LIEBHERR

Crawler crane with lattice mast

LR 1600/2

LR 1600-2-002

Operating instructions

BAL-No.: 18102-02-02

Pages: 1570

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

Warning notes

The terms **DANGER**, **WARNING**, **CAUTION** and **NOTICE** used in these operating instructions 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.
	**WARNING**	Designates a dangerous situation, which can lead to death or serious injury if it is not prevented.
	**CAUTION**	Designates a dangerous situation, which can lead to slight or medium-grade injuries if it is not prevented.
	NOTICE	Designates a dangerous situation, which can lead to property damage if it is not prevented.

Additional notes

The term **Note** is used in these operating instructions to indicate useful information and tips to all persons working with the crane.

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

Operating instructions

These operating instructions are intended to put you in a position to operate the crane safely and utilize the reliable usage options that it provides. The instructions also provide information about the function of important components and systems.
Certain expressions are used in these operating instructions. In order to avoid misunderstandings, the same expressions should always be used.
These operating instructions have been translated to be best of one's knowledge. Liebherr-Werk Ehingen GmbH assumes no liability for translation errors. The German version of these operating instructions is solely applicable for factual accuracy. If you find any errors or if any misunderstandings arise when reading these operating instructions, please contact Liebherr-Werk Ehingen GmbH immediately.

DANGER
Risk of fatal injury if operated incorrectly!
Incorrect operation of the crane can result in death or serious injuries!
▶ Only authorised and trained expert personnel are permitted to work on the crane!

The operating instructions and on-site regulations and specifications (such as accident prevention regulations) must be followed.
The use of these operating instructions:
– **makes it easier** to become familiar with the crane
– **avoids** problems due to improper operation

Observing these operating instructions:
– **increases** reliability in use
– **extends** the service life of your crane
– **reduces** repair costs and downtime

Always keep these operating instructions handy in the driver's or crane cab.
The operating manual is part of the crane!
Only operate the crane if you are well familiarized with the equipment, and always follow these operating instructions.

Note
▶ If you have received additional information about the crane from us, such as technical information bulletins, instructions and/or supplements to these operating instructions, then this information must also be followed and kept with the operating instructions.

If there is anything in the operating instructions or the individual chapters that you do not understand, please contact us before starting the relevant work.

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

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 crane configurations intended for it and the safety conditions must be observed according to the corresponding operating instructions.
Any other use or any other exceeding utilization is **not** destined use.
Part of destined use is also adherence of required safety regulations, conditions, preconditions, crane configurations and working steps as noted in the crane documentation (operating instructions, load chart, 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 crane configurations according to the load chart.
– Working outside the permissible projection radii and slewing ranges according to the load chart.
– Selecting load values, which do not correspond to the actual crane configuration.
– Selecting LMB-Codes, which do not match the actual crane configuration.
– Working with bypassed load moment limiter or bypassed hoist limit switch.
– Increasing the projection 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.
– Using equipment or attachment parts which are not approved for the crane.
– Using the crane at sports and recreational events, especially for 'Bungee' jumps.
– 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 its suspended load on the crane, is changed, for example by filling a container suspended on the load hook.

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 personnel with containers (cherry pickers), if no written approval of the corresponding job safety board has been issued
– transporting loads on the chassis
– two hook operation without auxiliary equipment
– extended material handling operation

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

Safety systems

Special attention must be paid to the safety equipment built into the crane. The functionality of the safety equipment must be monitored at all times. 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 had been built in accordance with the applicable crane operating and driving regulations and have been approved by the relevant authorities.

Attachment and spare parts

DANGER
Danger to life if original attachment parts are **not** used!
If the crane is operated with attachment parts, which are **not** original, then the crane can fail and cause fatal accidents!
Crane components can be damaged!
- ▶ Operate the crane only with original attachment parts!
- ▶ Crane operation with attachment parts, which do **not** belong to the crane is prohibited!

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

Definition of directional data

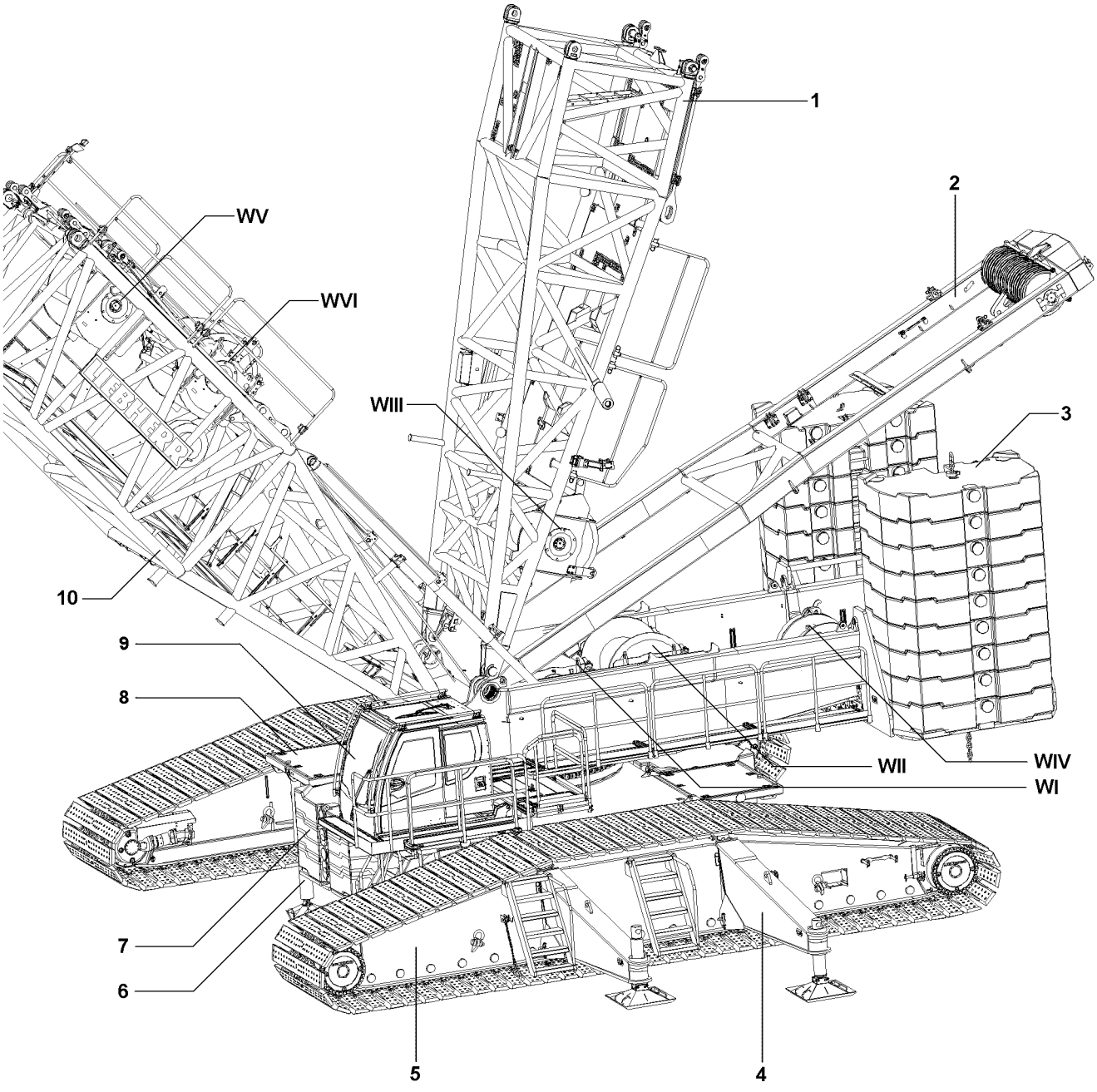
Forward driving means driving with the driver's cab on the front.
Reverse driving means driving with the tail lights of the chassis on the front.
Front, **rear**, **right**, **left** on the **crane** refer to the condition, that the driver's cab and the boom point in the same direction. Front is always in direction of the driver's cab.
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 boom.

Optional

Customer-specific equipment is marked with *****.

Contents

1.00 Description of crane



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1 Component overview

1.1 Crawler track

4 Mechanical auxiliary supports
5 Crawler carrier
6 Hydraulic assembly supports
7 Central ballast
8 Crawler center section

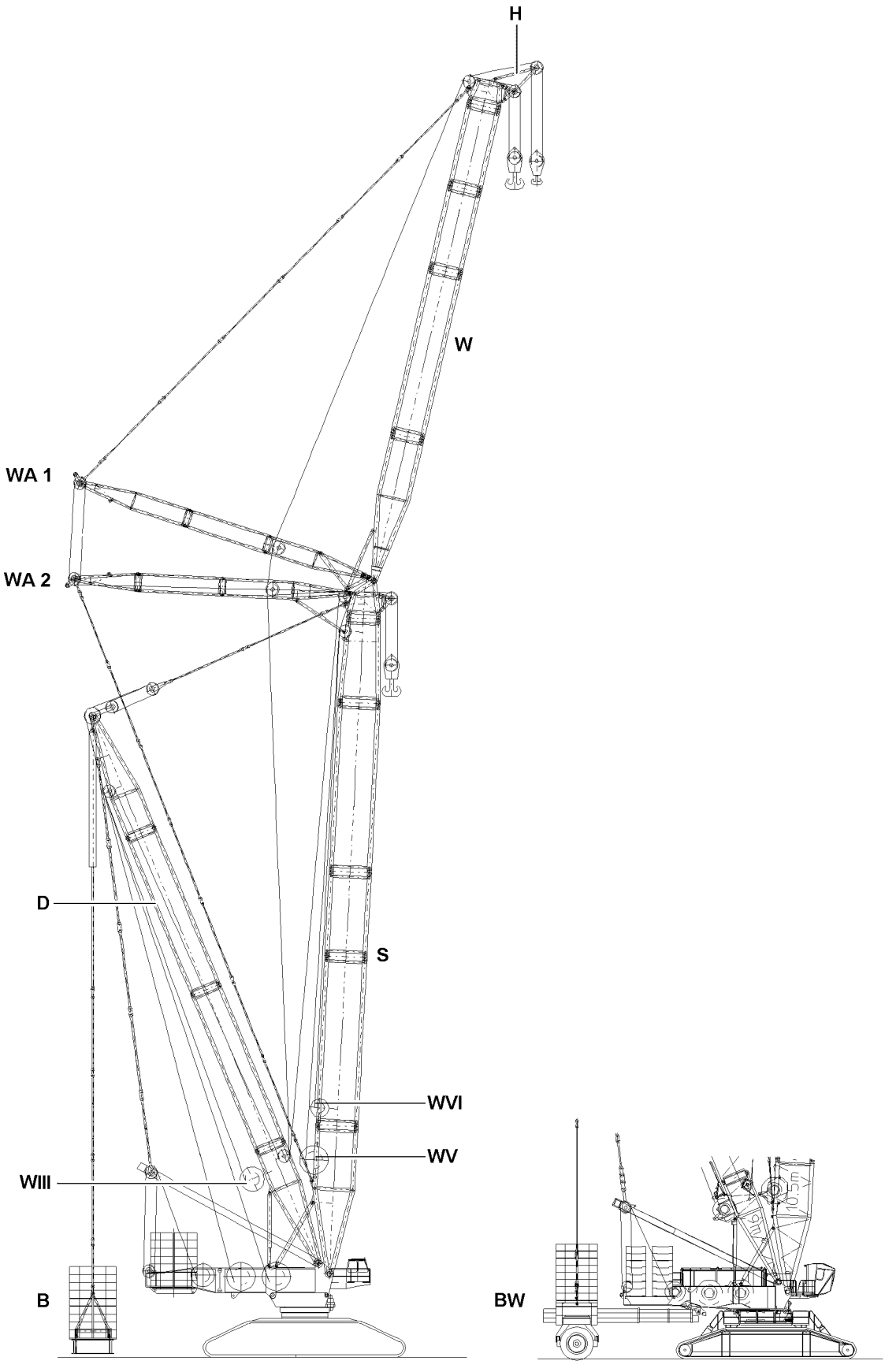
1.2 Turntable

2 SA-frame
3 Counterweight
9 Crane operator's cab

WI Winch 1
WII Winch 2
WIII Winch 3
WIV Winch 4
WV Winch 5
WVI Winch 6

1.3 Boom

1 D-pivot section
10 S-pivot section



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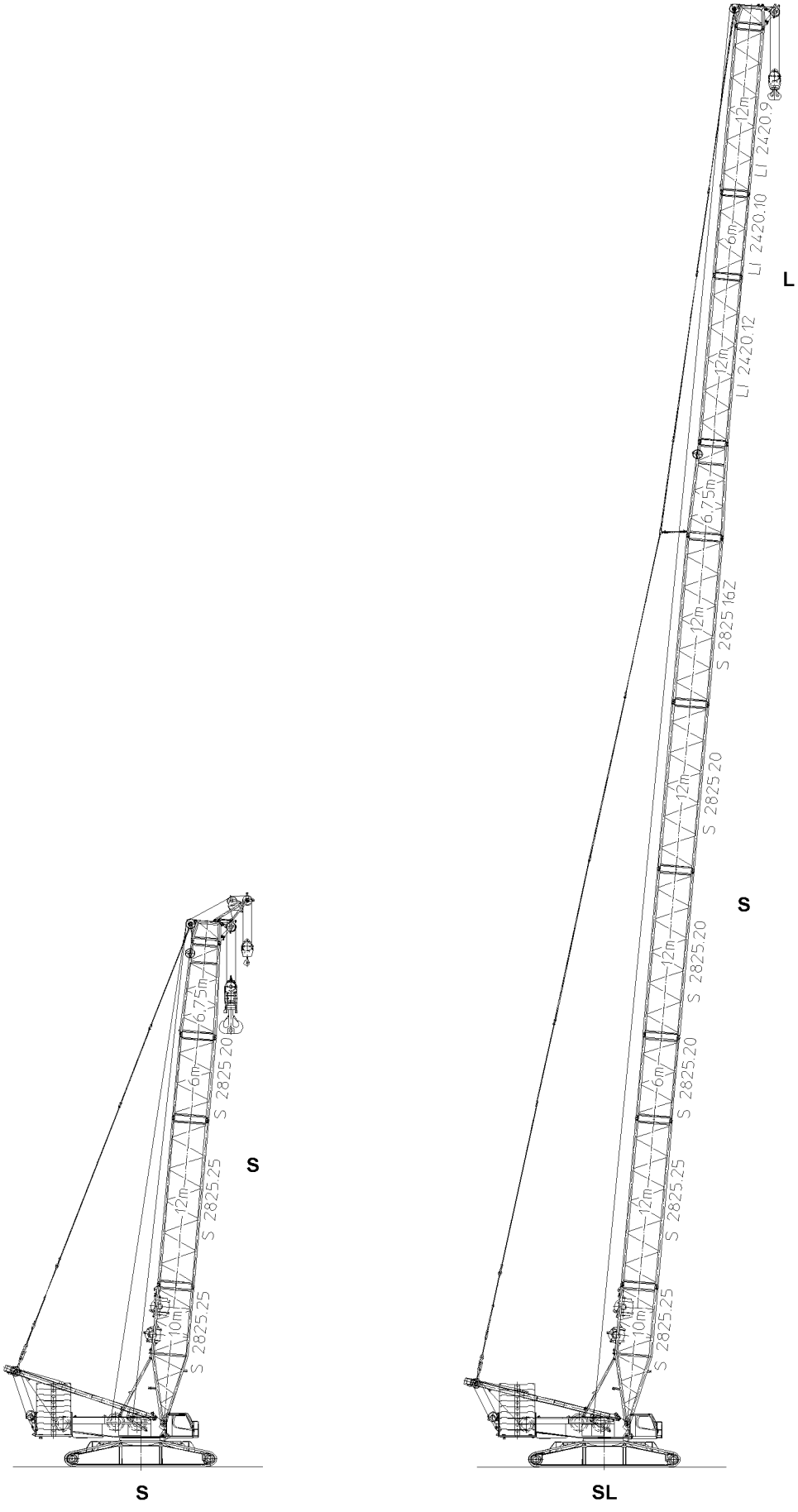
WA1 WA - frame 1
WA2 WA - frame 2
WIII Winch 3
WV Winch 5
WVI Winch 6
H Boom nose
W Luffing lattice jib
S Lattice mast - main boom, heavy duty version
D Derrick

1.4 Derrick ballast

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

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



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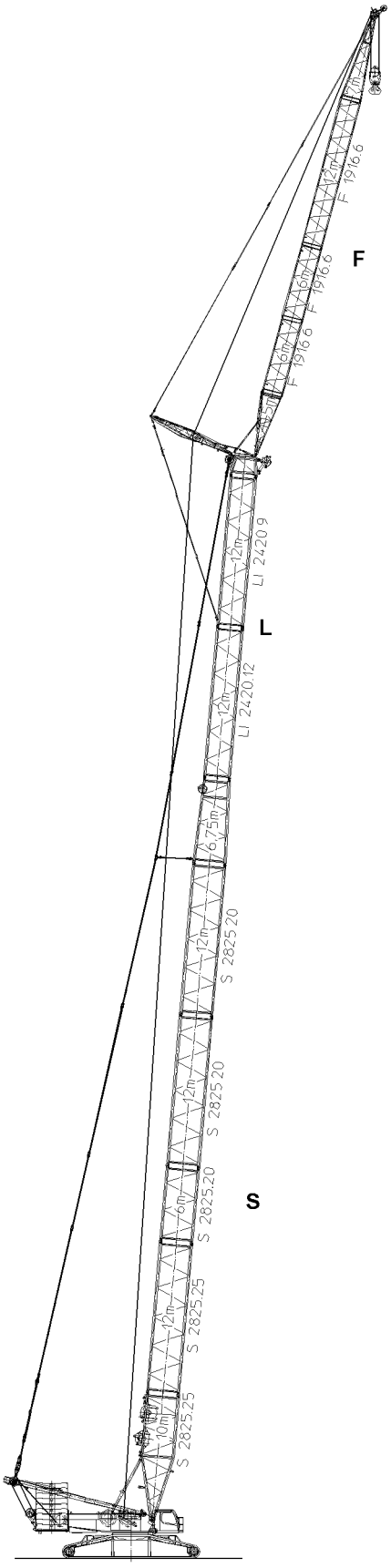
2 Boom systems

2.1 S / SL boom combinations

S = lattice boom, heavy
L = lattice boom, light

Abbreviation	System lengths		
S	S	=	24.0 m - 96.0 m
SL	SL	=	54.0 m - 102.0 m



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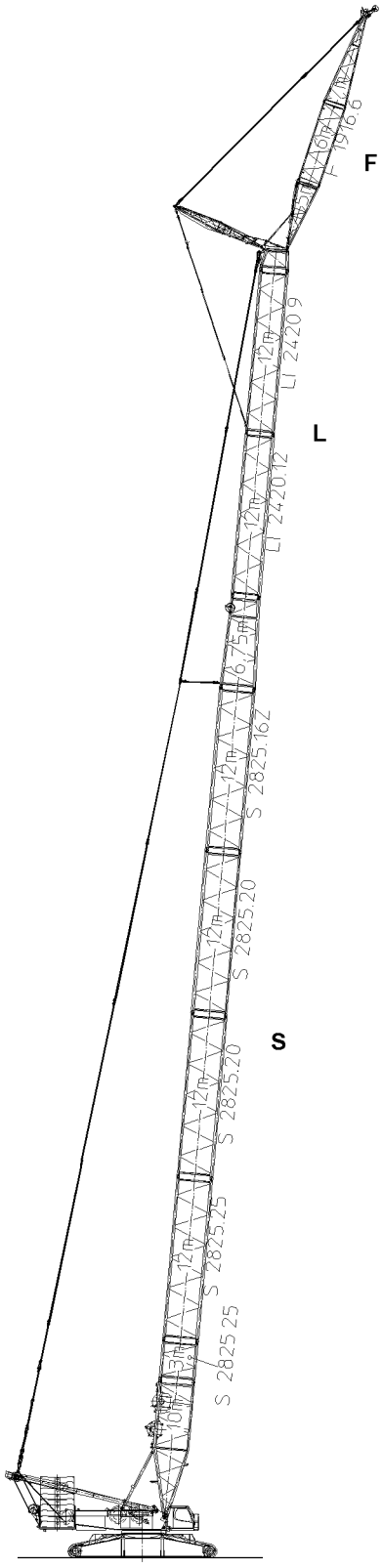

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2.2 SLF boom combinations

S = lattice boom, heavy
L = lattice boom, light
F = Lattice jib, fixed assembled

Abbreviation	System lengths		
SLF	SL	=	72.0 m - 90.0 m
	F	=	12.0 m - 36.0 m

Abbreviation	System lengths		
SL3F	SL3	=	75.0 m - 108.0 m
	F	=	12.0 m - 36.0 m

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1 Crawler track

1.1 Frame

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

1.2 Tracks

Maintenance free, dirt protected crawler track with flat bottom pads.
Pad width: 1.5 m
Track width: 8.4 m

1.3 Drive

Hydraulic travel drives with planetary gears.
The crawler chains can be controlled independently and in the opposite direction.
There is no preferred travel direction.

1.4 Travel power

Stepless speed from 0 km/h - 1.09 km/h.

2 Crane superstructure

2.1 Frame

In-house manufactured, distortion-resistant welded structure made from high-strength, close-grained structural steel.
Connection to crawler travel gear via 3-row roller rotary connection, slewable by 360°.

2.2 Crane engine

6-cylinder Diesel, Type D846 A7 (CR), water cooled.
Performance: 372 KW at 1900 RPM
Maximum torque: 2335 Nm at 1500 RPM
Exhaust emissions according to guidelines per 97/68/EC Stage 3 and EPA/CARB Tier 3.
Fuel tank: 1500 l

2.3 Crane drive

Hydraulic via pump distributor gear with four axial piston pumps with power regulation, closed oil circuits.
Axial piston pumps in open circuit for luffing and telescoping

2.4 Crane control

Servo control with electronic synchronous run device, energy recycling when lowering the load.
All movements are carried out independently of each other via joysticks.

2.5 Winches

Two winches as hoist and intake gear hydraulically driven via axial piston pumps and planetary gears.
Disk brakes spring loaded and hydraulically vented.

2.6 Slewing gear

Hydraulically driven via axial piston pumps and planetary gears.
Disk brakes spring loaded and hydraulically vented.
Slewing speed steplessly regulated from 0 RPM - 0.95 RPM.

2.7 Crane cab

Steel plate design with safety glass, can be swung out to the side and inclined to the rear with operating and control instruments.

2.8 Counterweight

190.0 t, consists of: Two consoles 2x5.0 t and 18 counterweight plates, each 10.0 t.

2.9 Safety equipment

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

2.10 Electrical system

24 Volt direct current, 2 batteries with 143 Ah each.

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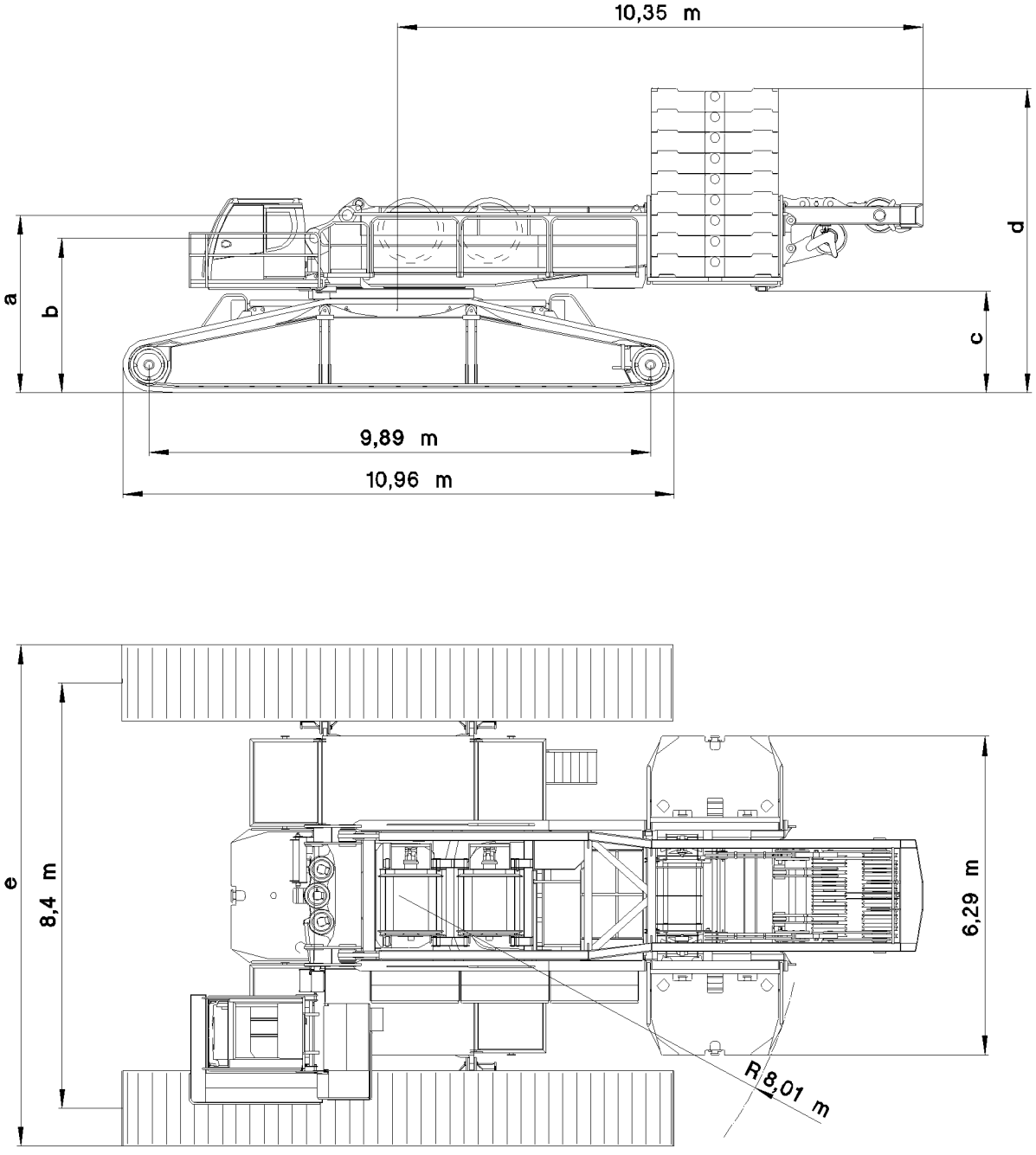

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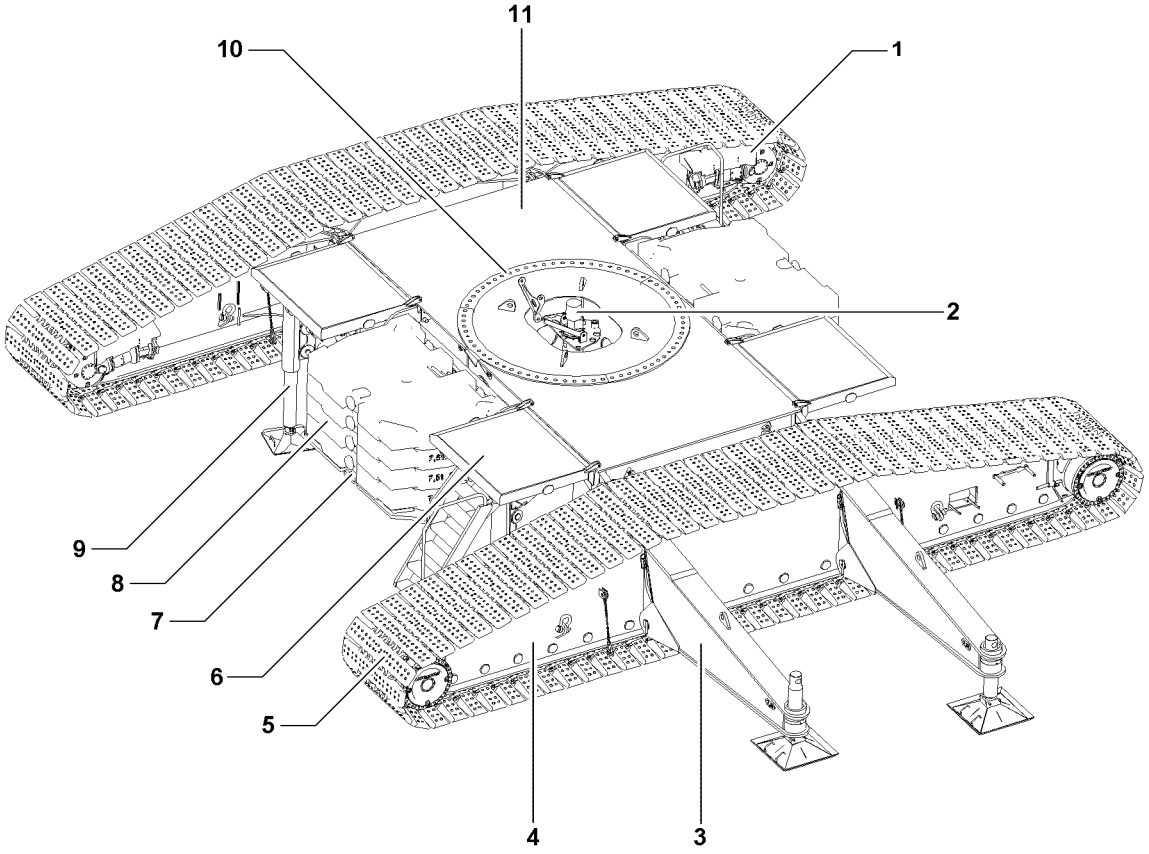
1 Dimensions and weights

1.1 Lengths Crawler track with superstructure

Component	a	b	c	d
Crawler track with Quick Connection	3.80 m	3.35 m	2.30 m	6.31 m
Crawler track without Quick Connection	3.50 m	3.05 m	2.00 m	6.01 m

Component	Track pad width	e
Crawler track	1.5 m	9.9 m
Crawler track	2.0 m	10.4 m



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1.2 Weights - Crawler track

Position	Component	Weight
1	Crawler carrier, left	17.5 t
2	Rotary connection	0.3 t
3	Mechanical auxiliary support	4.5 t
4	Crawler carrier, right	17.5 t
5	Track pads, complete 1.5 m	15.2 t
5	Track pads, complete 2.0 m	Approx. 24.0 t
6	Catwalk crawler track	0.7 t
7	Console	5.0 t
8	Central ballast	60.0 t
9	Hydraulic assembly support	3.2 t
10	Lower ring quick connection, complete	2.9 t
11	Crawler center section	20.5 t
–	Total weight with track pads 1.5 m	160.0 t
–	Total weight with track pads 2.0 m	178.0 t

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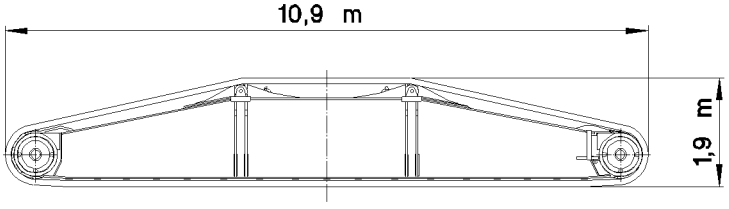

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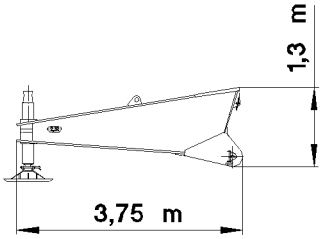

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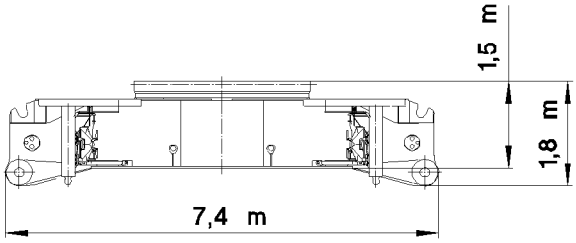

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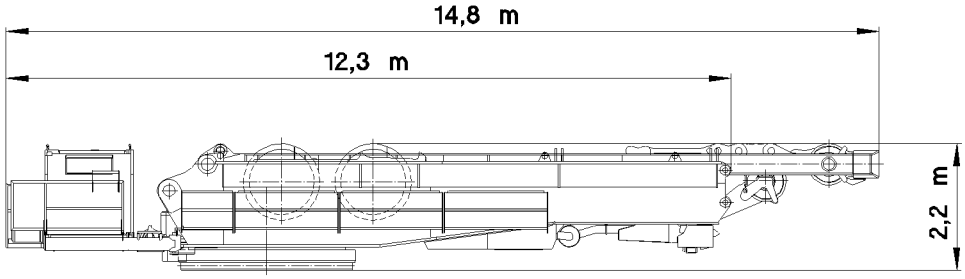

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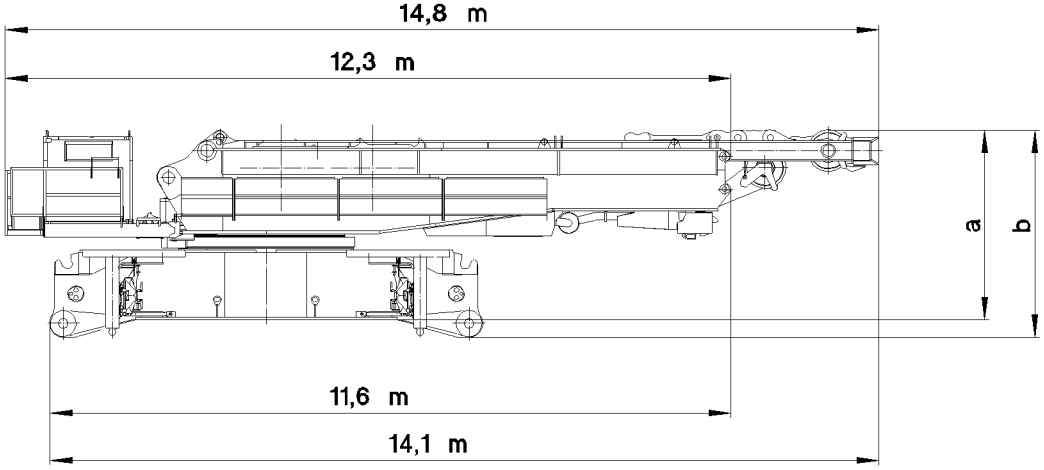

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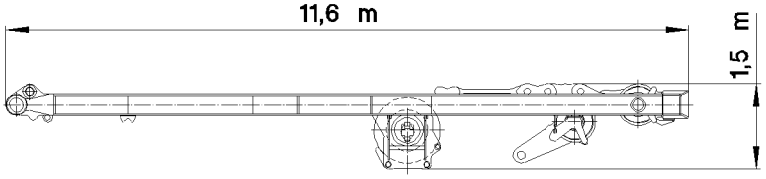

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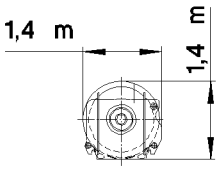

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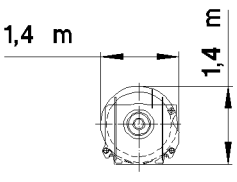

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1.3 Crawler carrier

See illustration **1**.

Component	Track pad width	Weight	Width
Crawler carrier with two travel drives	1.5 m	33.0 t	1.75 m
Crawler carrier with two travel drives	2.0 m	38.0 t	2.0 m

1.4 Mechanical auxiliary support

See illustration **2**.

Component	Weight	Width
Mechanical auxiliary support with support pads	4.45 t	3.56 m
Support pad	0.13 t	0.82 m

1.5 Crawler center section

See illustration **3**.

Component	Weight	Width
Crawler center section with assembly support	27.0 t	2.99 m

1.6 Turntable (quick connection)

See illustration **4**.
Valid for the weight data of assembly connections:
– Including 3 slewing gears
– Winches including ropes
– SA-frame with pulley set

Component	Weight	Width
Turntable with winch 1, winch 2 and winch 4 and SA-frame	64.5 t	2.98 m
Turntable with winch 1, winch 2, without winch 4, and SA-frame	47.5 t	2.98 m

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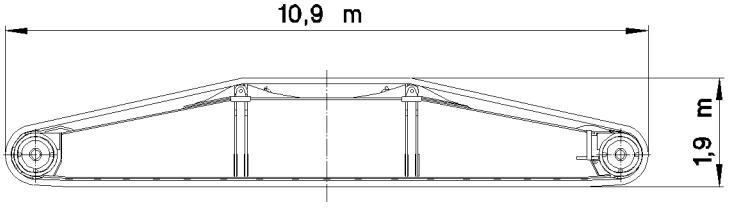

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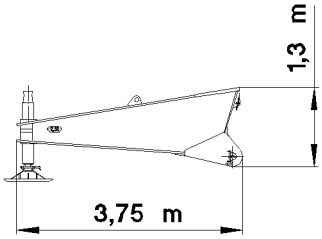

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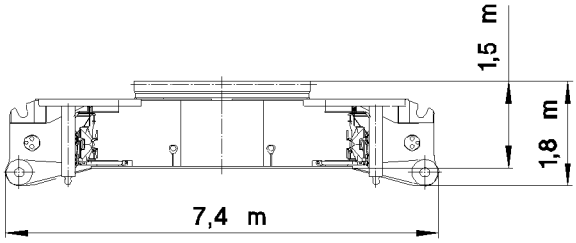

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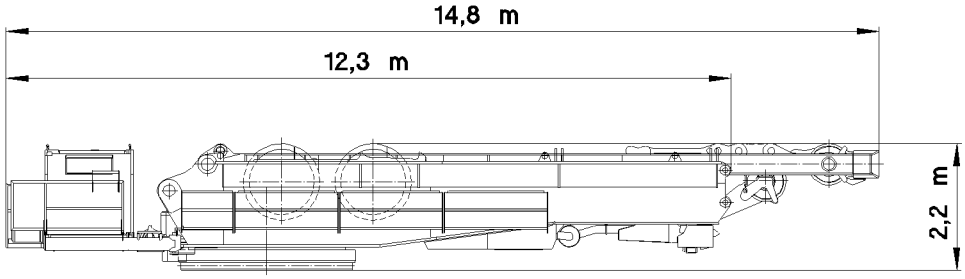

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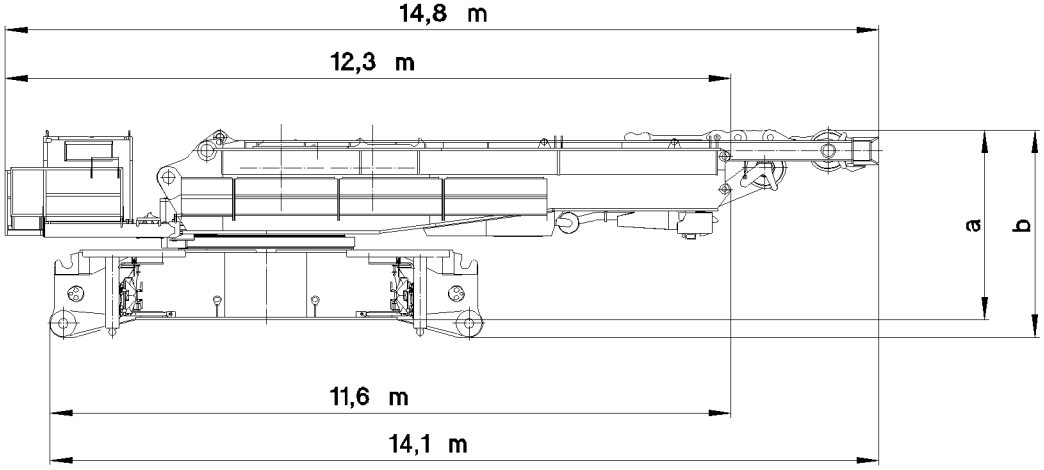

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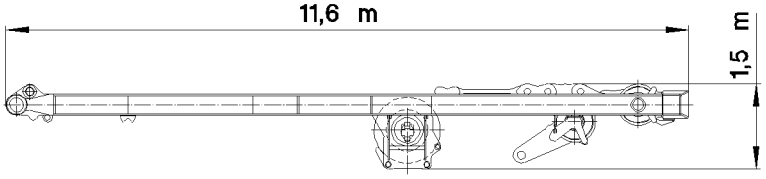

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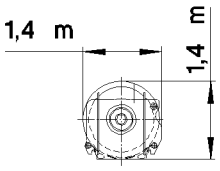

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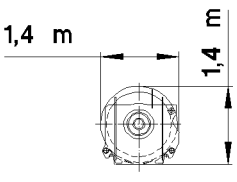

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1.7 Turntable with crawler center section

See illustration **5**.
For the weight data of assembly connections is valid on principle:
– Including 3 slewing gears
– Winches including ropes
– SA-frame with pulley set

Component	Weight	Width
Turntable, crawler center section with SA-frame, winch 4 and assembly support; without winch 1, winch 2	74.0 t	2.98 m
Turntable, crawler center section without SA-frame, winch 1, winch 2 and assembly support	57.0 t	2.98 m

Component	a	b
Turntable, crawler center section without quick connection	3.2 m	3.5 m
Turntable, crawler center section with quick connection	3.5 m	3.8 m

1.8 SA-frame

See illustration **6**.

Component	Weight	Width
SA-frame with winch 4 including rope and pulley set	17.0 t	2.66 m

1.9 Winch 1

See illustration **7**.

Component	Weight	Width
Winch 1 with rope	7.5 t	1.97 m

1.10 Winch 2

See illustration **8**.

Component	Weight	Width
Winch 2 with rope	7.5 t	1.97 m

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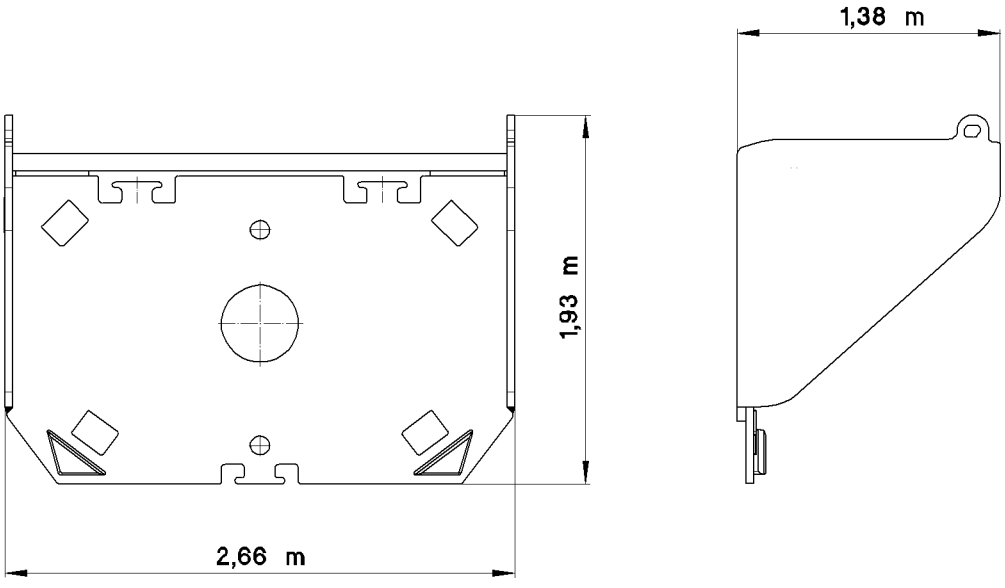

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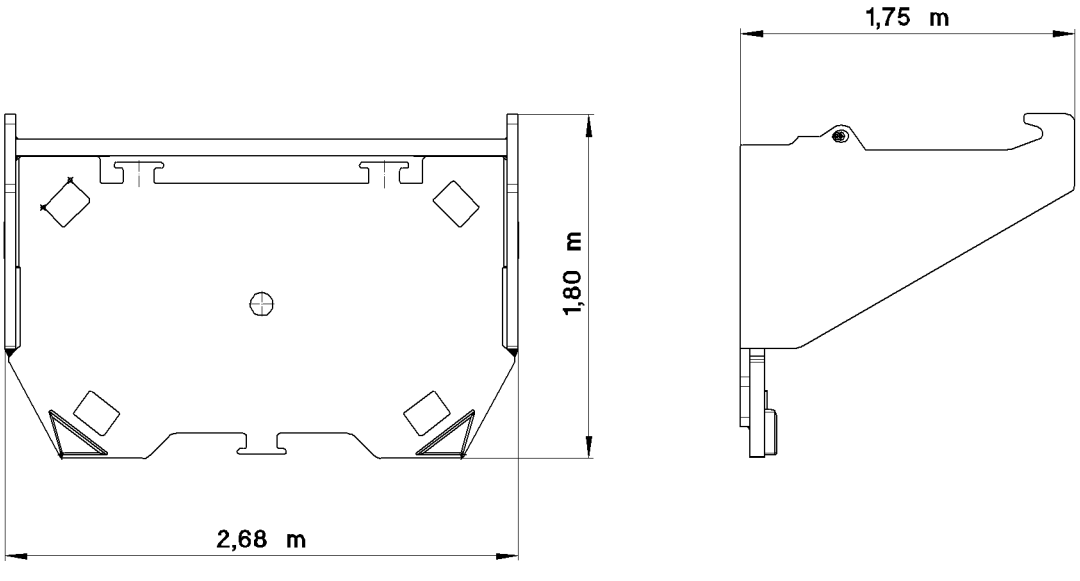

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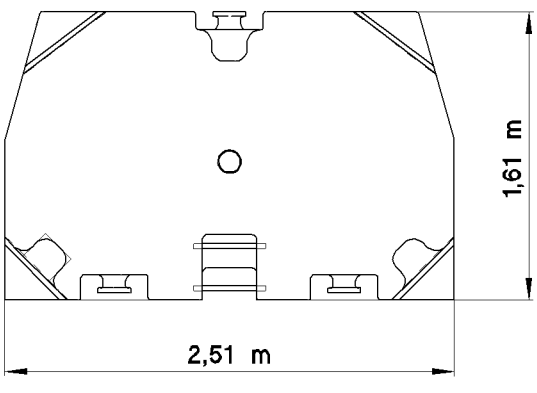

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1.11 Console central ballast

See illustration **9**.

Component	Weight
Console central ballast	2.5 t

1.12 Console counterweight turntable

See illustration **10**.

Component	Weight
Console counterweight turntable	5.0 t

1.13 Counterweight for central ballast / turntable

See illustration **11**.

Component	Weight	Thickness
Counterweight plate	10.0 t	0.46 m

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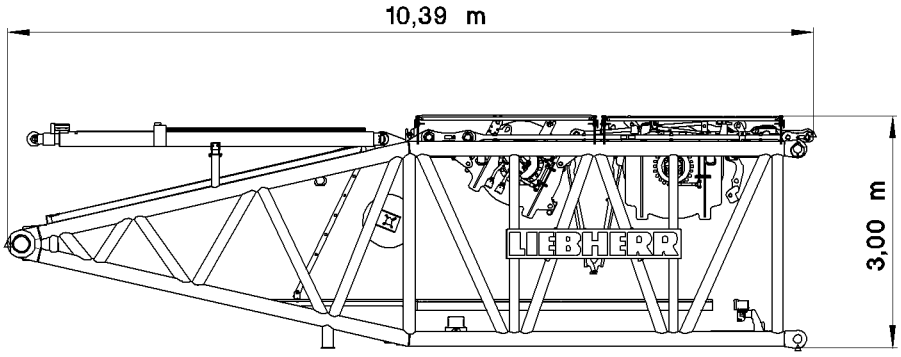

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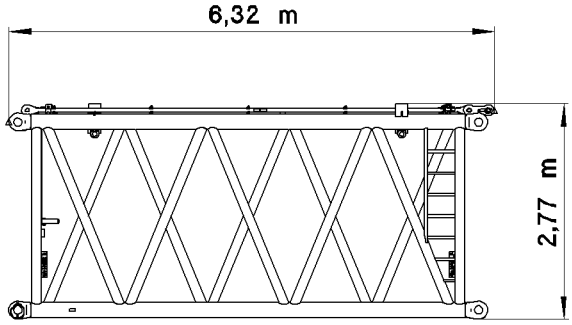

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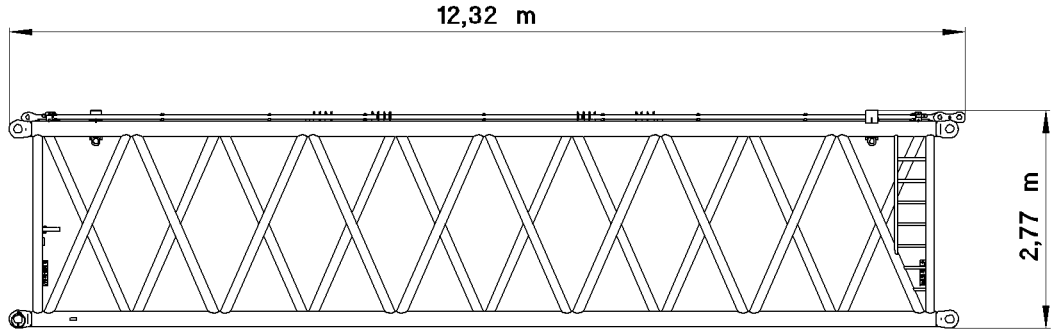

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1.14 S-pivot section 10 m

See illustration **12**.

Component	Weight	Width
S-pivot section complete	25.24 t	3.0 m
S-pivot section	11.97 t	
S-relapse retainer	1.12 t	
Winch 5 with rope	7.49 t	
Winch 6 with rope	4.17 t	
Rods WA-frame	0.51 t	

1.15 S-intermediate section 6.0 m, 2825.20

See illustration **13**.

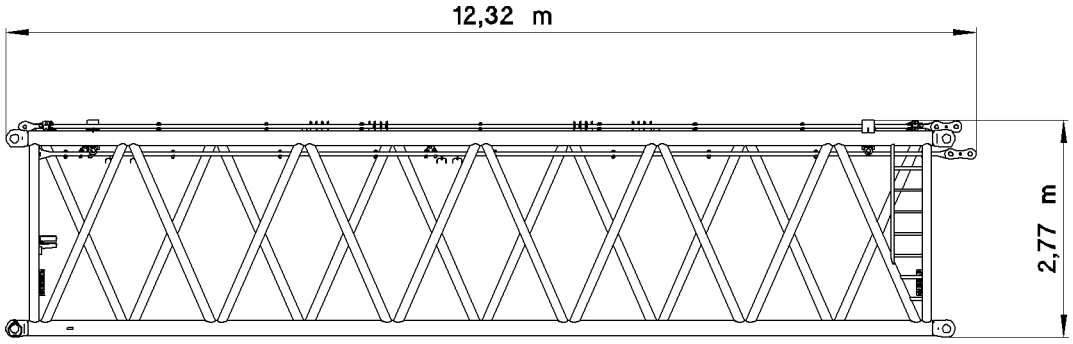
Component	Weight	Width
S-intermediate section without guy rods	3.65 t	3.0 m
S-intermediate section with S-guy rods	4.13 t	3.0 m
S-intermediate section with S- and W-guy rods	4.61 t	3.0 m

1.16 S-intermediate section 12.0 m, 2825.20

See illustration **14**.

Component	Weight	Width
S-intermediate section without guy rods	6.5 t	3.0 m
S-intermediate section with S-guy rods	7.4 t	3.0 m
S-intermediate section with S- and W-guy rods	8.3 t	3.0 m

15



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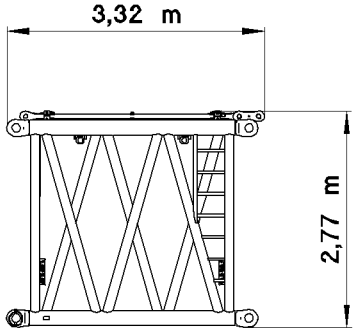

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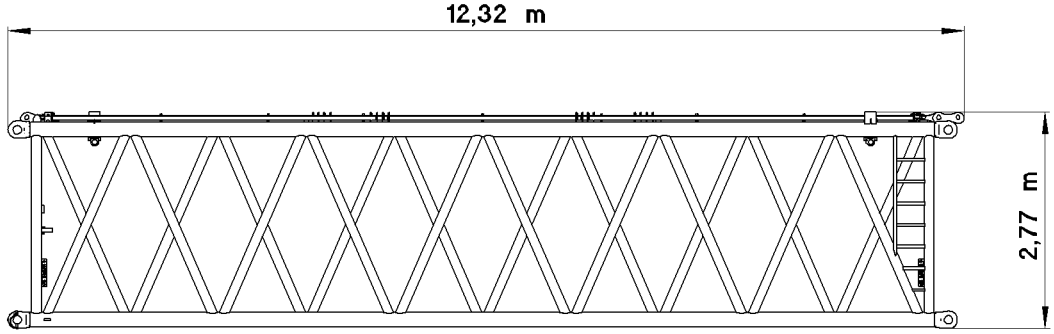

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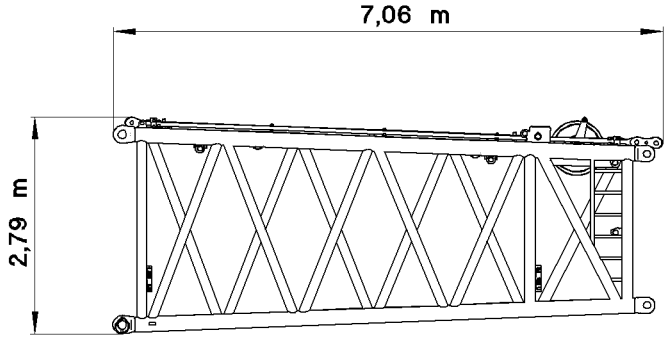

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1.17 S-intermediate section 12.0 m, 2825.25

See illustration **15**.

Component	Weight	Width
S-intermediate section without guy rods	7.6 t	3.0 m
S-intermediate section with S-guy rods	8.5 t	3.0 m
S-intermediate section with S- and W-guy rods	9.36 t	3.0 m

1.18 S-intermediate section 3,0 m, 2825.25

See illustration **16**.

Component	Weight	Width
S-intermediate section without guy rods	2.5 t	3.0 m
S-intermediate section with S-guy rods	2.75 t	3.0 m
S-intermediate section with S- and W-guy rods	3.0 t	3.0 m

1.19 S-intermediate section 12.0 m, 2825.16Z

See illustration **17**.

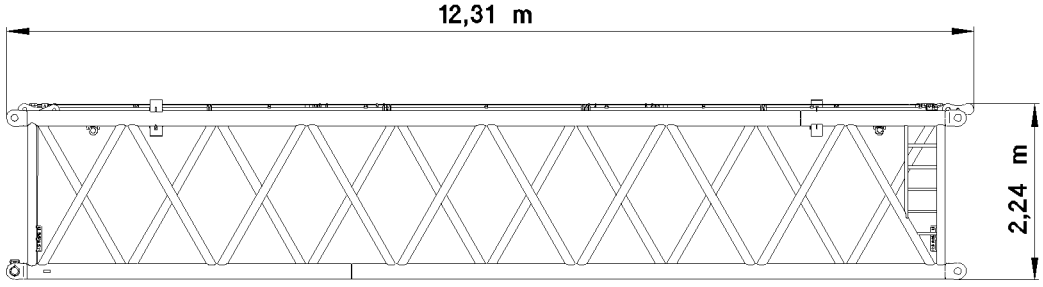
Component	Weight	Width
S-intermediate section without guy rods	6.2 t	3.0 m
S-intermediate section with S-guy rods	7.0 t	3.0 m
S-intermediate section with S- and W-guy rods	7.8 t	3.0 m

1.20 SL-reducer section 6.75 m

See illustration **18**.

Component	Weight	Width
SL-reducer section without guy rods	4.4 t	3.0 m
SL-reducer section with S-guy rods	5.0 t	3.0 m

19



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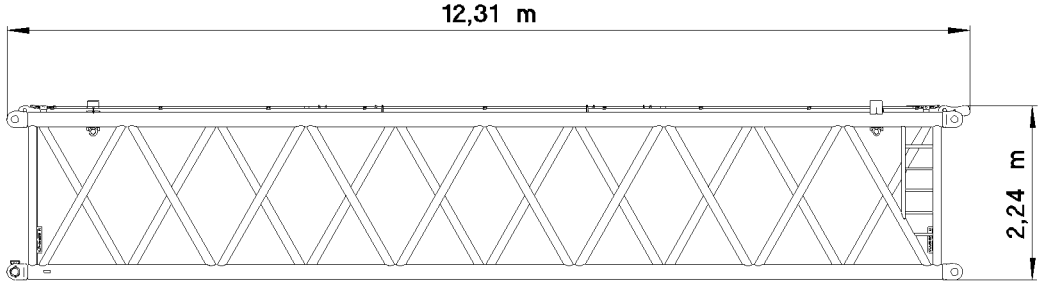

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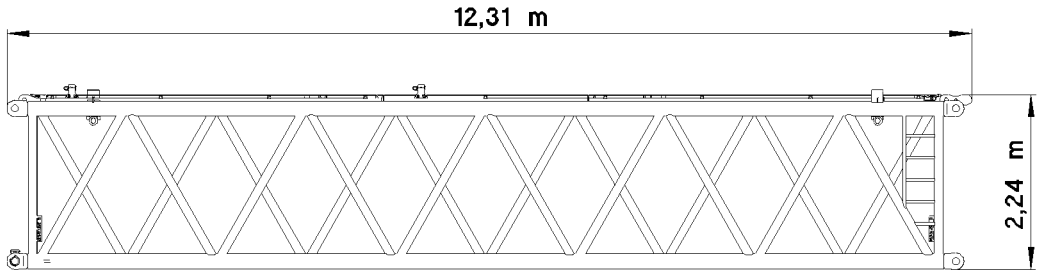

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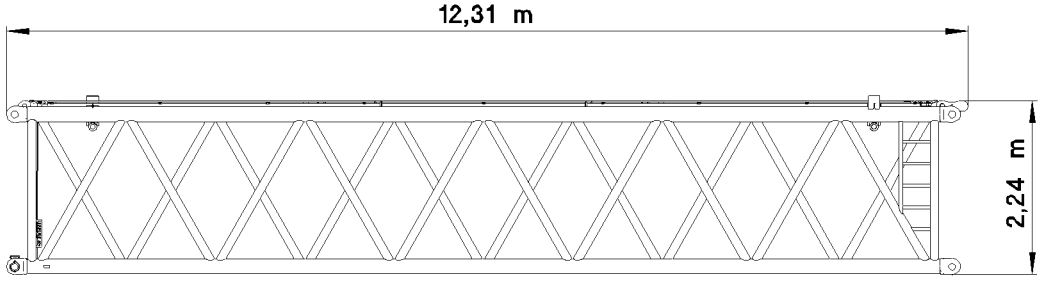

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1.21 LI-intermediate section 12 m, 2420.9

See illustration **19**.

Component	Weight	Width
LI-intermediate section without guy rods	3.84 t	2.6 m
LI-intermediate section with W-guy rods	4.72 t	2.6 m
LI-intermediate section with W- and FA-frame guy rods	5.10 t	2.6 m

1.22 LI-intermediate section 12 m, 2420.10

See illustration **20**.

Component	Weight	Width
LI-intermediate section without guy rods	3.8 t	2.6 m
LI-intermediate section with guy rods	4.7 t	2.6 m

1.23 LI-intermediate section 12 m, 2420.12

See illustration **21**.

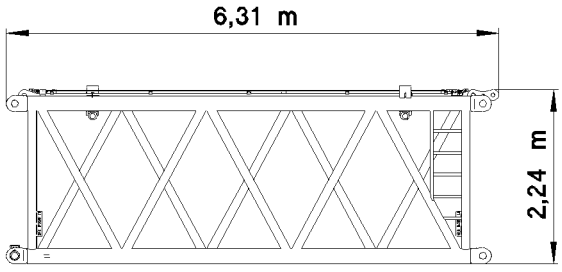
Component	Weight	Width
LI-intermediate section without guy rods	4.4 t	2.6 m
LI-intermediate section with guy rods	5.2 t	2.6 m

1.24 LI-intermediate section 12 m, 2420.10Z

See illustration **22**.

Component	Weight	Width
LI-intermediate section without guy rods	4.1 t	2.6 m
LI-intermediate section with guy rods	4.9 t	2.6 m

23



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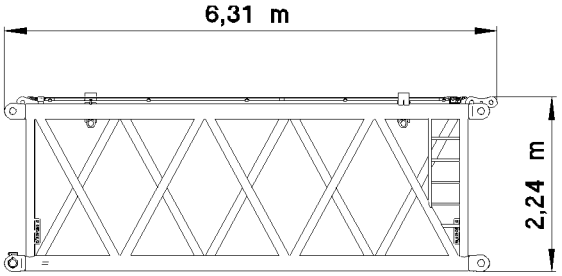

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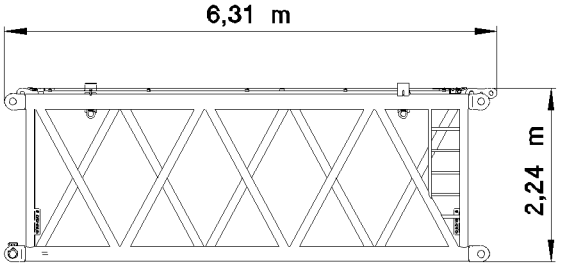

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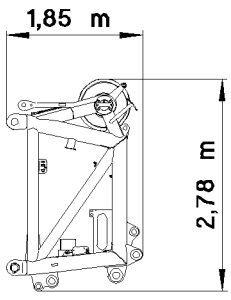

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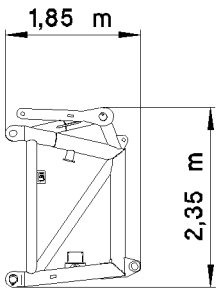

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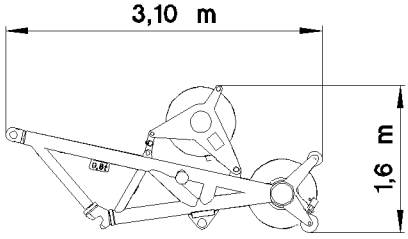

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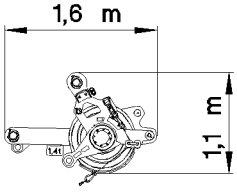

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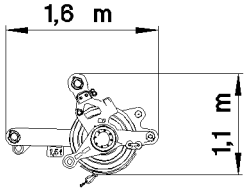

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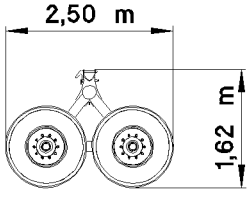

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1.25 LI-intermediate section 6 m, 2420.9

See illustration **23**.

Component	Weight	Width
LI-intermediate section without guy rods	2.2 t	2.6 m
LI-intermediate section with guy rods	2.6 t	2.6 m

1.26 LI-intermediate section 6 m, 2420.10

See illustration **24**.

Component	Weight	Width
LI-intermediate section without guy rods	2.4 t	2.6 m
LI-intermediate section with guy rods	2.8 t	2.6 m

1.27 LI-intermediate section 6 m, 2420.12

See illustration **25**.

Component	Weight	Width
LI-intermediate section without guy rods	2.5 t	2.6 m
LI-intermediate section with guy rods	3.0 t	2.6 m

1.28 SW-end section

See illustration **26**.

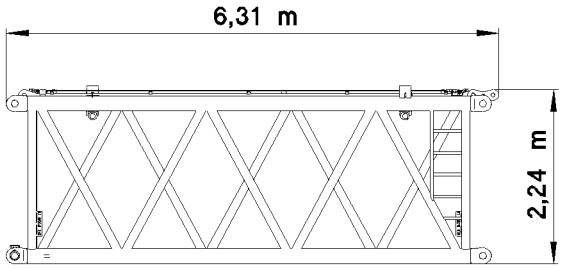
Component	Weight	Width
SW-end section	4.5 t	2.69 m

1.29 F-connector head

See illustration **27**.

Component	Weight	Width
F-connector head	1.90 t	2.69 m

23



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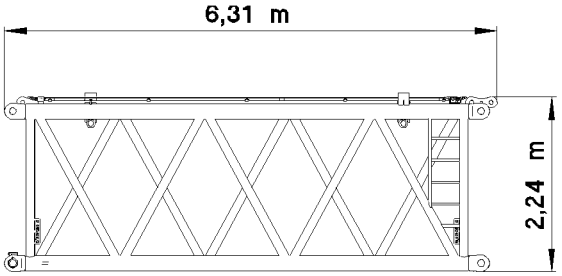

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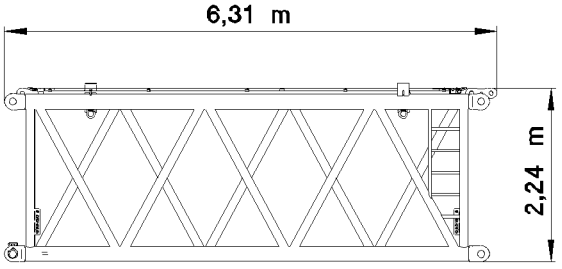

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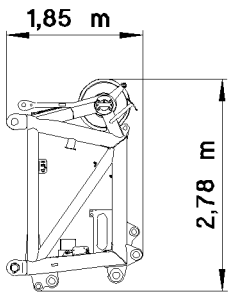

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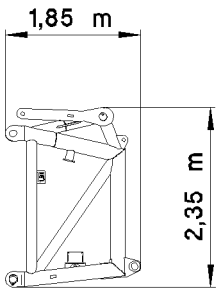

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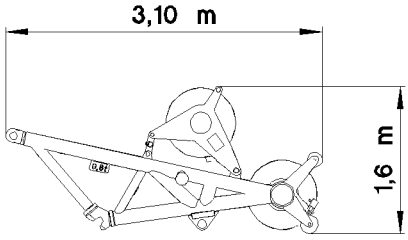

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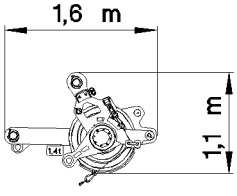

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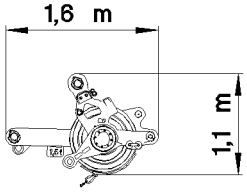

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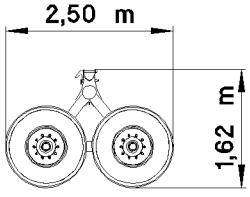

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1.30 Boom nose

See illustration **28**.

Component	Weight	Width
Boom nose	0.90 t	1.45 m

1.31 Pulley set 300 t

See illustration **29**.

Component	Weight	Width
Pulley set 300 t	1.4 t	1.24 m

1.32 Pulley set 320 t

See illustration **30**.

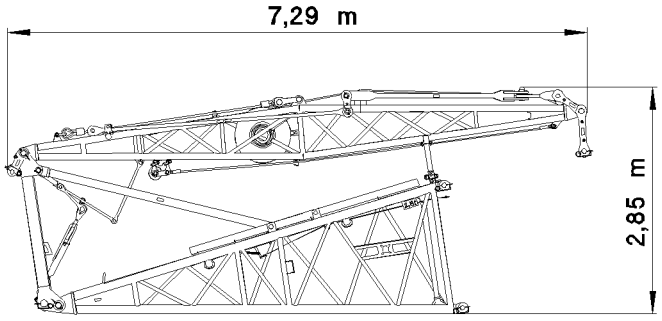
Component	Weight	Width
Pulley set 320 t	1.5 t	1.41 m

1.33 Pulley cart

See illustration **31**.

Component	Weight	Width
Pulley cart	1.5 t	1.84 m

32



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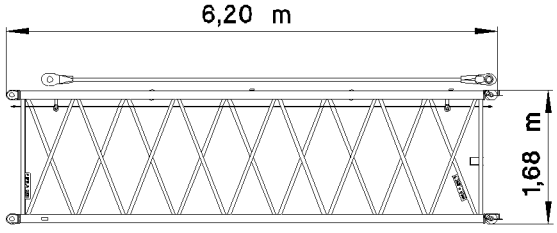

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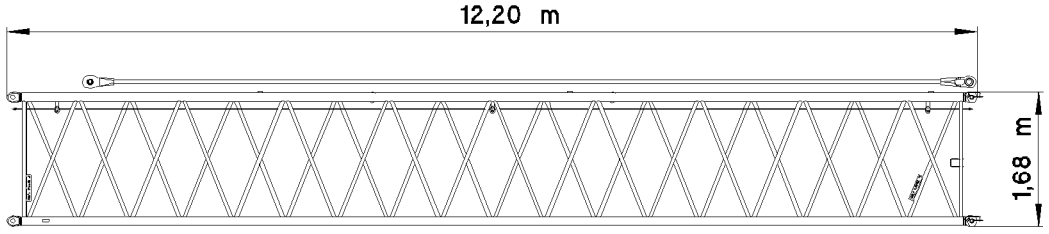

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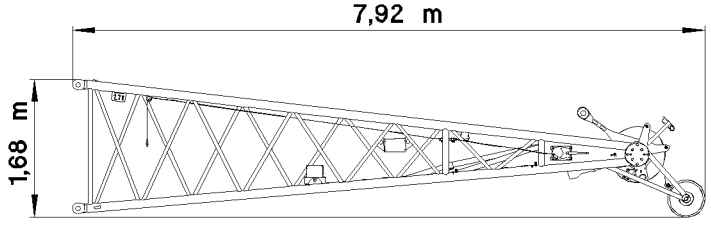

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1.34 F-assembly unit

See illustration **32**.

Component	Weight	Width
Assembly unit, complete	2.70 t	2.79 m
Assembly unit (without components)	0.43 t	
FA-frame	1.10 t	
F-pivot section	1.07 t	
F-relapse retainer	0.10 t	

1.35 F-intermediate section 6 m, 1916.6

See illustration **33**.

Component	Weight	Width
F-intermediate section without guy ropes	0.80 t	2.01 m
F-intermediate section with F-guy ropes	1.00 t	2.01 m

1.36 F-intermediate section 12 m, 1916.6

See illustration **34**.

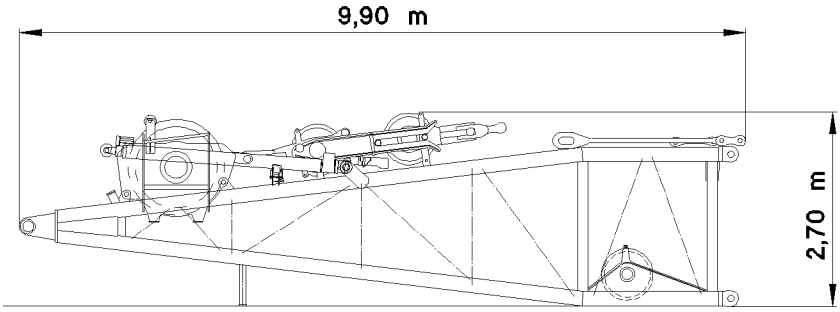
Component	Weight	Width
F-intermediate section without guy ropes	1.42 t	2.01 m
F-intermediate section with F-guy ropes	1.66 t	2.01 m

1.37 F-end section

See illustration **35**.

Component	Weight	Width
F-end section	1.7 t	2.01 m

36



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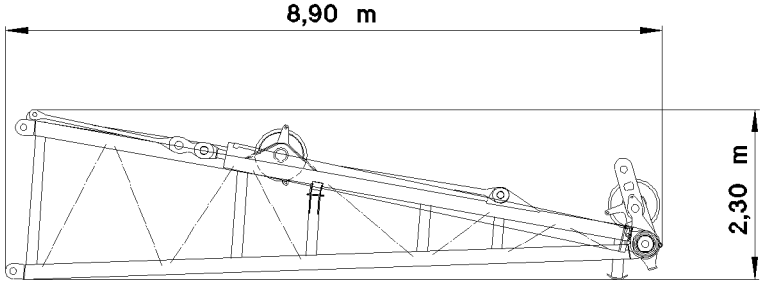

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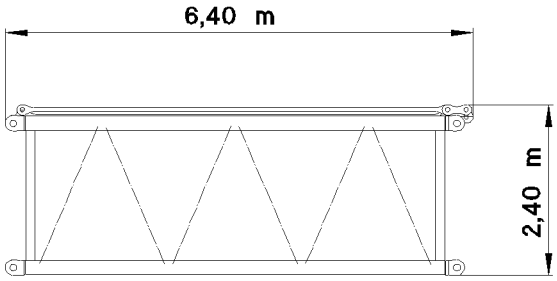

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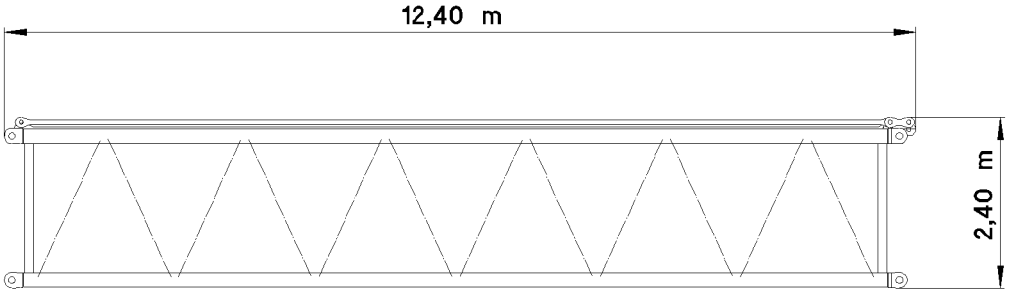

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1.38 D-pivot section 9.5 m

See illustration **36**.

Component	Weight	Width
D-pivot section, complete	22.75 t	3.0 m
D-pivot section	8.90 t	
D-relapse retainer	1.65 t	
D-pulley blocks	3.65 t	
Winch 3 with rope	8.55 t	

1.39 D-end section 8.5 m

See illustration **37**.

Component	Weight	Width
D-end section	13.30 t	2.7 m

1.40 D-intermediate section 6 m, 2420.16

See illustration **38**.

Component	Weight	Width
D-intermediate section without rods	3.3 t	2.6 m
D-intermediate section with rods	4.4 t	2.6 m

1.41 D-intermediate section 12 m, 2420.20

See illustration **39**.

Component	Weight	Width
D-intermediate section without rods	6.3 t	2.6 m
D-intermediate section with rods	8.1 t	2.6 m

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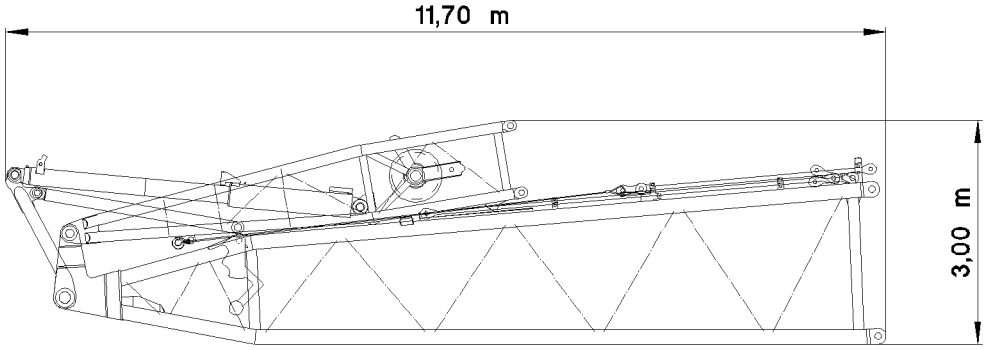

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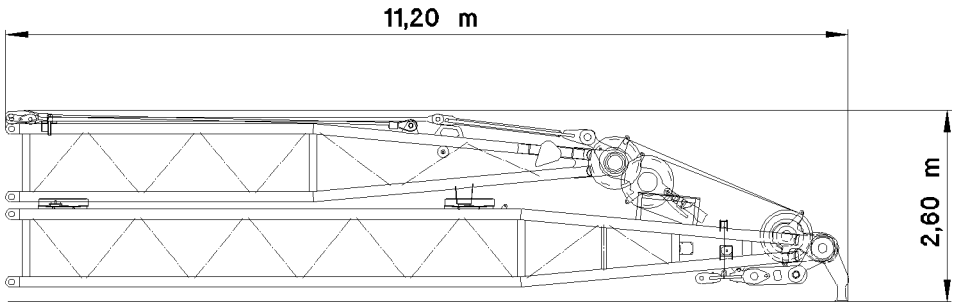

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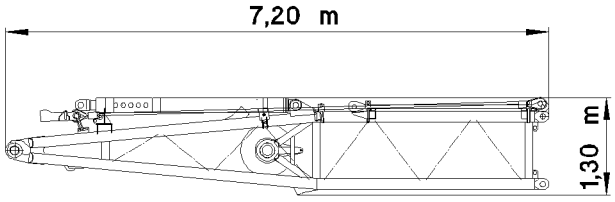

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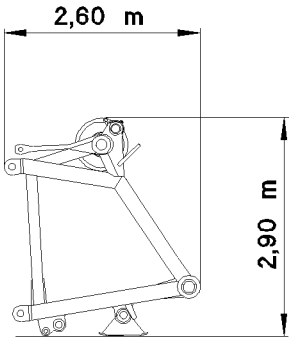

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1.42 W-pivot section 10.75 m with pivot section WA-frame 1 (transport unit 1)

See illustration **40**.

Component	Weight	Width
W-pivot section with pivot section WA-frame 1	12.0 t	2.8 m

1.43 WA-frame 1 and WA-frame 2, end sections (transport unit 2)

See illustration **41**.

Component	Weight	Width
WA-frame 1 and WA-frame 2, end sections	8.7 t	2.7 m

1.44 WA-frame 2, pivot section (transport unit 3)

See illustration **42**.

Component	Weight	Width
WA-frame 2, pivot section	3.6 t	2.7 m

1.45 W-connector head

See illustration **43**.

Component	Weight	Width
W-connector head	5.0 t	2.7 m

2 Load tackle

Note

▶ Load tackle, see chapter 4.06 of the crane operating instructions, as well as the separate load chart manual!

3 Ground pressure

	Track pad width 1.5 m	Track pad width 2.0 m
Maximum ground pressure at nominal load	1800 kN/m²	1300 kN/m²

4 Workplace-related emission value

Sound pressure level at nominal engine RPM	Stationary noise L_{pAeq}	
	Left ear	Right ear
Crane operator's cab	73 db(A)	

5 Crane speeds

Note
▶ The crane speeds refer to an engine RPM of 1900 RPM.

Drives	Speed
Winch 1	0 m/min to 132 m/min for single strand
Winch 2	0 m/min to 132 m/min for single strand
Winch 3	0 m/min to 130 m/min for single strand
Winch 5	0 m/min to 132 m/min for single strand
Winch 6	0 m/min to 94 m/min for single strand
Winch 4	2 × 78 m/min for single strand

Drives	RPM
Slewing gear	0 RPM to 0.95 RPM

6 Ropes

6.1 Hoist ropes

	Rope diameter
Winch 1	28 mm
Winch 2	28 mm
Winch 6	25 mm
Winch 6	28 mm

6.2 Control ropes

	Rope diameter
Winch 3	28 mm
Winch 4	28 mm
Winch 5	28 mm

6.3 Guy ropes

	Rope diameter
Auxiliary guying	34 mm

6.4 Assembly rope

	Rope diameter
Assembly winch	8 mm

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

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1 General

Note

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

1.1 Exhaust systems and other heated crane components

WARNING

Danger of burns!

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

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

▶ Let the components cool off before touching them!

▶ Proceed with special caution near heated crane components!

1.2 Movement on the crane

WARNING

Risk of accident!

No not step or place a load on surfaces, which are not approved, there is a danger of accidents!

Personnel can be severely injured or killed!

The crane can be damaged!

▶ Observed the signage!

▶ Replace damaged signs immediately!

WARNING

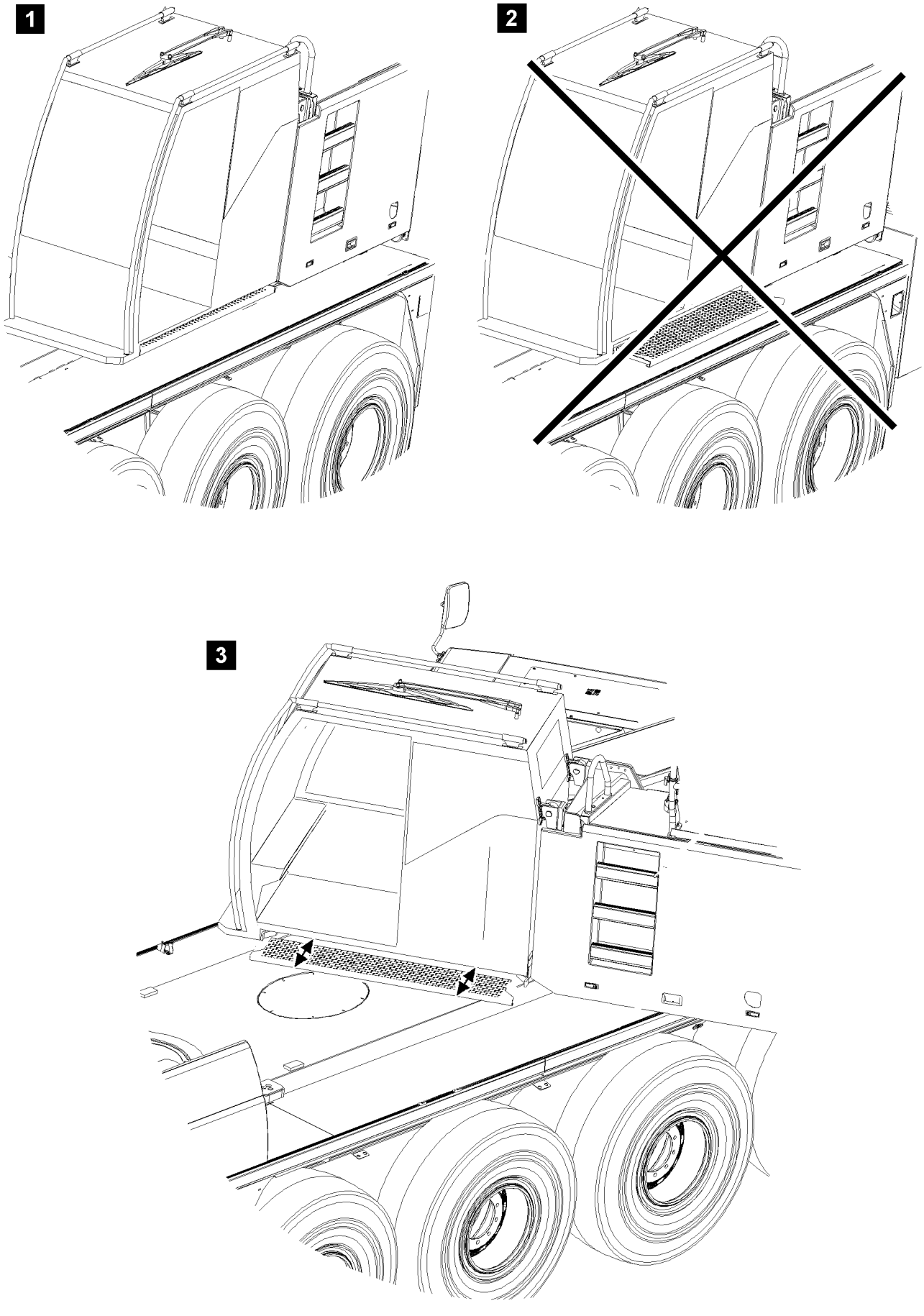
Danger of slipping / falling!

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

Danger of slipping / falling!

Personnel can be severely injured or killed!

▶ Always move on the crane depending on the respective circumstances!



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1.3 Crane operator's cab with retractable / extendable step

1.3.1 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!

1.3.2 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!

1.4 Crane operator's cab with incline adjustment

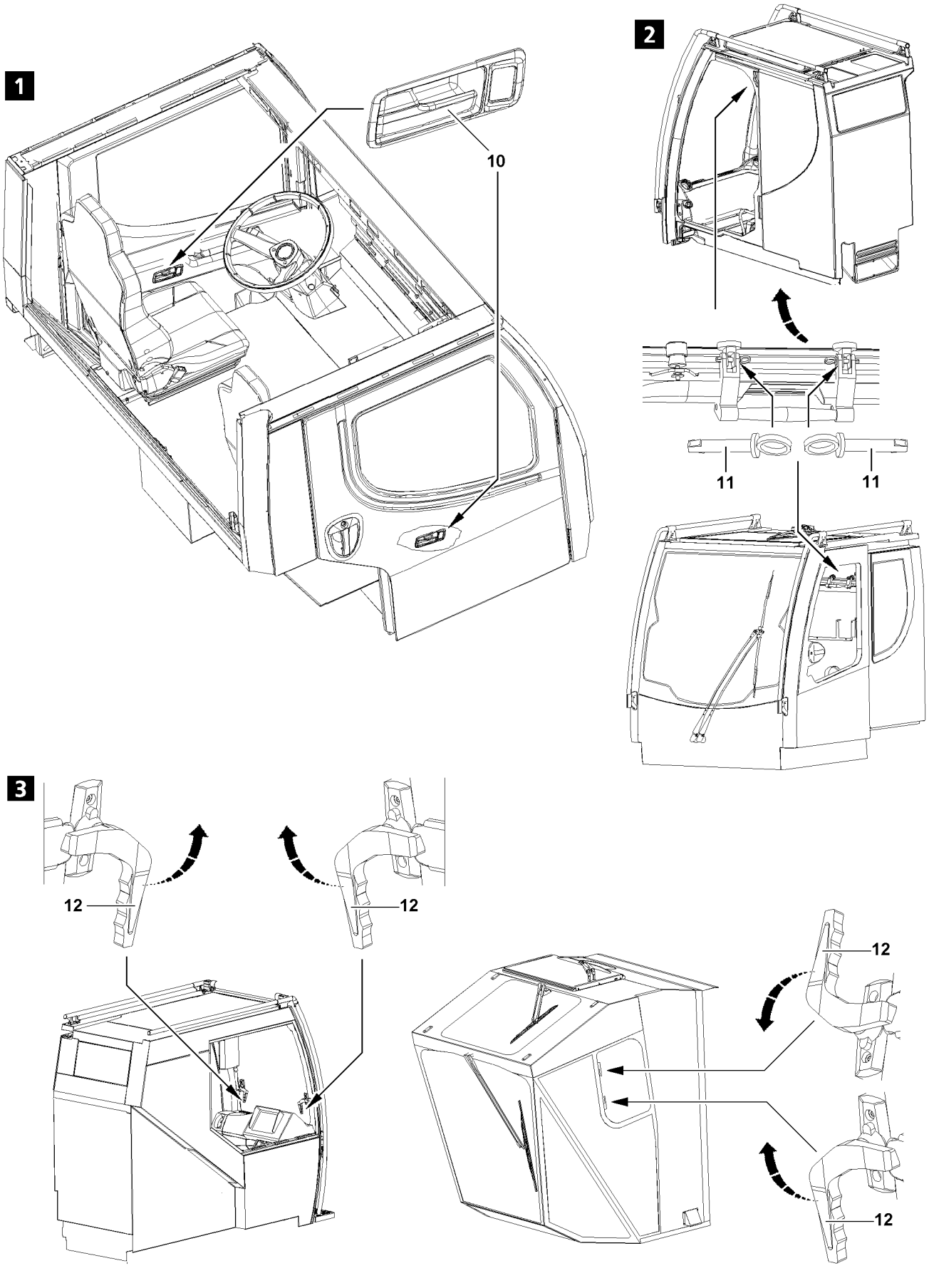
WARNING

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 appropriate pedestals or other suitable entry aids set up to ensure safe exit from the crane operator's cab!



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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”.

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 **3**: Unlock the top and bottom handles **12** and open the side window.

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3 Requirements of the crane operator

3.1 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.

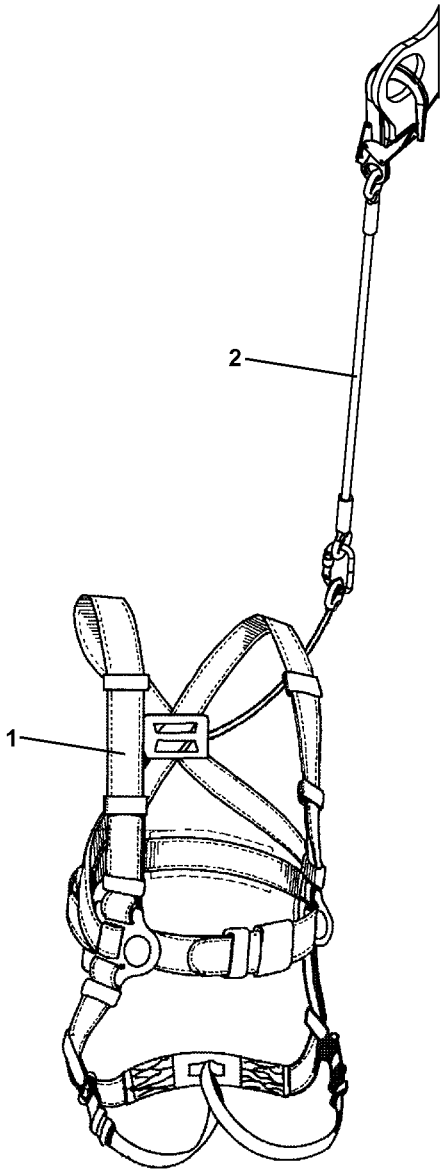
WARNING
Danger due to operating error!
▶ In the interest of both yourself and others, make sure you understand how your crane operates and familiarize yourself with all the risks associated with the work to be done.

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,
  - quick braking of the load,
  - diagonal pulling,
  - loose cable formations.
- Overloading.
- Driving too fast with a load, or setting up and loading on an uneven surface.
- Attaching the load incorrectly.
- Unsuitable operation; especially diagonal 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 wiring due to insufficient vertical clearance.
- Inadequate support; support base, support under the support pads.
- Incorrect 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 switches or load torque limiter (LMB) not operating properly.
- Brake and clutch failure.
- Hydraulic defects; for example cracked hoses.
- Loose bolts.



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3.2 Personal protection equipment

WARNING
Danger of accidents or falling!
If protective devices are not worn, the crane operator or the auxiliary personnel can be killed or severely injured!
- ▶ Any overhead work, where there is a danger of falling must be carried out with suitable aids!
- ▶ If fall arresters are available, then they must be used!
- ▶ If work cannot be carried out using these aids or from the ground, the crane operator and the assembly personnel must be protected from falling using approved antifall guard systems!
- ▶ **Only approved antifall guard systems (catch belt, connectors) may be used! These antifall guard systems must meet the standards EN 354, EN 358, EN 360, EN 361, EN 362, EN 363 and EN 365 or national regulations.**
- ▶ **No fall cushioning devices may be used due to low, possible falling height.**
- ▶ The operating instructions of the manufacturer of the antifall guard systems must be observed and adhered to!
- ▶ Check regularly to make sure that the legibility of the product identification marking is ensured.
- ▶ The crane operating company must provide personal protection equipment to the crane operator and all auxiliary personnel!
- ▶ The crane operating company must ensure that the crane operator and auxiliary staff wear personal protection equipment!
- ▶ The crane operator and auxiliary personnel are obligated to carry personal protection equipment along and to wear them!
- ▶ Replace defective or damaged personal protective equipment!

Personal protection equipment include the following equipment:
- – Hard hat: 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 cables, penetration safe safety gloves must be used.
- – Antifall guard systems (catch belt **1**, connectors **2** for retaining systems and work place positioning) to protect against the danger of falling.
- – Safety shoes: Protection from falling parts at assembly and disassembly.
- – Warning apparel.

WARNING
High risk of accident!
Even personal protection equipment does not provide 100 % protection!
A helmet can protect against small falling objects, but not against falling loads.
Personnel can nonetheless be killed or seriously injured!
- ▶ Always remain aware of your surroundings and behave in a safe manner!

WARNING
Risk of accident!
If the following instructions or 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, appropriate safety preparations must be made!

WARNING
Danger of accidents due to fall subjected antifall guard systems!
If fall subjected antifall guard systems are not replaced after a fall, then the antifall guard systems may fail in case of a new fall and personnel can be severely injured or killed!
▶ Replace fall subjected antifall guard systems immediately!

WARNING
Important for the safety of the user!
▶ If the personal protective equipment is subsequently sold into another country, the seller must provide the instructions for use, maintenance, regular inspections and upkeep in the language of the other country.

3.2.1 Documentation

Note
▶ The crane driver, who employs the user, is responsible for the creation of documentation and entry of the required data.

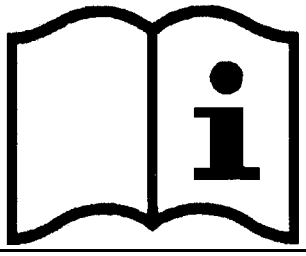
The following charts must be filled out after the respective inspections.

Documentation of personal protective equipment		
Product:		
Type and model / Identification	**Commercial name**	**Identification number**
Manufacturer	**Address**	**Phone and fax number, email and internet page**
Year of manufacture / expiration date	**Purchase date**	**Date of first use**
Other significant data , such as number of document		

Procedure of regular inspections and repairs of personal protective equipment				
Date	**Reason of process (regular inspection or repair)**	**Damage found, repairs made and other significant data**	**Name and signature of expert personnel**	**Date of next regular inspection**

3.2.2 Identification

Every personal protective equipment or other equipment must be marked clearly and permanently in the language of the user country. The identification must include at least the following data.

Manufacturer:		
Product description:		
Type and model / Identification:	**Serial number:**	**EN Standard(s)**
	**Observe the warning notes and instructions!**	

3.3 Work on the crane superstructure or boom

WARNING
Risk of falling!
During work on the crane superstructure of 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 catch systems to avoid falling, see section “Personal protective equipment”!
- ▶ It is prohibited to step on the operator's cab or cab roof and specially marked surfaces, see crane operating instructions, chapter 2.05!

3.4 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 defects, which would endanger 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, it 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 they 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 them.

10.) As long as a load is suspended on the crane, the crane operator must keep the control devices within reach. This does not apply for towing of vehicles with towing cranes.

11.) The crane operator may not run up to end positions operationally, if they are limited by the emergency limit switches.

12.) After a load moment limiter was triggered, the crane operator may not take on an overload by pulling in / raising the boom.

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

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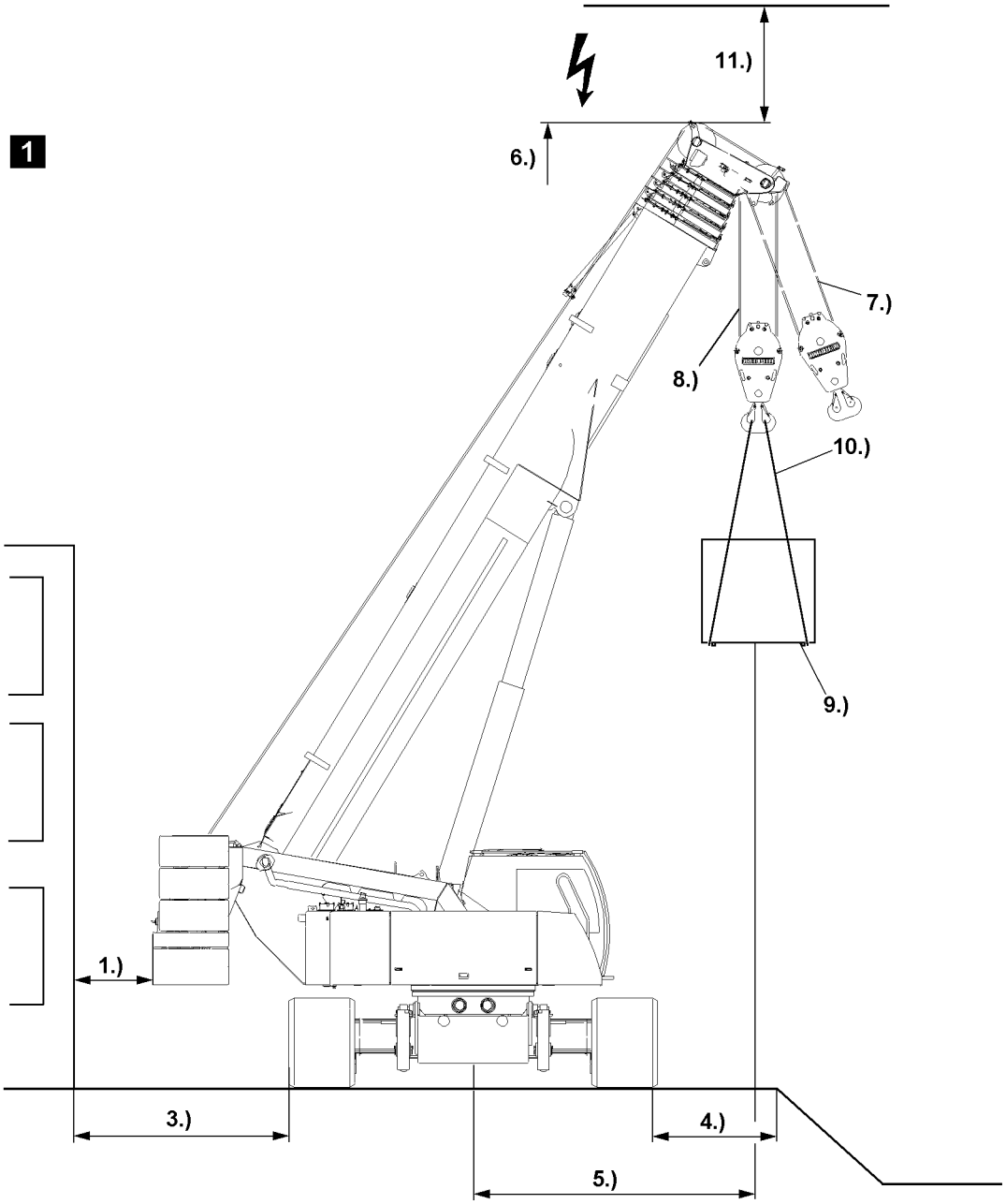
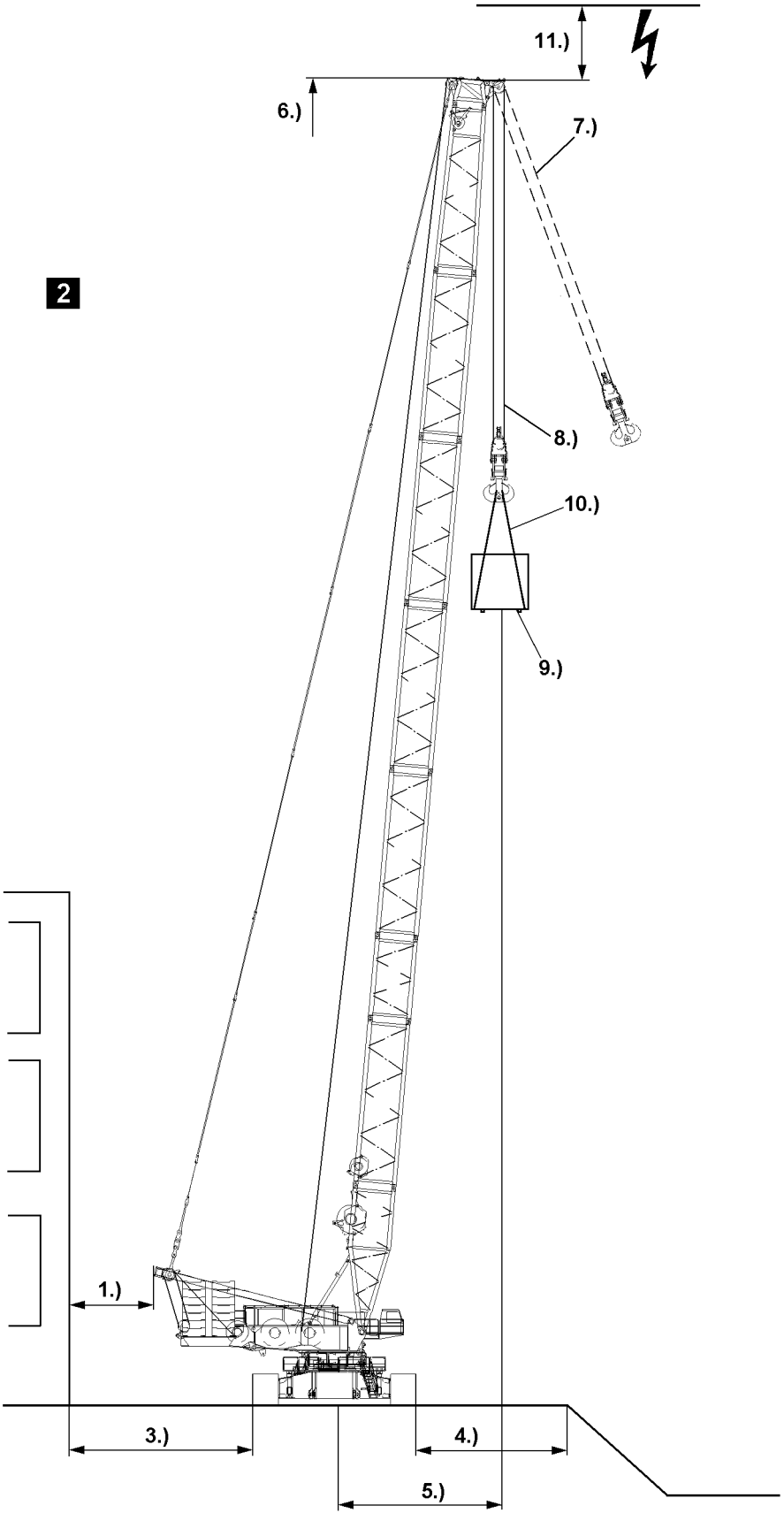
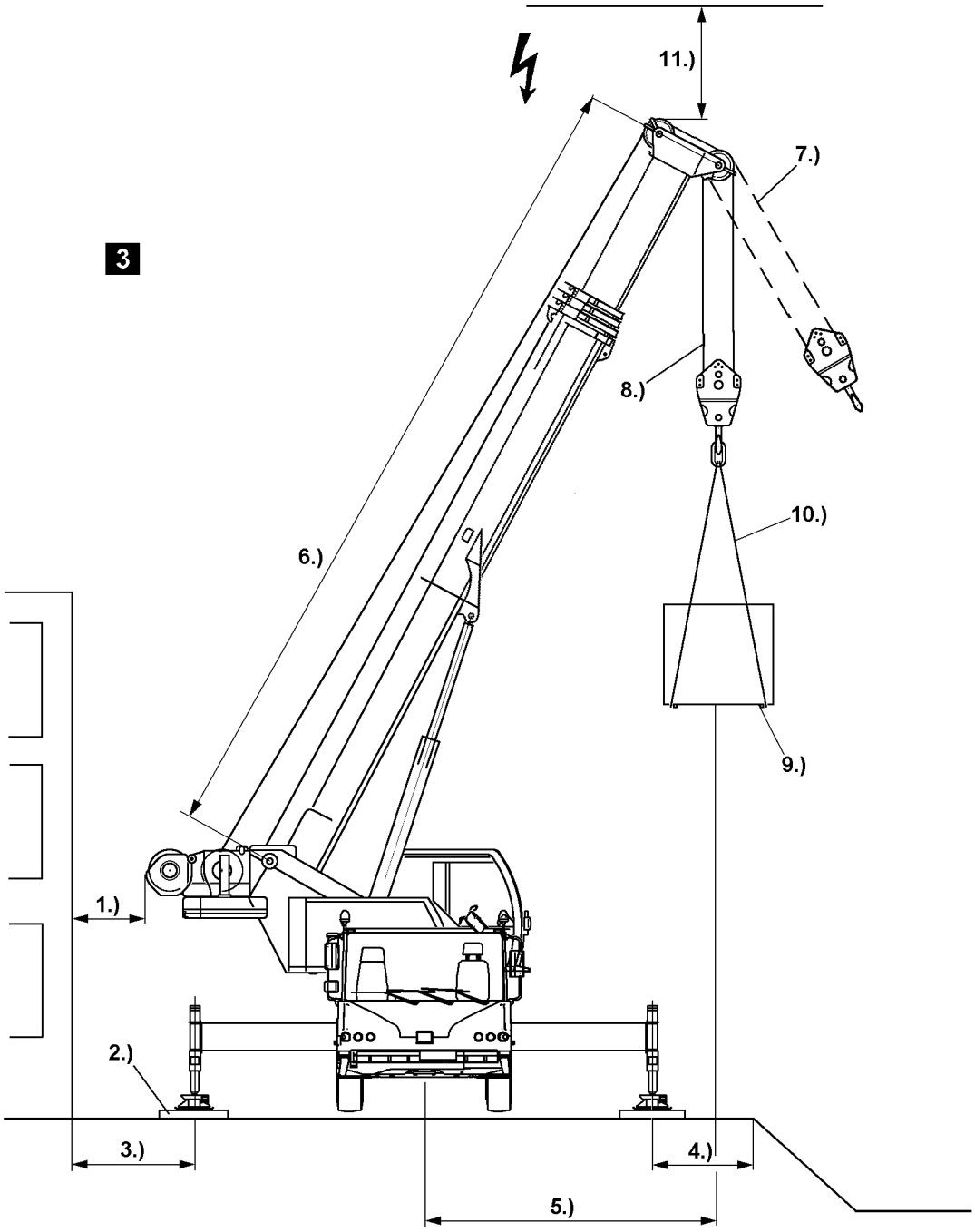


B104101 *Example for crawler crane with telescopic boom.*



B104102 *Example for crawler crane with lattice mast boom.*



B104103 *Example for mobile cranes*

4 Selecting the location, illustrations 1 to 3

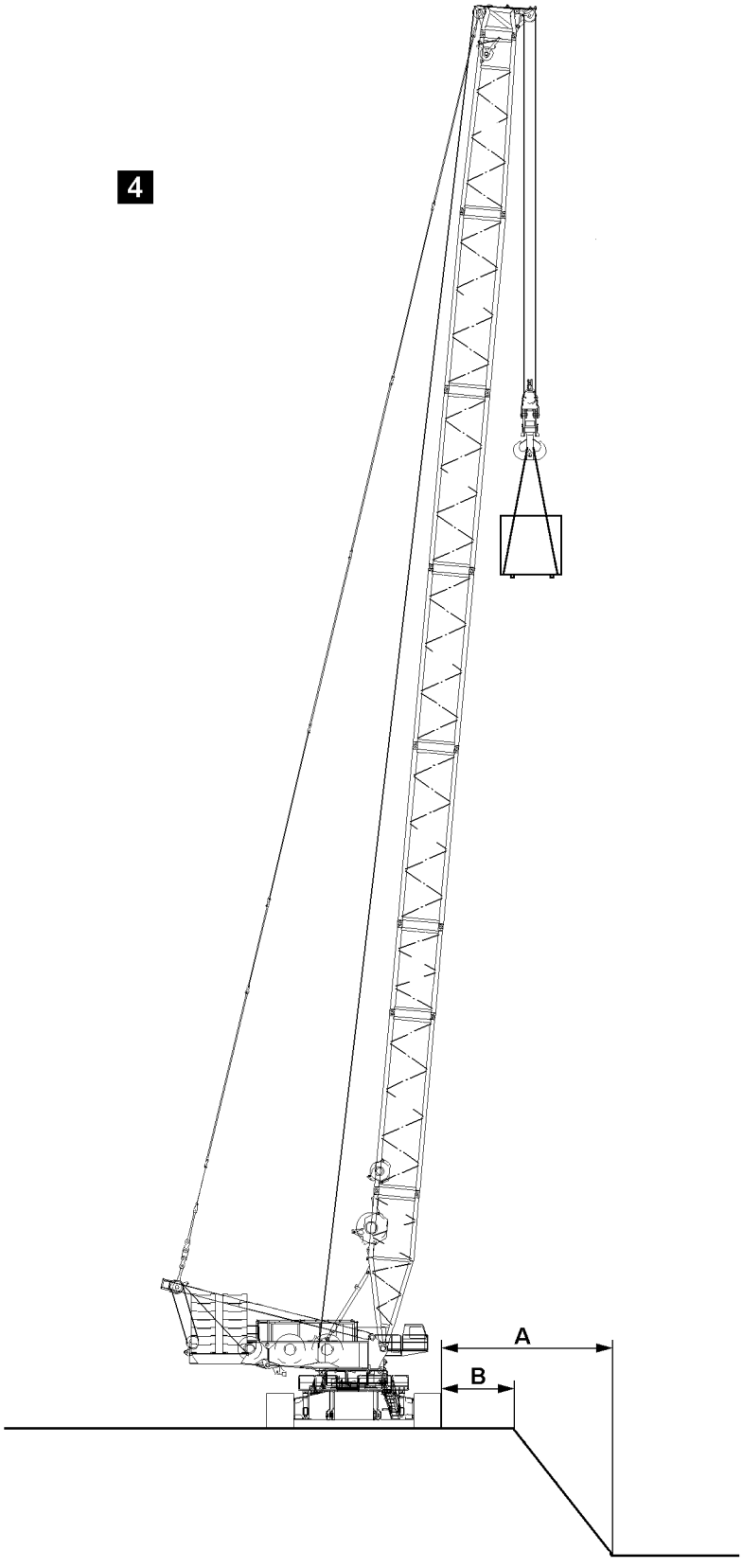
It is very important to choose an appropriate location for crane operation in order to minimize safety risks.

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, secure the danger zone.
2.) On mobile cranes:
Support the crane correctly and support the support pads 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 boom projection radius to a minimum.
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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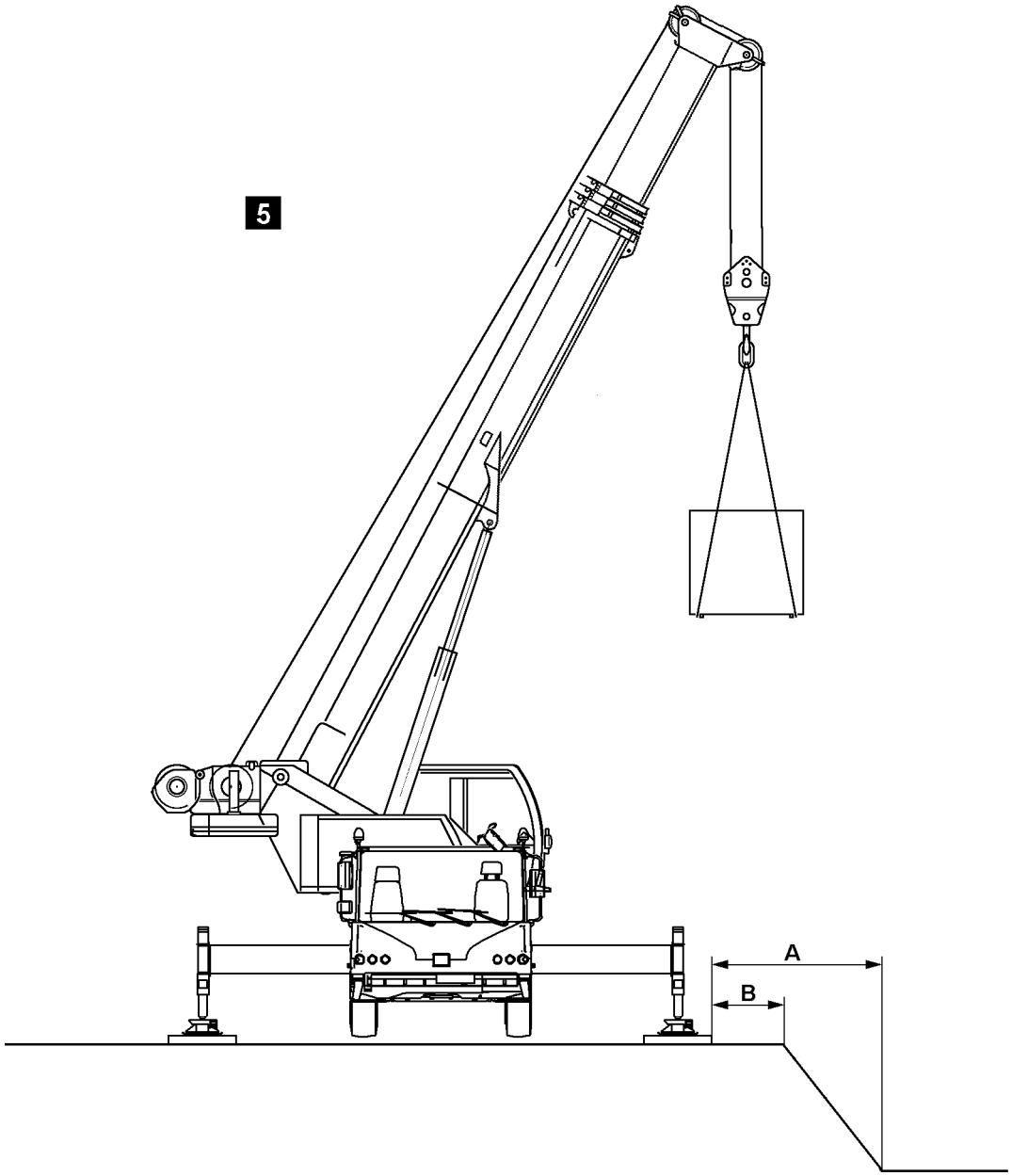
Example for crawler cranes



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Example for mobile cranes.

5 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

6 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	
	Stiff	9
	Semi-solid	14
	Solid	20
	d) Mixed granular ground, clay to sand, gravel and rocky areas	
	Stiff	15
	Semi-solid	22
	Solid	33
5.	Rock in evenly solid condition:	

Permissible ground pressures		
Soil type		[N/cm^2]
a)	Brittle, with traces of decomposition	150
b)	Not brittle	400

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

6.1 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 it 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!

6.2 Permitted ground pressure for mobile cranes

When the crane is supported, the support cylinders transmit significant forces to the ground.
The ground must be able to safely withstand this pressure. If the support pad area is inadequate, then it 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 pads 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 pad with 550 mm side length according to chapter 1.03, for example: 302500 mm^2	3025 cm^2
80 % as carrying surface of support pad: 302500 mm^2 x 0.8 = 242000 mm^2	2420 cm^2
Specific support pressure = Support force / surface support pad	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 pad 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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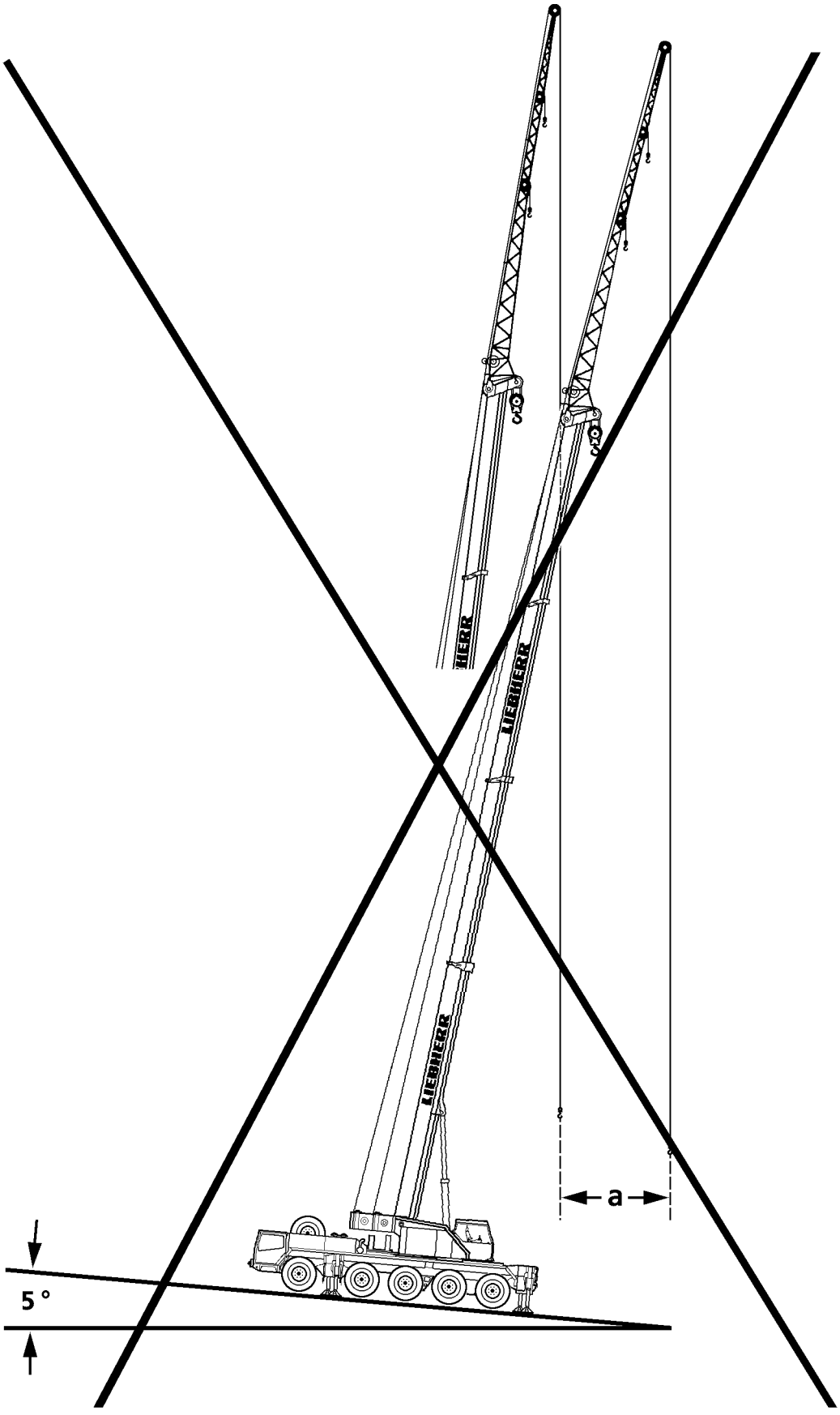

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General example

7 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 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!
f 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 pin in 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 to lattice jibs and guy ropes. If the load is dropped from the tackle cables or if the tackle 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 be extended according to the data in the load chart!

7.1 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 may topple if it leans!

If the crane is positioned at an incline, and if the boom is turned towards the slope, then the boom projection 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, uneven adjustment of the crane by only 5° will cause an boom projection radius of 10 m to be increased by a = 4 m.

8 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 projection 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 pads are pinned and secured in the operating position.
  • The axles are relieved, which means the tires do not touch the ground.

9 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 adjusted according to the current crane configuration.
- The loads given in the load chart may not be exceeded.
- The crane loads may never exceed 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
- ▶ It must be observed, that the weight of the hook block and the weight of the tackle must be 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 tackle 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** .

9.1 Counterweight

The counterweight required depends on the weight of the load to be lifted and the radius required for work. 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!

9.2 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 working with a single strand, the crane can only lift as much of a load as the hoist gear is able to pull.
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 manual instructions.

WARNING
Hoist rope failure!
If the maximum pull force of the hoisting gear is exceeded, the hoist rope can break or the hoisting gear can be damaged!
The load can fall and kill personnel!
▶ Never exceed the rated pull force of the hoist gear!

9.3 Crane operation

DANGER
There is a high risk of accidents should the following points not be observed!
▶ It is imperative to comply with the following instructions.

High accident risk if:

1.) The load torque limiter is not set to the actual configuration status of the crane, and as a result, cannot fulfill its function as a safety device.
2.) The load torque limiter is defective or put out of operation.
3.) The hoist limit switches are defective or turned off.
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 points specified in the load chart.
6.) On crawler cranes:
The crawlers are not supported with stable base material sufficiently large for the soil conditions.
7.) On mobile cranes:
The support pads are not supported with stable base material sufficiently large for the soil 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.) An excessive load is attached to the hook during disassembly work, which then hangs freely on the crane when it is detached.
10.) If loads which have become stuck are pulled free with the hook block.
Even if the weight of the load which is stuck is no greater than the permissible lifting load, the crane may topple over backwards if the load is suddenly freed since the tension created in the boom can cause it to jerk back violently.
11.) Work is carried out in strong winds.
Refer to the data given in the load chart.
12.) The crane is not aligned horizontally and the load is slewed toward the slope.
13.) The hook load begins swinging because the crane operator has not properly controlled the movements.
14.) The loads and boom projection radii contained in the load charts are exceeded.
15.) When working in the vicinity of power cables, these are not isolated by electricity engineers or if the hazardous area is not covered of fenced off.
If it is not possible to take such measures, a sufficient safety clearance must be maintained:

Rated voltage	Minimum distance
Up to 1 kV	1 m
Above 1 kV to 110 kV	3 m
Above 110 kV to 220 kV	4 m
above 220 kV to 380 kV	5 m
If rated voltage is unknown	5 m

WARNING
Danger of current transfer!
If, despite all precautions having been taken, a flashover occurs, carry out the following procedure:
- Keep calm!
- Do not leave the crane operator's cab.
- Warn those around the crane not to move and not to touch the crane.
- Move the crane away from the danger area.

10 Lifting of personnel

10.1 Generally valid instructions:

Note
- The destined use of the crane is **lifting of loads**!
- **Lifting of personnel** is **not** considered to be destined use of the crane!
- The **national laws and regulations** for **lifting personnel** must be adhered to!

DANGER
Danger of accidents or falling!
When lifting personnel, the dangers of accidents and falling are significantly increased. Accidents which occur when lifting personnel often result in severe injuries or even death!
The company, the supervisor, the crane operator and auxiliary personnel must proceed especially carefully and safety conscious!
The following warning notes and safety regulations must be strictly observed!
- Lifting of persons with personal lifting devices is only permitted for the assembly, the use and the removal, if the user can prove that reaching the work area by conventional means, for example: Via elevator, ladder, steps, lift, aerial platform or scaffolding is dangerous or due to the structural design of the project or the work place condition is not possible!
- Lifting of persons is only permitted with personal lifting devices, which have been designed for lifting personnel and which were tested and approved!
- When lifting personnel, the total load, including personal lifting devices, load lifting devices and load hook may only be 50 % of the nominal load for the respective condition of the valid load charts!
- The reeving must be handled in such a way that the rope pull with personal lifting devices, load lifting devices and load hook does not exceed 50 % of the maximum rope pull!
- The crane operator may not leave the crane operator's cab while lifting personnel with the crane!
- The lifting person must be in radio contact with the crane operator!
- The rescue of person(s) in the personal lifting device must be planned in advance in case it is necessary in an emergency!
- As long as person are lifted, the crane may not be used for other purposes!
- The job planning for crane operation, where personnel is to be lifted must be made especially carefully!
- Check the load bearing capacity of the ground especially carefully!
- Lifting personnel may only be carried out by authorized and trained expert personnel!
- Unauthorized persons must remain outside the danger zone!
- Carry out all crane movements especially carefully and smoothly!
- The **persons to be moved** must secure themselves with personal protective equipment (for example safety harnesses) to protect them from falling from the movement devices!

- ▶ Do **not** step on lifted loads or lifted tackle!
- ▶ The **crane operator** may **not** move personnel with the load or the load tackle!
- ▶ Before using the safety devices of the crane, check them for proper function! This applies especially for the hoist limit switch and the load moment limitations! But all other crane functions must also be in proper condition!
- ▶ The crane must be equipped in such a way that personnel can exit the personnel lifting device without danger in case of a power failure or if the control of the personnel lifting device cannot be returned to the initial position!
- ▶ The national laws and regulations for lifting personnel must be adhered to!

10.2 In addition, the following applies for Germany:

Note

- ▶ In Germany, **lifting of personnel** under observation of the safety regulations for “liftable personnel lifting devices” of the trade associations (Berufsgenossenschaften) BGR 159 is permissible!

DANGER

Danger of accidents or falling!

The following warning notes and safety regulations must be strictly observed!

Moving personnel and personnel lifting devices and working with these personnel lifting devices is approved and monitored by the national occupational heath and safety agencies, in Germany the trade association (Berufsgenossenschaft)!

- ▶ Observe the safety regulations and guidelines of the national occupational health and safety agencies!

Additional obligations of the company:

- – Report the operation of the lifting device to the appropriate trade association.
- – Determination of supervisor.
- – The operator of the lifting device must be familiar with the tasks.
- – The contractor may not assign other tasks to the lifting device operator and the guide while personnel is being lifted.
- – The contractor must make lifting devices with sufficient load carrying capacity available.
- – The contractor must provide personal protective equipment (such as safety harnesses).
- – Liftable personnel lifting devices must be inspected before the initial use and after significant changes by an expert before putting them back into service:
  - • Carry out trial runs in the present of the supervisor.
  - • Regular inspections at least once a year.
  - • Record and save proof of inspections.

11 Grounding

11.1 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 pads or if the support pads are placed on insulating materials (such as wooden planks).

11.2 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.

12 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 to keep the crane and the load always under control.

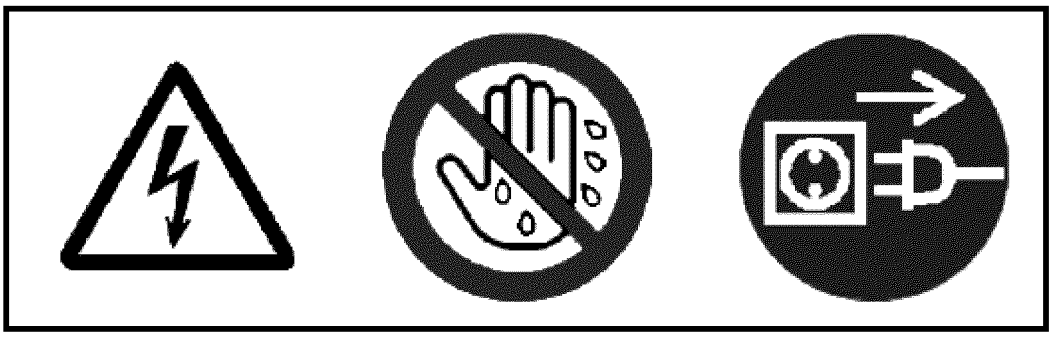
WARNING
Danger of accidents due to lightning strikes!
▶ Make sure that there are no persons near the immediate area of the crane.

13 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 welding piece to avoid current flow via hoist rope, crane superstructure or crane chassis.

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



A potential hazard exists when supplying a crane with external power 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. Subject to lethal currents.
▶ The external supply cable must be in good working order!

Make sure that the external flexible supply line is in good working order.
Where applicable, we recommend the use of an isolation transformer.

15 Endangering air traffic

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

WARNING
Endangering air traffic!
If no protective measures are taken, this can result in endangerment to air traffic!
▶ Get the approval from agency responsible for air traffic!
▶ Assemble the airplane warning light on the boom head and turn it on!

16 Joint lifting of a load by numerous cranes

If a load is to be lifted by means of several cranes, the procedure must be previously determined by means of the contractor or his representatives, and must be carried out in the presence of a supervisor nominated by the contractor.
Proceed with particular care in the following cases:

– The part to be lifted has no even shape.
– Dynamic influences are to be taken into account when the load is freed.

Note

▶ In the event of differing load-bearing capacities of the cranes, attach the loads in such a way as each crane is only loaded with its own permissible load-bearing capacity.

WARNING

High risk of accident during dual-lifting!
When lifting or lowering the load, the individual cranes can be overloaded and topple over!
Personnel can be killed or seriously injured!

▶ Only load the individual cranes with their individually permissible load capacities!
▶ Angular pull is prohibited!

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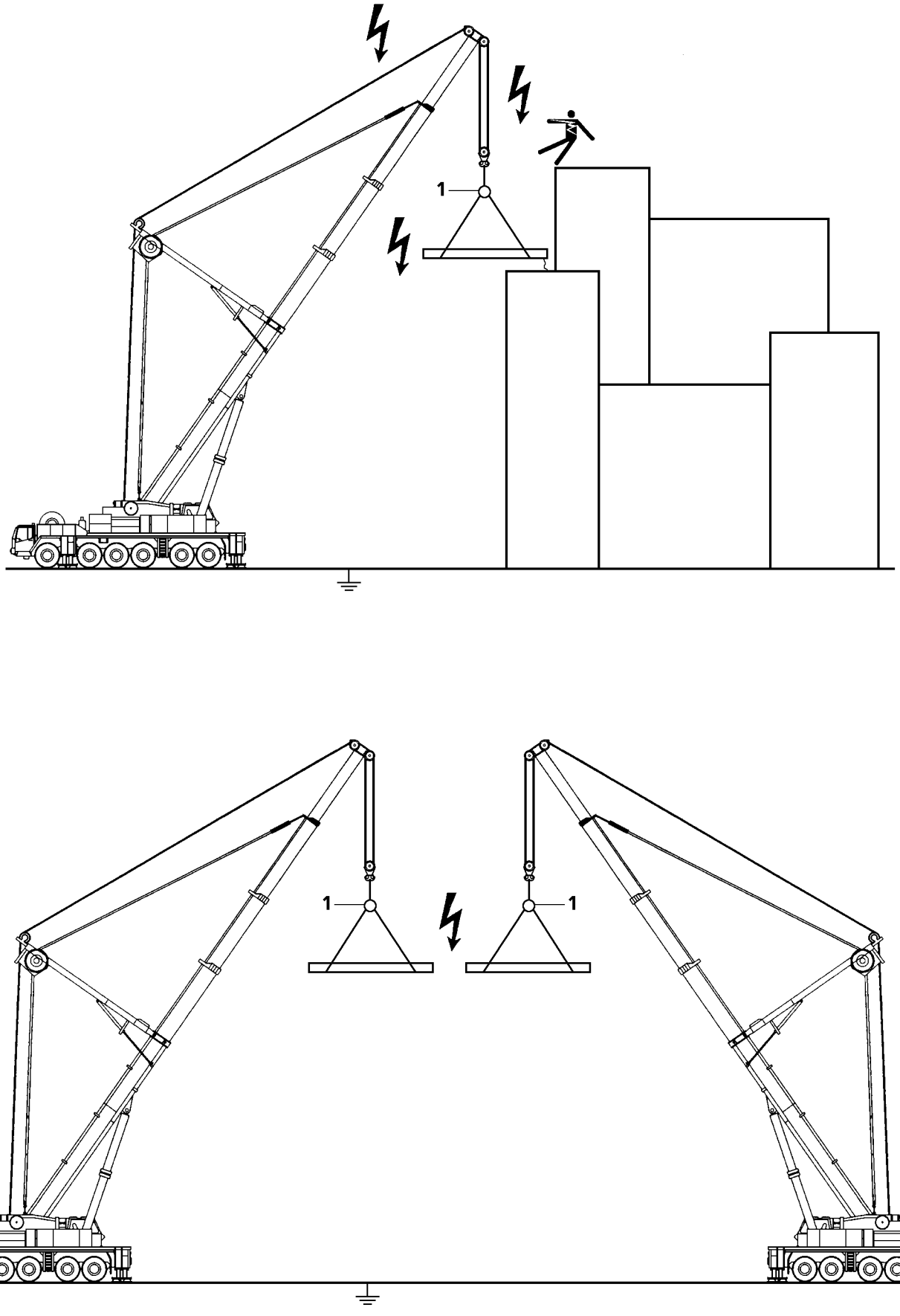

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General example

17 Working in the vicinity of transmitters

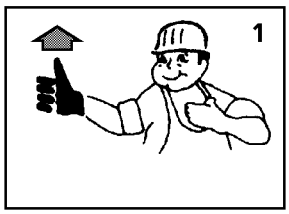
Strong electromagnetic fields are likely to be present if the construction site is close to a transmitter. Electromagnetic fields can expose people and objects to direct and indirect risks, such as:

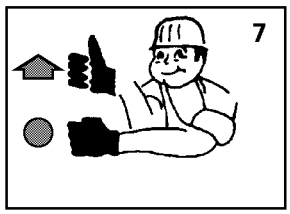
– Effect on human organs due to temperature increase.
– Danger of burns or inflammation due to temperature increase.
– Spark or electric arc formation.

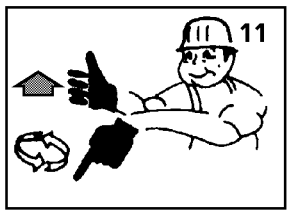
DANGER
Risk due to electromagnetic fields!
▶ Before operating a crane in the vicinity of transmitters, be sure to consult with LIEBHERR!
▶ Also consult a high frequency specialist!

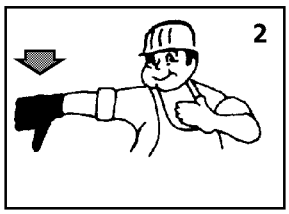
High frequency (HF) radiation from a transmitter requires supplementary work safety protection and special environmental specifications for crane operators and personnel:

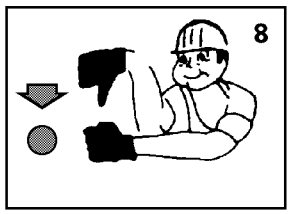
1.) Each crane must be “fully” grounded. Check visually or with a simple tester to ensure that ladder, cab and cable pulleys are grounded.
2.) All personnel working on the crane or with large metal objects must protect themselves from burns by wearing non-conductive synthetic gloves and suitable clothing 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 cable carrying capacity, any such occurrences must be reported immediately to the machinery supervisor so that the cables can be inspected.
6.) An insulator **1** is required at all times between the crane load hook and tackle. It is strictly prohibited to remove this insulator **1**.
7.) Do not touch the cables 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.
If, for example 500 V can be measured on a tool at a distance of 1 cm to - 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 a distance of 10 cm, the voltage is approx. 600 V, at a distance of 30 cm, the voltage is approx. 2000 V.
13.) When refueling the crane, it must be ensured that no sparks are created within the 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.

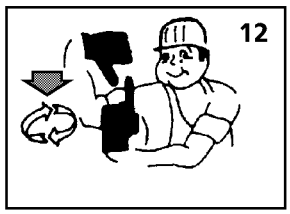


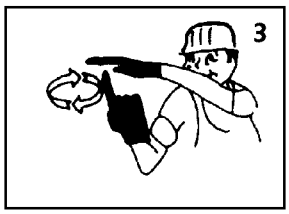


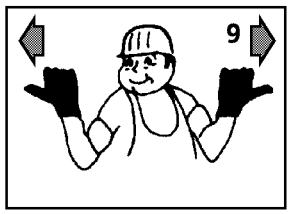


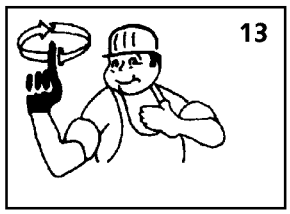


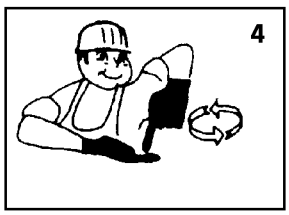


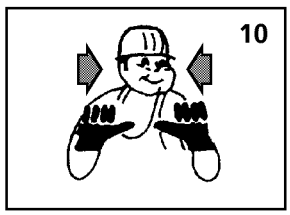


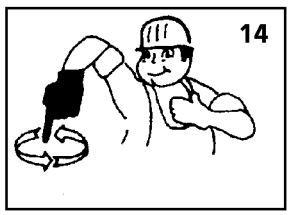


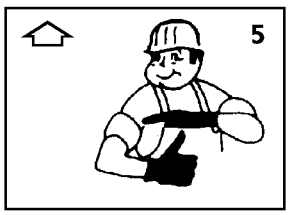


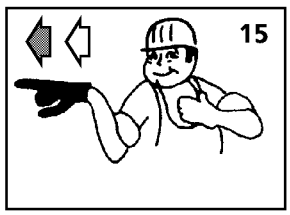


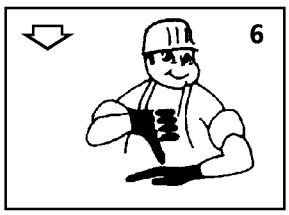


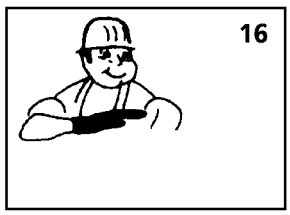


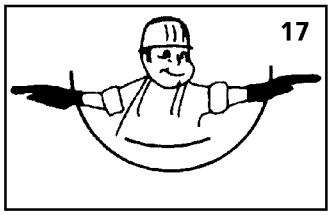












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18 Hand signals for guidance

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

WARNING
Risk of accident due to standing under swaying loads!
- ▶ Constantly 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!

We recommend using the hand signals described on the previous page.
In any case, **national regulations** must be observed when abroad.
Hand signal explanation:
Luff up boom **1**
Luff down boom **2**
Lift load slowly **3**
Lower load slowly **4**
Luff up boom slowly **5**
Luff down boom slowly **6**
Luff up boom and hold load steady **7**
Luff down boom and hold load steady **8**
Telescope out boom **9**
Telescope in boom **10**
Luff up boom and lower load **11**
Luff down boom and lift load **12**
Lift load **13**
Lower load **14**
Turn load in this direction **15**
Shut down all systems **16**
Stop! **17**

19 Consideration of wind conditions

It is imperative to observe the permissible wind speed data given in the load charts:
– For the equipped crane.
– For crane operation.

WARNING
The crane can topple over!
▶ It is prohibited to erect the crane to measure the wind speed!

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.) taking up crane operation again

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 charts, then it 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 the crane operation, then it is prohibited to lift a load!

Wind force		Wind speed		Effect of the wind
Beaufort	Description	[m/s]	[km/h]	in the inland
0	Calm	0 - 0,2	1	No wind, smoke rises straight up
1	Slight air (draft)	0,3 - 1,5	1 - 5	Wind direction is shown only by observing the trail of smoke, not by the wind sock
2	Light breeze	1,6 - 3,3	6 - 11	Wind can be felt on the face, the leaves rustle, wind sock moves slightly
3	Gentle breeze	3,4 - 5,4	12 - 19	Leaves and thin twigs move, wind extends a small breeze flag
4	Moderate breeze	5,5 - 7,9	20 - 28	Swirls up dust and loose paper, moves twigs and thin branches
5	Fresh breeze	8,0 - 10,7	29 - 38	Small deciduous trees begin to sway, foam forms at sea
6	Strong breeze	10,8 - 13,8	39 - 49	Thicker branches move; telephone lines begin to whistle, umbrellas are difficult to use
7	Stiff wind	13,9 - 17,1	50 - 61	Entire trees swaying; difficult to walk into wind

Wind force		Wind speed		Effect of the wind
Beaufort	Description	[m/s]	[km/h]	in the inland
8	Gale force wind	17,2 - 20,7	62 - 74	Breaks twigs off trees, walking becomes difficult
9	Gale	20,8 - 24,4	75 - 88	Minor damage to property (chimney tops and roofing tile are blown off)
10	Severe gale	24,5 - 28,4	89 - 102	Trees are uprooted, significant damage to property
11	Violent storm	28,5 - 32,6	103 - 117	Extensive, widespread storm damage
12	Hurricane	32,7 and more	118 and more	Major destruction

20 Interruption of crane operation

20.1 Interruption of crane operation

If the crane operator must leave an equipped crane, then it must be ensured that there is no danger for the crane or its surrounding area in case of an unforeseen event.

WARNING
Risk of fatal injury!
Situations may occur which could cause the crane to become unsafe if left unsupervised.
This could cause the crane to topple over, resulting in major personal injury and property damage.
▶ Always keep the crane under full control!

Incidents which could occur (for example):
– The ground giving way due to severe rain.
– Melting ice under the supports.
– Bad weather, storms, thunderstorms.
– Landslides.
– Wash outs.
– On mobile cranes:
  Support cylinder failure.
– On cranes with telescopic boom:
  Luffing cylinder failure.
– Vandalism.

Make sure that the following prerequisites are met:
– There is no load on the hook.
– The crane poses no traffic obstacle.

Note
▶ If crane work must be interrupted if the crane is equipped, then it must be ensured that measures are initiated in time by trained, qualified personnel, to bring the crane into a safe condition in case something happens.

DANGER
Risk of accident!
- If it is not possible to maintain full control over a rigged crane, the machinery and boom must be taken down.

21 Taking up crane operation again

21.1 Taking up crane operation again

Upon resumption of crane operation, the crane operator is required to check the state of the crane and its safety systems.

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.

22 Ending crane operation

22.1 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.
- On mobile cranes:
  Secure the mobile crane to prevent unauthorized use. Ensure the crane operator's cab and driver cab are not occupied. Lock the crane operator's cab and driver cab.
- On mobile cranes:
  Secure the crane against uncontrolled rolling. See paragraph “Parking the vehicle”.

23 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 a slow driving speed (manoeuvring speed)!
- ▶ Adhere to the national regulations!

24 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:

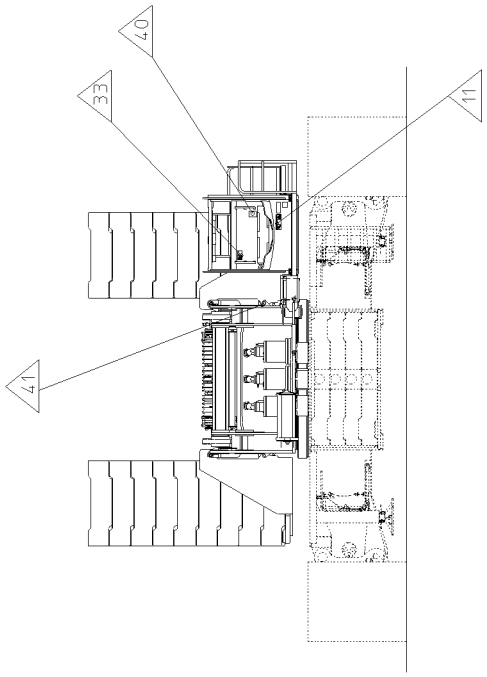
– The vehicle is standing on level ground with sufficient load bearing capacity.
– The parking brake is applied.

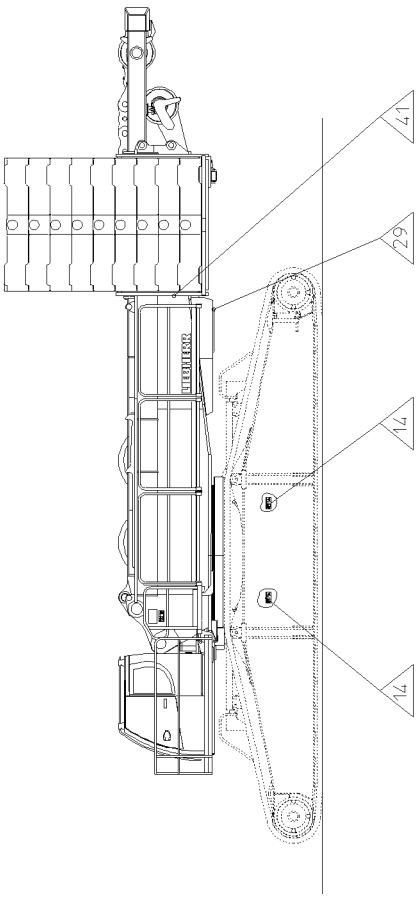
WARNING

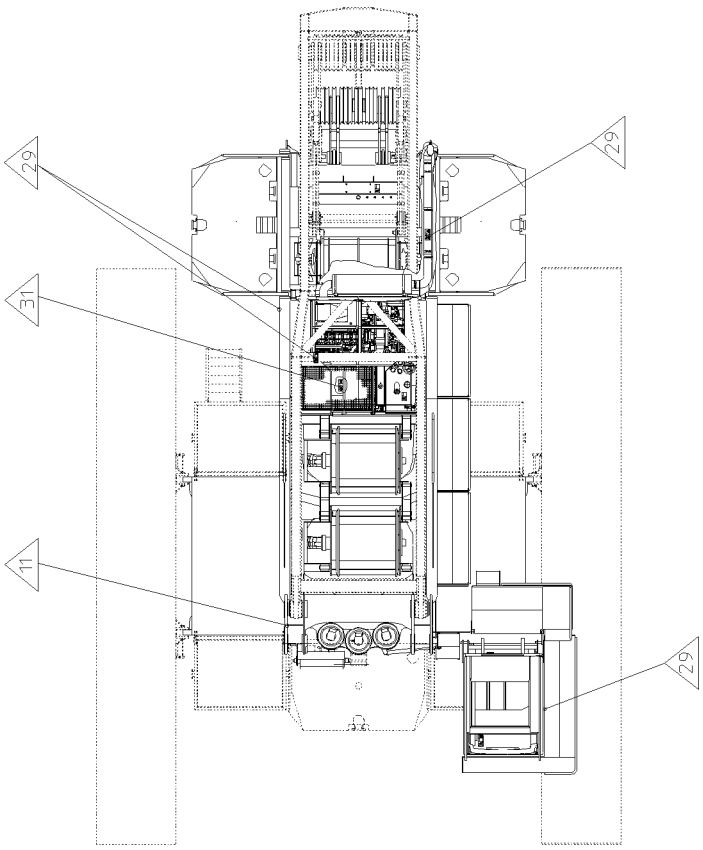
Vehicle can roll off uncontrollably!

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!







B108905

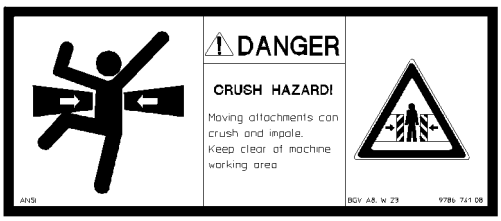
1 Warning signs

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

1.1 Warning of suspended load (position 11)

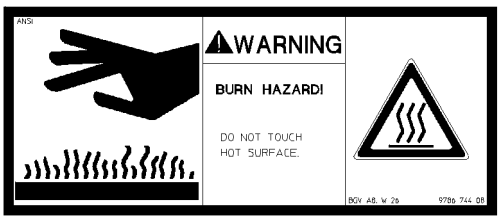
DANGER
Risk of fatal injury under suspended load!
- ▶ Standing under suspended loads is prohibited!
- ▶ Keep away from the working range of the machine!

1.2 Warning of crushing danger (position 14)



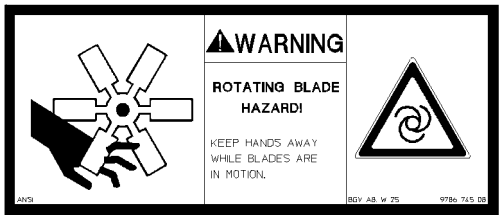
DANGER
Risk of fatal injury!
- ▶ It is prohibited for anyone to remain in areas, where there is a crushing danger!
- ▶ Keep away from the working range of the machine!

1.3 Danger of burning hands (position 29)



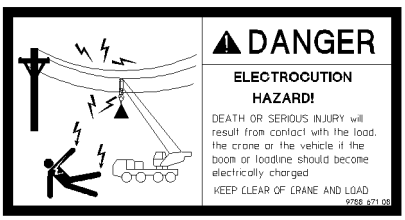
WARNING
Risk of burns!
- ▶ Do not touch hot surfaces!

1.4 Warning of rotating parts (position 31)



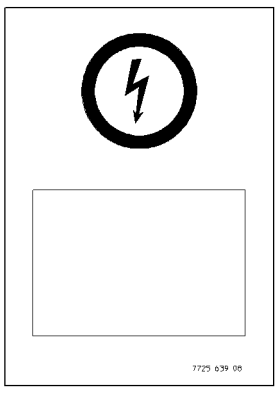
WARNING
Rotating parts!
The rotating fan blade can cause finger and hand injuries!
▶ Keep your hands away from the rotating fan blade!

1.5 Warning of fatal electric shock (position 33)



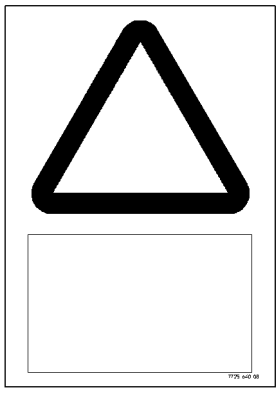
DANGER
Danger of fatal injury due to electric shock!
If the boom or the hoist rope is under electric current, then death or severe injuries can occur if anyone touches the crane, the vehicle or the load!
▶ Keep away from the crane and the load!

1.6 Warning of high voltage (position 40)



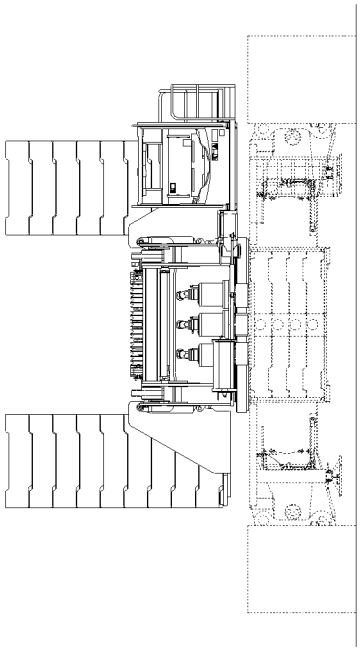
Note
▶ Only for certain countries!

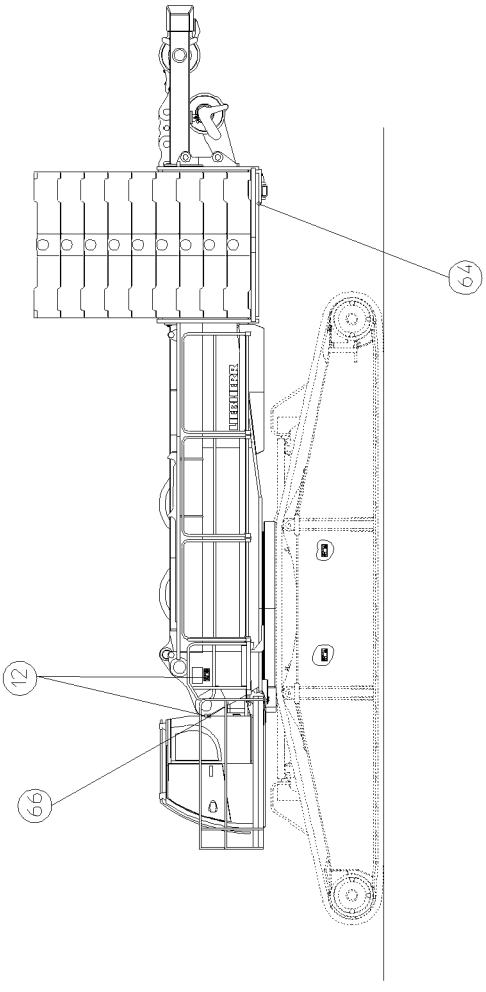
1.7 Slewing range (position 41)

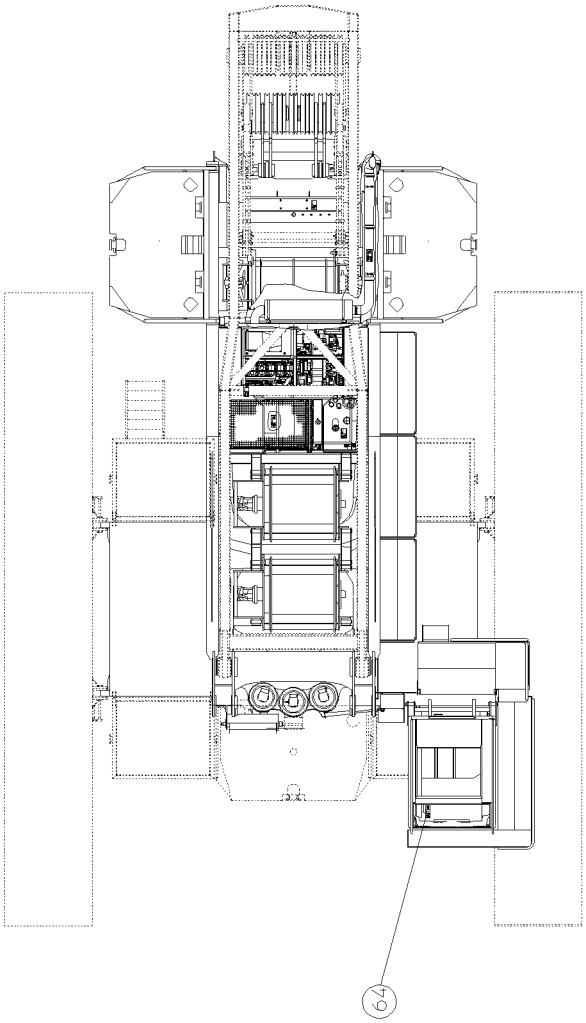


Note

▶ Only for certain countries!







B108906

2 Command and prohibition signs

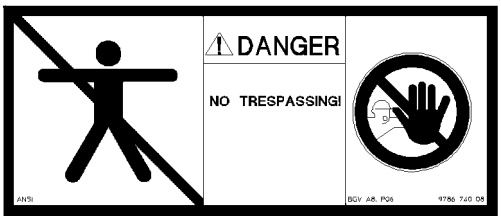
2.1 Command sign

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!

2.2 Prohibition sign

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

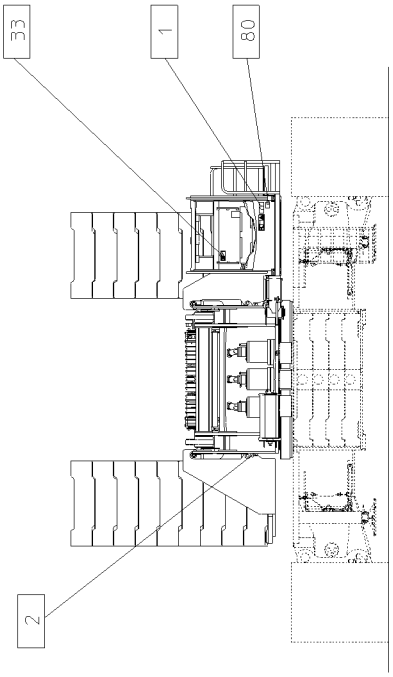
2.2.2 Access to the area is prohibited (position 64)

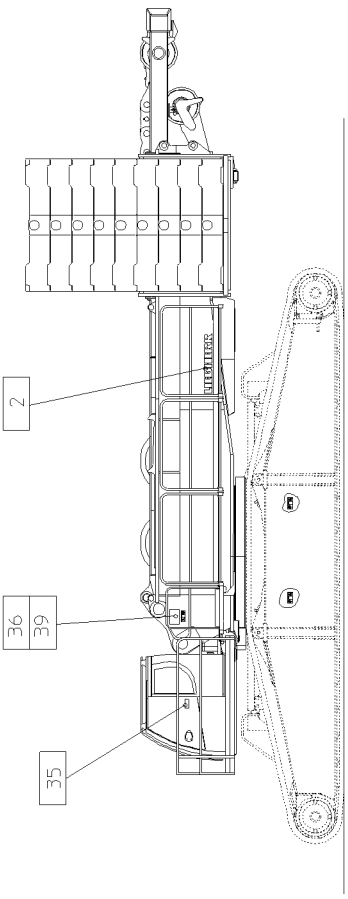
WARNING
Risk of injury!
If the prohibited area is accessed, injuries can occur!
- ▶ Do not access the area!

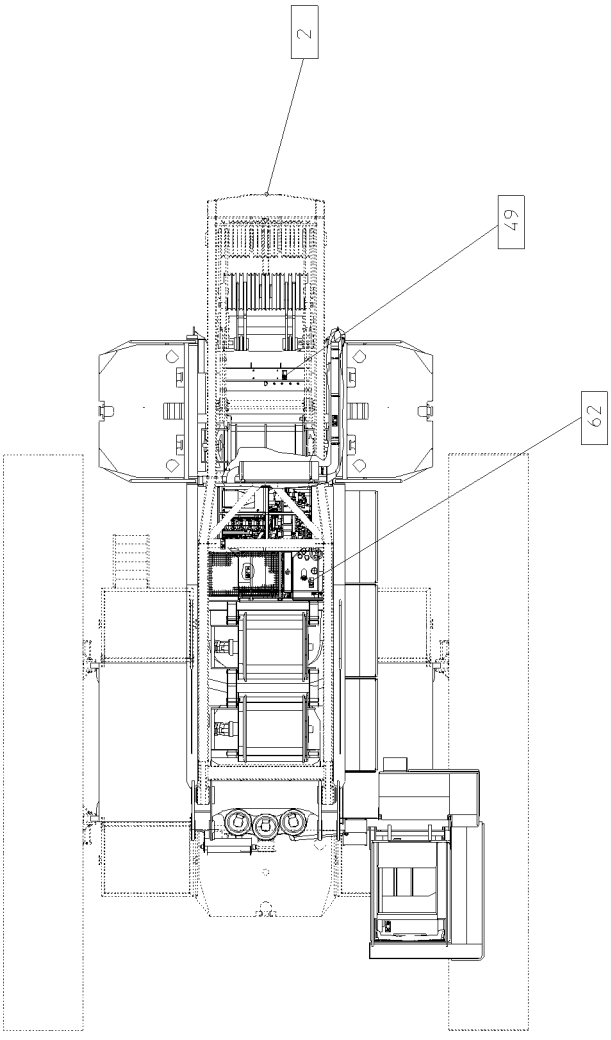
2.2.3 Access prohibited (position 66)

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

blank page!





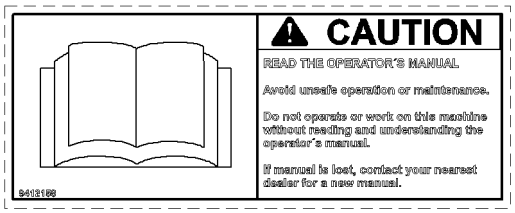


B108907

3 Notice signs

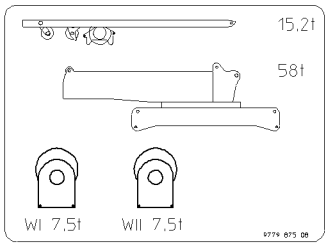
Note
- ▶ Notice signs are signs, which provide additional notes in text form and a pictogram!
- ▶ For that reason, all notice signs on the crane must be complete and always legible!
- ▶ Replace damaged notice signs immediately!

3.1 Read the operating instructions (position 35)

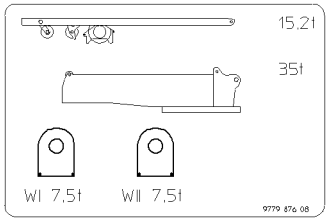


CAUTION
Read and observe the operating instructions!
- ▶ Avoid unsafe operation and dangerous maintenance!
- ▶ The crane may only be operated if the contents of the operating instructions have been read and understood!
- ▶ If the operating instructions are lost, request a new manual from your nearest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

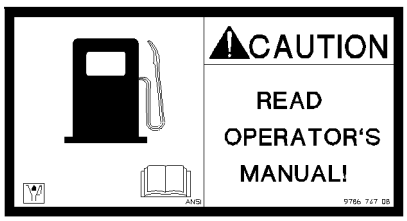
3.2 Transport weights of components (position 36)



3.3 Transport weights of components (position 39)

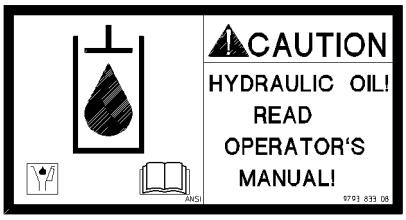


3.4 Notice sign for refuelling (position 49)



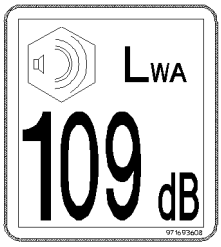
CAUTION
Property damage to the engine!
If the crane is refuelled with fuel not specified in the operating instructions, then engine damage can occur!
▶ Observe the operating instructions!

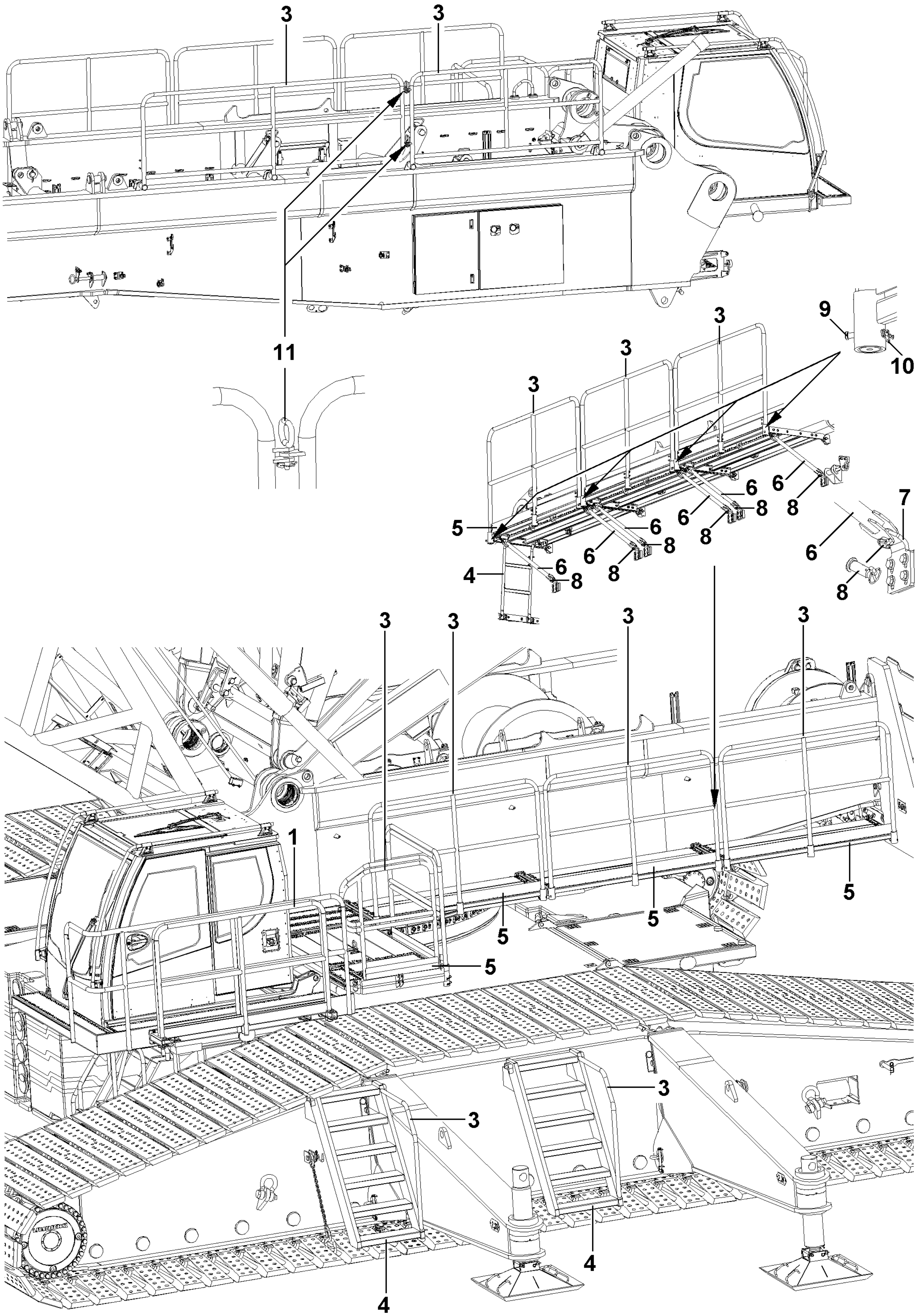
3.5 Notice sign for hydraulic oil tank (position 62)



NOTICE
Damage to hydraulic components!
If oil is added, which does not meet the specifications of the lubrication chart, hydraulic components can be damaged!
▶ When filling the hydraulic oil tank, make sure to add oil according to the lubrication chart!

3.6 Warranted maximum sound output level (position 80)


LWA
109 dB



B105375

1 Antifall guards on the crane

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

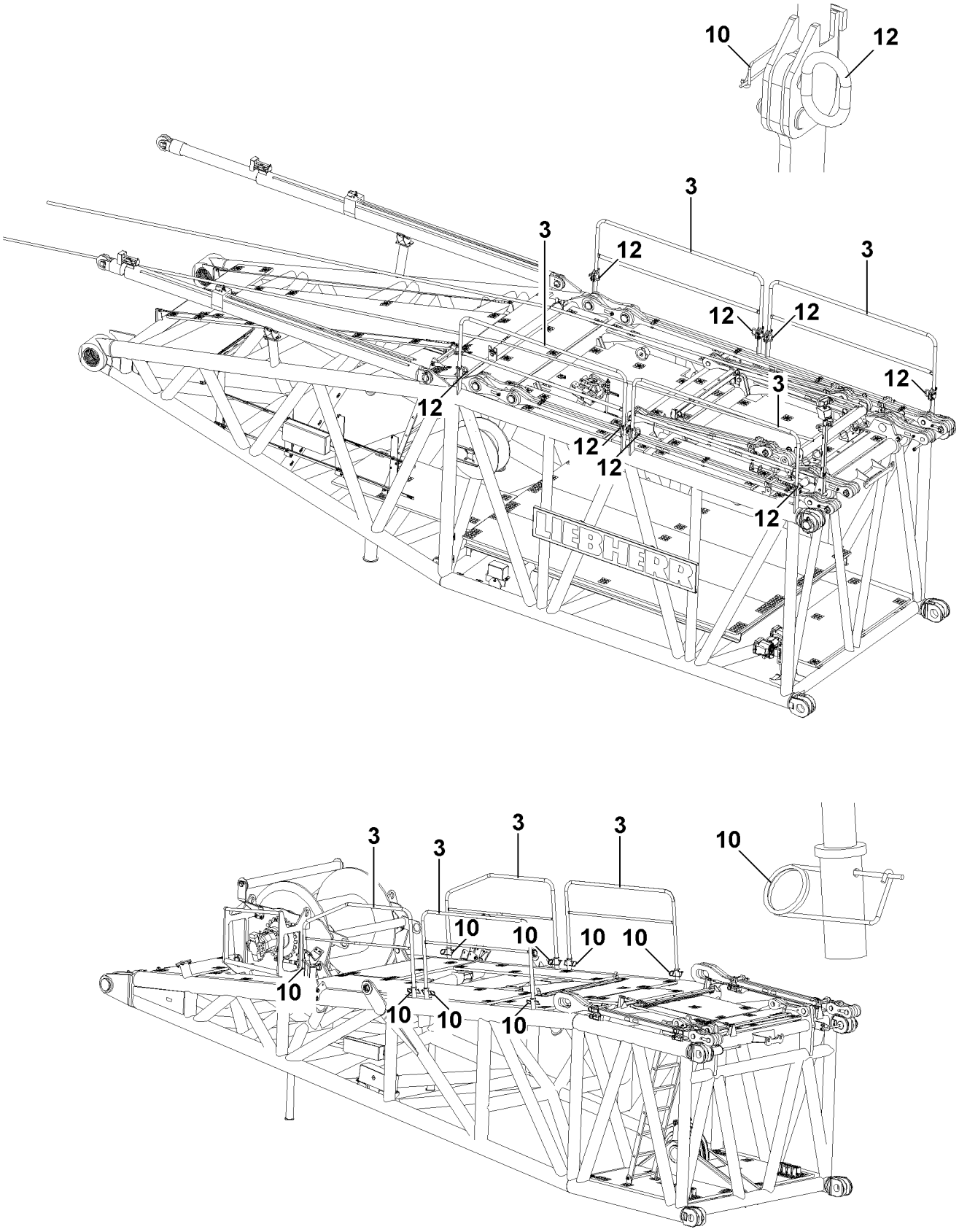
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see crane operating instructions, chapter 2.04!
- ▶ Wear personnel protective equipment and approved catch systems before any assembly / disassembly work, maintenance and inspection work.
- ▶ Only step on such aids with clean shoes!
- ▶ Keep aids clean and free of snow and ice!
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

1.1 Assembling railings, pedestals and ladders

WARNING
Risk of falling!
Before assembly / disassembly work, maintenance and inspection work, the assembly personnel must wear approved catch systems.
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- ▶ For assembly / disassembly work, maintenance work and inspections, install all railings **3**, ladders **4** and pedestals **5** properly, swing in position and secure!
- ▶ Step on ladders **4** only with “clean shoes”.
- ▶ Keep ladders **4** clean and free of snow and ice!
- ▶ Replace damaged ladders immediately!
- ▶ Set up all ladders **4** stable and safe to access.

- ▶ Swing all pedestals **5** in position and supports **6** on retainers **7**.
- ▶ Pin all supports **6** and retainers **7** with pins **8** and secure with folding pins.
- ▶ Assembly the railings **3** on the pedestals **5**.
- ▶ Pin the railings **3** with pins **9** on the pedestals **5** and secure with spring retainers **10**.
- ▶ Assemble the railings **3** on the turntable and pin and secure with pins **11**.


10
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3
3
12
3
12
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12
12
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12
12
LIEBHERR
3
3
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3
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10
10
10
10
10
10
10
10

B105374

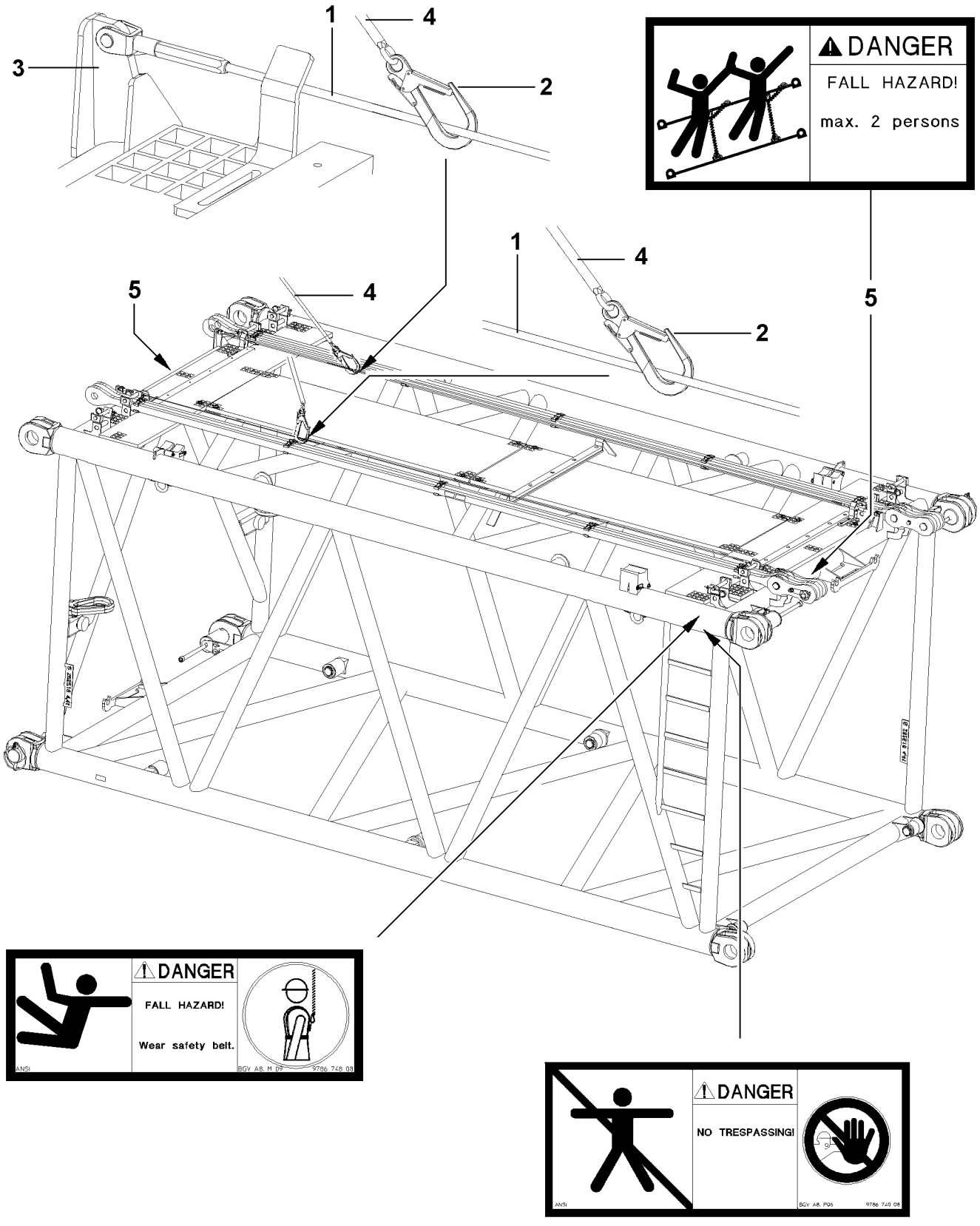
2 Fall guards on pivot sections and lattice mast boom

2.1 Assembling the railing on the S-pivot section and the derrick pivot section

WARNING
Risk of falling!
Before assembly / disassembly work, maintenance and inspection work, the assembly personnel must wear approved catch systems.
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- ▶ For assembly / disassembly work, maintenance work and inspections on the S-pivot section and the derrick pivot section, install all railings **3** and secure.
- ▶ Step on the S-pivot section and the derrick pivot section only with “clean shoes”.

- ▶ Swing the railing **3** on the S-pivot section into position, pin with pins **12** and secure with spring retainers **10**.
- ▶ Push the railings **3** on the derrick pivot section into position and secure with spring retainers **10**.


1
4
3
2
DANGER
FALL HAZARD!
max. 2 persons
1
4
5
4
2
5
DANGER
FALL HAZARD!
Wear safety belt.
DANGER
NO TRESPASSING!

B107341

2.2 Retaining ropes on the lattice sections

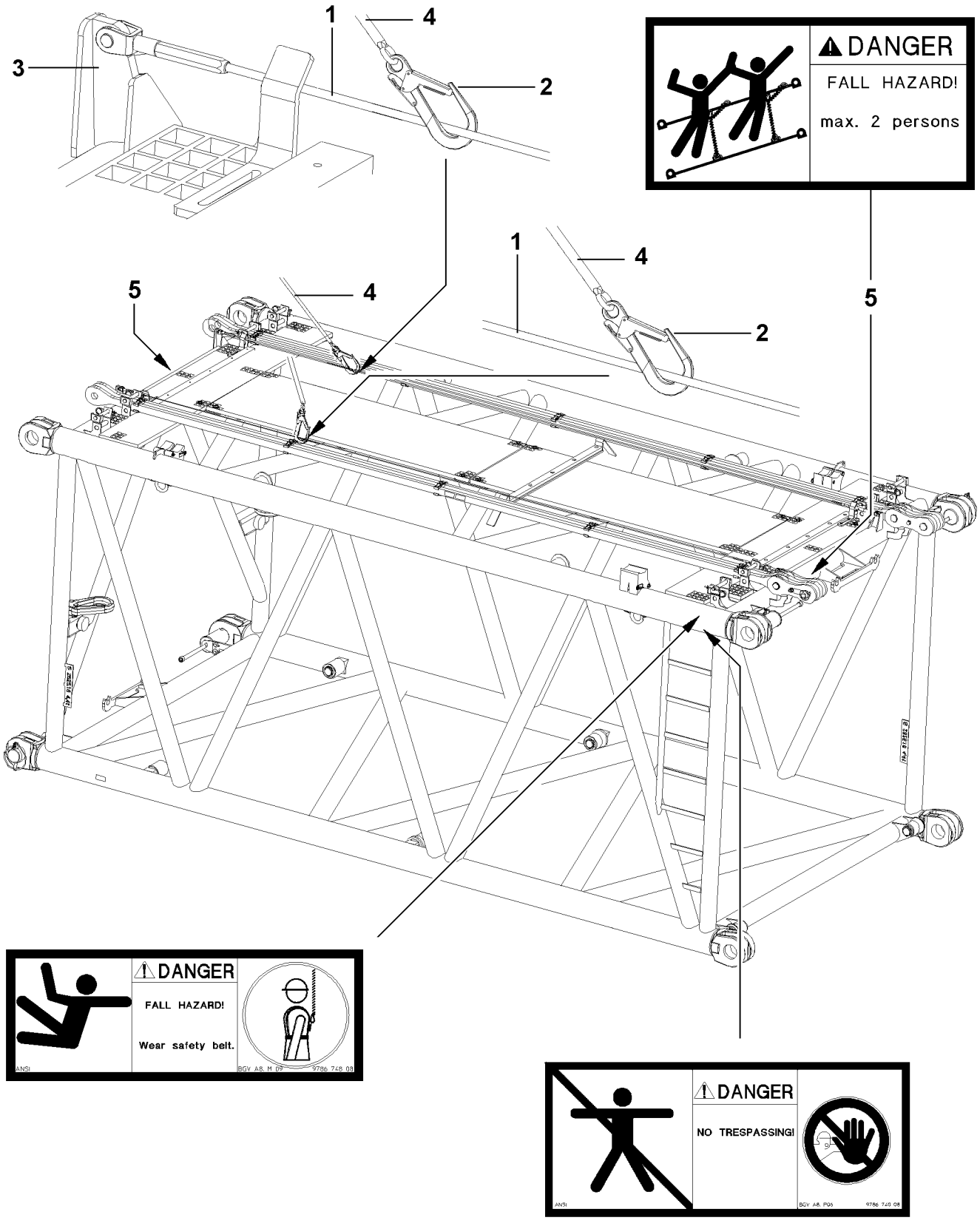
On the lattice sections, on the upper left and right hand side, are retaining ropes **1** assembled as antifall guards.

NOTICE
Danger of damage!
- ▶ Never hang loads or objects on the retaining ropes **1**.

WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems **4** to avoid falling, see Crane operating instructions, chapter 2.04!
- ▶ The assembly personnel must hook themselves for all assembly / disassembly work, maintenance and inspection work on the lattice mast boom with approved catch systems **4** on the retaining ropes **1** on the left and right hand side with both snap hooks **2** and secure themselves to prevent them from falling. (For example: Catch device with self-actuating blocking function and an automatic tension and pull in device for the connectors).
- ▶ The connector must be set to a length as short as possible so that is it impossible to hit the ground in case of a fall!
- ▶ Fall absorbers may not be used, because they stretch too much in case of a fall!
- ▶ On the retaining ropes **1** on the left and right hand side, no more than **maximum two persons** may hook themselves with the snap hooks **2** and secure themselves to prevent falls, see sign **5**!
- ▶ Changing the snap hooks **2** over is only permissible on the connecting points from lattice section to lattice section!
- ▶ When changing the snap hook **2** from lattice section to lattice section, one snap hook **2** must always be hooked on one retaining rope **1**!
- ▶ Never release both snap hooks **2** simultaneously from the retaining ropes **1**!
- ▶ Before any assembly / disassembly work, maintenance and inspection work it must be ensured that all obstacles below have been removed from the work place and that there is sufficient clearance in case of a fall!
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

2.3 Replacing retaining ropes subjected by a fall

WARNING
Danger of accidents due to fall subjected retaining ropes!
If fall subjected retaining ropes **1** are not replaced after a fall, then the retaining ropes can fail in case of another fall! The assembly personnel can be killed or severely injured!
- ▶ **Expert personnel** must immediately replace any retaining ropes **1** which were subjected in a fall and inspect the respective anchor points **3** for damage!
- ▶ If the anchor points **3** are damaged, then they must be replaced immediately by **expert personnel**!


1
4
3
2
DANGER
FALL HAZARD!
max. 2 persons
1
4
5
4
2
5
DANGER
FALL HAZARD!
Wear safety belt.
DANGER
NO TRESPASSING!

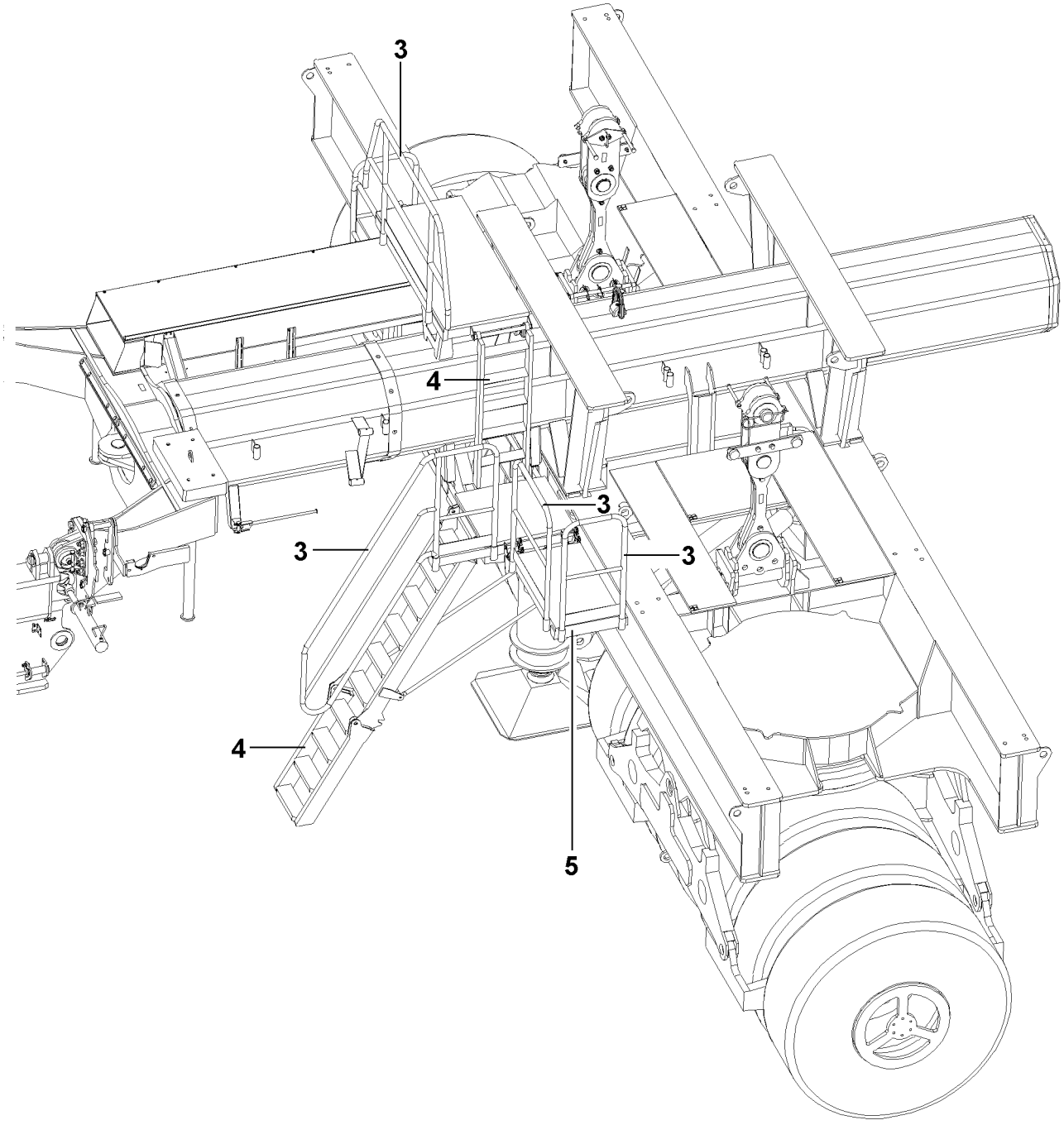
B107341

2.4 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 inspected **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!
▶ Have damaged retaining ropes **1** or anchor points **3** replaced immediately by **expert personnel**!

2.5 Documentation of test results

Note
▶ 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.

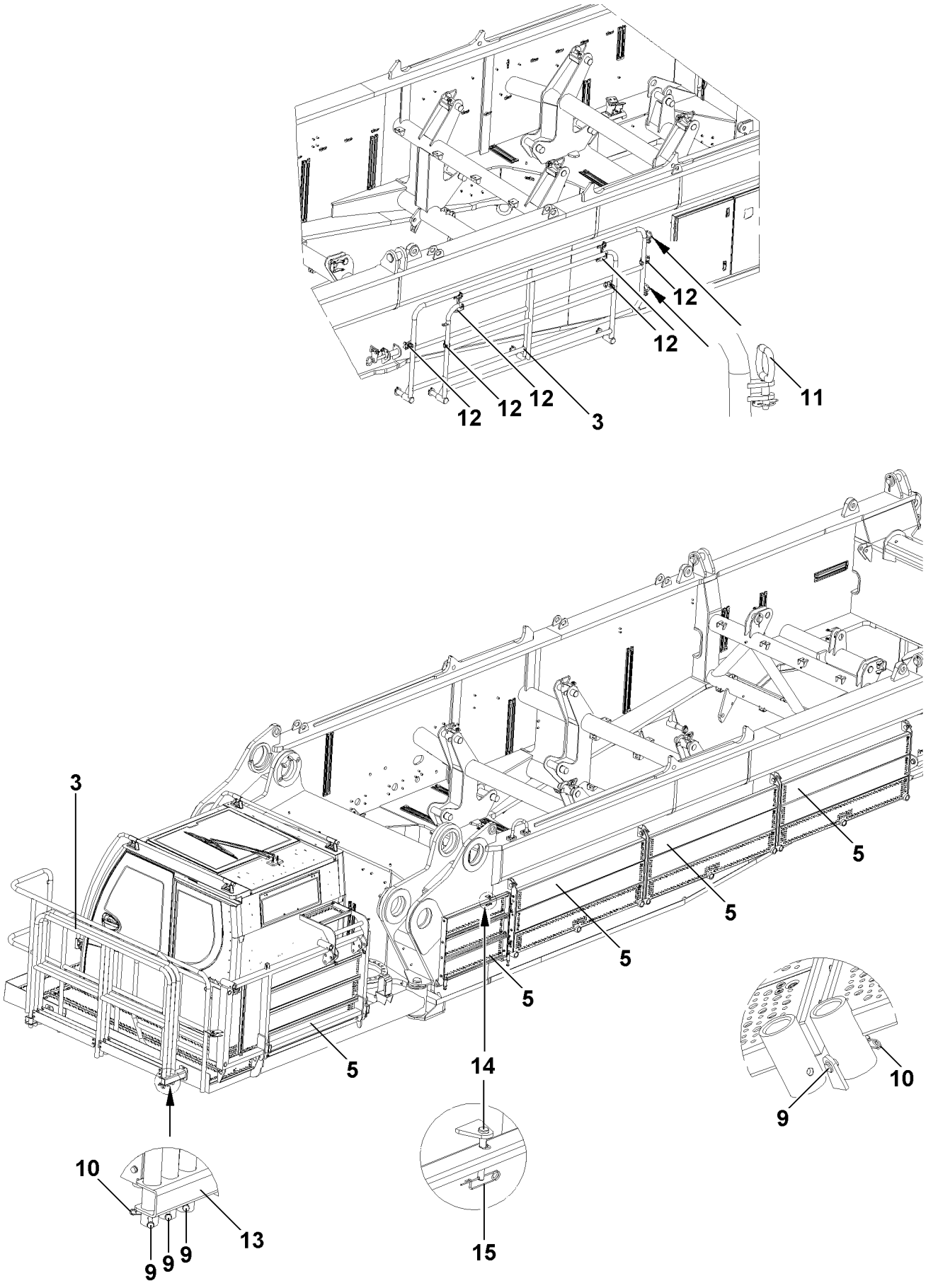


B105377

3 Fall guards on the ballast trailer

WARNING
Risk of falling!
Before assembly / disassembly work, maintenance and inspection work, the assembly personnel must wear approved catch systems.
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- For assembly / disassembly work, maintenance work and inspections, install all railings **3**, ladders **4** and pedestal **5** properly, swing in position and secure!
- Step on ladders **4** only with “clean shoes”.
- Keep ladders **4** clean and free of snow and ice!
- Replace damaged ladders immediately!
- Set up all ladders **4** stable and safe to access.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14
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13
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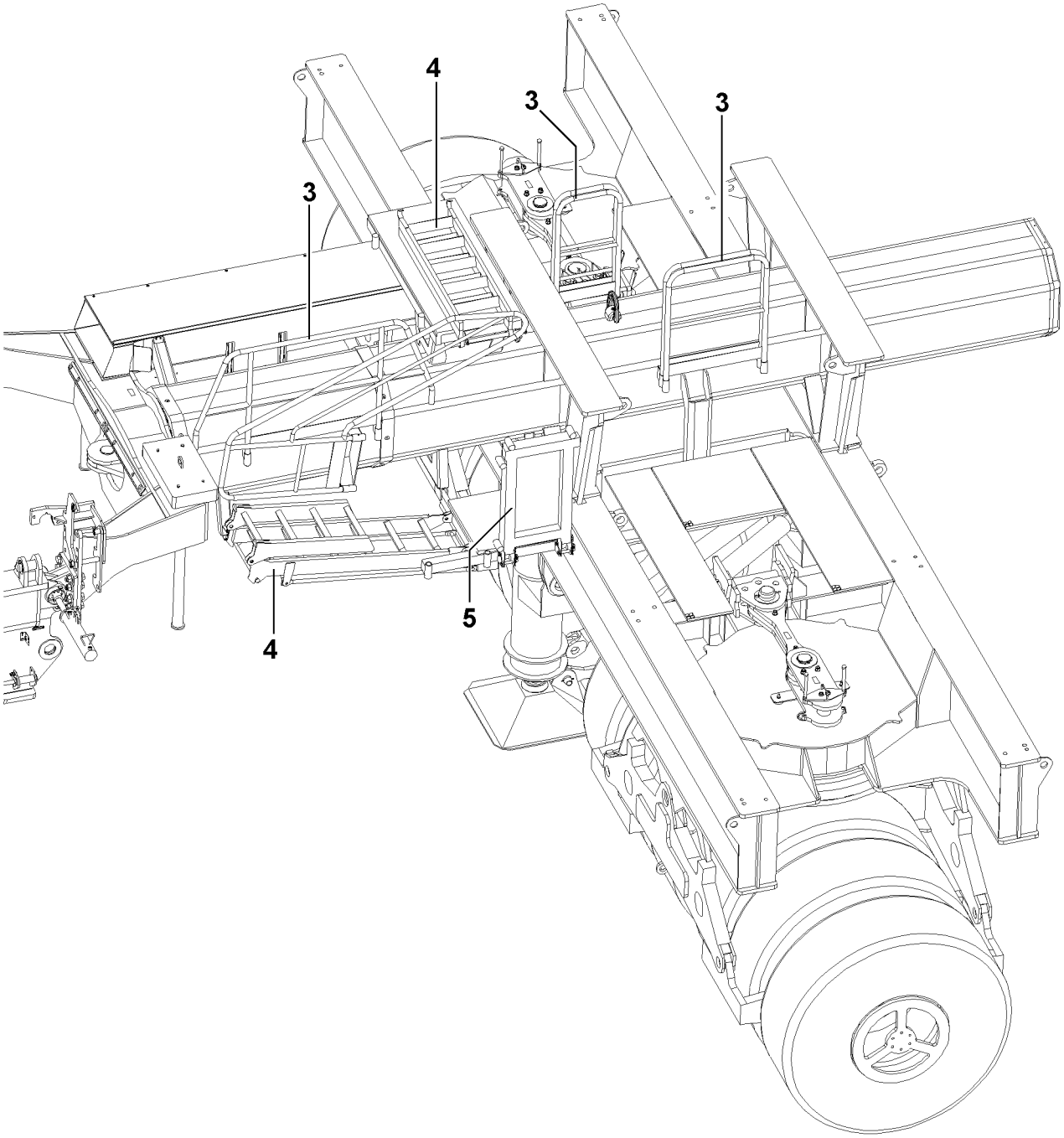
9
9
15
B105379

4 Fall guards on the turntable in transport position

WARNING
Risk of falling!
Before assembly / disassembly work, maintenance and inspection work, the assembly personnel must wear approved catch systems.
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
▶ Wear personal protective equipment and approved catch systems.

4.1 Disassembling railings and pedestals

▶ Attach the corresponding railing **3** in the transport retainers **12** and transport retainers **13** and secure.
▶ Pin and secure the pin **11** with folding pins in park position on the corresponding railing **3**.
▶ Pin the corresponding railings **3** with pins **9** on the transport retainers **13** and secure with spring retainers **10**.
▶ Pin the pedestal **5** “on the front” with pin **14** in transport position and secure with spring retainer **15**.
▶ Pin all others pedestals **5** with pin **9** in transport position and secure with spring retainers **10**.



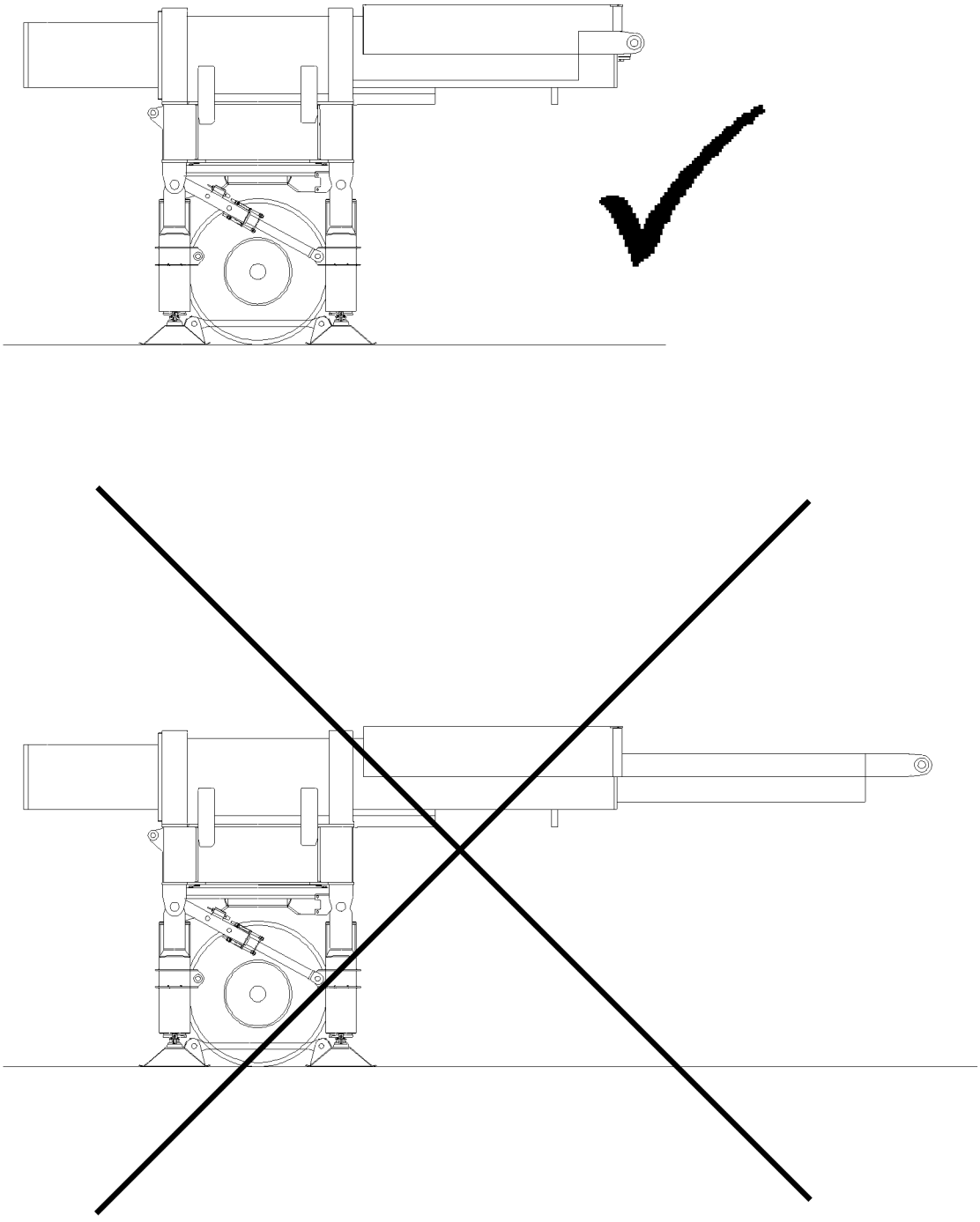
B105378

5 Fall guards on the ballast trailer in transport position

WARNING
Risk of falling!
Before assembly / disassembly work, maintenance and inspection work, the assembly personnel must wear approved catch systems.
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
▶ Wear personal protective equipment and approved catch systems.

5.1 Disassembling railings, ladders and pedestals

▶ Swing all railings **3**, ladders **4** and pedestals **5** in transport position and secure.



B107353

1 Safety guidelines

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

WARNING
Danger of tipping the ballast trailer!
If the following notes are not observed, the freestanding ballast trailer or the ballast trailer which needs to be disassembled can tip over!
Personnel can be severely injured or killed!
- ▶ The ballast trailer may only be parked on level ground of sufficient load bearing capacity!
- ▶ The ballast trailer may only be unpinned from the crane and parked if the ballast trailer guide is fully retracted!
- ▶ The ballast trailer may only be unpinned from the crane and parked if the support cylinders are extended and the tires are relieved!
- ▶ The ballast trailer may only be unpinned from the crane and parked if the strut on the support cylinders is pinned and secured!

WARNING
Mortal danger if the permissible travel speed is exceeded!
If the permissible travel speed is exceeded, the tires can be damaged!
Personnel can be severely injured or killed!
As a result, significant property damage can occur on the crane and on the ballast trailer!
- ▶ The travel speed of the ballast trailer when during or driving with maximum ballast on the tires may be not more than maximum 1 km/h (0.28 m/s)!

WARNING
The crane can topple over if the level of the travel path differs!
Due to impermissible level differences between the ballast trailer route and the crane placement level, the entire crane system can be pulled back suddenly!
The relapse cylinders can run to block position. The relapse cylinders and the boom system can be damaged!
Personnel can be severely injured or killed!
- ▶ Do not exceed or fall below the permissible level difference between the ballast trailer travel path and the crane placement level!
- ▶ The travel path of the crane or the circular path of the ballast trailer must be level and of sufficient load bearing capacity!
- ▶ The permissible level difference of the ballast trailer travel path and crane travel path for “towing” and “parallel driving” may be no more than maximum 250 mm!
- ▶ The permissible level difference of the ballast trailer path and the crane travel path in relation to the crane travel path for circular driving may be no more than maximum 250 mm - based on a constant uphill incline or constant downhill incline on a 90° turning range!

WARNING
The crane can topple over!
If the following notes are not observed, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ When lifting or lowering the ballast trailer, pay attention to the horizontal alignment of the ballast trailer!
- ▶ The assembly or disassembly work must be carried out according to the crane operating instructions, chapter 5.35!

NOTICE
Danger of damage to the crane and the ballast trailer!
Due to steering movements on the crawler tracks while driving parallel, the crane and the ballast trailer can be significantly damaged!
- ▶ When driving parallel, steering the crawler tracks is prohibited!
- ▶ When driving parallel, the side tire distortion on the wheel sets must be observed by an instructed person over the entire travel route of the crane. If the tires distort by more than 100 mm, then the position of the wheel sets must be corrected!

Note
General safety technical guidelines!
- ▶ The ballast trailer guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods!

2 Inspection of tires and disk wheels

Note
- ▶ See Crane operating instructions, chapter 8.01!

WARNING
Mortal danger when using non-approved tires!
Due to the use of tires, which are not explicitly approved by **LIEBHERR-Werk Ehingen GmbH**, uncontrollable operation conditions on the ballast trailer can occur due to the heavy load!
The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged!
Personnel can be severely injured or killed!
- ▶ Use only spare tires which have been approved in writing by **LIEBHERR-Werk Ehingen GmbH**!
- ▶ Using spare tires which have been not explicitly approved in writing by **LIEBHERR-Werk Ehingen GmbH** is prohibited!

NOTICE
Damage to tires!
Due to external environmental influences (for example: rain, wind, snow, frost, sun exposure) and the great weight load on the tires by the ballast trailer, the tires can become porous and the body can loose its original strength!
- ▶ The tires must be replaced according to the data of the tire manufacturer at least after 5 years, or if an expert representative of the tire manufacturer states in writing, after extensive inspection of the tires, that the tires can be utilized for an additional operation period stated by the expert representative!

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

2.1 Tires with air inflation

It is imperative to comply with the following instructions:
- – After extended downtime, the inflation pressure must be checked before using the ballast trailer.
- – The tires must be protected against UV rays during extended downtimes with tarps or wooden boards.

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

WARNING
Risk of accident due to damaged ballast trailer tires!
Due to extended downtime of the crane, when the ballast trailer tires are not relieved with supports, the tires can get out of round!
As a result, the tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged!
Personnel can be severely injured or killed!
- ▶ During extended downtimes, the ballast trailer tires must always be relieved by the outrigger supports!

WARNING
Risk of accident due to damaged ballast trailer tires!
When driving the crane on insufficiently prepared ground, the tires can become damaged or punctured by large rocks or other foreign matter!
As a result, the ballast trailer as well as the crane can be significantly damaged!
Personnel can be severely injured or killed!
- ▶ The travel route of the crane or the ballast trailer must be level, of sufficient load bearing capacity and free of rocks or other foreign matter!
- ▶ The travel route of the crane must be walked off personally in advance by the crane operator!
- ▶ Rocks and other foreign matter on the travel route must be removed before starting to travel!
- ▶ If the crane operator cannot ensure that the ballast trailer tires may not be damaged when moving the crane, then the ballast trailer tires must be foamed with a special foam approved by **LIEBHERR-Werk Ehingen GmbH**. Contact **LIEBHERR-Werk Ehingen GmbH** in this regard!
- ▶ If you decide to foam the ballast trailer tires, then ballast trailer operation is only permissible if all tires of the ballast trailer have been foamed according to the specifications of **LIEBHERR-Werk Ehingen GmbH**!

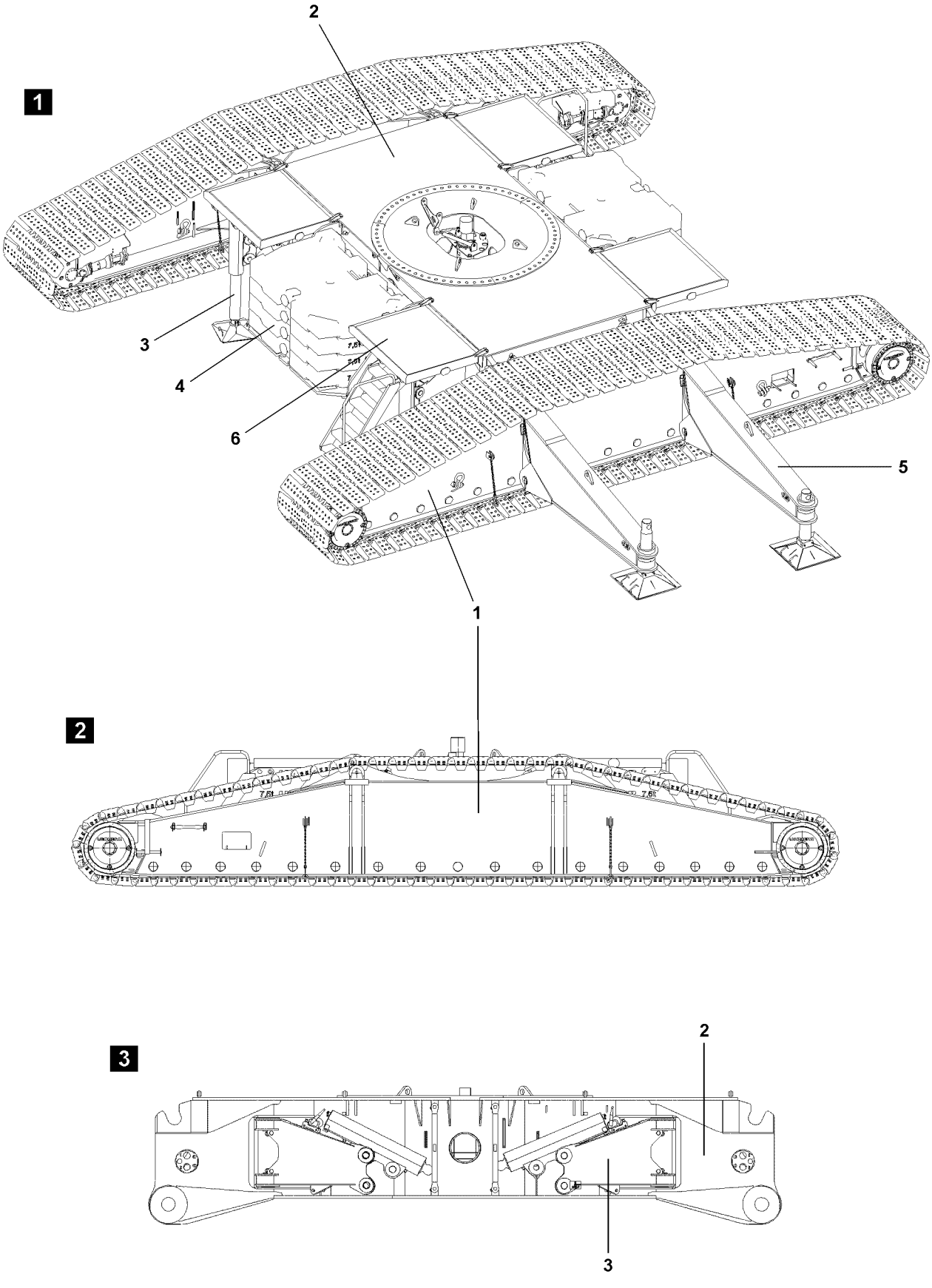
2.2 Tires foamed with special foam

The tires of the ballast trailer are foamed with a special, high quality foam.
It is imperative to comply with the following instructions:
- – Relieve the tires on the ballast trailer if it is at a standstill for more than 2 h via the support cylinders.
- – The tires must be protected against UV rays during extended downtimes with tarps or wooden boards.

WARNING
Mortal danger when using non-approved tire foams!
Due to the use of tire foams, which are not explicitly approved by **LIEBHERR-Werk Ehingen GmbH**, uncontrollable operation conditions on the ballast trailer can occur due to the heavy load!
The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged!
Personnel can be severely injured or killed!
- ▶ Use of spare tires filled with water, air or special foam of lower quality is prohibited!
- ▶ Using spare tires which have been not explicitly approved in writing by **LIEBHERR-Werk Ehingen GmbH** is prohibited!

WARNING
Danger of accidents due to retreaded tires!
If tires foamed with the special foam are retreaded, the usage properties can be significantly changed negatively!
The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged!
Personnel can be severely injured or killed!
- ▶ Tires which are filled with special foam may not be retreaded, except if a written approval has been issued by the tire manufacturer!

3.00 Crane assembly



B108929

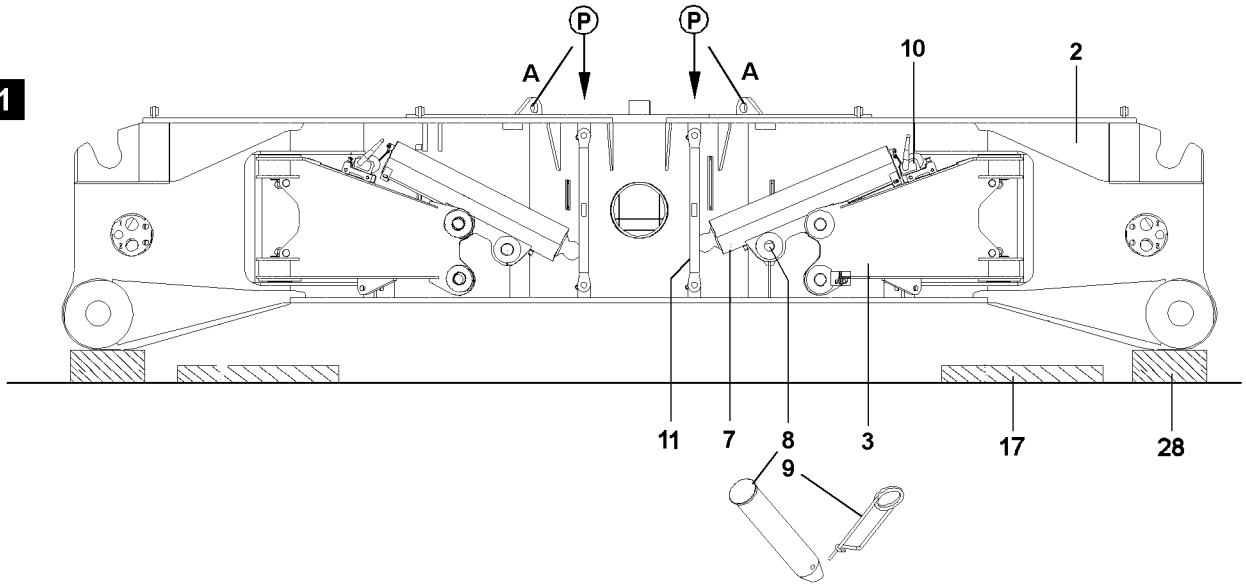
1 Component overview crawler travel gear

1 Crawler carrier with track pads
2 Crawler center section with rotary connection
3 Hydraulic assembly supports
4 Central ballast
5 Mechanical auxiliary support
6 Catwalks

2 Dimensions and weights

Note
▶ See Crane operating instructions, chapter 1.03!

1



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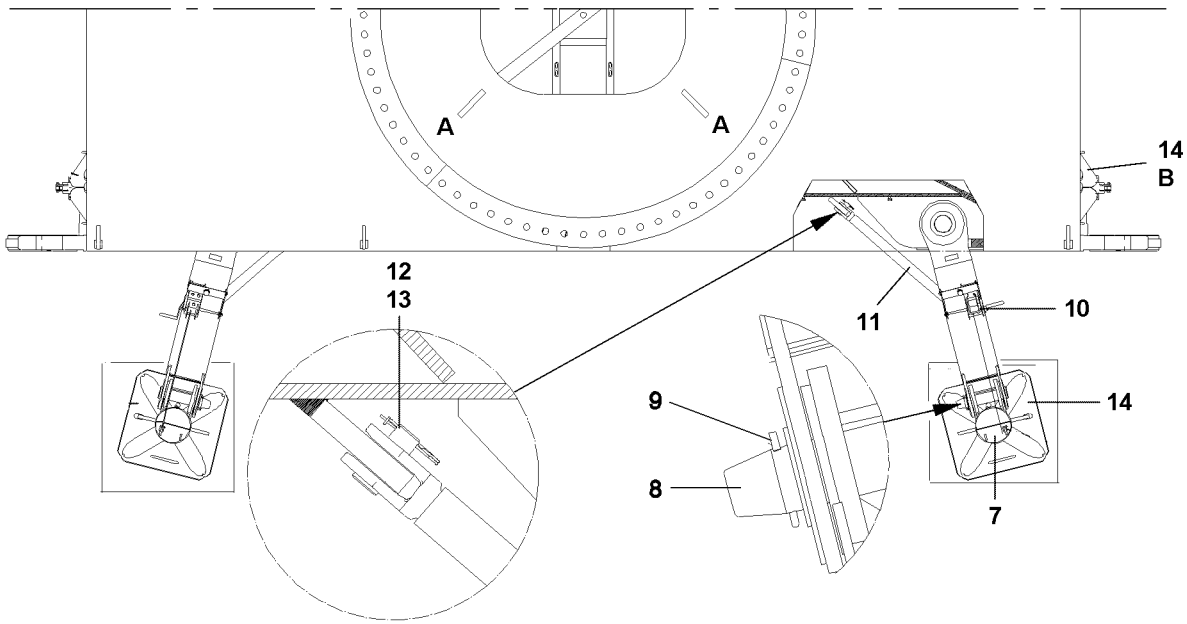

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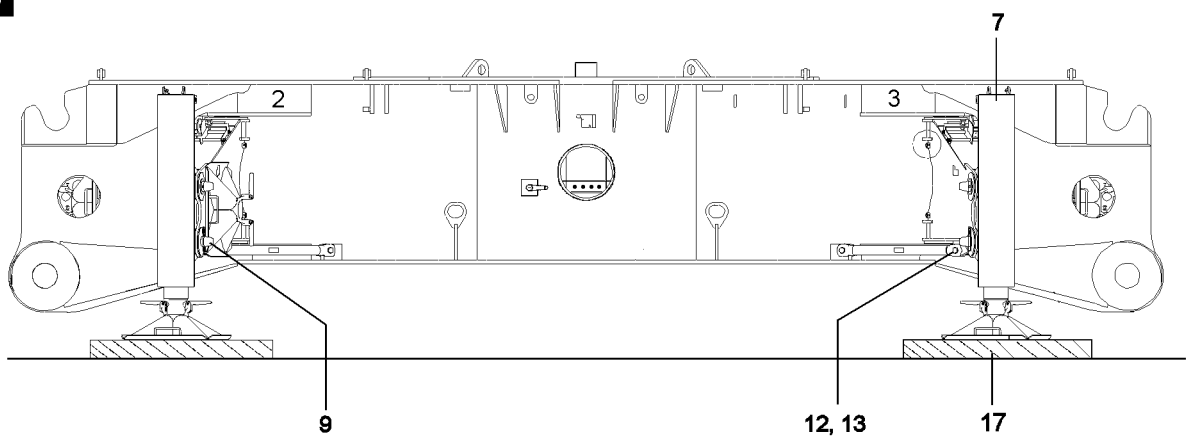


B107164

3 Assembling the assembly supports

Make sure that the following prerequisites are met:
– an auxiliary crane with sufficient load carrying capacity is available,
– the placement location must be level and have adequate load-bearing capacity.

3.1 Supporting the crawler center section

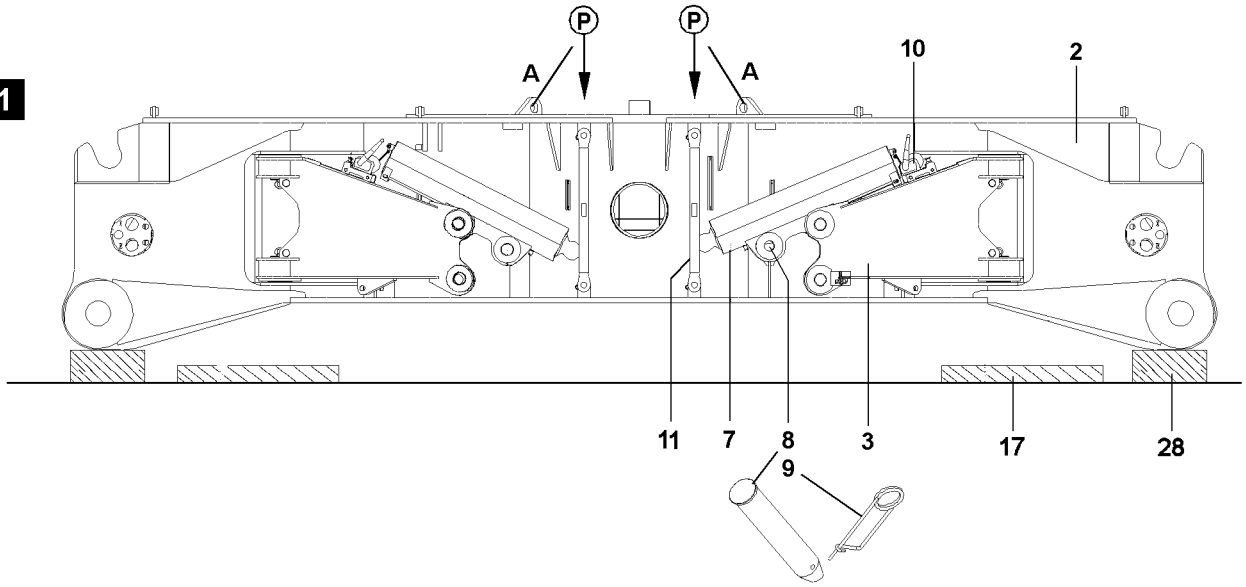
WARNING
Risk of accidents due to improper support!
If the crawler center section is not properly supported from below, it can sink into the ground and severely injure personnel!
▶ The supporting base must be able to safely take on the weight of the crawler center section, the turntable and the crawler carrier!
▶ The supporting base must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04 in the crane operating instructions!

Ensure that the following prerequisite is met:
– suitable material must be available for the supporting base of the crawler center section.

Note
▶ The supporting base **28** must be high enough so that the support pads **14** with supporting base **17** fit under the vertically positioned hydraulic cylinders **7**.
▶ Support the crawler center section **2** with hardwood timbers (or other suitable materials) from below!

▶ Attach the tackle on the four attachment brackets **A**.
▶ Lift the crawler center section **2** with the auxiliary crane and set it onto the support **28**.

1



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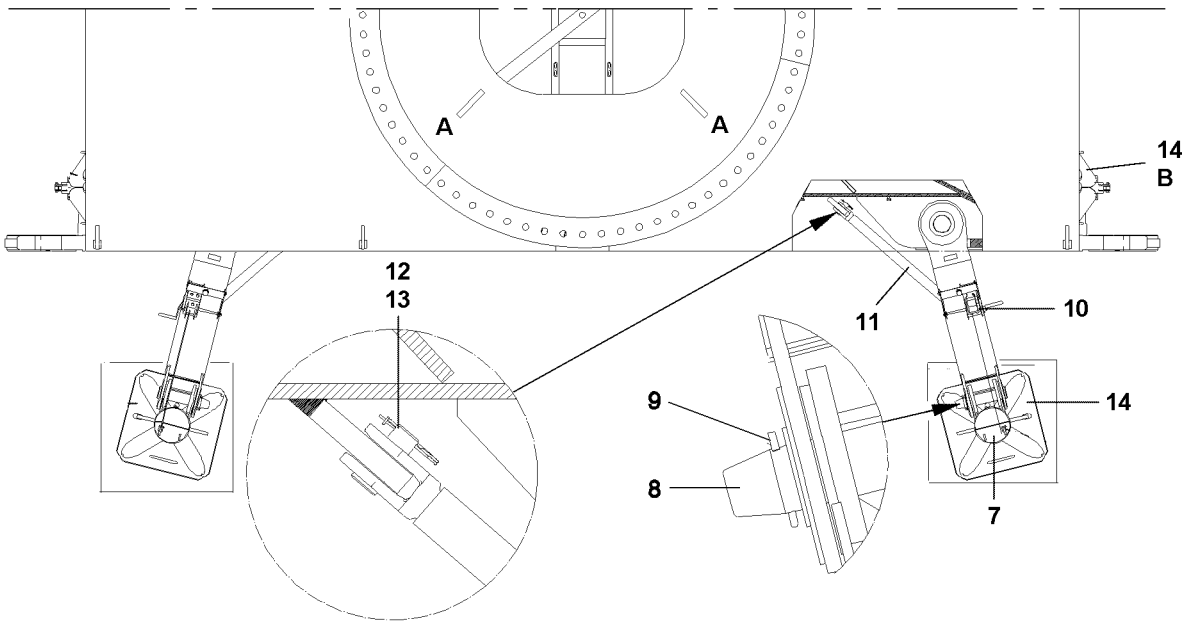

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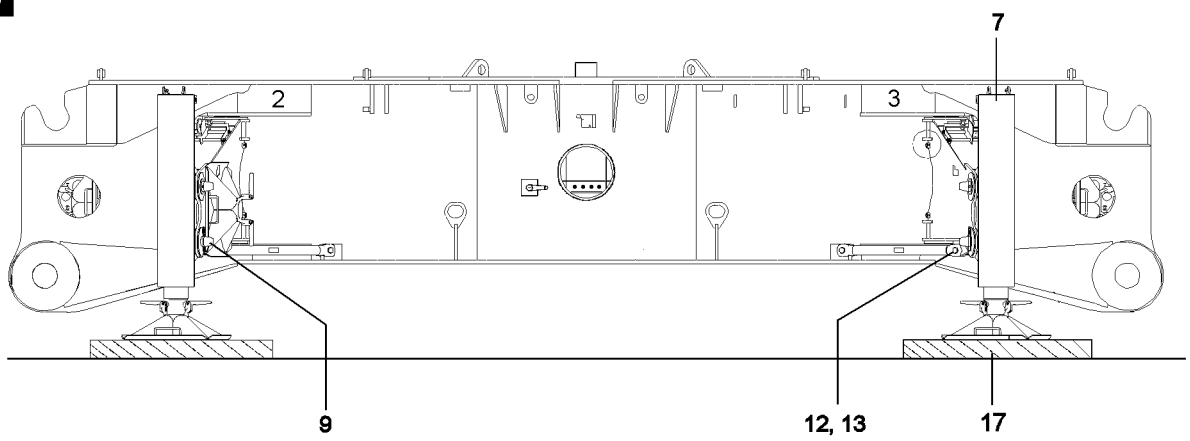


B107164

3.2 Assembling the assembly supports

Note

▶ For the assembly of the crawler carriers with the SA-frame, the turntable must be assembled, see crane operating instructions chapter 3.02!

The swinging out and locking procedure of the assembly support is the same for all four assembly supports and is therefore described only once.
Ensure that the following prerequisite is met:

– the rope for the rope winch **10** is secured on the eyehook on the hydraulic cylinder **7**.

▶ Unpin the pins **8**: Remove the spring retainer **9** and unpin the pin **8**.

Before the rope winch **10** can be put into operation, the spring latch must be pulled and the rope winch **10** must be pushed to the side until the crank can be rotated freely and the spring latch engages again by itself.

▶ Pull the spring latch up and hold.

▶ Push the rope winch **10** in direction of the crank to the outside until the spring latch engages again by itself.

Result:

– The rope winch is locked in operating position.

▶ Lift the hydraulic cylinder **7** from the transport retainer by spooling up the rope winch **10**.

▶ Swing the assembly support **3** out.

▶ Remove the brace **11** from the transport position **P**: Remove the spring retainer **13** and unpin the pin **12**.

▶ Pin the brace **11** on the crawler center section and on the assembly support: Pin in the pin **12** and secure with spring retainer **13**, see illustration **2** and illustration **3**.

▶ Spool out the rope winch **10** and lower the hydraulic cylinder **7**.

▶ Pin the hydraulic cylinder **7** on the assembly support **3** on the bottom: Pin in the pin **8** and secure with spring retainer **9**.

WARNING

Risk of accidents due to improper support!

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

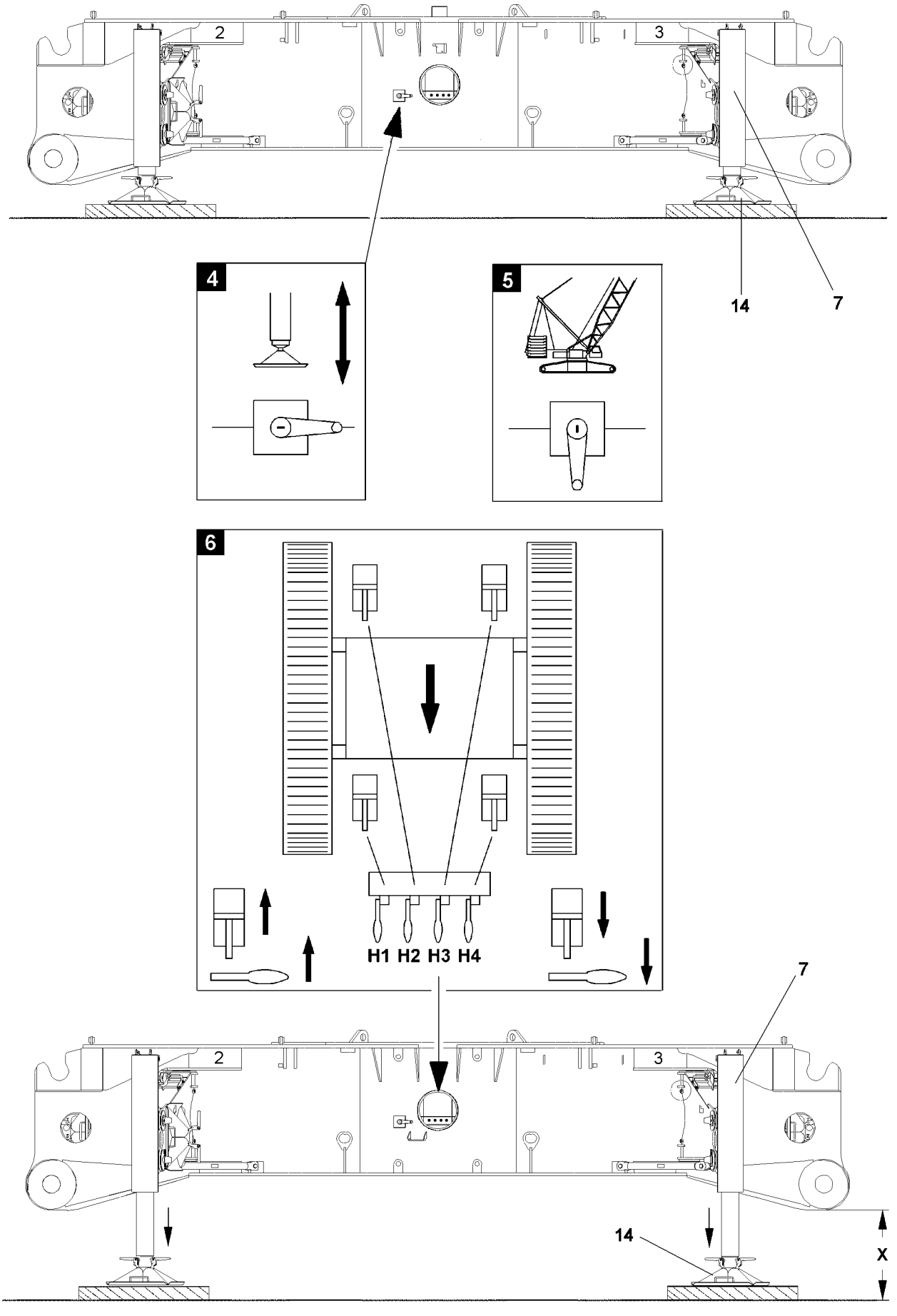
▶ The supporting base must be able to safely take on the weight of the crawler center section, the turntable and the crawler carrier!

▶ The supporting base must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04 in the crane operating instructions!

▶ Take the support pads **14** from the transport retainer **B** and place them on the supporting bases **17**.

▶ Align the support pads **14** to the hydraulic cylinders **7**.

▶ Establish the hydraulic connections from the hydraulic aggregate of the pin pulling device to the hydraulic cylinders **7**, see chapter 5.30 in the crane operating instructions.



B108933

3.3 Lifting the crawler center section

Make sure that the following prerequisites are met:
- the assembly supports are locked with braces,
- the hydraulic cylinders are pinned and secured,
- the support pads are properly supported,
- the ball cock is set to “assembly support”, see illustration **4**.

Ball cock positions	
Illustration 4	Assembly support
Illustration 5	Crane operation / crawler carrier installation with SA-frame

Function assignment of manual levers for the support cylinders	
H1	Manual lever for hydraulic cylinder, right front
H2	Manual lever for hydraulic cylinder, right rear
H3	Manual lever for hydraulic cylinder, left rear
H4	Manual lever for hydraulic cylinder, left front

▶ Turning the hydraulic aggregate on with the pin pulling device.

▶ Actuate the manual lever and enter the hydraulic cylinder **7** into the receptacle of the support pads **14**.

▶ Close the receptacle.

Note

▶ Lift the crawler centre section so that the crawler carrier can be assembled without restriction!

▶ Move the hydraulic cylinders out evenly!

▶ Actuate the hand lever **H1**, hand lever **H2**, hand lever **H3** and hand lever **H4**.

Result:

– The four hydraulic cylinders **7** move out.

WARNING

Risk of tipping the crawler center section!

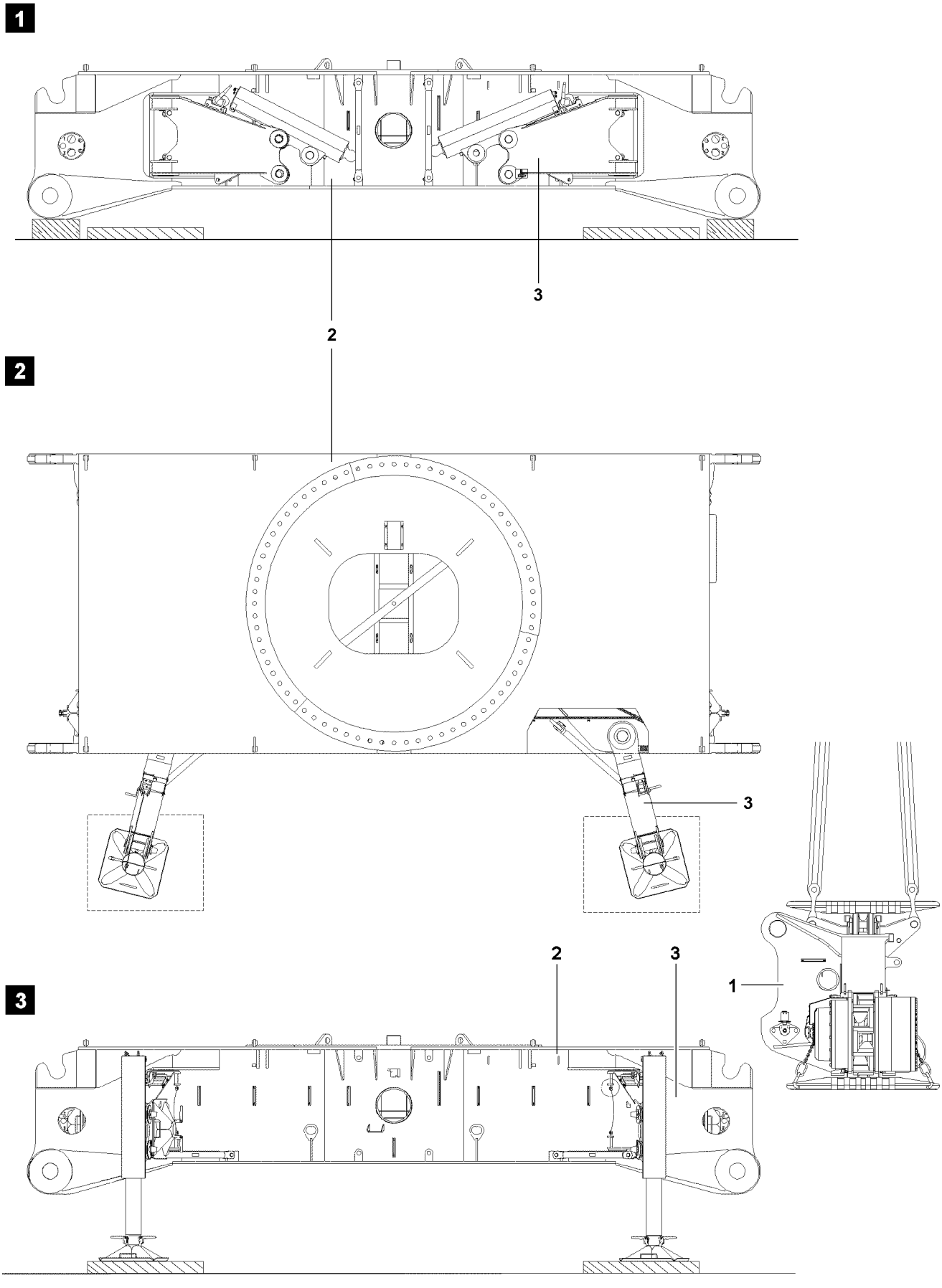
If the hydraulic cylinder **7** are moved out unevenly, the crawler center section can tip over!

Personnel can be severely injured!

▶ When lifting the crawler center section, pay attention to the horizontal alignment, check visually!

▶ After supporting and aligning the crawler center section, set the ball cock to “Crane operation / crawler carrier installation”, see illustration **5**.

▶ Turning the hydraulic aggregate off with the pin pulling device.



B106601

4 Assembly / disassembly of the crawler carrier with the auxiliary crane

4.1 Assembly of crawler carrier with the auxiliary crane

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

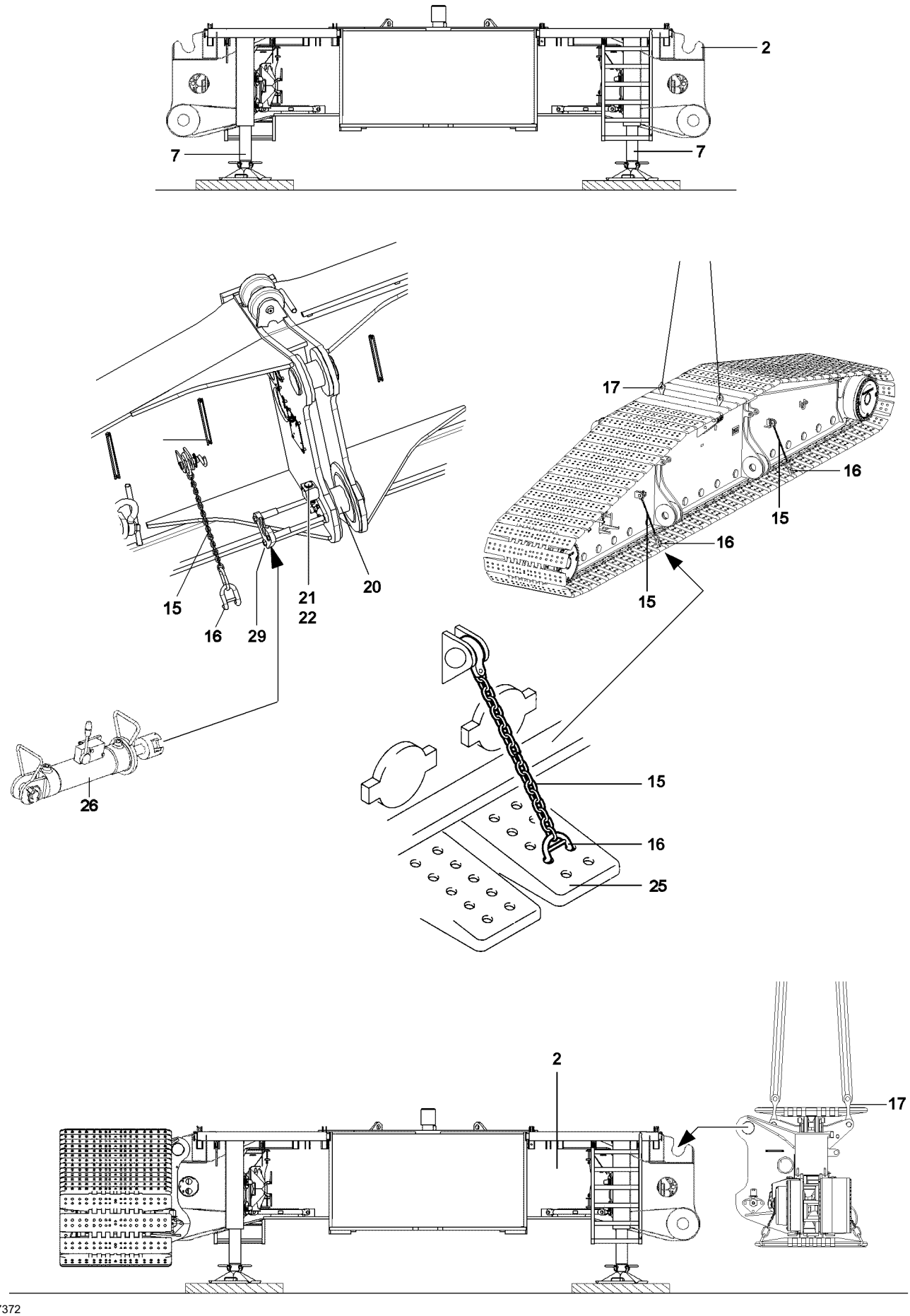
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see chapter 2.04 of the crane operating instructions!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

WARNING
Danger of crushing!
While assembling / disassembling crane components, body limbs can be crushed or severed by the swing movement of components!

- ▶ Make sure that the components do not swing back and forth during assembly!

Make sure that the following prerequisites are met:

- an auxiliary crane with sufficient load carrying capacity is available,
- the assembly supports are assembled,
- the crawler center section is raised: the support cylinders are move out.



B107372

4.1.1 Preparing the crawler carrier for assembly

Note
▶ Attach **two** chains **15** per crawler carrier side!

The track pads **25** must be secured before assembly of the crawler carriers with the chains **15** to prevent sag.
▶ Hang in the chains **15** with the bars **16** on the track pads.

Note
▶ The lugs **27** must be swung between the track pads **25**, “upward”!

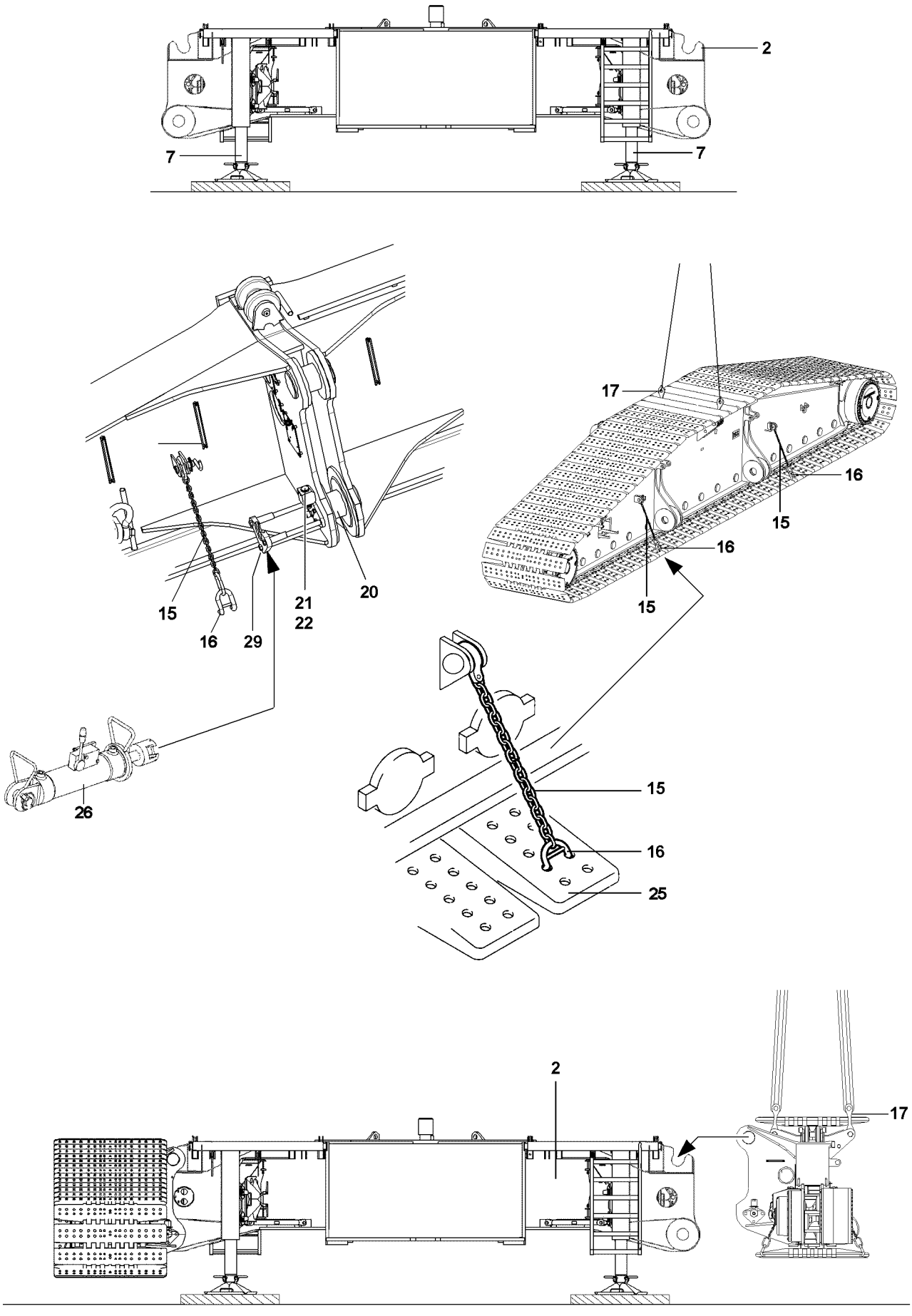
▶ Swing the lugs **27** upwards.

4.1.2 Assembling the crawler carrier

Note
▶ For assembly of the crawler carrier with the auxiliary crane, the turntable is not yet assembled!
▶ Note the identification on the crawler carrier and the crawler center section!
▶ The crawler carrier and the crawler center section are marked with numbers!

WARNING
Risk of accidents due to improper support!
If the crawler center section is not properly supported from below, it can sink into the ground and severely injure personnel!
▶ The supporting base must be able to safely take on the weight of the crawler center section, the turntable and the crawler carrier!
▶ The supporting base must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04 in the crane operating instructions!

Make sure that the following prerequisites are met:
– the track pads are secured with chains **15** to prevent them from hanging down,
– the pin pulling cylinder **26** is connected on the hydraulic aggregate.



B107372

Note

- For assembly of the crawler carrier on the crawler center section, the assembly installation and the process for both crawler carrier sides is identical!
- For that reason, the assembly of the crawler carrier is only described for one side as an example!

- Attach the attachment equipment on the lugs **27** of the crawler carrier.
- Swing in the crawler carrier with the auxiliary crane carefully to the pin points on the crawler center section **2**.
- Hang in the crawler carrier on the crawler center section **2** on top.
- Insert the pin pulling cylinder **26** into the pin pulling device.

NOTICE

Danger of property damage!

If the following notes are not observed, the pin pulling device can be damaged!

- The retaining pin **21** must be secured in the upper position with the spring retainer **22**!

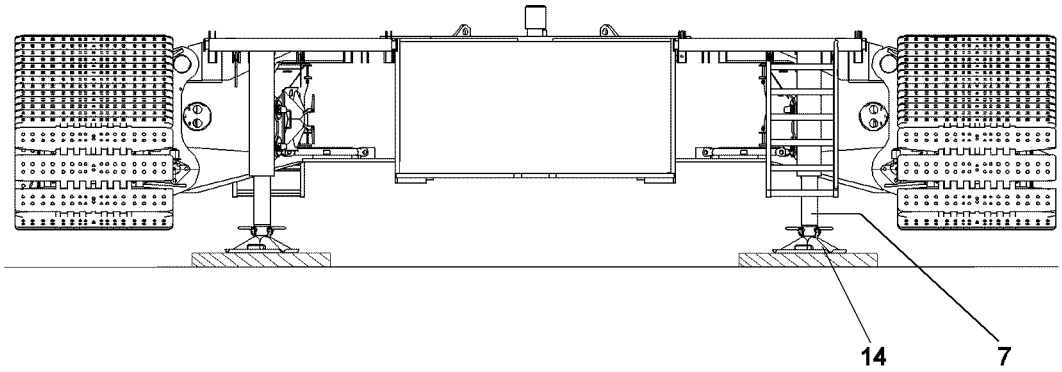
- Pin in the pin **20** with the pin pulling cylinder **26** and secure with retaining pin **21**.
- Secure the retaining pins **21** with spring retainers **22**.
- Remove the attachment equipment.

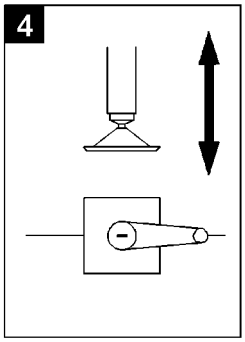
NOTICE

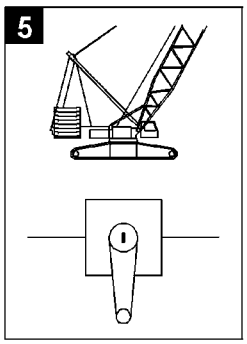
Damage to the lugs **17**!

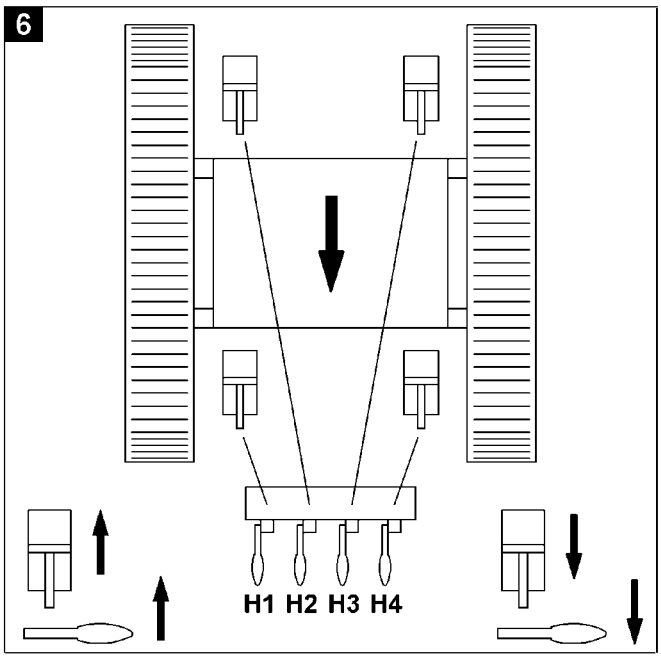
- After removing the attachment equipment, the lugs **17** must be swung down!

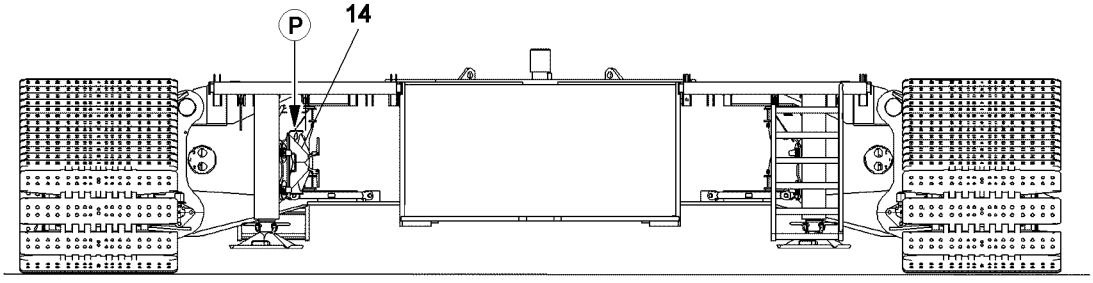
- Swing the lugs **17** down.











B108930

4.1.3 Lowering the crawler travel gear

WARNING
Danger of tipping the crawler travel gear over!
If the hydraulic cylinder **7** are move in unevenly, the crawler travel gear can tip over!
Personnel can be severely injured!
▶ When lowering the crawler travel gear, pay attention to the horizontal alignment, check visually!

▶ Actuate the hand lever **H1**, hand lever **H2**, hand lever **H3** and hand lever **H4**.

Result:
– The hydraulic cylinders **7** move in.

▶ Move the hydraulic cylinders **7** in until both crawler carriers on the ground and the support pads **14** are relieved.
▶ Open the receptacle on the support pads **14**.
▶ Move the hydraulic cylinders **7** completely in.
▶ Secure the support pads **14** in parking position **P**.
▶ Disengage the chains **15** on the track pads.

4.1.4 Establishing hydraulic and electrical connections to the crawler travel gear

Ensure that the following prerequisite is met:
– both crawler carriers are properly assembled, pinned and secured.

Hydraulic connections

When hydraulic lines are connected and disconnected with quick-release couplings, make sure that the coupling procedure is being performed correctly.

DANGER
Risk of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious injury due to component failure!
▶ Check that the quick-release couplings have been properly connected before using the crane!

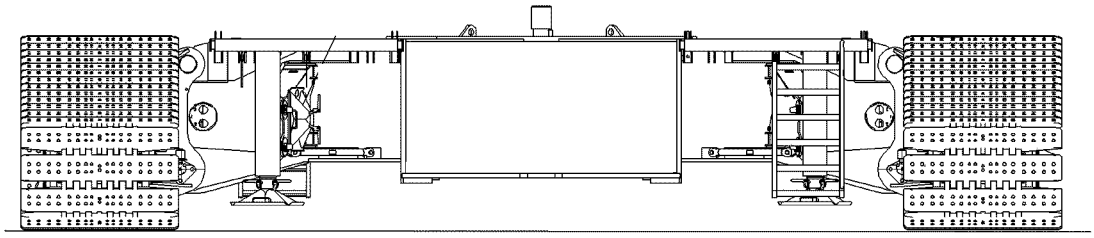
▶ Release the pressure in the hydraulic system before connecting and disconnecting. Turn the engine off and wait for short time.
▶ Assemble coupling components (sleeve and connector) and screw together using hand-tightened nut.
▶ Tighten hydraulic coupling by hand. Rotate hand-tightened nut until it reaches a tangible, fixed stop position.
▶ Establish the hydraulic connections.

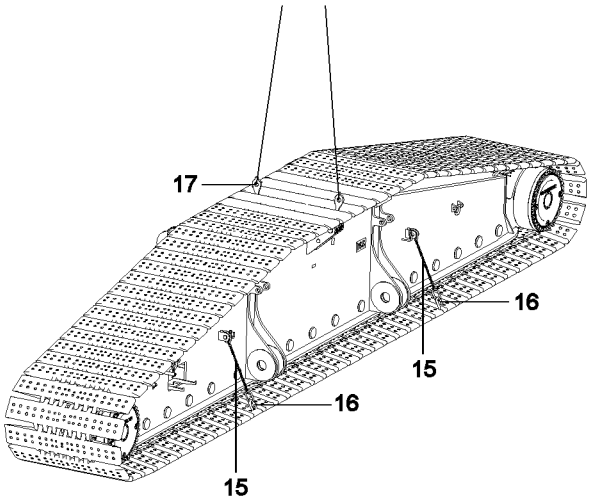
Electrical connections

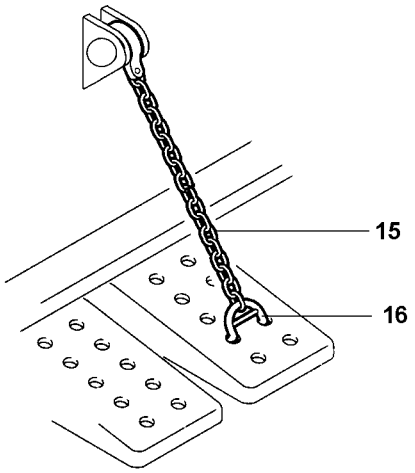
▶ Establish the electrical connections, see separate electrical wiring diagram.

4.1.5 Assembling / disassembling the turntable

Note
▶ For assembly / disassembly of the turntable, see crane operating instructions, chapter 3.02!







B106602

4.2 Disassembly of crawler carrier with the auxiliary crane

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

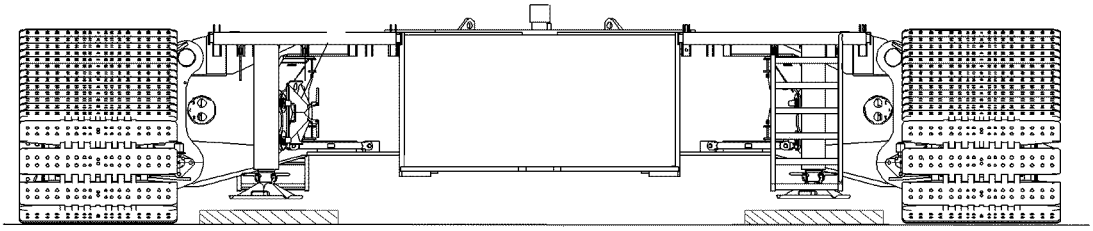
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see chapter 2.04 of the crane operating instructions!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

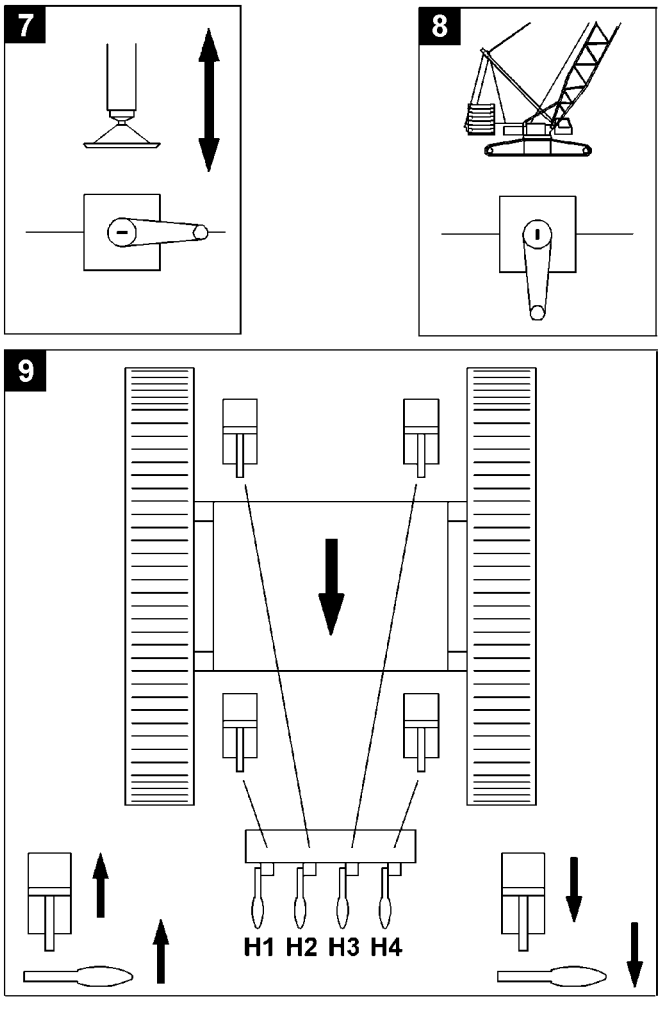
WARNING
Danger of crushing!
While assembling crane components, body limbs can be crushed or severed by the swing movement of components!

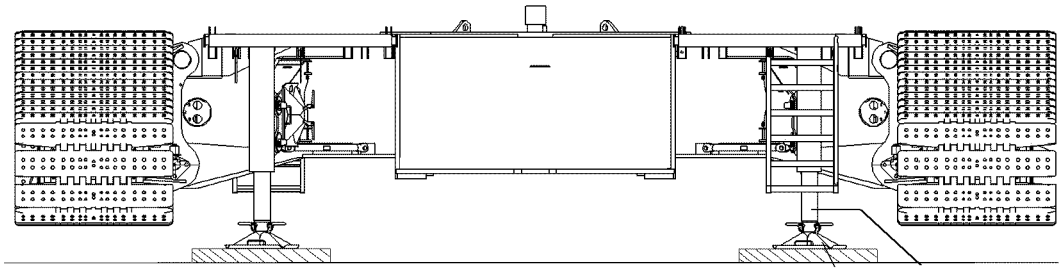
- ▶ Make sure that the components do not swing back and forth during assembly!

Make sure that the following prerequisites are met:

- the turntable is disassembled,
- an auxiliary crane is available,
- the disassembly location must be level and have adequate load-bearing capacity,
- suitable material must be available for the supporting base of the assembly supports,
- the support pads are assembled.







B107374

4.2.1 Disconnecting the hydraulic and electrical connections to the crawler travel gear

Hydraulic connections

When hydraulic lines are connected and disconnected with quick-release couplings, make sure that the coupling procedure is being performed correctly.

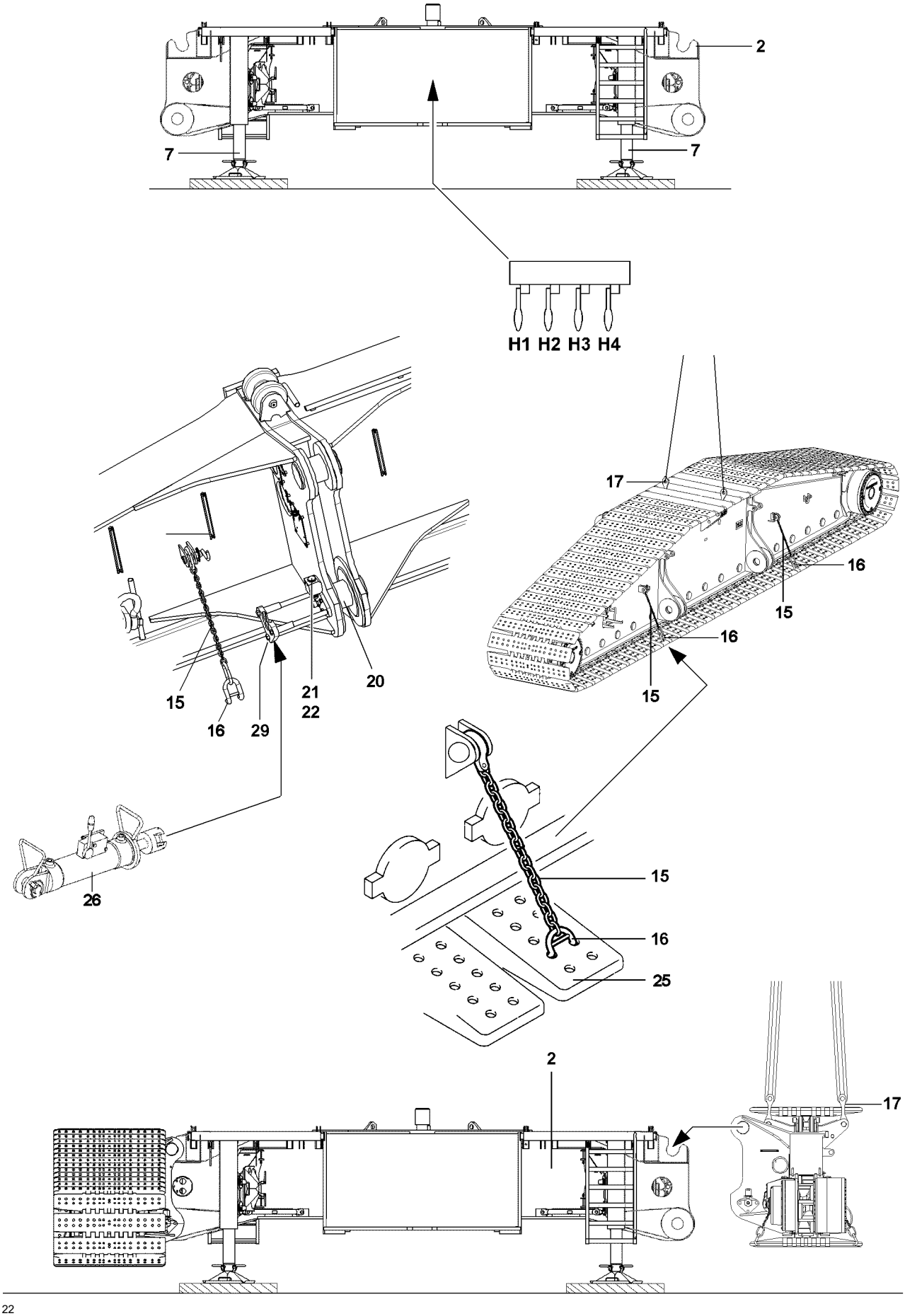
DANGER
Risk of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious injury due to component failure!

- ▶ Check that the quick-release couplings have been properly connected before using the crane!

- ▶ Release the pressure in the hydraulic system before connecting and disconnecting. Turn the engine off and wait for short time.
- ▶ Screw the coupling pieces (sleeve and plug) on with the hand nut.
- ▶ Disconnect the coupling sections
- ▶ Properly store the hydraulic hoses on the crawler carrier.
- ▶ Protect the coupling sections with caps to prevent contamination and damage.
- ▶ Disconnect the hydraulic connections.

Electrical connections

- ▶ Unplug the electrical connections, see separate electrical wiring diagram.



B107122

4.2.2 Preparing the crawler carrier for disassembly

Note
▶ Attach **two** chains **15** per crawler carrier side!

The track pads **25** must be secured before removal of the crawler carriers with the chains **15** to prevent sag.
▶ Hang in the chains **15** with the bars **16** on the track pads.

Note
▶ The lugs **17** must be swung between the track pads **25**, “upward”!

▶ Swing the lugs **17** upwards.

4.2.3 Lift the crawler track

WARNING
Risk of accidents due to improper support!
If the assembly support is not properly supported from below, it can sink into the ground and severely injure personnel!
▶ The supporting base must take on the weight of the crawler center section safely!
▶ The supporting base must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04 in the crane operating instructions!

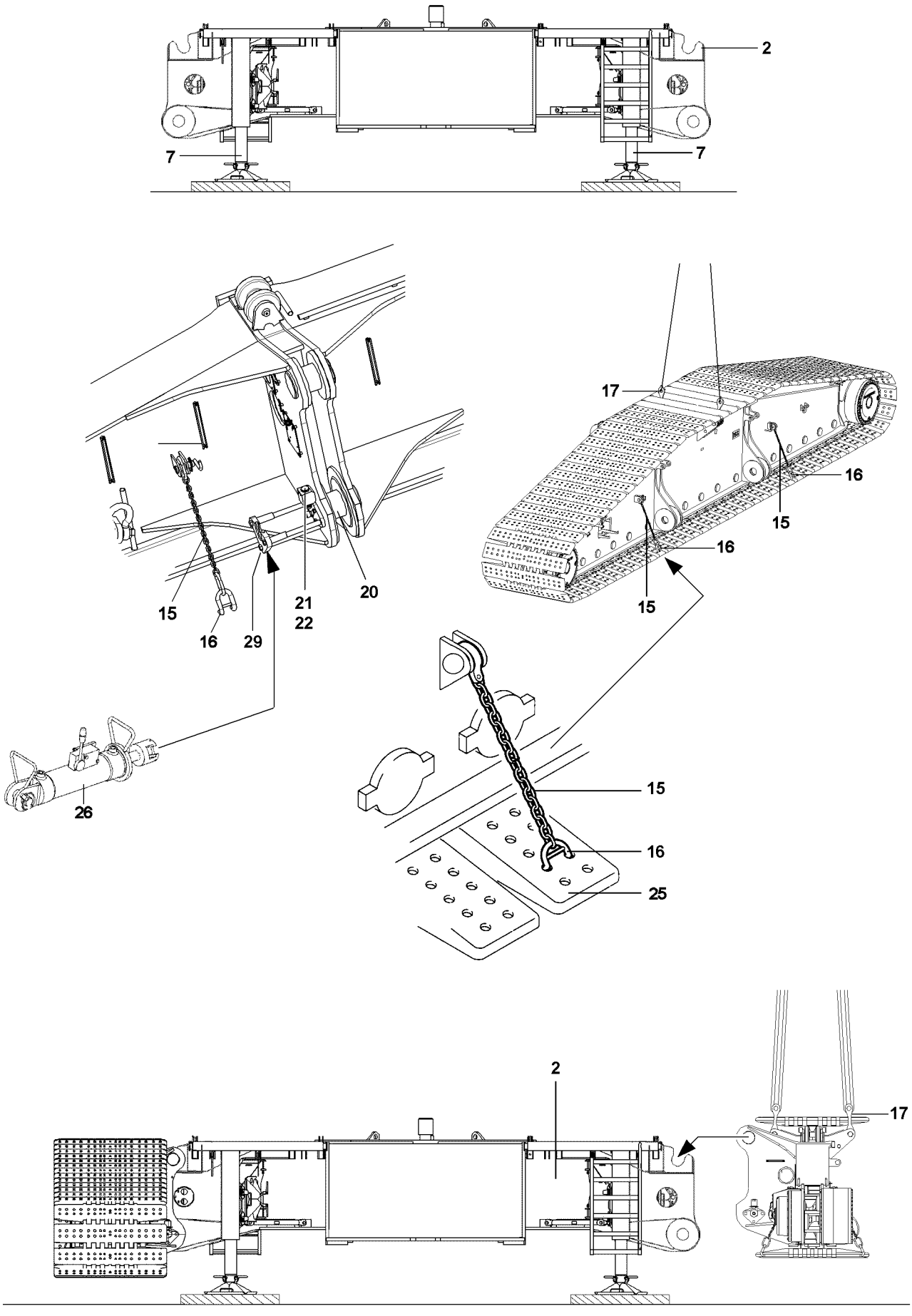
Make sure that the following prerequisites are met:
– the ball cock is set to “assembly support”,
– the hydraulic aggregate of the pin pulling device is turned on.

▶ Establish the hydraulic connections from the hydraulic aggregate of the pin pulling device to the hydraulic cylinders **7**.

Note
▶ Lift the crawler travel gear so that the crawler carriers can be removed without restriction!
▶ Move the hydraulic cylinders out evenly!

▶ Actuate the hand lever **H1**, hand lever **H2**, hand lever **H3** and hand lever **H4**.

Result:
– The four hydraulic cylinders **7** move out.



B107372

4.2.4 Disassembling the crawler carrier

Ensure that the following prerequisite is met:
– the turntable is disassembled,
– the crawler travel gear is raised.

Note
▶ For disassembly of the crawler carrier, the disassembly process and the process for both crawler carrier sides is identical!
▶ For that reason, the disassembly of the crawler carrier is only described for one side as an example!

▶ Attach the attachment equipment on the lugs **17** of the crawler carrier.

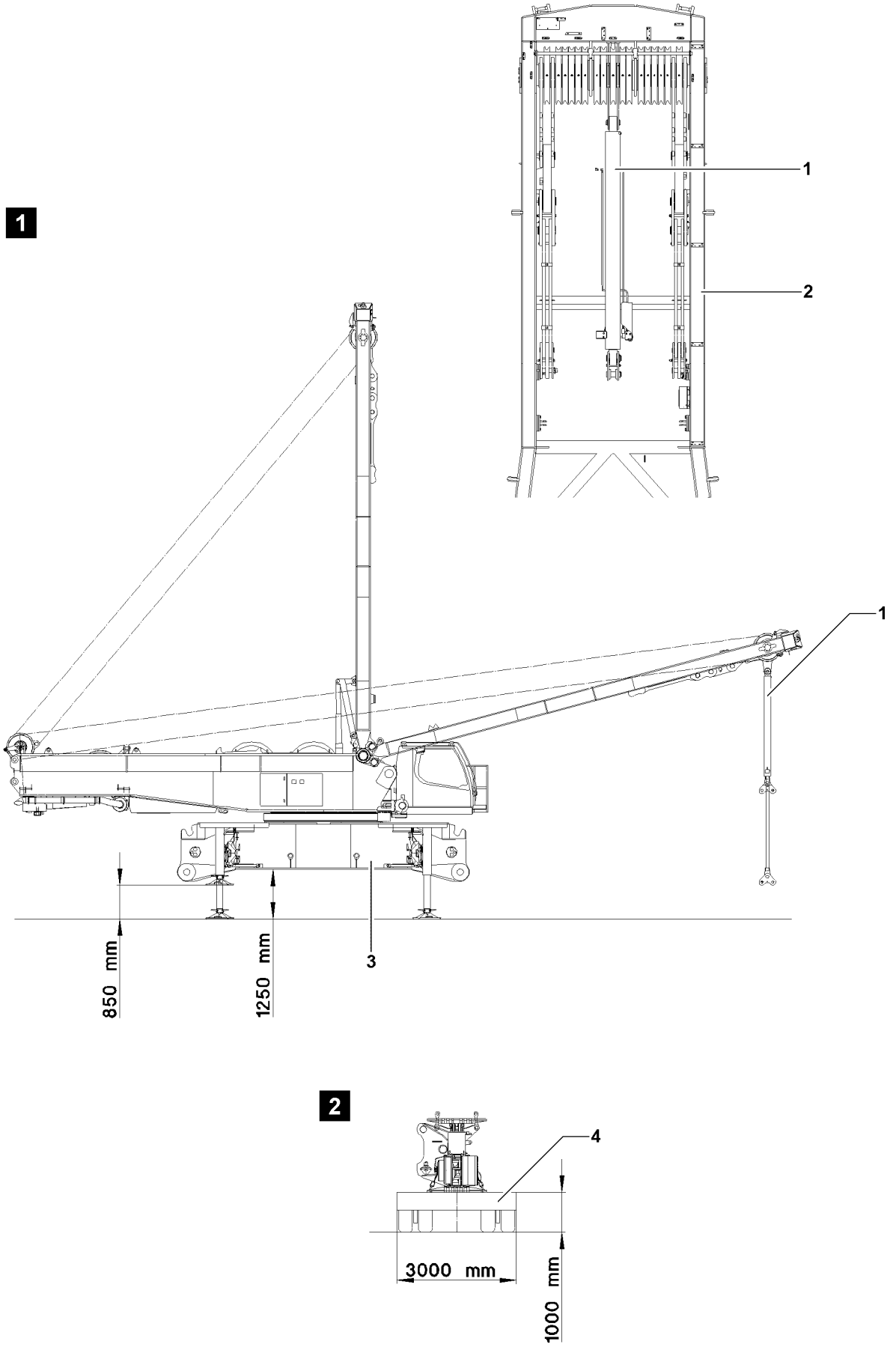
Unpin and release the crawler carrier **1** on the crawler center section **2** on the bottom.
▶ Remove the spring retainer **22** and unpin the retaining pin **21**.

NOTICE
Danger of property damage!
If the following notes are not observed, the pin pulling device can be damaged!
▶ The retaining pin **21** must be secured in the upper position with the spring retainer **22**!

▶ Secure the retaining pin **21** in the “up” position with spring retainer **22**.
▶ Unpin the pin **20** with the hydraulic pin pulling device.
▶ Lift the crawler carrier **1** with the auxiliary crane.
▶ When the crawler carrier is raised above the fastening points:
Swing the crawler carrier **1** out.
▶ Set the crawler carrier **1** down on the ground.
▶ Remove the attachment equipment.

4.2.5 Disassembling the assembly support

Note
▶ See section “Disassembling the assembly support”!



B107286

5 Assembly / disassembly of the crawler carrier with SA-frame

5.1 Assembly of the crawler carrier with SA-frame

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

- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see chapter 2.04 of the crane operating instructions!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

WARNING
Danger of crushing!
While assembling / disassembling crane components, body limbs can be crushed or severed by the swing movement of components!

- ▶ Make sure that the components do not swing back and forth during assembly!

Note

- ▶ The weight of the crawler carrier, depending on the equipment configuration, is maximum 38 t, see chart in chapter 3.01 of the crane operating instructions!
- ▶ The assembly support on the crawler center section is connected to the hydraulic of the turntable!

Note

- ▶ The assembly cylinder **1** is laying unsecured on the SA-frame **2**!
- ▶ The assembly cylinder **1** has a lift of 2300 mm!
- ▶ The load can be measured with the assembly cylinder **1**!

Note

- ▶ For function assignment of hand levers to move the support cylinders in / out, see section “Lifting the crawler center section”!

Note

▶ For assembly on supports, the SA-frame must be positioned vertically!

Make sure that the following prerequisites are met:

– the crane must be aligned horizontally,
– the placement location must be level and have adequate load-bearing capacity,
– the operating mode “SA-frame” has been set and confirmed on the LICCON computer system,
– the maximum height of the transport vehicle **4** may not exceed 1000 mm, see illustration **2**,
– the hydraulic support cylinders are moved out to 850 mm, see illustration **1**.

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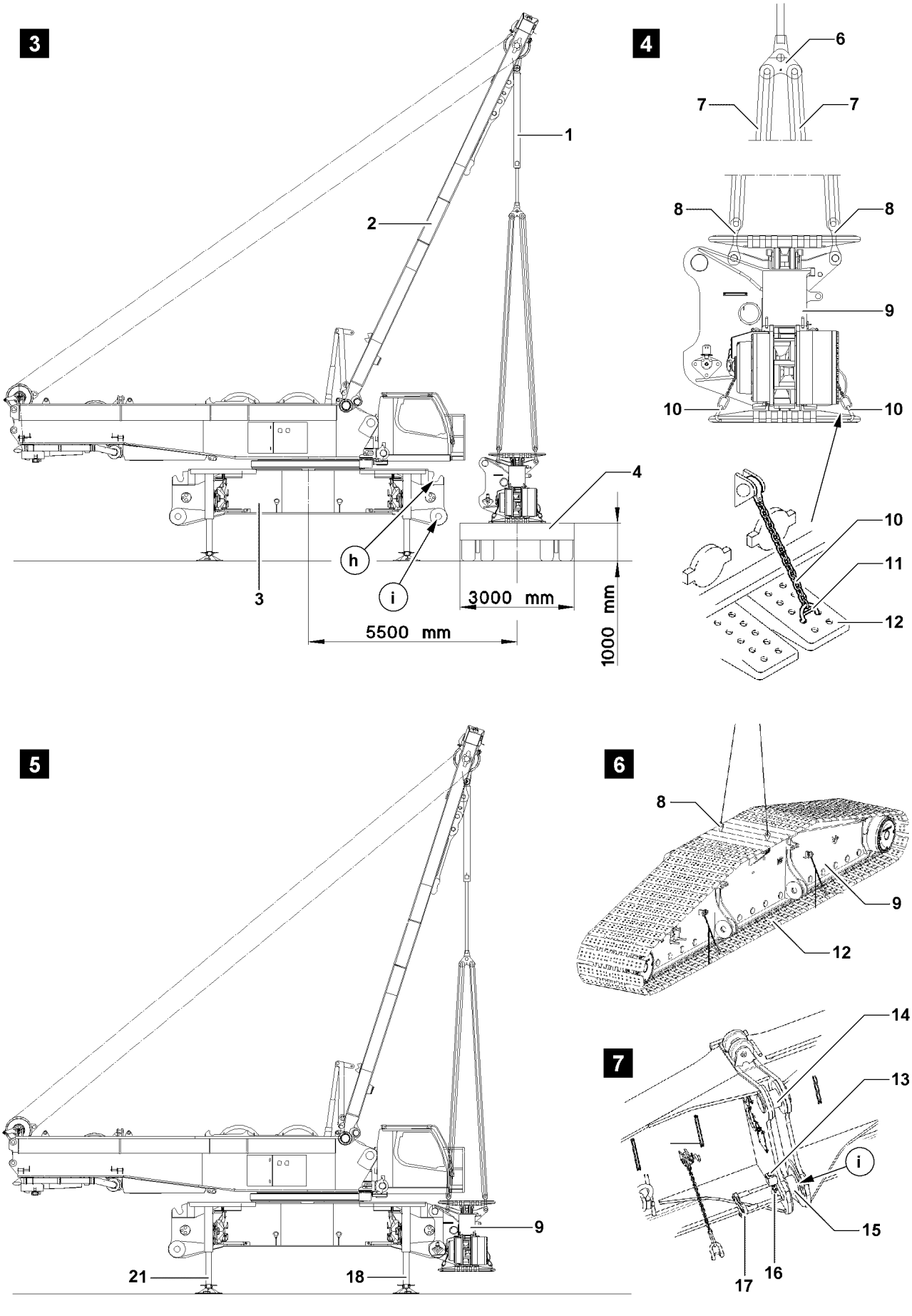
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B107285

5.1.1 Assembling the first crawler carrier

NOTICE
Damage to crane!
If the following instructions are not observed, the crane can be severely damaged when unloading the crawler carrier!
- ▶ Make sure that the crane is horizontally aligned!
- ▶ The maximum permissible distance of 5500 mm between the crawler carrier and the center of the turntable may not be exceeded, see illustration **3**!
- ▶ The specifications in the load charts for SA-operation must be adhered to!

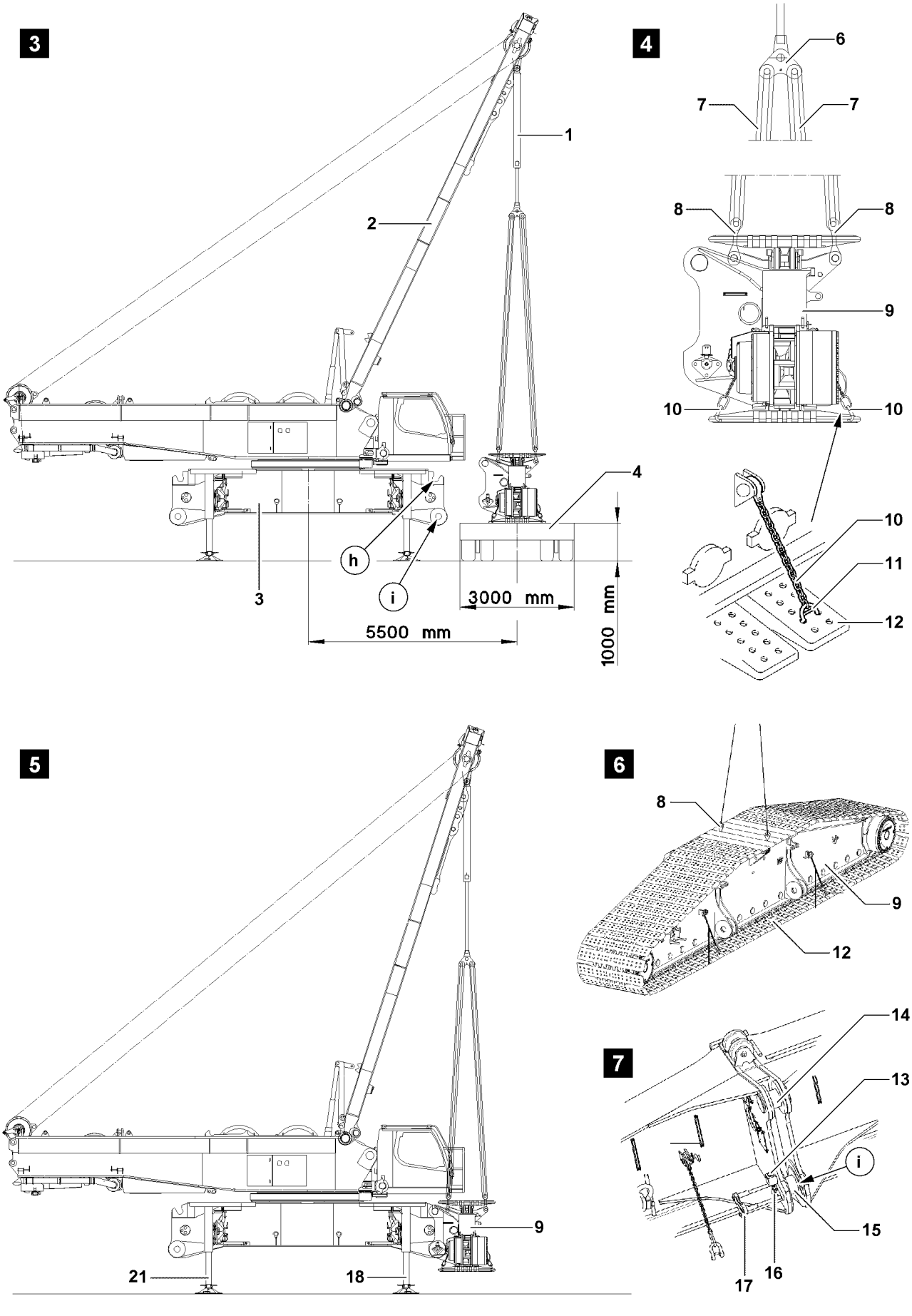
Preparing the crawler carrier for assembly

NOTICE
Damage to the crawler carrier!
If the track pads are not secured with the transport retainers to prevent them from sagging, the crawler carrier can be severely damaged!
- ▶ Secure the track pads **12** before assembly of the crawler carrier **9** with the chains **10** to prevent them from sagging!

- ▶ Hang in the chains **10** with the bars **11** on the track pads **12**, see illustration **4**.

Note
- ▶ The lugs **8** must be swung between the track pads **12**, “upward”!

- ▶ Swing the lugs **8** “up”.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B107285

Assembling the crawler carrier

Note
- ▶ Note the identification on the crawler carrier and the crawler center section!
- ▶ The crawler carrier and the crawler center section are marked with numbers!

- ▶ Luff the SA-frame **2** down until the assembly cylinder **1** is centered above the crawler carrier **9**.

Note
- ▶ The assembly cylinder **1** may not be moved out all the way!
- ▶ If the assembly cylinder **1** is moved out all the way and the limit switch position is reached, an error display appears on the LICCON monitor and the LML-Stop!

- ▶ Move the assembly cylinder **1** out: Actuate master switch 2.
- ▶ Pin the attachment ropes **7** on the assembly device **6** and secure with linch pins.
- ▶ Move the assembly cylinder **1** in until the attachment ropes **7** are tensioned: Actuate master switch 2.
- ▶ Lift the crawler carrier **9** with the assembly cylinder **1** from the transport vehicle **4**: Slowly move the assembly cylinder **1** in with master switch 2.
- ▶ Carefully luff the SA-frame **2** up.
- ▶ Swing the crawler carrier **9** with the SA-frame **2** to the receptacle on the crawler center section **3**.
- ▶ Bring the crawler carrier **9** carefully into the crawler center section **3**.
- ▶ Lower the crawler carrier **9** onto the crawler center section **3**: Hang in the on **14** on the points **h**.

NOTICE
Pin is not released!
If the pin **15** is secured with the retaining pin when pinning it in, the pin pulling device can be damaged!
- ▶ Before unpinning, secure the retaining pin **13** in up position with the spring retainer!

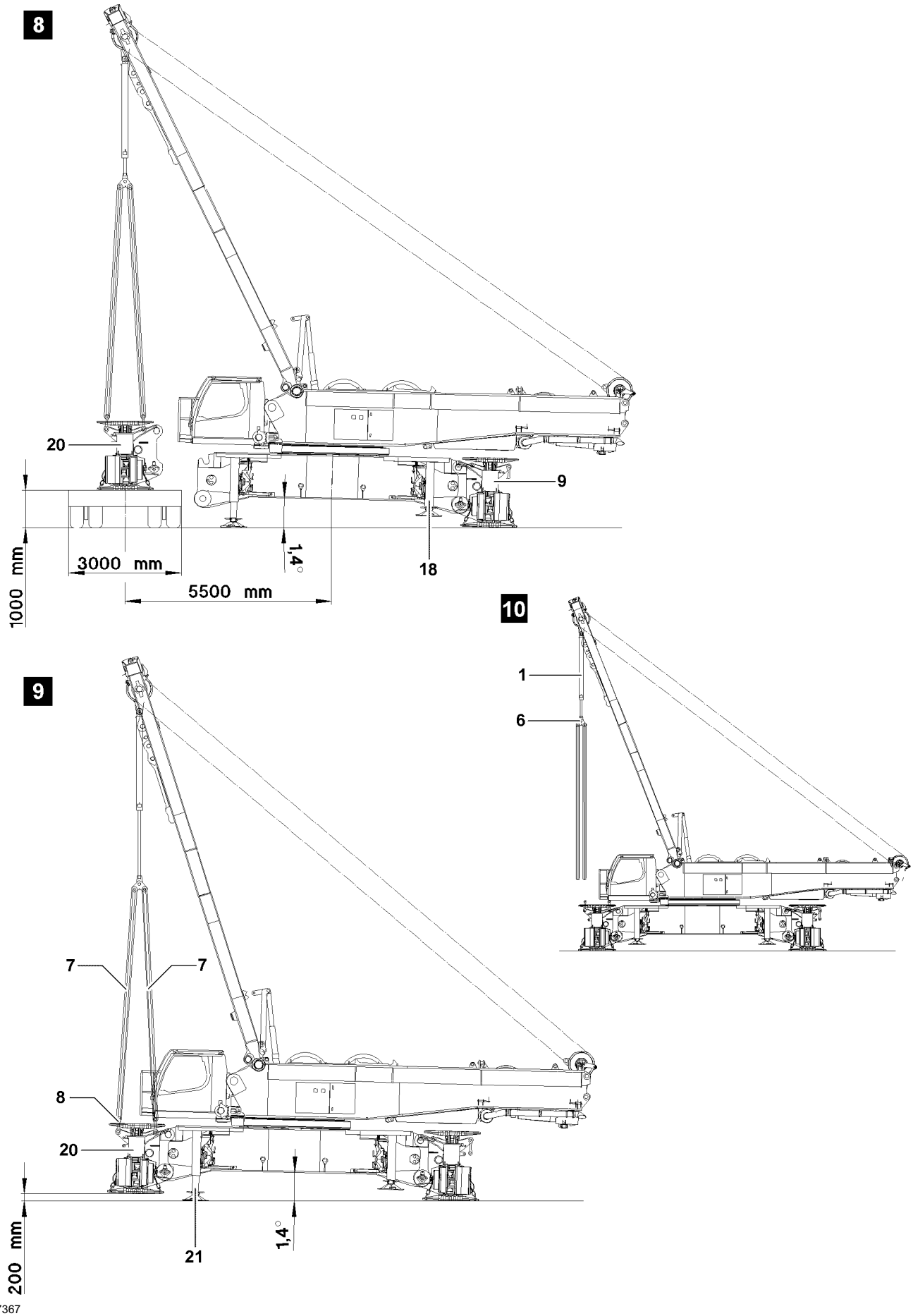
- ▶ Hang in the pin pulling cylinder on the screw **16** and retainer **17**, see illustration **7**.
- ▶ Pin in the pins **15** with the pin pulling cylinder on the pin points **i** and secure with retaining pins.
- ▶ Secure the retaining pins **13** with spring retainers.
- ▶ Release the attachment ropes **7** from the lugs **8** on the crawler carrier **9**.

WARNING
The crane can tip over!
If the support cylinders are moved out / in unevenly, the crane can tip over. Personnel can be severely injured or killed!
- ▶ When moving the support cylinders in / out, pay attention to the horizontal alignment, check visually!

- ▶ Move the support cylinder in evenly until the first crawler carrier **9** is standing on the ground.
- ▶ When the first crawler carrier **9** is standing on the ground:
  Move the support cylinders **18** in all the way.
- ▶ Move the support cylinder **21** out until the angle between the ground and the crawler center section is approx. 1.4°.

WARNING
Danger of tipping over!
Before turning the turntable, if the first assembled crawler carrier is not positioned on the ground, there is a danger of tipping over. Personnel can be severely injured or killed!
- ▶ Before turning the turntable: Set the first assembled crawler carrier on the ground!
- ▶ The hydraulic support cylinder **18** on the crawler side must be moved in all the way!

- ▶ Turn the turntable by 180°!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B107367

5.1.2 Assembly of the second crawler carrier

Make sure that the following prerequisites are met:
- the first crawler carrier **9** is standing on the ground,
- the second crawler carrier **20** is prepared for assembly,
- the hydraulic support cylinders **18** on the crawler side are fully moved in,
- the crane is inclined in direction of the assembled crawler carrier by approx. 1.4°, see illustration **8**,
- the turntable is turned by 180°.

Note
- ▶ For procedure to assemble the second crawler carrier **20**, see section “Assembling the first crawler carrier!”

- ▶ When the second crawler carrier **20** is assembled:
  Set the second crawler carrier on the ground: Move the support cylinder **21** in evenly.
- ▶ Remove the chains **10** on the track pads **12** and secure on the crawler carriers, see illustration **10**.
- ▶ Move the support cylinders **21** in all the way.

Note
- ▶ The hydraulic support must remain swung out!

- ▶ Unpin the attachment ropes **7** on the lugs **8** and on the assembly device **6**.

NOTICE
Damage to the lugs **8**!
- ▶ After removing the attachment equipment, the lugs **8** must be swung down!

- ▶ Swing the lugs **8** down.
- ▶ Move the assembly cylinder **1** in completely.

5.1.3 Establishing the hydraulic connection to the crawler travel gears

Ensure that the following prerequisite is met:
- both crawler carriers are properly assembled, pinned and secured.

When hydraulic lines are connected and disconnected with quick-release couplings, make sure that the coupling procedure is being performed correctly.

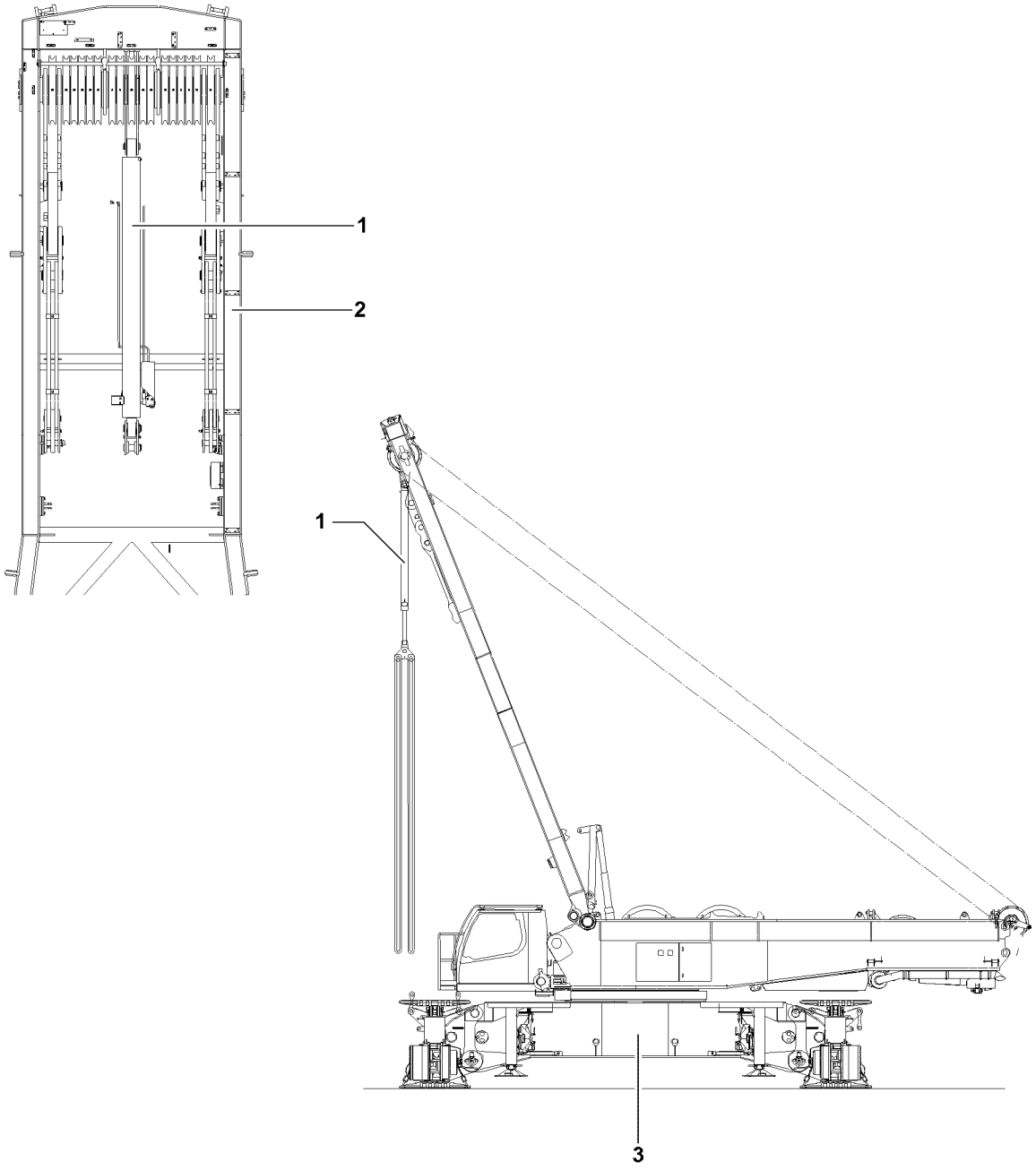
DANGER
Loss of pressure or leakage!
Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious accidents due to component failure!
- ▶ Check that the quick-release couplings have been properly connected before using the crane!

- ▶ Release the pressure in the hydraulic system before connecting and disconnecting. Turn the engine off and wait for short time.
- ▶ Assemble coupling components (sleeve and connector) and screw together using hand-tightened nut.
- ▶ Tighten hydraulic coupling by hand. Rotate hand-tightened nut until it reaches a tangible, fixed stop position.
- ▶ Establish the hydraulic connections.

5.1.4 Establishing the electrical connection to the crawler travel gears

- ▶ Establish the electrical connections, see separate electrical wiring diagram.

11



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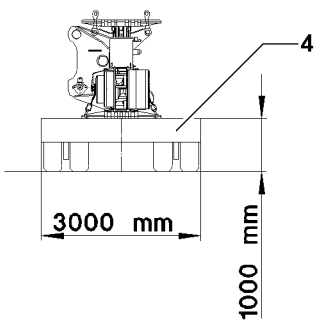


B107457

5.2 Disassembly of the crawler carrier with SA-frame

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

- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see chapter 2.04 of the crane operating instructions!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

WARNING
Danger of crushing!
While assembling / disassembling crane components, body limbs can be crushed or severed by the swing movement of components!

- ▶ Make sure that the components do not swing back and forth during assembly / disassembly!

Note

- ▶ The weight of the crawler carrier, depending on the equipment configuration, is maximum 38 t, see chart in chapter 3.01 of the crane operating instructions!
- ▶ The assembly support on the crawler center section is connected to the hydraulic of the turntable!

Note

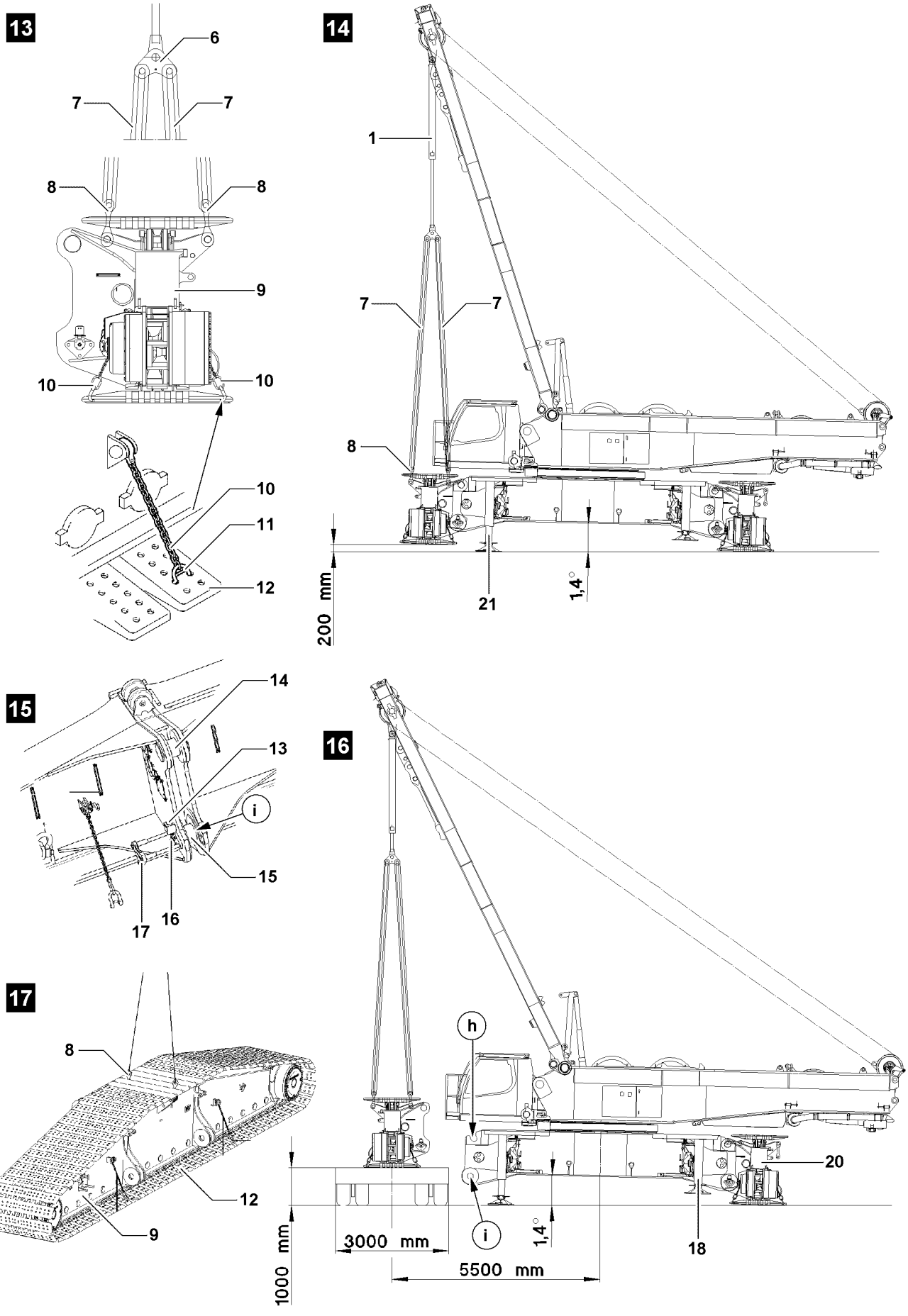
- ▶ The assembly cylinder **1** is laying unsecured on the SA-frame **2**!
- ▶ The assembly cylinder **1** has a lift of 2300 mm!
- ▶ The load can be measured with the assembly cylinder **1**!

Note

- ▶ For function assignment of hand levers to move the support cylinders in / out, see section “Assembling the assembly supports”!

Make sure that the following prerequisites are met:

- the crane must be aligned horizontally,
- the placement location must be level and have adequate load-bearing capacity,
- the operating mode “SA-frame” has been set and confirmed on the LICCON computer system,
- the maximum height of the transport vehicle **4** may not exceed 1000 mm, see illustration **12**,
- suitable material must be available for the supporting base of the assembly supports,
- the support pads are assembled.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B107368

5.2.1 Disconnect the hydraulic connection to the crawler travel gears

Ensure that the following prerequisite is met:

– both crawler carriers are properly assembled, pinned and secured.

When hydraulic lines are connected and disconnected with quick-release couplings, make sure that the coupling procedure is being performed correctly.

DANGER

Loss of pressure or leakage!

Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious accidents due to component failure!

▶ Check that the quick-release couplings have been properly connected before using the crane!

▶ Release the pressure in the hydraulic system before connecting and disconnecting. Turn the engine off and wait for short time.

▶ Assemble coupling components (sleeve and connector) and screw together using hand-tightened nut.

▶ Tighten hydraulic coupling by hand. Rotate hand-tightened nut until it reaches a tangible, fixed stop position.

▶ Establish the hydraulic connections.

5.2.2 Disconnect the electric connection to the crawler travel gears

▶ Disconnect the electrical connections, see separate electrical wiring diagram.

5.2.3 Disassembling the first crawler carrier

Preparing the crawler carrier for disassembly

Note

▶ The track pads **12** of both crawler carriers must be positioned in such a way that the lugs **8** between the track pads **12** can be swung through “upward”, see illustration **13**!

NOTICE

Damage to the crawler carrier!

If the track pads are not secured with the transport retainers to prevent them from sagging, the crawler carrier can be severely damaged!

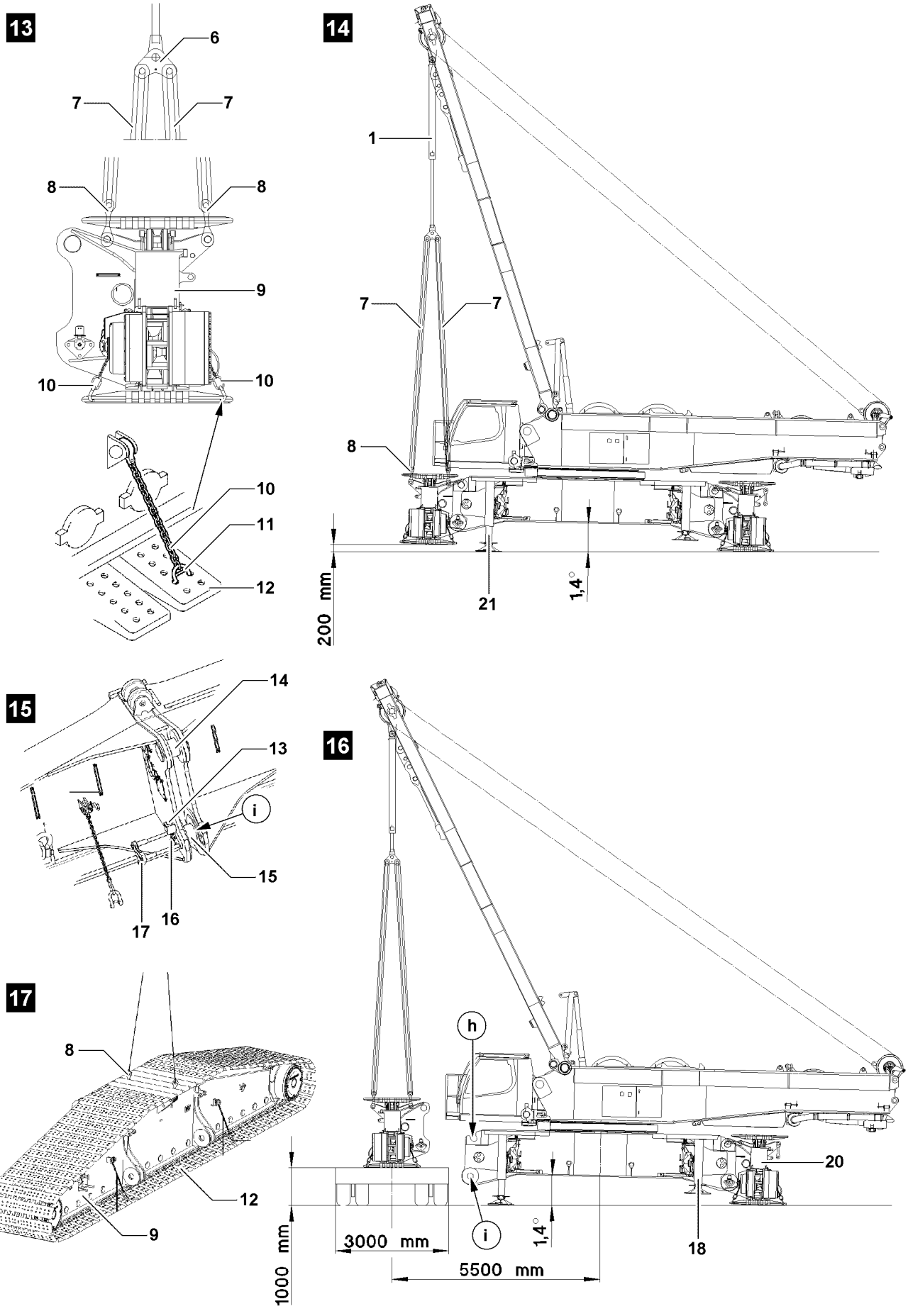
▶ Secure the track pads **12** before assembly of the crawler carrier **9** with the chains **10** to prevent them from sagging!

▶ Hang in the chains **10** with the bars **11** on the track pads **12**, see illustration **13**.

Note

▶ The lugs **8** must be swung between the track pads **12**, “upward”!

▶ Swing the lugs **8** “up”.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B107368

Disassembling the first crawler carrier

WARNING
Risk of accidents due to improper support!
If the assembly support is not properly supported from below, it can sink into the ground and severely injure personnel!
- ▶ The supporting base must take on the weight of the crawler center section safely!
- ▶ The supporting base must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04 in the crane operating instructions!

- ▶ Lift the first crawler carrier off the ground: Move the support cylinder **21** in until the angle between ground and crawler centre section is approx. 1.4°, see illustration **14**.
- ▶ Luff the SA-frame **2** down until the assembly cylinder **1** is centered above the crawler carrier **9**.

Note
- ▶ The assembly cylinder **1** may not be moved out all the way!
- ▶ If the assembly cylinder **1** is moved out all the way and the limit switch position is reached, an error display appears on the LICCON monitor and the LML-Stop!

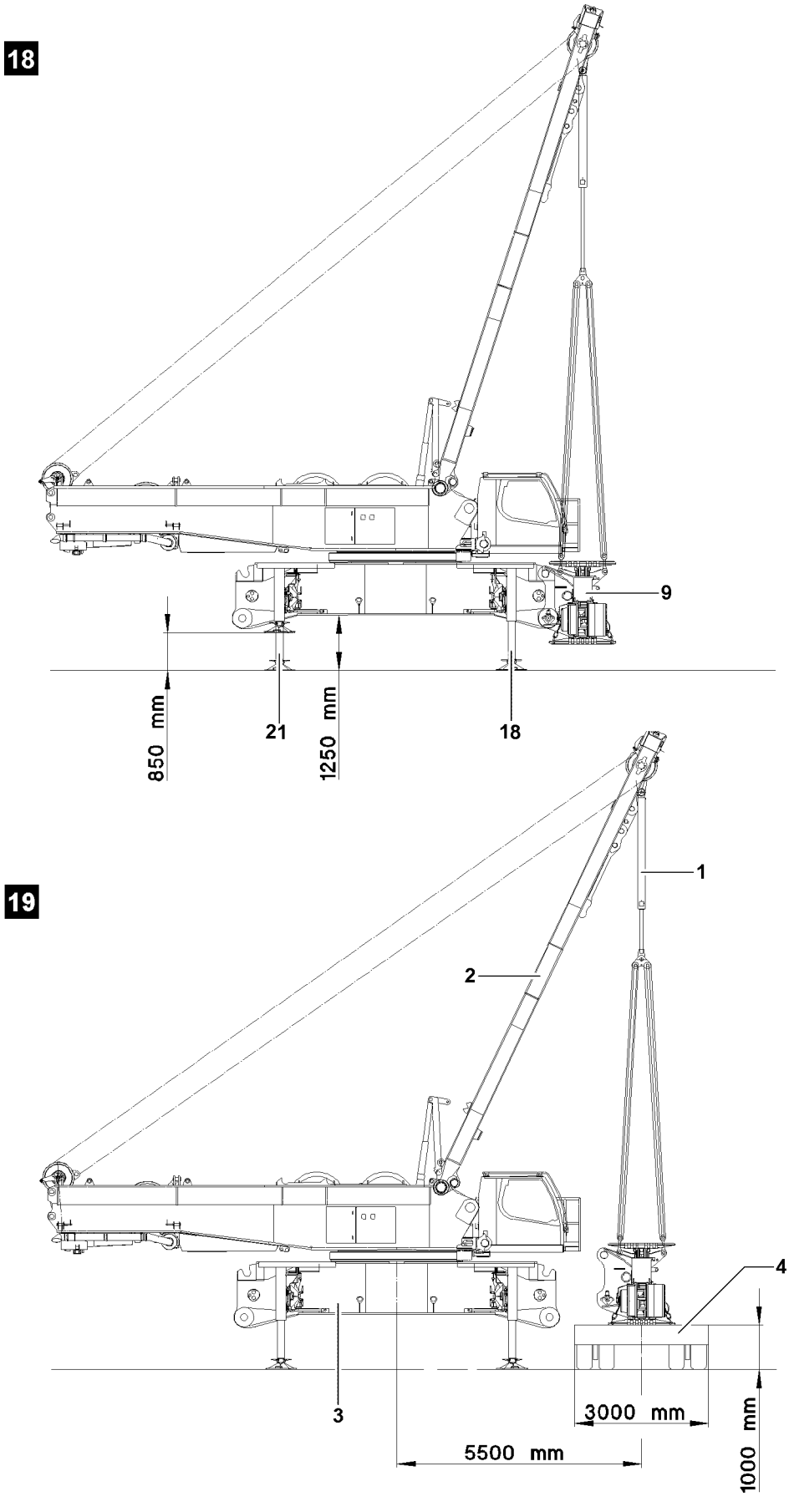
- ▶ Move the assembly cylinder **1** out: Actuate master switch 2.
- ▶ Pin the attachment ropes **7** on the assembly device **6** and secure with linch pins, see illustration **13**.

NOTICE
Pin is not released!
If the pin **15** is secured with the retaining pin when unpinning it, the pin pulling device can be damaged!
- ▶ Secure the retaining pin **13** before unpinning in “up” position with spring retainer, see illustration **15**!

- ▶ Hang in the pin pulling cylinder on the screw **16** and retainer **17**.
- ▶ Unpin the pin **15** with the pin pulling cylinder.
- ▶ Hang in the pin pulling cylinder on the screw **16** and retainer **17**.
- ▶ Unpin the pins **15** with the pin pulling cylinder on the pin points **i**.
- ▶ Remove the pin pulling cylinder.
- ▶ Move the assembly cylinder **1** in until the attachment ropes **7** are tensioned: Actuate master switch 2.
- ▶ Lift the crawler carrier **9** with the assembly cylinder **1** and unhook on point **h**: Slowly move the assembly cylinder **1** in with master switch 2.
- ▶ Luff the SA-frame **2** carefully up and place the crawler carrier **9** on the transport device.
- ▶ Release the attachment ropes **7** from the lugs **8** on the crawler carrier **9**.

NOTICE
Damage to the lugs **8**!
- ▶ After removing the attachment equipment, the lugs **8** must be swung down!

- ▶ Swing the lugs **8** down.



B107456

Moving the assembly support out

WARNING
The crane can tip over!
If the support cylinders are moved out / in unevenly, the crane can tip over. Personnel can be severely injured or killed!
▶ When moving the support cylinders in / out, pay attention to the horizontal alignment, check visually!

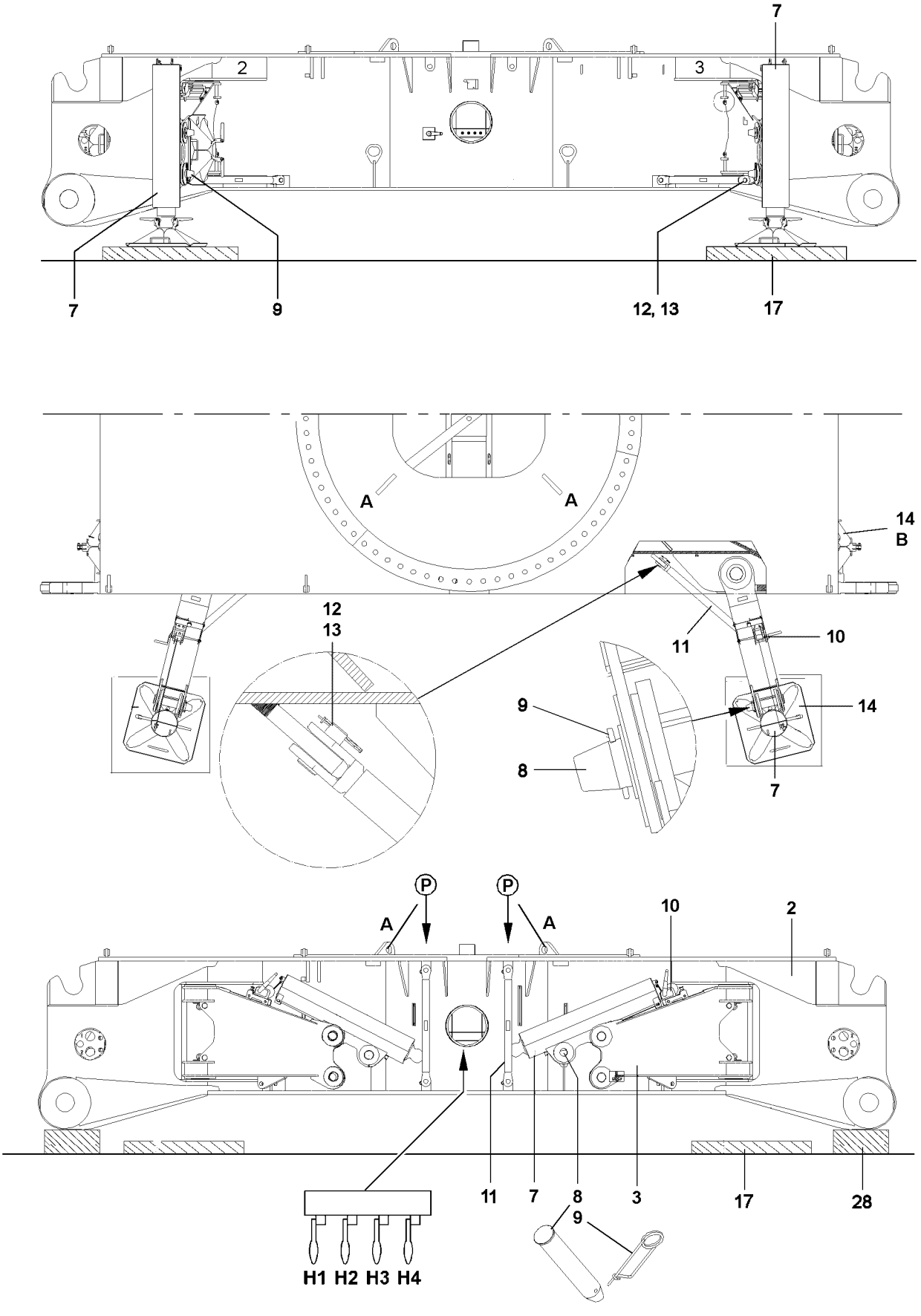
▶ Move the support cylinder **18** out until the crane is in horizontal position.
▶ Move all support cylinders out evenly to at least 850 mm.
▶ Turn the turntable by 180°.

Disassembling the second crawler carrier

Make sure that the following prerequisites are met:
– the first crawler carrier is assembled,
– the second crawler carrier is prepared for assembly,
– the hydraulic support cylinders are extended at least 850 mm,
– the turntable is turned by 180°.

Note
▶ For procedure to disassemble the second crawler carrier, see section “Disassembling the first crawler carrier”!

▶ When the second crawler carrier is disassembled:
Disassemble assembly supports, see section “Disassembling the assembly supports”.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10
2
11
7
8
3
17
28
9
H1 H2 H3 H4

B107166

6 Disassembling the assembly support

Note

▶ For the disassembly of the assembly supports, the turntable must be disassembled, see crane operating instructions chapter 3.02!

6.1 Supporting the crawler center section

Make sure that the following prerequisites are met:

– the crawler carriers **1** are completely disassembled,
– the disassembly location is level and of sufficient load carrying capacity.

Note

▶ The supporting base **28** must be high enough so that the hydraulic cylinders **7** can be completely moved in and folding down in transport position!
▶ The supporting base **28** must take on the weight of the crawler center section **2** safely.

▶ Support the crawler center section **2** with hardwood timbers (or other suitable materials) from below.

6.2 Lowering the crawler center section to the supporting base

Ensure that the following prerequisite is met:

– the crawler center section is supported properly with materials of sufficient load-bearing capacity.

WARNING

Risk of tipping the crawler center section!
If the hydraulic cylinders **7** are moved in unevenly, the crawler center section can tip over!
Personnel can be severely injured!

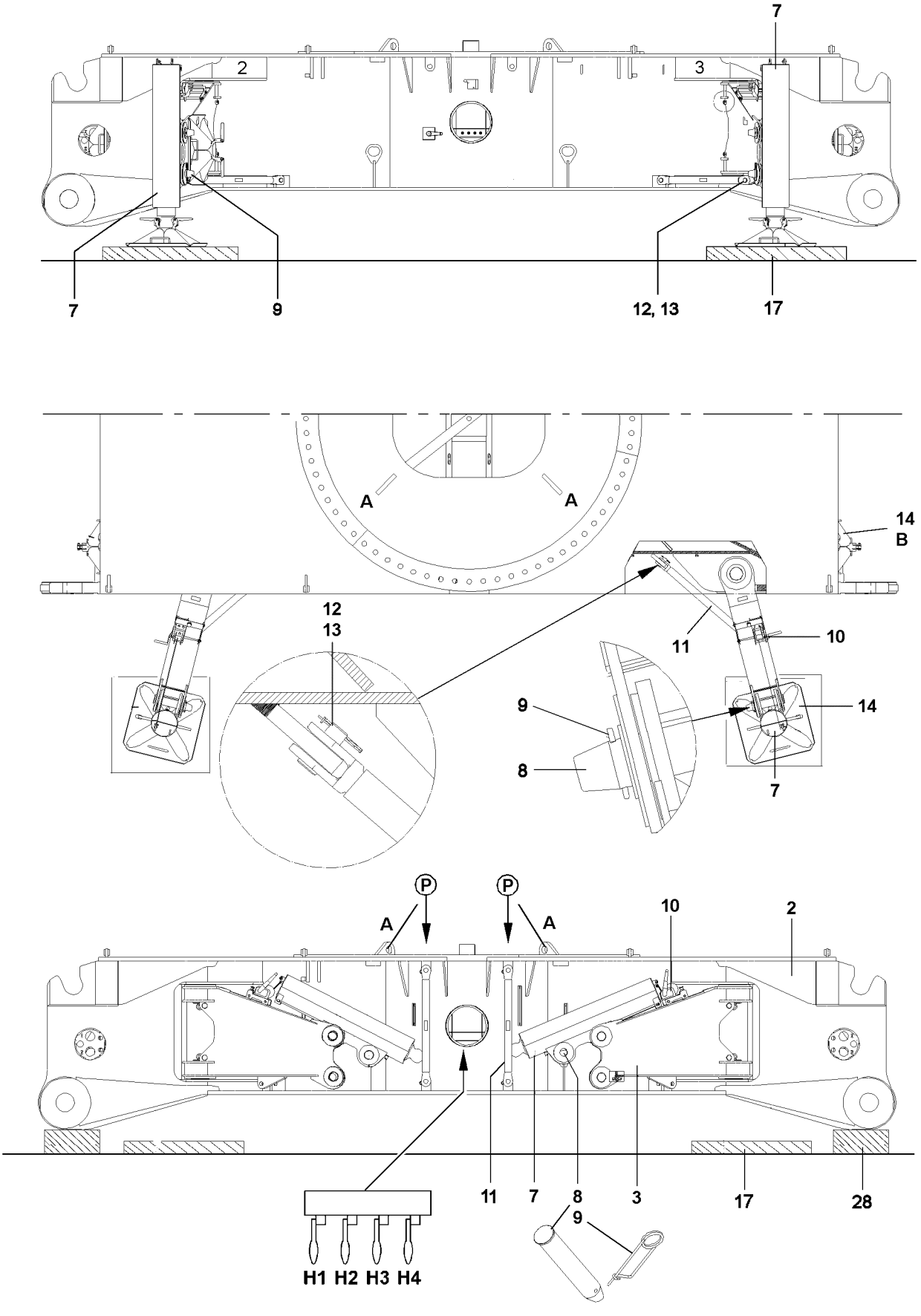
▶ When lowering the crawler center section, pay attention to the horizontal alignment, check visually!

▶ Actuate the hand lever **H1**, hand lever **H2**, hand lever **H3** and hand lever **H4**.

Result:

– The hydraulic cylinders **7** move in.

▶ Move the hydraulic cylinders **7** in and set the crawler center section **2** on the supporting base **28**.
▶ When the crawler center section has been placed on the supporting base:
Open the receptacle on the support pads **14**.
▶ Move the hydraulic cylinders **7** completely in.
▶ Secure the support pads **14** in transport position **B**.


7
2
3
7
9
12, 13
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P
P
A
A
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2
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3
17
28
9
H1 H2 H3 H4

B107166

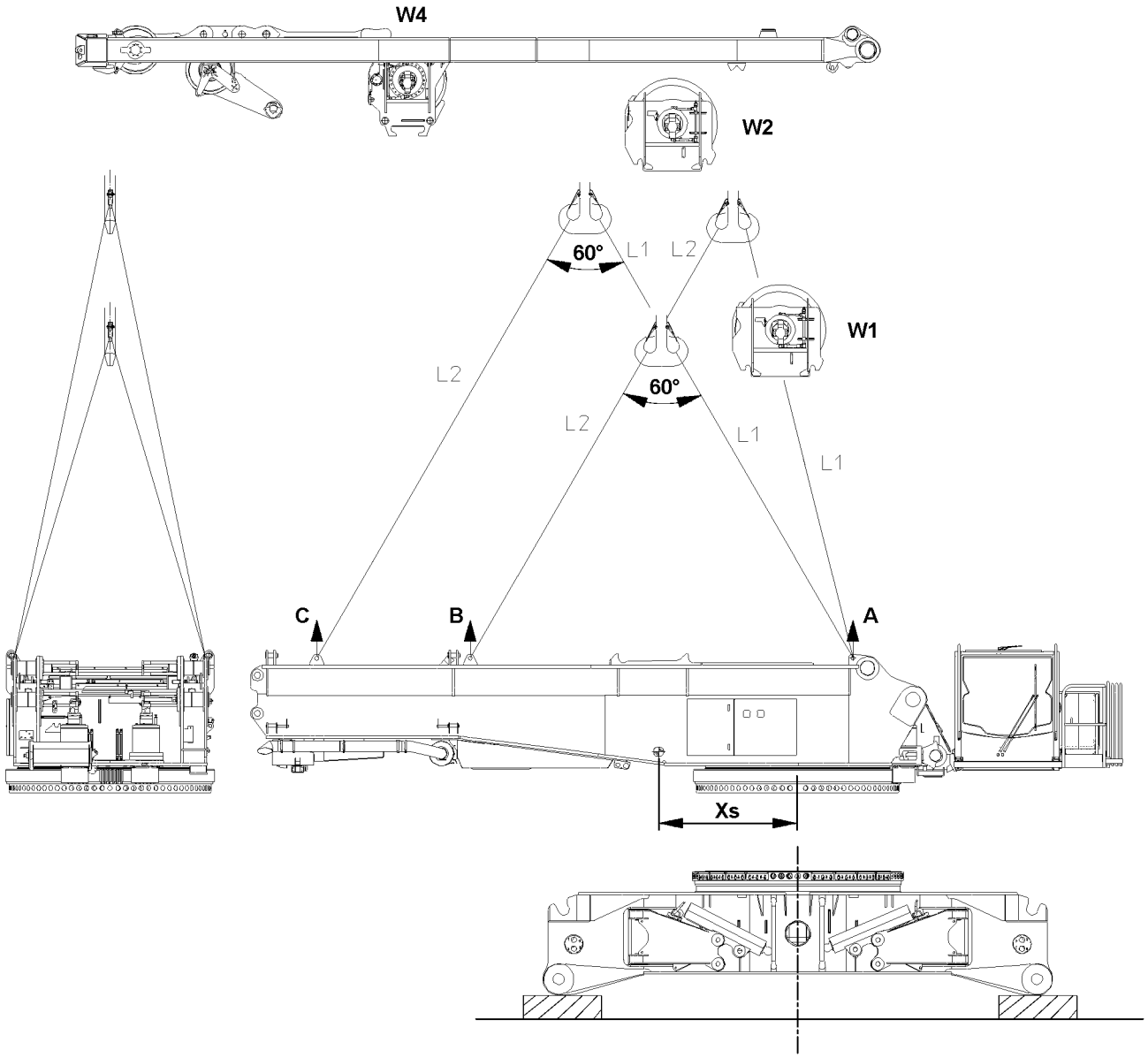
6.3 Disassembling the assembly supports

The swinging in and locking procedure of the assembly support is the same for all four assembly supports and is therefore described only once.

- ▶ Unpin the pins **8**: Remove the spring retainer **9** and unpin the pin **8**.
- ▶ Pull the hydraulic cylinder **7** in transport position - “to the rear” by spooling the rope winch **10** up.
- ▶ Unpin the brace **11** on the crawler center section and on the assembly support: Remove the spring retainer **13** and unpin the pin **12**.
- ▶ Install the brace **11** in transport position **P** on the crawler center section: Use pin **12** and spring retainer **13**.
- ▶ Swing the assembly support **3** in until it locks on the crawler center section.
- ▶ When the assembly support **3** is locked on the crawler center section:
  Secure the assembly support **3** with pin **8** spring retainer **9**.
- ▶ Bring the rope winch **10** into transport position: Pull the spring latch up and hold.
- ▶ Push the rope winch **10** in in direction of crawler center section until the spring latch engages again by itself.

Result:

– The rope winch **10** is locked in operating position.



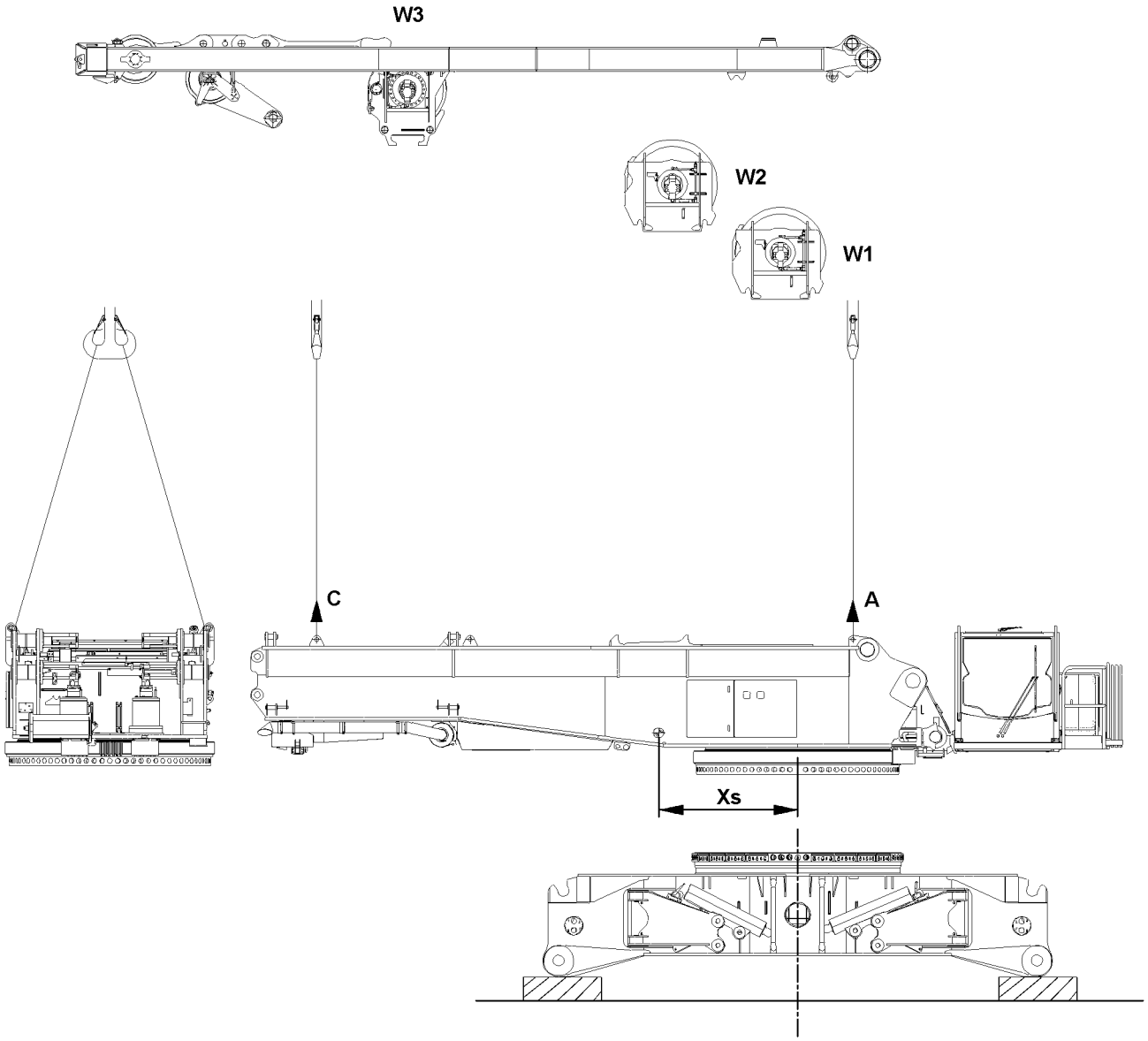
B105486

1 Turntable with Quick Connection*

For transport, the turntable can be separated from the crawler center section by the Quick Connection* device. In that case, the turntable as well as the crawler center section are each transported on a separate transport vehicle.

1.1 Load take-up with an auxiliary crane

		Load			Center of gravity	Length of tackle	
	Weight	**A**	**B**	**C**	**Xs**	**L1**	**L2**
Turntable with 2 slewing gears	33.90 t	18.59 t	15.31 t	–	-1.69 m	L1 = L2	
+ SA-Bracket with winch 4 and rope	51.40 t	24.44 t	–	26.96 t	-3.24 m	L1 = L2	
+ Winch 1 with 1050 m rope	58.90 t	30.94 t	–	27.96 t	-2.86 m	L1 = L2	
+ Winch 2 with 1050 m rope	66.40 t	35.93 t	–	30.47 t	-2.74 m	L1 = L2	
Turntable + center section + 2 slewing gears	61.30 t	42.05 t	19.25 t	–	-0.94 m	6.3 m	7.1 m
+ SA-Bracket with winch 4 and rope	78.80 t	37.10 t	41.70 t	–	-2.12 m	L1 = L2	
+ Winch 1 with 1050 m rope	86.30 t	43.20 t	43.10 t	–	-1.95 m	L1 = L2	
+ Winch 2 with 1050 m rope	93.80 t	47.16 t	46.64 t	–	-1.94 m	L1 = L2	



B105487

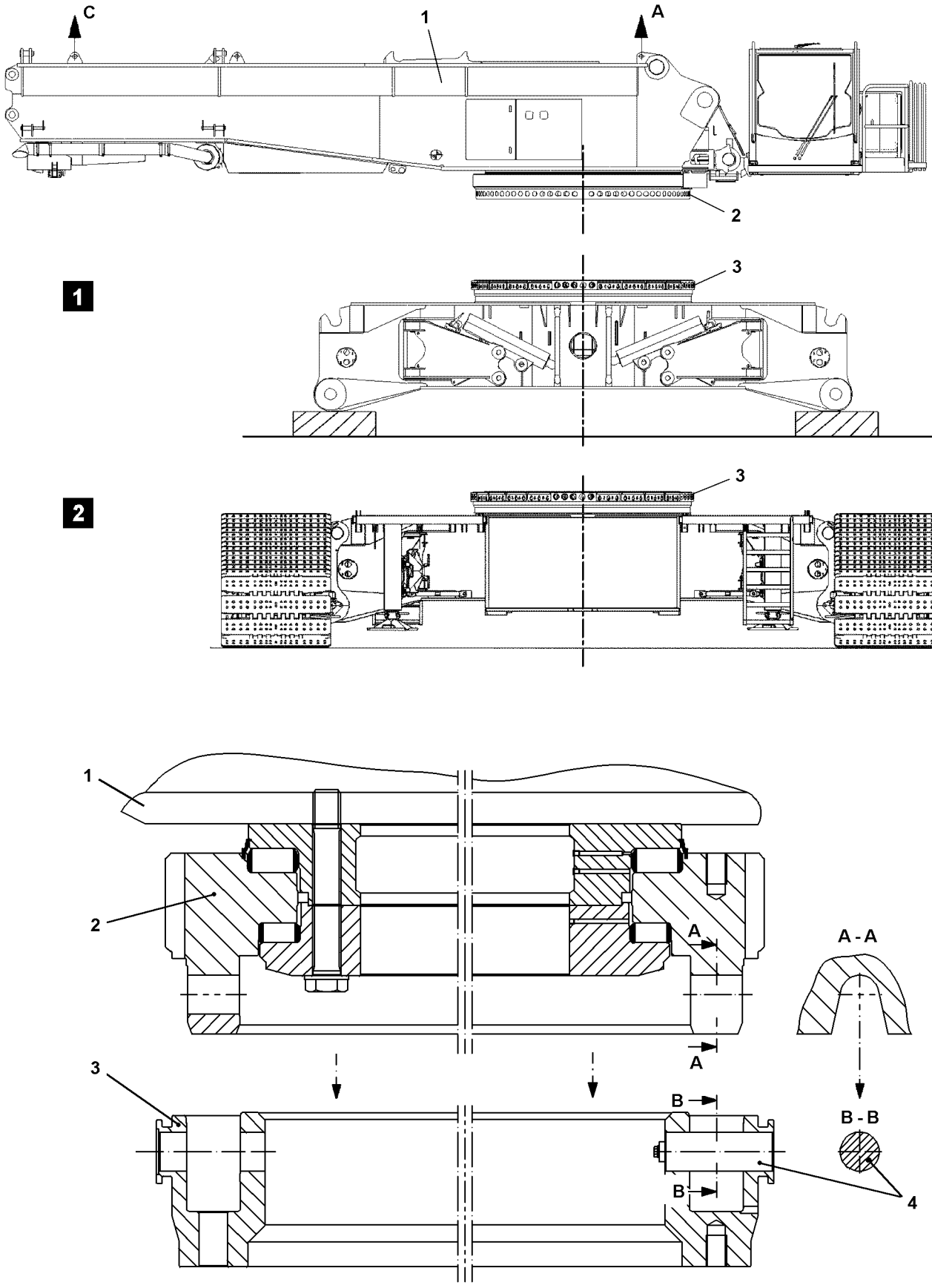
1.2 Load take-on with two auxiliary cranes

		Load		Center of gravity
	Weight	**A**	**C**	**Xs**
Turntable with 2 slewing gears	33.90 t	22.97 t	10.93 t	-1.69 m
+ 1 slewing gear	0.55 t	+0.60 t	-0.05 t	
+ Winch 1 with 1050 m rope	7.50 t	+6.49 t	+1.01 t	
+ Winch 2 with 1050 m rope	7.50 t	+4.97 t	+2.53 t	
+ SA-Bracket with winch 4 and rope	17.50 t	+1.46 t	+16.04 t	
Turntable, complete	66.40 t	35.93 t	30.47 t	-2.74 m
Turntable + center section with 2 slewing gears	61.30 t	47.56 t	13.74 t	-0.94 m
+ 1 slewing gear	0.55 t	+0.60 t	-0.05 t	
+ Winch 1 with 1050 m rope	7.50 t	+6.49 t	+1.01 t	
+ Winch 2 with 1050 m rope	7.50 t	+4.97 t	2.53 t	
+ SA-Bracket with winch 4 and rope	17.50 t	+1.46 t	+16.04 t	
Turntable, cpl. + center section	93.80 t	60.50 t	33.30 t	-1.94 m

1.3 Lift the turntable from transport vehicle

Make sure that the following prerequisites are met:
- One or two auxiliary cranes are available.
- The corresponding tackle is available, see charts.
- The tackle is pinned on the turntable, according to the data in the charts.

DANGER
Incorrect tackle points!
If the tackle is attached on the turntable on the incorrect tackle points, the tackle can be overloaded or the turntable can tip over. Personnel can be severely injured or killed!
- ▶ Attach the tackle only in the tackle points A, B or C, see charts.
- ▶ Tension the tackle.
- ▶ Lift the turntable.



B105488

2 Installing the turntable

The turntable **1** can be installed on:
– **Fig. 1**, center section installed underneath.
– **Fig. 2**, center section with installed crawler carrier.

NOTICE
Property damage!
If the rotary connection is dirty, severe damage can occur, even requiring replacement!
▶ Clean the upper section, the lower section as well as the pins properly.

Before setting the turntable onto the crawler center section, the placement surfaces or the contact surfaces as well as the pin bores on the upper section **2** and the lower section **3** on the rotary connection must be cleaned.
Make sure that the following prerequisites are met:
– The crawler or the center section is horizontally aligned.

2.1 Placing the turntable on the crawler center section

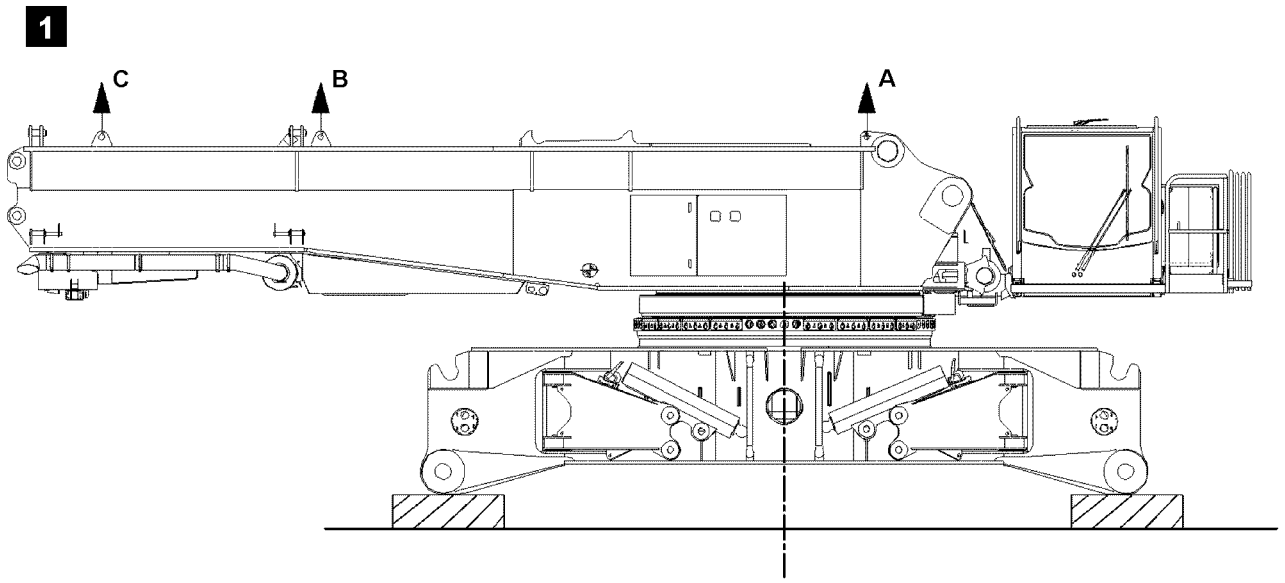
Make sure that the following prerequisites are met:
– The two centering pins **4** are installed and secured on the lower section **3** of the rotary connection.
– The centering pins **4** are greased with water repellent grease.

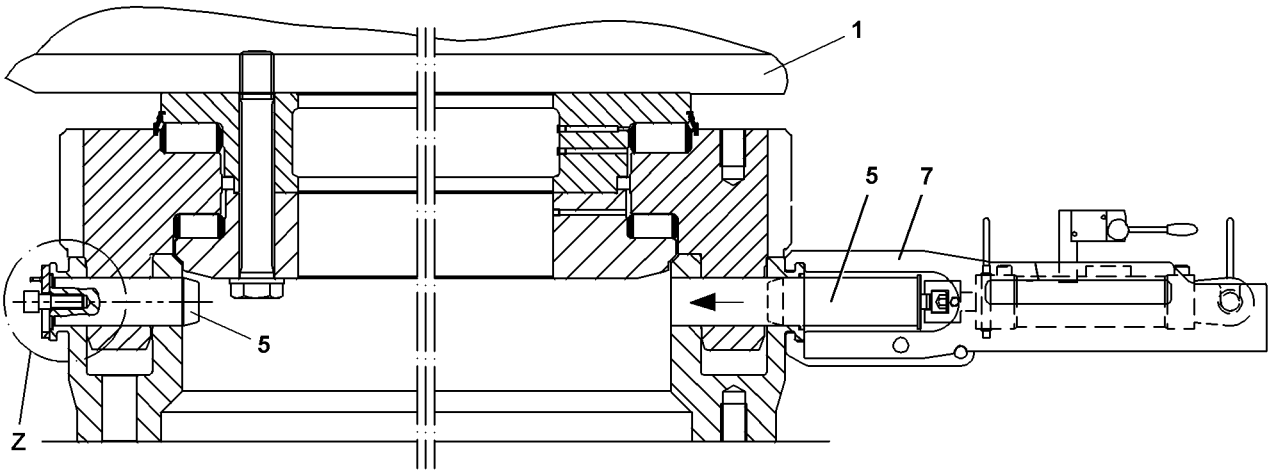
DANGER
Risk of accident!
It is prohibited for anyone to remain within the slewing range of the auxiliary crane and under the turntable when swinging the turntable in and lowering it.
▶ Swing the turntable **1** with the auxiliary crane slowly over the horizontally aligned crawler center section.

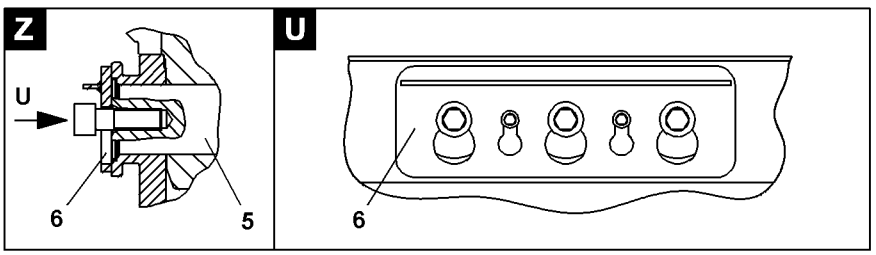
Note
▶ Pay attention to the alignment of the turntable or the receptacles **A-A** to the centering pins **4**.
▶ Before lowering it, bring the turntable into position in such a way that the receptacles **A-A** are positioned over the centering pins **4** on the lower section **3**.
▶ Lower the turntable **1** slowly.

DANGER
Risk of crushed limbs!
During the installation of the upper and lower section of the rotary connection, fingers and hands can be crushed and limbs can be severed.
▶ Do not reach with your hands into the danger zone.

▶ Lower the turntable **1** into the lower section to the point where the upper section is not yet touching but the tackle are still under “tension”.
▶ Carefully place the turntable **1** on the crawler center section.







B105489

2.2 Pinning the Quick Connection

Make sure that the following prerequisites are met:
- The turntable **1** is seated in lengthwise direction on the supported center section.
- The pin holes are open on the circumference of the roller slewing ring.
- The tackle is still under “tension”.
- The connector pins **5** are greased with water repellent grease.

2.2.1 Pinning

▶ Insert all connector pins **5** around the circumference of the roller slewing ring by hand.

Note
▶ Align all pin holes by lifting or lowering the turntable.
▶ Use a hydraulic pin pulling device **7** to pin hard to insert pins.

DANGER
Danger of accidents if connector pins loosen up by themselves!
Tipping of turntable.
▶ After pinning, secure the connector pins **5** immediately.
▶ Secure the connector pins **5** with retaining bars **6**.

▶ Attach the retaining bars **6** and secure all connector pins **5** around the circumference of the roller slewing ring, see fig. **U,Z**.

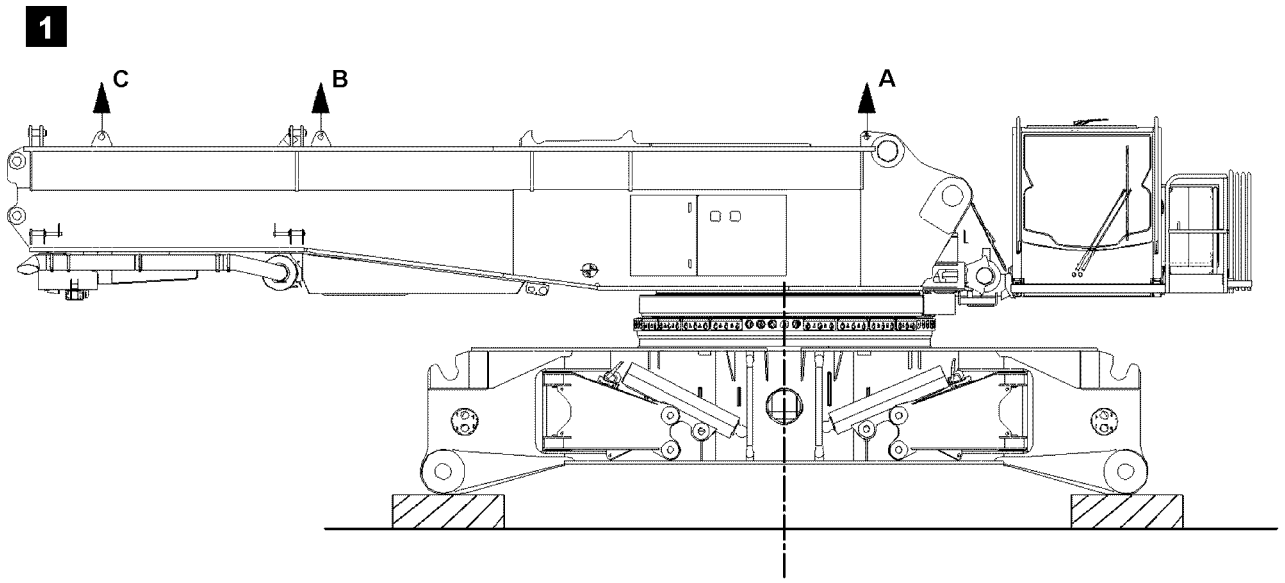
2.2.2 Establishing the hydraulic connection to the turntable

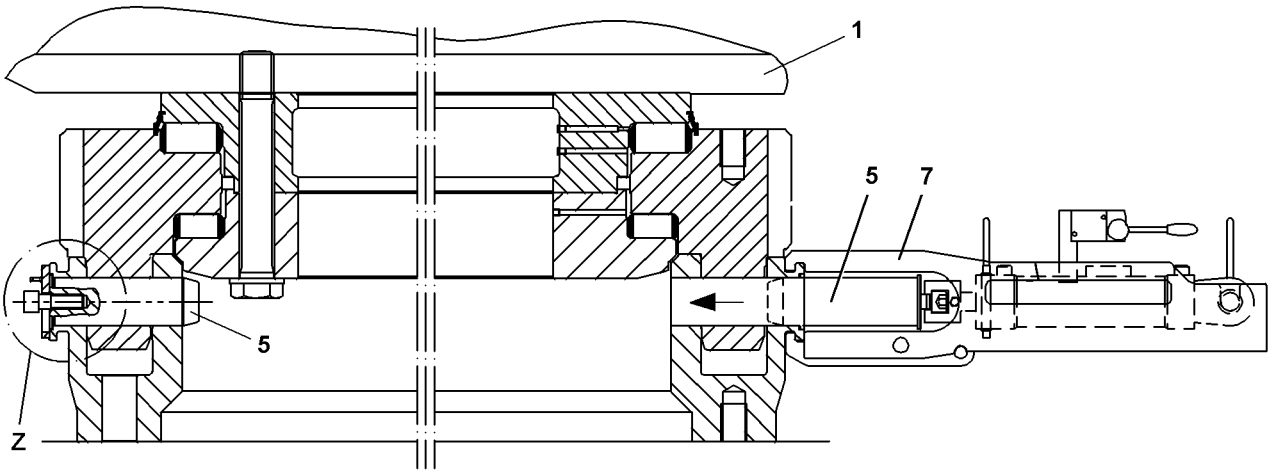
Ensure that the following preconditions are met:
- The turntable is pinned and secured on the rotary connection.

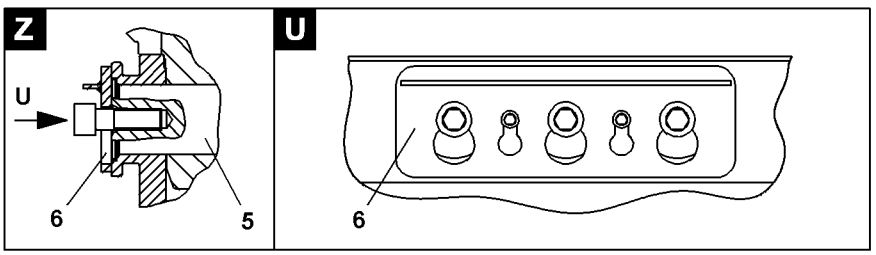
The hydraulic connection from the rotary connection in the crawler center section to the turntable is established with quick couplers.

Note
▶ The matching quick couplings are marked.
▶ To connect or release the hydraulic lines with quick couplers, see chapter 5.01.

▶ Establish the hydraulic connections.







B105489

3 Removing the turntable

Make sure that the following prerequisites are met:
– One or two auxiliary cranes are available.
– The turntable ballast and the boom system are removed.
– The crawler carriers are removed.
– The crawler center section is supported from below and horizontally aligned.
– The hydraulic connections on the rotary connection are separated.
– The corresponding tackle is available, see charts.
– The tackle is pinned on the turntable, according to the data in the charts.

NOTICE
Disconnect the hydraulic connection!
Connections become damaged!
▶ Make sure that all hydraulic connections between the rotary connection and the turntable are separated.

3.1 Disassembly

▶ Tighten the tackle with the auxiliary crane.
▶ Release and remove the retaining bars **6**, see fig. **U,Z**.
▶ Unpin all connector pins **5** around the circumference of the roller slewing ring with the pin pulling device.

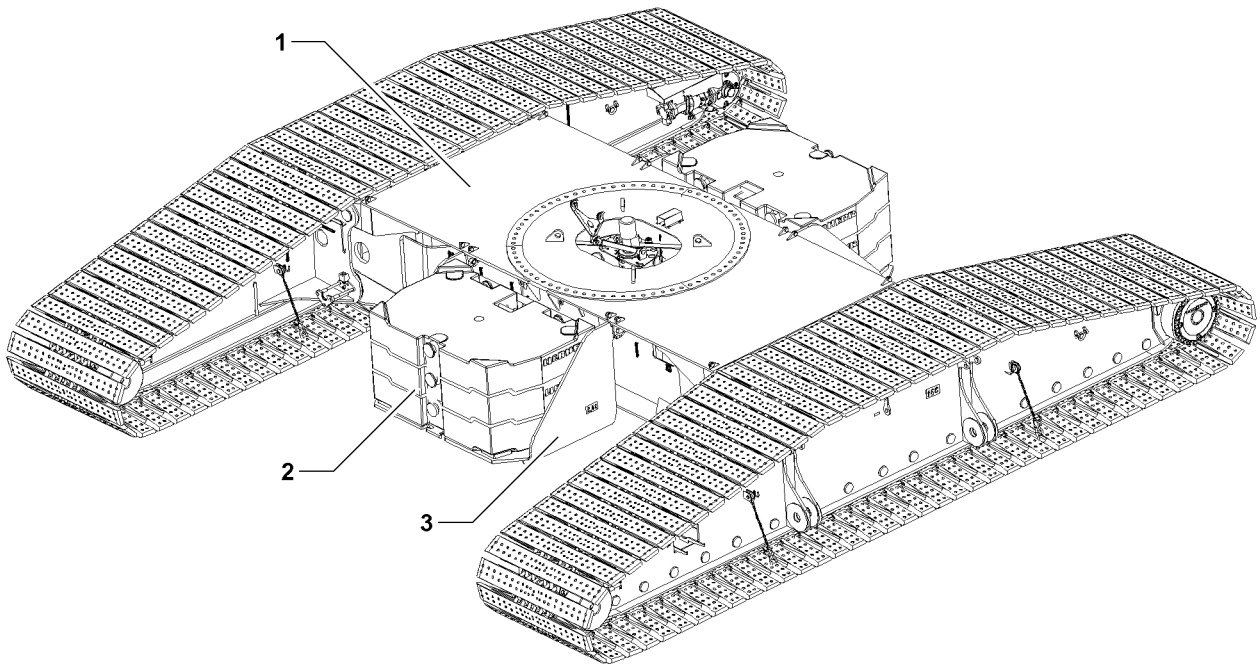
NOTICE
Remove connector pins.
The roller slewing ring becomes damaged!
▶ Before lifting the turntable with the auxiliary crane, make sure that all connector pins on the Quick Connection are fully unpinned.

▶ Carefully lift the turntable from the crawler center section.

DANGER
Risk of accident!
Danger of fatal injury if anyone remains within the swing range of the auxiliary crane and under the turntable!
▶ It is prohibited for anyone to remain within the swing range of the auxiliary crane and under the turntable!

▶ Slowly swing the turntable **1** with the auxiliary crane away from the crawler center section.

1



B109235

1 Components

For the central ballast on the crawler center section **1**, the following components are required:
Central ballast plates **2**
Consoles central ballast **3**

1.1 Central ballast plates

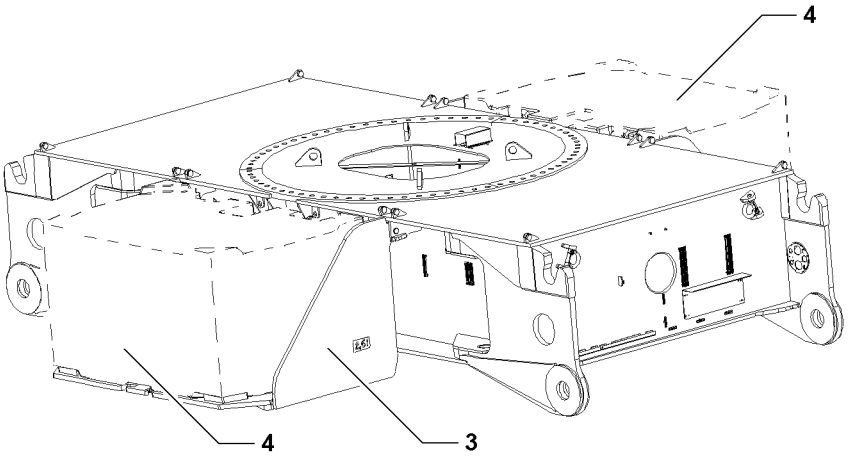
Note
▶ The central ballast plates **2** and the consoles **3** are marked with their own weight.

Component	Weight
Central ballast plate **2**	7.5 t 10.0 t

1.2 Consoles central ballast

Component	Weight
Console central ballast **3**	2.5 t

1



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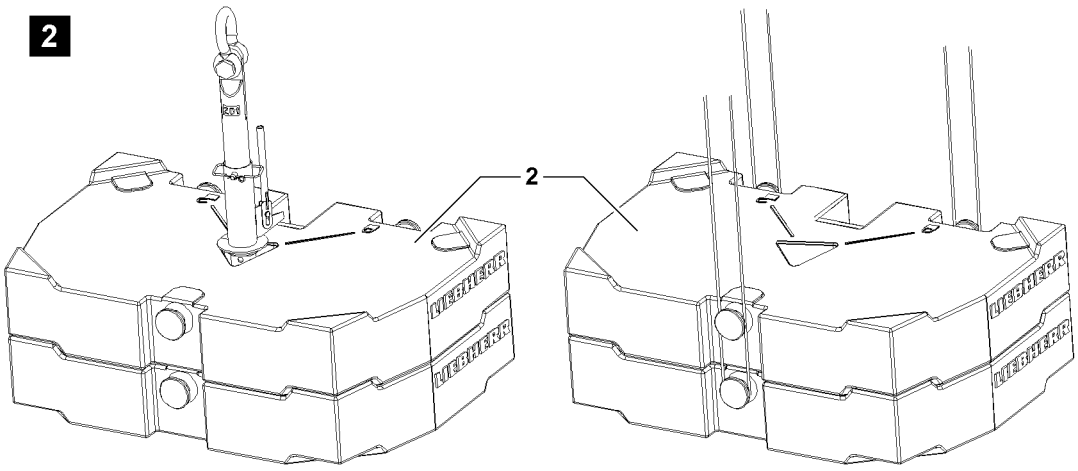


B109241

2 Central ballast combinations

Various central ballast combinations can be placed in the central ballast assemblies **4**:

Central ballast	Combination	Individual weight
5 t	2 x console	2.5 t

Central ballast	Combination	Individual weight
25 t	2 x console	2.5 t
	2 x central ballast plate	10 t

Central ballast	Combination	Individual weight
65 t	2 x console	2.5 t
	8 x central ballast plate	7.5 t

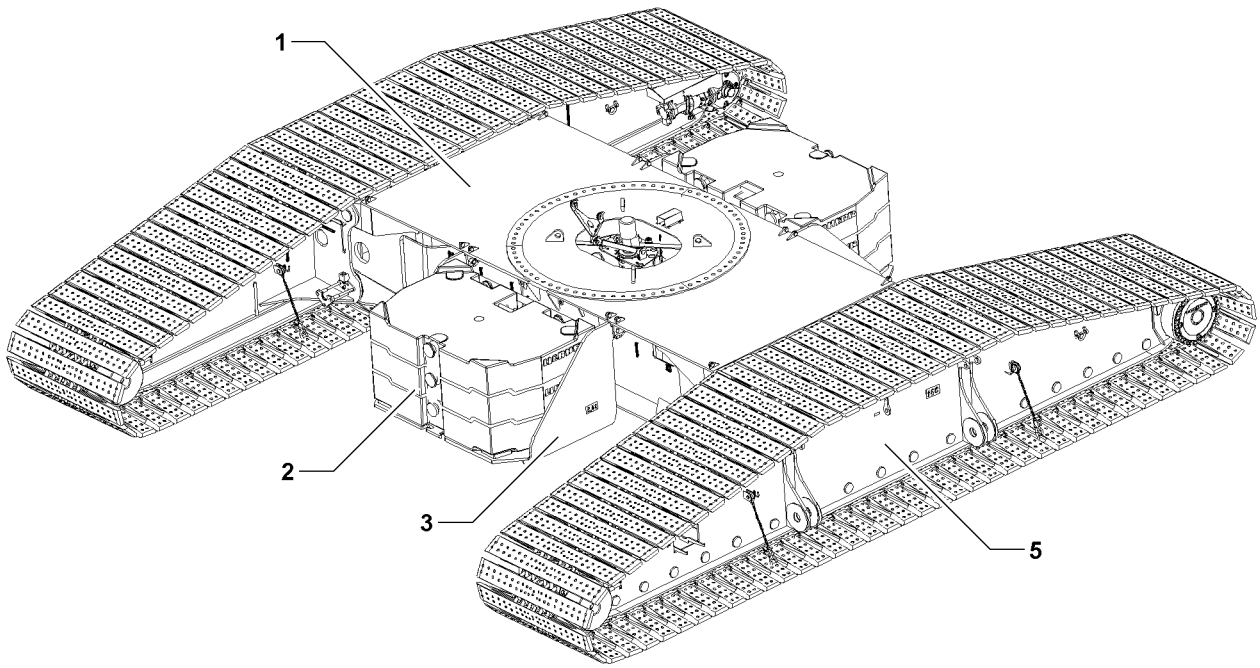
Central ballast	Combination	Individual weight
65 t	2 x console	2.5 t
	6 x central ballast plate	10 t

3 Permissible central ballast assemblies

WARNING
Overload attachment points central ballast plates!
If more than the permissible number of central ballast plates **2** are lifted together, then the attachment points can be overloaded!
The central ballast plates **2** and components can fall down!
Personnel can be severely injured or killed!
▶ Attach only the maximum permissible number of central ballast plates **2** per lift!

Individual weight	Maximum number of same central ballast plates per lift over	
Central ballast plate	Twist lock	Bitt
7.5 t	2	2
10.0 t	2	2

1



B109260

4 Installing the central ballast

WARNING
Danger of slipping / falling during assembly / disassembly work!
During assembly and disassembly work, personnel must be secured with appropriate antifall guards to prevent them from falling!
Weather influences, such as wetness, wind, snow, frost increase the slipping / falling danger!
Personnel can be severely injured or killed!
- ▶ All assembly / disassembly work must be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with the personal fall arrest system (see Crane operating instructions, chapter 2.04) to protect against falling!
- ▶ Hang in the personal antifall system in the corresponding attachment points on the crane (see Crane operating instructions, chapter 2.06)!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Step on aids and fall arresters only with clean shoes!
- ▶ Keep aids and fall arresters clean and free from snow and ice!

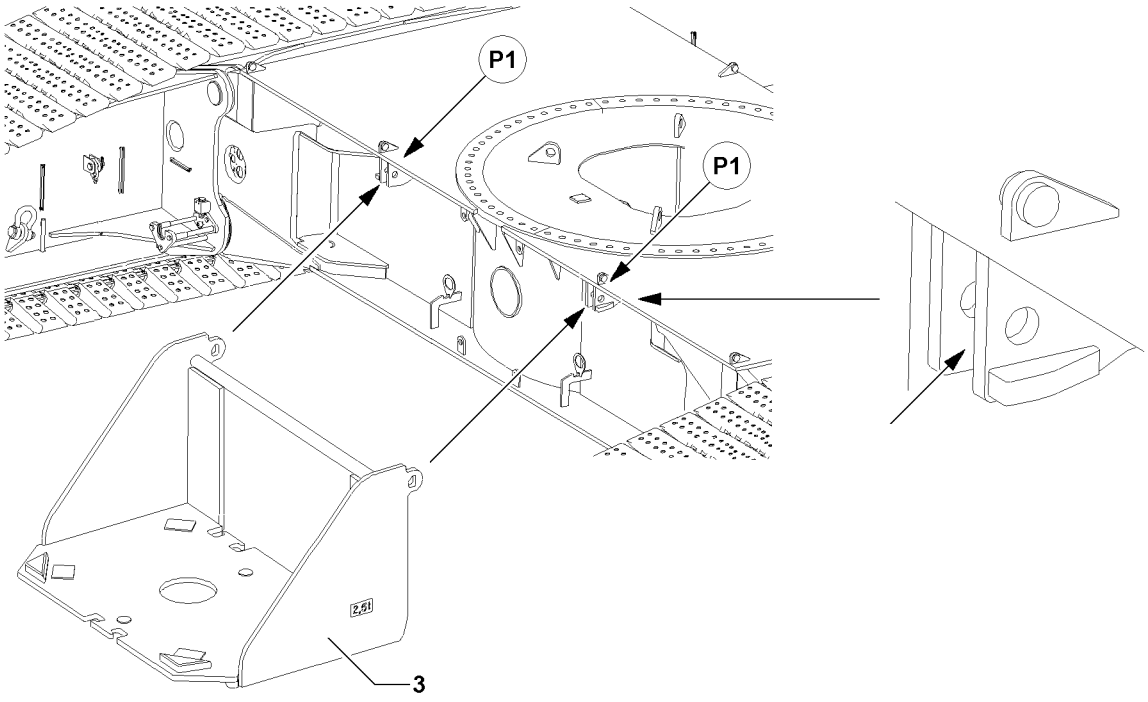
WARNING
Falling components and central ballast plates!
At assembly / disassembly, the components and central ballast plates **2** can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that no persons or objects are within the danger zone!

WARNING
Incorrect handling of the attachment equipment!
If attachment equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down. Personnel can be severely injured or killed!
- ▶ Make sure that the attachment equipment is correctly attached on the attachment points and that it is secured sufficiently to prevent it from loosening up!

WARNING
Danger of impact / crushing!
If anyone remains within the assembly / disassembly area of the ballast, they would be exposed to a danger of impact / crushing!
Personnel can be severely injured or killed!
- ▶ Make sure that there are no persons between the components which are to be assembled / disassembled on the components and the crawler travel gear!

Make sure that the following prerequisites are met:
- – the installation of the crawler carrier **5** is completed
- – both crawler carriers **5** are standing on the ground
- – the crane is aligned in horizontal direction

2



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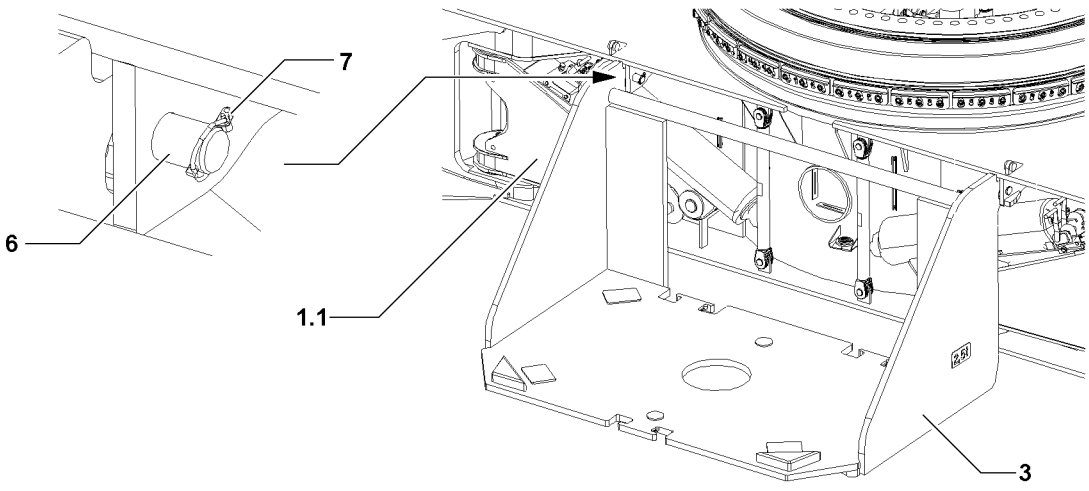

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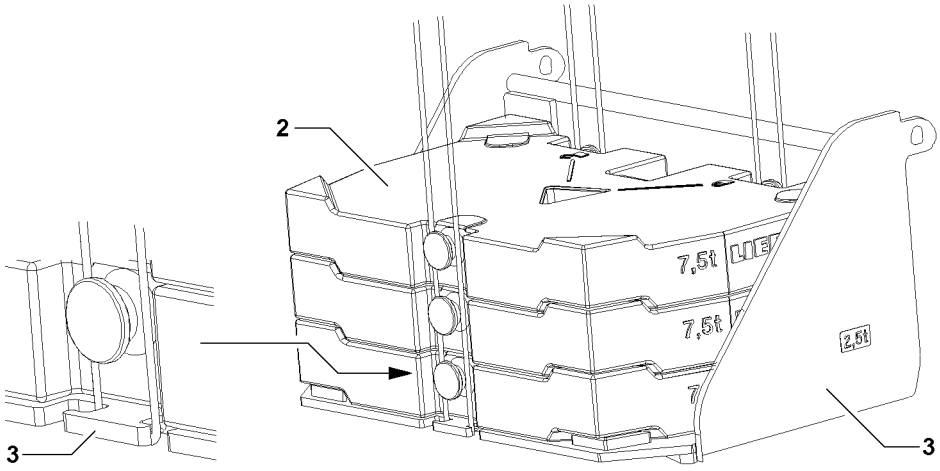


B109242

4.1 Installing the console

Ensure that the following prerequisite is met:
– The pin **6** is unpinned on point **P1**

Note
▶ It is permissible to install the consoles **3** under certain prerequisites with placed central ballast plates **2**, see illustration **4**!
▶ Observe section “Installing the consoles with placed central ballast plates” in this chapter!

Note
▶ The consoles can be installed either with folded in or folded out assembly support **1.1**!

▶ Attach the console **3** onto the auxiliary crane.
▶ Guide the console **3** with the auxiliary crane to the brackets on point **P1** and position in the perforation.
▶ Insert the pins **6** and secure with linch pins **7**, see illustration **3**.

4.2 Installing the consoles with placed central ballast plates

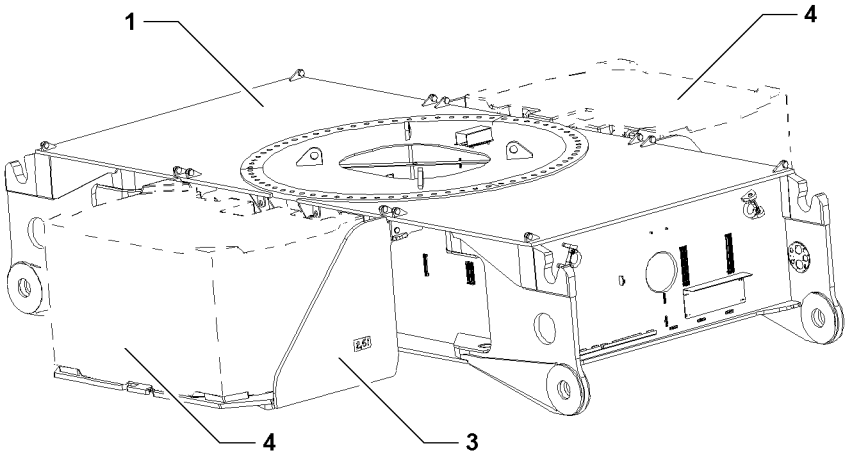
WARNING
Overload of attachment points console!
If the console **3** is lifted with more than 22.5 t of placed central ballast plates **2**, the attachment points will be overloaded!
The console **3** and central ballast plates **2** can fall down!
Personnel can be severely injured or killed!
▶ Make sure that no more than maximum 22.5 t of central ballast plates **2** are placed on the console **3** to be lifted, see illustration **4**!

Note
▶ When placing the central ballast plates **2** on the console **3** observe section “Placing the central ballast plates” in this chapter!

Ensure that the following prerequisite is met:
– The pin **6** is unpinned on point **P1**

▶ Attach the console **3** with the placed central ballast plates **2** on the auxiliary crane, see illustration **4**.
▶ Guide the console **3** with the auxiliary crane to the brackets on point **P1** and position in the perforation.
▶ Insert the pins **6** and secure with linch pins **7**, see illustration **3**.

5



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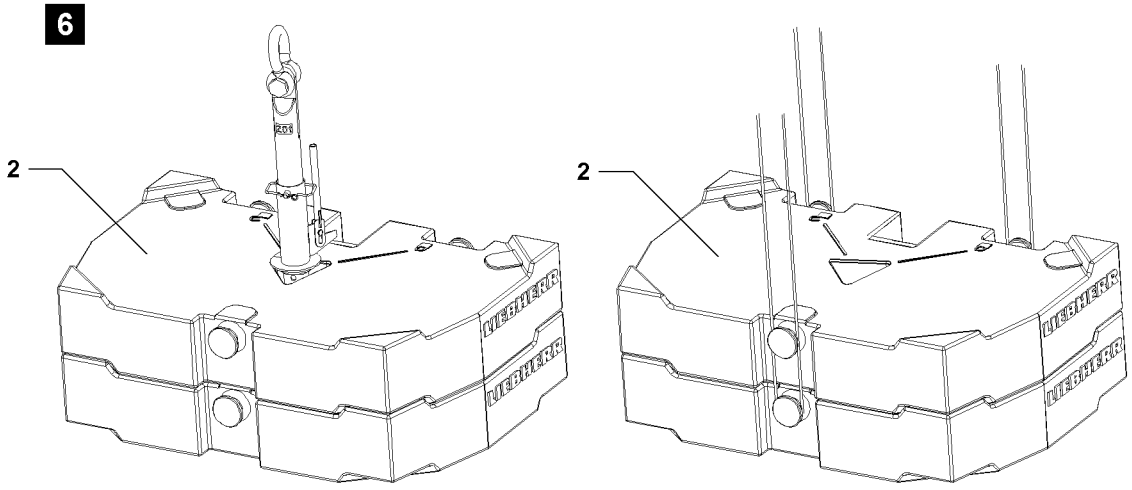


B109243

4.3 Placing the central ballast plates

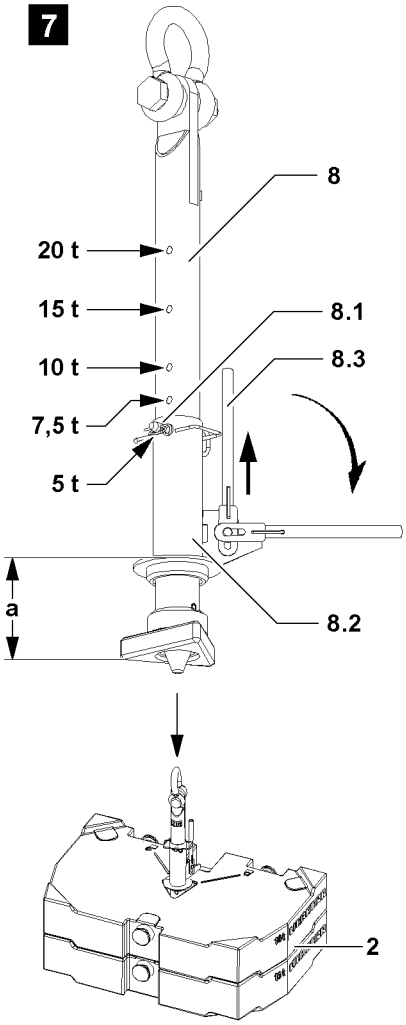
WARNING
Central ballast too low / too high!
If the placed central ballast deviates from the specified data in the load charts or the assembly conditions, then the crane can be damaged or topple over!
Personnel can be severely injured or killed!
▶ Make sure that the central ballast is placed according to the load chart!

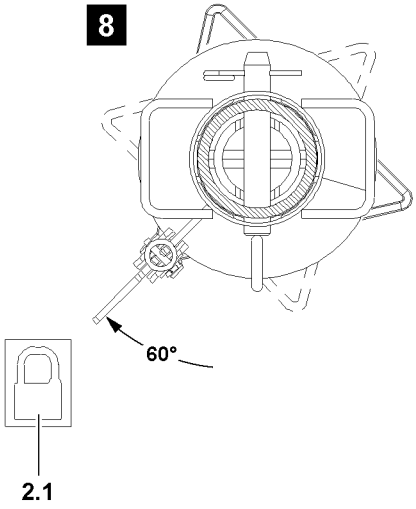
WARNING
Damaged central ballast plates!
Damage on the central ballast plates **2** can cause the tackle to release!
The central ballast plates **2** and components can fall down!
Personnel can be severely injured or killed!
▶ Do not use damaged central ballast plates **2** and replace them immediately!

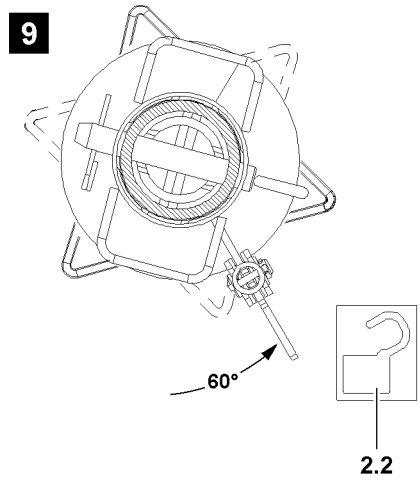
WARNING
Asymmetric central ballast distribution!
If the central ballast is not distributed evenly on both consoles **3**, then this can lead to overload!
The crane can be damaged and components can fall down!
Personnel can be severely injured or killed!
▶ Make sure that the central ballast is distributed evenly on the consoles **3**!

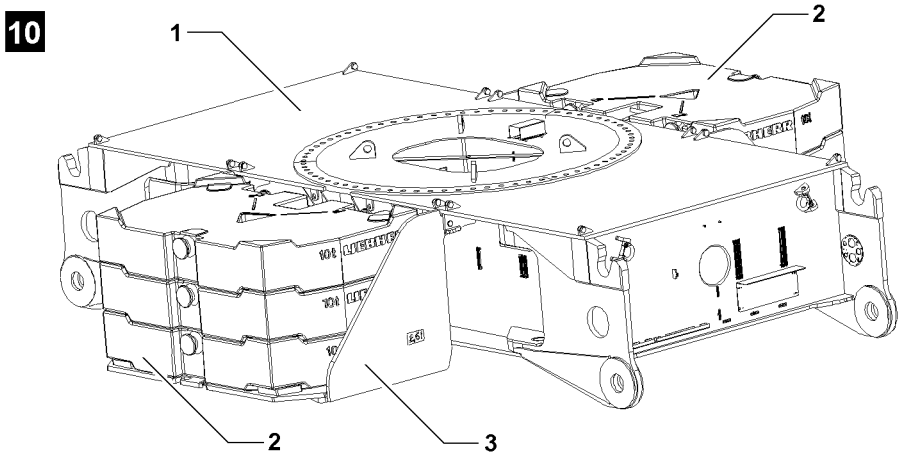
WARNING
Toppling central ballast assembly!
Lopsided stacked central ballast plates **2** create instability in the central ballast assembly **4**!
The central ballast plates **2** can tip from the consoles **3** and cause the crane to topple over!
Personnel can be severely injured or killed!
▶ Make sure that the central ballast plates **2** are placed correctly on the centerings!

Ensure that the following prerequisite is met:
– the consoles **3** are pinned and secured on the crawler center section **1**.









B109244

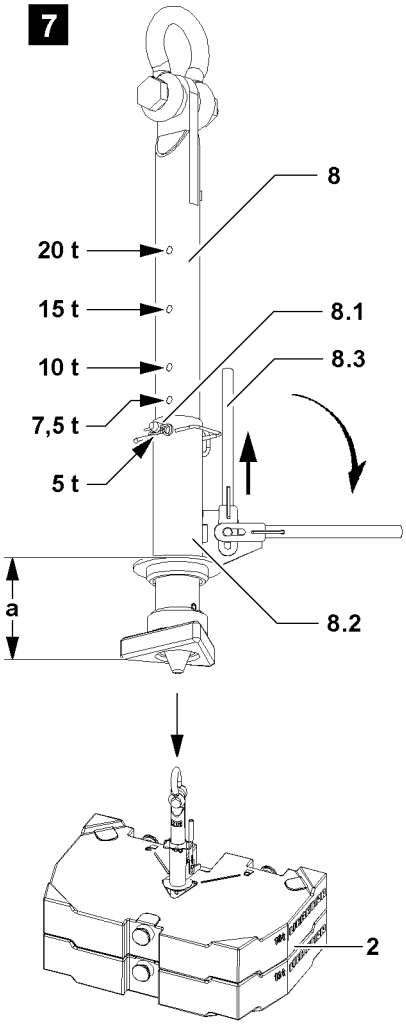
4.3.1 Placing the central ballast plates, attachment system: “Twist lock”

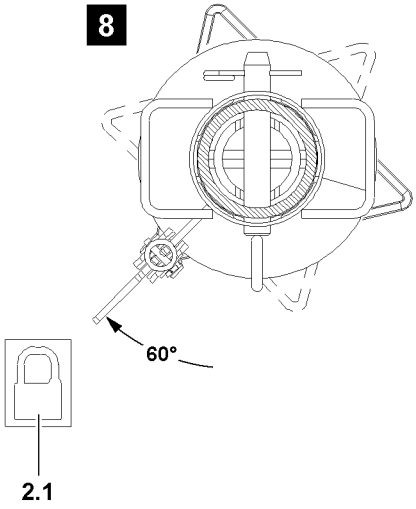
WARNING
Overload of receptacle stud and central ballast plates!
If more than the permissible number of central ballast plates **2** are lifted with the receptacle stud **8**, the receptacle stud **8** and the central ballast plates **2** can be overloaded and damaged!
Central ballast plates **2** can fall down!
Personnel can be severely injured or killed!
▶ Observe the chart “Permissible central ballast assemblies” in this chapter!

