Pump outlet **4**
– Pressure relief valve **5**
– Pump element **6**
– Push button **7**
– Control **8**
– LED **9** (green)
– Latched switch **10**: Pause time (h).
– Latched switch **11**: Cycles.
– LED **12** (red)

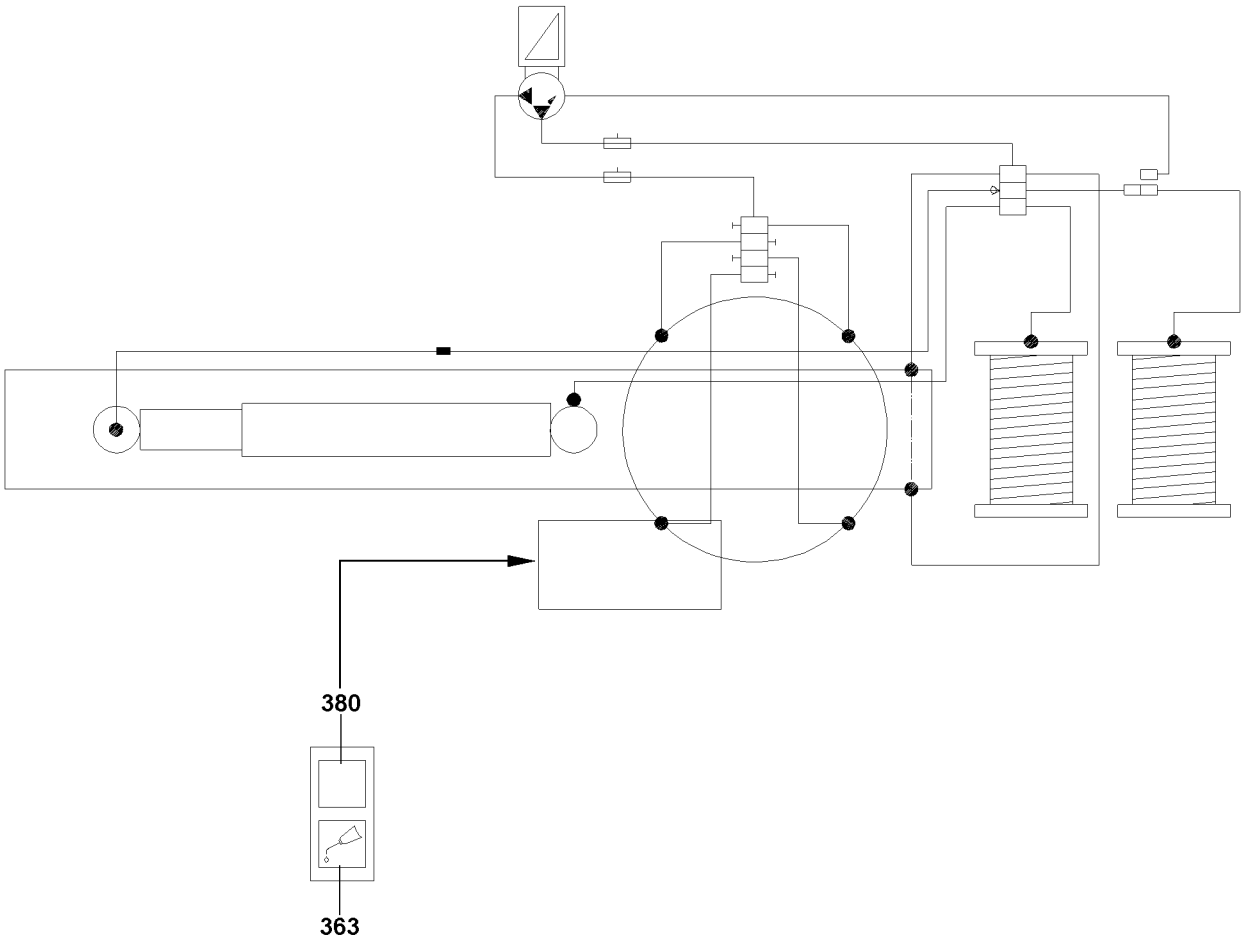
3.2 Adjusting the lubrication and pause time

The LED **9** on the engine protection housing blinks in a 0.5 second cycle during the lubrication process. The lubrication and pause time is set at the factory. The times can possibly be changed by using the latched switch **10** and latched switch **11**.
▶ Turn on the engine ignition.

Result:
– When turning the ignition on, the LED **9** lights up for approximately 2 seconds and displays the operational readiness of the control **8**.

3.3 Function check

Trigger 2 to 3 additional lubricating pulses with the ignition turned on, in order to determine if lubricant escapes from all lubricating points.
If the system is blocked but the electric pump is properly functioning, the grease emerges through the pressure relief valve **5**. This serves to secure the system and to monitor the system.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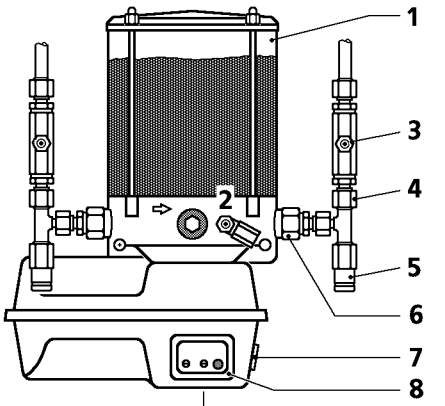
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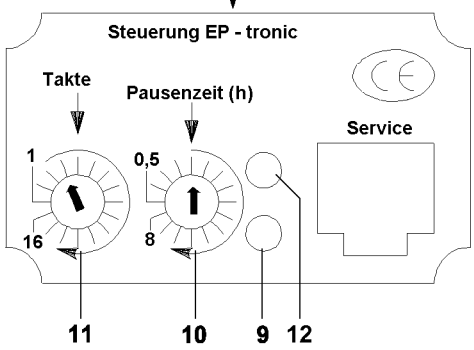
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3.4 Cycle control

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 indicator light **363** displays a malfunction or a problem by blinking.

3.4.1 Blinker code - cycle control

During operation

– Ignition on, ready for operation:
  The indicator light **363** lights up for 1.5 s and turns off.
  The warning light **380** lights up for 1.5 s and turns off.
– Lubrication active:
  The indicator light **363** lights up as long as the lubrication is active.
  The warning light **380** does not light up.

In case of a problem

– Error of monitoring period of cycle input, lubrication time larger monitoring period cycle input.
  The indicator light **363** lights up for 1 s and is off for 1 s etc.
  The warning light **380** lights up for 1 s and is off for 1 s etc.
– Error CPU, Error memory
  The indicator light **363** does not light up
  The warning light **380** lights up for 0.5 s and is off for 0.5 s etc.

3.5 Access to the automatic lubrication (intermediate lubrication)

Intermediate lubrication processes can be carried out after crane washing, or the grease lines are re-filled with grease after a repair.

▶ With the ignition turned on, press the red button **7** on the engine protection housing of the pump.

3.6 Filling the grease container

CAUTION
Risk of damage due to insufficient lubrication!

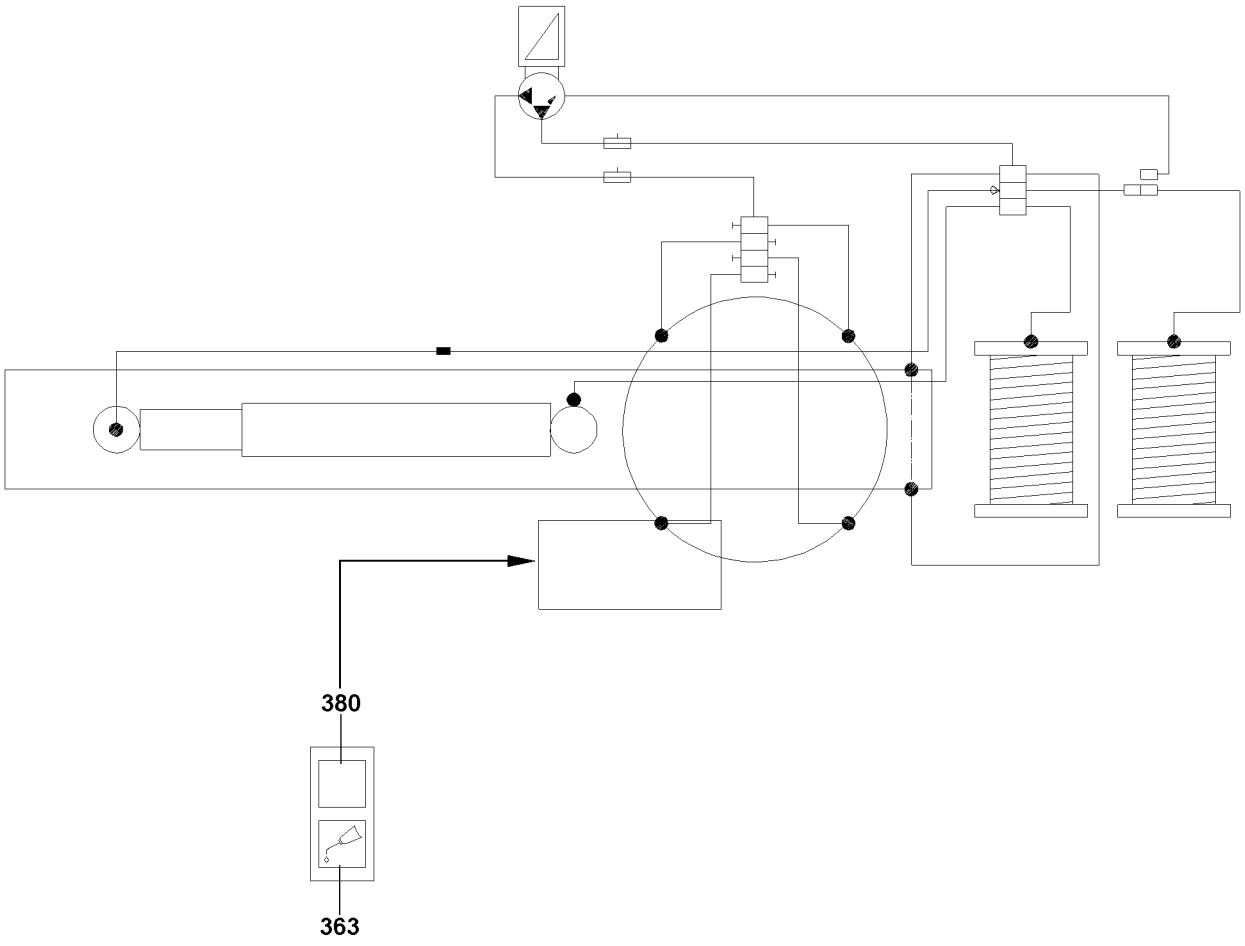
▶ There must be sufficient grease in the grease container **1** at all times.
▶ Observe utmost cleanliness when filling the grease container **1**!

▶ Fill the grease container **1** with a grease pump via the grease fitting **2** on the central lubrication pump.

3.7 Bleeding the system

If the grease container **1** has been emptied it may be necessary to bleed the system.

▶ Fill the grease container **1**.
▶ Unscrew the main line from the pump outlet **4**.
▶ Trigger additional lubricating pulses until there are no more air bubbles in the emerging grease at the pump outlet **4**.
▶ Reconnect the main line.
▶ Trigger an additional lubricating process.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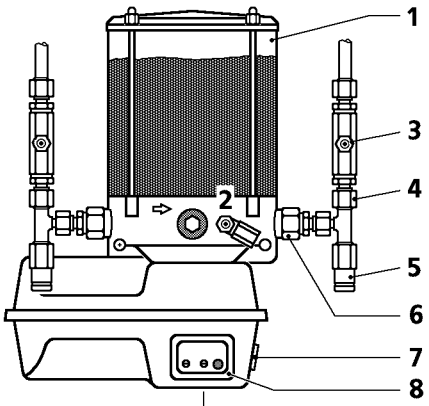
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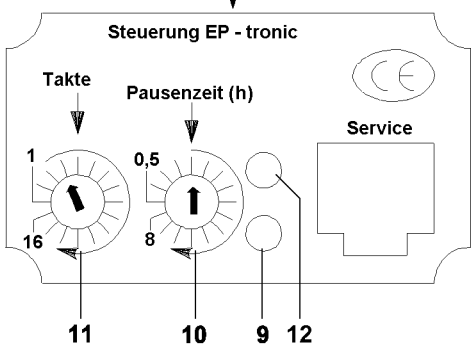
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3.8 Filling the lubricant lines

CAUTION
Risk of damage due to insufficient lubrication!
The lubrication lines must be refilled after any repair on components, which are lubricated with grease. If this is not observed, the component may run dry.
▶ Sufficient grease must be available in the grease lines after every repair on greased components.
▶ Observe utmost cleanliness when filling the grease lines!

▶ Add grease with an external grease pump via the grease fitting **3**.

or

■ With the ignition turned on, press the red button **7** on the engine protection housing of the pump.

3.9 Troubleshooting on the central lubrication system

Problem	Cause	Remedy
Pump is not working	Integrated electronic control defective, electrical line interrupted, pump defective	Replace lower part of motor protection housing, replace electrical line, replace pump
Pump operates, but does not deliver	Air cushion in delivery piston has dropped below minimum fill level, pump element defective	Bleed pump, fill reservoir, replace pump element
No grease collar on all lube points	Pump not operating, interval time too high or cycle time too short, system blocked	See “Pump not operating” , reduce 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
Pump speed reduced	Higher system pressure, lower ambient temperature	Check system / bearing points, no damage: Try 1 or 2 intermediate lubrication operations

Problem	Cause	Remedy
Grease escapes at the pressure relief valve	System pressure too high, progressive distributor blocked, system blocked, defective valve spring	Check system, replace distributor, repair blocked / seized bearing point, replace pressure relief valve
Red LED lights up in 0.5 second interval	Error CPU / memory	Consult Liebherr customer service
The green LED and the red warning light blink in 1 second interval	Error in the monitoring period from cycle start	Proximity switch is defective, possibly consult Liebherr customer service

4 Slewing ring connection

4.1 Greasing the slewing ring

Before and after long breaks in operation, especially before and after a possible winter break, carry out the lubrication procedure with special care to ensure the best possible corrosion protection.
If the crane has not been moved for more than 3 months, then it must be lubricated every 3 months with an external grease pump until grease emerges from all grease points. Then the relevant crane movement must be repeated several times and the lubrication procedure must be carried out again.

▶ Grease exterior of slewing ring.

4.2 Tilt play of roller ring connection

The wear of the roller ring connection is determined by measuring the “tilt play” with the ring installed.

Note

▶ The determination of the “tilt play” must be carried out according to the **test instructions** of **Liebherr-Werk Ehingen GmbH**.

▶ Contact the Service Dept. at **Liebherr-Werk Ehingen GmbH** for **test instructions**.

DANGER

Danger of accident if tilt play of roller ring connection is too large!
If the permissible tilt play of 2.0 mm is exceeded, then safe crane operation is no longer possible.

▶ Replace the roller ring connection if the tilt play is larger than 2.0 mm!

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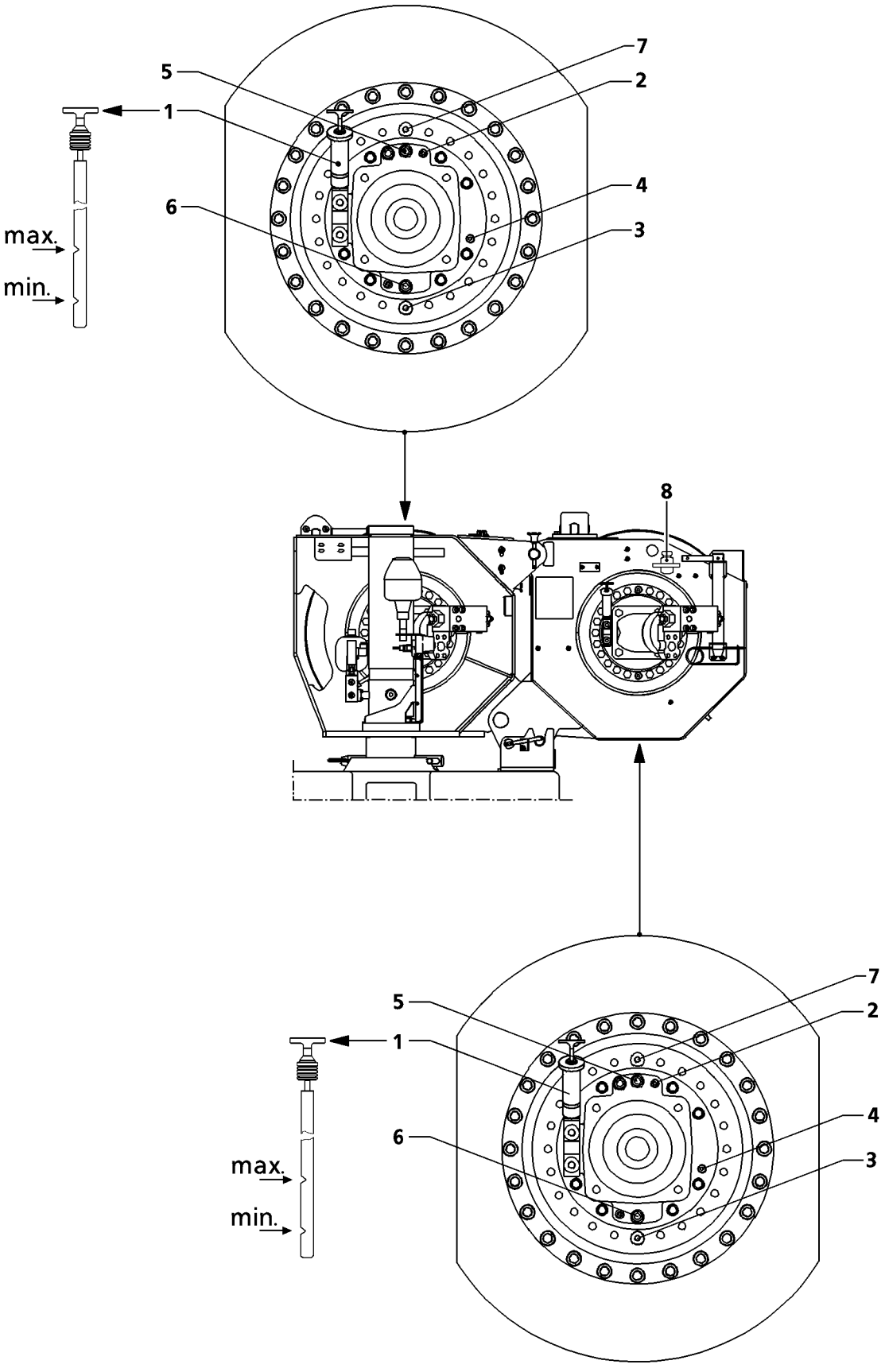

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5 Winches

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

5.1 Winch 1 / winch 2

5.1.1 Overflow container 8

When the oil heats up in the hydraulic motor of winch 2, the oil can enter the overflow container **8** via a non-return valve, but cannot flow back into the hydraulic system after cooling. For this reason the oil that has collected in the overflow container **8** must be disposed of at regular intervals.

5.2 Hoist gear

Make sure that the following prerequisites are met:

– The hoist gear is inactive.
– The crane is in horizontal position.

5.2.1 Checking the oil level

▶ Remove the dipstick **1** and wipe it off.
▶ Reinsert the dipstick **1** and pull it out again.

The oil level must be between the min. and max. marks on the dipstick **1**.

▶ Check the oil level.

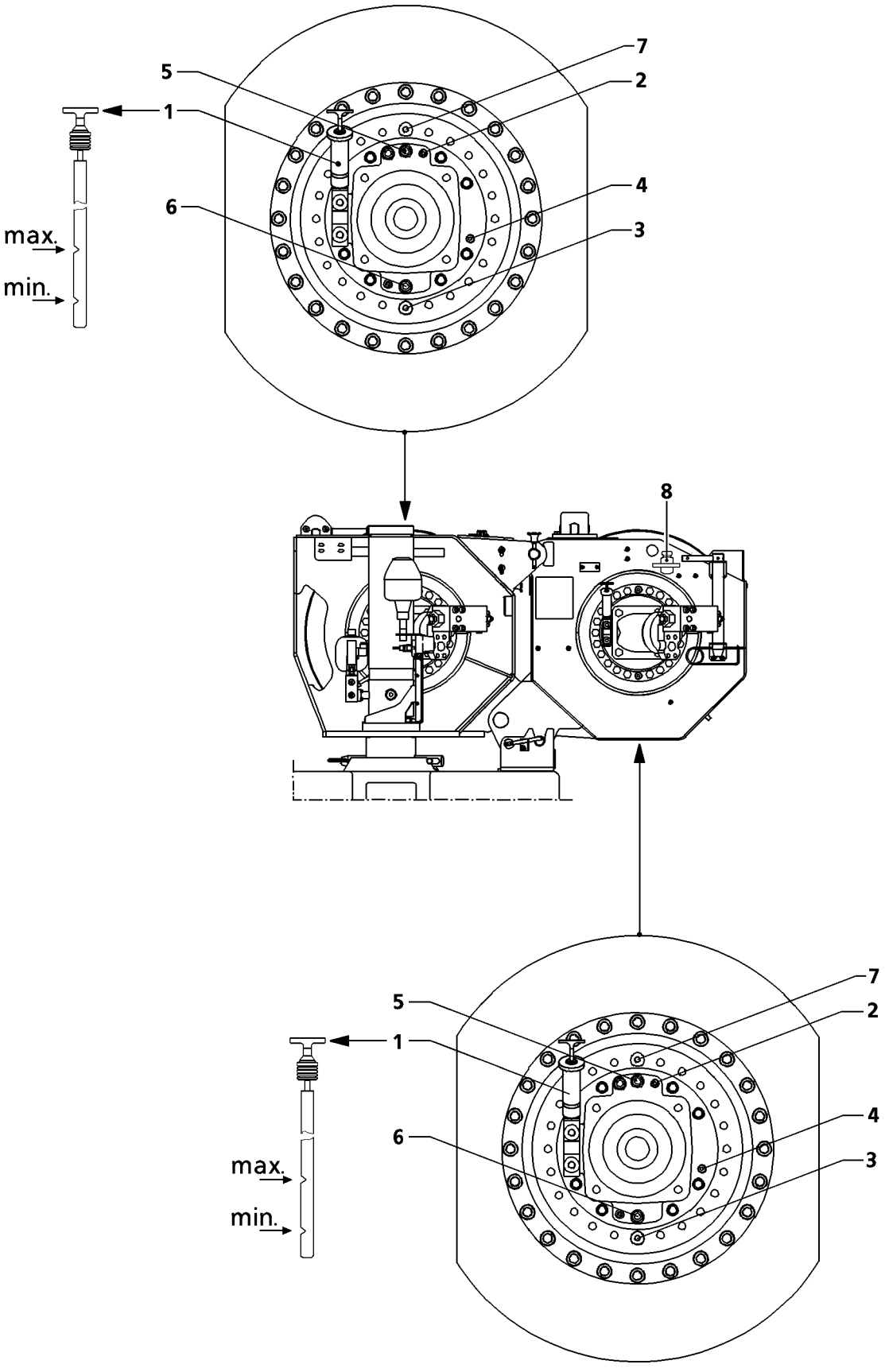
CAUTION
Danger of gear damage!
If the oil level has dropped below the minimum mark, add oil according to the lubrication chart until the oil level is between the minimum and maximum mark.

▶ Add oil and check again.

▶ Reinsert the dipstick **1**.

5.2.2 Changing the oil

▶ Unscrew the breather screw **2**.
▶ Unscrew the oil drain plug **3** with seal ring and drain oil into a suitable container.
▶ Install the oil drain plug **3** with new seal ring and tighten.
▶ Remove the oil filler plug **7**.
▶ Replenish with oil at oil filler plug **7** in accordance with lubrication chart.
▶ Screw in and tighten the vent screw **2** and the oil filler plug **7**.
▶ Check the oil level as described above.



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5.3 Hoist gear brake

Make sure that the following prerequisites are met:
– The hoist gear is inactive.
– The crane is in horizontal position.

5.3.1 Checking the oil level

▶ Remove the screw **4**.

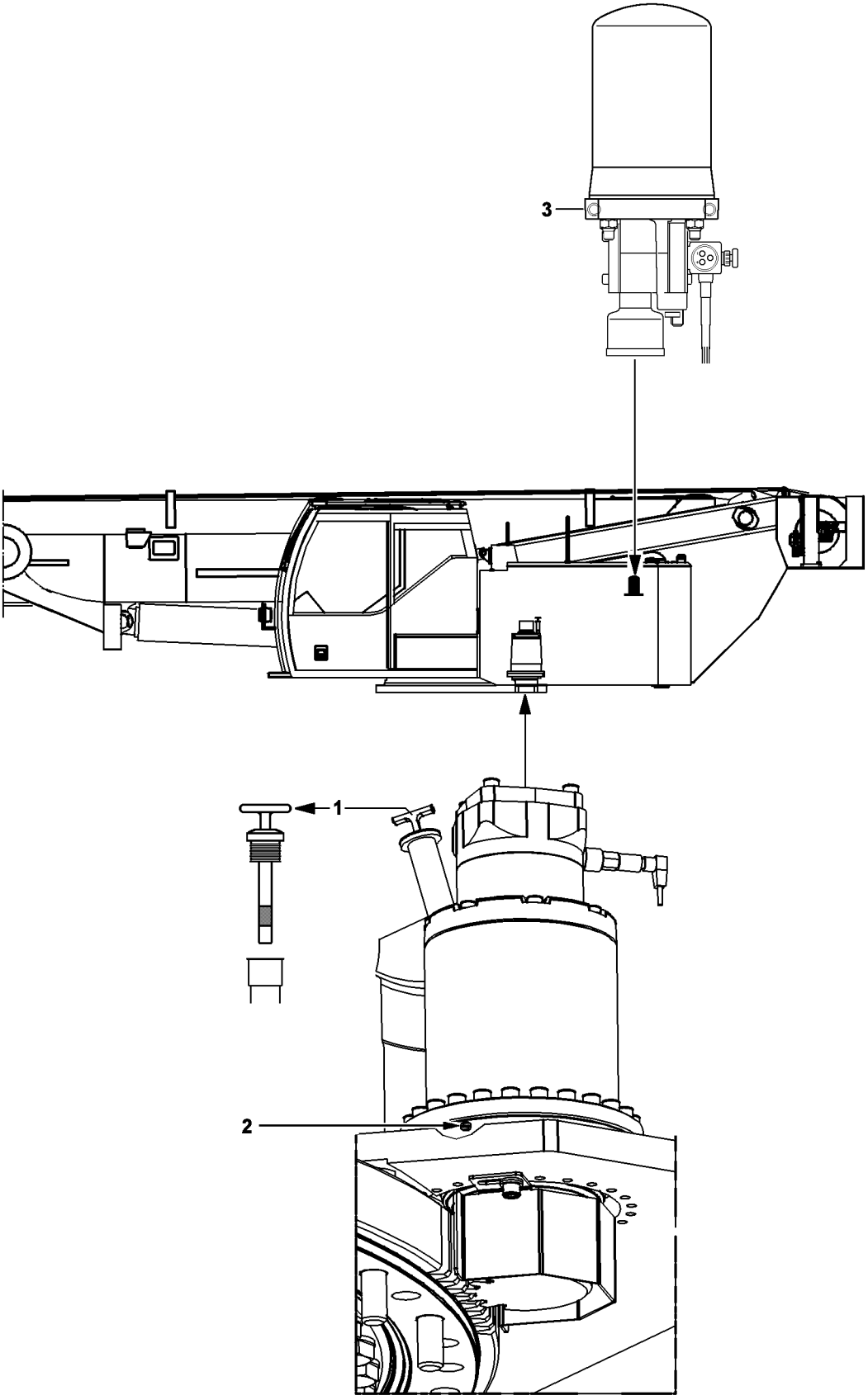
The oil level must reach the edge of the bore.
▶ Perform a visual inspection.

CAUTION
Danger of gear damage!
▶ If the oil level has dropped, add oil as specified in the lubrication chart until it overflows on the filler port.

▶ Clean the sealing surfaces on the housing and on the plug.
▶ Reinstall the screw **4** and tighten.

5.3.2 Changing the oil

▶ Remove the oil filler plug **5** and clean the sealing surface.
▶ Unscrew the oil drain plug **6** with seal ring and drain oil into a suitable container.
▶ Clean the oil drain plug **6** and sealing surface on the housing.
▶ Install the oil drain plug **6** with new seal ring and tighten.
▶ Add oil according to the lubrication chart on the filler port until the oil starts to overflow at the opening **4**.
▶ Clean the oil filler plug **5** and reinstall it with a new seal ring and tighten.
▶ Check the oil level as described above.



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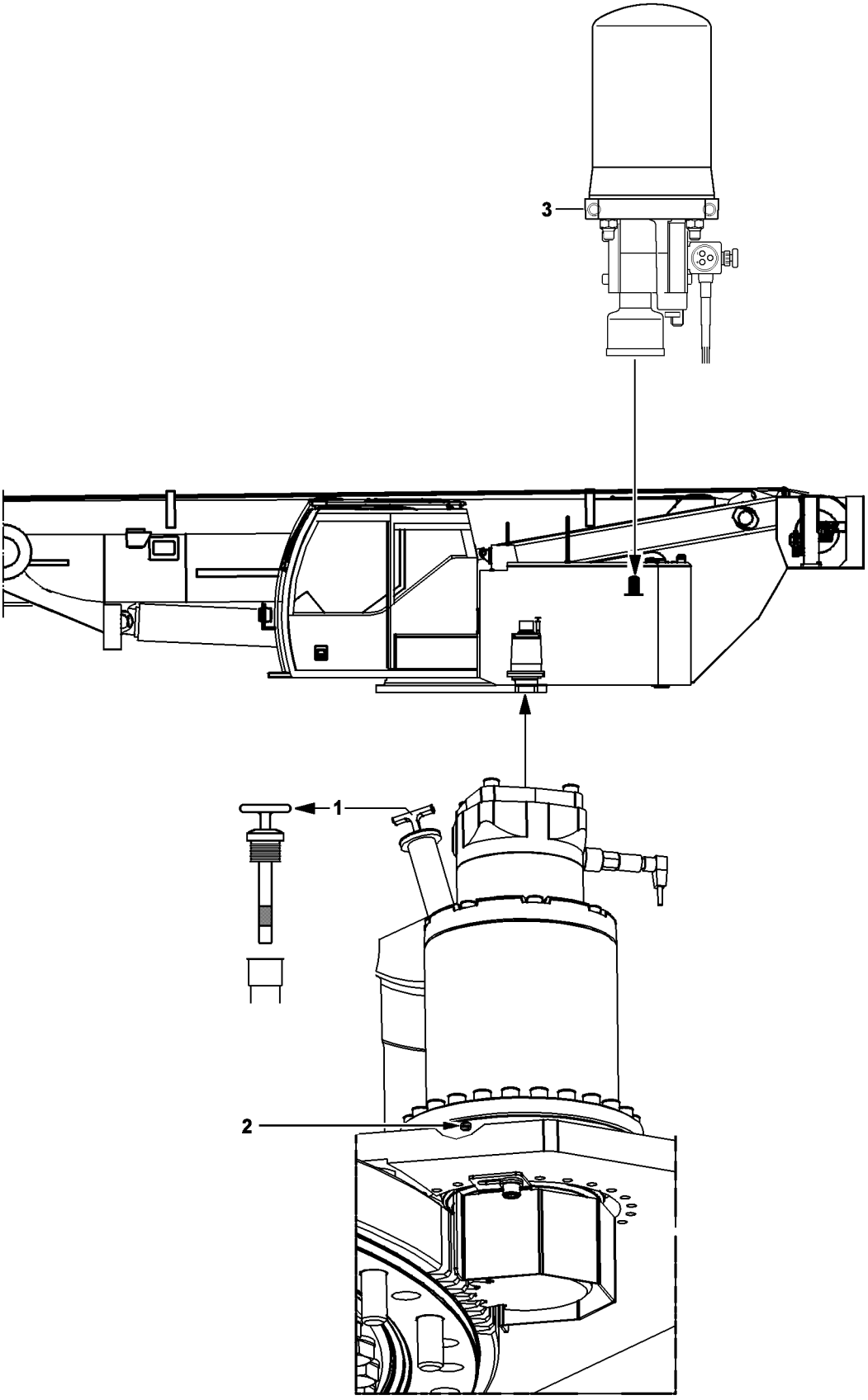
6 Air dryer of the compressed air system of the crane superstructure

The air dryer **3** of the compressed air system of the crane's superstructure is maintenance-free.

6.1 Replacing the granular cartridge

CAUTION
Danger!
The granular cartridge is under spring tension.
▶ Caution when replacing the granular cartridge.

▶ Replace the granular cartridge once a year.



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7 Slewing gear

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

7.1 Checking the oil level

Make sure that the following prerequisites are met:
– The crane is in horizontal position.

▶ Remove the dipstick **1** and wipe it off.
▶ Reinsert the dipstick **1** and pull it out again.

The oil level must be between the two notches on the dipstick **1**.
▶ Check the oil level.

CAUTION
Danger of gear damage!
If the oil level has dropped below the lower notch, add oil as specified in the lubrication chart until the oil level is between the two notches.
▶ Add oil and check again.

▶ Reinsert the dipstick **1**.

7.2 Changing the oil

Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The gear is warm.

▶ Open the oil filler port by unscrewing the dipstick **1**.
▶ Remove the oil drain plug **2** with the seal ring and drain the oil.
▶ Clean the oil drain plug **2** and sealing surface on the housing.
▶ Install the oil drain plug **2** with new seal ring and tighten.
▶ Add oil as specified in the lubrication chart on the oil filler port until the oil level is between the two notches on the dipstick **1**.
▶ Close the oil filler port by screwing in the dipstick **1**.
▶ Check the oil level as described above.

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
Danger 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 users 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!

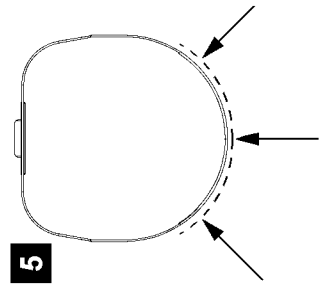
Recharging example: A battery with 170 Ah should be charged with a maximum charging current of 17.0 A.
▶ Frozen batteries must be thawed out before charging.
▶ Remove all plugs before charging.
▶ Provide ventilation during charging (risk of oxyhydrogen gas explosion!).
▶ Connect the battery to a battery 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 transfer 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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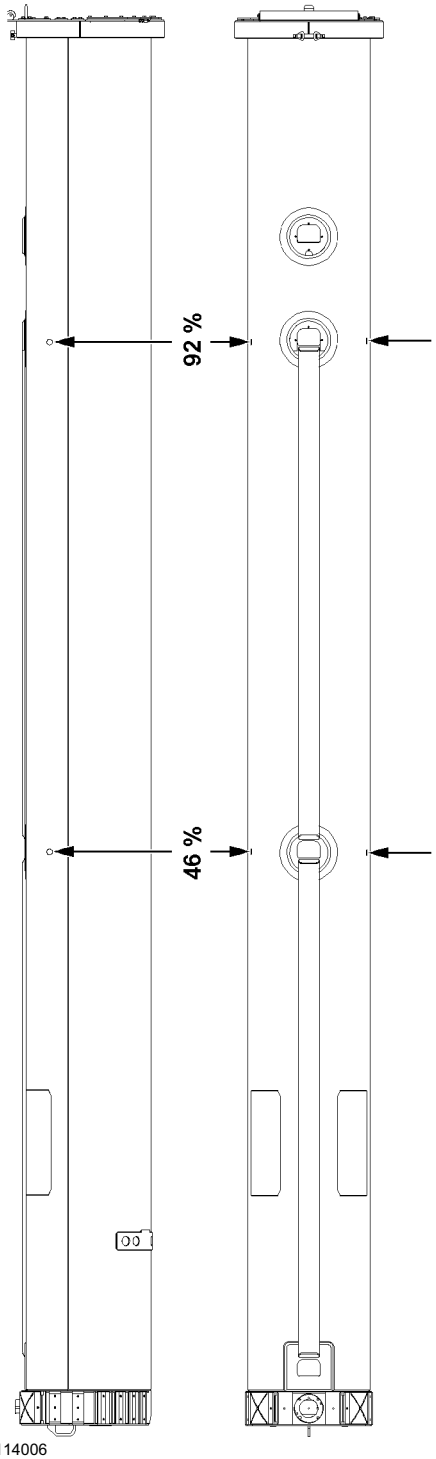

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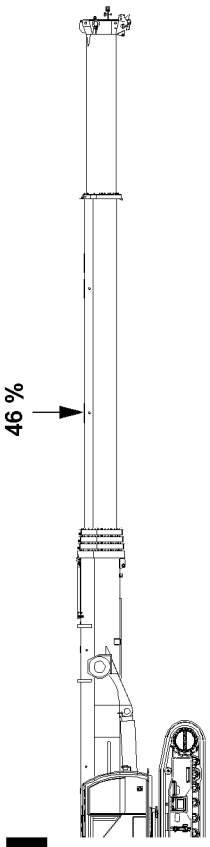

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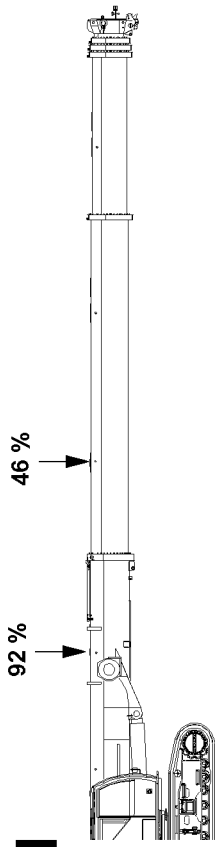

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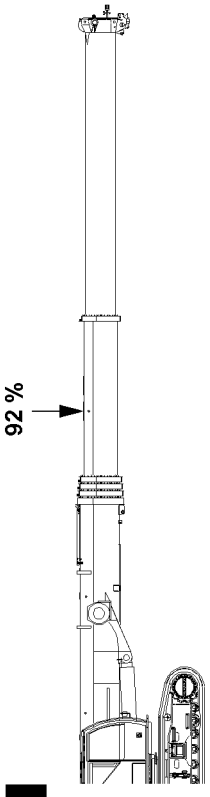

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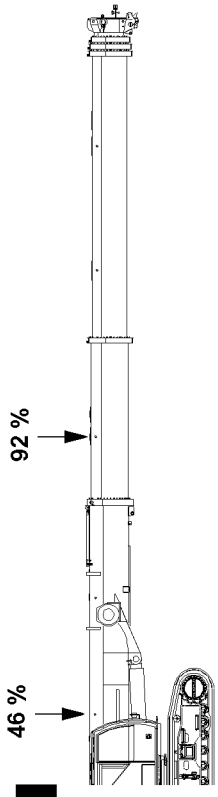

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9 Telescopic boom

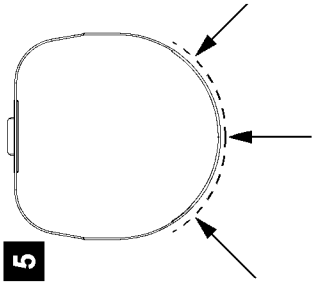
9.1 Lubricating the telescopic boom

WARNING
The crane can topple over!
When lubricating the telescopic boom and the specified extension conditions of the telescopes are deviated from, there is a danger of accidents!
The crane can topple over and kill or severely injure personnel!
- ▶ For lubrication, adhere to the specified extension conditions of the telescopes!
- ▶ Do not telescope out more telescoping sections than specified!

WARNING
Danger of accident!
During telescoping, no personnel may remain within the danger zone of the telescopic boom!
Personnel can be killed or seriously injured!
- ▶ Make sure that during telescoping no personnel remains within the danger zone of the telescopic boom!
- ▶ Lubricate the telescopic boom only in resting status!

Note
- ▶ For the gliding surfaces of the telescopic boom use special grease according to the lubrication chart as lubricant, see Crane operating instructions, chapter 7.07.
- ▶ To grease the outer glide surfaces, every telescoping section can be telescoped out individually to 100 %.
- ▶ The inner gliding surfaces of the telescoping sections (plastic glide bearing plates) are lubricated via grease fittings.
- ▶ These grease fittings can be accessed from the outside via inspection openings on both sides of the pivot section as well as on the telescoping sections.
- ▶ If the telescopic boom is pinned on the respective point, the grease fittings on the bearing shoes are automatically in the correct position.

Make sure that the following prerequisites are met:
- – The crawler track is set and aligned to“wide track”.
- – At least a counterweight of 10.0 t is installed on the turntable.
- – The central ballast with 15 t is installed on the crawler center section.
- – The folding jib is disassembled.
- – No hook block is reeved (reeved n=1).
- – No telescopic boom extension is installed.
- – The hoist rope is spooled up and secured on the winch.
- – The LICCON overload safety device has been set according to the set up condition.
- – The telescopic boom is in horizontal position (0°- main boom angle).
- – The telescoping program is selected on the LICCON computer system, see Crane operating instructions, chapter 4.05.



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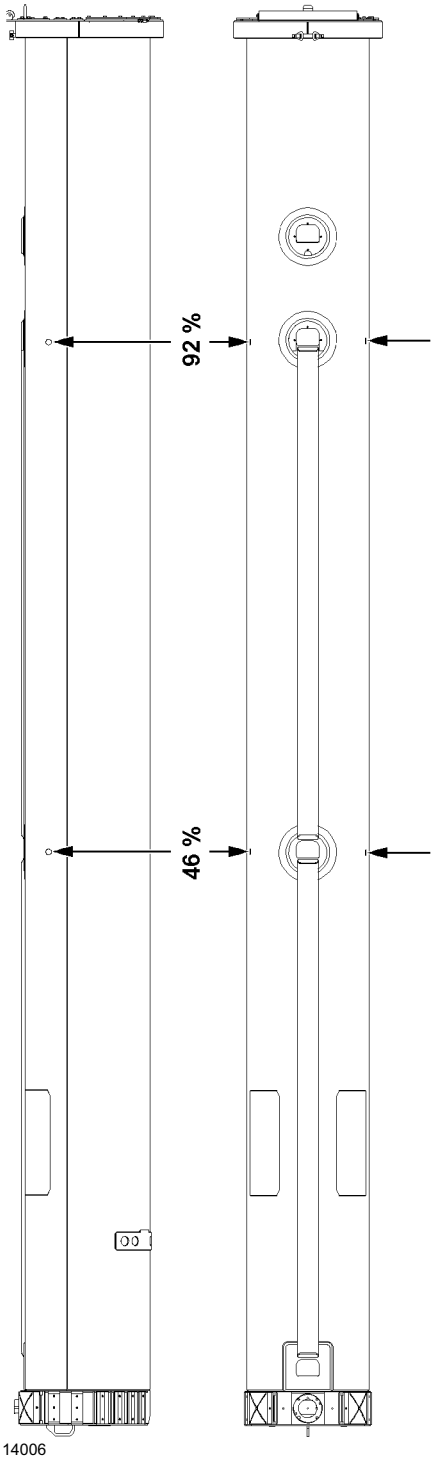

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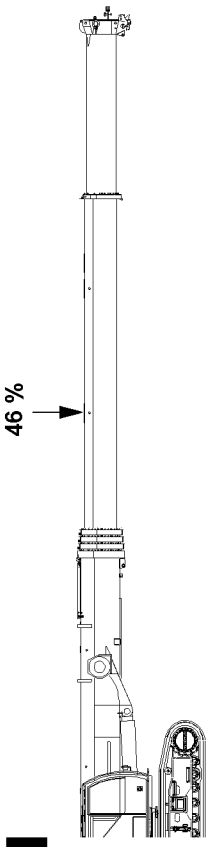

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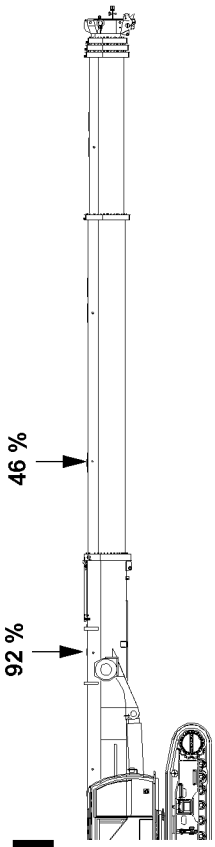

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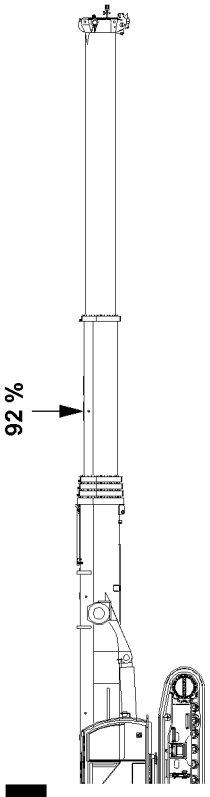

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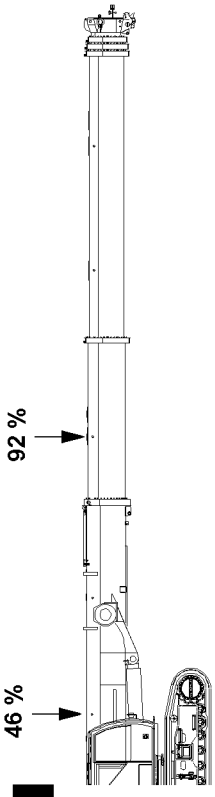

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9.1.1 Lubricating on the inspection ports

Make sure that the following prerequisite is met:

– The telescopic boom is fully telescoped in.

Extension conditions of telescope	Lube points
(0/0/0/46/92)	Lubricate on the 92 % inspection ports on telescoping section 4, see illustration **1** .
(0/0/0/92/46)	Lubricate on the 46 % inspection ports on telescoping section 4, see illustration **2** .
(0/0/46/92/0)	Lubricate on the 92 % inspection ports on telescopic section 3.
(0/0/92/46/0)	Lubricate on the 46 % inspection ports on telescopic section 3.
(0/46/92/0/0)	Lubricate on the 92 % inspection ports on telescopic section 2.
(0/92/46/0/0)	Lubricate on the 46 % inspection ports on telescopic section 2.
(46/92/0/0/0)	Lubricate on the 46 % inspection ports on the pivot section and on the 92 % inspection ports on telescoping section 1, see illustration **3** .
(92/46/0/0/0)	Lubricate on the 92 % inspection ports on the pivot section and on the 46 % inspection ports on telescoping section 1, see illustration **4** .

▶ Run all extension conditions of the telescopes one after the other and lubricate the telescopic sections at the lube points.

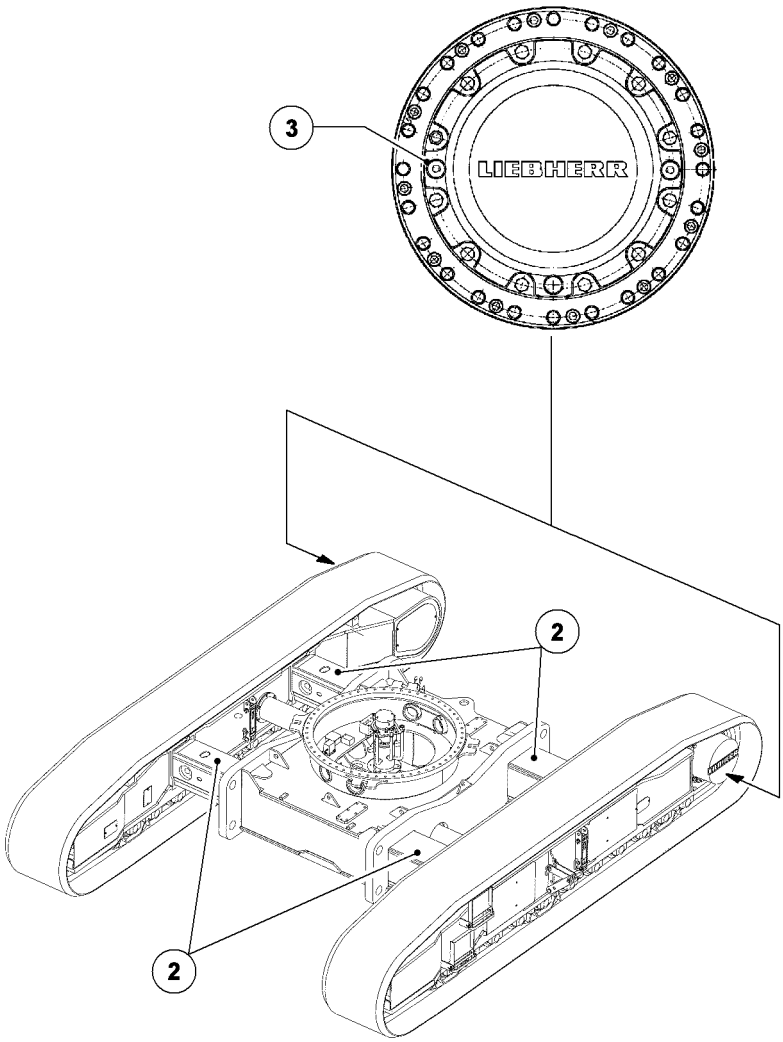
9.1.2 Lubricate the sliding surfaces

▶ Telescope every telescoping section out individually to 100 % and spray special grease on the outer gliding surfaces, see illustration **5**.

Note

Optimum lubrication result

▶ To obtain an optimum lubrication result, let the sprayed on special grease cure four to eight hours before telescoping in!



B198732

1 Crane chassis

Lubrication chart legend:

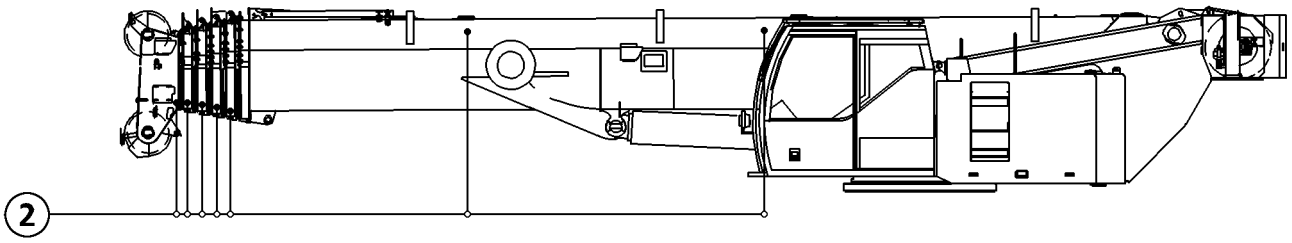
2 Lubricating grease
3 Gear oil

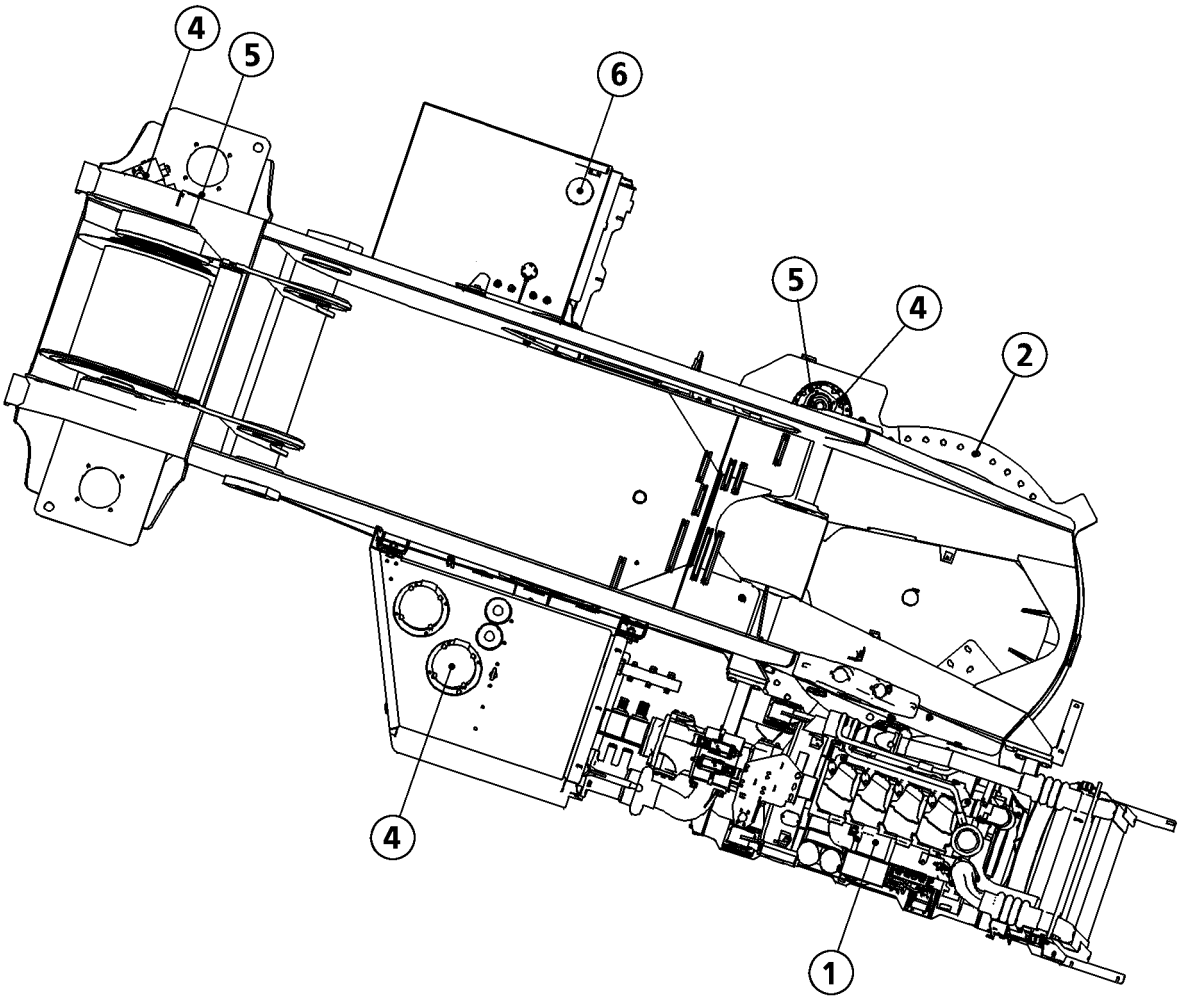
Fill chart
The specified filling quantities are orientation values. The markings on the dipsticks, inspection openings and viewing glasses are decisive for filling.

CAUTION
Danger of damage!
▶ Do not mix synthetic oils with mineral oils.

Assembly	Medium	Dosage
Travel gear	Gear oil	12.0 l
Beams (travel track adjustment)[1]	Lubricating grease	as necessary

[1] Before conversion from wide track to reduced or retracted track, the beams must be thoroughly cleaned, followed by **careful** lubrication with grease of the sliding surfaces.





B102858

2 Crane superstructure

Lubrication chart legend:

1 Engine oil
2 Lubricating grease
3 Gear oil
4 ATF
5 Synthetic gear oil
6 Diesel fuel

Fill chart
The specified filling quantities are orientation values. The markings on the dipsticks, inspection openings and viewing glasses are decisive for filling.

CAUTION
Danger of damage!
▶ Do not mix synthetic oils with mineral oils.

Assembly	Medium	Dosage
Crane engine	Engine oil	25.0 l
Crane engine	Coolant	35.0 l
Fuel tank	Diesel fuel	727.0 l
Winch 1	Synthetic gear oil	5.0 l
Winch brake, winch 1	ATF	0.2 l
Winch 2	Synthetic gear oil	5.0 l
Winch brake, winch 2	ATF	0.2 l
Slewing gear transmission	Synthetic gear oil	3.7 l
Slewing gear brake	ATF	0.2 l
Hydraulic fluid reservoir of the crane hydraulic system [1]	ATF	653.0 l
Central lubricating system	Special grease	2.0 kg
Friction bearing of boom	Special oil spray	3.0 kg
Slewing ring	Adhesive grease	0.5 kg

[1] When the oil level is checked, all hydraulic cylinders must be retracted. The oil level must be in the middle of the inspection glass.

B195219

1 Specified service items and lubricants for Liebherr cranes

1.1 Service items and lubricants

Note

- To improve the cold start ability of the diesel engine at an ambient temperature below -10 °C, we recommend the use of the following engine oil:
- Viscosity grade SAE 5W-30 according to specification ACEA E6.
- **LWE Id. No.: 11100934**!