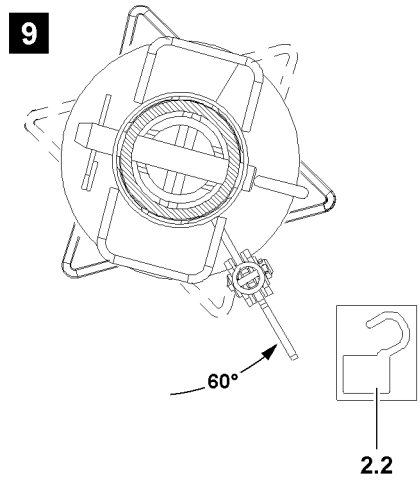
WARNING
Damage of receptacle stud and central ballast plates!
If two central ballast plates **2** are lifted which do not lay correctly in their centerings, the receptacle stud **8** and the central ballast plates **2** can be damaged!
Damage can cause the central ballast plates **2** to fall down!
Personnel can be severely injured or killed!
▶ Make sure that the central ballast plates **2** to be lifted are placed correctly in the centerings!

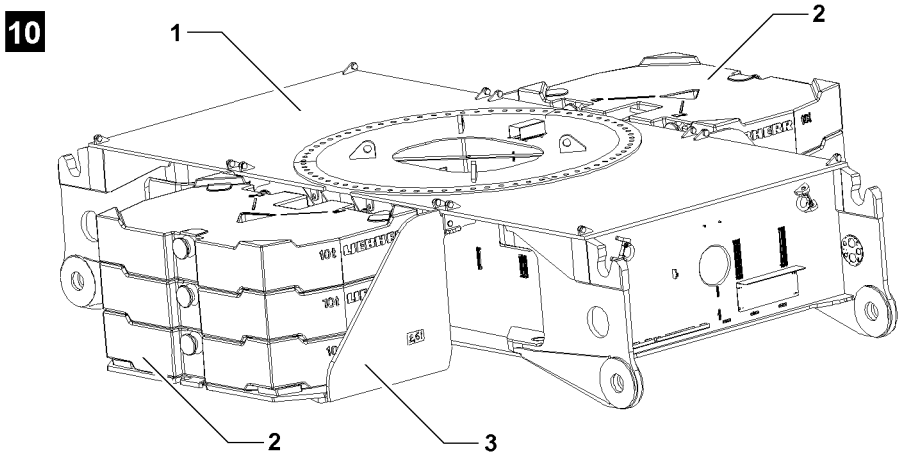
WARNING
Twist lock system opens by itself!
If the receptacle stud **8** is not correctly locked, the Twist lock system can open by itself!
Central ballast plates **2** can fall down!
Personnel can be severely injured or killed!
▶ Make sure, when initiating a lift, that the lever **8.3** points directly on the symbol “Locked” **2.1** of the central ballast plates **2**!

Note
▶ During a lift, the locked Twist lock system cannot release by itself due to its gravitational retention!
▶ During a lift, the locked Twist lock system cannot be released by hand due to its gravitational retention!









B109244

Before the receptacle stud **8** is guided in the central ballast plates **2**, make sure that the insertion length **a** of the receptacle stud **8** is set correctly.
The insertion length **a** of the receptacle stud **8** for central ballast plates **2** can be adjusted by hand.

- ▶ If the insertion length **a** of the receptacle stud **8** is to be adjusted:
  Release and unpin the pins **8.1**.
- ▶ Adjust the insertion length **a** by moving the guide sleeve **8.2** to the desired value, observe the stages in illustration **7**.
- ▶ Insert and secure the pin **8.1**.

Result:

– The receptacle stud **8** is adjusted.

Note

▶ The receptacle stud **8** in illustration **7** is set to 5 t!

- ▶ Attach the receptacle stud **8** on the auxiliary crane and guide it into the central ballast plate(s) **2**.
- ▶ Pull up the lever **8.3** and fold it down.
- ▶ Turn the receptacle stud **8** with the lever **8.3** by 60° until it points to the symbol “Locked” **2.1** of the central ballast plate **2**, see illustration **8**.

Note

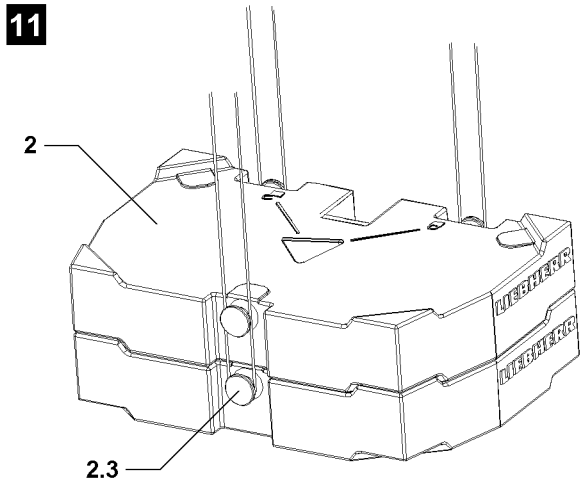
▶ The receptacle stud **8** is locked by lifting the central ballast plate(s) **2**!

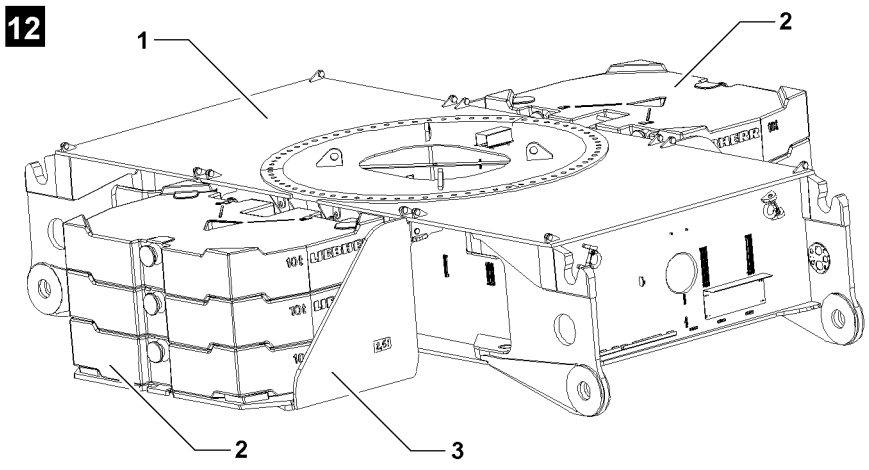
- ▶ Lift the central ballast plate(s) **2** or the central ballast assembly with the receptacle stud **8** and place it carefully on the centerings on the console **3** or on another central ballast plate **2**, see illustration **10**.
- ▶ When the central ballast plate(s) **2** are placed down:
  Turn the receptacle stud **8** with the lever **8.3** by 60° to the stop in direction of the symbol “unlocked” **2.2** of the central ballast plate **2**, see illustration **9**.

Result:

– The receptacle stud **8** is unlocked.

- ▶ Carefully pull out the receptacle stud **8**.
- ▶ Place the central ballast plates **2** according to the load chart.





B109255

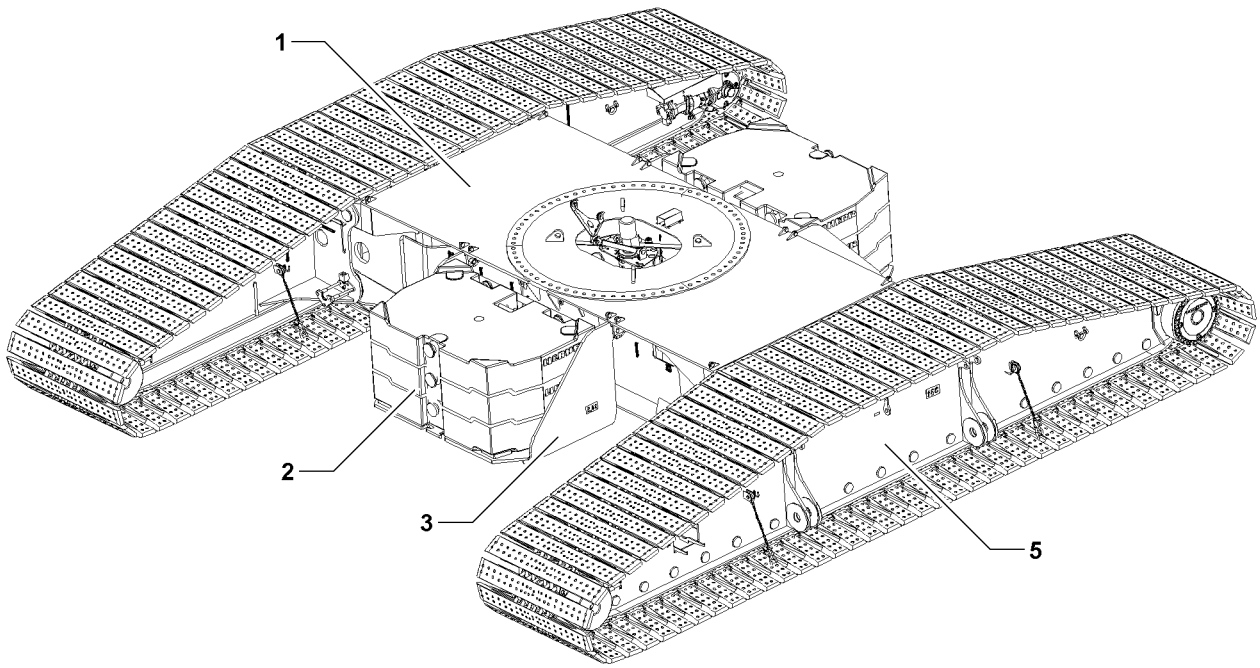
4.3.2 Placing the central ballast plates, attachment points: Bitt

WARNING
Overloaded central ballast plates!
If more than the permissible loads are lifted, the bitts **2.3** are overloaded!
The central ballast plates **2** can be damaged and fall down!
Personnel can be severely injured or killed!
▶ Observe the chart “Permissible central ballast assemblies” in this chapter!

WARNING
Incorrect handling of the attachment equipment!
If tackle cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, the central ballast plates **2** can fall down!
Personnel can be severely injured or killed!
▶ Make sure that the tackle is correctly attached on the bitts **2.3** and that it is secured sufficiently to prevent it from loosening up!

▶ Attach the central ballast plates **2** or the central ballast assembly, see illustration **11** on the auxiliary crane.
▶ Place the central ballast plates **2** or the central ballast assembly on the centerings of the console **3** or on another central ballast plate **2**.

1



B109260

5 Removing the central ballast

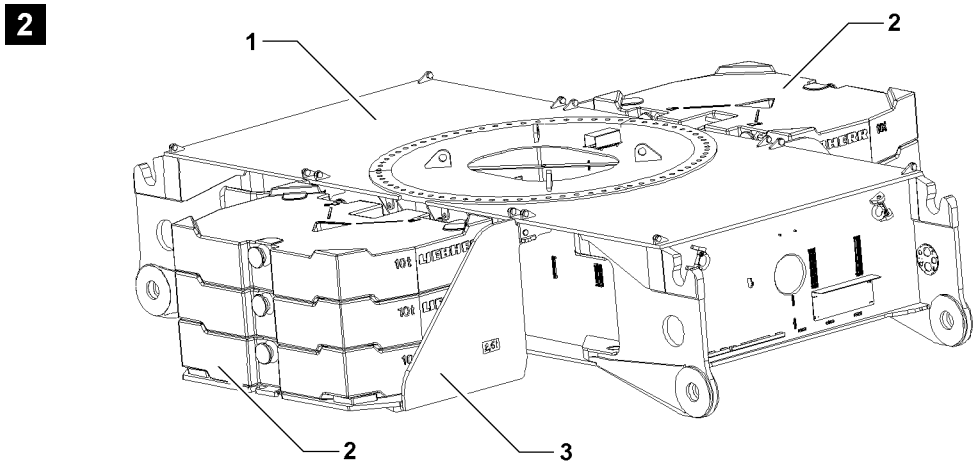
WARNING
Danger of slipping / falling during assembly / disassembly work!
During assembly and disassembly work, personnel must be secured with appropriate antifall guards to prevent them from falling!
Weather influences, such as wetness, wind, snow, frost increase the slipping / falling danger!
Personnel can be severely injured or killed!
- ▶ All assembly / disassembly work must be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with the personal fall arrest system (see Crane operating instructions, chapter 2.04) to protect against falling!
- ▶ Hang in the personal antifall system in the corresponding attachment points on the crane (see Crane operating instructions, chapter 2.06)!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Step on aids and fall arresters only with clean shoes!
- ▶ Keep aids and fall arresters clean and free from snow and ice!

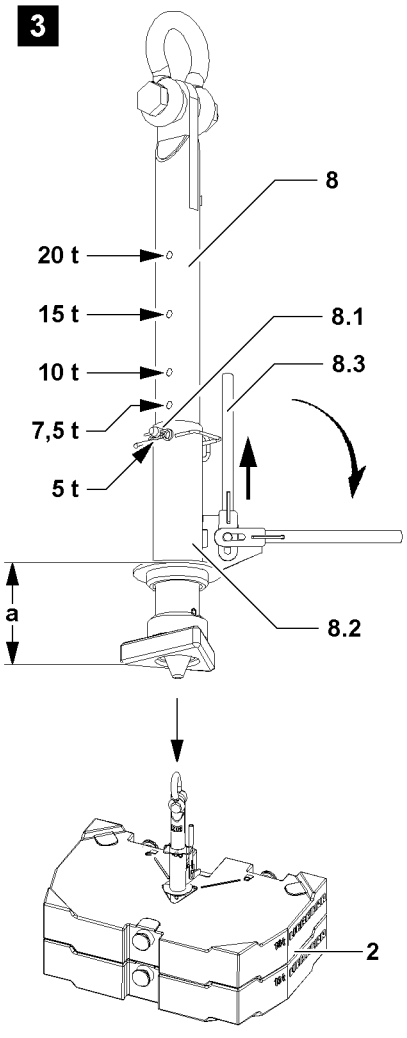
WARNING
Falling components and central ballast plates!
At assembly / disassembly, the components and central ballast plates **2** can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that no persons or objects are within the danger zone!

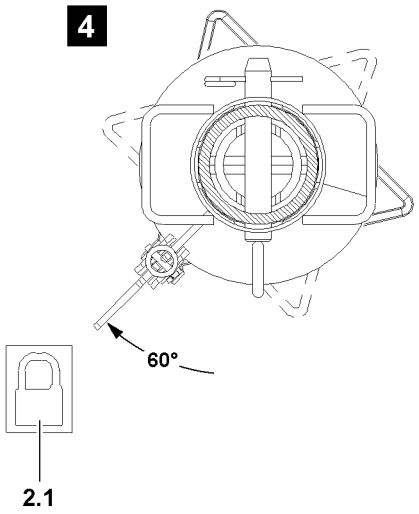
WARNING
Incorrect handling of the attachment equipment!
If tackle cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the attachment equipment is correctly attached on the attachment points and that it is secured sufficiently to prevent it from loosening up!

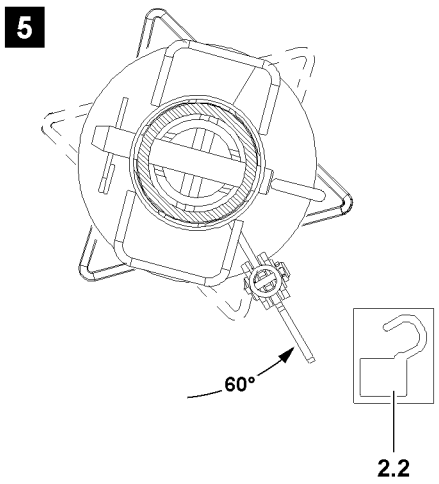
WARNING
Danger of impact and crushing!
If anyone remains within the assembly / disassembly area of the ballast, they would be exposed to a danger of impact and crushing!
Personnel can be severely injured or killed!
- ▶ Make sure that there are no persons between the components which are to be assembled / disassembled on the components and the crawler travel gear!

Make sure that the following prerequisites are met:
- – both crawler carriers **5** are standing on the ground
- – the crane is aligned in horizontal direction









B109257

5.1 Removing the central ballast plates

Note

- ▶ It is permissible to remove the consoles **3** under certain prerequisites with placed central ballast plates **2**!
- ▶ Observe section “Removing the consoles with placed central ballast plates” in this chapter!

5.1.1 Removing the central ballast plates, attachment system: “Twist lock”

WARNING

Overload of receptacle stud and central ballast plates!

If more than the permissible number of central ballast plates **2** are lifted with the receptacle stud **8**, the receptacle stud **8** and the central ballast plates **2** can be overloaded and damaged!

Central ballast plates **2** can fall down!

Personnel can be severely injured or killed!

- ▶ Observe the chart “Permissible central ballast assemblies” in this chapter!

WARNING

Damage of receptacle stud and central ballast plates!

If two central ballast plates **2** are lifted which do not lay correctly in their centerings, the receptacle stud **8** and the central ballast plates **2** can be damaged!

Damage can cause the central ballast plates **2** to fall down!

Personnel can be severely injured or killed!

- ▶ Make sure that the central ballast plates **2** to be lifted are placed correctly in the centerings!

WARNING

Twist lock system opens by itself!

If the receptacle stud **8** is not correctly locked, the Twist lock system can open by itself!

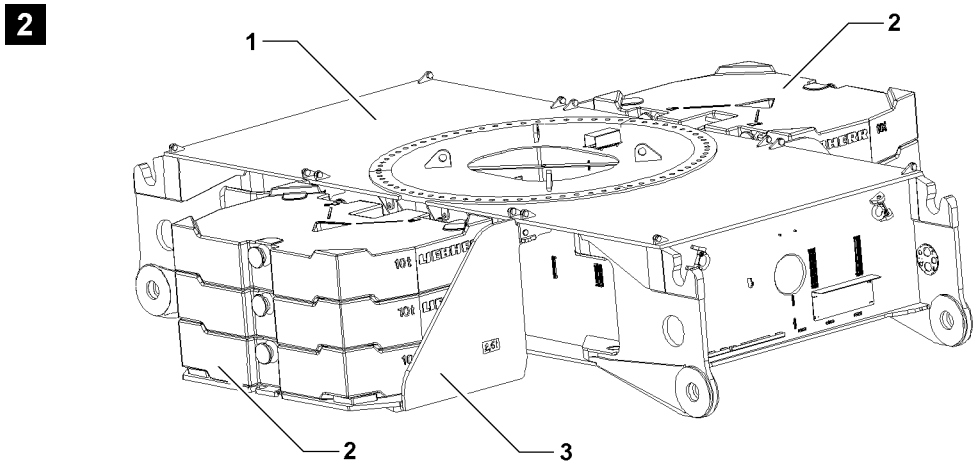
Central ballast plates **2** can fall down!

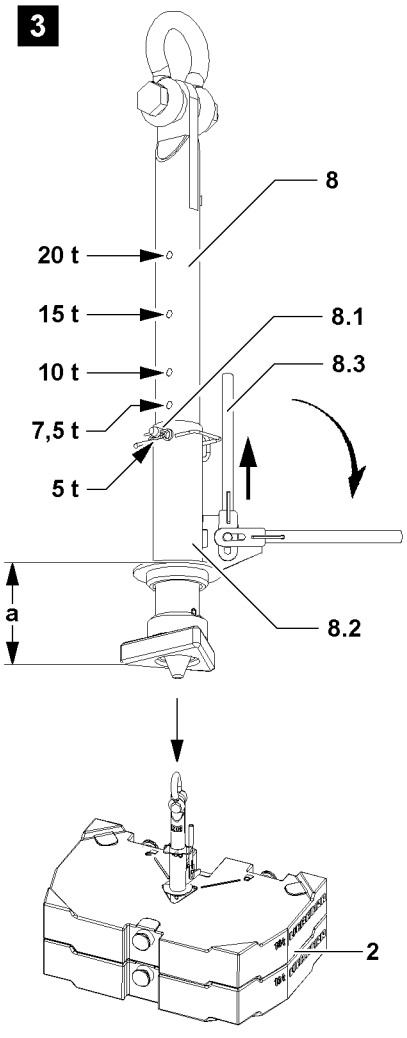
Personnel can be severely injured or killed!

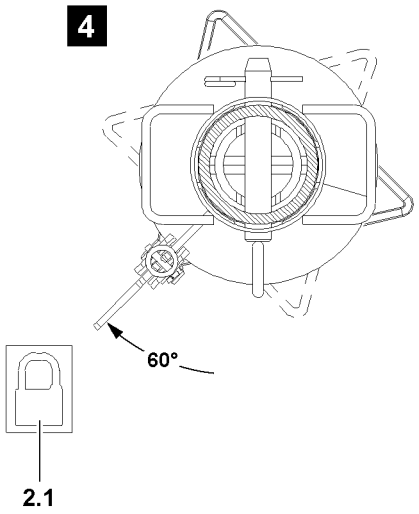
- ▶ Make sure, when initiating a lift, that the lever **8.3** points directly on the symbol “Locked” **2.1** of the central ballast plates **2**!

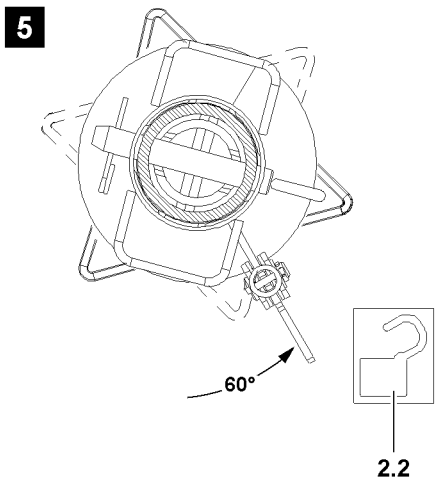
Note

- ▶ During a lift, the locked Twist lock system cannot release by itself due to its gravitational retention!
- ▶ During a lift, the locked Twist lock system cannot be released by hand due to its gravitational retention!









B109257

Before the receptacle stud **8** is guided in the central ballast plates **2**, make sure that the insertion length **a** of the receptacle stud **8** is set correctly.
The insertion length **a** of the receptacle stud **8** for central ballast plates **2** can be adjusted by hand.

- ▶ If the insertion length **a** of the receptacle stud **8** is to be adjusted:
  Release and unpin the pins **8.1**.
- ▶ Adjust the insertion length **a** by moving the guide sleeve **8.2** to the desired value, observe the stages in illustration **3**.
- ▶ Insert and secure the pin **8.1**.

Result:

– The receptacle stud **8** is adjusted.

Note

▶ The receptacle stud **8** in illustration **3** is set to 5 t!

- ▶ Attach the receptacle stud **8** on the auxiliary crane and guide it into the central ballast plate(s) **2**.
- ▶ Pull up the lever **8.3** and fold it down.
- ▶ Turn the receptacle stud **8** with the lever **8.3** by 60° until it points to the symbol “Locked” **2.1** of the central ballast plate **2**, see illustration **4**.

Note

▶ The receptacle stud **8** is locked by lifting the central ballast plate(s) **2**!

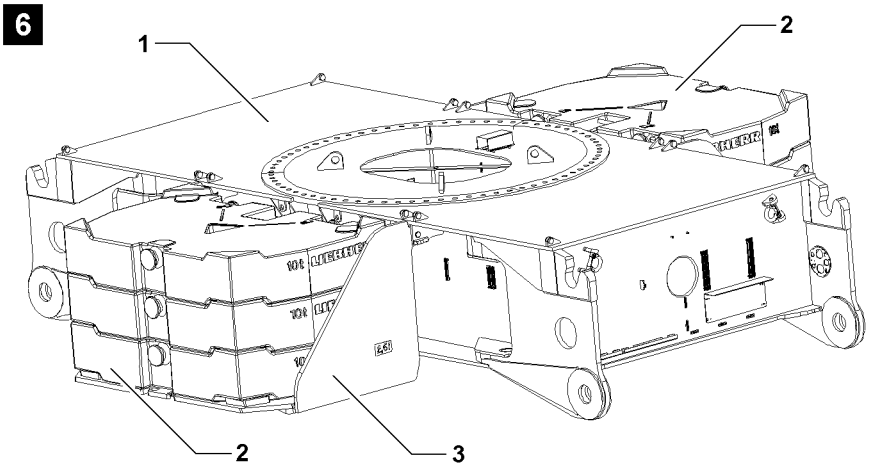
- ▶ Lift the central ballast plate(s) **2** or the central ballast assembly with the receptacle stud **8** and place them carefully on a suitable storage location.
- ▶ When the central ballast plate(s) **2** are placed down:
  Turn the receptacle stud **8** with the lever **8.3** by 60° to the stop in direction of the symbol “unlocked” **2.2** of the central ballast plate **2**, see illustration **5**.

Result:

– The receptacle stud **8** is unlocked.

- ▶ Carefully pull out the receptacle stud **8**.

6



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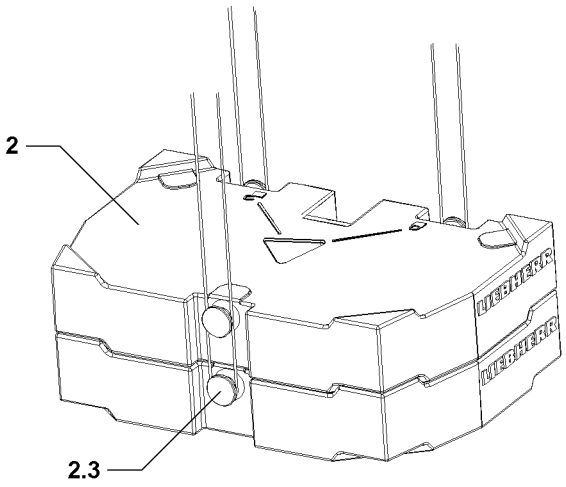


B109258

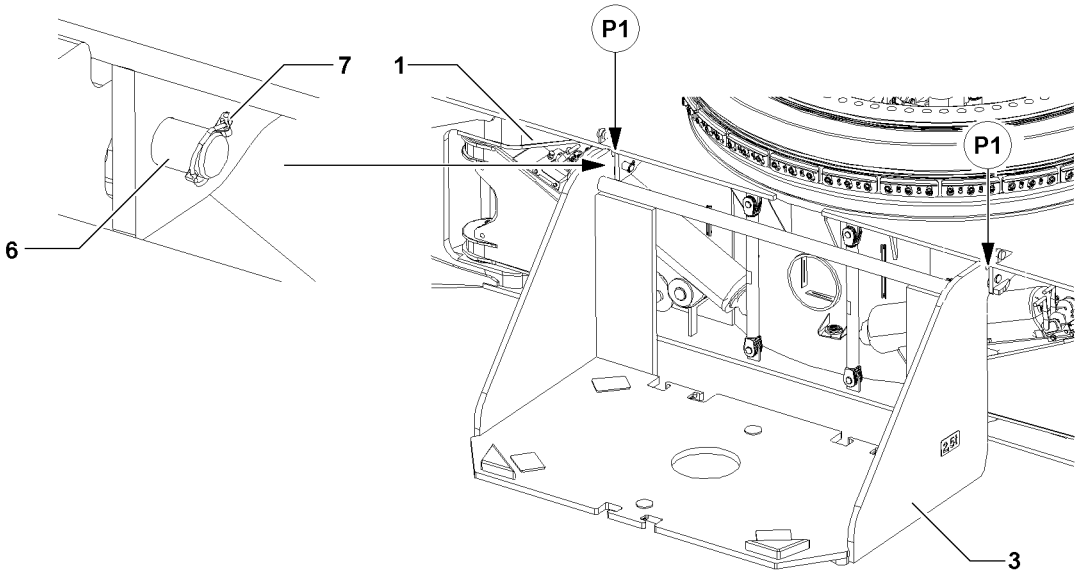
5.1.2 Removing the central ballast plates, attachment points: Bitt

WARNING
Overloaded central ballast plates!
If more than the permissible loads are lifted, the bitts **2.3** are overloaded!
The central ballast plates **2** can be damaged and fall down!
Personnel can be severely injured or killed!
▶ Observe the chart “Permissible central ballast assemblies” in this chapter!

WARNING
Incorrect handling of the attachment equipment!
If tackle cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, the central ballast plates **2** can fall down!
Personnel can be severely injured or killed!
▶ Make sure that the tackle is correctly attached on the bitts **2.3** and that it is secured sufficiently to prevent it from loosening up!

▶ Attach the central ballast plates **2** or the central ballast assembly, see illustration **7** on the auxiliary crane.
▶ Remove the central ballast plates **2** or the central ballast assembly from the console **3** and place it on a suitable storage location.

8



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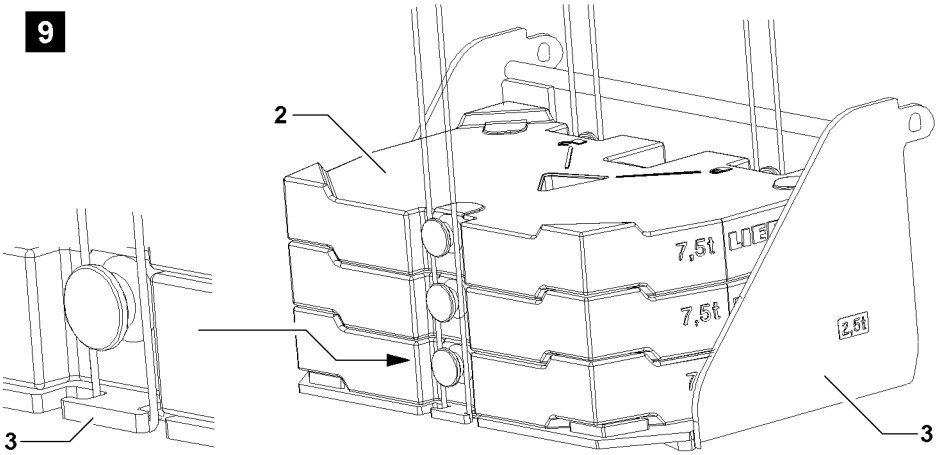


B109259

5.2 Removing the consoles

WARNING
Danger of accidents due to diagonal pull!
If pulled diagonally, a suspended console **3** can start to swing back and forth after releasing it from the crawler center section **1**!
Personnel can be severely injured or killed!
- ▶ Always position the tackle in the center above the attachment points!
- ▶ Take special caution when unpinning the consoles **3**!

- ▶ Position the tackle with the auxiliary crane in the center above attachment points.
- ▶ Attach the console **3** onto the auxiliary crane.
- ▶ Tighten the tackle with the auxiliary crane.
- ▶ Remove the linch pin **7** and unpin the pin **6**.
- ▶ Pull the console **3** with the auxiliary crane from the brackets on points **P1**.

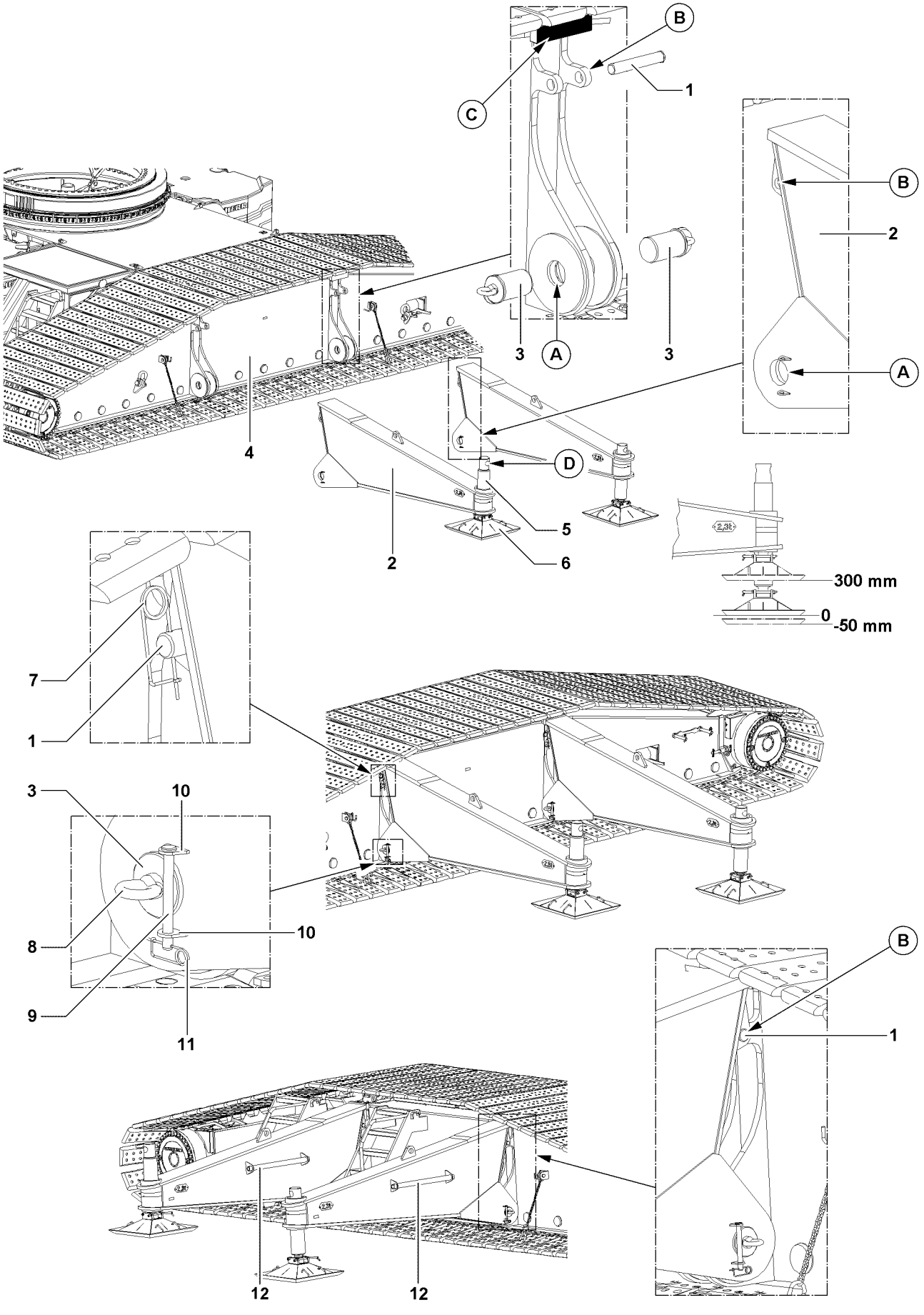
5.3 Removing the consoles with placed central ballast plates

WARNING
Danger of accidents due to diagonal pull!
If pulled diagonally, a suspended console **3** can start to swing back and forth after releasing it from the crawler center section **1**!
Personnel can be severely injured or killed!
- ▶ Always position the tackle in the center above the attachment points!
- ▶ Take special caution when unpinning the consoles **3**!

WARNING
Overload of attachment points console!
If the console **3** is lifted with more than 22.5 t of placed central ballast plates **2**, the attachment points will be overloaded!
The console **3** and central ballast plates **2** can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that no more than maximum 22.5 t of central ballast plates **2** are placed on the console **3** to be lifted, see illustration **9**!

Note
- ▶ When removing the central ballast plates **2** from the console **3** observe section “Removing the central ballast plates” in this chapter!

- ▶ Position the tackle with the auxiliary crane in the center above attachment points of the console **3**.
- ▶ Attach the console **3** with the placed central ballast plates **2** on the auxiliary crane.
- ▶ Tighten the tackle with the auxiliary crane.
- ▶ Remove the linch pin **7** and unpin the pin **6**.
- ▶ Pull the console **3** with the auxiliary crane from the brackets on points **P1**.



B105233

1 Installing the mechanical auxiliary support

Make sure that the following prerequisites are met:
- The crawler carriers are installed.
- The crane is aligned in horizontal direction.
- The ground has sufficient load bearing capacity in the area of the support pads.
- An auxiliary crane is available.

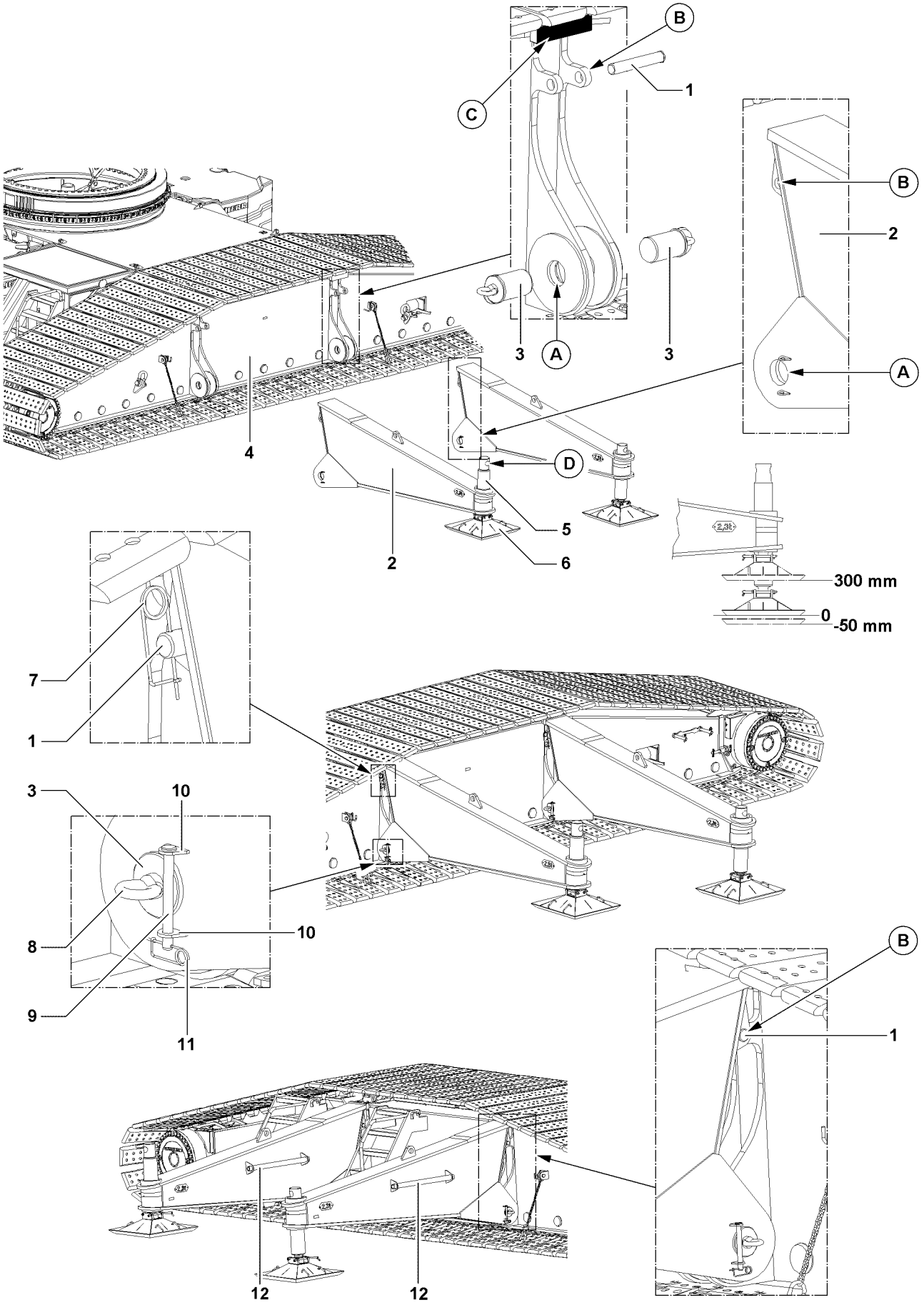
Note
▶ The mechanical auxiliary support is required to erect or take down long boom combinations and can be installed on the left or right crawler carrier.

WARNING
The crane can topple over!
If long boom combinations are erected or taken down without mechanical auxiliary support **2**, then the crane can topple over. Personnel can be severely injured or killed!
▶ Observe and adhere to the data in the erection and take down charts!
▶ Pin the mechanical auxiliary support **2** on the crawler carrier **4** and turn the spindle to lay the support pads on the ground.

1.1 Attaching the mechanical auxiliary support

Note
▶ The installation of the mechanical auxiliary support **2** is the same for both support beams on the left and right hand side!

▶ Hang the mechanical auxiliary support **2** on the auxiliary crane and swing into pin position.
▶ Align the mechanical auxiliary support **2**: Make sure that the pin bores of the auxiliary support and the crawler carrier align in points **A** and in points **B**.
▶ Insert the pins **3** each from the left and right on point **A**.
▶ Secure the pins **3** from the left and right: Insert the pins **9** into brackets **10** and secure with spring retainer **11**.
▶ Insert the pin **1** on point **B** and secure with spring retainer **7**.
▶ Remove the mechanical auxiliary support from the auxiliary crane.



B105233

1.2 Adjusting the mechanical auxiliary support

Note

- ▶ The mechanical auxiliary support is only an erection and take down aid device.
- ▶ Due to the mechanical auxiliary support, the stability momentum of the crane increases toward the side, on which the auxiliary support is installed.

DANGER

The crane can topple over!

If the load moments are increased due to the use of the mechanical auxiliary support, the crane can topple over and severely or fatally injure personnel.

- ▶ The support pads must be made large enough for the ground conditions, use solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

WARNING

Jerky movements of the boom system!

If the mechanical auxiliary support **2** is not placed on the crawler carrier **4** at point **C**, then the boom system can move jerkily during erection and take down.

Personnel can be severely injured or killed! The crane can be damaged.

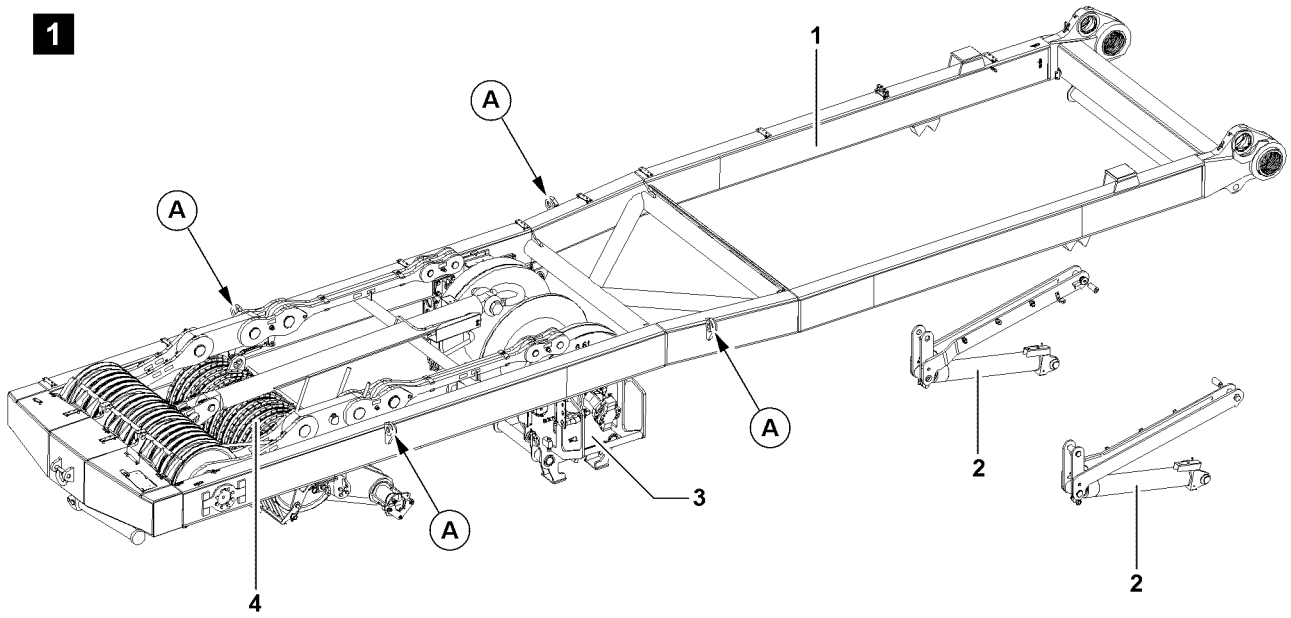
- ▶ Turn the support pad **6** with the spindle **5** until the mechanical auxiliary support **2** touches at point **C**.

Note

- ▶ Adjustment range of support pad: -50 mm to +300 mm.

- ▶ Remove the pipe **12** from the transport retainer on the mechanical auxiliary support.
- ▶ Insert the pipe **12** at point **D** into the bore on the spindle **5**.
- ▶ Extend the support pad **6** by turning the spindle **5** with the pipe **12** downward until it is “tensioned” and placed horizontally on the base support and has contact to the placement surface **C** on the crawler carrier.

1



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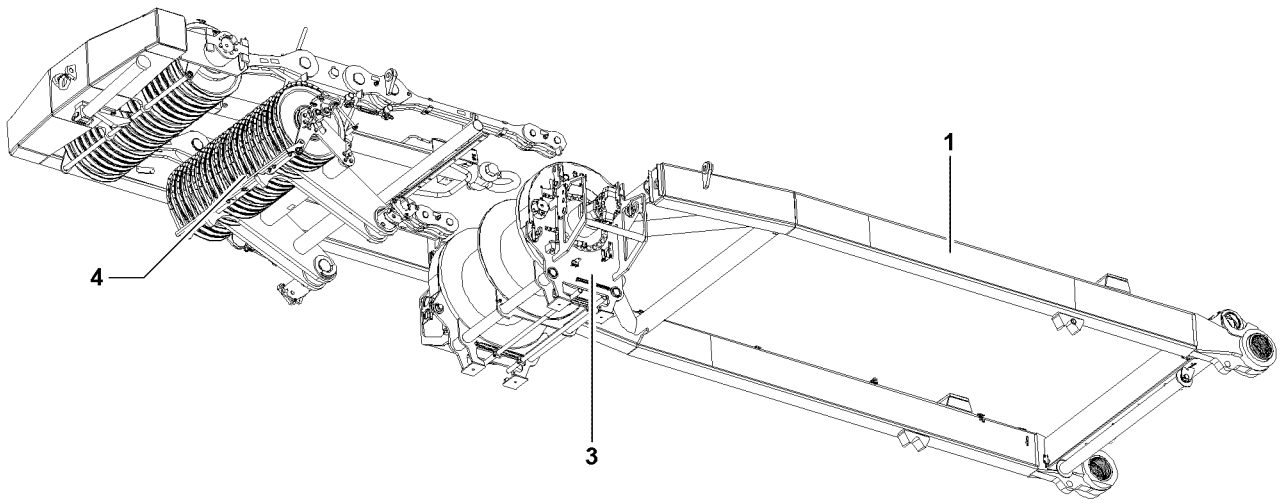


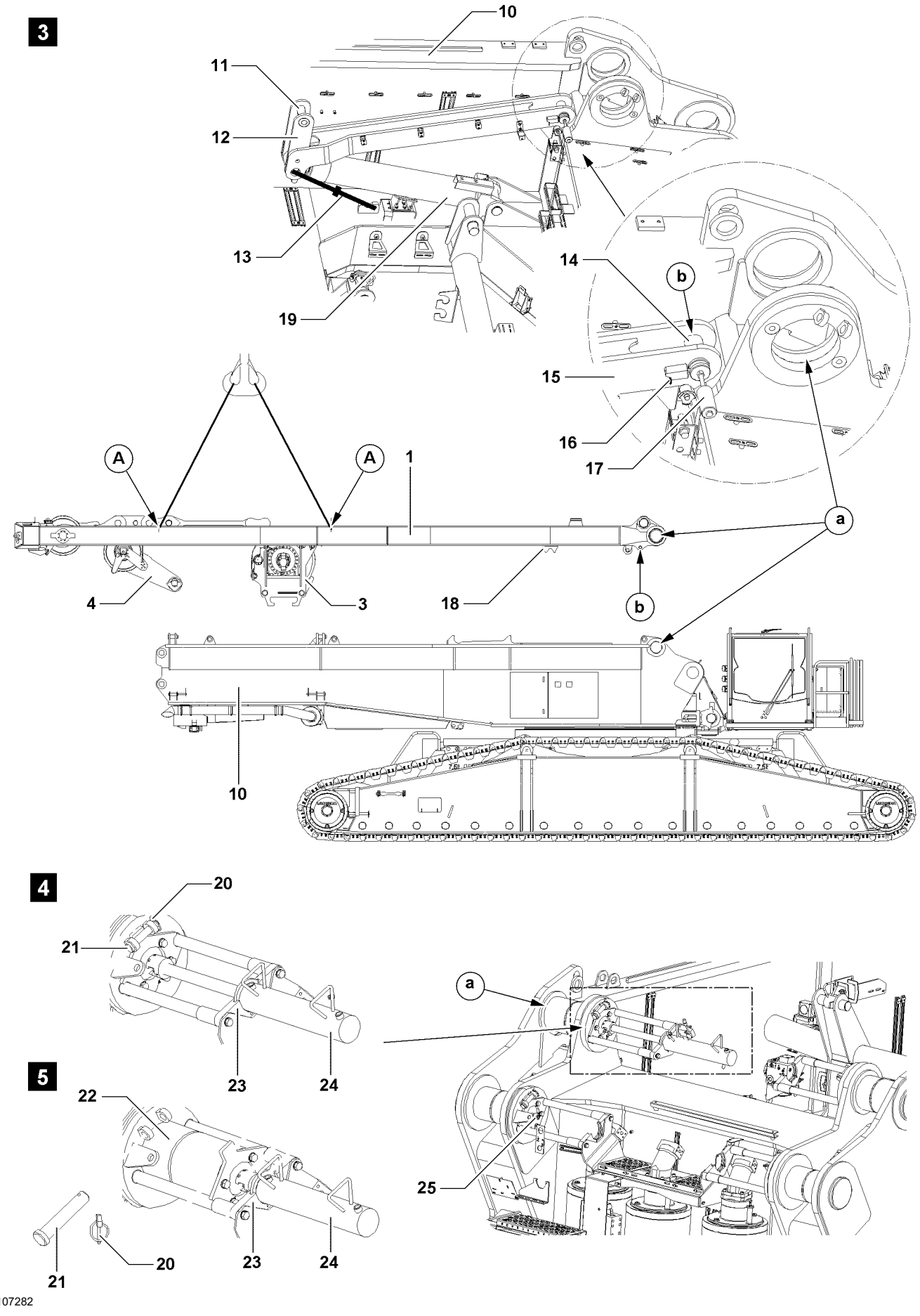
B107281

1 Component overview SA-frame

Position	Component	Weight
1	SA-frame	
3	Intake gear winch 4	
4	Roller bearings	
	SA-frame complete	17.5 t
2	Erection cylinder	

2 Attachment points SA-frame

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components!
▶ The corresponding components must be attached on the intended points **A**!


3
10
11
12
13
19
14
b
15
16
17
A
A
1
a
4
3
18
b
10
4
20
21
23
24
a
5
22
25
20
23
24
21
B107282

3 Assemble SA-frame

3.1 Pin the SA-frame on the turntable

Note

▶ Guarantee equally long tackle such that the SA-frame can be horizontally positioned over the turntable.

NOTICE

Collision of components!

If the SA-frame is positioned with the auxiliary crane on the turntable, roller bearings and hoist gear can collide with the turntable. Components can be damaged.

▶ Make sure that the roller bearing **4** does not collide with the turntable **10**.

▶ Make sure that the intake gear winch 4 **3** does not collide with the turntable **10**.

Ensure that the following prerequisite is met:

– unpin the pins **22** on both sides,

– unpin the pins **14** on both sides.

▶ Remove the linch pin **20** and unpin pins **21** see illustration **5**.

Result:

– The pin **22** cannot be pinned.

▶ Attach the pin pulling cylinder **24** between the retainer **23** and the pull screw **25**.

▶ Attach SA-frame **1** with auxiliary crane on the attachment points.

▶ Position SA-frame **1** with auxiliary auxiliary crane on the turntable **10** so that pinning points **a** and pinning points **b** align.

▶ Insert the pins **22** on both sides.

▶ Remove the pin pulling device **24**.

▶ Secure the pin **22**: Insert the pin **21** and secure with linch pin **20**.

▶ Pull, turn and latch spring pin **16** on both sides.

▶ Pin pins **14** with pin device **17**.

▶ Pins **16** should be pinned on both sides and secured with spring retainers **14**.

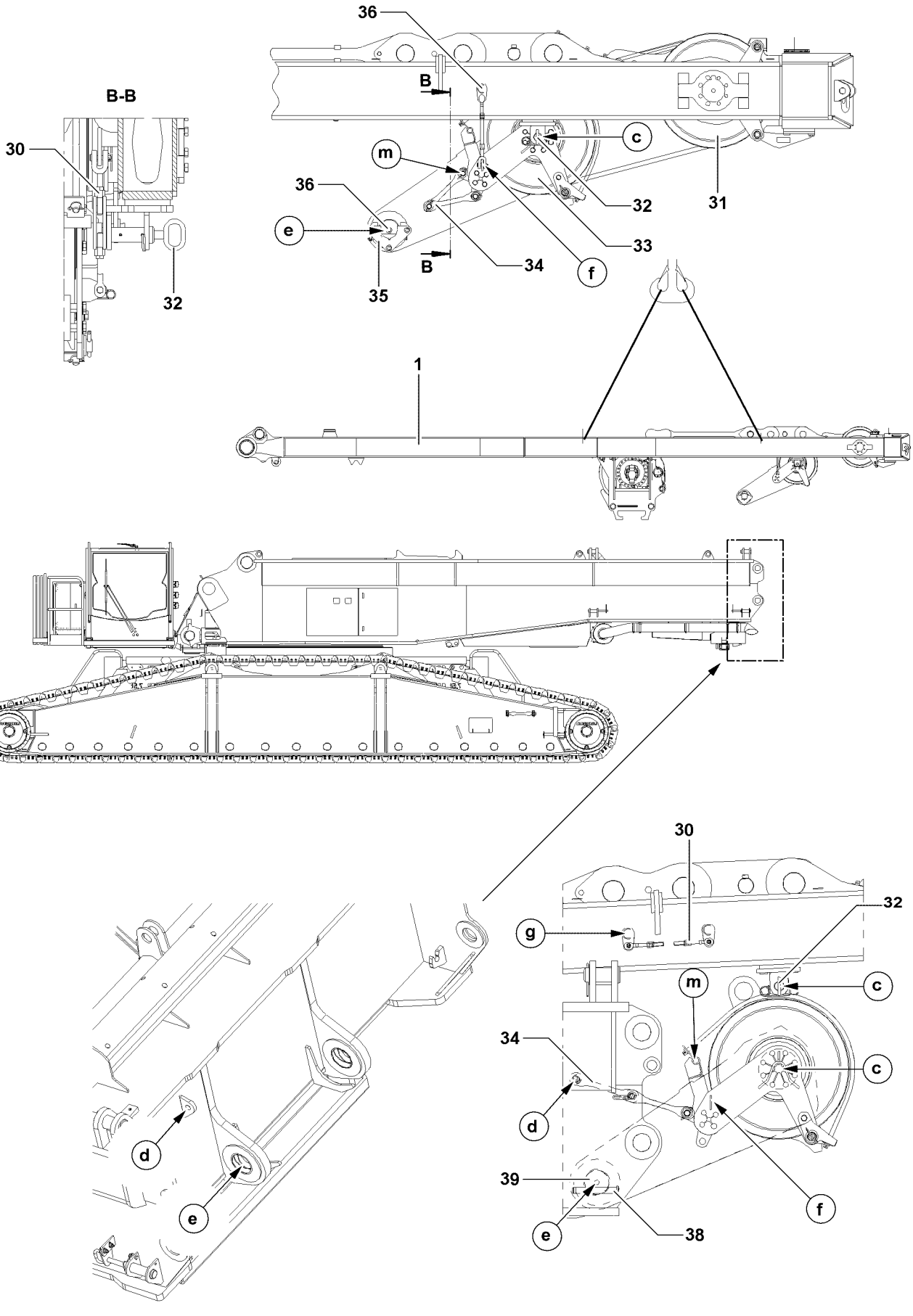
NOTICE

SA frame damage!

If the turnbuckle is not unpinned before the operation, the SA-frame is damaged.

▶ Unpin turnbuckle **13** before operation.

▶ Lay down SA-frame **1** completely: Make sure that the pins **11** lie on both sides of the plate **18**.



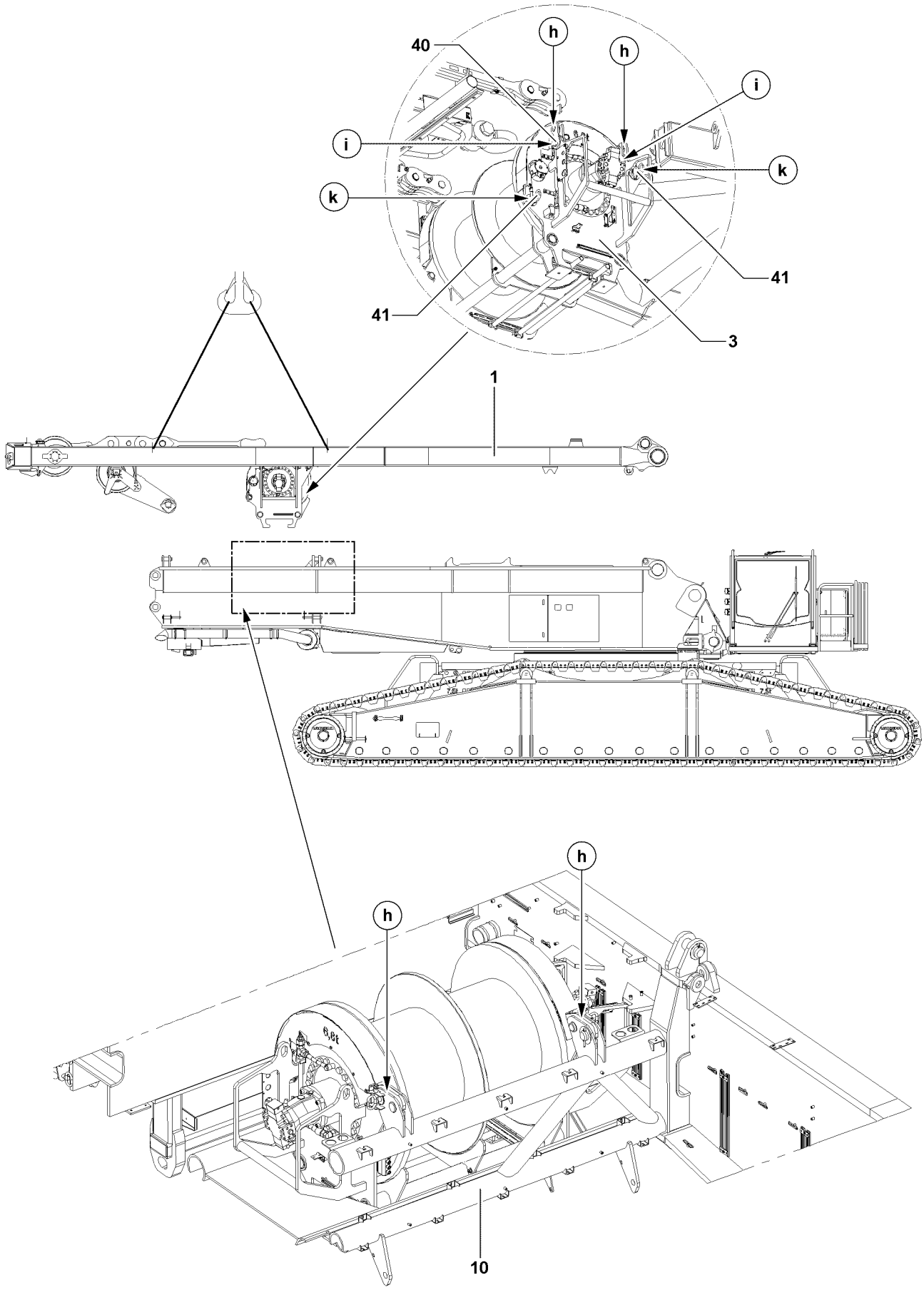
B107283

3.2 Pin roller bearings.

Ensure that the following prerequisite is met:

– align pinning points **e**.

- ▶ Hang the pin pulling cylinder on the retainer **35** and on the screw **36**.
- ▶ Insert the pin **39** and secure with pins **38**.
- ▶ Remove the pin pulling device.
- ▶ Hang pulley set **33** onto the auxiliary crane and and lightly lift until the retaining pin **32** may be unpinned.
- ▶ Unpin retaining pins **32**.
- ▶ Unpin turnbuckle **30** on the point **f** and pin and secure in park position **g**.
- ▶ Unpin and release the scissor clamping device **34** on the pinning point **m**.
- ▶ Lower pulley set **33** until scissor clamping device **34** may be pinned on pinning point **d**.
- ▶ Pin with scissor clamping device **34** on pinning point **d** and secure with cotter pin.
- ▶ Lower pulley set **33** with auxiliary crane, until pulley set **33** hangs completely in the rope reeving.
- ▶ Remove the auxiliary crane.



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3.3 Pin intake gear winch 4 on turntable

- Connect intake gear winch 4 **3** with turntable **10**: Pin locking pin **41** on the pinning points **k** and secure with spring retainers.
- Separate intake gear winch 4 **3** from SA-frame **1**: Remove spring retainers on the pinning points **i** and unpin locking pins **40**.
- Secure the locking pins **40** on both sides with spring retainers in the parking positions **h**.

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3.4 Establishing the electrical connections

Note

▶ For production of the electrical connections on the SA-boom, the separate electrical diagram is to be employed.

▶ Establish electric connections between turntable and SA-frame.

▶ Establish electric connections between turntable and intake gear winch 4.

3.5 Establish the hydraulic connections.

When hydraulic lines are connected and disconnected with quick-release couplings, make sure that the coupling procedure is being performed correctly.

DANGER

Risk of accident due to loss of pressure or leakage!

Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious injury due to component failure!

▶ Check that the quick-release couplings have been properly connected before using the crane.

Note

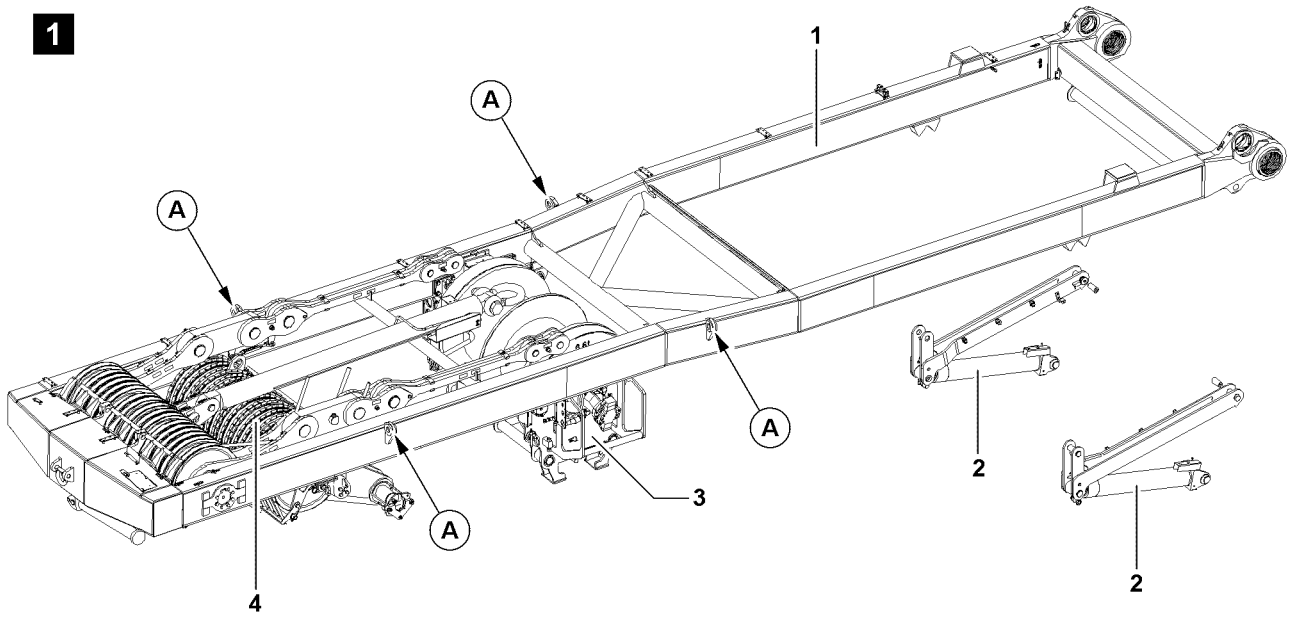
▶ To connect or release the hydraulic lines with quick couplers, see chapter 5.01.

▶ Release the pressure in the hydraulic system before connecting and disconnecting. Turn the engine off and wait for short time.

▶ Assembling coupling components (sleeve and connector) by using hand-tightened nut.

▶ Combine coupling components.

1



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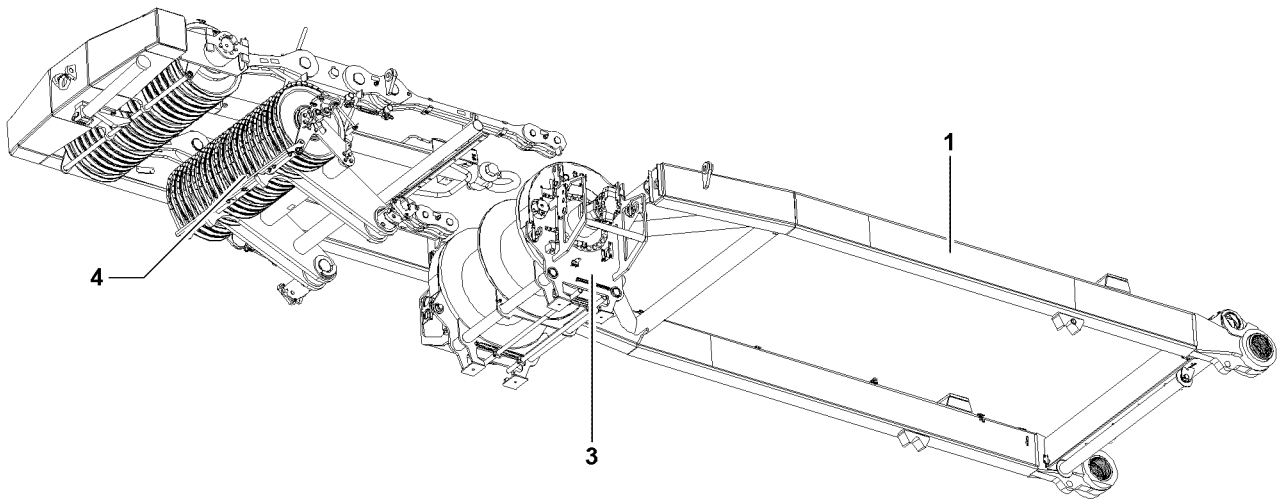

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4 Disassemble SA-frame

Ensure that the following prerequisite is met:
– roller bearings are found in transport position: SA-frame is found in the 0° position.

4.1 Disconnect the electrical connections

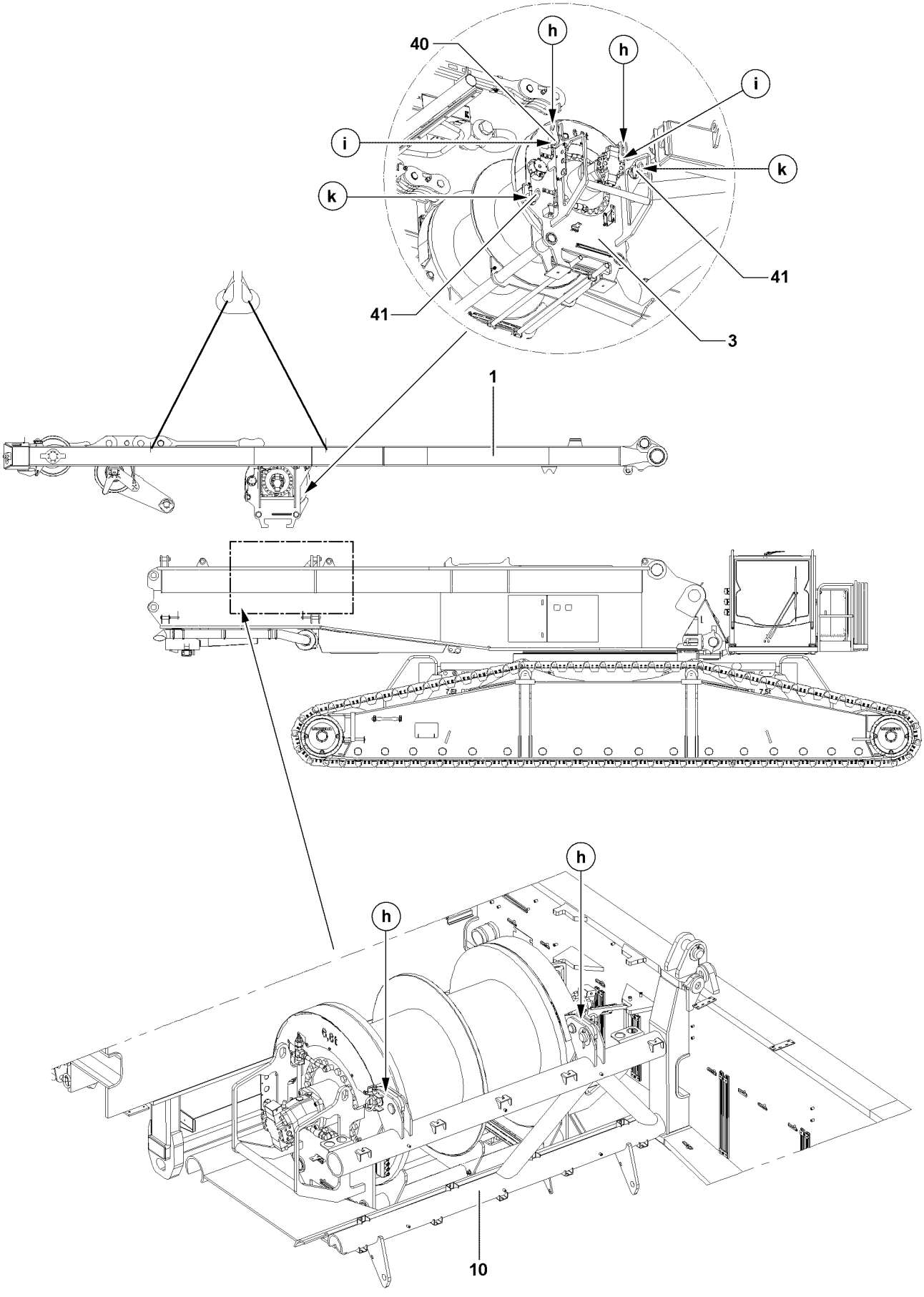
- ▶ Separate and properly store electrical connections between turntable and SA-frame.
- ▶ Separate and properly store electrical connections between turntable and winch 4.

4.2 Disconnect the hydraulic connections.

When hydraulic lines are connected and disconnected with quick-release couplings, make sure that the coupling procedure is being performed correctly.

Note
- ▶ To connect or release the hydraulic lines with quick couplers, see chapter 5.01.

- ▶ Release the pressure in the hydraulic system before connecting and disconnecting. Turn the engine off and wait for short time.
- ▶ Loosen coupling components (sleeve and connector) by using hand-tightened nut.
- ▶ Separate coupling components.
- ▶ Properly store hydraulic hoses on the the SA-frame on the turntable.
- ▶ Fitting the coupling components with protective caps against contamination and damage.



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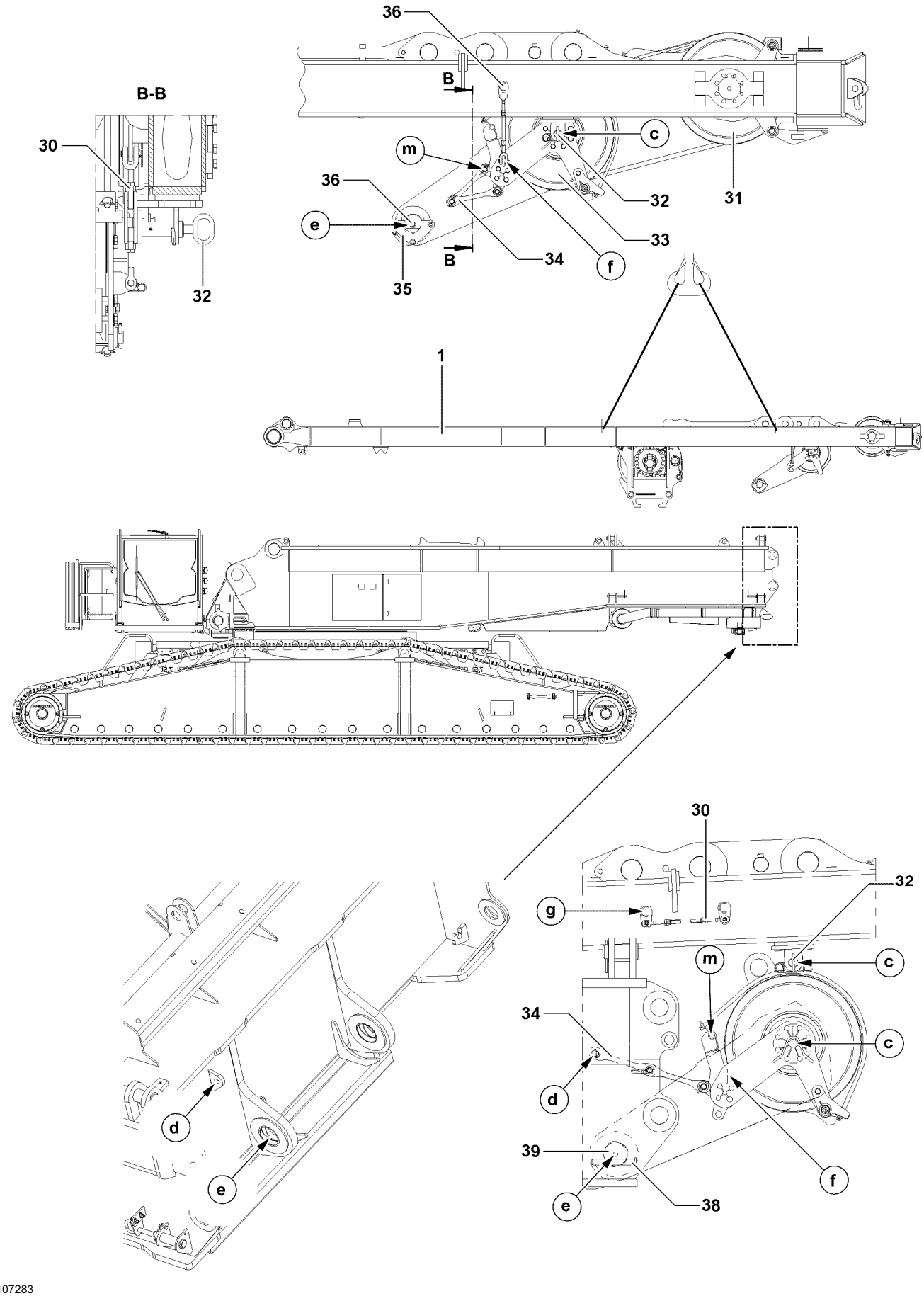
4.3 Prepare intake gear winch 4 for transport

- ▶ Separate intake gear winch 4 **3** from turntable **10**: Remove spring retainers on the pinning points **k** on both sides and unpin locking pins **41**.
- ▶ Connect intake gear winch 4 **3** with SA-frame **1**: Release and unpin the socket pin **40** from the park positions **h**.
- ▶ Pin locking pin **40** on the pinning points **i** and secure with spring retainers.



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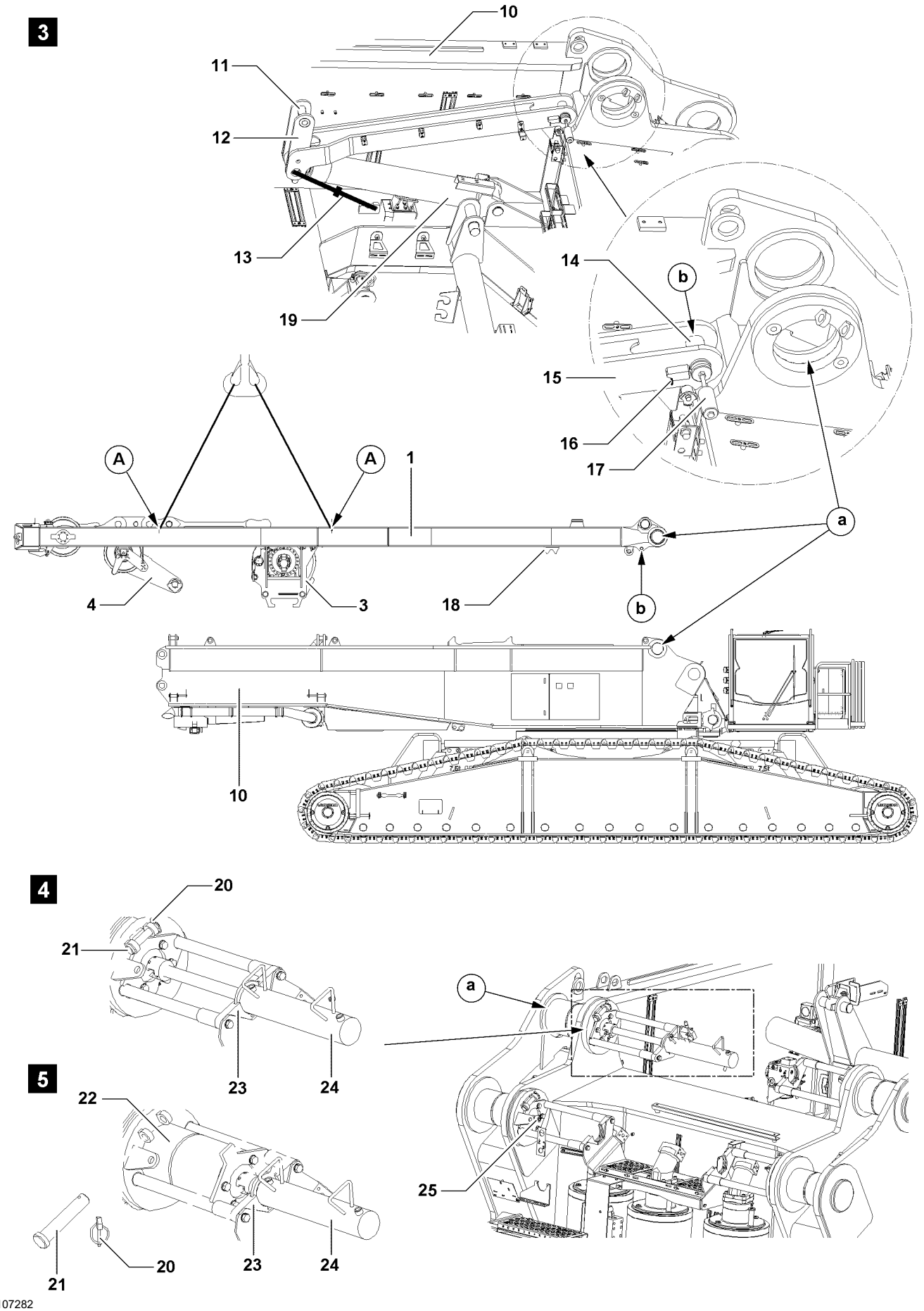
4.4 Preparing the roller bearings for transport

- ▶ Attach and lift pulley set **33** on auxiliary crane until scissor clamping device **34** may be pinned on pinning point **d**.
- ▶ Unpin and release the scissor clamping device **34** on the pinning point **d**.
- ▶ Pin with scissor clamping device **34** on pinning point **m** and secure with cotter pin.
- ▶ Lift pulley set **33** until pinning points **c** align.
- ▶ Pin locking pin **32** in the pinning point **c** on both sides.
- ▶ Unpin turnbuckle **30** on the park position **g** and pin and secure on position **f**.
- ▶ Remove the auxiliary crane.
- ▶ Hang the pin pulling cylinder on the retainer **35** and on the screw **36**.
- ▶ Release pin **39**: Unpin the pin **38**.
- ▶ Unpin the pin **39**.
- ▶ Remove the pin pulling device.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4.5 Unpin the SA-frame on the turntable

Ensure that the following prerequisites are met:
– intake gear winch 4 is in transport position,
– roller bearings are in transport position.

▶ Secure support cylinder **19**: Assembling the turnbuckle **13**.
▶ Pull, turn and latch spring pin **16** on both sides.
▶ Unpin pins **14** with pin device **17**.
▶ Pins **16** should be pinned on both sides and secured with spring retainers **14**.
▶ Attach the pin pulling cylinder **24** between the retainer **23** and the pull screw **25**.
▶ Release pin **22**: Remove the linchpin **20** and unpin the pin **21**.
▶ Unpin the pin **22** on both sides.
▶ Remove the pin pulling device **24**.

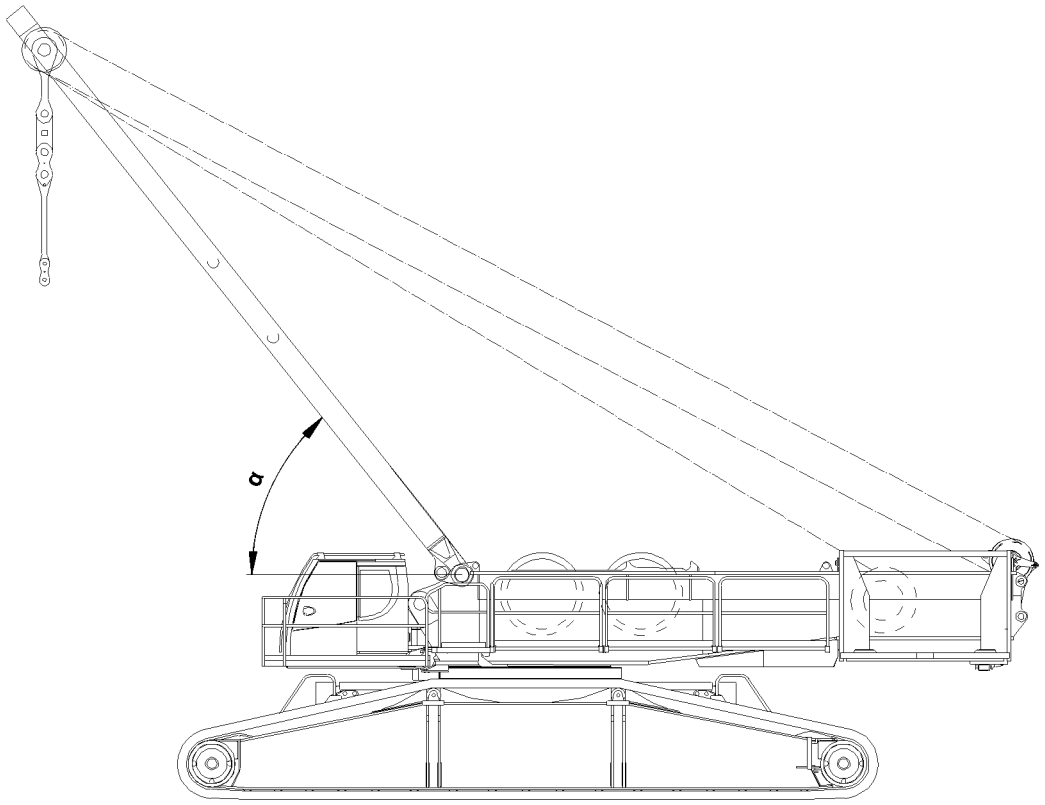
Result:
– SA-frame **1** is disassembled and can be lifted with the auxiliary crane.

4.6 Remove the SA-frame from the turntable

Note
▶ Guarantee equally long tackle such that the SA-frame can be horizontally lifted from the turntable.

NOTICE
Collision of components!
If the SA-frame is lifted with the auxiliary crane on the turntable, roller bearings and hoist gear can collide with the turntable. Components can be damaged.
▶ Make sure that the roller bearing **4** does not collide with the turntable **10**.
▶ Make sure that the intake gear winch 4 **3** does not collide with the turntable **10**.

▶ Attach SA-frame **1** with auxiliary crane on the attachment points.
▶ Carefully lift and remove SA-frame **1**.



B104917

1 Assembly conditions for operation on crawlers

1.1 Definition of assembly conditions

The assembly conditions take the following components into account:
- SA-bracket **1**
- Winch I **2**
- Winch II **3**
- Winch IV **4**

Assembly condition	SA-bracket, angle α	Winch I	Winch II	Winch IV	S-articulated piece
1	placed down	–	–	with rope	–
2	90°	–	–	with rope	–
3	90°	without rope	–	with rope	–
4	90°	with rope	–	with rope	–
5	90°	with rope	with rope	with rope	–
6	smaller than 60°	with rope	with rope	with rope	installed (laying on the ground)

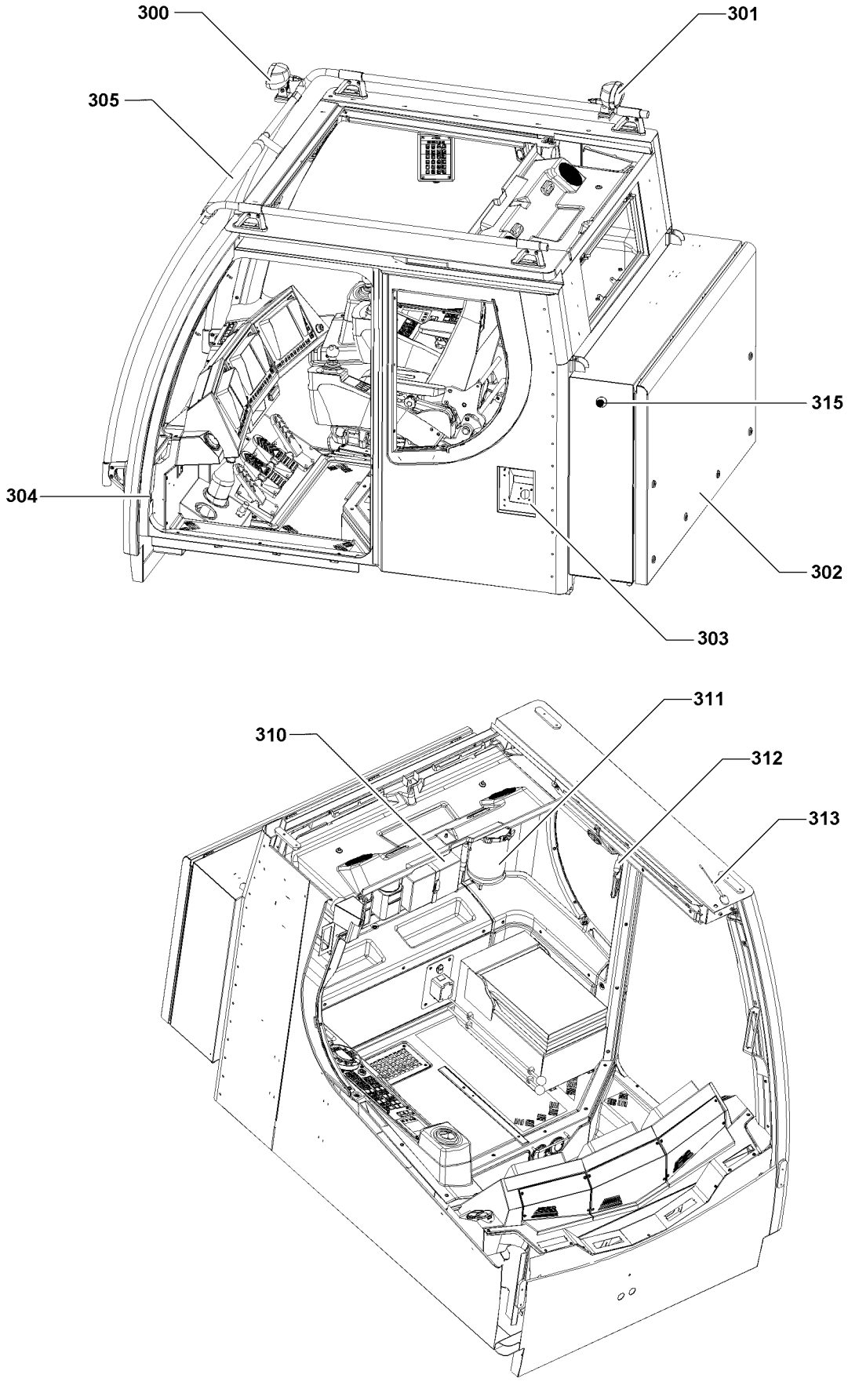
1.2 Permissible turntable ballast - ballast combinations

Note
▶ Definition of assembly conditions, see chart section “Definition of assembly conditions”.

Assembly condition	Central ballast			
	65 t	25 t	5 t	0 t
1	130 t	90 t	70 t	70 t
2	150 t	130 t	90 t	90 t
3	150 t	130 t	110 t /115 t	90 t
4	170 t	130 t	110 t /115 t	90 t
5	170 t	130 t	110 t /115 t	110 t /115 t
6	190 t	150 t	130 t	110 t /115 t

Maximum permissible turntable ballast depending on assembly condition and central ballast

4.00 Operation of crane superstructure



B104888

1 Operating and control instruments

This chapter describes the elements in the cab and is divided into:
– General equipment in the cab.
– Operating units in the cab.

2 Equipment in the cab

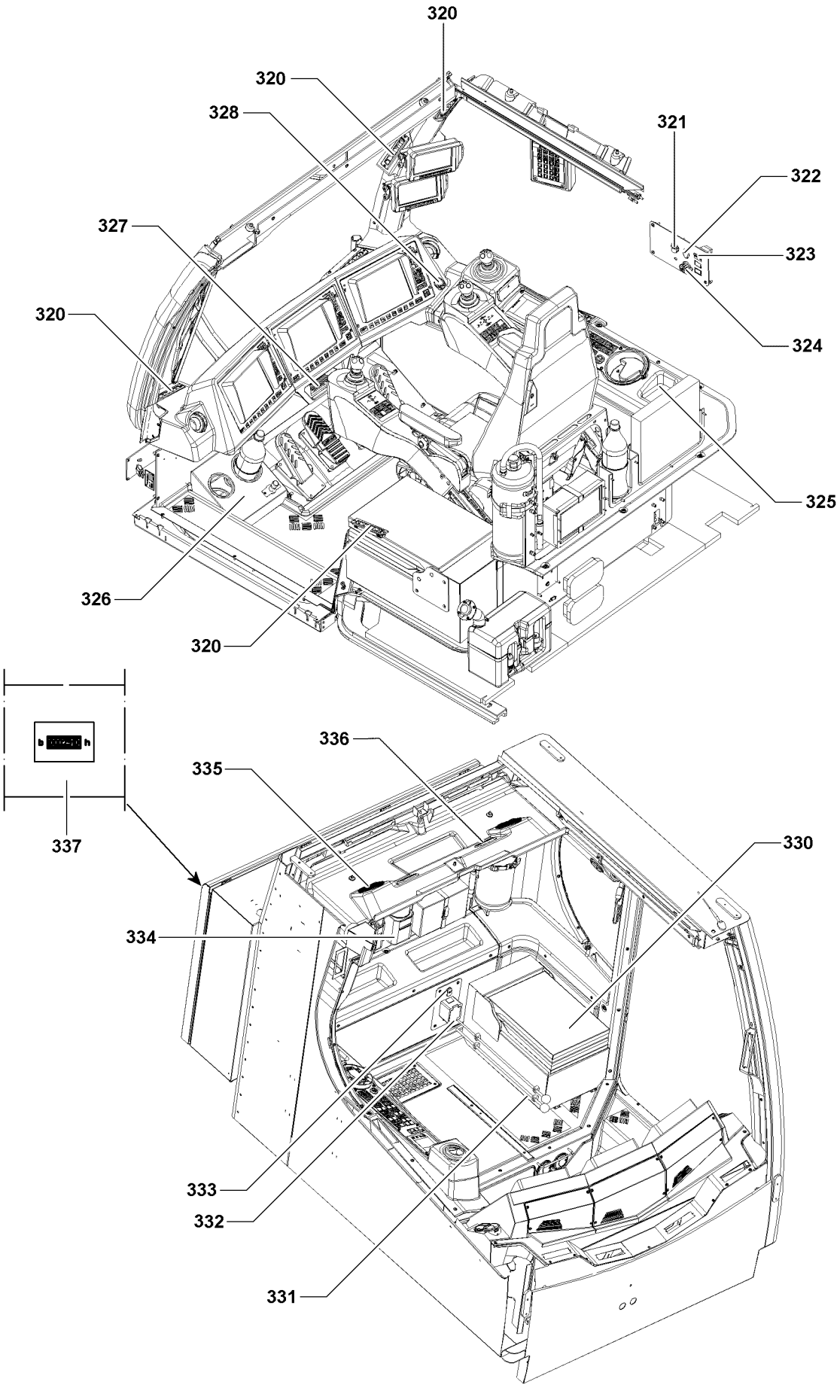
2.1 Installations in the cab

300 Working floodlight, front
301 Working floodlight, rear
302 Switch box
303 Reservoir for window cleaning fluid
304 Door contact switch
305 Three color light
313 Antenna

• LMB-warnings are optically shown

2.2 Emergency equipment

310 First aid kit
311 Fire extinguisher
312 Emergency hammer
315 EMERGENCY OFF switch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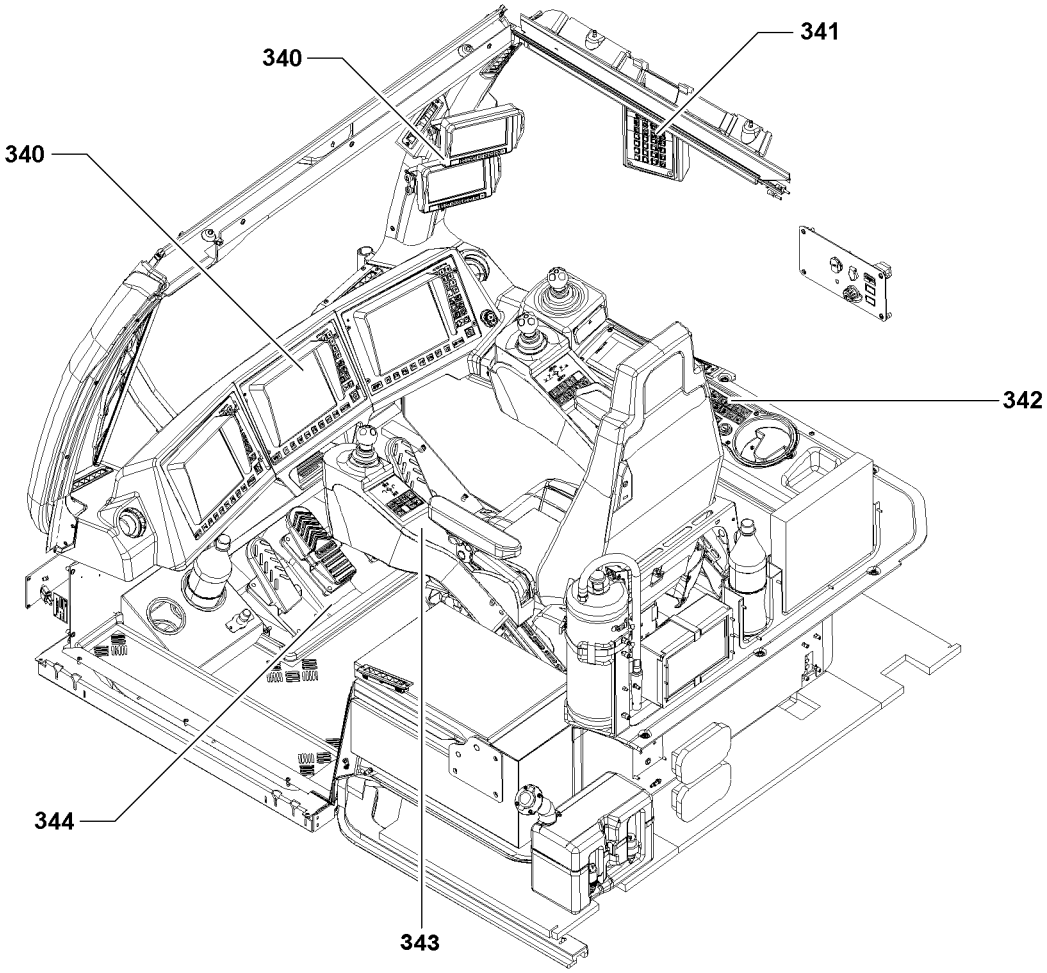
2.3 Interfaces

321 Socket, 24 V
322 Socket, 12 V
324 LAN socket
332 Socket, 230 V
333 Socket, 12 V

2.4 Interior equipment

320 Outlet nozzles
323 Hourmeter
- Recording of crane operating hours

325 Compartment
326 Drink holder
327 Radio
328 Cigarette lighter
330 Emergency seat
331 Manual control lever
334 Drink holder
335 Speaker
336 Interior lights
337 Hourmeter
- Recording of crawler operating hours.
- **Note:**
  The hourmeter for the crawlers is located in the switch cabinet!



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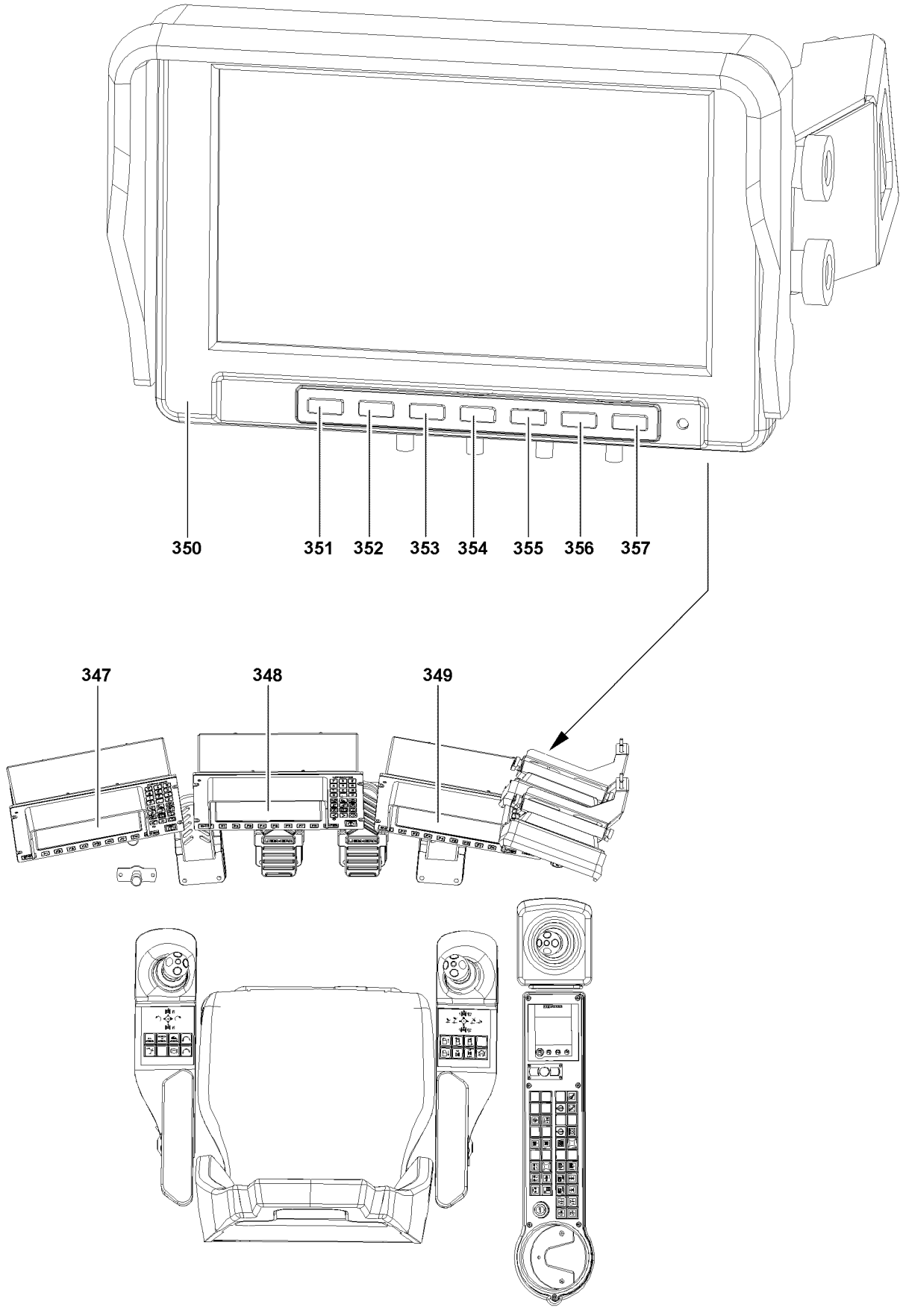
3 Operating units in the cab

The following operating units are in the cab:

340 Monitors and displays
341 Operating and control unit
- BKE
342 Instrument panel
343 Control panel
344 Pedal carrier



B104891

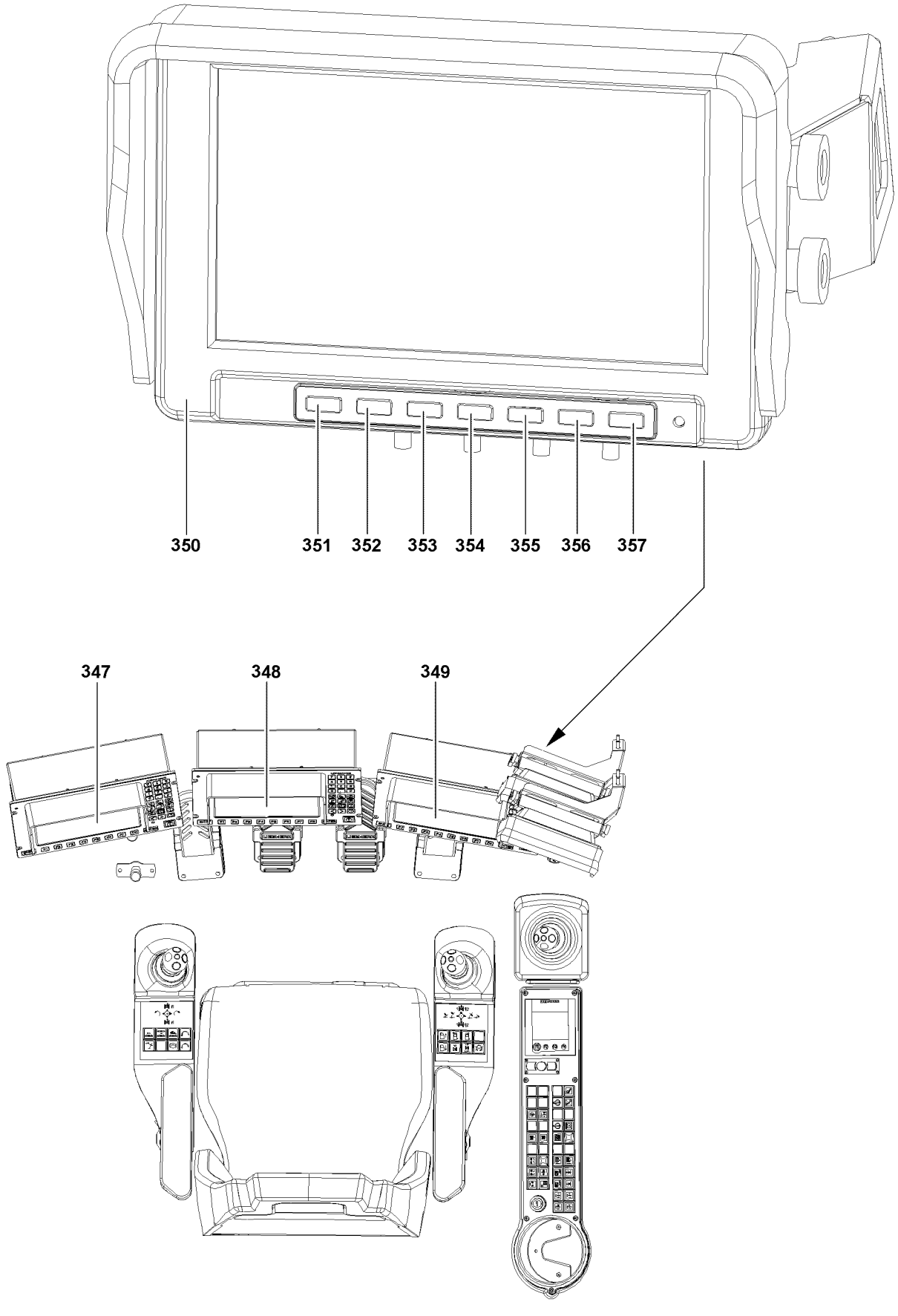
3.1 Monitors and displays

3.1.1 LICCON computer system

347 LICCON Monitor 2
- User interface for “LICCON job planner”.

348 LICCON Monitor 1
- User interface for operation with “derrick” boom.

349 LICCON Monitor 0
- User interface for entry of equipment configurations and for crane operation.



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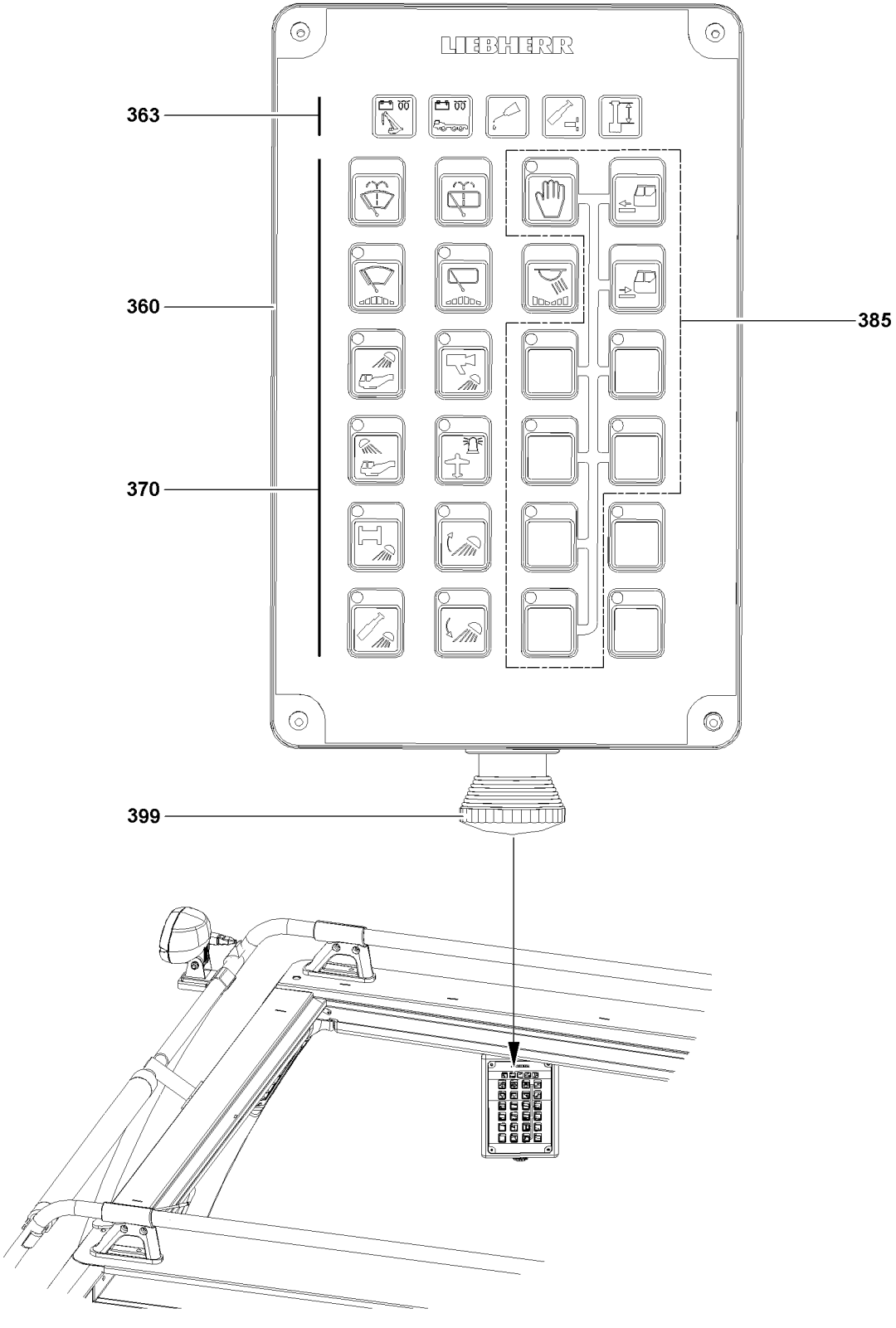
3.1.2 Camera monitoring

350 TFT monitor

357 Key	• Monitor on / off.
351 Button “MODE”	• By pressing the button “MODE” the system changes between the individual display modes: – Single display mode – Split display mode – Display mode in thirds or quarters
352 Button “Camera selection”	• By pressing the button “camera selection” the system changes between the cameras: – Single display mode: Change between camera 1 and camera 2 – Split display mode: Change between cameras 1/2, cameras 2/3, cameras 3/4 and camera 4/1 – Display mode split in thirds or quarters: Button has no function
353 Menu button	• By pressing the “Menu” button, menus for various adjustments are called up and changed over, in the following order: – Color: Adjustment of color saturation – Brightness: Brightness adjustment – Contrast: Contrast adjustment – Standard: Reset to factory settings – Volume: Volume adjustment – Language: Language adjustment (English, French, German, Spanish, Italian, Portuguese, Polish) – Reflection: Reflection of camera view. Return to the main menu with “Enter”. End menu with “End”.
354 Button “Minus”	• By pressing the “Minus” button, the value of a setting is reduced.
355 Button “Plus”	• By pressing the “Plus” button, the value of a setting is increased.
356 Button “Change between day / night”	• Press the button “Change over day / night” to match the brightness of the display to the time of day.



B104892

3.2 Operating elements on the operating and control unit (BKE)

3.2.1 Operating console

Note

▶ The indicator lights as well as the operating keys are described in detail in the following sections!

360	Operating console	• Housing with indicator lights and keys.
399	EMERGENCY OFF switch	• Impact switch.
363	Indicator lights on the BKE	
370	Operating keys on the BKE	• Standard assignment.
385	Operating keys on the BKE	• Standard assignment for release controls.

3.2.2 Indicator lights on the BKE “363”

Position	Button	LED condition	Description
364	 Engine monitoring superstructure	Yellow	Engine preheat active
		Yellow / red blinking	Engine ready to start
		Yellow blinking	Engine preheating Error / problem
		Off	Engine is running (after engine has been started)
		Red	Engine is running, alternator does not charge
		Red blinking	Engine is running in emergency operation
365		**Note:**	Indicator light **not** assigned!
366	 Central lubrication	Yellow + red (orange)	Functional readiness (is shown after engine start for 1.5 s)
		Yellow	Lubrication active
		Red	Error / problem
		Off	Central lubrication not active
367		**Note:**	Indicator light **not** assigned!

Position	Button	LED condition	Description
368		**Note:**	Indicator light **not** assigned!

3.2.3 Operating keys on the BKE “370”

Note

▶ With the LEDs in the operating buttons, the operating conditions and problems can be recognized quickly and reliably by the crane operator!

Position	Button	Function	LED	Description
371	 Windshield washer system “Front”	“On”	–	Clean window: By pressing and holding the button “Front” or “Roof”
			Note :	After releasing the key “Front” or “Roof” , three additional wipe movements are carried out before the wiper blades return to their original position.
372	 Windshield washer system “Roof”	“Off”	–	By releasing the button “Front” or “Roof”
373	 Windshield wiper “Front”		**Note:**	There are three different wipe stages: 1. Wiper “On” : Continuous operation 2. Intermittent 1: Wipe with long pauses 3. Intermittent 2: Wipe with short pauses 4. Wiper “Off”
374	 Windshield wiper “Roof”			Every time the button “Front” or “Roof” is pressed, the wipe stages change incrementally
		“On”	Lights up	By pressing the button “Front” or “Roof”
		“Off”	Off	By pressing the button “Front” or “Roof” long than one second until a “beep” sounds

Position	Button	Function	LED	Description
				or By pressing the button “Front” or “Roof” until the LED is off **or** Ignition “Off”
375	 Interior light cab	“On” (100 %)	–	By opening the door **or** By pressing the button
		Dim	–	There are three different dimmer stages: 1. 75 % 2. 50 % 3. 25 % 4. Interior light “Off” When the interior light is turned on: Each time the button is pressed, the brightness is reduced incrementally.
		“Off”	–	By pressing the button for longer than one second **or** By pressing the button until the light turns “Off” **or** If the following conditions are present simultaneously for longer than 30 s : – Driver's seat not occupied – Door closed – Engine “Off”
376	 Floodlight turntable rear	“Off”	Off	By pressing the button
		“On”	Lights up	By pressing the button
		“On”	Blinking	Error / problem
377	 Floodlight on front of turntable	“Off”	Lights up	By pressing the button
		“On”	Lights up	By pressing the button

Position	Button	Function	LED	Description
		“On”	Blinking	Error / problem
378	 Floodlight, winch	“Off”	Off	By pressing the button
		“On”	Lights up	By pressing the button
		“On”	Blinking	Error / problem
379	 Floodlight pivot section	“Off”	Off	By pressing the button
		“On”	Lights up	By pressing the button
		“On”	Blinking	Error / problem
380	 Camera illumination	“Off”	Off	By pressing the button
		“On”	Lights up	By pressing the button
		“On”	Blinking	Error / problem
381	 Airplane warning	“Off”	Off	By pressing the button
		“On”	Lights up	By pressing the button
		“On”	Blinking	Error / problem
382	 Floodlight swing “boom” up	“Off”	Off	By pressing the button
		“On”	Lights up	By pressing the button
		“On”	Blinking	Error / problem
383	 Floodlight swing “boom” down	“Off”	Off	By pressing the button
		“On”	Lights up	By pressing the button
		“On”	Blinking	Error / problem

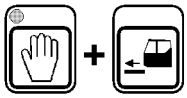
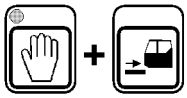
3.2.4 Operating keys on the BKE “385”

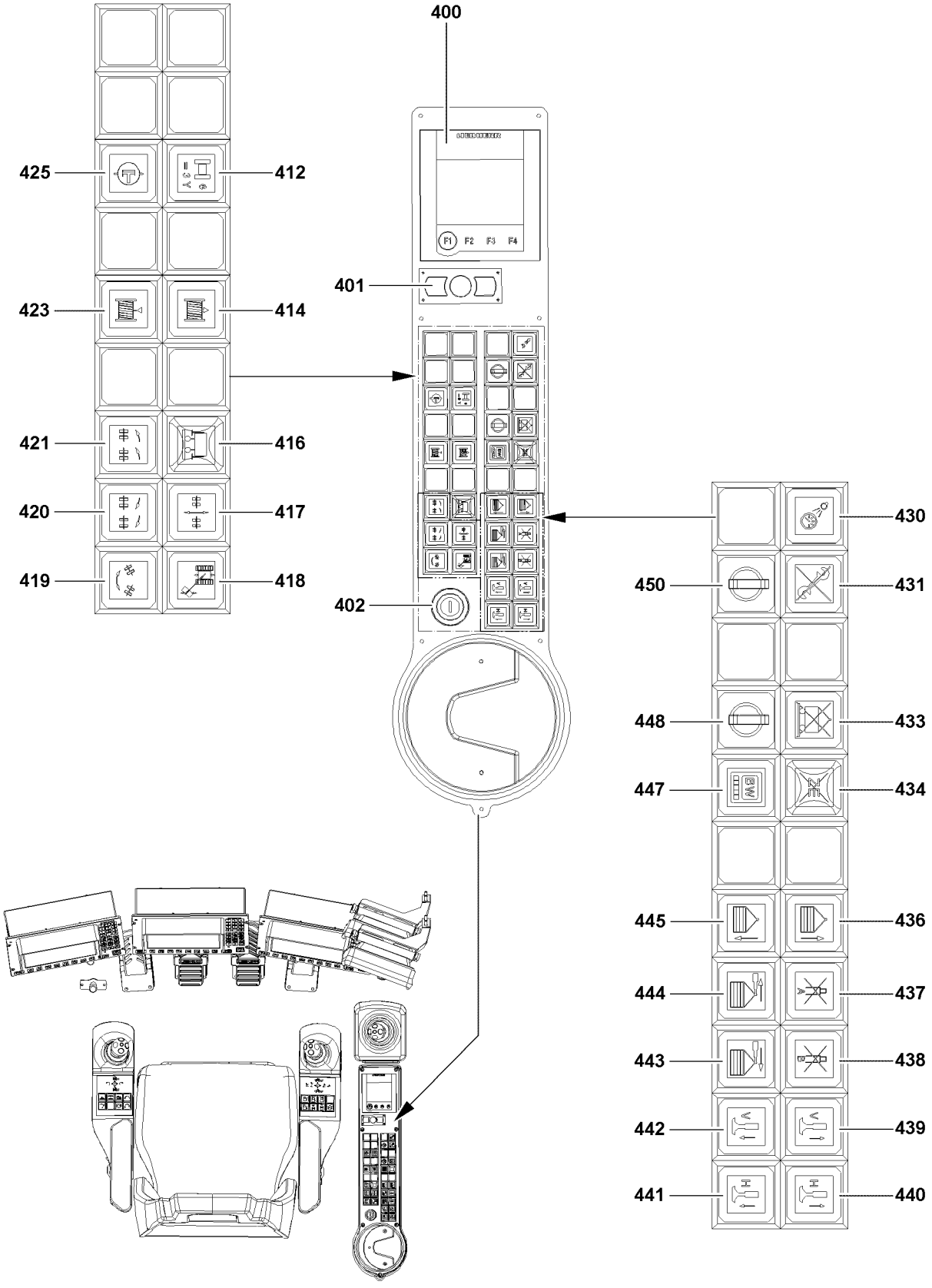
Note

- For this crane, there are no functions which require a release!

Note

- The “release button” is active for 30 s. If the operating button is pressed during this time, the release time is reset to 30 s. The release stops after 30 s!
- A function is triggered by activation of the “release button” and then pressing the corresponding operating button!
- For the listed button combinations, hold the corresponding operating button until the desired end position is reached!

Position	Button	Function	LED	Description
385			**Note:**	For this crane, there are no functions which require a release. After actuating the “release button” , the functions, which require a release can be activated.
	Release button	“On”	Lights up	By pressing the button
		“Off”	Off	By pressing the button **or** As long as no button is pressed, which requires a release: Automatically after 30 s
385+386			**Note:**	Key combination **not** assigned!
385+387			**Note:**	Key combination **not** assigned!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B104893

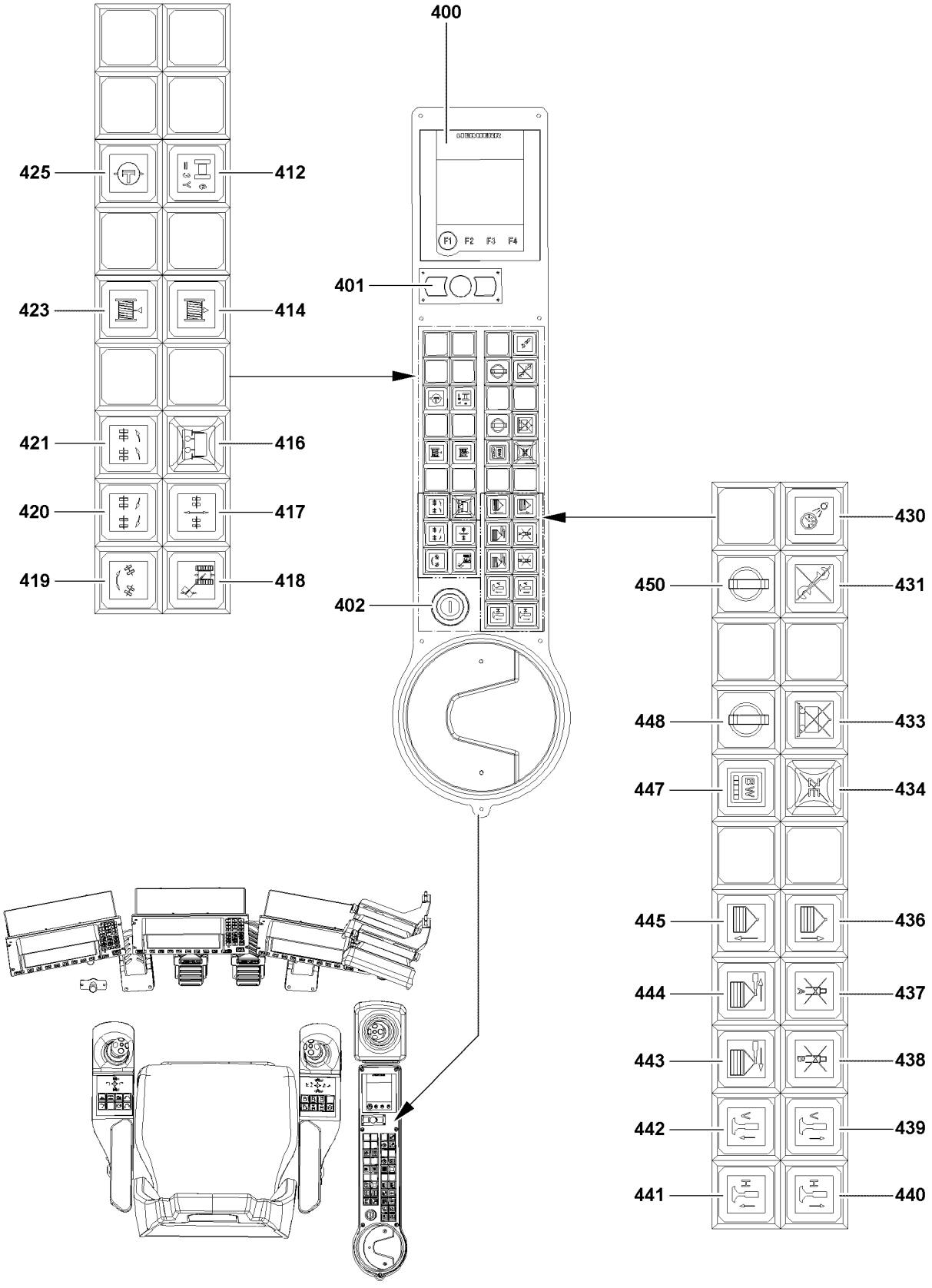
3.3 Instrument panel

400 Touch display • Heater and air conditioning system

Note

▶ Refer to chapter 6.01 of the crane operating instructions for a detailed description of the heater / air conditioning and ventilation settings!

401	Micro module (Mouse)	• Operation LICCON job planner
402	Ignition starter switch	• Engine
412	Switch	• Assignment of winch 6 on master switch MS3y.
414	Button	• Spool assembly winch up.
416	Warning light	• Ballast trailer support engaged.
417	Button with indicator light	• Turn ballast trailer wheels into travel position (towing).
418	Button with indicator light	• Turn ballast trailer wheels into parallel travel position.
419	Button with indicator light	• Turn ballast trailer wheels into turning position (circular travel).
420	Button with indicator light	• Steering, turn ballast trailer wheels to the right.
421	Button with indicator light	• Steering, turn ballast trailer wheels to the left.
423	Button	• Spool assembly winch out.
425	Switch with indicator light	• Pressure supply for auxiliary users.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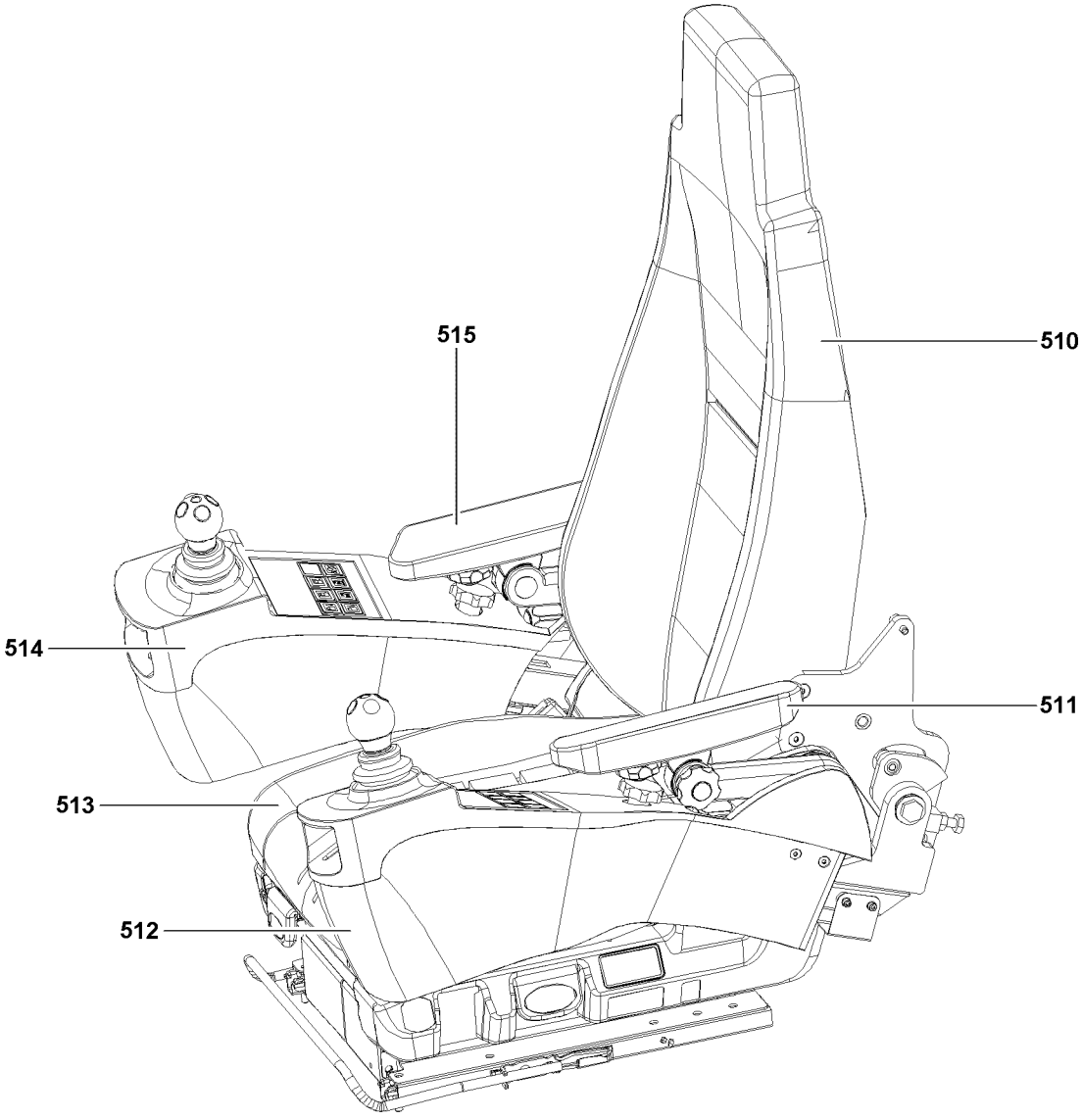
430	Switch with indicator light	• Instrument panel illumination, reading light.
431	Button with indicator light	• Turn off self-retention of the key button **450**.
433	Button with warning light	• Ballast trailer not lifted off. • Press the button **433** to turn off “Ballast trailer lifted off”. The warning light in the button turns off.
434	Warning light	• Control ballast trailer is not running or one of the turn sensors or length sensors is defective or missing.
436	Button	• Pull derrick ballast up.
437	Button	• Stop cylinder (A) on the derrick ballast.
438	Button	• Stop cylinder (B) on the derrick ballast.
439	Button	• Support cylinder ballast trailer front up.
440	Button	• Support cylinder ballast trailer rear up.
441	Button	• Support cylinder ballast trailer rear down.
442	Button	• Support cylinder ballast trailer front down.
443	Button	• Telescope ballast trailer out.
444	Button	• Telescope ballast trailer in.
445	Button	• Lower derrick ballast.
447	Switch with indicator light	• Switch monitor 1 to test system ballast trailer. **Note:** Can only be switched over when the engine is off.
448	Key button	• Ballast trailer lifted off, see chapter 5.35 of the crane operating instructions. • Press momentarily to turn on “Ballast trailer lifted off”, self retention. The warning light in the button **433** blinks.
450	Assembly key button	• Press momentarily to preselect Operating mode Assembly, self retention. **DANGER** **The assembly key button 450** bypasses the safety devices! **Observe the Safety technical notes, see chapter 5.01 of the crane operating instructions!** • **Note:** “Assembly turned on” is shown by: Indicator light in button **431**, icon on monitor and three color light and warning light on rear of turntable.

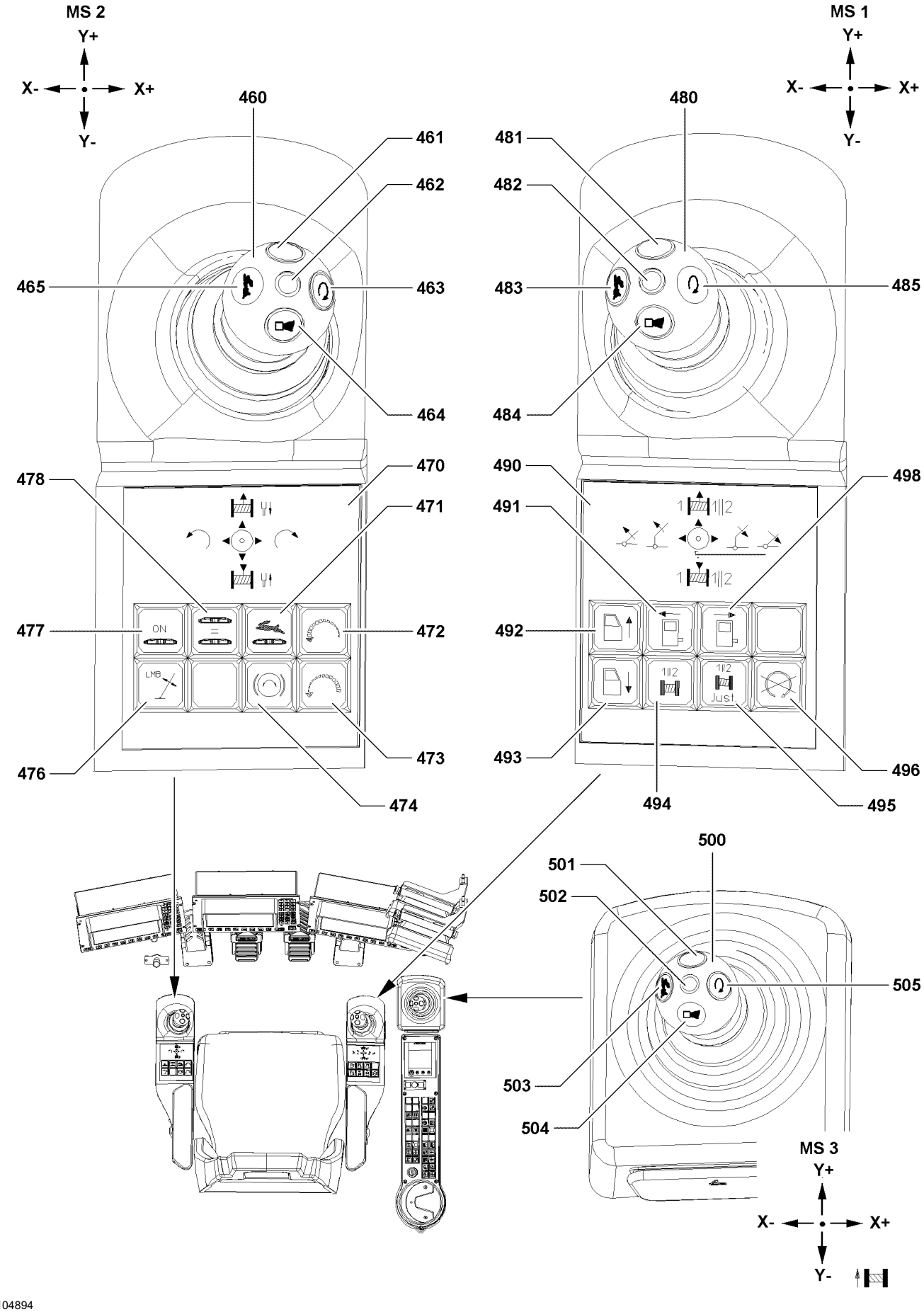


B104895

3.4 Operating elements on control platform

The control platform consists of the following elements:

510 Crane operator's seat
511 Left armrest
512 Control panel, left
513 Seat contact switch
514 Control panel, right
515 Right armrest


MS 2
Y+
X-
X+
Y-
460
461
462
465
463
464
478
470
471
477
472
476
473
474
MS 1
Y+
X-
X+
Y-
480
481
482
483
485
484
490
498
491
492
493
494
495
496
500
501
502
505
503
504
MS 3
Y+
X-
X+
Y-
ON
LMB
Just.
B104894

3.4.1 Operating elements on control panel

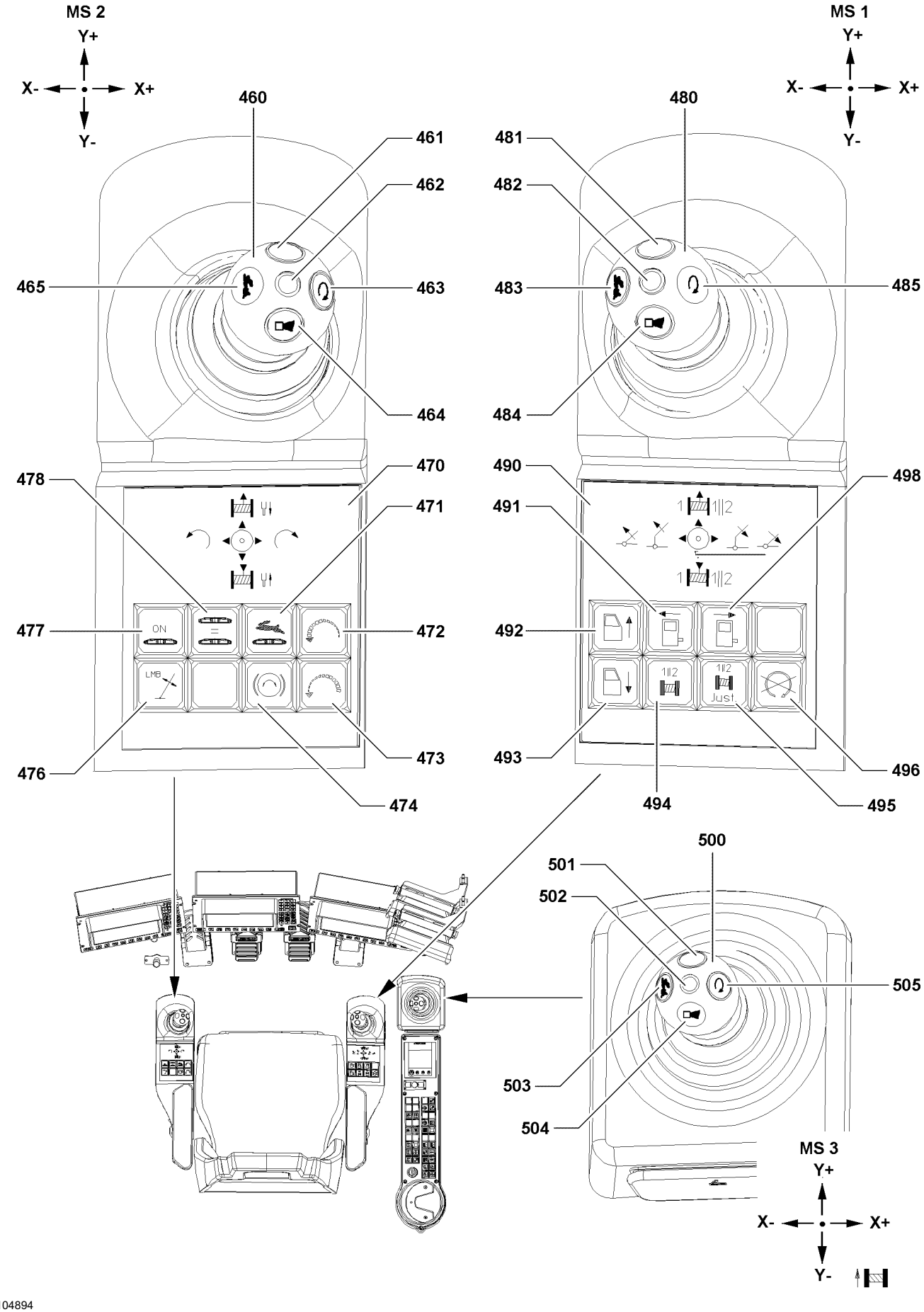
Control panel, left

Master switch assignment MS 2:

460	Master switch left (MS 2)	• **Note:** For assignment of master switch to operating modes, see chart, chapter 4.05.
461	Button	• Bypassing the seat contact switch. **Or** if the seat contact switch is actuated: Adding the vibration sensor **462**.
462	Vibration sensor	• Turn sensor and winches.
463	Button	• Locking the engine RPM. **Note:** Pressing button **463** will lock the engine RPM in its current condition.
464	Button	• Horn.
465	Button	• Power Plus addition, crane operation.

Instruments in the control console:

470	Instruments in the control console	
471	Switch with indicator light	• Crawler rapid gear On / Off.
472	Button	• Increase engine RPM.
473	Button	• Reduce engine RPM.
474	Switch with indicator light	• Turn slewing gear brake slewing gear off / on. **Note:** Indicator light lights up when the slewing gear brake is “On”.
476	Button	• Bypassing of overload protection, used to luff up at overload. **DANGER** **The bypass may only be done 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.**
477	Switch with indicator light	• Crawler operation On / Off.
478	Switch with indicator light	• Crawler parallel travel On / Off.


MS 2
Y+
X-
X+
Y-
460
461
462
465
463
464
478
470
471
477
472
476
473
474
MS 1
Y+
X-
X+
Y-
480
481
482
483
485
484
490
498
491
492
493
494
495
496
500
501
502
505
503
504
MS 3
Y+
X-
X+
Y-
ON
LMB
Just.
B104894

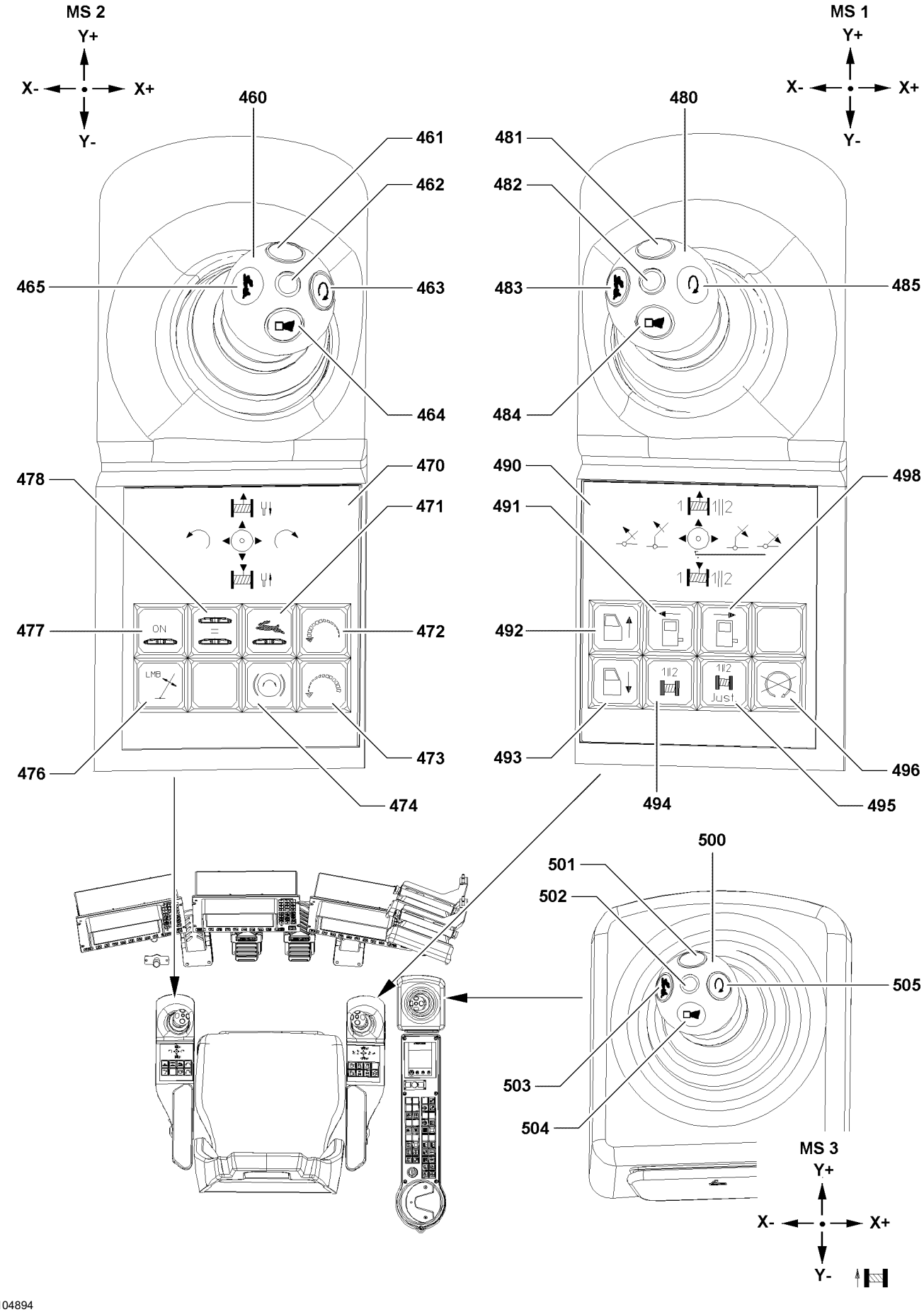
Control panel, right

Master switch assignment MS 1:

480	Master switch - right (MS 1)	
481	Button	• Bypassing the seat contact switch. **Or** if the seat contact switch is actuated: Adding the vibration sensor **482**.
482	Vibration sensor	• Turn sensor and winches.
483	Button	• Power Plus addition, crane operation.
484	Button	• Horn.
485	Button	• Locking the engine RPM. **Note:** Pressing button **485** will lock the engine RPM in its current condition.

Instruments in the control console

490	Instruments in the control console	
491	Button	• Swing cab into working position.
492	Button	• Tilting cab upward.
493	Button	• Tilting cab downward.
494	Switch with indicator light	• Parallel operation Winch 1II2.
495	Button	• Adjust parallel control winch 1II2. **Note:** Adjust only with parallel hook blocks, parallel control Winch 1II2.
496	Button	• Engine stop.
498	Button	• Swing the cab into transport position.


MS 2
Y+
X-
X+
Y-
460
461
462
465
463
464
478
470
471
477
472
476
473
474
MS 1
Y+
X-
X+
Y-
480
481
482
483
485
484
490
498
491
492
493
494
495
496
500
501
502
505
503
504
MS 3
Y+
X-
X+
Y-
ON
LMB
Just.
B104894

3.4.2 Operating elements Master switch (MS) 3

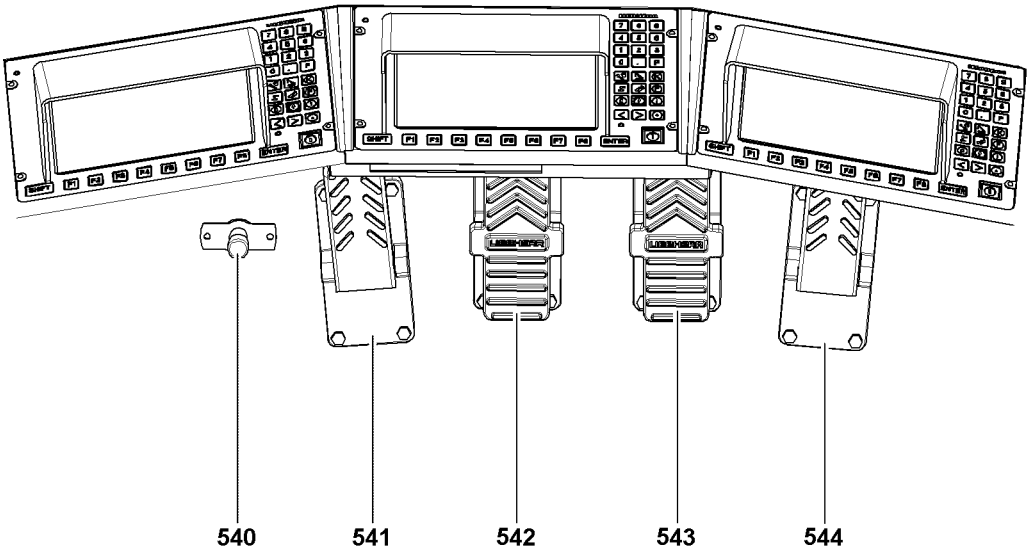
500 Master switch (MS 3)

501 Button	• Bypassing the seat contact switch. **Or** if the seat contact switch is actuated: Adding the vibration sensor **502**.
502 Vibration sensor	• Turn sensor and winches.
503 Button	• Power Plus addition, crane operation.
504 Button	• Horn.
505 Button	• Locking the engine RPM. **Note:** Pressing button **505** will lock the engine RPM in its current condition.

3.4.3 Operating elements crane operator's seat

Note

▶ For detailed description of operating elements to adjust the crane operator's seat, see chapter 4.03 of the crane operating instructions!



B104896

3.4.4 Pedal carrier

540 Foot button	• Coasting slewing gear.
541 Pedal	• Slewing gear brake.
542 Foot pedal (MS4)	• Move the crawler forward or backward on the left hand side.
543 Foot pedal (MS5)	• Move the crawler forward or backward on the right hand side.
544 Pedal	• Engine regulation.

B199898

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 and crawler cranes. In addition to the overload protection (Load moment limitation = **LMB**) there are a number of application programs that can be used for controlling and monitoring the crane movements. Currently the LICCON computer system includes the following application programs:

– “Configuration” program
– “Crane operation” program on monitor **0**
– “Crane operation” program on monitor **1**
– “Control parameter” program
– “Engine monitoring” program

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

1.1 Overload protection (LMB)

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

1.1.1 Actual load

The current load is recorded by acquiring variable values.
The **load on the crane** results from the load momentum and the boom momentum together. It exerts a force in the boom guying, which is measured by force test sensors.
The **boom momentum** is calculated from angle sensor information (boom angle) and the crane data (boom weights) for the set operating mode.
The **radius** is calculated with data from the angle sensors (boom angle) and the geometric data for the set operating mode. This also takes into account the boom flexation due to its own weight and the weight of the load.
The actual load is calculated from the total load, the boom momentum and the boom radius.

1.1.2 Maximum load according to load chart and reeving

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

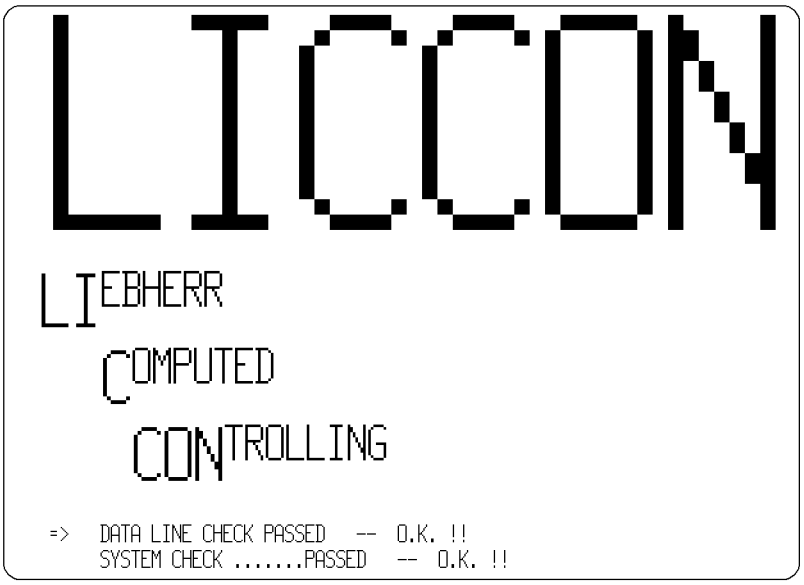
1.1.3 Comparison

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

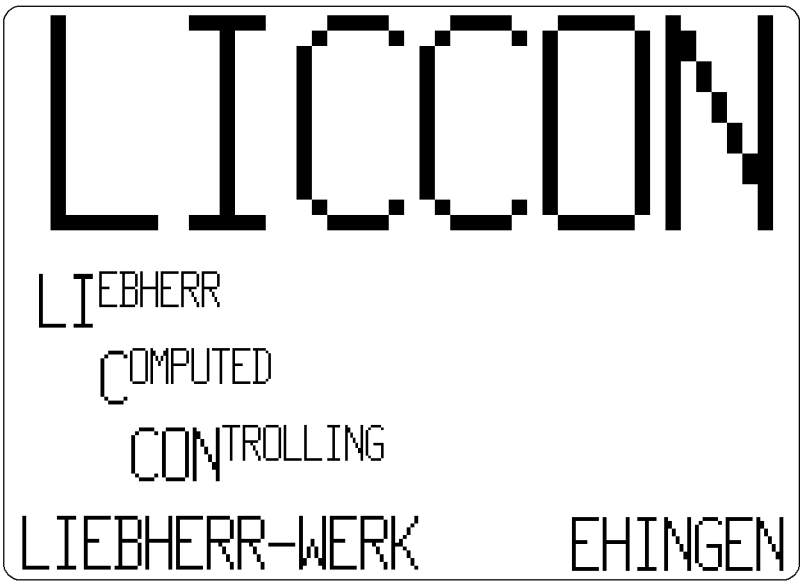
1


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

B199899

2 LICCON computer system boot up

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

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

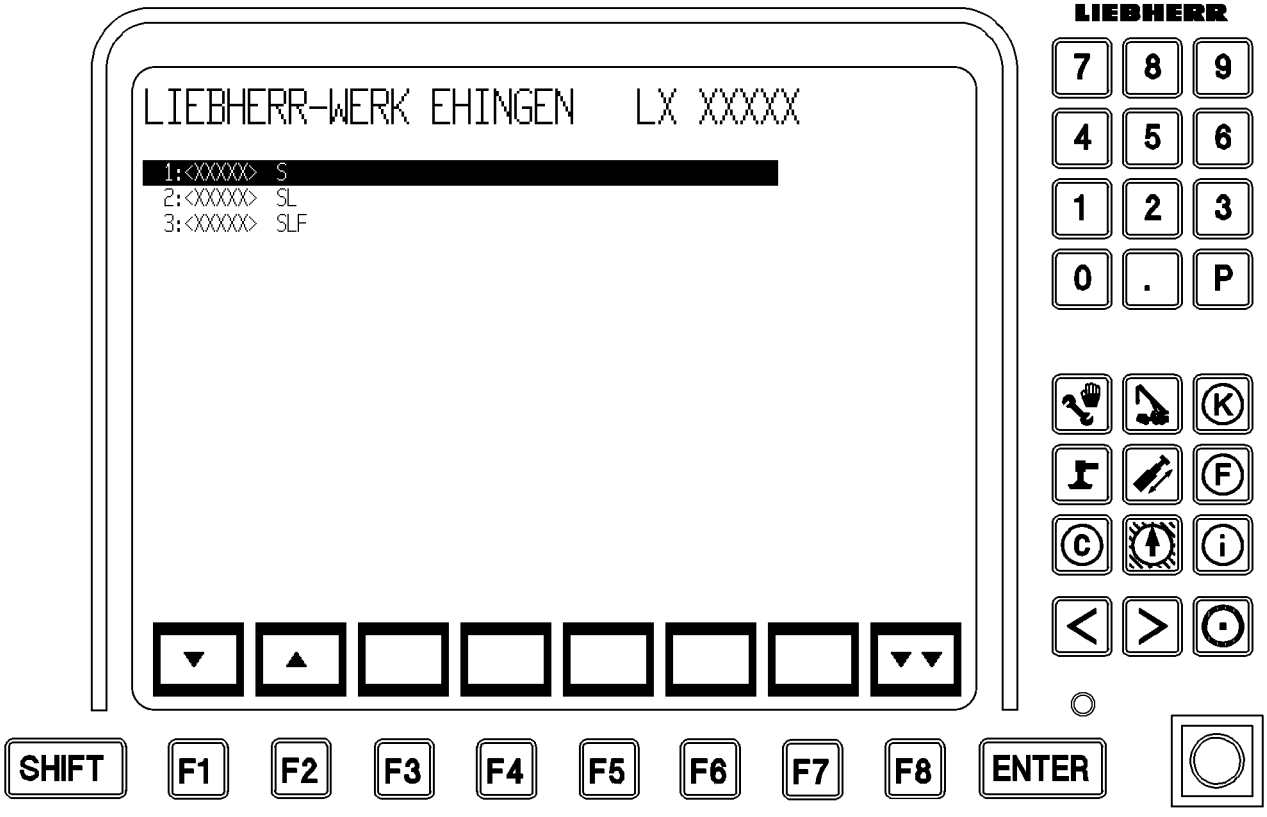
If the test finds no connection problems, there is a system test of all the microprocessor CPUs (ZE). The incremental sequence of the self test can be monitored on the 7 segment displays of the CPUs. If no errors are found during the system test, the monitor shows this image:

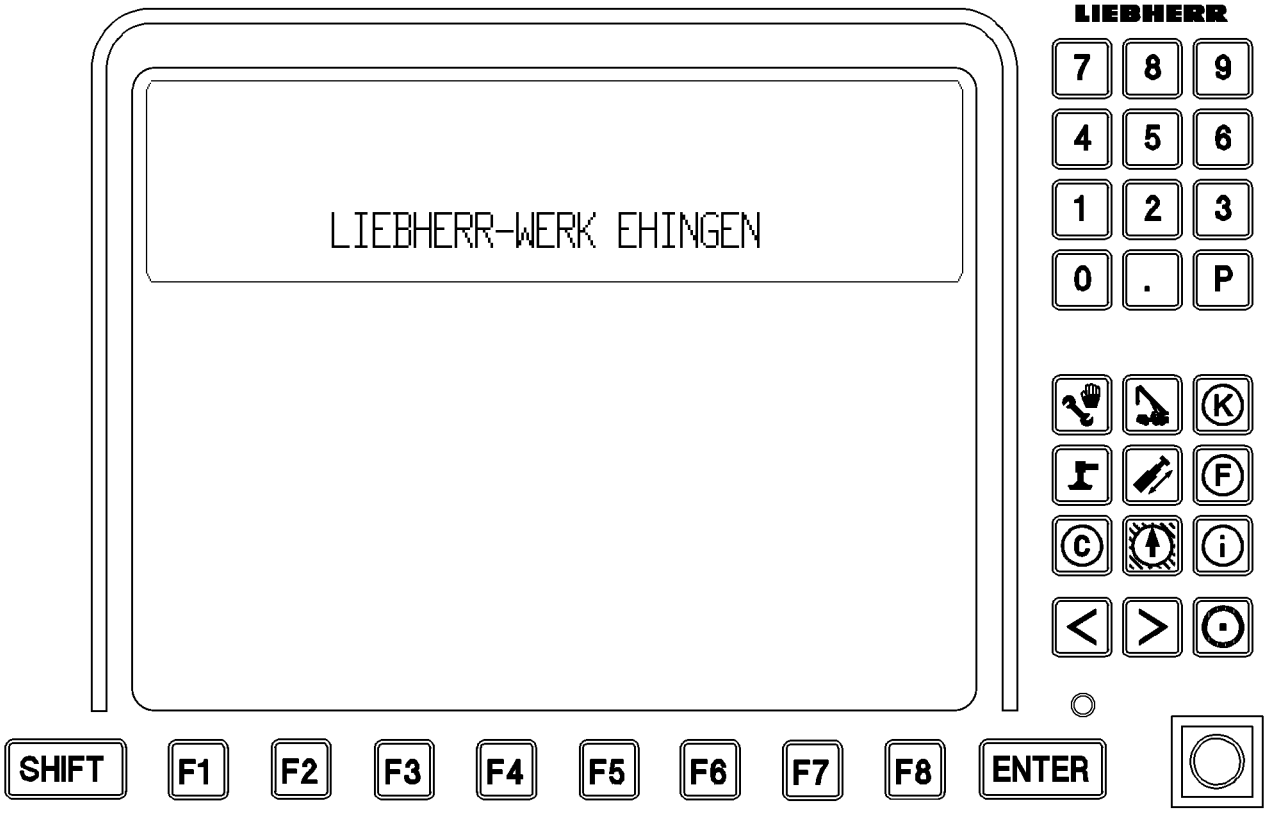
```
=>  DATA LINE CHECK PASSED   --  O.K. !!
    SYSTEM CHECK .......PASSED   --  O.K. !!
```

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

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.


LIEBHERR-WERK EHINGEN LX XXXX
1:<XXXXX> S
2:<XXXXX> SL
3:<XXXXX> SLF
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


LIEBHERR-WERK EHINGEN
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

B105189

2.1 Operating mode preselection on the LICCON computer system

WARNING
Danger of accident due to deviating equipment set up configuration!
If the equipment set up configuration and the operating mode of the crane set on the LICCON computer system **does not** match, then the crane can be overloaded unnoticed and topple over!
Personnel can be severely injured or killed!
▶ In the operating mode preselection, only the operating mode may be selected which actually corresponds to the equipment set up configuration of the crane!

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

2.1.1 Monitor 0

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

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

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

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

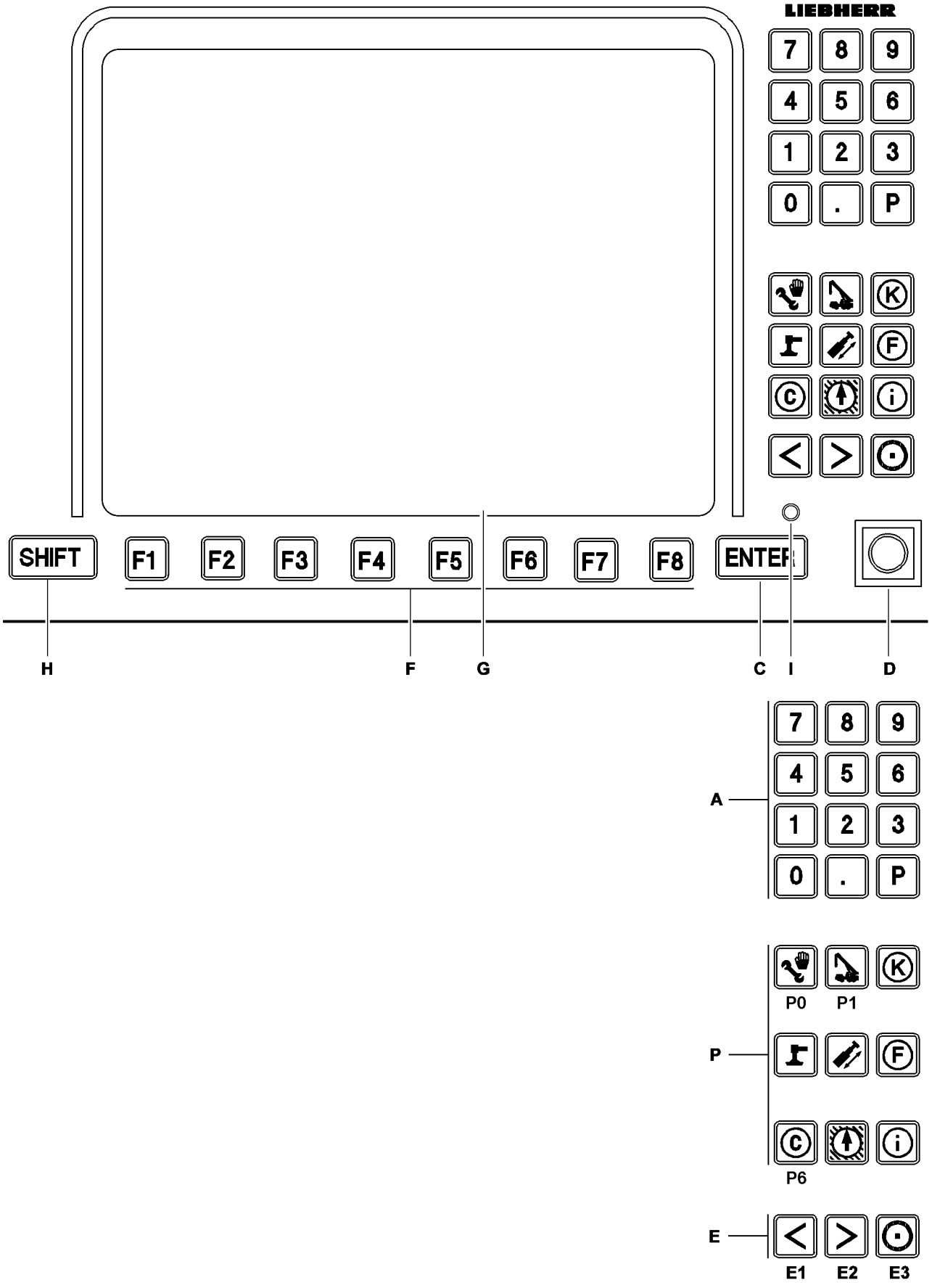
Press function key **“F1”** (cursor down) or **“F2”** (cursor up) and select the operating mode group required for the crane application.

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

Press **“F8”** or **“ENTER”** .
Result:
– The set operating mode group is taken over into the LICCON computer system and the corresponding configuration screen appears.

2.1.2 Monitor 1

Monitor 1 the title illustration with writing: **“LIEBHERR-WERK EHINGEN.”**

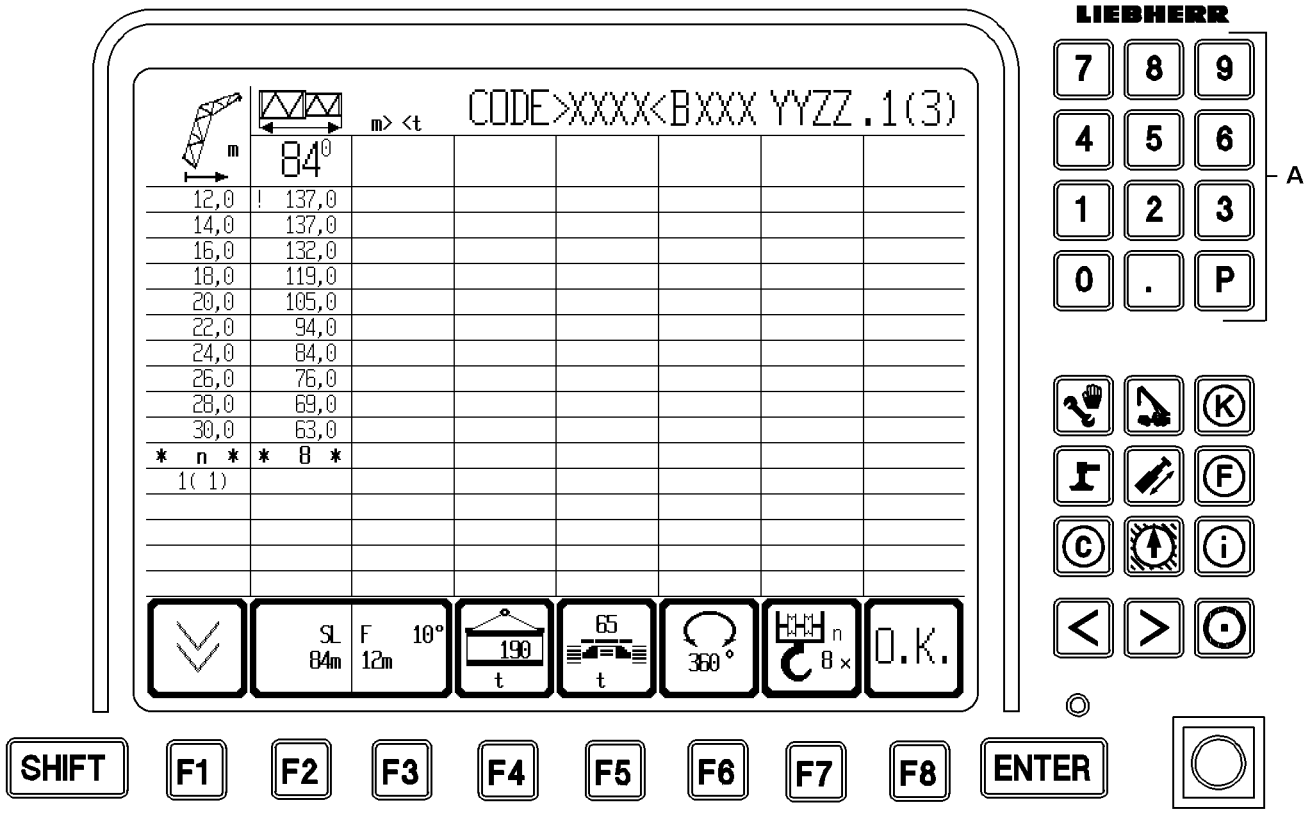

LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
H F G C I D
A
P0 P1
P
P6
E
E1 E2 E3

B105208

3 Operating elements of the LICCON computer system on monitor 0

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

A	Keypad	
P	Program keys	• Selection of the individual LICCON programs **Note:** For program keys without description, no key function is assigned!
P0	Configuration	• **SHIFT** and **P0:** Engine monitoring
P1	Crane operation	
P5	Winch - pulley head assignment	
P6	Control parameter	
C	Input key “ENTER”	• Confirmation of changes
D	Bypass key button	• Position to right (touching) = The hoist limit switch and the LMB shut off are bypassed • Center position (self retaining) = Normal operation
E	Special function keys	• Monitor brightness adjustment • **E3** and **E1**: Turn background illumination on / off • **E3** and **E2**: Brightness adjustment in three stages • Additional functions of the special function keys are program-dependent and are further explained in the descriptions of the individual LICCON programs
F	Function keys	• The function keys should always be viewed in conjunction with the function key icon line displayed on the monitor.
G	Monitor	• Display of the individual programs (example: “Crane operation” program)
H	SHIFT key	• Second-level key assignments, for example “Supervisory function”
I	LED display = Power supply for monitor available	


LIEBHERR
CODE>XXXX<BXXX YYZZ.1(3)
m> <t
84°
12,0 ! 137,0
14,0 137,0
16,0 132,0
18,0 119,0
20,0 105,0
22,0 94,0
24,0 84,0
26,0 76,0
28,0 69,0
30,0 63,0
* n * * 8 *
1(1)
SL 84m
F 10° 12m
190 t
65 t
360°
n 8 x
O.K.
7 8 9
4 5 6
1 2 3
0 . P
A
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B105209

4 “Configuration” program

Note

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

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

Note

Adjustment and display of equipment configuration and reeving.

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

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

4.1 Setting the operating mode and equipment configuration

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

4.1.1 Setting the operating mode and equipment configuration via the function keys

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

▶ Select the respective function keys.

▶ Press the **Enter** key to confirm and accept the settings.

Result:

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

4.1.2 Setting operating mode and equipment configuration via 4-digit short code

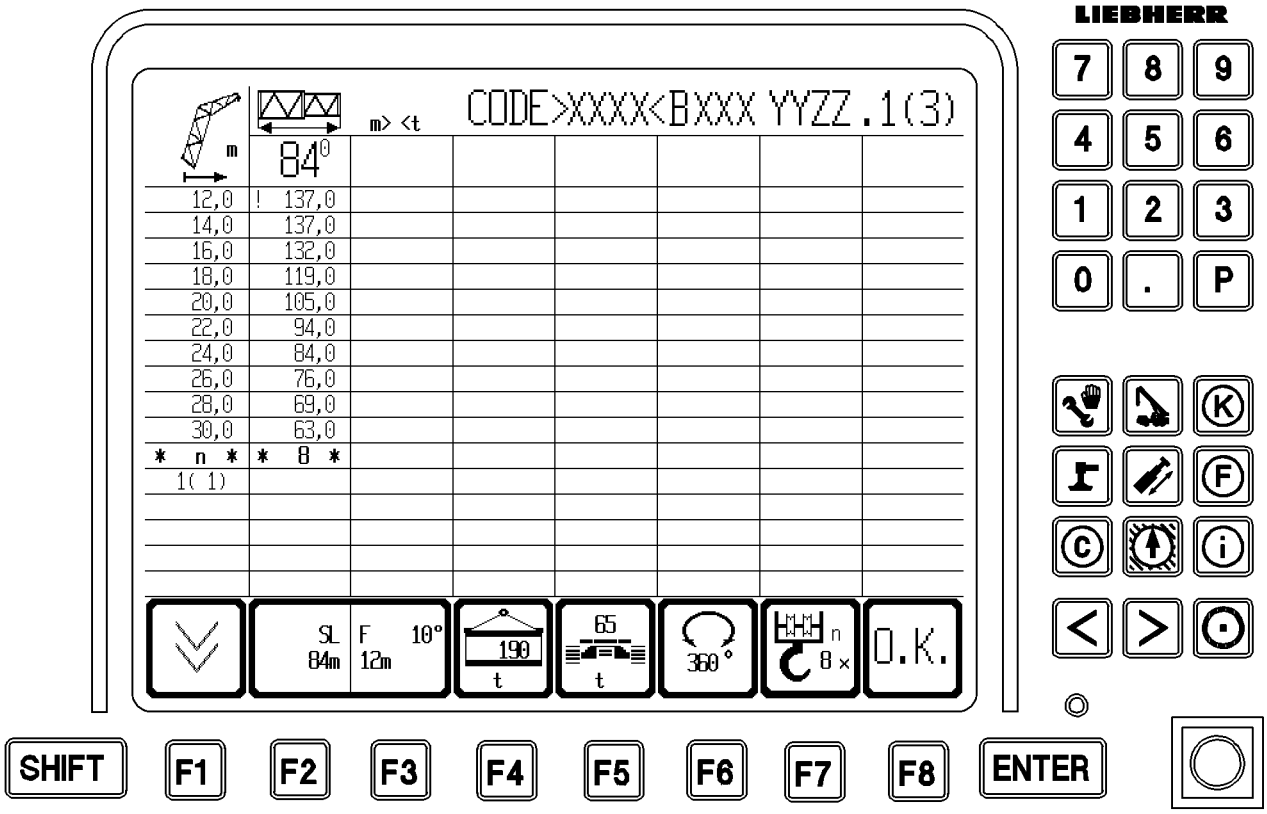
The function keys are explained in the section “Function key line” in this chapter.

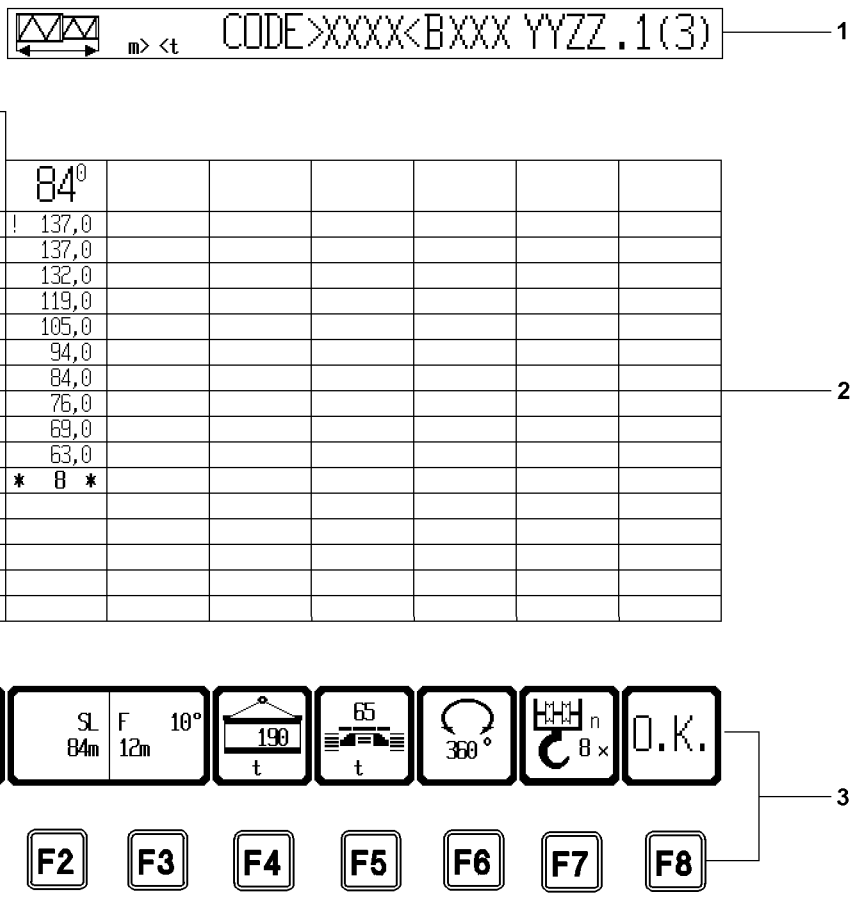
▶ Enter a 4-digit short code using the keypad on the LICCON monitor.

▶ Press the **Enter** key to confirm and accept the settings.

Result:

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


LIEBHERR
CODE>XXXX<BXXX YYZZ.1(3)
m> <t
84°
12,0 ! 137,0
14,0 137,0
16,0 132,0
18,0 119,0
20,0 105,0
22,0 94,0
24,0 84,0
26,0 76,0
28,0 69,0
30,0 63,0
* n * * 8 *
1(1)
SL 84m
F 10° 12m
190 t
65 t
360°
8 x
O.K.
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER


CODE>XXXX<BXXX YYZZ.1(3)
m> <t
1
84°
12,0 ! 137,0
14,0 137,0
16,0 132,0
18,0 119,0
20,0 105,0
22,0 94,0
24,0 84,0
26,0 76,0
28,0 69,0
30,0 63,0
* n * * 8 *
1(1)
2
SL 84m
F 10° 12m
190 t
65 t
360°
8 x
O.K.
3
F1 F2 F3 F4 F5 F6 F7 F8

B105210

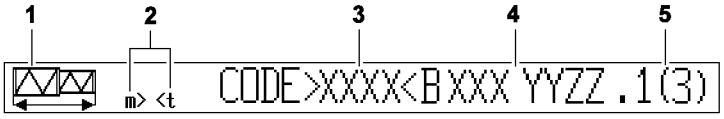
4.2 “Configuration” program areas

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

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

Note

▶ 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.



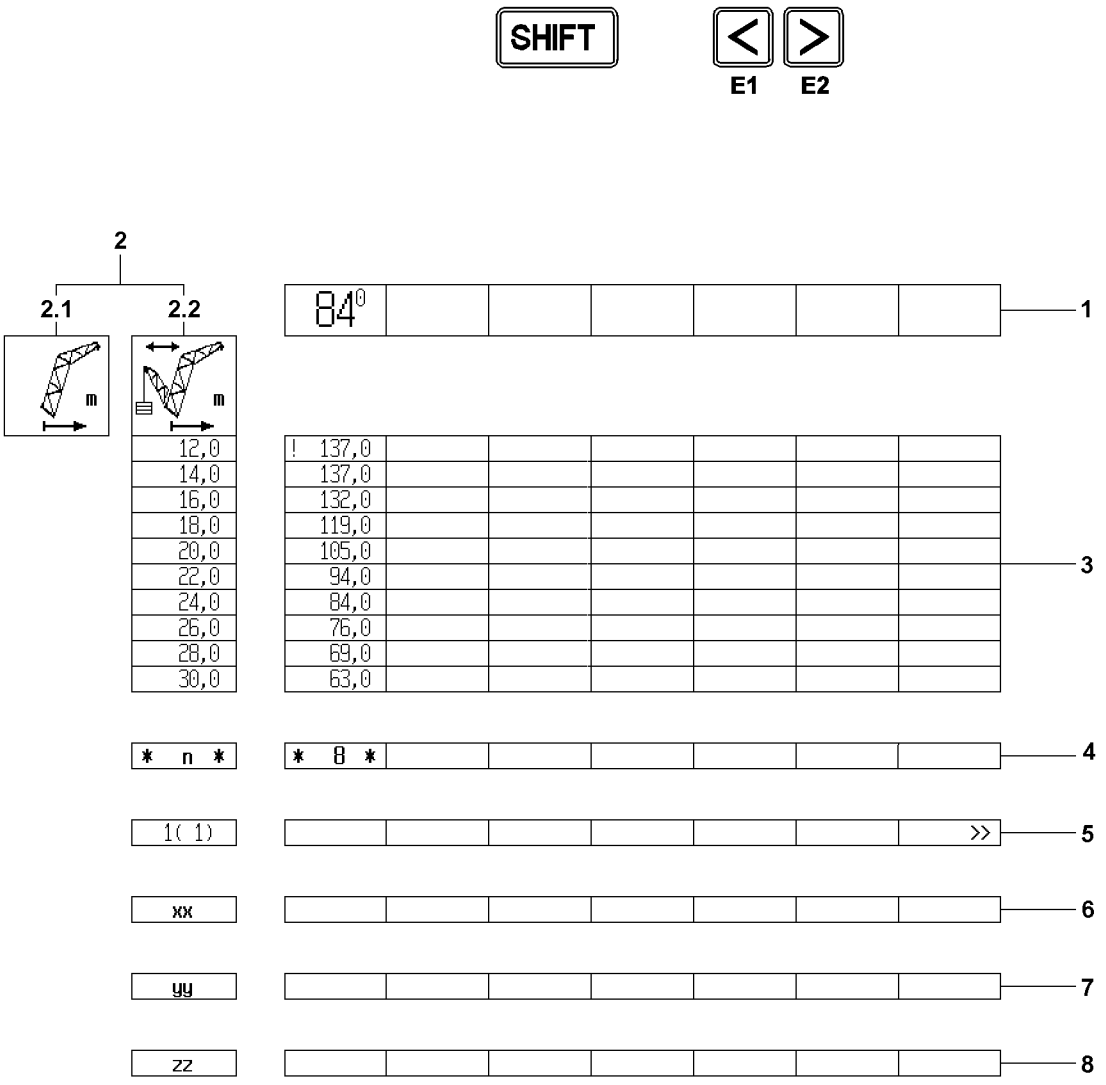
B105242

4.2.1 General information line

1 “Main boom length” icon	• The icon is identical for all operating modes.
2 Abbreviations	• For the programmed length units (LE) and weight units (GE) Possible length units are [m] and [ft] Possible weight units are [t] and [lbs]
3 4-digit short code	• It is located next to the text “CODE” inside angled brackets • Each short code uniquely identifies a crane configuration. The valid equipment configuration and their associated short code numbers for the crane can be found in the load chart manual of the crane.

4 8-digit organization number	• Relates to the selected load chart
	• Operating mode-dependent
	• Example: BXXX YYZZ
	  • Letter in first position = calculation basis for the load chart (country or county specific). Example: “B” = DIN, BS 75%
	  • Number combination “XXX” = crane type
	  • 4-digit letter block “YYZZ” = configuration characteristic

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


SHIFT
E1
E2
2
2.1
2.2
m
m
84°
1
12,0
14,0
16,0
18,0
20,0
22,0
24,0
26,0
28,0
30,0
! 137,0
137,0
132,0
119,0
105,0
94,0
84,0
76,0
69,0
63,0
3
* n *
* 8 *
4
1(1)
>>
5
xx
6
yy
7
zz
8

B105243

4.2.2 Display area of load chart values

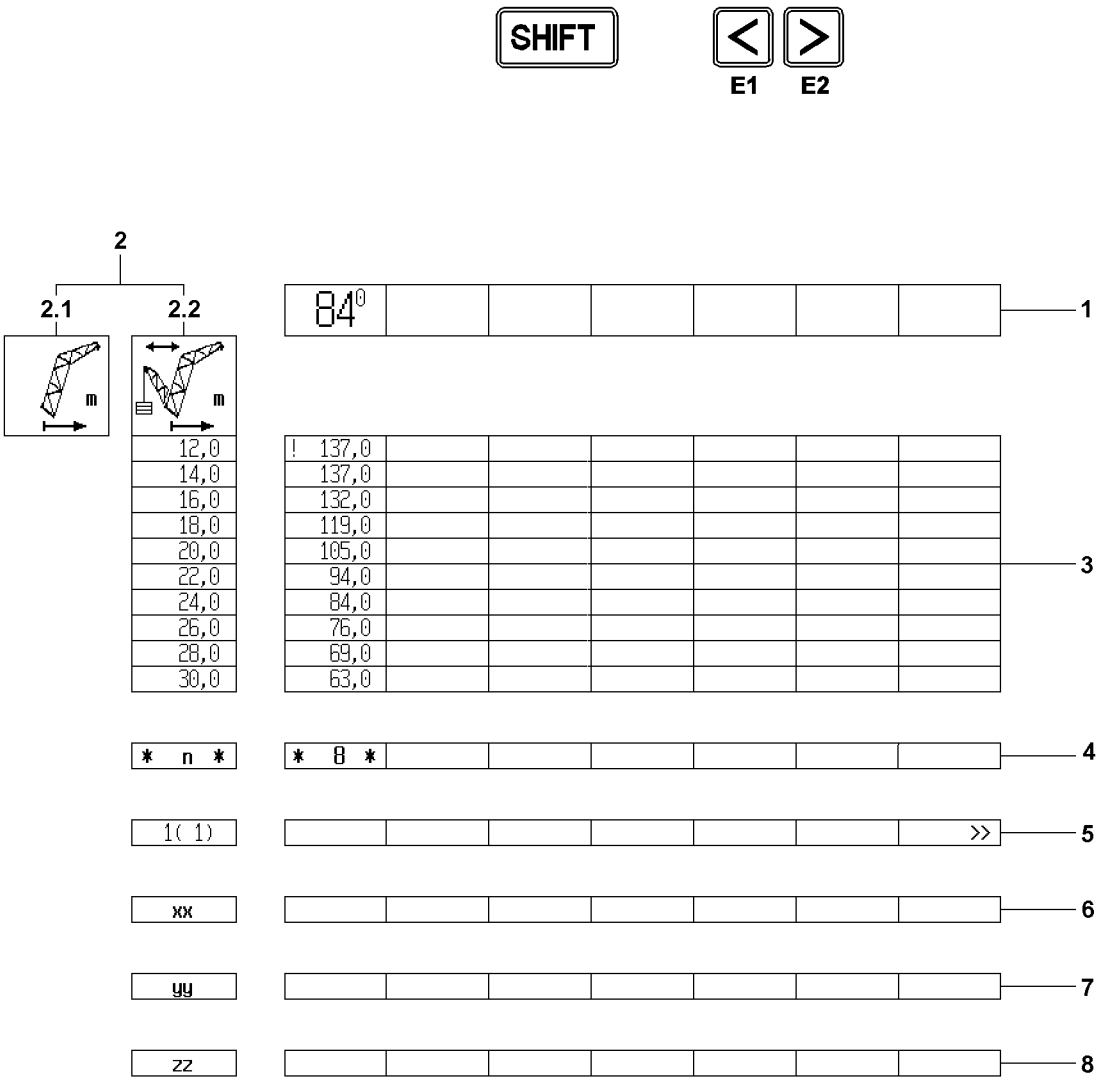
1 Main boom lengths
- In [m] or [ft]
  maximum of 7 columns per display page

2 “Boom radius” icon
- Operating mode-dependent
  - Operating modes without derrick **2.1**
  - Operating modes with derrick **2.2**
- In [m] or [ft]
- Maximum 10 lines of boom radius values
- Vertical axis of load value field

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

4 Reeving number of hoist rope
- * n *
  n = Reeving number of the hoist rope between the boom head and hook block, in order to be able to lift the maximum load in the corresponding load chart column in single winch operation
- **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.
- **Note:**
  - For parallel operation of winches **I** and **II**, always reeve in an even reeving.
  - If the minimum value of the reeving is uneven, then in parallel operation of the winches the next higher reeving must possibly be selected.
  - Enter and confirm the reeving on the LICCON monitor 0, according to the reeving on the boom head.
- **Note:**
  - In the assembly operating mode SA, the reeving number is always 0.
  - The reeving number **cannot** be changed (edited) in the assembly operating mode SA.

5 Line for special displays
- If a load chart consists of more than seven columns, it cannot be fully displayed because of the size of the monitor. In that case, marking arrows in the first or the seventh field in this line indicate that there are additional chart columns to the left or right of the displayed chart. They can be shown by pressing the key **E1** or the key **E2**.
  As supporting information, the currently selected column number and the number of columns in the chart are shown, for example, 1 (1) corresponds to the first of 1 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).


SHIFT
E1
E2
2
2.1
2.2
m
m
84°
1
12,0
14,0
16,0
18,0
20,0
22,0
24,0
26,0
28,0
30,0
! 137,0
137,0
132,0
119,0
105,0
94,0
84,0
76,0
69,0
63,0
3
* n *
* 8 *
4
1(1)
>>
5
xx
6
yy
7
zz
8

B105243

6 Main boom angle

- Line **xx**
- In [°]
- **Note:**

  Appears **only** in operating modes with luffing lattice jib.
  - **Main geometry:**
  - Appears "**xx°** " in main geometry status icon (for example: **"xx°** SDB") means **"xx°"** = main boom angle in [°].
  - In the line **xx** the main boom angles are listed, which must be set in order to be able to lift the load values in the corresponding load chart column.
  - **Auxiliary geometry:**
  - Appears "**xx°** " in auxiliary geometry icon (for example: **"WV" "xx°"**) means **"xx°"** = jib relative angle in [°].

    Note:

    Jib relative angle means: The jib angle is determined relative to the main boom angle (main boom angle on pulley head, jib angle bottom).
  - In the load chart columns, the jib relative angles, which must be set to be able to lift the load values in the corresponding load chart column are listed next to each other.

7 Derrick ballast radius

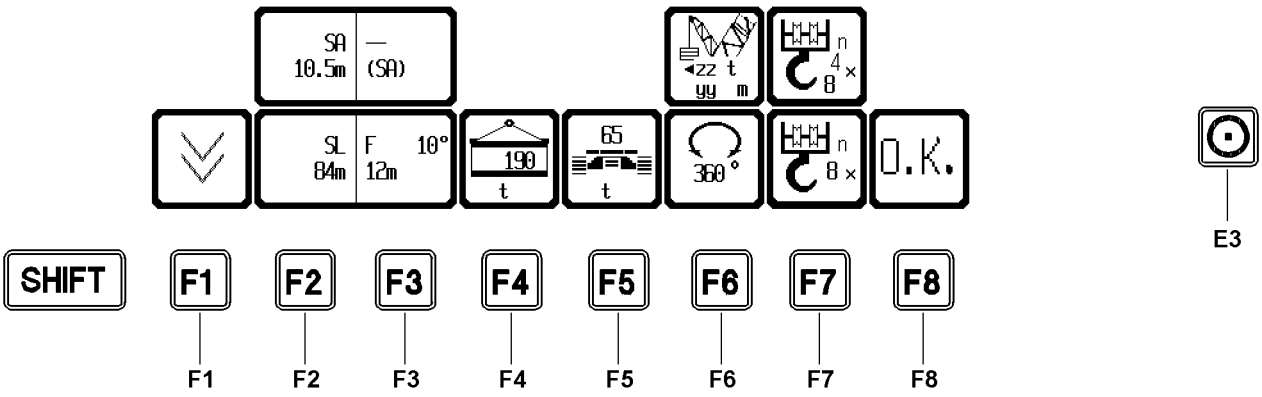
- Line **yy**
- In [m] or [ft]
- **Note:**

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

8 Derrick ballast weight

- Line **zz**
- In [t] or [lbs]
- **Note:**

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


SA
10.5m
—
(SA)
zz t
yy m
n
4 x
8
SL
84m
F
12m
10°
190
t
65
t
360°
n
8 x
O.K.
E3
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8

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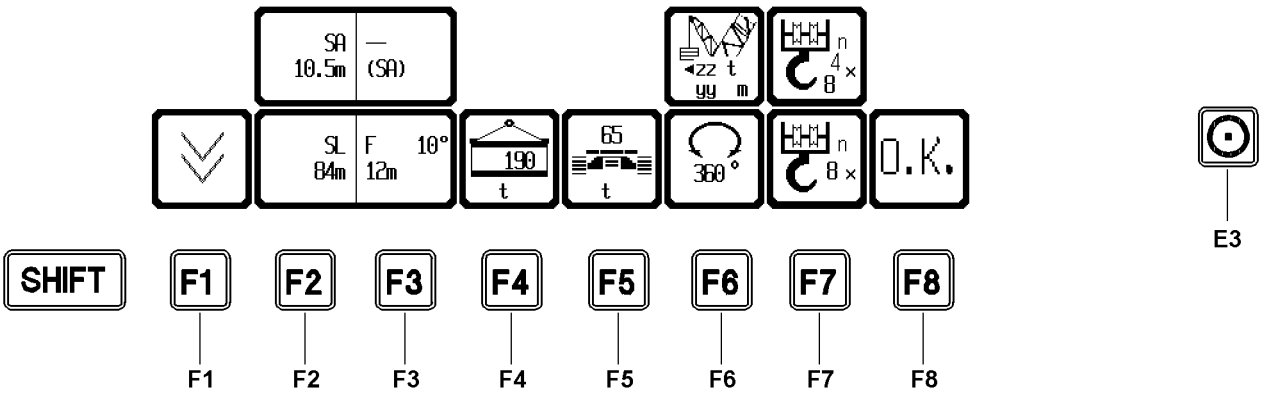
4.2.3 Function key line in the program “Configuration”

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

– operating mode and
– equipment configuration.

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

F1 Vertical paging	• Depending on the size of the monitor, up to 10 load chart lines can be displayed at once. If a chart consists of more than 10 lines, the display is spread over several pages. When pressing a key, the next page of the load chart will be displayed, and the number of the current page in the “general information line” will be counted up by 1. When the last page is reached, page 1 will appear again after pressing the function key **F1**.
F2 Main boom geometry	• Adjustment possibility of different main boom operating modes and main boom lengths of the crane (if available). The types are described using abbreviations, angle and length data in the icon. • Example: SL 84 m • **Note:** In addition to the main boom operating modes, the assembly operating mode SA can be set via the function key **F2**.
SHIFT and **F2**	• Previous main boom geometry (if available)


SA
10.5m
—
(SA)
zz t
yy m
n
4 x
8
SL
84m
F
12m
10°
190
t
65
t
360°
n
8 x
O.K.
E3
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8

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F3 Auxiliary boom geometry

- Adjustment possibility of different auxiliary boom operating modes and auxiliary boom lengths of the crane (if available). The types are described using abbreviations, angle and length data in the icon.
- Example:
  W 36 m
- **Note:**
  Pressing the function key **F2** and/or the function key **F3** removes all data related to the operating mode and configuration state from the monitor and sets the short code in the general information line to “CODE >????<”.
- **Operating mode dependent data:**
  - Boom length icon in the general information line
  - Length units and weight units
  - Load chart organization number
  - Boom radius icon
  - Boom length data
- **Configuration dependent data:**
  - Numbering of current page number and total number of pages in load chart
  - Radius values in length units
  - Load values in weight units

SHIFT and **F3**

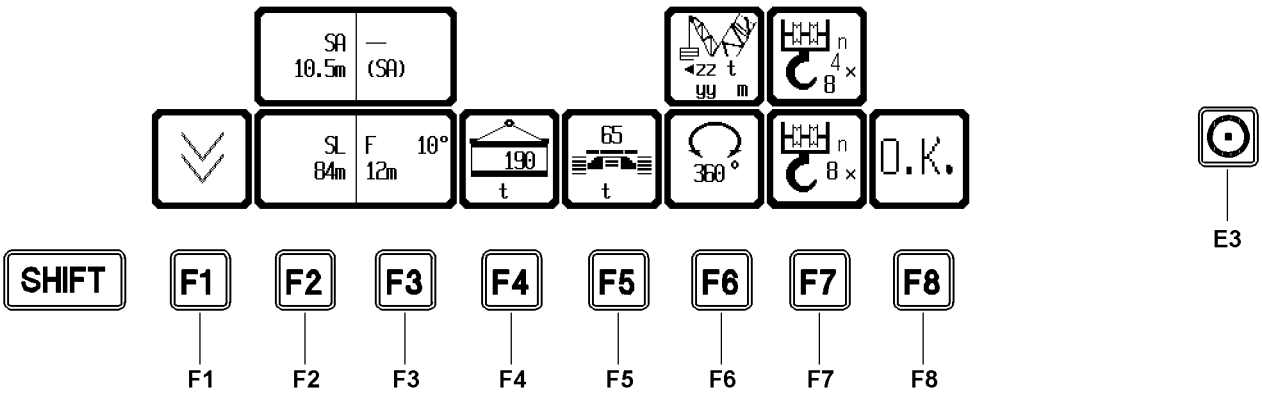
- Previous auxiliary boom geometry (if available)

F4 Counterweight

- Adjustment possibility for current counterweight, which must be on the turntable in order to obtain the values in the current chart. When pressing a key, the following icon appears with additional text in the counterweight symbol.
- Example:
  “190.0 t ” = total counterweight of 190.0 t

F5 Chassis

- Adjustment possibility “equipment configuration chassis” (for example: crawler, support, central ballast).
- In operating modes, where there are various chassis versions (for example: Ballast on chassis), this can be set with **“F5”** .


SA
10.5m
—
(SA)
zz t
yy m
n
4 x
8
SL
84m
F
12m
10°
190
t
65
t
360°
n
8 x
O.K.
E3
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8

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F6 Slewing range or derrick ballast radius and weight

- In crane operating modes **without** derrick ballast, when pressing **F6**, the “slewing range icon 360°” appears.
- In crane operating modes **with** derrick ballast, when pressing **F6**, the combined crane icon appears with:
  Derrick ballast radius **yy** in [m] or [ft] and derrick ballast weight **zz** in [t] or [lbs].

F7 Hoist rope reeving

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

Note

▶ For parallel operation of hoist winches (1II2), at hoist rope reeving, enter the total reeving of winch 1 and winch 2 on the LICCON computer system (Example: Winch 1 and winch 2 are each reeved 7ways, the total reeving is therefore n=14).

▶ The total reeving **must** always show an even number value in parallel operation!

SHIFT and **F7**

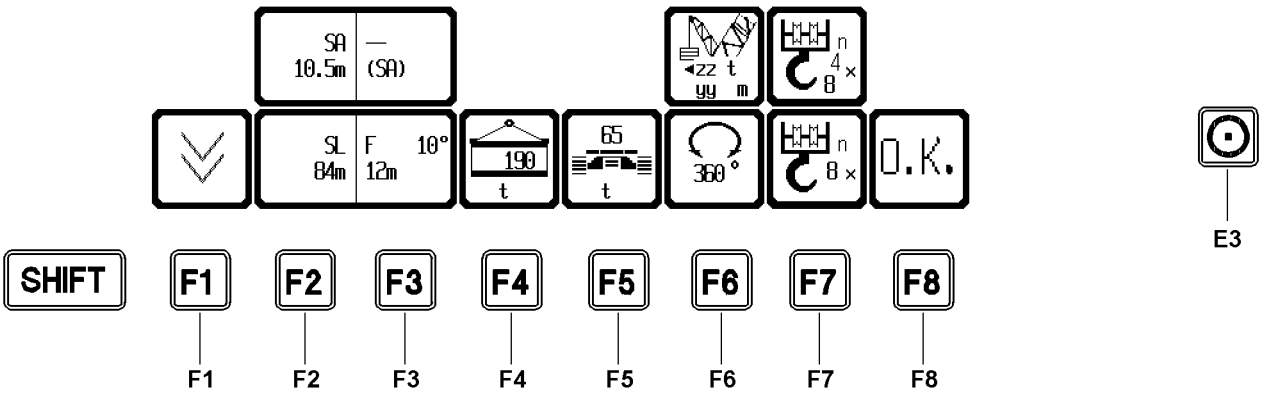
- Reeving number on boom is reduced by 1.

E3
und
F7 Hoist rope reeving on boom nose

- Adjustment possibility for the **number of hoist rope strands on the boom nose** to obtain a certain load carrying capacity.
  Note:
  The reeving for the boom nose (upper number) is only shown if the boom nose is installed. If the boom nose is installed during operation, then the reeving of the boom nose must be correctly entered in the “Configuration” program.

SHIFT and **E3** and **F7**

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


SA
10.5m
—
(SA)
zz t
yy m
n
4 x
8
SL
84m
F
12m
10°
190
t
65
t
360°
n
8 x
O.K.
E3
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8

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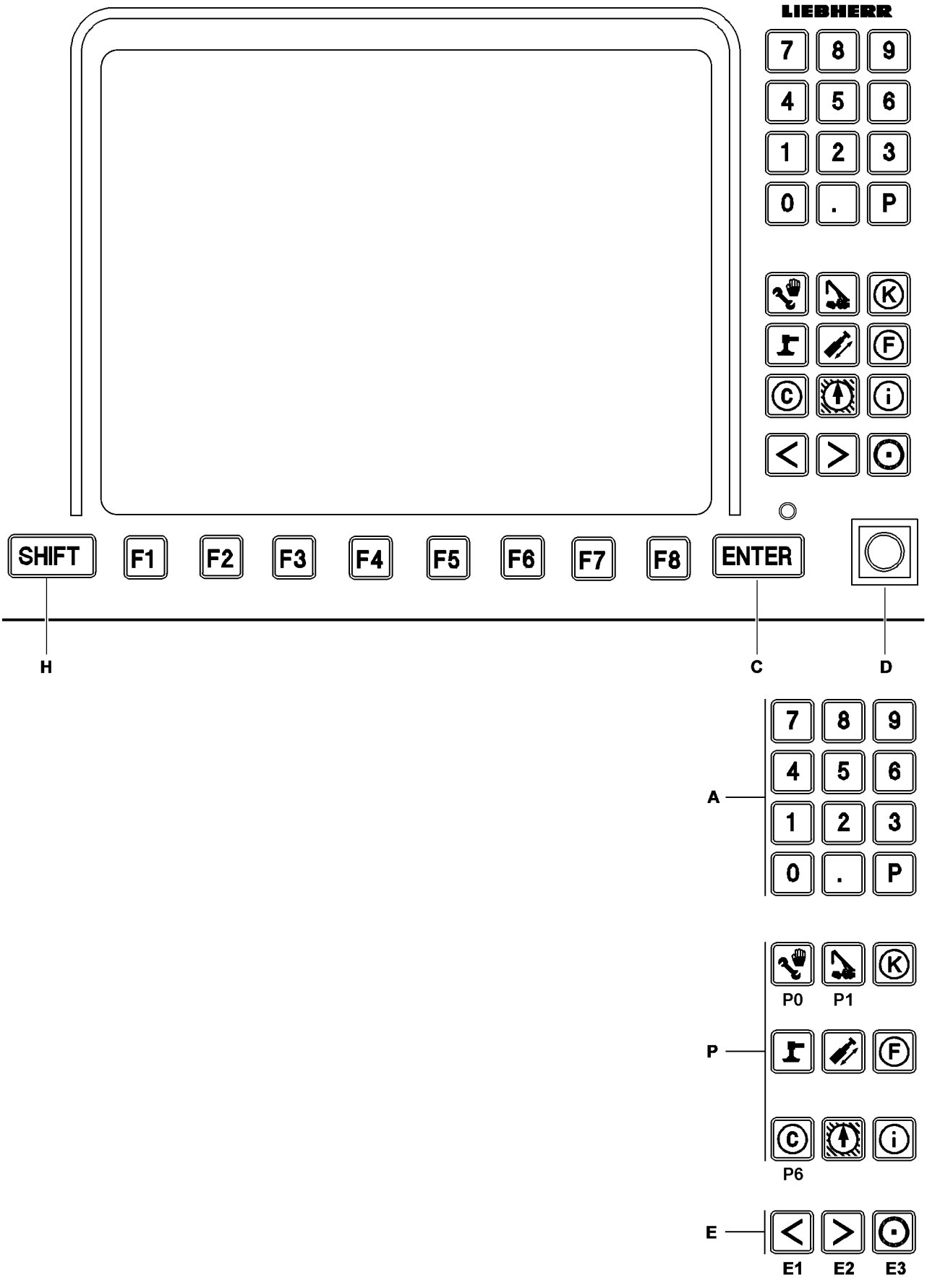
F8 Confirmation of selected equipment configuration

- **Prerequisites:**
  Setting the equipment configuration must be fully completed, i.e. a valid short code is displayed and load capacity values are in the chart field.
  The external conditions for this equipment configuration, if stipulated must be met.
  The crane may not be utilized in the previous equipment configuration by more than 20%. Switching to the “Crane operation” program can otherwise only be done using the program key **P1**. In that case, the newly entered equipment configuration is not accepted.
  Note:
  Make sure that after switching to the operating screen, the chosen equipment configuration (short code) and the hoist rope reeving(s) have been accepted.
- Display of operating errors from the “Configuration” program.
  Operating errors caused by the “Configuration” program are displayed in the icon above the function key **F8** and in the error line for about 5 seconds. If the function key **F8** is pressed within 5 seconds, the program will switch automatically to the error determination screen in the test system and the error documentary will be displayed. The operating error will not be saved.
  Operating errors are always placed on top in the error stack, see separate “Diagnostics manual”.


LIEBHERR
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
P6
E
E1 E2 E3

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4.2.4 Other operating elements

A Keypad

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

P Program keys

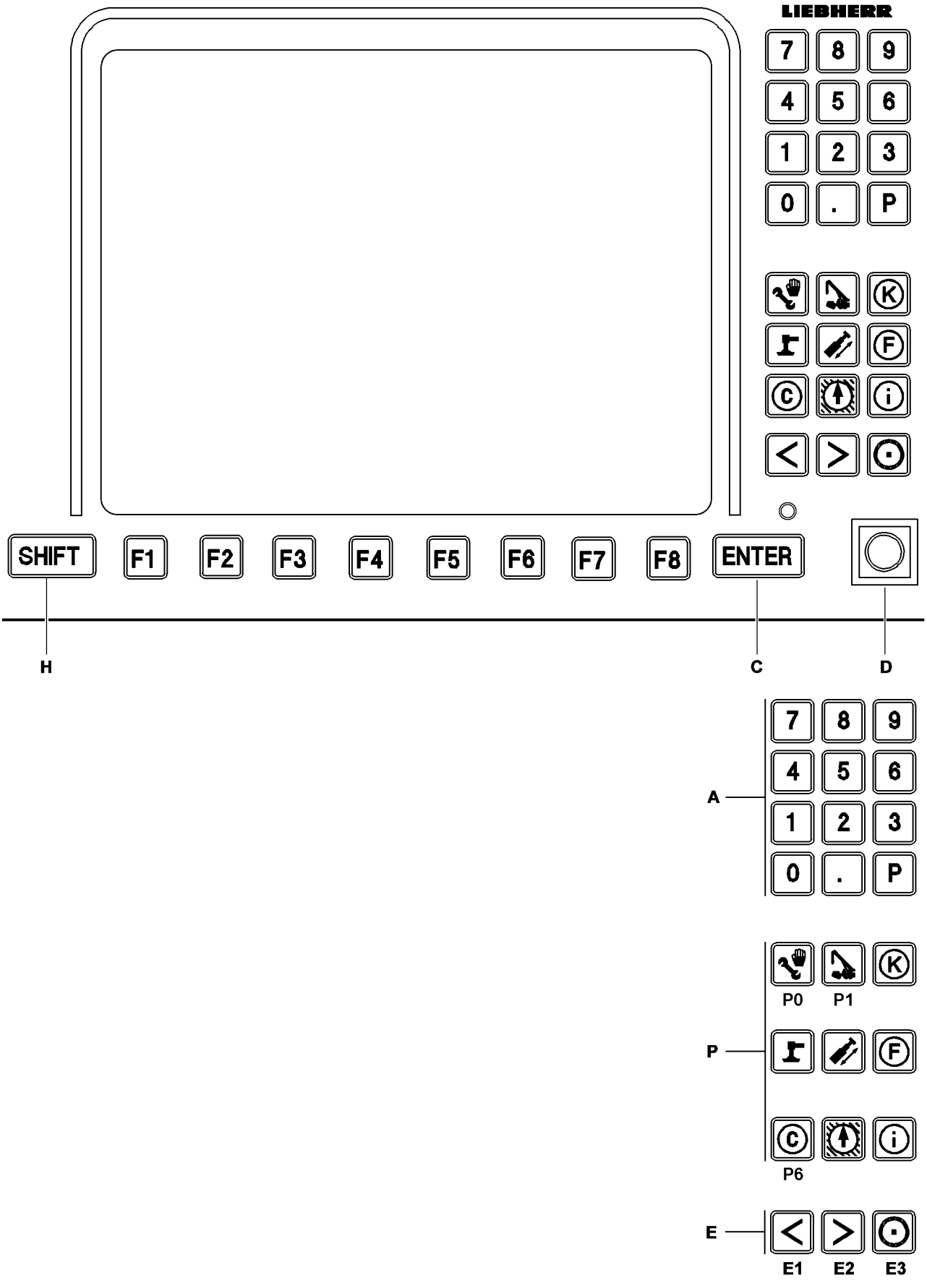
- Selection of individual programs. The settings in the Configuration program are discarded, and the equipment configuration and reeving most recently confirmed with the **O.K.** key will continue to be used.
  A program currently running **cannot** be called again using its program key.

C Input key “ENTER”

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

D Bypass key button

- Has no function in the “Configuration” program.


LIEBHERR
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
P6
E
E1 E2 E3

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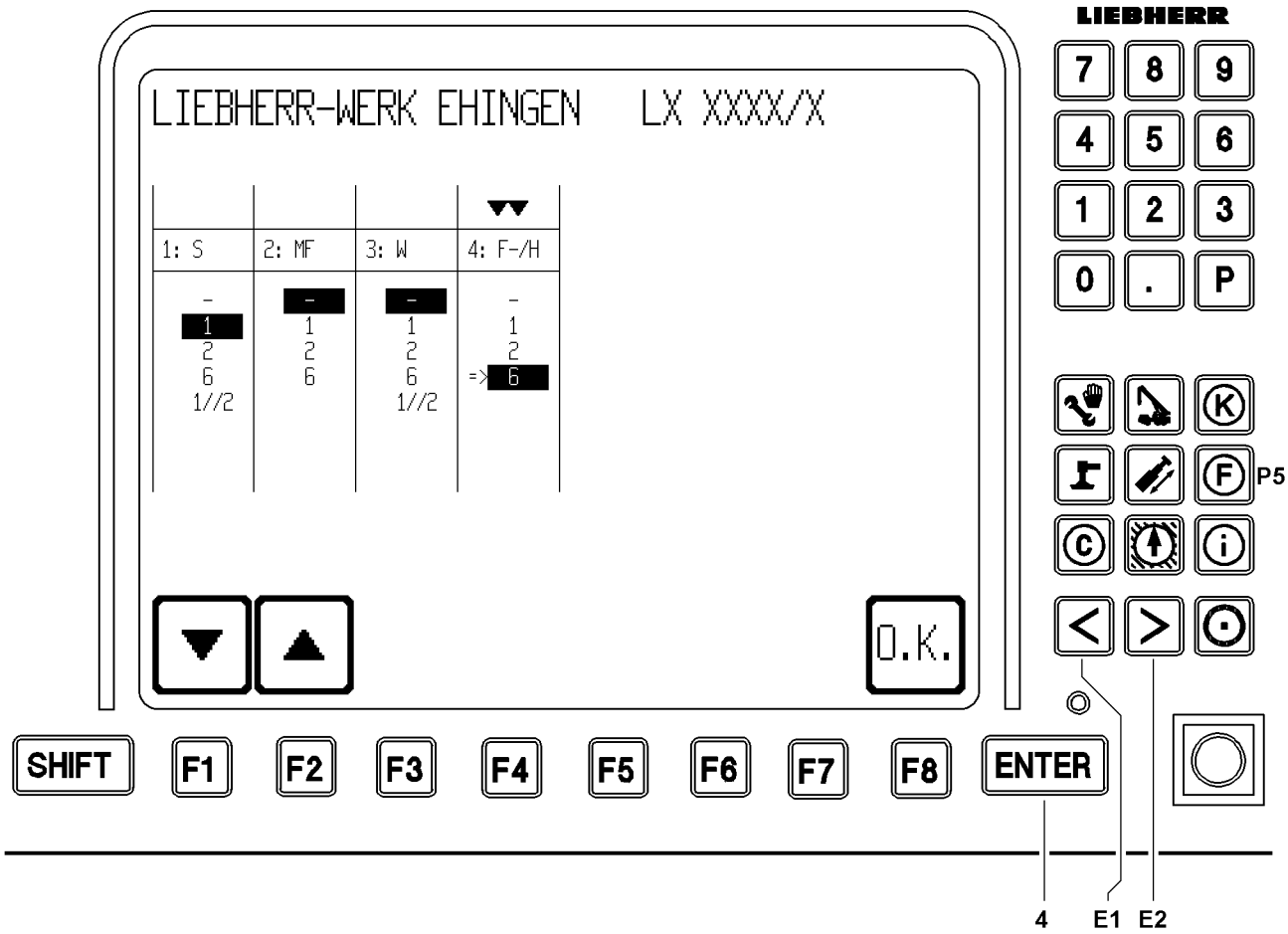
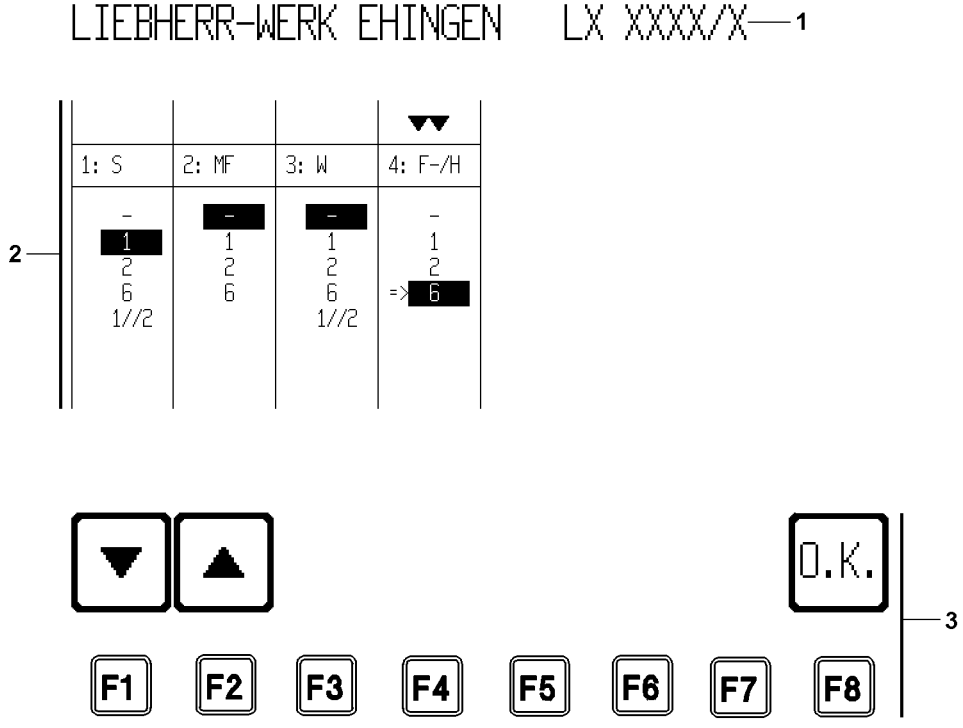
E Horizontal paging

- **Note:**
  The **E1** and **E2** keys only have a function if this is indicated in the “special displays line”.
- If a load chart consists of more than seven columns, the first display of the configuration state only shows columns 1 to 7.
- The double arrow at the right hand edge (>>) or at the left hand edge of the line (<<) points to additional columns in either direction.
- Press **“E1”** (<) to display the next left chart column.
- Press **“E2”** (>) to display the next right chart column.
- **Note:**
  Using the key combination **SHIFT** and **E1** (<) or **SHIFT** and **E2** (>), you can, where possible, page to the left or right by 7 load chart columns (corresponds to 1 page).

H SHIFT key

- For example Supervisory function
- By pressing and holding down the **SHIFT** key and then pressing one of the function keys, which must correspond to the corresponding function, the previous main boom geometry, the auxiliary boom geometry and the previous reeving are reset.
  Note:
  See section “The function key line” in the “Configuration” program!


LIEBHERR
LIEBHERR-WERK EHINGEN LX XXXX/X
1: S
2: MF
3: W
4: F-/H
O.K.
7 8 9
4 5 6
1 2 3
0 . P
P5
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
4 E1 E2


LIEBHERR-WERK EHINGEN LX XXXX/X
1
1: S
2: MF
3: W
4: F-/H
2
O.K.
3
F1 F2 F3 F4 F5 F6 F7 F8

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5 The “winch - pulley head assignment”

After the set equipment configuration has been confirmed in the “Configuration” program with the function key **F8** (OK), the set up parameters are taken over by the LICCON computer system and the “winch - pulley head assignment” appears automatically.
In the “winch - pulley head assignment”, the crane operator must assign the winch(es) required for crane operation to the corresponding pulley heads (S, MF, W, F-/H).

5.1 Starting the “winch - pulley head assignment”

By pressing the function key **F8** (OK) in the “Configuration” program, the LICCON computer system changes automatically into the “winch - pulley head assignment”.

▶ Starting the “winch - pulley head assignment”:
Press the function key **F8** (OK) in the equipment configuration screen.

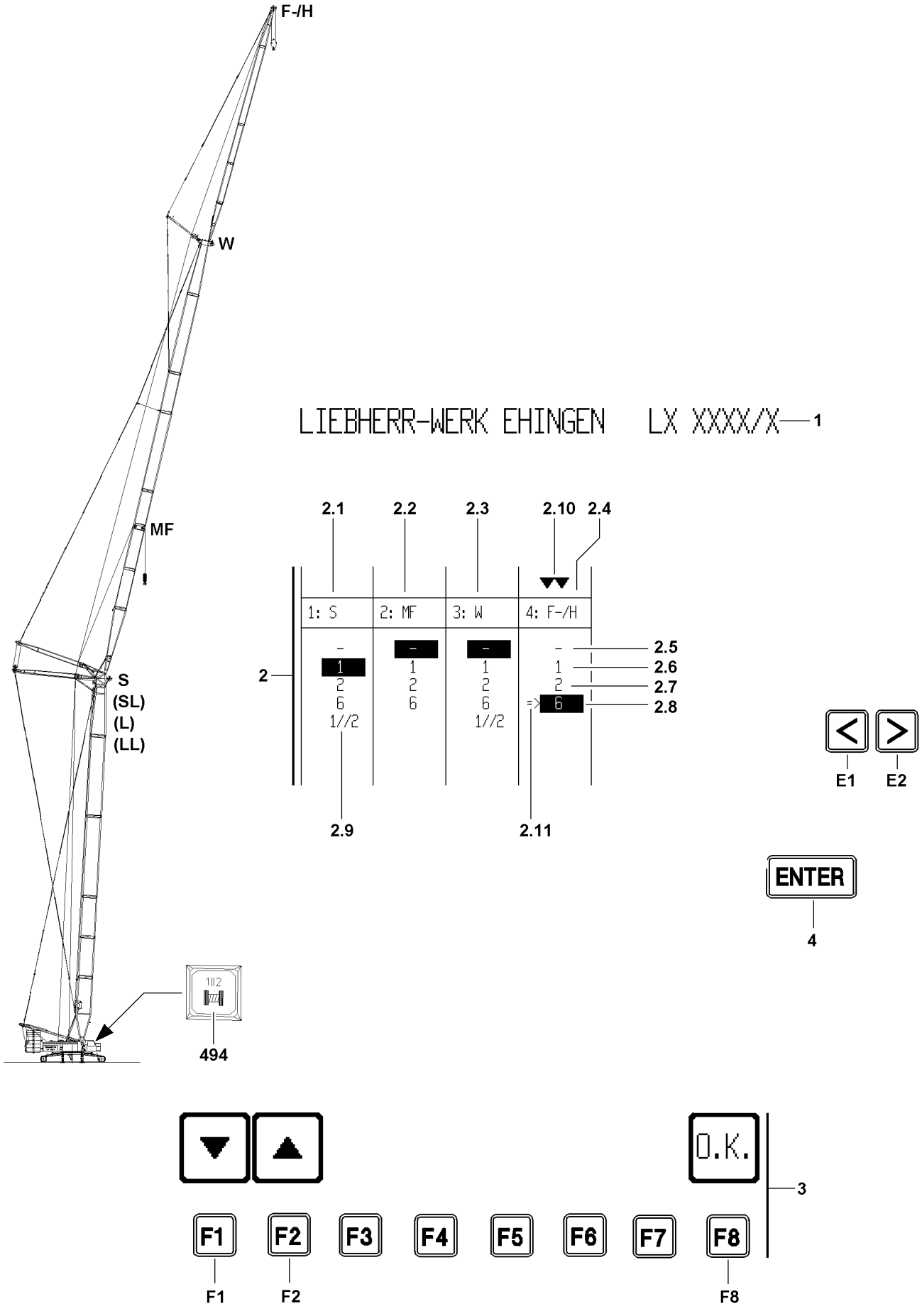
or

- Press the program key **P5**.

5.2 Areas in the “winch - pulley head assignment”

The LICCON monitor is divided into three areas in the “winch - pulley head assignment”:

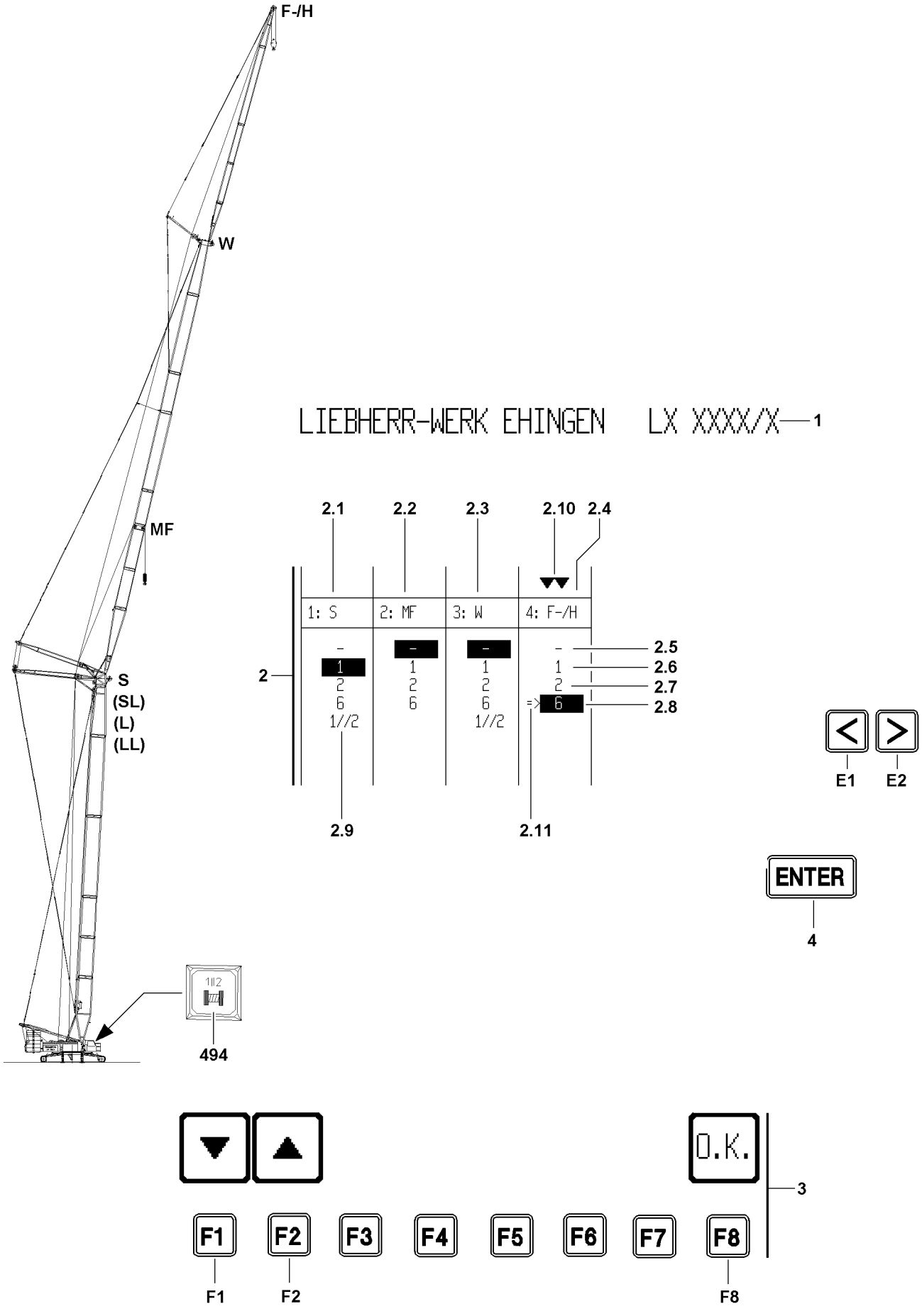
1 Crane type identification
2 Assignment overview • For the “winch - pulley head assignment”
3 Function key line


F-/H
W
MF
S
(SL)
(L)
(LL)
494
LIEBHERR-WERK EHINGEN LX XXXX/X
1
2.1
2.2
2.3
2.10
2.4
1: S
2: MF
3: W
4: F-/H
2
2.5
2.6
2.7
2.8
2.9
2.11
E1
E2
ENTER
4
O.K.
3
F1
F2
F3
F4
F5
F6
F7
F8
F1
F2
F8

B108721

5.3 User interface

1	Crane type identification	
2	Assignment overview	• **Note:** The winches are assigned to the pulley heads within the assignment overview.
2.1	“Pulley head 1”	• Pulley head on main boom • Valid for main boom operating modes (L, LL, SL, S, if present)
2.2	“Pulley head 2” *	• “Midfall” (MF) • Pulley head on the center pulley of the luffing jib
2.3	“Pulley head 3”	• Pulley head on the “luffing jib* ”
2.4	“Pulley head 4”	• Pulley head on the “fixed jib* ” **or** on the “boom nose* ”
2.5	No winch assigned	
2.6	Winch 1	• Not selected
2.7	Winch 2	• Not selected
2.8	Winch 6*	• Selected (background is black)
2.9	Winch 1 and 2 in parallel operation	• Not selected
2.10	Selector arrow	• Double arrow pointing down • Select pulley head
2.11	Winch selector	• Arrow to the right. • Select winch, which is to be assigned to the pulley head
3	Function key line	
F1	Function key	• Move winch selector **2.11** “down”
F2	Function key	• Move winch selector **2.11** “up”
F8	Function key “OK”	• Confirmation of set “winch - pulley head assignment” and take over of settings into the “crane operation” program
4	ENTER	• The winch selected with the winch selector **2.11**, after pressing the “ENTER” key, is highlighted in black and is therefore preselected
E1	Special function key	• Move the selector arrow **2.10** to the left to select the pulley head **Note:** The winch selector **2.11** is taken over into the corresponding column at the same time with the selector arrow **2.10**!
E2	Special function key	• Move the selector arrow **2.10** to the right to select a pulley head **Note:** The winch selector **2.11** is taken over into the corresponding column at the same time with the selector arrow **2.10**!


F-/H
W
MF
S
(SL)
(L)
(LL)
494
LIEBHERR-WERK EHINGEN LX XXXX/X
1
2.1
2.2
2.3
2.10
2.4
1: S
2: MF
3: W
4: F-/H
2
2.5
2.6
2.7
2.8
2.9
2.11
E1
E2
ENTER
4
O.K.
3
F1
F2
F3
F4
F5
F6
F7
F8
F1
F2
F8

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5.4 Selecting a pulley head and assigning it to winches

Make sure that the following prerequisites are met:

– The set up parameters from the configuration screen have been confirmed by pressing the function key **F8** “OK”.
– the “winch - pulley head assignment screen” is shown on the LICCON monitor.

DANGER

The crane can topple over!

If an incorrect winch is assigned to a pulley head, then there is the possibility that the LMB does not recognize an overload condition or recognizes it too late, since a thick hoist rope is assumed for the calculation of the “load capacity”, even though actually a thin hoist rope has been placed (the “load capacity” might be calculated too large in such a case)!

If an incorrect winch is assigned to a pulley head, then there is the possibility that the LMB does not recognize an overload condition or recognizes it too late, since a hoist rope lever arm, which is too small, is assumed for the calculation of the “actual load” and as a result, the “actual load” will be calculated too small!

The crane can be overloaded unnoticed and topple over!

Personnel can be severely injured or killed!

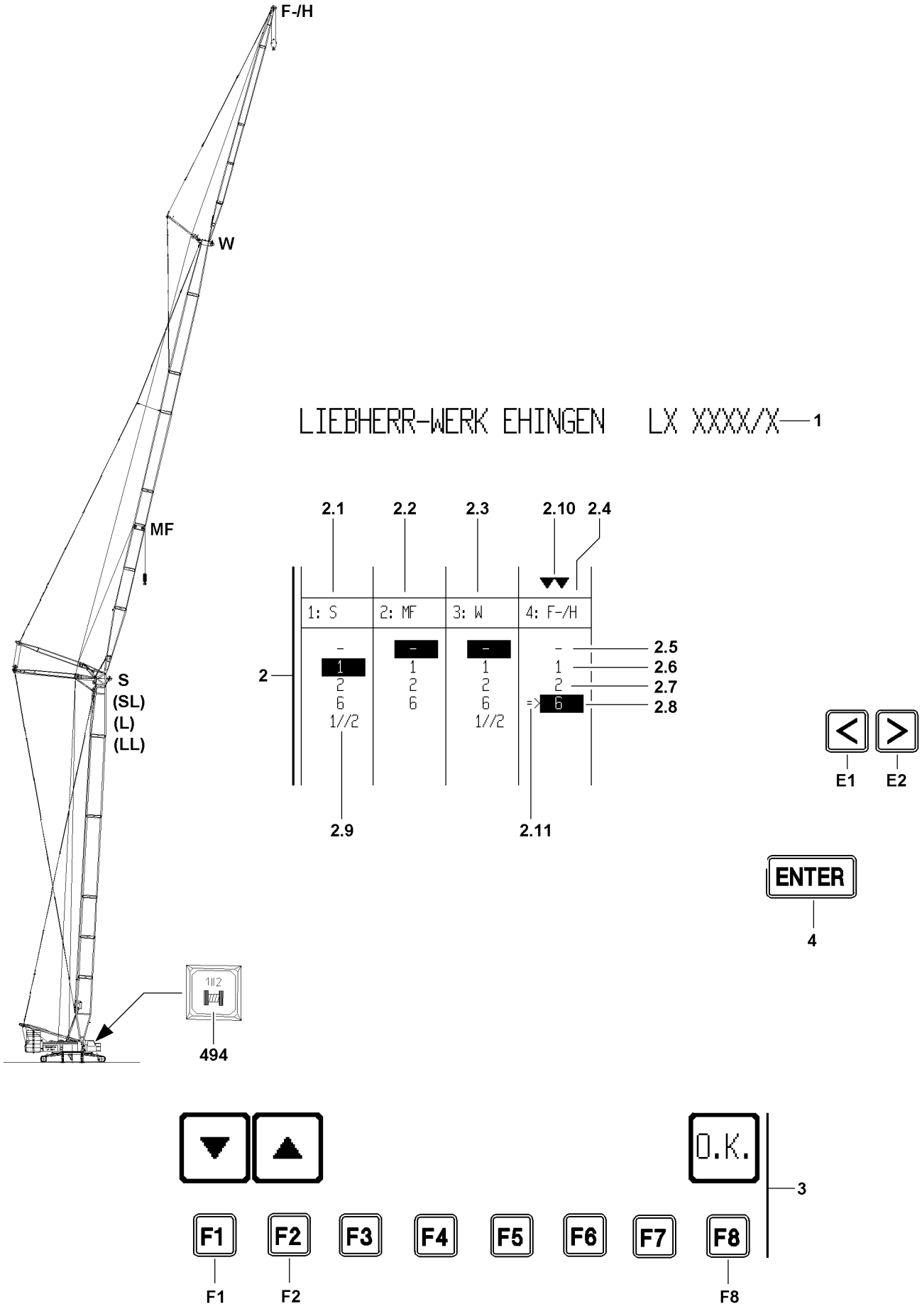
▶ The crane operator must ensure that the “winch - pulley head assignment” matches for the assembled boom system and the set operating mode!

WARNING

Impermissible “winch - pulley head assignment”!

If a “winch - pulley head assignment” is recognized by the LICCON computer system as impermissible, then the following display appears - after take over of the settings with the function key **F8** (OK) – on the winch icons of the crane operating screen (for winch 1, winch 2 and winch 6): “ **??** ”

▶ **Crane operation with impermissible settings is prohibited!**
▶ The crane operator must carefully check the settings in the “Configuration” program and in the “winch - pulley head assignment” and correct them, if necessary!
▶ The crane operator must ensure that the “winch - pulley head assignment” matches the installed boom system and the set operating mode!
▶ The crane operator must ensure that the “winch - pulley head assignment” has been taken over by the control correctly after confirmation of the settings with the function key **F8** (OK)! The correct boom identifications must appear in the winch icons in the crane operating screen! If necessary, recheck the settings!
▶ If there is any doubt, contact the Service Dept. at Liebherr-Werk Ehingen GmbH!


F-/H
W
MF
S
(SL)
(L)
(LL)
494
LIEBHERR-WERK EHINGEN LX XXXX/X
1
2.1
2.2
2.3
2.10
2.4
1: S
2: MF
3: W
4: F-/H
2
2.5
2.6
2.7
2.8
2.9
2.11
E1
E2
ENTER
4
O.K.
3
F1
F2
F3
F4
F5
F6
F7
F8
F1
F2
F8

B108721

5.4.1 Selecting a pulley head

Note

- ▶ The pulley heads are located in such a way that the radius increases from pulley head 1 to pulley head 4!
- ▶ A crane equipment consists of maximum four pulley heads!
- ▶ The selection of the desired pulley head by the selector arrow **2.10** is made by pressing the special function key **E1** or the special function key **E2**.

Move the selector arrow **2.10** into the desired column.

Move the selector arrow to the left

▶ Press the special function key **E1**.

Result:

– The selector arrow **2.10** and the winch selector **2.11** move by one column to the “left”.
– The winch selector **2.11** jumps automatically to the selected winch (black background).

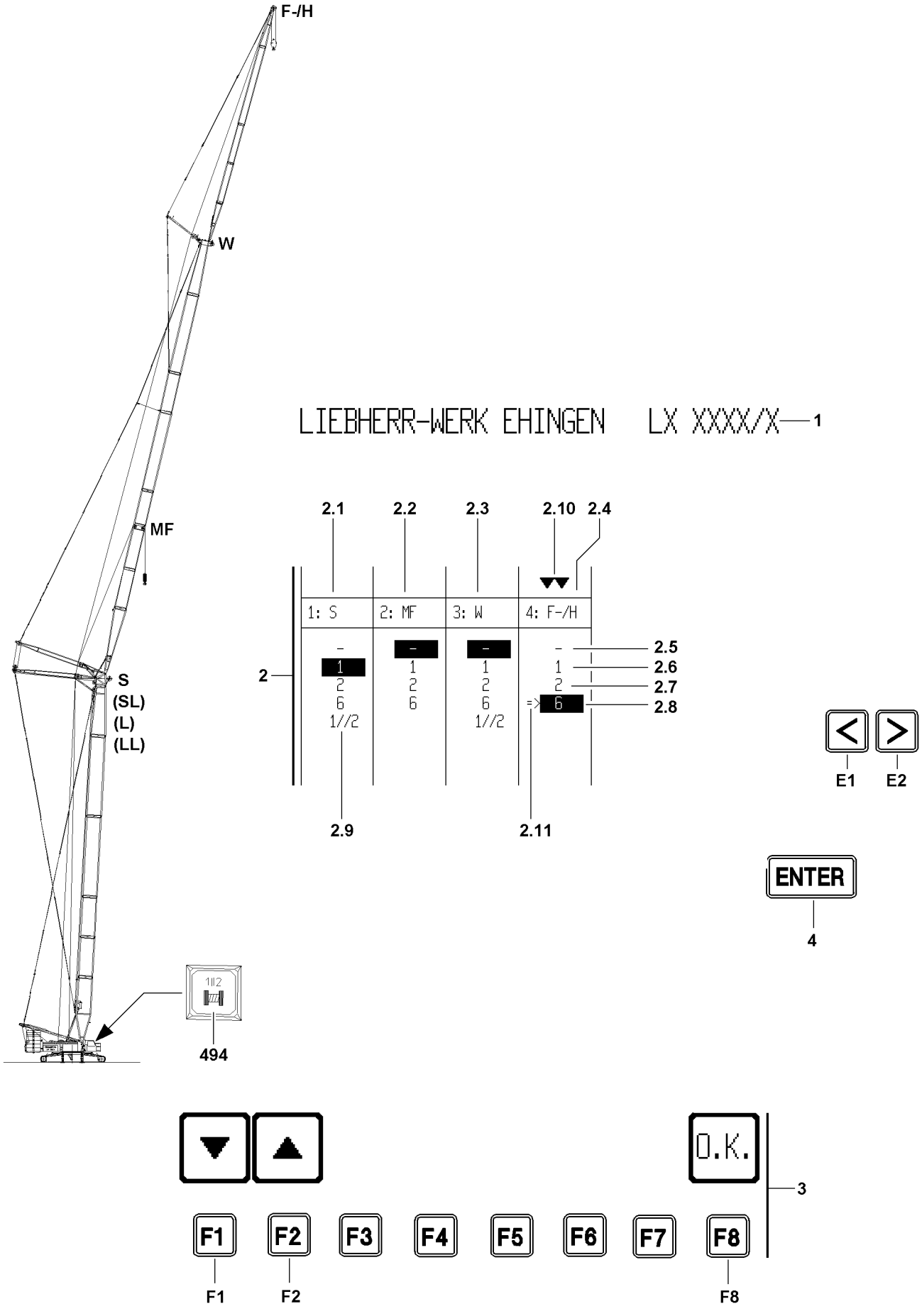
Move the selector arrow to the right

▶ Press the special function key **E2**.

Result:

– The selector arrow **2.10** and the winch selector **2.11** move by one column to the “right”.
– The winch selector **2.11** jumps automatically to the selected winch (black background).

▶ When the required pulley head is selected:
Select the winch(es) as outlined in section “Assigning winch(es)”!


F-/H
W
MF
S
(SL)
(L)
(LL)
494
LIEBHERR-WERK EHINGEN LX XXXX/X
1
2.1
2.2
2.3
2.10
2.4
1: S
2: MF
3: W
4: F-/H
2
2.5
2.6
2.7
2.8
2.9
2.11
E1
E2
ENTER
4
O.K.
3
F1
F2
F3
F4
F5
F6
F7
F8
F1
F2
F8

B108721

5.4.2 Assigning winch(es)

WARNING
The crane can topple over!
Due to incorrect settings during the winch assignment, dangerous operating situations can occur, up to toppling the crane!
Personnel can be severely injured or killed!
- ▶ At winch assignment of winch 1 and winch 2 in parallel operation (1//2), turn the switch **494** (parallel operation) in the control console on the right on!
- ▶ At winch assignment of winch 1 and winch 2 in single operation, turn the switch **494** in the control console on the right **off**!

Note
- ▶ The winch selector **2.11** is coupled to the selector arrow **2.10** and moves automatically into the same column as the selector arrow **2.10**. The winch selector **2.11** “jumps” automatically to the selected winch (black background)!
- ▶ The winch required for crane operation is selected by pressing the function key **F1** and the function key **F2**. This selection is confirmed by pressing the “ENTER” key!
- ▶ A winch which is already assigned to another pulley head is ignored and passed over when the function key is pressed. The winch selector **2.11** jumps automatically to the next “free” winch!
- ▶ One winch can only be assigned to one pulley head!

Note
- ▶ For pulley heads, which are not assembled, **or** which are assembled but no winch is to be assigned to them, instead of a winch, the sign “no winch selected” **2.5** must be assigned!

Ensure that the following prerequisite is met:
– the desired pulley head is selected.

Move the winch selector“down”.

- ▶ Actuate the function key **F1**.

Result:
– The winch selector **2.11** moves “down”.

Move the winch selector “up”

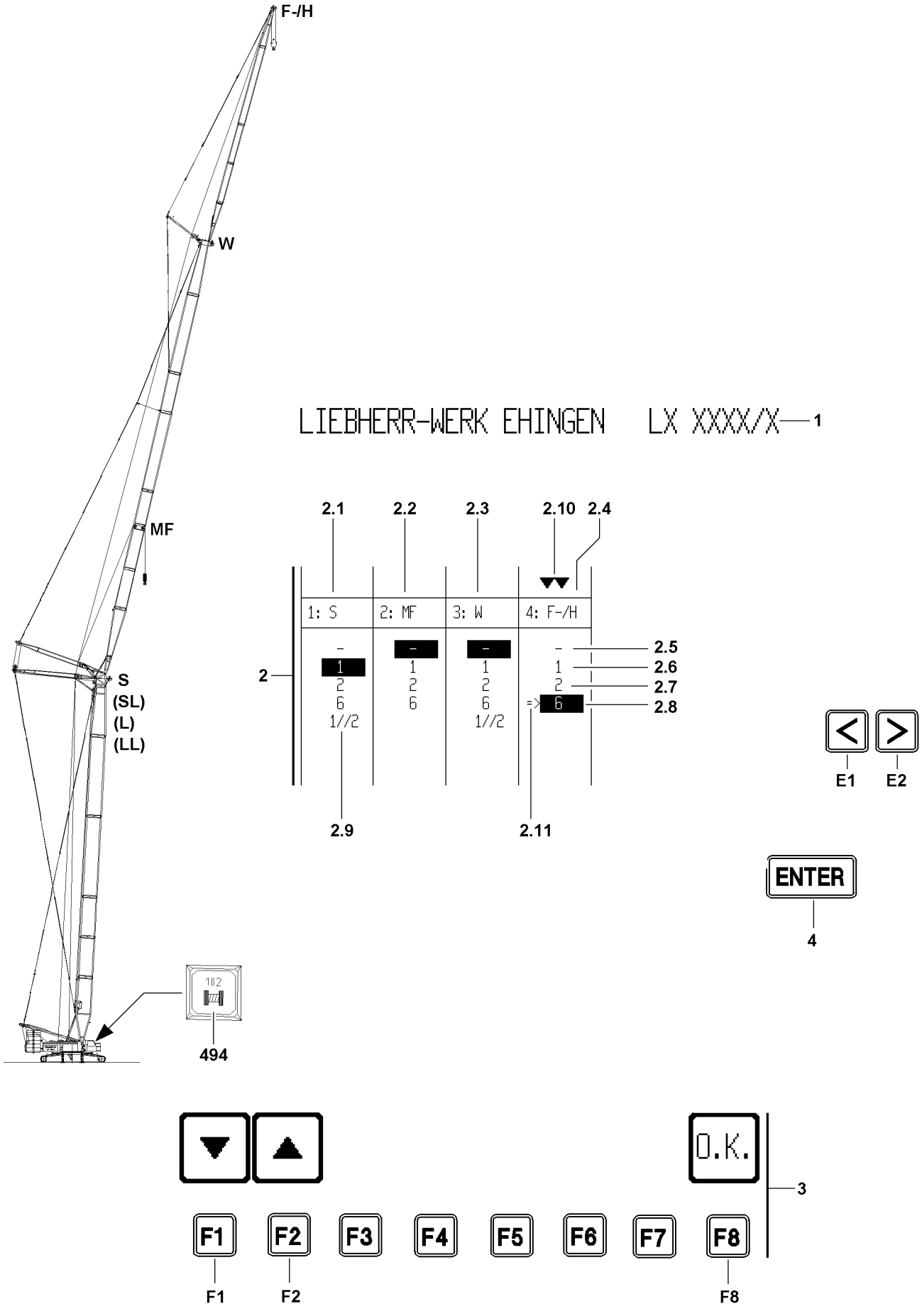
- ▶ Actuate the function key **F2**.

Result:
– The winch selector **2.11** moves “up”.

Confirm the selection

If the desired winch is assigned to a pulley head, the crane operator must confirm the setting for this pulley head with “ENTER”.
- ▶ Every assignment of a winch to a pulley head must be confirmed separately with the “ENTER” key!

Result:
– The selected winch is highlighted in black.


F-/H
W
MF
S
(SL)
(L)
(LL)
494
LIEBHERR-WERK EHINGEN LX XXXX/X
1
2.1
2.2
2.3
2.10
2.4
1: S
2: MF
3: W
4: F-/H
2
2.5
2.6
2.7
2.8
2.9
2.11
E1
E2
ENTER
4
O.K.
3
F1
F2
F3
F4
F5
F6
F7
F8
F1
F2
F8

B108721

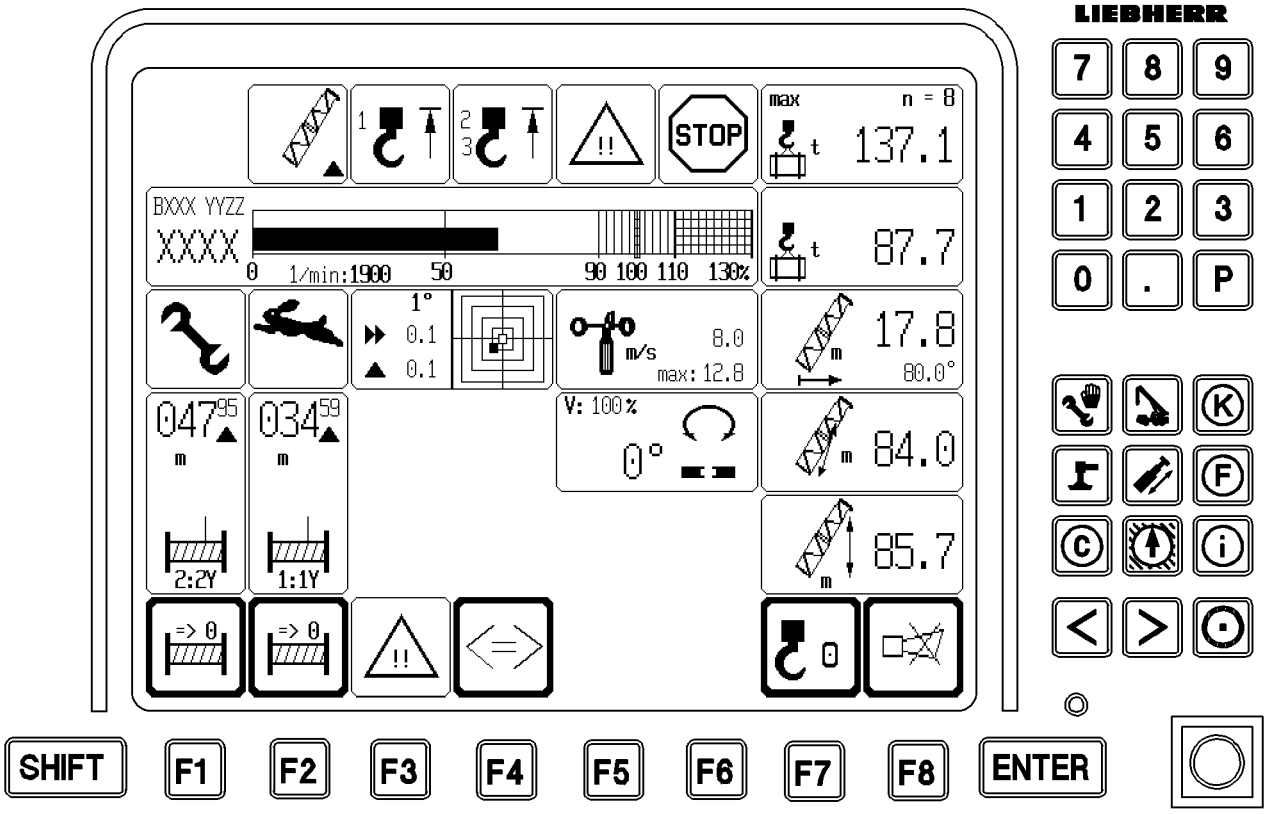
5.4.3 Taking over the settings into the crane operating screen

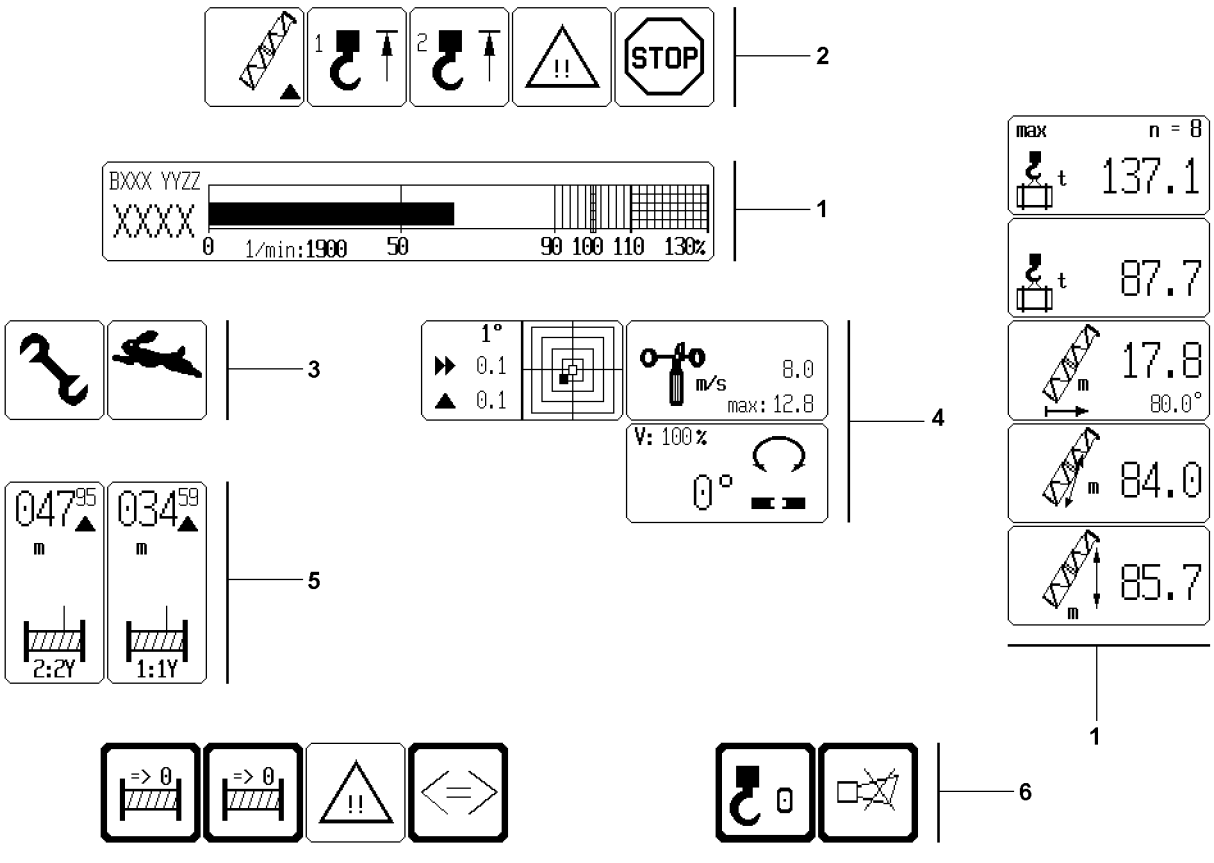
If the “winch - pulley head assignment” is completed for all required pulley heads, the data is taken over into the crane operating view and the control by pressing the function key **F8** “OK”.

▶ Press the function key **F8** “OK”.

Result:

– The settings are completely taken over into the control.
– The crane operating screen appears on the LICCON monitor.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
max n = 8
137.1
87.7
17.8
80.0°
84.0
85.7
BXXX YYZZ
XXXX
0 1/min:1900 50 90 100 110 130%
8.0
max: 12.8
V: 100%
0°
047 95
034 59
2:2Y
1:1Y
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


STOP
2
BXXX YYZZ
XXXX
0 1/min:1900 50 90 100 110 130%
1
max n = 8
137.1
87.7
17.8
80.0°
84.0
85.7
1
3
1°
0.1
0.1
8.0
max: 12.8
V: 100%
0°
4
047 95
034 59
2:2Y
1:1Y
5
6

B105246

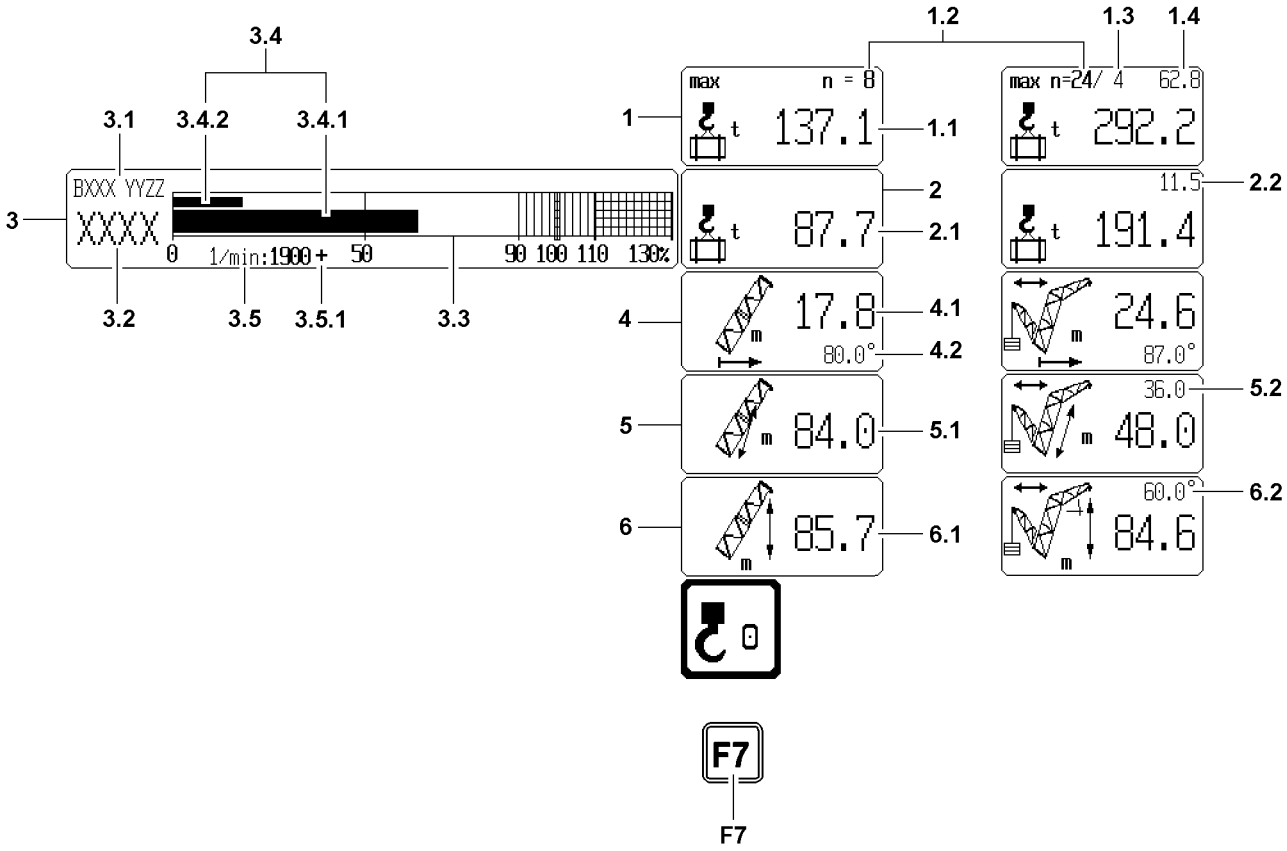
6 The “Crane operation” program on monitor 0

The LICCON program “Crane operation” assists the crane operator by displaying the data needed for operating the crane clearly on **Monitor 0**. An acoustical signal accompanies all critical displays. Depending on the equipment, a range of other icons may also be turned on as additional displays, either as required by the crane operator, or automatically in the event of a problem.
It also alerts the crane operator to imminent overload conditions. In the event of overload and many error conditions, which could be hazardous during crane operation, the system shuts off.
The LICCON monitor is divided into six areas in the “Crane operation” program:

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

Note

▶ The monitor illustrations in this chapter are only examples. The numerical values in the individual icons and charts do not have to necessarily match the crane exactly. The configuration of the LICCON monitor with icons is only descriptive.
▶ In actual crane operations, an identical icon display will **not** appear!


3.4
3.1
3.4.2
3.4.1
3
BXXX YYZZ
XXXX
0
1/min:1900+
50
90 100 110 130%
3.2
3.5
3.5.1
3.3
1.2
1.3
1.4
1
max
n = 8
137.1
1.1
max n=24/ 4
62.8
292.2
2
87.7
2.1
11.5
2.2
191.4
4
17.8
4.1
80.0°
4.2
24.6
87.0°
5
84.0
5.1
36.0
5.2
48.0
6
85.7
6.1
60.0°
6.2
84.6
F7
F7

B105201

6.1 Crane geometry and load information

6.1.1 Maximum load

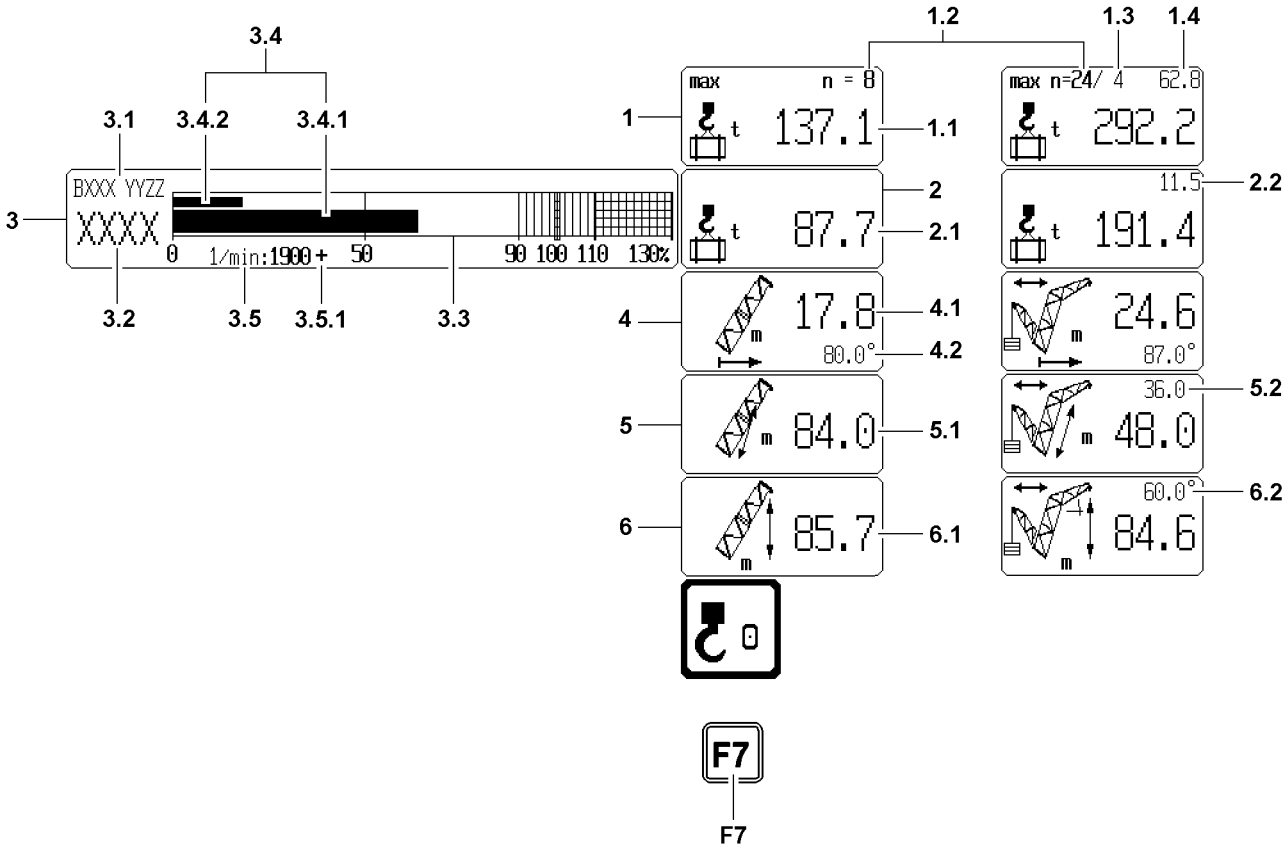
1 “Maximum load” icon
- In [t] or [lbs]

1.1 Maximum load according to load chart and reeving on boom
- In [t] or [lbs]
- It depends on:
  - the selected operating mode
  - the selected configuration (load chart)
  - the boom radius
  - the main boom angle or the jib relative angle*
  - the derrick ballast radius*
  - the currently pulled derrick ballast weight
  - the reeving of the hoist rope on the boom
  - **Note:**
    The “maximum load according to the load chart and the reeving on the boom” is the maximum load, which the crane can lift in its current operating condition.
  - **Note:**
    “? ? ? . ?” is shown if a value in the load chart cannot be accessed, for example because the crane is not within the load chart range, or one or more sensors are missing or so defective, so that the radius or the current operating condition cannot be calculated.
  - **Note:**
    In assembly operating mode SA, the maximum load capacity is shown in [t] or [lbs], according to the corresponding load chart.

1.2 Reeving number of the hoist rope on the boom
- n = reeving number of hoist rope that is reeved at the pulley head on the boom, which has been selected via the load chart (previously selected in the “Configuration” program)
- **Note:**
  - In the assembly operating mode SA, the reeving number is always 0.

1.3 Reeving number of hoist rope on boom nose*
- Reeving number of hoist rope, which has been set on the installed boom nose* (as been previously set in the “Configuration” program)

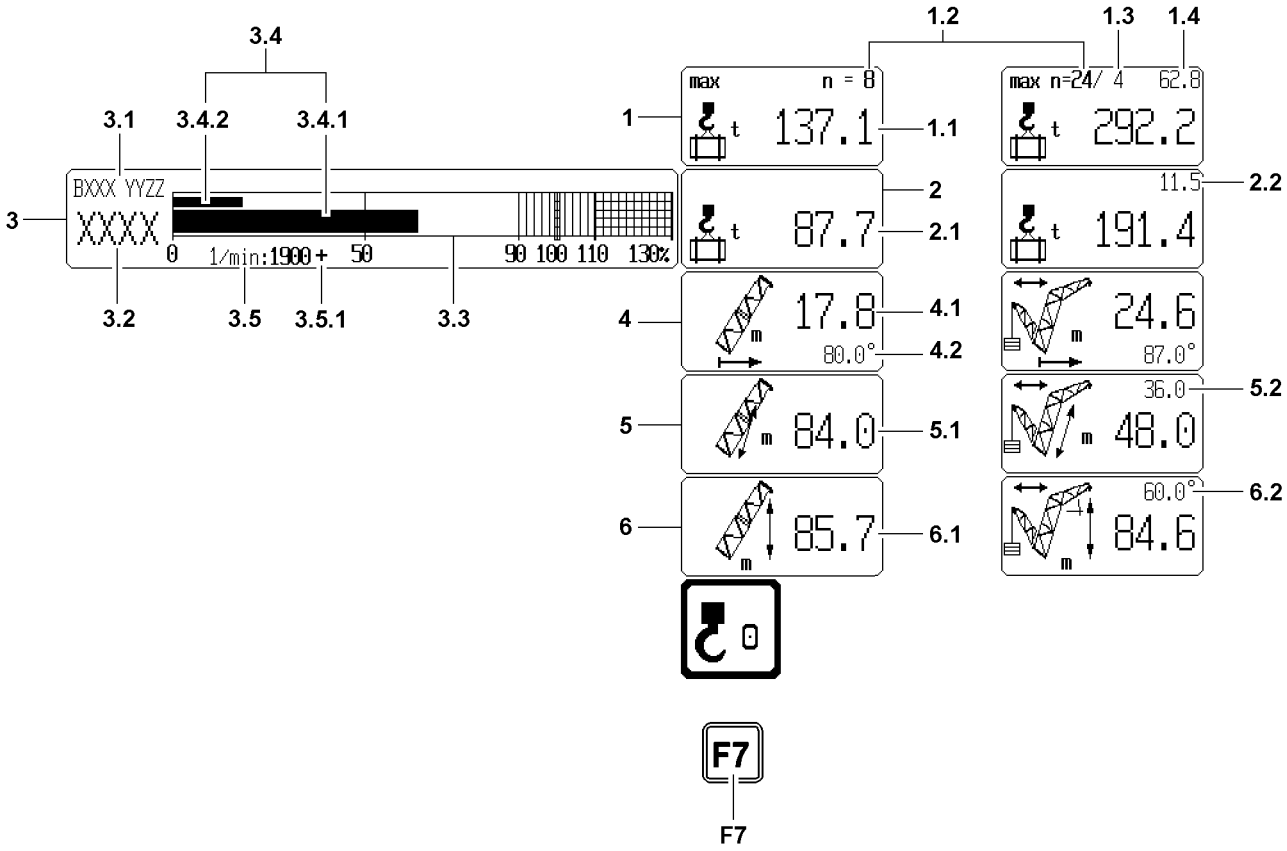
1.4 Maximum load carrying capacity of the installed boom nose*
- In [t] or [lbs]
- **Note:**
  The “maximum load carrying capacity” of the boom nose* depends only on the set reeving of the boom nose*.
- **Note:**
  The maximum load carrying capacities on the boom (1.1) and on the boom nose* (1.4) are monitored simultaneously. If the load carrying capacity is exceeded on the boom or on the installed boom nose*, then an LMB-Stop is triggered.


3.4
3.1
3.4.2
3.4.1
3
BXXX YYZZ
XXXX
0
1/min:1900+
50
90 100 110 130%
3.2
3.5
3.5.1
3.3
1.2
1.3
1.4
1
max
n = 8
137.1
1.1
max n=24/ 4
62.8
292.2
2
87.7
2.1
11.5
2.2
191.4
4
17.8
4.1
80.0°
4.2
24.6
87.0°
5
84.0
5.1
36.0
5.2
48.0
6
85.7
6.1
60.0°
6.2
84.6
F7
F7

B105201

6.1.2 Current load

2 “Current load” icon	• In [t] or [lbs]
2.1 Current load on the boom	• Actual load display = Load in [t] or [lbs] that is currently suspended on the selected boom. • Display of the calculated total load including the weights of the carrying equipment, the lifting equipment (hook block) and / or the tackle, but **without** the nominal weight of the hoist rope. By using the function “Tare” (see description of function key **F7** in section “function key icon line”) the display can be changed over to display the net load. In addition, the word “net” appears in the icon, the unit of weight is then shown directly next to the load icon. • **Note:** “? ? ? . ?” is displayed if one or more sensors are missing or so defective that the current load cannot be calculated. • **Note:** For assembly operating mode SA, the current load on the SA bracket is determined via pressure sensors on the assembly cylinder.
2.2 Current load on the boom nose*	• Actual load display = Load in [t] or [lbs] that is currently suspended on the boom nose*. • Display of the calculated total load on the boom nose*, including the weights of the carrying equipment, the lifting equipment (hook block) and / or the tackle, **including** the hoist rope. By using the function “Tare” (see description of function key **F7** in section “function key icon line”) the display can be changed over to display the net load. In addition, the word “net” appears in the icon, the unit of weight is then shown directly next to the load icon. • **Note:** “? ? ? . ?” is displayed if one or more sensors are missing or so defective that the current load cannot be calculated.


3.4
3.1
3.4.2
3.4.1
3
BXXX YYZZ
XXXX
0
1/min:1900+
50
90 100 110 130%
3.2
3.5
3.5.1
3.3
1.2
1.3
1.4
1
max
n = 8
137.1
1.1
max n=24/ 4
62.8
292.2
2
87.7
2.1
11.5
2.2
191.4
4
17.8
4.1
80.0°
4.2
24.6
87.0°
5
84.0
5.1
36.0
5.2
48.0
6
85.7
6.1
60.0°
6.2
84.6
F7
F7

B105201

6.1.3 Dynamic load utilization bar display

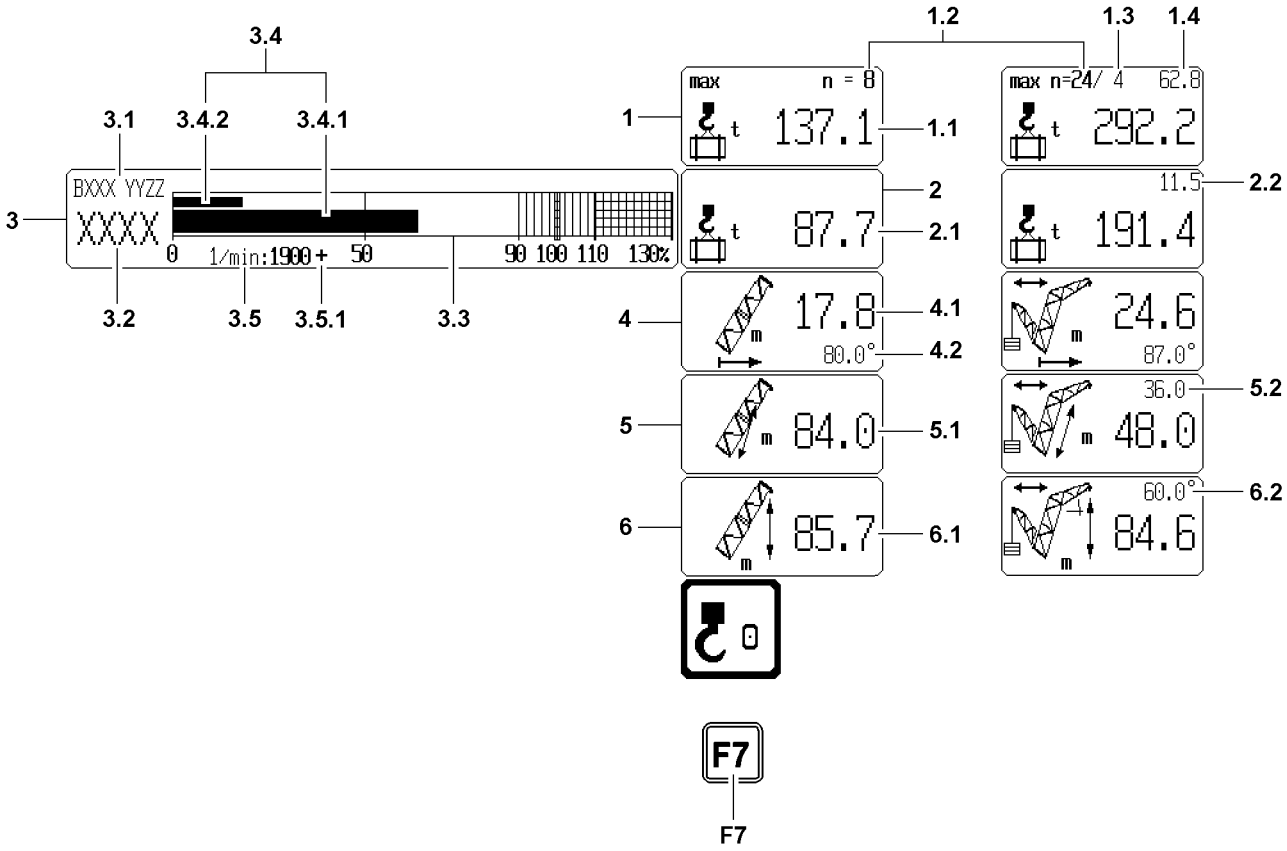
3	"Dynamic utilization bar display" icon	• In [%]
3.1	8-digit organization number	• Identifies the type of load chart that has been selected and the operating mode
3.2	Short code	• Identifies the selected equipment configuration
3.3	Utilization scale	• Marking from 90% utilization: **Advance warning** • Marking at 100% utilization: **STOP shut-off**
3.4	Utilization bar	
3.4.1	Utilization bar of crane	• According to load chart and reeving • **Note:** The utilization bar is the measurement for the current utilization of the crane.

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

3.4.2	Utilization bar boom nose*	• **Note:** The maximum load carrying capacity of the boom nose* is the load, which the boom nose* can lift by itself at sufficiently high maximum load carrying capacity on the boom head.

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

3.5	Engine RPM	• In [rpm] • **Note:** "????" is displayed in case of an error in RPM value (for approximately 5 seconds). Then the system switches to the nominal engine RPM for the power regulation of the drives and this nominal RPM is shown. 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.


3.4
3.1
3.4.2
3.4.1
3
BXXX YYZZ
XXXX
0
1/min:1900+
50
90 100 110 130%
3.2
3.5
3.5.1
3.3
1.2
1.3
1.4
1
max
n = 8
137.1
1.1
max n=24/ 4
62.8
292.2
2
87.7
2.1
11.5
2.2
191.4
4
17.8
4.1
80.0°
4.2
24.6
87.0°
5
84.0
5.1
36.0
5.2
48.0
6
85.7
6.1
60.0°
6.2
84.6
F7
F7

B105201

6.1.4 Radius

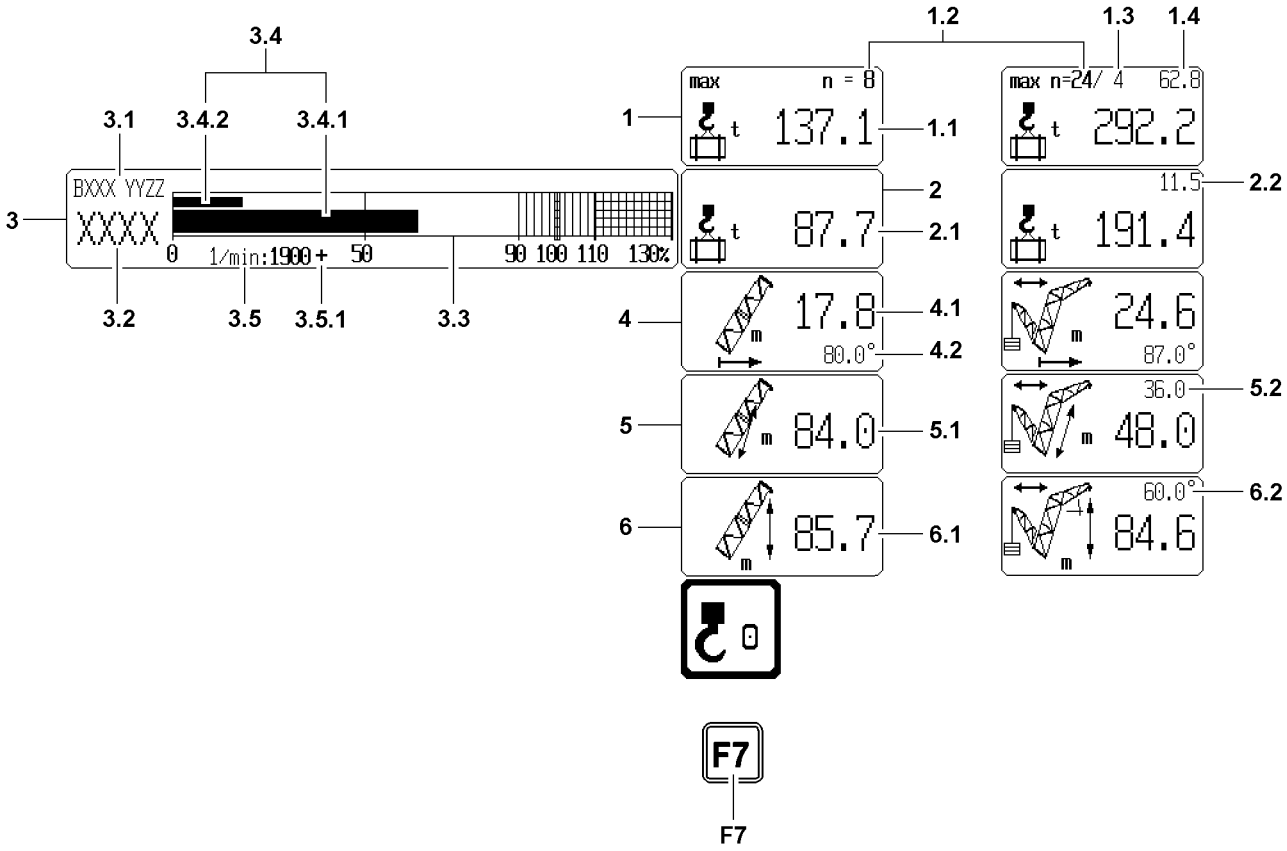
4 “Boom radius” icon

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 [°]
- Displayed is the medium value of the angle sensor in the main boom pivot section and the angle sensor in the main boom pulley head.
  If one of these angle sensor values is invalid, then the value of the other angle sensor is shown.
- **Note:**
  “? ? ? . ?” is shown if both angle sensor values are invalid or if the difference between the two angle sensors is unbelievably high.
- **Note:**
  In the assembly operating mode SA, the SA bracket angle is shown as the main boom angle to the horizontal in degrees [°].


3.4
3.1
3.4.2
3.4.1
3
BXXX YYZZ
XXXX
0
1/min:1900+
50
90 100 110 130%
3.2
3.5
3.5.1
3.3
1.2
1.3
1.4
1
max
n = 8
137.1
1.1
max n=24/ 4
62.8
292.2
2
87.7
2.1
11.5
2.2
191.4
4
17.8
4.1
80.0°
4.2
24.6
87.0°
5
84.0
5.1
36.0
5.2
48.0
6
85.7
6.1
60.0°
6.2
84.6
F7
F7

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6.1.5 Main boom length

5 “Main boom length” icon

5.1 Length of main boom
- In [m] or [ft]
- **Note:**
  In the assembly operating mode SA, the SA bracket length (up to the pivot point of the assembly cylinder) is shown in [m] or [ft], as main boom length.

5.2 Length of accessories
- In [m] or [ft]

6.1.6 Pulley head height

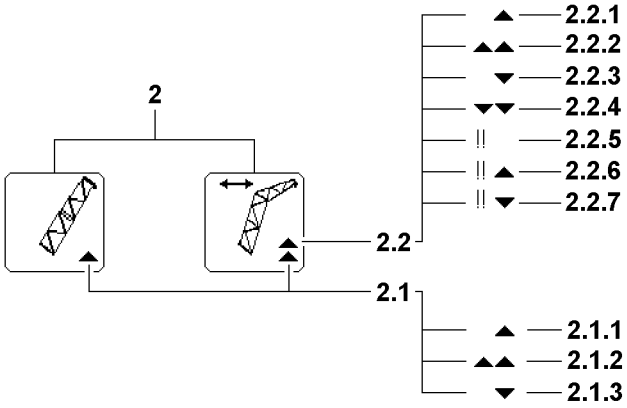
6 “Pulley head height” icon

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

6.2 Angle of lattice jib to the horizontal*
- In [°]
- **Note:**
  Display of the absolute angle always in operating modes with load chart for a fixed defined main boom angle (such as W).
- Displayed is the medium value of the angle sensor in the lattice jib pivot section and the angle sensor in the lattice jib end section.
  If one of these angle sensor values is invalid, then the value of the other angle sensor is shown.
- **Note:**
  “? ? ? . ?” is shown if both angle sensor values are invalid or if the difference between the two angle sensors is unbelievably high.

or

6.2 Relative angle between main boom (α) and jib angle (β)*
- (= α- β) in [°]
- **Note:**
  Display of the relative angle always in operating modes with load chart for a fixed defined jib relative angle (such as WV).
- **Note:**
  “? ? ? . ?” is shown if the relative angle cannot be calculated.



B105202

6.2 Alarm functions

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

6.2.1 Boom limitation

2 “Boom limitation” icon

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

2.1 Limit signs main boom

2.1.1 Arrow pointing up

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

- Triggering the upper load chart limit

  or

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

  RISK OF ACCIDENT!

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

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

  Note:

  Luffing down the main boom is still possible.

2.1.2 Two arrows pointing up

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

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

  or

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

  Note:

  Luffing down the main boom is still possible.

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

2.1.3 Arrow pointing down

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

- Triggering the lower load chart limit

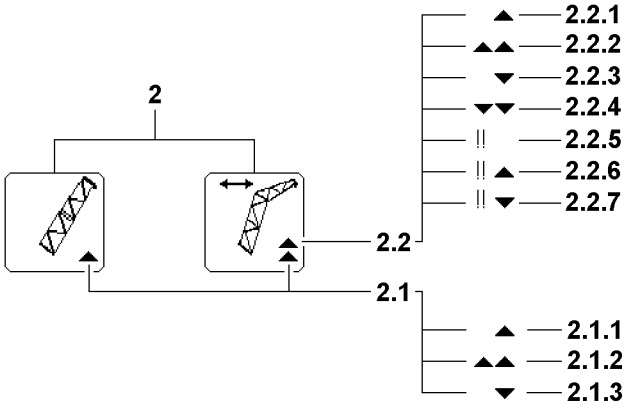
  RISK OF ACCIDENT!

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

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

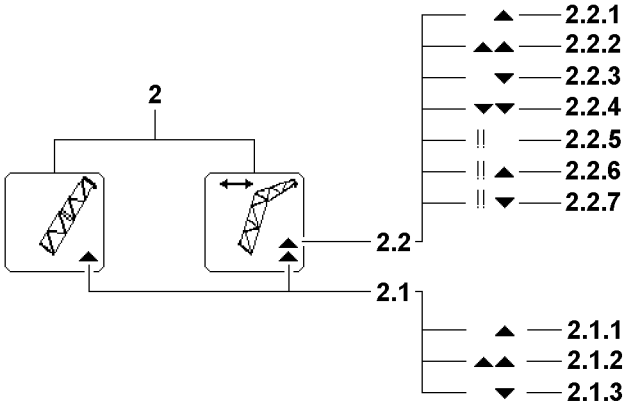
  Note:

  Luffing up the main boom is still possible.



B105202

2.2	**Limit sign equipment**	• Luffing jib, fixed jib
2.2.1	Arrow pointing up	The arrow shows that the shut off of the crane movement “Luffing up the equipment” was triggered by: • Triggering the upper load chart limit **RISK OF ACCIDENT!** **The shut off of the crane movement “Luffing up the equipment” is bypassed with actuated bypass key button. The crane operator is obligated to carry out all crane movements with foresight and extreme caution!** **Note:** Luffing down the equipment is still possible.
2.2.2	Two arrows pointing up	The arrows show that the shut off of the crane movement “luffing up the equipment” was triggered by: • Triggering a block limit switch of the luffing jib relapse cylinder **or** the retaining flap **or** an error in one of these limit switches **Note:** Luffing down the equipment is still possible. Luffing up the equipment is shut off and **cannot be bypassed**.
2.2.3	Arrow pointing down	The arrow shows that the shut off of the crane movement “Luffing down the equipment” was triggered by: • Triggering the lower load chart limit **RISK OF ACCIDENT!** **The shut off of the crane movement “Luffing down the equipment” is bypassed with actuated bypass key button. The crane operator is obligated to carry out all crane movements with foresight and extreme caution!** **Note:** Luffing up the equipment is still possible.
2.2.4	Two arrows pointing down	The arrows show that the shut off of the crane movement “luffing down the equipment” was triggered by: • Triggering a block limit switch of the monitoring of the “equipment on lower left / right” **or** an error in one of these limit switches **Note:** Luffing up the equipment is still possible. Luffing down the equipment is shut off and **cannot be bypassed**.



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2.2.5 Two exclamation marks

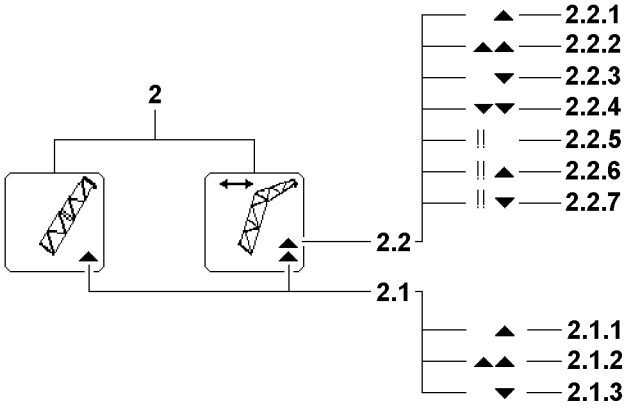
The exclamation marks show that one or both of the double limit switches (right and left) or angle sensor (top and bottom) of the equipment* are not reported on the bus or are defective.

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

2.2.6 Two exclamation marks and one arrow pointed upward

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

- Triggering the upper load chart limit
  or
  Triggering a block limit switch of the luffing jib relapse cylinder
  or
  the retaining flap
  In addition, one or both of the limit switches or angle sensors of the equipment do **not** report on the LSB or they are defective.
  RISK OF ACCIDENT:
  If the shut off has not been created by several block limit switches, then the crane movement “luffing up the equipment” is bypassed with actuated bypass key switch. The crane operator is obligated to carry out all crane movements with foresight and extreme caution!
  Note:
  If only one of the double limit switches or angle sensor is not ok, then the crane can continue to be operated with “normal function”. However, it must be operated with increased caution, since only one of the double limit switches is functioning. For that reason, the error must be remedied immediately. Along with the exclamation mark, a system error message is issued, which shows the defective limit switch or angle sensor.
  Note:
  Luffing down the equipment is still possible.



B105202

2.2.7 Two exclamation marks and one arrow pointed downward

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

- Triggering the lower load chart limit

  or

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

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

  RISK OF ACCIDENT:

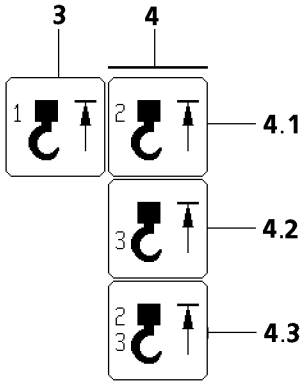
  If the shut off has not been created by several block limit switches, then the crane movement “luffing down the equipment” is bypassed with actuated bypass key switch. The crane operator is obligated to carry out all crane movements with foresight and extreme caution!

  Note:

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

  Note:

  Luffing up the equipment is still possible.



B199911

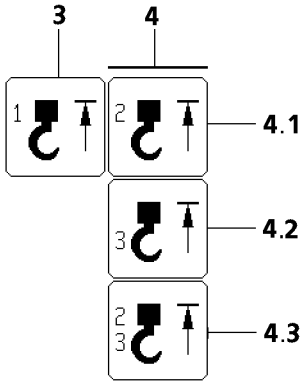
6.2.2 Hoist top limit switch HES1

3 “Hoist top on HES1” icon

- In order to prevent the crane from being operated without hoist limit switches (HES), the minimum hoist limit switch configuration is continuously monitored. If a hoist limit switch required for a particular operating mode is not plugged in, therefore not active on the LSB bus system, an LMB STOP is triggered and an operating error report is also issued.
- **Note:**
  In all operating modes with installed main boom, the HES1A + HES1B **must** also be plugged in and turn off the same functions as the remaining hoist limit switches.

3 HES1(1A/1B)

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



B199911

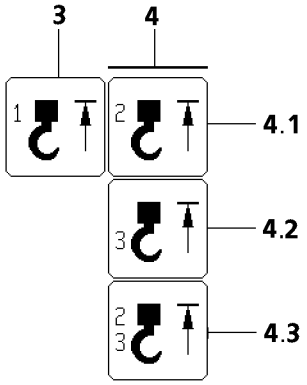
6.2.3 Hoist top limit switch HES2 and HES3

4 “Hoist top on HES2 / HES3” icon

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

4.1 “Hoist top on HES2 (2A/ 2B) ” * icon

- Installation location HES2A: Accessories, boom head left* Bus address: 27
- Installation location HES2B: Accessories, boom head right* Bus address: 28
- The **“HES2”** icon appears if:
  - the hook block moves against the HES2A on the accessories,
  - HES2A is not active, although it must be present on the bus,
  - HES2A has an internal error,
  - the hook block moves against the HES2B on the accessories,
  - HES2B is not active, although it must be present on the bus,
  - HES2B has an internal error.
  - **Note:**
    The crane movements spool up hoist winches, luff down the main boom, luffing jib* as well as the derrick are shut off. The HES2 (2A / 2B) must be plugged in in the “accessories” operating mode. If this is not the case, an “LMB STOP” is triggered and an operating error message is also transmitted.



B199911

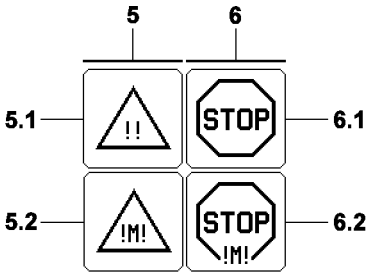
4.2 “Hoist top on HES3” icon

Installation location(s):

- Main boom boom nose 1, bus address: 24*
- Main boom boom nose 2, bus address: 25*
- Main boom boom nose 3, bus address: 26*
- Auxiliary equipment boom nose 1, bus address: 24*
- Auxiliary equipment boom nose 2, bus address: 25*
- Auxiliary equipment boom nose 3, bus address: 26*
- The **“HES3”** icon appears if:
  - The hook block runs against the HES3 at the boom nose,
  - HES3 is not active, although it must be present on the bus,
  - HES3 has an internal error.
- **Note:**
  The crane movements spool up hoist winch, luff down the main and the derrick boom as well as the luffing jib are shut off.
  The HES3 must be plugged in operation mode “Boom nose”. If this is not the case, an “LMB STOP” is triggered and an operating error message is also transmitted.

4.3 HES2 and HES3

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



B199912

6.2.4 Advanced warning load / motor

5 “Advance warning” icon

5.1 Load charts advance warning

- The current load chart utilization is calculated from the “current load” and the “maximum load according to the load chart and the reeving”.
- The “Advance warning” icon appears if:
  - the current load chart utilization of the crane, according to the “load chart and reeving” exceeds the programmed limit (**90%**) for the advance warning
    or
  - the current utilization of the boom nose* exceeds the programmed limit (**90%**) for the advance warning.

5.2 Engine monitoring

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

6.2.5 STOP load / motor

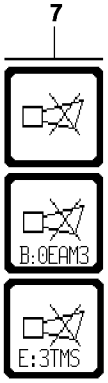
6 The “STOP” icon

6.1 Load carrying capacity exceeded

- The “STOP” icon appears if:
- the current load carrying capacity on the boom head (“current load” **is larger than** “maximum load according to the load chart and the reeving”) exceeds the **100% mark**
  or
- the current load on the boom nose exceeds the **100% mark**
  or
- if an error occurs, which triggers **LMB-STOP**.
- **Note:**
  All crane movements that increase the load momentum are shut off.

6.2 Engine monitoring

- If a STOP event occurs in the engine monitoring system, the system automatically switches over (from the “Crane operation” program) to the “Engine monitoring” program.



B199913

6.2.6 Horn

7 “Horn” icon

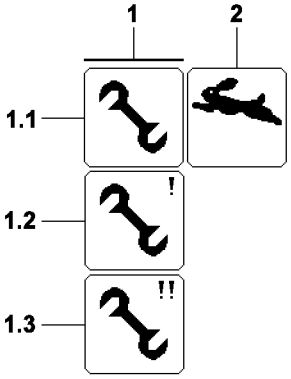
- Acoustical signal
- Sounds in addition to the optical display for operating errors on monitor 0, which lead to the shut off of a movement (for example: LMB-STOP) and application errors with error number (for example sensor errors, which occur due to insufficient sensor signals or a defective sensor, for example: E:3TMS) “Horn” is a beeping sound of a duration of approximately 0.5 seconds, which is repeated in one second rhythm.
- **Operational errors are:**
  - Overload
  - Boom outside the angle range of the load chart
  - Boom outside radius range of the load chart
- **The following sensors are monitored:**
  - Hoist limit switch
  - Length sensors
  - Angle sensors
  - Pressure sensors
  - Pull test brackets (force measuring boxes)
  - Wind sensor
  - Battery voltage
  - Inductive sensors

“Short horn”

- Sounds in addition to the visual display of error messages without an error number and which do not lead directly to crane movement shut off by the LICCON overload protection. “Short horn” is a beeping sound that lasts for approximately 0.1 seconds and is repeated in one second rhythm.
- **The following errors are monitored:**
  - Maximum permissible wind speed exceeded (only with activated wind sensors)
  - Crane utilization value for “Advance warning” (90%) reached

Priority and “Horn off”

- The “Horn” alarm has higher priority than the “Short horn” alarm, i.e. “Horn” takes preference over “Short horn”.
- The “Horn”, as well as the “Short horn” of the monitor may be turned off by function key **F8**.
- Pressing the function key **F8** again automatically changes the error determination screen of the testing system. The error is displayed there in documentary form.
- **Note:**
  The “Horn”, as well as the “Short horn” immediately become active again if an error recurs.



B199914

6.3 Special functions

6.3.1 Assembly operation

1 “Assembly operation” icon

1.1 Assembly
- The icon blinks if, the crane control has been switched to the “assembly” position with the bypass key button. The “Crane operation” program is then locked, which means that no other program can be turned on via the program keys.

1.2 Emergency operation without assembly
- The icon blinks during emergency operation, if “assembly” has **not** been enabled with the bypass key button.

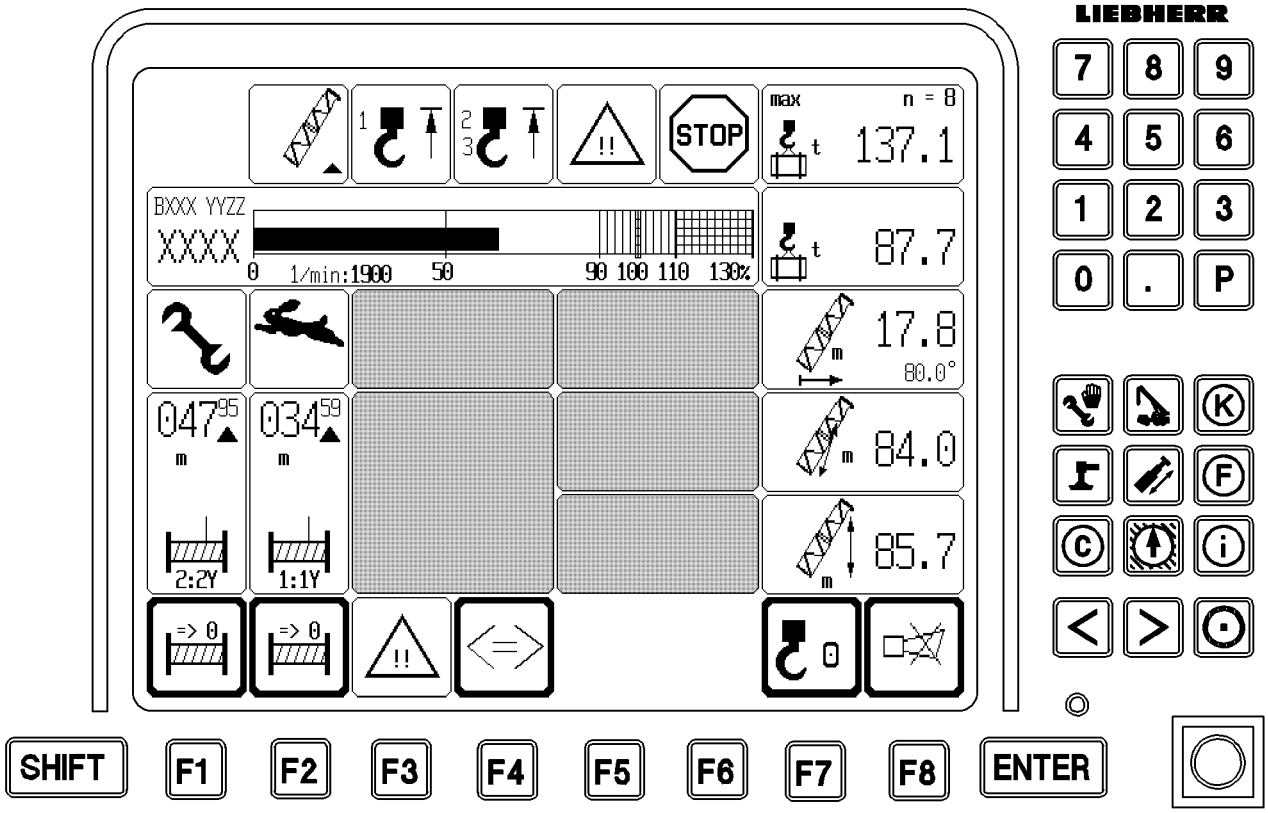
Note:
The program “Crane operation” is **not** locked in this case.

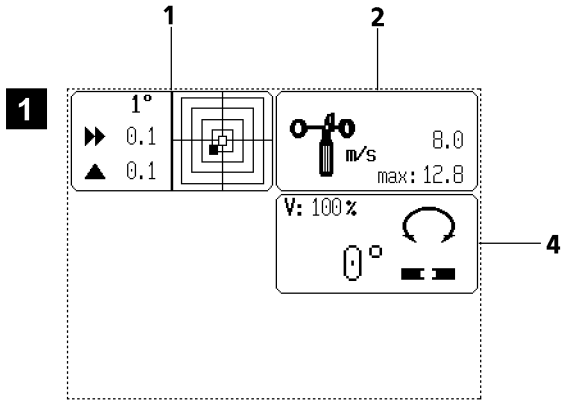
1.3 Emergency operation and assembly
- The icon blinks during emergency operation, if “assembly” has been enabled using the bypass key button.

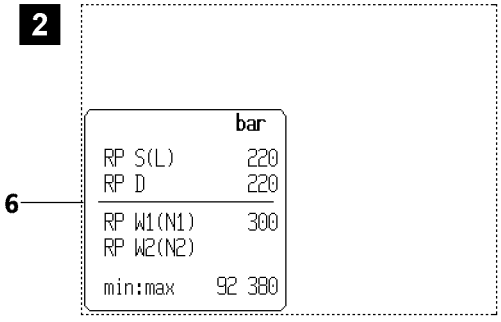
Note:
Operating mode “without engine bypass” is active.

6.3.2 Fast mode (Rapid gear)

2 “Rapid gear” icon
- The icon appears if rapid gear (“Power Plus”) is enabled during a crane movement.
- The speed increase can be added for various crane movements on the master switches MS1, MS2, or MS3.
- **Note:**
  If a crane movement has reached its maximum speed due to the current utilization, then no speed increase is possible by adding the rapid gear.
  If the total power requirement of all actuated crane movements is larger than the available power, then those crane movements are reduced which require the most power.
  If another crane movement is added or taken back to one or more actuated crane movements then this has an influence on the other movements. For that reason, we recommend in situations in which an interference of the individual crane movements is troublesome, not to add the rapid gear or to turn the rapid gear off.


LIEBHERR
STOP
max
n = 8
137.1
87.7
17.8
80.0°
84.0
85.7
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


1
2
1
1°
0.1
0.1
8.0
max: 12.8
V: 100%
0°
4


2
bar
RP S(L) 220
RP D 220
RP W1(N1) 300
RP W2(N2)
min:max 92 380
6

B105203

6.4 Monitored auxiliary functions for crane operation

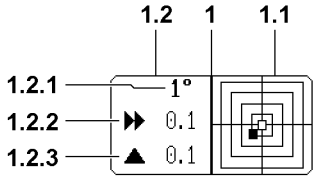
There are several monitored auxiliary functions, which can be displayed when needed or automatically.
The monitoring of all auxiliary functions is always active, only the icons may be hidden. The icons of the monitored auxiliary functions have their fixed place on the LICCON monitor.
Using the function key **F3**, you can show the icons for the monitored auxiliary functions. Since not all icons of the auxiliary functions fit on one page (at maximum assignment), they are split over two pages. The icons on page 2 (if available) can be shown with the function key **F4**.
Page 1 (illustration **1**):
Crane incline **1**
Wind speed **2**
Slewing range **4**

Page 2 (illustration **2**):
Relapse cylinder monitoring **6**

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

- Monitored auxiliary functions turned off **F3**:
- Only error in one function on page 1:
  Icon is displayed on page 1.
- Only error in one function on page 2:
  Icon is displayed on page 2.
- Error in a function on page 1 and 2:
  Icon is displayed on page 1 and icon for **F4** blinks (= indicates an error in a function on page 2).

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



B105204

6.4.1 Crane incline

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

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

1.2 Numeric part

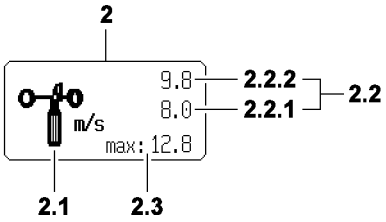
1.2.1 Incline range
- Value either 1° or 5°

This value describes the distribution of the graphic illustration and can only assume the two values “1°” or “5°”. If the incline is less than 1° in lateral direction **and** in longitudinal direction, the level moves within the 1° range. If at least one value exceeds the 1° limit, it switches to the 5° range.

Note:
The range change is automatic.

1.2.2 Incline of crane superstructure in crosswise (lateral) direction
- In [°]
- The double arrow shows the direction of incline:
  - Double arrow to left = crane superstructure slopes to the left
  - Double arrow to right = crane superstructure slopes to the right

1.2.3 Incline of crane superstructure in lengthwise (longitudinal) direction
- In [°]
- The arrow shows the direction of incline:
  - Up arrow = crane superstructure slopes to the front
  - Down arrow = crane superstructure slopes to the rear

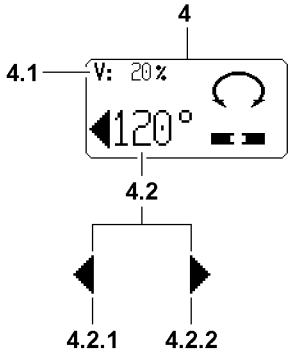


B105205

6.4.2 Wind speed

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/sec.] or [ft/sec.]
2.2	Current wind speeds	• **Note:** If no wind sensor is connected to the LSB bus or the wind speed sensor is defective, **“????”** appears in the display.
2.2.1	Current wind speed main boom or boom nose main boom	• **Note:** If a wind sensor is installed on a main boom and the main boom boom nose, then the value of the wind sensor is shown at **2.2.1**.
2.2.2	Current wind speed auxiliary equipment or boom nose auxiliary equipment	• **Note:** If a wind sensor is installed on an auxiliary equipment and the auxiliary equipment boom nose, then the value of the wind sensor is shown at **2.2.2**.
2.3	Maximum permissible wind speed	• With icon text “max:” • The value depends on the operating mode and the equipment configuration **Note:** If access to a load chart is not possible, then the maximum value starts to blink and the acoustic alarm “Short horn” sounds.

WARNING
Danger of toppling the crane!
If the maximum permissible wind speed is **exceeded** on an erected crane boom system – the maximum value starts to blink and the acoustical alarm “Short horn” sounds – then dangerous situations can arise (for example: due to swinging load), up to toppling the crane.
Personnel can be severely injured or killed!
▶ **The crane movements will not be shut off!**
▶ The danger notes in chapter 2.04 must be strictly observed and adhered to.



B199918

6.4.3 Slewing range

4 “Slewing range” icon

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

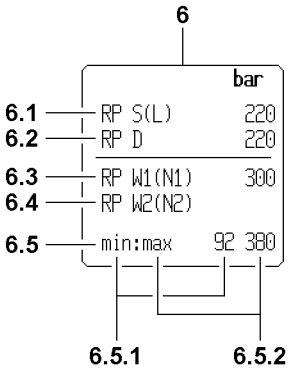
DANGER
Danger of accidents in case of excessive slewing speed!
▶ Make the preselection according to the specifications in the load chart.

4.2 Current superstructure position
- In relation to the direction “to the front” (chain tension side)
- The value increased to a value of 180°

4.2.1 Arrow for the crane superstructure position left of 0°
- The arrow in front of the value indicates the deviation direction (for example: left of 0°)

4.2.2 Arrow for the crane superstructure position right of 0°
- The arrow in front of the value indicates the deviation direction (for example: right of 0°)

Note
▶ At 0°, the crane superstructure is exactly in position “to the front”.
▶ At 180°, the crane superstructure is exactly in position “to the rear”.


6
bar
6.1
RP S(L) 220
6.2
RP D 220
6.3
RP W1(N1) 300
6.4
RP W2(N2)
6.5
min:max 92 380
6.5.1
6.5.2

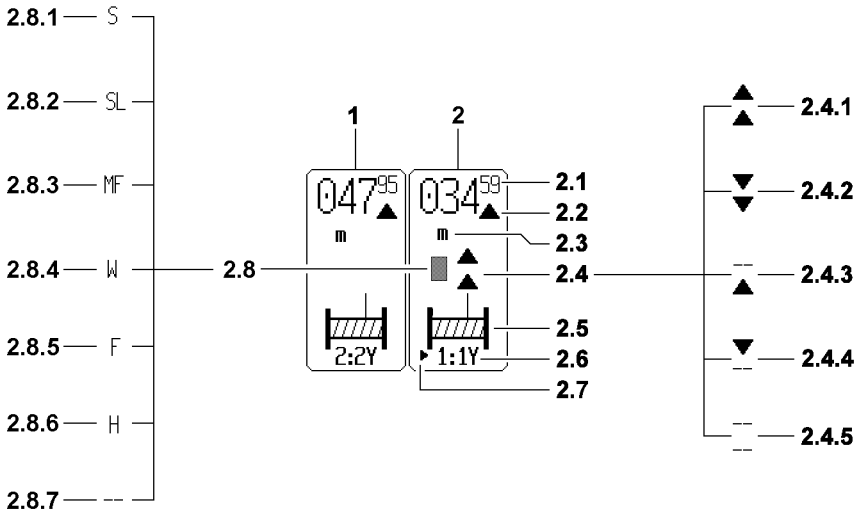
B199919

6.4.4 Relapse cylinder monitoring

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

Note

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


2.8.1 S
2.8.2 SL
2.8.3 MF
2.8.4 W
2.8.5 F
2.8.6 H
2.8.7 --
2.8
1
2
047 95
034 59
m
m
2:2Y
1:1Y
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.4.1
2.4.2
2.4.3
2.4.4
2.4.5

B109644

6.5 “Winch display” icon

6.5.1 Winch 2

1 “Winch 2” icon

- **Note:**
  The winch 1 and winch 2 icons have the same meaning, which are explained for the icon “winch 1” **2**.

6.5.2 Winch 1

2 “Winch 1” icon

- The icon “winch 1” is only shown if winch 1 is installed, plugged in and if the winch turn sensor is active on in emergency operation “ON”.

2.1 Travelled distance

- In [m] or [ft]
  from a zero point which must be determined.
- For a single operation with the reeving setting made in the “Configuration” program: completed hook path.
  For parallel operations: distance completed by hook block.
- The positions before the decimal point are displayed with up to 3 large digits. The digits after the decimal point are displayed with small digits. (also refer to the description of the function key **F1** and function key **F2**).
- A prerequisite for the correct display is that the entered value matches the actual number of rope strands between the boom head and the hook block.
- The hook path calculation only works accurately if the load is suspended freely and is not luffed during the lifting procedure. Not taken into account are flexation and rope expansion.

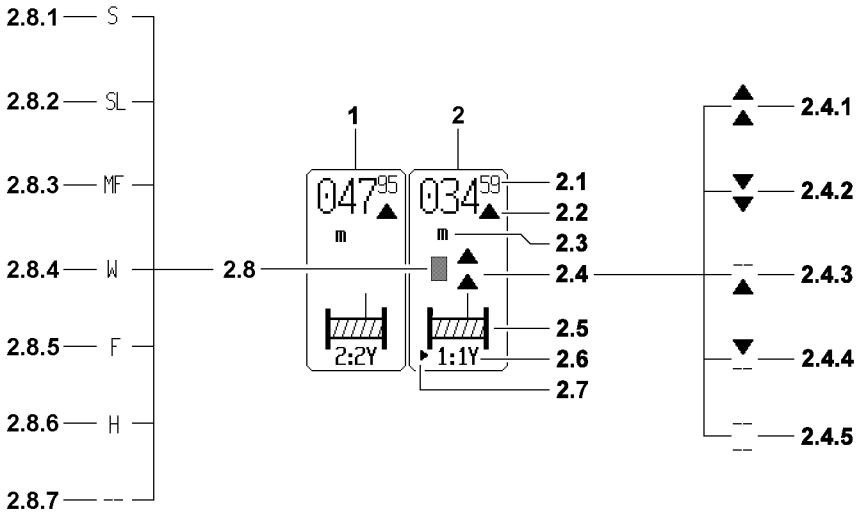
2.2 Direction of hook movement

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]


2.8.1 S
2.8.2 SL
2.8.3 MF
2.8.4 W
2.8.5 F
2.8.6 H
2.8.7 --
2.8
1
2
047 95
034 59
m
m
2:2Y
1:1Y
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.4.1
2.4.2
2.4.3
2.4.4
2.4.5

B109644

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

2.4.1 Spool out

2.4.2 Spool up

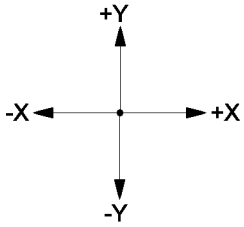
2.4.3 Spooled out
- Spooling out is blocked

2.4.4 Spooled up
- Spooling up is blocked

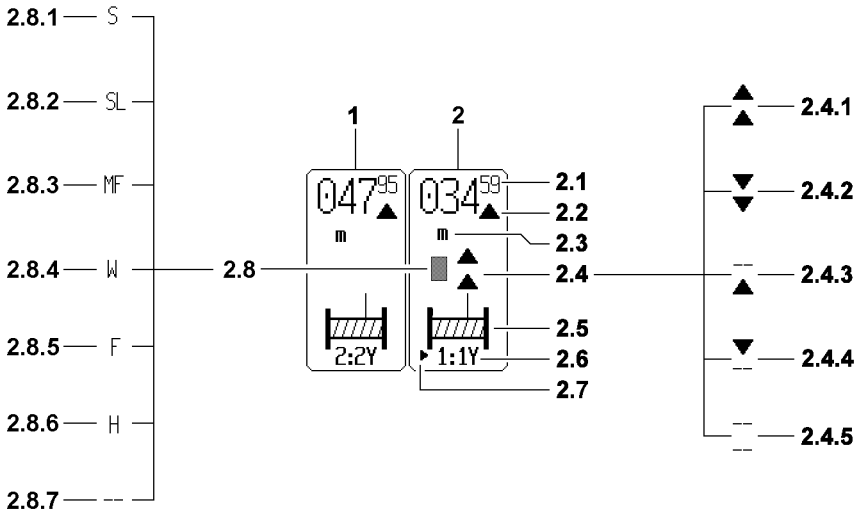
2.4.5 Winch is deactivated
- Spooling up and spooling out are blocked (see “Control parameter” program)
- **Note:**
  If no winch status icon appears, the activated winch is inactive and is neither spooled up nor spooled out.

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

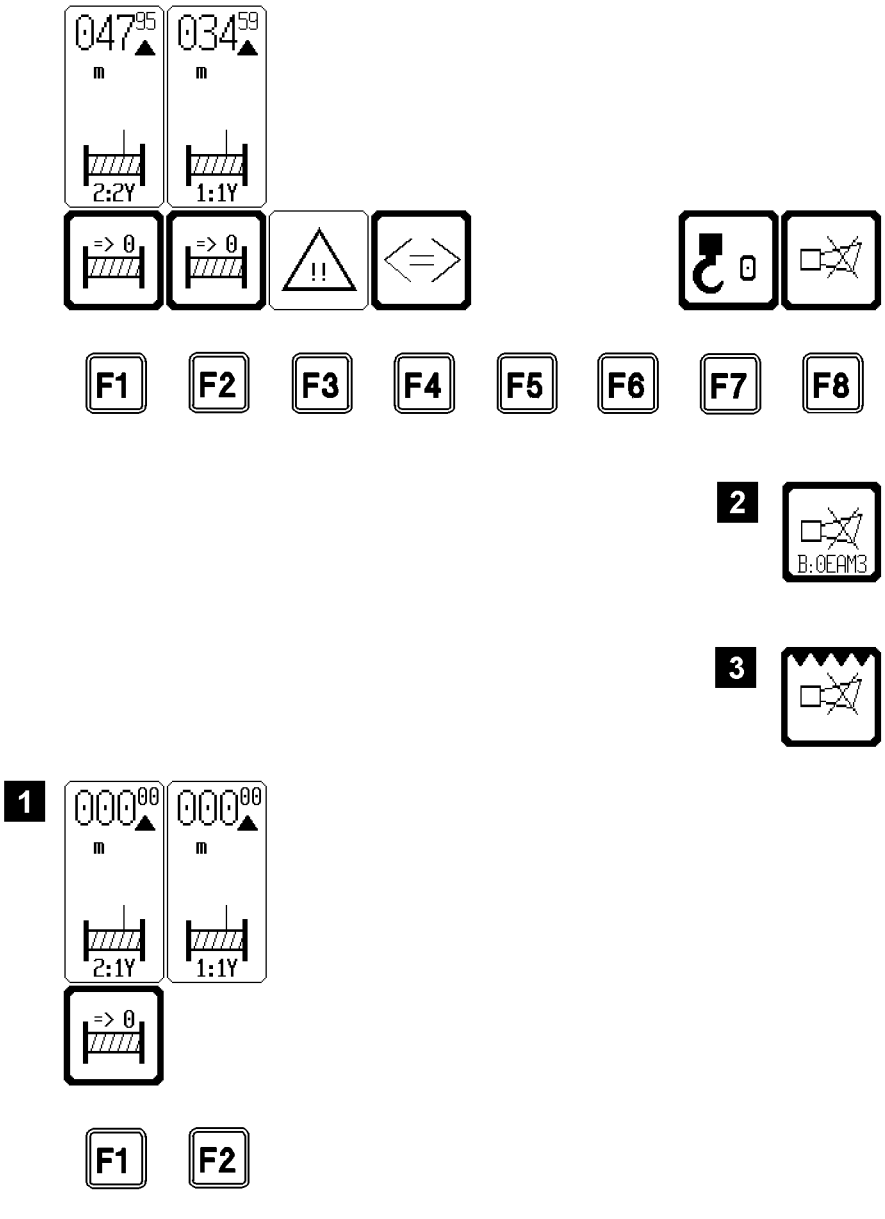


2.7 Vibration sensor
- If the vibration sensor for a winch is added on the master switch, then the arrow **2.7** appears in this winch icon for the added vibration sensor.
- **Note:**
  The vibration sensor is added at the first actuated crane function.


2.8.1 S
2.8.2 SL
2.8.3 MF
2.8.4 W
2.8.5 F
2.8.6 H
2.8.7 --
2.8
1
2
047 95
034 59
m
m
2:2Y
1:1Y
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.4.1
2.4.2
2.4.3
2.4.4
2.4.5

B109644

2.8 Reeved in boom	• To check the settings for “winch pulley head assignment” of various hoist winches, the respective boom symbol, on which the winch must be reeved according to the winch pulley head assignement is shown in the symbol element “winch display”. **Note:** The symbol reeved boom **2.8** is shown in the winch icon of winch 1, winch 2 and winch 6. See also chapter 4.02.
2.8.1 S	• Winch is reeved on the pulley head of the S-main boom
2.8.2 SL	• Winch is reeved on the pulley head of the SL-main boom
2.8.3 MF	• Winch is reeved on the pulley head of the center pulley of the luffing jib
2.8.4 W	• Winch is reeved on the pulley head of the luffing jib
2.8.5 F	• Winch is reeved on the pulley head of the F-lattice jib
2.8.6 H	• Winch is reeved on the pulley head of the boom nose
2.8.7 – –	• Winch is not reeved on **any** pulley head


047 95
m
2:2Y
034 59
m
1:1Y
=> 0
=> 0
!!
0
F1
F2
F3
F4
F5
F6
F7
F8
2
B:0EAM3
3
1
000 00
m
2:1Y
000 00
m
1:1Y
=> 0
F1
F2

B105207

6.6 The function key line in the “Crane operation” program

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

The function key icons may trigger a function or they change their appearance upon the push of a key (function keys) and thereby their definition.

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

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

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

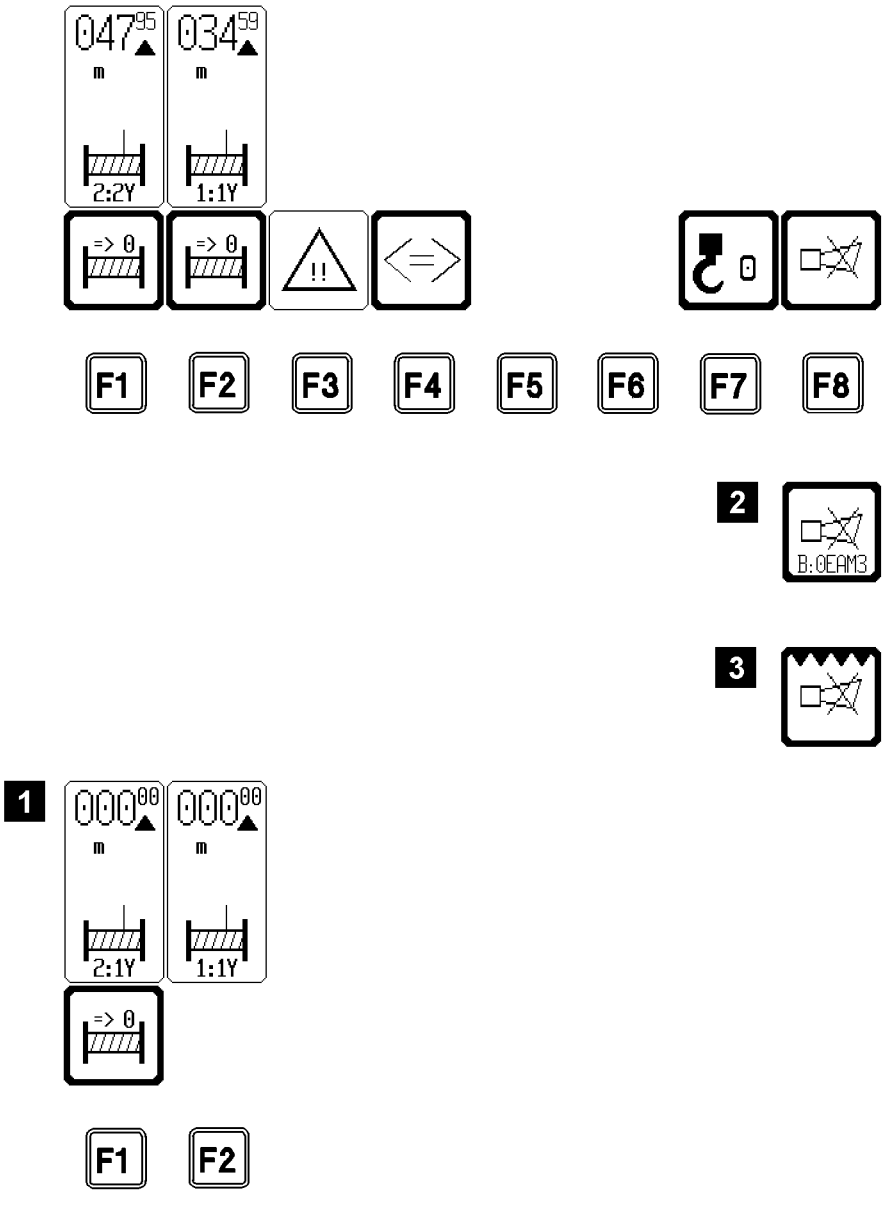
F2 Function key
- Zero point for hook travel display, winch 1
- Pressing the function key **F2** causes the “Set winch display to zero” icon to appear, i.e. the winch 1 hook travel display in the winch icon above is set to “000.00” when the key is pressed. The path measurement begins here.
- **Note:**
  When winch 1 and winch 2 work in parallel operation, then the lengths displays of winch 1 and winch 2 can only be set together with the function key **F1** to “000.00”. The function key **F2** has no function, see illustration **1**.

F3 Function key
- Turn monitoring icons on / off
- The function key **F3** can be used to turn all the monitored auxiliary functions in the crane on or off.
- The appearance of the icon changes according to the condition:
  - “Thick border” = auxiliary function icons turned off
  - “Thin border” = auxiliary function icons turned on
- **Note:**
  The monitoring of all auxiliary functions is always active and the icons may be hidden. If a monitored limit has been exceeded, an acoustical signal (horn) sounds and the corresponding icon is displayed, even if the monitoring symbols have been hidden.

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

F5 Function key
- Not assigned

F6 Function key
- Not assigned


047 95
m
2:2Y
034 59
m
1:1Y
=> 0
=> 0
!!
0
F1
F2
F3
F4
F5
F6
F7
F8
2
B:0EAM3
3
1
000 00
m
2:1Y
000 00
m
1:1Y
=> 0
F1
F2

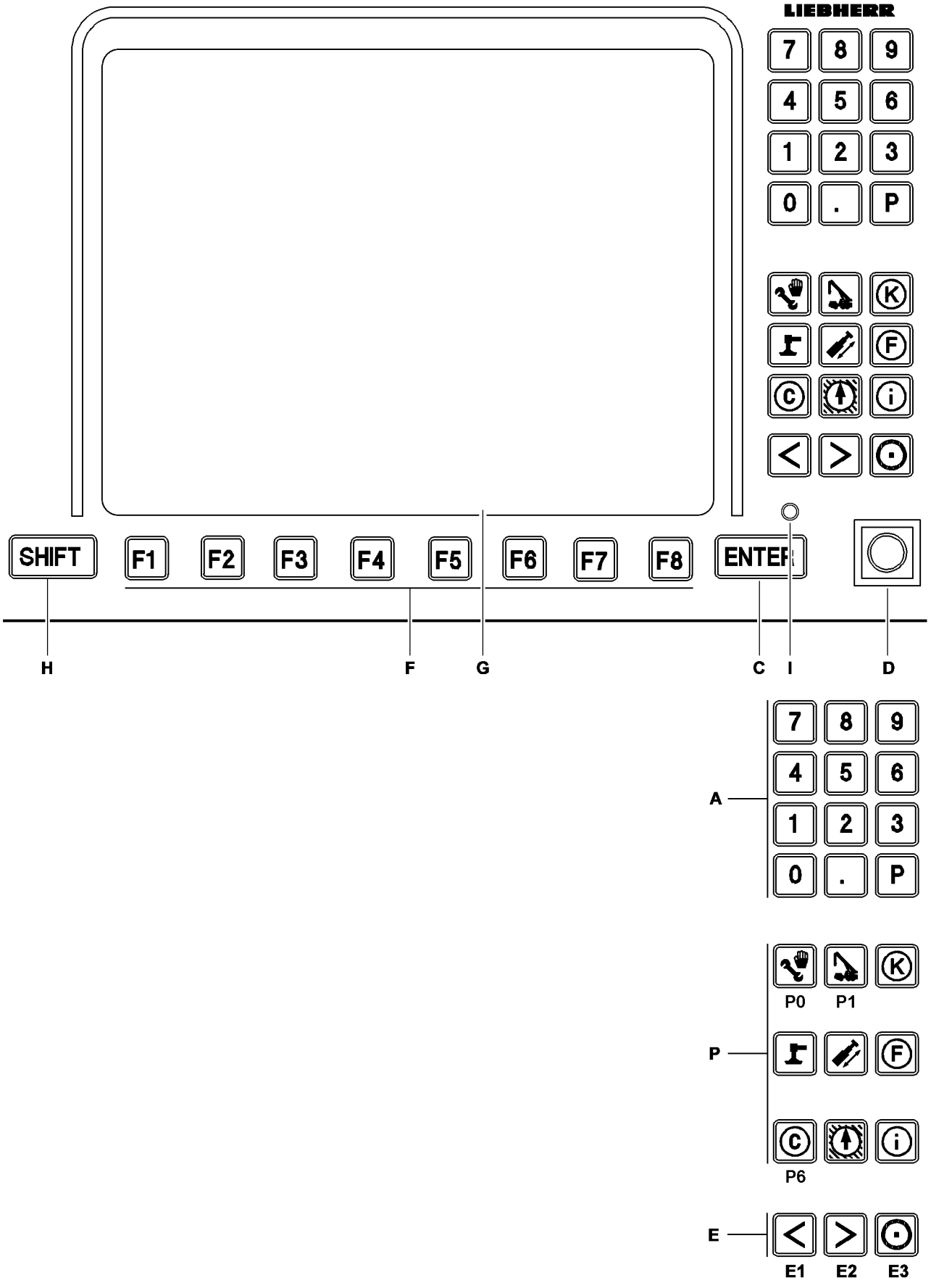
B105207

F7 Function key

- Taring
- When the function key **F7** is pressed, the actual load display is set to “zero”. At the same time, the word “net” appears in the icon of the actual load display. This function, for example, makes it possible to eliminate the weights of the hoist rope, load carriers, lifting and attachment equipment and only display the weight of the load that must be lifted (net load).
  If the taring is cancelled, the word “net” disappears from the icon “Actual load display” and the gross load value is displayed.
- Tare is cancelled by one of the following two actions:
  - Pressing the function key **F7** again
  - Luffing by more than ± 4°
  - **Note:**
    The function key **F7** acts the same way to the actual load display of the boom nose, if the boom nose is installed.

F8 Function key

- Turn off horn / error diagnostics
- Turn off the acoustic warning
  The “Horn” and “Short horn” acoustic warnings can be turned off by pressing the function key **F8**.
  Note:
  A new error turns the acoustic warning on again.
- Error message in “Horn” icon
  If a system, application or operating error occurs, an error message appears in the “Horn” icon, see fig. **2**.
  Example: E:0EAM1
  By pressing the function key **F8** twice, the acoustic warning is turned off and the “Test system” program switches to the error determination screen where the error is documented. (see separate Diagnostics manual)
- Special function “Horn” icon
  A special program is available for crane acceptance in the LICCON computer system. This program is blocked after completion of crane acceptance. If an additional mark is displayed in the “Horn” icon (talons along the upper margin, see fig. **3**), this means that the special 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
P
P6
E
E1 E2 E3

B105208

6.7 Other operating elements

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

A Keypad

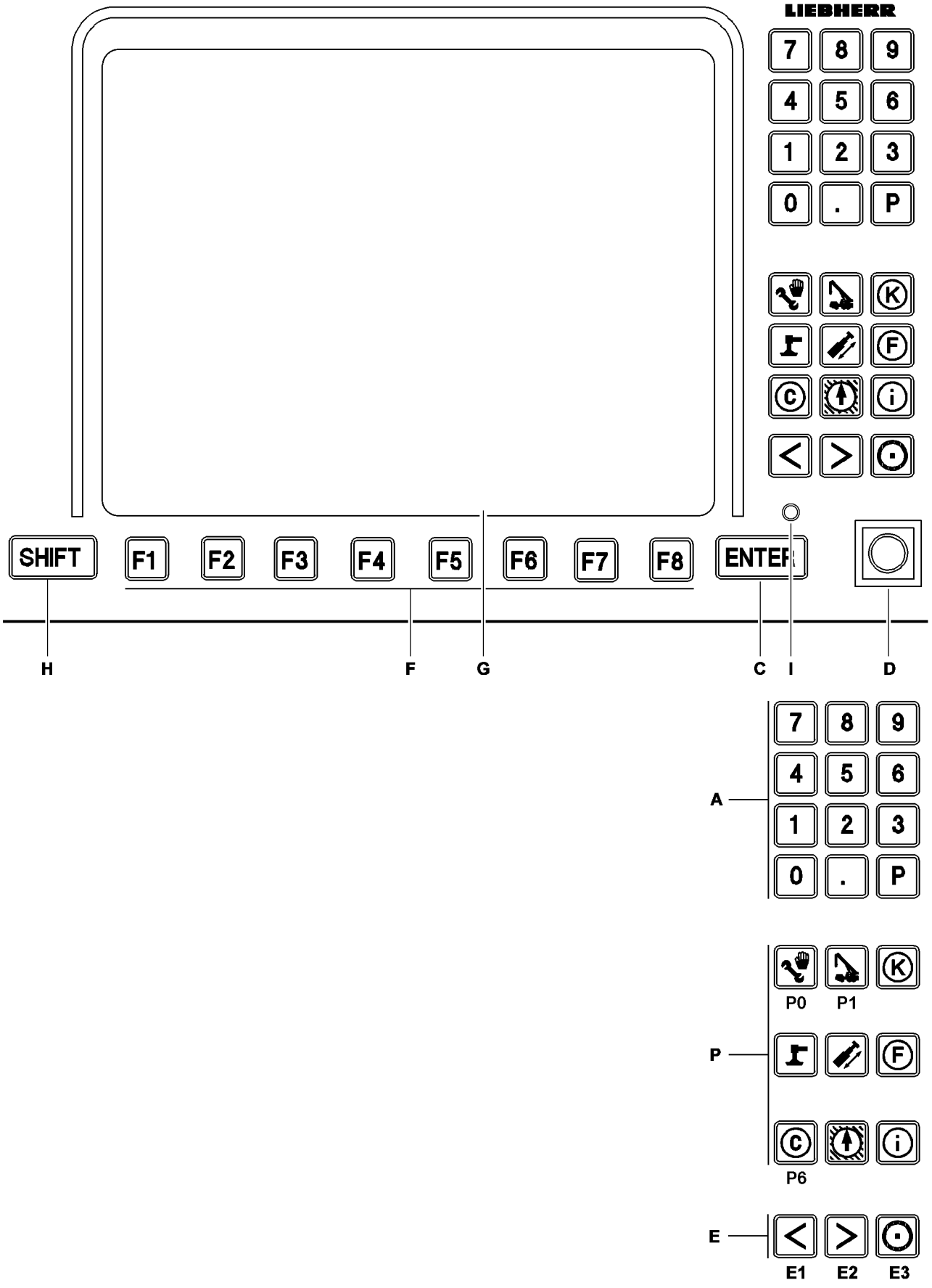
- Keys “0” to “9” and “P” have no function in the “Crane operation” program
- “SHIFT” and “.” keys
  Using key “.”, the so-called test pattern function is turned on and off, meaning that all available symbols appear on the LICCON monitor with an incorrect display value.
  Note:
  The monitored auxiliary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

P Program keys

- The program keys are used to select individual programs. However, the appropriate program-specific features (for example, switching from “Configuration” to “Crane operation” using the “O.K.”) must always be observed.
  Note:
  A program currently running **cannot** be called again using its program key.
  The programs may only be called up with their program key, if the bypass key switch “Assembly” is not in the “Assembly” position.

C Enter key

- No function in “Crane operation” program


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
P6
E
E1 E2 E3

B105208

D Bypass key button

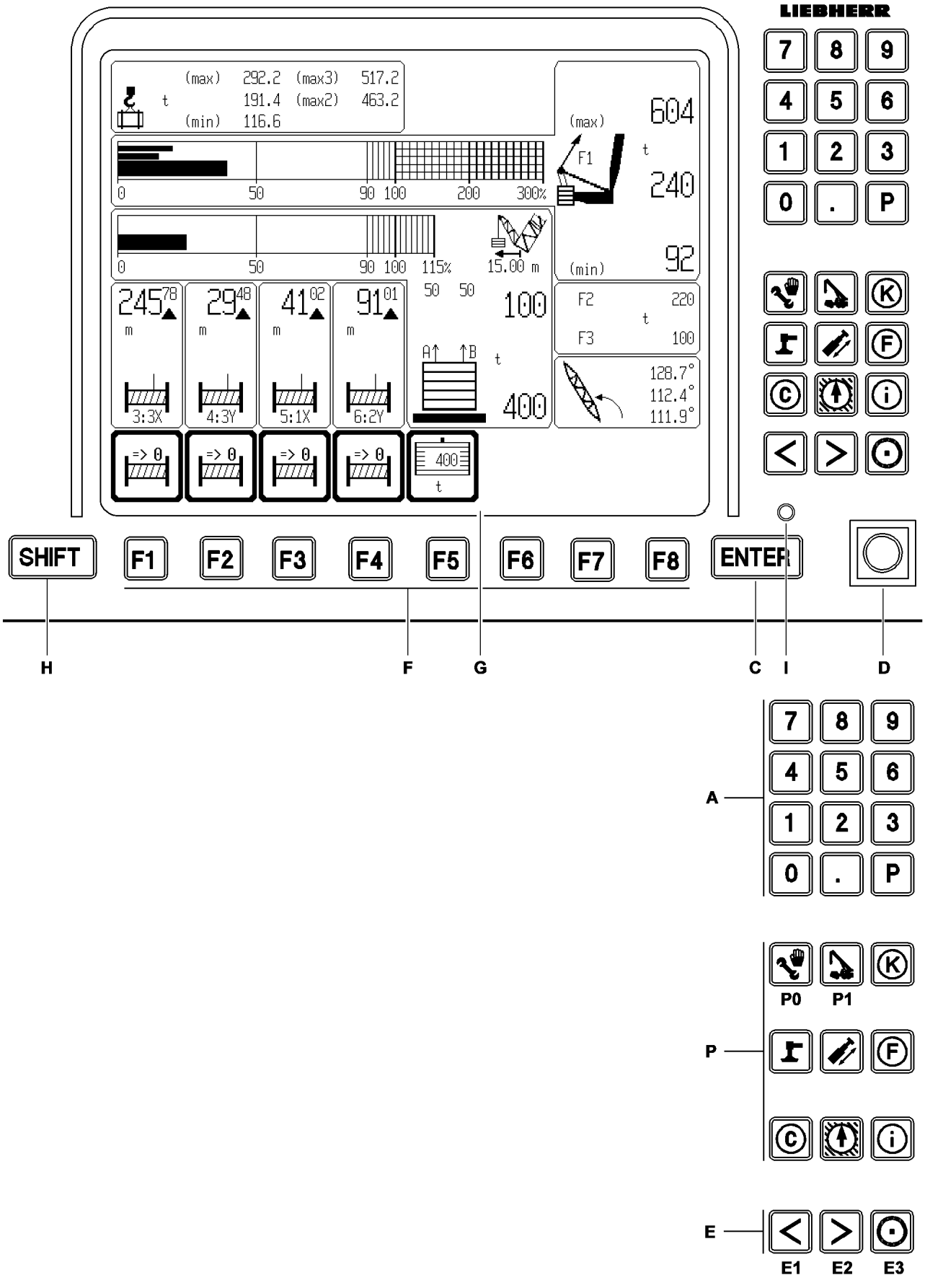
The bypass key button has two positions:
- Position to right (touching):
  The hoist limit switch and the LMB shut off are bypassed
- Center position (self-retaining):
  Normal operation

DANGER
Increased danger of accidents!
With the bypass key button, the overload protection as well as the hoist limit switches can be bypassed.
In this event, continued protection against overloading the rope or the crane **no longer** exists!
▶ Please exercise extreme caution.

In position “touching right”, movement limiting shut offs may be bypassed.
- Bypassing the overload protection:
  If the maximum permissible load momentum is exceeded, the LICCON overload protection turns off all crane movements that increase the load momentum. This shut off can be bypassed by the Bypass key button **D** in the “right touching position”.
  Note:
  Bypassing overload protection may only be done if the crane supervisor is present and with utmost caution. All LICCON overload protection displays remain functional.
- Bypassing the hoist limit switch:
  If the hook block touches the hoist limit switch weight during the upward movement, the hoist limit switch reacts. The crane movement “spool up winch” is turned off. This turn off can be bypassed by the Bypass key button **D** in the “right touching position”.
  Note:
  Bypassing the hoist limit switch may only be done if the crane supervisor is present, and with the help of a guide. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block and the boom head. Carry out all crane movements with utmost care and at the least possible speed.

E Special function keys
- Monitor brightness adjustment (see section “Operating elements of the LICCON computer system”)

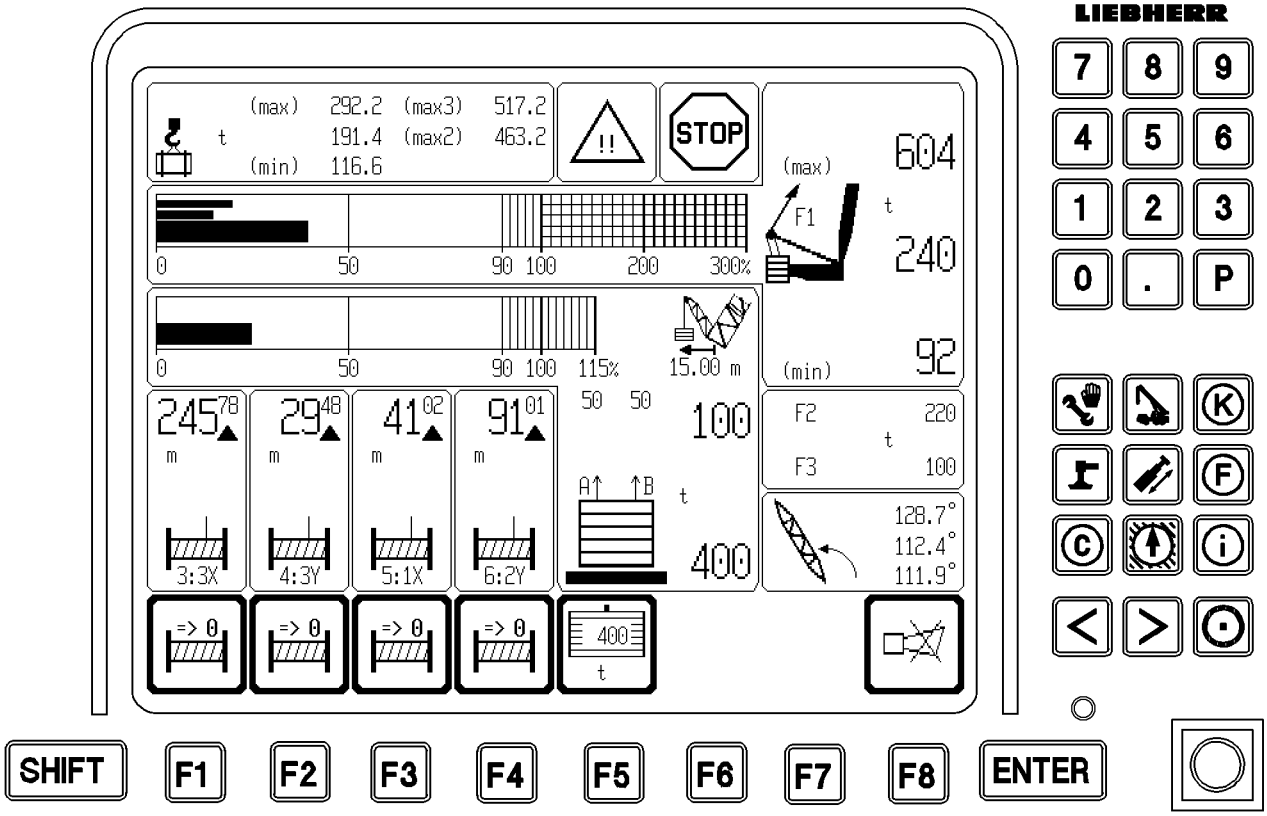
H “SHIFT” key
- Second level key assignments
  “SHIFT” and “P0”: Program call up for Engine monitoring

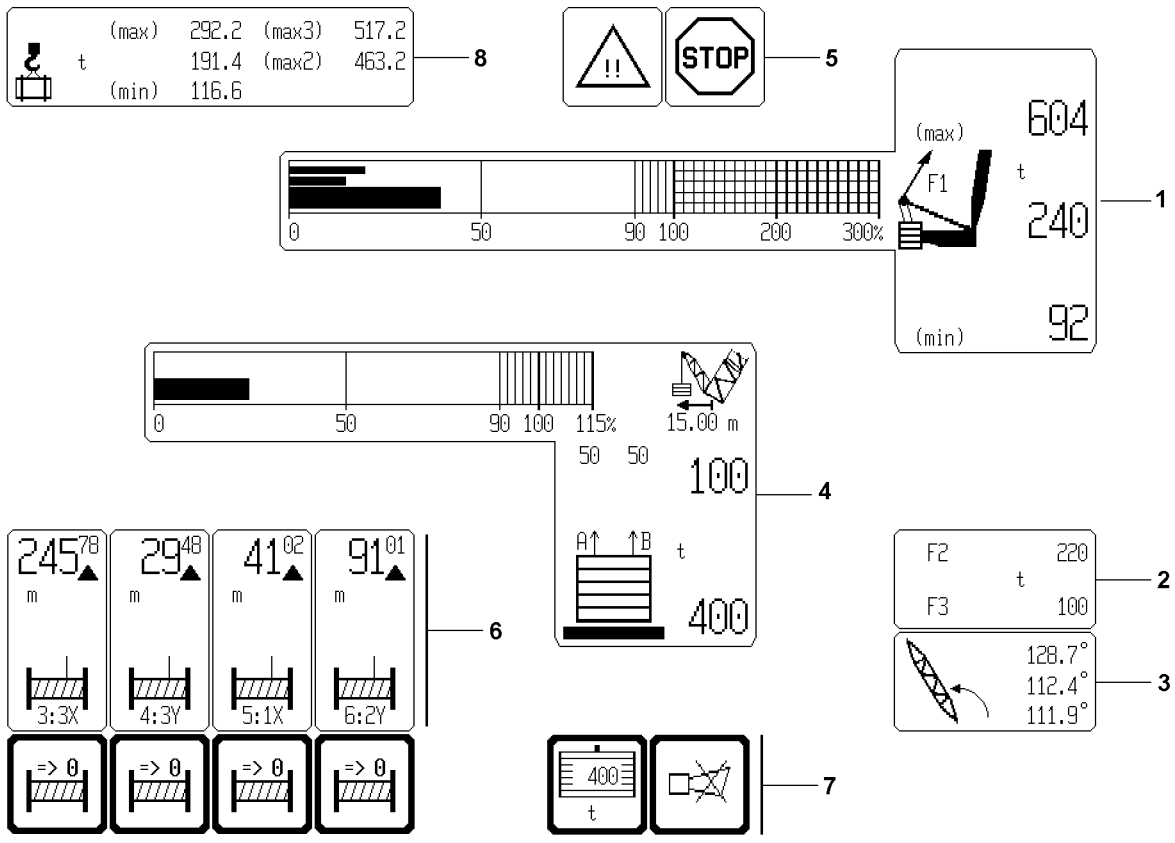

LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
H F G C I D
A
P
P0 P1
E
E1 E2 E3

B199925

7 Operating elements of the LICCON computer system on monitor 1

A	Keypad	• To edit the derrick ballast input values
P	Program keys	• No function
C	Input key “ENTER”	• Confirmation of changes
D	Key switch	• Turn off the “horn”
E	Special function keys	• Monitor brightness adjustment (see section “Operating elements of the LICCON computer system on monitor 0”)
F	Function keys	• The function keys should always be viewed in conjunction with the function key icon line displayed on the monitor.
G	Monitor	• Monitor 1 shows “normally” the crane operating screen of monitor 1. **Note:** For diagnostics purposes, the monitor can be assigned to the ballast trailer control.
H	SHIFT key	• No function
I	LED display	• Monitor supply voltage present


LIEBHERR
(max) 292.2 (max3) 517.2
t 191.4 (max2) 463.2
(min) 116.6
STOP
604
(max)
F1
t
240
92
(min)
0 50 90 100 200 300%
0 50 90 100 115%
15.00 m
245 78
29 48
41 02
91 01
m
3:3X
4:3Y
5:1X
6:2Y
50 50
100
A B
t
400
F2 220
t
F3 100
128.7°
112.4°
111.9°
=> 0
400
t
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


(max) 292.2 (max3) 517.2
t 191.4 (max2) 463.2
(min) 116.6
8
STOP
5
604
(max)
F1
t
240
92
(min)
1
0 50 90 100 200 300%
0 50 90 100 115%
15.00 m
50 50
100
4
A B
t
400
245 78
29 48
41 02
91 01
m
3:3X
4:3Y
5:1X
6:2Y
6
F2 220
t
F3 100
2
128.7°
112.4°
111.9°
3
=> 0
400
t
7

B199935

8 The “Crane operation” program on monitor 1

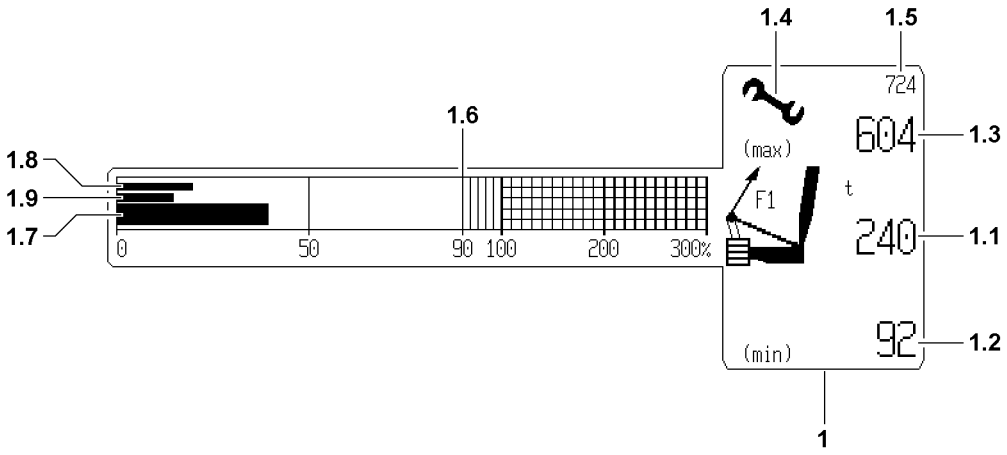
The maximum or minimum load required to balance the crane can be increased or decreased on cranes with a derrick ballast* operating under load, by increasing or reducing the derrick ballast.

Note

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

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

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


1.4
1.5
724
1.6
604
1.3
(max)
1.8
1.9
1.7
t
F1
240
1.1
0
50
90
100
200
300%
92
1.2
(min)
1

B199936

8.1 Test point 1 = F1

8.1.1 F1-assembly maximum force, general

DANGER
Danger of fatal injury in assembly operation!
If the crane is utilized in assembly operation to the assembly limit, then it can topple over.
Personnel can be severely injured or killed!
- ▶ In assembly operation, the crane operator must make sure that the crane is not subjected to loads to the assembly limit.
- ▶ The crane may always only be erected only **without loads**, according to the data in the operating instructions and the erection and take down charts.

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

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

F1-assembly maximum force value outside the operating range

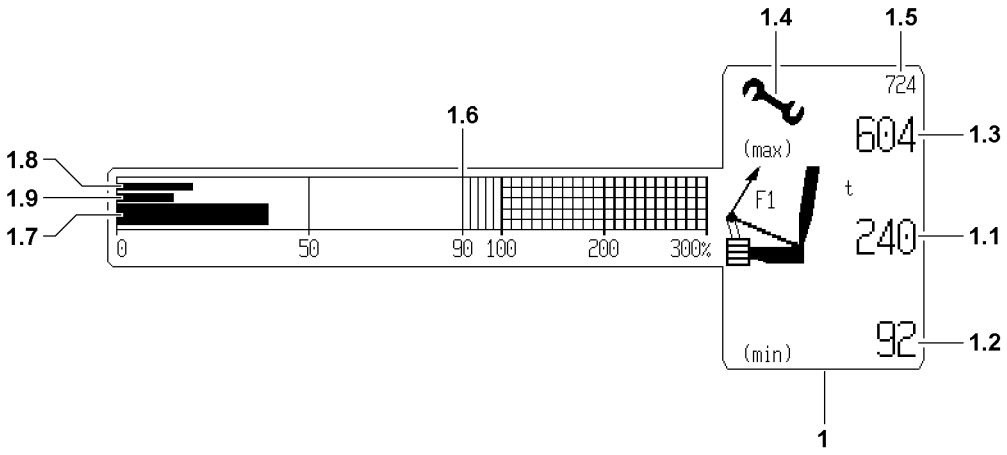
For erection and assembly of the crane.

F1-assembly maximum force value inside the operating range

Within the boom angle range with load chart and few angle degrees aside.
Maximum **not** bypassable F1 $_{\text{max limit}}$ in operating range.

Note
- ▶ For static reasons, in the operating range with load chart (and a few angle degrees aside) the F1-assembly maximum force value can be larger than outside the operating range, for example when lifting the main boom jib or needle jib off the ground.
- ▶ The selection of the F1-assembly maximum force value for inside or outside of the operating range is made on the basis of the values from the angle sensor on main boom and the angle sensor on jib.
- ▶ **In the operating range, the current F1-force can be above the F1-assembly maximum force outside the operating range.**

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

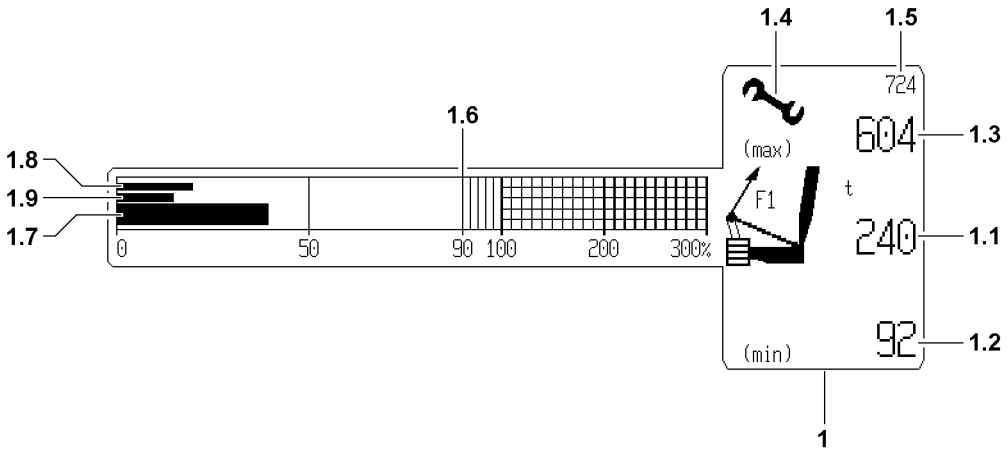

1.4
1.5
724
1.6
604
1.3
(max)
1.8
1.9
1.7
t
F1
240
1.1
0
50
90
100
200
300%
92
1.2
(min)
1

B199936

8.1.3 Test point 1 = F1 / icon description

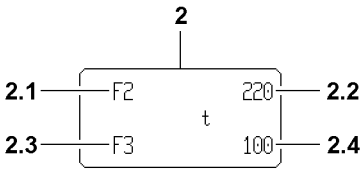
Pull test brackets on measuring point 1A and 1B in the SA bracket guying

Position	Icons / display values	Type of display	Is shown
1	Icon “test point 1” = F1 in units of [t] or [kips]	static	always
1.1	Actual force: = F1 = $F1_{is}$ F1 = F1A + F1B F1A = Force test point 1A (SA-bracket left) F1B = Force test point 1B (SA-bracket right)	static	for valid value
		“???” blinking	for invalid value
1.2	Minimum force = $F1_{min}$	static	always: **Note:** A shut off by $F1_{min}$ only occurs in operating modes with derrick ballast. In all other operating modes, $F1_{min}$ = 0. In these operating modes, the condition F1 = $F1_{min}$ **cannot** be reached in operation.
1.3	Maximum operating force = $F1_{max\ operation}$	static	in operating modes with derrick ballast (DB) **Note:** The force F1max operation is the maximum F1-force, which may be reached in operation. In F1 = $F1_{max\text{-}operation}$ there is no shut off, because the crane monitoring is ensured by the shut off at utilization of more or the same as 100%. For safety reasons, the $F1_{max\text{-}shut\ off}$ at $F1_{is}$ is larger than $F1_{max\text{-}operation}$ + $F1_{-addition\ for\ shut\ off}$ occurs. For cranes with maximum load **less** than 1000 t applies: $F1_{Addition\ for\ shut\ off}$ = 20 t For cranes with maximum load **more** than 1000 t applies: $F1_{Addition\ for\ shut\ off}$ = 40 t


1.4
1.5
724
1.6
604
1.3
(max)
1.8
1.9
1.7
F1
t
0
50
90
100
200
300%
240
1.1
92
1.2
(min)
1

B199936

Position	Icons / display values	Type of display	Is shown
1.4	Assembly icon	static	at “assembly and boom not in operating range” **or** at F1 larger or same as $F1_{max\text{-}assembly}$
1.5	Maximum assembly force = $F1_{max\text{-}assembly}$	static	at “assembly and boom not in operating range” and F1 smaller than $F1_{max\text{-}assembly}$
		blinking	at F1 larger or same as $F1_{max\text{-}assembly}$
1.6	F1-utilization scale in [%]	static	always
1.7	F1-utilization bar display = $F1/F1_{max\text{-}operation}$ 0% at: $F1_{max\text{-}operation} = 0$ **or** F1 = invalid	dynamic	in operating modes with derrick ballast (DB)
1.8	F1-Min-Warning bar = $F1_{min\text{-}Warning\ value}/F1_{max\text{-}operation}$ ($F1_{min\text{-}Warning\ value}$ = $F1_{min} + \mathbf{\Delta_{F1}}$) 0% at: $F1_{max\text{-}operation} = 0$ **or** $F1_{max\text{-}operation}$ = invalid	dynamic	in operating modes with derrick ballast (DB) $\mathbf{\Delta_{F1}}$ = **for example:** 15 t for cranes with max- load smaller than 1000 t 30 t for cranes with max- load larger or same as 1000 t
1.9	F1-Min-Stop bar = $F1_{min}/F1_{max\text{-}operation}$ 0% at: $F1_{max\text{-}operation} = 0$ **or** $F1_{max\text{-}operation}$ = invalid	dynamic	in operating modes with derrick ballast (DB)

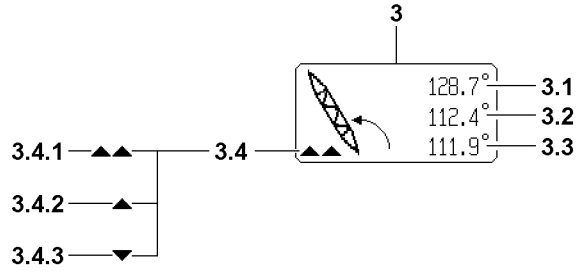


B199937

8.2 Test point 2 = F2 and test point 3 = F3

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

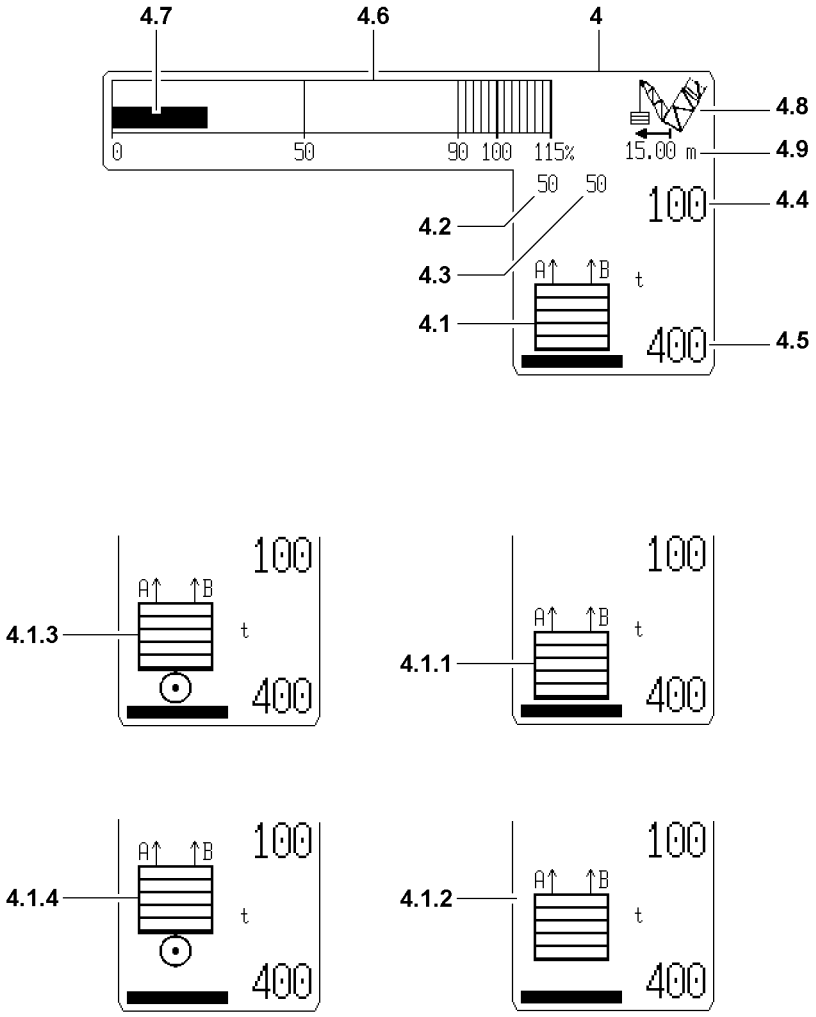
Position	Icons / display values	Type of display	Is shown
2	Icon for N/W-guy force and main boom guy force in derrick operation in units [t] or [kips]	static	in operating modes with lattice jib or derrick
2.1	Icon F2 for N/W-guy force test point 2	static	in operating modes with lattice jib
2.2	F2-actual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



B199938

8.3 Derrick boom angle

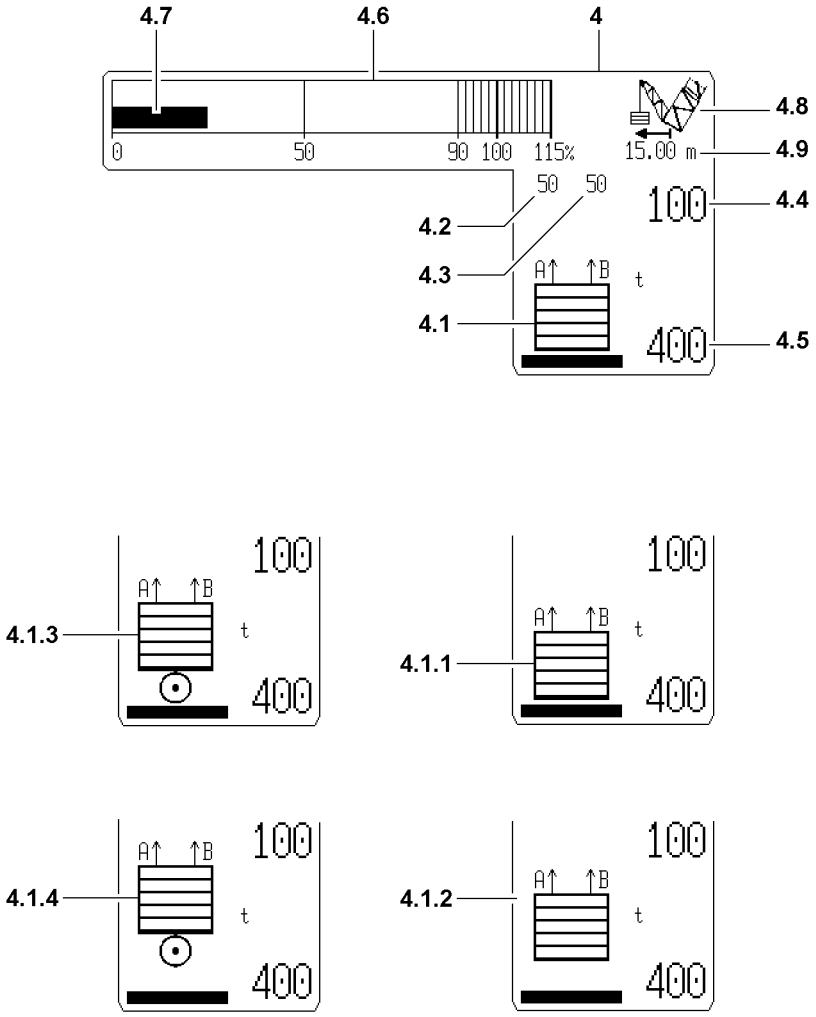
Position	Icons / display values	Type of display	Is shown
3	“Derrick boom angle” icon	static	in operating modes with derrick
3.1	Maximum derrick angle during operation = angle-D_{max} in [°]	static	in operating modes with derrick and angle-$D_{current}$ smaller or same as angle-D_{max}
		blinking	in operating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


4.7
4.6
4
0
50
90 100 115%
15.00 m
4.8
4.9
50 50
100
4.4
4.2
4.3
A↑ ↑B
t
4.1
400
4.5
4.1.3
4.1.1
4.1.4
4.1.2

B199939

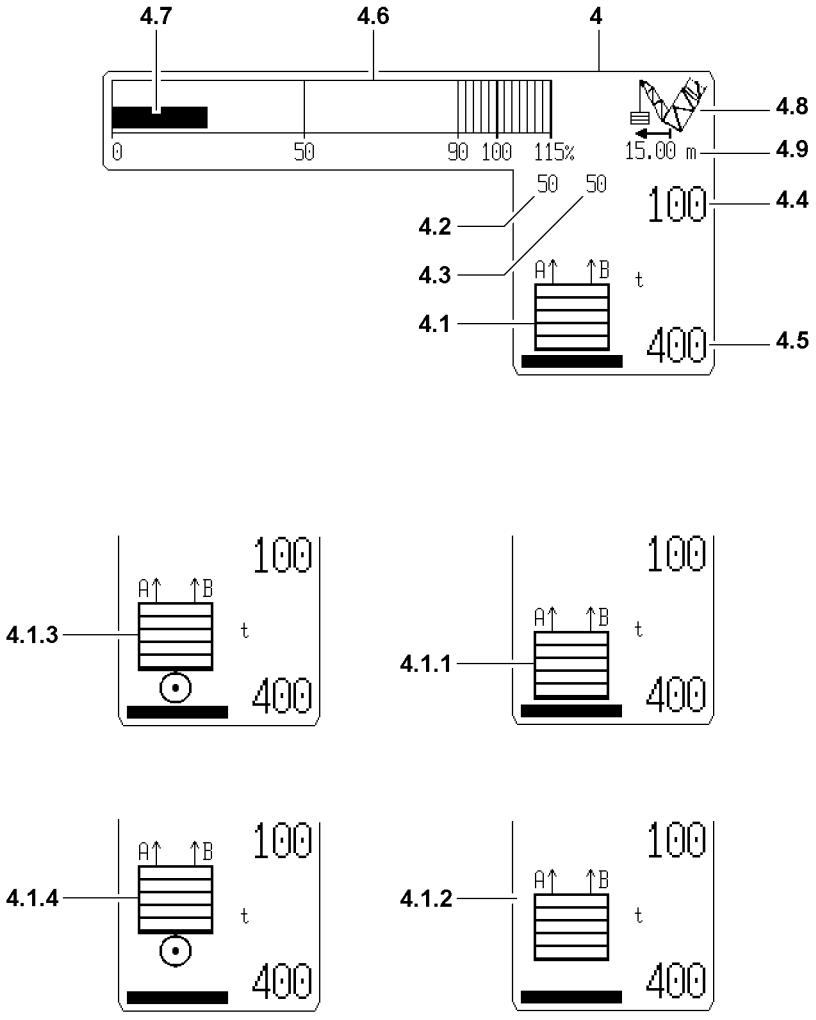
8.4 Derrick ballast, weight and utilization

Position	Icons / display values	Type of display	Is shown
4	“Derrick ballast, weight and utilization” icon	static	in operating modes with derrick ballast
4.1	“Derrick ballast” in unit [t] or [kips] icon **Note:** This force unit applies to all force or weight values shown within the frame	static	in operating modes with derrick ballast, depending on the type and the condition of the derrick ballast (see 4.1.1 - 4.1.4)
4.1.1	“Suspended ballast on the ground” icon	static	in operating modes with suspended ballast and suspended ballast **not suspended** , according to limit switch
4.1.2	“Suspended ballast suspended” icon	static	in operating modes with suspended ballast and suspended ballast **suspended** , according to limit switch
4.1.3	“Ballast trailer on the ground” icon	static	in operating modes with ballast trailer and ballast trailer **not suspended** , according to key switch **448** (see chapter 4.01)
4.1.4	“Ballast trailer suspended” icon	static	in operating modes with ballast trailer and ballast trailer **suspended** , according to key switch **448** (see chapter 4.01)


4.7
4.6
4
4.8
4.9
4.4
4.2
4.3
4.1
4.5
0
50
90 100 115%
15.00 m
50 50
100
A↑ ↑B
t
400
4.1.3
4.1.1
4.1.4
4.1.2

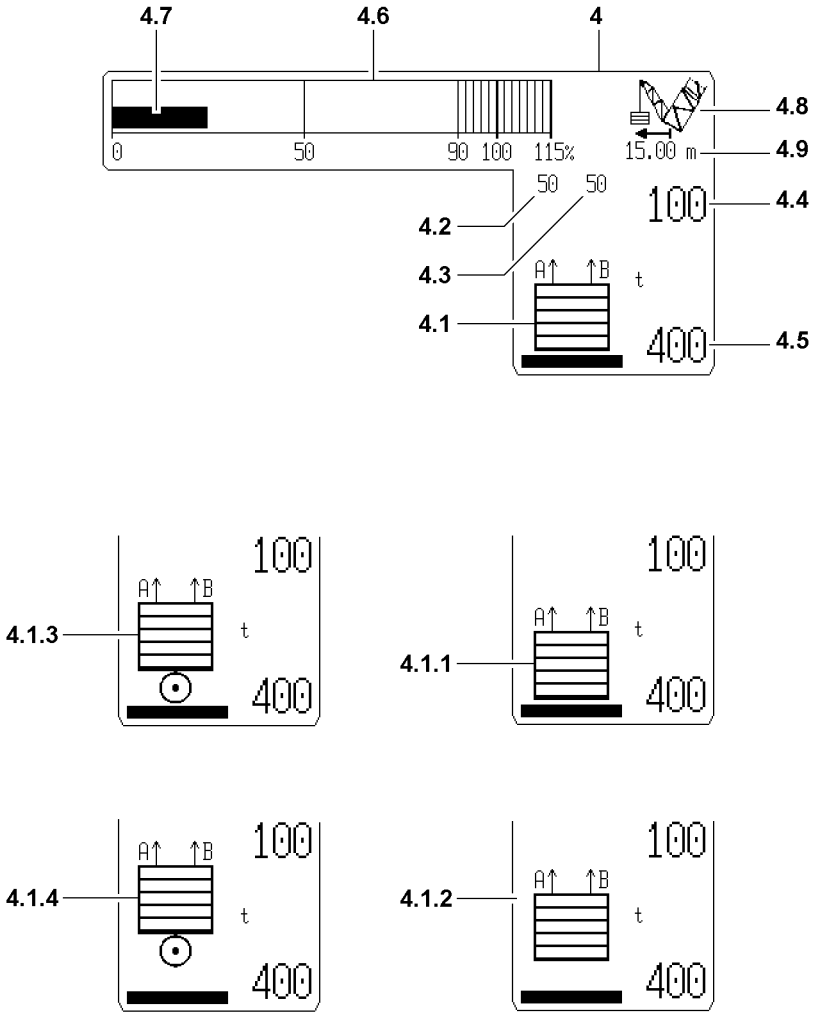
B199939

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


4.7
4.6
4
4.8
4.9
4.4
4.2
4.3
4.1
4.5
4.1.3
4.1.1
4.1.4
4.1.2
0
50
90 100 115%
15.00 m
50 50
100
400
A↑ ↑B
t

B199939

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


4.7
4.6
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0
50
90 100 115%
15.00 m
50 50
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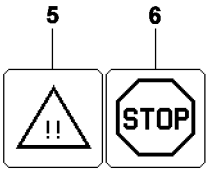
4.1.1
4.1.4
4.1.2

B199939

Position	Icons / display values	Type of display	Is shown
4.7	Derrick ballast utilization bar display = BA_{pulled} / BA_{placed} in percentages [%] Derrick ballast utilization bar display is 0 at: BA_{placed} smaller than BA_{placed_min} **or** BA_{pulled} = invalid **Note:** The bar can show max. 115%	dynamic	in operating modes with derrick ballast **Note:** BA_{placed_min} 5 t on cranes with max. load carrying capacity smaller than 1000 t BA_{placed_min} 10 t on cranes with max. load carrying capacity larger or same as 1000 t
4.8	“Derrick ballast radius” icon	static	in operating modes with derrick ballast
4.9	Display derrick ballast radius in [m] or [ft]	static	valid in operating modes with derrick ballast and derrick ballast radius value
		blinking	invalid in operating modes with derrick ballast and derrick ballast radius value



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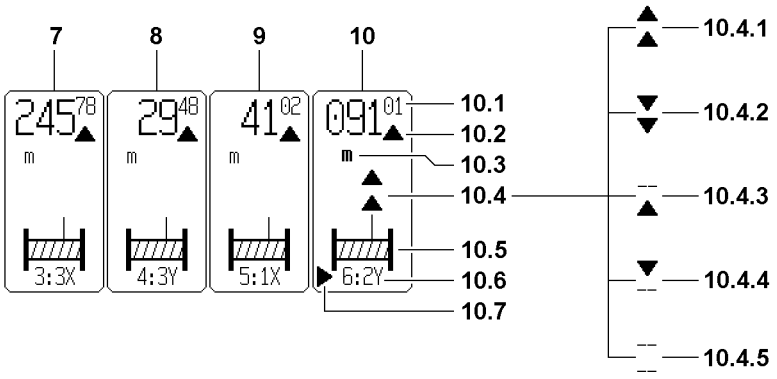
8.5 Alarm functions

Position	Icons / display values	Type of display	Is shown
5	“Advanced warning” icon	blinking	at $F1_{min\text{- advanced warning}}$ ($F1_{is}$ smaller than $F1_{min\text{-Warning value}}$)
6	“STOP” icon	blinking	at $F1_{min\text{-Stop}}$ ($F1_{is}$ smaller than $F1_{min}$) with after run 3 s **or** at $F1_{max\text{ - operation Stop}}$ ($F1$ larger or same as $F1_{max\text{- operation shut off value}}$) with after run 3 s **or** $F1_{max\text{-assembly-Stop}}$ ($F1_{is}$ larger or same as $F1_{max\text{-assembly}}$) with after run 3 s **Note:** $F1_{max\text{-operation shut off value}} = F1_{max\text{-operation}} + F1_{addition\text{ for shut off}}$ For cranes with maximum load **less** than 1000 t applies: $F1_{Addition\text{ for shut off}} = 20$ t For cranes with maximum load **more** than 1000 t applies: $F1_{Addition\text{ for shut off}} = 40$ t


7
8
9
10
245 78
m
3:3X
29 48
m
4:3Y
41 02
m
5:1X
091 01
m
6:2Y
10.1
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10.5
10.6
10.7
10.4.1
10.4.2
10.4.3
10.4.4
10.4.5

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8.6 Winch displays

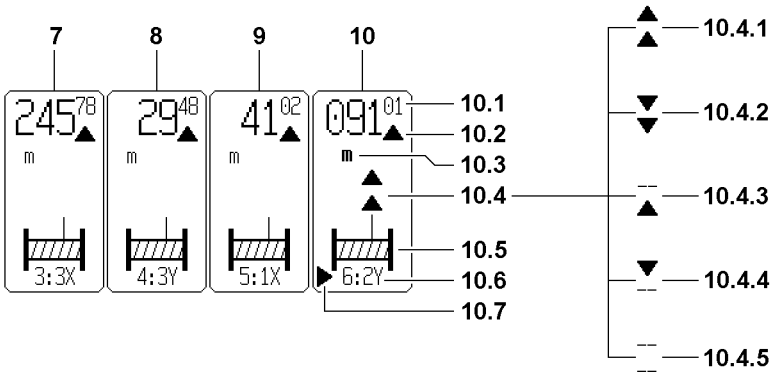
8.6.1 Winches

The icons for winches 3*, 4, 5* and 6* are only shown on monitor 1, if the crane is equipped with these winches.
The display of winches is the same as the display of winches 1 and 2 on monitor 0.

Note

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

Position	Icons / display values	Type of display	Is shown
7	Winch display winch 3*	static	with installed and plugged in winch 3 and winch turn sensor active* **or** if emergency operation is turned on
8	Winch display winch 4	static	with installed and plugged in winch 4 and winch turn sensor active **or** if emergency operation is turned on
9	Winch display winch 5*	static	with installed and plugged in winch 5 and winch turn sensor active* **or** if emergency operation is turned on
10	Winch display winch 6*	static	with installed and plugged in winch 6 and winch turn sensor active* **or** if emergency operation is turned on


7
8
9
10
245 78
m
3:3X
29 48
m
4:3Y
41 02
m
5:1X
091 01
m
6:2Y
10.1
10.2
10.3
10.4
10.5
10.6
10.7
10.4.1
10.4.2
10.4.3
10.4.4
10.4.5

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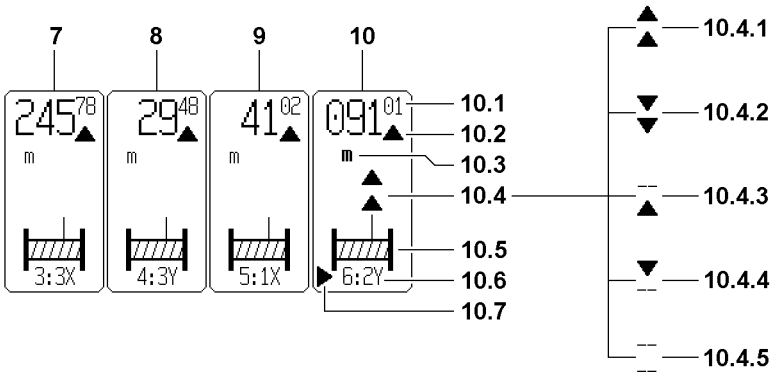
Position	Icons / display values	Type of display	Is shown
10.1	Hook path = rope length on winch / hoist rope reeving according to manual entry	static	if the winch is being calculated as hoist winch (winch 6) and this winch is to be assigned a manually entered reeving in the configuration screen
	or Rope length on winch drum (for the intake gear, the rope length is valid evenly for the left and the right half of the rope drum)	static	if the winch is calculated as control winch (winch 3* , winch 4, winch 5*) **or** if the winch is being calculated as hoist winch (winch 6) and this winch is to be assigned no reeving
		“???” blinking	in case of error in winch path measurement

Note

- “Winch 3* ”, “winch 4” and “winch 5” * are always calculated as control winches.
- “Winch 6* ” is calculated as hoist winch, if the reeving cannot be derived from the “reeving of the boom” and the “reeving of the boom nose”. In these cases, n = 1 is used as reeving.


7
8
9
10
245 78
29 48
41 02
091 01
m
3:3X
4:3Y
5:1X
6:2Y
10.1
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10.4
10.5
10.6
10.7
10.4.1
10.4.2
10.4.3
10.4.4
10.4.5

B199941

8.6.2 Winch display icon

"Winches" icon

- The meaning of icons for "winch 3" *, "winch 4", "winch 5" * and "winch 6" * is explained on the icon for "winch 6" * **10**.

Note

- If one of the winches is used as hoist winch according to the set operating mode (for example "winch 3" at derrick operation), then the **hook path** is shown in the winch icon. The value, which was tared by the corresponding function key is still shown unchanged, even after turning off and on or after an operating mode change.
- If one of the winches is used as a control winch, then **the current rope length on the winch drum** is shown, not the path of the hook block. Then taring is possible, but after turning on and off again or after an operating mode change, the original value "rope length on the rope drum" is shown again.

10 "Winch 6" icon

10.1 "Completed hook path" **or** "current rope length on the winch drum"

- In [m] or [ft] from a zero point which must be determined.
- The positions before the decimal point are displayed with up to 3 large digits. The digits after the decimal point are displayed with small digits. (Also refer to description for function key **F1**, function key **F2**, function key **F3** and function key **F4**).
- Prerequisite for the correct display is the correct entry of the 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.

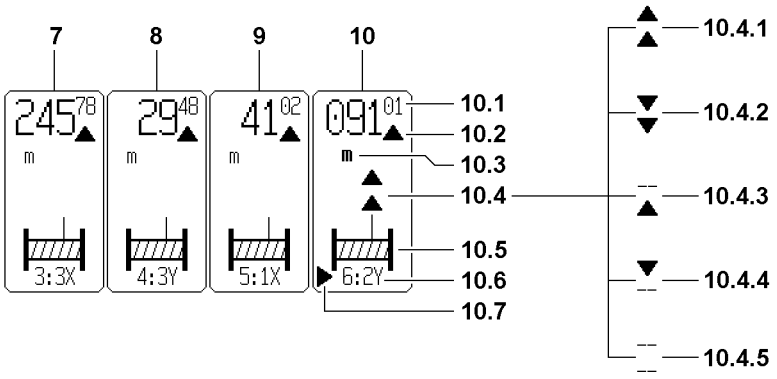
10.2 Direction of hook movement

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

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

10.3 Length unit for hook path display

- In [m] or [ft]


7
8
9
10
245 78
m
3:3X
29 48
m
4:3Y
41 02
m
5:1X
091 01
m
6:2Y
10.1
10.2
10.3
10.4
10.5
10.6
10.7
10.4.1
10.4.2
10.4.3
10.4.4
10.4.5

B199941

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

10.4.1 Spool out

10.4.2 Spool up

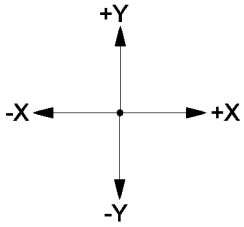
10.4.3 Spooled out
- Spooling out is blocked

10.4.4 Spooled up
- Spooling up is blocked

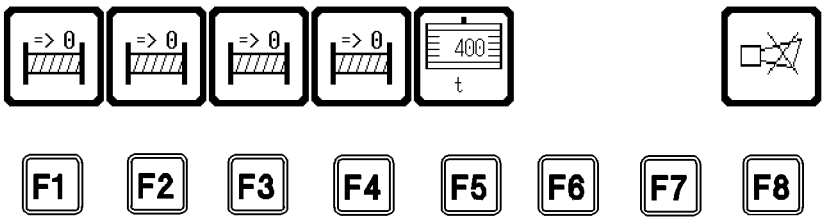
10.4.5 Winch is deactivated
- Spooling up and spooling out are blocked (via “Control parameter” program)
- **Note:**
  If no winch status icon appears, the activated winch is inactive and is neither spooled up nor spooled out.

10.5 Winch icon
- (with rope end for winch status icon)

10.6 Winch number with master switch number and master switch operating direction
- Example: 6:2Y
  First digit: Winch number
  Second digit: Master switch number
  Letter: Master switch operating direction



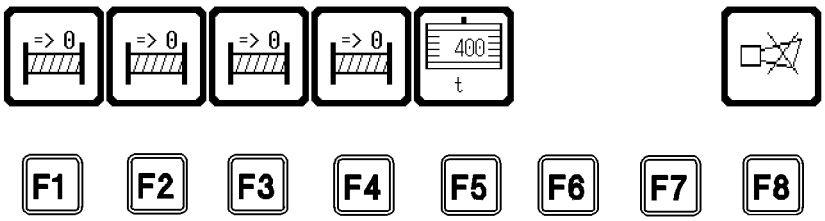
10.7 Vibration sensor
- If the vibration sensor for a winch is added on the master switch, then the arrow **10.7** appears in this winch icon for the added vibration sensor.
- **Note:**
  The vibration sensor is added at the first actuated crane function.



B199942

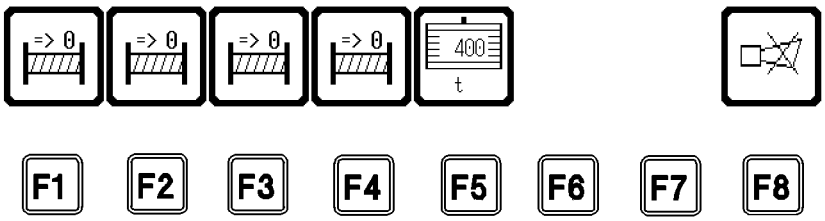
8.7 Function key line

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



B199942

Position	Function / Function key line	Type of display	Is shown
F5	Ballast editing key* When pressing function key F5, the thick icon frame changes to a thin icon frame. A blinking cursor appears in the ballast editing field. The value for the placed ballast can only be entered in the displayed weight unit [t] or [kips] via the key field on monitor 1. **The ballast editing can be ended with:** - pressing the “ENTER” key = take over value. The entered value appears now as value for the placed ballast (BA_{placed}) in the ballast icon **or** - pressing “F5” key = end editing. The change is discarded. The old value of BA_{placed} remains in the ballast icon. **Note:** When editing the ballast, make sure to observe the section instructions “Setting the derrick ballast” in chapter 4.03!	static	in operating modes with derrick ballast
F5*	Ballast input value (BA_{edit})* = edited ballast value in function key icon of “F5”	static	for **valid** ballast input value
		“???” blinking	for **invalid** ballast input value



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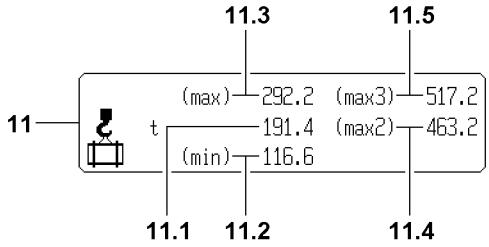
Position	Function / Function key line	Type of display	Is shown
F6-F7	Not assigned		
F8	“Horn” icon - Turn off the acoustical signal “Horn” on monitor 1 by pressing the “F8” key	blinking	if the acoustical signal “Horn” sounds on monitor 1. See paragraph “Acoustical warning on monitor 1”


11.3
11.5
11
(max) 292.2
(max3) 517.2
t 191.4
(max2) 463.2
(min) 116.6
11.1
11.2
11.4

B199934

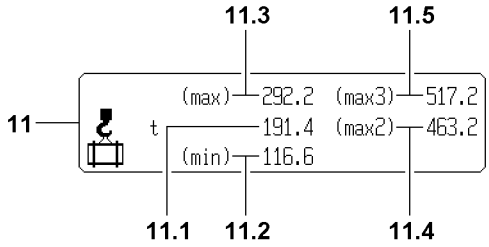
8.8 Load capacity min / max

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

11 Load capacity min / max
- In [t] or [kips])

11.1 Current load on the boom
- Actual load display = **Load**, which currently hangs on the selected boom.
- Display of the calculated total load including the weights of the carrying equipment, the lifting equipment (hook block) and / or the tackle, but **without** the nominal weight of the hoist rope.
- **Note:**
  The “current load on the boom” **11.1 cannot** “be tared” and set to zero on monitor 1.
  If the “current load on the boom” **2.1** was not tared (“zeroed out”) on monitor 0, then the following applies:
  the “current load on the boom” **11.1** of monitor 1 and the “current load on the boom” **2.1** of monitor 0 are identical. The displayed values must match.

11.2 min-load capacity
- Is the minimum load which the crane must pull in the current operating condition with the currently pulled derrick ballast, so that $F1_{is}$ is larger than $F1_{min}$ and no $F1_{min}$ -shut off occurs as a result.
  If this “min-load” is **not** reached, then the $F1_{min}$ -shut off occurs.
- The “min-load” is an approximate calculated value, which can still change slightly when lifting / setting down the load.
- When the “min-load” is larger then the weight of the hook and the tackle, then this means that the load can only be set down if the pulled derrick ballast is also reduced. This means a suspended derrick ballast must be set down on the ground, otherwise the $F1_{min}$ -shut off occurs.


11.3
11.5
(max) 292.2
(max3) 517.2
11
t 191.4
(max2) 463.2
(min) 116.6
11.1
11.2
11.4

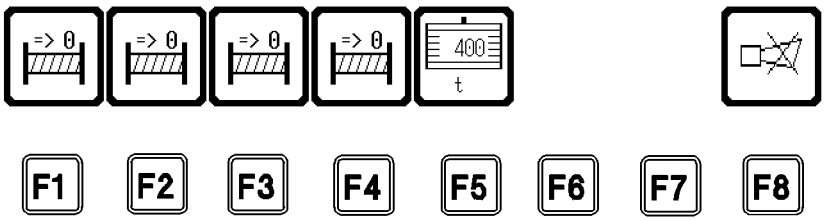
B199934

11.3 max-load capacity
- Is the maximum load (“maximum load according to load chart and reeving on the boom” **1.1**), which the crane can lift in the current operating condition with the currently **pulled** derrick ballast.
  Note:
  Die “max-load” on monitor 1 and the “Maximum load” on monitor 0 are identical. The displayed values must always match.

11.4 max2-load capacity
- Is the maximum load, which the crane can lift in the current operating condition, when the **placed** derrick ballast is fully **pulled**.

11.5 max3-load capacity
- Is the maximum load, which the crane can lift in the current operating condition, when the **optimum** derrick ballast is placed and fully **pulled**.
- **Note:**
  The optimum derrick ballast is reached when a further increase of the derrick ballast results in **no higher maximum load**.

Note
The following display values of the “min / max load capacity” **11** icon correspond:
- The “current load on the boom” **11.1** and the actual force “$F1_{is}$” **1.1**.
- The “min-load” **11.2** and the minimum force “$F1_{min}$” **1.2**.
- The “max-load” **11.3** and the maximum operating force “$F1_{max\text{-}operation}$” **1.3**.



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8.9 Acoustical warning on monitor 1

8.9.1 “Horn”

“Horn” icon

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

Note

▶ The sensor monitored by CPU1 (pull test brackets, pressure sensors, angle sensors) are shown in case of an error by a LEC error on monitor 0.

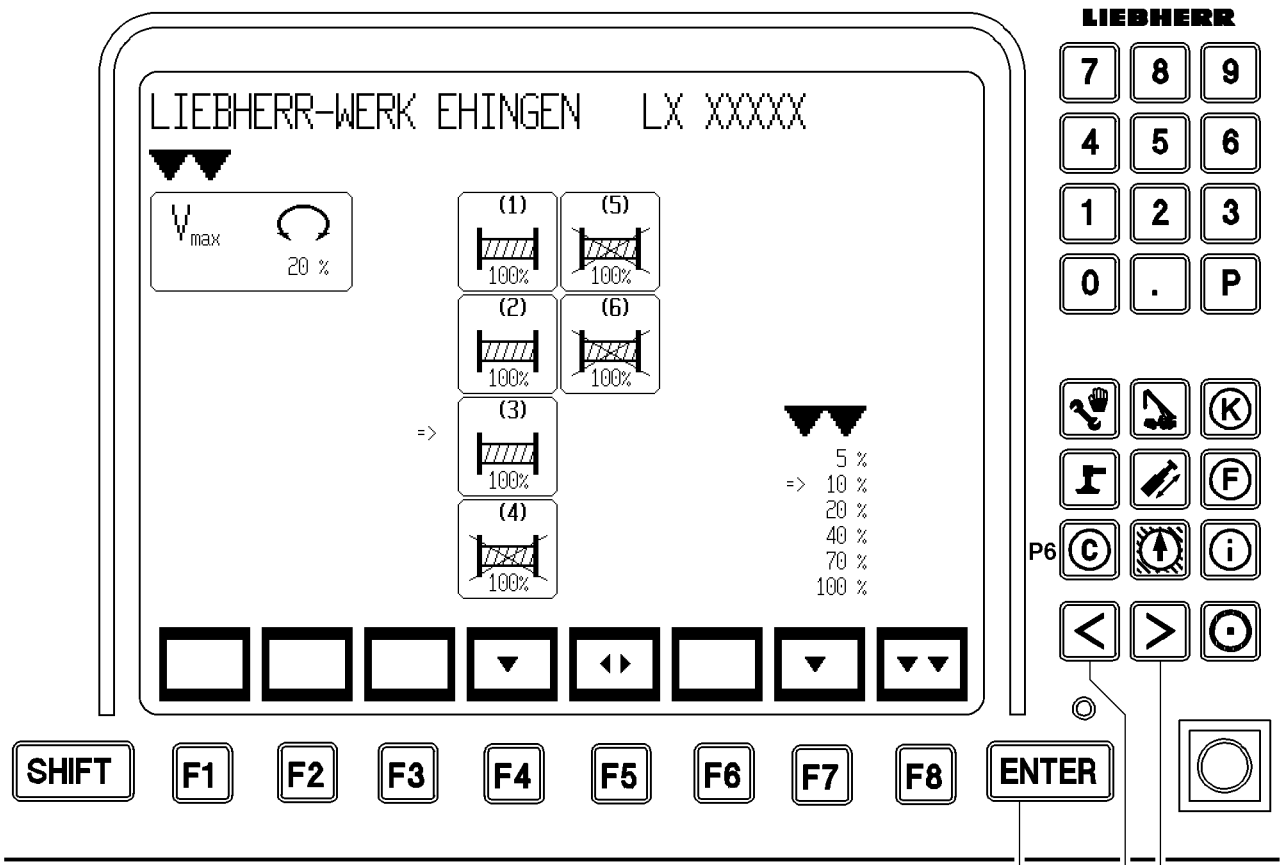
▶ There is **no** acoustical signal “Horn” on monitor 1.

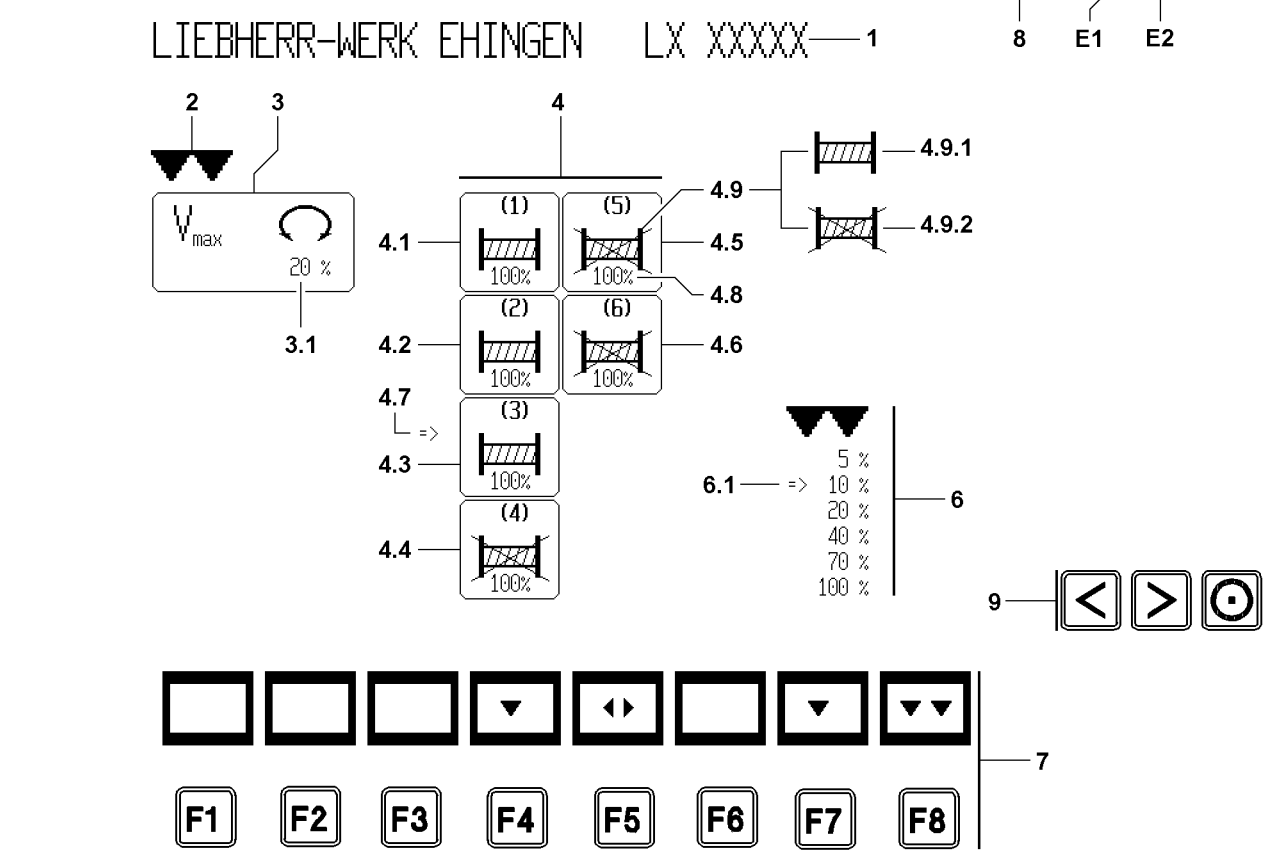
“Short horn” on monitor 1

- Sounds in addition to the visual display of error messages without an error number and which do not lead directly to crane movement shut off by the LICCON overload protection.
  “Short horn” is a beeping sound that lasts for approximately 0.1 seconds and is repeated in one second rhythm.
- **The following errors are monitored:**
  - Prewarn threshold of test point 1 - minimum force has been reached

Priority and “Horn off”

- The “Horn” alarm has higher priority than the “Short horn” alarm, i.e. “Horn” takes preference over “Short horn”.
- The “Horn”, as well as the “Short horn” of the monitor 1 may be turned off by function key **F8**.
- **Note:**
  The “Horn”, as well as the “Short horn” immediately become active again if an error recurs.


LIEBHERR
LIEBHERR-WERK EHINGEN LX XXXXX
Vmax
20 %
(1) 100%
(5) 100%
(2) 100%
(6) 100%
(3) 100%
(4) 100%
=>
5 %
=> 10 %
20 %
40 %
70 %
100 %
7 8 9
4 5 6
1 2 3
0 . P
P6
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR-WERK EHINGEN LX XXXXX
1
2
3
4
Vmax
20 %
3.1
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
4.9.1
4.9.2
6
6.1
5 %
=> 10 %
20 %
40 %
70 %
100 %
7
8
9
E1
E2
F1 F2 F3 F4 F5 F6 F7 F8

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9 “Control parameter” program

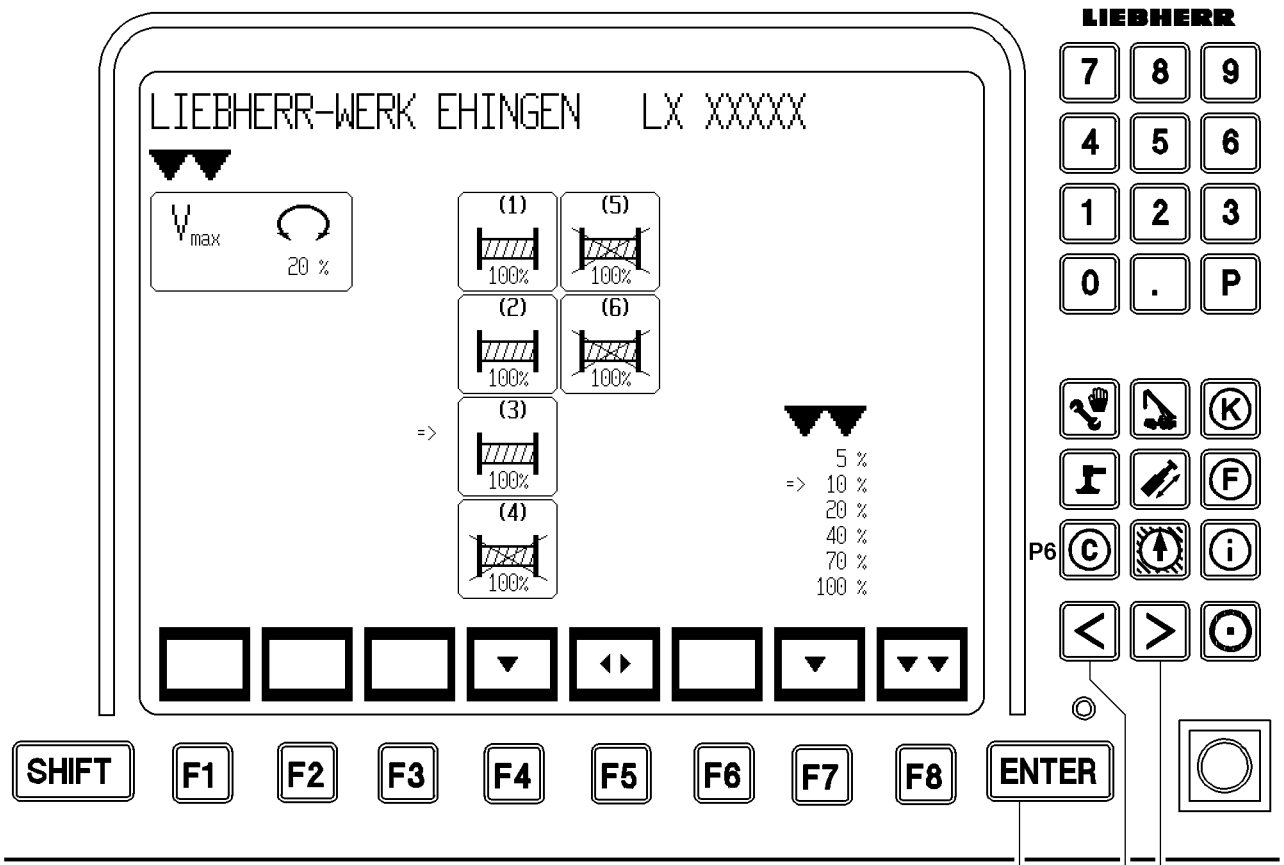
The “Control parameter” program offers the following possibilities:
– Preselection of maximum rotation speed of slewing gear
– Preselection of maximum rotation speed of individual winches
– Activation / deactivation of individual winches

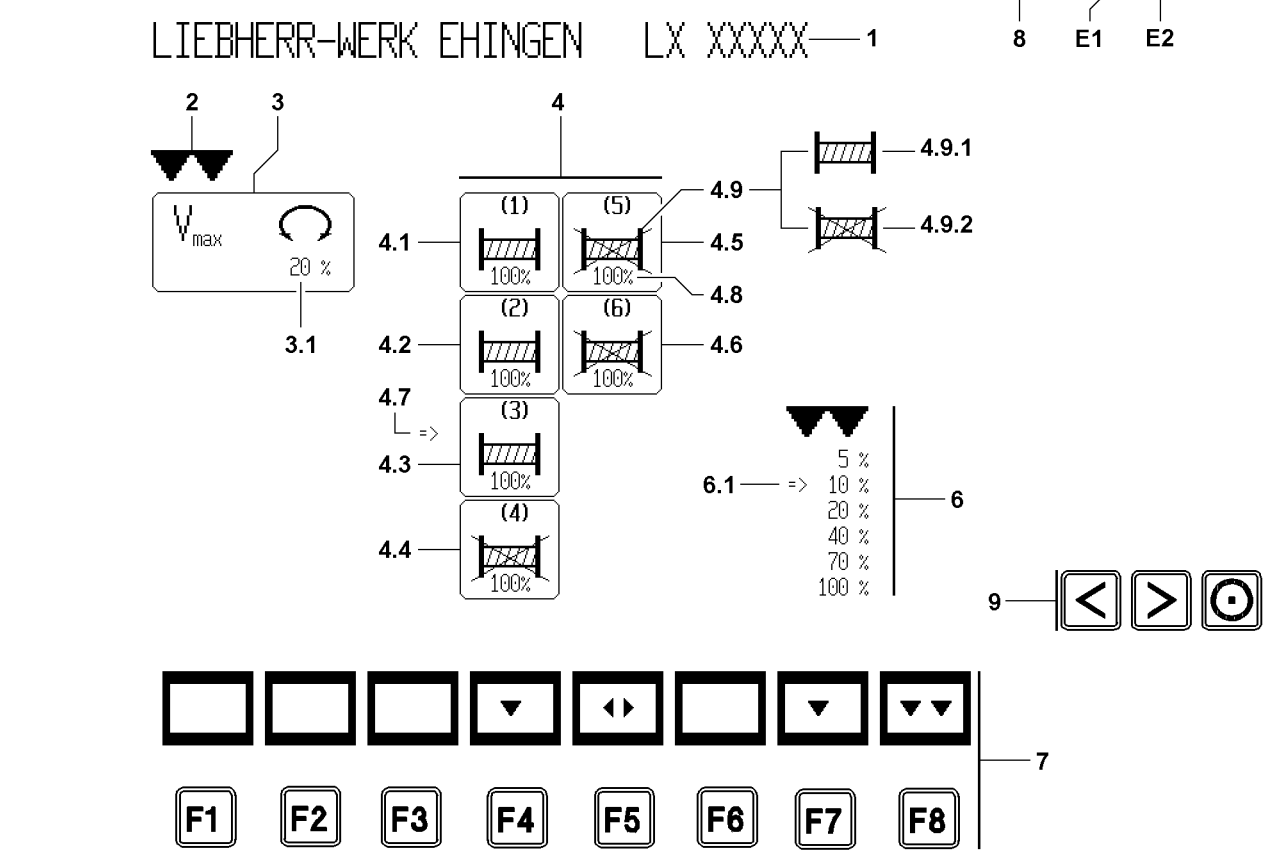
The assembly and bypass switches are monitored during the “Control Parameter” program. If one of these switches is activated during the program, the system immediately switches back to the “Crane operation” program.

DANGER
Risk of accident!
▶ **Never** change the speeds or the activation / de-activation of the winches during a crane movement.

9.1 Starting the program

▶ Press program key **P6**

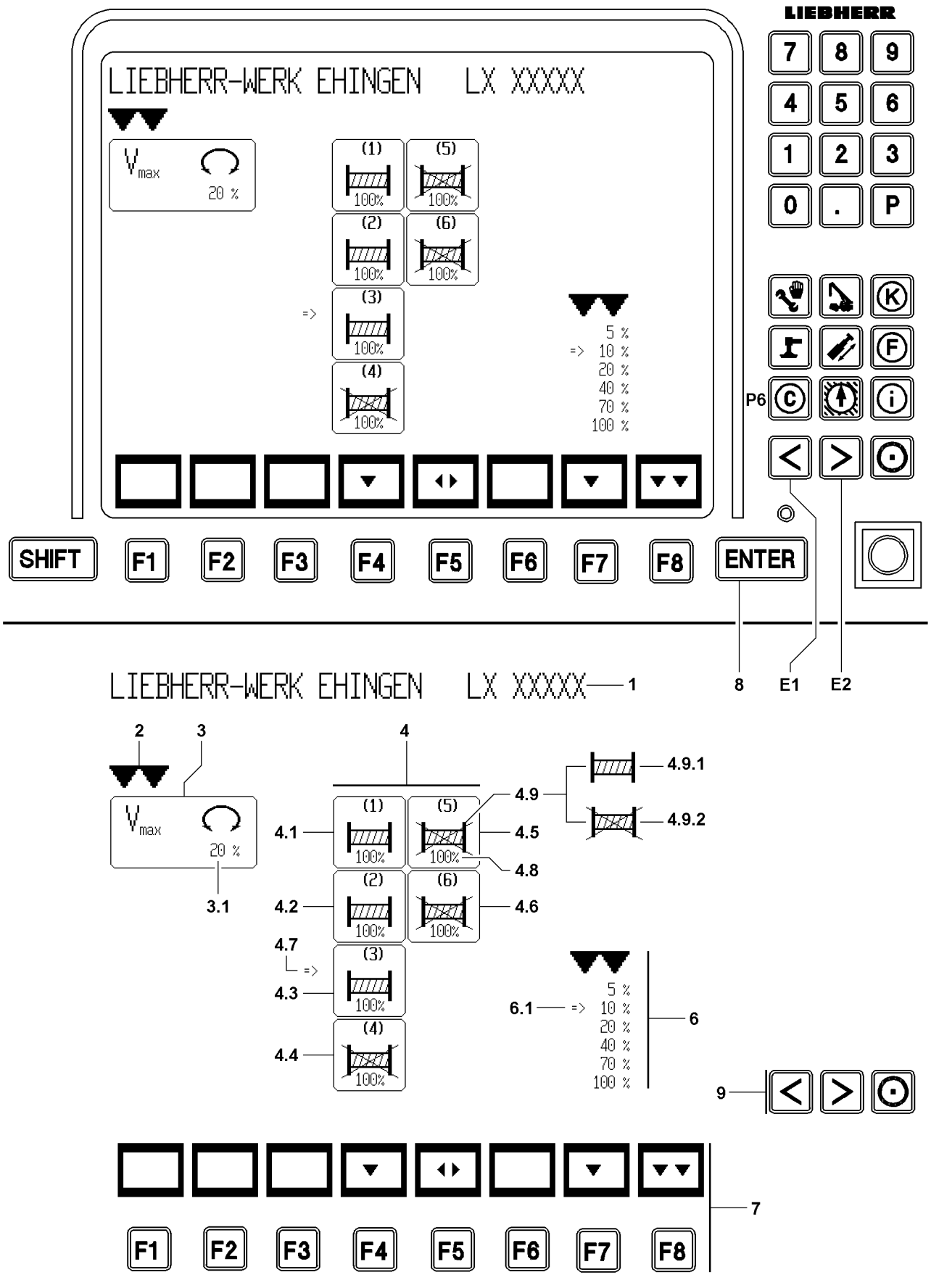

LIEBHERR
LIEBHERR-WERK EHINGEN LX XXXXX
Vmax
20 %
(1) 100%
(5) 100%
(2) 100%
(6) 100%
(3) 100%
(4) 100%
=>
5 %
=> 10 %
20 %
40 %
70 %
100 %
7 8 9
4 5 6
1 2 3
0 . P
P6
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR-WERK EHINGEN LX XXXXX
1
8
E1
E2
2
3
4
Vmax
20 %
3.1
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
4.9.1
4.9.2
6.1
6
9
7
F1
F2
F3
F4
F5
F6
F7
F8

B105271

9.2 User interface

1	Crane type	
2	Selector “icon selection”	• Double arrow pointing down • Select icon
3	“Slewing gear” icon	
3.1	“Maximum rotation speed”	• V_{max} in [%]
4	“Winches” icon group	
4.1	Winch 1	
4.2	Winch 2	
4.3	Winch 3*	
4.4	Winch 4	
4.5	Winch 5*	
4.6	Winch 6*	
4.7	Winch selector	• Arrow to the right. • Select the winch, which “properties” are to be changed.
4.8	Speed	• In [%] • See value field with selector
4.9	Winch icon	
4.9.1	Winch activated	
4.9.2	Winch deactivated	
6	Value field with selector	• The percentage values relate to the speed with maximum deflection of the manual control lever, always in relation to the maximum achievable speed of the drive, with 100% preselected speed. Six stages may be preselected.
6.1	Speed selector	• Arrow to the right. • Select percentage value(s) for speed stages
7	Function key line	
F4	Function key	• Select winch
F5	Function key	• Activate / deactivate selected winch(es)
F7	Function key	• Select percentage value of corresponding speed in value field
F8	Function key	• Return to the “Crane operation” program and take over parameter
8	ENTER key	• Take over the selected speed setting for the preset functions
9	Special function keys	
E1	Special function key	• Move the selector **2** for selecting icons to the left
E2	Special function key	• Move the selector **2** for selecting icons to the right


LIEBHERR
LIEBHERR-WERK EHINGEN LX XXXXX
Vmax
20 %
(1) 100%
(2) 100%
(3) 100%
(4) 100%
(5) 100%
(6) 100%
=>
5 %
=> 10 %
20 %
40 %
70 %
100 %
7 8 9
4 5 6
1 2 3
0 . P
P6
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
8 E1 E2
1
2 3 4
3.1
4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.9.1 4.9.2
6.1 6
9
7

B105271

9.3 Changing the maximum rotation speed of slewing gear

DANGER
Risk of accident!
- ▶ Always adhere to the maximum speeds relative to the boom length and the operating modes during crane operations with loads (according to load charts)!
- ▶ The greater the boom length, the heavier the equipment and the greater the load, the smaller the set “maximum rotation speed”.
- ▶ **Never** deflect the master switch for the slewing gear to the stop at maximum load.

▶ Use the special function key **E1** or special function key **E2** to select the “slewing gear” icon **3**.

Result:
– Selector (double arrow down) **2** appears above the icon “slewing gear” **3**.

▶ 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 “maximum rotation speed selected”.

Result:
– The value of the “maximum rotation speed” is shown in the icon and taken over into the control.

9.4 Winches

9.4.1 Changing maximum winch speed

▶ Using the special function key **E1** or special function key **E2**, select the icon group “winches” **4**.

Result:
– Selector (double arrow down) **2** appears above the icon group “winches”.

▶ With the function key **F4**, select the icon for “winch 1”, **or** “winch 2”, **or** “winch 3” *, **or** “winch 4”, **or** “winch 5”, * **or** “winch 6” *.

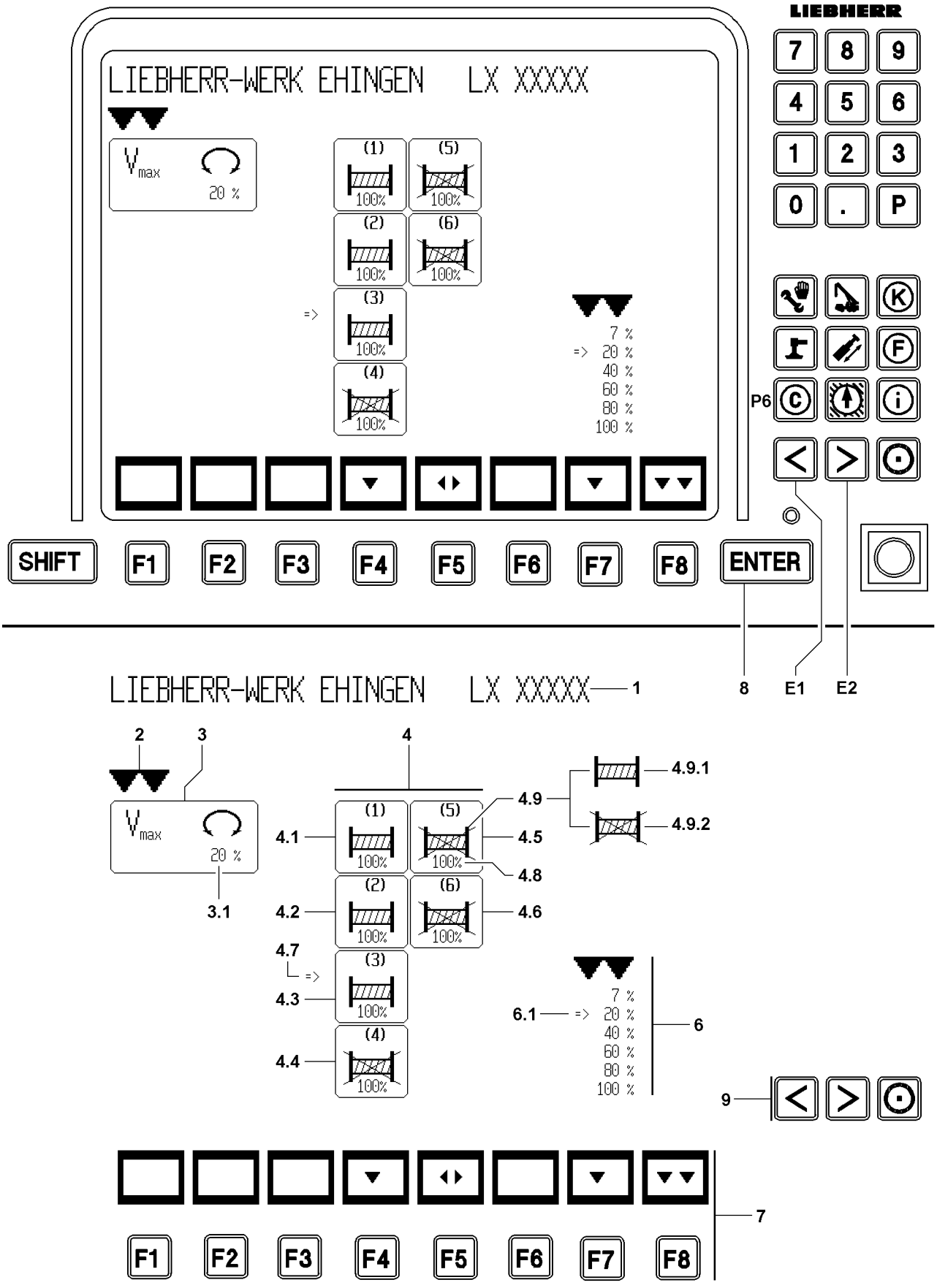
Result:
– Selector (arrow to right) **4.7** shows the selected winch.

▶ Select the “maximum winch 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 winch speed”.

Result:
– The value of the “maximum winch speed” is shown in the icon and taken over into the control.


LIEBHERR-WERK EHINGEN LX XXXXX
V max
20 %
(1)
(2)
(3)
(4)
(5)
(6)
100%
=>
7 %
=> 20 %
40 %
60 %
80 %
100 %
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
P6
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
LIEBHERR-WERK EHINGEN LX XXXXX
1
8 E1 E2
2 3 4
3.1
4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.9.1 4.9.2
6.1 6
9
7
F1 F2 F3 F4 F5 F6 F7 F8

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9.4.2 Activating / deactivating individual winches

In order to prevent unintentional activation of a winch that is currently not required, de-activate individual winches.

▶ Using the special function key **E1** or special function key **E2**, select the icon group “winches” **4**.

Result:

– Selector (double arrow down) **2** appears above the icon group “winches”.

▶ With the function key **F4**, select the icon for “winch 1”, **or** “winch 2”, **or** “winch 3” *, **or** “winch 4”, **or** “winch 5”, * **or** “winch 6” *.

Result:

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

▶ Using the function key **F5**, activate or deactivate the selected winch.

Result:

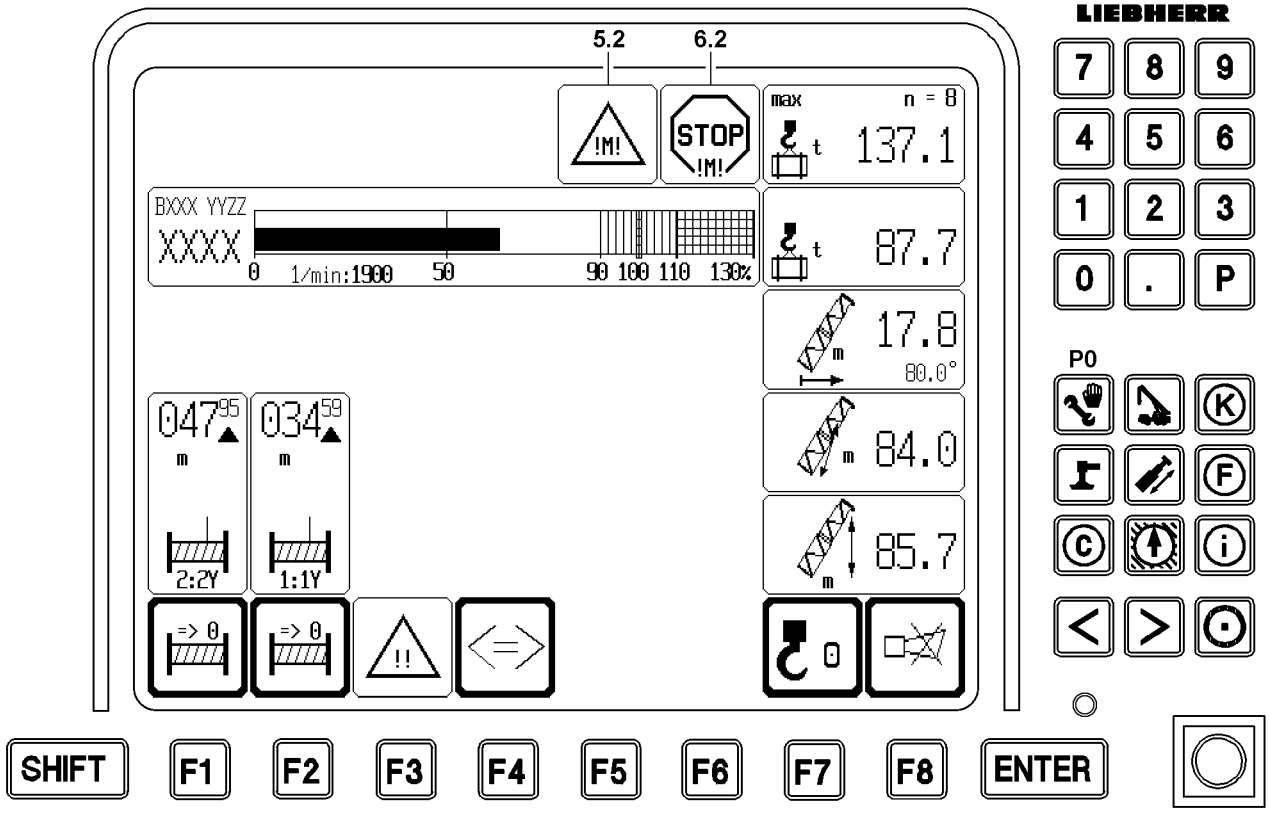
– The winch icon in the icon changes the appearance.
  • Winch icon not crossed out = winch activated **4.9.1**
  • Winch icon crossed out = winch deactivated **4.9.2**

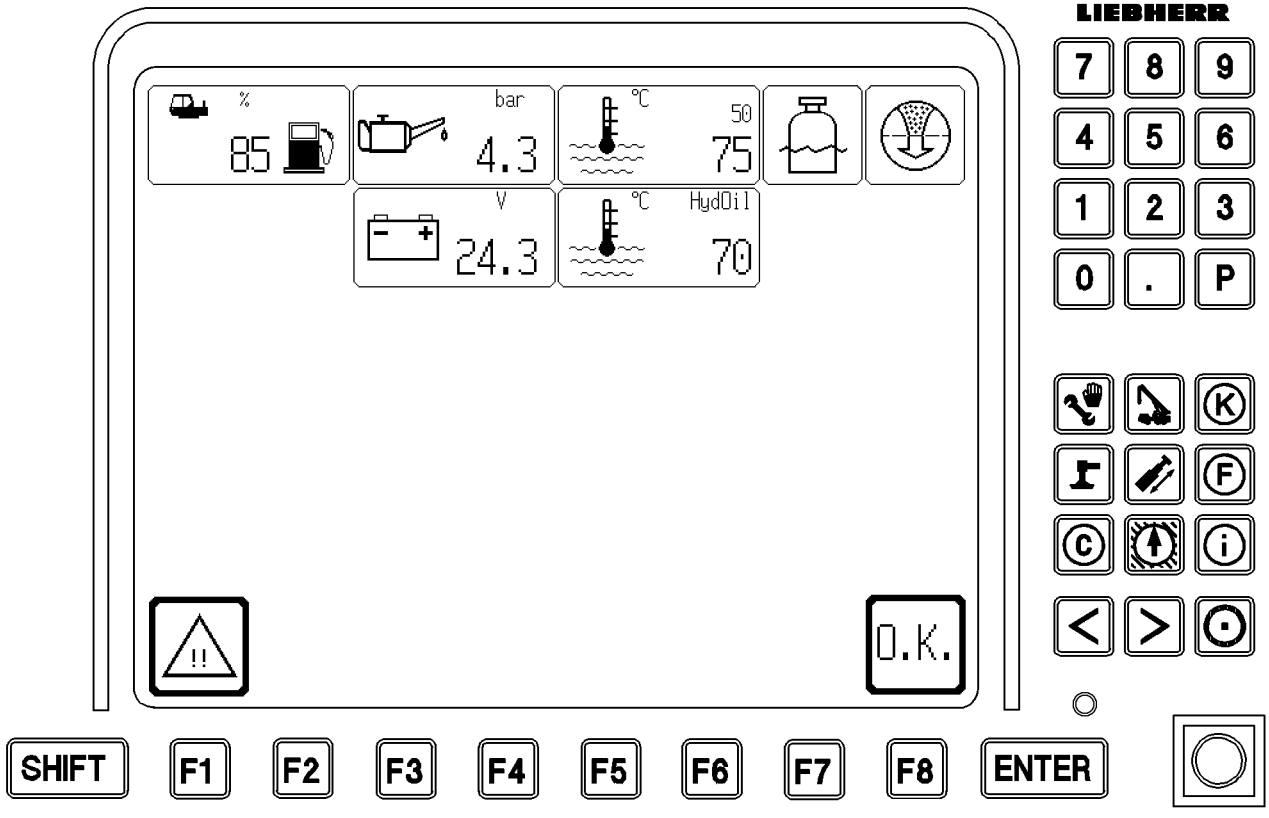
9.5 Switching back to the “Crane operation” program

▶ Press the function key **F8**.

Result:

– The parameters previously confirmed with the ENTER key **8** will be taken over into the control.


5.2
6.2
!M!
STOP
!M!
max
n = 0
137.1
BXXX YYZZ
XXXX
0
1/min:1900
50
90 100 110 130%
87.7
17.8
80.0°
047 95
034 59
m
2:2Y
1:1Y
84.0
85.7
=> 0
=> 0
!!
0
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
P0
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


%
85
bar
4.3
°C
50
75
V
24.3
°C
HydOil
70
!!
O.K.
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B105247

10 The “Engine monitoring” program

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

10.1 Starting the program

The program starts automatically:

▶ Once if a STOP event of the engine monitoring takes place during crane operations (at least one master switch is deflected or activated). The engine monitoring screen is displayed for approx. 5 seconds and then automatically reverts to the crane operating screen.

or

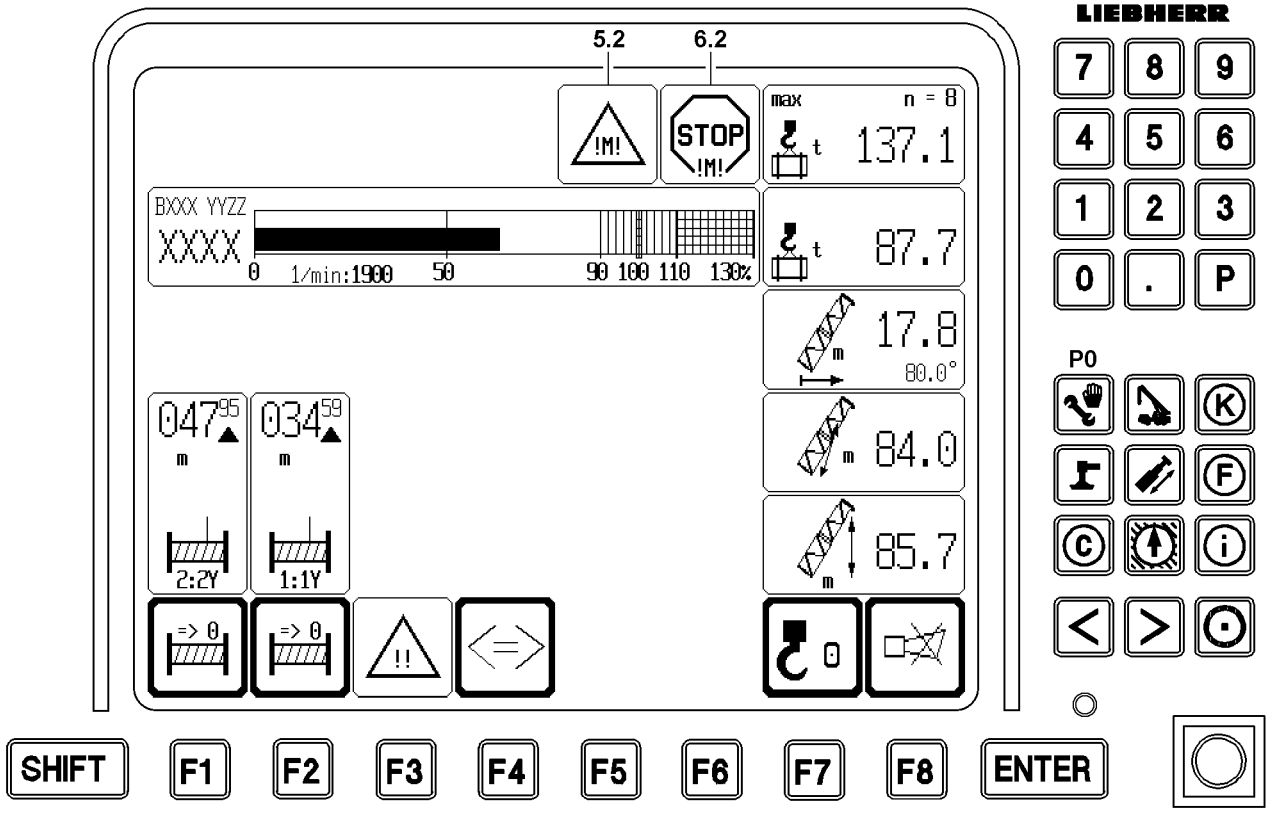
- At an advanced warning, warning or STOP event of the engine monitoring during the start-up of the LICCON computer system.

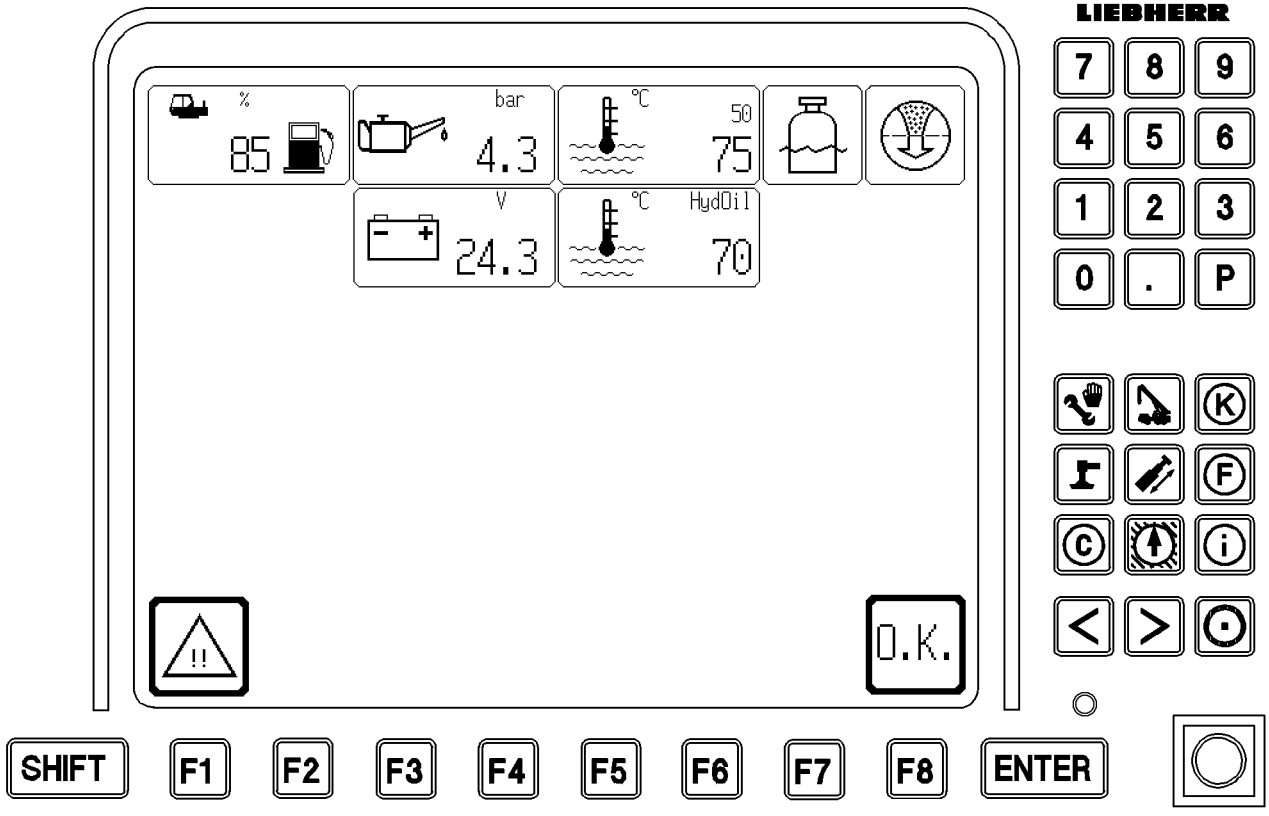
This is how you start the program on request:

▶ Press the key combination **SHIFT** and **P0** (Configuration).

Result:

– The engine monitoring screen is held.
– All **load moment increasing** crane movements are blocked or turned off.


LIEBHERR
5.2
6.2
!M!
STOP
!M!
max
n = 0
137.1
BXXX YYZZ
XXXX
0
1/min:1900
50
90 100 110 130%
87.7
17.8
80.0°
047 95
034 59
m
2:2Y
1:1Y
84.0
85.7
=> 0
=> 0
!!
0
7 8 9
4 5 6
1 2 3
0 . P
P0
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

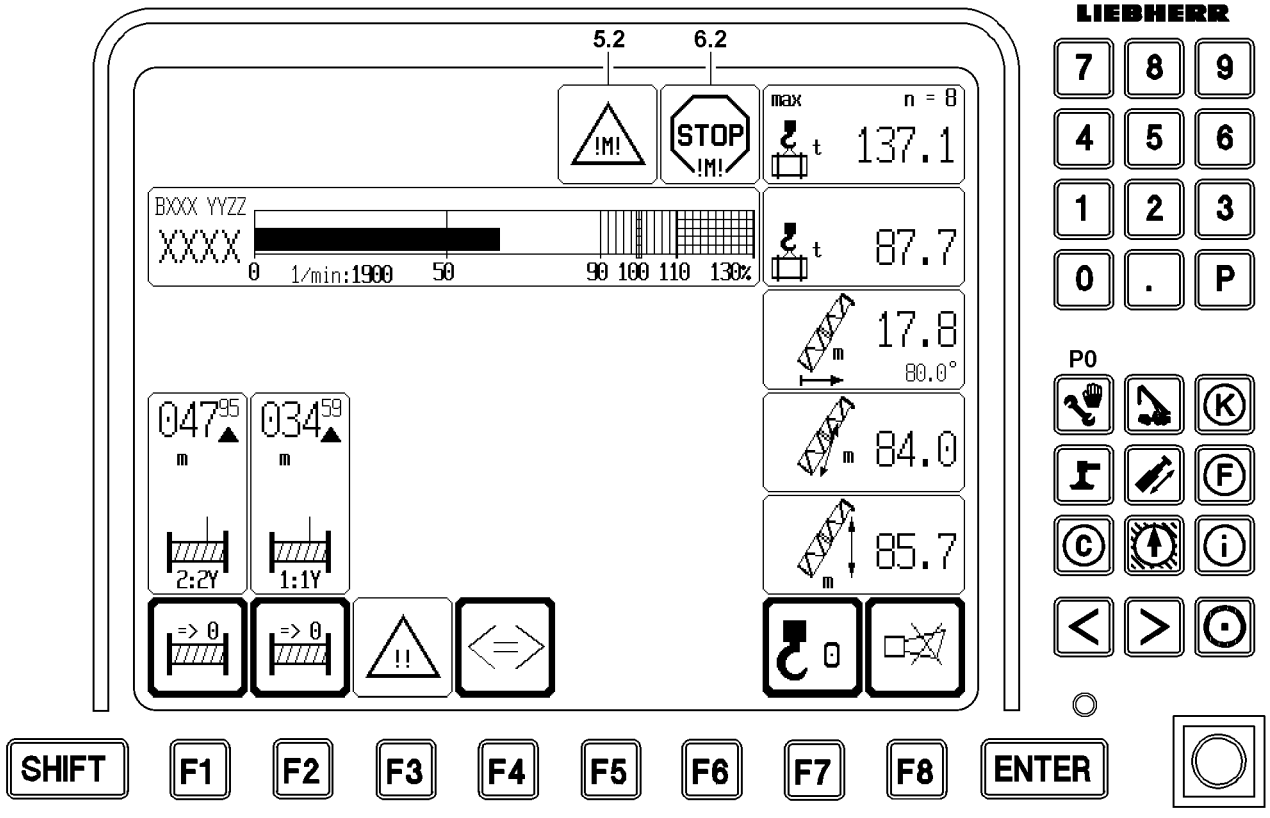

LIEBHERR
%
85
bar
4.3
°C
50
75
V
24.3
°C
HydOil
70
!!
O.K.
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

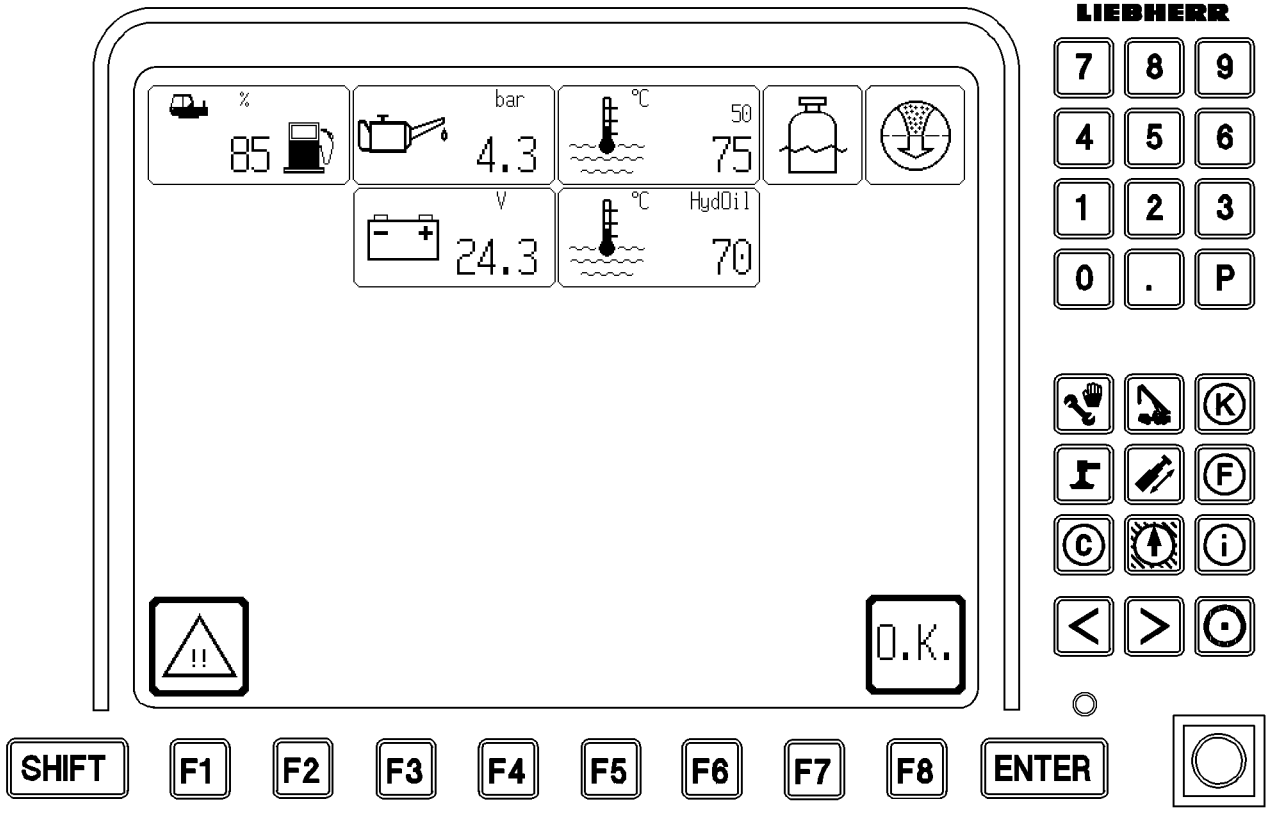
B105247

10.2 Possible engine monitoring advanced warning, warning and STOP events

Events	Advance warning	Warning 5.2	STOP 6.2
Engine oil pressure (display value) missing		x	
Erroneous engine oil pressure (display value)		x	
Engine oil pressure warning active			x
Coolant / charge air temperature (display value) missing		x	
Erroneous coolant / charge air temperature (display value)		x	
Coolant / charge air temperature warning active			x
Coolant level warning active			x
Hydraulic oil temperature (display value) missing	x		
Erroneous hydraulic oil temperature (display value)	x		
Hydraulic oil temperature (display value) too high		x	
Air filter monitoring		x	
Battery voltage (display value) missing	x		
Erroneous battery voltage (display value)	x		
Battery voltage not between 16 V and 36 V	x		
Fuel reserve (display value) missing	x		
Erroneous fuel reserve (display value)	x		
Fuel reserve (display value) 10 % or less	x		
Fuel reserve (display value) 6 % or less		x	
Fuel reserve (display value) 1 % or less			x

If the system automatically switches to the “Engine monitoring” program when an engine STOP event occurs, there is an option for retaining the engine monitoring screen within 5 seconds (retaining the engine monitoring screen is achieved by pressing the function key **F1**). Switch back to the operating screen using the function key **F8** (OK) or the program key **P1** (crane operation). If the engine monitoring screen is **not** retained, then after 5 seconds the system switches back automatically to the “Crane operation” program.


LIEBHERR
5.2
6.2
!M!
STOP
!M!
max
n = 0
137.1
BXXX YYZZ
XXXX
0
1/min:1900
50
90 100 110 130%
87.7
17.8
80.0°
047 95
034 59
m
2:2Y
1:1Y
84.0
85.7
=> 0
!!
0
7 8 9
4 5 6
1 2 3
0 . P
P0
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
%
85
bar
4.3
°C
50
75
V
24.3
°C
HydOil
70
!!
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

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10.3 Retaining the engine monitoring screen

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

If you confirm a monitoring event in the engine monitoring screen with the function key **F8**, then there will be **no** automatic change over to the engine monitoring screen for the same event.

When switching back to the “Crane operation” program, the STOP icon **6.2** or the Advanced warning icon **5.2** appears. Advanced warnings are **not** pointed out in the “Crane operation” program.

NOTICE

Danger of severe engine damage due to disregard of STOP occurrences!

If other programs are used for extended periods of time, for example the “Configuration”, 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!
- ▶ In case of an active engine STOP event, turn the engine off immediately!

▶ Press the function key **F1**.

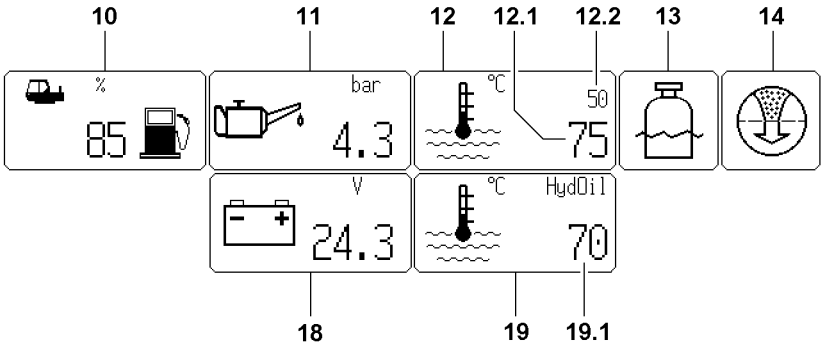
Result:

– Icon frames are displayed with a thin border.
– All load moment increasing crane movements will be turned off or blocked.

▶ Press the 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.


10
11
12
12.1
12.2
13
14
%
85
bar
4.3
°C
50
75
V
24.3
°C
HydOil
70
18
19
19.1


!!


O.K.

B199924

10.4 Engine monitoring icons

10.4.1 Crane 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 flashes if the coolant temperature is too high
12.2	Charge air temperature	• Numeric display blinks if the charge air temperature is too high
13	Coolant level too low	• Icon appears if the coolant level is too low
14	Air filter is dirty	• Icon appears if air filter is dirty
18	Auxiliary function - Battery voltage	• In [V] Numeric display in icon blinks if the operating voltage is less than 16 volts or above 36 volts
19	Hydraulic oil temperature	• In [°C]
19.1	Hydraulic oil temperature	• Numeric display blinks if the hydraulic oil temperature is too high

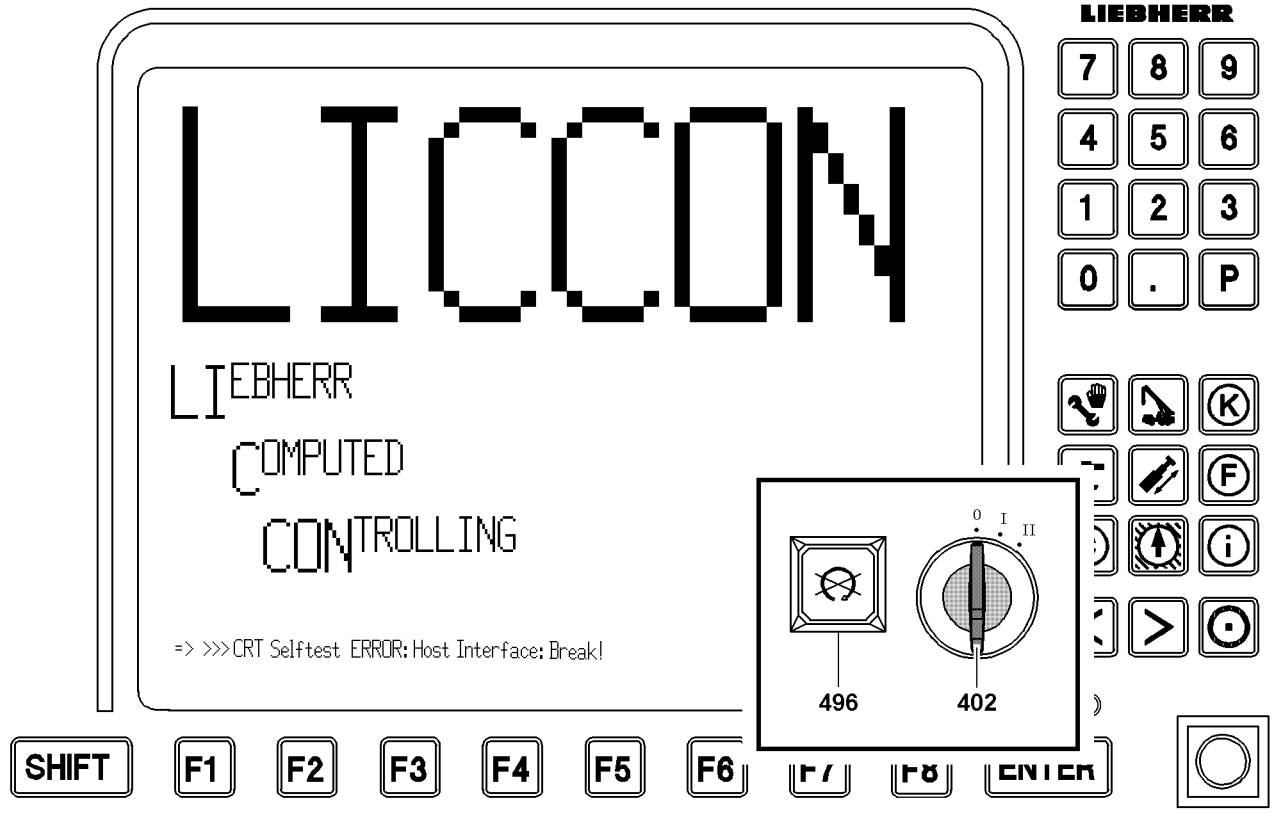
10.5 Function key line

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

Note

▶ The function keys **“F2”** - **“F7”** are **not** used.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
LICCON
LIEBHERR
COMPUTED
CONTROLLING
STANDBY
OFF !
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> >>>CRT Selftest ERROR: Host Interface: Break!
0 I II
496
402
SHIFT F1 F2 F3 F4 F5 F6

B105190

11 LICCON computer system in stand-by mode

11.1 Starting LICCON computer system in stand-by mode

There are two ways of achieving stand-by mode with the LICCON computer system.

Starting the LICCON computer system without the engine running:

▶ Turn the ignition switch **402** to position “I” and leave it there.

Result:

– The LICCON computer system runs and the LICCON monitor shows the configuration screen, or alternatively for a stop/warning/advanced warning, the engine monitoring screen.

▶ Press function key **F8** (O.K.).

Result:

– System switches to the “Crane operation” program.

Turning off the running engine with the engine stop key:

▶ Press the button **496**.

▶ Leave the ignition switch **402** in position “I”.

Result:

– The engine is turned off, the LICCON computer system continues to run.

11.2 Active stand-by operation / alarm

The operating programs and the monitor displays function exactly the same as in the turn-on procedure for the LICCON computer system with engine start (crane operation).

No crane movements are possible. If a crane movement is selected anyway, a message appears on the LICCON monitor.

Example: **Control turning shut off, the crane engine is not running.**

The duration of the Stand-by operation is 15 minutes, of which 3 minutes are the Stand-by Alarm. Operating the LICCON computer system during Stand-by operation automatically extends the stand-by time.

▶ In **Stand-by operation no** keys are pressed on the monitor.

Result:

– The stand-by alarm (horn) is reached after 12 minutes.
– This screen appears on the monitor: **STANDBY** (see Fig.).

▶ Now press any key on the LICCON monitor.

Result:

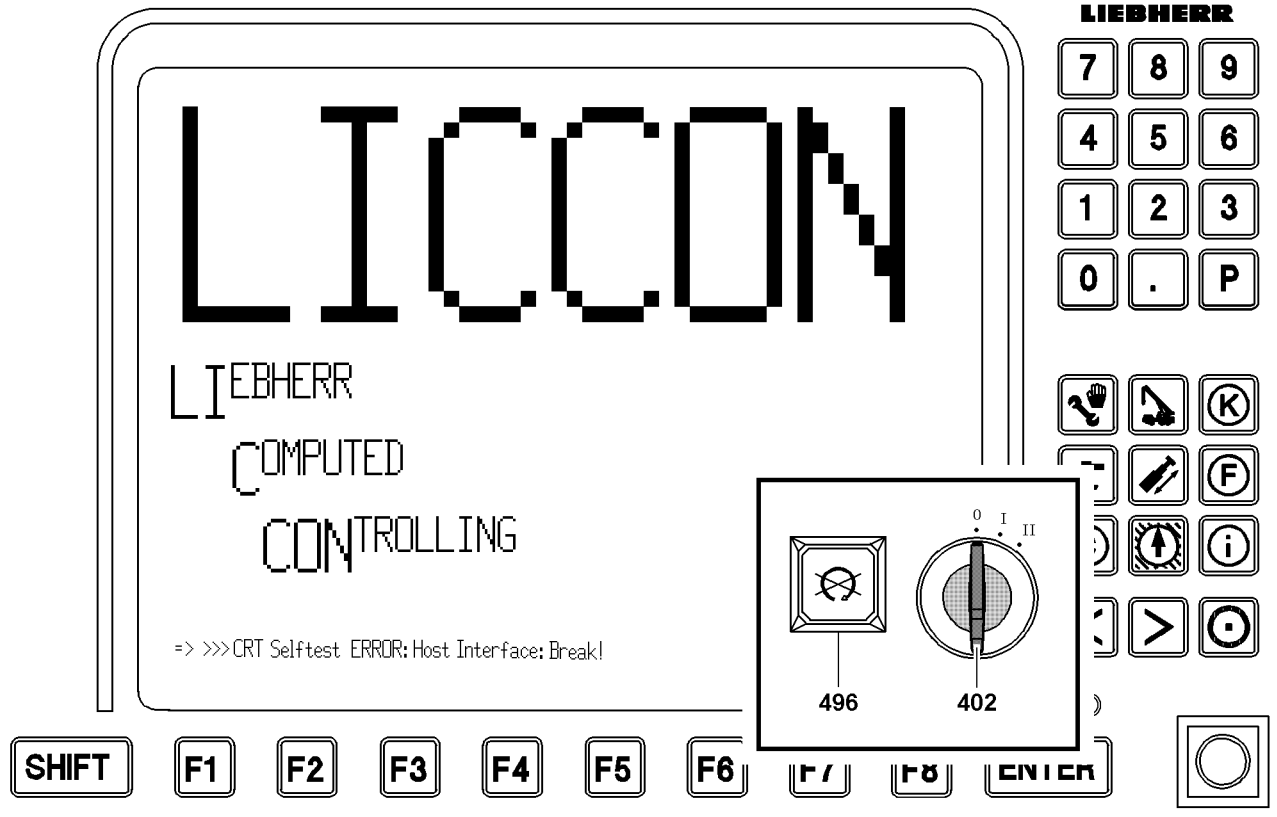
– System switches back to the interrupted program.
– The Stand-by time is extended by a further 15 minutes.

▶ During the **Stand-by Alarm** (Duration: 3 minutes) **no** keys on the monitor are pressed.

Result:

– The LICCON computer system shuts completely off. The shut off is announced by acoustical signals 60 seconds in advance (short horn) and 30 seconds in advance (long horn). The power supply of the LICCON computer system turns off.
– This screen appears on the LICCON monitor: **CRT Selftest ERROR: Host Interface: Break!** (see illustration). 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.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
LICCON
LIEBHERR
COMPUTED
CONTROLLING
STANDBY
OFF !
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> >>>CRT Selftest ERROR: Host Interface: Break!
0 I II
496
402
SHIFT F1 F2 F3 F4 F5 F6

B105190

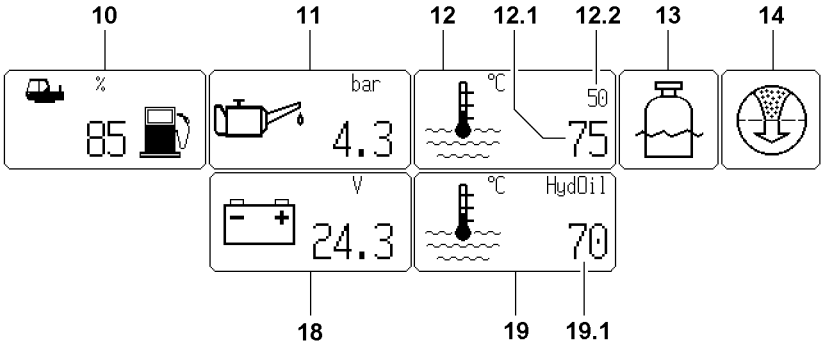
11.3 Start prevention

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

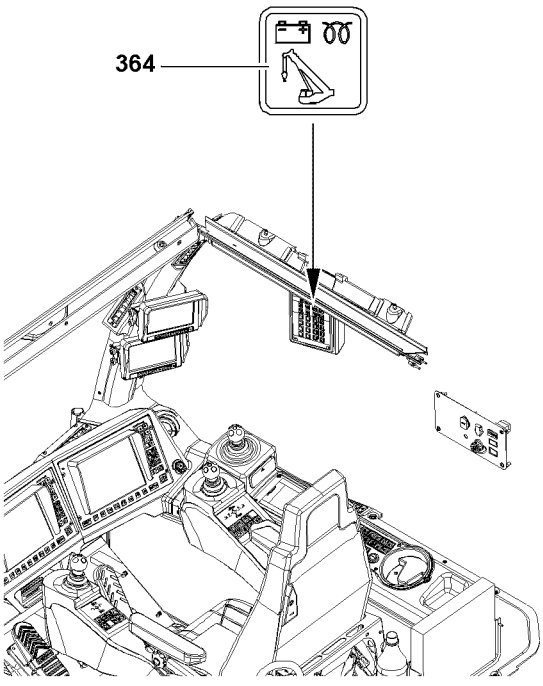
- ▶ Return the ignition switch **402** first to position “0”.
- ▶ Turn the ignition switch **402** to position “I” (note the preheating time).
- ▶ Turn the ignition switch **402** briefly to position “II”.

Result:

– The engine starts.


10
11
12
12.1
12.2
13
14
%
85
bar
4.3
°C
50
75
V
24.3
°C
HydOil
70
18
19
19.1


O.K.


364

B104899

1 Checks before start up

Various checks must be performed before operating the crane.
Make sure that the following prerequisites are met:
– Engine off.
– LICCON computer system in stand-by mode.

Note
▶ LICCON computer system in stand-by mode, see chapter 4.02

1.1 Checking the oil level and filters

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

1.2 Checking the fuel level

Note
Fuel tank empty!
If the fuel tank has been run dry, then the fuel system must be bled.
▶ Refuel in time.

On the LICCON monitor, the amount of fuel left in the tank is shown in the form of a numerical display in percentages [%], see icon **10**.
▶ Check the tank contents on LICCON monitor.

1.3 Checking the coolant level

For detailed description of lubricants and fill quantities, see chapter 7.06 and chapter 7.07.

WARNING
Danger of burns due to hot coolant!
Coolant at operating temperature is under pressure. If the cooling system is opened, there is the danger of scalding.
▶ Check the coolant level only when the engine is cold.

NOTICE
Property damage due to insufficient cooling!
▶ Check the coolant level.
If the coolant level of the coolant expansion tank falls below the overflow on the filler neck:
▶ Add coolant.

1.4 Checking the central lubrication system

For detailed description of lubricants and fill quantities, see chapter 7.06 and chapter 7.07.

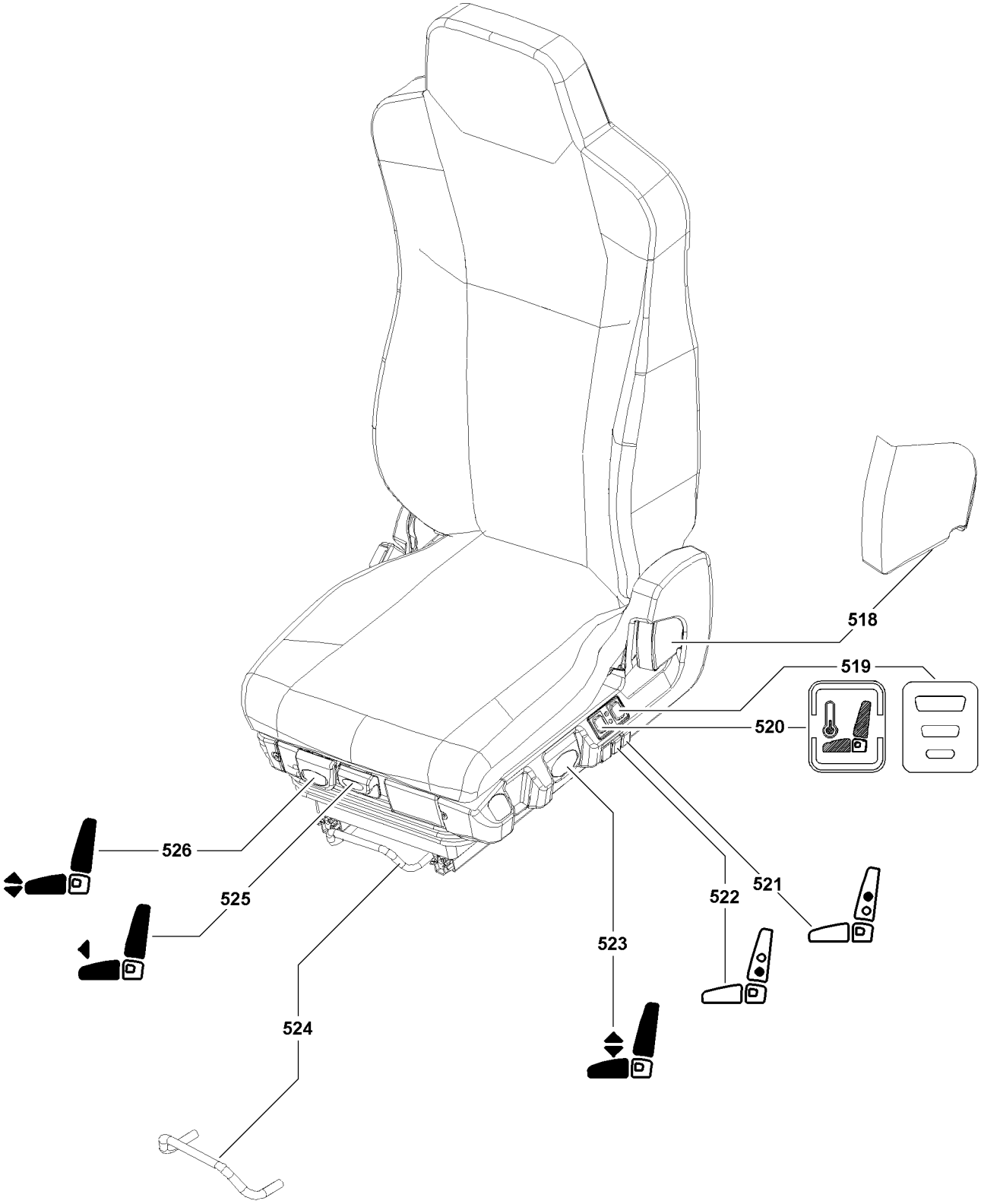
NOTICE
Property damage due to insufficient lubrication!
▶ Check the fill quantity of the grease containers.
If the fill quantity falls below the marked minimum amount:
▶ Fill the grease container with grease.

B195219

1.5 Checking general condition of crane

WARNING
Danger of fatal injuries due to falling parts!
If parts fall from the main boom during erection, personnel can be severely injured or killed.
- ▶ Before erecting the boom: Make sure that there are no loose parts on the boom system, such as pins, spring retainers or ice.
- ▶ Make sure that the cable / rope drum and the limit switches are free of snow and ice.

- ▶ 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.



B104902

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.

Adjust the seat position

- ▶ With the lever **518** adjust the angle of the backrest.
- ▶ With the button **521** adjust the lumbar area support “on top”.
- ▶ With the button **522** adjust the lumbar area support “on the bottom”.
- ▶ With the lever **523** adjust height of seat.
- ▶ Unlock the horizontal seat adjustment with the bar **524**.
- ▶ With the lever **525** adjust the seat cushion by moving it back or forth.
- ▶ With the lever **526** adjust the seat incline.

Turning on the seat heater / air conditioning

The seat heater or air conditioning is turned on and off with the switch **520**.
There are three switch positions:

– Center position: Heater and air conditioning is turned off.
– Pushed on top: Heater turned on (red light).
– Pushed on the bottom: Air conditioning turned on (blue light).

- ▶ Turn the seat heater / air conditioning on with switch **520**.
- ▶ Adjust the fan stage with switch **519**.

2.2 Adjusting the consoles

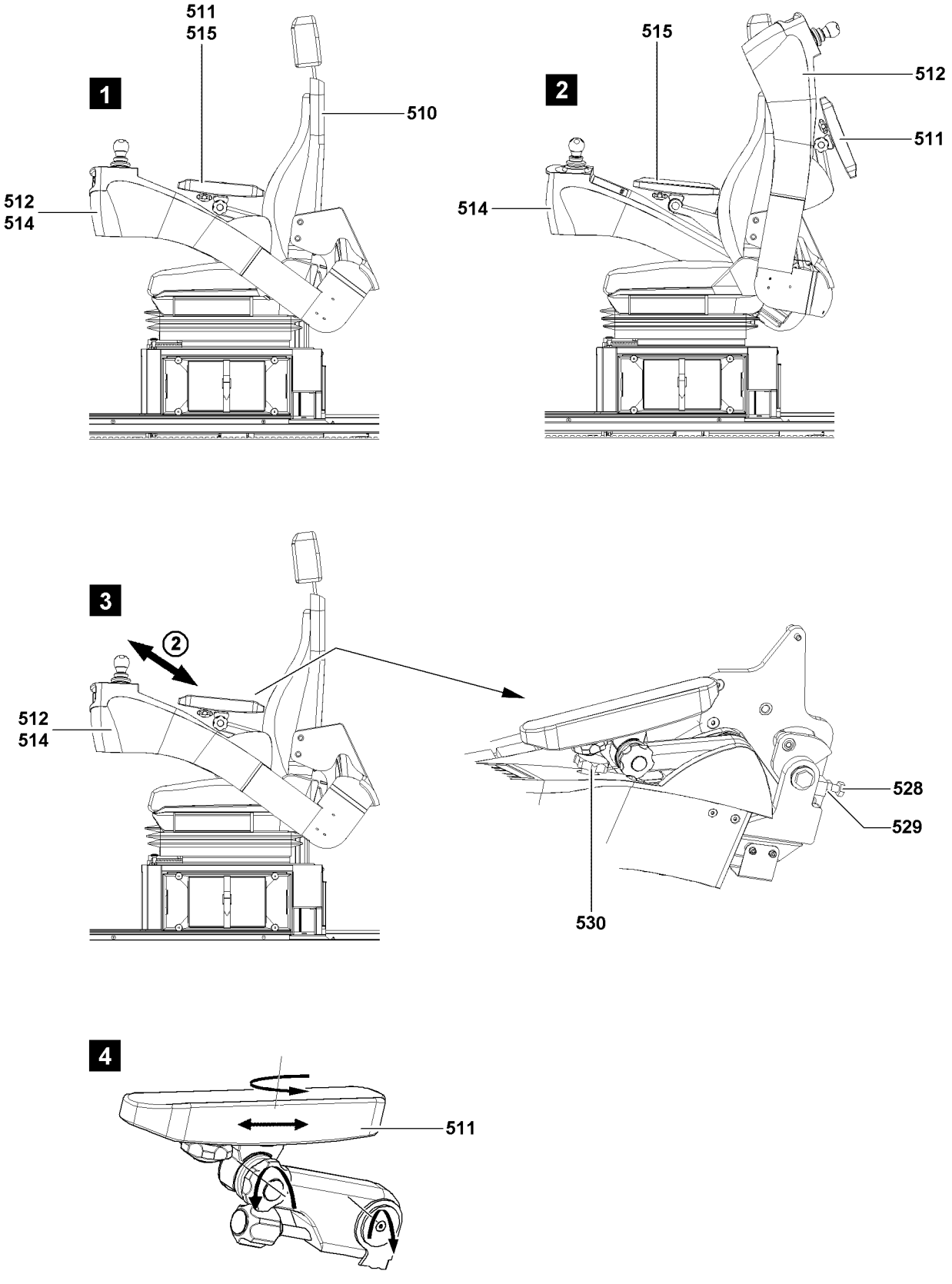
The control platform, with the consoles on the left and right hand side of the crane operator's seat **510** allows the crane operator to adjust the consoles for “crane operation” to suit his body size optimally.

Note

- ▶ The left and right consoles are individually adjustable.

Two different console positions are possible:

– “Crane operating position”
– “Entering / exiting”


1
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515
510
512
514
2
515
512
511
514
3
2
512
514
528
529
530
4
511

B105888

WARNING
Risk of accidents due to folded down console!
If the left console **512** is swung up (position “entering / exiting”), see figure **2**, when driving the crane - specially during severe braking maneuvers - there is an increases risk of accidents as well as a danger of property damage due to uncontrolled “down” or “forward” swing of the consoles.
- ▶ Driving the crane with upward swung consoles is **prohibited**.
- ▶ Before starting to drive, always bring the consoles into “crane operating position”.

You can move the left console from “crane operating mode” to “entering / exiting” position by swinging it up.

Note
- ▶ When swinging the console upward, hold on to it until the end position “entering / exiting” is reached.
- ▶ When the console is swung down, it returns to the previously set “crane operating position”.

The consoles can be adjusted with **one hand**.

2.2.1 Adapting the consoles to the crane operator

Note
- ▶ The consoles can be adjusted to suit the crane operator as described for the left console **512**.

Adjusting the incline
- ▶ Adjust the stop screw **528** until the console has reached the desired incline.
- ▶ Secure the stop screw with the nut **529**.

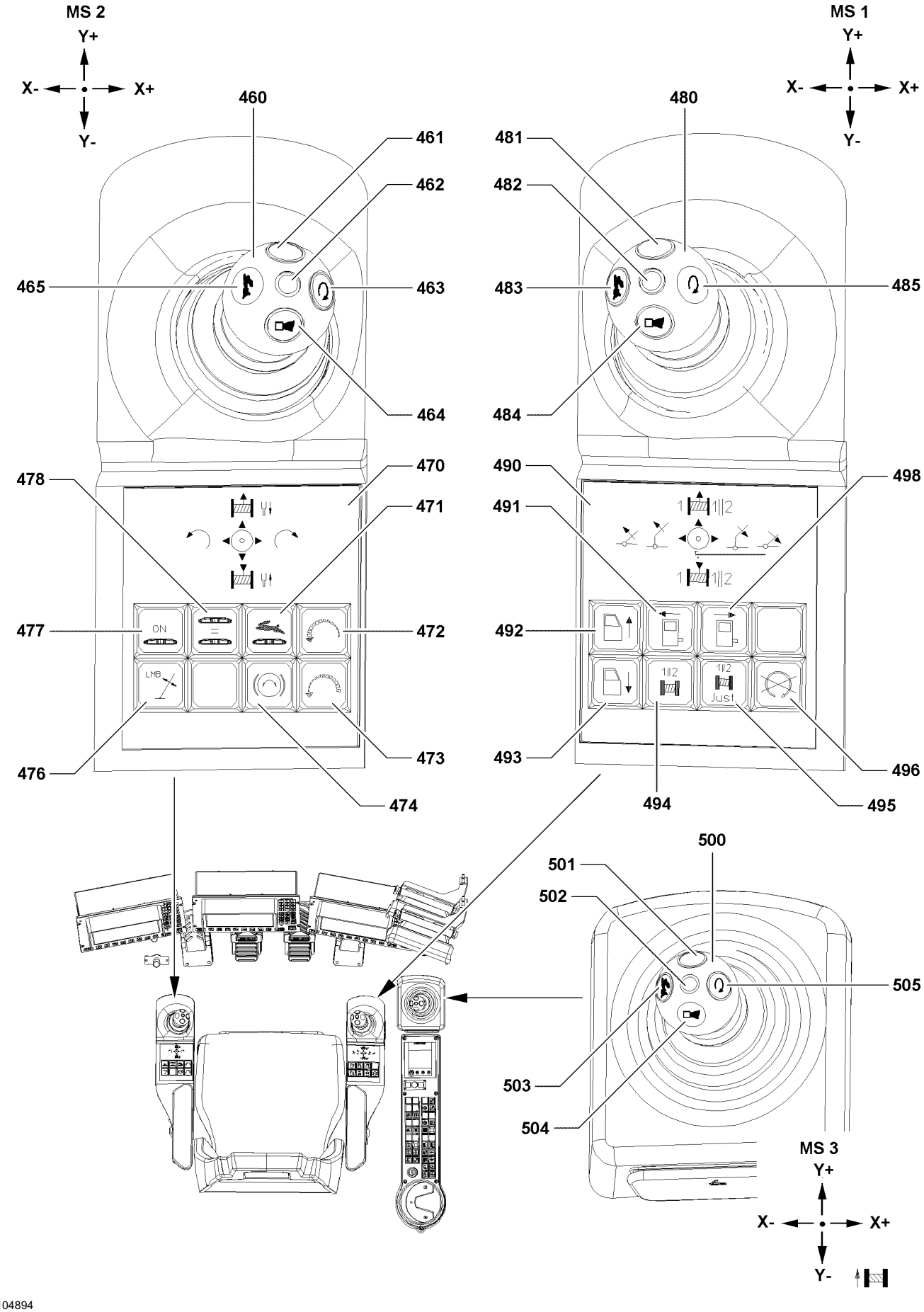
Moving the console horizontally
- ▶ Fold the arm rest up.
- ▶ Loosen the lock screw **530** until the console can be moved.
- ▶ Adjust the horizontal position of the console by moving it back or forth (point **2**).
- ▶ Tighten the lock screw **530**.
- ▶ Fold the arm rest down.

Result:
– The console is adjusted.

2.2.2 Adjusting the arm rests

The left arm rest **512** and the right arm rest **514** offer a multitude of adjustment possibilities, see fig. **4**.

Note
- ▶ To ensure fatigue free and concentrated work with the crane, the arm rests should be adjusted in such a way that you can comfortably reach and operate the master switch.


MS 2
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473
474
MS 1
Y+
X-
X+
Y-
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500
501
502
505
503
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MS 3
Y+
X-
X+
Y-
ON
LMB
Just.
B104894

2.3 Turning the heater and air conditioner on

The crane cab can be heated or ventilated depending on the desired temperature, see detailed description in chapter 6.01.

2.4 Tilting the crane cab

To give the crane driver a better field of view, the cab can be tilted upward.

Note

▶ After ending crane operation: Setting the cab to horizontal position

2.4.1 Tilting cab upward

▶ Press button **492**.

Result:

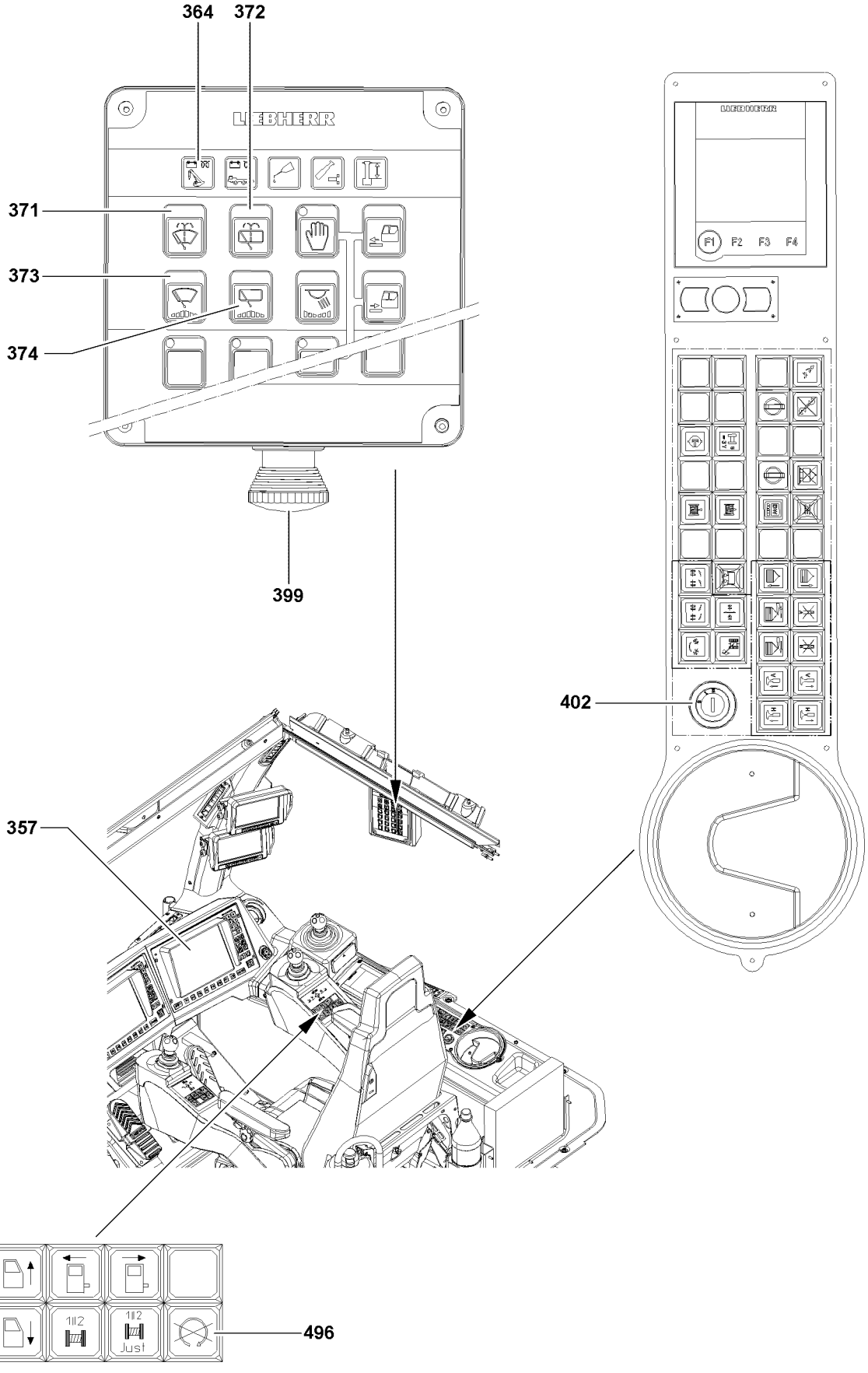
– The cab tilts upward.

2.4.2 Setting the cab to horizontal position

▶ Press button **493**.

Result:

– Cab tilts downward.


364
372
371
373
374
399
402
357
496
F1
F2
F3
F4
Just
B104898

2.5 Operating the windshield wiper / washer system

2.5.1 Operating the windshield wiper

The windshield wipers on the front and roof window can be operated via the function buttons on the operating and control unit. Each window is assigned its own button.

Turning the windshield wiper on

There are four different wipe stages.
Pressing the button **373** or the button **374** (less than 0.5 s) reduces the wiper speed incrementally:

1.) Continuous operation
2.) Intermittent 2
3.) Intermittent 1
4.) Wiper off

A beep sounds in wipe stage “Wiper off”.

▶ To activate the windshield wiper on the front window:
Press the button **373** until the desired wipe stage is reached.

or

To activate the windshield wiper on the roof window:

- Press the button **374** until the desired wipe stage is reached.

Turning the windshield wiper off

▶ In continuous operation:
Press the button **373** or the button **374** for at least one second.

or

- Press the button **373** or the button **374** (less than 0.5 s) until a “beep” sounds.

or

- Turn the ignition switch **402** off.

2.5.2 Operating the windshield washer system

The windshield washer system on the front and roof window can be operated via the function buttons on the operating and control unit. Each window is assigned its own button.

After releasing the button **371** or the button **372**, three additional wipe movements are carried out before the wiper blades return to their original position.
The wiper motor and the water pump run as long as the button **371** or button **372** is pressed down.

▶ To activate the windshield washer system for the front window:
Press button **371**.

or

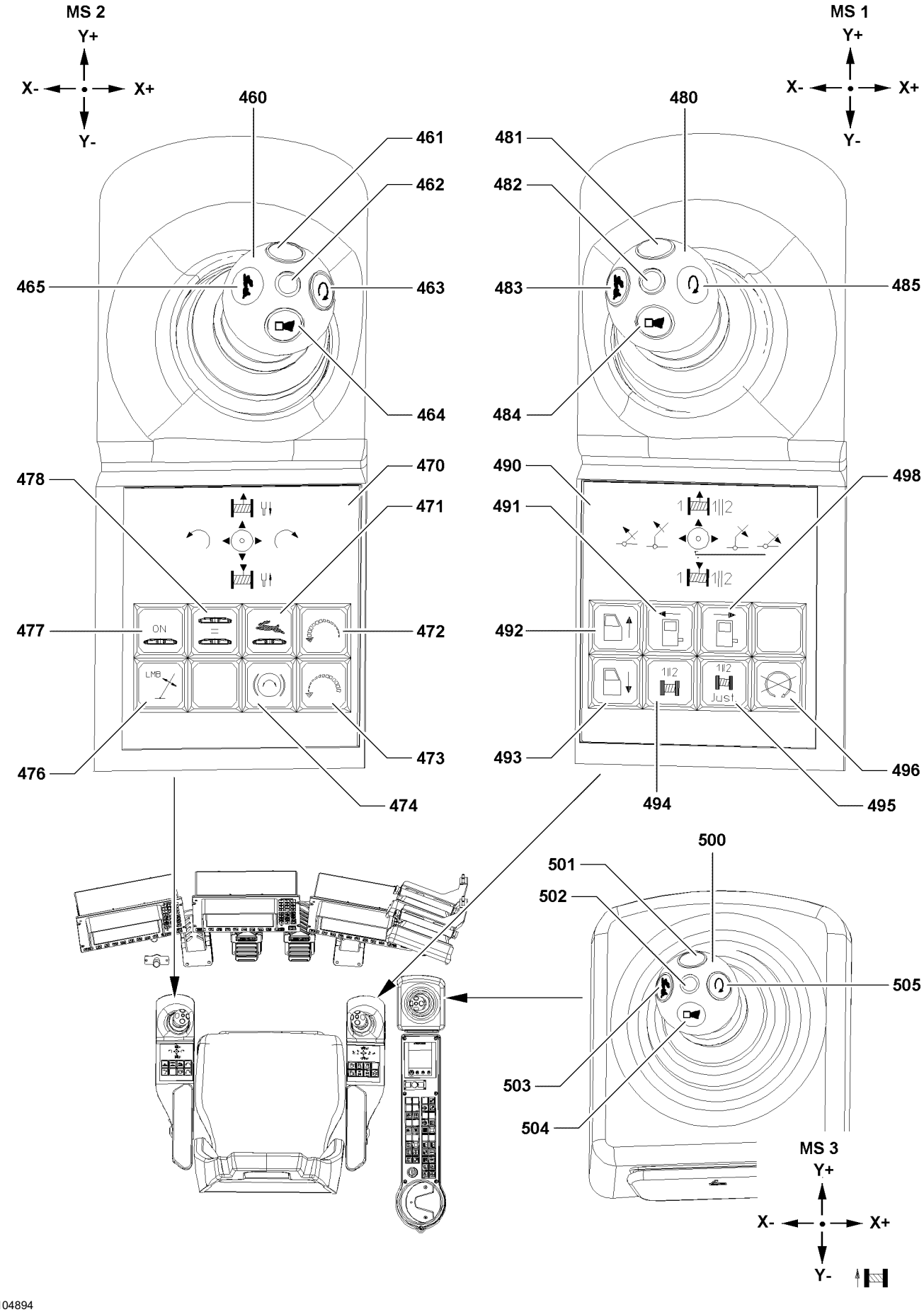
To activate the windshield washer system for the roof window:

- Press button **372**.

2.5.3 Filling the windshield washer system

For the location of the reservoir for the window cleaning fluid, see chapter 4.01.

▶ Before the start of the cold season:
Fill the reservoir for the window cleaning fluid with commercially available antifreeze fluid.


MS 2
Y+
X-
X+
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MS 1
Y+
X-
X+
Y-
480
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482
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485
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498
491
492
493
494
495
496
500
501
502
505
503
504
MS 3
Y+
X-
X+
Y-
ON
LMB
Just.

B104894

2.6 Opening the roof window

CAUTION
Do not jam your hands, danger of injury!
▶ Watch your hands when closing the roof window.

A pair of nitrogen gas cylinders support the lifting movement of the roof window.
▶ To open from inside, just press on the roof window.

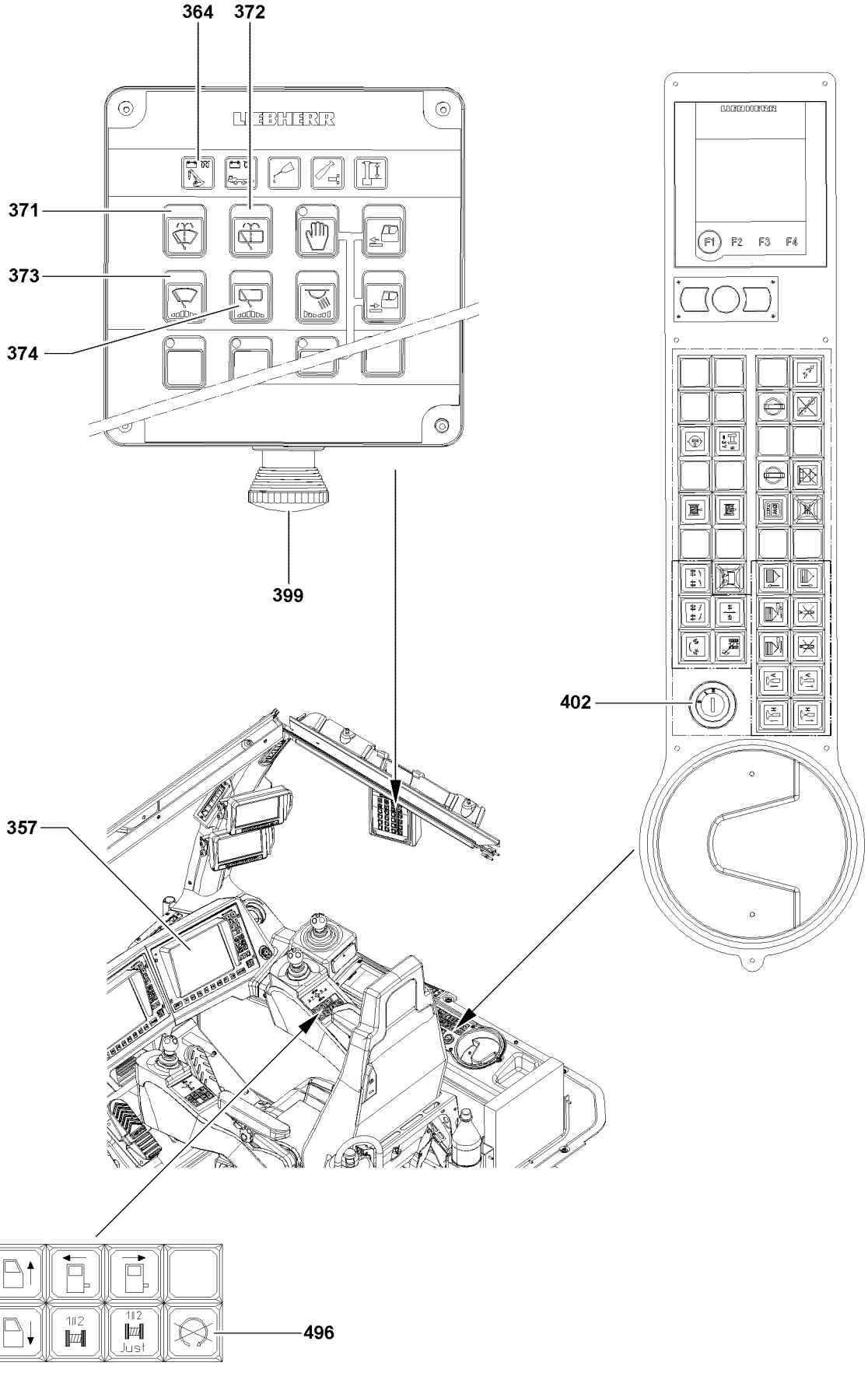
or

If you only want to partly open the window:
■ Use the attached strap to set the desired opening angle.

2.7 Checking the horn

Note
Use of the horn!
▶ Only use the horn only in dangerous situations to maintain its warning effect.

▶ Before starting to work, check that the horn is functioning: Press button **464**, button **484** and button **504**.



B104898

3 Starting and stopping the engine

Note
▶ The engine must be operated according to the separately supplied Engine Operating instructions.

3.1 Starting the engine

▶ Turn the ignition switch **402** to position “I”.

Result:
– The indicator light **364** lights up yellow.
– The engine preheating is active.

NOTICE
Property damage due to insufficient engine preheating!
If the engine is not preheated sufficiently, the engine will not start or the engine has a false start.
▶ Start the engine only if the indicator light **364** blinks yellow (1 Hz).

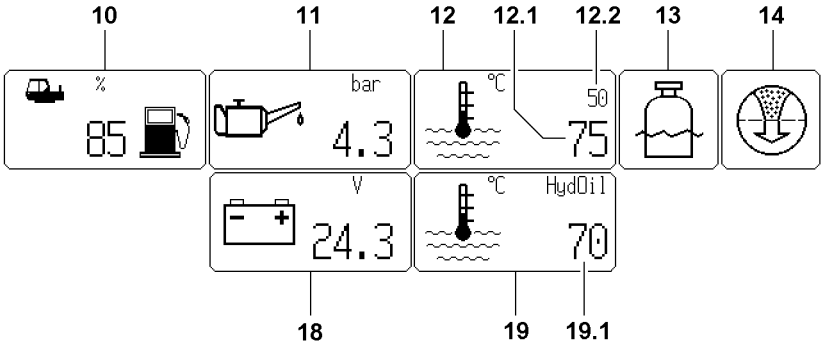
Note
Engine preheated too long!
The indicator light **364** turns off automatically after a certain time.
▶ Turn the ignition switch **402** to position “0” and wait a little.
▶ Start again.

▶ When the indicator light **364** blinks yellow (1 Hz), the engine is ready to start:
Turn the ignition switch **402** to position “II”.

Result:
– The engine starts.
– The indicator light **364** turns off.

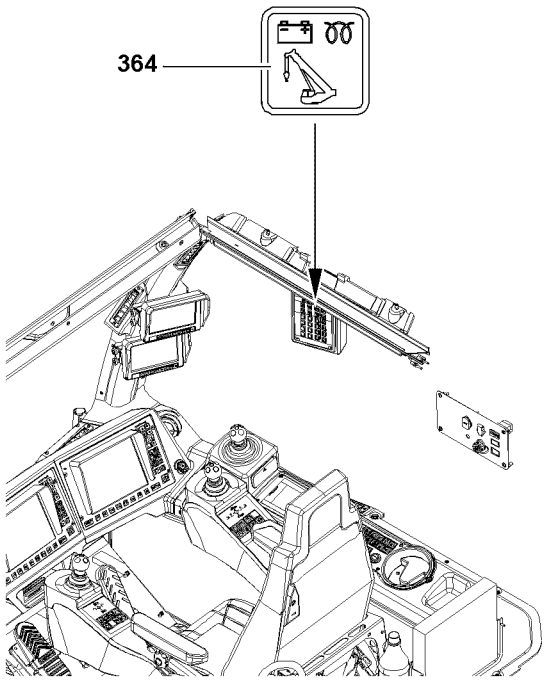
Troubleshooting
Indicator light **364** blinks yellow (2 Hz)?
The engine is not preheated sufficiently or there is a problem in the cold start system.
▶ Turn the ignition switch **402** off, wait a little and retry.
▶ or: Check the error message on the LICCON monitor 0 **357**. If possible, remedy the error.
▶ or: Contact the next Liebherr Service location or Liebherr-Werk Ehingen!

Troubleshooting
The indicator light **364** lights up red?
The engine is running, the alternator does not charge.
▶ Check the V-belt.
▶ or: Check the error message on the LICCON monitor 0 **357**. If possible, remedy the error.
▶ or: Contact the next Liebherr Service location or Liebherr-Werk Ehingen!


10
11
12
12.1
12.2
13
14
%
85
bar
4.3
°C
50
75
V
24.3
°C
HydOil
70
18
19
19.1


!!


O.K.


364

B104899

3.2 After engine start: Checking the instruments on LICCON monitor

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 configuration screen appears on the monitor.

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

- ▶ Check the indicator light **364**.
- ▶ 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 could 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?

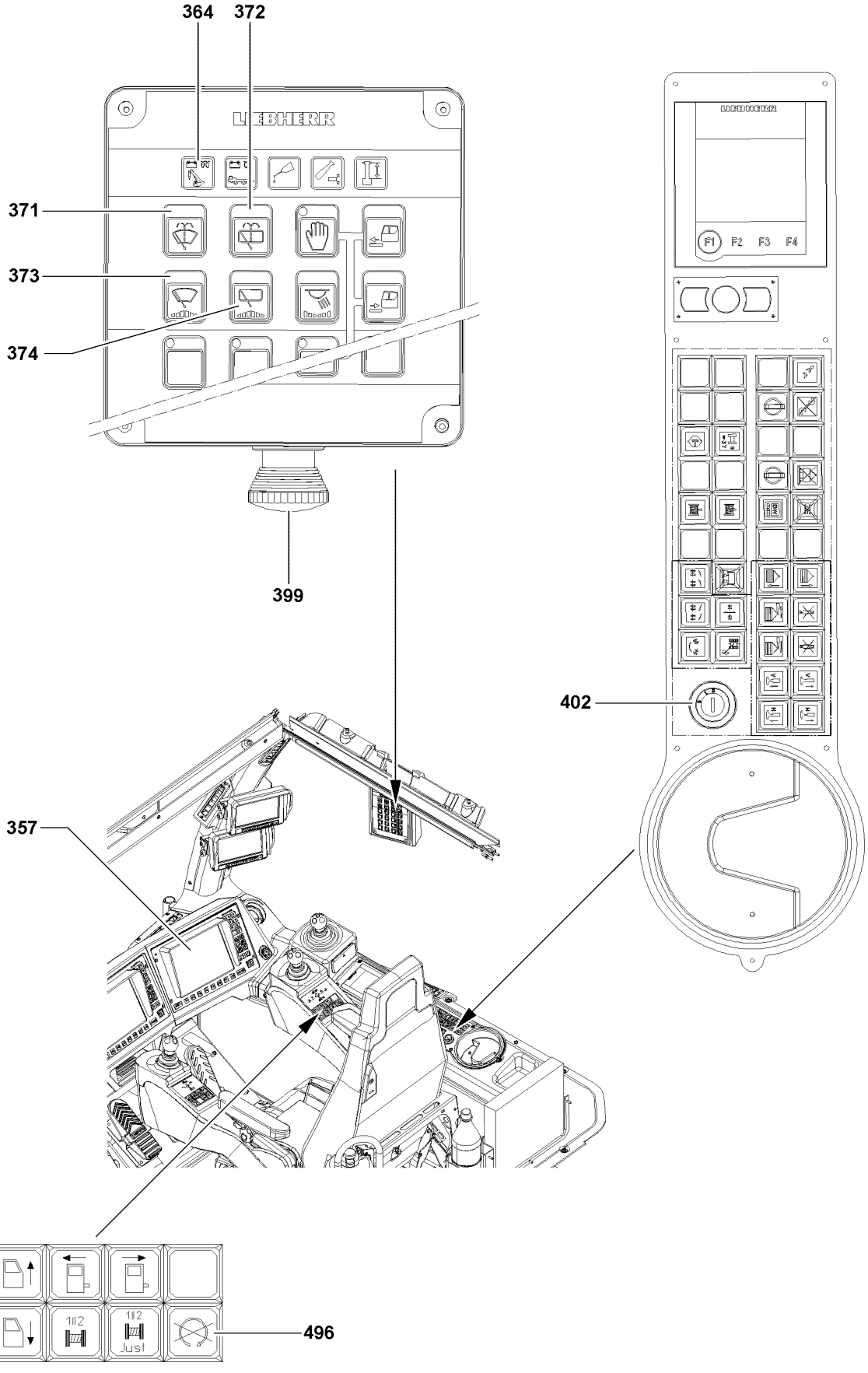
The coolant temperature is too high. Excessive coolant temperatures can lead to engine damage.

- ▶ Turn the engine off immediately.

- ▶ Check the icon **10** for “fuel content”.
- ▶ Check the icon **19** for “hydraulic oil temperature”.
- ▶ Check the icon **12.2** for “charge air temperature”.
- ▶ Check the icon **13** for “coolant level”.
- ▶ Check the icon **14** for “air filter”.
- ▶ Check the icon **18** for “battery voltage”.

3.3 Engine monitoring

For a detailed description of engine monitoring, see Chapter 4.02.



B104898

3.4 Turning the engine off

3.4.1 Turning off the engine in the event of danger

WARNING
Danger of accident due to falling loads!
If crane movements are stopped via EMERGENCY OFF, loads can start to swing and fall down.
Personnel can be severely injured or killed!
- ▶ Operational use of the EMERGENCY OFF switch **399** is prohibited!
- ▶ Only use the EMERGENCY OFF switch **399** in clear emergency situations!

▶ Press the EMERGENCY OFF switch **399**.

Result:
– The engine will be turned off immediately.

3.4.2 Turning the engine off

Turn the engine off with the ignition key

After operation with full engine load, let the engine run without a load for 3-5 minutes at low idle RPM.
▶ Turn the ignition switch **402** back to the stop to zero.

Result:
– The engine is turned off.

▶ Pull the ignition key and store it in a safe place.

Turn the engine off with the engine stop button

If the engine is turned off with the engine stop button, the LICCON computer system switches to “Stand-by” mode.
For detailed description of “Stand-by” mode of the LICCON computer system, see chapter 4.02.
▶ Press button **496**.

Result:
– The engine is turned off.
– The LICCON computer system is in “Stand-by” mode.

B195219

4 LICCON computer system after engine start

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 operating mode preselection appears.
– After 3 s: The configuration screen appears on the LICCON monitor.

Normally, the most recently set configuration state and reeving number will be displayed.

If a master switch is moved away from the zero position during the boot up phase, the function circuit of the electrical safety chain is interrupted.

▶ In this case:
Turn the engine and ignition off and then restart, so that the crane control can carry out a valid test of the electrical safety chain.

Troubleshooting

An error message appears on the LICCON monitor?

▶ Turn the engine and the ignition off and restart.

▶ The LICCON computer system automatically displays the troubleshooting display.

Troubleshooting

The LICCON monitor does **not** show the most recently set configuration state and reeving number?
If there has been a data loss in the memory (cold start), then the first valid configuration appears in the configuration screen. The reeving number is set to “0”.

▶ Set the configuration state and reeving number again.

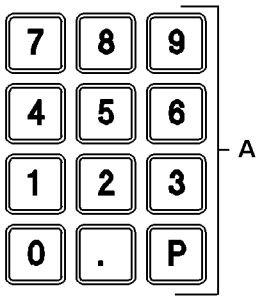
4.2 Taking over the previously selected configuration and hoist rope reeving

Check in the configuration screen if the correct short code and the correct reeving number have been set, see chapter 4.02.

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

Result:

– The “Configuration” program is terminated and the adjusted parameters are accepted for the newly started “Operation” program.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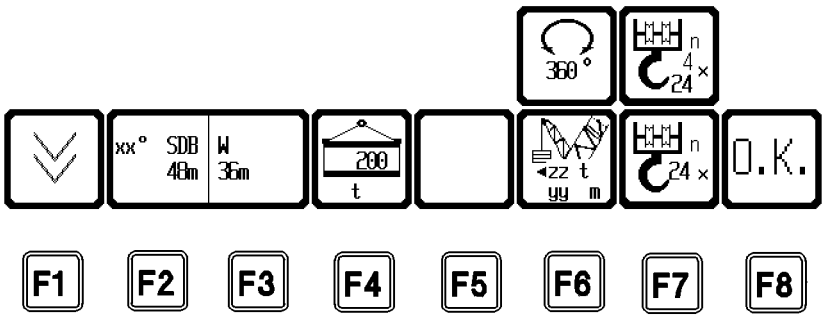
360°
n
4
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xx°
SDB
48m
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200
t
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O.K.
F1
F2
F3
F4
F5
F6
F7
F8

B104900

4.3 Changing the set up configuration and hoist rope reeving

The selected and displayed configuration can be changed with the function keys or by entering the short code.

4.3.1 Setting the set up configuration with the function keys

- ▶ Press the function key **F2** until the desired main geometry status is selected.
- ▶ Press the function key **F3** until the desired accessory status is selected.
- ▶ Press the function key **F4** until the desired counterweight is selected.
- ▶ Press the function key **F5** until the desired central ballast is selected.
- ▶ For crane operation **without** derrick ballast: Press the function key **F6** until the desired turning range is selected.
- ▶ For crane operation **with** derrick ballast: Press the function key **F6** until the desired derrick ballast radius or the derrick ballast weight is selected.
- ▶ Press the **ENTER** key.
- ▶ Check the set load chart.

4.3.2 Selecting the set up configuration with short code

The short code is taken from the load chart manual or from the job planner.

- ▶ Entering the 4-digit short code with the keypad **A**.
- ▶ Confirm with the **ENTER** key.

Result:

– The data from 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 the hoist rope reeving

- ▶ Press the function key **F7** until the desired reeving number is selected.

or

- ■ Press the function key **SHIFT** and the function key **F7** until the desired reeving numbers are selected.

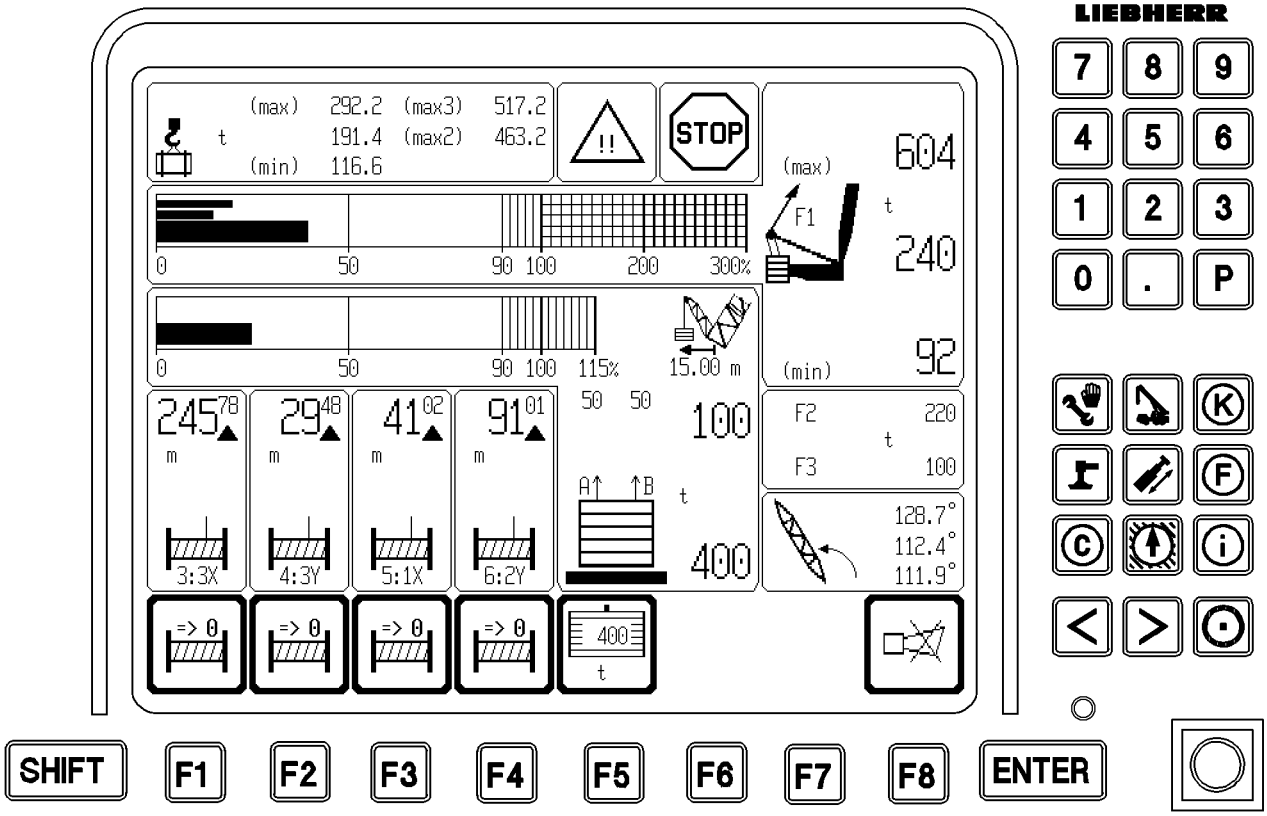
4.3.4 Checking and accepting the changed set up configuration and hoist rope reeving

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

Result:

– The “Configuration” program is terminated and the adjusted parameters are accepted for the newly started “Operation” program.

- ▶ Check in the operating screen if the correct short code and the correct reeving number have been set, see chapter 4.02.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max) 292.2 (max3) 517.2
t 191.4 (max2) 463.2
(min) 116.6
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604
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(min)
0 50 90 100 200 300%
0 50 90 100 115%
15.00 m
245 78
29 48
41 02
91 01
m
3:3X
4:3Y
5:1X
6:2Y
50 50
100
A B
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F3 100
128.7°
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=> 0
SHIFT
F1
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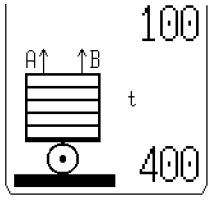
F3
F4
F5
F6
F7
F8
ENTER


100
A B
t
400

B104480

4.4 Adjusting the control parameters

Note

▶ For detailed description to adjust the control parameters, see chapter 4.02.

4.5 Adjusting the derrick ballast

For detailed description to adjust the derrick ballast, see chapter 4.02.
The weight of the derrick ballast consists of:

– The weight of the empty ballast pallet or the empty ballast trailer.
– The weight of the placed derrick ballast plates.

WARNING

Risk of accident due to toppling crane!

If an incorrect derrick ballast value is entered, the safety shut offs from test point 1 ($F1_{min}$) become ineffective. The crane can topple over and personnel can be severely injured or killed.

▶ If a derrick ballast value is set, which is too low, then the displayed derrick ballast utilization is too large.
▶ If a derrick ballast value is set, which is too large, then the displayed derrick ballast utilization is too small.
▶ Make sure that the set derrick ballast value matches the actually installed derrick ballast weight.

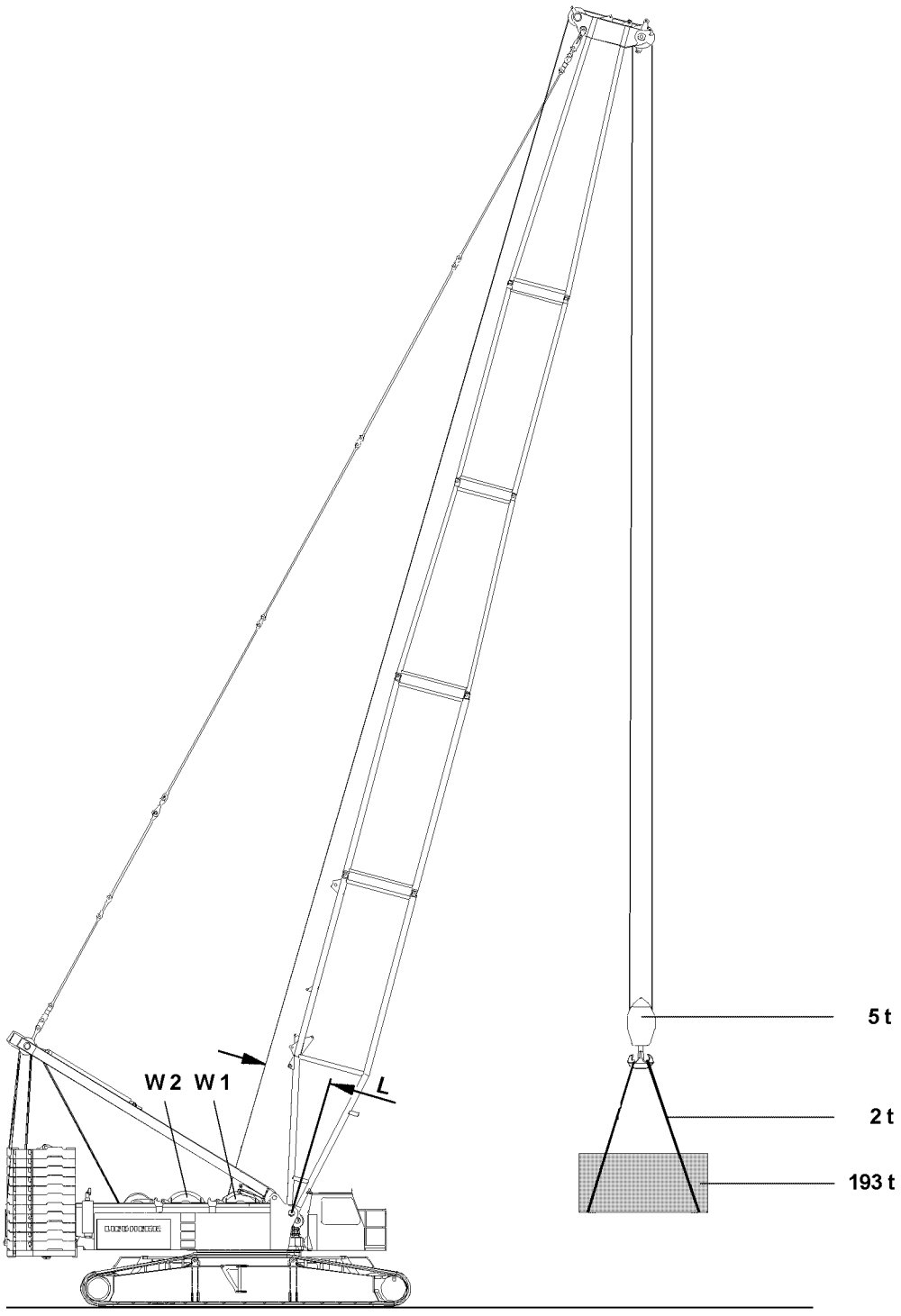
Note

During ballast editing, the remaining monitor displays cannot be updated.
The operating view on the monitor is frozen and can even show incorrect values.

▶ Quickly complete the adjustment of the ballast.

If a master switch is actuated during the adjustment of the ballast, the adjustment procedure is automatically aborted. The old value of the placed ballast (BA_{placed}) remains in the ballast symbol.

▶ LICCON Monitor 1: Enter the derrick ballast with key **F5**.



B103667

5 Load weighing and load display

Included in the load capacities given in the load charts are the weights of the load carrier, load take up equipment and tackle.

Note

- The weight of the hook block and the weight of the tackle must be subtracted from the load given in the load chart.

Example:		
Maximum permissible load according to chart		200 t
Weight of the hook block	5t	- 5 t
Weight of the tackle rope	2t	- 2 t
Actual load capacity of the crane		= 193 t

In this case, the load to be lifted may not exceed **193 t** .

Note

- In the LMB calculation, the lever arm to the winch **2** is not used, but always the lever arm **L** to the winch **1**.
- For that reason, to ensure an exact load weighing to lift the load on the main boom and on the fixed accessories (for example the fixed jib), winch 1 must be used.

DANGER

Danger of accidents due to overload!

In case of inaccurate load weighing or load display, a danger exists due to unrecognized overload of the crane!

- The crane operator must know the weight, the center of gravity and the dimensions of the load to be lifted before operating the crane.
- The crane operator must check, before lifting the load, if he may even lift the load according to the data in the load chart.

B195219

5.1 Load weighing

Make sure that the following prerequisites are met:
- The angle sensors are functioning.
- The incline sensors are functioning.
- The turn sensor in the turntable is functioning.
- The pressure sensors are functioning.
- The pull sensors are functioning.

The boom position where the relapse cylinders are actuated must be recognized by the LICCON exactly via the sensors, because otherwise the relapse cylinders have a strong affect onto the load - weighing error.

Note
- ▶ If only one of these sensors is not functioning, the LEC error display is issued, then the load display and the load weighing are not exact.
- ▶ The calculation is made anyway, but the result is not exact.

5.1.1 Possible weighing errors

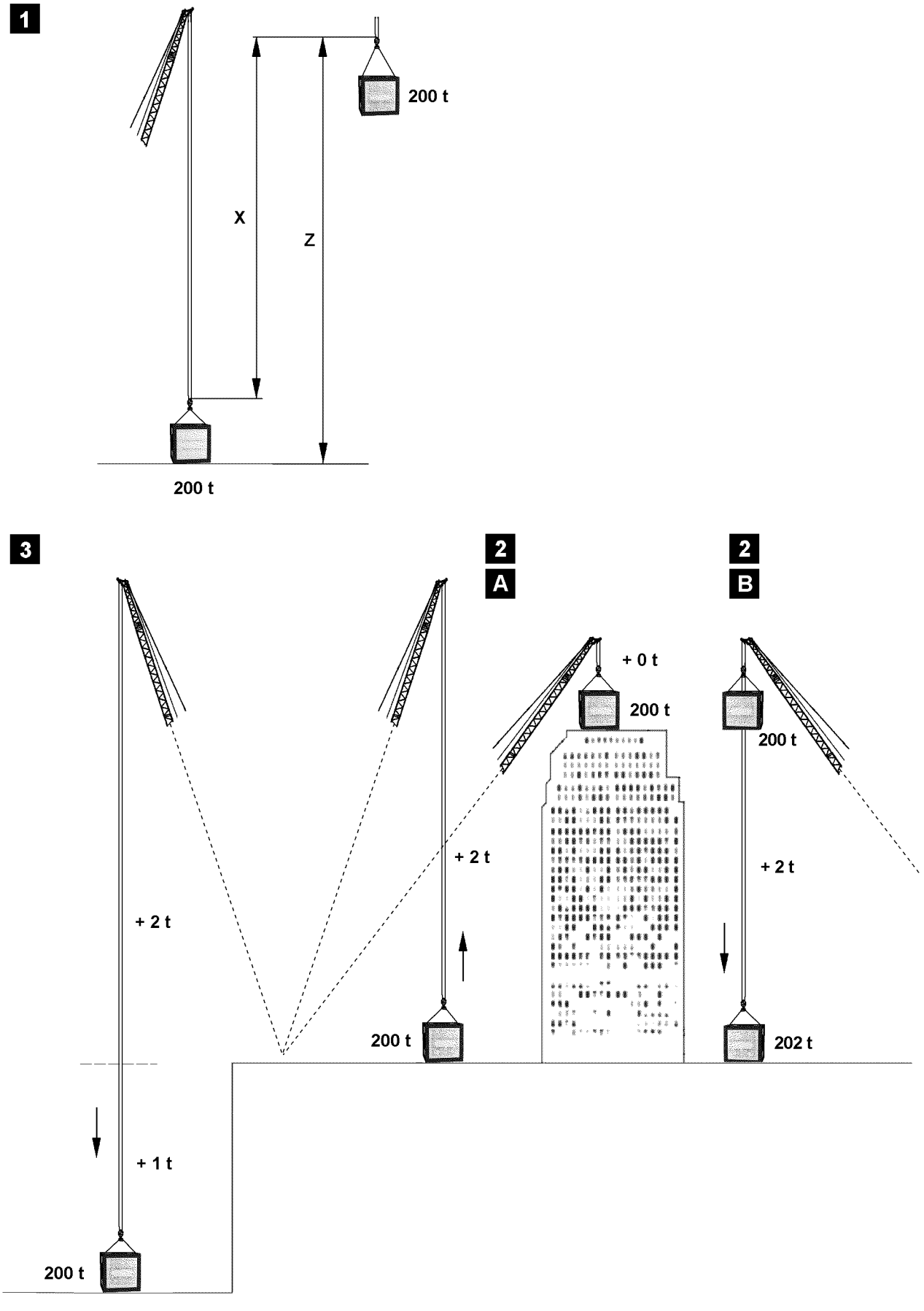
For an exact load weighing, exact signals of the pull test bracket, angle sensor, incline sensors and pressure sensors are required.
Since all sensor values are always within a certain tolerance, a weighing error can occur.
The weighing error is increasingly larger if:
- The hoist winch sits in the turntable instead of in the main boom.
- The reeving is small.
- The hoist winch sits far to the rear in the turntable.
- Several hoist winches are used (parallel operation).
- The boom, on which the load is suspended is short.
- The boom, on which the load is suspended is standing steeply.

DANGER
Danger of accidents due to overload!
Overload due to weighing error!
- ▶ When the prerequisites for small weighing errors not given, special caution must be exercised.

5.1.2 Adjustment of reeving

The number of reevings must be correctly set on the LICCON. The reeving should not be higher than the nominal reeving, otherwise the hoist ropes reeved above the nominal reeving count as part of the load.

Note
- ▶ The nominal reeving determines for which maximum reeving the load chart values of a load chart are valid.
- ▶ If the crane is in a position outside of the load chart, the hoist rope is added to the load, because no nominal reeving is known outside the load chart.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5.2 Load display

5.2.1 Lifting, fig. 1

For the calculation of the displayed actual load, the weight of the hoist rope to the ground is deducted from the total load **Z**, which hangs on the pulley head **X**, see fig. **1**.
In that case, the number of the reevings set on the LICCON is taken into account, but maximum the nominal reeving.

Note

▶ If the load is raised far above the ground, see fig. **1**, then the load display is too small by the weight of the hoist rope from the load to the ground.

5.2.2 Lifting over-ground, fig. 2A

When the load is raised above the crane level (highrise), then the hoist rope to the ground is deducted anyway for the display, therefore the load seems increasing lighter when lifting than it did on the ground.
Therefore a somewhat larger load can be lifted in large heights than on the ground, without triggering the LMB overload shut off at 100 %.
This poses no danger because the load stress for the crane is the same if, for example 200 t of load hangs on the bottom and 2 t rope or 202 t load on top and 0 t rope on the pulley head.

5.2.3 Load take up on highrise, fig. 2B

When a load is taken up on the highrise on top (=100 %), for example 200 t, and then lowered to the ground, then weight of the hoist rope below the highrise level is calculated as load and displayed.

5.2.4 Lifting below ground, fig. 3

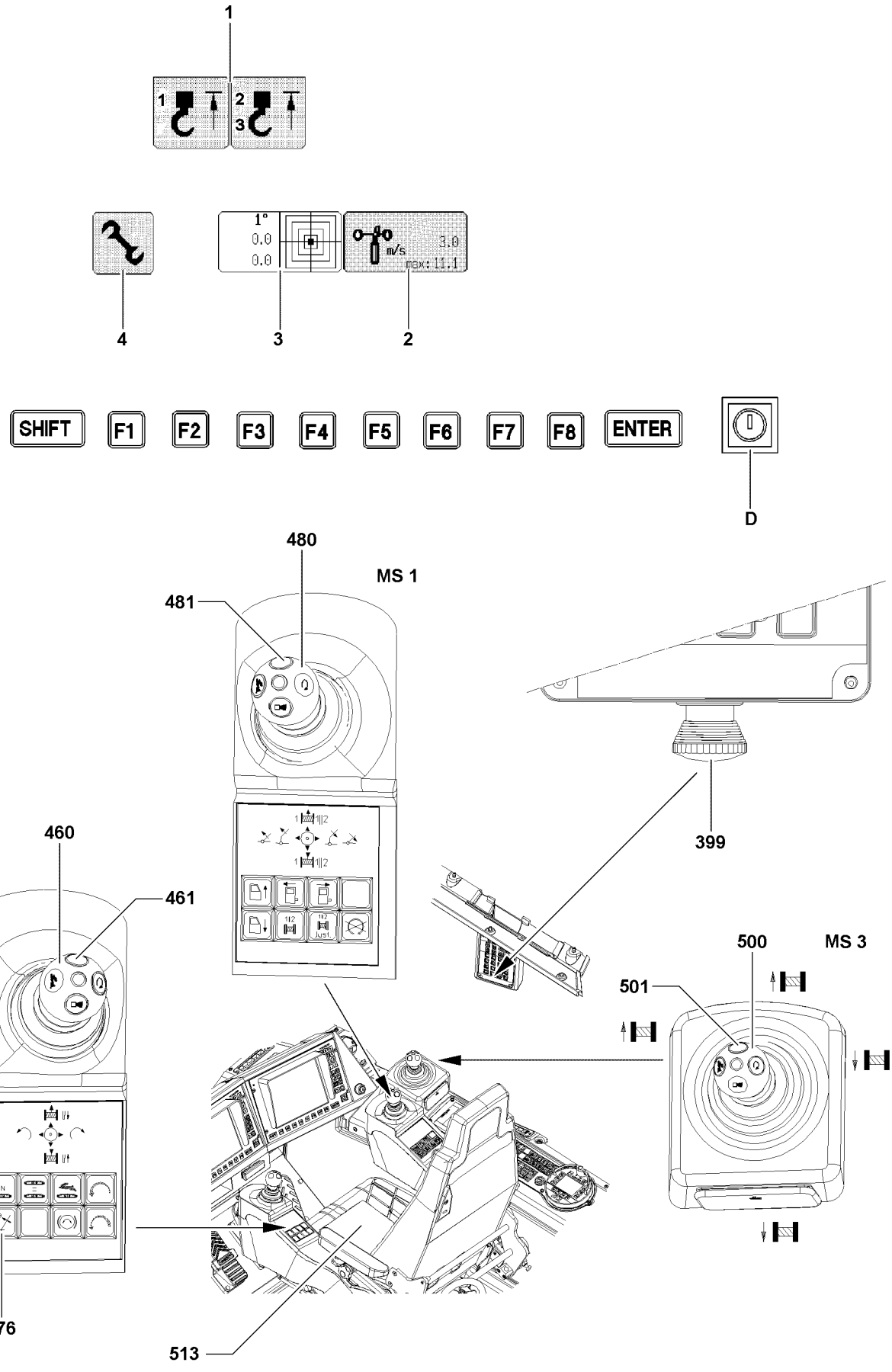
When a load is lowered below the crane level (excavation), then the hoist rope below the crane level is calculated as load and displayed.

DANGER

Danger of accidents due to overload!
It must be noted that the load display in fig. 2B and fig. 3 is correct, the overload of the crane is also shown in the utilization bar, but no shut off of the lowering movement occurs.

▶ At LMB overload, all crane movements are shut off, which would increase the danger of overload, however, lowering the load at 100 % -LMB shut off remains clear because one normally assumes that the overload was caused by lifting the load.

▶ However, the crane can also be overloaded by lowering the load, especially in case of high reevings with high hoist rope weight on the pulley head. The crane operator must know this, so that he can relieve the crane by careful lifting again in this special case, even though the lifting and not the lowering of the load is automatically shut off.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B104901

1 Prerequisites for crane operation

1.1 Checking the safety devices

Every time the crane is operated, the crane operator is required to satisfy himself about the functionality of the safety systems.

WARNING
Danger of accident from defective warning and safety systems!
Operating the crane with defective warning and safety systems can lead to life-threatening accidents.
- ▶ Make sure that all warning and safety systems are functioning.
- ▶ Make sure that the overload protection is functioning.

Note
- ▶ The crane operator must know and observe the shut off diagrams in the separately supplied electric wiring diagram.

1.2 Aligning the crane

To ensure the working safety of the crane, the crane must be aligned horizontally on level ground with sufficient load bearing capacity.

WARNING
Risk of accident due to toppling crane!
If the crane is not aligned horizontally, it can tip over. Personnel can be severely injured or killed!
- ▶ Ensure the crane is aligned horizontally.
- ▶ Observe the maximum permissible deviation from the horizontal position of the crane, see load charts.

The horizontal alignment of the crane is displayed in the LICCON computer system, both graphically as well as numerically, see icon **3**.

2 Overload protection of LICCON computer system

The LICCON computer system is a system for control and monitoring of cranes. In addition to the overload protection (Load torque limiter **LMB**) there are a number of application programs that can be used for controlling and monitoring the crane movements, see chapter 4.02.
The relevant sensors for the overload protection are:
- – Pull test brackets
- – Angle sensors
- – Pressure sensors
- – Length sensors

The electronic overload protection **turns** all **load torque increasing** crane movements **off** if the permissible load torque is being exceeded. Only load moment decreasing movements can then be carried out.

WARNING
Risk of accident!
The presence of the overload protection does not relieve the crane operator of his obligation for care and attention.
- ▶ Before lifting a load, determine its weight and radius and decide with the help of the load chart if the crane is able to carry out this task.

The overload protection cannot cover all possible operational conditions.

WARNING
Danger of accident due to incorrect operation of the crane!
Due to incorrect operation of the crane, the overload protection does not become effective or the shut off does not occur quickly enough. In these cases, accidents are possible despite an installed overload protection system!
▶ Be especially alert!

The overload protection registers, but:
– does not turn off, for example the wind speed
– does not monitor, for example the crane incline
– does not monitor, for example the turn angle of the turntable

The overload protection does **not** register:
– the hooking of the load or the load tackle
– excessive delay forces
– loads falling onto the rope
– angular pull
– driving the crane on ground with large slope
– collapsing ground

DANGER
Risk of accident due to crane toppling over or destruction of the crane!
▶ The overload protection is a device according to EN 13000. It may not be used as an operational shut off device for crane movements of any kind.
▶ The overload protection must be adjusted to the current equipment configuration of the crane before crane operation to match the load chart. Only that way can it fulfill its protective task.
▶ After every set up condition change and/or boom configuration, the overload protection device must be reset to the corresponding set up condition and/or boom configuration.
▶ The crane operator must meet his duty of care and attention, despite the overload protection device.

2.0.1 Failure of the overload protection

It is technically possible to operate the crane without the LICCON.

DANGER
Danger of accident due to crane operation without the LICCON computer system!
▶ If the LICCON system is no longer functioning properly because of a error in the LICCON monitor, the CPU or the power supply, then the crane can be operated in emergency mode with utmost caution, if absolutely necessary.
▶ In this case, the crane operator bears full responsibility.
▶ The crane operator may **not** use emergency mode if he is **not** fully aware of the extent of the monitoring tasks and dangers associated with that mode.

2.0.2 Procedure to follow in case of a problem

Basically, all conditions in the load charts must be strictly adhered to, even those not monitored by the LMB:

– the exact weight of the load, including load tackle, must be known
– the current crane geometry, such as main boom angle, derrick angle, luffing jib angle as well as the derrick ballast radius and the pulled derrick ballast weight must be known and match the given values in the corresponding load chart
– radius, boom angle and derrick ballast radius must be measured manually

In the event of a LICCON monitor failure:
Replace LICCON monitor with a functioning substitute monitor.

In the event of a CPU failure:
Replace CPU with a functioning substitute CPU.

In the event of power supply failure:
Replace the power supply unit with a functioning substitute power supply unit.

If one or more sensors fail, it is possible to continue work manually, if the “missing values” are monitored manually and agree with the values in the load chart that is used.

2.0.3 Ending a load lift

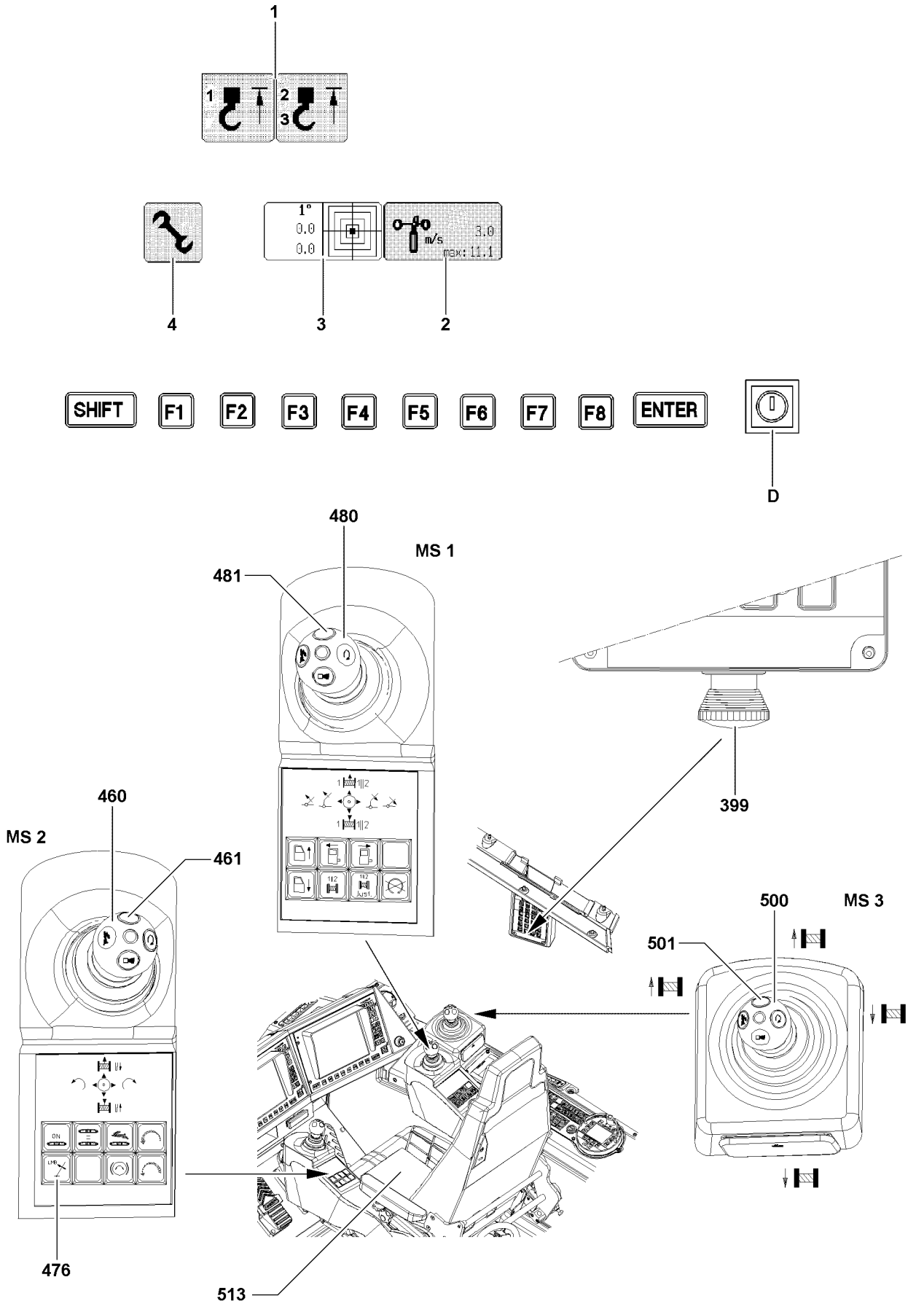
WARNING
Risk of accident due to overloading the crane!
▶ Determine the weight of the load with hook and tackle.

If the problem cannot be remedied using these measures, we recommend:

– before continuing the load lift, contact the nearest Liebherr Service center or the Liebherr-Werk in Ehingen

If this is not possible, then the load lift can be completed with utmost caution, as follows:

– all values, which are needed for determining the current set up condition and the associated load chart must be measured and/or manually determined.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3 Wind warning system

The wind warning appears in the operating view of the LICCON computer system.
If the current wind speed exceeds the displayed maximum value, the “Wind warning” icon **2** starts to blink and the acoustic alarm “short horn” sounds. But there is **no shut off** of crane movements.

WARNING
Danger of accidents if the permissible wind speed is exceeded!
There is **no** automatic shut off of crane movements.
▶ Stop crane operation and place down the boom.

4 Hoist limit switch “Hoist top”

The hoist limit switch is intended to prevent the hook block from colliding with the boom head.
Before every crane application, the function of the hoist limit switch must be checked by running against the switch weight with the book block.
When the hoist limit switch is actuated, the icon **1** appears in the operation screen. The crane movements “hoist and luff down boom” are turned off.

WARNING
Risk of accident due to crane toppling over or destruction of the crane!
If the hoist limit switch “Hoist top” is bypassed, the crane can topple over or be destroyed. Personnel can be severely injured or killed!
▶ Bypass the hoist limit switch during crane operation only with the bypass key button if a guide is present to monitor exactly the distance between the hook block and the boom head. The guide must be in direct contact with the crane operator.
▶ Carry out hoist movements with maximum care and minimum speed.
▶ In emergency situations, only an authorized person may bypass the hoist limit switch.
▶ Do **not** use the hoist limit switch as an operational shut off function.

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5 Limit switch “Winch spooled out”

The winch speed sensor is adjusted in the factory. If used properly, the winch speed sensor will not need readjustment.

Note
Minimum rope coils on the shut off point!
- ▶ For winches 1, 2, 3, 5 and 6, a minimum of 4 rope coils are set on the winch turn sensor.
- ▶ For winch 4, a minimum of 7 rope coils are set on the winch turn sensor.

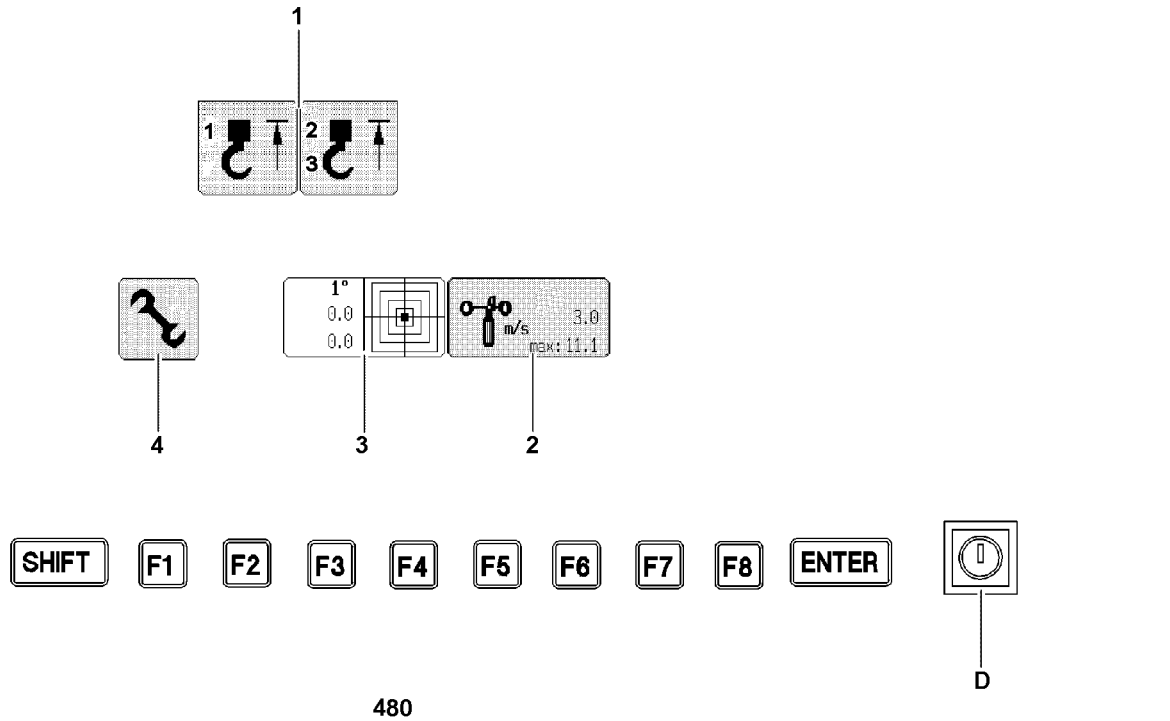
WARNING
Risk of accident due to falling load!
If the wind speed sensor does not turn off on the minimum rope coil, then the rope mount can be ripped out and the load can fall down. Personnel can be severely injured or killed!
- ▶ Crane operation with an incorrectly or non-adjusted winch is strictly prohibited!
- ▶ Make sure that the winches are correctly adjusted: Check the shut off without load on the hook.

If it is found during operation or when changing a rope that there is no shut off at the minimum rope coil:
- ▶ Have the winch speed sensor readjusted by **Liebherr Service**.

WARNING
Risk of accident due to falling load!
If the rope is not spooled up or out properly, then the turn sensor can no longer turn off controllably. The load can fall down and personnel can be severely injured or killed.
- ▶ Do **not** pull the end of rope underneath the winch by spooling the rope winch up!
- ▶ Do **not** pull the rope from the “stationary” winch.

5.0.1 Checking the shut off of minimum rope coils

Note
If the “spool out” crane movement does **not** turn off at minimum rope coil: Have the winch speed sensor readjusted by **Liebherr Service**.
- ▶ Slowly spool out winch 1, 2, 3, 4, 5 and 6 and check the shut off point by carefully running to 4 minimum rope coils.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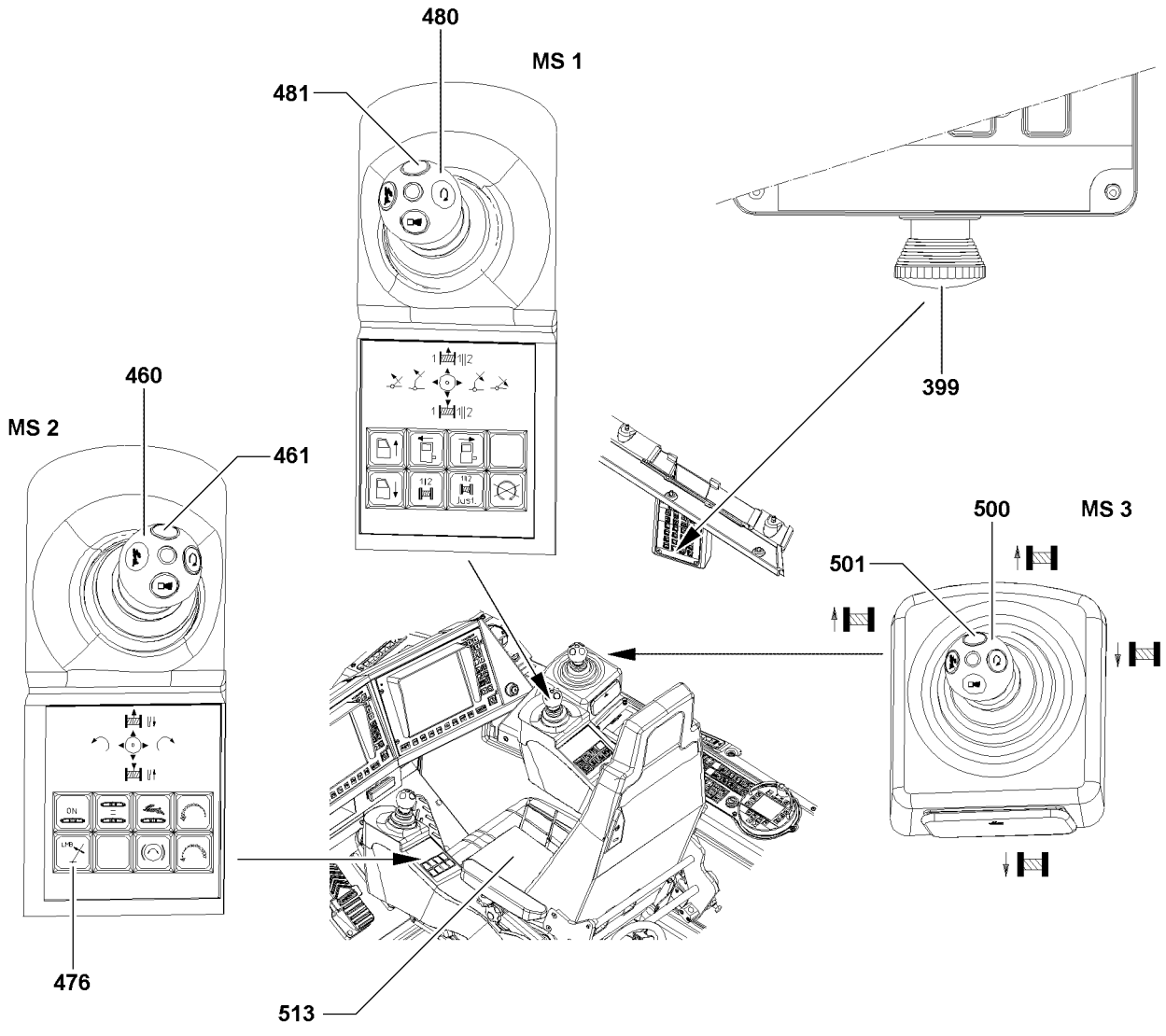
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6 EMERGENCY OFF switch

When pressing the EMERGENCY OFF switch **399**, the engine and the electric crane control are turned off. Every carried out movement can be stopped immediately.
After pressing the EMERGENCY OFF switch **399**, the release can only be made by an authorized person.

WARNING
Risk of accident due to falling load!
If crane movements are stopped by pressing the EMERGENCY OFF switch, loads can start to swing and fall down. Personnel can be severely injured or killed!
- ▶ Operational use of the EMERGENCY OFF switch **399** is prohibited!
- ▶ Do not press the EMERGENCY OFF switch **399** at maximum speed of a crane movement.
- ▶ Only use the EMERGENCY OFF switch **399** in clear emergency situations!

7 Control release

The seat contact switch **513** shuts the crane control down as soon as the crane operator gets up from the seat.
This prevents unintended crane movements by accidentally touching the master switch when getting in or out of the cab.
The button **461**, button **481** and button **501** bypass the seat contact switch **513** if necessary, for example when the operator has to work while standing up.

8 Hydraulic safety valves

A distinction is made between two types:
- – Pressure limit valves for preventing pipe and hose breaks
- – Shut off valves in the hydraulic cylinders

8.1 Pressure monitoring in the relapse cylinders

Pressure sensors are installed in the hydraulic cylinders. The pressure measured with the pressure sensor is shown on the LICCON monitor, see chapter 4.02.

WARNING
Risk of accident due to crane toppling over or destruction of the crane!
If the pressure drops, the relapse cylinder can no longer stabilize the boom. The crane can topple over or be destroyed. Personnel can be severely injured or killed!
- ▶ During crane operation: Constantly monitor the pressure in the relapse cylinders.

8.2 Servo oil pressure monitoring in the winches

If no servo oil pressure is present when the master switch is actuated, a corresponding error message appears.

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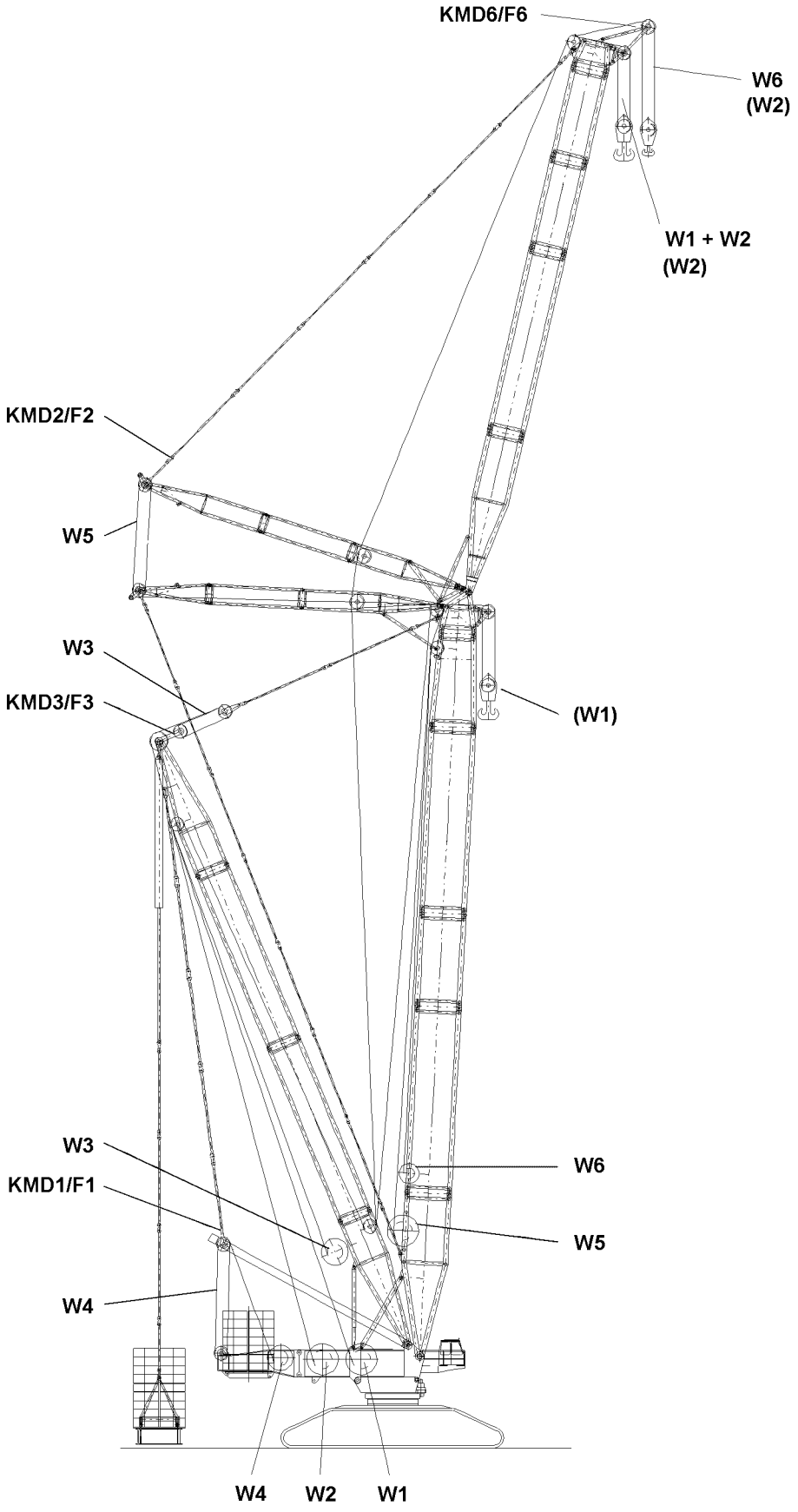
9 Limit switch

WARNING
Risk of accident due to crane toppling over or destruction of the crane!
If the crane movement is stopped by the limit switch, then the load forces cannot be received through the control. The boom system can become unstable and the crane can topple over or be destroyed. Personnel can be severely injured or killed!

▶ Do **not** use the hoist limit switch and limit switch for steepest boom position and luffing jib position as an operational shut off function.

Limit switch	Position
Hoist “top”	on main boom, lattice jib and on boom nose
Boom “top” , steepest position	on boom relapse cylinder
Lattice jib “top” , steepest position	on lattice jib relapse cylinder
Lattice jib “top” , steepest mechanical position	Mechanical flap in lattice jib articulated piece
Lattice jib “bottom” , lowest position	on boom head piece
Derrick, steepest electrical position 112.8°	on derrick relapse cylinder
SA bracket 15°, assembly position to the front	on SA bracket


KMD6/F6
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KMD2/F2
W5
W3
KMD3/F3
(W1)
W3
KMD1/F1
W6
W5
W4
W4
W2
W1

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10 Angle sensors

Component	Description - Angle sensor (WG)
S-articulated piece	Main boom bottom
S/W-head piece, if used on boom	Main boom top
S/W-head piece, if used on luffing jib	Luffing jib top
W-articulated piece	Luffing jib bottom
W-connector head	Main boom top
D-articulated piece	Derrick bottom
D-head piece	Derrick top
SA-bracket	SA-bracket

11 Test brackets (KMD=force test box)

NoTableDefined 38 96The test brackets measure the force in the guying, which results from the load and the boom momentum.
The test brackets are located:

- **KMD 1**, in the boom guying, SA-bracket to boom for all operating modes **without** derrick
- **KMD 1**, in the derrick guying, SA-bracket to derrick for all operating modes **with** derrick
- **KMD 2**, in the lattice jib guying, WA-bracket 1 to lattice jib head piece
- **KMD 3**, in the boom guying, derrick to boom for all operating modes **with** derrick
- **KMD 6**, in the boom nose

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12 Acoustical / optical warning

Note
▶ The crane operator must know and observe the overview, “acoustical / optical warning” for the crane operator and for personnel within the danger zone.

12.1 Crane operator

Signal	Crane operator							
	Acoustical warning		Optical warning - LICCON-monitor icons					
	slow	fast	Advance warning	Shut-off				Shut-off
								 *F1*
Load up to 90 %								
Load greater than 90%	X[3]		X					
Load greater than 100%		X[3]	X	X				
Emergency operation with LICCON E1.7						X		
+ E1.5							X	
+ E1.6							X	
LMB/hoist top bypass E1.5					X			
+ E1.7							X	
Assembly E1.6					X			
+ E1.7							X	
$F1_{max}$ Assembly								X
Blockposition between L and F								

Signal	Crane operator							
	Acoustical warning		Optical warning - LICCON-monitor icons					
	slow	fast	Advance warning	Shut-off				Shut-off
								 *F1*
Blockposition between W and F								
Bypass without motor						X		

X = cannot be switched off
X^1 = can be switched off after 5 seconds at the control stand
X^2 = can be switched off immediately at the control stand
X^3 = can be switched off immediately at the LICCON monitor

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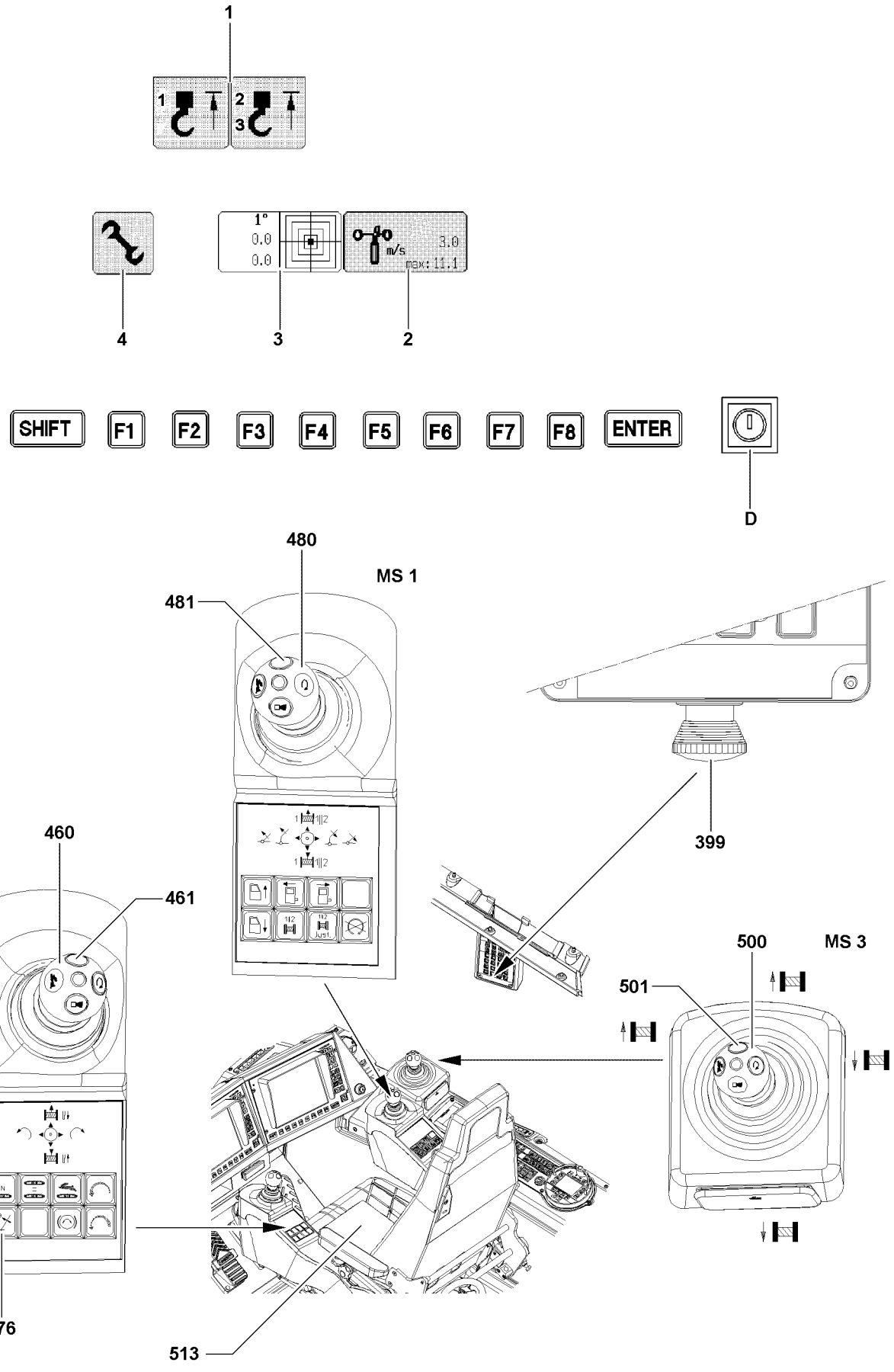
	Personnel present in danger zone				
	Acoustical warning	Optical warning - LICCON-monitor icons			
	Horn	Warning light			Warning light on slewing platfrom rear
Signal	**Intervall**	**green**	**yellow**	**red**	**red**
Load up to90%		X			
LMB load greater than 90%			X		
LMB load greater than 100%	X^1			X	X
Emergency operation with LICCON				X	X
LMB/hoist top bypass	X			X	X
Assembly	X^2			X	X
$F1_{max}$ Assembly	X				
Blockposition between L and F	X				
Blockposition between W and F	X				
Bypass without motor					

X = cannot be switched off
X^1 = can be switched off after 5 seconds at the control stand
X^2 = can be switched off immediately at the control stand
X^3 = can be switched off immediately at the LICCON monitor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13 Bypassing the safety devices

The safety devices are bypassed with the following control elements:
– Control console: Button **476**, Luff up at overload
– LICCON Monitor 0: Bypass key button **D**

The bypass key button **D** on the LICCON monitor has two positions:
– Position center - Operating position (self-retaining): crane is in normal operation
– Position to right (touching): the hoist limit switch and the LMB shut off are bypassed

Note
▶ For shut offs bypassable with the button **D**, see “shut off diagrams” in electric wiring diagram.

13.1 Bypassing the overload protection

If the maximum permissible load capacity is exceeded, the LICCON overload protection turns off all crane movements that increase the load torque.

DANGER
Danger of accidents when bypassing the overload protection!
If the overload protection is bypassed, there is no further protection against crane overload!
All LICCON overload protection displays remain functional!
▶ The bypass of the overload protection is only permitted in emergency cases!
▶ The bypass key button **D** may only be actuated by persons who are aware of the effects of their acts regarding the bypass of the overload protection!
▶ Bypassing the overload protection requires the presence of the crane supervisor and must be performed with utmost caution!
▶ **Crane operation** with bypassed overload protection is prohibited!

13.2 Bypassing the “hoist top” shut off

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

DANGER
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 “Hoist top” shut off may only be bypassed if the crane supervisor is present, and with the help of a “guide”. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block and the boom head.
▶ Carry out all crane movements with maximum care and minimum speed.

▶ Turn the bypass key button **D** to the right and hold.

Result:
– The LICCON overload protection is inactive.
– The assembly icon **4** in the LICCON monitor 0 blinks.
– An acoustic signal sounds.
– The 3 colored flashing beacon on the crane cab and the warning light on the slewing platform rear, turns off.

▶ Do not actuate the bypass key button **D**.

Result:

- The LICCON overload protection is active.
- The assembly icon **4** on the LICCON monitor 0 turns off.
- The acoustic signal is off.
- The 3 colored flashing beacon on the crane cab and the warning light on the slewing platform rear, turns off.

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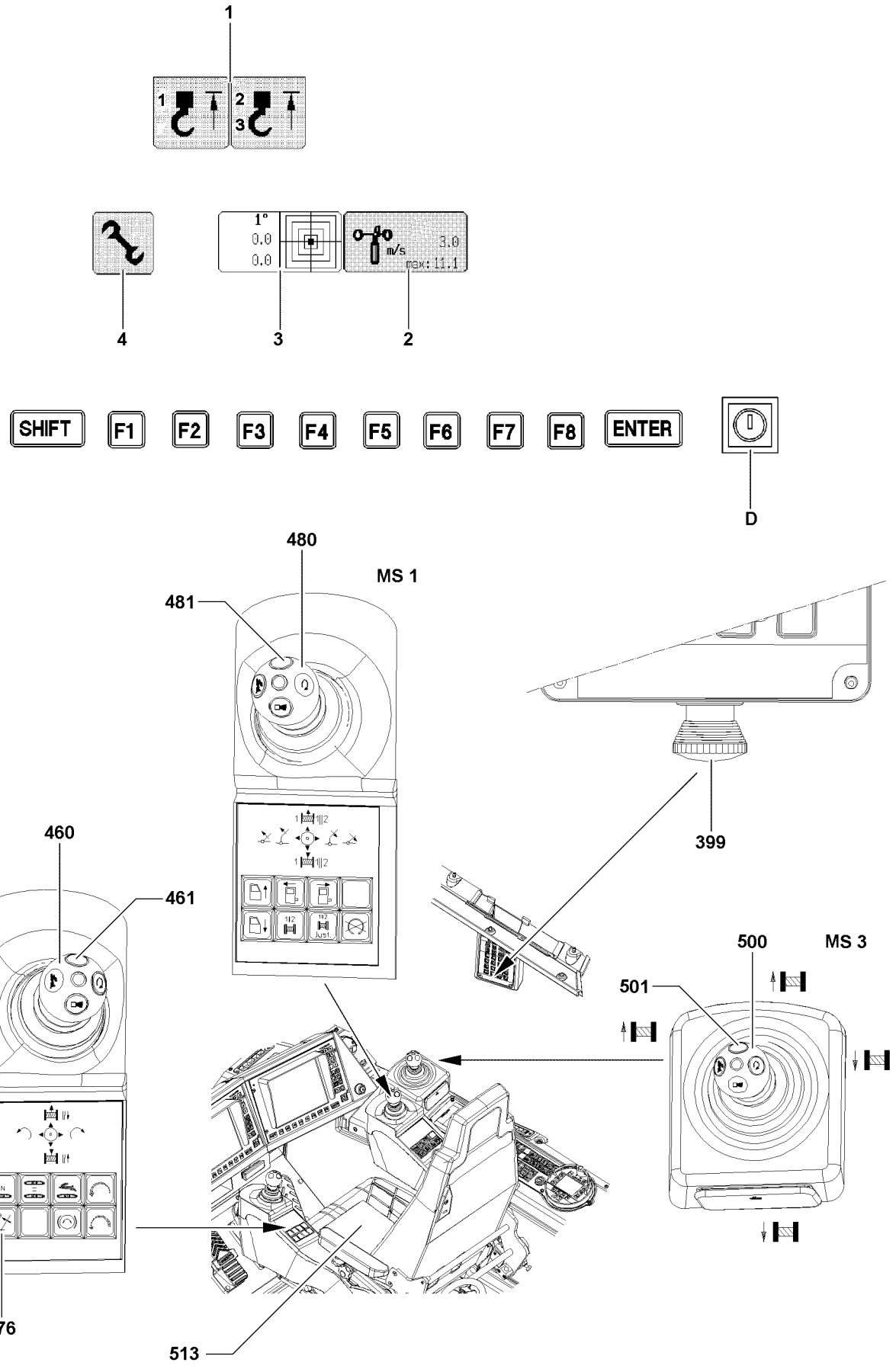
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13.3 Bypassing “luff up at overload”

The “luff up” crane movement:
– depicts a load torque decreasing crane movement
– at freely suspended load, it almost always leads to an increase of maximum load capacity

Note
▶ At overload, the “luff up” crane movement is turned off.
▶ With the button **476**, “luff up with boom of luffing jib”, the load torque limiter can be bypassed.

DANGER
Risk of accident due to toppling crane!
If the load torque limiter is bypassed, the crane can be overloaded and topple over. Personnel can be severely injured or killed!
It is not permissible to lift the load by luffing up the boom.
▶ If the hoist gear has been turned off by the load torque limiter when lifting a load.
Bypassing the load torque limiter with the button **476** is only permitted if:
▶ the load is freely suspended and the crane operator is sure at the same time that the load capacity will be increased when luffing up (utilization decreases).
▶ the overload occurred before by luffing the boom or the luffing jib down. The crane operator must clearly prove according to the load chart, that the luffing up movement will lead to an increase of the maximum load capacity and the overload will be thereby removed.

▶ In order to still perform the luffing up movement:
Press the button **476**, “bypass of overload” and deflect the “master switch 1 **480** ” in direction X-.

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1 LICCON computer system

WARNING
Danger of accidents due to overload!
- ▶ Constantly monitor the displays on the LICCON monitor.
- ▶ Observe changing utilization conditions and forces.

WARNING
Risk of accident!
- ▶ The crane operator must evaluate constantly if the data shown in the operating view can even be correct. He may not rely blindly on the LICCON system but must think for himself and must recognize a possible error or overload conditions.

For detailed description of the operation of the LICCON computer system, refer to chapter 4.02.

2 Winch and master switch assignment to operating modes

The assignment of the master switches to the winches is different, according to the operating modes. The assignments are shown in the winch icons on the LICCON monitor.

Note
- ▶ The crane operator must know and observe the assignments, refer to and observe the separately supplied electric wiring diagram!

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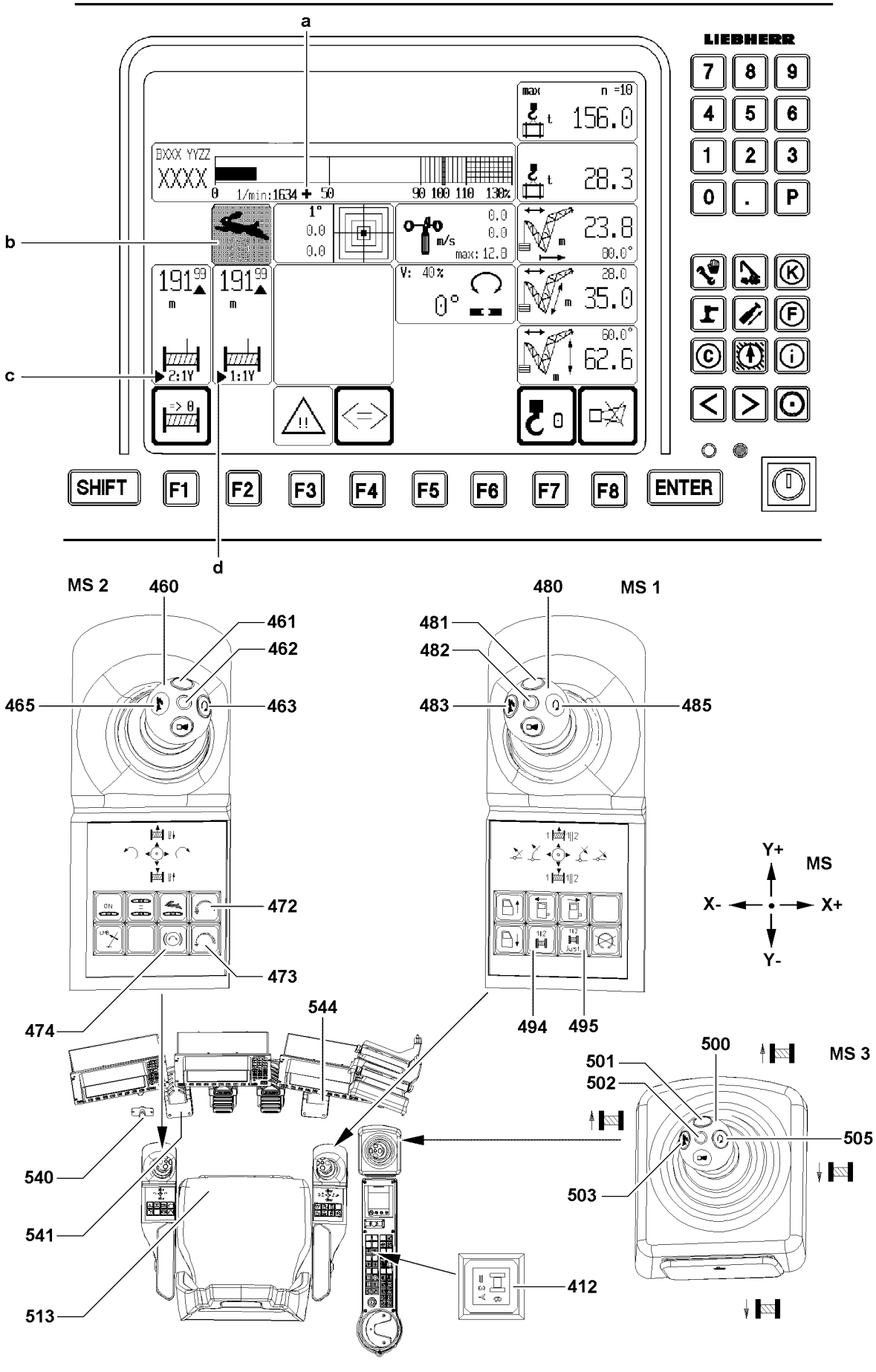
3 Carrying out crane movements

Make sure that the following prerequisites are met:
- the crane is aligned in horizontal direction,
- the counterweight is installed and secured according to the data in the load chart,
- the ground is able to carry the weight of the crane, the load and the load tackle,
- the hook block is correctly reeved as shown in reeving plan,
- the crawler operation is turned off,
- the crane engine is running,
- all safety devices have been adjusted according to the data in the load chart,
- the winches are correctly assigned to the respective pulley heads, see chapter 4.02,
- there are no persons or objects in the danger zone.

WARNING
Risk of accident!
- ▶ In order to protect the crane and reduce the danger of accidents, always operate the master switch slowly and sensitively.
- ▶ Ensure that there are no obstacles in the working range of the crane and that there are no persons within the danger zone.
- ▶ Give a warning signal before initiating a crane movement.
- ▶ Observe the danger notes for crane operation in chapter 5.01.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3.1 Regulating the engine RPM

3.1.1 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 RPM can be locked in any position.

▶ Press the pedal **544** down for the engine regulation until the desired RPM is reached.

▶ Press the button **463**.

or

■ Press button **485** or button **505**.

Result:

– The pedal **544** is locked and the engine RPM is saved.

– The icon **a** appears on the monitor.

3.1.2 Increasing engine RPM via pedal

Ensure that the following prerequisite is met:

– maximum RPM not yet reached.

When the engine RPM is locked, the engine RPM can be increased with the pedal.
When the pedal is released, the engine RPM drops to the saved value.

▶ Press the pedal **544** and increase the engine RPM.

▶ When this engine RPM is to be saved:
Press button **463**, button **485** or button **505**.

3.1.3 Increasing and decreasing the engine RPM with the button

If both feet are already used for operation, for example when “driving the crawler”, the engine RPM can be changed with the button **472** or the button **473** on the control console.
A regulation with the buttons deletes the saved engine RPMs.

Increase engine RPM

▶ Press the button **472** and hold it until the desired engine RPM is reached.

Result:

– The engine RPM increases steplessly.

– The engine RPM increases steplessly.

Reduce the engine RPM

▶ Press the button **473** and hold it until the desired engine RPM is reached.

Result:

– The engine RPM reduces steplessly.

3.1.4 Releasing the engine RPM lock

▶ If the engine RPM is locked:
Press the button **463**.

or

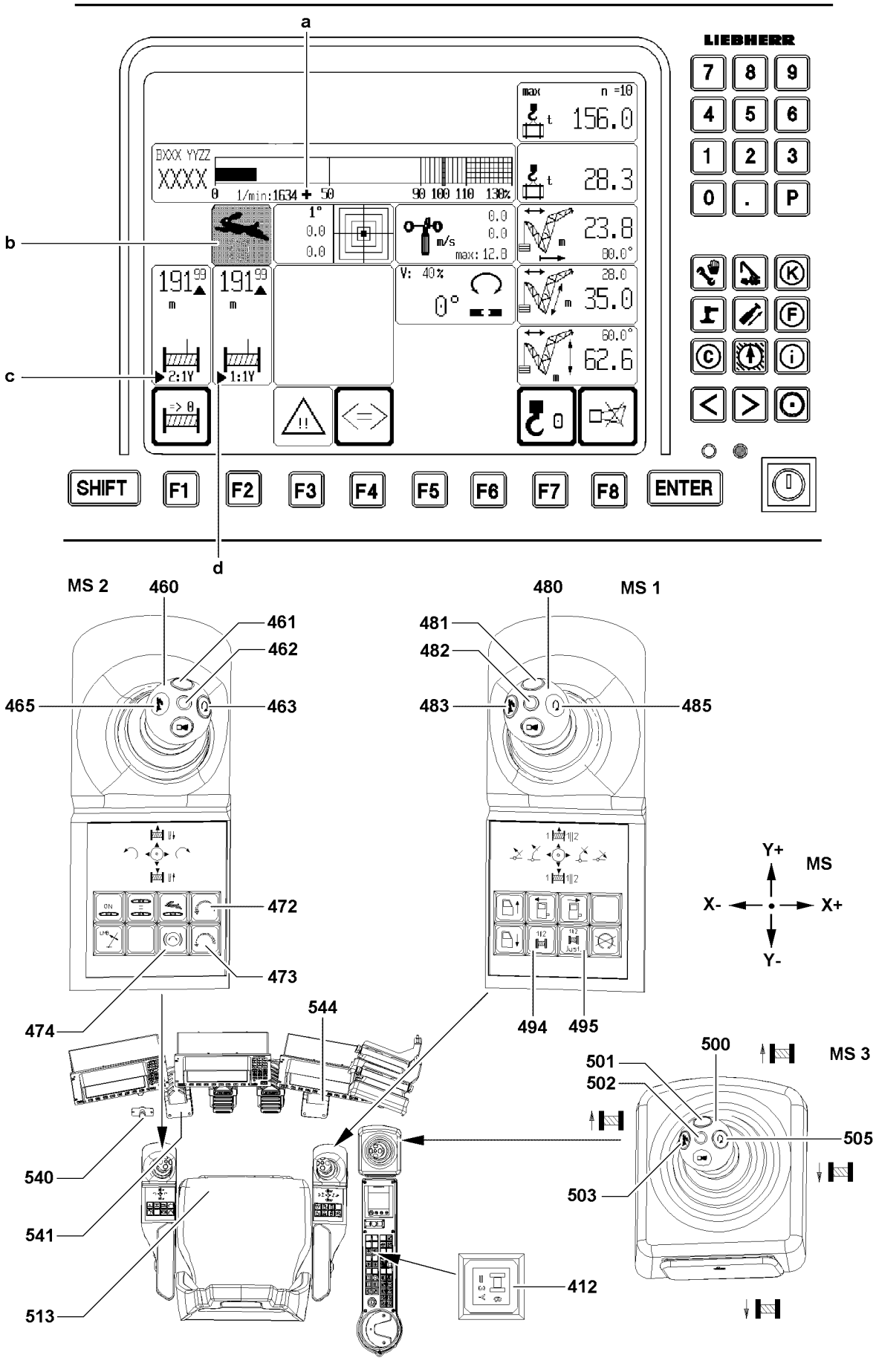
■ Press button **485** or button **505**.

Result:

– The lock is released.

– The icon **a** turns off on the monitor.

– The RPM reduces to low idle RPM.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3.1.5 “Power Plus”

Note
When “Power Plus” is turned on, observe the following:
- ▶ If a crane movement has reached its maximum speed due to the current utilization, then no speed increase is possible by adding the “Power Plus”.
- ▶ If the total power requirement of all actuated crane movements is larger than the available power, then those crane movements are reduced which require the most power.
- ▶ If another crane movement is added or taken back to one or more actuated crane movements then this has an influence on the other movements. For that reason we recommend in situations in which an interference of the individual crane movements is troublesome, not to add the “Power Plus” or to turn the “Power Plus” off.

Adding “Power Plus”

The speed of the “lift / lower” crane movement is increased with the button **465**, button **483** or button **503**.

WARNING
Danger of accidents in case of single to triple sheave reeving!
- ▶ Do **not** add “Power Plus” if the crane is utilized by more than 50 % of its maximum permissible load carrying capacity for the corresponding radius.

▶ Press the button **465**.

or

■ Press button **483** or button **503**.

Result:

– “Power Plus” is added.
The icon **b** appears on the LICCON monitor.

Turning the “Power Plus” off

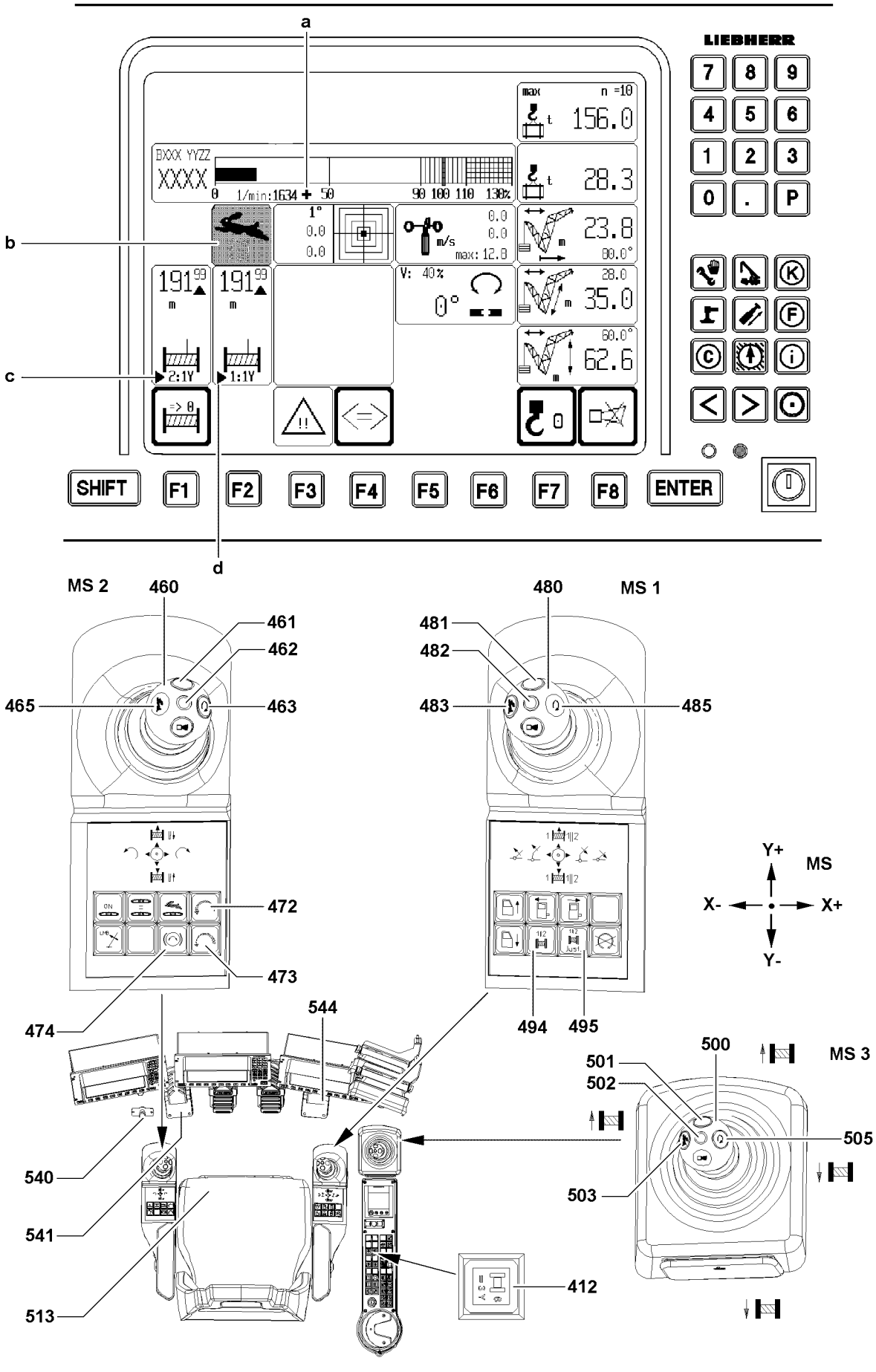
▶ If the “Power Plus” is added:
Press button **465** again.

or

■ Press button **485** or button **503** again.

Result:

– “Power Plus” is turned off.
The icon **b** turns off on the LICCON monitor.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3.2 Vibration sensor

By adding the vibration sensor, a crane movements can be detected by vibration of the master switch. Ensure that the following prerequisite is met:

– the seat contact switch **513** is activated.

3.2.1 Vibration sensor winch 1

Adding the vibration sensor

▶ Press the button **481**.

Result:

– The vibration sensor **482** is turned on.
  The icon **d** is turned on.

Turning the vibration sensor off

▶ When the vibration sensor **482** is turned on:
  Press button **481** again.

Result:

– The vibration sensor **482** is turned off.
  The icon **d** is turned off.

3.2.2 Vibration sensor winch 2 or slewing gear

If winch 2 and the slewing gear are operated, then the vibration sensor **462** will react to the first deflected movement.

Adding the vibration sensor

▶ Press the button **461**.

Result:

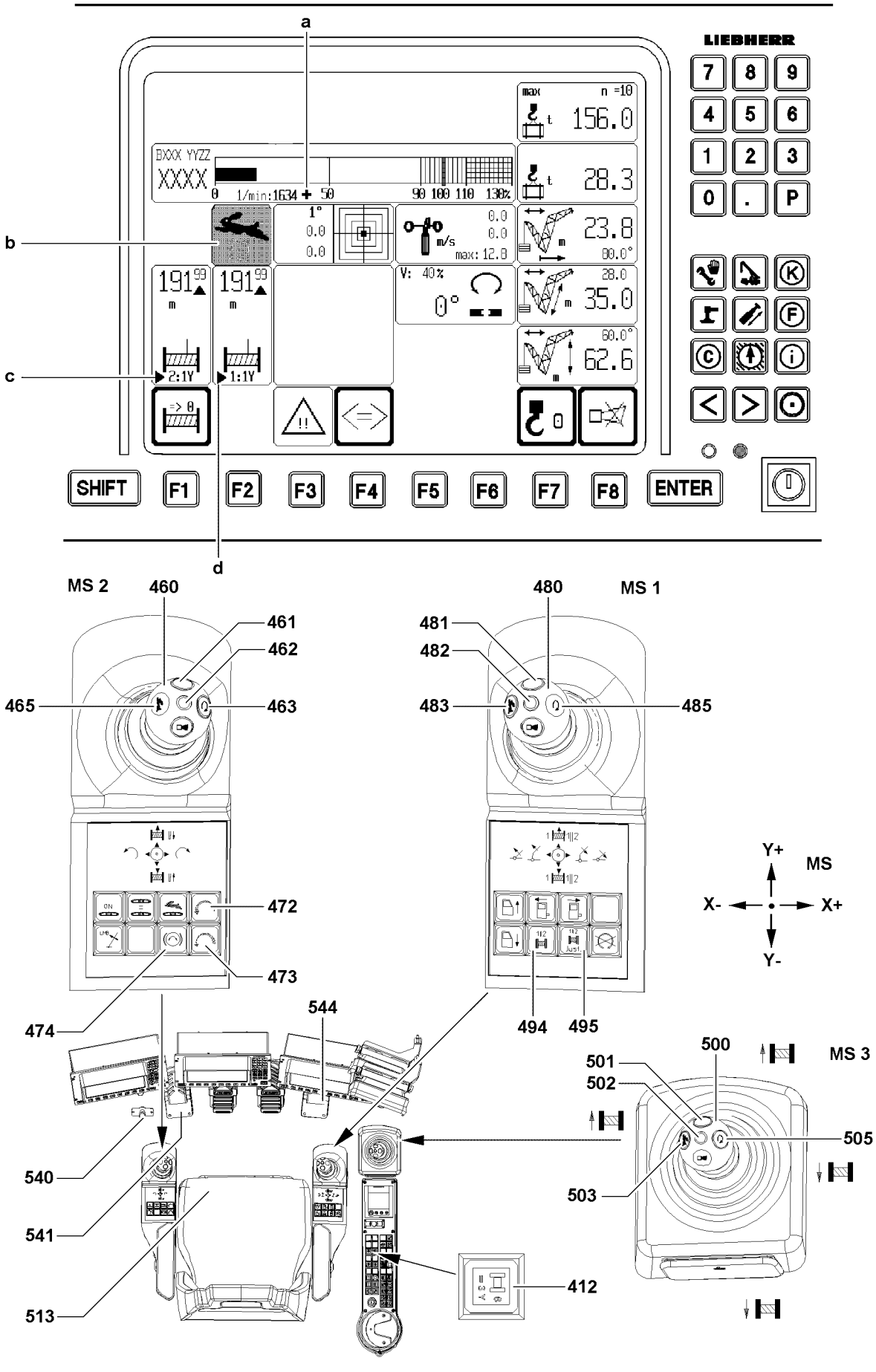
– The vibration sensor **462** is turned on.
  The icon **c** is turned on.

Turning the vibration sensor off

▶ When the vibration sensor **462** is turned on:
  Press button **461** again.

Result:

– The vibration sensor **462** is turned off.
  The icon **c** is turned off.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3.3 Lifting / lowering a load

NOTICE
Rope damage due to slack rope!
▶ When spooling the winches up or out, check visually to make sure that no slack rope forms.

The speed of crane movement “lifting and lowering” is controlled via the deflection of the corresponding master switch and via the pedal **544** of the engine regulation.
In the “Control Parameter” program, it is possible to preselect the maximum winch speed. It is also possible to deactivate or activate the individual winches.
See chapter 4.02, section “Control Parameter”.
Ensure that the following prerequisite is met:
– the winches are correctly assigned to the respective pulley heads, see chapter 4.02.

3.3.1 Operating winch 1 - hoist winch

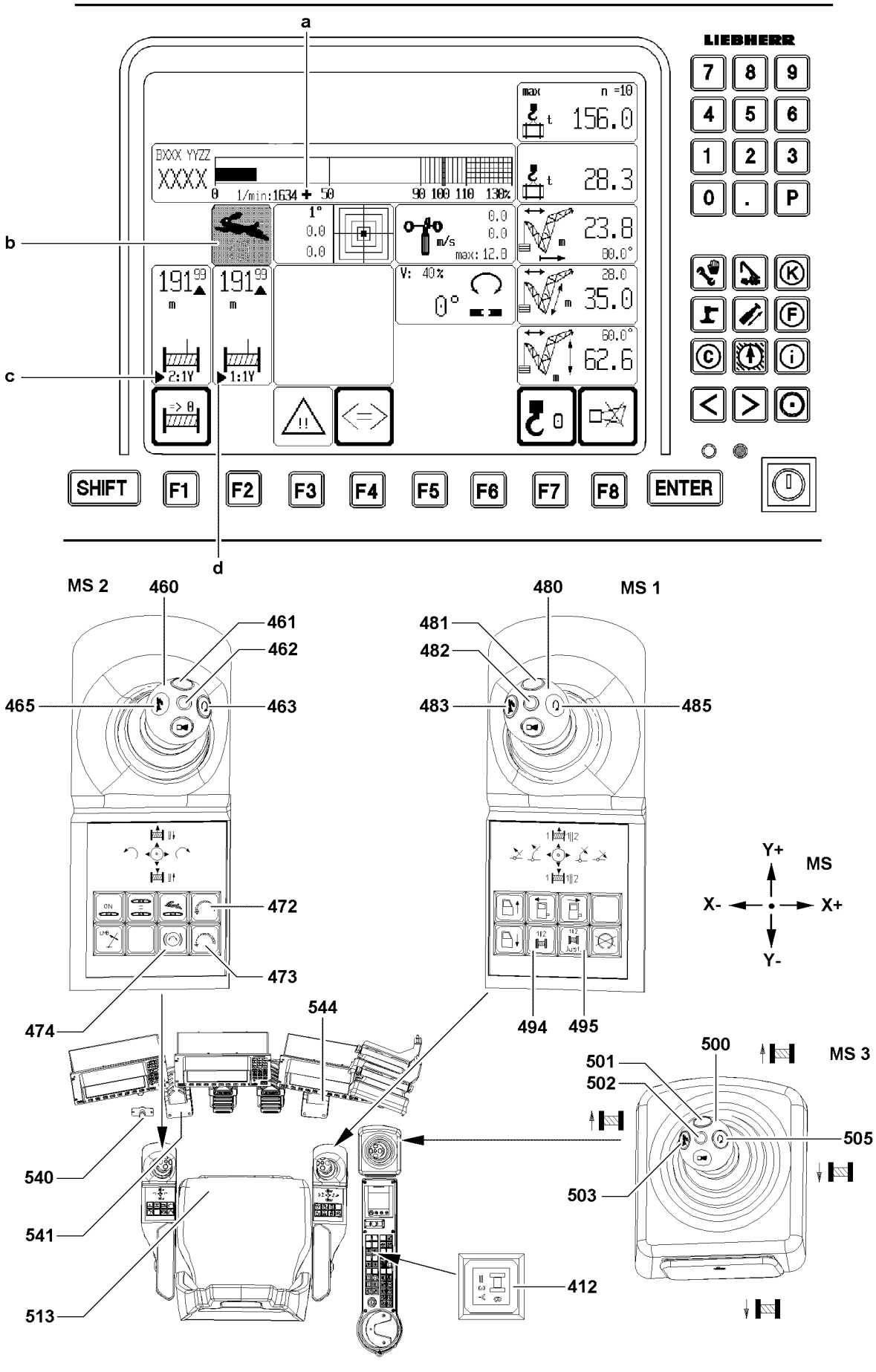
In the winch icon is shown with the arrow icons that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed.
▶ Deflect master switch 1 **480** in direction Y+.
Result:
– Winch 1 spools out and the load is lowered.

▶ Deflect master switch 1 **480** in direction Y-.
Result:
– Winch 1 spools up, the load is raised.

3.3.2 Operating winch 2 - hoist winch

In the winch icon is shown that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed.
▶ Deflect master switch 2 **460** in direction Y+.
Result:
– Winch 2 spools out and the load is lowered.

▶ Deflect master switch 2 **460** in direction Y-.
Result:
– Winch 2 spools up and the load is lifted.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3.3.3 Setting up parallel operation

For parallel operation, winch 1 and winch 2 are used.
In parallel operation, actuation of winch 1 and winch 2 is made only together with master switch 1 **480**.
Make sure that the following prerequisites are met:
– the double hook blocks are assembled together, see chapter 4.06,
– the double hook blocks are reeved according to the load charts,
– the double hook blocks are properly reeved according to the reeving plan, see chapter 4.06,
– the total reeving has been entered on the LICCON monitor,
– the reeving number on both winches 1 and 2 must be the same and even.

WARNING
Risk of accident!
▶ The total reeving number on both winches 1 and 2 must be the same and even in parallel operation. If the minimum value of the reeving is uneven, then - in parallel operation - the next higher, even reeving must be selected.
▶ Make sure to unpin the transport pins on the hook block before horizontal alignment and before crane operation.
▶ Make sure that the danger zone of the hook block is free of any personnel.

Align the hook blocks horizontally

Make sure that the following prerequisites are met:
– individual operation for winch 1 and winch 2 is set,
– the switch **494** is turned off: parallel control is turned off,
– there is no load on the hook.

Check visually and align the hook blocks horizontally. To do so, spool the winches manually up or out.
▶ Deflect master switch 1 **480** or master switch 2 **460** in direction Y.

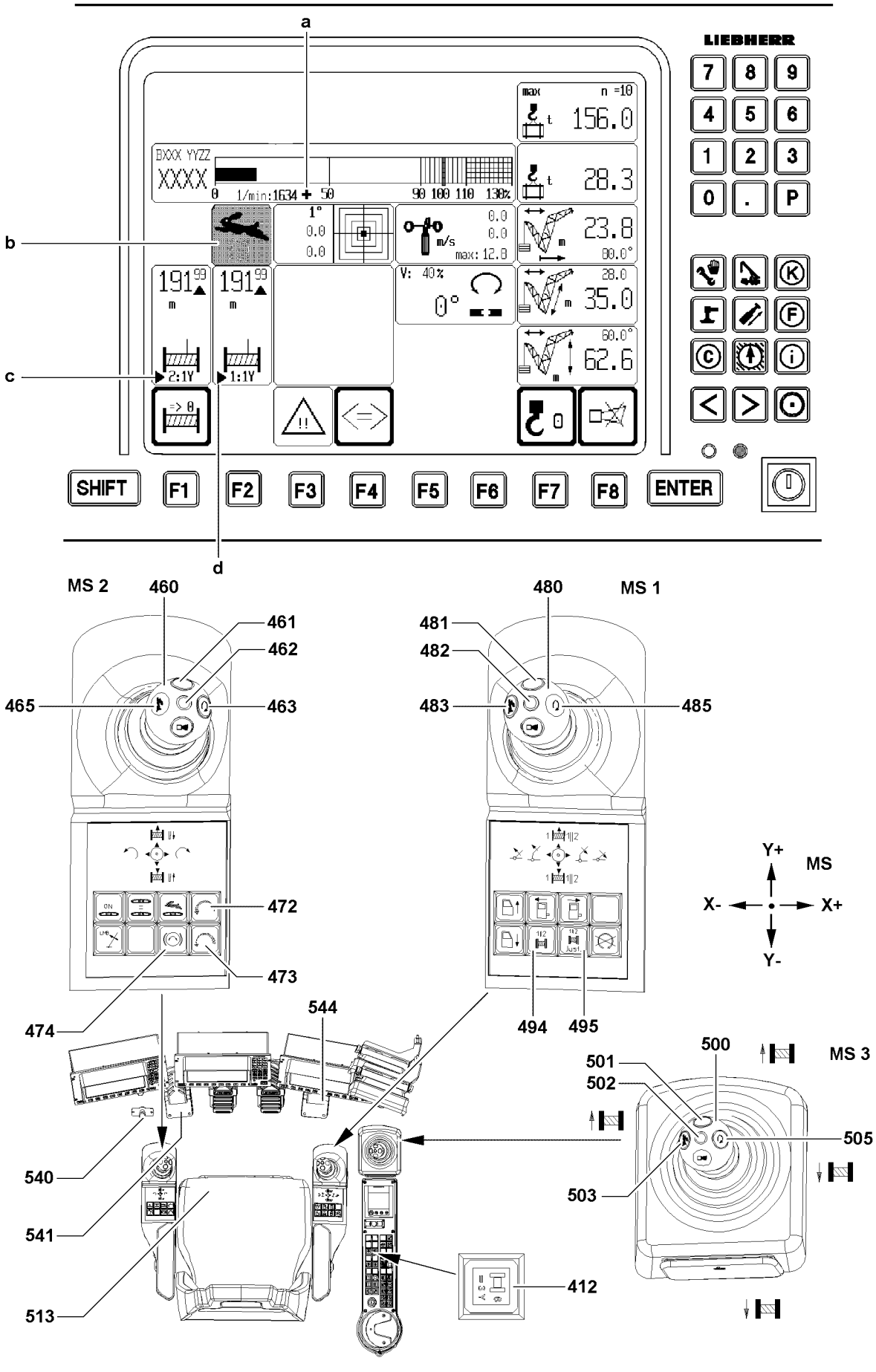
Result:
– Winch 1 or winch 2 spools out or up until the hook blocks are horizontally aligned.

Adjust parallel control of winch 1 and winch 2

Make sure that the following prerequisites are met:
– the double hook blocks are horizontally aligned, check visually,
– there is no load on the hook.

▶ Turn on the switch **494** for the parallel operation.
▶ Press the button **495**.

Result:
– The parallel control of winch 1 and winch 2 is adjusted.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3.3.4 Parallel operation: Lifting / lowering a load

WARNING
Danger of accidents due to overload!
If the compensation cross bar is inclined, then significant load increases will occur on the individual hook blocks.
If this is not observed, then the hook block, boom or rope can be overloaded, resulting in property damage and personal injury.
▶ Make sure that the compensation cross bar is always aligned horizontally on the double hook blocks.

WARNING
Danger of accidents due to different level of hook blocks!
The electronic parallel control monitors only the same turning speed of both winches, but it does not take the following errors into account:
Uneven rope length
Different winding behavior
Uneven reeving
▶ The crane operator must ensure and is responsible for that the hook blocks are always on the same level, despite electronic monitoring.

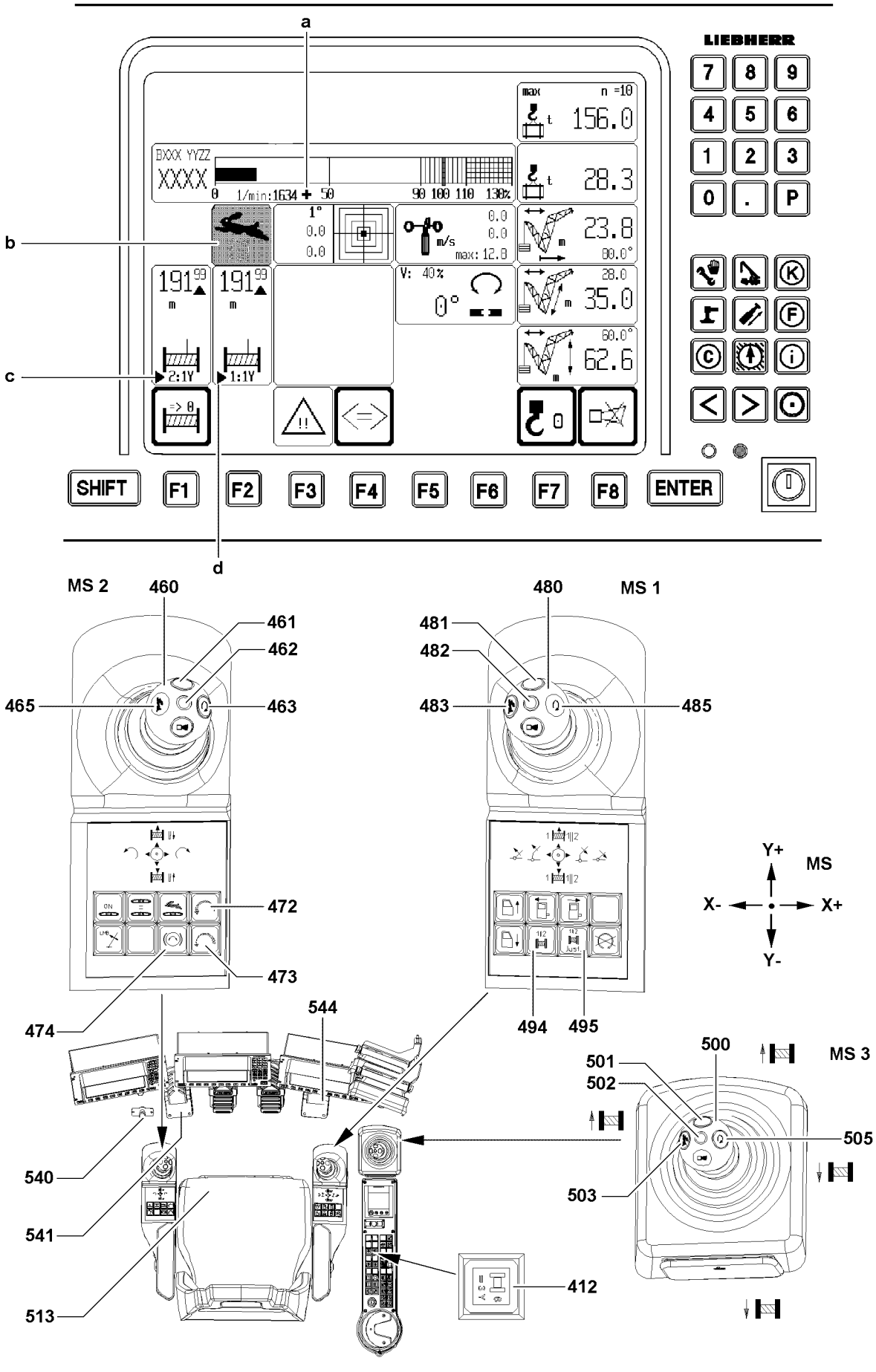
Note
▶ In emergency operation, no parallel control is possible.

Note
▶ The winch movement is shut off if the difference range of the parallel control is being exceeded. In that case, the winches must be again parallel adjusted.

Make sure that the following prerequisites are met:
– the double hook blocks are horizontally aligned, check visually,
– there is no load on the hook,
– parallel control of winches is adjusted,
– the button **494** for parallel operation is turned on.

▶ Deflect master switch 1 **480** in direction Y+.
Result:
– Winch 1 and winch 2 spool out together: The load is lowered.

▶ Deflect master switch 1 **480** in direction Y-.
Result:
– Winch 1 and winch 2 spool up together: The load is lifted.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3.3.5 Operating winch 6 - hoist winch

In the winch icon is shown that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed.

Note

- ▶ In individual operation of winch 1 and winch 2, no master switch is assigned to winch 6.
- ▶ To be able to run winch 6 in individual operation, the switch **412** must be turned on, this assigns winch 6 to the master switch 3 **500**.
- ▶ In parallel operation, winch 1 and winch 2 are actuated with the master switch 1 **480**. When the switch **412** is turned off, then the master switch 2 **460** is assigned to winch 6.

Operating winch 6 in parallel operation of winch 1 and winch 2

Make sure that the following prerequisites are met:
– switch **494** is turned on,
– the switch **412** is turned off.

▶ Deflect master switch 2 **460** in direction Y+.

Result:
– Winch 6 spools out and the load is lowered.

▶ Deflect master switch 2 **460** in direction Y-.

Result:
– Winch 6 spools up and the load is lifted.

Operating winch 6 in individual operation winch 1 + 2

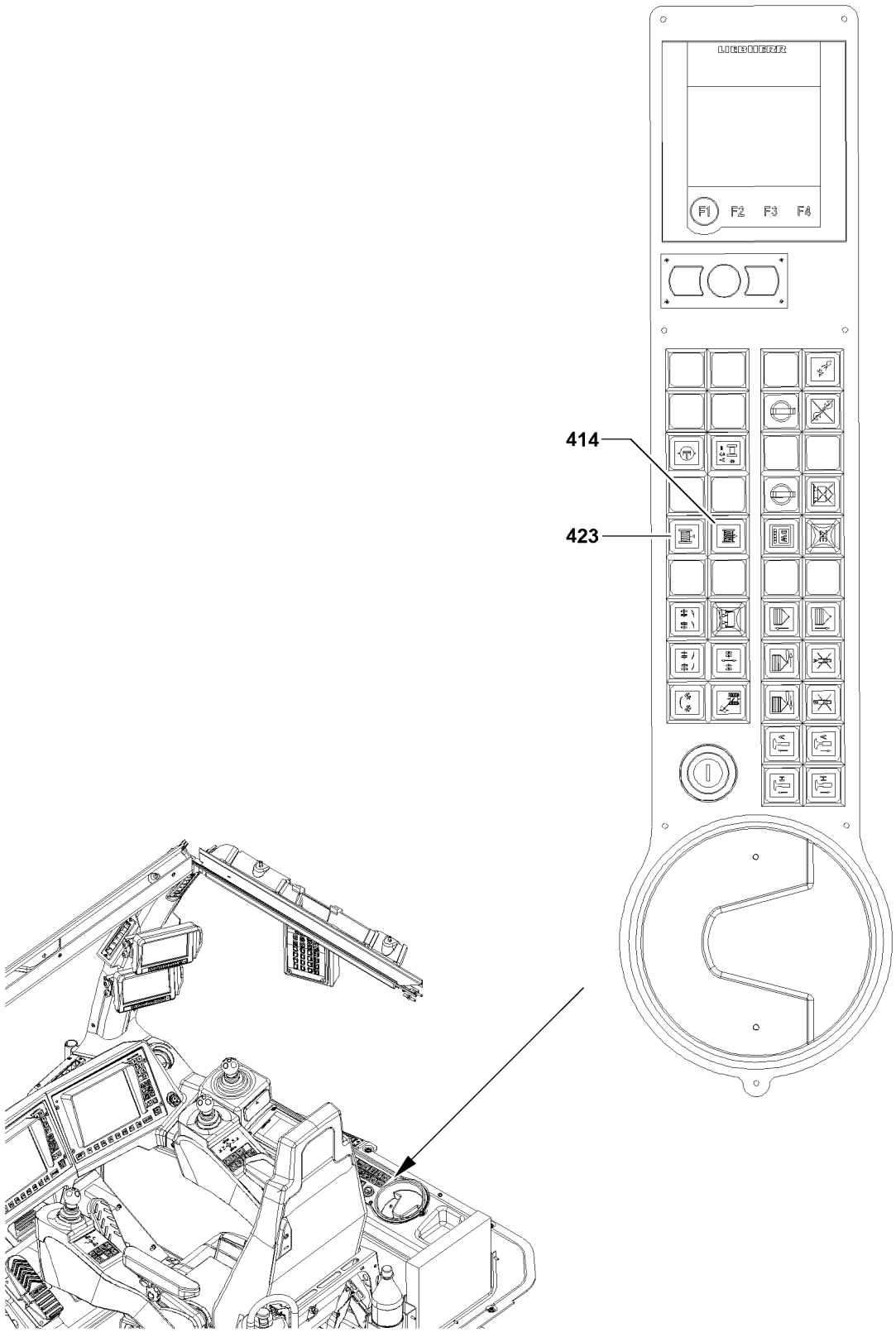
Make sure that the following prerequisites are met:
– the switch **494** is turned off,
– switch **412** is turned on.

▶ Deflect master switch 3 **500** in direction Y+.

Result:
– Winch 6 spools out and the load is lowered.

▶ Deflect master switch 3 **500** in direction Y-.

Result:
– Winch 6 spools up and the load is lifted.



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3.3.6 Operating the assembly winch

Spool the assembly winch out

▶ If the assembly winch is to be stopped:
Release the button **423**.

▶ Press the button **423** and hold.

Result:

– The assembly winch spools out.

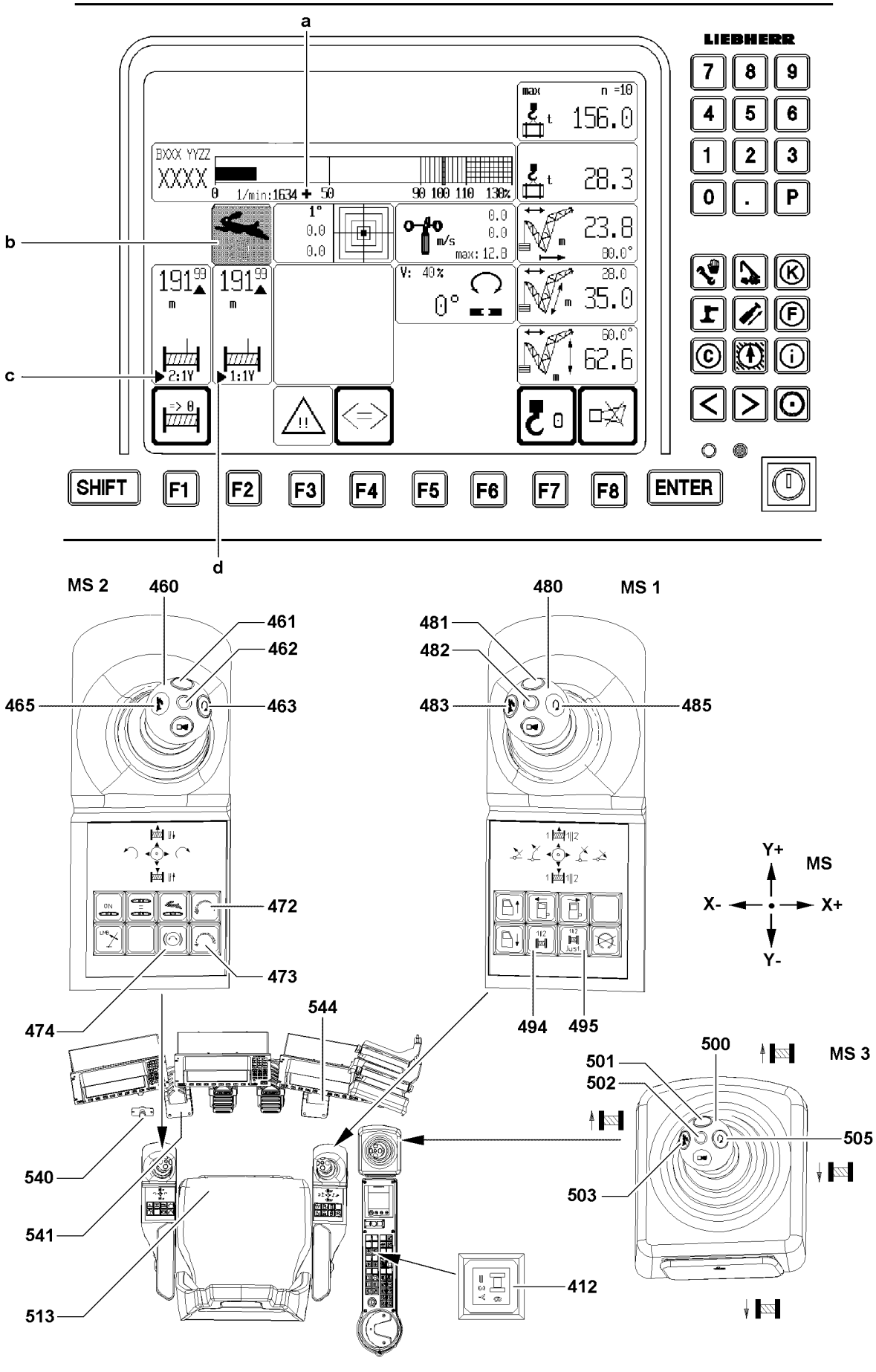
Spool the assembly winch up

▶ If the assembly winch is to be stopped:
Release the button **414**.

▶ Press the button **414** and hold.

Result:

– The assembly winch spools up.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3.4 Luffing the boom

DANGER
Risk of accident due to toppling crane!
If the LICCON overload safety turns off while trying to lift the load with the winch, then a subsequent luffing movement can cause the crane to topple over or damage it. Personnel can be severely injured or killed!
▶ Do not lift the load by luffing up the boom, see chapter 4.04.

The speed of crane movement “luffing” is controlled by the deflection of the corresponding master switch and via the pedal **544** of the engine regulation.

Note
▶ The operating modes are explained in the load chart manual.

3.4.1 Luffing the boom in S/SL/SLF/SL2DB/SDB/SDWV(B,BW) operating modes

▶ Deflect the master switch 1 **480** in direction X-.
Result:
– The boom is luffed up.

▶ Deflect the master switch 1 **480** in direction X+.
Result:
– The boom is luffed down.

3.4.2 Luffing the main boom in operating mode SW

Make sure that the following prerequisites are met:
– the switch **412** is **not** switched to winch 6, master switch 3 **500**.

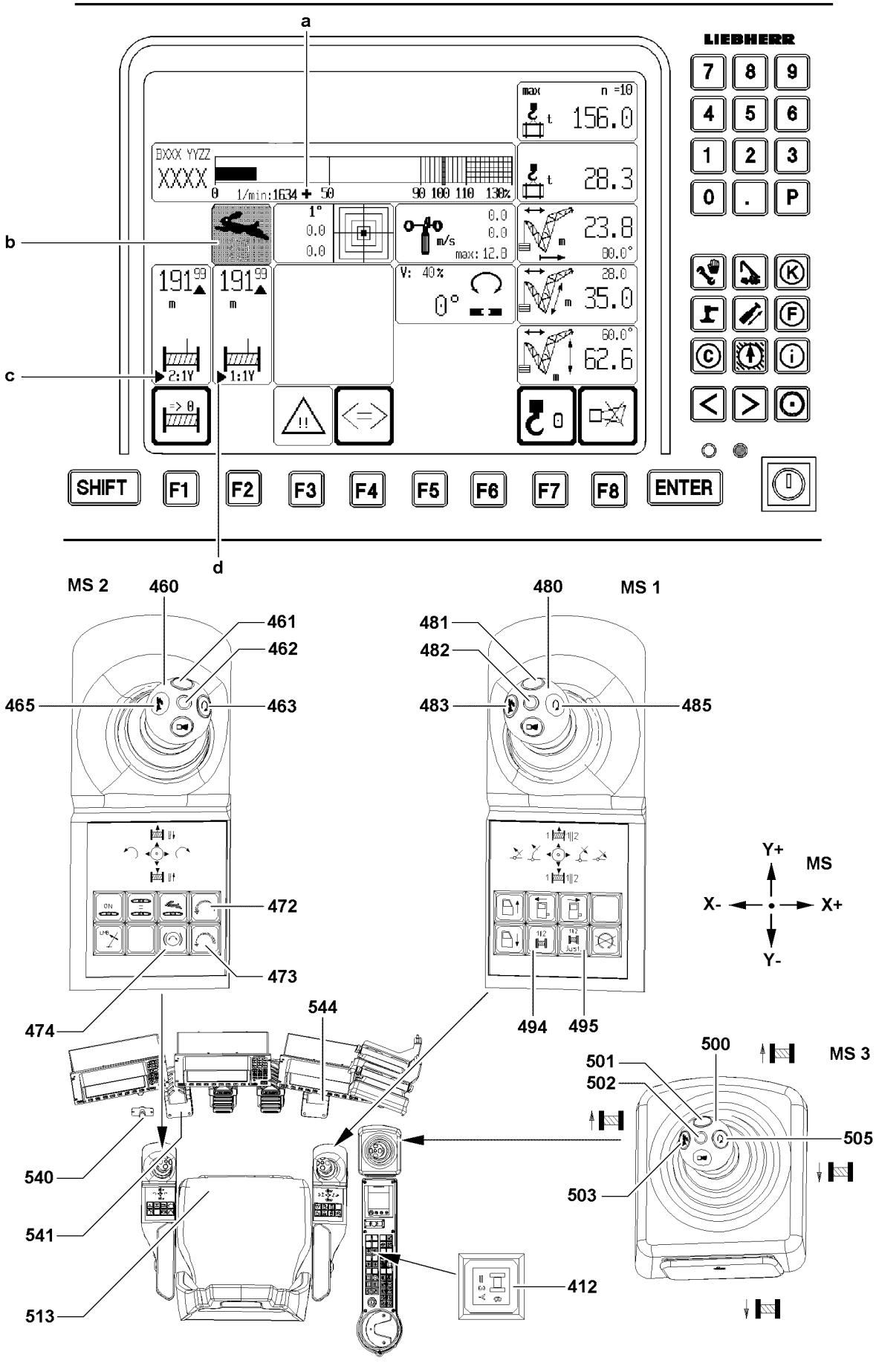
▶ Deflect master switch 3 **500** in direction Y-.
Result:
– The boom is luffed up.

▶ Deflect master switch 3 **500** in direction Y+.
Result:
– The boom is luffed down.

3.4.3 Luffing the main boom in operating mode SDW (B, BW)

▶ Deflect the master switch 3 **500** in direction X-.
Result:
– The boom is luffed up.

▶ Deflect the master switch 3 **500** in direction X+.
Result:
– The boom is luffed down.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3.4.4 Luffing the lattice jib in SW/SDW (B,BW) operation

▶ Deflect the master switch 1 **480** in direction X-.

Result:

– The lattice jib is luffed up.

▶ Deflect the master switch 1 **480** in direction X+.

Result:

– The lattice jib is luffed down.

3.4.5 Luffing the boom in SDWV (B,BW) operation

▶ Deflect the master switch 3 **500** in direction X-.

Result:

– The lattice jib is luffed up.

▶ Deflect the master switch 3 **500** in direction X+.

Result:

– The lattice jib is luffed down.

3.4.6 Luffing the derrick, for all D operating modes

Make sure that the following prerequisites are met:

– The switch **412** is **not** switched to winch 6, master switch 3 **500**.

▶ Deflect master switch 3 **500** in direction Y-.

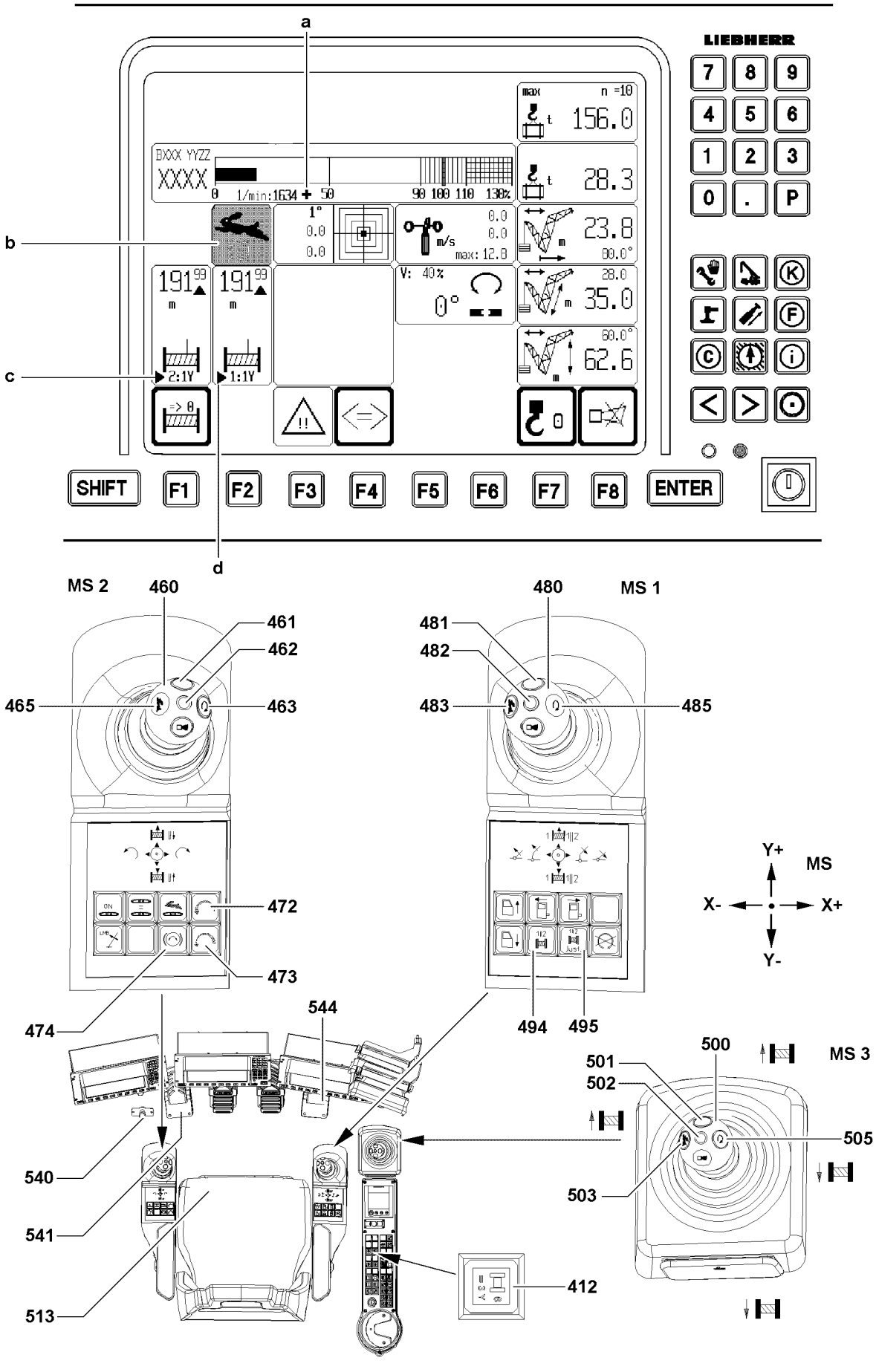
Result:

– The derrick is luffed up.

▶ Deflect master switch 3 **500** in direction Y+.

Result:

– The derrick is luffed down.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3.5 Slowing down a slewing movement

This crane is equipped with a slewing gear in a closed hydraulic circuit.
Various braking functions are differentiated:

1.) Working with automatic slewing brake: The hydraulic system brakes the slewing movement, the slewing brake is applied after completion of the integration period.
2.) Working with manually opened slewing brake: The slewing gear brake can be opened and closed manually.
3.) Working in strong side wind with additional actuation of the slewing brake with the pedal.

3.5.1 Opening and closing the slewing brake manually

Opening the slewing brake manually

DANGER
Danger of accident due to uncontrolled turning crane!
If the slewing brake is opened manually and the master switch 2 **460** is **not** deflected, the crane superstructure, as a result of external forces, such as wind, incline position of the crane, etc., can turn slowly due to leakage in the closed hydraulic circuit.
When the slewing brake is opened manually and the master switch 2 **460** is **not** deflected:
▶ Make sure that the crane is not turning uncontrolled.

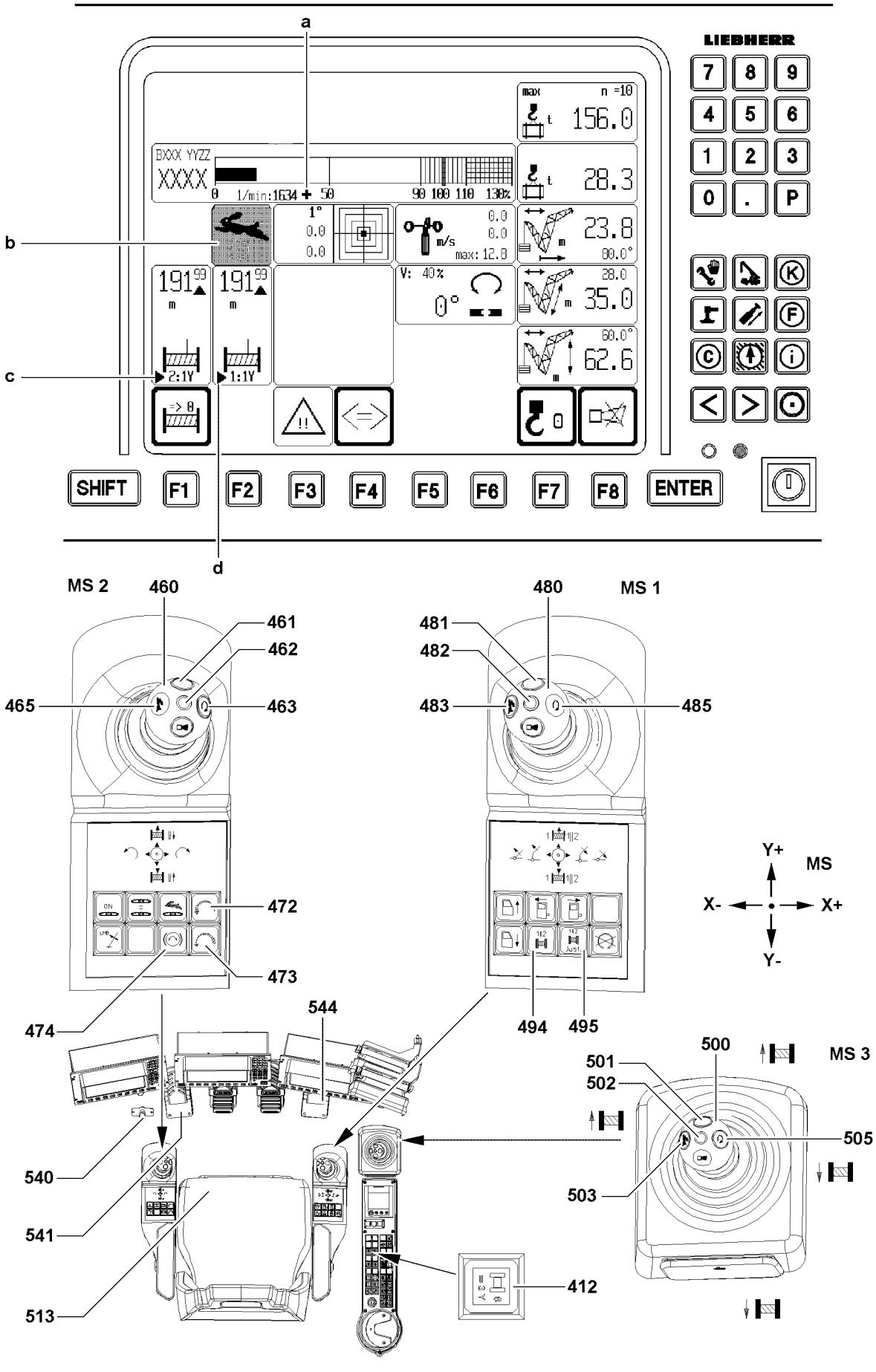
Note
▶ Observe the data in section “Actuating the slewing brake with the pedal”!

The slewing brake closes automatically if:
– The crane operator gets up from the crane operator's seat.
– The engine is turned off.

The slewing gear **cannot** be opened at:
– Slewing gear shut off by the LICCON overload protection.
– Activated working range limitation.

▶ Actuate the switch **474**.
Result:
– The slewing brake is opened.
– The indicator light **474** lights up.

Closing the slewing brake manually
▶ Press the button **474**.
Result:
– The slewing gear brake is applied.
– The indicator light **474** turns off.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SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
MS 2
460
461
462
463
465
472
473
474
MS 1
480
481
482
483
485
494
495
MS
Y+
X-
X+
Y-
544
540
541
513
412
MS 3
500
501
502
503
505

B104897

3.5.2 Actuating the slewing gear brake with the pedal

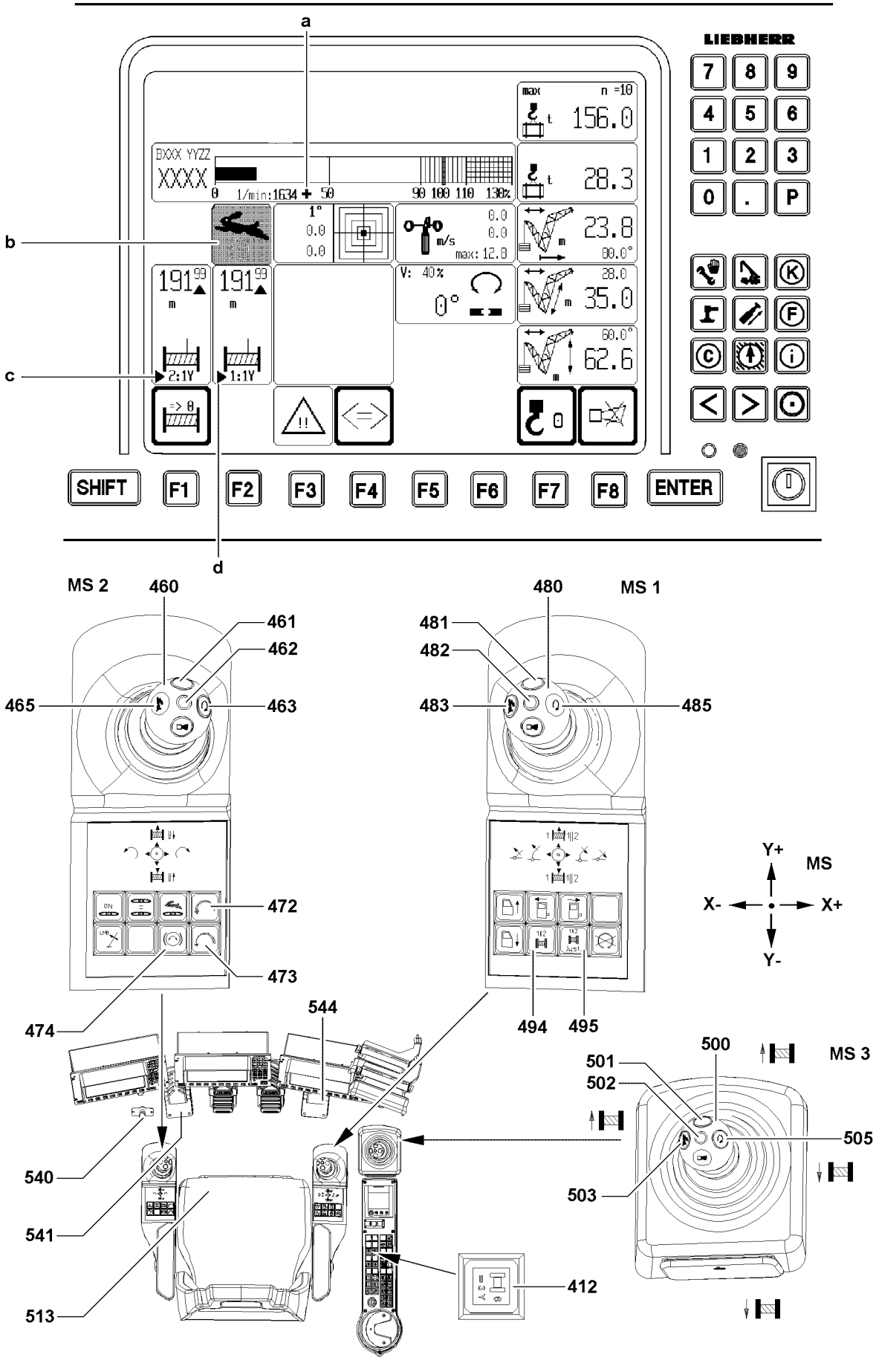
NOTICE
Danger of property damage on the roller ring connection!
When actuating the slewing gear brake with the pedal **541**, only part of the braking momentum of the slewing gear brake can be created.
- ▶ Use the pedal **541** to actuate the slewing gear brake only at minimum turning speeds, which means the master switch 2 **460** is almost in zero position.
- ▶ Do not brake the turning movement of the crane by moving the master switch 2 **460** back to the neutral position and/or by abruptly applying the slewing brake with the pedal **541**!

Use the pedal **541** to actuate the slewing gear brake only in the following cases:
– Starting out in strong side wind.
– Stopping the slewing movement in strong side wind.

Starting out in strong side wind

When turning against the wind in strong side wind and with a long boom systems, then the superstructure, due to leakage in the hydraulic motor, will turn into the opposite direction, in relation to the deflection of the master switch.
This can be avoided as follows:
- ▶ Actuate the pedal **541** and deflect the master switch 2 **460** into the desired turning direction.
- ▶ Slowly release the pedal **541** until the superstructure turns in the desired turning direction.

Stopping the slewing movement in strong side wind
- ▶ Slow down the crane with master switch 2 **460** to minimum turning speed.
- ▶ Apply the pedal **541** carefully, until the crane has come to a standstill at the desired position.


a
b
c
d
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
max n =10
156.0
28.3
23.8
35.0
62.6
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
MS 2
460
461
462
465
463
472
473
474
MS 1
480
481
482
483
485
494
495
Y+
MS
X-
X+
Y-
544
540
541
513
412
500
MS 3
501
502
505
503

B104897

3.6 Switching the slewing gear to coasting

In order to position the boom over the load more easily, the slewing gear can be switched to coasting.
The master switch 2 **460** may not be deflected while doing so.
The slewing gear **cannot** be switched to coasting in these situations:
– Slewing gear shut off by the LICCON overload protection.
– Activated working range limitation.

▶ Press the foot button **540**.

Result:
– The slewing gear is switched to coasting.

Troubleshooting
With the slewing gear released, the superstructure turns unintentionally (for example due to wind).
▶ Do not release the foot button **540**.
▶ Deflect the master switch 2 **460** in slewing direction and then release the foot button **540**.
▶ Slow down the slewing movement by slowly resetting the master switch 2 **460**.

3.7 Turning the crane superstructure

WARNING
Risk of accident!
▶ Ensure that there are no obstacles in the turning range for the crane and that there are no persons within the danger zone.
▶ Give a short warning signal (horn) before starting a crane movement.

WARNING
Risk of accident due to toppling crane!
If the slewing speed is exceeded, there is the danger that the loads start to swing. The crane can be damaged or topple over. Personnel can be severely injured or killed!
▶ Turning with a load: Initiate and slow down a turning movement extremely sensitively.
▶ Longer boom and larger load: Operate the crane with lower turning speed.
▶ Observe and adhere to the values in the load chart manual.

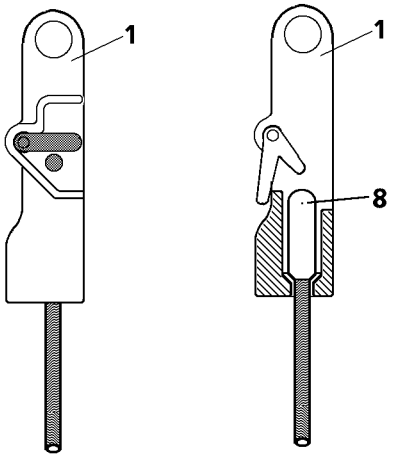
The speed of the “turning” crane movement is controlled via the deflection of master switch 2 **460** and via the pedal **544** of the engine regulation.
In the “Control Parameter” program, it is possible to preselect the maximum rotational speed.
See chapter 4.02 “LICCON computer system”, section “Control Parameters”.
▶ Deflect the master switch 2 **460** in direction X+.

Result:
– The crane superstructure turns to the right.

▶ Deflect the master switch 2 **460** in direction X-.

Result:
– The crane superstructure turns to the left.

1



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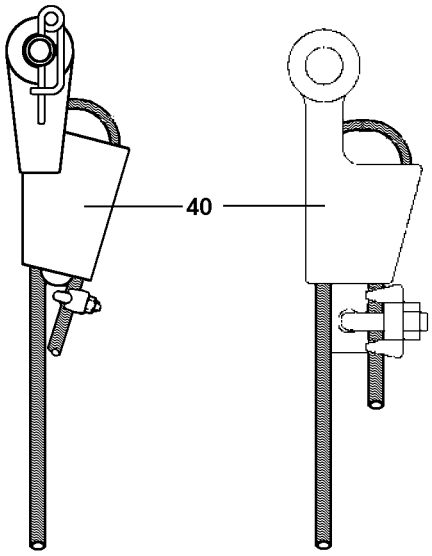


B108118

1 Wire ropes and rope end connections

1.1 Wire ropes

Please check if a **non-rotating** or a **rotation-resistant** rope is required for the application. The type of rope that is selected then determines the required type of rope end connections, see Crane operating instructions, chapter 8.04.

Note

▶ The correct choice and use of wire rope and rope end connections are decisive preconditions for proper and accident-free crane operation!

DANGER

Danger of serious personnel injury and equipment damage!

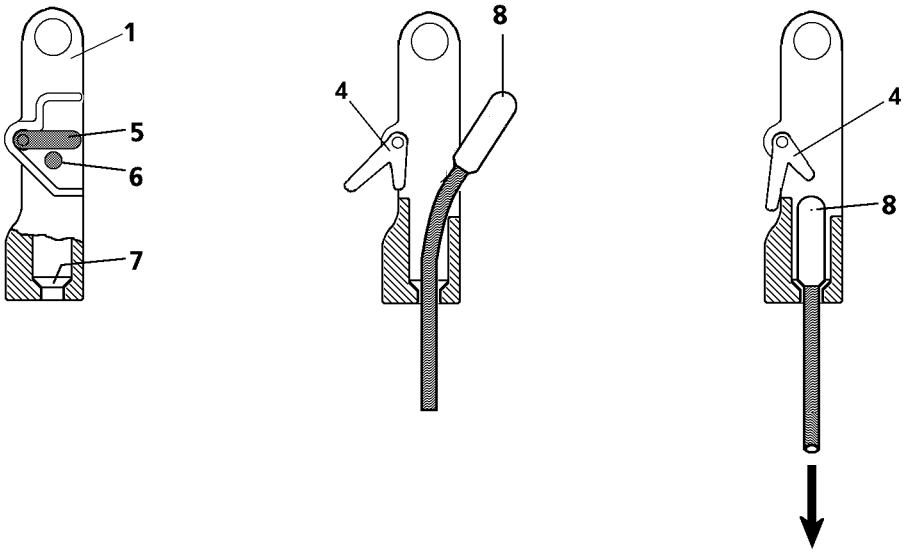
▶ **Never** use rotation-resistant ropes with a rotating rope end connection!

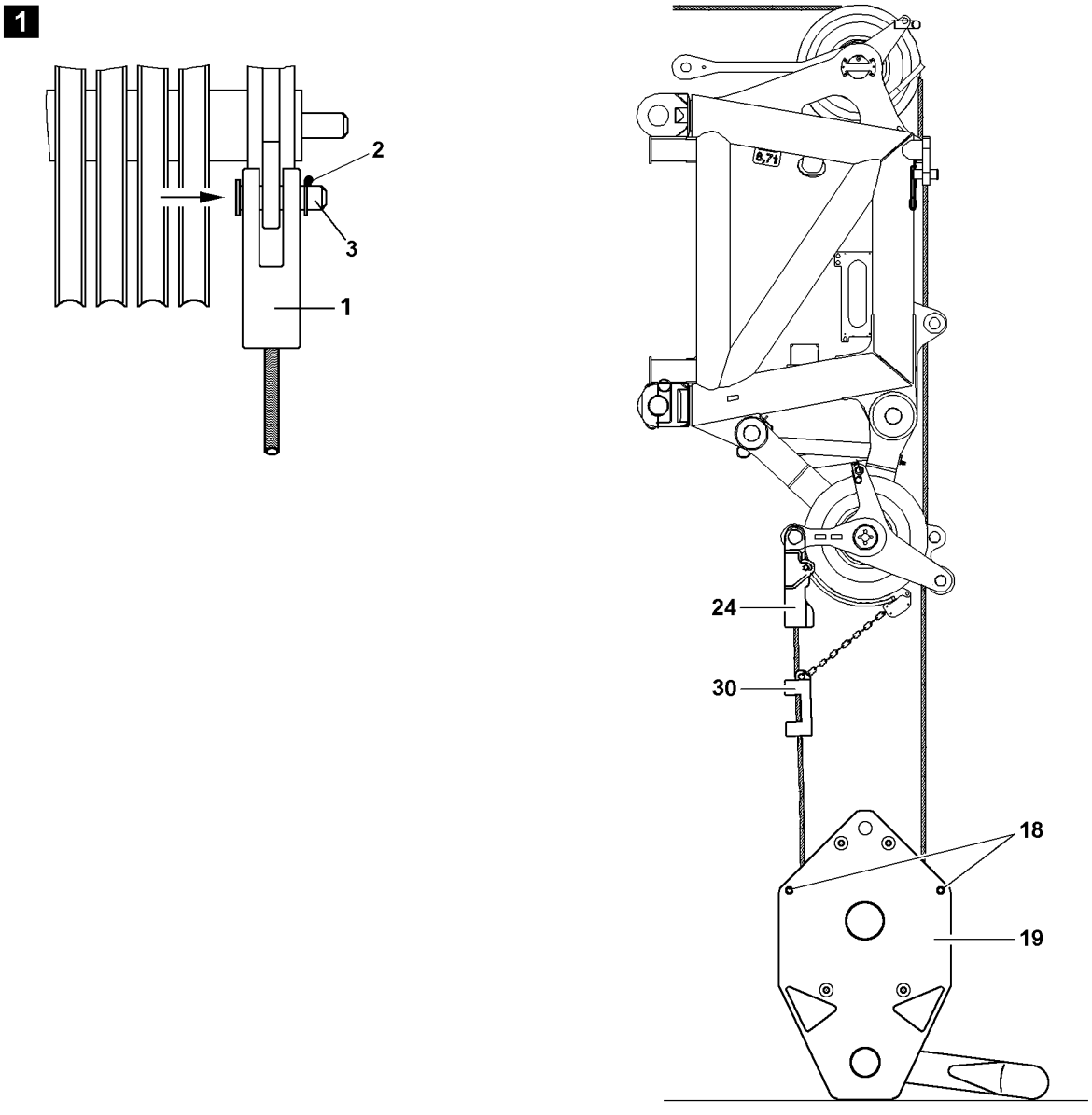
▶ **Never** install a twist compensator / swivel!

1.2 Rope end connections

Rope end connections are grouped into:

– Rope end connections with locking clamp **8**.
  For that, use a rope lock **1**, see illustration **1**.
– Rope end connections without locking clamp.
  For that, use a wedge lock **40**, see illustration **2**.





B108211

2 Reeving the hook block in and out

WARNING
Erroneous operation of crane function and danger of slipping on the boom!
If the following notes are not observed and adhered to, personnel can be severely injured or killed!
- ▶ Step on the boom only via the catwalks!
- ▶ The assembly personnel must secure themselves for all work on the lattice mast boom with approved antifall systems, on the safety ropes or on the lattice sections, with snap hook on both sides to prevent them from falling!
- ▶ Complete the assembly work from a stable location!
- ▶ Observe and adhere to the assembly guidelines in chapter 5.01 of the crane operating instructions!

2.1 Reeving in the hook block

WARNING
The hook block can fall over!
If the pins **2** are **not** inserted into the hook block before setting the hook block down, the hook block can fall over when unreeving the hoist rope!
Personnel can be severely injured or killed!
- ▶ Pin in the pin **2**, see chapter 5.19 of the crane operating instructions!

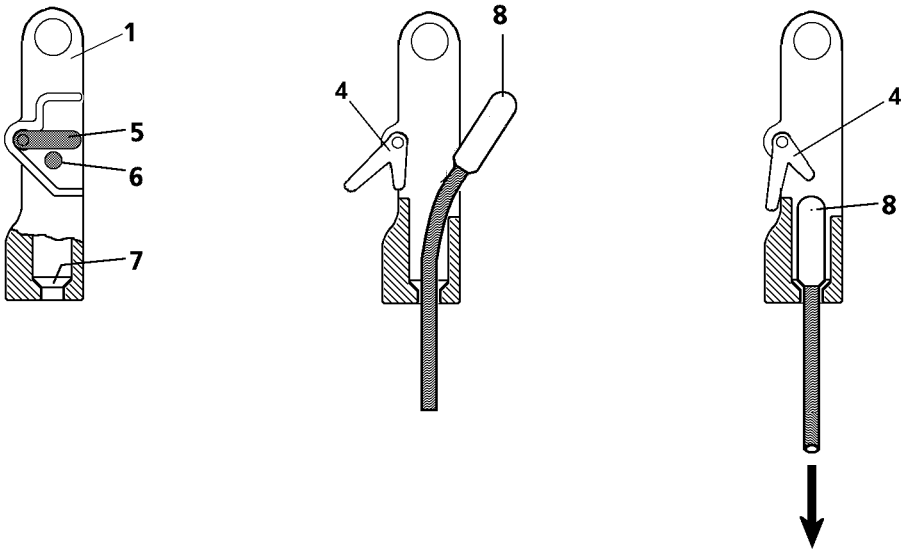
Note
- ▶ The reeving of the hoist rope can be carried out manually or with the aid of the assembly winch!
- ▶ Make sure that no slack rope forms during reeving!

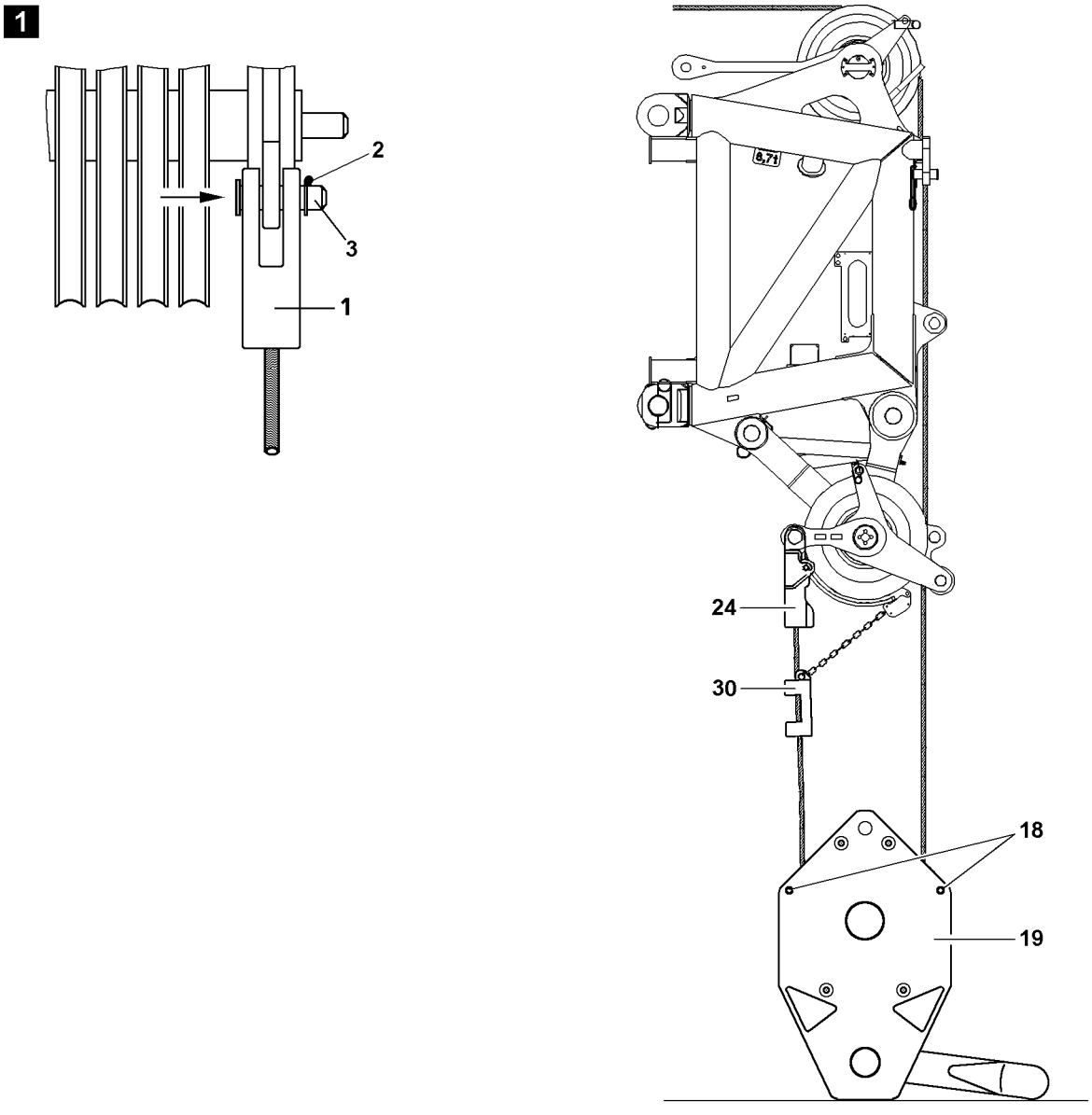
NOTICE
Damage to the hoist rope!
An incorrectly reeved hoist rope or the incorrect selection of the rope fixed point can cause the hook block not to hang vertically and thus cause damage to the hoist rope!
- ▶ Always carry out the reeving of the hoist rope according to the reeving plan!
- ▶ The rope fixed point on the hook block is to be selected in such a way that the last strand runs parallel to the remaining rope strands, as much as possible!

Make sure that the following prerequisites are met:
- – the crane is aligned in horizontal direction,
- – the hook block is set down on the ground properly,
- – the boom is luffed down to the point where the pulley head is above the hook block,
- – an assistant is present to guide the hoist rope.

2.1.1 Procedure

- ▶ Release and unpin the rope retaining pipe on the hook block.
- ▶ Release and unpin the rope retaining pipes on the back pulley and on the pulley head.





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2.1.2 Manual reeving

- ▶ An assistant guides the hoist rope over the boom to the pulley head and at the same time, the crane operator spools the hoist winch out.
- ▶ Place the hoist rope of the back pulley and reeve in according to the reeving plan between the pulley head and the hook block.
- ▶ When the hook block is completely reeved in:
  Insert the rope retaining pipes again and secure with spring retainers.

2.1.3 Reeving with assembly winch

- ▶ Reeve in the auxiliary rope in the reverse direction between the hook block and the pulley head.
- ▶ Connect the auxiliary rope with the hoist rope.
- ▶ Unwind the hoist rope from the hoisting winch and simultaneously wind up the auxiliary rope of the assembly winch.
- ▶ When the hook block is completely reeved in:
  Insert the rope retaining pipes again and secure with spring retainers.

2.1.4 Hook the hoist rope on the rope lock

NOTICE
Scraping of hoist rope!
If the pin **3** has been assembled incorrectly, the hoist rope may rub against the pin **3** or on the linch pin **2**!
Hoist rope, pin **3** and linch pin **2** are damaged!

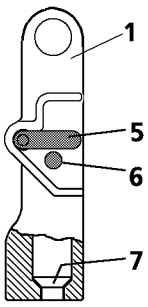
- ▶ Always insert pins **3** from “inside to outside” and secure them from the outside, see illustration **1**.

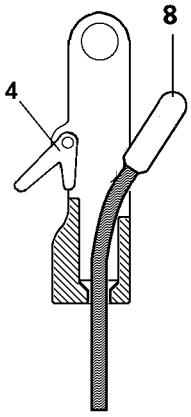
- ▶ The rope lock **1** must be pinned in either at the pulley head or on the hook block and secured with linch pins **2**, depending on reeving.
- ▶ On the rope lock **1**, push the retaining pin **6** in.
- ▶ Swing the lever **5** “down” and hold it in this position.

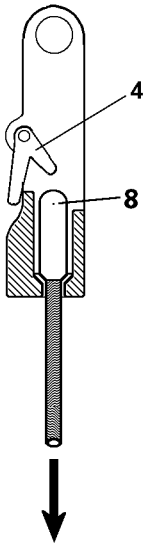
Result:

– The latch **4** will be swivelled “downward”.

- ▶ Attach the rope end with the locking clamp **8** in the rope lock **1** and pull “down” firmly (in direction of arrow), until the locking clamp **8** is touching in the cone **7**.







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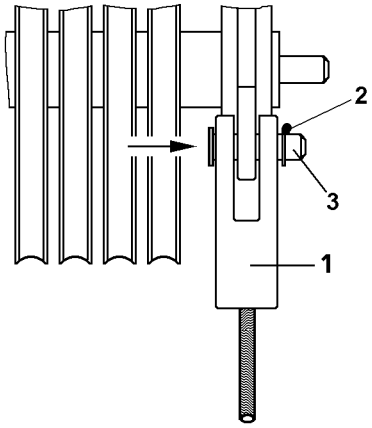
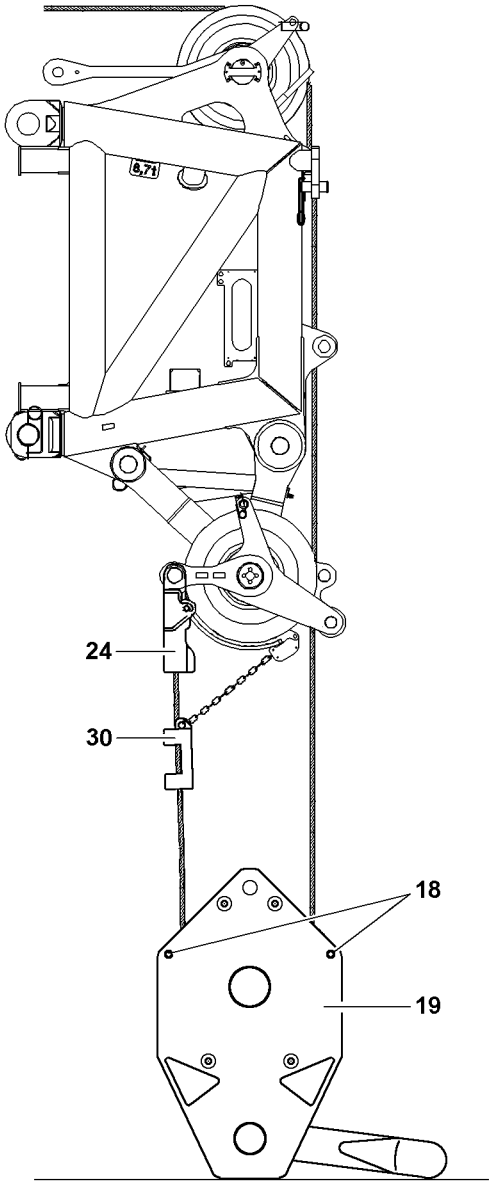




B108211

WARNING
Incorrectly secured locking clamp!
If the locking clamp **8** is hooked and secured incorrectly or insufficiently in the rope lock **1**, then the load and the hook block can fall down!
Personnel can be severely injured or killed!
▶ The locking clamp **8** must touch on the cone **7** after hanging it into the rope lock **1** and must be secured by the latch **4**!

▶ Release the lever **5**.

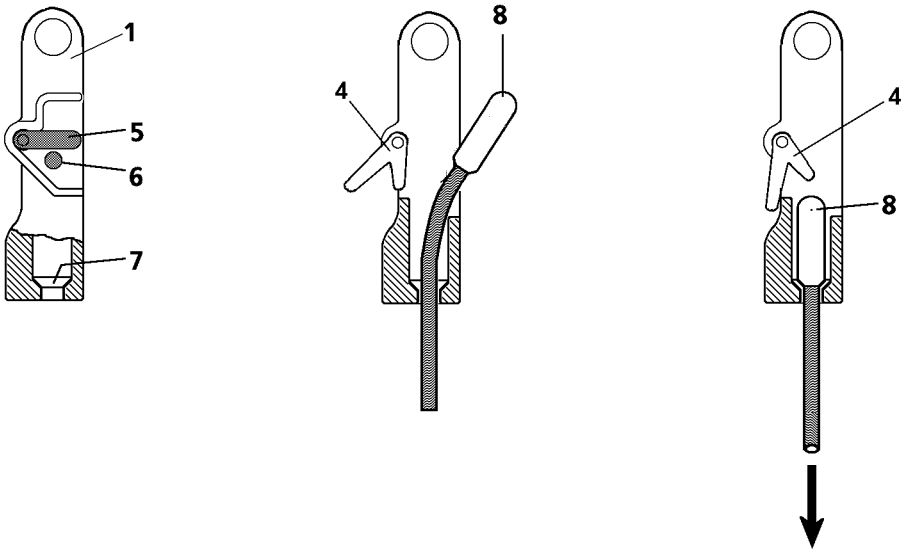
Result:
– The lever **5** returns to the initial position and is locked by the retaining pin **6**.

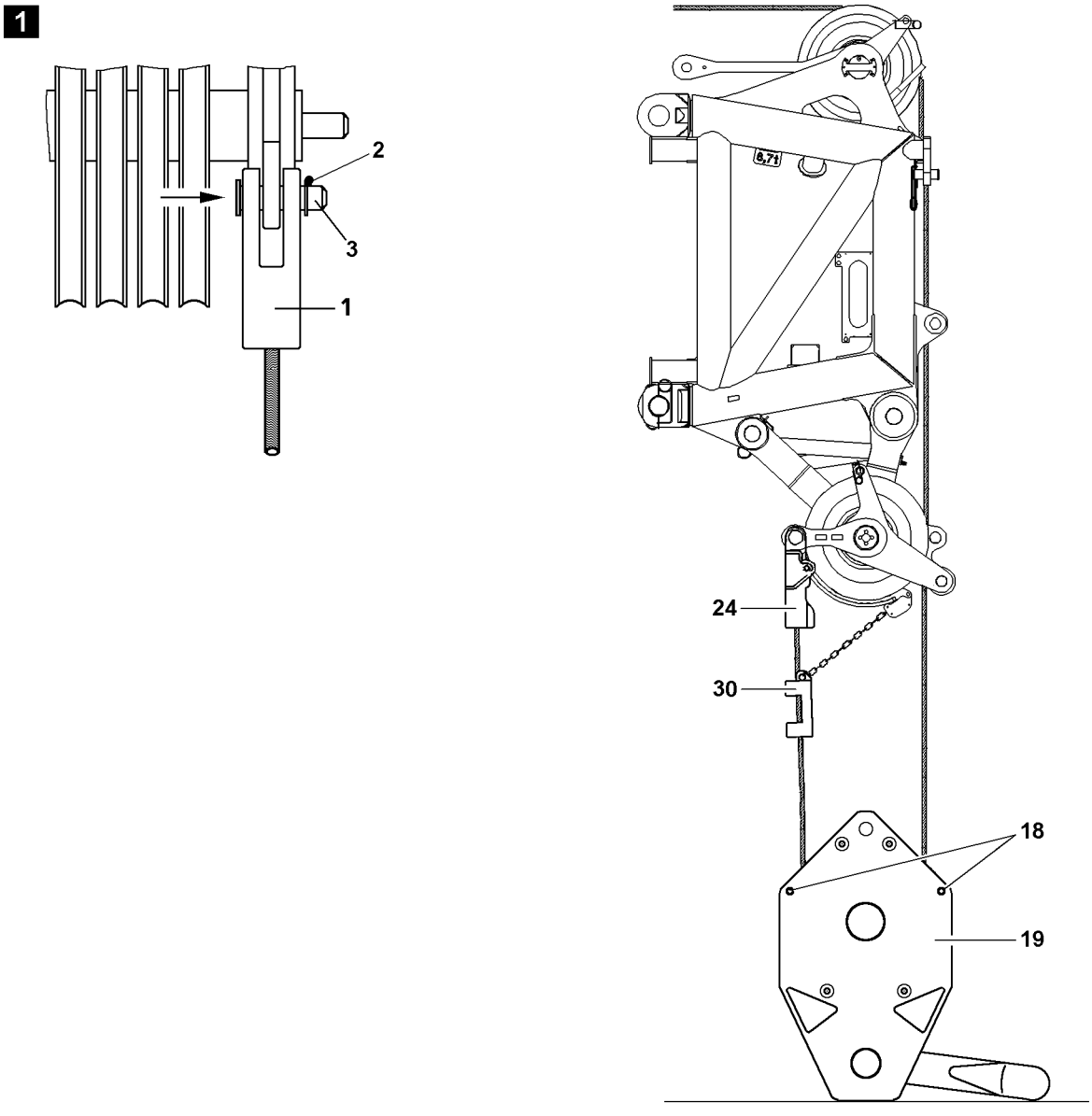
▶ Check the rope retainer. Check visually!

2.1.5 Preparing the hook block for crane operation

▶ Raise the boom or spool the hoist rope up until the hook block is completely lifted off the ground.

Note
▶ See chapter 5.19 of the crane operating instructions!





B108211

2.2 Unreeving the hook block

Make sure that the following prerequisites are met:
- the crane is aligned in horizontal direction,
- the ground is level and of sufficient load carrying capacity,
- the hook block is prepared for removal, see chapter 5.19 of the crane operating instructions,
- an assistant is present to guide the hoist rope.

2.2.1 Lowering the hook block

WARNING
Crushing of hands!
When guiding the hook block by hand, hands or fingers can be crushed!
When unreeving the hook block, it can topple over!
Personnel can be severely injured or killed!
- ▶ Use the handles in the safe area of the hook block!
- ▶ Make sure the hook block is safely positioned!

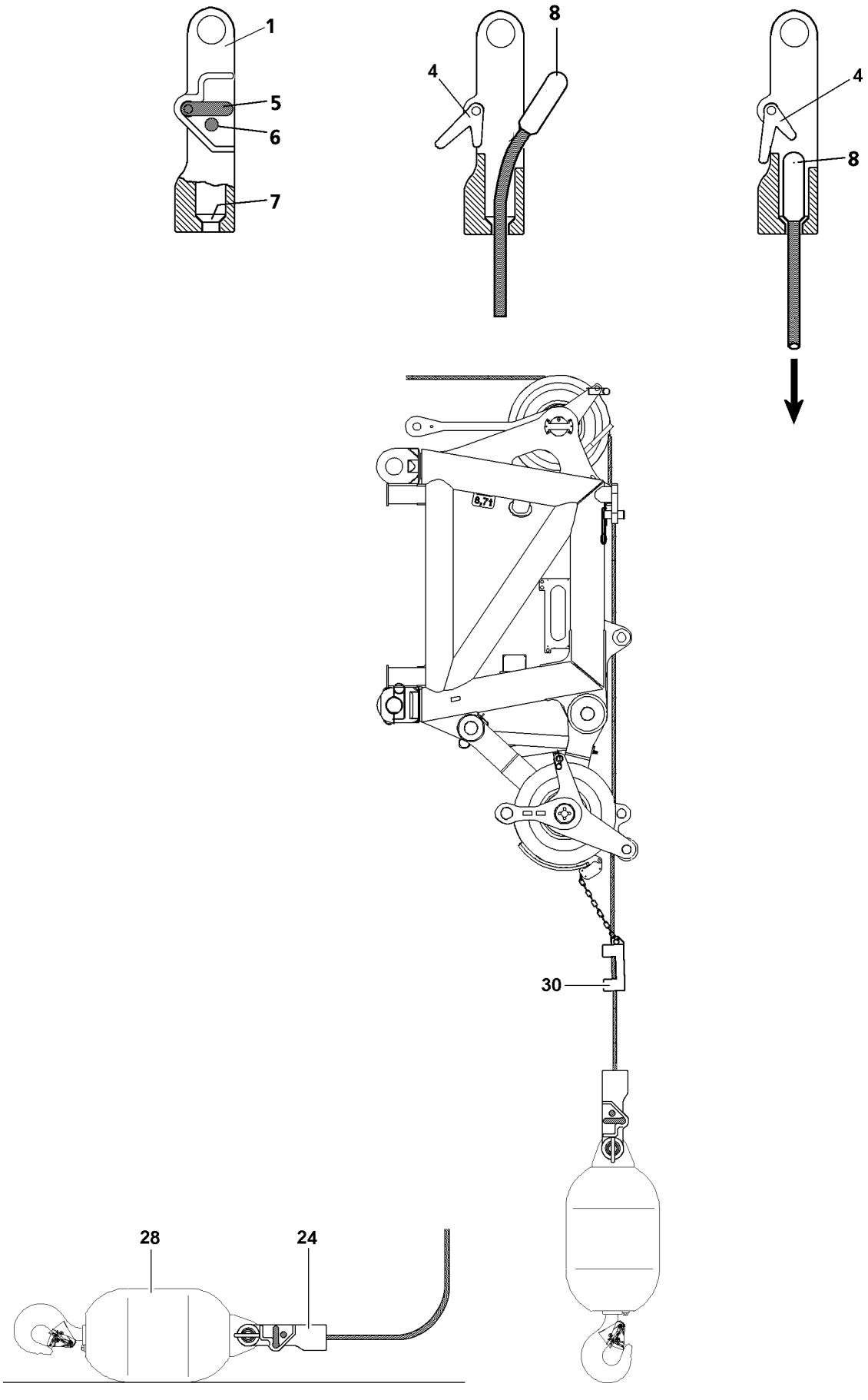
- ▶ Lower the hook block and set it on the ground.
- ▶ Remove the hoist limit switch weight, see section “Removing the hoist limit switch weight”.

2.2.2 Detaching the hoist rope

- ▶ Push in retaining pin **6** on the rope lock **1** move the lever **5** downward and hold it in this position.

Result:
- The latch **4** is moved to the side and the locking clamp **8** is released.

- ▶ Push the hoist rope up and detach the locking clamp **8**.
- ▶ Release and unpin the rope retaining pipe on the hook block.
- ▶ Unreeve the hoist rope from the hook block and the pulley head.
- ▶ Insert the rope retaining pipes again and secure with spring retainers.



B108212

3 Securing and removing the load hook*

3.1 Securing the load hook*

3.1.1 Assembling the load hook*

- ▶ Place the load hook under the pulley head of the boom.
- ▶ Release and unpin the rope retaining pipes on the back pulley and on the pulley head.

WARNING
Erroneous operation of crane function and danger of slipping on the boom!
If the following notes are not observed and adhered to, personnel can be severely injured or killed!
- ▶ Step on the boom only via the catwalks!
- ▶ The assembly personnel must secure themselves for all work on the lattice mast boom with approved antifall systems, on the safety ropes or on the lattice sections, with snap hook on both sides to prevent them from falling!
- ▶ Complete the assembly work from a stable location!
- ▶ Observe and adhere to the assembly guidelines in chapter 5.01 of the crane operating instructions!

- ▶ An assistant guides the hoist rope over the boom to the pulley head and at the same time, the crane operator spools the hoist winch out.
- ▶ Place the hoist rope over the back pulley.
- ▶ Insert the rope retaining pipes again and secure with spring retainers.
- ▶ Pin the rope lock **1** in the load hook **26** and secure with spring retainers.

3.1.2 Fastening the hoist rope

- ▶ Push the retaining pin **6** in on the rope lock **1**, move the lever **5** to the side and hold it in this position.

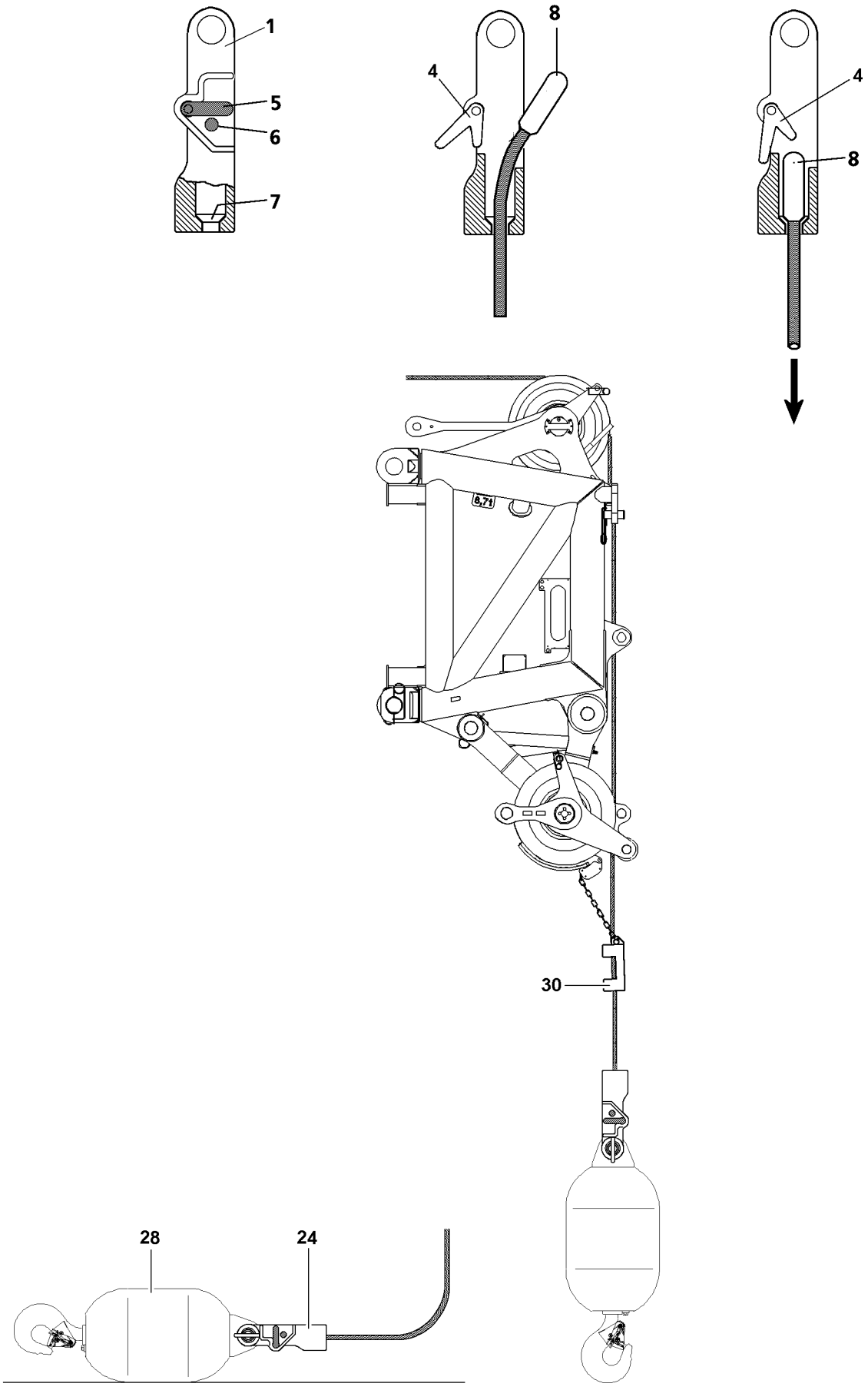
Result:
– The latch **4** is moved to the side.

- ▶ Fasten the rope end with the locking clamp **8** in the rope lock and pull the rope firmly in the direction of the arrow, until the locking clamp **8** contacts the cone **7**.

WARNING
Incorrectly secured locking clamp!
If the locking clamp **8** is hooked and secured incorrectly or insufficiently in the rope lock **1**, then the load and the hook block can fall down!
Personnel can be severely injured or killed!
- ▶ The locking clamp **8** must touch on the cone **7** after hanging it into the rope lock **1** and must be secured by the latch **4**!

- ▶ Release the lever **5**.

Result:
– The lever **5** returns to the initial position and is locked by the retaining pin **6**.



B108212

3.2 Removing the load hook*

Make sure that the following prerequisites are met:
– the crane is aligned in horizontal direction,
– an assistant is present to guide the hoist rope,
– the ground is level and of sufficient load carrying capacity.

3.2.1 Lowering the load hook

WARNING
Crushing of hands!
When guiding the load hook by hand, hands or fingers can be crushed!
The load hook could roll away!
▶ Make sure the load hook is safely positioned!

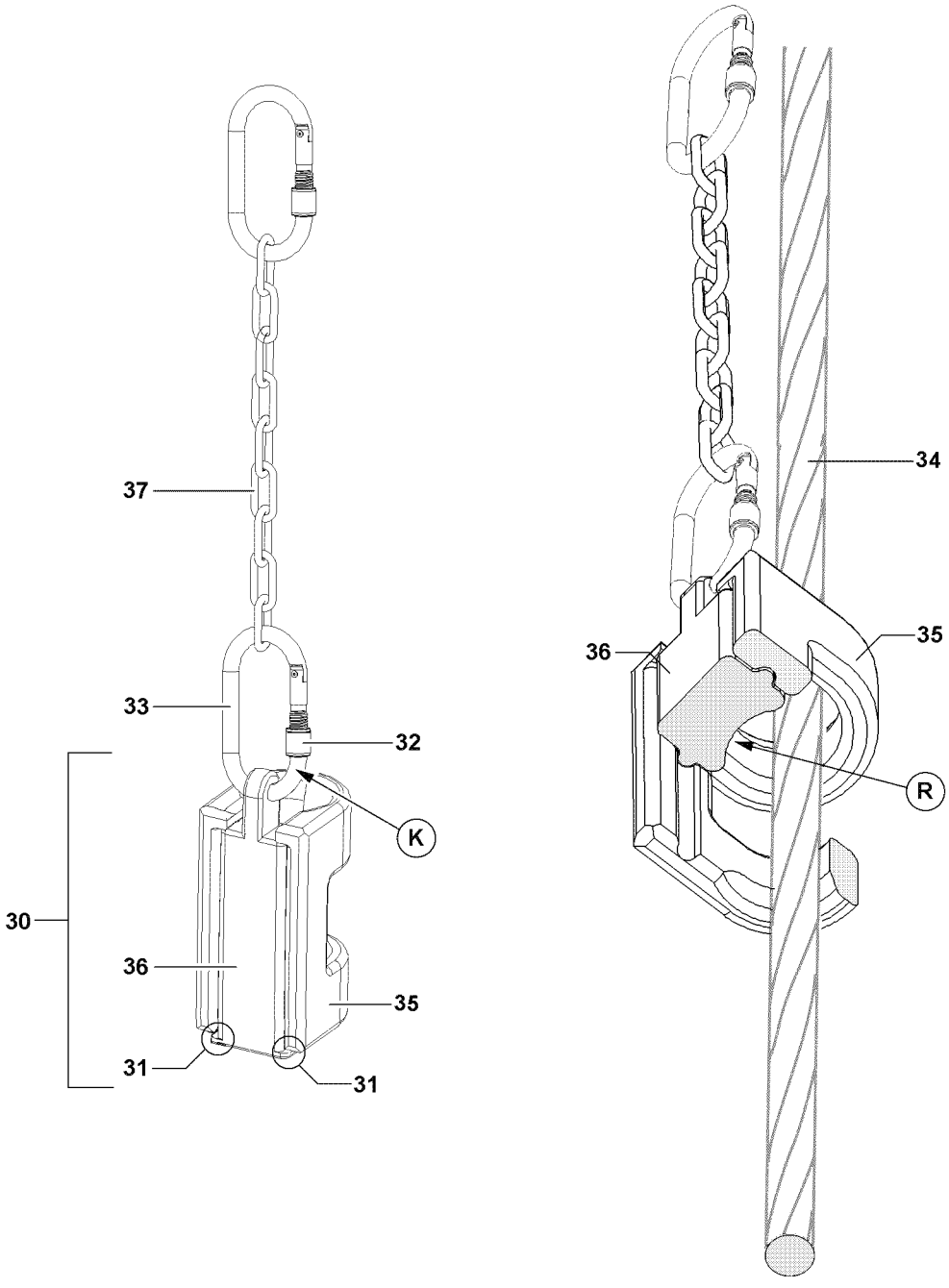
▶ Place the load hook **28** on the ground.
▶ Remove the hoist limit switch weight, see section “Removing the hoist limit switch weight”.

3.2.2 Detaching the hoist rope

▶ Push the retaining pin **6** in on the rope lock **1**, move the lever **5** to the side and hold it in this position.

Result:
– The latch **4** is moved to the side and the locking clamp **8** is released.

▶ Push the hoist rope in the direction of the load hook and detach the locking clamp **8**.
▶ Remove the rope retaining pipes on the pulley head and on the back pulley.
▶ Lift the hoist rope from the rope pulleys.
▶ Insert the rope retaining pipes again and secure with spring retainers.



B106127

4 Attaching / removing the hoist limit switch weight

4.1 Attaching the hoist limit switch weight

The hoist limit switch weight **30** consists of 2 parts, which are pushed into each other:
– The weight **35**
– The carrier section **36**

▶ Loosen and open the screw retainer **32**.

WARNING
The hoist limit switch can fall down!
If the hoist limit switch weight is incorrectly assembled, components can fall down!
Personnel can be severely injured or killed!
▶ Do not replace the snap hook **33** with other parts, such as a shackle or similar!
▶ When detaching or fastening the hoist limit switch weight **30** make sure that the weight **35** and the carrier section **36** do not fall down!
▶ Make sure that the curvature **R** of the carrier section **36** points to the hoist rope **34**!
▶ Make sure that the stubs **31** of the carrier section **36** touch on the weight **35**!
▶ Make sure that the screw retainer **32** can be turned to be closed from top to bottom, point **K**!

The attachment of the hoist limit switch weight **30** depends on the position of the rope fixed point.

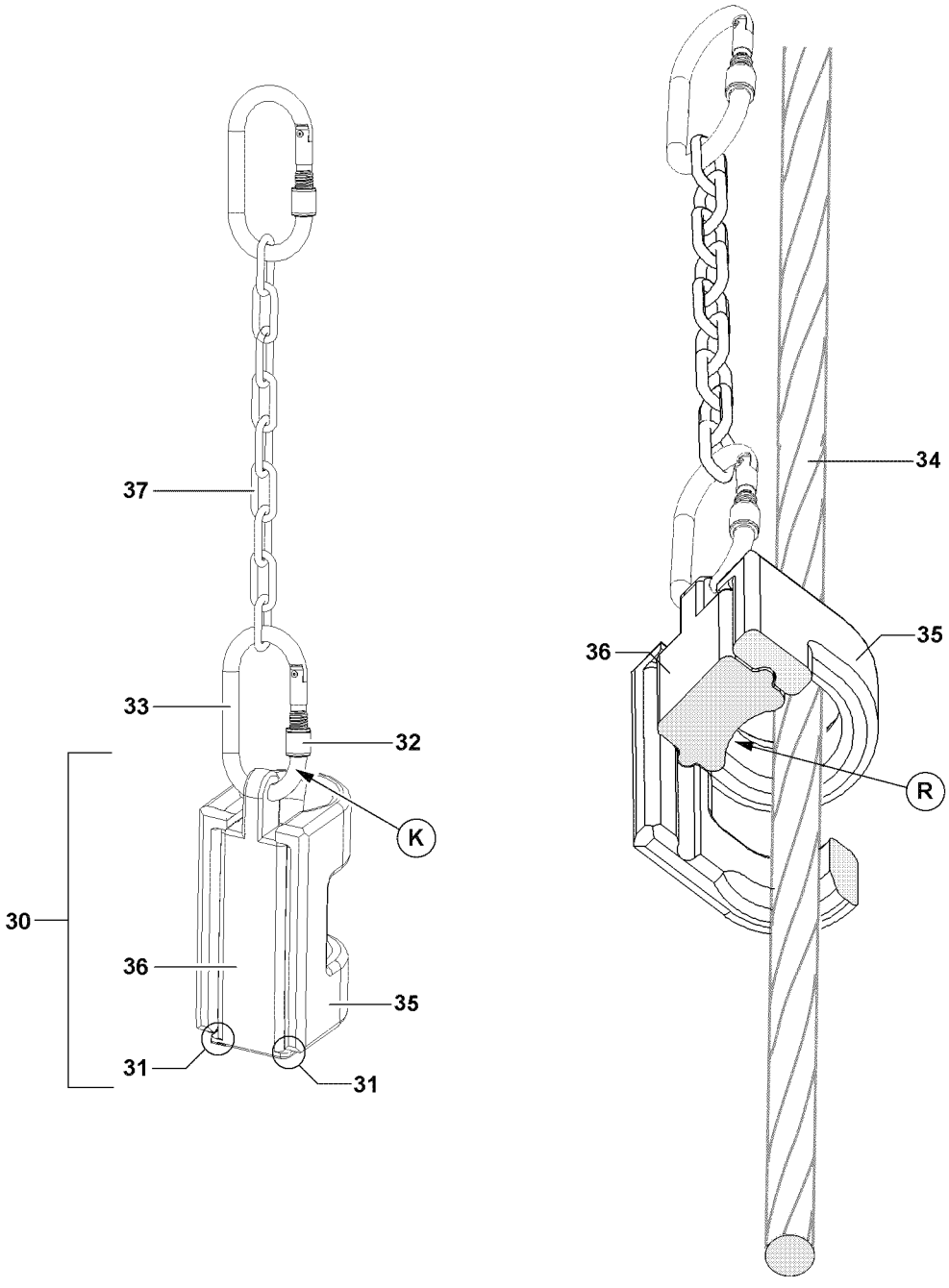
Rope fixed point on the pulley head:
– In the event of multiple hoist rope reeving, the hoist limit switch weight **30** must always be laid around the “stationary rope strand”, in other words around the rope strand that leads directly to the cable lock.

Rope fixed point on hook block:
– The hoist limit switch weight **30** is laid around the outer strand which shows the least diagonal pull, i.e. the one with the smallest angle between the hanging hoist limit switch weight and the hoist rope.

Note
▶ The chain **37** must be attached in full length during crane operation and may not be shortened.

▶ Push the weight **35** with one hand on the hoist rope **34** and hold.
▶ With the other hand, guide the carrier section **36** behind the hoist rope **34** and under the weight **35**. The curvature **R** of the carrier section **36** must point to the hoist rope **34**.
▶ Push the weight **35** on the carrier section **36**.
▶ Hang in the hoist limit switch weight **30** with the carrier section **36** in the snap hook **33**.

The snap hook **33** must be secured with the screw retainer **32**.
▶ Close the screw retainer **32** on the snap hook **33**.



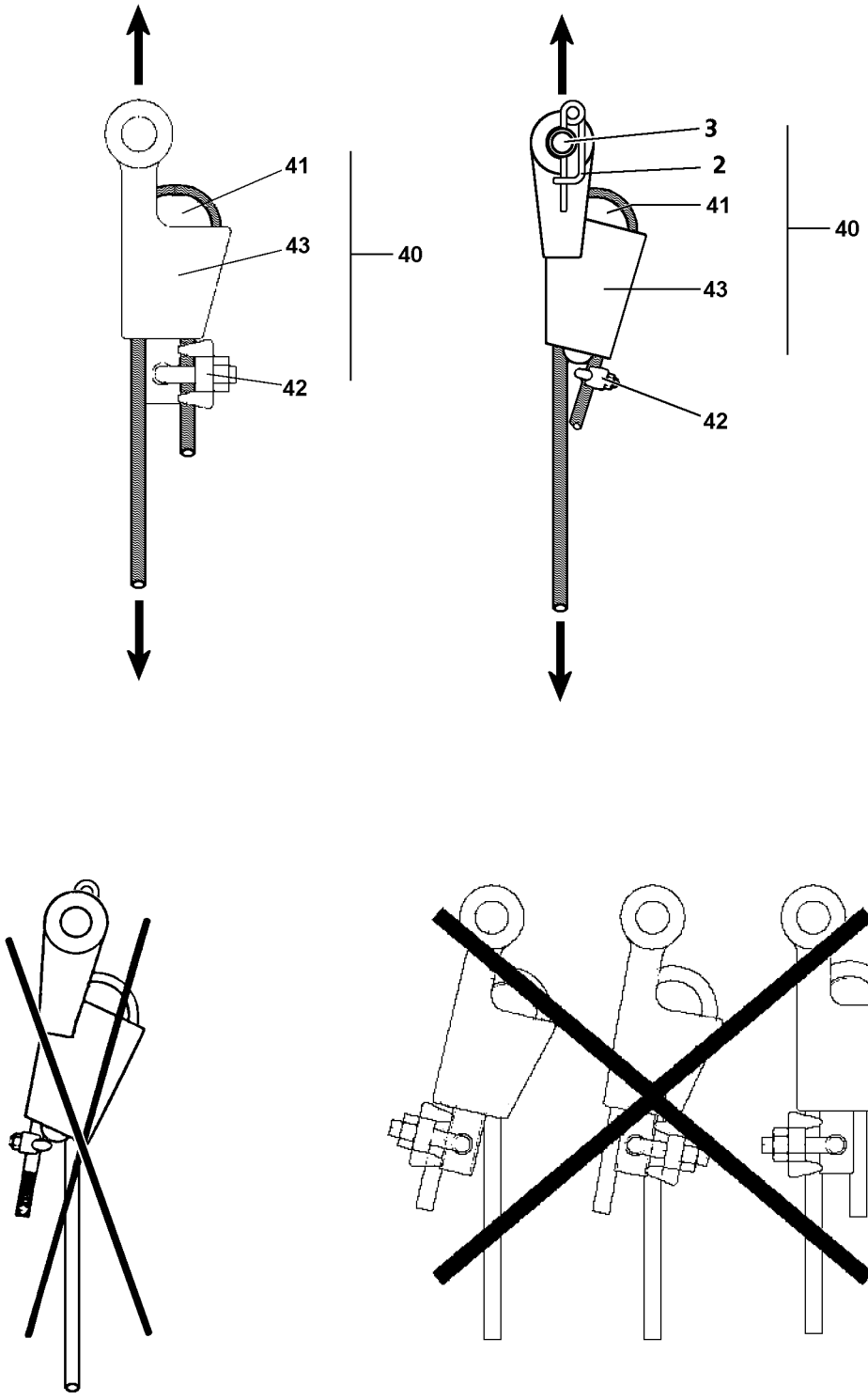
B106127

4.2 Removing the hoist limit switch weight

WARNING
The hoist limit switch can fall down!
If the hoist limit switch weight is incorrectly disassembled, components can fall down!
Personnel can be severely injured!

- When detaching or fastening the hoist limit switch weight **30** make sure that the weight **35** and the carrier section **36** do not fall down!
- It is prohibited for anyone to remain in the danger zone!

- Release and open the screw retainer **32** on the snap hook **33**.
- Detach the hoist limit switch weight **30** from the snap hook **33**.
- Hold the weight **35** with one hand and with the other hand, push the carrier section **36** from the weight **35**.
- Store the weight **35** and carrier section **36** safely.



B108119

5 Assembling / disassembling the wedge lock

Make sure that the following prerequisites are met:
– the locking clamp is cut off on the hoist rope,
– the hook block or the load hook are ready for assembly.

5.1 Assembling the wedge lock

WARNING
Danger of fatal accidents due falling load!
If an incorrect wedge lock **40** is used or if the wedge lock **40** is incorrectly assembled, the hoist rope can rip off or the hoist rope can be pulled through the wedge lock **40**!
The hook block and the load can fall down and kill personnel!
- ▶ Use only a wedge lock **40** approved by **LIEBHERR-Werk Ehingen GmbH**!
- ▶ Assembling the wedge lock **40** correctly!
- ▶ Place the hoist rope with the wedge **41** into the housing **43** in such a way that the rope strand runs in the pull axle of the wedge lock **40**!
- ▶ The dead end of the rope must be secured by the clamp **42** to prevent it from being pulled through!
- ▶ It is prohibited for personnel to remain in the danger zone!

- ▶ Take a matching wedge lock **40** from the tool box.
- ▶ Place the hoist rope with the wedge **41** into the housing **43**.
- ▶ If possible, assemble the clamp **42** through the wedge **41** on the dead end of the rope.

NOTICE
Damage to the hoist rope!
If the pin **3** has been assembled incorrectly, the hoist rope may rub against the pin **3** or on the linch pin **2**.
- ▶ Always insert the pins **3** from “inside to outside” and secure from the outside.

- ▶ Pin and secure the wedge lock **40** on the fixed point of the pulley head or that of the hook block or on the load hook, depending on the reeving plan.

5.2 Disassembling the wedge lock

- ▶ Unpin the wedge lock **40** on the fixed point.
- ▶ Remove the clamp **42** and pull the hoist rope with the wedge from the housing.
- ▶ Store the wedge lock **40**.

6 Rope reeving

Note
- ▶ For reeving plans, see crane operating instructions, chapter 4.15!

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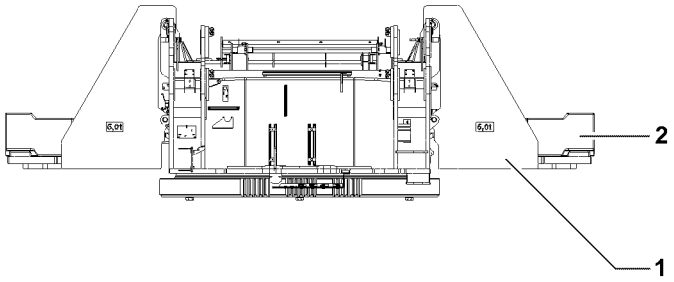
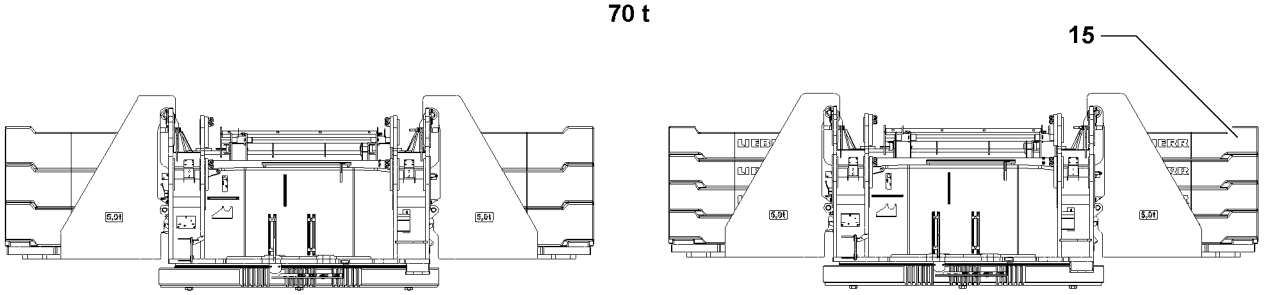
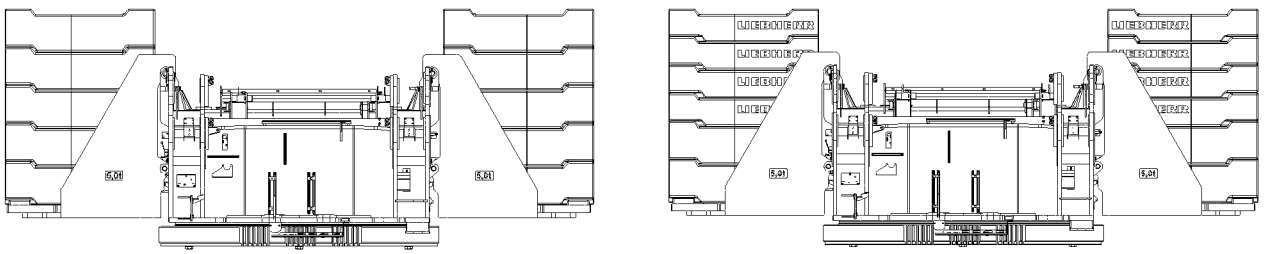


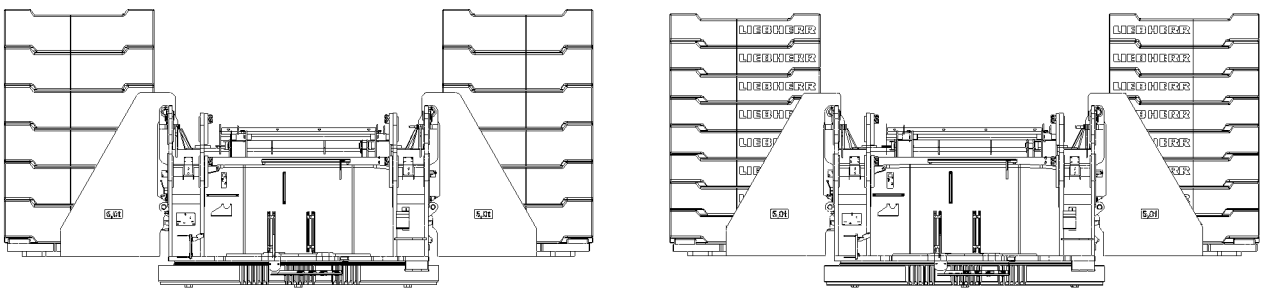
70 t



110 t



130 t



B108712

1 Counterweight combinations

The consoles **1** and the counterweight plates **2** and the counterweight plates **15** are marked with their own weight.

NOTICE
Incorrect placement of counterweight on the turntable!
An unsymmetrical counterweight condition of more than 20 t can cause the crane to topple over!
Personnel can be severely injured or killed!
▶ A counterweight difference between the right and left counterweight stack of more than 20 t is prohibited!

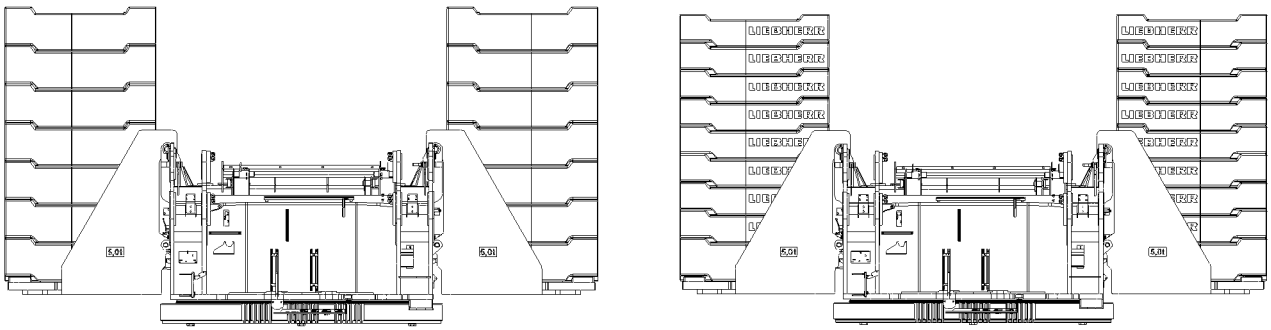
Counterweight	Combination	Individual weight
30 t	2 x console 1	5 t
	2 x counterweight plate 2	10 t

Counterweight	Combination	Individual weight
70 t	2 x console 1	5 t
	6 x counterweight plate 2	10 t
	or:	
	2 x console 1	5 t
	8 x counterweight plate 15	7.5 t

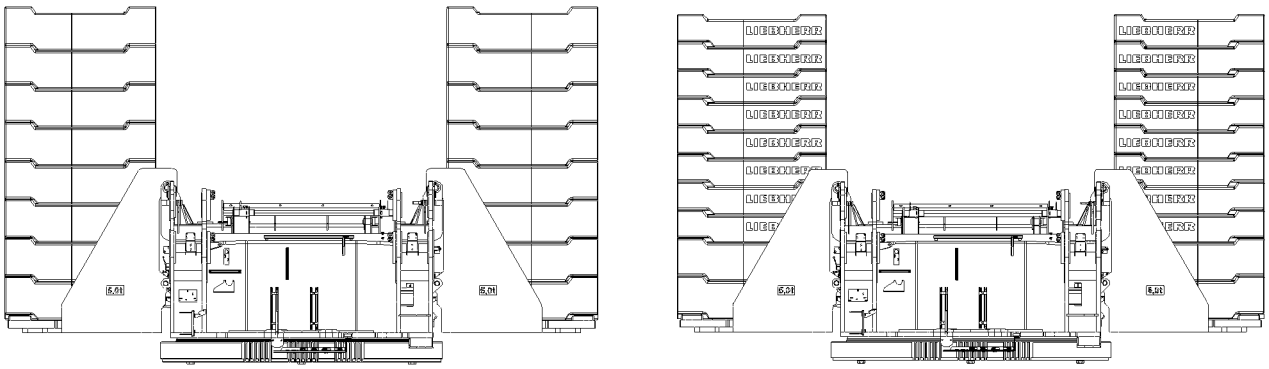
Counterweight	Combination	Individual weight
110 t	2 x console 1	5 t
	10 x counterweight plate 2	10 t
	or:	
	2 x console 1	5 t
	4 x counterweight plate 2	10 t
	8 x counterweight plate 15	7.5 t

Counterweight	Combination	Individual weight
130 t	2 x console 1	5 t
	12 x counterweight plate 2	10 t
	or:	
	2 x console 1	5 t
	16 x counterweight plate 15	7.5 t

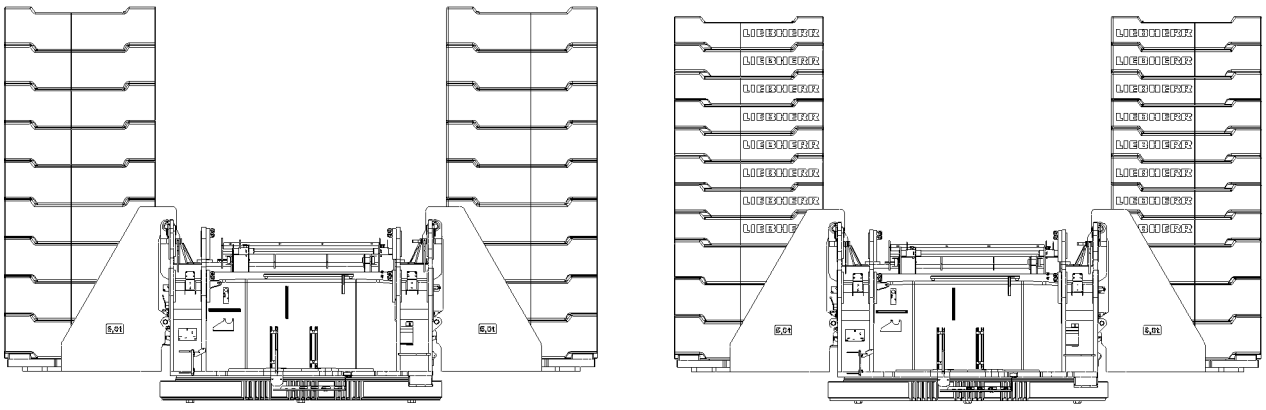
150 t



170 t



190 t

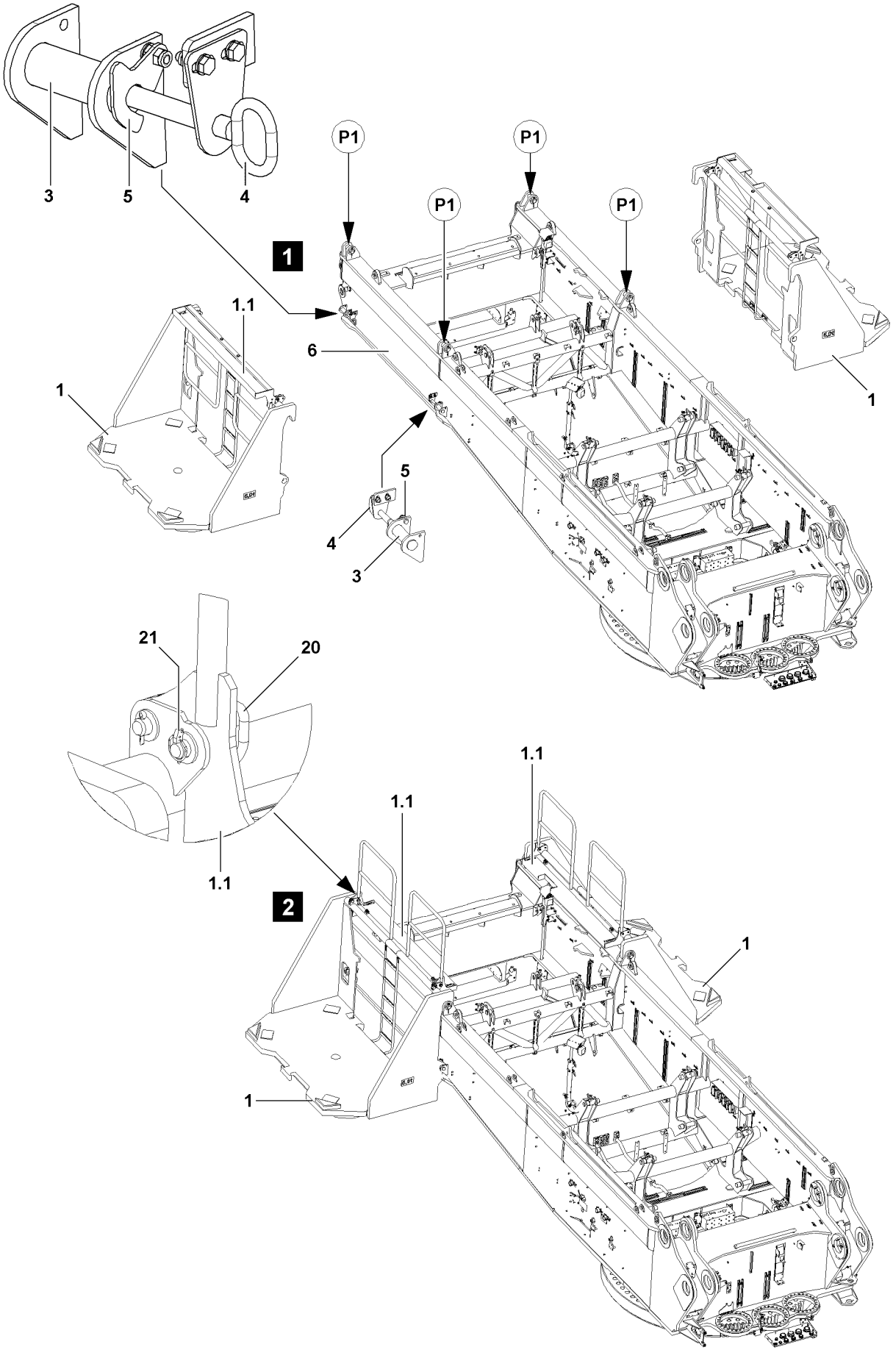


B108713

Counterweight	Combination	Individual weight
150 t	2 x console 1	5 t
	14 x counterweight plate 2	10
	or:	
	2 x console 1	5 t
	2 x counterweight plate 2	10 t
	16 x counterweight plate 15	7.5 t

Counterweight	Combination	Individual weight
170 t	2 x console 1	5 t
	16 x counterweight plate 2	10 t
	or:	
	2 x console 1	5 t
	4 x counterweight plate 2	10 t
	16 x counterweight plate 15	7.5 t

Counterweight	Combination	Individual weight
190 t	2 x console 1	5 t
	18 x counterweight plate 2	10 t
	or:	
	2 x console 1	5 t
	6 x counterweight plate 2	10 t
	16 x counterweight plate 15	7.5 t



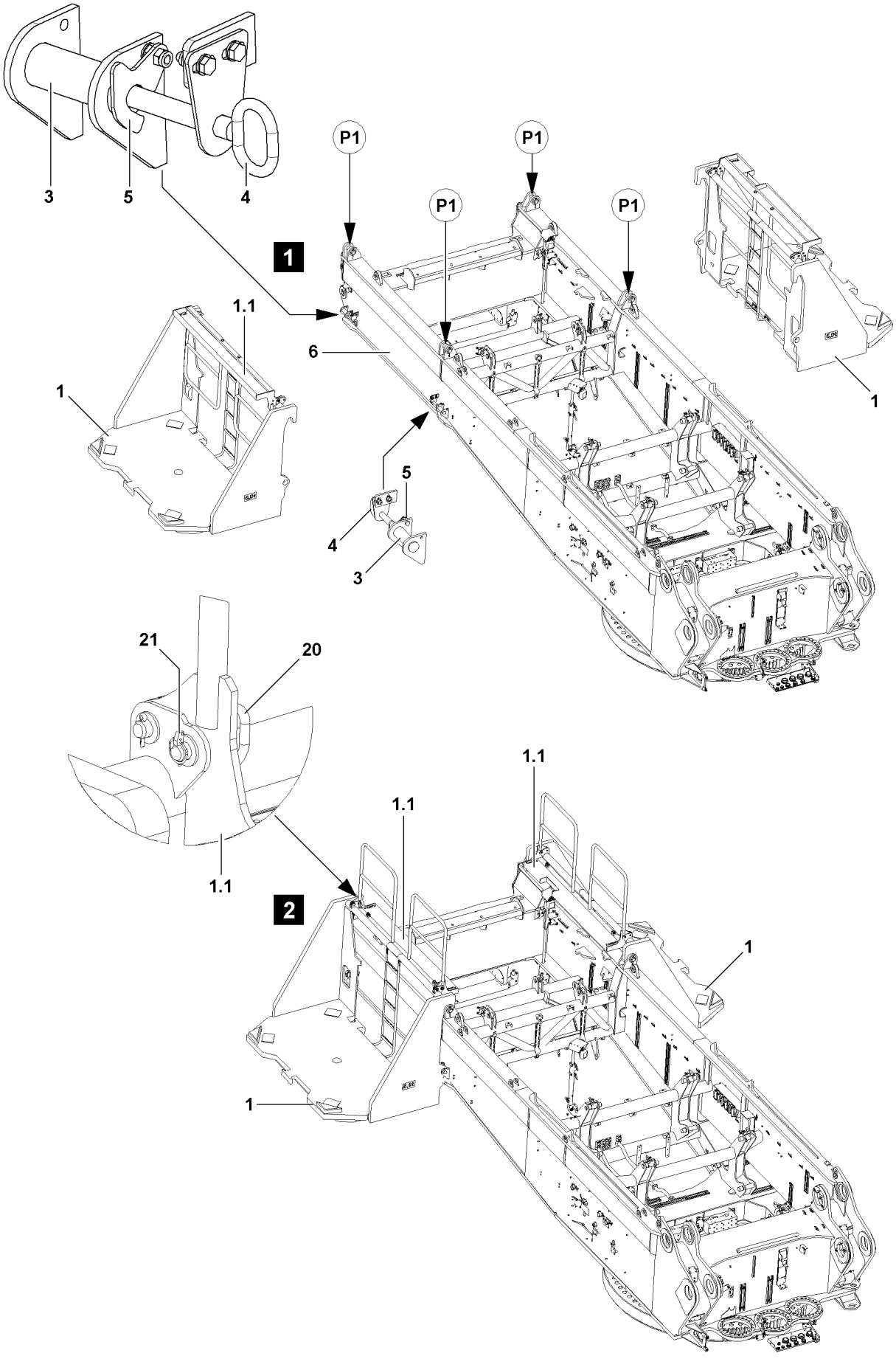
B108715

2 Assembling the counterweight

Ensure that the following prerequisite is met:
– the crane is aligned in horizontal direction.

WARNING
Falling components and counterweight plates!
At assembly, the components and counterweight plates can fall down!
Personnel can be severely injured or killed!
▶ Make sure that no persons or objects are within the danger zone!

WARNING
Risk of falling!
During assembly and disassembly work, personnel must be secured with appropriate antifall guards to prevent them from falling!
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with the personal antifall guard system (see Crane operating instructions, chapter 2.04) to protect against falling!
▶ Hang in the personal antifall system in the corresponding attachment points on the crane (see Crane operating instructions, chapter 2.06)!
▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
▶ Only step on aids and antifall guards with clean shoes!
▶ Keep aids and antifall guards clean and free from snow and ice!



B108715

2.1 Assembling the consoles on the turntable

Ensure that the following prerequisite is met:
– the pins **3** are unpinned.

2.1.1 Installing the consoles

Note
▶ The weight of the console is 5 t!

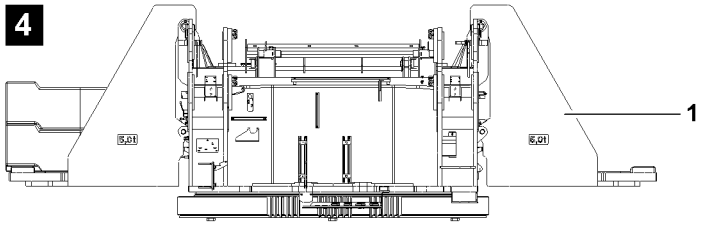
▶ Attach the console **1** onto the auxiliary crane.
▶ Hang in the console **1** with the auxiliary crane on points **P1** on the turntable **6**.
▶ Fold the pin retainer **5** up and hold.
▶ With the aid of the threaded handle **4**:
Pin in the pin **3** on the console **1**.

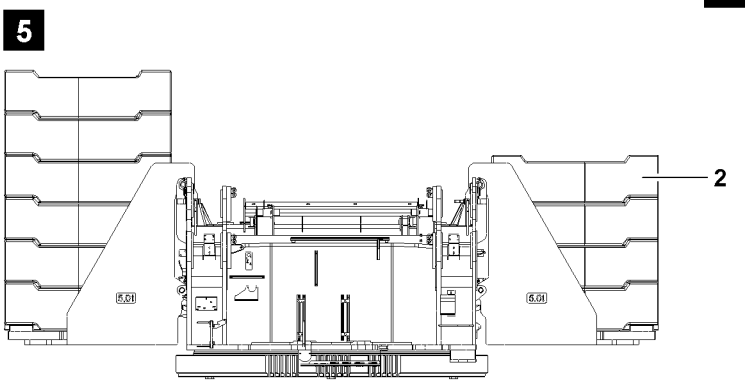
Result:
– The console **1** is pinned with the turntable **6**.

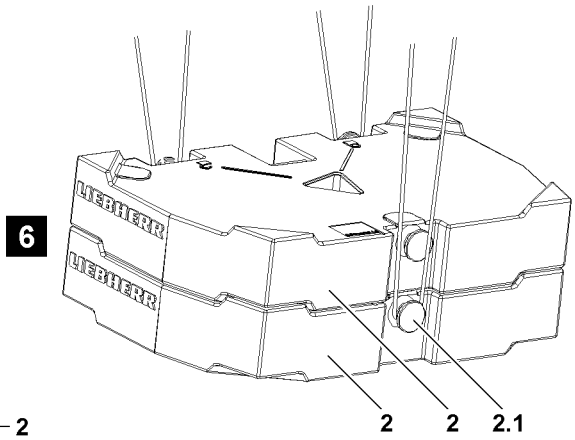
▶ Make sure that the pin **3** is secured with the retainer **5**.

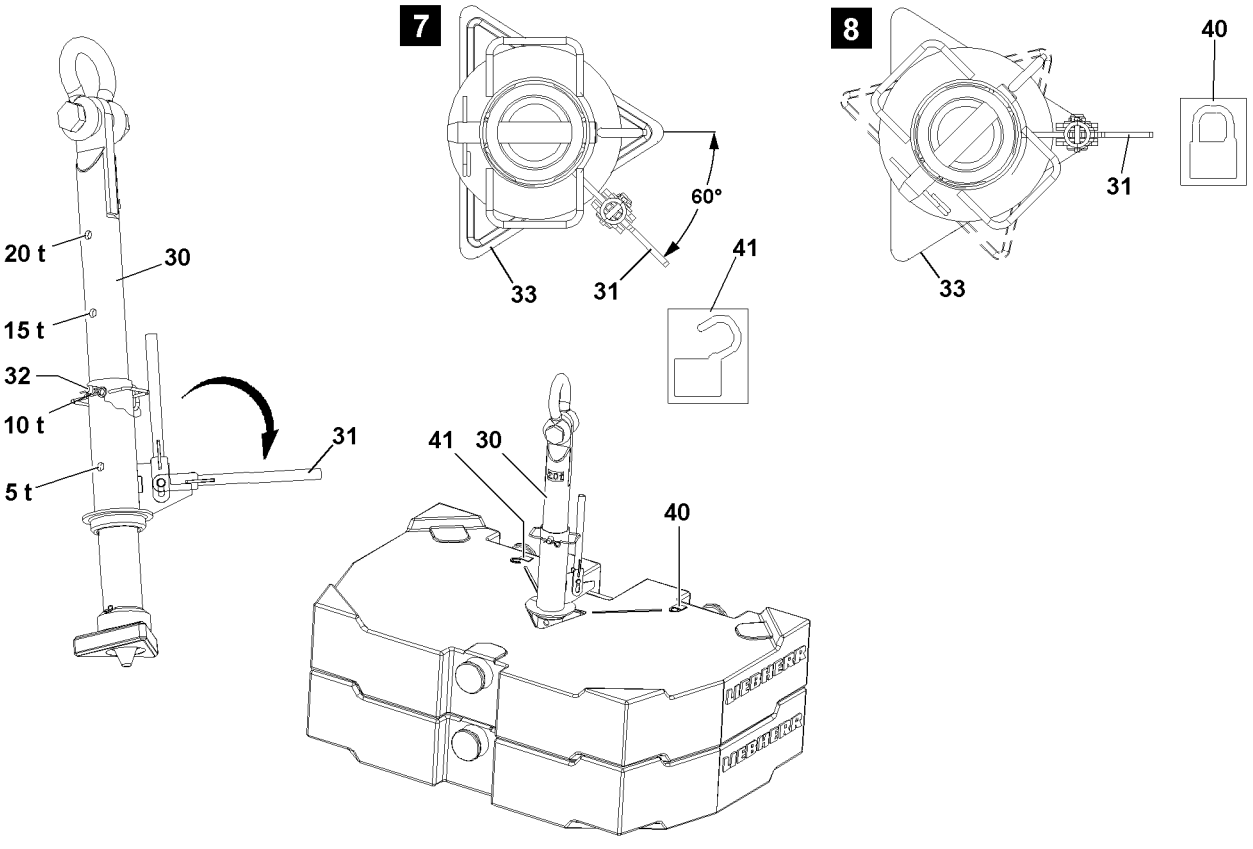
2.1.2 Bringing the pedestal into operating position

▶ When the console **1** is installed and secured on the turntable **6**:
Swing the pedestal **1.1** into operating position “upward”, see illustration **2**.
▶ When the pedestal **1.1** is in operating position:
Pin in the pin **20** and secure with linch pin **21**.


4
1


5
2


6
LIEBHERR
LIEBHERR
2
2
2.1


7
60°
33
31
41
8
40
31
33
20 t
30
15 t
32
10 t
5 t
31
41
30
40
LIEBHERR
LIEBHERR

B108714

2.2 Placing the counterweight

Ensure that the following prerequisite is met:

– the consoles **1** are pinned and secured on the turntable.

Note

▶ The counterweight plates are marked with their own weights!

WARNING

The crane can topple over!

If the placed counterweight deviates from the specified data in the load charts or the assembly conditions, then the crane can be damaged or topple over!

Personnel can be severely injured or killed!

▶ Place the counterweight according to the data in the load chart!

▶ Before placing the counterweight plates check the maximum permissible counterweight depending on the assembly conditions, see chapter 3.06 in the crane operating instructions!

WARNING

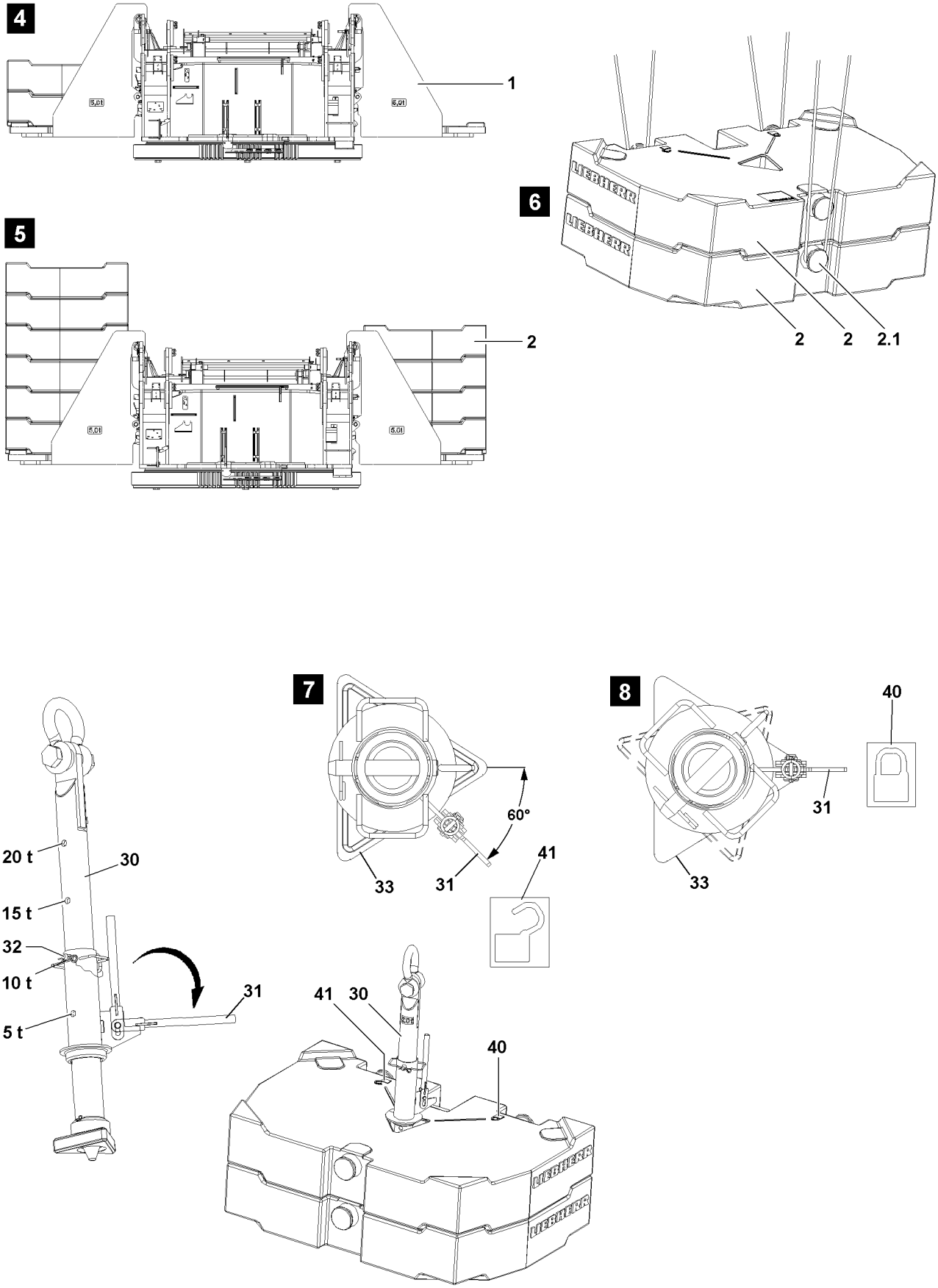
The crane can topple over!

If more than 20 t are placed with one lift on the console **1** or on the counterweight plates **2**, or if the counterweight is placed asymmetrically, then the crane can topple over!

Personnel can be severely injured or killed!

▶ A weight difference between the right and left counterweight stack of more than 20 t is prohibited!

▶ Alternately place no more than maximum 20 t counterweight assemblies on the counterweight stack, alternately symmetrically on the left and right!


4
1
5
2
6
2
2
2.1
7
60°
33
31
41
8
40
31
33
20 t
30
15 t
32
10 t
5 t
31
41
30
40
B108714

2.2.1 Placing the counterweight plates, attachment system: “Twistlok”

WARNING
Risk of accident!
If more than the permissible two counterweight plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged!
Personnel can be severely injured or killed!
- ▶ Make sure that the counterweight plates are laying correctly in the centerings!
- ▶ Replace damaged counterweight plates!

To stack the counterweight plate(s) **2**, use the receptacle stud **30**.
Before the receptacle stud **30** is guided into the counterweight plates, it must be ensured that the length of the receptacle stud **30** is set correctly. The length of the receptacle stud **30** can be adjusted with the pin **32**.

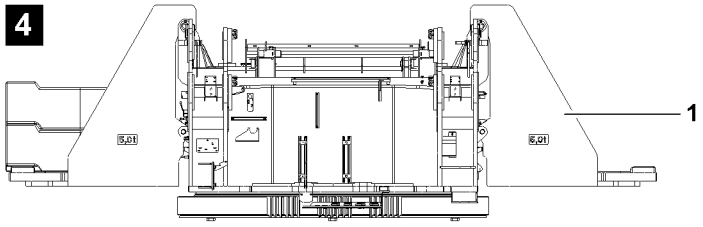
- ▶ If the length of the receptacle stud **30** is to be adjusted:
  Release and unpin the pin **32**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **30**.
- ▶ Pin in the pin **32** and secure with spring retainer.
- ▶ Attach the receptacle stud **30** on the auxiliary crane and guide it into the counterweight plate(s).
- ▶ Pull up the lever **31** and fold it down.
- ▶ Turn the lever **31** by 60° until the lever **31** points to the icon **40**. See illustration **8**.

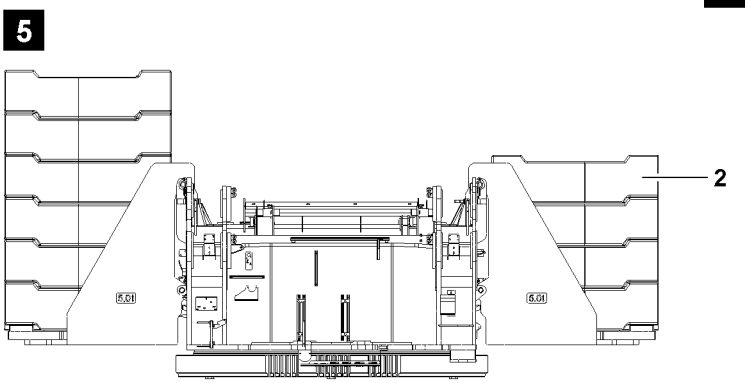
Result:
– The receptacle stud **30** is locked with the counterweight plate.

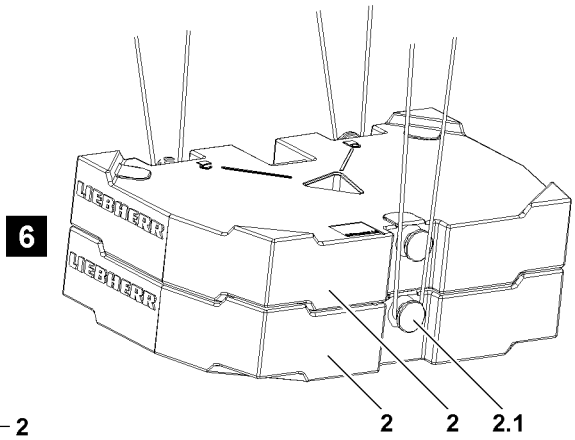
- ▶ Lift the counterweight plate(s) with the receptacle stud **30** and place carefully onto the centerings on the console **1** or on another counterweight plate.
- ▶ When the counterweight plate(s) are placed on the console **1** or on another counterweight plate: Turn the lever **31** by 60° until the lever **31** points to the icon **41**. See illustration **7**.

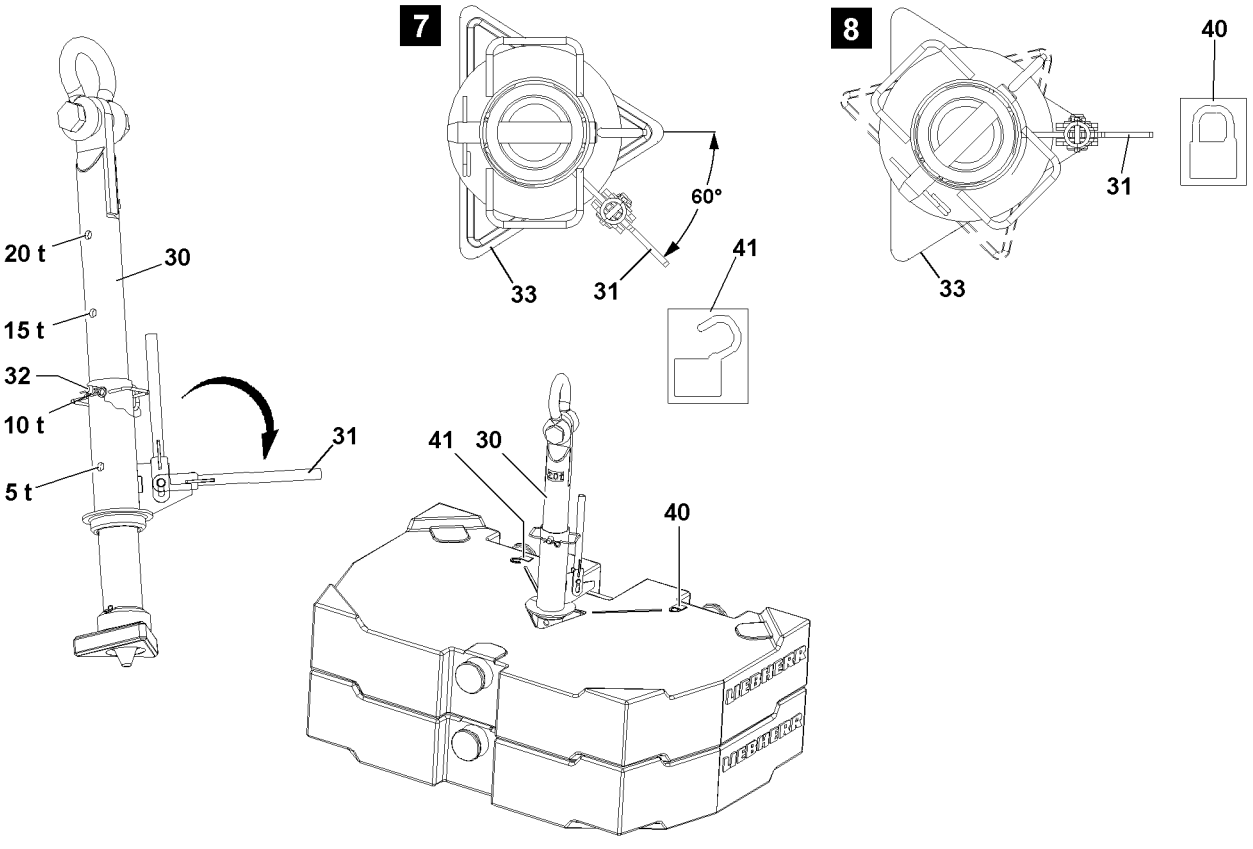
Result:
– The receptacle stud **30** is unlocked.

- ▶ Carefully pull the receptacle stud **30** from the counterweight plate / the counterweight plates.
- ▶ Stack the counterweight plates according to the load chart.


4
1


5
2


6
LIEBHERR
LIEBHERR
2
2
2.1


7
60°
33
31
41
8
40
31
33
20 t
30
15 t
32
10 t
5 t
31
41
30
40
LIEBHERR
LIEBHERR

B108714

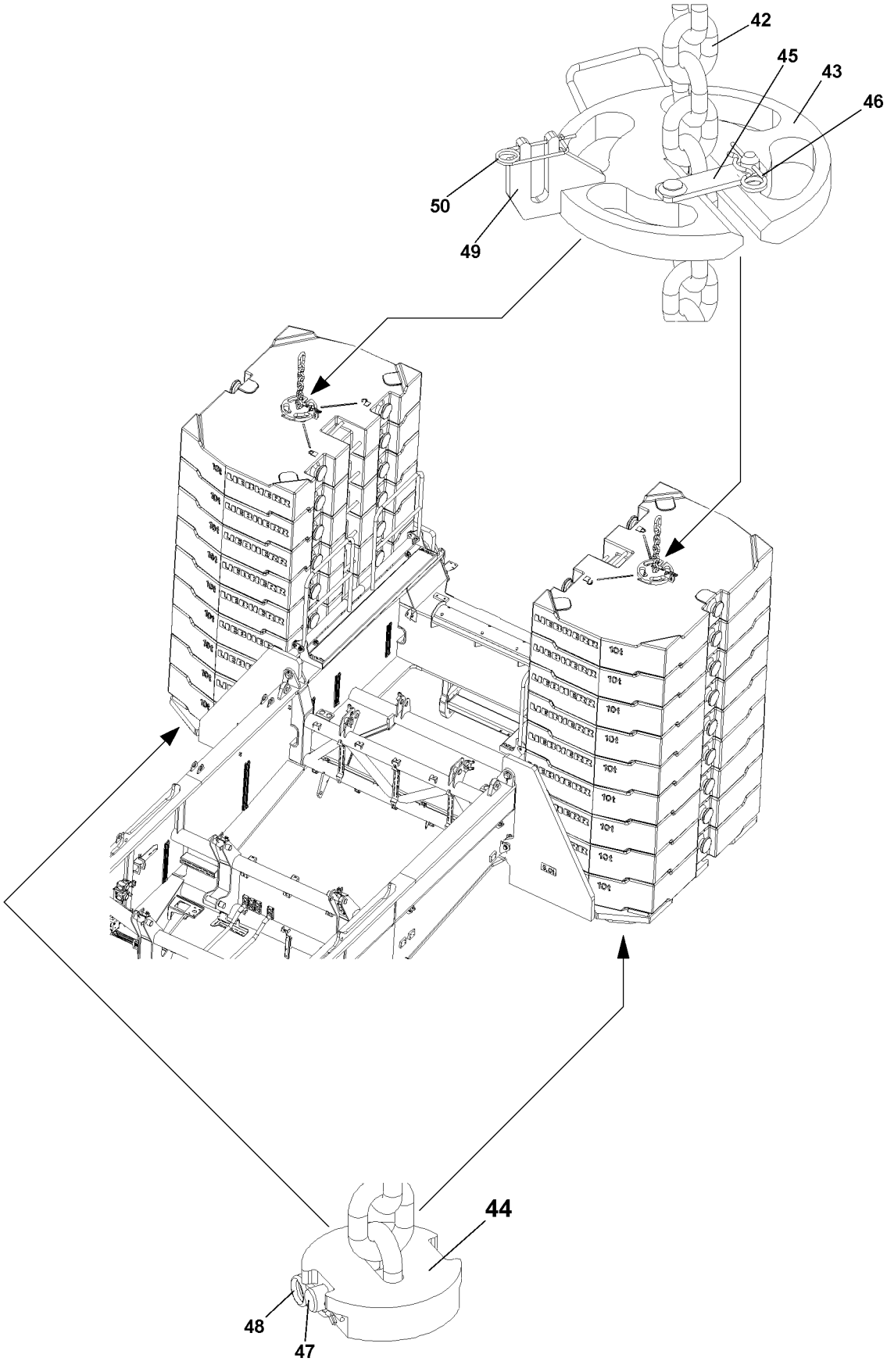
2.2.2 Placing the counterweight plates, attachment points: Bitt

WARNING
Falling counterweight plates!
If more than the permissible loads are lifted, then the bitts **2.1** are overloaded and the counterweight plates can fall down!
Personnel can be severely injured or killed!
- ▶ Lift no more than maximum 20 t with the ropes, 3 attachment points!
- ▶ Replace damaged counterweight plates immediately!

WARNING
Incorrect handling of the attachment equipment!
If attachment equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the attachment equipment is correctly attached on the bitts **2.1** and that it is secured sufficiently to prevent it from loosening up!

Note
- ▶ Place the counterweight plates individually or as a counterweight assembly, maximum 20 t!
- ▶ The weight difference between the counterweight stacks may be no more than maximum 20 t, for examples see illustration **4** and illustration **5**!
- ▶ 20 t counterweight assembly, see illustration **6**!

- ▶ Attach the counterweight plate **2** or counterweight assembly, see illustration **6**, onto the auxiliary crane and place it on both sides on the consoles **1** or on the already placed counterweight plates.



B108716

2.3 Securing the counterweight

Ensure that the following prerequisite is met:

– the counterweight has been stacked according to the load chart and the operating instructions.

WARNING

Danger of accident when securing the counterweight plates!

If the counterweight is not properly secured, it can fall down and fatally injure personnel!

▶ Before starting crane operation, the complete counterweight must be secured!

▶ Guide the retaining chain **42** with the auxiliary crane from the top through the counterweight assembly.

▶ Pin the retaining chain **42** on the bottom with the retaining plate **44**: Pin in the pin **47** and secure with spring retainer **48**.

▶ Carefully tighten the retaining chain **42** with the auxiliary crane.

▶ Secure the retaining chain **42** on top with the retaining plate **43**.

▶ Secure the retaining plate **43** with retainer **45**.

▶ Secure the retainer **45** with spring retainer **46**.

WARNING

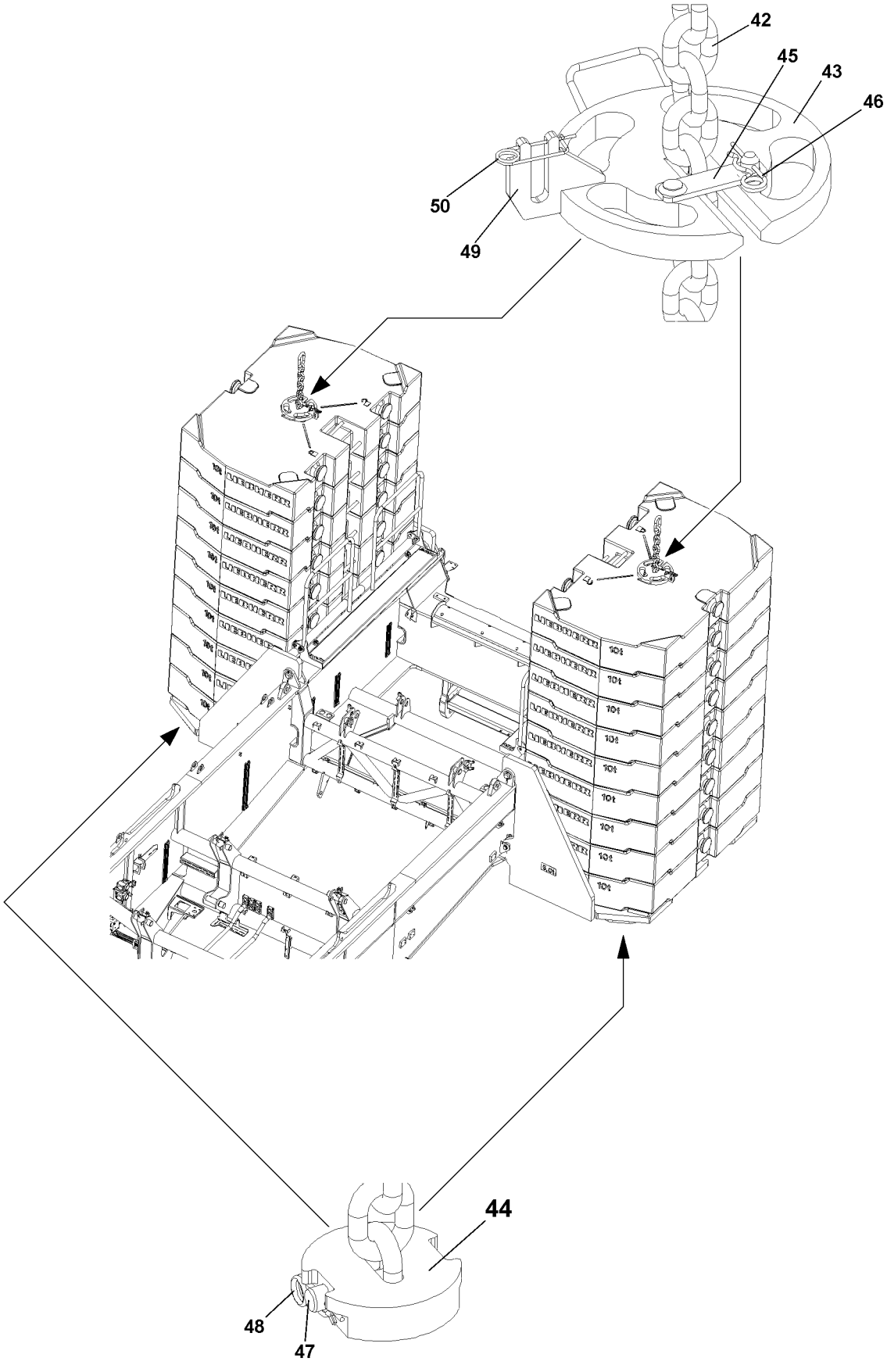
Danger of accidents due to chain overhang!

On a partial ballast, the chain overhang can fall down on the side of the counterweight stack!

Personnel can be severely injured or killed!

▶ In case of a chain overhang, hang in the retaining chain **42** into the fork **49** and secure with spring retainer **50** to prevent it from falling down!

▶ Secure the retaining chain to prevent it from falling down!



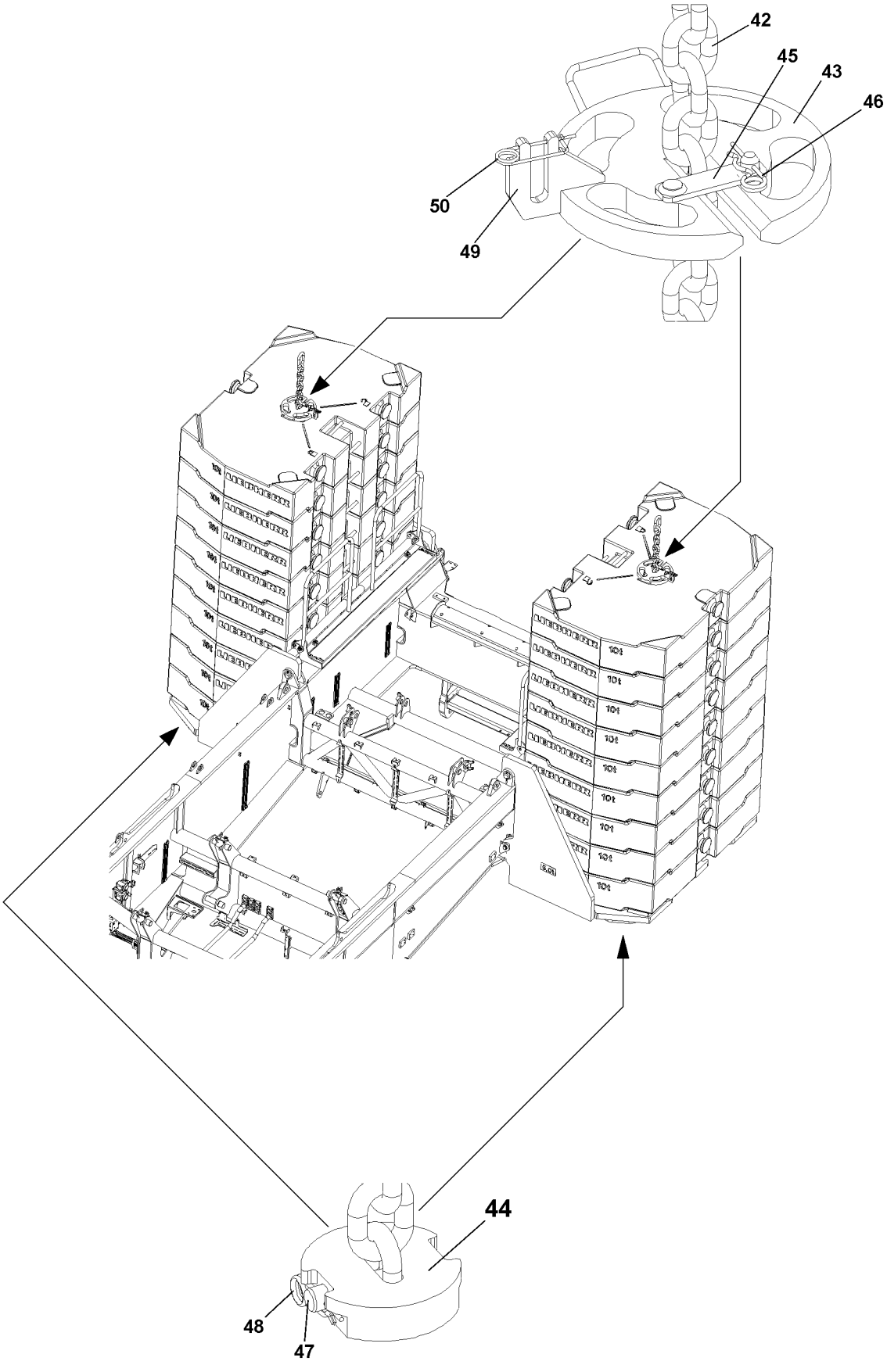
B108716

3 Removing the counterweight

Ensure that the following prerequisite is met:
– the crane is aligned in horizontal direction.

WARNING
Falling components and counterweight plates!
At disassembly, the components and counterweight plates can fall down!
Personnel can be severely injured or killed!
▶ Make sure that no persons or objects are within the danger zone!

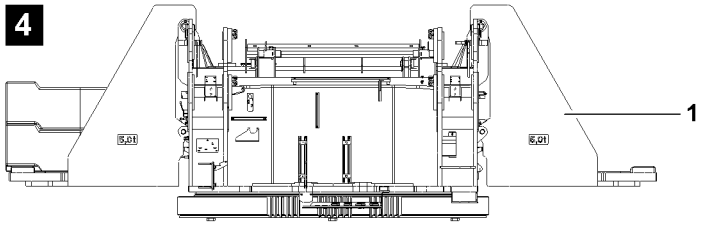
WARNING
Risk of falling!
During assembly and disassembly work, personnel must be secured with appropriate antifall guards to prevent them from falling!
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with the personal antifall guard system (see Crane operating instructions, chapter 2.04) to protect against falling! The personal antifall system must be attached in the corresponding attachment points on the crane (see chapter 2.06 of the crane operating instructions)!
▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
▶ Only step on aids and antifall guards with clean shoes!
▶ Keep aids and antifall guards clean and free from snow and ice!

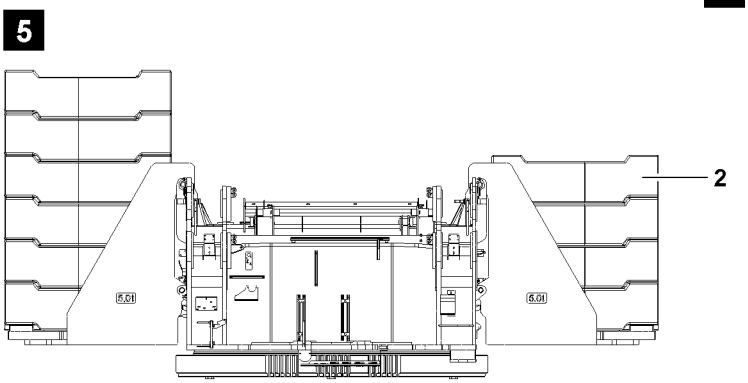


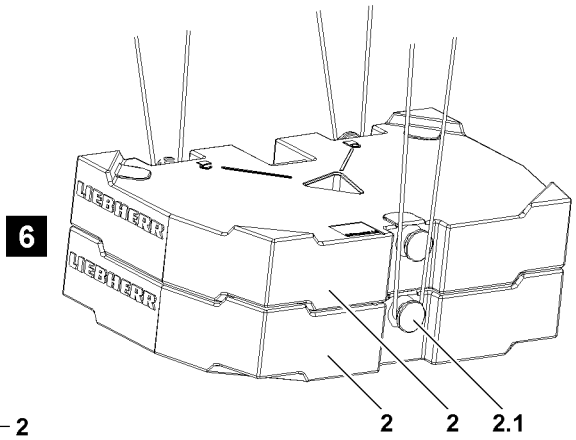
B108716

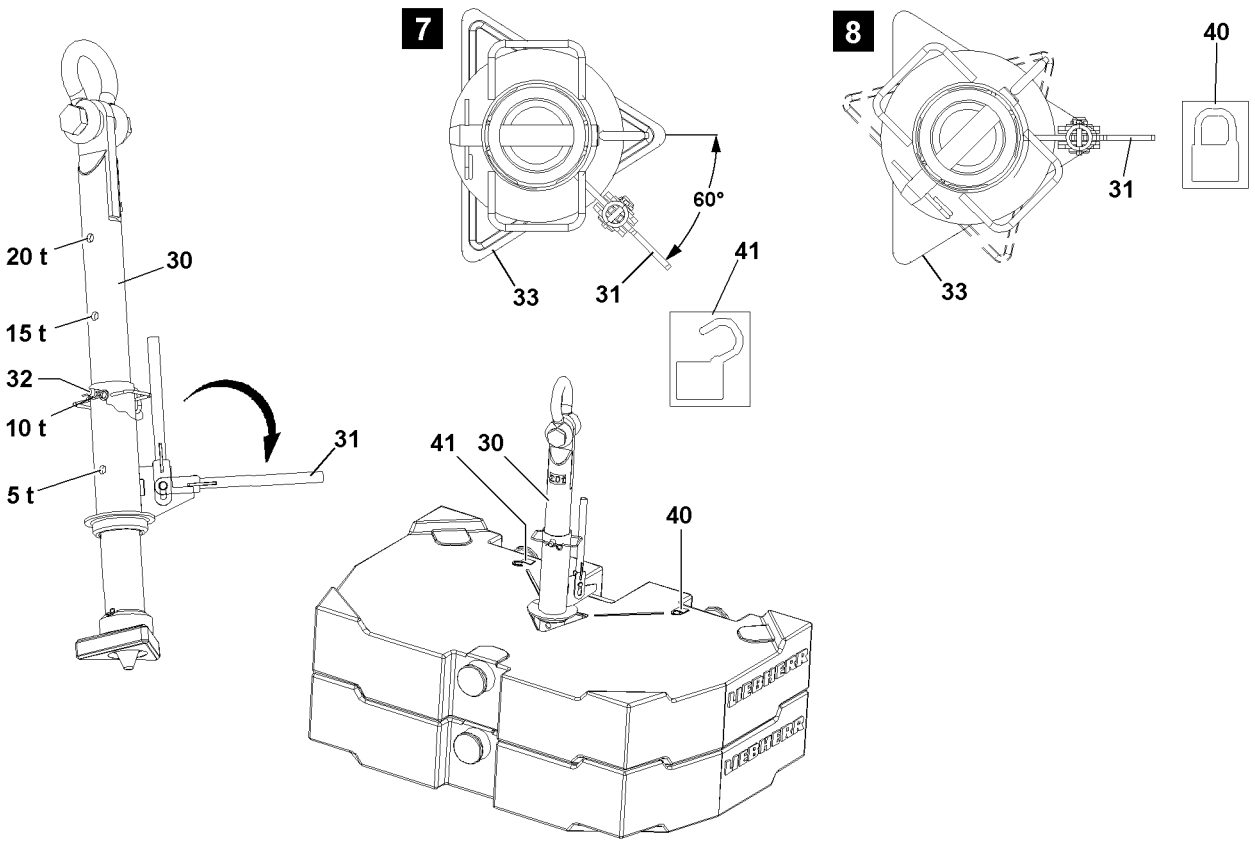
3.1 Releasing the counterweight

- If necessary:
  Remove the spring retainer **50**.
- Attach the retaining chain **42** on the auxiliary crane and secure it to prevent it from falling.
- Remove the retaining plate **44**: Release and unpin the pin **47**.
- Pull the retaining chain **42** with the auxiliary crane from the counterweight assembly and place it on a suitable base or on the ground.
- Release retainer **45** and remove the retaining plate **43**.
- Disassemble the counterweight plates.









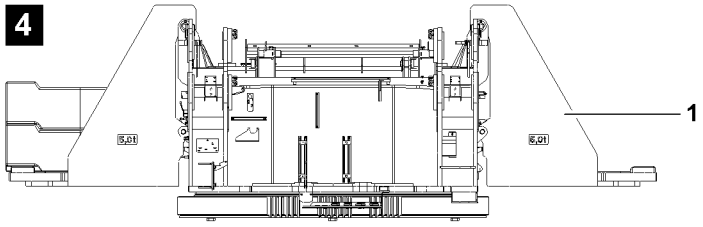
B108714

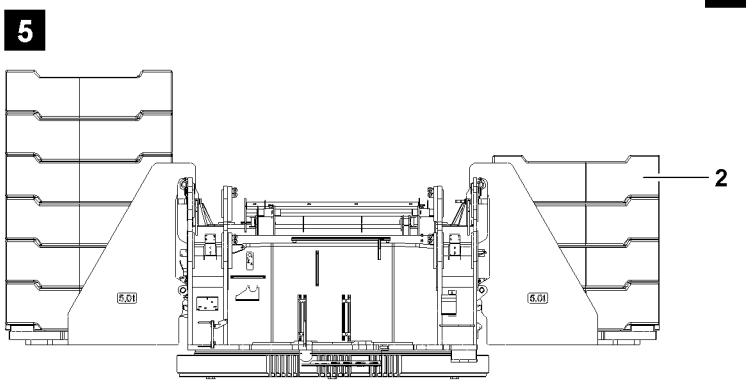
3.2 Removing the counterweight plates

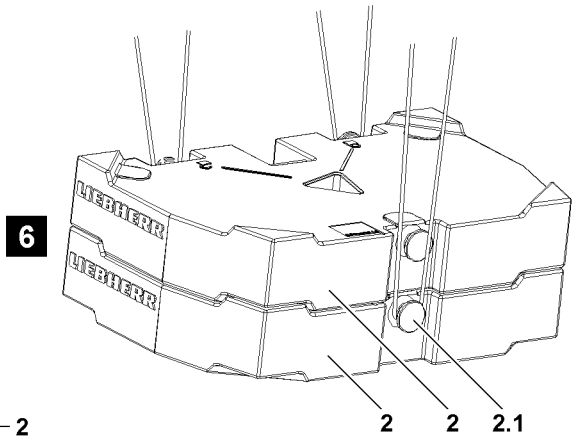
Ensure that the following prerequisite is met:
– the retaining chains are disassembled.

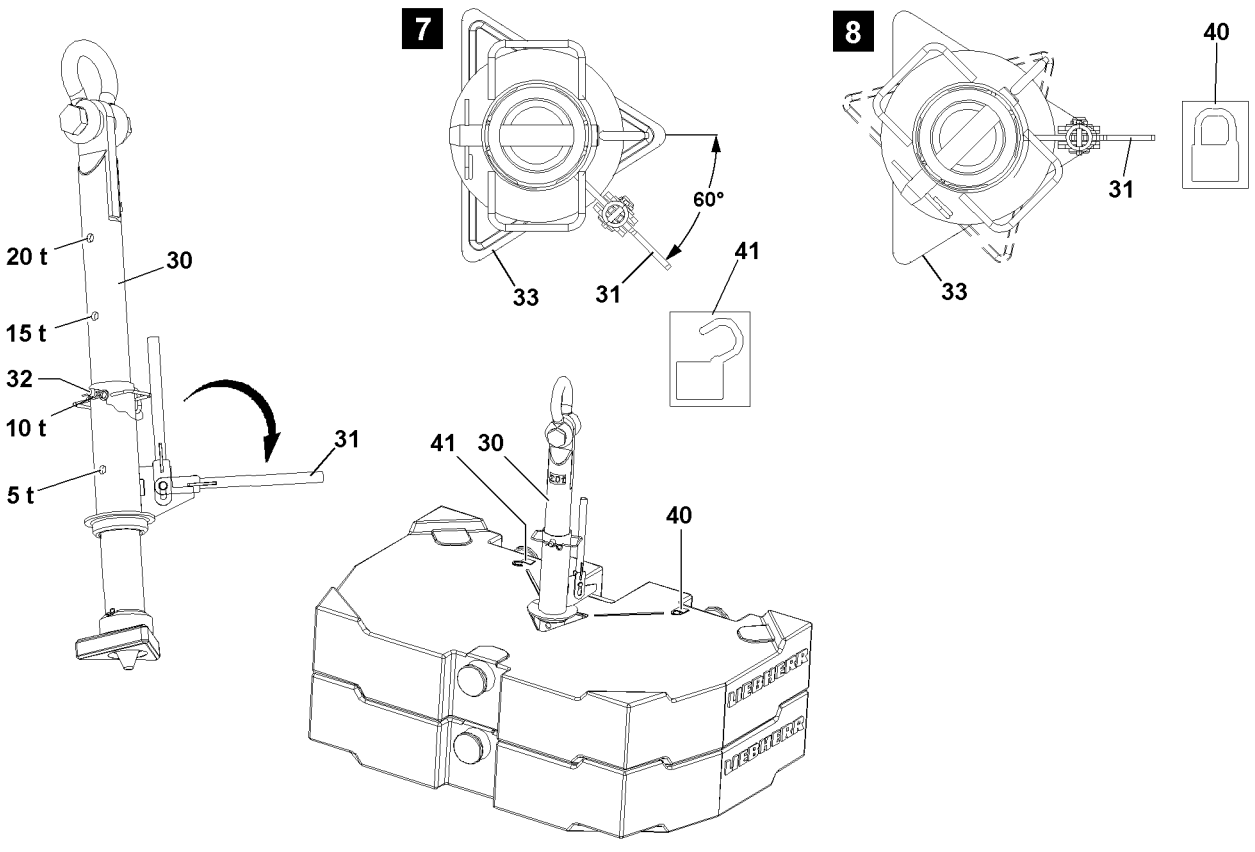
Note
▶ The counterweight plates are marked with their own weights!

WARNING
The crane can topple over!
If more than 20 t are removed with one lift from a counterweight stack or if the counterweight is removed asymmetrically, then the crane can topple over!
Personnel can be severely injured or killed!
▶ A weight difference between the right and left counterweight stack of more than 20 t is prohibited!
▶ Alternately remove no more than maximum 20 t counterweight assemblies from the counterweight stack, symmetrically on the left and right.









B108714

3.2.1 Removing the counterweight plates, attachment system: “Twistlok”

DANGER
Risk of accident!
If more than the permissible two counterweight plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged!
Personnel can be severely injured or killed!
- ▶ Make sure that the counterweight plates are laying correctly in the centerings!
- ▶ Replace damaged counterweight plates!

To remove the counterweight plate(s) **2**, use the receptacle stud **30**.
Before the receptacle stud **30** is guided into the counterweight plates, it must be ensured that the length of the receptacle stud **30** is set correctly. The length of the receptacle stud **30** can be adjusted with the pin **32**.

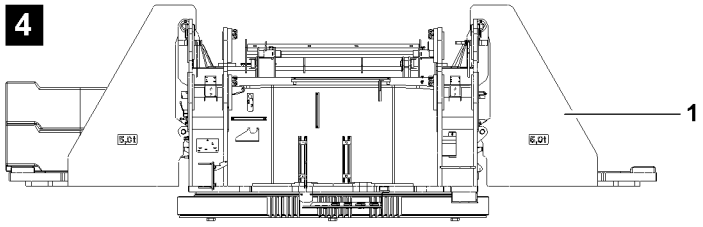
- ▶ If the length of the receptacle stud **30** is to be adjusted:
  Release and unpin the pin **32**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **30**.
- ▶ Pin in the pin **32** and secure with spring retainer.
- ▶ Attach the receptacle stud **30** on the auxiliary crane and guide it into the counterweight plate(s).
- ▶ Pull up the lever **31** and fold it down.
- ▶ Turn the lever **31** by 60° until the lever **31** points to the icon **40**. See illustration **8**.

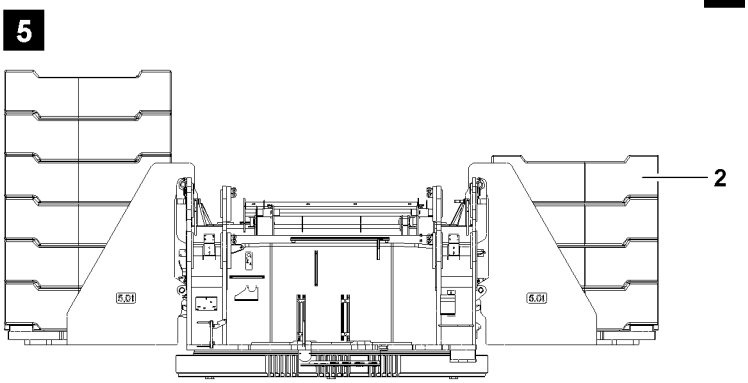
Result:
– The receptacle stud **30** is locked with the counterweight plate.

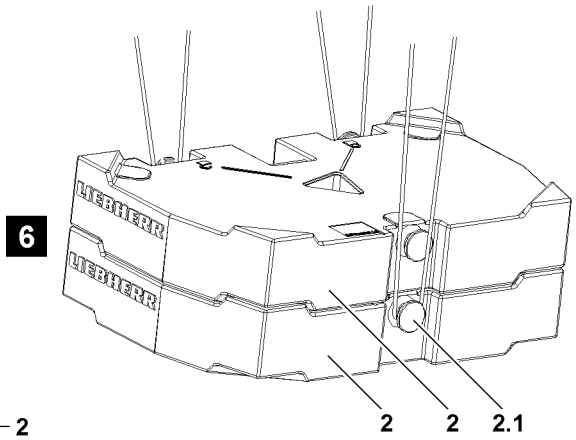
- ▶ Lift the counterweight plate with the receptacle stud **30** and remove it from the counterweight stack or the consoles.
- ▶ Turn the lever **31** by 60° until the lever **31** points to the icon **41**. See illustration **7**.

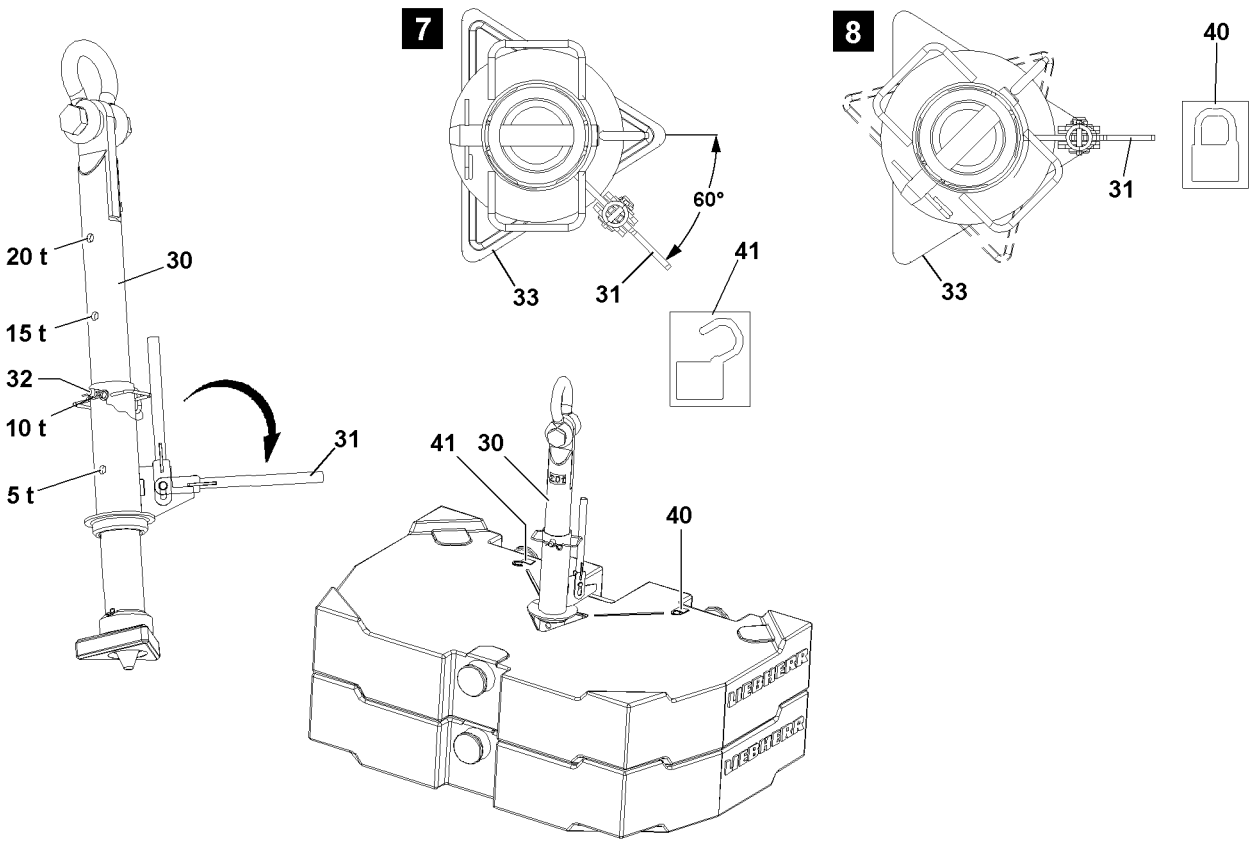
Result:
– The receptacle stud **30** is unlocked from the counterweight plate.

- ▶ Carefully pull the receptacle stud **30** from the counterweight plate.
- ▶ Alternately remove the counterweight plates from both sides.









B108714

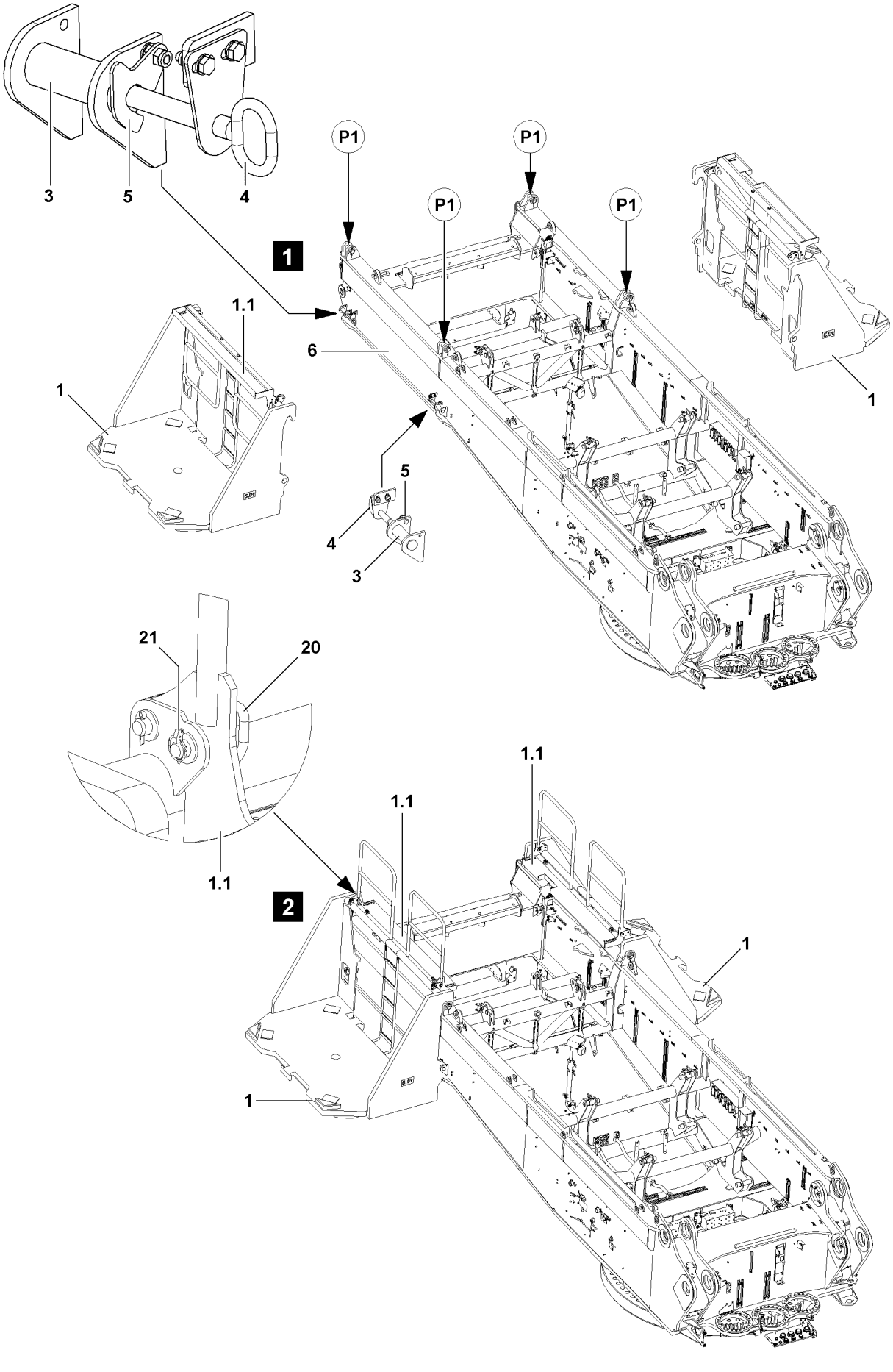
3.2.2 Removing the counterweight plates, attachment points: Bitt

WARNING
Falling counterweight plates!
If more than the permissible loads are lifted, then the bitts **2.1** are overloaded and the counterweight plates can fall down!
Personnel can be severely injured or killed!
- ▶ Lift no more than maximum 20 t with the ropes, 3 attachment points!
- ▶ Replace damaged counterweight plates immediately!

WARNING
Incorrect handling of the attachment equipment!
If attachment equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the attachment equipment is correctly attached on the bitt **2.1** and that it is secured sufficiently to prevent it from loosening up!

Note
- ▶ Remove the counterweight plates individually or as a counterweight assembly, maximum 20 t!
- ▶ The weight difference between the counterweight stacks may be no more than maximum 20 t, for examples see illustration **4** and illustration **5**!
- ▶ 20 t counterweight assembly, see illustration **6**!

- ▶ Lift the counterweight plate **2** or the counterweight assembly, see illustration **6** and remove it from the counterweight stack or the consoles.



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3.3 Removing the console

Note

▶ The weight of the console is 5 t!

Ensure that the following prerequisite is met:

– the pedestals **1.1** are in transport position, illustration **1**.

▶ Attach the console **2** onto the auxiliary crane.

▶ Fold the retainer **5** up and hold.

▶ With the aid of the threaded handle **4**:
Unpin the pin **3** on the turntable **6**.

▶ Unhook the console **2** with the auxiliary crane on points **P1**.

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 faulty operation!
If the reeving number on the pulley head is less than the reeving number set on the LICCON computer system and if the load is lifted with the luffing gear, it can result in an overload of the hoist rope, as a result, the hoist rope can rip, causing the load to drop!
Personnel can be severely injured or killed!
▶ Always comply with the reeving numbers specified in the load chart for maximum loads!
▶ The reeving on the pulley head and the reeving set on the LICCON computer system must match, otherwise crane operation is prohibited!

DANGER
Danger of fatal accidents due falling load!
If the 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 load 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 is being fully utilised, particularly when a telescopic boom extension such as a lattice jib, luffing lattice jib or folding jib is being used, the equipment must be visually inspected before picking up the load in order to ensure that the boom is not showing signs of side deformation because the sun shining on one side.

WARNING
Risk of accident because of component overloading!
If the telescopic boom has become distorted because of one-sided sunlight, this can cause component overloading and therefore accidents!

▶ Turn crane so that both sides of the boom are brought to about the same temperature, therefore preventing side deformation!

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

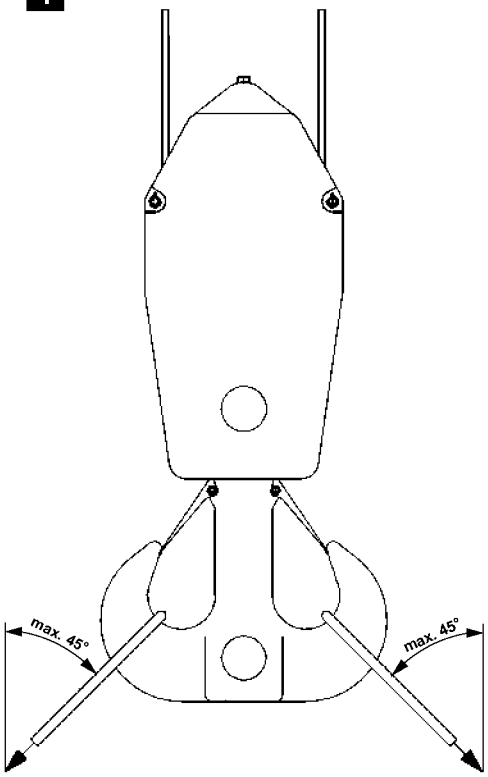
WARNING

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!

1



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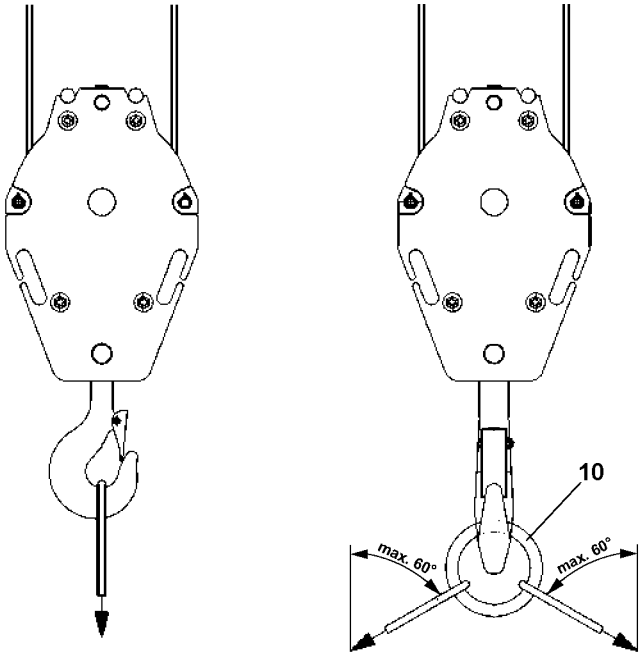

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4 Taking on a load

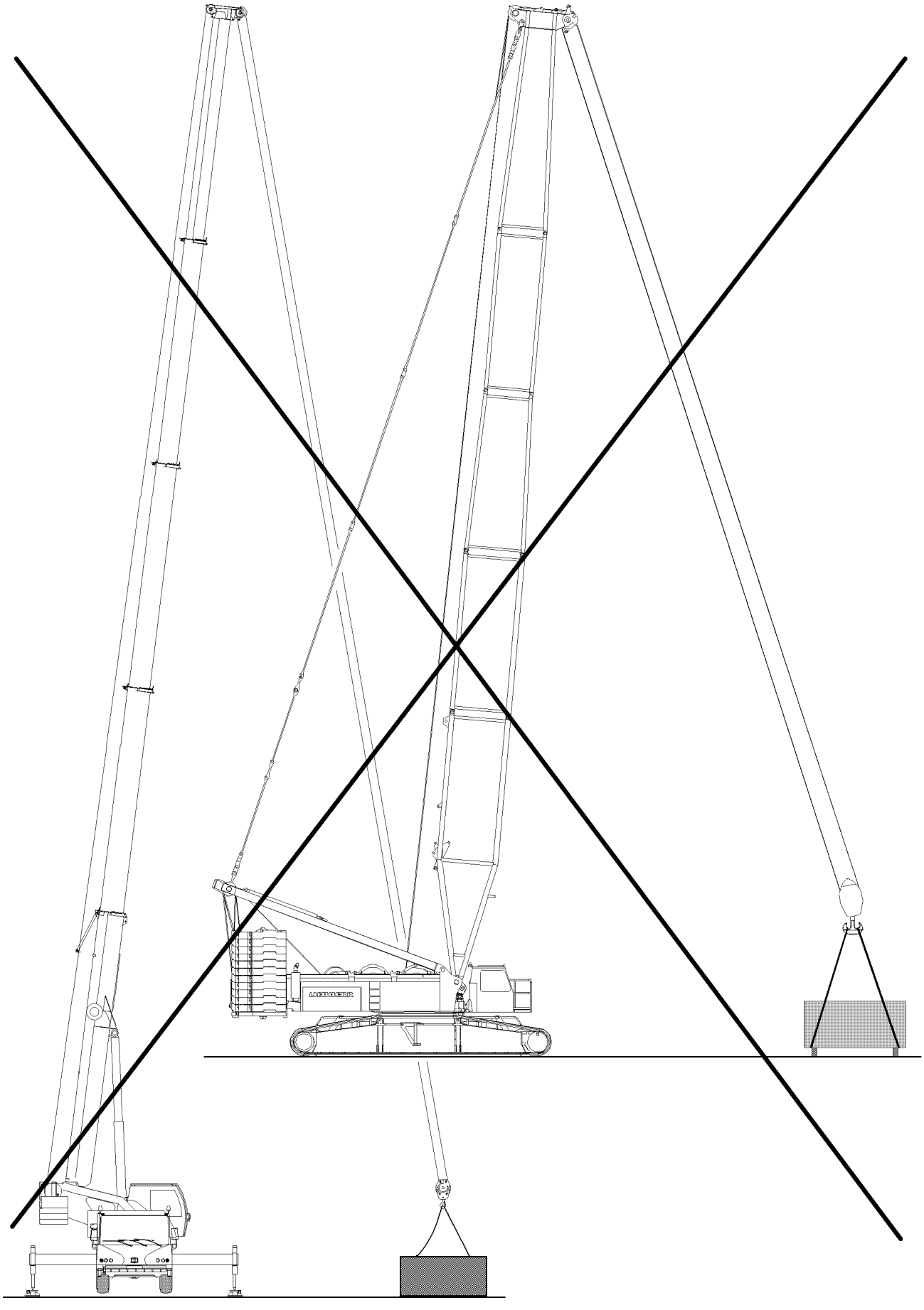
The crane must always be operated in such a way that its load-bearing parts are not destroyed or damaged and its stability is ensured.
Ensure that the following prerequisites are met:

– 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 inclination of the strands fastened on double hooks in the hook jaws amounts to 45°. See illustration **1**.
- ▶ On single hooks, operation with inclined strands in the hook jaws is prohibited!
- ▶ If necessary, use tackle with a suspension link **10**! The maximum permissible incline is 60°. See illustration **2**.