Line	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
1	Diesel engine	**LWE Id. No.: 10663796** SAE 10W-40 low ash ACEA E6 Observe the instructions of the engine manufacturer **Below -20 °C** with pre-heating	**LWE Id. No.: 11100934** SAE 5W-30 low ash ACEA E6 Observe the instructions of the engine manufacturer **Below -20 °C** with pre-heating
2	Drive axle With differential locks, Planetary gear and Installed distributor gear	**LWE Id. No.: 861901008** SAE 90 API GL 5	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5
3	Axle drive ZF DK-7	**LWE Id. No.: 861901008** ZF TE-ML 05	**LWE Id. No.: 10425142** ZF TE-ML 05
4	Vehicle distributor gear KESSLER VG 1800, VG 2400, VG 2550, VG 2600, VG 3750 W 3750 ZF Passau, STEYR PUCH VG 1200, VG 1600, VG 2000, VG 3800	**LWE Id. No.: 861901008** SAE 90 API GL 5 ZF TE-ML 19	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5 ZF TE-ML 19
5	Offset gear (drop box) ZF Passau, STEYR PUCH	**LWE Id. No.: 861901008** ZF TE-ML 19	**LWE Id. No.: 10425142** ZF TE-ML 19

1.2 Service items and lubricants (continuation)

Line	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
6.1	Pump distributor gear Filled with **mineral** gear oil	**LWE Id. No.: 861901008** SAE 90 API GL 5	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5
6.2	Pump distributor gear Filled with **synthetic** gear oil	**LWE Id. No.: 861901208** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**	**LWE Id. No.: 10664125** CLP PG 150, DIN 51517-3 **WARNING: May not be mixed with other oils!**
6.3	Pump distributor gear LTC 1055-3.1	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5
6.4	Pump distributor gear LTM 1750–9.1 Primary aggregate Secondary aggregate	**LWE Id. No.: 861900608** ATF Dexron II D	**LWE Id. No.: 861900608** ATF Dexron II D

1.3 Service items and lubricants (continuation)

Line	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
7.1	Powershift transmission ZF Torque converter transmission WG 120, WG 150, WG 180, WG 181, WG 200, WG 201	**LWE Id. No.: 8610240** ZF TE-ML 03 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861900608** ZF TE-ML 03 **Below -20 °C** run until warm according to operating instructions
7.2	Powershift transmission ZF torque converter WG 251* ZF ERGOPOWER WG 210, WG 260, WG 310 * also for ambient temperatures above -10 °C	**LWE Id. No.: 861900608** ZF TE-ML 03 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861900608** ZF TE-ML 03 **Below -20 °C** run until warm according to operating instructions
8	Powershift transmission CLARK	**LWE Id. No.: 8610240** SAE 10W-40 ACEA E4 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ALLISON C4 **Below -20 °C** run until warm according to operating instructions
9	Offset gear (drop box) ALLISON	**LWE Id. No.: 8610240** SAE 10W-40 API CF, ACEA E4 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ALLISON C4 **Below -20 °C** run until warm according to operating instructions

1.4 Service items and lubricants (continuation)

Line	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
10.1	Automatic transmission ALLISON CLBT 740, CLBT 750, CLBT 754, CLBT 755, HT 755, HD 4560	ATF Dexron III ALLISON C4 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861903708** CASTROL Transynd **Below -20 °C** run until warm according to operating instructions
10.2	Automatic transmission ZF	**LWE Id. No.: 861900608** ZF TE-ML 14 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861900608** ZF TE-ML 14 **Below -20 °C** run until warm according to operating instructions
11	Automatic transmission ZF AS-Tronic ZF TC-Tronic (basic gear) ZF TC-Tronic HD (basic gear)	**LWE Id. No.: 10218305** ZF-Ecofluid M ZF TE-ML 02	**LWE Id. No.: 10218305** ZF-Ecofluid M ZF TE-ML 02 **below -20 °C** preheat gear according to operating instructions
12.1	Converter clutch unit ZF TC HD	**LWE Id. No.: 10218305** ZF-Ecofluid M ZF TE-ML 02	**LWE Id. No.: 10218305** ZF-Ecofluid M ZF TE-ML 02 **below -20 °C** preheat gear according to operating instructions
12.2	Converter clutch unit ZF TC 2	**LWE Id. No.: 861900608** ZF TE-ML 14	**LWE Id. No.: 861900608** ZF TE-ML 14
13	Gearbox ZF ECO-Split	**LWE Id. No.: 10218305** ZF Ecofluid M ZF TE-ML 02	**LWE Id. No.: 10218305** ZF Ecofluid M ZF TE-ML 02

1.5 Service items and lubricants (continuation)

Line	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
14	Rope winch	**LWE Id. No.: 861901208** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**	**LWE Id. No.: 861901208** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**
15	Slewing gear	**LWE Id. No.: 861901208** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**	**LWE Id. No.: 861901208** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**
16	Winch of Telescopic boom guying	**LWE Id. No.: 861901208** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**	**LWE Id. No.: 861901208** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**
17.1	Crane hydraulics Crane chassis and crane super-structure	**LWE Id. No.: 861903508** Liebherr Hydraulic 37	**LWE Id. No.: 10293807** Liebherr Hydraulic Plus Arctic
17.2	Crane hydraulics LTC 1055-3.1	**LWE Id. No.: 10293807** Liebherr Hydraulic Plus Arctic	**LWE Id. No.: 10293807** Liebherr Hydraulic Plus Arctic
17.3	Crane hydraulics LTM 11200-9.1 Crane chassis and crane superstructure LTR 11200 Crane superstructure	**LWE Id. No.: 10293807** Liebherr Hydraulic Plus Arctic	**LWE Id. No.: 10293807** Liebherr Hydraulic Plus Arctic

1.6 Service items and lubricants (continuation)

Line	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
18	Brake system if hydraulically actuated	**LWE Id. No.: 861000108** DOT 4 SAE J 1703e	**LWE Id. No.: 861000108** DOT 4 SAE J 1703e
19	Clutch actuator	**LWE Id. No.: 861000108** DOT 4 SAE J 1703e	**LWE Id. No.: 861000108** DOT 4 SAE J 1703e
20	King pin bearing Drive shaft if **not** maintenance-free	Special regulations: Liebherr **LWE Id. No.: 861301308** Liebherr Special grease 9610 Plus	Special regulations: Liebherr **LWE Id. No.: 10296825** Liebherr Universal grease Arctic
21	Slide and roller bearing roller bearing joint	Special regulations: Liebherr **LWE Id. No.: 861301308** Liebherr Special grease 9610 Plus	Special regulations: Liebherr **LWE Id. No.: 10296825** Liebherr Universal grease Arctic
22	Central lubrication system	Special regulations: Liebherr **LWE Id. No.: 861301308** Liebherr Special grease 9610 Plus	Special regulations: Liebherr **LWE Id. No.: 10296825** Liebherr Universal grease Arctic
23	Boom lock	Special regulations: Liebherr **LWE Id. No.: 861301308** Liebherr Special grease 9610 Plus	Special regulations: Liebherr **LWE Id. No.: 10296825** Liebherr Universal grease Arctic
24	Slewing ring connection Roller bearing	Special regulations: Liebherr **LWE Id. No.: 861301308** Liebherr Special grease 9610 Plus	Special regulations: Liebherr **LWE Id. No.: 10296825** Liebherr Universal grease Arctic

1.7 Service items and lubricants (continuation)

Line	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
25	Support pad with equalization Glide shoes of cab guide on vehicle frame LTC 1045-3.1	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus
26	Plastic slide bearing Sliding beam Beam for track adjustment	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus
27	Plastic slide bearing Telescopic boom	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus
28	Outer slide bearing Telescopic boom Guide rail on Telescoping cylinder	Special regulations: Liebherr **LWE Id. No.: 861303308** Liebherr Special grease 1336 (Spray grease)	Special regulations: Liebherr **LWE Id. No.: 861303308** Liebherr Special grease 1336 (Spray grease)
29	Inner slide bearing Telescopic boom (only during assembly)	Special regulations: Liebherr **LWE Id. No.: 861303308** Liebherr Special grease 1336 (Spray grease)	Special regulations: Liebherr **LWE Id. No.: 861303308** Liebherr Special grease 1336 (Spray grease)

1.8 Service items and lubricants (continuation)

Line	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
30	Gear ring rotary connection Slewing gear drive pinion	Special regulations: Liebherr **LWE Id. No.: 861007708** RHS-Fluid	Special regulations: Liebherr **LWE Id. No.: 861007708** RHS-Fluid
31	Running rope	**LWE Id. No.: 10173371** Liebherr WR-Lube SC	**LWE Id. No.: 10173371** Liebherr WR-Lube SC
32	Radiator fluid Diesel engine and heating system	Special regulations: Liebherr **LWE Id. No.: 861600508** 50 % anti-corrosion fluid / antifreeze 50 % water **WARNING: May not be mixed with other anti-corrosion fluid / antifreeze!**	Special regulations: Liebherr **LWE Id. No.: 861600508** 50 % anti-corrosion fluid / antifreeze 50 % water **WARNING: May not be mixed with other anti-corrosion fluid / antifreeze!**
33.1	Travel gears Crawler crane	see data tag	see data tag
33.2	Travel gear LTR 1060, LTR 1100	**LWE Id. No.: 861901008** SAE 90 API GL 5	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5
33.3	Travel gear LTR 11200	**LWE Id. No.: 861901208** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**	**LWE Id. No.: 861901208** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**
34	Recovery winch	See data tag and manufacturer's instructions	See data tag and manufacturer's instructions
35	Recovery winch rope	See manufacturer's instructions	See manufacturer's instructions
36	Steering uncoupling LTC 1045-3.1	**LWE Id. No.: 10800345** Teflon Spray	**LWE Id. No.: 10800345** Teflon Spray

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1 Procedure to follow in case of a problem

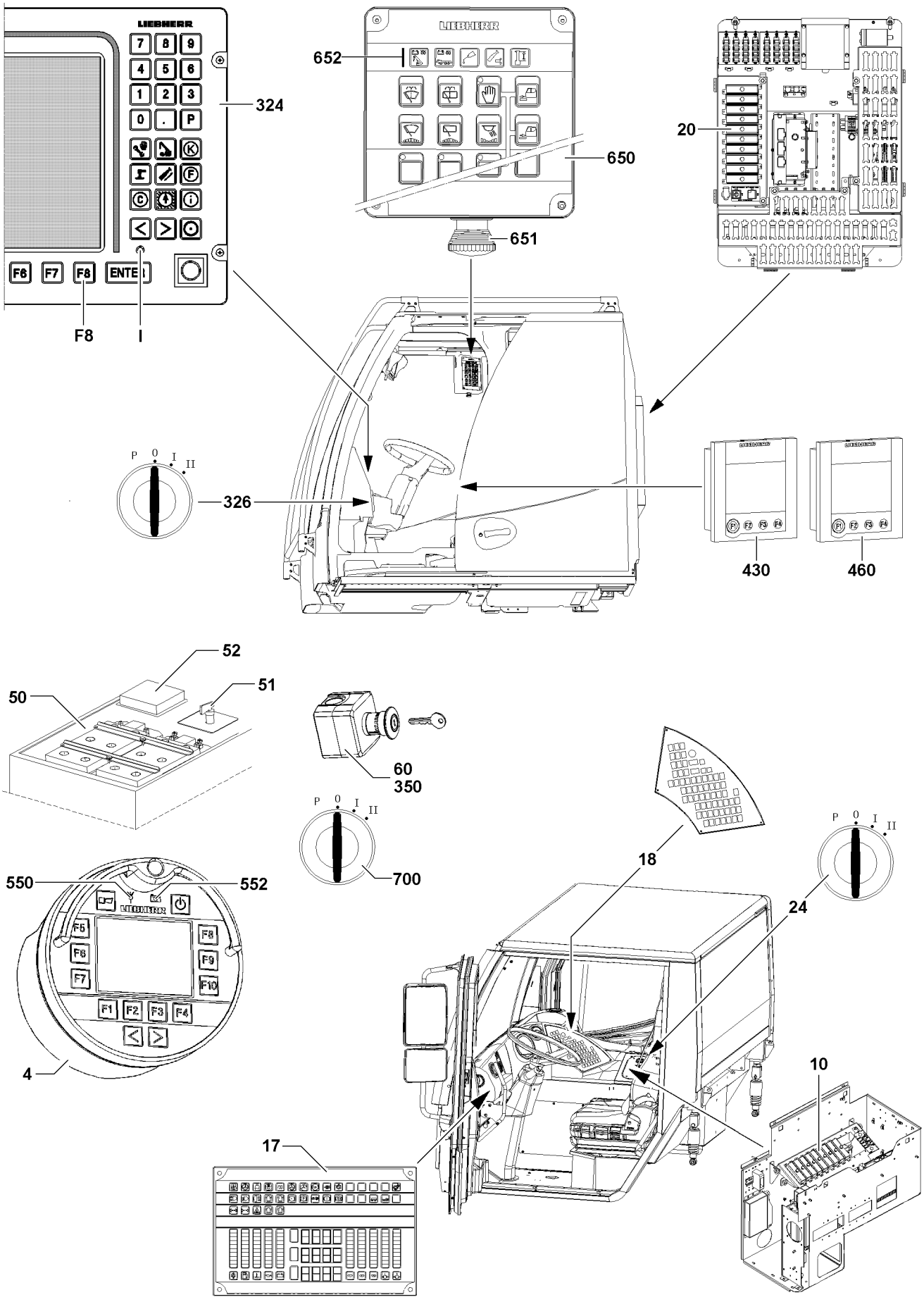
This chapter is supportive for the following questions:
- What to do in case of a problem?
- Which displays and component groups are relevant for error diagnostics?
- How can an error diagnostics be carried out?
- How to proceed in case of error messages of the LICCON computer system?
- Which measures are to be taken for defective components?
- Which measures are to be taken in clear problem cases?
- Which data is important for communication with Liebherr Service?

WARNING
Erroneous or insufficient repair!
If a crane is not properly or insufficiently repaired, then his can result in accidents!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ The crane may only be repaired by authorized and trained expert personnel!

WARNING
Measures without the help of Liebherr Service!
Measures in case of a problem, which are carried out without consulting Liebherr Service can cause damage to the crane!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.

WARNING
Problems with raised load!
If a crane is checked, diagnosed or repaired with a raised load, then there is a danger of accidents!
During accidents, personnel could be killed or seriously injured!
This could result in property damage!
▶ If possible, set the load down!
▶ If possible, telescope in / place down the boom system!
▶ If the load cannot be set down and / or the boom system cannot be telescoped in / placed down, secure a wide-ranging danger zone!

Note
▶ The display illustrations in this chapter are only examples. The display values may differ depending on the crane. In addition, some illustrations show a display with multiple icons. In normal crane operation, an identical display may **not** appear on the LICCON monitor.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
F6 F7 F8 ENTER
324
F8
I
652
650
651
20
326
P 0 I II
430
460
52
50
51
60
350
700
550
552
F5 F6 F7 F8 F9 F10 F1 F2 F3 F4
4
18
24
10
17

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1.1 Overview of displays and component groups for error diagnostics

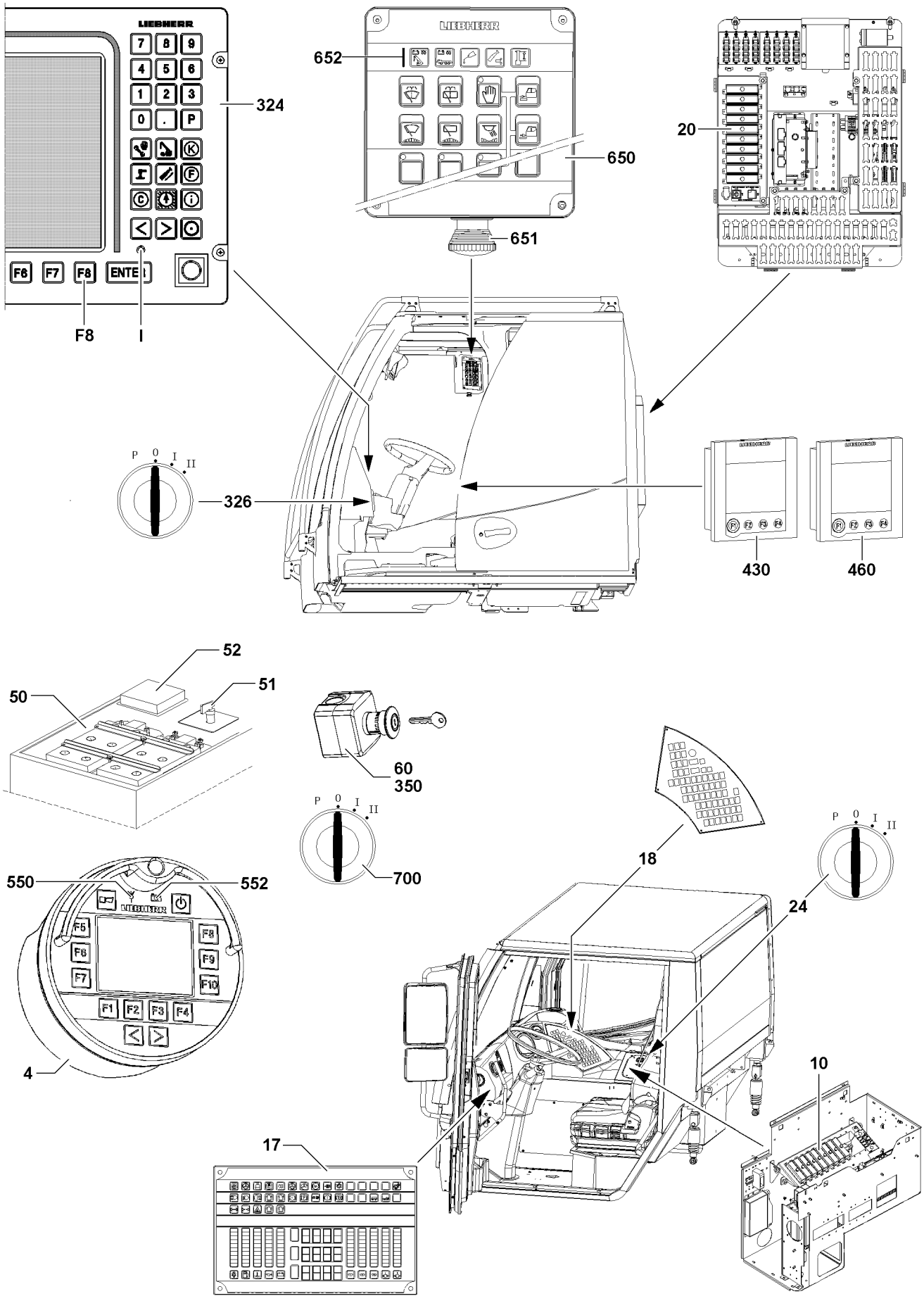
Various displays and component groups allow the crane driver:
- To localize error messages.
- To prepare quicker and more precise communication with Liebherr Service.
- To diagnose and remedy errors with the help of the “Diagnostics operating instructions”.

Note
- ▶ Displays and components in the driver's cab are only relevant for cranes with Liebherr crane chassis!
- ▶ If separate Operating instructions have been provided by the supplier as part of the scope of delivery for the crane, then it must be observed!

Position	Driver's cab (only Liebherr LTM chassis)
10	Fuses in driver's cab
17	Display unit
18	Operating unit
24	Ignition switch Driver's cab

Position	EMERGENCY STOP switch (location and number depending on crane type)
60	EMERGENCY STOP switch in chassis*
350	EMERGENCY STOP switch in crane superstructure*
651	EMERGENCY STOP switch in BKE

Position	Crane operator's cab
20	Fuses in crane operator's cab
324	LICCON monitor
F8	Function key
I	LED supply voltage
326	Ignition switch
430	Touch display left (only certain crane types)
460	Touch display right (only certain crane types)
650	Operating and control unit BKE (only certain crane types)
652	Indicator lights BKE (only certain crane types)


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
F6 F7 F8 ENTER
324
F8
I
652
650
651
20
326
P 0 I II
430
460
52
50
51
60
350
700
550
552
F5 F6 F7 F8 F9 F10
F1 F2 F3 F4
4
18
24
10
17

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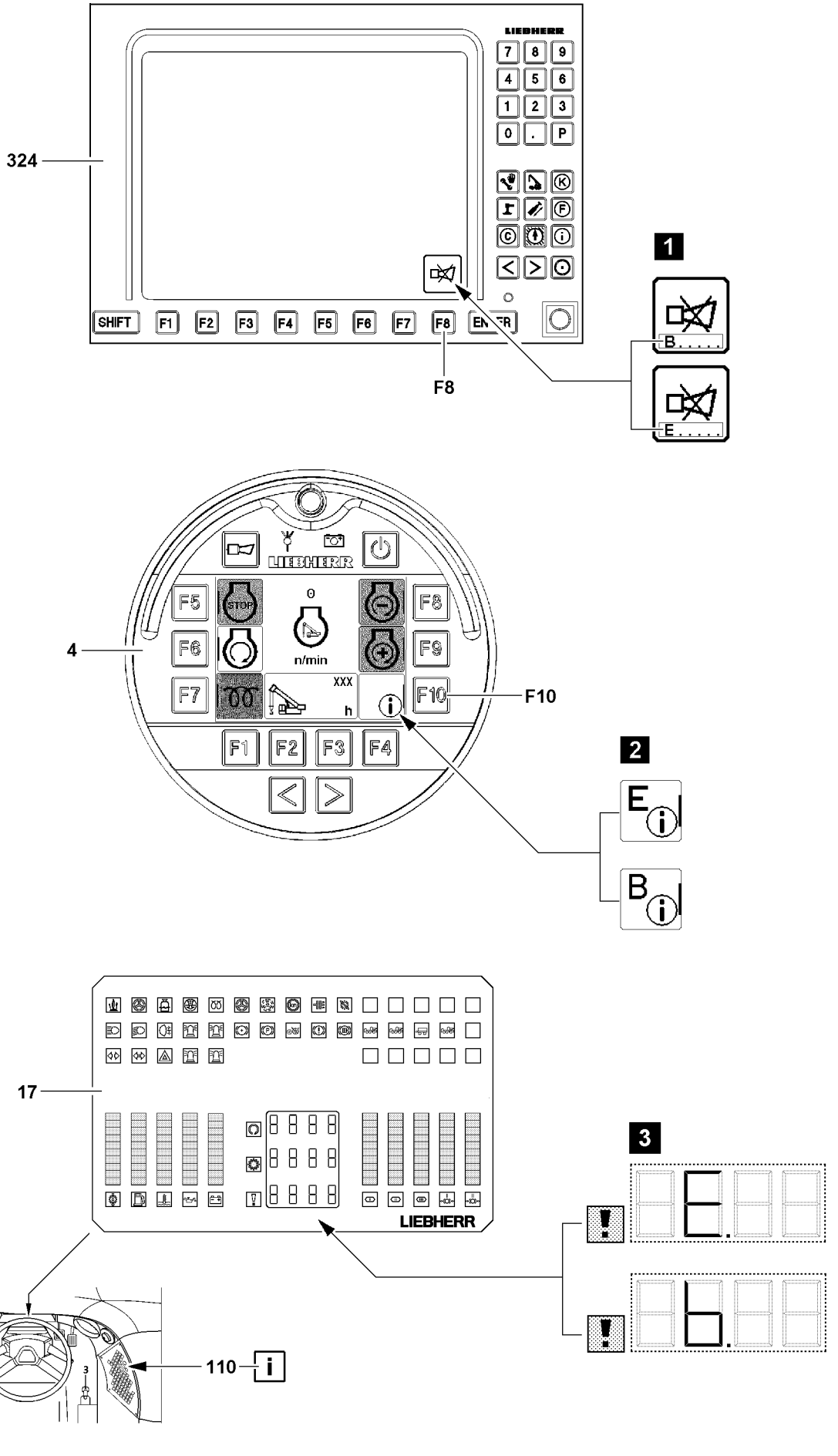
Position	Bluetooth™ Terminal BTT (abbreviated BTT, only certain crane types)
4	BTT
550	Indicator light transmission signal
552	Indicator light charge condition

Position	Battery box (sample illustration - location and number depending on crane type)
50	Battery box
51	Battery master switch
52	Main fuses

Position	Ignition switch on frame
700	Ignition switch (only certain crane types)


324
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8
F8
1
B . . . . .
E . . . . .
4
LIEBHERR
F5 STOP
F6
F7
0
n/min
XXX
h
F8
F9
F10
F10
F1 F2 F3 F4
2
E
B
17
LIEBHERR
3
E.
b.
110
B112957

1.2 Type of problem

Problems can be assigned to various error sources:

– Operating errors
  • Displayed by error number / LEC: B.....
  • To be remedied by crane operator.
– System errors in LICCON computer system
  • Displayed by error number / LEC: E.....
  • To be remedied by crane operator / Liebherr Service.
– Errors on mechanics / components
  • To be remedied by crane operator / Liebherr Service.
– Combination of error sources
  • To be remedied by crane operator / Liebherr Service.

Note

LICCON Error Code Manual (LICCON Error code list)

▶ All error numbers / LEC are listed in the “LICCON Error Code Manual” (LICCON error code list).

2 Carry out error diagnostics

The crane is monitored:

– By the LICCON computer system for operating / system errors.
– By indicator lights.

If errors occur, error messages are issued and / or indicator lights light up.
Error messages appear in:

– Horn icon of LICCON monitor, see illustration **1**
– Window of test system in BTT, see illustration **2**
– Window and warning light in display unit, see illustration **3**

Indicator lights are located within view:

– In the driver’s cab.
– In the Crane operator's cab.
– On Components.

WARNING

Risk of accident!

When carrying out the error diagnostics, there is a danger of accidents!

During accidents, personnel could be killed or seriously injured!

This could result in property damage!

▶ Take the crane out of service!
▶ In case of safety defects, secure the crane to prevent continued operation!
▶ The crane may only be inspected, diagnosed and repairs at a standstill and in shut down condition!
▶ Inspections, error diagnostics and repairs, for which the crane must be in operation are only permissible with extreme caution and constant visual and voice contact between all associated personnel!
▶ Inspections, error diagnostics and repairs may only be carried out by expert or trained personnel!
▶ For inspections, error diagnostics and repairs of electrical devices on the crane, power must be turned off and ensured to remain so for the duration of the work!
▶ Test operation after a repair must be made by the crane operator or in his presence!

Note
- ▶ Always observe error messages and illuminated indicator lights!
- ▶ For detailed procedure in case of error messages, see Diagnostics operating instructions, chapter 20.05.
- ▶ For overview of indicator lights on the crane chassis, see Crane operating instructions, chapter 3.01.
- ▶ For overview of indicator lights on the crane superstructure, see Crane operating instructions, chapter 4.01.

Several possibilities exist for an error diagnostics:
– Without the help of Liebherr Service.
– With the help of Liebherr Service: Error diagnostics by phone.
– With the help of Liebherr Service: Remote diagnostics.

2.1 Error diagnostics without the help of Liebherr Service

WARNING
Acting on your own authority!
If measures are carried out on your own authority in case of a problem, then this can result in damage to the crane!
Damage on the crane can cause erroneous functions and accidents!
Personnel can be severely injured or killed!
This could result in property damage!
- ▶ Observe and adhere to the notes and instructions in this chapter.
- ▶ Observe the Diagnostics operating instructions.
- ▶ In case of lack of clarity, contact Liebherr Service.
- ▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.

2.1.1 Error message in BTT

Note
- ▶ Only for crane types with BTT.

▶ After display of an error message in the BTT:
Press the function key **F10**.

Result:
– The error code is displayed on the BTT display (error determination display in the “test system”).
– In addition, all errors are listed in a separate error list (error text, cause, remedy).

In the error code, two different error types are differentiated:
– Operating errors - Error code starts with a “B”.
– System errors / application errors - Error code starts with an “E”.

▶ If an error code starts with a “B”:
Correct the operating error.

▶ If an error code starts with an “E”:
Call up the test system, see Diagnostics operating instructions.

or

In case of lack of clarity:
■ Consult Liebherr Service.

2.1.2 Error message in the display unit

▶ After display of an error message in the display unit:
Press the i-key **110**.

Result:

– The error code is shown alternately as long as the i-key **110** is pressed.

In the error code, two different error types are differentiated:

– Operating errors - Error code starts with a “b”.
– System errors / application errors - Error code starts with an “E”.

Note

LICCON Error Code Manual (LICCON Error code list)

▶ All error numbers / LEC are listed in the “LICCON Error Code Manual” (LICCON error code list).

▶ If an error code starts with a “b”:
Correct the operating error.

▶ If an error code starts with an “E”:
Call up the test system, see Diagnostics operating instructions.

or

In case of lack of clarity:

■ Consult Liebherr Service.

2.1.3 Error message in the LICCON monitor

▶ After display of an error message in the LICCON monitor:
Press the function key **F8**.

Result:

– Acoustic warning is turned off.

▶ Press function key **F8** again.

Result:

– The error code is displayed on the LICCON monitor (error determination display in the “test system”).
– In addition, all errors are listed in a separate error list (error text, cause, remedy).

In the error code, two different error types are differentiated:

– Operating errors - Error code starts with a “B”.
– System errors / application errors - Error code starts with an “E”.

▶ If an error code starts with a “B”:
Correct the operating error.

▶ If an error code starts with an “E”:
Call up the test system, see Diagnostics operating instructions.

or

In case of lack of clarity:

■ Consult Liebherr Service.

2.1.4 Calling up the test system

Note

▶ For calling up the test system, see Diagnostics operating instructions!

2.1.5 Problems on the mechanics / components of the crane

▶ Determine the damage and remedy it properly by using **original spare parts**.

2.1.6 Problems on pipes / hoses

Supply lines, return lines and control lines handle various media:
– Pneumatic pipes / hoses.
– Hydraulic pipes / hoses.
– Pipes / hoses for fluids and gases.

▶ Determine the damage and remedy it properly by using **original spare parts**.

2.1.7 Problems in electrical connections of the crane

– If a component / component group does no longer react, then the electrical connections may be interrupted.

▶ Check the error messages.
▶ Check the plug connections.
▶ Check the electrical connections visually.

Troubleshooting
The erection of the crane, for example after assembly on a new job site or with another equipment configuration, is not possible due to an error message?
▶ As the first step, make sure that all electrical connections have been made.
▶ Check if all sensors or dummy plugs with integrated electronic have been connected properly.

▶ Determine the damage and remedy it properly by using **original spare parts**.

or

In case of lack of clarity:
■ Observe the Diagnostics operating instructions.

or

■ Consult Liebherr Service.

2.2 Error diagnostics with the help of Liebherr Service

2.2.1 Which data is required by Liebherr Service?

If the assistance of Liebherr Service is required, always provide the following information:
– Crane type
– Crane number
– Complete error number and any error message displayed on the LICCON monitor **324**
– Complete error code and any error message from the BTT **4**
– Application conditions of crane.
– Action during which the error occurs.
– Possibly frequency of error.

2.2.2 Error diagnostics by phone

If there is any lack of clarity, contact Liebherr Service to determine the cause of the problem and further procedure.
▶ Contact Liebherr Service.
▶ Observe and adhere to the notes and instructions given by Liebherr Service.

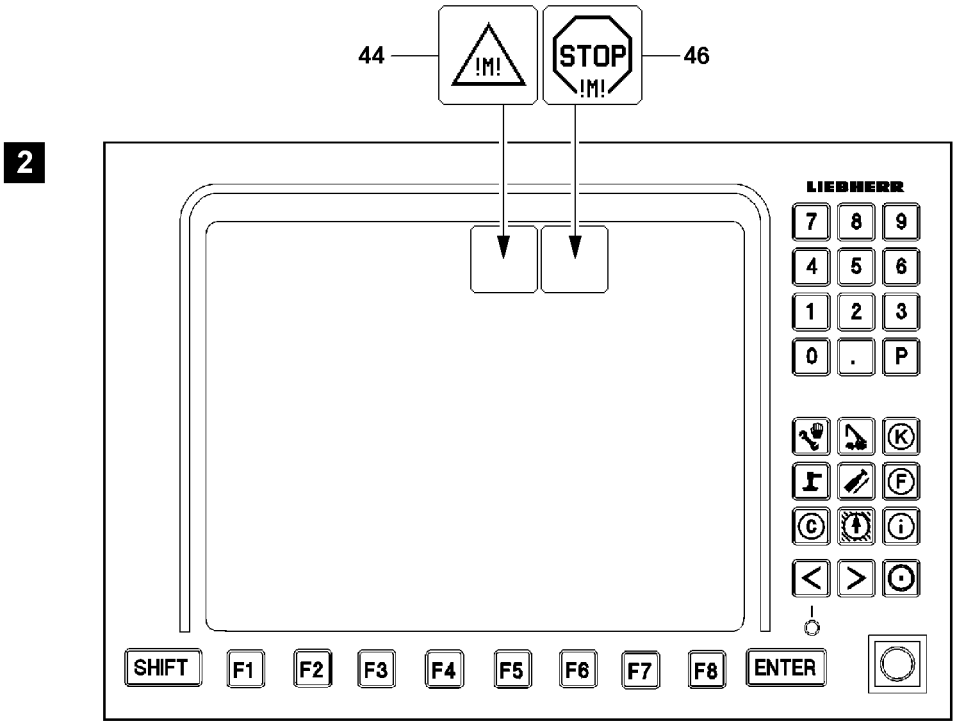
2.2.3 Remote diagnostics*

The remote diagnostics makes it possible for Liebherr Service to check Liebherr cranes from a remote location in case of problems.
Make sure that the following prerequisite is met:

– The crane is equipped with the optional Remote diagnostics*.

▶ Contact Liebherr service by phone.
▶ Follow the instructions given by Liebherr Service to set up the Remote diagnostics*.
▶ Keep the phone connection to Liebherr Service up during the Remote diagnostics*.


1
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK .....FAILED !!
ERROR 02 : INCORRECT MODUL-CHECKSUM -> E 0: B=000 ADR=4000H CH=FFH
1
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


2
44
!M!
STOP
!M!
46
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

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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 further procedure.

3.1 Remedying temporary errors during system start

Note
▶ While the LICCON computer system starts, temporary error messages **1** can occur, see illustration **1**.

Errors, which occur temporarily, can have various causes, for example:
– Fluctuations in the power supply.
– Error message can be a subsequent error.

▶ Turn the LICCON computer system off and restart it after waiting for at least 5 s.
▶ Repeat this procedure up to three times (wait 2 min after 3 start attempts).
▶ If the same error image appears several times:
Call up the test system, see Diagnostics operating instructions.
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

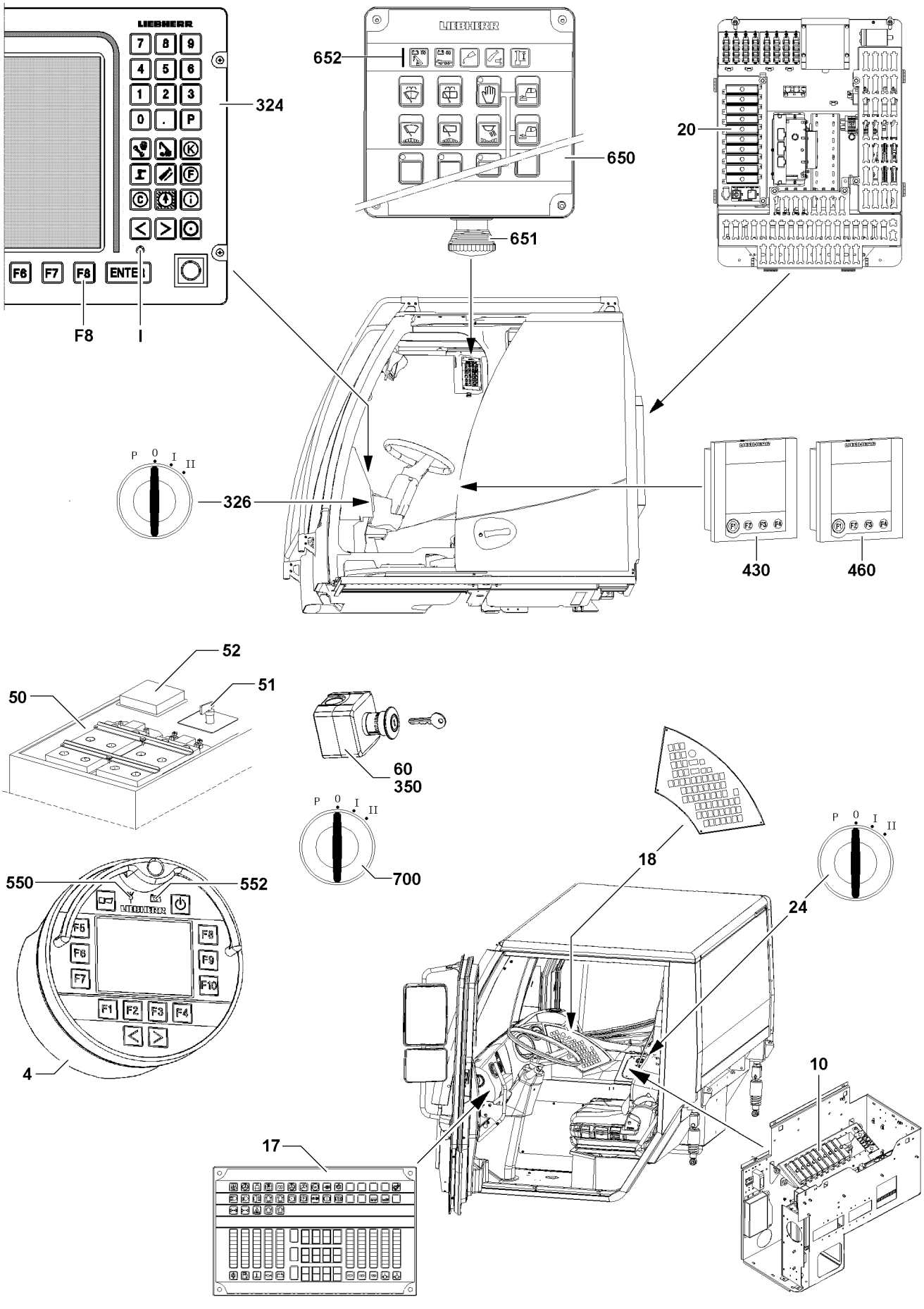
3.2 Monitoring function reports a problem

Note
▶ For a detailed description of monitoring functions, see Crane operating instructions, chapter 4.02.

NOTICE
Danger of severe engine damage!
If the monitoring functions report a problem and / or warning occurrence, then you must react immediately and remedy the problem!
▶ React to problems and / or warning occurrences immediately and remedy the problem!
▶ If necessary, stop crane operation and turn the engine off!

The following alarm functions are indicated by blinking icons on the LICCON monitor (illustration **2**):
– Advance warning - engine **44**
– Engine stop **46**

▶ 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.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
F6 F7 F8 ENTER
324
F8
I
652
650
651
20
326
P 0 I II
430
460
52
50
51
60
350
700
550
552
F5 F6 F7 F8 F9 F10
F1 F2 F3 F4
4
18
24
10
17

B112958

3.3 Engine does not start

Make sure that:
- There is sufficient fuel in the fuel tanks.
- There is sufficient voltage in the batteries.

3.3.1 Cranes with one engine

Make sure that no EMERGENCY STOP switch is actuated:
- EMERGENCY STOP switch **60** Chassis*
- EMERGENCY STOP switch **350** Crane superstructure*
- EMERGENCY STOP switch **651** on the BKE* **650**

The engine does not start from the driver's cab?

▶ No EMERGENCY STOP switch is actuated:
Turn the ignition off.

▶ Start the engine again.

▶ If the engine still cannot be started:
Check the indicator lights on the display unit **17**.

Note

▶ Problem remedy, see Crane operating instructions, chapter 3.04.

▶ If the error cannot be remedied:
Contact Liebherr Service to determine the cause of the problem and further procedure.

The engine does not start from the crane operator's cab?

▶ No EMERGENCY STOP switch is actuated:
Turn the ignition off.

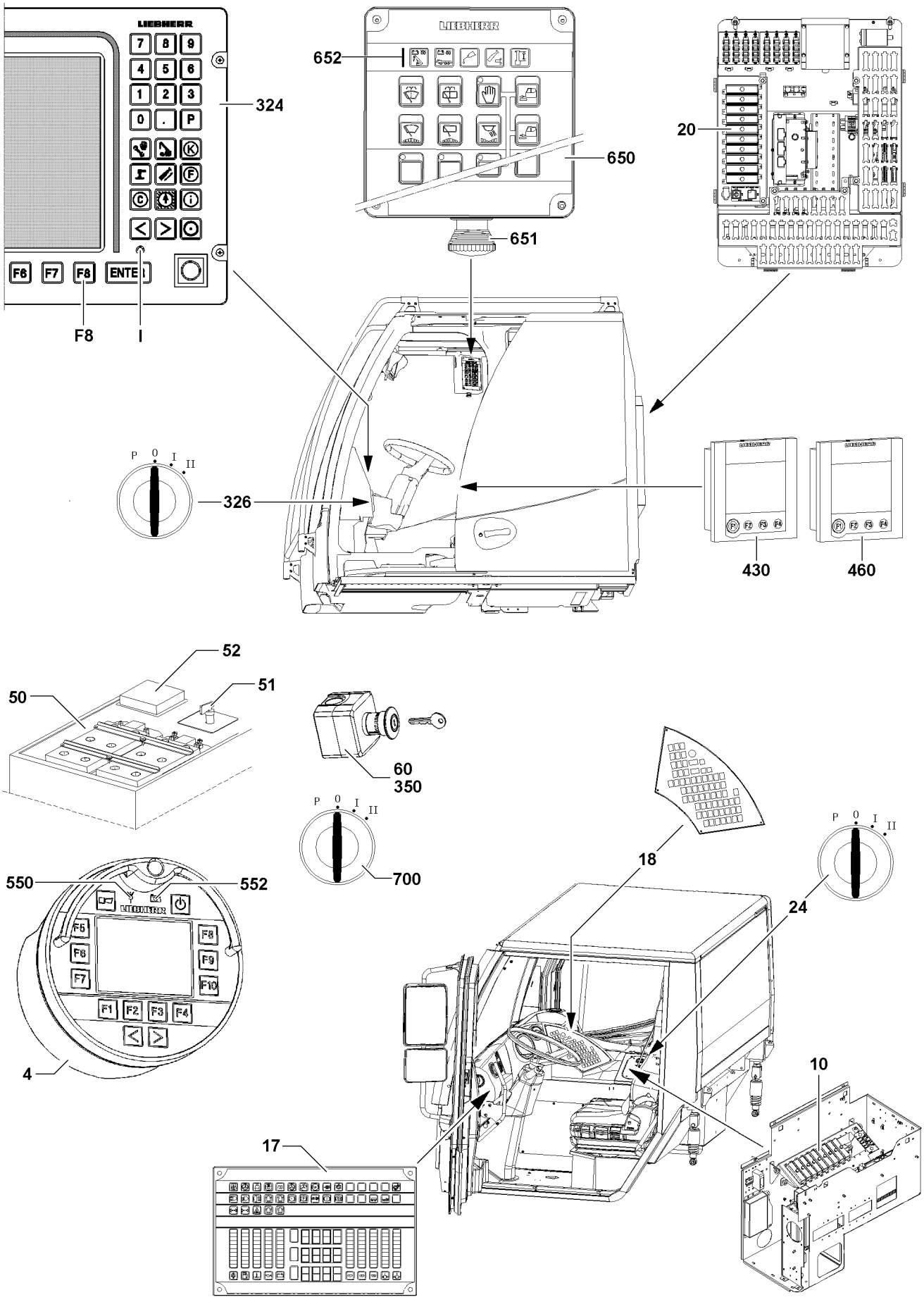
▶ Start the engine again.

▶ If the engine still cannot be started:
Watch the indicator lights **652** on the BKE **650**.

Note

▶ Problem remedy, see Crane operating instructions, chapter 4.03.

▶ If the error cannot be remedied:
Contact Liebherr Service to determine the cause of the problem and further procedure.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
F6 F7 F8 ENTER
324
F8
I
652
650
651
20
326
P 0 I II
430
460
52
50
51
60
350
700
550
552
F5 F6 F7 F8 F9 F10 F1 F2 F3 F4
4
18
24
10
17

B112958

3.3.2 Cranes with two engines

Make sure that no EMERGENCY STOP switch is actuated:
- EMERGENCY STOP switch **60** Chassis*
- EMERGENCY STOP switch **350** Crane superstructure*
- EMERGENCY STOP switch **651** on the BKE* **650**

The engine in the crane chassis does not start?

▶ No EMERGENCY STOP switch is actuated:
Turn the ignition off.

▶ Start the engine again.

▶ If the engine still cannot be started:
Check the indicator lights on the display unit **17**.

Note

▶ Problem remedy, see Crane operating instructions, chapter 3.04.

▶ If the error cannot be remedied:
Contact Liebherr Service to determine the cause of the problem and further procedure.

The engine in the crane superstructure does not start?

▶ No EMERGENCY STOP switch is actuated:
Turn the ignition off.

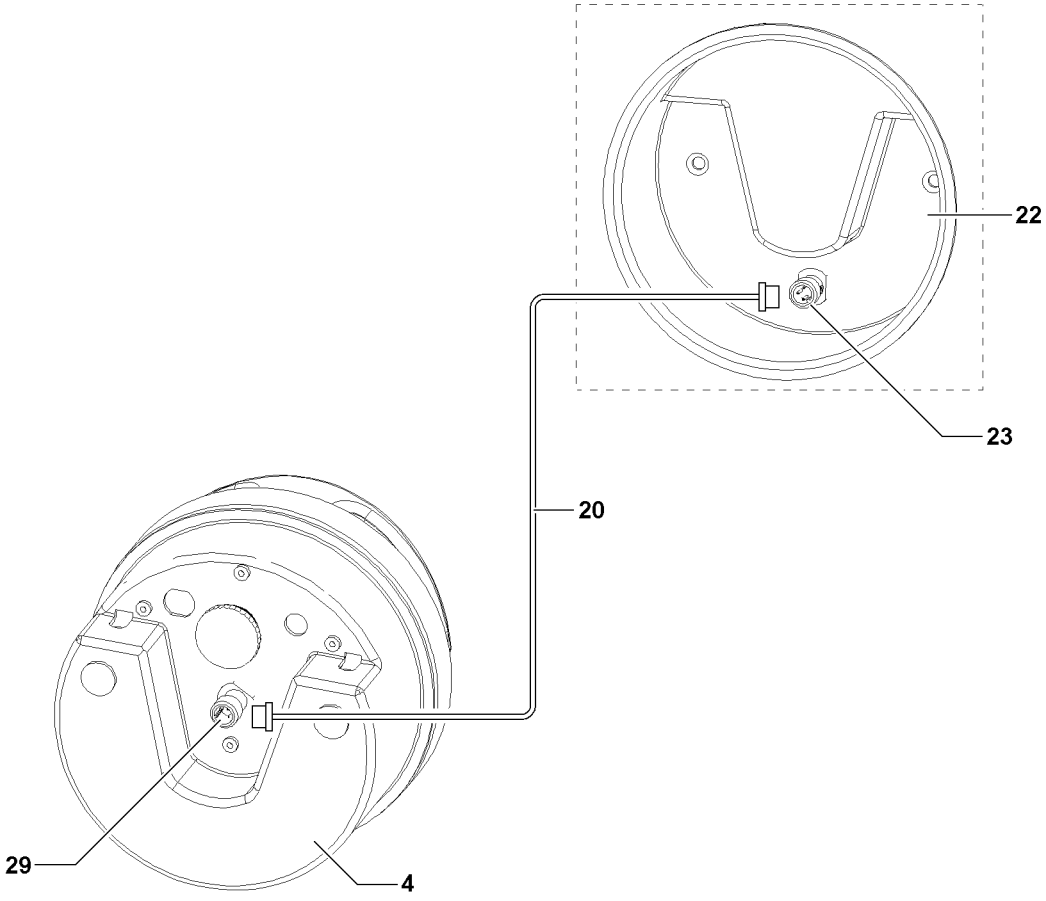
▶ Start the engine again.

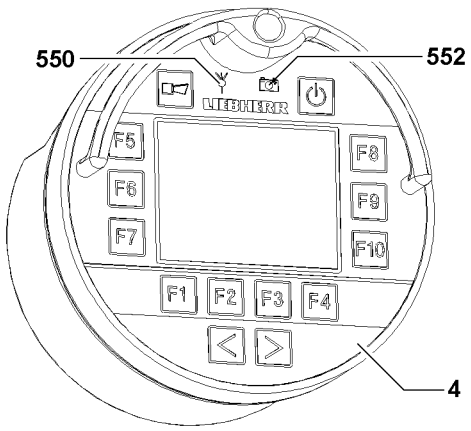
▶ If the engine still cannot be started:
Watch the indicator lights **652** on the BKE **650**.

Note

▶ Problem remedy, see Crane operating instructions, chapter 4.03.

▶ If the error cannot be remedied:
Contact Liebherr Service to determine the cause of the problem and further procedure.





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3.4 Bluetooth™ Terminal

Note
▶ Required only for cranes with Bluetooth™ Terminal (BTT).

3.4.1 The display of the BTT remains dark?

Note
▶ Indicator light Charge condition **552** shows the charge condition.
▶ Indicator light Transmission signal **550** shows the quality of the radio contact connection.

▶ When the indicator light charge condition **552** does not light up or lights up red:
Plug the BTT **4** into the charging module **22**.
▶ When the LED **552** does not light up with the BTT **4** plugged in or the BTT **4** cannot be turned on:
Contact Liebherr Service to determine the cause of the problem and further procedure.

3.4.2 Is the radio contact connection faulty?

If the radio contact connection to the BTT **4** is faulty or interrupted (Indicator light Transmission signal **550** lights up red), then it can be bypassed with line **20**.
The radio contact connection to the BTT **4** can become faulty or interrupted by the following occurrences:
– By interference signals from a nearby radio tower.
– The radio module on the BTT **4** or on the BTB is defective.
– The rechargeable battery in the BTT **4** is discharged.
– Due to bad selection of location by the operator.

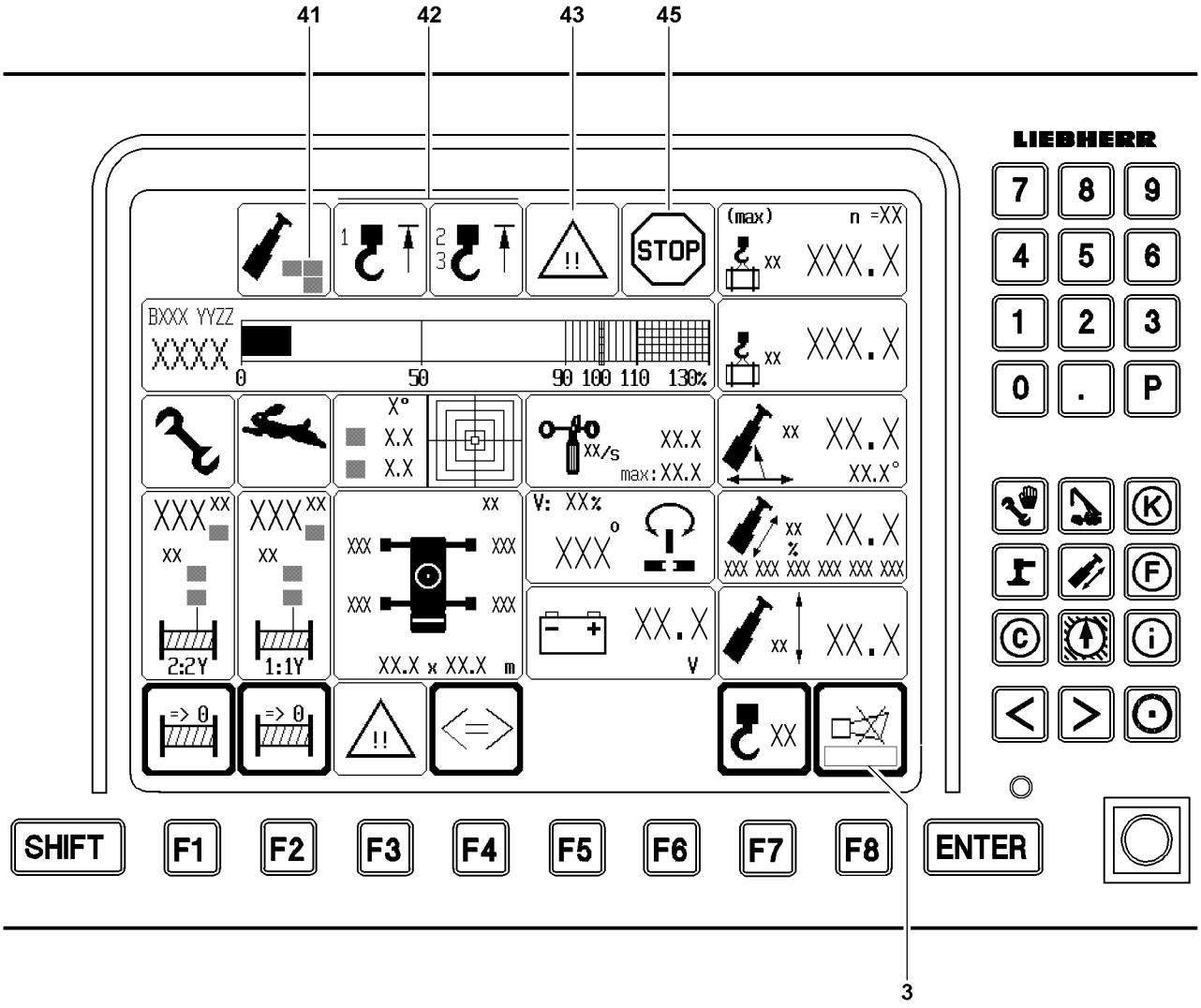
Bypassing the radio contact connection

Make sure that the following prerequisites are met:
– The line **20** to bypass the radio contact connection has been removed from the switch cabinet of the crane cab.
– The BTT **4** has been removed from the charging module **22** and is turned on.
– The caps on the plug connection **23** and the plug connection **29** have been removed.

▶ Screw the line **20** on the charging module **22** onto the plug connection **23**.
▶ Screw the line **20** on the BTT **4** onto the plug connection **29**.

Result:
– The radio contact connection is bypassed.

Note
If the BTT **4** does not turn on, even though the line **20** is connected with the charging module **22**, then the rechargeable battery may be defective!
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.


41
42
43
45
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
(max) n =XX
BXXX YYZZ
XXXX
0 50 90 100 110 130%
XXX.X
X.X
X.X
XX/s
XX.X
max:XX.X
XX.X
XX.X°
V: XX%
XXX°
XX.X
V
2:2Y
1:1Y
XX.X x XX.X m
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
3

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3.5 LICCON monitor

3.5.1 Operating errors: Did an alarm function occur?

Note
- ▶ For procedure of shut off of crane movement, see Crane operating instructions, chapter 4.20.
- ▶ For a detailed description of alarm functions, see Crane operating instructions, chapter 4.02.
- ▶ In case of an alarm function, an error message **3** with LICCON error code appears at the same time.

The following alarm functions are indicated by blinking icons on the LICCON monitor:
- Boom limitation **41**
- Hoist top limit switch **42**
- Advance warning **43**
- LMB Stop **45**

The limit ranges of the crane movements are monitored by:
- Hoist limit switch
- Angle sensors
- Pressure sensors
- Length sensors
- Wind sensor
- Inductive sensors

If the limit ranges for these sensors are exceeded, the crane movements are turned off (LMB-STOP).
- ▶ Correct the operating error.

3.6 Is telescoping not possible?

- Telescoping is not functioning.

Possible causes:
- An operating error has occurred.
- A system error has occurred.
- The valves are mechanically defective.
- The electrical connection is interrupted.

Note
If the crane is equipped with the optional “Hydraulic emergency control* ”, then the crane can be taken down in case of failure of the crane hydraulic, crane electric and crane engine.
- ▶ For hydraulic emergency control, see Crane operating instructions, chapter 6.05.

3.6.1 Telescopic boom system Telematic

If an operating error is present:
▶ Correct the operating error.

If no operating error is present:

WARNING
Increased danger of accidents in case of defective telescoping lock!
There is an increased risk of accident if the following danger notes are not observed!
▶ “Emergency control telescoping” may only be carried out by authorized expert personnel trained on **Liebherr-Werk Ehingen mobile cranes**, who know the dangers of emergency operation!
▶ It is imperative that the next **Liebherr Service location** or **Liebherr-Werk Ehingen** is contacted!
▶ All crane movements must be carried out with extreme caution!
▶ Telescoping must be constantly monitored by a second person!

▶ If the cause of the problem is unclear:
Contact Liebherr Service to determine the cause of the problem and further procedure.

3.6.2 Telescopic boom with rope mechanism

If an operating error is present:
▶ Correct the operating error.

If no operating error is present:
▶ If the cause of the problem is unclear:
Contact Liebherr Service to determine the cause of the problem and further procedure.

4 Measures for defective components

WARNING
Impairment of crane safety!
When using non-original spare parts, crane safety can be impaired!
Changed or manipulated components can fail!
Safety relevant components can malfunction!
The crane license as well as the manufacturer's warranty will become void!
Risk of accident!
Personnel can be severely injured or killed!
This could result in property damage!
▶ Use only original spare parts or spare parts approved by Liebherr Werk Ehingen!
▶ Leave installed original parts unchanged!

Make sure that the following prerequisites are met:
– Error diagnostics has been carried out.
– Defective component has been determined.

4.1 Failure of hydraulic, electric or engine

Note
If the crane is equipped with the optional “Hydraulic emergency control* ”, then the crane can be taken down in case of failure of the crane hydraulic, crane electric or crane engine.
▶ For hydraulic emergency control, see Crane operating instructions, chapter 6.05.

▶ Take the crane down with the hydraulic emergency control* and repair it, contact Liebherr Service if necessary.

or

If the crane has no “Hydraulic emergency control* ”:
- Secure the crane and danger zone wide-ranging.

4.2 Defective power supply (NT)

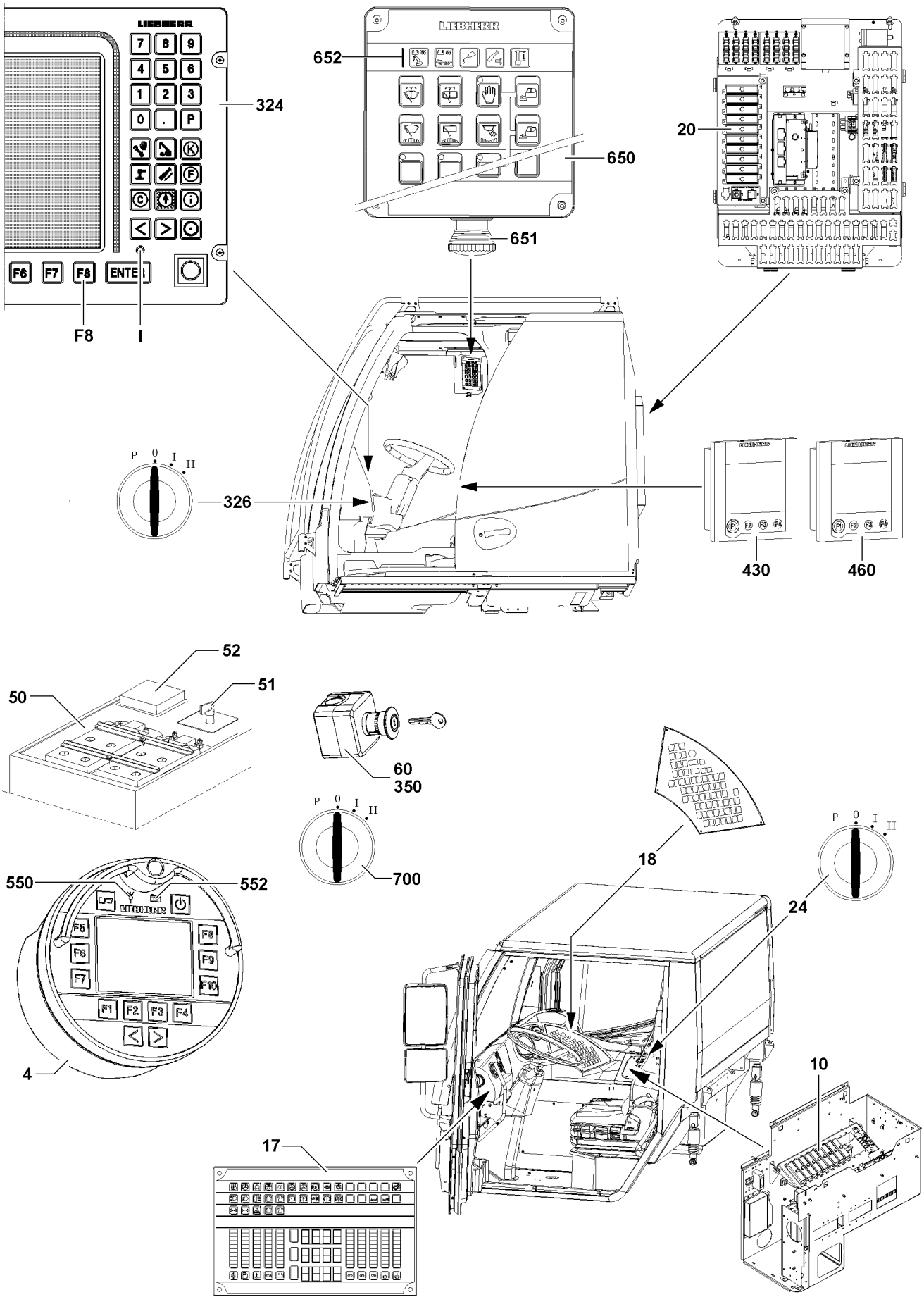
▶ Replace the power supply with a functioning power supply.

Note
▶ For instruction of replacement of a defective power supply, see Diagnostics operating instructions.

4.3 Central processing unit (CPU)

▶ Replace the CPU with a functioning CPU.

Note
▶ For instruction of replacement of a defective CPU, see Diagnostics operating instructions.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
F6 F7 F8 ENTER
324
F8
I
652
650
651
20
P 0 I II
326
430
460
52
50
51
60
350
700
550
552
F5 F6 F7 F8 F9 F10
F1 F2 F3 F4
4
18
24
10
17

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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:
– All battery master switches **51** are in position **0**.
– All ignition switches **24/328/700** are in position **0**.
– A spare fuse of the same size and strength is available.

Fuses are located:
– In the fuse box in the driver's cab. **10**
– In the fuse box in the crane operator's cab. **20**
– In the battery box **50** (main fuses **52**)
– Directly on the individual components.

▶ Replace a defective fuse.
▶ Check the function.

Troubleshooting
The same fuse fails again?
▶ Continue troubleshooting, contact Liebherr Service if necessary.
▶ Never bypass a defective fuse or replace it with a stronger fuse.

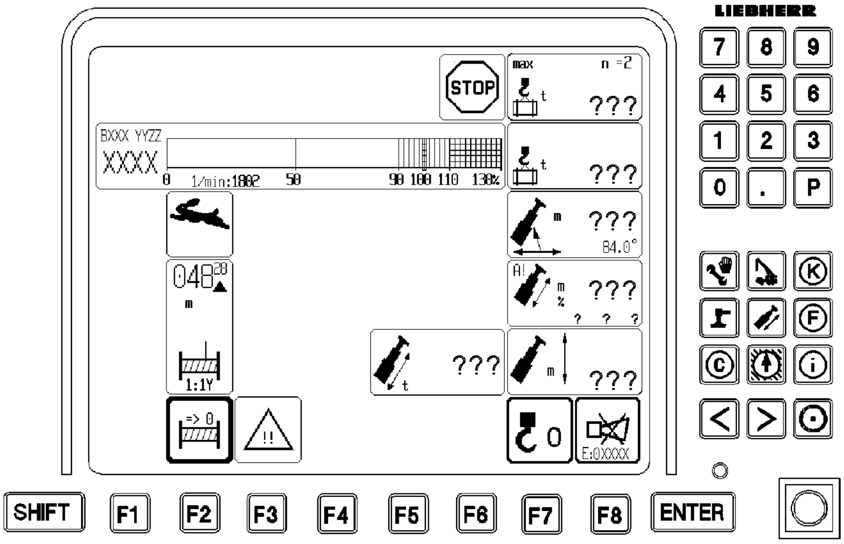
4.5 The LICCON monitor remains dark

▶ If the LICCON monitor **324** does not turn on after turn on:
See section Monitor errors in the Diagnostics operating instructions.
▶ If the problem cannot be remedied:
Contact Liebherr Service to determine the cause of the problem and further procedure.

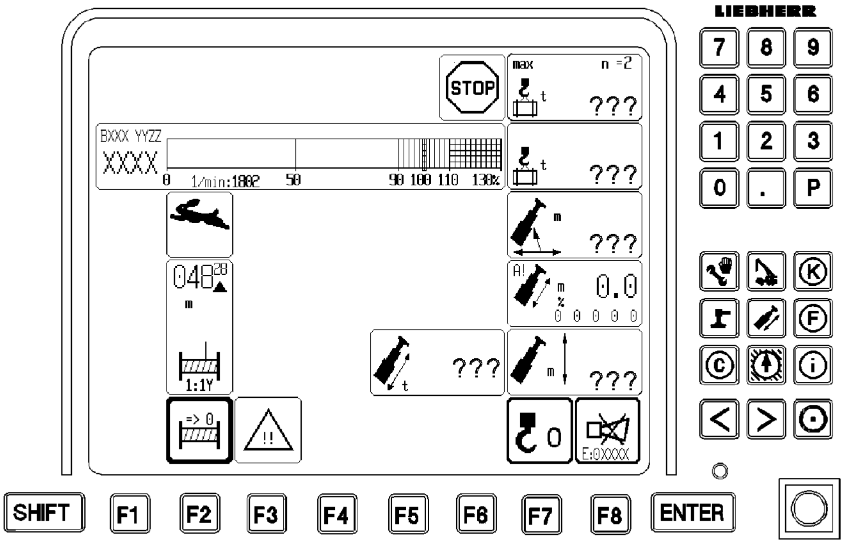
4.6 The touch display remains dark

▶ If the Touch display **430** or the touch display **460** does not turn on after turning the ignition on:
Check the error messages.
▶ If the problem cannot be remedied:
Contact Liebherr Service to determine the cause of the problem and further procedure.

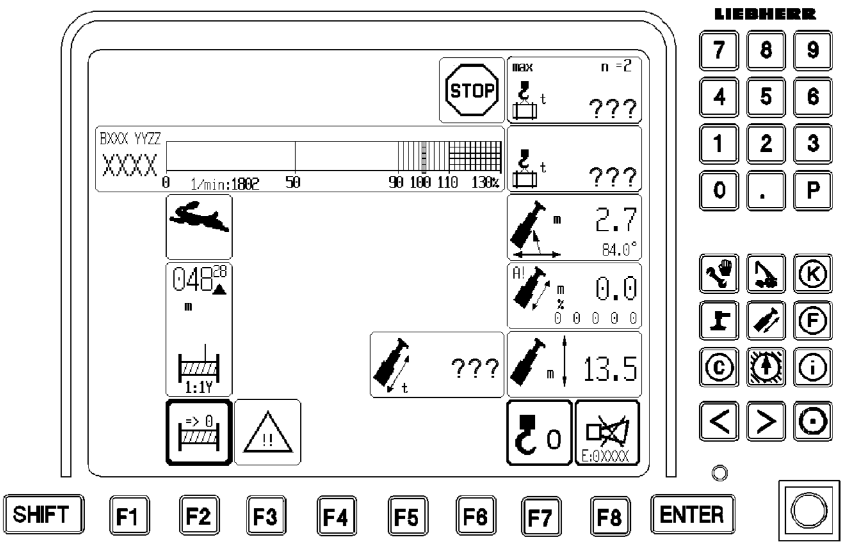
A


LIEBHERR
STOP
max
n =2
???
BXXX YYZZ
XXXX
0 1/min:1802 50 90 100 110 130%
84.0°
048
1:1Y
E:0XXXX
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B


LIEBHERR
STOP
max
n =2
???
BXXX YYZZ
XXXX
0 1/min:1802 50 90 100 110 130%
0.0
0 0 0 0 0
048
1:1Y
E:0XXXX
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

C


LIEBHERR
STOP
max
n =2
???
BXXX YYZZ
XXXX
0 1/min:1802 50 90 100 110 130%
2.7
84.0°
0.0
0 0 0 0 0
13.5
048
1:1Y
E:0XXXX
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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4.7 Defective sensors

4.7.1 General

Depending on the classification of the sensor, crane operation with defective sensor:
– Can be continued without restriction.
– Can be continued with restriction.
– Can be continued only in LMB emergency operation.

WARNING
Limited warning functions!
If there is a defect on a participating sensor (LMB) and the crane is continued to be operated by bypassing the sensor other otherwise, then the warning functions and the shut offs of the LICCON overload protection are deactivated / limited!
▶ If there is a defect on a participating sensor (LMB), then the crane may be operated further only in emergency cases!
▶ Fix / replace the sensor before starting crane operation again!

Certain crane functions are also monitored with two sets of sensors.
Defective sensors can occur in the LICCON monitor as follows:
– Length sensor defective, see illustration **A**.
– Angle sensor defective, see illustration **B**.
– Pressure sensor defective, see illustration **C**.

If a defective sensor is shown:
▶ Replace / repair the defective sensor.

4.7.2 Defective length sensor

▶ If the length sensor is defective, the crane operating screen is shown in the LICCON monitor as in illustration **A**:
Carry out error diagnostics via the test system, see Diagnostics operating instructions.
▶ Contact Liebherr Service to determine further procedure.

4.7.3 Defective angle sensor

▶ If the angle sensor is defective, the crane operating screen is shown in the LICCON monitor as in illustration **B**:
Carry out error diagnostics via the test system, see Diagnostics operating instructions.
▶ Contact Liebherr Service to determine further procedure.

4.7.4 Defective pressure sensor

▶ If the pressure sensor is defective, the crane operating screen is shown in the LICCON monitor as in illustration **C**:
Carry out error diagnostics via the test system, see Diagnostics operating instructions.
▶ Contact Liebherr Service to determine further procedure.

4.8 Defective limit switch

Depending on the classification of the limit switch, crane operation with defective limit switch:
– Can be continued without restriction.
– Can be continued with restriction.
– Can be continued only in LMB emergency operation.

Certain crane functions are monitored with two sets of limit switches.

WARNING
Limited warning functions!
If one of the double version limit switches is not ok and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited!
▶ The crane can only be operated in an emergency after failure of a double version limit switch!

If a defective limit switch is shown:
▶ Replace / repair the defective limit switch.

4.9 Bypass of overload protection

To bring the crane into safe condition after failure of a component required for the overload protection, it can be necessary that the overload protection has to be bypassed.

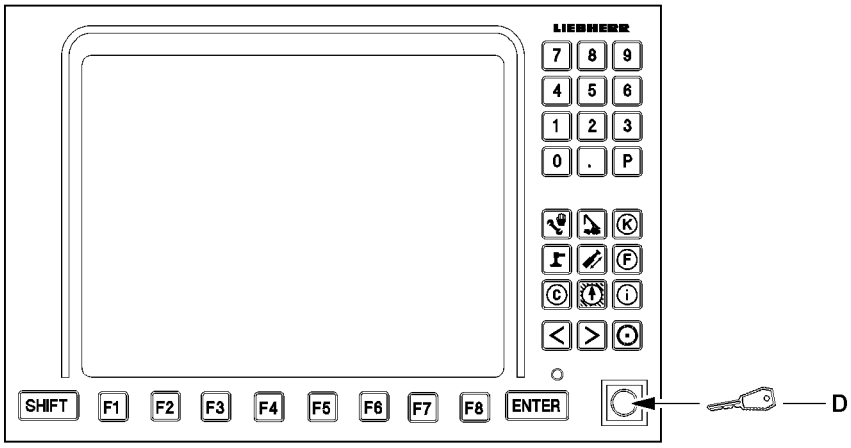
DANGER
Bypassing the overload protection!
If the overload protection is bypassed, there is no further protection against crane overload!
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ The bypass of the overload protection is only permitted in emergency cases!
▶ The bypass may only be carried out by persons who are aware of the effects of their acts regarding the bypass of the overload protection!
▶ Bypassing the overload protection requires the presence of an authorized person and must be performed with utmost caution!
▶ Missing values must be monitored manually and must match the load chart.
▶ Crane operation with bypassed overload protection is prohibited!

WARNING
Bypassed overload protection!
If the overload protection is bypassed, crane movements are no longer monitored!
The crane can be overloaded and collapse!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ Only carry out crane movements within the range of the load chart as well as the erection / take down charts!

As a rule, all specifications in the load chart must be adhered to strictly:
– The exact weight of the load, including load suspension equipment, must be known.
– The boom status and the boom geometry must be known.
– The boom length and boom radius must be measured manually.
– It must be ensured that the telescopic boom has been pinned accordingly (telescopic boom system Telematic).
– All values must match the values in the respective load chart.

4.9.1 Bypass of overload protection: Failure of the overload protection

Note
▶ Does **not** apply for cranes with CE-mark and configuration according to EN 13000:2010!
▶ For description of set up button **D**, see Crane operating instructions, chapter 4.02!



▶ Press the set up button **D**:

Result:

– The overload protection is bypassed.
– The crane is emergency operation.

To turn the bypass of overload protection off:

▶ Press the set up button **D** again.

Result:

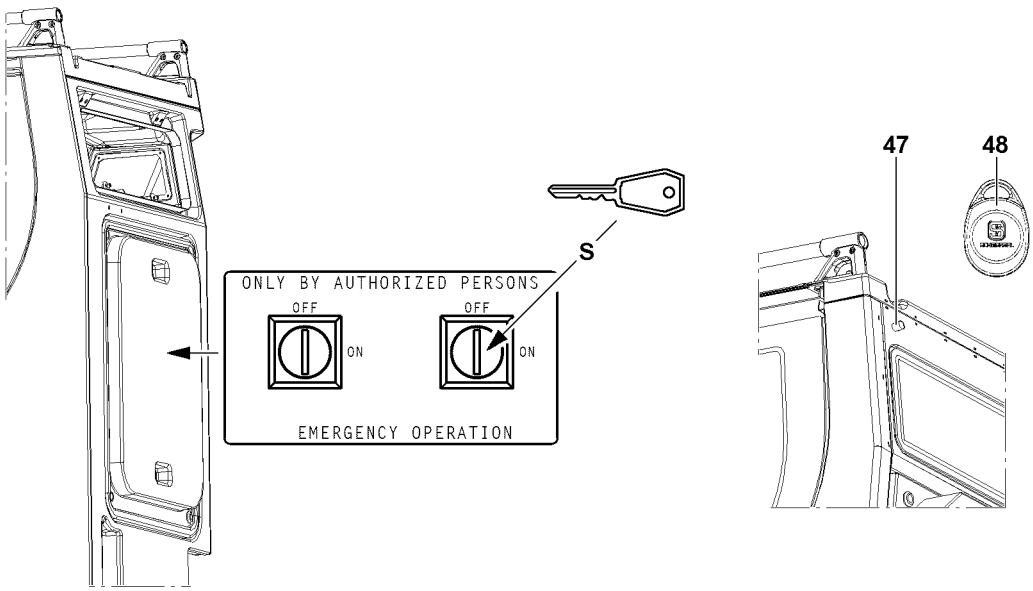
– The bypass of the overload protection is turned off.

4.9.2 Bypass of overload protection: Failure of overload protection (according to EN 13000:2010)

Note

▶ Applies **only** apply for cranes configuration according to EN 13000:2010!

▶ For location and detailed description of the bypass device outside the crane operator's cab, see Crane operating instructions, chapter 4.01 and chapter 4.02.



The bypass of the overload protection can be carried out with the restriction, that:
– The bypass is automatically reset when the engine is turned off.
– The bypass is automatically reset after no later than 30 minutes.
– The bypass of the overload protection limits the working speed to no more than maximum 15 %.

The bypass is made, depending on crane type, either:
– With the respective key switch **S**
  or
– via the sensor **47** through the transponder **48**.

Note
Actuation of sensor **47**.
▶ To actuate the sensor **47**, the transponder **48** must be placed momentarily and then removed again.
▶ If the transponder **48** remains too long or permanently on the sensor **47**, then the **bypass is not active** and an error message is issued.

▶ Actuate the key switch **S**.

or

■ Actuate the sensor **47** through the transponder **48**.

Result:
– The overload protection is bypassed.
– The crane is emergency operation.

To turn the bypass of overload protection off:
▶ Actuate the key switch **S** again.

or

■ Actuate the sensor **47** through the transponder **48** again.

Result:
– The bypass of the overload protection is turned off.

4.10 Ending the load lift to avert emergency situations

When the crane movements must be carried out manually (for example with the optional “Hydraulic emergency control* ”.

WARNING
Crane operation without overload protection!
If the LICCON overload protection is no longer functioning properly because of one or more errors, then there is a danger of accidents if crane operation is continued!
Due to operation of the crane with failed LICCON overload protection, the crane can be overloaded and collapse!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ Crane operation without overload protection is only permissible in emergency cases!
▶ Crane operation without overload protection may only be carried out by persons who know the effects of their actions regarding crane operation without overload protection!
▶ Crane operation without overload protection requires the presence of an authorized person and must be performed with utmost caution!
▶ Missing values must be monitored manually and must match the load chart.
▶ Do not take up regular crane operation again until the overload protection is functioning again!

Ending the load lift to avert emergency situations:

– Before continuing the load lift, contact the nearest Liebherr Service center or the Liebherr-Werk in Ehingen.

If this is not possible, then the load lift can be completed with utmost caution, as follows:

– All values that are needed for the exact determination of the equipment configuration and the associated load chart must be measured or manually determined.

As a rule, all specifications in the load chart must be adhered to strictly:

– The exact weight of the load, including load suspension equipment, must be known.
– The boom status and the boom geometry must be known.
– The boom length and boom radius must be measured manually.
– It must be ensured that the telescopic boom has been pinned accordingly (Telescopic boom system Telematic).
– All values must match the values in the respective load chart.

8.00 Inspections of cranes

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1 General

This crane was tested at the manufacturer's facilities prior to shipment in accordance with the valid ISO, FEM and DIN Standards and BGV D6 (BGG 905).
The safety level achieved during initial commissioning may not be attainable during operation. Examples of the root cause of such deviations include; e.g., wear and tear, corrosion, effects of external forces, changes in the environment and changes to the mode of operation.
The operator is responsible for taking the necessary steps to ensure that the maximum level of safety is maintained.
The crane operator is therefore obligated to have the crane inspected by an **expert**, at intervals depending on the operational conditions but at least once per year, from the first day of vehicle registration.
The crane must be inspected by an **authorized inspector** every four years after it has been licensed.
The crane must be annually inspected by an **authorized inspector** after its twelfth year of operation.
To ensure the high safety standard of the crane, we recommend - no later than the 12th year, in the 20th year, in the 26th year and then every 4 years - to have the crane undergo a general inspection by an **authorized inspector**. At that time, in addition to the usual scope of inspection, all load carrying parts of the crane - the complete steel structure with all welding seams as well as all components and connecting devices - are to be subjected to a complete visual inspection. The following procedural notes for repeat inspections are to be observed for that.

WARNING
There is a risk of weakening the supporting components when major changes or repairs are made to the crane!
▶ In this case, the operator must have the crane reinspected by an authorized inspector before putting it back into service!

Respective local regulations also apply.
Expert: Is a person whose technical training and experience means that he has adequate knowledge in the field of inspecting technical equipment. They must be familiar with regulations on safety at work, as well as guidelines and standards that allow them to assess the safe condition of technical equipment (e.g. cranes). Potential experts are workshop staff and customer service engineers.

Note
▶ Experts are not authorized inspectors!

Authorized inspector: Is a person whose technical training and experience means that he has explicit knowledge in the field of inspecting technical equipment. They must be familiar with regulations on safety at work, as well as guidelines and standards that allow them to assess the safe condition of technical equipment (e.g. cranes). They are responsible for testing technical equipment and giving an expert opinion. Authorized inspectors can be active engineers.

Note
▶ Authorized inspectors are legally recognized experts who have received special training!

Periodic inspection are principally a visual inspection, where the inspector (either type) appraises the condition of the crane and its components.
The purpose of the inspections is to avoid accidents by detecting deficiencies in a timely fashion. Any deficiencies determined by the inspector must be documented, corrected, and subsequently reinspected.
A number of important examples of items that are particularly important during the periodic crane inspections are listed in the following: We wish to advise that the authorized inspectors / experts take sole responsibility for the crane inspections that they carry out.

Note

▶ The inspection may not be solely limited to the following positions shown in the sample construction illustrations. Rather the **entire** crane structure must be subjected to a careful inspection!

A checklist for periodic inspections recommended for Liebherr mobile and crawler cranes is included in the appendix to assist the inspectors.
If the inspector has any questions they should be directed through our Service Department to Liebherr-Werk Ehingen GmbH's technical departments.

WARNING
Risk of accident!

▶ Adhere to the following inspection guidelines and intervals.

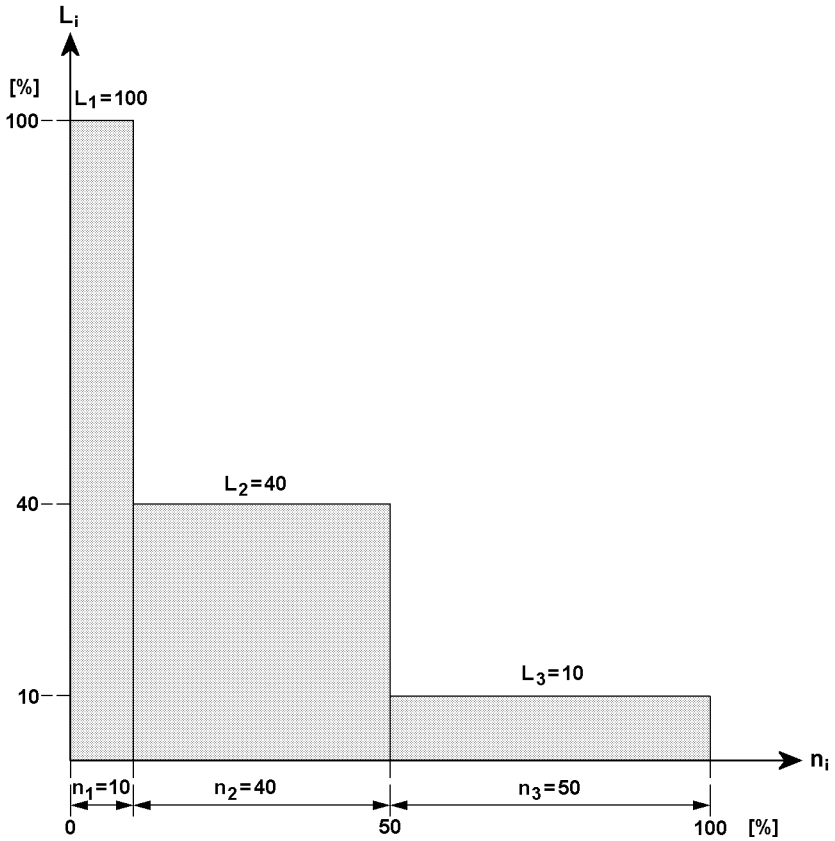
2 Inspection of carrying crane structures, especially steel structures

DANGER
Risk of fatal injury!

The crane structures, particularly steel constructions have to be checked by an expert or authorized inspector at least once a year. If this is not the case, they could fail and cause fatal injury or seriously damage the crane!

▶ Crane structures, particularly steel structures must be checked by an expert or an authorized inspector at least once a year!
▶ Shorten the inspection intervals when the crane is subjected to above-average load spectrums, for example when handling large material quantities or frequently erecting long boom systems.
▶ When the crane was subjected to excessive operating loads; e.g., due to an unusual impact, the crane structure, especially the steel structures must be inspected immediately!

Crane structures, especially steel structures, such as booms, turntables, chassis, support equipment (e.g., sliding beams or folding outriggers) must be carefully inspected, at the very least during the annual recommended crane inspections. Inspect welding seams especially through an intensive visual inspection.
If paint damage with corrosion (rust) is found on load carrying parts of the crane structure, especially on telescopic booms, lattice booms, lattice jibs, pull rods etc., then the rust must be removed, primed and painted.
During an electrolyte process, such as corrosion in combination with water, an atomic hydrogen is created, which causes to hydrogen induced corrosion with resulting cracks on high tensile fine grain construction steel.
If disassembly and assembly work on the crane is required to carry out the inspections, then they must be carried out by taking the manufacturer's data into account or in coordination with the crane manufacturer.
We would like to point out that the framework of mobile cranes is designed for a limited number of stress work cycles. This also determines the utilization or service life of the framework. The service life is not determined solely by the number of stress cycles. It also depends on the loads (load spectrum) applied during the time in operation.
Liebherr mobile and crawler cranes are designed for specific characteristics and movements, such as constant deployment of drive forces, only occasional operation and load conditions according to EN 13000:2010.
Liebherr mobile and crawler cranes are designed for assembly operation and - according to EN 13000:2010, chapter 4.1.2.1 - they can only take on a limited number of work cycles (N = 32000) when grouping them into collective class Q_1 = light (k_p = 0.125).
Example of a load collective according to grouping in collective class Q_1 = light (k_p = 0.125).



L_i: Load proportion in relation to maximum load [%]
n_i: Load cycles in relation to maximum number [%]

Note

- The service life of Liebherr mobile and crawler cranes can be drastically reduced, for example when used in magnet, grapple or material handling applications!
- Repeated inspection of crane structure, especially the steel structure and the welding seams must then be carried out in shorter intervals than specified.

For that reason, the steel structures and the welding joints must be subjected to an visual intensive inspection by the expert during the specified periodic inspections.
If any damage (such as cracks or suspicion of cracks) are apparent on any part of the steel structure, the total extent of the damage must be determined by qualified specialists using appropriate material testing methods, such as magnetic crack detection, ultrasound or x-rays. Thereafter, the qualified personnel must determine whether or not the damaged area can be repaired by welding or by other means.
The following diagrams are samples of the load-bearing weld designs. 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 diagrams are only examples and are not necessarily 100 % complete!

2.1 Repair welds

If defects such as cracks or permanent deformation are detected on load-bearing steel components, they should be immediately reported to the Service Department at **Liebherr-Werk Ehingen GmbH** (hereinafter called LWE).
Furthermore, the defect must immediately be appraised by an authorized inspector in accordance with standard welding practice rules. The inspector must immediately ascertain whether or not the crane can continue to be safely operated until the time of the repair.
The following items apply to the repair weld:

– Repair welds may only be carried out by **LWE** personnel or third party personnel contracted by **LWE**, with appropriate welding qualifications according to EN 287-1 for the subject material and welding method!
– The repair weld must be carried out in accordance with the latest revision of **LWE's** internal welding guideline ISR B 010!
– The repaired structural component must subsequently be subjected to a load test.
  The required test loads and boom configurations are to be determined by **LWE** Service!
  Successful test results are to be documented in the crane inspection log!
– We also refer to observing the accident prevention regulations “Principles for testing cranes by authorized inspectors or experts in accordance with UVV **Cranes** BGV D6 and BGG 905”!

WARNING
Danger of accidents in case of defective repair welds!
Due to defective repair welds, severe personnel and property damage can result!
▶ Observe and adhere to the instructions and welding regulations!

Note
Exclusion of liability!
For repair welds, which are not made by **LWE** personnel or by personnel authorized by **LWE**, Liebherr-Werk Ehingen GmbH excludes liability for the system functionality as well as for the parts!
▶ Have repair welds only made by **LWE** personnel or by personnel authorized by **LWE**!

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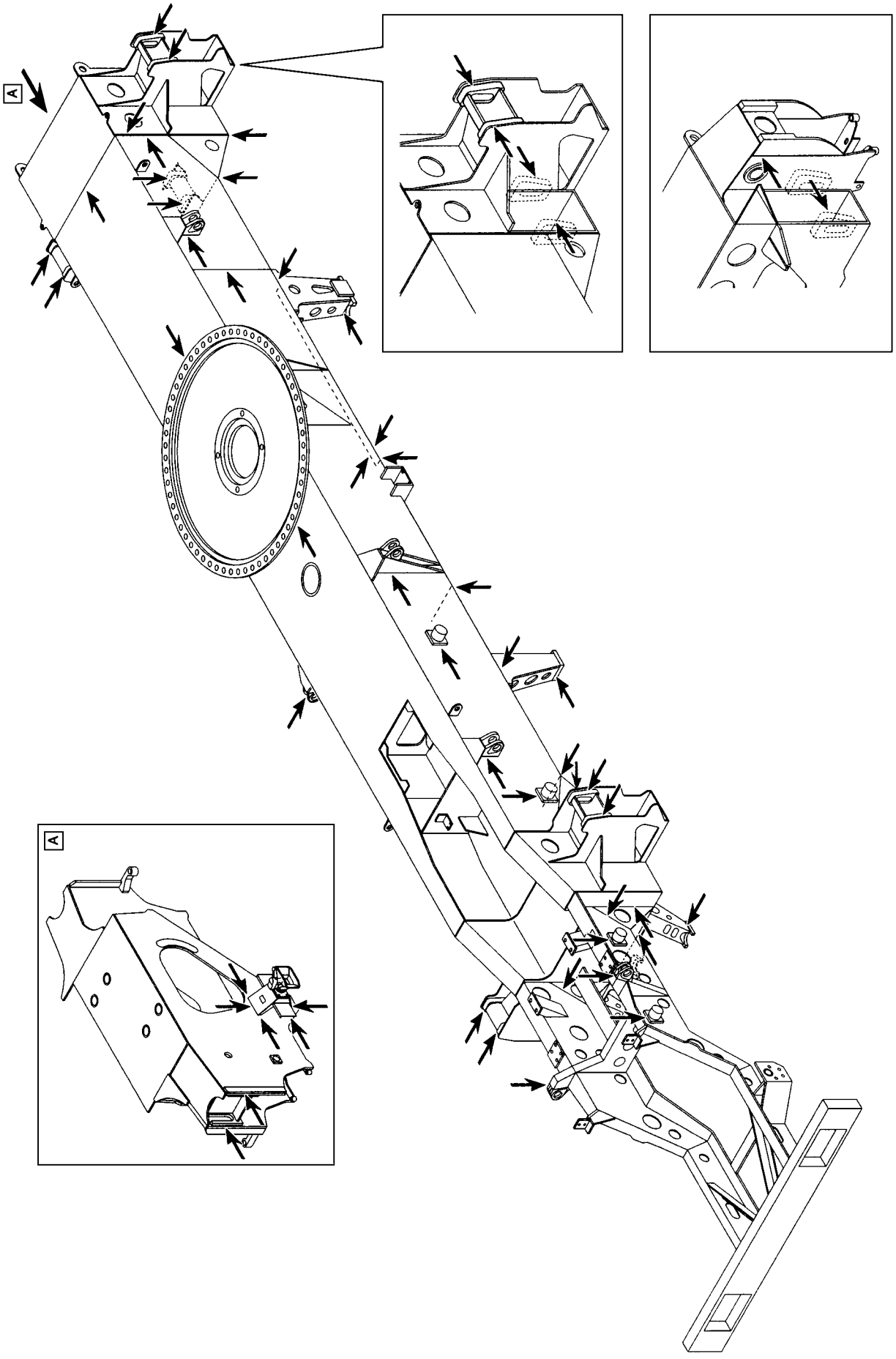
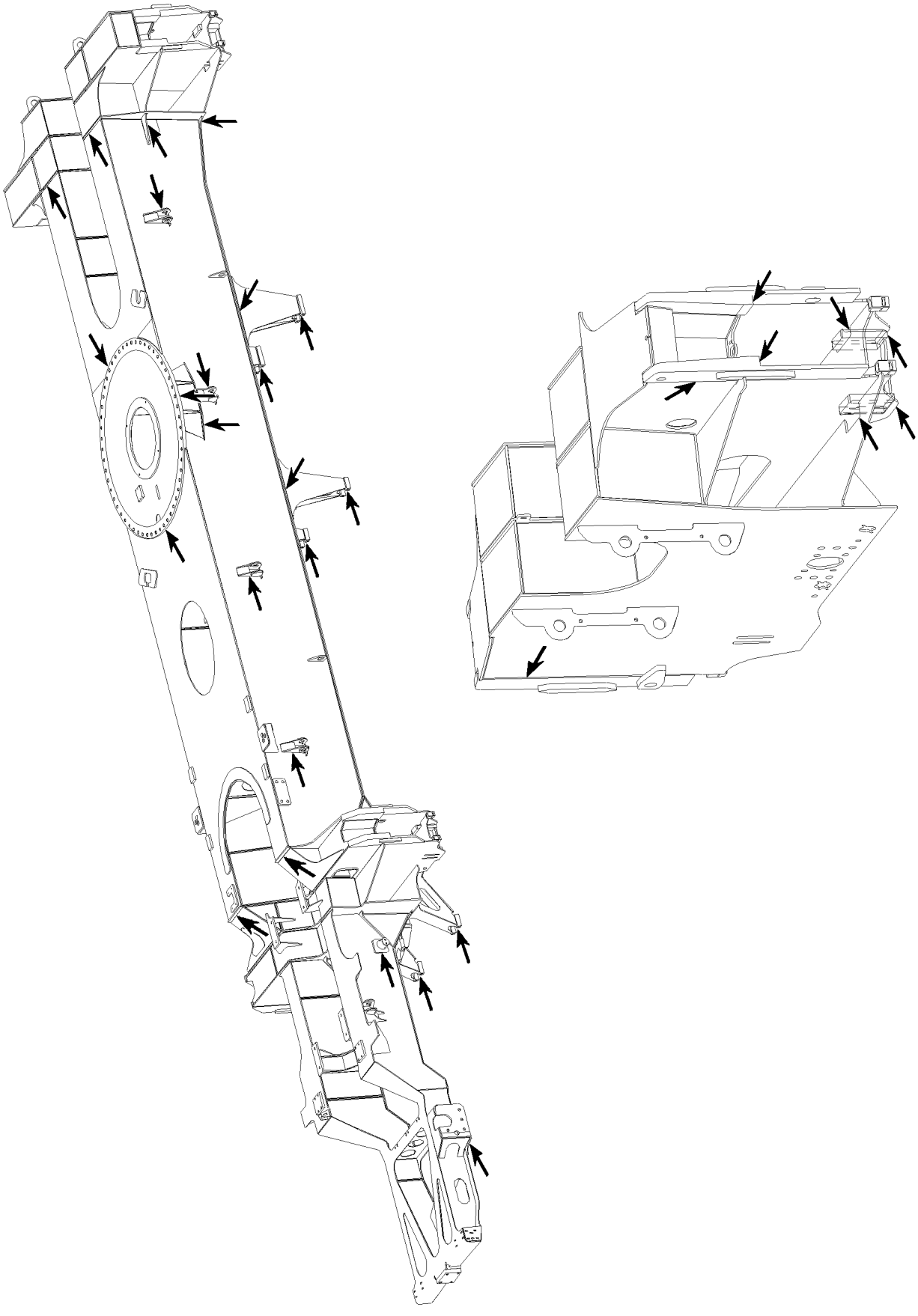


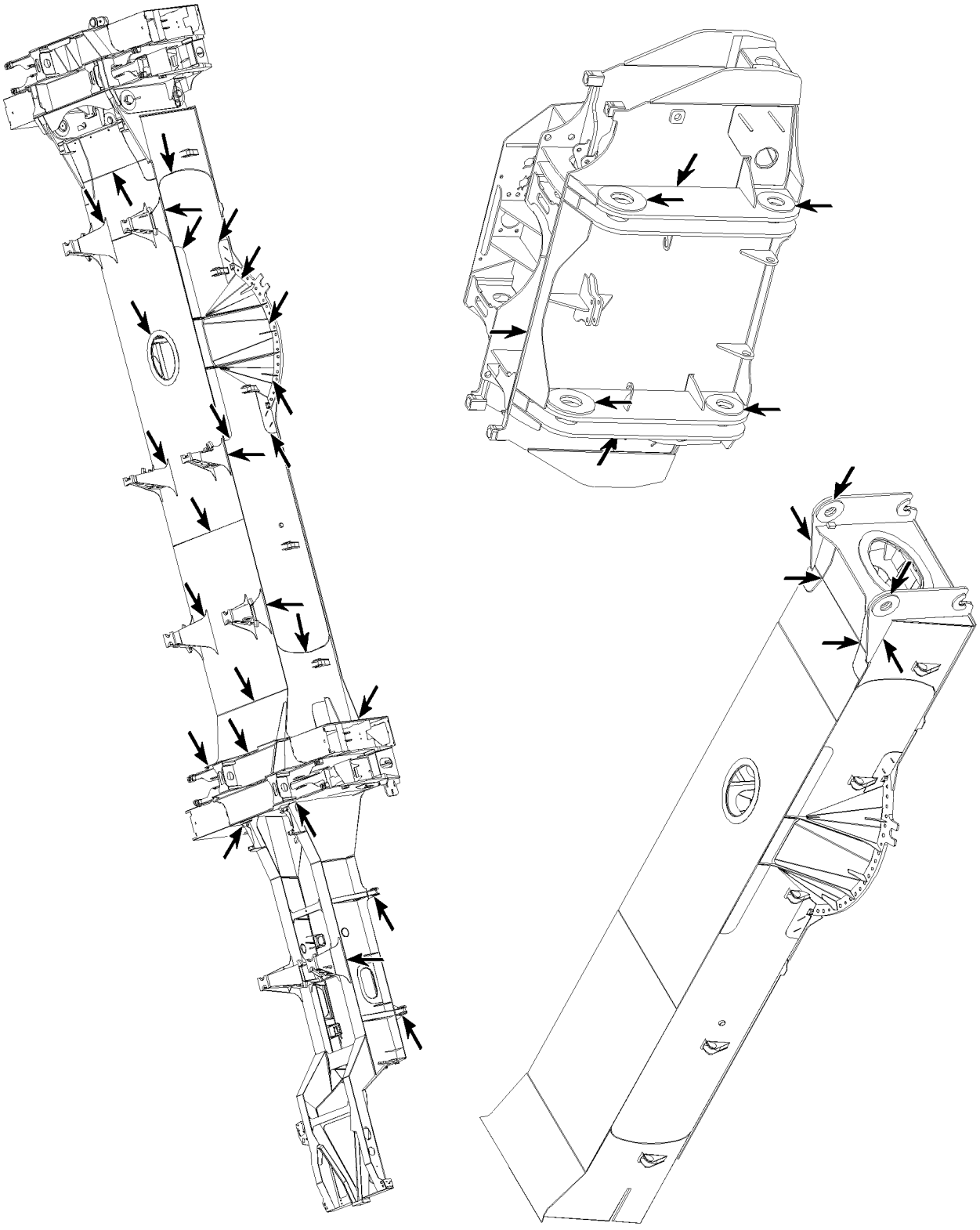
B185046

Example for vehicle frame



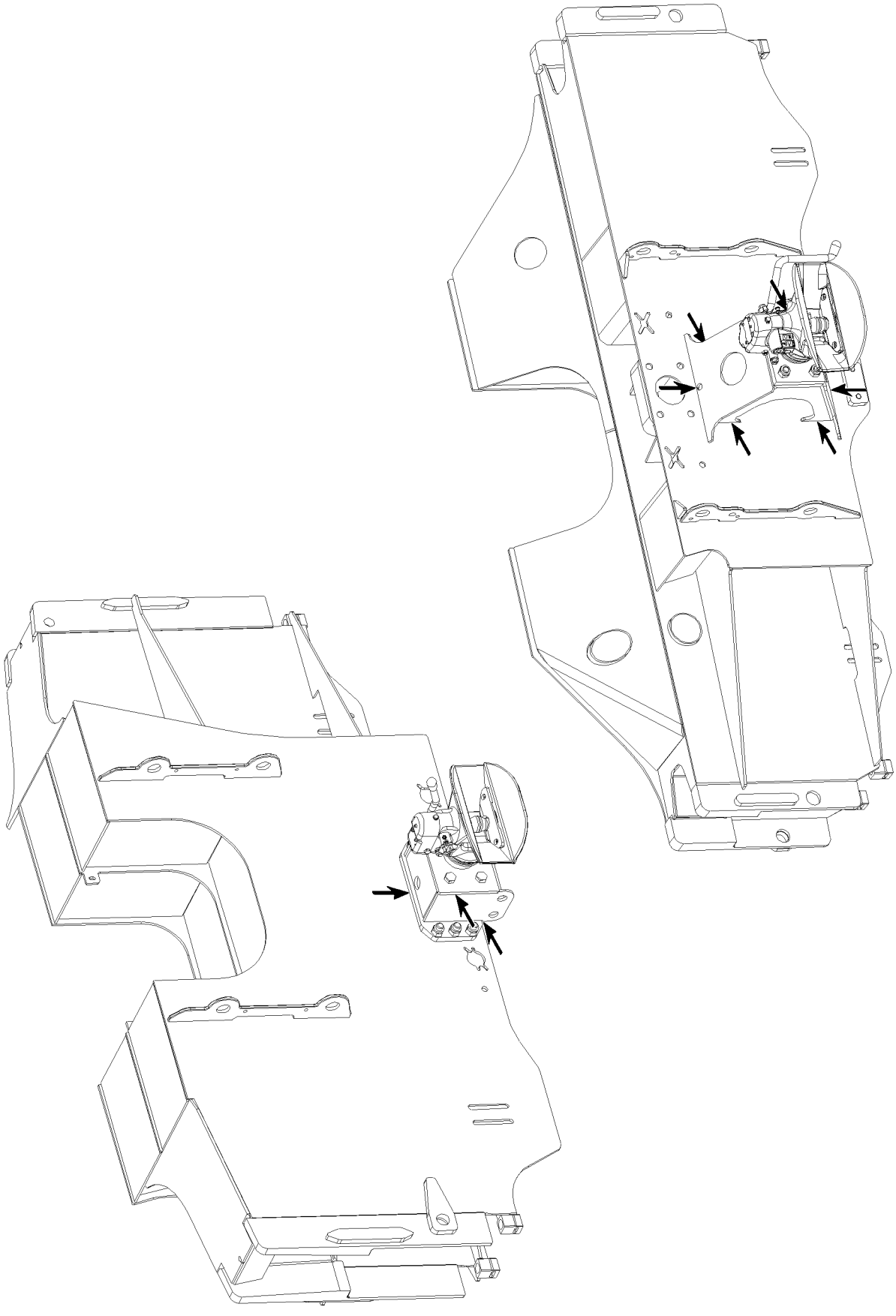
B105702

Example for vehicle frame



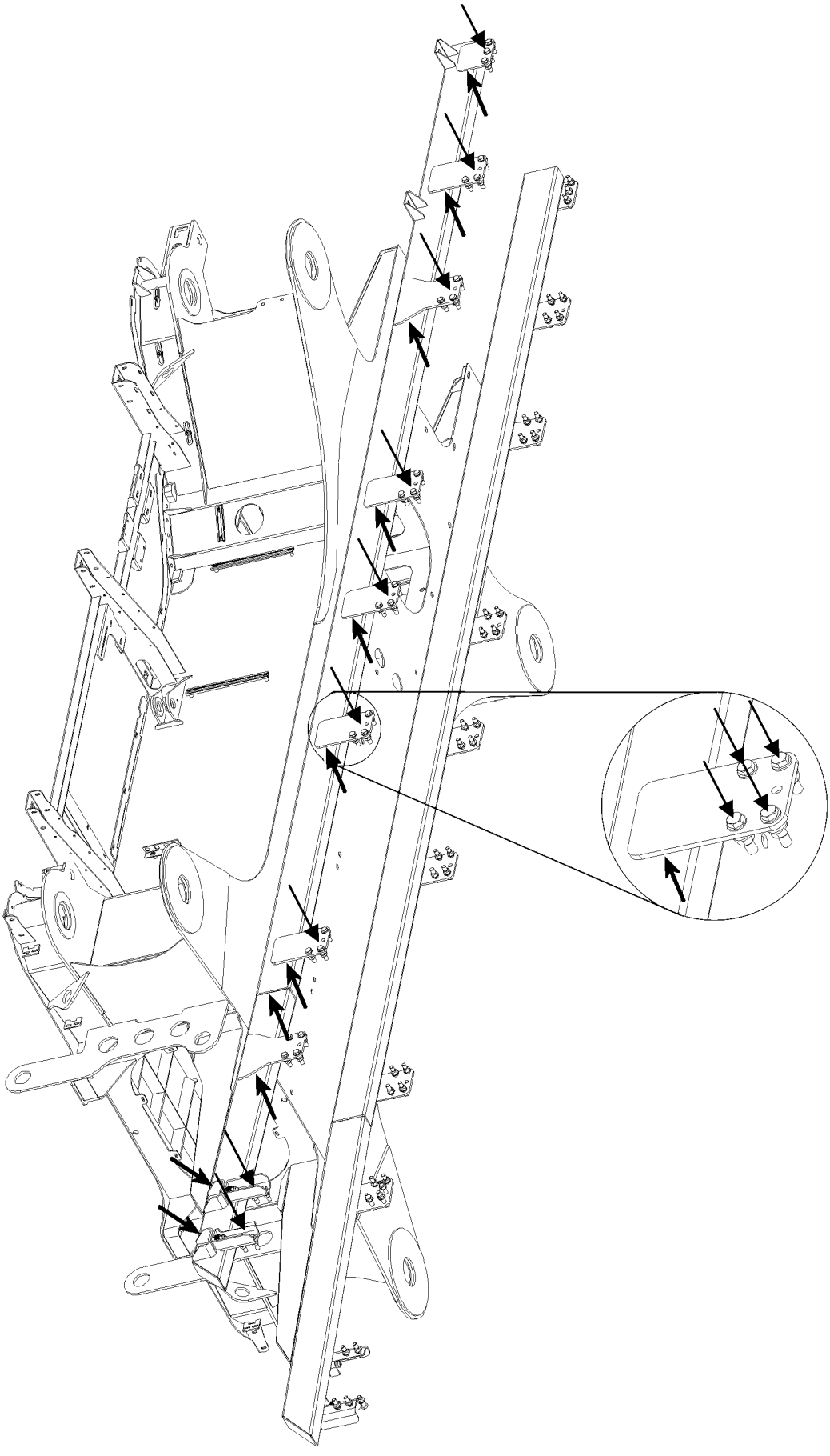
B105719

Example for vehicle frame



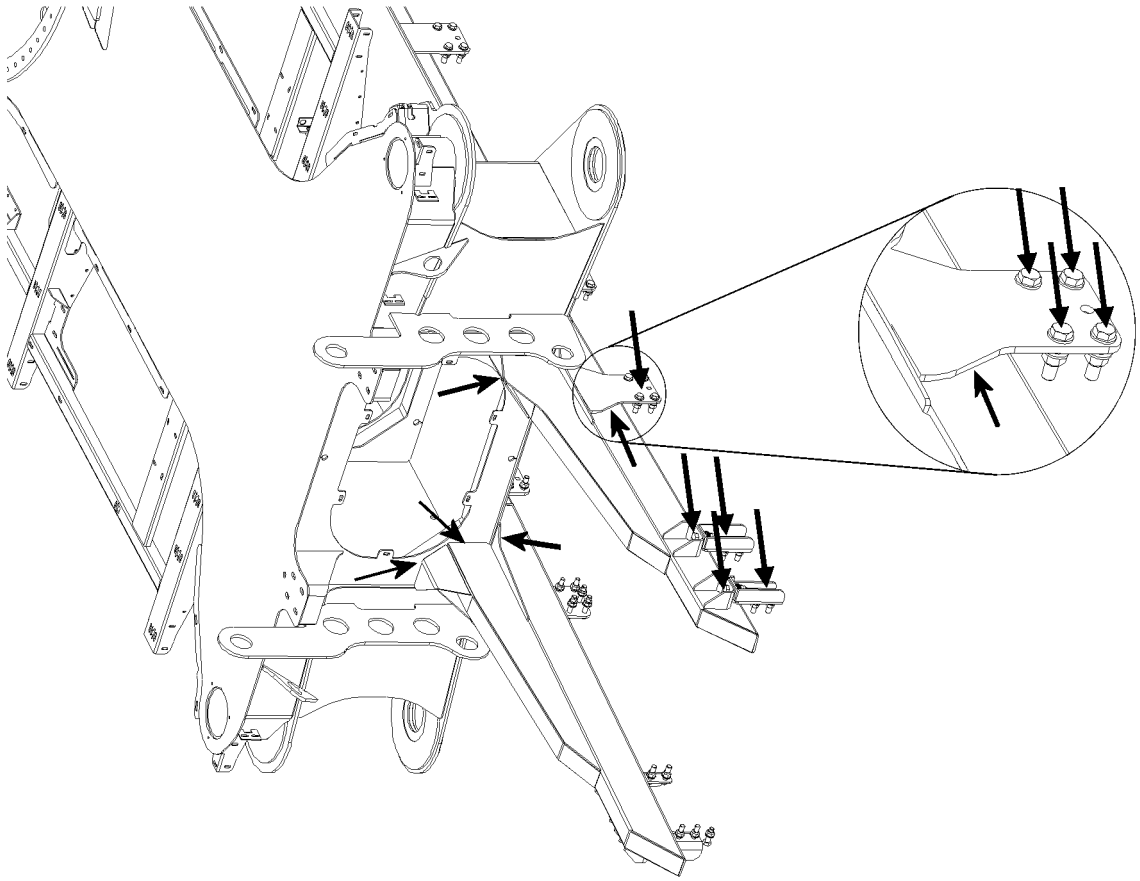
B105687

Example for tow coupling

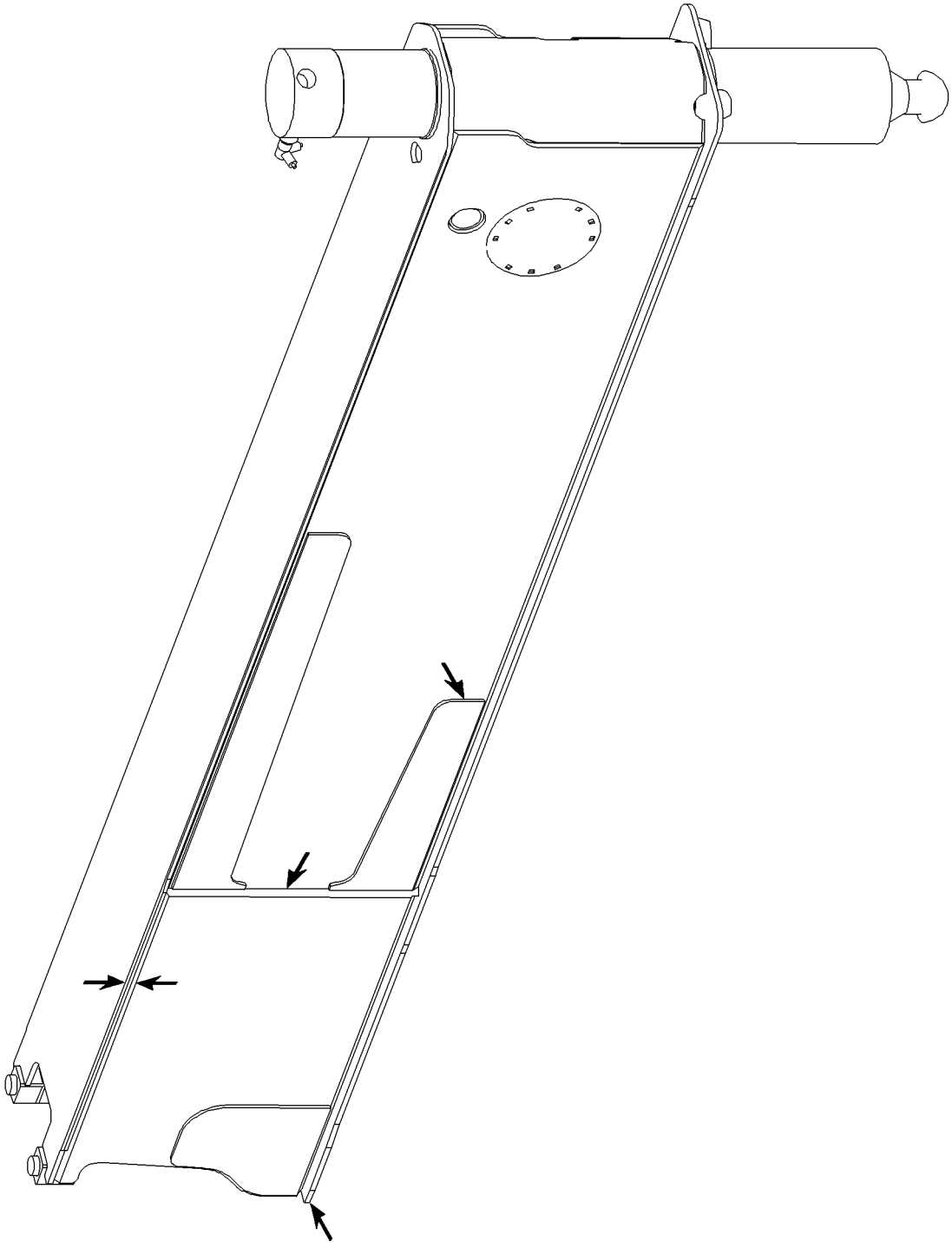


B113940

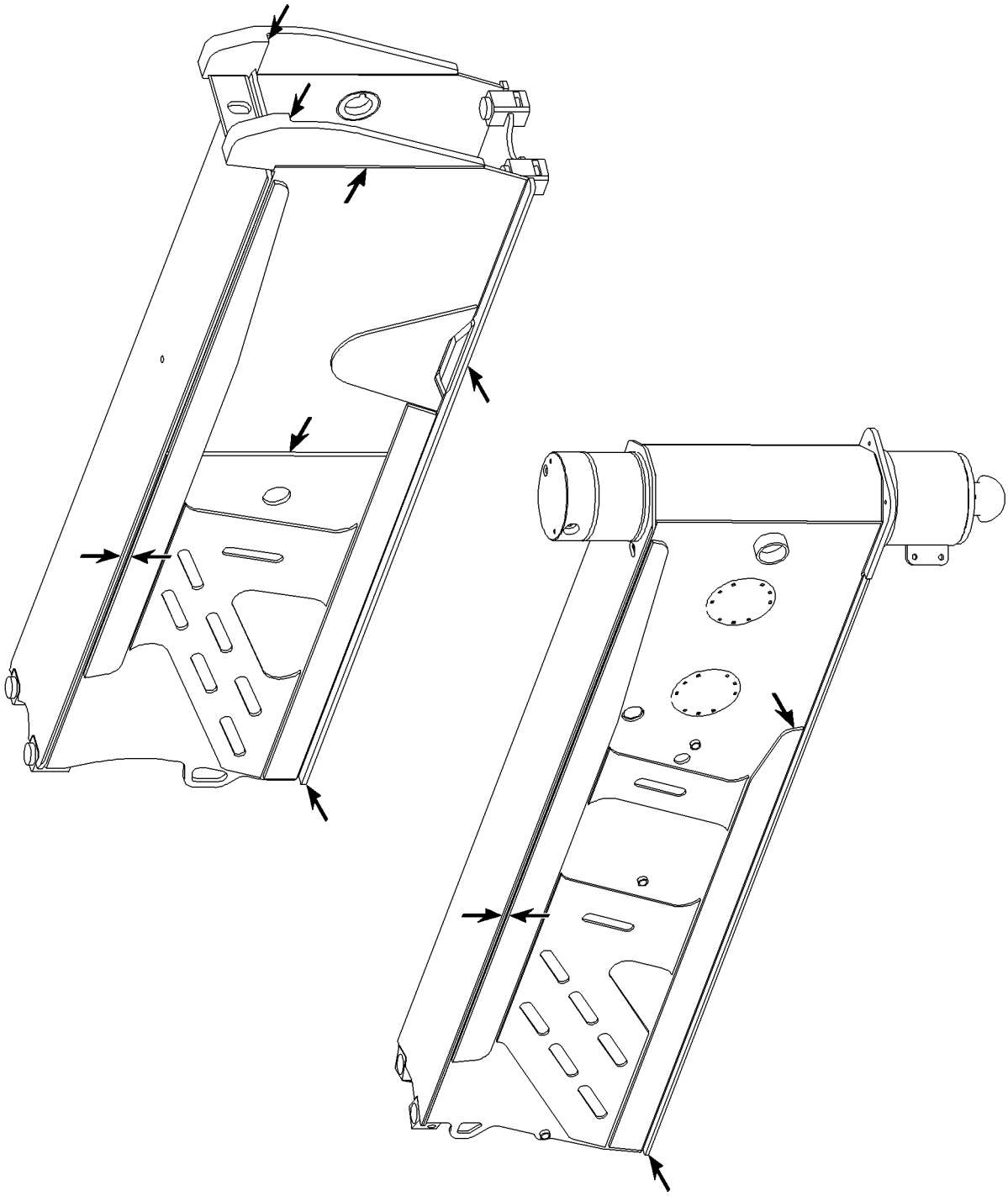
Example for intermediate frame



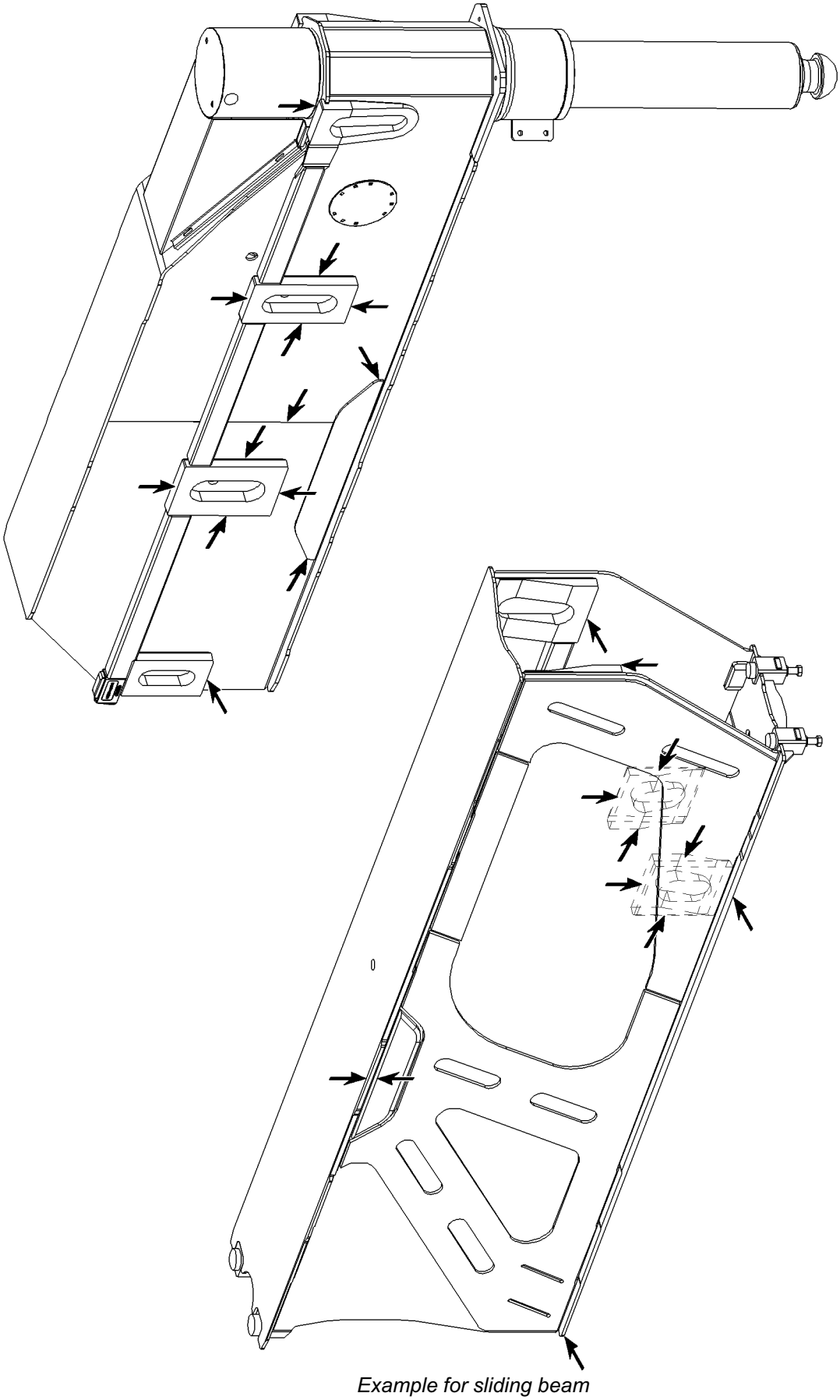
B114000 *Example for intermediate frame*