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4.2 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 switch off, then the load must not be lifted by raising 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!

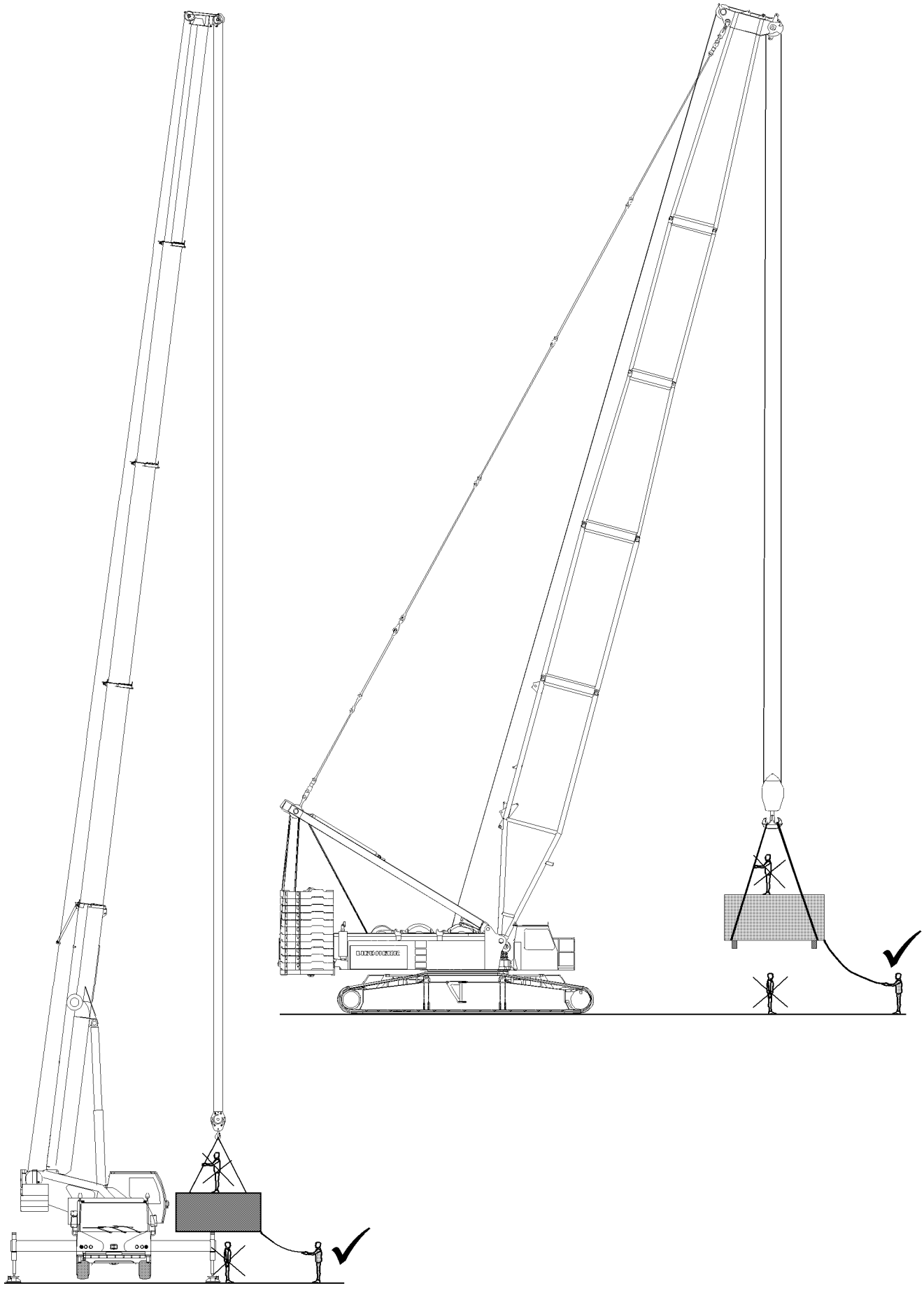
Note
When using the assembly winch* observe the following:
- ▶ The assembly winch* should only be used for assembly, and not for lifting loads!
- ▶ Lifting of loads with the auxiliary winch is prohibited!

If the cable is manually attached to the load to be raised by an assistant:
- – Make sure that the assistant's hands are not crushed between the load and the cable by the tautly pulled ropes.
- – Make sure that the assistant's body parts (hands, legs etc.) are not crushed by a pendulum movement of the load during lifting.

4.3 Angular pull

WARNING
The crane can topple over!
Angular pulling can destroy the crane or cause it to topple over!
Personnel can be severely injured or killed!
- ▶ The hook block must always be attached vertically over the center of gravity of the load to be lifted!
- ▶ Angular pull is not permitted!

The crane is designed only to lift loads vertically. During diagonal pulling, regardless of whether this is done in the same direction as the boom or diagonally, horizontal forces are generated in addition to the vertical ones, for which the boom is not designed.



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4.4 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.

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, boom, 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:

Rated 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 must not introduce vibration into the boom head!
▶ When pulling sheet piles the maximum lifting power of the crane is limited according to the load chart! Restricting the maximum lifting power via the crane overload protection **only** is prohibited! The pull force must be additionally checked by measuring.

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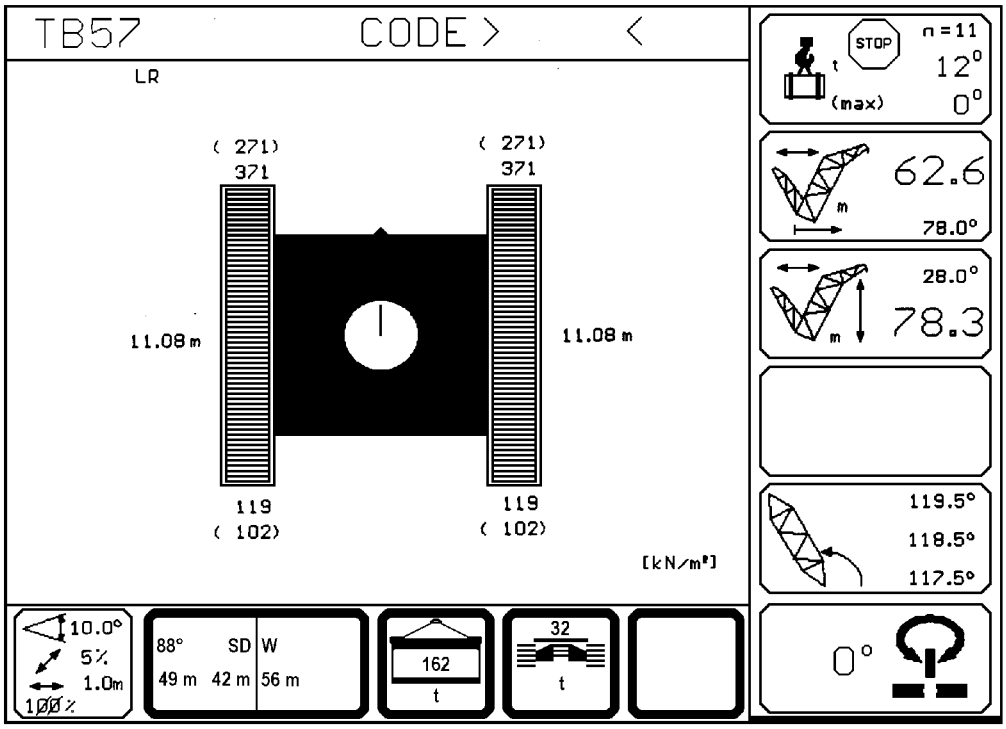
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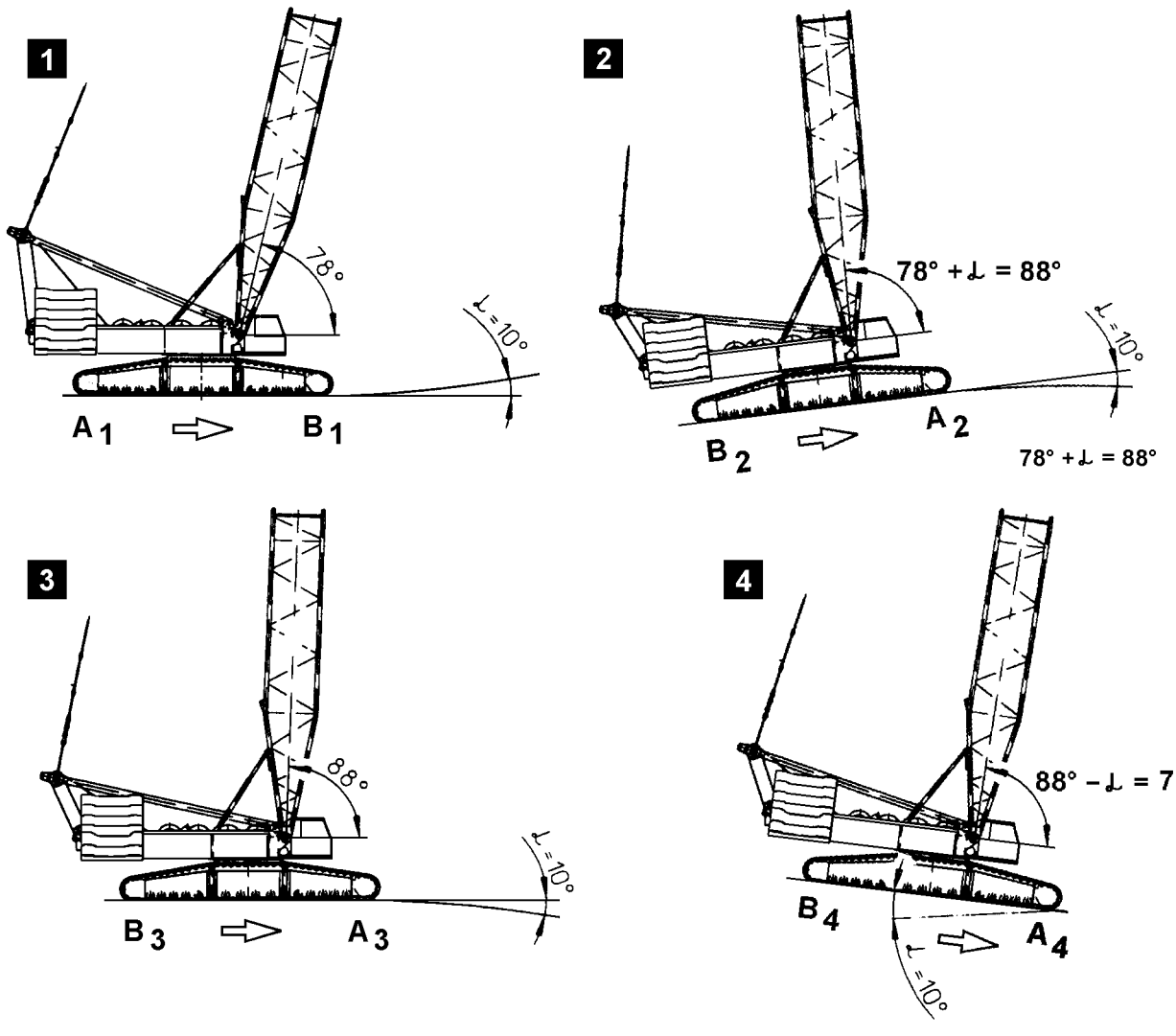
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1 Prerequisites for crawler operation

WARNING
The crane can topple over!
If the following instructions are not observed, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Before driving the crane with the attachment, the optimum boom position must be determined with the aid of the job planner, to obtain as even a ground pressure as possible!
- ▶ When driving crawler cranes, it must be ensured that the ground can take on the ground pressures, which have been calculated with the job planner, over the entire intended travel route. If this is not the case, appropriate measures must be taken to be able to discharge the forces into the ground!
- ▶ An additional monitor, who is connected by radio contact with the crane operator must ensure that there are no persons or objects within the danger zone of the crane!

Note
- ▶ The following danger note is only valid for crawler cranes with narrow crawler track!

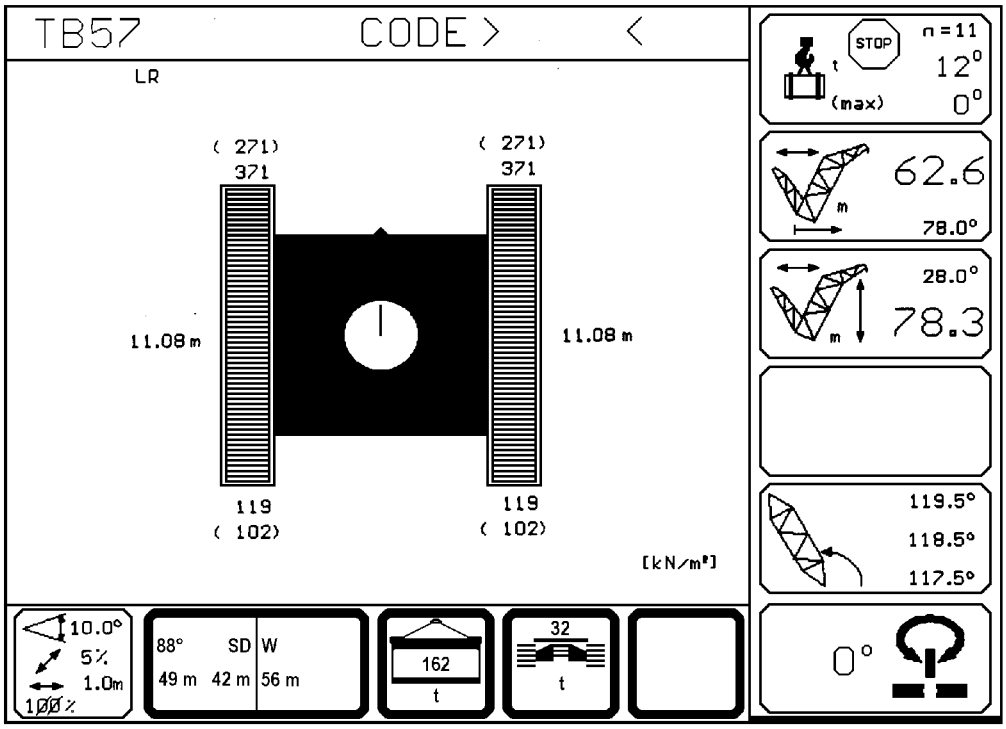
WARNING
Crane with narrow crawler track!
- ▶ When driving cranes with narrow tracks and corresponding equipment, special travel charts and danger notes must be observed and adhered to, see Crane operating instructions, chapter 6.21!

1.1 Distribution of the ground pressure

Note
- ▶ The boom must be luffed down before driving until the load is even distributed on the tracks!
- ▶ If the counterweight on the turntable is large, then it is required to position the boom in such a way that a suitable distribution of ground pressure for driving is obtained!

Note
While driving, in all travel conditions, the ratio between the front and rear or between the rear and the front ground pressures must be greater than 0.3!
- ▶ A: B must be greater than 0.3!

A = maximum ground pressure of the track which has the lower load of the two tracks.
B = maximum ground pressure of the track which has the higher load of the two tracks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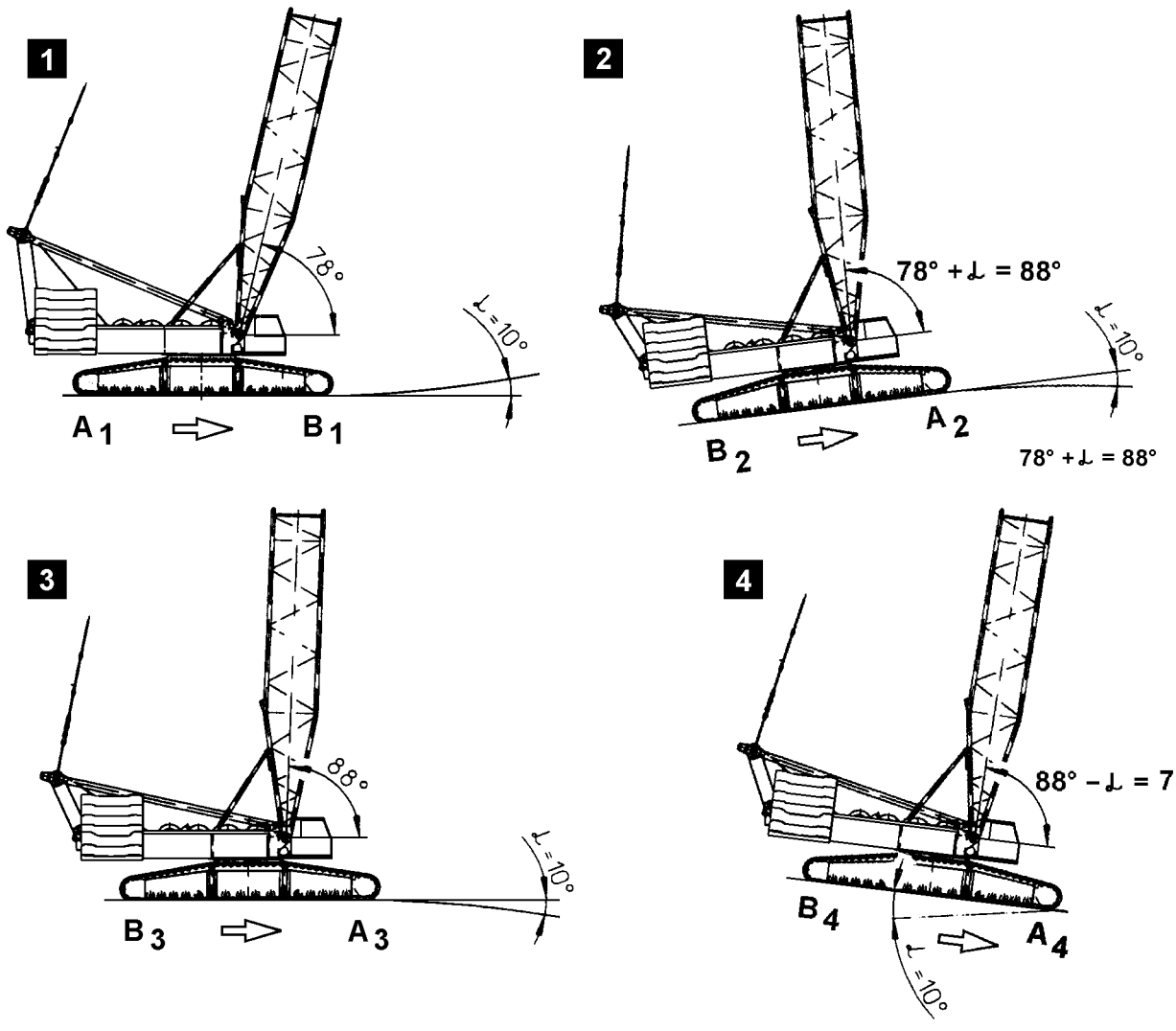
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1.2 Wear of track pads

The wear of the track pads depends on the following factors:

– Friction conditions under the chains
– Evenness of the ground
– Load bearing capacity of the ground
– Position of the total center of gravity
– Load on the hook
– Length of travel route

1.3 Prerequisites for driving on level ground

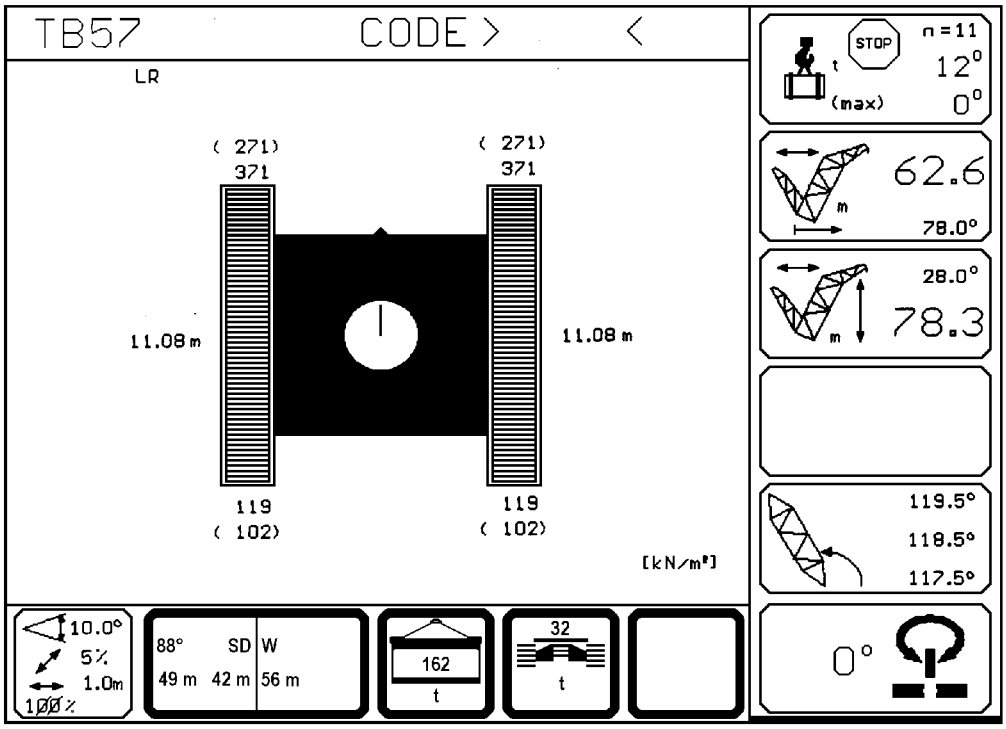
WARNING
The crane can topple over!
If the following conditions are not observed, the crane can topple over!
Personnel can be severely injured or killed!

▶ The ground must be level (± 0.2°) and have adequate load bearing capacity!
▶ The ground must be able to safely take on the maximum occurring ground pressures!

1.3.1 Driving with a load and / or suspended ballast

WARNING
The crane can topple over!
The crane can be driven with the given loads from the load charts, if the following prerequisites are met!
If the following prerequisites are not observed, the crane can topple over!
Personnel can be severely injured or killed!

▶ The maximum permissible travel speed of the crawler with load and / or suspended ballast may **not** exceed 3 m/min or 0.18 km/h!
▶ Steering the crawler with attached load and / or installed suspended ballast is prohibited!
▶ Avoid jerky driving movements!
▶ Secure the suspended load to avoid oscillation!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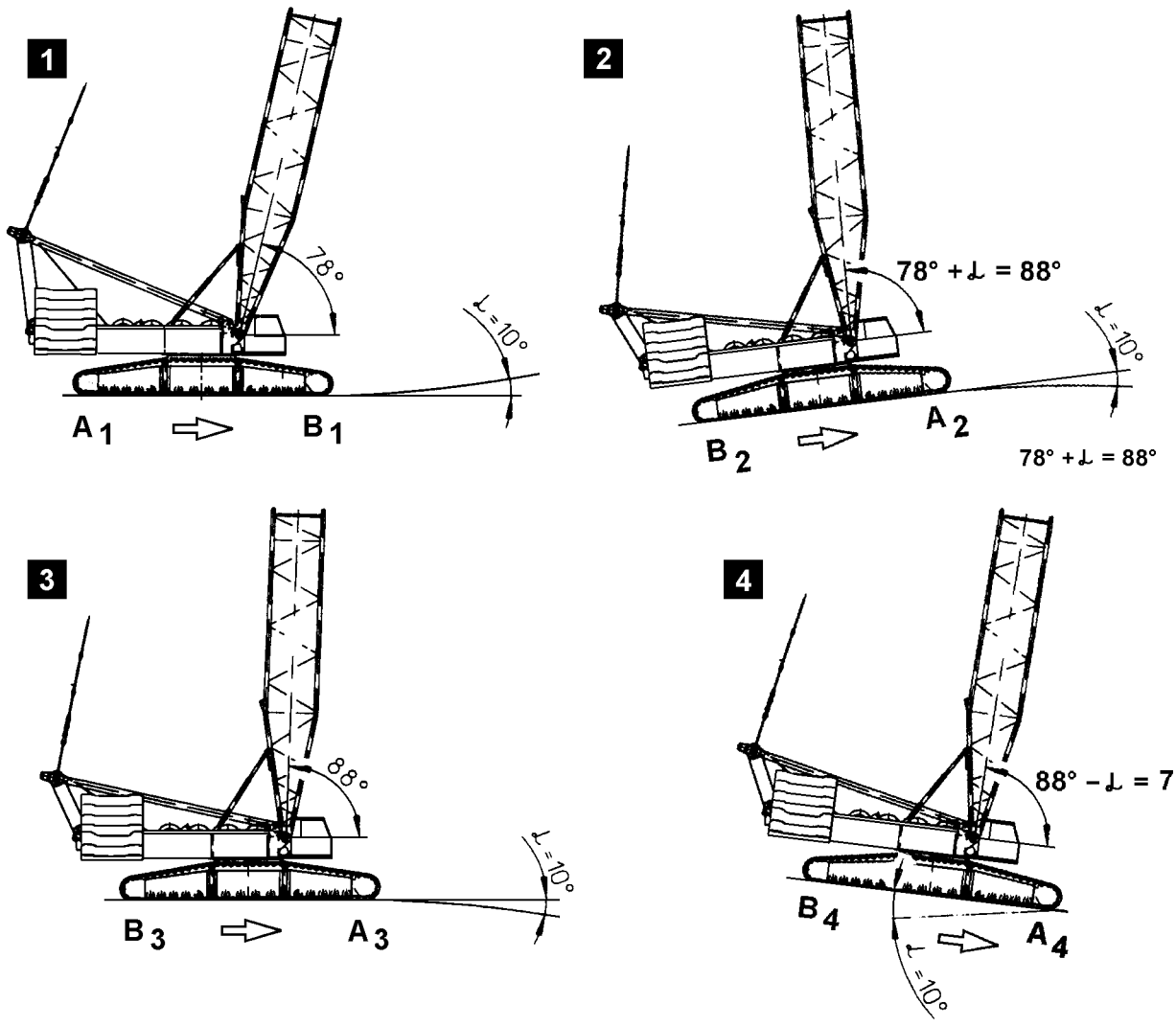
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For Australia, the following applies for driving crawler cranes:

Note

- ▶ In Australia, driving crawler cranes is only permitted with 66 percent of the respective nominal load, for that reason, the loads in the respective load chart must be multiplied with a calculation factor of 0.88!
- ▶ The crane operator bears the sole and full responsibility for the observation of national regulations!

Driving crawler cranes with reduced load

Calculation formula

T_{V} [1] = $T_{ISO\ DIN}$ [2] * **0,88** [3]

1) T_{V} = maximum permissible, drivable load (= 66 percent of the nominal load) Valid only for Australia!
2) $T_{ISO\ DIN}$ = Standard load charts according to ISO DIN
3) **0.88** = Calculation factor

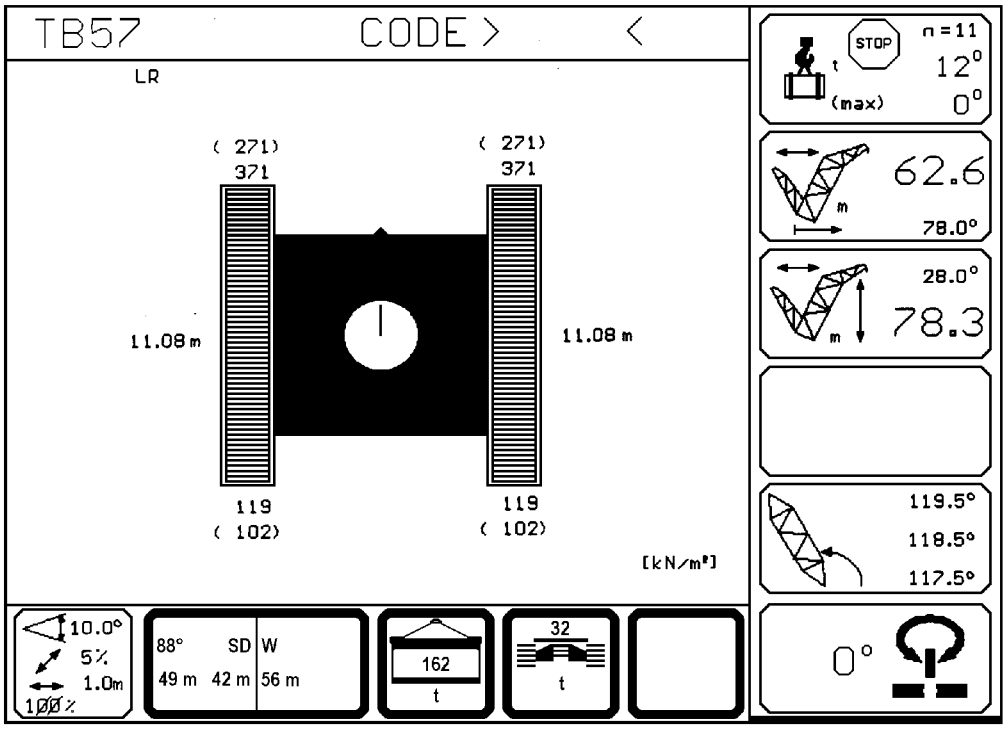
1.3.2 Steering ability

The steering ability depends on the following factors:

- Friction conditions under the chains
- Evenness of the ground:
  - Steering is not possible if the crawler track are only making contact with the ground at the front and rear.
- Load bearing capacity of the ground:
  - If the crawler tracks sink into the ground, then the steering ability is significantly restricted.
- Position of the total center of gravity:
  - If the total center of gravity - under consideration of the suspended load - is at the center of the crane, then steering is hard or not possible at all.

The steering ability can be improved by:

- Placing metal sheets, sand, gravel underneath.
- By observation of the ground load bearing ability: Changing the position of the center of gravity by changing the radius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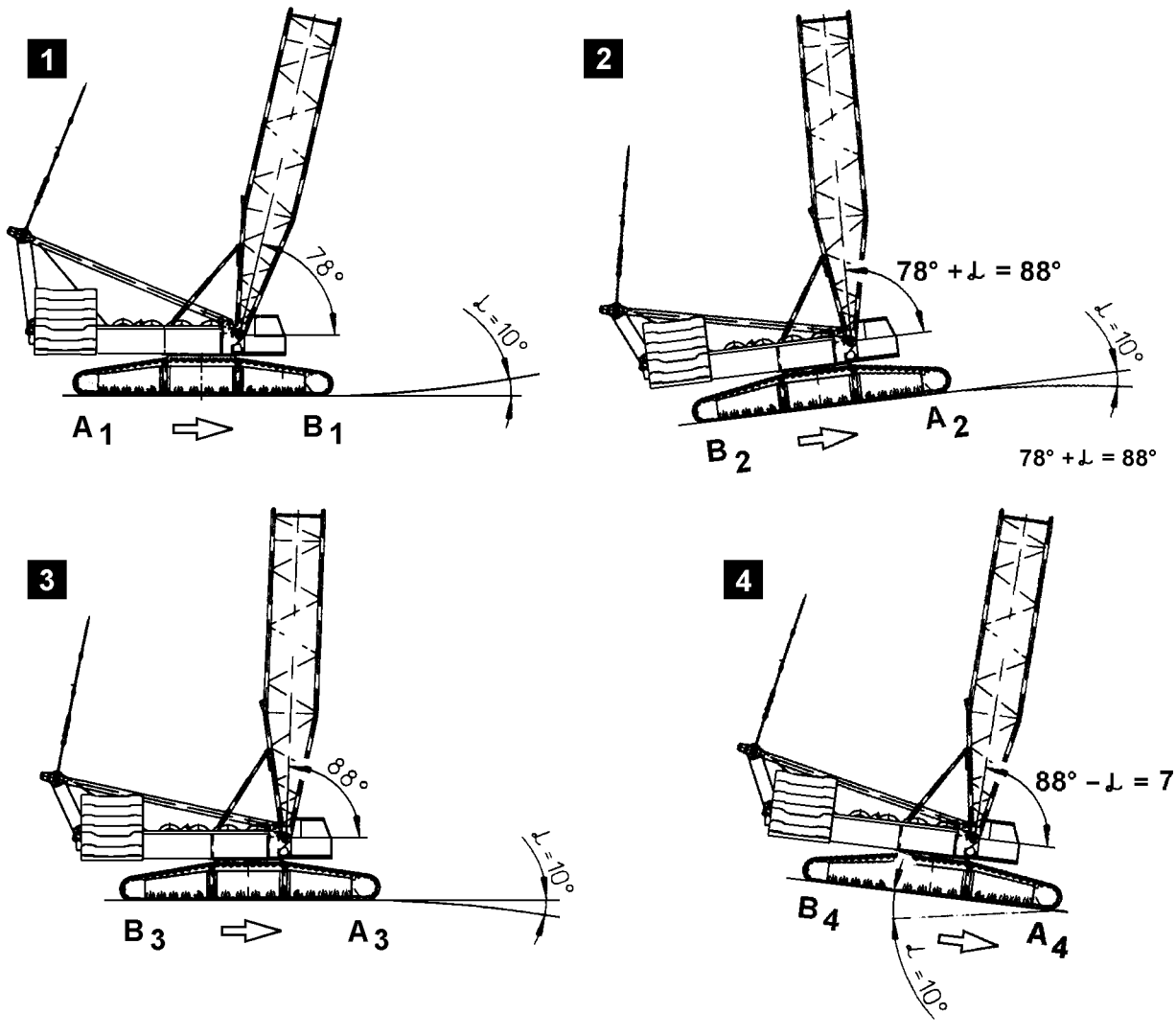
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1.4 Prerequisites for driving on uphill slopes

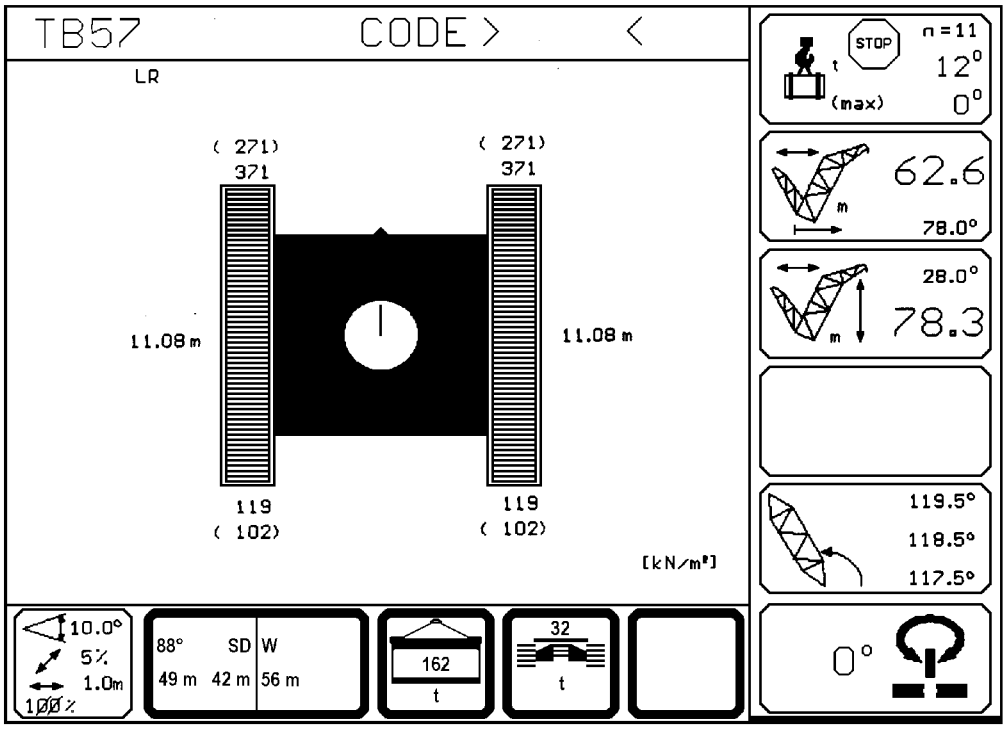
Make sure that the following prerequisites are met:
- the maximum permissible oil fill quantity in the motor is present,
- the oil level in the hydraulic oil tank is lowered from the cylinders to the extent that an overflow is not possible,
- the contents of the fuel tank must be reduced so that an overflow is not possible.

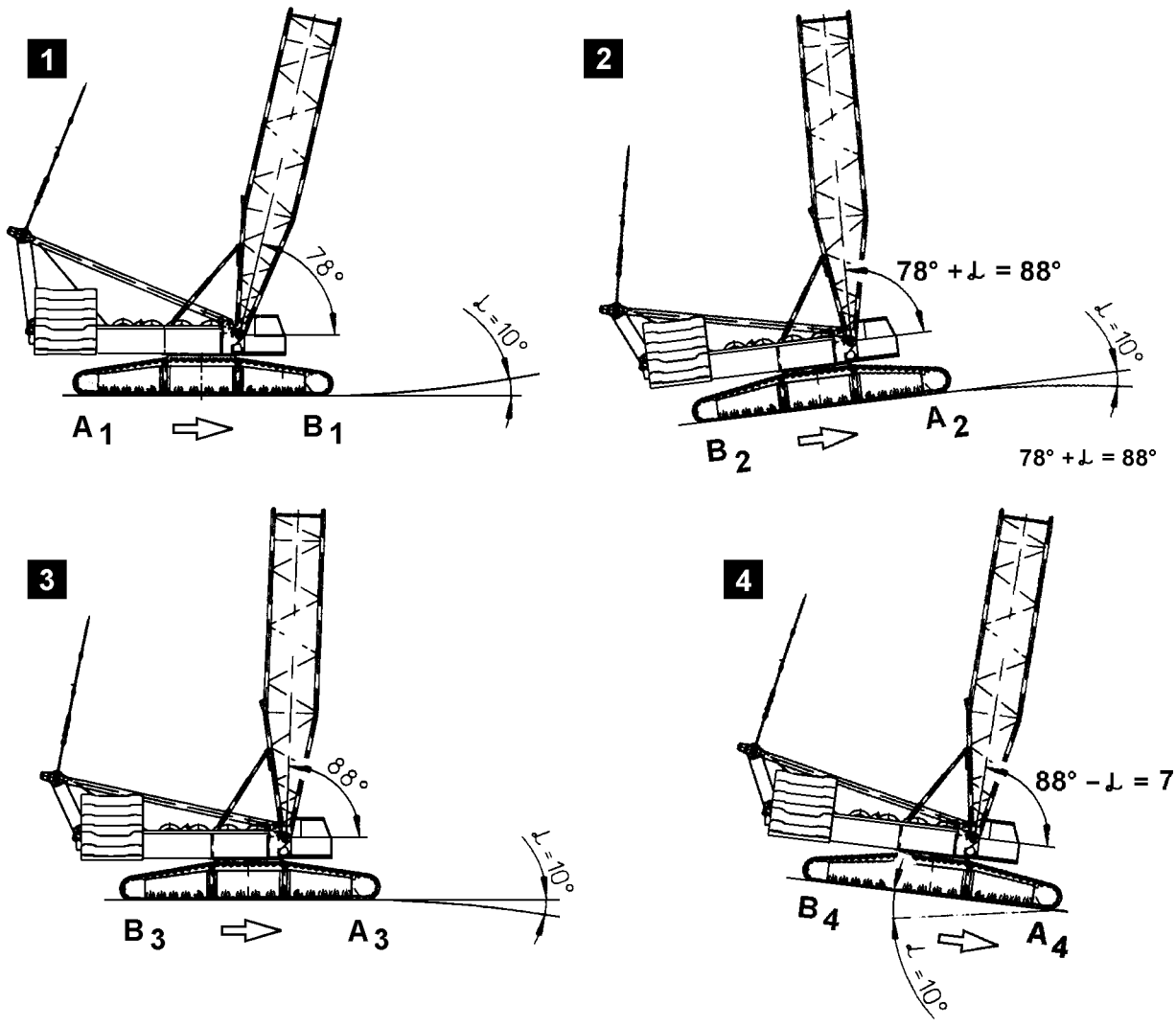
WARNING
The crane can topple over!
If the crane is driven uphill with a load, the crane can topple over!
Personnel can be severely injured or killed!
▶ Driving uphill with a load is prohibited!

WARNING
The crane can topple over!
If the following conditions are not met when driving the crawler crane on a hill, then the crane can topple over!
Personnel can be severely injured or killed!
▶ The ground must be able to absorb the ground pressures which will occur!
▶ The friction coefficient between the roadway and the ground must be large enough to take on the occurring drive forces!
▶ Slippery ground can cause the crane to slip off to the side and therefore lead to an impermissible side slope position!
▶ The turntable must be parallel to the crawler carriers and secured to prevent it from turning!
▶ Side slope is not permissible!
▶ All movements and delayed manoeuvres are to be operated with extreme caution and at the smallest possible speed!
▶ The transfer from the horizontal into an uphill slope and from the uphill slope into the horizontal must be made evenly, i.e.: there may be no edges which can cause the crane to topple over! The incline change must be made continuously!
▶ The ground pressures which will occur should be determined with the job planner before travel!
▶ The maximum permissible wind speed is 9 m/s!
▶ The ground must be sufficiently load bearing and have sufficient traction to prevent the crane from slipping!
▶ The counterweight on the turntable must be secured with a chain, see chapter 4.07 of the Crane operating instructions!
▶ The center of gravity of the crane must lie in the middle of the crawler track! The corresponding boom position is determined with the job planner!

1.4.1 Maximum climbing ability

The maximum climbing ability of the crawler crane is limited by the following criteria:
- The location of the center of gravity for the complete crawler crane.
- The friction coefficient between roadway and track pads.
- The transit between the horizontal and the incline.
- The maximum uphill incline of 10° to a boom length of 150 m.
- The maximum permissible uphill slope of 5° with derrick ballast.


TB57
CODE >
LR
(271)
371
(271)
371
11.08 m
11.08 m
119
(102)
119
(102)
[kN/m²]
STOP
n = 11
12°
(max)
0°
62.6
78.0°
28.0°
78.3
119.5°
118.5°
117.5°
0°
10.0°
5%
1.0m
100%
88° SD W
49 m 42 m 56 m
162
t
32
t


1
78°
⊿ = 10°
A 1
B 1
2
78° + ⊿ = 88°
⊿ = 10°
B 2
A 2
78° + ⊿ = 88°
3
88°
⊿ = 10°
B 3
A 3
4
88° − ⊿ = 78°
B 4
A 4
⊿ = 10°

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1.4.2 Calculation of required length for transfers

Illustration	Direction of travel	
	from	to
1	Horizontal	Uphill slope
2	Uphill slope	Horizontal
3	Horizontal	Downhill slope
4	Downhill slope	Horizontal

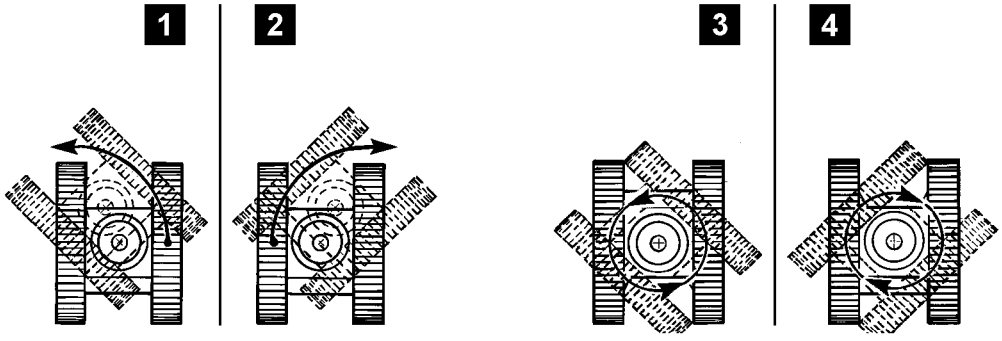
Note

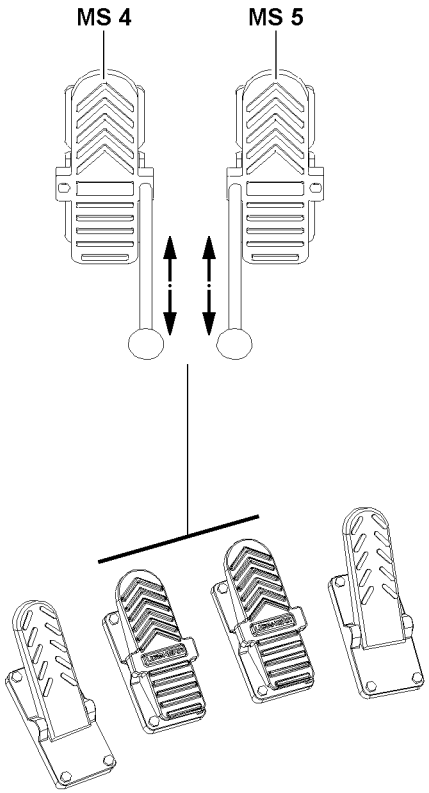
▶ The required length **L** for transfers results from the existing uphill angle **α** and the length of the crawlers **LC**!

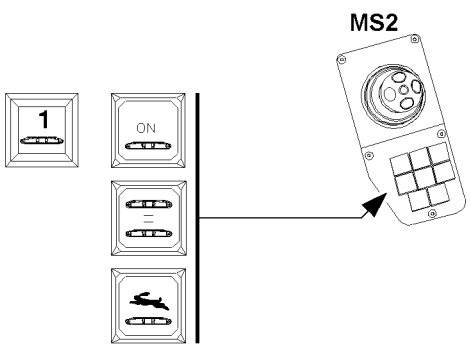
Abbreviation	Description
L	Required length of transfers
α	Angle of uphill slope in degrees
LC	Length of crawlers between drive wheels and change over wheels

Calculation example

Given:
α = 10°
LC = 12.6 m
Wanted:
L = ?
Formula:
L = 0.5 x **α** x **LC**
Result:
L = 0.5 x 10 x 12.6 m = 63 m







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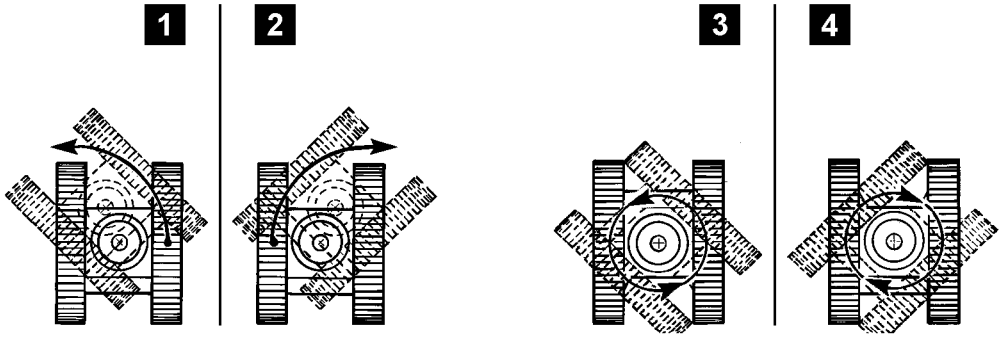
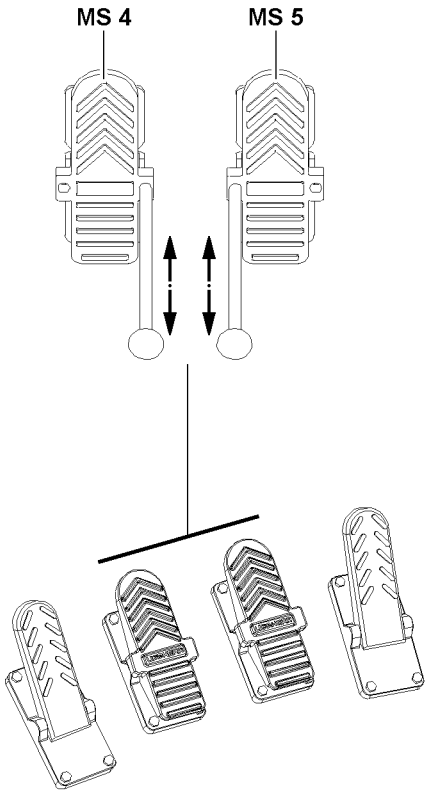
2 Driving the crawler crane

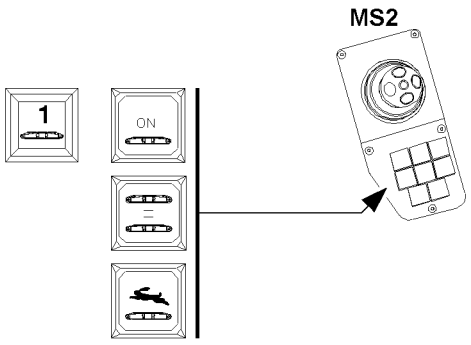
WARNING
The crane can topple over!
When driving the crane - this also applies for “circular travel” - and the ballast trailer is raised due to ground unevenness, the force on test point 1 **MS1** (F1) increases very quickly and the crane will be overloaded!
If the ballast trailer sinks while driving due ground unevenness, the force on test point 1 **MS1** (F1) drops and the ballast trailer lifts off the ground, or the entire boom system is pulled backward!
There is no LMB shut off!
The crane can topple over and personnel can be severely injured or killed!
- ▶ The crane operator must constantly observe the displays on the LICCON monitor while driving the crawler crane!
- ▶ The crane operator must correct the force changes on test point 1 **MS1** (F1) to a permissible operating range already when a prewarning occurrence on the LICCON monitor is issued by actuating the pull cylinder in the derrick ballast guying!

WARNING
The crane can topple over!
If the following instructions are not observed, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Before driving the crane with the attachment, the optimum boom position must be determined with the aid of the job planner, to obtain as even a ground pressure as possible!
- ▶ When driving crawler cranes, it must be ensured that the ground can take on the ground pressures, which have been calculated with the job planner, over the entire intended travel route. If this is not the case, appropriate measures must be taken to be able to discharge the forces into the ground!
- ▶ An additional monitor, who is connected by radio contact with the crane operator must ensure that there are no persons or objects within the danger zone of the crane!

Ensure that the following prerequisite is met:
– the crane engine is running.







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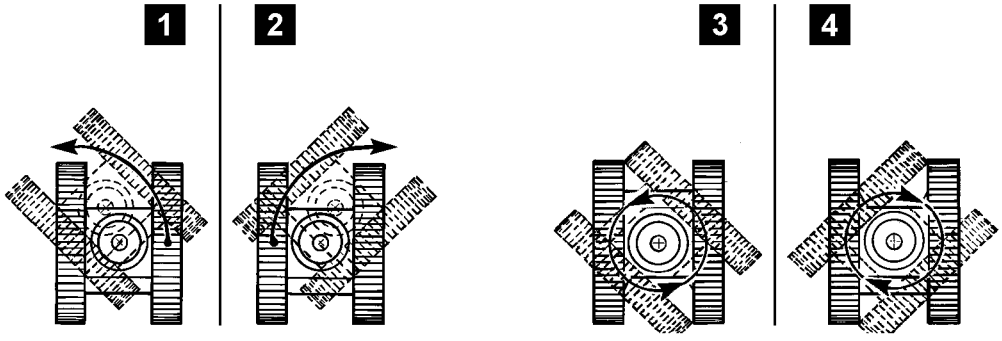
2.1 Operating elements for the crawler operation

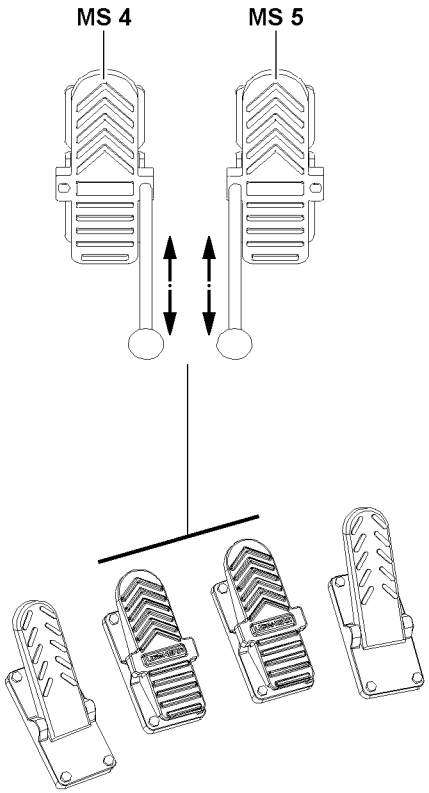
2.1.1 Pedal carrier

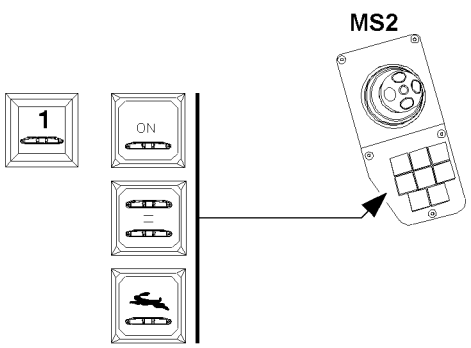
	Pedal carrier (Pedal assignment, see opposite illustration)			
	 *Pedal*	 *Foot pedal **MS 4***	 *Foot pedal **MS 5***	 *Pedal*
Function:	Slewing gear brake	Crawler travel “left”	Crawler travel “right”	Engine regulation:
	Note: Refer also to chapter 4.01 and chapter 4.05 of the Crane operating instructions.			

2.1.2 Switch for crawler operation

	Control panel MS2		
	 *Switch “Crawler operation”* **or:**  *Switch “Crawler operation”*	 *Switch “Parallel travel”*	 *Switch “Rapid gear”*
Function:	On / Off	On / Off	On / Off
	Note: Also see Crane operating instructions, chapter 4.01!		







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2.2 Activating crawler operation

Note
▶ The engine RPM is increased or decreased via the pedal “engine regulation”!
▶ The switch “crawler operation” can differ somewhat, depending on the crane type!

▶ Actuate the switch “Crawler operation”.

Result:
– Crawler operation is activated.
– The indicator light in the switch “crawler operation” lights up.

▶ To deactivate crawler operation:
Actuate the switch “Crawler operation”.

Result:
– Crawler operation is deactivated.
– The indicator light in the switch “crawler operation” turns off.

2.3 Selecting the travel speed

This crawler crane has 2 possible speeds:
1.) Speed stage 1:
Creeper gear
2.) Speed stage 2:
Fast mode (Rapid gear)

2.3.1 Activating the creeper gear

Make sure that the following prerequisites are met:
– the switch “Rapid gear” is not actuated
– the indicator lights in the switch “Rapid gear” is off

▶ Actuate the switch “Crawler operation”.

Result:
– The creeper gear is active.

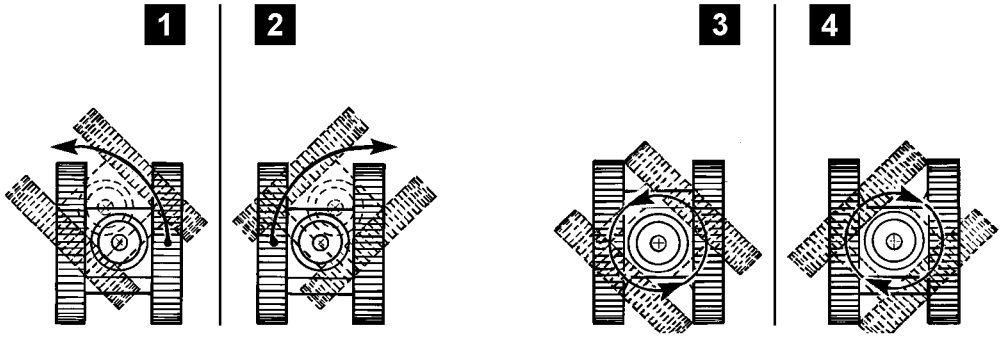
2.3.2 Turning the rapid gear on

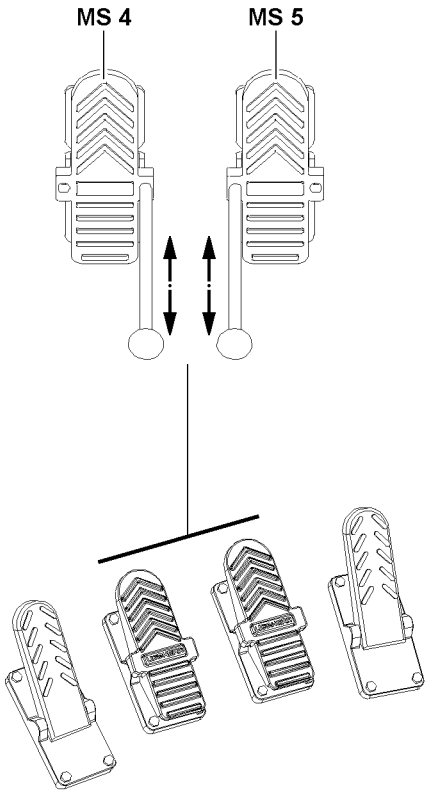
WARNING
The crane can topple over!
If the crane is driven in rapid gear with a load or suspended ballast, then the crane can topple over!
Personnel can be severely injured or killed!
▶ Travel with a load or suspended ballast in rapid gear is prohibited!

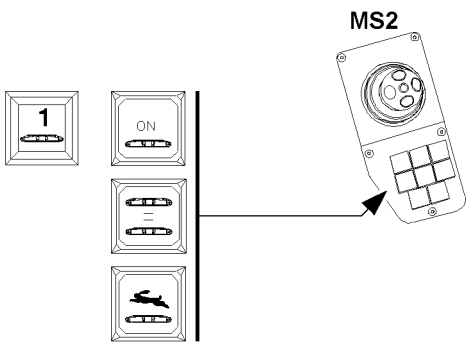
Make sure that the following prerequisites are met:
– the switch “Parallel travel” is not actuated
– the indicator light in switch “Parallel travel” is off
– the creeper gear is active.

▶ To select speed stage 2:
Actuate the switch “Rapid gear”.

Result:
– The rapid gear is activated.
– The indicator light in the switch “Rapid gear” lights up.







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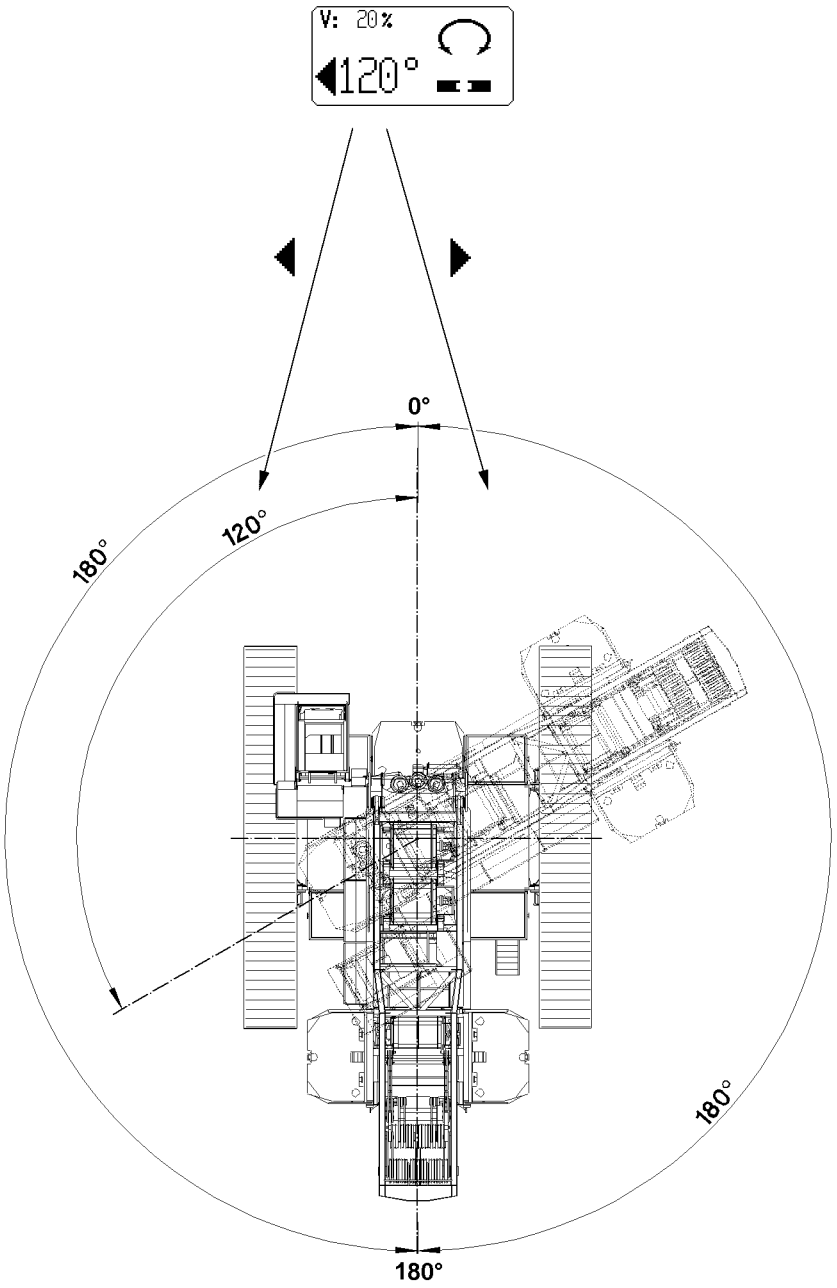
2.4 Driving the crawler

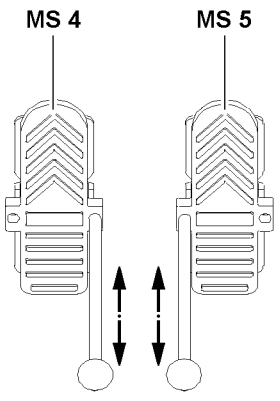
WARNING
The crane can topple over!
If the crane is driven in rapid gear with a load and / or suspended ballast, then it can topple over!
Personnel can be severely injured or killed!
- ▶ Travel with a load and / or suspended ballast in rapid gear is prohibited!
- ▶ The maximum permissible travel speed of the crawler with load and / or suspended ballast may not exceed 3 m/min or 0.18 km/h!
- ▶ Steering the crawler with attached load and / or installed suspended ballast is prohibited!

WARNING
Personnel present in danger zone!
Personnel within the danger zone of the crane can be severely injured or killed!
- ▶ An additional monitor, who is connected by radio contact with the crane operator must ensure that there are no persons or objects within the danger zone of the crane!
- ▶ The observer may not remain in the crane danger zone!

Note
- ▶ Take the manual level from the transport retainer in the crane operator's cab!
- ▶ The technical design of the manual lever is completely identical. The differentiation of the two manual levers is only in their assignment to the corresponding foot pedals in assembled (pushed on) condition!

Ensure that the following prerequisite is met:
– the switch “crawler operation” is actuated:





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2.4.1 Changes of travel direction

Note

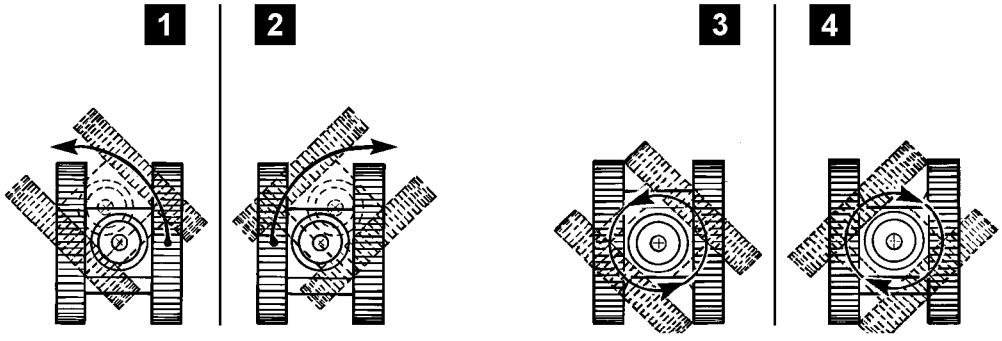
- ▶ At 0°, the crane superstructure is exactly in position “to the front”.
- ▶ At 180°, the crane superstructure is exactly in position “to the rear”.

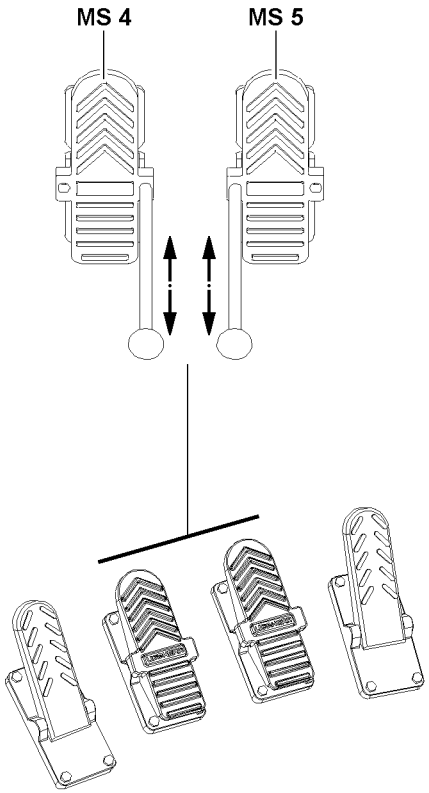
The travel direction relates to the position of the crane superstructure:

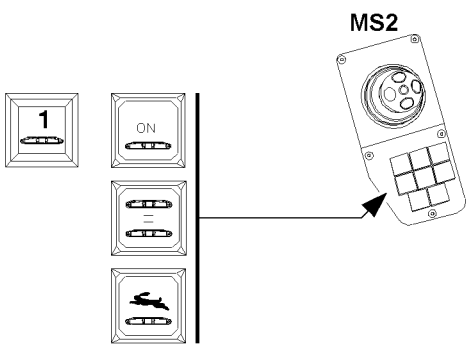
– If the crane superstructure is turned past 90°, then the “forward / reverse” travel direction changes.

– If the crane superstructure with actuated foot pedal **MS 4** or foot pedal **MS 5** is turned past 90°, then the travel direction remains until the corresponding foot pedal / manual control lever is “returned” to neutral position.

  This means the new travel direction becomes active only if the corresponding foot pedal / manual control lever is no longer actuated.







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2.4.2 Driving the crawler forward and backward

The tracks can be operated with the foot pedals:
– Crawler track left: Foot pedal **MS4**
– Crawler track right: Foot pedal **MS5**

Alternatively, a manual lever can be installed (inserted) on the foot pedal **MS4** and the foot pedal **MS5** in order to control the travel movements of the crawler precisely.

Driving the crawler forward

▶ Push the right foot pedal **MS5** forward.

or

■ Move the manual lever on the foot pedal **MS5** forward.

Result:
– The right crawler moves forward.

▶ Push the left foot pedal **MS4** forward.

or

■ Move the manual lever on the foot pedal **MS4** forward.

Result:
– The left crawler moves forward.

Move the crawler backward

▶ Push the right foot pedal **MS5** back.

or

■ Move the manual lever on the foot pedal **MS5** backward.

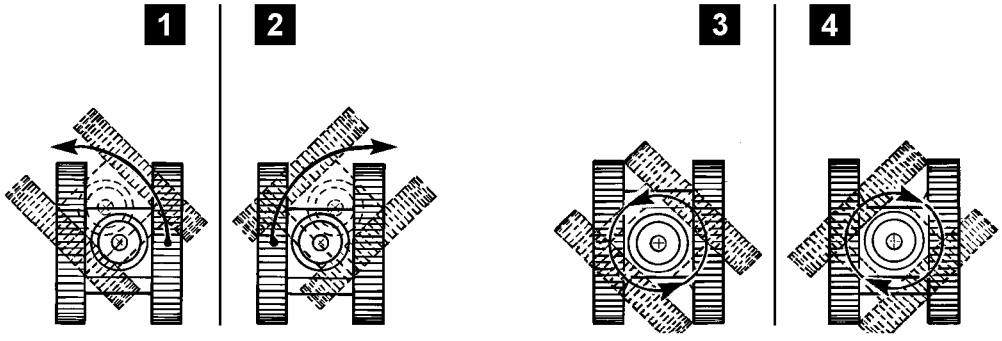
Result:
– The right crawler moves backward.

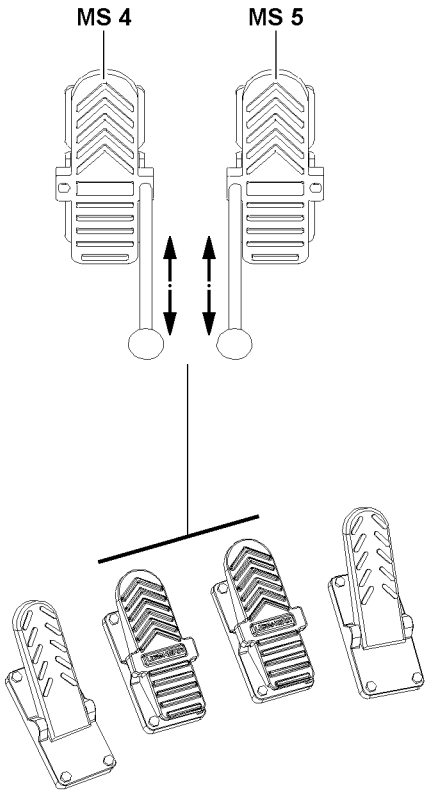
▶ Push the left foot pedal **MS4** back.

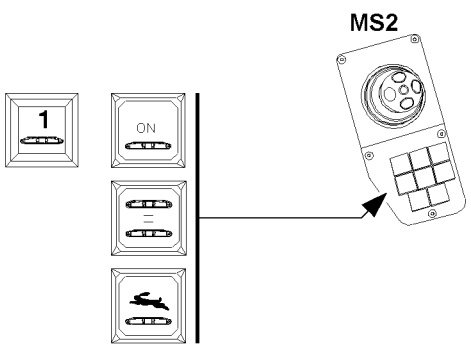
or

■ Move the manual lever on the foot pedal **MS4** backward.

Result:
– The left track moves backward.







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2.4.3 Activating parallel travel

If “parallel travel” is added, both crawlers are simultaneously controlled by pressing down on foot pedal **MS4** or foot pedal **MS5**. The foot pedal, which is actuated first serves as the control for both crawler tracks. This makes is possible to drive the tracks exactly straight forward on suitable ground.

Note

- ▶ If, with the “rapid gear” turned on, the function “parallel travel” is added, then the function “rapid gear” is deactivated: The indicator light in the switch “rapid gear” turns off. However, the switch remains actuated!
- ▶ If the function “parallel travel” is turned off again, the rapid gear activates automatically: The indicator light in the switch “rapid gear” lights up!

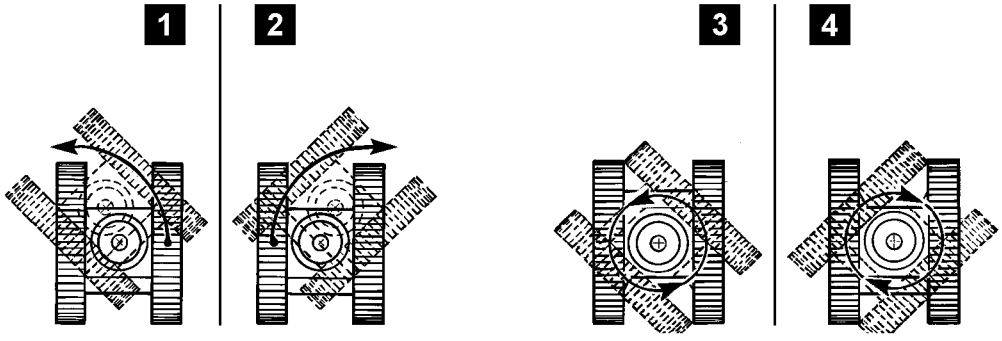
Ensure that the following prerequisite is met:

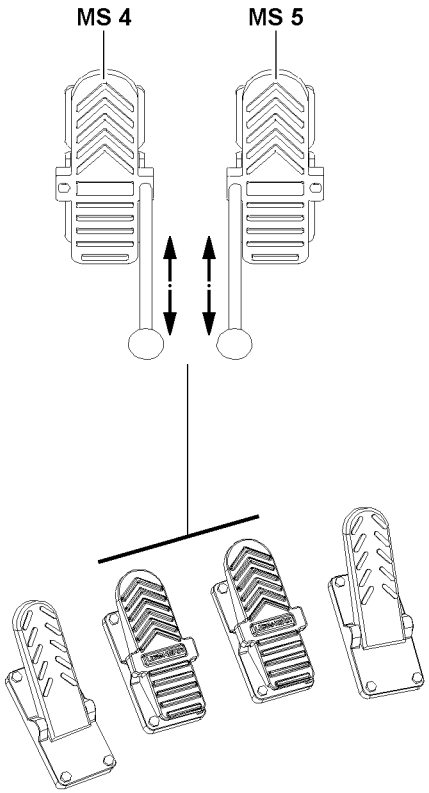
– Rapid gear is deactivated: The indicator lights in switch “rapid gear” is off.

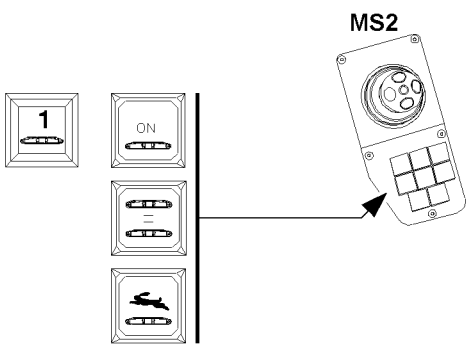
▶ Actuate the switch “parallel travel”.

Result:

– Parallel travel is activated.
– The indicator light in the switch “parallel travel” lights up.







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2.4.4 Steering the crane

WARNING
The crane can topple over!
If the crane is steered with closed slewing gear brake, then the boom system can be damaged due to high side acceleration!
Personnel can be severely injured or killed!
If the crane is steered with or without a load:
▶ When steering the crawler, always activate the slewing gear coasting!

NOTICE
The crane can topple over!
If the crawler chain sags on uneven ground, then the centering cams of the track pads can no longer be centered and guided sufficiently in the track rollers!
The centering cams will be damaged and the chain can jump out of its guide!
Personnel can be severely injured or killed!
▶ Stop steering movements immediately!
▶ Drive straight forward until all centering cams are centered again!
▶ When possible, retension the crawler chain, see chapter 7.04 of the Crane operating instructions!

NOTICE
High friction forces during steering!
When steering in small radii, high friction forces are created!
The track pads are heavily worn!
▶ Steer the tracks in as large a radius as possible!
▶ Avoid counter rotation!

Steering the tracks to the left

See illustration **1**.
▶ Push the right foot pedal **MS5** forward.

or

■ Move the manual lever on the foot pedal **MS5** forward.

Steering the tracks to the right

See illustration **2**.
▶ Push the left foot pedal **MS4** forward.

or

■ Move the manual lever on the foot pedal **MS4** forward.

Counter rotating the tracks to the left

See illustration **3**.
▶ Push the right foot pedal **MS5** forward and the left foot pedal **MS4** backward.

or

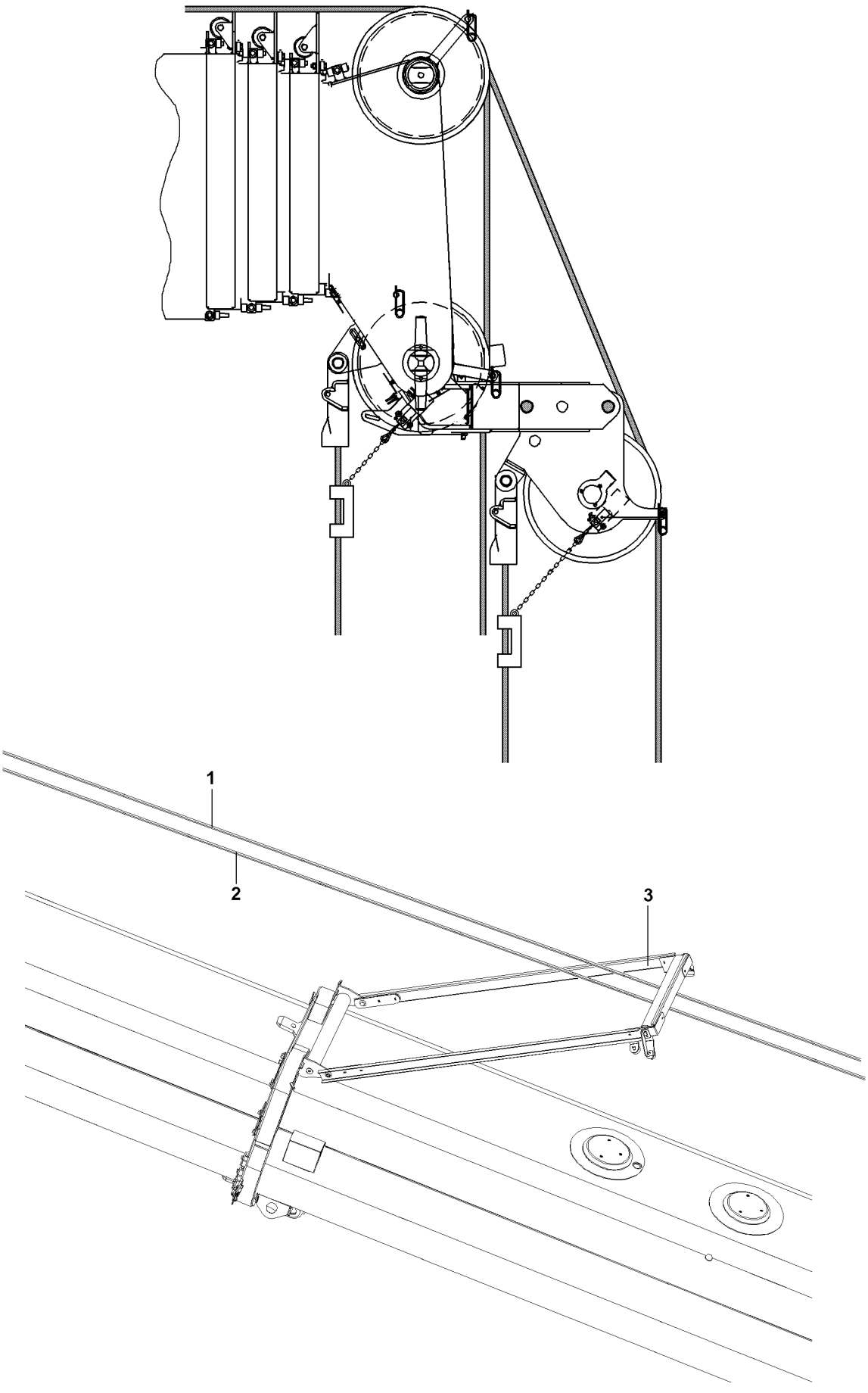
■ Move the manual lever on the foot pedal **MS5** forward and move the foot pedal **MS4** backward.

Counter rotating the tracks to the right

See illustration **4**.
▶ Push the left foot pedal **MS4** forward and the right foot pedal **MS5** backward.

or

■ Move the manual lever on the foot pedal **MS4** forward and move the foot pedal **MS5** backward.



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.

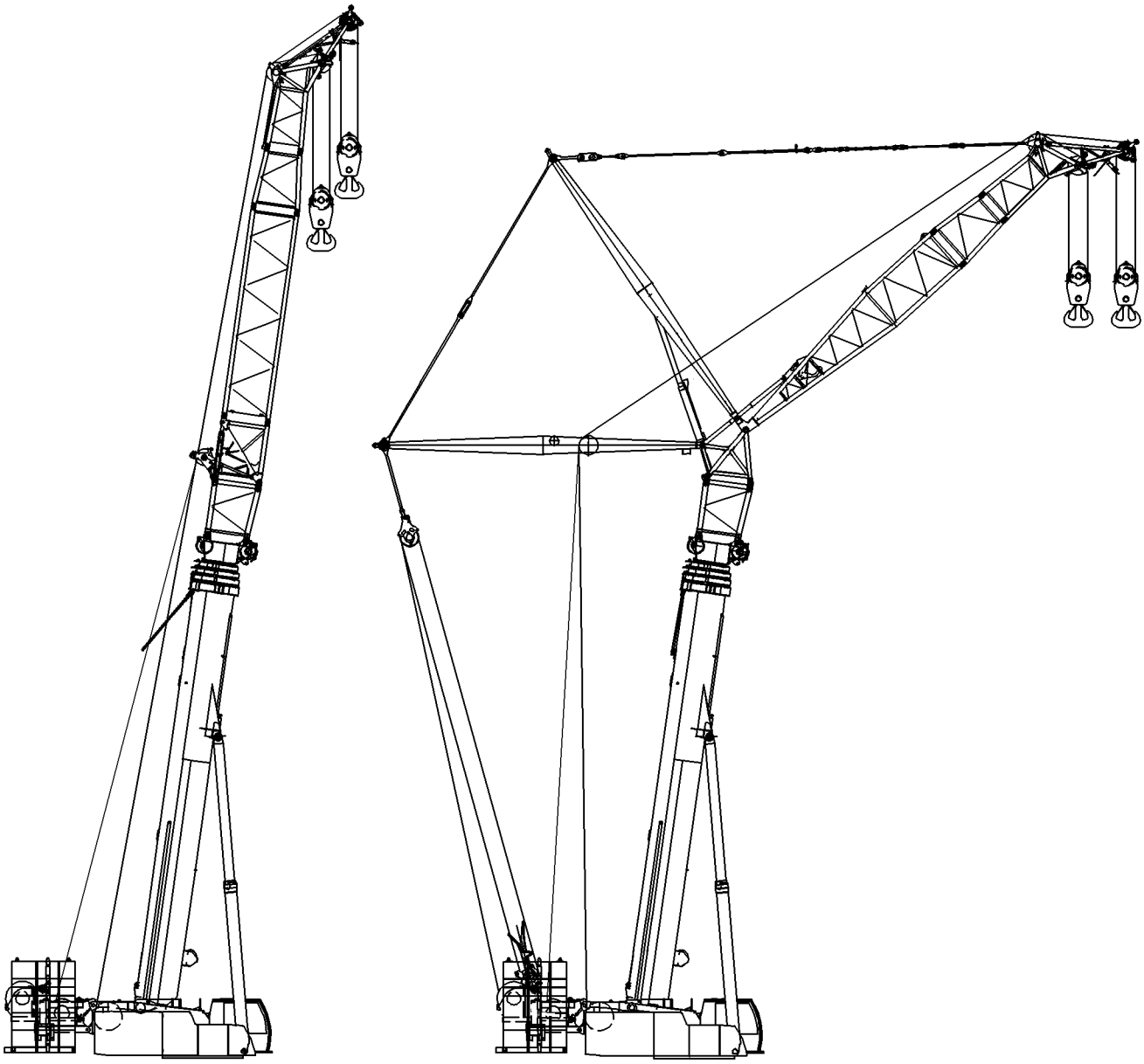
This option is set up for rapid hoists over the boom nose, whereby the hook block reeved on the telescopic boom can remain reeved.
No special loading tables are available for boom nose operations. The boom nose is generally run in the telescopic boom operating mode.

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

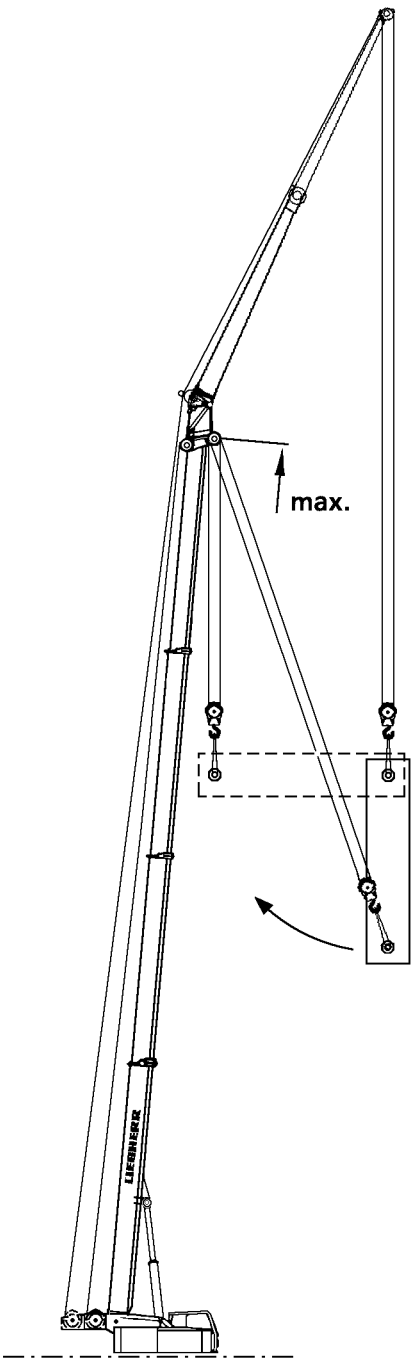
This option is set up for rapid hoists over the boom nose, whereby the hook block reeved on the lattice jib can remain reeved.
No special loading tables are available for boom nose operations. The boom nose is generally extended in the lattice jib operating mode.

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.

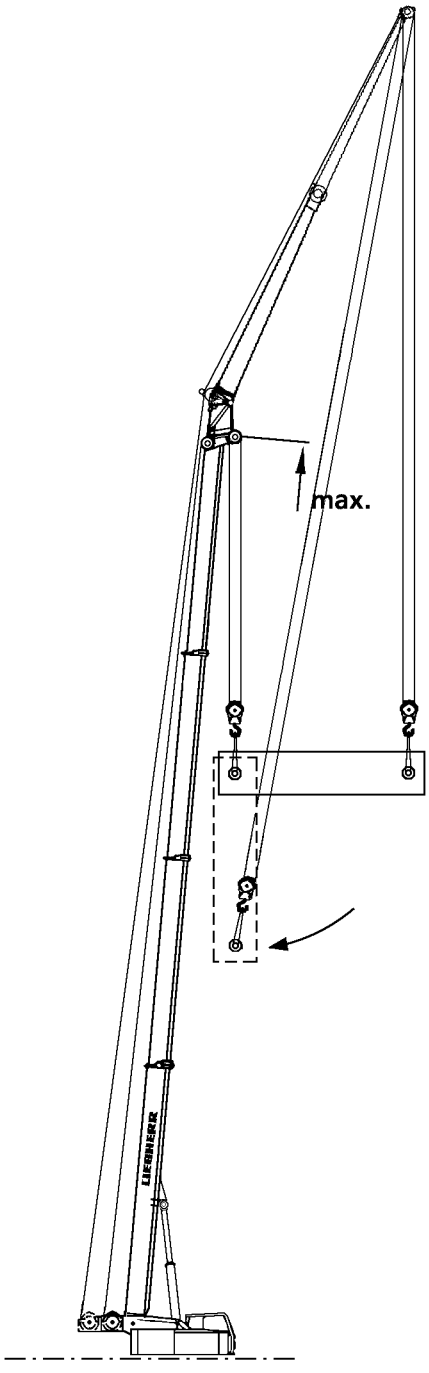
▶ Set the operating mode of the lattice jib to overload protection.

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.

B195219

1 Reeving plans

Note

▶ See separate reeving plans!

5.00 Equipment

B195219

1 Checking the retaining elements

Retaining elements are used to secure the pins in the folding jibs and lattice sections. The spring force of the retaining elements may significantly reduce if they are mechanically damaged or distorted. Do not re-use retaining elements if there is insufficient spring force. The pins must be secured with correctly **functioning** retaining elements.

DANGER
Risk of accident if retaining element does not provide enough spring force!
It cannot be guaranteed that the pin is correctly secured if the retaining element does not provide sufficient spring force.
▶ Use retaining elements with sufficient spring force!

2 Checking the ropes

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 deformation.

2.1 Placing the hoist rope

In order to guarantee safety and operating characteristics, only original Liebherr replacement parts or parts approved by Liebherr may be used.

NOTICE
Damage to the hoist rope!
If a hoist rope is placed with worn rope pulleys, the hoist rope can be damaged!
▶ The rope pulleys must be checked before placing the hoist rope. See Crane operating instructions, chapter 8.01!
▶ Replace worn or damaged rope pulleys!

2.1.1 Cranes with cam limit switch

The cam limit switch is calibrated in the factory to switch off when only 3 hoist rope coils are left 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!
▶ If the hoist rope is wound up during the assembly, the hoist rope end must remain in front of the winch and may not be pulled over the winch, otherwise the cam limit switch must be reset!

2.1.2 Cranes with winch turn sensor

The winch turn sensor is adjusted in the factory. If used properly, the winch turn sensor will not need to be readjusted.

DANGER

Avoid the following situations otherwise the winch turn sensor will need readjusting.

- Pulling the hoist rope ends under the winch by spooling up the winch!
- Pulling the hoist rope from the “stationary” winch.
- The winch turn sensor must also be readjusted if it is established that the “winch does not stop spooling out” when 4 rope coils are left on the winch. This applies during operation or when changing the hoist rope.

3 Inspection procedures

WARNING

The crane can topple over!

If the control measures are not carried out before crane operation, then the crane can 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!

Note

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

3.1 Control measures - mobile cranes

Perform the following checks before operating the crane:

- Check if the axle suspension is blocked.
- Check if the support pads are secured in the operating position.
- Check if the crane is sufficiently supported depending on the load case and the ground conditions.
- Check if there is adequate safety distance to excavations and embankments.
- Check if there are any live cables within the operating range of the crane.
- Ensure that the work can be carried out with minimum boom projection radius.
- Check that there are no obstacles that might hinder required crane movements.
- Check if the sliding beams are prevented from sliding by pins.
- Check if the crane is supported.
- Check if the crane is level.
- Check that the tires are not in contact with the ground.
- Check that the overload protection has been adjusted as per the information in the load chart.
- Check if the bypass keyed button and the assembly keyed button are turned off.
- Check the shut-off of the overload protection by luffing the telescopic boom up.
- Check the shut-off of the overload protection by running against the hoist limit switch.
- Check the easy movement and function of the wind speed sensor.
- Check the shut-off of the limit switches - boom “steepest position”. See Crane operating instructions, chapter 8.12.
- Check the easy movement of the pendulum for the mechanical relapse retainer over the total swing range of the pendulum.
- **On cranes with derrick boom:**
  - Check the shut-off of the limit switches - derrick. See Crane operating instructions, chapter 8.12.
- **On cranes with lattice jib:**
  - Check the shut-off of the limit switches - lattice jib “steepest position”. See Crane operating instructions, chapter 8.12.
  - Check the shut-off of the limit switches - lattice jib “lowest position”. See Crane operating instructions, chapter 8.12.
  - Check the shut-off of the limit switches – flap in position lattice jib “steepest position”. See Crane operating instructions, chapter 8.12.

3.2 Control measures - crawler cranes

Perform the following checks before operating the crane:

- Check if the crane is sufficiently supported depending on the load case and the ground conditions.
- Check if there is adequate safety distance to excavations and embankments.
- Check if there are any live cables within the operating range of the crane.
- Ensure that the work can be carried out with minimum boom projection radius.
- Check that there are no obstacles that might hinder required crane movements.
- **For crawler cranes with crane support:**
  - Check if the support pads are secured in the operating position.
  - Check if the folding beams are prevented from sliding by pins.
  - Check if the crane is supported.
- Check if the crane is level.
- Check that the overload protection has been adjusted as per the information in the load chart.
- Check if the bypass key button and the assembly key button are turned off.
- **On certain crawler cranes:**
  - Check that the crawler assembly key button is turned off.
- Check the shut-off of the overload protection by luffing the telescopic boom up.
- Check the shut-off of the overload protection by running against the hoist limit switch.
- Check the easy movement and function of the wind speed sensor.
- Check the shut-off of the limit switches - boom “steepest position”. See Crane operating instructions, chapter 8.12.
- Check the shut-off of the limit switches - derrick. See Crane operating instructions, chapter 8.12.
- Check the shut-off of the limit switches - lattice jib “steepest position”. See Crane operating instructions, chapter 8.12.
- Check the shut-off of the limit switches - lattice jib “lowest position”. See Crane operating instructions, chapter 8.12.
- Check the shut-off of the limit switches – flap in position lattice jib “steepest position.” See Crane operating instructions, chapter 8.12.
- Check the easy movement of the pendulum for the mechanical relapse retainer over the total swing range of the pendulum.

4 Dangerous conditions without shut-off

4.1 Block position of relapse cylinders when setting down a 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!

5 Transporting components

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.

5.1 Transporting lattice sections

If the lattice sections are pushed inside each other for transportation purposes, they must each be secured with 2 chains.

6 Pneumatic springs for assembly support of components

Pneumatic springs are installed on various 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!

- ▶ Do not use components with defective pneumatic springs! Replace defective pneumatic springs!
- ▶ Always check pneumatic springs for external damage before actuating the corresponding components!
- ▶ It is strictly prohibited for personnel or objects to remain within the movement range of the components, which are supported by the pneumatic spring!
- ▶ It is prohibited for personnel or objects to remain within the danger zone of the moveable components!

7 Weights

Note
Please note:

- ▶ The weight of each component is specified in the corresponding chapter of the Crane operating instructions or stated on the tag attached to the corresponding component!
- ▶ 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.
- ▶ If components are pushed into one another (for example intermediate pieces) or folded together (for example the folding jib), then the total weight is given by the sum of the individual components!
- ▶ Use an auxiliary crane with sufficient load carrying capacity!

8 Guy rods

If guy rods, which are not used in crane operation, are left on the lattice sections during crane operation, then the following points must be observed and adhered to:

8.1 Crane operation with placed guy rods

WARNING
Falling components!
If guy rods, which are not needed in crane operation are pinned to each other, then they can slide downward within the transport receptacle and bend due to their own weights!
Components can loosen up and fall down!
Persons can be severely injured or killed by loosened components!

- Before starting crane operation, secure the guy rods in the transport receptacles of the lattice sections!
- Do **not** pin guy rods, which are not needed to each other!
- Do not use damaged or bent guy rods!

8.2 Reduction of load carrying capacity with placed guy rods

Note

- The load carrying capacities noted in the load charts are valid without placed guy rods!
- If the guy rods are placed, then the possible load carrying capacity values are reduced!
- The reduction of the load carrying capacity depends on the boom angle and the boom length. The longer the main boom and the wider the boom is inclined to the horizontal, the larger is the reduction of load carrying capacity.

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B197716 *Example for cranes with LICCON overload protection*

9 Bypassing the overload protection

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.

Impermissible crane operation with bypassed overload protection – with the aim of increasing the maximum load-bearing capacity of the crane above the rated value in the load chart, or 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 operating instructions.

Such deliberate improper use can neither be prevented by means of the constructive design, nor by means of information in the operating instructions!

- ▶ Only operate the bypass key button in accordance with the operating instructions!
- ▶ All other usage of the bypass key button other than as described in the operating instructions is prohibited!

9.1 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 with the bypass key button. The LICCON overload protection displays remain functional.

WARNING

Increased accident risk when bypassing the overload protection!

If the overload protection is bypassed, there is no further protection against crane overload!

In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be killed!

This could result in high property damage!

- ▶ It is only permitted to bypass the overload protection during assembly or in emergencies!
- ▶ The bypass key button may only be actuated by persons who are aware of the effects of their acts regarding the bypass of the overload protection!
- ▶ Bypassing the overload protection requires the presence of a person authorized by the crane operator and must be performed with utmost caution!
- ▶ Crane operation with bypassed overload protection is strictly prohibited!

B197716 *Example for cranes with LICCON overload protection*

9.2 Bypassing the hoist-top shut off

If the hook block touches the hoist limit switch weight during the upward movement, the hoist limit switch reacts. The crane movements “Spool up winches”, “Luff boom down” and “Telescope telescopic boom out” are turned off. The shut off can be bypassed by the bypass key button.

WARNING
Increased accident risk when bypassing the overload protection!
When bypassing the hoist top shut off, there is a risk that the hook block may be pulled against the pulley head when continuing to lift or luffing down the boom. This may damage the pulleys and cause the loads to fall!

- ▶ The 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.

9.3 Actuating the overload protection

9.3.1 Actuating the LICCON overload protection

▶ Turn the bypass key button to the right and hold.

Result:

– The LICCON overload protection is inactive.
– The assembly icon on the LICCON monitor blinks.
– An acoustic signal sounds.
– The red flashing beacon on the crane cab blinks.

▶ If the bypass key button is to be turned off:
Do not actuate the bypass key button any more.

Result:

– The LICCON overload protection is active.
– The assembly icon on the LICCON monitor turns off.
– The acoustic signal is turned off.
– The red flashing beacon on the crane cab extinguishes.

9.3.2 Actuating the PAT overload protection

▶ Actuate the bypass key button and turn the PAT overload protection off.

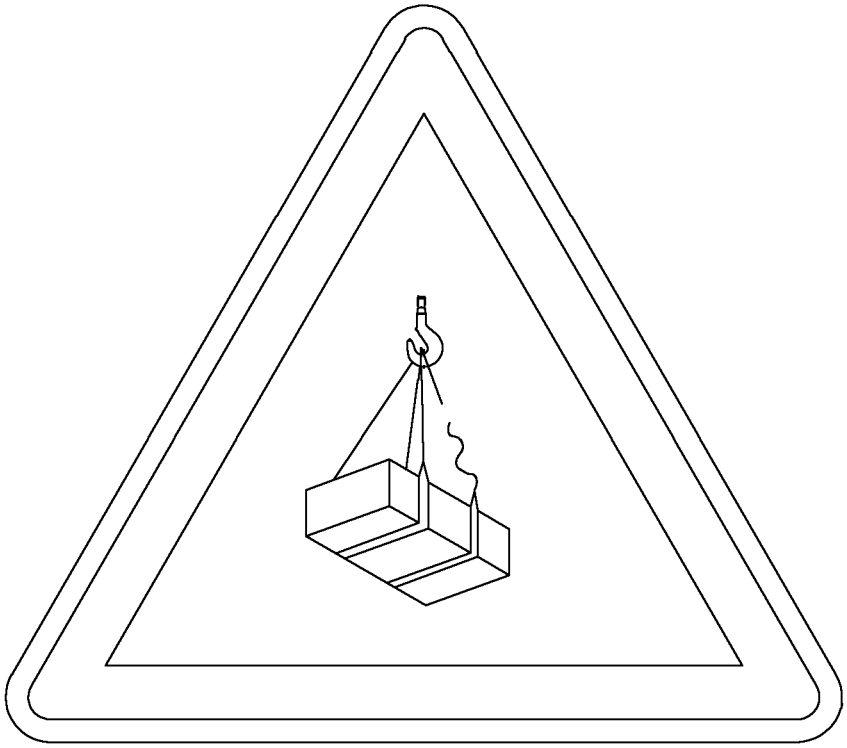
Result:

– The PAT overload protection is inactive.

▶ Actuate the bypass key button and turn the PAT overload protection on.

Result:

– The PAT overload protection is active.




DANGER
IMPACT HAZARD!
Moving attachments can crush and impale.
Keep clear of machine working area.

B108048

10 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 injury!
- ▶ Assembly and disassembly may only be carried out by authorized trained experts!

Note
- ▶ For assembly / disassembly of individual components, also refer to the chapters relating to those components!
- ▶ 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!

Normal assembly / disassembly procedures require all separately transported components to be transported close to the ground using appropriate auxiliary cranes and tackle. They must be safely (correctly) connected to the crane.

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 even underneath the suspended load before the load has been secured!

WARNING
Risk of falling!
During assembly and disassembly, inspection and maintenance work, personnel must be secured with appropriate fall arresters to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.
- ▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with the personal catch system (see Crane operating instructions, chapter 2.04) to protect against falling! The personal protective equipment must be attached in the corresponding attachment points on the crane (see crane operating instructions chapter 2.06).
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly, inspection and maintenance work.
- ▶ Step on aids and fall arresters only with clean shoes!
- ▶ Keep aids and fall arresters clean and free from snow and ice!
- ▶ It is prohibited to walk on the telescopic or an auxiliary boom without suitable protective devices!

B197715

10.1 Assembly / disassembly of the booms

If lattice sections are not in contact with the ground during assembly / disassembly they must be supported with suitable, stable materials. Adjust the height of the support so that the lattice sections are not in contact with the ground. Pay particular attention if the lattice sections are equipped with rope pulleys. Otherwise the rope pulleys could be damaged.

During disassembly it must be ensured that the auxiliary crane lifts the load vertically. The crane operator must ensure that the load bearing capacity of the auxiliary crane is sufficient to safely raise the dismantled component at the given radius. When attaching the auxiliary crane it must be ensured that the hook of the auxiliary crane is above the center of gravity of the disassembled component and the fastening ropes are attached to the load.

WARNING

The crane can topple over!

Angular pulling can destroy 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!
- Diagonal pull is not permitted!

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 under unsecured or unsupported booms!
- Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- Safely secure the pins in the bearing points as well as receptacles!
- Do not lean the ladder against the component being disassembled!

WARNING

Risk of accident from distorted pins!

Angular pulling or excessive / low hoisting force of the auxiliary crane may result in distortion of the pins.

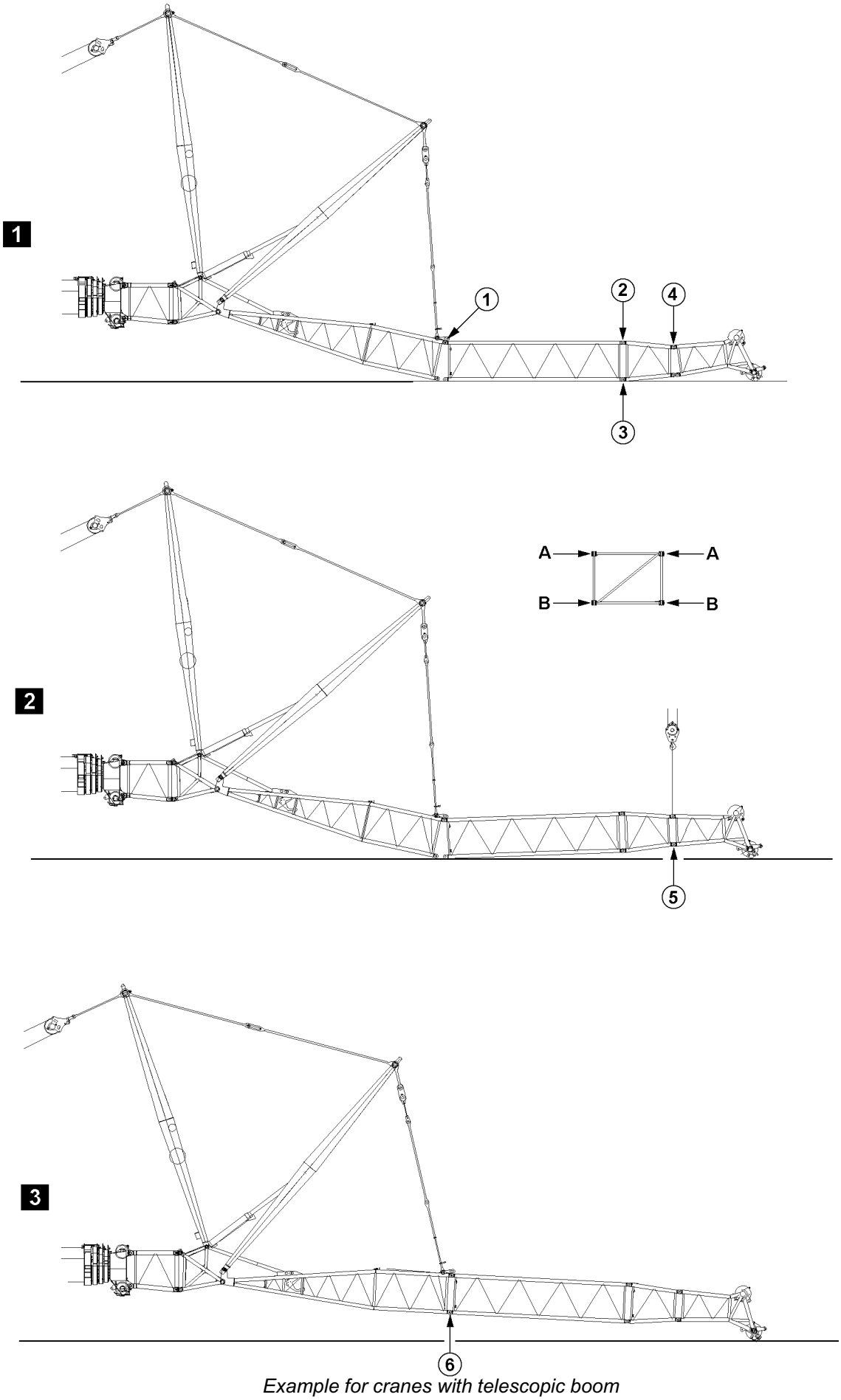
Distorted parts can suddenly detach themselves when the pins are unpinned. This represents a fatal injury risk to assembly personnel.

- 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!

Note

Instructions for pinning and unpinning:

- Unpin or pin both pins at the same horizontal level, i.e. **left and right**!
- Pin the lower pins **from inside to outside** and unpin from **outside to inside**!
- Pin in and unpin horizontally-assembled double cone pins from **outside to inside**!
- Pin and unpin vertically assembled double cone pins from **top to bottom**!



B197718

Example for cranes with telescopic boom

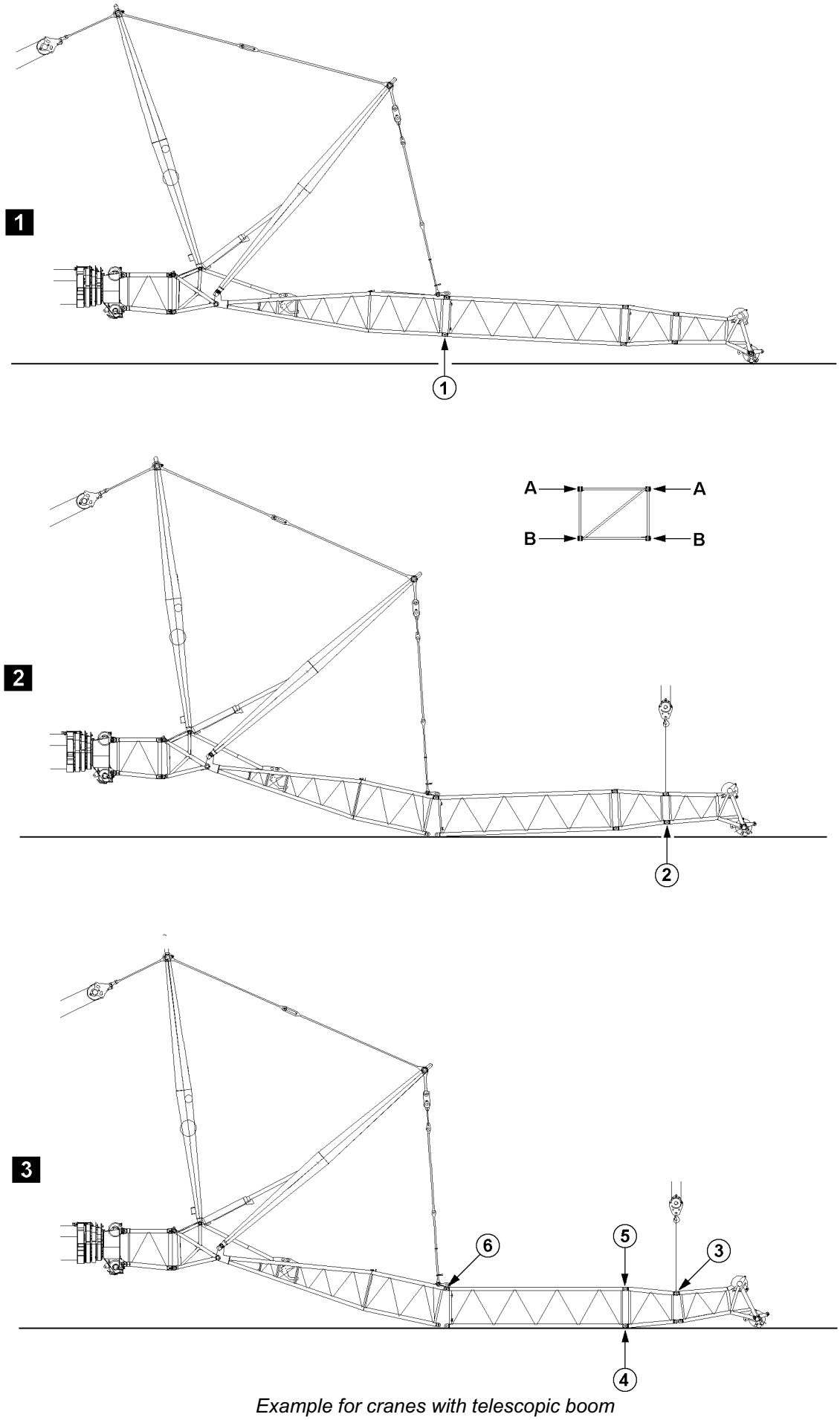
10.2 Assembly of lattice sections for telescopic cranes

10.2.1 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 even fall down. This can result in life-threatening injuries to personnel.
- ▶ Pins must be pinned in the order specified!

- ▶ Pin in and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **A**) at point **2**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **B**) at point **3**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **A**) at point **4**, illustration 1.
- ▶ Lift the end section with the auxiliary crane, illustration 2.
- ▶ Pin in and secure pins at both sides (level **B**) at point **5**, illustration 2.
- ▶ Lift the lattice sections, illustration 3.
- ▶ Pin in and secure pins at both sides (level **B**) at point **6**, illustration 3.



B197719

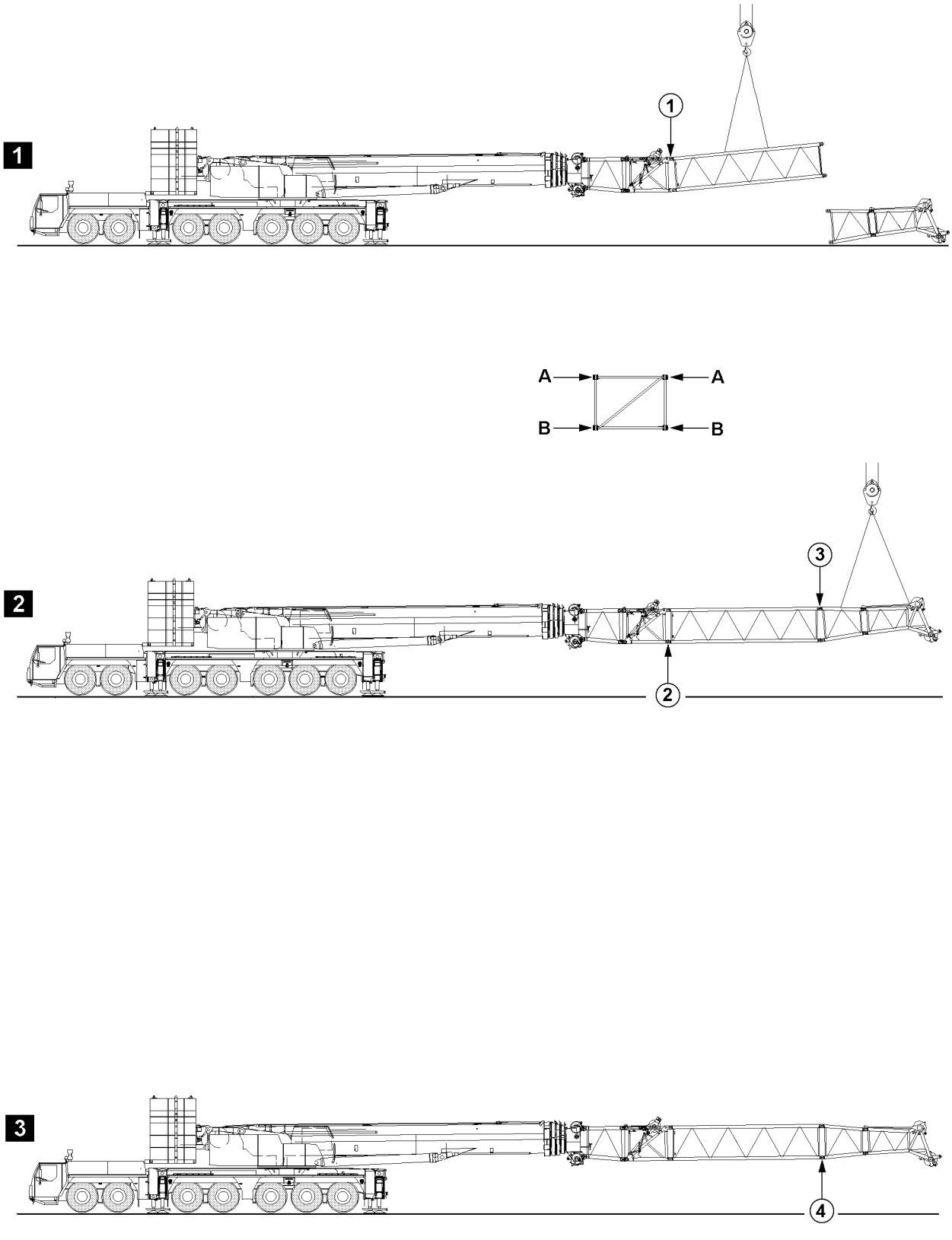
Example for cranes with telescopic boom

10.2.2 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, lattice sections may suddenly fold down or even 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 is lightly touching the ground, illustration 1.
- ▶ Release and unpin 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 pins at both sides (level **B**) at point **2**, illustration 2.
- ▶ Release and unpin pins at both sides (level **A**) at point **3**, illustration 3.
- ▶ Release and unpin pins at both sides (level **B**) at point **4**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **5**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **6**, illustration 3.



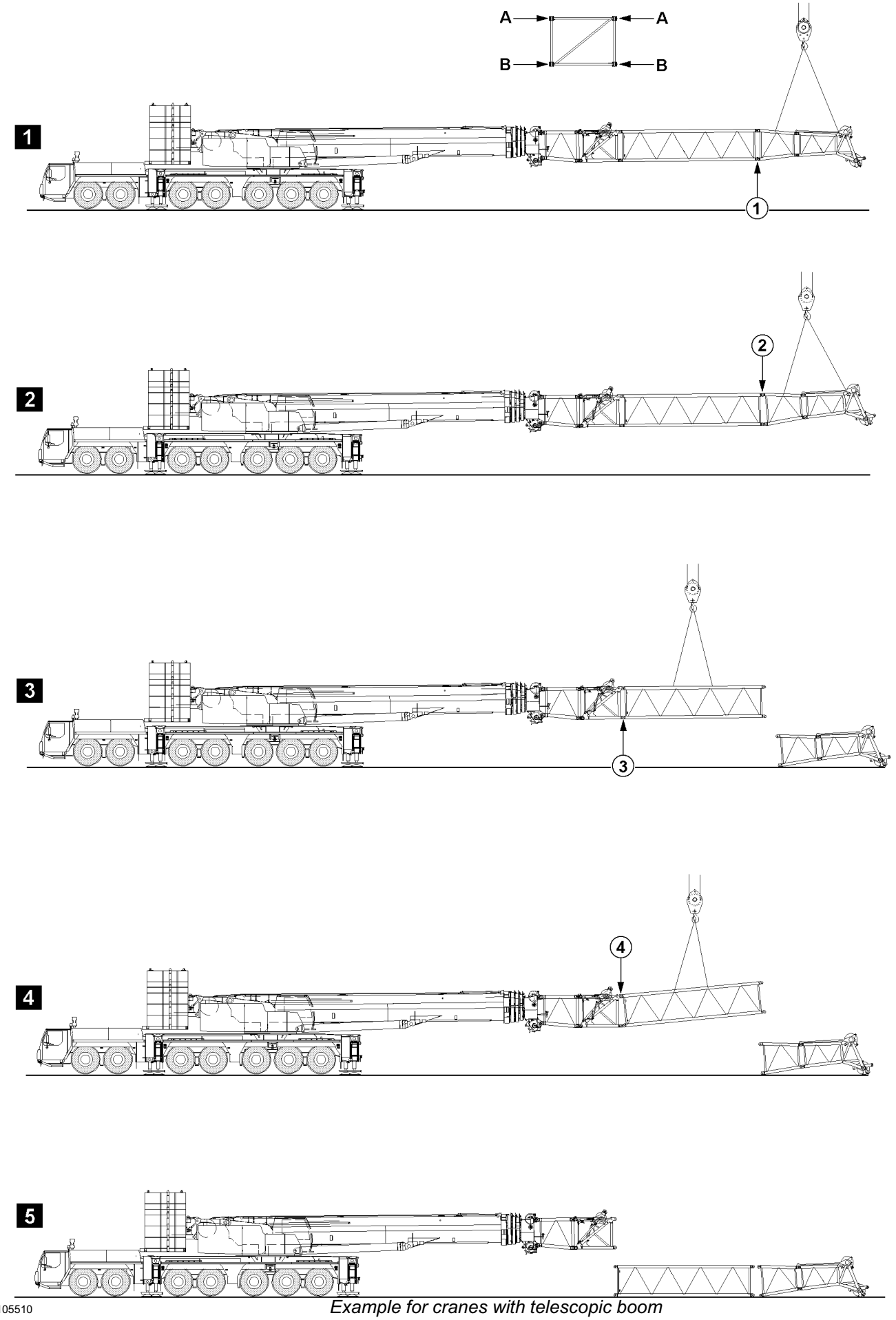
B197705 *Example for cranes with telescopic boom*

10.2.3 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 even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

- ▶ Pin in and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **B**) at point **2**, illustration 2.
- ▶ Pin in and secure pins at both sides (level **A**) at point **3**, illustration 2.
- ▶ Pin in and secure pins at both sides (level **B**) at point **4**, illustration 3.



B105510

Example for cranes with telescopic boom

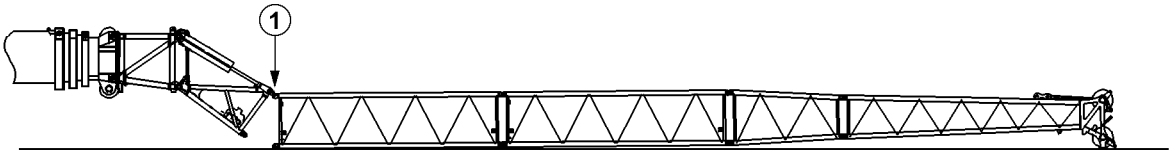
10.2.4 Disassembly of lattice sections on self-supporting auxiliary booms using an auxiliary crane

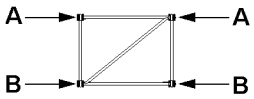
The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

- ▶ Release and unpin pins at both sides (level **B**) at point **1**, illustration 1.
- ▶ Release and unpin pins at both sides (level **A**) at point **2**, illustration 2.
- ▶ Release and unpin pins at both sides (level **B**) at point **3**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **4**, illustration 4.

1





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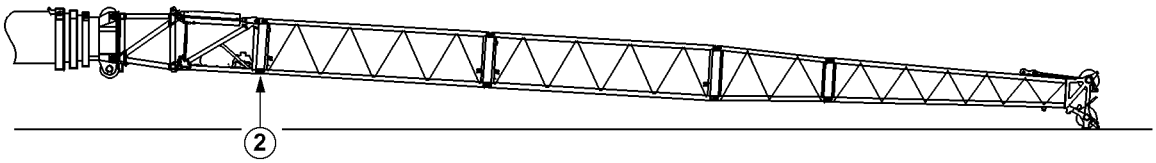

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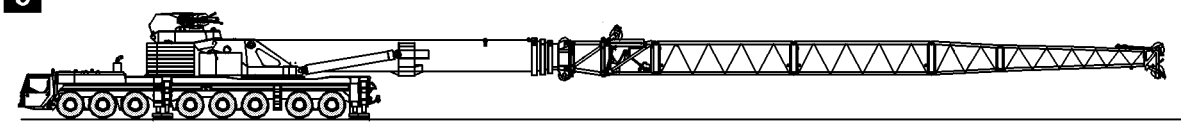


B197712

Example for cranes with telescopic boom

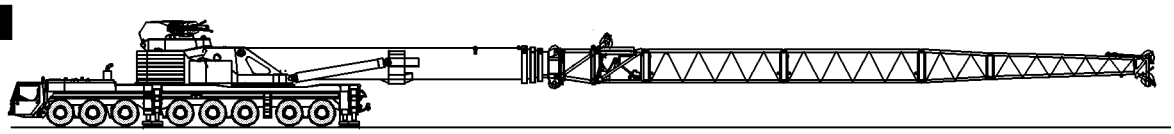
10.2.5 Assembly of lattice sections on self-supporting auxiliary booms without using an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

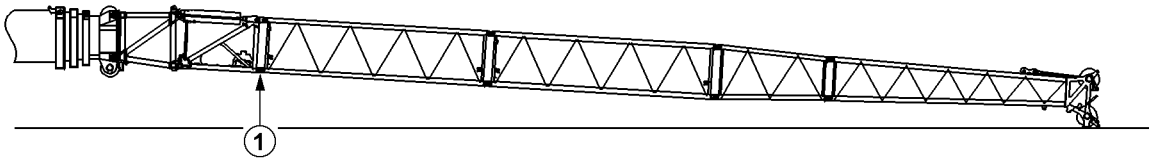
WARNING
Risk of fatal injury when assembling auxiliary booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

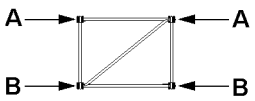
For cranes with hydraulic angle adjustment and self-supporting auxiliary boom, the assembly / disassembly of additional lattice sections may be performed using the crane itself.
In order to do so, proceed as follows.
▶ Assemble the lattice sections to the required length.
▶ Pin in and secure pins at 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 in and secure pins at both sides (level **B**) at point **2**, illustration 2.

1

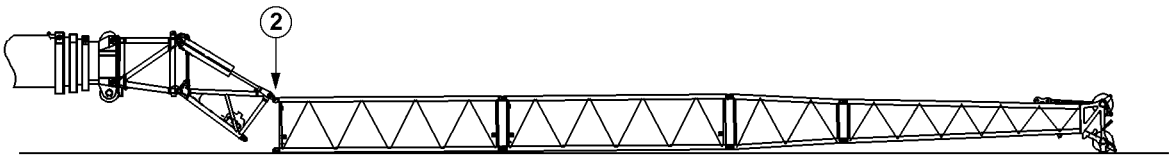


2





3



B197713

Example for cranes with telescopic boom

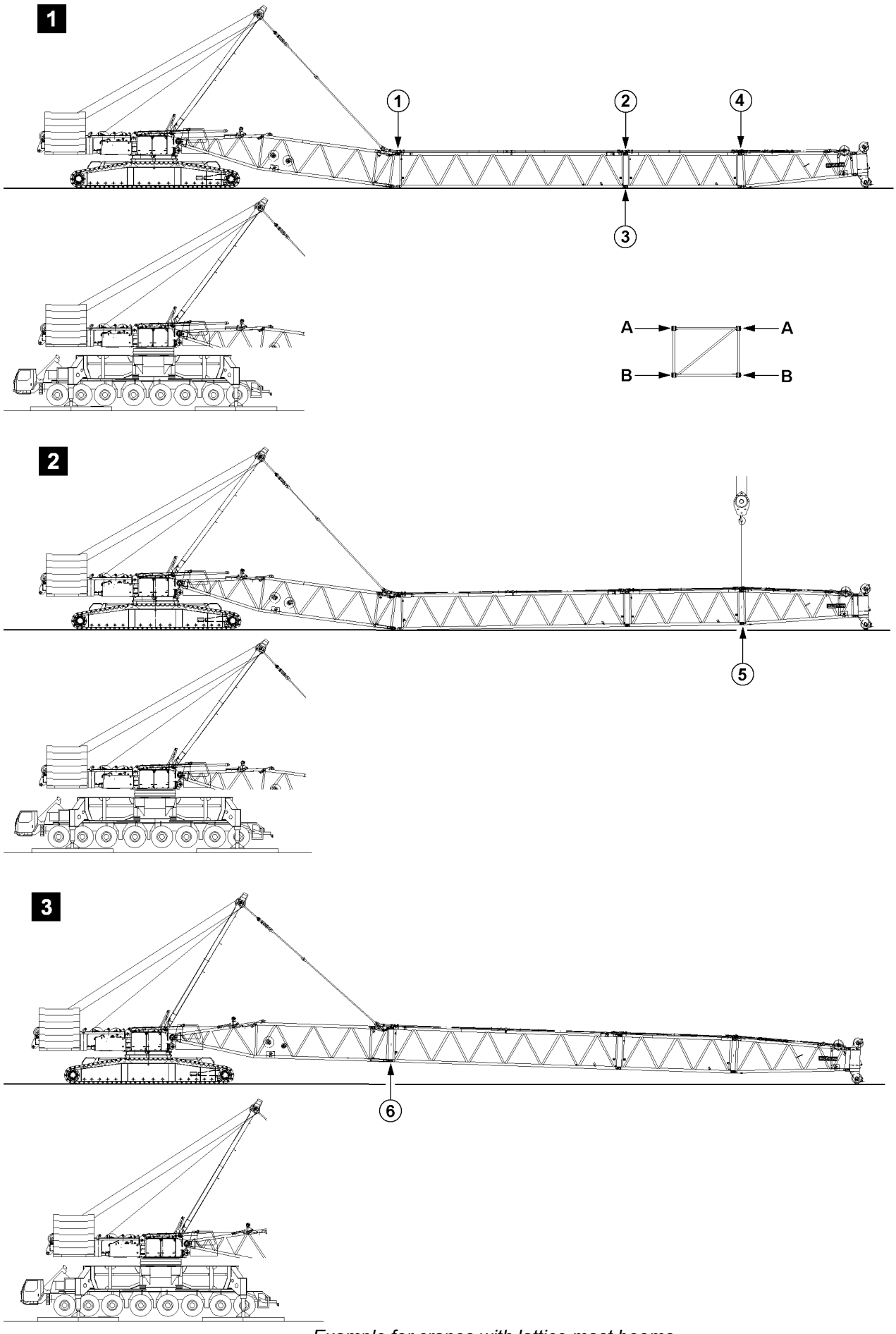
10.2.6 Disassembly of lattice sections on self-supporting auxiliary booms without using an auxiliary crane

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, lattice sections may suddenly fold down or even 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 is lightly touching the ground, illustration 2.
- ▶ Release and unpin pins at both sides (level **B**) at point **1**, illustration 2.
- ▶ Luff the auxiliary boom down until the lattice section to be disassembled are completely laying on the ground, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **2**, illustration 3.
- ▶ Completely remove the auxiliary boom.



B197710 *Example for cranes with lattice mast booms*

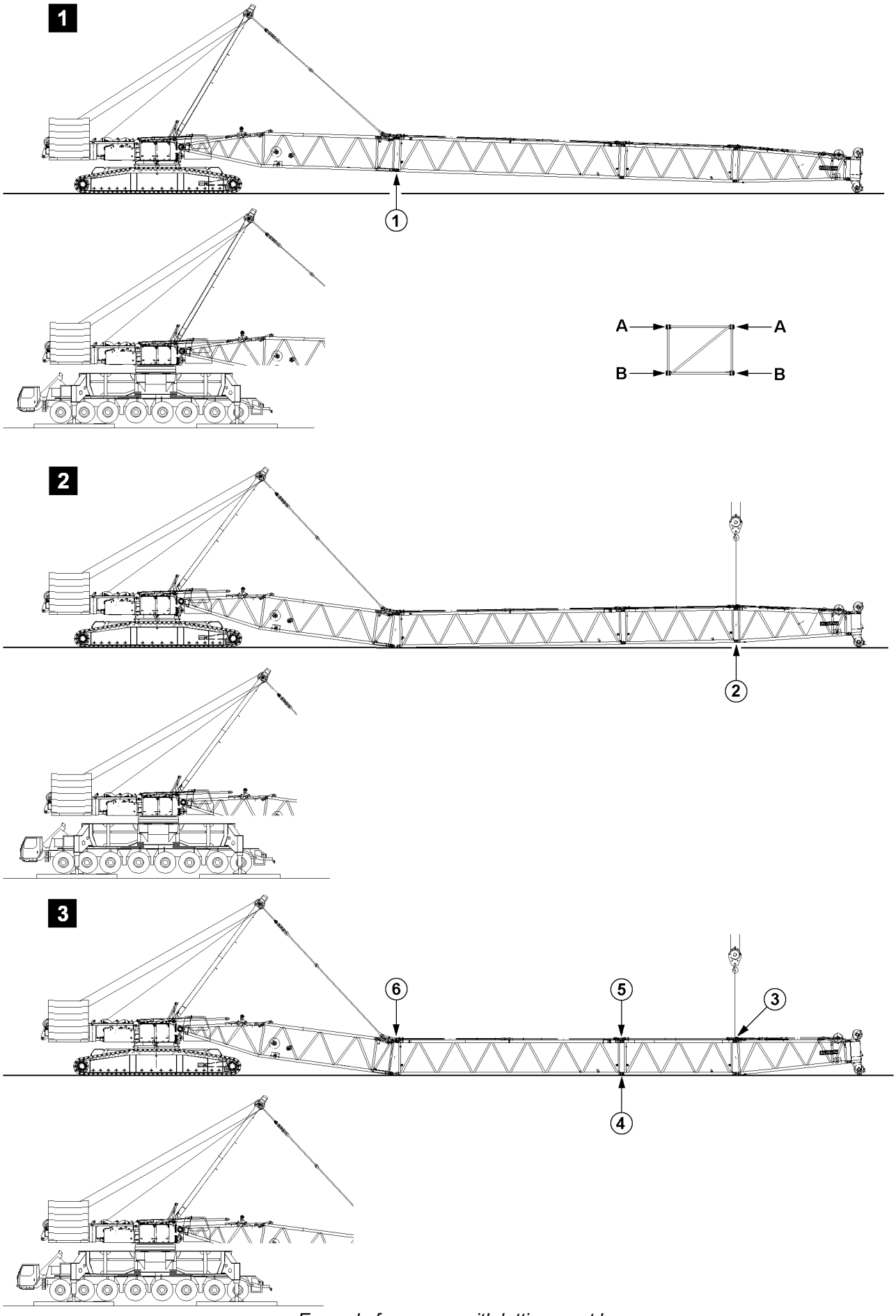
10.3 Assembly of lattice sections for lattice mast cranes

10.3.1 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 even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

- ▶ Pin in and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **A**) at point **2**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **B**) at point **3**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **A**) at point **4**, illustration 1.
- ▶ Lift the end section with the auxiliary crane, illustration 2.
- ▶ Pin in and secure pins at both sides (level **B**) at point **5**, illustration 2.
- ▶ Lift the lattice sections, illustration 3.
- ▶ Pin in and secure pins at both sides (level **B**) at point **6**, illustration 3.



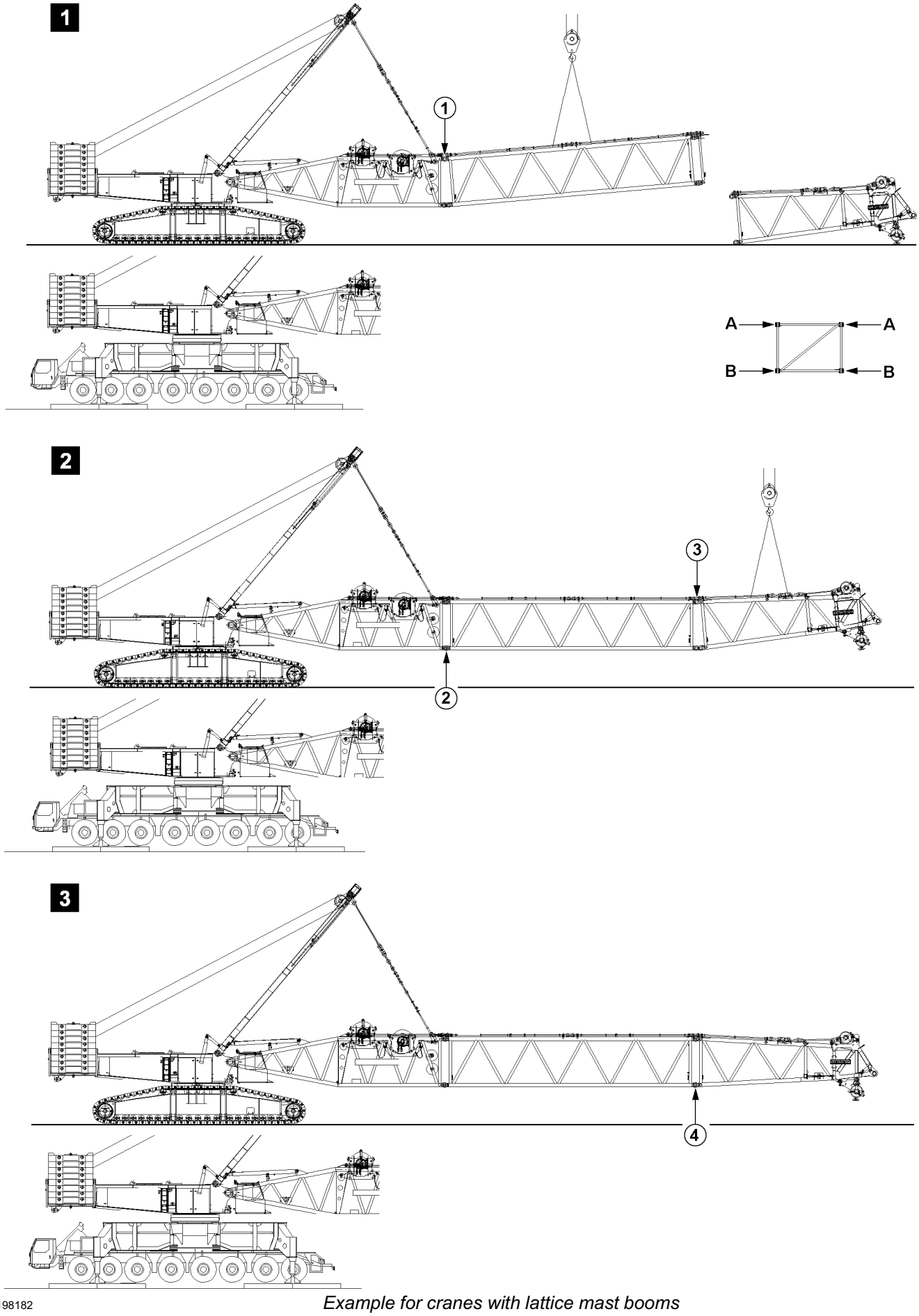
B197711 *Example for cranes with lattice mast booms*

10.3.2 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, lattice sections may suddenly fold down or even 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 is lightly touching the ground, illustration 1.
- ▶ Release and unpin 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 pins at both sides (level **B**) at point **2**, illustration 2.
- ▶ Release and unpin pins at both sides (level **A**) at point **3**, illustration 3.
- ▶ Release and unpin pins at both sides (level **B**) at point **4**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **5**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **6**, illustration 3.



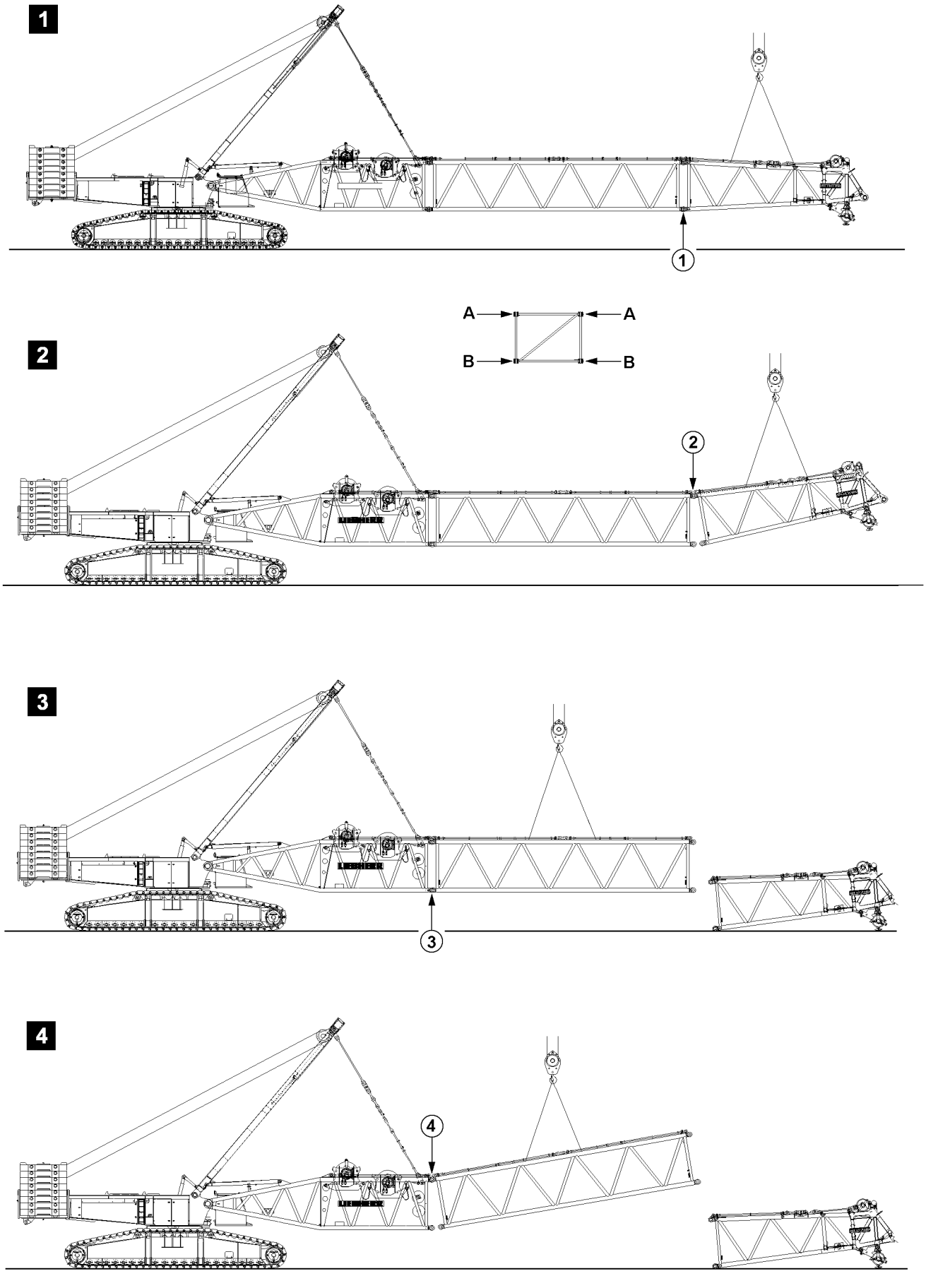
B198182 *Example for cranes with lattice mast booms*

10.3.3 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 even fall down. This can result in life-threatening injuries to personnel.
- ▶ Pins must be pinned in the order specified!

- ▶ Pin in and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **B**) at point **2**, illustration 2.
- ▶ Pin in and secure pins at both sides (level **A**) at point **3**, illustration 2.
- ▶ Pin in and secure pins at both sides (level **B**) at point **4**, illustration 3.



B105511

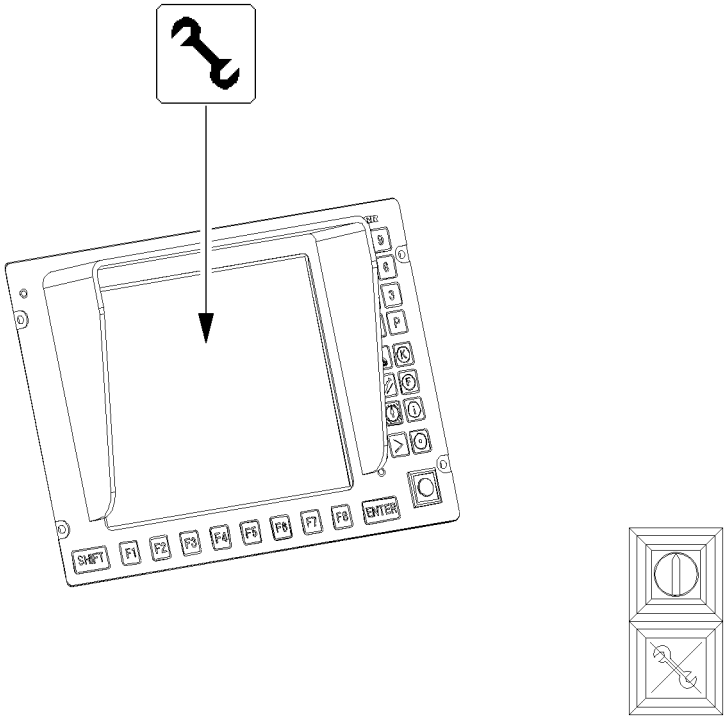
Example for cranes with lattice mast booms

10.3.4 Flying 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, lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
- ▶ Pins must be unpinned in the order specified!

- ▶ Release and unpin pins at both sides (level **B**) at point **1**, illustration 1.
- ▶ Release and unpin pins at both sides (level **A**) at point **2**, illustration 2.
- ▶ Release and unpin pins at both sides (level **B**) at point **3**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **4**, illustration 4.



B108049 *Example for cranes with LICCON overload protection*

10.4 Bypass for assembly and disassembly

Note

▶ The assembly key button is only installed on certain cranes.

WARNING

High risk of injury when operating crane with assembly key button enabled!

Operating the assembly key button bypasses the hoist limit switch and the overload protection!

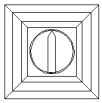
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be killed!

This could result in high property damage!

- ▶ Only operate the assembly key button when performing assembly and disassembly tasks!
- ▶ All other usage of the assembly key button other than as described in the operating instructions is prohibited!
- ▶ The assembly key button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ Operating the crane with the assembly key button enabled is strictly prohibited!
- ▶ The assembly key button must be removed immediately and handed to a person authorized by the crane operator after carrying out any assembly and disassembly work!

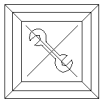
10.4.1 Crane with LICCON overload protection



▶ Actuate assembly key button.

Result:

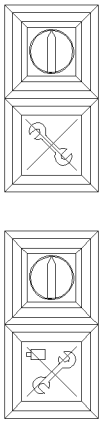
– The LICCON overload protection is inactive.
– The indicator light in the button lights up.
– The assembly icon on the LICCON monitor blinks.
– An acoustic signal sounds.
– The red flashing beacon on the crane cab blinks.



▶ To turn the assembly key button off:
Turn off the assembly key button by pressing the button.

Result:

– The LICCON overload protection is active.
– The indicator light in the button turns off.
– The assembly icon on the LICCON monitor turns off.
– The acoustical signal turns off.
– The red flashing beacon on the crane cab turns off.

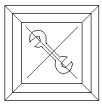


B108050 *Example for cranes with LICCON overload protection*

10.5 Bypassing during crawler assembly

Note

▶ The crawler assembly key button is only installed on certain cranes.



Make sure that the following prerequisites are met:

– The assembly key button is actuated.
– The indicator light in the button lights up.

WARNING

High risk of injury in case of actuated crawler assembly key button!

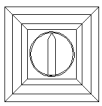
Operating the crawler assembly key button bypasses the overload protection! No shut off at overload will occur in assembly mode or in crane operations!

In the event of deliberate misuse, the crane can topple over!

Personnel can be killed!

This could result in high property damage!

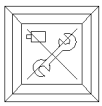
▶ The crawler assembly key button may only be actuated for assembly tasks!
▶ All other usage of the crawler assembly key button other than as described in the operating instructions is prohibited!
▶ Operating the crane with the crawler assembly key button enabled is strictly prohibited!



▶ Actuate the crawler assembly key button.

Result:

– The LICCON overload protection is inactive.
– The indicator light in the button lights up.



▶ To turn the crawler assembly key button off:
Turn off the crawler assembly key button by pressing the button.

Result:

– The indicator light in the button turns off.

10.6 Assembling / disassembly of hydraulic lines

When hydraulic lines are connected and disconnected with quick-release couplings, make ensure that the coupling procedure is being performed correctly.

WARNING

Risk of accident due to loss of pressure or leakage!

Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious injury due to component failure!

▶ Check the quick-release couplings after installation for correct connection.

- ▶ Release the pressure in the hydraulic system before connecting and disconnecting. Turn the engine off and wait for short time.
- ▶ Assemble coupling components (sleeve and connector) and screw together using hand-tightened nut.
- ▶ Tighten hydraulic coupling by hand. Rotate hand-tightened nut until it reaches a tangible, fixed stop position.

11 Erection / take down

WARNING
The crane can topple over!
Due to an unforeseen occurrence, for example: sudden strong wind or storm, dangers operating situations can occur, 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
Risk of fatal injury!
- ▶ Incorrectly assembled or non-operational limit switches and falling parts (pins, spring retainers, ice etc.) can cause accidents!

11.1 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 to the turntable according to the load chart.
- – The telescopic boom is fully telescoped in.
- – The boom has been installed according to the load chart specifications 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 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.

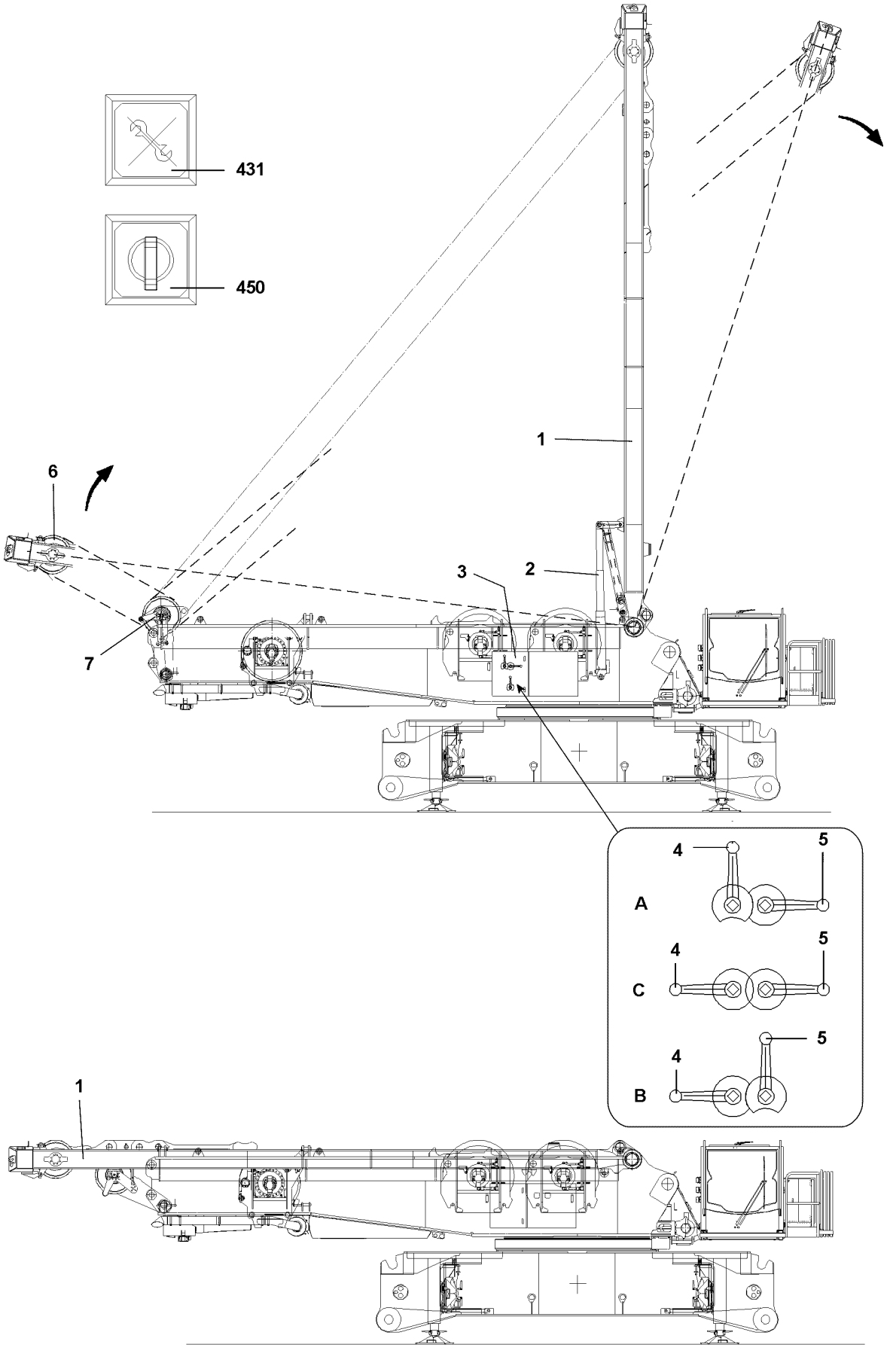
11.2 Erection / take down for crawler cranes

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The counterweight has been installed to the turntable according to the load chart.
- The central ballast has been attached according to the load chart.
- The counterweight is stacked on the suspended ballast or on the ballast trailer according to the load chart.
- The boom has been installed according to the load chart specifications 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 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.

11.3 Checking the prerequisites

▶ Check if all prerequisites have been met.



B105885

1 SA-bracket

Note

▶ The SA-bracket in assembly operation: for assembly of the crawler track, see chapter 3.01, is used for closing and for flying assembly of the lattice sections, see chapter 5.38.

Make sure that the following prerequisites are met:
– The turntable is installed on the supported center section.
– The SA-bracket has been placed on the turntable, transport position.
– Winch 1 and winch 2 (with rope), are installed in the turntable.
– No counterweight is installed on the turntable.
– The rope of winch 4 is reeved on the SA-bracket.
– The engine is running.
– The assembly key button **450** is actuated, the indicator light in the button **431** lights up.
– The SA-operating mode has been set and confirmed on the LICCON.

1.1 Erecting the SA-bracket

The following positions are available for the ball cocks:
A - SA-bracket down
C - SA-bracket - stop, cylinder stop, extension and retraction of erection cylinders is blocked
B - SA-bracket - erection and operation, extend erection cylinder, assembly and operating position

1.1.1 Erection

▶ Set ball cocks into position **B**.

Result:
– The SA-bracket **1** is pushed upward by the erection cylinders **2** until the ropes between the rope pulleys **6** in the SA-bracket and the rope pulleys **7** on the turntable are tensioned.

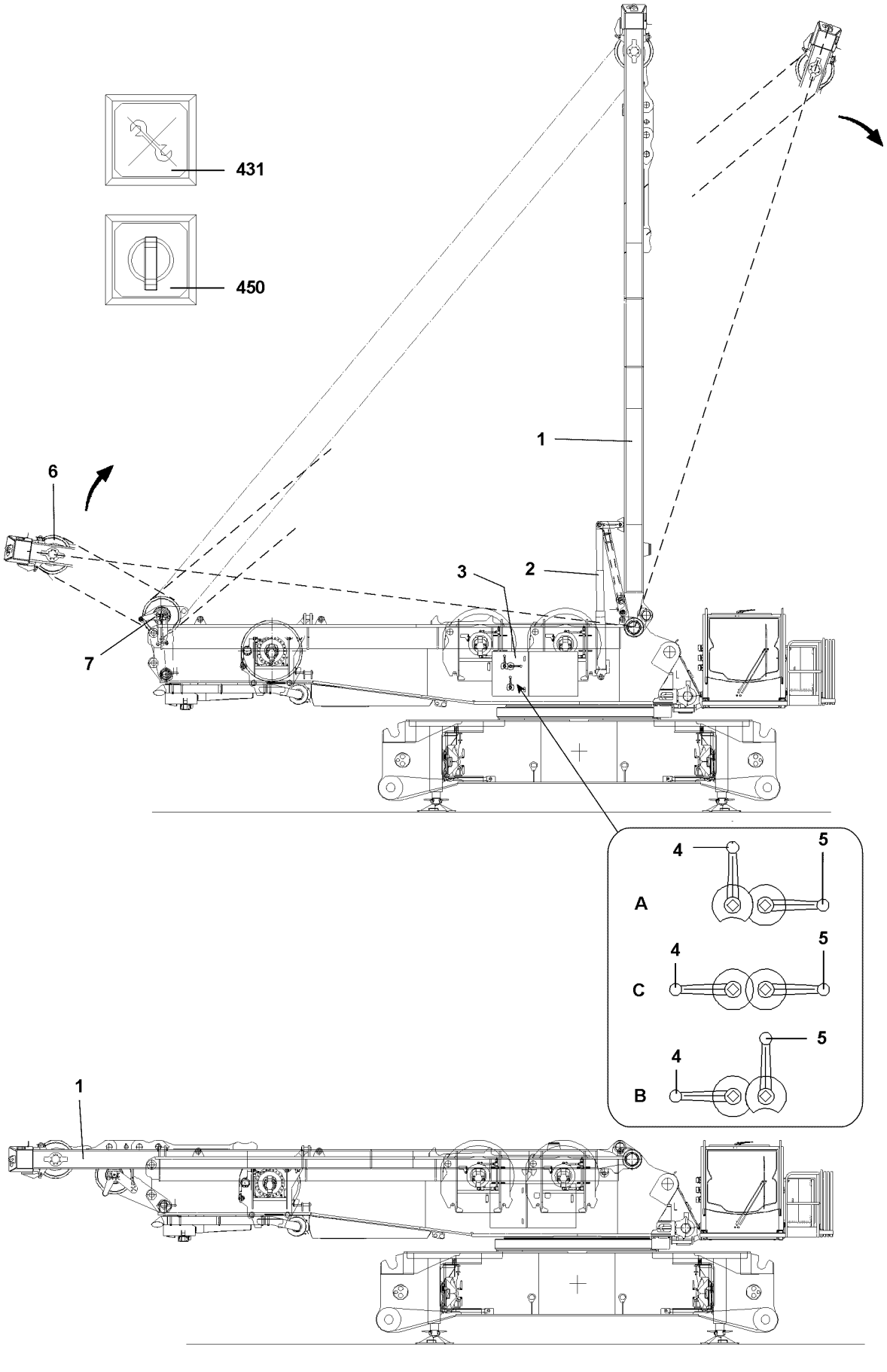
NOTICE
Damage to the intake ropes!
By actuating winch 4 significant property damage can occur if the intake ropes are not placed correctly in the rope pulleys!
▶ Inspect the intake ropes visually!
▶ The intake ropes must be laying correctly in the corresponding rope pulleys.
▶ If the intake ropes are not in the rope pulleys, winch 4 may not be actuated.

NOTICE
Danger of slack rope formation!
If winch 4 is spooled out too quickly during the erection procedure of the SA-bracket, slack rope can form!
▶ The intake rope of winch 4 must be tensioned during the entire erection procedure!
▶ The spool out speed of winch 4 must be matched to the erection speed of the erection cylinders!

▶ Deflect the master switch MS1 **480** in direction X.

Result:
– Winch 4 spools out, the SA-bracket is erected.

▶ Spool winch 4 out until the erection cylinders are fully extended.



B105885

Note

- When the erection cylinders are fully extended, the SA-bracket is located approx. 75° to the horizontal to the front.
- The SA-bracket is now in SA-operating range, this is shown on the LICCON monitor. The ??? turn off and the SA Operating mode is shown.

DANGER

Risk of accident!

The assembly key button **450** bypasses the safety devices.

- Turn the assembly key button **450** off after reaching the SA-operating range.

Note

- Lower the SA-bracket to the front.
- Due to the own weight of the SA-bracket and by spooling out winch 4 simultaneously, the SA-bracket is lowered to the front.
- After reaching the SA-bracket position 20°, an error message appears on the LICCON monitor and LMB - Stop is initiated.
- Spooling out winch 4 is turned off.
- Luffing down the SA-bracket is blocked. Luffing the SA-bracket up is only possible if the assembly key switch **450** is turned on.
- If the minimum or maximum pressure is reached in the erection cylinder, winch 4 turns off. Error is shown.

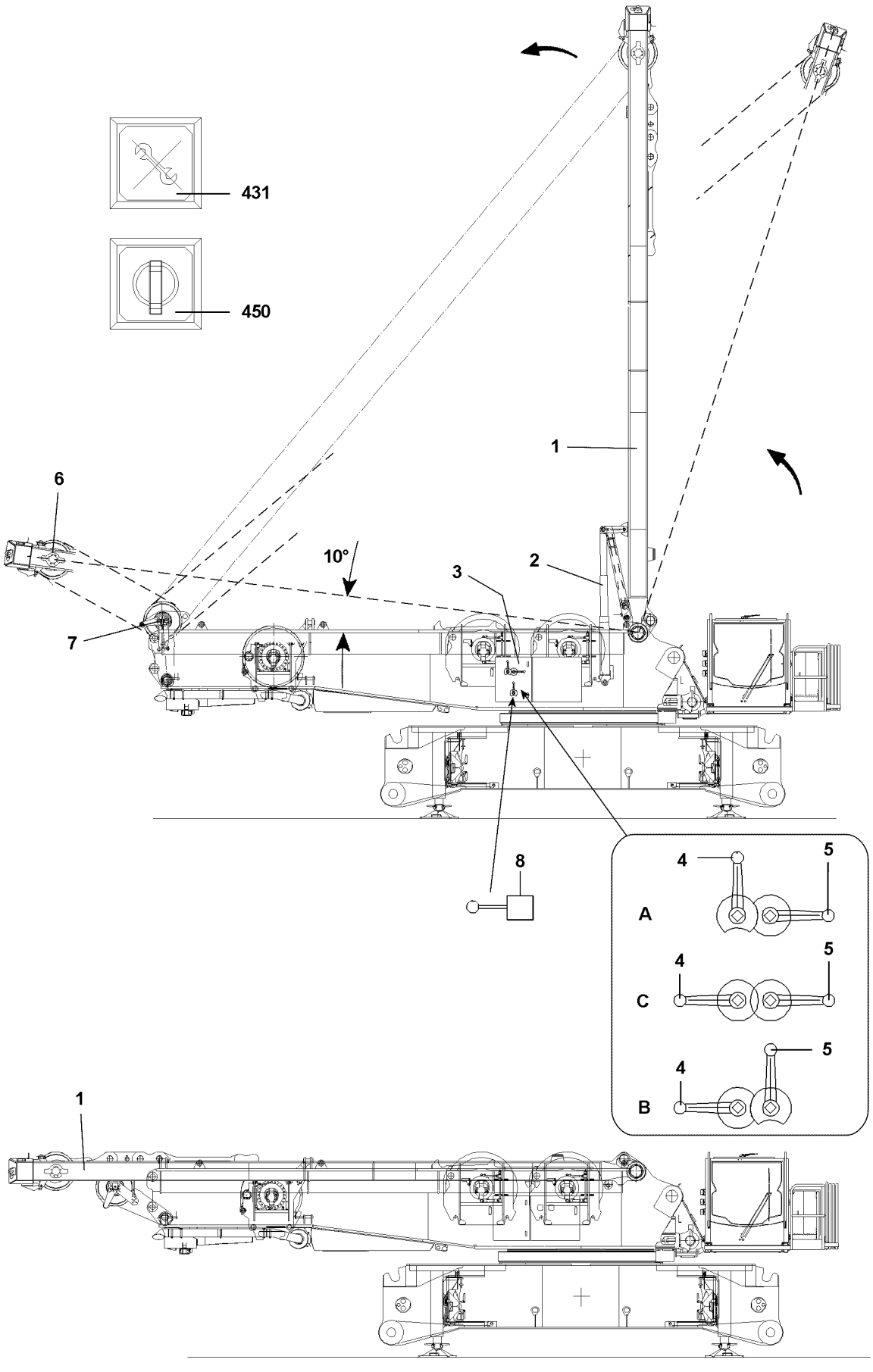
DANGER

Risk of accident!

The ball cocks **4** and **5** must be in position (B) during assembly and crane operation. Ball cock positions (C) “STOP” and (A) “DOWN” are only permissible when lowering the SA-bracket onto the turntable (transport position)!

- Set the ball cocks into position (B).

- Lock the switch box **3**.



B105886

2 Placing the SA-bracket onto the turntable

Make sure that the following prerequisites are met:
– The SA-Operating mode is turned on.
– The ball cocks are in position **B**.
– The SA-bracket is in the SA-operating range.

2.1 Take down procedure

▶ Luff up the SA-bracket in SA-Operating mode to approx. 75°.
▶ Deflect the master switch MS1 **480** in direction X. Erect the SA-bracket is erected to 75° by spooling up winch 4.

Note
▶ When the SA-bracket reaches the position 75° during luffing up, an **error message** and **LMB-STOP** is shown on the LICCON monitor.
▶ Spooling up of winch 4 is turned off.

▶ Turn the assembly key button **450** on.

Result:
– The shut off of spooling up winch 4 is bypassed.

DANGER
Danger of accidents due to bypass of shut off!
▶ The overload protection is bypassed!
▶ The bypass of the shut off is only permitted for assembly purposes.

DANGER
Risk of accident!
▶ Before lowering the SA-bracket, the crane driver must ensure that there are no persons or objects within the danger zone. There is a danger of crushing!

▶ Switch the ball cocks from position **B** to position **A**.
▶ Lower the SA-bracket.
▶ Deflect the master switch MS1 **480** in direction X.

Result:
– Winch 4 spools up. The SA-bracket is pulled back against the pressure in the erection cylinders to approx. 10°.

▶ Do not actuate winch 4 any longer.
▶ Actuate the hand lever **8**.

Result:
– Due to the own weight of the SA-bracket and by retracting the erection cylinder, the SA-bracket is lowered to placement.

CAUTION
The ball cock positions (C) “STOP” and (A) “DOWN” are only permissible when lowering the SA-bracket from 10° - 0° onto the turntable (transport position)!
▶ If this is not observed, parts of the crane will be destroyed.

▶ Place the SA-bracket down.
▶ Set the ball cocks into position (C).

B195219

1 Equipment for boom combinations

Note

▶ The boom combinations must be assembled according to the separately supplied rod and assembly plans!

Lattice sections are clearly marked by welded on tags.
The number on the tags of the lattice sections is split in two, for example 2420.10:

– The first number signifies the system dimension (2420).
– The second number signifies the grade (10).

Lattice sections, where the number is expanded by the letter “Z” mean:

– The lattice section has brackets for the auxiliary guying.

DANGER

Incorrectly installed intermediate sections!
Due to incorrectly installed intermediate sections, the boom will be overloaded and can break, the crane can collapse or topple over. Personnel can be severely injured or killed!

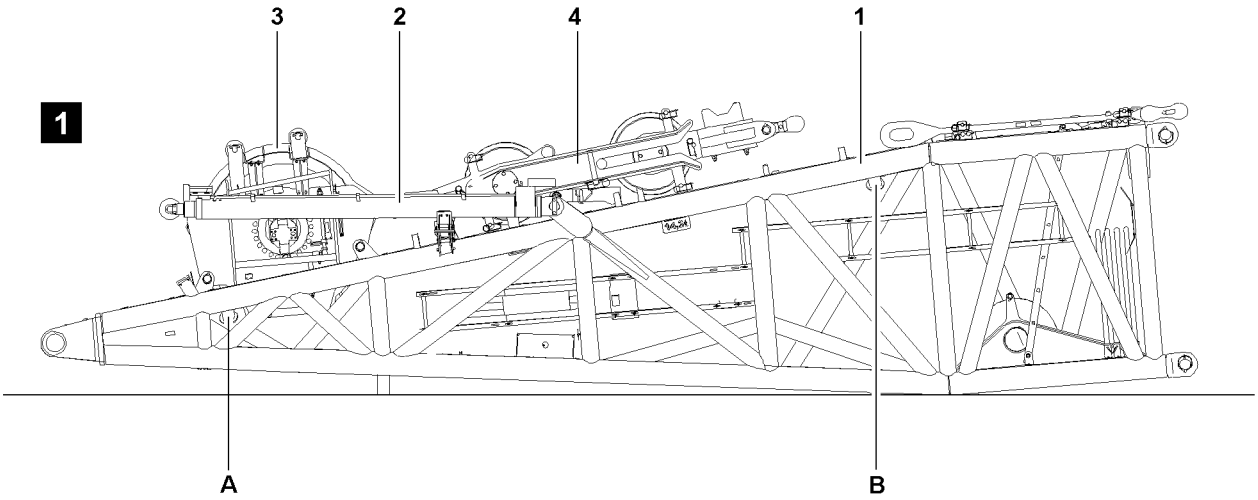
▶ Lattice sections and guy rods must be selected and assembled according to the data in the Operating instructions and the separately supplied rod and assembly plans!
▶ The sequence, system dimension and grade of the selected intermediate sections must match the data in the Operating instructions and the separately supplied rod and assembly plans!
▶ Use of lattice sections with numbers with the expansion “Z” must match the data in the separately supplied rod and assembly plans!

For the combination of the lattice sections with the same system number and the same grade, the following rules apply:

– Two intermediate sections 3 m can be replaced with one intermediate section 6 m.
– Two intermediate sections 6 m can be replaced with one intermediate section 12 m.
– Two intermediate sections 7 m can be replaced with one intermediate section 14 m.

Note

▶ Two short lattice sections are heavier than one long lattice section.
▶ If a long lattice section is replaced with two short ones, then it must be ensured that the short lattice sections are installed directly in connection to a pivot section, a reducer section or to the lattice sections with the same system dimension, but with the number for the higher grade.



B106551

1 Components and attachment points

1.1 Component overview D-pivot section

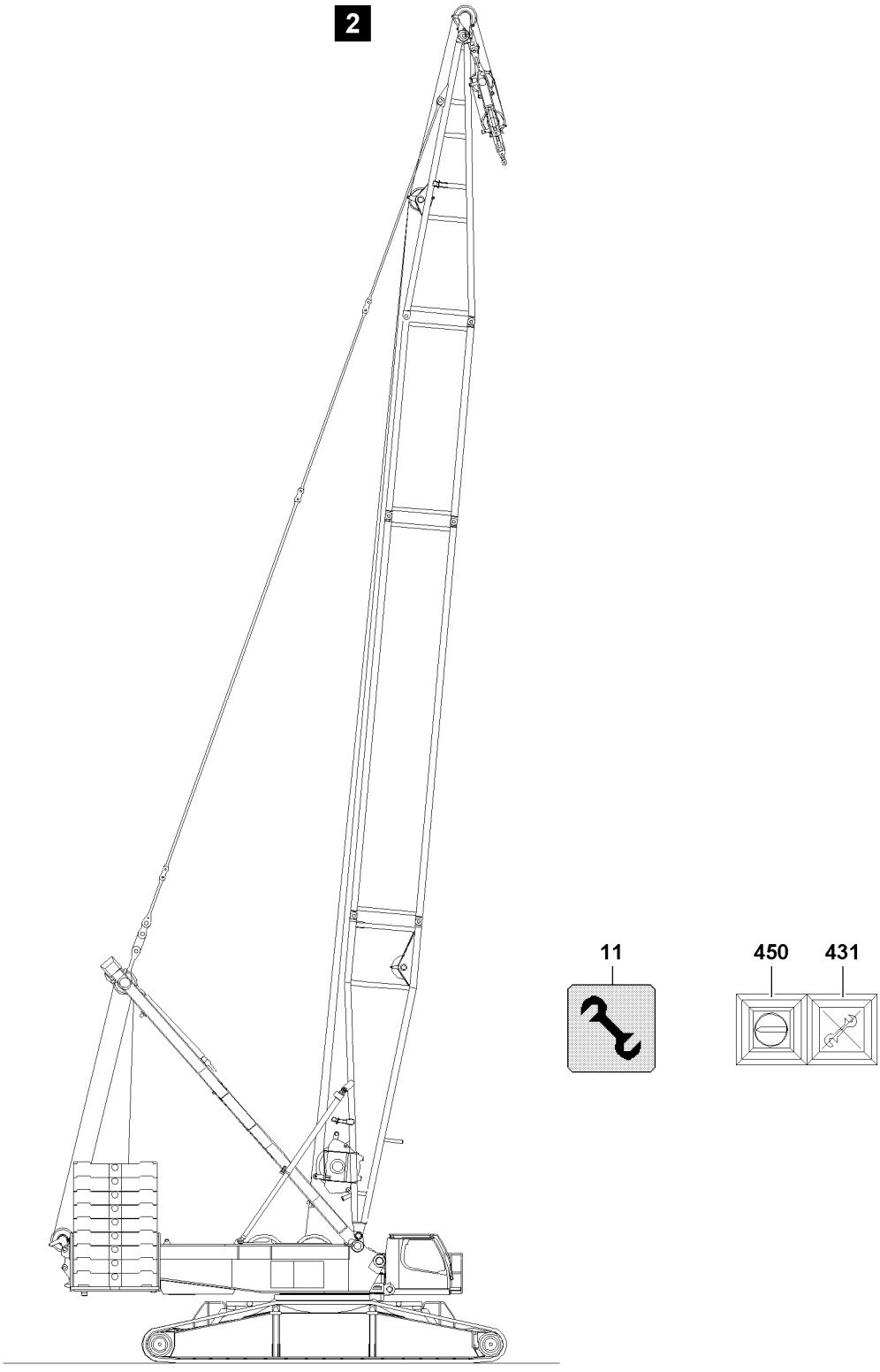
The D-pivot section consists of:

D-pivot section incl. winch 3, pulley block and rope		
Position	**Component**	**Weight[1)]**
1	D-pivot section	8.90 t
2	D-relapse cylinder	1.65 t
3	Winch 3 with rope	8.55 t
4	D-pulley blocks	3.65 t
	Total weight:	**22.75 t**

1) The stated weights are approximate

1.2 Attachment points D-pivot section

Attachment points on D-pivot section	
A + B	Attachment points for D-pivot section with assembled winch 3



B106552

2 Assembly D-boom

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

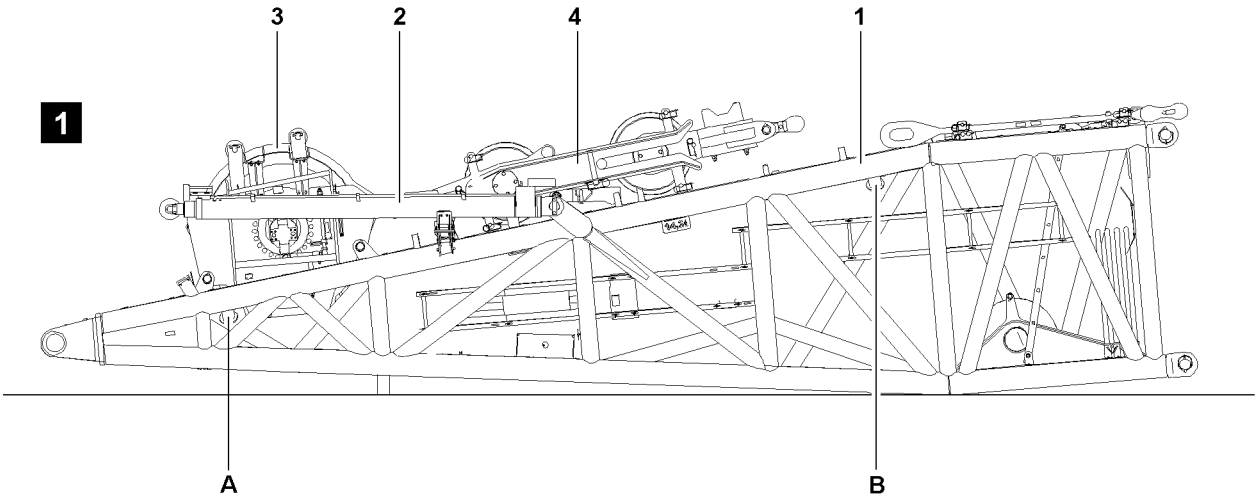
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see crane operating instructions, chapter 2.04 of the crane operating instructions!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel!

- ▶ Unpin or pin both pins at the same horizontal level, i.e. **left and right**!
- ▶ Do not stand under the lattice sections or within the complete danger zone during the pinning and unpinning procedure of the boom!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being disassembled!

WARNING
Danger of crushing!
When assembling crane components, limbs can be crushed or even severed due to oscillation of components!

- ▶ Make sure that the component do not swinging back and forth during assembly!

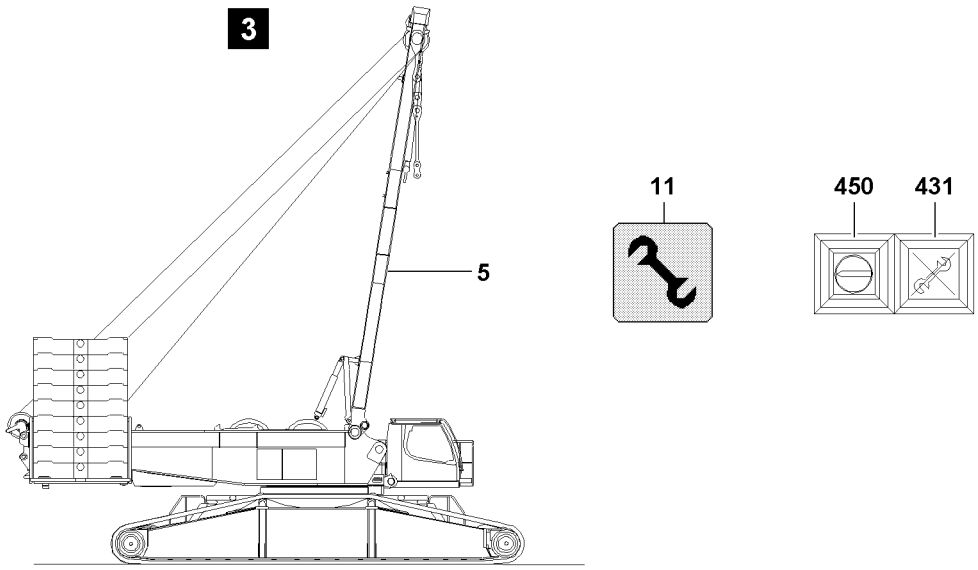


B106551

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down!
Personnel can be severely injured or killed!
▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured!

NOTICE
Damage of derrick boom and SA-frame!
If the SA-frame is pulled by winch 4 (intake gear) to the rear in direction of the turntable, then the derrick boom and the SA-frame can be severely damaged!
Expensive and extensive repairs can result!
▶ As long as the guying between the SA-frame and the assembled D-pivot section or between the SA-frame and the assembled D-boom is **not** assembled and guyed, do not pull the SA-frame to the rear in direction of the turntable!

Make sure that the following prerequisites are met:
– the crane is properly supported and horizontally aligned,
– an auxiliary crane is available,
– an assembly scaffolding / work platform is available,
– the counterweight has been installed to the turntable according to the load chart,
– the LICCON overload protection has been set according to the data in the load chart,
– the assembly icon on the LICCON monitor blinks,
– no main boom is assembled on the turntable.



B106553

2.1 Assembling the D-boom

2.1.1 Turning the turntable into assembly position

DANGER
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** installed D-boom, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Observe the data in the erection and take down charts!
- ▶ For D-boom assembly, a central ballast of 65 t (including the consoles) is required!
- ▶ If no D-boom is assembled on the turntable, no more than max. 150 t counterweight may be installed on the turntable!

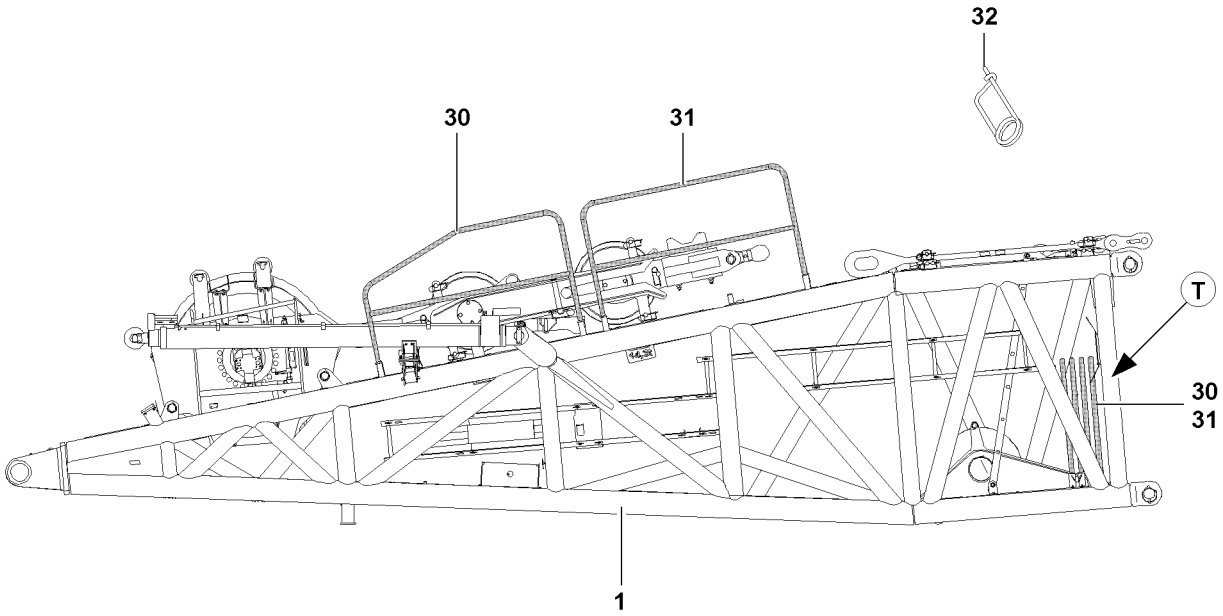
▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side.

2.1.2 Turning the assembly key button on

DANGER
Risk of fatal injury at crane operation with turned on assembly key button!
If the assembly key button is turned on, the hoist limit switch and the LICCON overload protection is 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 actuation of the assembly key button **450** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **450** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **450** turned on is strictly prohibited!
- ▶ The assembly key button **450** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **450**.

Result:
- – The LICCON overload protection is bypassed.
- – The indicator light **431** in the button lights up.
- – The assembly icon **11** on the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The three color light lights up red.
- – The warning lights on the rear of the turntable light up.



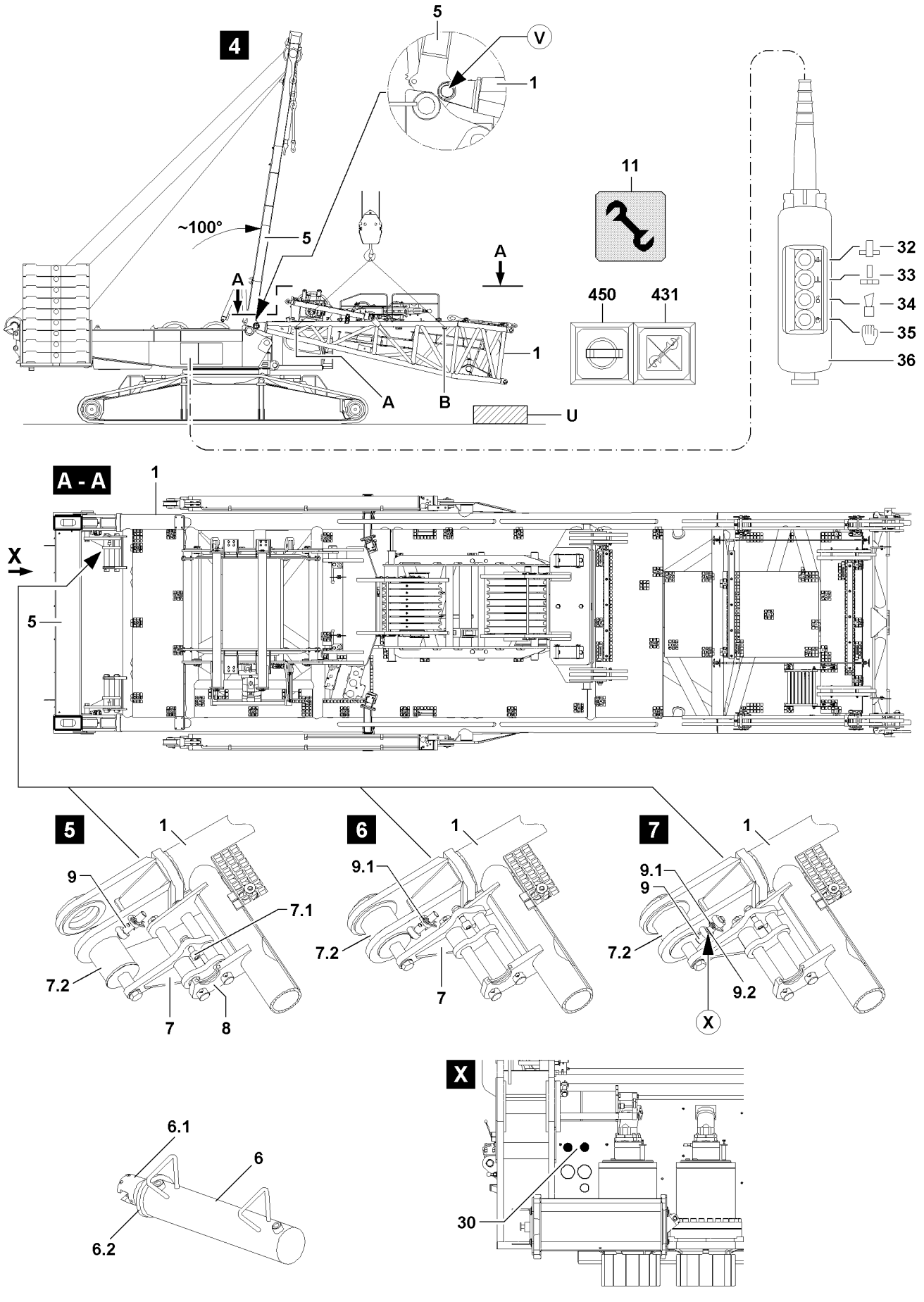
B106738

2.1.3 Assembling the railing on the D-pivot section

WARNING
Risk of falling!
During assembly and disassembly, the assembly personnel must be secured with appropriate aids to prevent them from falling!
Even for assembly of protective devices there is a danger of falling!
Assembly personnel can fall and be killed or severely injured!

- ▶ For assembly and disassembly work, maintenance and inspection work on the D-pivot section, all railing must be assembled and secured!
- ▶ Step on the D-pivot section **1** only with “clean shoes”.

- ▶ Release the railing in the transport retainer (point **T**) on the D-pivot section **1**: Remove spring retainers **32**.
- ▶ Remove the railing from the transport retainer (point **T**) and insert into the intended fastening points on the D-pivot section **1**.
- ▶ Secure the railing **30** in the fastening points with spring retainers **32**.
- ▶ Secure the railing **31** in the fastening points with spring retainers **32**.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X
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6.1
6
6.2

B108722

2.1.4 Pinning the D-pivot section on the SA-frame

DANGER
Danger of fatal accidents due falling components!
If the pin connections are not visually inspected, the pins can loosen up by themselves and cause components to fall down!
Personnel can be killed or severely injured!
- ▶ All pins must be secured after assembly with the intended safety elements! Check visually!
- ▶ The guy rods must be inspected regularly, see chapter 8.15 in the crane operating instructions!

Ensure that the following prerequisite is met:
- – the SA-frame is erected to approx. 100°,
- – the connector pins **7.2** on the D-pivot section **1** are unpinned, see illustration **5**.

▶ Attach the D-pivot section **1** on the attachment points **A** and the attachment points **B** on the auxiliary crane and swing in to the pin points **V** on the SA-frame, see illustration **4**.

Establish the hydraulic connection to the pin pulling device via two quick couplers **30**.

Note
- ▶ When hooking the pin pulling cylinder **6**, make sure that the collar **6.2** on the cylinder mount **8** and the catch **6.1** on the screw **7.1** are properly hooked!

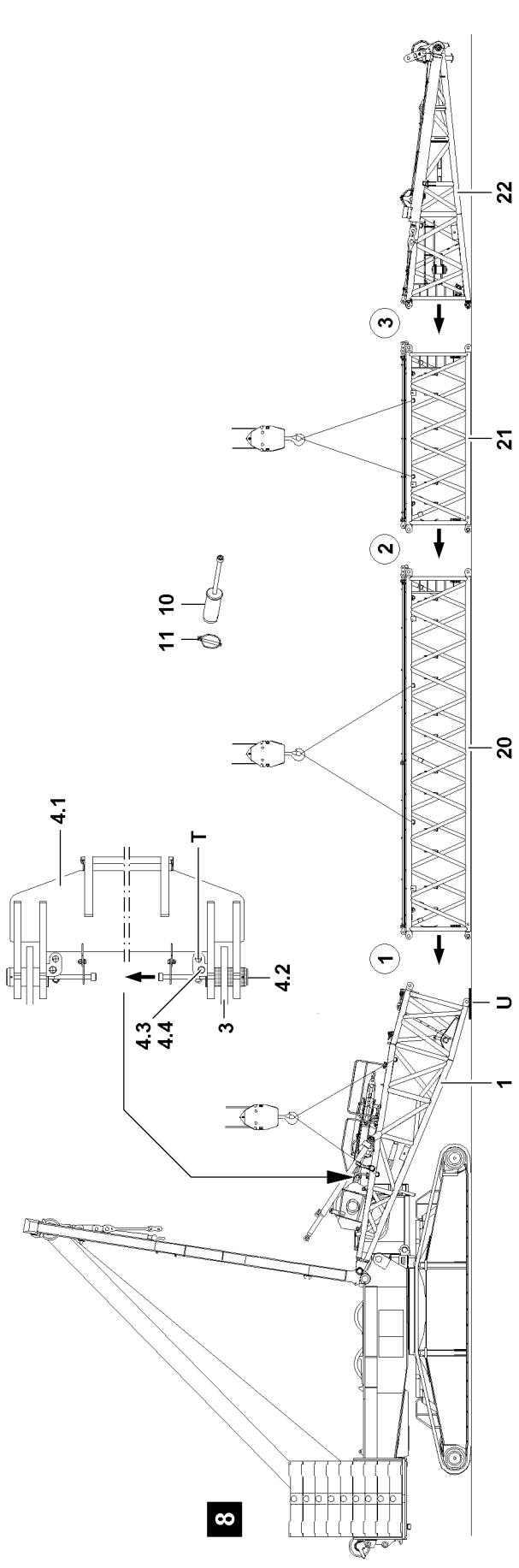
- ▶ Hook the pin pulling cylinders **6**.
- ▶ Connect the pin pulling cylinders **6** on the quick couplers **30**, Hydraulic turntable.

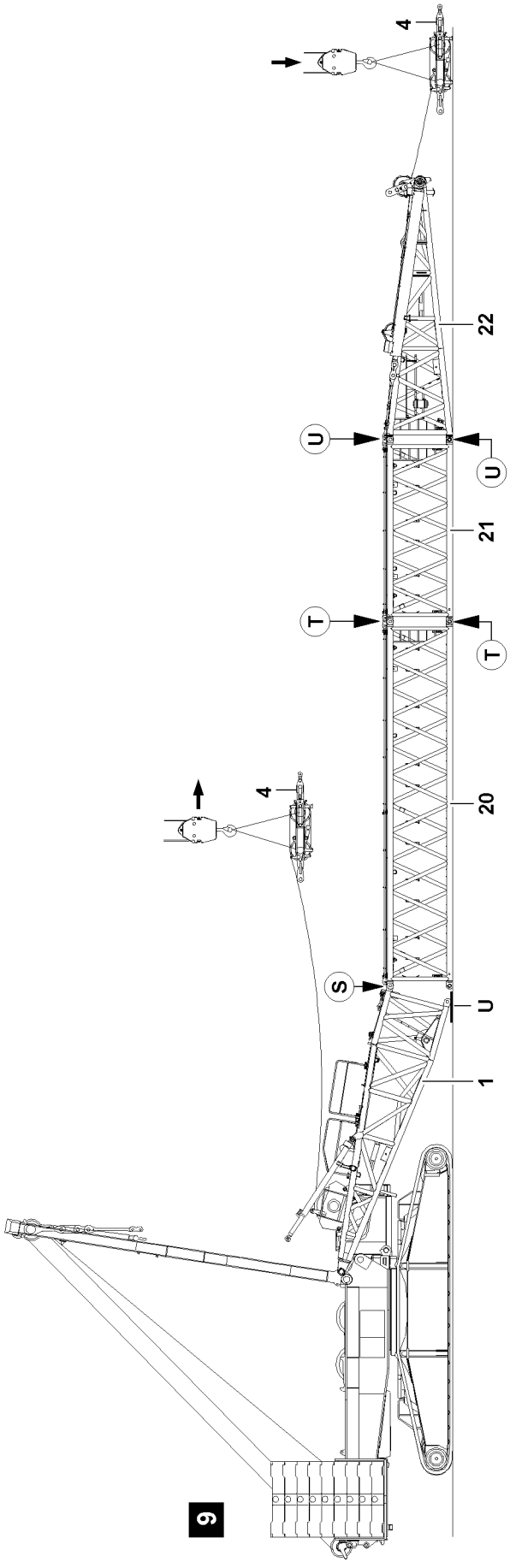
WARNING
Falling D-pivot section!
Due to non-secured or insufficiently secured connector pins, the D-pivot section can fall down!
Personnel can be severely injured or killed!
- ▶ The connector pins **7.2** must be secured after the pinning procedure on the SA-frame **5** with the retaining pins **9**!

- ▶ Insert the connector pins **7.2** on both sides with the hydraulic pin pulling cylinder **6**: Press the button **35** on the control panel **36** and “hold it down”, then press the button **32** until the connector pin **7.2** is fully pinned.
- ▶ When the connector pins **7.2** are fully pinned on both sides:
  Secure the connector pins **7.2** with retaining pins **9**.
- ▶ Remove the spring retainer **9.1**, see illustration **6**.
- ▶ Push the retaining pin **9** down until the cotter pin **9.2** is seated on the lower pin guide (point **X**), see illustration **7**.
- ▶ Secure the retaining pin **9** with spring retainers **9.1**, see illustration **7**.

NOTICE
Damage to the D-pivot section!
Property damage can occur on the D-pivot section by placing the assembled pivot section on the ground!
- ▶ The D-pivot section may not be placed directly on the ground!
- ▶ When placing the D-pivot section down, always use a sufficiently load bearing and large enough base support!

- ▶ Place the D-pivot section carefully with the auxiliary crane on the support **U**!
- ▶ Remove the auxiliary crane!





B106555

2.1.5 Installing the D-lattice sections on the D-pivot section

Make sure that the following prerequisites are met:
– the D-pivot section is pinned and secured on the SA-frame,
– the D-pivot section is placed on the support **U** (approx. 20 cm high) .

Note
▶ Always support the D-lattice sections sufficiently for easier installation!
▶ To pin and unpin the D-lattice sections with the pin pulling device, see also chapter 5.30 in the crane operating instructions!

Pin the D-intermediate section **20** on the D-pivot section **1** on top, (point **S**).
▶ Attach the D-intermediate section **20** on the auxiliary crane and align on the D-pivot section **1**.
▶ When the pin bores on the D-pivot section **1** and on the D-intermediate section **20** (point **S**) align: Insert the pin **10** and secure with linch pin **11**.
▶ Attach the D-intermediate section **21** on the auxiliary crane and align on the D-intermediate section **20**.
▶ When the pin bores on the D-intermediate section **21** and on the D-intermediate section **20** (point **T**) align:
Pin and secure pins **10** on top and bottom with linch pins **11**.
▶ Attach the D-end section **22** on the auxiliary crane and align on the D-intermediate section **21**.
▶ When the pin bores on the D-intermediate section **21** and on the D-end section **22** (point **U**) align: Pin and secure pins **10** on top and bottom with linch pins **11**.

2.1.6 Pulling the pulley block to the D-end section and placing it down

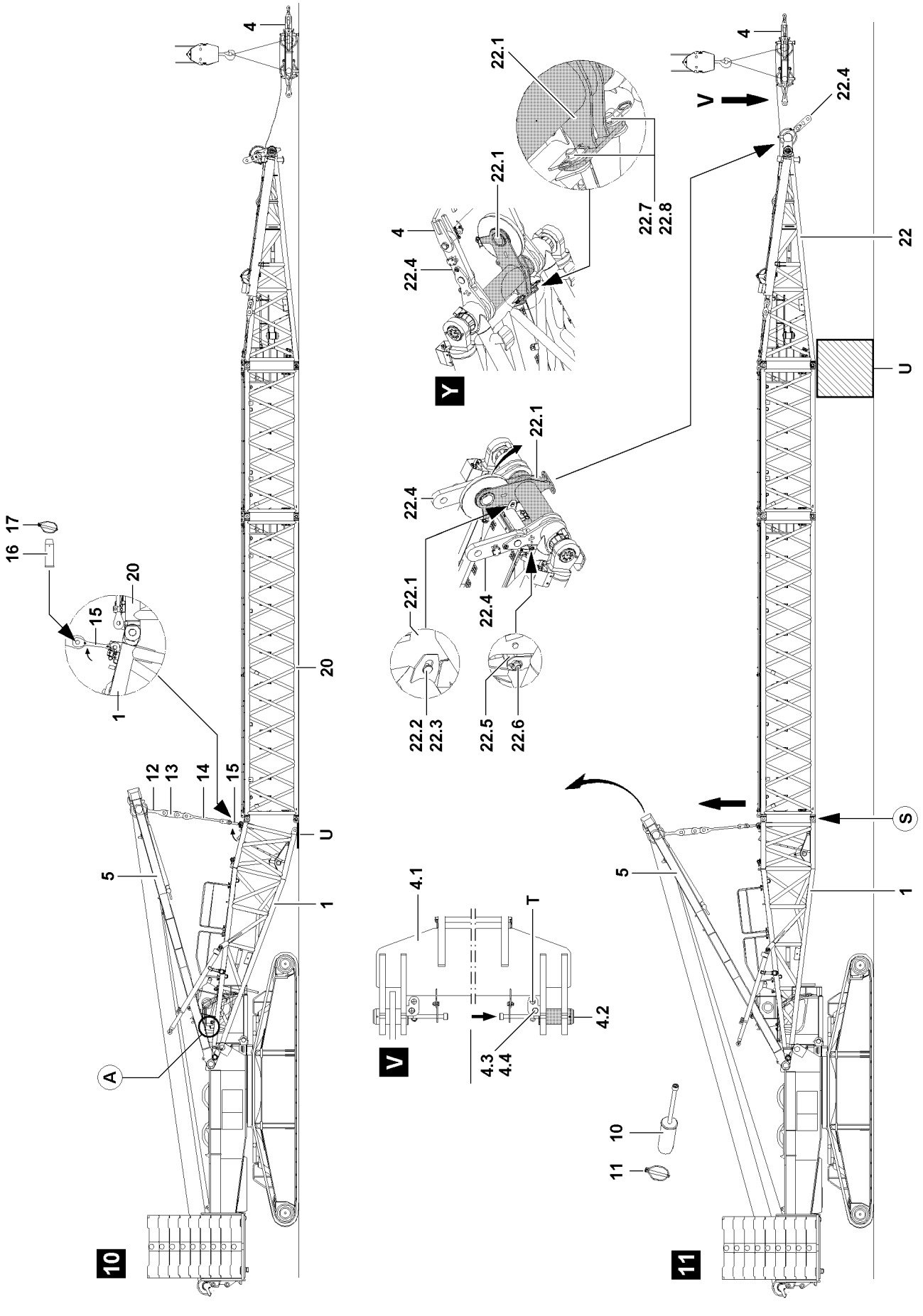
WARNING
Slipping pulley block!
By unpinning the pulley block on winch 3, the pulley block can start to slip and severely injure personnel!
▶ The pulley block must be secured by an auxiliary crane before unpinning it on winch 3!

▶ Attach the pulley block onto the auxiliary crane.

Before assembly of the pulley block on the D-end section, the pulley block must be unpinned on the D-pivot section.
▶ Unpin the pulley block **4** on winch 3: Release the retaining pin **4.3** and unpin from the pin bore.
▶ Pin in the retaining pin **4.3** in the transport retainer **T** and secure with spring retainer **4.4**, see ! **8**.
▶ Unpin the pin **4.2** on both sides, see illustration **8**.

NOTICE
Rope damage!
▶ When spooling winch 3 out, make sure that no slack rope forms!

▶ While spooling out winch 3, pull the pulley block **4** with the auxiliary crane to the D-end section **22** and place it on the ground on a support in sufficient distance to the D-end section, see illustration **9**.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22.8

B106556

2.1.7 “Closing” the D-boom

Make sure that the following prerequisites are met:
– the transport retainers for the guy rods on the SA-frame are released,
– the D-lattice sections are pinned and secured,
– the pulley block has been placed on the ground in sufficient distance to the D-end section.

▶ Lower the SA-frame to the front, see chapter 5.02 of the crane operating instructions.

Lower the SA-frame carefully to the placement **A** on the D-pivot section until the guy rods **14** can be pinned with the brackets **15** of the D-pivot section **1**.

▶ Pin the guy rods **14** with the lugs **15**: Pin in the pin **16** and secure with linch pin **17**.

▶ Erect the SA-frame **5** until the pin bores on the D-pivot section **1** and on the D-intermediate section **21** “on the bottom” (point **S**):
Pin in the pins **10** on both sides at point **S** and secure with linch pin **11**, illustration **11**.

NOTICE
Damage of control rope and the pulley block!
When lifting the D-boom, the control rope or the pulley block can be damaged!
▶ When lifting the D-boom, carefully spool out the winch 3 so that the pulley block remains on the ground!
▶ Check the rope run on the D-end section, carry out a visual inspection!

▶ When the pins are properly pinned and secured on all D-lattice sections:
Luff up the SA-frame until the D-end section lifts off the ground.

▶ Support the D-boom from below.

▶ Lower the D-boom on the support **U**.

2.1.8 Bringing the pull test brackets into operating position

WARNING
The pull test brackets can pose a mortal danger!
If the pull test brackets are not secure with an auxiliary crane during the swing procedure, they can swing forward with a large momentum due to their weight!
Personnel can be severely injured or killed!
▶ Swing the pull test brackets into operating position only with the aid of an auxiliary crane!
▶ Swinging the pull test brackets without an auxiliary crane is **prohibited**!

▶ Attach the pull test brackets onto the auxiliary crane.

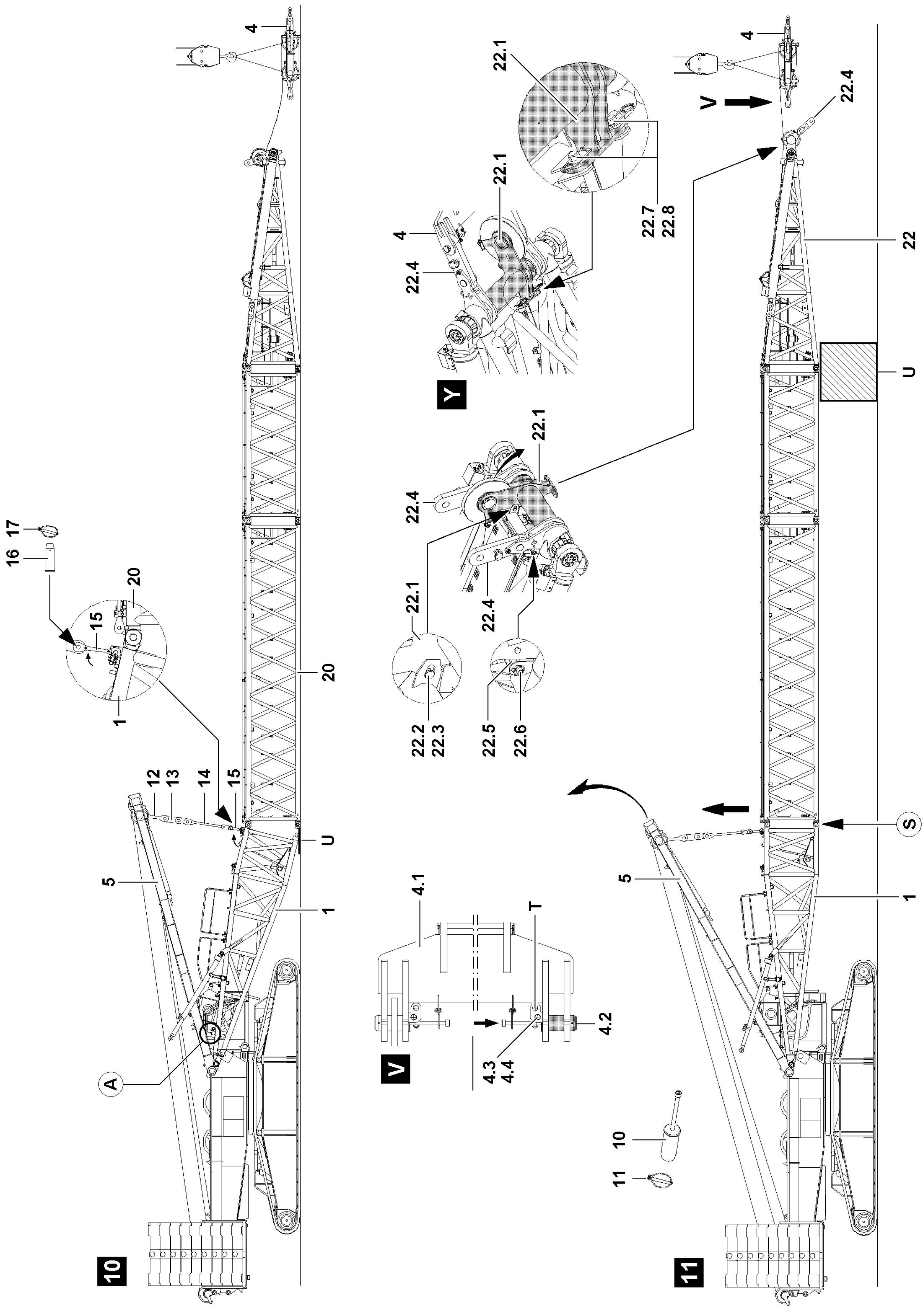
▶ When the pull test brackets **22.4** are secured with the auxiliary crane:
Tension the tackle carefully.

▶ Remove the linch pin **22.6** on the transport retainer and unpin the retaining pin **22.5**.

▶ Swing the pull test bracket **22.4** forward with the auxiliary crane.

▶ When the pull test brackets **22.4** are swung forward completely:
Remove the auxiliary crane.

▶ Pin in the pin **22.5** in transport position and secure with linch pin **22.6**.



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B106556

2.1.9 Bringing the pulley retainers into operating position

WARNING
Mortal danger due to pulley retainer!
If the pulley retainer is not secure with an auxiliary crane during the swing procedure, it can swing forward with a large momentum due to its weight!
Personnel can be severely injured or killed!
- ▶ Swing the pulley retainer into operating position only with the aid of an auxiliary crane!
- ▶ Swinging the pulley retainer without an auxiliary crane is **prohibited**!

- ▶ Attach the pulley retainer on the auxiliary crane.
- ▶ When the pulley retainer **22.1** is secured with the auxiliary crane:
  Tension the tackle carefully.
- ▶ Remove the spring retainer **22.3** on the transport retainer and unpin the retaining pin **22.2**.
- ▶ Remove the spring retainer **22.8** and unpin the pin **22.7**, see illustration **Y**.
- ▶ Swing the pulley retainer **22.1** forward with the auxiliary crane.
- ▶ When the pulley retainer **22.1** is in operating position:
  Remove the auxiliary crane.
- ▶ Pin in the pins **22.7** in operating position of the pulley retainer **22.1** and secure with spring retainer **22.8**.
- ▶ Pin in the retaining pin **22.2** in transport position and secure with spring retainer **22.3**.

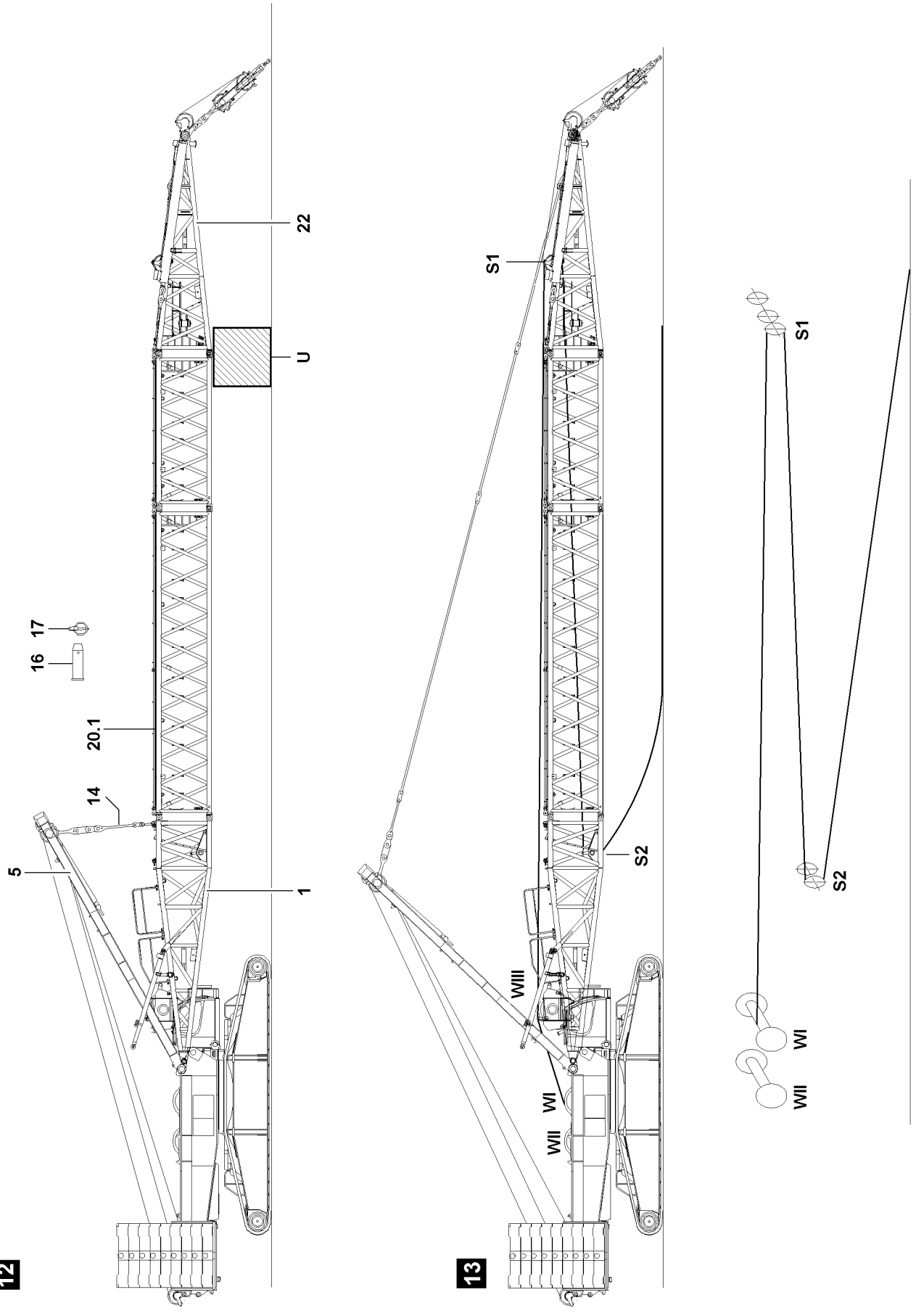
2.1.10 Pinning the pulley block on the pull test brackets

Pin the pulley block **4** on the D-end section **22** with the pull test brackets **22.4**.
- ▶ Attach the pulley block **4** on the auxiliary crane and lift it off the ground.

Pin the pulley block **4** on the pull test brackets on the D-end section.

NOTICE
Danger of slack rope formation!
When swinging the pulley block on the D-end section in, slack rope can form on winch 3!
- ▶ When swinging the pulley block in to the D-end section, slowly and carefully spool up winch 3!

- ▶ When the pulley block **4** is on the D-end section **22** positioned and aligned on the pull test brackets **22.4**:
  Pin in the pin **4.2** on both sides, see illustration **11** and illustration **V**.
- ▶ Secure the pin **4.2**: Pin in the retaining pin **4.3** and secure with spring retainer **4.4**.
- ▶ Carefully lower the pulley block **4** with the auxiliary crane.
- ▶ When the pulley block is laying on the ground or on the support:
  Remove the auxiliary crane.



B106557

2.1.11 Assembling the D-guy rods

WARNING
Inspection and maintenance on guy rods not carried out!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!
Personnel can be severely injured or killed!
- ▶ The guy rods must be checked before every assembly, see also chapter 8.15 in the crane operating instructions!

Note
- ▶ The D-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods!

The D-guy rods are placed and secured for transport on the D-lattice components. Before assembly, the transport retainers must be released.
- ▶ Release the transport retainers on the guy rods.
- ▶ Lower the SA-frame to the front.

DANGER
Risk of accident!
- ▶ The pins **16** of the Derrick guy rods may only be pinned from the “inside” to the “outside”!

Pin the guy rods **14** of the SA-frame with the guy rods **20.1** on the D-pivot section.
- ▶ Pin in the pin **16** and secure with spring retainer **17**.

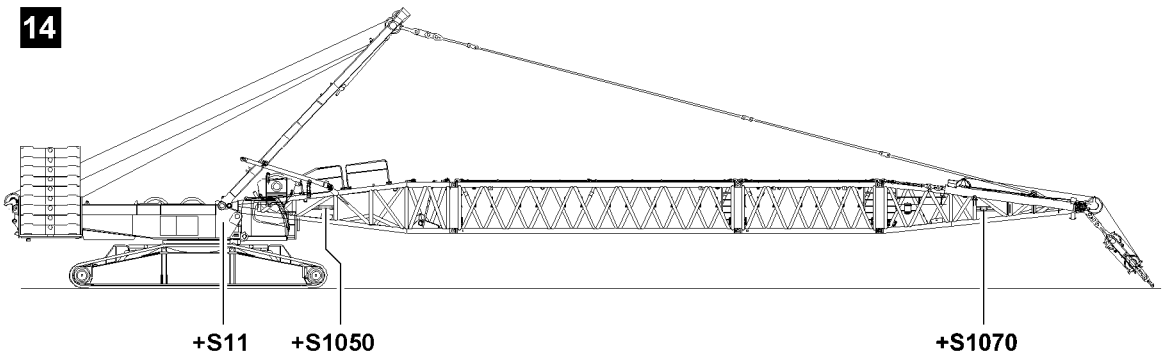
Pin the guy rods of the D-intermediate sections with each other.
- ▶ Pin in the pin **16** and secure with spring retainer **17**.

Pin the guy rods of the D-intermediate sections with the guy rods on the D-end section.
- ▶ Pin in the pin **16** and secure with spring retainer **17**.
- ▶ When the guy rods are pinned and secured to each other:
  Actuate winch IV until the guy rods are tensioned between the SA-frame and the D-end section.

DANGER
General danger notes!
If the following conditions are not met before erecting the D-boom, the hoist rope can fall down due to its own weight!
Personnel can be severely injured or killed!
- ▶ Enough hoist rope must be guided over the rope pulleys so that the hoist rope is **not** pulled back and falls down when erecting the D-boom!

Note
- ▶ The hoist rope reeving is shown in chapter 4.06 of the crane operating instructions!

- ▶ Pull the hoist rope over the rope pulley **S1** in the D-end section and over the rope pulley **S2** in the D-pivot section, see illustration **13**.
- ▶ Luff the D-boom up until the D-boom hangs horizontally above the ground.
- ▶ Remove the support **U**.



B106558

2.2 Establishing the electrical connections

Note
▶ To establish the electrical connections on the D-boom, use the separate electrical wiring diagram!

Ensure that the following prerequisite is met:
– the D-boom is completely assembled.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.

2.3 Checking the function of the safety devices

WARNING
Non-functioning safety devices!
If the function of the safety devices is defective, personnel can be severely injured or killed!
▶ Crane operation with non-functioning safety devices is **prohibited**!

Note
▶ The function of the individual limit switches must be checked before erection!
▶ The function of the limit switch initiators must be checked in the test system, see separate “Diagnostics manual”!

Note
▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked! If no visible connection errors or component defects can be found, contact **LIEBHERR** Service!

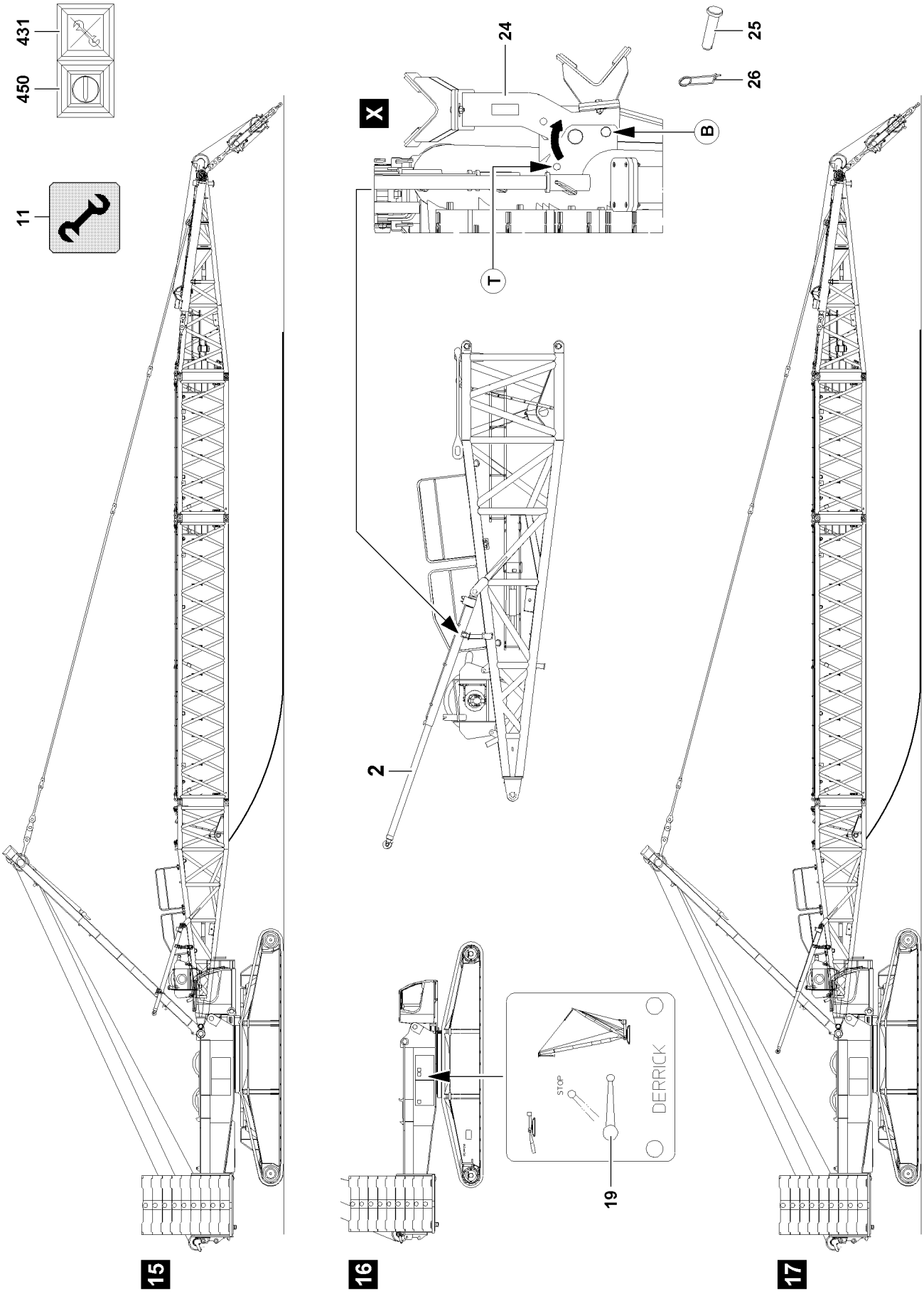
Make sure that the following prerequisites are met:
– all electrical connections have been made,
– the crane engine is running,
– the corresponding operating mode is set on the LICCON monitor.

2.3.1 Limit switch D-boom, relapse cylinder

Note
▶ The limit switch functions have to be checked individually before erection!

▶ Cover the limit switch initiators individually with a metal plate, see chapter 8.12 in the crane operating instructions.

Result:
– The spool up function of winch IV (control winch) turns off in upward movement.
– The icon “Derrick boom angle” appears on the LICCON monitor 1, see chapter 4.02 of the crane operating instructions.



B106737

2.4 Swinging the folding brackets into operating position

Before extending the D-relapse cylinder **2**, bring the folding brackets **24** into operating position.

- ▶ Remove the spring retainer **26** and unpin the pin **25** from the transport position **T**, see illustration **X**.
- ▶ Attach the auxiliary crane first to the D-relapse cylinder **2**.
- ▶ Lift the D-relapse cylinder **2** with the auxiliary crane from the folding bracket **24**.
- ▶ Swing the folding brackets **24** into operating position, see illustration **X**.
- ▶ Insert the pins **25** in operating position **B** and secure with spring retainer **26**.

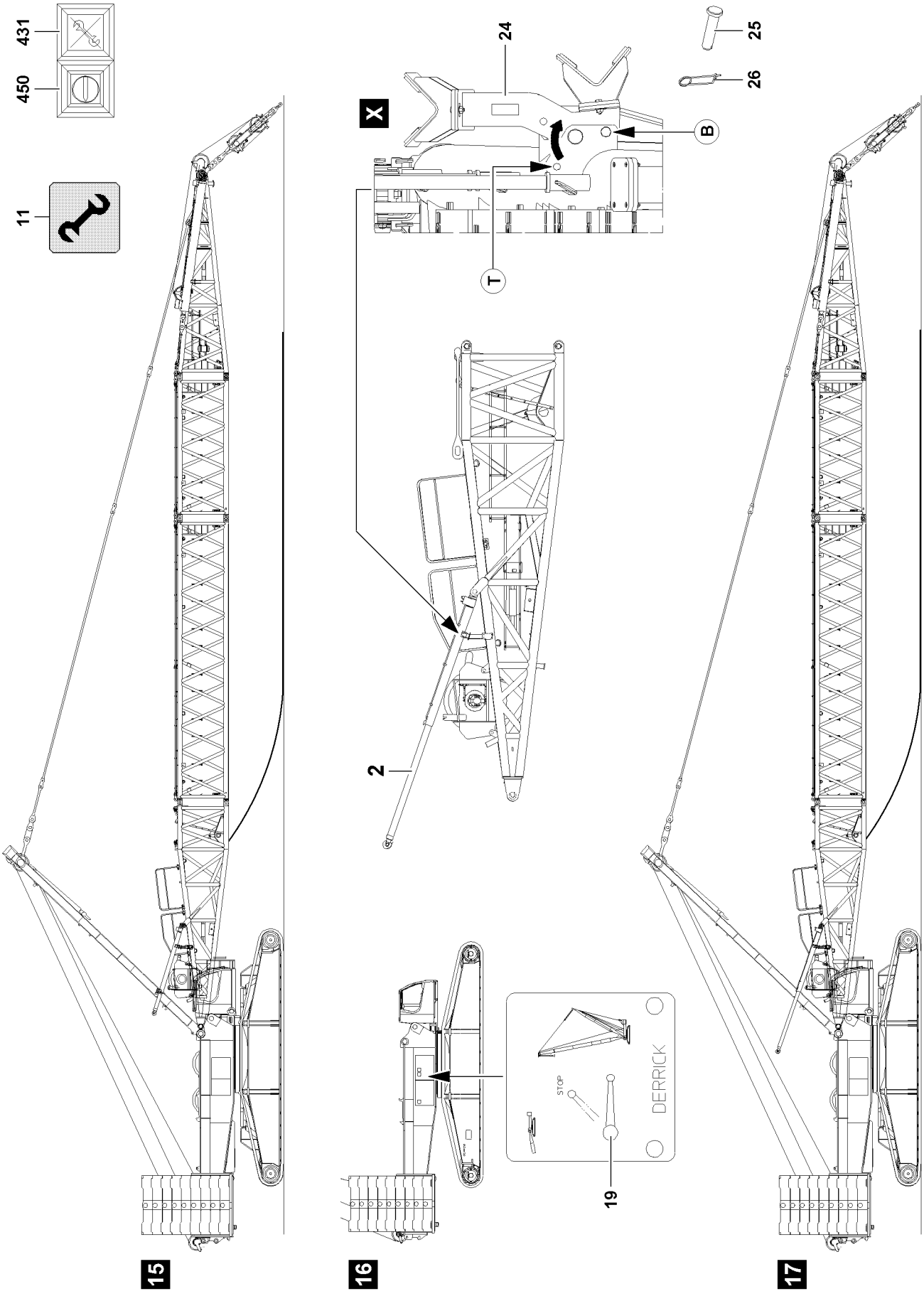
2.5 Installing the adapter for the ballast trailer on the turntable

If the ballast trailer is required for the intended crane application, then the adapter for the ballast trailer must be assembled on the turntable **before the D-boom is erected**. Otherwise access to the turntable is significantly limited by the SA-frame.

Note

- ▶ Install the adapter on the turntable before erecting the D-boom, see chapter 5.35 in the crane operating instructions!

- ▶ When the adapter is pinned on the turntable and secured:
  Erect the D-boom!



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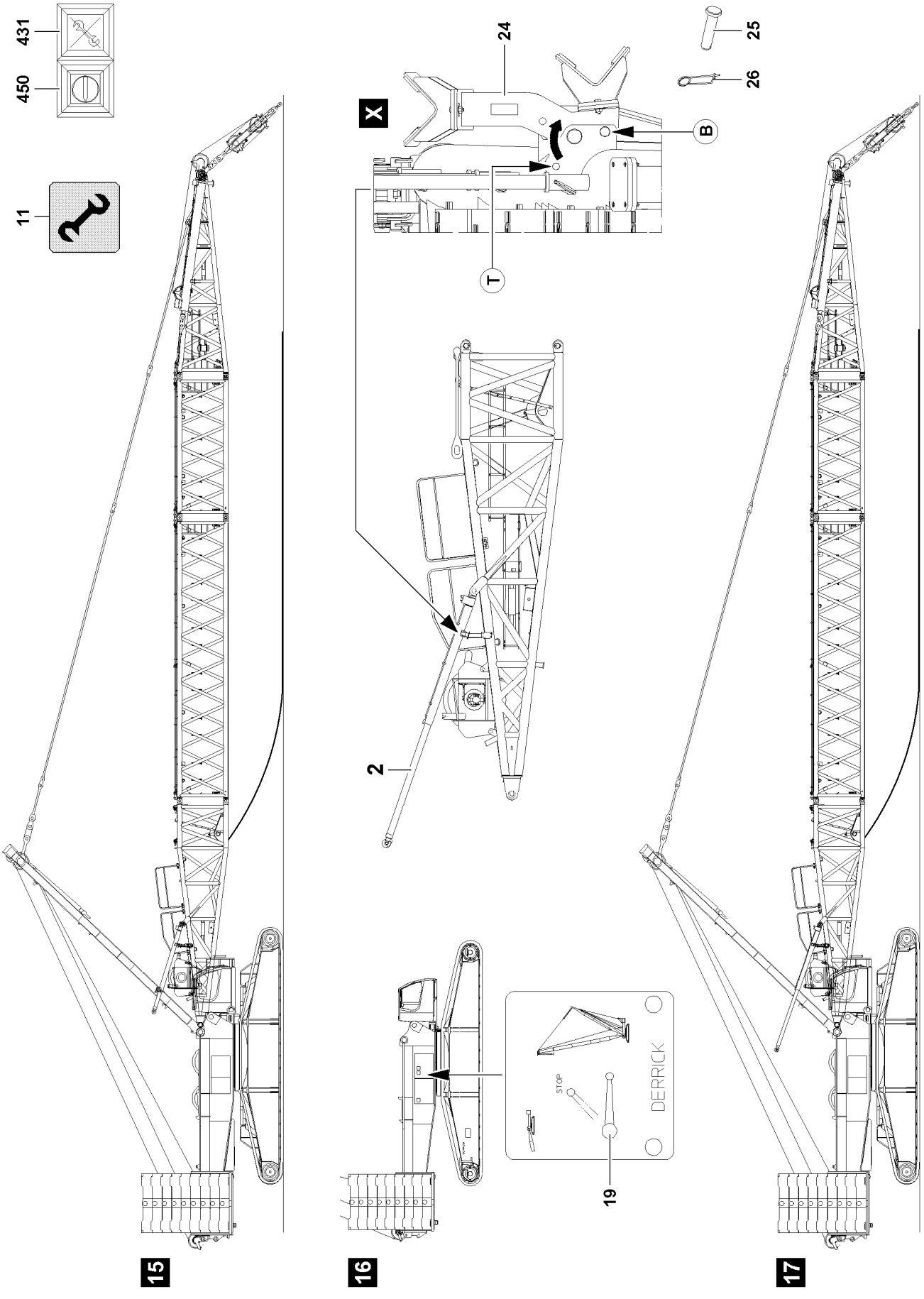
2.6 Erecting the D-boom

DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Observe the data in the erection and take down charts!

WARNING
The crane can topple over!
If the following conditions are not met before erecting the D-boom, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Observe the Safety technical notes, see chapter 5.01 in the crane operating instructions!
- ▶ Extend the D-relapse cylinder **2** before erection!
- ▶ Do not allow slack cable to build up on the control winch (winch 3)!
- ▶ The ball cock cabinet must be locked! Always pull the key and hand it to an authorized person!

WARNING
Falling hoist rope!
If the hoist rope is not reeved with the respective length over the D-boom before the erection procedure, then it can fall backward due to its own weight!
Personnel can be severely injured or killed!
- ▶ Reeve the hoist rope before the erection procedure with sufficient length on the D-boom!
- ▶ The hoist rope must be constantly monitored during erection!
- ▶ Do not step into the danger zone!

Make sure that the following prerequisites are met:
- – the crane is aligned in horizontal direction,
- – all electrical connections have been made,
- – all limit switches are functioning,
- – the counterweight has been installed to the turntable according to the load chart,
- – all pin connections have been secured,
- – the folding brackets of the D-relapse cylinders are in operating position, see illustration **17**,
- – the D-relapse cylinders on the D-pivot section are extended,
- – the hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins,
- – the LICCON overload protection has been adjusted according to the data in the load chart,
- – the LICCON overload protection settings have been compared with the actual crane configuration,
- – the assembly key button **450** is actuated,
- – the indicator light **431** “Assembly” lights up,
- – the assembly icon **11** on the LICCON monitor 0 lights up.



B106737

2.6.1 Extending the D-relapse cylinder

WARNING
Mortal danger due to the D-boom!
If the D-relapse cylinders are not extended before erecting the D-boom, then the D-boom can fall backward!
Personnel can be severely injured or killed!
▶ The D-relapse cylinders must be extended before erection of the D-boom!
▶ The ball cock must be secured during crane operation to prevent unintended actuation!

The piston rod on the D-relapse cylinder must be extended by actuating the ball cock **19**.

Ball cock positions	
Horizontal	Crane operation, extend the piston rod
Vertical	Assembly, retract the piston rod
45°	STOP (The piston rod cannot be retracted / extended)

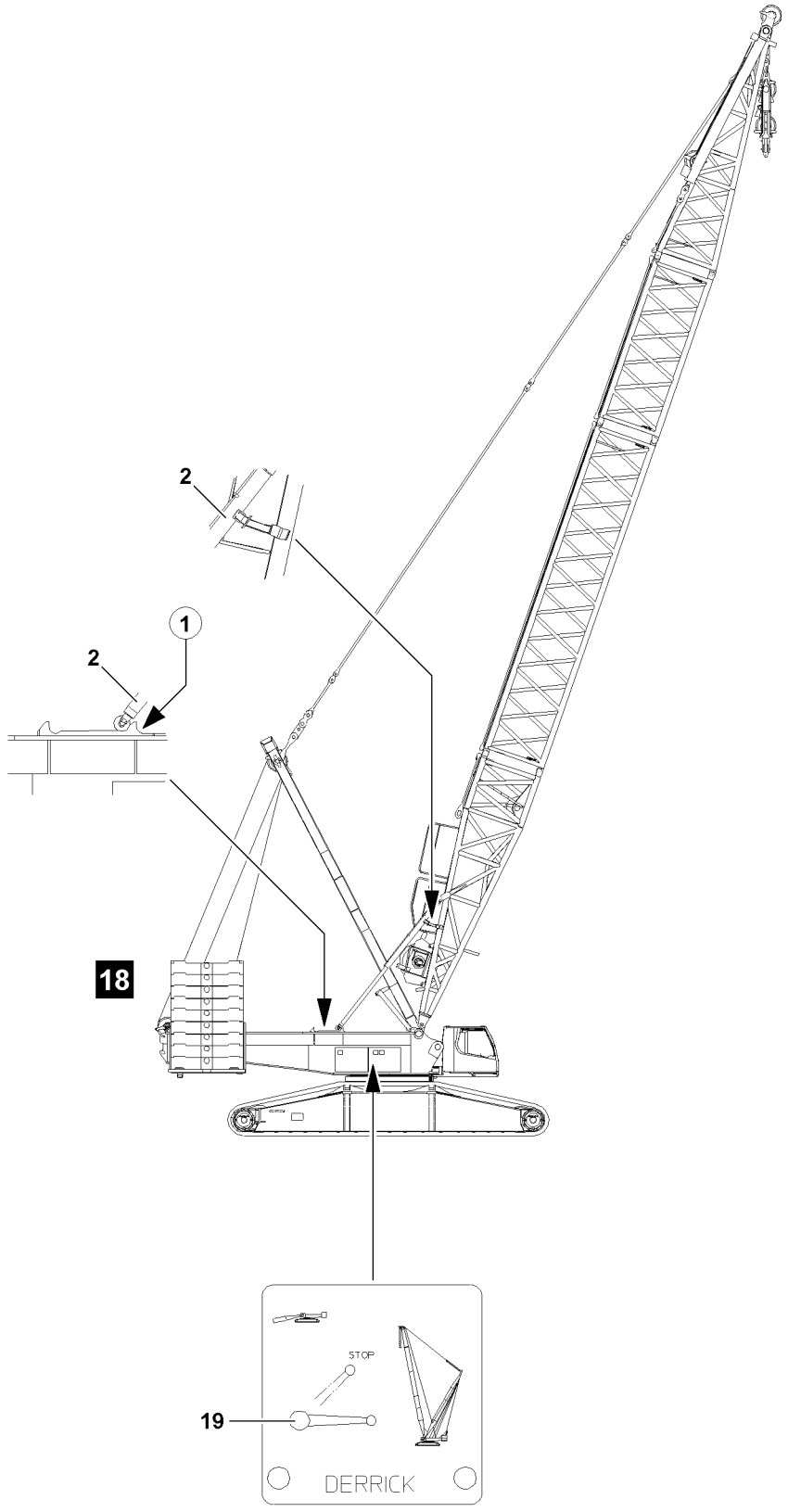
Ensure that the following prerequisite is met:
– all hydraulic connections have been made.

▶ Move the ball cock **19** into horizontal position.

Result:
– The piston rods of the D-relapse cylinders **2** extend.

Note
▶ The ball cock is secured by closing the cabinet door and removing the key!

▶ Close the cabinet door and pull the key.
▶ Hand the key to an authorized person.



B106735

2.6.2 Erection procedure

Make sure that the following prerequisites are met:

– the D-relapse cylinders **2** are fully extended before erection,
– the control rope of winch 3 is properly reeved on the pulley block and properly secured on the rope fixed point,
– the connector pins between the upper pulley block and the lower pulley block are unpinned.

Note

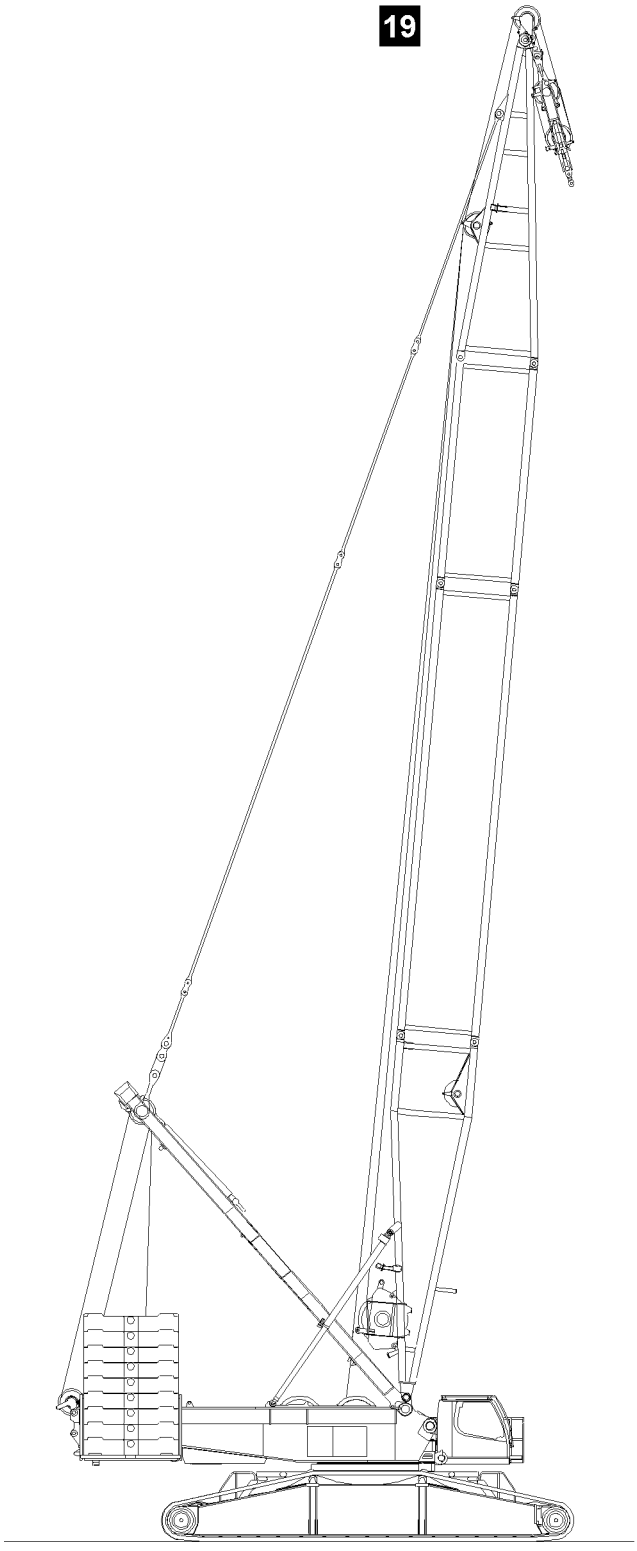
▶ During the erection procedure it must be ensured that the D-relapse cylinders **2** engage past the first stop (point **1**) into the second rail on the D-relapse retainer!

DANGER

The crane can topple over!

▶ It is not permitted to turn the crane superstructure during erection procedure!
▶ Do not allow slack cable to build up on the control winch (winch 3)!
▶ Do not erect the D-boom further than maximum 80° to the horizontal!

▶ Actuate winch IV and erect the D-boom to an angle range of 75° to 80°.



B106739

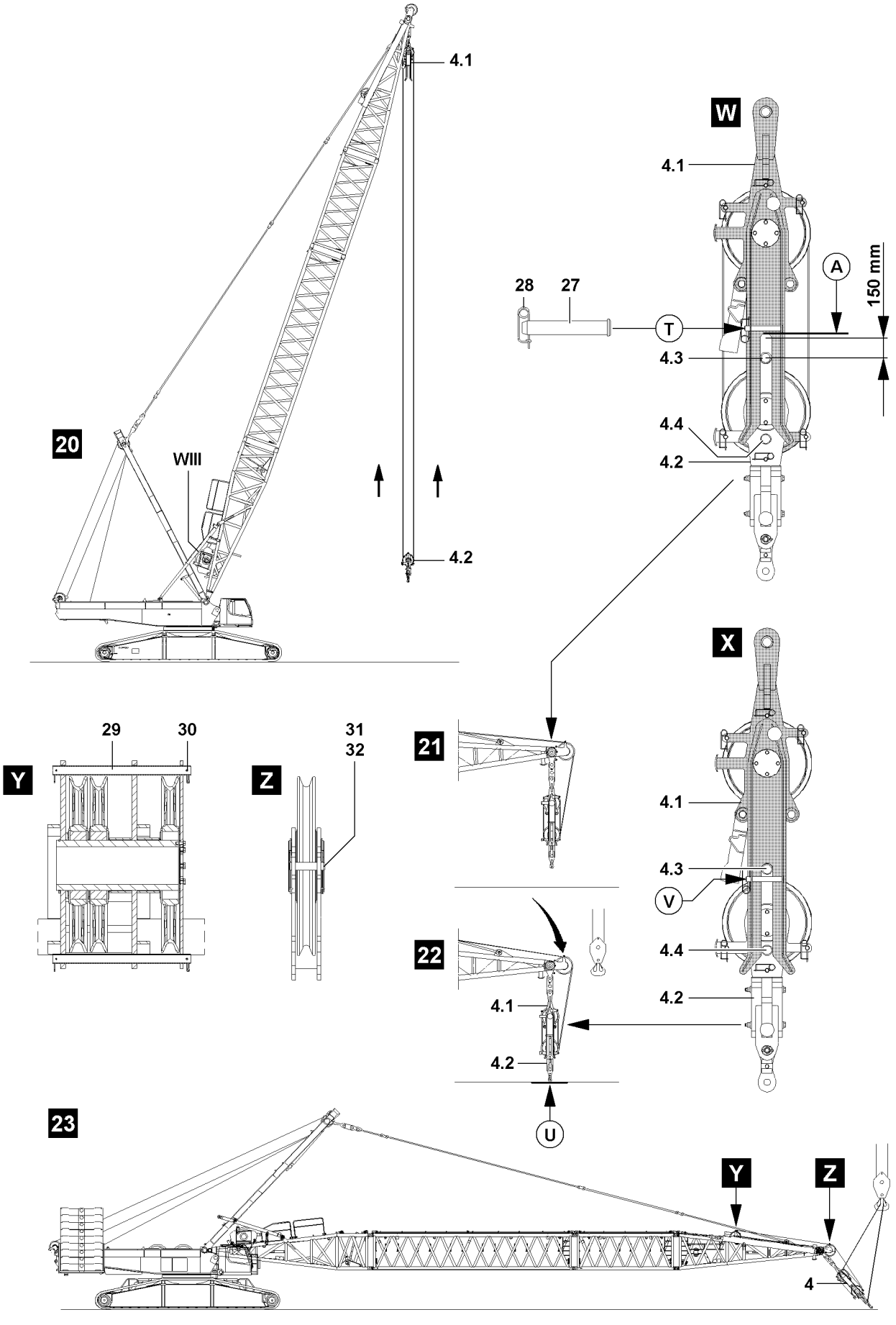
3 Disassembly

WARNING
Risk of falling!
During assembly and disassembly, the assembly personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see crane operating instructions, chapter 2.04 of the crane operating instructions!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel!
- ▶ Unpin or pin both pins at the same horizontal level, i.e. **left and right**!
- ▶ Do not stand under the lattice sections or within the complete danger zone during the pinning and unpinning procedure of the boom!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being disassembled!

WARNING
Danger of crushing!
When assembling crane components, limbs can be crushed or even severed due to oscillation of components!
- ▶ Make sure that the component do not swinging back and forth during assembly!

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel!
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured!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B106736

3.1 Disassembling the D-boom

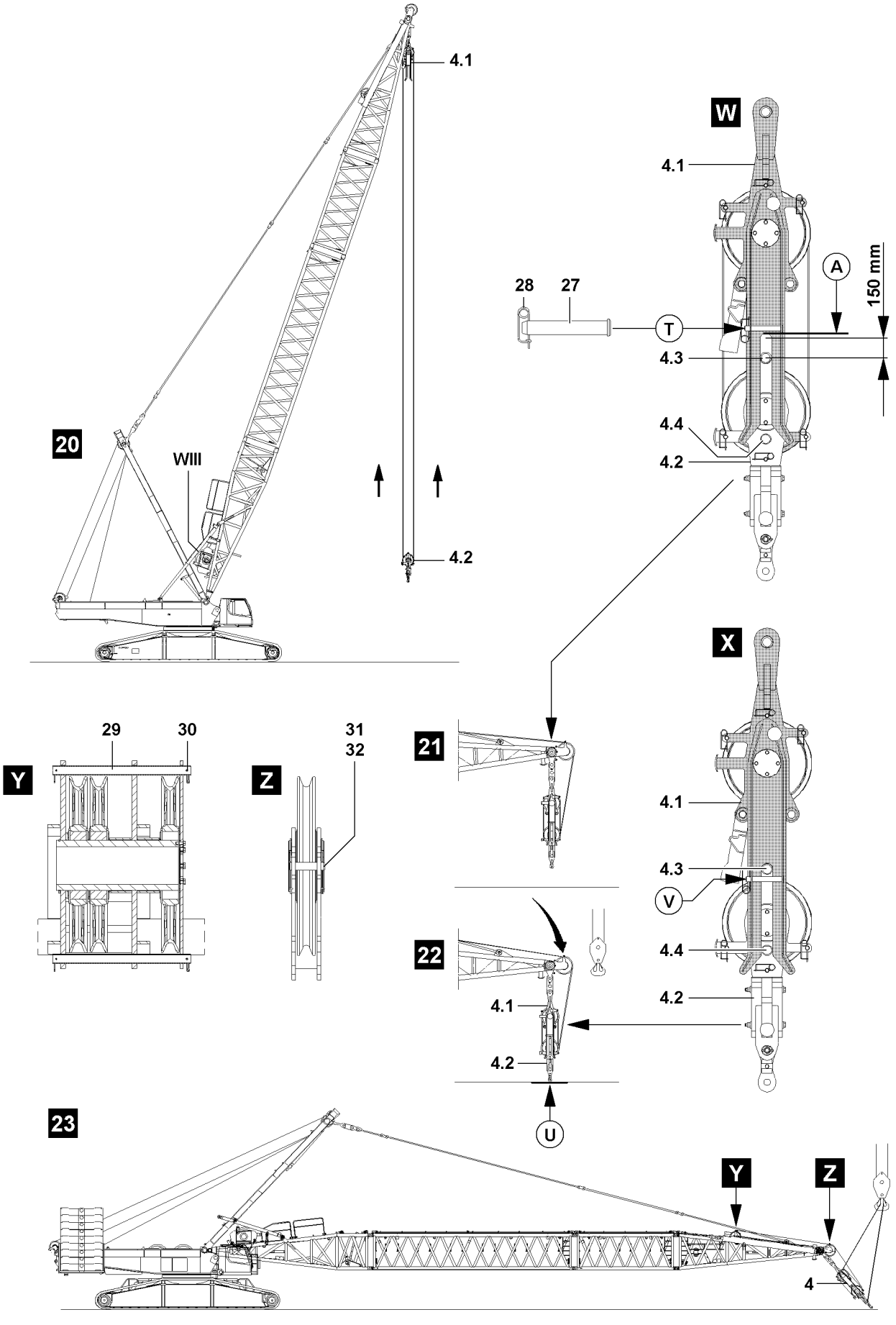
WARNING
Falling boom!
If the D-boom is not properly supported before disassembly or held with an auxiliary crane, then the D-boom can fall down when it is unpinned!
Personnel can be severely injured or killed!
- ▶ Before supporting the D-boom, the ground condition must be checked regarding load bearing capability and level.

If the ground condition is not classified as sufficient:
- ▶ Support the D-boom properly and safely with suitable material!

3.1.1 Luffing the D-boom down

NOTICE
Damage to the pulley block!
If the D-boom is lowered too quickly “to the front”, significant damage can occur on the pulley block and on the D-end section!
- ▶ Lower the D-boom carefully to the front!

- ▶ Lower the D-boom to the front until the pulley block is just above the ground.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B106736

3.1.2 Pinning the upper pulley block with the lower pulley block

Make sure that the following prerequisites are met:
- the main boom is completely disassembled,
- the upper pulley block **4.2** hangs in reeved condition above the ground level, see illustration **20**,
- the retaining pin **27** on the bracket of the lower pulley block **4.1** is unpinned on point **V**, see illustration **W**.

The upper pulley block **4.2** must be pinned with the lower pulley block **4.1** before the complete pulley block **4** can be placed in the transport receptacle on the D-pivot section.

▶ Slowly luff the D-boom down and spool up winch 3 at the same time until the upper pulley block **4.2** is connected with the guide pin **4.3** in the bracket to approx. 150 mm on the stop, point **A** of the lower pulley block **4.1**, see illustration **21** and illustration **W**.

▶ When the upper pulley block is approx. 150 mm before the stop of the lower pulley block **4.1**, point **A**:
Slowly and carefully luff the D-boom down until the upper pulley block **4.2** is in contact with the ground (point **U**), see illustration **22**.

NOTICE
Danger of property damage on the pulley block!
If the D-boom is luffed down too quickly, then significant property damage can occur on the upper as well as the lower pulley block!

▶ Always use a guide when connecting the upper and lower pulley block!
▶ Carry out all crane movements slowly and with utmost caution!
▶ When the guide pin **4.3** reaches the stop at point **A**, stop the luff down movement of the D-boom immediately!

▶ When the upper pulley block **4.2** is in contact with the ground at point **U**, illustration **22**:
Luff the D-boom down slowly and carefully until the guide pin **4.3** is entered to the stop at point **A**.

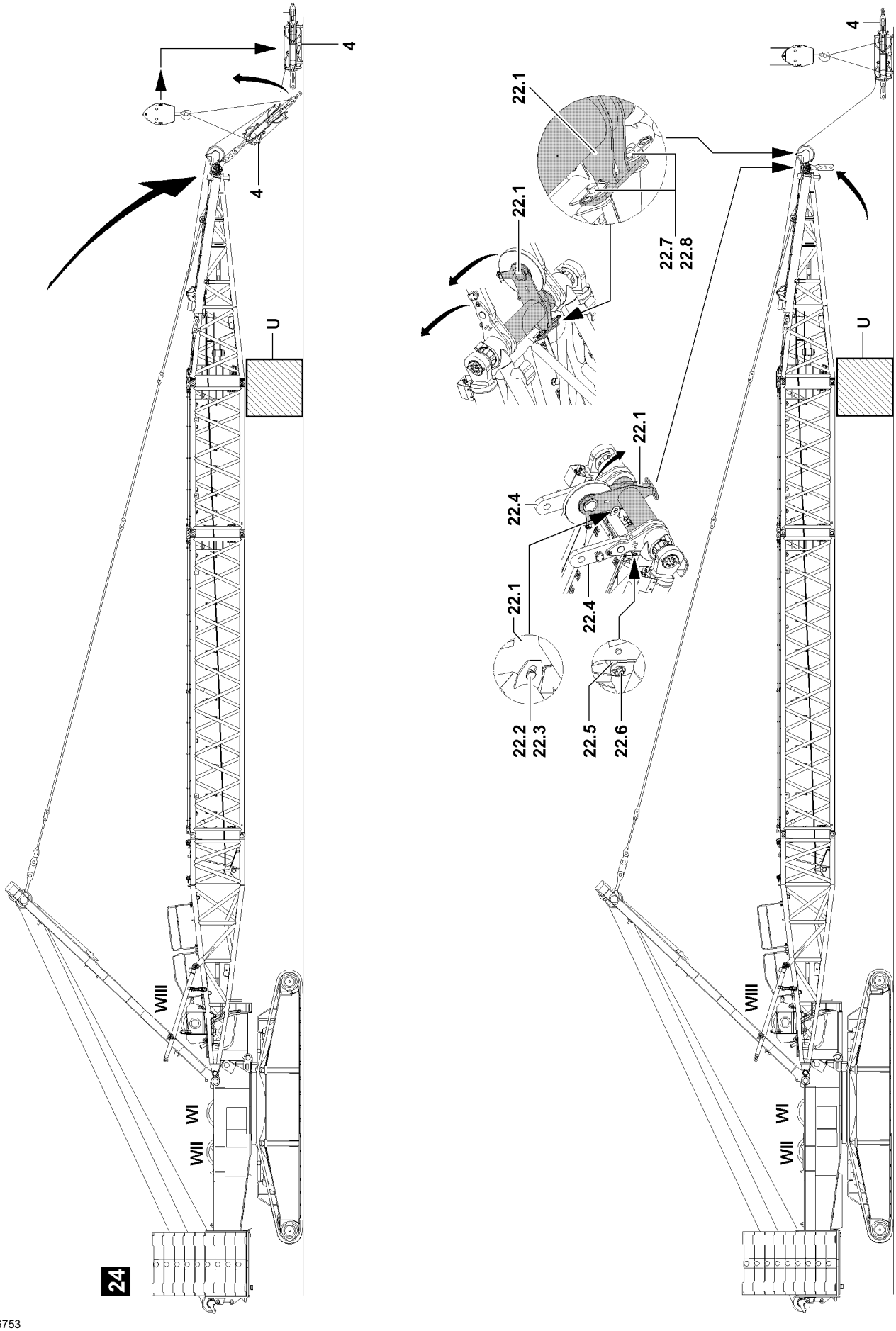
▶ When the guide pin **4.3** touches on stop point **A** of the lower pulley block **4.1**, illustration **X**:
Stop the luff down movement immediately.

▶ Pin in the retaining pins **27** on both sides on the bracket of the lower pulley block **4.1** at point **V** and secure with spring retainer **28**.

Result:
- The upper pulley block **4.2** is connected with the lower pulley block **4.1** and now forms the “transport unit” pulley block **4**, illustration **23**.

Before the pulley block **4** can be placed in the transport receptacle on the D-pivot section, the rope retaining pin **29**, see illustration **Y** and the rope retaining pin **31**, see illustration **Z** must be removed, illustration **23**.

▶ Remove the spring retainer **30** on the rope retaining pin **29**.
▶ Unpin the rope retaining pin **29**, illustration **Y**.
▶ Remove the spring retainer **32** on the rope retaining pin **31**.
▶ Unpin the rope retaining pin **31**, illustration **Z**.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3.1.3 Place the pulley block on the ground

NOTICE
Damage to the pulley block!
If the D-boom is placed on the support **U**, the pulley block can be damaged!
▶ Before placing the D-boom on the support **U**, lift the pulley block with the auxiliary crane off the ground!

▶ Attach the pulley block **4** on the auxiliary crane and lift it off the ground, see illustration **24**.
▶ Luff the D-boom down carefully to the support **U**.

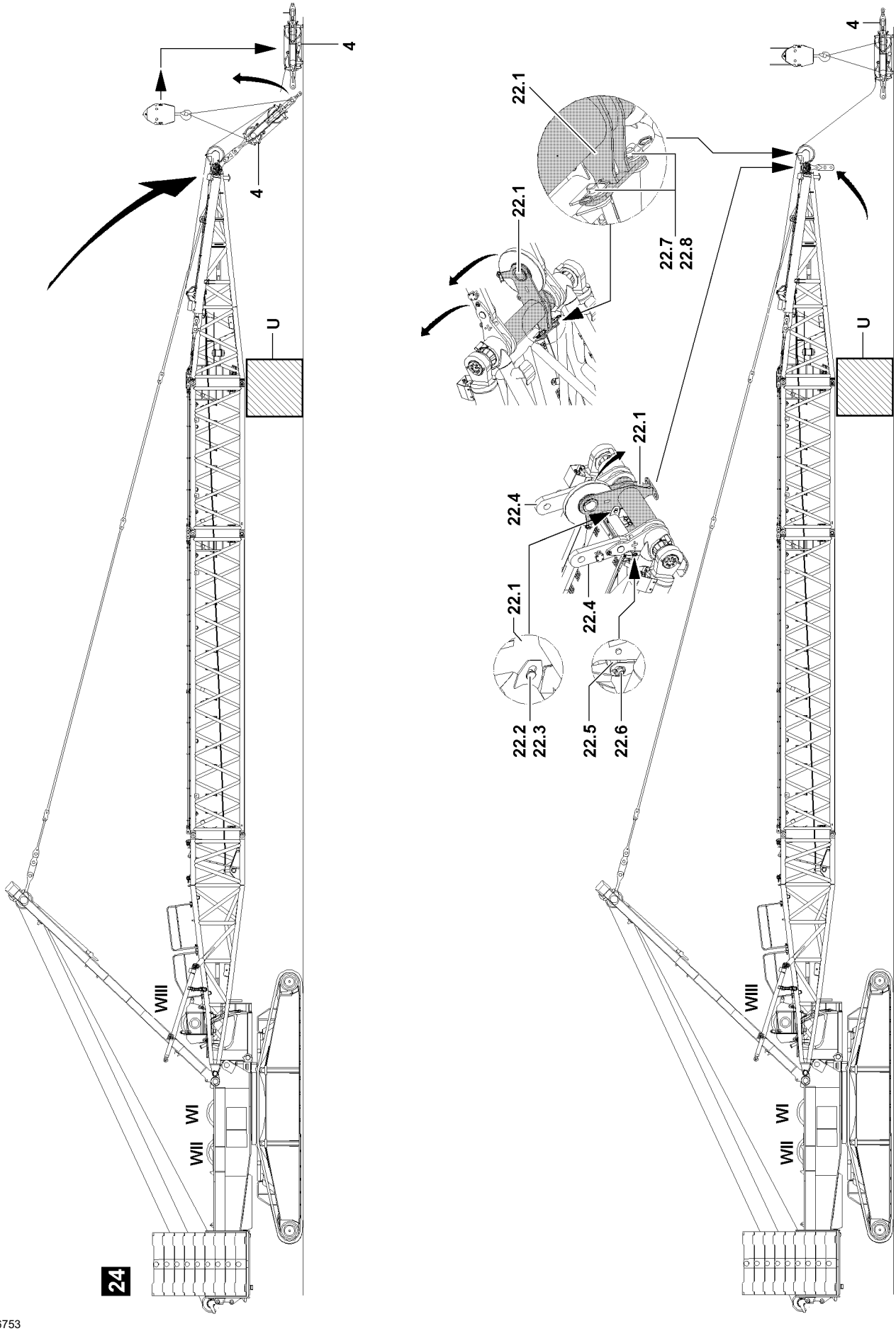
Disassemble the pulley block on the pull test brackets and place it on the ground in sufficient distance.
▶ Unpin the pulley block **4** on the pull test brackets **22.4**.
▶ Swing the pulley block **4** out with the auxiliary crane and spool winch 3 out at the same time.
▶ Place the pulley block **4** on the ground with the auxiliary crane.
▶ Remove the auxiliary crane.

3.1.4 Bring the pulley retainer into transport position

Make sure that the following prerequisites are met:
– the pulley block is disassembled on the D-end section and placed on the ground.

WARNING
Mortal danger due to pulley retainer!
If the pulley retainer is not secured with an auxiliary crane during the swing procedure, it can swing forward with a large momentum due to its weight!
Personnel can be severely injured or killed!
▶ Swing the pulley retainer into transport position only with the aid of an auxiliary crane!
▶ Swinging the pulley retainer without an auxiliary crane is **prohibited**!

▶ Unpin the pulley retainer **22.1** in operating position: Remove the spring retainer **22.8** and unpin the pin **22.7**, see illustration **Y**.
▶ Unpin the retaining pin **22.2** in transport position of the pulley retainer: Remove the spring retainer **22.3** and unpin the retaining pin **22.2**, see illustration **28**.
▶ Attach the pulley retainer **22.1** on the auxiliary crane.
▶ Swing the pulley retainer **22.1** upward with the auxiliary crane into transport position.
▶ When the pulley retainer **22.1** is in transport position:
Pin in the retaining pin **22.2** and secure with spring retainer **22.3**, see illustration **28**.
▶ When the pulley retainer **22.1** is pinned and secured in transport position:
Remove the auxiliary crane.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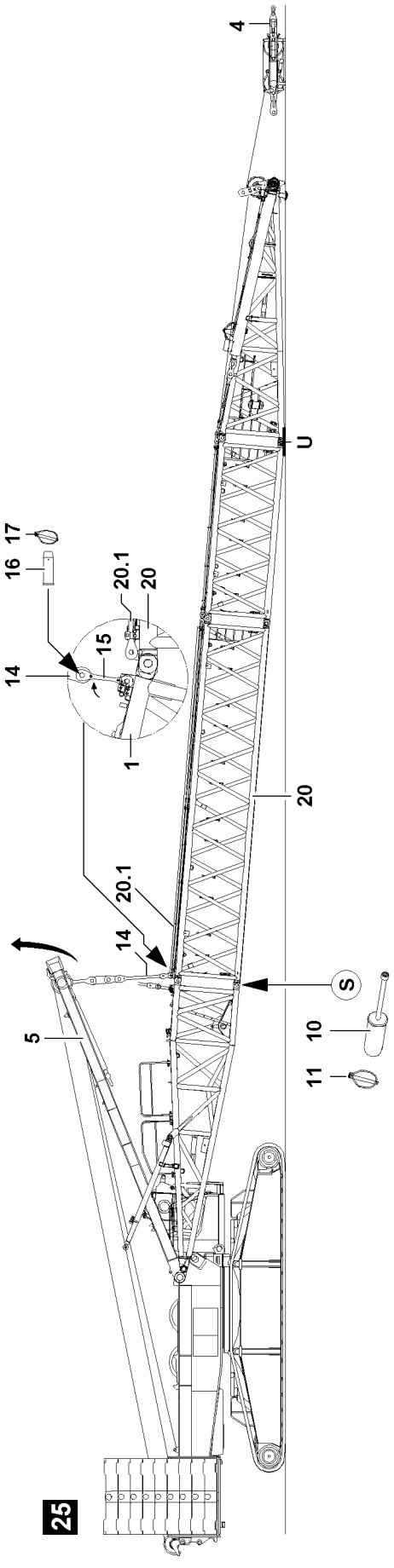
3.1.5 Bring the pull test brackets into transport position

WARNING
Danger of crushing!
If the pull test brackets are not secured with an auxiliary crane during the swing procedure, they can swing forward with a large momentum due to their weight and severely injure personnel!
Serious crushing injuries may be the result!
- ▶ Swing the pull test brackets into operating position only with the aid of an auxiliary crane!
- ▶ Swinging the pull test brackets without an auxiliary crane is prohibited!
- ▶ Bring the pull test brackets individually into transport position!

- ▶ Attach the pull test bracket onto the auxiliary crane.
- ▶ When the pull test bracket **22.4** is attached on the auxiliary crane:
  Tension the tackle carefully.
- ▶ Remove the linch pin **22.6** on the transport retainer and unpin the retaining pin **22.5**, see illustration **28**.
- ▶ Swing the pull test bracket **22.4** upward with the auxiliary crane into transport position.
- ▶ When the pull test bracket **22.4** is in transport position:
  Pin in the pin **22.5** in transport position and secure with linch pin **22.6**.
- ▶ When the pull test bracket **22.4** is pinned and secured in transport position:
  Remove the auxiliary crane.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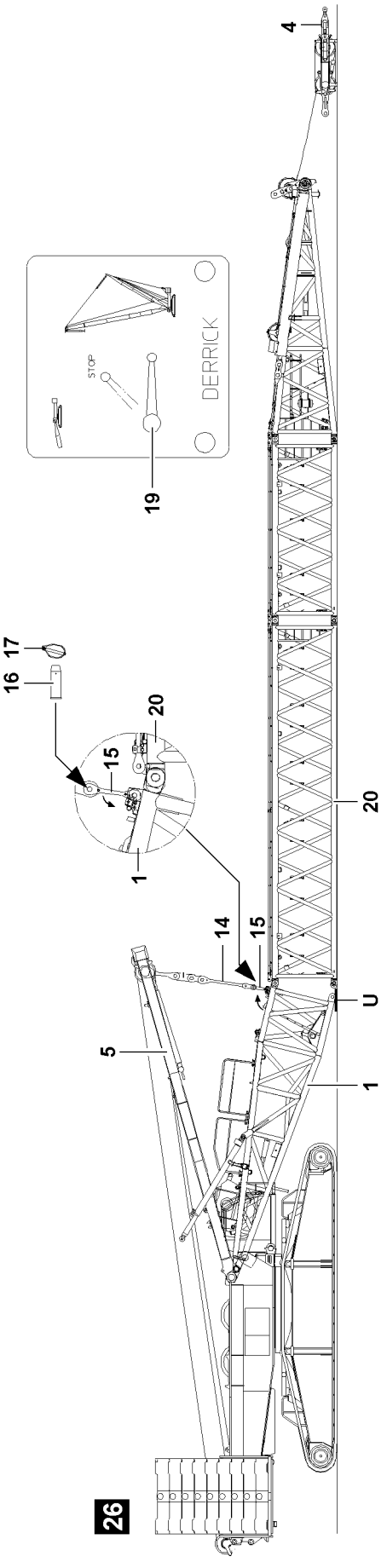
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3.1.6 Disassembling the D-guy rods

- ▶ Place the guy rods into the transport retainers of the D-intermediate sections: Lower the SA-frame to the front.
- ▶ Pin and secure the guy rods in the transport retainers.
- ▶ Unpin the guy rods **14** of the SA-frame and the guy rods **20.1** of the D-intermediate section: Remove the linch pin **17** and unpin the pin **16**.

3.1.7 “Open” the D-boom and place it down

Note

- ▶ For disassembly of the D-boom, the guying of the SA-frame **5** must be pinned with the lug **15** on the D-pivot section so that the D-boom can be lowered over the SA-frame on the support **U** and removed!

- ▶ When the boom guying between the guy rods **14** of the SA-frame and the guy rods **20.1** of the D-intermediate section **20** is unpinned:
  Pin the guy rods **14** of the SA-frame **5** and guy rods **15** of the D-pivot section **1**, pin in the pin **16** and secure with linch pin **17**, see illustration **25**.
- ▶ Luff the SA-frame **5** up until the guying between the SA-frame and the D-pivot section **20** is tensioned.

WARNING
Falling D-boom!
When unpinning the D-boom on the D-pivot section, the D-boom can fall down!
Personnel can be killed or severely injured!

- ▶ It is prohibited for anyone to remain under the D-boom during the unpinning procedure!
- ▶ Make sure that the D-boom is safely held by the guying!

- ▶ Unpin the D-pivot section **1** on the D-intermediate section **20**: Release pins **10** on both sides at point **S** and unpin.
- ▶ When the pins **10** are unpinned on both sides at point **S**:
  Luff the SA-frame down and place the D-boom on the ground, see illustration **26**.
- ▶ Luff the SA-frame down until the guying is relieved.
- ▶ Unpin the guying: Release and unpin the pin **16**.
- ▶ Luff the SA-frame up to approx. 75 to 80°.

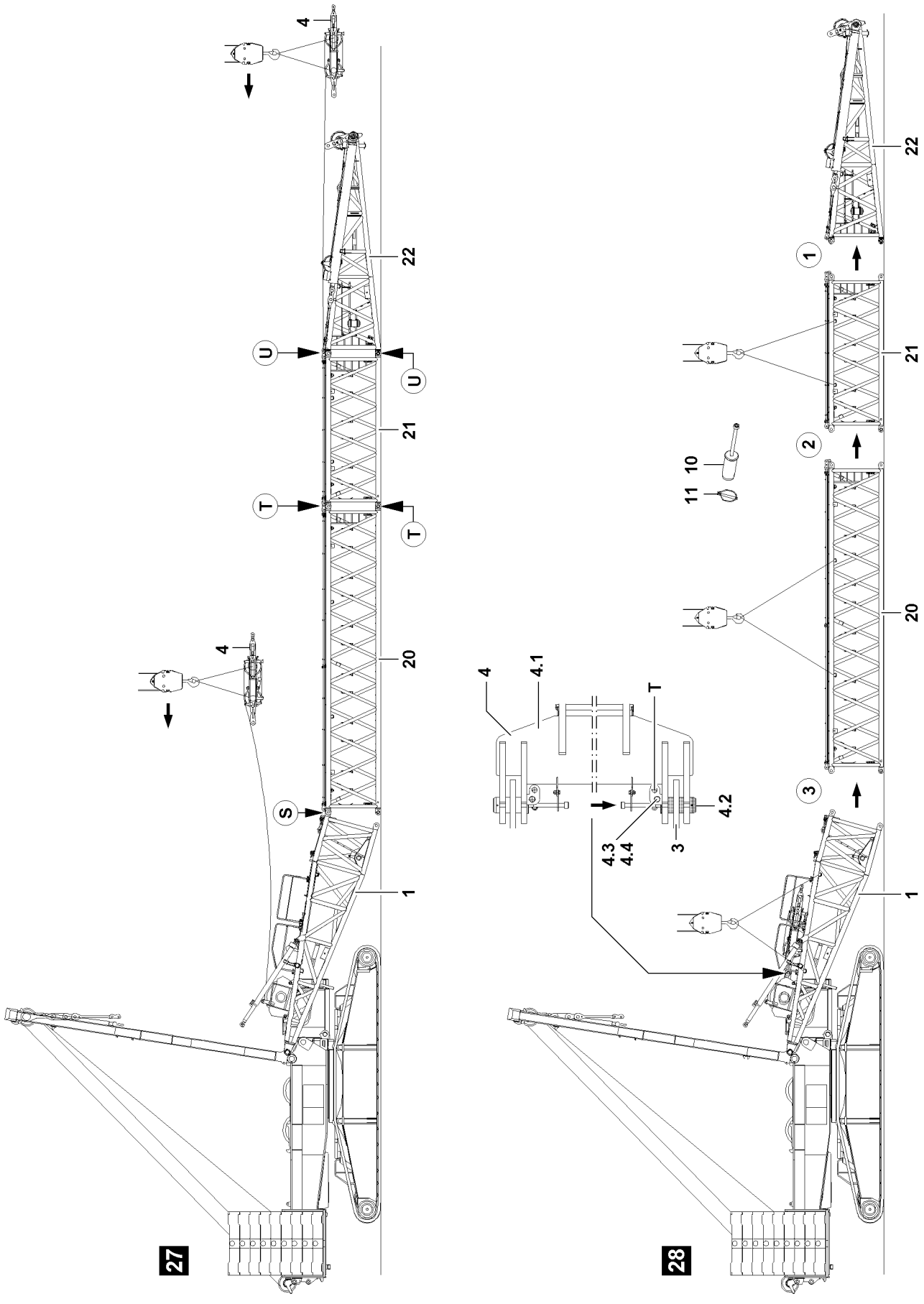
3.1.8 Retract the D-relapse cylinder

The piston rod on the D-relapse cylinder must be retracted by actuating the ball cock **19**.

- ▶ Move the ball cock **19** into vertical position.

Result:

– The piston rod of the D-relapse cylinder retracts.



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3.1.9 Place the pulley block into the transport retainer on the D-pivot section

Make sure that the following prerequisites are met:
- the lower and the upper pulley block are pinned together as a “transport unit” pulley block **4**,
- the rope retaining pins on the D-end section are released and unpinned,
- the guy rods are placed in the transport retainers and secured,
- the SA-frame is luffed up to approx. 75 to 80°,
- the D-boom is laying fully on the ground (on the support).

▶ Attach the pulley block **4** onto the auxiliary crane.
▶ Tension the tackle between the pulley block and the hook block of the auxiliary crane.

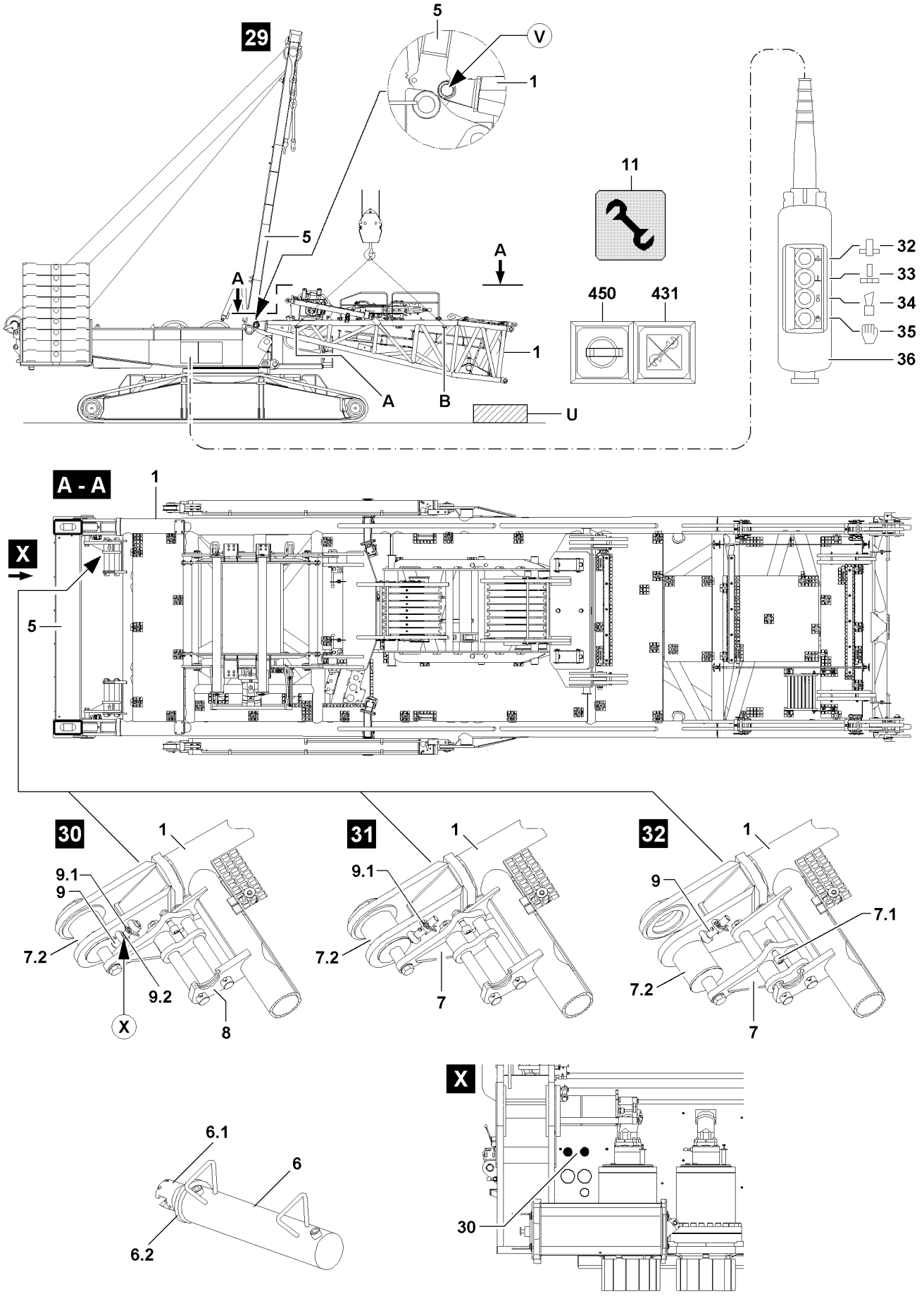
NOTICE
Ropes may become slack!
▶ Hold the control rope of winch 3 always slightly tensioned!

▶ Pull the pulley block **4** with the auxiliary crane to the D-pivot section while spooling out winch 3 at the same time.
▶ Place the pulley block **4** into the transport retainer on the D-pivot section.
▶ Pin and secure the pulley block **4** in the transport retainer on the D-pivot section with winch **3**: Pin in the pin **4.2** and secure with retaining pin **4.3** and spring retainer **4.4**.

3.1.10 Disassembling the D-lattice components

WARNING
Tipping lattice sections!
When the lattice sections are unpinned, they can tip over, depending on the ground or the support!
Personnel can be severely injured or killed!
▶ The lattice sections must be safely held by the auxiliary crane before unpinning them!
▶ The tackle must be tensioned before unpinning!

Release and unpin the pin **11** “at the bottom” at point **U**.
▶ Remove the linch pin **11** “on the bottom” at point **U** on pin **10**.
▶ Unpin the pin **10** “at the bottom” at point **U**.
▶ Hang the D-end section on the auxiliary crane.
▶ When the D-end section is being held by the auxiliary crane:
Release and unpin the pin **10** “on top” at point **U**.
▶ Remove the D-end section with the auxiliary crane.
▶ Attach the D-intermediate section **21** on the auxiliary crane.
▶ Release and unpin the D-intermediate section **21** on the “bottom” at point **T**.
▶ Release and unpin the D-intermediate section **21** on the “top” at point **T**.
▶ Remove the D-intermediate section **21** with the auxiliary crane.
▶ Attach the D-intermediate section **20** on the auxiliary crane.
▶ Release and unpin the D-intermediate section **20** on the “top” at point **S**.
▶ Remove the D-intermediate section **20** with the auxiliary crane.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- ▶ Attach the D-pivot section **1** on the attachment points **A** and attachment points **B** on the auxiliary crane.
- ▶ Lift the D-pivot section **1** with the auxiliary crane off the ground.
- ▶ Hang the pin pulling cylinder **6** in the cylinder mount **8**, see illustration **30**.
- ▶ Release the connector pin **7.2**: Remove the spring retainer **9.1** and push retaining pin **9** “up”.
- ▶ Secure the retaining pin **9** in the “up” position: Use the spring retainer **9.1**, see illustration **31**.

Establish the hydraulic connection to the pin pulling device via two quick couplers **30**, see illustration **X**.
Unpin the D-pivot section on the turntable.

- ▶ Unpin the connector pins **7.2** with the hydraulic pin pulling device.
- ▶ Unpin the connector pins **7.2** on both sides with the hydraulic pin pulling cylinder **6**: Press the button **35** on the control panel **36** and “hold it down”, then press the button **33** until the connector pin **7.2** is fully unpinned.
- ▶ When the connector pins **7.2** are fully unpinned on both sides:
  Release the electrical and hydraulic connections from the turntable to the D-pivot section.
- ▶ Remove the pin pulling cylinder **6** on the D-pivot section **1**.
- ▶ Remove the D-pivot section with the auxiliary crane.

3.1.11 Disassembling the railing on the D-pivot section

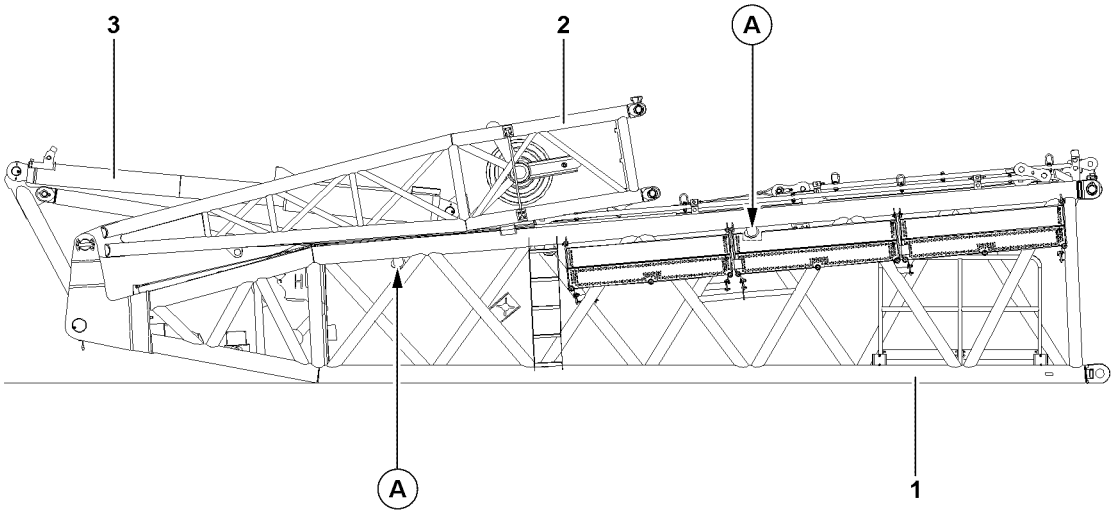
Note

- ▶ To retain the transport dimensions on the D-pivot section, remove the railings!

The railings must be removed after disassembly of the D-pivot section and stored in the transport retainer.

- ▶ Insert the railings in the intended transport retainers on the D-pivot section and secure with spring retainers.

T1



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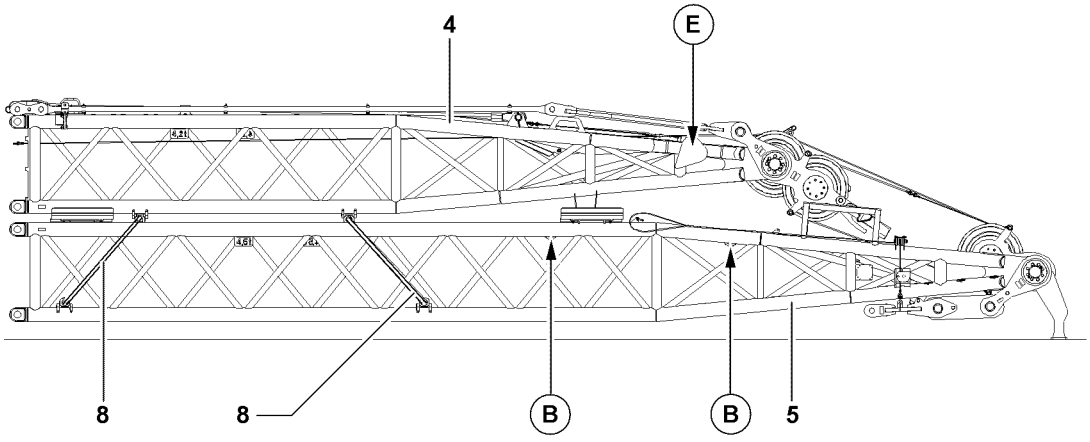
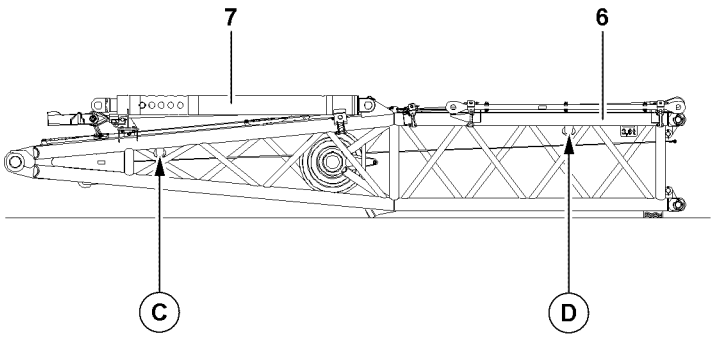


T3



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1 Component overview W-boom system

The transport unit **T1** consists of:
– W-pivot section **1**
– WA-frame 1, pivot section **2**
– W-relapse retainer **3**

The transport unit **T2** consists of:
– WA-frame 2, end section **4**
– WA-frame 1, end section **5**
– Lashing straps **8**

The transport unit **T3** consists of:
– WA-frame 2, pivot section **6**
– Relapse support **7**

Position	Component	Weight
T1	Transport unit 1	12 t
T2	Transport unit 2	8.7 t
T3	Transport unit 3	3.6 t

2 Attachment points W-transport units

Attachment points	
A	For transport unit 1
B	For transport unit 2
C / D	For transport unit 3
E	For WA-frame 2

B195219

3 Assembling the W-boom system

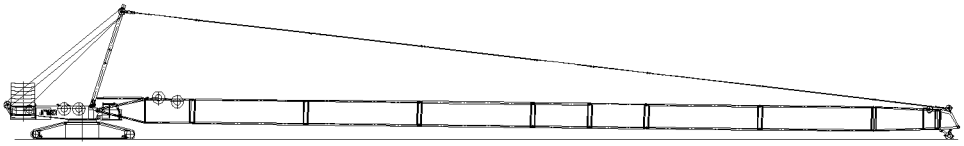
WARNING
Risk of falling!
During assembly and disassembly work, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.
- ▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (see chapter 2.04) to protect against falling! The personal protective equipment must be attached in the corresponding attachment points on the crane (see chapter 2.06).
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly, inspection and maintenance work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free of snow and ice!

WARNING
Falling components!
If unsecured or non-supported components are assembled or disassembled, they can fall down. Personnel can be killed or seriously injured.
- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
- ▶ Support the boom and components before pinning / unpinning!
- ▶ Both pins that lie in at a horizontal level, i.e. **left** and **right**, pin or unpin!
- ▶ Secure the pins in the bearing points and in the receptacles!
- ▶ Do not disengage the auxiliary crane until each component is pinned on and secured!
- ▶ It is prohibited to lean a ladder against the component being disassembled!

WARNING
Danger of crushing!
Components can swing during assembling. Hands can be crushed or severed.
- ▶ Make sure that the components do not swing back and forth during assembly!

WARNING
Neglectful inspection and maintenance on guy rods!
If the regular inspection and maintenance of the guy rods is not carried out or is carried out only in irregular intervals, then severe accidents can occur due to existing and unrecognized damage to the guy rods!
Personnel can be severely injured or killed!
- ▶ Check the guy rods before every assembly, see chapter 8.15.

1



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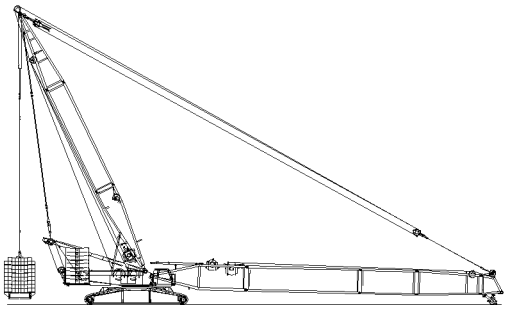

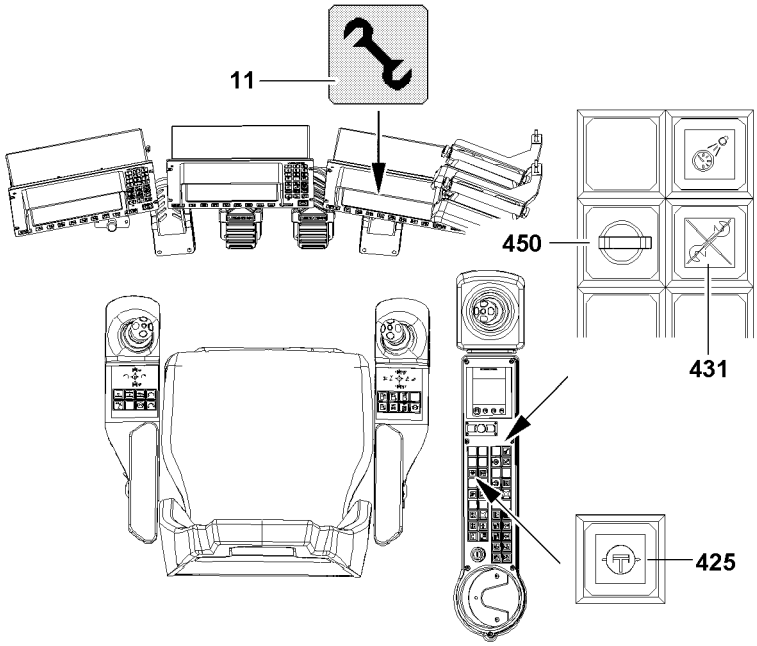

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Note
- By supporting the components during assembly / disassembly, ground unevenness is compensated for and the material is protected.

Note
- The W-intermediate sections are pinned and unpinned with the aid of the pin pulling device, see chapter 5.30.

NOTICE
Property damage!
- Always pin the guy rods from the “inside” to the “outside”.

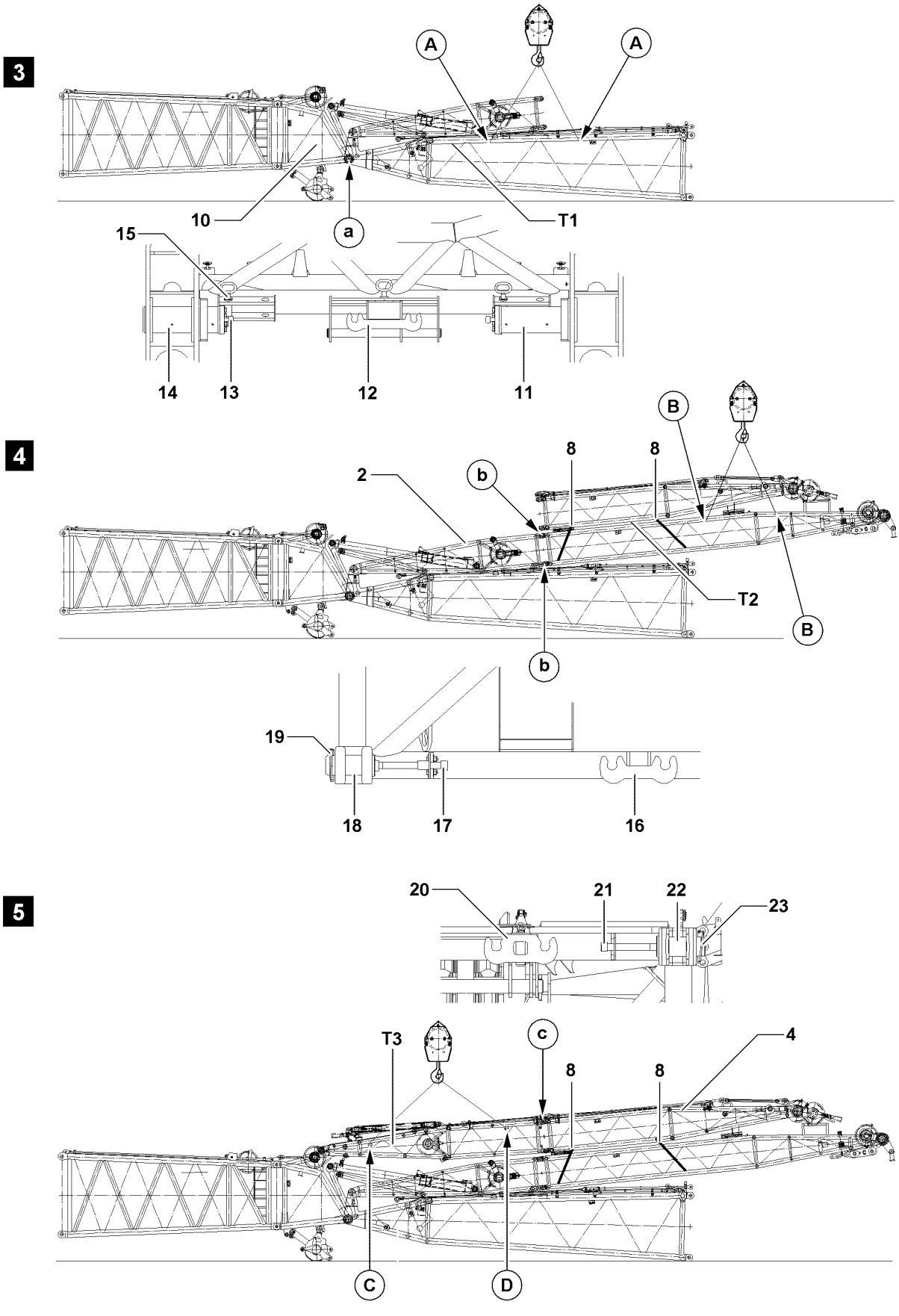
Note
- The S-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

Note
- The boom combinations must be assembled according to the separately supplied rod and assembly plans!

The W-boom system can be assembled on the following ground configurations:
– S-operation, see illustration **1**.
– SDB-operation, see illustration **2**.

DANGER
Risk of fatal injury in crane operation with enabled assembly key button.
- The actuation of the assembly key button **450** is only permitted for assembly tasks!
- The assembly key button may only be operated by persons who are aware of the consequences of a bypass!
- If the assembly key button **450** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- Crane operation with the assembly key button **450** turned on is strictly prohibited!
- The assembly key **450** must be removed immediately after carrying out the assembly work and handed to an authorized person!

Make sure that the following prerequisites are met:
– the crane is aligned in horizontal direction,
– the S-boom is assembled,
– in SDWB operation: derrick boom and derrick ballast are assembled,
– the W-connector head is assembled on the S-boom,
– the counterweight is installed on the turntable and on the derrick according to the load chart,
– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is pressed and the indicator light **431** lights up,
– the assembly icon **11** on the LICCON monitor blinks,
– an auxiliary crane is available.


3
A
A
10
a
T1
15
14
13
12
11
4
B
8
8
2
b
T2
B
b
19
18
17
16
5
20
21
22
23
T3
c
8
8
4
C
D

B107237

3.1 Assemble W-transport units

3.1.1 Assemble W-transport unit 1

See illustration **3**.

- ▶ Attach the auxiliary crane on the attachment points **A** on the transport unit **T1**.
- ▶ Hang the pin pulling cylinder on the retainer **12** and on the screw **13**.
- ▶ Make sure that the connecting pin **15** is removed.

Result:

– Pin **14** is released and can be pinned in.

- ▶ Pin transport unit **T1** on the point **a** both sides on the W-connector head **10** with pin **14** and secure with connecting pin **15**.

3.1.2 Assemble W-transport unit 2

See illustration **4**.

Ensure that the following prerequisite is met:

– the lashing straps are tightly secured on transport unit 2.

WARNING

Component sliding under!

If the lashing strips are not present or insufficiently tightly secured while raising transport unit 2, the end-section of WA-frame 2 can slide under. Personnel can be severely injured or killed!

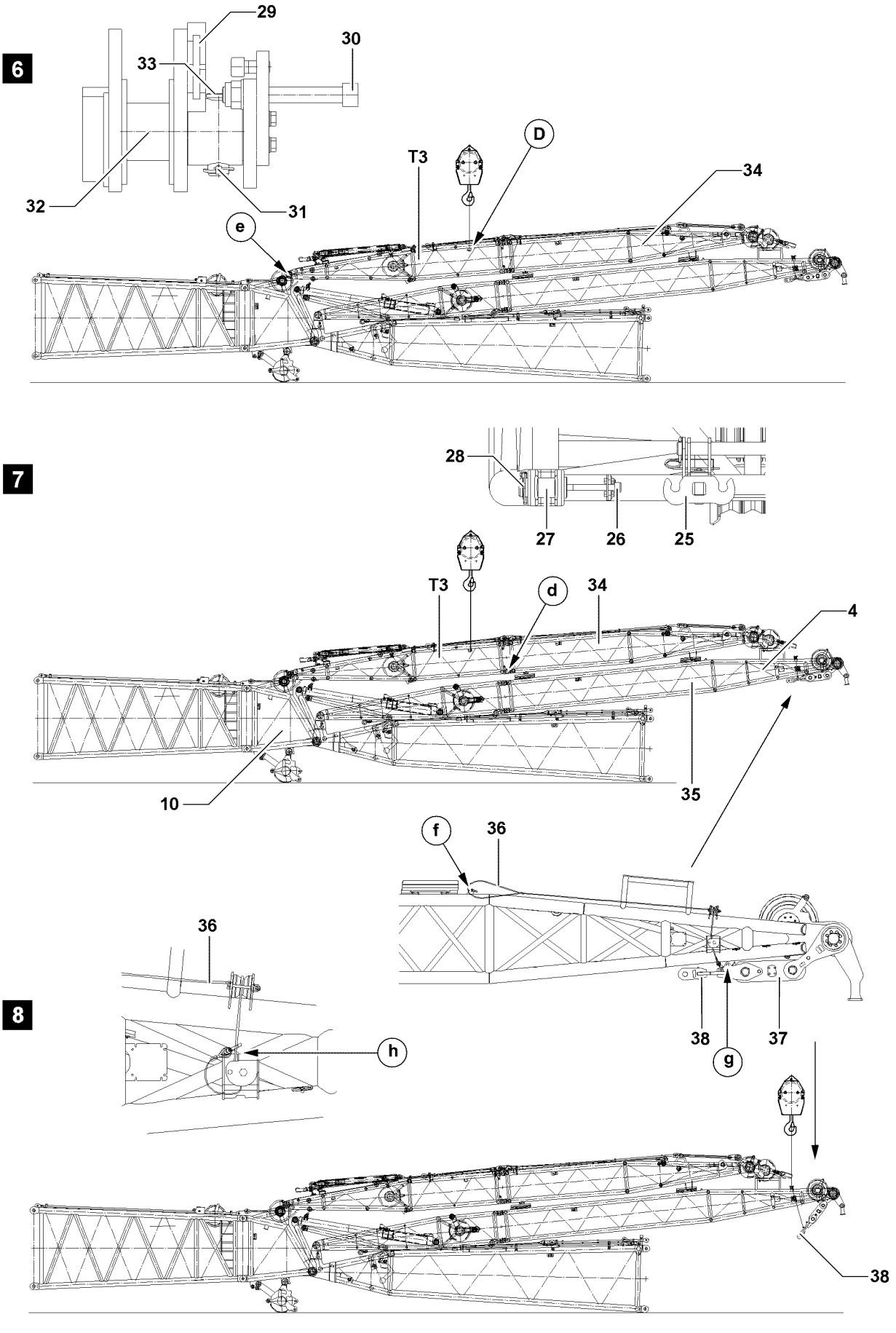
- ▶ Make sure that the lashing strips **8** on the transport unit **T2** are tightly secured.

- ▶ Attach the auxiliary crane on the attachment points **B** on the transport unit **T2**.
- ▶ Hang the pin pulling cylinder on the retainer **16** and on the screw **17**.
- ▶ Pin transport unit **T2** on the WA-frame 1 pivot section **2** on both sides at the points **b** with pins **18** and secure with linchpins **19**.

3.1.3 Assemble W-transport unit 3

See illustration **5**.

- ▶ Attach the auxiliary crane on the attachment points **C** on the transport unit **T3**.
- ▶ Hang the pin pulling cylinder on the retainer **20** and on the screw **21**.
- ▶ Pin transport unit **T3** on the WA-frame 2 end section **4** on both sides at the points **c** with pins **22** and secure with linchpins **23**.
- ▶ Remove lashing strips **8** on the transport unit **T2**.


6
29
30
33
32
31
T3
D
34
e
7
28
27
26
25
T3
d
34
4
10
35
f
36
36
h
38
37
g
38
B107238

3.1.4 Pin W-transport units with one another

See illustration **6**.

▶ Attach the auxiliary crane on the attachment points **D** on the transport unit **T3**.

The pinning position between the transport unit and the W-connector head is established through:

– Luffing up or luffing down the S-boom.
– Positioning of WA-frame 2 **15** with auxiliary crane.

▶ Position WA-Bock 2 **34** until the pin points **e** align.
▶ Make sure that the pin **33** is removed.
▶ Hang the pin pulling cylinder on the retainer **29** and on the screw **30**.
▶ Pin transport unit **T3** and W-connector head **10** on both sides on the point **e** with pins **32** and secure pins **33** and linchpins **31**.

See illustration **7**.

▶ Lift transport unit **T3** with auxiliary crane until the pin points **d** align.
▶ Hang the pin pulling cylinder on the retainer **25** and on the screw **26**.
▶ Pin transport unit **T3** on the WA-frame 2 end section **5** on both sides at the points **d** with pins **27** and secure with linchpins **28**.
▶ Release both sides of rope **36** on the point **f** and hang auxiliary crane.

WARNING
Components folding downward!
If the unsecured cross brace unpins, these will fold downward. Personnel can be severely injured or killed!
▶ Secure the cross brace **38** with the auxiliary crane.

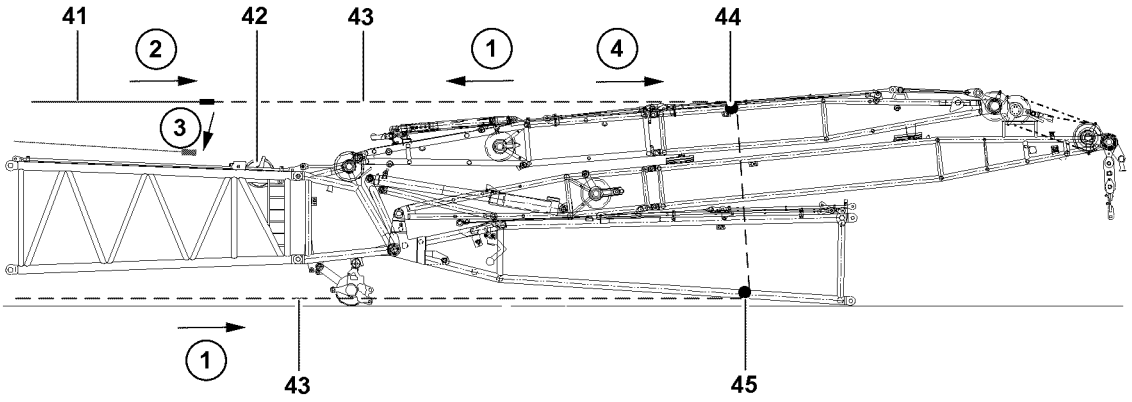
Note
▶ The cross brace **38** may more easily be unpinned, if it is raised with the auxiliary crane.

▶ Unpin cross brace **38** on the point **g**.

See illustration **8**.

▶ Release cross brace **38** and lower with auxiliary crane.
▶ Release rope **36** on cross brace **38**.
▶ Secure rope **36** on both sides in park position point **f** and secure point **h**.

9



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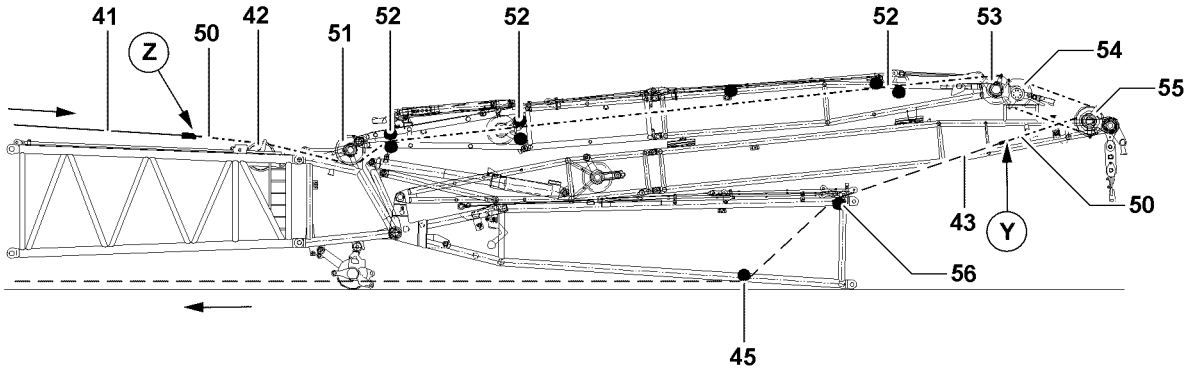

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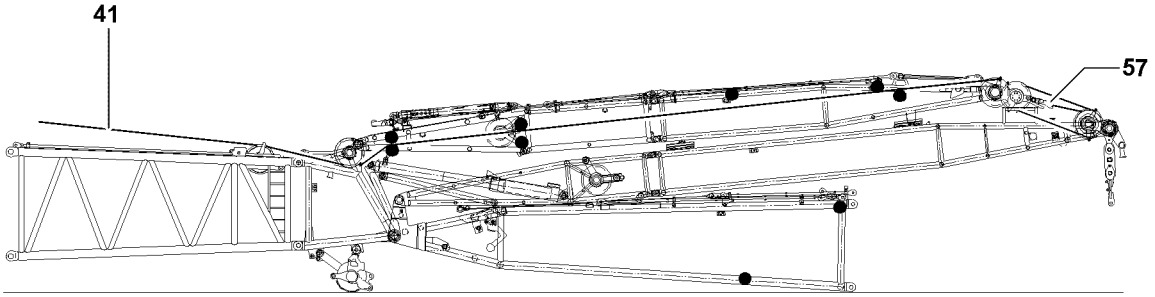

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3.2 Reeve the W-adjusting rope in

NOTICE
Ropes may become slack!
The adjusting rope can become damaged due to slack rope formation.
- ▶ Do not allow slack rope formation when unreeling the W-adjusting rope!
- ▶ Maintain a tight W-adjusting rope when unreeling!

Note
- ▶ The reeving plans may be derived from the separately supplied drawings!

Ensure that the following prerequisite is met:
– rope pulley **42** is pinned and secured in operating position.

3.2.1 Get adjusting rope with assembly rope

Rope run for the assembly rope **43**, see illustration **9**.
- ▶ Pull assembly rope **43** for the assembly winch over the roller **45** and the roller **44** up to winch V, action step **1**.
- ▶ Connect the assembly rope **43** with the W-control rope **41** from winch V.
- ▶ Pull W-adjusting rope **41** up to the cable pulley **42** on the S-boom: Spool up assembly winch and simultaneously spool winch V out, action step **2**.
- ▶ Separate W-adjusting rope **41** from assembly rope **43** and lay down before the cable pulley **42**, action step **3**.
- ▶ Pull assembly rope **43** back up to the roller **45** and lay on the ground, action step **4**.

3.2.2 Reeve the W-adjusting rope in

Make sure that the following prerequisites are met:
– intake ropes are bound to one another on the WA-frame 2,
– intake role is reeved in on the W-roller sets.

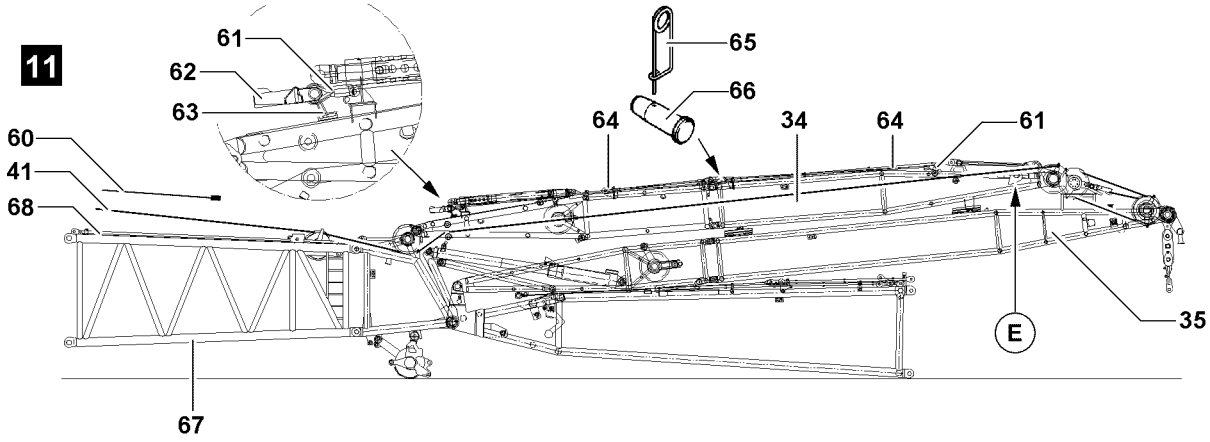
Note
- ▶ Before reeving in the W-adjusting rope, the rope retaining pins of rope pulley **42**, rope pulley **51**, rope pulley **53**, pulley set **54** and pulley set **55** must be released and unpinned.

Note
- ▶ For easing the reeving, the W-cable pulleys are raised with an auxiliary crane.

Rope run for the intake rope **50** and the assembly rope **43**, see illustration **10**.
- ▶ Connect W-adjusting rope **41** and intake rope **50** on the point **Z**.
- ▶ Ensure that the intake rope **50** runs between the rollers **52**.
- ▶ Lay intake rope **50** on rope pulley **42** and rope pulley **51**.
- ▶ Pull assembly rope **43** over roller **56** to the point **Y**.
- ▶ Connect assembly rope **43** and intake rope **50** on the point **Y**.

See illustration **11**.
- ▶ Pull in W-adjusting rope **41** and hang on rope fixed point **57**.
- ▶ Spool assembly rope **43** on the assembly winch.

11



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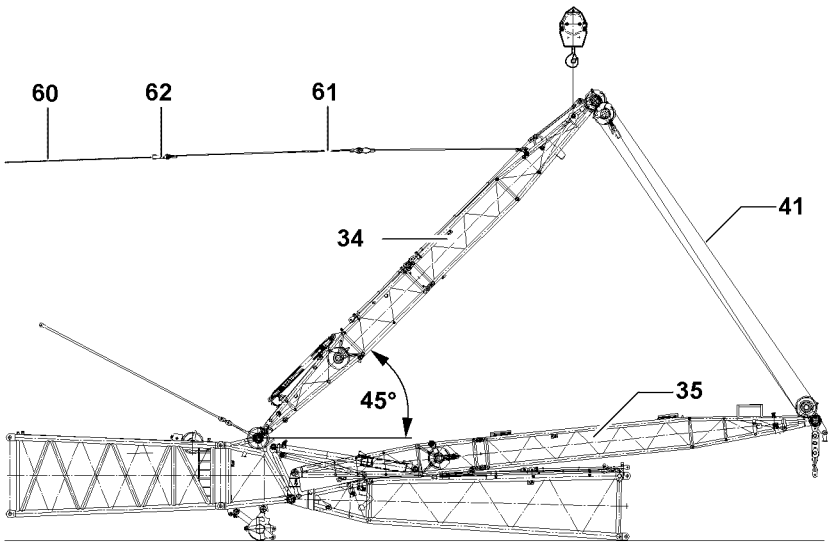

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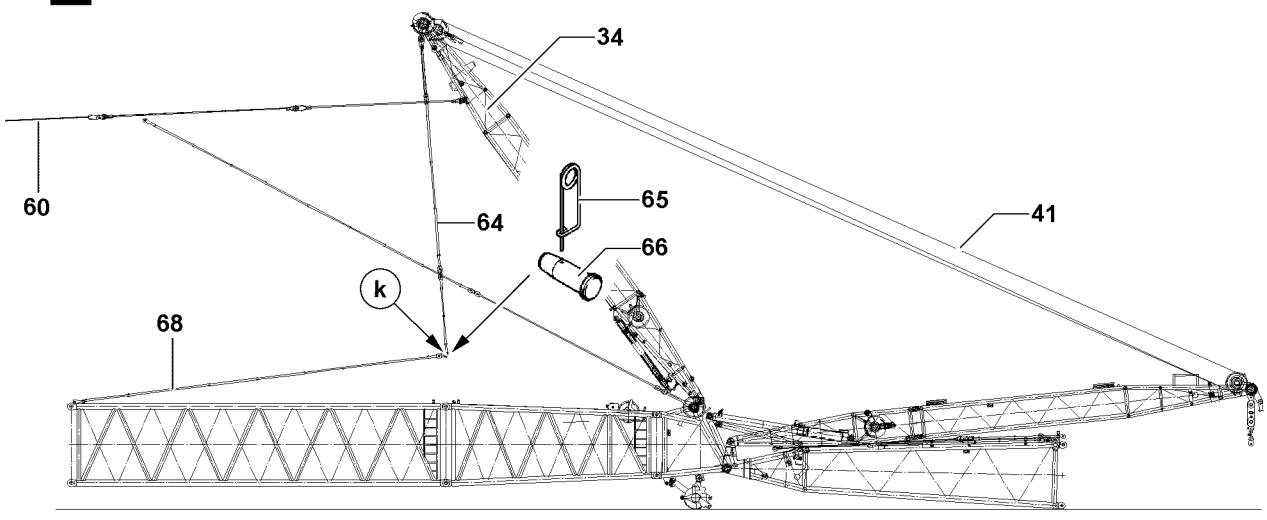

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3.3 Assembling WA-frame 2 guy rods

NOTICE
Property damage!
▶ Always pin the guy rods from the “inside” to the “outside”.

Ensure that the following prerequisite is met:
– the WA-frame 2 **34** is laying on the WA-frame 1 **35**.

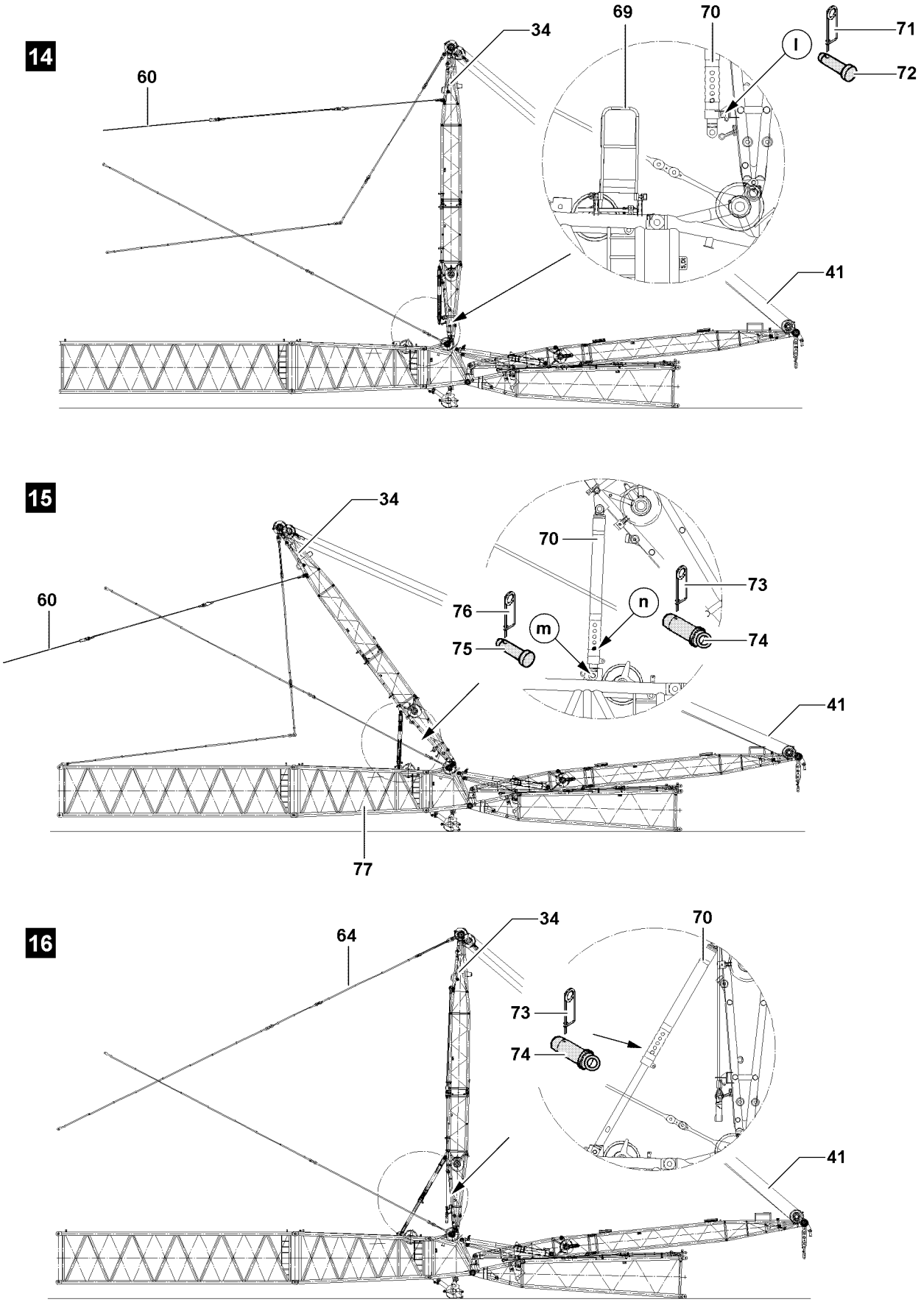
See illustration **11**.
▶ Release and unpin transport restraints of the W-guy rods **68** on the S-lattice sections **67**.
▶ Release and unpin transport restraints for the W-guy rods **64** on the WA-frame 2 **34**.
▶ Pin W-guy rods **64** on the WA-frame 2 **34** on both sides from the “inside” to the “outside” with pins **66** and secure with spring retainers **65**.
▶ Loosen fixing **63** for the assembly rope **61** on WA-frame 2 **34**.
▶ Hang hoist rope **60** in the hook block **62** on the assembly rope **61**.
▶ Attach auxiliary crane to attachment points **E**.

See illustration **12**.

Note
▶ While spooling out the W-control rope, lightly lift up WA-frame 1 **35** in order to prevent slack rope formation.

▶ Spool out W-adjusting rope **41** and simultaneously lift WA-frame 2 **34** with auxiliary crane approximately 45°.
▶ Tension the hoist rope **60** until WA-frame 2 **34** is held by the hoist rope.
▶ Remove the auxiliary crane.

See illustration **13**.
▶ Spool out W-adjusting rope **41** and simultaneously pull WA-frame 2 **34** backward with hoist rope **60**.
▶ Pin W-guy rods **64** on both sides in the point **k** from the “inside” to the “outside” with pins **66** and secure with spring retainers **65**.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71
l
72
60
41
15
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70
73
n
76
m
74
75
60
41
77
16
64
34
70
73
74
41

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3.4 Pin relapse support

See illustration **14**.

▶ Erect WA-frame 2 **34** vertically: Spool up W-adjusting rope **41** and simultaneously spool out hoist rope **60**.

WARNING
Risk of falling!
If the fold platforms **69** on the SL-reducer section is not used, personnel can fall down and be severely injured or killed.

▶ Pinning of the relapse supports by the folding platforms is carried out on the SL-reducer section.

WARNING
Uncontrolled swinging of the relapse supports!
If the relapse supports are unpinned without the WA-frame 2 standing vertically, the relapse supports can swing without control. Personnel can be severely injured or killed!

▶ Unpin relapse supports **70** after the WA-frame 2 **34** is erected vertically.

▶ Unpin relapse supports **70** on the point **l**: Remove the spring retainer **71** and unpin the connecting pins **72**.

See illustration **15**.

▶ Spool out W-adjusting rope **41** and simultaneously pull back WA-frame 2 **34** with the hoist rope **60** until the relapse supports **70** on the point **m** on the SL-reducer section **77** can be pinned.

▶ Unpin relapse supports **70** on the point **m**: Pins **75** should be pinned on both sides and secured with spring retainers **76**.

NOTICE
WA-frame 2 damage!
If the connecting pin is not unpinned before erection of WA-frame 2, the WA-frame 2 can be damaged.

▶ Unpin connecting pin **74** before erection of WA-frame 2 **34**.

▶ Remove the spring retainer **73** and unpin the connector pins **74** on the point **n**.

See illustration **16**.

▶ Erect WA-frame 2 **34** until the guy rods **64** tension: Spool up the W-adjusting rope **41**.

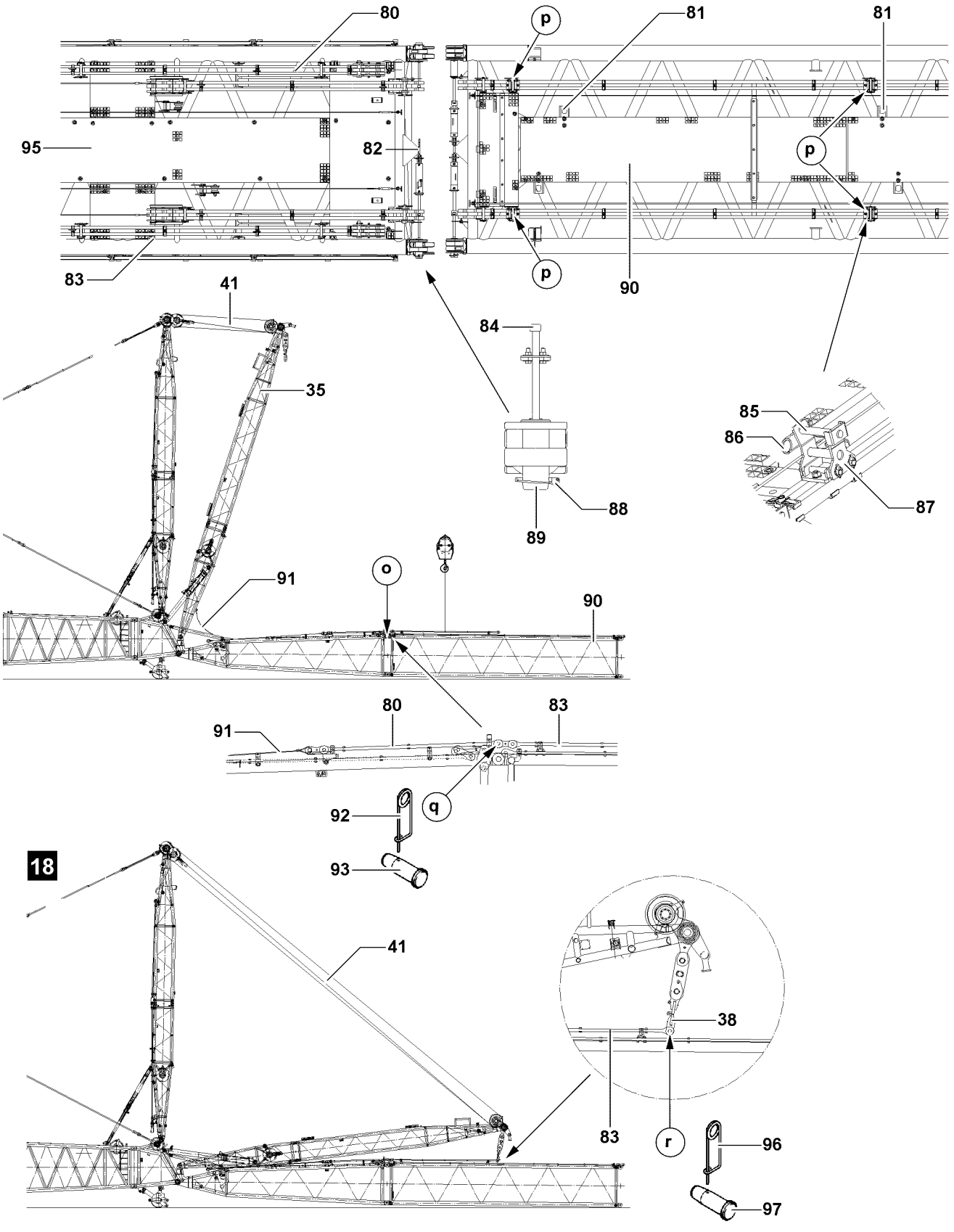
▶ Luff up WA-frame 1 **35** until the limit switch switches off the movement.

Result:

– Relapse supports are completely tensioned.

▶ Insert relapse supports **70** in maximum possible length with connecting pins **74** and secure with spring retainers **73**.

17



18

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3.5 Assembling the W-lattice jib

Note

▶ Adhere to the pin sequence described in chapter 5.01 during the assembly of the W-lattice jib!

3.5.1 Assembly the W-lattice section

See illustration **17**.

▶ Erect WA-frame 1 **35**: Spool up the W-adjusting rope **41**.

▶ Hang the pin pulling cylinder on the retainer **82** and on the screw **84**.

▶ Pin LI-intermediate section **90** both sides on the point **o** with pins **89** and secure with linchpins **88**.

▶ Remove transport retainers from guy rods **80** and guy rods **83**.

▶ Remove receptacle **87** from the parking position **81** and assemble points **p**.

▶ Remove spring retainer **86** and pins **85**.

Result:

– Guy rods **83** can be placed on the LI-intermediate section **90**.

▶ Lay guy rods **83** both sides with the auxiliary crane receptacle **87** on the LI-intermediate section **90**.

▶ Pin guy rods **80** and guy rods **83** both sides on the point **q** from “the inside” to the “outside” with pins **93** and secure spring retainers **92**.

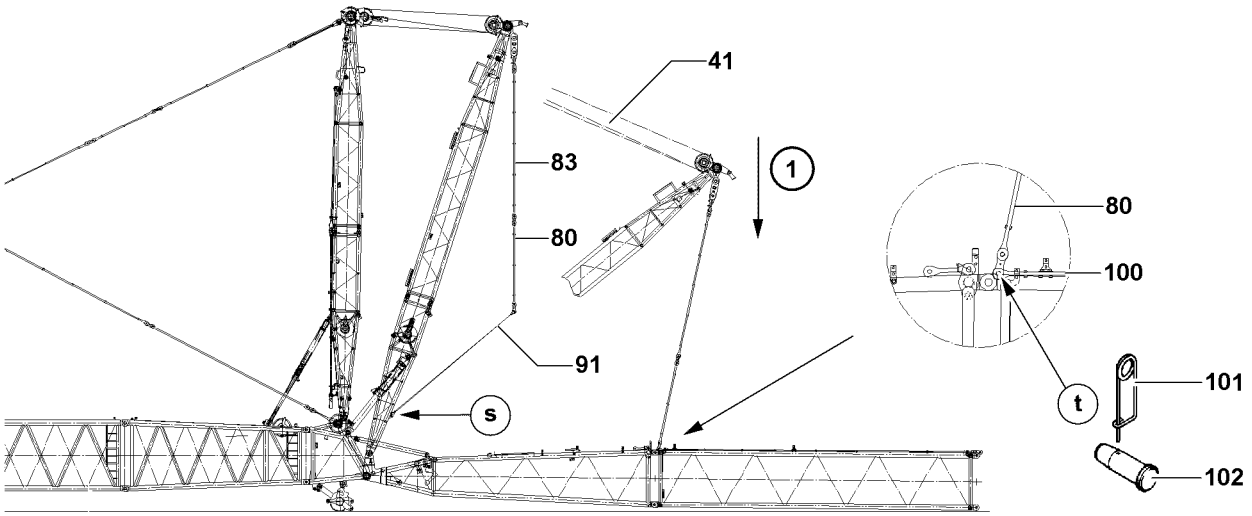
▶ Ensure that WA-frame 1 **35** and the guy rods **80** are bound with the assembly ropes **91**.

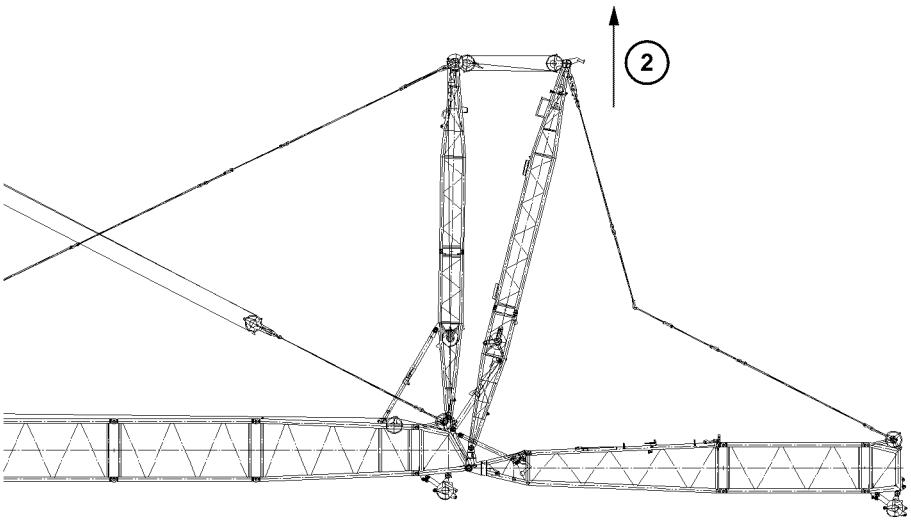
See illustration **18**.

▶ Put down WA-frame 1 **35** until cross brace **38** can be pinned with guy rods: Spool out W-adjusting rope **41**.

▶ Pin cross brace **38** and guy rods **83** both sides on the point **r** from “the inside” to the “outside” with pins **97** and secure spring retainers **96**.

19





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See illustration **19**.

- ▶ Erect WA-frame 1 **35** until assembly rope **91** on the point **s** can be hanged out: Spool up the W-adjusting rope **41**.
- ▶ Hang out assembly rope **91** on the point **s**.
- ▶ Disengage WA-frame 1 **35** until assembly rope **91** on the point **t** can be hung out.

Ensure that the following prerequisite is met:

– the SW-end section has been placed in the pulley cart at assembly of the W-lattice jib, see chapter 5.15.

Note

- ▶ The air pressure in the tires of the pulley cart must be 9 bar.

WARNING

Falling components!

If the intermediate sections are incompletely pinned, then components can fall down. Personnel can be severely injured or killed!

- ▶ Make sure that all components of the boom are completely pinned and secured.

- ▶ Assemble the W-lattice jib to the required length.
- ▶ Spool the hoist rope out and pull in the W-end section.

3.5.2 Assemble W-guy rods

The W-guy rods are placed and secured for transport on the W-lattice sections. Before assembly of the W-guy rods, the transport retainers must be loosened.

See illustration **19**.

- ▶ Release and unpin transport restraints for the W-guy rods.

Note

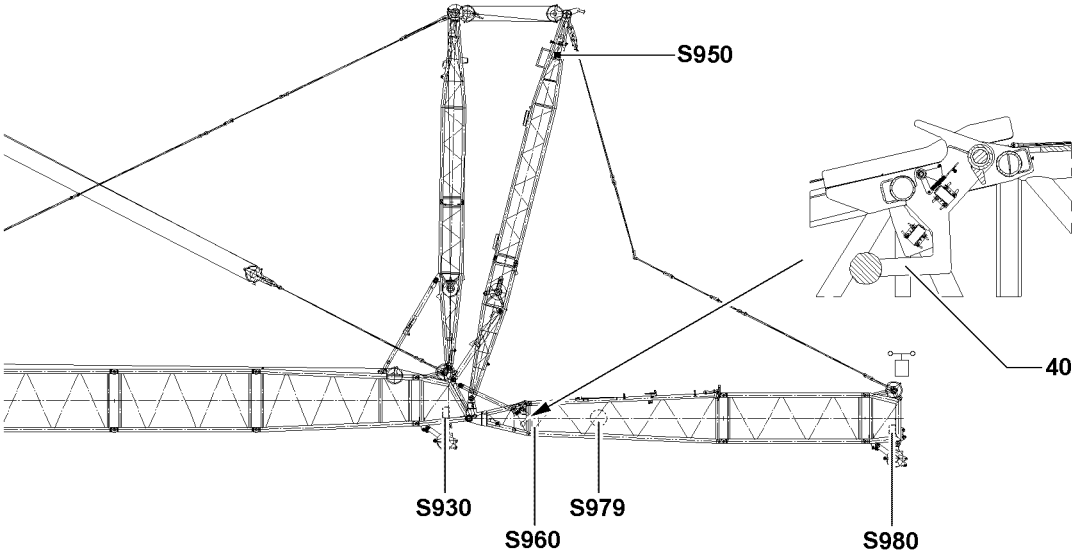
- ▶ The guy rods for the LI-intermediate sections are pinned to each other starting from the fixed point on the end section of the boom.

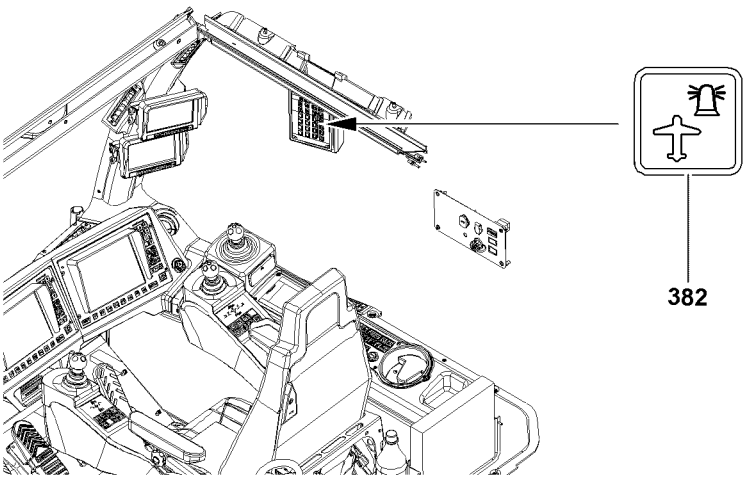
NOTICE

Property damage!

- ▶ Always pin the guy rods from the “inside” to the “outside”.

- ▶ Pin and secure the guy rods for all LI-intermediate sections.
- ▶ When all boom system guy rods are pinned with one another:
  Put down WA-frame 1 **35** until the guy rods can be pinned **80** with the guy rods **100** in the point **t**:
  Spool out W-adjusting rope **41**.
- ▶ Pin guy rods **80** and guy rods **100** on both sides on the point **t** with pins **102** and secure with spring retainers **107**.
- ▶ Tension the W-guy rods: Spool up the W-adjusting rope **41**.





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3.6 Establishing the electrical connections

Ensure that the following prerequisite is met:
– the W-boom is completely assembled,
– flight warning lamps and wind-speed gauge are assembled.

CAUTION
Damage to the electrical connection on the cable drum!
If the electrical connection from the cable drum to the terminal box on the W-pivot section is established first before the connection to the terminal box on the SW-end section, the electrical connection is damaged when spooling out the cable drum.
▶ Make the electrical connection from the cable drum in the W-pivot section to the terminal box on the SW-end section and then effect the electrical connection from the terminal box in the W-connector head to the cable drum!

Note
▶ For production of the electrical connections on the W-boom, the separate electrical diagram is to be employed.

▶ Establish electrical connections.
▶ Make sure that all electrical connections on the boom are established.

3.7 Check the function of the safety devices

WARNING
Non-functioning safety devices!
If the function of the safety devices is defective, personnel can be severely injured or killed.
▶ Crane operation with non-functioning safety devices is **prohibited**!

Note
▶ The function of the individual limit switches must be checked before erection!
▶ The function of the limit switch initiators must be checked in the test system, see separate “diagnostics” manual.

Note
▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact **LIEBHERR** Service.

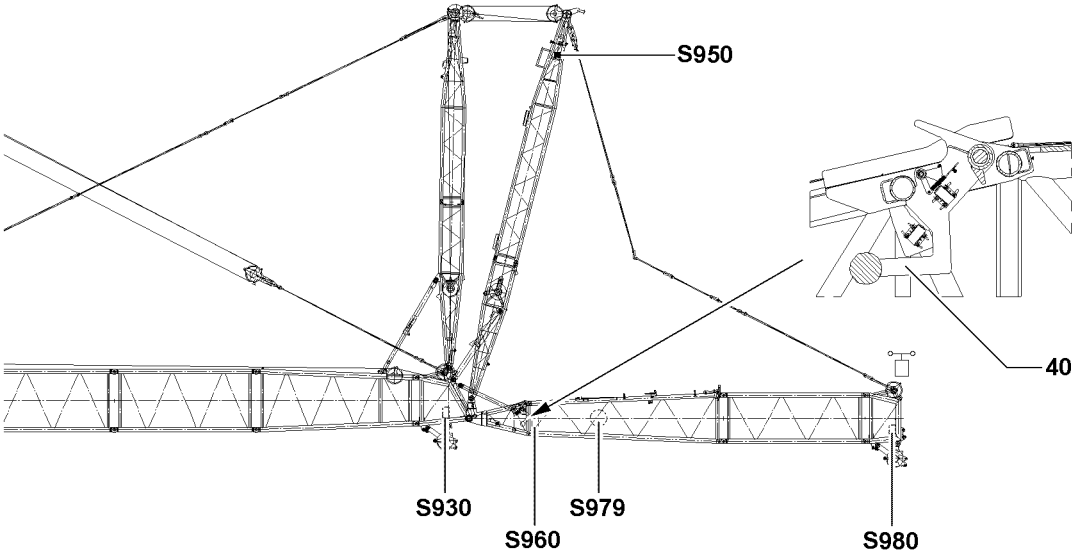
Make sure that the following prerequisites are met:
– all electrical connections have been made,
– the crane engine is running,
– the corresponding operating mode is set on the LICCON monitor.

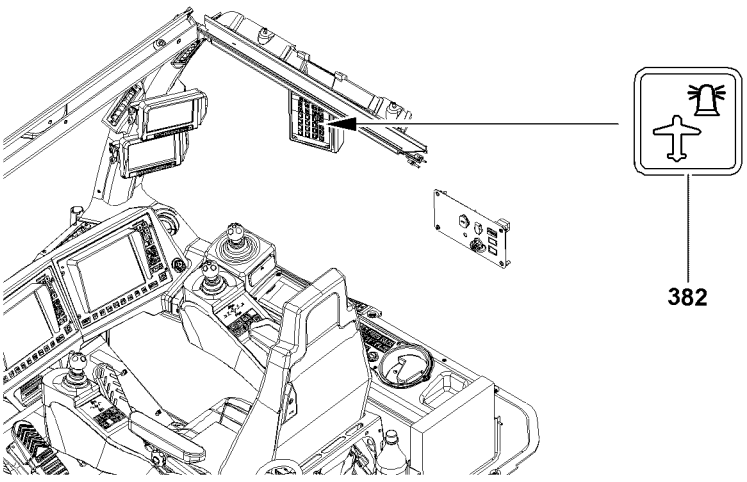
3.7.1 Check the wind speed sensor

▶ Test the movement and the function of the wind speed sensor.

3.7.2 Check the airplane warning light

▶ Switch the airplane warning light on with the button **382**.
▶ Visually check functionality.





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3.7.3 Check oscillation guard

DANGER
Danger of tipping over if the oscillation guard is hard to move!
If the oscillating safety is hard to move, the mechanical relapse retainer will no longer function. The W-lattice jib can tip backwards uncontrolled and cause the crane to topple over!
▶ Crane operation with hard to move oscillation guard is prohibited!

▶ Check the oscillation guard **40** for easy movement.

3.7.4 Check the hoist limit switch on the pulley head

Note
▶ When replacing or changing a hoist limit switch (HES), the corresponding hoist limit switch must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB).

▶ Actuate the hoist limit switch manually on the pulley head.
Result:
– The spool up function of the hoist winch turns off.
– The icon “Hoist top” appears on the LICCON monitor 0.
– Limit switch is functioning.

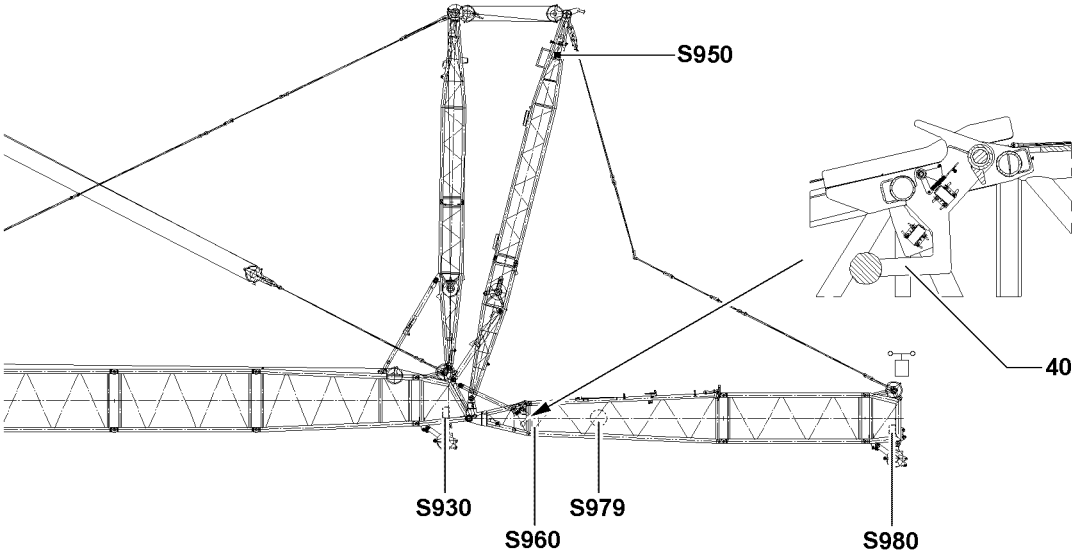
3.7.5 Check limit switches

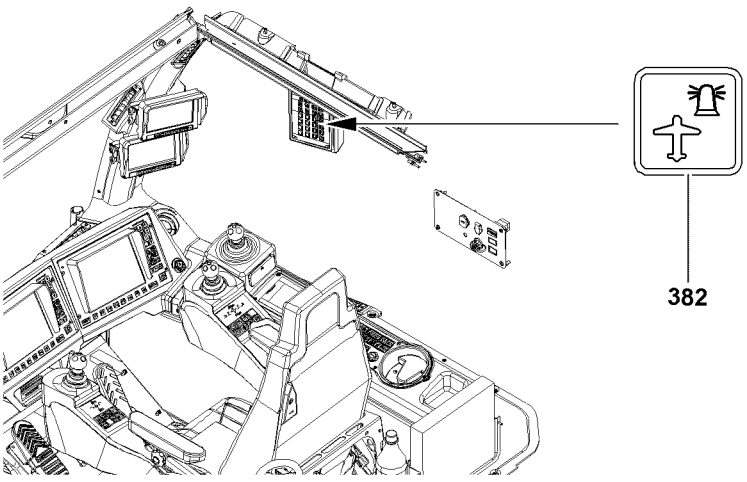
Note
▶ The limit switch functions have to be checked individually before erection!

Test limit switch W-lattice jib “steepest position”, relapse cylinder
▶ Cover the limit switch initiators individually with a metal plate, see chapter 8.12
Result:
– The icon “boom limitation” appears on the LICCON monitor 0.
– The spool up function of winch V switches off.

Test limit switch W-lattice jib “steepest position”, relapse cylinder
▶ Cover the limit switch initiators individually with a metal plate, see chapter 8.12.
Result:
– The icon “boom limitation” appears on the LICCON monitor 0.
– The spool up function of winch V switches off.

Test limit switch flap W-lattice jib “steepest position”, relapse cylinder
▶ Cover the limit switch initiators individually with a metal plate, see chapter 8.12.
Result:
– The icon “boom limitation” appears on the LICCON monitor 0.
– The spool up function of winch V switches off.





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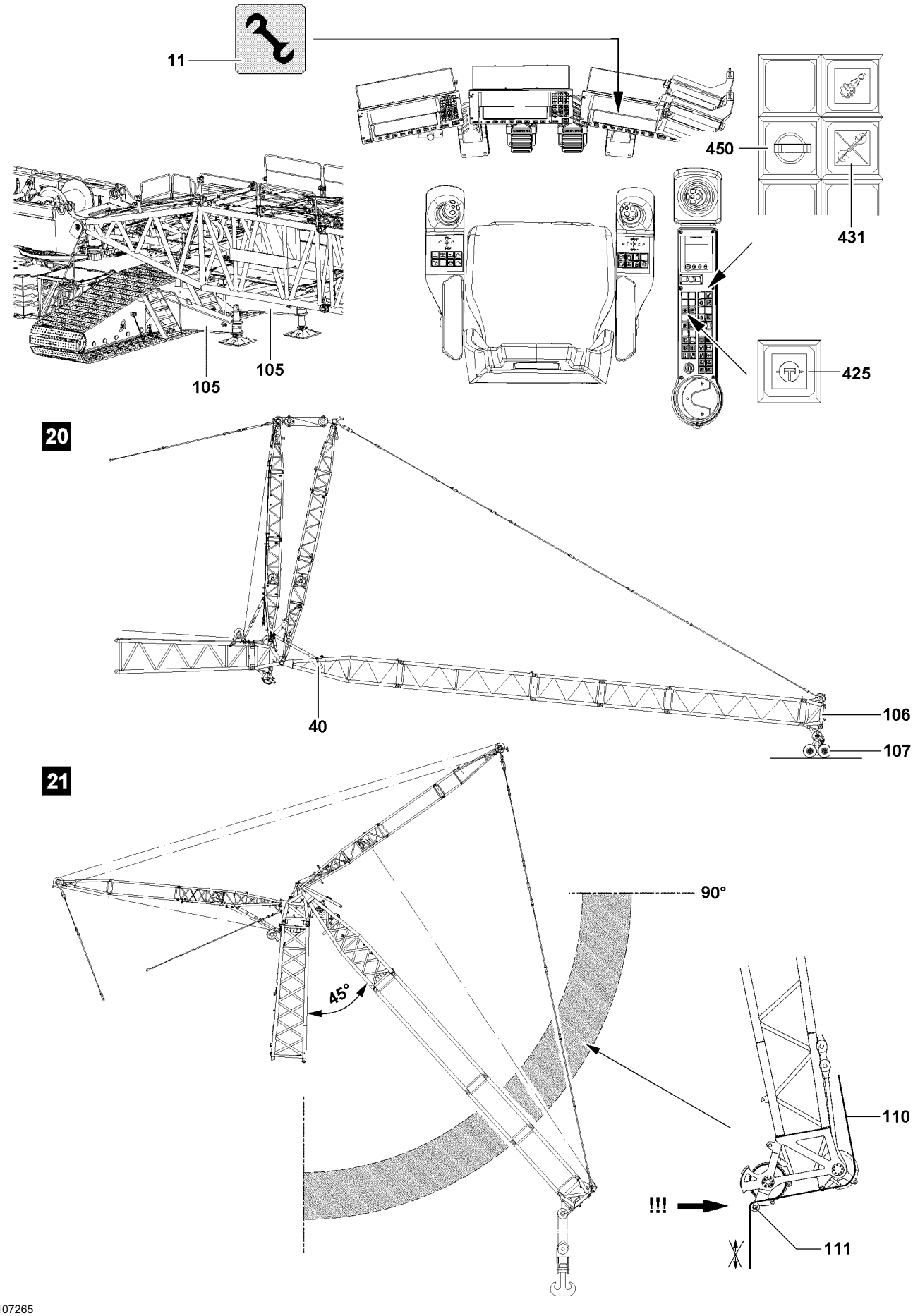
3.7.6 Check the limit switch S-boom “steepest position”

▶ Cover the limit switch initiators on the S-relapse cylinder individually with a metal plate.

Result:

– The hoist limit switch is actuated manually.
– The spool up function of winch IV (control winch) turns off.
– The icon “boom limitation” appears on the LICCON monitor 0.
– Limit switch is functioning.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431
105
105
425
20
40
106
107
21
90°
45°
110
!!!
111
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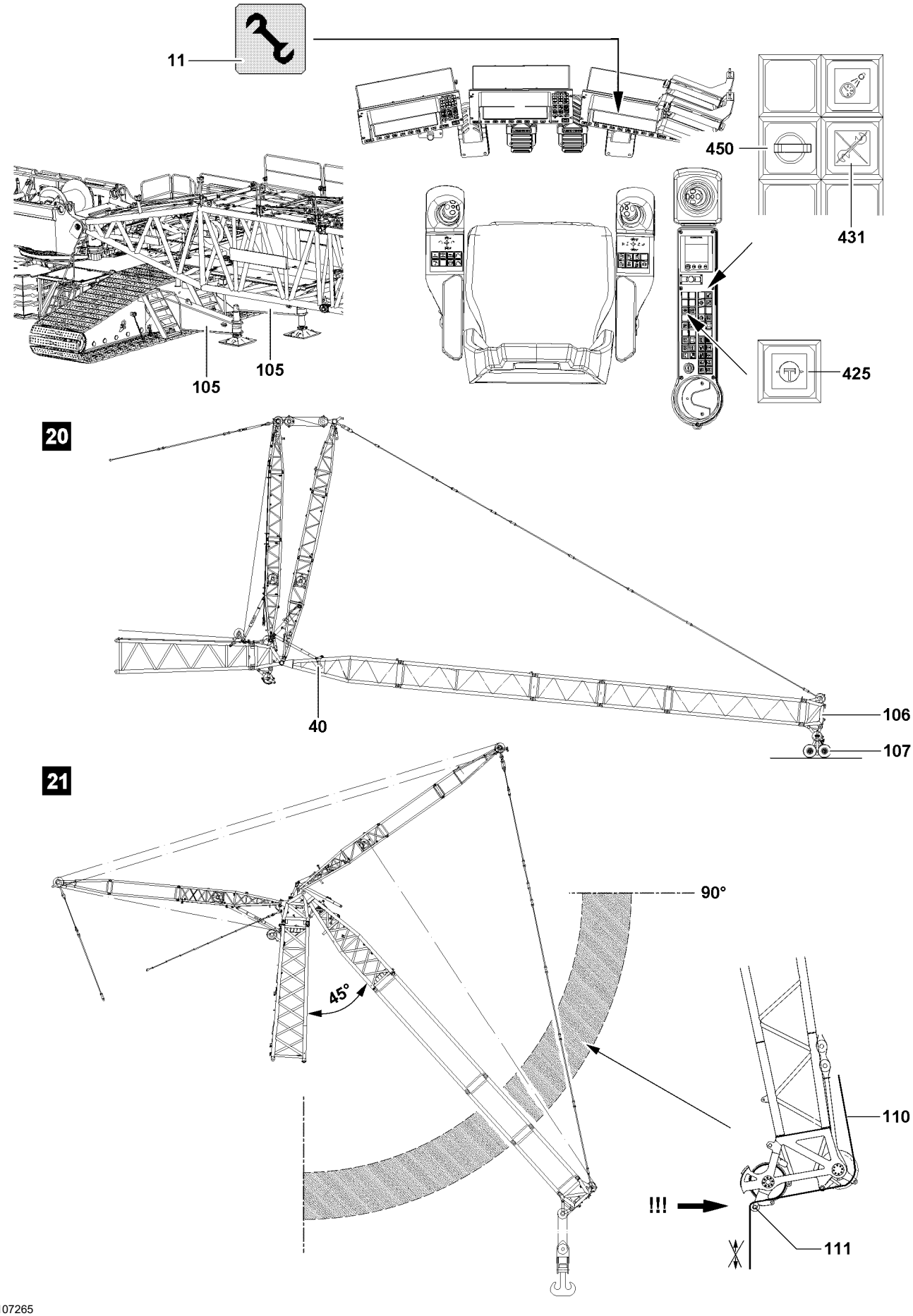
3.8 Erecting the boom

DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Observe the data in the erection and take down charts!
- ▶ Observe the safety technical guidelines in chapter 5.01.

DANGER
The crane can topple over!
For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down charts!
- ▶ The boom must be erected or taken down “to the side” “in direction” of the mechanical auxiliary supports **105**.
- ▶ Always erect or take down according to the data in the **Erection and take down charts**!

DANGER
Tipping lattice jib!
If the easy movement on the pendulum of the mechanical relapse support is not checked before erection or not re-established, if necessary, then the mechanical relapse support will not engage in steep lattice jib position. As a result, the lattice jib can tip to the rear.
Personnel can be severely injured or killed!
- ▶ Check the easy movement on the pendulum **40** of the mechanical relapse support before erection.
- ▶ If the pendulum does not move easily: Make the pendulum **40** easy to move!

WARNING
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over. Personnel can be severely injured or killed!
- ▶ The lattice jib must roll on the ground with its entire weight!
- ▶ Spool the lattice jib control out so that the guy rods sag slightly!
- ▶ Do not allow slack cable to build up on the control winch!
- ▶ Extend the relapse cylinder before erection.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425
20
40
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107
21
90°
45°
110
!!!
111
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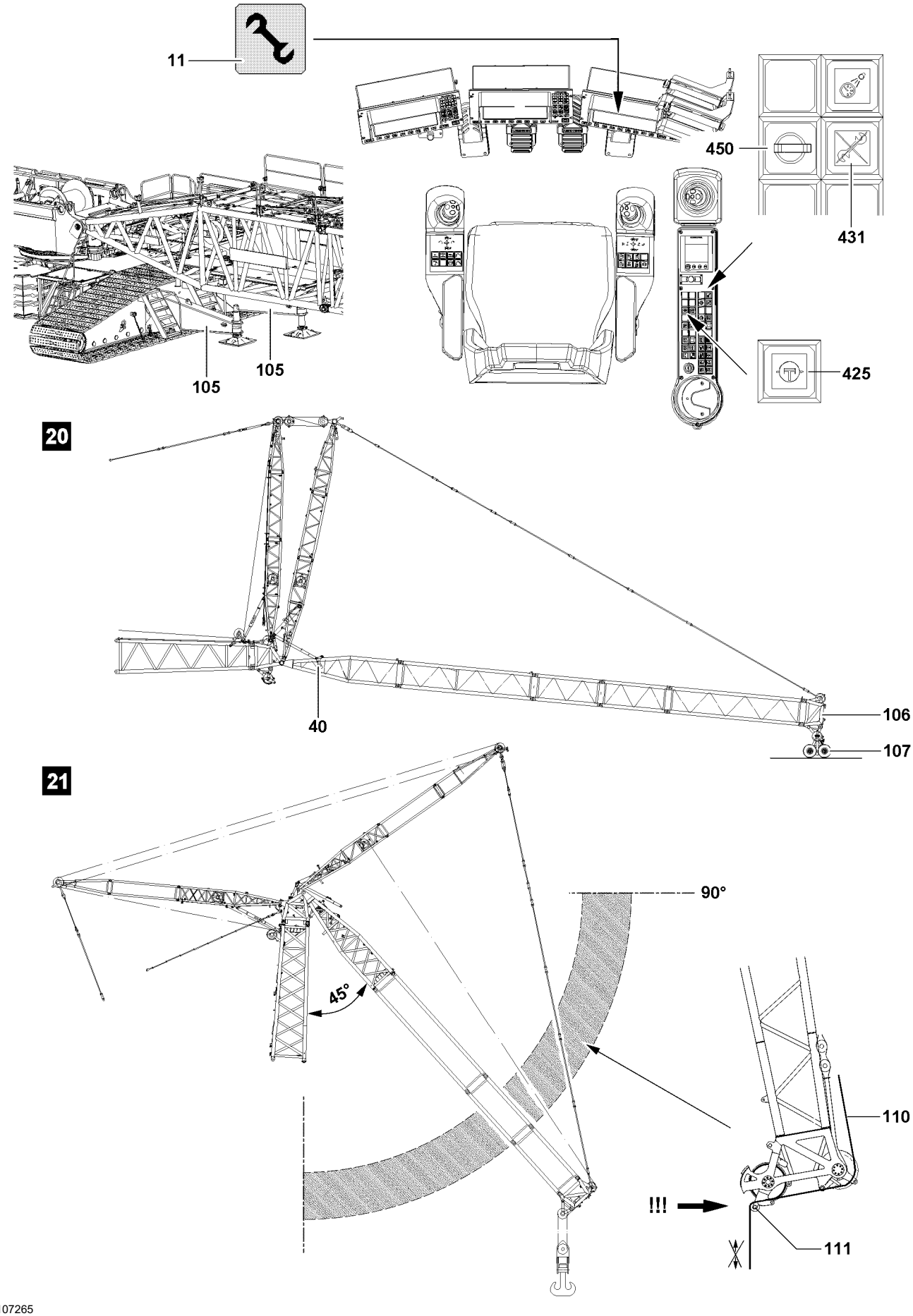
Make sure that the following prerequisites are met:
- the W-lattice jib is fully assembled,
- the pulley cart **107** is assembled on the SW-end section **106**, illustration **20**,
- no personnel are within the danger zone,
- the crane is aligned in horizontal direction,
- all electrical connections have been established,
- all limit switches are functional,
- the counterweight has been attached to the turntable and on the derrick, according to the load chart,
- all pin connections have been secured,
- the hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins,
- there are no loose parts on the boom or the lattice jib,
- boom, lattice jib and safety devices are free from snow and ice,
- the LICCON overload protection has been adjusted according to the data in the load chart,
- the LICCON overload protection settings have been compared with the actual crane configuration,
- the assembly key button **450** is actuated,
- the indicator light **431** “assembly” lights up,
- the assembly icon **11** on the LICCON monitor 0 lights up.

WARNING
Falling hoist rope!
If the hoist rope before the erection procedure is not properly secured onto the corresponding length on the W-lattice jib, it can fall down backward on the basis of its own weight. Personnel can be severely injured or killed!
- ▶ Reeve in the hoist rope with sufficient length on the W-lattice jib before the erection process!
- ▶ The hoist rope must be constantly monitored during erection!
- ▶ Do not step into the danger zone!

NOTICE
Damage to hoist rope!
If the hoist rope **110** are reeved on the hook block and redirected over the small guard rollers **111**, the hoist gear may no longer be driven. During spooling up or spooling out, the hoist rope can become damaged.
- ▶ Do not spool up or spool out hoist rope **110**, if the angle between S-boom and W-lattice jib amounts to less than 90°, see illustration **21**.

The erection process is carried out until:
- S-boom und W-lattice jib form an angle of approximately 45° (switch position “W-lattice jib below”), see illustration **21**,
- **or** the W-end section lifts off from the ground.

- ▶ Luff up S-boom and simultaneously spool out W-adjusting rope so that the SW-end section remains on the ground with the pulley cart.
- ▶ Loosen pulley cart SW-end section: Uninstall the pulley cart, see chapter 5.15.
- ▶ Luff up S-boom until SW-end section lifts off the roller cart.
- ▶ Reeve in the hook block properly and secure the hoist rope on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.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90°
45°
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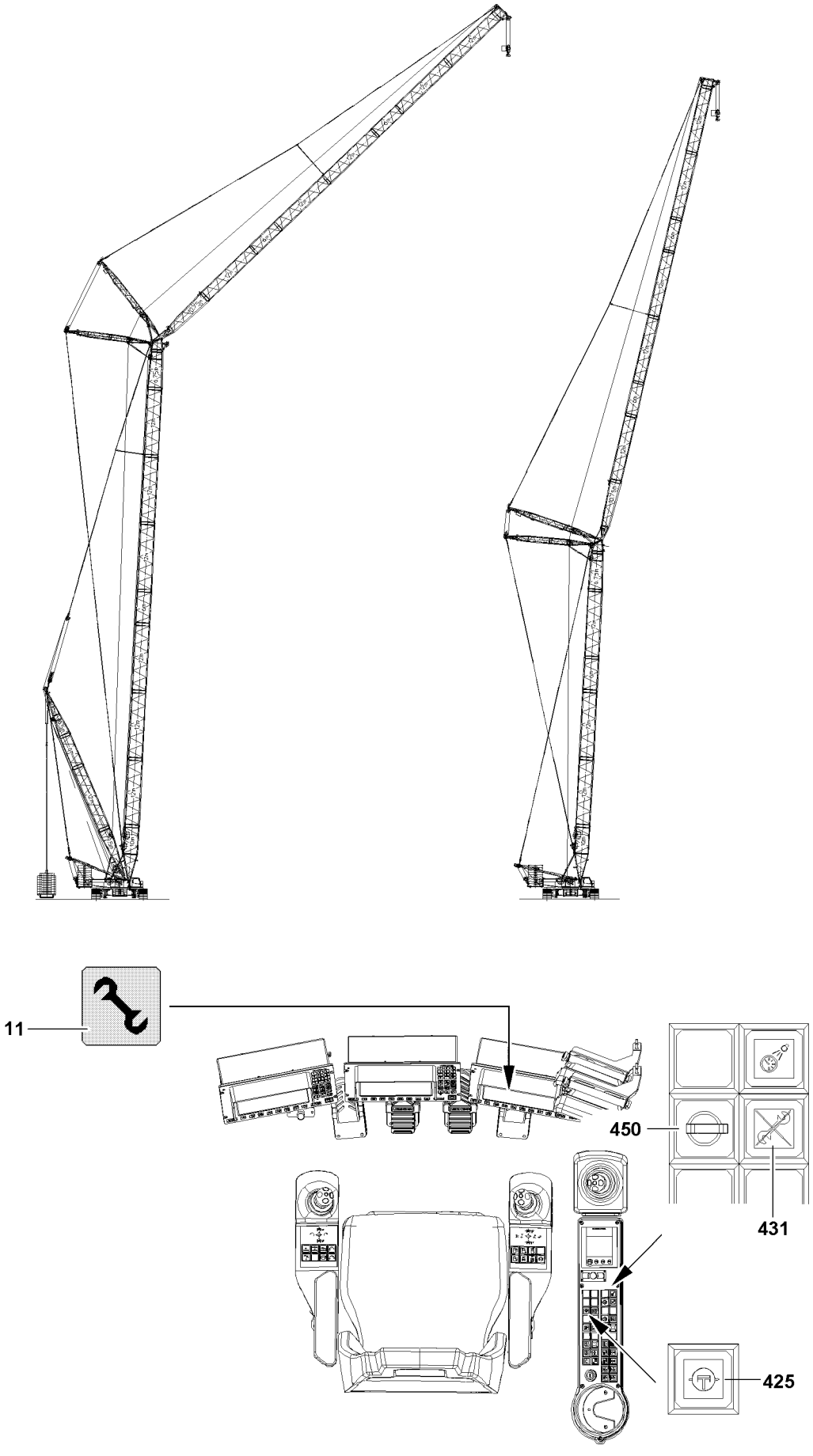
DANGER
The crane can topple over!
In crane operation with bypassed safety devices, the crane can topple over. Personnel can be severely injured or killed!
- ▶ When the lowest operating position of the W-lattice jib is reached, immediately turn off the assembly key button **450**.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

Note
- ▶ When the lowest operating position of the W-lattice jib is reached, the displays turn off.
- ▶ In the icon “Maximum load”, a load number in “t” appears instead of the display “???”!

- ▶ Luff the S-boom up to the lowest operating position.
- ▶ Luff up the W-lattice jib to the lowest operating position.
- ▶ When the W-lattice jib has reached the lowest operating position:
  Switch the assembly key switch **450** off.

Result:
- – The LICCON overload protection is active.
- – The indicator light **431** turns off.
- – The assembly symbol **11** on the LICCON monitor turns off.
- – The acoustical signal turns off.
- – The three color light lights up red and the warning light on the rear of the turntable lights up.



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4 Operating the crane

4.1 Preparing for crane operation

Note

▶ Observe the notes in chapters 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is turned off.

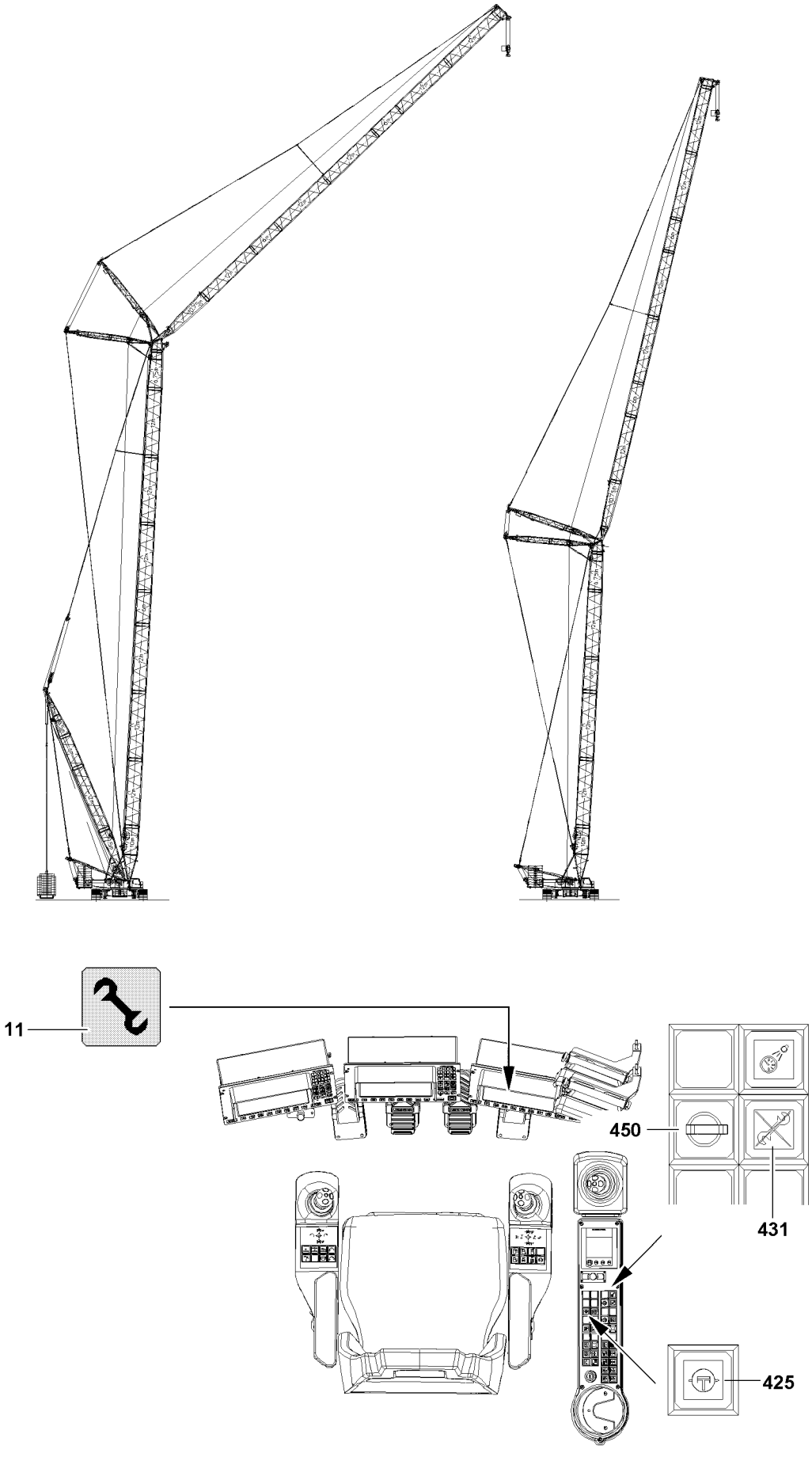
WARNING

The crane can topple over!

▶ Check the horizontal position of the crane before and during operation!
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation!

4.2 Checking the settings.

▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the limit switches on the relapse cylinders.



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5 Disassemble the W-boom system

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

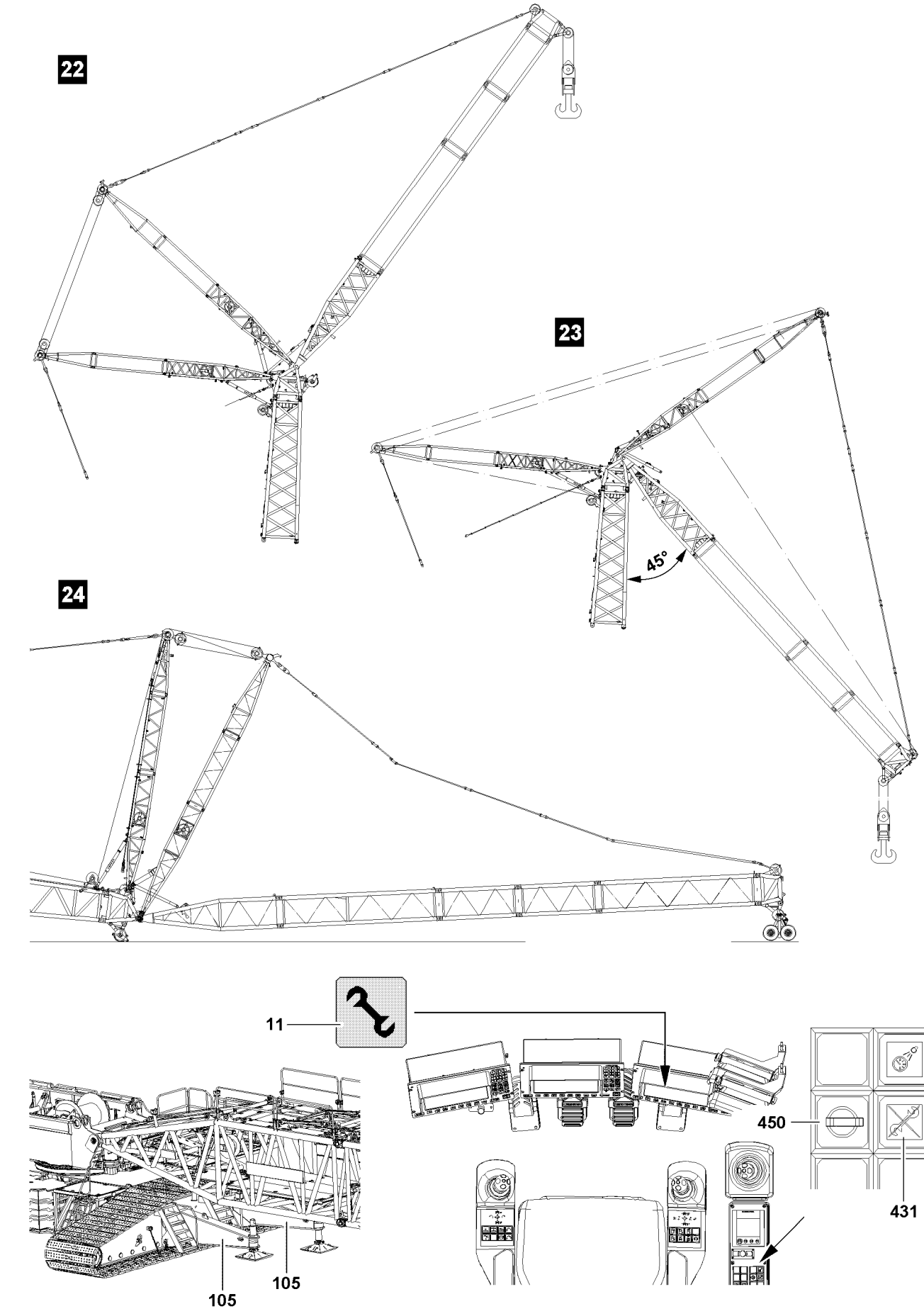
- ▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (see chapter 2.04) to protect against falling! The personal protective equipment must be attached in the corresponding attachment points on the crane (see chapter 2.06).
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly, inspection and maintenance work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free of snow and ice!

WARNING
Falling components!
If unsecured or non-supported components are assembled or disassembled, they can fall down. Personnel can be killed or seriously injured.

- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
- ▶ Support the boom and components before pinning / unpinning!
- ▶ Both pins that lie in at a horizontal level, i.e. **left** and **right**, pin or unpin!
- ▶ Secure the pins in the bearing points and in the receptacles!
- ▶ Do not disengage the auxiliary crane until each component is pinned on and secured!
- ▶ It is prohibited to lean a ladder against the component being disassembled!

WARNING
Danger of crushing!
Components can swing during assembling. Hands can be crushed or severed.

- ▶ Make sure that the components do not swing back and forth during assembly!



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Note

▶ By supporting the components during assembly / disassembly, ground unevenness is compensated for and the material is protected.

Note

▶ The W-intermediate sections are pinned and unpinned with the aid of the pin pulling device, see chapter 5.30.

WARNING

Risk of accident!

Personnel can be severely injured or killed!

▶ While pinning and unpinning with the pin pulling device, observe and follow warning guidelines in chapter 5.30!

Make sure that the following prerequisites are met:

– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is pressed and the indicator light **431** lights up,
– the assembly icon on the LICCON display blinks,
– an auxiliary crane is available.

5.1 Lay down W-lattice jib

DANGER

The crane can topple over!

For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down charts!

▶ The boom must be erected or taken down “to the side” “in direction” of the mechanical auxiliary supports **105**.
▶ Always erect or take down according to the data in the **Erection and take down charts**!

WARNING

The crane can topple over!

If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!

▶ Observe the Safety technical guidelines in chapter 5.01!
▶ Observe the data in the Erection and take down charts!

NOTICE

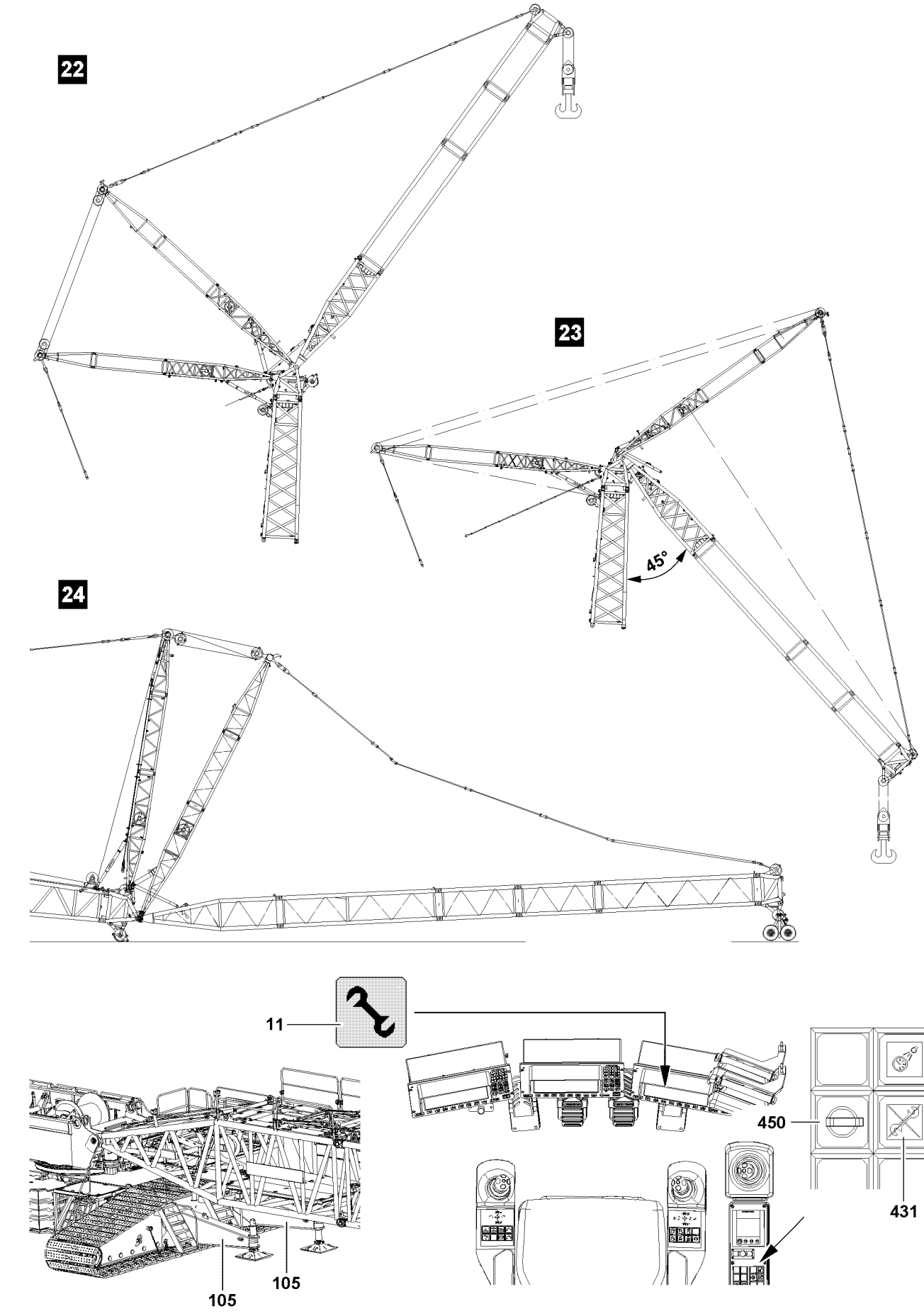
Damage of boom components!

Taking down the boom system can lead to a collision between the hook block and the pulley head. Boom components can be severely damaged.

▶ Luff the boom system down at the same time and spool the hoist winch out.

Ensure that the following prerequisite is met:

– the S-boom is found in operating position, see illustration **22**,
– the hook block is approx. 5 m below the pulley head of the lattice jib,
– the pulley cart is available.



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5.1.1 Luff down W-lattice jib

Note

- ▶ The Luff down movement is turned off as soon as the lowest operating position is reached.
- ▶ When the lowest operating position of the boom is reached, the load display in the “Maximum load” icon turns off and instead of the load display, the display “???” appears.
- ▶ In the crane operating screen appear alarm functions.

▶ Luff the W-lattice jib down to the “lowest” operating position.

Result: The following alarm functions become active:

– “STOP”
– “Horn” and acoustical signal.

DANGER

Crane operation with added assembly key button!

- ▶ The actuation of the assembly key button **450** is only permitted for assembly tasks!
- ▶ The assembly key button **450** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **450** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **450** turned on is strictly prohibited!
- ▶ The assembly key button **450** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ When the W-lattice jib has reached the “lowest” operating position:
Turn the assembly key button **450** on.

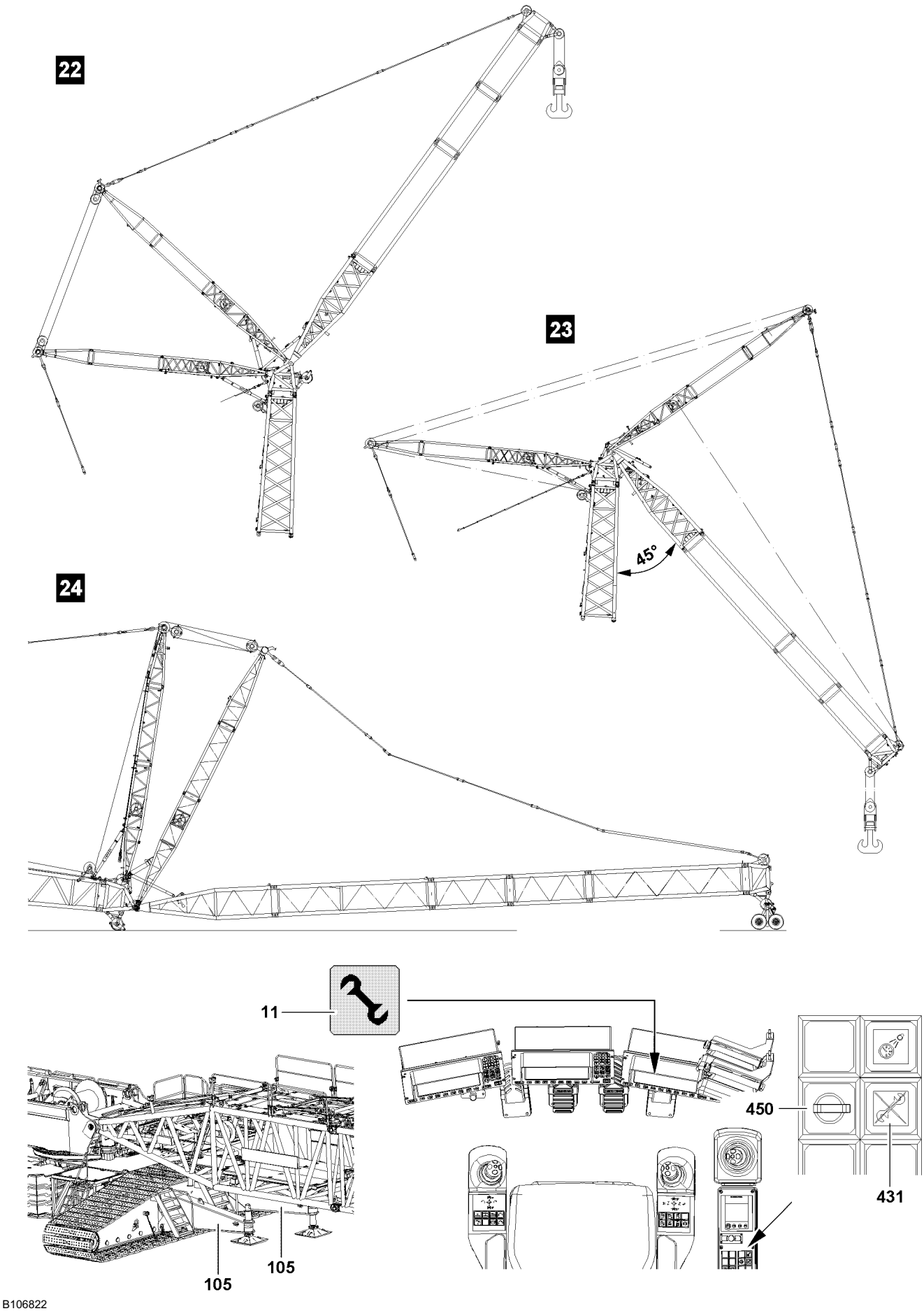
Result:

– The LICCON overload protection is deactivated.
– The indicator light **431** lights up.
– The assembly icon **11** on the LICCON monitor blinks.
– The “STOP” icon on the LICCON monitor blinks.
– An acoustical signal sounds.
– The three color light lights up red and the warning light on the rear of the turntable lights up.