B105698 *Example for sliding beam*

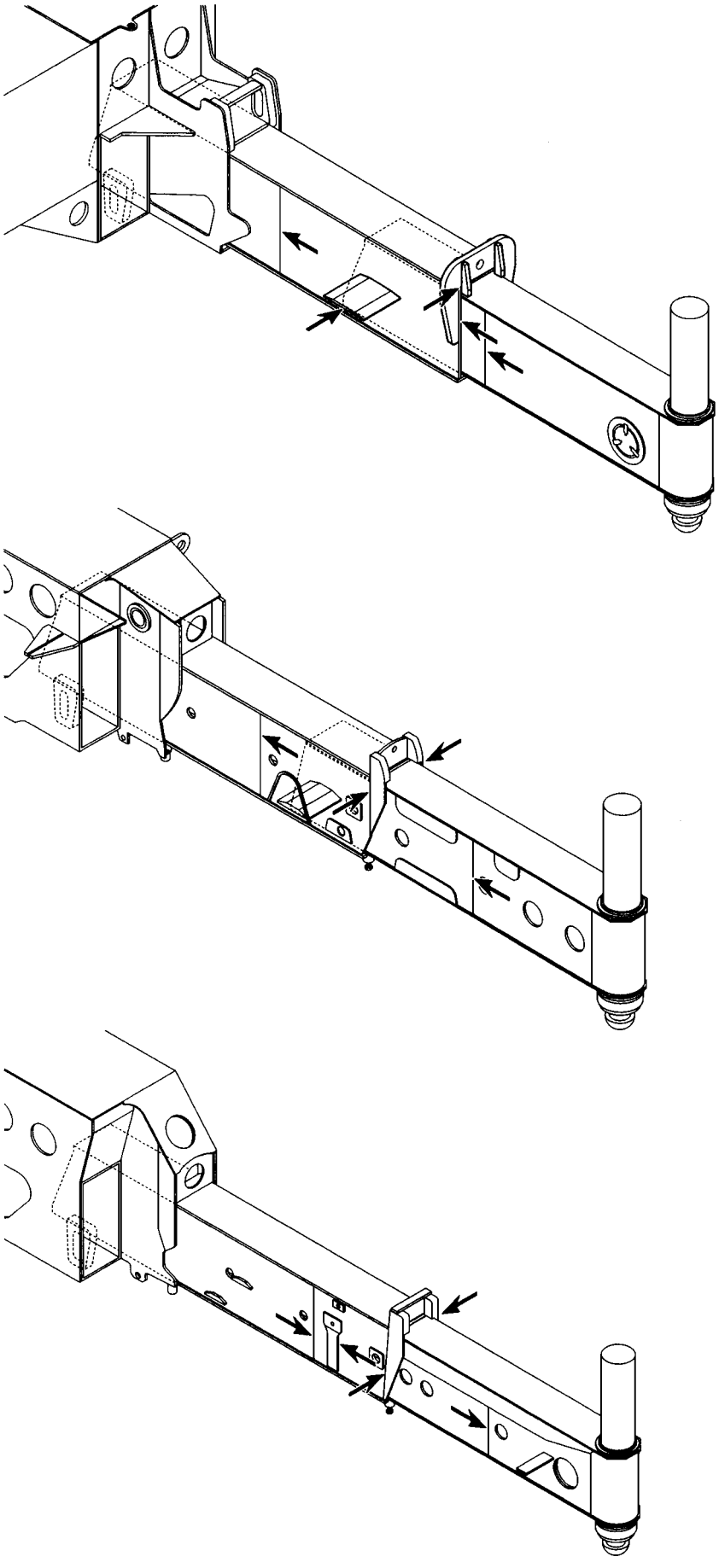


B105717 *Example for sliding beam*



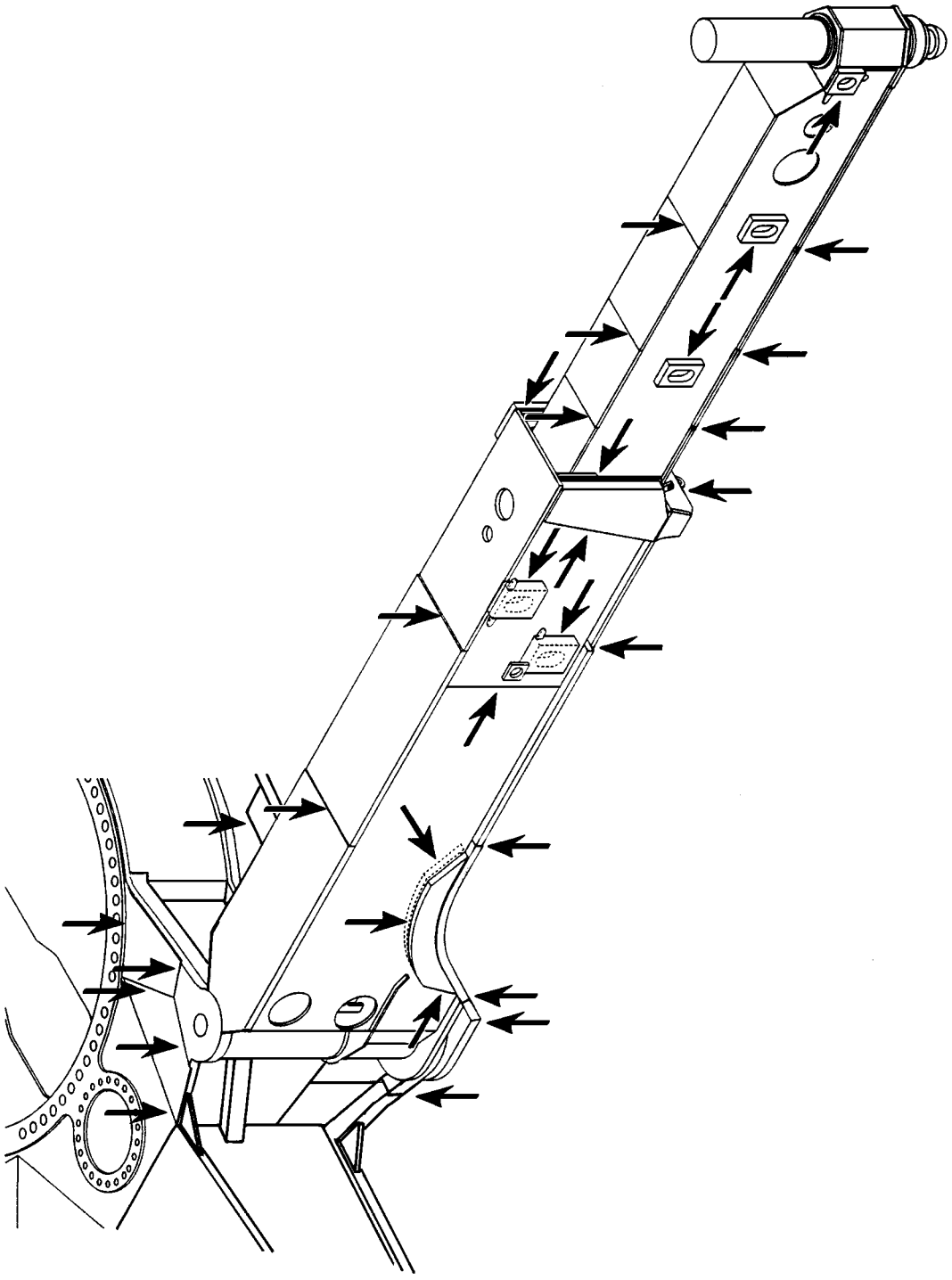
B105718

Example for sliding beam

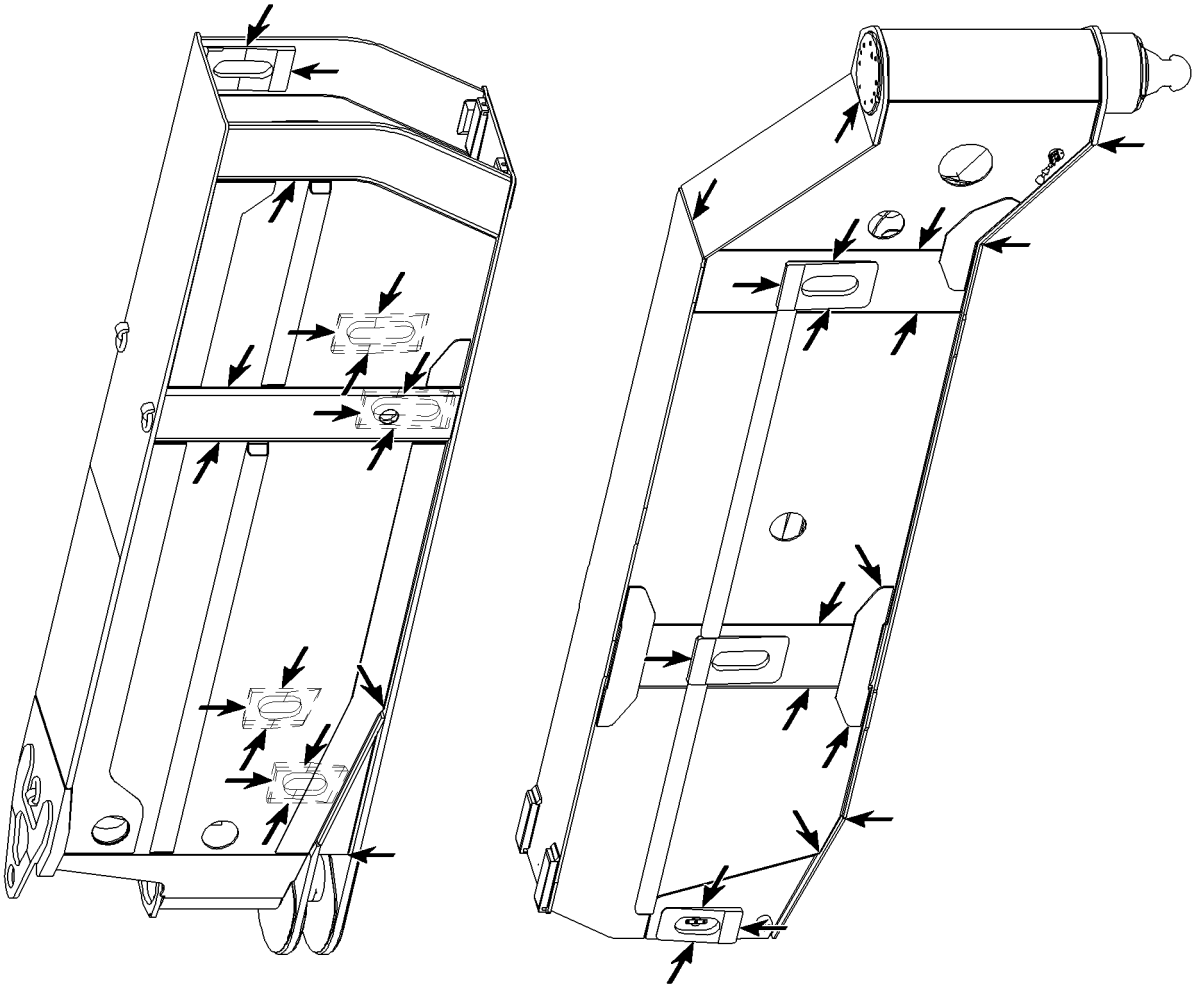


B185047

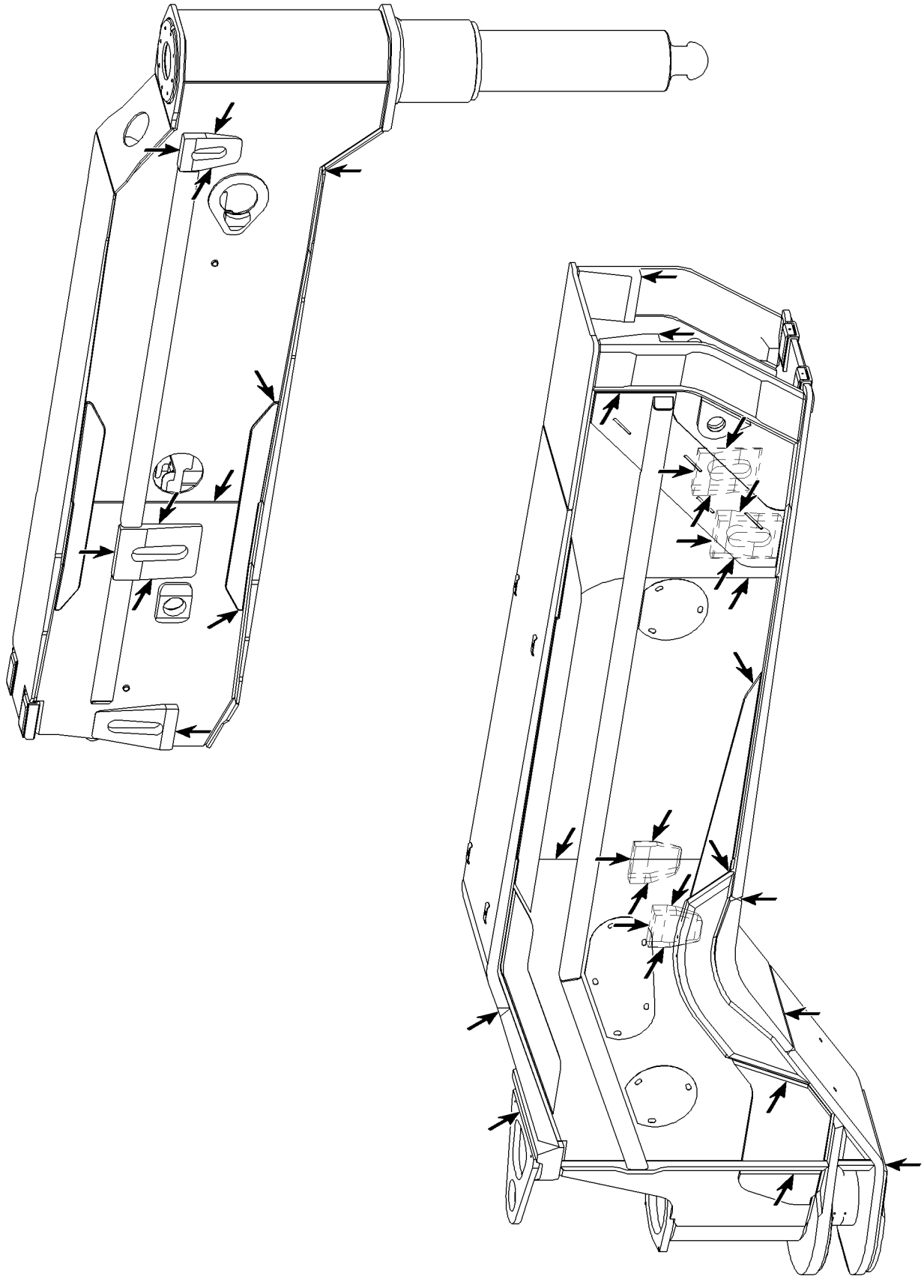
Example for sliding beam



B185060 *Example for slewing sliding beam*

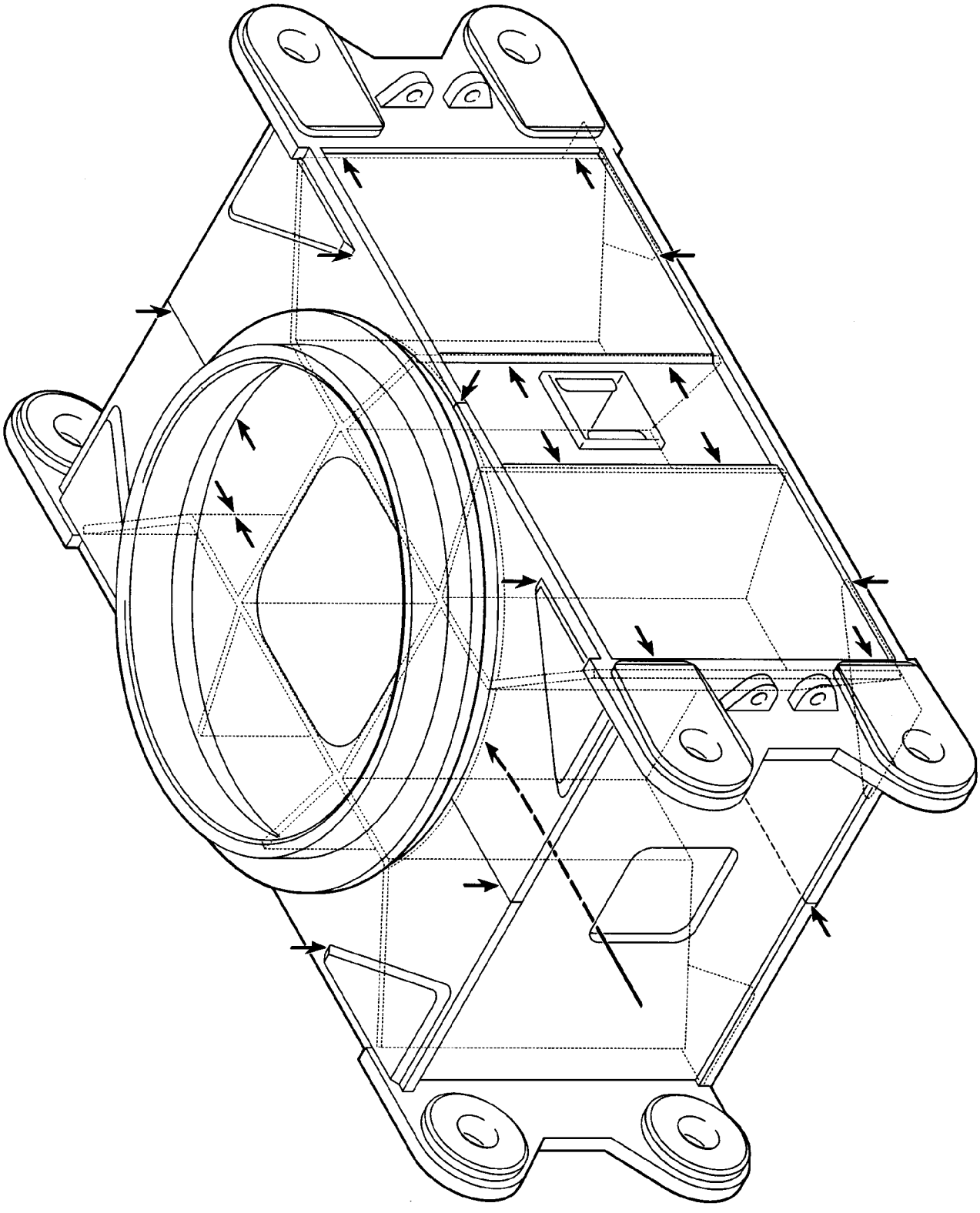


B105690 *Example for slewing sliding beam*

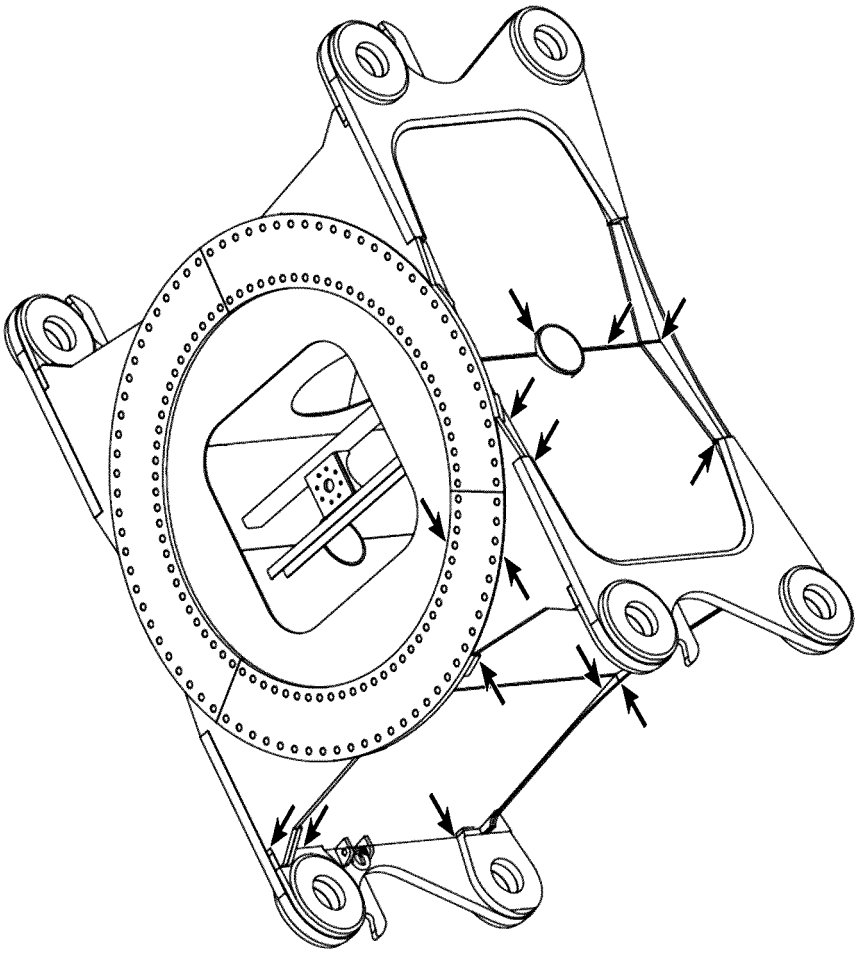


B105704

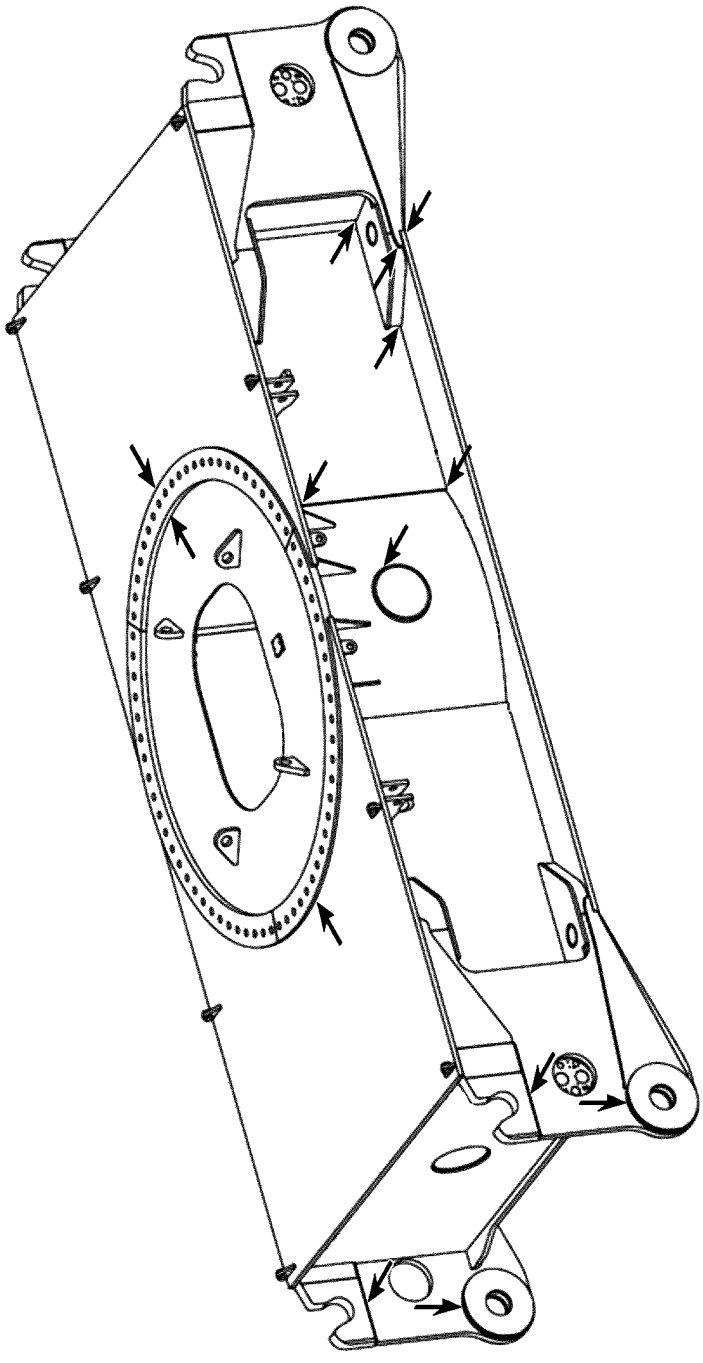
Example for slewing sliding beam



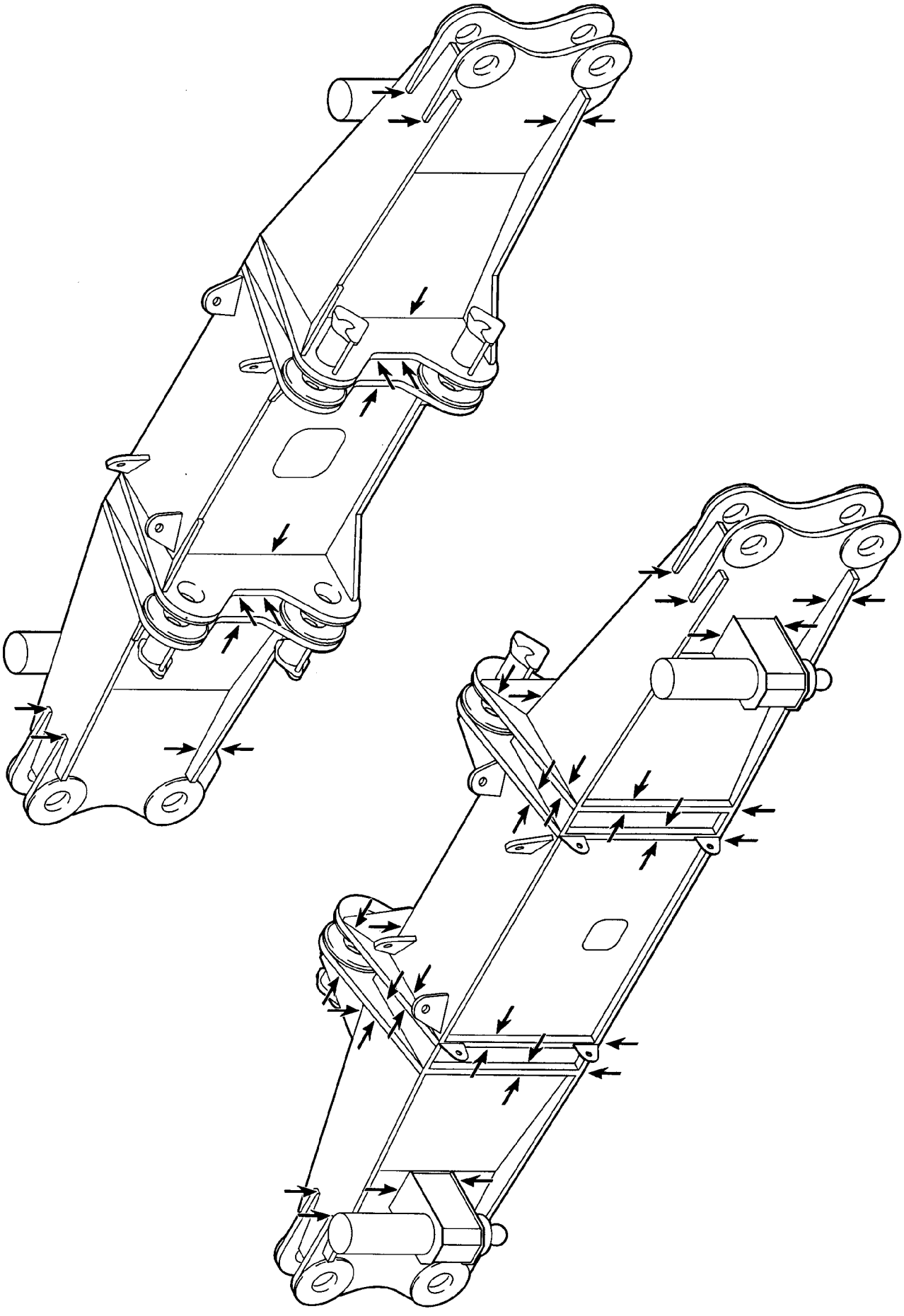
B187347 *Example for crawler center section*