See illustration **23**.
The luff down process is carried out, up until:

– S-boom und W-lattice jib form an angle of approximately 45° (switch position “W-lattice jib below”)
– **or** the hook block can be reeved out.

▶



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5.1.2 Lay down W-lattice jib

- ▶ If the hook block has not yet touched the ground:
  At the same time, spool the hoist winch out and luff the S-boom down until the hook block touches the ground.
- ▶ Remove the hoist limit switch weight.
- ▶ Unreeve the hook block.
- ▶ Luff up S-boom until SW-end section lies on the roller cart.
- ▶ Assemble SW-end section on roller cart, see chapter 5.15.

WARNING
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over.
Personnel can be severely injured or killed!
- ▶ Spool the lattice jib control out so that the guy rods sag slightly!
- ▶ The lattice jib must roll on the ground with its entire weight!
- ▶ Do not allow slack cable to build up on the control winch!
- ▶ Do not pull the hook block along on the ground!

- ▶ Continue to luff down the S-boom and simultaneously spool the W-lattice jib control out so that the guy rods sag slightly.

See illustration **24**.
- ▶ Luff the S-boom down until the S-boom head is laying on the support on the ground.

WARNING
Risk of accident!
- ▶ Make sure that no personnel are within the danger zone.
- ▶ Secure the hoist rope with the assembly rope and pull it back slowly over the rope pulleys in the WA-frames and lower it toward the W-connector head.

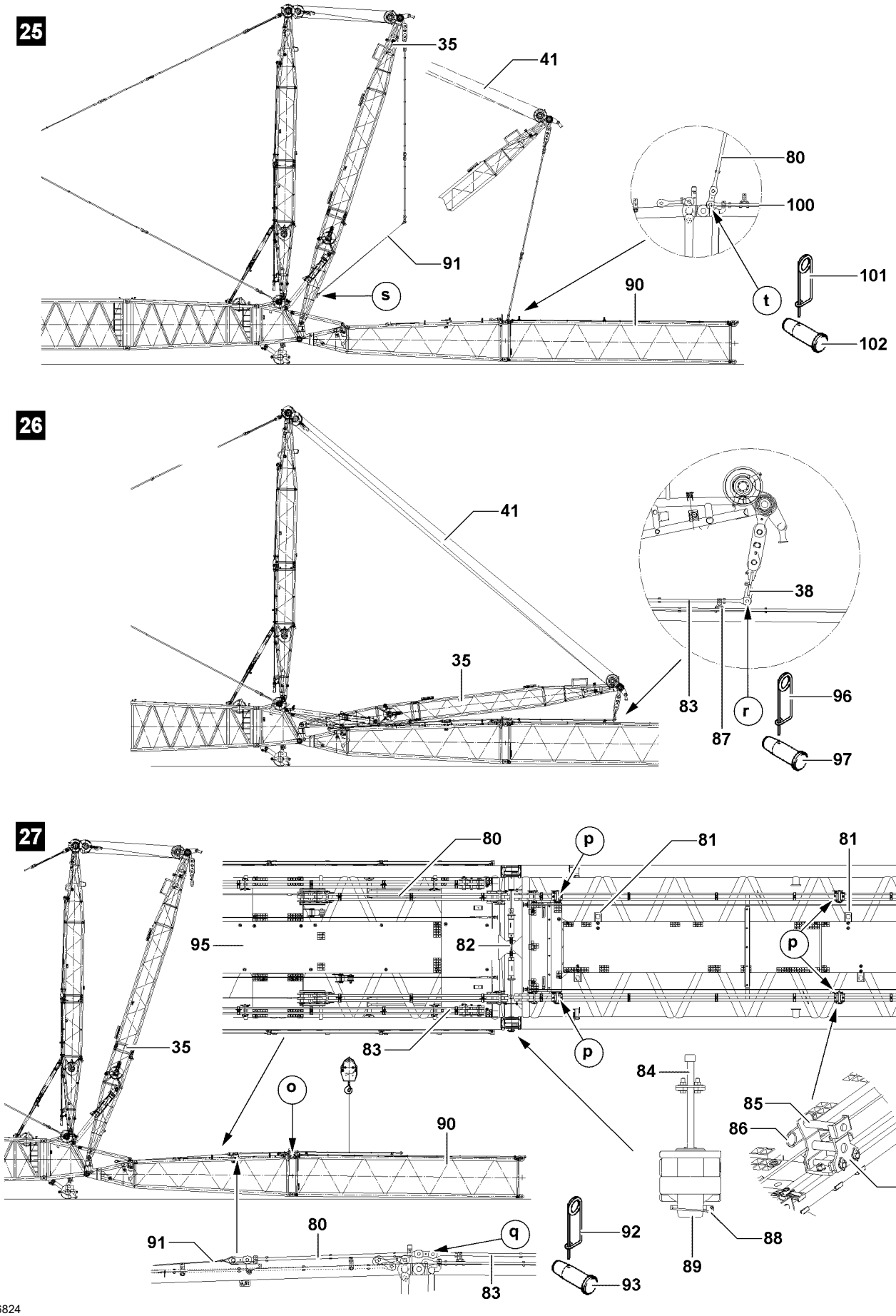
- ▶ Lay down hoist rope.

5.2 Disconnect the electrical connections

Ensure that the following prerequisite is met:
– the S-boom has been laid down.

NOTICE
Damage to the cable drum or cable!
If the electrical connection between the W-end section and W-pivot section is not separated before spooling up the cable drum, the electrical connection is damaged!
If the cable drum cable is not properly spooled up on the cable drum after disconnection on the SW-end section, the cable drum or the cable can be significantly damaged!
- ▶ Make the electrical connection from the cable drum in the W-pivot section to the terminal box on the W-connector head and then separate the electrical connection from the terminal box on the SW-end section to the cable drum!
- ▶ Spool cable after disconnection from the cable drum.

- ▶ Disconnect the electrical connections.
- ▶ Spool cable after disconnection from cable drum and secure against unintended spooling out.
- ▶ Secure cable: Re-establish electrical condition between W-connector head and cable drum.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5.3 Disassemble the W-lattice jib

WARNING
Falling components!
If unsecured or non-supported components are assembled or disassembled, they can fall down.
Personnel can be killed or seriously injured.
- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
- ▶ Both pins that lie in at a horizontal level, i.e. **left** and **right**, pin or unpin!
- ▶ Secure the pins in the bearing points and in the receptacles!
- ▶ Do not disengage the auxiliary crane until each component is pinned on and secured!
- ▶ It is prohibited to lean a ladder against the component being disassembled!

Note
- ▶ Adhere to the pin sequence during the disassembly of the W-lattice jib, see chapter 5.01!

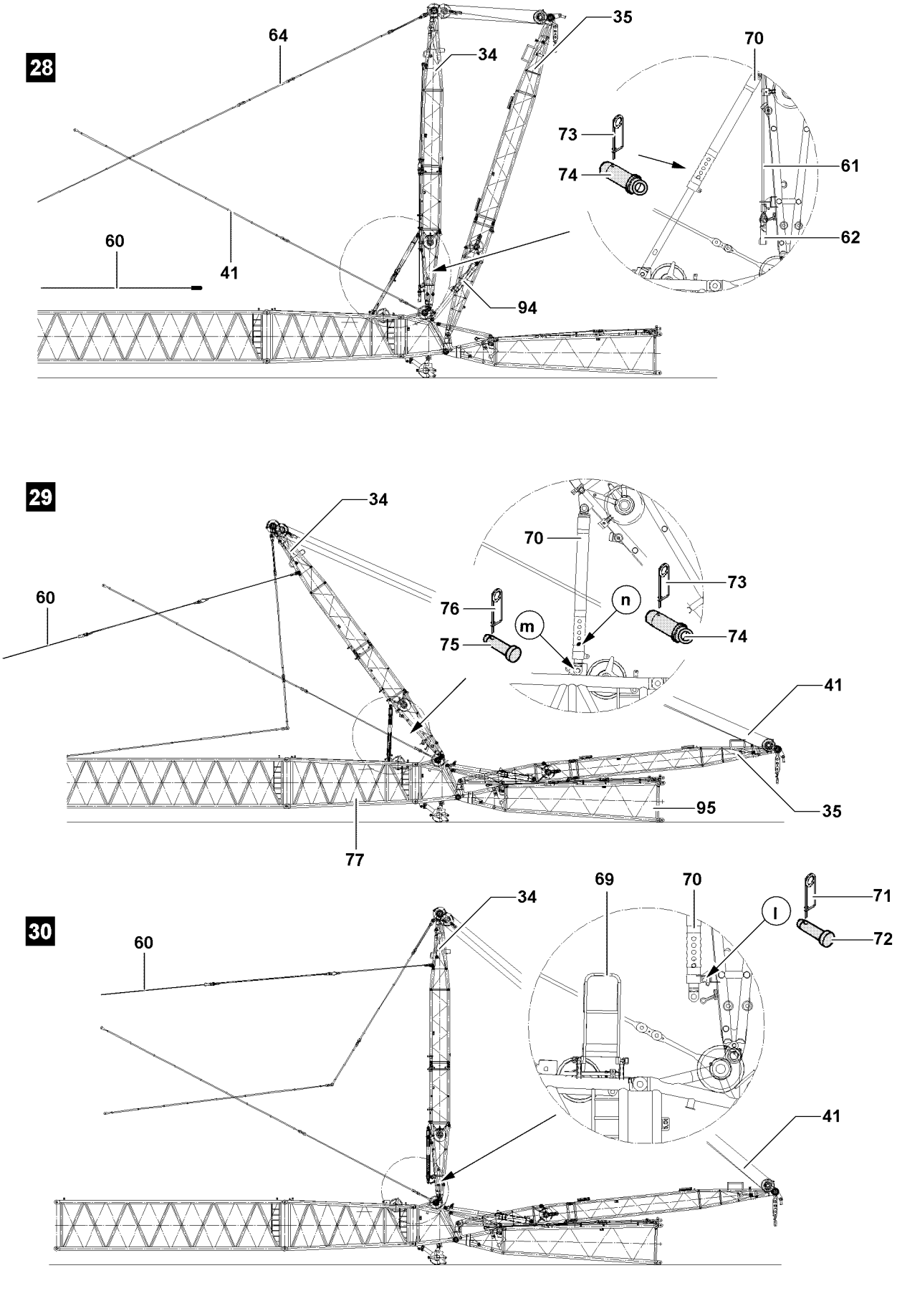
5.3.1 Disassemble the W-guy rods

The W-guy rods are placed and secured for transport on the LI-lattice sections. Before disassembly of the W-guy rods, the transport retainers must be assembled.
See illustration **25**.
- ▶ Put down WA-frame 1 **35** until the guy rods **80** and guy rods **100** in the point **t** can be unpinned: Spool out W-adjusting rope **41**.
- ▶ Separate guy rods **80** and guy rods **100** both sides on the point **t**: Remove the spring retainer **101** and unpin the pin **102**.
- ▶ Hang assembly rope **91** on the point **t**.
- ▶ Erect WA-frame 1 **35** until assembly rope **91** on the point **s** can be hung out: Spool up the W-adjusting rope **41**.
- ▶ Hang assembly rope **91** on the point **s**.
- ▶ Release and unpin guy rods of all LI intermediate sections.
- ▶ Secure W-guy rods with transport retainers.

5.3.2 Disassemble the W-lattice section

See illustration **26**.
- ▶ Put down WA-frame 1 **35** until guy rods **80** on the W-pivot section **95** and guy rods **83** lie in the receptacles **87**: Spool out W-adjusting rope **41**.
- ▶ Separate guy rods **38** and guy rods **83** both sides on the point **r**: Remove the spring retainer **96** and unpin the pins **97**.
- ▶ Erect WA-frame 1 **35**: Spool up the W-adjusting rope **41**.

See illustration **27**.
- ▶ Separate guy rods **80** and guy rods **83** both sides on the point **q**: Remove the spring retainer **92** and unpin the pins **93**.
- ▶ Put down guy rods **83** with auxiliary crane on W-pivot section **95** and secure with transport retainers.
- ▶ Secure guy rods **83** with transport retainers.
- ▶ Hang the pin pulling cylinder on the retainer **82** and on the screw **84**.
- ▶ Disassemble SW-end section and LI-intermediate section: Remove the linchpins **88** and unpin the pins **89** with pin-pulling cylinder.
- ▶ Disassemble receptacles **87** on the points **p** and secure in the parking position **81**.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5.4 Unpin relapse supports

See illustration **28**.

▶ Erect the WA-frame 1 **35** until the relapse cylinder **94** is completely retracted.

Result:

– The relapse supports **70** are relieved: Connecting pin **74** can be unpinned.

WARNING
Risk of falling!
If the fold platforms **69** on the SL-reducer section is not used, personnel can fall down and be severely injured or killed.

▶ Pinning of the relapse supports by the folding platforms is carried out on the SL-reducer section.

NOTICE
WA-frame 2 damage!
If the connection pin on the relapse supports is pinned when the WA-frame 2 is not drawn backward, WA-frame 2 can be damaged!

▶ Unpin connecting pins **74** on both sides before WA-frame 2 **34** is drawn backward.

▶ Remove the spring retainer **73** on both sides and unpin the connecting pins **74**.

▶ Loosen the assembly rope **61** on the WA-frame 2 **34**.

▶ Hang hoist rope **60** in the hook block **62** on the assembly rope **61**.

See illustration **29**.

Note

▶ While spooling up the W-adjusting rope, WA-frame 1 **35** may not be lifted.

▶ Lay down WA-frame 1 **35** onto W-pivot section **95**: Spool out W-adjusting rope **41**.

▶ Pull WA-frame 2 **34** backward: Spool out W-adjusting rope **41** and spool up hoist rope **60** up to the relapse supports **70** are pushed in.

▶ Pin connector pin **74** on point **n** and secure with spring retainer **73**.

▶ Unpin relapse supports **70** on both sides on the point **m**: Remove the spring retainer **76** and unpin the pins **75**.

See illustration **30**.

▶ Erect WA-frame 2 **34** vertically: Spool up W-adjusting rope **41** and simultaneously spool out hoist rope **60**.

▶ Pin relapse supports **70** on both sides on the point **l**: Insert the pin **72** and secure with spring retainer **71**.

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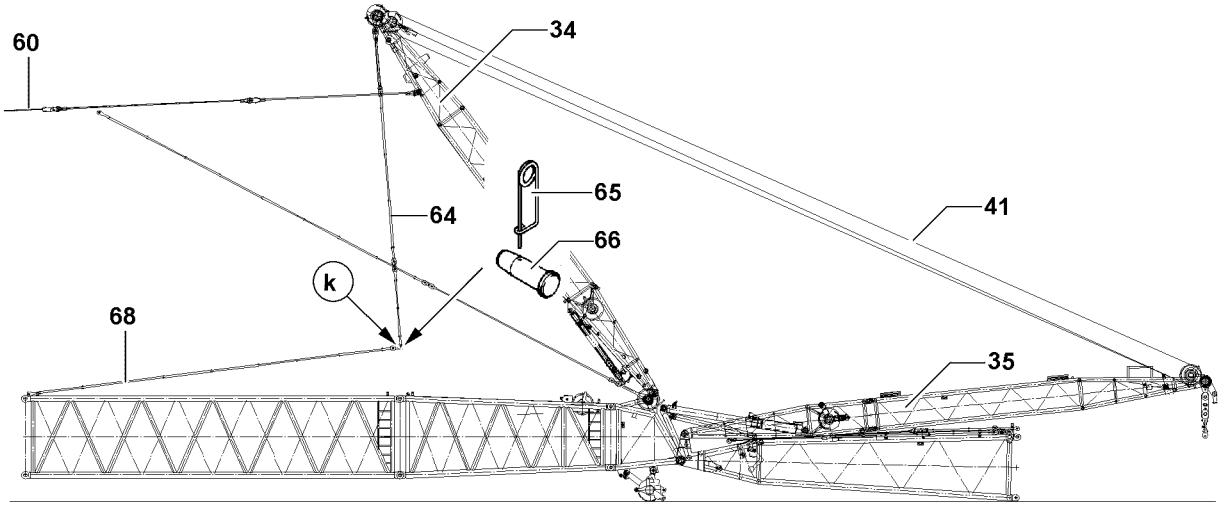

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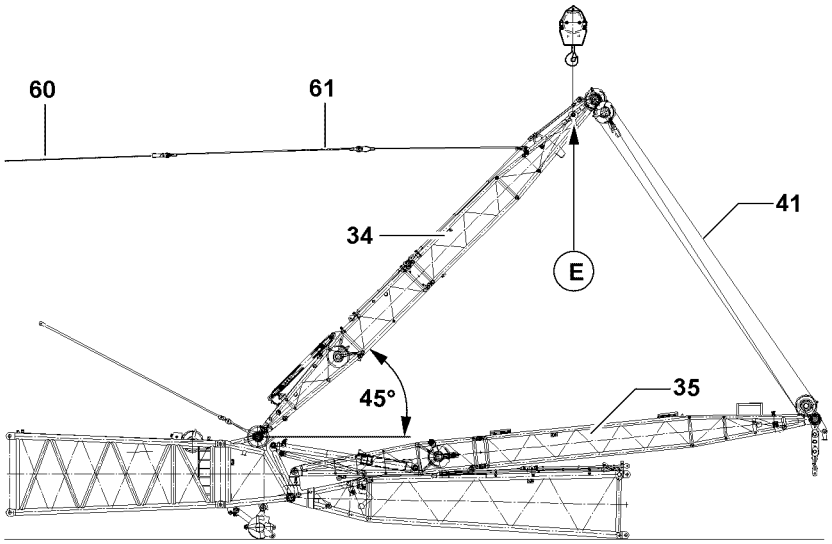

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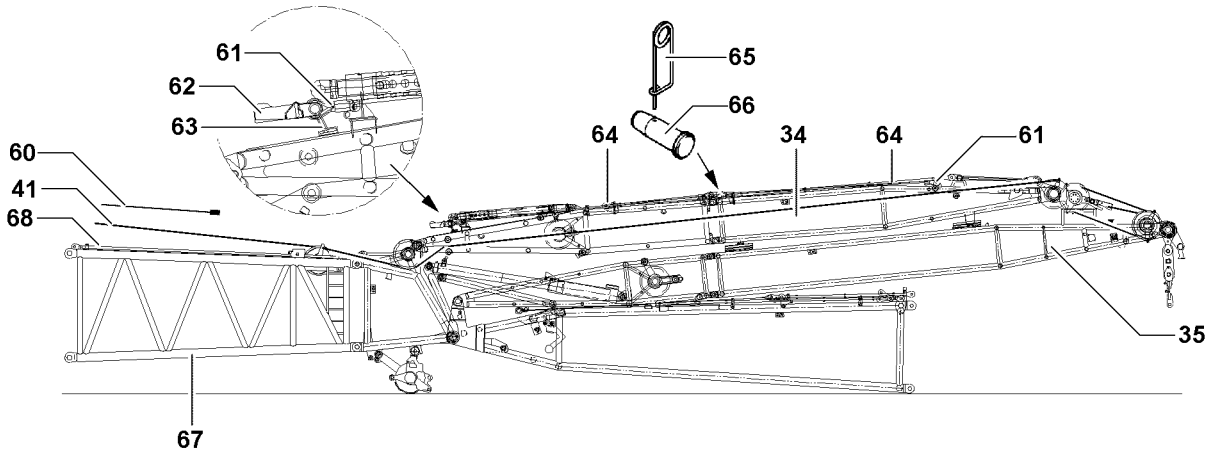

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5.5 Disassemble WA-frame 2 guy rods

Note

▶ While spooling out the W-control rope, lightly lift up WA-frame 1 **35** in order to prevent slack rope formation.

See illustration **31**.

▶ Pull WA-frame 2 **34** backward until W-guy rods **64** hang vertically downward: Spool up W-adjusting rope **41** and simultaneously spool out hoist rope **60**.

▶ Lay down W-guy rods **68** on the S / SL-boom.

▶ Separate W-guy rods **64** both sides on the point **k** from the W-guy rods **68**: Remove the spring retainer **65** and unpin the pins **66**.

▶ Secure W-guy rods **68** with transport retainers.

See illustration **32**.

WARNING

WA-frame 2 folding downward!

If WA-frame 2 is not held with the auxiliary crane while placing down, it can fold downward. Personnel can be severely injured or killed!

▶ Attach WA-frame 2 **34** with auxiliary crane and slowly lower.

▶ Erect WA-frame 2 **34** and tilt 45° forward: Spool up W-adjusting rope **41** and simultaneously spool out hoist rope **60**.

▶ Secure WA-frame 2 **34**: Hang attachment points **E** on auxiliary crane.

▶ Spool out hoist rope **60** until assembly rope **61** is relaxed.

See illustration **33**.

▶ Put down WA-frame 2 **34** with auxiliary crane on WA-frame 1 **35**, spool up W-adjusting rope **41** simultaneously spool out hoist rope **60**.

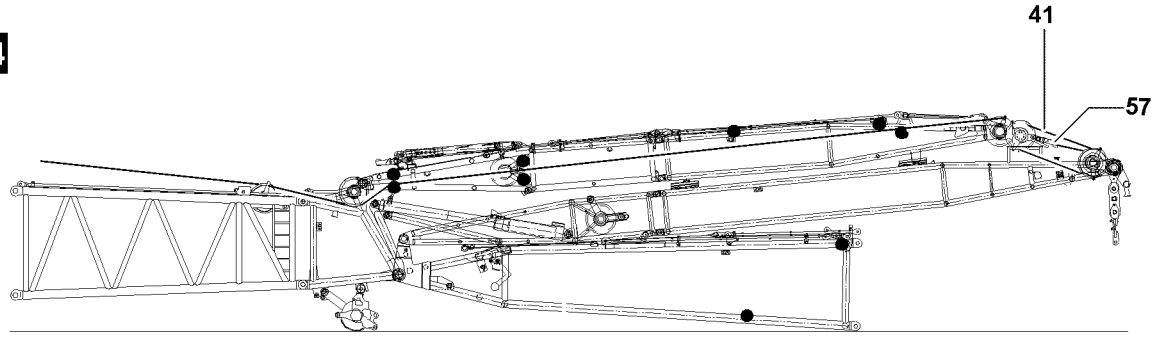
▶ Secure assembly rope **61** on WA-frame 2 **34** and separate hoist rope **60**.

▶ Spool up hoist rope **60**.

▶ Separate W-guy rods **64** on WA-frame 2 **34**: Remove the spring retainer **65** and unpin the pins **66**.

▶ Secure W-guy rods **64** with transport retainers.

34



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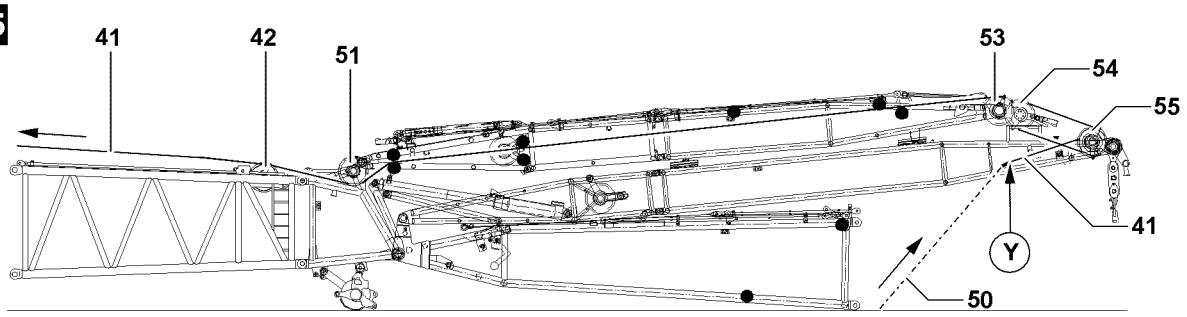

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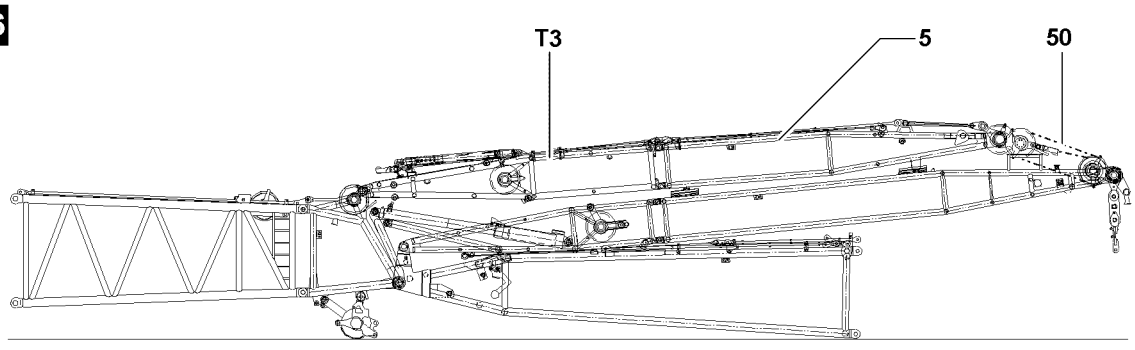


B106826

5.6 Reeving the W-adjusting rope out

NOTICE
Ropes may become slack!
The adjusting rope can become damaged due to slack rope formation.
- ▶ Do not allow slack rope formation while unreeling the W-adjusting rope!
- ▶ Maintain a tight adjusting rope when unreeling!

Note
- ▶ Before reeving out the W-adjusting rope, the rope retaining pins of rope pulley **42**, rope pulley **51**, rope pulley **53**, pulley set **54** and pulley set **55** must be released and unpinned, see disassemble **35**.

5.6.1 Unreeve adjusting rope on the pulley sets

Ensure that the following prerequisite is met:
– the intake rope for the pulley sets lies ready.

See illustration **34**.
- ▶ Hang out W-adjusting rope **41** on the rope lock **57**.

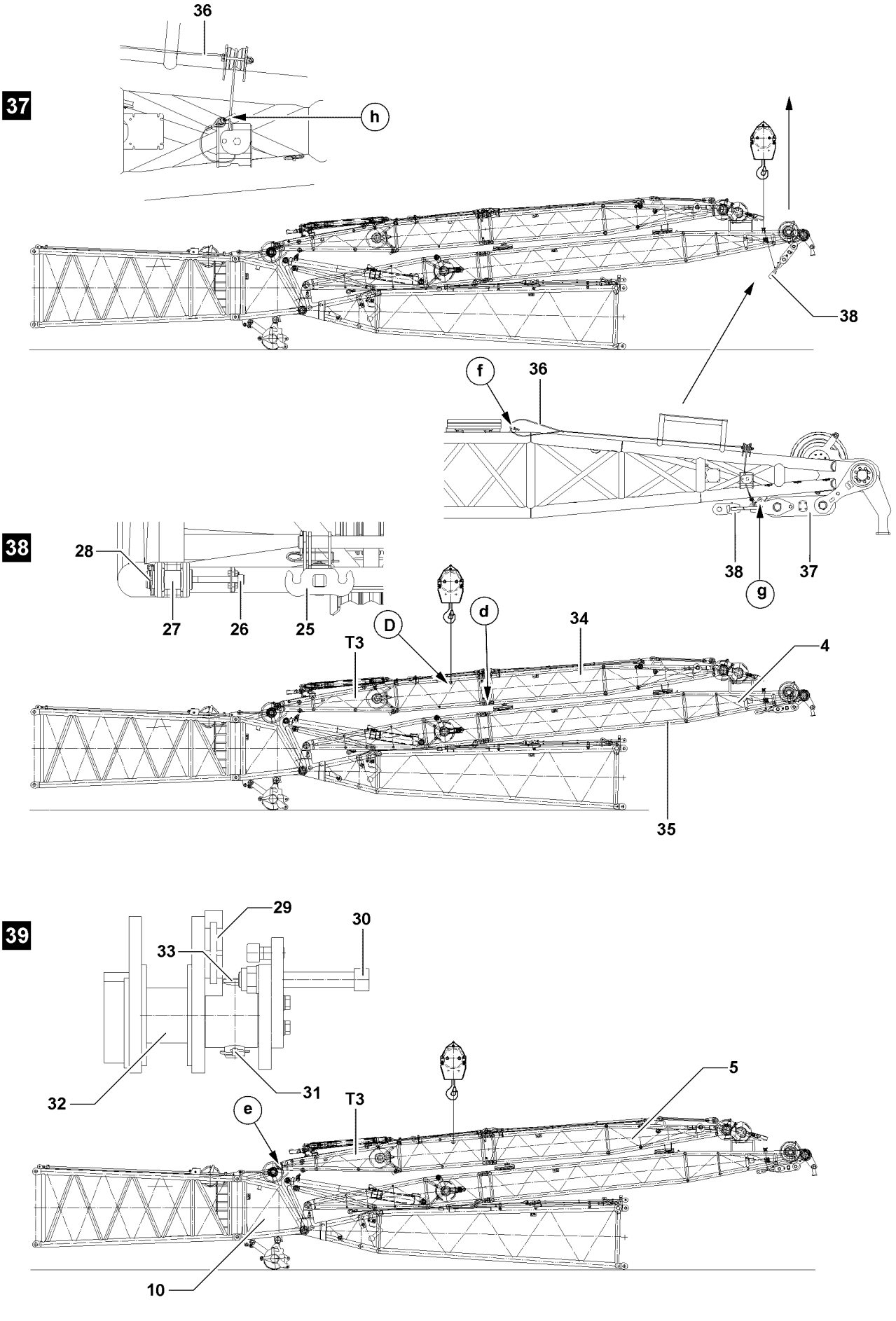
See illustration **35**.
- ▶ Pull intake rope **50** to the point **Y**.
- ▶ Connect intake rope **50** and W-adjusting rope **41** on the point **Y**.
- ▶ Spool out W-adjusting rope **41** and pull in intake rope on pulley set **54** and on pulley set **55** and engage rope lock **57**.
- ▶ Separate W-adjusting rope **41** on the cable pulley **53** from intake rope **50**.
- ▶ Assembly retaining pins on the pulley sets and the rope pulleys.

5.6.2 Unreeve W-adjusting rope on WA-frame 2

Ensure that the following prerequisite is met:
– intake rope for WA-frame 2 lies ready.

See illustration **35**.
- ▶ Pull W-adjusting rope **41** from WA-frame 2 **34** and spool onto winch V.

See illustration **36**.
- ▶ Secure intake rope **53** on the transport unit **T3** and on end piece WA-frame 2 **5**.
- ▶ Assemble the rope retaining pins to the rope pulleys.


37
36
h
38
f
36
38
g
37
38
28
27
26
25
D
d
T3
34
4
35
39
29
30
33
32
31
T3
e
5
10

B107267

5.7 Disassemble W-transport units

5.7.1 Separate WA - frame 2

See illustration **37**.

- ▶ Secure rope **36** on both sides in park position point **f** and secure point **h**.
- ▶ Attach cross brace **38** with rope **36** on auxiliary crane.
- ▶ Raise cross brace **38** with auxiliary crane and pin and secure on the point **g**.
- ▶ Separate rope **36** from auxiliary crane and secure on the point **f**.

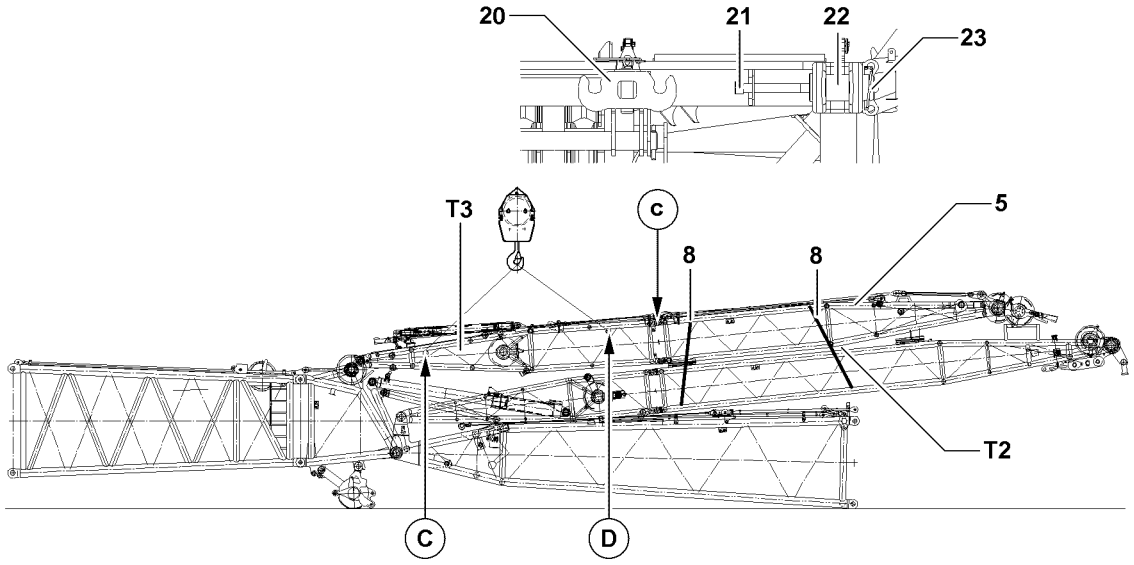
See illustration **38**.

- ▶ Secure and lightly lift WA-frame 2 **34** with the auxiliary crane on the attachment point **D** until it can be unpinned on the point **d**.
- ▶ Hang the pin pulling cylinder on the retainer **25** and on the screw **26**.
- ▶ Separate transport unit **T3** and WA-frame 2 end section **5** both sides on the point **d**: Remove linchpins **28** and unpin the pins **27**.

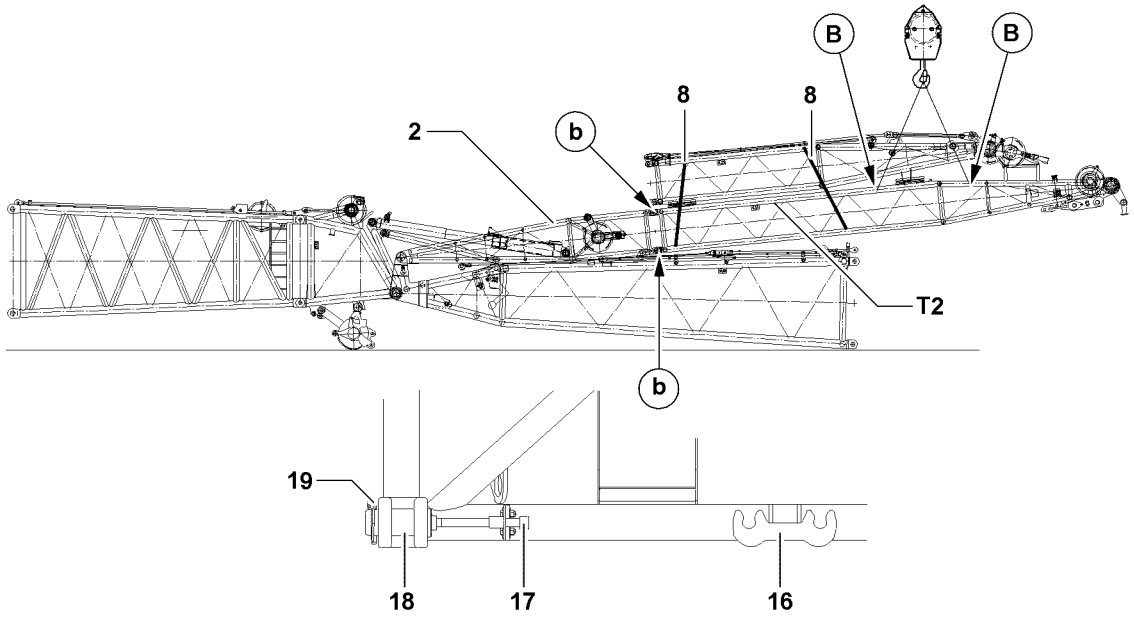
See illustration **39**.

- ▶ Hang the pin pulling cylinder on the retainer **29** and on the screw **30**.
- ▶ Separate transport unit **T3** and W-head connector **10** both sides on the point **e**: Remove linchpins **31** and unpin the pins **33**.
- ▶ Hang the pin pulling cylinder on the retainer **29** and on the screw **30**.
- ▶ Unpin the pin **32** with pin pulling cylinder.
- ▶ Lower transport unit **T3** and remove the auxiliary crane.

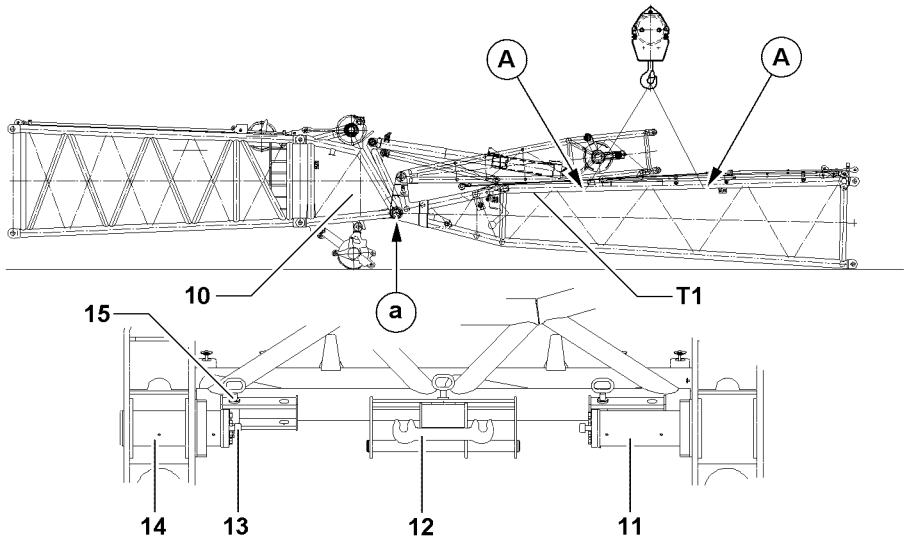
40



41



42



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5.7.2 Disassemble W-transport unit 3

See illustration **40**.

- ▶ Secure transport unit **T2** with lashing straps **8**.
- ▶ Attach and secure attachment point **C** and attachment point **D** on the transport unit **T3**.
- ▶ Hang the pin pulling cylinder on the retainer **20** and on the screw **21**.
- ▶ Separate transport unit **T3** and WA-frame 2 end section **5** both sides on the point **c**: Remove linchpins **23** and pin the pins **22**.
- ▶ Remove transport unit **T3** and remove the auxiliary crane.

5.7.3 Disassemble W-transport unit 2

See illustration **41**.

Ensure that the following prerequisite is met:

– the lashing straps are tightly secured on transport unit 2.

WARNING

Component sliding under!

If the lashing strips are not present or insufficiently tightly secured while raising transport unit 2, the end-section of WA-frame 2 can slide under. Personnel can be severely injured or killed!

- ▶ Make sure that the lashing strips **8** are tightly secured on transport unit 2.

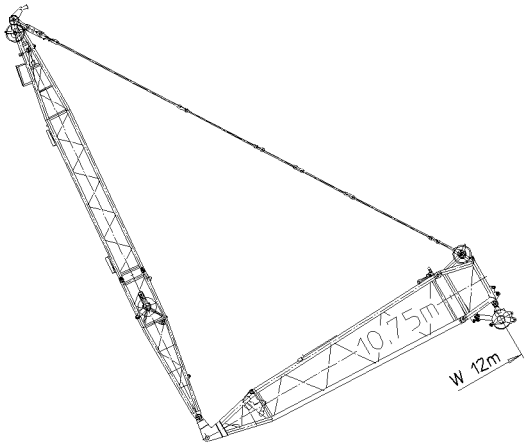
- ▶ Disconnect connection for tension measuring lug between transport unit **T2** and transport unit **T1**.
- ▶ Attach and secure the auxiliary crane on the attachment points **B** on the transport unit **T2**.
- ▶ Hang the pin pulling cylinder on the retainer **16** and on the screw **17**.
- ▶ Separate transport unit **T2** and WA-frame 1 pivot section **2** both sides on the point **b**: Remove linchpins **19** and unpin the pins **18**.
- ▶ Remove transport unit **T2** and remove the auxiliary crane.

5.7.4 Disassemble W-transport unit 1

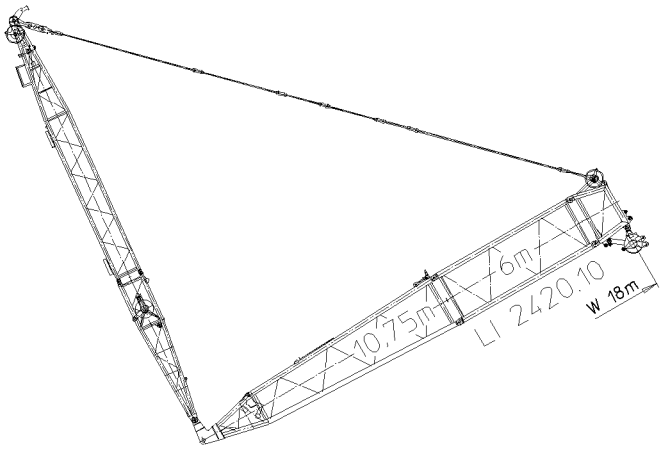
See illustration **42**.

- ▶ Attach and secure the auxiliary crane on the attachment points **A** on the transport unit **T1**.
- ▶ Hang the pin pulling cylinder on the retainer **12** and on the screw **13**.
- ▶ Separate transport unit **T1** and W-head connector **10** both sides on the point **a**: Remove connector pins **15** and unpin the pins **14**.
- ▶ Remove transport unit **T1** and remove the auxiliary crane.

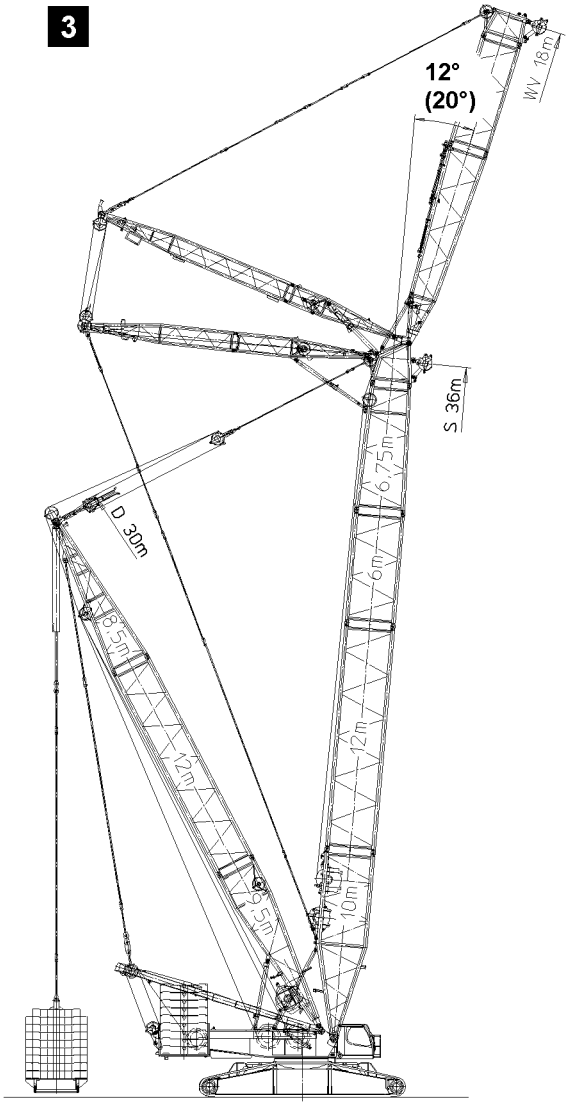
1


10,75m
W 12m

2


10,75m
6m
LI 2420.10
W 18m

3


12°
(20°)
WV 18m
S 36m
D 30m
6,75m
6m
12m
8,5m
12m
8,5m
10m

B107224

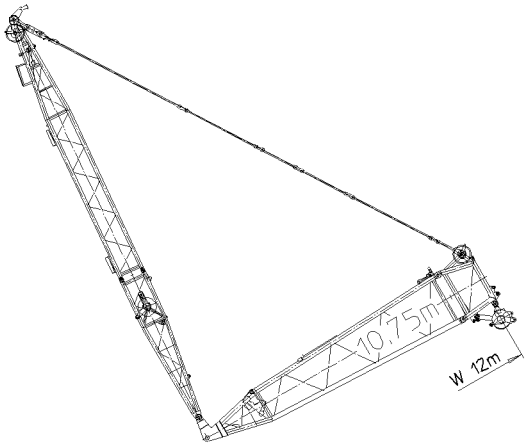
1 Overview WV lattice jib

This chapter regards the SDW boom systems with the following WV lattice jib lengths:
– 12 m, see illustration **1**.
– 18 m, with LI-intermediate section LI 2621.10, see illustration **2**.

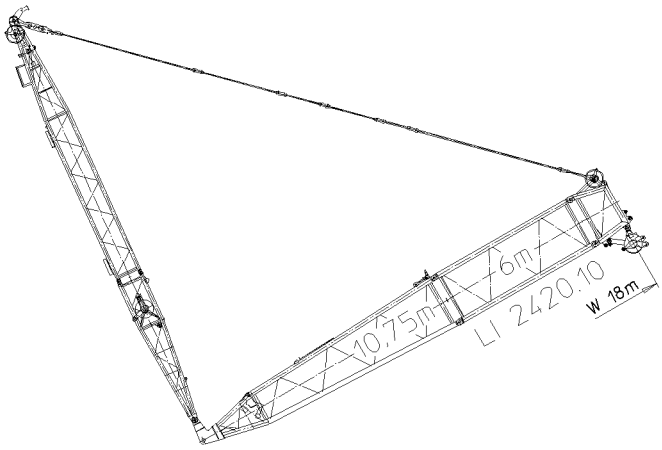
The operating positions of the WV-lattice jib to the S-boom, see illustration **3**, amount to:
– 12°
– **or** 20°.

The adjustment of the WV-lattice jib is made by winch 5.
The adjustment of the S-boom, together with the WV-lattice jib is made by winch 3.

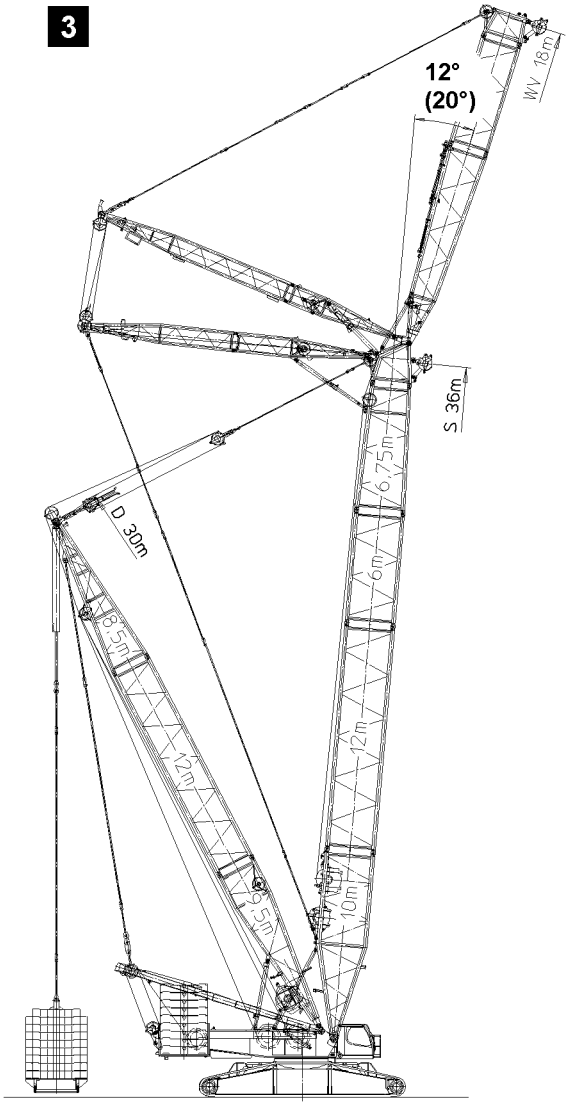
1


10,75m
W 12m

2


10,75m
6m
LI 2420.10
W 18m

3


12°
(20°)
WV 18m
S 36m
D 30m
6,75m
6m
12m
8,5m
12m
8,5m
10m

B107224

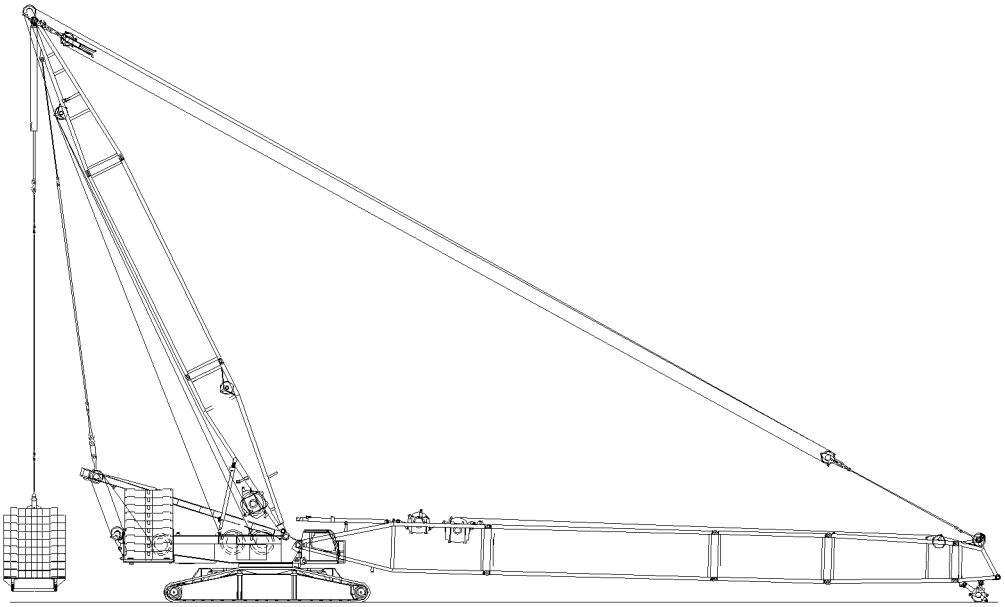
2 Assembling the WV-boom system

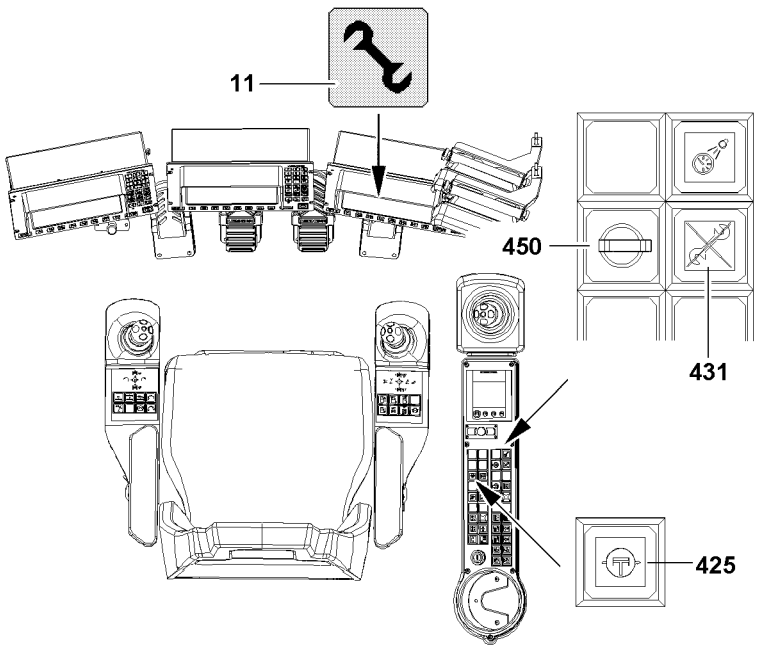
WARNING
Risk of falling!
During assembly and disassembly work, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.
- ▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (see chapter 2.04) to protect against falling! The personal protective equipment must be attached in the corresponding attachment points on the crane (see chapter 2.06).
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly, inspection and maintenance work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free of snow and ice!

WARNING
Falling components!
If unsecured or non-supported components are assembled or disassembled, they can fall down. Personnel can be killed or seriously injured.
- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
- ▶ Support the boom and components before pinning / unpinning!
- ▶ Both pins that lie in at a horizontal level, i.e. **left** and **right**, pin or unpin!
- ▶ Secure the pins in the bearing points and in the receptacles!
- ▶ Do not disengage the auxiliary crane until each component is pinned on and secured!
- ▶ It is prohibited to lean a ladder against the component being disassembled!

WARNING
Danger of crushing!
Components can swing during assembling. Hands can be crushed or severed.
- ▶ Make sure that the components do not swing back and forth during assembly!

WARNING
Neglectful inspection and maintenance on guy rods!
If the regular inspection and maintenance of the guy rods is not carried out or is carried out only in irregular intervals, then severe accidents can occur due to existing and unrecognized damage to the guy rods!
Personnel can be severely injured or killed!
- ▶ Inspect the guy rods before every assembly, see chapter 8.15.





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Note

▶ By supporting the components during assembly / disassembly, ground unevenness is compensated for and the material is protected.

Note

▶ The intermediate sections are pinned and unpinned with the aid of the pin pulling device, see chapter 5.30

NOTICE

Property damage!

▶ Always pin the guy rods from the “inside” to the “outside”.

Note

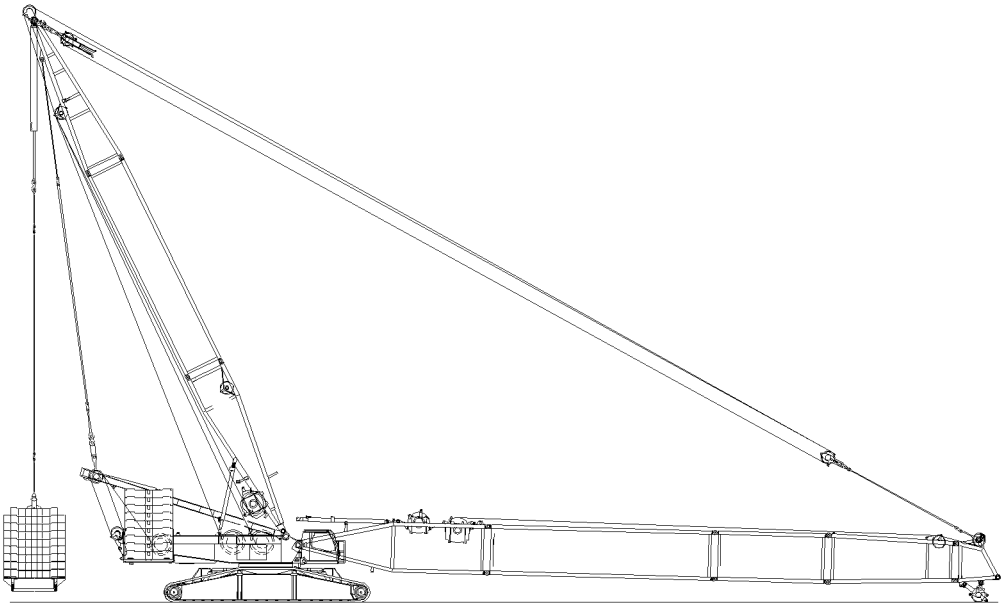
▶ The S-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

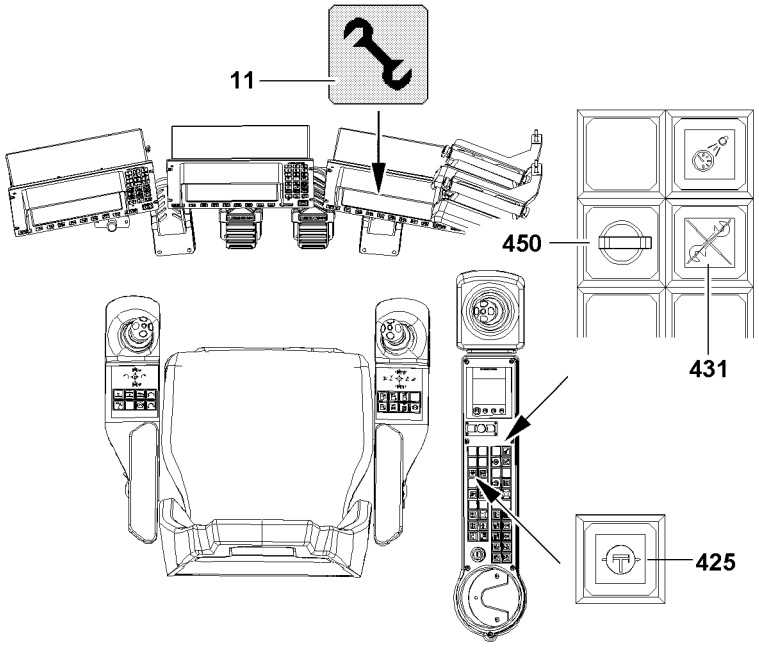
Note

▶ The boom combinations must be assembled according to the separately supplied rod and assembly plans!

Make sure that the following prerequisites are met:

– the crane is aligned in horizontal direction,
– the SD-boom combination is assembled, see chapter 5.04 and 5.05,
– the counterweight has been attached to the turntable according to the load chart,
– the derrick ballast is placed on the suspended ballast or the ballast trailer, according to the load chart,
– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is pressed and the indicator light **431** lights up,
– the assembly icon **11** on the LICCON monitor blinks,
– an auxiliary crane is available.





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2.1 Assemble W-transport units

Note
▶ Observe and follow the instructions in chapter 5.07!

2.2 Reeve the W-adjusting rope in

Note
▶ Observe and follow the instructions in chapter 5.07!

2.3 Assembling WA-frame 2 guy rods

Note
▶ Observe and follow the instructions in chapter 5.07!

2.4 Pin relapse support

Note
▶ Observe and follow the instructions in chapter 5.07!

2.5 Assemble WV lattice jib

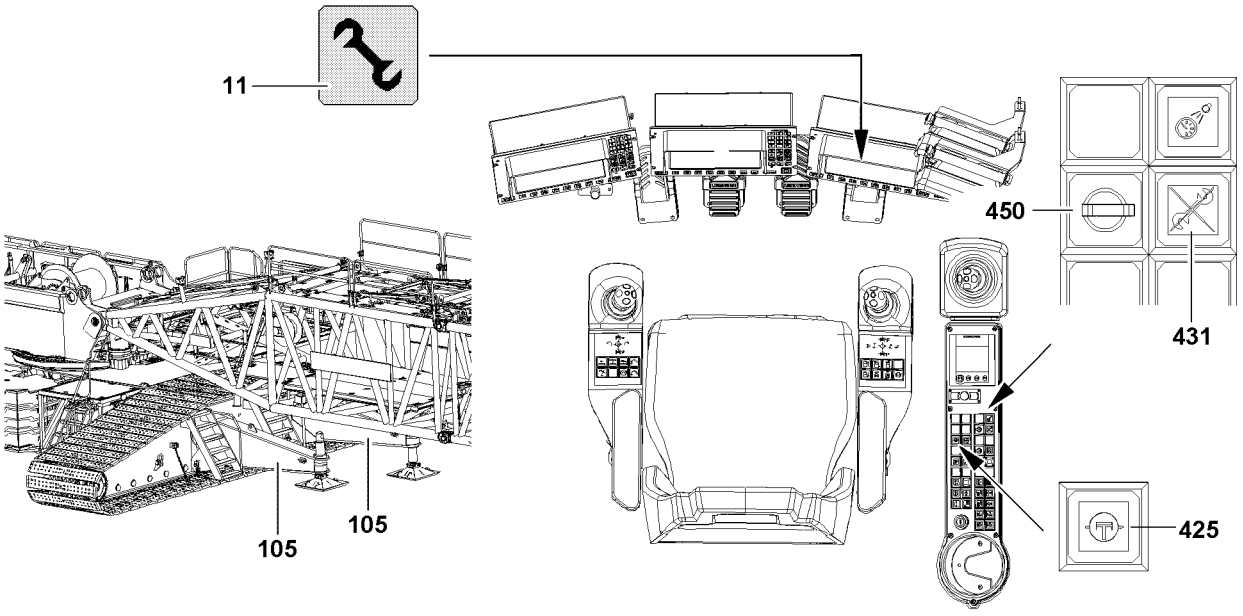
Note
▶ Observe and follow the instructions in chapter 5.07!

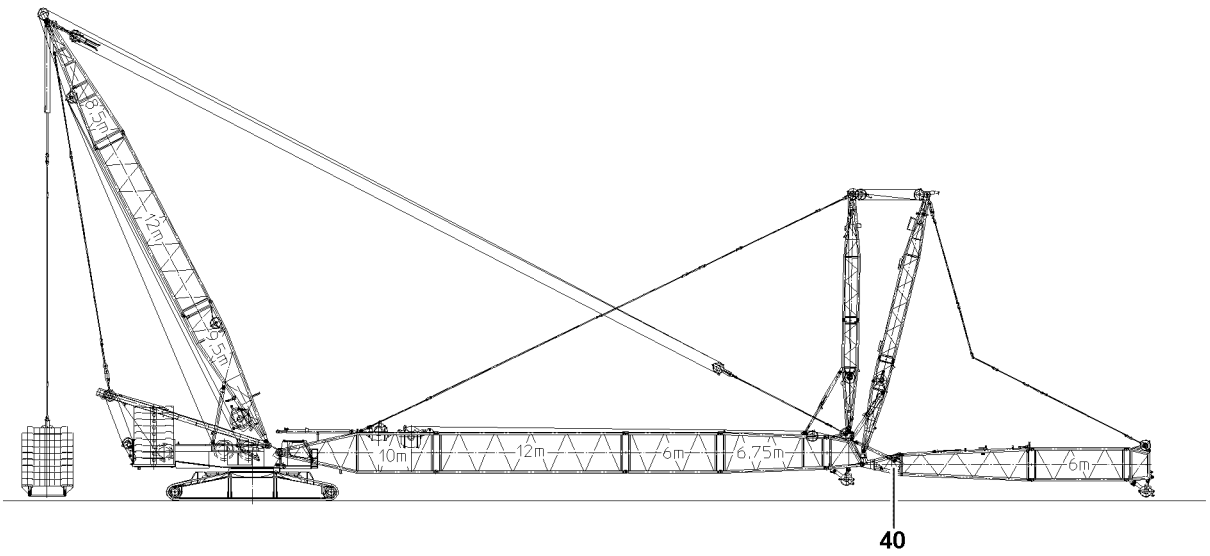
2.6 Establishing the electrical connections

Note
▶ Observe and follow the instructions in chapter 5.07!

2.7 Check the function of the safety devices

Note
▶ Observe and follow the instructions in chapter 5.07!





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2.8 Erecting boom

Note

- The erection procedure in this chapter regards the WV-lattice jibs W12 and W18. Assembly procedure for longer lattice jibs, see chapter 5.07.

DANGER

The crane can topple over!

- It is not permitted to turn the crane during erection!
- Observe the data in the erection and take down charts.
- Observe the safety technical guidelines in chapter 5.01.

DANGER

The crane can topple over!

For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down charts!

- The boom must be erected or taken down “to the side” “in direction” of the mechanical auxiliary supports **105**.
- Always erect or take down according to the data in the **Erection and take down charts**!

DANGER

Tipping lattice jib!

If the easy movement on the pendulum of the mechanical relapse support is not checked before erection or not re-established, if necessary, then the mechanical relapse support will not engage in steep lattice jib position. As a result, the lattice jib can tip to the rear.

Personnel can be severely injured or killed!

- Check the easy movement on the pendulum **40** of the mechanical relapse support before erection.
- If the pendulum does not move easily: Make the pendulum **40** easy to move!

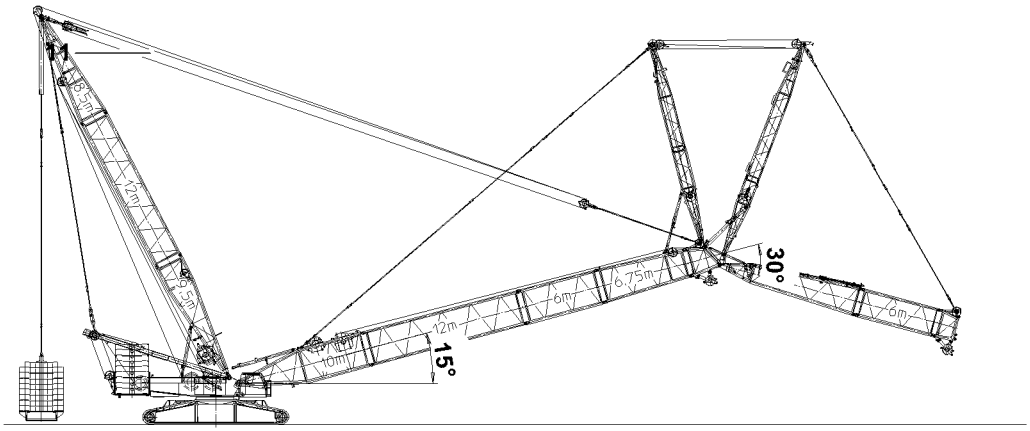
WARNING

The crane can topple over!

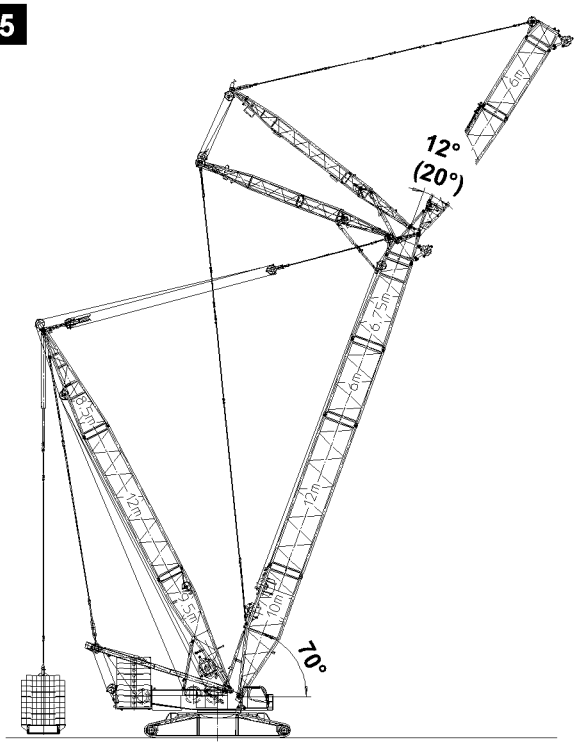
If the following conditions are not met before erecting the boom, the crane can topple over. Personnel can be severely injured or killed!

- Spool the lattice jib control out so that the guy rods sag slightly!
- Do not allow slack cable to build up on the control winch!
- Extend the relapse cylinder before erection!

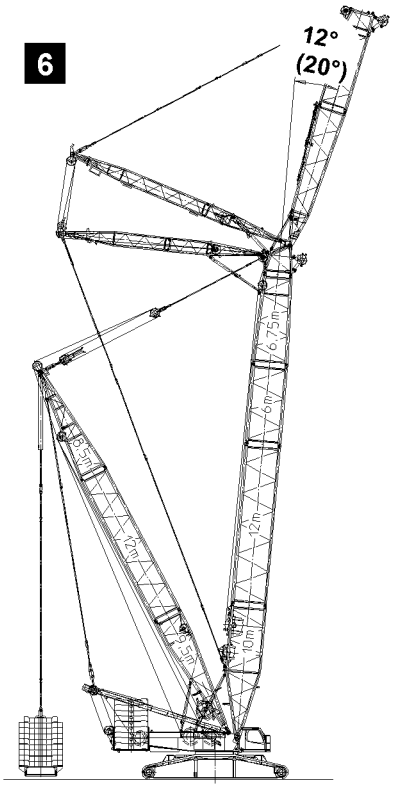
4

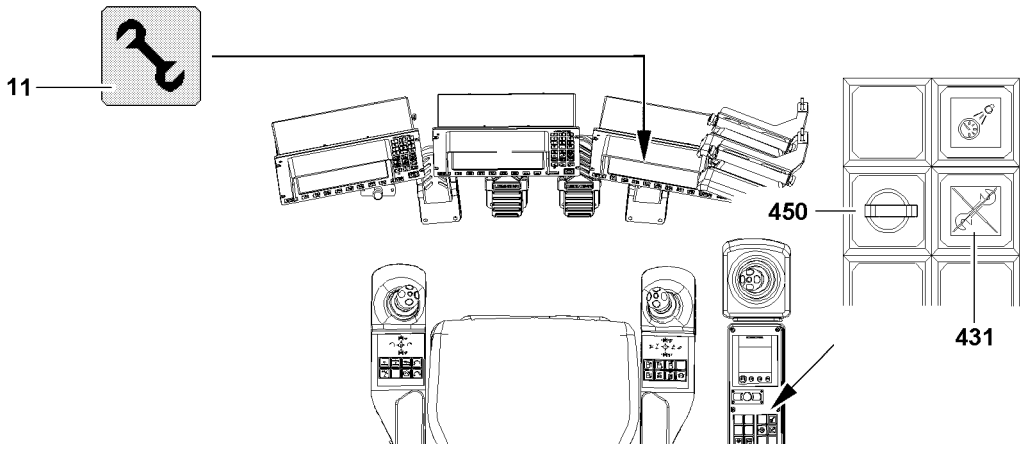

11
8.5m
12m
6.5m
10m
12m
6m
6.75m
6m
6m
30°
15°

5


6m
12°
(20°)
6.75m
6m
8.5m
12m
12m
10m
8.5m
70°

6


12°
(20°)
6.75m
6m
8.5m
12m
12m
10m
8.5m


11
450
431

B107226

Make sure that the following prerequisites are met:
- the WV-lattice jib is fully assembled,
- no personnel are within the danger zone,
- the crane is aligned in horizontal direction,
- all electrical connections have been established,
- all limit switches are functional,
- the counterweight has been attached to the turntable and on the derrick, according to the load chart,
- all pin connections have been secured,
- the hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins,
- there are no loose parts on the boom or the lattice jib,
- boom, lattice jib and safety devices are free from snow and ice,
- the LICCON overload protection has been adjusted according to the data in the load chart,
- the LICCON overload protection settings have been compared with the actual crane configuration,
- the assembly key button **450** is actuated,
- the indicator light **431** “assembly” lights up,
- the assembly icon **11** on the LICCON monitor 0 lights up.

WARNING
Falling hoist rope!
If the hoist rope before the erection procedure is not properly secured onto the corresponding length on the WV-lattice jib, it can fall down backward on the basis of its own weight. Personnel can be severely injured or killed!
- ▶ Reeve in the hoist rope with sufficient length on the WV-lattice jib before the erection process!
- ▶ The hoist rope must be constantly monitored during erection!
- ▶ Do not step into the danger zone!

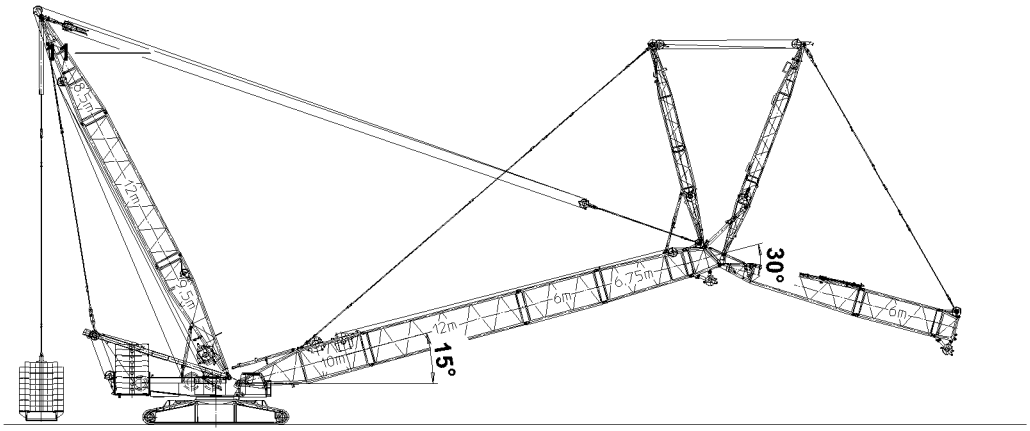
- ▶ Luff the S-boom down until the hook block can be reeved.
- ▶ Reeve in the hook block properly and secure the hoist rope on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.

See illustration **4**.
- ▶ Luff the S-boom up to 15°.

WARNING
The crane can topple over!
If the angle between the boom and the lattice jib is smaller than or equal to 30°, the mechanical relapse support will collide with the flap on the oscillating guard. The crane can topple over! Personnel can be severely injured or killed!
- ▶ The angle between the S-boom and the WV-lattice jib must be more than 30° during the complete erection procedure!
- ▶ The angle between the S-boom and the WV-lattice jib may not exceed 30° during the complete erection procedure!
- ▶ Perform a visual inspection during erection.

- ▶ Lower the WV-boom to -15° (angle between the S-boom and the WV-lattice jib amounts to 30°).

4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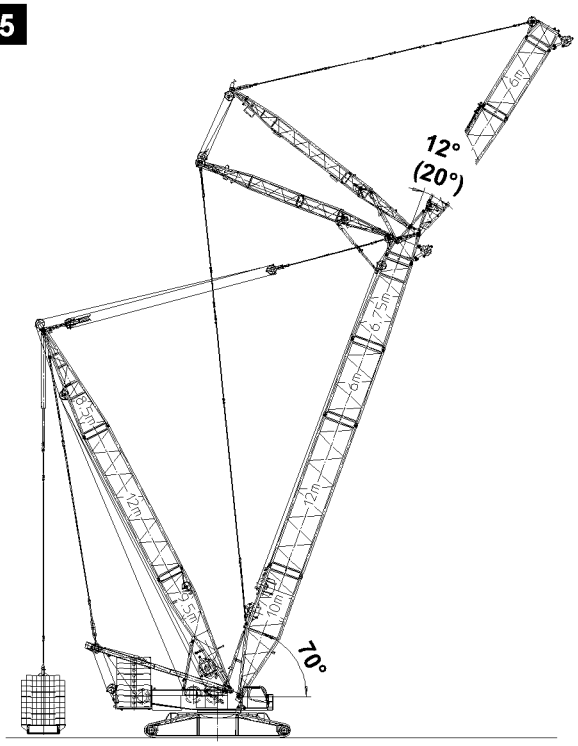
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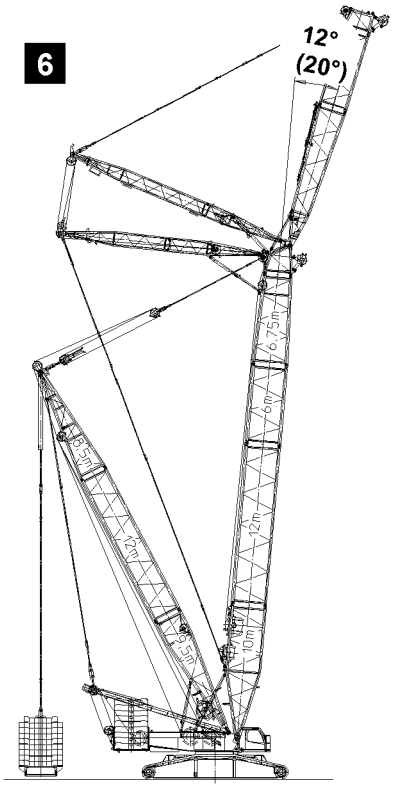
6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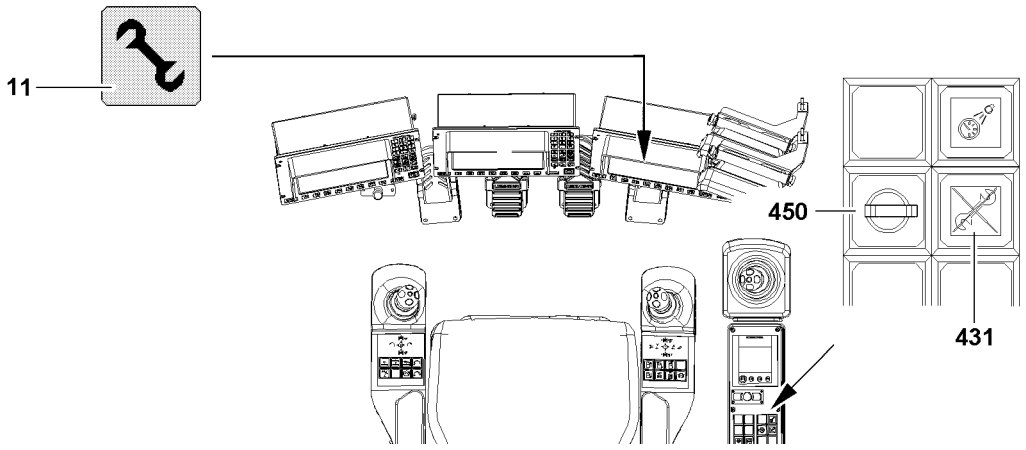
11
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431

B107226

See illustration **5**.

DANGER
The crane can topple over!
In crane operation with bypassed safety devices, the crane can topple over. Personnel can be severely injured or killed!
- ▶ When the lowest operating position of the WV-lattice jib is reached, immediately turn off the assembly key button **450**.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

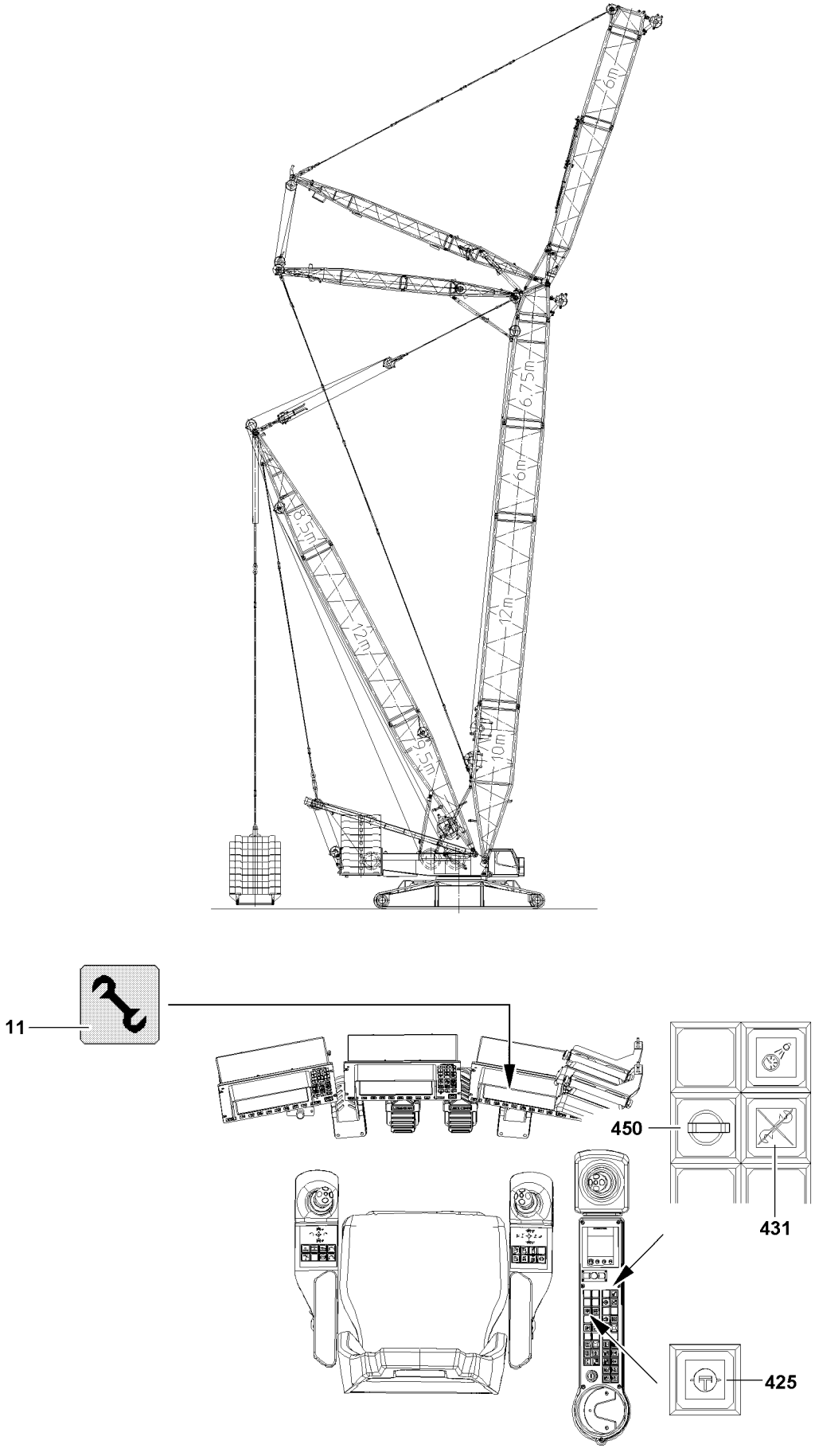
Note
- ▶ When the lowest operating position of the WV-lattice jib is reached, the displays turn off.
- ▶ In the icon “Maximum load”, a load number in “t” appears instead of the display “???”!

- ▶ Luff the S-boom up to the lowest operating position.
- ▶ When the S-boom has reached the lowest operating position:
  Switch the assembly key switch **450** off.

Result:
- – The LICCON overload protection is active.
- – The indicator light **431** turns off.
- – The assembly symbol **11** on the LICCON monitor turns off.
- – The acoustical signal turns off.
- – The three color light lights up red and the warning light on the rear of the turntable lights up.

- ▶ Luff the S-boom up to 70°.
- ▶ Luff the WV-lattice jib to 12° or 20° operating position.

See illustration **6**.
- ▶ Luff up the S-boom into operating position.



B107223

3 Operating the crane

3.1 Preparing for crane operation

Note

▶ Observe the notes in chapters 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is turned off.

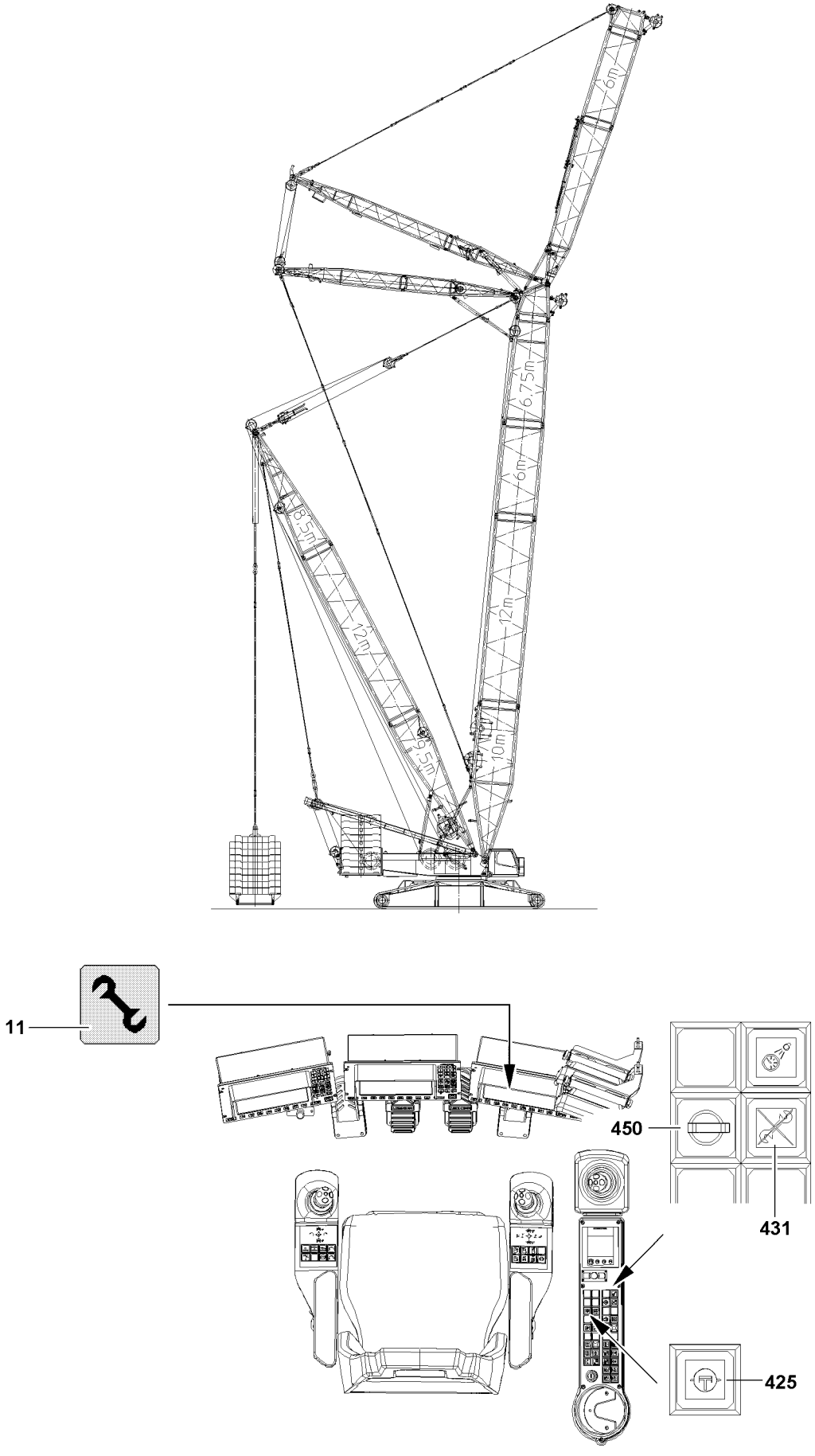
WARNING

The crane can topple over!

▶ Check the horizontal position of the crane before and during operation!
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation!

3.2 Checking the settings.

▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the limit switches on the relapse cylinders.



B107223

4 Disassembling the WV-boom system

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

- ▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (see chapter 2.04) to protect against falling! The personal protective equipment must be attached in the corresponding attachment points on the crane (see chapter 2.06).
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly, inspection and maintenance work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free of snow and ice!

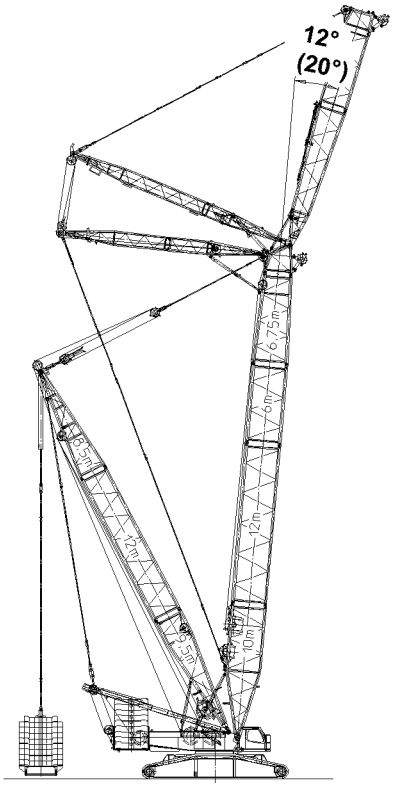
WARNING
Falling components!
If unsecured or non-supported components are assembled or disassembled, they can fall down. Personnel can be killed or seriously injured.

- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
- ▶ Support the boom and components before pinning / unpinning!
- ▶ Both pins that lie in at a horizontal level, i.e. **left** and **right**, pin or unpin!
- ▶ Secure the pins in the bearing points and in the receptacles!
- ▶ Do not disengage the auxiliary crane until each component is pinned on and secured!
- ▶ It is prohibited to lean a ladder against the component being disassembled!

WARNING
Danger of crushing!
Components can swing during assembling. Hands can be crushed or severed.

- ▶ Make sure that the components do not swing back and forth during assembly!

7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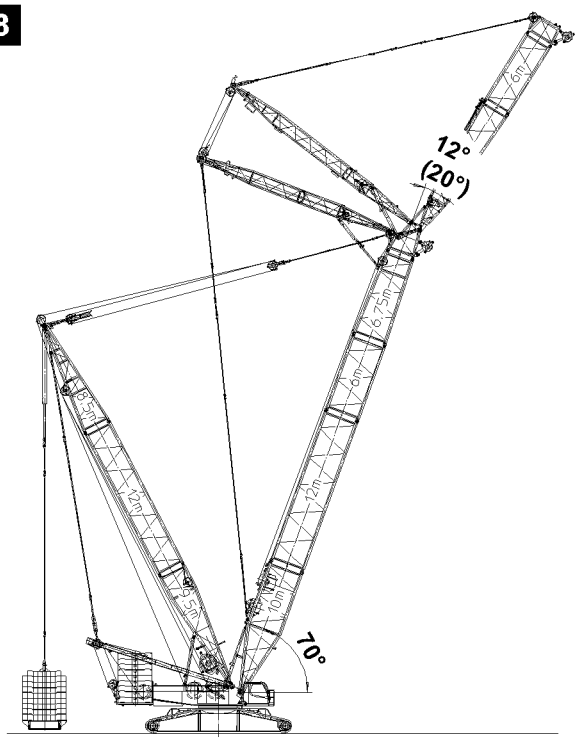
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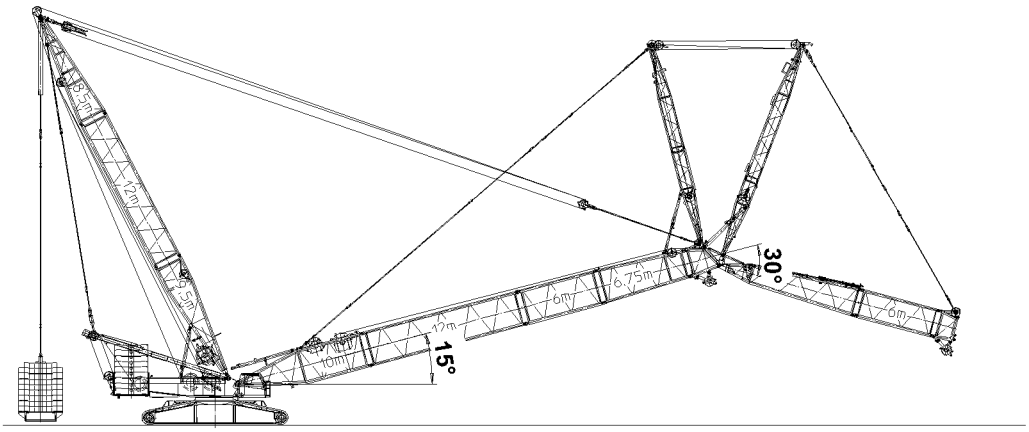
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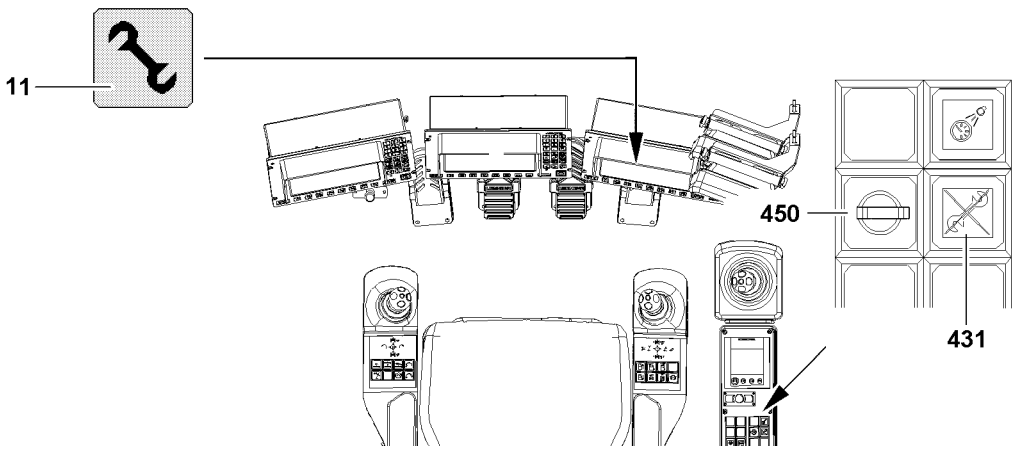
11
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Note

▶ By supporting the components during assembly / disassembly, ground unevenness is compensated for and the material is protected.

Note

▶ The intermediate sections are pinned and unpinned with the aid of the pin pulling device, see chapter 5.30.

WARNING

Risk of accident!

Personnel can be severely injured or killed!

▶ While pinning and unpinning with the pin pulling device, observe and follow warning guidelines in chapter 5.30!

Make sure that the following prerequisites are met:

– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is pressed and the indicator light **431** lights up,
– the assembly icon on the LICCON display blinks,
– an auxiliary crane is available.

4.1 Place down WV lattice jib

DANGER

The crane can topple over!

For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down charts!

▶ The boom must be erected or taken down “to the side” “in direction” of the mechanical auxiliary supports **105**.
▶ Always erect or take down according to the data in the **Erection and take down charts**!

WARNING

The crane can topple over!

If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!

▶ Observe the safety technical guidelines in chapter 5.01!
▶ Observe the data in the erection and take down charts!

NOTICE

Damage of boom components!

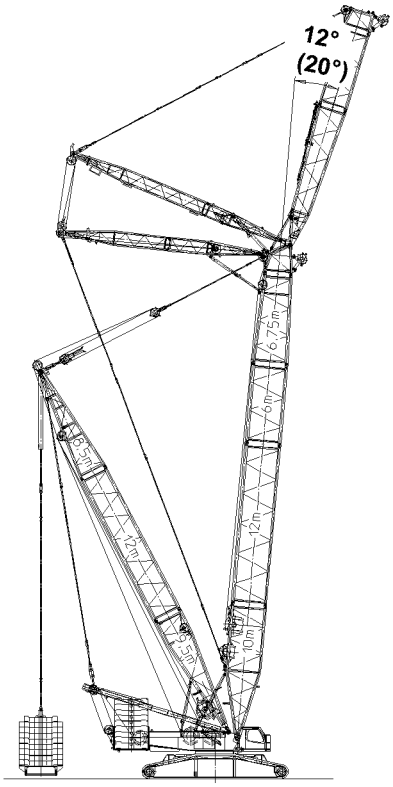
Taking down the boom system can lead to a collision between the hook block and the pulley head. Boom components can be severely damaged.

▶ Luff the boom system down at the same time and spool the hoist winch out.

Ensure that the following prerequisite is met:

– the S-boom is found in operating position, see illustration **7**,
– the hook block is approx. 5 m below the pulley head of the lattice jib.

7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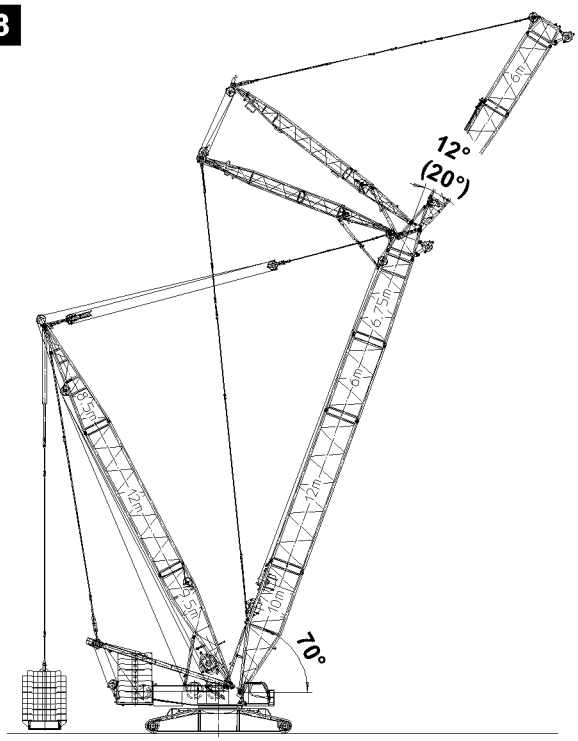
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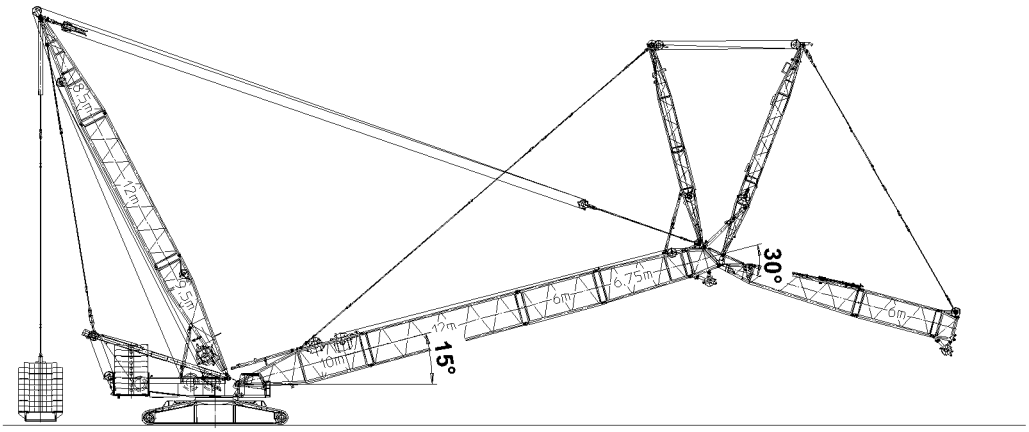
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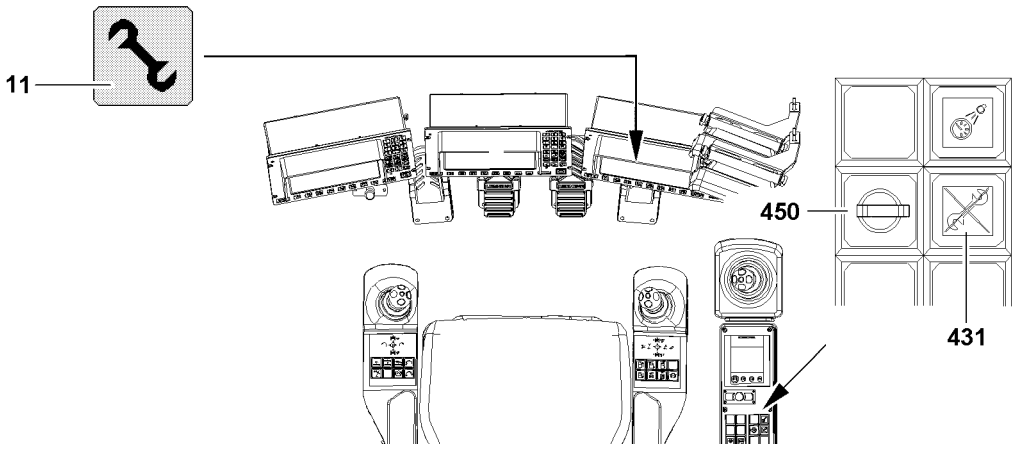

11
450
431

B107229

4.1.1 Luff down WV lattice jib

▶ Luff down S-boom up to 70°, see illustration **8**.

WARNING
The crane can topple over!
If the angle between the boom and the lattice jib is smaller than or equal to 30°, the mechanical relapse support will collide with the flap on the oscillating guard. The crane can topple over! Personnel can be severely injured or killed!
▶ Make sure that the angle between the S-boom and the WV-lattice jib is more than 30° during the complete erection procedure.
▶ The angle between the S-boom and the WV-lattice jib may not exceed 30° during the complete take-down procedure!
▶ Perform a visual inspection during erection.

▶ Luff down WV-lattice jib to approx. 30° for S-boom, see illustration **9**.

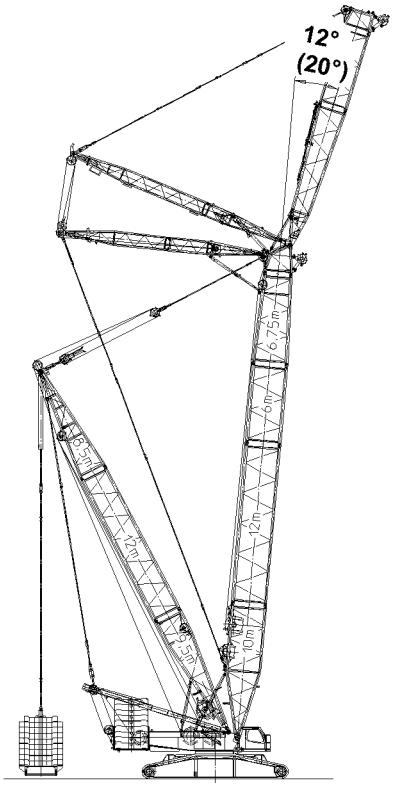
Note
▶ The Luff down movement is turned off as soon as the lowest operating position is reached.
▶ When the lowest operating position of the WV-lattice jib is reached, the load display in the “Maximum load” icon turns off and instead of the load display, the display “???” appears.
▶ In the crane operating screen appear alarm functions.

▶ Luff the WV-lattice jib down to the “lowest” operating position.
Result: The following alarm functions become active:
– “STOP”
– “Horn” and acoustical signal

DANGER
Crane operation with added assembly key button!
▶ The actuation of the assembly key button **450** is only permitted for assembly tasks!
▶ The assembly key button **450** may only be operated by persons who are aware of the consequences of a bypass!
▶ If the assembly key button **450** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
▶ Crane operation with the assembly key button **450** turned on is strictly prohibited!
▶ The assembly key button **450** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ When the WV-lattice jib has reached the “lowest” operating position:
Turn the assembly key button **450** on.
Result:
– The LICCON overload protection is deactivated.
– The indicator light **431** lights up.
– The assembly icon **11** on the LICCON monitor blinks.
– The “STOP” icon on the LICCON monitor blinks.
– An acoustical signal sounds.
– The three colour light lights up red and the warning light on the rear of the turntable lights up.

7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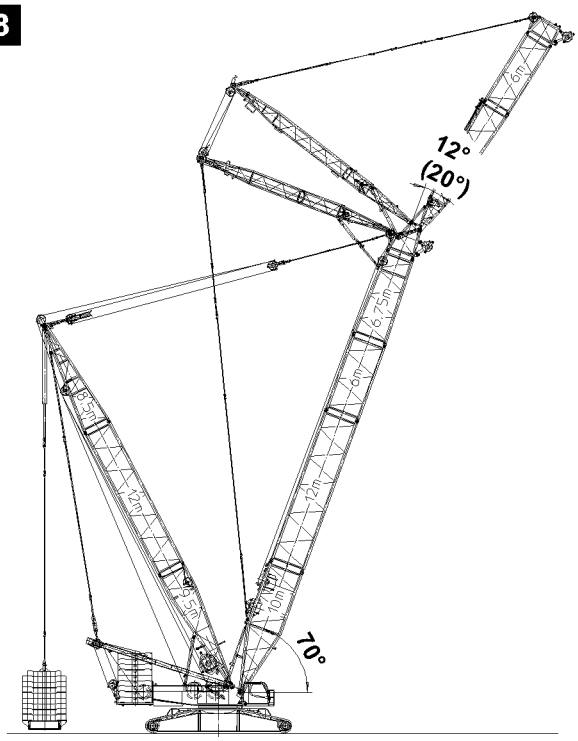
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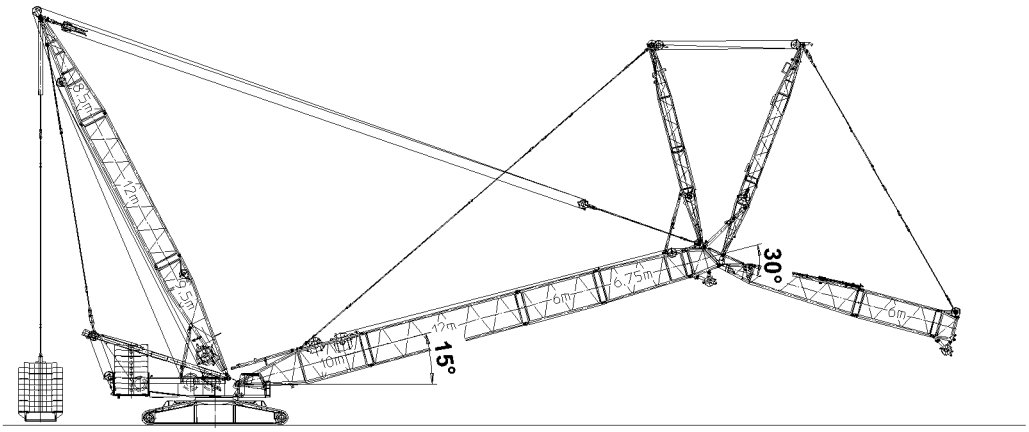
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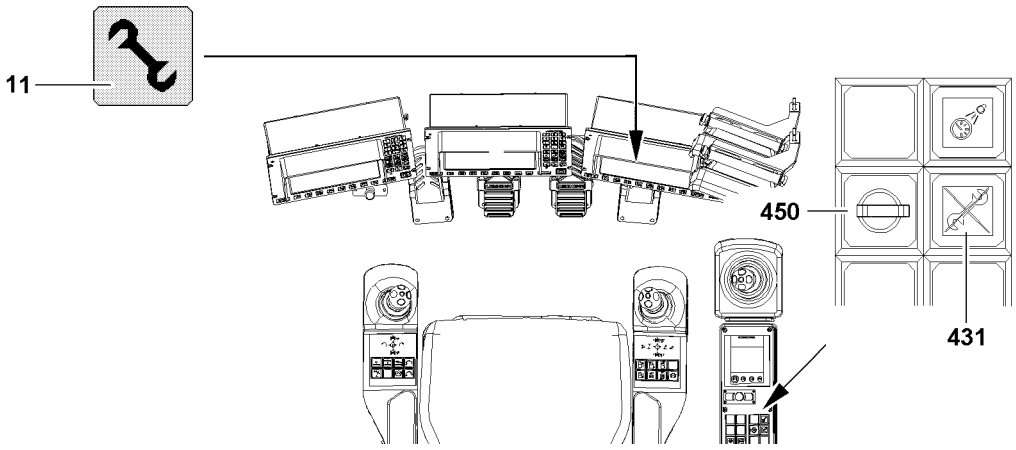
11
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B107229

4.1.2 Place down WV lattice jib

- ▶ If the hook block has not yet touched the ground:
  At the same time, spool the hoist winch out and luff the S-boom down until the hook block touches the ground.
- ▶ Remove the hoist limit switch weight.
- ▶ Unreeve the hook block.
- ▶ Luff down S-boom until SW-end section lies on the floor.

WARNING
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over.
Personnel can be severely injured or killed!
- ▶ Spool the lattice jib control out so that the guy rods sag slightly!
- ▶ Do not allow slack cable to build up on the control winch!
- ▶ Do not pull the hook block along on the ground!

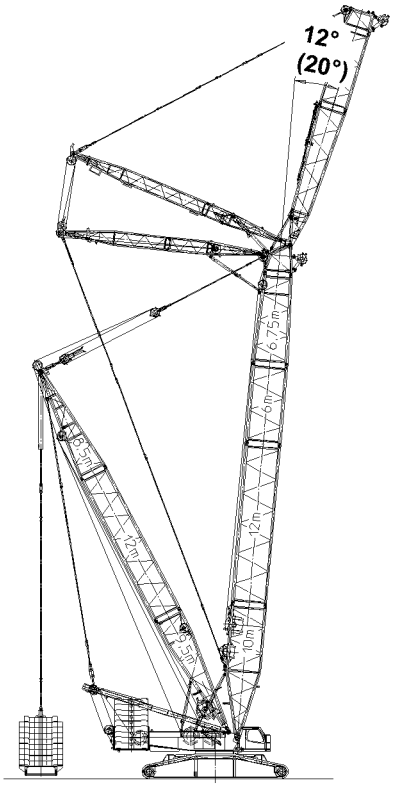
- ▶ Continue to luff down the S-boom and simultaneously spool the WV-lattice jib control out so that the guy rods sag slightly.

See illustration **24**.
- ▶ Luff the S-boom down until the S-boom head is laying on the support on the ground.

WARNING
Risk of accident!
- ▶ Make sure that no personnel are within the danger zone.
- ▶ Secure the hoist rope with the assembly rope and pull it back slowly over the rope pulleys in the WA-frames and lower it toward the W-connector head.

- ▶ Lay down hoist rope.

7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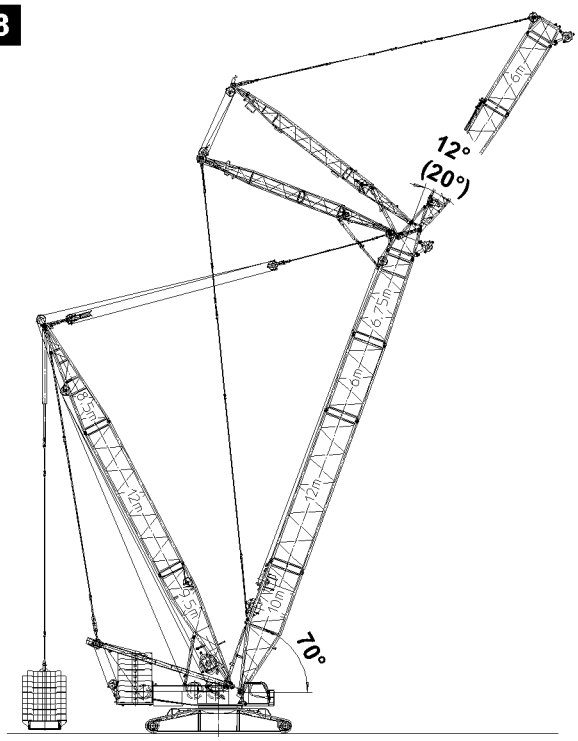
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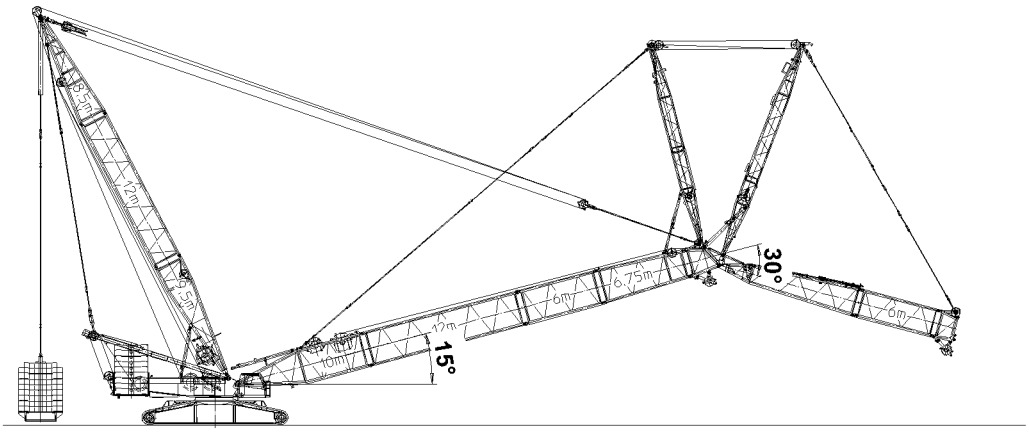
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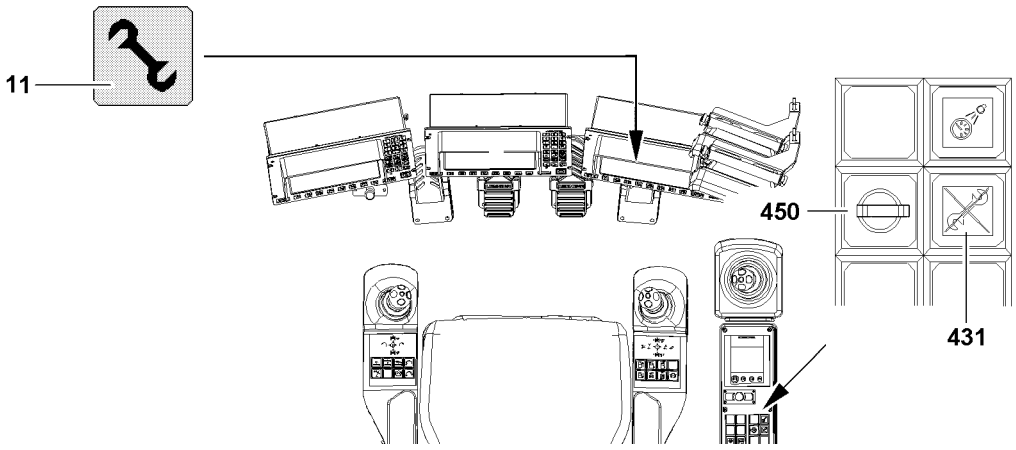

11
450
431

B107229

4.2 Disconnect the electrical connections

Note
▶ Observe and follow the instructions in chapter 5.07!

4.3 Disassemble WV lattice jib

Note
▶ Observe and follow the instructions in chapter 5.07!

4.4 Unpin relapse supports

Note
▶ Observe and follow the instructions in chapter 5.07!

4.5 Disassemble WA-frame 2 guy rods

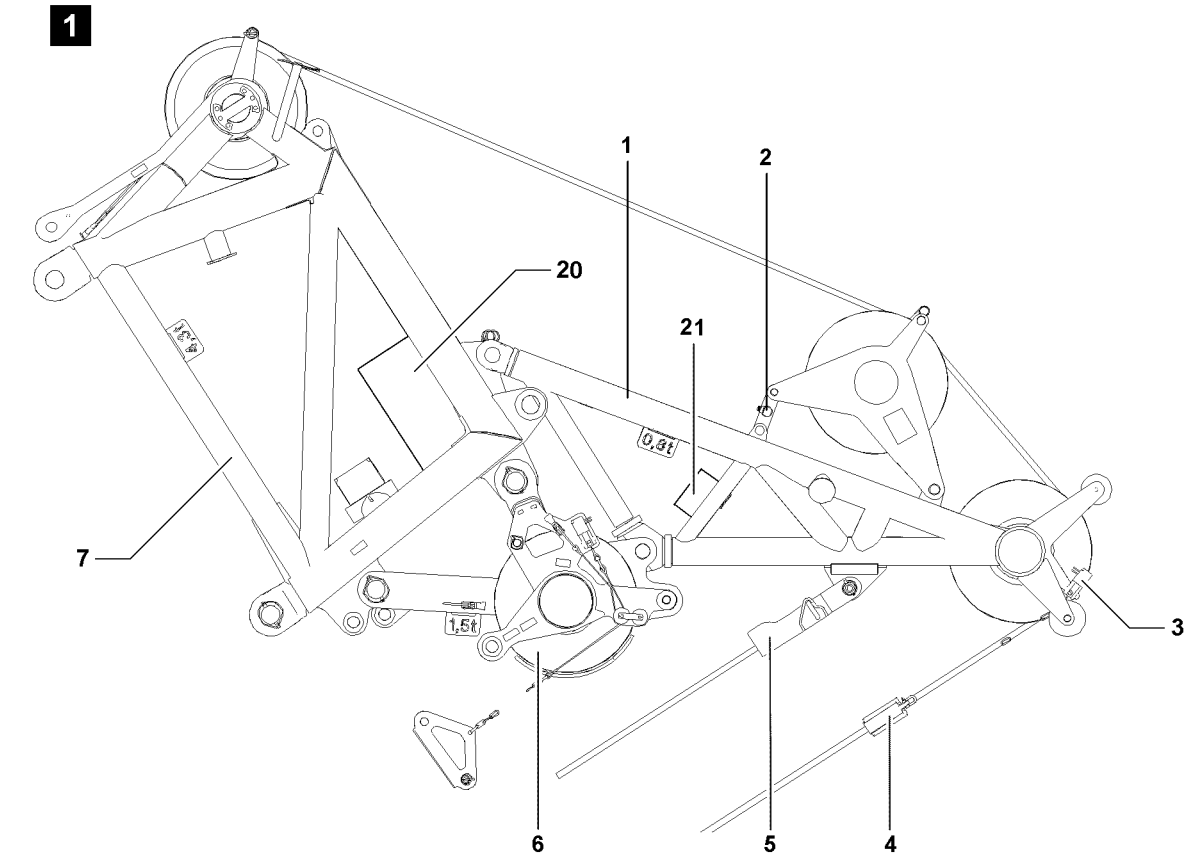
Note
▶ Observe and follow the instructions in chapter 5.07!

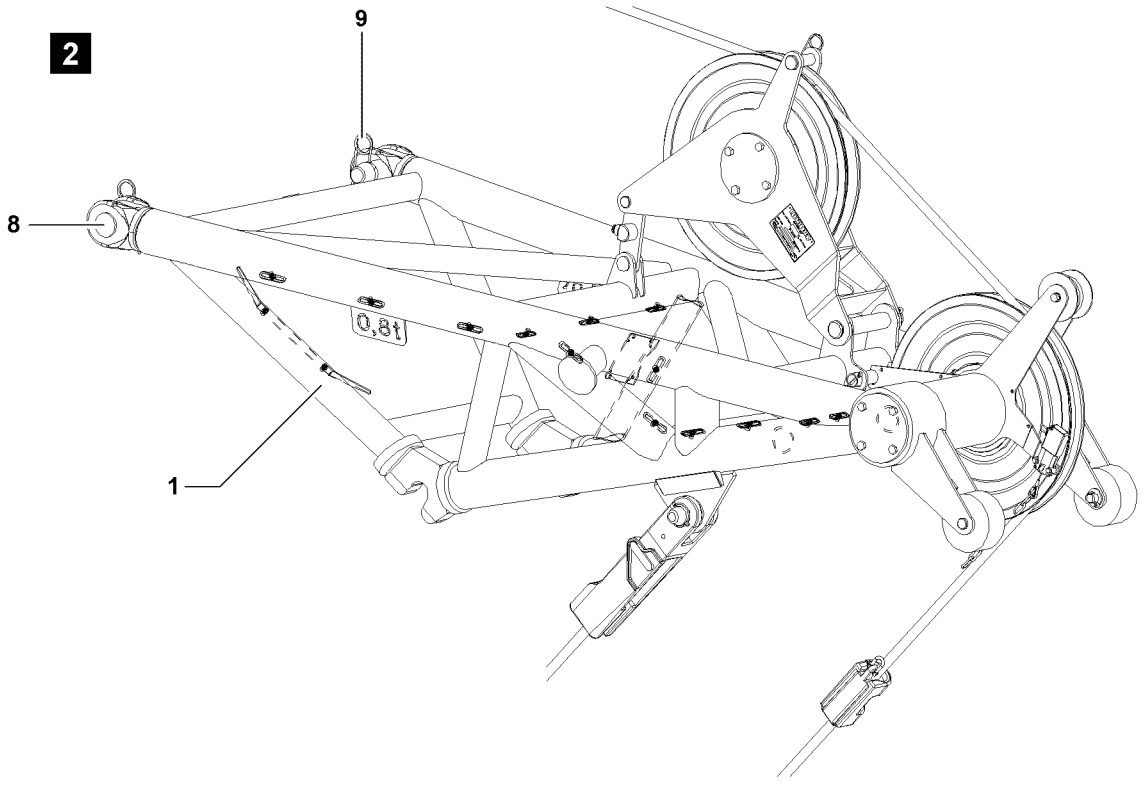
4.6 Reeving the W-adjusting rope out

Note
▶ Observe and follow the instructions in chapter 5.07!

4.7 Disassemble W-transport units

Note
▶ Observe and follow the instructions in chapter 5.07!



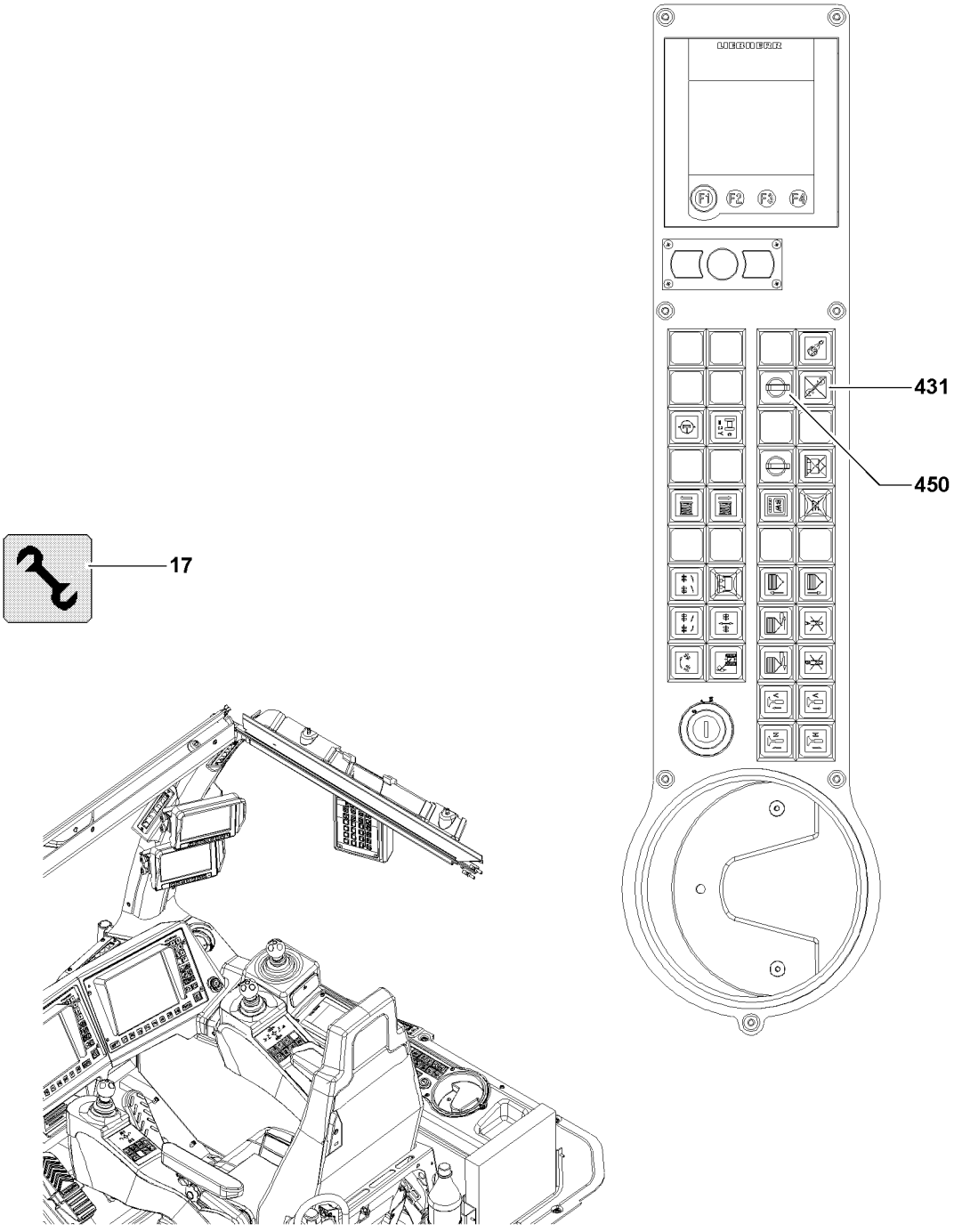


B105237

1 Overview of boom nose components

The 36 t boom nose **1** is assembled on the SW-end section **7** and placed on the pulley set arrangement **6**, see illustration **1**.

Position	Description
1	Boom nose 36 t
2	Pressure test bracket
3	Hoist limit switch
4	Hoist limit switch weight
5	Rope fixed point (rope lock)
6	Roller set
7	SW-end section
8	Pin
9	Spring retainer
20	Terminal box SW-end section +S930
21	Terminal box boom nose +S1030



B108924

2 Assembling the 36 t boom nose on the SW-end section

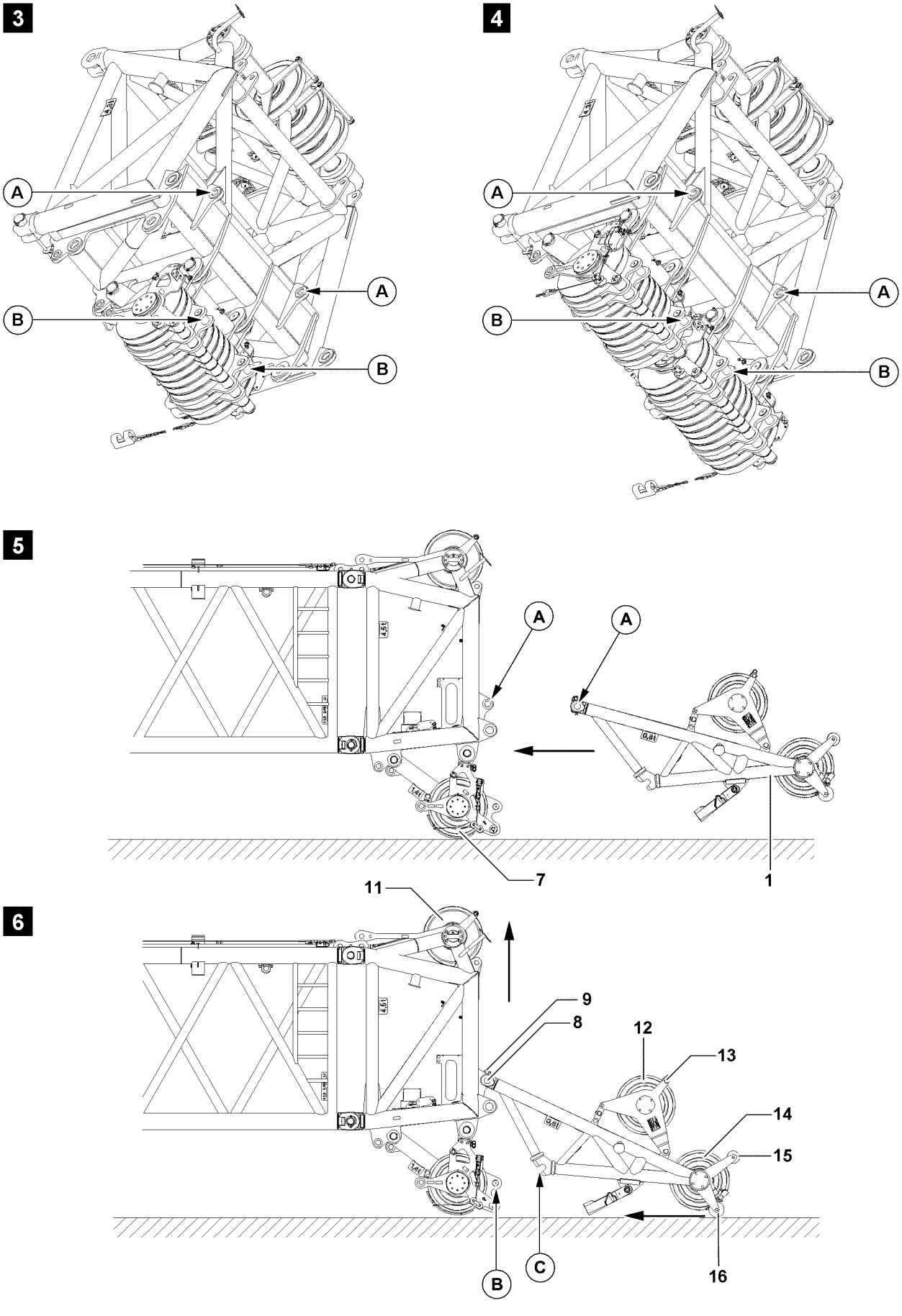
DANGER
Crane operation with turned on assembly key button!
If the LICCON overload protection is bypassed during crane operation with the assembly key button **450**, personnel can be severely injured or killed.
- ▶ Crane operation with turned on assembly key button **450** is strictly prohibited!
- ▶ The actuation of the assembly key button **450** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ After assembly work is completed, the assembly key button **450** must be pulled immediately and turned over to an authorized person!

WARNING
Falling booms at assembly / disassembly!
If unsecured or non-supported booms are removed, the booms can fall. Personnel can be severely injured or killed!
- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

WARNING
Incorrect or missing fall guard!
Using inappropriate aids to secure the assembly personnel at assembly can result in a fall. Personnel can be severely injured or killed!
- ▶ Secure yourself and others during all assembly work with suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.), basically from a height of 2 m on.
- ▶ Observe national regulations: The height from which aids must be used can differ from country to country.

When work with aids cannot be carried out from the ground:
- ▶ Secure yourself and others during all assembly work with personal protective equipment (for example safety belts) to prevent a fall.

Observe the safety guidelines for assembly in chapter 5.01.



B105238

2.1 Assembling the boom nose

Make sure that the following prerequisites are met:
- the crane is aligned in horizontal direction,
- the counterweight has been installed to the turntable according to the load chart,
- the derrick ballast is placed on the suspended ballast or the ballast trailer, according to the load chart,
- the LICCON overload protection has been set according to the data in the load chart,
- the mechanical auxiliary support is installed on the crane,
- an auxiliary crane is available,
- the boom is laying with the pulley set on the ground, see illustration **5**.

Note

▶ The weight of the 36 t boom nose is 0.45 t.

The SW-end section can be equipped with one or with two pulley sets:
- The pin points **A** and the attachment pins **B** for the assembly of the boom nose are shown in illustration **3** and illustration **4**.

▶ Hang the boom nose **1** onto the auxiliary crane.

▶ Position the boom nose **1** with the auxiliary crane on the SW-end section in such a way that the pin bores align in point **A**, see illustration **5**.

▶ When the pin bores align:
Pin in the pin **8** on the end section in point **A** and secure with spring retainer **9**.

▶ Lower the boom nose **1** to the ground with the auxiliary crane.

▶ Remove the auxiliary crane.

▶ Release and unpin the rope retaining pin **13**.

▶ Pull the hoist rope over the rope pulley **11** on the end section and the rope pulley **12** on the boom nose.

▶ Pin in and secure the rope retaining pin **13**.

▶ Guide the hoist rope between the rope pulley **14** and the rope retaining pulley **15**.

NOTICE

Automatic fold out of fork connection at luff down or place down!
If the boom is luffed down or placed down at excessive speed, the boom nose can be damaged.

▶ Luff the boom down or place it down very carefully.

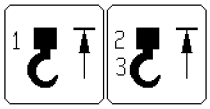
▶ Luff the boom up slowly.

Result:
- The boom nose moves on the pulleys **16** in direction of the boom head, see illustration **6**.

▶ Luff the boom up until the boom nose lays on the pulley set.

▶ Make sure that the fork head **C** of the boom nose lays on the stop pin **B** of the pulley set.

7



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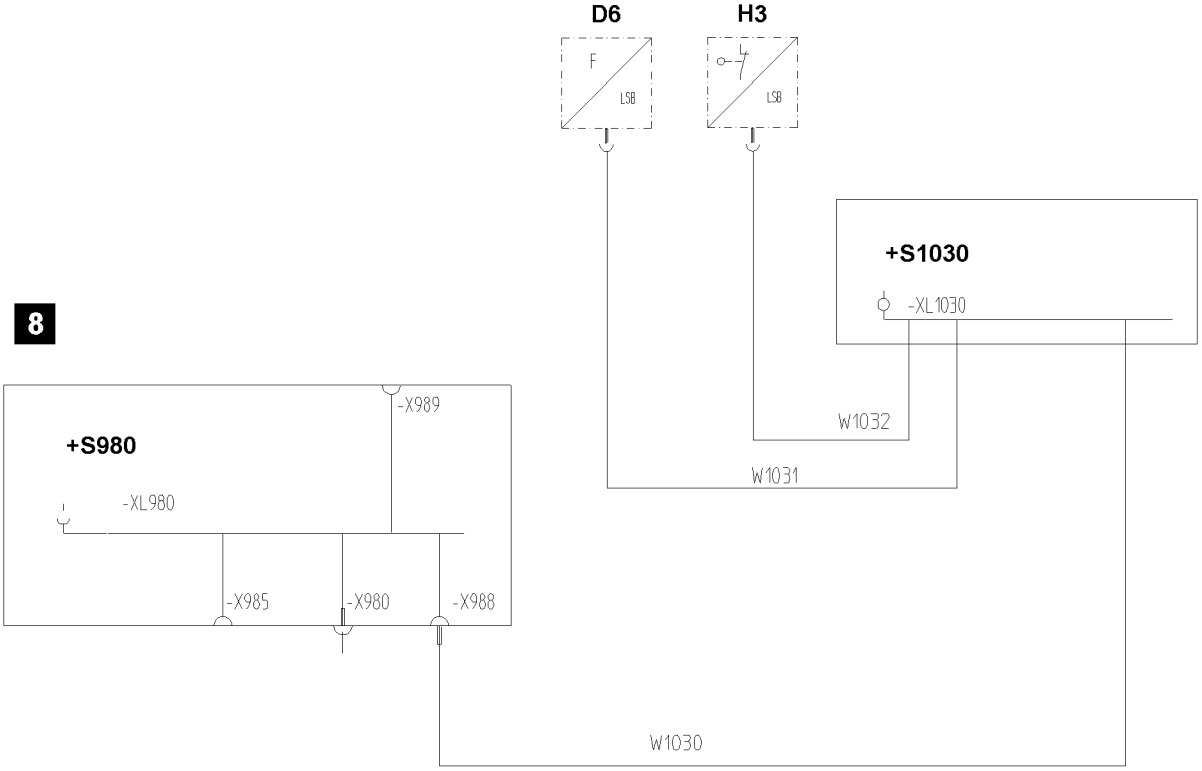

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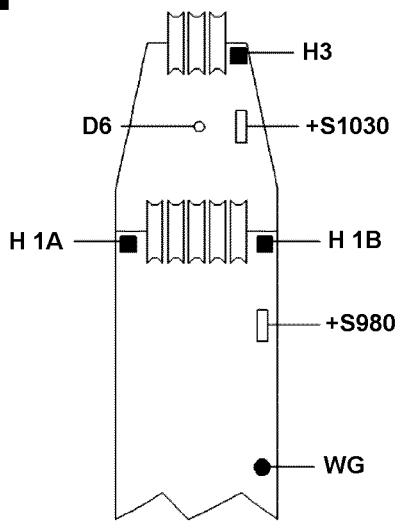

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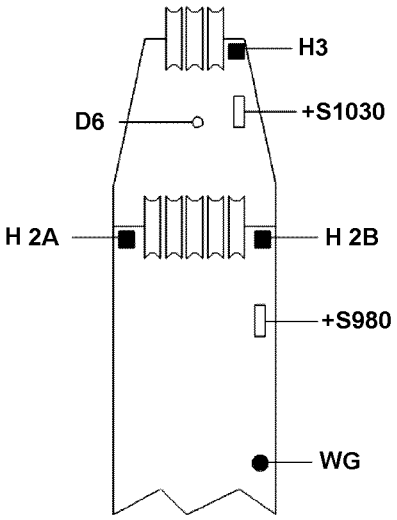


B105239

2.2 Establishing the electrical connections

Ensure that the following prerequisite is met:
– the boom nose is completely assembled.

For wiring diagram “Operation with boom nose”, see illustration **8**.

2.2.1 Establishing the electrical connection to the hoist limit switch

▶ Plug the cable **W1032** from the terminal box **+S1030** into the hoist limit switch **H3**.

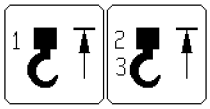
2.2.2 Establishing the electrical connection to the pressure test bracket

▶ Plug the cable **W1031** from the terminal box **+S1030** into the pressure test bracket **D6**.

2.2.3 Establishing the electrical connection between the boom nose and the SW-end section

▶ Plug the cable **W1030** from the terminal box **+S1030** into the terminal box **+S980**.

7



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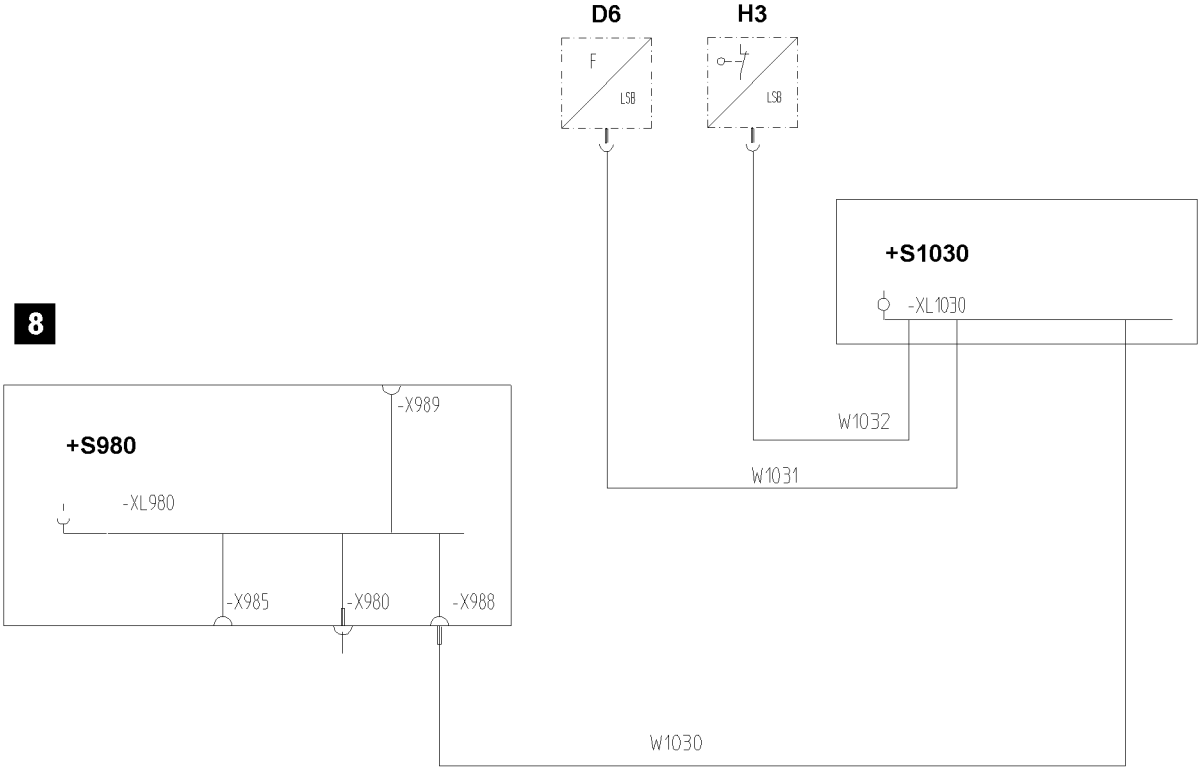

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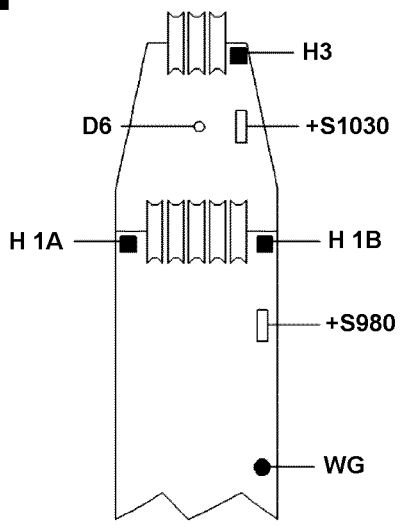

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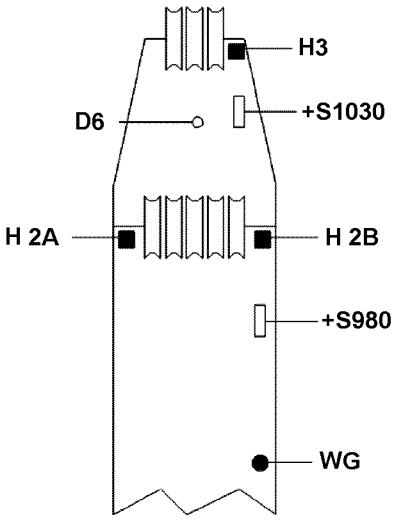


B105239

2.3 Checking the function of the hoist limit switch

Note
- ▶ The function of the individual limit switches must be checked before erection!
- ▶ The function of the limit switch initiators must be checked in the test system, see separate “Diagnostics” manual.

Make sure that the following prerequisites are met:
- – all electrical connections have been established,
- – the crane engine is running,
- – the corresponding operating mode is set on the LICCON monitor.

Assignment of limit switches to operating modes:
- – S-operation, see illustration **9**.
- – W-operation, see illustration **10**.

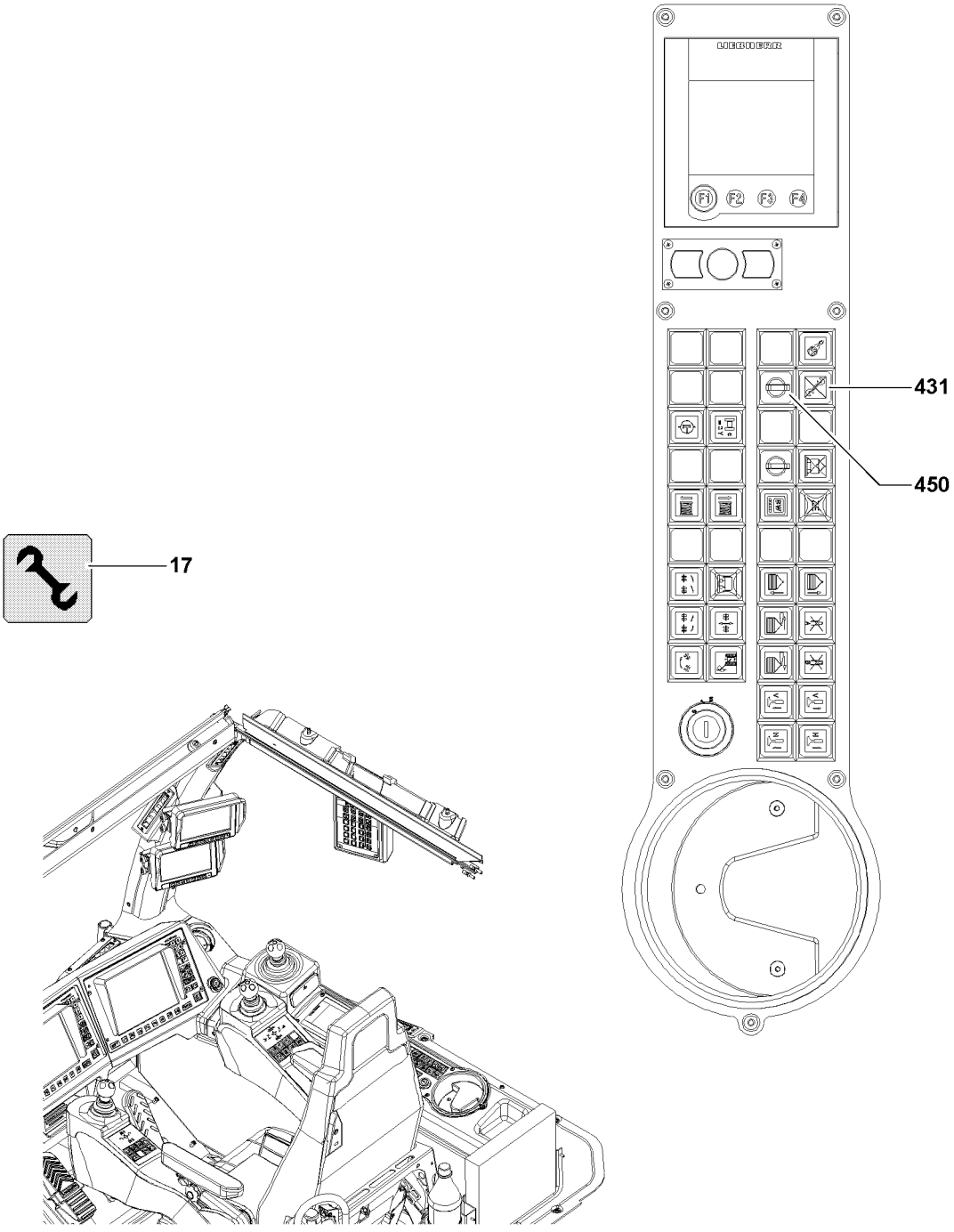
▶ Cover the hoist limit switch initiators individually with a metal plate.

Result:
- – The hoist limit switch is actuated manually.
- – The corresponding symbol element “Hoist top” appears on the LICCON monitor.
- – The hoist winch turns spool up off.
- – Hoist limit switch is functioning.

Note
- ▶ When replacing or changing the hoist limit switch (HES), the corresponding hoist limit switch must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB).

3 Erecting / taking down the boom

WARNING
The crane can topple over!
- ▶ Always erect or take down according to the data in the **Erection and take down charts**.
- ▶ Observe chapter 5.04.



B108924

4 Crane operation

The operation with boom nose is designed for quick lifts:
– With winch II or winch VI
– In operating modes S, SL and W

The hook block can remain reeved on the boom head.

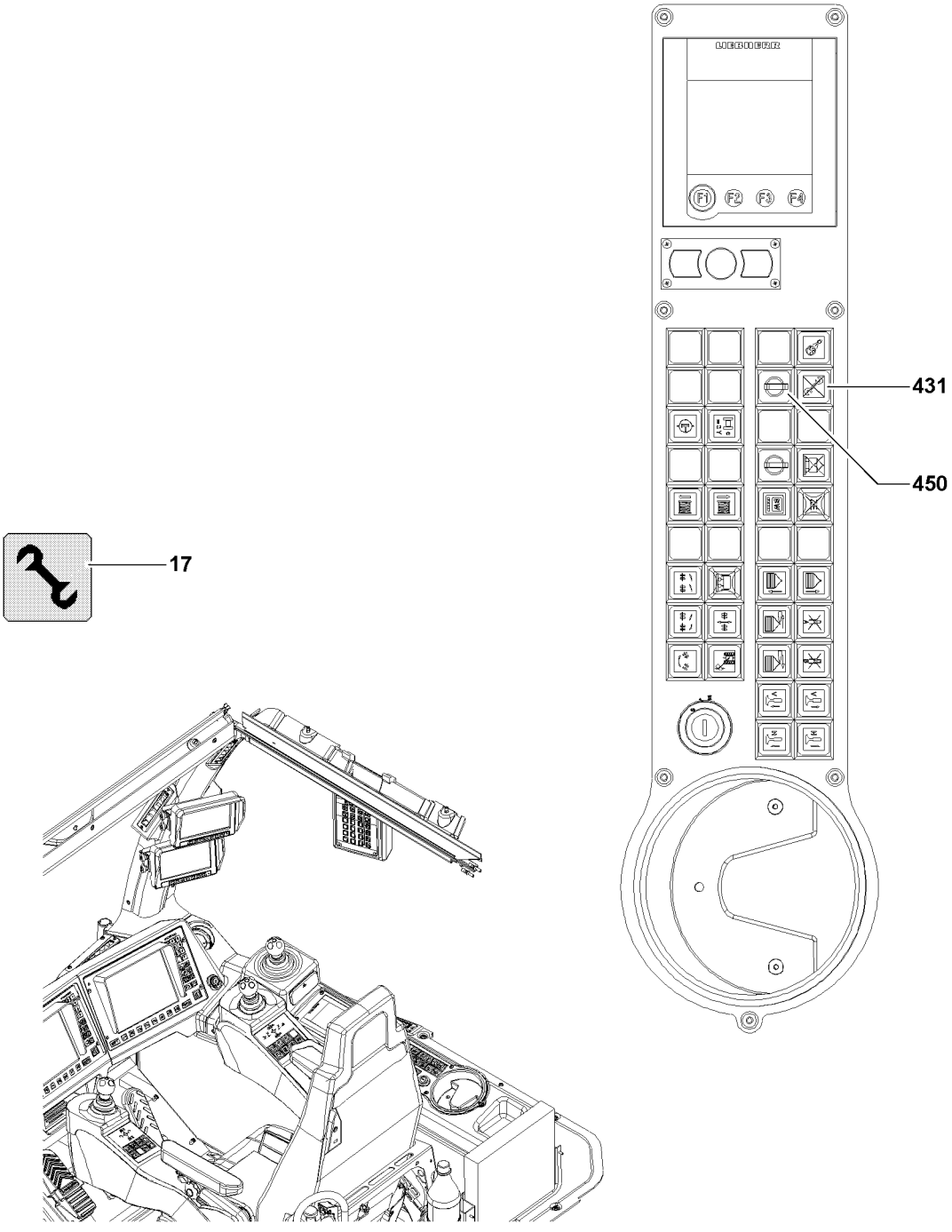
Note
▶ Observe the notes in chapter 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:
– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** has been turned off by pressing the button **431**,
– the assembly icon **17** on the LICCON monitor is off.

WARNING
The crane can topple over!
▶ Check the horizontal position of the crane before and during operation.
▶ If the crane operator leaves the cab, even for a short time, then he is obligated to check the operating mode setting before resuming crane operation and reset it, if necessary.

4.1 Checking the settings

▶ Check the function of the LICCON overload protection by running against the operating positions on top and bottom.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the limit switches on the relapse cylinders.



B108924

5 Disassembling the 36 t boom nose

Note
▶ Observe the safety guidelines for disassembly in chapter 5.01.

5.1 Luffing the boom down

WARNING
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over.
Personnel can be severely injured or killed!
▶ Observe the Safety technical guidelines in chapter 5.01!
▶ Observe the data in the erection and take down charts!

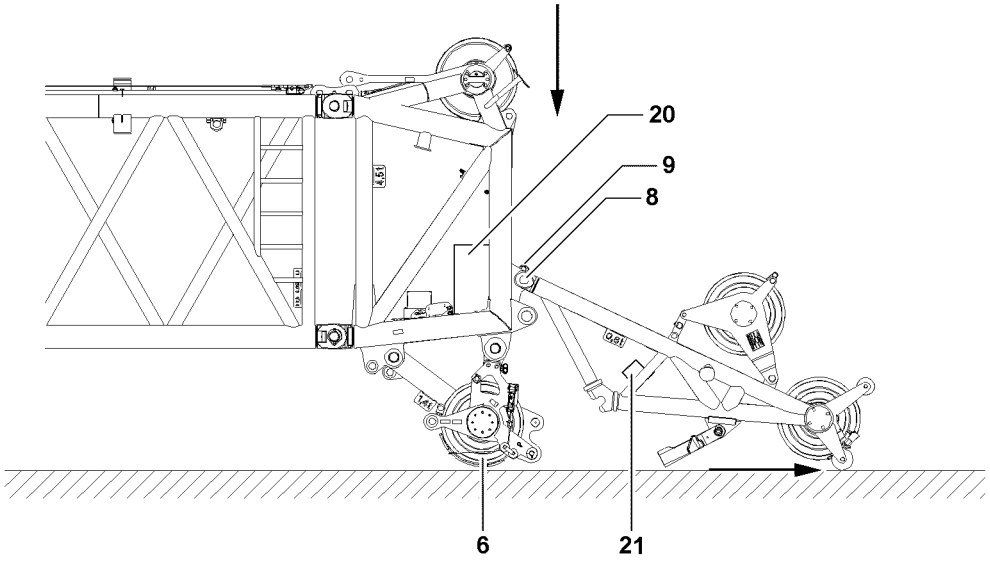
NOTICE
Hoist winch not spooled out!
If the hoist winch is not spooled out sufficiently when the boom is luffed down, then the hook block will collide with the boom nose.
When the boom is luffed down:
▶ Spool the hoist winch up simultaneously.

▶ Luff the boom down to the **lowest** operating position.

When the lowest operating position is reached the luff down movement is shut off.
The load value in the “maximum load” icon disappears and question marks appear (????).
The following alarm functions become active:
– “STOP”
– “Horn” and acoustical signal

▶ Actuate the assembly key button **450**.
Result:
– The LICCON overload protection is inactive.
– The assembly icon **17** on the LICCON monitor blinks.
– An acoustical signal sounds.
– The red beacon on the crane cab blinks.

11



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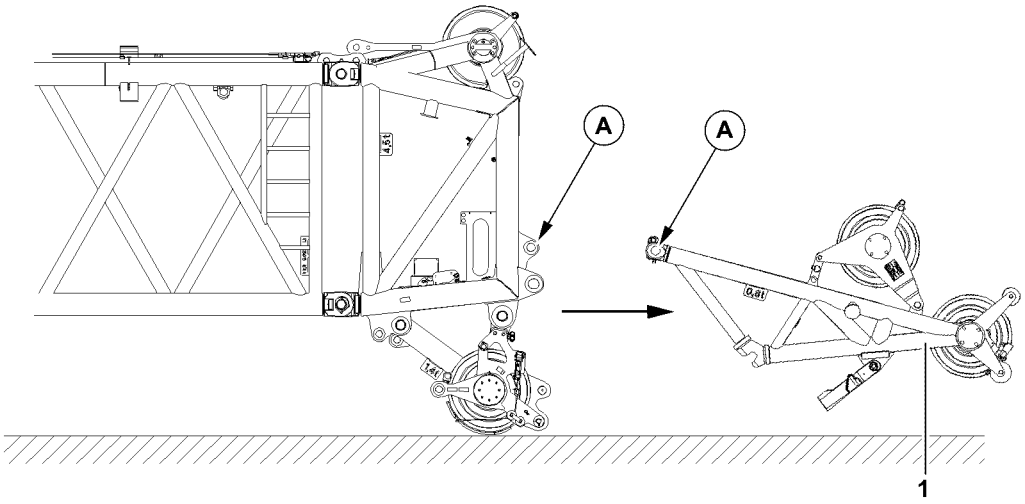


B105344

▶ Luff the boom down until hook block touches the ground.

Note

▶ Observe the description for disassembly of the hoist limit switch weight and the hook block in chapter 4.06.

▶ Remove the hoist limit switch weight and unreeve the hook block.

NOTICE

Automatic fold out of fork connection at luff down or place down!

If the boom is luffed down or placed down at excessive speed, the boom nose can be damaged.

▶ Luff the boom down or place it down very carefully.

▶ Luff the boom down until the pulley set **6** touches the ground, see illustration **11**.

▶ Remove the hoist rope.

5.2 Removing the 36 t boom nose on the SW-end section

Ensure that the following prerequisite is met:

– the boom is laying with the pulley set **6** on the ground, see illustration **11**.

▶ Hang the boom nose **1** onto the auxiliary crane.

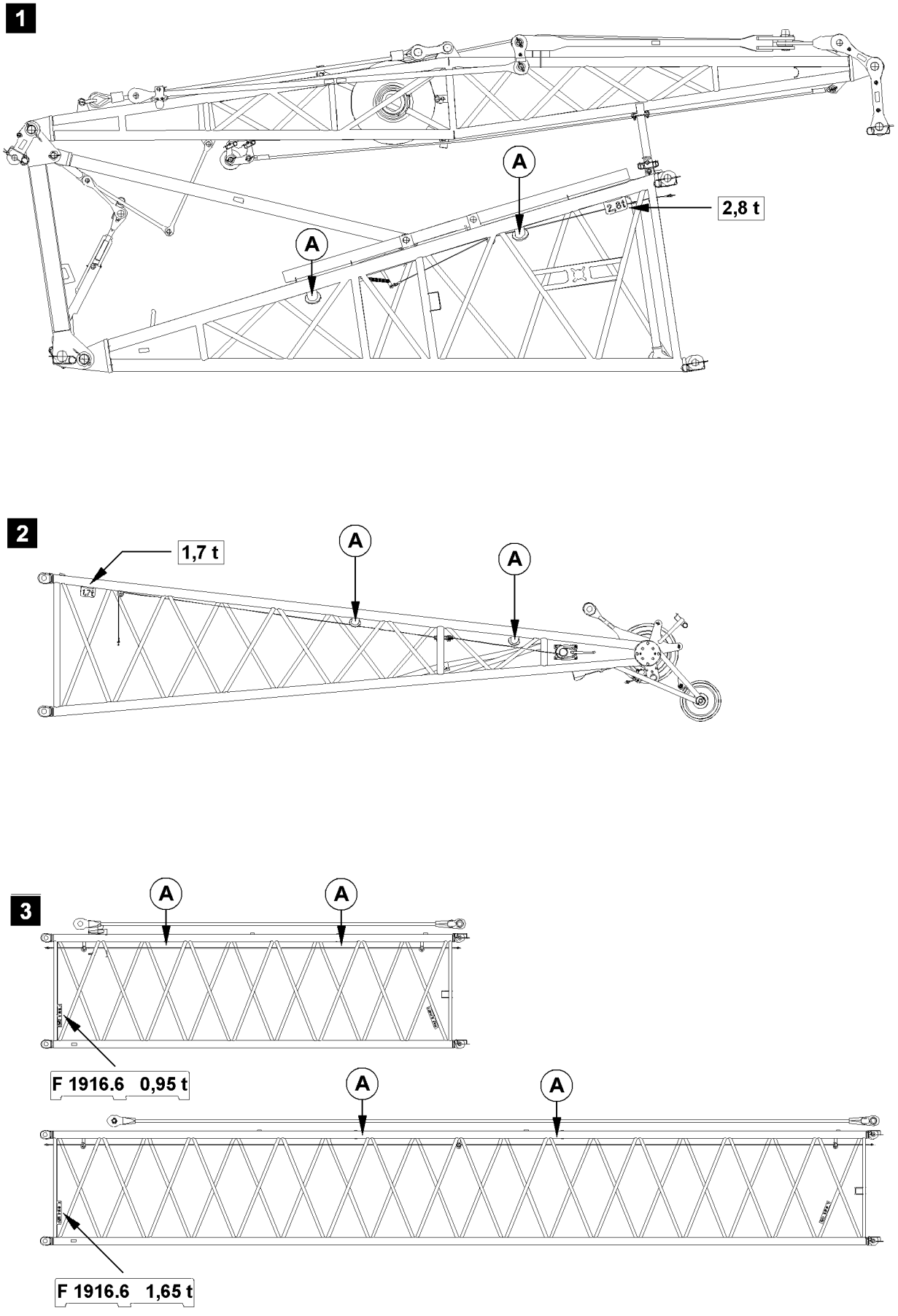
▶ Unplug the cable **W1030** on the terminal box +980 **20**.

▶ Release the pin **8** on the end section in point **A** and unpin.

▶ Lift the boom nose **1** with the auxiliary crane.

▶ Remove the boom nose with the auxiliary crane and place it down outside the working range.

▶ Remove the auxiliary crane from the boom nose.



B105063

1 Component overview

1.1 Attachment points

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components!
▶ The corresponding components must be attached on the intended points **A**!

Note
▶ For assembly or disassembly, tackle with a strand length of at least **4 m** must be used.

1.2 F-assembly unit, see illustration 1

Description	Abbreviation	Weight
F-assembly unit	—	2.8 t

1.3 F-end section, see illustration 2

Description	Abbreviation	Weight
F-end section	—	1.7 t

1.4 F-intermediate sections 6 m and 12 m, see illustration 3

Description	Abbreviation	Weight
F-intermediate section (6 m) with guy ropes	F 1916.6	0.95 t

Description	Abbreviation	Weight
F-intermediate section (12 m) with guy ropes	F 1916.6	1.66 t

B195219

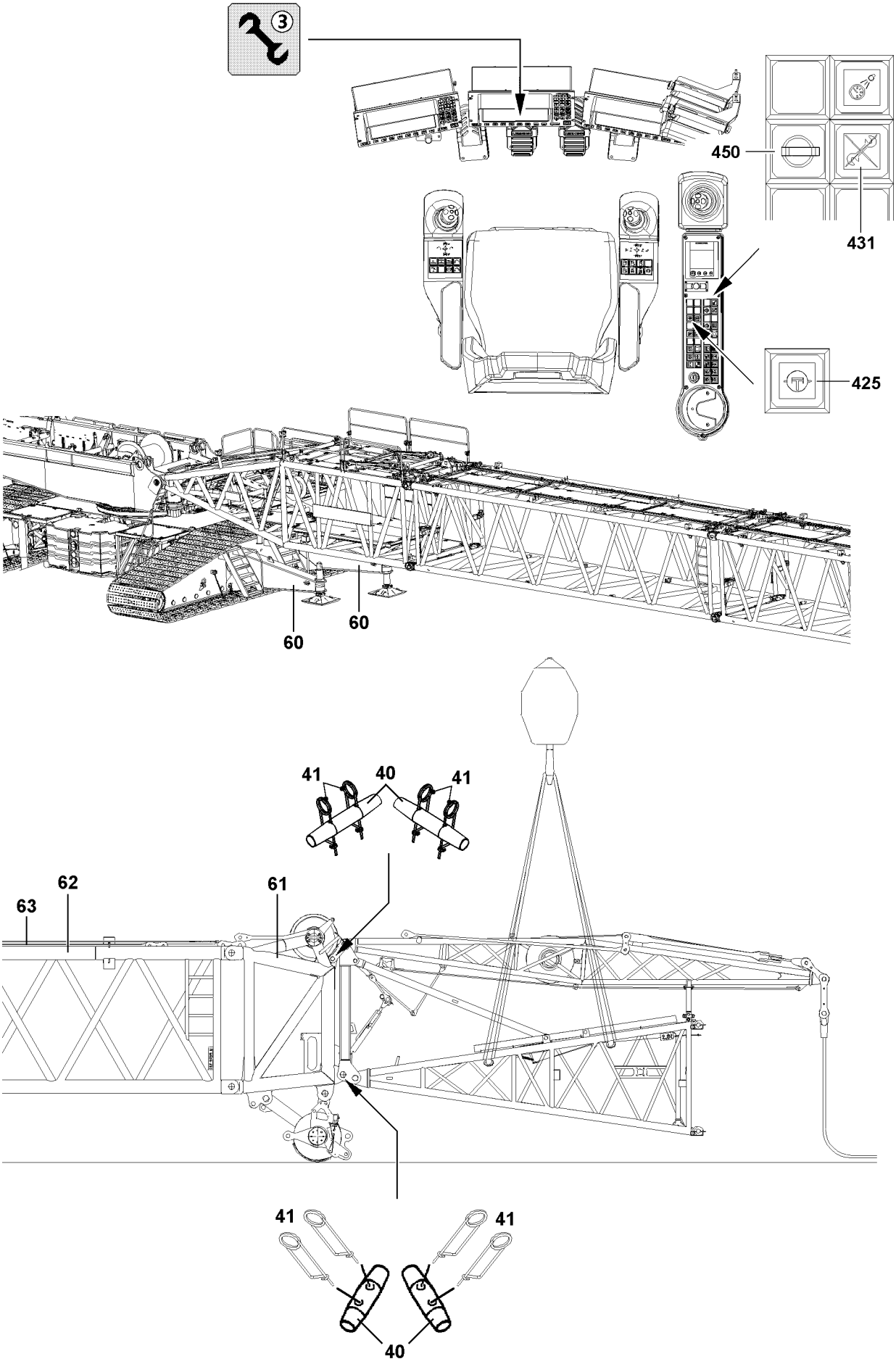
2 Assembling the auxiliary jib

DANGER
The crane can topple over!
The boom combinations must be assembled according to the “separately supplied set up drawings”!
Any other arrangement of the lattice sections and the guy rods than specified in the set up drawings is prohibited!
At assembly of the intermediate sections, it must be observed that they are assembled according to their identification!
- ▶ Assemble the lattice sections and guy rods as noted in the set up drawings.

WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel 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 with suitable means (such as safety belts, working platform)!

DANGER
Danger of accident at assembly / disassembly of booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.
- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

DANGER
Falling components!
If a component is assembled or disassembled without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!
- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!



B106171

This crane can be equipped with an auxiliary jib. The auxiliary jib can be assembled at an angle of 10 °, 15 ° or 30 ° to the SL-boom. Lengths of 12 m to 36 m are possible.

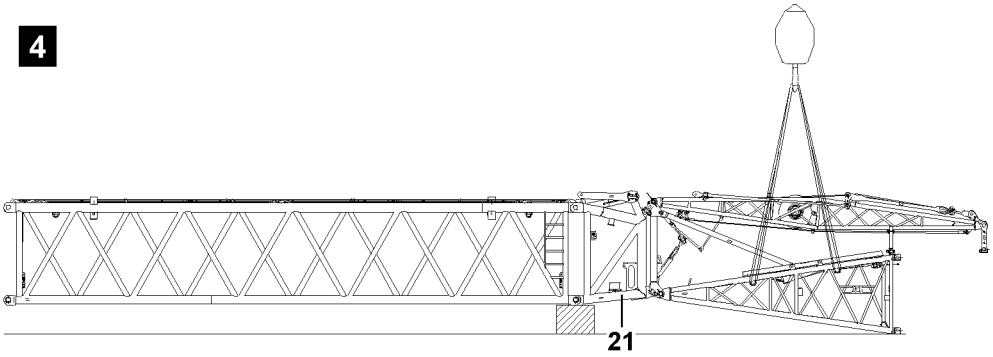
Note

▶ The auxiliary jib is **not** adjustable in crane operation.

Make sure that the following prerequisites are met:

– the “mechanical auxiliary supports **60** ” are properly assembled on the crane, see also **Erection and take down charts**,
– the SL-boom is assembled and luffed down “to the side” over the “mechanical auxiliary supports **60** ”,
– the LI-intermediate section **62** is pinned and secured on the SL-boom with the “guy brackets for the F-guying”,
– the guy rods **63** are placed on the LI-intermediate section **62** and are pinned and secured with the guy brackets,
– the corresponding SW-end section **61** is pinned and secured on the LI-intermediate section **62**,
– the F-assembly unit is properly hung and secured on the auxiliary crane,
– the F-assembly unit is pinned on the SW-end section **61** with the double cone pins **40** on top and bottom and is secured with the spring retainers **41**,
– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is pressed and the indicator light **431** lights up,
– the assembly icon **3** blinks on the LICCON display.

4



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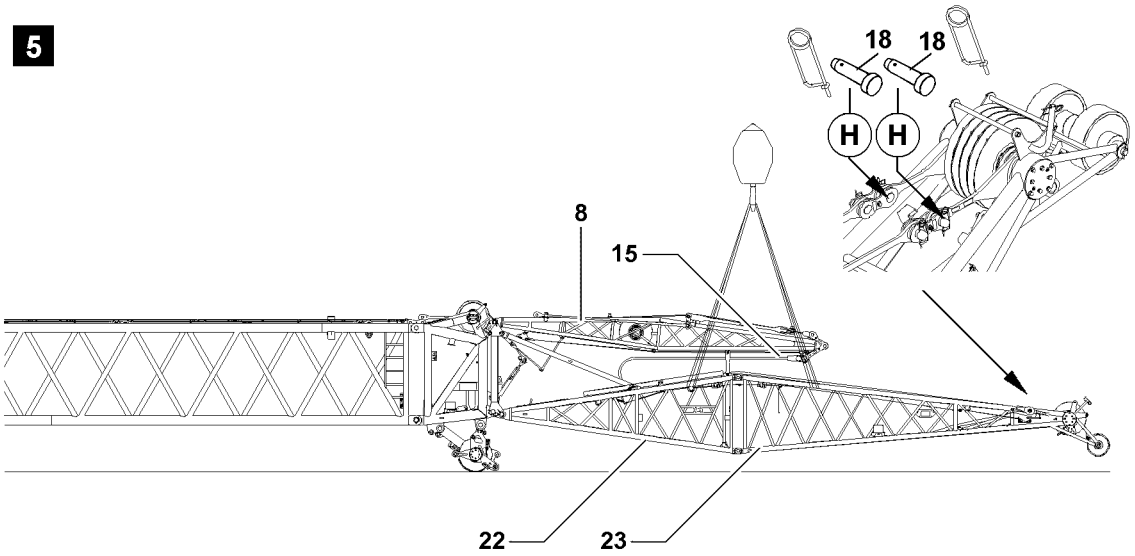


B106172

2.1 SLF-assembly conditions

2.1.1 F-connector head on the boom end

The F-boom can be assembled on the following end sections:
– SW-end section **55**
– F-connector head **21**

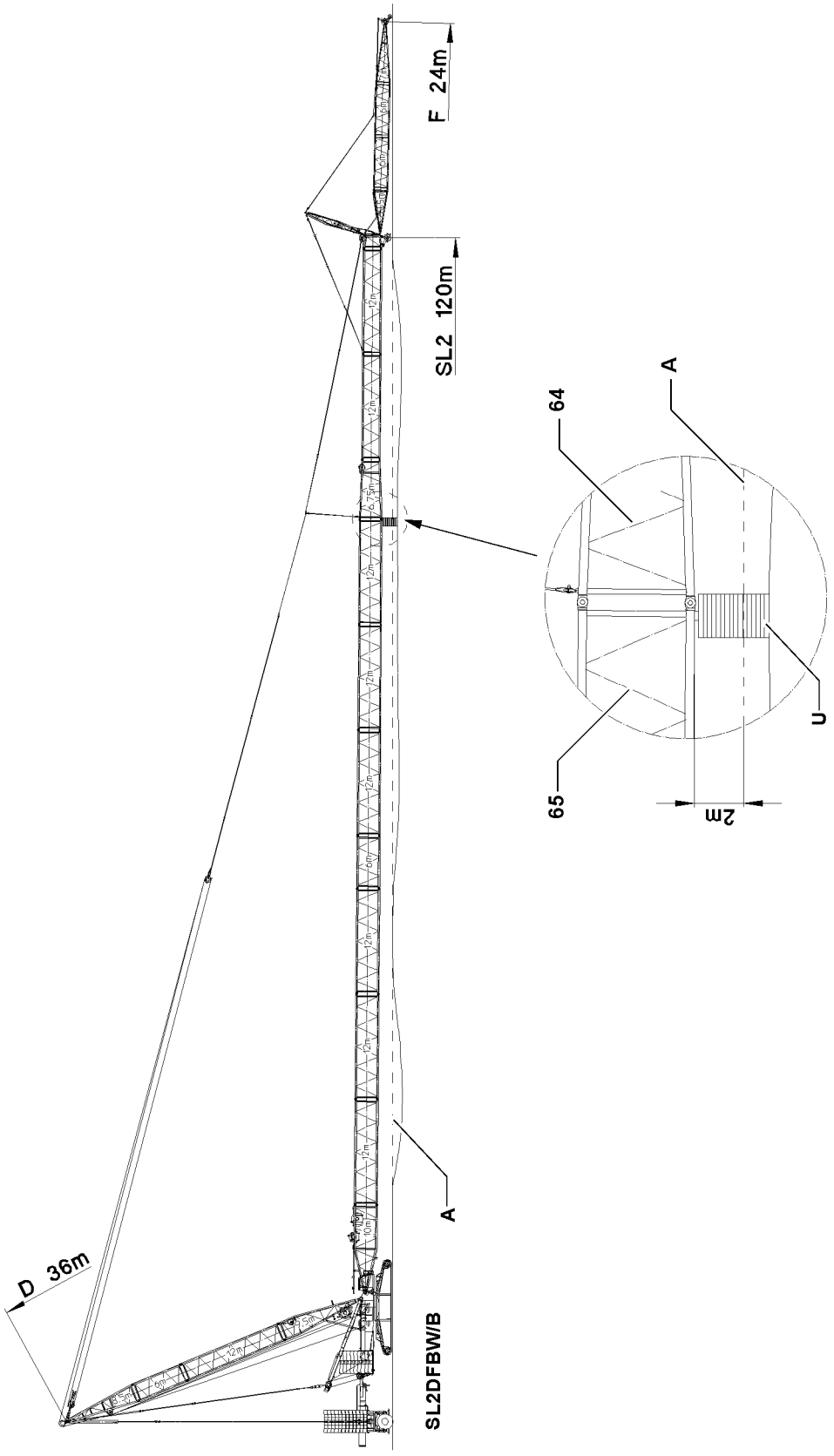
Note
▶ If the F-connector head **21** is assembled on the boom end, then it must be supported for the F-assembly, see illustration **4**.

▶ Support the F-connector head for the F-assembly, see illustration **4**.

2.1.2 Special case - F-end section is pinned with F-pivot section (12 m F-jib)

Note
▶ If the F-end section **23** is already pinned with the F-pivot section **22**, then - before lifting the FA-frame **8** - the pins **18** between the F-guy ropes **15** and brackets on the F-end section **23** must be released on the points **H**, see illustration **5**.

▶ Carry out the remainder of the assembly as described in section “Assembling the F-assembly unit”.



B108932

2.1.3 Assembly of the SL2DF-boom combination with supporting base

NOTICE
Overload of boom!
If the SL2-boom is not supported before the erection procedure, then the boom will be overloaded! The crane will be damaged!
- ▶ For boom lengths SL2 larger than 120 m, a support must be used!
- ▶ Support the boom with suitable material of sufficient load bearing capacity!

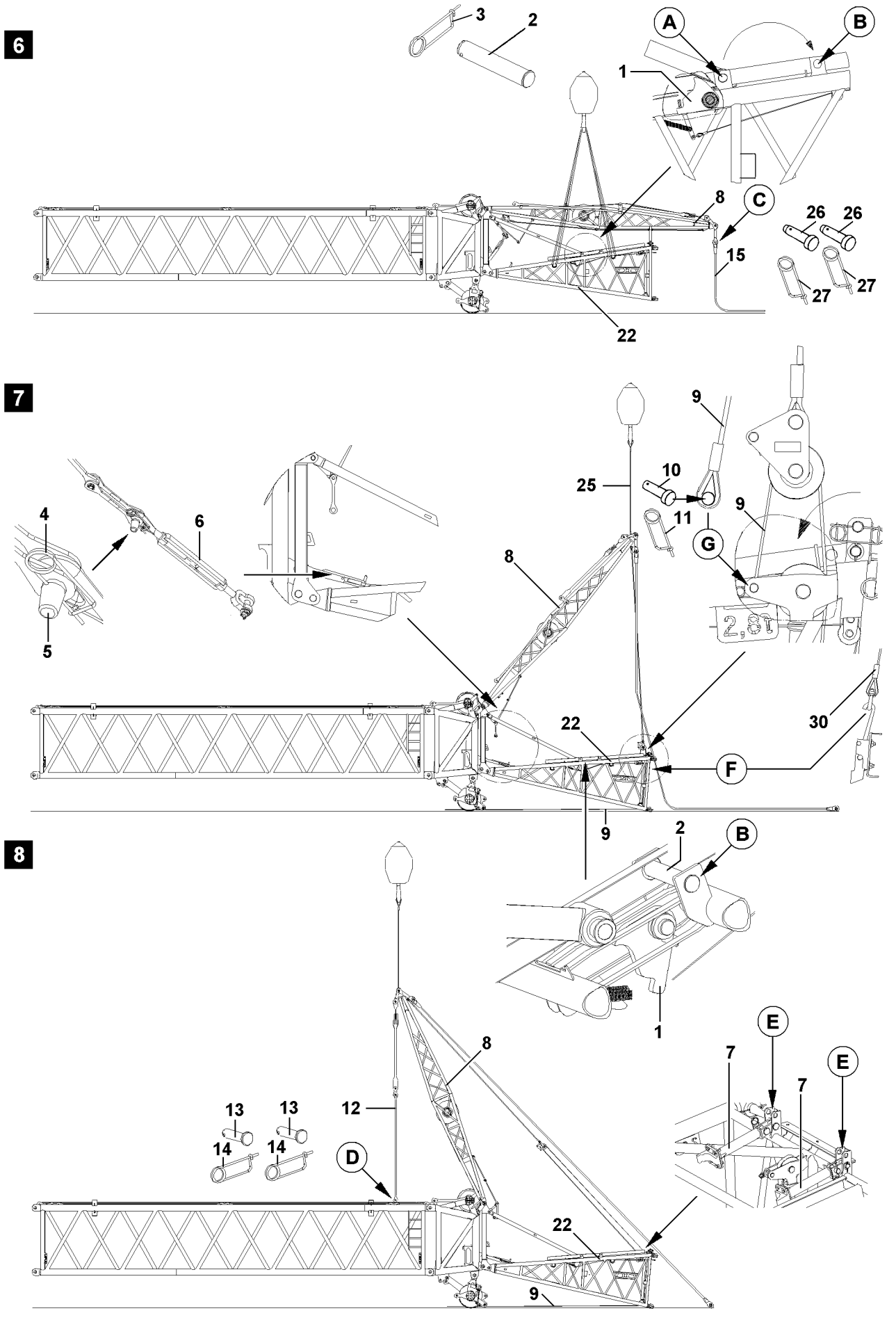
The support base is independent of the length of the F-auxiliary jib.

Note
- ▶ The alignment level **A** is the placement level of the crane!

The SL-boom combination - comprising an S-pivot section and S-intermediate sections - should be preassembled at a suitable location. The pre-assembled S-boom combination must be swung towards the turntable with an auxiliary crane and pinned and secured in position at that location.
- ▶ Pre-assemble the SL-boom combination.
- ▶ Swing the preassembled SL-boom combination with the auxiliary crane in to the turntable.
- ▶ Pin and secure the S-boom combination to the S-pivot section on the turntable.

Note
- ▶ The boom combination must be supported from below on the last intermediate section **65** before the reducer section **64** to the height of the alignment level **A**, see illustration!

- ▶ Make sure that the upper edge of the base support **U** is 2 m above the alignment level **A**.
- ▶ Place the SL-boom combination on the support base.
- ▶ Assemble the F-auxiliary boom.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B106173

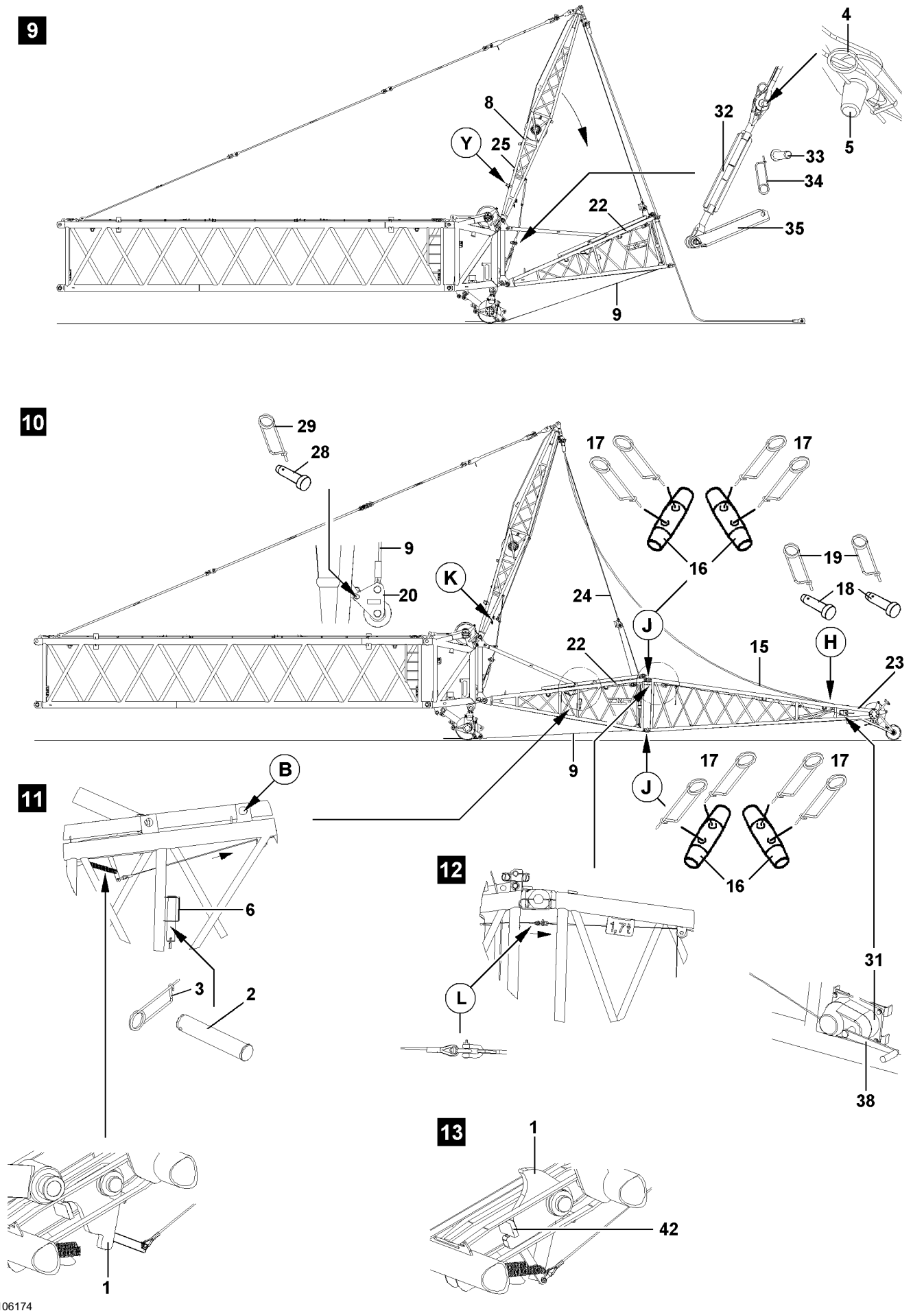
2.2 Assembling the F-auxiliary jib

- ▶ Release and unpin the pin **2** from the F-pivot section and the F-relapse retainer on point **A** “Transport position”, see illustration **6**.
- ▶ Pin in the pin **2** in “stop position” at point **B** and secure with spring retainer **3**, see illustration **6**.
- ▶ Slowly lower the F-pivot section **22** with the auxiliary crane.
- ▶ Secure the F-guy ropes **15** with the brackets of the FA-frame **8** on point **C** with pins **26** and secure with spring retainers **27**, see illustration **6**.
- ▶ Release and unpin the pin **5** on the FA-frame relapse retainer, place the turnbuckle **6** on the F-pivot section **22**, see illustration **7**.
- ▶ Pull the flap **1** on the F-pivot section **22** down and affix the rope **30** on the hook lock at point **F**, see illustration **7**.
- ▶ Hang in the FA-frame **8** with the fastening rope **25** on the auxiliary crane and lift, see illustration **7**.
- ▶ Reeve in the assembly winch rope **9** from the turntable into the rope pulleys on the F-pivot section **22** and pin on point **G** with pin **10** and secure with spring retainer **11**, see illustration **7**.

CAUTION
Danger of damage!
Before crane operation or before erecting or taking down the boom, both support frames **7** must be folded down.

- ▶ Unpin the support frames **7** on points **E** and fold them down, see illustration **8**.

- ▶ Carefully fold the FA-frame **8** with the auxiliary crane “in direction of the main boom” and “spool the assembly winch rope **9** out at the same time” until it can be pinned on point **D**, see illustration **8**.
- ▶ Pin the F-guy rods **12** on point **D** with pins **13** and secure with spring retainers **14**, see illustration **8**.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B106174

- ▶ Pull the FA-frame **8** with the assembly winch rope **9** in direction of the F-pivot section **22**, see illustration **9**.

Note

- ▶ Extend the turnbuckle **32**, if necessary so that the pin **5** can be pinned, see illustration **9**.
- ▶ Then tighten the turnbuckle **32** and close the retaining plate **35**.
- ▶ Secure the retaining plate **35** with pin **33** and spring retainer **34**.

- ▶ Connect the FA-frame relapse retainer again by pinning the pin **5** and securing it with the spring retainer **4**, see illustration **9**.

Note

- ▶ Pin and secure the attachment rope **25** for the auxiliary crane on the FA-frame **8** at point **Y** with a shackle, see illustration **9**.

- ▶ Lower the F-pivot section **22**, see illustration **10**.
- ▶ Properly install the F-end section **23** and the F-intermediate sections (if applicable) on the auxiliary crane and on the F-pivot section **22** and pin.
- ▶ Pin in the double cone pins **16** on points **J** from the “outside to the inside” and secure with spring retainers **17**, see illustration **10**.
- ▶ Pin the F-guy ropes **15** on the F-end section on point **H** with pins **18** and secure with spring retainers **19**, see illustration **10**.

Note

- ▶ If the F-intermediate sections are installed, then the additional guy ropes for the F-intermediate sections must be assembled, pinned and secured.

- ▶ Unreeve the assembly winch rope **9** after the F-jib is completely assembled.
- ▶ Pin the attachment rope **24** with the pulley block **20** on the FA-frame **8** at point **K** with pin **28** and secure with spring retainer **29**, see illustration **10**.

Note

- ▶ Unpin the pin **2** before erecting the boom on point **B** and insert it into the retainer **6** “park position”, see illustration **11**.

- ▶ Insert the pin **2** into the retainer **6** “park position” and secure with spring retainer **3**, see illustration **11**.
- ▶ Connect the rope strand from flap **1** to manual rope winch **31** on the F-end section **23** at point **L**, see illustration **12**.

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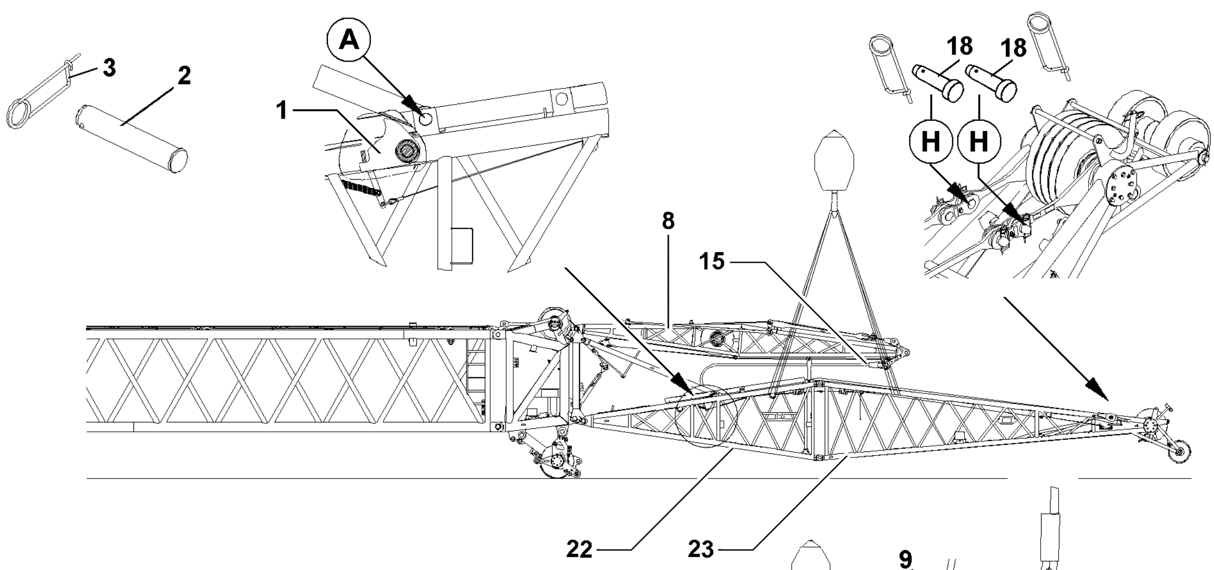
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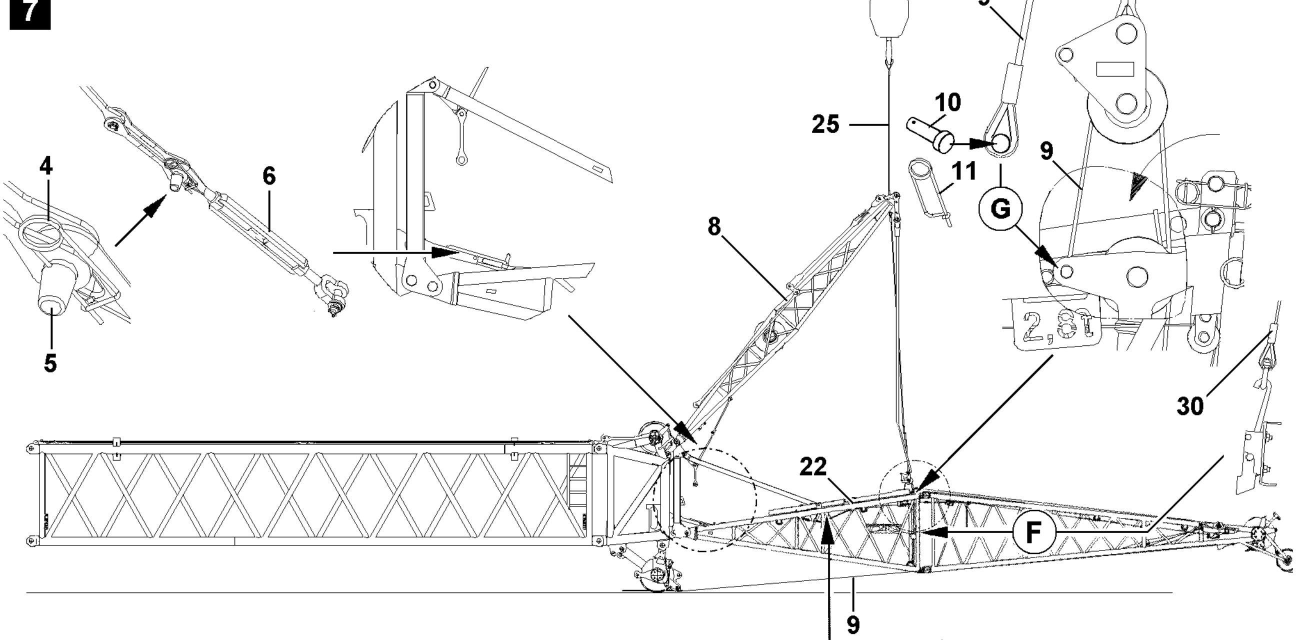
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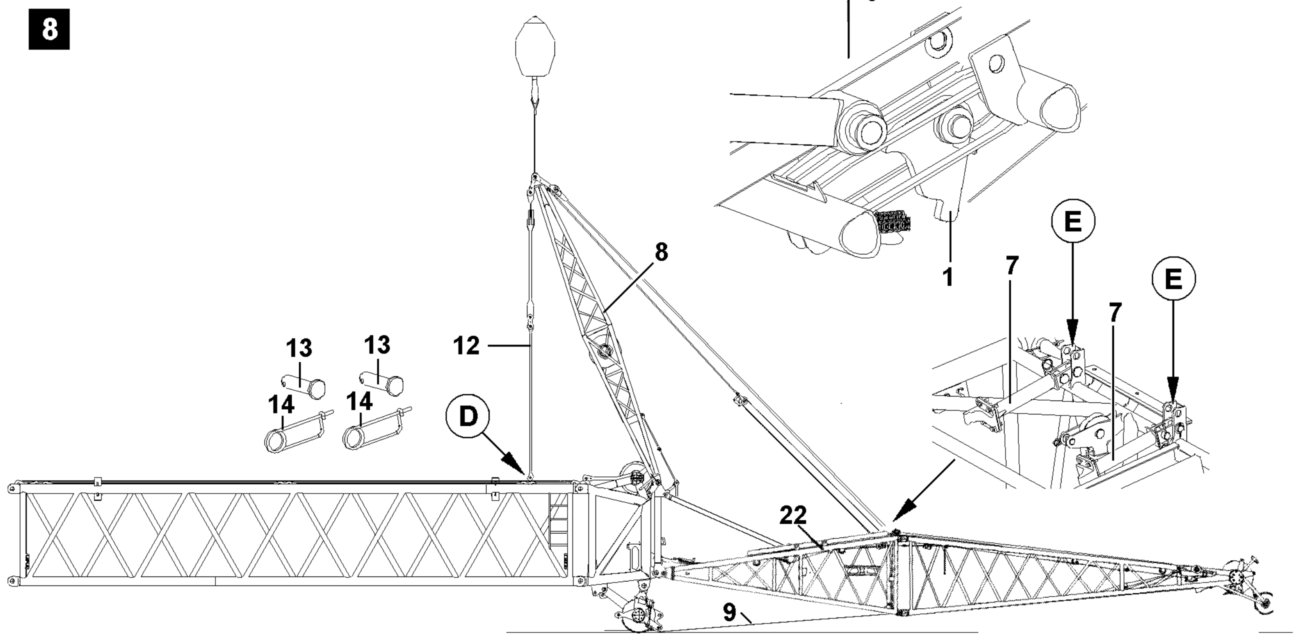
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B106639

2.3 Flying assembly of F-auxiliary jib (12 m)

Ensure that the following prerequisite is met:

– the pin **2** of the F-pivot section and the F-relapse retainer is on point **A** “Transport position”.

WARNING

Folding down of F-lattice jib!

If the pin **2** is unpinned during assembly, then the F-lattice jib folds down. Personnel can be severely injured or killed!

▶ The pin **2** of the F-pivot section and the F-relapse retainer must remain pinned during assembly on point **A** “Transport position”!

NOTICE

Damage of F-auxiliary jib!

▶ F-jib, which are longer than 12 m may not be assembled in flying mode!

▶ Release and unpin the pin **5** on the FA-frame relapse retainer, place the turnbuckle **6** on the F-pivot section **22**, see illustration **7**.

▶ Pull the flap **1** on the F-pivot section **22** down and affix the rope **30** on the hook lock at point **F**, see illustration **7**.

Note

▶ Before lifting the FA-frame **8**, the pins **18** between the F-guy ropes **15** and the brackets on the F-end section **23** must be released on points **H**, see illustration **6**.

▶ Hang in the FA-frame **8** with the attachment rope **25** on the auxiliary crane and lift, see illustration **7**.

▶ Reeve in the assembly winch rope **9** from the turntable into the rope pulleys on the F-pivot section **22** and pin on point **G** with pin **10** and secure with spring retainer **11**, see illustration **7**.

CAUTION

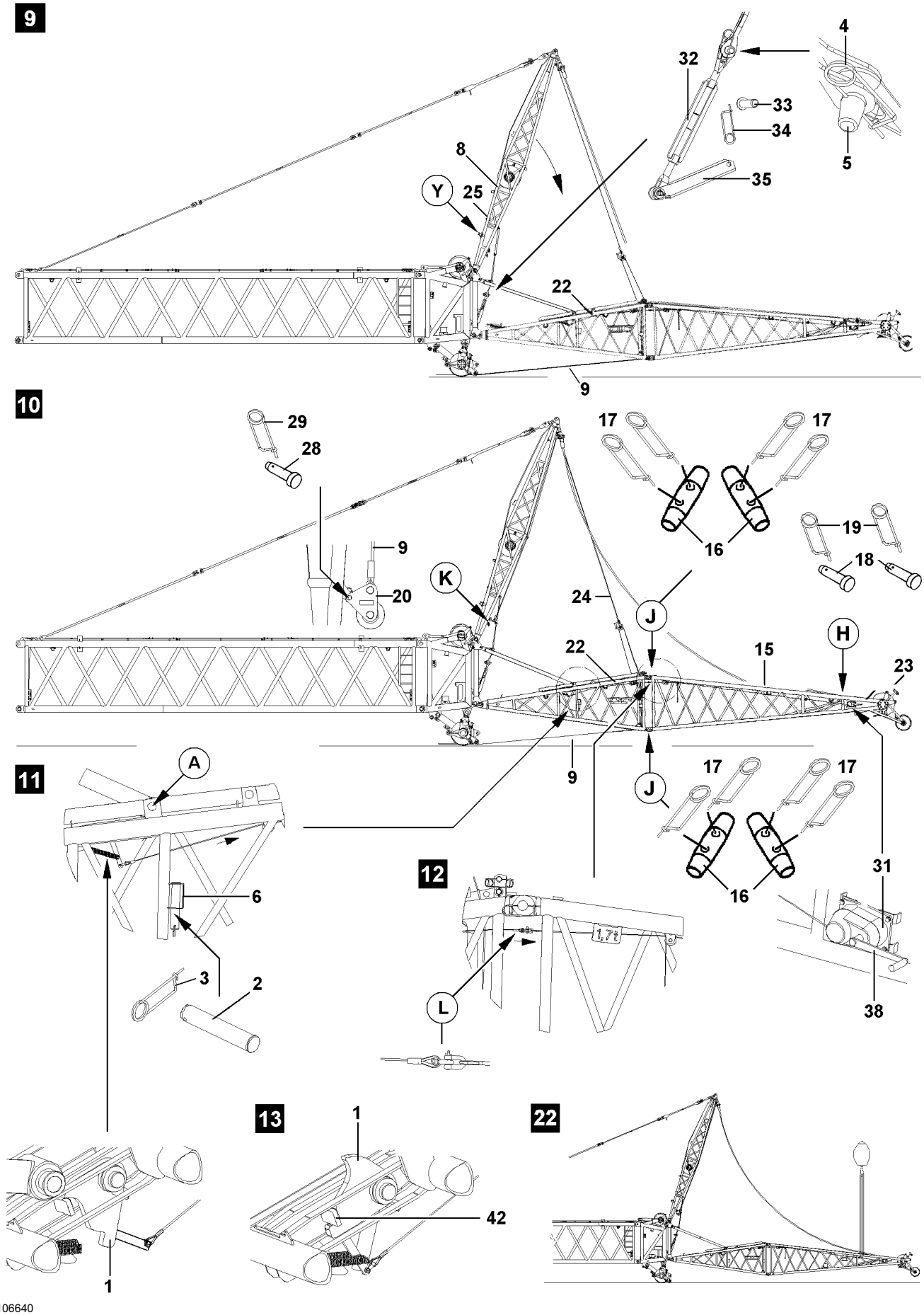
Danger of damage!

Before crane operation or before erecting or taking down the boom, both support frames **7** must be folded down.

▶ Unpin the support frames **7** on points **E** and fold them down, see illustration **8**.

▶ Carefully fold the FA-frame **8** with the auxiliary crane “in direction of the main boom” and “spool the assembly winch rope **9** out at the same time” until it can be pinned on point **D**, see illustration **8**.

▶ Pin the F-guy rods **12** on point **D** with pins **13** and secure with spring retainers **14**, see illustration **8**.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- ▶ Pull the FA-frame **8** with the assembly winch rope **9** in direction of the F-pivot section **22**, see illustration **9**.

Note

- ▶ Extend the turnbuckle **32**, if necessary so that the pin **5** can be pinned, see illustration **9**.
- ▶ Then tighten the turnbuckle **32** and close the retaining plate **35**.
- ▶ Secure the retaining plate **35** with pin **33** and spring retainer **34**.

- ▶ Connect the FA-frame relapse retainer again by pinning the pin **5** and securing it with the spring retainer **4**, see illustration **9**.

Note

- ▶ Pin and secure the attachment rope **25** for the auxiliary crane on the FA-frame **8** at point **Y** with a shackle, see illustration **9**.

- ▶ Lower the F-pivot section **22**, see illustration **10**.
- ▶ Pin the F-guy ropes **15** on the F-end section on point **H** with pins **18** and secure with spring retainers **19**, see illustration **10**.
- ▶ Unreeve the assembly winch rope **9** after the guy ropes are completely assembled.
- ▶ Pin the attachment rope **24** with the pulley block **20** on the FA-frame **8** at point **K** with pin **28** and secure with spring retainer **29**, see illustration **10**.

Note

- ▶ Lift the F-jib with the auxiliary crane until the pin **2** can be pulled on point **A**, see illustration **22**.

- ▶ Unpin the pin **2** before erecting the boom on point **A** and insert it into the retainer **6** “park position” and secure with spring retainer **3**, see illustration **11**.
- ▶ Connect the rope strand from flap **1** to manual rope winch **31** on the F-end section **23** at point **L**, see illustration **12**.

CAUTION

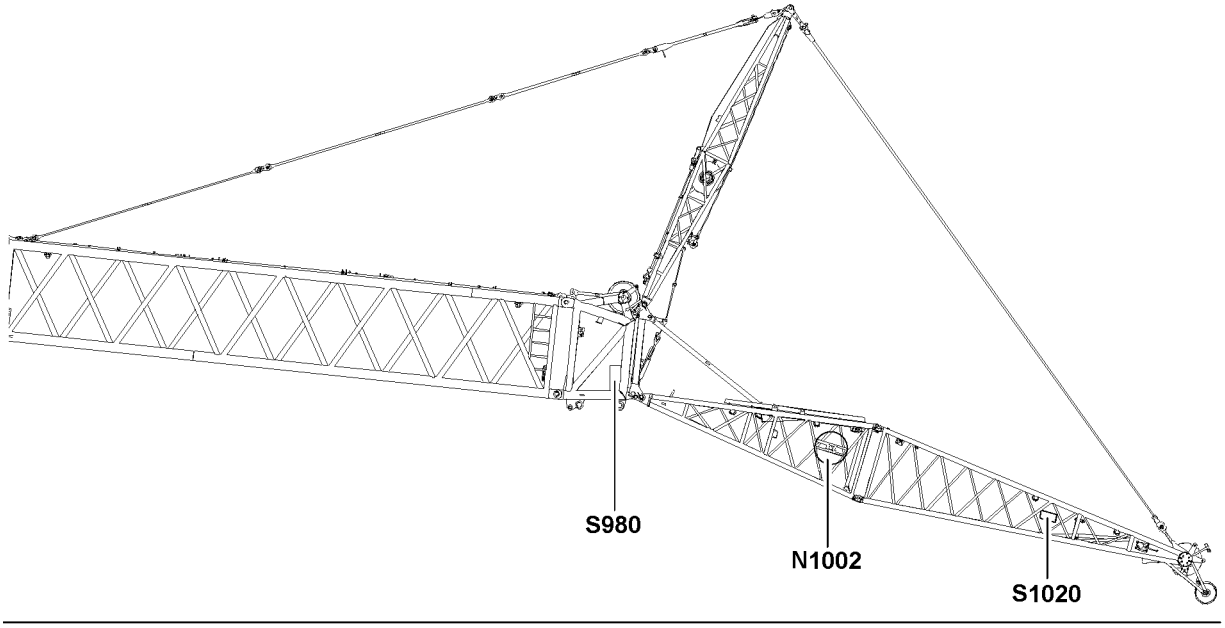
Danger of damage on the relapse support!

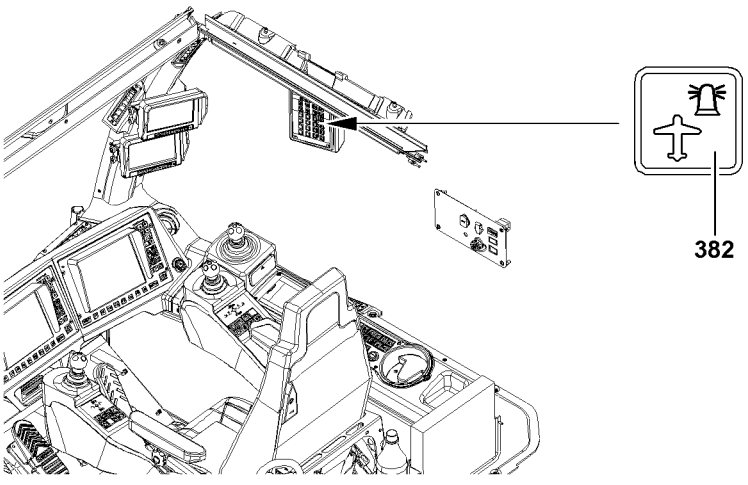
When taking the boom down, the flap **1** must be set in “down” position as soon as the F-end section **23** touches the ground or as soon as the manual rope winch **31** can be reached!

If this is not observed, components on the F-assembly unit can be damaged!

- ▶ Set the flap **1** with the manual rope winch **31** in “down” position to that the plunger **50** can “slide” in the guide over the flap **1**, see illustration **11**.

- ▶ Set the flap **1** on the F-pivot section **22** with the manual rope winch **31** into “down” position, see illustration **11**.





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2.4 Establishing the electrical connections

Ensure that the following prerequisite is met:
– the SWF-boom is completely assembled,
– the airplane warning light and the wind speed sensors are assembled.

CAUTION
Damage to the electrical connection on the cable drum!
If the electrical connection from the cable drum on the F-pivot section to the terminal box on the SW-end section is established first before the connection to the terminal box on the F-end section, the electrical connection can be damaged when spooling out the cable drum!
▶ Establish the electrical connection from the cable drum on the F-pivot section to the terminal box on the F-end section first and then the electrical connection from the terminal box on the SW-end section to the cable drum!

Note
▶ To establish the electrical connections on the F-auxiliary jib, use the separate electrical wiring diagram!

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.

2.5 Checking the function of the safety devices

WARNING
Non-functioning safety devices!
If the function of the safety devices is defective, personnel can be severely injured or killed.
▶ Crane operation with non-functioning safety devices is **prohibited**!

Note
▶ The function of the individual limit switches must be checked before erection!
▶ The function of the limit switch initiators must be checked in the test system, see separate “Diagnostics” manual.

Note
▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact **LIEBHERR** Service.

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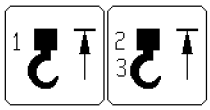

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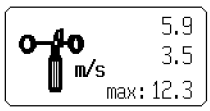

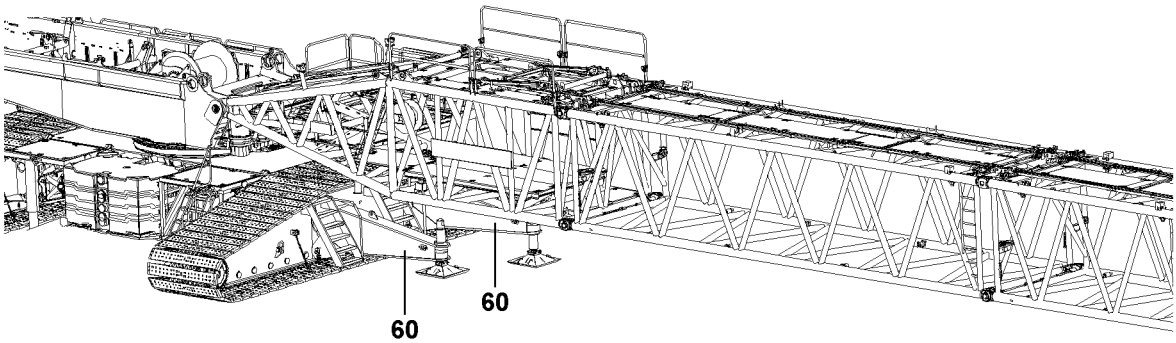

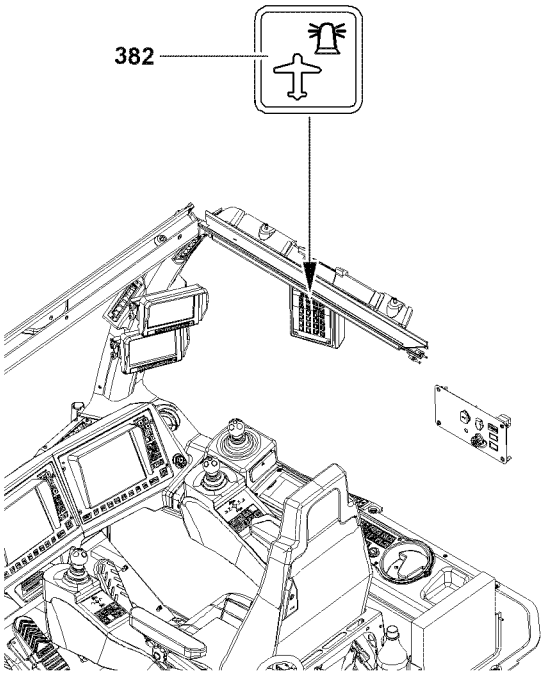

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Make sure that the following prerequisites are met:
– all electrical connections have been made,
– the crane engine is running,
– the corresponding operating mode is set on the LICCON monitor.

2.5.1 Checking the wind speed sensor

▶ Test the movement and the function of the wind speed sensor.

Result:
– The icon “Wind speed”, see illustration **15**, appears on the LICCON monitor.

2.5.2 Checking the airplane warning light

▶ Turn on the airplane warning light on with the button **382**.
▶ Check the function visually.

2.5.3 Checking the hoist limit switch on the pulley head

Note
▶ When replacing or changing a hoist limit switch (HES), the corresponding hoist limit switch must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB).

▶ Actuate the hoist limit switch manually on the pulley head.

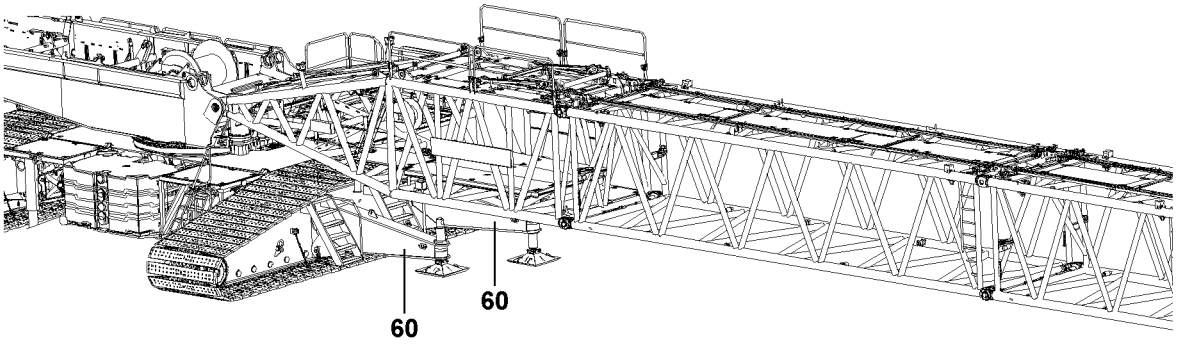
Result:
– The spool up function of the hoist winch turns off.
– The icon “Hoist top” appears on the LICCON monitor 0, see illustration **14** .
– Limit switch is functioning.

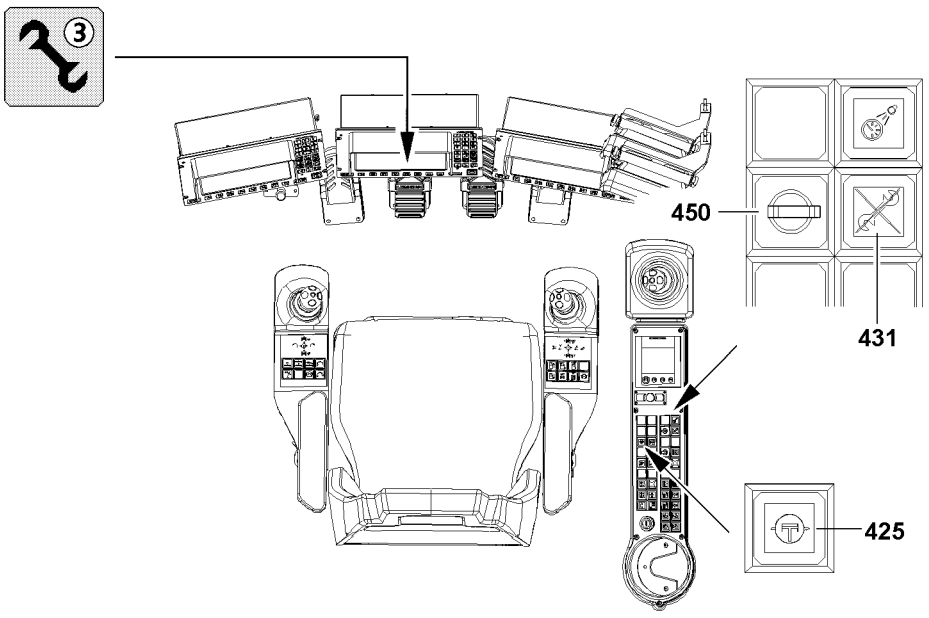
2.5.4 Check the limit switch S-boom “steepest position”

Note
▶ The limit switch functions have to be checked individually before erection!

▶ Cover the limit switch initiators on the S-relapse cylinder individually with a metal plate.

Result:
– The hoist limit switch is actuated manually.
– The spool up function of winch IV (control winch) turns off.
– The icon “boom limitation” appears on the LICCON monitor 0.
– Limit switch is functioning.





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2.6 Raising the SLF-booms

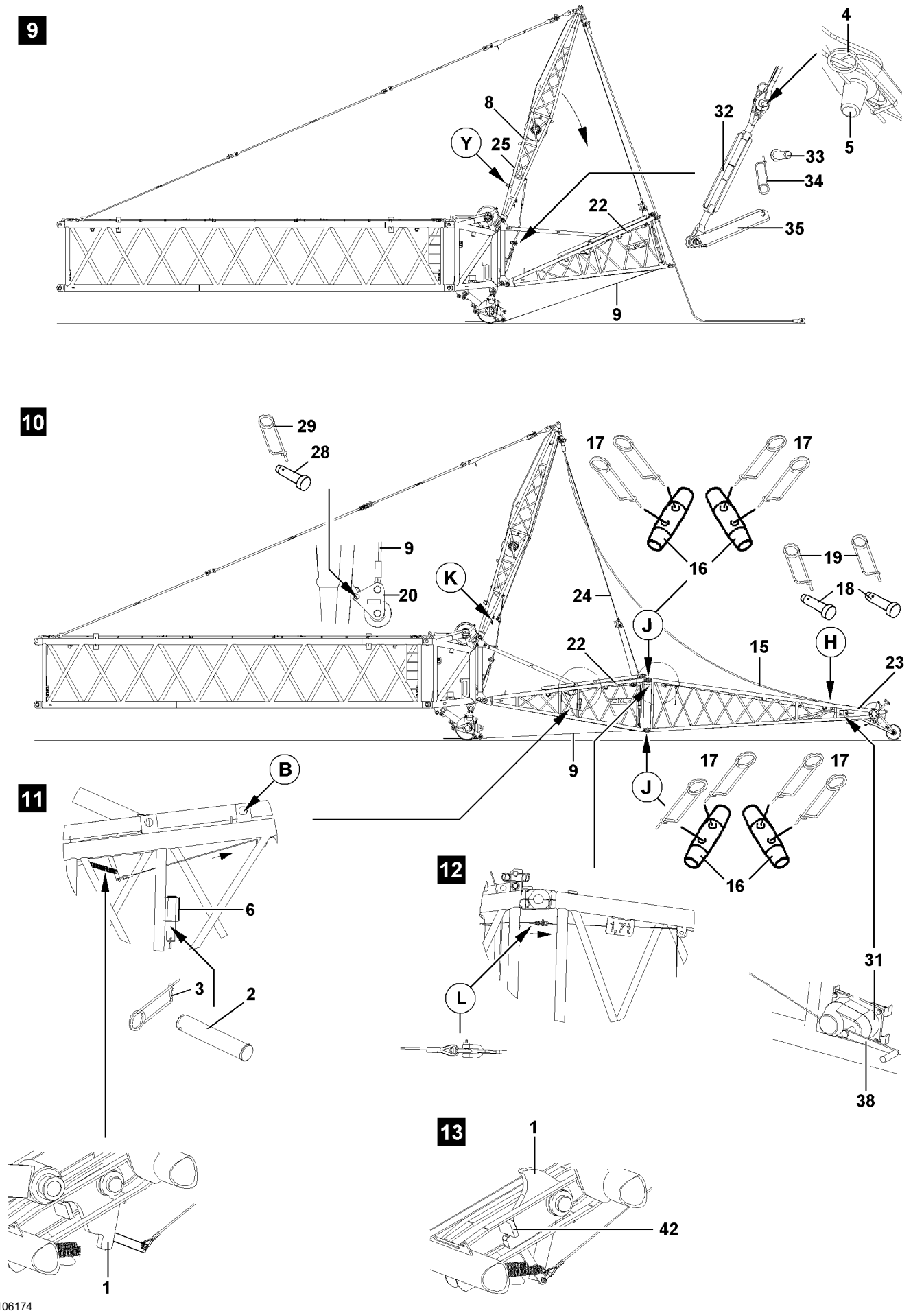
DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Observe the data in the erection and take down charts!

DANGER
The crane can topple over!
For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down charts!
- ▶ The boom must be erected or taken down “to the side” “in direction” of the mechanical auxiliary supports **60**.
- ▶ Always erect or take down according to the data in the **Erection and take down charts**!

WARNING
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over. Personnel can be severely injured or killed!
- ▶ Observe the Safety technical guidelines in chapter 5.01.
- ▶ Extend the relapse cylinder before erection.
- ▶ Do not allow slack cable to build up on the control winch!

WARNING
Falling hoist rope!
If the hoist rope before the erection procedure is not properly secured onto the end section, it can fall down backward on the basis of its own weight. Personnel can be severely injured or killed!
- ▶ Attach the hoist rope properly on the end section before the erection procedure!

Make sure that the following prerequisites are met:
- – the crane is aligned in horizontal direction,
- – all electrical connections have been established,
- – all limit switches are functioning,
- – the counterweight has been installed to the turntable according to the load chart,
- – all pin connections have been secured,
- – the hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins,
- – there are no loose parts on the boom,
- – the LICCON overload protection has been adjusted according to the data in the load chart,
- – the LICCON overload protection settings have been compared with the actual crane configuration,
- – the assembly key button **450** is actuated,
- – the indicator light **431** “Assembly” lights up,
- – the assembly icon **3** on the LICCON monitor 0 lights up.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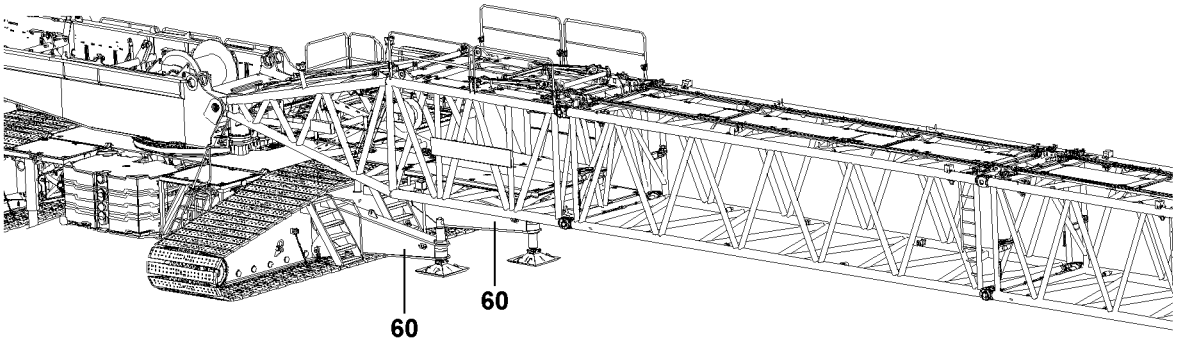
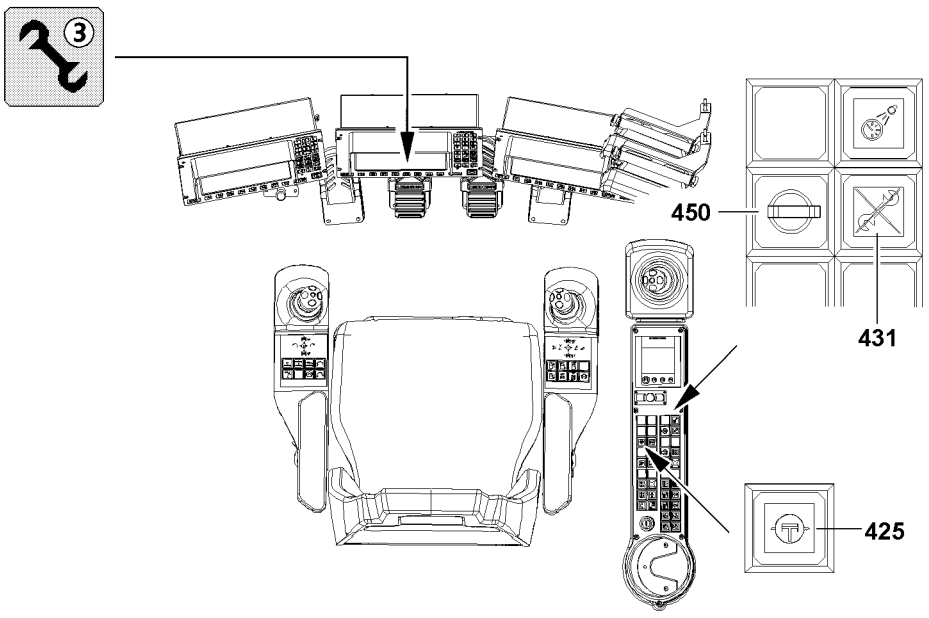
2.6.1 Setting the relapse retainer

WARNING
Risk of accident!
During crane operation, the flap **1** must be in “up” position, see illustration **13**!

- ▶ Set the flap **1 immediately before lift off** of the F-end section **23** or when erecting the boom into the relapse retainer position in “up” position!
- ▶ Then remove the manual lever **38** from the manual rope winch **31** and store it in the tool box.

- ▶ Set the flap **1** with the manual rope winch **31** in relapse retainer position (“up” position), until the flap **1** touches on the stop **42**, see illustration **13**.
- ▶ Remove the manual lever **38** from the manual rope winch **31**.





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2.6.2 Erection procedure

DANGER
The crane can topple over!
- ▶ It is prohibited to turn the crane superstructure while erecting the boom!
- ▶ Observe the data in the erection and take down charts!

Reeving in the hook block

- ▶ Luff up the boom until the auxiliary jib lifts off the ground.
- ▶ Reeve in the hook block properly and secure the hoist rope on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.

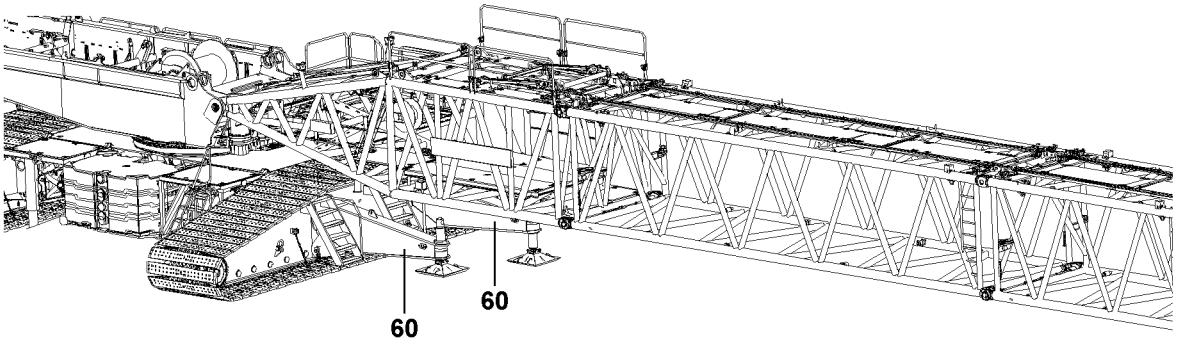
Erecting the boom

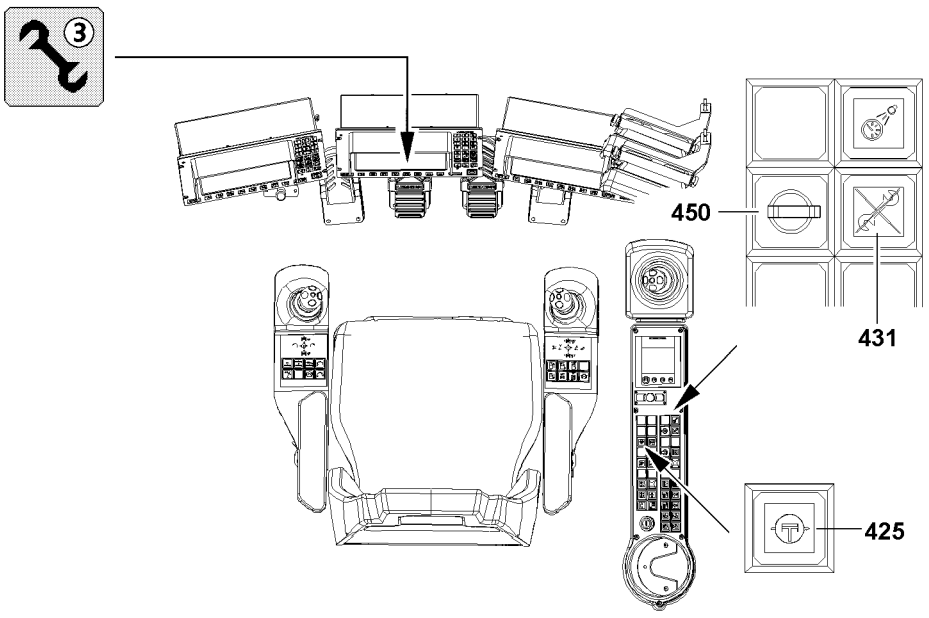
DANGER
The crane can topple over!
In crane operation with bypassed safety devices, the crane can topple over. Personnel can be severely injured or killed!
- ▶ When the lowest operating position of the boom is reached, turn off the assembly key button **450** immediately.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

Note
- ▶ When the lowest operating position of the boom is reached, the displays turn off.
- ▶ In the “Maximum load” icon appears a load number in “t” instead of the display “???”!

- ▶ Luff the boom up to the lowest operating position.
- ▶ When the boom has reached the lowest operating position:
  Turn the assembly key button **450** off: Press the button **431**.

Result:
- – The LICCON overload protection is active.
- – The indicator light **431** turns off.
- – The assembly icon **3** on the LICCON monitor turns off.
- – The acoustical signal turns off.
- – The three color light and the warning light on the rear of the turntable turn off.





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3 Operating the crane

3.1 Preparing for crane operation

Note

▶ Observe the notes in chapters 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is turned off.

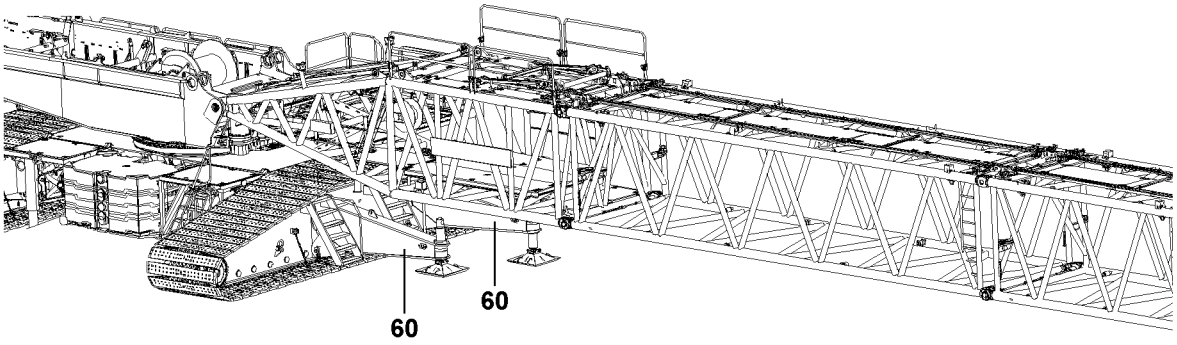
WARNING

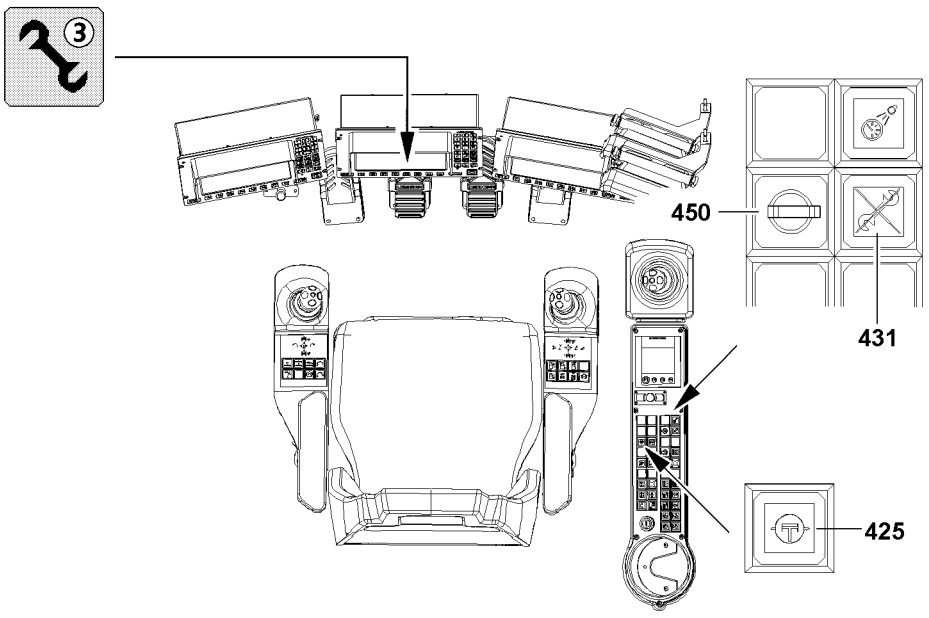
The crane can topple over!

▶ Check the horizontal position of the crane before and during operation!
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation!

3.2 Checking the settings

▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the limit switches on the relapse cylinders.





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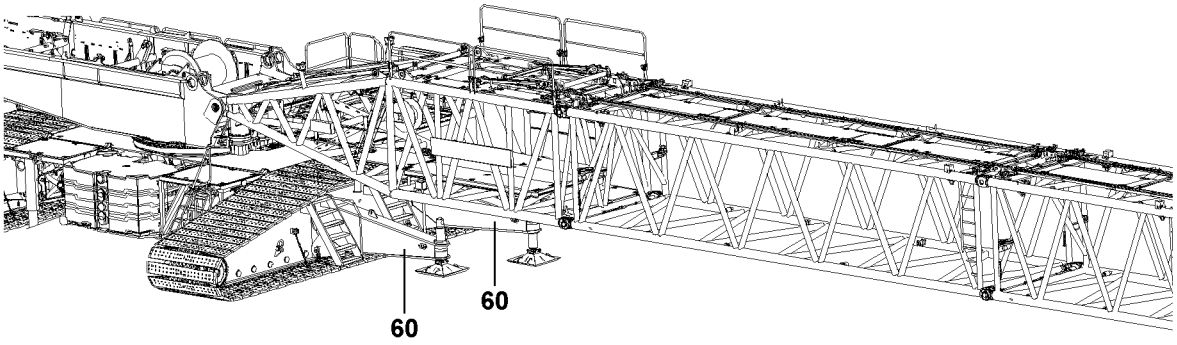
4 Disassembling the auxiliary jib

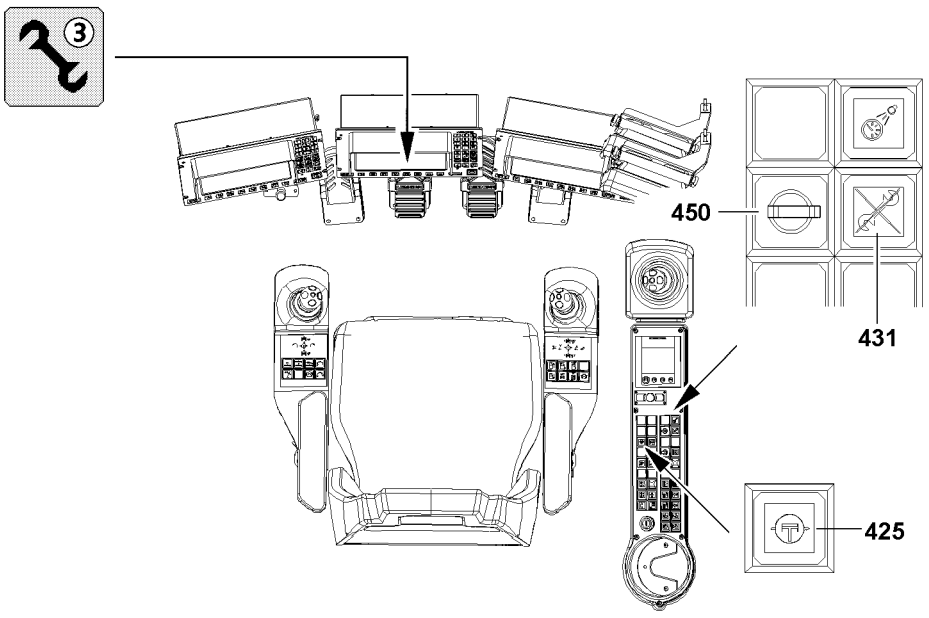
WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening injuries.
- ▶ All assembly work from a height of 2 m must normally be carried out 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 with suitable means (such as safety belts, working platform)!

DANGER
Danger of accident at assembly / disassembly of booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.
- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

DANGER
Falling components!
If a component is assembled or disassembled without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!
- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!

Make sure that the following prerequisites are met:
- – the “mechanical auxiliary supports **60** ” are properly assembled on the crane, see also **Erection and take down charts**,
- – the SL-boom is luffed down “to the side” over the “mechanical auxiliary supports **60** ” and is luffed down to the “lowest” operating position,
- – the LICCON overload protection has been set according to the data in the load chart,
- – the assembly key button **450** is pressed and the indicator light **431** lights up,
- – the assembly icon on the LICCON display blinks,
- – the auxiliary crane is available.





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4.1 Taking the SLF-boom down

WARNING
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head. Boom components can be severely damaged.
- ▶ Luff the boom system down at the same time and spool the hoist winch out.

4.1.1 Luffing the SLF-boom down

Note
- ▶ The Luff down movement is turned off as soon as the lowest operating position is reached.
- ▶ When the lowest operating position of the boom is reached, the load display in the “Maximum load” icon turns off and instead of the load display appears the display “???”.
- ▶ In the crane operating screen appear alarm functions.

- ▶ Luff the S-boom down to the **lowest** operating position.

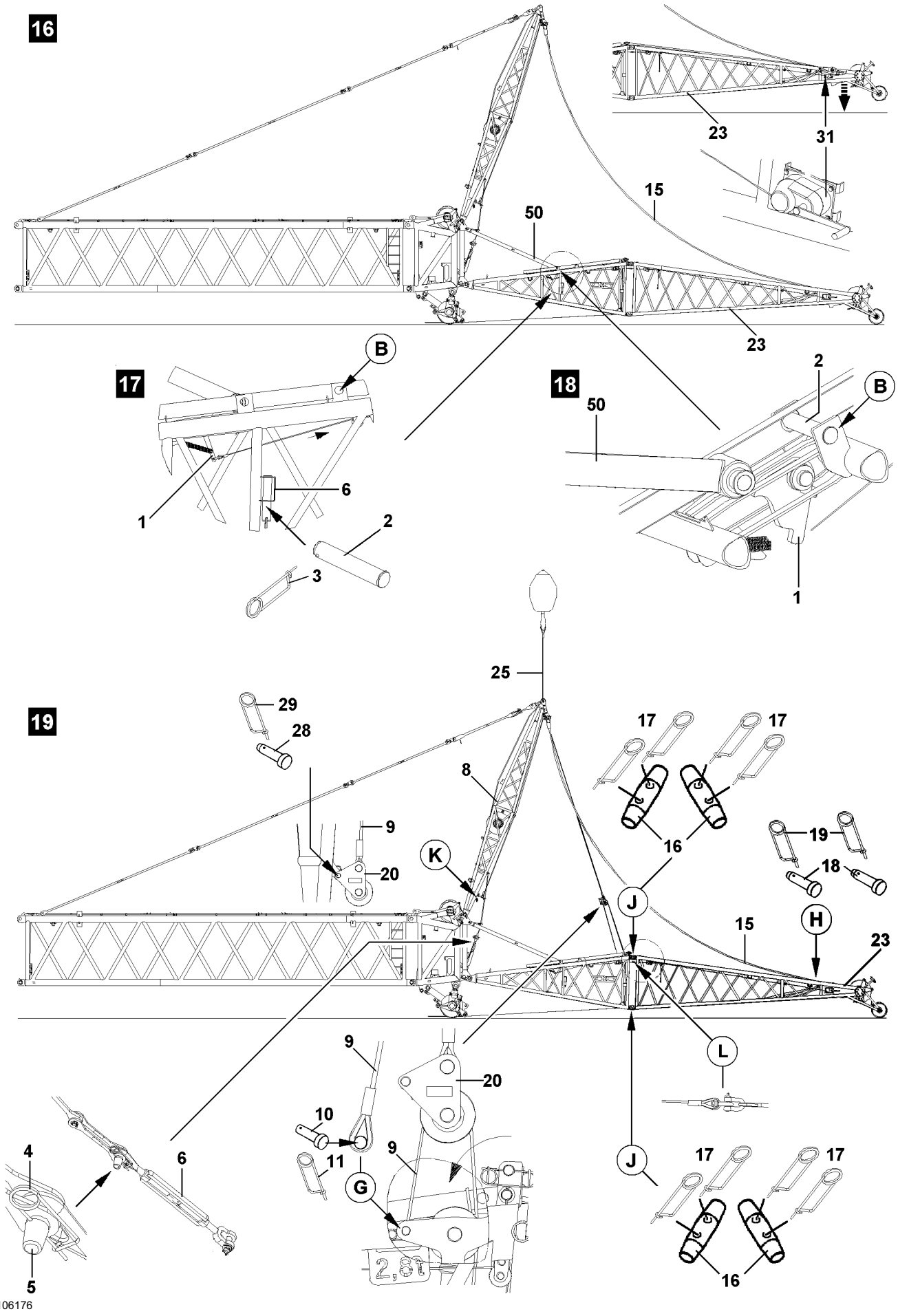
Result: The following alarm functions become active:
– “STOP”
– “Horn” and acoustical signal

DANGER
Crane operation with added assembly key button!
- ▶ The actuation of the assembly key button **450** is only permitted for assembly tasks!
- ▶ The assembly key button **450** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **450** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **450** turned on is strictly prohibited!
- ▶ The assembly key button **450** must be removed immediately after carrying out the assembly work and handed to an authorized person!

- ▶ When the boom has reached the lowest operating position:
  Turn the assembly key button **450** on: Press the button **431**.

Result:
– The LICCON overload protection is deactivated.
– The indicator light **431** lights up.
– The assembly icon **3** on the LICCON monitor blinks.
– The “STOP” icon on the LICCON monitor blinks.
– An acoustical signal sounds.
– The three color light lights up red and the warning light on the rear of the turntable lights up.

- ▶ At the same time, spool the hoist winch out and luff the S-boom down until the hook block touches the ground.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4.1.2 Taking the SLF-boom down

- ▶ Actuate the master switch and luff the S-boom down until the hook block touches the ground.
- ▶ Remove the hoist limit switch weight.
- ▶ Unreeve the hook block.
- ▶ Spool up the hoist rope to the winch.
- ▶ Luff down the boom until the pulley head from the F-end section is just above the ground, see illustration **16**.
- ▶ Remove the pin **2** from the retainer **6** (park position) and insert at point **B** (attachment position) and secure with spring retainer **3**, see illustration **17**.

CAUTION

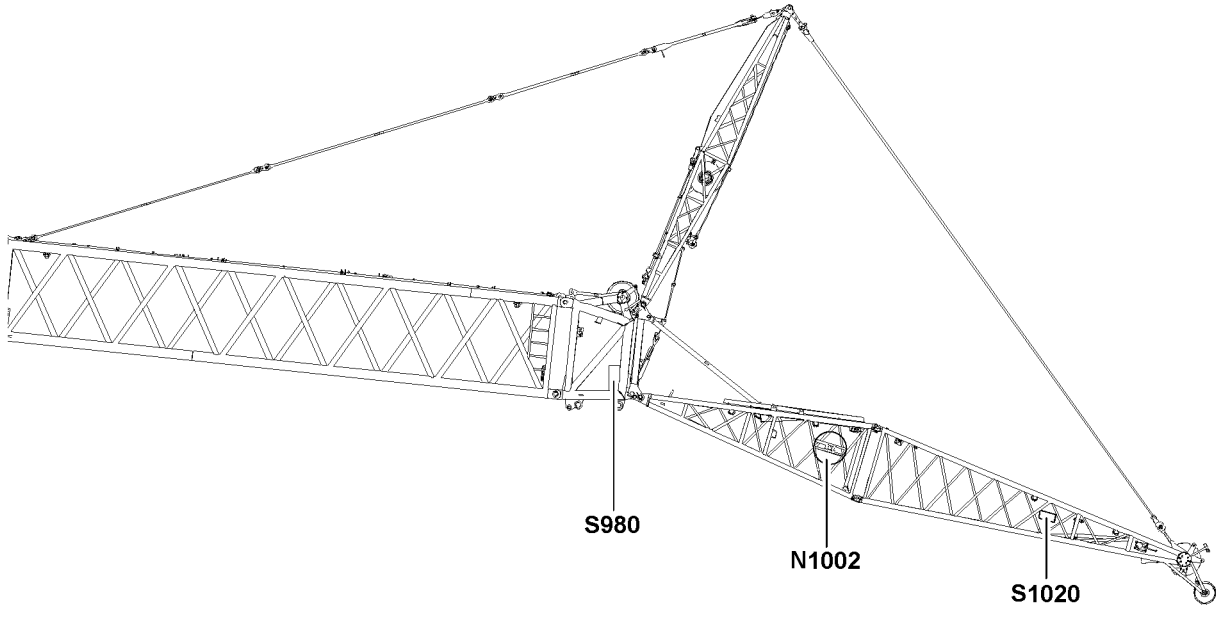
Danger of damage on the relapse support!

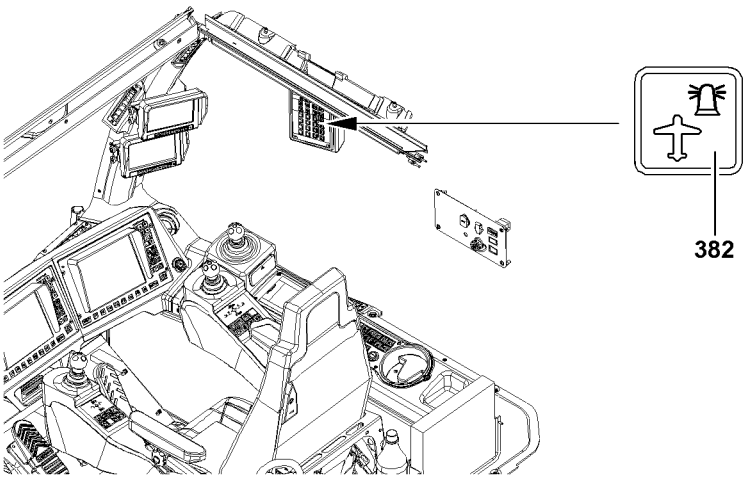
When taking the boom down, the flap **1** must be set in “down” position as soon as the F-end section **23** touches the ground or as soon as the manual rope winch **31** can be reached!

If this is not observed, components on the F-assembly unit can be damaged!

- ▶ Set the flap **1** with the manual rope winch **31** in “down” position to that the plunger **50** can “slide” in the guide over the flap **1**, see attachment **16**.

- ▶ Set the flap **1** on the F-pivot section **22** with the manual rope winch **31** into “down” position, see attachment **16**.
- ▶ Place the boom all the way on the ground.





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4.2 Disconnecting the electrical connections

Ensure that the following prerequisite is met:

– the SLF-boom has been placed down.

CAUTION

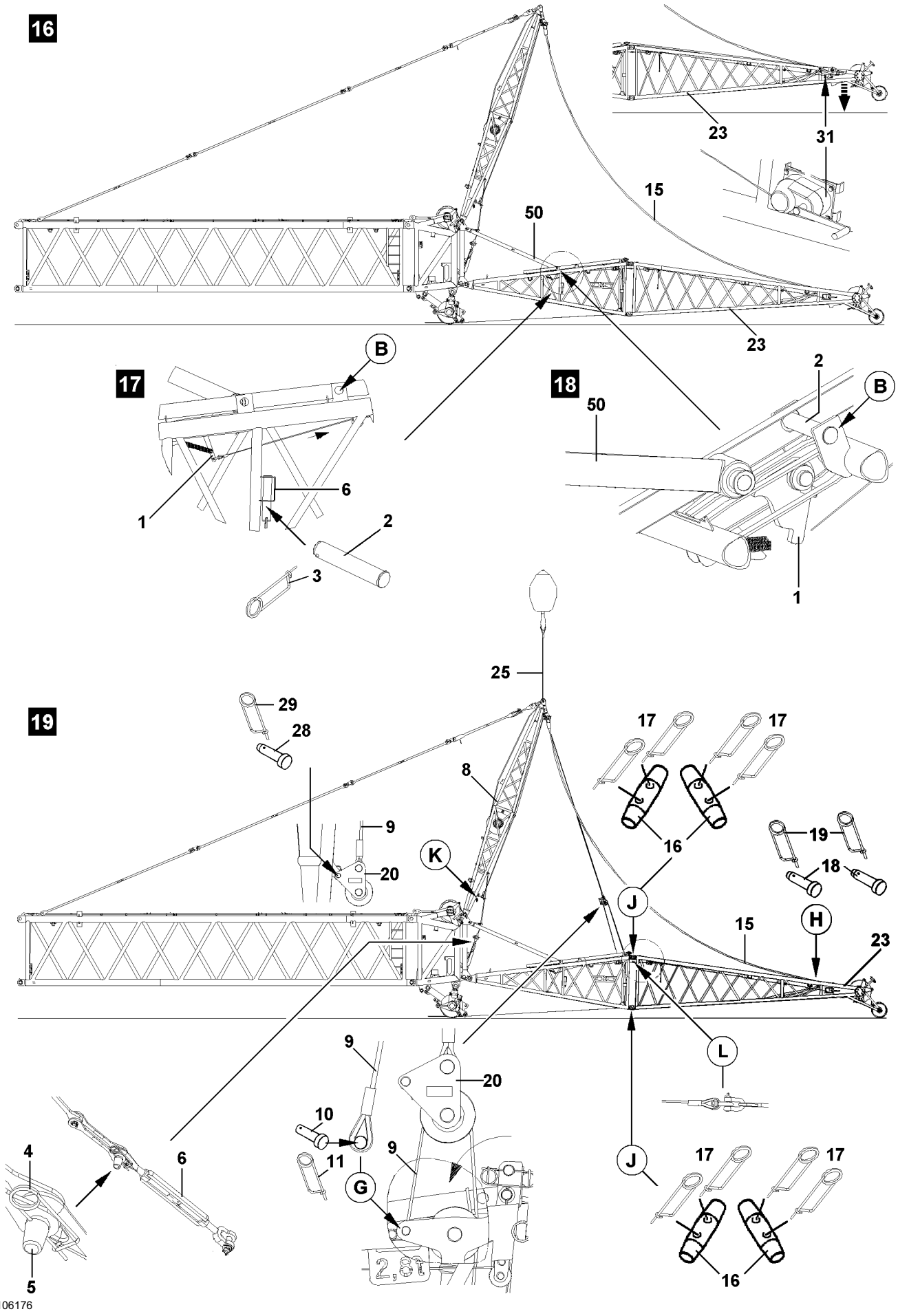
Damage to the electrical connection on the cable drum!

If the electrical connection between the SW-end section and the F-pivot section is not separated before spooling up the cable drum, the electrical connection will be damaged!

If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the F-end section, then the cable drum or the cable can be significantly damaged!

- ▶ Disconnect the electrical connection from the cable drum on the F-pivot section to the terminal box on the SW-end section first and then the electrical connection from the terminal box on the F-end section to the cable drum!
- ▶ After unplugging, spool the cable onto the cable drum.

- ▶ Disconnect the electrical connections.
- ▶ After unplugging, spool the cable onto the cable drum and secure it to prevent it from spooling out inadvertently.
- ▶ Secure the cable: Reestablish the electrical connection between the W-connector head and the cable drum.


16
23
31
15
50
23
17
B
1
6
2
3
18
2
B
50
1
19
25
29
28
8
9
20
K
17
17
16
19
18
J
15
H
23
L
9
20
10
11
9
G
4
6
5
J
17
17
16
B106176

4.3 Disassembling the F-assembly unit

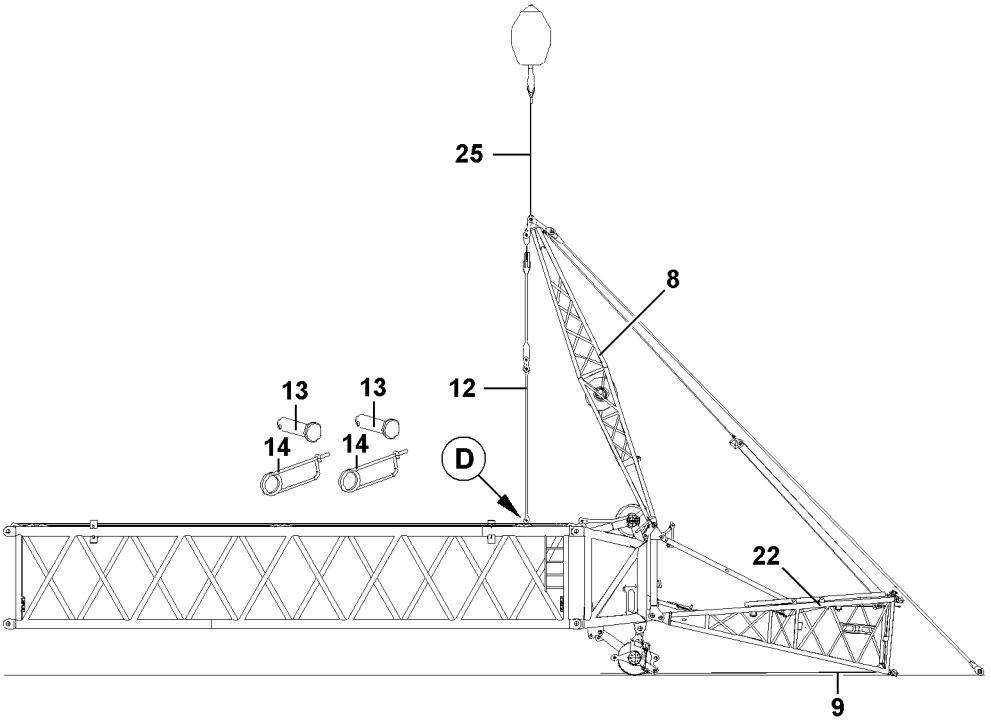
- ▶ Remove the F-guy ropes **15** on the F-end section, see illustration **19**.
- ▶ Release the pins **18** on point **H** and unpin, see illustration **19**.
- ▶ Hang in the F-end section or the F-intermediate sections properly on the auxiliary crane.
- ▶ Release the rope strand to the manual rope winch **31** on the F-end section **23** at point **L**, see illustration **19**.
- ▶ Unpin the double cone pins **16** on the points **J** from the “outside to the inside” and remove the F-end section or the F-intermediate sections.

WARNING
The FA-frame **8** can fold back uncontrolled!
Before the FA-frame relapse retainer is released, the FA-frame **8** must be secured to prevent it from folding back uncontrolled!

- ▶ Properly hang the FA-frame **8** with the attachment rope **25** on the auxiliary crane, see illustration **19**.
- ▶ Reeve in the assembly winch rope **9** into the rope pulley block **20** and pin, see illustration **19**.

- ▶ Release and unpin the rope pulley **20** on the FA-frame **8** at point **K** and unpin, see illustration **19**.
- ▶ Reeve in the assembly winch rope **9** from the turntable into the rope pulleys and pin on point **G** with pin **10** and secure with spring retainer **11**, see illustration **17**.
- ▶ Release the FA-frame relapse retainer by releasing the spring retainer **4** and unpinning the pin **5**, see illustration **19**.
- ▶ Place the turnbuckle **6** on the F-pivot section **22** and secure.

20



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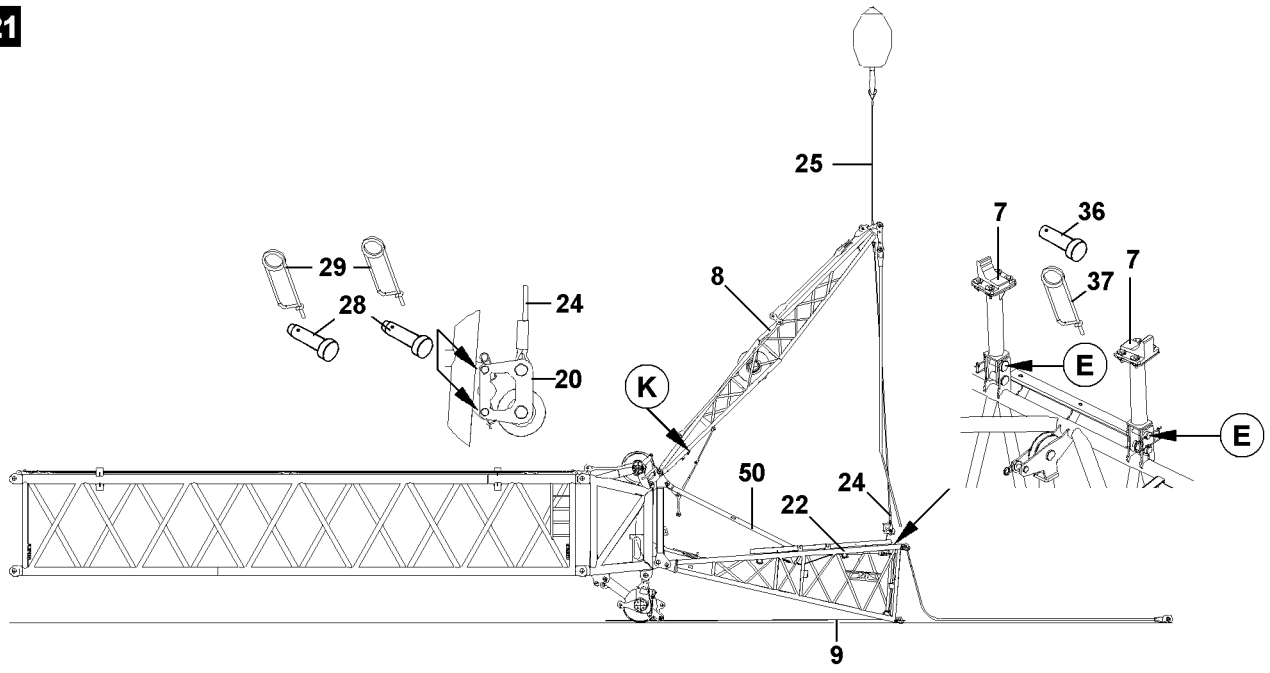
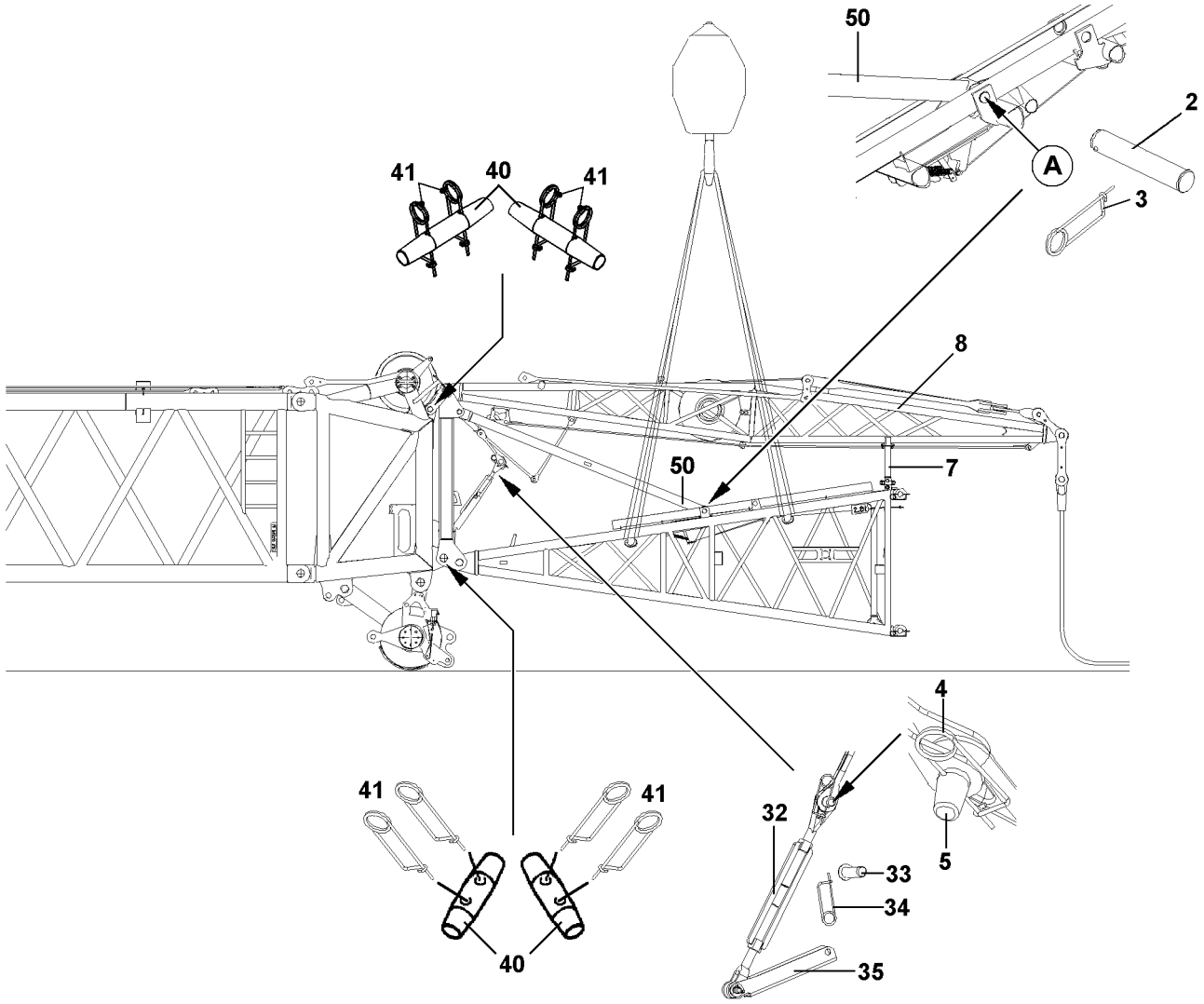


B106177

- ▶ Swing the FA-frame **8** with the auxiliary crane “carefully to the rear in direction of the main boom” and “at the same time, spool out the assembly winch rope **9** ”, see illustration **20**.
- ▶ Unpin the F-guy rods **12** on point **D**, see illustration **20**.
- ▶ Release and unpin the pins **13**, see illustration **20**.
- ▶ Swing the FA-frame **8** with the auxiliary crane forward, see illustration **21**.
- ▶ Pin the attachment rope **24** with the pulley block **20** on the FA-frame **8** at point **K** with pin **28** and secure with spring retainer **29**, see illustration **21**.
- ▶ Fold the support brackets **7** up and pin on points **E** with pins **36** and secure with spring retainers **37**, see illustration **21**.

22

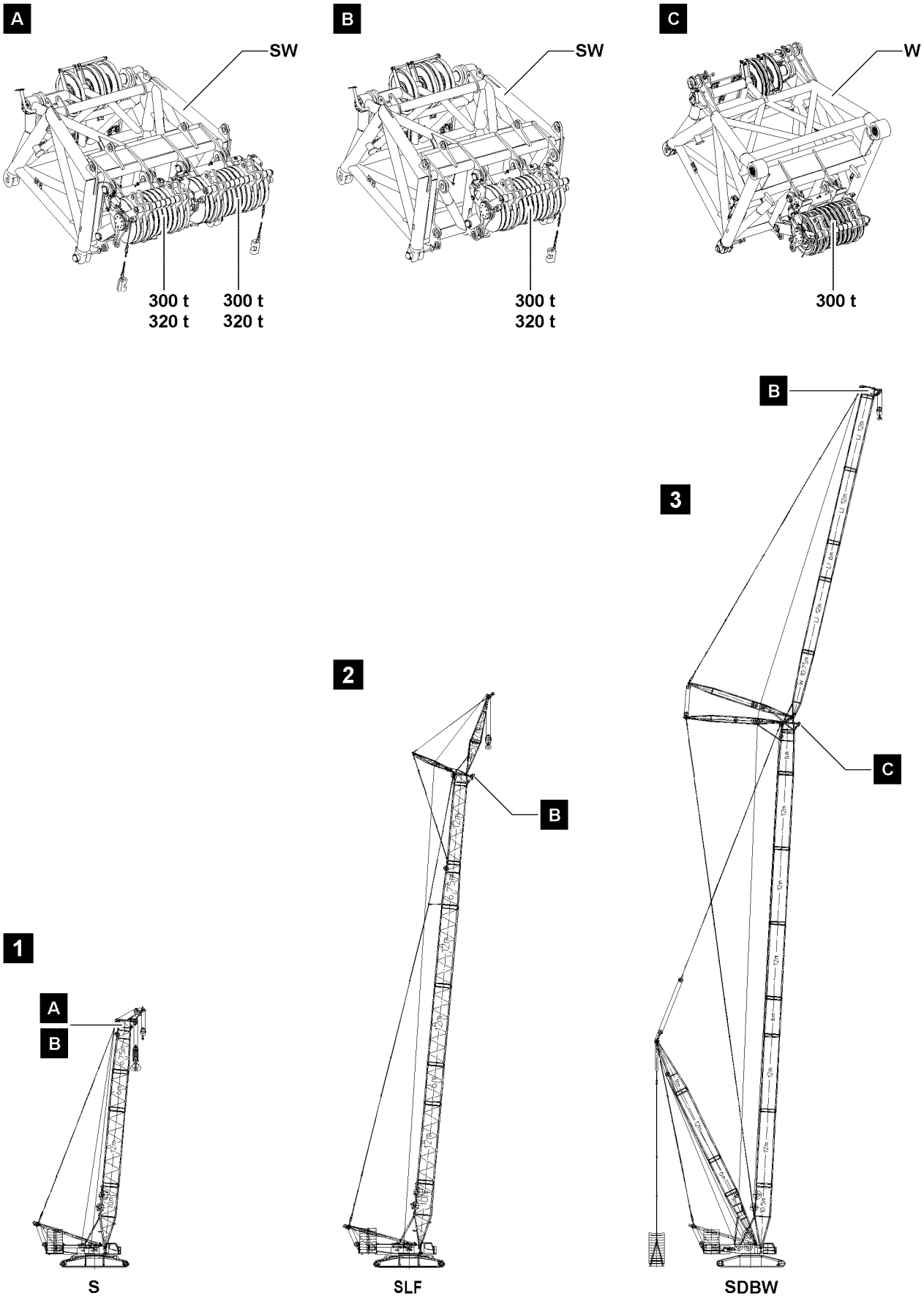


B106179

- ▶ Place the FA-frame **8** with the auxiliary crane onto the support frames **7**.
- ▶ Connect the FA-frame relapse retainer by pinning the pin **5** and securing it with the spring retainer **4**, see illustration **22**.
- ▶ Tighten the turnbuckle **32** and close the retaining plate **35**, see illustration **22**.
- ▶ Secure the retaining plate **35** with pin **33** and spring retainer **34**, see illustration **22**.
- ▶ Properly hang the F-assembly unit on the auxiliary crane, see illustration **22**.

WARNING
Risk of accident!
The plunger **50** must be pinned on point **A** in “transport position” with pin **2**, see illustration **22**!
- ▶ Pin in the pin **2** on point **A** and secure with spring retainer **3**.

- ▶ Unpin the double cone pins **40** on top and bottom from the “outside to the inside” and remove the F-assembly unit.


A
SW
300 t
320 t
300 t
320 t
B
SW
300 t
320 t
C
W
300 t
1
A
B
S
2
B
SLF
3
B
C
SDBW

B105345

1 Combinations of boom heads with pulley sets

WARNING
The crane can topple over!
If the pulley sets are improperly assembled, the crane can topple over. Personnel can be severely injured or killed!
▶ Select pulley sets according to the operating modes, as specified in the load charts!
▶ Observe the instructions in the erection and take down charts!

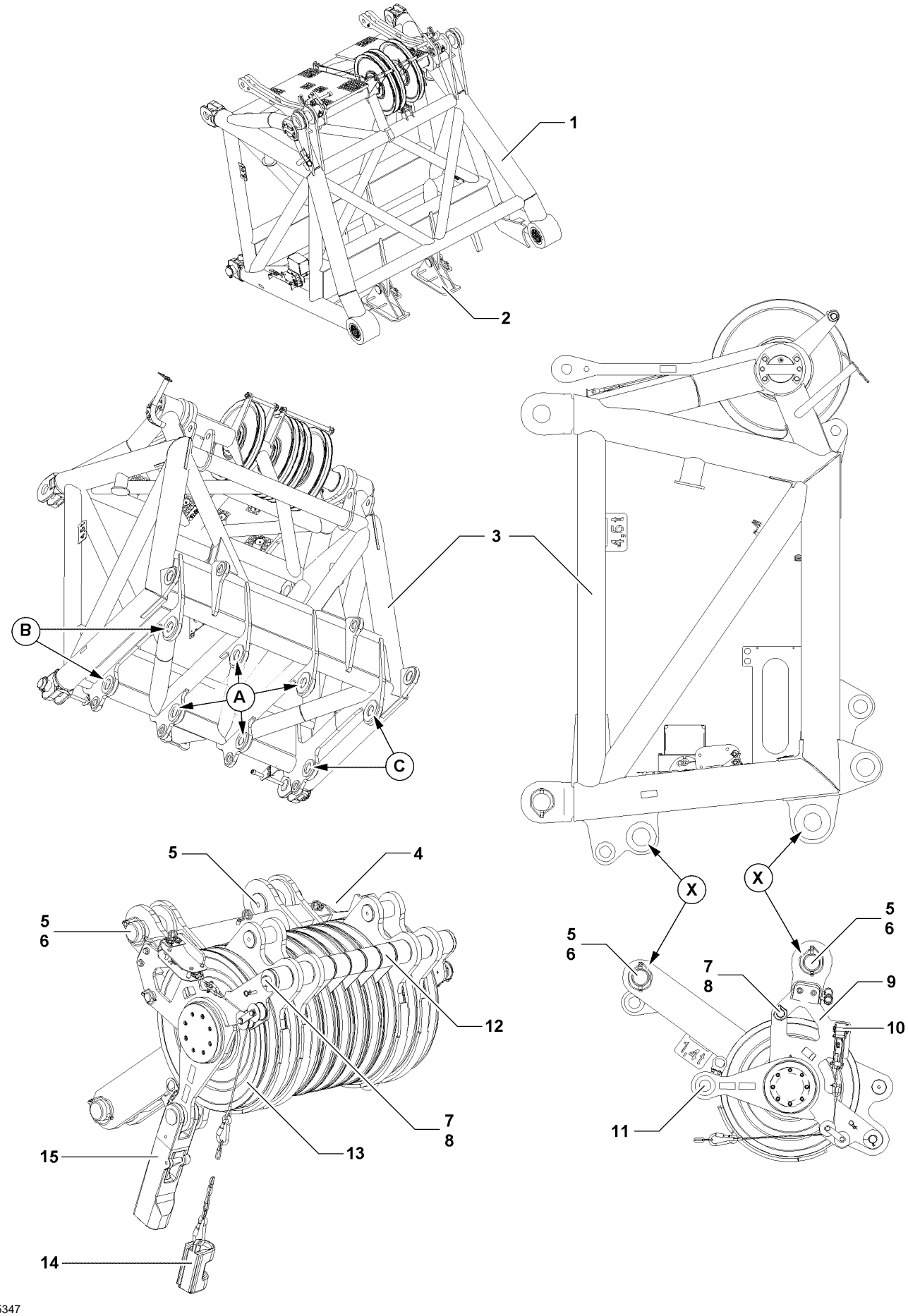
Changeable pulley sets:
– Pulley set 320 t
– Pulley set 300 t

For the SW-end section applies:
– The pulley sets can be assembled individually or together on the SW-end section.

WARNING
Collision of the W-pivot section with the pulley set 320 t!
When luffing down the W-lattice jib, the W-pivot section collides with the 320 t pulley set. The W-pivot section and the pulley set will be damaged.
▶ For operation with the W-lattice jib, use the 300 t pulley set only.

Note
▶ The roller set 320 t can not be assembled on the W-connector head **C**.

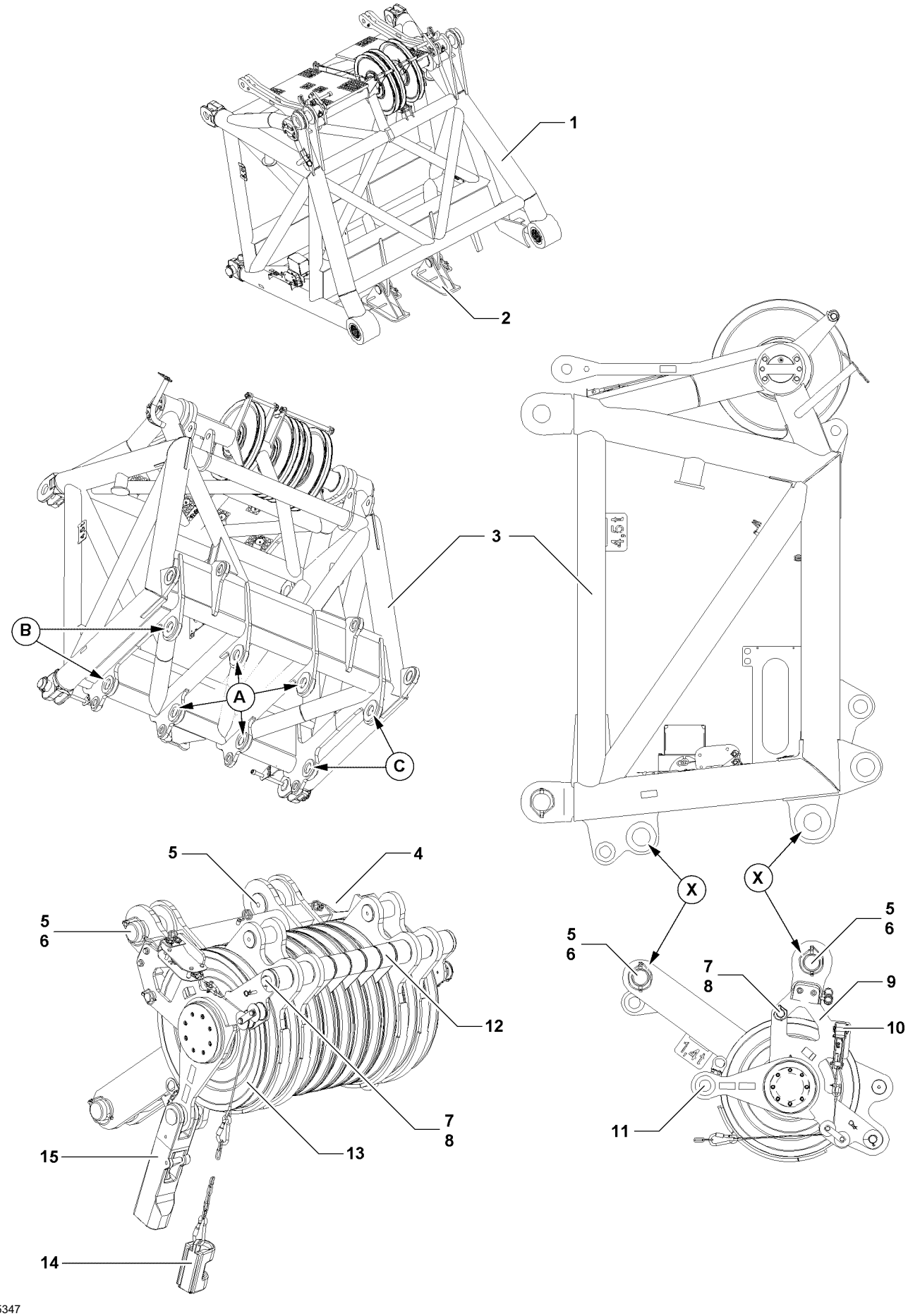
Operating mode	Example	End sections used	Pulley sets used
S / SD	Illustration **1**	SW-end section **A**	320 t and / or 300 t
SL / SL2 / SLF / SLD / SL2D / SL2DF	Illustration **2**	SW-end section **B**	320 t or 300 t
SW / SWF / SDW / SDWV	Illustration **3**	W-connector head **C**	300 t
		SW-end section **B**	320 t or 300 t



B105347

2 Overview components pulley set

Position	Component
1	W-connector head
2	Foot
3	SW-end section
4	Roller set
5	Pin
6	Spring retainer
7	Rope retaining pin
8	Spring retainer
9	Retainer
10	Hoist limit switch
11	Rope fixed point
12	Rope guard pulleys
13	Rope pulleys
14	Hoist limit switch weight
15	Lock



B105347

3 Assembling / disassembling the pulley set

Make sure that the following prerequisites are met:
– the pins **5** on the pulley set **4** are unpinned,
– the pulley sets **4** and feet **2** on the SW-end section **3** or the W-connector head **1** are removed.

3.1 Assembling the pulley set

WARNING
The crane can topple over!
If the pulley sets are improperly assembled, the crane can topple over. Personnel can be severely injured or killed!
▶ Select pulley sets according to the operating modes, as specified in the load charts!
▶ Observe the instructions in the erection and take down charts!

WARNING
Overload of boom system!
If only the pulley set is used and the pulley set is assembled off centre of the end section, then the boom system can be overloaded. Personnel can be severely injured or killed!
If only one pulley set is used:
▶ Assemble the pulley set in the centre of the end section on the pin points **A**.

Note
Assemble of two pulley sets on the SW-end section!
▶ One pulley set is assembled on the pinning points **A** and the pinning points **B**.
▶ One pulley set is assembled on the pinning points **A** and the pinning points **C**.

Note
▶ The weight of the 320 t pulley set is 1.5 t.
▶ The weight of the 300 t pulley set is 1.4 t.

▶ Position the pulley set **4** on the SW-end section **3** or the W-connector head in such a way that the pin bores align in points **X**.
▶ When the pin bores align:
Insert the pin **5** on point **X** from the outside to the inside and secure with spring retainer **6**.
▶ Pin and secure the lock **15** on the rope fixed point **11**.

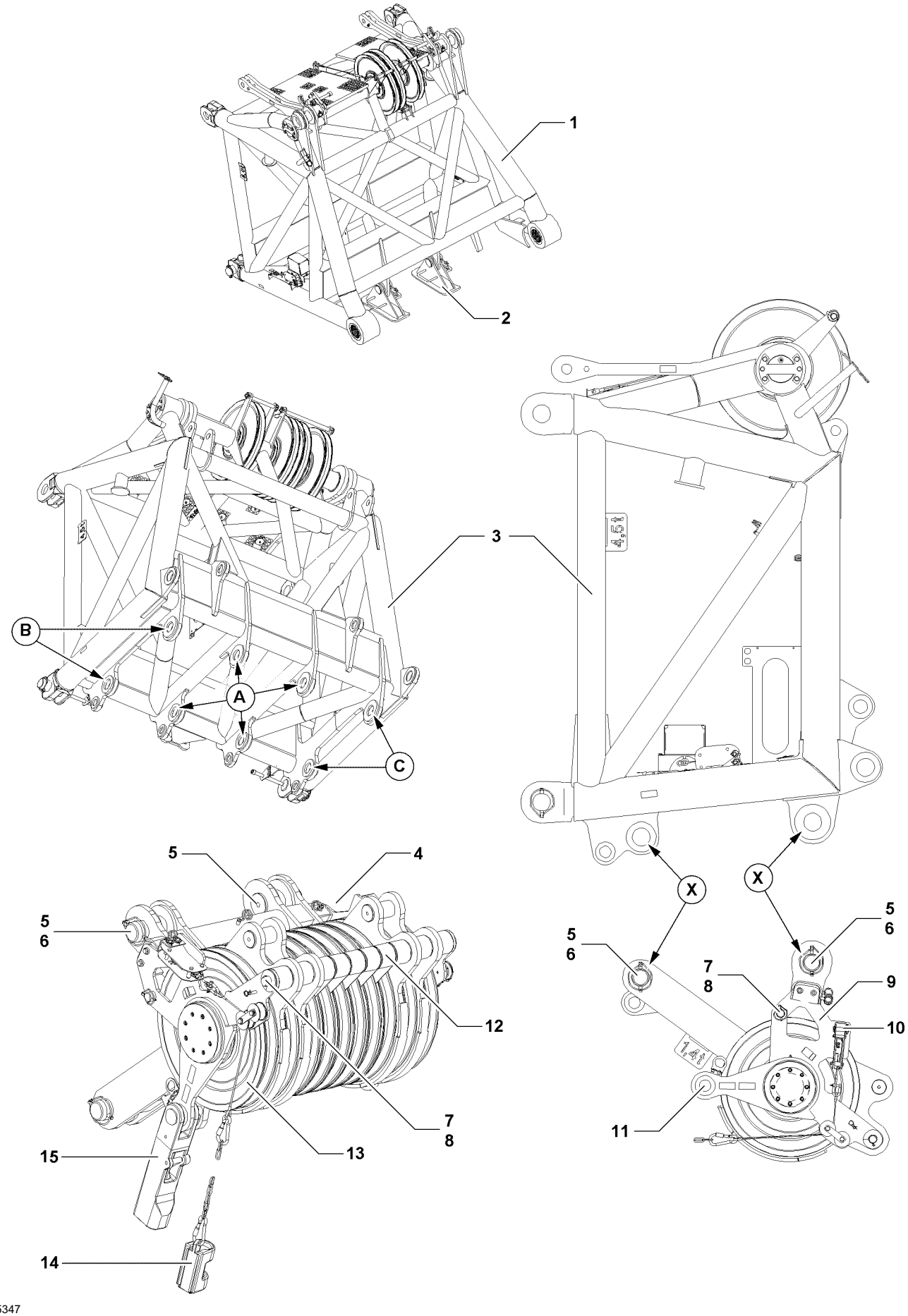
Note
▶ Reeve the hoist rope according to the separately supplied reeving plans.

▶ Reeve in the hoist rope on to the rope pulleys **13**.

Note
▶ For electrical connections on the SW-end section or the W-connector head, see chapter 5.04, 5.07.

▶ Establish the electrical connection to the hoist limit switch **10**.
▶ Reeve hook block properly and attach the hoist limit switch weight **14**.

Result:
– The pulley set **4** is assembled.



B105347

3.2 Disassembling the pulley set

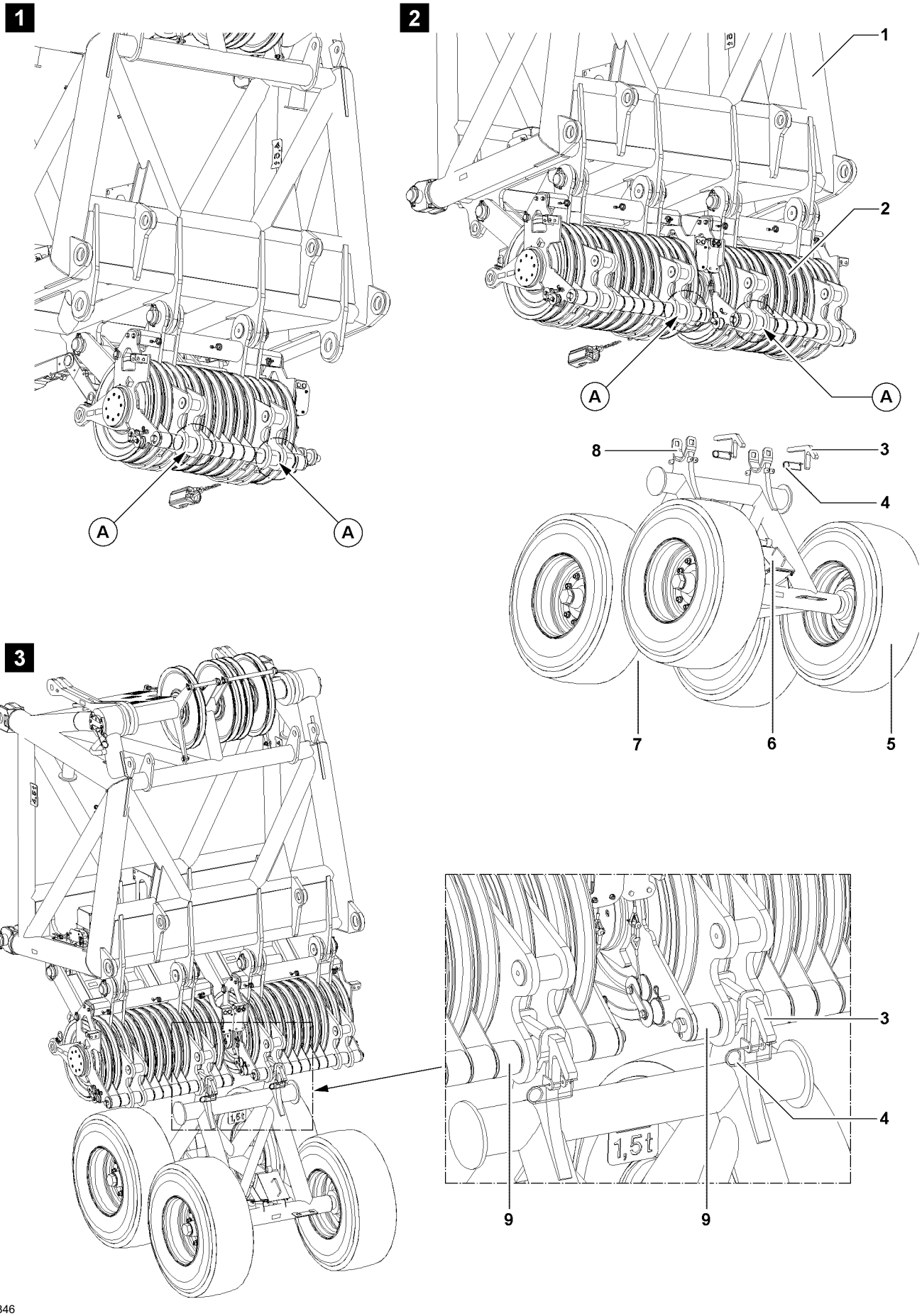
Note
- ▶ The weight of the 320 t pulley set is 1.5 t.
- ▶ The weight of the 300 t pulley set is 1.4 t.

- ▶ Unreeve the hoist rope.
- ▶ Luff the boom down until the pulley set is laying on the ground.
- ▶ Remove the lock **15**.

Note
- ▶ For electrical connections on the SW-end section or the W-connector head, see chapter 5.04, 5.07.

- ▶ Disconnect the electrical connection to the hoist limit switch **10**.
- ▶ Remove the spring retainer **6** and unpin the pin **5**.
- ▶ Luff the boom up.

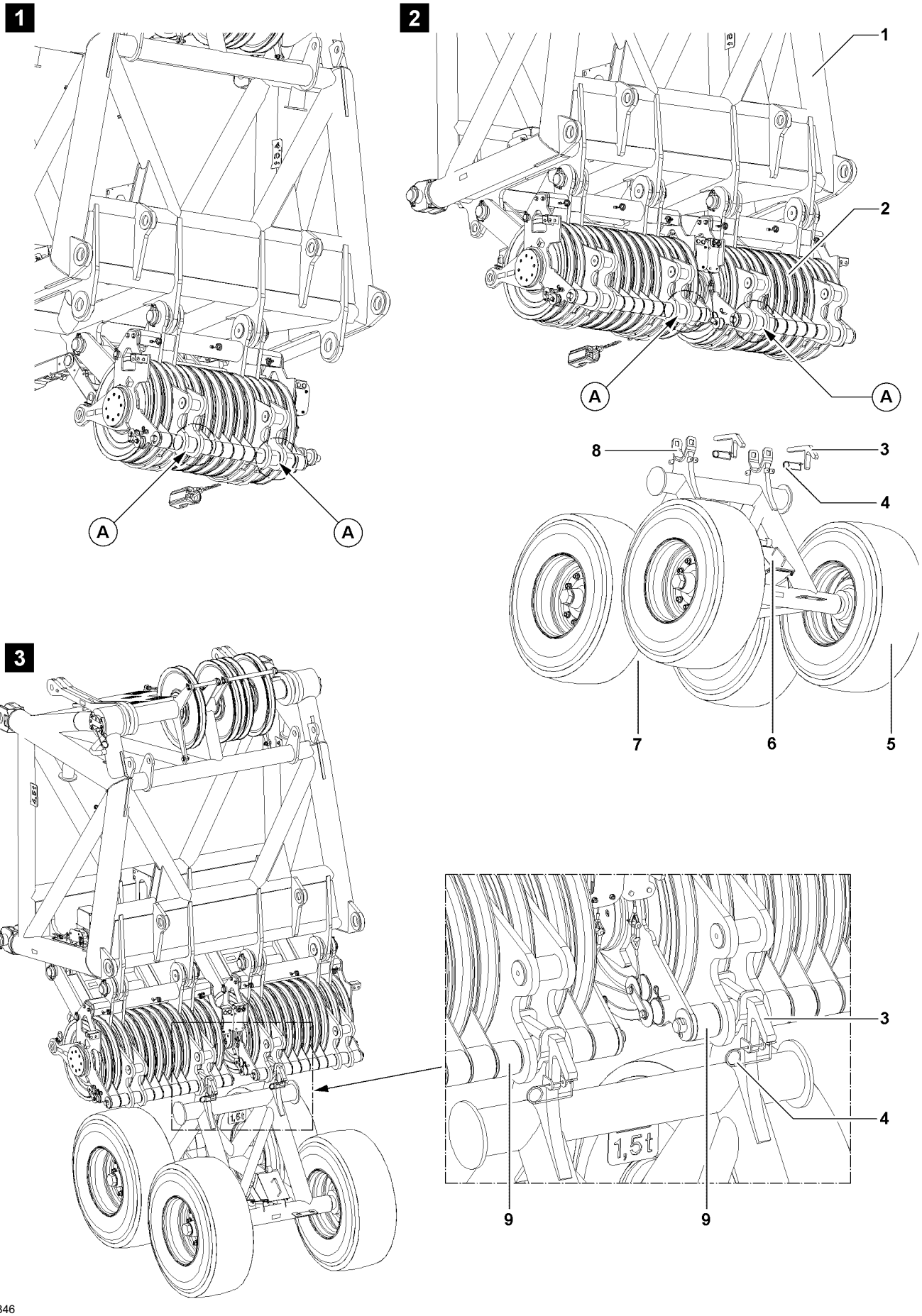
Result:
– The pulley set **4** is removed.



B105346

1 Overview components pulley cart

Position	Description
1	SW-end section
2	Pulley set
3	Fuse
4	Spring retainer
5	Tires
6	Wedge
7	Pulley cart
8	Retainer
9	Pulleys on the pulley set



B105346

2 Installing / removing the pulley cart

2.1 Installing the pulley cart

– For illustration of a SW-end section with installed pulley set, see fig. **1**.
– For installation of the pulley cart on example of a SW-end section with two pulley sets, see fig. **2** and fig. **3**.

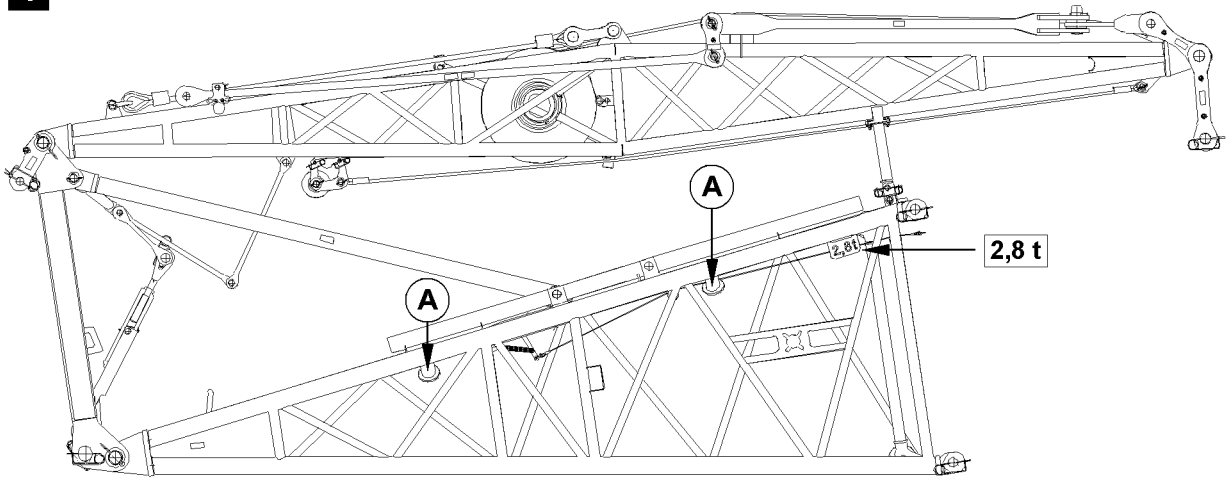
▶ Position the pulley cart **7** below the SW-end section **1** and secure the tires **5** with wedges **6**.
▶ Slowly lower the SW-lattice jib until the pulleys of the pulley set **9** in point **A** are laying in the receptacle **8** of the pulley cart.
▶ Plug in the retainer **3** and secure with spring retainer **4**.
▶ Remove the weges **6**.

2.2 Removing the pulley cart

WARNING
Risk of accident!
▶ Observe and adhere to the data in the erection and take down charts.
▶ Observe chapter 5.07.

▶ Secure the pulley cart **7** with wedges **6**.
▶ Release the spring retainer **4** and pull the retainer **3**.
▶ Luff up boom combination.

1



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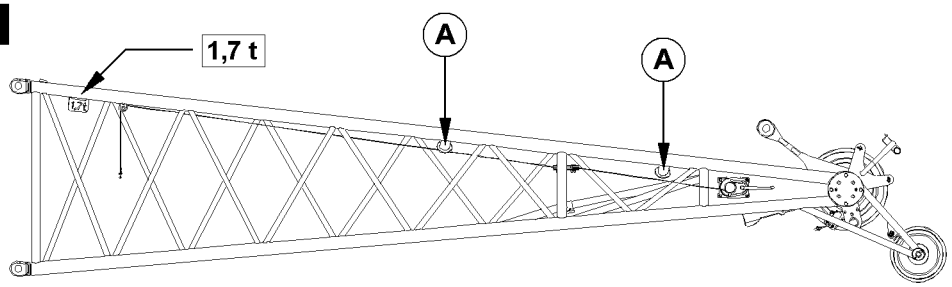

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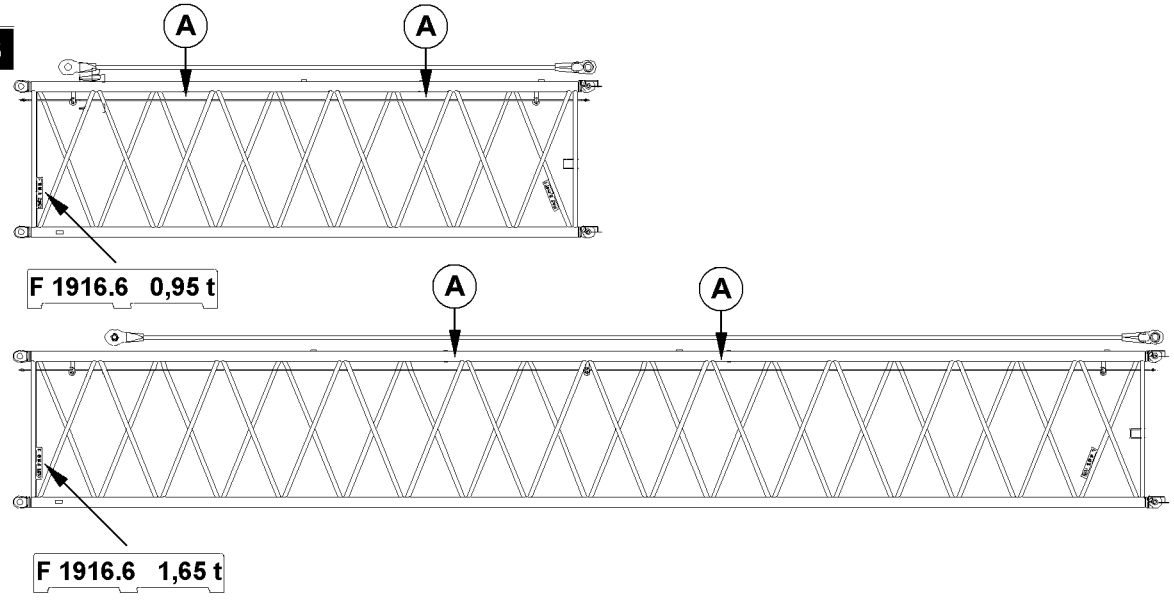


B105063

1 Component overview

1.1 Attachment points

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components!
▶ The corresponding components must be attached on the intended points **A**!

Note
▶ For assembly or disassembly, tackle with a strand length of at least **4 m** must be used.

1.2 F-assembly unit, see illustration 1

Description	Abbreviation	Weight
F-assembly unit	—	2.8 t

1.3 F-end section, see illustration 2

Description	Abbreviation	Weight
F-end section	—	1.7 t

1.4 F-intermediate sections 6 m and 12 m, see illustration 3

Description	Abbreviation	Weight
F-intermediate section (6 m) with guy ropes	F 1916.6	0.95 t

Description	Abbreviation	Weight
F-intermediate section (12 m) with guy ropes	F 1916.6	1.66 t

B195219

2 Assembling SWF-boom

DANGER
The crane can topple over!
The boom combinations must be assembled according to the “separately supplied set up drawings”!
Any other arrangement of the lattice sections and the guy rods than specified in the set up drawings is prohibited!
At assembly of the intermediate sections, it must be observed that they are assembled according to their identification!

- ▶ The boom combinations must be assembled according to the separately supplied rod and assembly plans!

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

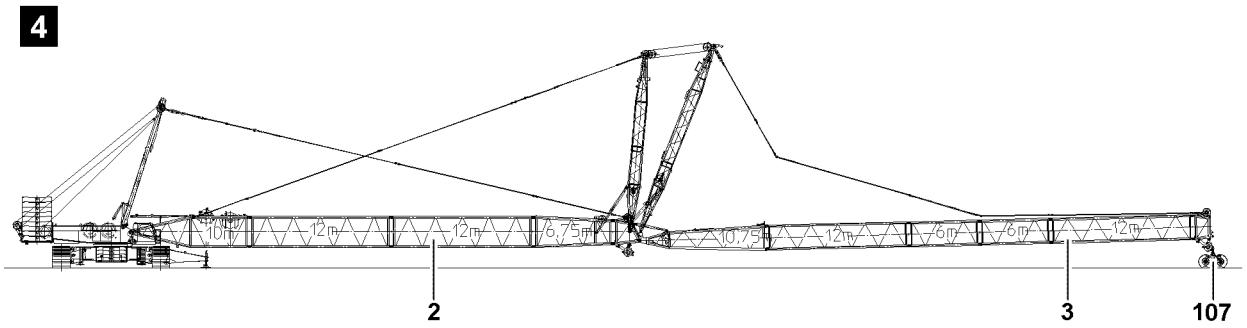
- ▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (see chapter 2.04) to protect against falling! The personal protective equipment must be attached in the corresponding attachment points on the crane (see chapter 2.06).
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly, inspection and maintenance work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free of snow and ice!

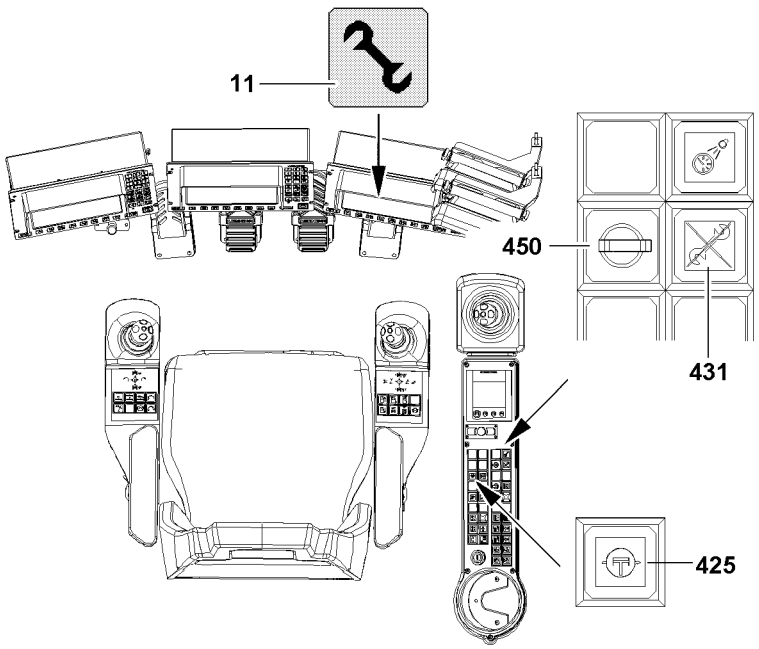
WARNING
Falling components!
If unsecured or non-supported components are assembled or disassembled, they can fall down. Personnel can be killed or seriously injured.

- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
- ▶ Support the boom and components before pinning / unpinning!
- ▶ Both pins that lie in at a horizontal level, i.e. **left** and **right**, pin or unpin!
- ▶ Secure the pins in the bearing points and in the receptacles!
- ▶ Do not disengage the auxiliary crane until each component is pinned on and secured!
- ▶ It is prohibited to lean a ladder against the component being disassembled!

WARNING
Danger of crushing!
Components can swing during assembling. Hands can be crushed or severed.

- ▶ Make sure that the components do not swing back and forth during assembly!





B106856

WARNING
Neglectful inspection and maintenance on guy rods!
If the regular inspection and maintenance of the guy rods is not carried out or is carried out only in irregular intervals, then severe accidents can occur due to existing and unrecognized damage to the guy rods!
Personnel can be severely injured or killed!
▶ Check the guy rods before every assembly, see chapter 8.15.

Note
▶ By supporting the components during assembly / disassembly, ground unevenness is compensated for and the material is protected.

WARNING
Risk of accident!
Personnel can be severely injured or killed!
▶ While pinning and unpinning with the pin pulling device, observe and follow warning guidelines in chapter 5.30!

NOTICE
Property damage!
▶ Always pin the guy rods from the “inside” to the “outside”.

Note
▶ The S-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

See illustration **4**.
Make sure that the following prerequisites are met:
– the crane is aligned in horizontal direction,
– the S-boom **2** is assembled,
– the W-lattice jib **3** lies assembled on the pulley cart **107** on the ground,
– the counterweight has been attached to the turntable according to the load chart,
– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is pressed and the indicator light **431** lights up,
– the assembly icon **11** on the LICCON monitor blinks,
– an auxiliary crane is available.

B195219

2.1 F-assembly conditions

Note
▶ Observe and follow the instructions in chapter 5.13!

2.2 Assembling the F-assembly unit

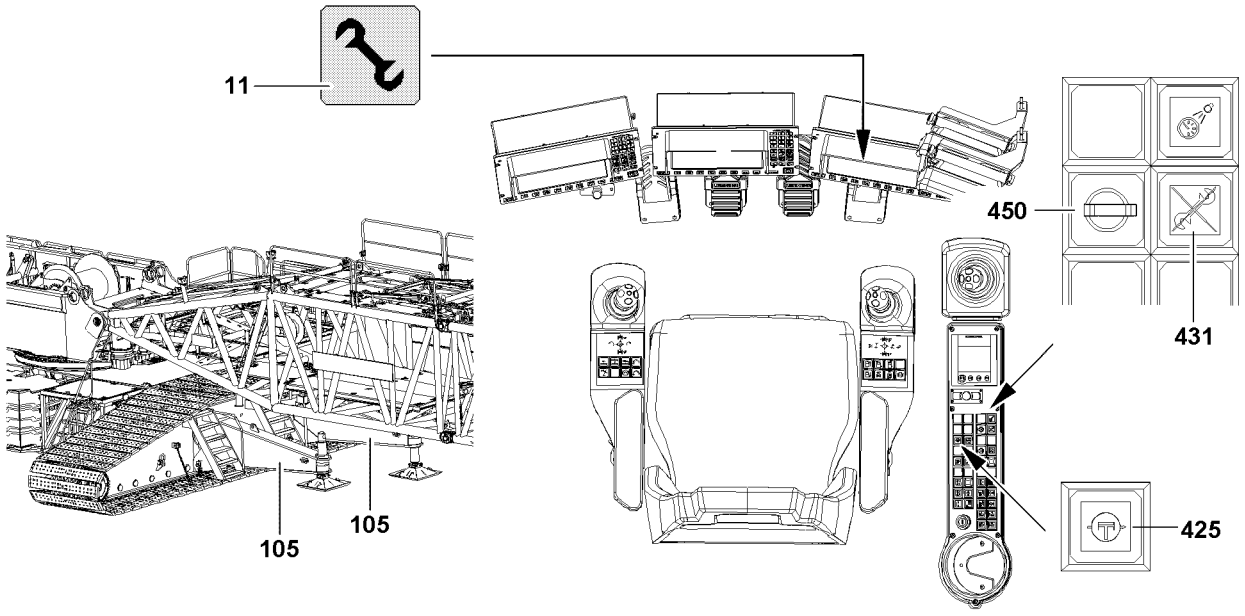
Note
▶ Observe and follow the instructions in chapter 5.13!

2.3 Flying assembly of F-auxiliary jib (12 m)

Note
▶ Observe and follow the instructions in chapter 5.13!

2.4 Establishing the electrical connections

Note
▶ Observe and follow the instructions in chapter 5.13!



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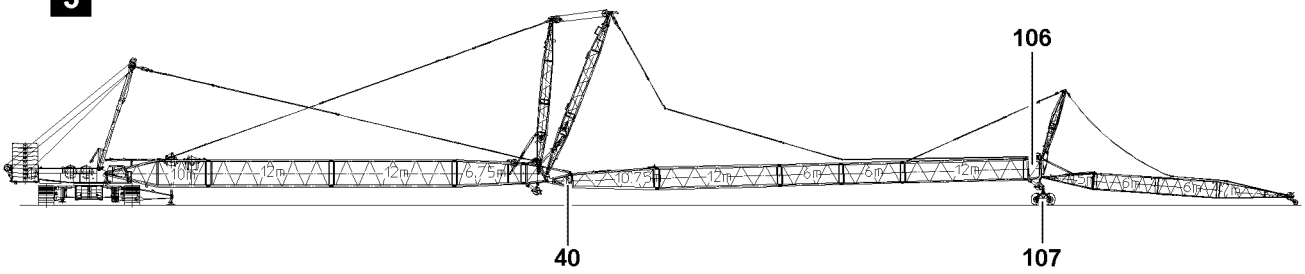

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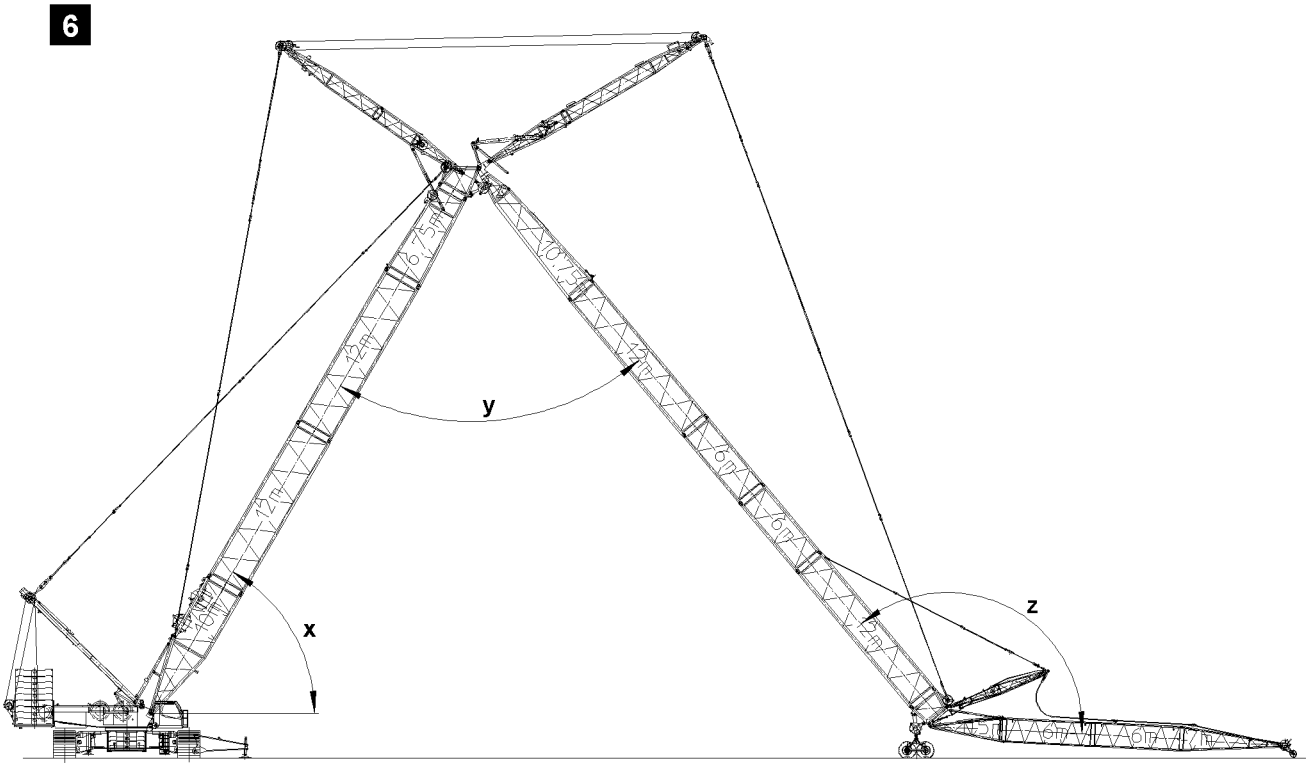


B106854

2.5 Erecting the SWF-booms

Note

▶ SWF boom systems in stretched condition may not be completely erected.

DANGER

The crane can topple over!

▶ It is not permitted to turn the crane during erection!
▶ Observe the data in the erection and take down charts.
▶ Observe the safety technical guidelines in chapter 5.01.

DANGER

The crane can topple over!

For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down charts!

▶ The boom must be erected or taken down “to the side” “in direction” of the mechanical auxiliary supports **105**.
▶ Always erect or take down according to the data in the **Erection and take down charts**!

DANGER

Tipping lattice jib!

If the easy movement on the pendulum of the mechanical relapse support is not checked before erection or not reestablished, if necessary, then the mechanical relapse support will not engage in steep lattice jib position. As a result, the lattice jib can tip to the rear.

Personnel can be severely injured or killed!

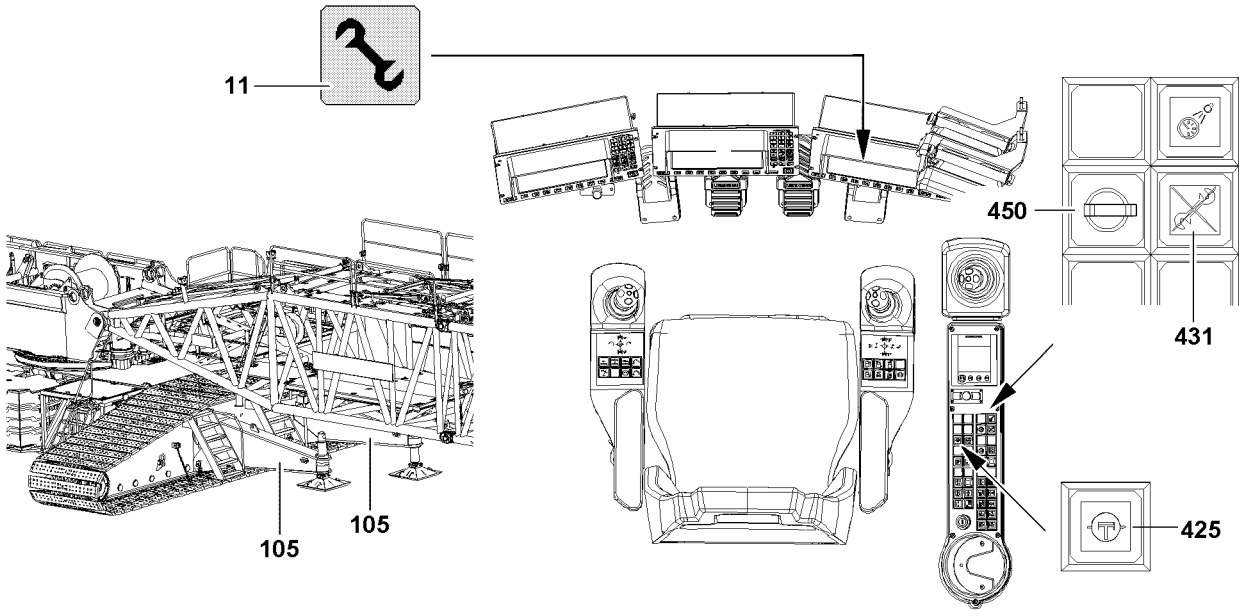
▶ Check the easy movement on the pendulum **40** of the mechanical relapse support before erection.
▶ If the pendulum does not move easily: Make the pendulum **40** easy to move!

WARNING

The crane can topple over!

If the following conditions are not met before erecting the boom, the crane can topple over. Personnel can be severely injured or killed!

▶ The lattice jib must roll on the ground with its entire weight!
▶ Spool the lattice jib control out so that the guy rods sag slightly!
▶ Do not allow slack cable to build up on the control winch!
▶ Extend the relapse cylinder before erection.



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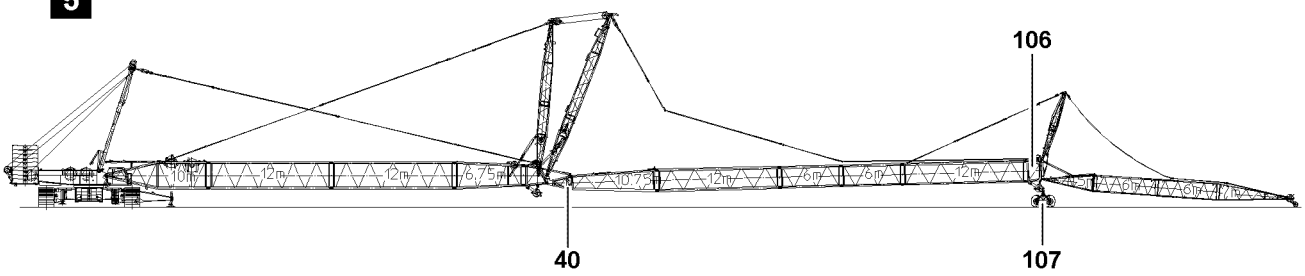

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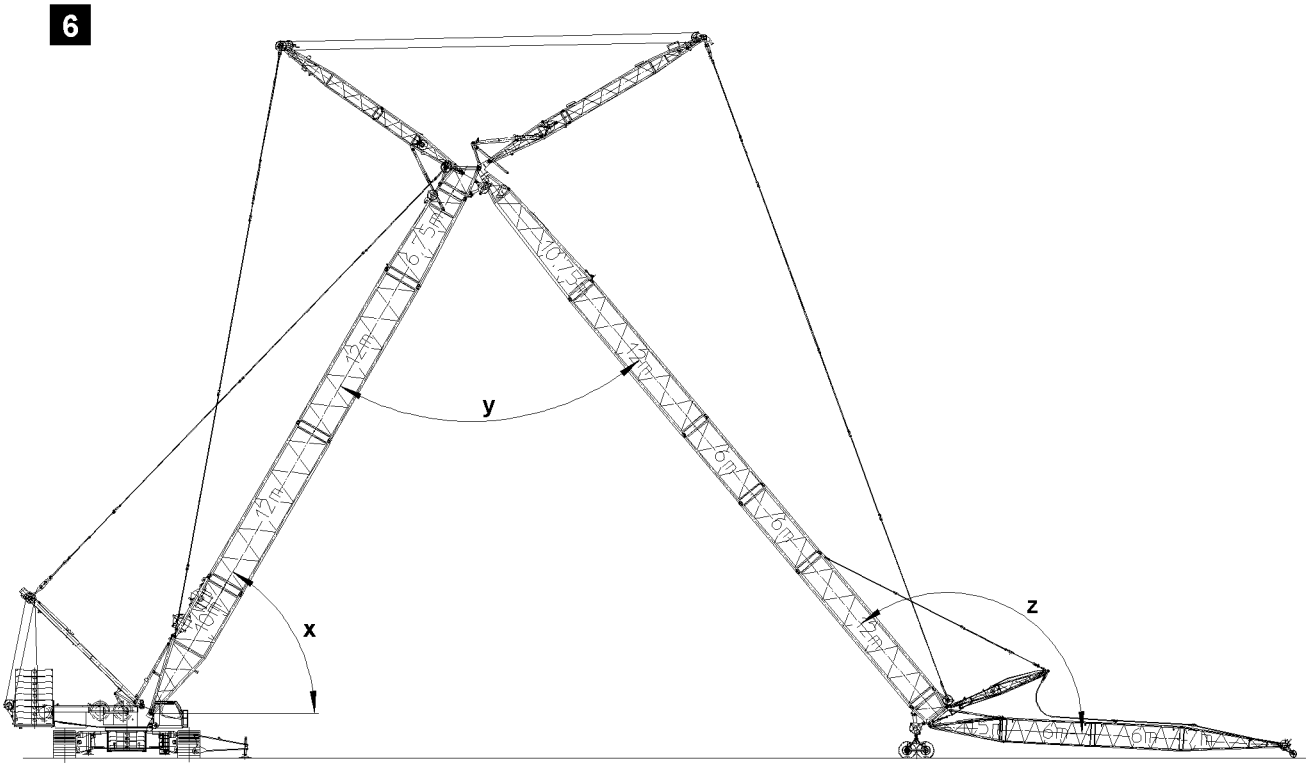


B106854

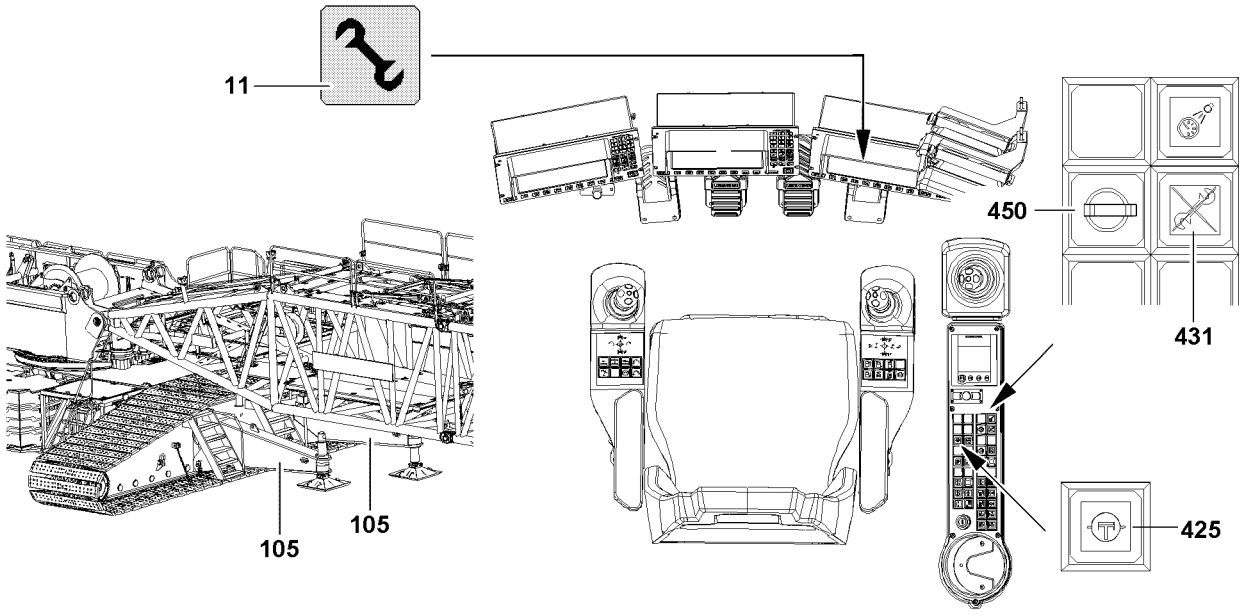
Make sure that the following prerequisites are met:
- the SWF-boom is fully assembled,
- the pulley cart **107** is assembled on the SW-end section **106**, illustration **5**,
- no personnel are within the danger zone,
- the crane is aligned in horizontal direction,
- all electrical connections have been established,
- all limit switches are functional,
- the counterweight has been attached to the turntable according to the load chart,
- all pin connections have been secured,
- the hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins,
- there are no loose parts on the boom or the lattice jib,
- boom, lattice jib and safety devices are free from snow and ice,
- the LICCON overload protection has been adjusted according to the data in the load chart,
- the LICCON overload protection settings have been compared with the actual crane configuration,
- the assembly key button **450** is actuated,
- the indicator light **431** “assembly” lights up,
- the assembly icon **11** on the LICCON monitor 0 lights up.

WARNING
Falling hoist rope!
If the hoist rope before the erection procedure is not properly secured onto the corresponding length on the F-auxiliary jib, it can fall down backward on the basis of its own weight. Personnel can be severely injured or killed!
- ▶ Reeve in the hoist rope with sufficient length on the F-auxiliary jib before the erection process!
- ▶ The hoist rope must be constantly monitored during erection!
- ▶ Do not step into the danger zone!

WARNING
Damage to the boom parts!
If the luffing up movement is not switched off when a warning signal sounds, boom parts can collide. Personnel can be severely injured or killed!
If acoustic warning signal sounds:
- ▶ Switch off the luffing up movement.

Note
- ▶ If a warning signal sounds, an error report appears on the LICCON monitor: "Block position W/F achieved – caution: no switch off accident danger".

See illustration **6**.
The S-boom is luffed up until the warning signal sounds:
- Angle **z** between F-auxiliary jib and W- lattice jib amounts to 115°,
- **or** angle **y** between W-lattice jib and S-boom amounts to 45°,
- **or** angle **x** of the S-boom amounts to 87°.



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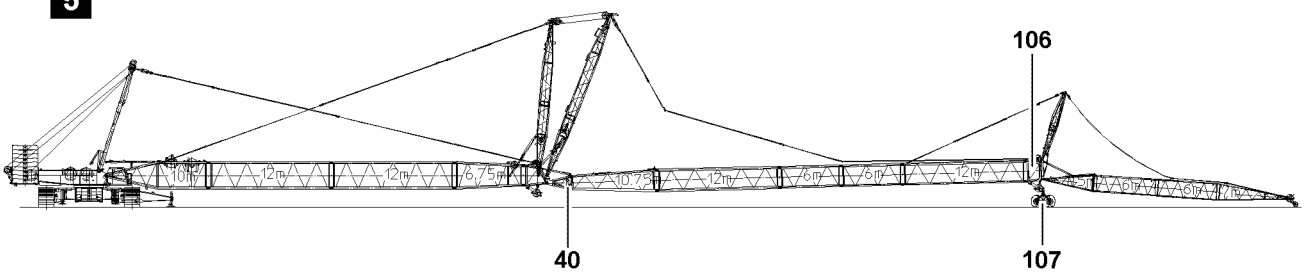

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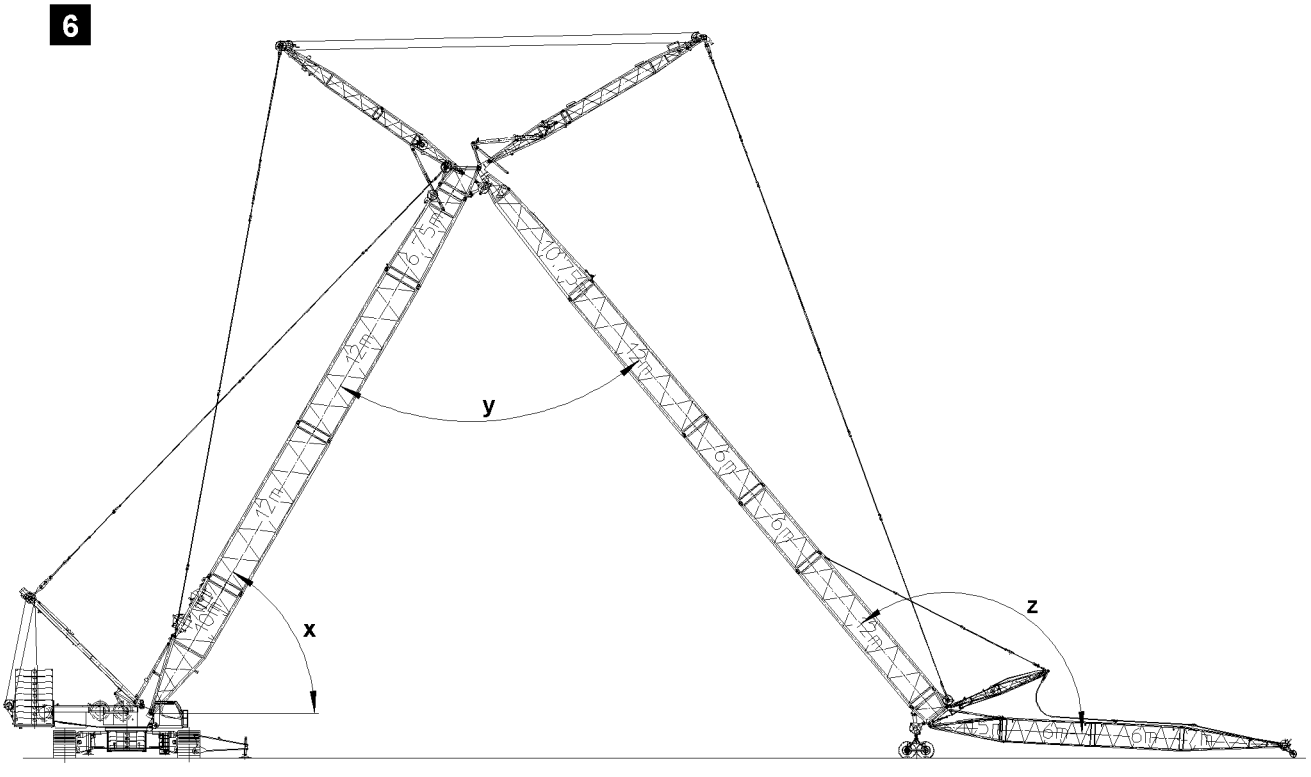


B106854

Note

- While the S-boom is luffed up, the W-guy rods must remain released so that the F-auxiliary jib remains on the ground.

- The S-boom is luffed up and simultaneously W-adjusting rope spools out until warning signal sounds.

WARNING

Damage to the boom parts!

If the W-guy rods during lifting are not tensioned, the SW-end section can move in the direction of the crane. W-connector head and W-pivot section can collide.

Personnel can be severely injured or killed!

- Ensure that the W-guy rods are tensioned before lifting.

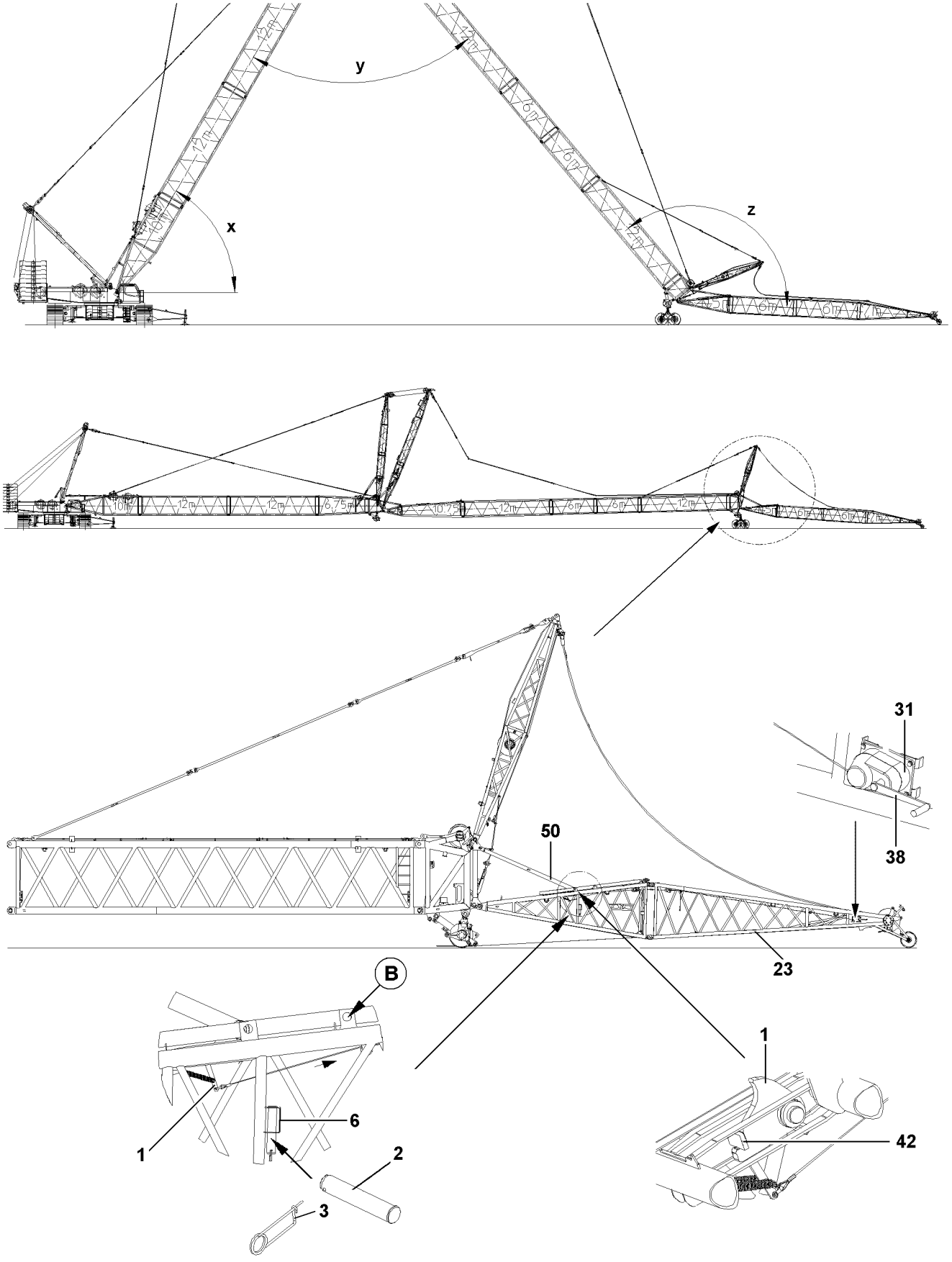
- If acoustic warning signal sounds:
  Tension the W-guying: Spool up the W-adjusting rope.

WARNING

Damage to the boom parts!

If the following conditions are not met, the boom parts can collide or be damaged.

- Ensure that the F-guy ropes do not remain hanging on the F-auxiliary jib during erection.
- Control distances between F-auxiliary jib and SW-end section by an additional observer.



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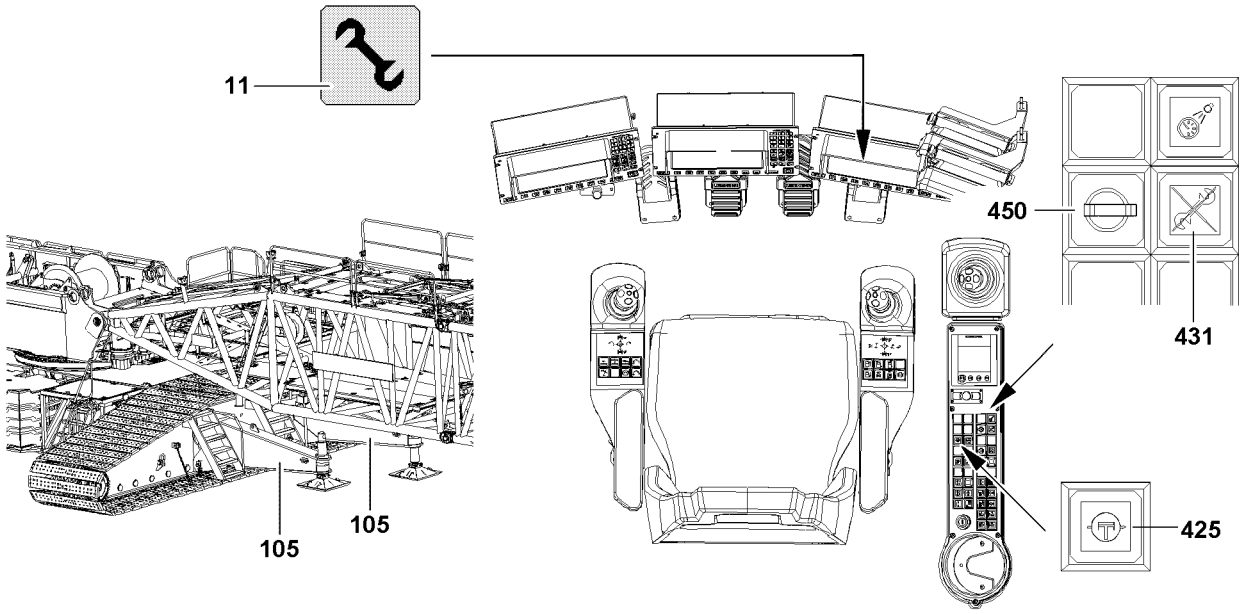
WARNING
Risk of accident!
During crane operation, the flap **1** must be “above” position!
- ▶ Set the flap **1 immediately before lift off** of the F-end section **23** or when erecting the boom into the relapse retainer position in “up” position!
- ▶ Then remove the manual lever **38** from the manual rope winch **31** and store it in the tool box.

- ▶ Set the flap **1** with the manual rope winch **31** in relapse retainer position (“up” position), until the flap **1** touches on the stop **42**, see illustration **13**.
- ▶ Remove the manual lever **38** from the manual rope winch **31**.



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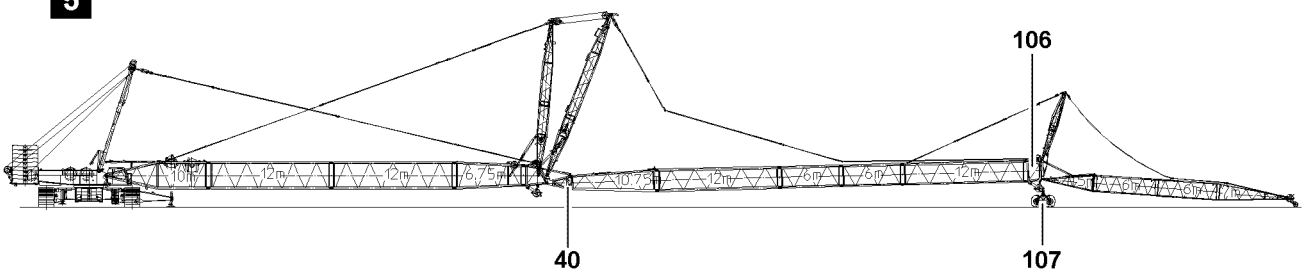

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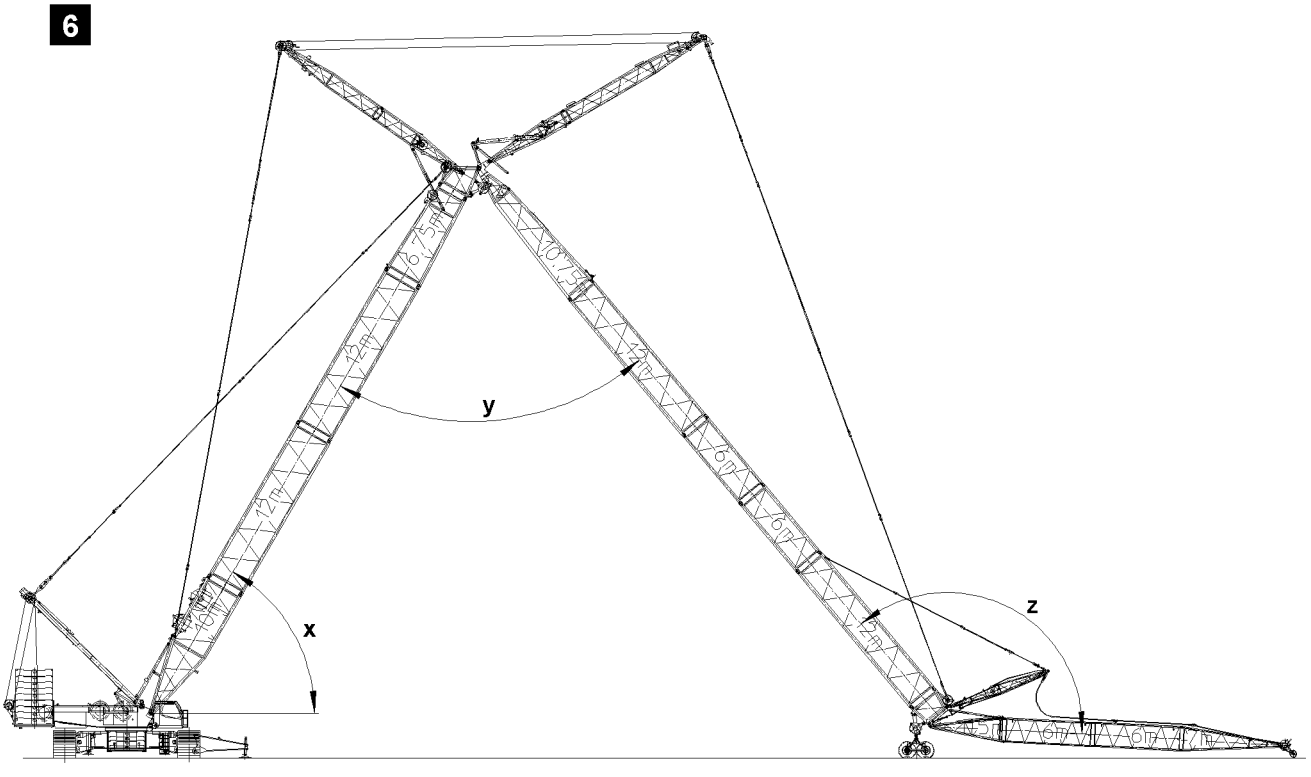

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See illustration **5**.

- ▶ Loosen pulley cart **107** from SW-end section **106**: Uninstall the pulley cart, see chapter 5.15.
- ▶ Luff up boom until the hook block may reeve on the F-auxiliary jib.
- ▶ Reeve in the hook block properly and secure the hoist rope on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.
- ▶ The S-boom is not yet in operating position, (angle **x** amounts to 87°):
  Luff up the S-boom to the operating position.

DANGER

The crane can topple over!

In crane operation with bypassed safety devices, the crane can topple over. Personnel can be severely injured or killed!

- ▶ When the lowest operating position of the W-lattice jib is reached, immediately turn off the assembly key button **450**.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

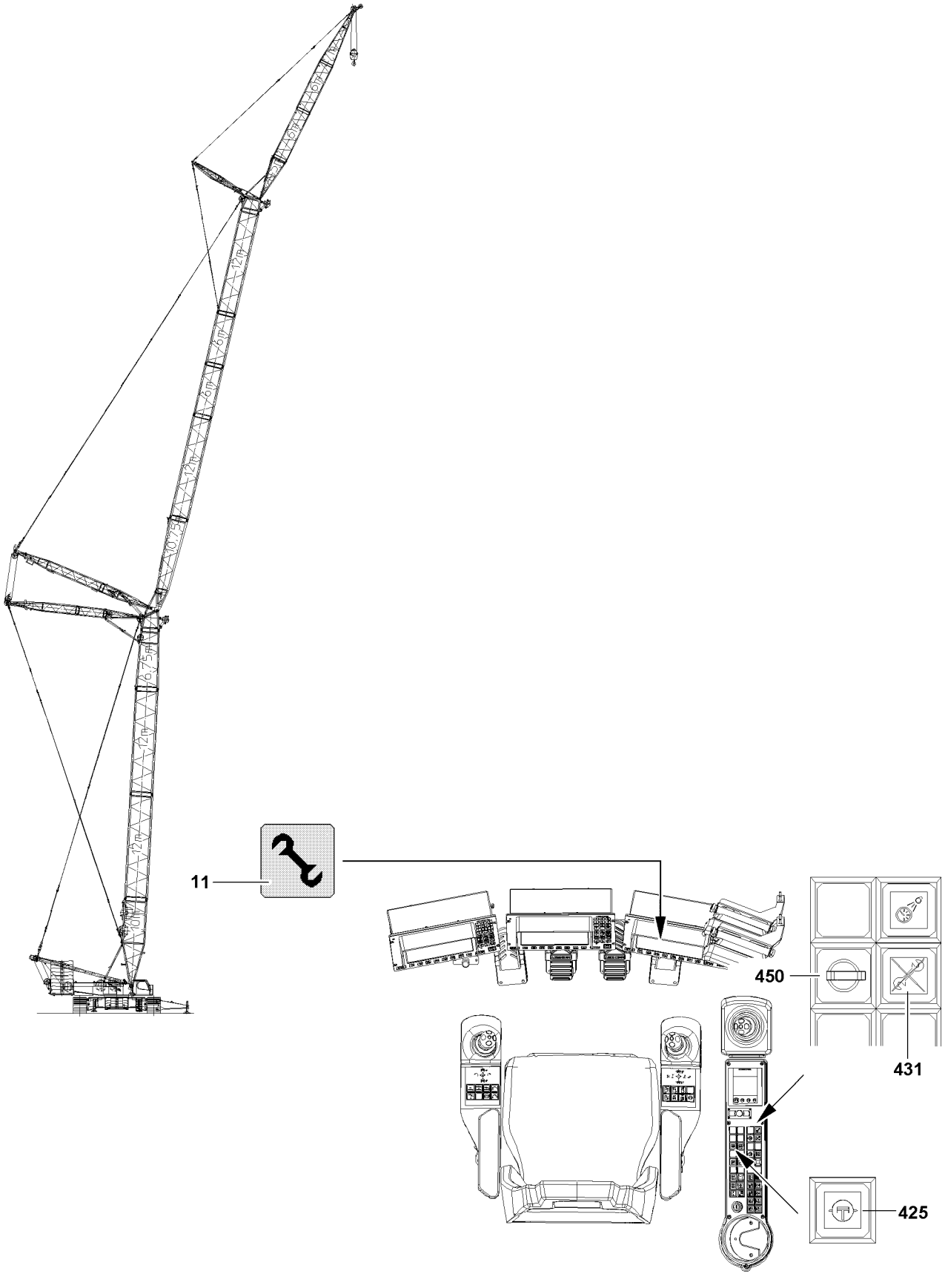
Note

- ▶ When the lowest operating position of the W-lattice jib is reached, the displays turn off.
- ▶ In the icon “Maximum load”, a load number in “t” appears instead of the display “???”!

- ▶ Luff up the F-auxiliary jib to the lowest operating position.
- ▶ When the W-lattice jib has reached the lowest operating position:
  Switch the assembly key switch **450** off.

Result:

– The LICCON overload protection is active.
– The indicator light **431** turns off.
– The assembly symbol **11** on the LICCON monitor turns off.
– The acoustical signal turns off.
– The three color light lights up red and the warning light on the rear of the turntable lights up.



B106855

3 Operating the crane

3.1 Preparing for crane operation

Note

▶ Observe the notes in chapters 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is turned off.

WARNING

The crane can topple over!

▶ Check the horizontal position of the crane before and during operation!
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation!

3.2 Checking the settings.

▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the limit switches on the relapse cylinders.

B195219

4 Disassembling the SWF-booms

WARNING
Risk of falling!
During assembly and disassembly work, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.
- ▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (see chapter 2.04) to protect against falling! The personal protective equipment must be attached in the corresponding attachment points on the crane (see chapter 2.06).
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly, inspection and maintenance work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free of snow and ice!

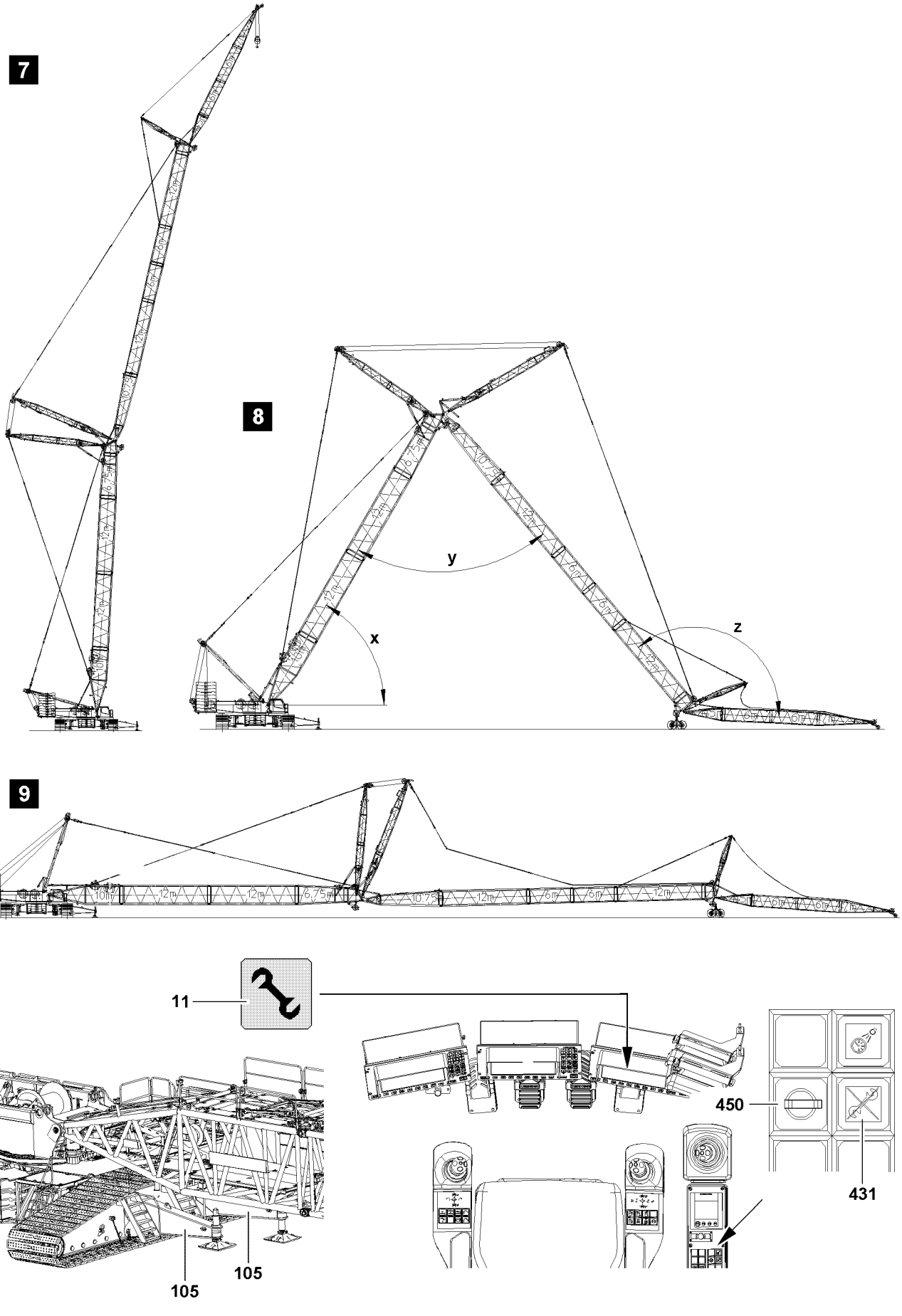
WARNING
Falling components!
If unsecured or non-supported components are assembled or disassembled, they can fall down. Personnel can be killed or seriously injured.
- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
- ▶ Support the boom and components before pinning / unpinning!
- ▶ Both pins that lie in at a horizontal level, i.e. **left** and **right**, pin or unpin!
- ▶ Secure the pins in the bearing points and in the receptacles!
- ▶ Do not disengage the auxiliary crane until each component is pinned on and secured!
- ▶ It is prohibited to lean a ladder against the component being disassembled!

WARNING
Danger of crushing!
Components can swing during disassembly. Hands can be crushed or severed.
- ▶ Make sure that the components do not swing back and forth during assembly!

WARNING
Risk of accident!
Personnel can be severely injured or killed!
- ▶ While pinning and unpinning with the pin pulling device, observe and follow warning guidelines in chapter 5.30!

Note
- ▶ By supporting the components during assembly / disassembly, ground unevenness is compensated for and the material is protected.

Note
- ▶ The intermediate sections of the auxiliary jib are pinned and unpinned with the aid of the pin pulling device, see chapter 5.30.



B106857

4.1 Taking the SWF-booms down

Note

▶ SWF boom systems may not be placed in stretched condition on the ground.

DANGER

The crane can topple over!

For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down charts!

▶ The boom must be erected or taken down “to the side” “in direction” of the mechanical auxiliary supports **105**.

▶ Always erect or take down according to the data in the **Erection and take down charts**!

WARNING

The crane can topple over!

If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!

▶ Observe the safety technical guidelines in chapter 5.01!

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

WARNING

The crane can topple over!

If the following conditions are not met before placing the boom, the crane can topple over. Personnel can be severely injured or killed!

▶ Spool the lattice jib control out so that the guy rods sag slightly!

▶ The lattice jib must roll on the ground with its entire weight!

▶ Do not allow slack cable to build up on the control winch!

▶ Do not pull the hook block along on the ground!

WARNING

Damage to the boom parts!

If the luffing down movement is not switched off when a warning signal sounds, boom parts can collide. Personnel can be severely injured or killed!

If acoustic warning signal sounds:

▶ Switch off the luffing down movement.

NOTICE

Damage of boom components!

Taking down the boom system can lead to a collision between the hook block and the pulley head. Boom components can be severely damaged.

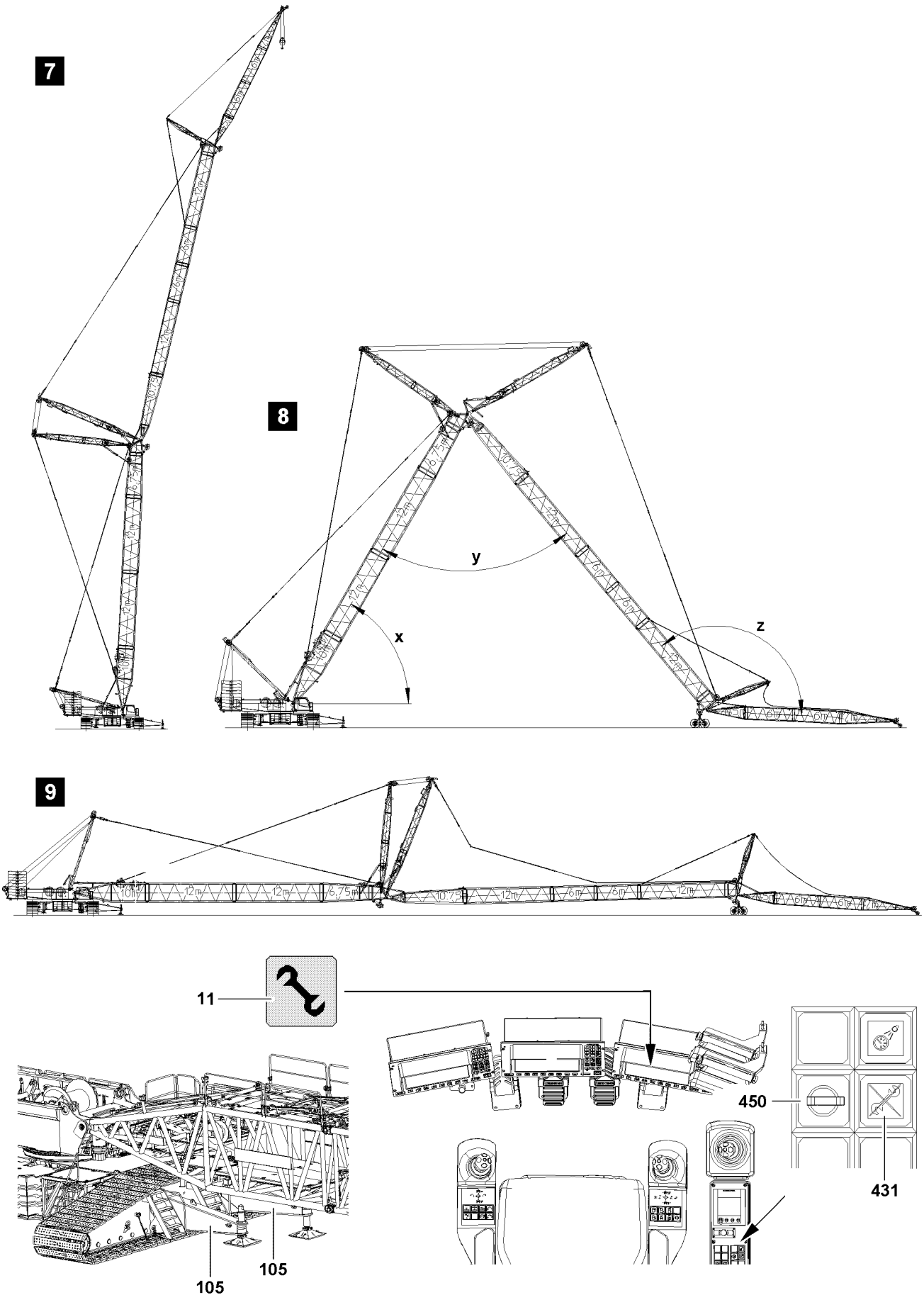
▶ Luff the boom system down at the same time and spool the hoist winch out.

Ensure that the following prerequisite is met:

– the S-boom is found in the steepest position, angle **x**, amounts to 87°, see illustration **7**,

– the hook block is approx. 5 m below the pulley head of the F-end section,

– the pulley cart is available.



B106857

4.1.1 Luff down W-lattice jib

Note

- ▶ Luffing down of the W-lattice jib is turned off as soon as the lowest operating position is reached.
- ▶ When the lowest operating position of the boom is reached, the load display in the “Maximum load” icon turns off and instead of the load display, the display “???” appears.
- ▶ In the crane operating screen appear alarm functions.

▶ Luff the W-lattice jib down to the “lowest” operating position.

Result: The following alarm functions become active:

– “STOP”
– “Horn” and acoustical signal

DANGER

Crane operation with added assembly key button!

- ▶ The actuation of the assembly key button **450** is only permitted for assembly tasks!
- ▶ The assembly key button **450** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **450** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **450** turned on is strictly prohibited!
- ▶ The assembly key button **450** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ When the W-lattice jib has reached the “lowest” operating position:
Turn the assembly key button **450** on.

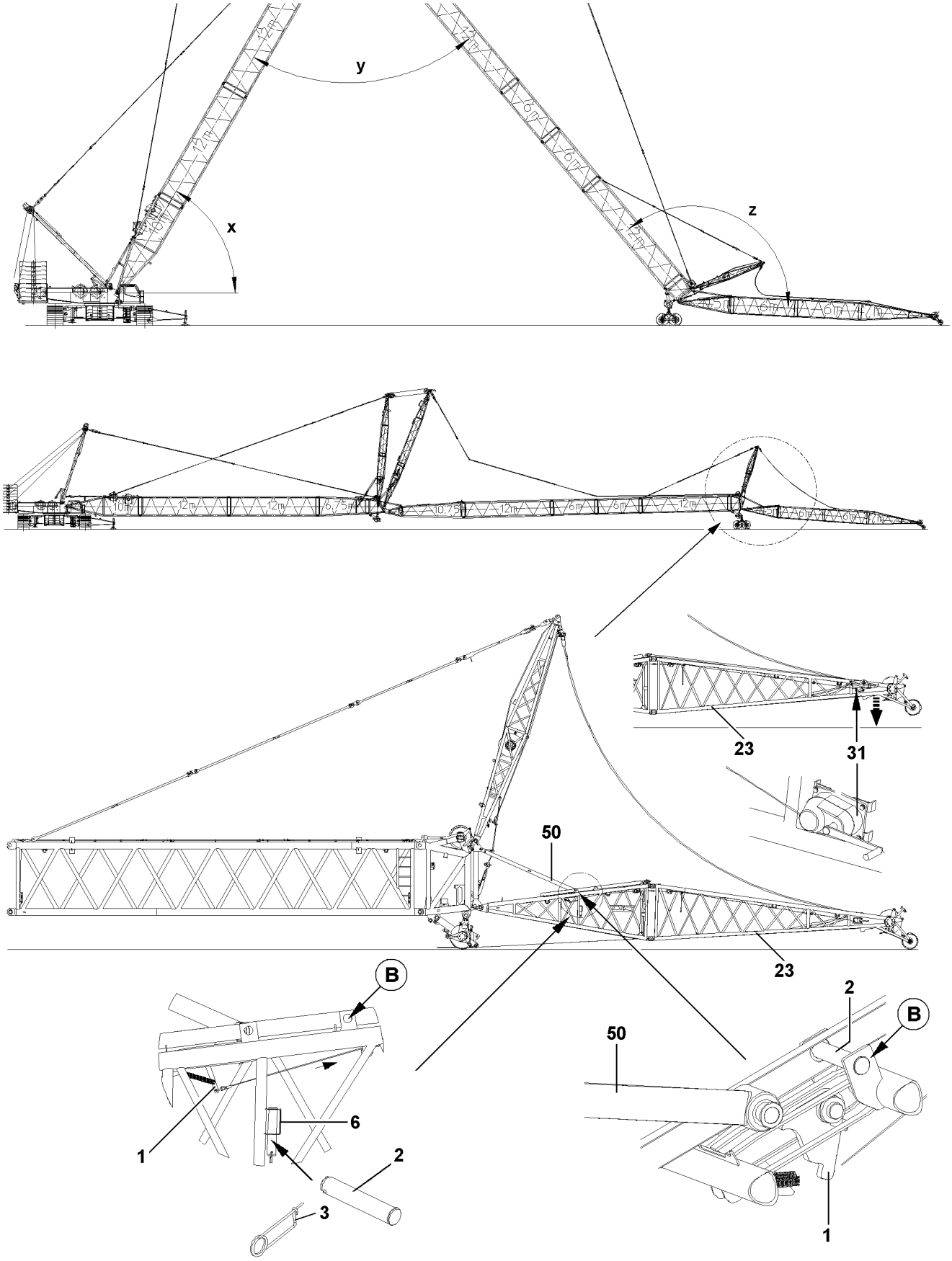
Result:

– The LICCON overload protection is deactivated.
– The indicator light **431** lights up.
– The assembly icon **11** on the LICCON monitor blinks.
– The “STOP” icon on the LICCON monitor blinks.
– An acoustical signal sounds.
– The three colour light lights up red and the warning light on the rear of the turntable lights up.

The W-lattice jib is luffed down until:

– Warning signal sounds: Angle **y** between W-lattice jib and S-boom amounts to 45°,
– **or** the hook block touches the ground.

▶ Luff down W-lattice jib further.



B106853

4.1.2 Taking the SWF-booms down

▶ If the W-lattice jib is luffed down as far as possible with the F-auxiliary jib:
Luff the S-boom down until the warning signal sounds.

Note

▶ If a warning signal sounds, an error report appears on the LICCON monitor: "Block position W/F achieved – caution: no switch off accident danger".

▶ If the hook block has not yet touched the ground:
Continue to luff the S-boom down until the hook block touches the ground.

▶ Remove the hoist limit switch weight.

▶ Unreeve the hook block.

▶ Remove the pin **2** from the retainer **6** (park position) and insert at point **B** pin (attachment position) and secure with spring retainer **3**.

CAUTION

Danger of damage on the relapse support!

When taking the boom down, the flap **1** must be set in “down” position as soon as the F-end section **23** touches the ground or as soon as the manual rope winch **31** can be reached!

If this is not observed, components on the F-assembly unit can be damaged!

▶ Set the flap **1** with manual rope winch **31** in a position “downward” so that the plunger **50** guide over the flap **1** “can slide”.

▶ Set the flap **1** on the F-pivot section **22** with manual rope winch **31** into “down” position.

NOTICE

Damage to the boom parts!

If the F-auxiliary jib can not reel off forward without disturbance, the boom parts can be damaged.

▶ Ensure that the F-auxiliary jib can not reel off forward without disturbance.

Note

▶ The S-boom is luffed up until the warning signal sounds: Angle **z** between W-lattice jib and F-auxiliary jib amounts to 115°.

NOTICE

Colliding boom parts!

If the S-boom luffs down, the F-auxiliary jib and SW-end section can collide.

▶ Hold the angle **z** continually constant: Luff down S-boom further and simultaneously W-lattice jib.

▶ Control distances between F-auxiliary jib and SW-end section by an additional observer.

▶ Luff the S-boom down.

▶ If angle between F-auxiliary jib and W- lattice jib permits:
Set down the SW-end section in the roller cart.

▶ Release W-guying.

▶ Luff the S-boom down until the boom system is lying completely on the ground.

B195219

4.2 Disconnect the electrical connections

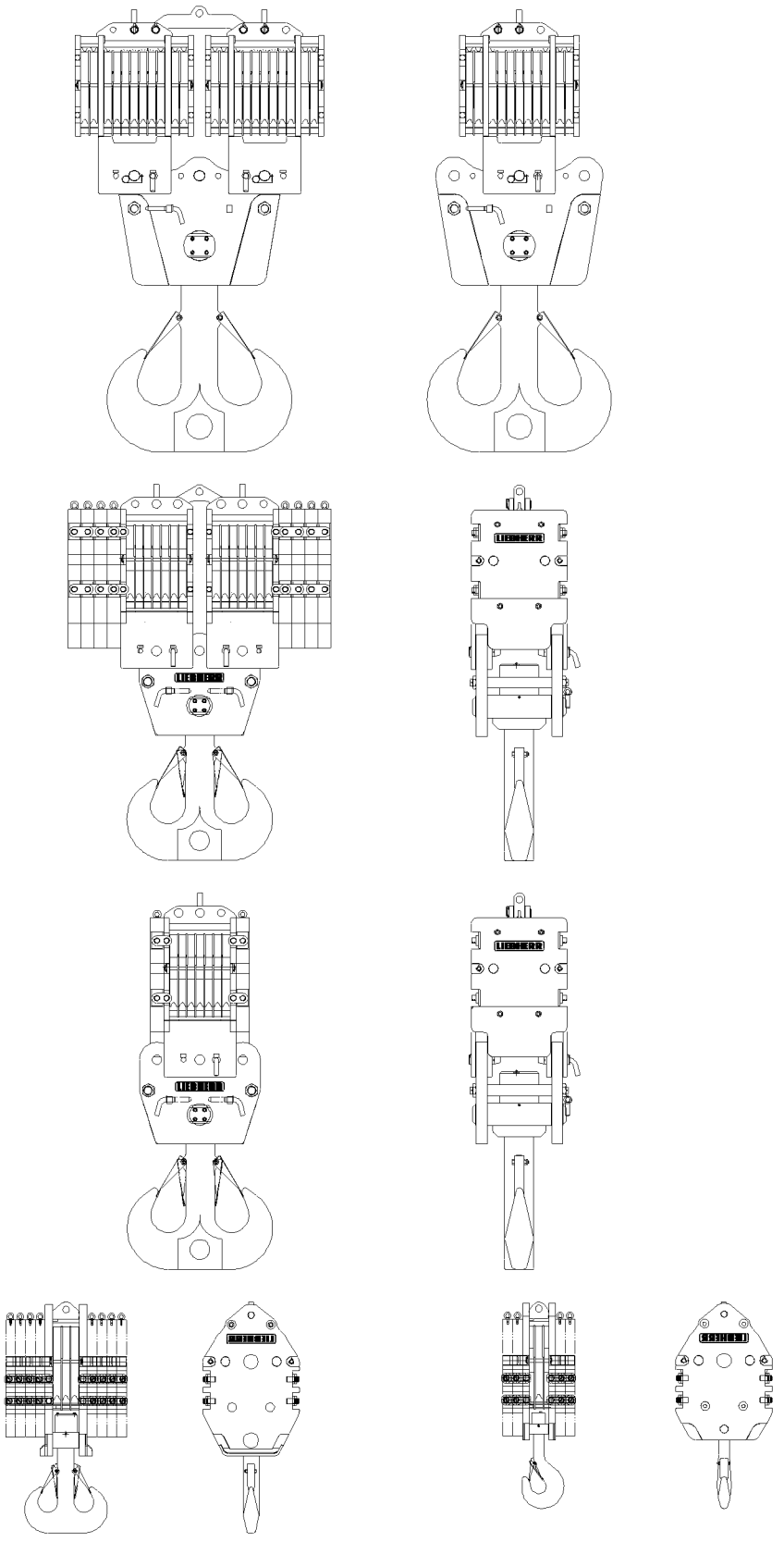
Note
▶ Observe and follow the instructions in chapter 5.13!

Ensure that the following prerequisite is met:
– the SWF-boom has been placed down.

4.3 Disassembling the F-assembly unit

Note
▶ Observe and follow the instructions in chapter 5.13!

Make sure that the following prerequisites are met:
– an auxiliary crane is available.



B108122

1 Hook block overview

Note

- For this crane type, the permissible load hooks and hook blocks may be found in a separate load chart!
- The hook blocks described in this chapter only serve as examples and can depart their design type and the number of rope pulleys from your hook block. The various assembly and disassembly procedures therefore serve only as exemplary description for a large number of different hook blocks!

DANGER

Hook block weights!

If the information in the erection and take down charts or those in the load charts are not observed, dangerous situations can result, up to toppling of the crane!

Personnel can be severely injured or killed; additionally, high property damages 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 alone is responsible for his actions for maintaining the specifications in the erection and take down charts and in the load charts!

For different sized loads, various large hook blocks can be used.

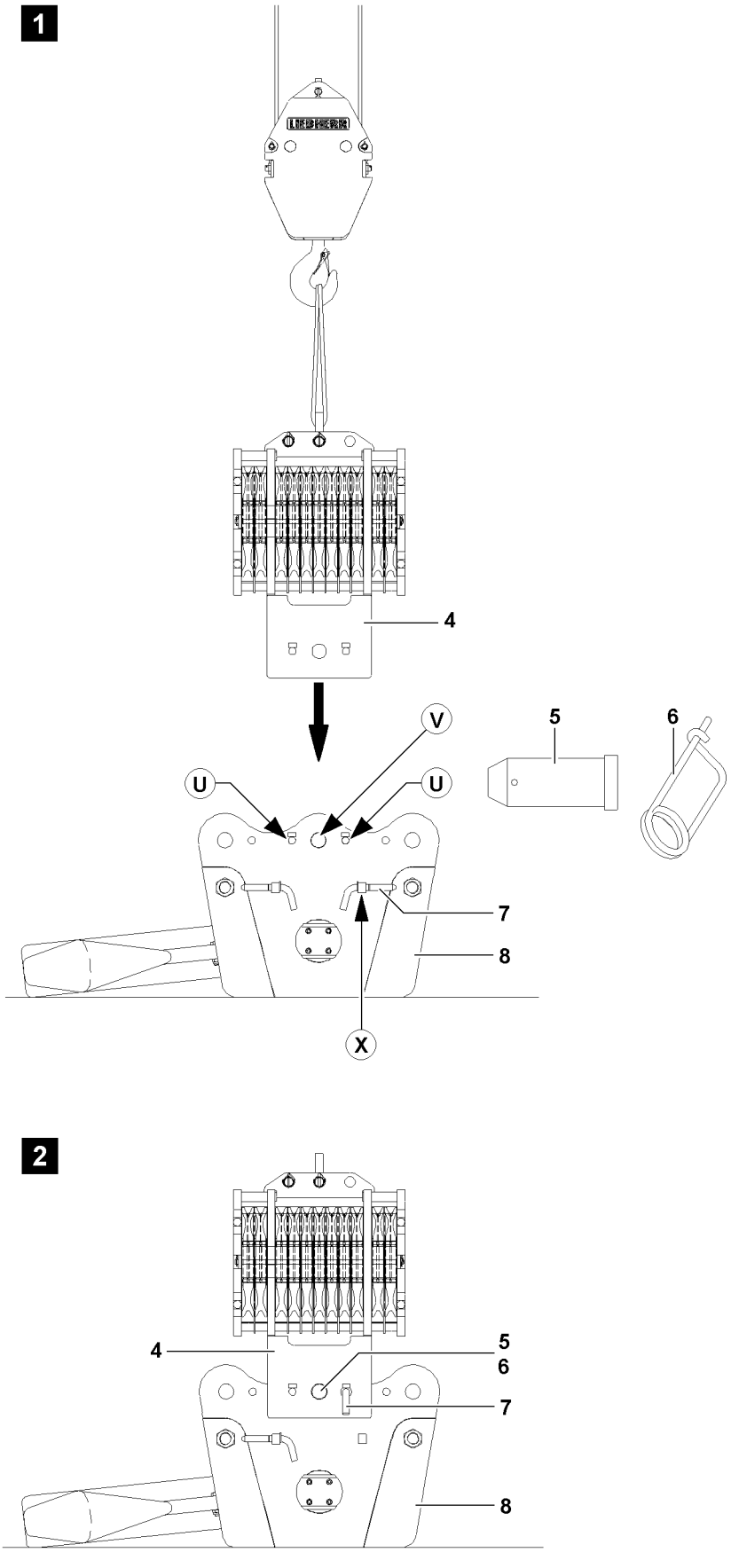
NOTICE

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!



B108123

2 Assembling a double hook block for individual operation

2.1 Assembling the hook blocks

If the hook blocks are to be brought into individual operation, then the pulley block **4** is attached centrally on the cross brace **8**.

2.1.1 Assembling the pulley block on cross brace

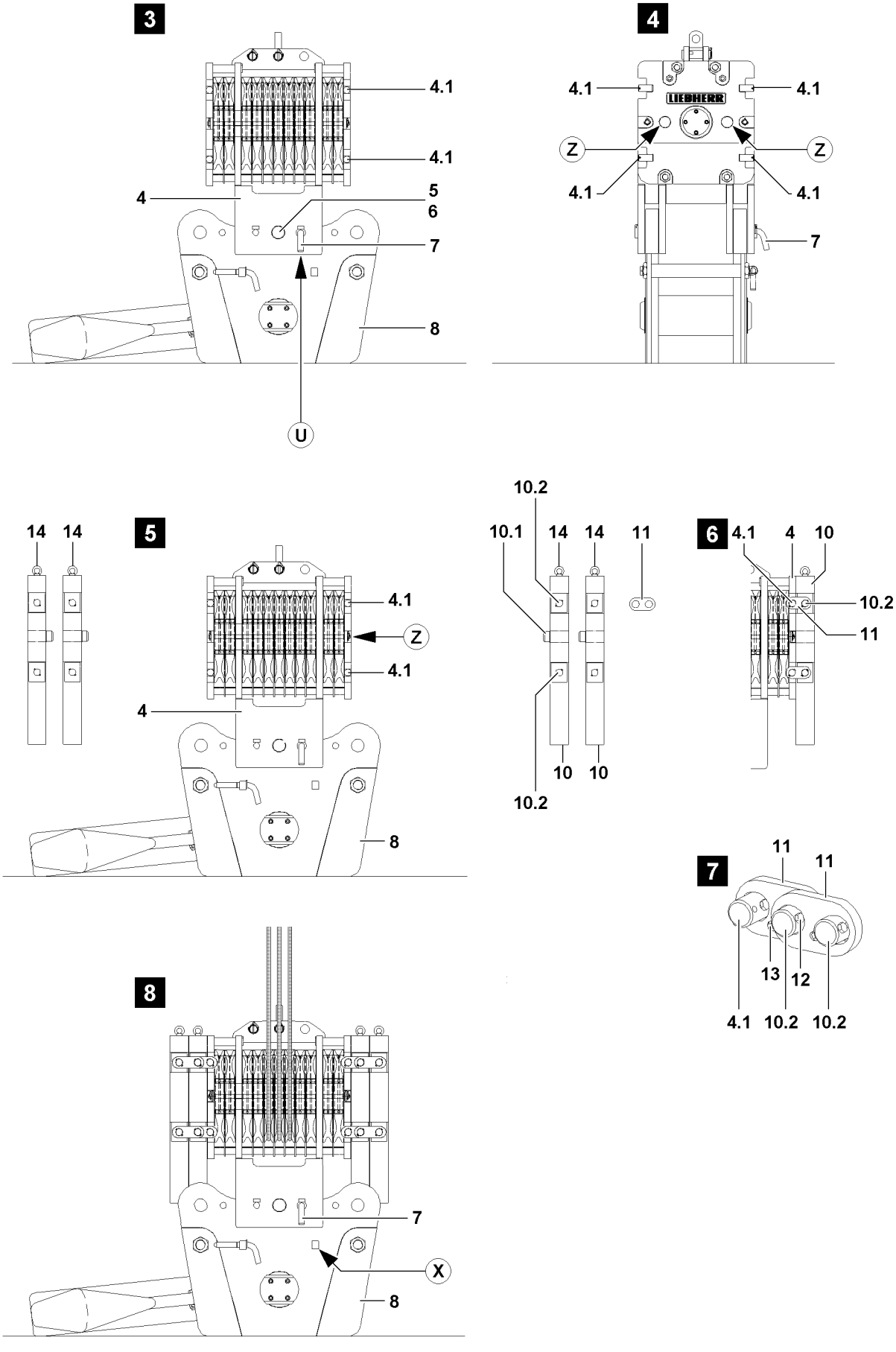
Make sure that the following prerequisites are met:

– the ground is sufficiently load bearing to take on the weight of the hook block safely,
– the subsoil is level and horizontal,
– the cross brace **8** is placed on the floor, see illustration **1**.

DANGER
Risk of tipping the pulley block!
If the retaining pins **7**, during assembly of the pulley block **4**, is not pinned to the cross brace, then the pulley block tips to the side upon removal of the auxiliary crane!
Personnel remaining in the danger zone can be severely injured or killed!

▶ Pin in the retaining pins **7** into the bores **U** on the hook block!
▶ Make sure before removing the auxiliary crane that the pulley block is properly pinned and secured!

▶ Attach the pulley block **4** onto the auxiliary crane, illustration **1**.
▶ Position pulley block **4** on the cross brace **8** and align the pin bore **V**.
▶ Pin in the pin **5** on point **V** and secure with spring retainer **6**.
▶ Unpin the retaining pin **7** from the transport receptacle (point **X**).
▶ Pin in the retaining pins **7** into the bores (point **U**) on the cross brace **8**, illustration **1**.
▶ If the pulley block **4** is secured through the retaining pins **7** at point **U**:
Remove the auxiliary crane.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B108141

2.1.2 Assembling the auxiliary weights

Note

▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING

Toppling of hook block!

One-sided placement of auxiliary weights can topple the hook block!

Personnel can be severely injured or killed!

▶ The auxiliary weights may only be installed **individually** and alternating left and right on the pulley block!

▶ If the required auxiliary weight is assembled on the pulley block, then the difference between left and right side may never be more than one auxiliary weight!

▶ Asymmetrical installation of auxiliary weights is prohibited!

Make sure that the following prerequisites are met:

– the hook block is placed on the ground,

– the pulley block **4** is properly assembled and secured,

– the retaining pin **7** is pinned and secured at point **U**.

WARNING

Falling auxiliary weights!

If the auxiliary weights on the pulley block are not properly assembled, they can fall down during assembly or during crane operation!

Personnel can be severely injured or killed!

▶ Standing under suspended auxiliary weight is prohibited!

▶ Ensure that the auxiliary weights are assembled properly and securely!

▶ Operating the crane without insufficiently secured auxiliary weights is forbidden!

▶ Attach the auxiliary weight **10** onto the eyebolt **14** on the auxiliary crane, see illustration **5**.

WARNING

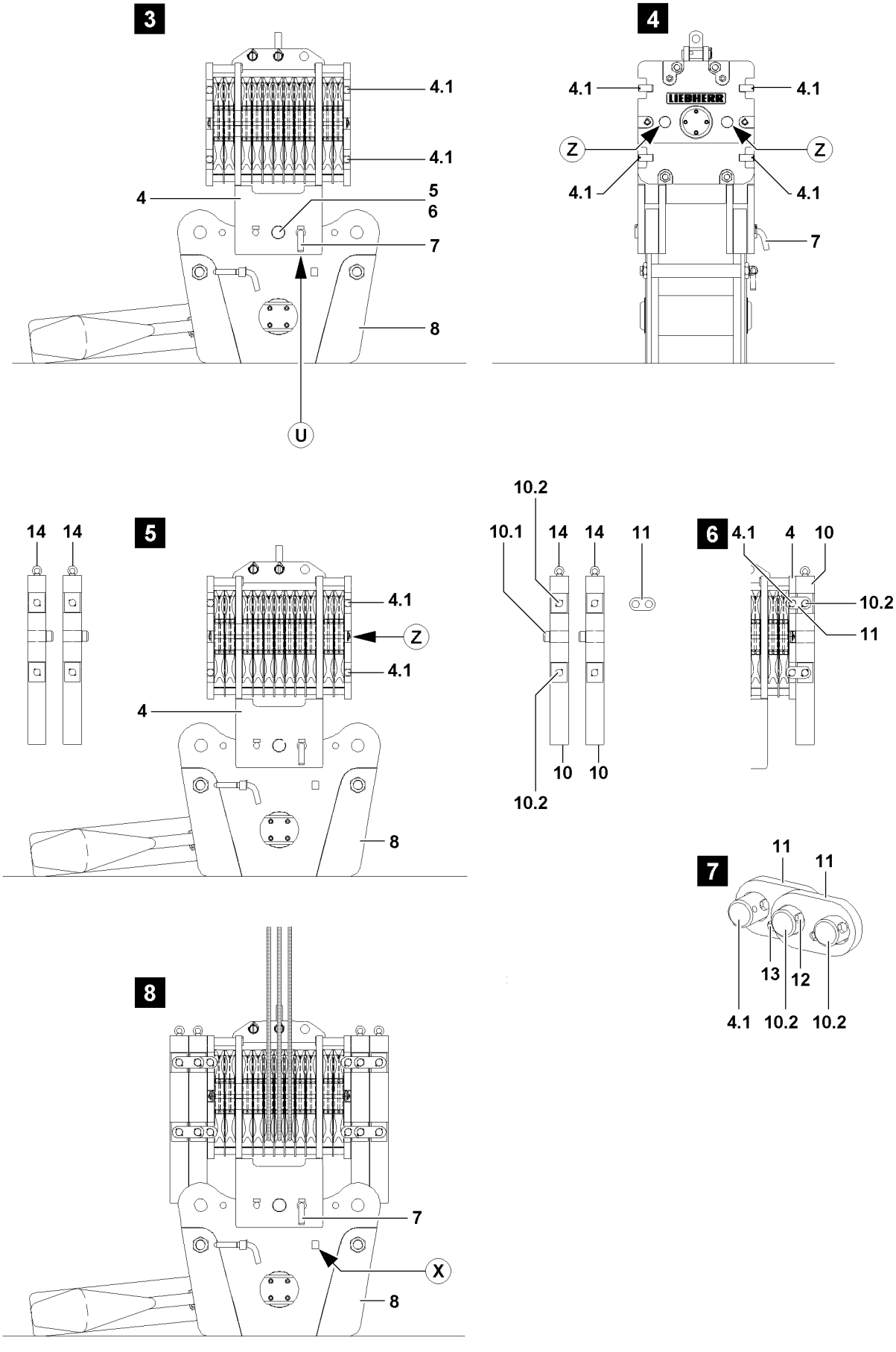
Danger of crushing!

While swinging in the auxiliary weights for the pulley block, personnel can be severely injured or killed!

Fingers, hands or arms can be crushed or severed!

▶ Standing between pulley block and auxiliary weight is prohibited!

▶ Swing in auxiliary weights with extreme caution and at low speed for the pulley block!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B108141

- ▶ Align auxiliary weight **10** on the pulley block **4**.
- ▶ Retract auxiliary weight centring pin **10.1** into the centring bores **Z** on them pulley block **4**, illustration **6**.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Install mounting brackets **11** laterally and connect the pulley block **4** with the auxiliary weight **10**, illustration **7**.
- ▶ Secure mounting brackets **11** with screws **12** and safety nut **13**, illustration **7**.

Note
- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

WARNING
Falling auxiliary weights!
By removing the auxiliary crane, the auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Only remove the auxiliary crane when it is ensured that the auxiliary weight **10** is secured properly with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly assembled and secured:
  Remove the auxiliary crane.