B105725 *Example for crawler center section*

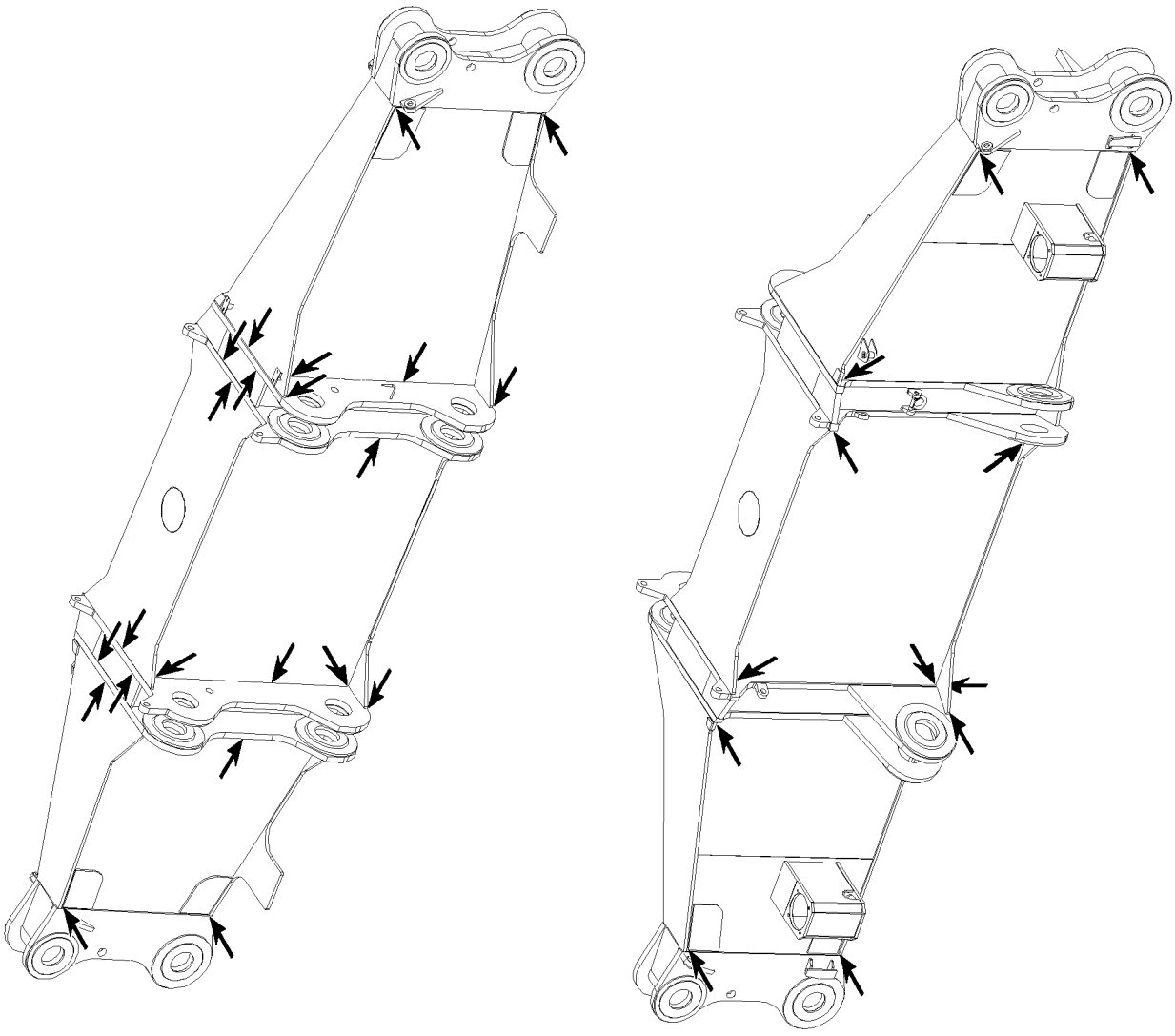


B105726 *Example for crawler center section*

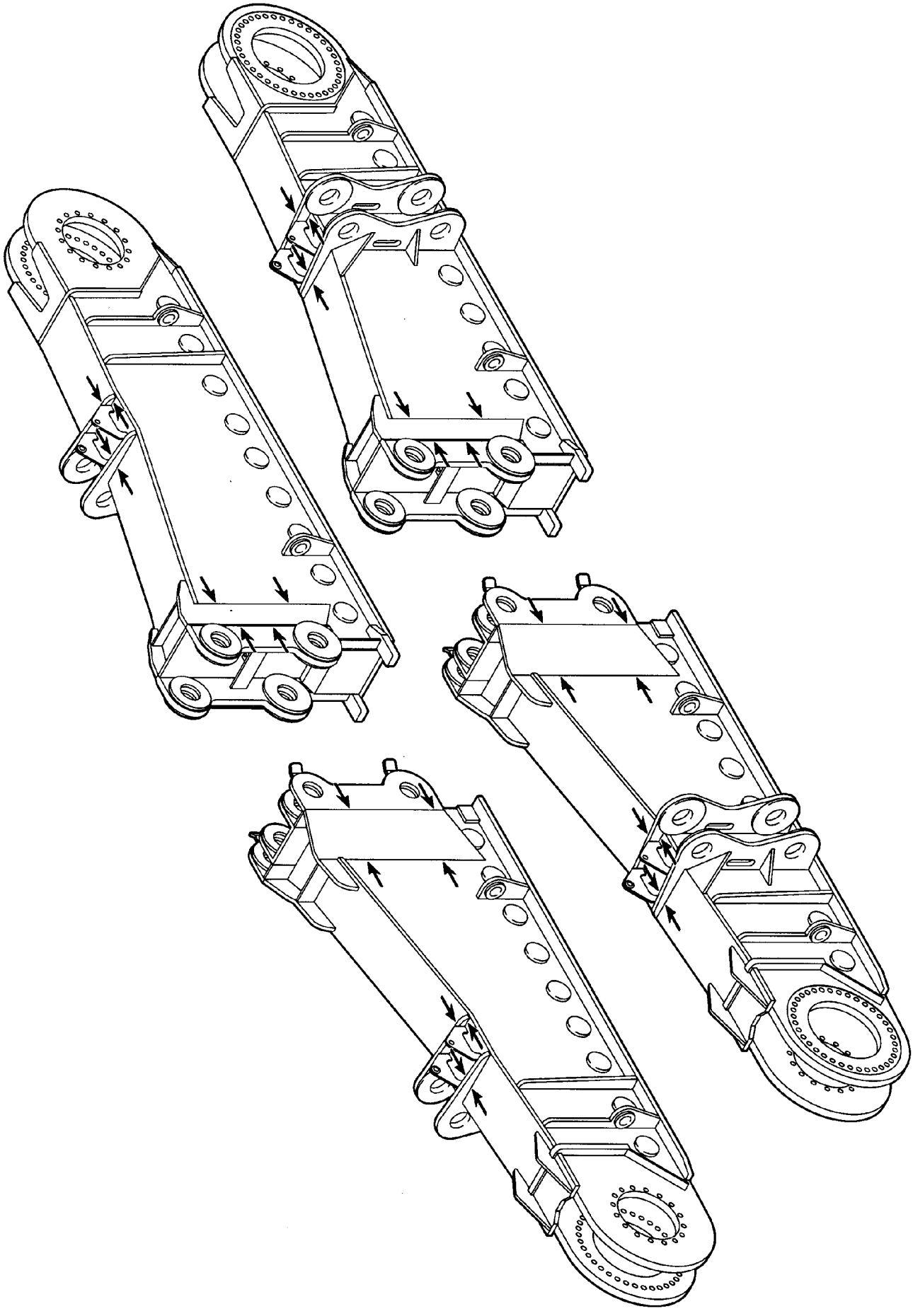


B187348

Example for cross carrier

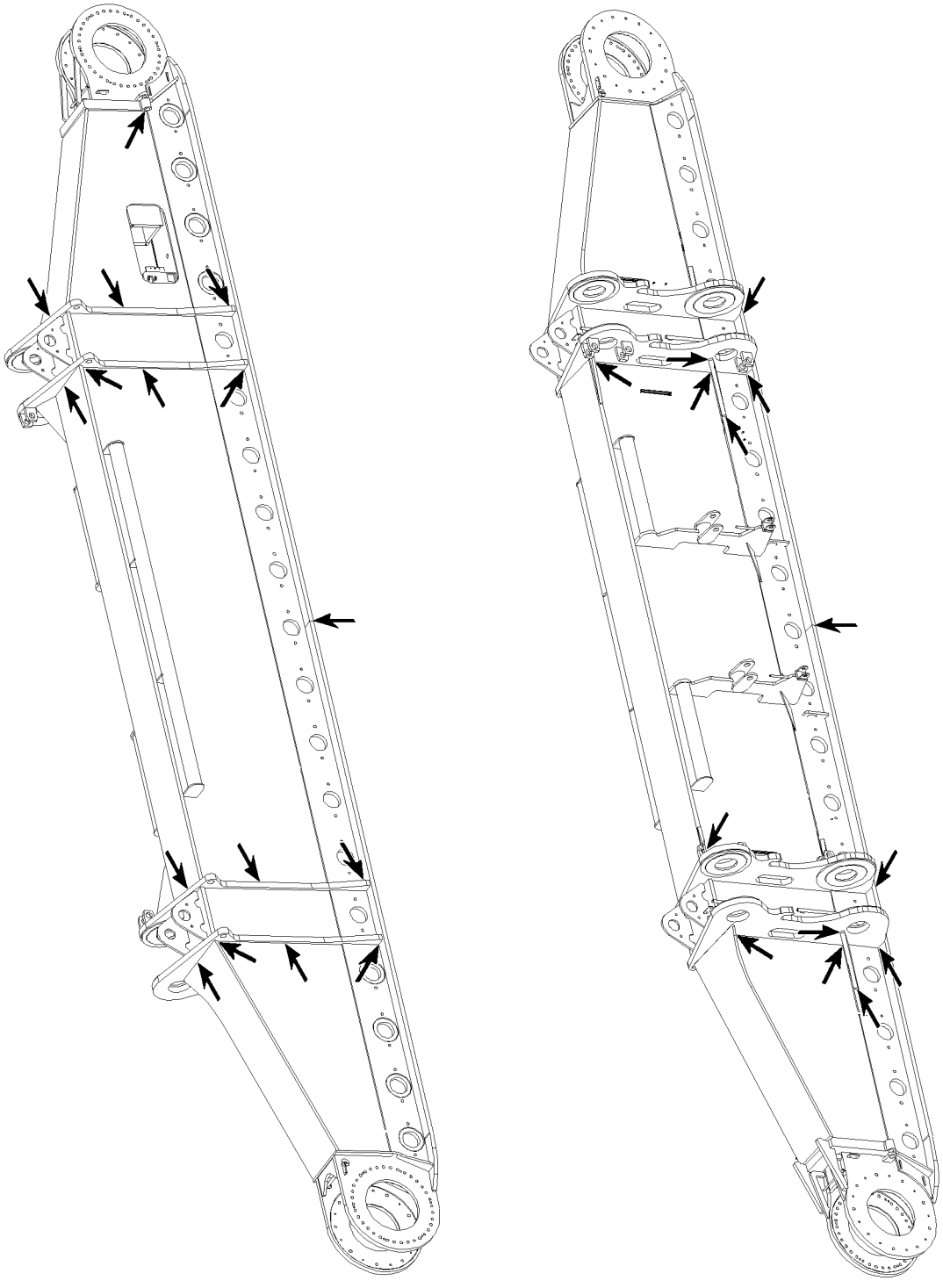


B105727 *Example for cross carrier*



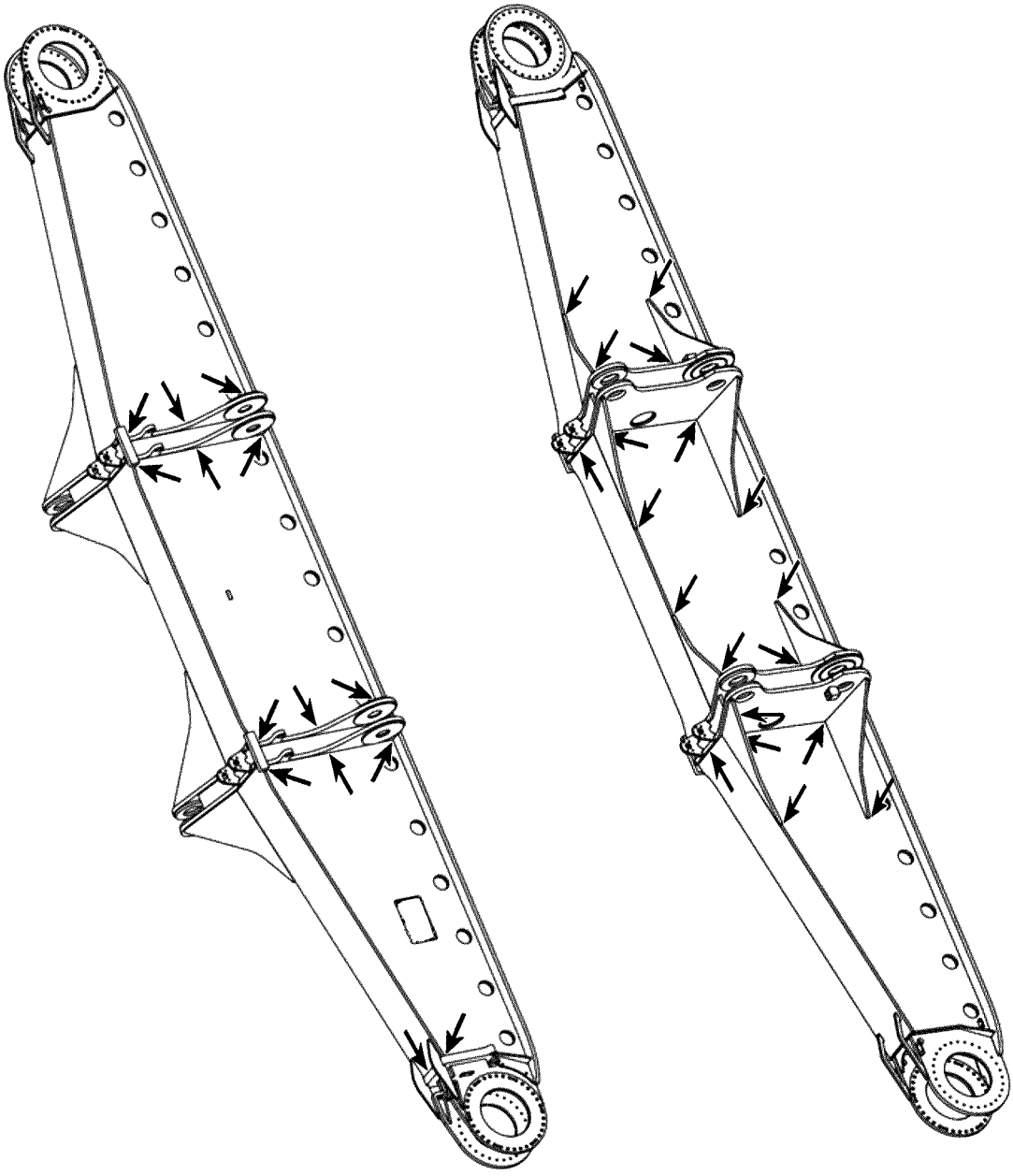
B187349

Example for crawler carrier

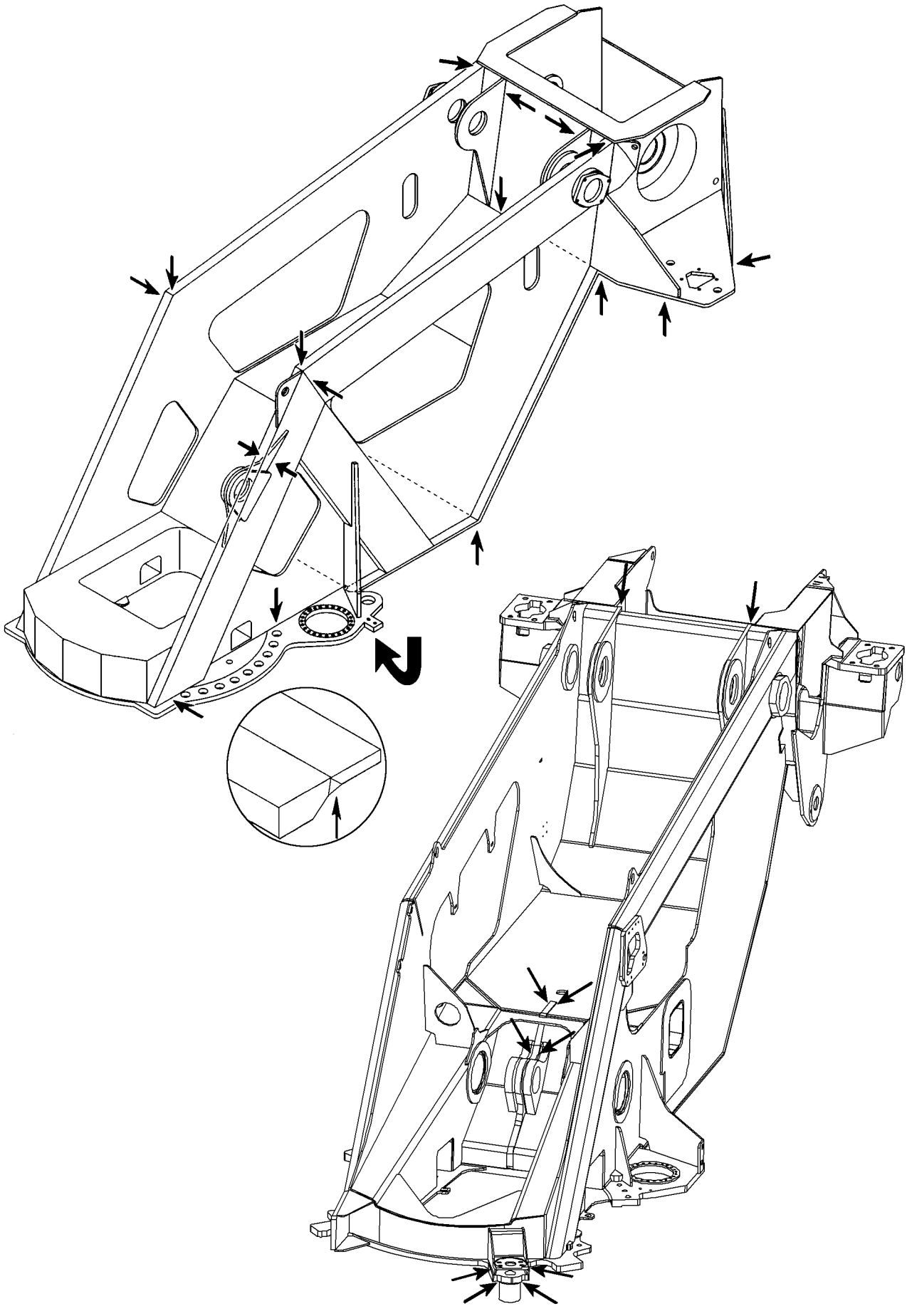


B105728

Example for crawler carrier

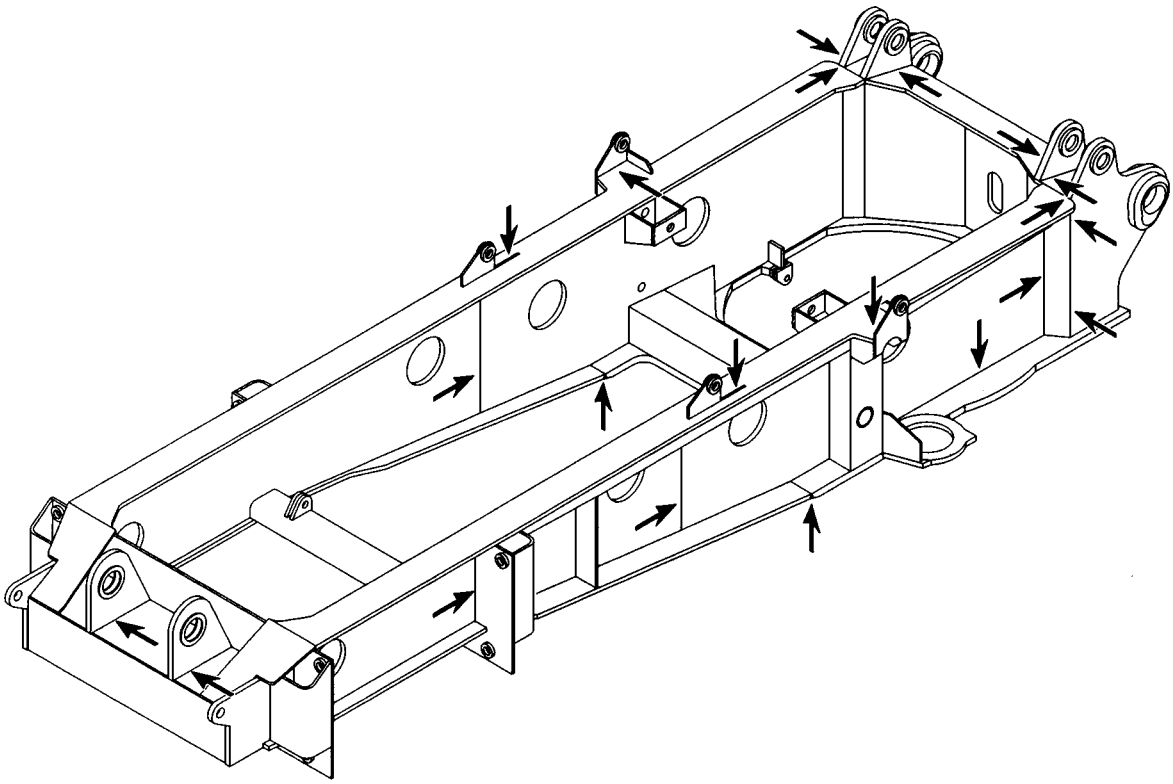


B105729 *Example for crawler carrier*



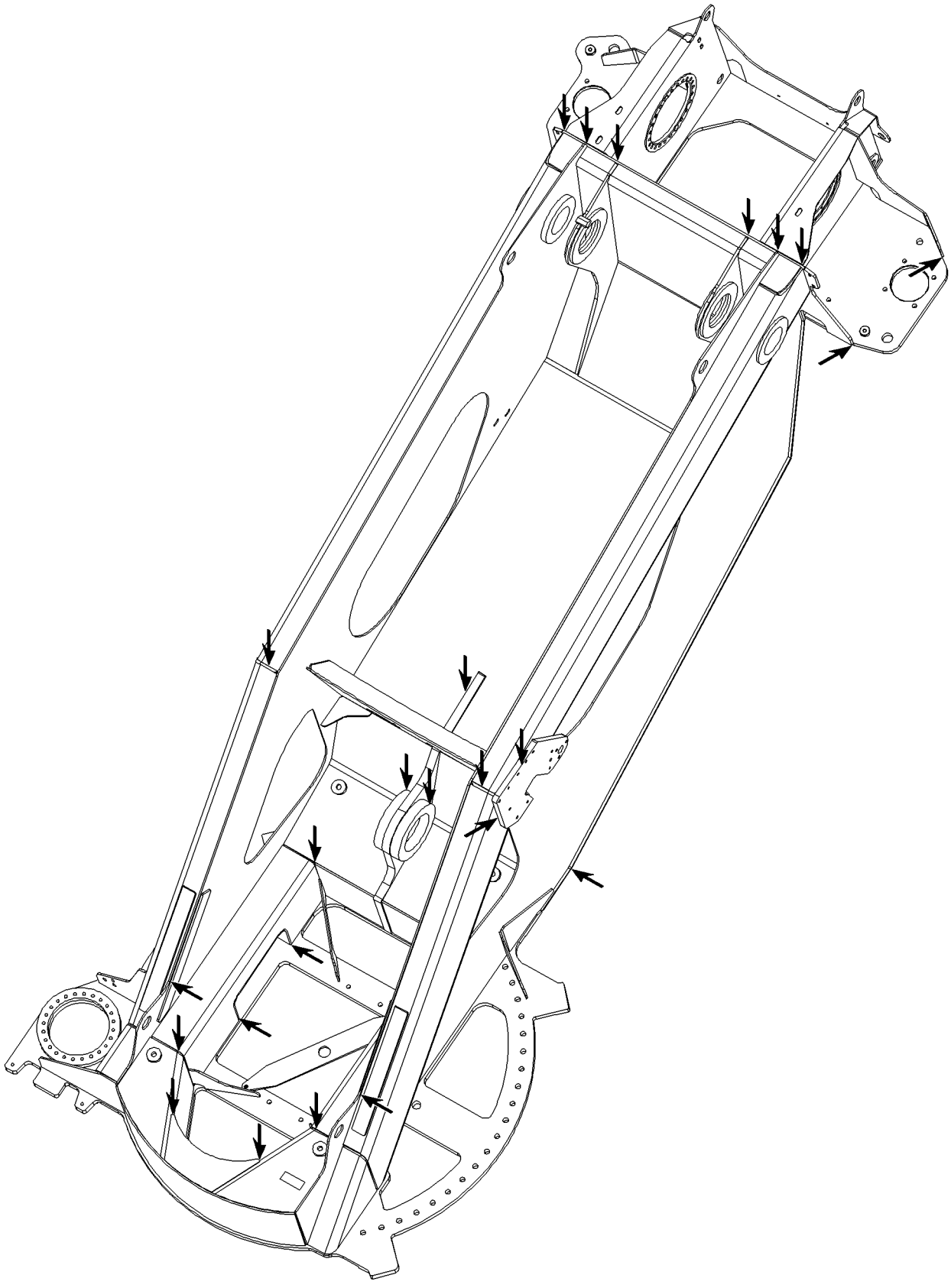
B185048

Example for turntable frame

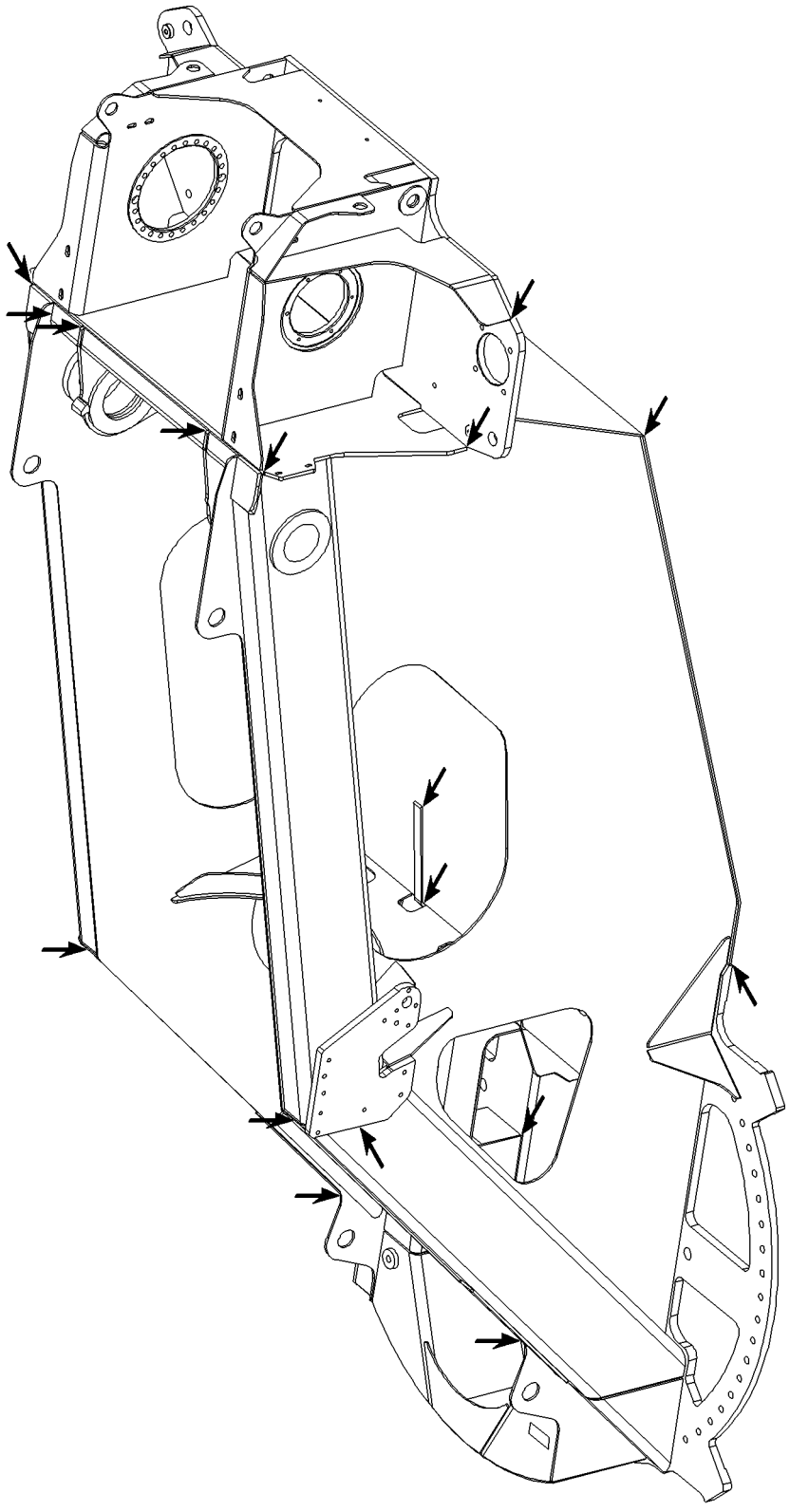


B185049

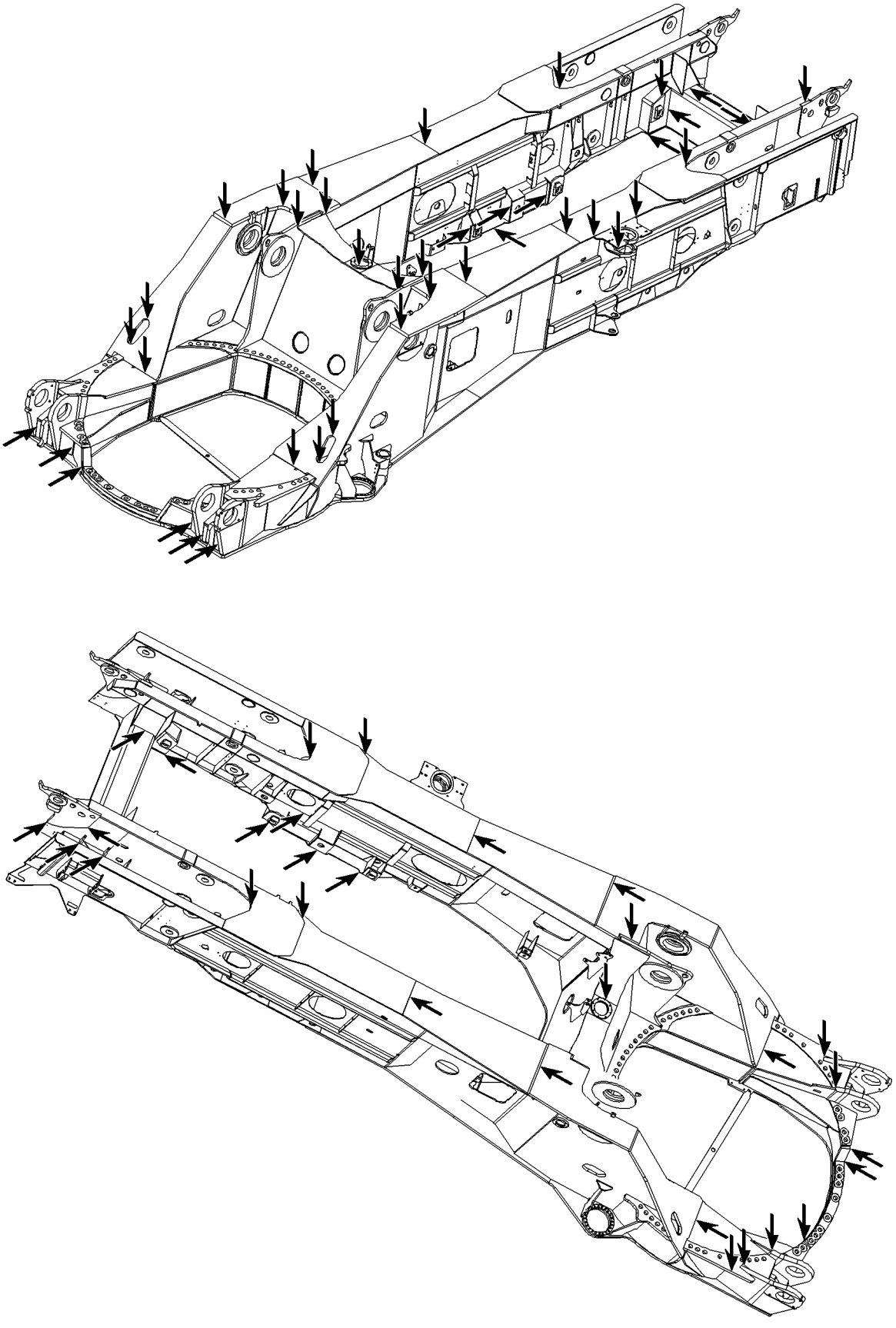
Example for turntable frame



B105700 *Example for turntable frame*

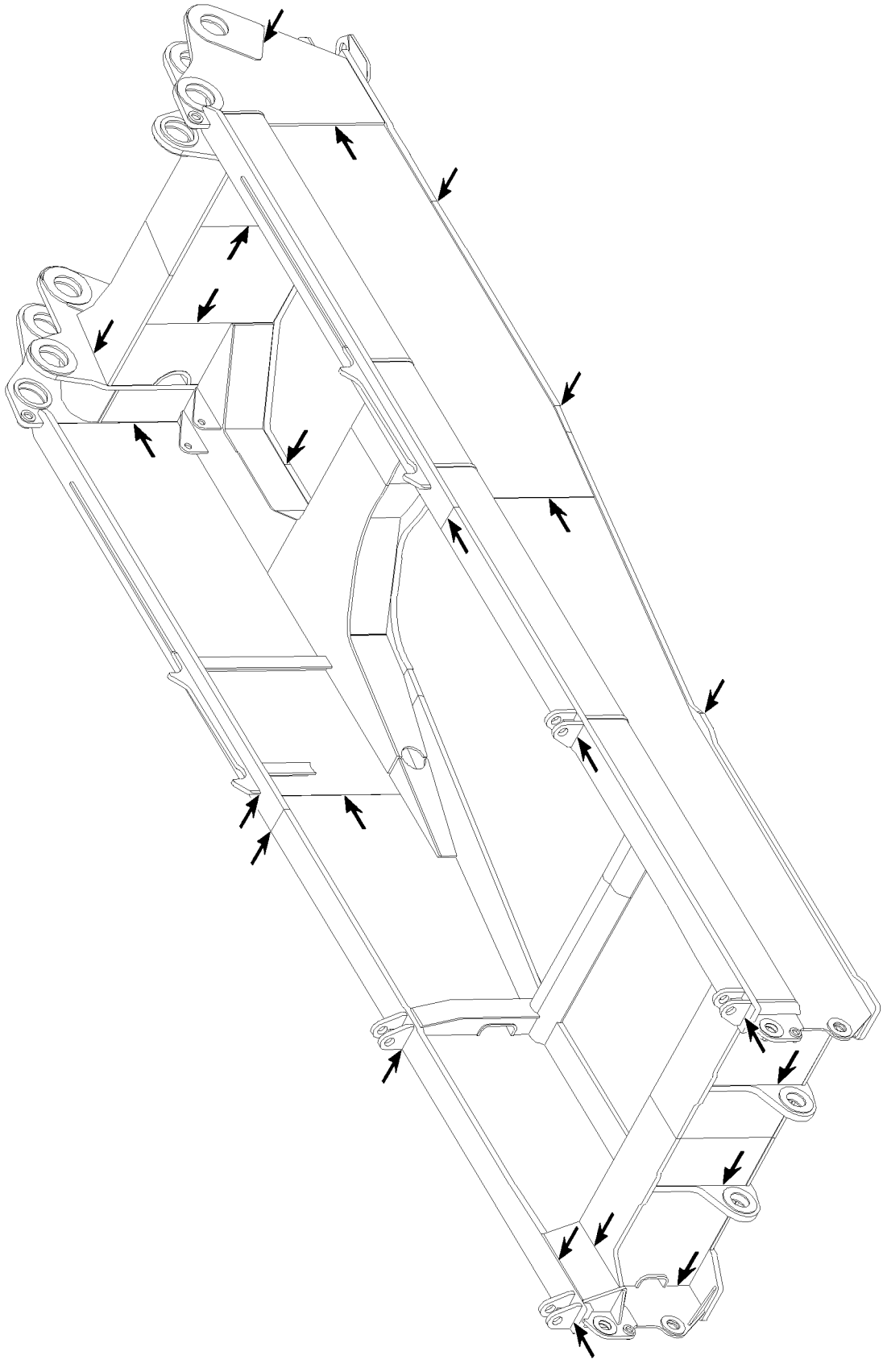


B105701 *Example for turntable frame*



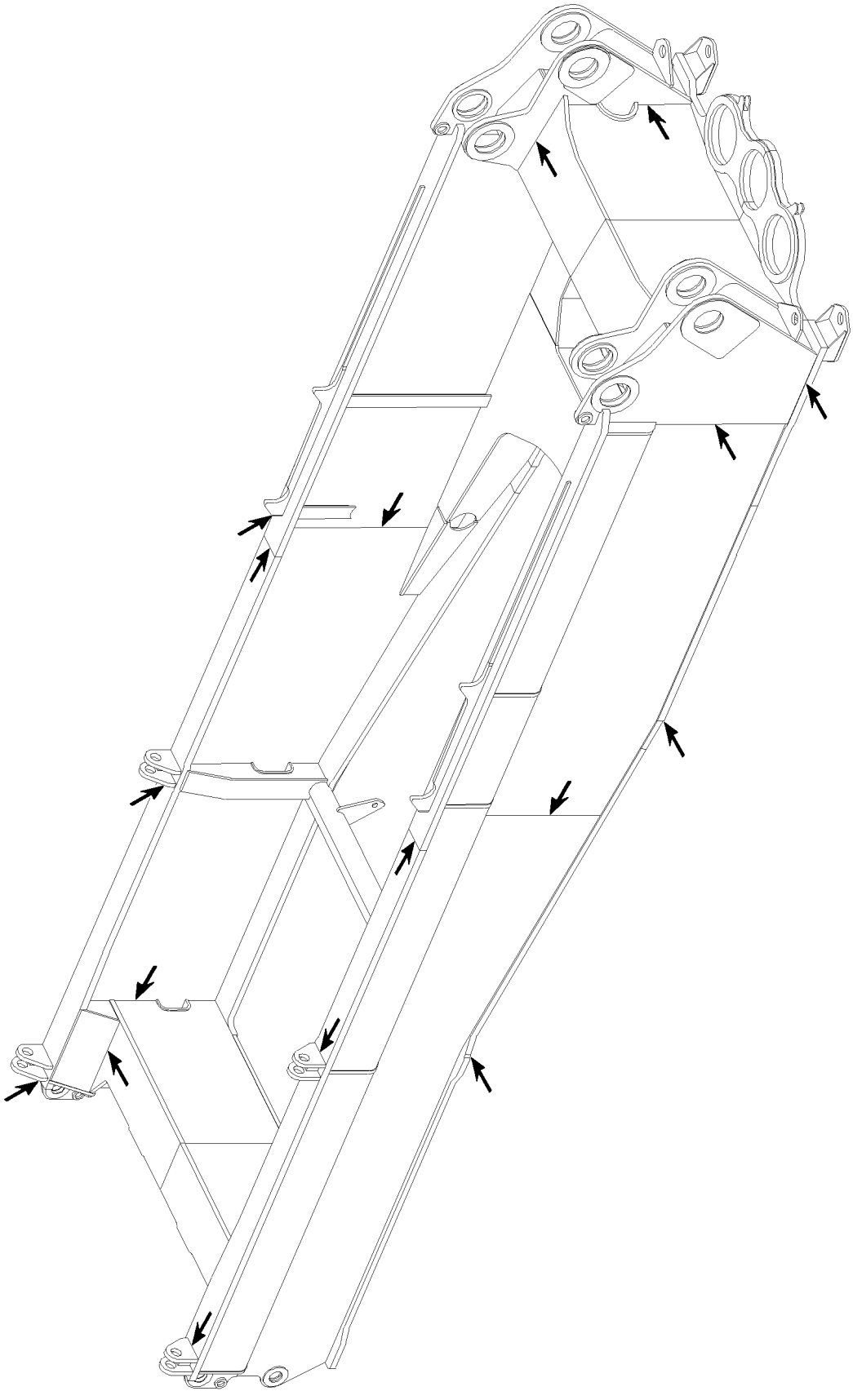
B105706

Example for turntable frame



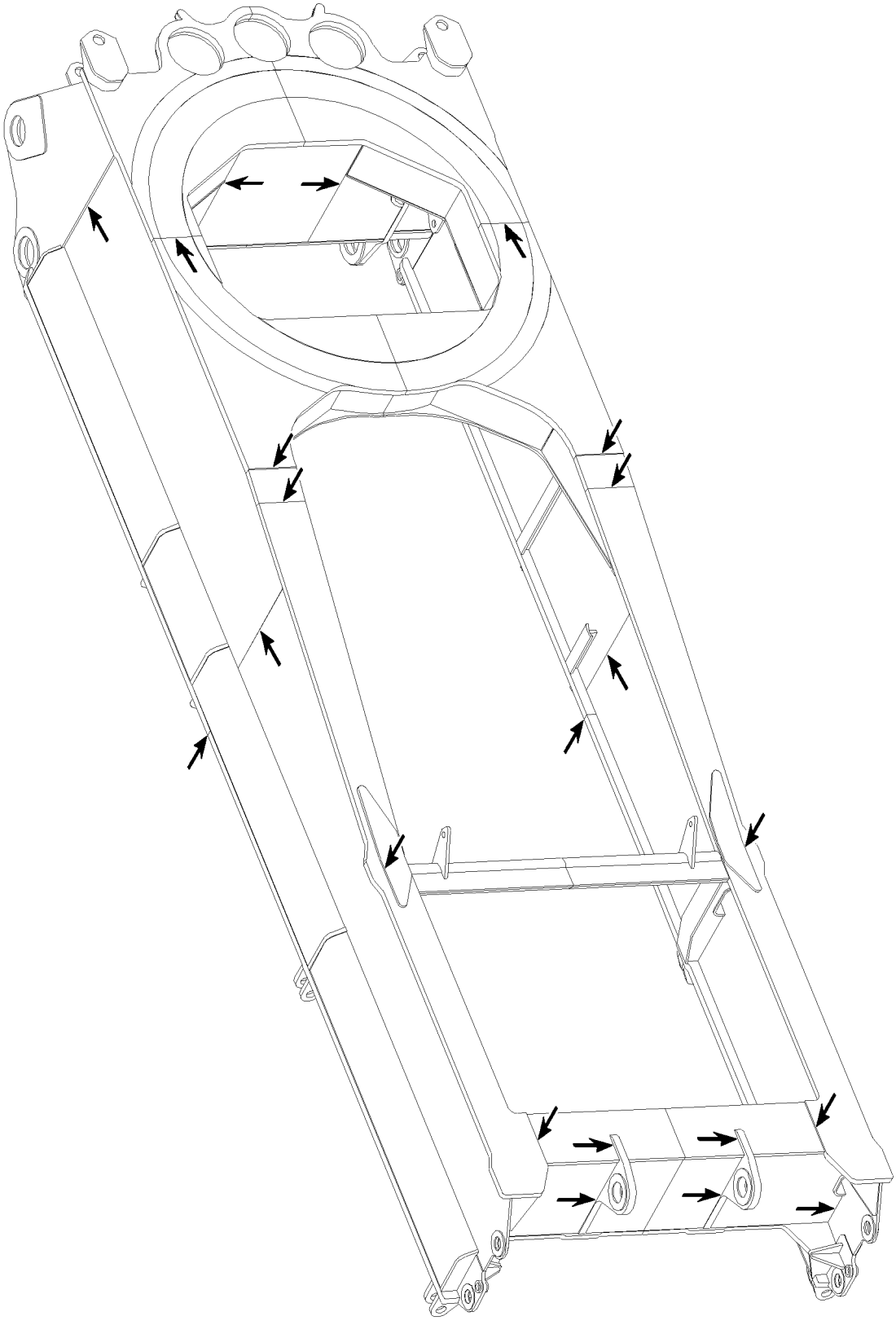
B105694

Example for turntable frame



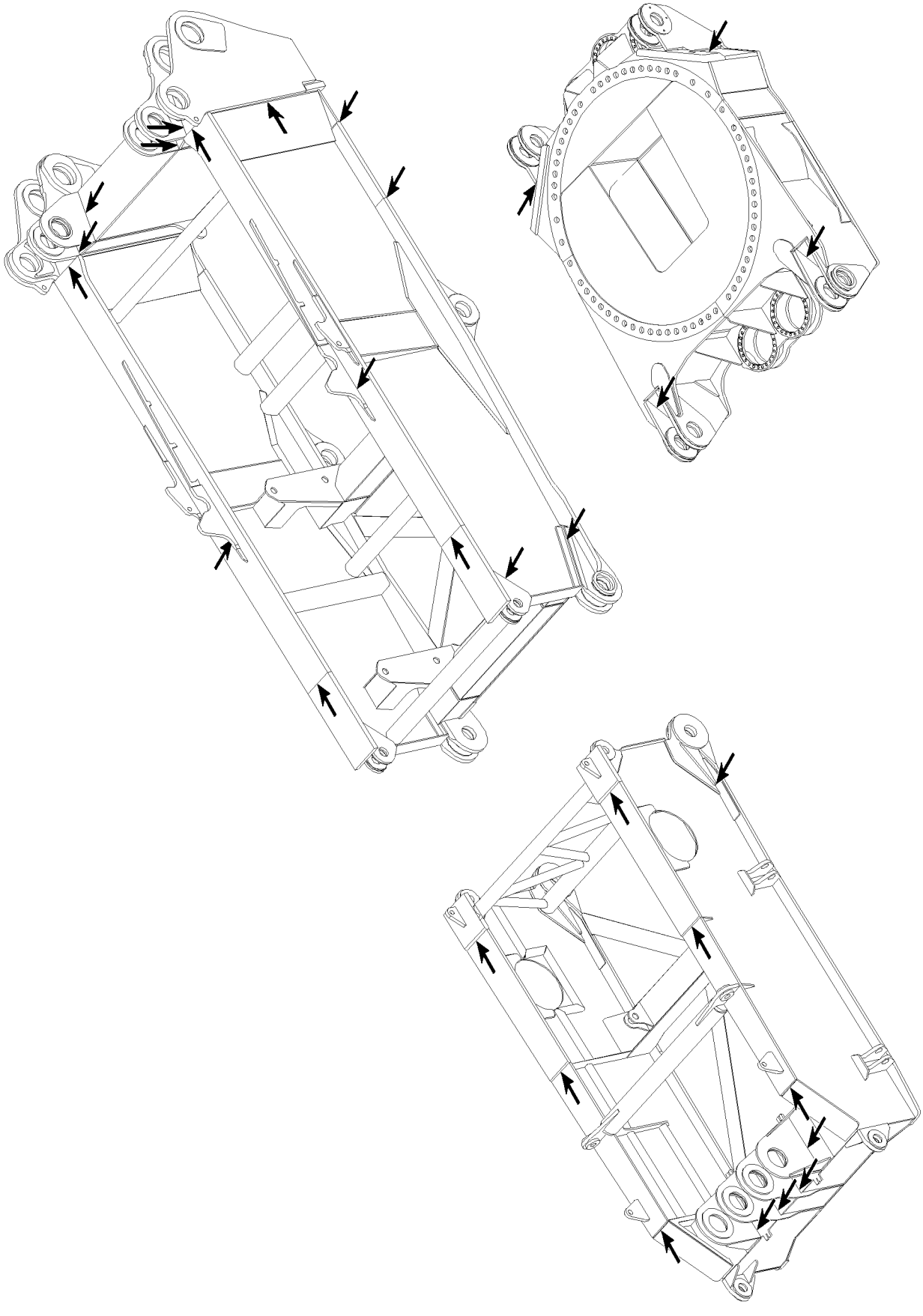
B105695

Example for turntable frame



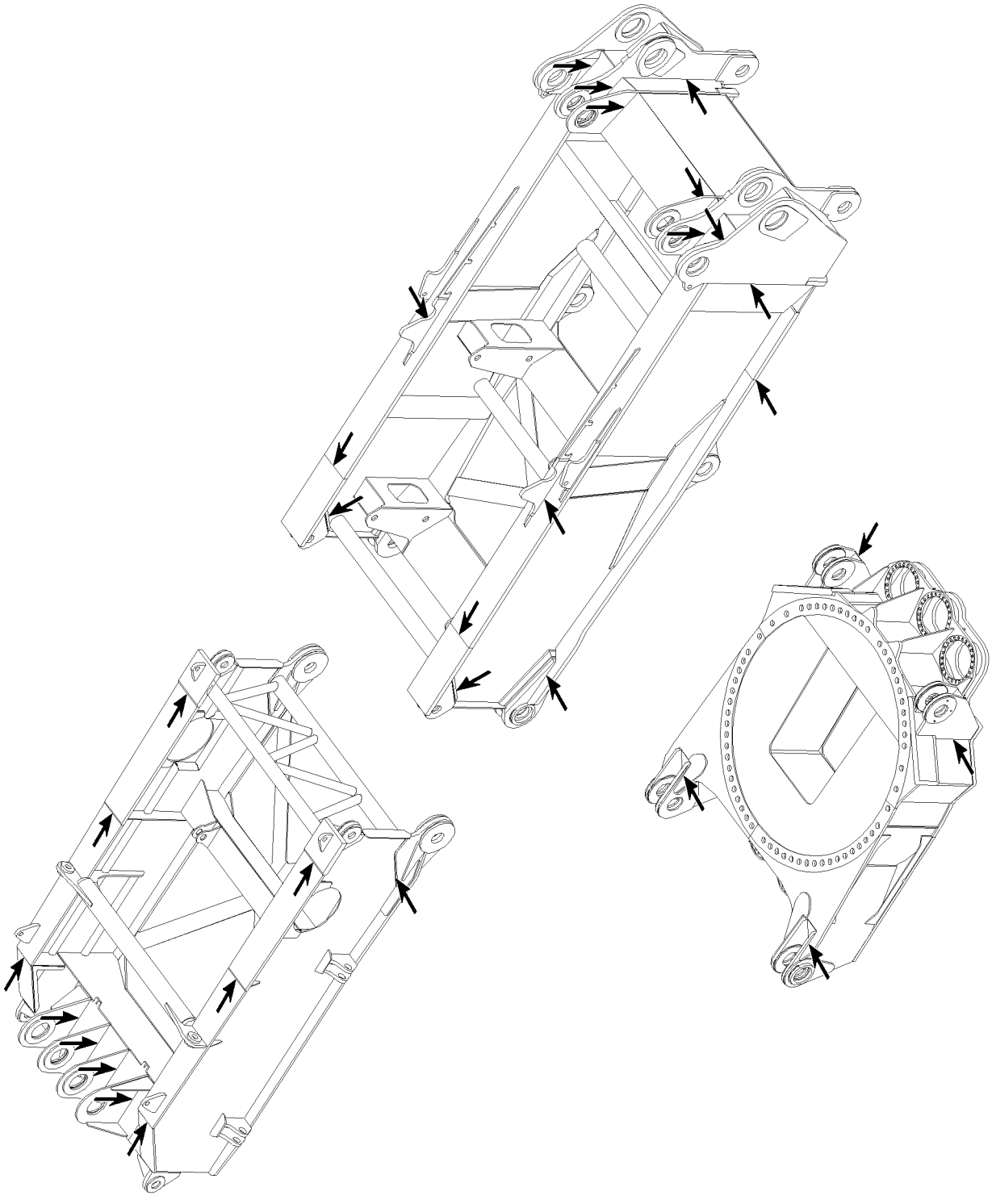
B105696

Example for turntable frame



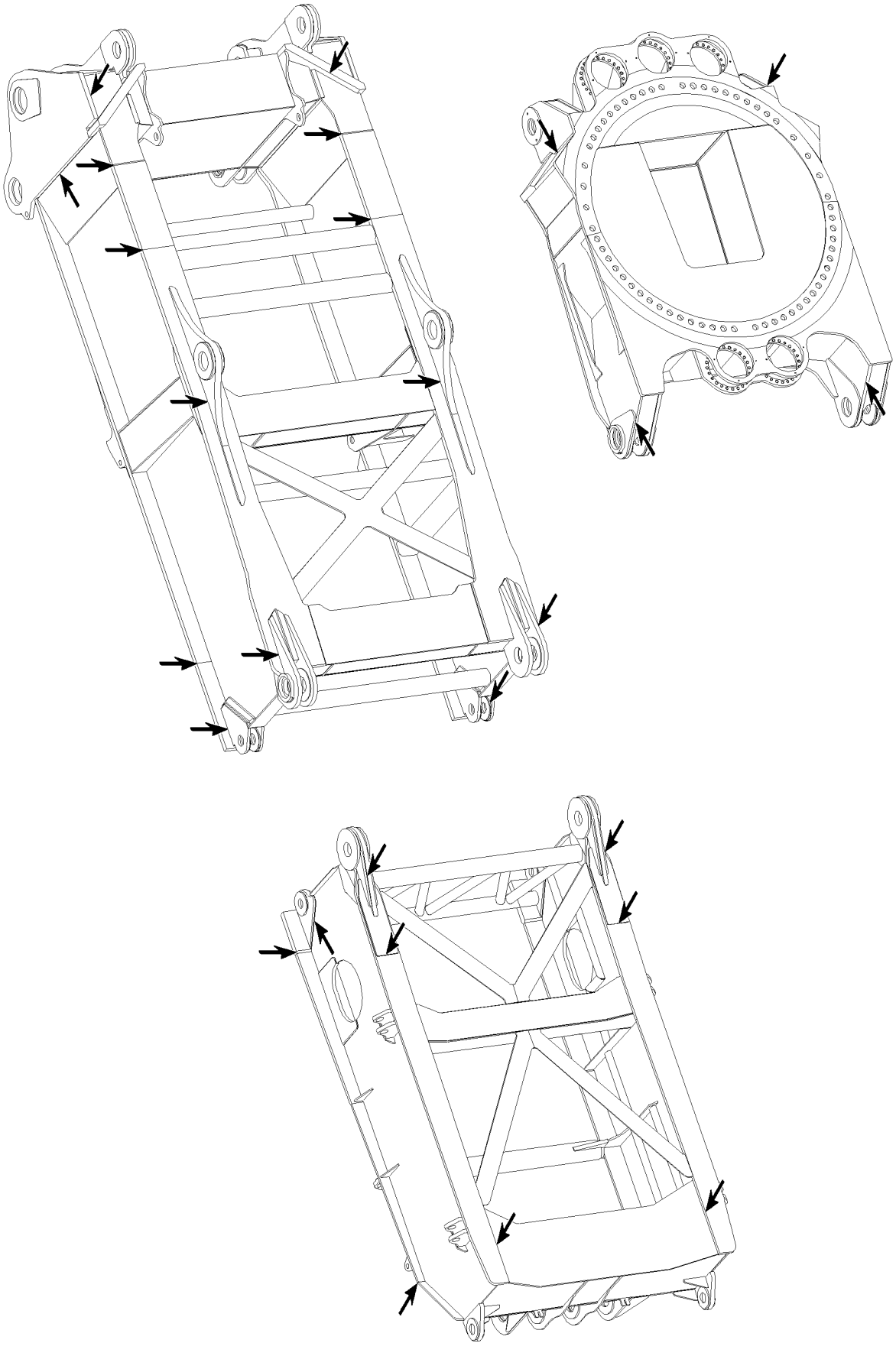
B105691

Example for turntable frame



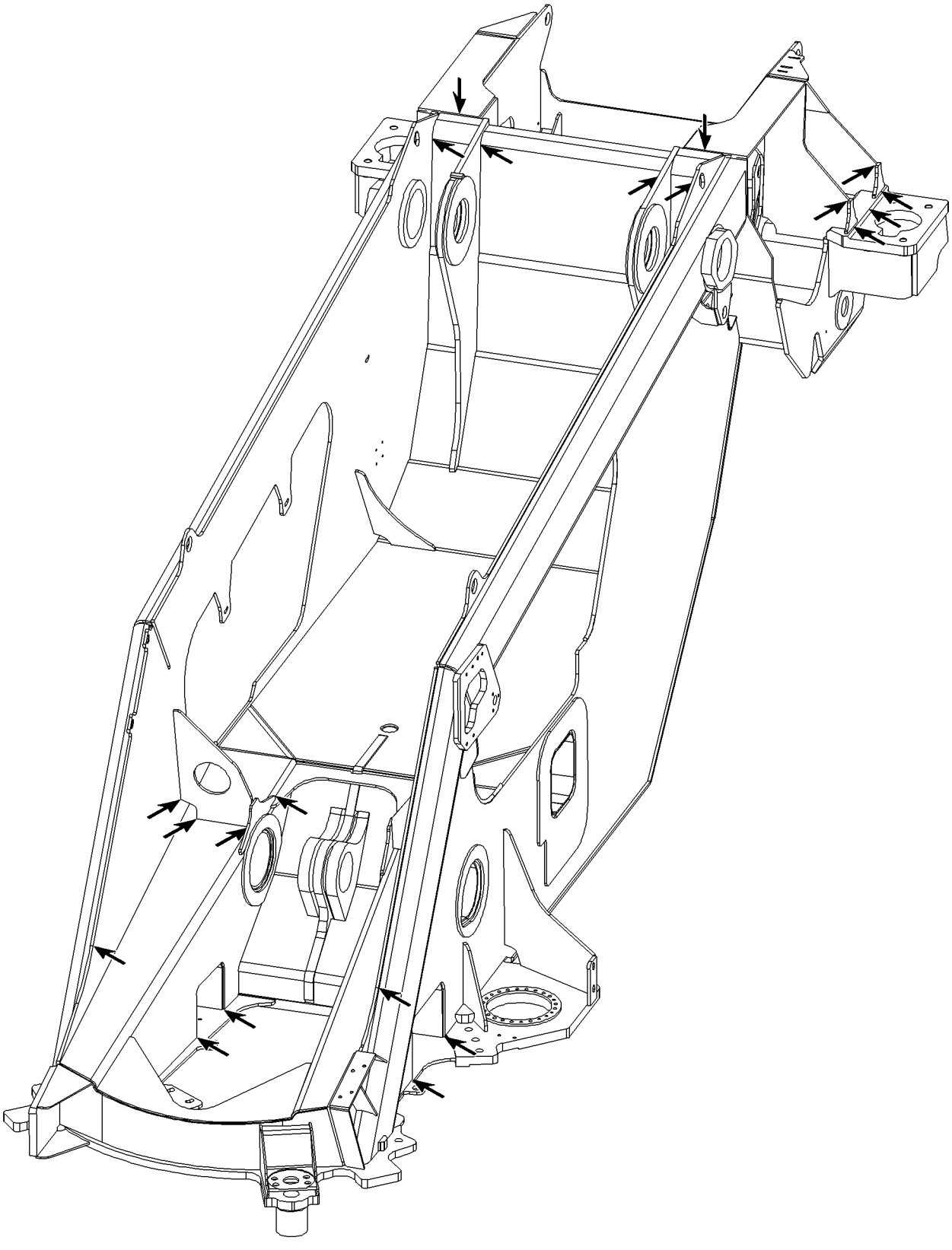
B105692

Example for turntable frame

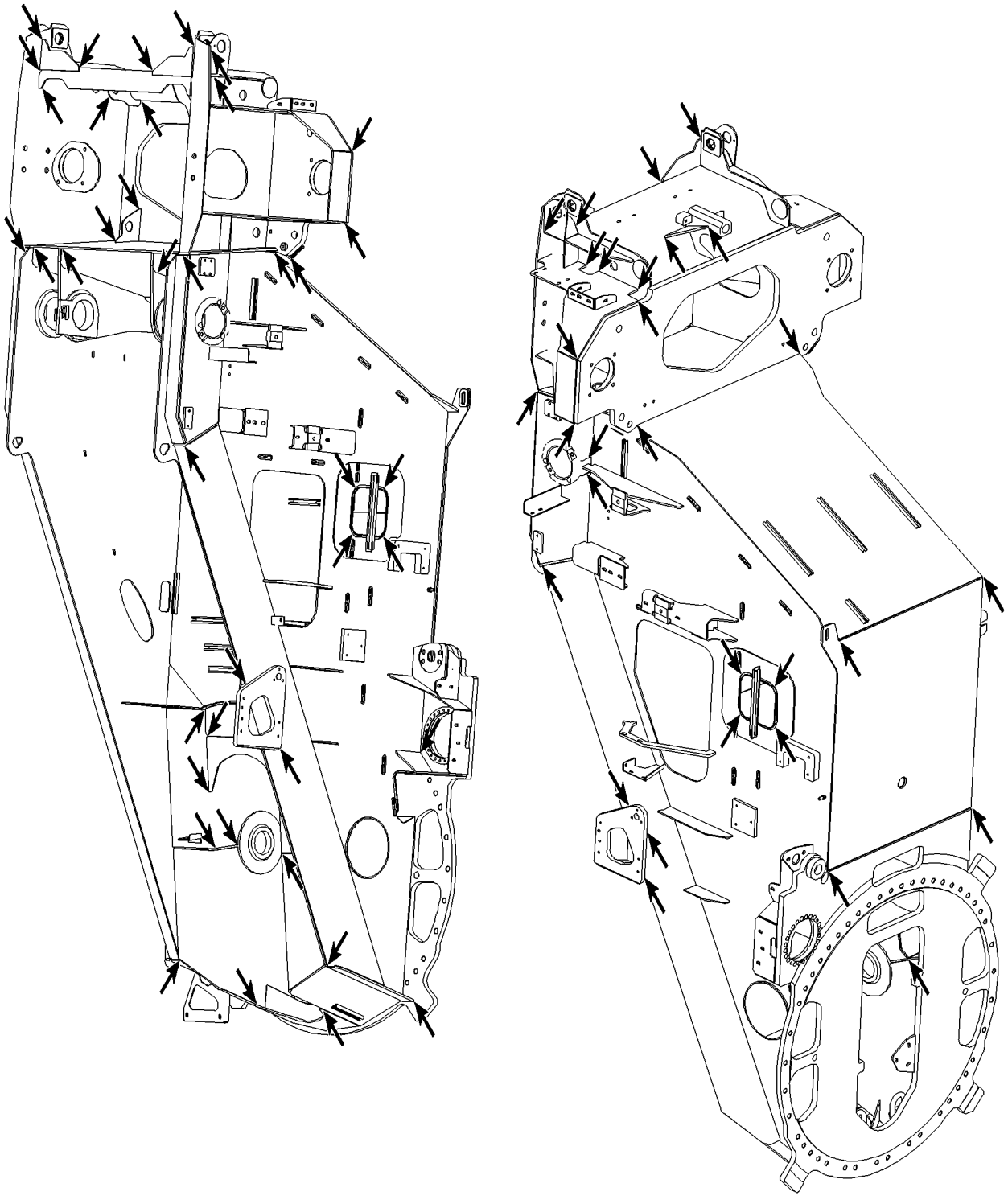


B105693

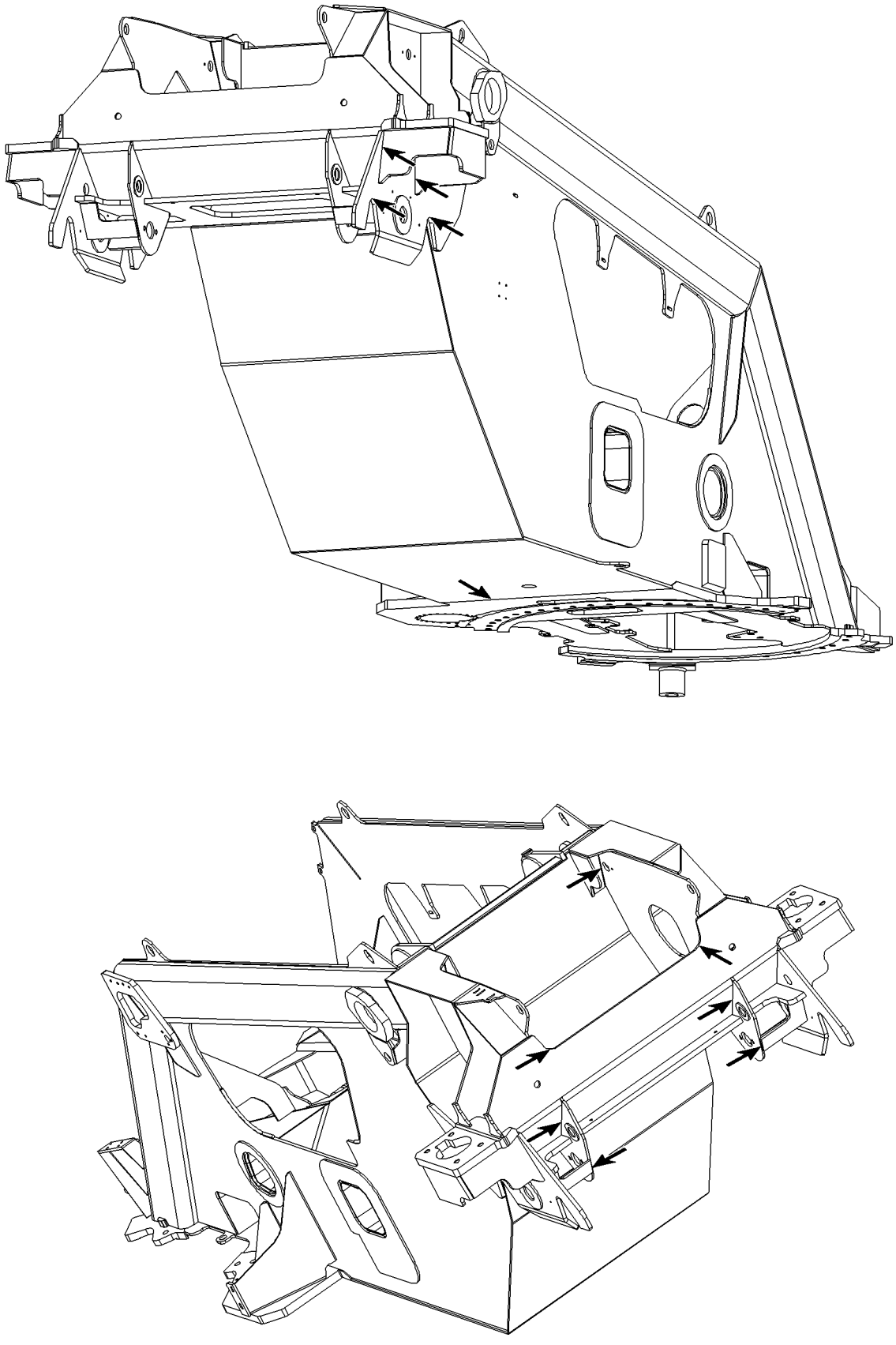
Example for turntable frame



B105722 *Example for turntable frame*

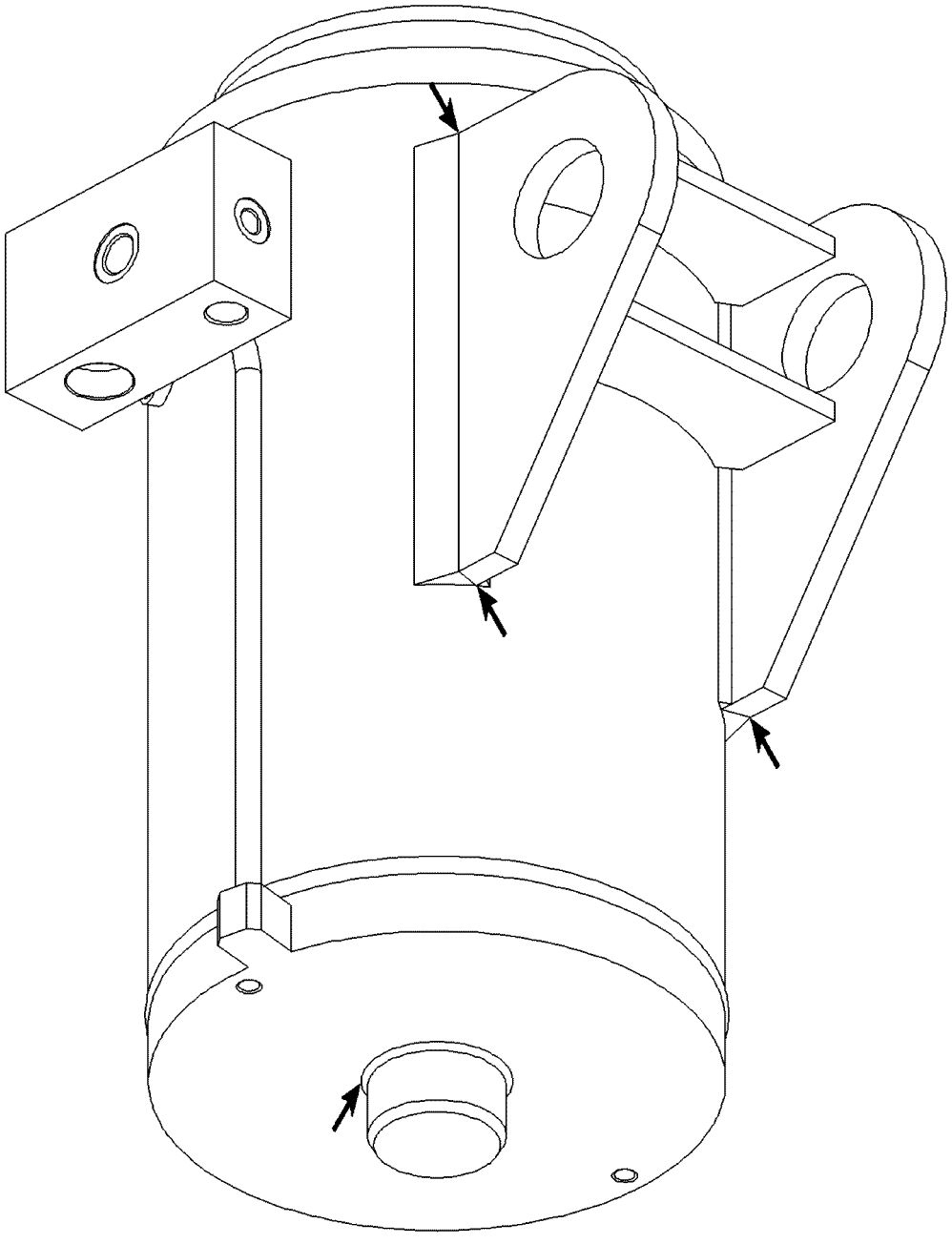


B105932 *Example for turntable frame*

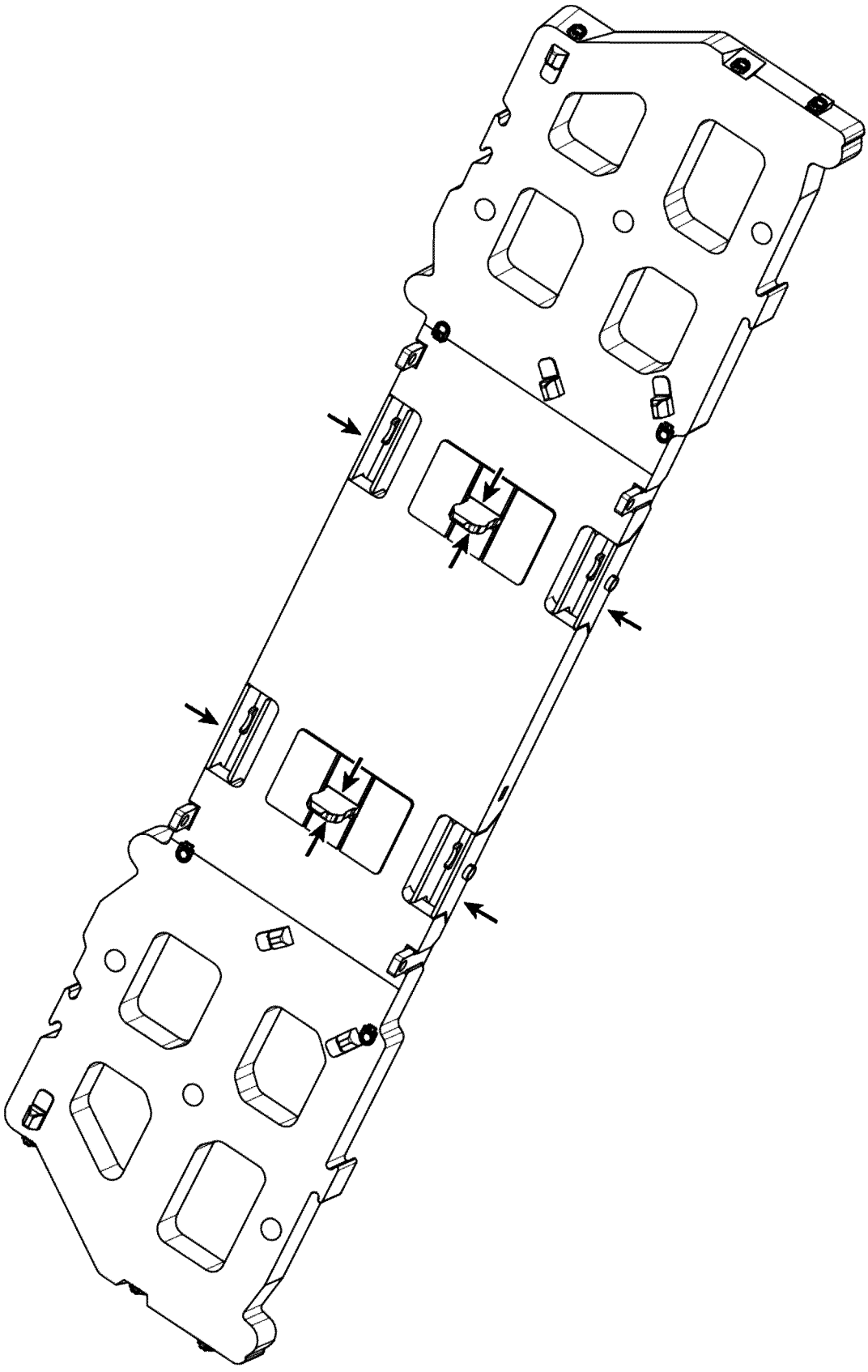


B105723

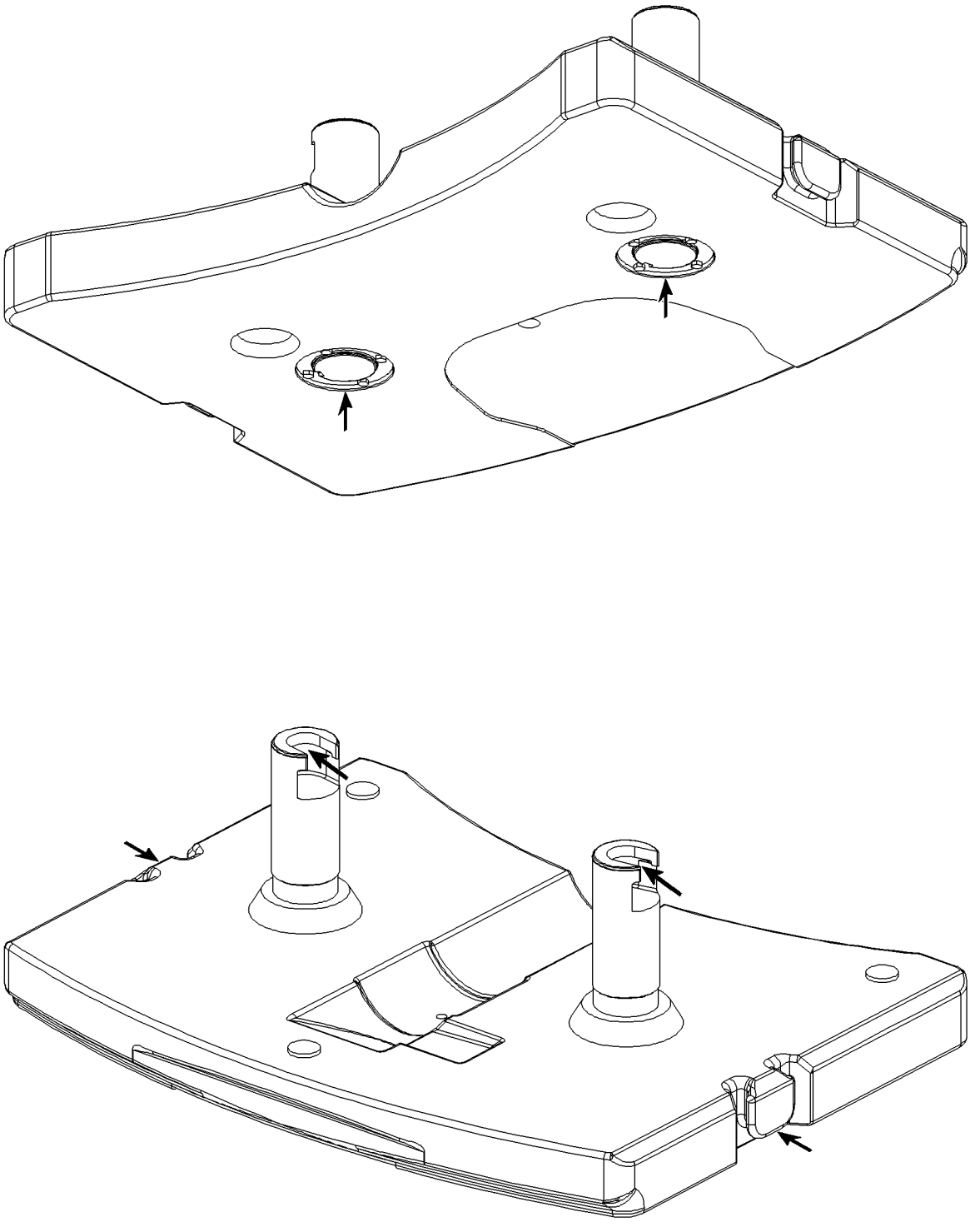
Example for turntable frame



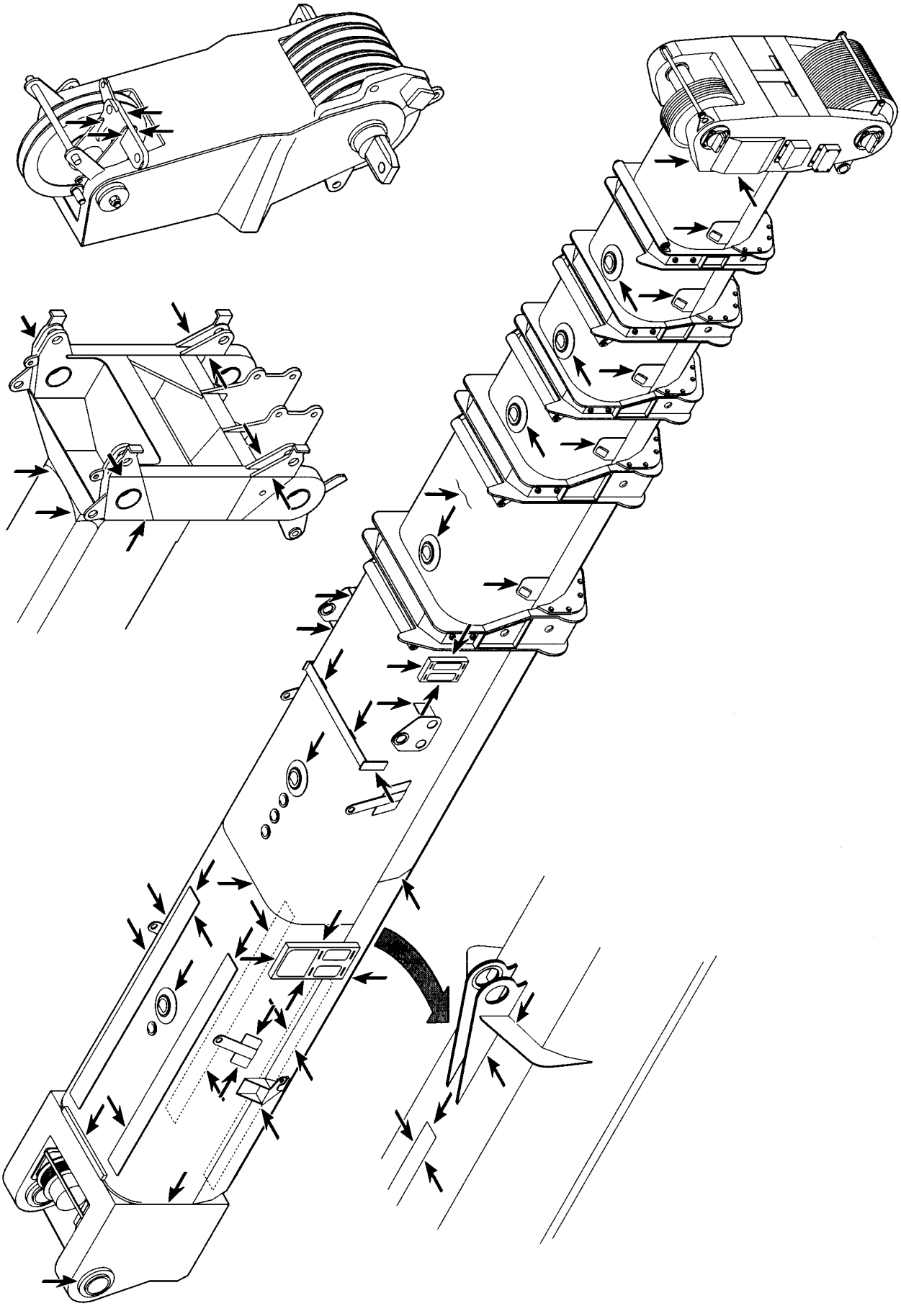
B105801 *Example for ballasting cylinder*



B105705 *Example for mounting plate*

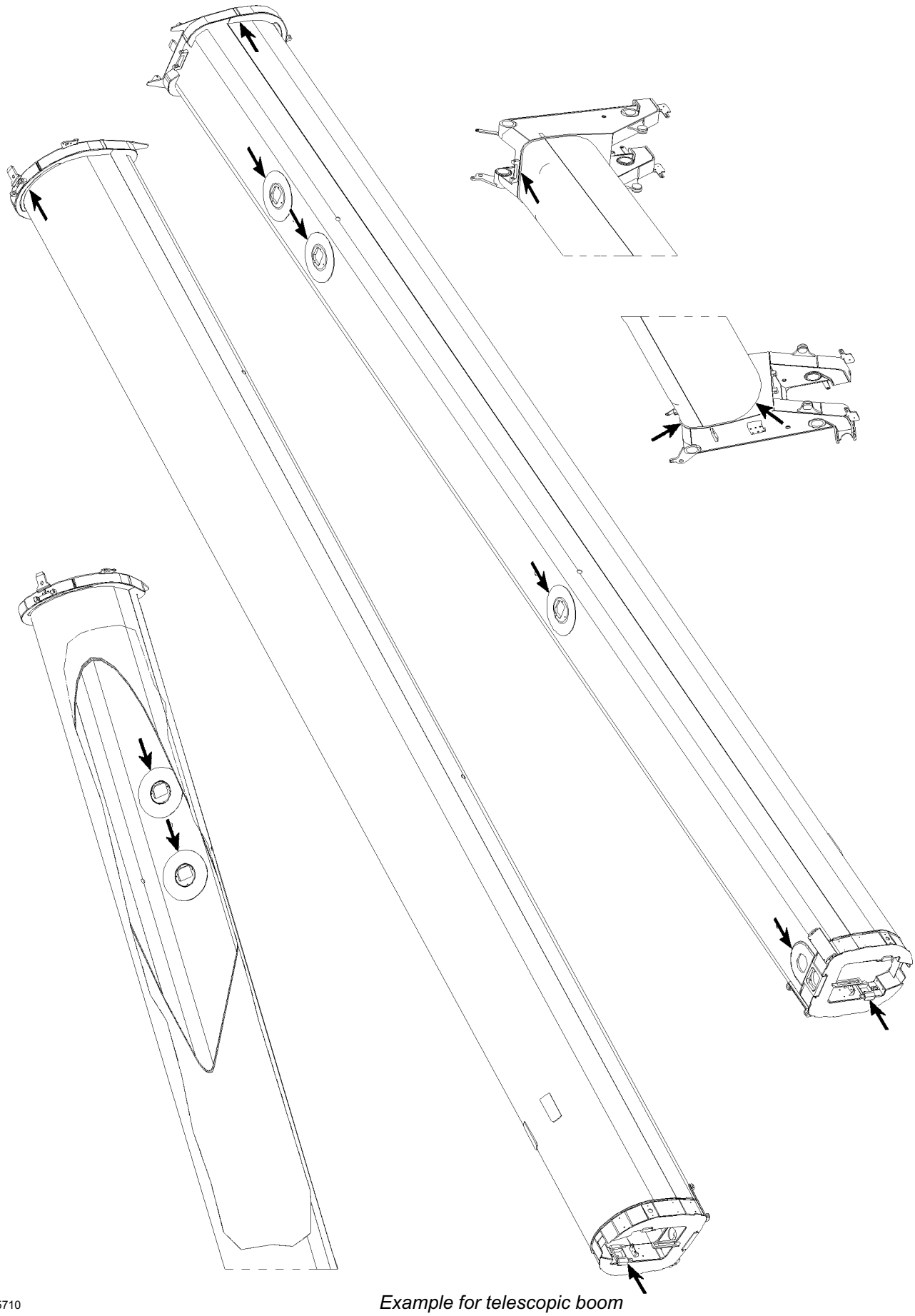


B105807 *Example for base plate*



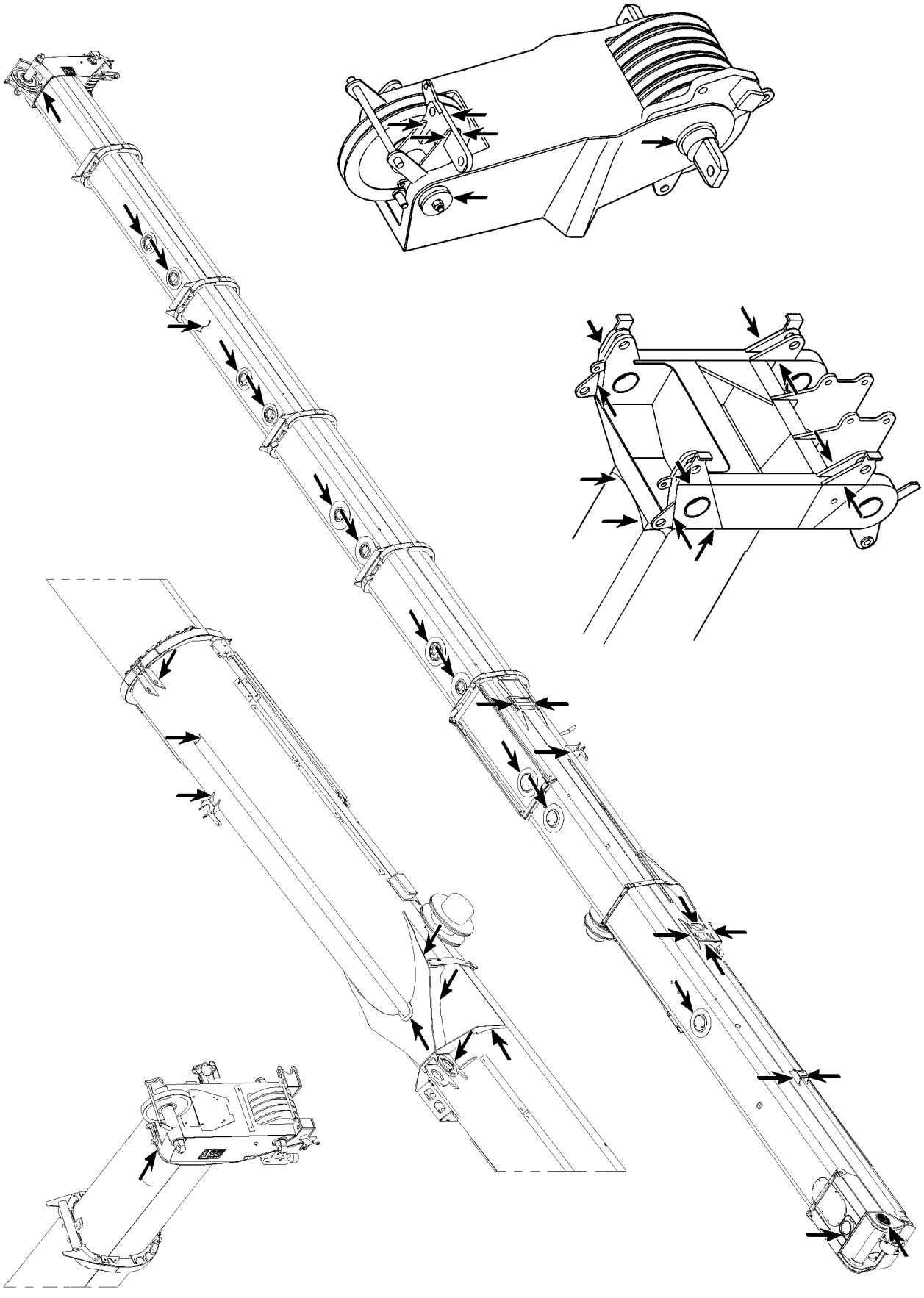
B185050

Example for telescopic boom



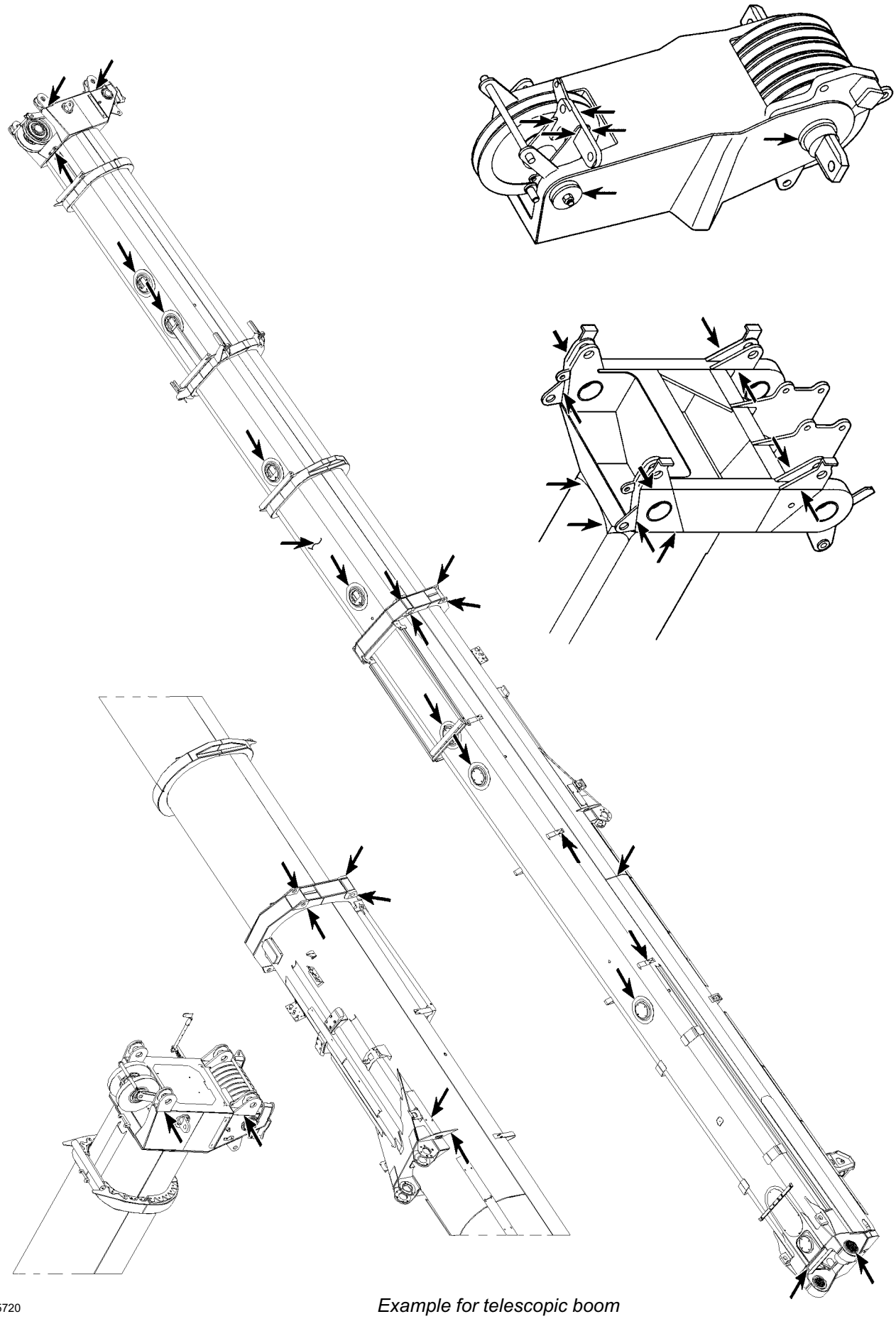
B105710

Example for telescopic boom



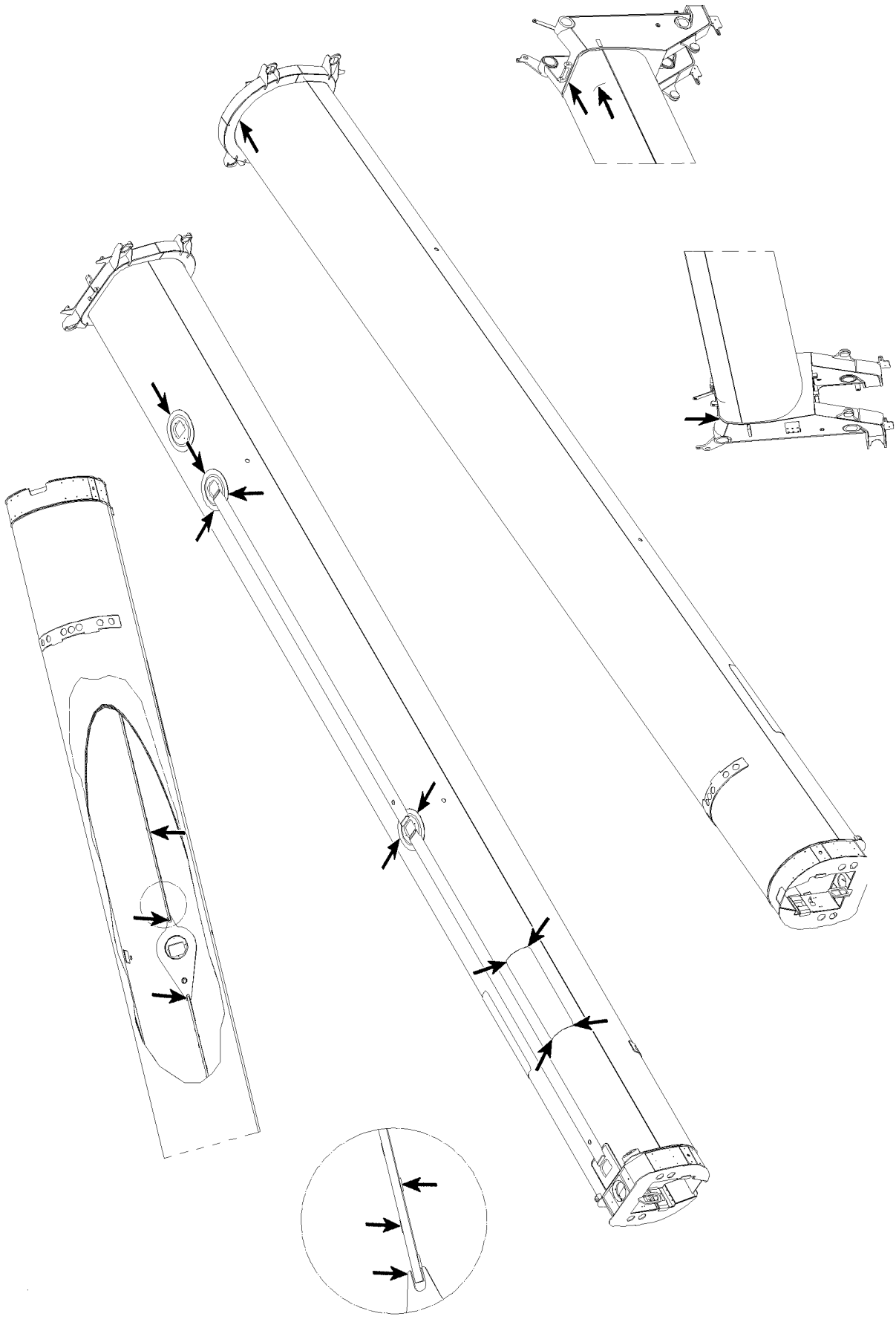
B105711

Example for telescopic boom



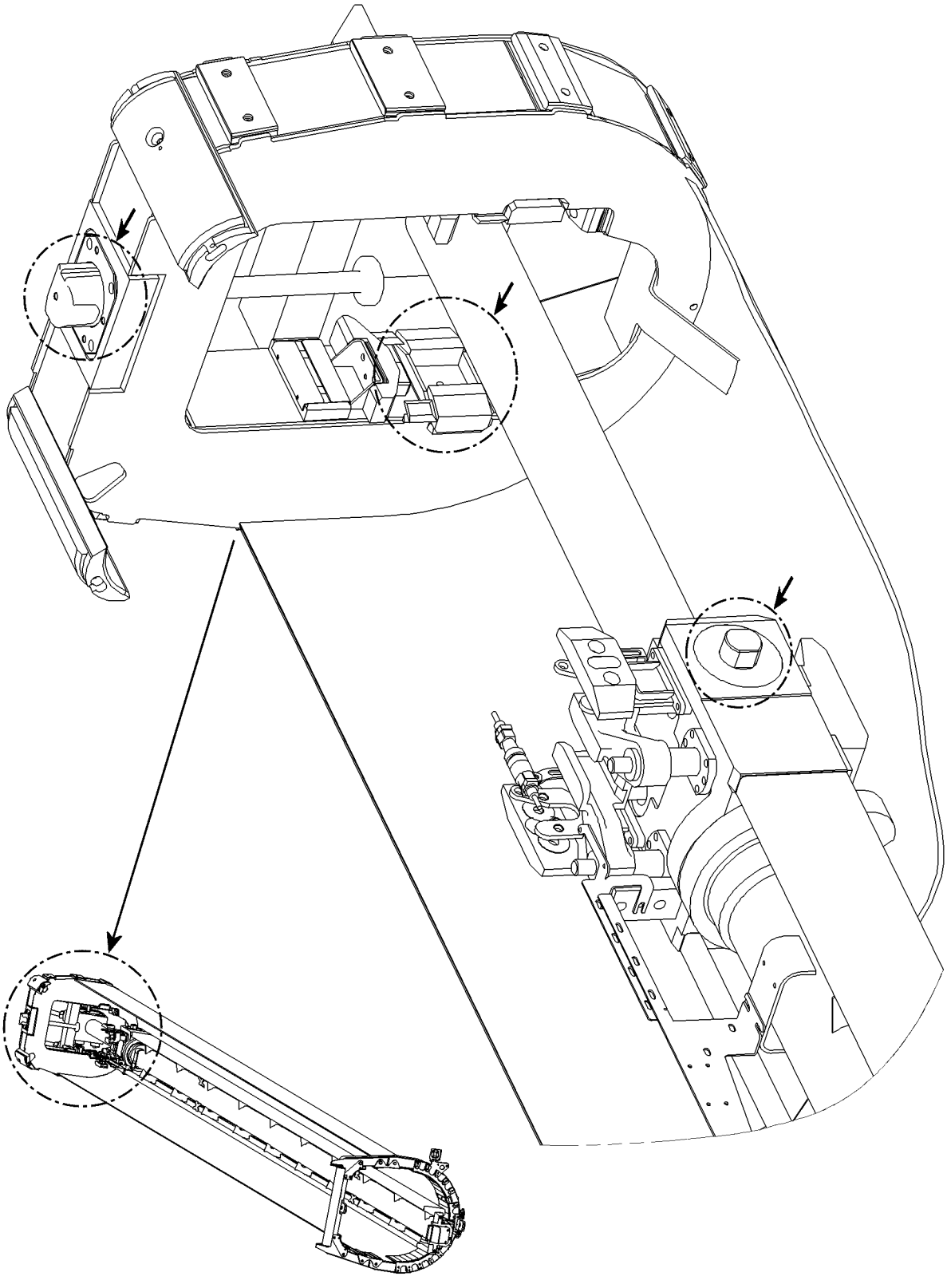
B105720

Example for telescopic boom

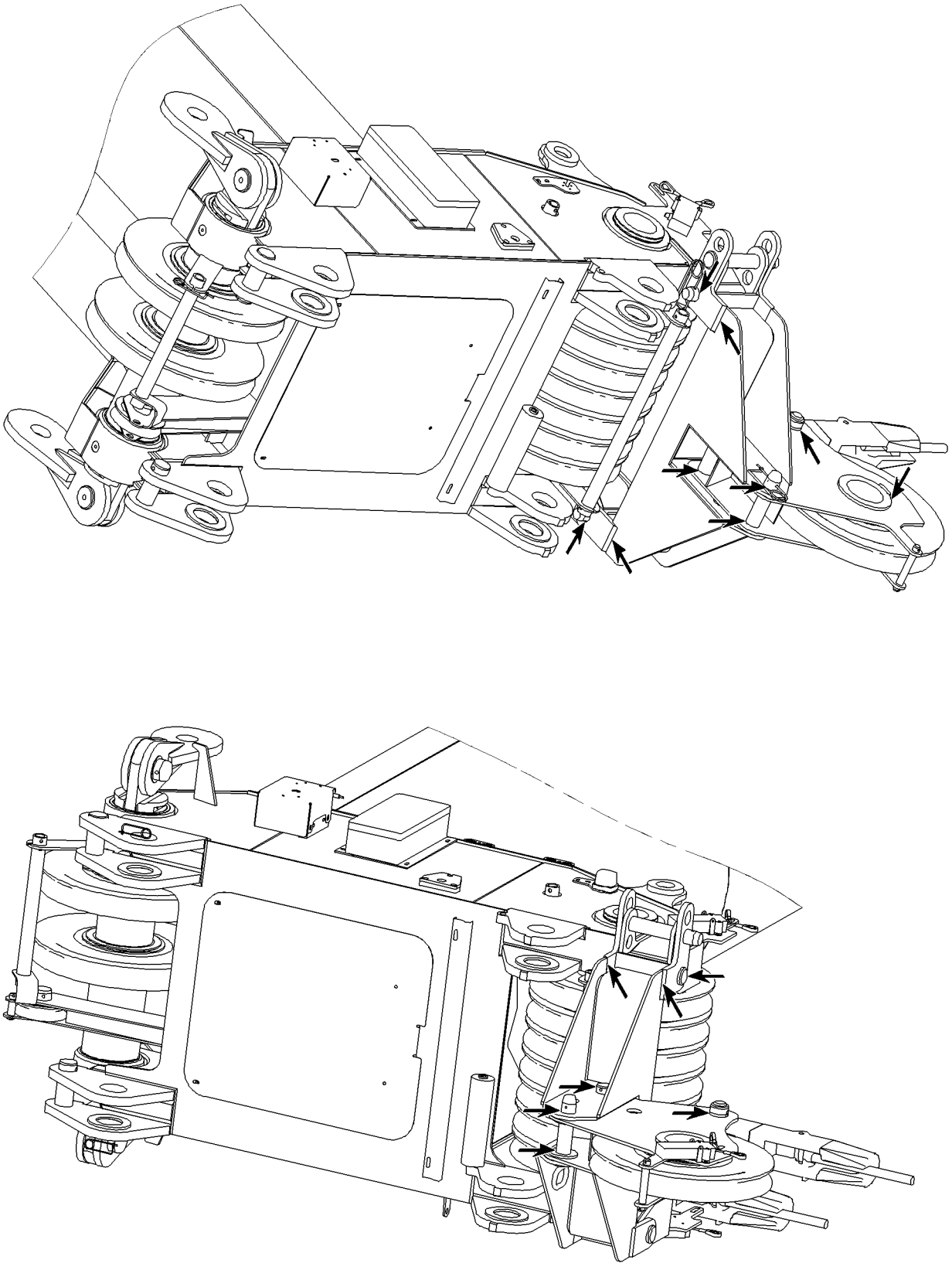


B105721

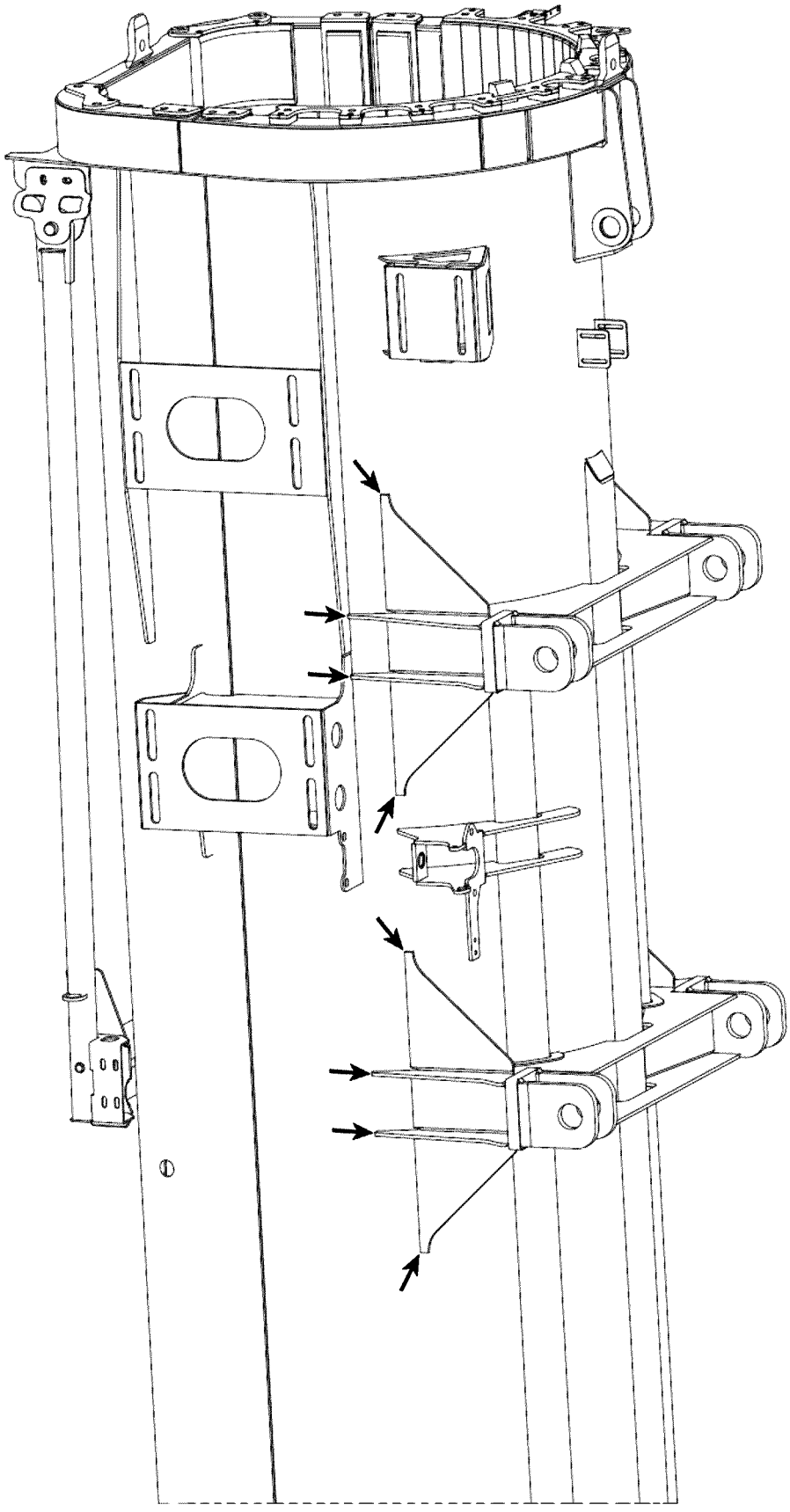
Example for telescopic boom



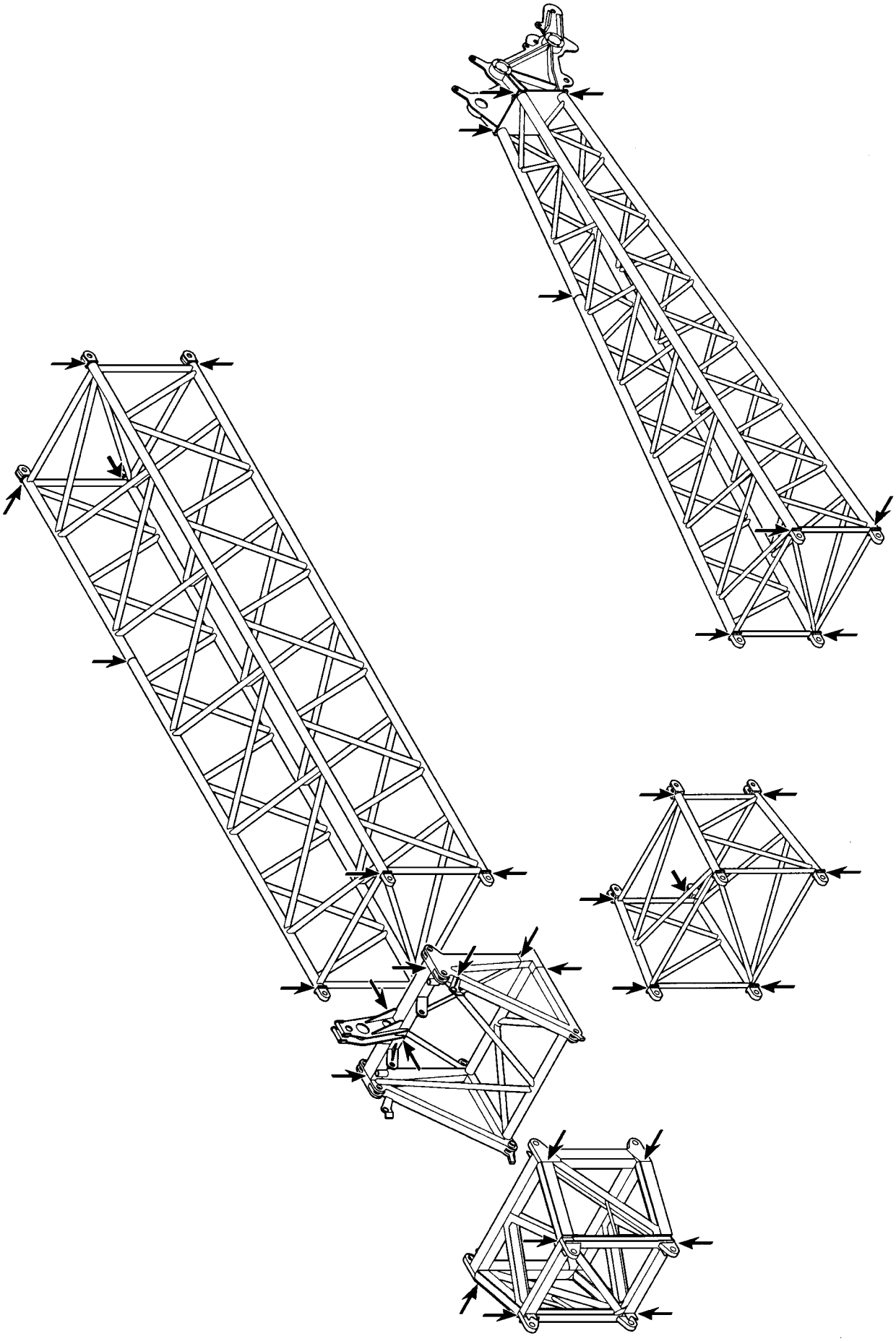
B105891 *Example for push out mechanics telescopic boom*



B105892 *Example for boom nose*

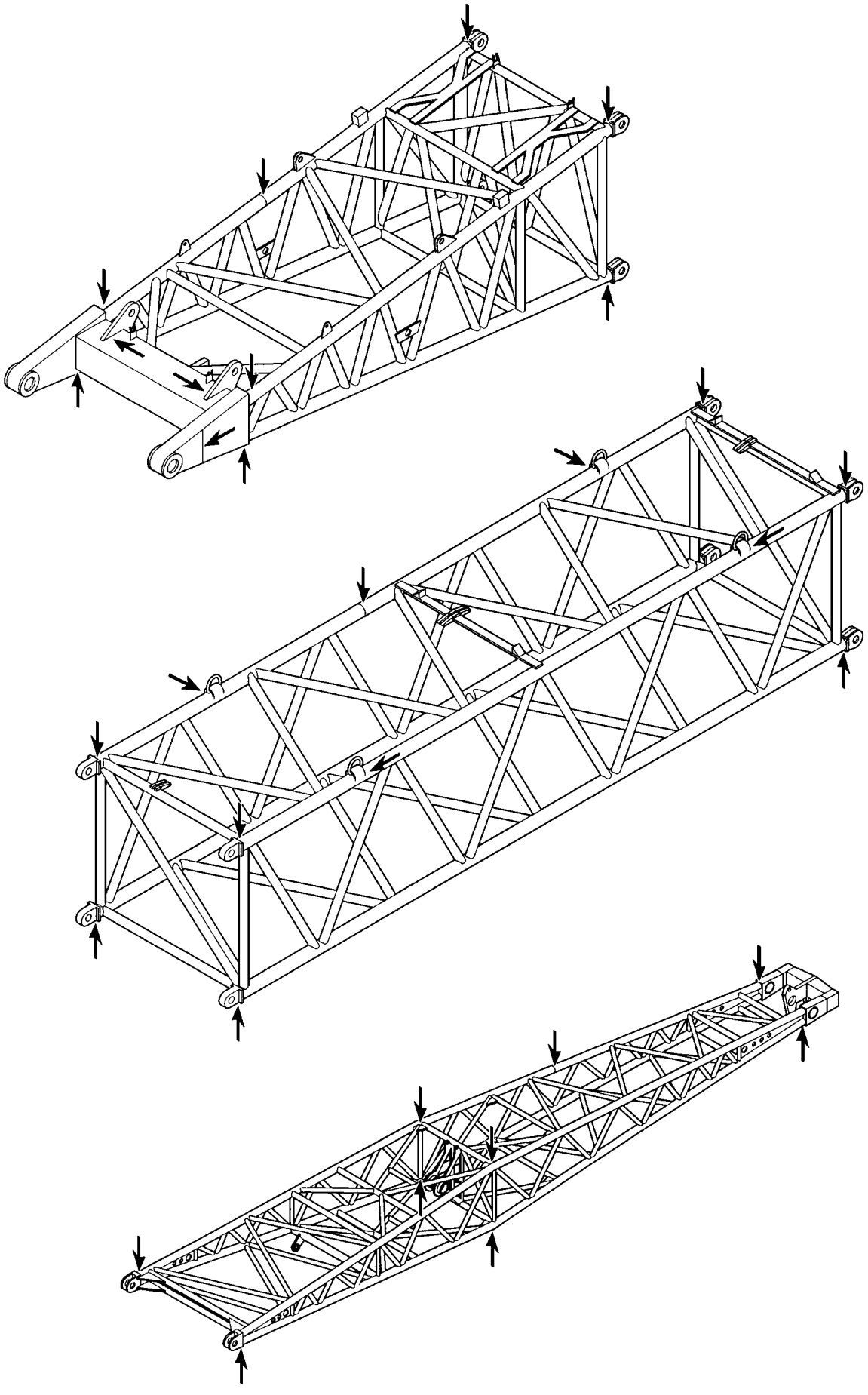


B105689 *Example for dolly console*



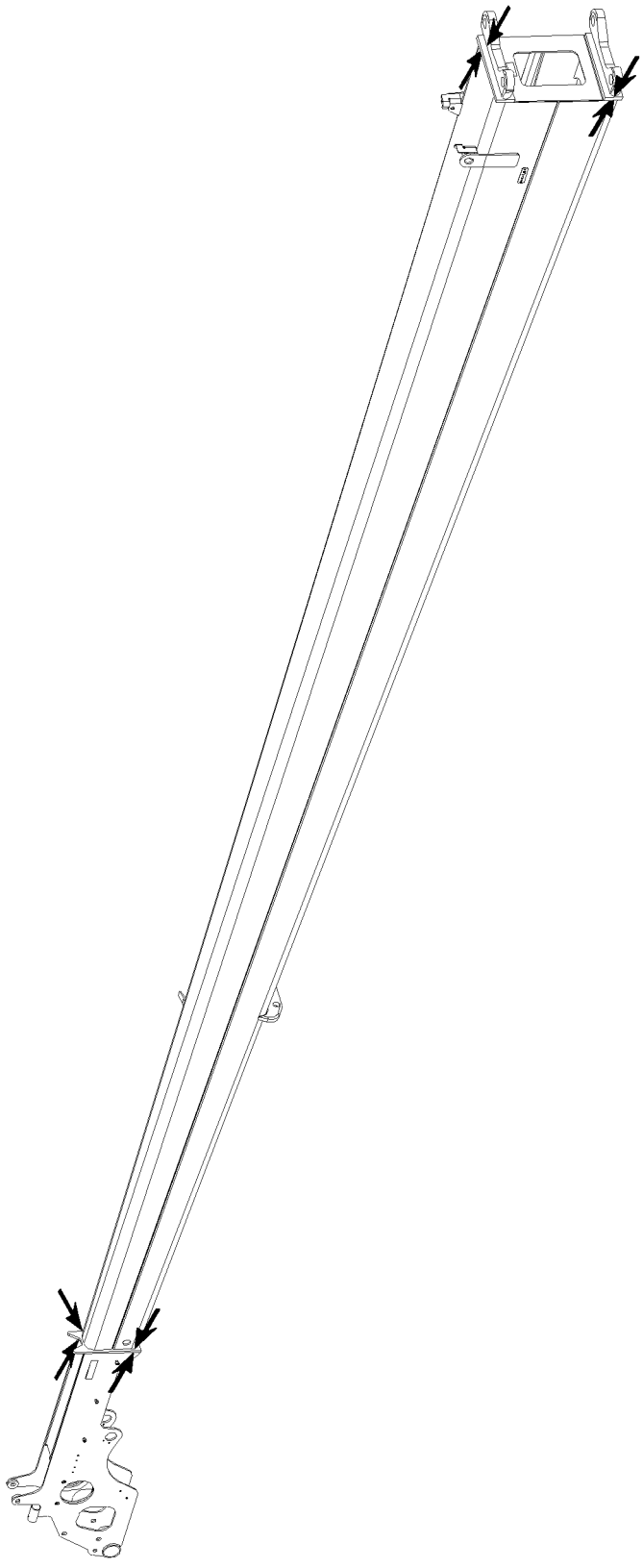
B185051

Example for lattice jib



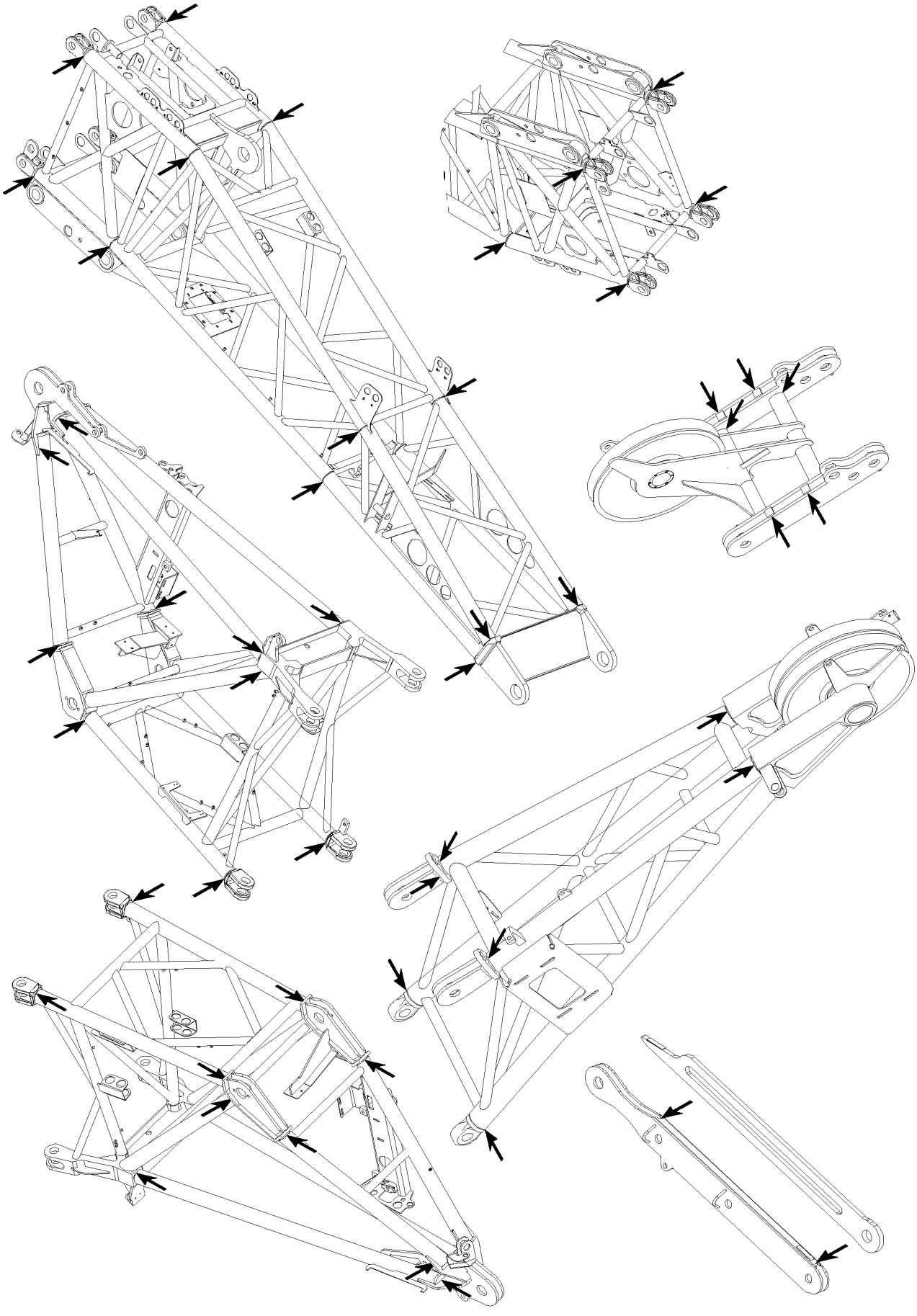
B185052

Example for NA / WA frame



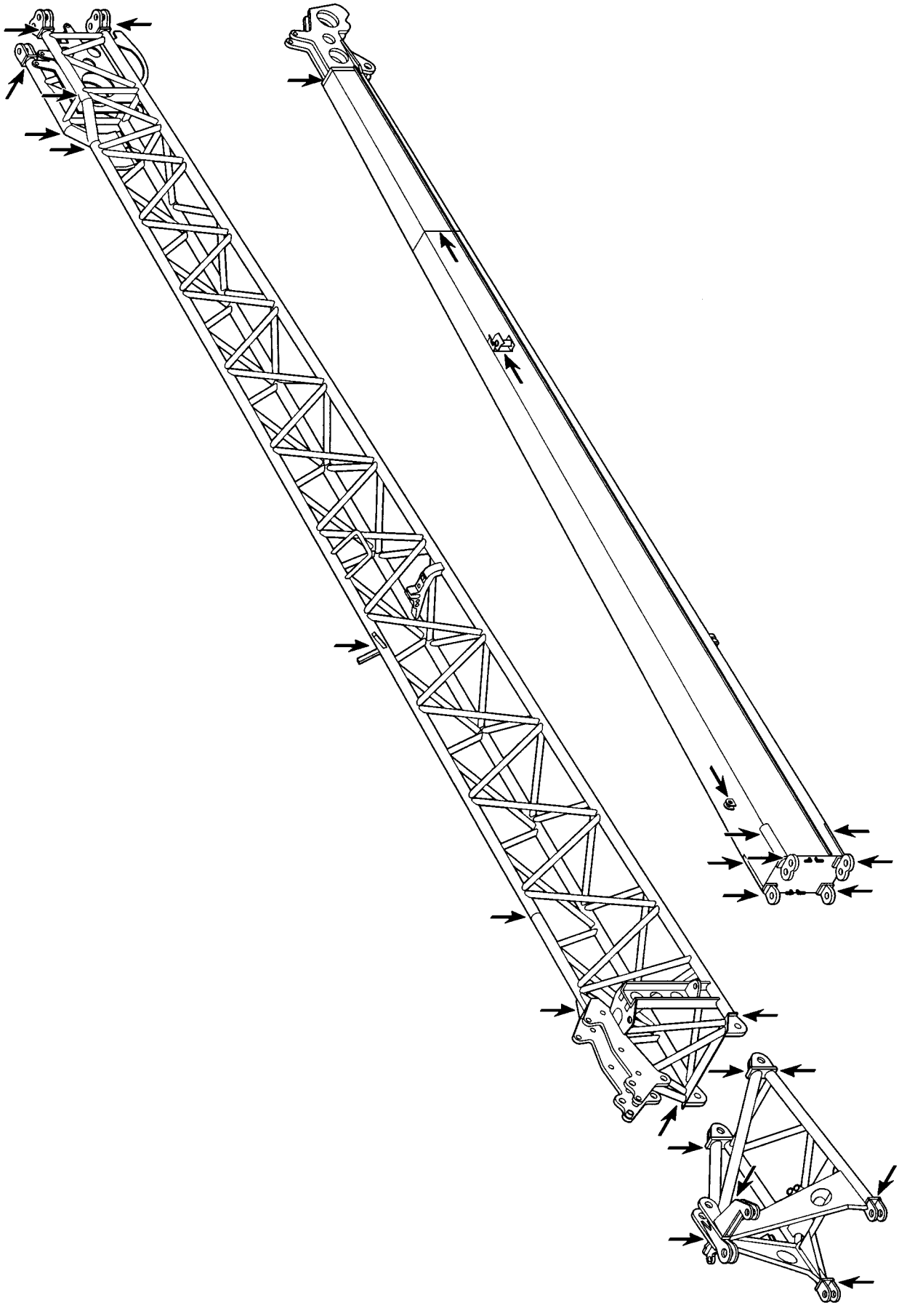
B105713

Example for end section



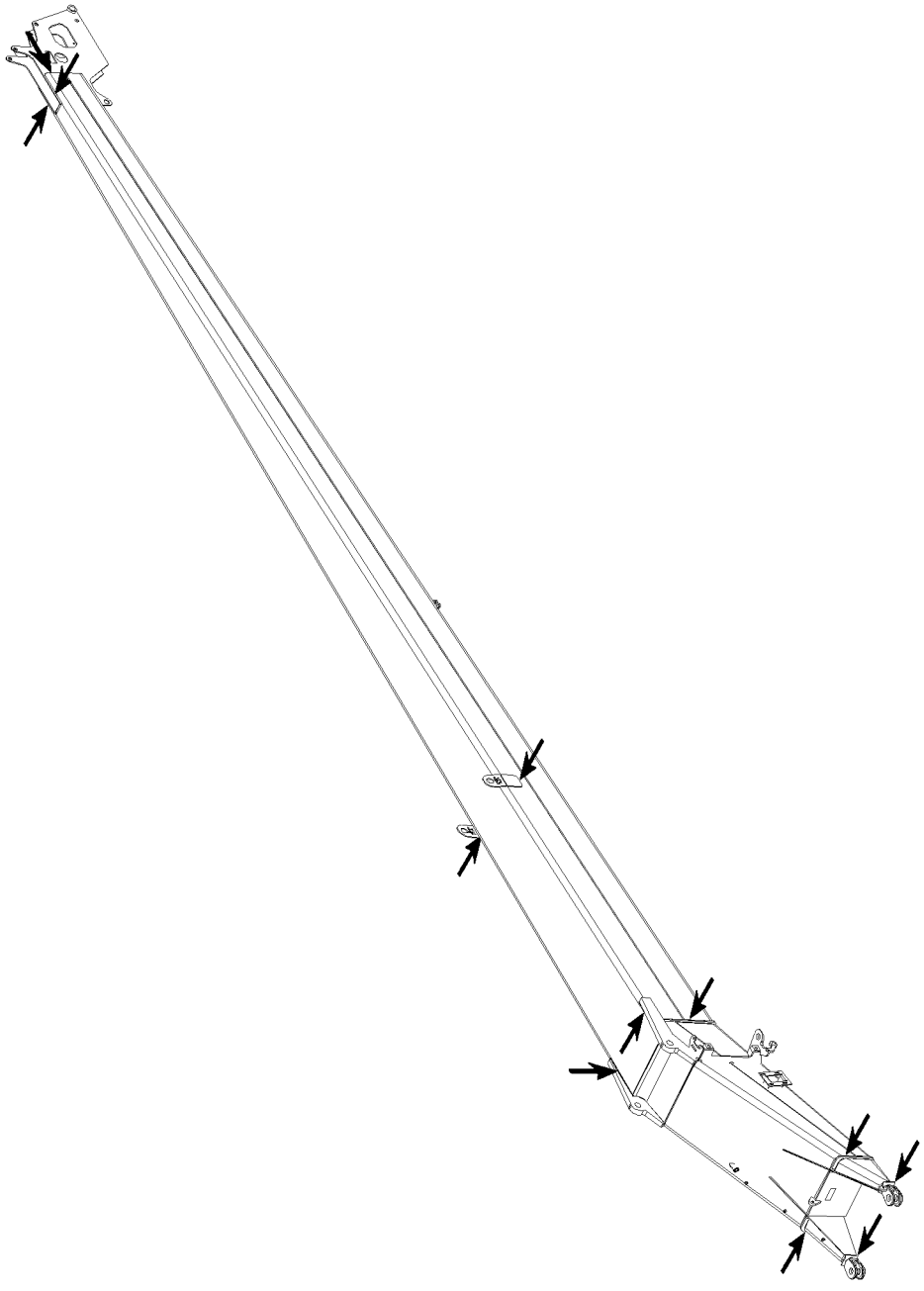
B105836

Example for pivot section, adapter and boom nose

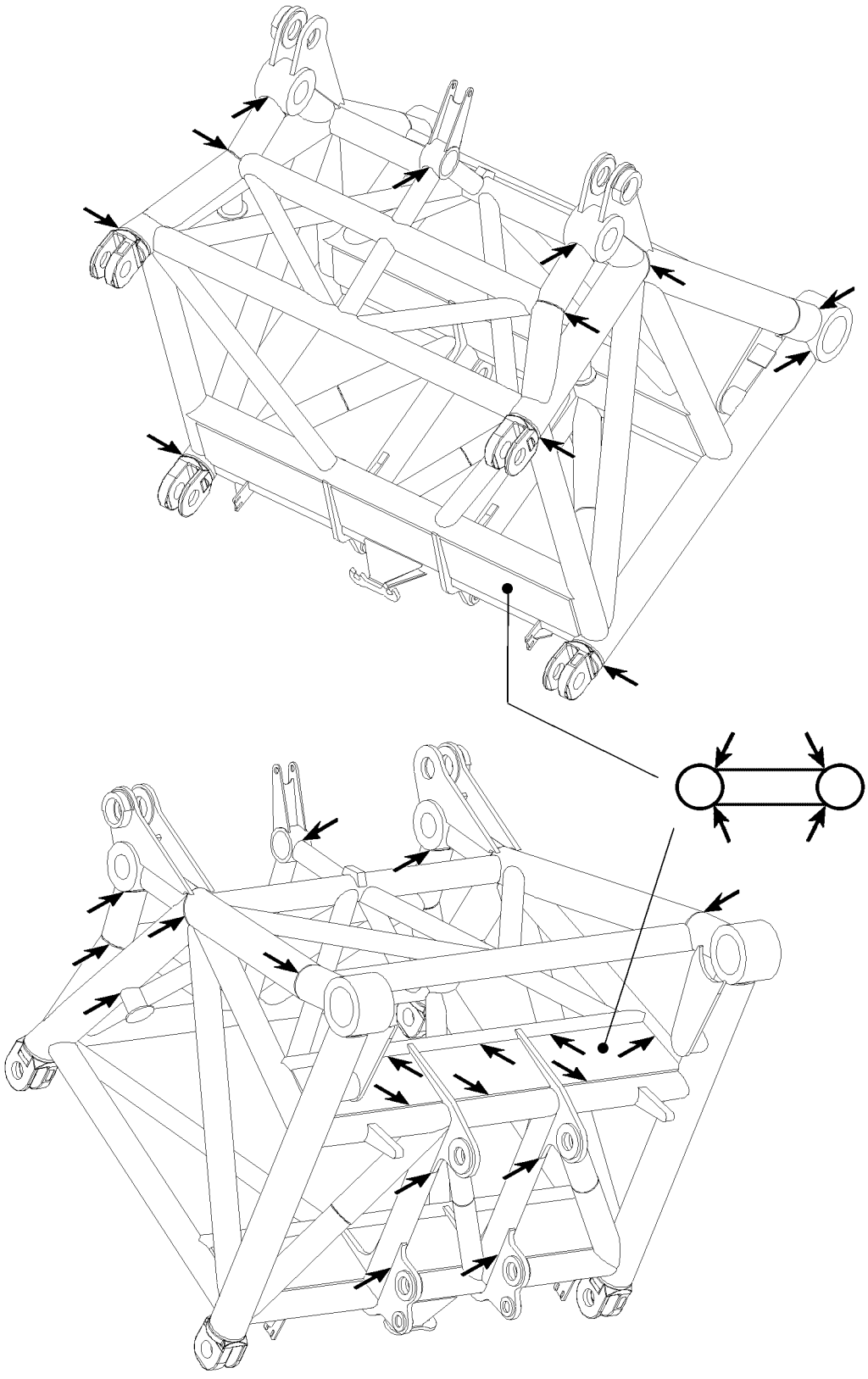


B185058

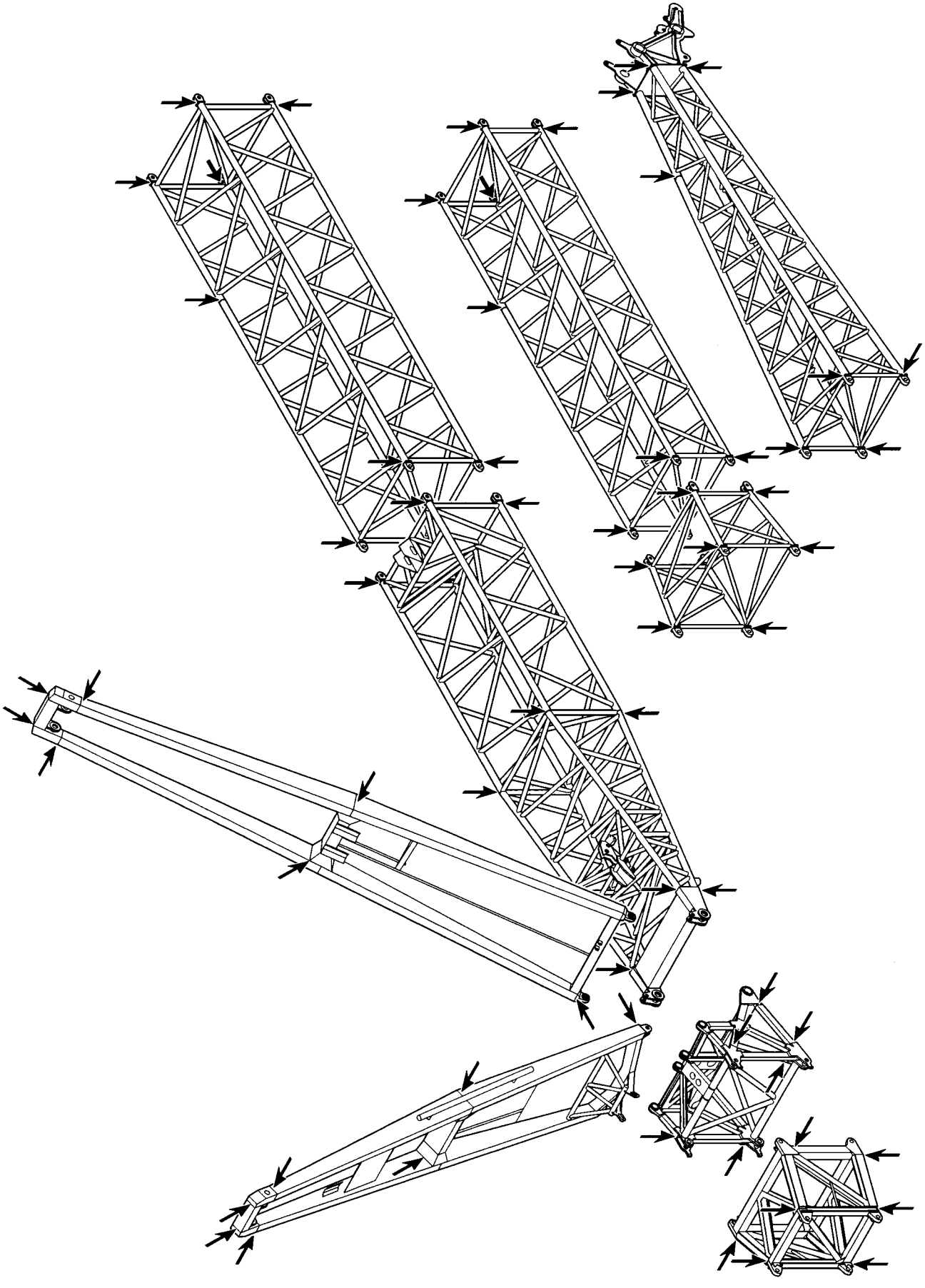
Example for folding jib



B105697 *Example for folding jib*

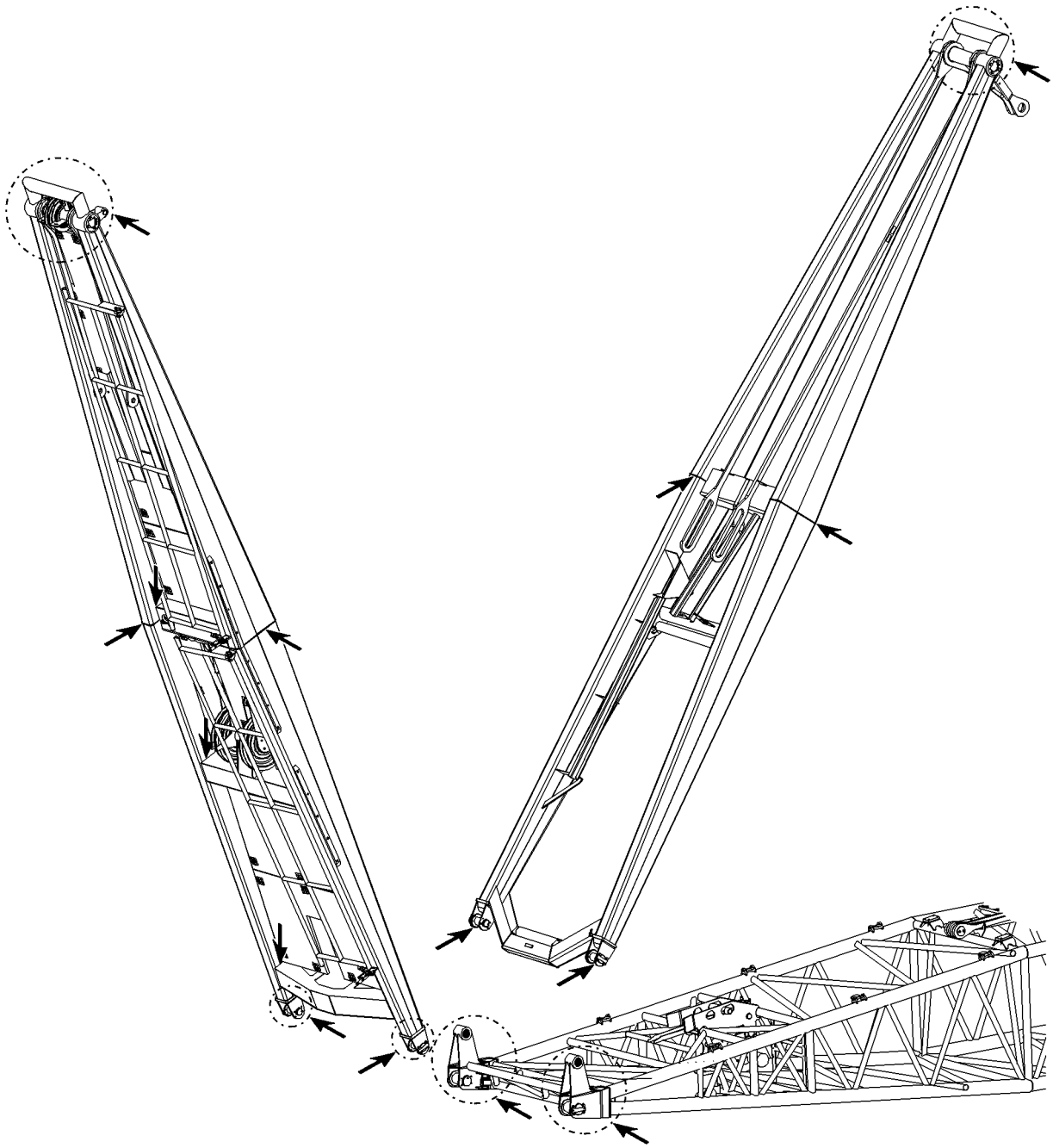


B105732 *Example for W-connector head*



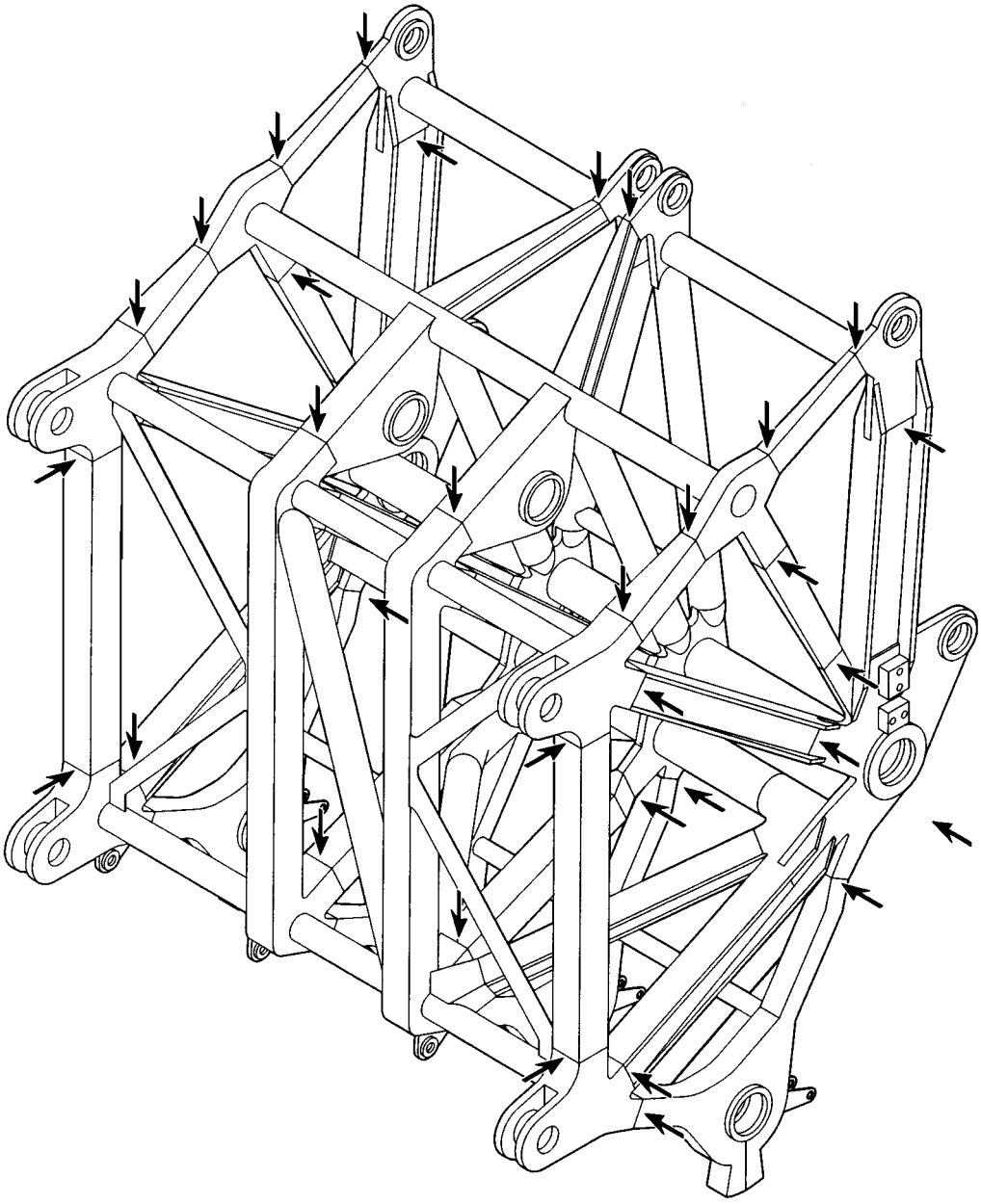
B185053

Example for assembly unit with lattice jib

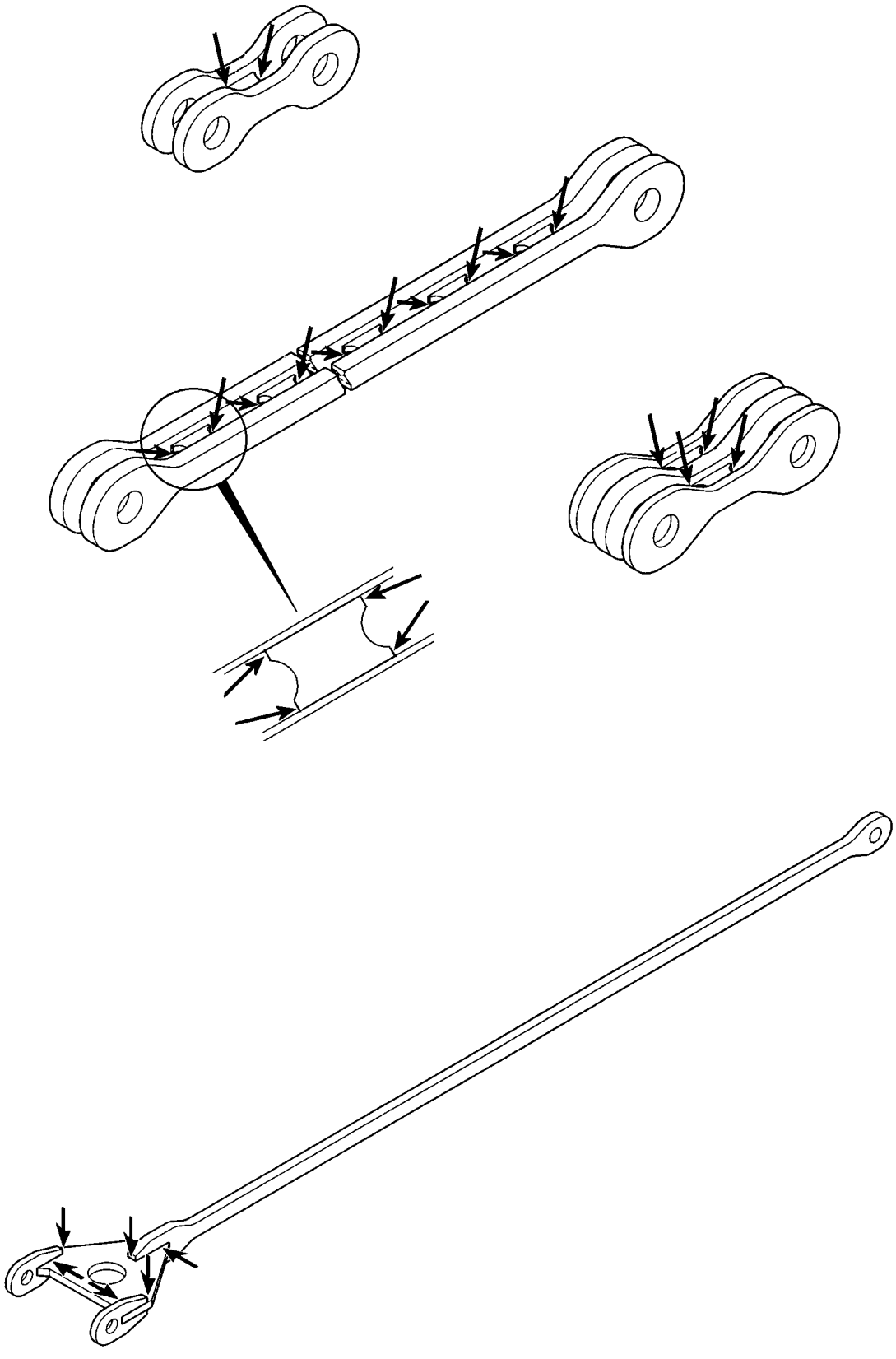


B105838

Example for NA frames

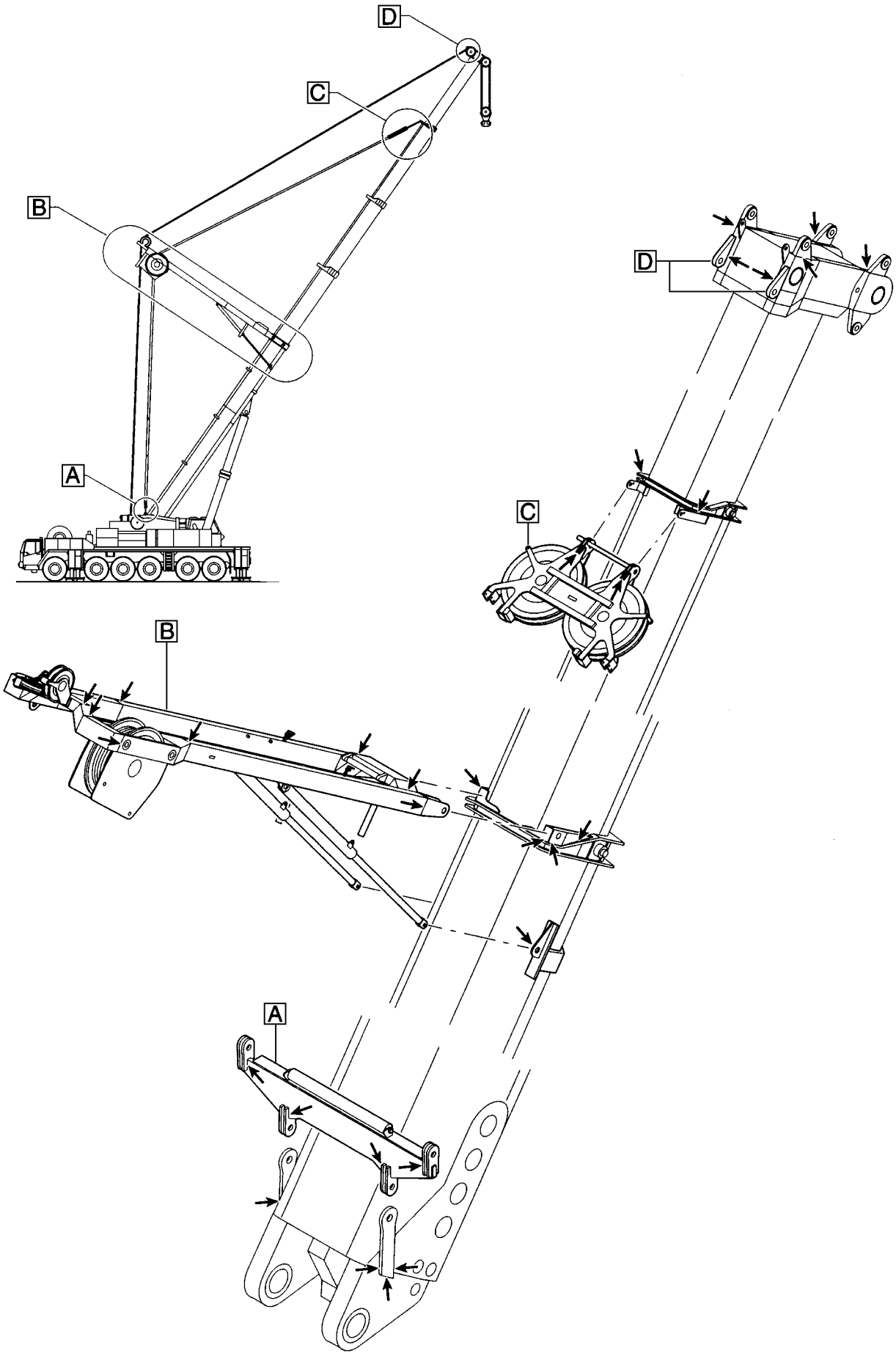


B185054 *Example for pulley head*



B185055

Example for guy rod



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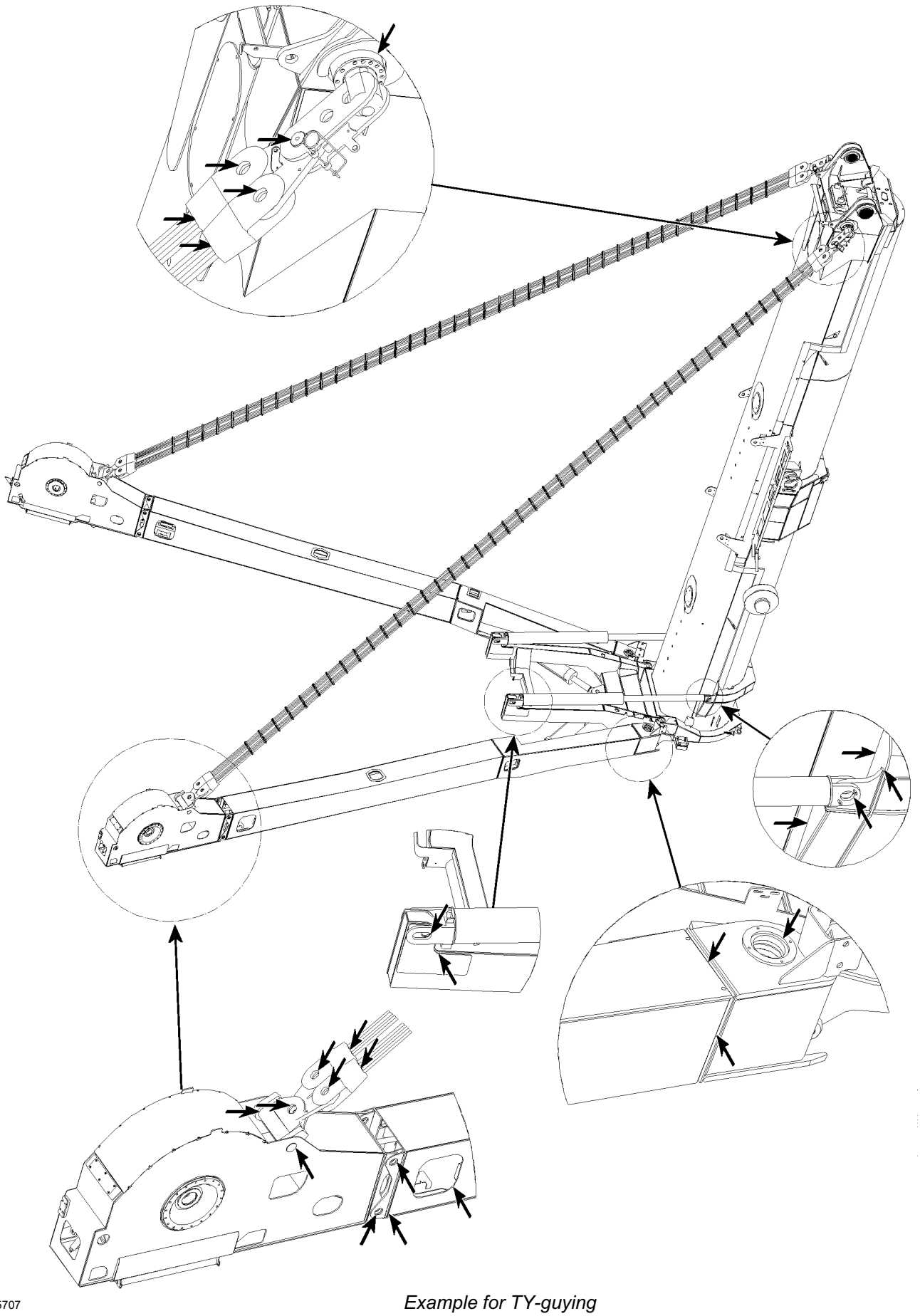
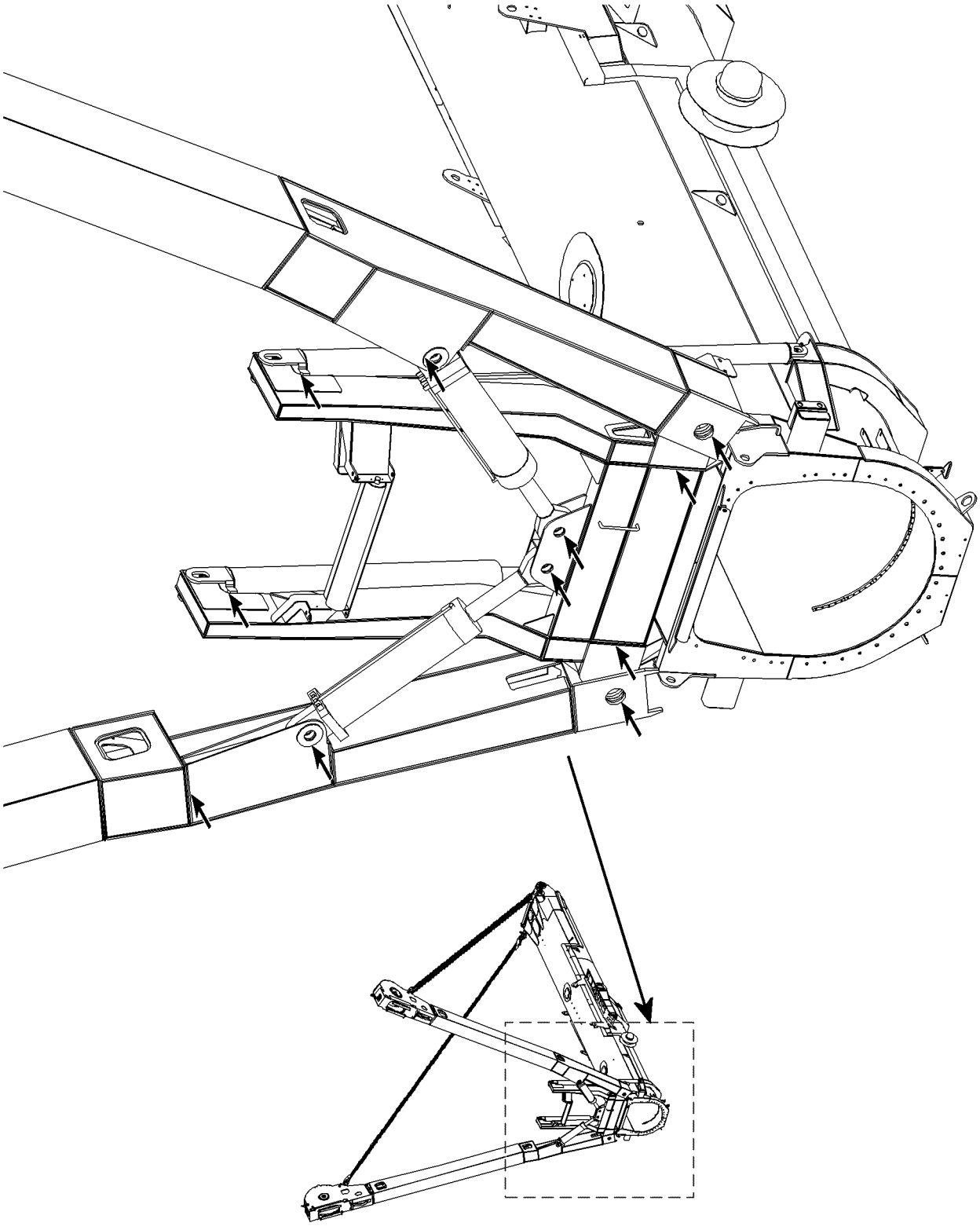
Example for TA-guying