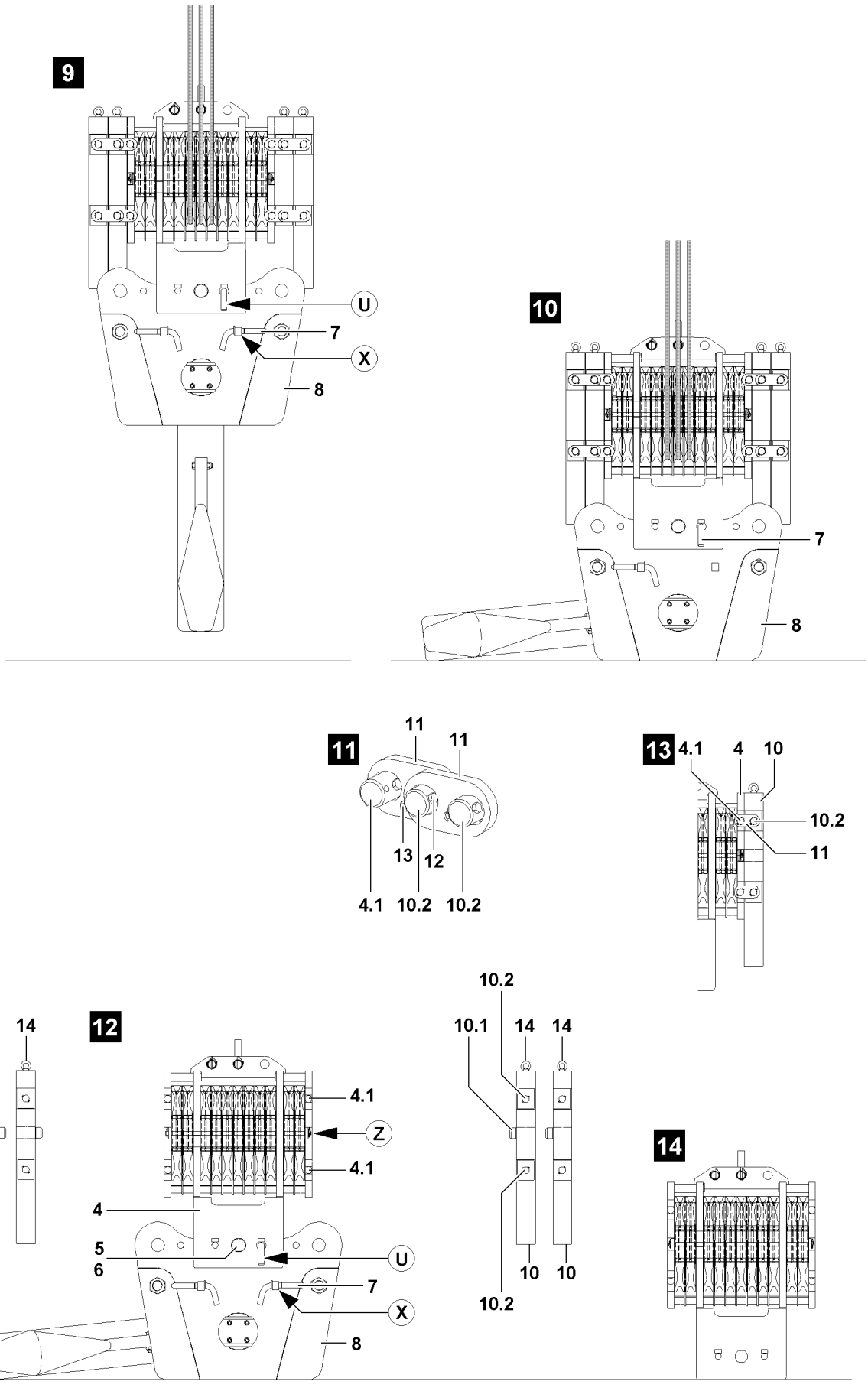
2.1.3 Preparing the hook block for crane operation

Note
- ▶ Reeving in 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 in hoist rope according to chapter 4.06 of the crane operating instructions and on the basis of the separate reeving plans!

NOTICE
Pin in retaining pins **7** when lifting the load!
If the retaining pin **7** is not unpinned prior to the crane operation, the retaining pin **7** may be sheered off when raising the load!
- ▶ Unpin the retaining pin **7** from the hook block before crane operation!

- ▶ When the hook block is properly reeved and has been lifted from the ground:
  Unpin retaining pin **7** and pin and secure into the transport receptacle (point **X**), illustration **8**.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B108142

2.2 Disassembling the hook block

2.2.1 Preparing the hook block for disassembly

Note

- ▶ Reeving out 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!

NOTICE

Retaining pin **7** unpinned upon lowering the hook block!

If the retaining pin **7** - before setting the hook block on the ground - is not pinned, the pulley block tips away laterally upon being set down!

Personnel can be severely injured or killed!

- ▶ Pin in and secure retaining pin **7**, before setting down hook block onto the ground, at point **U**!

Make sure that the following prerequisites are met:

– the subsoil is sufficiently load bearing to take on the weight of the hook block safely, including the auxiliary weights,

– the subsoil is level and horizontal.

- ▶ Lower the hook block completely onto the ground.
- ▶ If the hook block has been placed properly onto the ground:
  Reeve out hoist rope according to chapter 4.06 of the crane operating instructions!

2.2.2 Disassembling auxiliary weights

Note

- ▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING

Toppling of hook block!

One-sided disassembly of auxiliary weights can topple the hook block!

Personnel can be severely injured or killed!

- ▶ The auxiliary weights may only be placed **individually** and are disassembled alternating left and right on the pulley block!
- ▶ The difference between left and right side may never be more than one auxiliary weight upon disassembly of the auxiliary weight!
- ▶ Asymmetrical disassembly of auxiliary weights is prohibited!

Ensure that the following prerequisite is met:

– the retaining pin **7** is pinned in and secured at point **U**.

WARNING

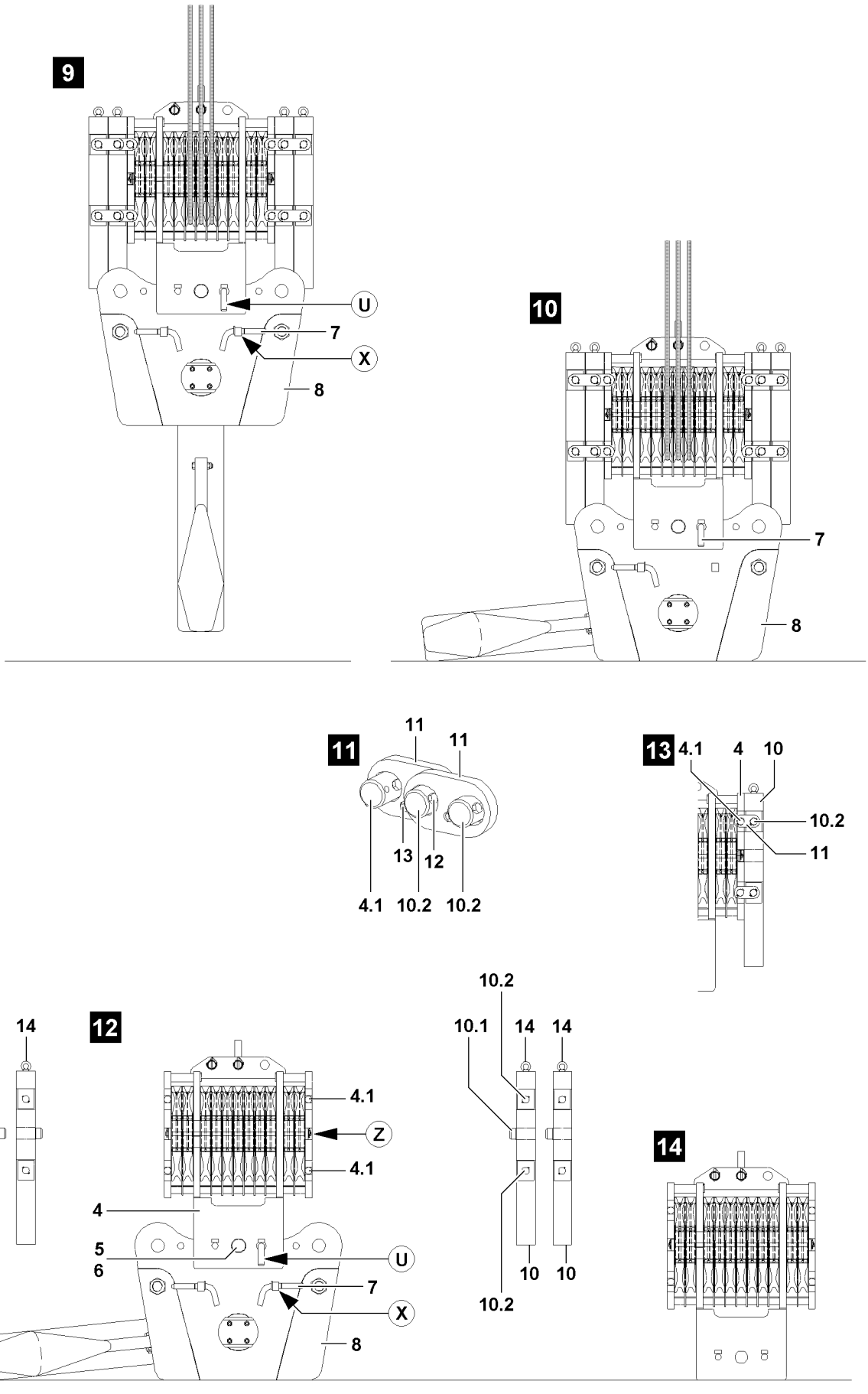
Falling auxiliary weights!

If the auxiliary weights on the pulley block are not properly disassembled, they can fall down during disassembly!

Personnel can be severely injured or killed!

- ▶ Standing under suspended auxiliary weight is prohibited!

- ▶ Attach auxiliary weight **10** on the eyebolt **14** on the auxiliary crane.
- ▶ Carefully tension the tackle.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WARNING
Swinging auxiliary weights!
During disassembly of the auxiliary weights, the auxiliary weights can lead to swinging!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Take heed that the auxiliary weight to be disassembled is properly attached on the auxiliary crane before loosening the mounting brackets!
- ▶ Diagonal pull is not permitted!

- ▶ When the tackle on the auxiliary weight is tensioned:
  Loosen bolt connection on the mounting brackets of the outermost auxiliary weights and remove bolts.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Disconnect mounting brackets **11** laterally.

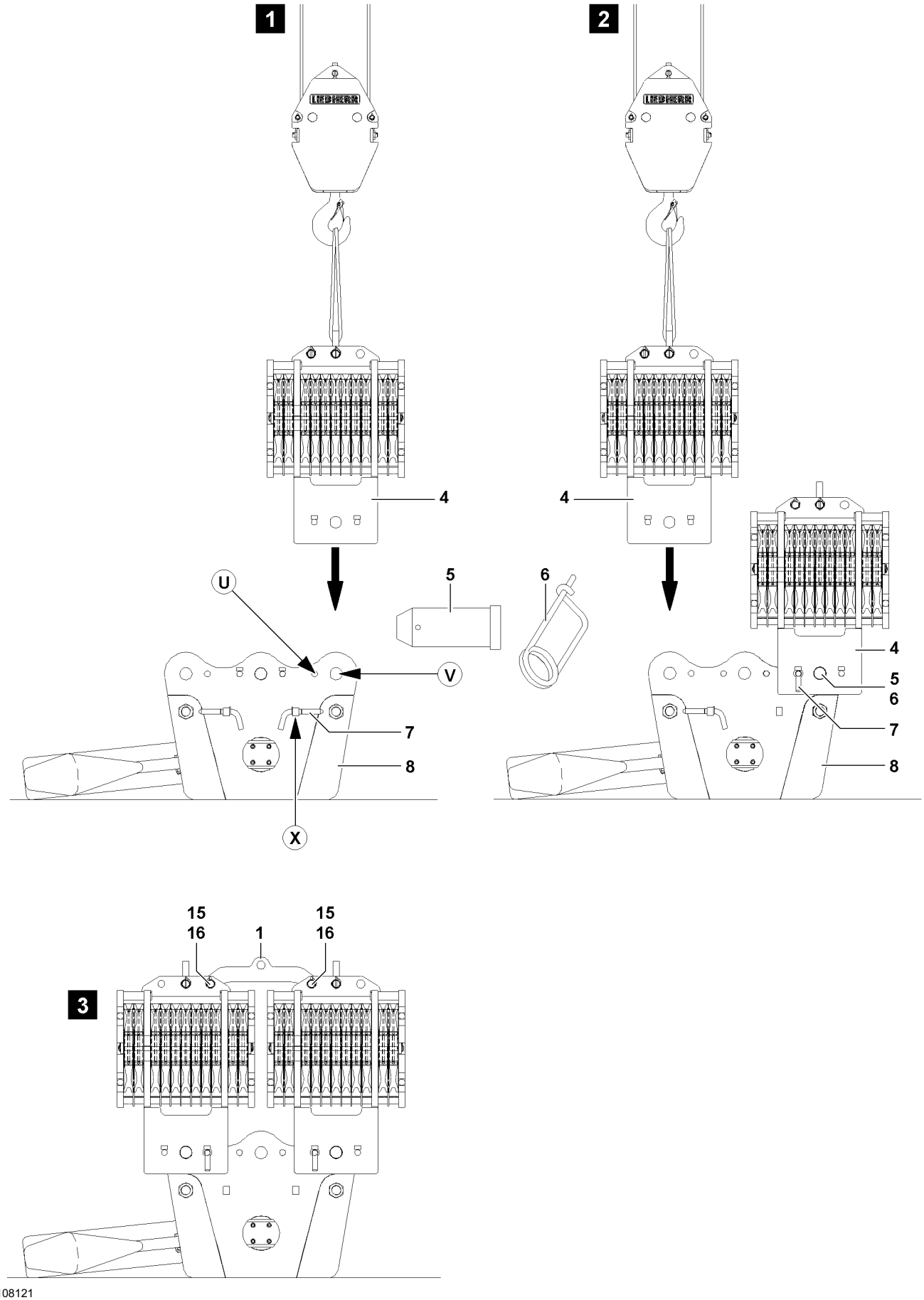
WARNING
Falling auxiliary weights!
If more than the auxiliary weights to be disassembled are released, these auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the other auxiliary weights are secured with the mounting brackets before removing the outermost auxiliary weights!

- ▶ If additional mounting brackets must be removed for releasing the outermost auxiliary weights: Immediately reinstall mounting brackets so that only the relevant auxiliary weight to be disassembled is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the pulley block.
- ▶ Place the auxiliary weight onto the ground.
- ▶ Remove the auxiliary crane.
- ▶ Disassemble additional auxiliary weights as described above.

2.2.3 Disassembling the pulley block on cross brace

Ensure that the following prerequisite is met:
– the auxiliary weights are disassembled.

- ▶ Attach the pin pulling device **4** on the auxiliary crane.
- ▶ Carefully tension the tackle.
- ▶ Unpin retaining pin **7** at point **U** and pin into transport receptacle on the cross brace, point **X**, illustration **12**.
- ▶ Release and unpin the pin **5**.
- ▶ Swing out pulley block **4** with auxiliary crane.
- ▶ Place the pulley block **4** on the ground, illustration **14**.
- ▶ Remove the auxiliary crane.



B108121

3 Assembling a double hook block for parallel operation

3.1 Assembling the hook blocks

If the hook blocks are to be brought into parallel operation, then attach the pulley blocks **4** left and right on the cross brace **8**.

3.1.1 Assembling the pulley blocks on cross brace

Make sure that the following prerequisites are met:
- the ground is sufficiently load bearing to take on the weight of the hook block safely,
- the subsoil is level and horizontal,
- the cross brace **8** is placed on the floor, see illustration **1**.

DANGER
Tipping over the pulley blocks!
If the retaining pins **7**, are not pinned during assembly of the pulley blocks **4** on the cross brace, then the pulley block tips to the side upon removal of the auxiliary crane!
Personnel remaining in the danger zone can be severely injured or killed!
- ▶ Pin in the retaining pins **7** into the bores **U** on the hook block!
- ▶ Make sure before removing the auxiliary crane that the pulley blocks are properly pinned and secured!

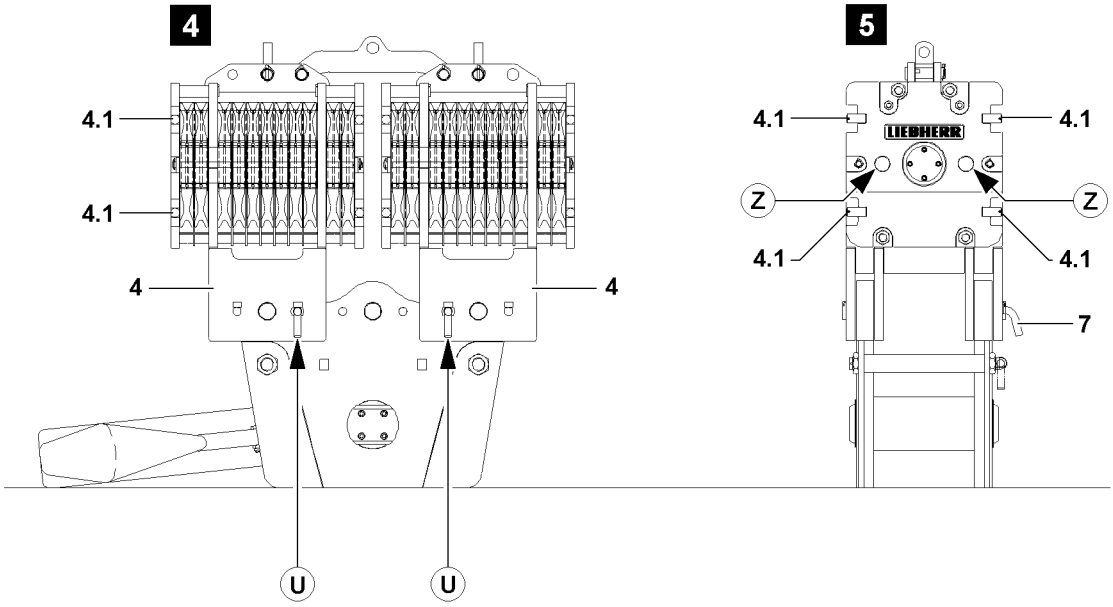
Note
- ▶ The assembly of two pulley blocks **4** is identical and is described on the example of a pulley block!

- ▶ Attach the pulley block **4** onto the auxiliary crane, illustration **1**.
- ▶ Position pulley block **4** on the cross brace **8** and align the pin bore **V**.
- ▶ Pin in the pin **5** on point **V** and secure with spring retainer **6**.
- ▶ Unpin the retaining pin **7** from the transport receptacle (point **X**).
- ▶ Pin in the retaining pins **7** into the bore (point **U**) on the cross brace **8**, illustration **1**.
- ▶ If the pulley block **4** is secured through the retaining pins **7** at point **U**:
  Remove the auxiliary crane, illustration **2**.
- ▶ Assemble second pulley block.

3.1.2 Assembling the block connector

Ensure that the following prerequisite is met:
- assemble and secure the two pulley blocks **4** on the cross brace **8**.

Both pulley blocks **4** are pinned with the block connector **1**.
- ▶ Attach the block connector **1** on the auxiliary crane.
- ▶ Position block connector **1** with auxiliary crane in pinning position, illustration **3**.
- ▶ Pin in the pins **15** on both sides to the pulley blocks **4** and pin with linchpin **16**, illustration **3**.
- ▶ When the block connection **1** is pinned and secured properly:
  Remove the auxiliary crane.


4
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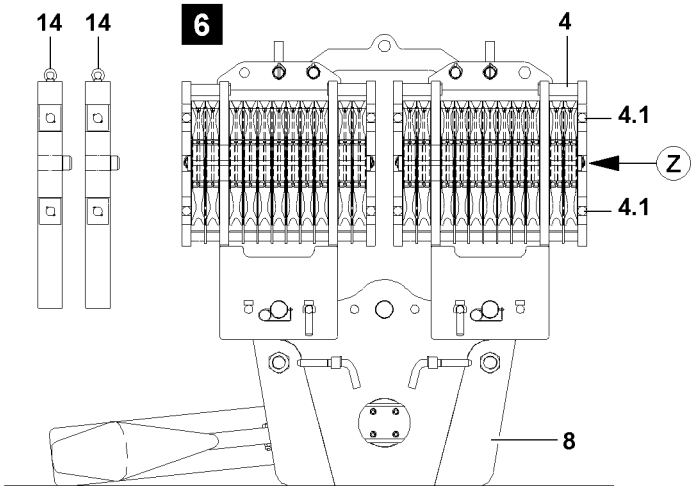
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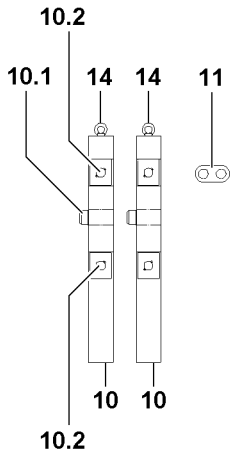
4.1
8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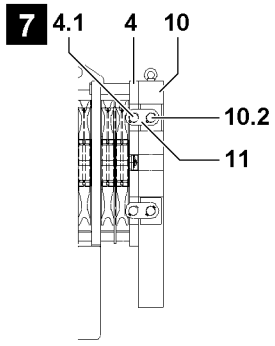
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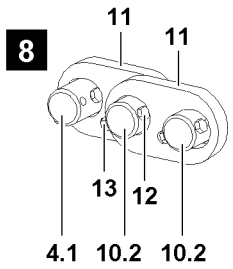
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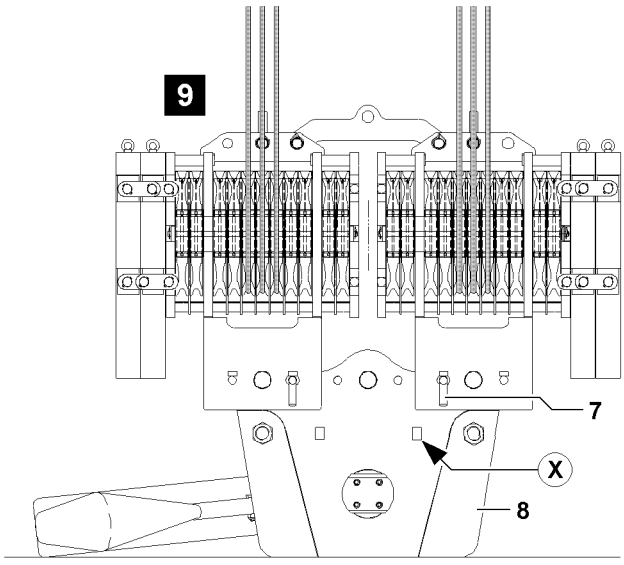

9
7
X
8

B108120

3.1.3 Assembling the auxiliary weights

Note

▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING

Toppling of hook block!

One-sided placement of auxiliary weights can topple the hook block!

Personnel can be severely injured or killed!

▶ The auxiliary weights may only be placed **individually** and alternating left and right on the pulley blocks of the hook block!

▶ If the required auxiliary weight is assembled on the pulley blocks, then the difference between left and right side may never be more than one auxiliary weight!

▶ Asymmetrical installation of auxiliary weights is prohibited!

Make sure that the following prerequisites are met:

– the hook block is placed on the ground,
– the pulley blocks **4** are properly assembled and secured,
– the retaining pins **7** are pinned in and secured at point **U**,
– the block connector **1** is properly assembled and secured.

WARNING

Falling auxiliary weights!

If the auxiliary weights on the pulley blocks are not properly assembled, they can fall down during assembly or during crane operation!

Personnel can be severely injured or killed!

▶ Standing under suspended auxiliary weight is prohibited!

▶ Ensure that the auxiliary weights are assembled properly and securely!

▶ Operating the crane without insufficiently secured auxiliary weights is forbidden!

▶ Attach auxiliary weight **10** on the eyebolt **14** on the auxiliary crane.

WARNING

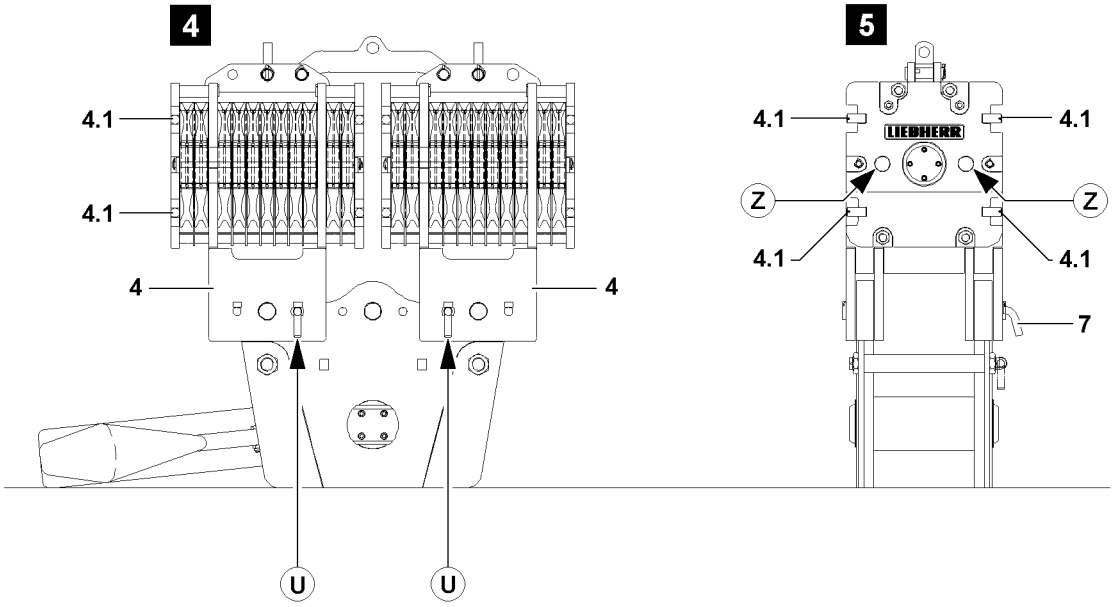
Danger of crushing!

While swinging in the auxiliary weights for the pulley block, personnel can be severely injured or killed!

Fingers, hands or arms can be crushed or severed!

▶ Standing between pulley blocks and auxiliary weight is prohibited!

▶ Swing in auxiliary weights with extreme caution and at low speed for the pulley block!


4
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4.1
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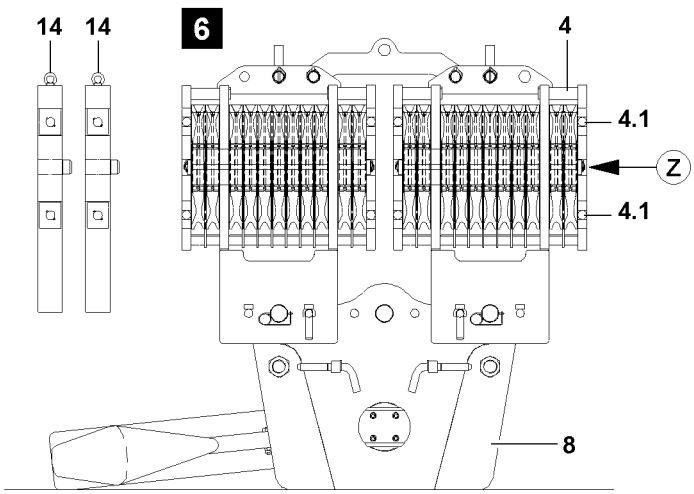
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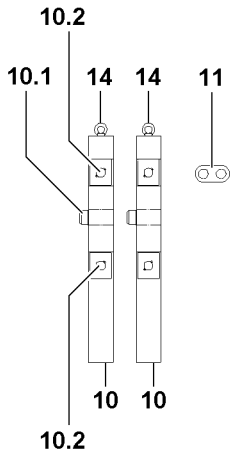
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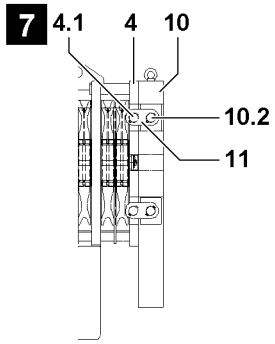
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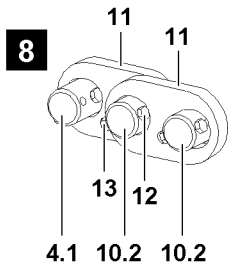
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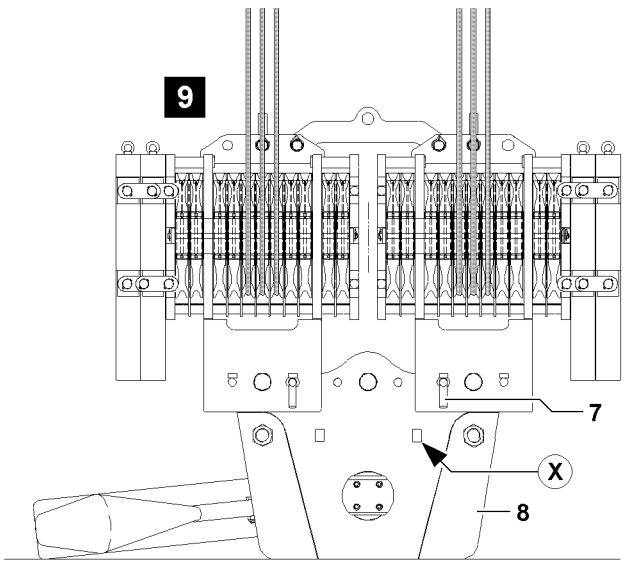
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B108120

- ▶ Align auxiliary weight **10** on the pulley block **4**.
- ▶ Retract auxiliary weight centring pin **10.1** into the centring bores **Z** on them pulley block **4**, illustration **7**.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Install mounting brackets **11** laterally and connect the pulley block **4** with the auxiliary weight **10**, illustration **8**.
- ▶ Secure mounting brackets **11** with screws **12** and safety nut **13**, illustration **8**.

Note
- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

WARNING
Falling auxiliary weights!
By removing the auxiliary crane, the auxiliary weights can fall down laterally!
Personnel can be severely injured or killed!
- ▶ Only remove the auxiliary crane when it is ensured that the auxiliary weight **10** is secured properly with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly assembled and secured:
  Remove the auxiliary crane.

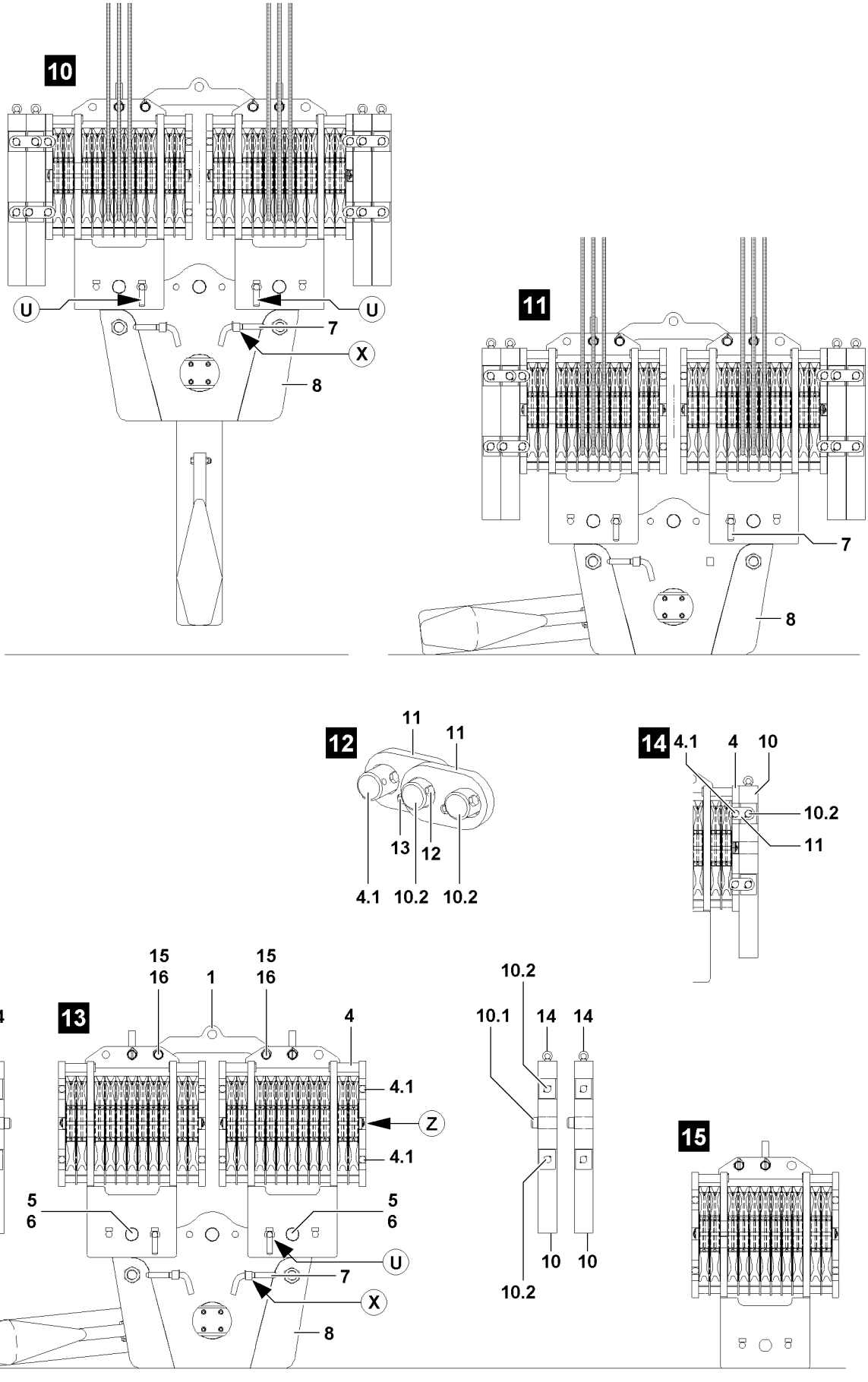
3.1.4 Preparing the hook block for crane operation

Note
- ▶ Reeving in 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 in hoist rope according to chapter 4.06 of the crane operating instructions and on the basis of the separate reeving plans!

NOTICE
Pin in the retaining pins **7** when lifting the load!
If the retaining pins **7** are not unpinned prior to the crane operation, the pins **7** may be sheered off when raising the load!
- ▶ Unpin the retaining pin **7** from the hook block before crane operation!

- ▶ When the hook block is properly reeved and has been lifted from the ground:
  Unpin retaining pin **7** and pin and secure into the transport receptacle (point **X**), illustration **9**.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3.2 Disassembling the hook block

3.2.1 Preparing the hook block for disassembly

Note

- ▶ Reeving out 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!

NOTICE

Retaining pin **7** unpinned upon lowering the hook block!

If the retaining pins **7** - before setting the hook block on the ground - is not pinned in, the pulley blocks tip away laterally upon reeving out the hoist rope!

Personnel can be severely injured or killed!

- ▶ Pin in and secure retaining pin **7**, before setting down hook block onto the ground, at both pulley blocks at point **U**!

Make sure that the following prerequisites are met:

- – the subsoil is sufficiently load bearing to take on the weight of the hook block safely, including the auxiliary weights,
- – the subsoil is level and horizontal.

- ▶ Lower the hook block completely onto the ground.
- ▶ If the hook block has been placed properly onto the ground:
  Reeve out hoist rope(s) according to chapter 4.06 of the crane operating instructions!

3.2.2 Disassembling the auxiliary weights

Note

- ▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING

Toppling of hook block!

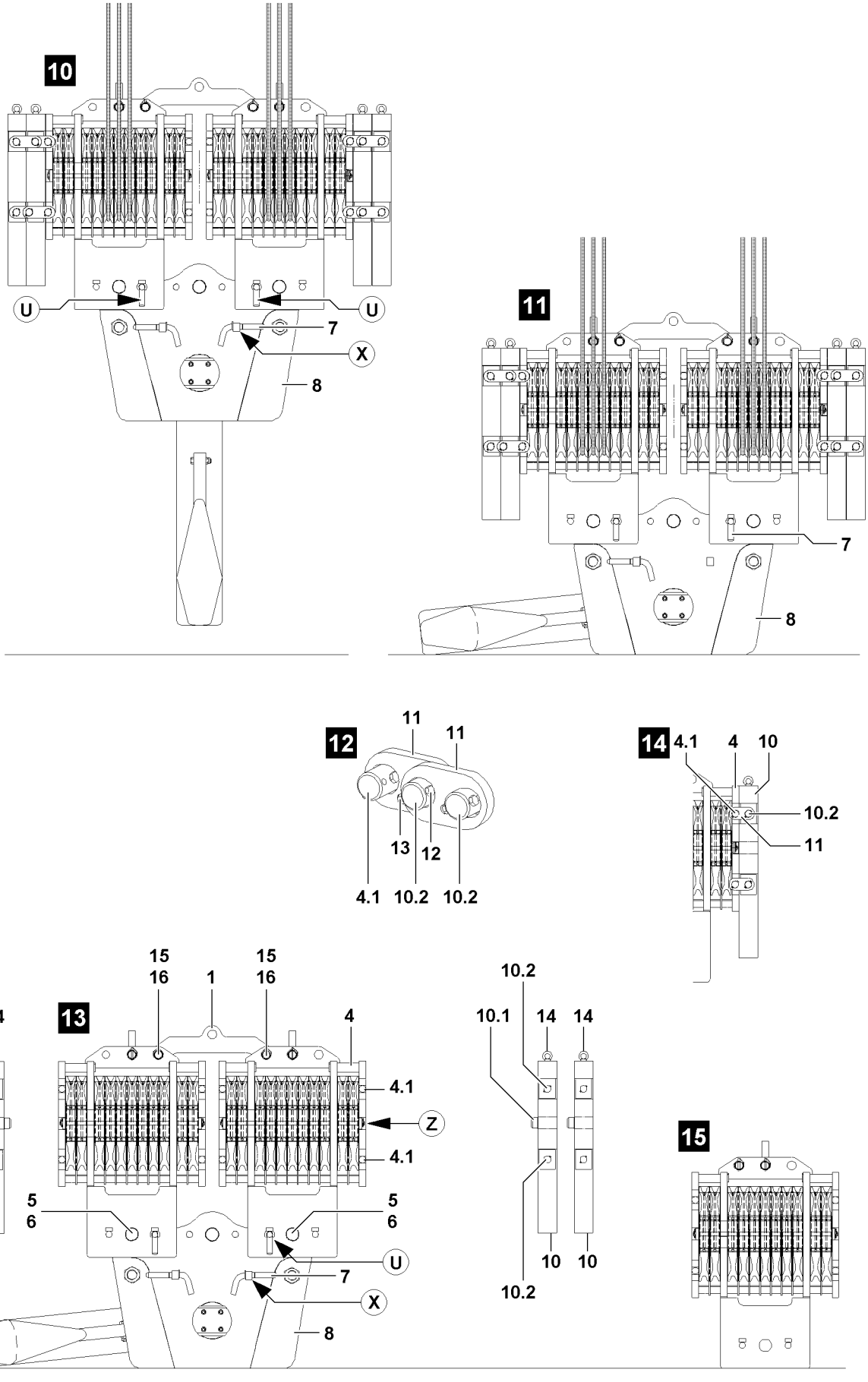
One-sided disassembly of auxiliary weights can topple the hook block!

Personnel can be severely injured or killed!

- ▶ The auxiliary weights may only be disassembled **individually** and alternating left and right on the pulley blocks of the hook block!
- ▶ The difference between left and right side may never be more than one auxiliary weight upon disassembly of the auxiliary weight!
- ▶ Asymmetrical disassembly of auxiliary weights is prohibited!

Make sure that the following prerequisites are met:

- – the retaining pins **7** are pinned and secured on both sides at point **U**,
- – the block connector **1** is disassembled.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WARNING
Falling auxiliary weights!
If the auxiliary weights on the pulley blocks are not properly disassembled, they can fall down during disassembly!
Personnel can be severely injured or killed!
- ▶ Standing under suspended auxiliary weight is prohibited!

- ▶ Attach auxiliary weight **10** on the eyebolt **14** on the auxiliary crane.
- ▶ Carefully tension the tackle.

WARNING
Swinging auxiliary weights!
During disassembly of the auxiliary weights, the auxiliary weights can lead to swinging!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Take heed that the auxiliary weight to be disassembled is properly attached on the auxiliary crane before loosening the mounting brackets!
- ▶ Diagonal pull is not permitted!

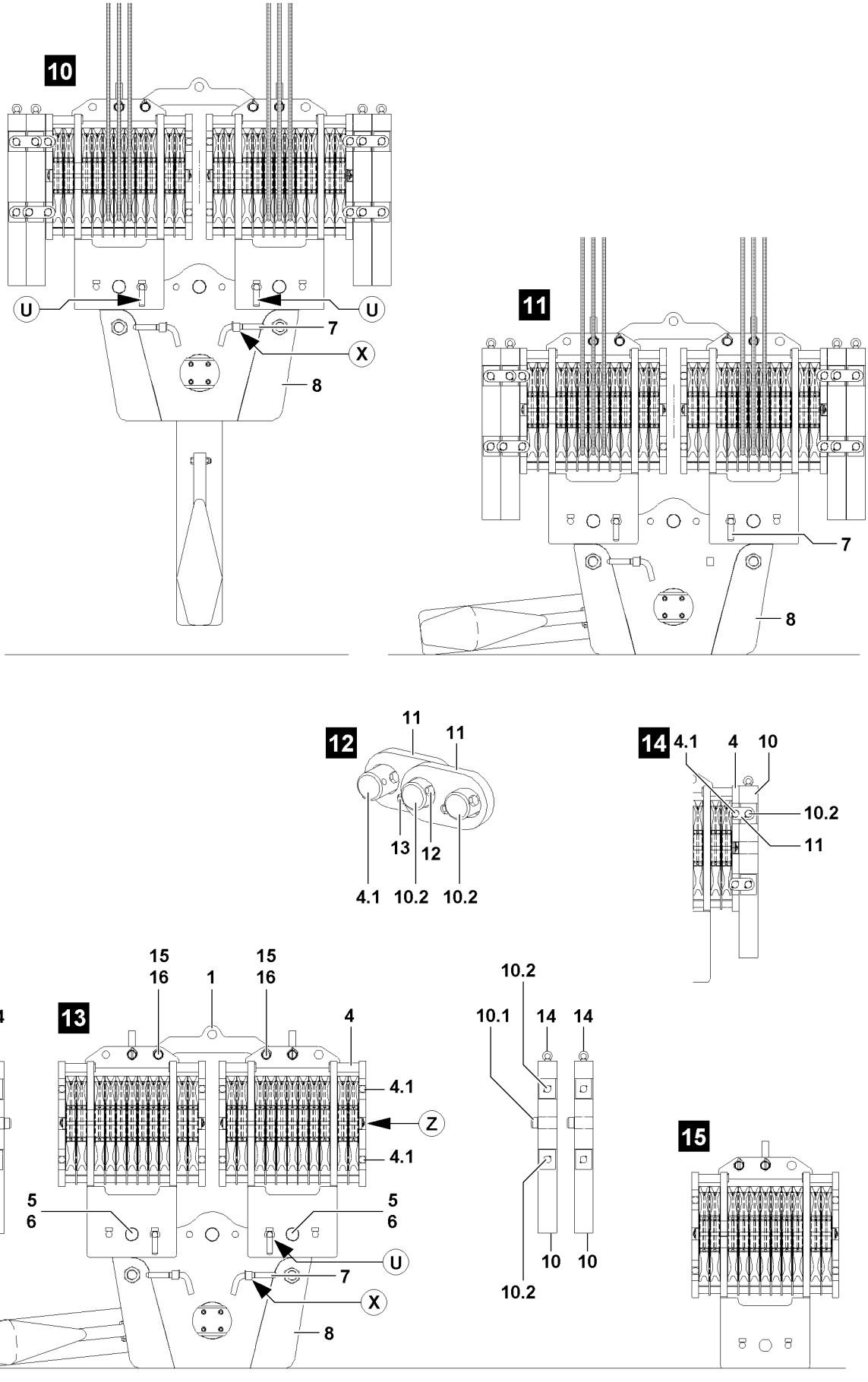
- ▶ When the tackle on the auxiliary weight is tensioned:
  Loosen bolt connection on the mounting brackets of the outermost auxiliary weights and remove bolts.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Disconnect mounting brackets **11** laterally.

WARNING
Falling auxiliary weights!
If more than the auxiliary weights to be disassembled are released, these auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the other auxiliary weights are secured with the mounting brackets before removing the outermost auxiliary weights!

- ▶ If additional mounting brackets must be removed for releasing the outermost auxiliary weights: Immediately reinstall mounting brackets so that only the relevant auxiliary weight to be disassembled is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the pulley block.
- ▶ Place the auxiliary weight onto the ground.
- ▶ Remove the auxiliary crane.
- ▶ Disassemble additional auxiliary weights as described above.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5
6
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7
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15

B108143

3.2.3 Disassembling the block connector

▶ Attach the block connector **1** on the auxiliary crane.

DANGER
Tipping over the pulley blocks!
If the retaining pins **7**, are not pinned during disassembly of the block connector **1** on the pulley blocks, then the pulley block tips to the side upon removal of the block connector!
Personnel remaining in the danger zone can be severely injured or killed!
▶ Pin in the retaining pins **7** into the bores **U** on the hook block!
▶ Make sure before removing the block connector that the pulley blocks are properly pinned and secured!

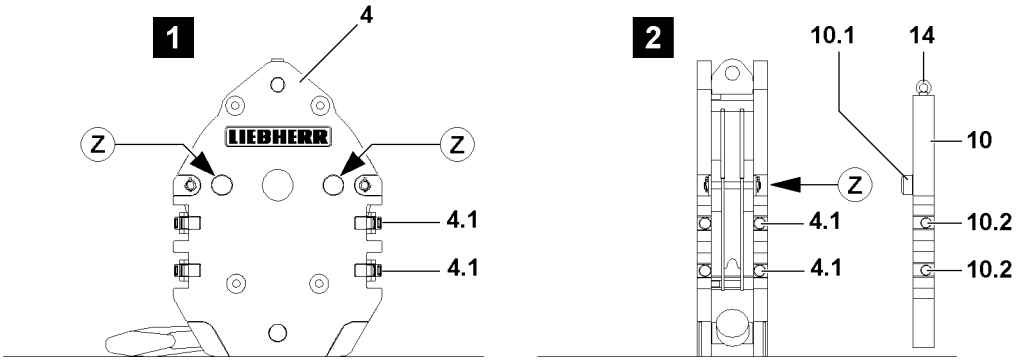
▶ Release and unpin the pins **15** on both sides at the pulley blocks **4**.
▶ Remove the block connector **1** with the auxiliary crane.
▶ Place the block connector **1** onto the ground.
▶ Remove the auxiliary crane.

3.2.4 Disassembling the pulley blocks on cross brace

Note
▶ The disassembly of two pulley blocks is identical and is described on the example of a pulley block!

Make sure that the following prerequisites are met:
– the auxiliary weights are disassembled,
– the block connector is disassembled.

▶ Attach the pin pulling device **4** on the auxiliary crane.
▶ Carefully tension the tackle.
▶ Unpin retaining pin **7** at point **U** and pin into transport receptacle on the cross brace, point **X**, illustration **13**.
▶ Release and unpin the pin **5**.
▶ Swing out pulley block **4** with auxiliary crane.
▶ Place the pulley block **4** onto the ground.
▶ Remove the auxiliary crane.
▶ Disassemble second pulley block.


1
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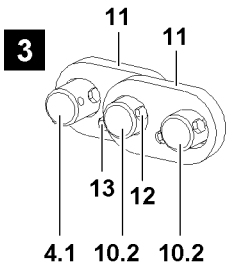
3
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10.2
10.2

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4 Single hook block

4.1 Assembling the single hook block

4.1.1 Assembling the auxiliary weights

Note

▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING

Toppling of hook block!

One-sided placement of auxiliary weights can topple the hook block!

Personnel can be severely injured or killed!

▶ The auxiliary weights may only be placed **individually** and alternating left and right on the hook block!

▶ If the required auxiliary weight is assembled on the hook block, then the difference between left and right side may never be more than one auxiliary weight!

▶ Asymmetrical attachment of auxiliary weights is prohibited!

Ensure that the following prerequisite is met:

– the hook block is placed on the ground.

WARNING

Falling auxiliary weights!

If the auxiliary weights on the pulley blocks are not properly assembled, they can fall down during assembly or during crane operation!

Personnel can be severely injured or killed!

▶ Standing under suspended auxiliary weight is prohibited!

▶ Ensure that the auxiliary weights are assembled properly and securely!

▶ Operating the crane without insufficiently secured auxiliary weights is forbidden!

▶ Attach auxiliary weight **10** on the eyebolt **14** on the auxiliary crane.

WARNING

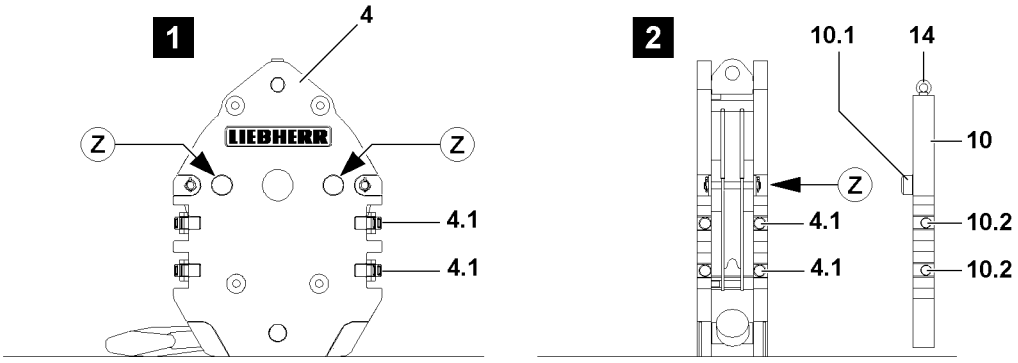
Danger of crushing!

While swinging in the auxiliary weights for the hook block, personnel can be severely injured or killed!

Fingers, hands or arms can be crushed or severed!

▶ Standing between hook block and auxiliary weight is prohibited!

▶ Swing in auxiliary weights with the most extreme caution and at low speed for the hook block!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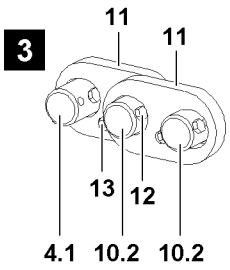
14
10
Z
4.1
4.1
10.2
10.2


3
11
11
13
12
4.1
10.2
10.2

B108146

- ▶ Align auxiliary weight **10** at the hook block.
- ▶ Retract auxiliary weight centring pins **10.1** into the centring bores **Z** at the hook block.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Install mounting brackets **11** laterally and connect the hook block with the auxiliary weight **10**, illustration **3**.
- ▶ Secure mounting brackets **11** with screws **12** and safety nut **13**, illustration **3**.

Note
- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

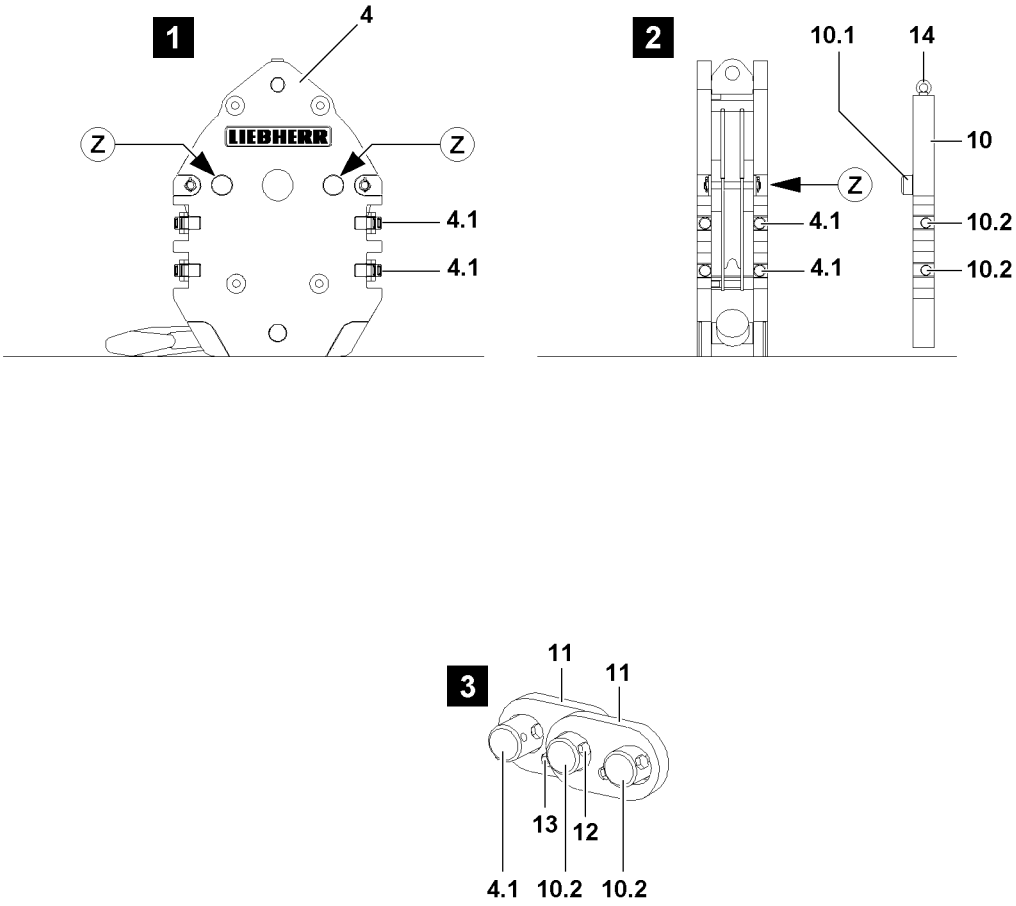
WARNING
Falling auxiliary weights!
By removing the auxiliary crane, the auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Only remove the auxiliary crane when it is ensured that the auxiliary weight **10** is secured properly with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly assembled and secured:
  Remove the auxiliary crane.

4.1.2 Preparing the hook block for crane operation

Note
- ▶ Reeving in 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 in hoist rope according to chapter 4.06 of the crane operating instructions and on the basis of the separate reeving plans!


1
4
LIEBHERR
Z
Z
4.1
4.1
2
10.1
14
10
Z
4.1
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3
11
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13
12
4.1
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10.2

B108146

4.2 Disassembling the single hook block

4.2.1 Preparing the hook block for disassembly

Note
- ▶ Reeving out 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 subsoil is sufficiently load bearing to take on the weight of the hook block safely, including the auxiliary weights,
– the subsoil is level and horizontal.

- ▶ Lower the hook block completely onto the ground.
- ▶ If the hook block has been placed properly onto the ground:
  Reeve out hoist rope according to chapter 4.06 of the crane operating instructions!

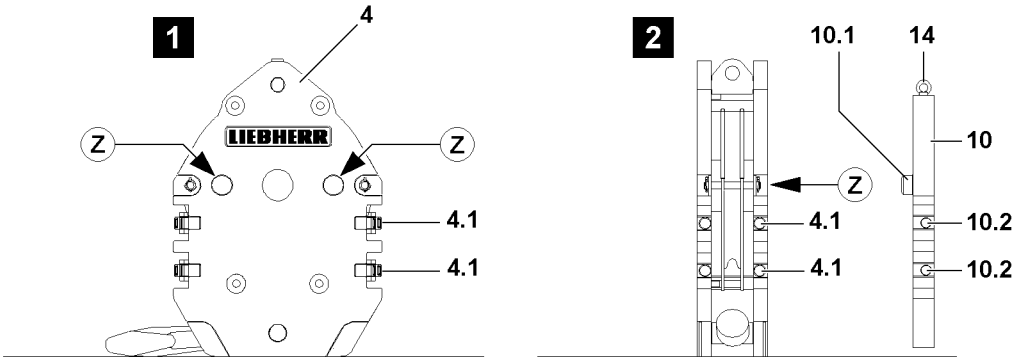
4.2.2 Disassembling the auxiliary weights

Note
- ▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING
Toppling of hook block!
One-sided disassembly of auxiliary weights can topple the hook block!
Personnel can be severely injured or killed!
- ▶ The auxiliary weights may only be disassembled **individually** and alternating left and right on the hook block!
- ▶ The difference between left and right side may never be more than one auxiliary weight upon disassembly of the auxiliary weight!
- ▶ Asymmetrical disassembly of auxiliary weights is prohibited!

WARNING
Falling auxiliary weights!
If the auxiliary weights on the pulley block are not properly disassembled, they can fall down during disassembly!
Personnel can be severely injured or killed!
- ▶ Standing under suspended auxiliary weight is prohibited!

- ▶ Attach auxiliary weight **10** on the eyebolt **14** on the auxiliary crane.
- ▶ Carefully tension the tackle.


1
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LIEBHERR
Z
Z
4.1
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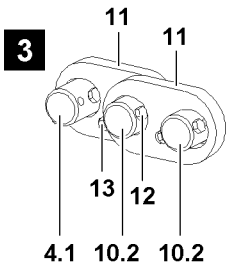
2
10.1
14
10
Z
4.1
4.1
10.2
10.2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10.2

B108146

WARNING
Swinging auxiliary weights!
During disassembly of the auxiliary weights, the auxiliary weights can lead to swinging!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Take heed that the auxiliary weight to be disassembled is properly attached on the auxiliary crane before loosening the mounting brackets!
- ▶ Diagonal pull is not permitted!

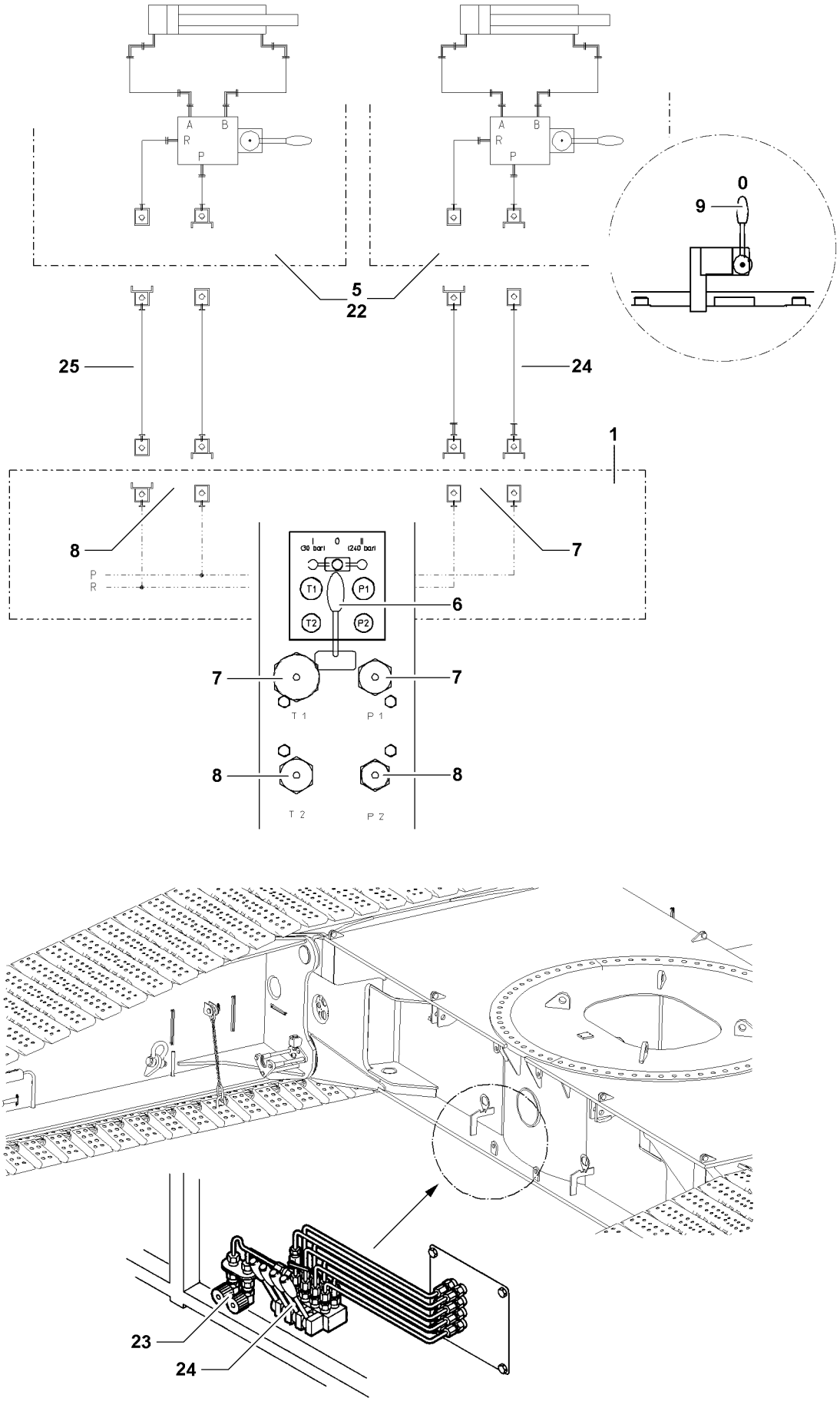
- ▶ When the tackle on the auxiliary weight is tensioned:
  Loosen bolt connection on the mounting brackets of the outermost auxiliary weights and remove bolts.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Disconnect mounting brackets **11** laterally.

WARNING
Falling auxiliary weights!
If more than the auxiliary weights to be disassembled are released, these auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the other auxiliary weights are secured with the mounting brackets before removing the outermost auxiliary weights!

- ▶ If additional mounting brackets must be removed for releasing the outermost auxiliary weights: Immediately reinstall mounting brackets so that only the relevant auxiliary weight to be disassembled 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.
- ▶ Disassemble additional auxiliary weights as described above.


A
B
R
P
0
9
5
22
25
24
1
8
7
P
R
I 30 bar I
0
II 240 bar II
T1
P1
T2
P2
6
7
7
T 1
P 1
8
8
T 2
P 2
23
24

B105424

1 Operating the pin pulling device

The hydraulic aggregate can be connected to the following users:
– Cylinder of pin pulling device.
– Assembly support cylinder on crawler center section.

The pin pulling device consists of the aggregate **1**, the cylinders **5** and the cylinder **22**.
The cylinders are differentiated:
– Cylinder **22**, without collar: Pin / unpin the pins of the lattice sections.
– Cylinder **5**, with collar: Pin / unpin the pins between the crawler carrier and the crawler center section.

1.1 Connecting the aggregate

There are two connector pairs:
– P1-T1 **7**
– P2-T2 **8**

P = Pressure line
T = Return line
The connector pairs differentiate in the diameter of the connector fittings.
Hose extension **24** and hose extension **25** are equipped with the matching hose coupler.

1.1.1 Connecting the aggregate on the cylinder

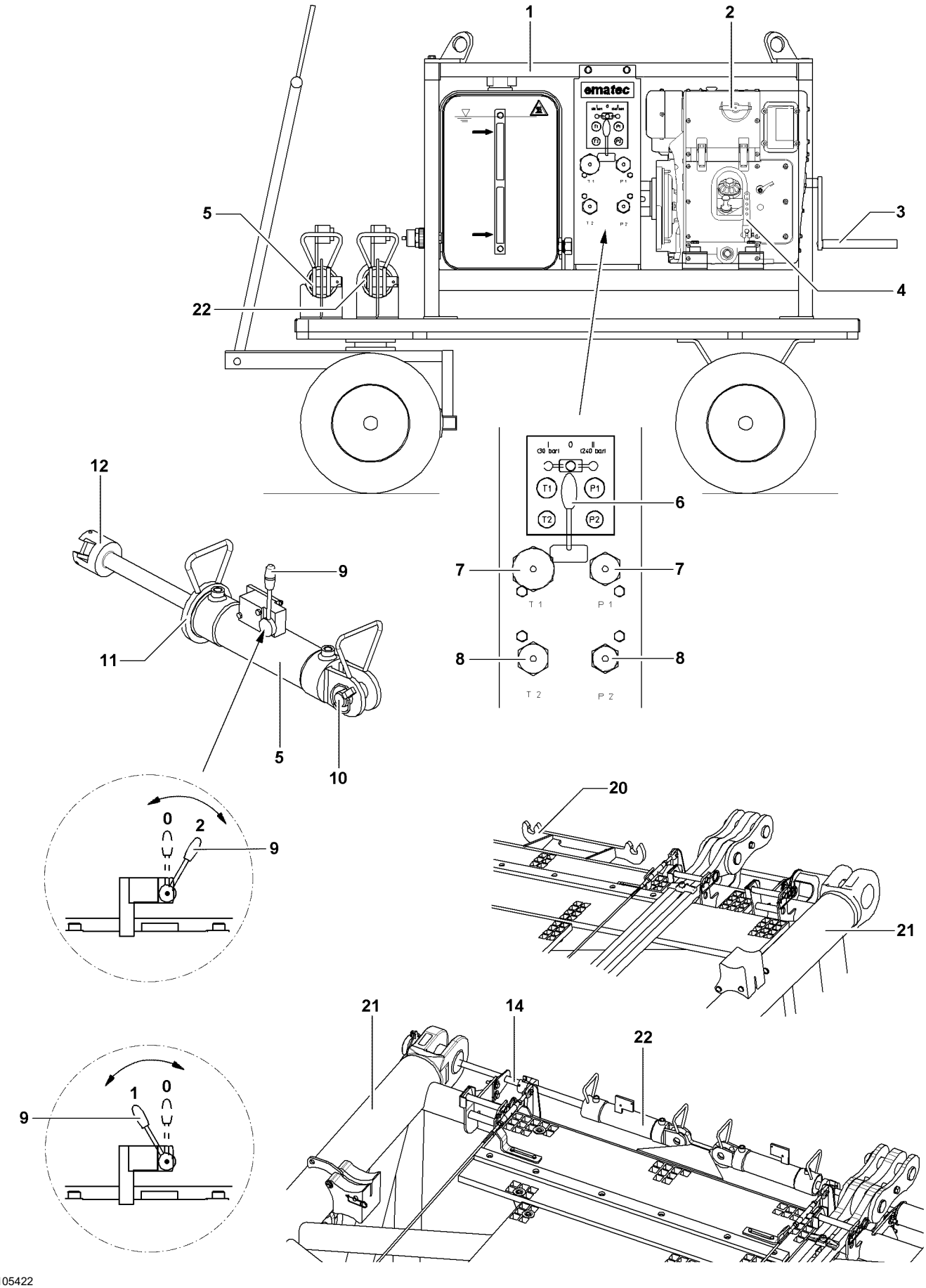
Make sure that the following prerequisites are met:
– The aggregate **1** is turned off.
– The lever **6** on the aggregate is in **Position 0**.
– The lever **9** on the cylinder is in **Position 0**.

▶ Connect hydraulic hoses on connector pair **7** or connector pair **8** on the aggregate.
▶ Connect hydraulic hoses on hose couplers of cylinder **5** or cylinder **22**.

1.1.2 Connecting the aggregate on the assembly support cylinder

Make sure that the following prerequisites are met:
– The aggregate **1** is turned off.
– The lever **6** on the aggregate is in **Position 0**.

▶ Connect hydraulic hoses on connector pair **7** or connector pair **8** on the aggregate.
▶ Connect hydraulic hoses on the hose couplers **23** on the crawler center section.


1
2
3
4
5
22
ematec
6
7
7
8
8
T1
P1
T2
P2
12
9
11
5
10
0
2
9
20
21
21
14
22
1
0
9
B105422

1.2 Starting the aggregate

Note

▶ Observe the information in the Operating and Maintenance manual of the hydraulic aggregate!

Make sure that the following prerequisites are met:

– The lever **2** and lever **4** for motor start are set, see Operating and Maintenance manual of hydraulic aggregate.
– The lever **6** on the aggregate **1** is in **Position 0**.

▶ Start the motor with the hand crank **3**.
▶ When the motor is running:
Pull the hand crank **3** out.

1.3 Pinning and unpinning with pin pulling device

WARNING

Falling components!

If unsecured or non-supported crane sections are removed, they can fall down. Personnel can be killed or seriously injured!

▶ During the pinning and unpinning procedure it is prohibited for anyone to remain **under** or **on** the crane sections, as well within the entire danger zone!
▶ During the unpinning procedure, it is prohibited for anyone to remain **under** or **on** unsecured or non-supported crane section!
▶ Before unpinning: Support crane sections and boom.
▶ Do not lean the ladder against the crane part being disassembled!

The operating pressure can be set with the lever **6**:

– Position I: 30 bar
– Position II: 230 bar

NOTICE

Overheating of aggregate!

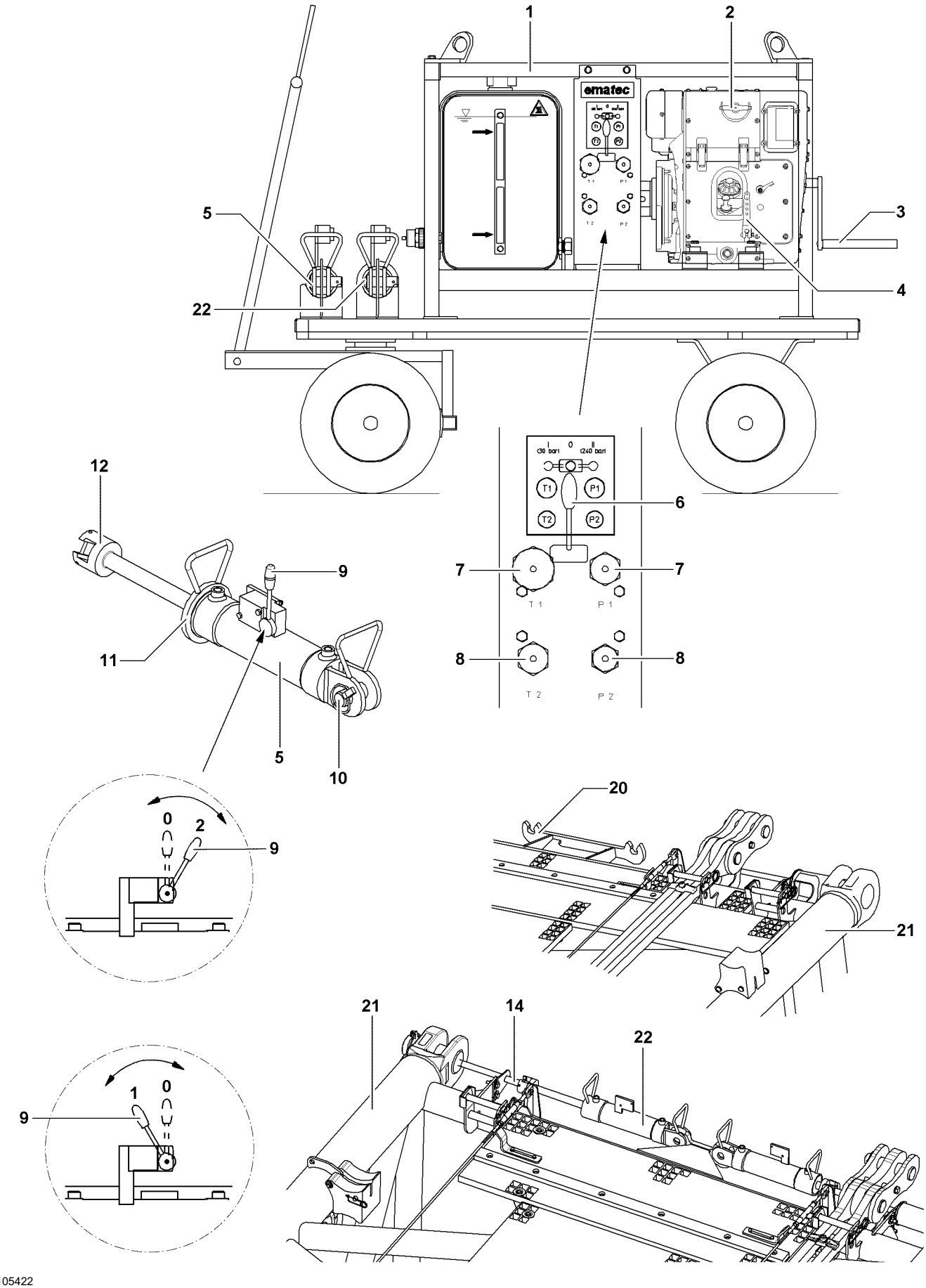
Continuous operation with operating pressure of 240 bar causes damage to the hydraulic pump and overheats the hydraulic oil.

▶ Set the lever **6** for no longer than maximum 10 min to Position II.

Note

▶ The operating pressure of 230 bar is required if the pin is tensioned or hard to move.
▶ The lever **6** has a spring return in Position II.

Both cylinders can be connected and operated simultaneously.


1
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ematec
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8
T1
P1
T2
P2
12
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11
5
10
0
2
9
20
21
21
14
22
1
0
9
B105422

1.3.1 Pinning and unpinning the pins on the boom lattice sections

Make sure that the following prerequisites are met:
- The motor of the hydraulic aggregate is running.
- Hydraulic hoses and cylinders **22** are connected.
- The lever **6** is in **Position 0**.

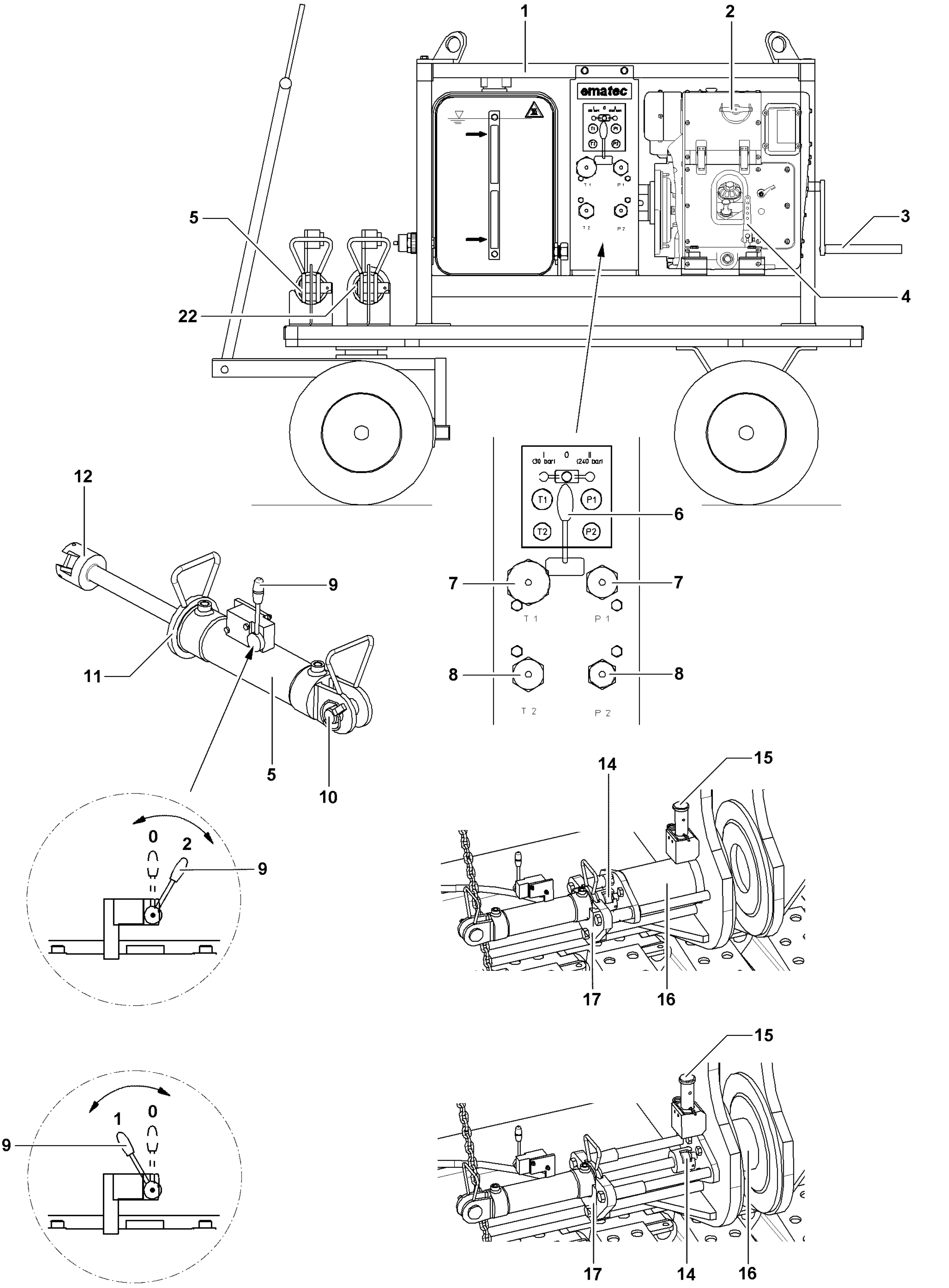
▶ Aggregate: Set the lever **6** to **Position I**.
▶ Extend cylinder: Set the lever **9** to **Position 1**.
▶ When the piston rod is extended sufficiently:
Hang the cylinder with pin **10** into the retainer **20** and the piston rod head **12** on screw **14**.
▶ Cylinder: Set the lever **9** to **Position 0**.
▶ Aggregate: Set the lever **6** to **Position 0**.

WARNING
Falling components!
When pinning / unpinning the pins on the lattice sections, components can fall down. Personnel can be killed or seriously injured!
▶ During the pinning / unpinning procedure of the lattice sections, do not step into the danger zone!
▶ Actuate the cylinder to pin and unpin only on the hydraulic aggregate with the lever **6**.

▶ For pinning:
Cylinder: Set the lever **9** to **Position 1**.
▶ For unpinning:
Cylinder: Set the lever **9** to **Position 2**.

Result:
- Cylinder is operational.

▶ Pinning / unpinning pins **16**: Set the lever **6** on the aggregate to **Position I**.
▶ When the pin is pinned / unpinned:
▶ Aggregate: Set the lever **6** to **Position 0**.
▶ Cylinder: Set the lever **9** to **Position 0**.
▶ Detach the cylinder on the retainer **20** and the piston rod head **12** on screw **14**.


1
2
3
4
5
22
ematec
12
9
11
5
10
0
2
9
1
0
9
6
7
7
T 1
P 1
8
8
T 2
P 2
T1
P1
T2
P2
14
15
17
16
15
17
14
16

B105423

1.3.2 Pinning and unpinning the pins on the crawler carriers

Make sure that the following prerequisites are met:

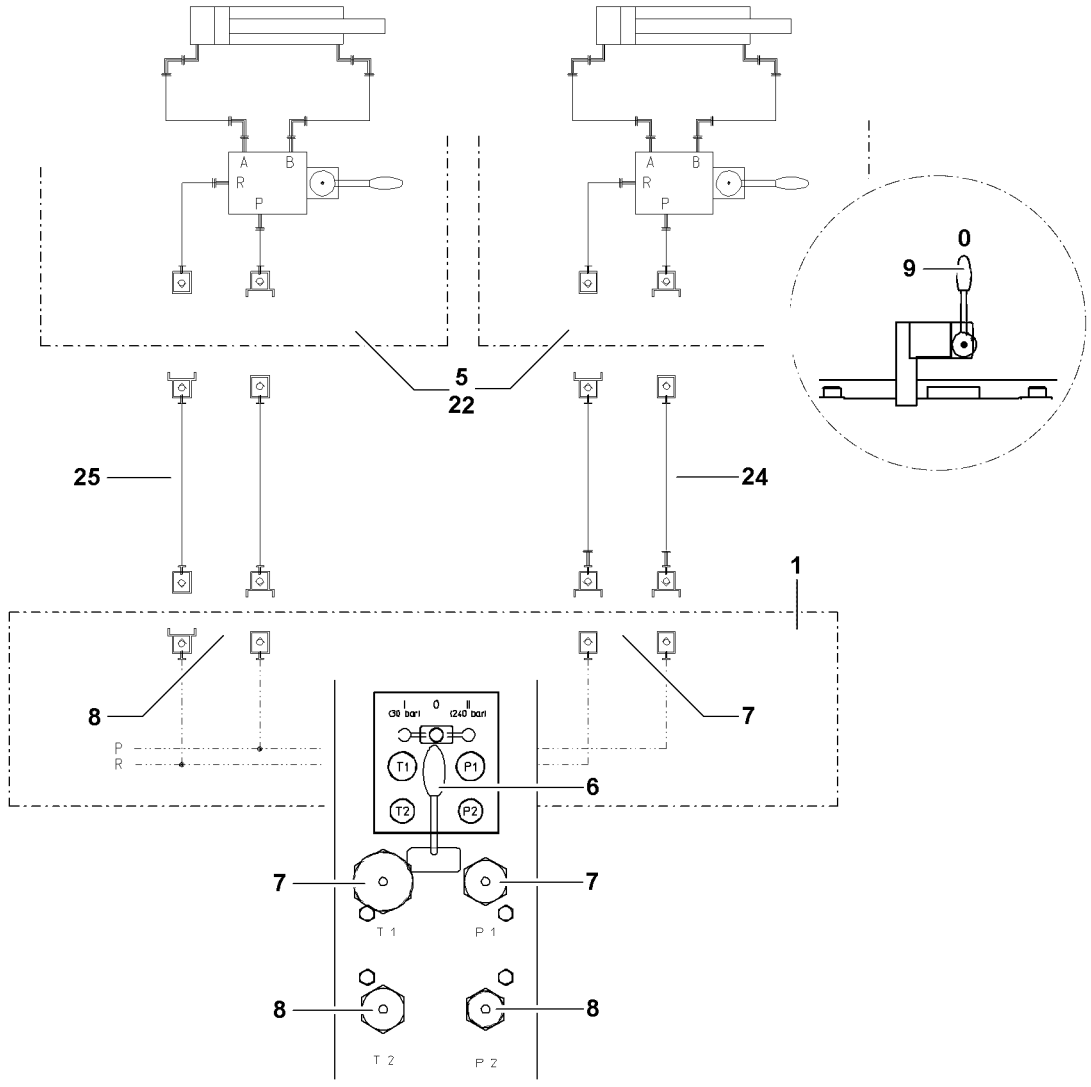
– The motor of the hydraulic aggregate is running.
– Hydraulic hoses and cylinders **5** are connected.
– The lever **6** is in **Position 0**.
– The pin **15** is unpinned.

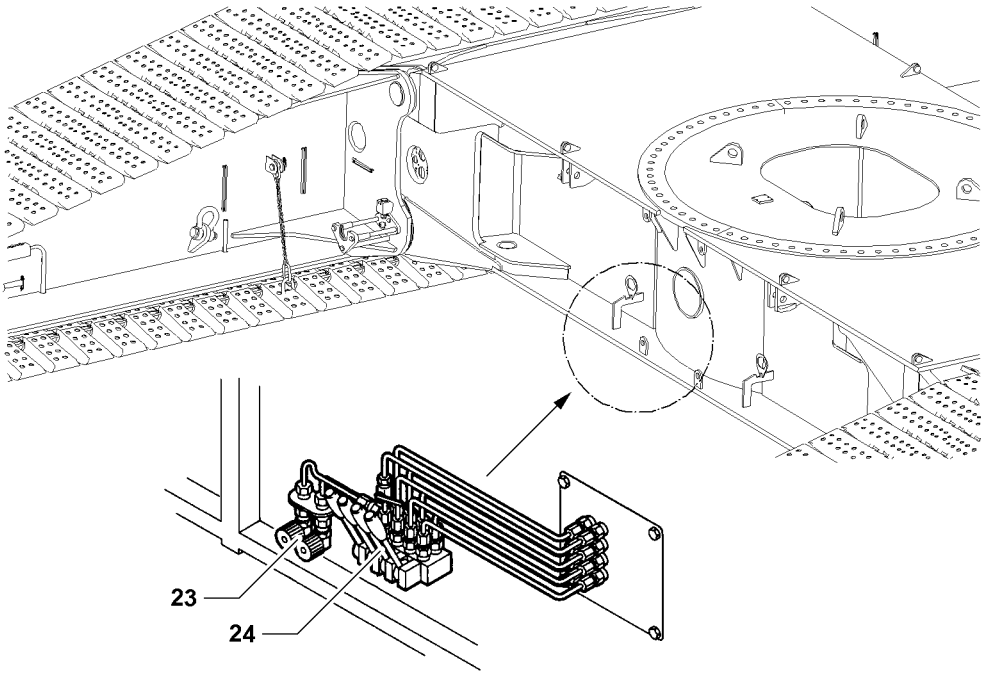
▶ Aggregate: Set the lever **6** to **Position I**.
▶ Extend cylinder: Set the lever **9** to **Position 1**.
▶ When the piston rod is extended sufficiently:
Hang the cylinder with collar **11** into the retainer **17** and the piston rod head **12** on screw **14**.

Result:

– Cylinder is operational.

▶ For pinning:
Cylinder: Set the lever **9** to **Position 1**.
▶ For unpinning:
Cylinder: Set the lever **9** to **Position 2**.
▶ When the pin is pinned / unpinned:
Cylinder: Set the lever **9** to **Position 0**.
▶ Aggregate: Set the lever **6** to **Position 0**.
▶ Detach the cylinder on the retainer **20** and the piston rod head **12** on screw **14**.


A
B
R
P
0
9
5
22
25
24
1
8
7
P
R
I30 bar
0
II240 bar
T1
P1
T2
P2
6
7
7
T 1
P 1
8
8
T 2
P 2


1
23
24

B105424

1.4 Establishing operational readiness for operation on assembly support cylinders

Note

▶ To lift the crawler center section with assembly support cylinders, see chapter 3.01.

Note

▶ If the turntable is already installed, then the operating pressure of the pin pulling device for operation of the assembly support cylinders is not sufficient. The assembly support cylinders are connected to the hydraulic of the turntable.

Make sure that the following prerequisites are met:

– The hydraulic hoses are connected with the aggregate and the assembly support cylinders on the crawler center section.
– The motor of the hydraulic aggregate is running.
– The lever **6** is in **Position 0**.

NOTICE

Overheating of aggregate!

Continuous operation with operating pressure of 240 bar causes damage to the hydraulic pump and overheats the hydraulic oil.

▶ Set the lever **6** for no longer than maximum 10 min to Position II.

Note

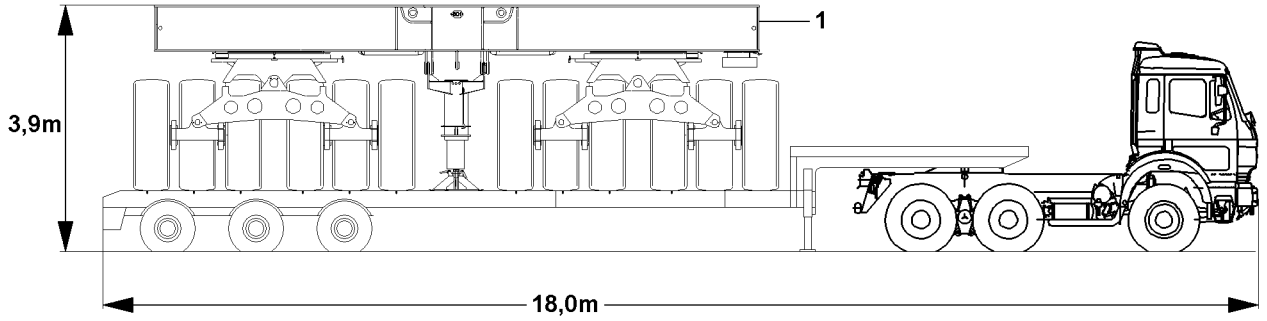
▶ For operation of assembly support cylinders with pin pulling device, you need an operating pressure of 230 bar.
▶ Operation of assembly support cylinders: One person actuates the lever **6** on the pin pulling device and another person actuates the levers **24** on the crawler center section.

▶ Set the lever **6** to **Position II**.

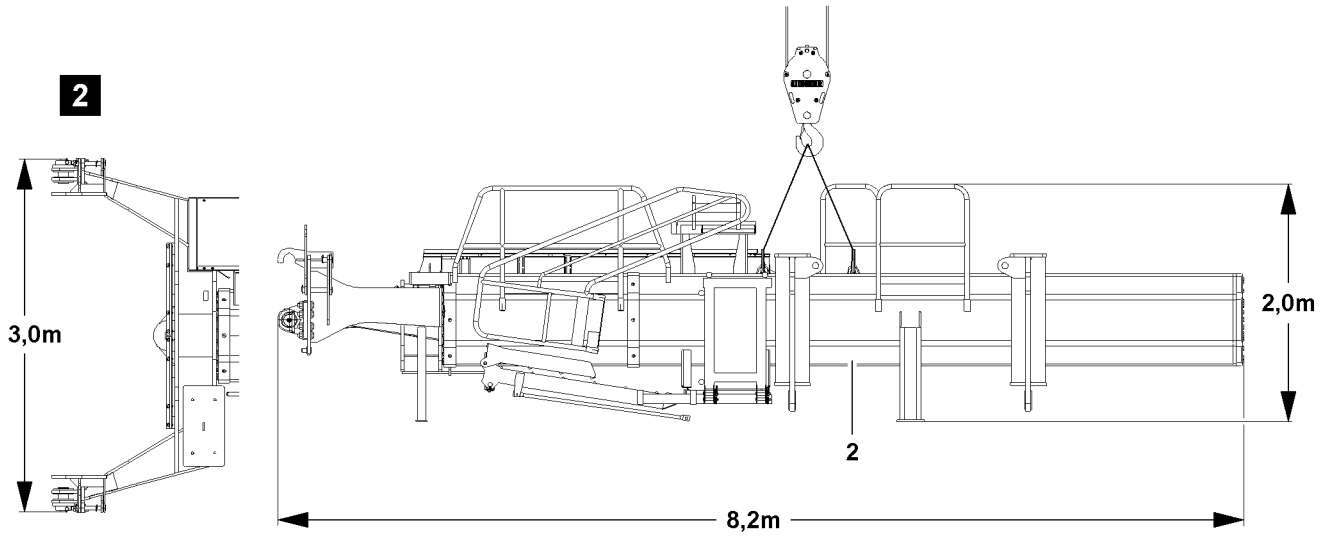
Result:

– Assembly support cylinders are operational.

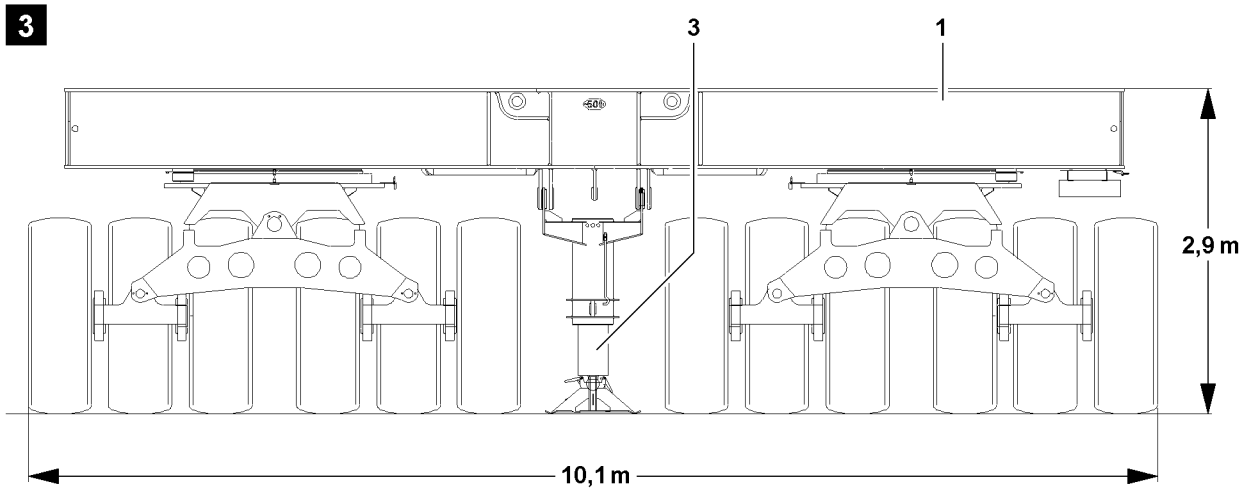
1



2



3



B108745

1 Component description and general notes

Ballast trailer, complete, consisting of:
- 2 axle lines with 2 each oscillating wheel sets.
- Ballast trailer **1**
- Ballast trailer guide **2**
- Support cylinder **3**

Hydraulic, telescopic ballast trailer guide for ballast trailer radii of R13 m - R18 m.
The pull cylinders for the ballast trailer are assembled on the D-end section and can be actuated under load.
Hydraulic, mechanical steering is electronically adjustable for:
- Towing
- Circular travel
- Parallel travel
- Manual resteering

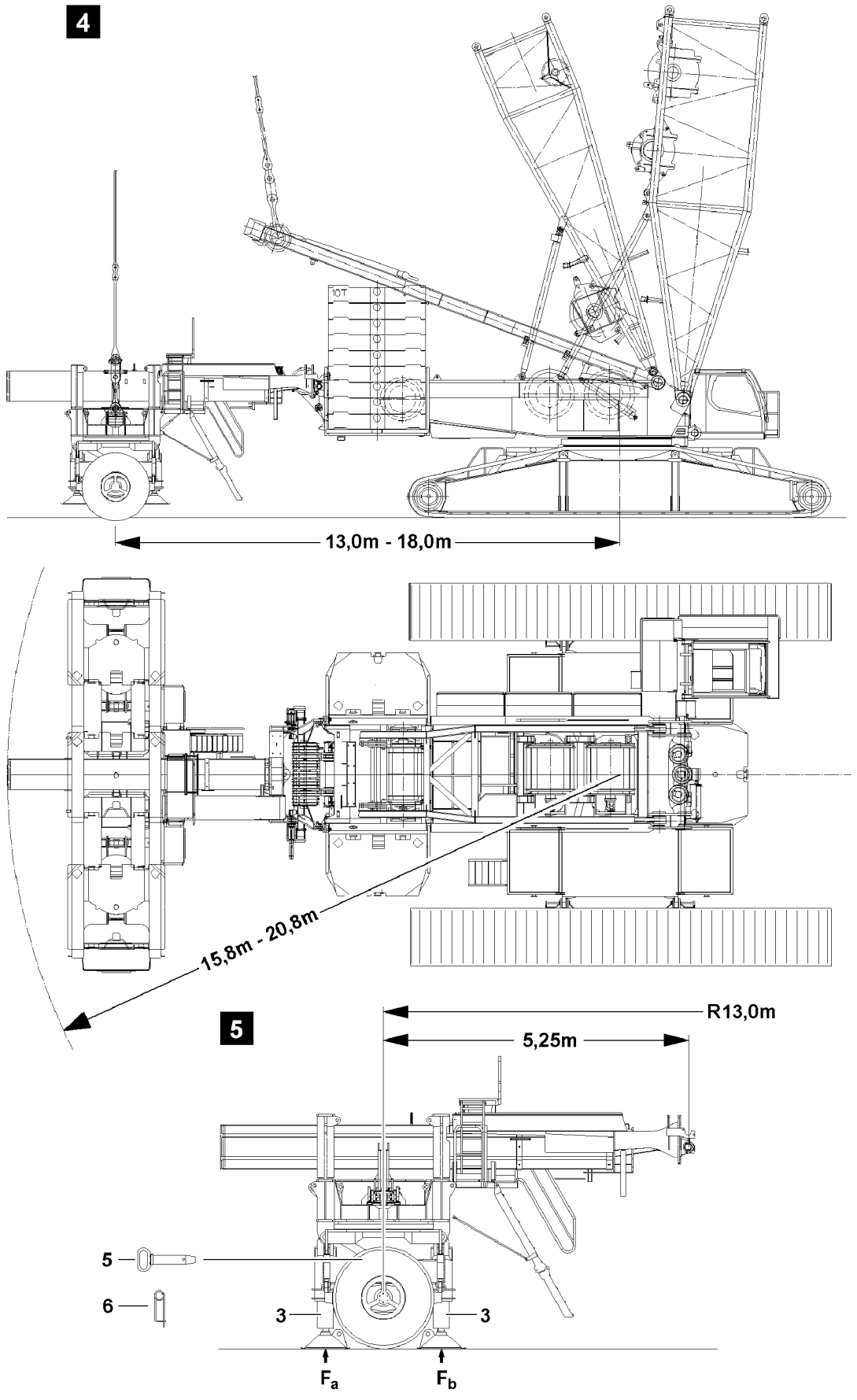
1.1 Components, weights

See illustration **2** and illustration **3**.

Position	Components	Weight
1	Ballast trailer including support cylinder 3	47.2 t
2	Ballast trailer guide	15.9 t

1.2 Dimensions

See illustration **1**, illustration **2** and illustration **3**.



B108746

1.3 Radii

Derrick boom radius	Ballast trailer radius
13.0 m	13.0 m
13.0 m	15.0 m
13.0 m	18.0 m

1.4 Stability and tipping safety for ballast trailer not assembled on the turntable

Make sure that the following prerequisites are met:

– the ballast trailer guide is hydraulically fully moved in,
– the ballast trailer is supported and aligned in horizontal direction.

WARNING

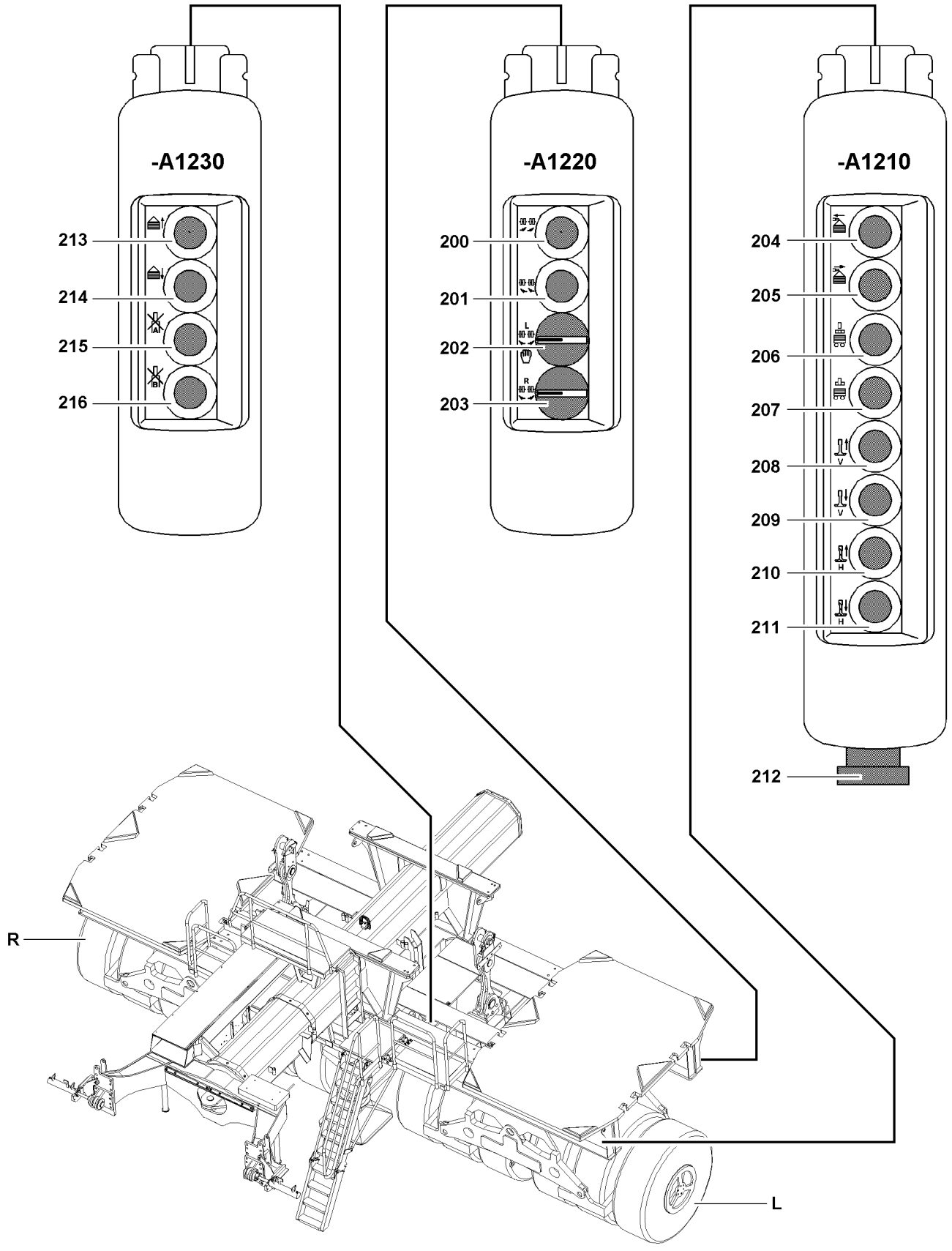
Danger of tipping the ballast trailer!

If the ballast trailer is not assembled on the turntable and the ballast trailer guide is not fully moved in, then the ballast trailer can tip over!

Personnel can be severely injured or killed!

▶ Before removal of the ballast trailer on the turntable, the locking pin **5** must be pinned on the strut of the ballast trailer and secured with the spring retainer **6**!
▶ The ballast trailer guide must be fully moved in before disassembly of the ballast trailer on the turntable!
▶ The support cylinders **3** are moved out to the point where the tires are relieved!

Illustration	Ballast trailer radius	Ballast	Maximum support pressure F_a	Maximum support pressure F_b
5	R = 13.0 m	0 t	23.6 t	39.6 t


-A1230
213
214
215
216
-A1220
200
201
202
203
-A1210
204
205
206
207
208
209
210
211
212
R
L

B108747

1.5 Control elements on the control panels

Control panel

-A1220

200	Button	• Corrective steering, turn wheel sets to left
201	Button	• Corrective steering, turn wheel sets to right
202	Rotary switch	• Turn the wheel set on the left side L to the right or left
		• Manual operation for assembly or emergency operation
203	Rotary switch	• Turn the wheel set on the right side R to the right or left
		• Manual operation for assembly or emergency operation

Control panel

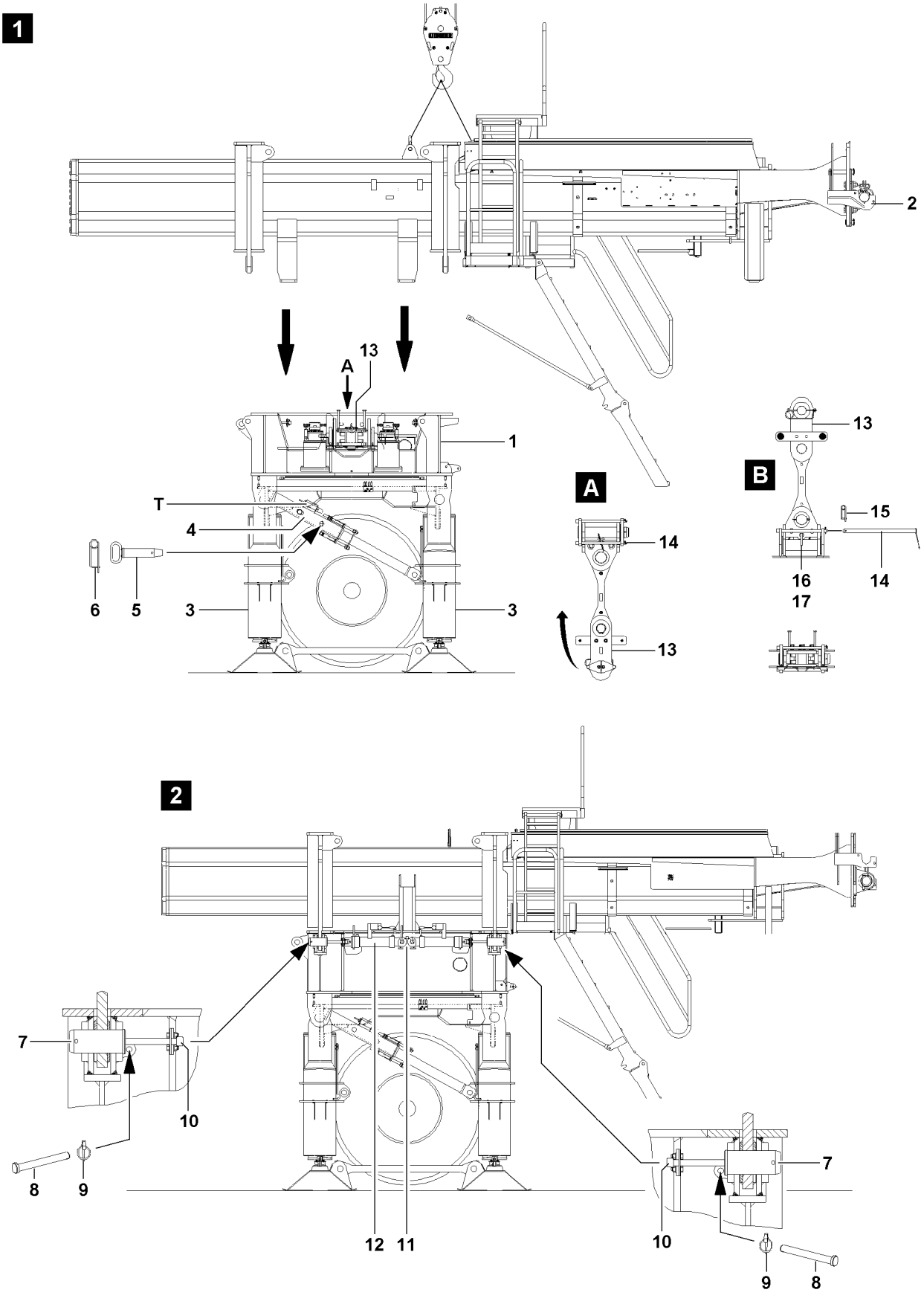
-A1210

204	Button	• Ballast trailer, move the guide cylinder in
205	Button	• Ballast trailer, move the guide cylinder out
206	Button	• Ballast trailer on turntable - unpin
207	Button	• Ballast trailer on turntable - pin
208	Button	• Move the front support cylinder in
209	Button	• Move the front support cylinder out
210	Button	• Move the rear support cylinder in
211	Button	• Move the rear support cylinder out
212	Switch	• **EMERGENCY-OFF**

Control panel

-A1230

213	Button	• Move the pull cylinder in, lift the ballast trailer
214	Button	• Move the pull cylinder out, lower the ballast trailer
215	Button	• Stop pull cylinder A
216	Button	• Stop pull cylinder B



B108748

2 Assembling the ballast trailer

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

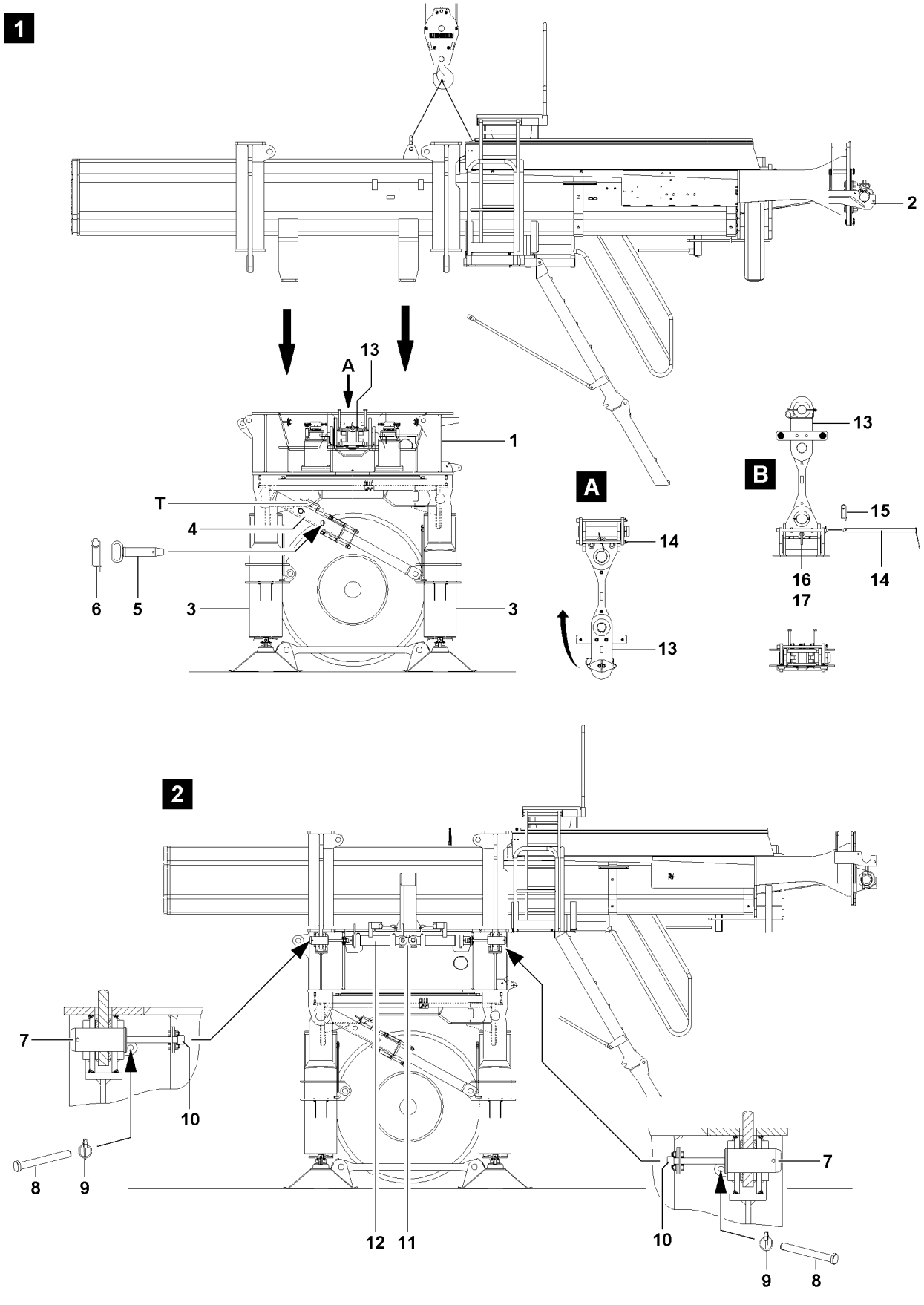
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see crane operating instructions, chapter 2.04!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

WARNING
Danger of tipping the ballast trailer!
Due to improperly carried out assembly or improper assembly conditions, the ballast trailer can tip over!
Personnel can be severely injured or killed!

- ▶ The assembly of the ballast trailer may only be carried out by authorized personnel!
- ▶ Carry out the assembly of the ballast trailer only on level ground of sufficient load bearing capacity!
- ▶ The ballast trailer has **no** brake system! The ballast trailer must be supported with the support cylinders if it is **not** pinned on the turntable!

Make sure that the following prerequisites are met:

– the placement location must be level and have adequate load bearing capacity,
– an auxiliary crane is available.



B108748

2.1 Pre-assembling the ballast trailer

Note

- ▶ Park the ballast trailer for assembly of the ballast trailer guide on level ground with sufficient load bearing capacity in the vicinity of the crane!
- ▶ Observe the safety guidelines in chapter 2.15 of the crane operating instructions!

Make sure that the following prerequisites are met:

– the locking pin **5** is pinned in and secured in the strut **4**,
– the ballast trailer is supported with the support cylinders **3** and aligned in horizontal direction.

DANGER

Danger of tipping over!

If the safety guidelines for the stability and tipping safety are not observed and the strut **4** is not pinned with the locking pin **5**, there is a danger of tipping over!

- ▶ Observe the specified stability and tipping safety for ballast trailer not assembled on the turntable!
- ▶ The strut **4** must be pinned and secured with the locking pin **5**!

2.1.1 Assembling the ballast trailer guide

Make sure that the following prerequisites are met:

– the ballast trailer guide **2** is fully moved in,
– the retaining pins **8** are released and unpinned (4x), illustration **2**,
– the connector pins **7** are unpinned (4x), illustration **2**.

WARNING

Mortal danger due to tipping ballast trailer!

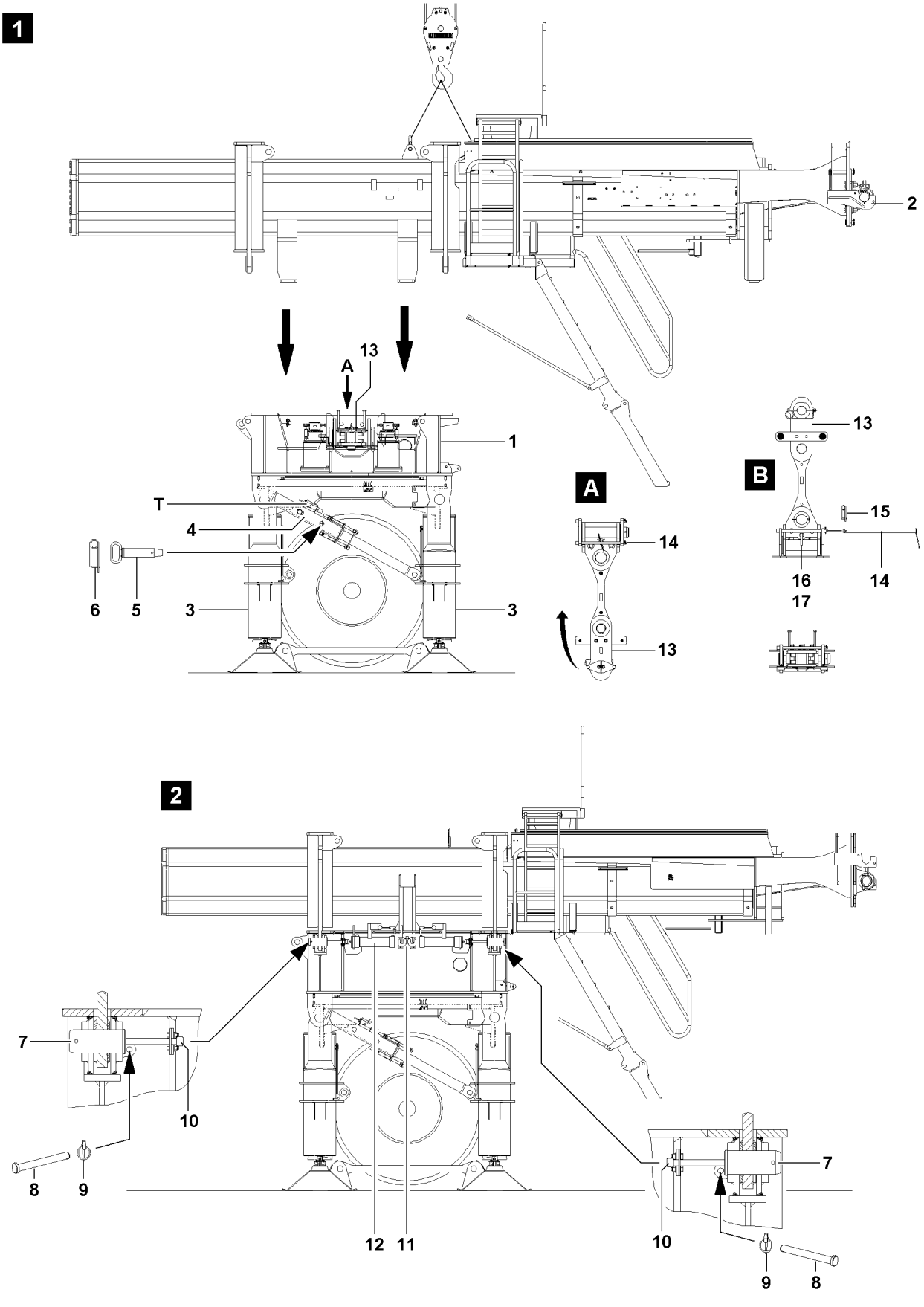
Due to unsecured or insufficiently secured connector pins, the ballast trailer guide can loosen up from the ballast frame and the ballast trailer can tip over!

Personnel can be severely injured or killed!

Significant property damage can occur on the crane and on the ballast trailer!

- ▶ Make sure before starting any crane work with the ballast trailer, that all **four connector pins 7** are properly pinned and secured!

- ▶ Attach the ballast trailer guide **2** on the auxiliary crane and swing it in and lower it to the pin points on the ballast frame **1**, see illustration **1**.
- ▶ Attach the pin pulling cylinder **12** to the retainer **11** and hook into the screw head **10**.
- ▶ Establish the hydraulic connection of the pin pulling cylinder **12** to the hydraulic aggregate, see crane operating instructions, chapter 5.30.
- ▶ When the ballast trailer guide **2** is laying completely on the ballast frame **1** and the pin bores align: Actuate the lever on the pin pulling cylinder **12** and pin in the connector pin **7**.
- ▶ Secure the connector pin **7**: Pin in the retaining pin **8** and secure with linch pin **9**.
- ▶ When all four connector pins **7** are pinned in and secured: Remove the auxiliary crane.
- ▶ Fold the access to the ballast trailer down into operating position.



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2.1.2 Bringing the guy rods on the ballast trailer into operating position

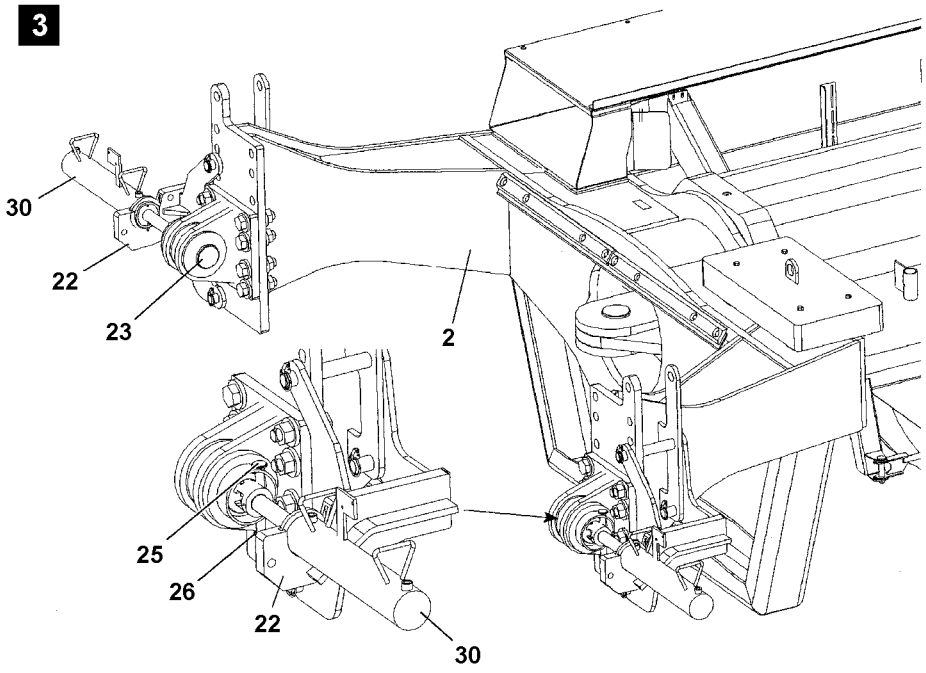
The guy rods **13** are folded down and secured in transport position on the side on the ballast frame, see illustration **1** and illustration **A**.
Make sure that the following prerequisites are met:
– the ballast trailer guide **2** is assembled and secured on the ballast frame **1**,
– the access to the ballast trailer is in operating position,
– the stability and tipping safety of the ballast trailer is ensured.

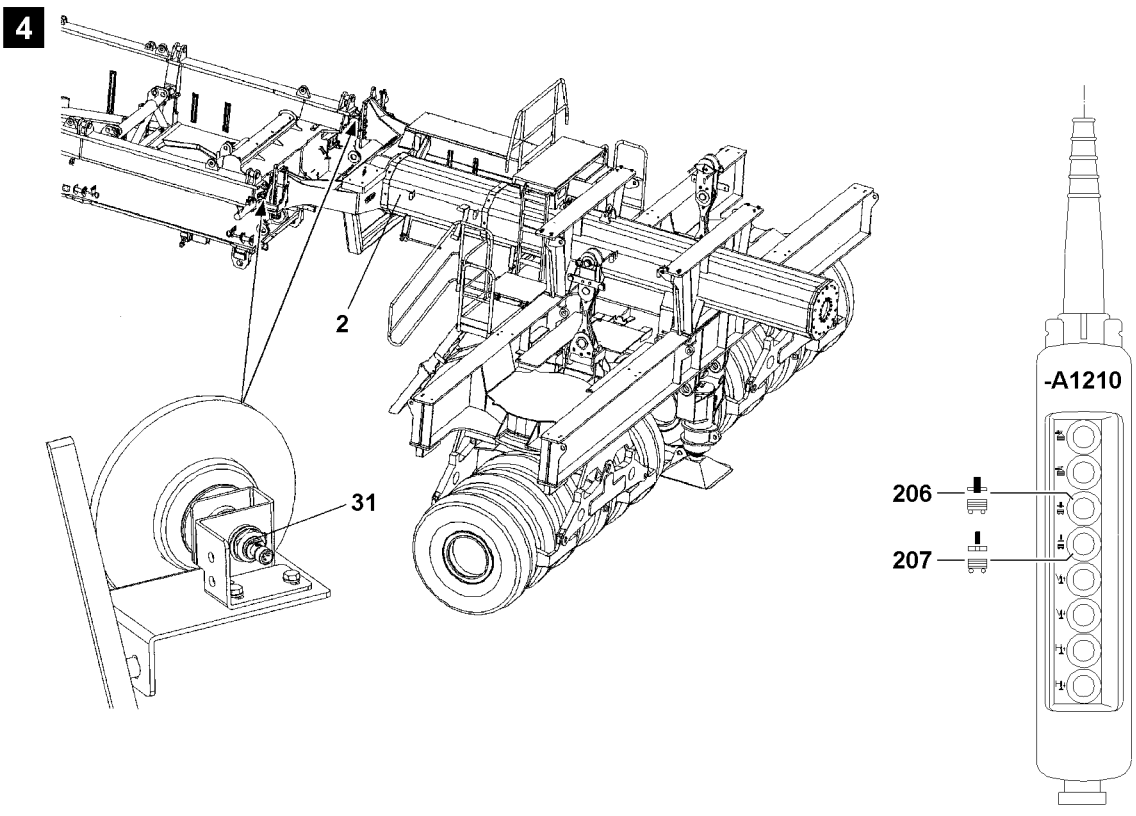
WARNING
Risk of falling!
If the following notes are not observed, the assembly personnel can fall of the ballast trailer and be severely injured or killed!
▶ Use only the access on the ballast trailer!
▶ Step on the access with utmost caution!

▶ Release and unpin the retaining pins **14**, see illustration **A**.
▶ Attach the guy rod **13** onto the auxiliary crane.
▶ Erect the guy rod **13** with the auxiliary crane to the vertical position.

DANGER
Tipping guy rod!
If the erected guy rod **13** is not secured on both sides with the retaining pin **14**, the guy rod will tip to the side when the auxiliary crane is removed!
If the erected guy rod **13** is not secured with the retaining pin **16**, the guy rod will tip to the side when the auxiliary crane is removed!
Personnel can be severely injured or killed!
▶ Make sure, before removing the auxiliary crane on the guy rod **13**, that both retaining pins **14** are always pinned and secured, **check visually**!
▶ Make sure, before removing the auxiliary crane on the guy rod **13**, that the retaining pin **16** is pinned and secured, **check visually**!

▶ When the guy rods is erected vertically:
Pin in the retaining pin **14** and secure with spring retainer **15**, see illustration **B**.
▶ When the retaining pin **14** and the retaining pin **16** are pinned and secured:
Remove the auxiliary crane.





B108749

2.2 Pin the ballast trailer on the turntable

Make sure that the following prerequisites are met:
- the crane is positioned in axial alignment, as close as possible to the ballast trailer guide,
- the crane engine is turned off,
- the ballast trailer is supported.

2.2.1 Establishing the electrical connection from the ballast trailer to the turntable

Note
- ▶ For assembly of the ballast trailer, the electrical connection from the ballast trailer to the turntable must be established to be able to control the support cylinders, if necessary!
- ▶ The “Ballast UP/DOWN” release is available, independent if the ballast trailer is assembled, providing the conditions in the shut off diagram are fulfilled!
- ▶ The “Ballast UP” release allows the entry of the pull and support cylinders!
- ▶ The release “Ballast DOWN” allows the extension of the pull and support cylinders!
- ▶ This means, the support cylinders and the pull cylinders can be moved, even if the “Ballast trailer pinned” signal is not yet present!

Note
- ▶ To establish the electrical connections, use the separate electrical wiring diagram!

▶ Establish the electrical connections.

2.2.2 Establishing the hydraulic connection from the ballast trailer to the turntable

When hydraulic lines are connected and disconnected with quick-release couplings, make ensure that the coupling procedure is being performed correctly.

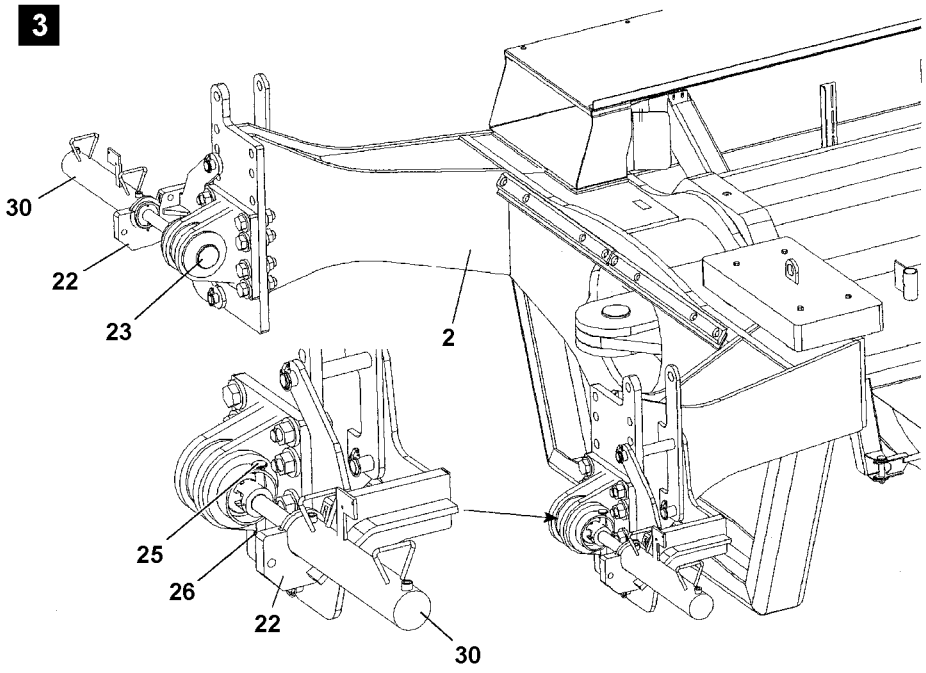
DANGER
Risk of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious accidents due to component failure!
- ▶ Check that the quick-release couplings have been properly connected before using the crane!

▶ Release the pressure in the hydraulic system before connecting and disconnecting: Turn the engine off and wait for short time.

▶ Assemble coupling components (sleeve and connector) and screw together using hand-tightened nut.

▶ Tighten hydraulic coupling by hand: Rotate hand-tightened nut until it reaches a tangible, fixed stop position.

3



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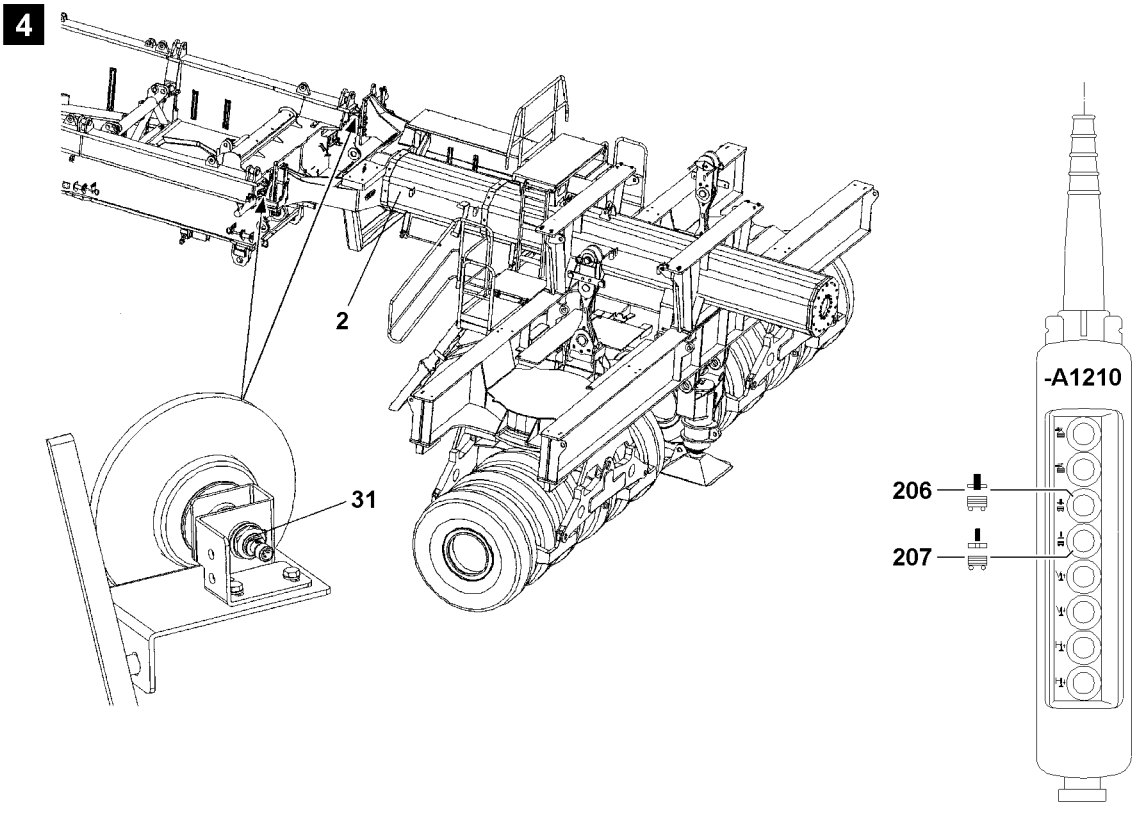

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2.2.3 Aligning the ballast trailer

Make sure that the following prerequisites are met:
– the electrical and hydraulic connections from the turntable to the ballast trailer are established,
– the connector pins **23** are unpinned,
– the crane has been moved to the pin points on the ballast trailer guide.

▶ Align the ballast trailer by lifting or lowering it in such a way that the pin bores on the turntable and the ballast trailer guide align.

Note
▶ To be able to align the pin bores between the turntable and the ballast trailer guide, it may be necessary to “swing” the turntable somewhat, check visually!

DANGER
Danger due to operating error!
When “swinging” the turntable, severe accidents can occur!
Personnel can be severely injured or killed!
Significant damage can occur on the crane and on the ballast trailer!
▶ Initiate all movements with utmost caution and at the least possible speed!
▶ It is prohibited to stand in the danger zone while “swinging”!

▶ Align the ballast trailer until the pin bores align.

2.2.4 Pin procedure

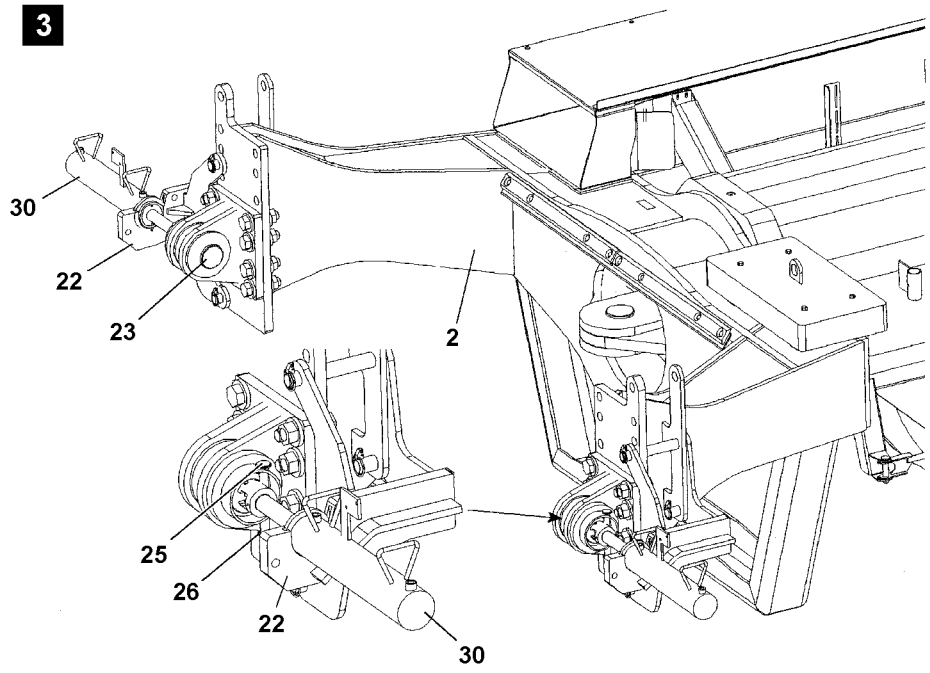
Make sure that the following prerequisites are met:
– the ballast trailer is aligned on the turntable,
– the pin bores between the turntable and the ballast trailer guide align.

NOTICE
Damage to the pin pulling device!
If the retaining pins **25** are not unpinned before the pin procedure, the pin pulling device **22** can be damaged!
▶ The retaining pins **25** on the pin pulling device **22** must be released and unpinned before pinning the connector pins **23**!

▶ Release the retaining pins **25** and unpin at both sides.
▶ Press the button **207** on the control panel **-A1210**.

Result:
– The pin pulling cylinders **30** move out.
– The connector pins **23** move out and the ballast trailer is pinned on the turntable.

3



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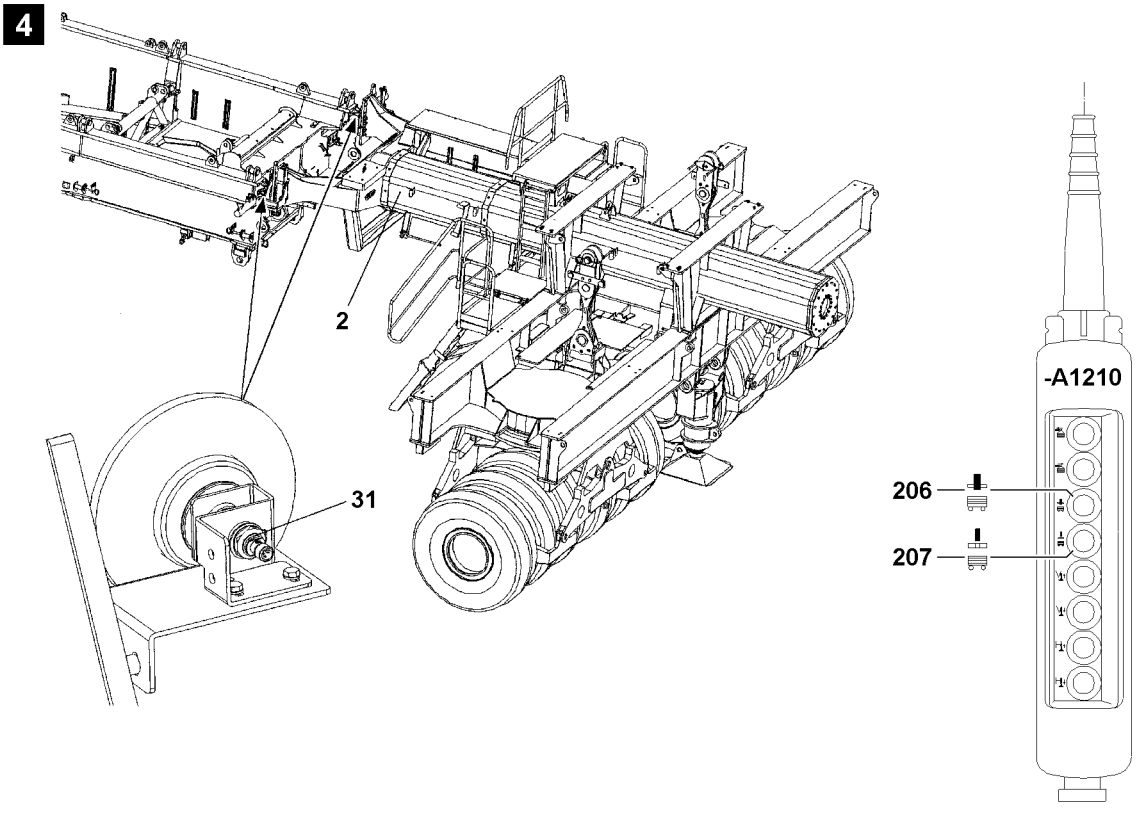

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Note

- The crane control system recognized with the left and right limit switch initiators **31** of the pin points, if the connector pins **23** on the turntable are fully pinned!
- If both connector pins **23** are fully and correctly pinned, the crane control, via the limit switch initiators **31** receives the message, “Ballast trailer installed on left” and “Ballast trailer installed on right. ” Which means: The turntable can no longer be turned and the crawler cannot be moved!
- After pinning, it must be checked again if the electrical and hydraulic connector lines are fully and correctly connected!
- The control release for the crane is only made when the wheels sets are in one of the required positions, “circular travel”, “towing” or “parallel travel”!

DANGER

Danger due to operating error!

If only one connector pin **23** is pinned and if the crane control therefore has only one message “Ballast trailer installed” from a limit switch initiator, then the turntable can be turned anyway and the crane can be moved!

Personnel can be severely injured or killed!

The crane or the ballast trailer can be severely damaged!

- Carry out all movements with utmost caution and at the least possible speed!

- When the ballast trailer is pinned on the turntable on both sides:
  Secure the connector pins **23** through the retaining pins **25**, see illustration **3**.
- Pin in the retaining pin **25** on the safety device.
- Secure the retaining pins **25** with linch pins **26**.

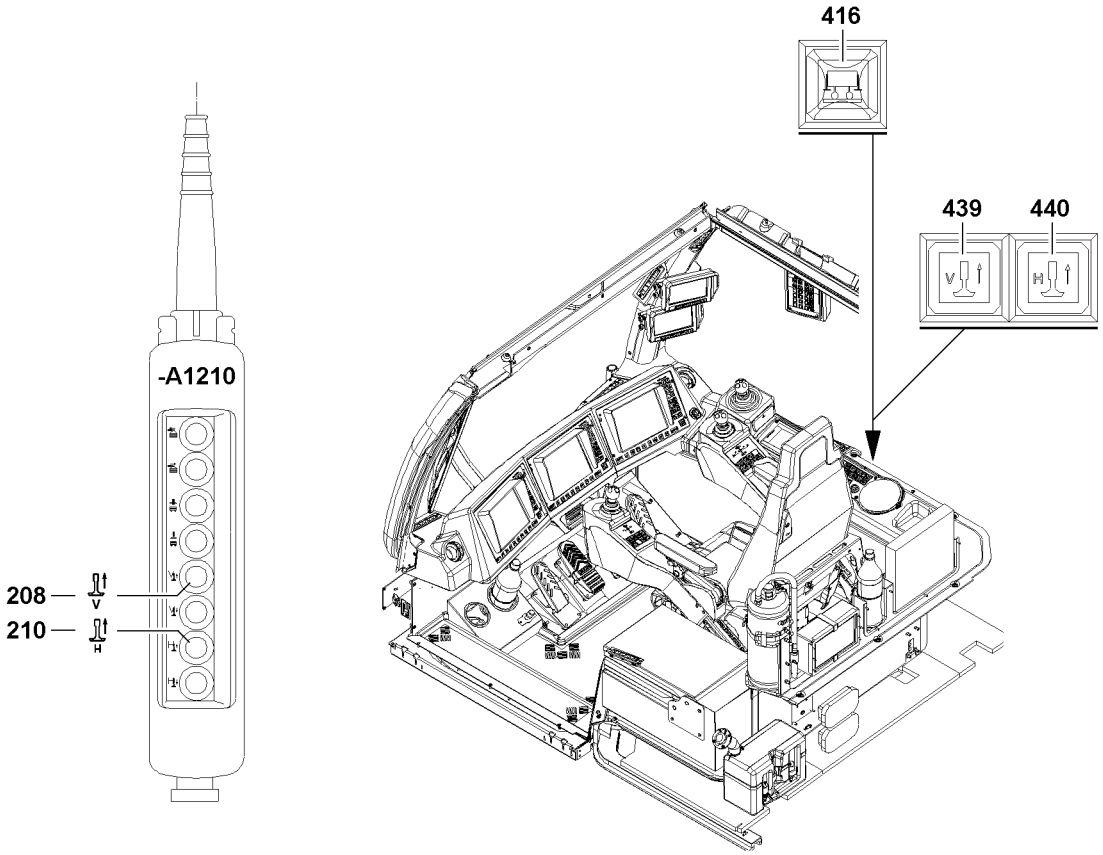
Troubleshooting

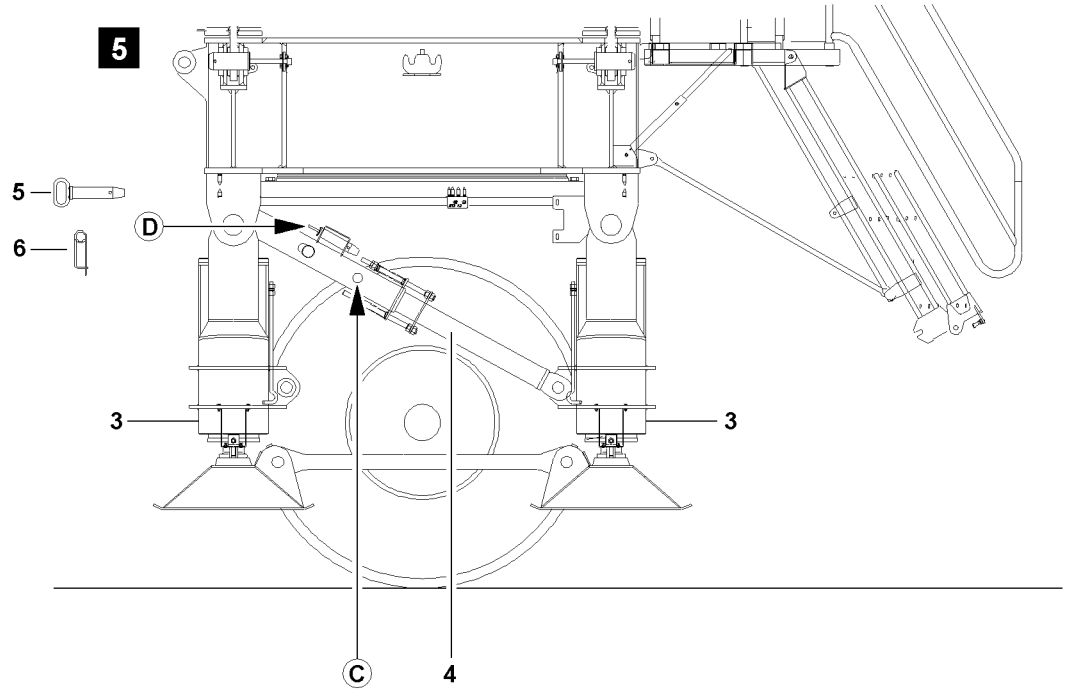
The second connector pin **23** cannot be pinned?

You did not align the ballast trailer exactly before assembly.

- Slightly lift or lower the ballast trailer via the support cylinder.
- Carefully telescope the ballast trailer guide in or out.
- Carefully swing the turntable after.

- When the second pin bore aligns between the turntable and ballast trailer guide **2** align:
  Pin in the second connector pin **23** with the pin pulling device.





B108968

2.3 Moving the support cylinders in

Note

- ▶ The support cylinders **3** can be moved in via the control panel **-A1210**, or via the corresponding button on the instrument panel of the crane operator's cab!
- ▶ When the pin procedure between the ballast trailer and the turntable is completed, move the support cylinders **3** in!

Make sure that the following prerequisites are met:

– the ballast trailer is pinned and secured on the turntable on both sides,
– the electrical and hydraulic connections are connected.

Move the support cylinders 3 in completely on the front and rear:

▶ press the button **439** and button **440** in the crane operator's cab,

or

■ press the button **208** and button **210** on the control panel **-A1210**.

Result:

– The support cylinders **3** move in.

Note

- ▶ The locking pin **5** can only be unpinned if the support cylinders **3** are relieved!

▶ When the support cylinders **3** are relieved:
Release and unpin the locking pin **5** on the strut **4** at point **C** .

▶ Insert the locking pin **5** into the transport retainer, point **D**, and secure with spring retainer **6**.

NOTICE

Damage of ballast trailer!

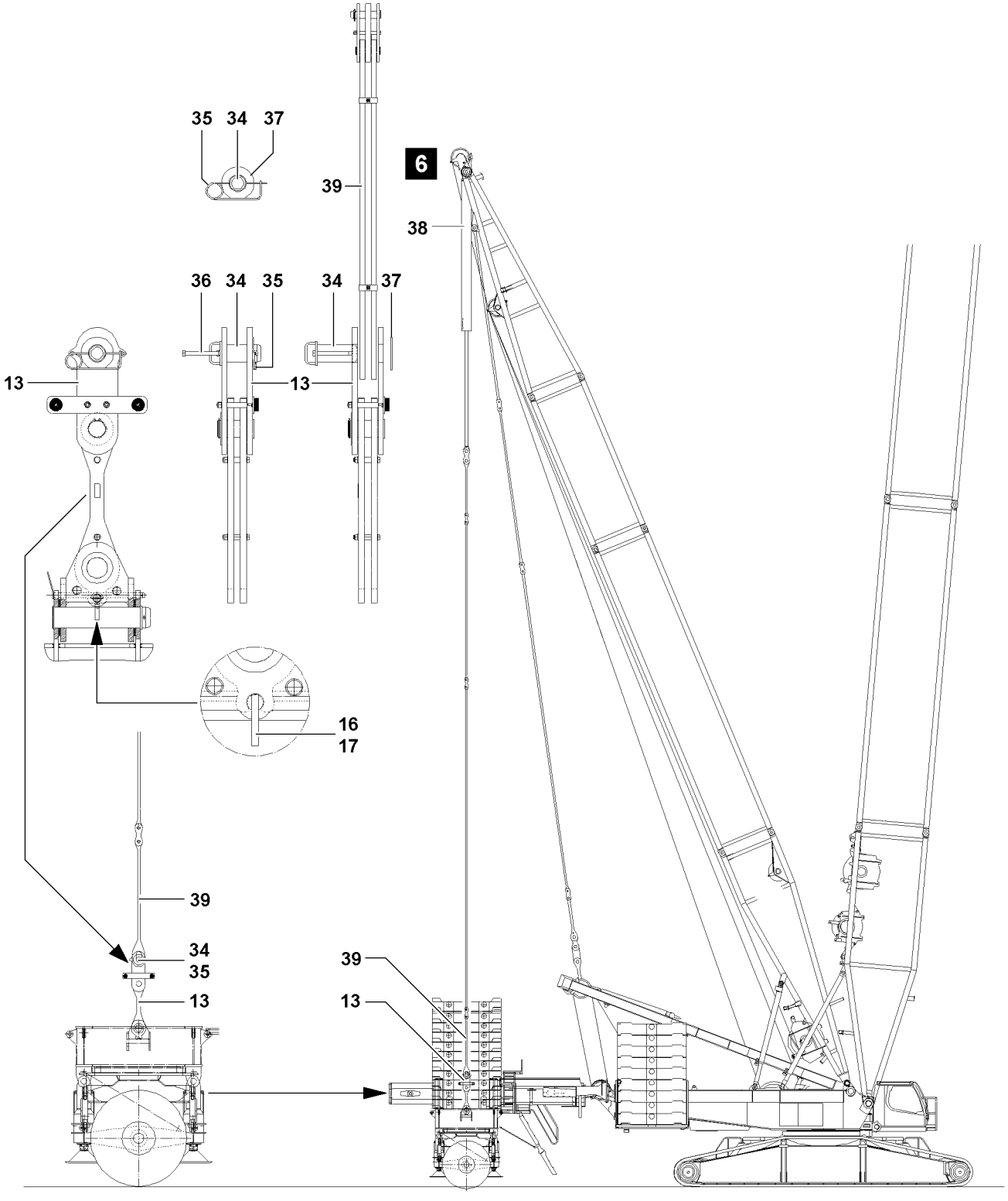
If the following notes are not observed, the support cylinders of the ballast trailer can be significantly damaged!

- ▶ Unpin the locking pins **5** as soon as the ballast trailer is assembled on the turntable and the support is relieved!
- ▶ When the ballast trailer is assembled and ballasted on the turntable, then the locking pin **5 must** be unpinned so that the level between the strut **4** and the support cylinders **3** can be adjusted!
- ▶ Supporting the ballasted ballast trailer with pinned strut **4** is prohibited!

▶ Move the support cylinders **3** in all the way.

Result:

– The warning light **416** (“Ballast trailer support moved in”) lights up.



B108750

2.4 Assembling the ballast trailer guying

Make sure that the following prerequisites are met:

– the derrick boom radius is 13 m,
– the ballast trailer radius is 13 m,
– the guy rods **13** on the ballast trailer are in operating position and are pinned and secured, see section “Bringing the guy rods on the ballast trailer into operating position”,
– the guy rods on the derrick boom are pinned and secured.

Note

▶ The ballast trailer guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods!

The guy rods **39** of the derrick boom are to be pinned with the guy rods **13** on the ballast trailer. The connector pins **34** are held in “pulled” condition by the allen screws **36** in pin position.

▶ Unpin the connector pin **34**: Remove the spring retainer **35** and unpin connector pins **34** on both sides.
▶ Position the guy rods **39** by moving the pull cylinder **38** out over the guy rods **13**.
▶ Align the guy rods **39** on the guy rods **13**.
▶ Pin the guy rods **39** on both sides with the guy rods **13**: Pin in the connector pins **34**.
▶ Secure the connector pins **34** with washer **37** and spring retainer **35**.

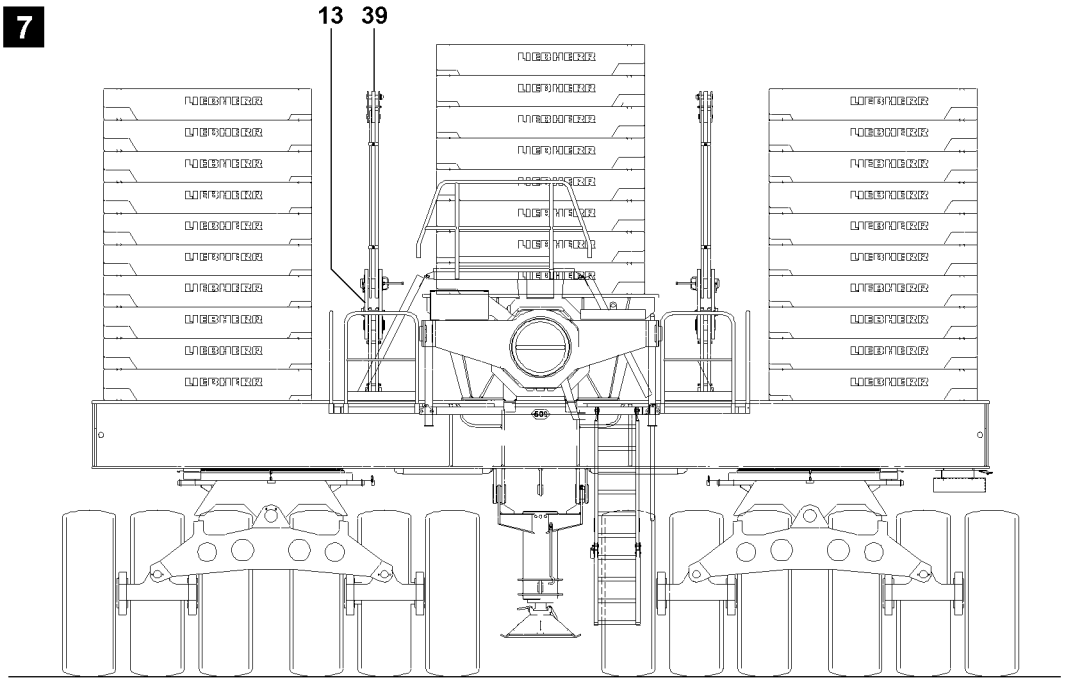
DANGER

Toppling guy rods!
When the retaining pins **16** are removed, the guy rods **13** tip to the side!
Personnel can be severely injured or killed!

▶ Before unpinning the retaining pin **16**, make sure that the entire derrick guying is properly pinned and secured!
▶ It is **prohibited** to unpin the retaining pins **16** as long as it is not ensured that the guy rods **39** are pinned and secured with the guy rods **13**, check visually!
▶ For crane operation with ballast trailer, the retaining pins **16** must be unpinned!

▶ When the guy rods **39** are pinned and secured with the guy rods **13** on both sides:
▶ Release and unpin the retaining pin **16**.

7



B108751

2.5 Ballasting the ballast trailer

Note

▶ The ballast plates are marked with their own weights!

WARNING

The crane can topple over!

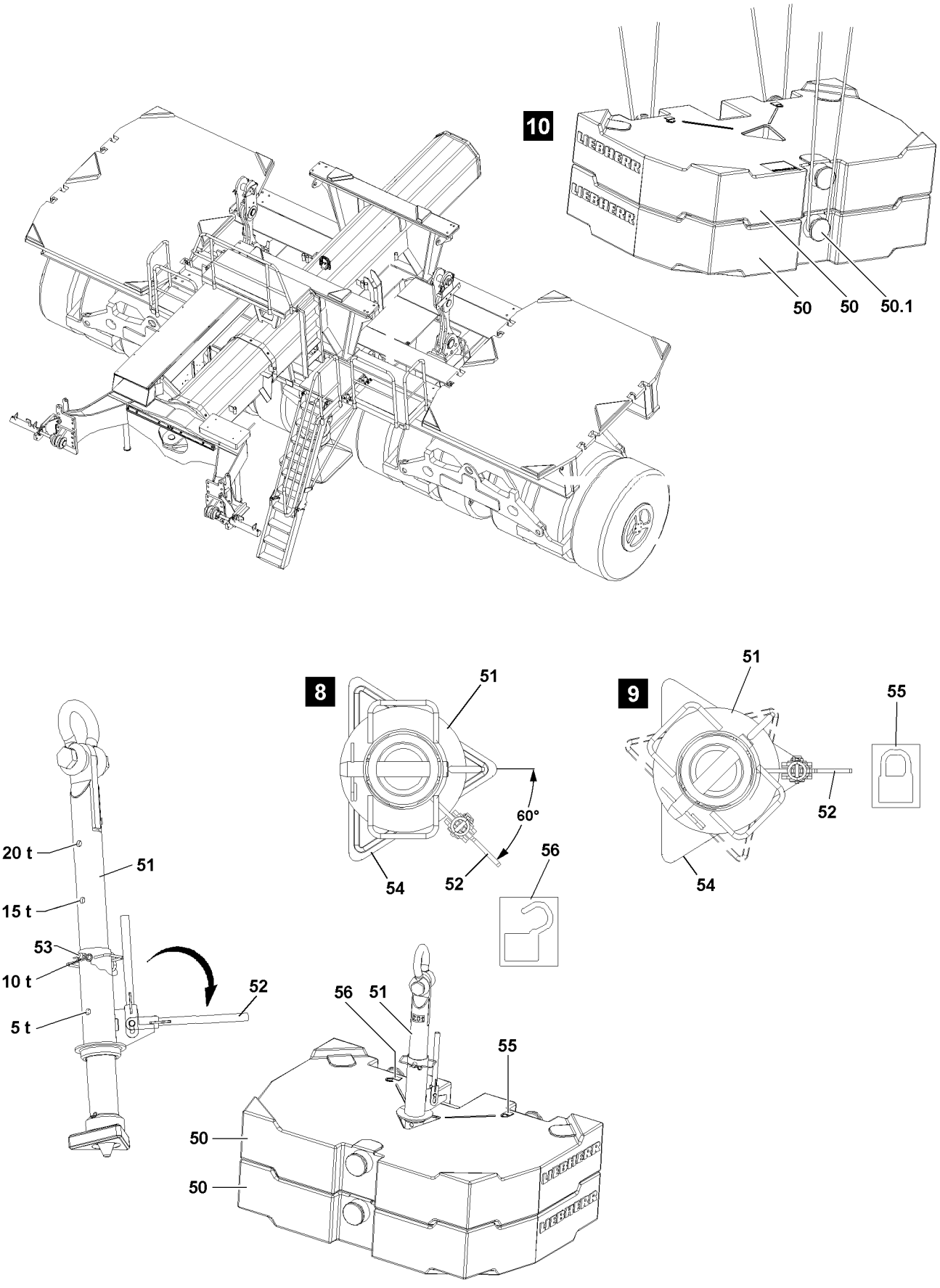
If the following danger notes are not observed, the ballast plates or the ballast stack can slip on the ballast trailer and fall down!

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

- ▶ The ground on which the ballast trailer is ballasted must be level and have adequate load-bearing capacity!
- ▶ Place the ballast plates always symmetrically, in reference to the longitudinal axis!
- ▶ The outer ballast stacks must weigh the same and be the same height after ballasting!
- ▶ The ballast stacks may only be stacked to three times the height of the ballast plate width!
- ▶ When ballasting on and off in **suspended condition**, the weight difference between the left and right ballast stack may be no more than maximum 20.0 t!
- ▶ The outer ballast stacks can differ in stack height from the inner ballast stacks!
- ▶ The maximum permissible total weight of the ballast trailer may not exceed 350 t!
- ▶ Secure all ballast plates so they cannot move and fall down!
- ▶ Replace damaged ballast plates immediately with new ballast plates!

Ensure that the following prerequisites are met:

- the ballast trailer is pinned and secured on the turntable on both sides,
- the ballast trailer is properly pinned and secured to the derrick ballast guying,
- the retaining pins **16** are unpinned,
- an auxiliary crane is available.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B108920

2.5.1 Stacking the ballast plates on the ballast trailer, attachment system: “Twistlok”

WARNING
Risk of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged!
Personnel can be severely injured or killed!
- ▶ Make sure that the ballast plates are laying correctly in the centerings!
- ▶ Replace damaged ballast plates!

To stack the ballast plate(s) **50**, use the receptacle stud **51**.
Before the receptacle stud **51** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **51** is set correctly. The length of the receptacle stud **51** can be adjusted with the pin **53**.

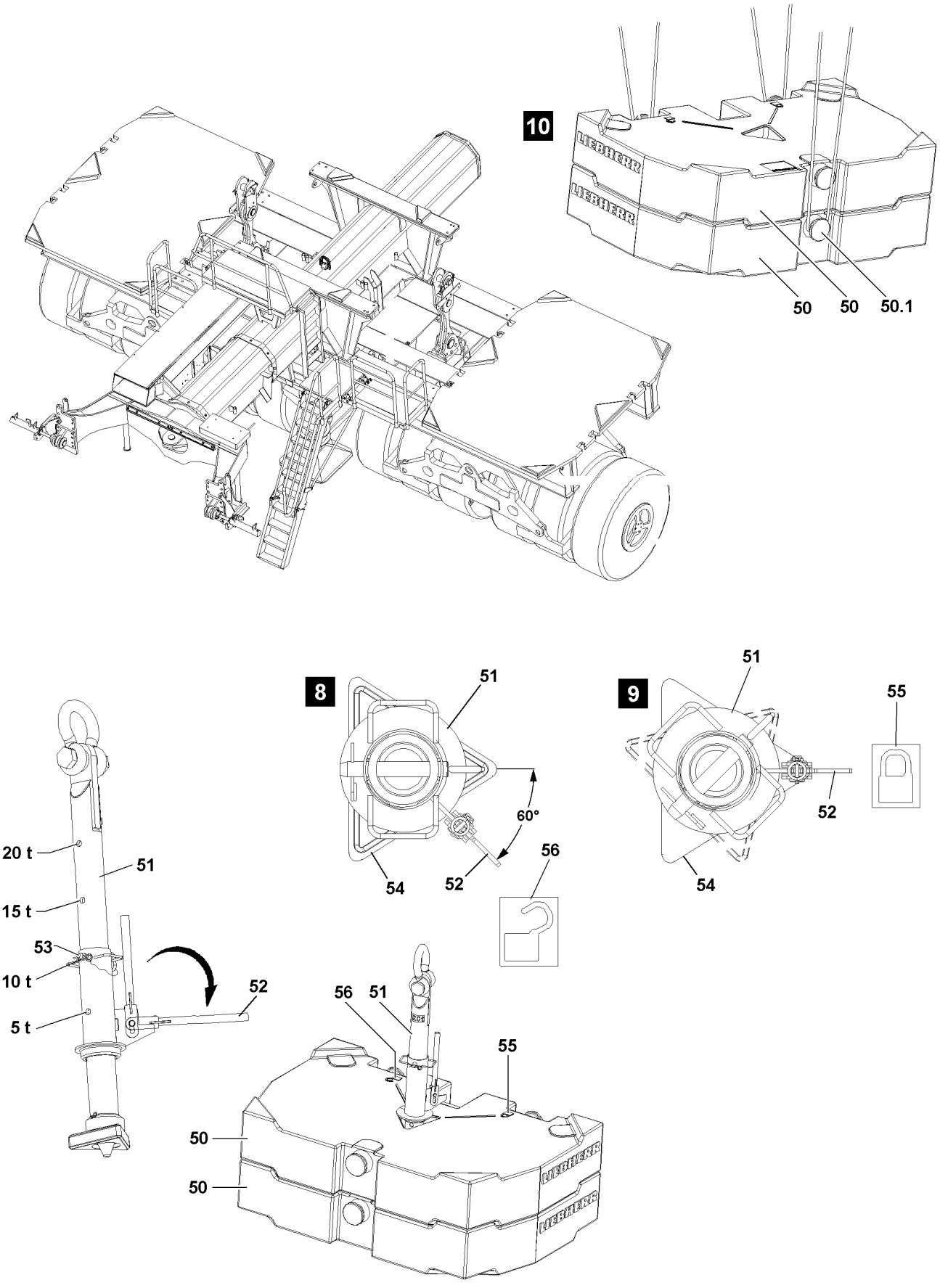
- ▶ If the length of the receptacle stud **51** is to be adjusted:
  Release and unpin the pin **53**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **51**.
- ▶ Pin in the pin **53** and secure with spring retainer.
- ▶ Attach the receptacle stud **51** on the auxiliary crane and guide it into the ballast plate(s).
- ▶ Pull up the lever **52** and fold it down.
- ▶ Turn the lever **52** by 60° until the lever **52** points to the icon **55**, see illustration **9**.

Result:
– The receptacle stud **51** is locked with the ballast plate.

- ▶ Lift always one ballast plate with the receptacle stud **51** and place it carefully on the centerings on the ballast trailer or on another ballast plate **4**.
- ▶ Turn the lever **52** by 60° until the lever **52** points to the icon **56**, see illustration **8**.

Result:
– The receptacle stud **51** is unlocked.

- ▶ Carefully pull the receptacle stud **51** from the ballast plate.
- ▶ Stack the ballast plates according to the load chart, observe the danger notes.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B108920

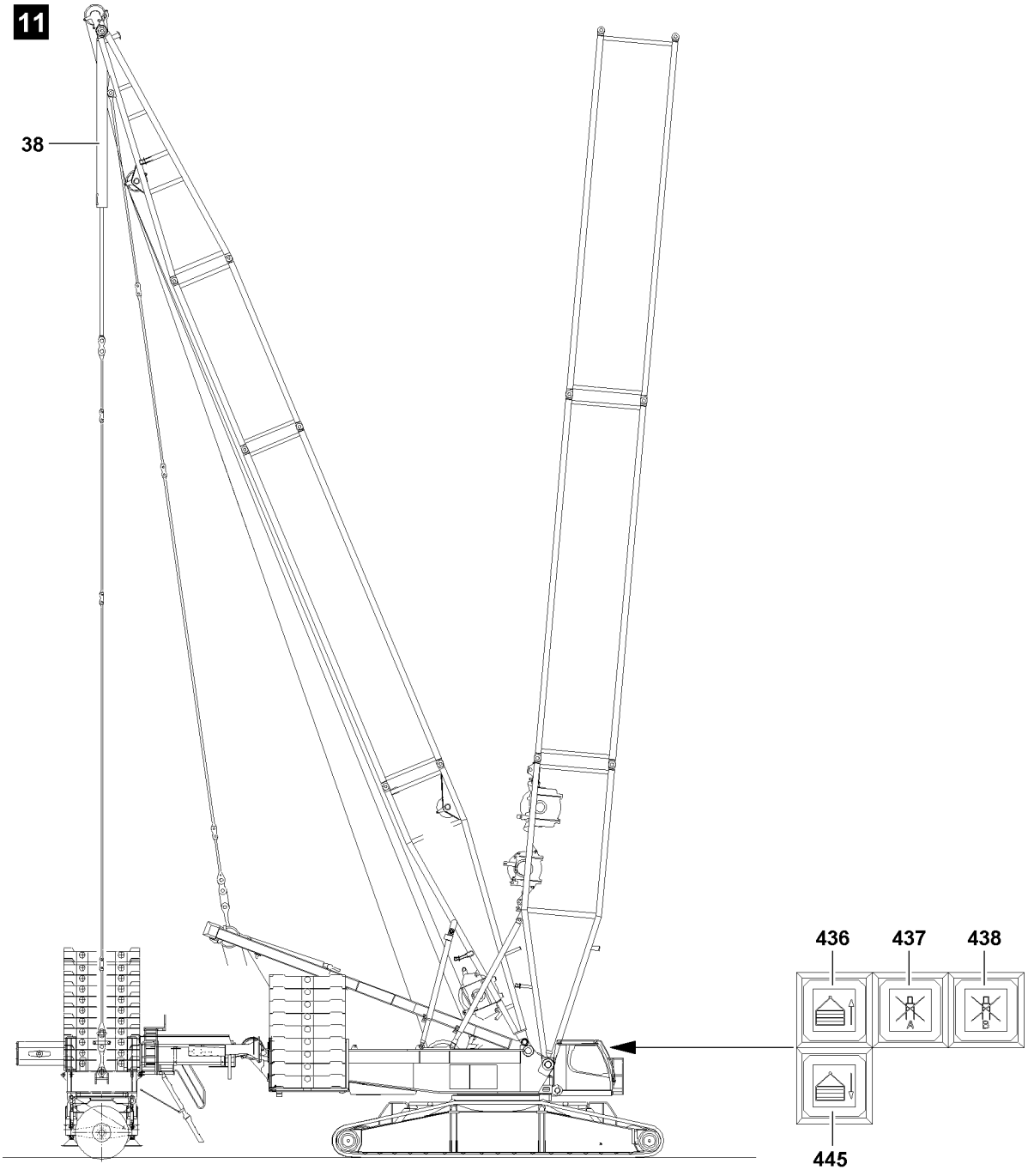
2.5.2 Stacking the ballast plates on the ballast trailer, attachment points: Bitt

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **3.1** are overloaded and the ballast plates can fall down!
Personnel can be severely injured or killed!
- ▶ Lift no more than maximum 20 t with the ropes, 3 attachment points!
- ▶ Replace damaged ballast plates immediately!

WARNING
Incorrect handling of the attachment equipment!
If attachment equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the attachment equipment is correctly attached on the bitts **50.1** and that it is secured sufficiently to prevent it from loosening up!

Note
- ▶ Place the ballast plates individually or as a ballast assembly, maximum 20 t!
- ▶ The weight difference between the outer ballast stacks no more than maximum 20 t !
- ▶ 20 t ballast assembly, see illustration **10**!

- ▶ Use the auxiliary crane to evenly distribute the ballast plates **50** on the ballast trailer and center them on the centering points.
- ▶ Stack the ballast plates according to the load chart.



B108752

2.6 Lifting and lowering the ballast trailer with the pull cylinders

The pull cylinders **38** in the derrick ballast guying can only be controlled from the crane operator's cab.

Note

- If the ballast trailer is raised via the button **436** or lowered via the button **445**, then the horizontal alignment of the ballast trailer is automatically regulated by a level sensor!
- For a ballast utilization of **more than** or **equal to** 90 %, the level regulator regulates the ballast trailer level to ± 0,45°!
- At a ballast utilization of **less than** 90 %, the level sensor regulates the ballast trailer level to ± 2.5°! This makes it possible to set the ballast trailer down to a ground slope of 2.5°!

DANGER

Risk of accident!

If the following notes are not observed, personnel can be severely injured or killed!

In addition, damage can occur on the ballast trailer!

- When lifting or lowering the ballast trailer, pay attention to the horizontal alignment of the ballast trailer!
- When lifting or lowering the ballast trailer, the forces in the ballast guyings must be regularly checked on the LICCON monitor! If the difference of the forces between the “derrick ballast guying A” and “derrick ballast guying B” are too large, an acoustical warning will be issued and the values on the LICCON monitor blink, see also section “Difference force monitoring of ballast guying”!
- When pressing the button **437** (“cylinders A on the derrick ballast stop”) or the button **438** (“cylinders B on the derrick ballast stop”) then the level sensor is bypassed and the ballast trailer can be included within the limited angle range. This is only permitted when setting down the ballast trailer on uneven ground and applying utmost caution!

2.6.1 Lifting the ballast trailer

- Press the button **436**.

Result:

– The ballast trailer is raised.

2.6.2 Lowering the ballast trailer

- Press the button **445**.

Result:

– The ballast trailer is lowered.

2.6.3 Stopping the pull cylinder on the derrick ballast

- Press the button **437**.

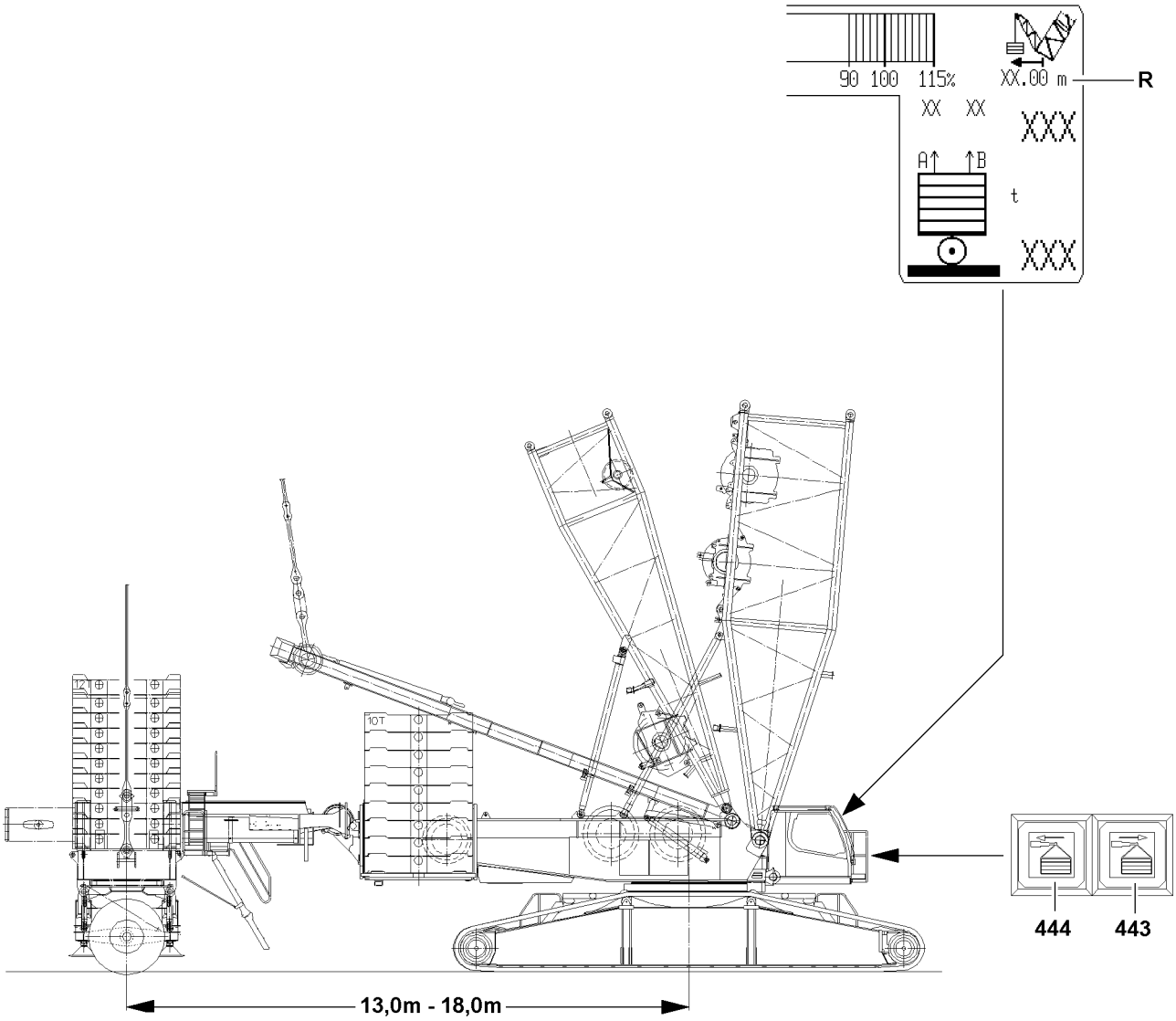
Result:

– The pull cylinder (A) on the derrick ballast is stopped.

- Press the button **438**.

Result:

– The pull cylinder (B) on the derrick ballast is stopped.



B108784

3 Setting the ballast trailer radii

The ballast trailer can be telescoped hydraulically from 13 m to 18 m.
The ballast trailer is equipped with a telescopable ballast trailer guide. This allows the derrick ballast radius to be adjusted to suit the environment or type of lifting work. The derrick ballast radius **R** is displayed on the LICCON monitor.

Note

- ▶ The release for telescoping the ballast trailer guide our and in is only given when the wheel sets are in “towing” mode, see section “Towing”!
- ▶ If the ballast trailer is supported for installation on the turntable, then it is possible to telescope the ballast trailer guide out and in with reduced pressure!
- ▶ When telescoping the ballast trailer guide out, monitor the derrick ballast radius **R** on the LICCON monitor constantly!
- ▶ The crane operator may not blindly rely on the derrick ballast radius measurement, he must think for himself and check if the length sensor measure functions correctly, see chapter 4.02 in the crane operator's instructions!

3.1 Telescoping the ballast trailer guide out

Ensure that the following prerequisite is met:
– the wheel sets of the ballast trailer are in “towing” position.

▶ Press the button **443**.

Result:
– The ballast trailer guide moves out.

▶ Observe the force display in the derrick guying $F1_{min}$ -$F1_{max}$.

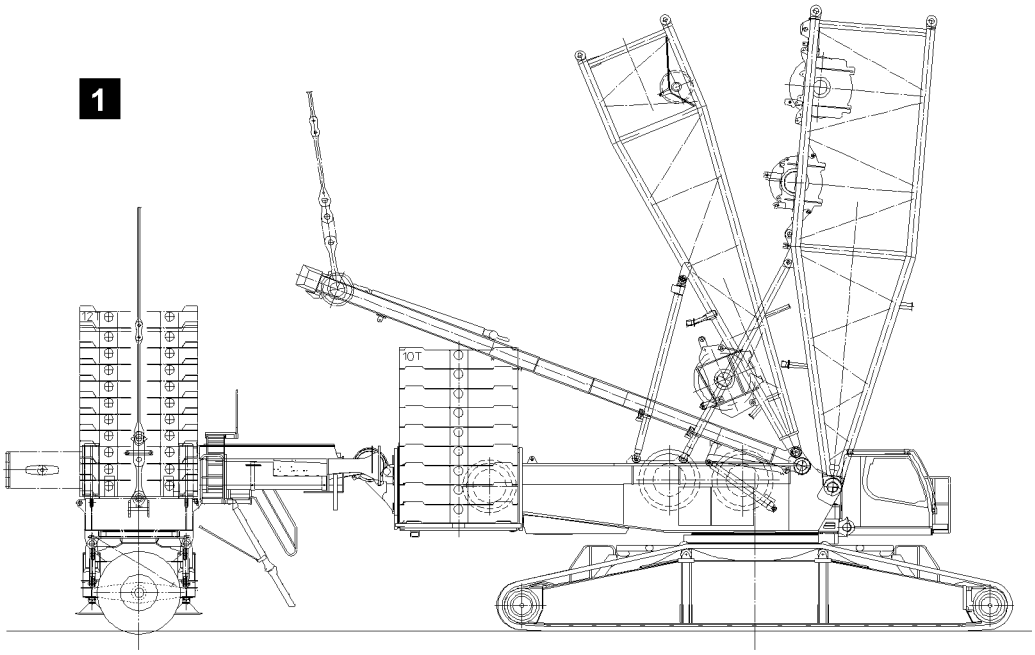
3.2 Telescoping the ballast trailer guide in

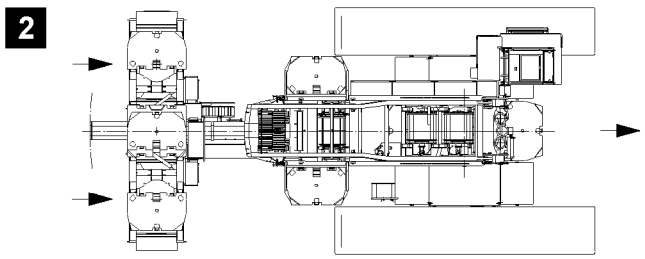
Ensure that the following prerequisite is met:
– the wheel sets of the ballast trailer are in “towing” position.

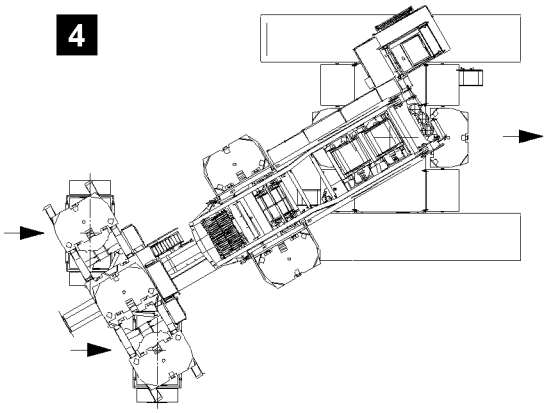
▶ Press the button **444**.

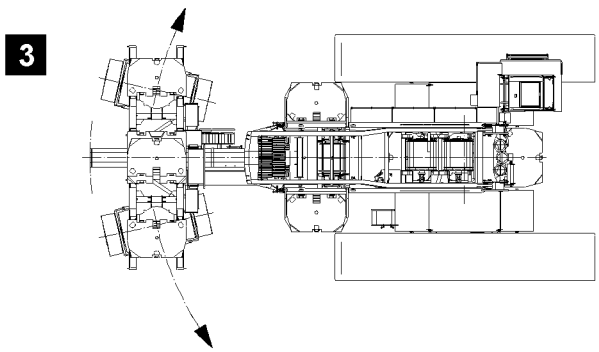
Result:
– The ballast trailer guide moves in.

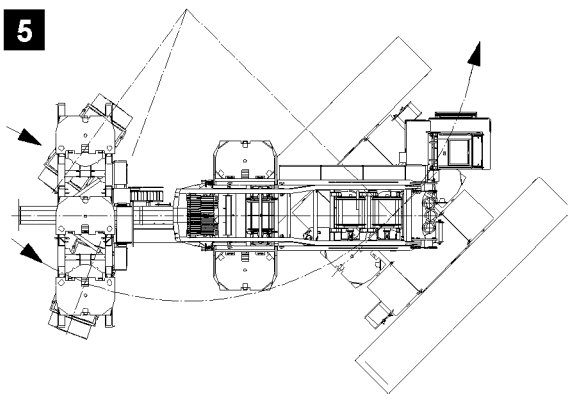
▶ Observe the force display in the derrick guying $F1_{min}$ -$F1_{max}$.











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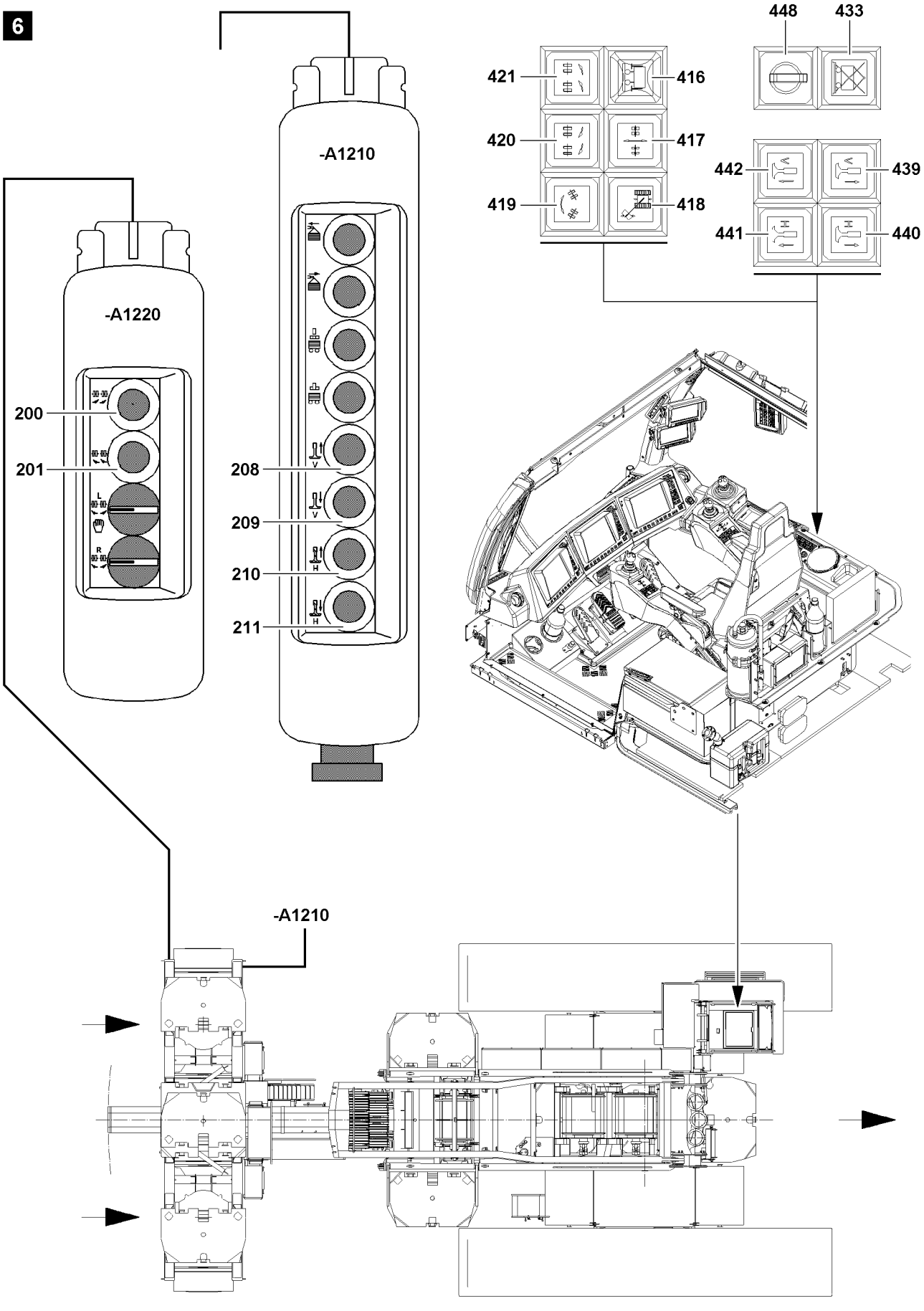
4 Steering programs

The ballast trailer has the following computer controlled steering programs:
- Towing, illustration **2**
- Circular travel, illustration **3**
- Parallel travel, illustration **4**
- Resteering, illustration **5**

The steering programs “towing”, “circular travel” and “parallel travel” can only be actuated from the crane operator's cab.

WARNING
Danger when moving the wheel sets on the ballast trailer!
When moving the wheel sets on the ballast trailer, personnel can be severely injured or killed!
- ▶ The crane operator as well as any operating personnel must make sure that there are no persons within the danger zone - between the wheel sets!
- ▶ It is prohibited for anyone to remain between the wheel sets for all setting / adjustment work on the ballast trailer!
- ▶ It is prohibited to anyone to remain between the wheel sets when selecting the various steering programs!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4.1 Notes to change the wheel sets

Note

▶ The buttons for the setting of the various steering programs are in the instrument panel of the crane operator's cab, see crane operating instructions, chapter 4.01!

Moving the wheel sets for “towing” is made with the button **417**.
Moving the wheel sets for “circular travel” is made with the button **419**.
Moving the wheel sets for “parallel travel” is made with the button **418**.
The wheel sets are resteered “to the right” with the button **420** from the crane operator's cab, or with the button **201** from the control panel **-A1220** on the ballast trailer.
The wheel sets are resteered “to the left” with the button **421** from the crane operator's cab, or with the button **200** from the control panel **-A1220** on the ballast trailer.
The manual change of the wheel sets for assembly purposes is only possible with the buttons on the control panel **-A1220** on the ballast trailer.

Note

▶ If the ballast trailer is suspended, the wheel sets can be positioned in any mode, if the key button **448** “Ballast trailer lifted off” was turned on! Turning and driving the crane is possible!

NOTICE

Danger of accidents when turning or driving!
If the lifted off ballast trailer scrapes on the ground- with turned on key button **448** - when turning or driving the crane, then the ballast trailer and the crane can be significantly damaged!

▶ If the ballast trailer has been lifted off the ground, the key button **448** “Ballast trailer lifted off” is actuated, then it must be checked that the wheels do **not scrape on the ground**! An instructed person must check visually!
▶ It is prohibited for anyone to remain in the danger zone!

4.2 Adjustment procedure

The adjustment procedure for the various steering programs is identical.

Note

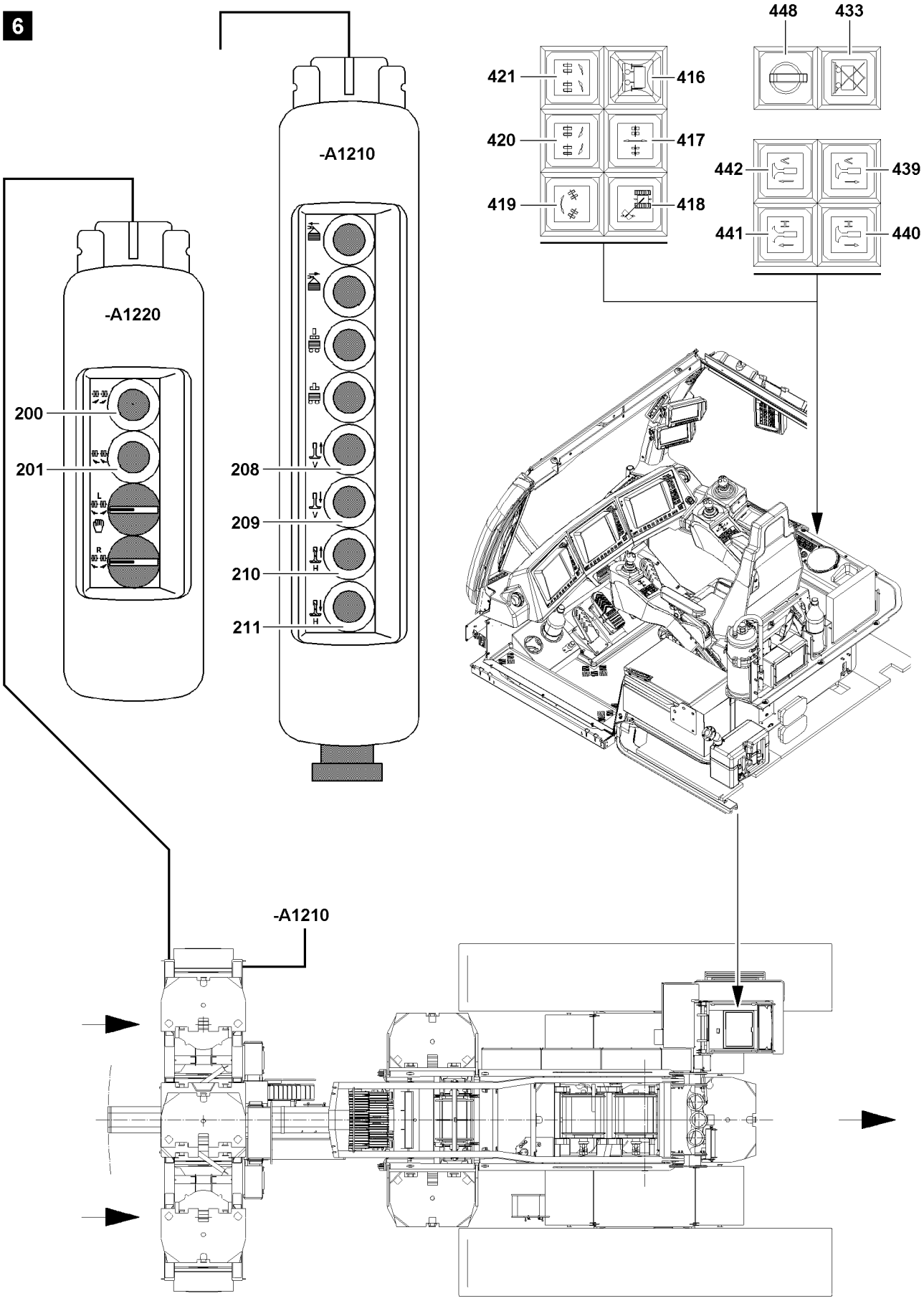
▶ If the ballast trailer is **not loaded**, the wheel sets can be changed without relieving the tires!
▶ If the ballast trailer is **loaded**, the ballast trailer must be raised first with the support cylinders until the tires are relieved!

DANGER

Risk of accident from overloading the crane!
By raising the ballast trailer with the support cylinders, the force at test point 1 (MS1) can increase to the permissible maximum value. The extension of the support cylinders is then turned off!

▶ Monitor the actual force display of test point 1 (MS1) on the LICCON monitor and stop the extension of the support cylinders in time before the shut off, see crane operating instructions, chapter 4.02!

▶ Actuate the support cylinders from the crane operator's cab and at the same time, monitor the “Actual force display of test point 1 (MS1)” on the LICCON monitor.
▶ Before reaching the maximum operating force, “$F1_{max\text{-}operation}$”: Stop the extension of the support cylinders.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4.3 Towing

4.3.1 Raising the ballast trailer with the support cylinders

Note
▶ The support cylinders of the ballast trailer must always be moved out evenly!

Move the front and rear support cylinders out:
▶ Press the button **442** and button **441** in the crane operator's cab.

or

■ Press the button **209** and button **211** on the control panel **-A1210**.

4.3.2 Aligning the wheel sets in towing position

Ensure that the following prerequisite is met:
– the ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

▶ Press the button **417**.

Result:
– The wheel sets of the ballast trailer are aligned in towing position.
– During the turning procedure of the wheel sets, the indicator light in the button **417 blinks**.
– When the towing position is reached, the indicator light in the button **417 lights up**.

4.3.3 Lowering the ballast trailer with the support cylinders

Note
▶ The support cylinders of the ballast trailer must always be moved in evenly!

Move support cylinders in completely on the front and rear:
▶ Press the button **439** and button **440** in the crane operator's cab.

or

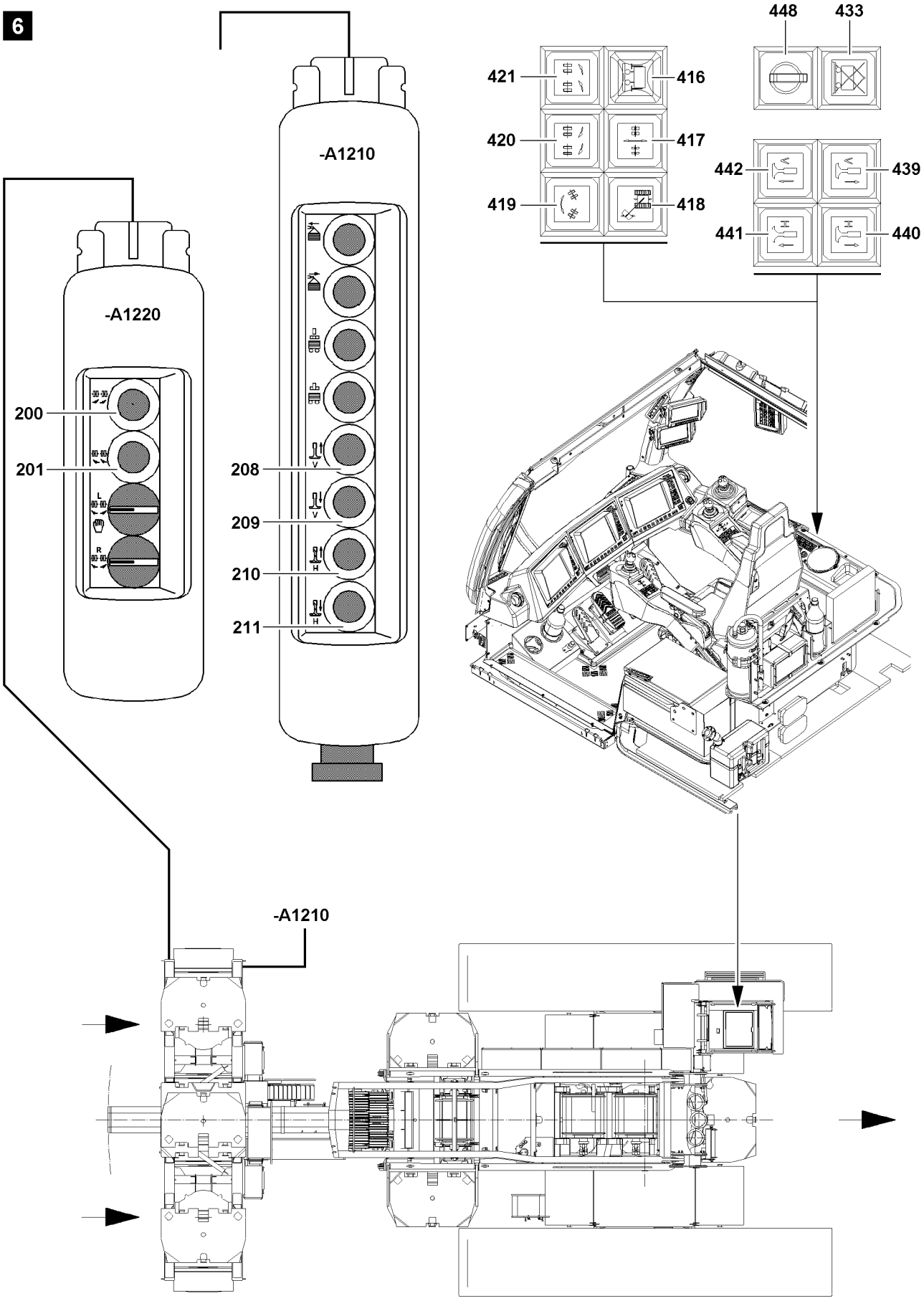
■ Press the button **208** and button **210** on the control panel **-A1210**.

Result:
– The support cylinders move in.

Note
▶ The release to drive the crane in steering program “Towing” is only made when both wheel sets are in travel direction and the support cylinders are fully moved in!
▶ Check the settings of the wheel sets and the support cylinders before driving the crane!

▶ Move the support cylinders in completely.

Result:
– The warning light **416** (“Ballast trailer support moved in”) **lights up**.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4.3.4 Resteering the wheel sets

NOTICE

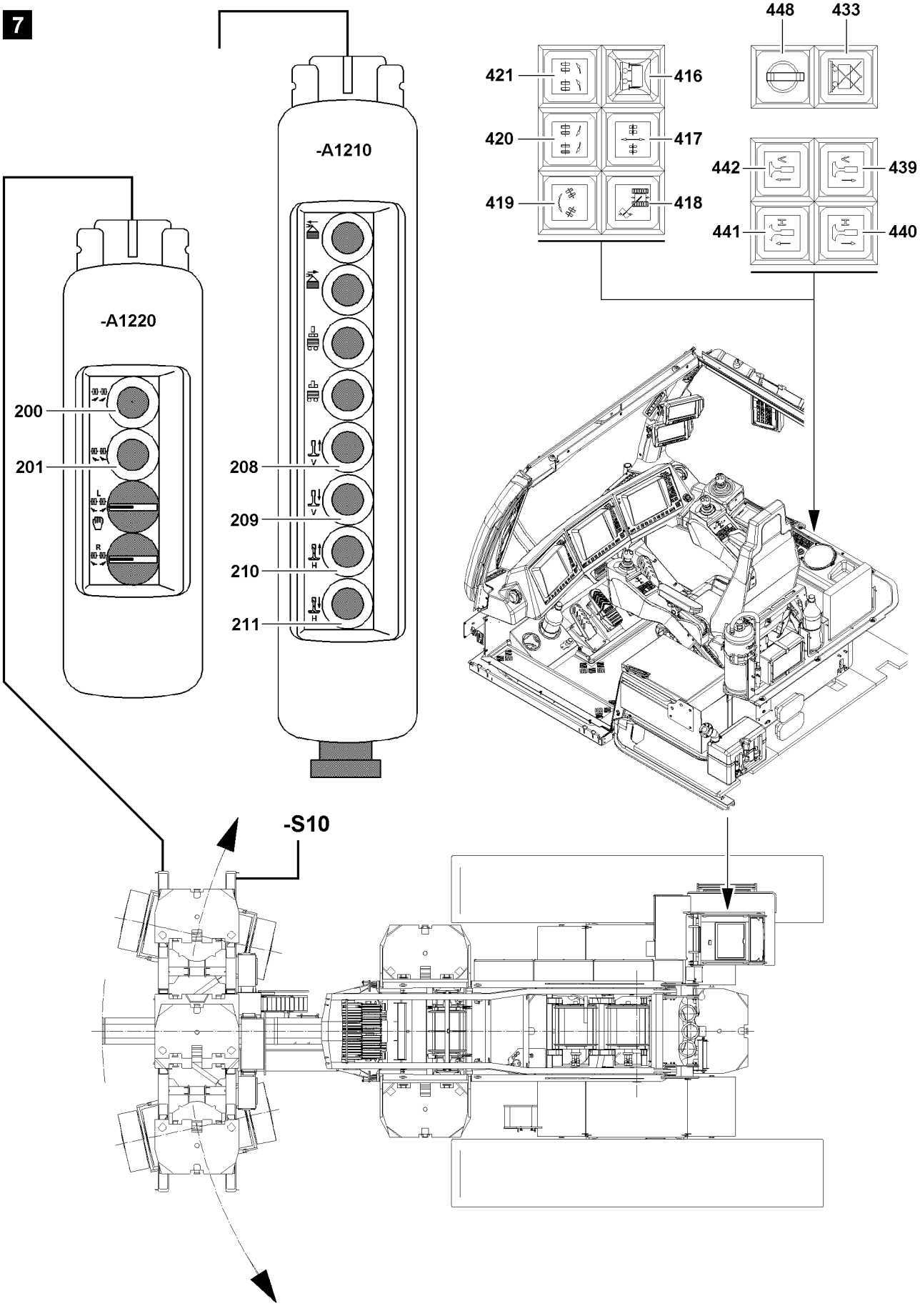
Damage of ballast trailer!

When the wheel sets are resteered at a standstill, the ballast trailer can be damaged!

- If the ballast trailer is ballasted, the resteering of the wheel sets at a standstill is **prohibited**!
- When the ballast trailer is ballasted, the resteering of the wheel sets is only permissible while driving!
- Monitor the distortion of the tires!

Note

- Changing from the steering program “towing” into the steering program “resteering” and back is possible while driving the crawler!
- If the steering program “corrective steering is switched” into the steering program “towing operation” then the indicator light **blinks** on “the button” **417** until the towing operation position of the wheel sets is achieved!
- If one of the wheel sets deviates from the specified limit angle, the indicator light in “button” **417** blinks and the wheel sets must be reset as described above!
- **The following generally applies:** The wheel sets only move if either the button **420**, the button **421**, or the button **417** in the crane operator's cab, or the button **200** or the button **201** on the control panel is pressed in the respective steering program or if the crawler is driven!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4.4 Circular travel

Ensure that the following prerequisite is met:
– the ballast trailer guide is telescoped out to the required derrick ballast radius.

4.4.1 Raising the ballast trailer with the support cylinders

Note
▶ See section towing operation!

4.4.2 Align wheel sets into circle driving position

Ensure that the following prerequisite is met:
– the ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

▶ Press the button **419**.

Result:
– The ballast trail wheel sets are aligned in the circular driving position.
– During the turning procedure of the wheel sets, the indicator light in the button **419 blinks**.
– If the circular driving position is achieved, the indicator light in the button **419 lights up** .

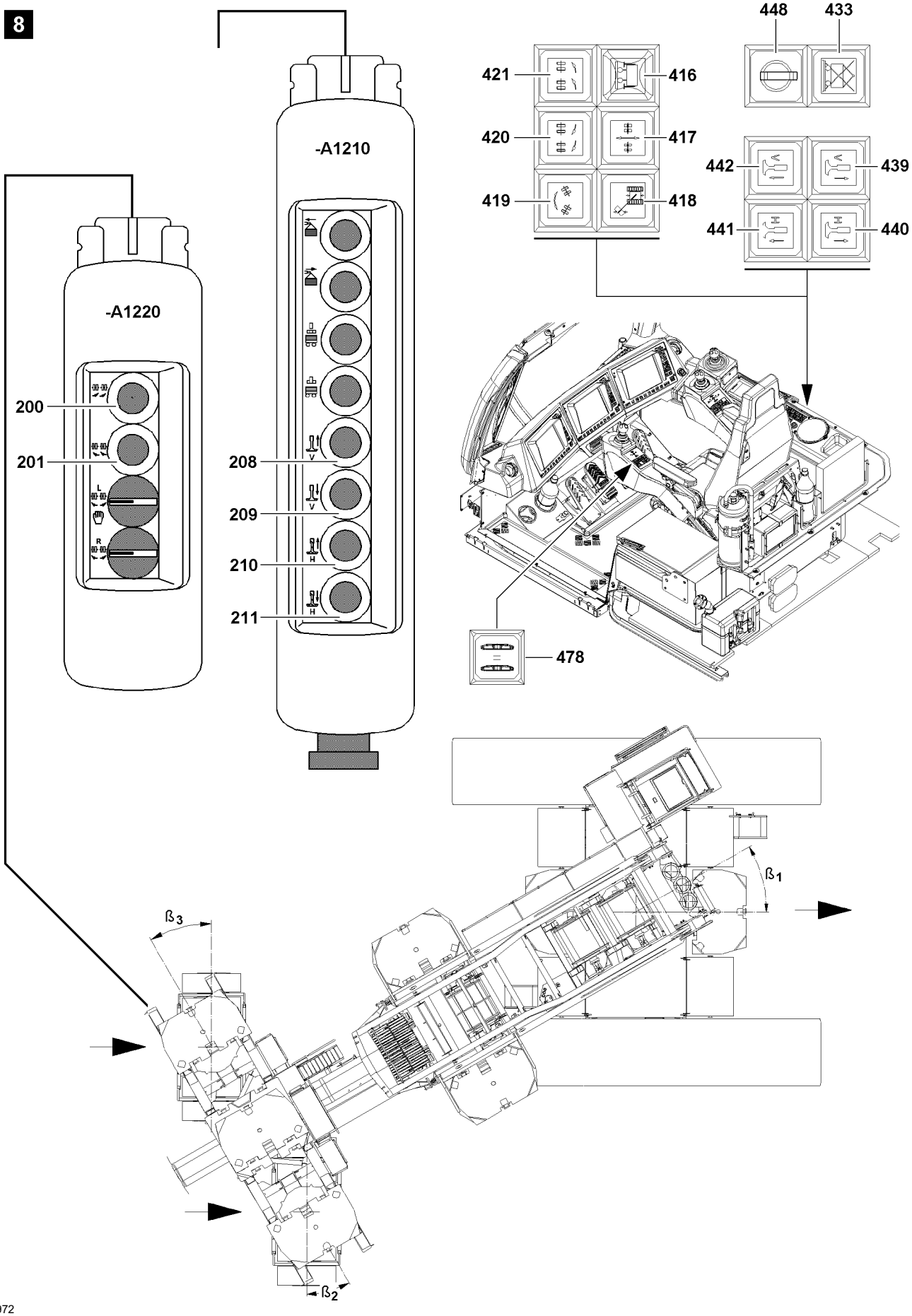
Note
▶ If one of the wheel sets deviates from the specified limit angle, the indicator light in the button **419** blinks and the wheel sets must be reset as described above!

▶ Press the button **419** again.

4.4.3 Lowering the ballast trailer with the support cylinders

Note
▶ See section towing operation!

Note
▶ The release for turning the turntable in the steering program “circular driving” is only made when both wheel sets are in turning position (circular driving) and the support cylinders are completely moved in!
▶ Check the settings for the wheel sets and support cylinders before inspecting turning of the turntable!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4.5 Parallel travel

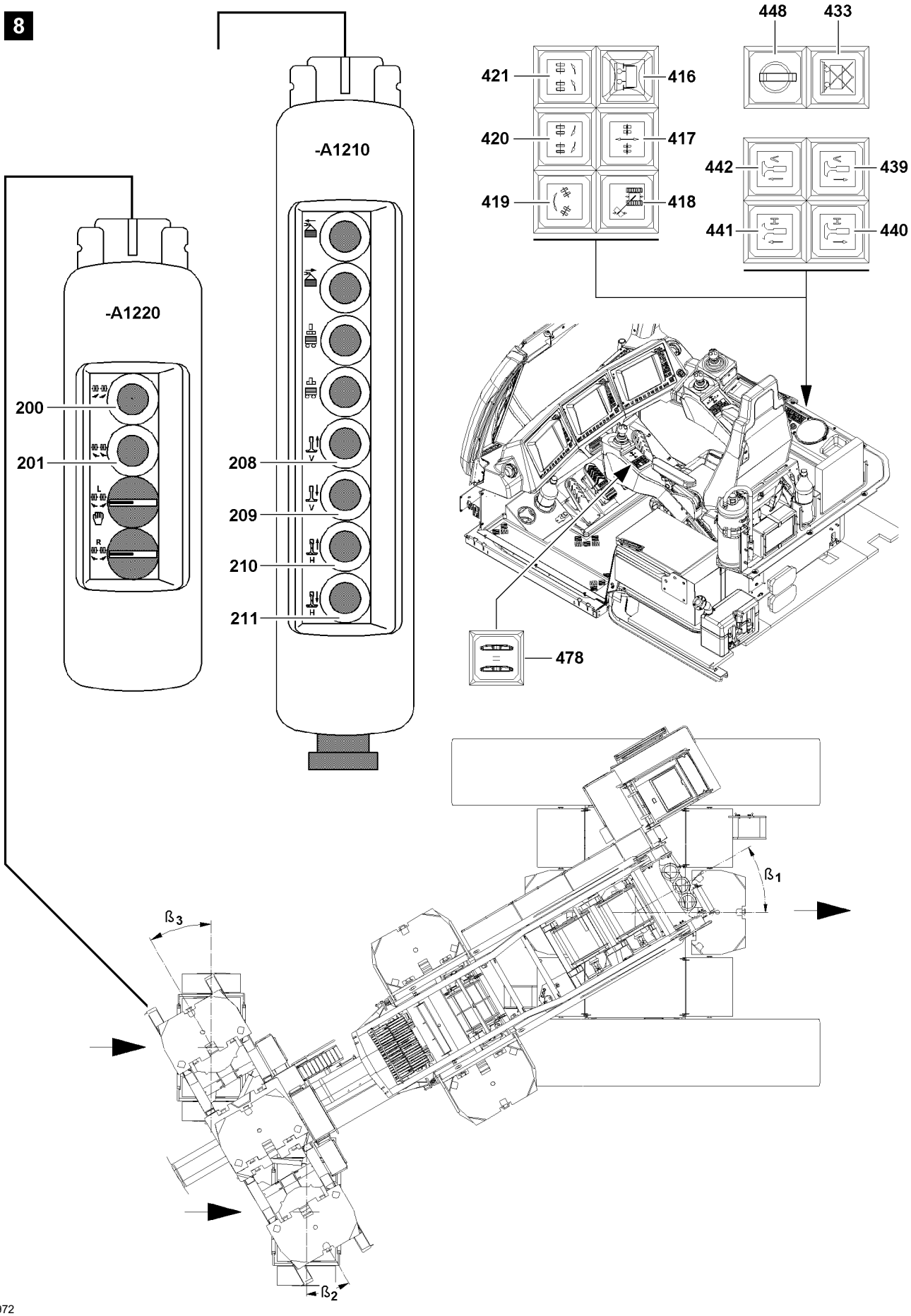
NOTICE
Danger of damage to the crane and the ballast trailer!
Due to steering movements on the crawler tracks while driving parallel, the crane and the ballast trailer can be significantly damaged!
- In parallel travel, steering the crawler track is **prohibited**!
- In parallel travel, the side tire distortion on the wheel sets must be observed by an instructed person over the entire travel route of the crane. If the tires distort by more than 100 mm, then the position of the wheel sets must be corrected!

Note
- Independently of whether the ballast trailer stands on the ground or is lifted from the ground, the wheel sets must always stand in a “parallel travel” position!
- With deviated position for the wheel sets, steering switches itself off!
- For crane procedures in “parallel travel” the switch **478** is to be activated on the control panel left!

Note
- The travel drive of the crawler is locked until the wheel sets are in parallel position!
- During crawler drive, the slewing gear brake on the crane is engaged and the hydraulic concentric operational is opened!
- If the angle deviates $ß_2$ and $ß_3$ in relation to $ß_1$ by more than the permissible limit angle, the crawler track is stopped, the indicator light in the button **418** flashes!
- Only through renewed alignment of the wheel sets on the required angle specified, the crawler track can be driven again!
- If the switch **478** “crawler parallel travel” is turned on, the crawler moves straight forward on appropriate terrain! This simplifies driving the crane with ballast trailer in the steering program “parallel travel”!

4.5.1 Raising the ballast trailer with the support cylinders

Note
- See section towing operation!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4.5.2 Align wheel sets into parallel travel position

Ensure that the following prerequisite is met:

– the ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

▶ Press the button **418**.

Result:

– The ballast trail wheel sets are aligned in the parallel travel position.
– During the turning procedure of the wheel sets, the indicator light in the button **418 blinks**.
– If the parallel travel position is achieved, the indicator light in the button **418 lights up**.

Note

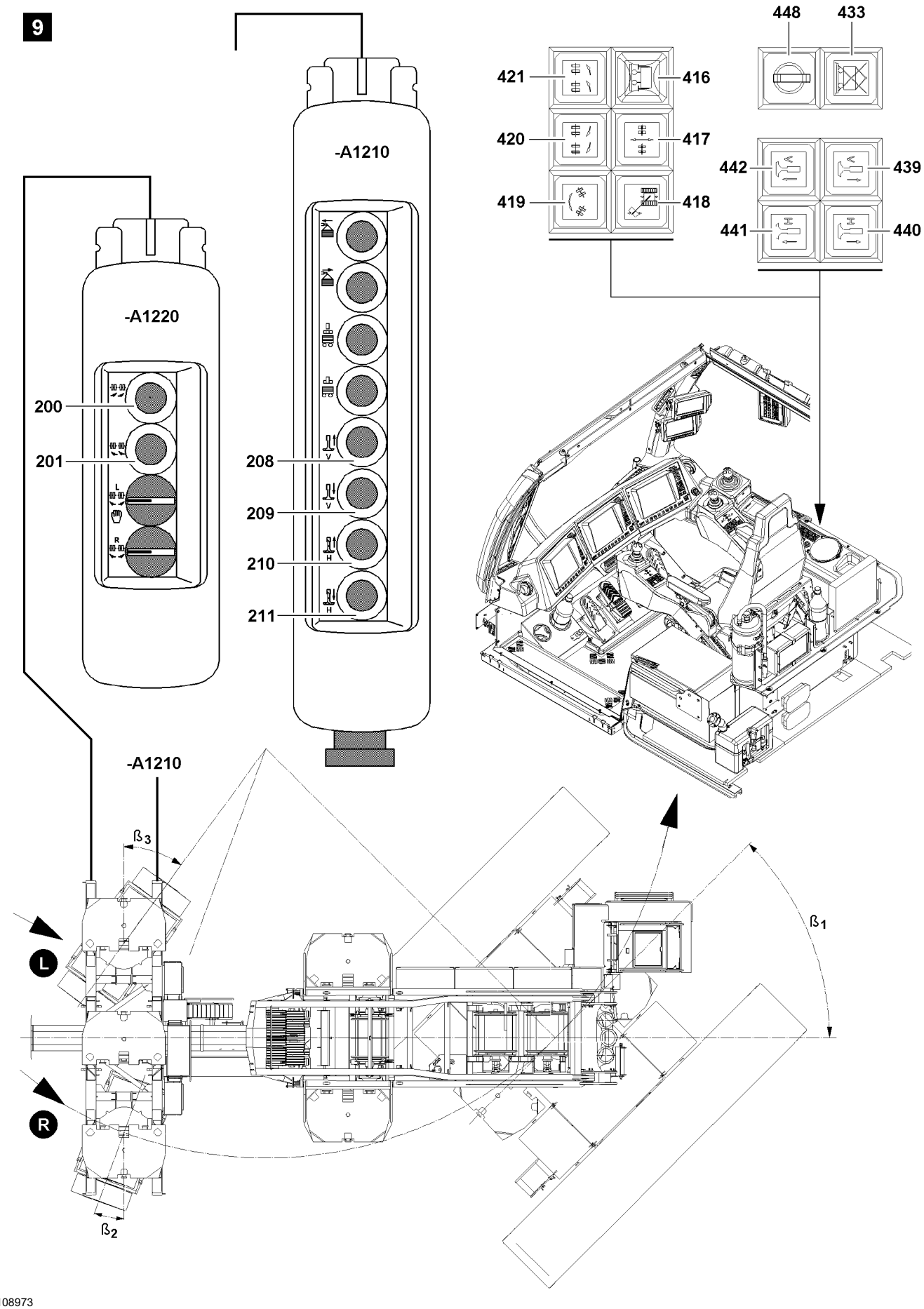
▶ If one of the wheel sets deviates from the specified limit angle, the indicator light in button **418** blinks and the wheel sets must be reset as described above!

▶ Check the parallel position of the wheel sets.

4.5.3 Lowering the ballast trailer with the support cylinders

Note

▶ See section towing operation!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4.6 Resteering

Ensure that the following prerequisite is met:
– crawler operation is turned on.

4.6.1 Steering and corrective steering of the wheel sets

Make sure that the following prerequisites are met:
– the steering program “towing” is selected **and** the wheel sets are found in towing position,
– the indicator light in the button **417** lights up.

Turn wheel sets to the right:
▶ Press button **420** in the crane operator's cab.

or

■ Press the button **200** on the control panel **-A1220**.

Turn wheel sets to the left:
▶ Press button **421** in the crane operator's cab.

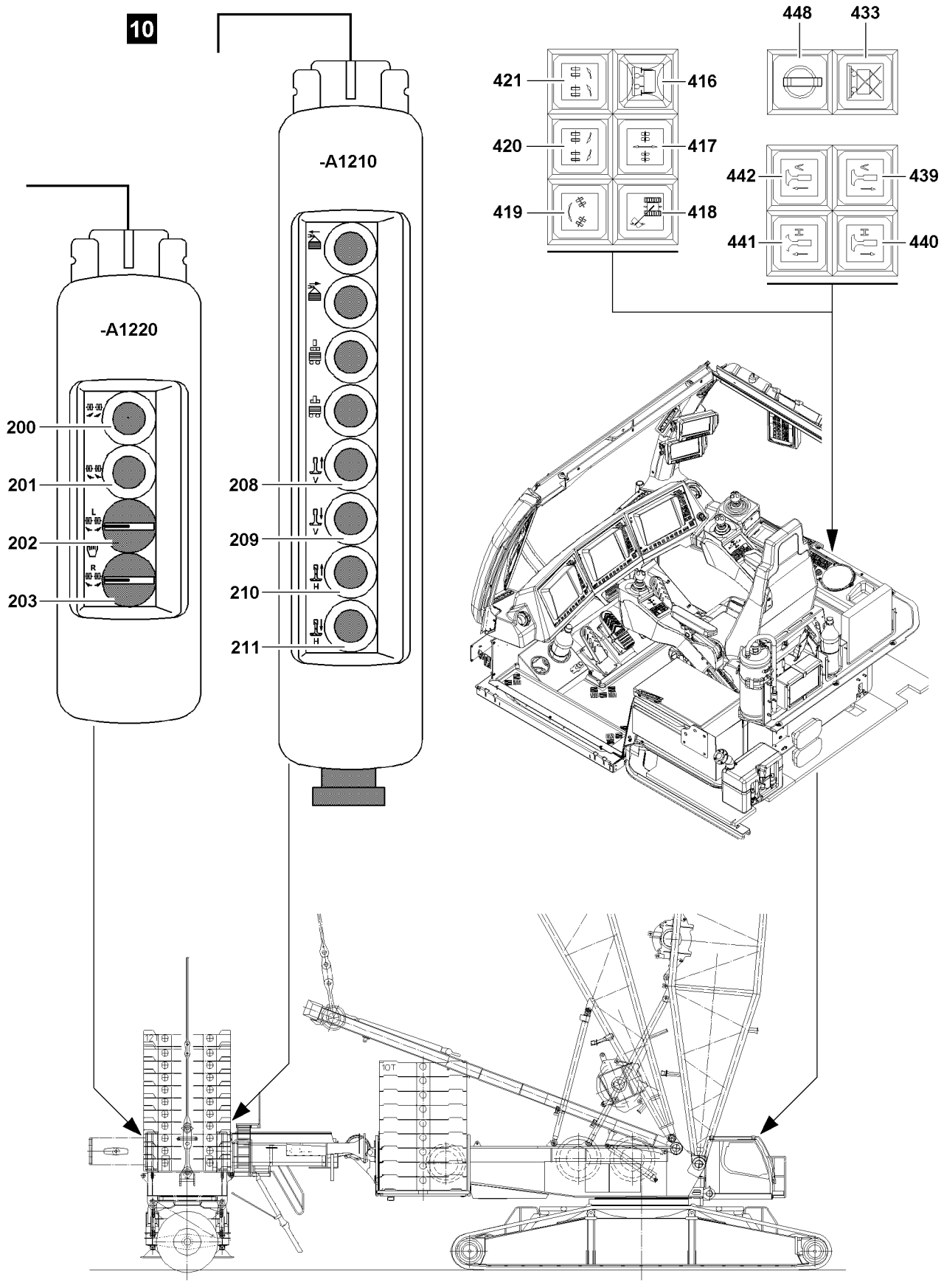
or

■ Press the button **201** on the control panel **-A1220**.

The right wheels set is regulated by the computer controlled steering program in such a way that a steering center is always present. The angle $ß_1$ is determined by the travel of the crawler and the angle $ß_3$ is determined by the steering of the operator, whereby the angle $ß_2$ is continually corrected. Switching from the steering program “corrective steering” into the steering program “towing” and back, after achieving the towing position, is possible while driving the crawler! If the steering program “corrective steering” is selected from the steering program “towing” the indicator light in the button **420** and the indicator light in the button **421**.

Note
▶ The left wheel set can be steered to the specified limit angle $ß_3$. It is not possible to steer beyond this limit angle!
▶ The right wheel set is reregulated according to the steering center. If the right wheel set (corrective steering) cannot follow the left wheel set, the left wheel set is halted until the right wheel set (corrective steering) has caught up!
▶ If the right wheel set still deviates from the specified limit angle, the indicator lights in indicator light in the button **420** and the indicator light in the button **421** and it must begin again with “towing”!
▶ If the crawler is driven and exceeds the angle $ß_1$ the turntable automatically switches the specified value into the steering program “towing”. The indicator light in the button **420**, the indicator light in the button **421** and the indicator light in the button **417** blinks!
▶ When the towing position is reached, manual resteering can continue. The indicator light in the button **417** lights up!
▶ **The following generally applies:** The wheel sets only move upon corrective steering if either the button **420** or the button **421** from the crane operator's cab, **or** the button **200** or the button **201** on the control panel is pressed in the respective steering program or if the crawler is driven!

▶ Check the settings.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4.7 Manual operation for assembly

The ballast trailer is equipped with a program which allows for each wheel set to be turned individually at assembly.

4.7.1 Raising the ballast trailer with the support cylinders

Note

▶ See section towing operation!

4.7.2 Setting the wheel sets

For setting the wheel sets, the rotary switch on the control panel **-A1220** is to be activated.

▶ Turn rotary switch **202** to the right.

Result:

– Turn left wheel set to right.

▶ Turn rotary switch **202** to the left.

Result:

– Turn left wheel set to the left.

▶ Turn rotary switch **203** to the right.

Result:

– Turn right wheel set to right.

▶ Turn rotary switch **203** to the left.

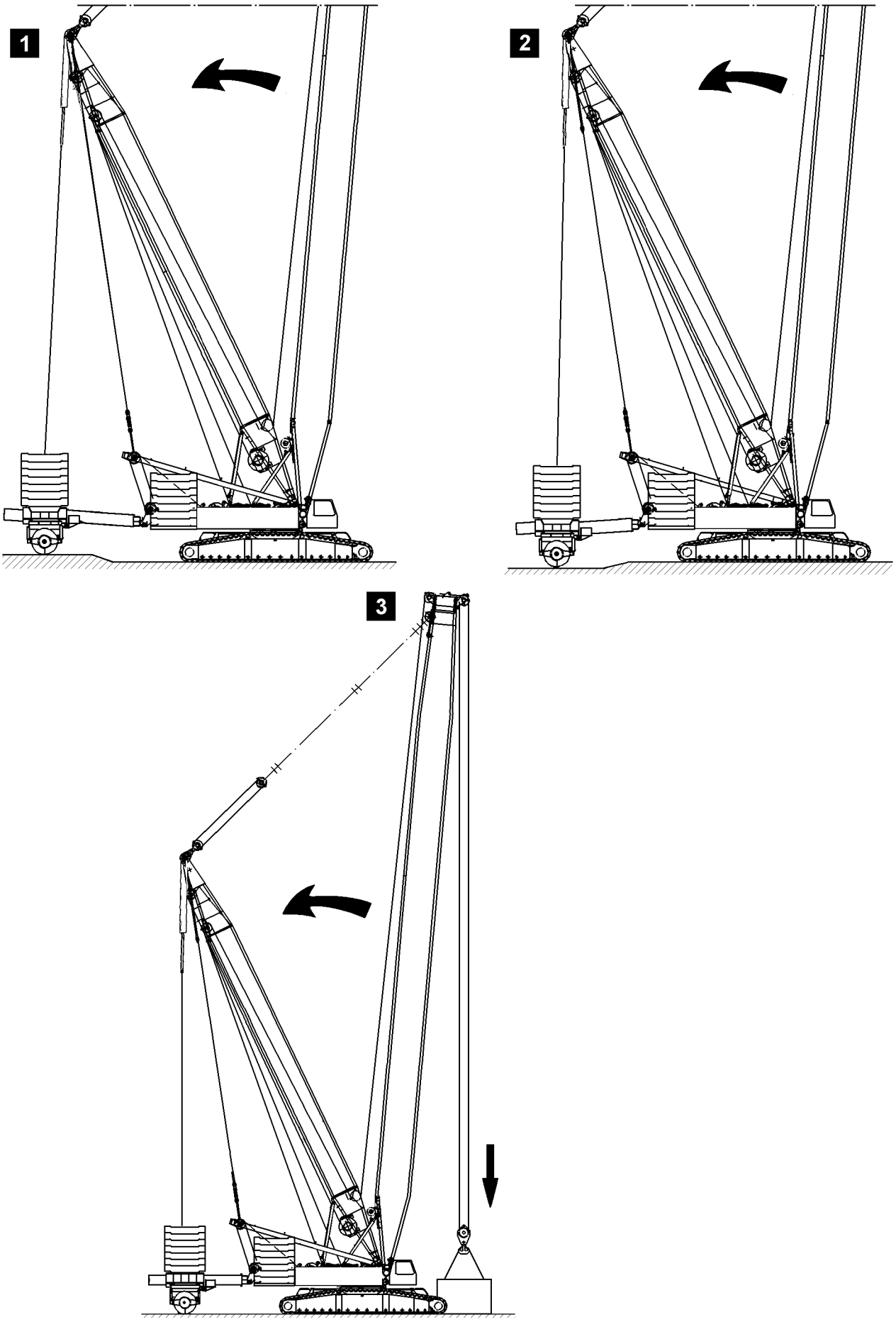
Result:

– Turn right wheel set to the left.

4.7.3 Lowering the ballast trailer with the support cylinders

Note

▶ See section towing operation!



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5 Driving with the ballast trailer

5.1 Driving

Note

- ▶ It is only permitted to drive the ballast trailer on level ground capable of supporting the load!
- ▶ Driving over obstacles is not permitted!

DANGER

The crane can topple over!

In case of non-permissible level difference between the ballast trailer travel route and the crane position level, the entire crane system can be pulled back suddenly!

The relapse cylinders can thereby run into the mechanical block position be significantly damaged!

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

- ▶ Do not exceed or fall below the permissible level difference between the ballast trailer travel path and the crane placement level!

5.1.1 Pressure monitoring in extension cylinder

Through propelling force of the crawler upon forward and backward travel, the extension cylinder can be overloaded in the pull and push direction if the ballast trailer travels over ground unevenness or slopes.

Note

- ▶ If the maximum permissible pressure in the extension cylinder is exceeded, a bell will sound and an error message appears!
- ▶ There is **no** shut off!

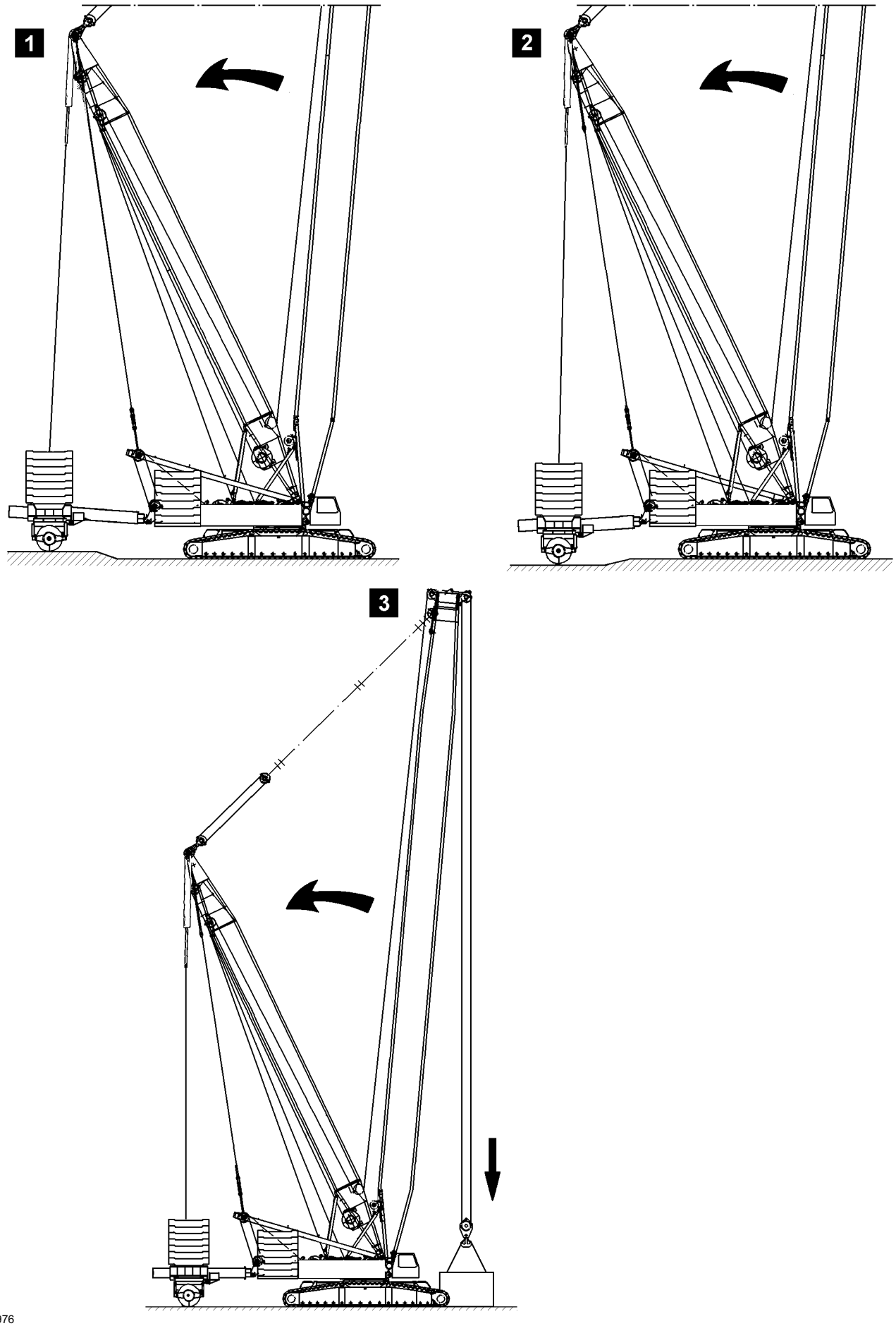
NOTICE

Piston rod on block!

If the piston rod of the extension cylinder is already on block through telescoping out or in of the ballast trailer guide, no pressure monitoring occurs!

The extension cylinder can be significantly damaged!

- ▶ It is prohibited to move the piston rod in or out up to the block position!



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5.2 Safety guidelines for travel operation

5.2.1 Relapse cylinder

When the steepest operating position of the main boom is reached, luffing up is turned off by the LICCON overload protection in all operating modes.

Note

▶ However, there are cases when the relapse cylinders move mechanically to stop position, due to a movement of the entire crane system to the rear!

5.2.2 Block position relapse cylinders

NOTICE

Danger of damages to the relapse cylinder and the boom!

Through level difference between the ballast trailer and crane route, the boom can suddenly be pulled backward and the relapse cylinder can go into the block position!

The relapse cylinder or the boom can be damaged!

▶ Make sure before taking up the driving mode, or before turning the crane superstructure, that the crane driving track or the ballast trailer circular path is even and capable of supporting the load!

In normal crane operation without bypass of the LICCON overload protection, a block position is not possible. Should a block position still occur, the movement is turned off and the boom limitation symbol shown on the operating screen indicates which block position has been started up.

With this boom limitation icon it is to be determined which limit switch on which relapse cylinder has been actuated. Reverse the last movement which was carried out until the corresponding limit switch is released again.

5.2.3 Case 1

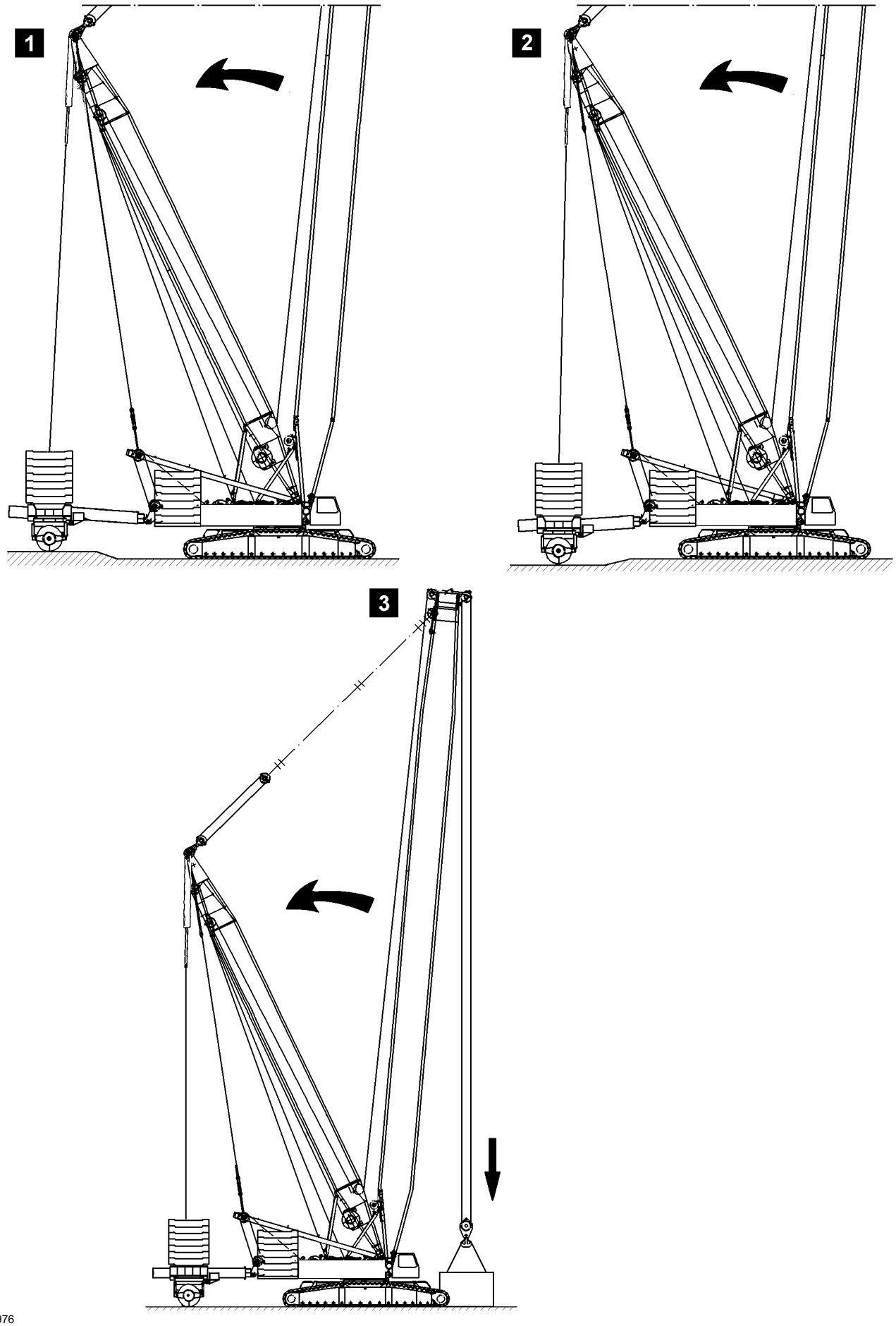
Note

▶ Refer to illustration **1**!

When driving or turning the crane with steeply positioned boom, the ballast trailer can be lowered, due to the level differences. This causes the whole boom system to be pulled backward. There is a risk of reaching a block position in the relapse cylinders. The same risk applies when turning if the ballast trailer sinks due to level differences.

Note

▶ By the signals “main boom relapse cylinder on block” or “derrick relapse cylinder on block” the drive and turn movements of the “crawler driving” and “turning” are automatically turned off!



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5.2.4 Case 2

Note
▶ Refer to illustration **2**!

If the level under the crane increases, the boom system is also pulled back. There is a risk that the relapse cylinders reach the block position.

Note
▶ Due to the signals “main boom relapse cylinder on block” or “derrick relapse cylinder on block”, the drive and turn movements of the crawler are automatically tuned off in operation with the ballast trailer!

5.2.5 Case 3

Note
▶ Refer to illustration **3**!

When the load is set down with the hoist gear, the crane is relieved. This causes the booms to move backward, refer to section “Monitoring lowest force F1”.

5.3 Maximum permissible ground unevenness

WARNING
The crane can topple over!
By exceeding the maximum permissible value for ground unevenness while driving the crane, the crane can topple!
Personnel can be severely injured or killed!
▶ The permissible ground unevenness may not be exceeded!

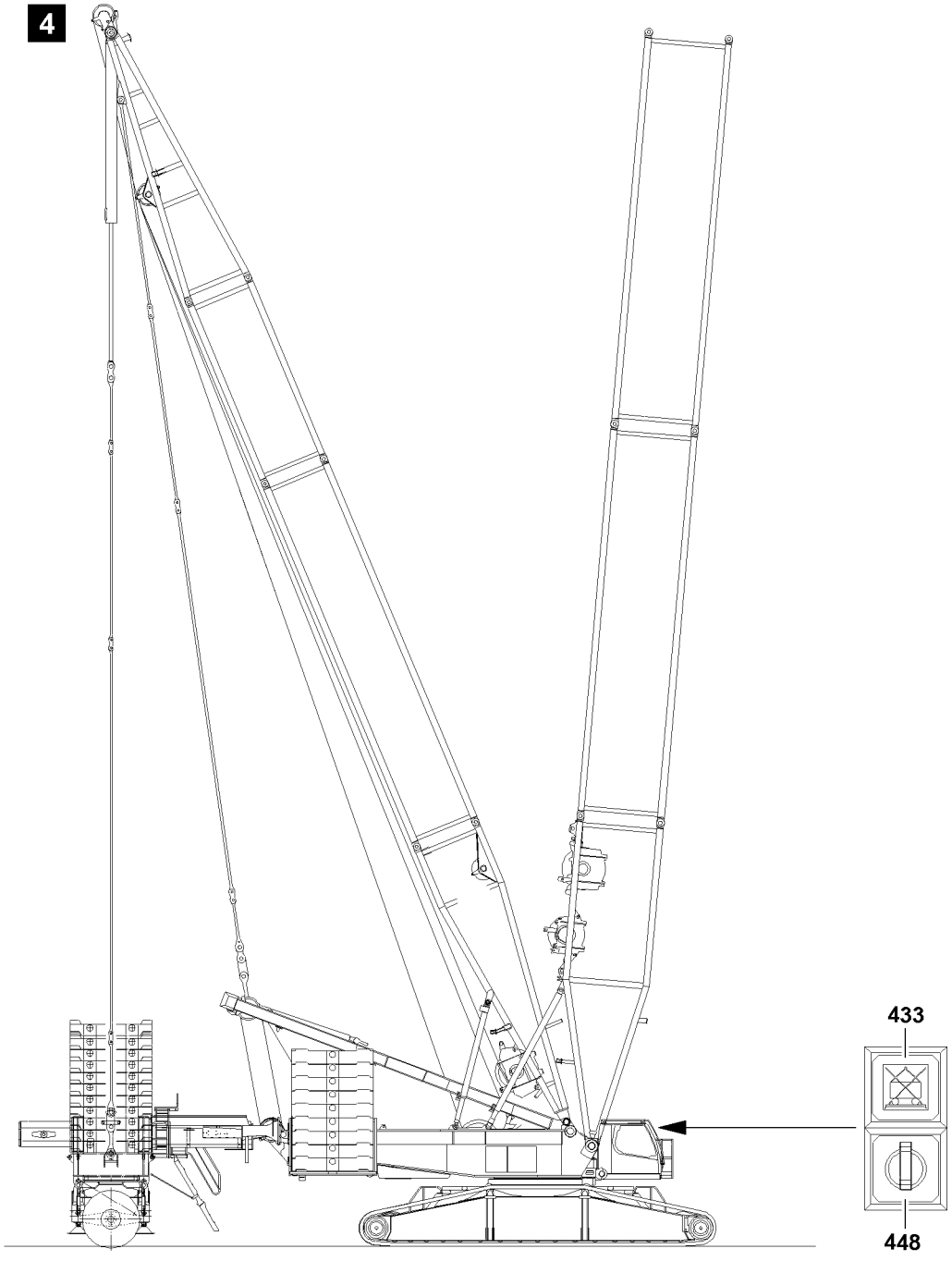
Level change between placement surface of the crane and the ballast trailer during tow, parallel and circular travel may not exceed a maximum permissible value.

Note
▶ The level difference, ballast trailer route in relation to the crane route during **towing** and **parallel travel**, may amount to a maximum ± 250 mm!
▶ The level difference, ballast trailer route in relation to the crane route with **circular driving**, may amount to a maximum ± 250 mm - constant uphill or downhill slope for 90° slewing range!

5.3.1 Compensate for ground unevenness

The maximum permissible ground unevenness can be compensated by means of pull cylinders by lifting or sinking the ballast trailer.

Note
▶ The pull cylinders are operated from the crane operator's cab!



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5.4 Key button “Ballast trailer lifted off”

When “crawler driving” and key switch **448** is not operated, i.e. “Ballast trailer not lifted off”, the slewing gear brake and hydraulic concentric running of the slewing gear are opened. For “drive crawler” with **lifted off ballast trailer** (constant visual check), the key switch **448** “Ballast trailer lifted off” must be turned on.

DANGER
Risk of accident
If the ballast trailer is lifted from the ground during crawler driving in the steering program “towing”, there exists the danger that the wind turns the turntable to the side during “crawler driving”!

- ▶ After lifting the ballast trailer, the key button **448** “Ballast trailer lifted off” must be switched on, so that the “crawler driving” the slewing gear brake remains closed, however the hydraulic concentric running remains open!
- ▶ If, when “driving the crawler”, the ballast trailer scrapes on the ground or gets stuck on the ground, so that the turntable twists with the ballast trailer against the crawler track, the slewing brake can slip. The slewing gear will not be damaged!
- ▶ However, if the wheel sets of the ballast trailer are not aligned in “towing position”, the ballast trailer or the crane will be damaged.

Note

- ▶ When the function “Ballast trailer lifted off” is turned on, the warning light in the button **433** blinks, it is possible to turn the turntable or to drive the crane even though the wheel sets of the ballast trailer are not set on “circular travel”, “towing” or “parallel travel”.

“Ballast trailer lifted off” switched on:

- ▶ Press key button **448** “Ballast trailer lifted off”.

Result:

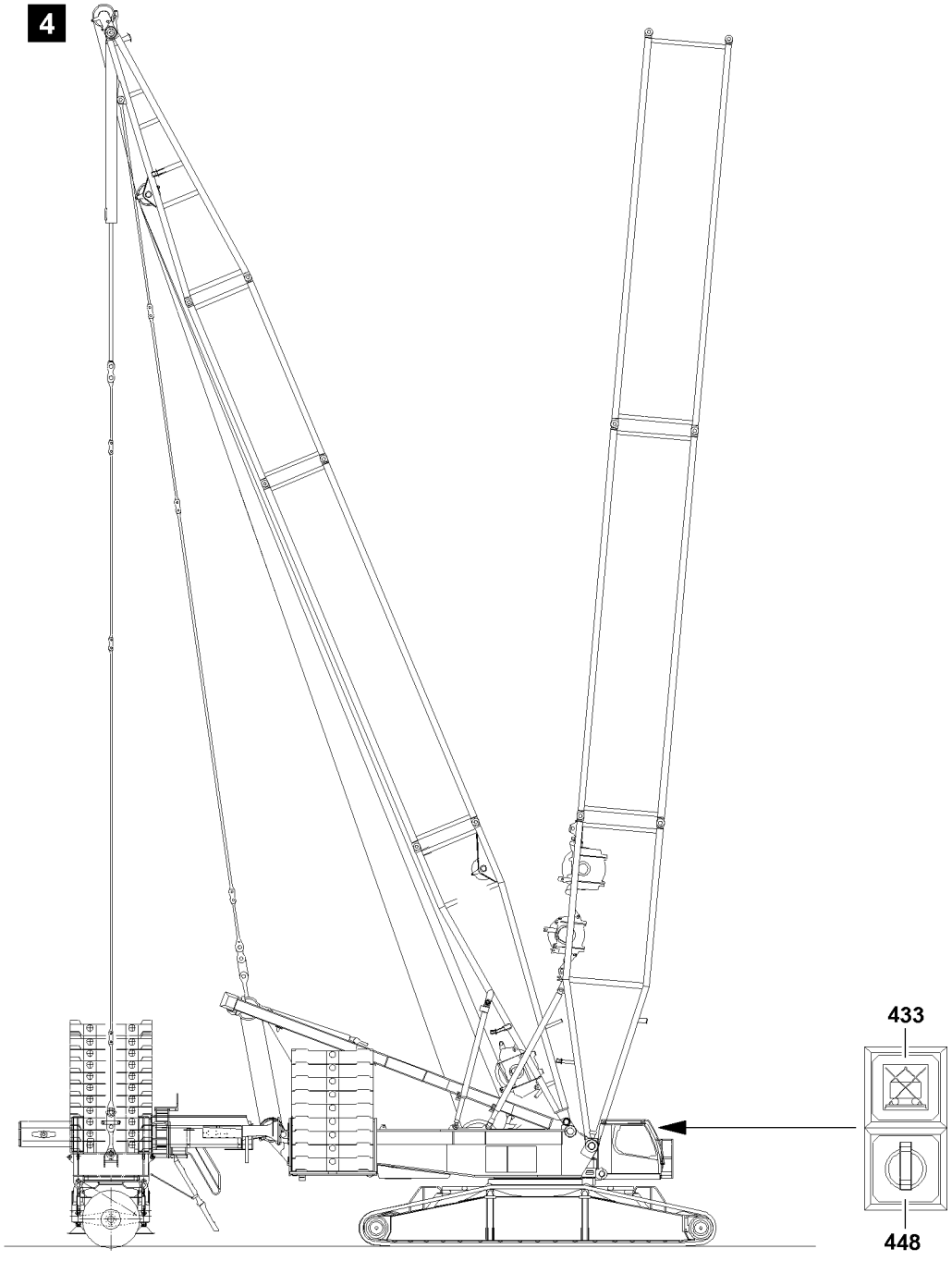
- – The warning light in button **433** flashes.
- – The ballast trailer icon on LICCON-Monitor 1 is represented “suspended”.

“Ballast trailer lifted off” switched off:

- ▶ Press the button **433**.

Result:

- – The warning light in the button **433** turns off.
- – The ballast trailer icon on LICCON-Monitor 1 is represented “on the ground” (placed down).



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5.5 Defined ballast trailer operation

DANGER
Risk of accident!
If the ballast trailer is operated in an undefined condition, it can result in severe accidents up to toppling of the crane!
Personnel can be severely injured or killed!
- ▶ The ballast trailer must always find itself in a defined condition!
- ▶ Operation of the ballast trailer in an undefined state is prohibited!

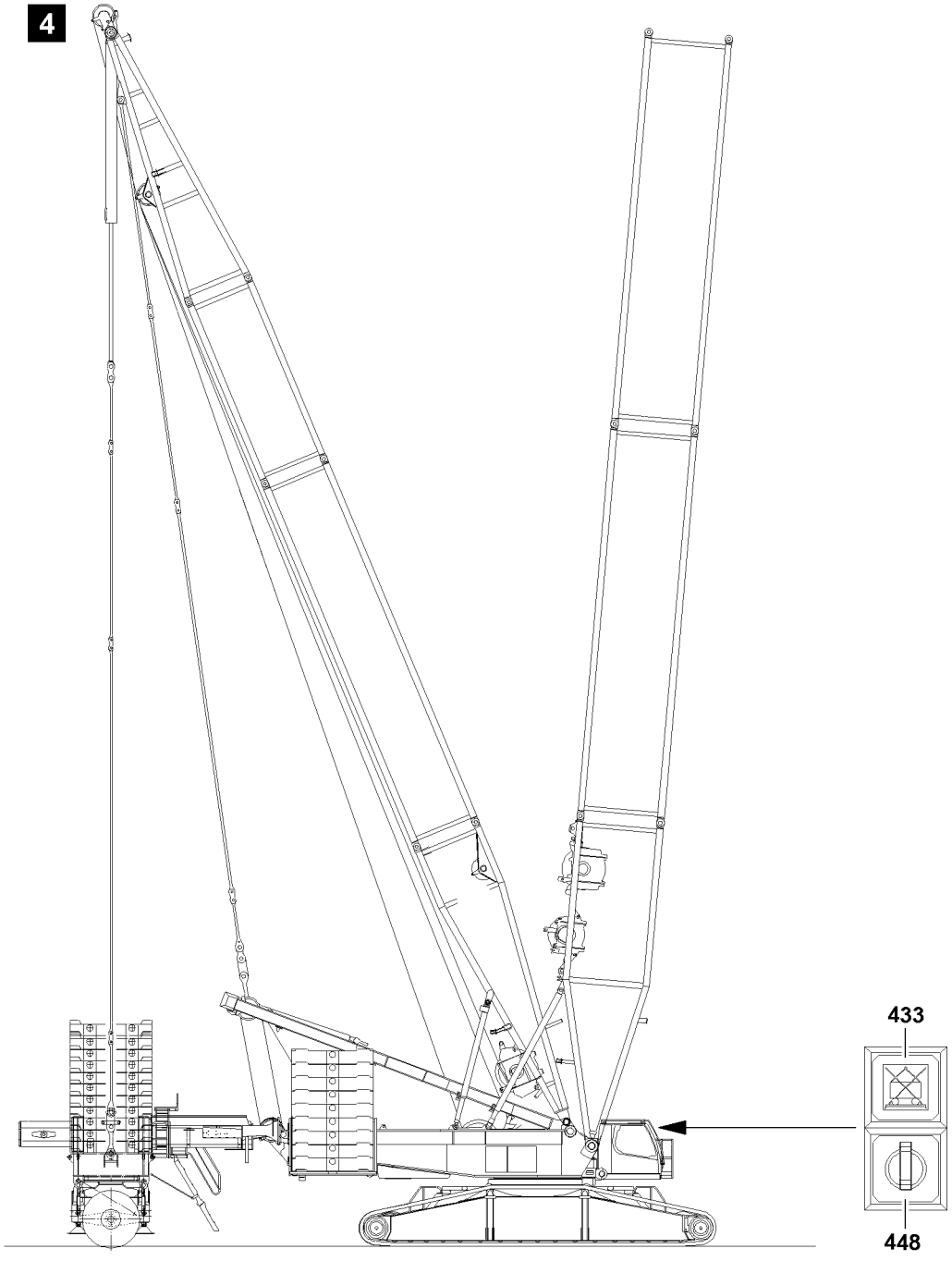
The ballast trailer may not raised or set down when driving, rather this be done **before** driving off.

5.5.1 Ballast trailer lifted off

“Ballast trailer defined lifted from the ground” means:
The ballast trailer is lifted from the ground and the key button **448 “Ballast trailer lifted off”** is pressed. Thereby, the slewing brake does **not** open during “crawler driving” and the wind can during “crawler driving”, the turntable does not turn.
Make sure that the following prerequisites are met:
– the ballast trailer has been lifted off the ground,
– the key button **448** is pressed,
– the warning light in the button **433** flashes.

5.5.2 Ballast trailer on the ground

“Ballast trailer defined lifted on the ground” means:
That the ballast trailer and its residual load are resting on the ballast trailer tires and the key button **448** is **not** pressed. This residual load is large enough to prevent the wind from turning the turntable, if the slewing brake is open during operation of “crawler driving”.
Make sure that the following prerequisites are met:
– the ballast trailer is found with a residual load on the ground,
– the key button **448** is **not** pressed,
– the warning light in the button **433** does **not** flash.



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5.6 Non-defined ballast trailer operation

DANGER
Risk of accident!
If the ballast trailer is operated in an undefined condition, it can result in severe accidents up to toppling of the crane!
Personnel can be severely injured or killed!
- ▶ The ballast trailer must always find itself in a defined condition!
- ▶ Operation of the ballast trailer in an undefined state is prohibited!

5.6.1 Ballast trailer lifted off

Note
- ▶ Only operate ballast in a defined condition!

“Ballast trailer undefined lifted from the ground” means:
That the ballast trailer with a residual load of circa 1 t lies on the ballast trailer tires and the key button **448** is pressed. Thereby, the slewing brake does **not** open upon cornering of the “crawler” and the ballast trailer tires or the slewing brake slides through.

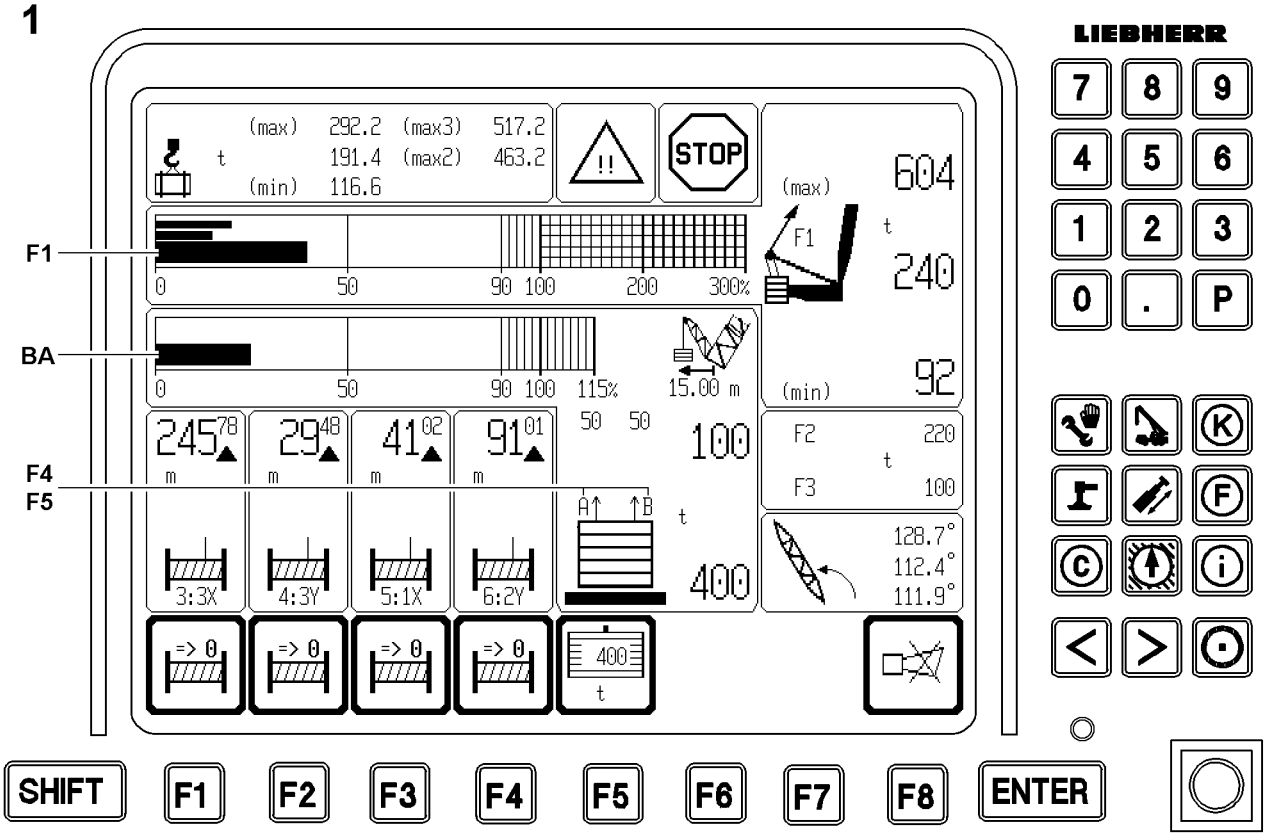
5.6.2 Ballast trailer on the ground

Note
- ▶ Only operate ballast in a defined condition!

DANGER
Swinging load!
Personnel can be killed or severely injured by swinging loads!
- ▶ Operation of the ballast trailer in an undefined state is prohibited!

“Ballast trailer undefined on the ground” means: That the ballast trailer with a residual load of circa 1 t lies on the ballast trailer tires and the key button **448** is **not** pressed. This residual load is so small that the wind can turn the turntable, if the slewing brake is open during operation of “crawler driving”.

1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(max) 292.2 (max3) 517.2
t 191.4 (max2) 463.2
(min) 116.6
STOP
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240
92
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400
F2 220
F3 100
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112.4°
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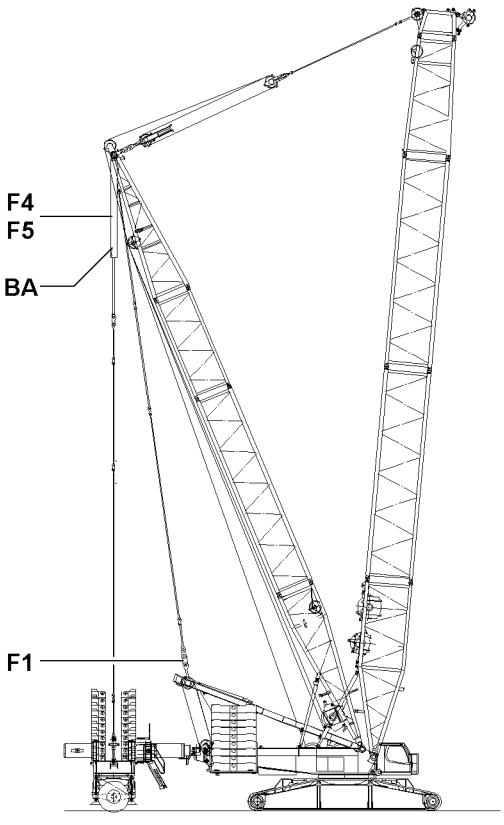
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER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6 Crane operation with derrick ballast

6.1 Safety guidelines

Note

- The test points must be checked for function before taking on crane operation!
- The weight of the load to be lifted must be known!
- The placement surface of the ballast trailer may be no more than maximum 250 mm above, or 250 mm below the level of the crane!
- There may be no obstacles within the slewing range of the crane, the suspended derrick ballast and the load!
- The lift off of the derrick ballast must be monitored by the crane operator or a guide!
- Before setting down the load and the suspended derrick ballast, the crane operator must make sure that a safe placement is ensured!
- The level of the ballast trailer, at the end of the load lift, must be level, horizontal and have sufficient load bearing capacity to safely take on the weight of the ballast trailer!

DANGER

Danger of accidents due to diagonal pull!

The crane can topple over by angular pulling of the load!

Personnel can be severely injured or killed!

- Diagonal pull is not permitted!
- Upon taking up the load, it must be ensured that the derrick ballast, the center of rotation of the turntable and the load must be in one line!

When lifting the load, the guying between the derrick ballast and derrick head must be relieved to the point where the actual force F1 ($F1_{actual}$) is larger than the F1 minimum force ($F1_{min}$).

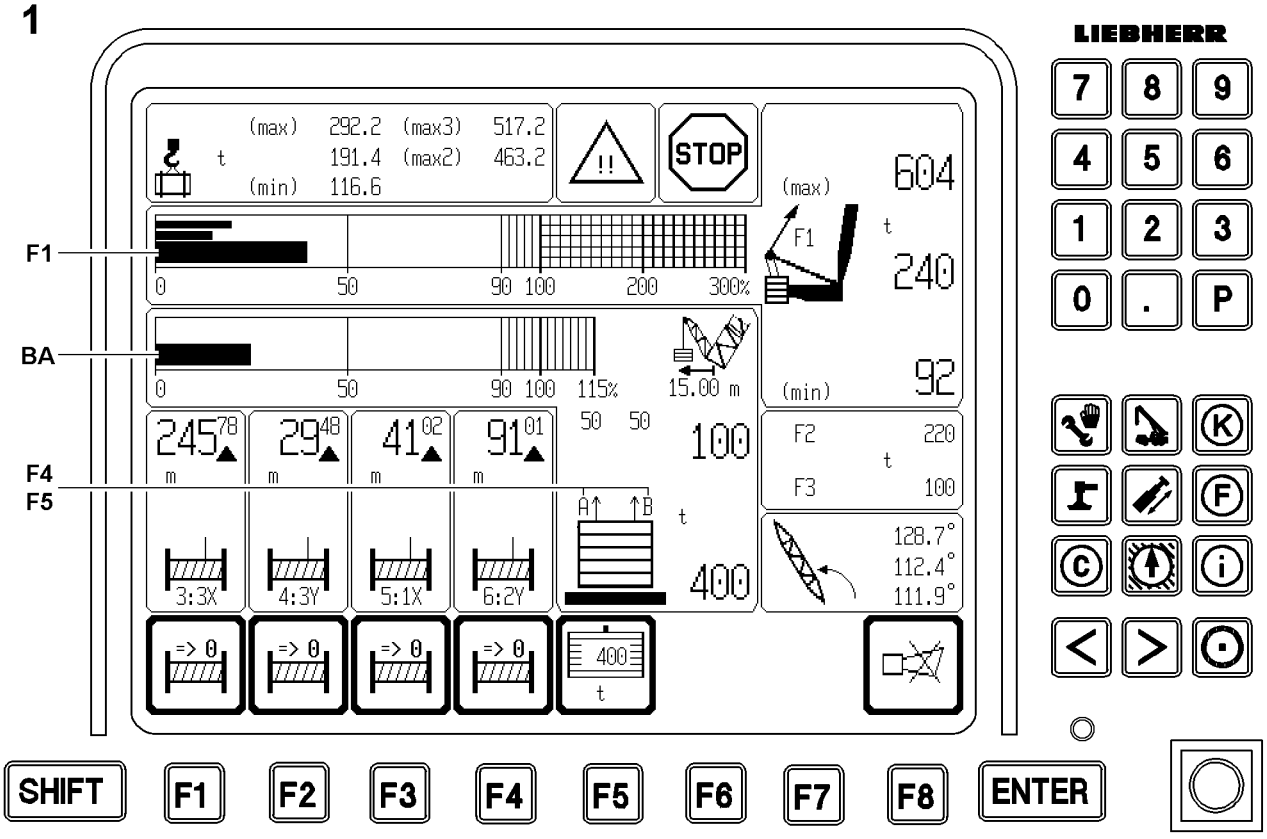
DANGER

Risk of accident!

If the guying between the SA-frame and the derrick end section is without force ($F1\text{-}_{min}$ is fallen below), then this can lead to uncontrolled movements of the boom system and cause the crane to topple over!

- The guying between the SA frame and the derrick end section, test point 1 **F1**, may never be without power!
- The F1-Minimum force ($F1_{min}$) may not be fallen below!

1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t 191.4 (max2) 463.2
(min) 116.6
STOP
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100
400
F2 220
F3 100
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112.4°
111.9°
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4 5 6
1 2 3
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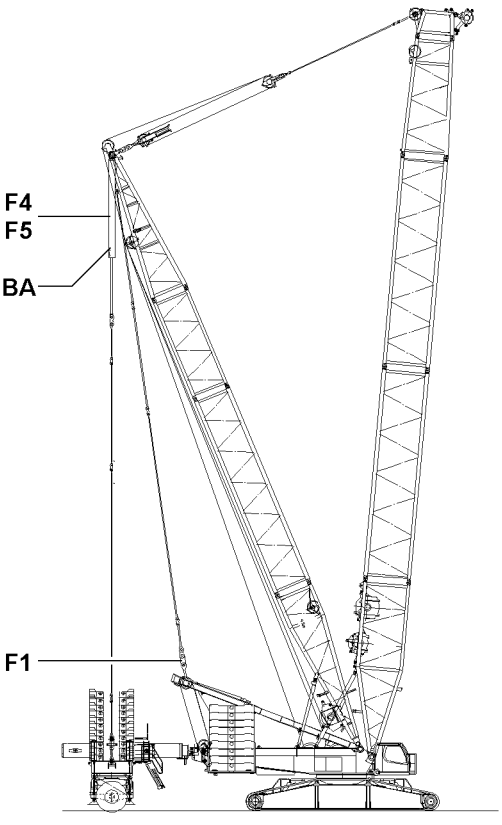
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


F4
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F1

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6.2 LICCON overload safety device

On cranes with derrick ballast, during operation also under load, by increasing or reducing the derrick ballast, the maximum load or the minimum load required for the balance of the crane, can be increased or decreased.

Note

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

Make sure that the following prerequisites are met:

– the required derrick ballast according the load chart is placed and exactly entered and confirmed in the LICCON overload protection,
– the D-boom is in crane operating position.

6.2.1 Pre-adjustments

- ▶ Adjust the LICCON overload protection according to the data in the load chart and confirm.

Note

- ▶ Enter the actually present derrick ballast weight in the LICCON overload protection!
- ▶ Enter the actually present reeving in the LICCON overload protection!

- ▶ Enter the derrick ballast weight and derrick ballast radius into the LICCON overload protection, refer to chapter 4.02 and chapter 4.03 of the crane operating instructions.

DANGER

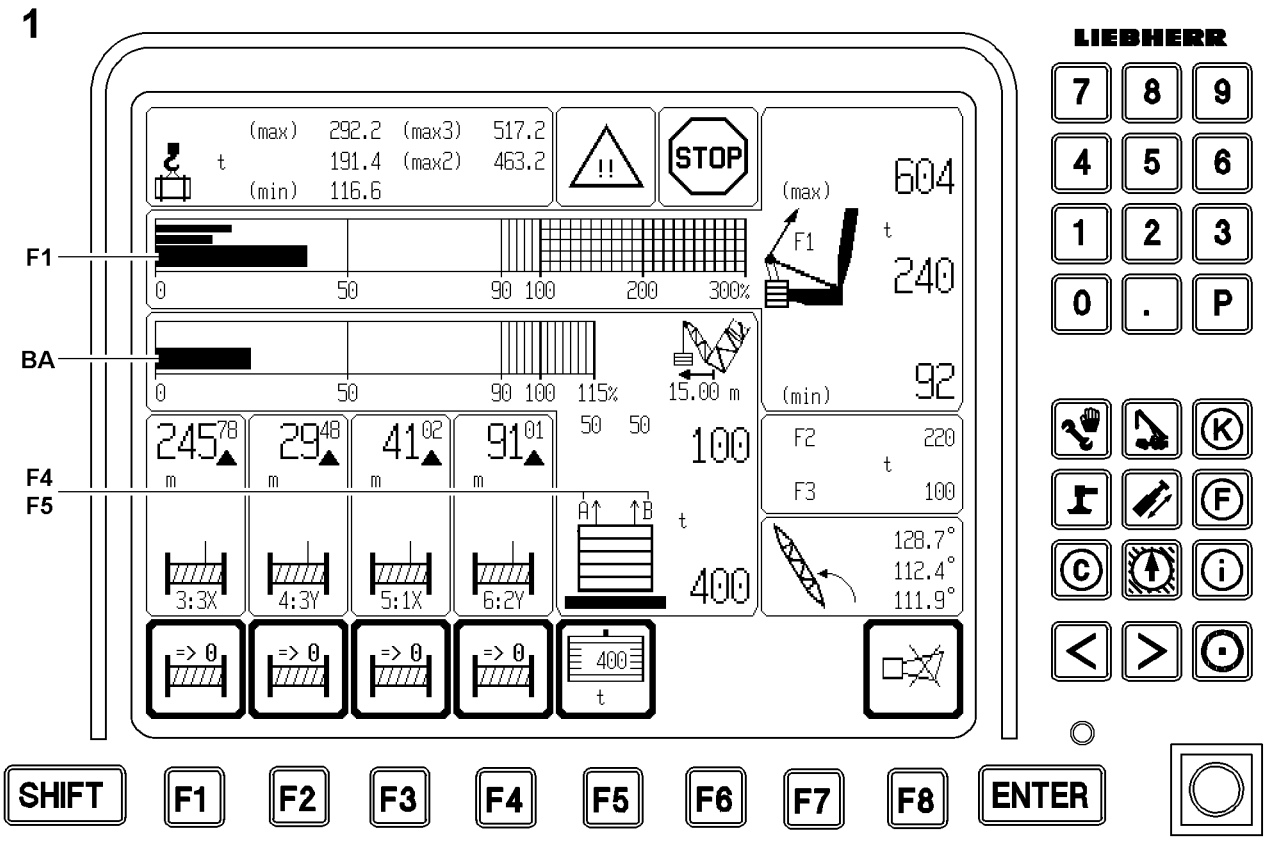
Danger of accident due to set-up parameters!

Dangerous operational situations can occur due to an incorrect ballast entry!

Personnel can be severely injured or killed!

- ▶ The set derrick ballast value must correspond to the actual derrick ballast weight added!
- ▶ All settings carried out in the “configuration” program, must agree with the actual settings on the crane!

- ▶ Checking the settings!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(min) 116.6
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F2 220
F3 100
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1 2 3
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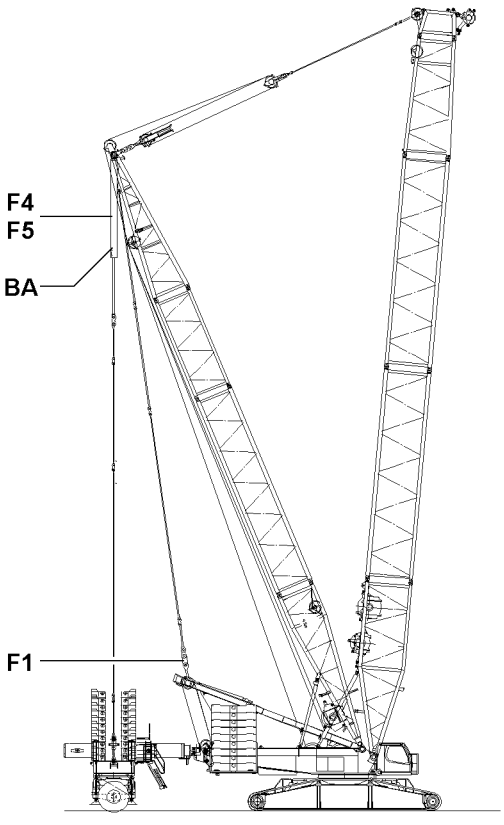
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


F4
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F1

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6.2.2 Crane operation

Note

▶ For crane operation with derrick ballast, the data in chapter 4.02 of the crane operating instructions must be observed and maintained!

WARNING

Danger of toppling the crane!

The jerky execution / braking of turning manoeuvres can cause the load or suspended derrick ballast to lead to swinging!

This can cause the boom to break off or the crane to topple over!

Personnel can be severely injured or killed!

▶ There may be no persons or obstacles within the slewing range of the derrick ballast!

▶ During the turning, a guide must watch the main boom, D-boom and derrick ballast for a danger of collision!

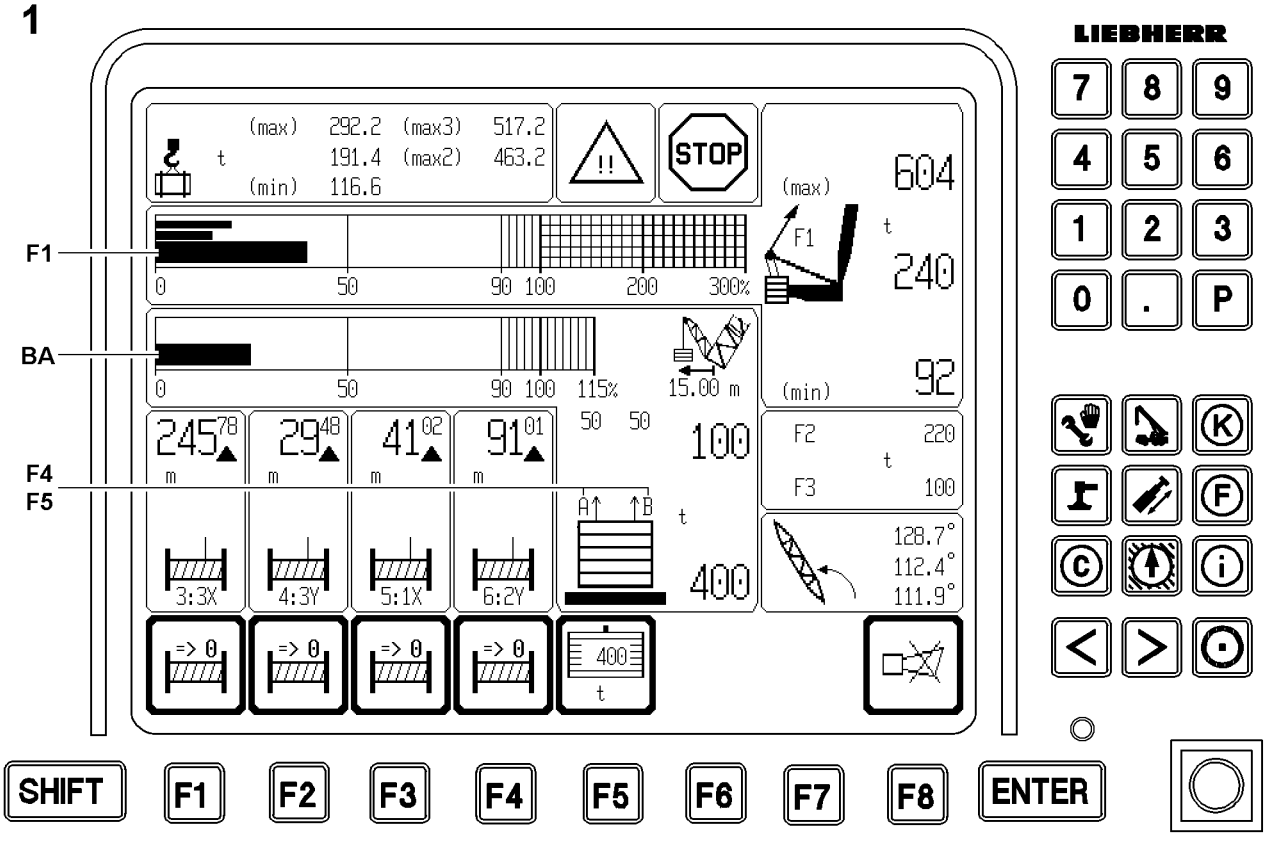
▶ When turning with a load and suspended derrick ballast, the turning movement must be initiated or slowed down extremely carefully!

Note

▶ For crane operation, observe the section “lifting and lowering the ballast trailer with pull cylinders” and “ballasting guying differential force monitoring”!

▶ Observe the move out condition of the pull cylinder and the inclination of the ballast trailer.

1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(min) 116.6
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604
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F2 220
F3 100
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112.4°
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F1
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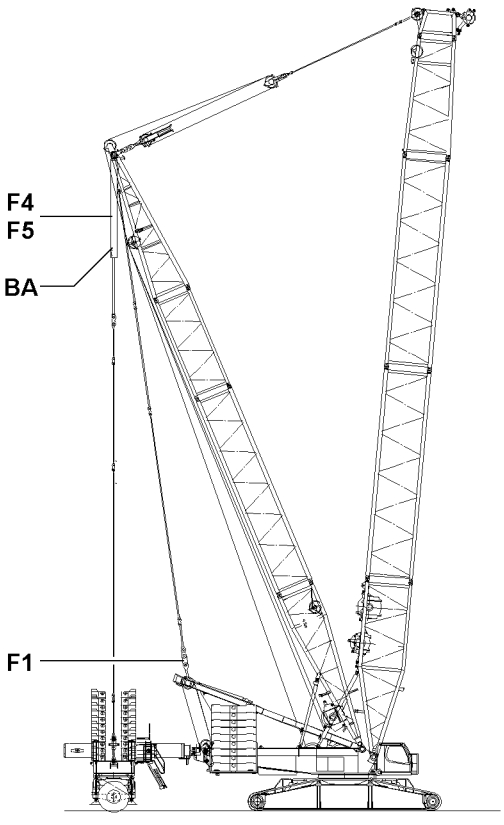
ENTER


F4
F5
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F1

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6.3 Determination of forces in operating mode with derrick ballast

In all operating modes with derrick ballast, the load is divided between the guy rods from the derrick head to the SA-frame (F1) and the derrick ballast (F4/5).

Note

▶ See the crane operating instructions chapter 4.02!

6.3.1 Force F1 (test point 1) between guying SA-frame - derrick end section

The force F1 (test point 1) is determined in the guy rods from the SA-frame to the derrick head by 2 force test boxes and is shown on the LICCON as total force of the guying.

From the “operating force” (F1) and the “maximum operating force” ($F1_{max\text{-}operation}$) results the F1-utilisation. This is shown on the LICCON monitor on the utilization bar in percent.

6.3.2 Force F4/F5 (test point 4/5) guying derrick ballast - derrick head

The forces F4/5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.

The existing forces in the guy rods (A = left and B = right) are calculated from the four pressure sensors, which are installed on the pull cylinders and shown in the LICCON monitor as individual forces.

The ballast being pulled is calculated from the forces in each guying, i.e. the proportion of ballast which is pulled up by the guying. The remaining part is on the ground. The derrick ballast utilization results from the pulled ballast and the placed ballast. This is shown on the LICCON monitor with a utilization bar (BA in %).

Pull cylinder on block

DANGER

The crane can topple over!

By completely moving one or both pull cylinders in (block position move in), the pressure increases strongly on the ring surface of the pull cylinder and the weighing of the currently pulled derrick ballast is incorrectly calculated and displayed!

The LICCON overload protection therefore assumes that a larger derrick ballast is pulled than is actually the case, and calculates a too large carried load as a result!

An overload of the crane is recognized too late by the LICCON overload protection and the crane can topple!

Personnel can be severely injured or killed!

▶ If the pull cylinder are in block position “moved in”, **crane operation is explicitly prohibited**!
▶ The forces in the derrick ballast guying A and B are to be carefully observed on LICCON monitor!
▶ Potentially encountered error reports are to be heeded!

WARNING

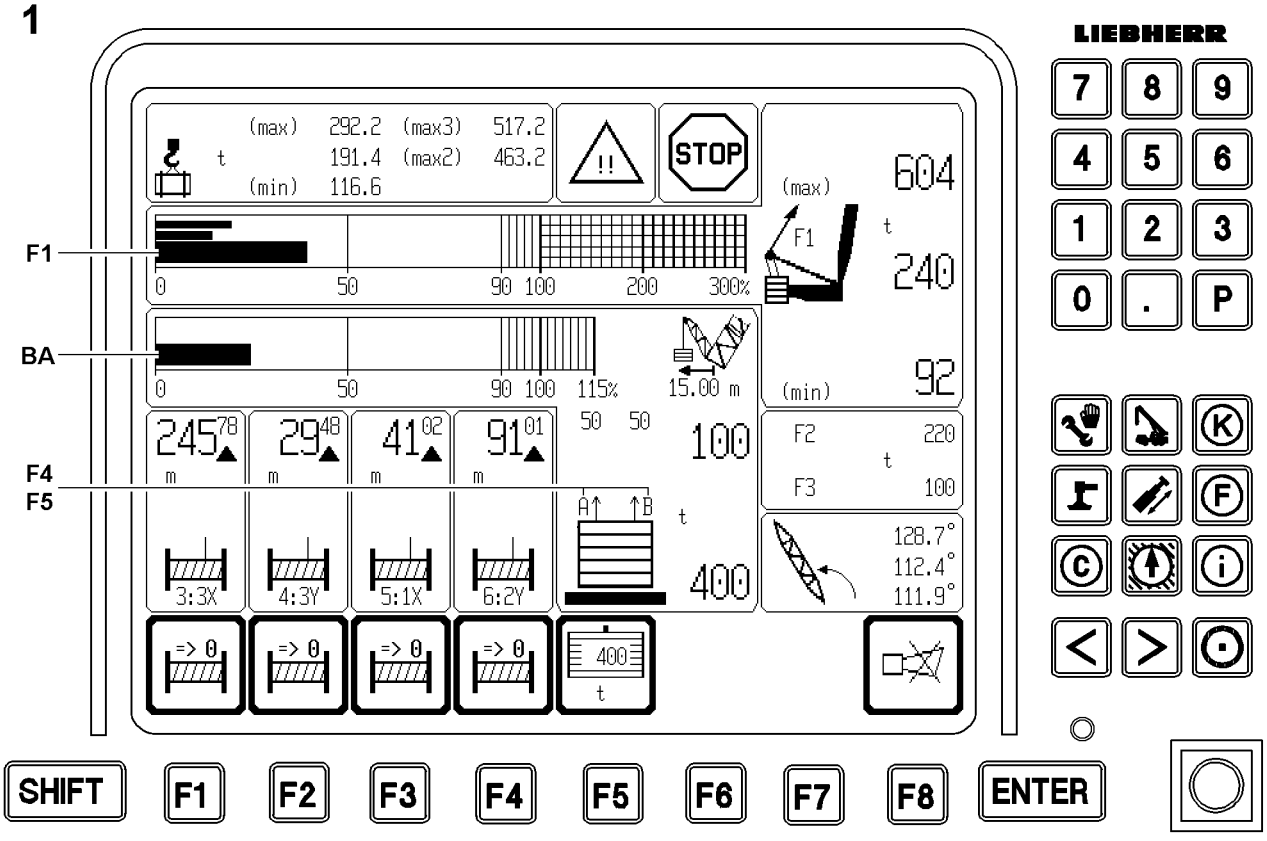
Switching off the LICCON overload safety device too early!

By moving one or two pull cyllinder completely out (block position moved out), the LICCON overload protection calculates and insufficient load-bearing capacity!

Possible shut off by the LICCON overload protection takes place too early!

▶ If the pull cylinders are in block position “moved out”, crane operation on the basis of reduced load-bearing capacity is not meaningful!

1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t 191.4 (max2) 463.2
(min) 116.6
STOP
604
(max)
F1
t
240
92
(min)
F1
BA
F4
F5
0 50 90 100 200 300%
0 50 90 100 115%
15.00 m
245 78
29 48
41 02
91 01
m
50 50
100
F2 220
t
F3 100
A B
t
400
128.7°
112.4°
111.9°
3:3X
4:3Y
5:1X
6:2Y
=> 0
400
t
7 8 9
4 5 6
1 2 3
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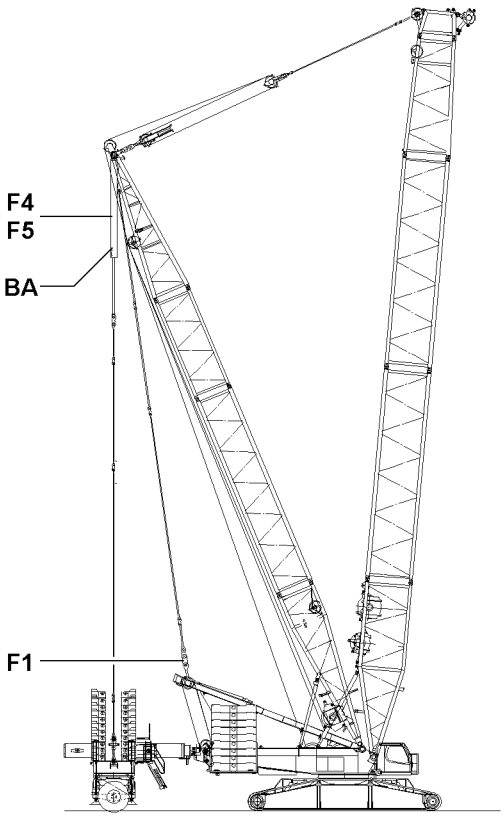
F8
ENTER


F4
F5
BA
F1

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6.3.3 Monitoring of minimum force F1

If more than 50 % of the set derrick ballast is being pulled (ballast utilization bar > 50 %) and the force drops below the minimum value $F1_{min}$ (test point 1) fall below, all crane **movements that increase load torque** switch off.

DANGER
Risk of accident!
It is prohibited to let the minimum force $F1_{min}$ (test point 1) fall below if more than 50 % of the derrick ballast is pulled. If this is not observed, in case of loose tension from test point 1 (F1) and **derrick ballast on the ground**, the derrick ballast can suddenly lift off the ground due to the increased load moment and the boom system can suddenly move forward! This will result in the load swinging violently and could damage the boom and cab!
▶ Do not exceed minimum force - $F1_{min}$!

If more than 90 % of the set derrick ballast is being pulled (ballast utilization bar greater than 90 %) and the force drops below the minimum value $F1_{min}$ (test point 1) fall below, all crane **movements that increase load torque** and all **crane movements that decrease load torque** switch off. Thereby, the movement winch “spool out” is switched off.

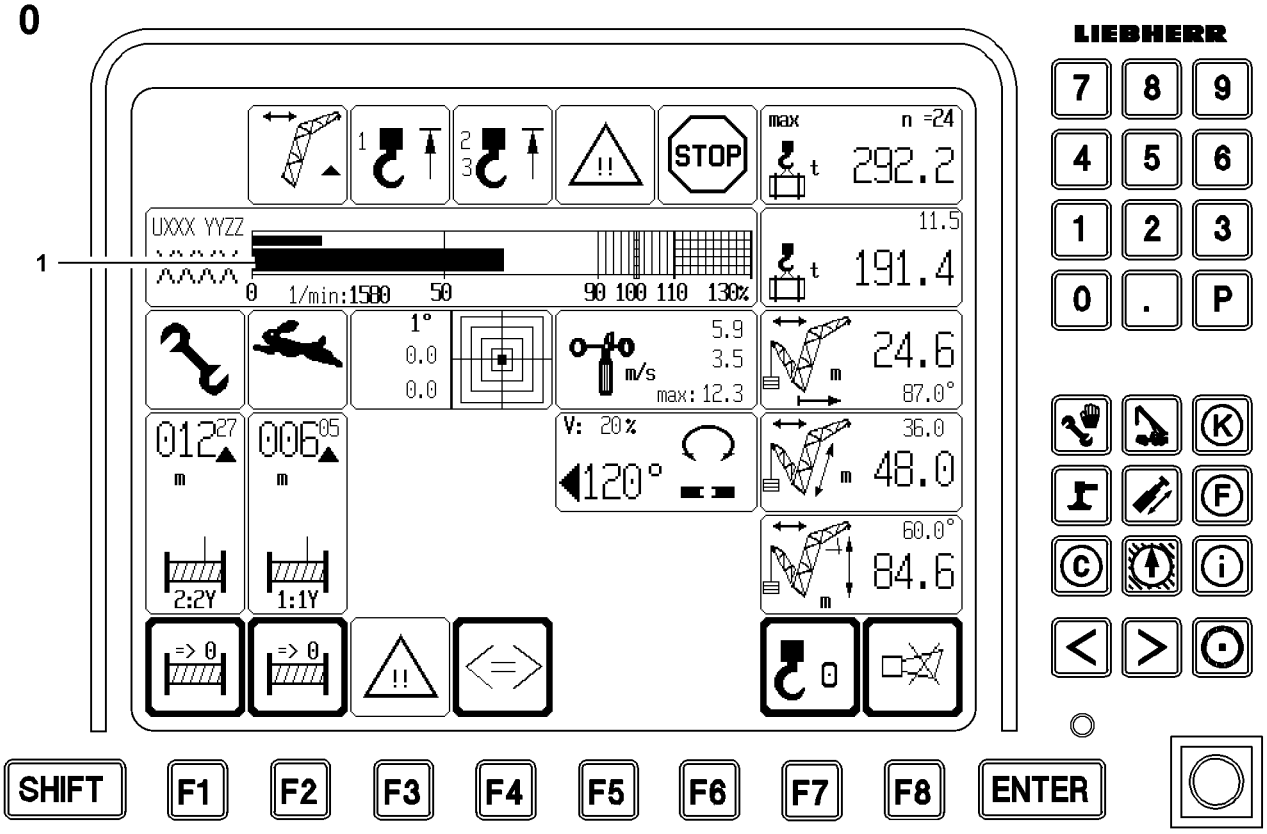
DANGER
Risk of accident!
It is prohibited to let the minimum force $F1_{min}$ (test point 1) fall below if more than 90 % of the derrick ballast is pulled. If this is not observed and the load torque is increased when the guying is slack at test point 1 (F1) and the derrick ballast is suspended, the derrick ballast can suddenly drop to the ground, causing the boom system to suddenly lurch backwards! Thereby the relapse cylinders can be pressed on block and be overloaded. The relapse cylinders on the boom and D-boom may become damaged! This will result in the load swinging violently and could damage the boom and cab!
▶ Do not exceed minimum force - $F1_{min}$!

Note
▶ By actuating the assembly key button, the test point 1 - minimum force ($F1_{min}$) is reduced by several tons, this allows one to reverse the manoeuvre and retreat from the situation in which the $F1_{min}$ shut off occurred.
▶ This is the only exception on the crane, where, after a shut off, a load moment increasing movement may be continued with the assembly key switch!

DANGER
Risk of accident!
If the LICCON overload protection is bypassed, there is no further protection against crane overload!
There is an increased danger of accidents!
Personnel can be severely injured or killed!
▶ The crane operator carries complete and sole responsibility for its handling upon bypass of LICCON overload protection!

After switch off via $F1_{min}$ a maneuver must be increased through increased force F1 on the test point 1. If the derrick ballast is suspended, this can be achieved by setting down the ballast.
If the assembly key button is already pressed and the F1 force under the reduced minimal force by the assembly key button $F1_{min}$ sinks further, then $F1_{min}$ switch off is no longer bypassed.

0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4 5 6
1 2 3
0 . P
STOP
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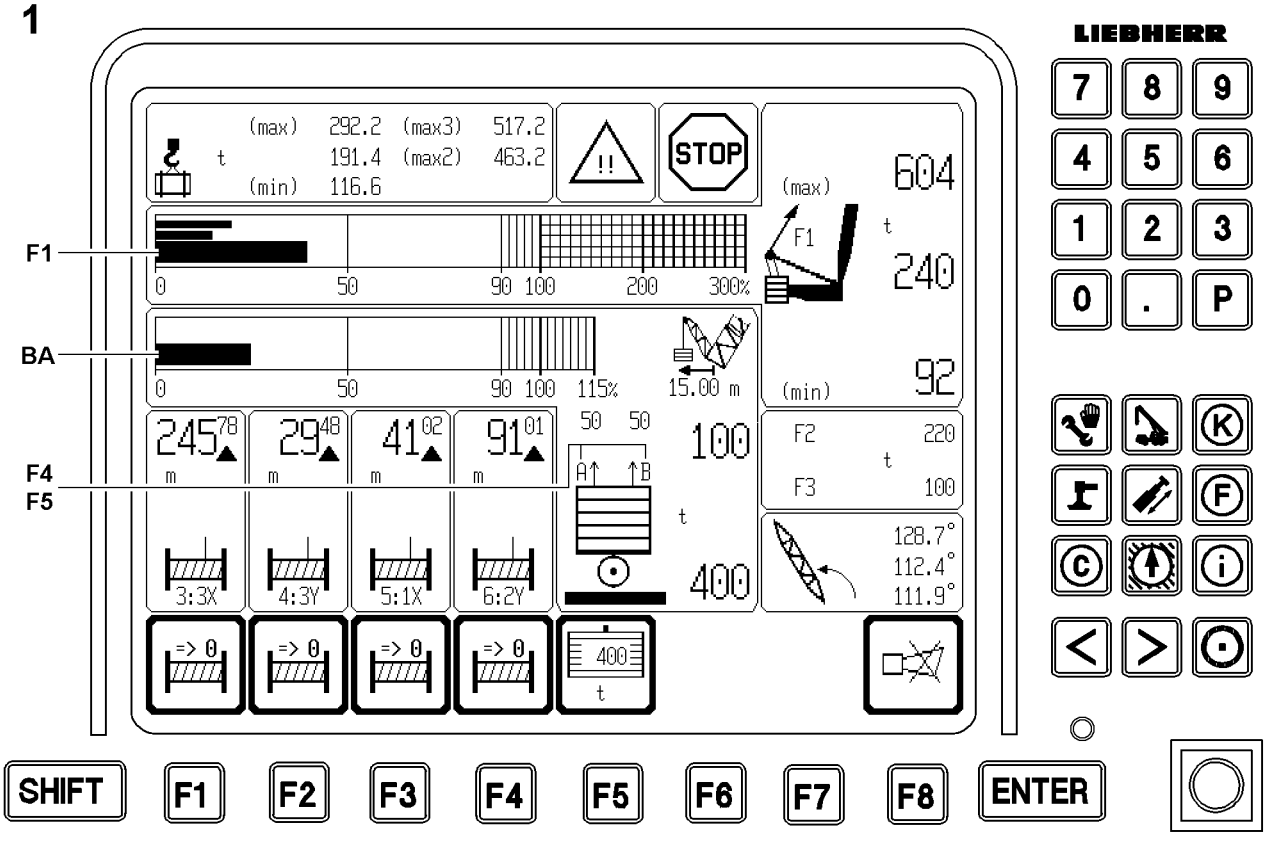
292.2
191.4
11.5
24.6
87.0°
48.0
36.0
84.6
60.0°
012 27
006 05
2:2Y
1:1Y
V: 20%
120°
5.9
3.5
max: 12.3
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

1


F1
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4 5 6
1 2 3
0 . P
STOP
(max) 292.2 (max3) 517.2
(min) 116.6
(max2) 463.2
604
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92
100
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F2 220
F3 100
128.7°
112.4°
111.9°
245 78
29 48
41 02
91 01
3:3X
4:3Y
5:1X
6:2Y
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

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6.4 Overload monitoring in operating mode with derrick ballast

In operating modes with derrick ballast, the “maximum load for the current crane condition” is monitored two ways:

1.) Monitoring of maximum load on the LICCON monitor 0.
2.) Monitoring of test point 1-operational maximum force LICCON monitor 1.

6.4.1 Monitoring of maximum load on the LICCON monitor 0

It monitors the “maximum load according to load chart and reeving”.
In operating modes with derrick ballast, this is the maximum load of the current crane condition. It is shown on LICCON monitor 0. The current utilization of the crane results from the load utilization bar (1) on LICCON monitor 0.
If the load utilization bar reaches 90 %, an advance warning is given in the form of a “caution icon” and a “SHORT HORN” on LICCON monitor 0.
At 100 % on the load utilization bar, the shut off of all load moment increasing movements with the “stop icon” and the acoustical warning “HORN” occurs on LICCON monitor 0.

Note

- The “maximum load of the current crane condition” can possibly be increased further, refer to section “utilisation conditions”!

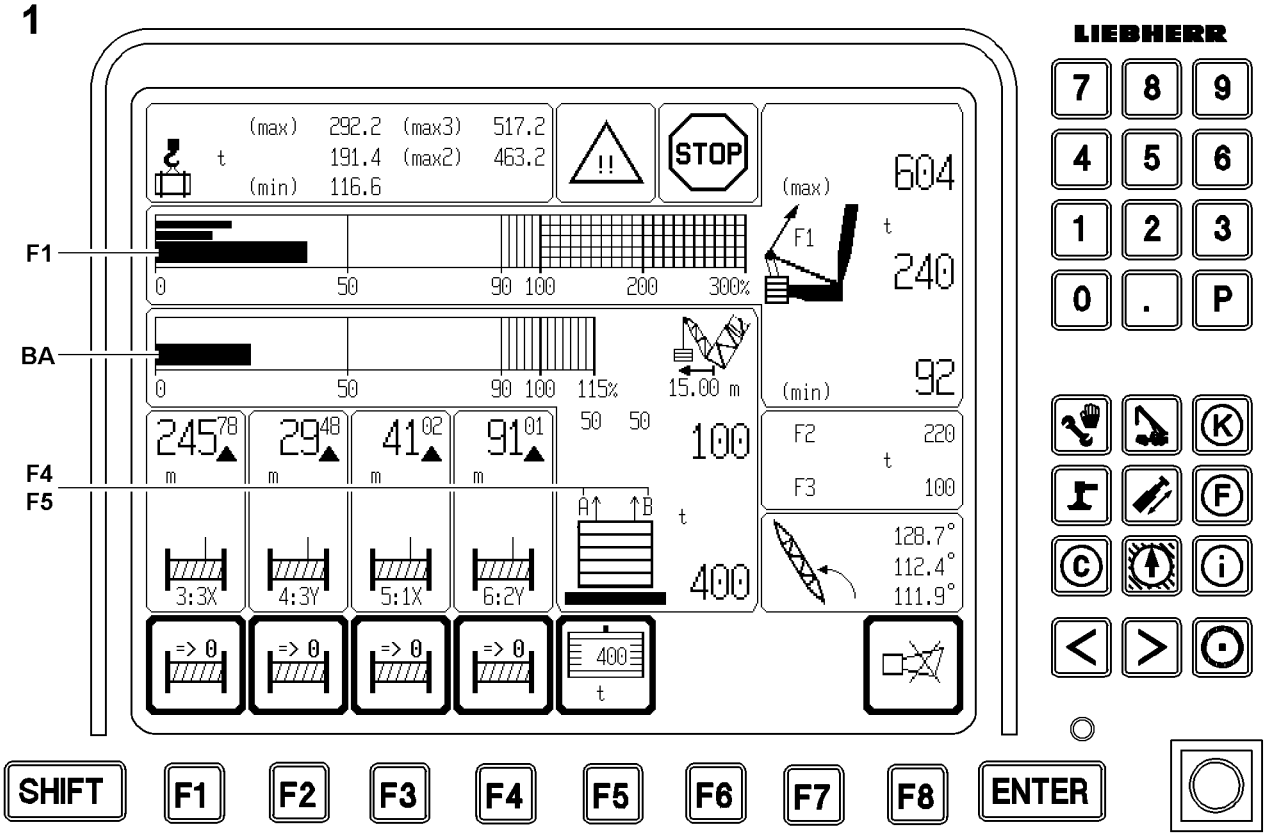
6.4.2 Monitoring of test point 1-operational maximum force (= $F1_{max}$ operation)

It is shown on LICCON monitor 1. When F1 is greater than $F1_{max\text{-}shut\ off\ value}$ shut off of all movements which could increase load torque with the stop icon and the acoustic warning “HORN” by LICCON monitor 1.

Note

- The maximum load can be safely monitored by the “LICCON overload protection monitoring” itself!
- The “$F1_{max}$-monitoring” is an additional monitoring function which shows the overload parallel to the “LICCON overload protection”!
- In all cases, where the maximum load capacity according to the load chart “max-load” is smaller than the maximum load of the current equipment configuration with optimal derrick ballast “max3-load”, which means “max-load” appears smaller “max3-load”, when lifting the maximum load, the monitor display looks as if the “LMB utilization bar of the crane” is at 100 % and the “F1 utilization bar” is approximately at 100 %!
- At the just completed LMB-Stop (“current load” / “max-load capacity” greater than 100 %) $F1_{actual}$ already lies just over $F1_{max}$ or just below. There is a certain tolerance due to the component weights and the wind influences. Since the maximum load can always be raised, shut off will not occur at $F1_{actual}$ / $F1_{max}$ greater than 100 %. Shut off will only occur at $F1_{actual}$ / $F1_{max\ operation\ shut\text{-}off\ value}$. For this crane, the following applies: $F1_{max\text{-}operation\ shut\ off\ value}$ = $F1_{max\text{-}operation}$ +$F1_{addition\ for\ shut\ off}$ (also see Crane operating instructions chapter 4.02). The $F1_{addition\ for\ shut\ off}$ is selected such that $F1_{max\text{-}operation\ shut\ off}$ may normally never come about. This shut off provides a second safety, particularly in cases with “max-load capacity” smaller “max3-load capacity” as additional safety precaution. For example, if the weighed load is far too low due to a sensor failure, the actual load could be greater than the maximum permissible load without the LICCON overload protection shut off tripping. The crane could be overloaded. In this particular case, with the “max-load capacity” smaller than the “max3-load capacity”, with $F1_{max}$ larger $F1_{max\text{-}operation\ shut\ off\ value}$ the $F1_{max\ -shut\ off}$ triggers. In this case, the crane is already slightly overloaded, however shut off prevents an overload in certain cases or toppling of the crane. This means that the $F1_{max\text{-}operation\ shut\ off}$ can protect the crane from overload in certain cases!
- It is to be ensured that the load weight and the shut off upon maximum load capacity function reliably!

1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(min) 116.6
STOP
604
(max)
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240
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(min)
F1
BA
F4
F5
0 50 90 100 200 300%
0 50 90 100 115%
15.00 m
245 78
29 48
41 02
91 01
m
50 50
100
F2 220
t
F3 100
A B
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112.4°
111.9°
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4:3Y
5:1X
6:2Y
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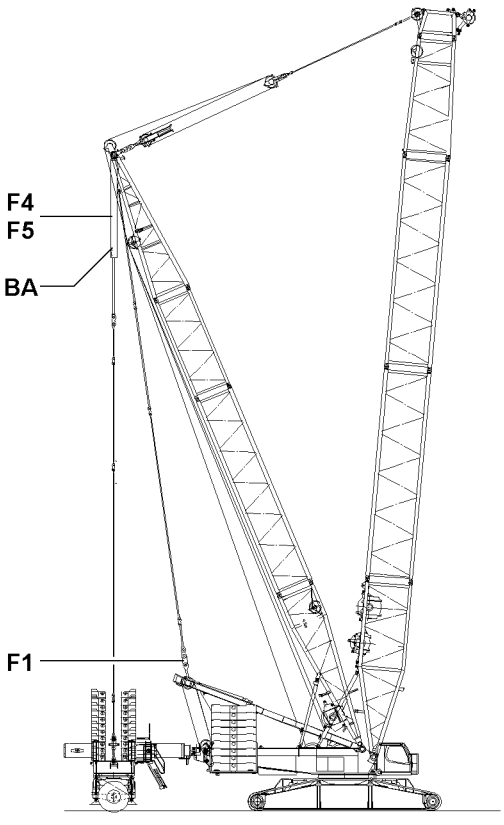
F4
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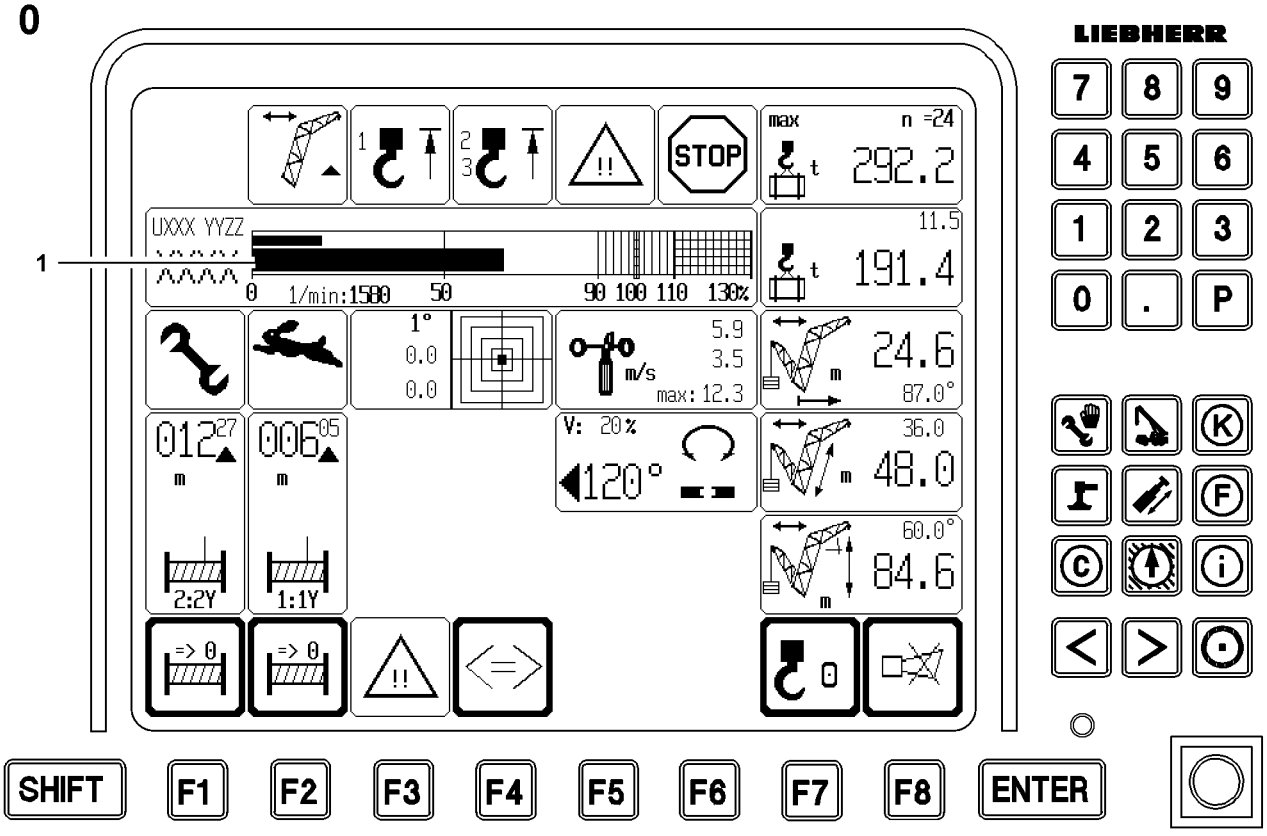
DANGER
The crane can topple over!
In cases with “max-load capacity” = “max3-load capacity”, the $F1_{max}$ -shut off value does not offer protection! The $F1_{max}$ shut-off threshold is so high that the crane will probably topple over or be damaged before the shut-off threshold is reached!
▶ Carefully monitor the displays on the LICCON monitor!

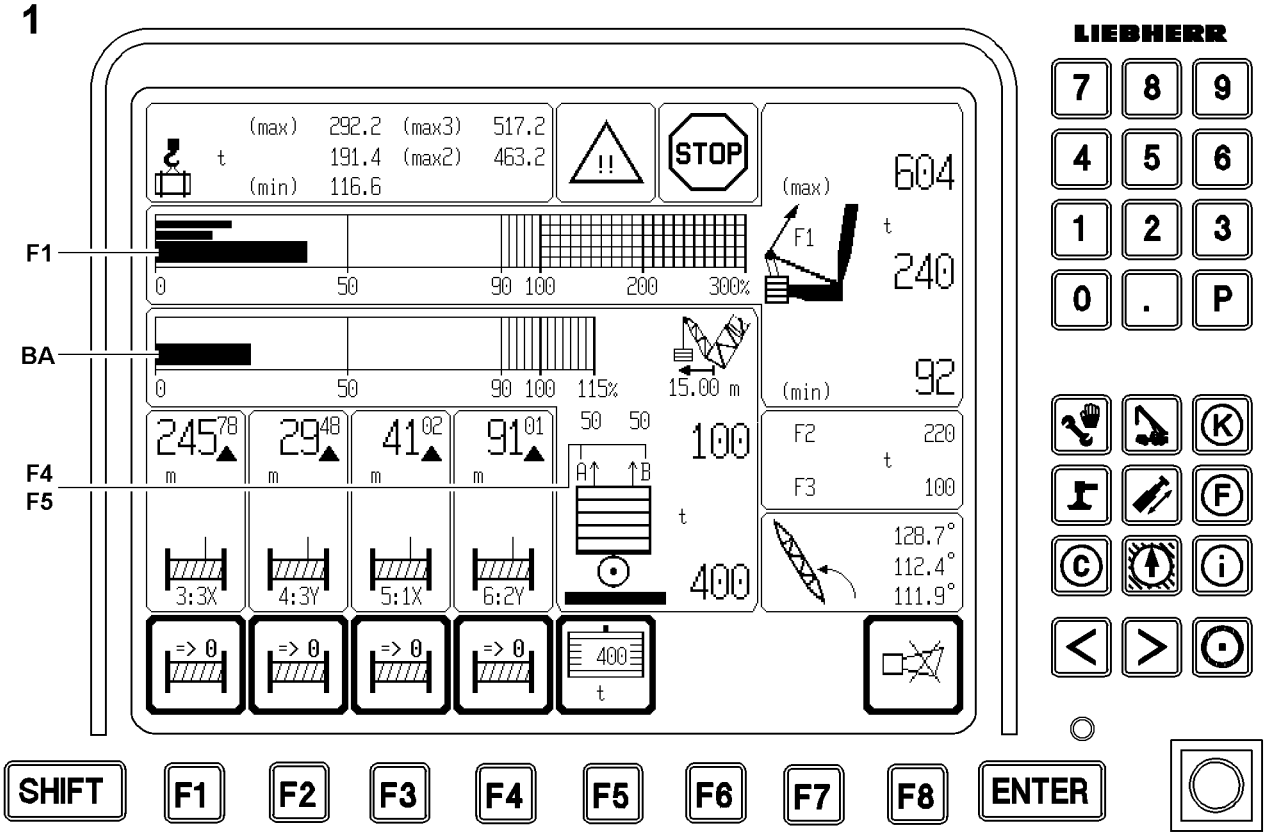
WARNING
Risk of accident!
▶ Measuring point 1-Operation-Maximum force not only depends on the current crane configuration but also on the derrick ballast pulling force measured by the pressure sensors!
▶ If the pulled derrick ballast increases, the maximum permitted $F1_{max}$ removes force and vice-versa!
▶ It is therefore important to carefully monitor the ballast weighing process and the value for the pulled derrick ballast to ensure it is plausible!

DANGER
The crane can topple over!
If the pulled ballast value has been incorrectly determined and is too low, the calculated $F1_{max}$ may be too high and the crane could be overloaded without this becoming evident!
▶ Carefully monitor the displays on the LICCON monitor!

0


1
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
max n =24
292.2
191.4
11.5
24.6
87.0°
48.0
36.0
84.6
60.0°
012 27
006 05
2:2Y
1:1Y
V: 20%
120°
5.9
3.5
max: 12.3
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

1


F1
BA
F4
F5
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
(max) 292.2 (max3) 517.2
(min) 116.6
(max2) 463.2
604
240
92
100
400
F2 220
F3 100
128.7°
112.4°
111.9°
245 78
29 48
41 02
91 01
3:3X
4:3Y
5:1X
6:2Y
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

B107247

6.4.3 Utilization conditions

The current utilization of the crane results from the “crane load utilization bar” **1** on the LICCON monitor 0.

Max. load carrying capacity:

– The “maximum load carrying capacity in current operating condition (**“max-load carrying capacity”**) ” is achieved, when the “crane load utilization bar” **1** displays 100 %.
This is the case when the “crane utilization accords with the load chart and reeving” 100 % achieved (“momentary load” is equal to the “maximum load carrying capacity”).
When the “max-load carrying capacity” is smaller or equal to the “max2-load carrying capacity”, then the “max-load carrying capacity” can be increased through:
  • Pulling up the derrick ballast, if the derrick ballast is not already suspended and the currently pulled derrick ballast is still smaller than the optimum derrick ballast.

Max2-load carrying capacity:

– The “maximum load carrying capacity of the current crane equipment ” (**“max2-load carrying capacity”**) is achieved when the “crane utilization bar” **1** stands at 100 % **and** the “derrick ballast-utilization bar display” **BA** stands at greater than or equal to 100 % (the current derrick ballast is completely lifted from the ground), and the derrick ballast-entry value and the ballast weight are correct.
This is the case when the “current load” and the “max2-load carrying capacity” achieves 100 % (“current load” is equal to the “max2-load carrying capacity”).
When the “max2-load carrying capacity” is smaller than the “max3-load carrying capacity”, then the “max-load carrying capacity” can be increased through:
  • Increasing the derrick ballast by adding additional ballast plates if the placed ballast is still smaller than the optimum ballast.

Max3-load carrying capacity:

– The “maximum load carrying capacity of the current crane equipment ” (**“max3-load carrying capacity”**) is achieved when the “crane utilization bar” **1** stands at 100 % **and** the “derrick ballast-utilization bar display” **BA** stands at 100 % (the optimal derrick ballast is completely lifted from the ground), and the derrick ballast-entry value and the ballast weight are correct.
This is the case when the “current load” and the “max3-load carrying capacity” achieves 100 % (“current load” is equal to the “max3-load carrying capacity”).
Here, the optimal derrick ballast is already entirely pulled!
Further increasing the derrick ballast at this derrick ballast radius will not increase the permitted load as the “max3-load carrying capacity”!

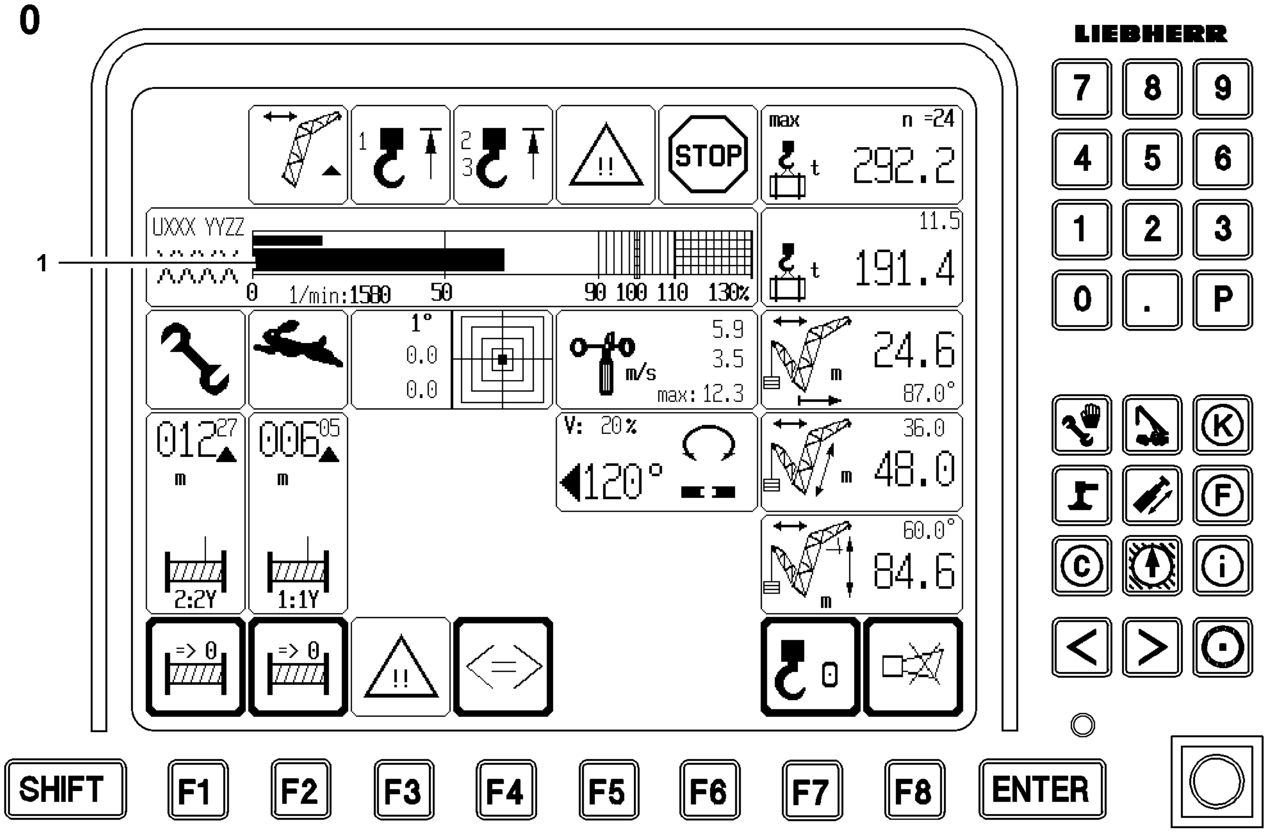
Note

▶ In some cases it may be possible to increase the load capacity, in some cases reducing the derrick ballast radius as well; refer to the load chart manual or LICCON job planner!

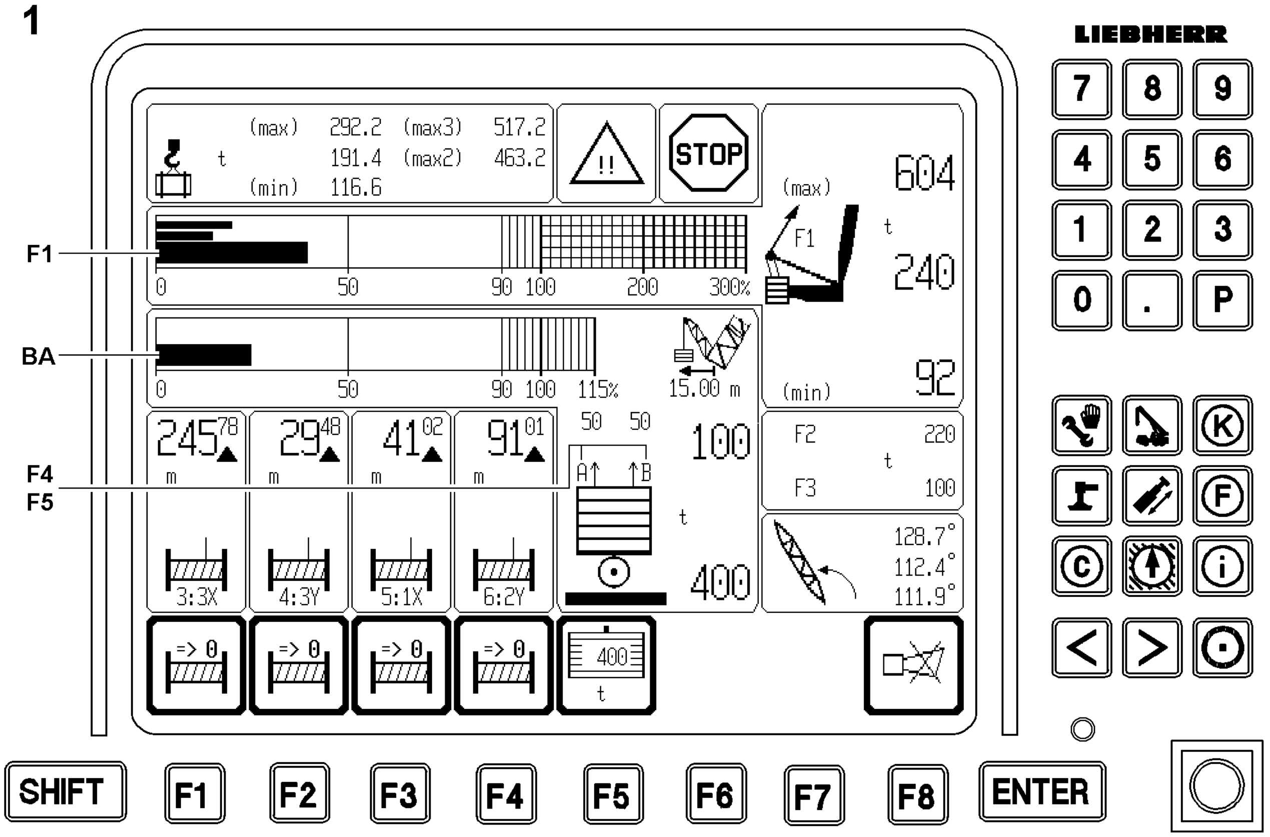
This also applies with:

– “Current load” equal to “max-load carrying capacity”.
– “Current load” equal to “max2-load carrying capacity”.

0


1
LIEBHERR
max n =24
292.2
UXXX YYZZ
0 1/min:1580 50 90 100 110 130%
11.5
191.4
1°
0.0
0.0
5.9
3.5
m/s
max: 12.3
24.6
87.0°
012 27
006 05
V: 20%
120°
36.0
48.0
60.0°
84.6
2:2Y
1:1Y
STOP
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

1


F1
BA
F4
F5
LIEBHERR
(max) 292.2 (max3) 517.2
191.4 (max2) 463.2
(min) 116.6
STOP
(max)
604
240
92
(min)
0 50 90 100 200 300%
0 50 90 100 115%
15.00 m
245 78
29 48
41 02
91 01
50 50
100
400
F2 220
F3 100
128.7°
112.4°
111.9°
3:3X
4:3Y
5:1X
6:2Y
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B107247

The bypass of the maximum load according to the load chart and reeving (crane utilization bar 1 stands at 100 %) can be bypassed by the following measures:

1.) Bypass key button D on the LICCON monitor 0.
2.) Assembly key switch in the instrument panel.
3.) **Note:**
The test point 1-assembly - maximum force shut off (= F1 max-assembly) cannot be bypassed.

DANGER
The crane can topple over!
When the assembly key button is turned on, the LICCON overload protection is bypassed and is thereby no longer effective!
The crane can be overloaded unnoticed and topple over!
Personnel can be severely injured or killed!

- ▶ When the assembly key switch is turned on, it is only permitted to execute crane movements that reduce the load torque within certain operating and load ranges!
- ▶ Turn the assembly key button is immediately switched off after reaching the permissible load range!
- ▶ The crane operator alone is responsible completely for his actions during bypass of LICCON overload protection!

Note

- ▶ The movement “ballast up” or “ballast down” requires utmost attention by the crane operator!

6.5 Checking the length sensor value on the ballast trailer

CAUTION
Risk of accident!
If the derrick ballast radius is measured incorrectly, a maximum load and a F1-operational-max load carrying capacity will be calculated due to the incorrect radius!
The crane will be overloaded unnoticed and can topple!
Personnel can be severely injured or killed!

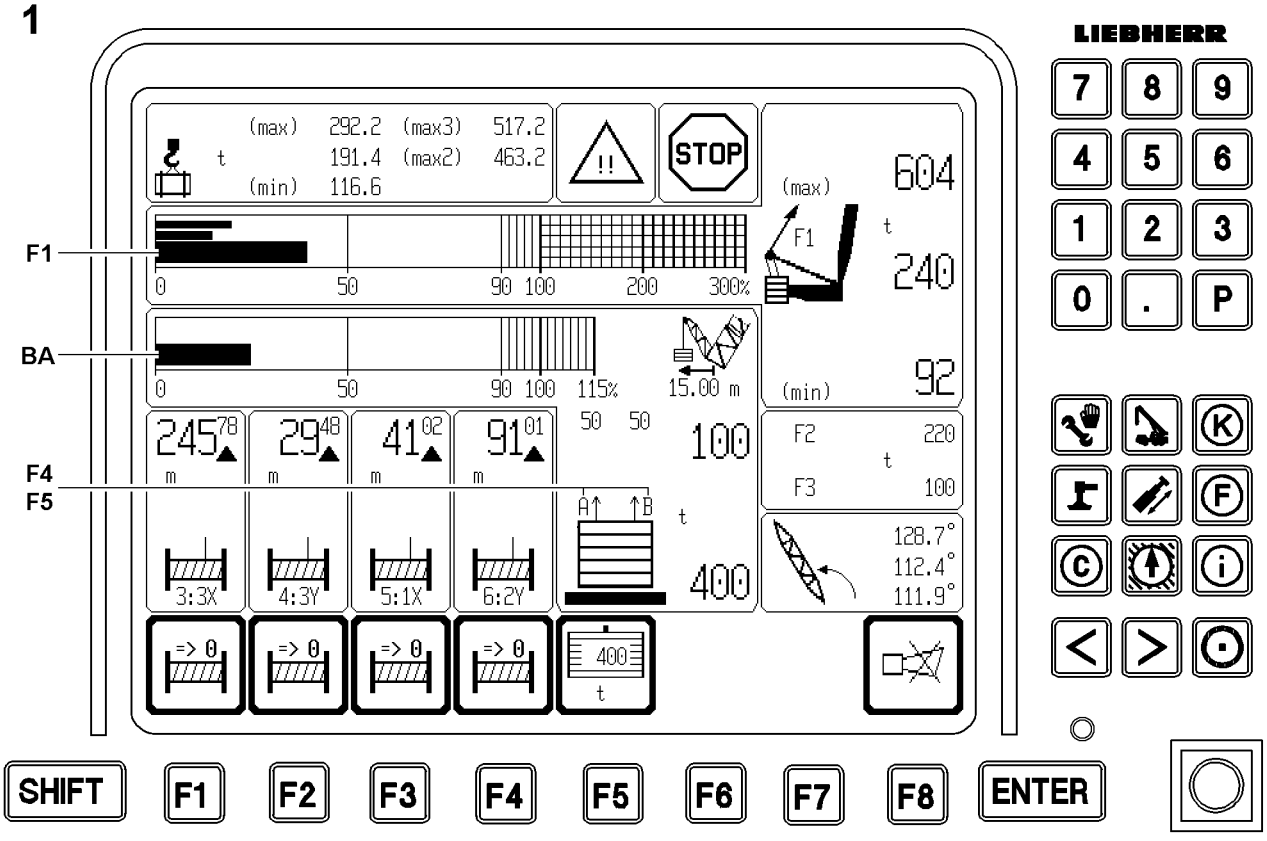
- ▶ The crane driver may not rely blindly on the derrick ballast radius measurement, but he must think for himself and check, if the measurement is still working correctly!
- ▶ If the derrick ballast is fully telescoped out or in, the display “derrick ballast radius” must show almost the end position of the radius 13 m or 18 m!

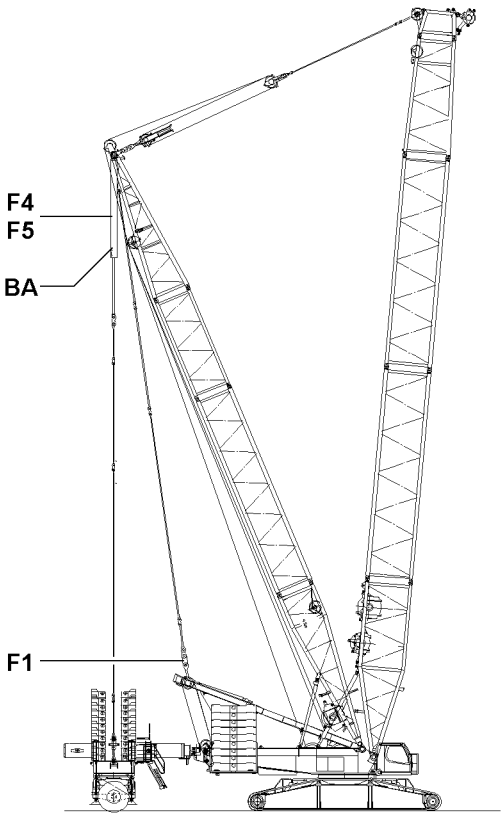
Note

- ▶ When telescoping the ballast trailer guide, the indicator must change the display “derrick ballast radius” on the LICCON monitor corresponding to the movement of the derrick ballast! If this is not the case, the crane operator can immediately notice if the length sensor rope drum jams when spooling in or out!

- ▶ When telescoping the derrick ballast in and out, the “derrick ballast radius” display must be observed carefully on the LICCON monitor.

1


LIEBHERR
F1
BA
F4
F5
(max) 292.2 (max3) 517.2
t 191.4 (max2) 463.2
(min) 116.6
STOP
604
240
92
100
400
F2 220
F3 100
128.7°
112.4°
111.9°
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


F4
F5
BA
F1

B108977

6.6 Difference force monitoring of ballast guying

In operating modes with derrick ballast, the difference between the forces on derrick guying A and B is monitored on LICCON monitor 1. If the difference exceeds a permissible value, an acoustical warning is issued and the two force values blink.

WARNING

Risk of accident from damaged crane components!

Too high a difference in the derrick ballast guying A and B can have the result that the derrick ballast arrives in an impermissible inclined position, and thereby the derrick end section, the ballast guide or other crane components may be damaged!

Personnel can be severely injured or killed!

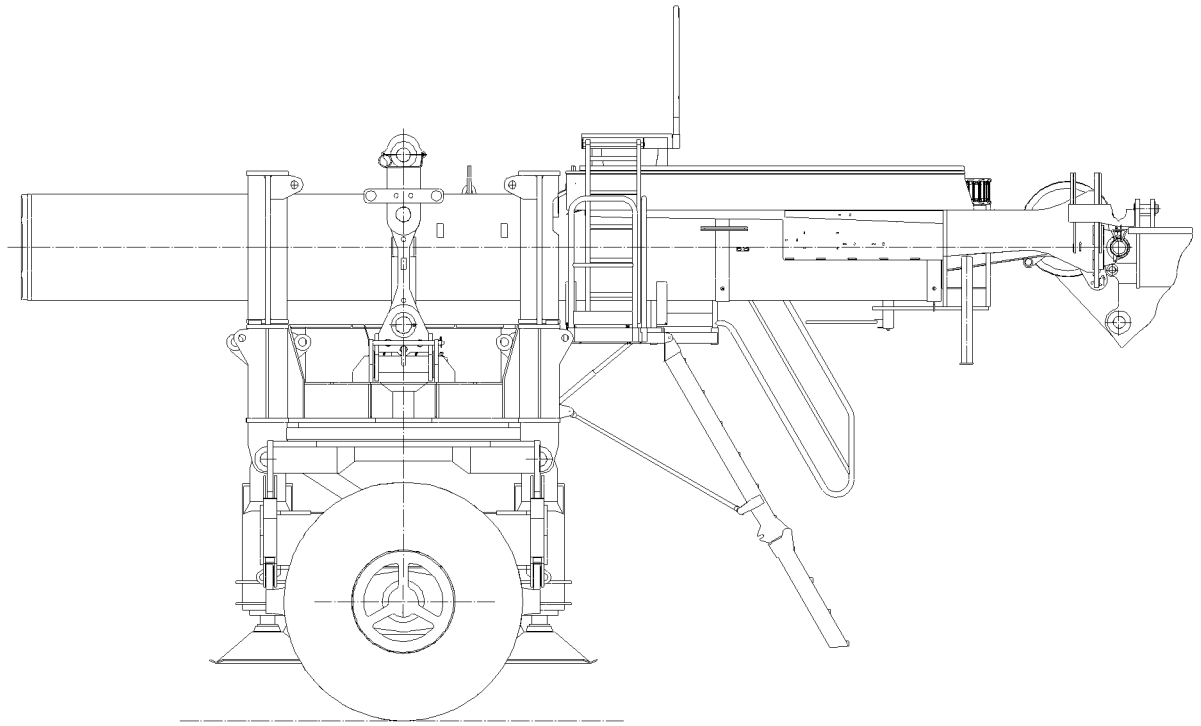
- ▶ The forces in the derrick ballast guying A and B are to be carefully observed on LICCON monitor!
- ▶ If the specified limit value is exceeded, there occurs **no shut off** of crane movements!

Exceeding the limit value can have the following causes:

- – Taking on the load: Taking on the load by relieving the tires on the ballast trailer or flexing of the turntable.
- – The ground under the derrick ballast is uneven.
- – The crane is leaning to one side.
- – The derrick ballast has been loaded one-sided.
- – Incorrect force measurement in one of the derrick ballast guying is incorrect.

The crane driver must determine the correct cause and take appropriate remedial action:

- – Error message appears.
- – The error, which caused the one-sided force, must be remedied.
- – In case of small ground unevenness only, the following measure is permissible:
  Lock one pull cylinder and with the other pull cylinder lift the derrick ballast or “derrick ballast lower” activate until the difference between the forces A and B is smaller.
- – In case of implausible sensor values: Check whether the ballast weighing pressure sensors or inputs for the ballast weighing are faulty. If necessary, pull out the sensor or replace the CPU.



B108755

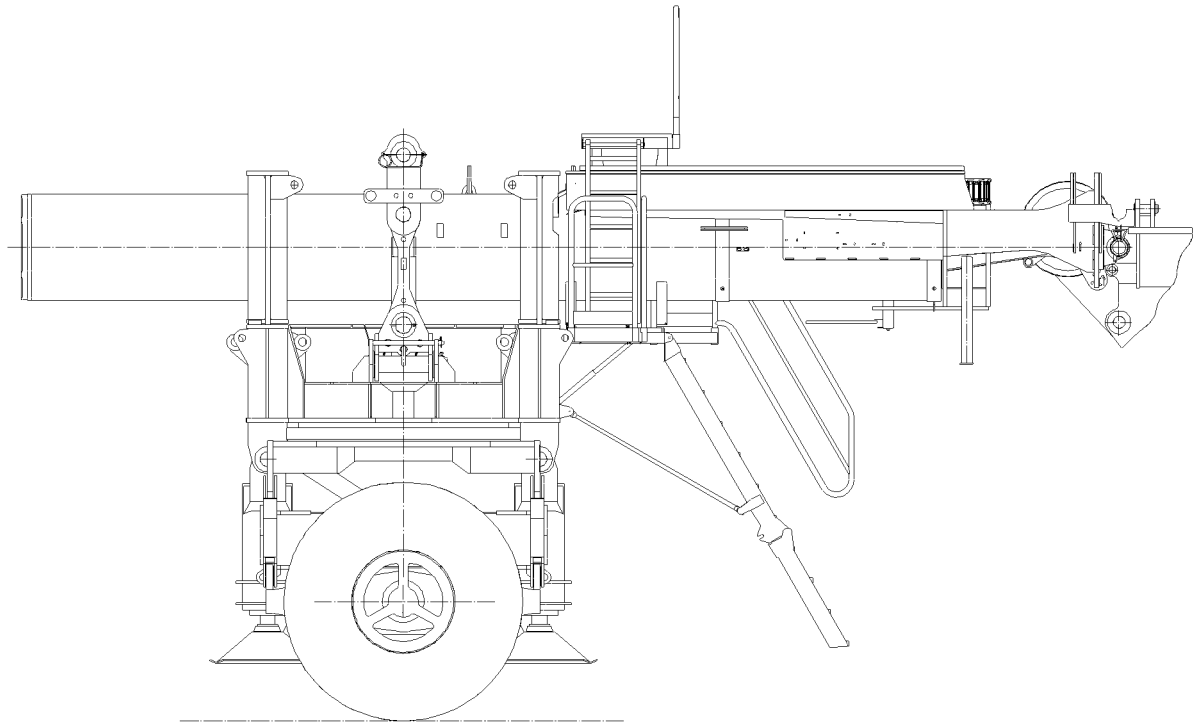
7 Disassembling the ballast trailer

WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see crane operating instructions, chapter 2.04!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

Make sure that the following prerequisites are met:
– the boom equipment is placed down,
– the ballast trailer guide is fully telescoped in,
– the ballast plates on the ballast trailer are removed,
– an auxiliary crane and a lifting platform are available.

Note
- ▶ Observe the data in the erection and take down charts when placing the boom equipment down!

WARNING
Danger of tipping the ballast trailer!
If the ballast trailer is unpinned on the turntable, there is a danger of tipping over!
Personnel can be severely injured or killed!
- ▶ Ballast trailer disassembly may only be carried out by authorized experts!
- ▶ The disassembly of the ballast trailer may only be conducted on a level and load-bearing surface!
- ▶ The ballast trailer has **no** brake system! The ballast trailer must be supported with the support cylinders if it is **not** pinned on the turntable!
- ▶ From unpinning the ballast trailer on the turntable, it must be ensured that the condition and stability of the ballast trailer is ensured, refer to section “condition and stability with ballast trailers not assembled on the turntable”!



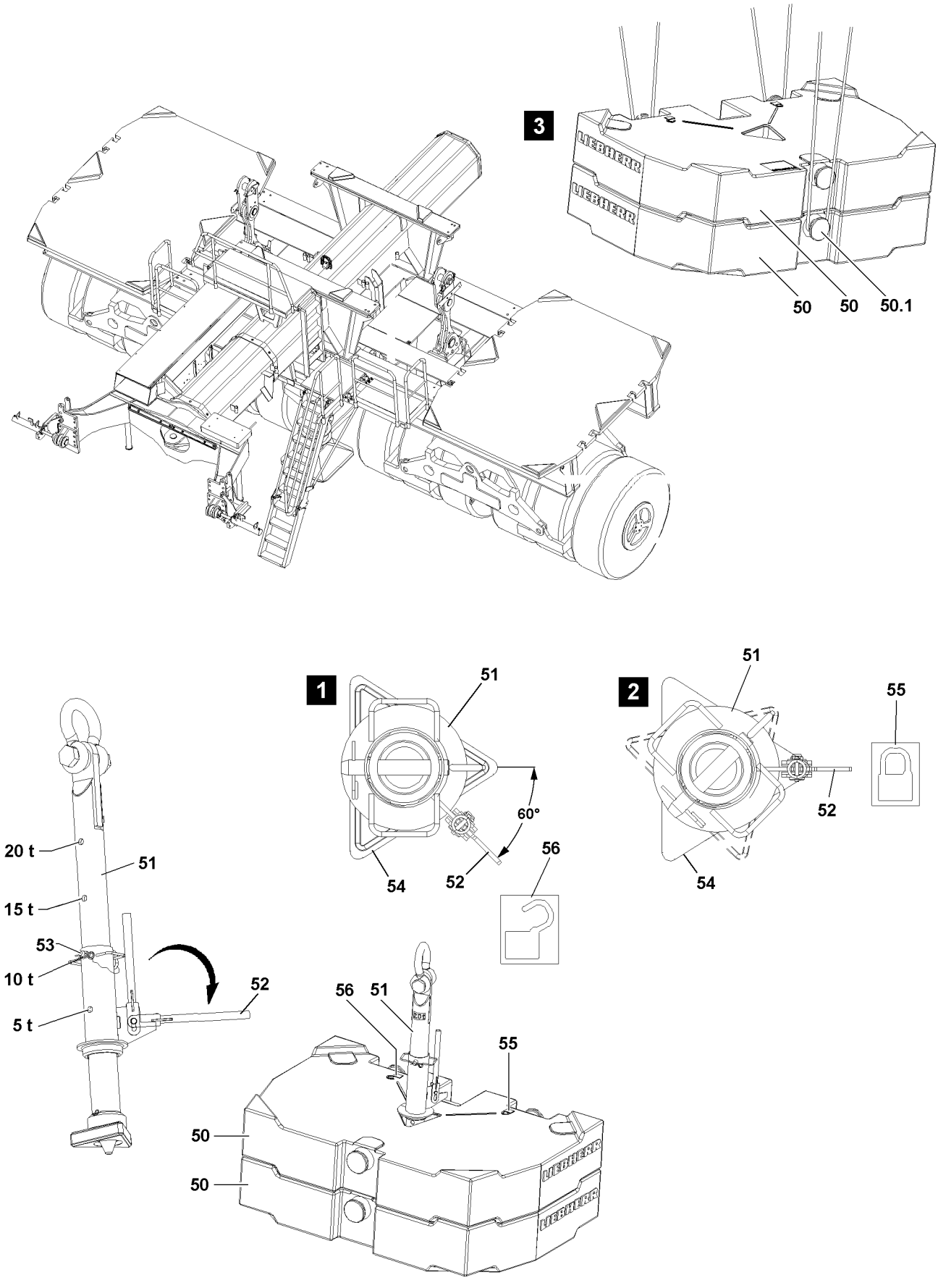
B108755

7.1 Removing the ballast plates

Ensure that the following prerequisite is met:
– the ballast retainers have been removed.

Note
▶ The ballast plates are marked with their own weights!

WARNING
The crane can topple over!
If more than 20 t are removed with one lift from a ballast stack or if the ballast is removed asymmetrically, then the crane can topple over!
Personnel can be severely injured or killed!
▶ A weight difference between the right and left ballast stack of more than 20 t is prohibited!
▶ Alternately remove no more than maximum 20 t ballast assemblies from the ballast stack, symmetrically on the left and right!


3
50
50
50.1
1
51
60°
54
52
56
2
51
55
52
54
20 t
51
15 t
53
10 t
52
5 t
56
51
55
50
50

B108978

7.1.1 Removing the ballast plates, attachment system: “Twistlok”

DANGER
Risk of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged!
Personnel can be severely injured or killed!
- ▶ Make sure that the ballast plates are laying correctly in the centerings!
- ▶ Replace damaged ballast plates!

To remove the ballast plate(s) **50**, use the receptacle stud **51**.
Before the receptacle stud **51** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **51** is set correctly. The length of the receptacle stud **51** can be adjusted with the pin **53**.

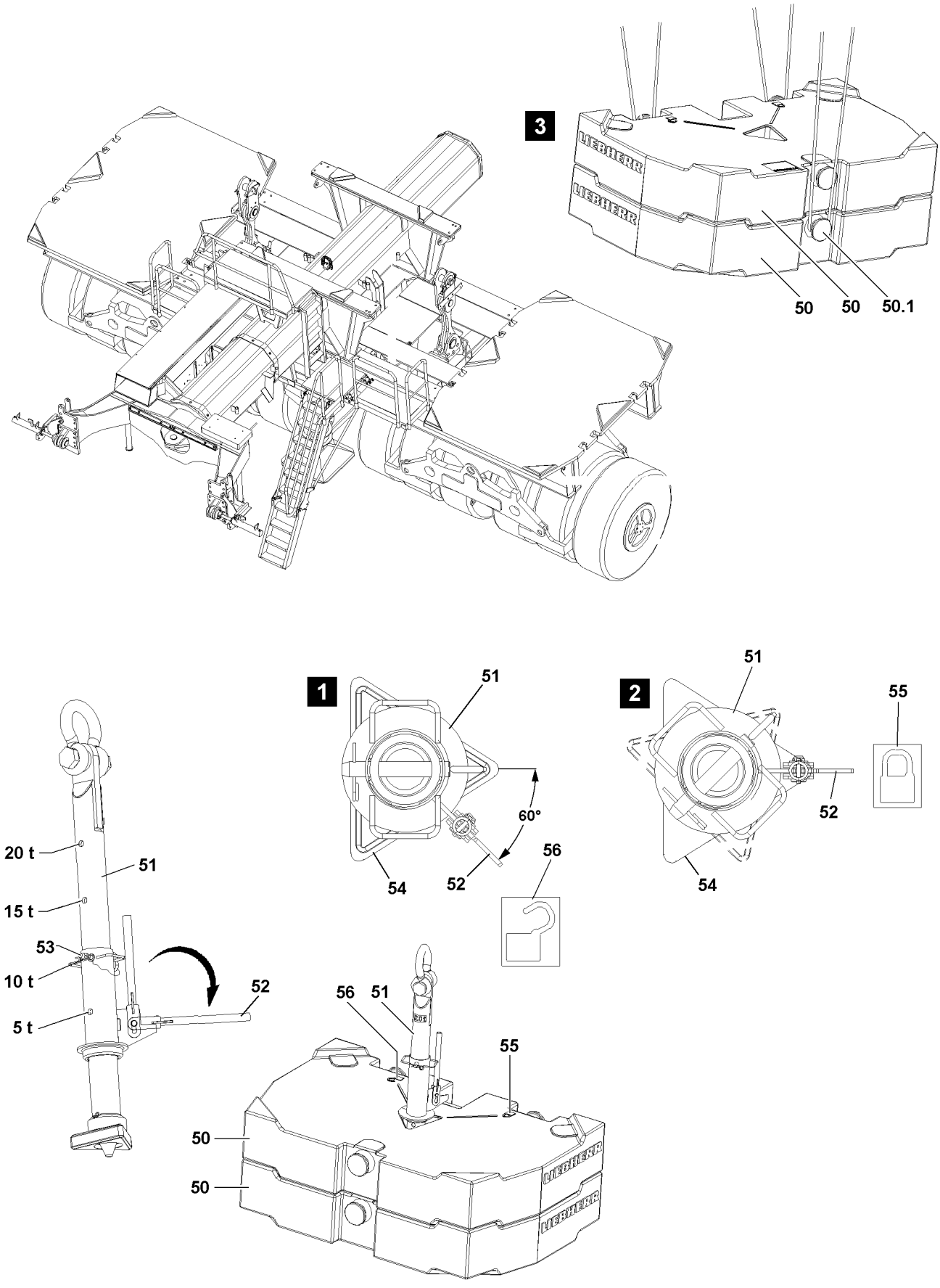
- ▶ If the length of the receptacle stud **51** is to be adjusted:
  Release and unpin the pin **53**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **51**.
- ▶ Pin in the pin **53** and secure with spring retainer.
- ▶ Attach the receptacle stud **51** on the auxiliary crane and guide it into the ballast plate(s).
- ▶ Pull up the lever **52** and fold it down.
- ▶ Turn the lever **52** by 60° until the lever **52** points to the icon **55**. See illustration **2**.

Result:
– The receptacle stud **51** is locked with the ballast plate.

- ▶ Lift the ballast plate with the receptacle stud **51** and remove it from the ballast stack or the ballast pallet.
- ▶ Turn the lever **52** by 60° until the lever **52** points to the icon **56**. See illustration **1**.

Result:
– The receptacle stud **51** is unlocked from the ballast plate.

- ▶ Carefully pull the receptacle stud **51** from the ballast plate.
- ▶ Alternately remove the ballast plates from both sides.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54
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51
15 t
53
10 t
52
5 t
56
51
55
50
50

B108978

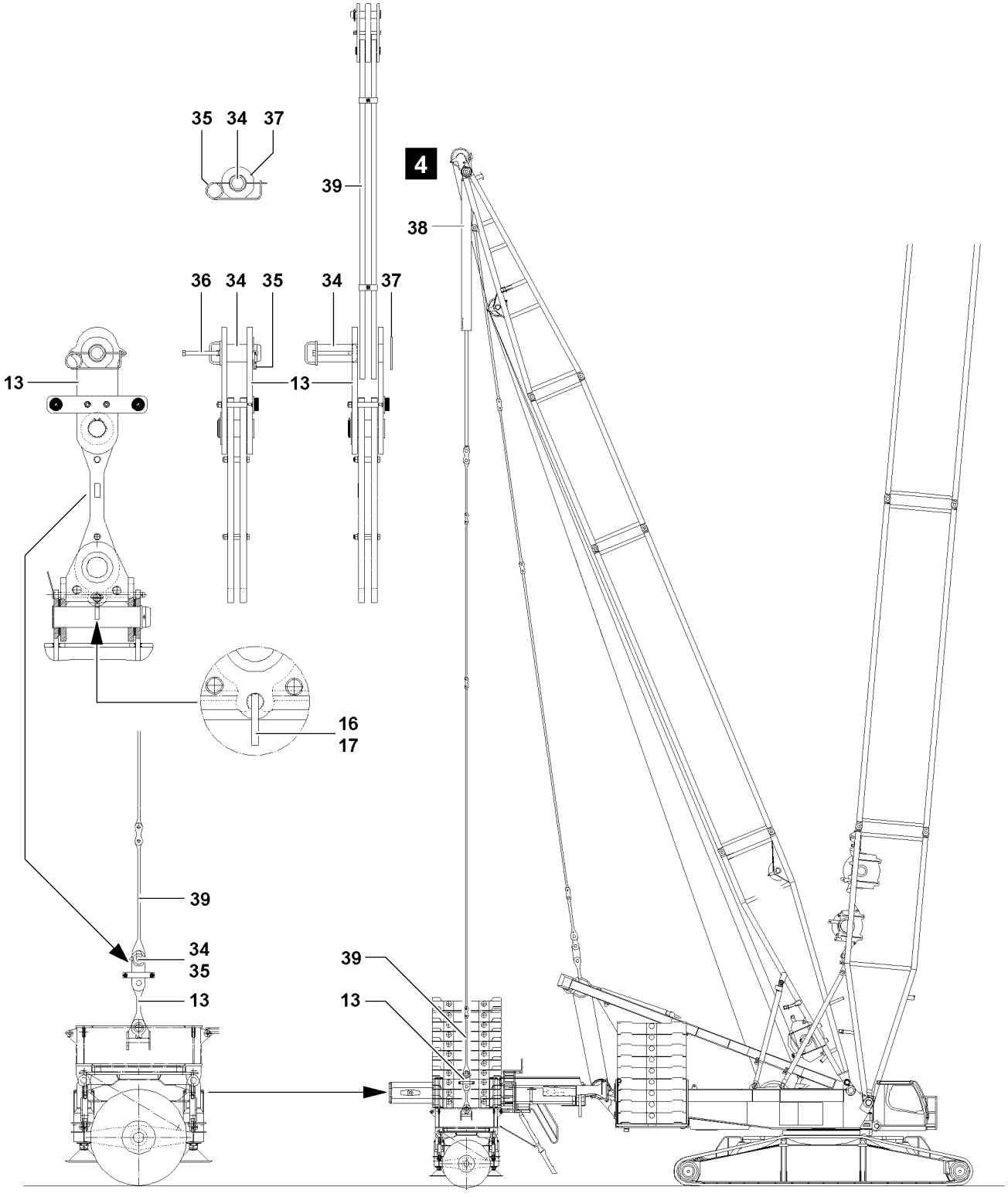
7.1.2 Removing the ballast plates, attachment points: Bitt

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **50.1** are overloaded and the ballast plates can fall down!
Personnel can be severely injured or killed!
- ▶ Lift no more than maximum 20 t with the ropes, 3 attachment points!
- ▶ Replace damaged ballast plates immediately!

WARNING
Incorrect handling of the attachment equipment!
If attachment equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the attachment equipment is correctly attached on the bitts **50.1** and that it is secured sufficiently to prevent it from loosening up!

Note
- ▶ Remove the ballast plates individually or as a ballast assembly, maximum 20 t!
- ▶ The weight difference between the outer ballast stacks no more than maximum 20 t !
- ▶ 20 t ballast assembly, see illustration **3**!

- ▶ Lift the ballast plate **50** or ballast assembly, see illustration **3** and remove it from the ballast stack or the ballast pallet.



B108756

7.2 Disassembling the ballast trailer guying

7.2.1 Unpin guy rods

Make sure that the following prerequisites are met:
- the ballast trailer guide is fully moved in,
- the derrick radius and the ballast trailer radius are identical (13.0 m),
- the guy rod hangs vertically,
- the guy rods are relieved by moving the pull cylinders out.

WARNING
Risk of accident due to swaying guy rods!
The guy rods can sway during the unpinning procedure!
Personnel can be severely injured or killed!
- ▶ Set the derrick boom and derrick ballast to the same radius before unpinning!
- ▶ If this is not possible, secure the guy rods against swaying with the auxiliary crane!

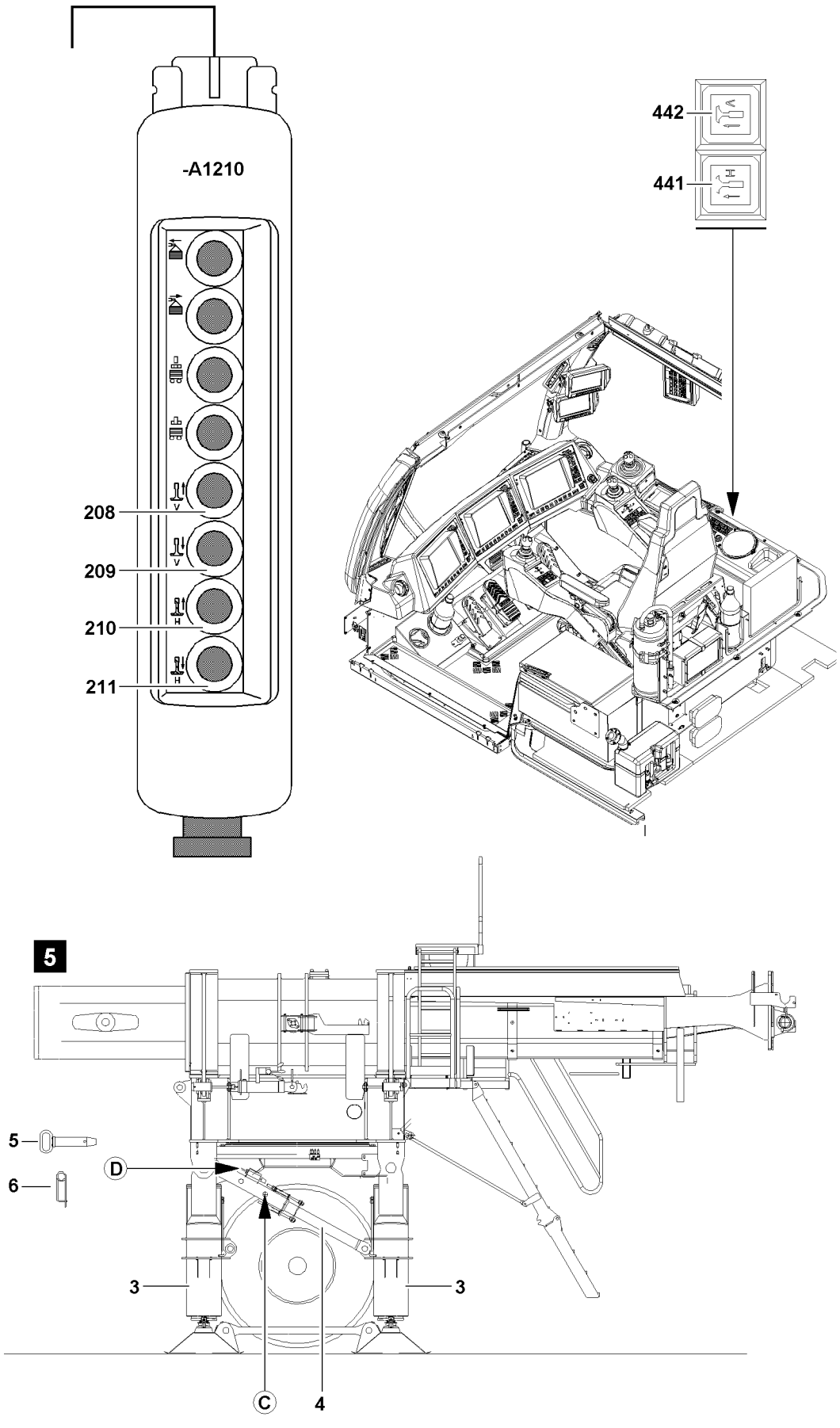
DANGER
Toppling guy rods!
If the retaining pins **16** before unpinning of the guy rods **39** are not pinned on the cross strap , the guy rods tip **13** away to the side!
Personnel can be severely injured or killed!
- ▶ Make sure before unpinning the retaining pins **34** that the retaining pins **16** are pinned and secured on both sides!
- ▶ It is **prohibited** to unpin connector pins **34** as long as it is not ensured that the retaining pins **16** are correctly pinned and secured, visual inspection!

- ▶ Pin and secure the retaining pin **16**.
- ▶ Unpin the guy rods **39** on the guy rods **13**.
- ▶ Remove the spring retainer and unpin the connector pins **34**.
- ▶ Move the pull cylinders **38** in and pull the guy rods **39** up.

7.2.2 Bring the guy rods on the ballast trailer into transport position

Make sure that the following prerequisites are met:
- the guy rods **39** are unpinned,
- the guying is pulled over the pull cylinder **38** “upward”.

- ▶ Attach the guy rod **13** onto the auxiliary crane.
- ▶ If the guy rod **13** is securely attached on the auxiliary crane:
  Release and unpin the retaining pin **14**.
- ▶ Place the guy rod **13** with the auxiliary crane to the side.
- ▶ If the guy rod **13** is laterally placed on the ballast trailer:
  Pin retaining **14** and secure with spring retainer.
- ▶ Remove the auxiliary crane.



B108781

7.3 Supporting the ballast trailer

The ballast trailer must be supported before unpinning it from the turntable.
Before supporting the ballast trailer, the locking pin **4** must be pinned and secured on the strut **5**.
Make sure that the following prerequisites are met:

– the ballast plates and the guy rods are disassembled,
– the ballast trailer guide is fully moved in,
– the crane is aligned in horizontal direction.

7.3.1 Pin the strut on the ballast trailer

WARNING
Risk of tipping the ballast trailer!
If the strut **31** is not pinned before ballast trailer disassembly with point **C** the ballast trailer can tip over!
Personnel can be severely injured or killed!
▶ Always pin the strut **31** before disassembly of the ballast trailer!

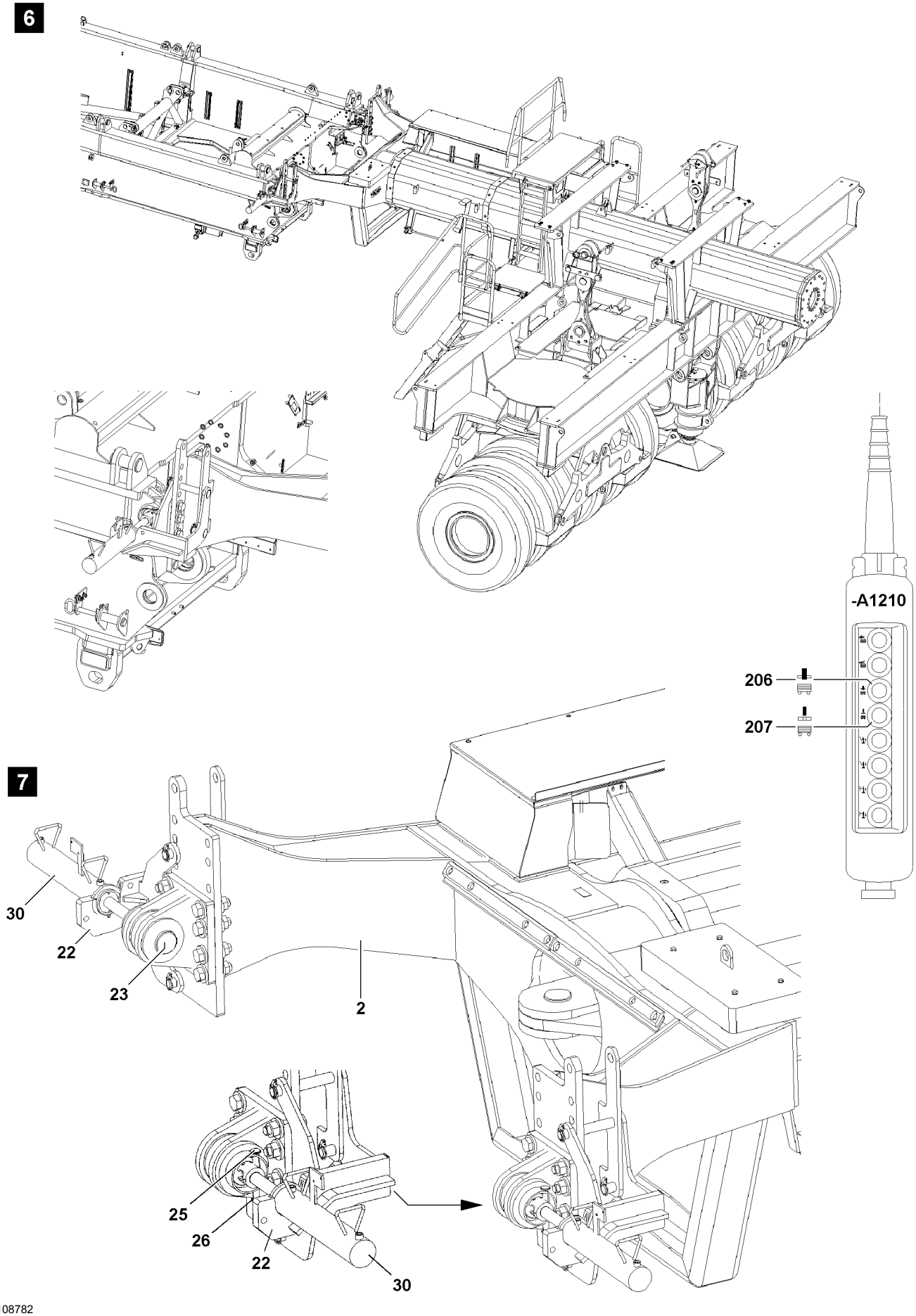
▶ Release and unpin the locking pin **32** from the transport receptacle **D**.
▶ Pin locking pin **32** into operating position **C** and secure with spring retainer **33**.

7.3.2 Moving the support cylinders out

Move the front and rear support cylinders out:
▶ Press the button **442** and button **441** in the crane operator's cab.

or

■ Press the button **209** and button **211** on the control panel **-A1210**.
▶ Check the moved out support cylinder visually.


6
-A1210
206
207
7
30
22
23
2
25
26
22
30
B108782

7.4 Unpinning the ballast trailer on the turntable

Make sure that the following prerequisites are met:
– the ballast trailer is supported,
– the electrical and hydraulic connections are present.

7.4.1 Unpinning procedure

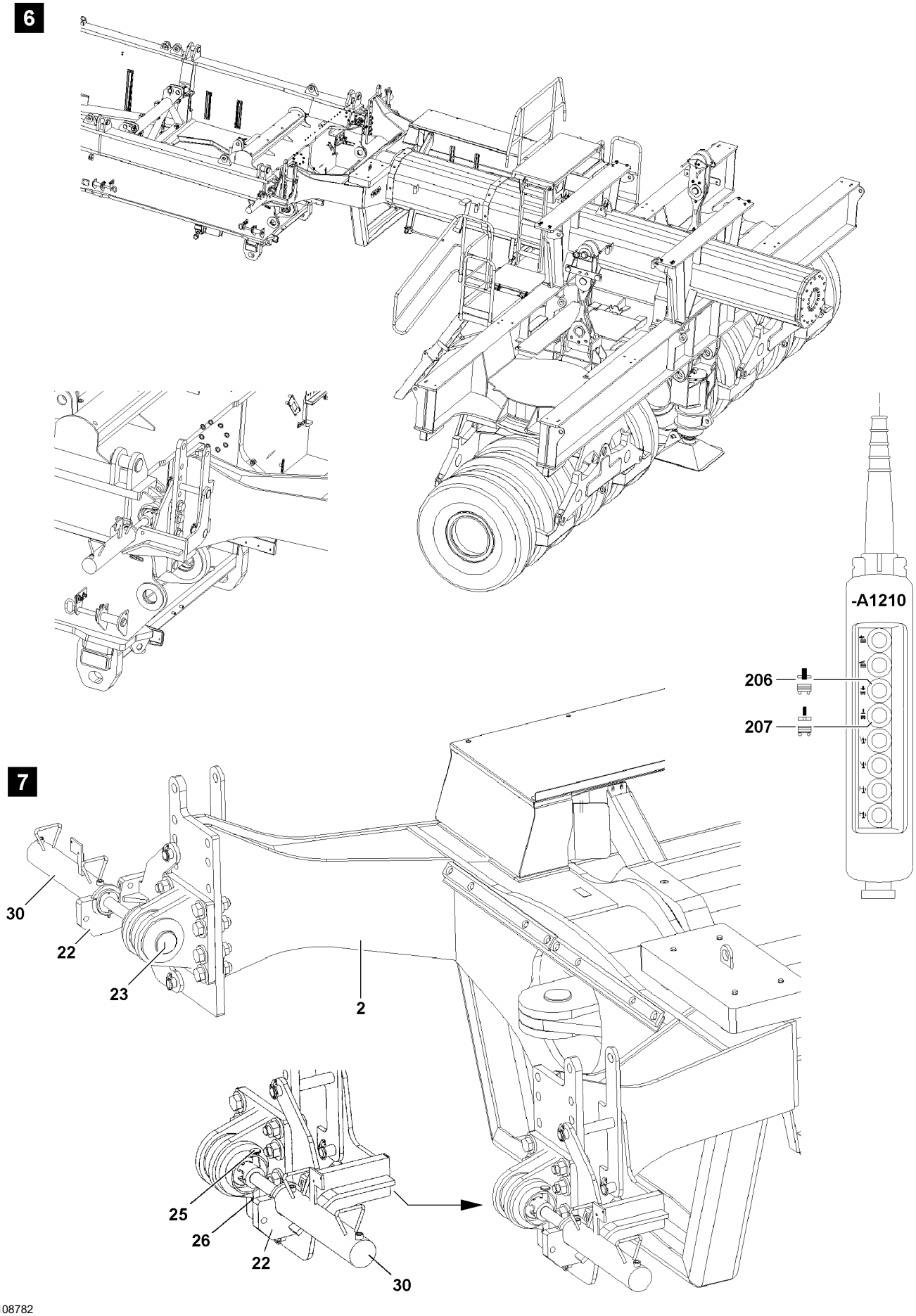
NOTICE
Damage to the retaining pins!
If the retaining pins **25** are not unpinned before the unpinning procedure, the pin pulling device can be damaged!
▶ The retaining pins **25** must be released and unpinned on both sides before pinning the connector pins **23**!

▶ If the connector pins **25** are completely unpinned in on both sides:
Press the button **206** on the control panel **-A1210**.

Result:
– The pin pulling cylinders move in.
– The connector pins **23** are unpinned on the turntable.

NOTICE
Damage to the ballast trailer or to the turntable!
If through distortion upon unpinning of the ballast trailer on the turntable only a connector pin **23** unpins (signal “Ballast trailer installed” is no longer present), the crane steering is no longer recognized, although the ballast trailer is still connected with the second connector pins **23** with the turntable!
Through the missing error signal, “Ballast trailer installed”, it is possible to turn the turntable, to drive the crane or to telescope the ballast trailer guide out / in!
This could significantly damage both the crane and the ballast trailer!
▶ All crane movements are to be limited to a “minimal degree” and must be driven with extreme caution and the smallest possible speed!
▶ After unpinning of the second connector pin **23**, it must again be checked whether both connector pins are completely unpinned!

▶ Perform a visual inspection.
▶ If the ballast trailer guide has been telescoped out during the unpinning procedure:
Move the ballast trailer guide all the way in.


6
-A1210
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23
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22
30
B108782

7.4.2 Release the electrical connection from the ballast trailer to the turntable

Note

▶ Release the electrical connections only when the ballast trailer is completely unpinned on the turntable, which means both connector pins **23** must be unpinned.

Ensure that the following prerequisite is met:

– the ballast trailer is completely unpinned on the turntable.

▶ Disconnect the electrical connections and store the cables carefully.

7.4.3 Loosen the hydraulic connections from the ballast trailer to the turntable

When hydraulic lines are connected and disconnected with quick-release couplings, make ensure that the coupling procedure is being performed correctly.

DANGER

Risk of accident due to loss of pressure or leakage!

Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious injury due to component failure!

▶ Check that the quick-release couplings have been properly connected before using the crane!

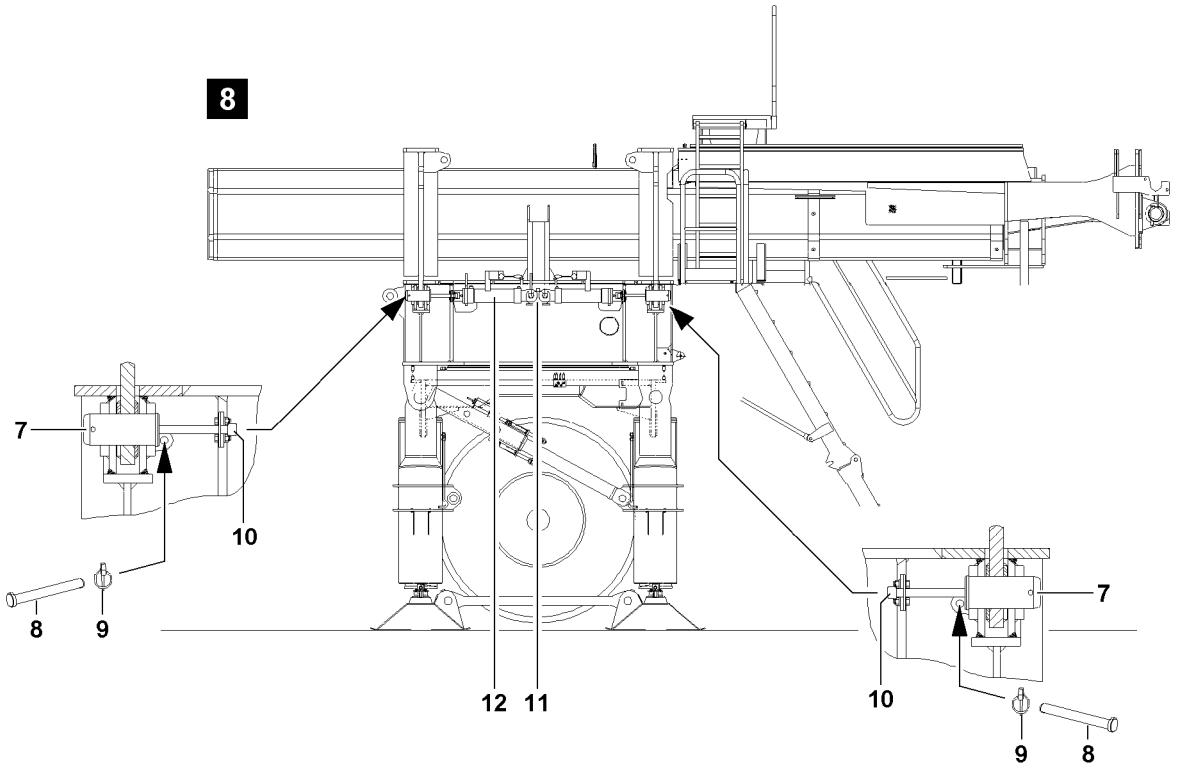
▶ Release the pressure in the hydraulic system before connecting and disconnecting. Turn the engine off and wait for short time.

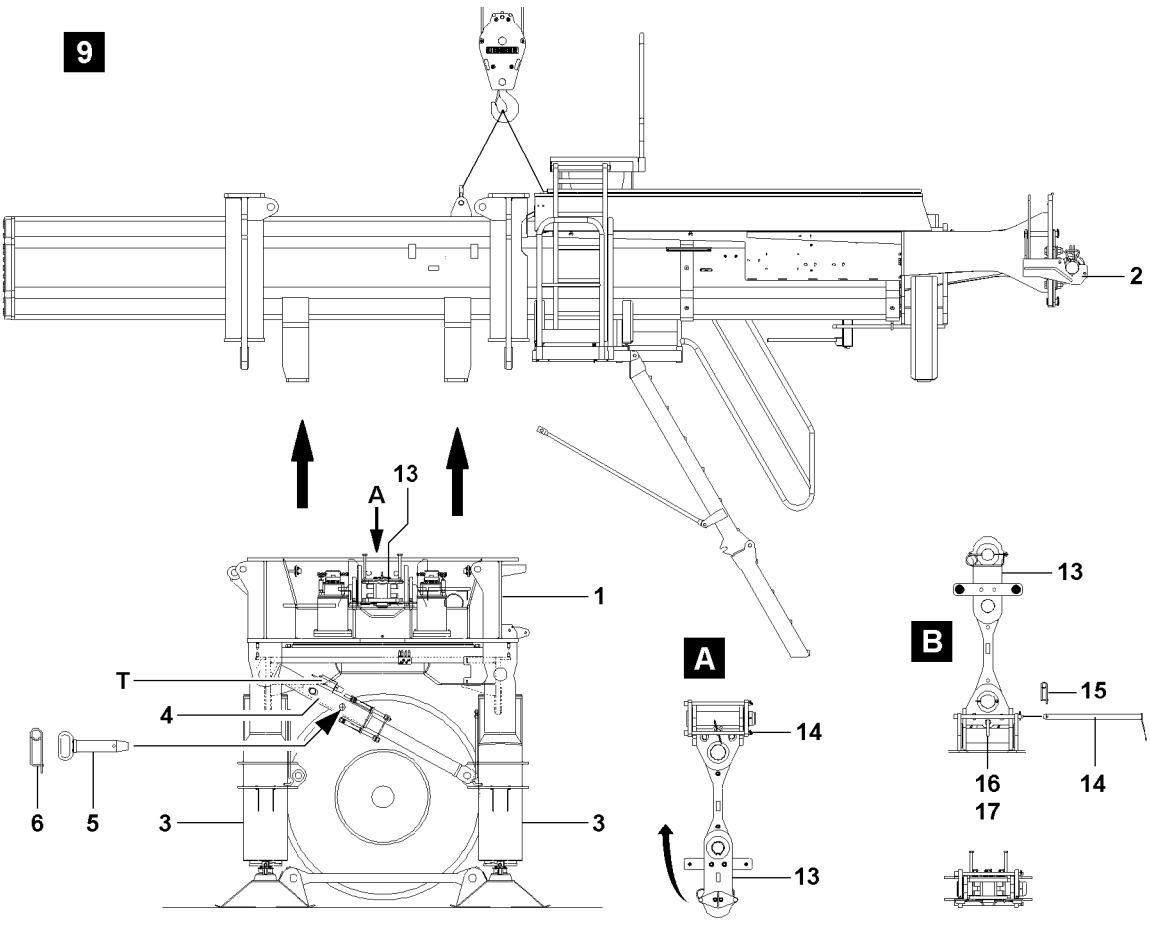
▶ Screw the coupling components (sleeve and connector) with a hand-tightened nut.

▶ Disconnect the coupling sections

▶ Store hydraulic hoses on the ballast trailer correctly.

▶ Protect the coupling sections with caps to prevent contamination and damage.





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7.5 Disassembling the ballast trailer guide

Make sure that the following prerequisites are met:

– the locking pin **5** is pinned in and secured in the strut **4**,
– the ballast trailer is supported with the support cylinders **3** and aligned in horizontal direction,
– the wheel sets are relieved,
– the ascent for the ballast trailer is in transport position.

WARNING

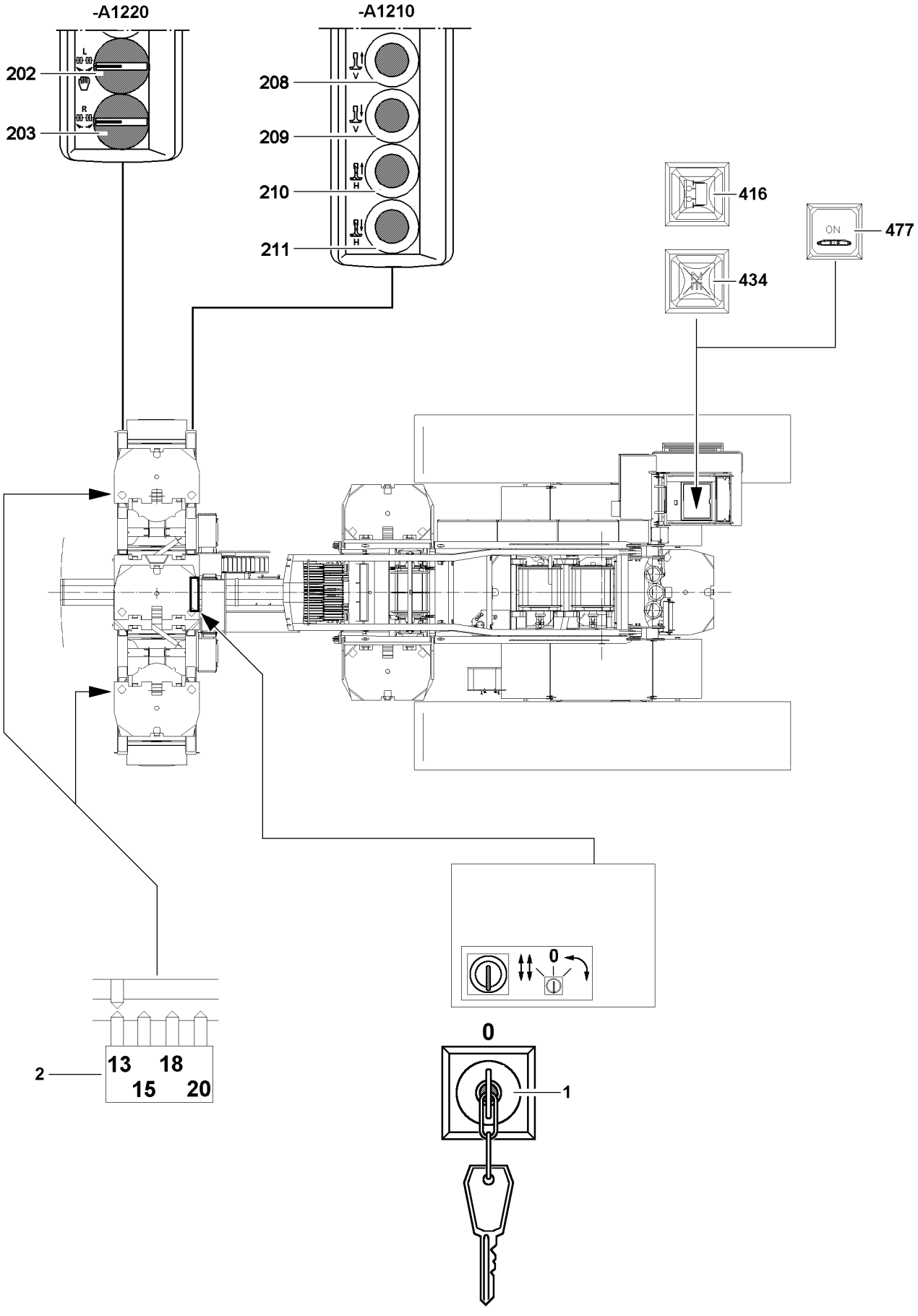
Danger of tipping the ballast trailer!

If the stability and tipping safety guidelines for the ballast trailer are not observed, the ballast trailer can tip over!

Personnel can be severely injured or killed!

▶ See section “Observe the stability and tipping resistance when ballast trailer is not fitted to the turntable”.

▶ Attach the ballast trailer guide **2** on the auxiliary crane.
▶ Carefully tension the attachment equipment.
▶ Attach the pin pulling cylinder **12** to the retainer **11** and hook into the screw head **10**.
▶ Establish the hydraulic connection of the pin pulling cylinder **12** to the hydraulic aggregate, see crane operating instructions, chapter 5.30.
▶ Remove linchpin **9** on the retaining pins **8**, see illustration **8**.
▶ Unpin retaining pins **8**.
▶ When the retaining pins **8** are unpinned and the attachment equipment on the ballast trailer guide **2** are tensioned:
Apply lever on the pin pulling cylinder and unpin connector pins **7**.
▶ When all four connector pins **7** are completely unpinned:
Lift and swing ballast trailer guide **2** with auxiliary crane from the ballast trailer, see illustration **9**.
▶ Disassemble ascent for the ballast trailer.
▶ Place ballast trailer guide **2** on suitable and sufficiently load-bearing support.
▶ Remove the auxiliary crane.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B107254

8 Emergency operation with a defective CPU

8.1 Emergency operation of ballast trailer

With a defect on the ballast trailer CPU, a warning light **434** is lit, the electronic steering of the ballast trailer can no longer be steered.

The signal “towing” and “circular driving” are no longer sent by the ballast trailer control to the crane control.

However, by actuating the key switch **1** in the switch box on the ballast trailer, the central unit can be bypassed.

Key switch positions

– 0 (center) = no emergency operation
– I (left) = emergency operation towing
– II (right) = emergency operation circular travel

NOTICE

Damage of ballast trailer!

By activating the key switch **1** the signal “towing” or “circular driving” is released in crane steering, although the wheel sets could potentially be incorrectly aligned!

This can result in severe property damage on the ballast trailer or on the crane!

- ▶ Operate the key switch **1** only if the electronics fail.
- ▶ Before driving the crane, inspect the alignment of the wheel sets!
- ▶ All driving movements may only be conducted with utmost caution, minimum acceleration and careful braking.
- ▶ Upon activating the key switch **1** the crane operator alone is responsible completely for his actions!

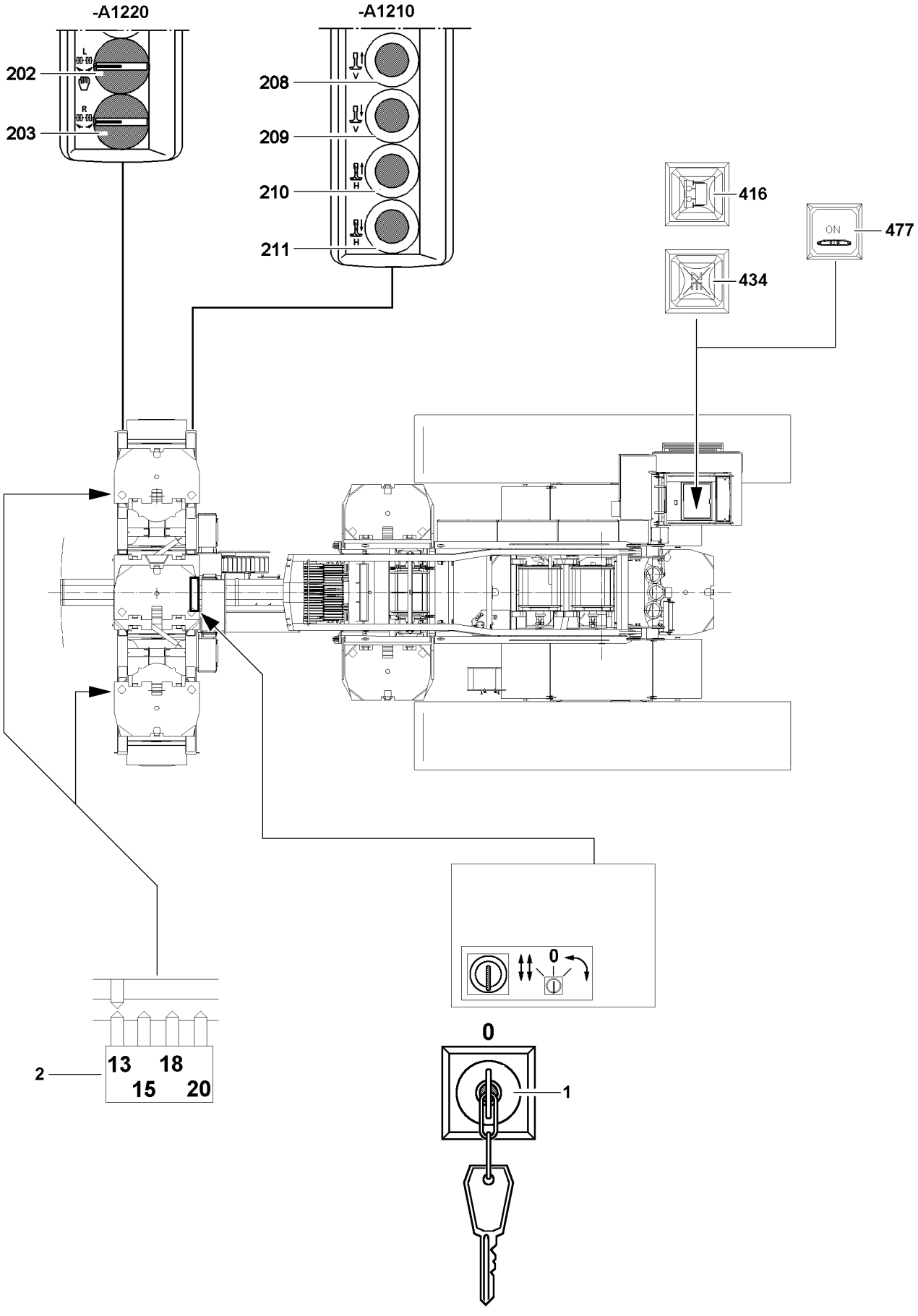
WARNING

Danger of accident due to faulty operation!

Upon activating the key switch **1** there exists increased danger of accident due to bypassing the ballast trailer control!

Personnel can be severely injured or killed!

- ▶ It is forbidden to stand in the ballast trailer danger zone!
- ▶ The alignment of wheel sets is to be monitored manually, visual inspection!
- ▶ Observe the angle scale on the ballast trailer!
- ▶ Emergency operation should only be carried out by authorized personnel. They must be aware of all related supervisory tasks and hazards!
- ▶ Upon activating the key switch **1** the crane operator alone is responsible completely for his actions!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B107254

8.2 Emergency operation - towing

Make sure that the following prerequisites are met:
– the ballast trailer is properly assembled,
– crawler operation is turned on (switch **477**).

8.2.1 Raising the ballast trailer with the support cylinders

Note
▶ The support cylinders of the ballast trailer must always be moved out evenly!

Move the front and rear support cylinders out:
▶ Press button **209** and button **211**.

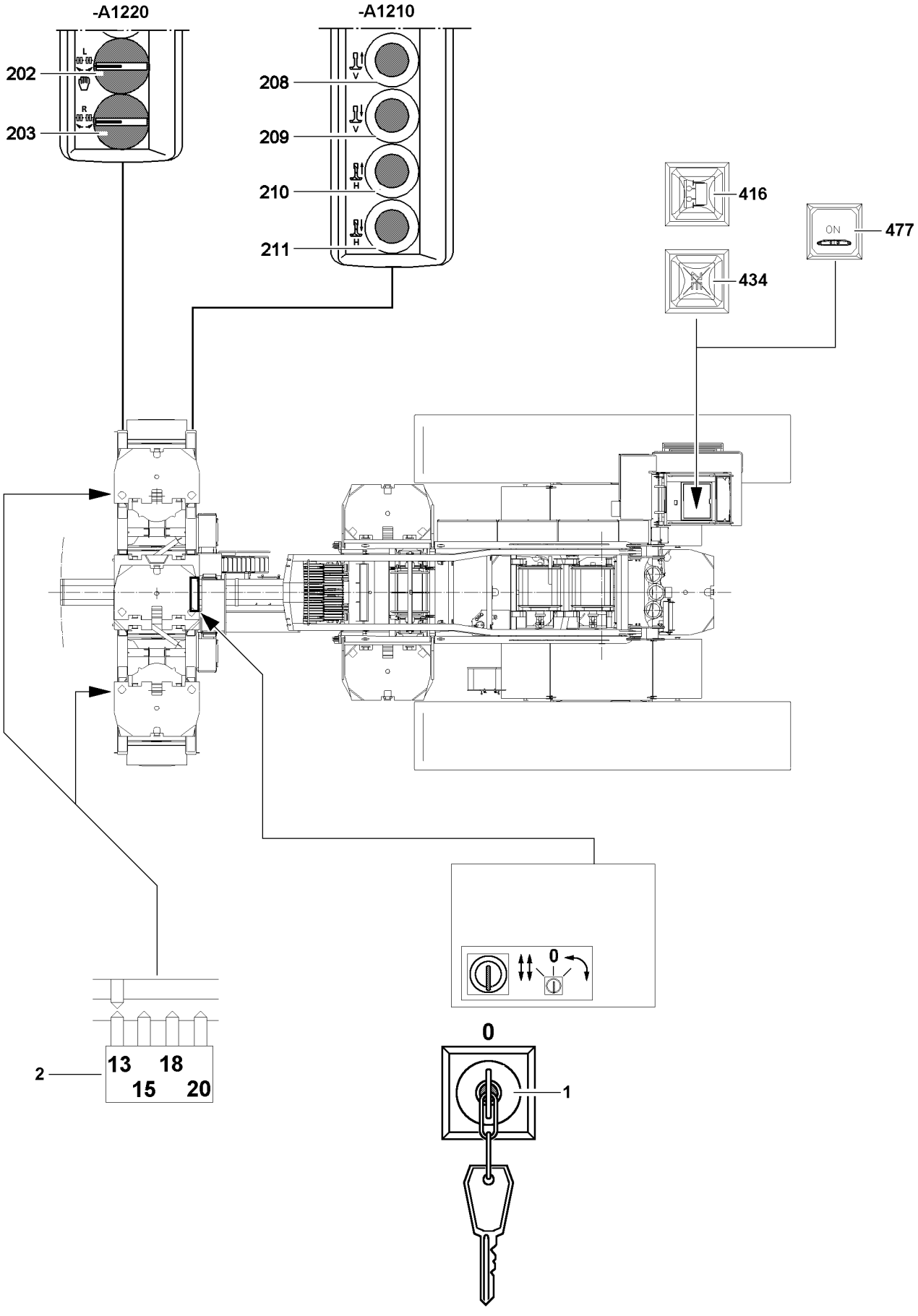
8.2.2 Aligning the wheel sets in towing position

So that the wheel sets in towing position can be aligned, the ballast trailer must be lifted with the support cylinders.
Ensure that the following prerequisite is met:
– the ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

▶ Turn the key switch **1** on the ballast trailer to the “left”.

Note
▶ By activating the key switch **1** into position “left”, the order “towing” is passed on to the crane and emergency operation is switched on!
▶ During emergency operation the support can only be activated control panel **-A1210** on the ballast trailer!

▶ When the wheel sets are relieved:
Activate the rotary switch **202** on the control panel **-A1220** and align the left wheel set into towing position.
▶ Activate the rotary switch **203** on the control panel **-A1220** and align the right wheel set into towing position.
▶ Check the settings.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8.2.3 Lowering the ballast trailer with the support cylinders

Note

▶ The support cylinders of the ballast trailer must always be moved in evenly!

Move support cylinders in completely on the front and rear:

▶ Press button **208** and button **210**.

Result:

– The support cylinders move in.

▶ Move the support cylinders in completely.

Result:

– The warning light **416** (“Ballast trailer support moved in”) **lights up**.

8.2.4 Towing

Make sure that the following prerequisites are met:

– the wheel sets are in the towing position.

NOTICE

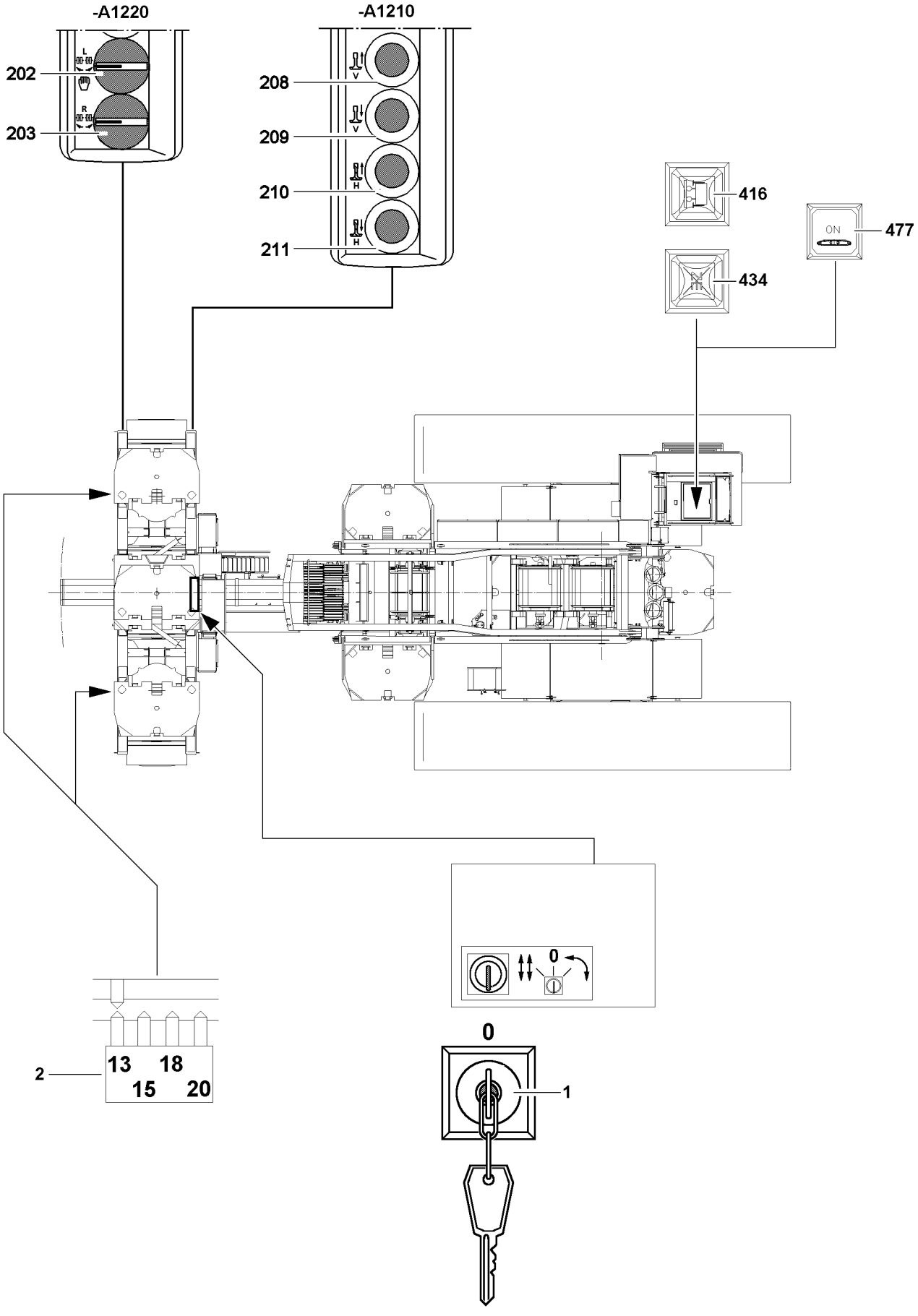
Damage of ballast trailer!

If the angle settings on the wheel sets are not monitored during driving in emergency operation, it can lead to significant damages to the wheel sets!

▶ The angle settings **2** on the wheel sets are to be constantly inspected!

▶ Constantly monitor the alignment of the wheel sets constantly during travel!

▶ If the wheel sets become excessively deformed, they are to be re-aligned!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B107254

8.3 Emergency operation - circular travel

Make sure that the following prerequisites are met:
– the ballast trailer is properly assembled,
– crawler operation is turned on (switch **477**).

8.3.1 Raising the ballast trailer with the support cylinders

Note
▶ The support cylinders of the ballast trailer must always be moved out evenly!

Move the front and rear support cylinders out:
▶ Press button **209** and button **211**.

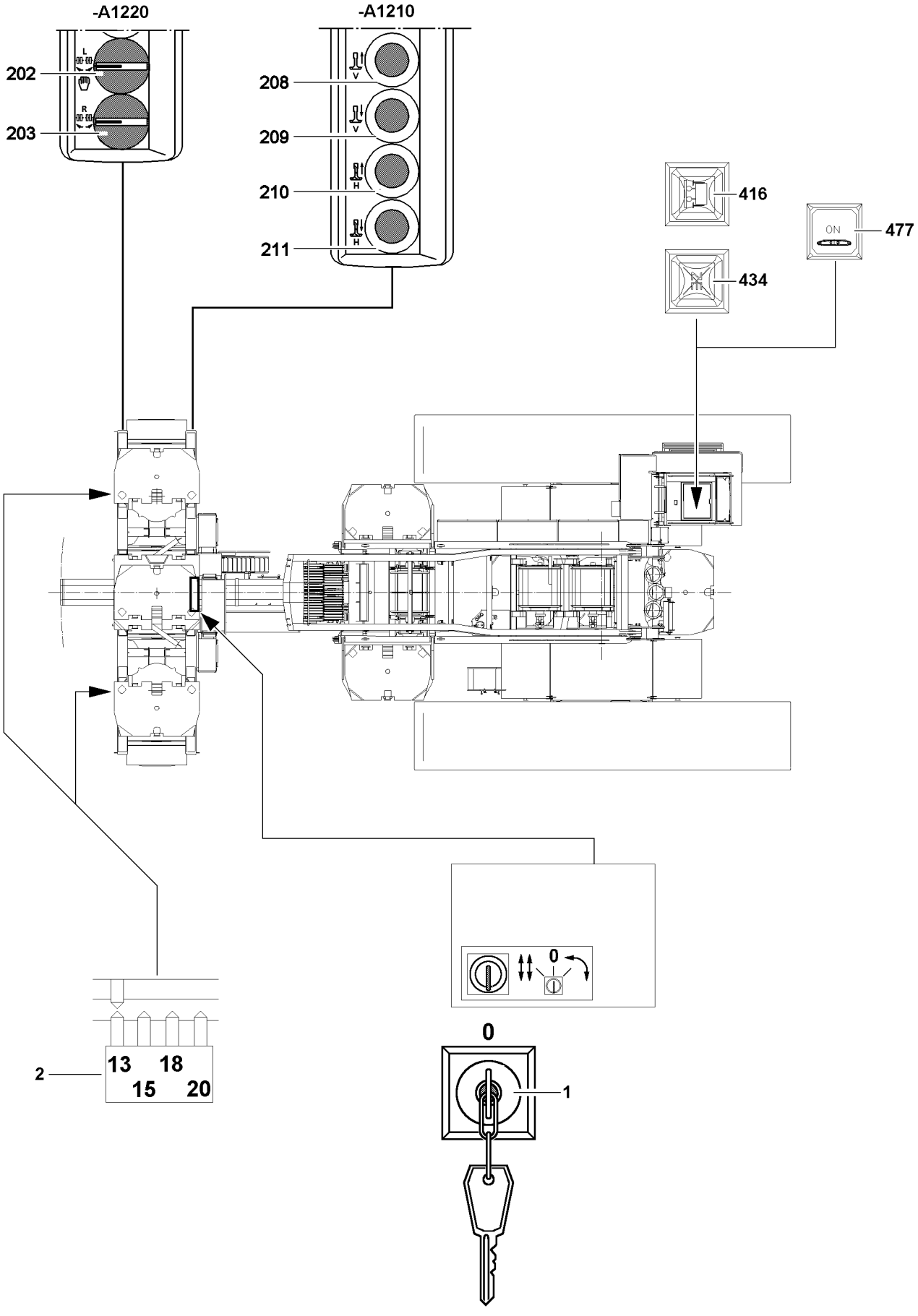
8.3.2 Align wheel sets into circle driving position

So that the wheel sets in circular driving position can be aligned, the ballast trailer must be lifted with the support cylinders.
Ensure that the following prerequisite is met:
– the ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

▶ Turn the key switch **1** on the ballast trailer to the “right”.

Note
▶ By activating the key switch **1** into position “right”, the order “circular driving” is passed on to the crane and emergency operation is switched on!
▶ During emergency operation the support can only be activated control panel **-A1210** on the ballast trailer!

▶ When the wheel sets are relieved:
Activate the rotary switch **202** on the control panel **-A1220** and align the left wheel set into circular driving.
▶ Activate the rotary switch **203** on the control panel **-A1220** and align the right wheel set into circular driving.
▶ Check the settings.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B107254

8.3.3 Lowering the ballast trailer with the support cylinders

Note
▶ The support cylinders of the ballast trailer must always be moved in evenly!

Move support cylinders in completely on the front and rear:
▶ Press button **208** and button **210**.
Result:
– The support cylinders move in.

▶ Move the support cylinders in completely.
Result:
– The warning light **416** (“Ballast trailer support moved in”) **lights up**.

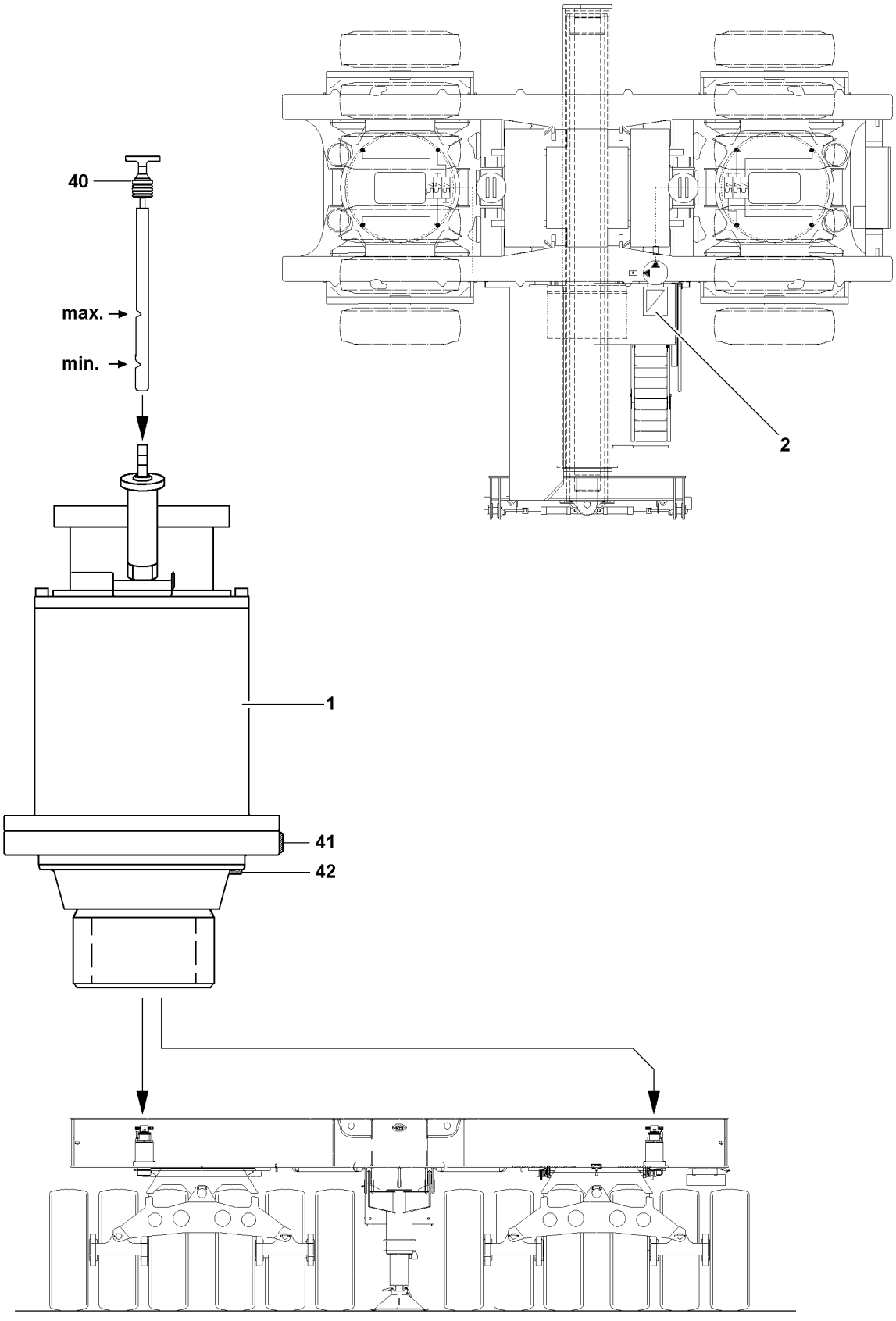
8.3.4 Circular travel

Make sure that the following prerequisites are met:
– the wheel sets are in the circular driving position.

NOTICE
Damage of ballast trailer!
If the angle settings on the wheel sets are not monitored during driving in emergency operation, it can lead to significant damages to the wheel sets!
▶ The angle settings **2** on the wheel sets are to be constantly inspected!
▶ Constantly monitor the alignment of the wheel sets constantly during travel!
▶ If the wheel sets become excessively deformed, they are to be re-aligned!

9 Maintenance intervals for the ballast trailer

Note
▶ See the crane operating instructions chapter 7.02!



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10 Maintenance

10.1 Ballast trailer tires

10.1.1 Ballast trailer tires

Note
▶ See the crane operating instructions chapter 2.15!

10.1.2 Ballast trailer tires and disk wheels

Note
▶ See Crane operating instructions, chapter 8.01!

10.2 Hydraulic hose lines

Note
▶ See the crane operating instructions chapter 7.05!

10.3 Slewing gear

Please maintain utmost cleanliness during all work to prevent dirt from entering the interior of the gear system.

10.3.1 Check the oil level

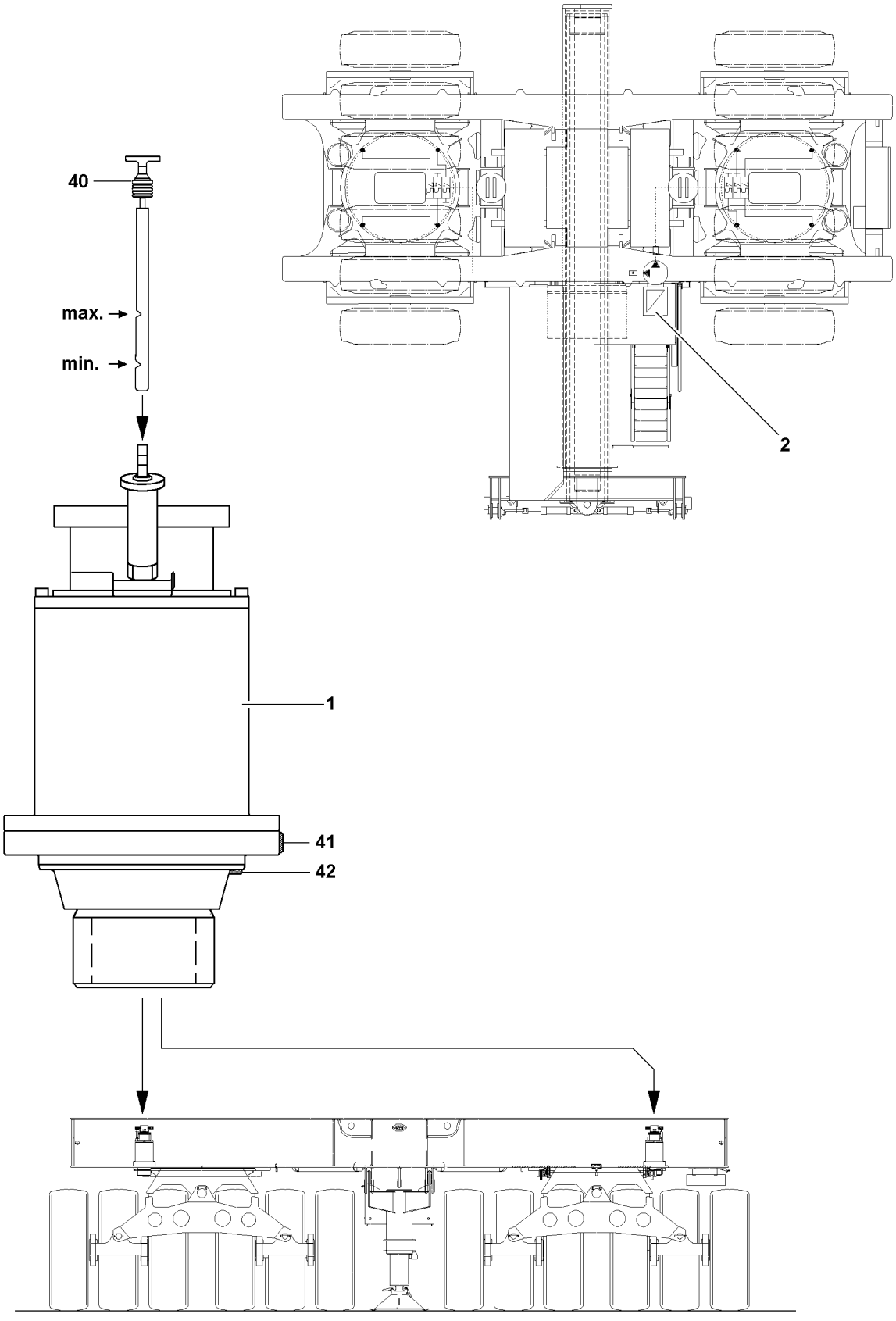
Make sure that the following prerequisites are met:
– the ballast trailer is in horizontal position.

▶ Remove the dipstick **40** and wipe it off.
▶ Reinsert the dipstick **40** and pull it out again.

The oil level must be between the min. and max. mark on the dipstick **40**.
▶ Check the oil level.

NOTICE
Danger of transmission damage!
If the oil level has dropped below the minimum mark, add engine oil as specified in the lubrication chart until the oil level is between the minimum and maximum marks!
If the required minimum marks are fallen below, the gearing is destroyed!
▶ Top off oil, wait a short time and then check the oil level again!

▶ Reinsert the oil dipstick **40**.



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10.3.2 Changing the oil

Note

▶ On the slewing gear as desired, the gear oil at the oil drain plug **41** or at the oil drain plug **42** or be released from both oil drain plugs at the same time!

Make sure that the following prerequisites are met:
– the ballast trailer is in horizontal position,
– the slewing gear is warm.

▶ Open the oil filler port by unscrewing the oil dipstick **40**.
▶ Remove the oil drain plug **41** and oil drain plug **42** and drain the oil completely with the seal ring loosened.
▶ Clean the oil drain plug **41** and sealing surface on the housing.
▶ Clean the oil drain plug **42** and sealing surface on the housing.
▶ Reinstall the oil drain plug **41** and the oil drain plug **42** with a new seal and tighten.
▶ Add oil as specified in the lubricant chart at the oil filler port until the oil level is between the minimum and maximum mark on the oil dipstick **40**.
▶ Close the oil filler port by screwing in the oil dipstick **40**.
▶ Check the oil level as described in the section “check oil level”.

10.4 Central lubrication system

Note

▶ See the crane operating instructions chapter 7.05!

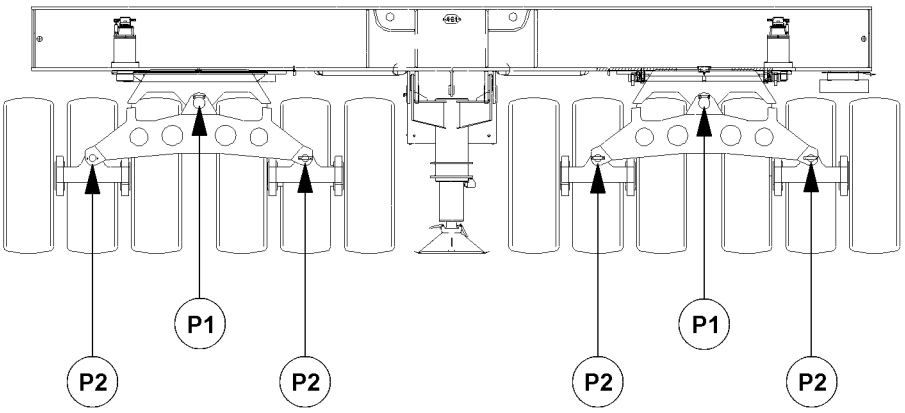
11 Fill quantities

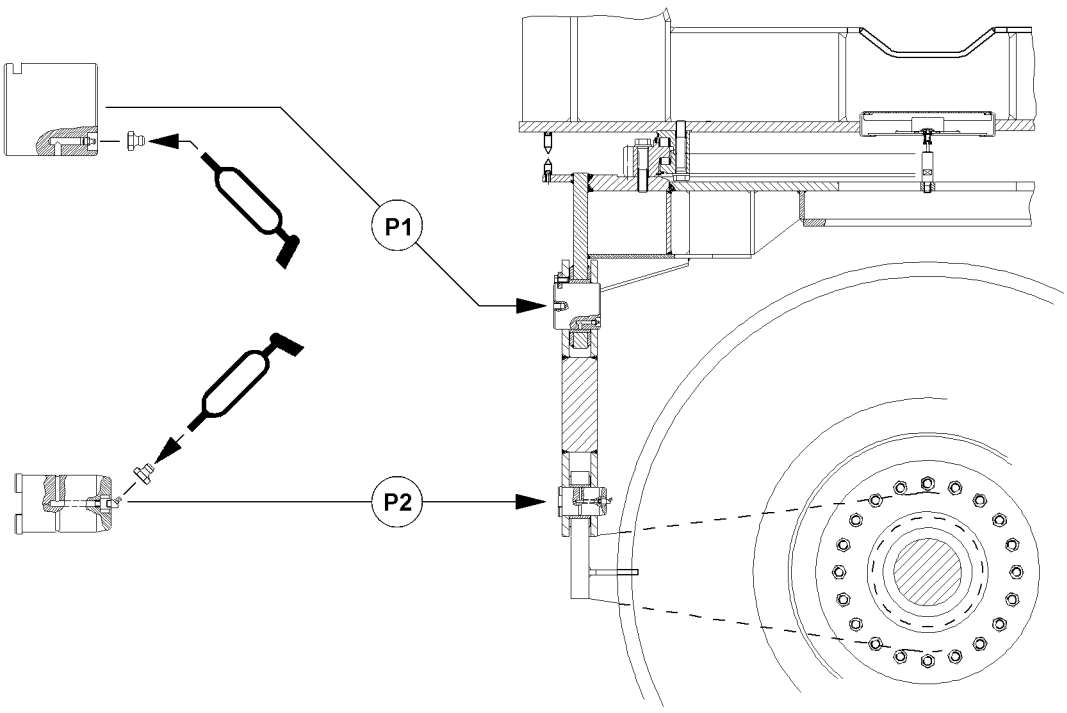
11.1 Fill quantities for ballast trailer

The specified fill quantities (change quantities) are orientation values. The markings on the dipsticks, inspection ports or sight gauges are decisive for filling.

NOTICE
Danger of property damage!
▶ Do not mix synthetic oils with mineral oils!

Position	Component	Fill quantity
1	Slewing gear	4.4 l
2	Central lubrication system	2.5 kg





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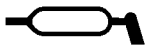
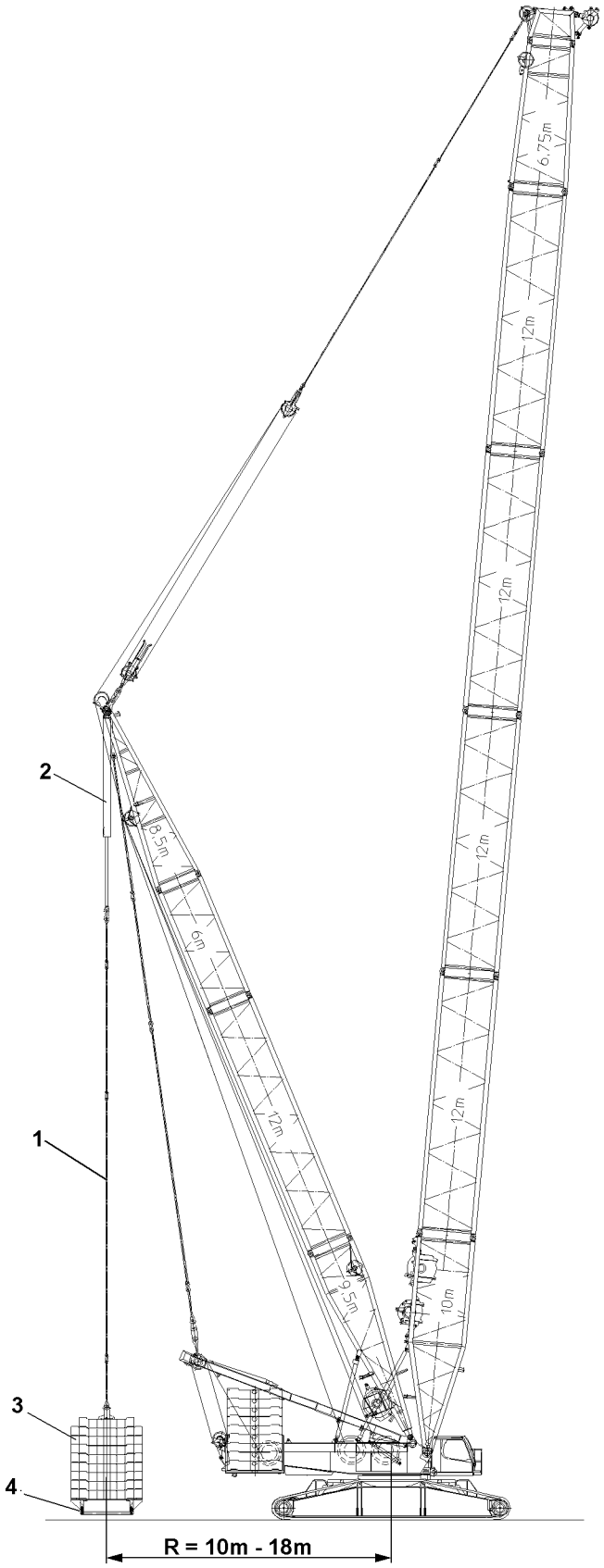
12 Lubrication schedule

12.1 Lubrication schedule Ballast trailer*



Note

▶ The lube points are marked with this icon!



B106761

1 Suspended ballast

1.1 Description

The required derrick ballast radius **R** according to the load chart is set by adjusting the derrick boom.
The following radii are possible as derrick ballast radius **R**:

– R 10 m
– R 13 m
– R 15 m
– R 18 m

Note

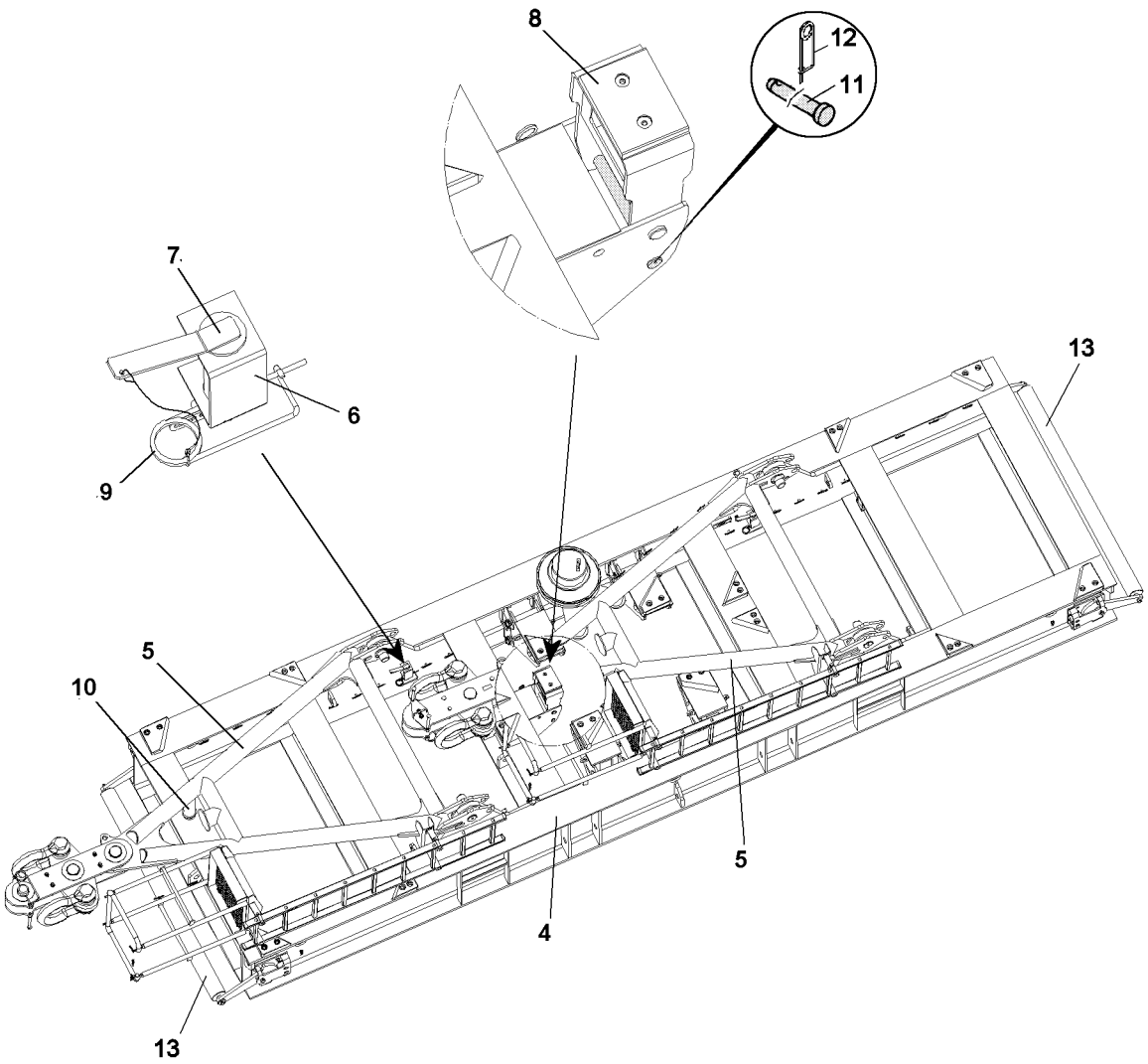
▶ **B** = Suspended ballast **without** guide!

The suspended ballast and ballast trailer are generally referred to as the derrick ballast. The fixed compensation weight which is assembled on the turntable is generally referred to as the counterweight.
The derrick boom angle, the derrick ballast, weight and utilization are shown on LICCON monitor 1.
After assembly on the ground, the derrick ballast is raised for crane operation with the pull cylinders **2** in the derrick guying **1**.
For crane operation with derrick ballast, also see Crane operating instructions, chapter 4.02.

1.2 Component overview - Derrick ballast

The components for crane operation with derrick ballast are:

Position	Component
1	D-guying
2	Pull cylinder
3	Ballast plates
4	Ballast pallet



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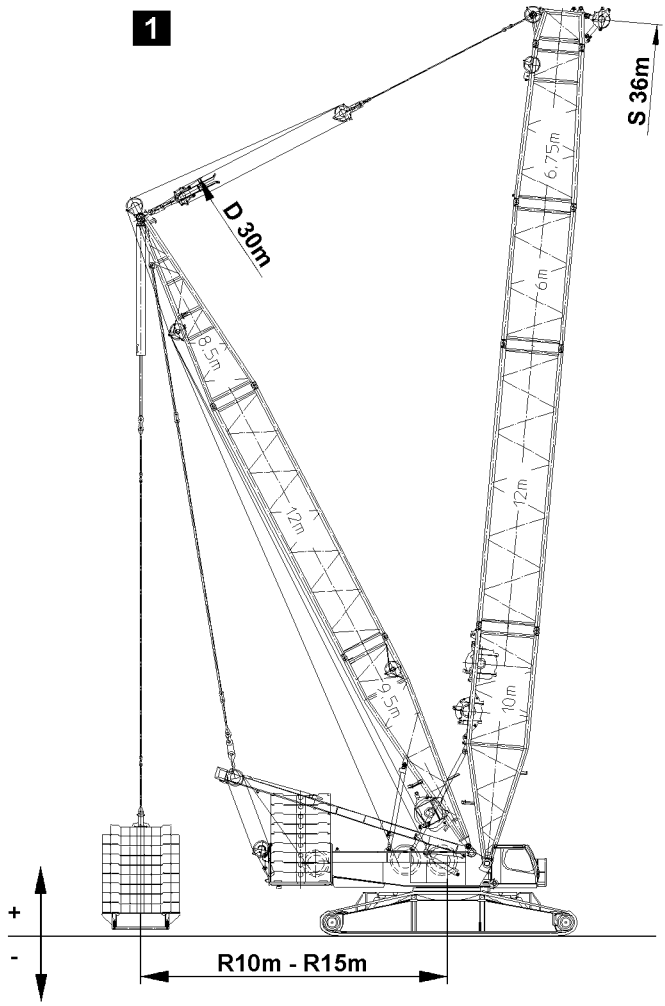
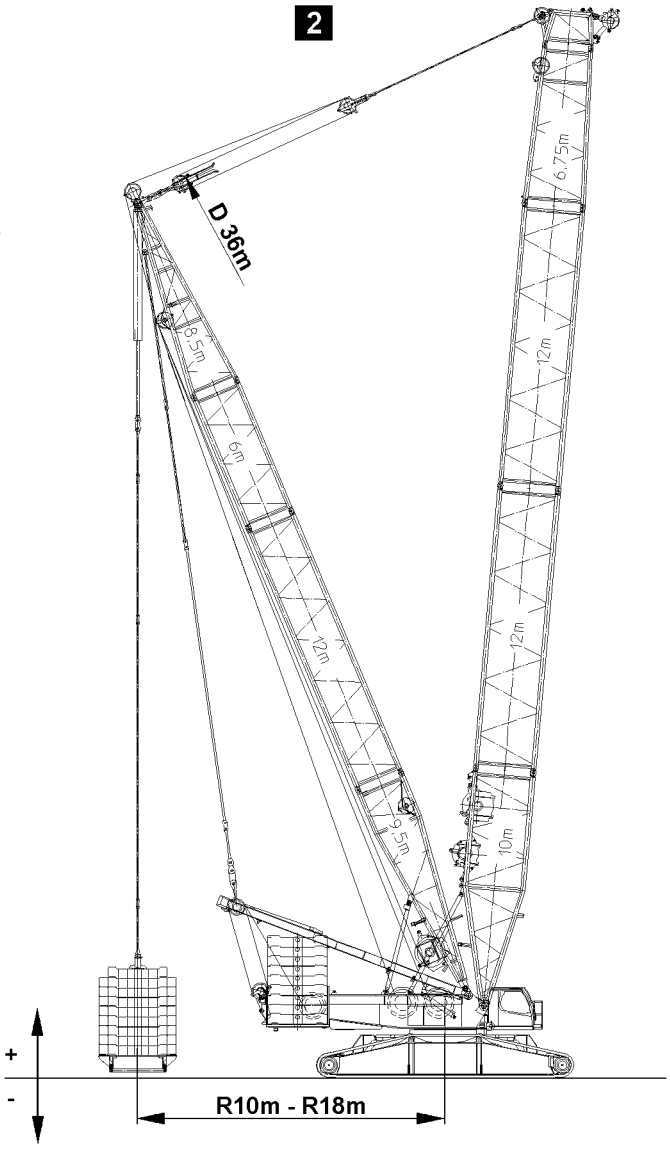
1.3 Component overview - Ballast pallet

The components for the ballast pallet are:

Position	Component
4	Ballast pallet
5	Erection rack
6	Receptacle for retaining pin **7**
7	Retaining pins for erection rack
8	Receptacle for erection rack
9	Spring retainer
10	Assembly support
11	Pin
12	Spring retainer
13	Limit switch


1
S 36m
D 30m
6.75m
6m
8.5m
12m
12m
9.5m
10m
+
-
R10m - R15m


2
D 36m
6.75m
8.5m
12m
6m
12m
12m
9.5m
10m
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-
R10m - R18m

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2 Derrick radii

Note
- ▶ **No** guide is fitted between the turntable and the ballast pallet!
- ▶ The derrick ballast radius and the derrick boom radius are identical!

2.1 Derrick 30 m, illustration 1

The following radii are possible with the 30 m derrick: R10 m, R13 m and R15 m.

Note
- ▶ For the 30 m derrick there is only one operating mode with S-36 m, observe the load chart!

2.1.1 Derrick ballast lifting heights with respect to the base of the crawler

Radius R = 10 m	
Above base	+4050 mm
Below base	-950 mm

Radius R = 15 m	
Above base	+1550 mm
Below base	-3450 mm

2.2 Derrick 36 m, illustration 2

The following radii are possible with the 36 m derrick: R10 m, R13 m, R15 m and R18 m.

2.2.1 Derrick ballast lifting heights with respect to the base of the crawler

Radius R = 10 m	
Above base	+4410 mm
Below base	-590 mm

Radius R = 18 m	
Above base	+750 mm
Below base	-4250 mm

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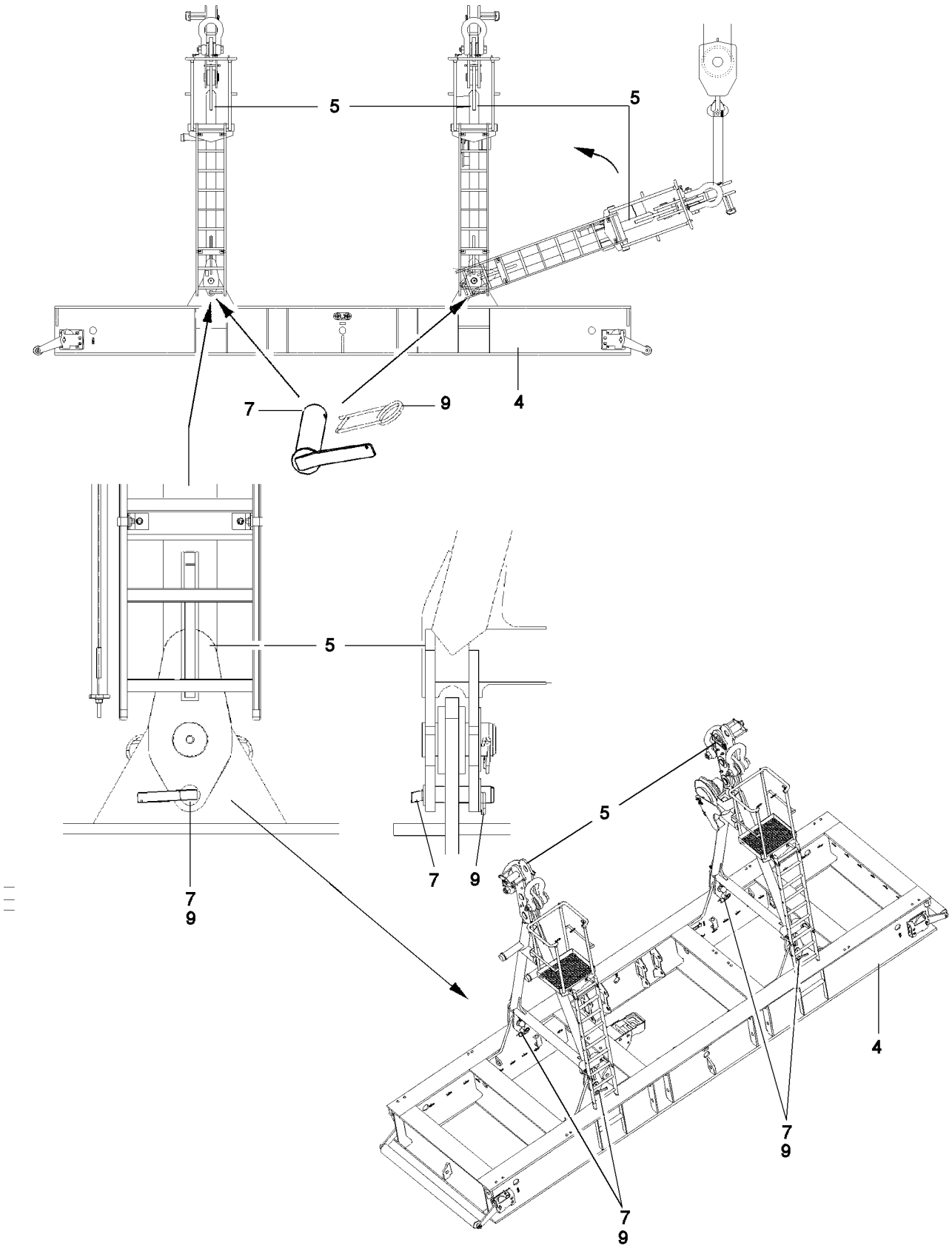
3 Assembly

WARNING
Risk of falling!
During assembly and disassembly work, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
- ▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with the personal catch system (see Crane operating instructions, chapter 2.04) to protect against falling! The personal catch system must be attached in the corresponding attachment points on the crane (see Crane operating instructions, chapter 2.06)!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!

WARNING
Danger of crushing!
While assembling, hands can be crushed or even severed by swing movements of the components!
- ▶ Make sure that the components do not swing back and forth during assembly!

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel!
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured!

Make sure that the following prerequisites are met:
- the crane is aligned in horizontal direction,
- the boom and the derrick are assembled on the turntable,
- the derrick is erected,
- the counterweight has been installed to the turntable according to the load chart,
- the LICCON overload protection has been set according to the data in the load chart,
- an auxiliary crane is available.



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3.1 Installing the ballast pallet

DANGER
Danger of accidents when assembling / disassembling the erection racks!
If you assemble or disassemble unsecured erection racks, the erection racks can tip over and fatally injure or kill personnel!
- ▶ Never unpin the retaining pins under unsecured or unsupported erection racks!
- ▶ Do not stand under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

3.1.1 Placing the ballast pallet in the assembly position

- ▶ Set the derrick to the required radius.
- ▶ Hang the ballast pallet **4** onto the auxiliary crane and position it within the slewing range of the crane under the D-guy rods on the derrick.

Note
- ▶ Set down ballast pallet **4** in the lengthwise direction of the turntable for better assembly to the D-guy rods!

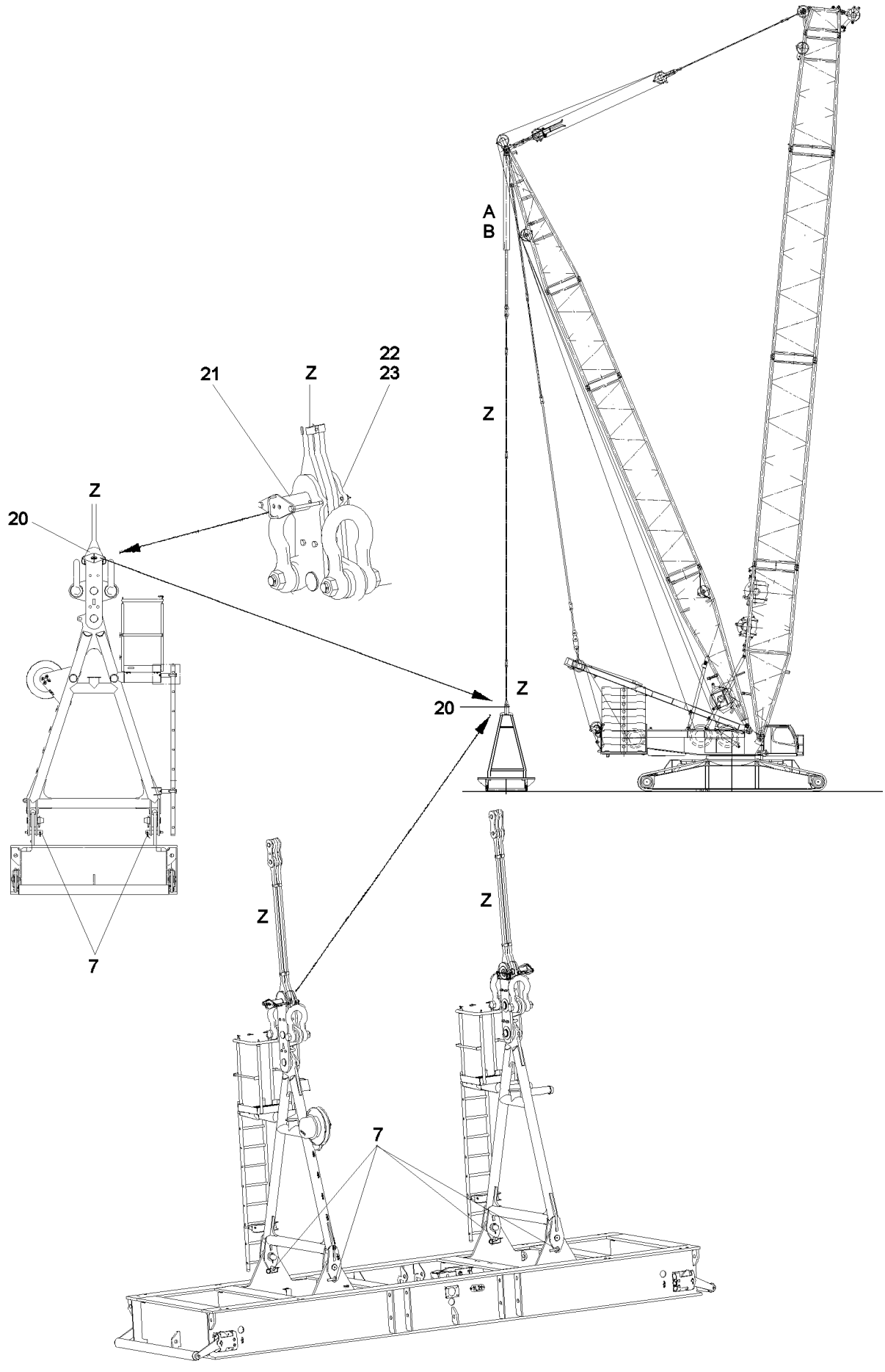
- ▶ Align the ballast pallet **4** horizontally.

3.1.2 Setting up the erection racks

- ▶ Hang the erection rack **5** onto the auxiliary crane.
- ▶ Vertically position the erection rack **5** using the auxiliary crane.

DANGER
Danger of accidents when assembling / disassembling the erection racks!
The erection racks must hang securely on the auxiliary crane, otherwise the erection racks can tip over!
Personnel can be severely injured or killed!
- ▶ The erection racks must be locked and secured in a vertical position using four retaining pins **7**! Only then should the auxiliary crane be removed!
- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks!
- ▶ Do not stand under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

- ▶ Pin in four retaining pins **7** on the erection racks **5** on both sides.
- ▶ Secure the retaining pins **7** with spring retainers **9**.



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3.1.3 Assembly of the D-guy rods on the erection racks

Make sure that the following prerequisites are met:
- the erection racks are set up and secured by four retaining pins **7**,
- the D-guy rods must be suspended above the brackets on the erection frames,
- the derrick is set to the required radius.

▶ Lower the D-guy rods **Z** by moving the piston rods out on the pull cylinder **A** and on the pull cylinder **B** into the brackets **20** and position for pinning.

▶ Pin and secure the D-guy rods **Z** on the brackets **20** on both sides.

DANGER
Danger of accidents when pinning and unpinning the guying!
The guy rods must be pinned and secured on both sides, otherwise the ballast pallet can tip over and kill or severely injure personnel!
▶ Do not stand under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

▶ Pin in the pin **20**, place the spacer **22** and secure with spring retainer **23**.

WARNING
Uncontrolled oscillation of the ballast pallet!
When the ballast pallet is raised, it can start to swing!
Personnel can be severely injured or killed!
▶ It is prohibited for anyone to remain in the danger zone!
▶ Secure the ballast pallet with auxiliary ropes!

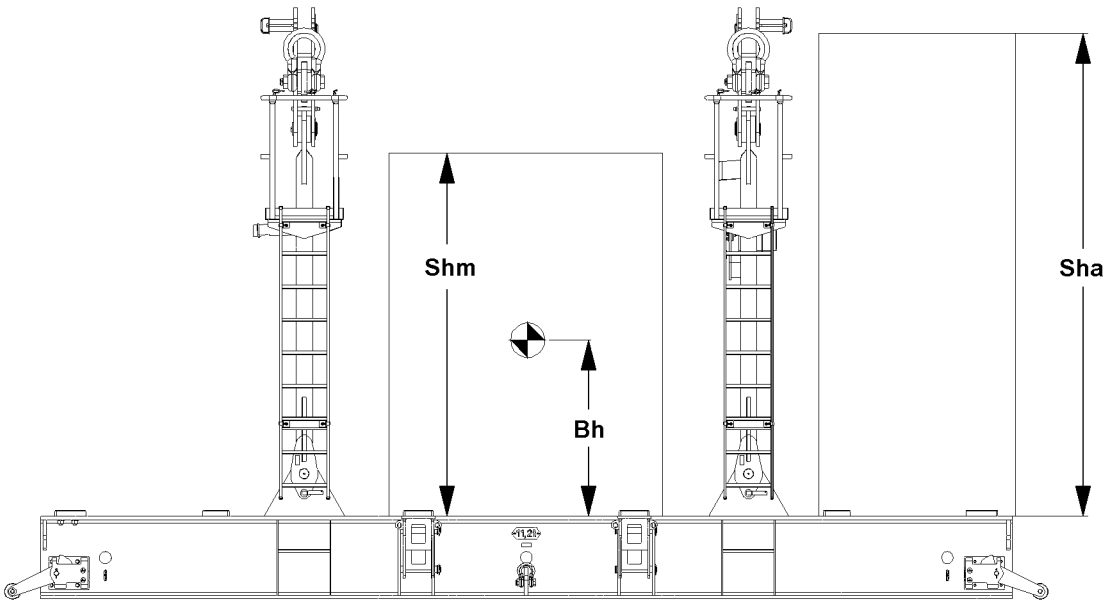
▶ Lift the empty ballast pallet with the pull cylinder **A** pull cylinder **B** and then set it down again.

Result:
- The empty ballast pallet is thereby precisely placed vertically under the derrick head.

▶ Align the ballast pallet horizontally.

NOTICE
Damage to the retaining pins!
If the retaining pins **7** are not unpinned before crane operation, then they can be damaged in crane operation!
▶ Unpin the retaining pins **7** before start of crane operation!

▶ When the ballast pallet is pinned and secured on the D-guying:
Release the retaining pins **7** on the erection racks on both side and unpin.



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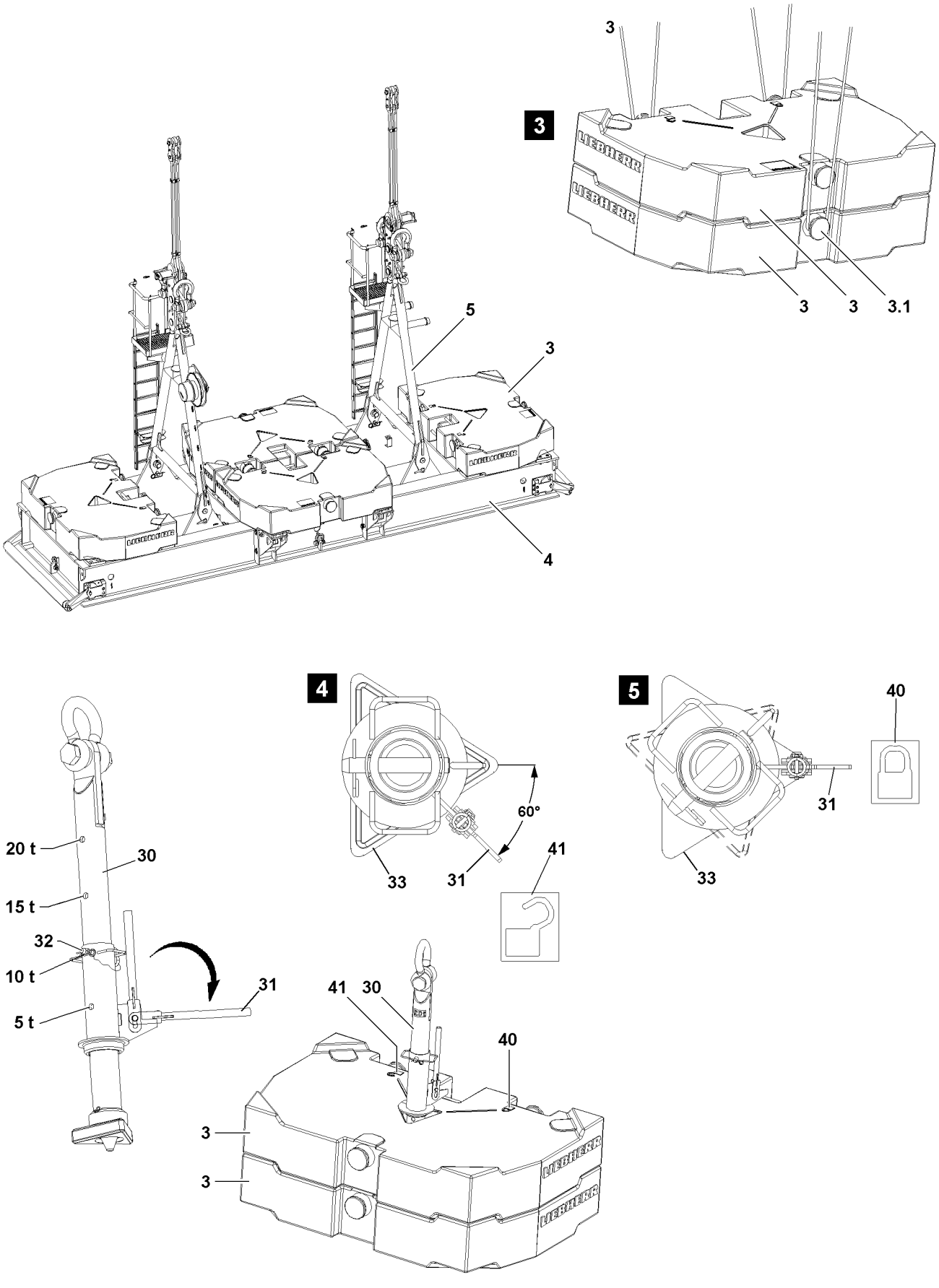
3.2 Ballasting the ballast pallet

WARNING
The crane can topple over!
If the following danger notes are not observed, the ballast plates or the ballast stack can slip on the ballast pallet and fall down!
The crane can topple over and personnel can be severely injured or killed!

- The ground on which the ballast pallet is ballasted must be level and have adequate load-bearing capacity!
- Place the ballast plates always symmetrically, in reference to the longitudinal axis!
- When ballasting the two outer ballast stacks, only one ballast plate may be placed at the start of every ballast stack!
- Do **not** start with the two center ballast stacks!
- The two outer ballast stacks may be ballasted with ballast assemblies of two each ballast plates, after the first ballast plate has been placed on each stack!
- The difference for the center ballast stack may not be more than max. one ballast plate for ballasting!
- The outer ballast stacks must weigh the same and be the same height after ballasting!
- The two center ballast stacks must weigh the same and be the same height after ballasting!
- The outer ballast stacks can differ in stack height from the inner ballast stacks!
- The maximum permissible height of the ballast center of gravity **Bh** of 1750 may not be exceeded!
- The maximum permissible stack height **Sha** of 4550 may not be exceeded on the outer ballast stacks!
- The permissible stack height **Shm** of 3314 may not be exceeded on the center ballast stacks!
- The maximum permissible total weight of the suspended ballast may not exceed 350 t!
- Secure all ballast plates so they cannot move and fall down!
- Replace damaged ballast plates immediately with new ballast plates!

Ensure that the following prerequisites are met:
– the ballast pallet is properly pinned and secured to the derrick ballast guying,
– an auxiliary crane is available.


3
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10 t
5 t
31
41
30
40
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3

B108734

3.2.1 Placing the ballast plates, attachment system: “Twistlok”

WARNING
Risk of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged!
Personnel can be severely injured or killed!
- ▶ Make sure that the ballast plates are laying correctly in the centerings!
- ▶ Replace damaged ballast plates!

To stack the ballast plate(s) **2**, use the receptacle stud **30**.
Before the receptacle stud **30** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **30** is set correctly. The length of the receptacle stud **30** can be adjusted with the pin **32**.

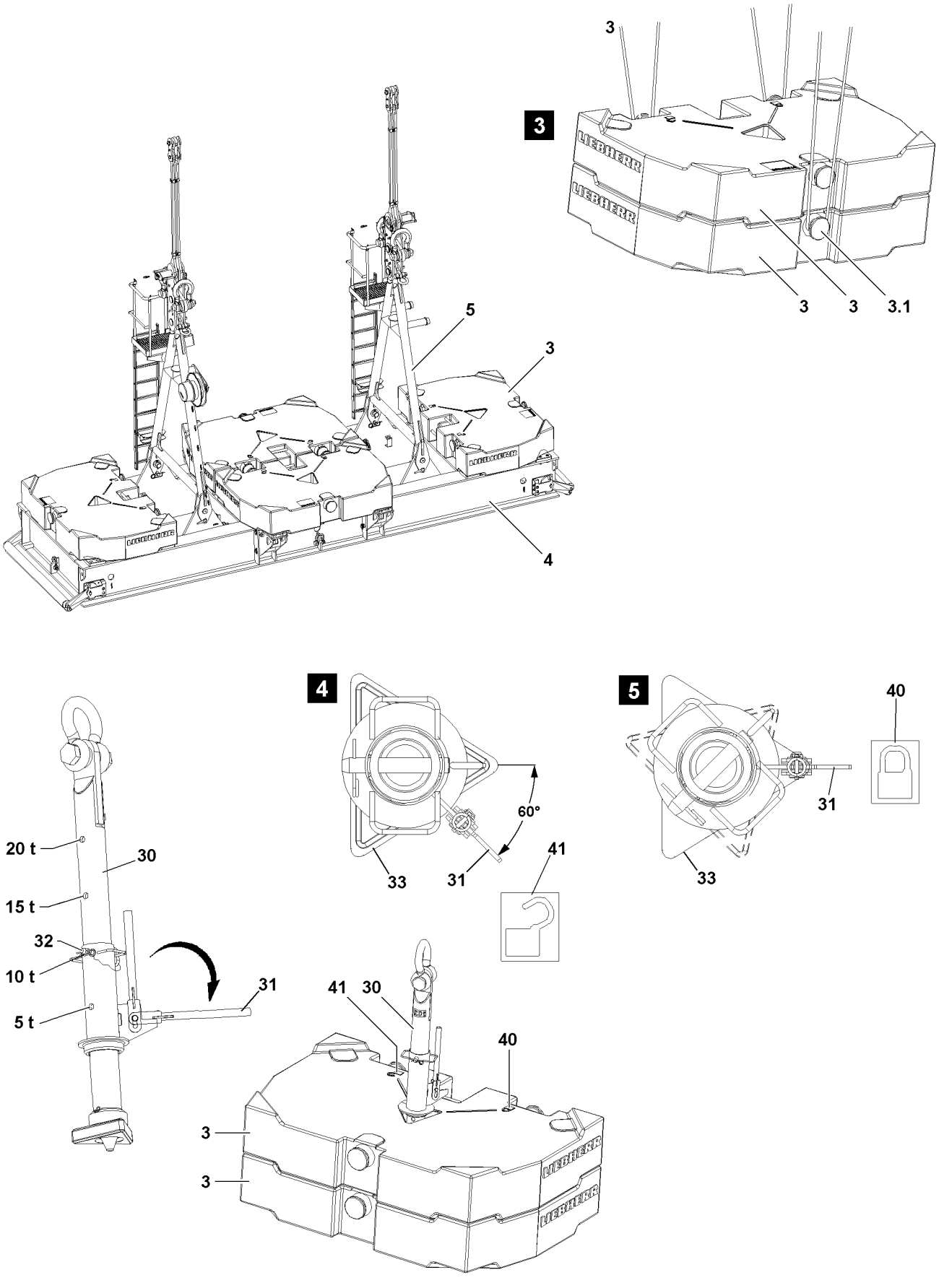
- ▶ If the length of the receptacle stud **30** is to be adjusted:
  Release and unpin the pin **32**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **30**.
- ▶ Pin in the pin **32** and secure with spring retainer.
- ▶ Attach the receptacle stud **30** on the auxiliary crane and guide it into the ballast plate(s).
- ▶ Pull up the lever **31** and fold it down.
- ▶ Turn the lever **31** by 60° until the lever **31** points to the icon **40**. See illustration **5**.

Result:
– The receptacle stud **30** is locked with the ballast plate.

- ▶ Lift always one ballast plate with the receptacle stud **30** and place it carefully on the outer centerings of the ballast plate **4**.
- ▶ When the ballast plate has been placed on the outer centerings of the ballast pallet **4**:
  Turn the lever **31** by 60° until the lever **31** points to the icon **41**. See illustration **4**.

Result:
– The receptacle stud **30** is unlocked.

- ▶ Carefully pull the receptacle stud **30** from the ballast plate.
- ▶ Stack the ballast plates according to the load chart, observe the danger notes.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15 t
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10 t
5 t
31
41
30
40
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3

B108734

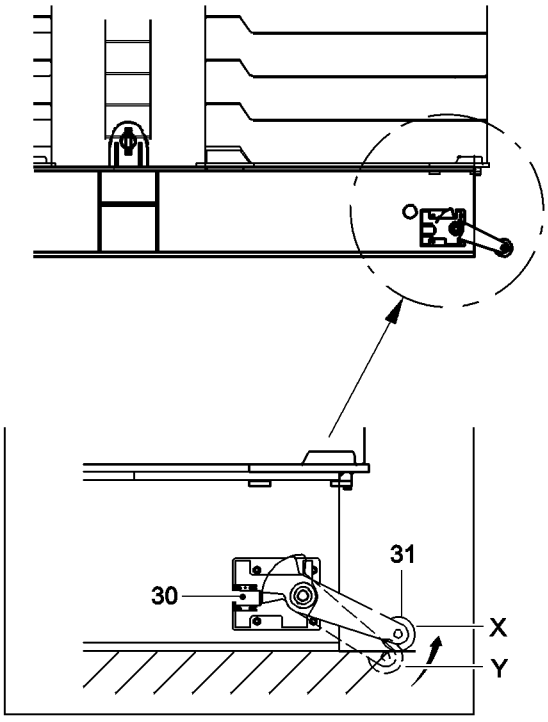
3.2.2 Placing the ballast plates, attachment points: Bitt

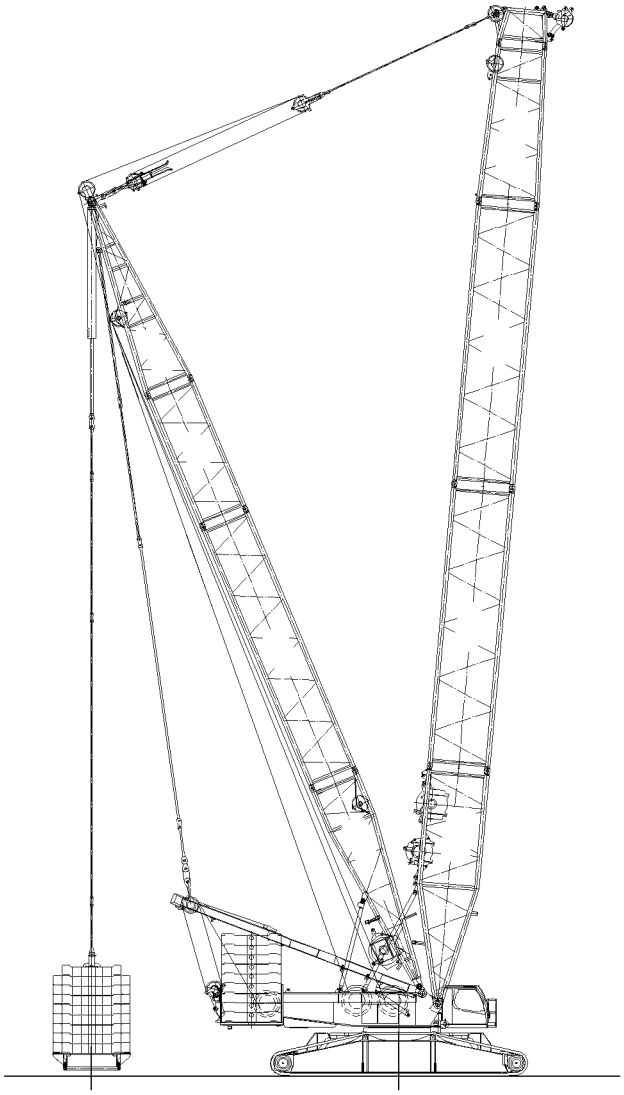
WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **3.1** are overloaded and the ballast plates can fall down!
Personnel can be severely injured or killed!
- ▶ Lift no more than maximum 20 t with the ropes, 3 attachment points!
- ▶ Replace damaged ballast plates immediately!

WARNING
Incorrect handling of the attachment equipment!
If attachment equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the attachment equipment is correctly attached on the bitts **3.1** and that it is secured sufficiently to prevent it from loosening up!

Note
- ▶ Place the ballast plates individually or as a ballast assembly, maximum 20 t!
- ▶ The weight difference between the outer ballast stacks no more than maximum 20 t !
- ▶ 20 t ballast assembly, see illustration **3**!

- ▶ Place always only one ballast plate on the outer centerings on the ballast pallet.
- ▶ When a ballast plate has been placed on the outer centerings of the ballast pallet:
  Place the ballast plates individually or as an assembly of maximum two plates alternately on the left and right with the auxiliary crane.
- ▶ Stack the ballast plates according to the load chart.





B106767

3.3 Functional control before lifting the derrick ballast

Make sure that the following prerequisites are met:

– the electrical connection between the derrick ballast and the turntable has been established,
– the cable drum cable is plugged into the turntable,
– the ground contact rollers must move easily.

DANGER

Danger of accident if the derrick ballast touches the ground!

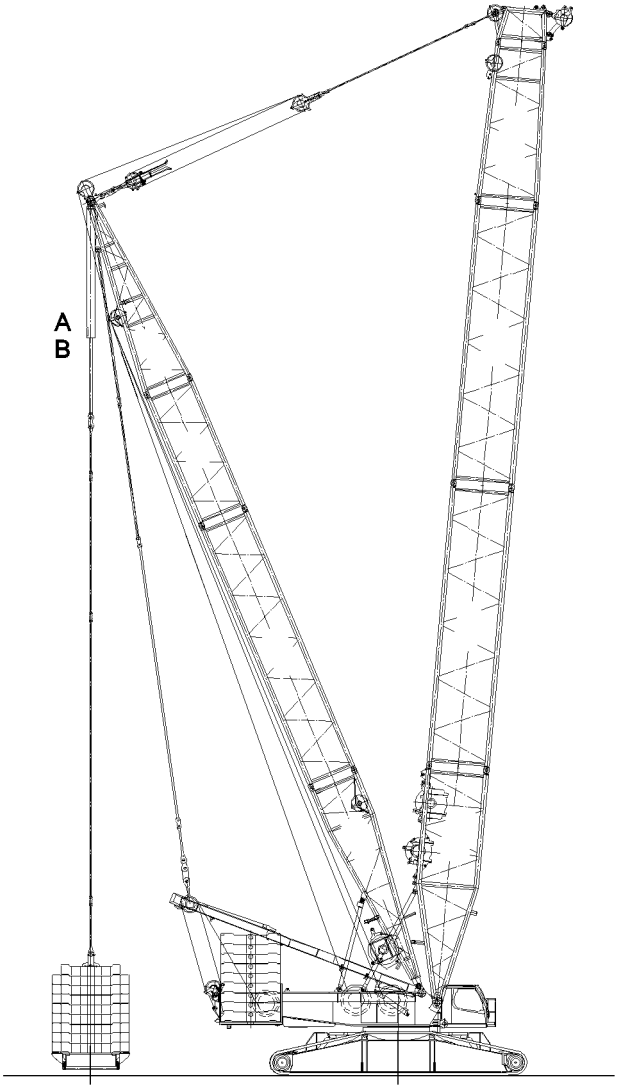
▶ If the ballast pallet touches the ground, **at least one** ground contact switch **30** must be actuated via the ground contact roller **31**!

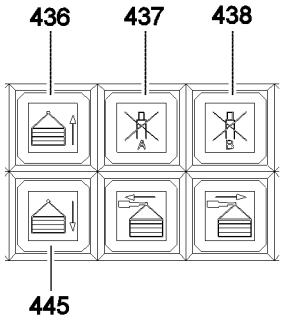
▶ The crane movements **turning the turntable** and **driving the crawler** turn off!

▶ Manually lift the ground contact roller **31**.

Result:

– The ground contact switch **30** is actuated.
– The crane movements **turning the turntable** and **driving the crawler** turn off.





B108732

3.4 Lifting and lowering the derrick ballast using the pull cylinder

The pull cylinders **38** in the derrick ballast guying can only be controlled from the crane operator's cab.

Note

- If the ballast trailer is lifted via the button **436** or lowered via the button **445** then the horizontal alignment of the ballast trailer is automatically regulated by a level sensor!
- With a ballast utilisation of **greater than** or **equal to** 90 %, the level sensor regulates the ballast level to ± 0,45°!
- With a ballast utilisation of **less than** 90 %, the level sensor regulates the ballast trailer level to ± 2.5°! This makes it possible to set the ballast trailer down up to a ground slope of 2.5°!

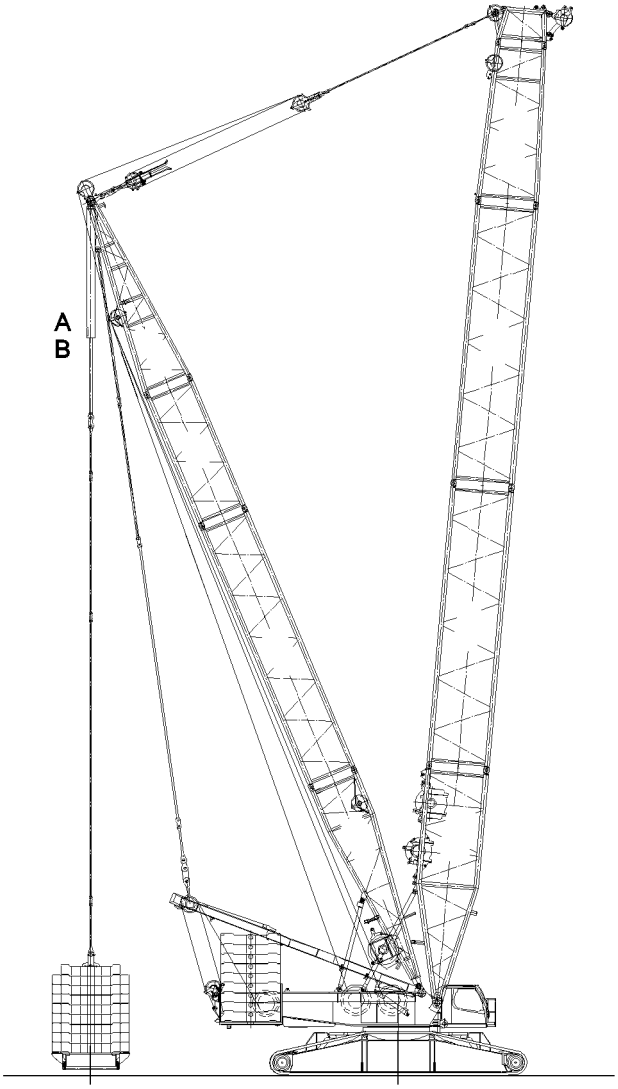
DANGER

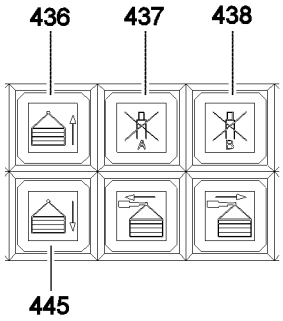
Risk of accident!

If the following notes are not observed, personnel can be severely injured or killed!

In addition, property damages can occur on the ballast trailer!

- Pay attention to the horizontal alignment of the derrick ballast when lifting and lowering the derrick ballast!
- When lifting and lowering the derrick ballast, check the forces in the ballast guy rods - on the LICCON-Monitor 1 - regularly! With a greater difference of forces between “derrick ballast guying A” and “derrick ballast guying B”, an acoustic warning sounds and the value on the LICCON monitor 1 blinks, refer to section “differential force monitoring of ballast guying”!
- Upon activation of the button **437** (“stop cylinder A on the derrick ballast”) or the button **438** (“stop cylinder B on the derrick ballast”), the level control sensor can be bypassed and the derrick ballast within a limited sloping angle. This is exclusively permitted when setting down the derrick ballast on uneven ground and only under maintenance of utmost caution!





B108732

3.4.1 Raising derrick ballast

▶ Press the button **436**.

Result:

– The derrick ballast is raised.

3.4.2 Lower derrick ballast

▶ Press the button **445**.

Result:

– The derrick ballast is lowered.

3.4.3 Stopping the pull cylinder on the derrick ballast

▶ Press the button **437**.

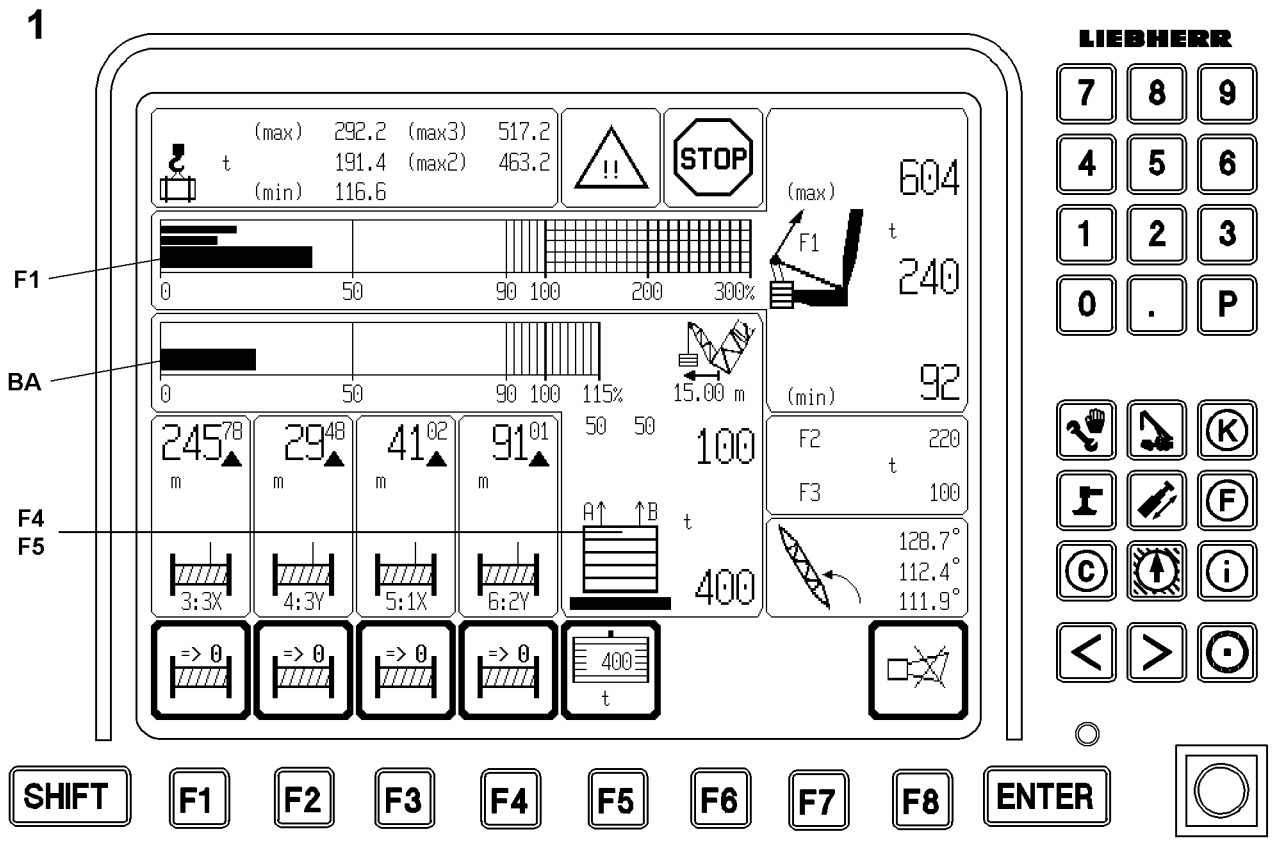
Result:

– The pull cylinder (A) on the derrick ballast is stopped.

▶ Press the button **438**.

Result:

– The pull cylinder (B) on the derrick ballast is stopped.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(min) 116.6
STOP
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(max)
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240
92
(min)
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0 50 90 100 115%
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245 78 m
29 48 m
41 02 m
91 01 m
50 50
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F2 220
t
F3 100
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400
128.7°
112.4°
111.9°
3:3X
4:3Y
5:1X
6:2Y
=> 0
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t
7 8 9
4 5 6
1 2 3
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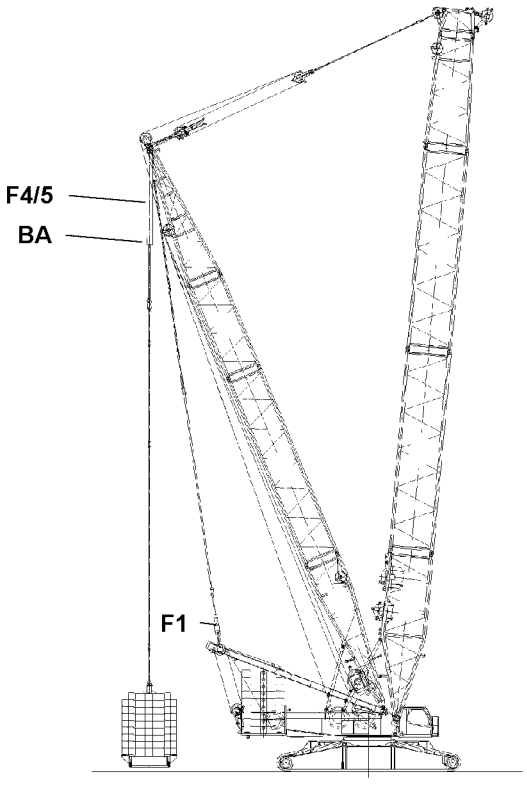
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


F4/5
BA
F1

B106770

4 Crane operation with derrick ballast

4.1 LICCON overload safety device

On cranes with derrick ballast, during operation also under load, by increasing or reducing the derrick ballast, the maximum load or the minimum load required for the balance of the crane, can be increased or decreased.

Note

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

Make sure that the following prerequisites are met:

– the required derrick ballast according the load chart is placed and exactly entered and confirmed on the LICCON monitor 1,

– the derrick boom is found in operating position.

4.1.1 Pre-adjustments

▶ Adjust the LICCON overload protection according to the data in the load chart and confirm.

Note

- ▶ Enter the placed derrick ballast on the LICCON monitor 1!
- ▶ Enter the actual reeving on the pulley head on LICCON monitor 0!

To set the derrick ballast - see Crane operating instructions chapter 4.03.

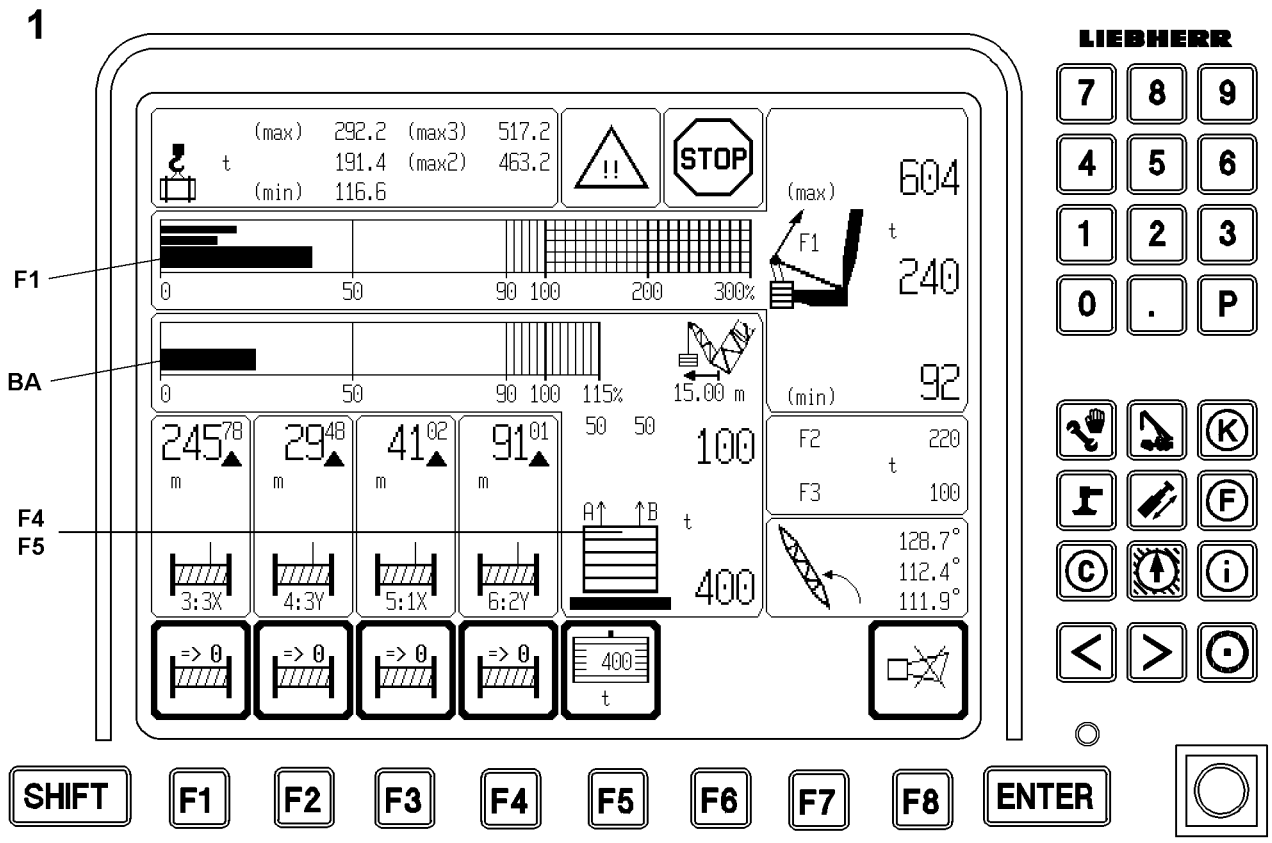
DANGER

Risk of accident!

The set derrick ballast value must agree with the actual derrick ballast weight added!

- ▶ Incorrect entry of the ballast weight can result in dangerous operational situations!

▶ Check the settings.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F3 100
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128.7°
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245 78
29 48
41 02
91 01
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4:3Y
5:1X
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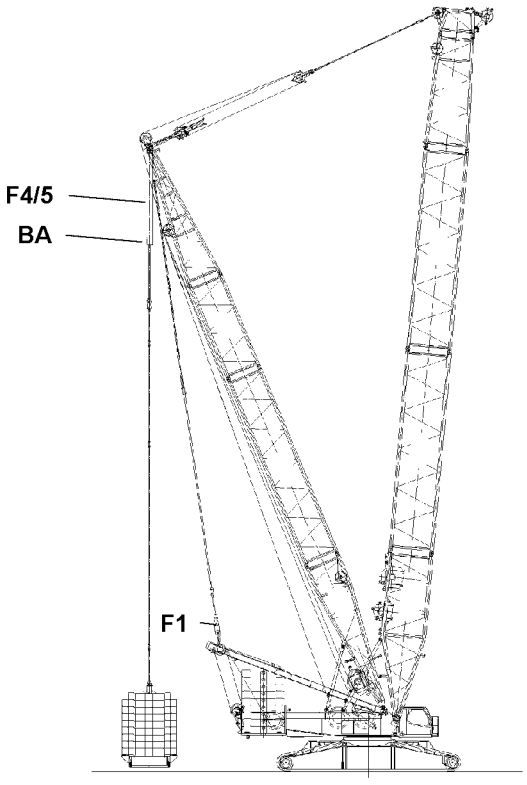
F8
ENTER


F4/5
BA
F1

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4.2 Crane operation

For crane operation with derrick ballast, the information in chapter 4.02 of the crane operating instructions, program “Crane operation” on LICCON-Monitor 1, must be observed.

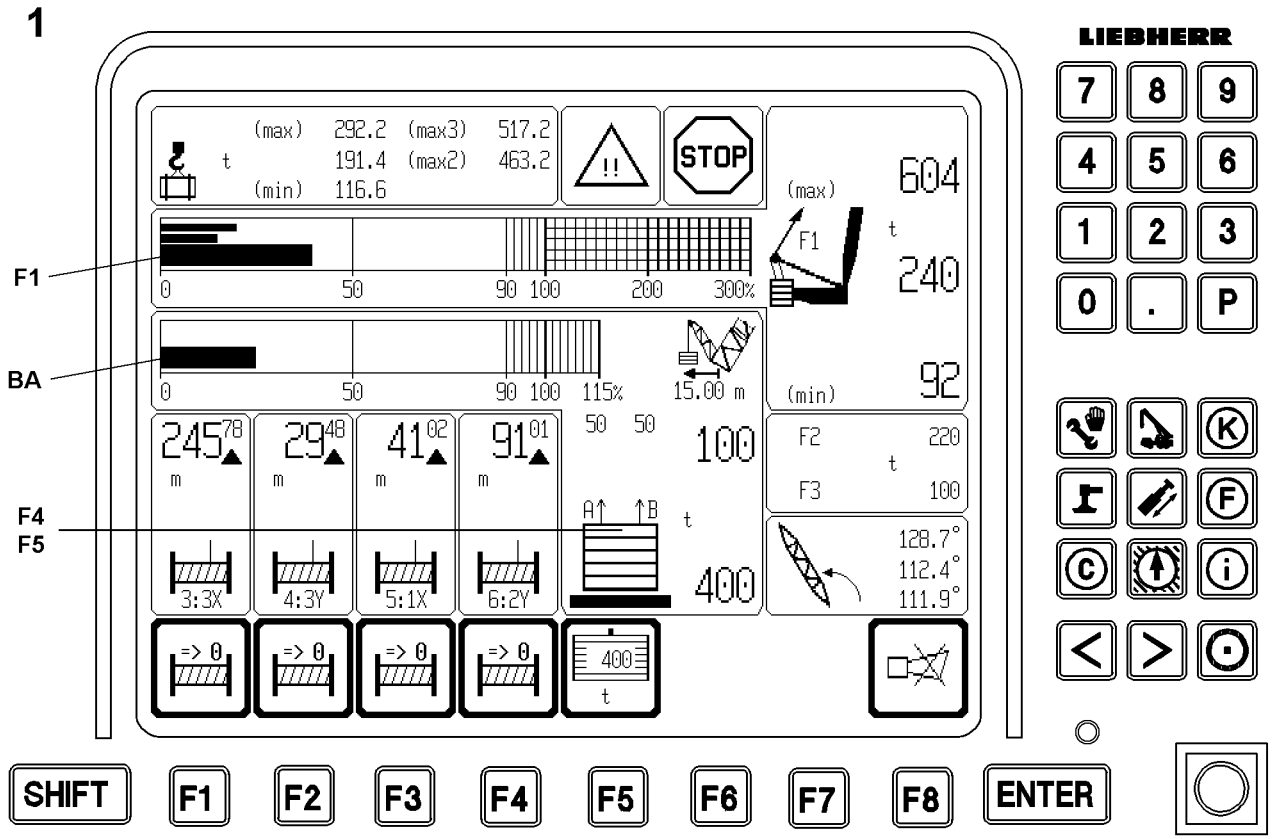
DANGER
Risk of accident!
There may be no persons or obstacles within the turning range of the derrick ballast!
During the turn, a guide must watch the boom, derrick and derrick ballast for a danger of collision!
When turning with a load and suspended derrick ballast, the turning movement must be initiated or slowed down extremely carefully!

- ▶ The jerky execution / braking of turning movement can cause the load or suspended derrick ballast to swing!
- ▶ This can cause the boom to break off or the crane to topple over!

Note

- ▶ See section “Lifting and lowering with pull cylinders” and section “Differential force monitoring for ballast guying”!

Observe the move out conditon of the pull cylinder and the inclination of the derrick ballast.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t 191.4 (max2) 463.2
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STOP
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(min)
0 50 90 100 200 300%
0 50 90 100 115%
15.00 m
245 78
29 48
41 02
91 01
m
50 50
100
F2 220
t
F3 100
A B
t
400
128.7°
112.4°
111.9°
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4:3Y
5:1X
6:2Y
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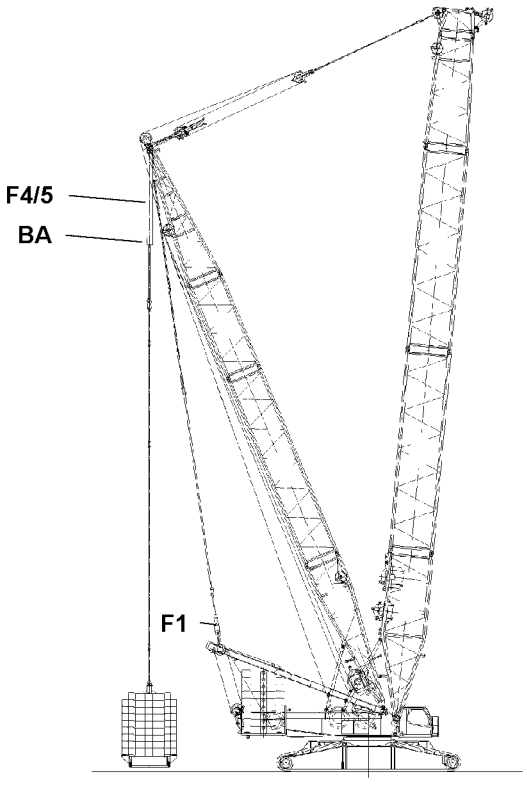
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


F4/5
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4.2.1 Safety guidelines

Note

- The test points must be checked before crane operation for functionality!
- The weight of the load to be lifted must be known!
- The contact area of the derrick ballast trailer should not be no more than maximum 250 m above or 250 m below the level of the crane base.
- The placement surface on which the derrick ballast is placed after load lifting has been completed must be level, horizontal in order to be able to safely support the weight!

CAUTION

Risk of accident!

- Before setting down the load and suspended derrick ballast, the crane operator must make sure that it can be safely set down!

Note

- There may be no obstacles within the slewing range of the crane, and the derrick ballast and the load!
- When the derrick ballast is raised, it must be observed by a guide or the crane operator!

DANGER

Danger of accidents due to diagonal pull!

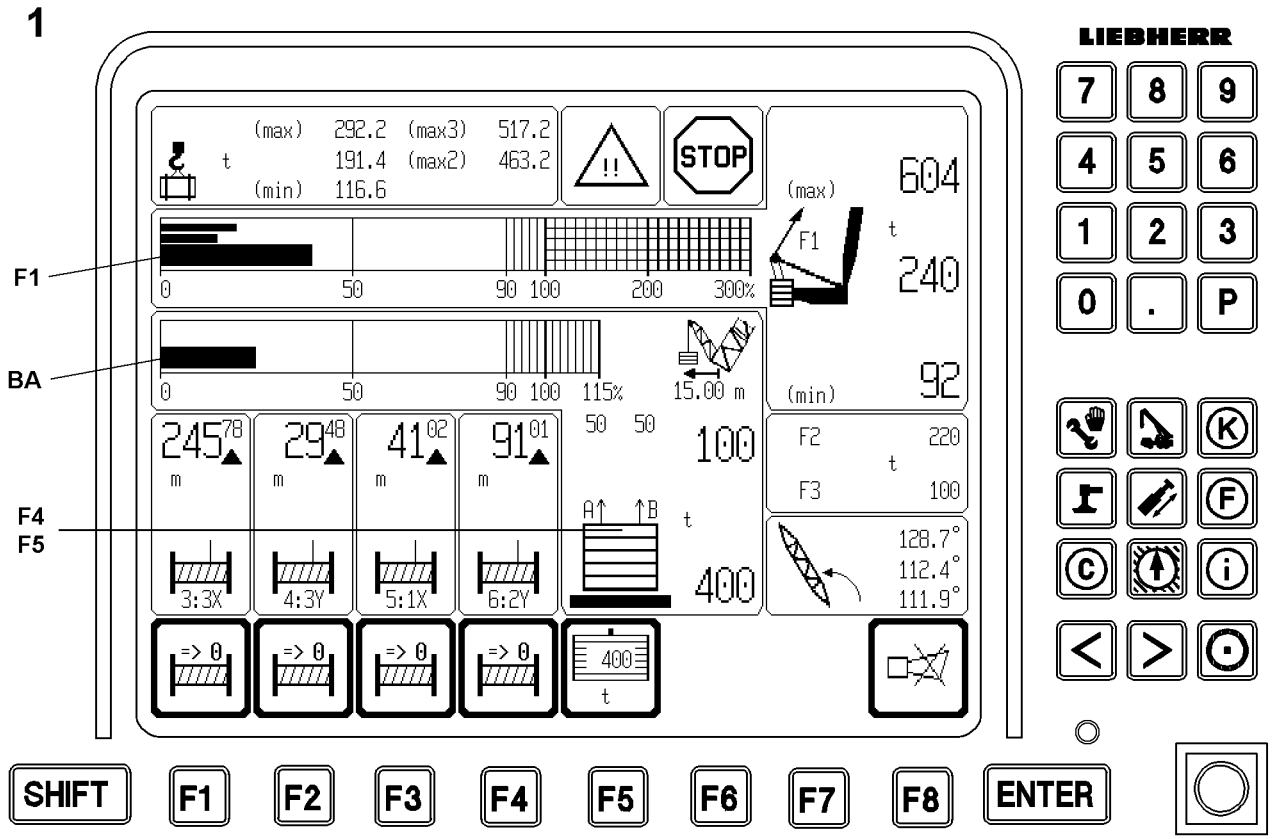
- When taking on the load, diagonal pull must be avoided, which means the derrick ballast, the center of rotation of the turntable and the load must be on one line!
- If this is not observed, there is a risk of tipping when lifting with ballast plates. This could cause the crane to topple over!

When lifting the load, the derrick guying between the derrick ballast and the derrick head must be relieved to the point where the actual force at test point 1 (F1 - actual) is higher than the $F1_{min}$ (test point 1).

DANGER

Risk of accident!

- The guying between the SA frame and the derrick end section, test point 1, may never be without power!
- This can lead to uncontrolled movements of the boom system and cause an accident!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(min) 116.6
STOP
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(max)
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(min)
0 50 90 100 200 300%
0 50 90 100 115%
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41 02
91 01
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50 50
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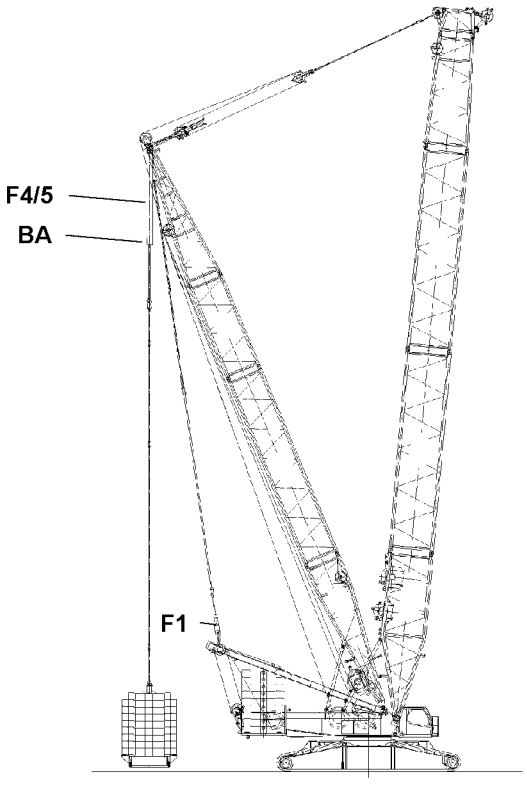
F4/5
BA
F1

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4.3 Determination of forces in operating mode with derrick ballast

In all operating modes with derrick ballast, the load is divided between the guy rods from the derrick head to the SA-frame (F1) and the derrick ballast (F4/5).

Note

▶ For a detailed description, see also chapter 4.02 of the crane operating instructions!

4.3.1 Force F1 (test point 1) guying SA-frame - derrick head

The force F1 (test point 1) is determined in the guy rods from the SA-frame to the derrick head by 2 force test boxes and is shown on the LICCON monitor 1 as total force of the guying.

The F1 - utilization is determined from the F1 operating force and the F1-maximum operating force. This is represented on LICCON monitor 1 by a bar display (F1 percent).

4.3.2 Force F4/F5 (test point 4/5) guying derrick ballast - derrick head

The forces F4/5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.

The existing forces in the guy rods (A = left and B = right) are calculated from the four pressure sensors, which are assembled on the pull cylinders and shown in the LICCON monitor 1 as individual forces.

The ballast being pulled is calculated from the forces in each guying, i.e. the proportion of ballast which is pulled up by the guying. The remaining part is on the ground. The derrick ballast utilization results from the pulled ballast and the placed ballast. This is represented on the LICCON monitor with a utilization bar (BA in %).

Pull cylinder on block

DANGER

The crane can topple over!

By completely moving one or both pull cylinders in (block position moved in), the pressure increases strongly on the ring surface of the pull cylinder and the weighing of the currently pulled derrick ballast is incorrectly calculated and displayed!

The LICCON overload protection therefore assumes that a larger derrick ballast is pulled than is actually the case, and calculates a too large carried load as a result!

An overload of the crane is recognized too late by the LICCON overload protection and the crane can topple!

Personnel can be severely injured or killed!

▶ If the pull cylinder are in block position “moved in”, **crane operation is explicitly prohibited**!
▶ The forces in the derrick ballast guyings A and B are carefully observed on LICCON monitor 1!
▶ Potentially encountered error reports are to be heeded!

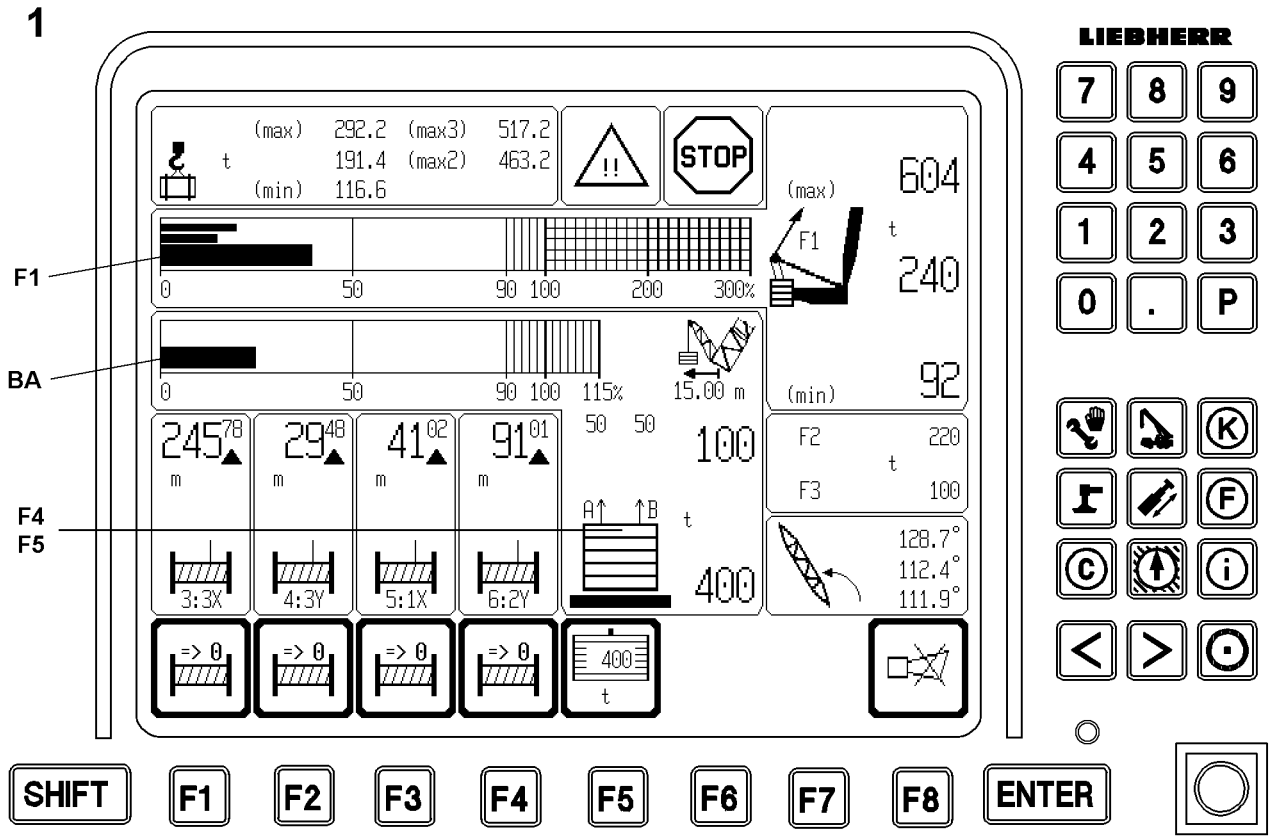
WARNING

Switching off the LICCON overload safety device too early!

By moving one or two pull cyllinder completely out (block position moved out), the LICCON overload protection calculates and insufficient load-bearing capacity!

Possible shut off by the LICCON overload protection takes place too early!

▶ If the pull cylinders are in block position “moved out”, crane operation on the basis of reduced load-bearing capacity is not meaningful!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STOP
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0 50 90 100 200 300%
0 50 90 100 115%
15.00 m
245 78
29 48
41 02
91 01
m
50 50
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F2 220
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F3 100
A B
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400
128.7°
112.4°
111.9°
3:3X
4:3Y
5:1X
6:2Y
=> 0
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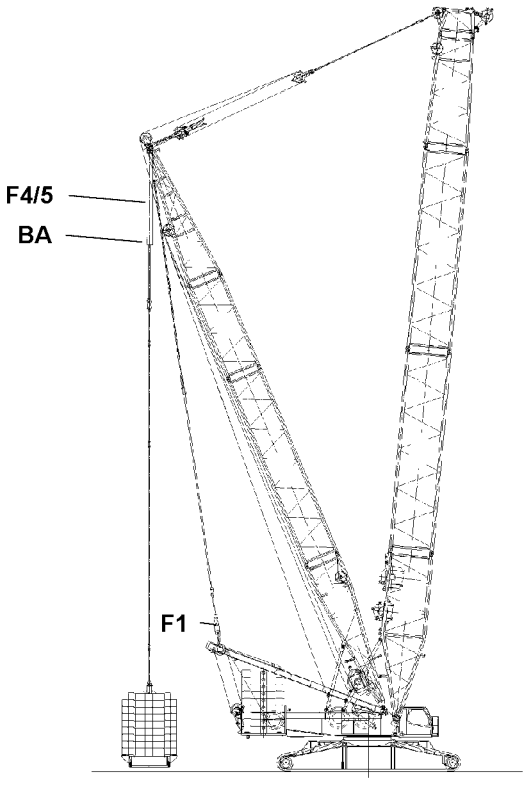
F7
F8
ENTER


F4/5
BA
F1

B106770

4.3.3 Monitoring of minimum force F1

If more than 50 % of the set derrick ballast is being pulled (ballast utilization bar > 50 %) and the force drops below the minimum value $F1_{min}$ (test point 1) fall below, all crane **movements that increase load torque** switch off.

DANGER
Risk of accident!
It is prohibited to let the minimum force $F1_{min}$ (test point 1) fall below if more than 50 % of the derrick ballast is pulled. If this is not observed, in case of loose tension from test point 1 (F1) and **derrick ballast on the ground**, the derrick ballast can suddenly lift off the ground due to the increased load moment and the boom system can suddenly move forward! This will result in the load swinging violently and could damage the boom and cab!
▶ Do not exceed minimum force - $F1_{min}$!

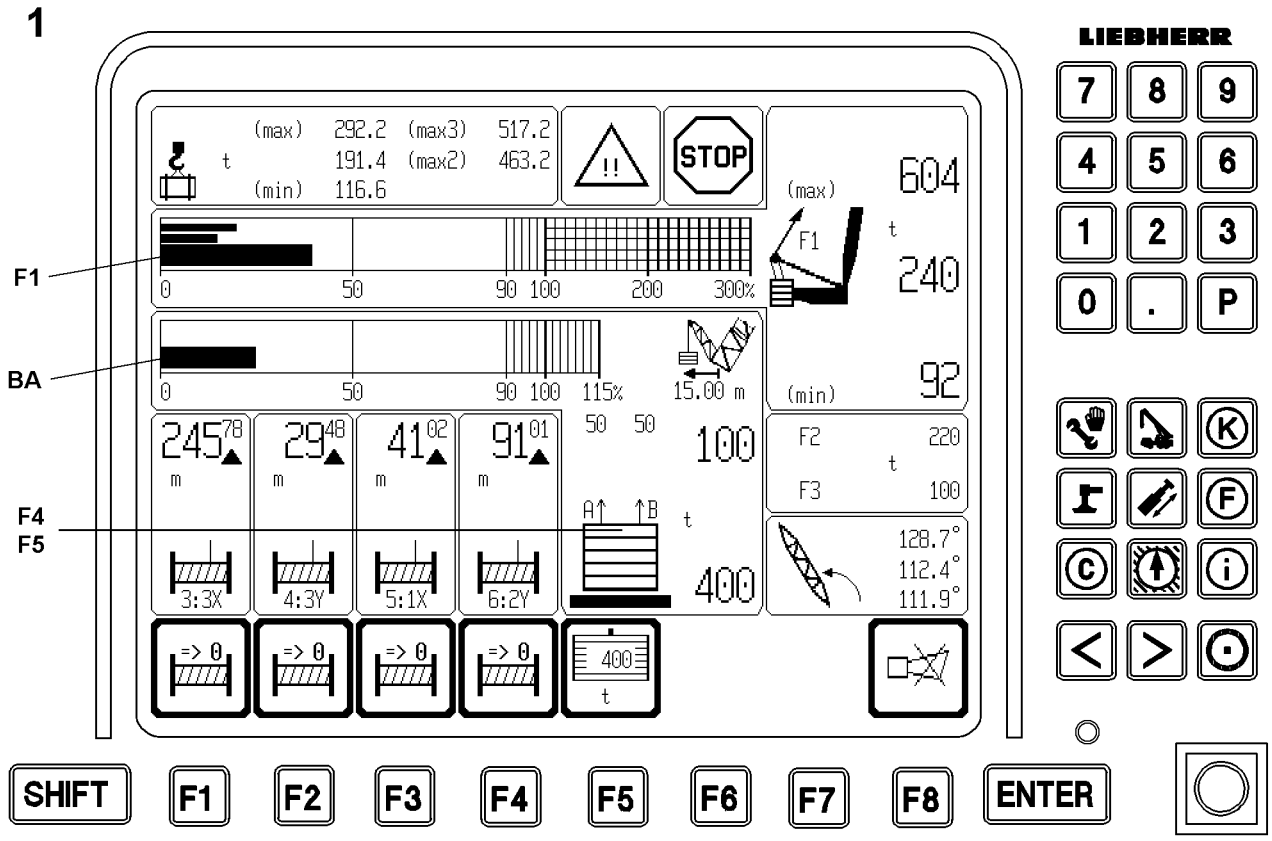
If more than 90 % of the set derrick ballast is being pulled (ballast utilization bar greater than 90 %) and the force drops below the minimum value $F1_{min}$ (test point 1) fall below, all crane **movements that increase load torque** and all **crane movements that decrease load torque** switch off. Thereby, the movement winch “spool out” is switched off.

DANGER
Risk of accident!
It is prohibited to let the minimum force $F1_{min}$ (test point 1) fall below if more than 90 % of the derrick ballast is pulled. If this is not observed and the load torque is increased when the guying is slack at test point 1 (F1) and the derrick ballast is suspended, the derrick ballast can suddenly drop to the ground, causing the boom system to suddenly lurch backwards! Thereby the relapse cylinders can be pressed on block and be overloaded. The relapse cylinders on the boom and D-boom may become damaged! This will result in the load swinging violently and could damage the boom and cab!
▶ Do not exceed minimum force - $F1_{min}$!

Note
▶ By actuating the assembly key button, the test point 1 - minimum force ($F1_{min}$) is reduced by several tons, this allows one to reverse the manoeuvre and retreat from the situation in which the $F1_{min}$ shut off occurred.
▶ This is the only exception on the crane, where, after a shut off, a load moment increasing movement may be continued with the assembly key switch!

DANGER
Risk of accident!
If the LICCON overload protection is bypassed, there is no further protection against crane overload!
There is an increased danger of accidents!
Personnel can be severely injured or killed!
▶ The crane operator carries complete and sole responsibility for its handling upon bypass of LICCON overload protection!

After switch off via $F1_{min}$ a maneuver must be increased through increased force F1 on the test point 1. If the derrick ballast is suspended, this can be achieved by setting down the ballast.
If the assembly key button is already pressed and the F1 force under the reduced minimal force by the assembly key button $F1_{min}$ sinks further, then $F1_{min}$ switch off is no longer bypassed.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LIEBHERR
(max) 292.2 (max3) 517.2
t 191.4 (max2) 463.2
(min) 116.6
STOP
604
(max)
F1
t
240
92
(min)
15.00 m
100
F2 220
t
F3 100
400
128.7°
112.4°
111.9°
3:3X
4:3Y
5:1X
6:2Y
SHIFT
F1
F2
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F4
F5
F6
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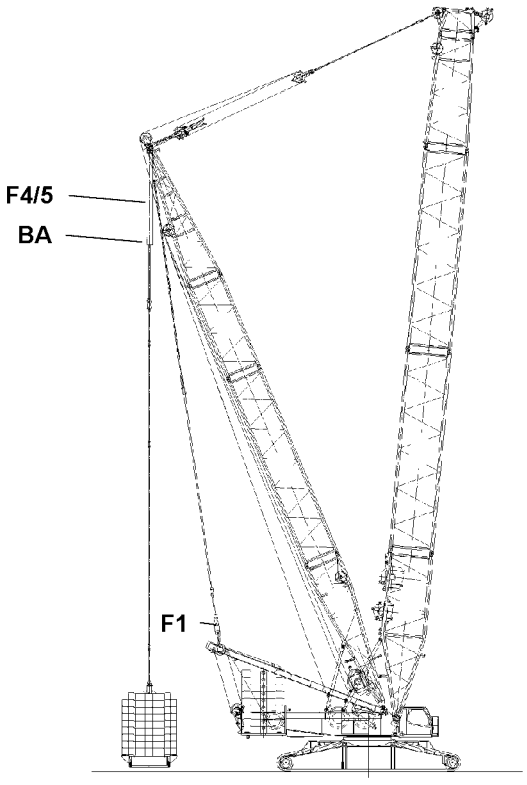
F8
ENTER


F4/5
BA
F1

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4.4 Overload monitoring in operating mode with derrick ballast

In operating modes with derrick ballast, the “maximum load for the current crane condition” is monitored two ways:

1.) Monitoring of maximum load on the LICCON monitor 0.
2.) Monitoring of test point 1-operational maximum force LICCON monitor 1.

4.4.1 Monitoring of maximum load on the LICCON monitor 0

It monitors the “maximum load according to load chart and reeving”.
In operating modes with derrick ballast, this is the maximum load of the current crane condition. It is shown on LICCON monitor 0. The current utilization of the crane results from the load utilization bar (1) on LICCON monitor 0.
If the load utilization bar reaches 90 %, an advance warning is given in the form of a “caution icon” and a “SHORT HORN” on LICCON monitor 0.
At 100 % on the load utilization bar, the shut off of all load moment increasing movements with the “stop icon” and the acoustical warning “HORN” occurs on LICCON monitor 0.

Note

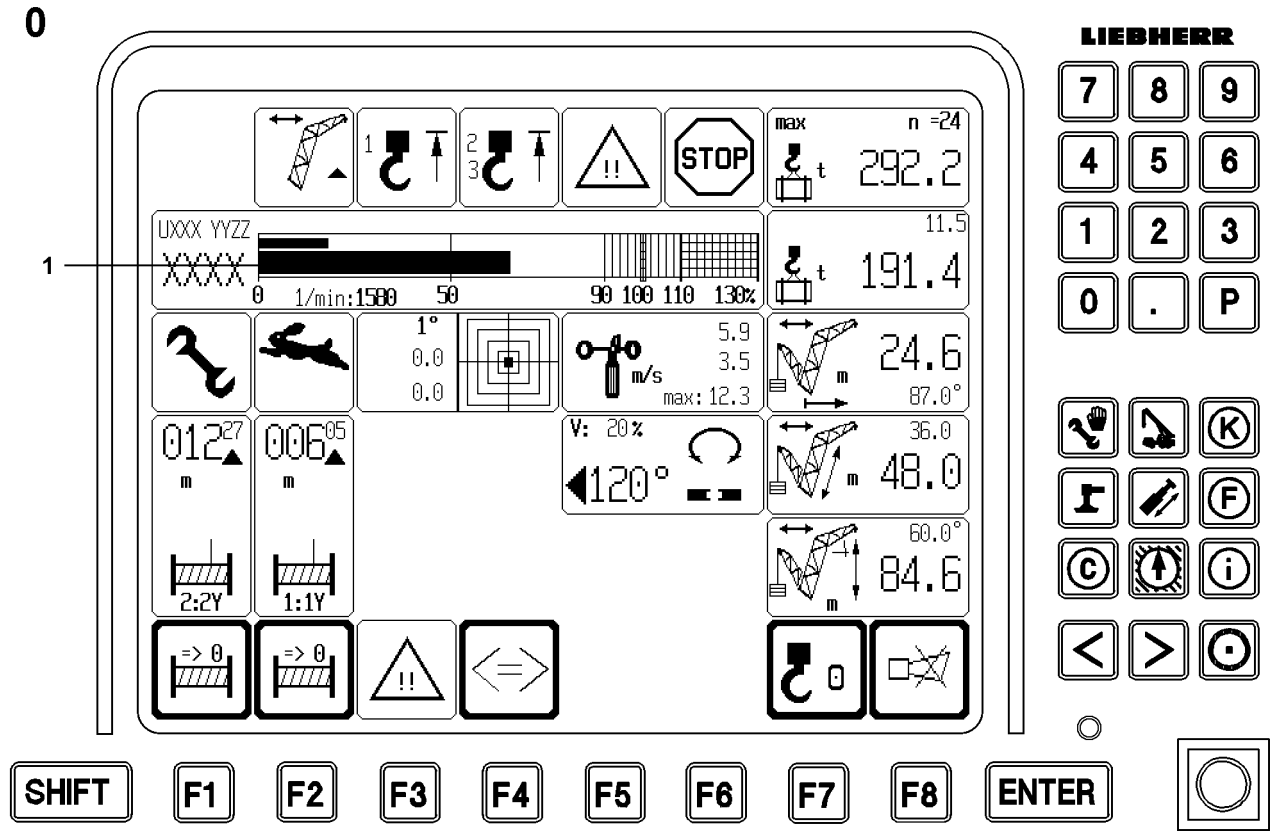
- The “maximum load of the current crane condition” can possibly be increased further, refer to section “utilisation conditions”!

4.4.2 Monitoring of test point 1-operational maximum force (= $F1_{max}$ operation)

It is shown on LICCON monitor 1. When F1 is greater than $F1_{max\text{-}shut\ off\ value}$ shut off of all movements which could increase load torque with the stop icon and the acoustic warning “HORN” by LICCON monitor 1.

Note

- The maximum load can be safely monitored by the “LICCON overload protection monitoring” itself!
- The “$F1_{max}$-monitoring” is an additional monitoring function which shows the overload parallel to the “LICCON overload protection”!
- In all cases, where the maximum load capacity according to the load chart “max-load” is smaller than the maximum load of the current equipment configuration with optimal derrick ballast “max3-load”, which means “max-load” appears smaller “max3-load”, when lifting the maximum load, the monitor display looks as if the “LMB utilization bar of the crane” is at 100 % and the “F1 utilization bar” is approximately at 100 %!
- At the just completed LMB-Stop (“current load” / “max-load capacity” greater than 100 %) $F1_{actual}$ already lies just over $F1_{max}$ or just below. There is a certain tolerance due to the component weights and the wind influences. Since the maximum load can always be raised, shut off will not occur at $F1_{actual}$ / $F1_{max}$ greater than 100 %. Shut off will only occur at $F1_{actual}$ / $F1_{max\ operation\ shut\text{-}off\ value}$. For this crane, the following applies: $F1_{max\text{-}operation\ shut\ off\ value}$ = $F1_{max\text{-}operation}$ + F1 addition for shut off (also see crane operating instructions chapter 4.02). The $F1_{addition\ for\ shut\ off}$ is selected such that $F1_{max\text{-}operation\ shut\ off}$ may normally never come about. This shut off provides a second safety, particularly in cases with “max-load capacity” smaller “max3-load capacity” as additional safety precaution. For example, if the weighed load is far too low due to a sensor failure, the actual load could be greater than the maximum permissible load without the LICCON overload protection shut off tripping. The crane could be overloaded. In this particular case, with the “max-load capacity” smaller than the “max3-load capacity”, with $F1_{max}$ larger $F1_{max\text{-}operation\ shut\ off\ value}$ the $F1_{max\ -shut\ off}$ triggers. In this case, the crane is already slightly overloaded, however shut off prevents an overload in certain cases or toppling of the crane. This means that the $F1_{max\text{-}operation\ shut\ off}$ can protect the crane from overload in certain cases!
- It is to be ensured that the load weight and the shut off upon maximum load capacity function reliably!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n =24
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36.0
48.0
60.0°
84.6
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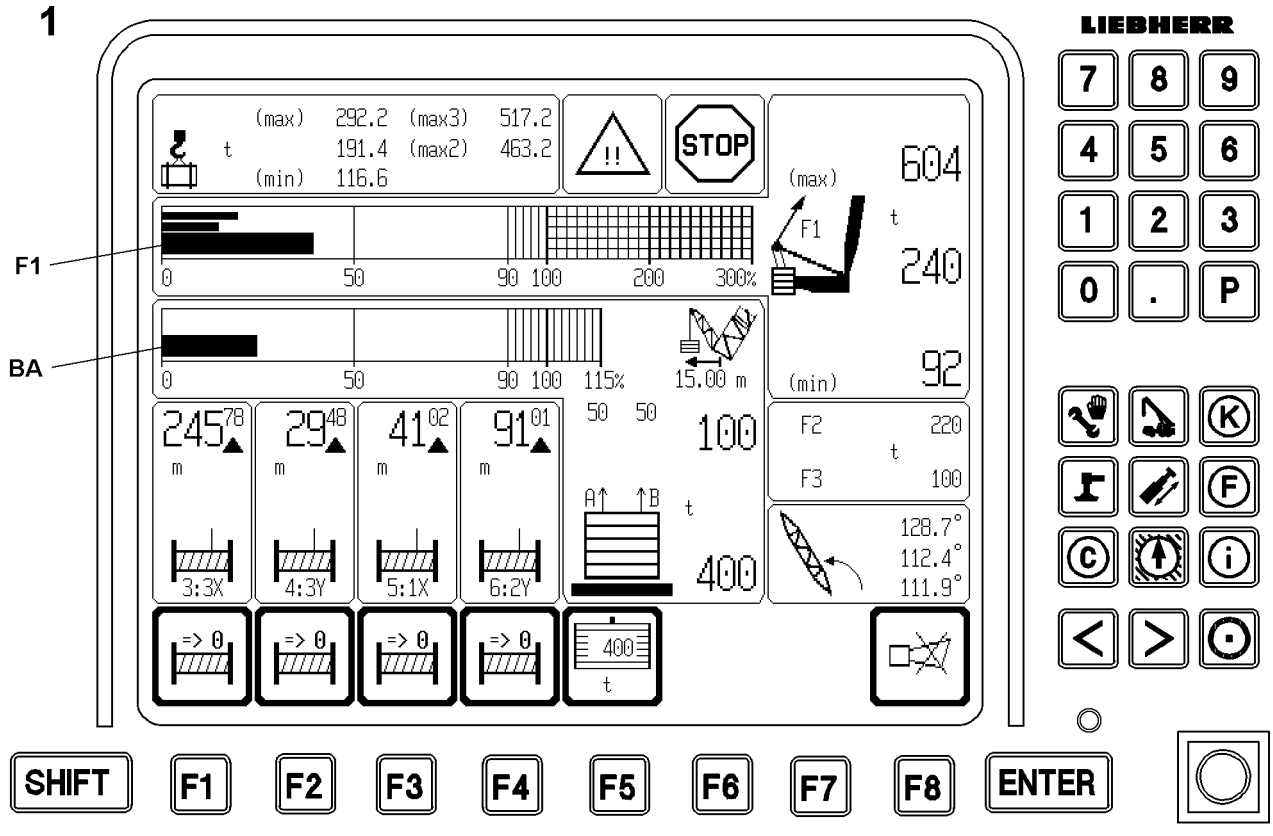
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(max) 191.4 (max2) 463.2
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245 78
29 48
41 02
91 01
3:3X
4:3Y
5:1X
6:2Y
F2 220
F3 100
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112.4°
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7 8 9
4 5 6
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0 . P
SHIFT
F1
F2
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F4
F5
F6
F7
F8
ENTER

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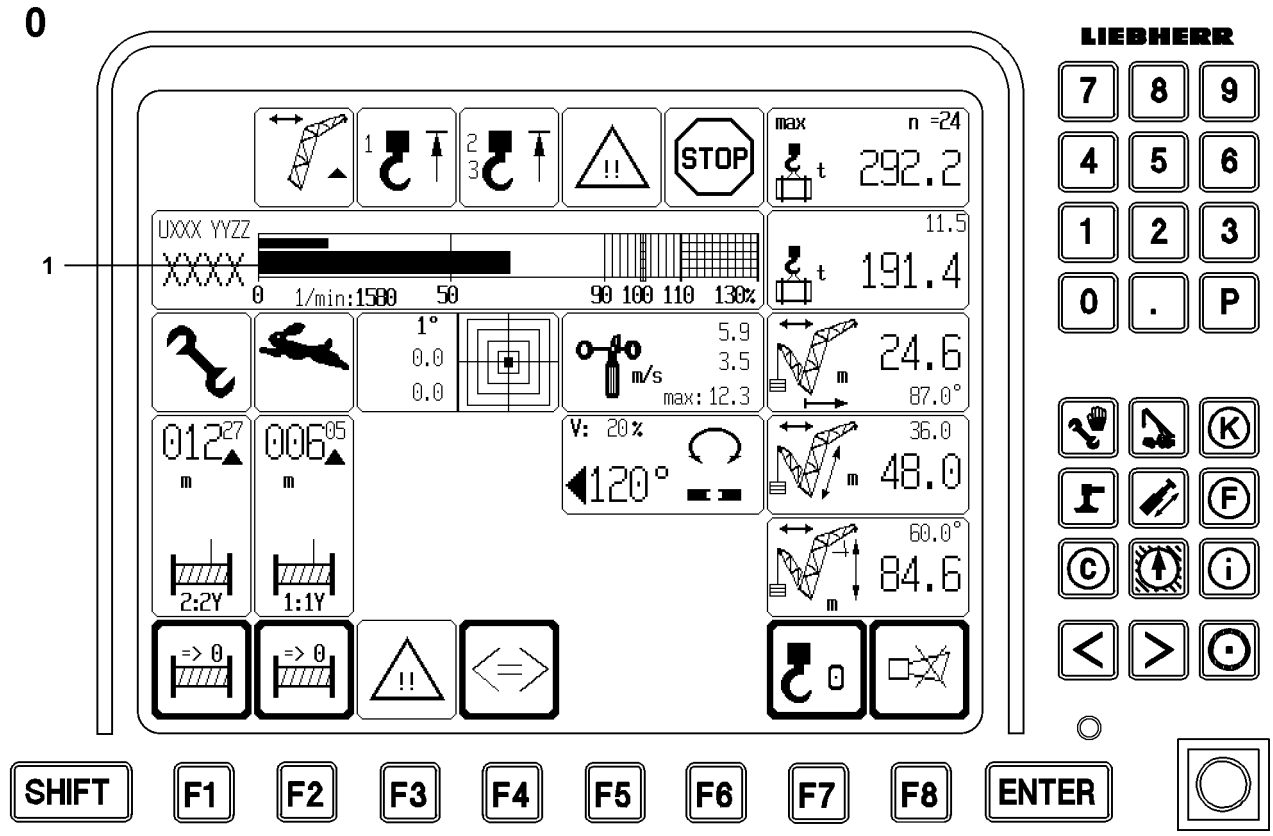
DANGER
The crane can topple over!
In cases with “max-load capacity” = “max3-load capacity”, the $F1_{max}$ -shut off value does not offer protection! The $F1_{max}$ shut-off threshold is so high that the crane will probably topple over or be damaged before the shut-off threshold is reached!
▶ Carefully monitor the displays on LICCON monitor 1!

WARNING
Risk of accident!
▶ Measuring point 1-Operation-Maximum force not only depends on the current crane configuration but also on the derrick ballast pulling force measured by the pressure sensors!
▶ If the pulled derrick ballast increases, the maximum permitted $F1_{max}$ removes force and vice-versa!
▶ It is therefore important to carefully monitor the ballast weighing process and the value for the pulled derrick ballast to ensure it is plausible!

DANGER
The crane can topple over!
If the pulled ballast value has been incorrectly determined and is too low, the calculated $F1_{max}$ may be too high and the crane could be overloaded without this becoming evident!
▶ Carefully monitor the displays on LICCON monitor 1!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n =24
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191.4
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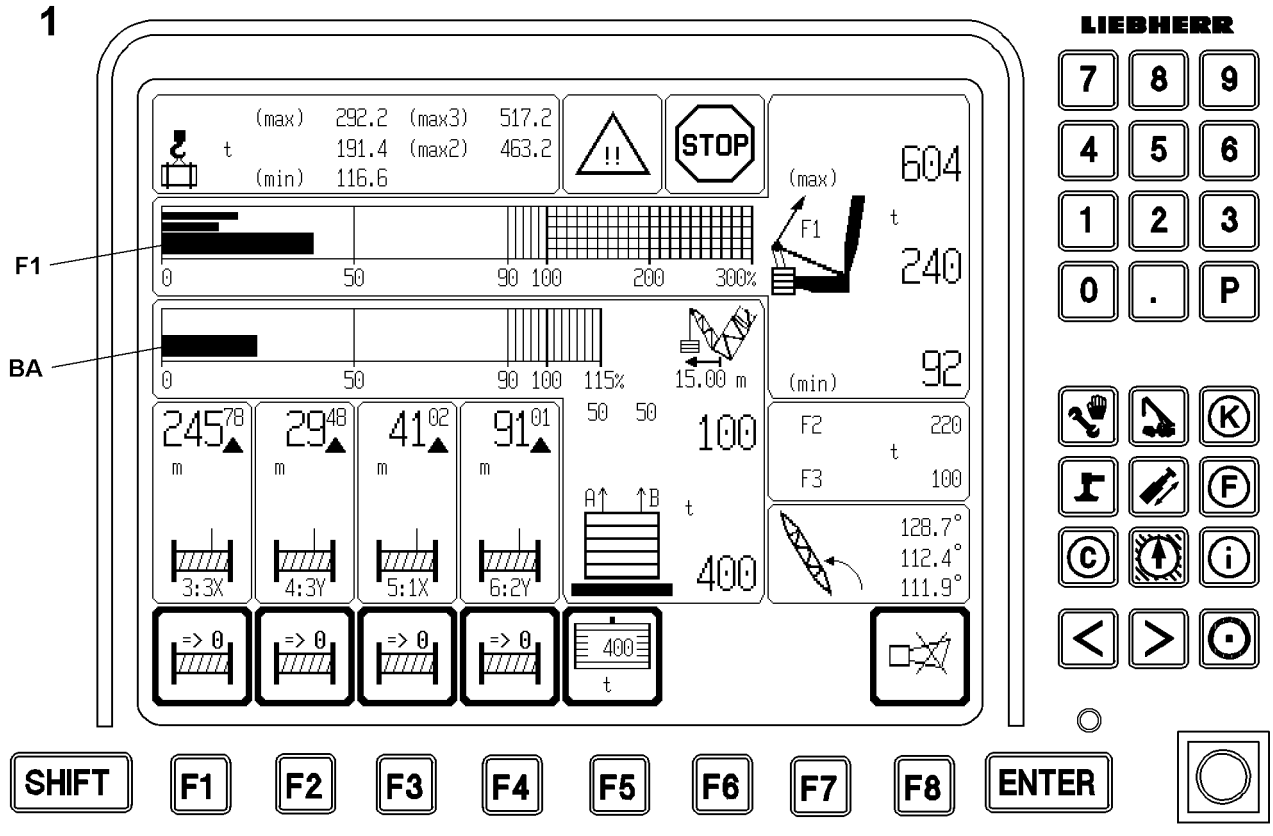
87.0°
36.0
48.0
60.0°
84.6
012 27
006 05
2:2Y
1:1Y
V: 20%
120°
5.9
3.5
max: 12.3
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER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(max) 191.4 (max2) 463.2
(min) 116.6
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245 78
29 48
41 02
91 01
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4:3Y
5:1X
6:2Y
F2 220
F3 100
128.7°
112.4°
111.9°
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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4.4.3 Utilization conditions

The current utilization of the crane results from the “crane load utilization bar” **1** on the LICCON monitor 0.

Max. load carrying capacity:

– The “maximum load carrying capacity in current operating condition (**“max-load carrying capacity”**) ” is achieved, when the “crane load utilization bar” **1** displays 100 %.
This is the case when the “crane utilization accords with the load chart and reeving” 100 % achieved (“momentary load” is equal to the “maximum load carrying capacity”).
When the “max-load carrying capacity” is smaller or equal to the “max2-load carrying capacity”, then the “max-load carrying capacity” can be increased through:
  • Pulling up the derrick ballast, if the derrick ballast is not already suspended and the currently pulled derrick ballast is still smaller than the optimum derrick ballast.

Max2-load carrying capacity:

– The “maximum load carrying capacity of the current crane equipment ” (**“max2-load carrying capacity”**) is achieved when the “crane utilization bar” **1** stands at 100 % **and** the “derrick ballast-utilization bar display” **BA** stands at greater than or equal to 100 % (the current derrick ballast is completely lifted from the ground), and the derrick ballast-entry value and the ballast weight are correct.
This is the case when the “current load” and the “max2-load carrying capacity” achieves 100 % (“current load” is equal to the “max2-load carrying capacity”).
When the “max2-load carrying capacity” is smaller than the “max3-load carrying capacity”, then the “max-load carrying capacity” can be increased through:
  • Increasing the derrick ballast by adding additional ballast plates if the placed ballast is still smaller than the optimum ballast.

Max3-load carrying capacity:

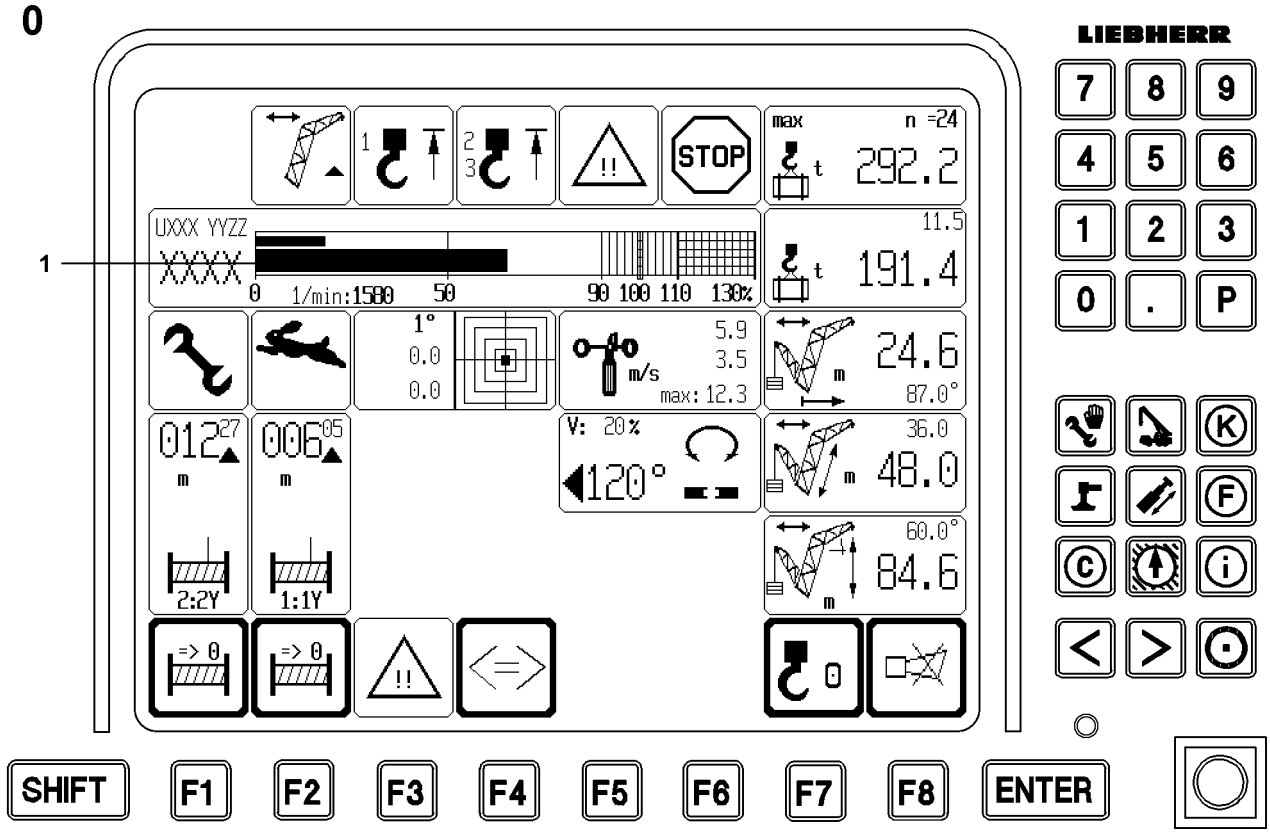
– The “maximum load carrying capacity of the current crane equipment ” (**“max3-load carrying capacity”**) is achieved when the “crane utilization bar” **1** stands at 100 % **and** the “derrick ballast-utilization bar display” **BA** stands at 100 % (the optimal derrick ballast is completely lifted from the ground), and the derrick ballast-entry value and the ballast weight are correct.
This is the case when the “current load” and the “max3-load carrying capacity” achieves 100 % (“current load” is equal to the “max3-load carrying capacity”).
Here, the optimal derrick ballast is already entirely pulled!
Further increasing the derrick ballast at this derrick ballast radius will not increase the permitted load as the “max3-load carrying capacity”!

Note

▶ In some cases it may be possible to increase the load capacity, in some cases reducing the derrick ballast radius as well; refer to the load chart manual or LICCON job planner!

This also applies with:

– “Current load” equal to “max-load carrying capacity”.
– “Current load” equal to “max2-load carrying capacity”.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n =24
292.2
11.5
191.4
24.6
87.0°
36.0
48.0
60.0°
84.6
012 27
006 05
2:2Y
1:1Y
V: 20%
120°
5.9
3.5
max: 12.3
7 8 9
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SHIFT
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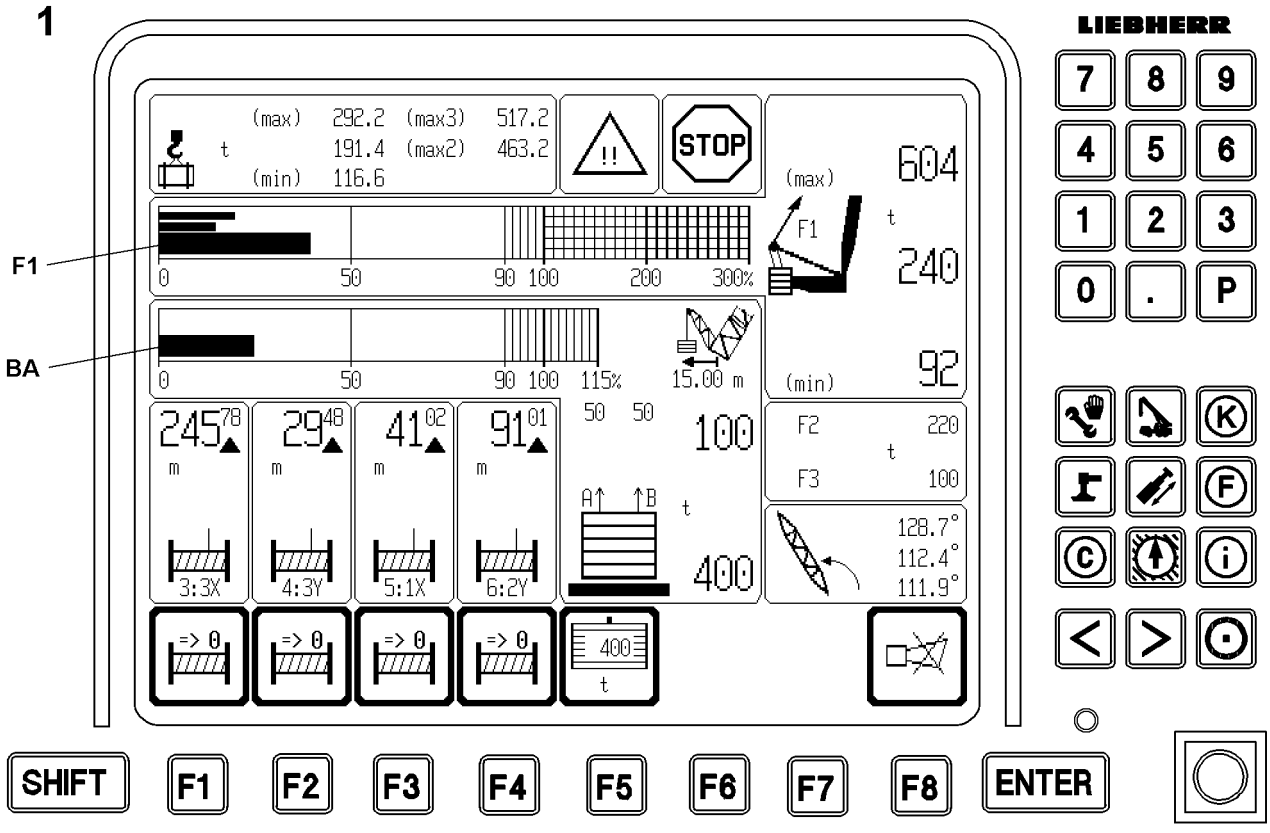
ENTER


1
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(max) 292.2 (max3) 517.2
(max) 191.4 (max2) 463.2
(min) 116.6
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92
15.00 m
100
400
245 78
29 48
41 02
91 01
3:3X
4:3Y
5:1X
6:2Y
F2 220
F3 100
128.7°
112.4°
111.9°
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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The bypass of the maximum load according to the load chart and reeving (crane utilization bar 1 stands at 100 %) can be bypassed by the following measures:

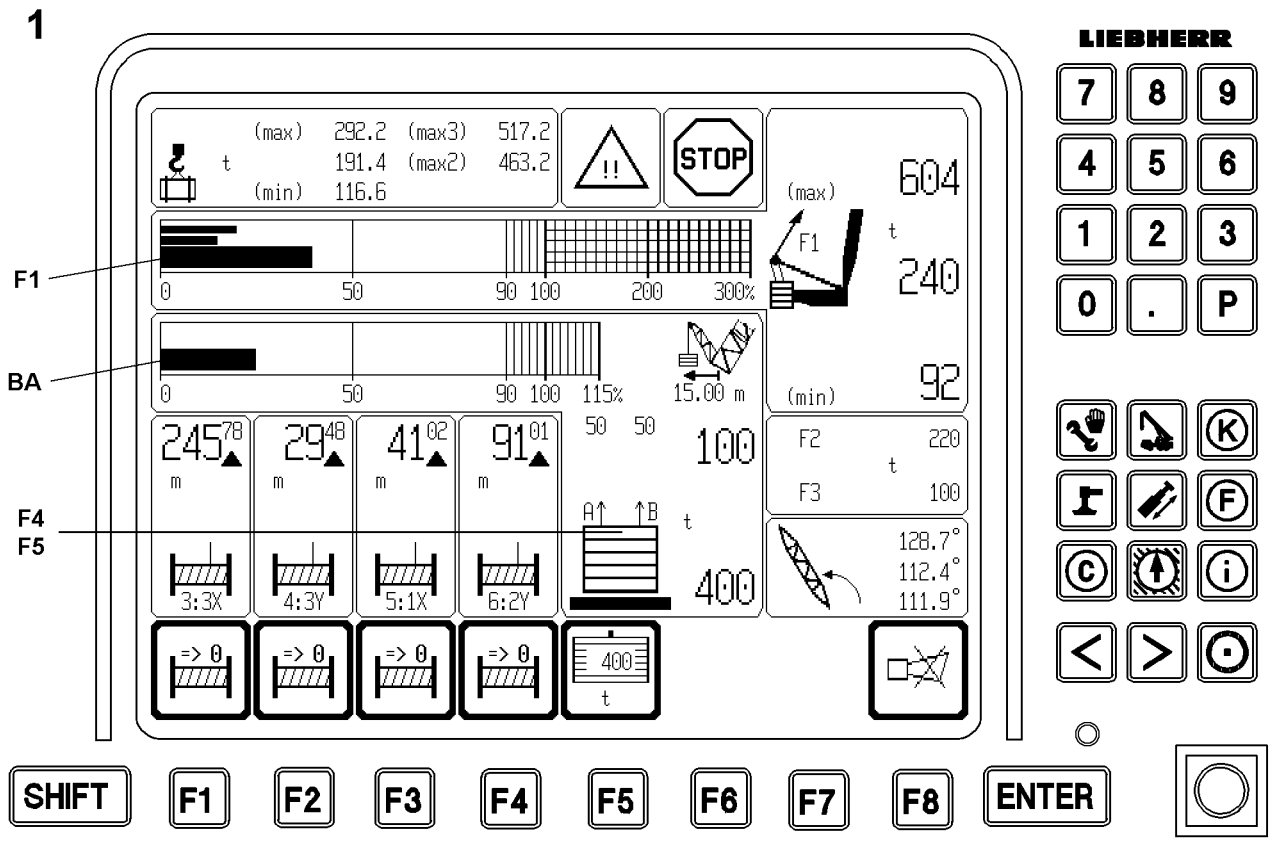
1.) Bypass key button D on the LICCON monitor 0.
2.) Assembly key switch in the instrument panel.
3.) **Note:**
The test point 1-assembly - maximum force shut off (= F1 max-assembly) cannot be bypassed.

DANGER
The crane can topple over!
When the assembly key button is turned on, the LICCON overload protection is bypassed and is thereby no longer effective!
The crane can be overloaded unnoticed and topple over!
Personnel can be severely injured or killed!

- ▶ When the assembly key switch is turned on, it is only permitted to execute crane movements that reduce the load torque within certain operating and load ranges!
- ▶ Turn the assembly key button is immediately switched off after reaching the permissible load range!
- ▶ The crane operator alone is responsible completely for his actions during bypass of LICCON overload protection!

Note

- ▶ The movement “ballast up” or “ballast down” requires utmost attention by the crane operator!


1
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(max) 292.2 (max3) 517.2
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(min) 116.6
STOP
604
(max)
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t
240
92
(min)
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0 50 90 100 115%
15.00 m
245 78
29 48
41 02
91 01
m
50 50
100
F2 220
t
F3 100
A B
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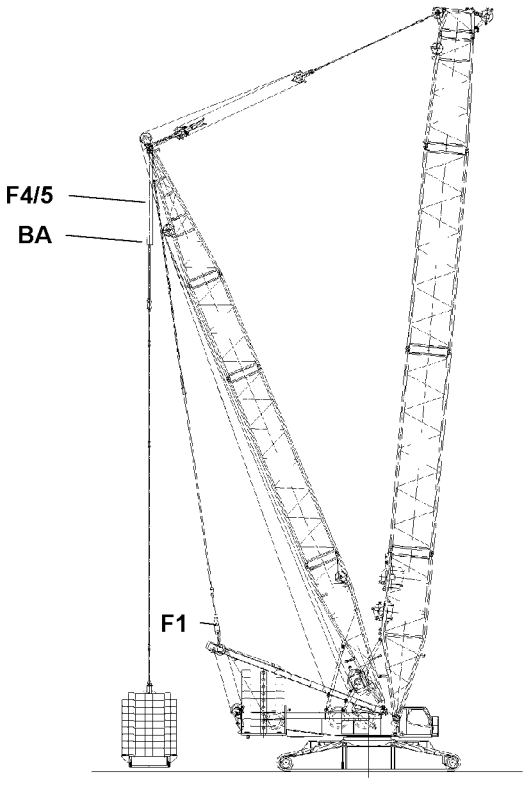
400
128.7°
112.4°
111.9°
3:3X
4:3Y
5:1X
6:2Y
=> 0
400
t
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


F4/5
BA
F1

B106770

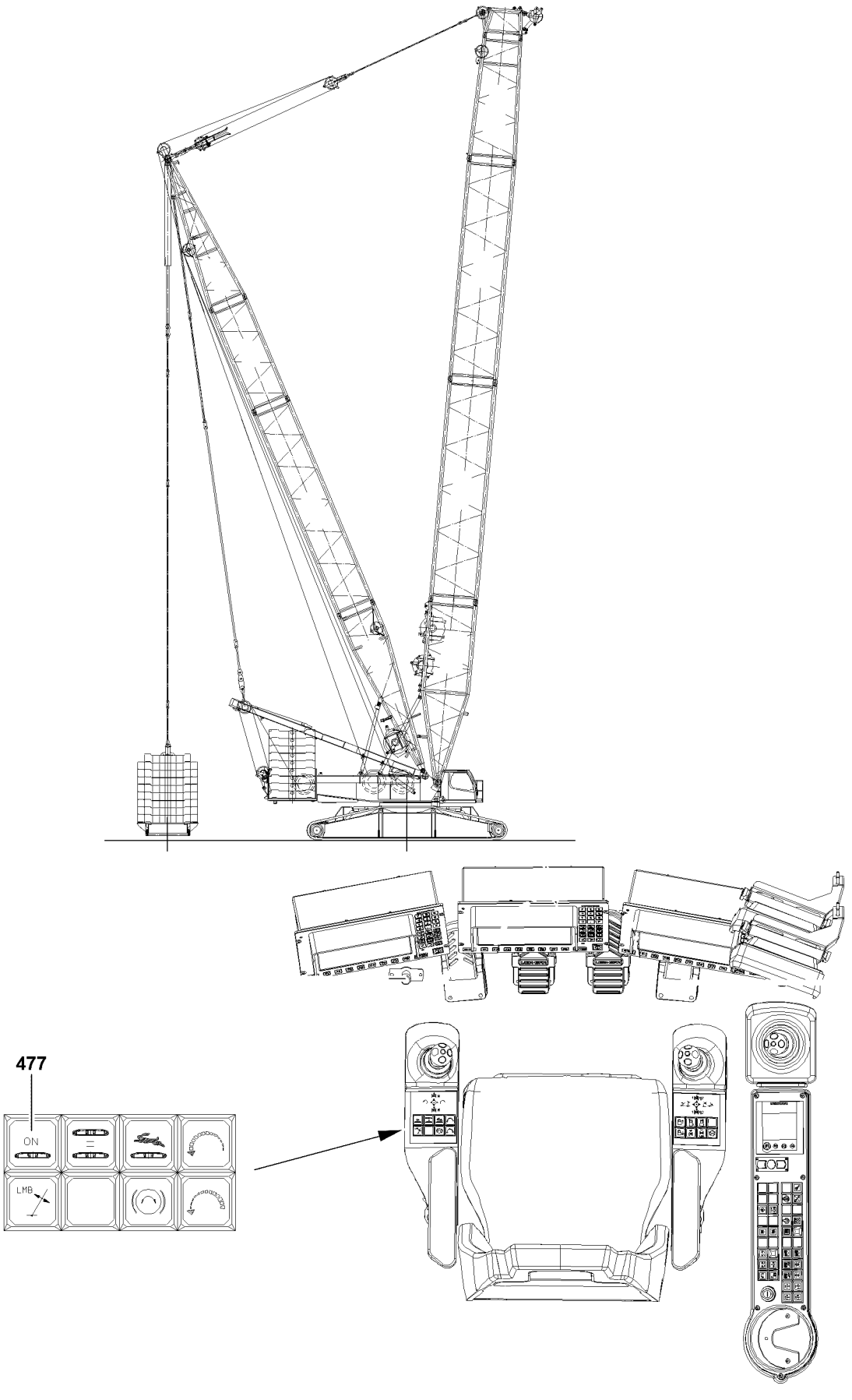
4.5 Differential force monitoring for derrick ballast-guying

In operating modes with derrick ballast, the difference of the forces of derrick ballast guying A and B, Monitor LICCON monitor 1, are monitored.

DANGER
Risk of accident!
If the difference of these forces is too high, it will damage the derrick head or other crane components!
▶ Danger of accidents!

The forces in the derrick ballast guyings A and B are shown and compared on LICCON monitor 1. If the difference exceeds a permissible value, an acoustical warning is issued and the two force values blink. However **none of the movements are turned off**.
If the difference of the forces of the derrick ballast guyings A and B exceeds the specified limit value, then this can have various causes:
– Flexing of the turntable.
– The ground under the derrick ballast is uneven.
– The crane is leaning to one side.
– The derrick ballast has been loaded one-sided.
– Incorrect force measurement in one guying.

The crane driver must determine the correct cause and take appropriate remedial action:
– Rectify the error which is causing the force to be applied on one side.
– In case of small ground unevenness only, the following measure is permissible:
  Lock one ballasting cylinder and use the other ballasting cylinder to “Raise the ballast” or “Lower the ballast” until the difference between the forces reduces. Ensure that the derrick ballast is not tilted at an inadmissible angle with respect to the crane, otherwise the derrick ballast guide and attachments will be damaged.
– In case of implausible sensor values: Check whether the ballast weighing pressure sensors or inputs are faulty. If necessary, detach the sensor or replace the CPU.



B106769

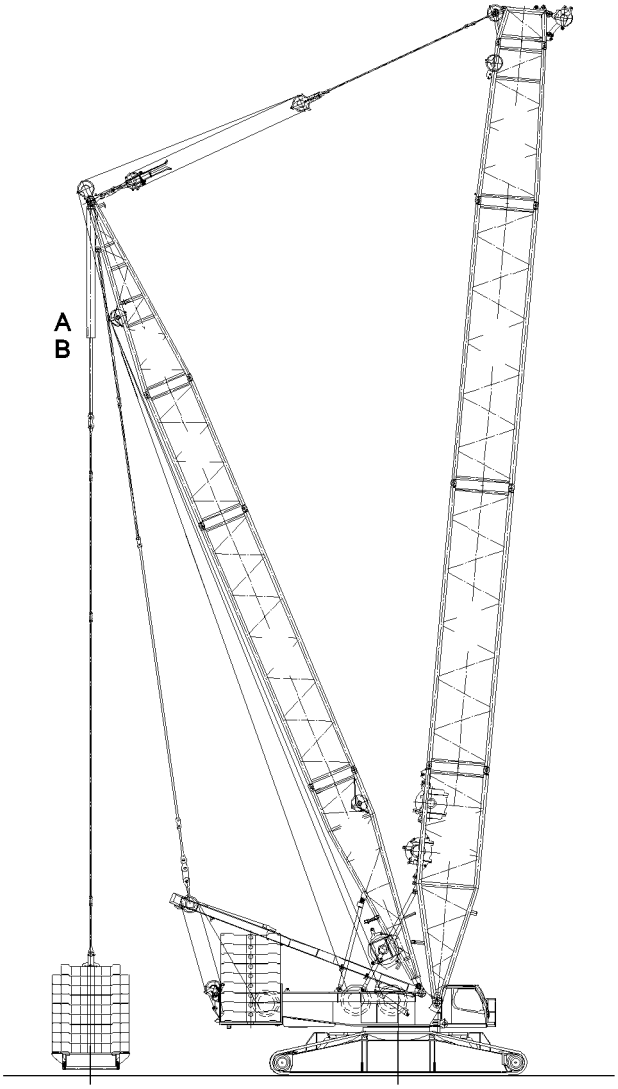
5 Crawler operation with derrick ballast

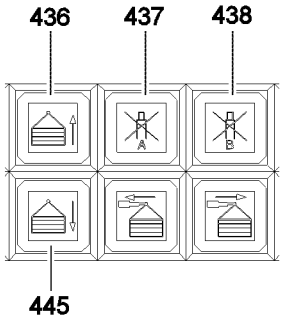
5.1 Driving the crawler

Driving with raised and suspended derrick ballast.
Make sure that the following prerequisites are met:
– the derrick ballast has been lifted off the ground,
– the derrick ballast icon on LICCON monitor 1 represents a suspended state,
– the derrick ballast is horizontally aligned,
– the sub-surface is able to support the weight of the crane, the load and the derrick ballast.

Note
- ▶ The hazard warnings described in chapter 4.10 of the crane operating instructions must be observed!
- ▶ Release for driving the crawler takes place when all 4 ground contact rollers are no longer **in contact with the ground**!
- ▶ The crawler operation must be switched off with the switch **477**!

DANGER
Risk of accident!
If the following conditions are not observed, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ There are no persons or objects in the danger zone!
- ▶ The driving area should be monitored by cameras or a supervisor!
- ▶ Only drive at the lowest possible speed!
- ▶ Avoid jerky driving movements!
- ▶ The attached load and suspended derrick ballast must be secured to prevent it from swinging! If the derrick ballast should swing by more than +/-0.5m, use the pull cylinders to immediately set the derrick ballast down on the ground! Hereby, the upper load threshold at measuring point 1 (F1) may not be exceeded!
- ▶ Steering manoeuvres are prohibited!
- ▶ Uphill or downhill travel is prohibited!





B108732

6 Disassembly

Ensure that the following prerequisite is met:
– the placement surface for the derrick ballast must be level, horizontal and of sufficient load carrying capacity.

WARNING
Danger of toppling the ballast stack!
The surface on which the derrick ballast is set down must be level, horizontal and of sufficient load bearing capacity, otherwise the ballast stacks can tip over!
Personnel can be severely injured or killed!
▶ Check the horizontal position of the crane during the set down procedure!
▶ Check the horizontal position of the derrick ballast during the set down procedure!
▶ Constantly check the differential forces in the guying on LICCON monitor 1!
▶ It is strictly prohibited for anyone to stand under the derrick ballast or in any part of the danger zone during the set down procedure!

6.1 Setting down the ballast pallet

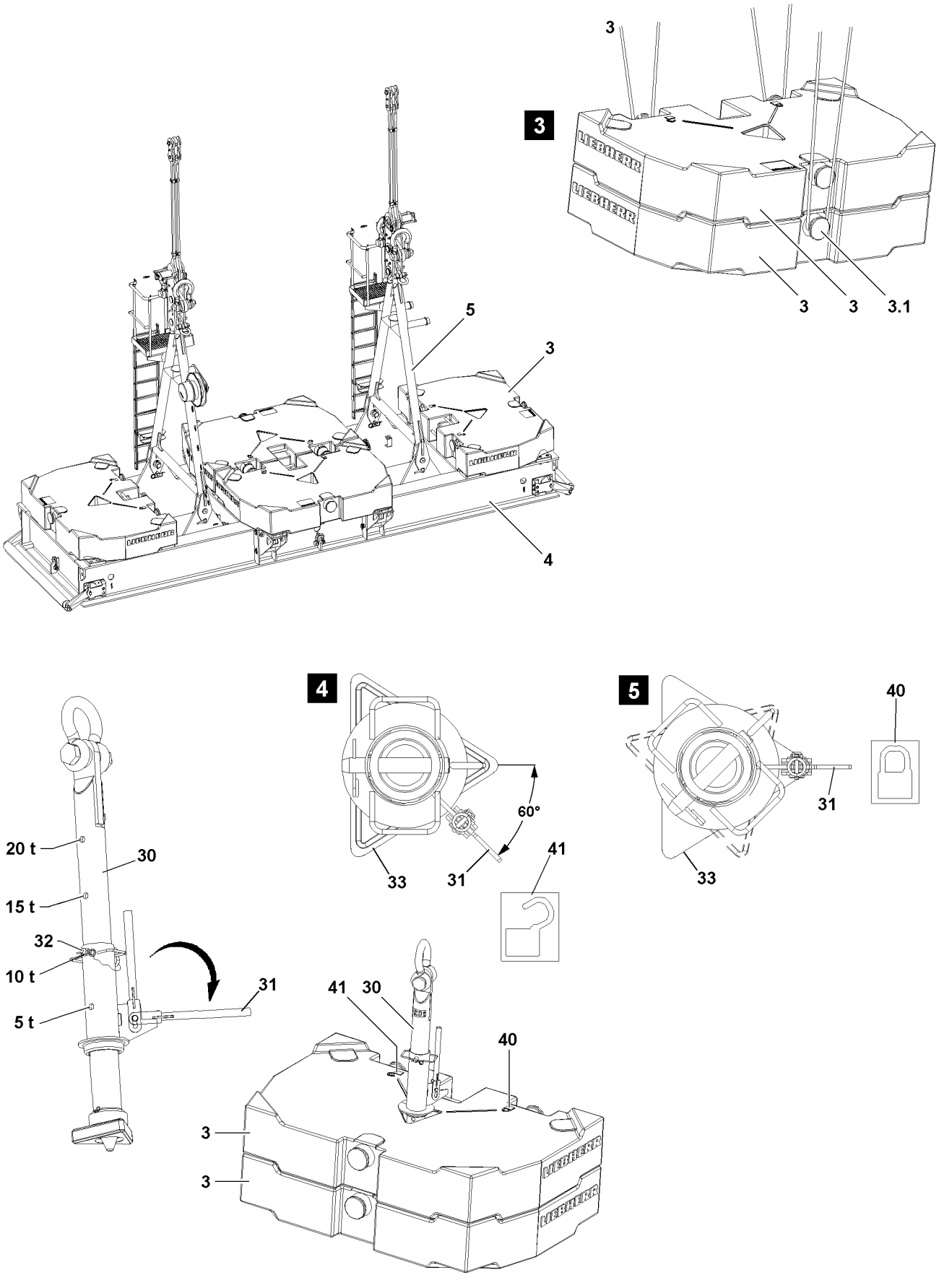
Ensure that the following prerequisite is met:
– a guide or crane operator must monitor the setting down of the derrick ballast and the load.

▶ Press the button **445**.

Result:
– The piston rods of the pull cylinders move out.
– The derrick ballast is lowered.

▶ When the ballast pallet touches the ground, the ground contact switches are actuated.

Result:
– The crane movements **turning the turntable** and **driving the crawler** turn off.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32
10 t
5 t
31
41
30
40
3
3

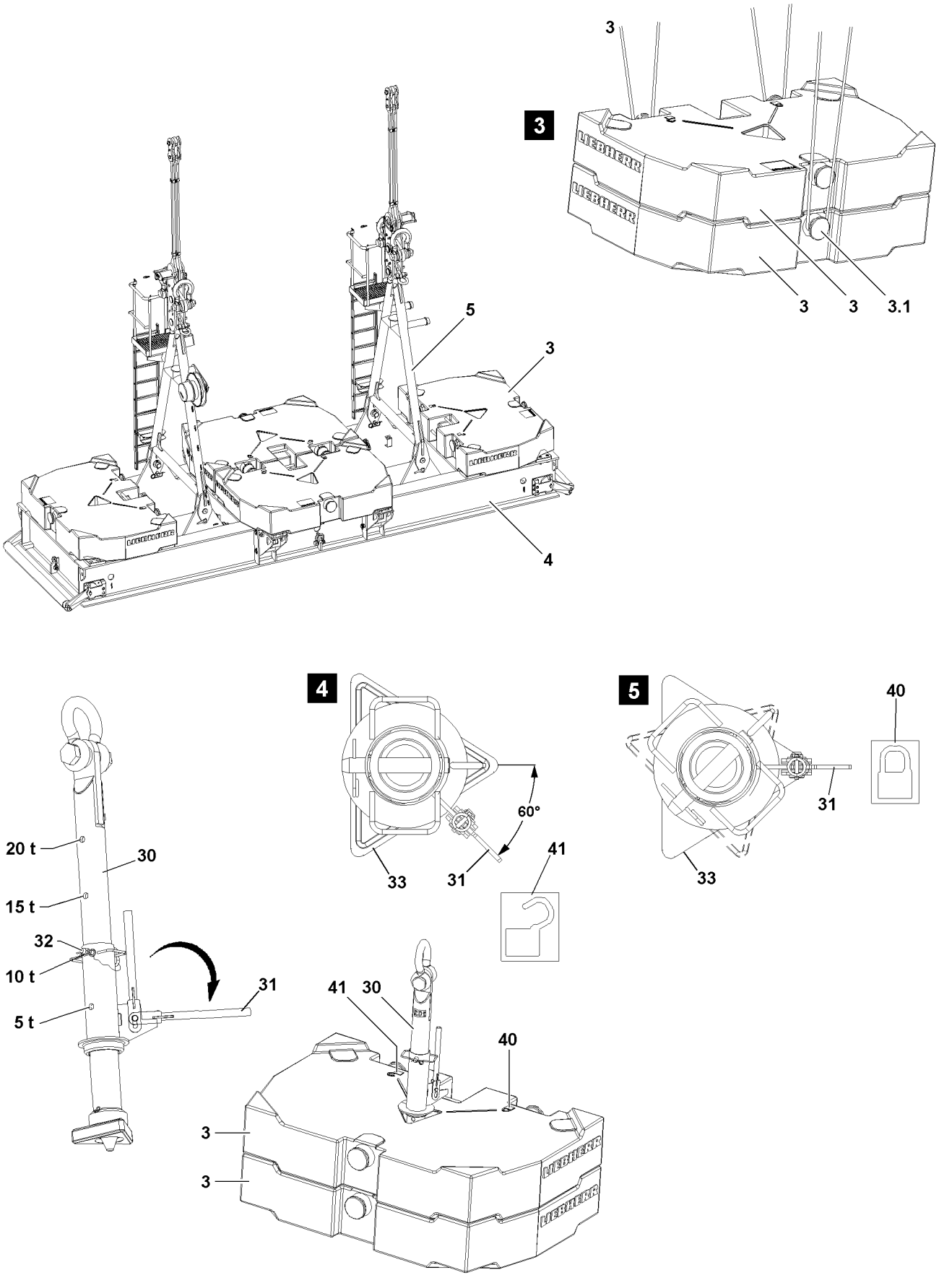
B108734

6.2 Removing the ballast plates

Ensure that the following prerequisite is met:
– the retaining chains are disassembled.

Note
▶ The ballast plates are marked with their own weights!

WARNING
The crane can topple over!
If more than 20 t are removed with one lift from a ballast stack or if the ballast is removed asymmetrically, then the crane can topple over!
Personnel can be severely injured or killed!
▶ A weight difference between the right and left ballast stack of more than 20 t is prohibited!
▶ Alternately remove no more than maximum 20 t ballast assemblies from the ballast stack, symmetrically on the left and right.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41
30
40
3
3

B108734

6.2.1 Removing the ballast plates, attachment system: “Twistlok”

DANGER
Risk of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged!
Personnel can be severely injured or killed!
- ▶ Make sure that the ballast plates are laying correctly in the centerings!
- ▶ Replace damaged ballast plates!

To remove the ballast plate(s) **2**, use the receptacle stud **30**.
Before the receptacle stud **30** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **30** is set correctly. The length of the receptacle stud **30** can be adjusted with the pin **32**.

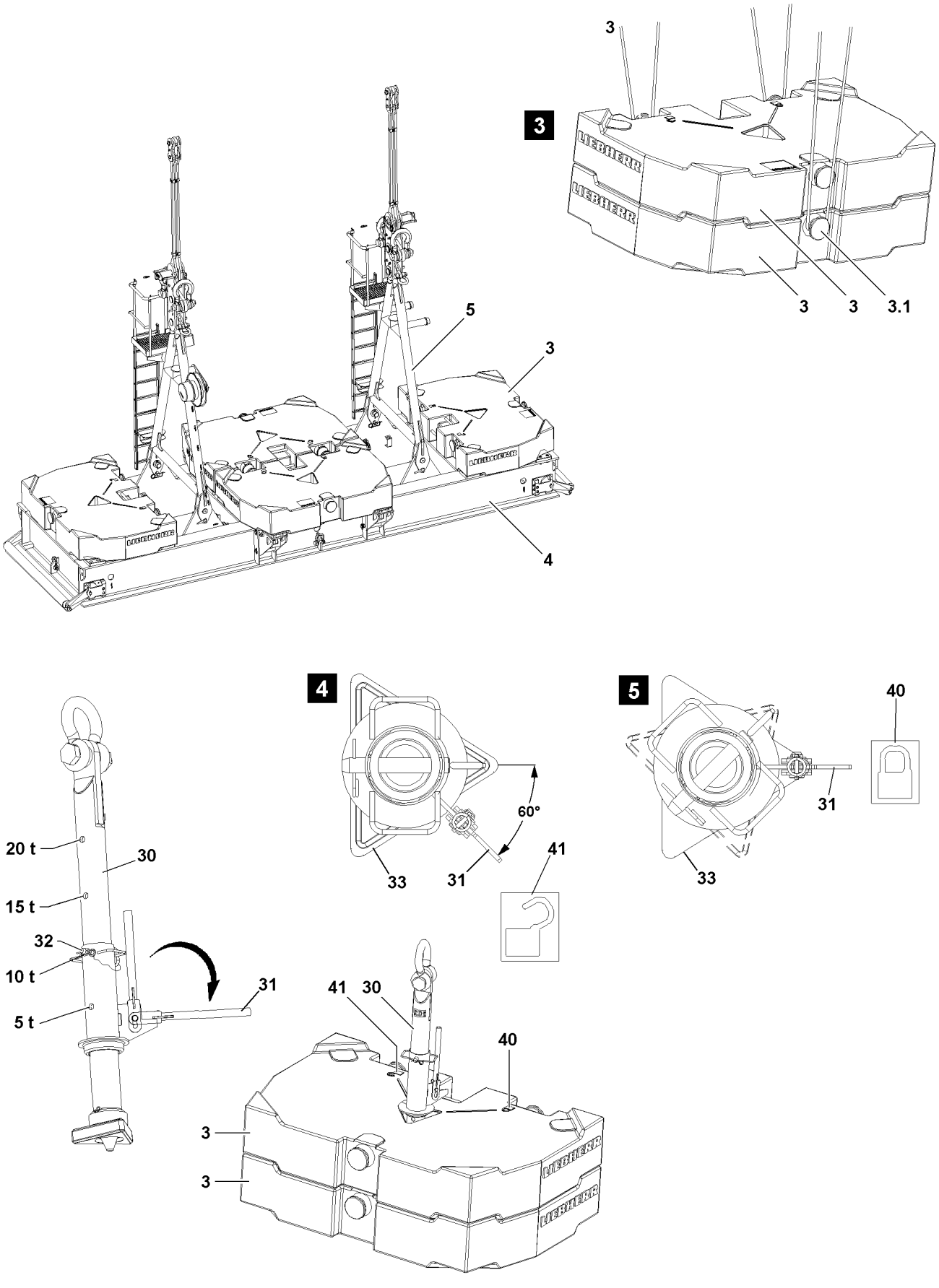
- ▶ If the length of the receptacle stud **30** is to be adjusted:
  Release and unpin the pin **32**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **30**.
- ▶ Pin in the pin **32** and secure with spring retainer.
- ▶ Attach the receptacle stud **30** on the auxiliary crane and guide it into the ballast plate(s).
- ▶ Pull up the lever **31** and fold it down.
- ▶ Turn the lever **31** by 60° until the lever **31** points to the icon **40**. See illustration **5**.

Result:
– The receptacle stud **30** is locked with the ballast plate.

- ▶ Lift the ballast plate with the receptacle stud **30** and remove it from the ballast stack or the ballast pallet.
- ▶ Turn the lever **31** by 60° until the lever **31** points to the icon **41**. See illustration **4**.

Result:
– The receptacle stud **30** is unlocked from the ballast plate.

- ▶ Carefully pull the receptacle stud **30** from the ballast plate.
- ▶ Alternately remove the ballast plates from both sides.


3
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33
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32
10 t
5 t
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41
30
40
3
3

B108734

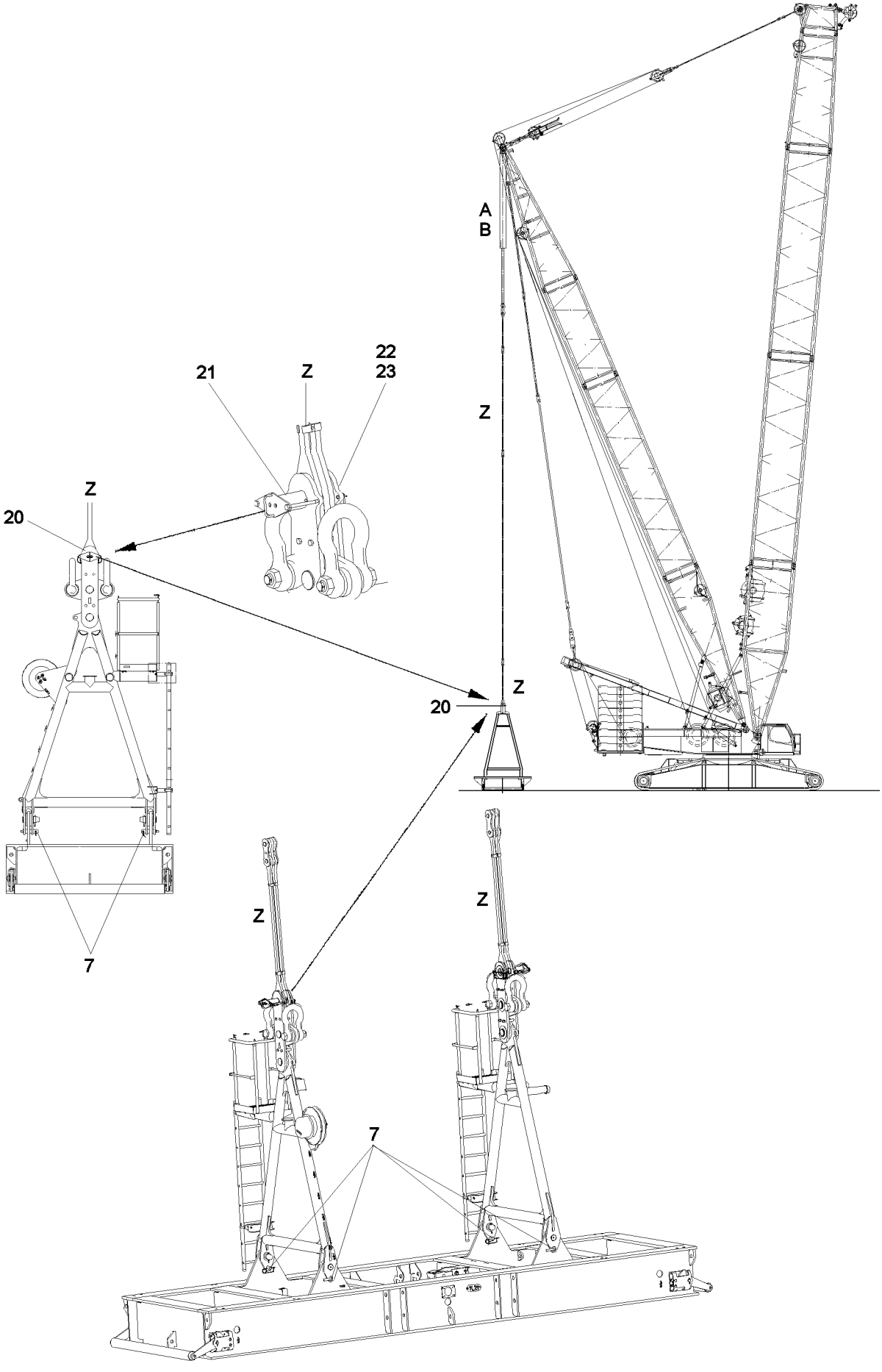
6.2.2 Removing the ballast plates, attachment points: Bitt

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **3.1** are overloaded and the ballast plates can fall down!
Personnel can be severely injured or killed!
- ▶ Lift no more than maximum 20 t with the ropes, 3 attachment points!
- ▶ Replace damaged ballast plates immediately!

WARNING
Incorrect handling of the attachment equipment!
If the attachment equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the attachment equipment is correctly attached on the bitts **3.1** and that it is secured sufficiently to prevent it from loosening up!

Note
- ▶ Remove the ballast plates individually or as a ballast assembly, maximum 20 t!
- ▶ The weight difference between the outer ballast stacks no more than maximum 20 t !
- ▶ 20 t ballast assembly, see illustration **3**!

- ▶ Lift the ballast plate **2** or ballast assembly, see illustration **6** and remove it from the ballast stack or the ballast pallet.



B106765

6.3 Disassembly of D-guy rods on ballast pallet

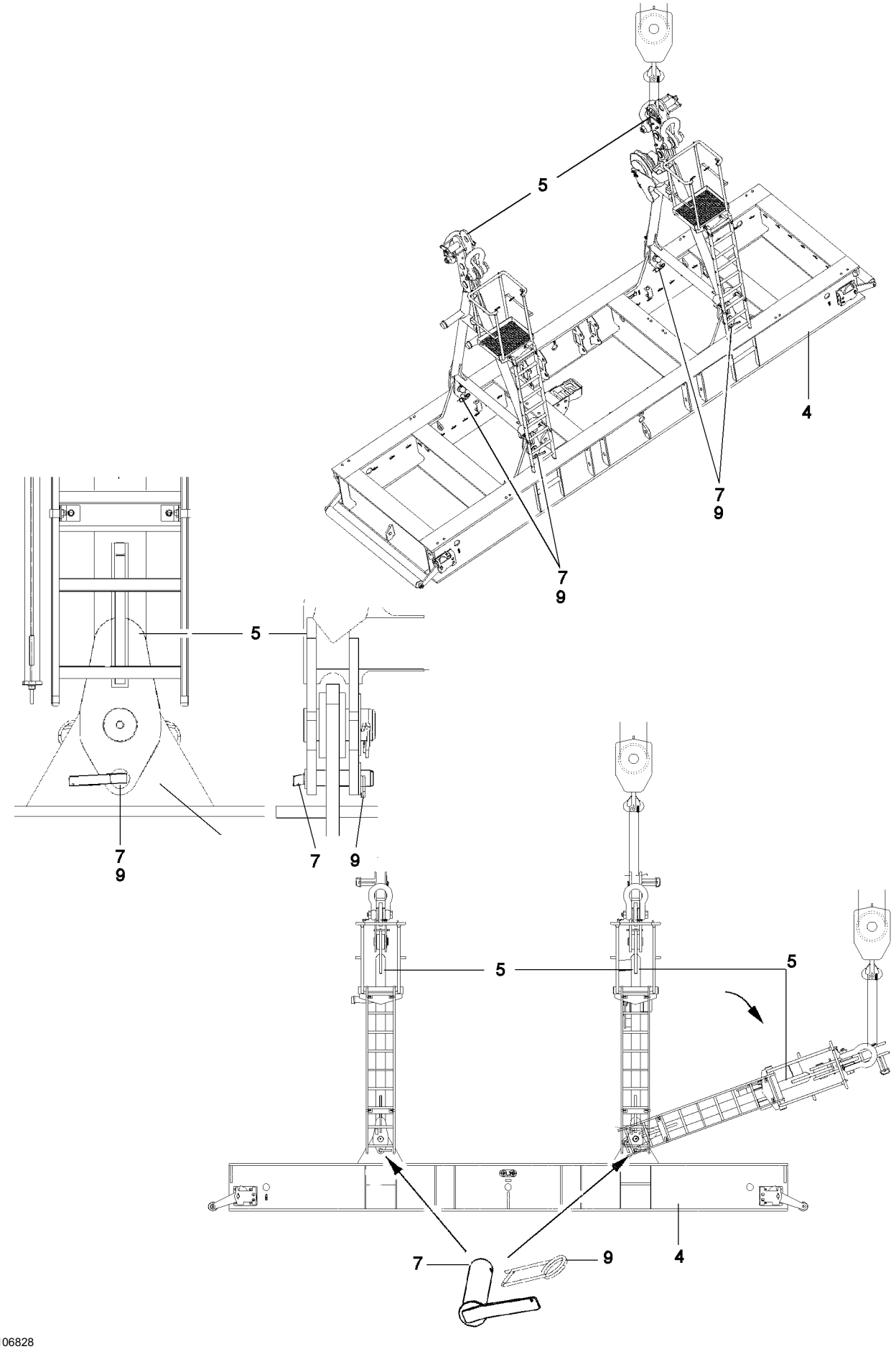
DANGER
Accident risk when unpinning the derrick ballast guying!
Before unpinning the derrick ballast guy rods on the erection rods must be held with an auxiliary crane and must be secured with four retaining pins, otherwise the erection racks tip!
Personnel can be severely injured or killed!

- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks!
- ▶ Do not stand under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

Make sure that the following prerequisites are met:

– the erection racks are secured using four retaining pins **7** to prevent them from tipping,
– an auxiliary crane is secured on erection rack.

- ▶ Tension auxiliary crane retaining rope on the erection rack.
- ▶ Unpin derrick ballast guy rods **Z** on the bracket **20**.
- ▶ Remove the spring retainer **23** and spacer **22** and unpin pins **21**.
- ▶ Repeat the process on second erection rack.



B106828

6.4 Placing down the erection racks

Ensure that the following prerequisite is met:

– the erection rack **5** hangs from the auxiliary crane which holds it in position.

DANGER

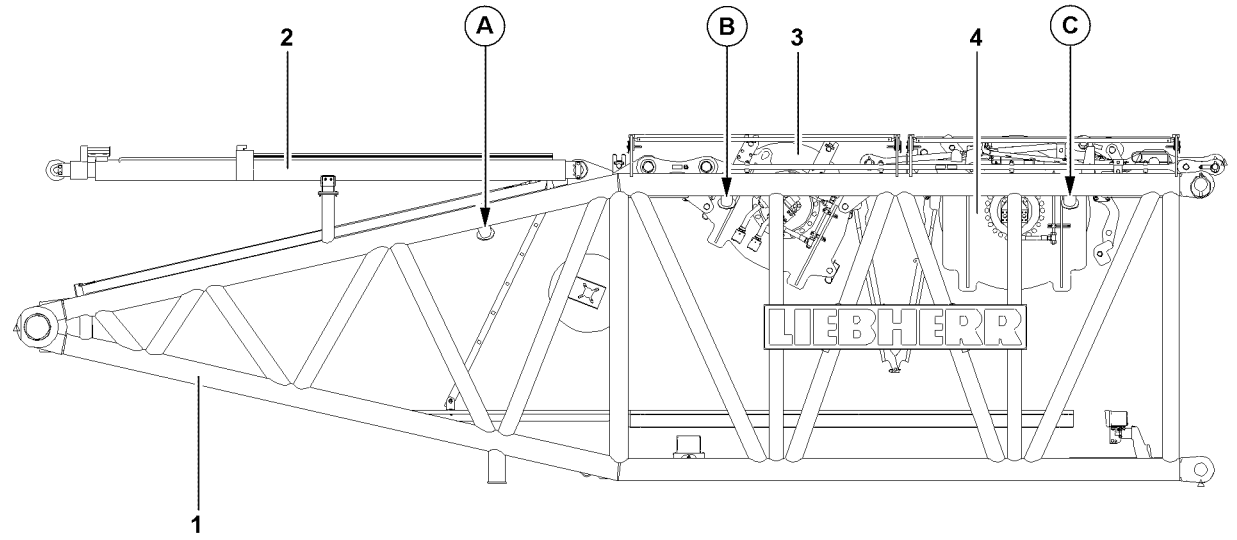
Accident risk when disassembling the erection racks!

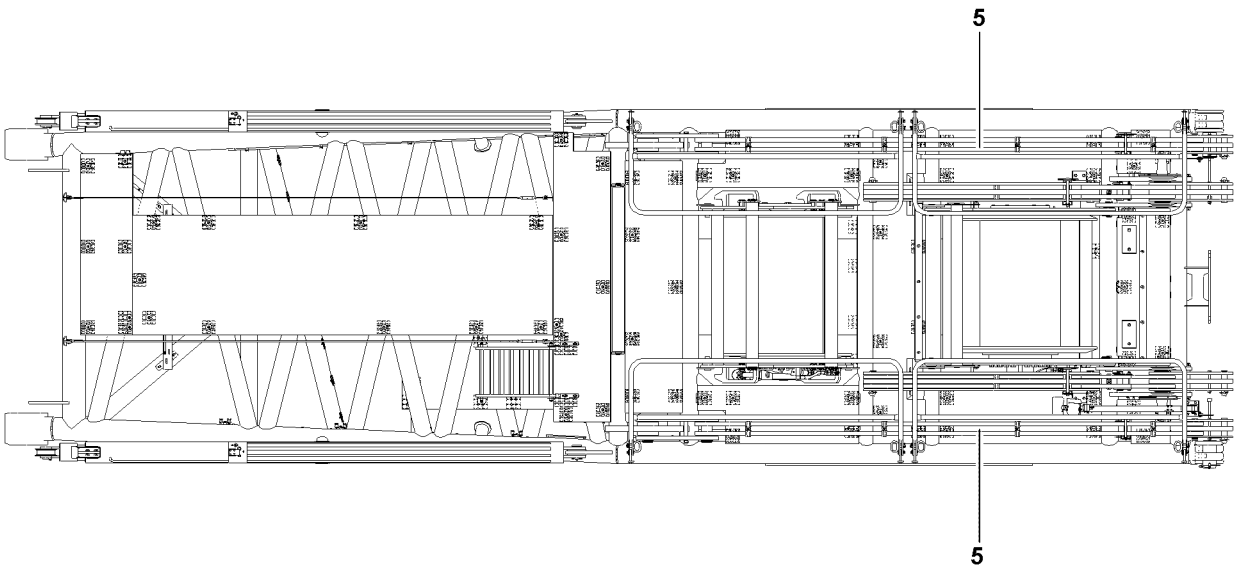
Before unpinning the retaining pins **7**, the erection racks must hang securely on the auxiliary crane, otherwise the erection racks can tip over!

Personnel can be severely injured or killed!

- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks!
- ▶ Do not stand under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

- ▶ Remove the spring retainer **9**.
- ▶ Unpin the retaining pin **7** and insert into the transport receptacle.
- ▶ Put down erection rack **5** with the auxiliary crane.





B105477

1 Component overview S-pivot section

Position	Component	Weight
1	S-pivot section	12.0 t
2	S-relapse retainer	1.1 t
3	Winch VI including rope	4.6 t
4	Winch V including rope	8.0 t
5	Rods WA-frame	0.5 t
	S-pivot section complete	26.2 t

2 Attachment points

Attachment points	
A + B	For S-pivot section **without** winches
A + C	For S-pivot section **with** winches and rope

B195219

3 Assembling the S/SL boom

Note

▶ The assembly is described using the S-boom example!

WARNING

Risk of falling!

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

- ▶ Any work where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see “Chapter 2.04”!
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly, inspection and maintenance work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free of snow and ice!
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

WARNING

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then the lattice jib can fall down and fatally injure personnel!

- ▶ Unpin or pin both pins at the same horizontal level, i.e. **left and right**!
- ▶ Do not stand under the booms or within the entire danger zone during the boom pinning and unpinning procedure!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being disassembled!

WARNING

Danger of crushing!

While assembling crane components, body limbs can be crushed or severed by the swing movement of the swing beam!

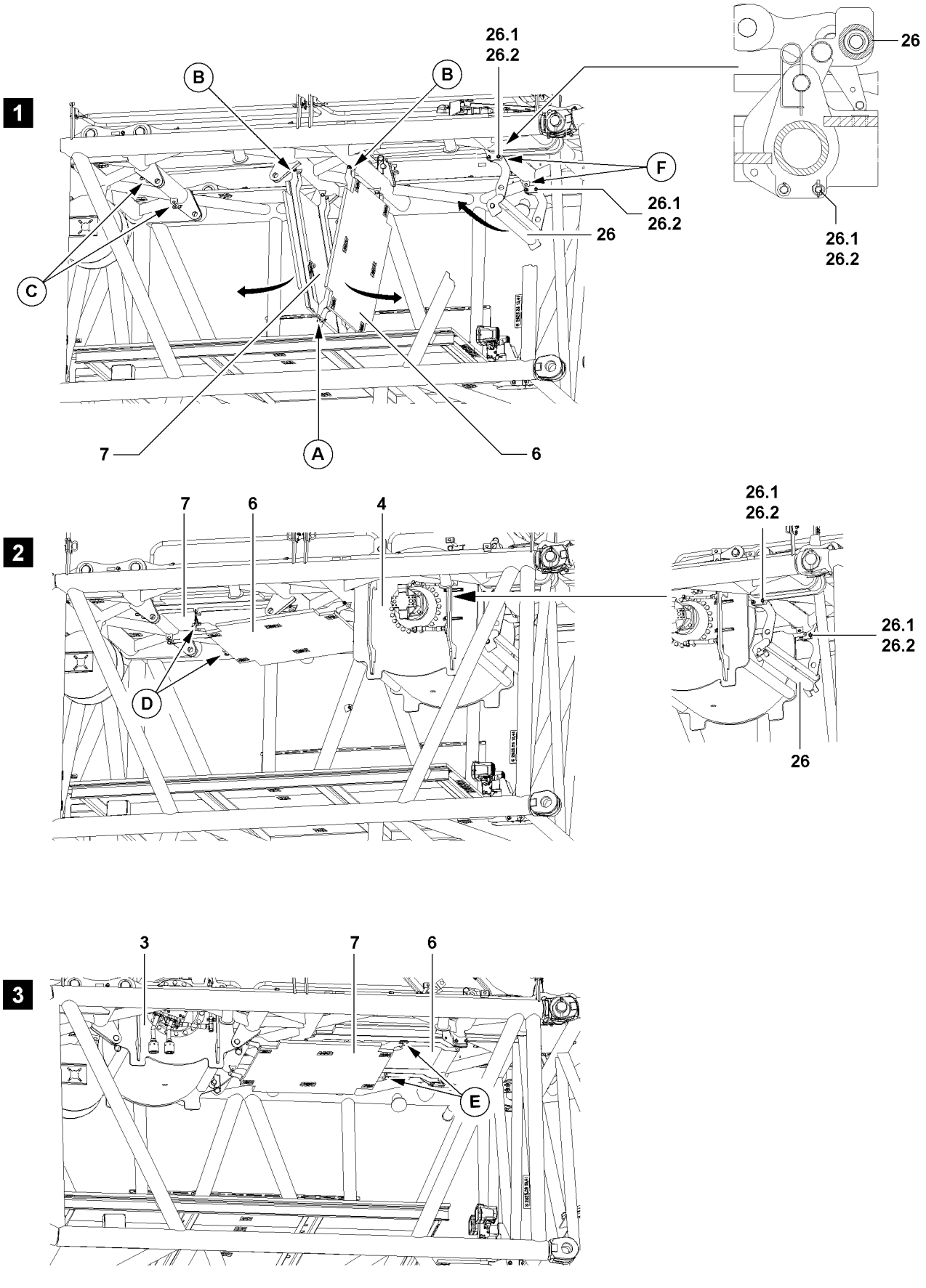
- ▶ Make sure that the components do not swing back and forth during assembly!

DANGER

Falling down of components!

If each component hangs from the auxiliary crane before each component is pinned on, each component can fall down and kill personnel!

- ▶ Do not disengage the auxiliary crane until each component is pinned on and secured!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E

B106747

3.1 Swing guard rails on the S-pivot section into operating position

WARNING
Risk of falling!
During guard rail assembly and disassembly, assembly personnel must be secured with appropriate antifall guards to prevent them from falling!
A danger of falling also exists during assembly of protective equipment!
Assembly personnel can fall down and thereby be severely injured or killed!
- ▶ During assembly and disassembly, maintenance and testing work on the S-pivot section, all guard rails must be installed and secured.
- ▶ Step on S-pivot section **1** only with “clean shoes”.

- ▶ Swing guard rails on the S-pivot section **1** into operating position, with handle bolts and with spring retainers.

3.2 Assemble the catwalks

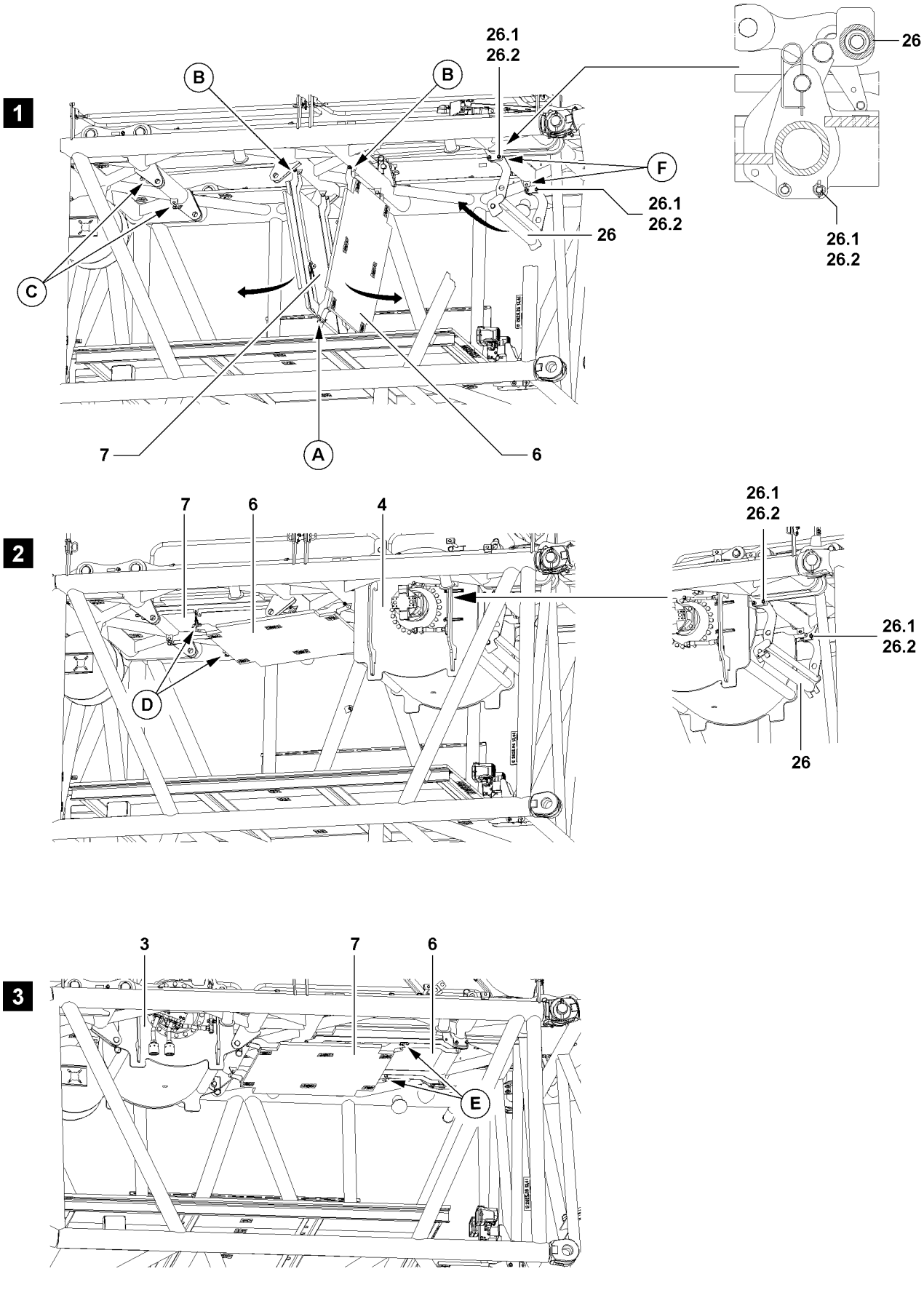
WARNING
Disassembled or incompletely assembled catwalks!
If the catwalks are not assembled, if the winches are missing or if the catwalks are not completely assembled, then personnel can fall and be severely injured or killed!
- ▶ For each non-assembled winch on the S-pivot section: assemble the catwalks.
- ▶ The catwalks may only be accessed when they are completely folded open, pinned and secured, visually inspected!

WARNING
Catwalks swinging downward!
Catwalks swinging downward can result in severe facial or head injuries to assembly personnel!
Personnel can be severely injured or killed!
- ▶ For safety reasons, installation of catwalks is always to be carried out by two persons!

Note
- ▶ If winch V is not assembled, the protective roller **26** must be pinned into position during crane operation “above”!
- ▶ If winch V is to be assembled, the protective roller **26** must be folded down and pinned - into position before assembly of winch V “below”!

Catwalks are assigned to the openings for the winches:
– Winch V - catwalk **6**
– Winch VI - catwalk **7**

Ensure that the following precondition is met:
– the guard rails are pinned in operating position and secured.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6
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26.1
26.2
26.1
26.2
26
3
3
7
6
E

B106747

3.2.1 S-pivot section without winches

Make sure that the following prerequisites are met:
- catwalks are pinned into transport position in the point **A**,
- protective roller **26** is pinned and secured in position “above”.

▶ Release and unpin the catwalks in point **A**.

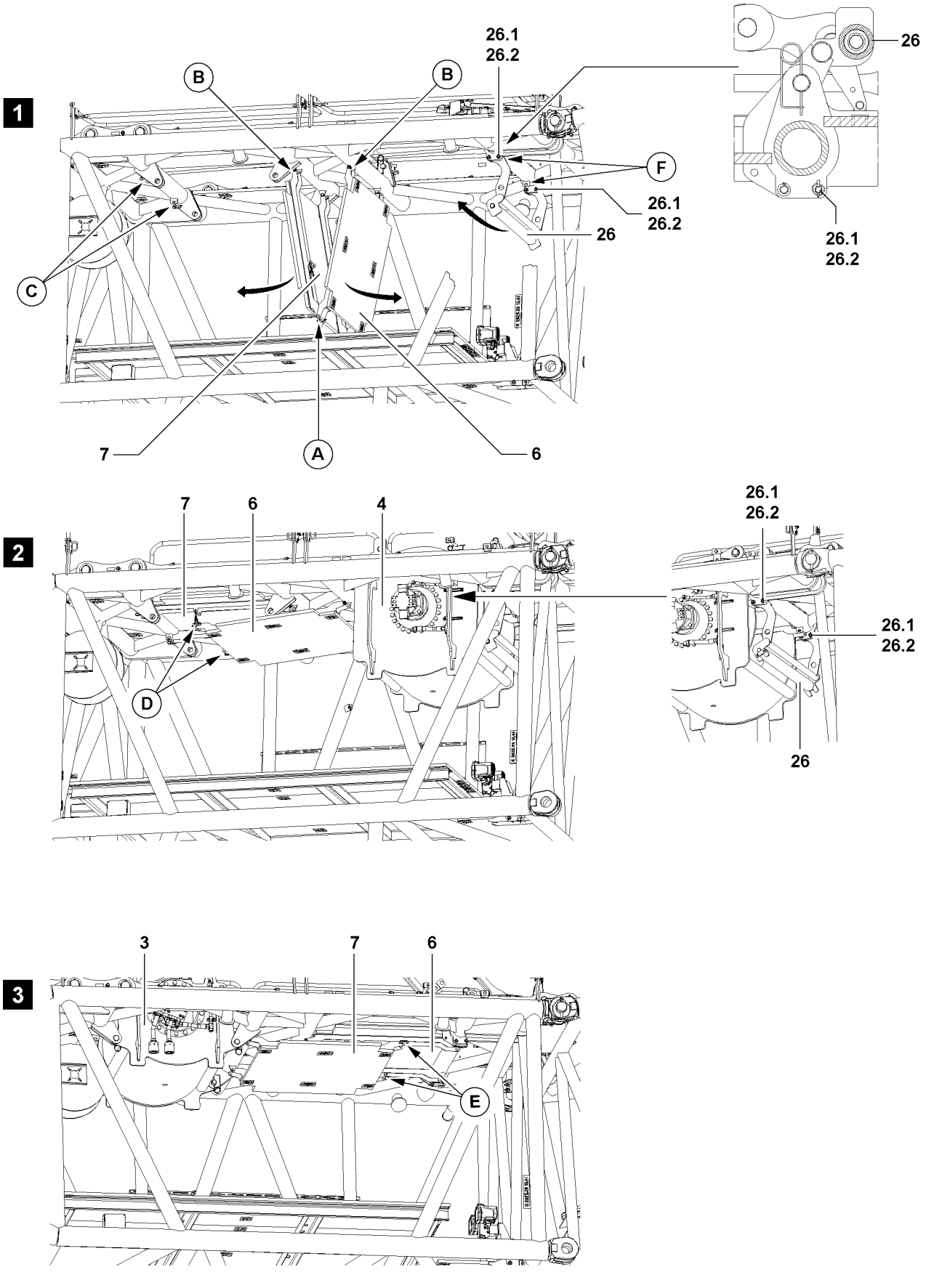
Swing and pin catwalks individually in operation position “upward”.
▶ Swing catwalk **7** into operating position and pin and secure on the points **C** see figure **1**.
▶ Swing catwalk **6** into operating position and pin and secure on the points **F** see figure **1**.

3.2.2 S-pivot section before installation of winch V

Make sure that the following prerequisites are met:
- winch V is not assembled,
- winch VI is not assembled,
- protective roller **26** is pinned and secured in position “above”,
- catwalk **6** and catwalk **7** are pinned and secured in operating position.

▶ Hang the catwalk **6** onto the auxiliary crane.
▶ If the catwalk **6** is held securely by the auxiliary crane:
unpin the catwalk **6** on the points **F**.
▶ Drop catwalk **6** downward and remove auxiliary crane.
▶ Lower catwalk **6** to the opposite lying side upward and pin and secure pin points **D** of the catwalk **7** see figure **2**.
▶ Release and unpin protective roller **26** in position “above”.
▶ Lower protective roller **26** into position “downward”, with retaining pins **26.1** secure and pin with linchpin **26.2**.

Result:
- Winch V can be assembled.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26.1
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7
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E

B106747

3.2.3 S-pivot section before assembly of winch VI

Make sure that the following prerequisites are met:
- winch V is not assembled,
- winch VI is not assembled,
- protective roller **26** is pinned and secured in position “above”,
- catwalk **6** and catwalk **7** are pinned and secured in operating position.

▶ Hang the catwalk **7** onto the auxiliary crane.
▶ If the catwalk **7** is held securely by the auxiliary crane:
unpin the catwalk **7** on the points **C**.
▶ Drop catwalk **7** downward and remove auxiliary crane.
▶ Lower catwalk **7** to the opposite lying side upward and pin and secure pin points **E** of the catwalk **6** see figure **3**.

Result:
- Winch VI can be assembled.

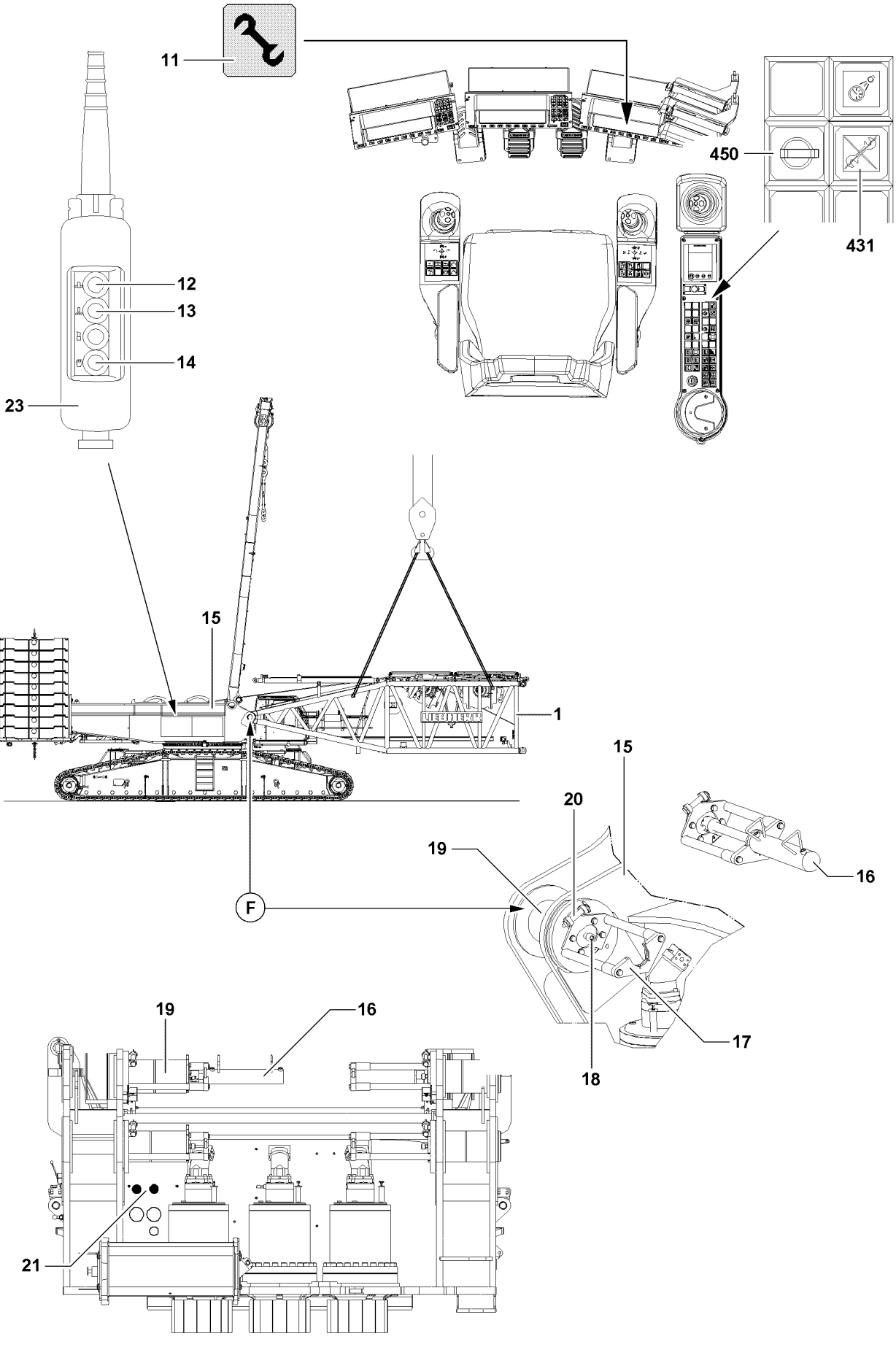
3.2.4 S-pivot section before installation of both winches

Make sure that the following prerequisites are met:
- protective roller **26** is pinned and secured in position “above”,
- catwalk **6** and catwalk **7** are pinned and secured in operating position.

Note
▶ Lower catwalks downward individually and in sequence with auxiliary crane!

▶ If the catwalk is held securely by the auxiliary crane:
release and unpin the catwalk into operating position, see fig. **1**.
▶ Lower catwalk and remove auxiliary crane.
▶ If catwalk **6** and catwalk **7** are lowered downward:
pin and secure catwalks in the point **A**, see figure **1**.
▶ Release and unpin protective roller **26** in position “above”.
▶ Lower protective roller **26** into position “downward”, with retaining pins **26.1** secure and pin with linchpin **26.2**.

Result:
- Winch V and winch VI can be assembled.



B106759

3.3 Assembling the boom

Note

▶ The boom combinations must be assembled according to the separately supplied rod and assembly plans!

Make sure that the following prerequisites are met:
– the crane is aligned in horizontal direction,
– an auxiliary crane is available,
– an assembly scaffolding / work platform is available,
– the counterweight has been attached to the turntable according to the load chart,
– the LICCON overload protection has been set according to the data in the load chart.

3.3.1 Turning the turntable into assembly position

WARNING

Crane can topple over!

If the following conditions are not met before turning the turntable - **without** assembled S-boom, the crane can topple over. Personnel can be severely injured or killed!

▶ Observe the data in the erection and take down charts!
▶ Observe the maximum permissible ballast combinations in Chapter 3.06!

Note

▶ If the turntable is turned to the side for the installation of the boom, then boom and lattice sections must be supported, depending on the ground condition.

▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side.

3.3.2 Adding the operating mode “Assembly”

DANGER

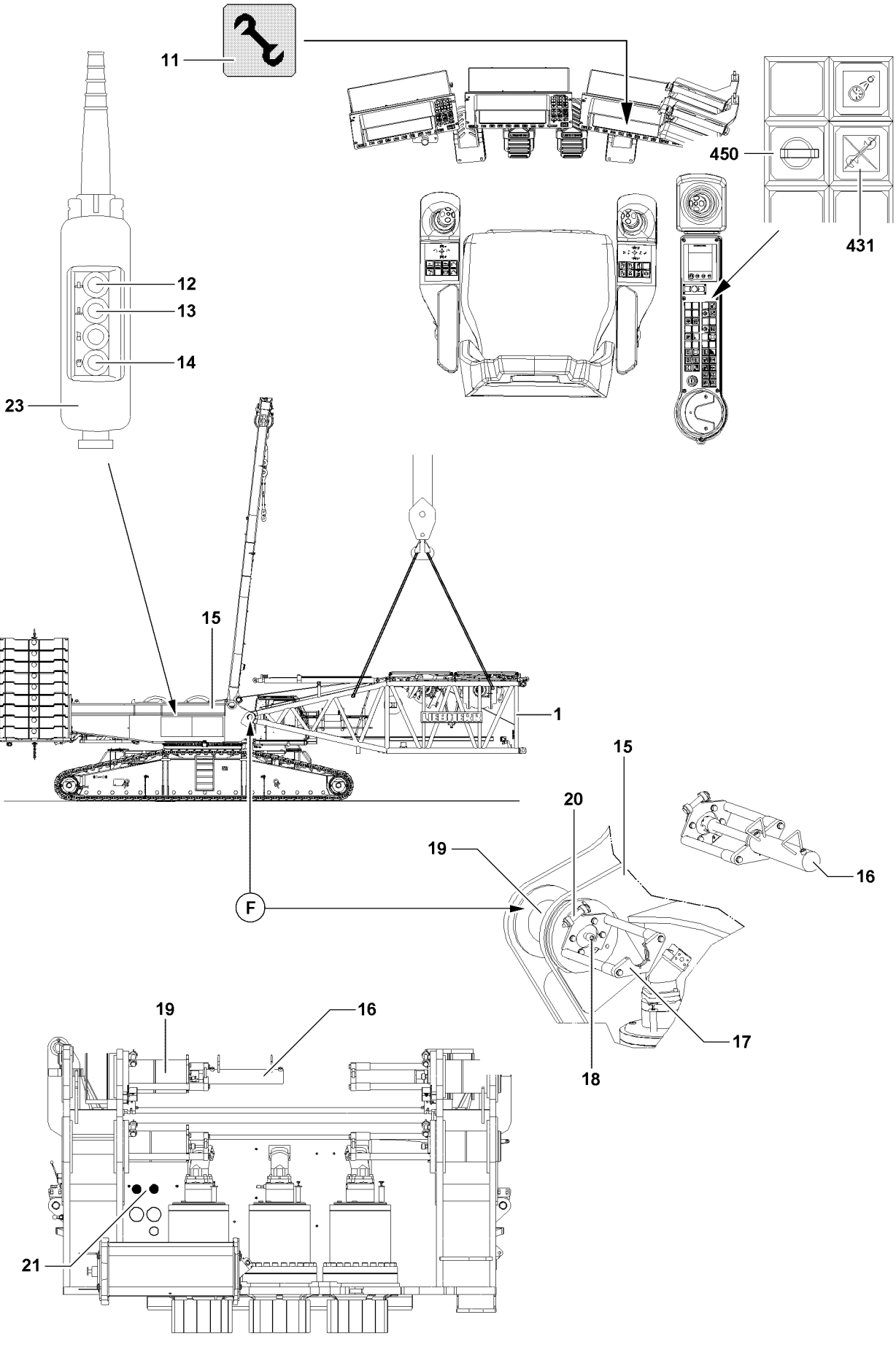
Risk of fatal injury in crane operation with enabled assembly key button.

▶ The actuation of the assembly key button **450** is only permitted for assembly tasks!
▶ The assembly key button may only be operated by persons who are aware of the consequences of a bypass!
▶ If the assembly key button **450** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
▶ Crane operation with the assembly key button **450** turned on is strictly prohibited!
▶ After assembly work is completed, the assembly keyed button **450** must be pulled immediately and turned over to an authorized person!

▶ Actuate the assembly key button **450**.

Result:

– The LICCON overload protection is bypassed.
– The indicator light in the button **431** lights up.
– The Assembly icon **11** on the LICCON monitor blinks.
– An acoustical signal sounds.
– The three-colored light illuminates in red.
– The warning lights on the turntable illuminates in red.



B106759

3.4 Pinning the S-pivot section on the turntable

WARNING
General danger notes!
- ▶ Support the S-boom during assembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly! Please refer to Chapter 8.15.

Ensure that the following precondition is met:
– the pins **20** on the connector points **F** are unpinned.

▶ Hang the S-pivot section **1** onto the auxiliary crane and swing in to the pin points **F** on the turntable.

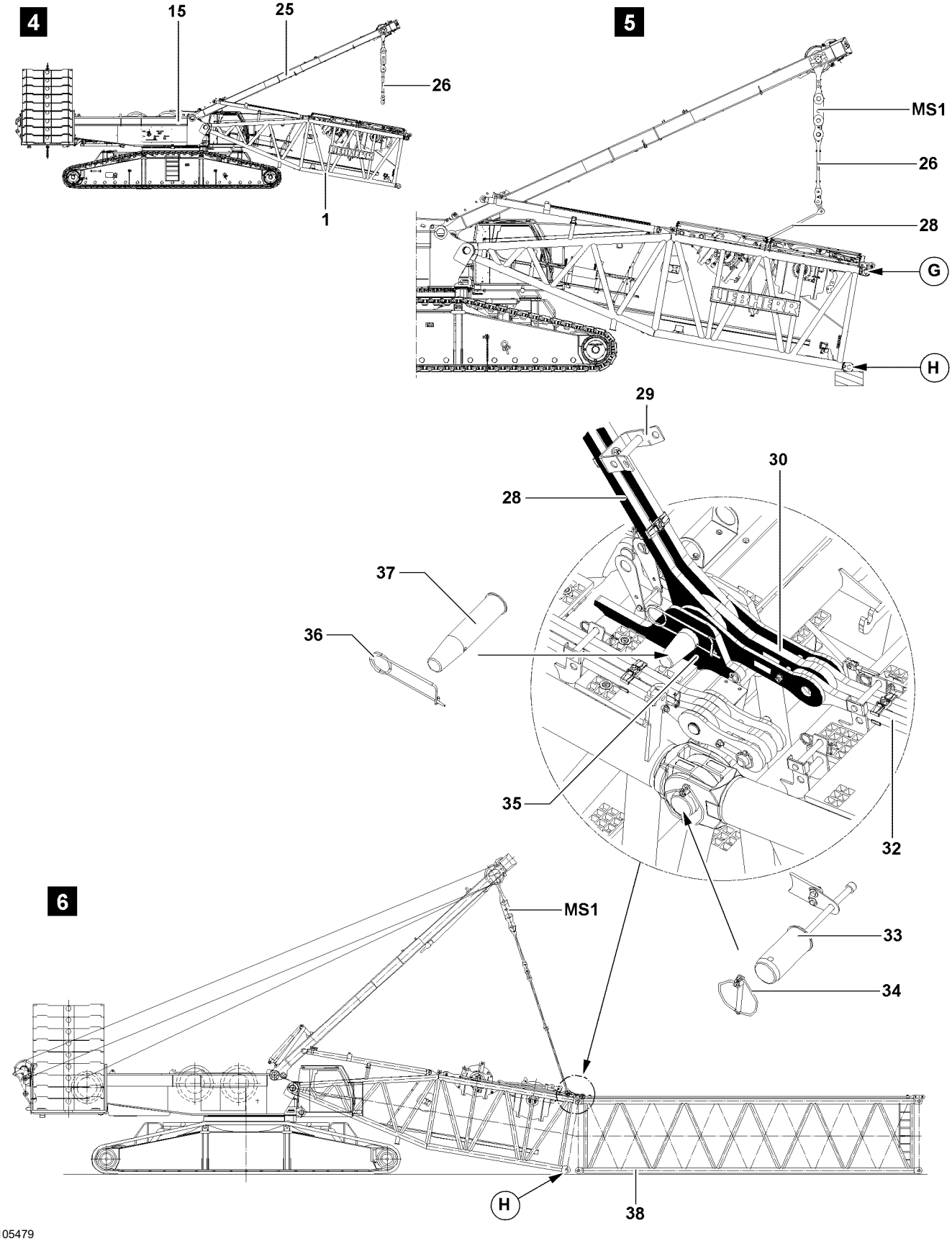
Establish the hydraulic connection to the pin pulling device via two quick couplers.
- ▶ Hang the pin pulling cylinder **16** into the receptacle **17** and the screw **18** on the pin **19**.
- ▶ Connect the pin pulling cylinder **16** on quick couplers **21**, hydraulic turntable.

WARNING
Falling S-pivot section!
Due to non-secured or insufficiently secured connector pins, the S-pivot section can fall down!
Personnel can be severely injured or killed!
- ▶ Secure the pins **19** between the S-pivot section **1** and the turntable **15** after the pin procedure with the pins **20**.

- ▶ Pin the pins **19** on both sides with the hydraulic pin pulling cylinder **16**: actuate key **14** on the control console **23** and “hold down”, finally actuate the key **12** until the pin **19** is fully pinned in.
- ▶ When the pins **19** are completely pinned on the left and right on the S-pivot section **1**: insert the pins **19** on the left and right and secure with the pins **20** and spring retainer.

NOTICE
Damage to the S-pivot section!
When the assembled S-pivot section is placed on the ground, the S-pivot section can be damaged.
- ▶ Slowly place the S-pivot section **1** with the auxiliary crane and at low speed onto the ground!
- ▶ Before placing it on the ground, support the S-pivot section **1**!

- ▶ Carefully place the S-pivot section **1** down.
- ▶ Remove the auxiliary crane.


4
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35
32
6
MS1
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34
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38
B105479

3.5 Assemble the S-intermediate sections

3.5.1 Install the S-intermediate section on the S-pivot section

Make sure that the following prerequisites are met:
– the S-pivot section **1** is pinned and secured on the turntable,
– the S-pivot section **1** is placed on the ground,
– the auxiliary crane is removed.

WARNING
General danger notes!
▶ All pins are to be secured after assembly with the intended safety elements!
▶ The guy rods must be checked regularly! Please refer to Chapter 8.15.

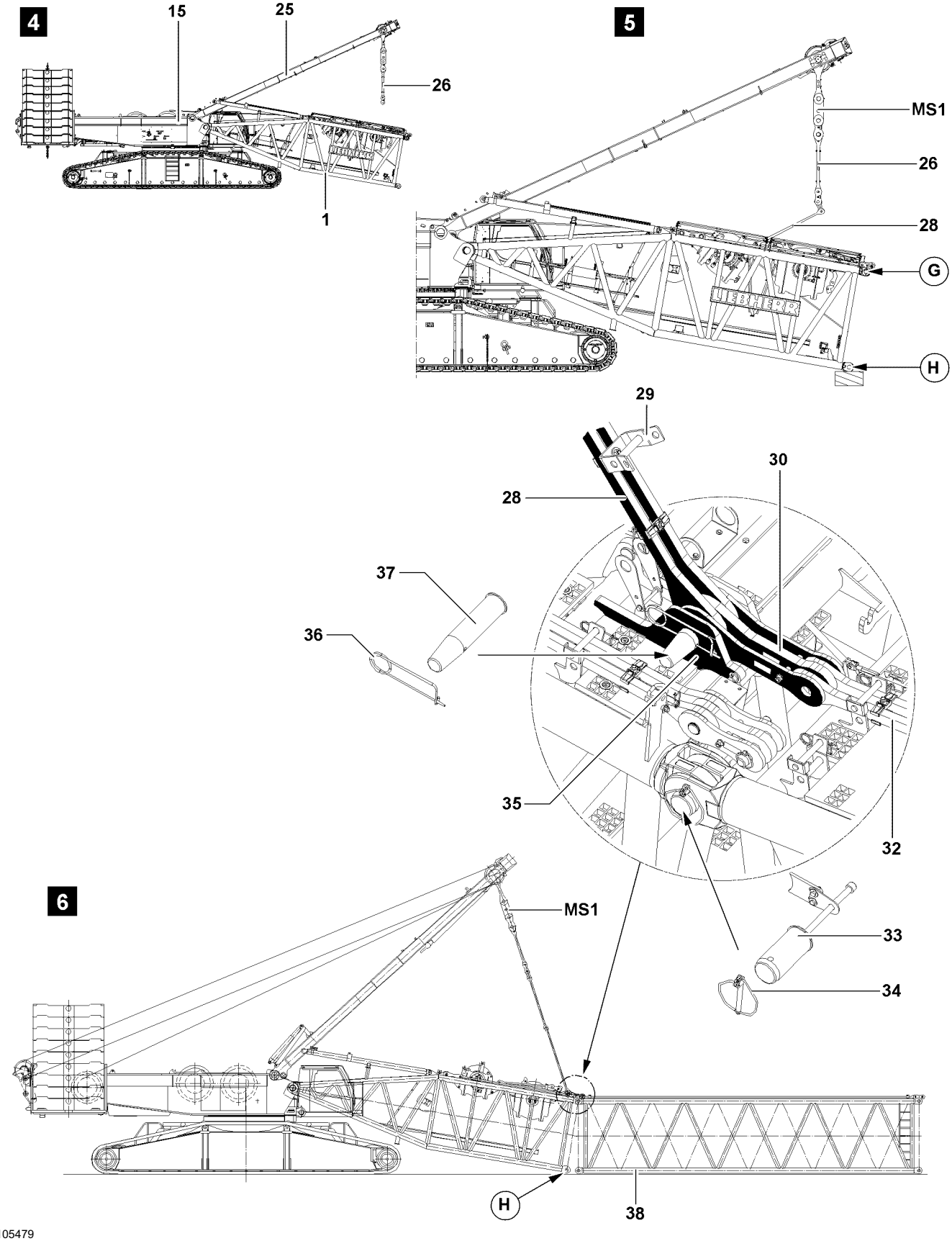
Note
▶ The S-intermediate sections **38** are pinned with the aid of the pin pulling device, see Chapter 5.30.
▶ For more convenient assembly / disassembly of the S-intermediate pieces, these should be supported!

Connect the guy rods SA-frame with the guy rod's S-pivot section

▶ Unpin the transport retainers **29** for the guy rods **28**.
▶ Lower the SA-frame **25** forward until the guy rods **26** hang freely over the guy rods **28** of the S-pivot section **1**, fig. **4**.
▶ Pin the guy rods **26** of the SA-frame with the guy rods **28** of the S-pivot section, see fig. **5**.
▶ Make sure that the guy rods **28** of the SA-frame are pinned on the assembly brackets **35** with pins **37** and secured with spring retainers **36**.
▶ Erect the SA-frame **25** until the guy rods are completely tensioned, fig. **6**.

Pinning the S-intermediate section on the S-pivot section above

▶ Attach the S-intermediate section **38** on the auxiliary crane and align on the S-pivot section **1**, fig. **6**.
▶ When the pin bores on the S-pivot section **1** and on the S-intermediate section **38** “on top” (point **G**) align:
insert in the pin **33** and secure with linchpin **34**.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G
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29
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B105479

Closing the boom

WARNING
Crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!

- During the “closing procedure” of the S-intermediate sections, the maximum total force on test point **MS1** of 70 t, may **not** be exceeded.
- The end section of the corresponding S/SL-boom combination during the “closing procedure” may **not** lift off the ground!
- With the SA-frame, S-boom combinations to maximum **S 96 m** may be lifted / closed.
- With the SA-frame, SL-boom combinations to maximum **SL 102 m** may be lifted / closed.
- With the SA-frame, SL-boom combinations to maximum **SL3108 m** may be lifted / closed.

Note

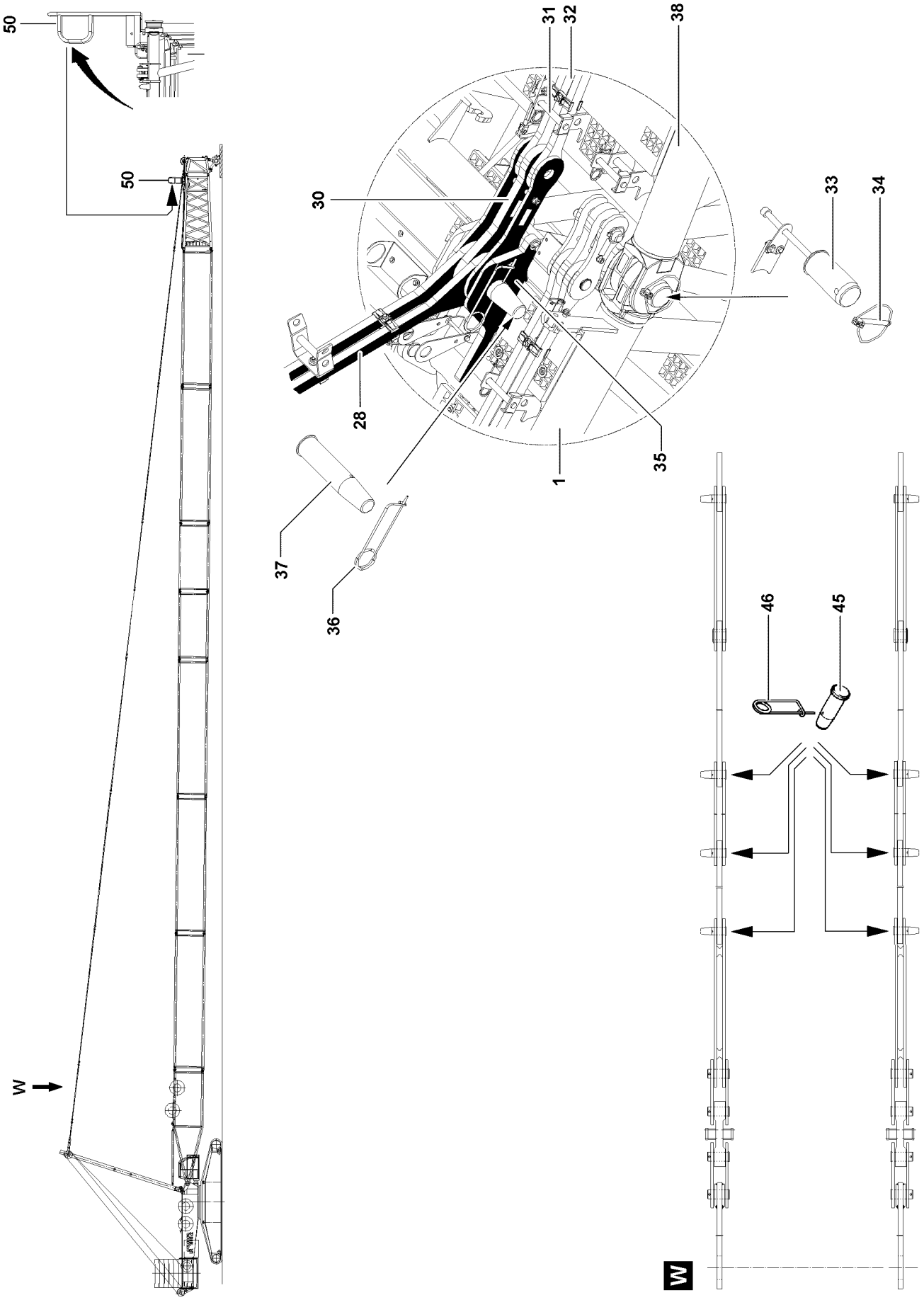
- The actual force on the test point **MS1** - which is exerted during the closing procedure of the boom system - is shown on the LICCON monitor 1.
- The actual force is noted and kept ready for the disassembly of the boom system.
- During the boom disassembly, the guying is tensioned with the noted actual force (assembly) so that the connector pins of the intermediate sections can be unpinned.

Note

- The guy rods of the intermediate sections are only assembled after the closing procedure.
- The brackets **30** and guy rods **32** are not pinned for the closing procedure.

Before closing the S-boom, assemble the S-boom to the required length.

- Pin the S-intermediate sections **38** “on top” and “bottom” with pins **33** and secure with linchpins **34**.
- When the S/SL-boom combination is assembled to the desired length:
  lift the S-pivot section **1** with the SA-frame **25** until the pin bores on the “bottom” align at point **H**, fig. **6**.
- Read the actual force of the test point **MS1** on the LICCON monitor and note.
- Insert the pin **33** at point **H** and secure with linchpin **34**.



B106841

3.5.2 Install the S-guy rods

WARNING
Not carrying out inspection and maintenance on guy rods!
If the regular inspection and maintenance of the guy rods is not carried out or is carried out only in irregular intervals, then severe accidents can occur due to existing and unrecognized damage to the guy rods!
Personnel can be severely injured or killed!
▶ Check the guy rods before every assembly, see Chapter 8.15.

Note
▶ The S-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

Ensure that the following precondition is met:
– the fold platforms **50** on the SL reducer section are folded and secured “upwards”.

WARNING
Falling components!
If the intermediate sections are incompletely pinned, then components can fall down. Personnel can be severely injured or killed!
▶ Make sure that all components of the boom are completely pinned and secured.

▶ Relieve the guy rods between the SA-frame and the S-pivot section: Lower the SA-frame somewhat to the front.

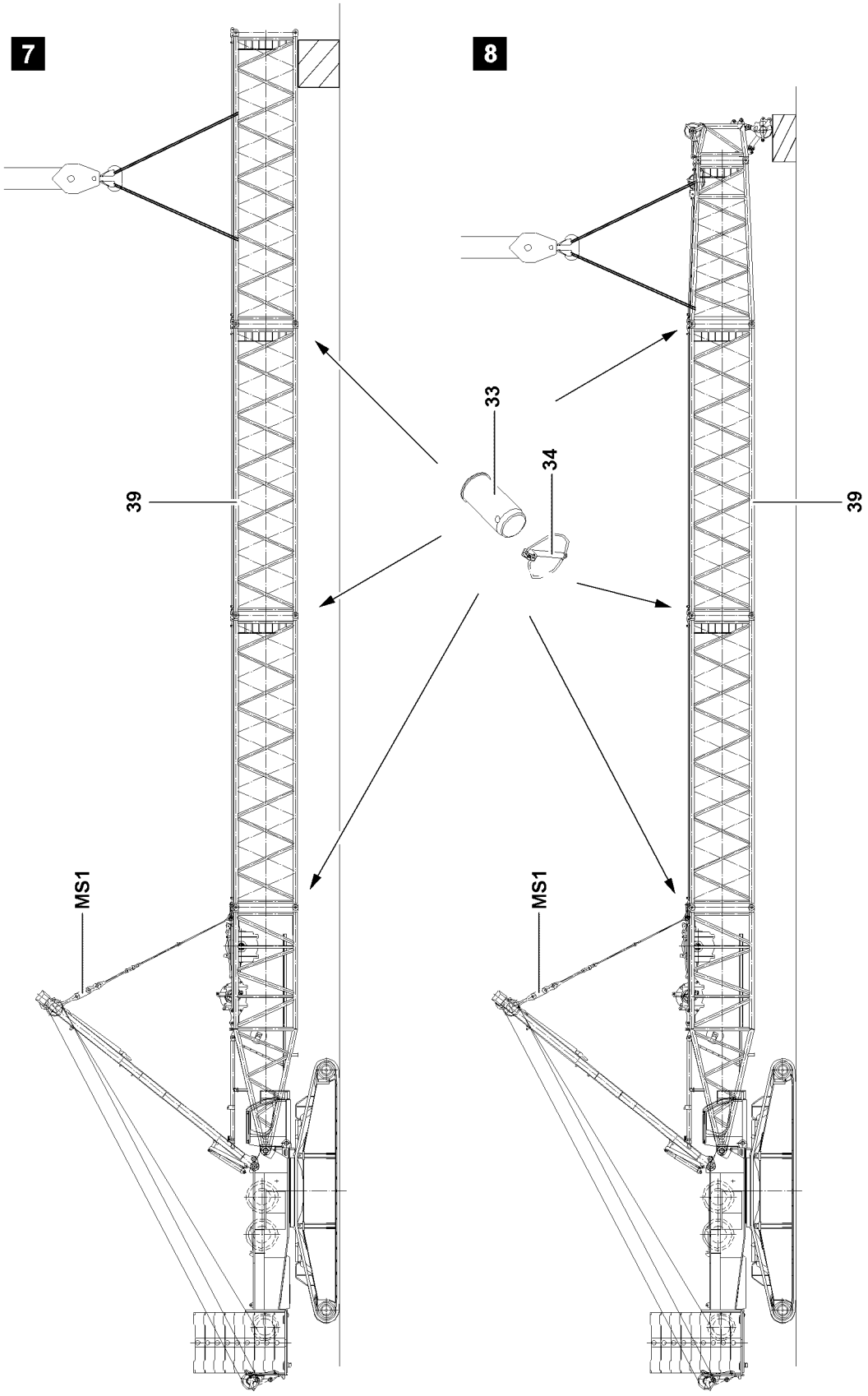
Result:
– The guy rods between the SA-frame and the S-pivot section are relieved.

The guy rods are placed and secured for transport on the S-intermediate sections. Before assembly of the guy rods, remove the transport retainers.
▶ Release and unpin the transport retainers **31**.

NOTICE
Property damage!
▶ Always insert the pins of the guy rods from the “inside” to the “outside”.

Note
▶ The guy rods of the S-intermediate sections are pinned to each other starting from the fixed point on the end section of the boom.

▶ Pin the guy rods of all intermediate sections: insert the pins **45** from the “inside” to the “outside”.
▶ Secure the pin **45** with spring retainer **46**.
▶ When all guy rods on the boom system are pinned:
release and unpin the pins **37** on the assembly brackets **35**.
▶ Erect the SA-frame until the guy rods between the SA-frame and the S-end section tension.



B105481

3.6 Flying installation of the S-intermediate sections

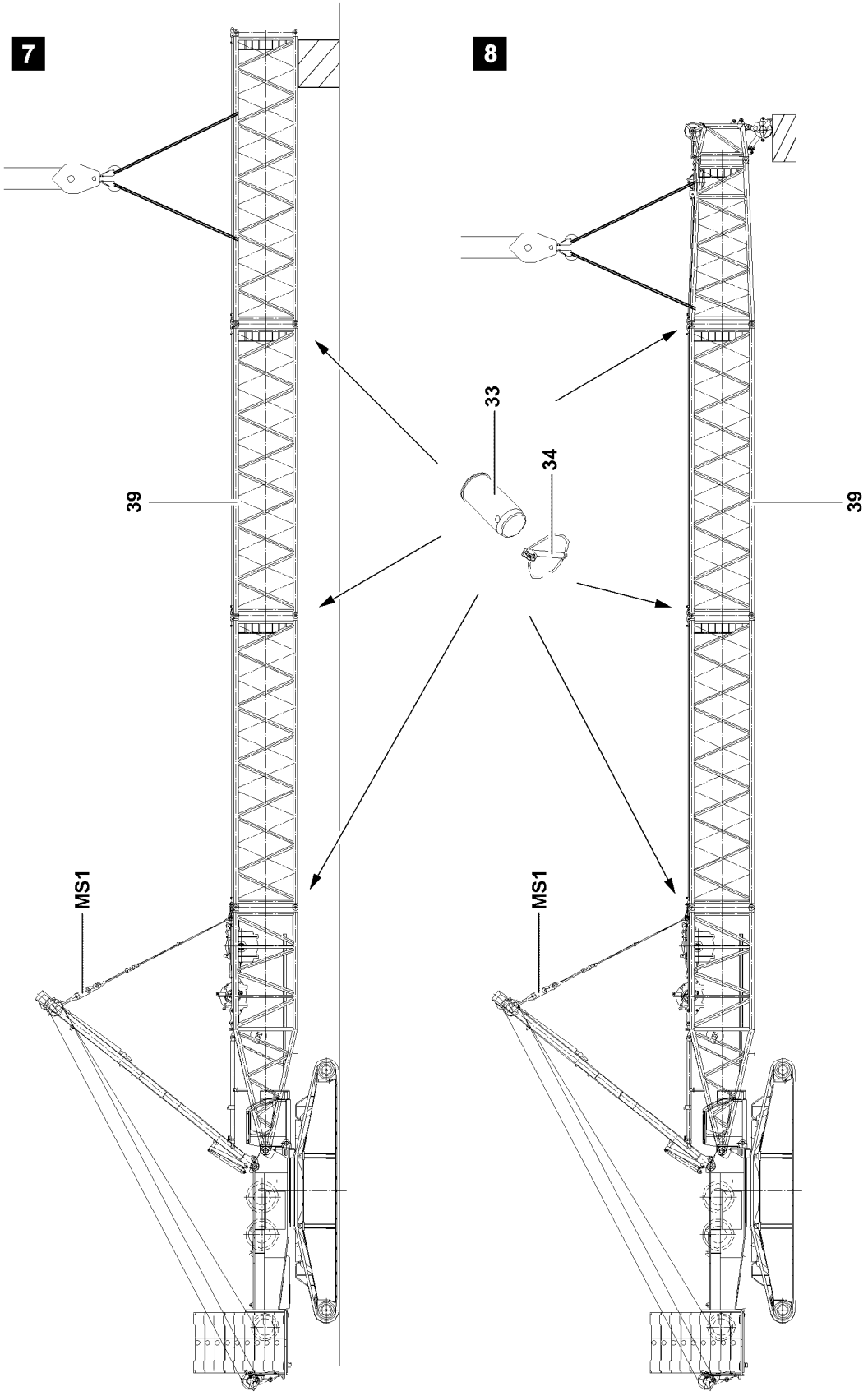
If spatial prerequisites on the job site are limited for the assembly of the S-boom, or if they are limited by buildings or similar, then the S-boom can be assembled in flying mode.

WARNING
General danger notes!
- ▶ Support the S-boom during assembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly! Please refer to Chapter 8.15.

WARNING
Crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged. Personnel can be severely injured or killed!
- ▶ For the “flying” boom assembly, the maximum permissible total force on the test point **MS1** may **not** be exceeded. The “actual force” is shown on LICCON monitor 1.
- ▶ The “flying” boom assembly is only permissible up to a certain system length, observe the following charts!
- ▶ The data in the erection and take down charts as well as the load charts must be observed!

Maximum permissible total force MS1 160 t				
Boom system	**Maximum system length**	**Equipment**	**DB_{min}** 1)	**ZB_{min}** 2)
S	48 m	- with SW-end section - with S- and WA-frame II guy rods	110 t	5 t
S	52 m	- without SW-end section - with S- and WA-frame II guy rods	110 t	5 t
SL	54 m	- with SW-end section - with S-guy rods	110 t	5 t

1) This counterweight must be at least assembled on the turntable for “flying assembly”.
2) This central ballast must be at least assembled on the crawler center section for “flying assembly”.



B105481

3.6.1 Assembling the intermediate section “flying” on the S-pivot section

For “flying” assembly of the intermediate sections, they can be assembled individually or as preassembled boom unit on the S-pivot section.

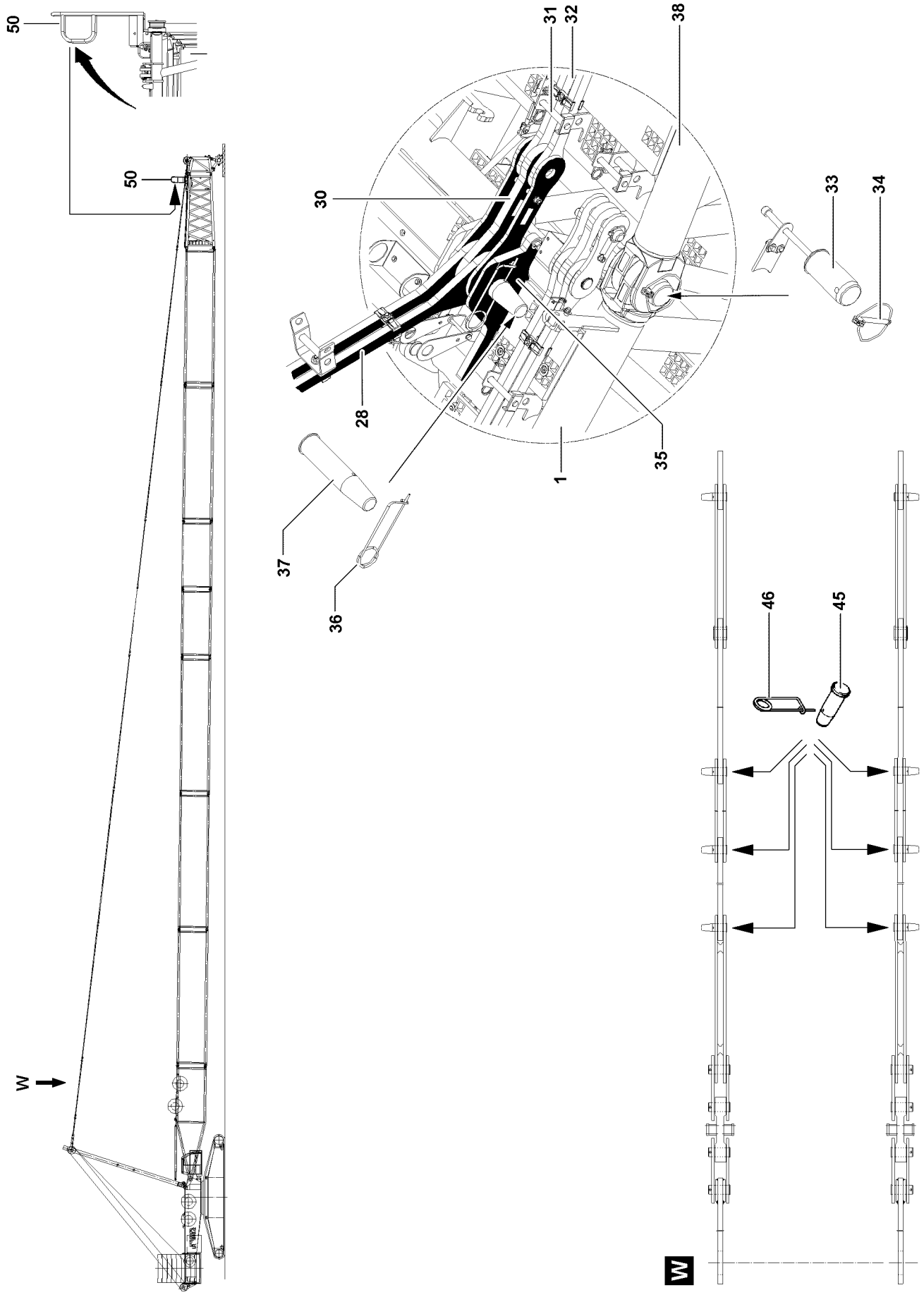
WARNING
Impermissible boom lengths!
If impermissible boom lengths are assembled on the crane, significant property damage can occur on the crane. Personnel can be severely injured or killed!
- ▶ The maximum permissible boom lengths for the “flying assembly” may not be exceeded!
- ▶ The data in the erection and take down charts as well as the load charts must be observed!

Note
- ▶ For weights of intermediate sections with placed guy rods, see Chapter 1.03!

Make sure that the following prerequisites are met:
- the S-pivot section is pinned and secured on the turntable,
- the S-pivot section is horizontally tensioned,
- a minimum of 110 t counterweight is placed on the turntable,
- a minimum of 5 t central ballast is assembled on the crawler center section,
- an auxiliary crane is available.

WARNING
Falling components!
If unsecured or non-supported components are assembled or removed, they can fall down. Personnel can be killed or seriously injured!
- ▶ During pinning and unpinning of the intermediate sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
- ▶ Before unpinning: support crane components and boom.
- ▶ Secure the pins in the bearing points and in the receptacles.
- ▶ It is prohibited to lean a ladder against the crane section which is being disassembled!

- ▶ Attach intermediate sections or preassembled boom unit **39** on the auxiliary crane.
- ▶ Lift the intermediate sections or preassembled boom unit **39** with the auxiliary crane and position on the S-pivot section **1**.
- ▶ When the pin points between the S-pivot section **1** and on the S-intermediate section or the preassembled boom unit **39** align “on top” and “bottom”:
  Pin the pins **33** “on top” and “bottom” and secure with linchpins **34**.
- ▶ When the pins are properly pinned and secured on “top” and “bottom” between the S-pivot section **1** and the S-intermediate section or the preassembled boom unit **39**:
  remove the auxiliary crane.



B106841

3.6.2 Install the S-guy rods

WARNING
Not carrying out inspection and maintenance on guy rods!
If the regular inspection and maintenance of the guy rods is not carried out or is carried out only in irregular intervals, then severe accidents can occur due to existing and unrecognized damage to the guy rods!
Personnel can be severely injured or killed!
▶ Inspect the guy rods before every assembly, see Chapter 8.15.

Note
▶ The S-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

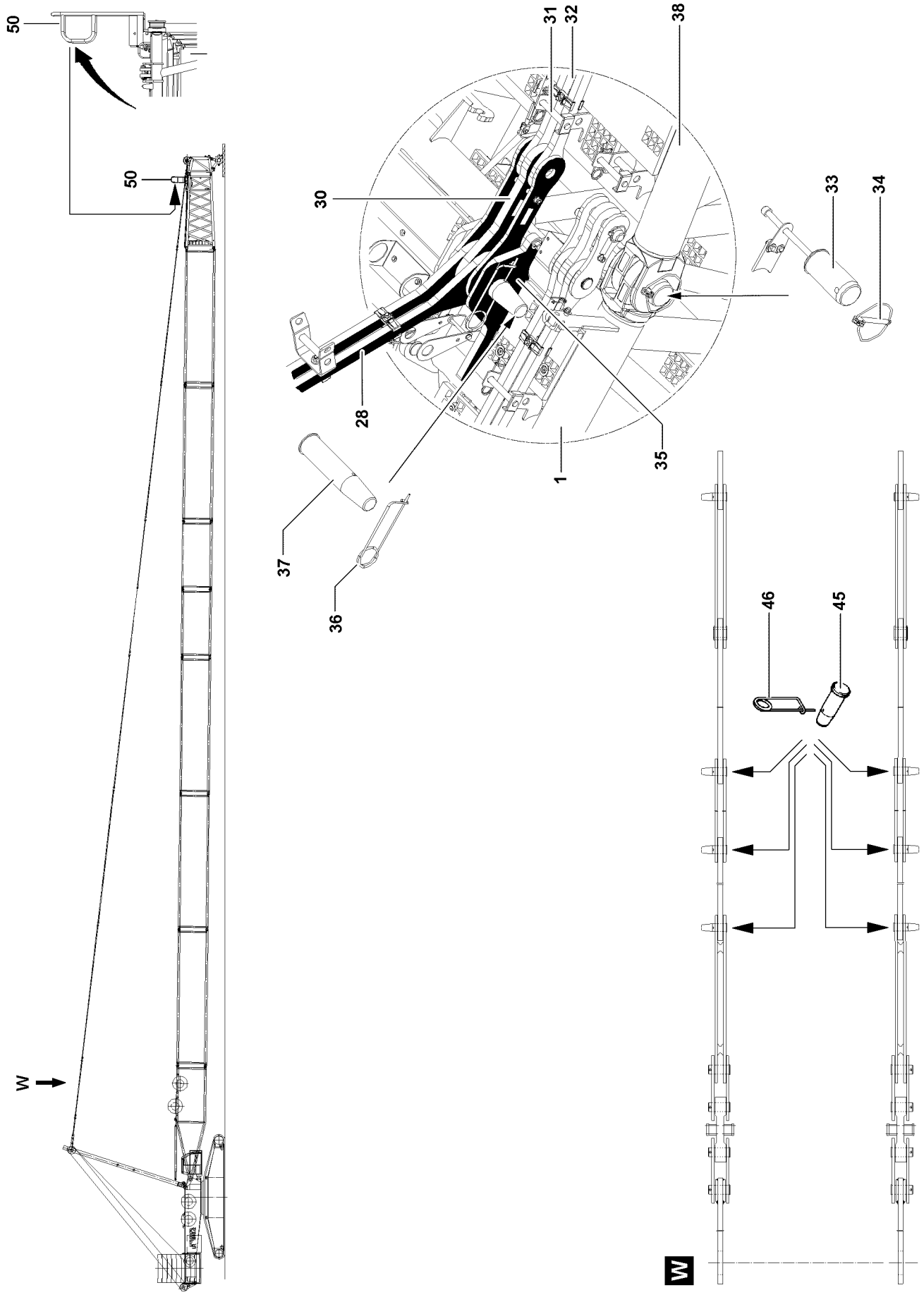
Ensure that the following precondition is met:
– the fold platforms **50** on the SL reducer section are folded and secured “upwards”.

WARNING
Falling components!
If the intermediate sections are incompletely pinned or secured, then components can fall down.
Personnel can be severely injured or killed!
▶ Make sure that the intermediate sections or preassembled boom unit are pinned and secured on the S-pivot section.
▶ Make sure that the intermediate sections or preassembled boom unit are supported with suitable materials or secured with an auxiliary crane, see fig. **7** and fig. **8**.

▶ Relieve the guy rods: Lower the SA-frame somewhat to the front.
Result:
– The guy rods between the SA-frame and the S-pivot section are relieved.

The guy rods are placed and secured for transport on the S-intermediate sections. Before assembly of the guy rods, remove the transport retainers.
▶ Release and unpin the transport retainers **31**.

NOTICE
Property damage!
▶ Always insert the pins of the guy rods from the “inside” to the “outside”.



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Note

- The guy rods of the S-intermediate sections are pinned to each other starting from the fixed point on the end section of the boom.

- Pin the guy rods of all intermediate sections: Insert the pins **45** from the “inside” to the “outside”.
- Secure the pin **45** with spring retainer **46**.

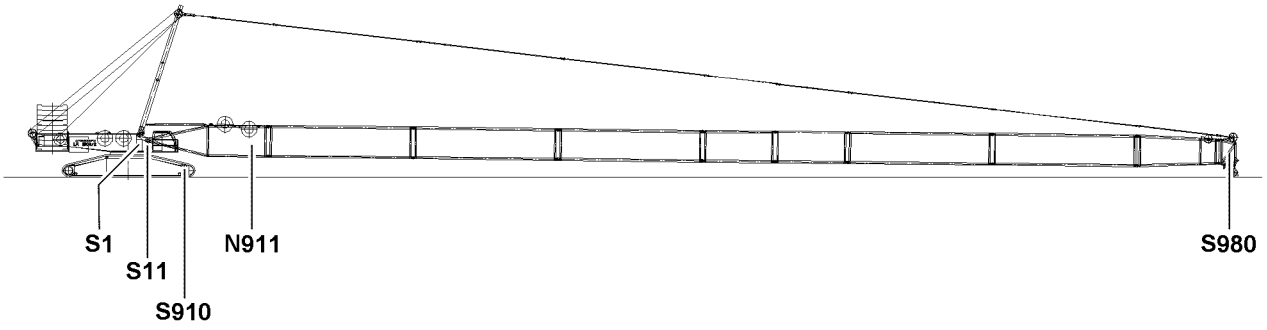
WARNING

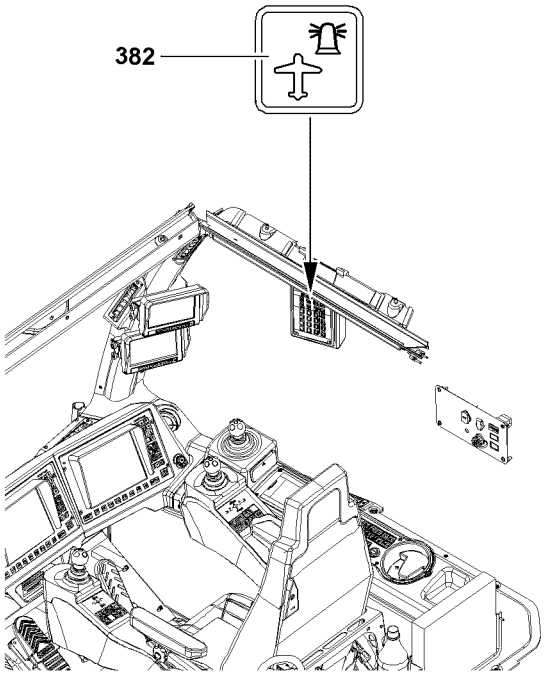
Folding down boom!

If the pins on the hollow axle are unpinned, then the boom can fold down. Personnel can be severely injured or killed!

- Unpin the pins **37** on the assembly brackets **35** only when it is ensured that the intermediate sections are supported with suitable materials or if they are held by an auxiliary crane.

- When all guy rods on the boom system are pinned:
  release and unpin the pins **37** on the assembly brackets **35**.
- Erect the SA-frame until the guy rods between the SA-frame and the S-end section tension.





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3.7 Establishing the electrical connections

NOTICE
Damage to the electrical connection on the cable drum!
If the electrical connection from the cable drum to the terminal box on the S-pivot section is established first before the connection to the terminal box on the S-end section, the electrical connection can be damaged when spooling out the cable drum.
▶ Make the electrical connection from the cable drum in the S-head piece to the terminal box on the S-head piece and then effect the electrical connection from the terminal box in the S-articulated piece to the cable drum!

Note
▶ For production of the electrical connections on the S-boom, the separate electrical diagram is to be employed.

Ensure that the following precondition is met:
– the S-boom is completely assembled,
– the flight warning lamp and the wind-speed gauge are assembled.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.

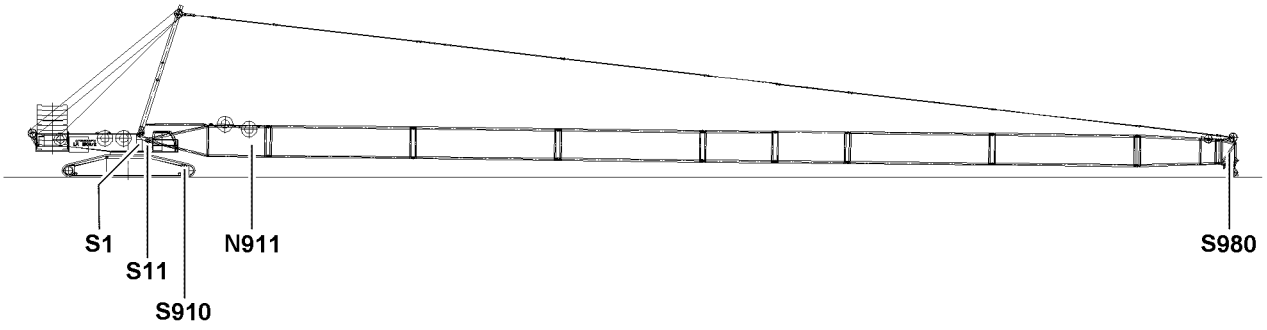
3.8 Checking the function of the safety devices

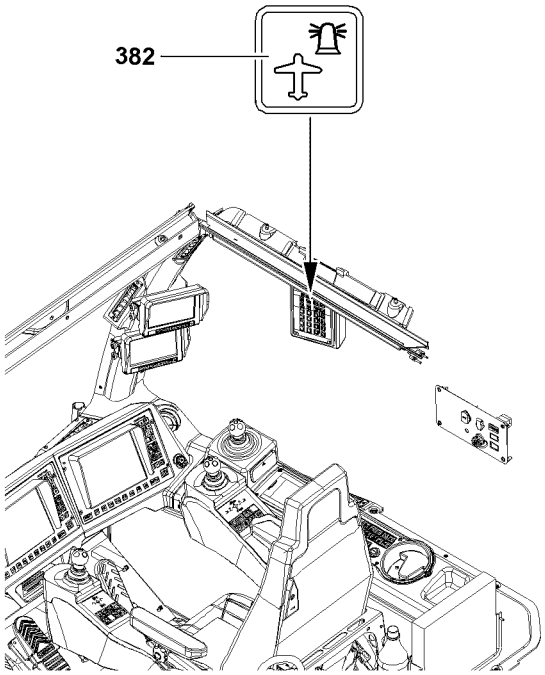
WARNING
Non-functioning safety devices!
If the function of the safety devices is defective, personnel can be severely injured or killed.
▶ Crane operation with non-functioning safety devices is **prohibited**!

Note
▶ The function of the individual limit switches must be checked before erection!
▶ The function of the limit switch initiators must be checked in the test system, see separate “Diagnostics” manual.

Note
▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact **LIEBHERR** Service.

Make sure that the following prerequisites are met:
– all electrical connections have been made,
– the crane engine is running,
– the corresponding operating mode is set on the LICCON monitor.





B106760

3.8.1 Checking the wind speed sensor

▶ Test the movement and the function of the wind speed sensor.

3.8.2 Check the airplane warning light

▶ Turn on the airplane warning light on with the button **382**.

▶ Visually check functionality.

3.8.3 Check the hoist limit switch on the pulley head

Note

▶ When replacing or changing a hoist limit switch (HES), the corresponding hoist limit switch must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB).

▶ Actuate the hoist limit switch manually on the pulley head.

Result:

– The spool up function of the hoist winch turns off.
– The icon “Hoist top” appears on the LICCON monitor 0.
– Limit switch is functioning.

3.8.4 Check the limit switch S-boom “steepest position”

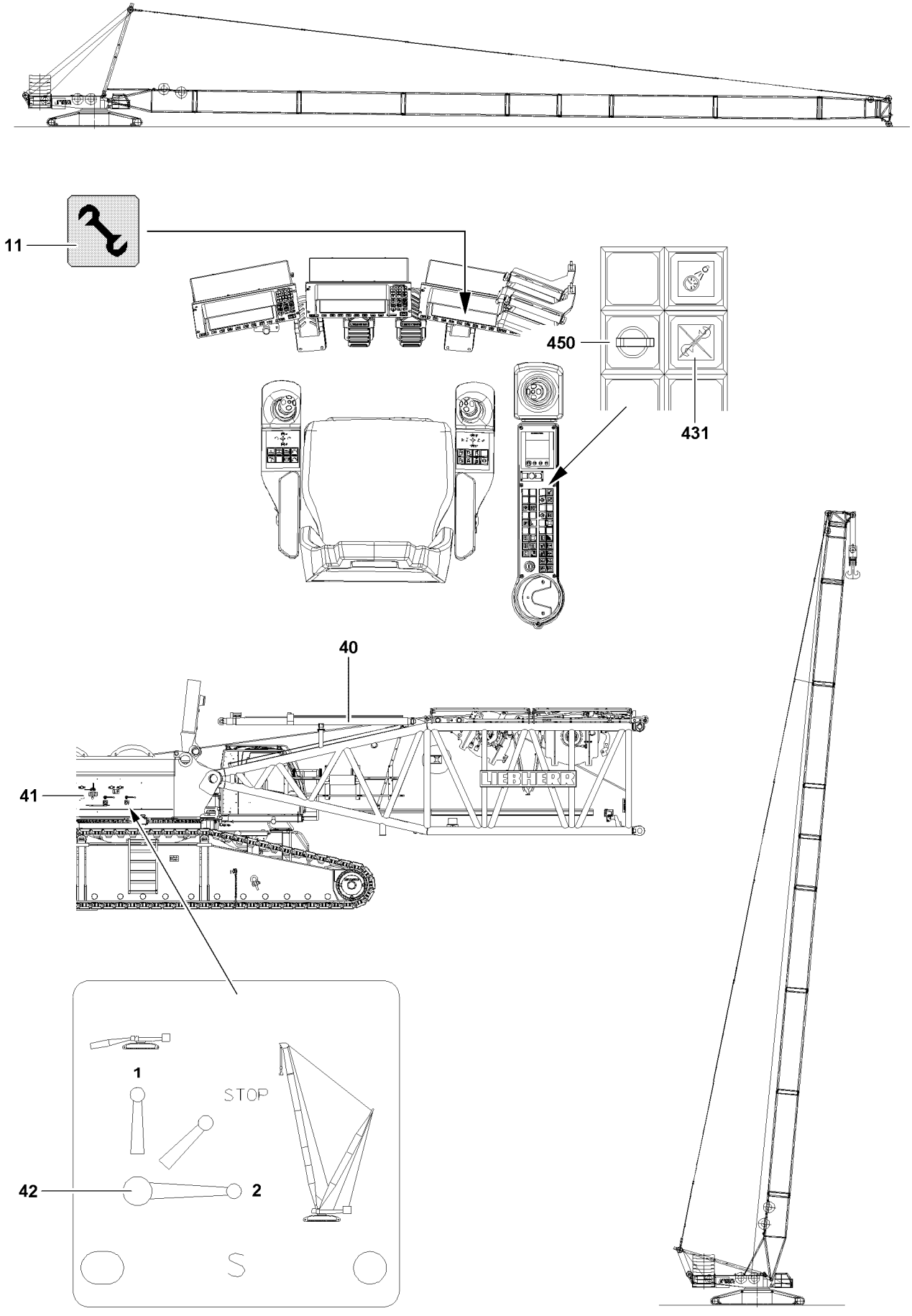
Note

▶ The limit switch functions have to be checked individually before erection!

▶ Cover the limit switch initiators on the S-relapse cylinder individually with a metal plate.

Result:

– The hoist limit switch is actuated manually.
– The spool up function of winch IV (control winch) turns off.
– The icon “boom limitation” appears on the LICCON monitor 0.
– Limit switch is functioning.



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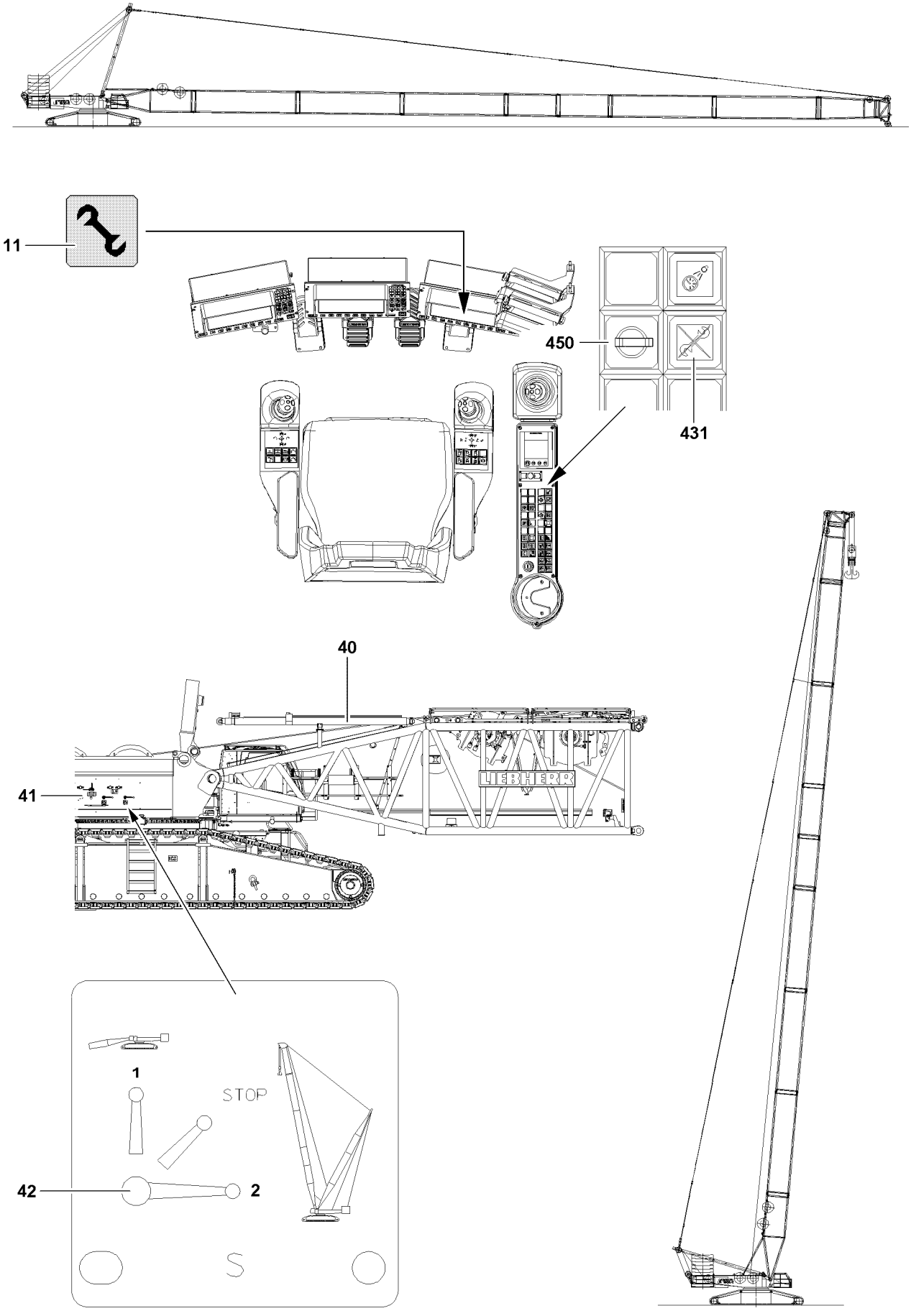
3.9 Erect the S-boom

DANGER
Crane can topple over!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Observe the data in the erection and take down charts!

WARNING
Crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over. Personnel can be severely injured or killed!
- ▶ Observe the safety technical guidelines in Chapter 5.01.
- ▶ Extend the S-relapse cylinder before erection.
- ▶ Do not allow slack cable to build up on the control winch!

WARNING
Falling hoist rope!
If the hoist rope before the erection procedure is not properly secured onto the corresponding length on the S-boom, it can fall down backward on the basis of its own weight.
Personnel can be severely injured or killed!
- ▶ Reeve in the hoist rope with sufficient length on the S-boom before the erection process!
- ▶ The hoist rope is to be observed continuously during erection!
- ▶ The danger zone must not be entered!

Make sure that the following prerequisites are met:
- – the crane is aligned in horizontal direction,
- – all electrical connections have been established,
- – all limit switches are functioning,
- – the counterweight has been attached to the turntable according to the load chart,
- – all pin connections have been secured,
- – the hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins,
- – there are no loose parts on the boom,
- – the LICCON overload protection has been adjusted according to the data in the load chart,
- – the LICCON overload protection settings have been compared with the actual crane configuration,
- – the assembly key button **450** is actuated,
- – the indicator light **431** “Assembly” lights up,
- – the Assembly icon **11** on the LICCON monitor 0 lights up.



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3.9.1 Extending the S-relapse cylinder

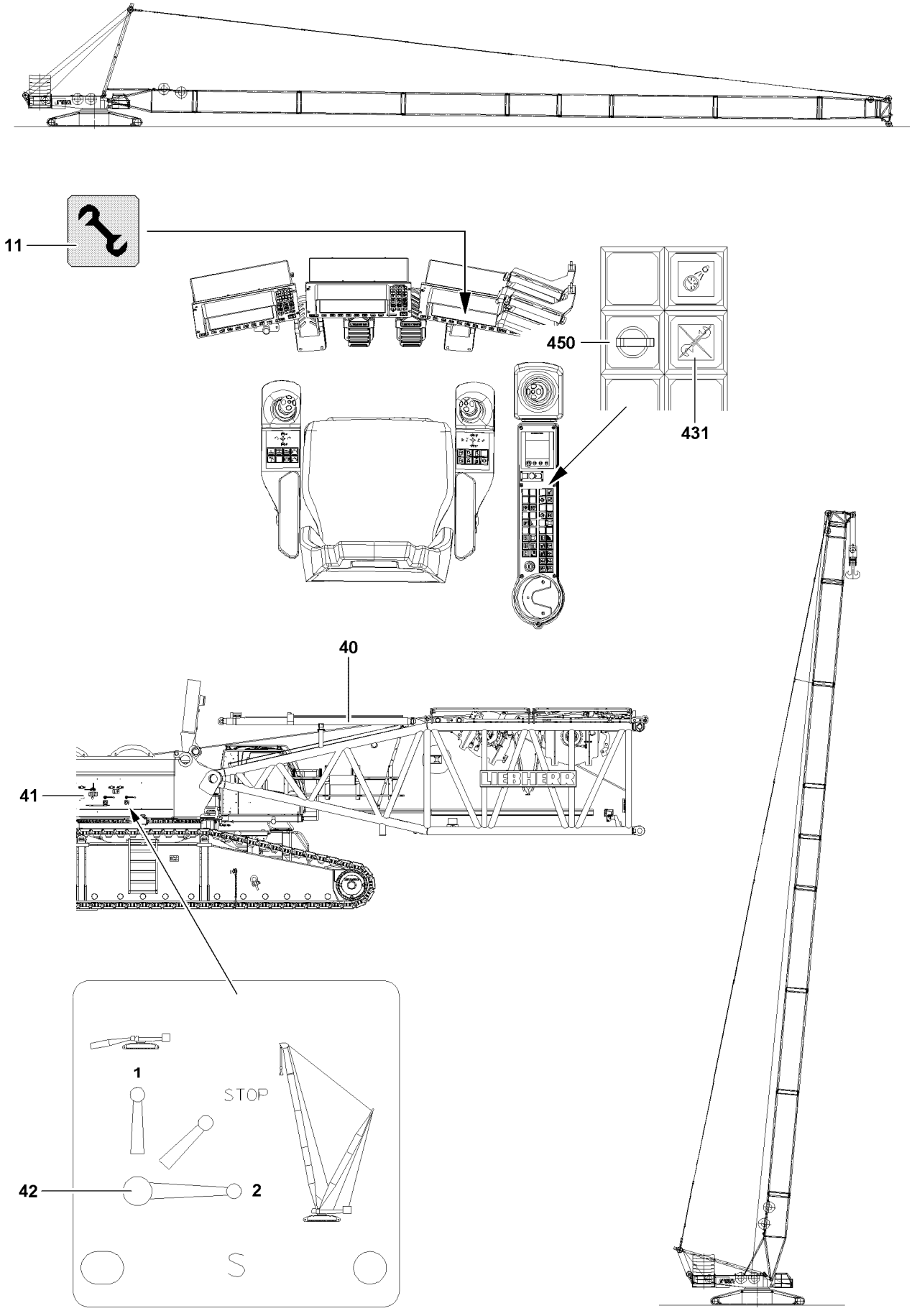
WARNING
Crane can topple over!
If the S-relapse cylinders are not extended before erecting the S-boom, then the S-boom can fall off to the rear in crane operation and the crane can topple over. Personnel can be severely injured or killed!
▶ Extend the S-relapse cylinders **40** before erecting the S-boom.
▶ Secure the ball cock **42** during crane operation to prevent inadvertent actuation.

Ball cock positions	
2	Crane operation, extend the piston rod
1	Assembly, retract the piston rod
STOP	The piston rod cannot be retracted / extended

The piston rods on the S-relapse cylinders **40** can be extended with the ball cock **42**.
▶ Set the ball cock **42** to **position 2**.
Result:
– The piston rods of the S-relapse cylinders **40** extend.

Note
▶ The ball cock **42** is secured by closing the cabinet door and removing the key.

▶ Close the cabinet door and pull the key.
▶ Hand the key to an authorized person.



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3.9.2 Erecting the boom

DANGER
Crane can topple over!
- ▶ It is prohibited to turn the crane superstructure while erecting the boom!
- ▶ Observe the data in the erection and take down charts!

Reeving in the hook block

- ▶ Luff up the boom until the end section lifts off the ground.
- ▶ Reeve in the hook block properly and secure the hoist rope on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.

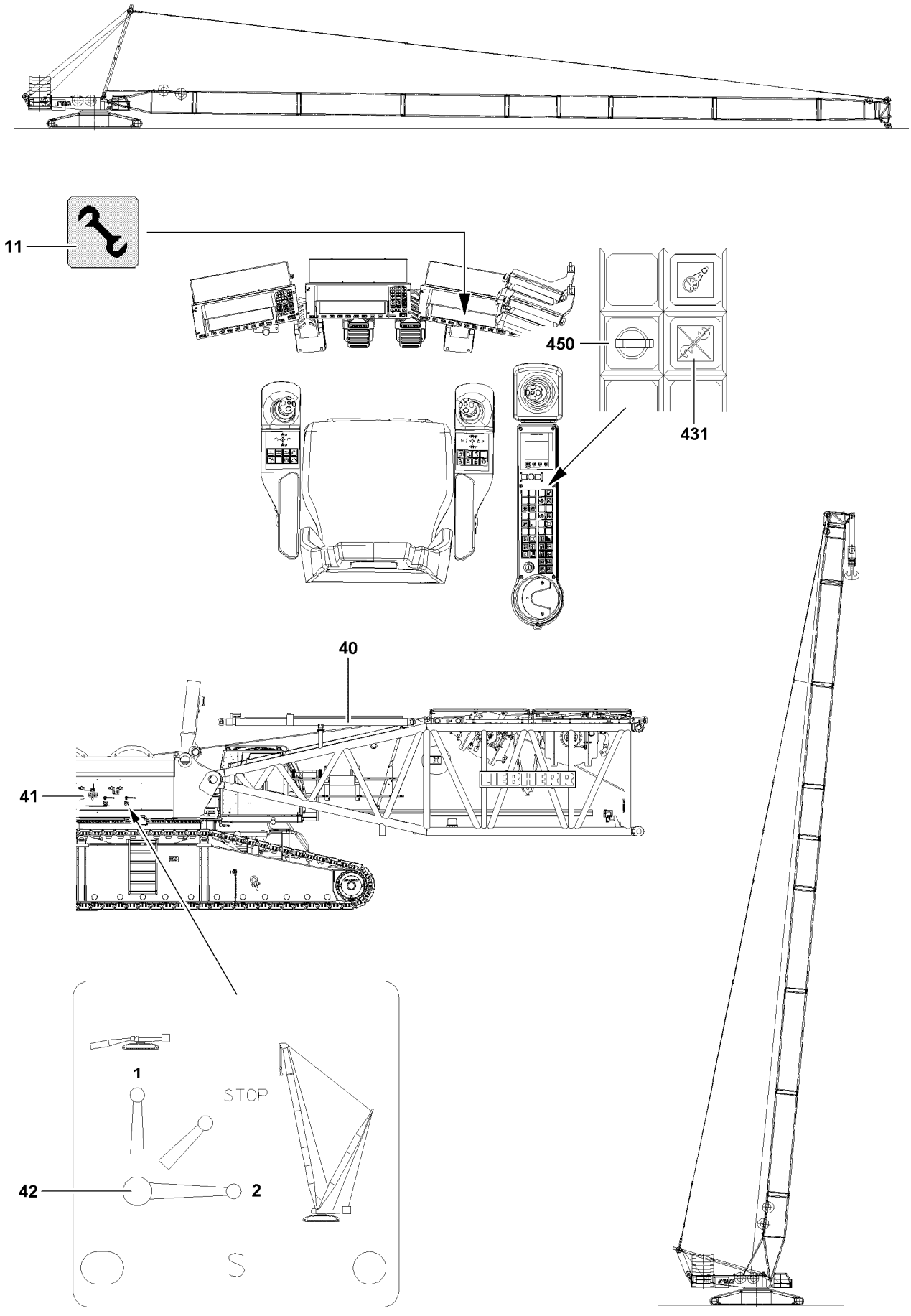
Erecting the boom

DANGER
Crane can topple over!
In crane operation with bypassed safety devices, the crane can topple over. Personnel can be severely injured or killed!
- ▶ When the lowest operating position of the boom is reached, turn off the assembly key button **450** immediately.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

Note
- ▶ When the lowest operating position of the boom is reached, the displays turn off.
- ▶ In the “Maximum load” icon appears a load number in “t” instead of the display “???”!

- ▶ Luff the boom up to the lowest operating position.
- ▶ When the boom has reached the lowest operating position:
  Turn the assembly keyed button **450** off: Press the button **431**.

Result:
- – The LICCON overload protection is active.
- – The indicator light **431** turns off.
- – The assembly symbol **11** on the LICCON monitor turns off.
- – The acoustical signal turns off.
- – The three-colored light illuminates in green.
- – The warning lights on the turntable are off.



B106758

4 Operating the crane

4.1 Preparing for crane operation

Note

▶ Observe the notes in chapters 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** is turned off.

WARNING

Crane can topple over!

▶ Check the horizontal position of the crane before and during operation!
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation!

4.2 Checking the settings

▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the limit switches on the relapse cylinders.

B195219

5 Disassembling the S/SL boom

Note

▶ The disassembly is described on the example of the S-boom!

WARNING

Risk of falling!

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

- ▶ Any work where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see “Chapter 2.04”!
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly, inspection and maintenance work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free of snow and ice!
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

WARNING

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then the lattice jib can fall down and fatally injure personnel!

- ▶ Unpin or pin both pins at the same horizontal level, i.e. **left and right**!
- ▶ Do not stand under the booms or within the entire danger zone during the boom pinning and unpinning procedure!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being disassembled!

WARNING

Danger of crushing!

While assembling crane components, body limbs can be crushed or severed by the swing movement of the swing beam!

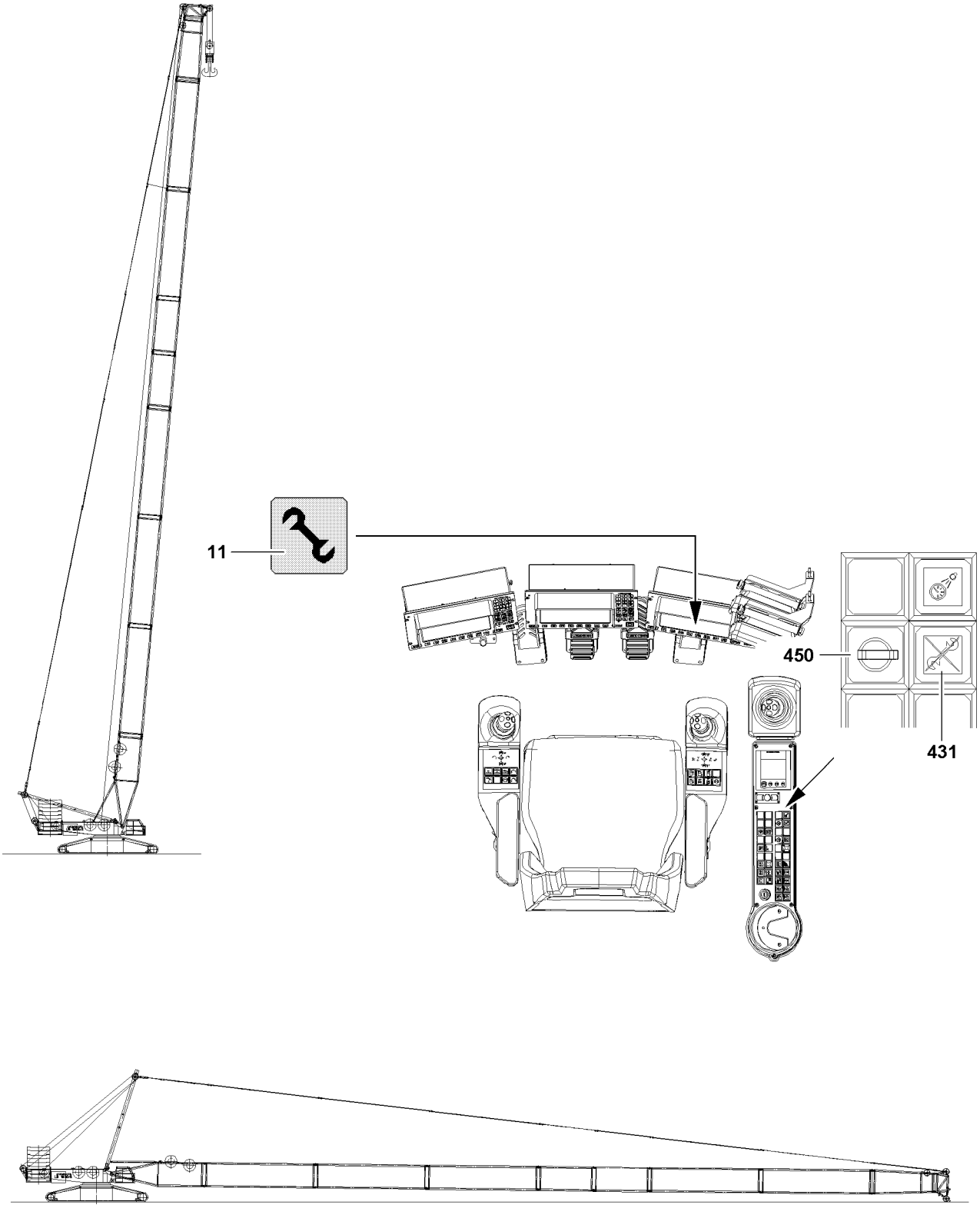
- ▶ Make sure that the components do not swing back and forth during assembly!

DANGER

Falling down of components!

If each component hangs from the auxiliary crane before each component is pinned on, each component can fall down and kill personnel!

- ▶ Do not disengage the auxiliary crane until each component is pinned on and secured!



B106757

5.1 Setting down the boom

WARNING
Crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the safety technical guidelines in Chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head. Boom components can be severely damaged.
- ▶ Luff the boom system down at the same time and spool the hoist winch out.

5.1.1 Luffing the boom down

Note
- ▶ The Luff down movement is turned off as soon as the lowest operating position is reached.
- ▶ When the lowest operating position of the boom is reached, the load display in the “Maximum load” icon turns off and instead of the load display appears the display “???”.
- ▶ In the crane operating screen appear alarm functions.

▶ Luff the S-boom down to the **lowest** operating position.

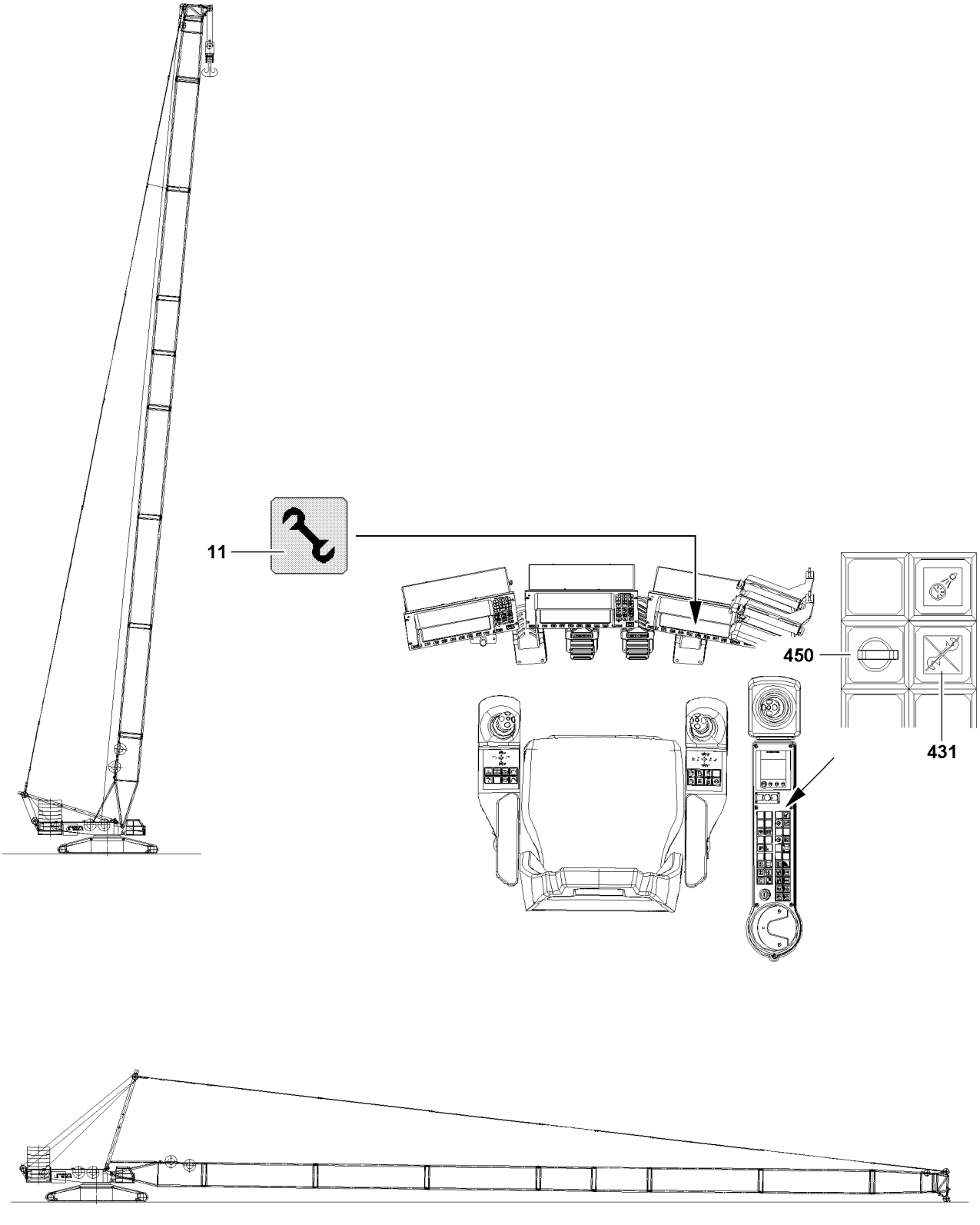
Result: The following alarm functions become active:
– “STOP”
– “Horn” and acoustical signal

DANGER
Crane operation with added assembly key button!
- ▶ The actuation of the assembly key button **450** is only permitted for assembly tasks!
- ▶ The assembly key button **450** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **450** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **450** turned on is strictly prohibited!
- ▶ The assembly key button **450** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ When the boom has reached the lowest operating position:
turn the assembly key button **450** on:

Result:
– The LICCON overload protection is deactivated.
– Control light **431** illuminates.
– The assembly icon **11** on the LICCON monitor blinks.
– The “STOP” icon on the LICCON monitor blinks.
– An acoustical signal sounds.
– The three-colored light illuminates in red.
– The warning lights on the turntable illuminates in red.

▶ At the same time, spool the hoist winch out and luff the S-boom down until the hook block touches the ground.



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5.1.2 Unreeving the hook block

- ▶ Remove the hoist limit switch weight and unreeve the hook block.
- ▶ Luff the boom down until the boom head is laying on the support on the ground.

5.1.3 Spooling up the hoist rope

WARNING
Falling hoist rope!
By spooling up the hoist rope, personnel can be severely injured or killed!
- ▶ All rope retaining pins / pipes are removed on the S-boom!
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch!
- ▶ Make sure that no personnel may be found within the danger zone!

NOTICE
Over spooled winch!
If the rope is pulled under the winch when spooling up, then the adjustment of the winch turn sensor is incorrect. A new adjustment by **LIEBHERR Service** is required.
- ▶ Stop the winch in time, with sufficient rope reserve!
- ▶ Do not over spool the winch!

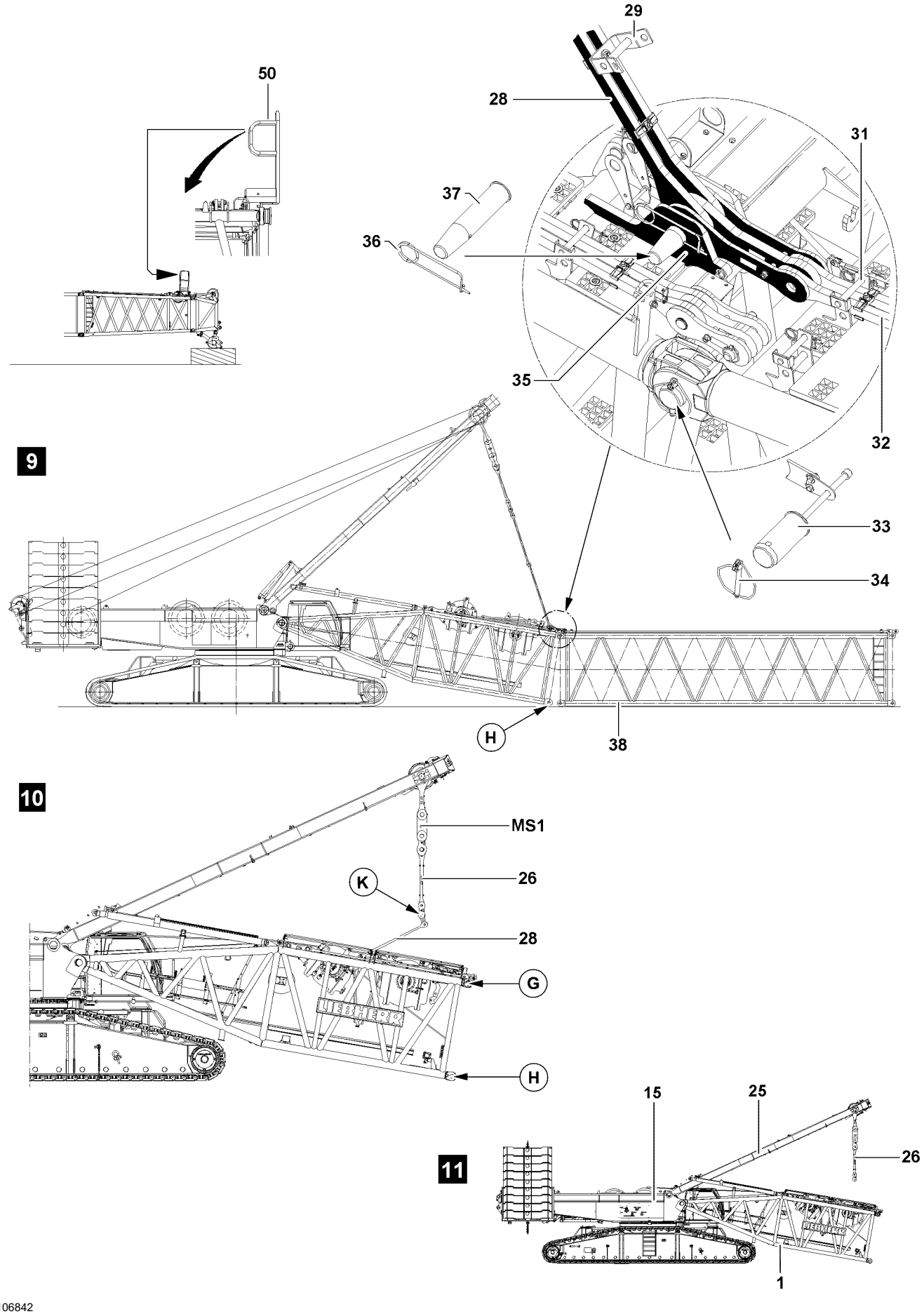
- ▶ Spool up the hoist rope.

5.2 Disconnect the electrical connections

Ensure that the following precondition is met:
– the S-boom has been placed down.

NOTICE
Damage to the cable drum or cable!
If the cable drum cable is not properly spooled up on the cable drum after disconnection on the S-end section, the cable drum or the cable can be significantly damaged!
- ▶ Spool up cable drum after disconnection!

- ▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.



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5.3 Disassemble the S-booms

WARNING
Folding down boom!
If the following conditions are not met before disassembling the boom, the boom can fold down.
Personnel can be severely injured or killed!
- ▶ Support the S-boom during disassembly with suitable materials!
- ▶ Before unpinning the S-intermediate section **38**, the guy rods **28** on the assembly brackets **35** must be pinned and secured!
- ▶ During pinning and unpinning of the intermediate sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!

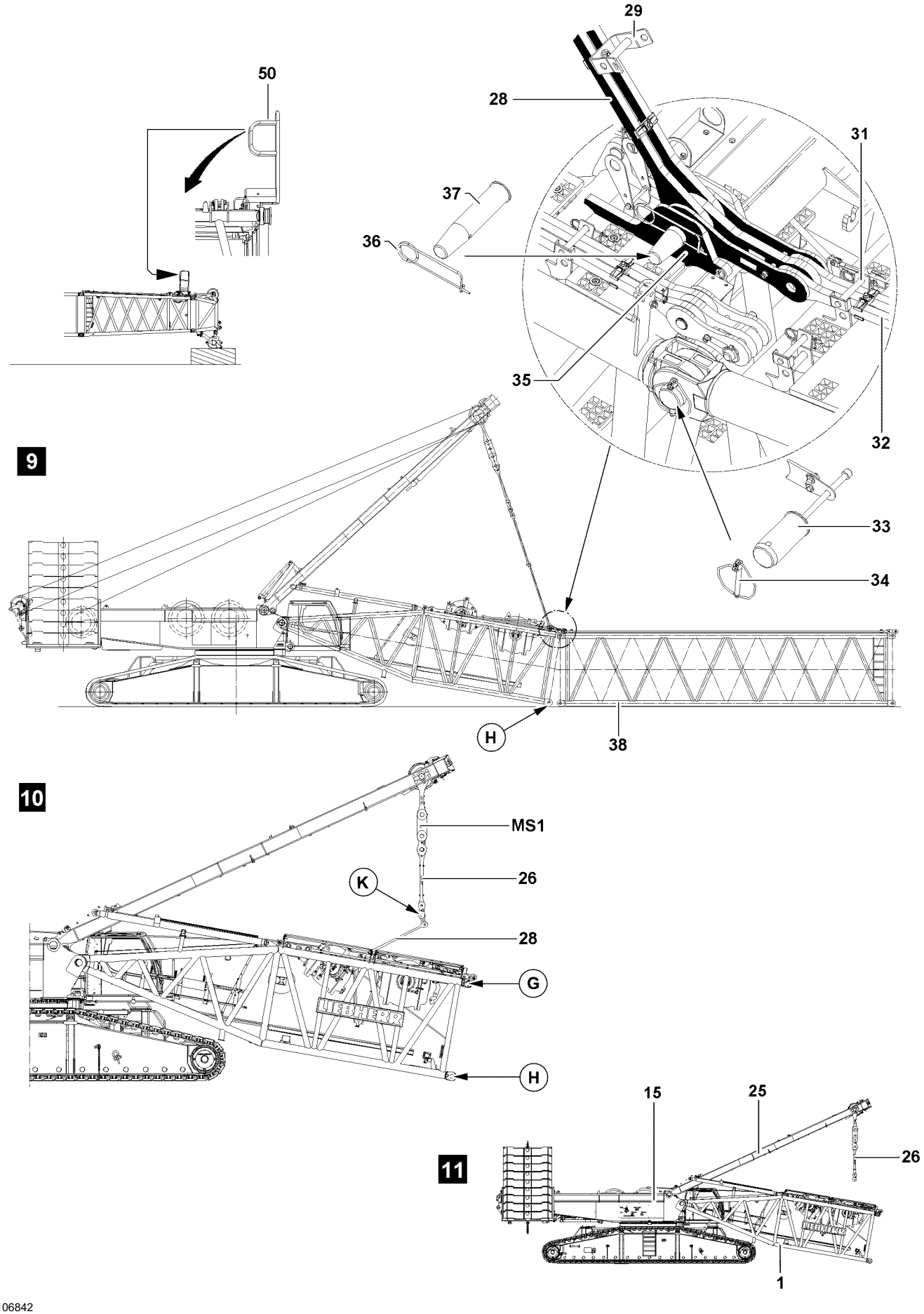
Ensure that the following precondition is met:
– all electrical connections are separated on the boom.

- ▶ Place the guy rods on the S-intermediate sections.
- ▶ Release and unpin the guy rods on the S-intermediate sections.
- ▶ Secure the guy rods with the transport retainers **31**.

Note
- ▶ For maintenance of the system dimension for highway transport, the fold platforms **50** must be folded and pinned in transport position!

- ▶ Bring fold platforms **50** into transport position with auxiliary crane.
- ▶ Pin and secure fold platforms **50** into transport position.
- ▶ Pin the guy rods **28** of the S-pivot section on the assembly brackets **35**: insert the pin **37** and secure with spring retainer **36**, see figure **9**.

WARNING
Crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ The maximum permissible total force on test point **MS1** may **not** be exceeded. The “actual force” is shown on LICCON monitor 1.
- ▶ Lifting the following boom length is permissible if the maximum permissible total force on test point 1 (**MS1**) is noted, observe the following charts!



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Maximum permissible total force MS1 160 t				
Boom system	**Maximum system length**	**Equipment**	**DB_{min} 1)**	**ZB_{min} 2)**
S	48 m	- with SW-end section - with S- and WA-frame II guy rods	110 t	5 t
S	52 m	- without SW-end section - with S- and WA-frame II guy rods	110 t	5 t
SL	54 m	- with SW-end section - with S-guy rods	110 t	5 t

1) This counterweight must be at least assembled on the turntable for “flying assembly”.
2) This central ballast must be at least assembled on the crawler center section for “flying assembly”.

Note

▶ Unpin the intermediate sections with the pin pulling device, see Chapter 5.30.

NOTICE

Property damage!

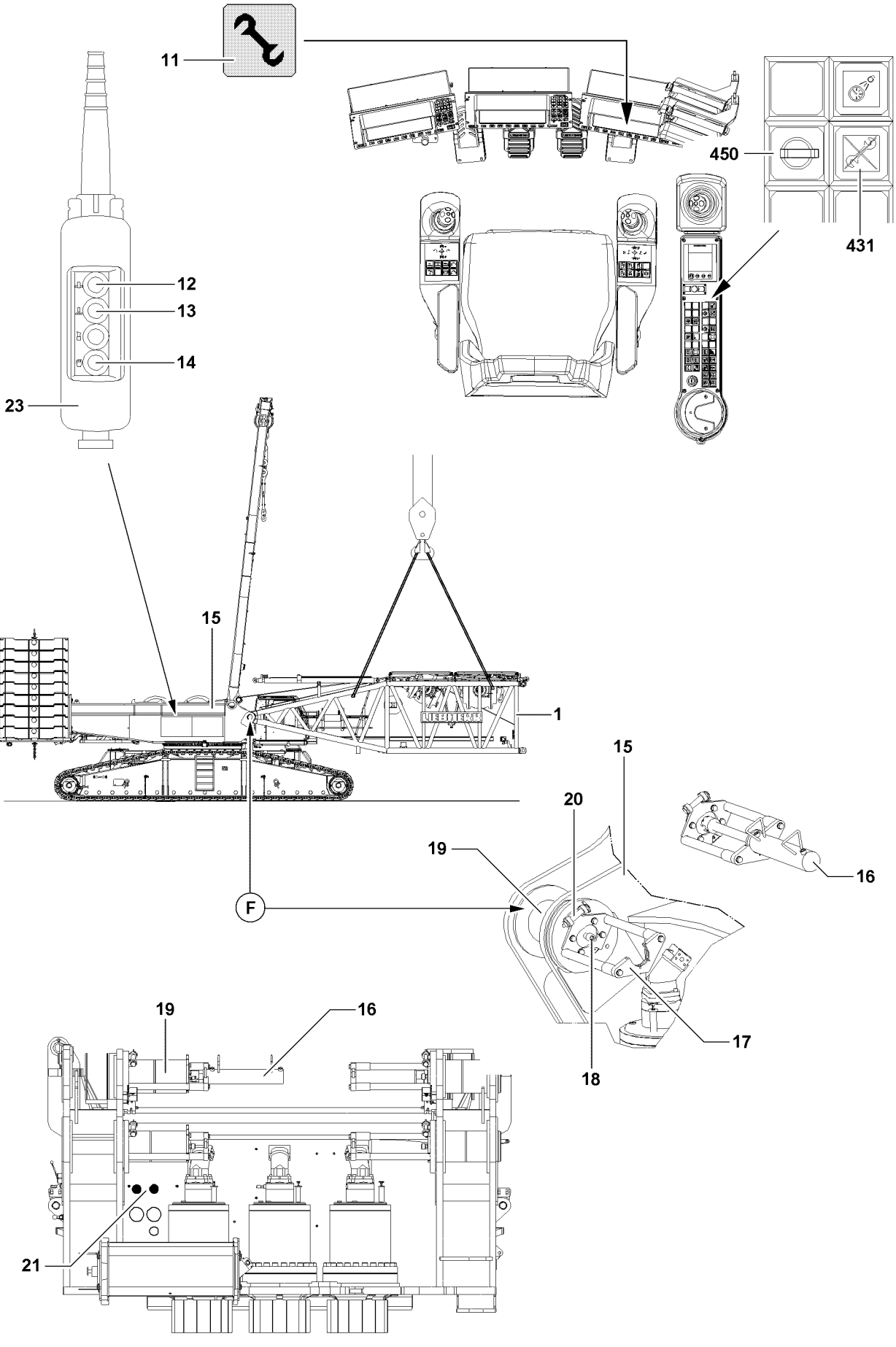
If the maximum permissible total force is not observed when lifting the boom system for disassembly, then components can be severely damaged.

▶ Do not exceed the maximum permissible total force!

Note

▶ The ACTUAL force on test point **MS1** is shown on monitor 1.
▶ Tension the guy rods on the SA-frame with the same force as during the assembly.
▶ Refer to the ACTUAL force, which was measured and noted during assembly on test point **MS1**.
▶ The pins can be pulled easier and the pins and lugs are therefore not damaged.

▶ Lift the SA-frame and tension the guy rods **28** until the force on test point **MS1** corresponds to the force at assembly.
▶ Unpin the S-pivot section on both sides “on the bottom” at point **H**: remove the linchpin **34** and unpin the pin **33**.
▶ Lower the S-pivot section on the support.
▶ Lower the SA-frame and place the guy rods **28** on the S-pivot section.
▶ Unpin the guy rods **28** S-pivot section from the guy rods **26** SA-frame in point **K**, place them down and securely with transport retainers **29**, see fig. **10** and fig. **11**.
▶ Erect the SA-frame to the point where the S-pivot section can be attached on the auxiliary crane.
▶ Unpin and disassemble the intermediate sections **38**.



B106759

5.4 Unpin the S-pivot section

- ▶ Attach the S-pivot section **1** on the auxiliary crane.
- ▶ Lift the S-pivot section **1** with the auxiliary crane to the horizontal.

Establish the hydraulic connection to the pin pulling device via two quick couplers.

- ▶ Release and unpin the pin **20**.
- ▶ Hang the pin pulling cylinder **16** into the receptacle **17** and the screw **18** on the pin **19**.
- ▶ Connect the pin pulling cylinder **16** on quick couplers **21**, hydraulic turntable.

WARNING
Falling S-pivot section!

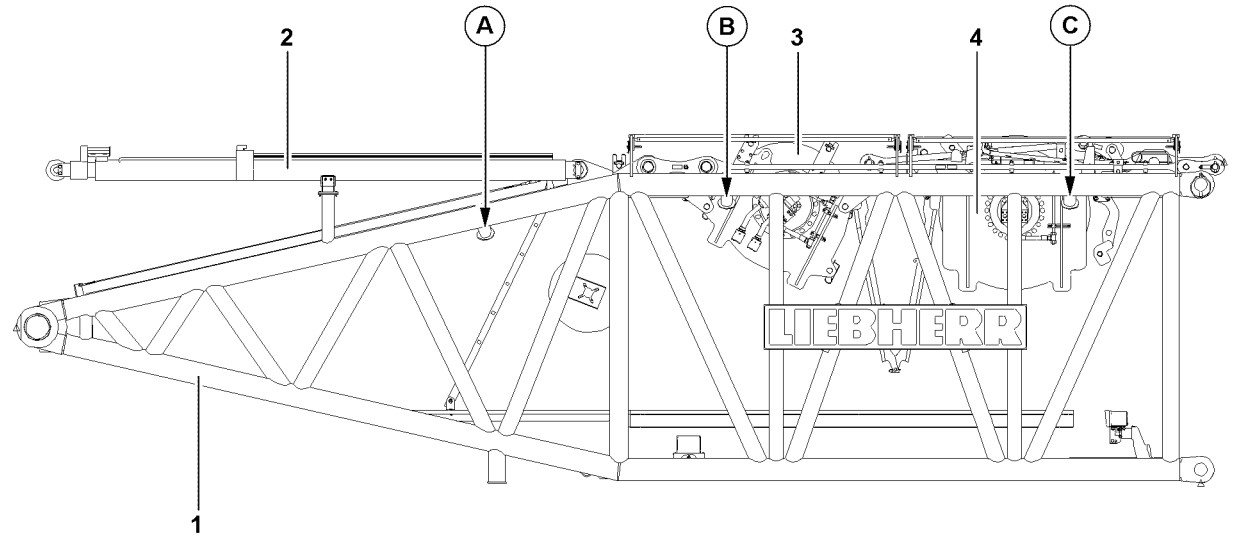
- ▶ Make sure that the S-pivot section is secured with the auxiliary crane before unpinning the pin **19**.

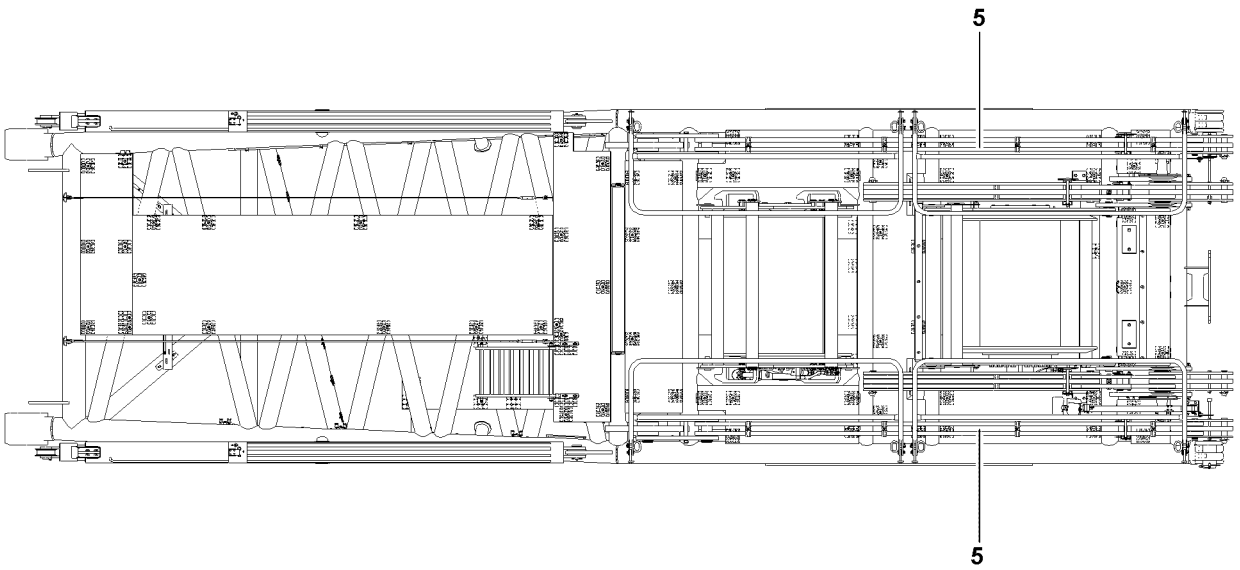
- ▶ Unpin the pins **19** with the hydraulic pin pulling cylinder **16**: actuate key **14** on the control console **23** and hold down, finally actuate the key **13** until the pin is completely unpinned.
- ▶ When the pins **19** are completely unpinned on the left and right on the S-pivot section **1**: pin and secure the pin **20** on the left and right.

NOTICE
Damage on the turntable and the S-pivot section!

- ▶ Slowly swing the S-pivot section **1** with the auxiliary crane and at low speed from the turntable.
- ▶ Before placing it on the ground, support the S-pivot section **1**.

- ▶ Carefully place the S-pivot section **1** down.
- ▶ Remove the auxiliary crane.
- ▶ Place the SA-frame on the turntable, see Chapter 5.02.





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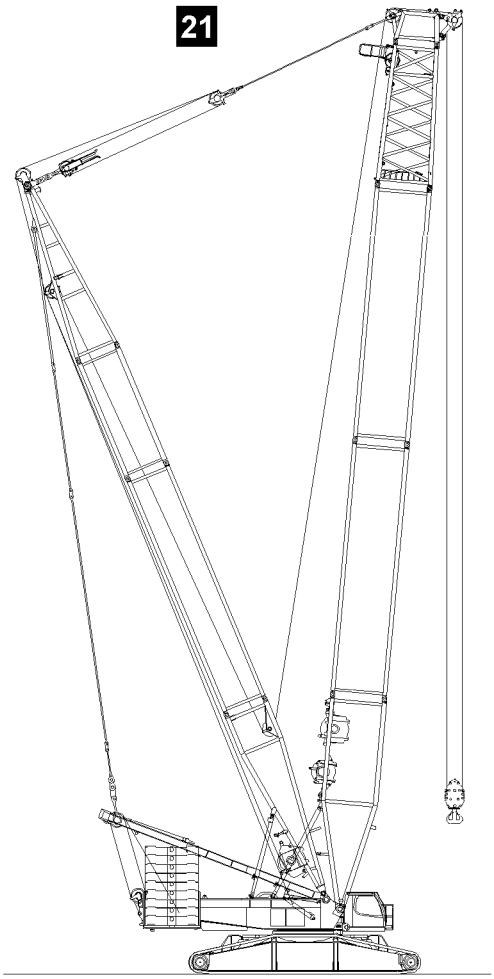
1 Component overview S-pivot section

Position	Component	Weight
1	S-pivot section	12.0 t
2	S-relapse retainer	1.1 t
3	Winch VI including rope	4.6 t
4	Winch V including rope	8.0 t
5	Rods WA-frame	0.5 t
	S-pivot section complete	26.2 t

2 Attachment points

Attachment points	
A + B	For S-pivot section **without** winches
A + C	For S-pivot section **with** winches and rope



B106831

3 Assembling the SLD/SD-boom

Note

▶ The assembly is described on the example of the S-boom!

WARNING

Risk of falling!

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

- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see “chapter 2.04”!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

WARNING

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel!

- ▶ Unpin or pin both pins at the same horizontal level, i.e. **left and right**!
- ▶ Do not stand under the lattice sections or within the complete danger zone during the pinning and unpinning procedure of the boom!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being disassembled!

WARNING

Danger of crushing!

When assembling crane components, limbs can be crushed or even severed due to oscillation of components!

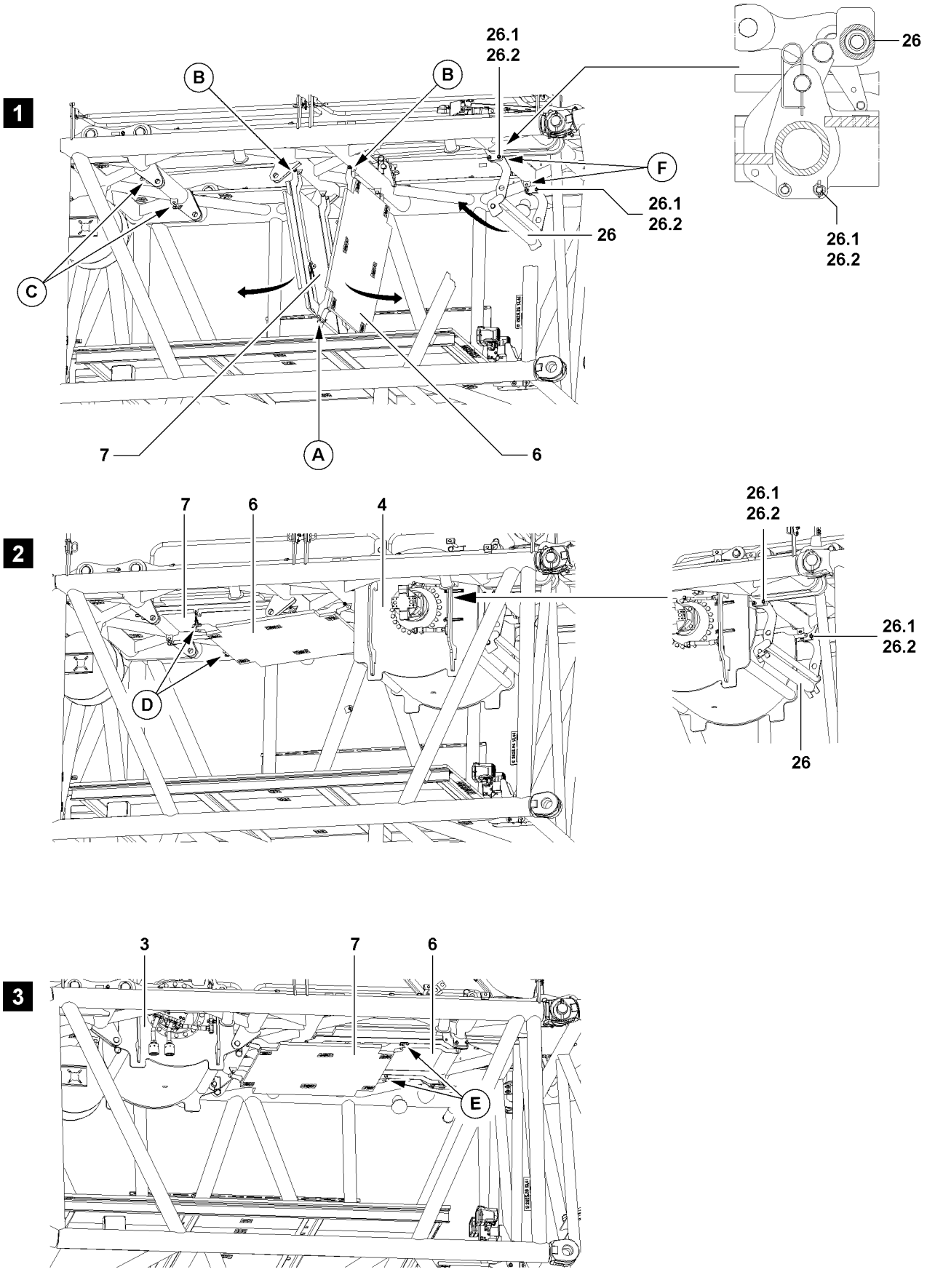
- ▶ Make sure that the component do not swinging back and forth during assembly!

DANGER

The components can fall down!

If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel!

- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured!


1
26.1
26.2
B
B
26
F
26.1
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C
26
26.1
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7
A
6
2
7
6
4
26.1
26.2
D
26.1
26.2
26
3
3
7
6
E

B106747

3.1 Swing the railing on the S-pivot section into operating position

WARNING
Risk of falling!
During assembly and disassembly of the railing, personnel must be secured with appropriate antifall guards to prevent them from falling!
Even for assembly of protective devices there is a danger of falling!
Assembly personnel can fall and be severely injured or killed!
- ▶ For assembly and disassembly work, maintenance and inspection work on the S-pivot section, all railings must be assembled and secured.
- ▶ Step on the S-pivot section **1** only with “clean shoes”.

- ▶ Swing the railing on the S-pivot section **1** into position, pin with the pin and secure with spring retainers.

3.2 Assembling the catwalks

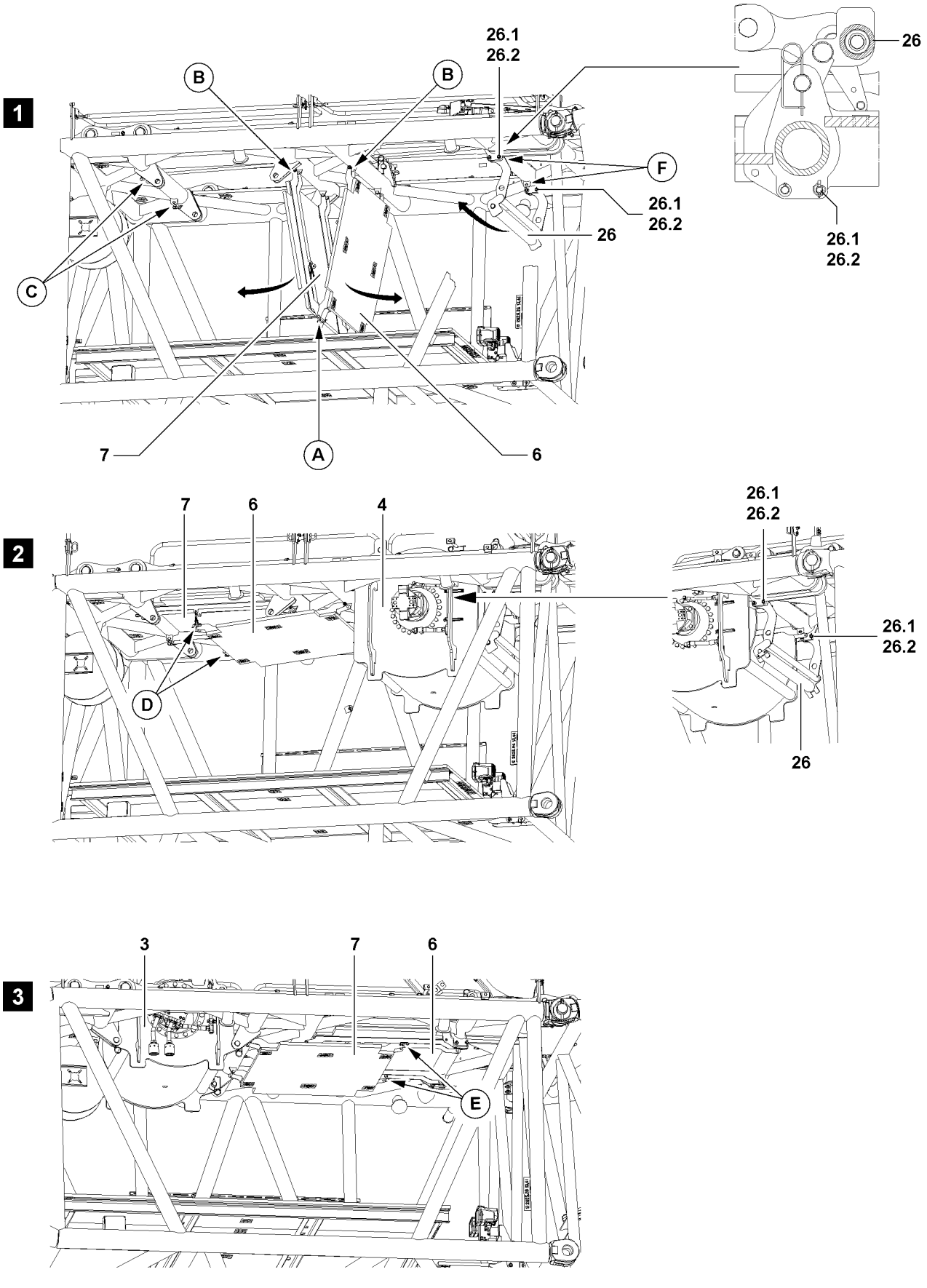
WARNING
Disassembled or incompletely assembled catwalks!
If the catwalks are not assembled if the winches are missing or if the catwalks are not completely assembled, then personnel can fall and be severely injured or killed!
- ▶ For each non-assembled winch on the S-pivot section: Assemble the catwalks.
- ▶ The catwalks may only be accessed when they are pinned and secured in operation position, check visually!

WARNING
Catwalks swung down!
Catwalks which swing down by themselves can cause severe face or head injuries for the assembly personnel!
Personnel can be severely injured or killed!
- ▶ For safety reasons, assemble the catwalks always always with two persons!

Note
- ▶ If winch V is not preassembled, the protective roller **26** must be pinning in crane operation in position “up”!
- ▶ If winch V is to be assembled, then - before assembly of winch V - the protective roller **26** must be folded down and pinned in position “down”!

Catwalks are assigned to the openings for the winches:
– Winch V – catwalk **6**.
– Winch VI – catwalk **7**.

Ensure that the following prerequisite is met:
– the railings are pinned in operating position and secured.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4
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26.1
26.2
26.1
26.2
26
3
3
7
6
E

B106747

3.2.1 S-pivot section without winches

Make sure that the following prerequisites are met:
- catwalks are pinned in transport position in point **A**,
- the protective roller **26** is pinned and secured in position “up”.

▶ Release and unpin the catwalks at point **A**.

Swing the catwalks individually into operation position “up” and pin.

▶ Swing the catwalk **7** into operating position and pin and secure on points **C**, see illustration **1**.

▶ Swing the catwalk **6** into operating position and pin and secure on points **F**, see illustration **1**.

3.2.2 S-pivot section before installation of winch V

Make sure that the following prerequisites are met:
- winch V is not assembled,
- winch VI is not assembled,
- the protective roller **26** is pinned and secured in position “up”,
- the catwalk **6** and catwalk **7** are pinned and secured in operating position.

▶ Hang the catwalk **6** onto the auxiliary crane.

▶ When the catwalk **6** is safely held by the auxiliary crane:
Unpin the catwalk **6** on points **F**.

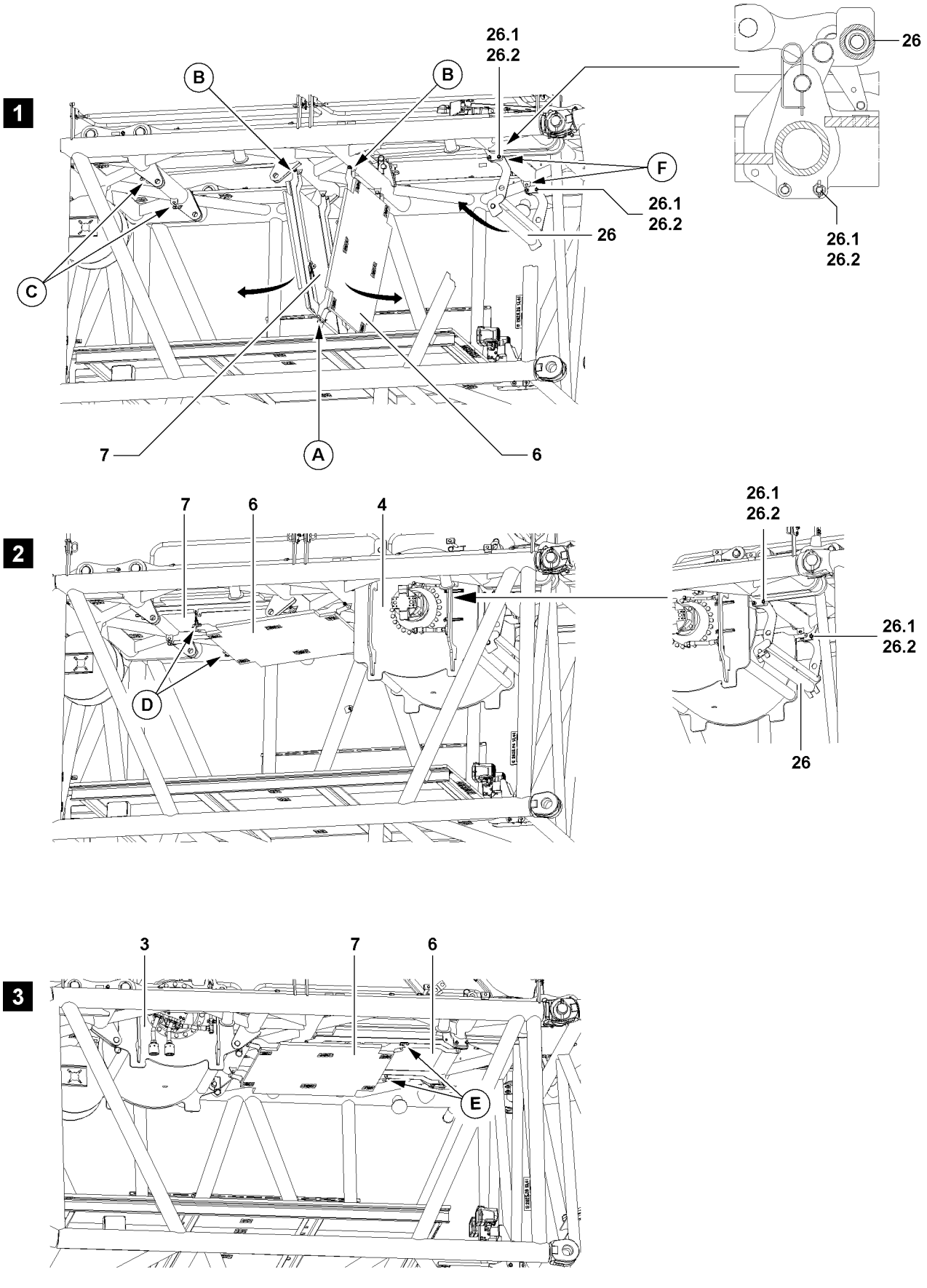
▶ Lower the catwalk **6** downward and remove the auxiliary crane.

▶ Swing the catwalk **6** upward to the opposite side and pin and secure on the pin points **D** of the catwalk **7**, see illustration **2**.

▶ Release and unpin the protective roller **26** in “up” position.

▶ Swing the protective roller **26** into “down” position, pin with retaining pins **26.1** and secure with linch pins **26.2**.

Result:
- Winch V can be assembled.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6
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D
26.1
26.2
26.1
26.2
26
3
3
7
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E

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3.2.3 S-pivot section before assembly of winch VI

Make sure that the following prerequisites are met:
- winch V is not assembled,
- winch VI is not assembled,
- the protective roller **26** is pinned and secured in position “up”,
- the catwalk **6** and catwalk **7** are pinned and secured in operating position.

▶ Hang the catwalk **7** onto the auxiliary crane.
▶ When the catwalk **7** is safely held by the auxiliary crane:
Unpin the catwalk **7** on points **C**.
▶ Lower the catwalk **7** downward and remove the auxiliary crane.
▶ Swing the catwalk **7** upward to the opposite side and pin and secure on the pin points **E** of the catwalk **6**, see illustration **3**.

Result:
- Winch VI can be assembled.

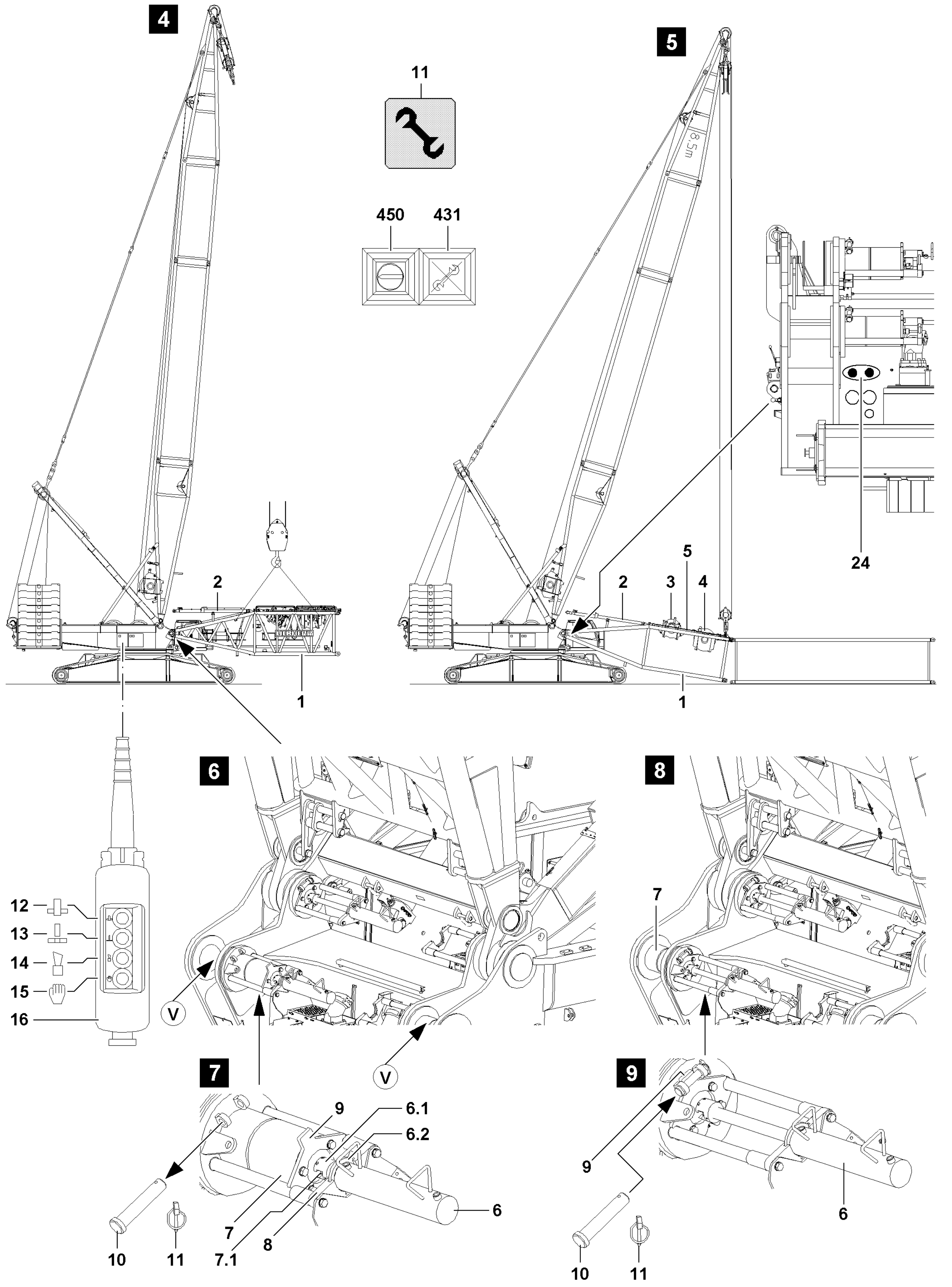
3.2.4 S-pivot section before installation of both winches

Make sure that the following prerequisites are met:
- the protective roller **26** is pinned and secured in position “up”,
- the catwalk **6** and catwalk **7** are pinned and secured in operating position.

Note
▶ Lower the catwalks individually and one after the other with the auxiliary crane!

▶ When the catwalk is safely held by the auxiliary crane:
Release and unpin the catwalk in operating position, see illustration **1**.
▶ Lower the catwalk and remove the auxiliary crane.
▶ When the catwalk **6** and the catwalk **7** are lowered down:
Pin and secure the catwalks in point **A**, see illustration **1**.
▶ Release and unpin the protective roller **26** in “up” position.
▶ Swing the protective roller **26** into “down” position, pin with retaining pins **26.1** and secure with linch pins **26.2**.

Result:
- Winch V and winch VI can be assembled.



B106746

3.3 Assembling the boom

Make sure that the following prerequisites are met:
- the crane is aligned in horizontal direction,
- an auxiliary crane is available,
- an assembly scaffolding / work platform is available,
- the counterweight has been installed to the turntable according to the load chart,
- the D-boom is completely assembled and erected on the turntable, see chapter 5.05,
- the LICCON overload protection has been set according to the data in the load chart.

3.3.1 Turning the turntable into assembly position

WARNING
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** assembled S-boom, the crane can topple over. Personnel can be severely injured or killed!
- ▶ Observe the data in the erection and take down charts!
- ▶ Observe the maximum permissible ballast combinations in chapter 3.06!

Note
- ▶ If the turntable is turned to the side for the assembly of the boom, then boom and lattice sections must be supported, depending on the ground condition.

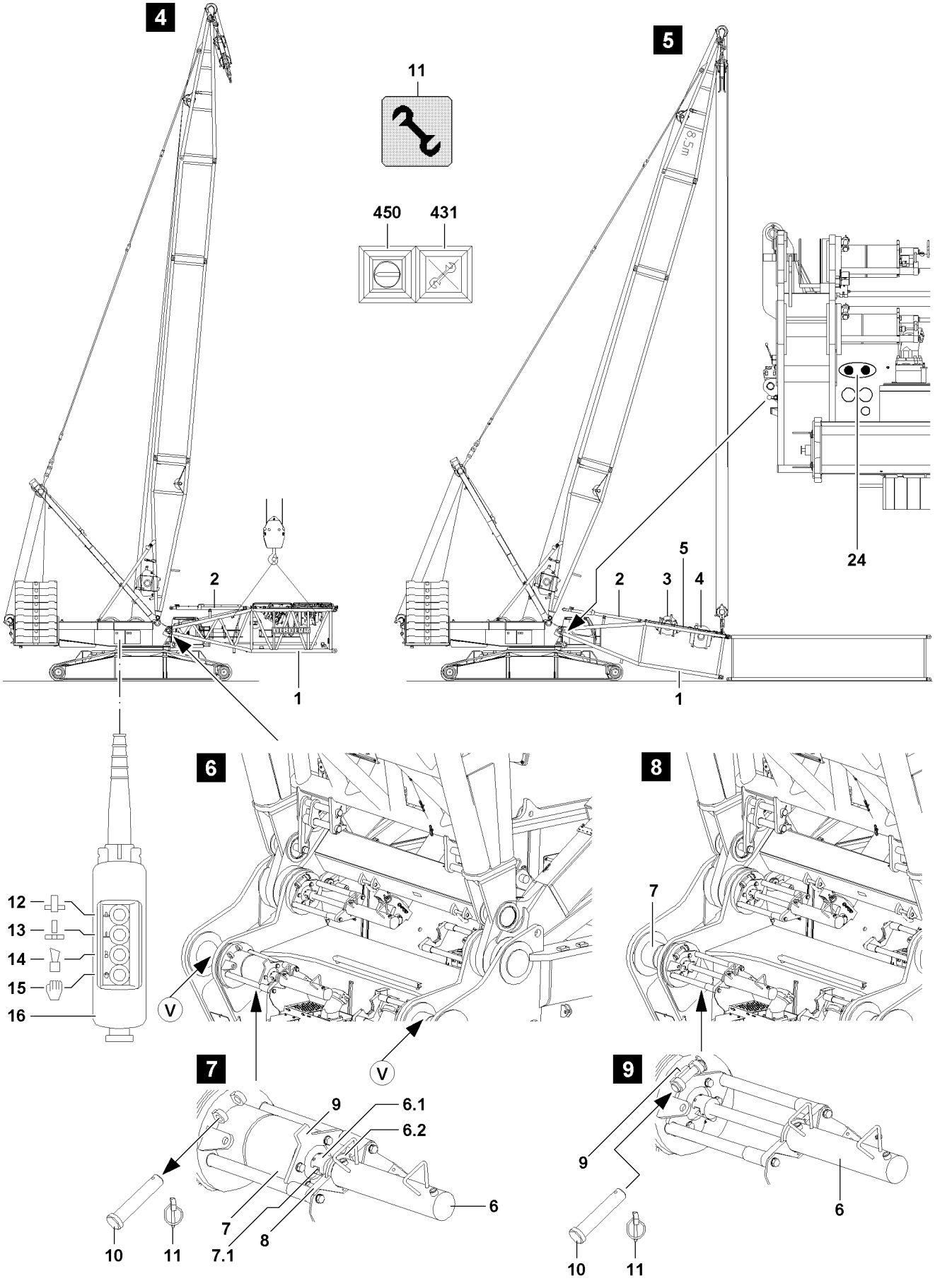
▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side.

3.3.2 Adding the operating mode “Assembly”

DANGER
Risk of fatal injury at crane operation with turned on assembly key button!
If the assembly key button is turned on, the hoist limit switch and the LICCON overload protection is 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 actuation of the assembly key button **450** is only permitted for assembly tasks!
- ▶ The assembly key button **450** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **450** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **450** turned on is strictly prohibited!
- ▶ The assembly key button **450** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **450**.

Result:
- The LICCON overload protection is bypassed.
- The indicator light **431** in the button lights up.
- The assembly icon **11** on the LICCON monitor blinks.
- An acoustical signal sounds.
- The three color light lights up red.
- The warning lights on the turntable light up red.



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3.3.3 Pinning the S-pivot section on the turntable

Note

▶ The boom combinations must be assembled according to the separately supplied rod and assembly plans!

WARNING

General danger notes!

▶ Support the S-boom during assembly with suitable materials!
▶ All pins are to be secured after assembly with the intended safety elements!
▶ The guy rods must be checked regularly! Please refer to chapter 8.15.

Ensure that the following prerequisite is met:

– the connector pins **7** on the turntable are unpinned, see illustration **7**,
– the retaining pins **10** are unpinned.

Note

▶ Select the attachment points on the S-pivot section in such a way that the S-pivot section hangs horizontally on the auxiliary crane at assembly. See paragraph “Attachment points”!

▶ Attach the S-pivot section **1** on the attachment points **A** and attachment points **B** on the auxiliary crane.

or

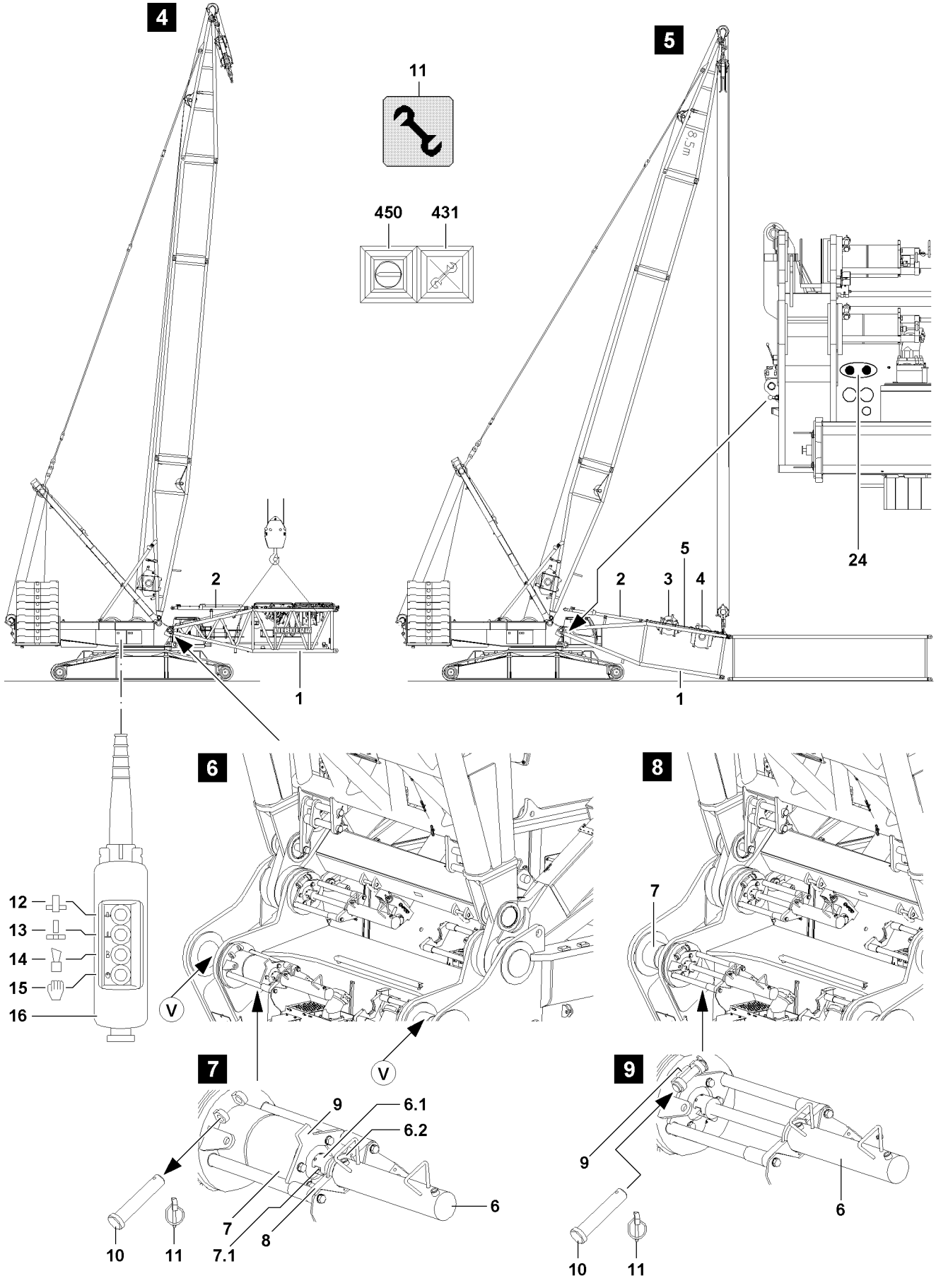
■ Attach the S-pivot section **1** on the attachment points **A** and attachment points **C** on the auxiliary crane.
▶ Swing the S-pivot section **1** in with the auxiliary crane to the pin points **V** on the turntable, illustration **4** and illustration **6** .

Establish the hydraulic connection to the pin pulling device via two quick couplers.

Note

▶ When hooking the pin pulling cylinder **6**, make sure that the collar **6.2** on the cylinder mount **8** and the catch **6.1** on the screw **7.1** are properly hooked!

▶ Hook the pin pulling cylinders **6**.
▶ Connect the pin pulling cylinder **6** on the quick couplers **24**, illustration **5**.


4
11
450
431
5
18.5m
24
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1
2
3
4
5
1
6
8
12
13
14
15
16
V
V
7
9
6.1
6.2
6
7
8
7.1
10
11
7
9
6
9
10
11

B106746

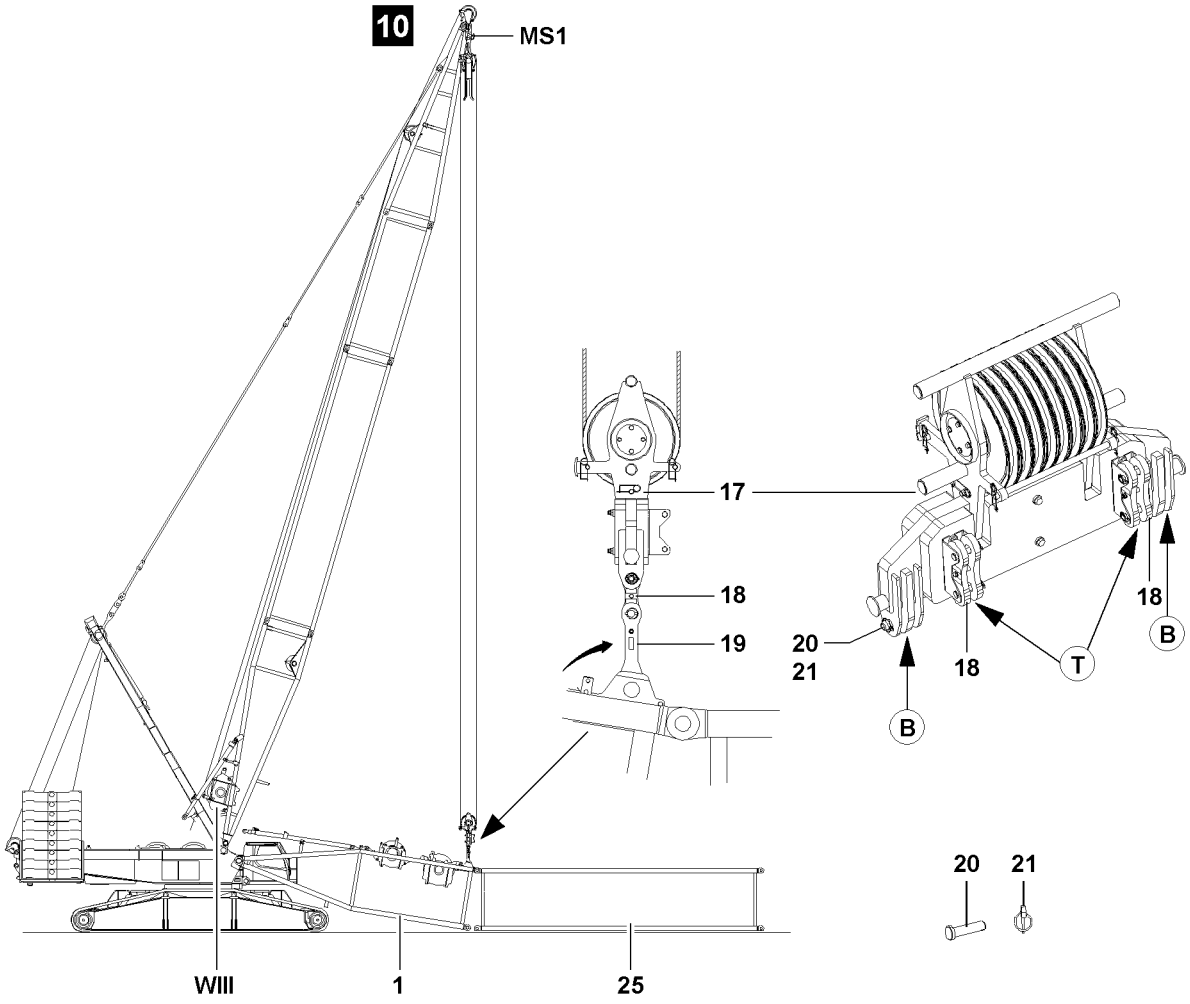
DANGER
Falling S-pivot section!
Due to non-secured or insufficiently secured connector pins, the S-pivot section can fall down!
Personnel can be severely injured or killed!
▶ Secure the connector pins **7** between the S-pivot section **1** and the turntable after the pin procedure with the retaining pins **10**.

▶ Pin in the connector pins **7** on both sides with the hydraulic pin pulling cylinder **6**: Press the button **15** on the control panel **16** and “hold it down”, then press the button **12** until the connector pin **7** is fully pinned.
▶ When the connector pins **7** are fully pinned on both sides:
Secure the connector pins **7** with retaining pins **10** and linch pins **11**.

Result:
– The connector pins **7** have been secured with the retaining pins **10** to prevent them from unpinning by themselves, see illustration **9**.

NOTICE
Damage to the S-pivot section!
Damage can occur on the S-pivot section by placing the assembled S-pivot section on the ground.
▶ Slowly place the S-pivot section **1** with the auxiliary crane and at low speed on the ground!
▶ Before placing it on the ground, support the S-pivot section **1**!

▶ Place the S-pivot section **1** down.
▶ Remove the auxiliary crane.



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3.3.4 Pin the upper pulley block to the S-pivot section

To be able to “close” the S-boom combination after assembly, it is necessary to luff the D-boom down to the front and to lower the upper pulley block via the control winch **W III** to the S-pivot section **1**. Then pin the upper pulley block **17** with the S-pivot section **1** and secure.

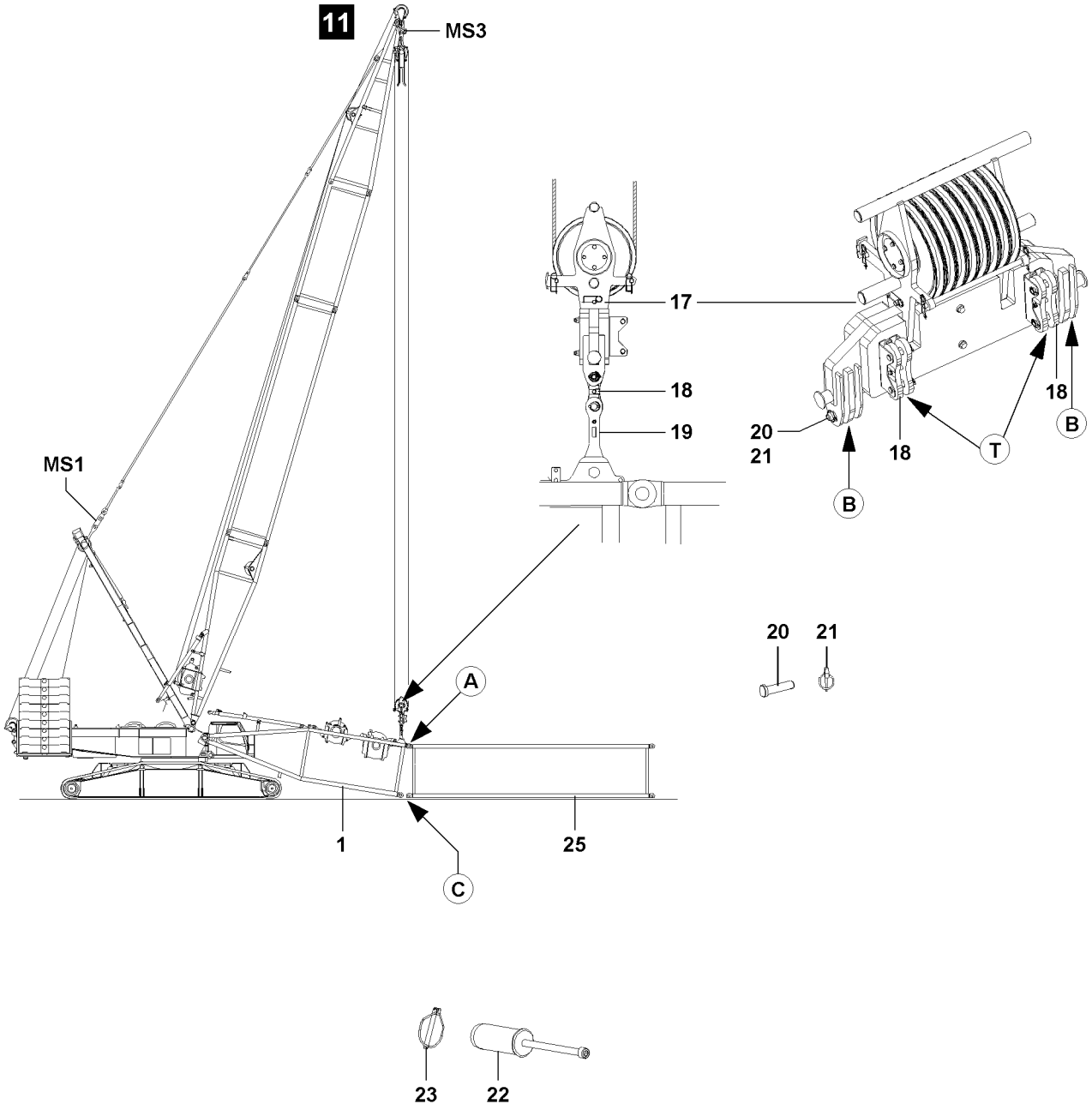
Note

▶ Luff the D-boom forward only to the point where the upper pulley block **17** “stands” vertically above the pin points on the S-pivot section **1**.

Ensure that the following prerequisites are met:

– the S-pivot section **1** is pinned and secured on the turntable,
– the S-pivot section **1** is placed on the ground on the supporting base,
– the auxiliary crane is removed.

▶ Luff the D-boom down to the front until the upper pulley block **17** hangs freely over the assembly bracket **19** of the S-pivot section **1**.
▶ Lower the upper pulley block **17** to the S-pivot section **1**.
▶ Remove the lug **18** from the transport retainer **T** on the upper pulley block **17**.
▶ Pin the lug **18** in operating position **B** on the upper pulley block **17** with pin **20** and secure with linch pin **21**.
▶ Pin and secure the lug **18** with the assembly brackets **19** of the S-pivot section **1**.
▶ Use pin **20** and linch pin **21**.



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3.3.5 Installing the S-intermediate section on the S-pivot section

Make sure that the following prerequisites are met:

– the S-pivot section **1** is pinned and secured on the turntable,
– the S-pivot section **1** is placed on the ground on the supporting base,
– the upper pulley block **17** is pinned and secured with the S-pivot section **1**,
– the auxiliary crane is removed.

Note

▶ The S-intermediate sections are pinned with the aid of the pin pulling device, see chapter 5.30!
▶ Support the S-intermediate section from below for easier assembly / disassembly!

WARNING

General danger notes!

▶ All pins are to be secured after assembly with the intended safety elements!

Pin the S-intermediate section **25** on the S-pivot section **1** “on top”:

▶ Attach the S-intermediate section **25** to the auxiliary crane and align on the S-pivot section **1**.
▶ When the pin bores on the S-pivot section **1** and on the S-intermediate section **25** “on top” (point **A**) align, illustration **11**:
Pin in the pin **22** from the inside to the outside and secure with linch pin **23**, illustration **11**.

Assemble the S-boom to the required length and pin and secure the intermediate section “on top” and “bottom”.

▶ Pin in the pin **22** from the inside to the outside and secure with linch pin **23**.

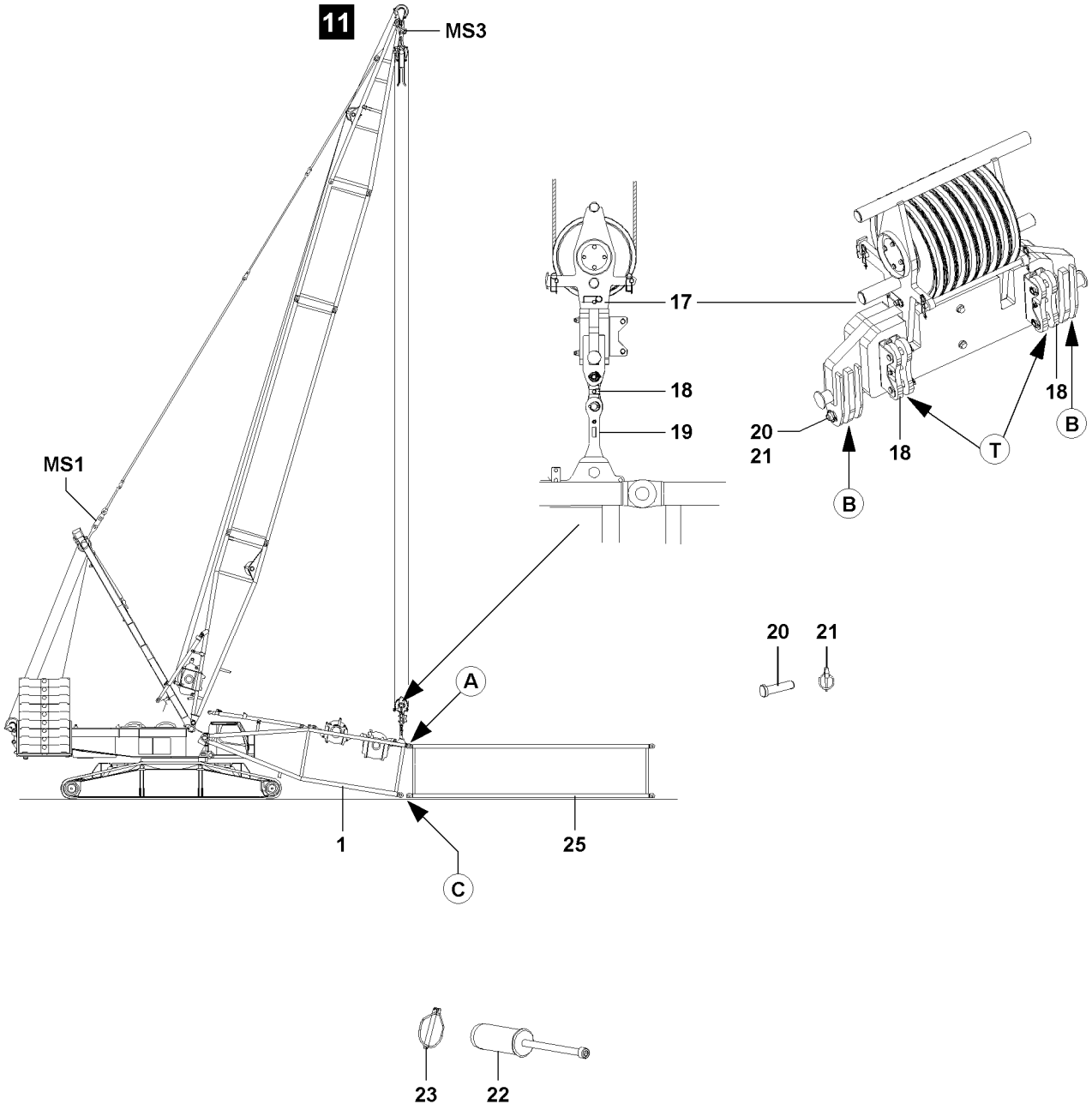
WARNING

The crane can topple over!

If the following conditions are not met, the crane can topple over or be significantly damaged!

Personnel can be severely injured or killed!

▶ During the “closing procedure” of the S-intermediate sections, the maximum permissible force of **146 t** on test point **MS1** may **not** be exceeded!
▶ During the “closing procedure” of the S-intermediate sections, the maximum permissible force of **90 t** on test point **MS3** may **not** be exceeded!
▶ The end section of the corresponding SL/S-boom combination may **not** lift off the ground during the “closing procedure”!



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Note

- The actual forces of test point **MS1** and the test point **MS3** - which are used during the closing procedure of the S-boom system - are shown on LICCON monitor 1!
- Note the actual forces of test point **MS1** and test point **MS3** and keep it ready for the disassembly of the S-boom system!
- At boom disassembly, “tension” the control rope of winch 3 until the noted actual forces of test point **MS1** and test point **MS3** on the LICCON monitor are reached, so that the connector pins of the S-intermediate sections can be unpinned!

- When the SL/S-boom combination is assembled to the desired length:
  Lift the S-pivot section **1** with the upper pulley block **17** until the pin bores on the “bottom” align at point **C**, illustration **11**.
- Pin in the pin **22** from the inside to the outside and secure with linch pin **23**, illustration **11**.

WARNING

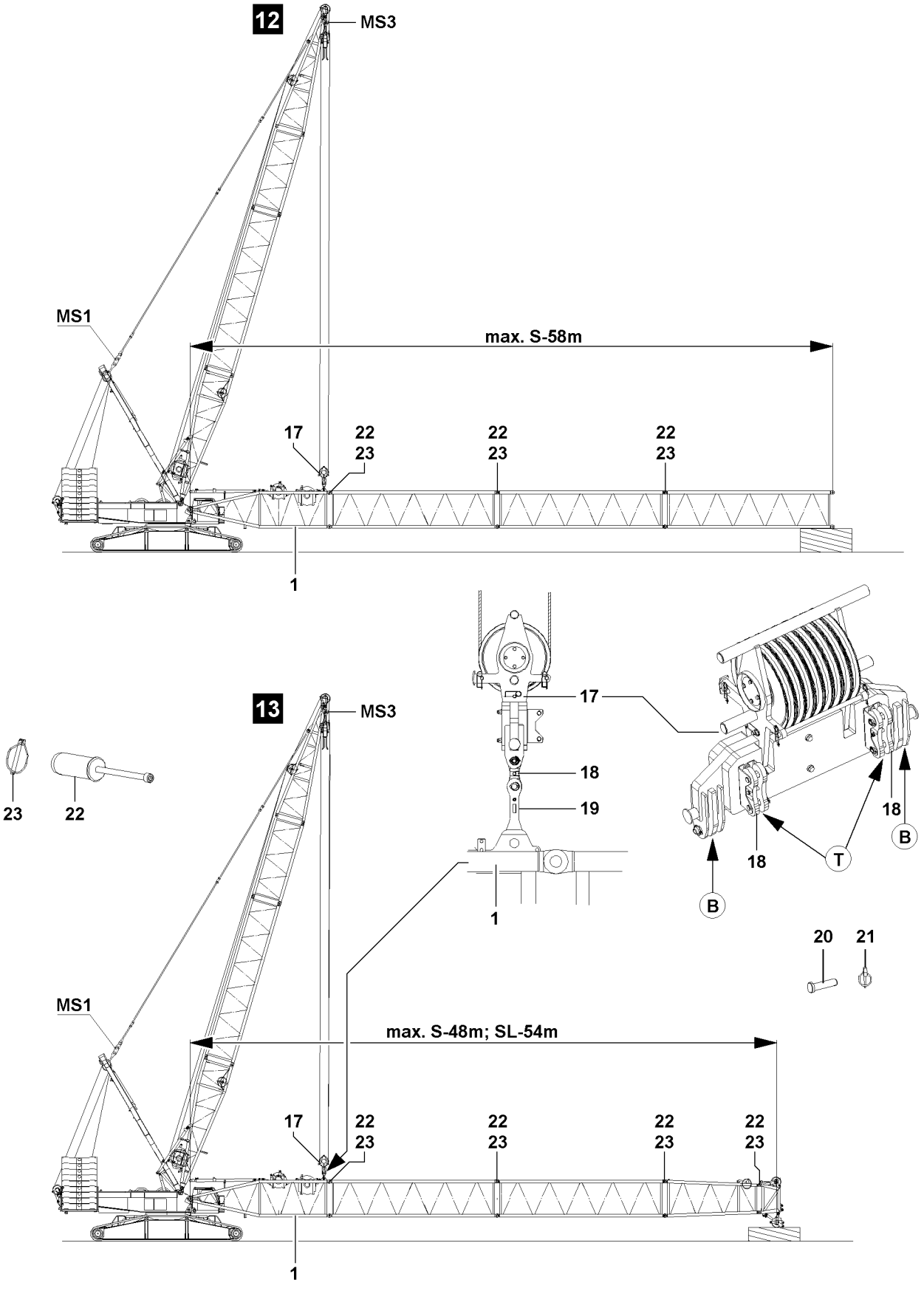
Mortal danger due to folding down of boom!

By unpinning the upper pulley block **17** on the assembly brackets **19**, the boom can suddenly fold down if the boom is not pinned at point **C** “on the bottom”.

Personnel can be severely injured or killed!

- It is prohibited for anyone to remain under the raised boom combination during the pinning / unpinning procedure!
- Unpin the upper pulley block **17** only when it is ensured that the S-pivot section **1** is pinned and secured “on top” and “bottom” with the S-intermediate section **25**.

- When the S-boom is “closed”:
  Unpin the lug **18** on the assembly bracket **19**: Release and unpin the pin **20**.
- Unpin the lug **18** on the upper pulley block **17**: Release and unpin the pin **20**.
- Pin and secure the lug **18** in transport position **T** on the upper pulley block **17**.


12
MS3
MS1
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1
18
B
18
T
B
20
21
MS1
max. S-48m; SL-54m
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22
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B106750

3.4 Assembling the SL/S-boom “flying mode”

If spatial prerequisites on the job site are limited for the assembly of the S-boom, or if they are limited by buildings or similar, then the S-boom can be assembled in “flying” mode.

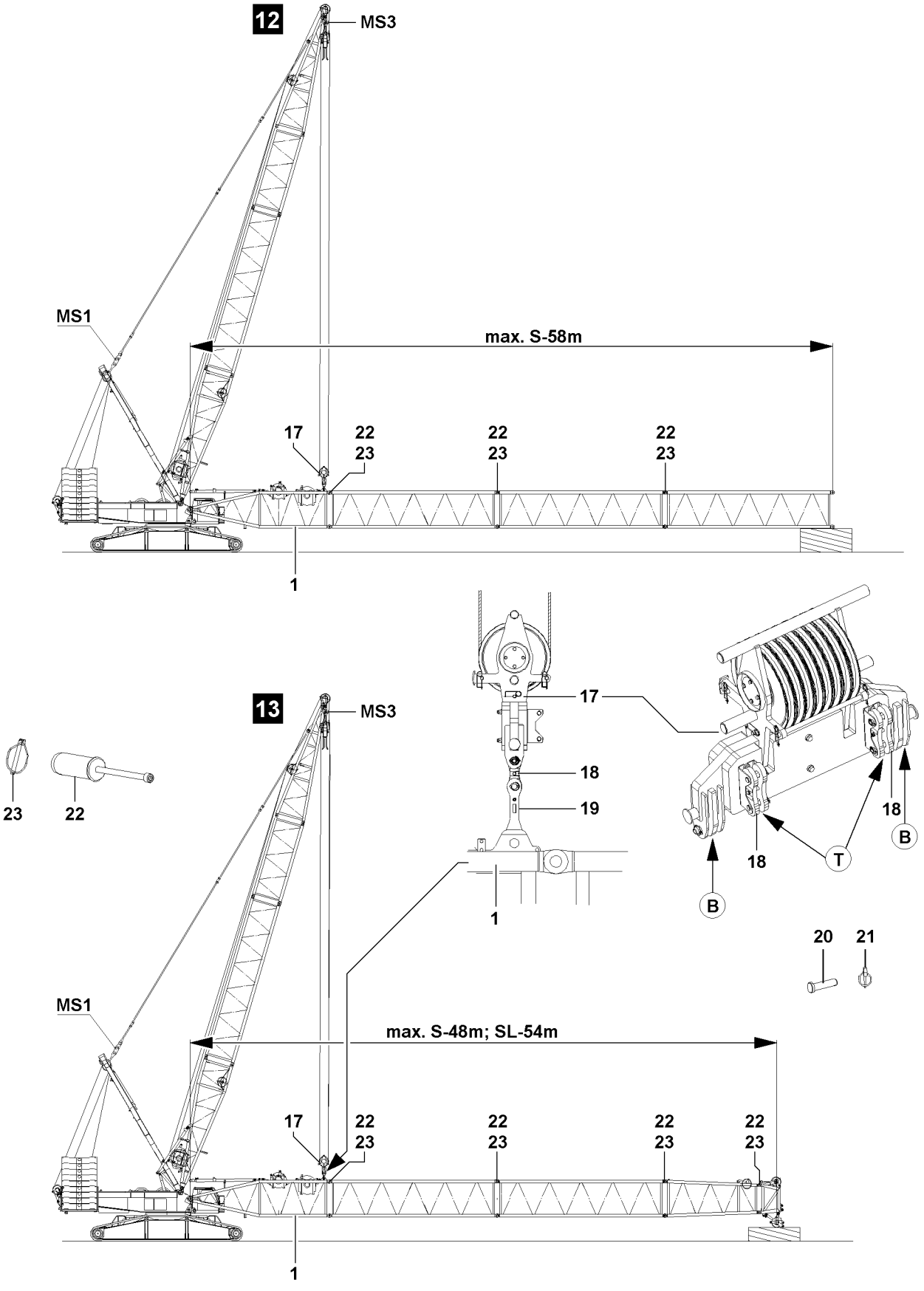
WARNING
General danger notes!
- ▶ Support the S-boom during assembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ For the “flying mode” boom assembly, the maximum permissible total force on the test point **MS1** and test point **MS3** may **not** be exceeded. The “actual force” is shown on LICCON monitor 1!
- ▶ The “flying mode” boom assembly is only permissible to certain system lengths!
- ▶ The maximum permissible system lengths may **not** be exceeded, refer to the following table!

Note
- ▶ The weights of the individual lattice sections including the corresponding guy rods are shown in chapter 5.03!

Maximum permissible system length for a maximum total force MS1 of 200 t and a maximum total force MS3 of 138 t					
Boom system	**Maximum system length**	**Equipment**	**DB_{min} 1)**	**ZB_{min} 2)**	**Illustration**
SL(D)	54.0 m		150 t	65 t	13
	60.0 m	- with reducer section - without head	150 t	65 t	12
S(D)	48.0 m		150 t	65 t	13
	58.0 m		150 t	65 t	12
	66.0 m	- without reducer section - without head	150 t	65 t	12

1) This counterweight must be at least installed on the turntable for “flying assembly”.
2) This central ballast must be at least installed on the crawler center section for “flying assembly”.


12
MS3
MS1
max. S-58m
17
22
23
22
23
22
23
1
13
MS3
23
22
17
18
19
1
18
B
18
T
B
20
21
MS1
max. S-48m; SL-54m
17
22
23
22
23
22
23
22
23
1

B106750

3.4.1 Assembling the S-intermediate section in “flying mode” on the S-pivot section

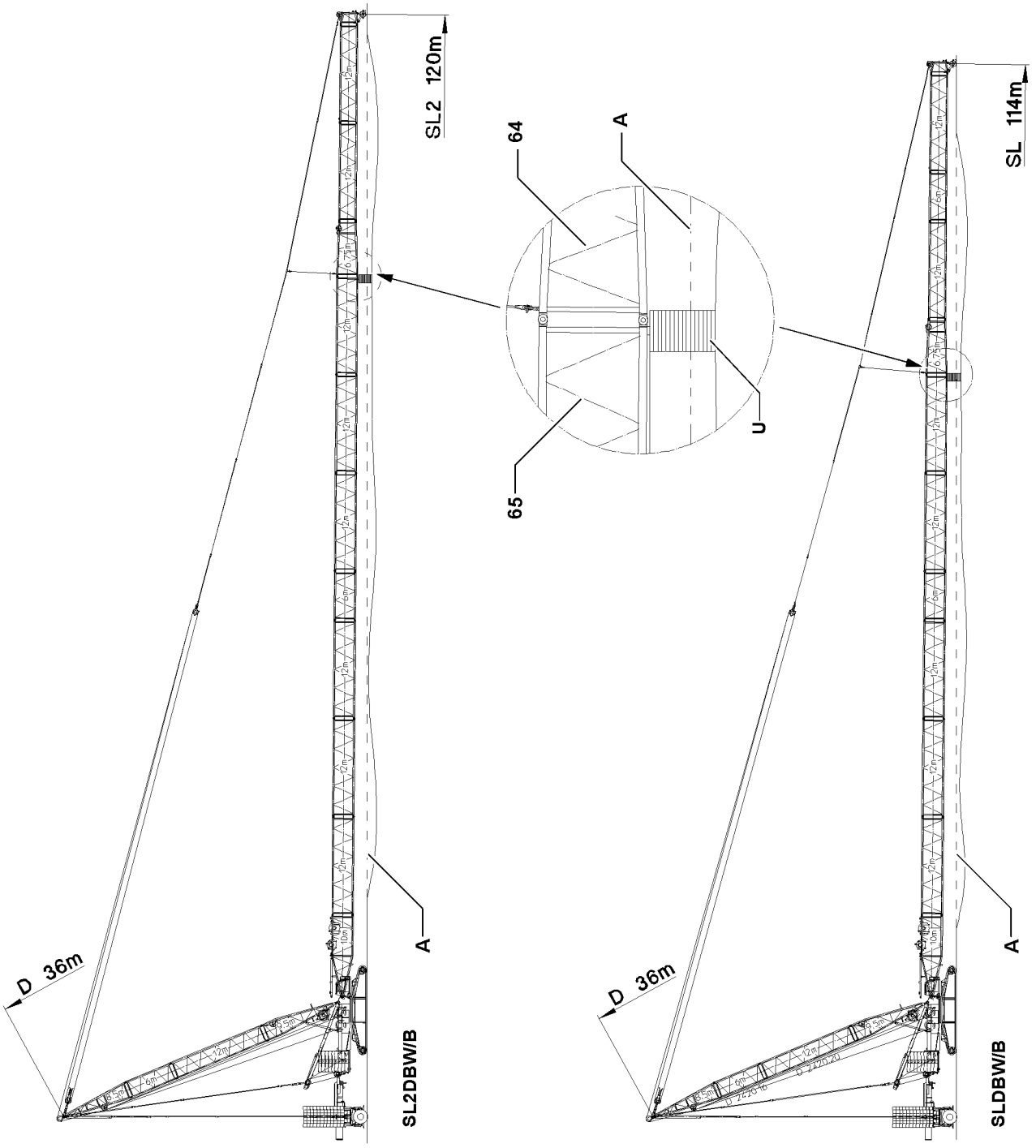
In “flying” assembly, the intermediate sections can be pinned and secured with the auxiliary crane individually or as a preassembled unit on the pivot section.