B105707

Example for TY-guying



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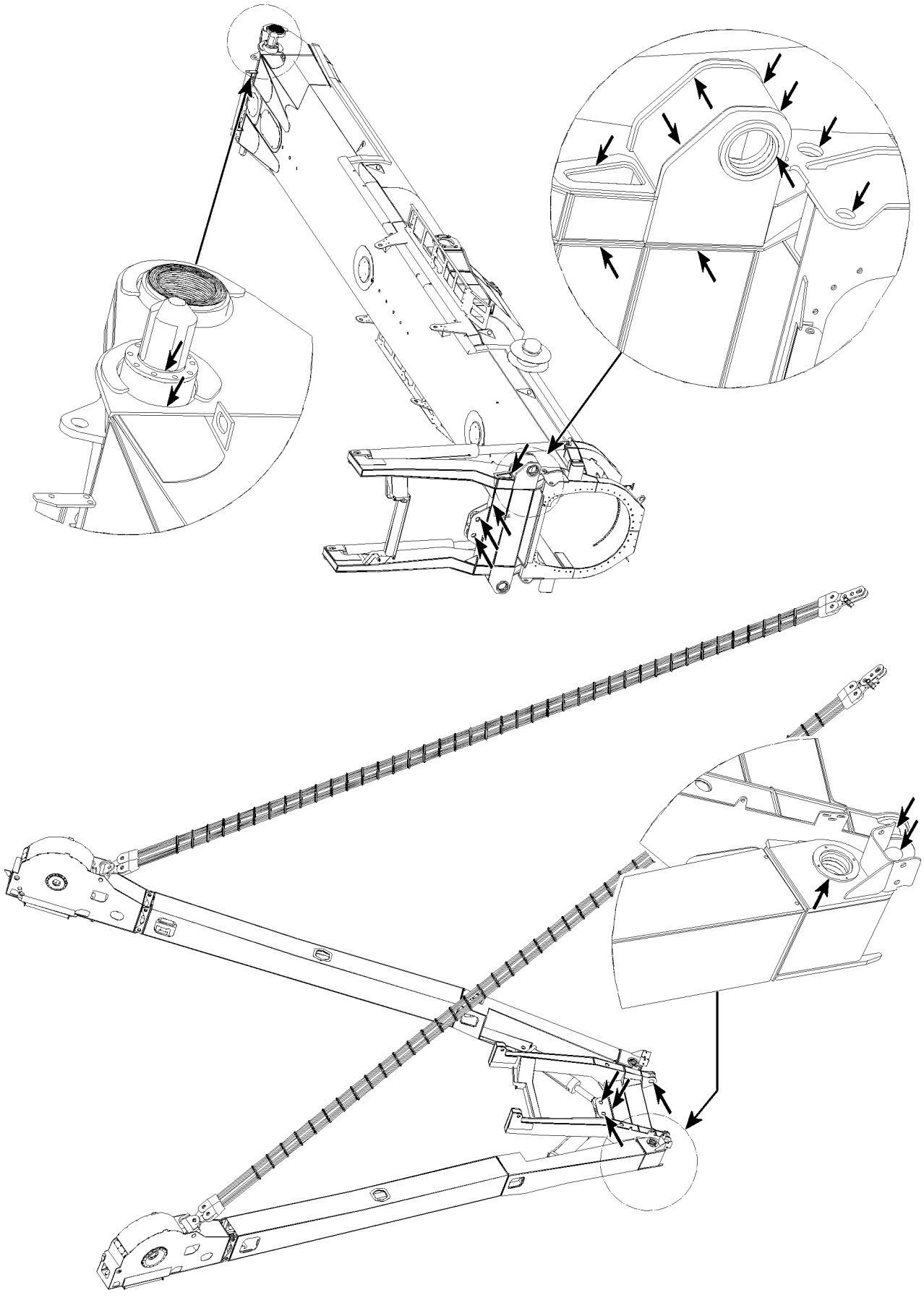
Example for TY-guying



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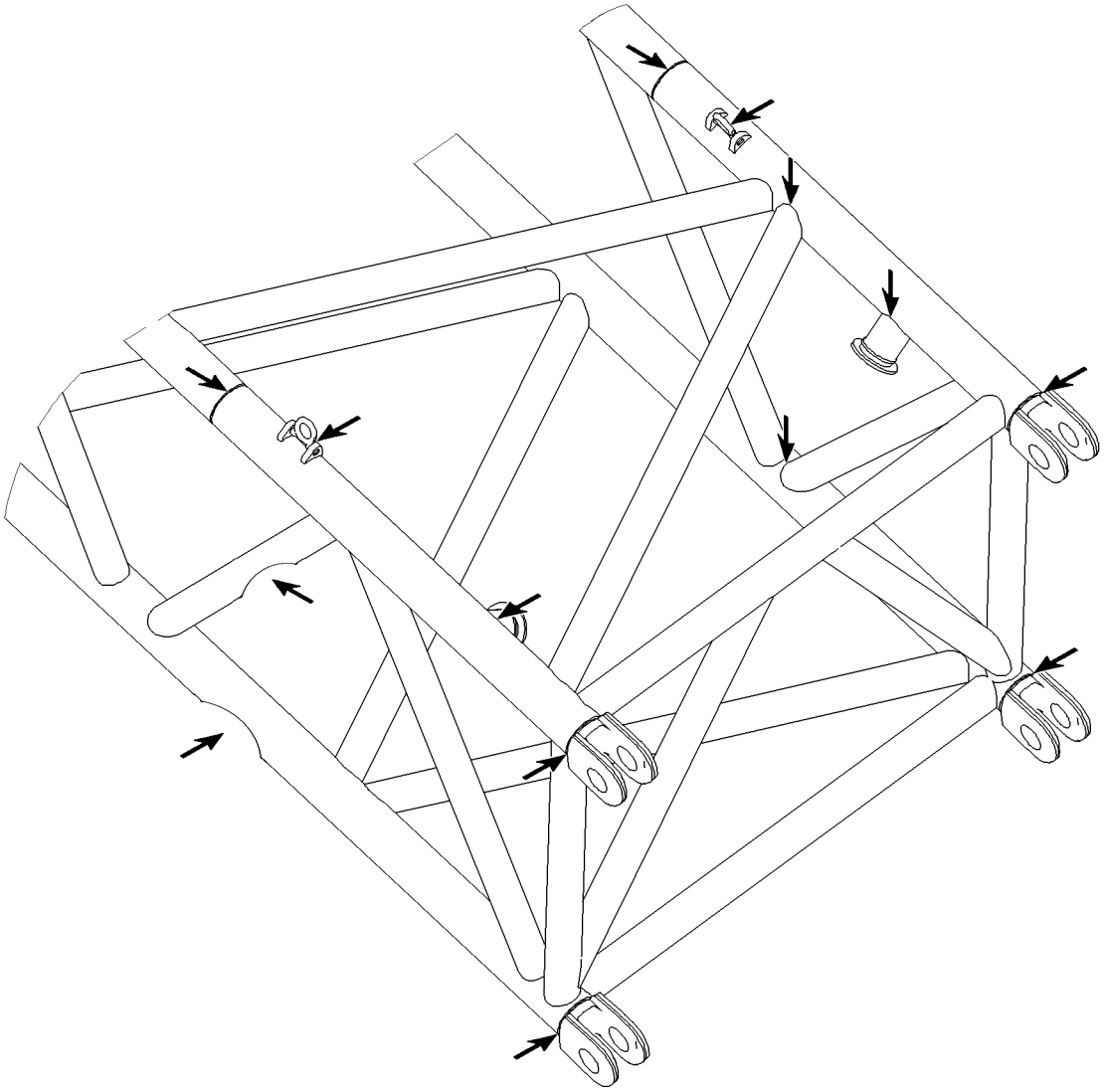
Example for TY-guying

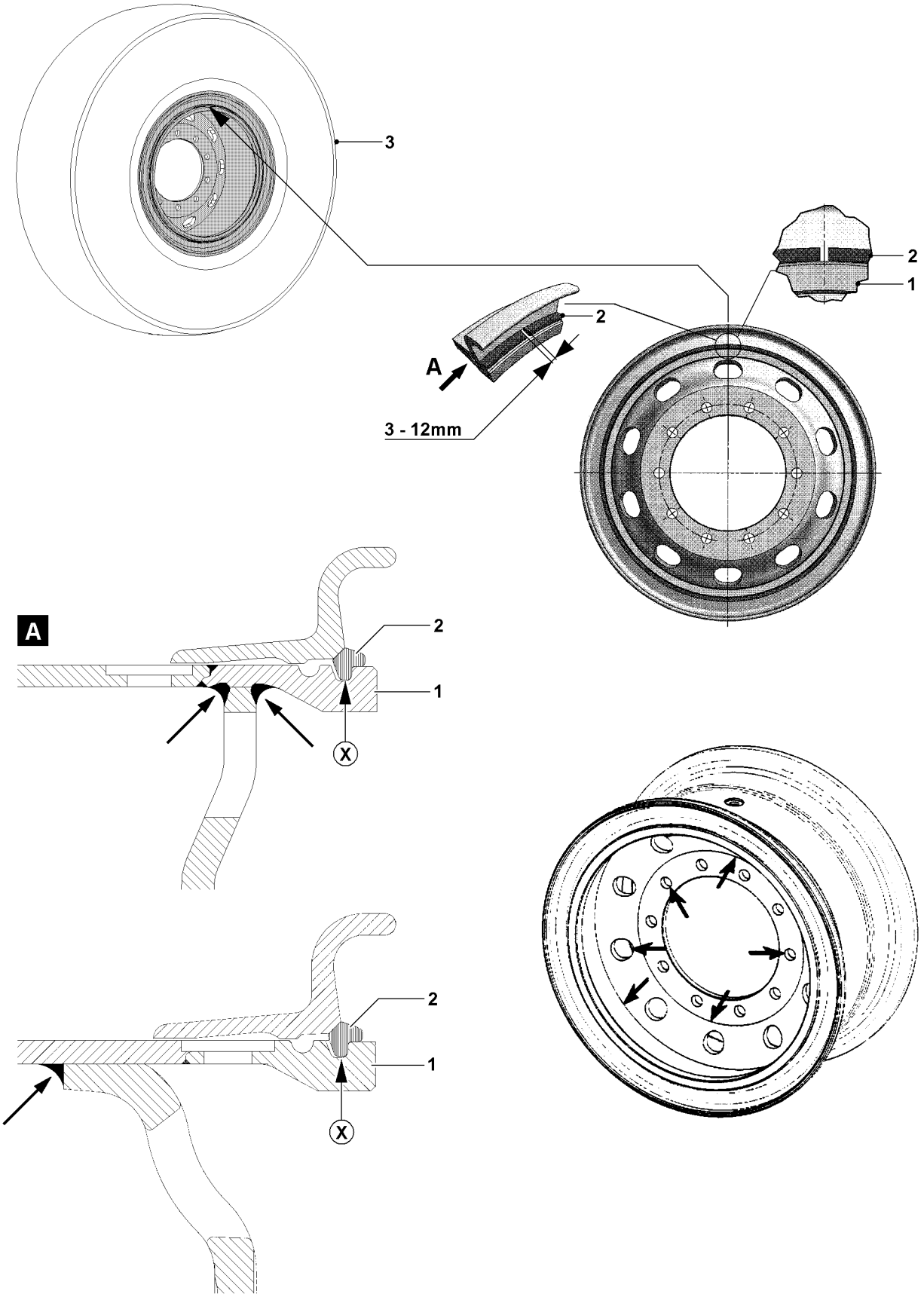
2.2 Inspection of lattice sections

Note

- The illustration is only an example and is valid for all lattice sections!
- Check all diagonal and frame pipe connections!



Example for lattice sections



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3 Inspection of tires and disk wheels

3.1 Inspection of tires

WARNING
Risk of accident if incorrect tires are used!
The use of improper tires and tires which do **not** meet the license permits may result in serious accidents with fatal injuries!
- ▶ Only tire types and sizes approved for this crane may be assembled on the crane.
- ▶ Regularly check the tires for damage, tread depth, foreign particles and tire pressures!
- ▶ Carefully remove any foreign particles stuck or wedged in the tire tread before starting to travel (for example: rocks)!

The tread depth of the tire may not fall below the legally specified minimum value.
- – Check the tread depth.
- – Check the tires for damage.
- – Make sure that the tire **3** is correctly seated on the disk wheel **1**. The tire bead must touch the inside and outside of the disk wheel evenly.

WARNING
Risk of fatal injury if the lock ring **2** is not properly seated!
Personnel can be severely injured or killed due to an incorrectly assembled lock ring **2**!
- ▶ Check to ensure that the lock ring is correctly seated!
- ▶ Consult with authorized and trained specialists if there is any doubt whether a lock ring **2** has been correctly assembled!

Indications of an incorrectly installed lock ring are present if:
- – The lock ring **2** is not completely seated with its entire circumference in the groove (point **X**) of the disk wheel, see illustration **A**.
- – The gap of the installed lock ring **2** is outside the permissible tolerance range of 3 mm to 12 mm.

3.2 Inspection of tire pressure

Make sure that the following prerequisites are met:
- – The tire **3** is correctly seated on the disk wheel.
- – The lock ring **2** correctly sits in the groove (point **X**) on the disk wheel, see illustration **A**.
- – The gap on the lock ring **2** is between 3 mm and 12 mm.

WARNING
Risk of fatal injury!
When checking the tire inflation pressure on the vehicle or after assembling tires, make sure that the lock ring **2** is correctly installed on the disk wheel.
If the tire pressure has dropped below 3 bar and the tires are improperly inflated, there is a risk of fatal injury if the lock ring **2** jumps off explosively.
- ▶ If the tire pressure is below 3 bar, the tire may only be inflated by authorized and trained specialists!
- ▶ If the lock ring **2** is not correctly seated on the disk wheel, it is essential that authorized and trained personnel are called in. Do **not** attempt to change the tire pressure yourself!
- ▶ Adhere to the specified tire pressure!

The tire pressure may not exceed or fall below the permitted range, otherwise the body of the tire could be damaged and tire failure may occur.

Note
- ▶ Always check the tire pressure when the tires are cold!
- ▶ The specified tire pressure must be within the tolerance range of ±0.2 bar!

Observe the tire pressure, which is approved for the tire installed on the crane. See Crane operating instructions, chapter 1.03.
– Check the tire pressure.

3.3 Inspection of disk wheels

The disk wheel is one of the most important safety relevant components on the vehicle.
The disk wheel is a welded steel structure and must be checked according to section 2.
In addition, at least during the annual specified inspection of cranes, the outside and the inside of the disk wheel must be visually inspected, taken the below listed points into account.
If cracks on the outside in the paint of the disk wheel can be seen, also recognizable by rust lines in the paint, then the disk wheel must be inspected closely for cracks. The “color penetration procedure” is recommended for this crack inspection.
In particular, the disk wheels must be inspected for cracks that are developing in the base material, as well as at the locations indicated by the arrows.
Any disk wheels that show evidence of cracks or crack formation must be replaced immediately.
After a mileage of maximum 40,000 km, the operator must routinely inspect the disk wheel regardless of the actual load spectrum.
The following safety and maintenance guidelines are the manufacturer's recommendations for avoiding safety risks caused by damaged disk wheels. In addition, the manufacturer can only provide a warranty in case of a claim if these guidelines have been observed.

Note
- ▶ Tires may only be changed by authorized and trained specialists!
- ▶ This applies both to dismounting and mounting of the tire on the disk wheel **1**!

Workshop personnel or authorized and trained specialists should check the wheels at the rim and the disk wheel for the following when changing the tires:
– Excessive rust or corrosion.
– Bent rim flanges.
– Cracks in the disk wheel.
– Cracks on the fastening circle to the brake drum on the inside or outside of the disk wheel.
– Welding seam connection on inside or outside of disk wheel.
– Damage to side and locking rings.
– Damaged wheel lugs or nuts.
– Worn out pin holes.
– Matching disk wheel parts.

WARNING
Risk of overload breakage!
Disk wheels with worn bolt holes must be scrapped immediately. Repairing these highly-stressed disk wheel components causes structural changes in the material, which can lead to premature overload breakage!
- ▶ No welding work is permitted on rims and disk wheels, particularly repairs to worn bolt bores!

– If damaged disk wheel parts are discovered during the inspection:
  Remove and replace any damaged disk wheel components.
– If paint damage or minor rust formation is found:
  Recondition the wheels with commercially available paint after removing the rust. Pay special attention to a perfect surface on the tire seating surfaces.

4 Inspecting the hoist and luffing winches

The hoist and luffing winches are designed in sealed planetary gear version. These gears are sized for long service life and the drive shafts and gears are rated for endurance.
Even though the hoist and luffing winches are designed for long life, an external visual inspection is not adequate, since their life can be significantly affected by bad maintenance (insufficient oil), using oil that does not meet specification requirements, defective seals, improper operation or overloading.
The annual inspection must therefore be carried out by an **expert** in accordance with the following requirements.
The winches must be inspected by an **authorized inspector** every four years after the initial license.
Within the territorial validity of the BGV D6, after the 10th year in operation, counted from the first day of initial license, when the theoretical utilization time is not over, the winches must be checked annually by an **authorized inspector**.

4.1 Inspections

4.1.1 Inspection intervals

At least once a year, see Crane operating instructions, chapter 7.03.

4.1.2 Inspecting oil level

Re-check oil level using the dipstick.
For hoist and intake winches **without** a dipstick, we recommend that the oil is drained and the amount compared to the specified oil quantity.

4.1.3 Evaluating oil color

Assume that the oil has been overheated if it is black and / or a burnt oil smell is detected. Change the oil.

4.1.4 Checking for foreign substances

As a rule, a qualified laboratory should carry out an oil analysis.
For simple testing, the following procedure can be used:
Drip the used oil on a specified filter fleece. Visual inspection with a magnifying glass may reveal coarse particles. If particles are detected, all the oil's properties must be examined by a qualified laboratory.

Note

- ▶ The evaluation of the foreign particles found in the oil must be made by a qualified laboratory!
- ▶ The maximum permissible quantity of foreign material measured by weight is 0.15 % of total oil weight!
- ▶ Maximum permissible foreign particle size from fine abrasion is 0.25 microns!
- ▶ If the above value have been exceeded, remove the gear and search for the cause of the increased abrasion!
- ▶ Damaged components must be replaced and the gear refilled with fresh oil!

NOTICE
Risk of property damage!

- ▶ Repairs may only be carried out by specialists with appropriate technical knowledge!

4.1.5 Visual inspection for leaks

The gears must be checked for leaks, since oil losses - in addition to polluting the environment - can lead to gear failure.

4.1.6 Inspecting the gear brakes

Check the brakes each time the gears are inspected.
Proceed as follows:

– Attach a load, which creates 40 % of the maximum rope pull in the uppermost layer of the coil and raise it just off the ground.
– Remove the plug on the brake vent magnet.
  This causes the brake to remain engaged when operated.
– Operate the winch to lower it.

Note

▶ The brake should not slip, i.e. the winch should not turn. If the brake slips, contact the Service department at Liebherr-Werk Ehingen GmbH!
▶ Only operate the crane after it has been checked and approved for use by the Service department at Liebherr Werk Ehingen GmbH!

NOTICE

Risk of property damage!
▶ Only qualified personnel with specialized knowledge may be used to evaluate gears and brakes!

4.1.7 Documenting the completed inspection and tests

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".

4.2 Requirements for monitoring the winches

4.2.1 Theoretical service life

The designer of your crane used a theoretical total operating time when designing and sizing the winches. This resulted in the theoretical service life of the equipment.
The winches of your crane are classified according to ISO 4301/1 as follows:

Winches	Classification
Power train group:	M3
Load spectrum:	L1
Load spectrum factor Km:	0.125
Theoretical service life D:	3200 h

Note

▶ The “theoretic service life” is not equal to the real (true) service life of a winch!

The actual life of the winch is affected by many additional outside factors; for example:

– Overloads caused by unapproved use of the crane.
– Inadequate maintenance: Oil is not changed in a timely manner.
– Improper operation:
  • Extreme acceleration or deceleration of the load.
  • Load falling into the ropes.
– Improper maintenance:
  • Using the wrong type of oil.
  • Too much or too little oil.
  • Contamination during oil change.
– Assembly errors during repair and maintenance.
– Undetected leakage.
– Incorrectly set safety devices.
– Hidden damage from accidents.
– Extreme environmental conditions:
  • Extreme low or high temperatures.
  • Corrosive atmosphere.
  • Dust and dirt.

4.2.2 Actually used part of the Service life

The crane operator is obligated to carry out an inspection of the crane at least once a year.
At this time, the actually used part of the theoretical service life must also be calculated. If necessary, the crane operator must contract an authorized inspector.
For the determination of the used part of the theoretical service life, the actual operating conditions (load spectrum) and the hoist gear operating hours for each inspection interval are to be determined.
The operator is responsible for the documentation in the crane inspection log.

Determining the operating conditions (load spectrum)

The load spectrum of the crane is divided into groups, please refer to ISO 4301/1.
Select one of the following load spectrums and record it in the crane inspection log for the respective inspection interval based on the actual operating conditions. A more precise determination of the load spectrum is permissible.

Load spectrum class: Light L1

Definition:

Power train or parts thereof are subjected to maximum stress only in exceptional cases, but normally only operate at very light loads.

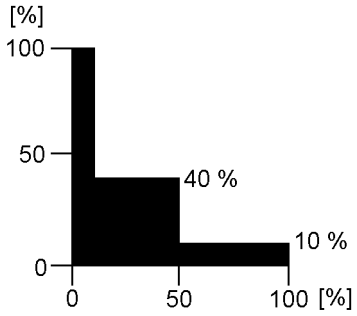
Operating time rates:

10 % of the time at maximum load (dead load and 1/1 working load)
40 % of the time with dead load and 1/3 working load
50 % of the time only with dead load

Factor of load spectrum:

Km = 0.125

Graphic view:



Note

▶ Load spectrum L1 with load spectrum factor Km = 0.125 is normally applied to cranes used for assembly operations!

Load spectrum class: Medium L2

Definition:

Power train or parts thereof are subjected to maximum load relatively often, but normally only operate at light load.

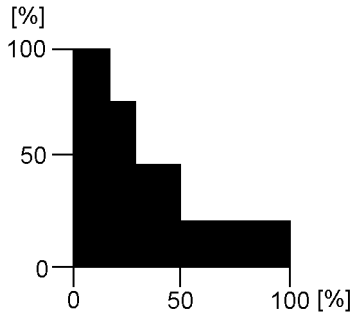
Operating time rates:

1/6 of the time at maximum load (dead load and 1/1 working load).
1/6 of the time with dead load and 2/3 working load.
1/6 of the time with dead load and 1/3 working load.
50 % of the time only with dead load

Factor of load spectrum:

Km = 0.25

Graphic view:



Load spectrum class: Heavy L3

Definition:

Power train or parts thereof are frequently subjected to maximum load and normally operate at medium load.

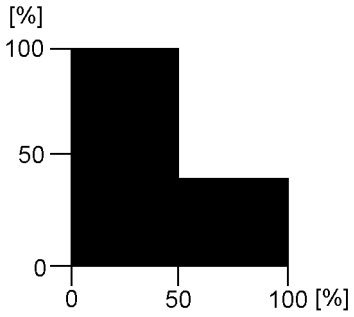
Operating time rates:

50 % of the time at maximum load (dead load and 1/1 working load)
50 % of the time only with dead load

Factor of load spectrum:

Km = 0.5

Graphic view:



Load spectrum class: Very heavy L4

Definition:

Power train or parts thereof are regularly subjected to near maximum load.

Operating time rates:

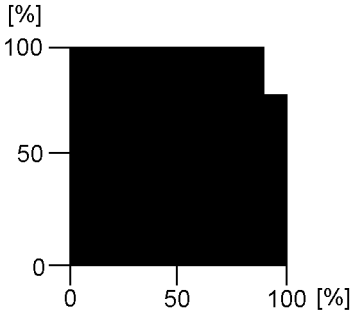
90 % of the time at maximum load (dead load and 1/1 working load)

10 % of the time only with dead load

Factor of load spectrum:

Km = 1

Graphic view:



Determining the effective operating hours T_i

The effective operating hours calculated as follows must be entered into the crane inspection log for the respective inspection interval.
There are four different scenarios:

1.) Operating hour meter installed on every winch.
If an operating hour meter is installed on every winch, the effective operating hours T_i can be read directly during each inspection.

2.) Operating hour meter installed for the overall crane drive.
The winch proportion of the total superstructure operating hours must be estimated.
For cranes used in assembly operations, the operating time for the hoist winches can be estimated 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 installed.
In this case the operator must estimate and document the actual operating hours of the winch.
The approximate percentages stated above normally apply to main hoist winches. For auxiliary hoist winches or boom control winches, the proportion of the total operating hours can be significantly less and should therefore be estimated by the operator.

Determining the used proportion of the theoretical service life

For an inspection interval i (max. 1 year), the actually used proportion S_i of the theoretical Service life is derived from the formula:

$$S_i = \frac{Km_i}{Km} \times T_i$$

Abbreviation	Explanation
S_i	Used proportion of the theoretical service life.
Km	Load spectrum factor that was used to calculate the winch rates. This factor is provided in the Operating instructions.
Km_i	Load spectrum factor for inspection interval i according to section “Determining the operating conditions” .
T_i	Effective operating hours for inspection interval i according to section “Determining the effective operating hours T_i” .

The actually used proportion is subtracted from the remaining theoretical service life D_i after each inspection interval (see example).
If the remaining theoretical service life is not long enough to cover the next projected operating period, a general overhaul of the winch is required.

If the theoretical service life D has been reached (see chapter on “Theoretical service life”), then the winch may only be operated after conducting a general overhaul.
A general overhaul of the winch is required not later than 10 years after commissioning.
The general overhaul must be arranged by the operator and carried out by the manufacturer or the manufacturer's authorized representatives and must be documented in the inspection log. After the general overhaul, the manufacturer or the manufacturer's authorized representative will define a new theoretical service life D.
When the design life has not been reached after 10 years, continued operation of the winch without a general overhaul is acceptable, when the crane's authorized inspector has confirmed the accuracy of the actual usage calculation by signing the crane inspection log at each authorized inspection interval. In such a case, the crane authorized inspector must thoroughly inspect the winch. This comprises at least:

– External visual inspection (leakage, damage, deformation, etc.).
– Oil check, especially for metal residues.
– Load test at minimum and maximum rope tension and at maximum possible speed in both cases. At least one layer must be spooled up. Pay particular attention to any unusual noises during this load test.

The crane's authorized inspector must confirm this inspection in the crane inspection log and must make a statement regarding suitability of the winch for continued operation. The next inspection must take place at the end of the 12th operating year and annually thereafter.

4.2.3 Example

According to the manufacturer's operating manual, a mobile crane with a separate operating hour meter for the crane engine and the crane drives classified as follows:

– Power train group: M3
– Load spectrum: Light L1
– Factor of load spectrum: Km = 0.125
– Theoretical service life: D = 3200 h

Actual usage proportion S of the theoretical service life is calculated using the individual inspection intervals as follows:

First inspection (first year)

The crane was used for assembly work during the elapsed year:
Load spectrum L1, in other words $Km_1 = 0.125$.
The superstructure hour meter indicates 800 h. The winch was operated about 20 % of the time; i.e. $T_1 = 160$ h.
The actual usage proportion S of the theoretical service life at the time of the first inspection is therefore:

$$S_1 = \frac{0{,}125}{0{,}125} \times 160\ h = 160\ h$$

Remaining theoretical service life:
$D_1 = 3200\ h - 160\ h = 3040\ h$
The above values are recorded in the crane inspection log.

Second inspection (second year)

The crane was used at a harbor for unloading work:
Load spectrum L3, in other words $Km_2 = 0.5$.
The superstructure hour meter indicates 2000 h; i.e., during this period:
2000 h – 800 h = 1200 h (800 h were used in the first year of operation)
The winch was operated about 40 % of the time; i.e. $T_2 = 480$ h.
The actual usage proportion S_2 of the theoretical service life at the time of the second inspection is therefore:

$$S_2 = \frac{0{,}5}{0{,}125} \times 480\ h = 1920\ h$$

Remaining theoretical service life:
D_2 = 3040 h – 1920 h = 1120 h

Third inspection (third year)

The crane was used for assembly work and occasionally at a harbor for unloading work:
Load spectrum L2, in other words Km_3 = 0.25.
The superstructure hour meter indicates 3000 h; i.e., during this period:
3000 h – 2000 h = 1000 h (2000 h were used in the first two years of operation)
The winch was operated about 30 % of the time; i.e. T_3 = 300 h.
The actual usage proportion S_3 of the theoretical service life at the time of the third inspection is therefore:

$$S_3 = \frac{0{,}25}{0{,}125} \times 300\ h = 600\ h$$

Remaining theoretical service life:
D_3 = 1120 h – 600 h = 520 h

4.2.4 Table for theoretically determining the remaining service life

Table 1 includes an example.
The theoretical remaining service life should be documented in table 2.

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Chart to determine the remaining theoretical service life of winch No. 1 (Main hoist winch)

Crane type: LTM 1050
Fabrication No.: 0010 540 08
Put in service : 12345
Serial number of winch according to data tag: 0815
Last general overhaul performed on: .....
Configuration data of winch (see Operating Manual):
Drive gear group: M 3
Load collective: Q 1 (L1)
Factor of load collective Km: 0.125
Theoretical service life D: 3200 hrs.

S_i = Used part of theoretical service life since last inspection
D_i = Remaining theoretical service life
D_{i-1} = Remaining theoretical service life after previous inspection
Km = Factor of load collective, which was taken for calculation of winch. This factor is to be taken from the Operating Manual
Km_i = Factor of load collective in inspection interval i
T_i = Effective operating hours in inspection interval i

(*) In the following pages, carry over the last line from the previous page.

Inspection interval No. (max. annually) i	Date of initial service / data of inspection	Operating conditions since last inspection (load collective)	Factor of load connective Km_i	Total crane operating hours [h]	Operating hours of super-structure [h]	Operating hours of super-structure since last inspection [h]	Operating hours of winch [h]	Operating hours of winch since last inspection T_i [h]	Used part of theoretical service life D: $S_i = \frac{Km_i}{Km} \times T_i$ [h]	Remaining theoretical service life $D_i = D_{i-1} - S_i$ [h]	Name of inspector	Signature	Remarks	Name of expert	Signature
(*) 0	10.06.90	-	-	-	0				0	3200					
1	05.06.91	L1	0,125	-	800	800	-	160 (20 % of 800)	160	3040	Müller				
2	20.05.92	L3	0,5	-	2000	1200	-	480 (40 % of 1200)	1920	1120	Huber				
3	18.05.93	L2	0,25	-	3000	1000	-	300 (30 % of 1000)	600	520	Maier				
4															

C A U T I O N : Perform general overhaul at least once every 10 years. In case of deviation, see guidelines in this chapter.

General overhaul last performed on : .....

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Chart to determine the remaining theoretical service life of winch No. ....

Crane type: .....
Fabrication No.: .....
Put in service: .....
Serial number of winch according to data tag: .....
Last general overhaul performed on: .....
Configuration data of winch (see Operating Manual): .....
Drive gear group: M.....
Load collective: Q.....(L.....)
Factor of load collective Km: .....
Theoretical service life D: .....

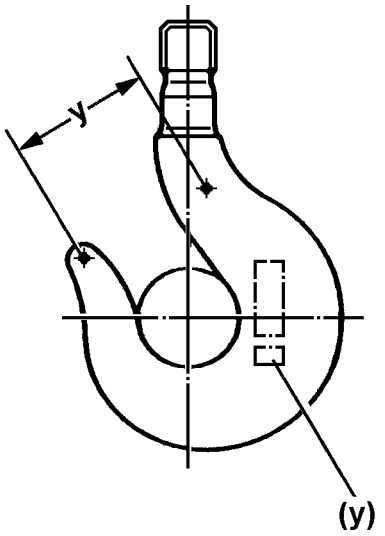
S_i = Used part of theoretical service life since last inspection
D_i = Remaining theoretical service life
D_{i-1} = Remaining theoretical service life after previous inspection
Km = Factor of load collective, which was taken for calculation of winch. This factor is to be taken from the Operating Manual
Km_i = Factor of load collective in inspection interval i
T_i = Effective operating hours in inspection interval i

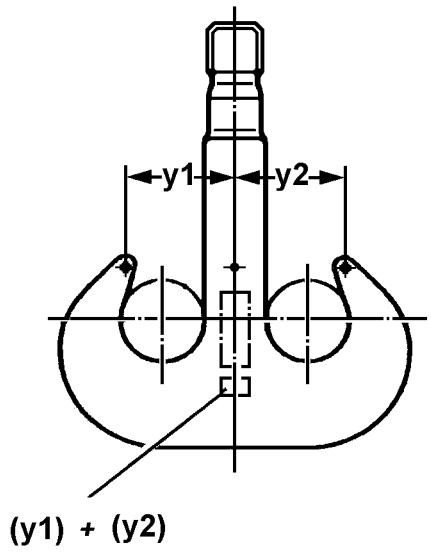
*) In the following pages, carry over the last line from the previous page.

Inspection interval No. (max. annually) i	Date of initial service / data of inspection	Operating conditions since last inspection (load collective)	Factor of load connective Km_i	Total crane operating hours [h]	Operating hours of super-structure [h]	Operating hours of super-structure since last inspection [h]	Operating hours of winch [h]	Operating hours of winch since last inspection T_i [h]	Used part of theoretical service life D: $S_i = \frac{Km_i}{Km} \times T_i$ [h]	Remaining theoretical service life $D_i = D_{i-1} - S_i$ [h]	Name of inspector	Signature	Remarks	Name of expert	Signature
(*)															

C A U T I O N : Perform general overhaul at least once every 10 years. In case of deviation, see guidelines in this chapter.

General overhaul last performed on : .....





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5 Inspecting load hooks

The load hooks must be visually inspected annually by a competent inspector.
This inspection must be carried out by an authorized expert every 4 years.
The purpose of the inspections is to avoid accidents by detecting deficiencies in a timely fashion.
Any deficiencies determined by the inspector must be documented, corrected, and subsequently reinspected.

5.1 Inspection and monitoring procedure

5.1.1 Deformation

The hook should be inspected for distortion as required, but at least once a year; e.g., at the hook jaw.
The original dimensions, (y) or (y1) and (y2), are given on the load hook itself.
Measure between the punch marks.

DANGER
Risk of accident!
Hook jaw distortion may not exceed 10 % of the original dimensions (y) or (y1) and (y2).
- ▶ Do not use a load hook that exhibits greater expansion!
- ▶ Contact the Service department at Liebherr-Werk Ehingen GmbH!

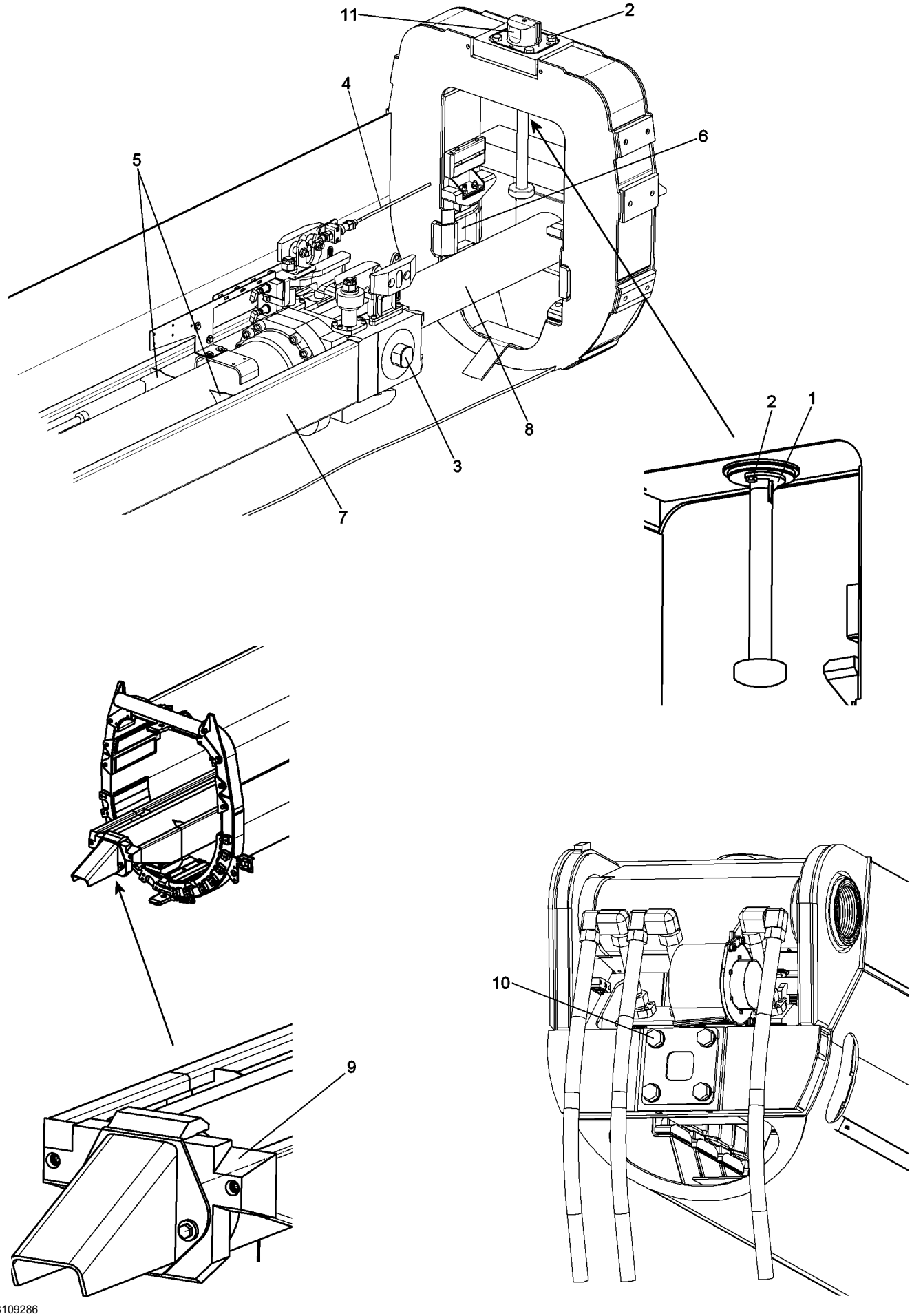
5.1.2 Corrosion

DANGER
Risk of accidents caused by thread corrosion / wear and tear!
- ▶ Stop using the load hook!
- ▶ Contact the Service department at Liebherr-Werk Ehingen GmbH!

Unscrew the nut from the hook shank so that the threads can be checked for corrosion and wear every 4 years by an authorized expert.

6 Inspecting the rope feed mechanics in the telescopic boom

- For inspection of rope end mounts, see Crane operating instructions, chapter 7.05.
- For inspection of the pre-tension on the intake ropes, see Crane operating instructions, chapter 7.05.
- For inspection of ropes for damage according to DIN 15020 or ISO 4309, see Crane operating instructions, chapter 8.04.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2
1
9
10
B109286

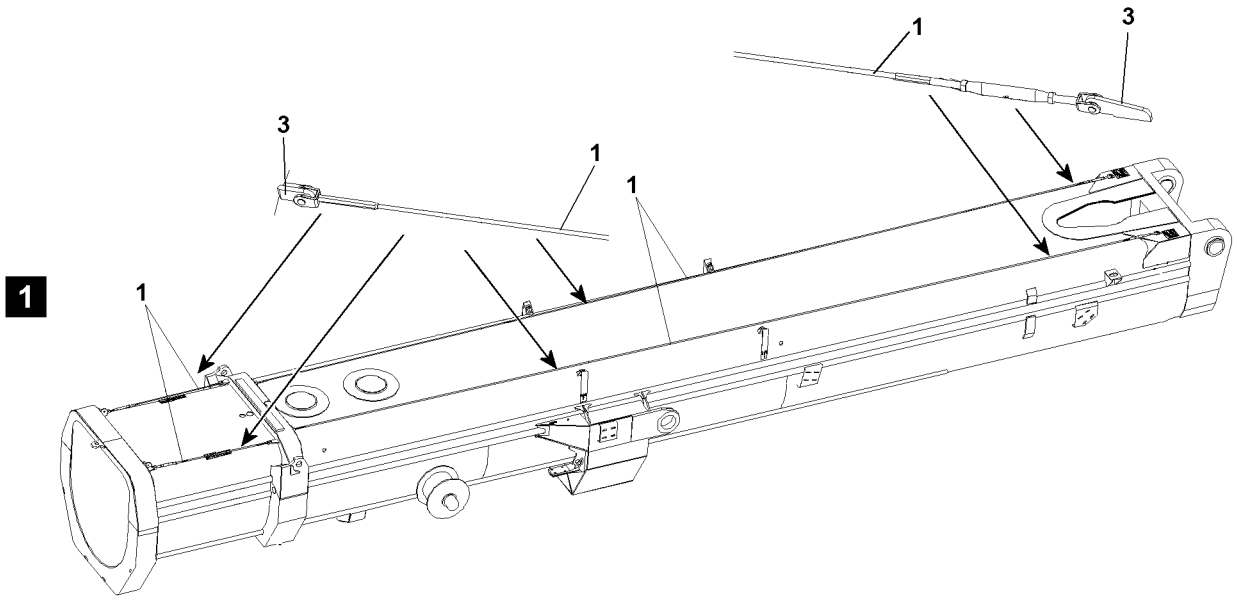
7 Inspection of locking system of telescopic boom

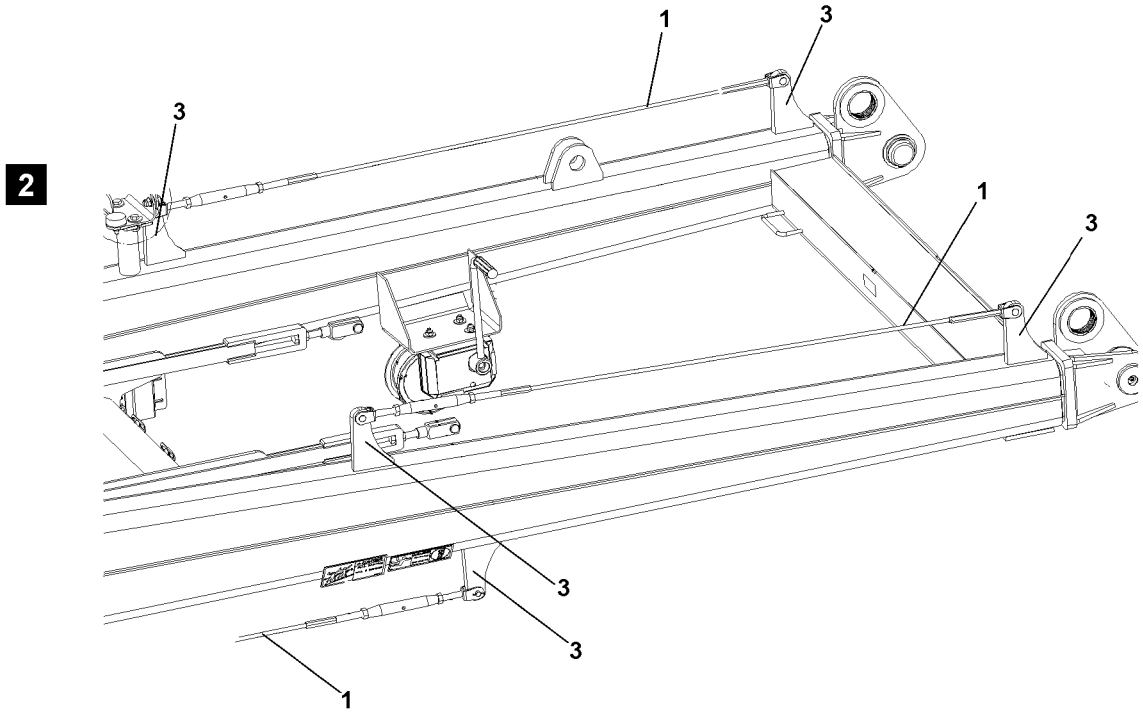
7.1 For cranes with pneumatic boom locking system

- For inspection of function, see Crane operating instructions, chapter 8.11.
- For inspection of pin wear pattern, see Crane operating instructions, chapter 8.11.
- For inspection of wear, see Crane operating instructions, chapter 8.11.
- For inspection of safety control, see Crane operating instructions, chapter 8.11.

7.2 For cranes with telescopic boom system Telematik

- Inspection of the pull knob safety **1** and all mounting screws **2** for tight seating
- Inspection of twist guards of cylinder pinning **3** and the telescopic boom pinning **11**
- Inspection of the length sensor rope **4** for damage
- Inspection of the cylinder barrel in the area of all welding seams **5** for crack formation
- Inspection of the locking pockets **6** for damage
- Grease the guide rail **7**
- In case of leakage: Inspection of the piston rod **8** for grooves.
- Inspection of the wear pattern on the cylinder pinning **3** and the telescopic boom pinning **11**
- Inspection of guide rail **7** for distortion of contour
- Inspection of plastic guide **9** on cylinder bottom for damage
- Inspection of all mounting screws **10** on the push out cylinder for tight seating





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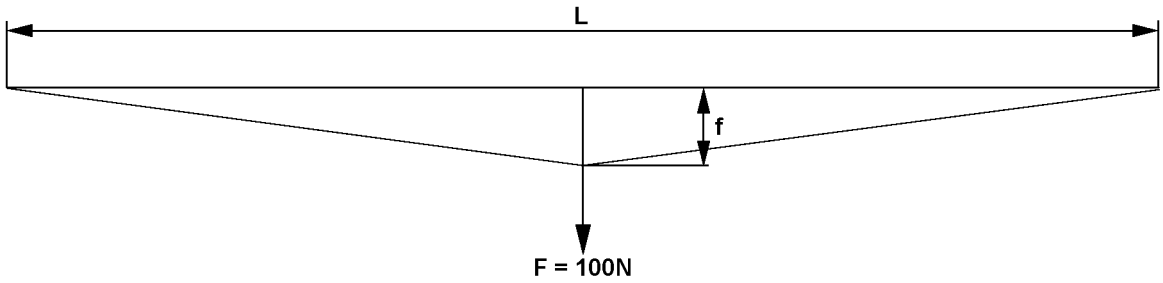
8 Inspection of retaining ropes and anchor points

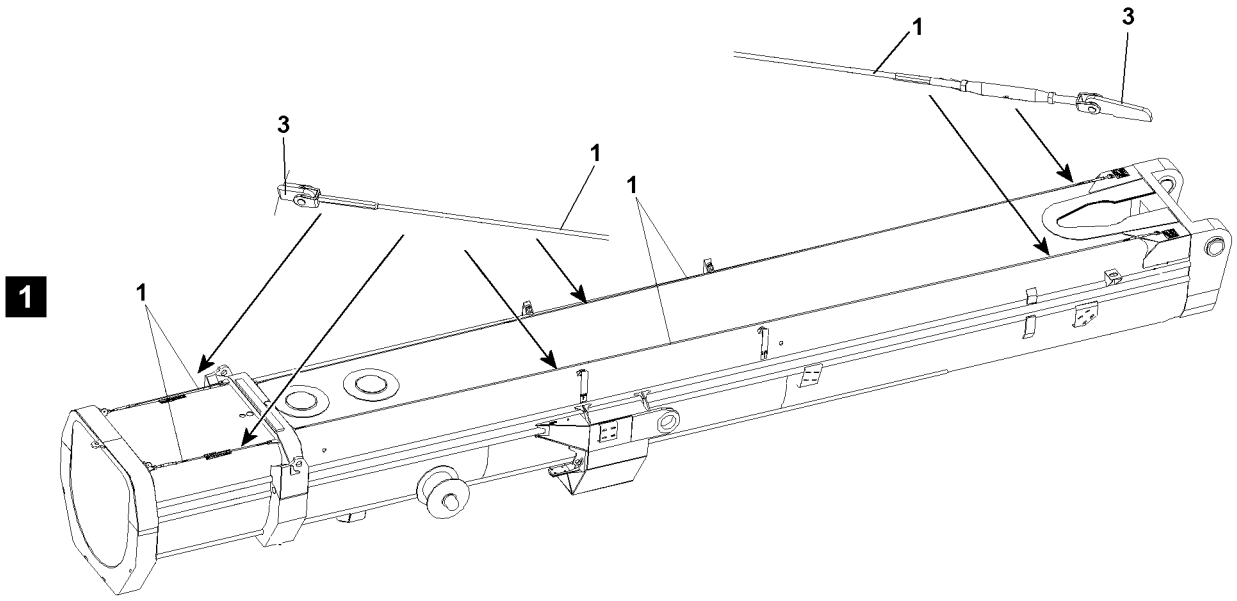
WARNING
Danger of falls due to damaged retaining ropes or anchor points!
The retaining ropes **1** and anchor points **3** must be checked **at least once a year** by **expert personnel** for safety and damage!
If any defects are found on the retaining ropes **1** or anchor points **3** during the inspections, then the retaining ropes **1** or anchor points **3** must be replaced immediately by **expert personnel**! If this is not observed, assembly personnel could be killed or fatally injured in a fall!
- ▶ The rope pretension on the retaining ropes must be 800 N!
- ▶ Have damaged retaining ropes **1** or anchor points **3** replaced immediately by **expert personnel**!

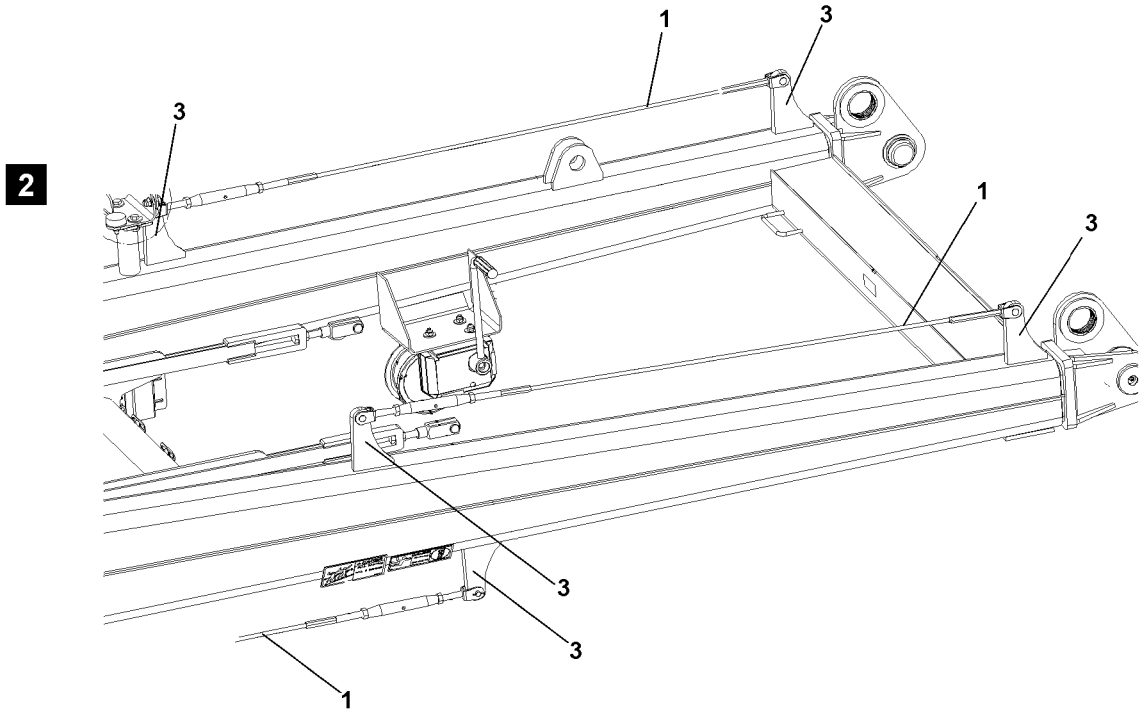
Note
Document the inspections in writing!
- ▶ The scope and results of tests should be documented to permit reproducibility. This documentation forms part of the crane records and should be safely stored during the entire service life of the crane.

8.1 Inspection of rope pretension



The rope pretension must be 800 N. This can be checked with the aid of a spring balance, which is pulled centered on the retaining rope. If the specified deflection (f) depending on the rope length (L) according to the following charts results for the raised load F = 100 N then the rope pretension of 800 N is set correctly.





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8.1.1 Retaining ropes on telescopic booms, illustration 1

The rope pretension is 800 N, if a sag (f) according to the chart is present on the retaining 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)	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

8.1.2 Retaining ropes on lattice sections, illustration 2

The rope pretension is 800 N, if a sag (f) according to the chart is present on the retaining 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

9 Inspection of membrane accumulator

Note

▶ The national regulations for pressurized container inspection must be observed!

The inspection of the membrane accumulators for specified gas pressure must be carried out by authorized and trained expert personnel, see Crane operating instructions, chapter 7.04, 7.05.

10 Inspection of relapse cylinders

10.1 Check the relapse cylinders for visible defects

WARNING
Defective relapse cylinders!
The relapse cylinders can be damaged due to loss of oil or corrosion and a safe crane operation can no longer be ensured! This could result in serious accidents!
Personnel can be severely injured or killed!
- ▶ Before any operation, visually check the relapse cylinders for leaks, damage and corrosion!
- ▶ If any defects are found, the relapse cylinders must be inspected by the cylinder manufacturer!

10.2 Checking the gas pressure and oil fill

10.2.1 Checking the gas pressure

Note
- ▶ The gas pressure may only be checked by an expert for pressurized containers!

10.2.2 Check the oil quantity

Note
- ▶ The oil fill may only be checked by an expert for pressurized containers!

11 Inspection of the safety controls on the relapse cylinders

For inspection of the safety control or limit switches on the relapse cylinders and the boom A-frames, see Crane operating instructions, chapter 8.12.

12 Inspecting the cable pulleys

DANGER
Risk of accident when damaged or cracked!
- ▶ Replace rope pulley immediately!

Inspect the entire cable 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 immediately visually inspected for damage or cracks.
Also check for wear in the rope groove. Replace the pulley if the bottom of the rope groove has been run down up to 1/4 of the rope diameter.

13 Inspecting the function of the overload protection

Position the longest boom at minimum and maximum radius: Check the load indicator, using the hook block as a test load.

The indicator reading may not deviate by more than 10 % off the true load value at these two extreme positions.

Measure the indicated radius for the longest boom at its minimum radius and at a boom angle of 45°.

The indicator reading may not deviate more than 10 % off the measured projection.

14 Inspecting the roller slewing ring connection

For tilt play dimension, see Crane operating instructions, chapter 7.05.

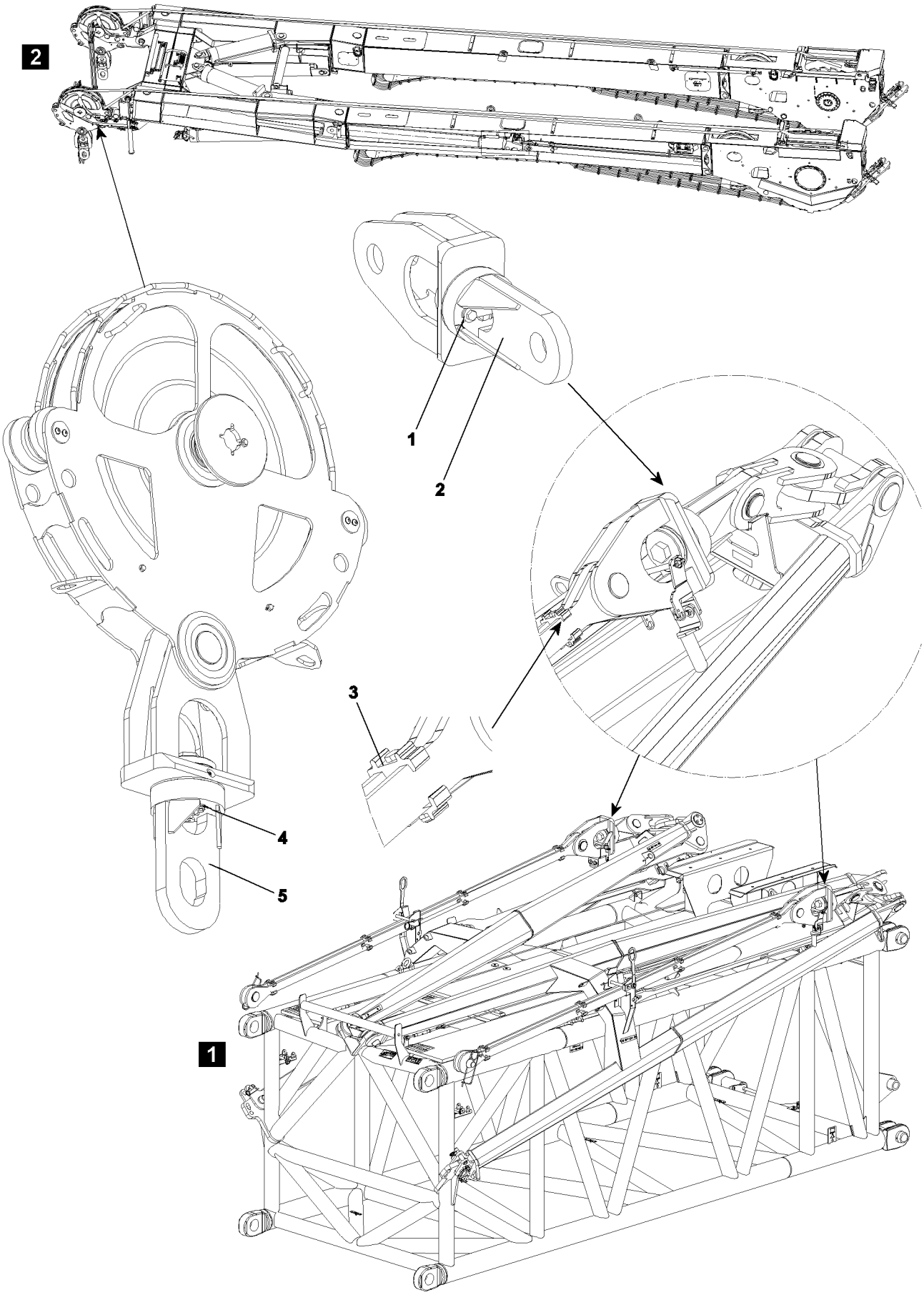
15 Inspecting the mounting of the load bearing equipment

Check that the mounting bolts for the roller slewing ring, winches, slewing gears and hitch are properly seated.

The slewing ring connection mounting bolts are pre-stressed at the factory, so that no loosening of the screw connections will occur during normal crane operation.

However, the screw connection may become overloaded and the bolts may be permanently stretched if the crane is overloaded or if the load is pulled free. It is therefore important to check these screws for tight seating during the annual crane inspection or after an overload.

Remove loose screws completely as well as the two adjacent screws on the right and left and check them for damage closely. Inspect the screws especially for cracks or permanent distortion. If a screw has been stretched by more than 0.2 % (in relation to its original length) or if cracks or other damage are detected, then the damaged screws must be replaced. If the screws have been stretched or there is other damage, then the adjacent screws must also be replaced.



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16 Inspection of the tele extension with eccentric, illustration 1

– Inspection of twist guard **1** for damage and loose screw connection.
– Inspection of rotator **2** for easy turnability.
– Inspection of all clamps **3** for damage and function.

17 Inspection of change over pulleys, illustration 2

– Inspection of twist guard **4** for damage and loose screw connection.
– Inspection of rotator **5** for easy turnability.

18 Inspecting the oil and fuel reservoirs

Visually check the oil and fuel tanks at least once a year for leaks and safe mounting.
Repairs may only be carried out by trained and knowledgeable specialists.
Improper repairs; e.g., welding, hard or soft soldering is not permitted, particularly if the Service department at Liebherr-Werk Ehingen GmbH has not been consulted!

19 Inspection of the auxiliary reeving winch, towing winch and spare wheel winch

Determine the service life of the auxiliary reeving winch, recovery winch and spare wheel winches from their respective original manufacturer.

20 Appendix

The following is a checklist to assist the inspector during the periodic inspections of Liebherr mobile and crawler cranes.

20.1 Inspection recommendations for periodic inspections of Liebherr mobile and crawler cranes

Company:	**Inspector:**
Crane manufacturer: LIEBHERR	**Crane type:**
Serial number:	**Stock number:**
Construction year:	**Date:**
Inspector's signature for No. 1 to 22:	

1. Inspection category: Crane document						
Component 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/ labeling						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Factory tag						
Load data						
Operating specifications label						
Prohibition and command signs						
Other safety signs						

3. Inspection category: Travel gear[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Frame[2]						
Supports[3]						
Axles						
Wheels						

3. Inspection category: Travel gear[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Tires						
Bearings						
Gear						
Universal drive shaft						
Leaf springs / springs						
Shock absorbers						
Steering						
Brakes						
Hydraulic axle suspension						

4. Inspection category: Chassis[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Coverings						
Treads						
Counterweight holders[2]						
Suspension equipment						
Ladders						
Hook block mounting[2]						
Boom support[2]						

5. Inspection category: Chassis - driver's cab[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Doors						
Windows / glazing						
Windshield wipers						
Mirrors						
Seat						
Heater						
Ventilation						
Sound absorber						
Trip recorder						
First aid kit						

5. Inspection category: Chassis - driver's cab[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Spare bulbs						
Hazard warning triangle						
Safety vest						

6. Inspection category: Chassis - drive[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Combustion engine						
Exhaust system						
Fuel tank						
Filter						
Sound absorber						
Engine mount						
Oil levels						
Fuel lines						

7. Inspection category: Chassis - hydraulics[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Oil reservoir						
Filter						
Pumps						
Motors						
Valves						
Lines						
Hoses						
Cylinder						
Pressure limiting valves						

8. Inspection category: Chassis - pressurized air system[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Compressor						
Filter						
Air tanks						
Valves						

8. Inspection category: Chassis - pressurized air system[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Lines						
Hoses						
Cylinder						

9. Inspection category: Chassis - electrical system[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Motors						
Generators						
Battery						
Switch						
Lines						
Fuses						
Resistors						
Lighting						
Brake lights						
Indicator lights						
Tail lights						
Working lights						
Signaling systems						
Indicator lights						
Battery switch						
Limit switches: Transmission, steering, drive train						
Support pressure indicator[2]						

10. Inspection category: Chassis - control devices[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Engine regulation						
Gear						
Couplings						
Circuits						
Brakes						
Steering						
Indicator displays						
Engine shut off line						

10. Inspection category: Chassis - control devices[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Control of supports[2]						
Axle suspension						
Crane leveling						
Rear axle steering						

11. Inspection category: Superstructure						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Frame						
Coverings						
Treads						
Bearings						
Counterweights						
Relapse retainer						
Slewing ring connection: Tilt play						
Slewing ring connection: Mounting screws						
Slewing ring connection: Gears						
Slewing gear: Mounting screws						
Slewing gear: Gears						

12. Inspection category: Superstructure - crane operator's cab						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Doors						
Windows / glazing						
Windshield wipers						
Mirrors						
Seat						
Heater						
Ventilation						
Sound absorbers						
Joystick for working functions						
Gear shifts						
Safety: Crushing / shear locations						

13. Inspection category: Superstructure - Retaining and protection devices						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Grab handles and accesses						To the cab and to the power train
Coverings						
Covers						
Hatches						

14. Inspection category: Superstructure - drive train						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Combustion engine						
Exhaust system						
Fuel tank						
Filter						
Sound absorber						
Engine mount						
Fuel lines						

15. Inspection category: Superstructure - hydraulic system						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Oil reservoir						
Filter						
Pumps						
Motors						
Valves						
Lines						
Hoses						
Cylinder						
Pressure limiting valves						
Lowering brake valves						
Brake control: Hoist gear						
Brake control: Slewing gear						

16. Inspection category: Superstructure - electrical system						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Motors						
Generators						
Batteries						
Switch						
Lines						
Fuses						
Resistors						
Lighting						

17. Inspection category: Superstructure - control systems						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Engine regulation						
Gear						
Flexible couplings						
Circuits						
Engine shut off line						
Monitoring indicators						

18. Inspection category: Superstructure - rope drives						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Winch 1[3]						
Winch 2[3]						
Winch 3[3]						
Winch 4[3]						
Rope pulleys						
Rope end connection						
Rope for winch 1						
Rope for winch 2						
Rope for winch 3						
Rope for winch 4						
Guy ropes						

19. Inspection category: Superstructure - hook						
Component 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 inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Hoist emergency limit switch I						
Hoist emergency limit switch II						
Lowering emergency limit switch I						
Lowering emergency limit switch II						
Boom emergency limit switch I						
Boom emergency limit switch II						
Luffing jib: Boom limit switch I						
Luffing jib: Boom limit switch II						
Load moment limiter						
Angle display: Boom						
Angle display: Luffing jib						
Angle display: Slewing gear						
Safety devices: Control						
Working range limitation						
Pressure sensors						
Speed sensor						
Wind sensor						
Sliding beam monitoring						
Support pressure indicator						
Incline display						
Length indicator: Radius, boom length						
Emergency off system						
Engine stop						

21. Inspection category: Boom						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Weld structure						
Rope pulleys						
Luffing cylinder						
Telescoping cylinder						
Boom extension ropes						
Boom retraction ropes						
Boom bearings						
Boom pinning						
Guy rods						
Relapse cylinders						

22. Inspection category: Equipment						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Weld structure						
Rope pulleys						
Relapse cylinder						
Relapse support						
Oscillation guard						
A-frame bearings						
Pinning of components						
Guy rods with pinning						
Rods with guide rail on A-frame 2 and A-frame 3						
All limit switches with switch mechanism						

Inspection criteria:
A = present / complete
B = condition / maintenance
C = function
D = repair / replace
E = reinspection required

Evaluation:
Satisfactory = x
Unsatisfactory = -
Not required = 0

Comments:
[1] Inspection of the crane carrier vehicle road worthiness is also fulfilled if it has already been certified by the road traffic department certification authority. For cranes that are not certified for use on public roads, an expert or authorized inspector must conduct the required tests to validate the vehicle's road worthiness.
[2] These inspections must be carried out by an authorized inspector even if it has passed the road traffic department test and is certified.
[3] Inspection of the winches regarding the used portion of the theoretical service life.

B195219

1 Introduction

DANGER
Danger of fatal injury due to defective crane ropes!
▶ Please observe the following criteria.

The rope should be considered to be a wear part, which must be replaced if the inspection shows that its strength has reduced to such an extent that continued use may be dangerous.
Regular inspection of the rope is required in order to safely carry loads with correctly deployed equipment, meaning that the rope must be taken out of service at an appropriate point in time.
The take-down criteria with regard to wire breaks, wear, corrosion and deformation can be applied immediately under all application conditions. The different factors are dealt with in ISO 4309, which is intended to serve as a guideline to competent experts who are involved in the maintenance and inspection of cranes.
We recommend to carry out an annual inspection by an **expert** according to the following standard (ISO 4309).
The ropes should be inspected every 4 years by an **authorized inspector**.
The scope of the inspection and the inspection results must be traceably documented, see addendum 2. This documentation must be retained as part of the crane records!
The criteria that are covered here are intended to provide an appropriate safety margin for movement of loads with cranes until the rope is taken down.

2 Wire rope

2.1 Condition before installing

The rope is usually replaced with a rope that is of the same type as the original. If the spare part is of another type, the user must ensure that the rope characteristics are at least as good as those of the rope that was taken down.
Before installing a new wire rope, the grooves of the rope drums and pulleys must be checked in order to ensure that the spare ropes is placed correctly in the rope grooves (see section entitled “Inspection”).

2.2 Installation

When the rope is removed from the spool or unwound from a reel, it must be ensured that the rope is not twisted, otherwise loops, reverse bends or kinks could originate in the rope.
If the rope is looped over any part of the system when it is not under strain, these areas must be protected accordingly.
Before starting to use the rope on the system, the user must ensure that all components that are functionally associated with the wire rope in connection with the standing components have been set up in such a way that they will operate correctly.
To stabilize the wire rope, a few lifting procedures should be carried out at approximately 10 % of the normal load.

2.3 Maintenance

The maintenance of the wire ropes depends on the type of lifting device, its application, the environment as well as the type of rope that is used. If no other instructions from the crane or rope manufacturer are provided, the wire rope should be cleaned, if possible, and lubricated with grease or oil, particularly in areas in which the rope is subjected to bending when it runs over pulleys.
The kind of grease that is used must be suitable for steel ropes.
Lack of maintenance will reduce the service life of the rope, particularly if the crane is used in a corrosive environment and if re-lubricating is not possible because of the nature of the respective crane application.

2.4 Inspection according to ISO 4309

2.4.1 Frequency

Daily inspection

If possible, all visible parts of the ropes must be checked for general wear and distortion every working day. Special attention must be paid to the rope end connections. Any suspected changes in the condition of the rope must be reported and the rope must be inspected by a trained expert inspector in accordance with the section “Points to check on the rope”.
If the lower rope layers on the drum are used infrequently or not at all, periodically unwind and rewind the entire drum under pretension. A rope is most cost-effective if it is used over its entire length. For that reason, it is recommended to use an appropriate rope length when operating the crane over longer periods.

Note

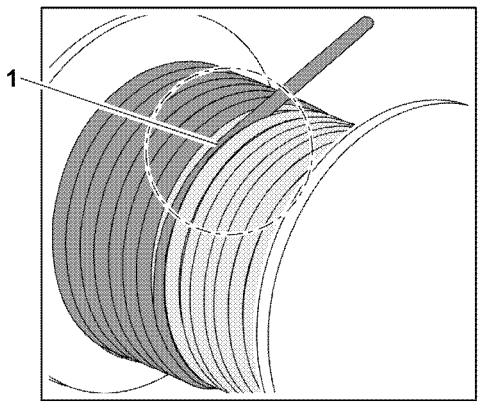
▶ If a rope is newly placed, then it must be pretensioned and placed with a pretension of at least 10 % of the maximum rope pull.

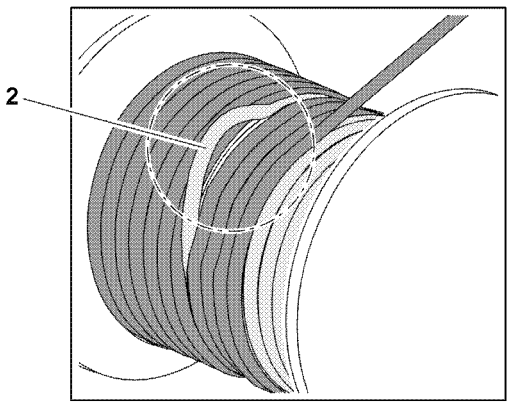
Special inspection as described in section “Points to check on the rope”

The rope must be checked after any events that may have led to damage to the rope and / or the rope ends and whenever the rope is taken back into service after being taken down and then re-installed.

2.4.2 Checking the spooling behavior of the rope on the cable drum

To avoid spooling errors and associated rope damage, it is necessary to check the spooling behavior daily. If spooling errors are determined, the rope must be reeled off until there are only 3 rope coils on the winch. Thereafter, the rope is to be tensioned with a pretension of at least 10 % of the maximal rope pull and then placed again.





Possible spooling errors:
– Cutting into the lower rope layers **1**
– Loop formation in the lower rope layers **2**

2.4.3 Points to check on the rope

General

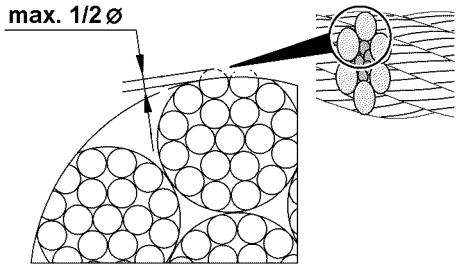
Although the entire length of the rope must be checked, particular attention must be paid to checking the following areas:

– At the rope end points on both sides, for movable as well as fixed ropes.
– The part of the rope that runs through the block or over rope pulleys; particular attention must be paid to parts of the rope that are on rope pulleys when under load (see appendix 1) in systems that carry out repeated movements.
– Parts of the rope that run over a compensation pulley.
– All parts of the rope that can be subjected to wear caused by external elements (e.g. protruding hatch surrounds).
– All parts of the rope that are subjected to the effects of heat.
– On the contact positions of the ropes when spooling up.
– Check the inside of the rope for corrosion and material fatigue.

The results of the inspection must be entered in the inspection log for the system (for typical example see section entitled “Rope inspection log” and appendix 2).

Checking the rope in the uphill pitch zones of the rope coil for flat sections

In the cross area of the coiled up rope layers, the rope is under more strain and can therefore be flattened. To void flat sections, the rope can be shortened on the rope drum fixed point.



If the wires in the outer braids are flattened to no more than maximum half the wire diameter:

– Shorten the rope by a length of 1/3 of the rope drum circumference and reset.

DANGER

Rope breakage!

If the following measures are not observed, the rope can break, the load can fall down and fatally injure personnel!

▶ Take the rope down when the take down criteria is reached, as described in section “Take down criteria”!
▶ Take the rope down when the wires in the outer braids are flattened by more than half the wire diameter!

Rope suspension and connection systems - except loops

The rope must be examined at the exits of the rope suspension and connection system, since this area is particularly susceptible to initial signs of material fatigue (wire breaks) and corrosion. The rope suspension and connection systems must also be examined for signs of deformation or wear.
Rope suspension and connection systems with pressure sleeves must undergo the same checking, and the sleeve must be checked for cracks in the sleeve material and possible slippage of the rope in the sleeve.
Detachable rope suspension systems (cotters, rope clamps) must be checked for wire breaks inside and beneath the mount or fastening; it must also be examined whether the cotters and screwed-on rope clamps are firmly connected to the rope. This check should also ensure that the requirements of the rope suspension and connection systems standards and procedural guidelines are complied with.

2.5 Take-down criteria

The safe use of the rope is assessed in accordance with the following criteria:

1.) Number of wire breaks
2.) Broken wire nests
3.) Wire break increase rate
4.) Strand breaks
5.) Rope diameter reduction, including the reduction caused by damage to the rope core
6.) External and internal wear
7.) External and internal corrosion
8.) Deformation
9.) Damage caused by the effects of heat or arc welders

These individual factors must be taken into consideration in accordance with the relevant criteria during all examinations. However, rope quality deterioration frequently results from a combination of the individual factors, meaning that a worsening effect occurs that must be detected by an expert and that influences the decision as to whether the rope has reached its rope removal limit and whether it can continued to be used.
The inspector must investigate if the deterioration has been caused by a fault in the system; if this is the case remedial action should be recommended before placing a new rope.

2.5.1 Number of wire breaks

The number of wire breaks must be determined by visually inspecting the entire length of the rope. When a wire break is found, sections that are 30 × d (d = nominal rope diameter) in length are marked at both sides of this point. These sections must be examined extremely carefully. All wire breaks are now carefully counted in each section. Please compare the number of visible wire breaks with appendix 4. If the number of visible wire breaks is less than the number specified in the chart, then the area in which the most broken wires are found is marked over a length of 6 × d. Count the number of visible wire breaks again and compare the result with appendix 4. If the number of visible wire breaks is less than the number specified in the chart, then the rope does not have to be taken down yet.

Note
Defining the interval until the next inspection
▶ The interval until the next inspection is set depending on the number of visible wire breaks.

2.5.2 Broken wire nests

If the wire breaks are extremely close together and form wire nests, the rope must be taken down. If the frequency of such wire breaks occurs over a rope length of less than **6d** or is concentrated on one strand, taking the rope down is recommended, even if the number of wire breaks is less than the maximum number specified in the tables.

2.5.3 Wire break increase rate

For applications in which the main reason for damage to the rope is material fatigue, the first wire breaks will not occur until a certain time has elapsed, but the number of wire breaks will increase rapidly at ever-decreasing intervals.
Careful checking and logging of the increased number of wire breaks over time is recommended in these cases.

2.5.4 Strand breaks

If an entire strand breaks, the rope must be taken down.

2.5.5 Reduction in rope diameter caused by damage to core rope

The rope diameter can be reduced as a result to damage to the core because of:

1.) Internal wear and notching
2.) Internal wear due to friction between individual strands and wires in the rope, particularly if it is subjected to bending
3.) Steel core breakage
4.) Break in internal layers of multi-strand ropes

If the rope diameter (average of two diameter measurements) is reduced by 3 % of the nominal diameter (rotation resistant ropes) or 10 % of the nominal diameter of other ropes due to these factors, the ropes must be taken down, even if no wire breaks are visible.

Note
Diameter of new ropes
▶ New ropes can have an actual diameter that is greater than the nominal diameter, meaning that proportionally greater wear is possible.

2.5.6 External wear

Abrasion of outer wires of outer rope strands as a result of rubbing contact under pressure with the grooves in the rope reels and drums. This condition is particularly evident in moving ropes in the areas in which they come into contact with rope pulleys when the load is being moved and braked, and manifest themselves as flattened surfaces on the outer wires. Abrasion is exacerbated by a lack of or incorrect lubrication as well as the effects of dust.
Wear reduces the breaking strain of steel ropes because the cross section of the steel is reduced. The rope must be taken down if the actual rope diameter has reduced by 7 % or more because of outer wear, even if no wire breaks are visible.

2.5.7 External and internal corrosion

Corrosion is a particular problem in maritime climates and atmospheres that are polluted by industrial emissions, reducing breaking strain and accelerating material fatigue because of the reduction in the rope material cross section, leading to irregular surfaces which are the starting point for stress cracks. Extreme corrosion can reduce the elasticity of the rope.

1.) External corrosion
Corrosion of the outer rope wires can be determined by visual inspection.
2.) Internal corrosion
This condition is more difficult to detect than external corrosion.

Note
Internal corrosion
▶ If there are any signs of internal corrosion the rope must be checked by a competent expert.

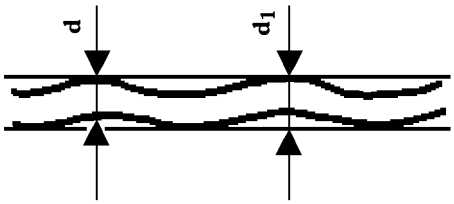
DANGER
Occurrence of internal corrosion!
▶ If the suspicion of extreme internal corrosion is confirmed, the rope must be taken down immediately.

2.5.8 Rope deformations

A visible change to the rope structure is referred to as “rope deformation” and can cause a change at the deformation point that results in irregular rope tension.
A distinction is made between the following important types of cable deformation on the basis of the cable appearance (see following sections):

1.) Corkscrew-like deformation
2.) Basket formation
3.) Strands protruding from the rope
4.) Wire loop formation
5.) Flattening
6.) Reverse bends or knots
7.) Kinks

Corkscrew-like deformation (see appendix 3, table 1)



Corkscrew-like deformation

If there is any corkscrew-like deformation the rope must be taken down if the following condition is net:

$$d_1 > \frac{4\,d}{3}$$

d = nominal diameter of rope
$\mathbf{d_1}$ = rope sheath diameter of the distorted rope

Basket formation (see appendix 3, table 2)

If there are kinks in the rope, it must be replaced immediately.

Strands protruding from the rope (see appendix 3, table 3)

The rope must be replaced immediately if this kind of deformation occurs.

Wire loop formation (see appendix 3, tables 4 and 5)

In this case, certain wires or groups of wires protrude from the rope at the side facing the rope pulley in the form of loops - this is normally the result of sudden strain. If serious deformation occurs, the rope must be taken down.

Flattening (see appendix 3, tables 8 and 9)

Flattening is the result of mechanical damage; if it is pronounced the rope must be replaced.

Reverse bends or knots (see appendix 3, tables 6 and 7)

If the rope has any reverse loops or knots it must be taken down immediately.

Kinks (see appendix 3, table 10)

Kinks are angled deformations in the rope caused by external influences. If there are kinks in the rope, it must be replaced immediately.

2.5.9 Damage caused by the effects of heat or arc welders

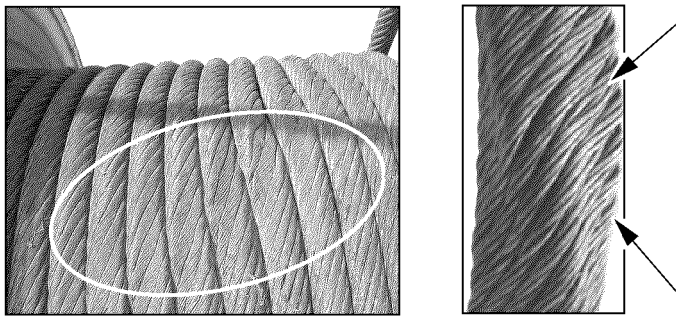
Steel ropes that have been subjected to extremely high temperatures, which can be detected externally because of the coloring that it causes, must be taken down.

2.5.10 Distortion on non-rotation resistance control ropes

Note

▶ The erection and control procedure must be carried out with a pretension of at least 10 % of the maximum rope pull.

For crane types with control winches for the boom control, especially the first rope layer of the control winch must be checked for rope dents and / or rope distortions.



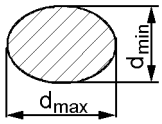
Distortions on control ropes

– At a distortion of more than 5 %, the control rope must be checked before every assembly and erection procedure and the distortion must be documented. Example for inspection protocol: See Addendum 2.

– At a distortion of more than 10 %, the control rope must be taken down.

Calculation formula for rope distortion

$$[V]\,\% = \frac{(d_{max} - d_{min})}{d} \times 100$$



[V] % = rope distortion in %
d = control rope nominal diameter
$\mathbf{d_{max}}$ = largest diameter of distortion area
$\mathbf{d_{min}}$ = smallest diameter of distortion area

3 Operating behavior of steel ropes

Exact logging of information by the checker can be useful for predicting the behaviour of a certain type of steel rope on a crane. This information is useful for planning and adapting maintenance instructions and controlling the stocking of spare ropes. The use of such a prediction system should not cause the examinations to be less strict or the rope usage time to be extended beyond the criteria that are specified in the previous sections of this guideline for monitoring and taking down of crane ropes.

4 Condition of equipment that is functionally associated with the rope

Note
Groove radius
▶ The radius must not be smaller than the actual diameter of the rope.

Rope drums and pulleys must be checked at regular intervals in order to ensure that all these components rotate correctly in their bearings. Stiff or blocked rope pulleys wear rapidly and unevenly and cause serious rope abrasion. Ineffective compensation pulleys can lead to irregular rope tension. The radius at the bottom of the rope grooves of all rope pulleys and the drum must be suitable for the nominal diameter of the rope. If the radius has become too big or too small the rope groove must be reworked or the rope pulley replaced.

5 Rope inspection log

The user must provide a log for each of the regular inspections in which all rope inspection information is recorded. Typical example of a log - see appendix 2.

6 Rope storage and marking

Clean, dry rope storage facilities must be provided in order to prevent damage to ropes that are not in use; it must also be ensured that the ropes can be clearly and unambiguously assigned to their checking logs.

7 Wire ropes and rope end connections

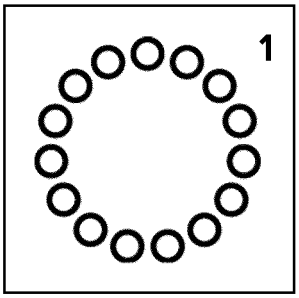
DANGER
Risk of accident!
▶ Correct choice and use of the wire rope and the rope end connections are a decisive precondition for proper and accident-free crane operation.

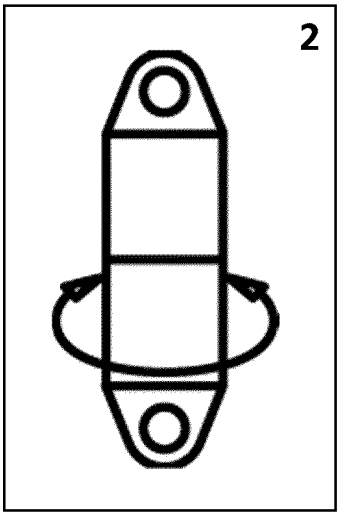
The wire ropes and rope end connections selected in accordance with their usage. It must be determined whether a rotation-resistant or non-rotation free rope is required. The type of rope that is selected then determines the type of rope end connections that are used.

7.1 Rotation-resistant ropes and their rope end connections

Rotation-resistant ropes are special ropes that produce extremely little torque and twisting at the rope end connection when they are under strain.

Note
▶ Rotation-resistant ropes are used as **hoist ropes**.





Typical rotation-resistant wire rope structures are ropes with 15 to 18 outer strands. Rotation-resistant ropes are symbolically depicted with 15 outer strands (circles) (see table **1**).
Rotation-resistant ropes can be optionally used with the following rope end connections:

– Rope end connection **rotating** in the form of a PFEIFER link **with** swivel or spin stabiliser / swivel.
– Rope end connection **non-rotating** in the form of a PFEIFER link **without** swivel or gib and cotter.

If possible, preference should be given to the use of a twisting rope end connection to reduce torsional stress with **rotation-resistant ropes** (see table **2**).

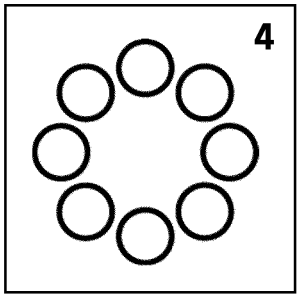
DANGER
Danger of severe injuries to personnel and property damage!
▶ **Never** use rotating rope end connections with non-rotation free ropes!

Note
Usage warning notes
▶ The usage warning notes on the rotating PFEIFER link with pulley indicates that this rope end connection may **not** be used for non-rotation free ropes (see table **3**)!

7.2 Non-rotation free ropes and their rope end connections

Non-rotation free ropes generate high torque levels at the rope end connection when they are under load. For this reason, the rope ends must be protected from twisting using an appropriate rope end connection to prevent the rope from unscrewing under strain!

Note
▶ Non-rotation free ropes are used as **guy ropes** or **control ropes**.



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5

Typical non-rotation free wire rope structures are ropes with 8 to 10 outer strands. Twisting ropes are symbolically depicted with 8 outer strands (circles) (see table **4**).
Non-rotation free ropes can only be used with the following rope end connections:

– Rope end connection **non-rotating** in the form of a PFEIFER link **without** swivel or gib and cotter. A non-rotating rope end connection is also the mount of the rope on the fixed point of the winch drum.

DANGER
Danger of severe injuries to personnel and property damage!
▶ **Never** use rotating rope end connections with non-rotation free ropes!
▶ Never install a twist compensator / swivel!

Note
Usage warning notes
▶ The usage warning note on PFEIFER links without swivel and cotter indicates that this rope end connection may **not** be used for non-twist free ropes **in combination** with a twist compensator / swivel (see table **5**)!

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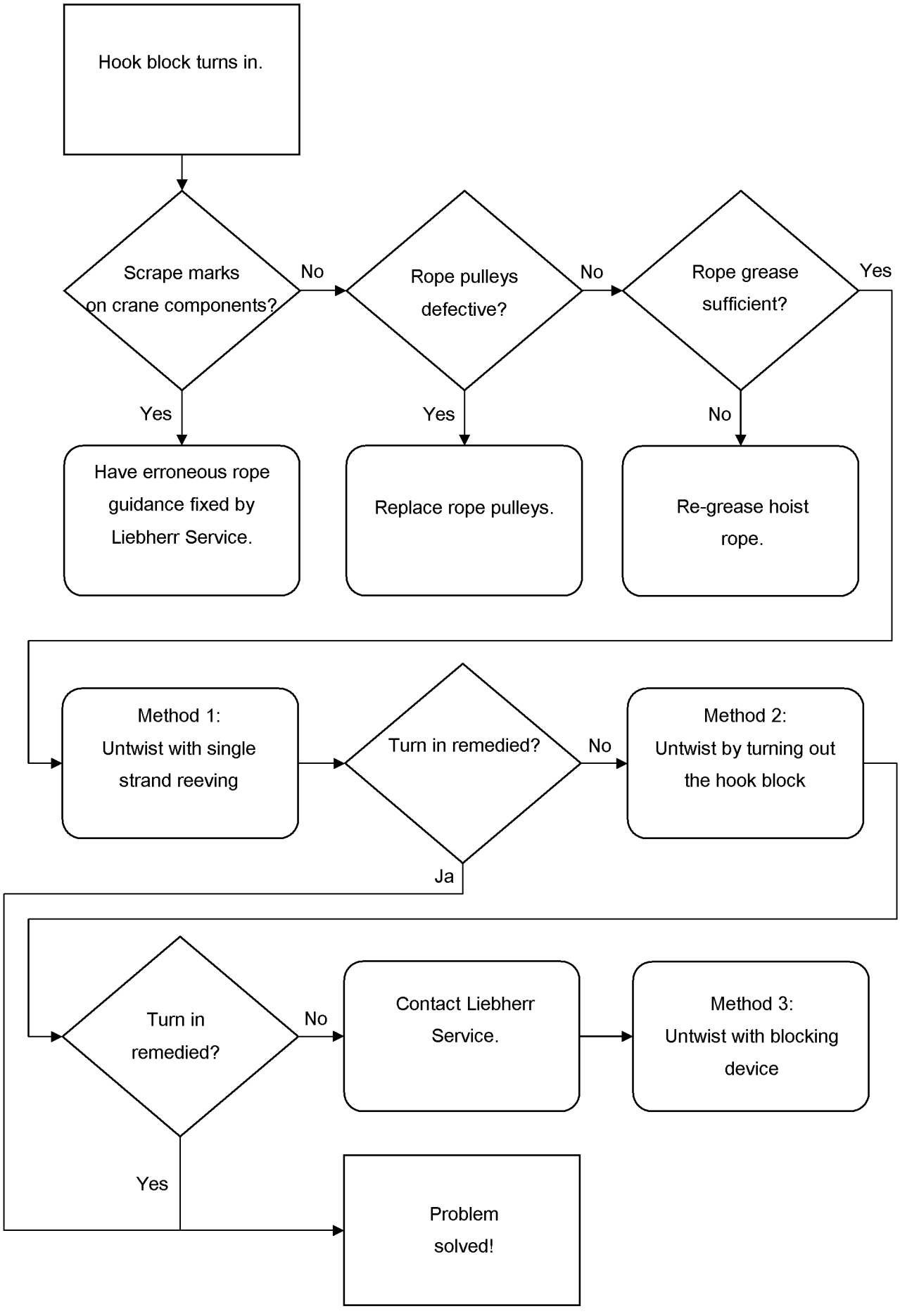
Hook block turns in.
Scrape marks on crane components?
No
Rope pulleys defective?
No
Rope grease sufficient?
Yes
Yes
Yes
No
Have erroneous rope guidance fixed by Liebherr Service.
Replace rope pulleys.
Re-grease hoist rope.
Method 1: Untwist with single strand reeving
Turn in remedied?
No
Method 2: Untwist by turning out the hook block
Ja
Turn in remedied?
No
Contact Liebherr Service.
Method 3: Untwist with blocking device
Yes
Problem solved!

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8 Twisting caused by stretching in rotation-resistant ropes and its remedy

For procedure, see illustration opposite.

WARNING
Damage to the rope!
▶ Please proceed with extreme caution when performing the following actions.
▶ Observe the following instructions exactly.

8.1 General

The cause for the turn-in of the hook block can have various reasons. For that reason, check the crane first for the following peculiarities:

– Scrub marks: Are hoist rope scrub marks present on the crane components? If scrub marks are present, check the hoist rope pathway and rectify.
– Rope pulleys: Has the groove diameter become too small, or do the rope pulleys exhibit a negative profile?
  • Groove diameter dimensional stability must be present.
  • The rope groove must be uniformly smooth without a hoist rope negative profile.
  • If this is not the case, the rope pulley must be exchanged.
– Rope greasing: Has the hoist rope been sufficiently greased? If the rope surface is dry, the hoist rope must be re-greased.

If the crane does not display other features, the hoist rope must be spun out. Following, two methods are described by which the hoist rope can be spun out. The methods must be applied in the described sequence.

8.2 Turning out extremely rotation-resistant hoist ropes

8.2.1 Method 1: Spinning out with one strand reeve

1.) Reeve in the one strand hoist rope.
2.) Extend the boom to the maximal boom length and hook height.
3.) Lower hooks to approximately 1 m above the ground and allow the hoist rope to spin out.
4.) With an empty hook block, carry out one complete hoist cycle.
5.) Lower the hook again to approximately 1 m above the ground and allow the hoist rope to spin out again.
6.) Reeve the number of strands of hoist rope carefully and spin free where the twisting of the hook block is largest.
7.) Carry out at least two complete hoist cycles at maximum boom length and hook height, in order to divide the spin out onto the entire rope length.

If the hook block turns in further, method 2 must be used.

8.2.2 Method 2: Spinning out by turning out the hook block

1.) The hook block is reeved with the largest number of strands are twisted.
2.) Extend the boom completely and lower the hook block.
3.) Attach a load of approximately 10 % of the nominal rope pull on the hook block.
4.) Before lifting the load, an assistant must carry out the following measures: Rotate the twisted hook block to a straight position by hand until the rope strands no longer touch each other.
5.) Rotate the hook block further by a complete revolution, the rope strands touch each other again.
6.) Hold the hook block in the prescribed position until the load lifts off the ground.
   - **CAUTION:**
     When the hook block comes under load, it will attempt to rotate back to a straight position. Release the hook block.
7.) Move the load until approximately 15 m before the uppermost hook position of the completely extended boom.
8.) Lower load and set it down. The twisting should now be remedied.

If the hook block turns in further, then the process must be repeated. If this does not remedy the problem, contact Liebherr Service.

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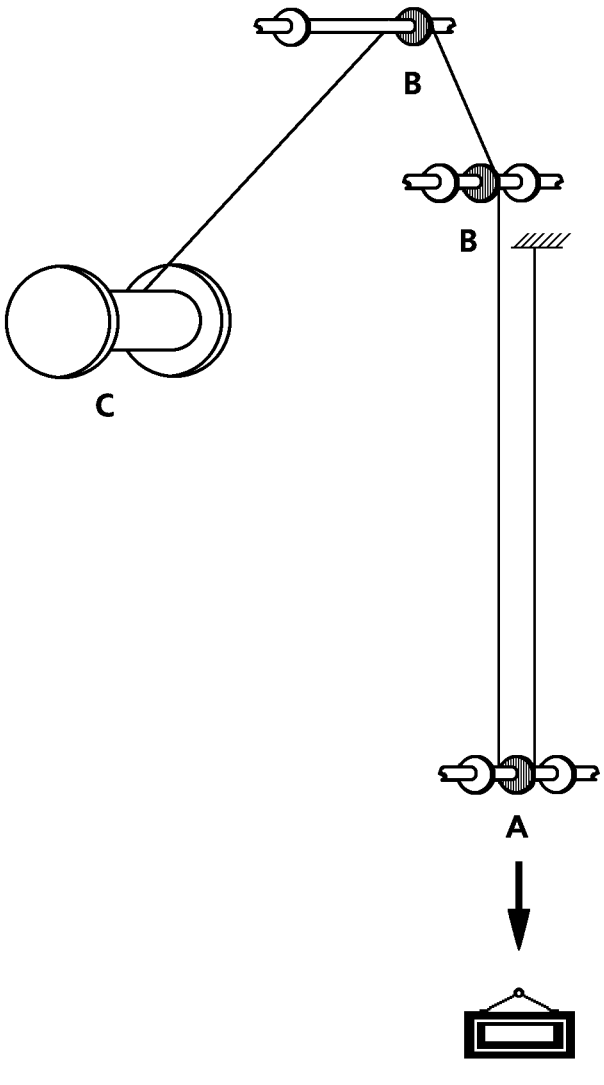

Fig. 1

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A Hook block **B** Rope pulley **C** Rope drum

9 Appendix 1

Diagram of possible defects, with reference to different areas that must be considered during inspection:

1.) Check rope end connection at rope drum
2.) Examine for incorrect spooling up, which causes deformation (crushing) and wear, which can have serious consequences at rope crossing points
3.) Examine for wire breaks
4.) Examine for corrosion
5.) Look for deformation as a result of hook block loading
6.) Inspect parts of rope that run over rope pulleys for wire breaks and wear
    - Rope suspension and rope mountings:
    - Check for wire breaks and corrosion
    - Also inspect parts of rope that run on or next to compensating pulleys
7.) Look for deformation
8.) Check rope diameter
9.) Carefully check length of rope that runs through the hook block, particularly the part that rests on the rope pulley under load
10.) Check for wire breaks and surface wear
11.) Check for corrosion

Datasheet for ropes	Machine: ..... Application: .....
Construction:	Date fitted: .....
Direction of rope lay: RH / LH [1]	Date discarded: .....
Type of lay: Ordinary / Langs [1]	
Nominal diameter:	Minimum breaking load: .....
Tensile grade:	Working load: .....
Quality: ungalvanized / galvanized [1]	
Type of core:	Diameter measured: .....
steel / natural or synthetic textile / mixed [1]	under a load of: .....
Preformation:	
Length of rope:	
Type of termination:	

Visible broken wires		**Abrasion of outer wires**	**Corrosion**	**Reduction of rope diameter**	**Positions measured**	**Overall assessment**	**Damage and deformations**
Number in length of **6 d**	Number in length of **30 d**	Degree of deterioration [2]	Degree of deterioration [2]	%		Degree of deterioration [2]	Nature

	Date: ..... Signature: .....
Rope supplier:	Number of working hours: .....
Other observations:	Reasons for discard: .....

[1] Delete as applirope
[2] In these columns, describe the latter as: slight, medium, high, very high, discard.

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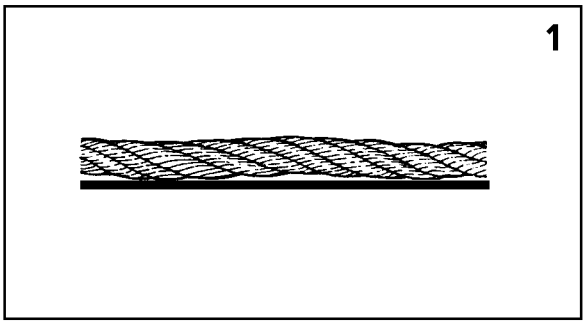
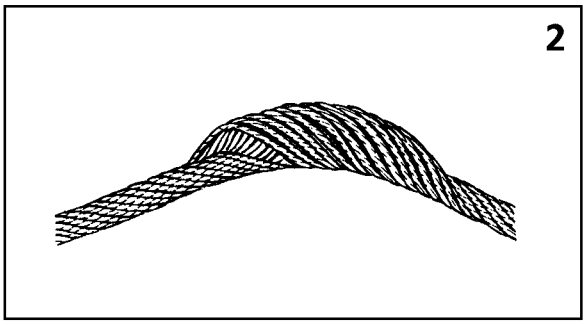
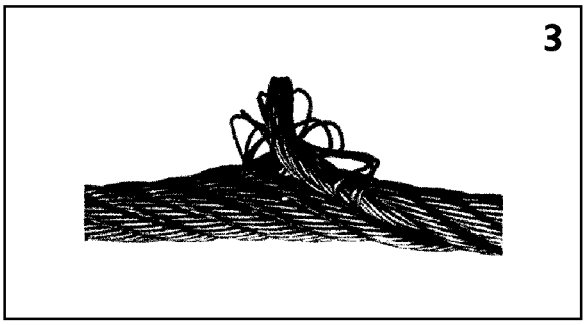
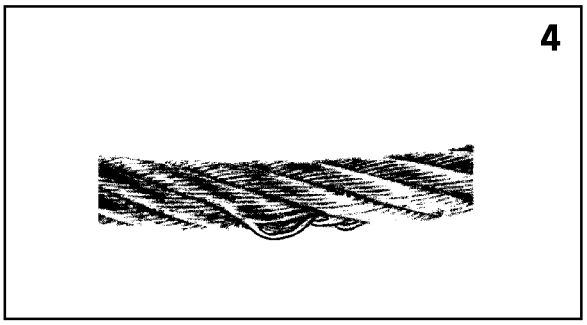
10 Appendix 2

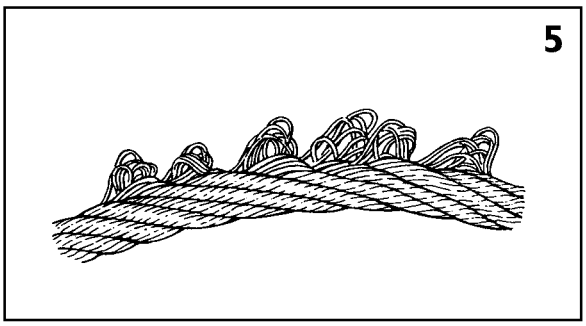
Typical example for an inspection log

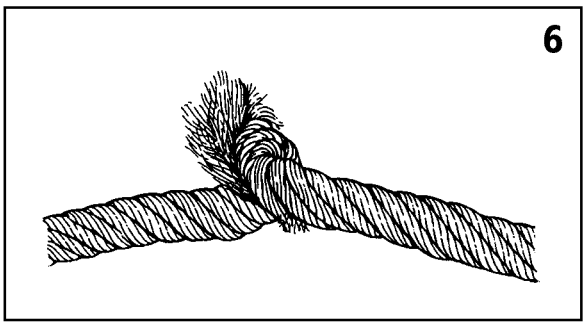


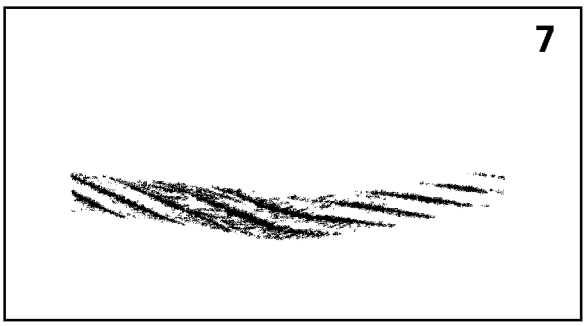


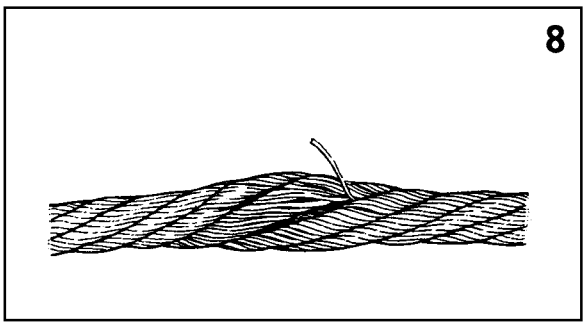


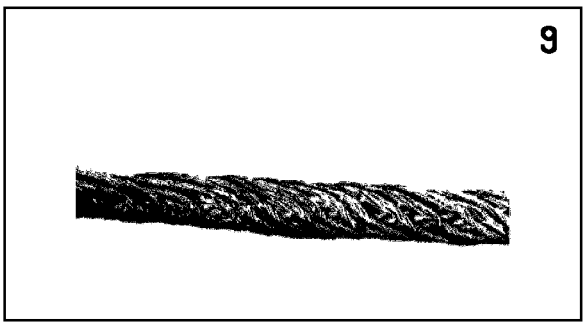


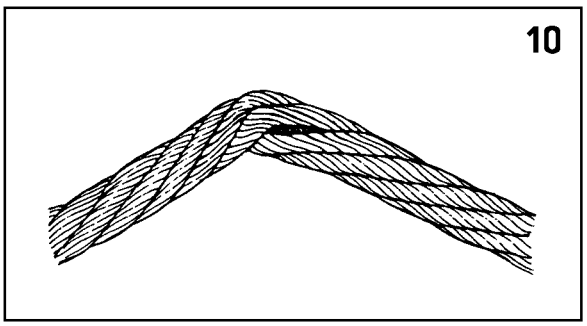












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11 Appendix 3

Note
Depiction of deformation
The deformation that is depicted on many pictures is exaggerated in order to show it more clearly.
▶ The ropes that are shown would have had to be taken down long before they reached this stage.

Typical examples of damage that can occur to wire ropes:

– Picture **1**:
  Corkscrew-like deformation: deformation where rope is in the form of a spiral along its longitudinal axis.
  The rope must be taken down if the deformation exceeds the value that is mentioned in chapter "Take-down criteria", section entitled "Corkscrew-like deformation".
– Picture **2**:
  Basket formation on a multi-strand rope.
  Reason for immediate rope take-down.
– Picture **3**:
  Steel core rope exit, generally in combination with basket formation in the immediate vicinity.
  Reason for immediate rope take-down.
– Picture **4**:
  Only one strand is affected by loop formation, although the examination of a longer section of rope shows that the deformation is visible at regular intervals; normally deformation along the length of a lay.
  Reason for immediate rope take-down.
– Picture **5**:
  Serious worsening of the previous problem (see picture **4**) (typical of hoist rope in a ram system).
  Reason for immediate rope take-down.
– Picture **6**:
  A serious reverse bend or knot.
  Note the destroyed lay that leads to the exit of the fibre layer.
  Reason for immediate rope take-down.
– Picture **7**:
  A wire rope that has been kinked during installation but still taken into operation, and now suffers from localised wear and substandard rope tension.
  Reason for rope take-down.
– Picture **8**:
  Crushing as a result of local mechanical damage causing imbalance beneath the strands, resulting in wire breaks.
  Reason for rope take-down.
– Picture **9**:
  Crushing of a multi-strand rope caused by incorrect spooling up on the rope drum.
  Note increase in length of outer strands of lay. Here too, imbalance would occur under load.
  Reason for rope take-down.
– Picture **10**:
  Example of serious kinking.
  Reason for rope take-down.

12 Appendix 4

Guideline for number of wire breaks in accordance with ISO 4309
for power train classification groups M1, M2, M3 and M4

12.1 Wire ropes

12.1.1 Hoist ropes

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	2	4

Note
- ▶ If a rotation resistant hoist rope is placed on winch 5, then it can be used for the jib adjustment or as a hoist rope for the boom nose!

WARNING
Use of hoist rope as control rope!
Frequent jib adjustment movements with a rotation resistant hoist rope lead to significant wear and require premature take down of the hoist rope!
If it is not recognized in time that the rope needs to be taken down, the hoist rope can rip!
The crane can topple over and personnel can be severely injured or killed!
- ▶ In case of frequent jib adjustment movements, a non-rotation free control rope must be placed!
- ▶ Make sure that no spin stabilizer / swivels are used as rope end connections when using a non-rotation free control rope!
- ▶ Remove spin stabilizer or swivels!

12.1.2 Telescoping ropes

Note
- ▶ Installed in cranes with telescopic boom with rope mechanism!

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	7	14

12.1.3 Boom retraction ropes

Note
- ▶ Installed in cranes with telescopic boom with rope mechanism!

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	6	13

12.1.4 Assembly ropes

Note

▶ Installed in cranes with auxiliary winch!

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	2	4

12.1.5 Guy ropes, control ropes

Note

▶ Installed in cranes with boom guying and / or luffing lattice jib!

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	6	13

WARNING

Non-rotation free control ropes can rip off!

If a non-rotation free control rope is used in connection with a rotating rope end connection, the rope damage can occur or the control rope can rip off!

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

▶ Make sure that no spin stabilizer / swivels are used as rope end connections when using a non-rotation free control rope!

▶ Remove spin stabilizer or swivels!

9.00 General notes

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1 Checks before start up

We recommend to carry out the following visual inspections in the engine compartment before start up:

- Check if all oil and fuel lines are leak-free and dry.
- Check if the injection pump, fuel and oil filters are leak-free.
- Check if the hydraulic units, the hydraulic motors for the fan drives and their supply lines are leak-free.
- Check if the exhaust system and exhaust flange are leak-free.
- Check if the exhaust flap retention flap is moveable.
  The return springs that open the exhaust flaps must function properly, because seized (therefore closed) exhaust flaps during engine operation will result in considerable overheating.
- Inspect electrical wiring and ensure that there is sufficient clearance to hot exhaust system piping and that it is properly fastened and that there is no insulation damage.
- Inspect the soundproofing mats for soiling from solutions and large quantities of oil or fuel, as well as other damage.
  Immediately remove any soundproofing mats that are excessively damaged or soiled and replace them with original parts.
  When cleaning the engine and gear compartments, observe the care instructions for the sound insulation, see Crane operating instructions, chapter 7.01.

2 Repair and maintenance tasks

Note

▶ Repair and maintenance tasks are to be carried out carefully!

Take particular precautions regarding cleanliness when replacing diesel and oil filters. Remove any diesel fuel or oil that has leaked. Perform a test run on the systems to ensure that there are no leaks.
The diesel engine V-room must be inspected regularly, and any oil or diesel fuel must be cleaned up, particularly after repairs and servicing. Any fuel that has collected in V-room can spread throughout the engine room while the crane is travelling on the road and can ignite if it comes into contact with hot surfaces.
We stress that all electrical wiring must be installed according to the regulations and must be properly fastened. Immediately repair any wiring insulation that exhibits signs of chafing or brittleness as a result of operational activities. Any wiring that is not in perfect condition is to be immediately and professionally replaced.
We would like to particularly emphasise that over time fuel and oil lines can become brittle or porous as they age. Any hoses that appear to be excessively porous should be replaced immediately, see crane maintenance chapter.

3 Important servicing

The following service tasks are to be carried out regularly:

- Check gearbox and engine oil levels regularly.
  Add oil as required during normal operation. If oil consumption or loss is unusually high, determine the cause and correct.

4 Maintenance notes for replacement parts

The following is to be considered when replacing drive components such as engine, gearbox or axles:

– Before start up, be sure to refill with the correct type of oil to the center of the min. - max. marks. For type of oil, refer to the data tag and service items and lubricants.
– Conduct initial maintenance according to chapter “Maintenance intervals”; thereafter, maintain in accordance with the specified periodic maintenance intervals.
– Maintain break-in instructions, see Crane operating instructions, chapter 2.02.

5 Recommendations for travel operation

NOTICE
Risk of engine damage!
If the permissible engine speed in exceeded, the engine can be seriously damaged!
▶ Do not exceed the permissible engine rpm!

6 Disposal of fuels and greases

Note
Engine, gearbox and hydraulic oils, brake fluids, grease and fuels are dangerous waste materials!
▶ These materials must be disposed of separately!
▶ These materials may not be disposed of in the ground or in any bodies of waters: wastewater systems, sewers or groundwater!
▶ Comply with the regulations specified by local authorities before disposing of any of these items or substances!

Note
Radiator fluid for diesel motors and heating systems are dangerous waste materials!
▶ Undiluted antifreeze / corrosion inhibitor must be handled as dangerous waste materials!
▶ Follow the regulations of the local authorities when disposing of used cooling fluids (mixture of antifreeze / corrosion inhibitor and tap water).

90.00 Appendix

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1 Preface

This crane may only be used in flawless technical condition and according to its mission as well as with constant awareness of safety and dangers. Any problems, which could affect safety must be fixed immediately.

Note

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

1.1 Changes and updates for Operating instructions

Changes and updates for Operating instructions, which you receive in the circular as Customer information, must be filed in the Operating instructions for the respective crane under chapter 90.05.

Note

Procedure after receiving customer information!

- ▶ Attach the decals **1**, which are enclosed in the customer information to the footer of the respective chapter. See following example.
- ▶ Fill out the update confirmation form in chapter 90.05 of the operating instructions,
- ▶ Insert changes and updates under chapter 90.05 of the operating instructions.

Example:

A change or update affects the Crane operating instructions, chapter 2.04.

- ▶ Attach the decal **1** in the footer of chapter 2.04.

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1 Update confirmation

Chapter	Change / update	Completed	
		on	by

2 Customer information

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