WARNING
Impermissible boom lengths!
If impermissible boom lengths are installed on the crane, significant property damage can occur on the crane!
Personnel can be severely injured or killed!
- ▶ The maximum permissible boom lengths for the “flying assembly” may not be exceeded!
- ▶ The data in the erection and take down charts as well as the load charts must be observed!

Make sure that the following prerequisites are met:
- – the S-pivot section is pinned and secured on the turntable,
- – the S-pivot section is horizontally tensioned,
- – a minimum of 150 t counterweight is placed on the turntable,
- – a minimum of 65 t central ballast is installed on the crawler center section,
- – an auxiliary crane is available.

WARNING
Falling components!
If unsecured or non-supported components are installed or removed, they can fall down!
Personnel can be severely injured or killed!
- ▶ During pinning and unpinning of the intermediate sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
- ▶ Before unpinning: support crane components and boom.
- ▶ Secure the pins in the bearing points and in the receptacles.
- ▶ It is prohibited to lean a ladder against the crane section which is being disassembled!

- ▶ Attach the S-intermediate sections or preassembled boom unit on the auxiliary crane.
- ▶ Lift the S-intermediate sections or the preassembled boom unit with the auxiliary crane and position on the S-pivot section **1**.
- ▶ When the pin points between the S-pivot section **1** and the S-intermediate section **or** the S-pivot section **1** and pre-assembled boom unit align on “top” and “bottom”:
  Pin the pins **22** “on top” and “bottom” and secure with linch pins **23**.
- ▶ When the pins between the S-pivot section **1** and the S-intermediate section **or** the S-pivot section **1** and pre-assembled boom unit are properly pinned and secured “top” and “bottom”:
  Place the boom on the supporting base.
- ▶ Remove the auxiliary crane.
- ▶ When the boom is safely placed on the supporting base:
  Unpin the lug **18** on the assembly bracket **19**: Release and unpin the pin **20**.
- ▶ Unpin the lug **18** on the upper pulley block **17**: Release and unpin the pin **20**.
- ▶ Pin and secure the lug **18** in transport position **T** on the upper pulley block **17**.



B108931

3.5 Assembly of the SL/SL2-boom combination with supporting base

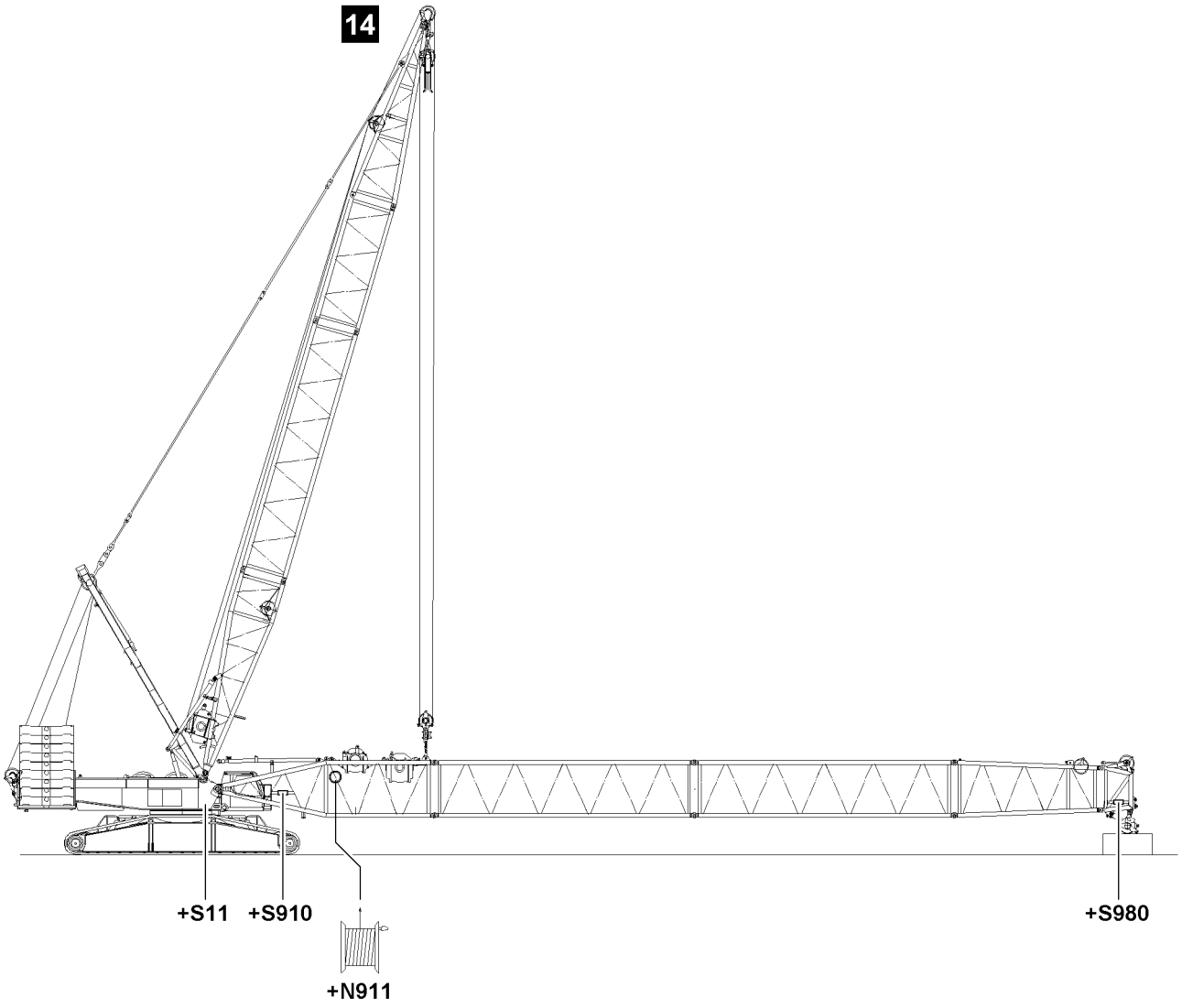
NOTICE
Overload of boom!
If the SL2-boom or the SL-boom is not supported before the erection procedure, then the boom will be overloaded! The crane will be damaged!
- ▶ For boom lengths SL2 larger than 120 m, a support must be used!
- ▶ For boom length SL, a supporting base of more than 114 m must be used!
- ▶ Support the boom with suitable material of sufficient load bearing capacity!

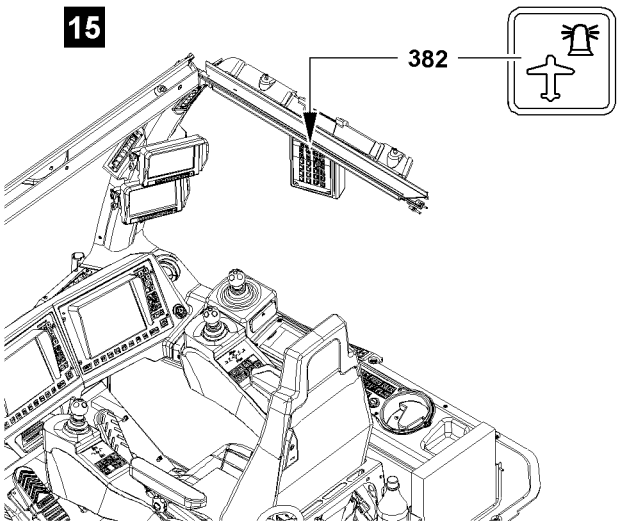
Note
- ▶ The alignment level **A** is the placement level of the crane!

The SL/SL2-boom combination - consisting of a S-pivot section and S-intermediate sections, reducer section and the LI-intermediate section should be preassembled at a suitable location. The pre-assembled S/SL2-boom combination must be swung towards the turntable with an auxiliary crane and pinned and secured in position at that location.
- ▶ Pre-assemble the SL/SL2-boom combination.
- ▶ Swing the preassembled SL/SL2-boom combination with the auxiliary crane in to the turntable.
- ▶ Pin and secure the S/SL2-boom combination to the S-pivot section on the turntable.

Note
- ▶ The boom combination must be supported from below on the last intermediate section **65** before the reducer section **64** to the height of the alignment level **A**, see illustration!

- ▶ Make sure that the upper edge of the base support **U** is 2 m above the alignment level **A**.
- ▶ Place the SL/SL2-boom combination on the supporting base **U**.





B106751

3.6 Establishing the electrical connections

NOTICE
Damage to the electrical connection on the cable drum!
If the electrical connection from the cable drum on the S-pivot section to the terminal box on the S-pivot section is established first before the connection to the terminal box on the S-end section, the electrical connection can be damaged when spooling out the cable drum!
▶ Establish first the electrical connection from the cable drum in the S-pivot section to the terminal box on the S-end section and then the electrical connection from the terminal box in the S-pivot section to the cable drum!

Note
▶ To establish the electrical connections on the S-boom, use the separate electrical wiring diagram.

Ensure that the following prerequisite is met:
– the S-boom is completely assembled,
– the airplane warning light and the wind speed sensor are assembled.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.

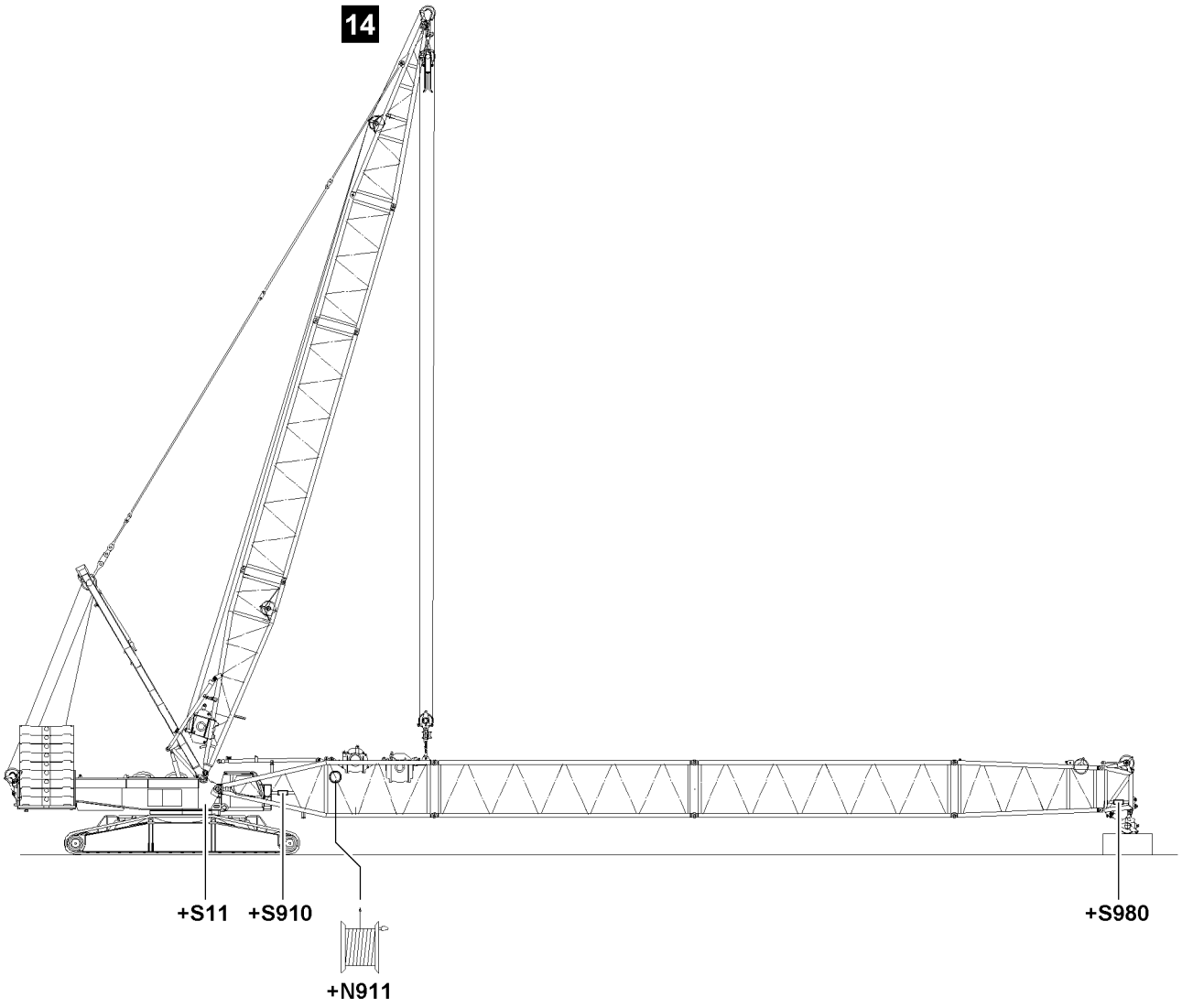
3.7 Function check

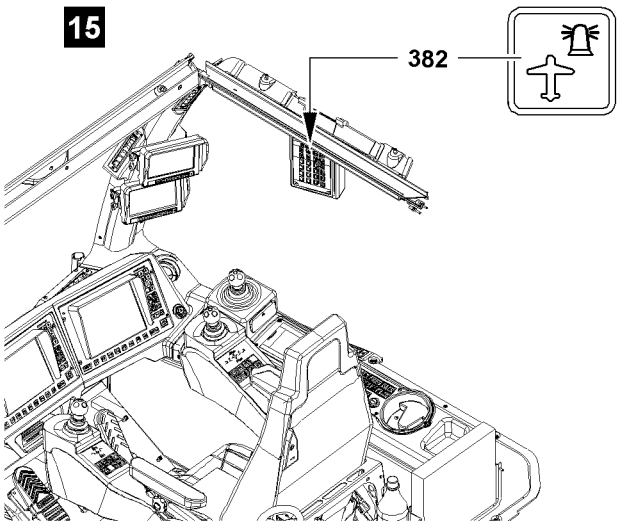
WARNING
Non-functioning safety devices!
If the function of the safety devices is defective, personnel can be severely injured or killed!
▶ Crane operation with non-functioning safety devices is **prohibited**!

Note
▶ The function of the individual limit switches must be checked before erection of the boom system!
▶ The function of the limit switch initiators must be checked in the test system, see separate “Diagnostics” manual.

Note
▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact LIEBHERR Service.

Make sure that the following prerequisites are met:
– all electrical connections have been made,
– the crane engine is running,
– the corresponding operating mode is set on the LICCON monitor,
– the actuator levers of the limit switches have been checked for easy movement and are lubricated.





B106751

3.7.1 Wind speed sensor

▶ Test the movement and the function of the wind speed sensor.

3.7.2 Airplane warning light

▶ Turn on the airplane warning light on with the switch **382**.

▶ Check the function visually.

3.7.3 Hoist limit switch

▶ Actuate the hoist limit switch manually on the pulley head.

Result:

– The hoist winch turns off in upward movement.
– The hoist top icon on the LICCON monitor 0 blinks.
– The hoist limit switch is functioning.

3.7.4 Check the limit switch S-boom “steepest position”

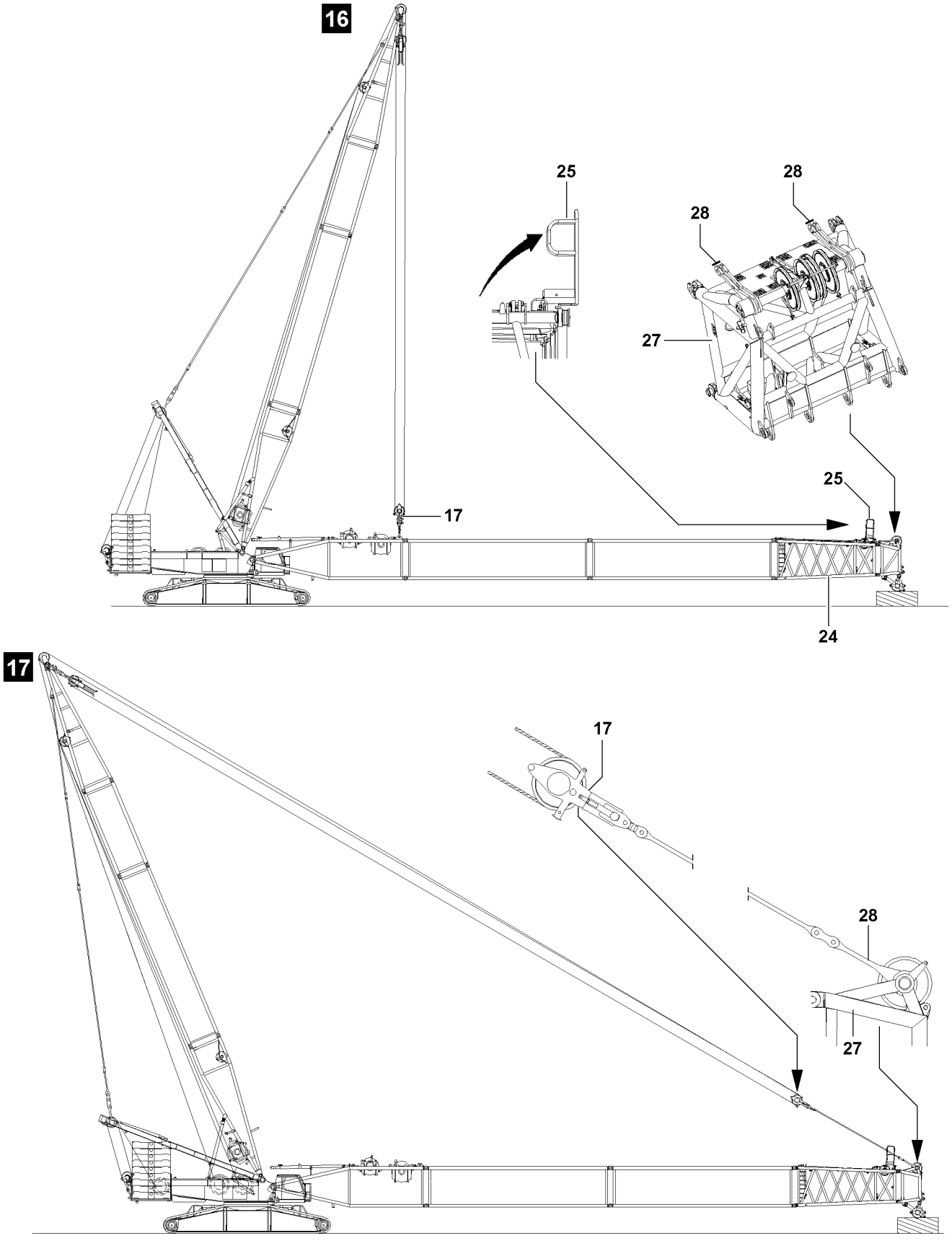
Note

▶ The limit switch functions have to be checked individually before erection!

▶ Cover the limit switch initiators on the S-relapse cylinder individually with a metal plate.

Result:

– The hoist limit switch is actuated manually.
– The spool up function of winch 4 turns off.
– The icon “boom limitation” appears on the LICCON monitor 0.
– The limit switch is functioning.



B106752

3.8 Assembling guy rods

WARNING
Inspection and maintenance on guy rods not carried out!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also chapter 8.15.

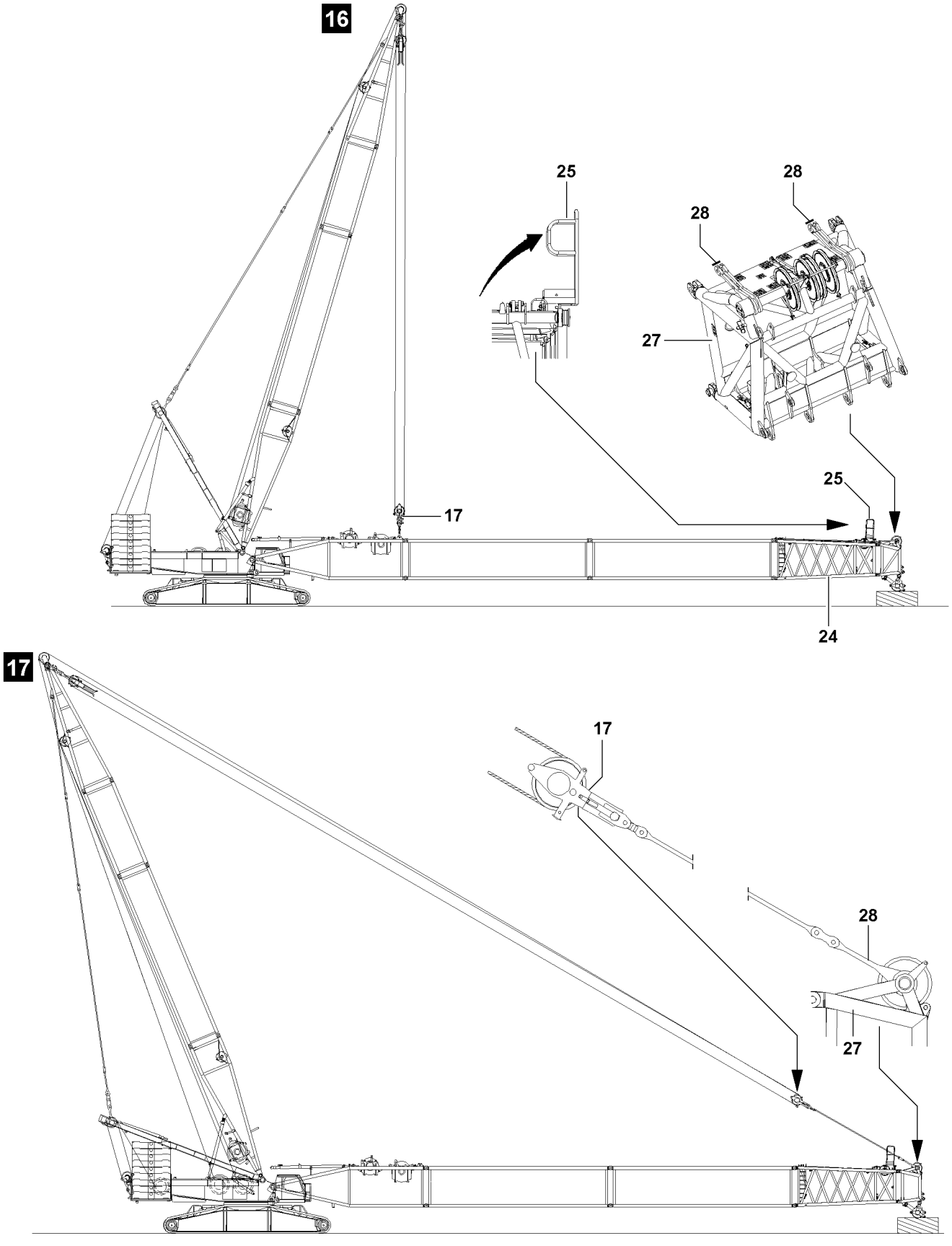
Note
▶ The guy rods must be installed and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

Make sure that the following prerequisites are met:
– the S-boom is completely assembled,
– all lattice sections are properly pinned with each other,
– all pin connections have been secured,
– the upper pulley block **17** is unpinned on the S-pivot section,
– the folding pedestals **25** on the SL-reducer section **24** are folded and secured “upward” in operating position.

▶ Luff the D-boom down to the front.
▶ Lower the upper pulley block **17** to the boom: Spool out winch 3.

The guy rods are placed and secured for transport on the corresponding intermediate sections. Before assembly, the transport retainers must be released.
▶ Release the transport retainers on the guy rods.

NOTICE
Danger of property damage!
If the pins of the guy rods are not pinned from the “inside” to the “outside”, the hoist rope can scrape on the ground and be damaged!
▶ Always pin in the pins of the guy rods from the “inside” to the “outside”.
▶ Pay attention to the special rod plan!



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Note

▶ The guy rods of the S-intermediate sections are pinned and secured together starting from the lugs **28** on the fixed point of the S-end section.

▶ Pin and secure the guy rods for the intermediate sections according to the separate rod plan.

▶ Pin and secure the guy rods with the upper pulley block **17**.

Note

▶ The S-boom must remain on the ground when erecting the D-boom and may **not** be pulled up along!

▶ When the guy rods are pinned and secured with the upper pulley block **17**:
Erect the D-boom to operating position and at the same time, spool out winch 3.

▶ When the D-boom has reached the operating position:
Tension the guying between the D-boom and the S-boom, see illustration **17**.

WARNING

The boom can suddenly fold down!

If the following notes are not observed, the boom can suddenly fold down when the auxiliary boom or the supporting base is removed!

Personnel can be severely injured or killed!

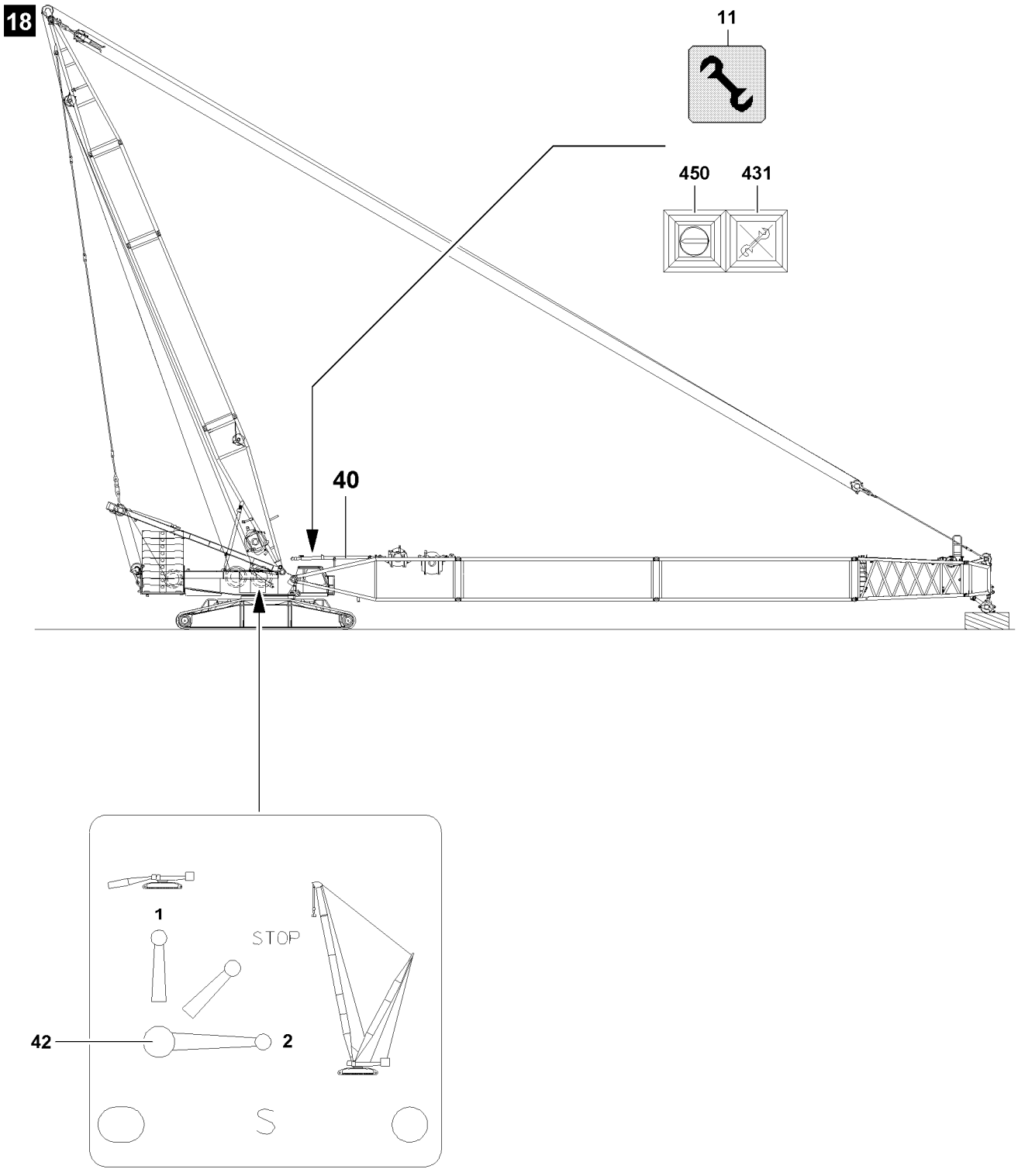
▶ Remove the auxiliary boom or the supporting base only if it is ensured that the D-boom is in operating position and he S-boom is safely being held by the guying!

▶ Remove the auxiliary crane on the S-boom head.

or

■ Remove the supporting base.

▶ Guide the hoist rope over the rope pulley(s) on the S-boom head, see separate reeving plans.

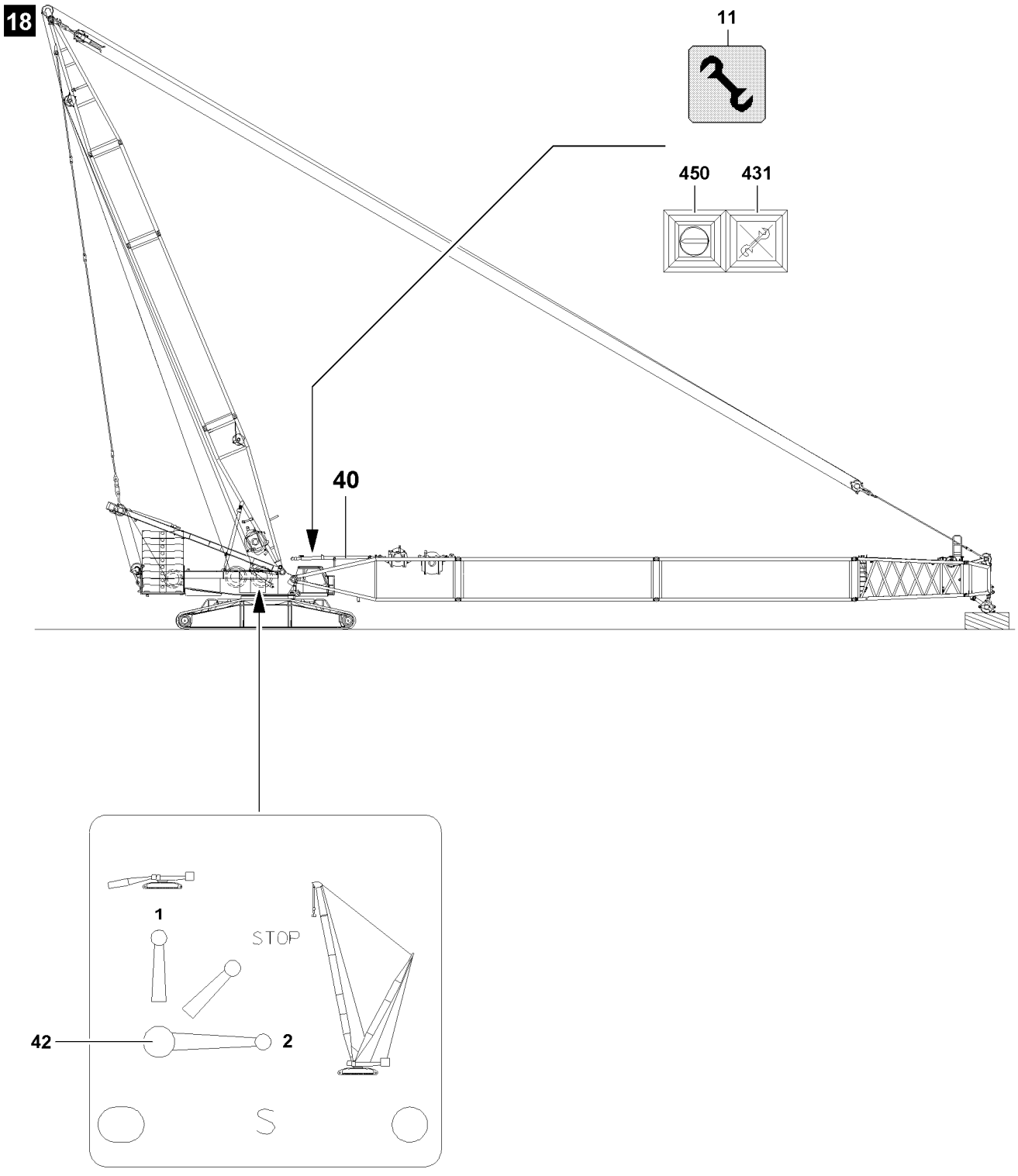


B106754

3.9 Erecting the boom

WARNING
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Extend the S-relapse cylinders before erecting the S-boom combination!

Make sure that the following prerequisites are met:
- – the crane is aligned in horizontal direction,
- – all electrical connections have been made,
- – all limit switches are functioning,
- – the counterweight has been installed to the turntable according to the load chart,
- – all pin connections have been secured,
- – the hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins,
- – there are no loose parts on the boom,
- – the LICCON overload protection has been adjusted according to the data in the load chart,
- – the LICCON overload protection settings have been compared with the actual crane configuration,
- – no personnel is within the danger zone,
- – the assembly key button **450** is actuated,
- – the indicator light **431** “Assembly” lights up,
- – the assembly icon **11** on the LICCON monitor 0 lights up.



B106754

3.9.1 Extend the S-relapse cylinder

NOTICE
Damage of the relapse cylinder!
By extending the S-relapse cylinder, a collision with the D-relapse cylinders can occur!
This can result in severe damage on the relapse cylinders!
▶ Extend the S-relapse cylinders only when the D-boom is in operating position!

WARNING
The crane can topple over!
If the S-relapse cylinders are not extended before erecting the boom, then the boom can fall to the rear in crane operation and the crane can topple over!
Personnel can be severely injured or killed!
▶ Extend the S-relapse cylinders before erecting the S-boom!
▶ Secure the ball cock **42** during crane operation to prevent inadvertent actuation!

Ball cock positions	
2	Crane operation, extend the piston rod
1	Assembly, retract the piston rod
STOP	The piston rod cannot be retracted / extended

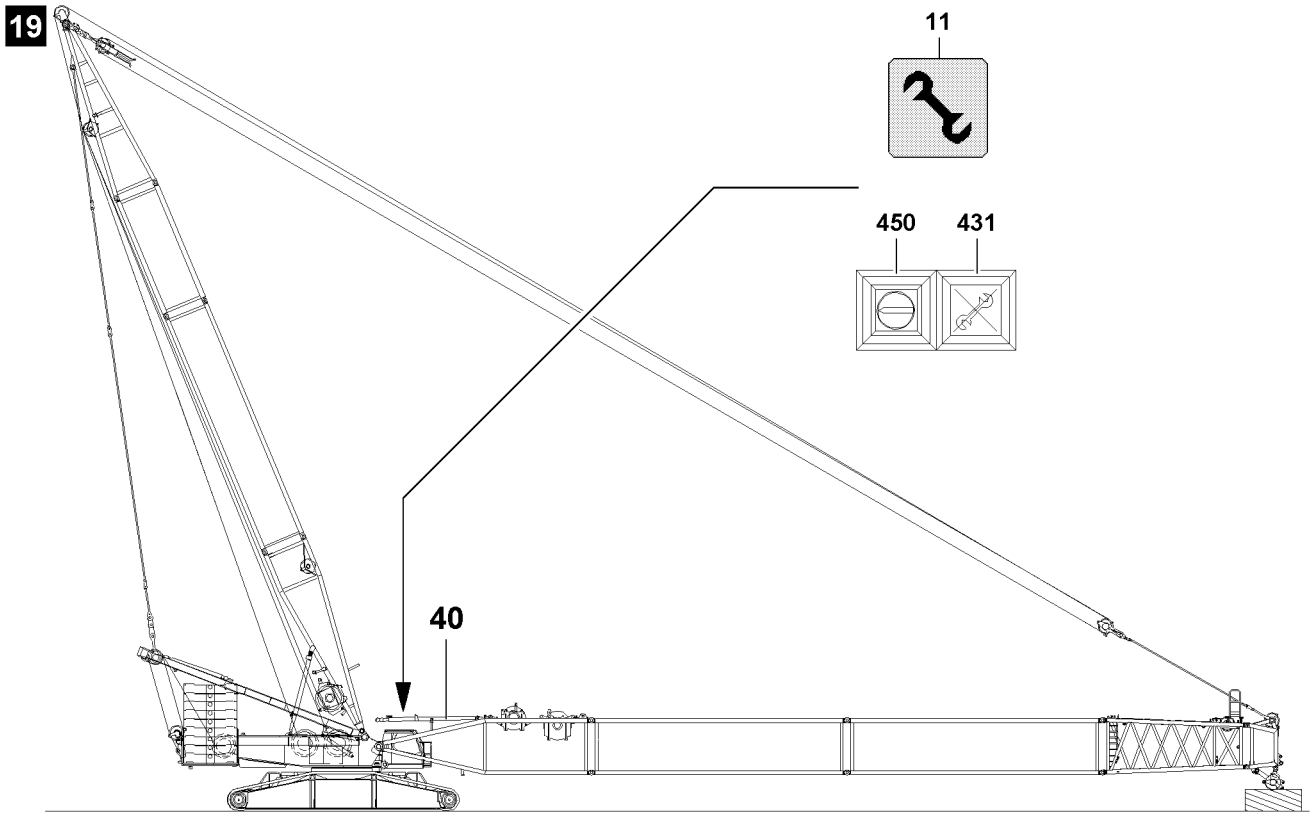
Ensure that the following prerequisite is met:
– all hydraulic connections have been made.

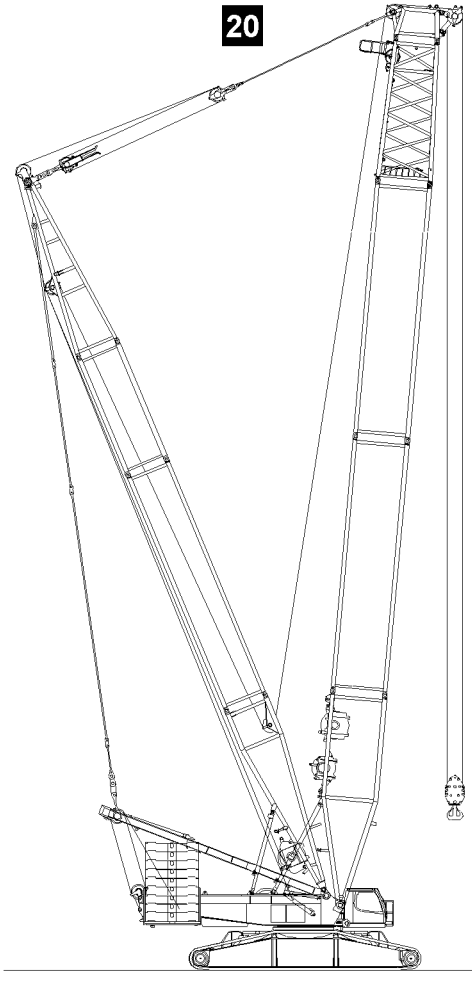
▶ Set the ball cock **42** to Position **2**.

Result:
– The piston rods of the S-relapse cylinders **40** extend.

Note
▶ The ball cock **42** is secured by closing the cabinet door and removing the key!

▶ When the piston rods of the S-relapse cylinders **40** are fully extended:
Close the cabinet door and pull the key.
▶ Hand the key to an authorized person.





B106755

3.9.2 Erection procedure

DANGER
The crane can topple over!
- ▶ It is prohibited to turn the crane superstructure while erecting the boom!
- ▶ Observe the data in the erection and take down charts!

Ensure that the following prerequisite is met:
– the boom has been lifted off the ground.

Reeving in the hook block

- ▶ Erect the boom until the end section lifts off the ground.

WARNING
Falling hoist rope!
If the hoist rope is not reeved with the respective length over the S-boom before the erection procedure, then it can fall backward due to its own weight.
Personnel can be severely injured or killed!
- ▶ Reeve the hoist rope before the erection procedure with sufficient length on the D-boom!
- ▶ The hoist rope must be constantly monitored during erection!
- ▶ Do not step into the danger zone!

- ▶ Reeve in the hoist rope properly and secure on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.

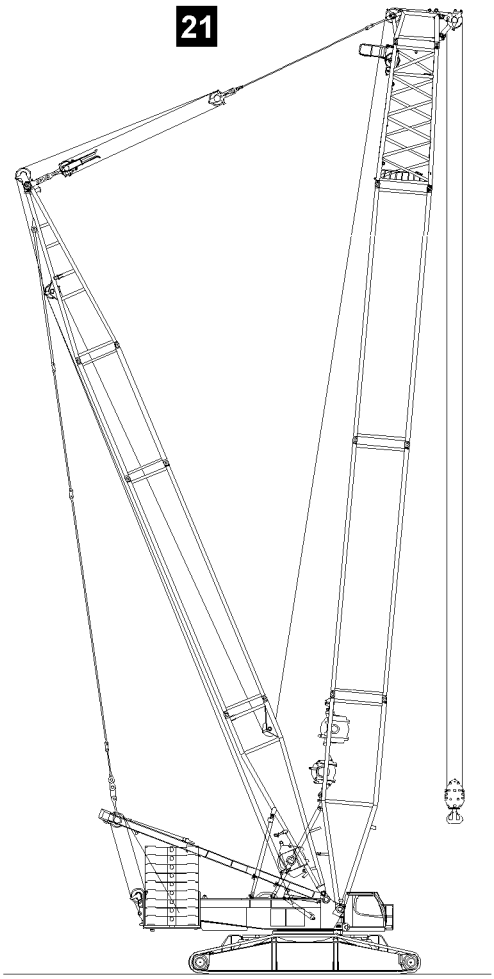
Erecting the boom

DANGER
The crane can topple over!
In crane operation with bypassed safety devices, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ When the lowest operating position of the boom is reached, turn off the assembly key button **450** immediately.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

Note
- ▶ When the lowest operating position of the boom is reached, the displays turn off.
- ▶ In the “Maximum load” icon appears a load number in “t” instead of the display “???”!

- ▶ Luff the boom up to the lowest operating position.
- ▶ When the boom has reached the lowest operating position:
  Turn the assembly key button **450** off: Press the button **431**.

Result:
– The LICCON overload protection is active.
– The indicator light **431** turns off.
– The assembly icon **11** on the LICCON monitor turns off.
– The acoustical signal turns off.
– The three color light lights up green.
– The warning lights on the rear of the turntable are off.



B106831

4 Operating the crane

4.1 Preparing for crane operation

Note

▶ Observe the notes in chapters 4.02, 4.05, 4.08 and 5.01!

Make sure that the following prerequisites are met:

– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **450** has been turned off by pressing the button **431**.

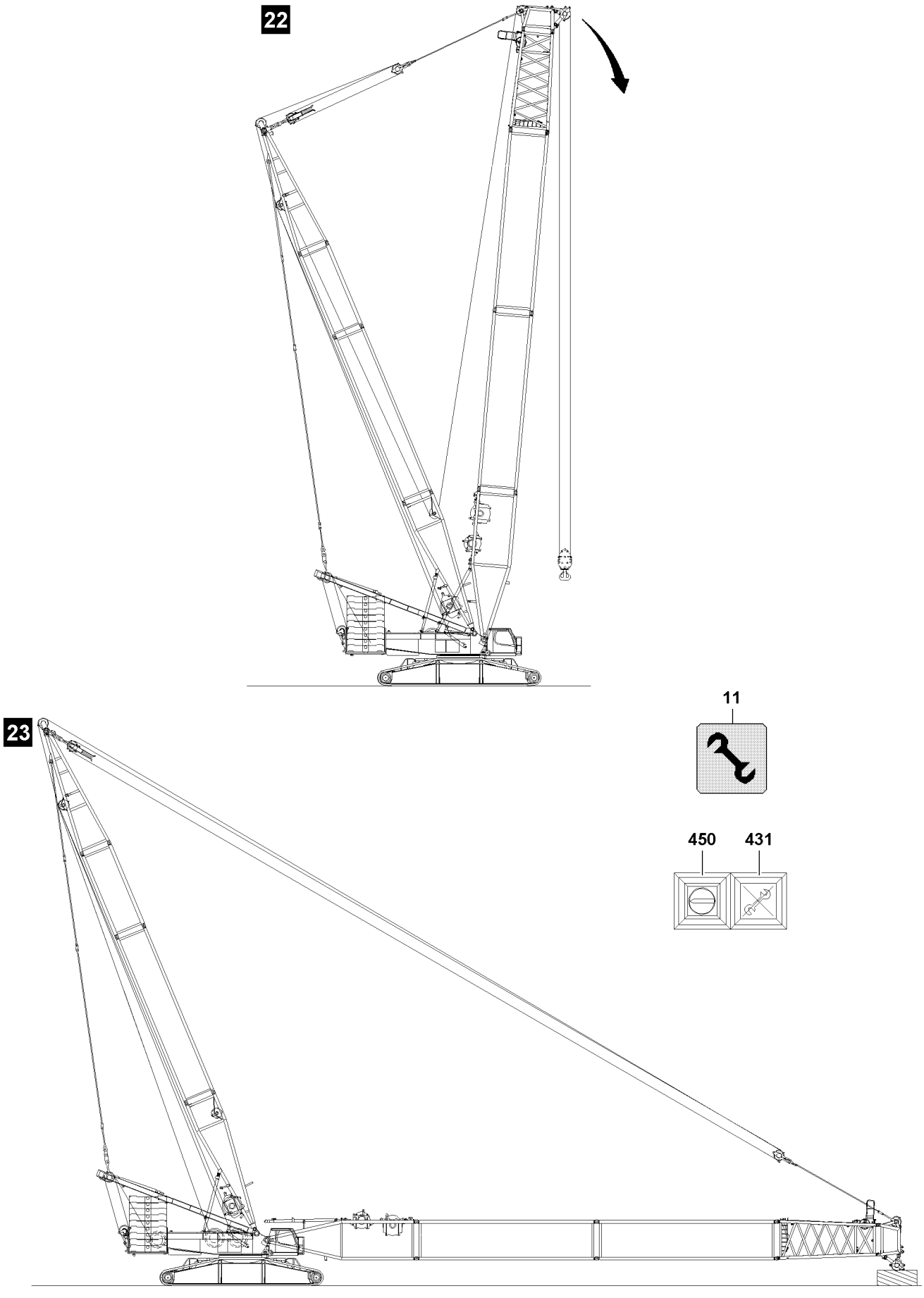
WARNING

The crane can topple over!

▶ Check the horizontal position of the crane before and during crane operation!
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation!

4.1.1 Checking the settings

▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the limit switches “boom steep” on the relapse cylinders.



B106832

5 Disassembling the SLD/SD-boom

Note

▶ The disassembly is described on the example of the S-boom!

WARNING

Risk of falling!

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

- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see “chapter 2.04”!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

WARNING

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel!

- ▶ Unpin or pin both pins at the same horizontal level, i.e. **left and right**!
- ▶ Do not stand under the lattice sections or within the complete danger zone during the pinning and unpinning procedure of the boom!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being disassembled!

WARNING

Danger of crushing!

When assembling crane components, limbs can be crushed or even severed due to oscillation of components!

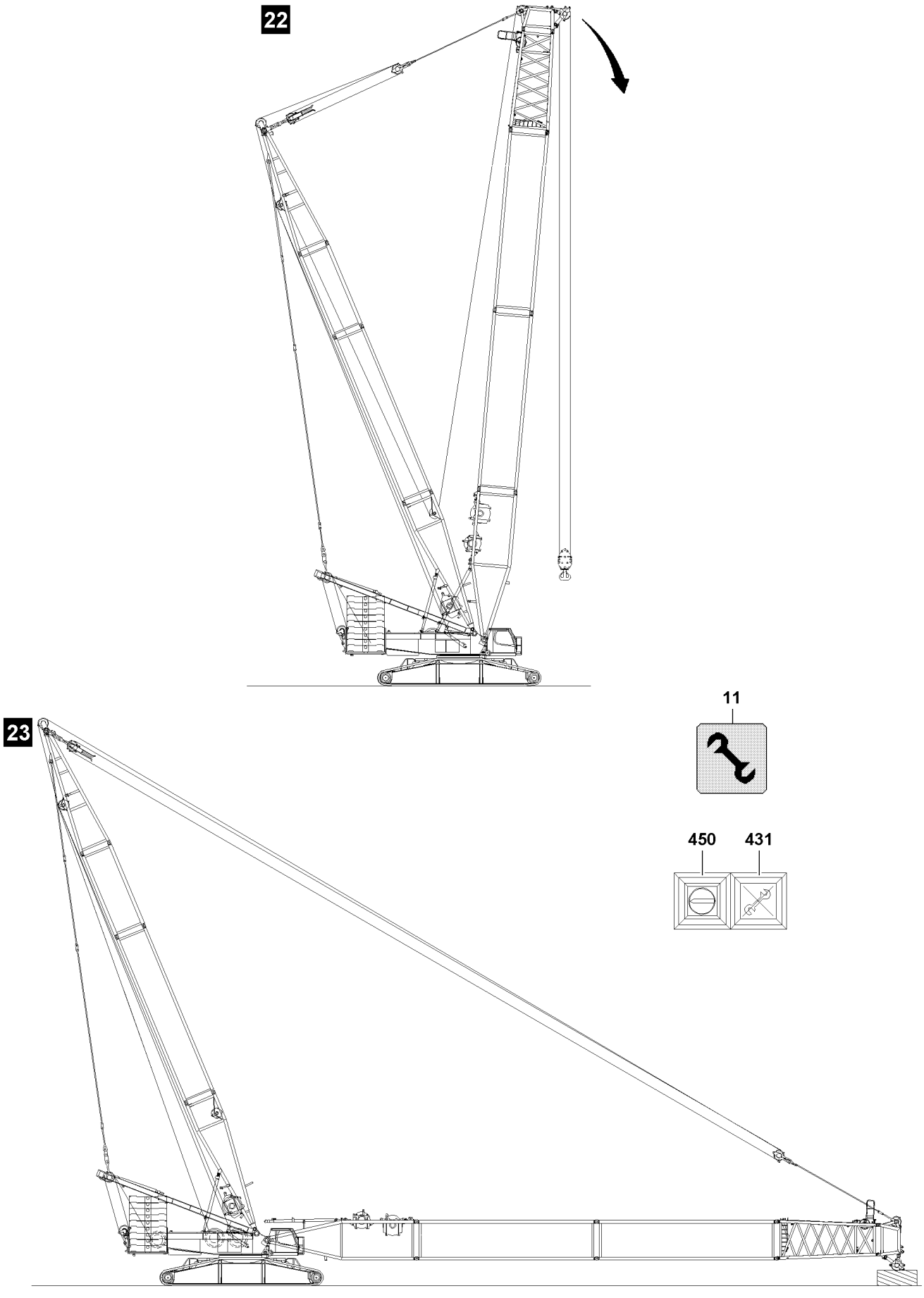
- ▶ Make sure that the component do not swinging back and forth during assembly!

DANGER

The components can fall down!

If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel!

- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured!


22
23
11
450
431
B106832

5.1 Taking the S-booms down

WARNING
The crane can topple over!
If the following conditions are not met before taking down the S-boom, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

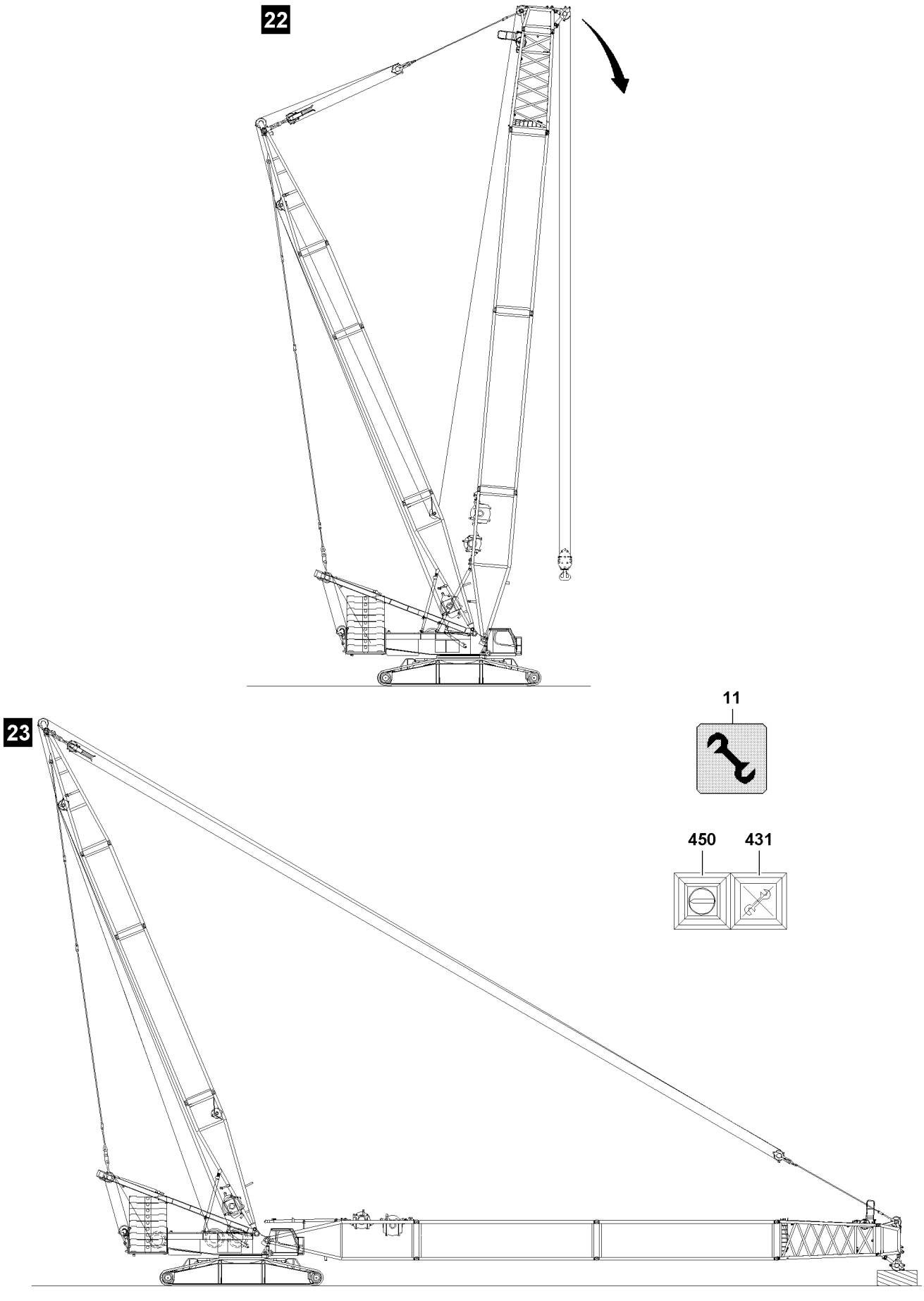
NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head.
Boom components can be severely damaged!
- ▶ Luff the boom system down at the same time and spool the hoist winch out!
- ▶ When luffing the boom system down, the D-boom must remain in operating position until the S-end section is laying on the ground or on a supporting base.

Note
- ▶ The luff down movement is turned off as soon as the lowest operating position of the S-boom is reached!
- ▶ When the lowest operating position of the S-boom is reached, the load display in the “Maximum load” icon turns off and instead of the load display appears the display “???”.
- ▶ In the crane operating screen appear alarm functions!

- ▶ Luff the boom down to the **lowest** operating position.

Result: The following alarm functions become active:
– “STOP”
– “Horn” and acoustical signal

WARNING
Crane operation with added assembly key button!
- ▶ The actuation of the assembly key button **450** is only permitted for assembly tasks!
- ▶ The assembly key button **450** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **450** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **450** turned on is strictly prohibited!
- ▶ The assembly key button **450** must be removed immediately after carrying out the assembly work and handed to an authorized person!



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▶ Actuate the assembly key button **450**.

Result:

– The LICCON overload protection is deactivated.
– The indicator light in the button **431** lights up.
– The assembly icon **11** in the LICCON monitor blinks.
– The “STOP” icon on the LICCON monitor blinks.
– An acoustical signal sounds.
– The three color light lights up red.
– The warning lights on the turntable light up red.

▶ At the same time, spool the hoist winch out and luff the S-boom down until the hook block touches the ground.
▶ Remove the hoist limit switch weight and unreeve the hook block.
▶ Luff the boom down until the boom head is laying on the support on the ground.

WARNING
Spooling up of hoist rope!
By spooling up the hoist rope, personnel can be severely injured or killed!
▶ All rope retaining pins / pipes on the S-boom are removed!
▶ Slowly spool up the hoist rope over the rope pulleys back to the winch!
▶ Make sure that no personnel is within the danger zone!

NOTICE
Overspooled winch!
If the hoist rope is pulled under the winch when spooling up, then the adjustment of the winch turn sensor is incorrect. A new adjustment by **LIEBHERR Service** is required!
▶ Stop the winch in time, with sufficient rope reserve!
▶ Do not overspool the winch!

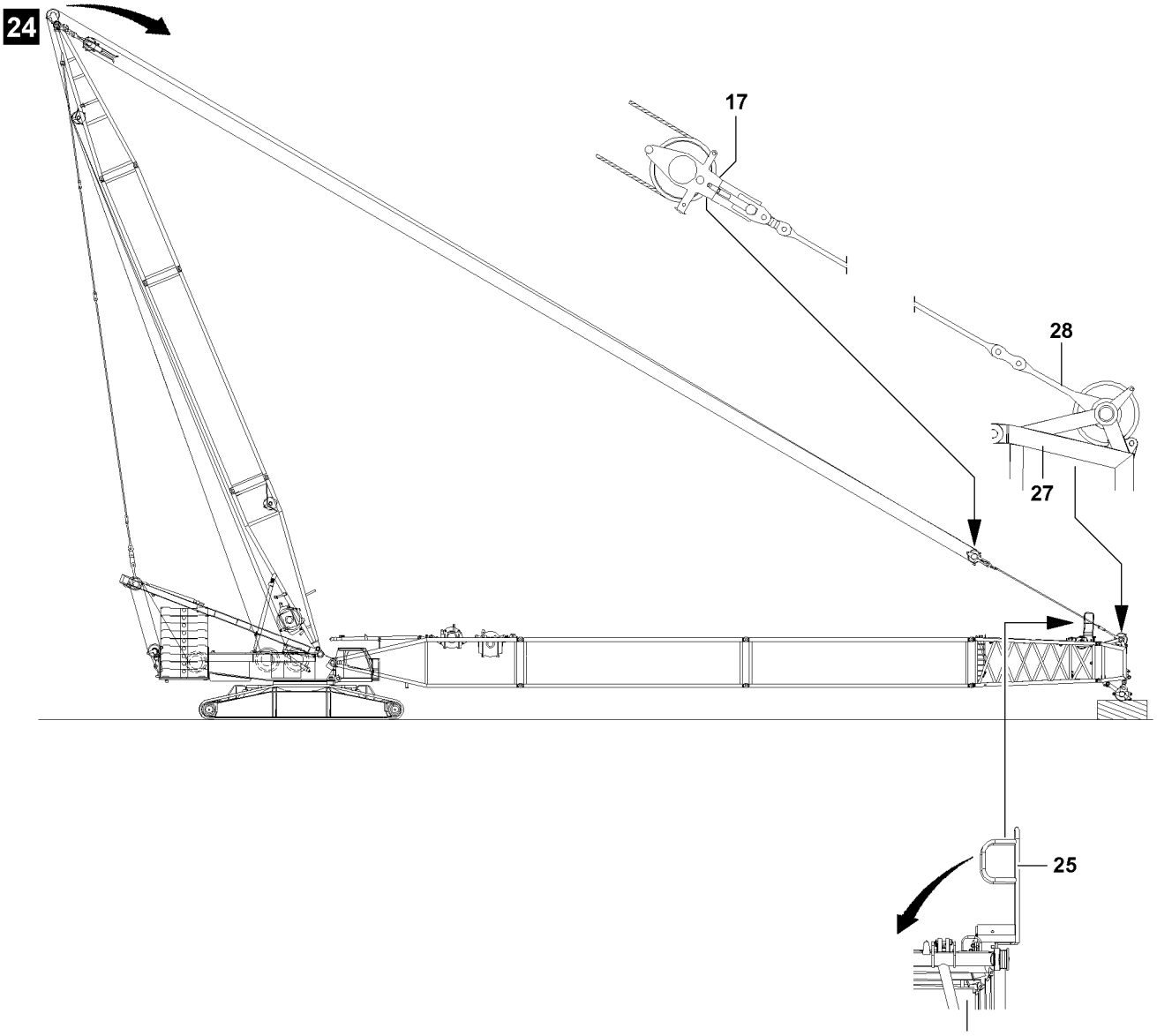
▶ Spool up the hoist rope.

5.2 Disconnecting the electrical connections

Ensure that the following prerequisite is met:
– the S-boom has been placed down.

NOTICE
Damage to cable drum or cable!
If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the S-end section, then the cable drum or the cable can be significantly damaged!
▶ Spool the cable drum up after unplugging!

▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.



B106833

5.3 Disassembling the guy rods and folding the folding pedestals in

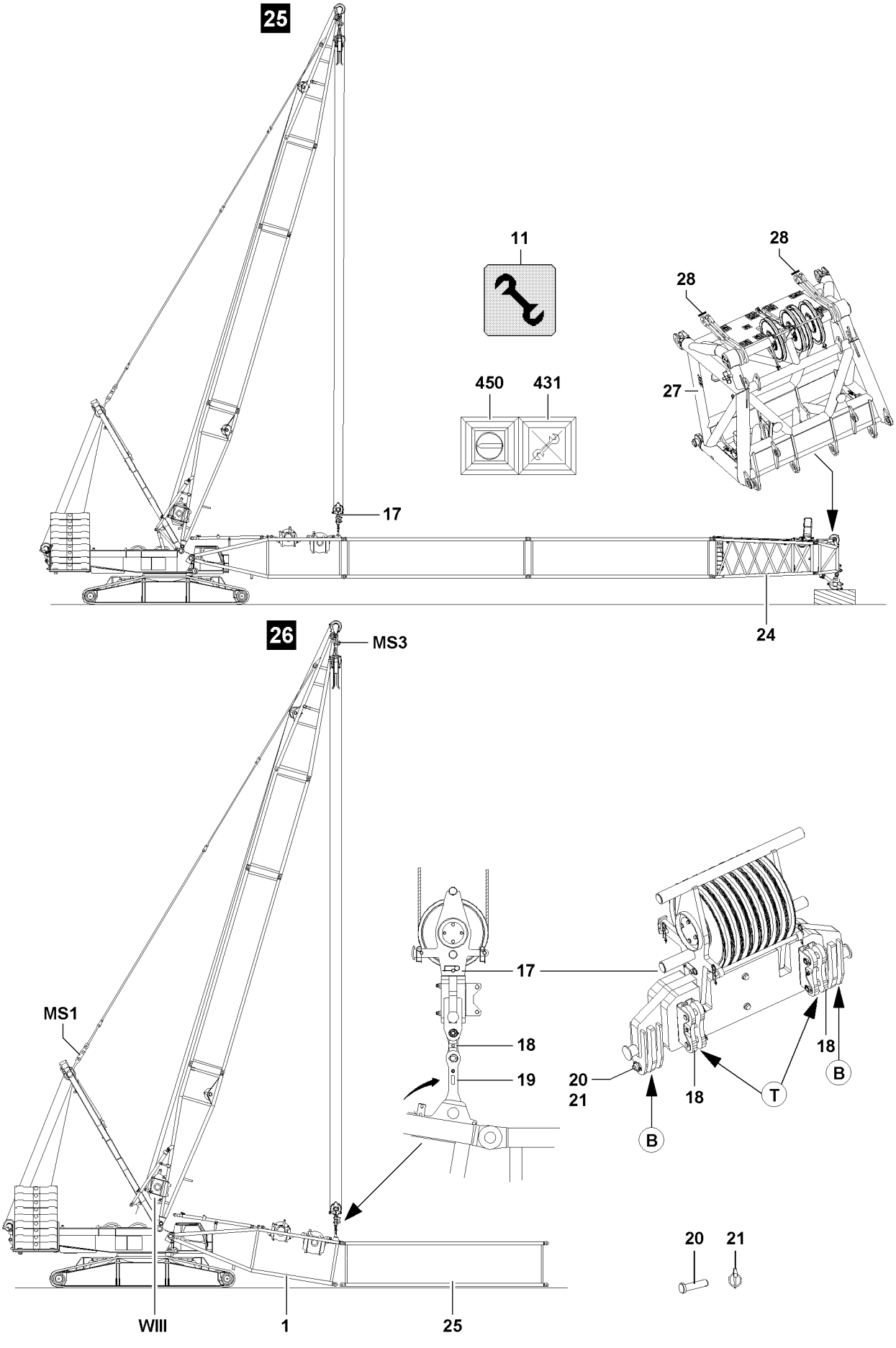
- ▶ Relieve the guying: Luff the D-boom down to the front and at the same time, spool out winch 3.
- ▶ When the guying is relieved:
  Unpin the upper pulley block **17** on the guy rods.
- ▶ Place the guy rods on the intermediate sections and secure with transport retainers.
- ▶ Disconnect the guy rods according to their association to the intermediate sections.

NOTICE
Damage to the intermediate sections!
- ▶ Do not pull the upper pulley block **17** over the intermediate sections, rather guide them with the auxiliary crane!

- ▶ When the guy rods are placed in the transport retainers and secured:
  Erect the D-boom and spool the hoist rope up at the same time.

Note
- ▶ To retain the system dimensions for on road travel the folding pedestals **25** must be folded in in transport position and be pinned!

- ▶ Bring the folding pedestals **25** into transport position with the auxiliary crane.
- ▶ Pin and secure the folding pedestals **25** into transport position.


25
11
28
28
27
450
431
17
24
26
MS3
MS1
17
18
19
20
21
18
18
B
T
B
20
21
WIII
1
25
B106834

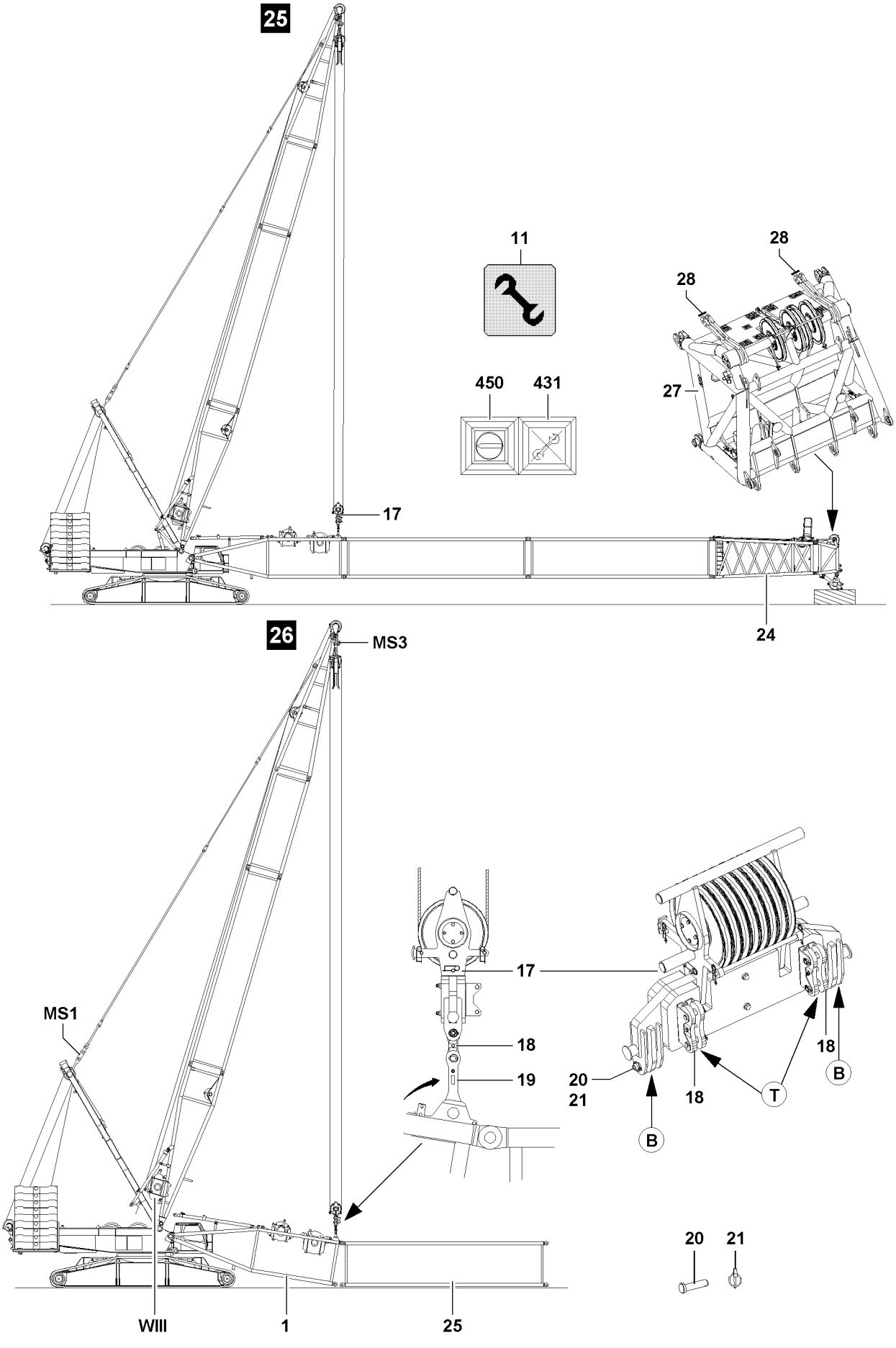
5.4 Disassembling the S-booms

WARNING
The boom can suddenly fold down!
If the following conditions are not met before disassembling the boom, the boom can fold down!
Personnel can be severely injured or killed!
- ▶ Support the S-boom during disassembly with suitable materials!
- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!

Ensure that the following prerequisite is met:
– all electrical connections have been separated,
– the guy rods have been disassembled and placed in the transport retainers,
– the folding pedestals are pinned and secured in transport position.

- ▶ Lower the upper pulley block **17** until it is over the assembly brackets **19** on the S-pivot section **1**.
- ▶ Pin and secure the upper pulley block **17** with the lugs **18** on the assembly bracket **19**.
- ▶ Use pin **20** and linch pin **21**.

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ The maximum permissible total force on test point **MS1** may **not** exceed **200 t** .
- ▶ The maximum permissible total force on test point **MS3** may **not** exceed **138 t** .
- ▶ Lifting the following boom lengths is permissible if the maximum permissible total force on test point 1 (MS1) and test point 3 (MS3) is noted, observe the following charts!


25
11
28
28
27
450
431
17
24
26
MS3
MS1
17
18
19
20
21
18
18
B
T
B
20
21
VIII
1
25
B106834

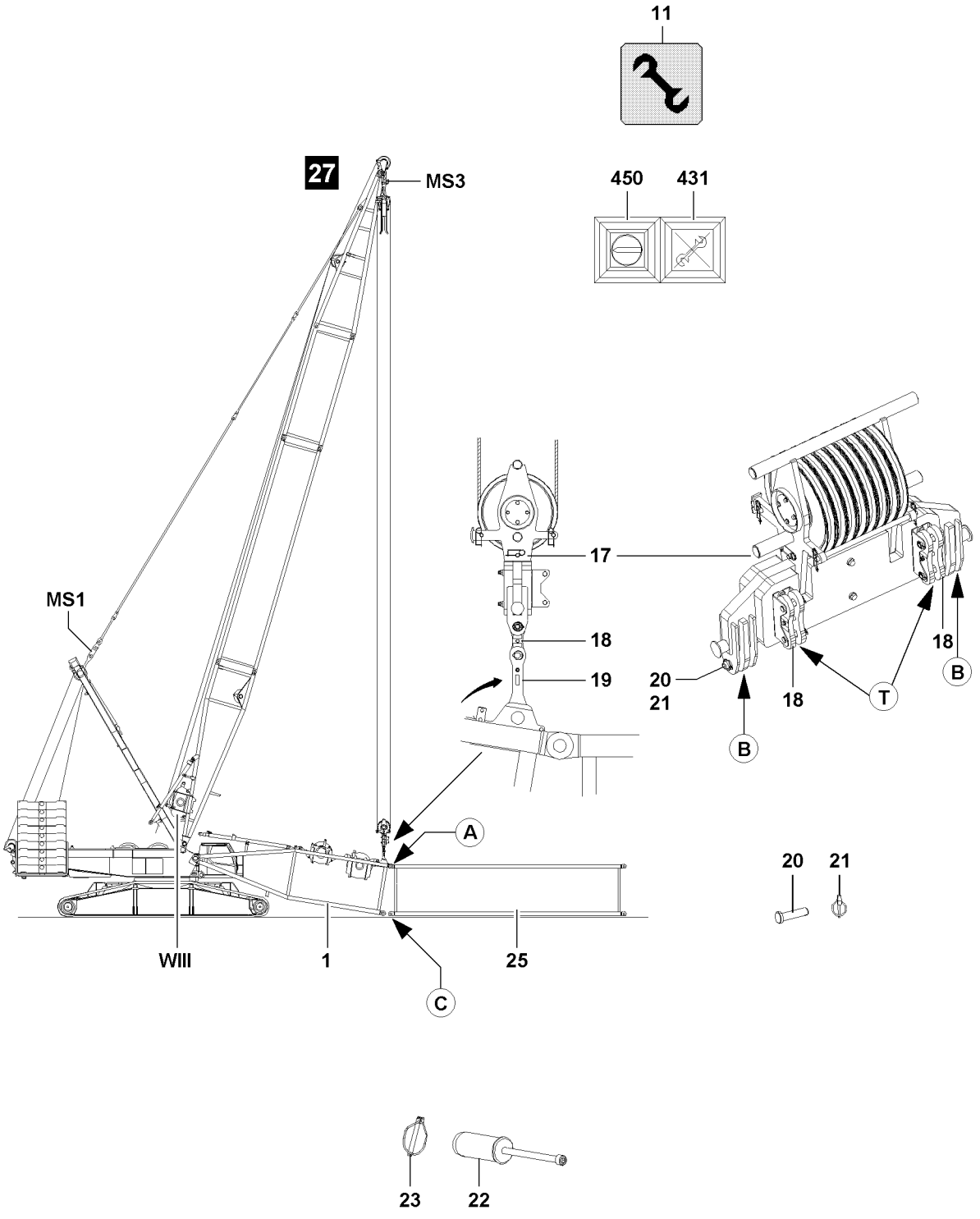
Note

- The actual forces on the test point **MS1** and on the test point **MS3** are shown on the LICCON monitor 1!
- Tension the guy rods on the SA-frame with the same force as during the assembly!
- For this, refer the ACTUAL force at the test point (MS1) measured and recorded during the assembly.
- The pins can be pulled easier and the pins and lugs are therefore not damaged!

Maximum permissible system length for a maximum total force MS1 of 200 t and a maximum total force MS3 of 138 t

Boom system	Maximum system length	Equipment	DB_{min} 1)	ZB_{min} 2)	Illustration
SL(D)	54.0 m		150 t	65 t	13
	60.0 m	- with reducer section - without head	150 t	65 t	12
S(D)	48.0 m		150 t	65 t	13
	58.0 m		150 t	65 t	12
	66.0 m	- without reducer section - without head	150 t	65 t	12

1) This counterweight must be at least installed on the turntable for “disassembly”.
2) This central ballast must be at least installed on the crawler center section for “disassembly”.


11
27
MS3
450
431
MS1
17
18
19
18
20
21
18
B
T
B
A
20
21
WIII
1
25
C
23
22

B106835

Note

▶ Unpin the intermediate sections with the pin pulling device, see chapter 5.30.

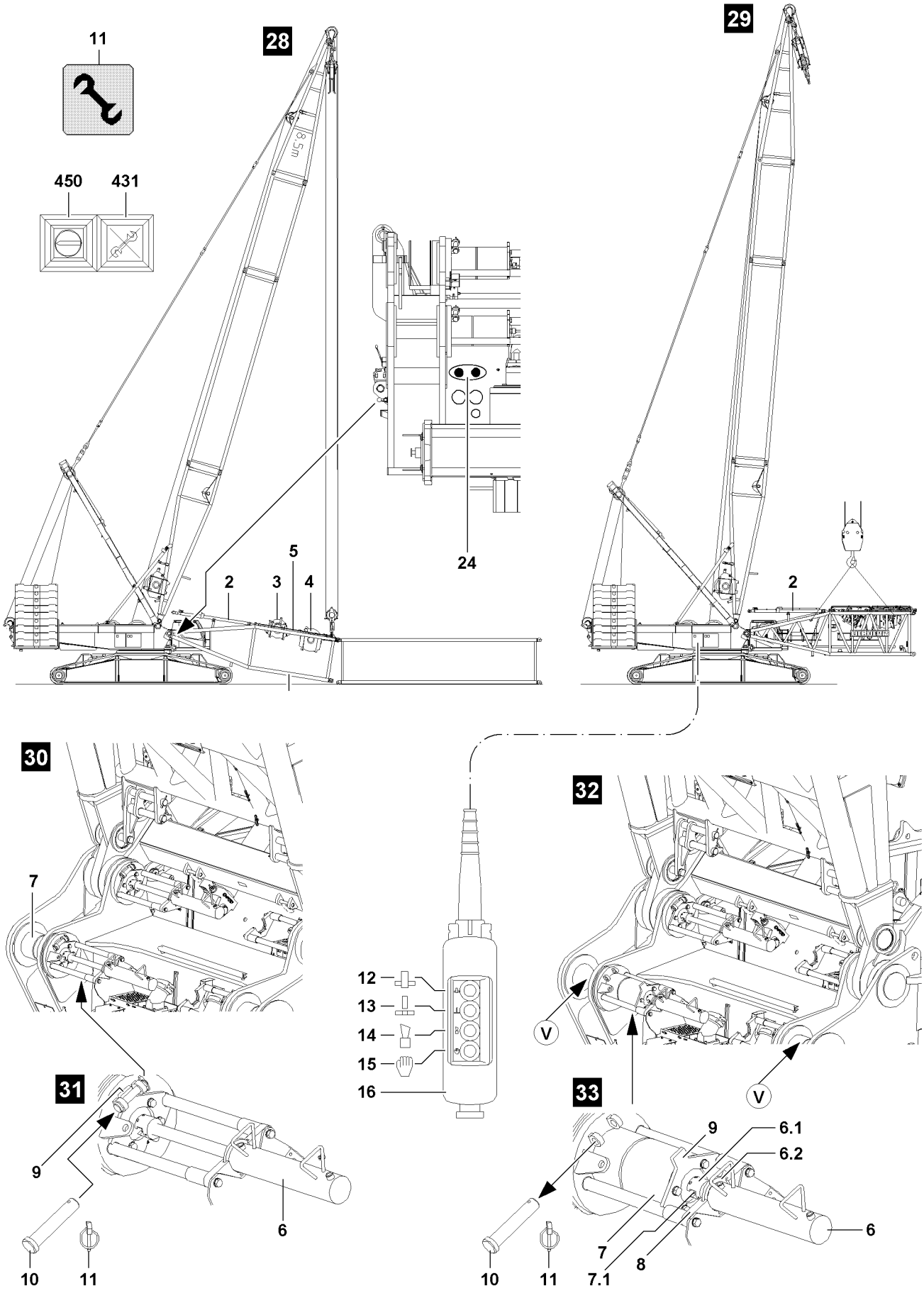
NOTICE

Danger of property damage!

If the maximum permissible total forces is not observed when lifting the boom system for disassembly, then crane components can be severely damaged!

▶ Do not exceed the maximum permissible total forces!

- ▶ Lift the S-boom from the supporting base or off the ground by spooling up winch III.
- ▶ When the S-boom has been lifted off the ground and is safely held by winch III:
  Unpin the S-pivot section **1** and S-intermediate section **25** at point **C** on both sides: Remove the linch pin **23** and unpin the pin **22**.
- ▶ When the pins **22** are unpinned at point **C**:
  Carefully place the S-boom on the ground.
- ▶ Unpin the S-pivot section **1** on both sides at point **A**: Remove the linch pin **23** and unpin the pin **22**.
- ▶ Relieve the guying by lowering the upper pulley block **17**.
- ▶ Unpin the upper pulley block **17** on the assembly brackets **19**: Remove the linch pin **21** and unpin the pin **20**.
- ▶ Unpin the lug **18** on the upper pulley block **17** from the operating position **B** and pin it in the transport retainer **T** on the upper pulley block **17**.
- ▶ Unpin and disassemble all intermediate sections.


11
28
450
431
8.5m
24
5
2
3
4
29
2
30
7
12
13
14
15
16
32
V
V
31
9
6
10
11
33
9
6.1
6.2
6
7
8
7.1
10
11

B106836

5.5 Unpinning the S-pivot section on the turntable

WARNING
General danger notes!
▶ Insert and secure all pins after disassembly in the intended transport receptacles!

Ensure that the following prerequisite is met:
– the D-boom is erected to the point where the S-pivot section can be disassembled without obstructions.

Note
▶ Select the attachment points on the S-pivot section in such a way that the S-pivot section hangs horizontally on the auxiliary crane at assembly. See paragraph “Attachment points”!

▶ Attach the S-pivot section **1** on the attachment points **A** and attachment points **B** on the auxiliary crane.

or

■ Attach the S-pivot section **1** on the attachment points **A** and attachment points **C** on the auxiliary crane.
▶ Lift the S-pivot section **1** with the auxiliary crane to the horizontal.

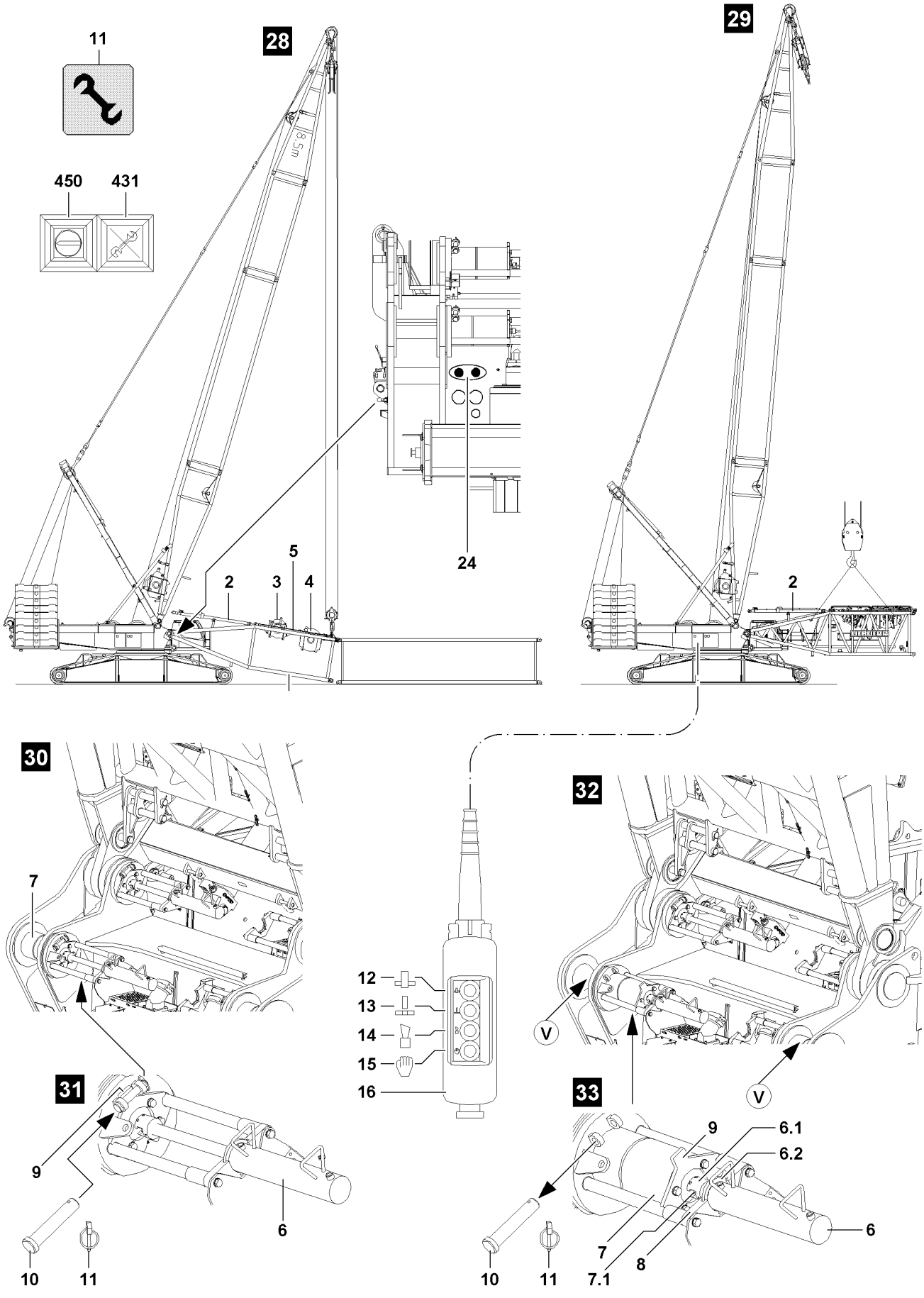
Establish the hydraulic connection to the pin pulling device via two quick couplers.
▶ Establish the hydraulic connection to the pin pulling device.

WARNING
Falling pivot section!
▶ Make sure that the pivot section is safely held by the auxiliary crane before unpinning the pins **7**.

▶ Unpin retaining pins **10**.

Note
▶ When hooking the pin pulling cylinder **6**, make sure that the collar **6.2** on the cylinder mount **8** and the catch **6.1** on the screw **7.1** are properly hooked!
▶ Make sure that the retaining pins **10** are unpinned!

▶ Hook the pin pulling cylinders **6**.
▶ Connect the pin pulling cylinder **6** on the quick couplers **24**, illustration **28**.
▶ Unpin the connector pins **7** on both sides with the hydraulic pin pulling cylinder **6**: Press the button **15** on the control panel **16** and “hold it down”, then press the button **13** until the connector pin **7** is fully unpinned.
▶ When the connector pins **7** are fully unpinned on both sides:
Pin in the retaining pins **10** in the pin bores and secure with linch pins **11**.
▶ Remove the pin pulling cylinder **6** from the cylinder receptacle **8**.
▶ Disconnect the hydraulic connections to the pin pulling device.


11
28
450
431
5
2
3
4
24
29
2
30
7
12
13
14
15
16
32
V
V
31
9
6
10
11
33
9
6.1
6.2
6
7
8
7.1
10
11

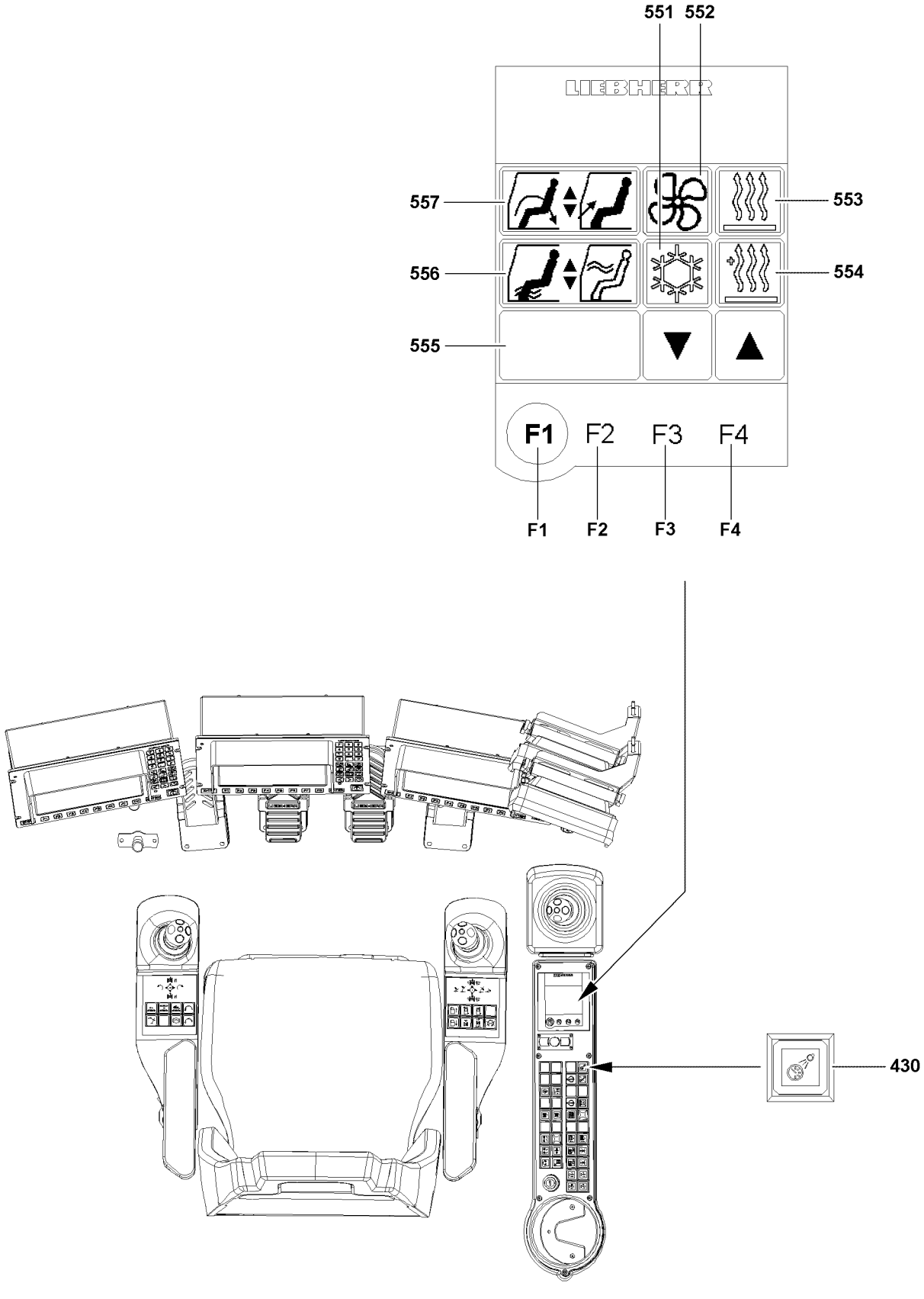
B106836

NOTICE
Damage of the turntable and the S-pivot section!
▶ Slowly swing the S-pivot section out with the auxiliary crane and at low speed on the turntable.

▶ Place the S-pivot section with the auxiliary crane on the support on the ground.
▶ Remove the auxiliary crane.

Note
▶ Disassemble the D-boom, see chapter 5.05!

6.00 Additional equipment



B105887

1 Heating the crane cab

The cab can be heated with three independent types of heat:
– Engine-dependent heater.
– Engine-independent auxiliary heater with engine pre-heating, at ambient temperatures of up to -40 °C, WEBASTO; Thermo 90 ST*.
– Engine-independent auxiliary heater for cab preheating, at ambient temperatures of less than -40 °C, WEBASTO; DBW 2020*.

The individual heat adjustment (both for engine-dependent as well as the engine-independent auxiliary heater*) are made solely via the “Air conditioning settings” menu on the touch display.

NOTICE
Risk of damage in the electrical / electronic component area when carrying out electrical welding work on the crane!
▶ Disconnect the negative and positive cables from the batteries and place the positive cable on the vehicle ground!

2 The “Air conditioning settings” menu

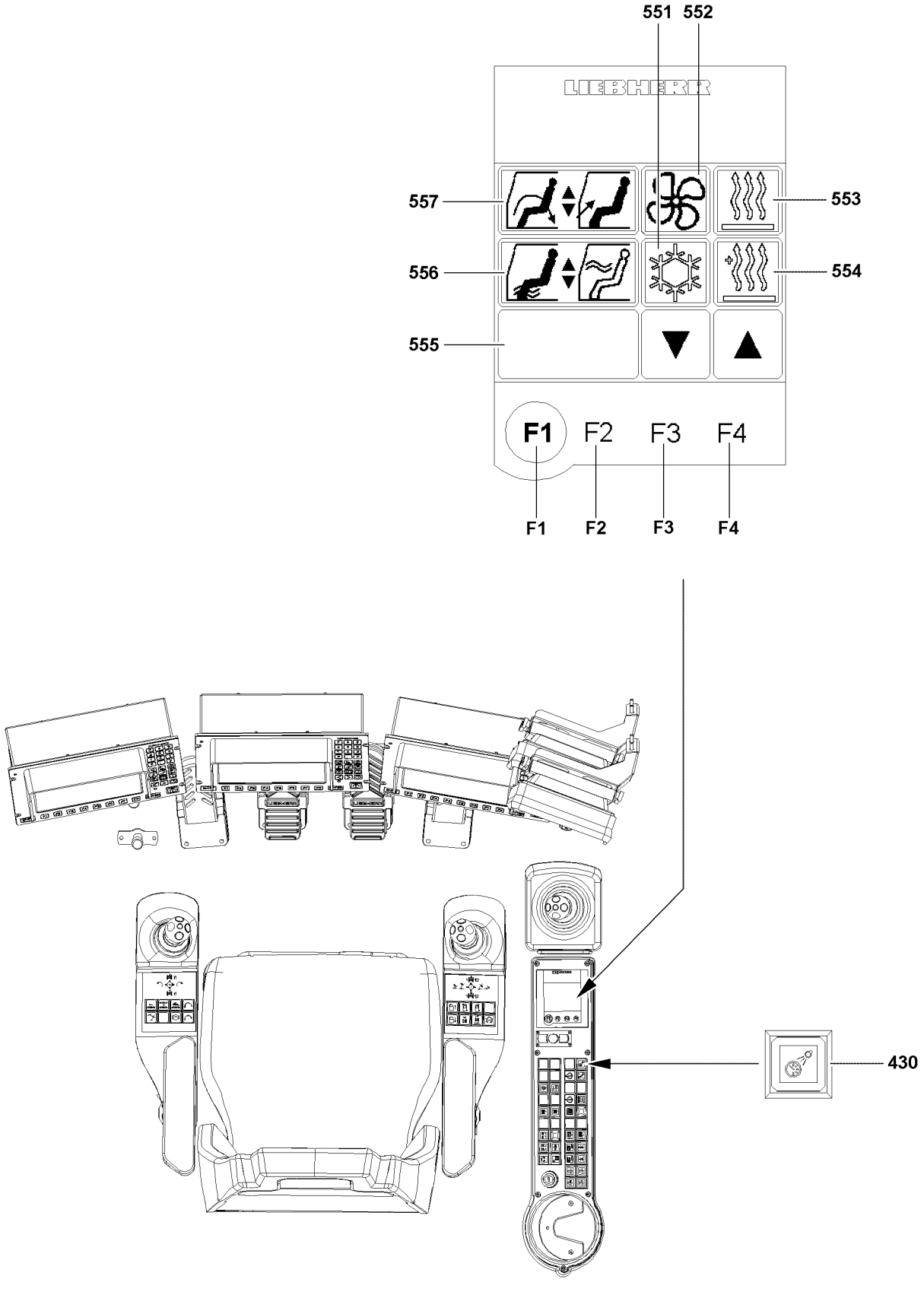
2.1 General

The “Air conditioning settings” menu is accessed - with the ignition turned on - by pressing the function key **F1** on the touch display.

Note
▶ The “Air conditioning settings” menu is faded out automatically after 30 sec. if no settings are changed during this time.

If the crane ignition is turned off, the LICCON computer system as well as the touch display also turn themselves off. The settings made in the “Air conditioning settings” menu are retained.

Note
▶ If the auxiliary heater has been programmed, the settings are saved when the ignition is turned “OFF”.



B105887

2.2 Operating the touch display

On the touch display, all functions are available for making and operating all heating, ventilation and air conditioning settings and for programming the auxiliary heater on the crane:

– Circulating air / fresh air **557**
  • Function selection
– Air distribution “upper” / “lower” **556**
  • Function selection
– Status display **555**
  • Display function
  • The status indicator **555** contains the following depending on the function that is selected:
  • The adjustment rates between the head and floorboard area for circulating air / fresh air
  • The adjustment rates for air distribution
  • The temperature setting in manual heating mode
  • The temperature setting in AUTOmatic heating mode
  • Air conditioning on - “ON”
  • Air conditioning off - “OFF”
  • The programming display for the auxiliary heater
– Air conditioning system **551**
  • Function selection
– Fan / blower **552**
  • Function selection
– Heater **553**
  • Function selection
– Auxiliary heater **554**
  • Function selection

The background illumination for the touch display can be turned on or off with the button **430**.

▶ Press button **430**.

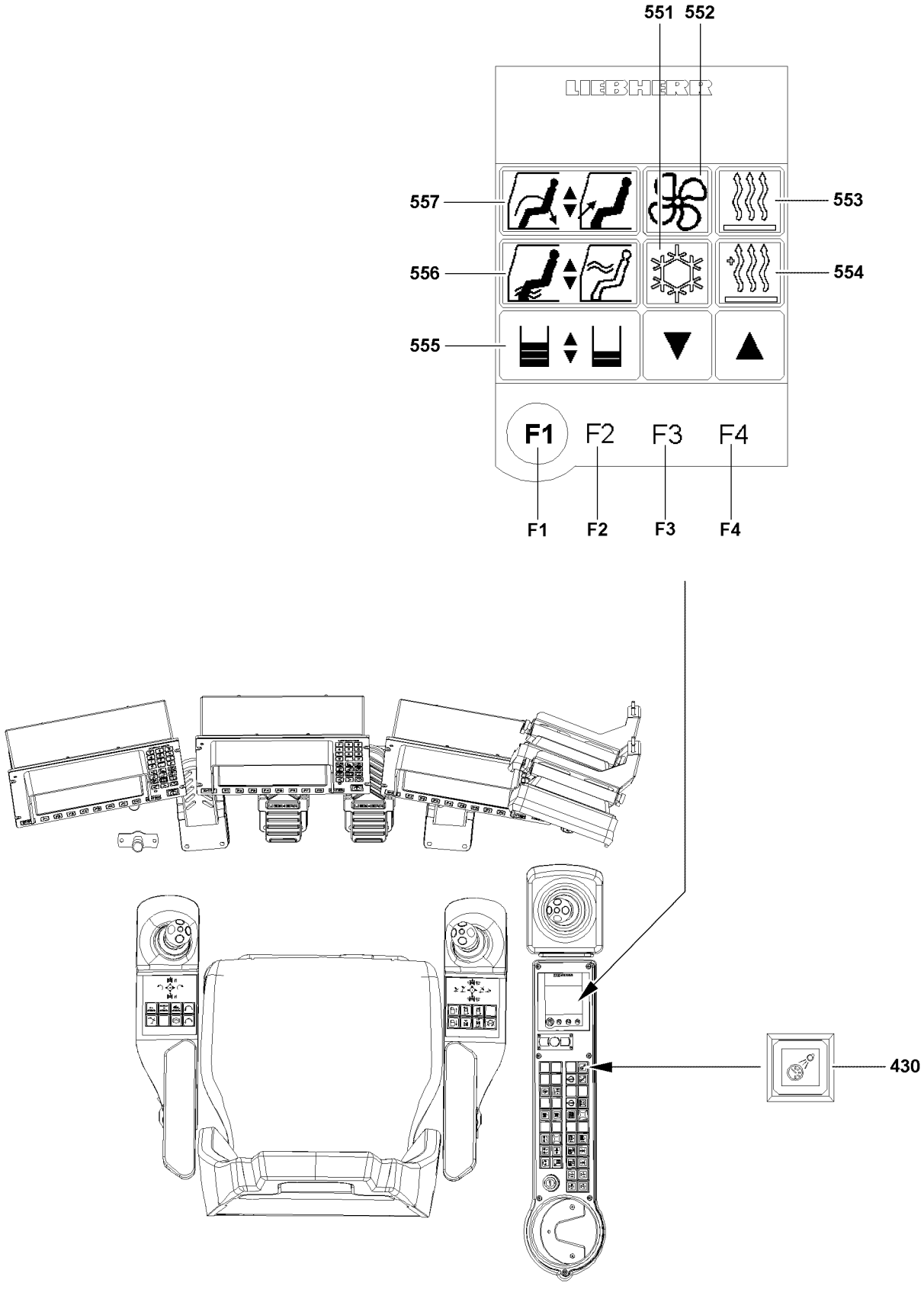
Result:

– The background illumination for the touch display is turned on.

▶ Press button **430** again.

Result:

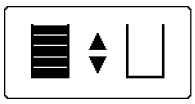
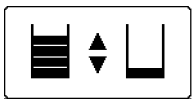
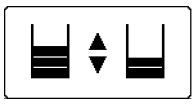
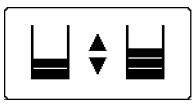
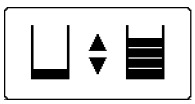
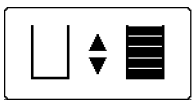
– The background illumination for the touch display is turned off.



B105890

2.3 Adjusting the circulating air / fresh air

The “circulating air / fresh air” function is selected by “touching” the icon **557** on the left touch display.
The adjustment rate is displayed in the Status display **555** as a double bar display for “circulating air” and “fresh air”.
The adjustment rate between “circulating air / fresh air” is changed with the function key **F3** and the function key **F4**.

Adjustment rates for circulating air / fresh air			
Status display	Circulating air	Fresh air	Icon display
	**5**	**0**	 *Fresh air “OFF”*
	**4**	**1**	
	**3**	**2**	
	**2**	**3**	
	**1**	**4**	
	**0**	**5**	 *Circulating air “OFF”*

▶ Select “circulating air / fresh air” **557** function by “touching”.

Result:

– The “circulating air / fresh air” icon is surrounded with a black border.
– The current adjustment rate is displayed in the Status display **555** as a double bar display for “circulating air” and “fresh air”.

▶ Press the function key **F3**.

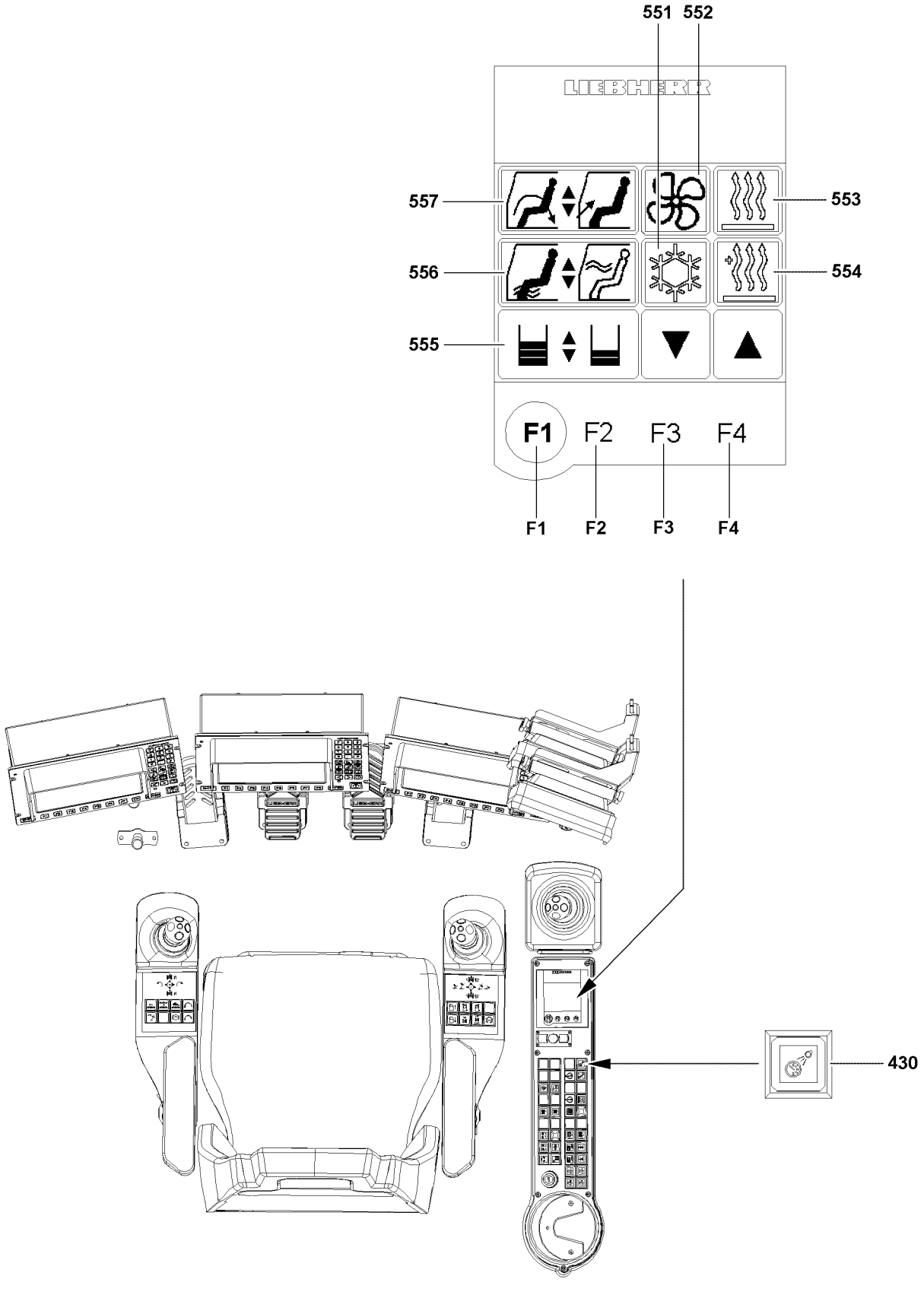
Result:

– The “proportion of circulating air” is reduced and the “proportion of fresh air” increases at the same time.

▶ Press the function key **F4**.

Result:

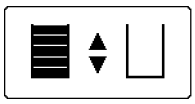
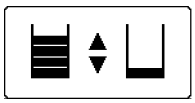
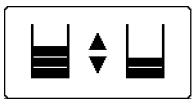
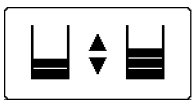
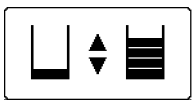
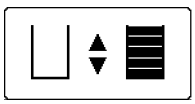
– The “proportion of fresh air” is reduced and the “proportion of circulating air” increases at the same time.



B105890

2.4 Adjusting the “lower” / “upper” air distribution

The “lower” / “upper” air distribution function is selected by “touching” the icon **556** on the left touch display.
The adjustment ratio is displayed in the Status display **555** - as a double bar display - for the “lower” and “upper” air distribution.
The “lower” and “upper” adjustment rate is changed with the function key **F3** and the function key **F4**.

Air distribution adjustment rates			
Status display	“lower”	“upper”	Icon display
	**5**	**0**	 *upper “OFF”*
	**4**	**1**	
	**3**	**2**	
	**2**	**3**	
	**1**	**4**	
	**0**	**5**	 *lower “OFF”*

▶ Select Air distribution “upper / lower” **556** function by “touching”.

Result:

– The “lower / upper” air distribution icon is surrounded with a black border.
– The current adjustment rate is displayed in the Status display **555** - as a double bar display - for “lower” and “upper”.

▶ Press the function key **F3**.

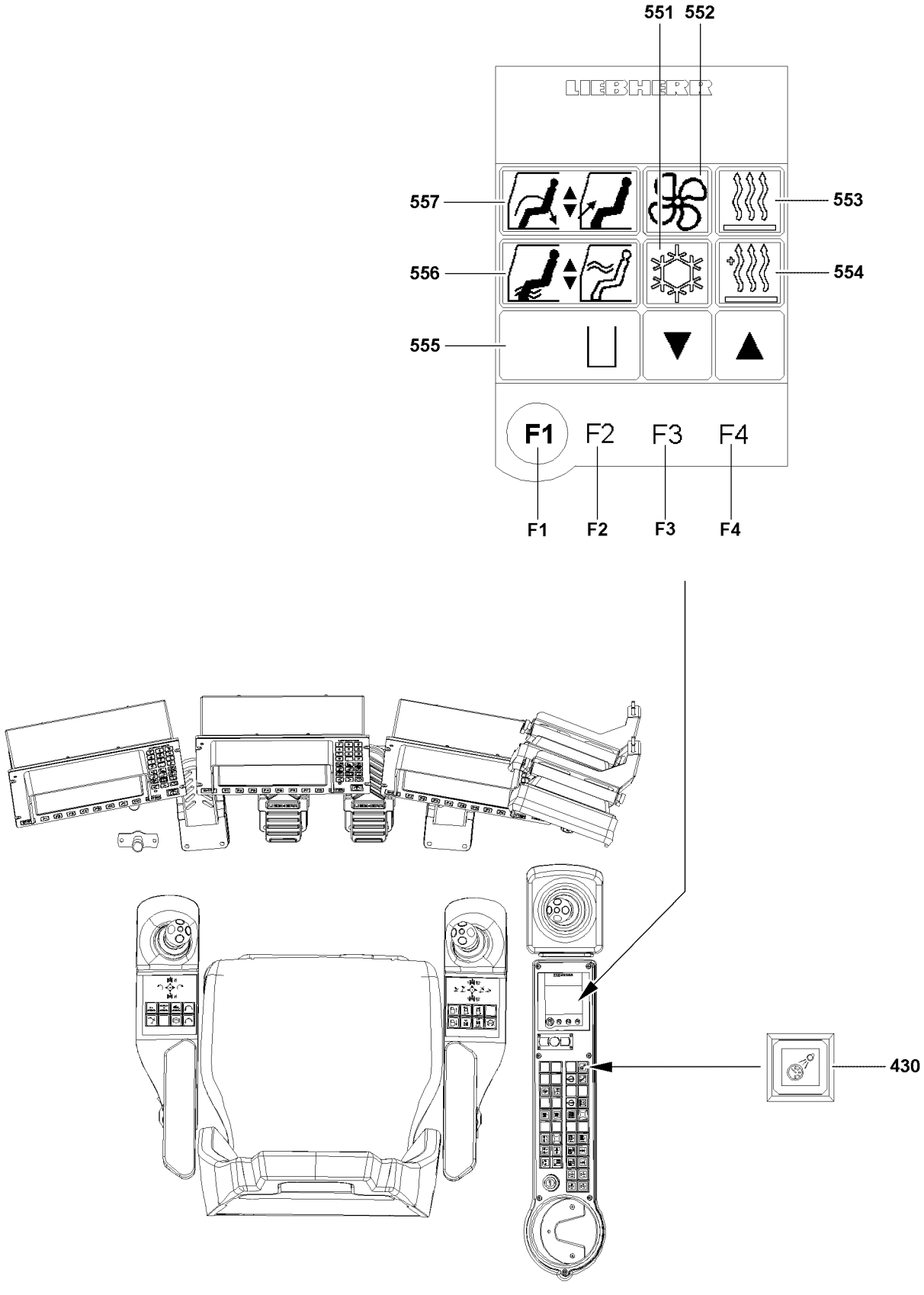
Result:

– The proportion of “lower” air is reduced; while the proportion of “upper” air increases at the same time.

▶ Press the function key **F4**.

Result:

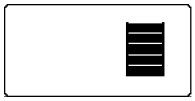
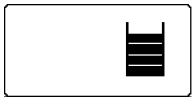
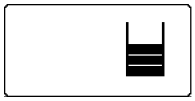
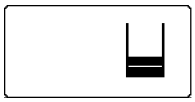
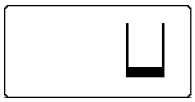
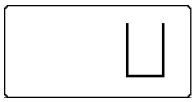
– The proportion of “upper air” is reduced, while the proportion of “lower air” increases at the same time.



B106302

2.5 Fan / blower adjustment

The “fan / blower” function is selected by “touching” the icon **552** on the left touch display.
The current “fan” / “blower setting” is shown as a bar display in the Status display **555**.
The “fan” / “blower setting” is reduced with the function key **F3** and increased with the function key **F4**.

“Fan” / “blower setting”		
Status display	Stage	Icon display
	**5**	
	**4**	
	**3**	
	**2**	
	**1**	
	**0**	 *Fan “OFF”*

▶ Select “fan / blower **552** ” by “touching”.

Result:

– The “fan / blower” icon is surrounded with a black border.
– In “fan ” / “blower stage” appears as a bar display in the Status display **555**.

▶ Press the function key **F3**.

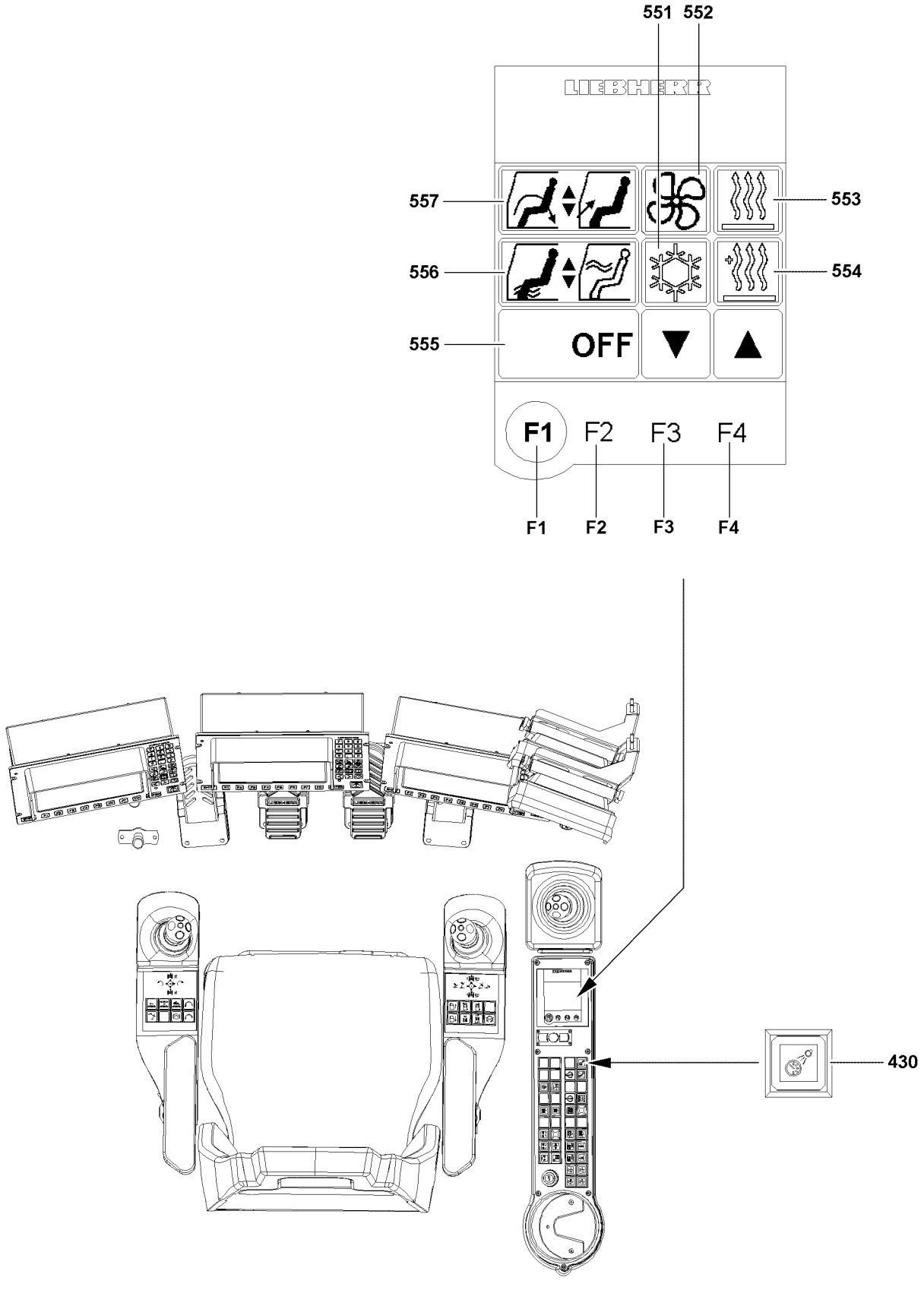
Result:

– The “fan ” / “blower stage” is reduced.

▶ Press the function key **F4**.

Result:

– The “fan” / “blower stage” is increased.


551
552
LIEBHERR
557
553
556
554
555
OFF
F1
F2
F3
F4
F1
F2
F3
F4
430

B106303

2.6 Operating the air conditioning system

The “Air conditioning system” function is selected by “touching” the icon **551** on the left touch display.
The status of the air conditioning system is displayed in the Status display **555**.
The “Air conditioning system” is turned off with the function key **F3** (“OFF”) and turned with the function key **F4** (“ON”).

Note

▶ The air conditioning system turns itself on automatically if the “AUTO” heating mode is activated.

Air conditioning system		
Status display	State	Icon display
OFF	**“OFF”**	
ON	**“ON”**	

Make sure that the following preconditions are met before starting up the air conditioning system:
– The air intake opening for circulating air operation is clear.
– All windows and the cab door are closed.
– The circulating air / fresh air adjustment rate is 5:0.

▶ Select “Air conditioning system **551** ” function by “touching”.

Result:
– The “Air conditioning system” icon is surrounded with a black border.
– The switch status of the air conditioning system appears in the status display **555**.

▶ Press the function key **F3**.

Result:
– The air conditioning system is turned off.

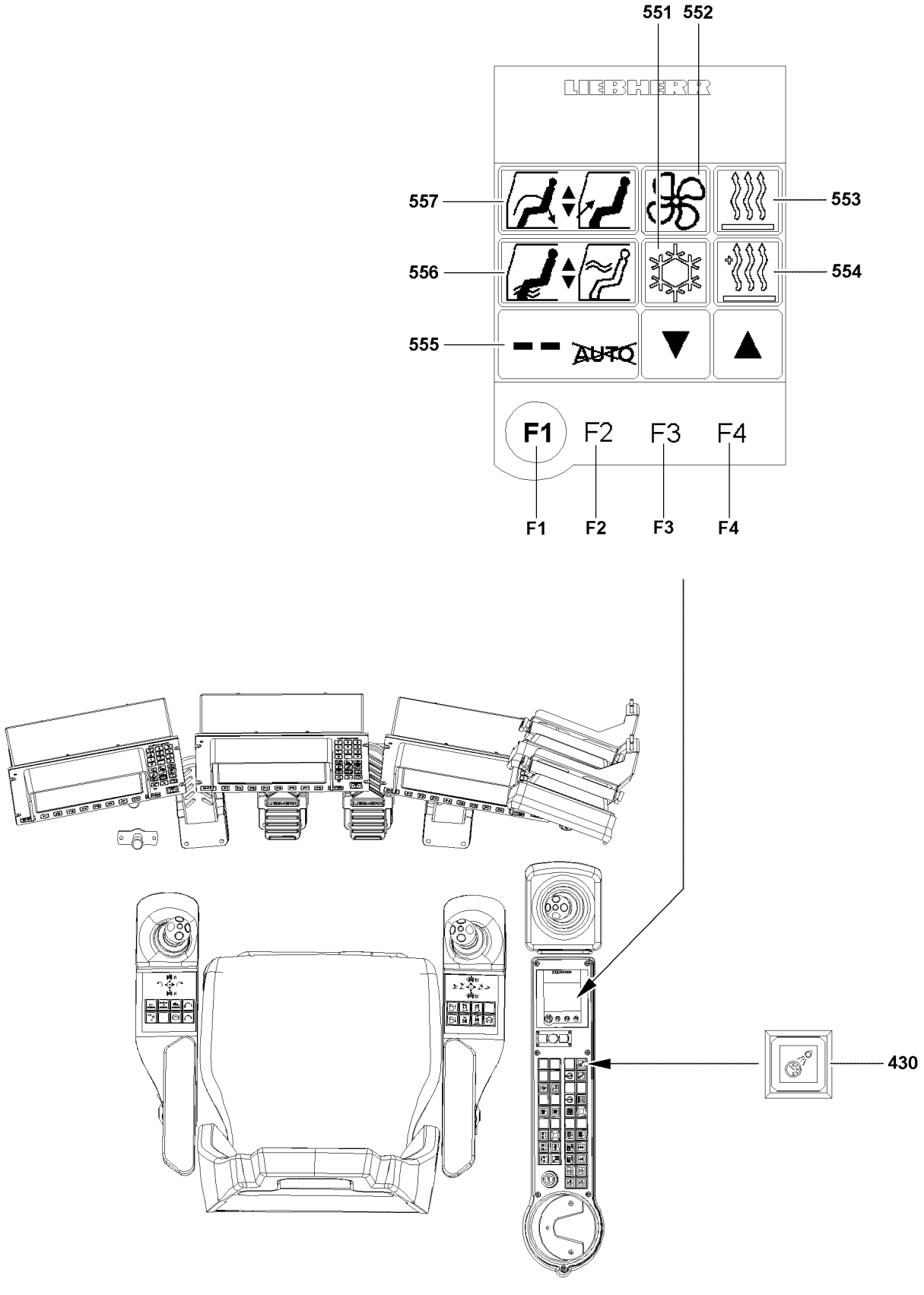
▶ Press the function key **F4**.

Result:
– The air conditioning system is turned on.

▶ Open or close the air vents as desired.
▶ Open the appropriate air vent for upward air distribution.
▶ Turn the fan / blower on.
▶ Select heater and change into “MANUAL” heating mode.
▶ Set the temperature stage.

or

■ Select heater and change into “AUTO” heating mode.
▶ Set the temperature in [°C] or [°F].



B106304

2.7 Turning the heater on

2.7.1 General

The “heater” function is selected by “touching” the icon **553** on the left touch display.
The heater status is displayed in the Status display **555**.
The temperature is regulated in “MANUAL” heating mode via the function key **F3** (“reduce” temperature) and function key **F4** (“increase” temperature).
Function key **F2** is used to switch from “MANUAL” heating mode to “AUTO” heating mode and vice versa.

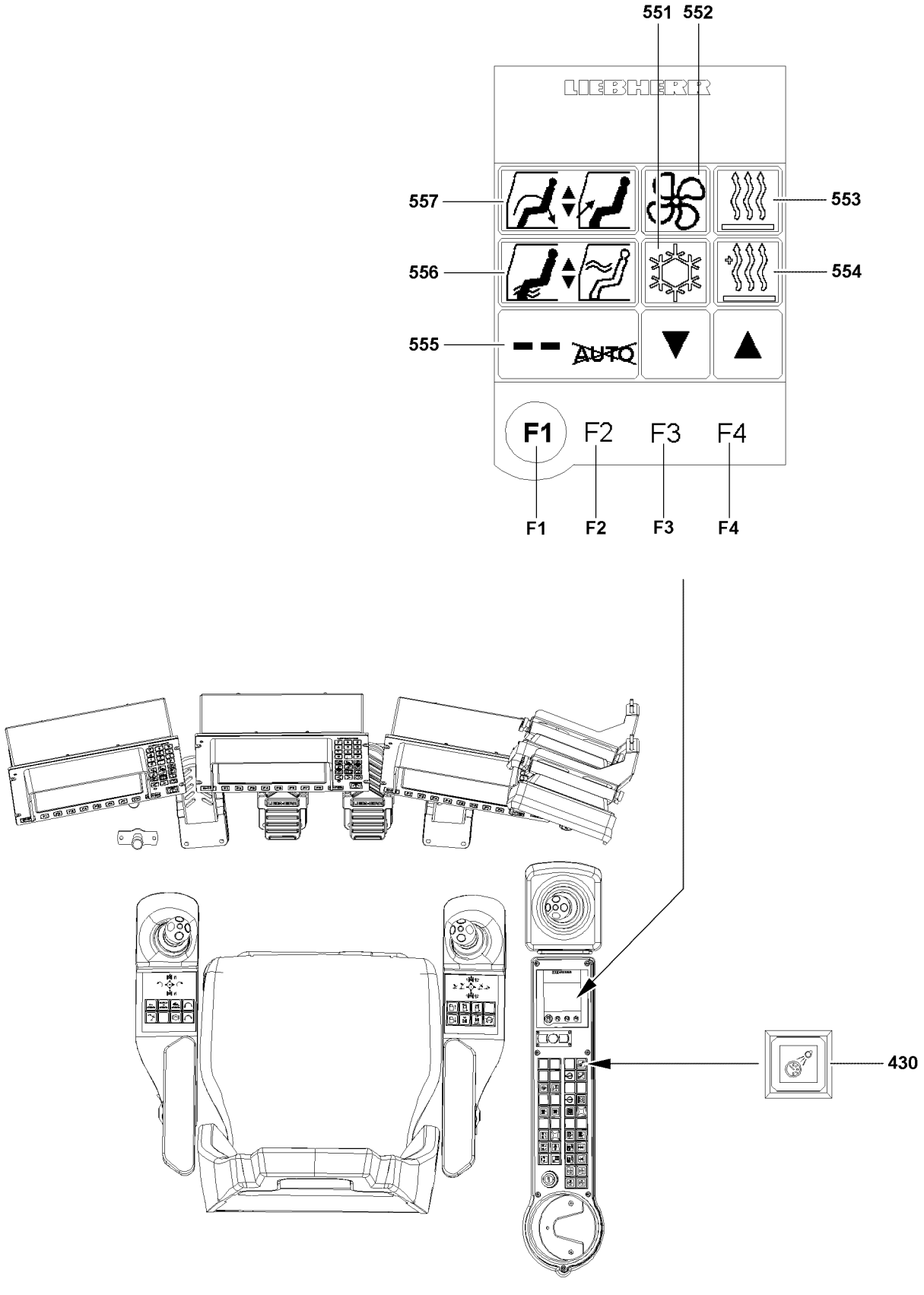
2.7.2 Manual heating mode

In “MANUAL” heating mode, the temperature stages - from stage 1 to stage 16 - are available to the crane operator for temperature adjustment.
With the function key **F3**, the temperature stages can be reduced from stage 16 in increments until “heater OFF”.

Note
- If the status “heater OFF” is reached, the heater does not operate.
- The crane cab is **not** heated.

Press the function key **F4** to leave the “OFF” status and to increase the temperature stages incrementally from stage 1 to maximum stage 16.

Heating mode “MANUAL”			
Status display	State	Stage	Icon display
-- AUTO	**“OFF”**	— —	 *Heater “OFF”*
1 AUTO	**“ON”**	**1**	
16 AUTO	**“ON”**	**16**	



B106304

▶ Select “heater **553** ” function by “touching”.

Result:

– The “Heater” icon is surrounded with a black border.
– In the status display **555** appears the current status of the “Heater”.

▶ Press the function key **F2**.

Result:

– Switch from heating mode “AUTO” to heating mode “MANUAL”.

▶ Press the function key **F3**.

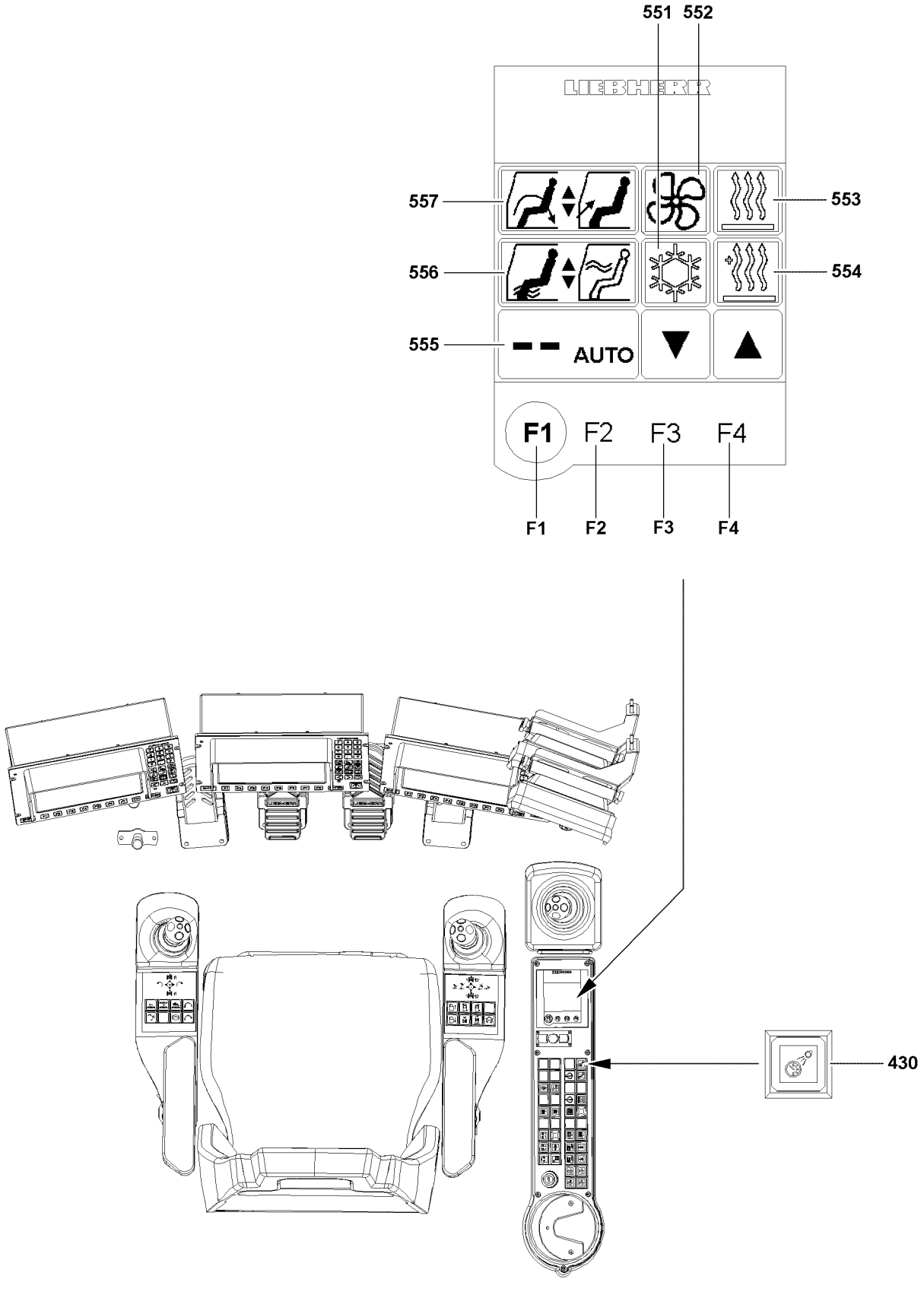
Result:

– The “temperature stages” are reduced incrementally by one stage.
– The amount of heat supplied into the cab is reduced accordingly.

▶ Press the function key **F4**.

Result:

– The “temperature stages” are increased incrementally by one stage.
– The amount of heat supplied into the cab is increased.


551
552
LIEBHERR
557
553
556
554
555
AUTO
F1
F2
F3
F4
F1
F2
F3
F4
430

B106305

2.7.3 AUTO heating mode

If heating mode “AUTO” is selected, the air conditioning system is automatically enabled.

Note

- The blower / fan stage is automatically regulated in the “AUTO” heating mode, whereby the maximum blower / fan stage is available, which was set before manually.

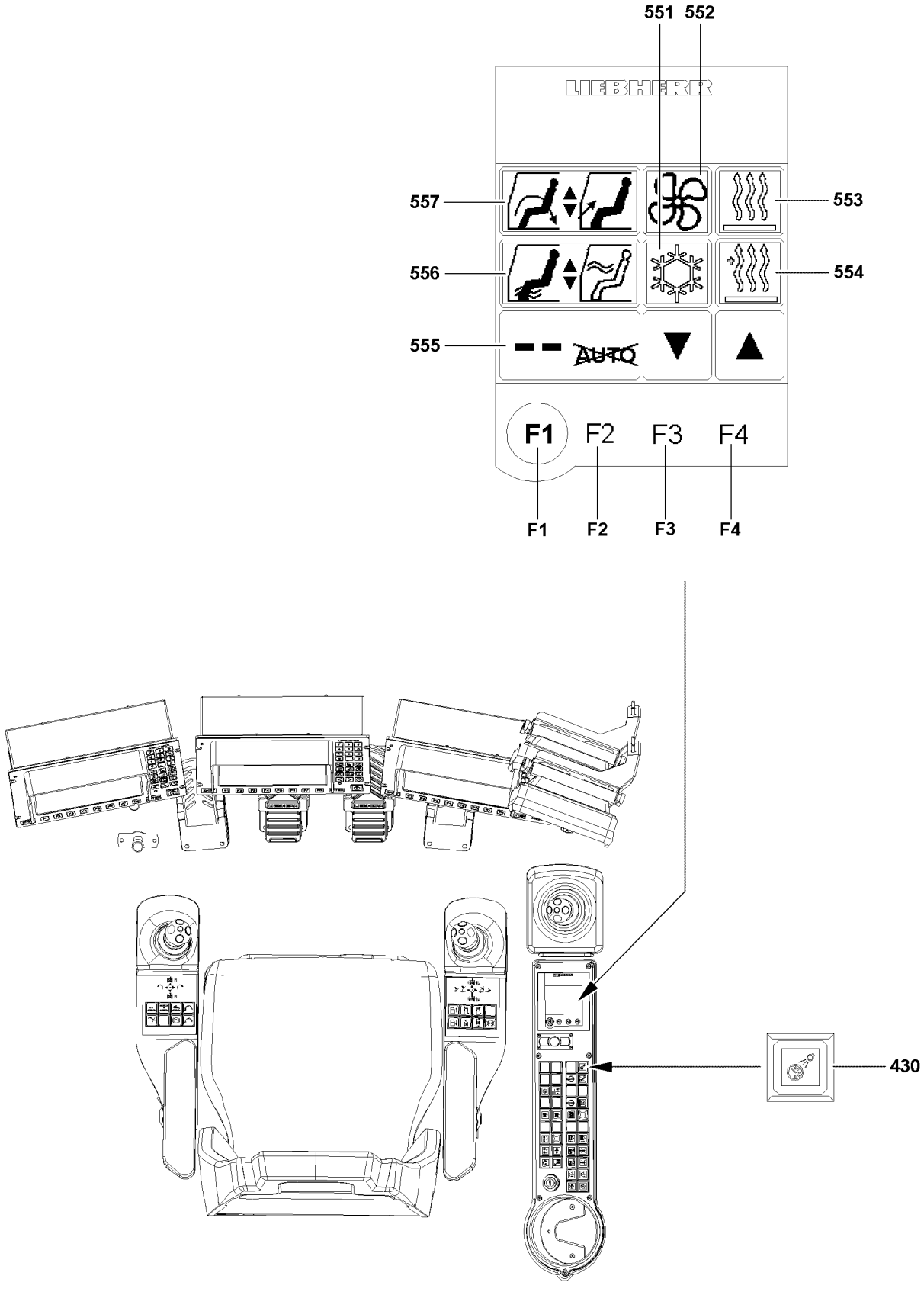
In “AUTO” heating mode, the crane operator can adjust the temperature infinitely variable.
By pressing the function key **F3**, the temperature is reduced steplessly from maximum value to minimum value and if the function key **F3** is pressed again, the heater is turned off.

Note

- If a status “Heat OFF” has been reached, the heater does **not** operate but the cab can continue to be cooled.
- The crane cab is **not** heated.

Leave the “OFF” state by pressing the function key **F4** and the temperature can be increased infinitely variable from minimum value to maximum value.

Heating mode “AUTO”			
Status display	State	Temperature in [**°C**] or [°F]	Icon display
-- AUTO	**“OFF”**	—	 *Heater “OFF”*
15 °X AUTO *Minimum value*	***“ON”***	***15***	
30 °X AUTO *Maximum value*	***“ON”***	***30***	



B106304

▶ Select “heater **553** ” function by “touching”.

Result:

– The “Heater” icon is surrounded with a black border.
– In the status display **555** appears the current status of the “Heater”.

▶ Press the function key **F2**.

Result:

– Change from heating mode “MANUAL” to heating mode “AUTO”.

▶ Press the function key **F3**.

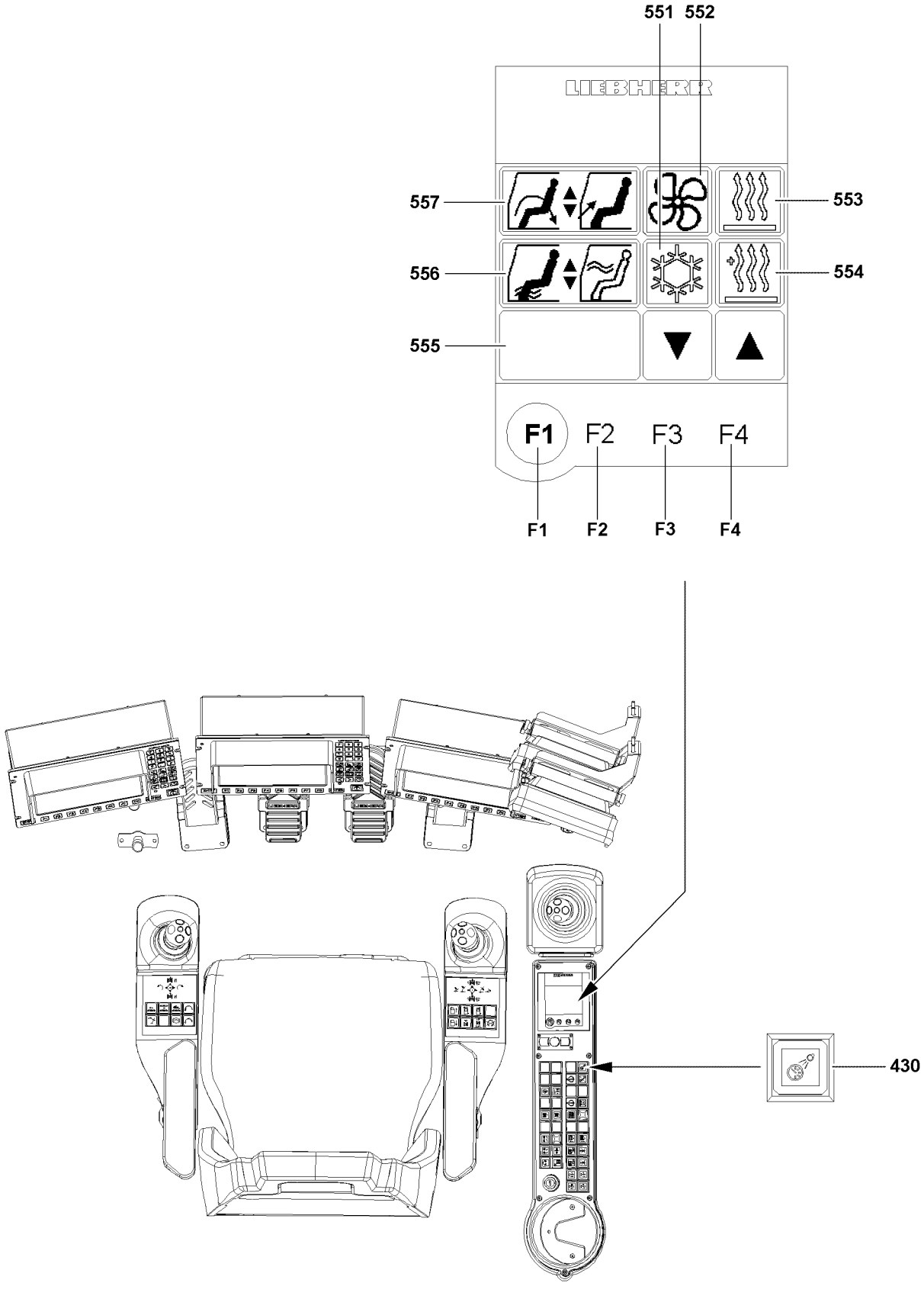
Result:

– The “temperature setting” is reduced in stages in steps of 1 °C.
– The amount of heat that is led to the cab is controlled according to the current temperature setting.

▶ Press the function key **F4**.

Result:

– The “temperature setting” is increased in stages in steps of 1 °C.
– The amount of heat that is led to the cab is controlled according to the current temperature setting.



B105887

2.8 Procedure for fogged windows

2.8.1 General

A certain sequence of adjustments must be followed to clear the windows quickly in order to use the crane.
The settings can be made manually or semi-automatically.

2.8.2 Manual adjustments in the “Air conditioning settings” menu

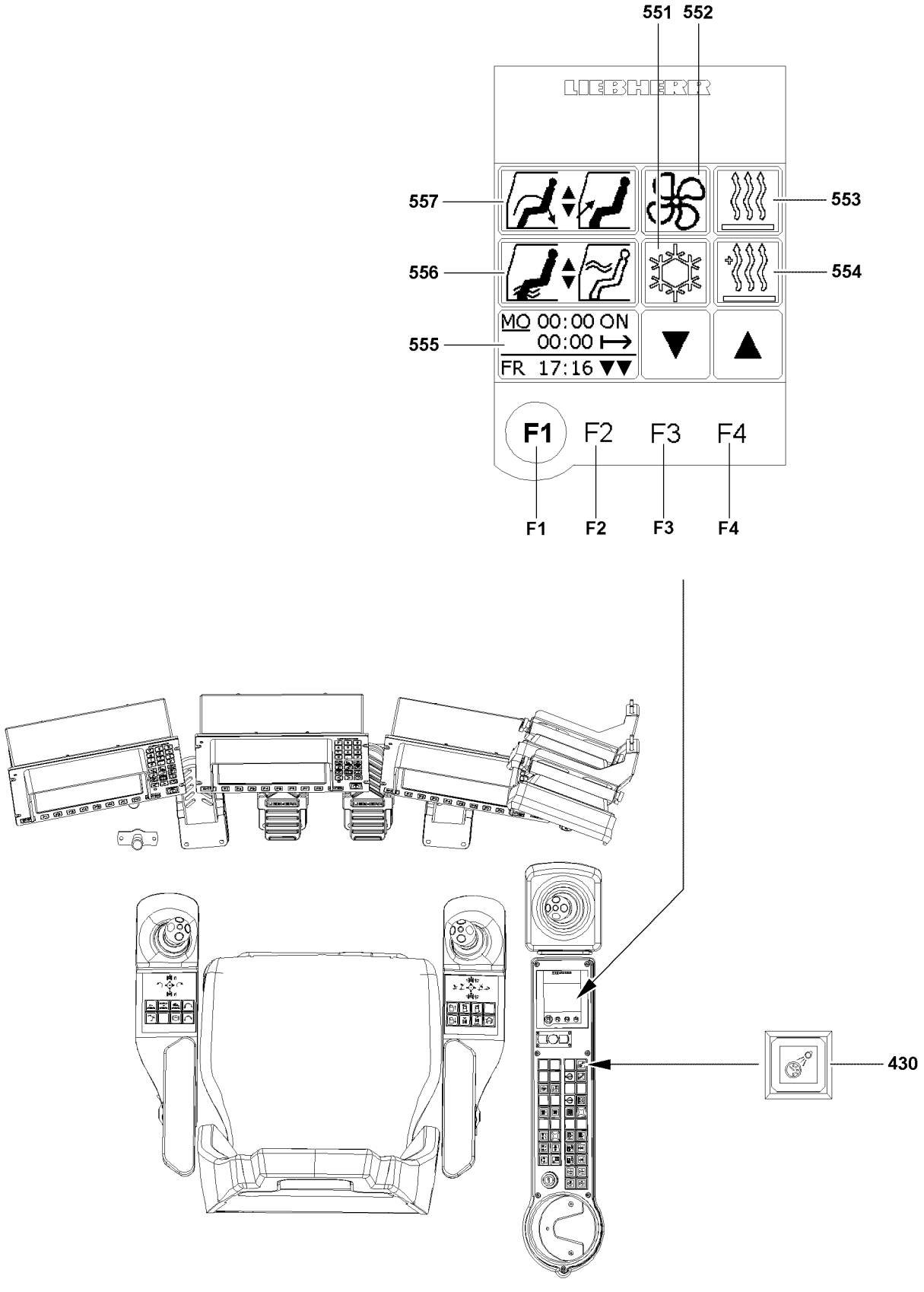
- ▶ Set air distribution **556** to maximum level “upwards” - level 5.
- ▶ Open the air vents.
- ▶ Set circulating air **557** to maximum level - level 5.
- ▶ Set fan / blower **552** to maximum level - level 5.
- ▶ Set Air conditioning system **551** to “ON”.
- ▶ Set heater **553** to maximum possible level in “**manual** ” heating mode.
- ▶ If the crane engine is cold, add the auxiliary heater **554**, if required.

2.8.3 Making adjustments semi-automatically in the “Air conditioning settings” menu

- ▶ Set heater **553** to “**AUTO** ” heating mode.
- ▶ Set air distribution **556** to maximum level “upwards” - level 5.
- ▶ Open the air vents.
- ▶ If the crane engine is cold, add the auxiliary heater **554**, if required.

Note

- ▶ The other functions are automatically added by the system.


551
552
557
553
556
554
555
MO 00:00 ON
00:00
FR 17:16
F1
F2
F3
F4
F1
F2
F3
F4
430

B106307

2.9 Operating the engine-independent auxiliary heater

The engine-independent auxiliary heater is used to heat the crane cab when the engine is turned off and to provide additional heat at low ambient temperatures if the engine-dependent heater is not sufficient.

At ambient temperatures of below -20 °C , the crane engine must be pre-heated by the engine-independent auxiliary heater. In this case, the crane cab does not have to be heated too.

Note

▶ In summer, run the auxiliary heating once a month for approx. 15 to 20 minutes.

Carry out maintenance work on the auxiliary heater according to the supplied manufacturer's operating instructions.

2.9.1 General

NOTICE

Damage of auxiliary heater!

▶ Fill all units with sufficient service fluids for winter operation, as specified in the lubricant chart!

DANGER

Risk of poisoning and suffocation in enclosed areas!

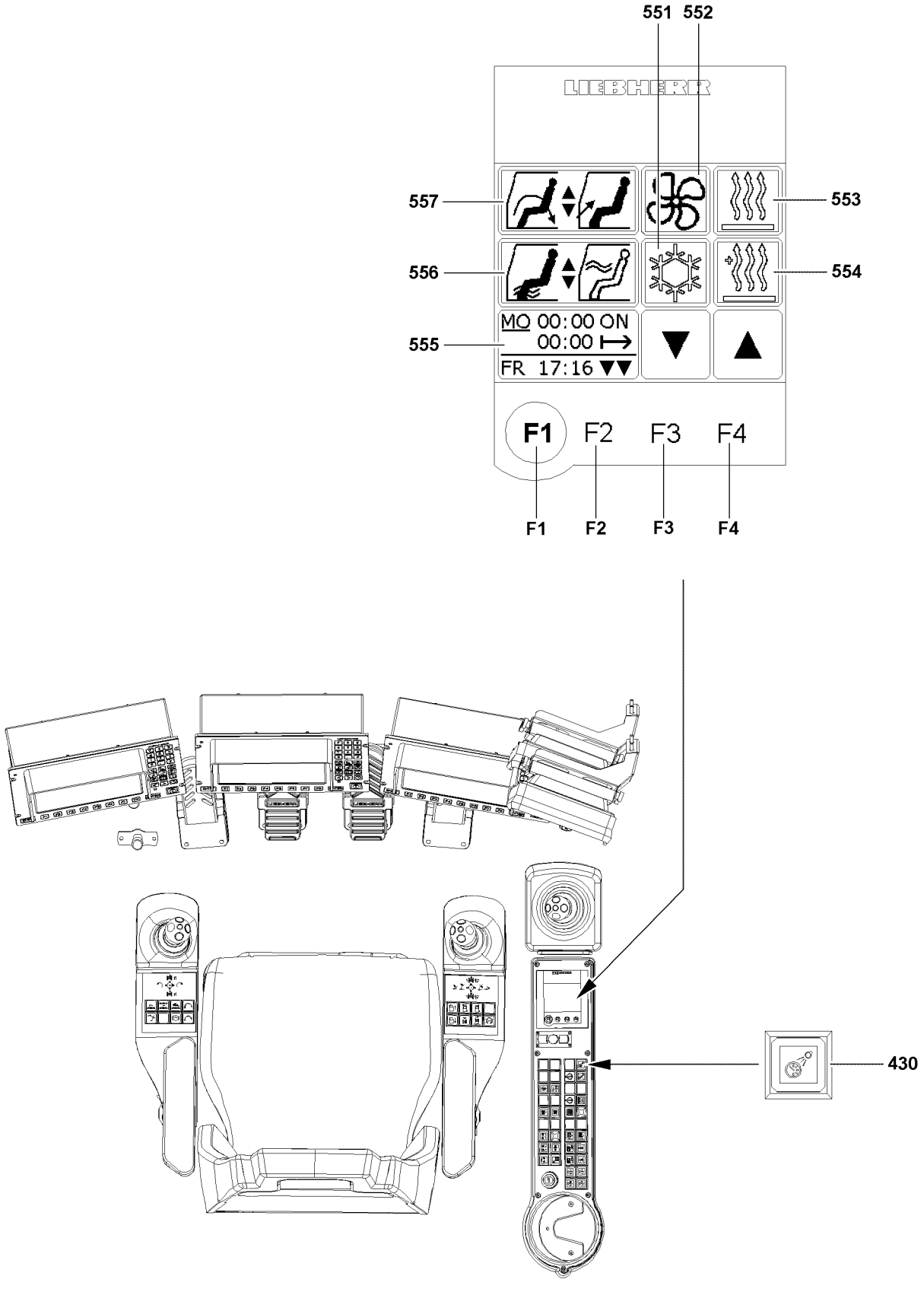
▶ Operate the engine-independent auxiliary heater in enclosed areas such as garages or workshops only if a exhaust emission suction is present, even in “programming mode”.

DANGER

Risk of explosion!

In areas where combustible fumes or dust could form, such as in the vicinity of storage areas for fuel, coal, wood dust or grain storage or similar and in the vicinity of filling stations or tank depots, there is a risk of explosion.

▶ Turn the auxiliary heater off.


551
552
557
553
556
554
555
MO 00:00 ON
00:00
FR 17:16
F1
F2
F3
F4
F1
F2
F3
F4
430

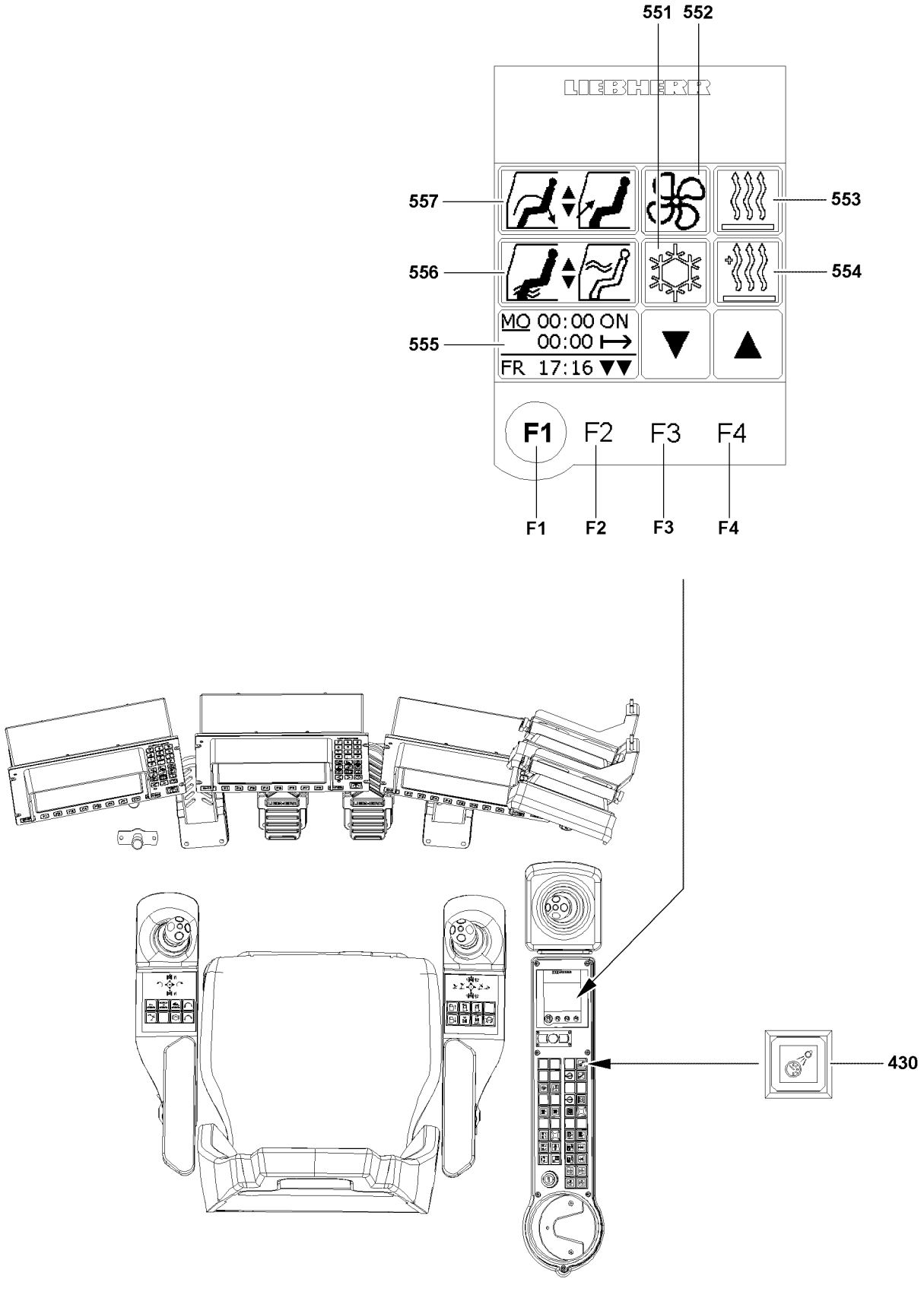
B106307

2.9.2 Turning the engine-independent auxiliary heater on manually

The engine-independent auxiliary heater can be turned on manually in driving or crane operation. The auxiliary heater, icon **554**, must be selected and turned on.
If the auxiliary heater is in the “OFF” state, pressing function key **F4** once adds the cab auxiliary heater.
Pressing the function key **F4** again turns engine preheating auxiliary heater on.

Note
▶ If the auxiliary heater is turned on for engine pre-heating, then the crane cab is **not** heated.

Manual auxiliary heater			
Status display	Function key **F4**	Function key **F3**	Icon display
MO 06:45 ON 00:30 ↦ FR 17:16 **OFF**	▲ F4	— —	*Auxiliary heater “OFF”*
MO 06:45 ON 00:30 ↦ FR 17:16 **ON**	▲ F4	▼ F3	*Auxiliary heater - cab “ON”*
MO 06:45 ON 00:30 ↦ FR 17:16 **ON**≈	▲ F4	▼ F3	*Auxiliary heater - engine pre-heating “ON”*


551
552
557
553
556
554
555
MO 00:00 ON
00:00
FR 17:16
F1
F2
F3
F4
F1
F2
F3
F4
430

B106307

Adding the auxiliary heater

▶ Select heat **553** and set the required temperature via function key **F3** or function key **F4** (see section entitled “Turning the heater on”).

Note

▶ The temperature adjustment via function key **F3** or function key **F4** is only needed to heat the crane cab!

▶ Select auxiliary heater **554** and press function key **F3** or function key **F4** until the required setting is displayed in the status display **555** (see chart).

Result:

– The auxiliary heater is added.
– The crane cab or the engine is heated, depending on the setting.

Note

▶ When the crane cab is “warm” and the engine is at the operating temperature, turn the auxiliary heater off.
▶ This increases the service life of the auxiliary heater!

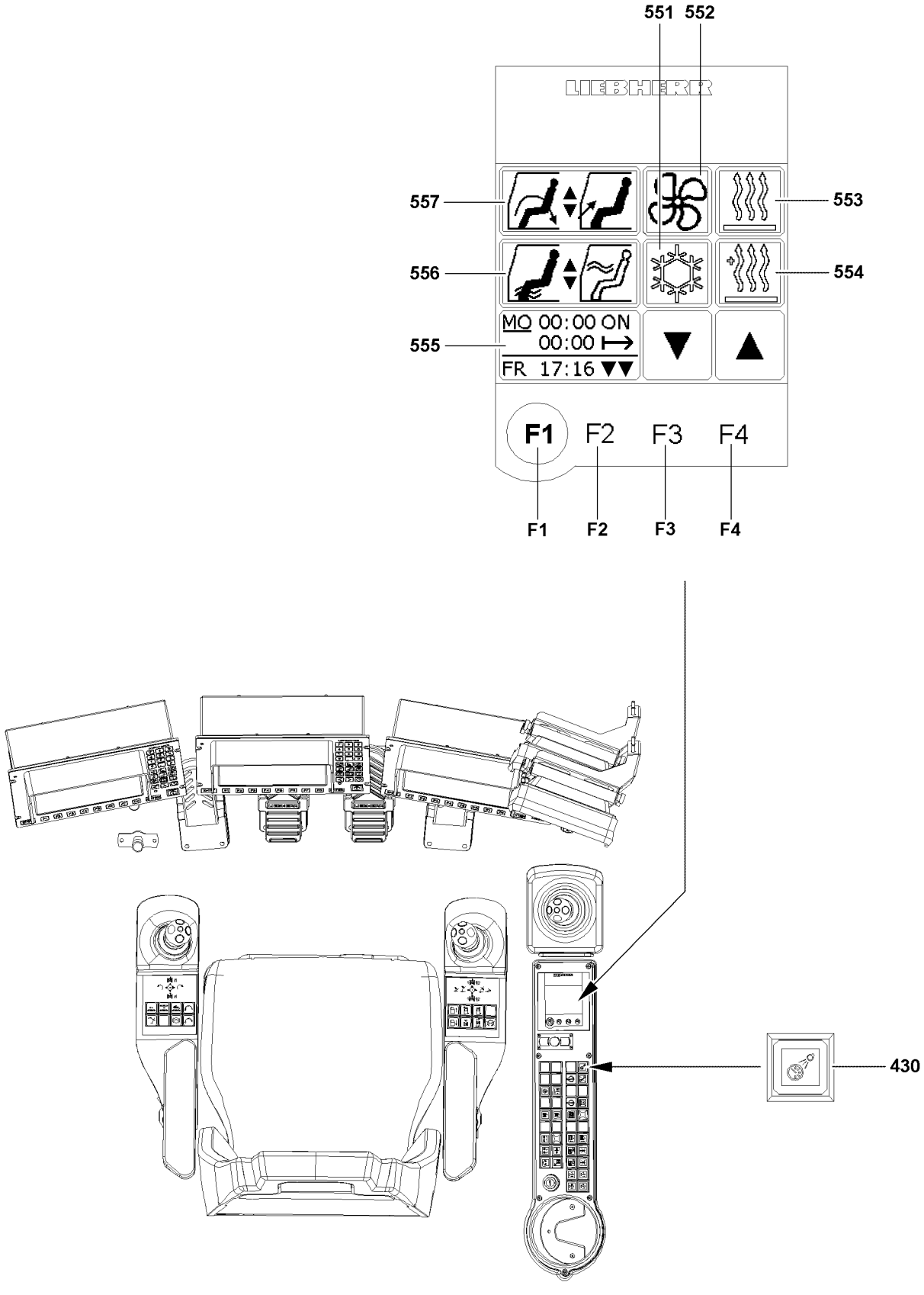
Turning the auxiliary heater off

▶ Select auxiliary heater **554** and press the function key **F3** until the status display **555** shows the setting auxiliary heater “OFF” (**OFF**).

Result:

– The auxiliary heater is turned off.
– An afterrun is carried out each time the auxiliary heater is turned off.

▶ Turn the battery master switch off if the crane is temporarily not being used.


551
552
557
553
556
554
555
MO 00:00 ON
00:00
FR 17:16
F1
F2
F3
F4
F1
F2
F3
F4
430

B106307

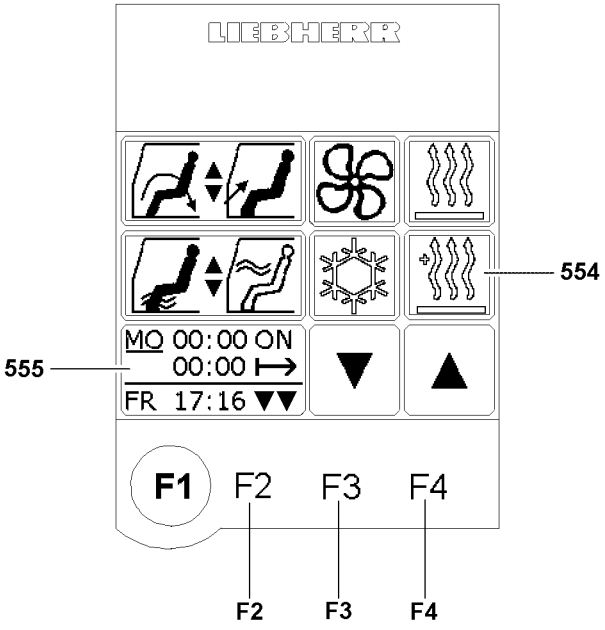
2.9.3 Turning the engine-independent auxiliary heater on in programming mode

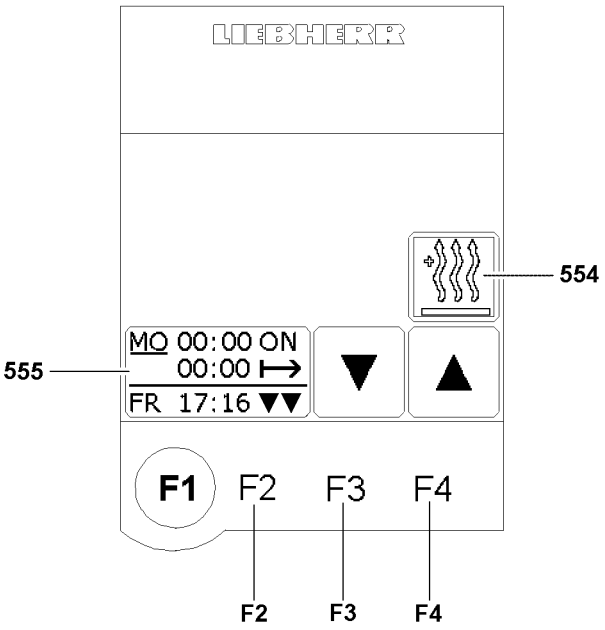
The engine-independent auxiliary heater to heat the cab or to preheat the engine can be programmed a **maximum** of one week in advance.

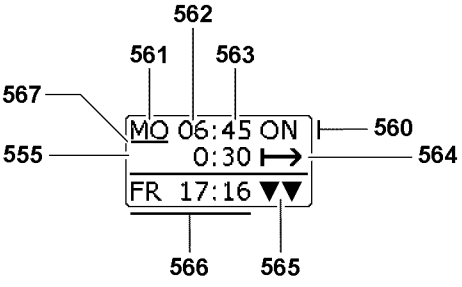
Note

▶ It is advisable to restrict the auxiliary heater programming to two days, since there is a risk that the battery discharge extremely quickly at freezing temperatures.

Auxiliary heater programmed			
Status display	Function key **F4**	Function key **F3**	Icon display
MO 06:45 ON 00:30 ⟼ FR 17:16 **OFF**	▲ F4	— —	*Auxiliary heater “OFF”*
MO 06:45 ON 00:30 ⟼ FR 17:16 ⏲	▲ F4	▼ F3	*Auxiliary heater - cab*
MO 06:45 ON 00:30 ⟼ FR 17:16 ⏲≈	— —	▼ F3	*Auxiliary heater - engine preheating*


LIEBHERR
554
555
MO 00:00 ON
00:00
FR 17:16
F1
F2
F3
F4
F2
F3
F4


LIEBHERR
554
555
MO 00:00 ON
00:00
FR 17:16
F1
F2
F3
F4
F2
F3
F4


562
561
563
567
MO 06:45 ON
560
555
0:30
564
FR 17:16
566
565

B106308

Programming the auxiliary heater

In order to access auxiliary heater programming mode, press the function key **F4** until the status display shows the “clock” (programming mode for cab heater), or the “clock with wave” (programming mode for engine preheating), fig. **1**.
The status display **555** shows the current day of the week with the time **566**. The time in the status display **555** is coupled to the “real-time clock” in the test system.

Note

▶ The procedure for programming the auxiliary heater - to heat the crane cab or to preheat the engine - is identical in both cases.

Make sure that the following preconditions are met **before** the auxiliary heater is programmed:
– The required temperature of the heater has been set.
– The fan / blower is set to stage 0 (“OFF”).
– The required programming mode, cabin heater (“clock”) or engine preheating (“clock with wave”) has been selected.

▶ Press the function key **F2**.

Result:
– The auxiliary heater programming interface is displayed, fig. **2**.
– In the status display **555** appears the cursor **567** under the modifiable input value.

Note

▶ The cursor **567** is positioned to day programming **560** by default.

▶ Press the function key **F4** and select the required day of the week **561** (**ascending** order).

or

■ Press the function key **F3** and select the required day of the week **561** (**descending** order).

Result:
– The selected day of the week is “set”.

▶ Press the function key **F2**.

Result:
– The cursor **567** changes from day programming **561** to hour programming **560**.

▶ Press the function key **F4** and select the desired hour **562** (**ascending** order).

or

■ Press the function key **F3** and select the desired hour **562** (**descending** order).

Result:
– The selected hour is “set”.

▶ Press the function key **F2**.

Result:
– The cursor **567** changes from hour programming **562** to minute programming **563**.

▶ Press the function key **F4** and select the desired minute **563** (**ascending** order).

or

■ Press the function key **F3** and select the desired minute **563** (**descending** order).

Result:
– The selected minute is “set”.

▶ Press the function key **F2**.

Result:
– The cursor **567** changes from minute programming **563** to turn on duration **564**.

▶ Press the function key **F4** and select the desired turn on duration **564** (ascending).

or

■ Press the function key **F3** and select the desired turn on duration **564** (descending).

Result:

– The selected turn on duration **564** is “set”.

Note

▶ The turn on duration **564** of the auxiliary heater is restricted to a maximum of **0:55 minutes**!
▶ The cursor **567** automatically changes to the minutes setting for the turn on duration **564**.
▶ The turn on duration **564** can only be changed in 5 minute increments.

▶ Press the function key **F2**.

Result:

– The cursor **567** changes from turn on duration **564** to day programming **560**.
– The auxiliary heater programming is complete.

▶ Select the auxiliary heater **554** by “touching”.

Result:

– The programmed settings are taken over.
– The “Air conditioning settings” menu is displayed.
– The auxiliary heater starts to operate when the programmed turn on time for heater operation is reached and turns the heater operation off again when the selected turn on duration has expired.
– In automatic regulation, the auxiliary heater operates according to the “manual” or “AUTO” heat setting.

Note

▶ The auxiliary heater programming must be manually reset to “zero” after programmed heating has taken place. Otherwise, the auxiliary heater is automatically turned on according to the programming.

Resetting the auxiliary heater programming

To reset the auxiliary heater programming, proceed as described in “Programming the auxiliary heater”.

▶ Reset the values in the status display **555** to “zero”.

Result:

– The programming is turned off.

Note

▶ The programming can be modified manually or turned off altogether at any time.

2.10 Bleeding the heating system

When draining the engine coolant, the contents of the heating system will also be drained because the engine and heater operate as one circuit. When refilling the system, it should be carefully bled.

▶ Add coolant via the expansion tank of the engine cooling system according to the lubricant chart.
▶ Start the engine as described in Chapter 3.04.
▶ Set the heater to “warm”.
▶ Check the expansion tank for air bubbles.

Result:

– The engine is bled as soon as no more air bubbles rise.

▶ When no more air bubbles rise in the expansion tank:
Set the heater to “cold”.

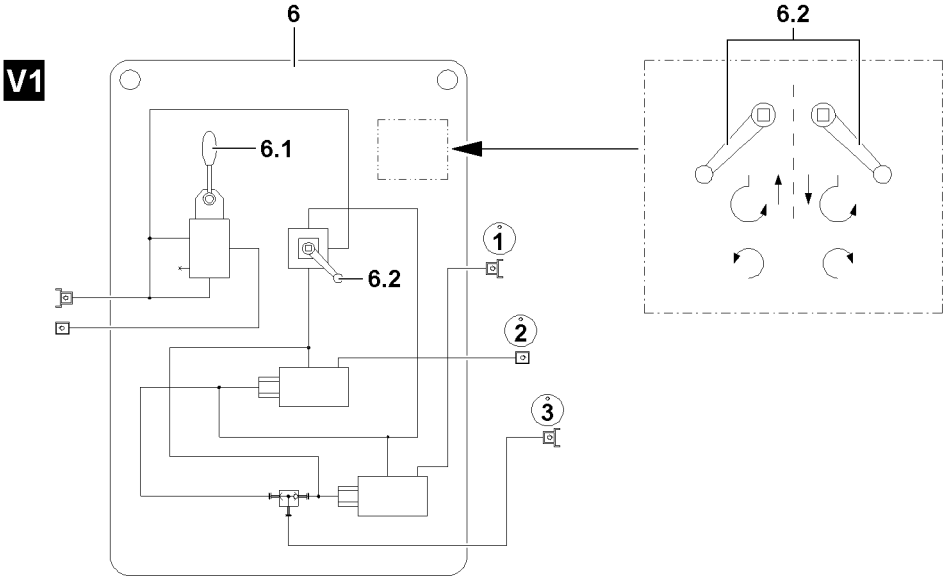
Result:

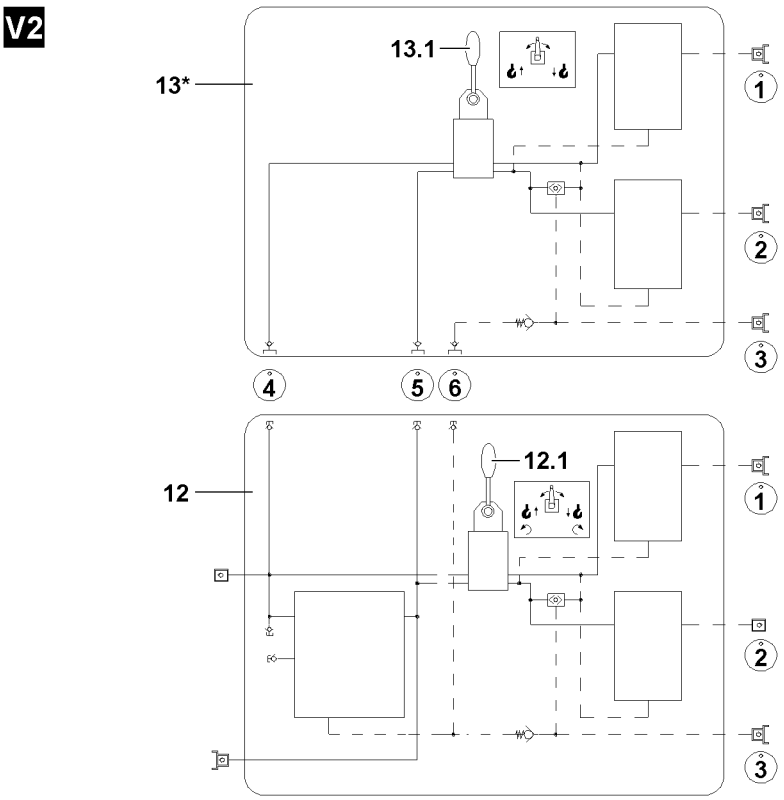
– The heating circuit will be vented.

▶ Check the expansion tank for air bubbles.

Result:

– The heating circuit is vented as soon as no more air bubbles rise.





B109407

1 Emergency operation

Note
▶ The illustrations in this chapter are examples and may not apply exactly to your crane!

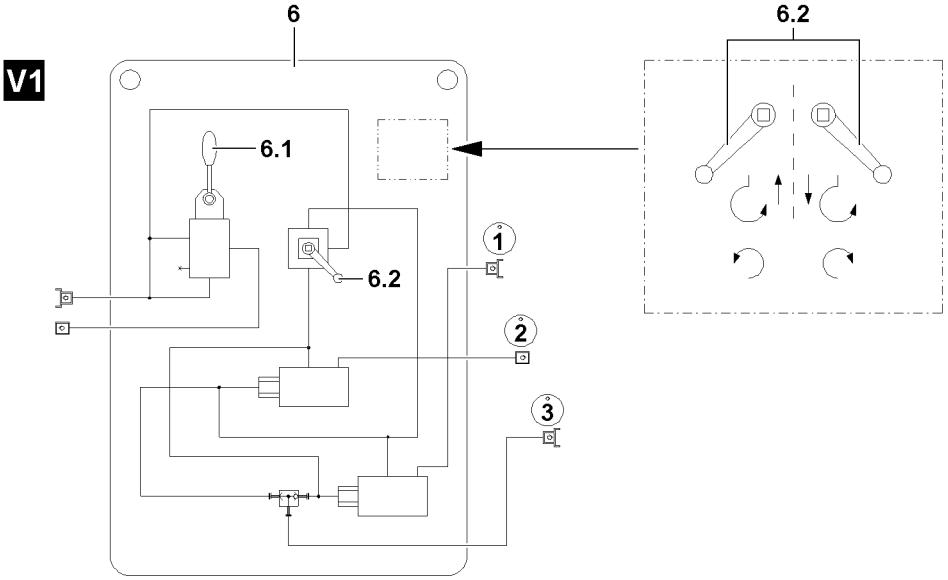
Note
▶ Before you start with preparations for emergency operation, check which of the following assembly plates you have available to carry out the emergency operation!

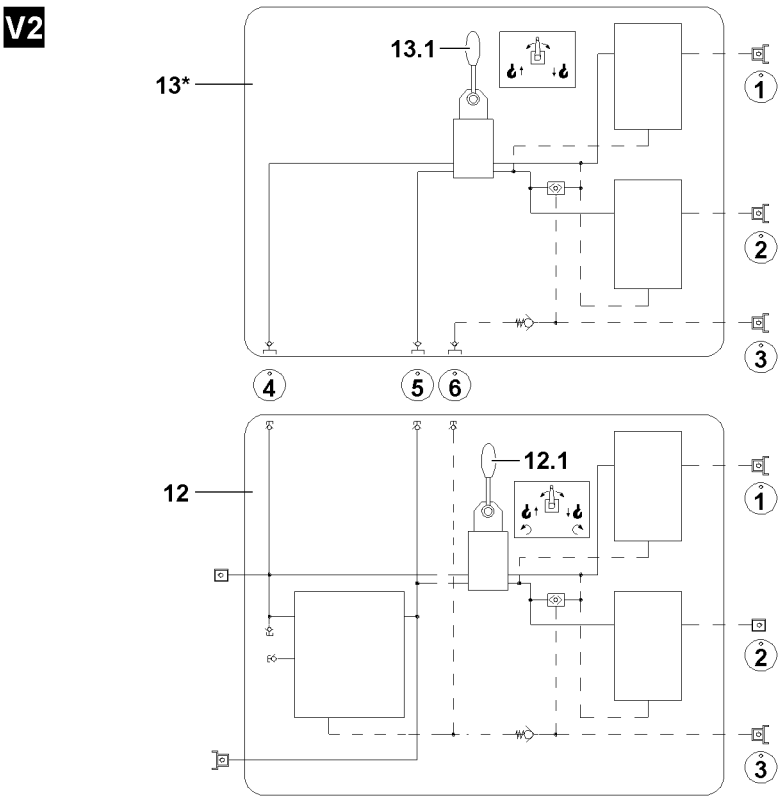
There are two **different** variations of assembly plates.
With variation 1 **V1**, all winches, which are equipped with the respective auxiliary hydraulic for emergency operation and the slewing gear can be actuated, each individually.
With variation 2 **V2**, which consists of two assembly plates, all winches, which are equipped with the respective auxiliary hydraulic for emergency operation can be actuated, each individually,
or winch 1 **WI** and winch 2 **WII** can be actuated in parallel operation or the slewing gear can be actuated individually.

Note
▶ Observe the following charts!

	Variation 1 (V1) each in individual operation	**Variation 2 (V2)** each in individual operation
Winch 1	X	X
Winch 2	X	X
Winch 1II2 [1)]	—	X
Winch 3	X	X
Winch 4	X	X
Winch 5	X	X
Winch 6	X	X
Slewing gear	X	X

1) Parallel operation Winch 1 and winch 2 (1II2)





B109407

1.1 General danger notes

DANGER
Significant accident risk during emergency operation!
During an emergency operation, crane movements are no longer monitored by the LICCON computer system!
In the event of improper operation or deliberate misuse, the crane can topple over!
There is an increased risk of accident if the following danger notes are not observed!
Personnel can be severely injured or killed!
This could result in high property damage!
▶ All hazard warnings are to be observed and maintained!

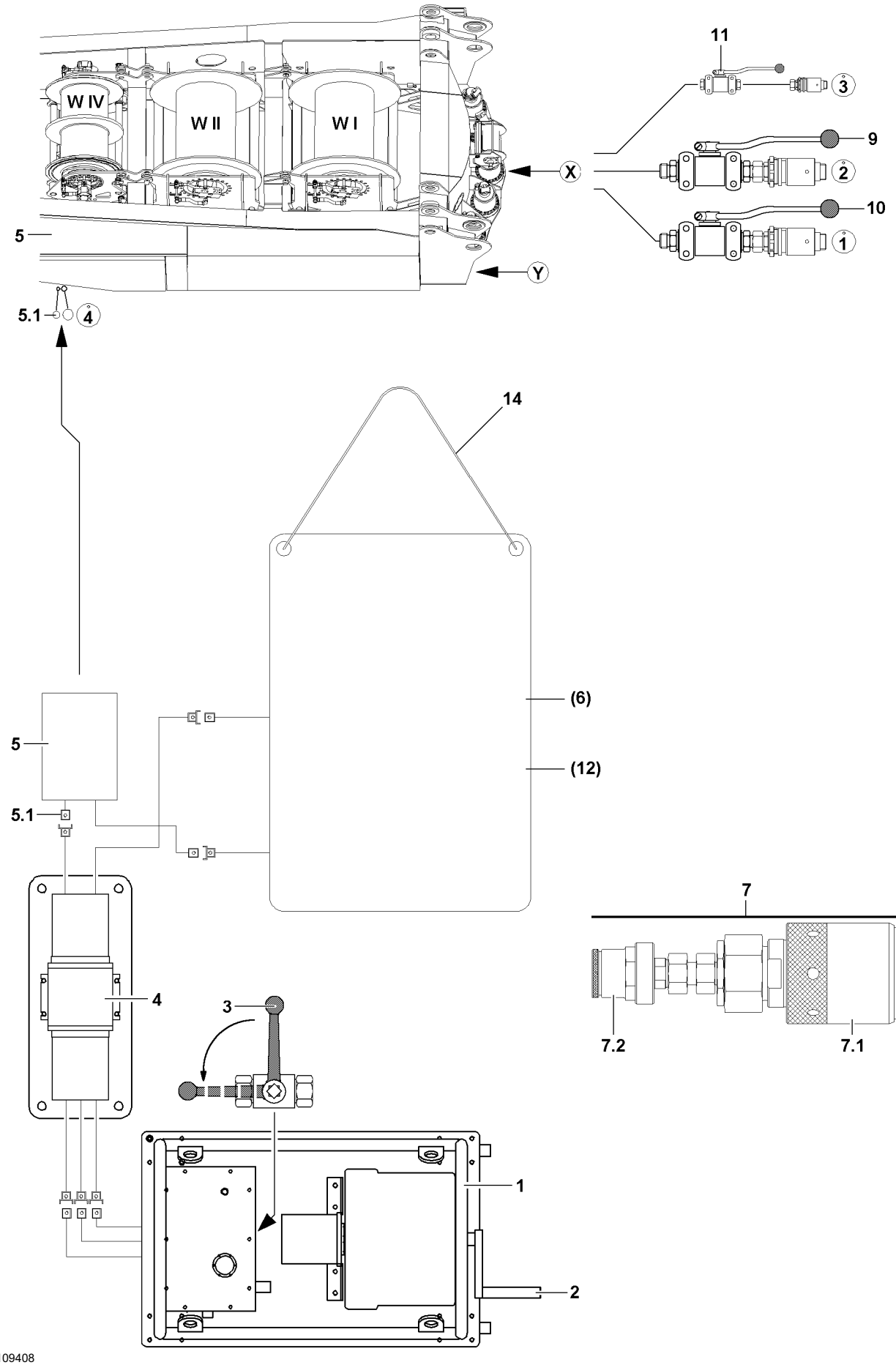
General danger notes!

1.) **Emergency operation of the crane superstructure may only be carried out:**
- **To remove a dangerous situation.**
- **After consultation with customer service at LIEBHERR-Werk Ehingen GmbH.**
- **By authorized personnel who are knowledgeable of the hydraulic circuit diagram, the connection diagram and carrying out emergency operation.**
- **By authorized personnel who are aware of the risks of emergency operation.**
- **To carry out load reducing movements.**

2.) **The danger zone must be blocked off!**
3.) **No persons or objects are to be situated in the danger zone!**
4.) **If a load is on the hook, then it must first be set down to relieve the boom!**
5.) **In the event of a defect or failure of the LICCON computer system, each step must be carried out and monitored with extreme caution and care, since a visual check on the LICCON monitor is no longer possible. Visual check!**
6.) **All crane movements must be travelled with extreme caution and at the lowest speed!**
7.) **The crane operator must be in visual contact with auxiliary personnel or guides person!**

Note
Please note!
▶ The hydraulic supply for the crane can, to the extent that the crane has been equipped, take place through an emergency unit*. If this is not the case, the crane must be taken down by using additional auxiliary cranes!

WARNING
The crane can topple over!
▶ The boom may only be luffed down if the stability of the crane permits this action, observe information in the load tables and maintain them!
▶ When taking down the boom, the information in the Erection and take down charts are to be observed and followed!


W IV
W II
W I
X
Y
5
5.1
4
11
3
9
2
10
1
14
(6)
(12)
5
5.1
4
3
1
2
7
7.2
7.1
B109408

1.2 Handling of assembly plates

WARNING
Falling assembly plates!
Non-secured assembly plates can fall down when carrying out the emergency operation!
Personnel can be severely injured or killed!
- ▶ For emergency operation, secure the assembly plates with the chains **14** to prevent them from falling down!
- ▶ Do not secure the assembly plates near movable crane components!

1.3 Prerequisites for emergency operation

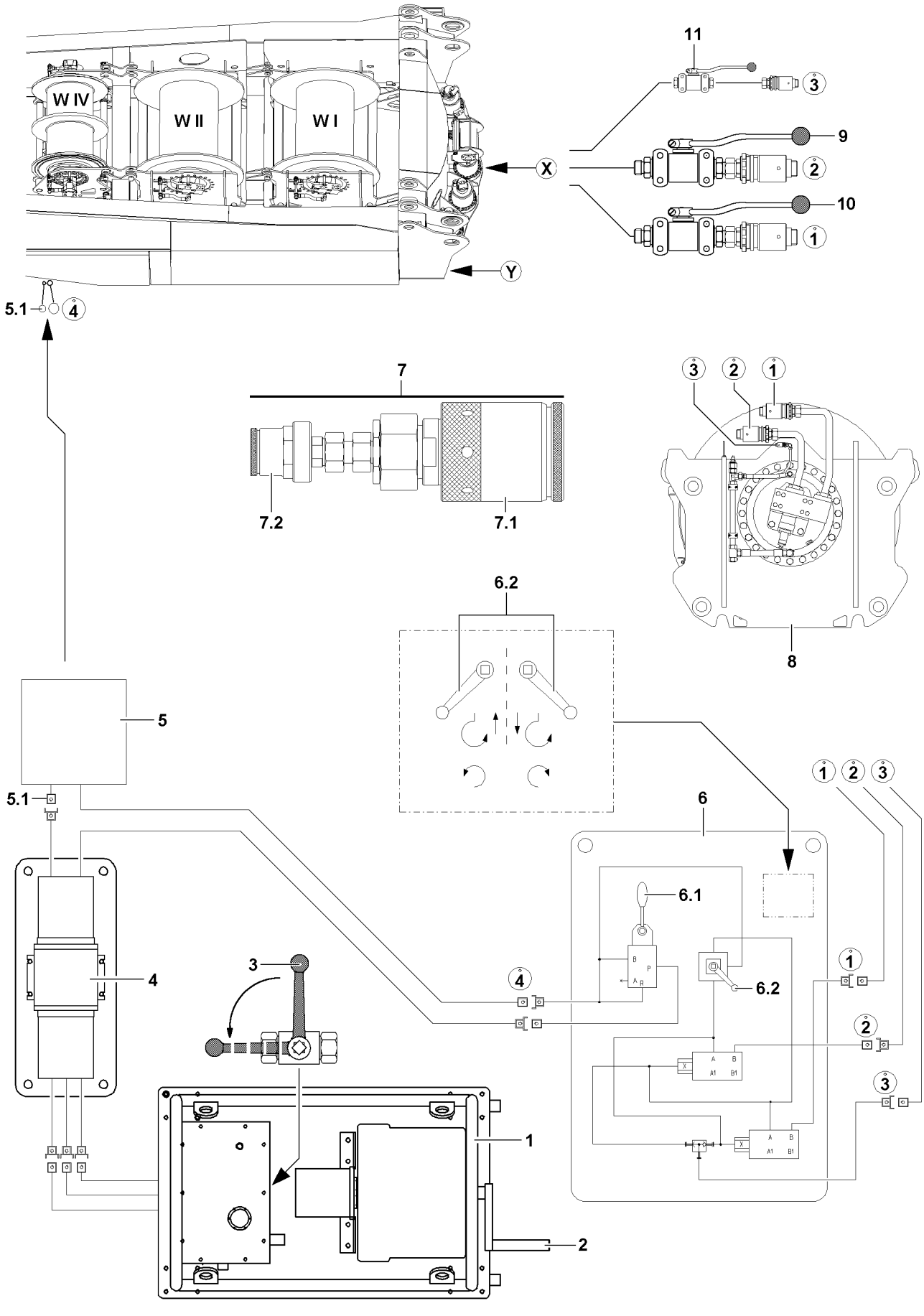
Note
- ▶ On the basis of different line diameters on the hydraulic lines, false couplings are prevented, additionally the hydraulic connections are identified with numbers!

Make sure that the following prerequisites are met:
- the hydraulic circuit diagram is available,
- the hydraulic system is operative,
- an emergency operation aggregate **1** is available,
- a “hydraulic transformer **4** ” is available,
- the assembly plate(s) are available
- reducer sections **7** (adapter) are available,
- the dust plugs for the hydraulic connections are removed.

1.4 Establish the hydraulic connections

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines stand under pressure upon loosening the connections, it can lead to severe injuries to assembly personnel!
- ▶ Remove pressure from hydraulic lines before loosening!

- ▶ Establish the hydraulic connections from the emergency operation aggregate* **1** to the transformer **4**.
- ▶ Establish the hydraulic connection from the transformer **4** to the (suction line) on the turntable **5** of the crane, connection **5.1**.
- ▶ Hydraulic connection (return line, number **4**) from the turntable of the crane to the assembly plate **6** or to the assembly plate **12**.
- ▶ Establish the hydraulic connection (pressure line) from the transformer **4** to the assembly plate **6** or to the assembly plate **12**.



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2 Emergency operation with assembly plate Variation 1 (V1)

Note
▶ Carrying out emergency operation is identical for all winches and is described on the example of a winch!

To carry out the emergency operation, use an emergency operation aggregate **1**, a hydraulic transformer **4** and the assembly plate **6**.

2.1 Functional selection on the assembly plate

With the ball valve **6.2** on the assembly plate **6** the following movements are preselected:
– Lift or lower.
– Turn left or right.

▶ Preselect crane movement: Activate ball valve **6.2** in the corresponding direction.

Moving the hand lever **6.1** determines the speed of the each crane movement.
▶ Operate the hand lever **6.1** and carry out the relevant crane movement carefully.

2.2 Start the emergency operation aggregate

▶ Turn crank **2** on the emergency operation aggregate* **1**.
▶ Ball valve **3** switched over “horizontally”.

Note
▶ The engine rpm on the emergency operation aggregate can be set via a separate speed regulator!

2.3 Emergency operation winches

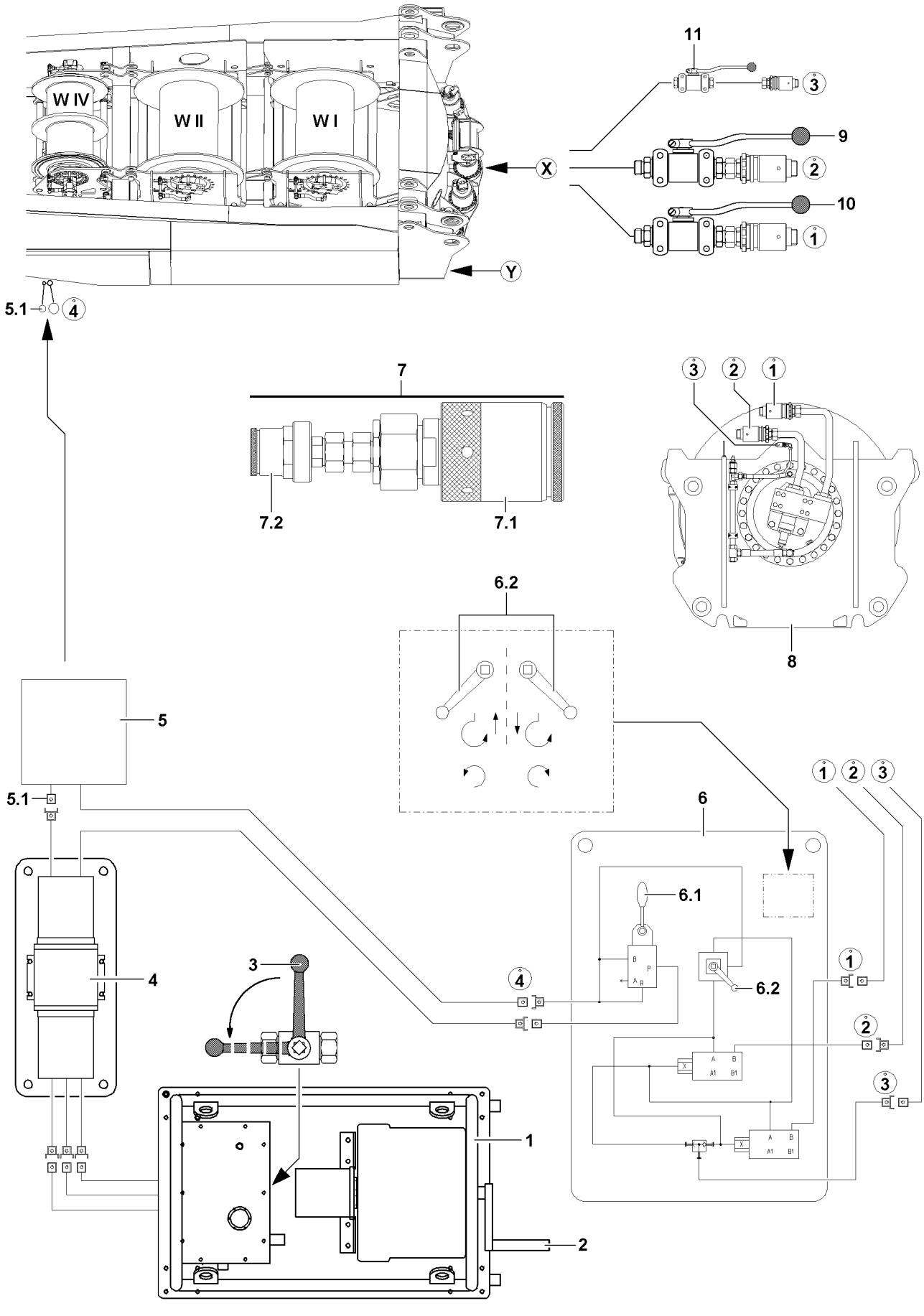
2.3.1 Establishing the hydraulic connections to the winch

Ensure that the following prerequisite is met:
– the hydraulic system is pressureless.

▶ Loosen hydraulic connections on the corresponding winch.
▶ Assemble Reducer sections **7** (adapter) with coupling sleeve **7.1** on the connection **1** and on the connection **2** of the winch **8**.

Note
▶ Observe numbering of the hydraulic lines!

▶ Create hydraulic connections for the assembly plate **6** (connection **1**, connection **2** and brake **3**) for the winch **8**.



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2.3.2 Spooling the winch out

▶ Set ball cock **6.2** for the assembly plate **6** on “lower”.

▶ Move the manual lever **6.1** carefully.

Result:

– The winch spools out.

2.3.3 Spooling the winch up

▶ Set ball cock **6.2** for the assembly plate **6** on “lift”.

▶ Move the manual lever **6.1** carefully.

Result:

– The winch spools up.

2.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

– the emergency operation is completed,

– the hydraulic system is pressureless.

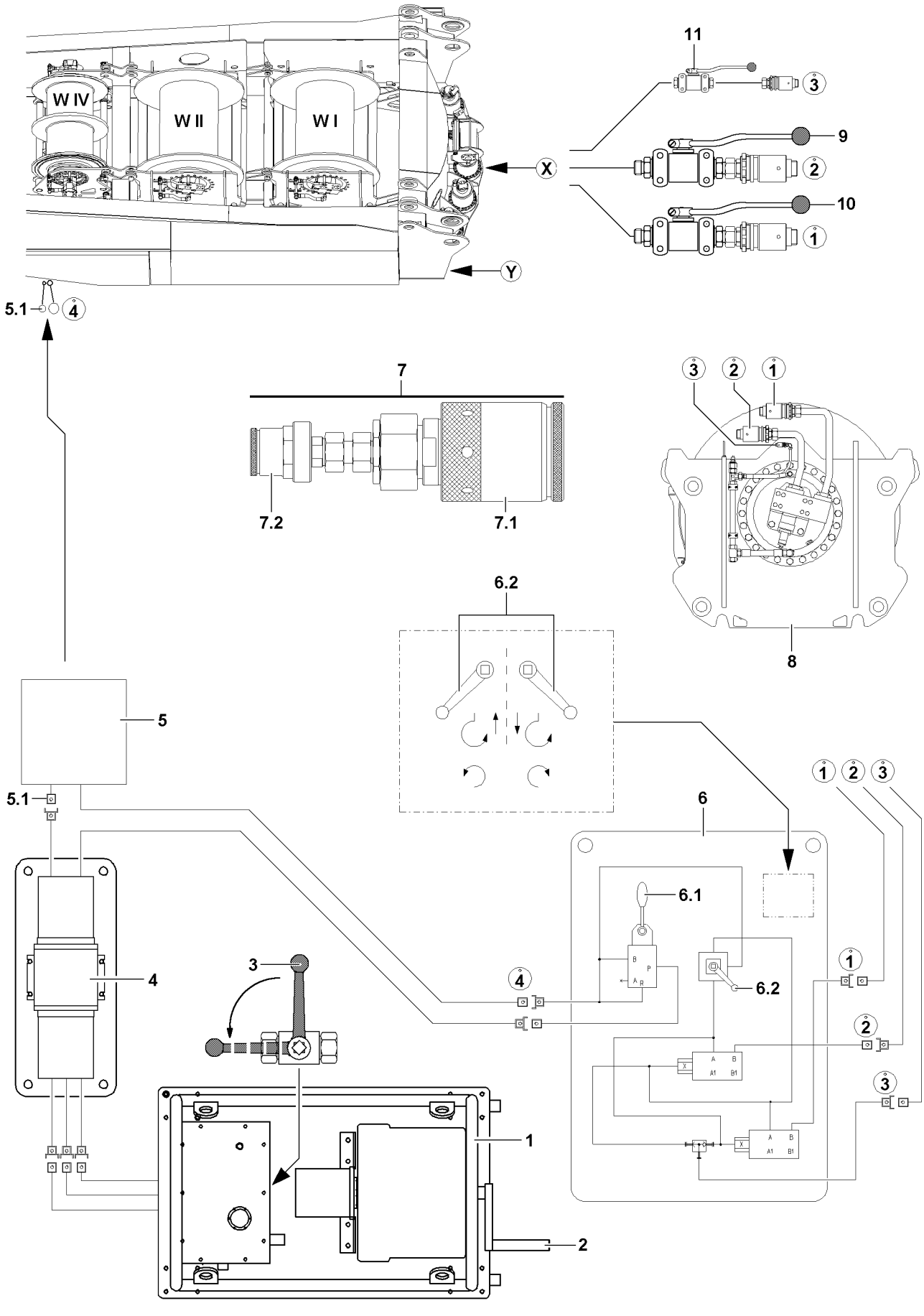
▶ Separate hydraulic connections from winch **8** to the assembly plate **6**.

▶ Remove the reducer sections **7** (adapter).

▶ Close hydraulic connections of the winch **8** with dust plugs.

or

■ Reconnect winch **8** onto the crane hydraulic system.



B108301

3 Emergency operation of slewing gear(s) with assembly plate Variation 1 (V1)

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines stand under pressure upon loosening the connections, it can lead to severe injuries to assembly personnel!
▶ Remove pressure from hydraulic lines before loosening!

Note
▶ For each crane type, the installation position of the ball valves for emergency operation of the slewing gear on the turntable varies!
▶ Possible installation positions of the ball valve: Point **X** or point **Y**!

3.1 Establishing the hydraulic connection to the slewing gears

Ensure that the following prerequisite is met:
– the hydraulic system is pressureless.

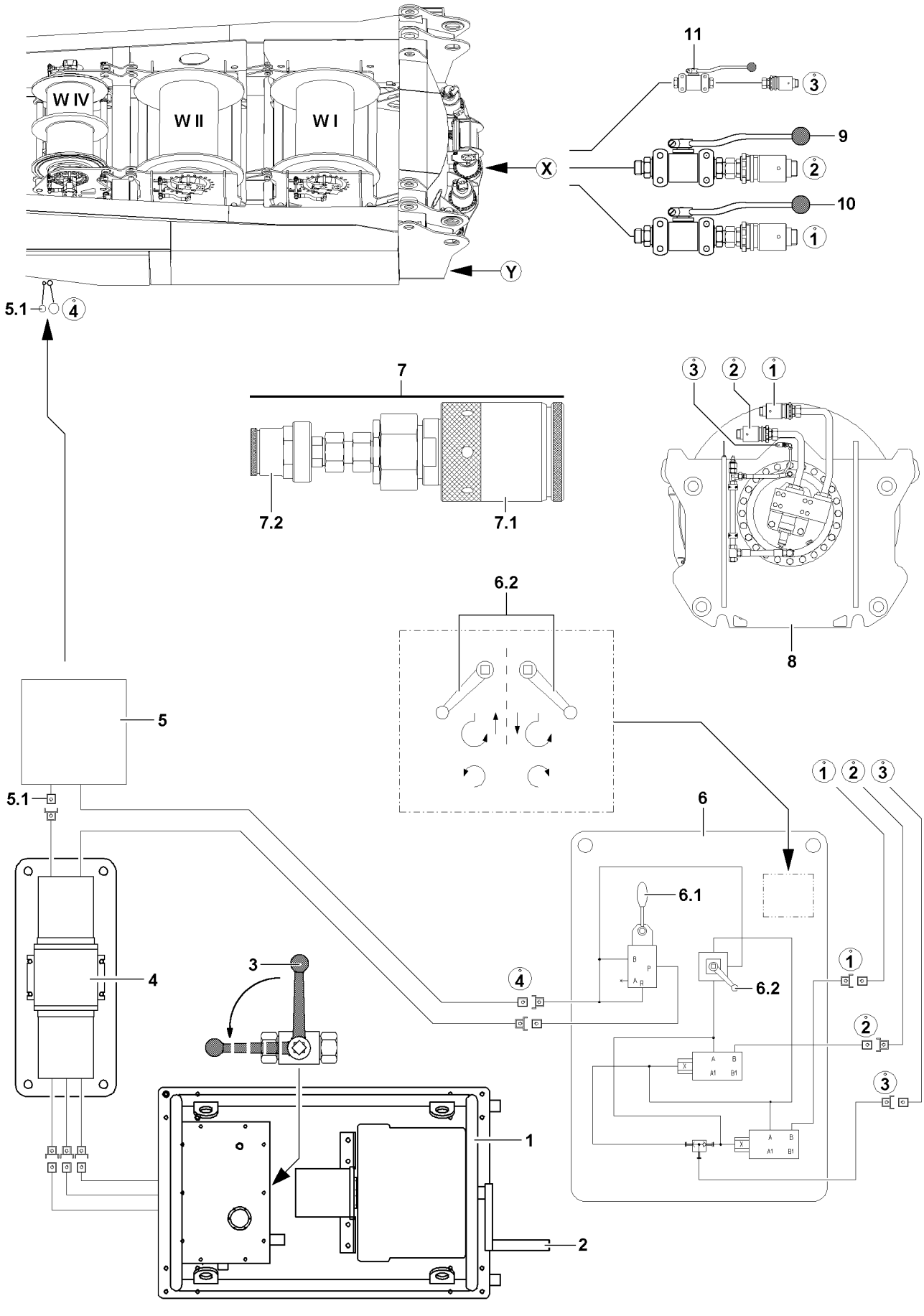
Note
▶ Observe numbering of the hydraulic lines!

▶ Create hydraulic connections to the assembly plate **6** (connection **1**, connection **2** and brake **3**) to the “ball valves” on the turntable.

3.2 Turning the turntable to the left

▶ Setting ball valve **9** into emergency operation position.
▶ Setting ball valve **10** into emergency operation position.
▶ Setting ball valve **11** into emergency operation position.
▶ Set ball valve **6.2** for the assembly plate **6** on “turn left”.
▶ Move the manual lever **6.1** carefully.

Result:
– Turntable turns to the left.



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3.3 Turning the turntable to the right.

- ▶ Setting ball valve **9** into emergency operation position.
- ▶ Setting ball valve **10** into emergency operation position.
- ▶ Setting ball valve **11** into emergency operation position.
- ▶ Set ball valve **6.2** for the assembly plate **6** on “turn right”.
- ▶ Move the manual lever **6.1** carefully.

Result:

– Turntable turns to the right.

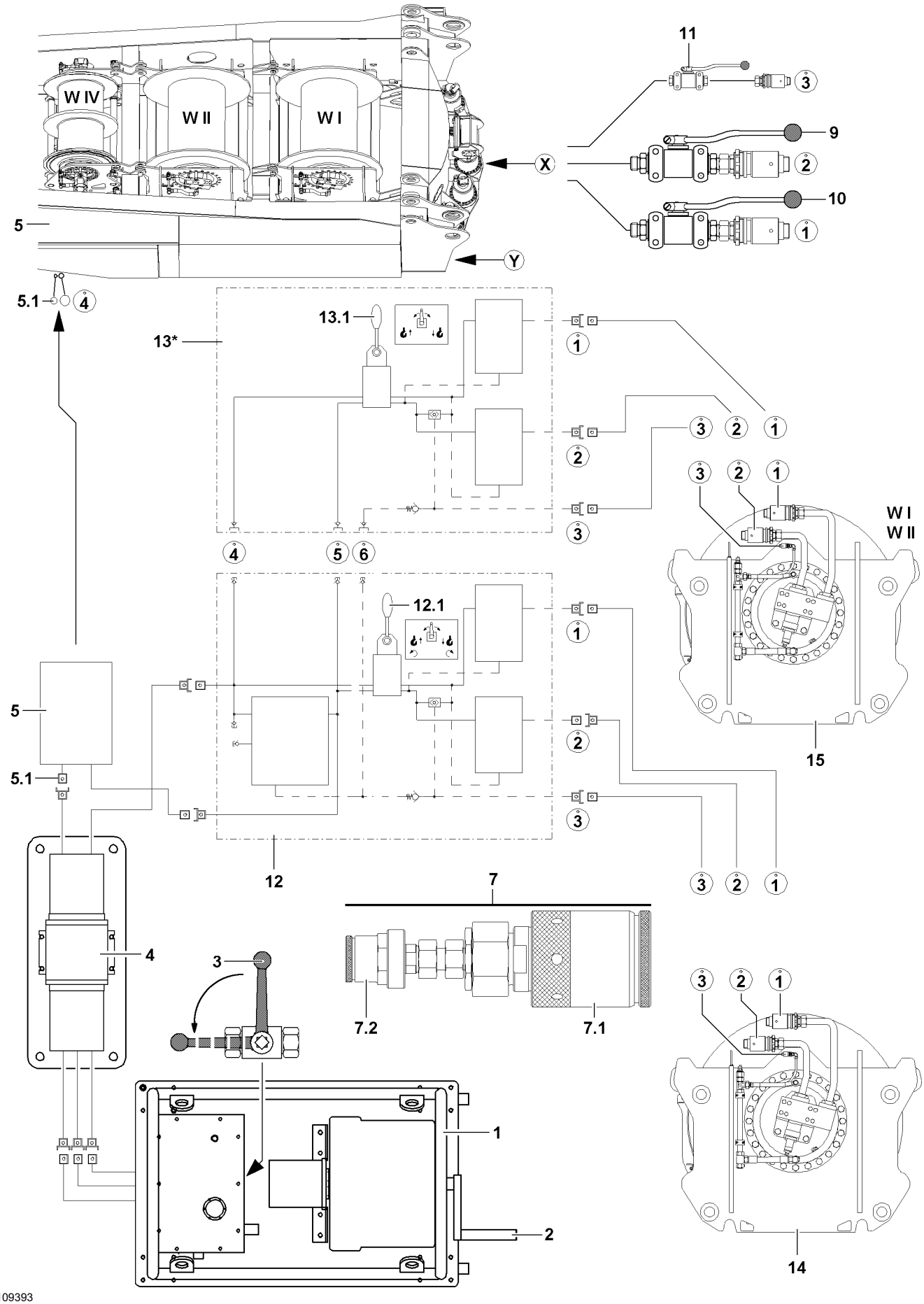
3.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

– the emergency operation is completed,
– the hydraulic system is pressureless.

Disconnect the hydraulic connections to the assembly plate **6**.

- ▶ Reposition the ball valve **9** in position for crane operation.
- ▶ Reposition the ball valve **10** in position for crane operation.
- ▶ Reposition the ball valve **11** in position for crane operation.
- ▶ When ball valve **9**, ball valve **10** and ball valve **11** are repositioned into crane operation position. Disconnect the hydraulic connections to the assembly plate **6**.
- ▶ Close hydraulic connections with dust plugs.


W IV
W II
W I
X
Y
5
11
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10
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5.1
4
13*
13.1
12.1
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W I
W II
14
7
7.1
7.2
3
4
1
2
B109393

4 Emergency operation with assembly plate(s) Variation 2 (V2)

Note
▶ Carrying out emergency operation is identical for all winches and is described on the example of a winch!

To carry out the emergency operation, use an emergency operation aggregate **1**, a hydraulic transformer **4** and the assembly plate **12**. To carry out the emergency operation from winch 1 **W I** and winch 2 **W II** in parallel operation (1II2), in addition to the assembly plate **12**, the assembly plate **13** is needed. Connect the assembly plate **12** with the assembly plate **13** hydraulically on hydraulic connections 4, 5 and 6.

4.1 Start the emergency operation aggregate

▶ Turn crank **2** on the emergency operation aggregate* **1**.
▶ Switch the ball valve **3** to “horizontal” position.

Note
▶ The engine rpm on the emergency operation aggregate can be set via a separate speed regulator!

4.2 Emergency operation of winches, individual operation

Note
▶ The crane movements are actuated and the speed of the respective crane movement is determined via the ball valve **12.1** and ball valve **13.1**!

4.2.1 Establishing the hydraulic connections to the winch

Ensure that the following prerequisite is met:
– the hydraulic system is pressureless.

▶ Loosen hydraulic connections on the corresponding winch.
▶ Install the reducer sections **7** (adapter) with coupling sleeve **7.1** on the connection **1** and on the connection **2** of the respective winch.

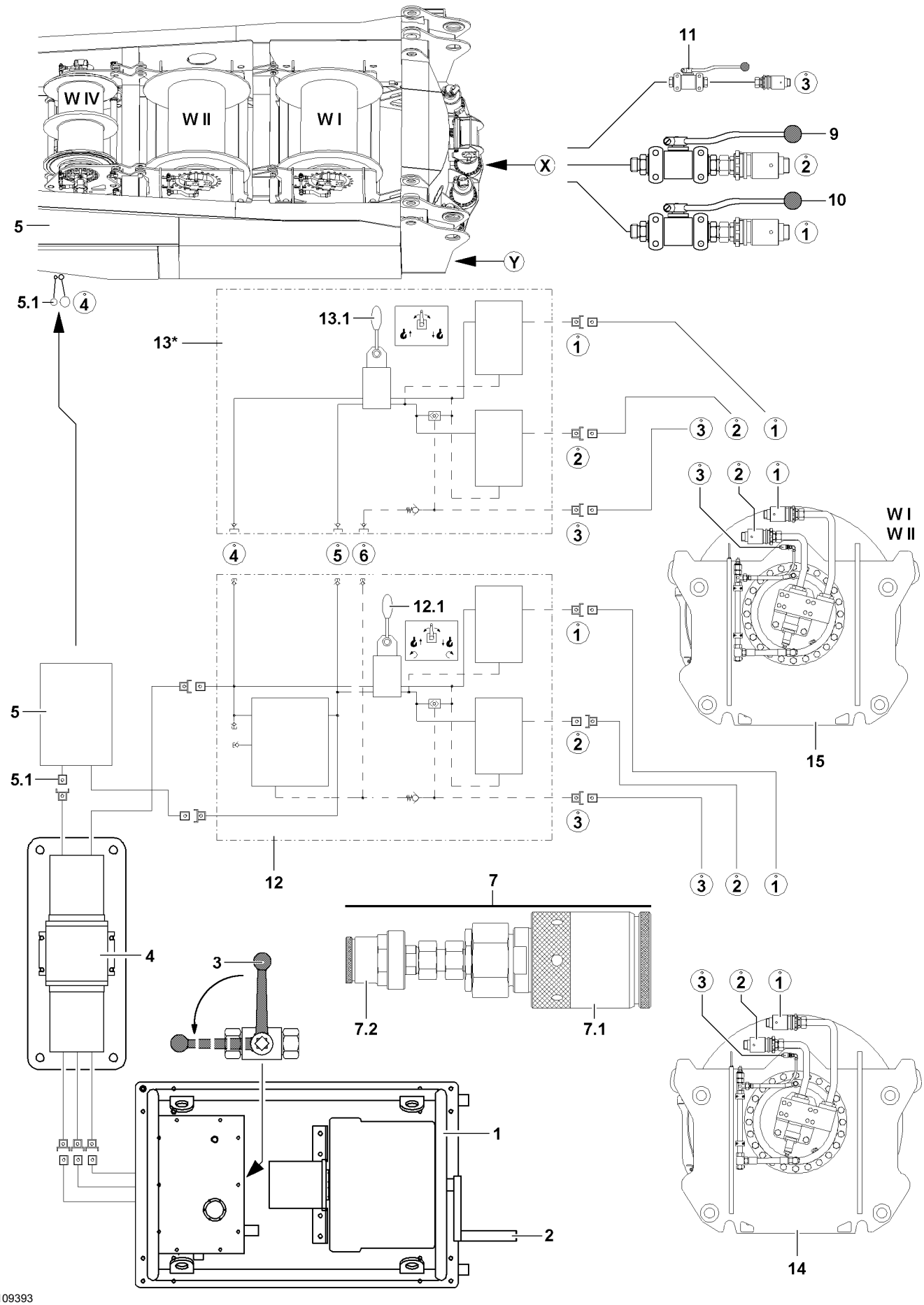
Note
▶ Observe numbering of the hydraulic lines!

▶ Create hydraulic connections for the assembly plate **12** (connection **1**, connection **2** and brake **3**) for the respective winch.

4.2.2 Spooling the winch out

▶ Set ball cock **12.1** for the assembly plate **12** on “lower”.

Result:
– The winch spools out.


W IV
W II
W I
X
Y
5
11
9
10
3
2
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5.1
4
13*
13.1
12.1
12
15
W I
W II
7
7.1
7.2
3
4
1
2
14
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4.2.3 Spooling the winch up

▶ Set ball cock **12.1** for the assembly plate **12** on “lift”.

Result:

– The winch spools up.

4.2.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

– the emergency operation is completed,
– the hydraulic system is pressureless.

▶ Separate the hydraulic connections from the respective winch to the assembly plate **12**.
▶ Remove the reducer sections **7** (adapter).
▶ Close off the hydraulic connections of the winch with dust plugs.

or

■ Reconnect the winch to the hydraulic system of the crane.

4.3 Emergency operation of winches, parallel operation winch 1II2

Note

▶ The crane movements are actuated and the speed of the respective crane movement is determined via the ball valve **12.1** and ball valve **13.1**!

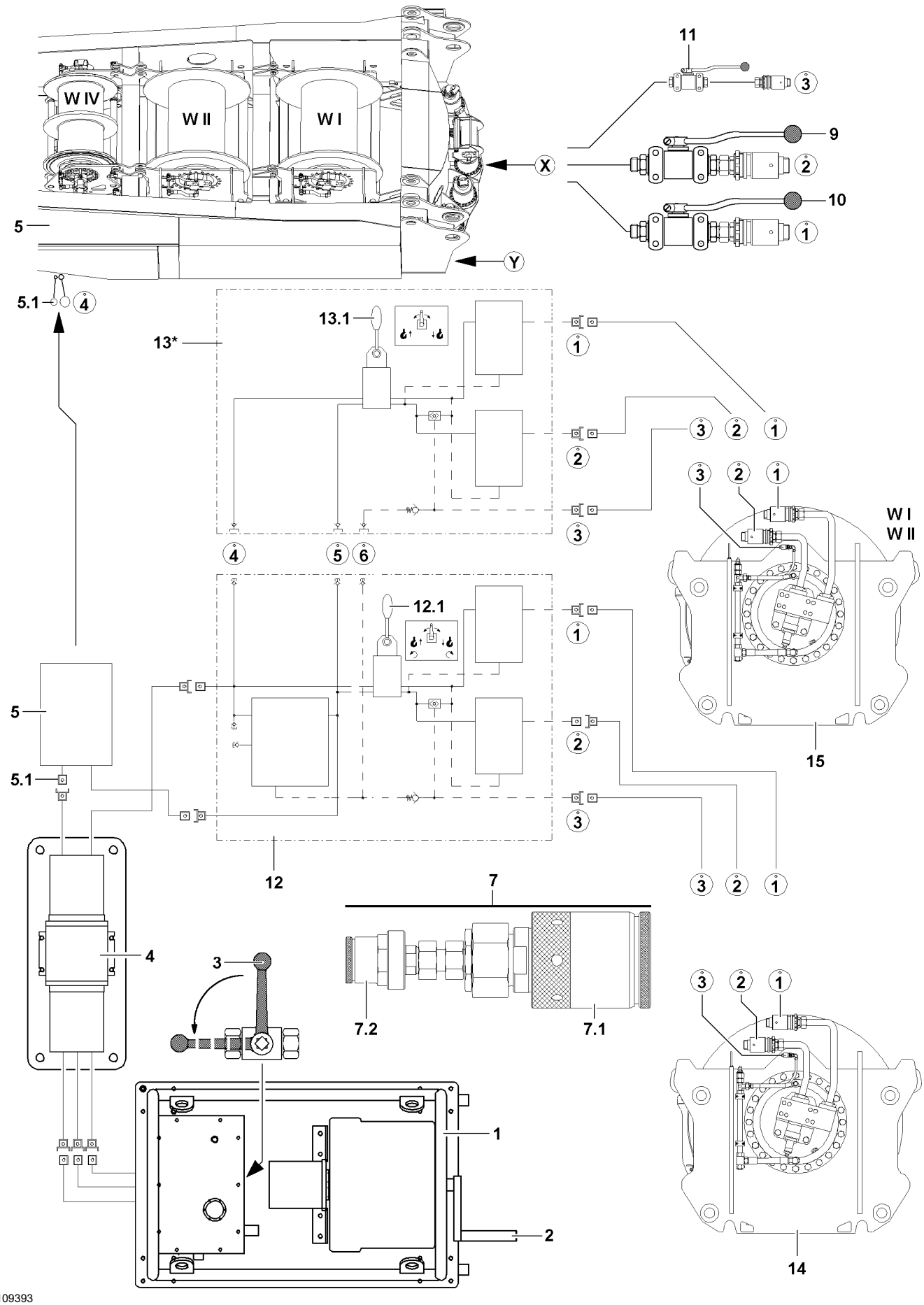
WARNING

Risk of accident!

If the following notes are not observed, dangerous situations can arise!

Personnel can be severely injured or killed!

▶ If winch 1 and winch 2 are actuated in parallel operation, then it must be ensured that the hook blocks are horizontally aligned!
▶ Always actuate winch 1 and winch 2 simultaneously!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5.1
4
13*
13.1
12.1
12
15
W I
W II
7
7.1
7.2
3
4
1
2
14
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4.3.1 Establishing the hydraulic connections to the winches

Ensure that the following prerequisite is met:
– the hydraulic system is pressureless.

▶ Release the hydraulic connections on winch 1 and winch 2.
▶ Install the reducer sections **7** (adapter) with coupling sleeve **7.1** on the connection **1** and on the connection **2** of the respective winch.

Note
▶ Observe numbering of the hydraulic lines!

▶ Establish the hydraulic connections for the assembly plate **12** (connection **1**, connection **2** and brake **3**) to winch 1.

or

■ Establish the hydraulic connections for the assembly plate **12** (connection **1**, connection **2** and brake **3**) to winch 2.
▶ Establish the hydraulic connections for the assembly plate **13** (connection **1**, connection **2** and brake **3**) to winch 1.

or

■ Establish the hydraulic connections for the assembly plate **13** (connection **1**, connection **2** and brake **3**) to winch 2.

4.3.2 Spooling the winches out

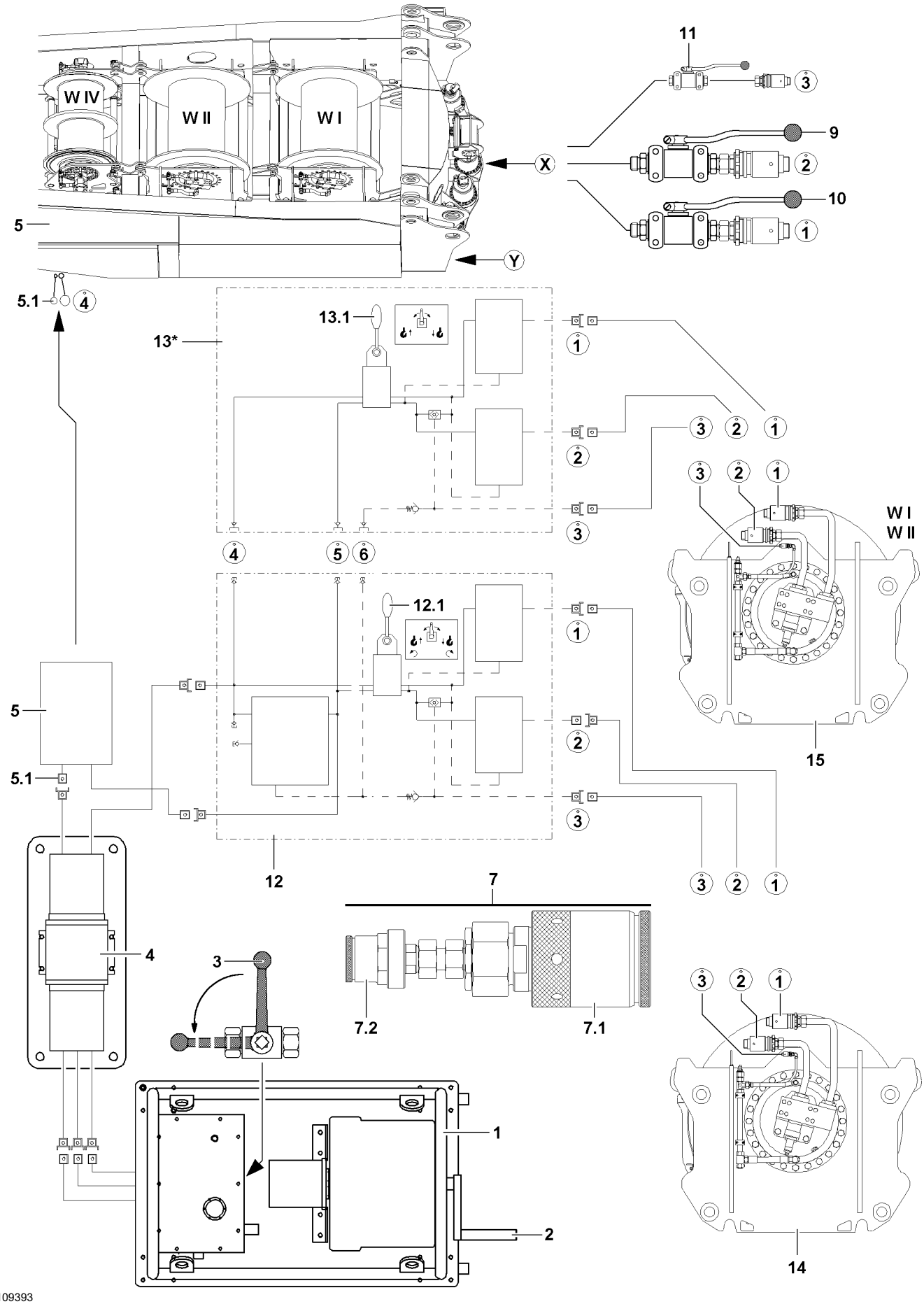
Note
▶ Check which winch you have connected to which assembly plate!

▶ Set ball cock **12.1** for the assembly plate **12** on “lower”.

Result:
– Winch 1 **or** winch 2 spools out.

▶ Set ball cock **13.1** for the assembly plate **13** on “lower”.

Result:
– Winch 2 **or** winch 1 spools out.


W IV
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13*
13.1
12.1
12
15
W I
W II
14
7
7.1
7.2
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4
1
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4.3.3 Spooling the winches up

▶ Set ball cock **12.1** for the assembly plate **12** on “lift”.

Result:

– Winch 1 **or** winch 2 spools up.

▶ Set ball cock **13.1** for the assembly plate **13** on “lift”.

Result:

– Winch 2 **or** winch 1 spools up.

4.3.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

– the emergency operation is completed,
– the hydraulic system is pressureless.

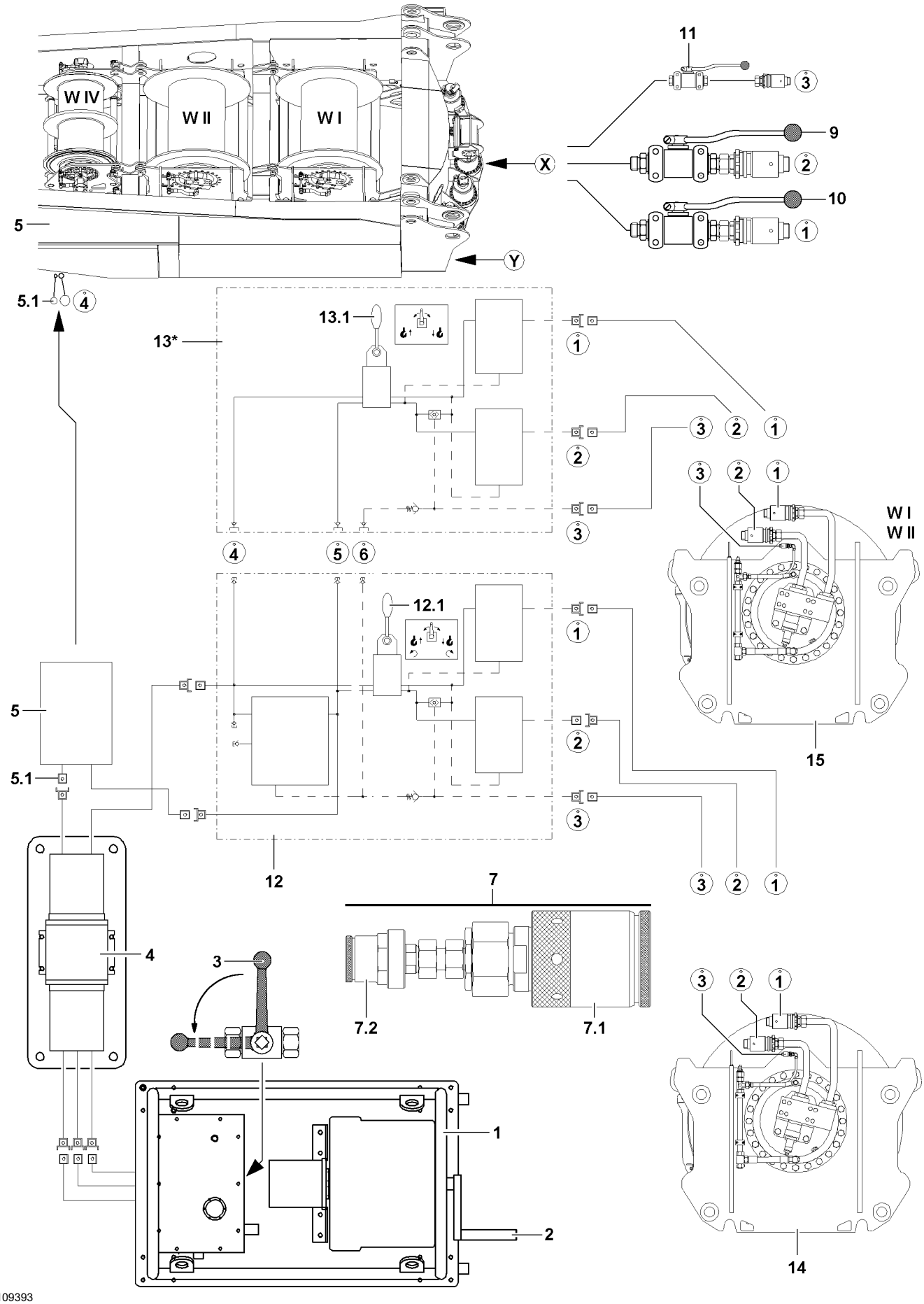
▶ Disconnect the hydraulic connections of winch 1 and winch 2 to the respective assembly plates.

▶ Remove the reducer sections **7** (adapter).

▶ Close off the hydraulic connections of the winches with dust plugs.

or

■ Reconnect the winches to the hydraulic system of the crane.


W IV
W II
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13*
13.1
12.1
12
15
W I
W II
7
7.1
7.2
3
4
1
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14
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5 Emergency operation slewing gear(s) with assembly plate(s) Variation 2 (V2)

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines stand under pressure upon loosening the connections, it can lead to severe injuries to assembly personnel!
▶ Remove pressure from hydraulic lines before loosening!

Note
▶ For each crane type, the installation position of the ball valves for emergency operation of the slewing gear on the turntable varies!
▶ Possible installation positions of the ball valve: Point **X** or point **Y**!

Note
▶ The slewing movement is actuated and the speed of the slewing movement is determined via the ball valve **12.1**!

5.1 Establishing the hydraulic connection to the slewing gears

Ensure that the following prerequisite is met:
– the hydraulic system is pressureless.

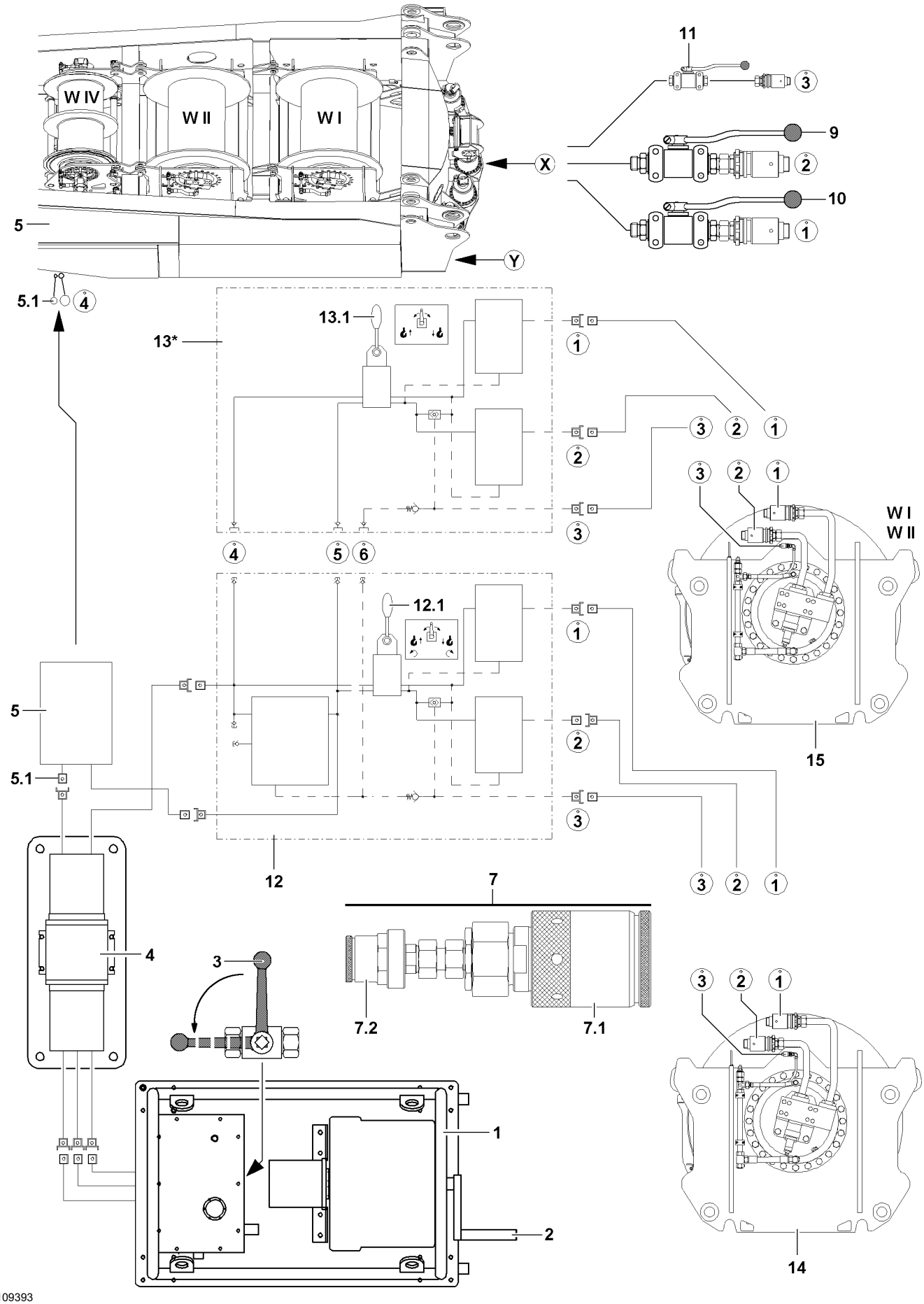
Note
▶ Observe numbering of the hydraulic lines!

▶ Create hydraulic connections to the assembly plate **12** (connection **1**, connection **2** and brake **3**) to the “ball valves” on the turntable.

5.2 Turning the turntable to the left

▶ Setting ball valve **9** into emergency operation position.
▶ Setting ball valve **10** into emergency operation position.
▶ Setting ball valve **11** into emergency operation position.
▶ Set ball valve **12.1** for the assembly plate **12** on “turn left”.

Result:
– Turntable turns to the left.


W IV
W II
W I
X
Y
5
11
9
10
3
2
1
5.1
4
13*
13.1
12.1
12
15
W I
W II
14
7
7.1
7.2
3
4
1
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5.3 Turning the turntable to the right.

- ▶ Setting ball valve **9** into emergency operation position.
- ▶ Setting ball valve **10** into emergency operation position.
- ▶ Setting ball valve **11** into emergency operation position.
- ▶ Set ball valve **12.1** for the assembly plate **12** on “turn right”.

Result:

– Turntable turns to the right.

5.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

– the emergency operation is completed,
– the hydraulic system is pressureless.

Disconnect the hydraulic connections to the assembly plate **12**.

- ▶ Reposition the ball valve **9** in position for crane operation.
- ▶ Reposition the ball valve **10** in position for crane operation.
- ▶ Reposition the ball valve **11** in position for crane operation.
- ▶ When ball valve **9**, ball valve **10** and ball valve **11** are repositioned into crane operation position. Disconnect the hydraulic connections to the assembly plate **12**.
- ▶ Close hydraulic connections with dust plugs.

6 Completing emergency operation

6.1 Procedure

- ▶ Turn the emergency operation aggregate* **1** off.
- ▶ Close the ball valve **3**.
- ▶ Loosen the hydraulic connections and close with dust plugs.

7.00 Service and maintenance

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1 General

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 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 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 fail!
The warranty for the respective crane components will be voided!
- ▶ Maintain crane components according to the data in the maintenance intervals, the maintenance notes and the lubrication chart!

1.1 LIEBHERR Service for you

LIEBHERR 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, which these cranes provide today, offer functional security, resistance to failure and easy 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 in ensuring the operational readiness and high availability of the cranes.
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 also have specialist service advisers who can help you to fix your on-site problems creatively. This contact by telephone saves time and money. In the event of problems, get in touch as soon as possible.
Our service technicians are also specialists with years of experience, and can be deployed from local support points. Naturally these experts have specialized knowledge and special tools.
But before you call on these people, it is worth making full use of the facilities for getting advice mentioned above.

Note
Customers claims for warranties and refunds!
The buyer only has a claim to warranties and possible credit if only Original LIEBHERR replacement parts, LIEBHERR service items and LIEBHERR lubricants are used for LIEBHERR cranes!
- ▶ Only original LIEBHERR replacement parts have been tested for operational use in cranes, and they can be installed 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 replacement parts!

2 Cleaning and care of the crane

2.1 Instructions for sound damping (soundproofing)

Sound proofing in the area of engines and other noise sources is an integral part of the entire 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 absorption 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.
They have been designed to be maintenance free. They have been equipped with surfaces that repel dirt, oil and water. They are fire-resistant and some of them are fireproof, depending on the location. 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
Damage of insulation (sound proofing)!
If unsuitable tools or cleaning methods are used, the insulation can be destroyed or damaged during cleaning!
▶ Remove coarse dirt with suitable tools, such as soft plastic scrapers!
▶ Do not use tools with sharp edges!
▶ Use steam cleaners only with utmost caution, sufficient distance to the insulation and low water pressure!
▶ **Solvents** may **not** be used for cleaning!

WARNING
Contamination due to solvents and foreign matter!
If the insulation is contaminated with solvents, engine oils, gear oils, hydraulic oils or fuel, then these substances can ignite and significantly change the fire proofing of the insulation!
▶ If the respective insulation was contaminated, remove the insulation **immediately** and replace with **original parts**!

2.2 Care instructions for the driver's cab and the crane operator's cab

Note
▶ The steering wheel, center console, dashboard cover, floor cover, and dirty upholstery in the driver's cab and the crane operator's cab should only be cleaned with warm water mixed with a little dish washing detergent!
▶ Do not use any scouring agents!

3 Measures to take during work stoppage or transport

3.1 Hydraulic cylinder

NOTICE
Risk of corrosion of hydraulic cylinders!
During crane application under aggressive environmental conditions, such as on locations with sea climate and especially salt containing air, the hydraulic cylinders can corrode, resulting in destruction or severe damage!
As a result, extensive and expensive repairs may be needed!

- If the crane is out of service for a longer period of time: Dismantle the crane!
- Fully retract all hydraulic cylinders on the crane! If the hydraulic cylinders cannot be retracted all the way, then protect exposed areas of the piston rod from corrosion, for example by applying a layer of grease!
- Carefully grease exposed areas of the piston rods, such as on luffing cylinders and ballasting cylinders!

4 Maintenance work on the crane superstructure or boom

WARNING
Risk of falling!
During maintenance work on the crane superstructure of boom, personnel must be secured with appropriate antifall guards 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 maintenance personnel must secure themselves with approved antifall guards to avoid falling, see crane operating instructions, chapter 2.04!
- It is prohibited to step on the operator's cab or cab roof and specially marked surfaces, see crane operating instructions, chapter 2.05!

5 Maintenance and inspection guidelines

Note

- ▶ The maintenance and inspection work on the crane chassis is carried out based on operating hours or by kilometers travelled!
- ▶ The maintenance and inspection work on the crane superstructure is carried out based entirely on operating hours!

Observe the following chapters when performing 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 maintenance 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 is an increased danger of accidents if the maintenance and inspection guidelines are not observed!

Personnel can be severely injured or killed!

- ▶ Observer and adhere to the following listed warning notes and the generally valid safety regulations!

5.1 Warning notes

- Maintenance and inspection work may only be carried out by authorized and especially trained personnel.
- Unauthorized personnel may not remain within the danger zone.
- Turn the engine in the crane superstructure and the crane chassis off.
- Apply the parking brake for the crane chassis.
- Pull the ignition key on the crane superstructure and the crane chassis and hand it to an authorized person.
- It is strictly prohibited to carry out maintenance or inspection work during travel or crane operation.

5.1.1 Warning notes regarding danger of burns

WARNING

Danger of burns during maintenance or inspection work!

When carrying out maintenance or inspection work, you can be burnt severely on hot surfaces of 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 hot components!
- ▶ Avoid short circuits in the electrical system, especially on the battery!

5.1.2 Warning notes regarding rotating parts

WARNING
Danger due to rotating parts!
If inspection work must be carried out while the engine is running, there is a significant danger from turning parts and from the ignition system!
Personnel can be severely injured!
- ▶ Be especially careful and do not reach into rotating parts!
- ▶ Never reach into the cooler fan when the engine is warm! The cooler fan could turn on suddenly!

5.1.3 Warning notes regarding scalding danger

WARNING
Danger of scalding during maintenance or inspection work!
When opening the coolant reservoir, hot coolant can emerge explosively!
Severe scalding over the whole body can result!
- ▶ Never open the cap on the coolant reservoir as long as the engine is warm!
- ▶ The cooling system is under pressure!
- ▶ To protect face, hands and arms from steam of hot coolant, cover the cap with a large rag when opening!

5.1.4 Warning notes regarding danger of fire

DANGER
Danger of fire!
When working on the fuel system or on electrical systems, there is an increased danger of fires if the general safety regulations are not observed!
Personnel can be severely injured or killed!
This could result in high property damage!
- ▶ Disconnect the battery from the power supply!
- ▶ Do not smoke!
- ▶ Do not work near open flames!
- ▶ Keep a functioning fire extinguisher ready!

5.1.5 Maintenance errors

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 in regular intervals for leaks!
- ▶ Have leaking components sealed immediately and properly!

B195219

1 Crane chassis maintenance and inspection plan

Note

- The operating hour meter of the crawler travel gear is the deciding factor for the maintenance intervals in this chart!
- The operating hour meter “crawler travel gear” * is located in the control cabinet!

	First maintenance	Regular maintenance, every			Minimum maintenance	Checks	
	After	10 h	100 h	1000 h	Annually	Daily	Weekly
Travel gear							
Oil change	200 h			4000 h	Every 4 years		
Check for leaks		X					
Grease the sprocket bearing		X					
Check the mounting screws for tight seating		X			X		
Crawler carrier							
Check track rollers, carrier rollers (with oil lubrication) for leaks			X				
Grease track rollers, carrier rollers (with grease lubrication)		X					
Grease guide rails at sliding piece					X		
Lubricate the consoles					X		
Crawler chain							
Check correct mounting			X				
Check for damage			X				
Check the chain tension, retension if necessary			X				X
Check the wear on the bores of the track pads, replace track pads if necessary			X				

	First maintenance	Regular maintenance, every			Minimum maintenance	Checks	
	After	10 h	100 h	1000 h	Annually	Daily	Weekly
Check the wear on the connector pins of the track pads, replace pins if necessary			X				
Assembly support							
Check the hydraulic cylinder for leaks							X
Check ease of movement / grease the support beam					X		
Lubricate the bearing points of the support beams					X		
Check sight gauge, readjust if necessary					X		
Crane support							
Check the hydraulic cylinder for leaks							X
Check ease of movement / grease the support beams					X		
Lubricate the struts					X		
Lubricate the mounting pins on the struts					X		
Lubricate the support pad bearing					X		
Rotary connection							
Lubricate				X			
Hydraulic cylinder							
Check for leaks							X
Hydraulic hose lines							
Check for leaks and damage						X	
A safety check should be performed by experts					X		

	First maintenance	Regular maintenance, every			Minimum maintenance	Checks	
	After	10 h	100 h	1000 h	Annually	Daily	Weekly
Central lubrication system							
Check grease supply of central lubrication system		X					
Check for correct function			X				

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2 Ballast trailer maintenance and inspection schedule

	First maintenance	Regular maintenance, every			Minimum maintenance	Checks	
	After	10 h	100 h	1000 h	Annually	Daily	Weekly
Tires							
Check for external damage							X
Check the tire pressure							X
Ensure that lug nuts are tight, retighten if necessary		X					
Axle link							
Lubricate			250 h		X		
Hydraulic cylinder							
Check for leaks							X
Hydraulic hose lines							
Check for leaks and damage						X	
A safety check should be performed by experts					X		
Slewing gear							
Check for leaks						X	
Check the oil level							X
Check the mounting screws for tight seating	250 h		500 h		X		
Oil change				4000 h	Every 4 years		
Central lubrication system							
Check grease supply of central lubrication system		X					
Check for correct function			X				
Emergency control							
Check for correct function					X		

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1 Crane superstructure maintenance and inspection schedule

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Diesel engine								
Check the oil level For all other maintenance tasks, follow the instructions of the engine manufacturer							X	
Check the coolant level in the equalising reservoir							X	
Replace coolant						Every 2 years		
Air filter								
Check monitoring device							X	
Clean or change (follow the instructions of the engine manufacturer)								
Rotary connection								
Lubricate gearing			X					
Lubricate the rotary connection						X[1]		
Check screws for tight seating	250 h				X	X		
Check tilt play					X	X		
Rope winches								
Check for leaks							X	
Check the oil level								X
Check the mounting screws for tight seating	250 h			X		X		
Check the condition of the oil in the oil reservoir						X		

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Oil change					3000 h	Every 4 years		
Check the remaining theoretical utilization life by a technical expert						X		
Check the remaining theoretical utilization life by authorized specialist						Every 4 years		
Hoist gear brake								
Check for leaks							X	
Check the oil level						X		
Oil change					4000 h	Every 4 years		
Drive shafts								
Check flange bolts		X						
Lubricate		X				X		
Lattice sections								
Check for cracks and damage						X		
Guy rods								
Check for cracks, damage and distortion by a technical expert						X		
Check for cracks, damage and distortion by an authorised inspector						Every 4 years		
Checking the retaining elements						X		
Relapse supports								
Lubricate bearings				X		X		
Check the oscillation guard for easy movement	X[2, 6]							
Relapse cylinder								

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Check for leaks	X[2, 6]							
Check pretension pressure (nitrogen)	X[2, 6]			X		X		
Check oil level	X[2, 6]			X		X		
Pneumatic springs								
Check the function	X[2, 5, 6]			X		X		
A-bracket								
Lubricate bearing				X				
Check the lever for the limit switch on the A-frame 3 for easy movement and reset of spring						X		
Check the rods with guide rail on the A-frame 2 and A-frame 3 for easy movement and distortion						X		
Counterweight								
Check tightening torque of mounting screws	1,000 km			or 10,000 km		X		
Ballasting								
Lubricate bearings			X			X		
Press on pulleys of cable winches								
Grease guides			X			X		
Rope pulleys								
Check for wear, damage, cracks and easy movement					X	X		
Lubricate rope pulleys					X	X		
Crane ropes								
Visual inspection for cracks and deformation							X	

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Check by trained personnel, grease if necessary						Monthly		
Check by technical expert						X		
Check by authorised inspector						Every 4 years		
Hook blocks								
Grease hook				X		X		
Check distance gap (y)				X		X		
Crane cab								
Check armatures / instruments for function							X	
Check indicator lights for function							X	
Replace filter insert water heater						X		
Check fluid level in expansion tank of engine control							X	
Crane cab, extendable or inclinable								
Check for correct function				X		X		
Lubricate bearings				X		X		
Overload protection								
Check for correct function							X	
Check length sensor for function				X		X		
Check length sensor rope for damage				X		X		
Electrical system								
Check cable connections and battery acid levels						X[3]		
Fuel system								
Check for leaks							X	

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Check condition and mounting						X		
Drain off water and sediments						X		
Slewing gear								
Check for leaks							X	
Check the oil level								X
Check the mounting screws for tight seating	250 h			X		X		
Oil change					4000 h	Every 4 years		
Turntable locking mechanism								
Check for correct function				X		X		
Lubricate				X		X		
Bearings								
Checking the retaining elements						X		
Pump distributor gear								
Check for leaks							X	
Check the oil level								X
Oil change	500 h				X	X		
Hydraulic hose lines								
Check for leaks and damage							X	
Check for safe condition by expert						X		
Hydraulic system								
Check the oil level							X	
Check for leaks								X
Replace servo pressure and replenishing pressure filter inserts	250 h			X		X		

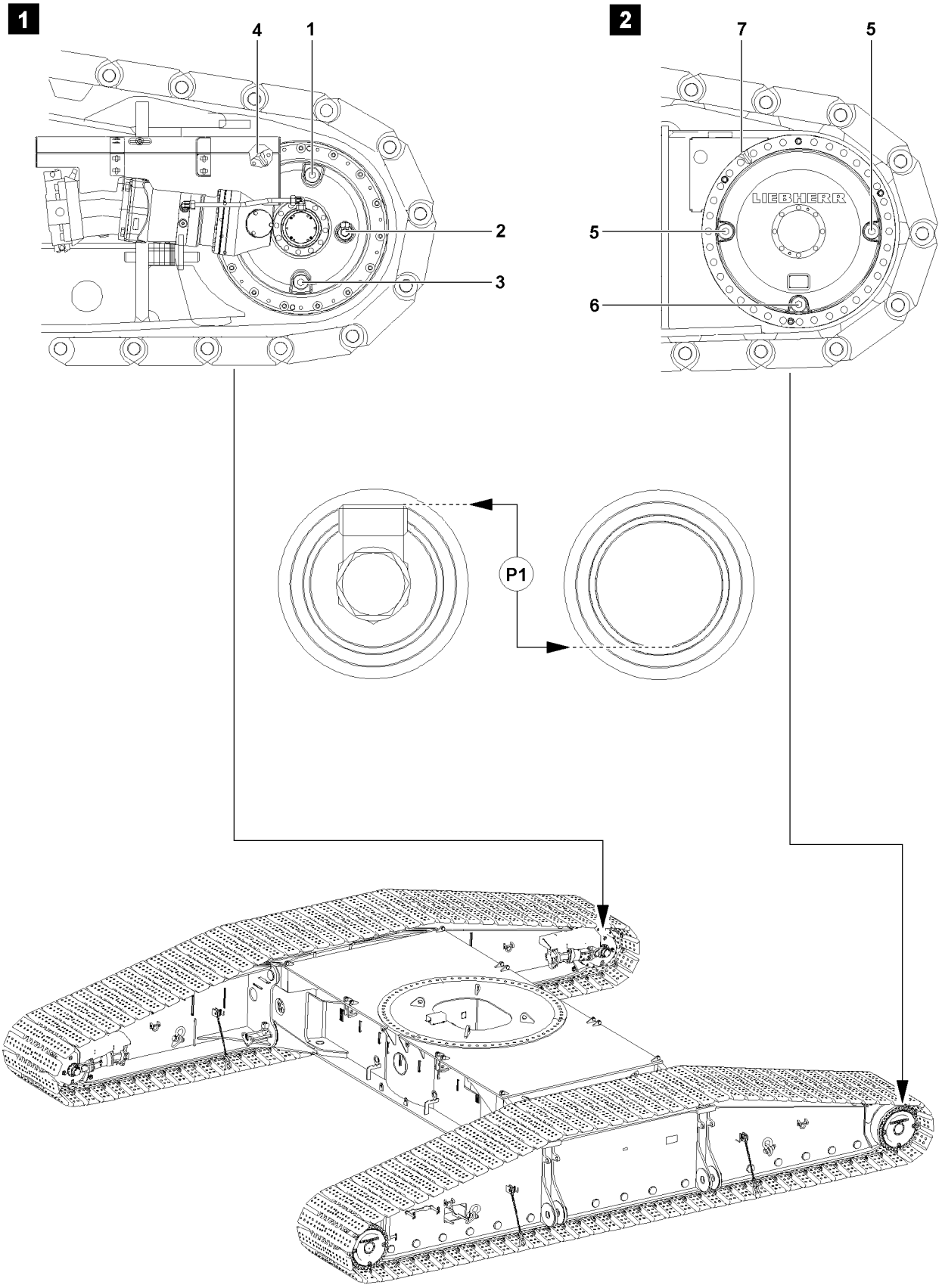
	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Replace return filter inserts (only for cranes with open hydraulic circuit)	250 h			X		X		
Replace bleeder filter of hydraulic tank	250 h			X		X		
Check hydraulic oil, required degree of purity: 20/18/15 (take oil sample and have it checked by oil supplier)	500 h				X	X		
Hydraulic cylinder								
Check for leaks								X
Hydraulic pressure accumulator (nitrogen)								
Check pretension pressures				X[4]		X[4]		
Air pressure system								
Check for leaks								X
Check operating pressure								X
Check shut off pressure								X
Check operation of automatic drain valve								X
Replace air drier granule elements						X		
Clean air drier preliminary filter						X		
Central lubrication system								
Check for correct function				X				
Check the grease container fill level		X				X		
Emergency control								
Check for correct function						X		
Telescopic boom with cable mechanism								
Check telescopic boom for distortions and cracks						X		

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Grease the sliding surfaces of the telescopic boom bearing		X				X		
Lubricate change over pulleys of telescoping mechanism		X				X		
Check mounting screws on change over pulleys for tight seating		X				X		
Check cable mechanism, readjust, if necessary	250 h			X				
Dismantle and check boom					20000 h	Every 10 years		
Pneumatic boom lock								
Clean air filter with compressed air		X				X		
Check locking pins				X		X		
Lubricate locking pins					X	X		
Telematik telescopic boom system								
Check telescopic boom system for distortion, damage and cracks						X		
Check hydraulic components for leaks and damage						X		
Check telescoping cylinder for proper condition				X		X		
Check pull knob retainer and mounting screws for tight seating						X		
Check mounting screws of push out cylinder for tight seating						X		

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Check twist guard of cylinder pinning and telescopic boom pinning						X		
Check push out rod 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		X		
Lubricate sliding surfaces						X[5]		
Grease guide rails on telescoping cylinder						X[5]		
Dismantle and check boom					20000 h	Every 10 years		
Telescopic boom guying								
Check for distortions and cracks						X		
Lubricate grease fitting on the TA / TY-guying						Every 3 months [5, 6]		
Check guy winch for leaks							X	
Check the oil level on the guy winch								Every 6 months
Check the mounting screws for tight seating	250 h			X		X		
Change the oil on the guy winch						Every 4 years		
Derrick ballast								
Check frame, suspension and guide section for distortion and cracks						X		

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Check wheels for condition and tight seating						X		

[1] Every 3 months if the crane is not moved.
[2] Carry out a visual inspection before every start up in service.
[3] In hot climates twice a year.
[4] Note chapter 7.05, Crane superstructure maintenance instructions.
[5] when necessary
[6] during assembly



B109101

1 Maintaining the travel gear

The travel gear consists of
– Miter gear with brake, illustration **1**
– Planetary gear, illustration **2**

WARNING
Danger of burns during maintenance and inspection work!
Severe burns can results due to the travel gear and oils at operating temperatures!
▶ Avoid direct body contact to heated components and fluids!

NOTICE
Dirt in travel gear!
If any dirt gets into the inside of the travel gear, gear damage can occur!
▶ Make sure that no dirt gets into the inside of the travel gear!

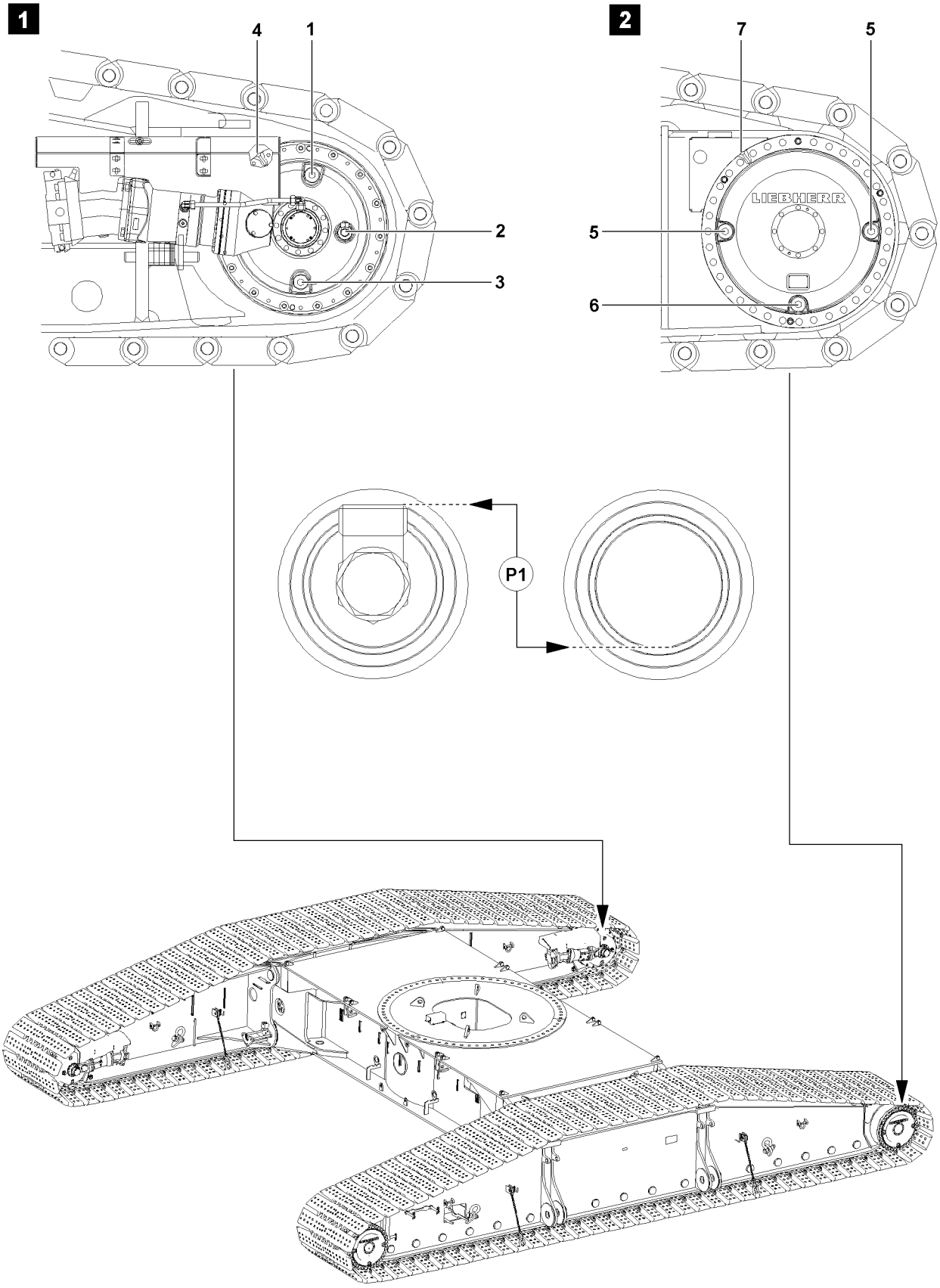
The following maintenance openings are on the miter gear with brake, see illustration **1**:

1 Oil filler plug, oil filler port
2 Oil level plug, oil level port
3 Oil drain plug, oil drain port
4 Grease lubrication miter gear

The following maintenance openings are on the planetary gear, see illustration **2**:

5 Oil level plug, oil level port
6 Oil drain plug, oil drain port
7 Grease lubrication planetary gear

Note
▶ No separate oil filler port is located on the planetary gear, the oil level port is used for this purpose!
▶ Oil level ports on planetary gears and miter gears can be constructed differently!
▶ The planetary gear and the miter gear have separate, different sized oil chambers. The oil levels in gears must be checked independently of each other!



B109101

1.1 Check the oil level

NOTICE
Damage to the travel gear!
Travel gears can be damaged due to loss of oil!
▶ Use the seals on the maintenance ports only once!

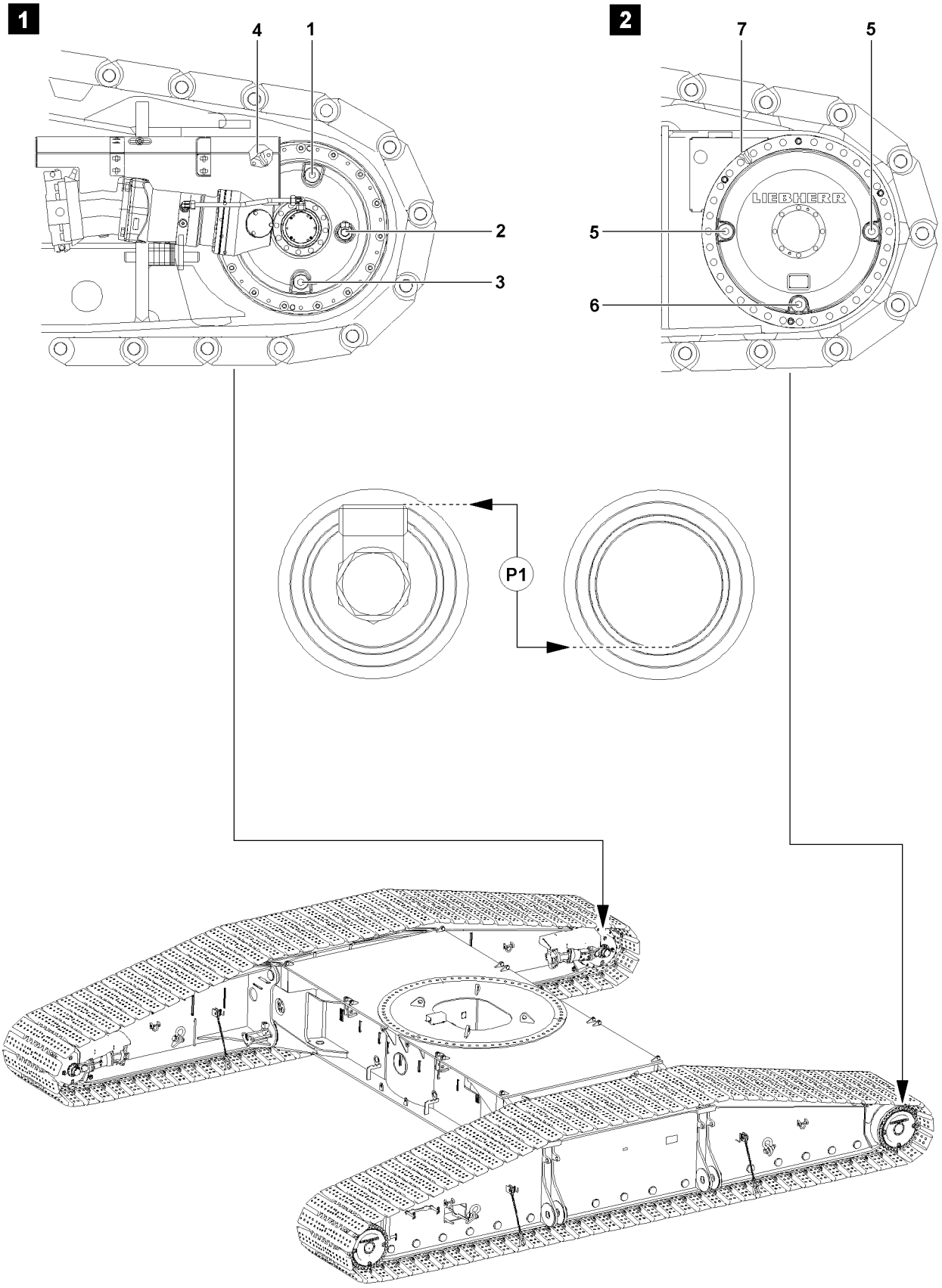
Make sure that the following prerequisites are met:
– the crane is in horizontal position,
– the travel gears are at a standstill.

Note
▶ To ensure proper oil level check, make sure that the travel gears are at a standstill for at least two minutes before checking the oil level. This ensures that the oil has returned to the oil chamber completely!

▶ Open the oil level port carefully.

NOTICE
Insufficient oil fill quantity!
If the oil level drops below the fill level on point **P1**, the travel gears can be damaged!
▶ Add gear oil according to the lubrication chart until the oil level is again on the fill level on point **P1**!

▶ If gear oil must be added:
Add oil on the oil filler port.
▶ If the oil level is on the fill level on point **P1**, then the oil level on the travel gear is ok.
▶ Close the maintenance ports tightly.



B109101

1.2 Changing the oil

NOTICE
Damage to the travel gear!
Travel gears can be damaged due to loss of oil!
▶ Use the seals on the maintenance ports only once!

1.2.1 Changing oil on the miter gear

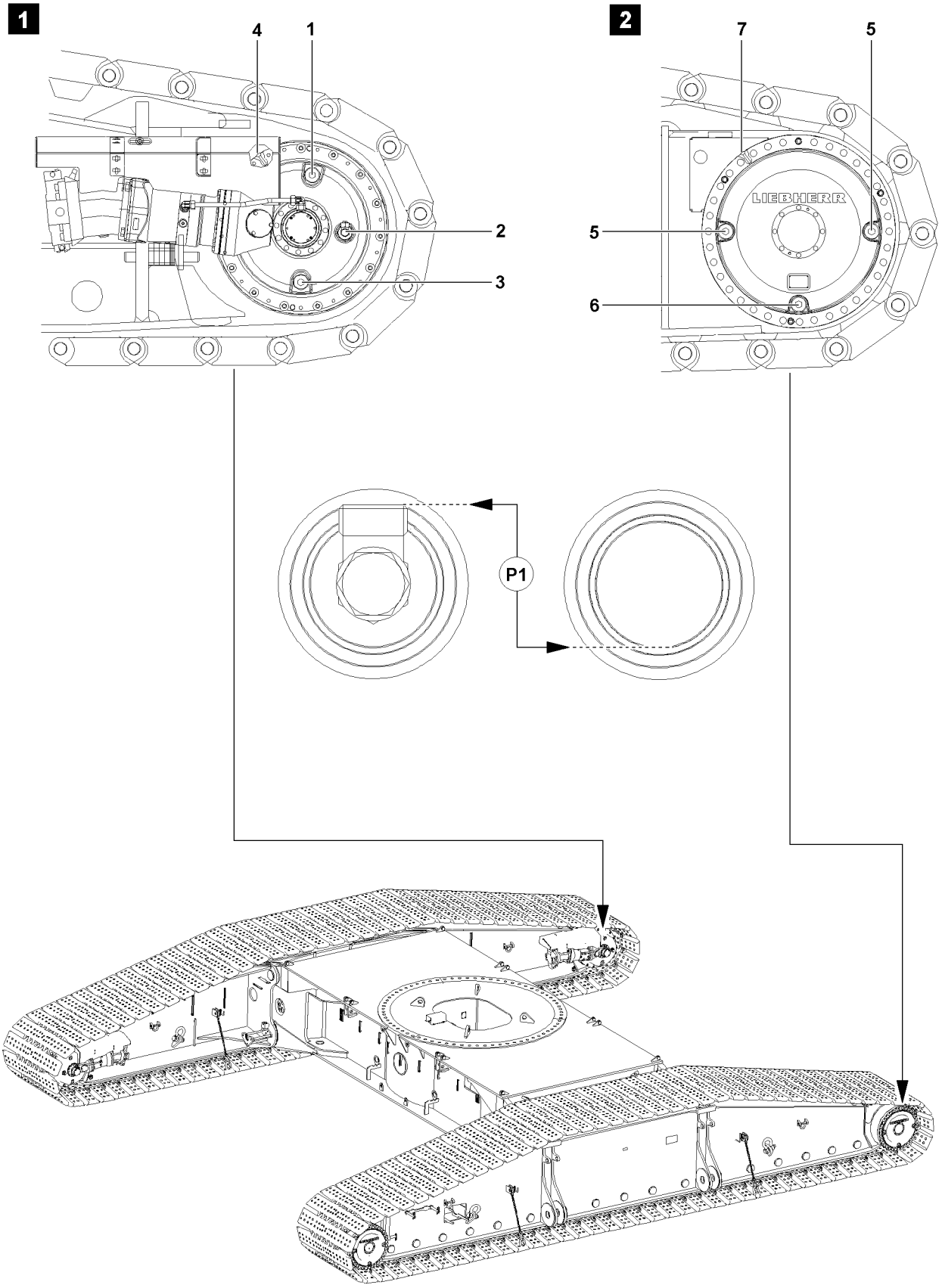
Make sure that the following prerequisites are met:
– the crane is in horizontal position,
– the travel gear is at a standstill,
– the travel gear is at operating temperature,
– a container to catch the used oil is available.

Note
▶ When selecting the container to catch the use oil, make sure that the container is sufficiently sized to be able to catch all the used oil!
▶ For fill quantity of miter gear, see chapter 7.06 of the crane operating instructions!

▶ Remove the oil filler plug **1**.
▶ Remove the oil drain plug **3** and drain oil into a suitable container.

Note
▶ Allow the miter gear to empty completely!

▶ Clean the oil drain plug **3** and the sealing surface.
▶ Close off the oil drain port **3** tightly.
▶ Open the oil level port **2**.
▶ Add oil according to the lubrication chart on the oil filler port **1** until “it is” at the height of the fill level on point **P1** of the oil level port **2** or until it starts to run over.
▶ Clean the sealing surfaces.
▶ Close off the oil level port **2** tightly.
▶ Close off the oil fill port **1** tightly.



B109101

1.2.2 Changing oil on the planetary gear

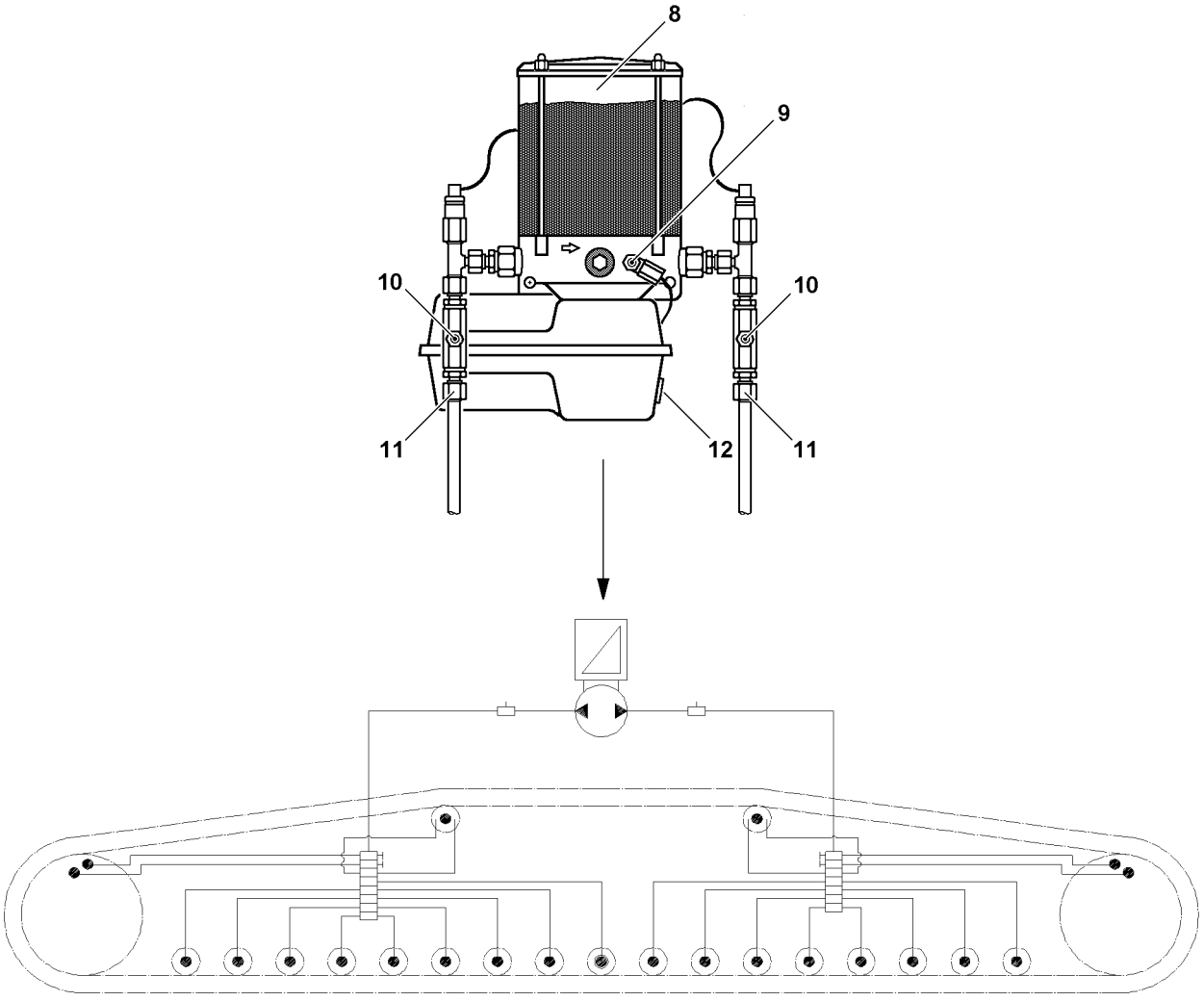
Make sure that the following prerequisites are met:
- the crane is in horizontal position,
- the travel gear is at a standstill,
- the travel gear is at operating temperature,
- a container to catch the used oil is available.

Note
- ▶ When selecting the container to catch the use oil, make sure that the container is sufficiently sized to be able to catch all the used oil!
- ▶ For fill quantity of planetary gear, see chapter 7.06 of the crane operating instructions!

- ▶ Remove the oil level plugs **5**.
- ▶ Remove the oil drain plug **6** and drain oil into a suitable container.

Note
- ▶ Allow the planetary gear to empty completely!

- ▶ Clean the oil drain plug **6** and the sealing surface.
- ▶ Close off the oil drain port **6** tightly.
- ▶ Add oil according to the lubrication chart on the oil level port **5** until “it is” at the height of the fill level **P1** of the oil level ports **5** or until it starts to run over.
- ▶ Clean the sealing surfaces.
- ▶ Close off the oil level ports **5** tightly.



B109102

2 Maintaining the central lubrication system of the crawler carrier

The crawler carriers are equipped with a central lubrication system. All grease points, see illustration, are automatically supplied with the correct amount of grease.

Note
- ▶ If the crane is not moved for a period of more than three months, then it must be lubricated every quarter!
- ▶ Due to insufficient lubrication, the crawler carriers are exposed to significant wear and can be damaged!
- ▶ When working on the central lubrication system, observe utmost cleanliness!
- ▶ Cleaning is permitted in washing bays or with steam cleaners!

On the grease pump, see illustration, there are the following maintenance relevant components:

8 Grease container
9 Grease nipple
10 Grease nipple
11 Main line, main line connection
12 Intermediate lubrication button

- Filling the grease container
- Filling the lube lines

2.1 Filling the grease container

NOTICE
Insufficient lubrication!
In case of insufficient lubrication, the grease lubrication points can run dry!
- ▶ Fill the grease container **8** before it is completely empty!

- ▶ Fill the grease container **8** using an external grease pump via the grease fitting **9**.

Note
- ▶ Do not deplete the grease container **8**!
- ▶ If the grease container **8** is empty, the central lubrication system must be bled!

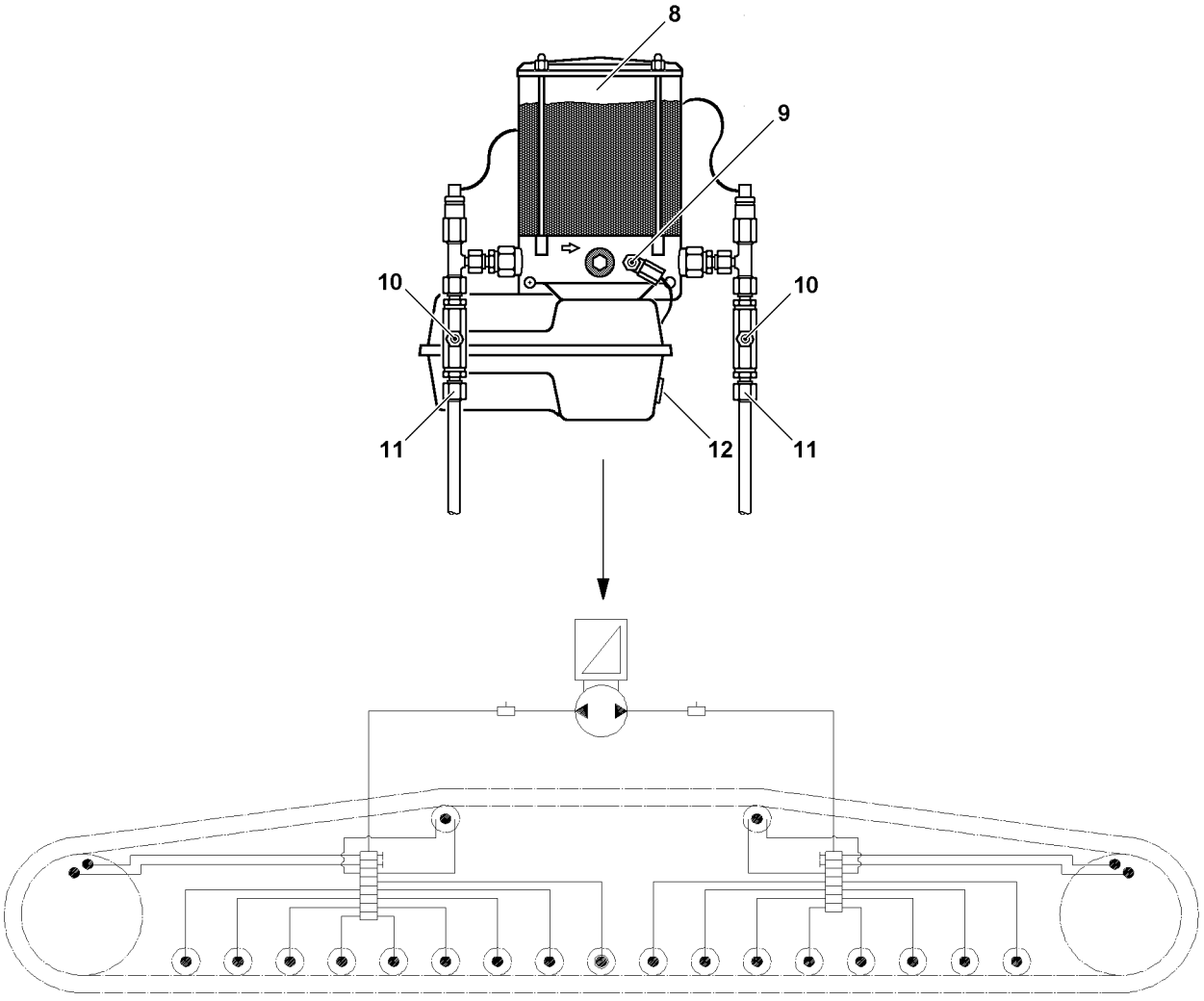
2.2 Bleeding the grease pump

NOTICE
Insufficient lubrication!
If there is air in the grease pump, lubrication points can run dry!
- ▶ Bleed the grease pump carefully!

- ▶ Fill the grease container **8** using an external grease pump via the grease fitting **9**.

Note
- ▶ The bleeding procedure must be carried out individually for each main line connection **11**!

- ▶ Unscrew the main line **11** from the main line connection **11**.
- ▶ Trigger an additional lubrication impulse with the intermediate lubrication button **12** until grease free of air bubbles emerges on the main line connection **11**.
- ▶ Connect the main line **11** again.
- ▶ Trigger an additional lubrication impulse with the intermediate lubrication button **12**.



B109102

2.3 Bleeding the lube lines

NOTICE
Insufficient lubrication!
If there is air in the lube lines, lubrication points can run dry!
▶ If the lube lines are repaired or replaced, make sure that they are completely filled with grease!

▶ Fill the lube lines with grease.

2.4 Lubricating the crawler carrier after extended downtime

NOTICE
Insufficient lubrication!
The lubrication film is removed due to environmental influences!
▶ If the crane is not moved for a period of more than three months, then it must be lubricated every quarter, possibly with an external grease pump!

Note
▶ Carry out the lubrication procedure until grease emerges on all lube points!

▶ Trigger an additional lubrication impulse with the intermediate lubrication button **12**.

or

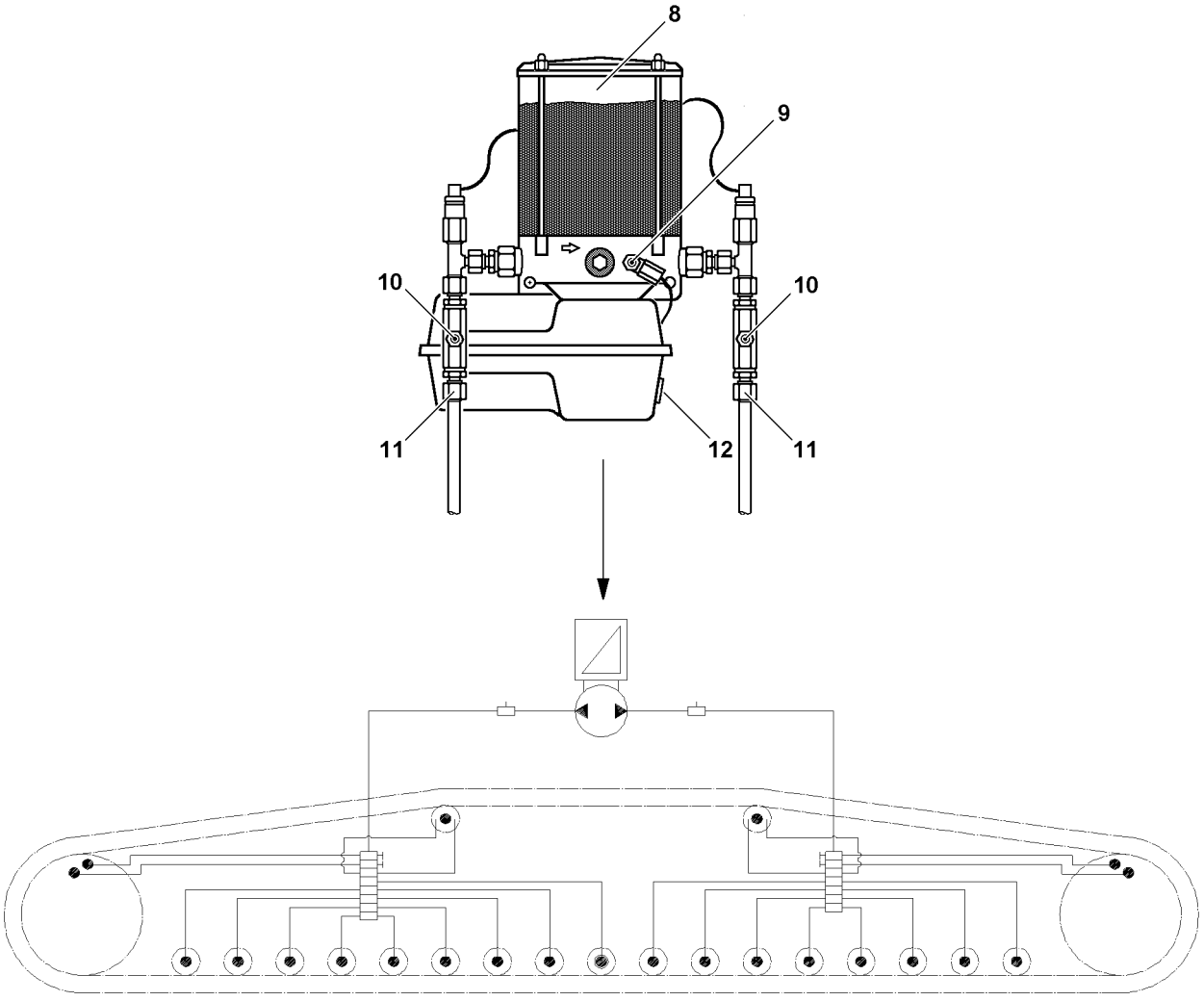
If the grease pump is not functioning:
■ Grease with an external grease pump via grease fitting **10**.

2.5 Lubricating the crawler carrier at start up

NOTICE
Insufficient lubrication!
The lubrication film has been removed after extended downtime!
▶ When the crane is put back into operation, carry out a separate lubrication procedure!
▶ For even distribution of the grease, move the crawler!

Note
▶ Trigger the lubrication procedure via the auxiliary lubrication impulse until grease emerges on all lube points!

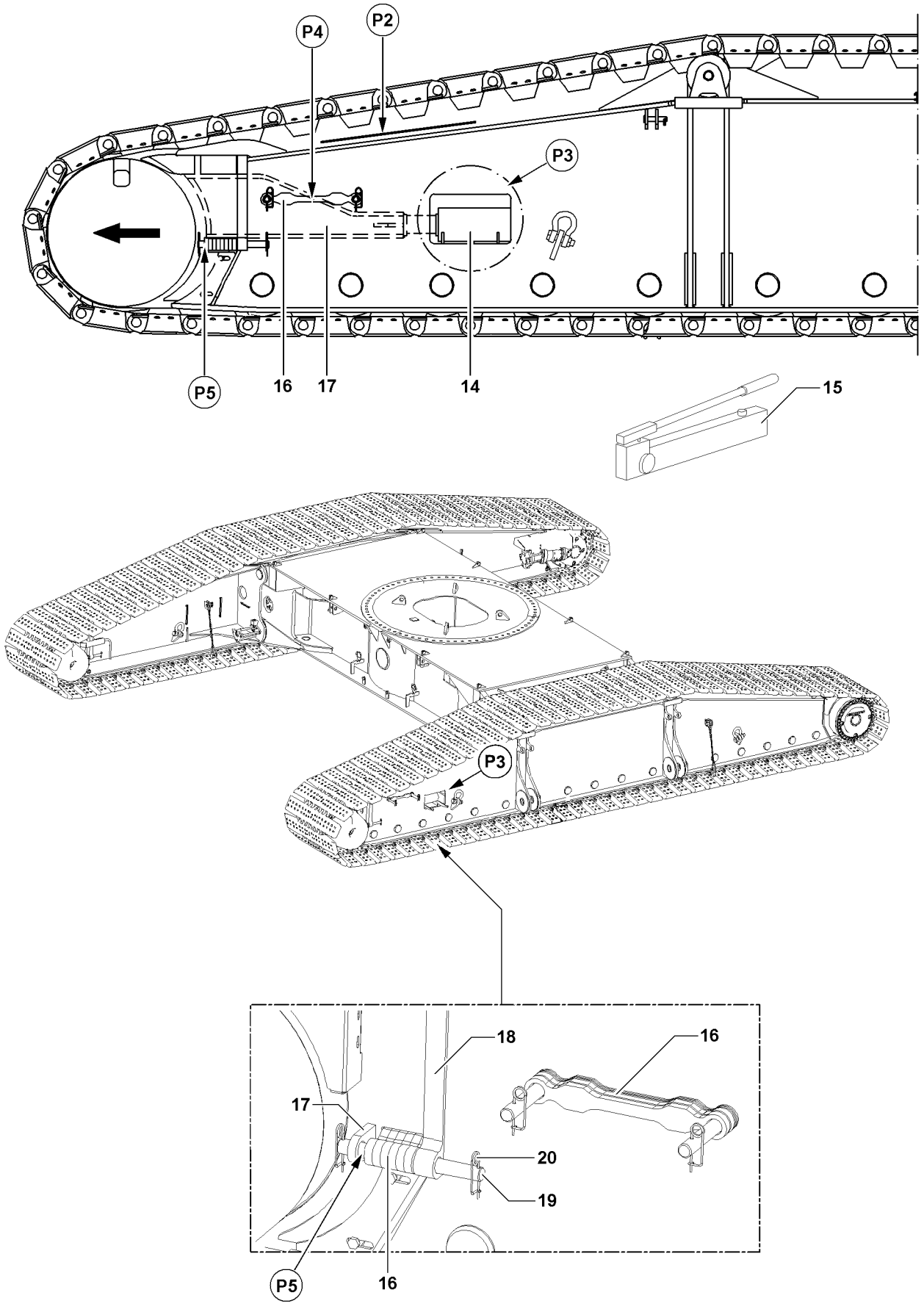
▶ Trigger an additional lubrication impulse with the intermediate lubrication button **12**.
▶ Drive the crawler back and forth about one crawler length in operating mode “straight forward travel”.
▶ Trigger another additional lubrication impulse with the intermediate lubrication button **12**.



B109102

2.6 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
Grease escapes on the pressure relief valve	System pressure too high, progressive distributor blocked, system blocked, defective valve spring	Check system, replace distributor, repair blocked / seized bearing point, replace pressure relief valve
Indicator light lights up constantly	Engine is overloaded	Consult LIEBHERR or BekaMax customer service
Indicator light blinks in 0.5 second cycle	Error in the monitoring period from cycle start	Proximity switch is defective, possibly consult Liebherr or BekaMax customer service



B109103

3 Maintaining the track chain

3.1 Tensioning the track chain

NOTICE
Damage to the track chain!
If the chain tension is not checked within the specified maintenance intervals, then damage can occur on the track chain or on the steel construction of the crawler carrier!
- ▶ Observe and adhere to the maintenance intervals in chapter 7.02 of the crane operating instructions!
- ▶ If the track chain of the steel construction of the crawler carrier comes close to point **P2** or if it already contacts the steel construction, then the track chain must be retightened **immediately**!

Note
- ▶ By extending the tension cylinder **14**, the sliding section **17** of the crawler carrier is moved in direction of the arrow.
- ▶ The chain tension is held by spacer plates **16**!

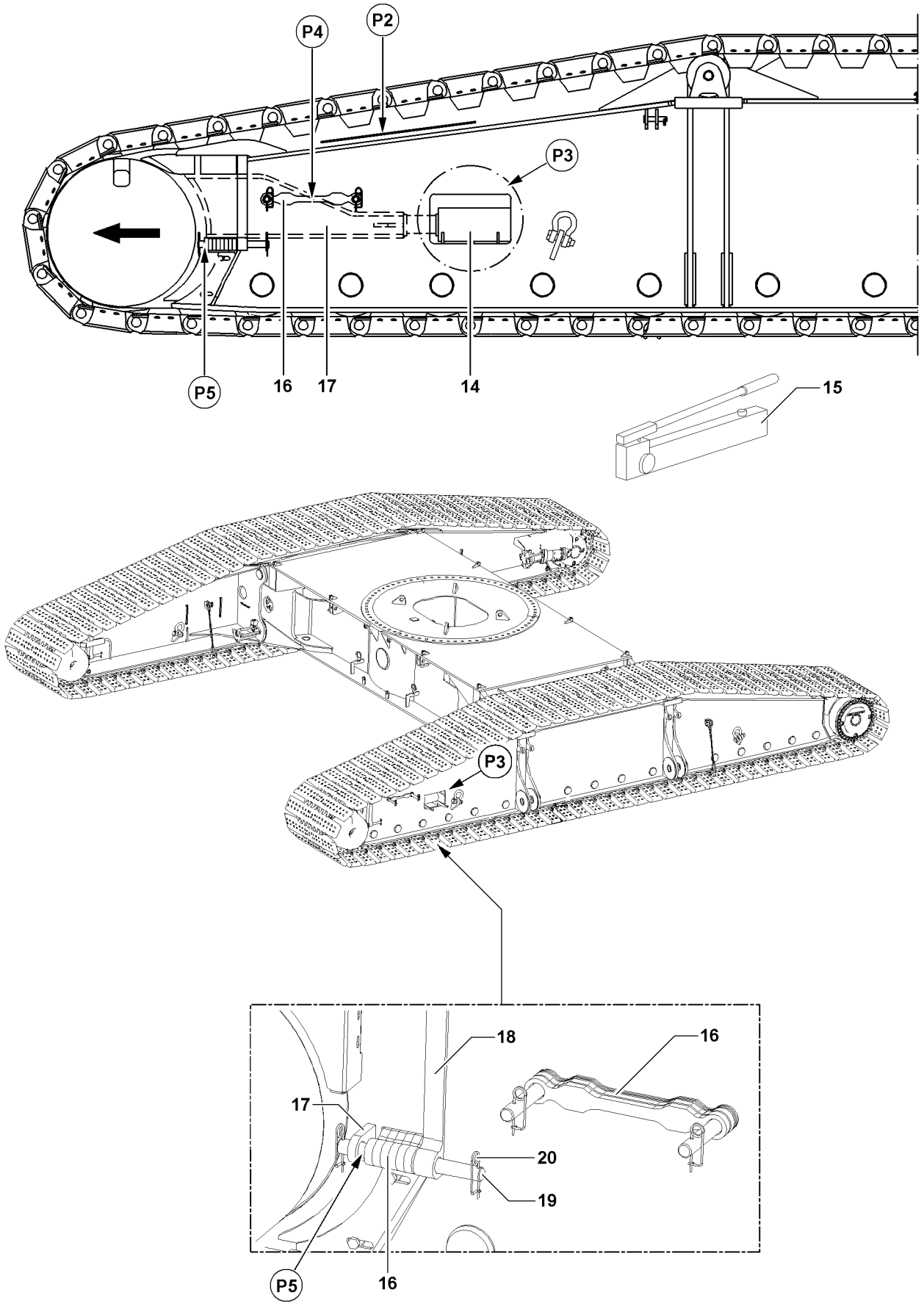
NOTICE
Foreign particles in track chains!
Foreign particles in the track chains and on the travel drive can cause damage!
- ▶ Before tensioning the track chains, check the track chains and the travel drives for foreign particles, such as rocks and clean them, if necessary!

Make sure that the following prerequisites are met:
- the crane is in horizontal position,
- the tension cylinder **14** is placed into the cylinder receptacle on point **P3**, see illustration.

- ▶ Extend the tension cylinder **14** with the hand pump **15** until the hand pump lever can no longer be moved.

Result:
- The track chain is tensioned.

- ▶ Remove the spacer plates **16** from the transport receptacle on point **P4**.
- ▶ On point **P5**, insert as many spacer plates **16** as fit into the gap between the sliding section **17** and the crawler carrier **18**!
- ▶ Secure the spacer plates **16** with pins **19** and spring retainer **20**.



B109103

WARNING
Danger of crushing!
When releasing the tension cylinder **14**, body parts, such as: Fingers, hands and arms can be crushed or cut off!
▶ When releasing the tension cylinder **14**, any work on the crawler carrier is prohibited!

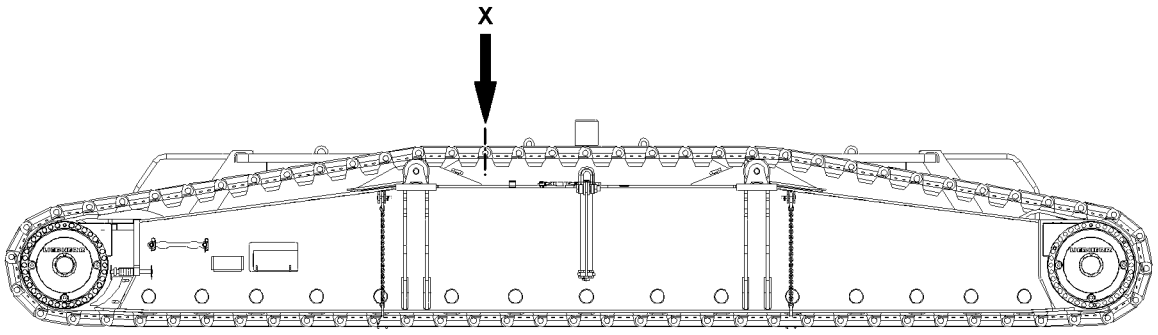
▶ Relieve the tension cylinder **14**.
▶ After the tension procedure, drive the crawler back and forth about one crawler length in operating mode “straight forward travel”.

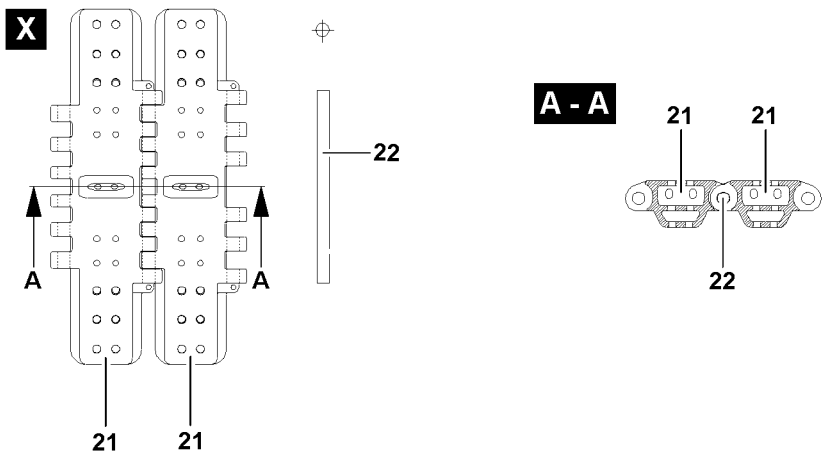
Result:
– The tension of the track chain is reduced.

▶ Check the distance of the track chain to the steel construction of the crawler carrier again at point **P2**.

Note
▶ If necessary, repeat the tension procedure of the crawler chain and insert additional spacer plates!
▶ If the lift on the tension cylinder is no longer sufficient to tension the track chain, then trained expert personnel must remove one track pad!

▶ Take the relieved tension cylinder **14** from the cylinder receptacle on the crawler carrier **P3**.





B108536

3.2 Check the wear on the connections of the track pads

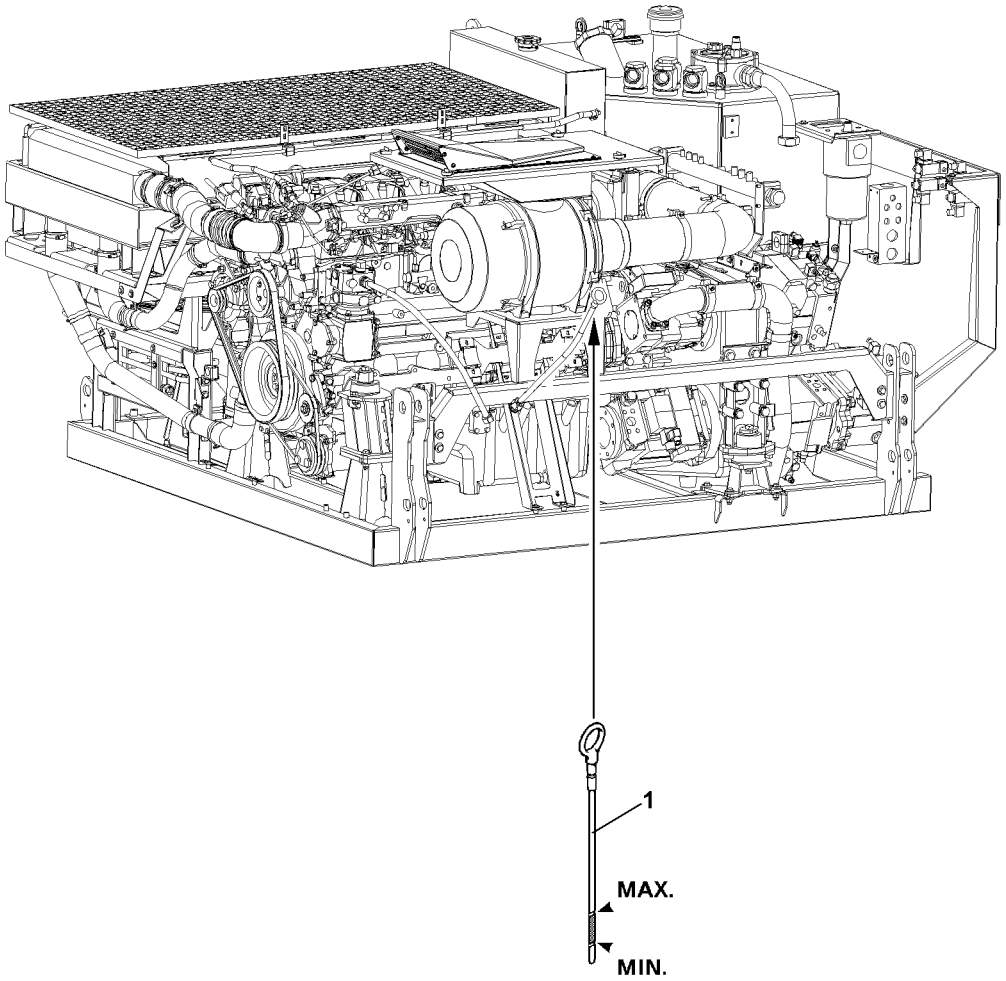
The track pads **21** of the crawler travel gear are connected by bolts **22** .
In crawler operation, these components wear and must therefore be checked in specified intervals, see chapter 7.02 of the crane operating instructions and replaced with new components, if necessary.

WARNING
Track chain can rip!
If the wear limit is reached on the connections of the track pads, then the track chain can rip off in crawler operation and cause the crane to topple over!
Personnel can be severely injured or killed!
- ▶ The random sample inspection of the bolt diameter must be made within the specified intervals!
- ▶ If one bolt falls below the minimum permissible dimension, then the bolt must be replaced with a new bolt!
- ▶ The random sample inspection of the bore diameter must be made within the specified intervals!
- ▶ If the bore diameter exceeds the maximum permissible dimension, then the track pad must be replaced with a new track pad!

NOTICE
Damage to sprocket!
If the wear limit is reached on the connections of the track pads, then increased wear of the sprocket and on the transport cams of the track pads can occur!
Expensive and extensive repairs can result!
- ▶ If one bolt falls below the minimum permissible dimension, then the bolt must be replaced with a new bolt!
- ▶ If the bore diameter exceeds the maximum permissible dimension, then the track pad must be replaced with a new track pad!

Wear limit bolt	
Initial diameter	45 mm
Maximum permissible minimum dimension	44 mm

Wear limit bore track pad	
Initial diameter	48 mm
Maximum permissible dimension	51 mm



B105381

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 Check 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 is collected in the oil pan.

- ▶ Remove and wipe off the dipstick **1**.
- ▶ Reinsert the dipstick **1** and pull it out again.

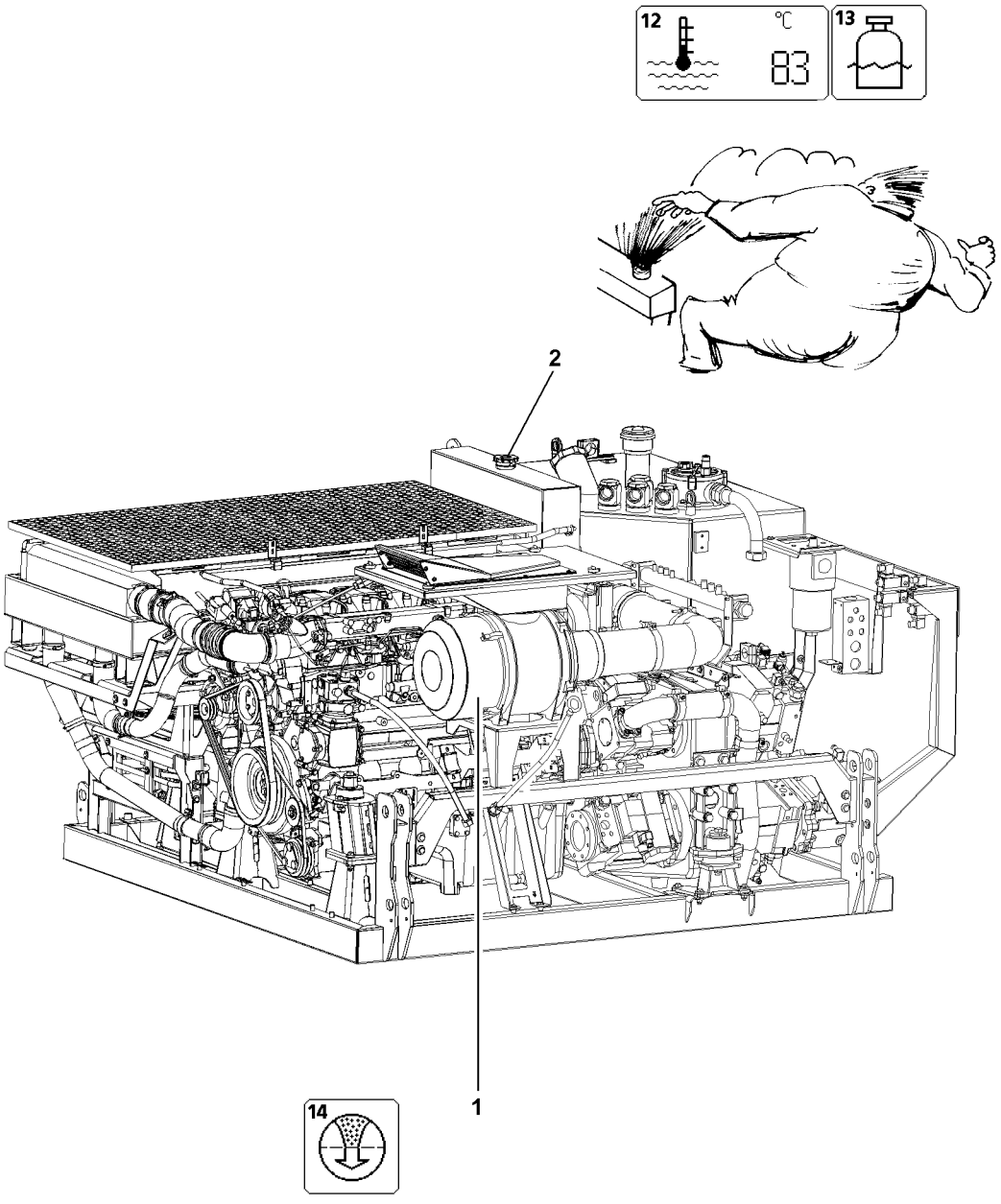
The oil level must be between the min. and max. marks on the dipstick **1**.
- ▶ Check the oil level.

NOTICE
Danger of damaging the engine!
If the oil level has dropped below the minimum mark, add engine oil according to the lubrication chart until the oil level is between the minimum and maximum marks!
- ▶ Add engine oil and check again!

- ▶ Reinsert the dipstick **1**.

1.1.2 Changing the oil

Refer to the separate operating instructions for “LIEBHERR Diesel engines”.



B105382

1.2 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.

WARNING
Danger of skin burns!
▶ Check the coolant only when the engine is cold!

▶ Turn the cap **2** on the filler neck of the water cooler expansion tank to the 1st notch.
▶ Release excess pressure.
▶ Remove the cap **2**.
▶ Check the coolant level.

Only add coolant according to the lubrication chart on the filler neck on the water cooler expansion tank.
▶ Add coolant to overflow level if necessary.

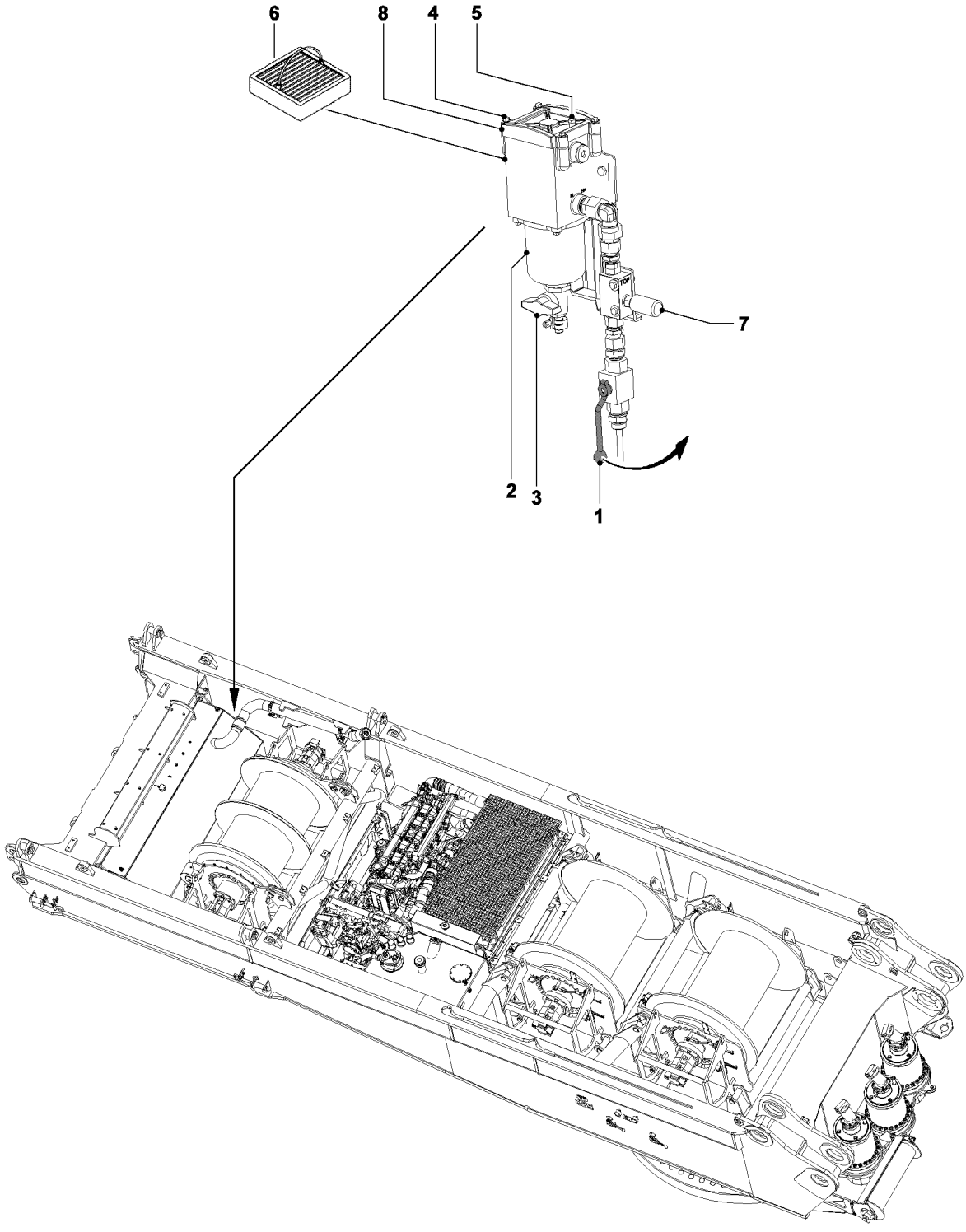
1.3 Air filter

The air filter **1** is 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.

1.4 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.



B105421

1.5 Fuel pre-filter

1.5.1 Draining the fuel pre-filter

Note

▶ The water separator **2** on the fuel pre-filter must be drained at regular intervals!

▶ Turn the engine off.
▶ Place a catch basin under the water separator.
▶ Close the ball valve **1**.
▶ Open the drain valve **3** and drain water until fuel emerges.
▶ Close the drain valve **3**.
▶ Open the ball valve **1**.
▶ Remove the catch basin and dispose of the fluid.

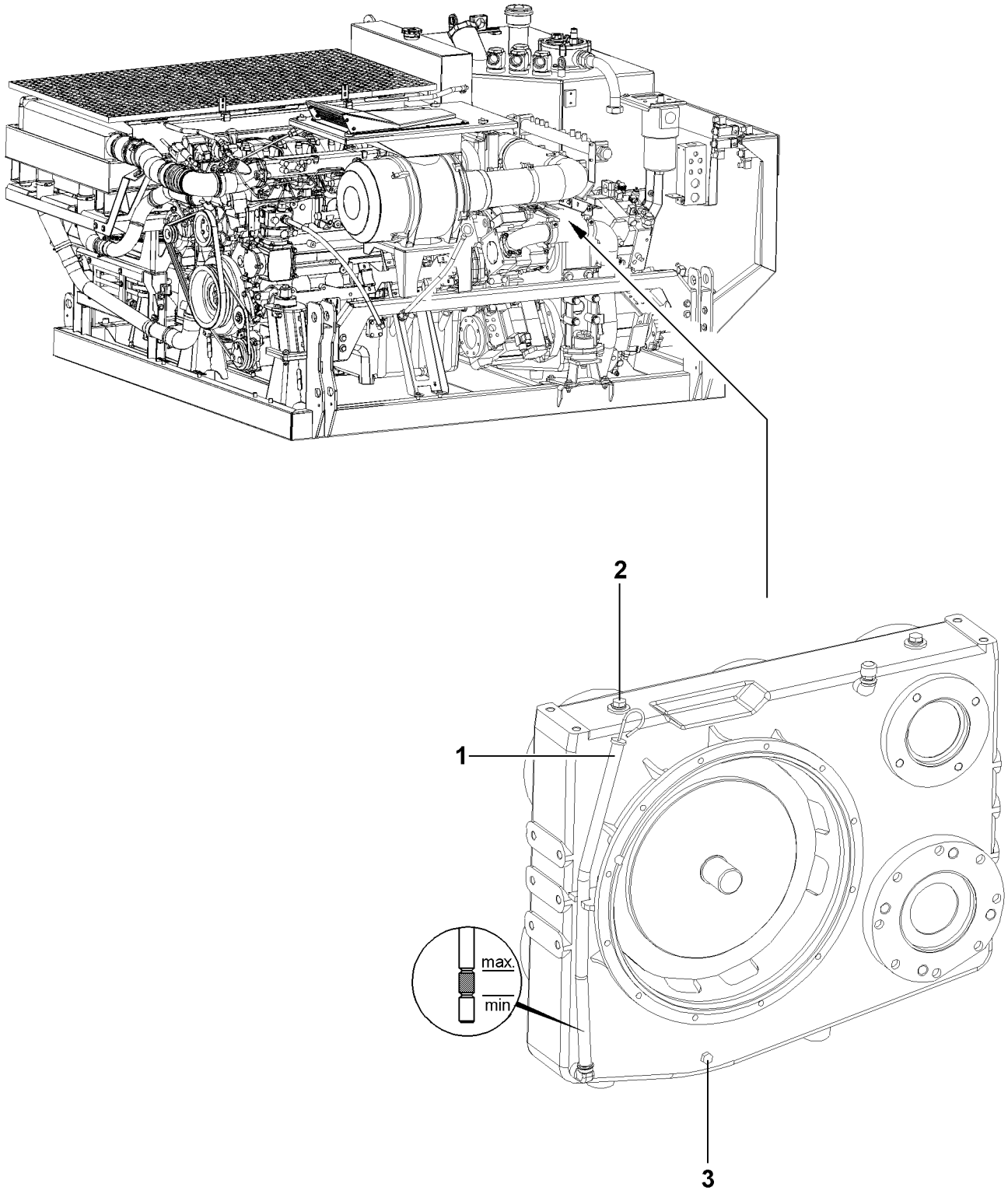
1.5.2 Cleaning the filter strainer

DANGER

Danger of fire and explosion!

▶ Do not smoke!
▶ Avoid open flames!
▶ Work only when the diesel engine is turned off!
▶ Maintain extreme cleanliness during all work!

▶ Turn the engine off.
▶ Place a catch basin under the fuel pre-filter.
▶ Close the ball valve **1**.
▶ Open the drain valve **3** until no more fuel emerges.
▶ Remove the catch basin and dispose of the fluid.
▶ Remove the screws **4** and remove the cover **8**.
▶ Remove the filter strainer **6** and clean it properly.
▶ Insert the cleaned filter strainer **6** properly.
▶ Assemble the cover **8** with seals properly.
▶ Properly tighten the screws **4**.
▶ Open the ball valve **1**.
▶ Open the breather screw **5**.
▶ Operate the hand pump **7** and properly bleed the fuel filter.
▶ Properly tighten the breather screw **5**.
▶ Start the engine and check the fuel pre-filter for leaks.



B105383

2 Pump distributor gear

Please maintain utmost cleanliness during all work to prevent dirt from entering the gear system.

2.1 Check the oil level

Ensure that the following prerequisite is met:
– the crane is in horizontal position.

▶ Remove and wipe off the dipstick **1**.
▶ Reinsert the dipstick **1** and pull it out again.

The oil level must be between the min. and max. marks on the dipstick **1**.
▶ Check the oil level.

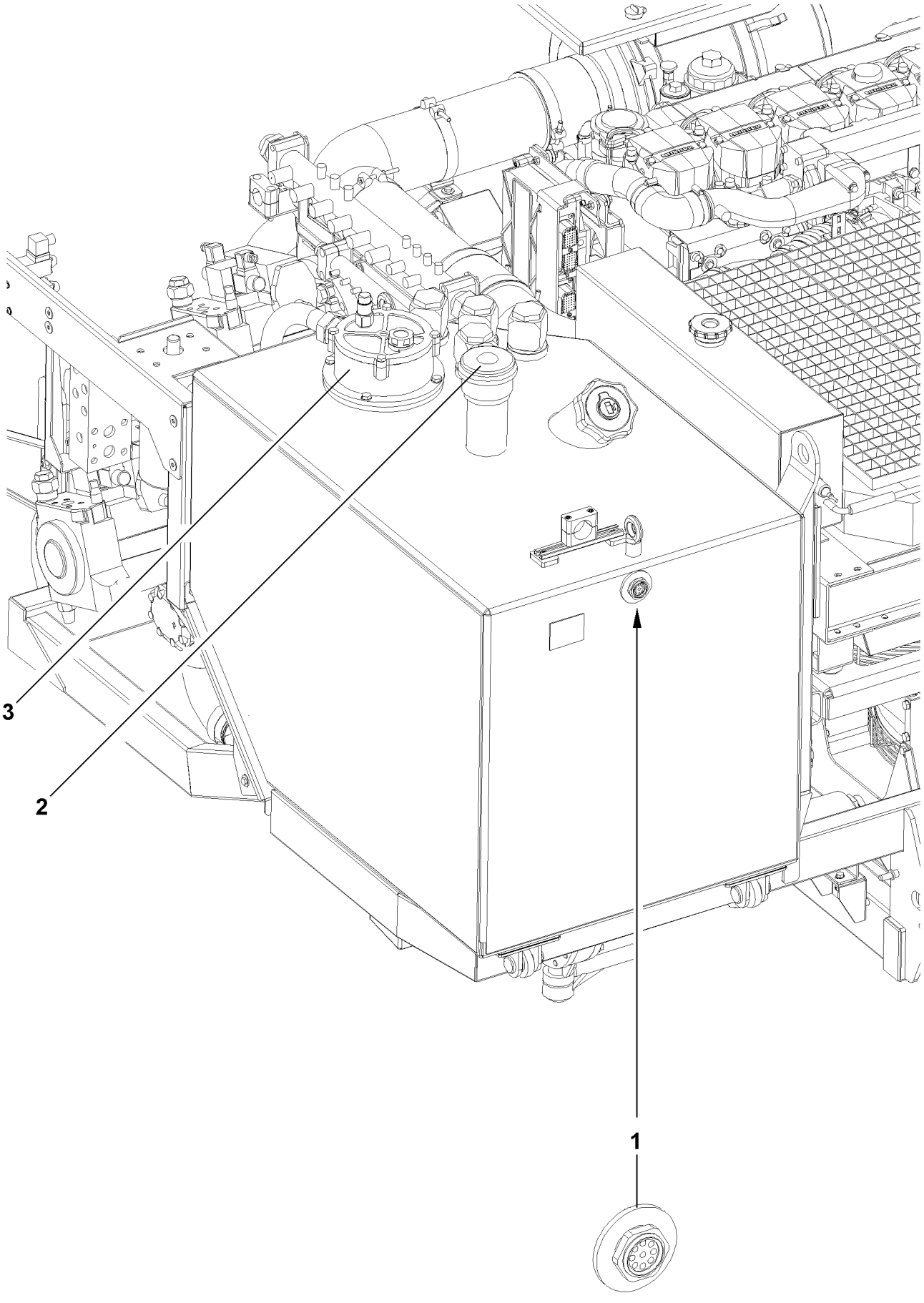
NOTICE
Danger of transmission damage!
If the oil level has dropped below the minimum mark, add engine oil as specified in the lubrication chart until the oil level is between the minimum and maximum marks!
▶ Add oil and check again!

▶ Reinsert the dipstick **1**.

2.2 Changing the oil

Make sure that the following prerequisites are met:
– the crane is horizontal,
– the transmission has warmed up.

▶ Remove the oil filler plug **2**.
▶ Remove the oil drain plug **3** and drain the oil.
▶ Install the oil drain plug **3** with new seal and tighten.
▶ Add oil as specified in the lubrication chart on the oil filler plug **2** until the oil level is between the min. and max. marks on the dipstick **1**.
▶ Install the oil filler plug **2** with new seal.
▶ Check the oil level.



B105414

3 Hydraulic system

When adding oil, observe utmost cleanliness.

3.1 Hydraulic tank

3.1.1 Check the oil level

Make sure that the following prerequisites are met:
– the crane is in horizontal position,
– all hydraulic cylinders are fully retracted.

The oil level must be in the center of the oil level sight gauge **1**.
▶ Check the oil level in the oil level sight gauge **1** of hydraulic oil tank.

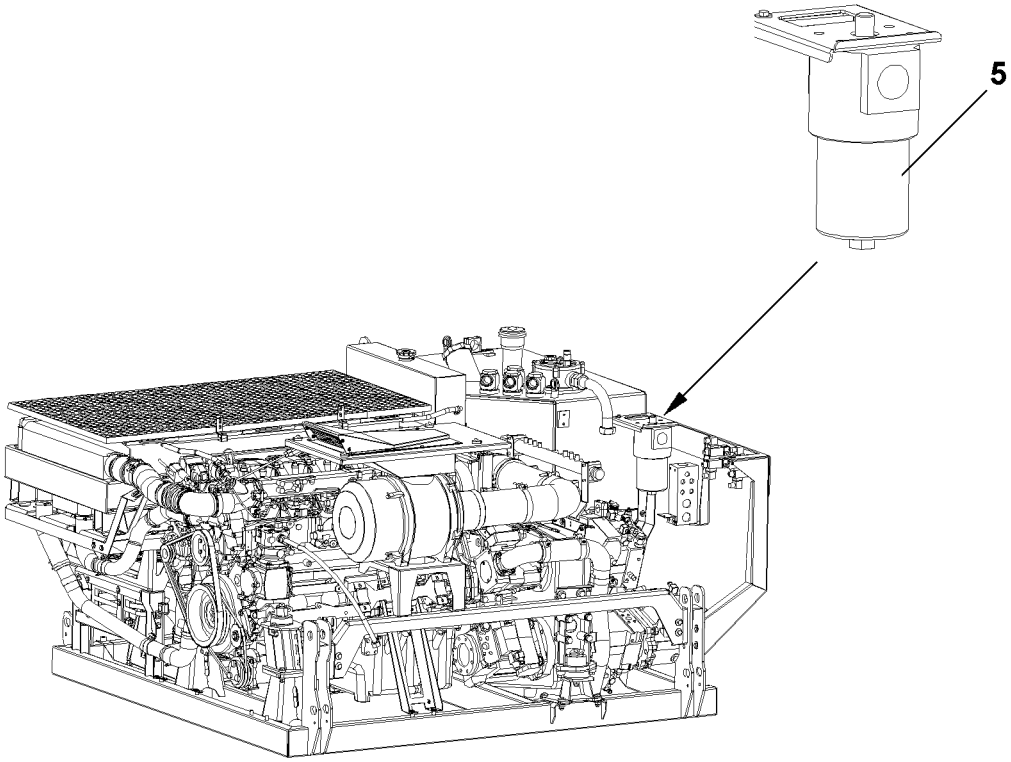
Troubleshooting
No oil visible in the oil level sight gauge **1**?
▶ Add oil as specified in the lubrication chart using a fine-mesh strainer until oil level is in center of the oil level sight gauge **1**.

3.1.2 Checking the vent / breather filter

▶ Open the cover with the turn lock.
▶ Check the filter **2** for impurities (visual inspection).
▶ In the event of heavy contamination:
Replace the filter **2**.
▶ Close the cover with the turn lock again.

3.1.3 Return filter

The return filter **3** is 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.
▶ Remove the filter cover.
▶ Remove the filter insert.
▶ Rinse out the filter housing.
▶ Clean sealing surface on the cover and the filter housing.
▶ Insert a new filter insert.
▶ Lubricate the rubber seal ring in the cover with oil.
▶ Replace the filter cover and tighten.
▶ Start the engine and check the filter for leaks.
▶ Check the oil level and add oil if necessary.



B105415

3.2 Pressure filter in crane hydraulic

The pressure filter **5** is equipped with a maintenance indicator. If the red bar indicator is visible when the oil is at operating temperature, then the filter cartridge must be replaced.

- ▶ Turn the engine off.
- ▶ Release the filter cartridge and collect any escaping oil in a suitable container.
- ▶ Remove and dispose of the filter cartridge.
- ▶ Clean the sealing surface on the filter bracket.
- ▶ Lubricate the rubber seal ring on the new oil filter cartridge with oil.
- ▶ 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.

3.3 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.

NOTICE

Risk of damaging the hydraulic system!

If the ambient temperatures fluctuate considerably, for example after transfer to countries with extremely hot or cold temperatures or in countries with considerable differences between the summer and winter temperatures, the accumulator pressures may change!

- ▶ Check the accumulator pressures and correct if necessary!

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!

- ▶ The diaphragm reservoir must be relieved on the fluid side!
- ▶ Do not use air or oxygen to fill the diaphragm reservoir!

- ▶ Turn the engine off.

Result:

– The diaphragm reservoir is relieved on the fluid side.

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.

3.4 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:

– possess sufficient knowledge about cranes due to their professional background and experience,
– are familiar with the relevant settings to detect any abnormal operating situations,
– have undergone special training.

Expert mechanics are mechanics, who:

– are experienced in the design, construction or maintenance of cranes,
– possess sufficient knowledge about the relevant settings and standards,
– are fully equipped to perform inspections,
– are able to assess the safety of the crane,
– can decide which action needs to be taken to ensure the crane can continue to be operated safely.

Note

▶ The applicable national regulations must also be complied with!

3.4.1 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 by the authorized inspector annually.

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 he has adequate knowledge in the field of hydraulic hoses and hose systems,
– who is familiar with the relevant occupational health and safety regulations,
– who is familiar with the relevant accident prevention guidelines,
– who is familiar with the 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),
– who can properly assess whether hydraulic hoses and hose systems are deemed safe in accordance with the guidelines and regulations stated above.

Authorized inspector(s) is/are :

– an authorized expert employed by the technical supervisory authorities,
– in Hamburg this is the Amt für Arbeitsschutz (office for occupational health and safety),
– in Hessen these are the technical supervisory offices,
– an authorized expert appointed by the professional associations.

3.4.2 Examples of possible defects in hose lines

DANGER
Risk of fire or accident!
If problems are discovered during inspections, then they must be remedied immediately or suitable measures are to be taken. Failure to do this can result in serious injury to persons, death or damage to property!
▶ Remedy problems or take suitable measures!

- Damage to the outer layer as far as the intermediate 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.

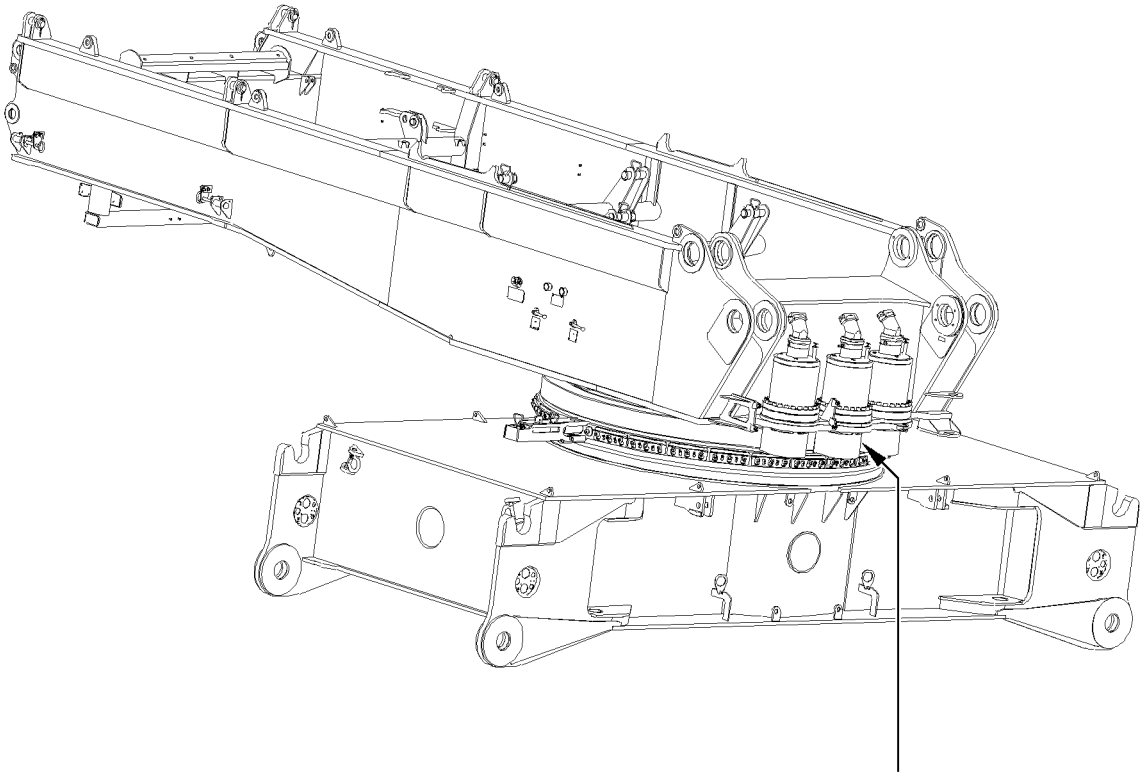
3.4.3 Maintenance of hose lines

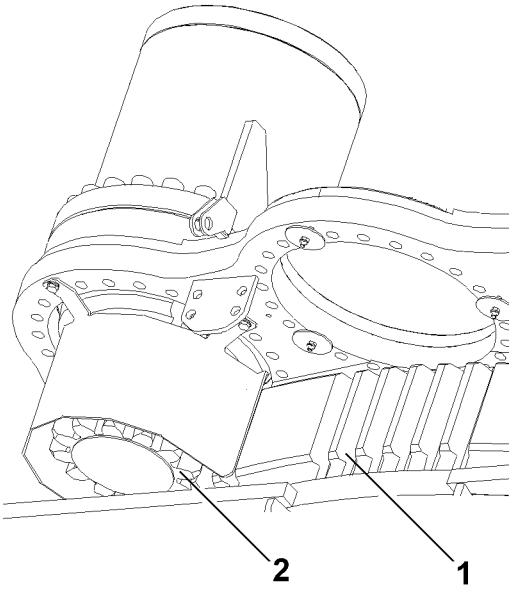
- We recommend to check all hoses, hose lines and screw fittings daily, but at least every two weeks for leaks and externally recognizable signs of damage.
- Damaged parts must be replaced immediately! Oil spray can lead to injuries and fires!
- Hydraulic lines and hoses may not be repaired!
- Hoses that have already been used in a hose system may not be reinstalled in hose systems.
- Always use original LIEBHERR spare parts when replacing hoses and hose systems.
- Always ensure that the hoses are routed free of torsion. If high pressure hoses are being used, attach screw of 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.

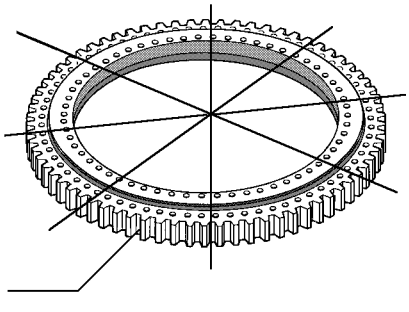
3.4.4 Replacing the hose lines

DANGER
Risk of fire or accident!
Failure to replace hose lines at appropriate intervals can cause serious injury to persons, death or damage to property!
▶ Replace hose lines in appropriate intervals!

This must be documented in the crane's log book by the **expert** or the **authorized inspector**.
The service life of a hose system may not exceed six years, including a storage period of a maximum of two years (observe the manufacturing date on the hoses). The duration of use can also be defined by the **expert** or **authorized inspector** in accordance with existing test and empirical data in the individual application areas, taking the usage conditions into consideration.







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4 Rotary connection

4.1 Lubricate the rotary connection

Perform lubrication with extreme care before and after long operating intervals, particularly before and after any winter break, in order to provide 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, see also section of “Central lubrication system”. Then the relevant crane movement must be repeated several times and the lubrication procedure must be carried out again.

▶ Lubricate the rotary connection.

4.2 Lubricating the gear ring and the slewing gear pinion

Before and after extended breaks in service, grease the gear ring **1** and the slewing gear pinion **2** to ensure the best possible protection from corrosion.

▶ Grease the gear ring **1** and the slewing gear pinion **2** externally.

4.3 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**!

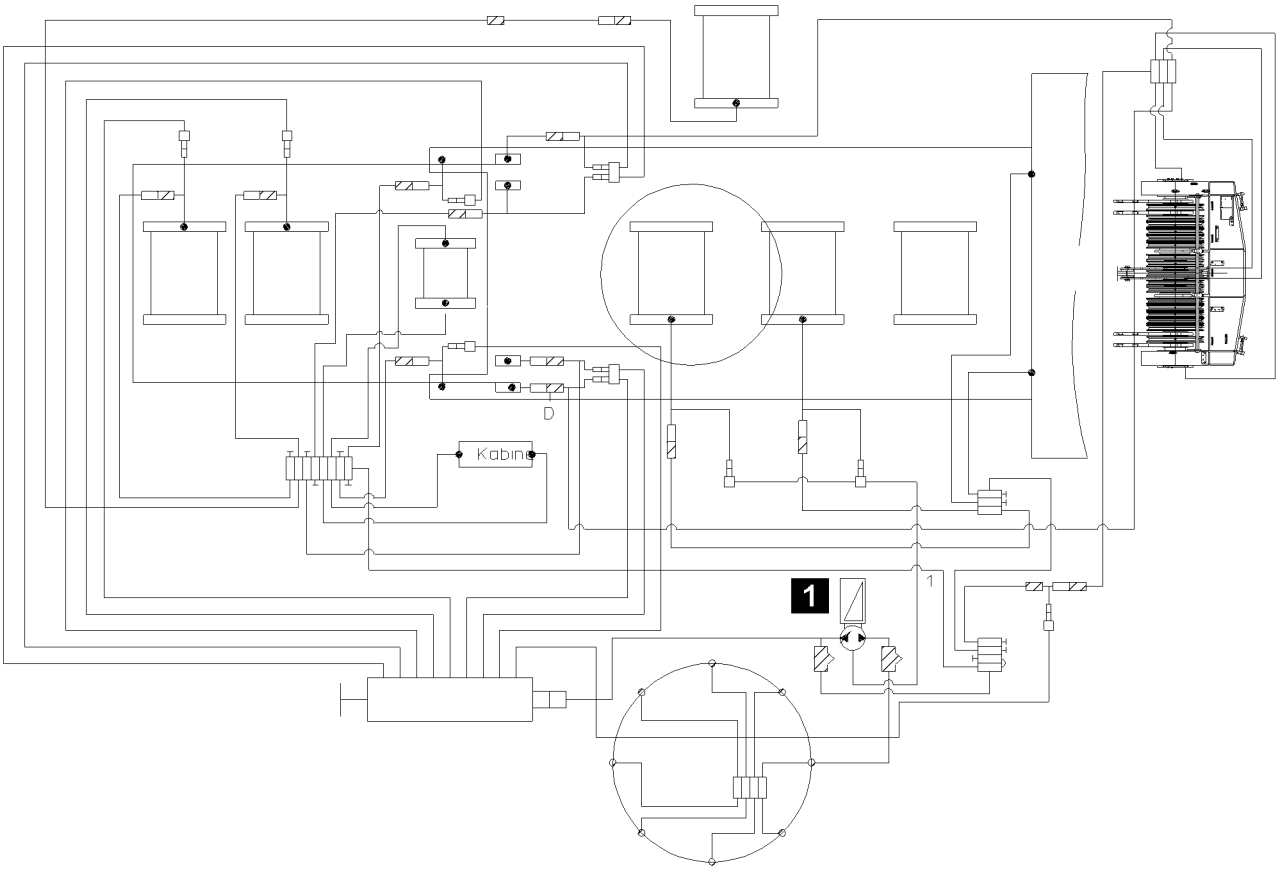
▶ Contact the Service Dept. at **Liebherr-Werk Ehingen GmbH** for **test instructions**!

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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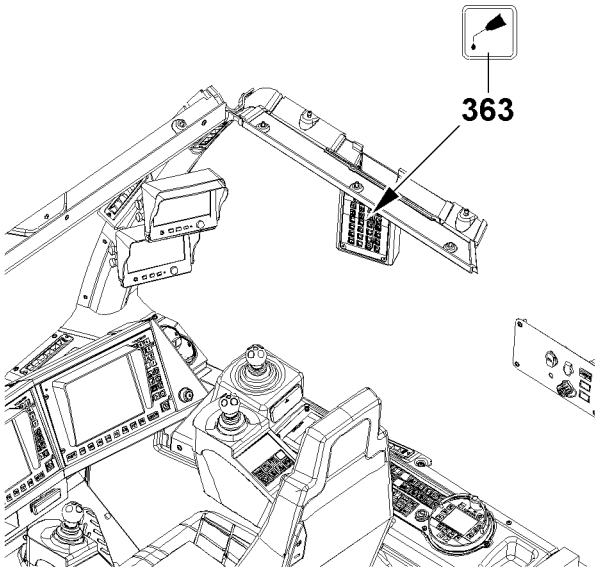
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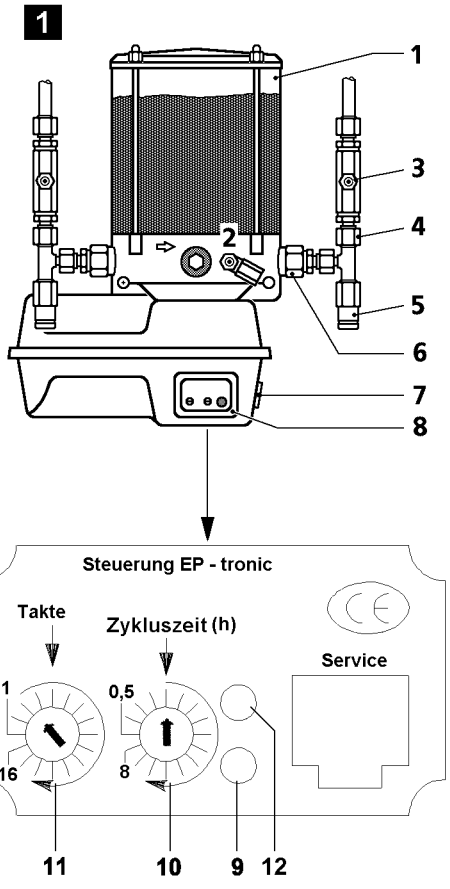
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B108923

5 Maintaining the central lubrication system

5.1 Overview of central lubrication system

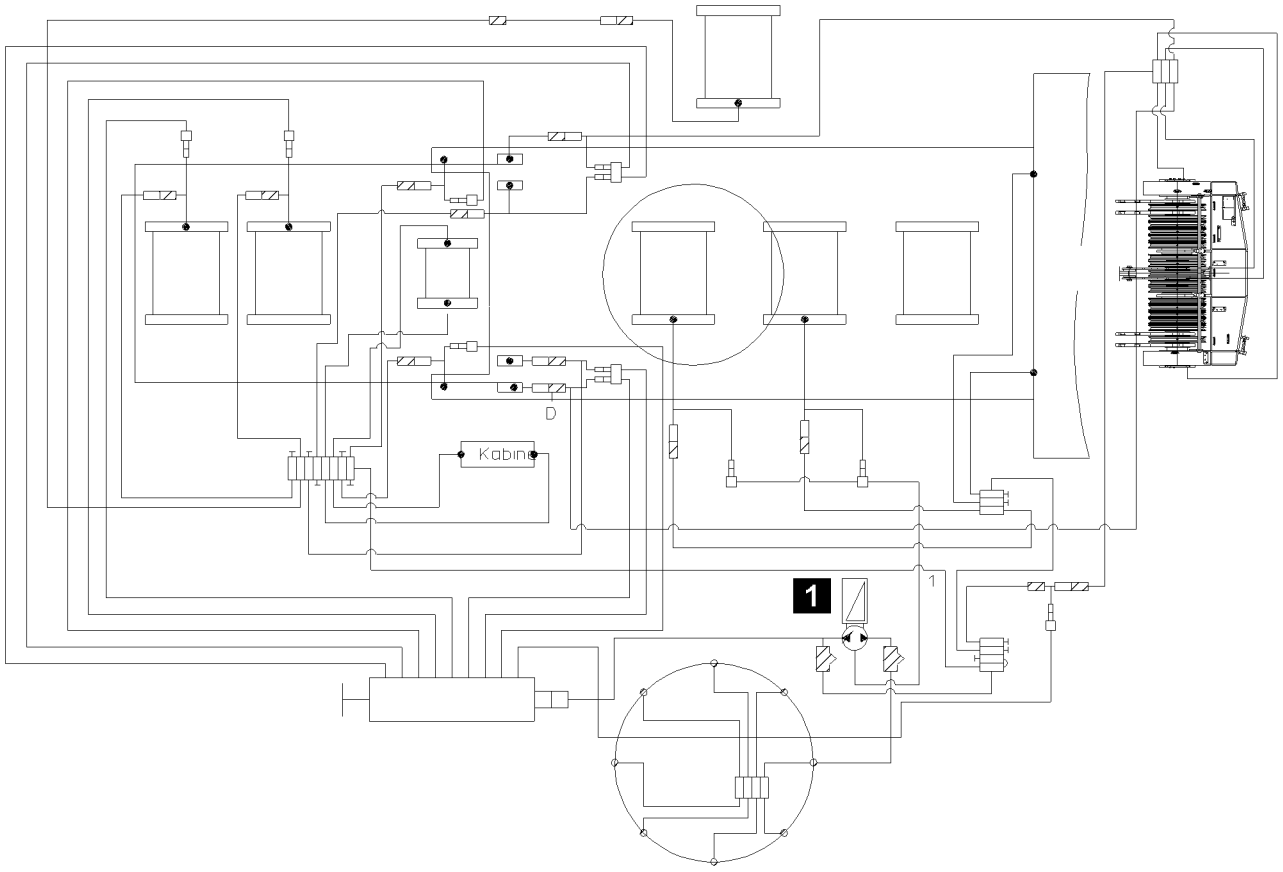
The crane superstructure is equipped with a central lubrication system.

NOTICE
Dirty lubricant!
If the crane is not moved for longer than 3 months, then contaminants adhere to the lubricant!
Components are exposed to increased wear!
If the crane has not been moved for longer than three months:
- ▶ Lubricate the grease fitting with an external lube pump until lubricant emerges on all lube points!
- ▶ Repeat crane movements several times and carry out the lubrication procedure again!

Note
- ▶ Cleaning is permitted in washing bays or with steam cleaners!

The central lubrication system consists of the following components:

1	Grease container	
2	Grease nipple	• Filling the central lubrication pump
3	Grease nipple	• Filling the lube lines
4	Pump outlet	
5	Pressure relief valve	
6	Pump element	
7	Push button	
8	Control	
9	Green LED	• Function display
10	Latched switch	• Cycle time in hours
11	Latched switch	• Lube time in cycles
12	Red LED	• Fault display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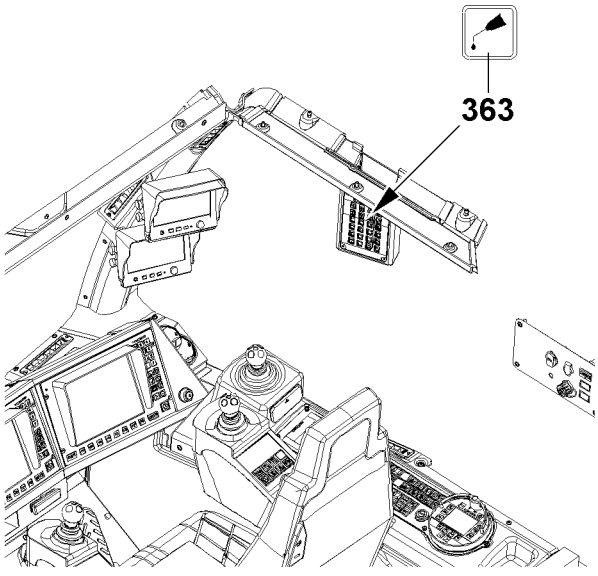
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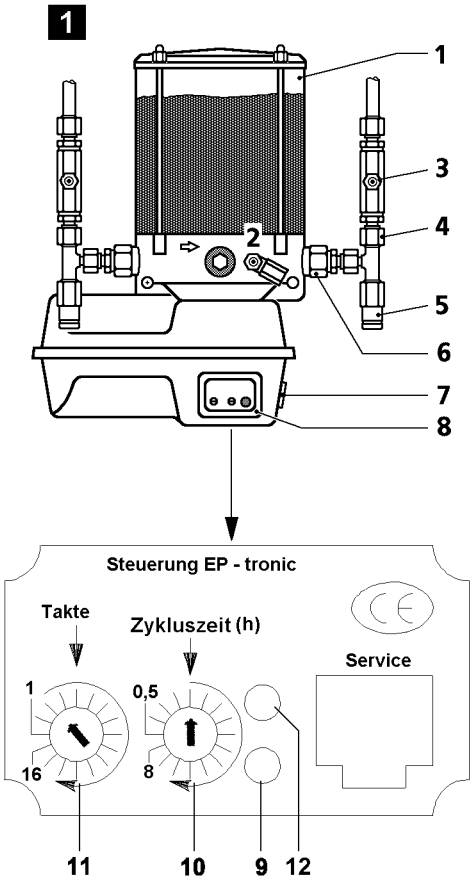
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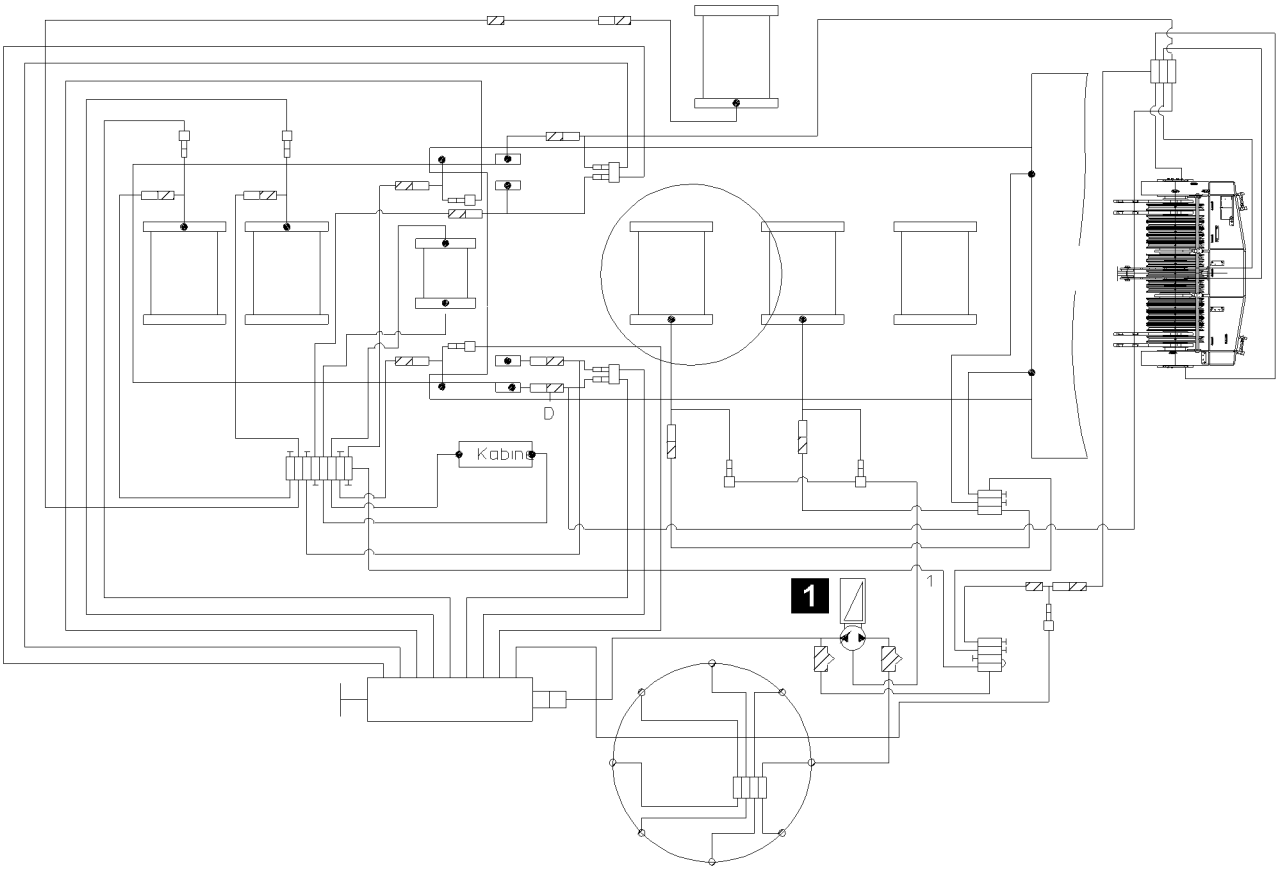
5.2 Indicator lights of the central lubrication system

Position	Beacon	LED condition	Description
363		Orange: Blinks once after engine start	
12		Red: Blinks once after engine start	
9		Green: Blinks once after engine start	
363		Yellow: Lights up during the lubrication time	Pump on, lubrication active
9		Green: Lights up during the lubrication time	
363		Orange: Blinking	Error monitoring time lubrication time
12		Red: Blinking fast	
9		Green: Blinking fast	
363		Red: Blinking fast	
12		Red: Blinking very fast	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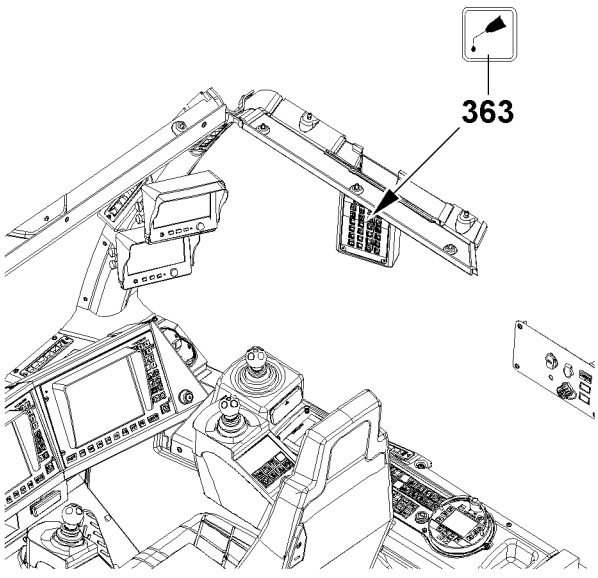
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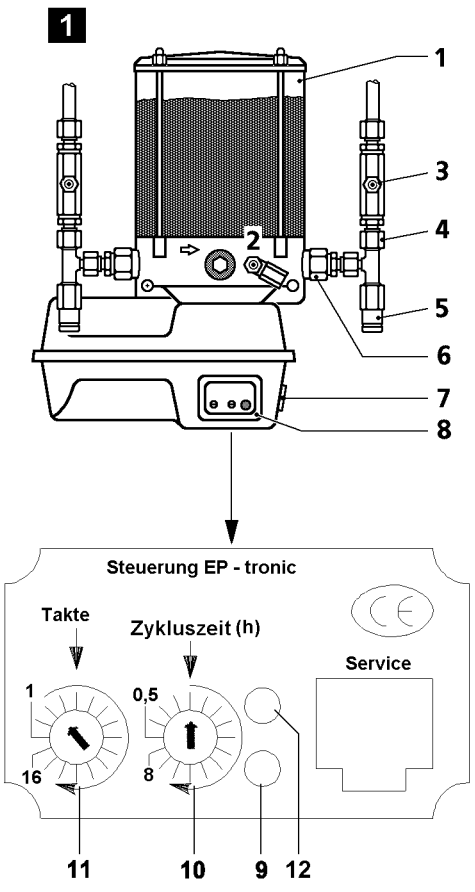
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5.3 Maintaining the central lubrication system

5.4 Setting the lubrication and break periods

Note

- ▶ The pump running time is 3 cycles!
- ▶ The cycle time is 2.5 hours!
- ▶ During the lubrication procedure, the green LED **9** on the engine protection housing lights up!

The lubrication and pause time is set at the factory.

- ▶ Turn on the engine ignition.
- ▶ Set the cycles: Turn the latched switch **11**.
- ▶ Set the cycle time: Turn the latched switch **10**.
- ▶ Check functional readiness: Turn on the engine ignition.

Result:

– When turning the ignition on: The green LED **9** and the red LED **12** light up for approx. 2 s.

– The control **8** is functionally ready .

5.5 Check the function of the central lubrication system

- ▶ Start the engine.
- ▶ Trigger 2 or 3 grease pulses using the push button **7**.

Result:

– Grease emerges on the grease points.

– If the system is blocked but the electric pump is properly functioning, the grease emerges through the pressure relief valve **5**.

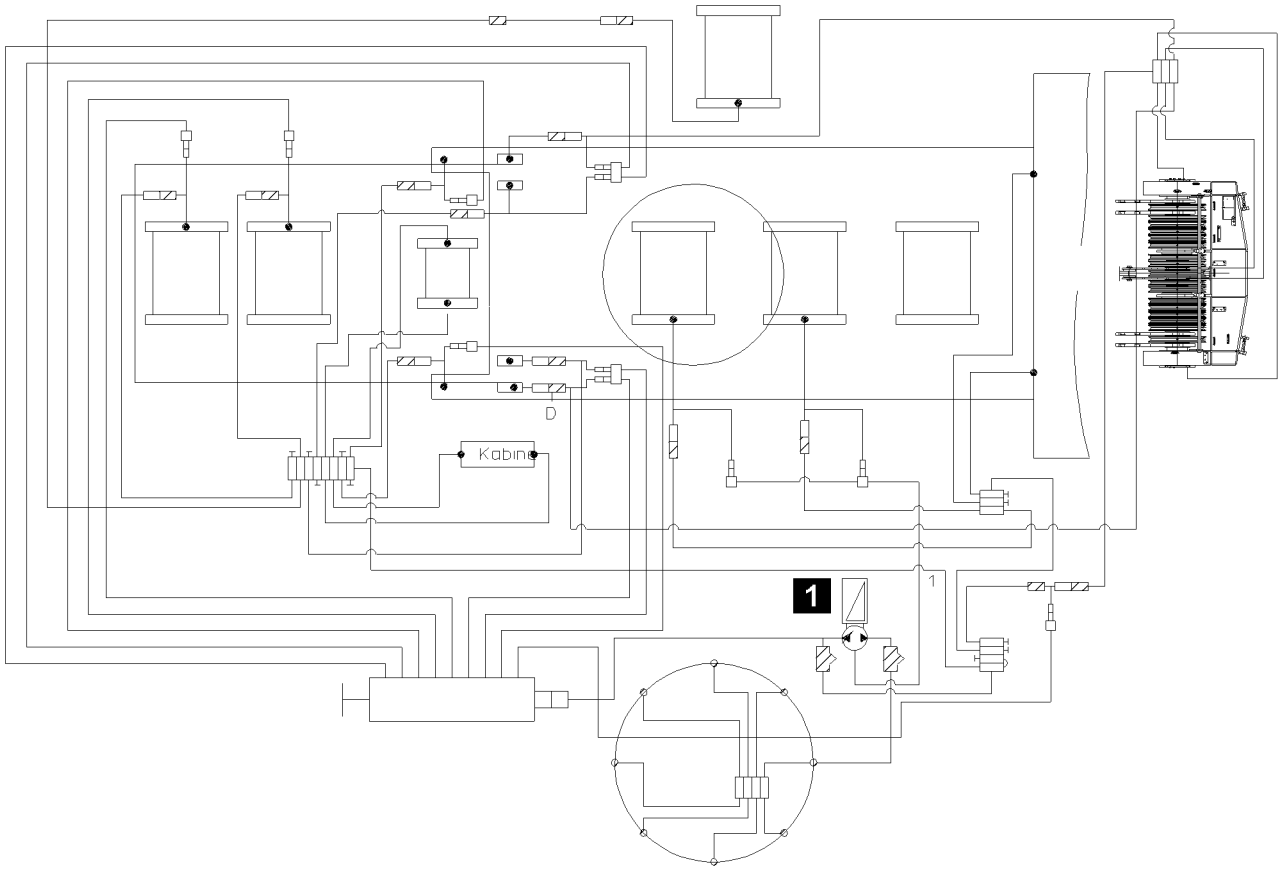
5.6 Carrying out an intermediate lubrication

An intermediate lubrication is made in the following cases:

– After washing the crane.

– After a repair.

- ▶ With ignition turned on: Press the push button **7** on the engine protection housing of the pump.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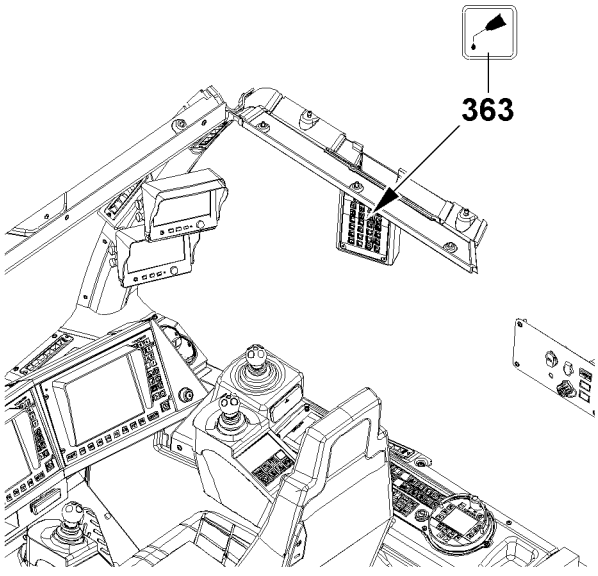
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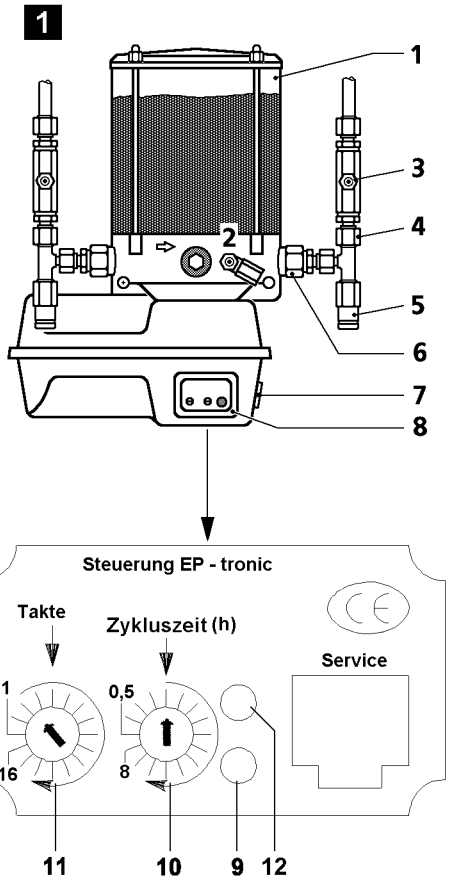
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B108923

5.7 Filling the grease container of the central lubrication system

NOTICE
Insufficient lubrication!
If there is not enough grease in the container, components will be damaged or worn!
- ▶ There must always be sufficient grease in the grease container **1**!
- ▶ 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.

5.8 Bleeding the central lubrication system

If the grease container **1** has been emptied, then it may be necessary to bleed the central lubrication system.
- ▶ Fill the grease container **1**.
- ▶ Unscrew the main line from the 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.

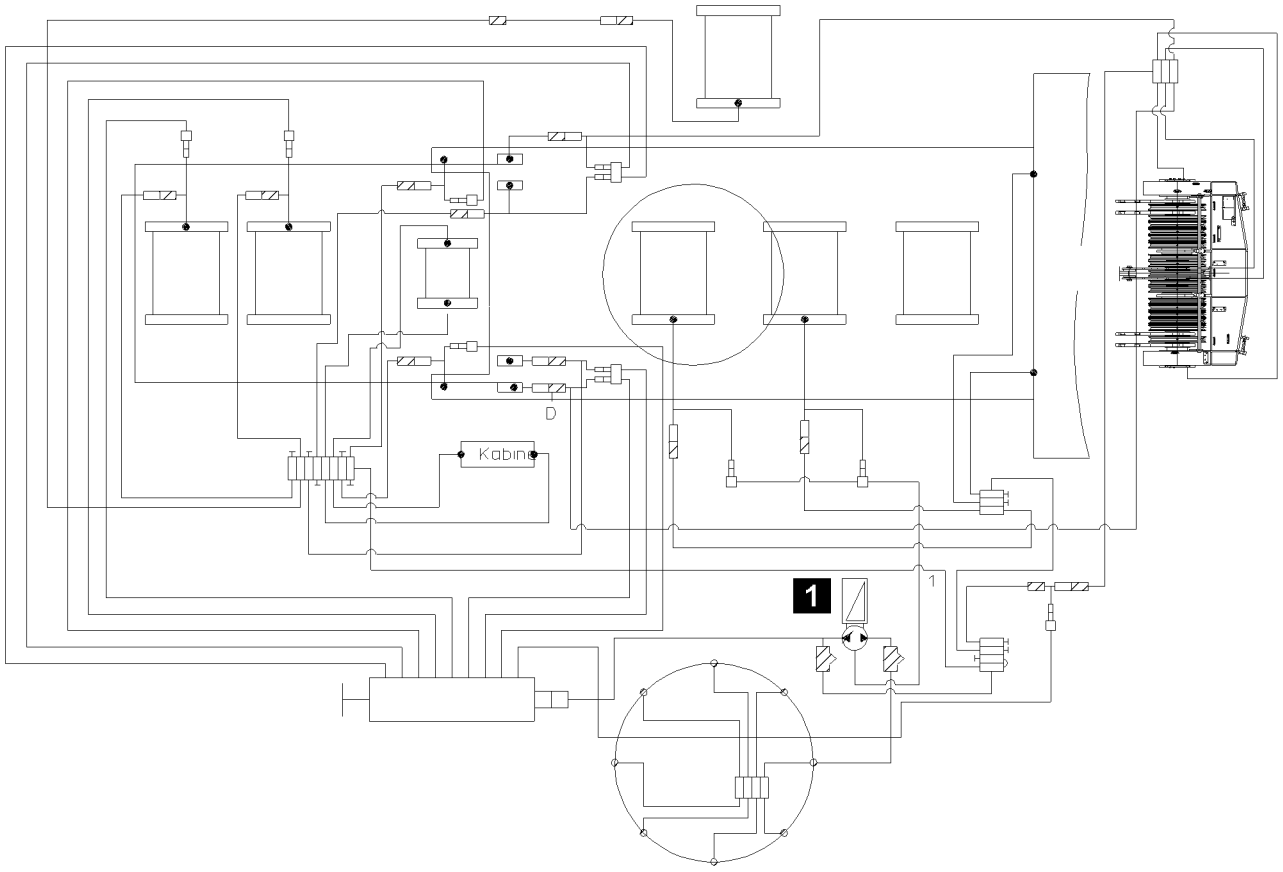
5.9 Filling the lubrication lines

NOTICE
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 push button **7** on the engine protection housing of the pump.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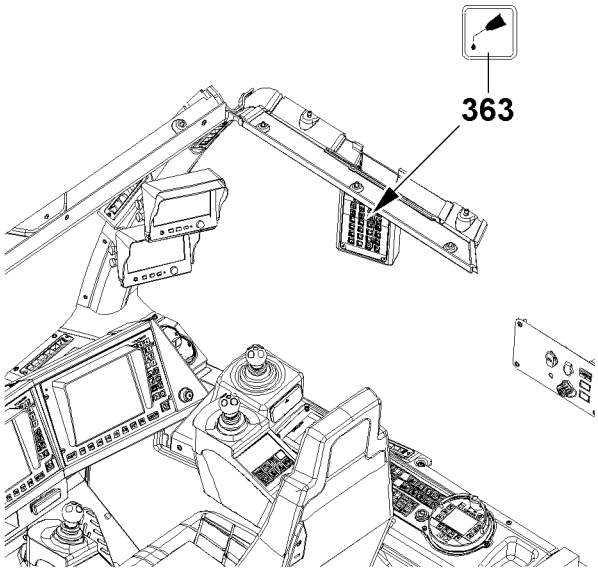
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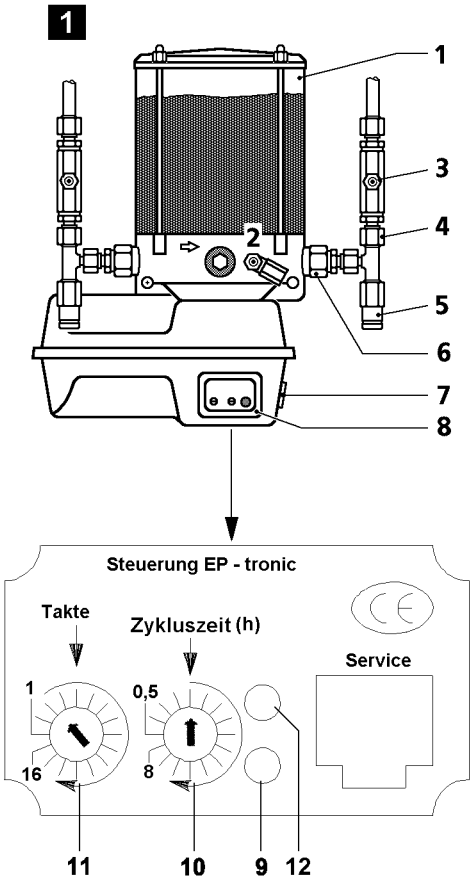
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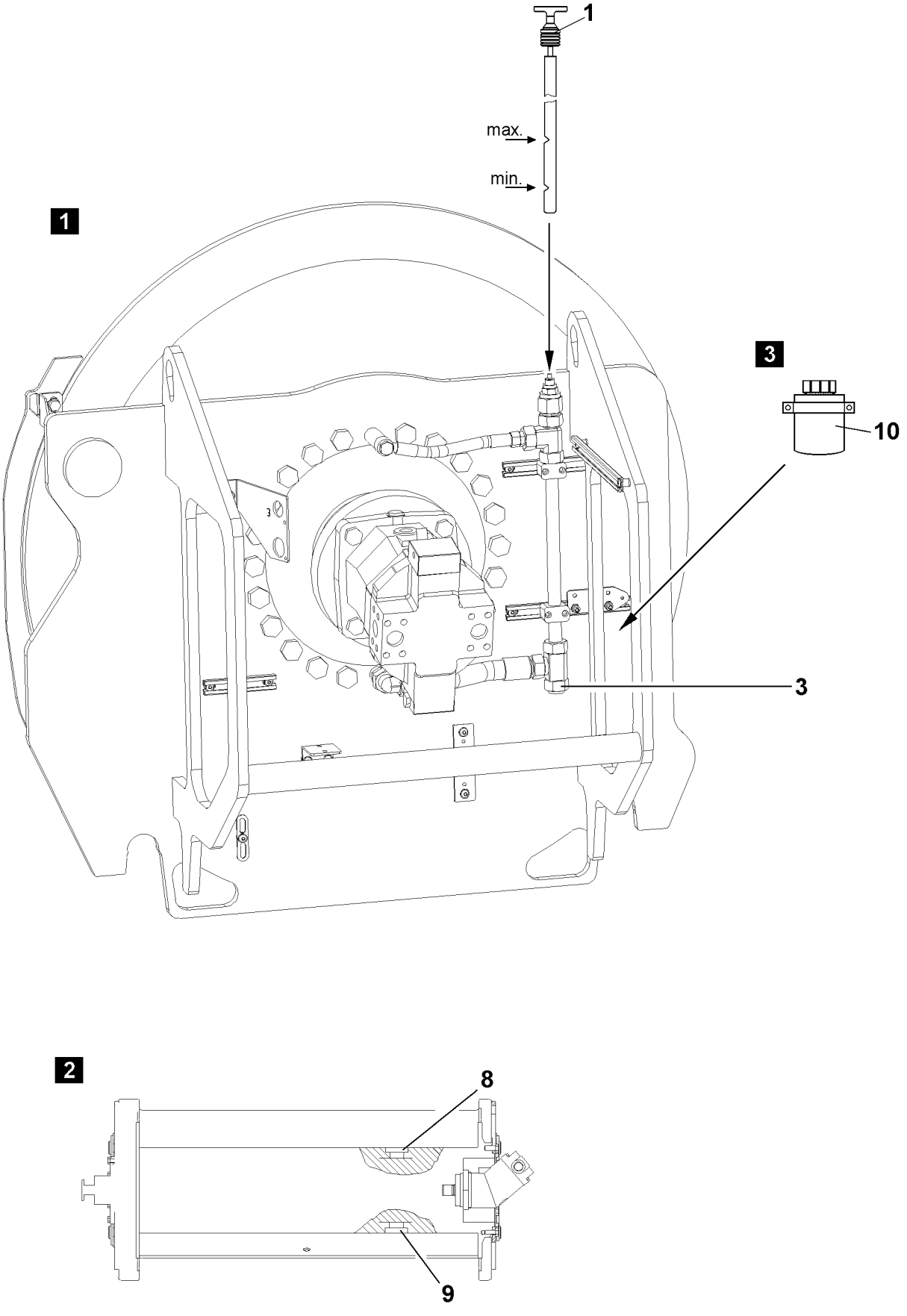
B108923

5.10 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
Grease escapes on the pressure relief valve	System pressure too high, progressive distributor blocked, system blocked, defective valve spring	Check system, replace distributor, repair blocked / seized bearing point, replace pressure relief valve
The red LED blinks very fast	Error CPU / memory	Consult LIEBHERR or BekaMax customer service
The red LED and the indicator light blink fast	Error in the monitoring period from cycle start	Proximity switch is defective, possibly consult Liebherr or BekaMax customer service



B105418

6 Hoist gear 1 to 6, illustration 1

Please maintain utmost cleanliness during all work to prevent dirt from entering the gear system.

6.1 Overflow container, illustration 3

When the oil heats up in the hydraulic motor for the winches, the oil can enter the overflow container **10** via a check valve, but cannot flow back into the hydraulic system after cooling off. For this reason the oil that has collected in the overflow container **10** must be disposed of at regular intervals.

6.2 Winch

Make sure that the following prerequisites are met:
– the winch is inactive,
– the crane is in horizontal position.

6.2.1 Checking the oil level

▶ Remove and wipe off the dipstick **1**.
▶ Reinsert the dipstick **1** and pull it out again.

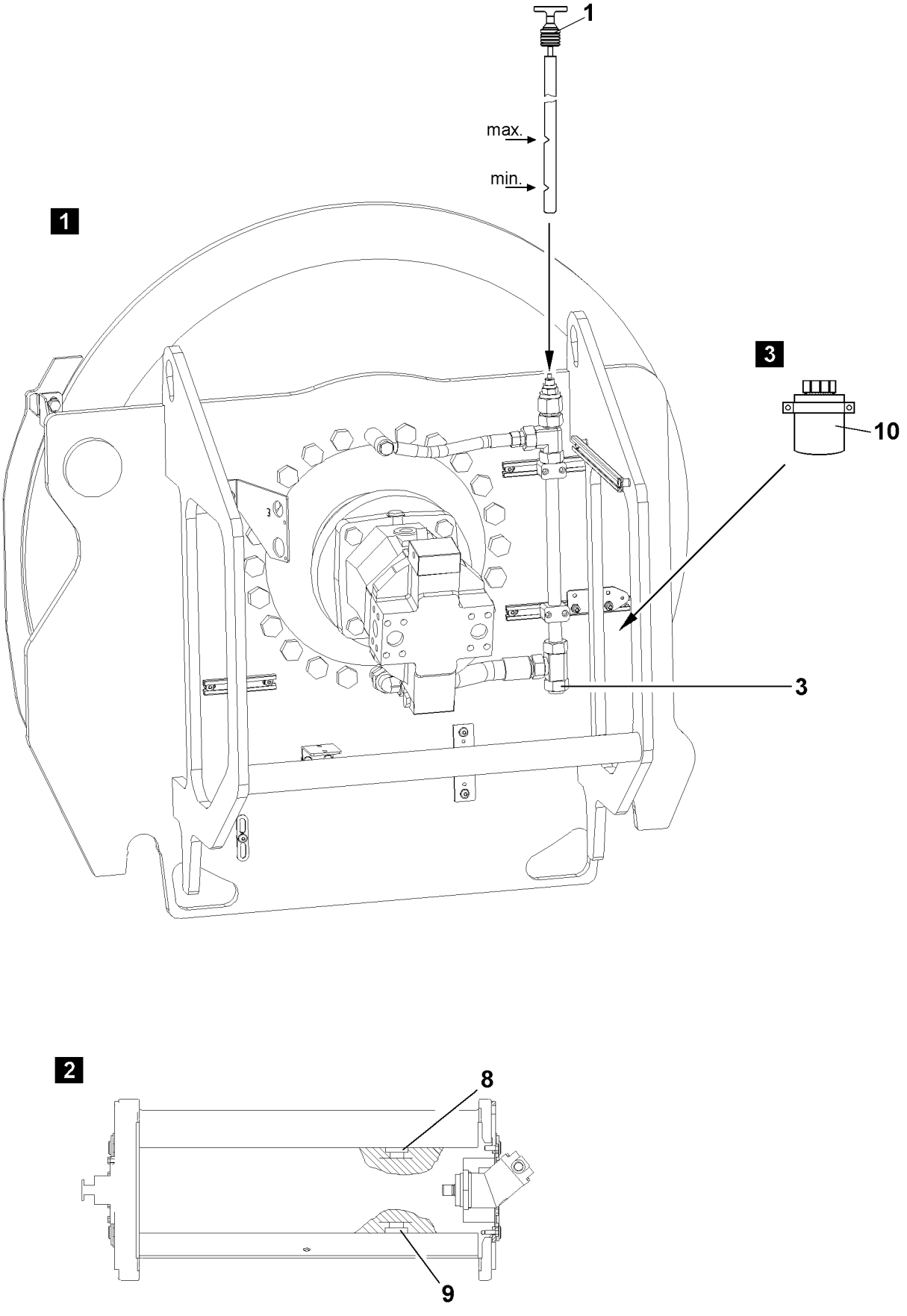
The oil level must be between the min. and max. mark on the dipstick **1**.
▶ Check the oil level.

NOTICE
Danger of transmission damage!
If the oil level has dropped below the minimum mark, add engine oil as specified in the lubrication chart until the oil level is between the minimum and maximum marks!
▶ Add oil and check again!

▶ Reinsert the dipstick **1**.

6.2.2 Oil change

▶ Pull out the oil dipstick **1**.
▶ Remove the oil drain plug **3** and drain the oil into a suitable container.
▶ Install the oil drain plug **3** with new seal and tighten.
▶ Add oil as specified in the lubrication chart at the oil filler port until the oil level is between the minimum and maximum mark on the dipstick **1**.
▶ Install the oil dipstick **1** and tighten.
▶ Check the oil level as described above.



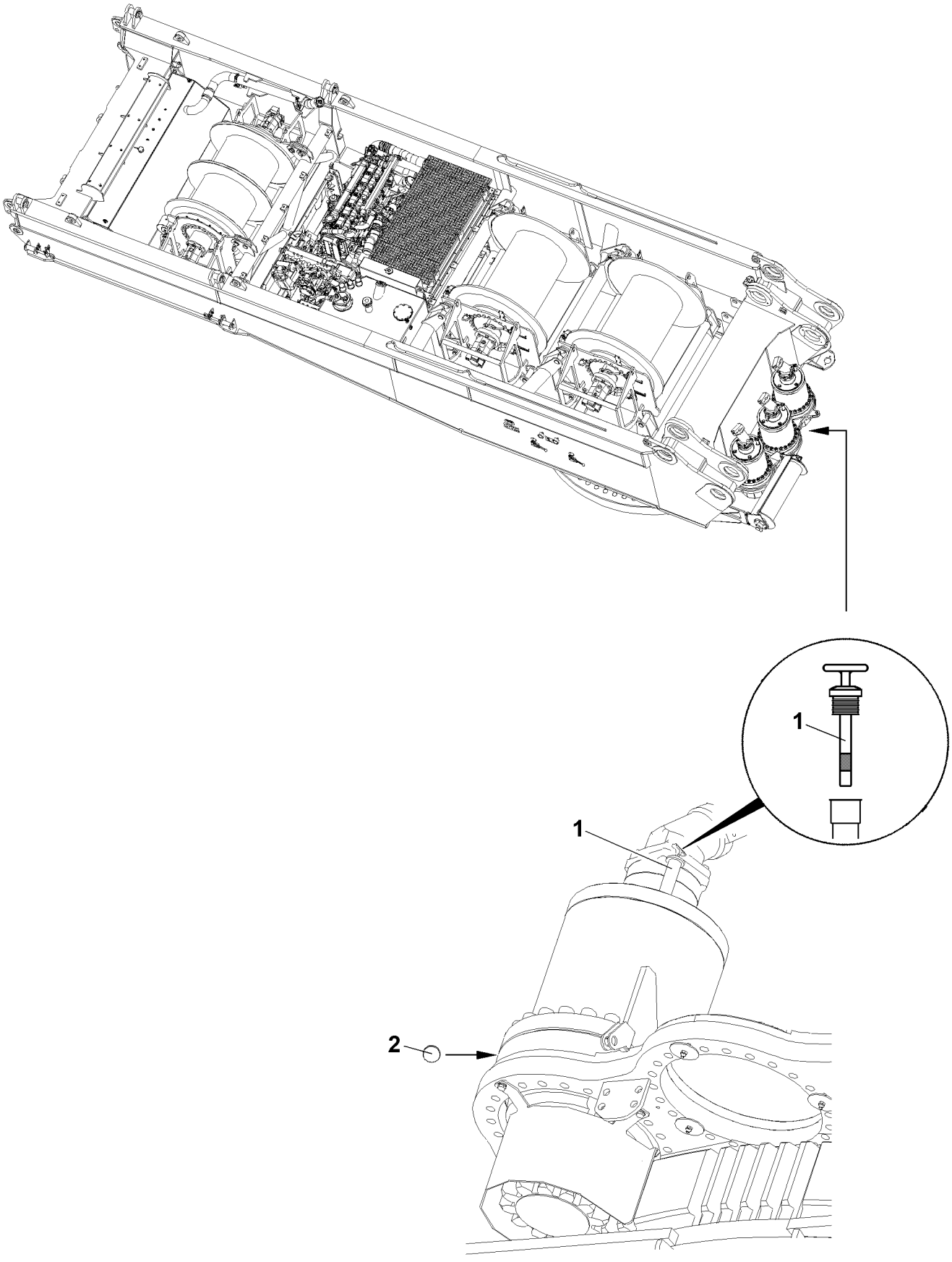
B105418

7 Assembly winch, illustration 2

7.1 Oil change

Ensure that the assembly winch has been spooled out.

- ▶ Remove the oil filler plug **8**.
- ▶ Remove the oil drain plug **9** and drain the oil into a suitable container.
- ▶ Install the oil drain plug **9** with new seal and tighten.
- ▶ Add oil as specified on the lubrication chart on the oil filler plug **8**.
- ▶ Install the oil filler plug **8** with new seal and tighten.



B105419

8 Slewing gear

Please maintain utmost cleanliness during all work to prevent dirt from entering the gear system.

8.1 Check the oil level

Ensure that the following prerequisite is met:
– the crane is in horizontal position.

▶ Remove and wipe off the dipstick **1**.
▶ Reinsert the dipstick **1** and pull it out again.

The oil level must be between the two notches on the oil dipstick **1**.
▶ Check the oil level.

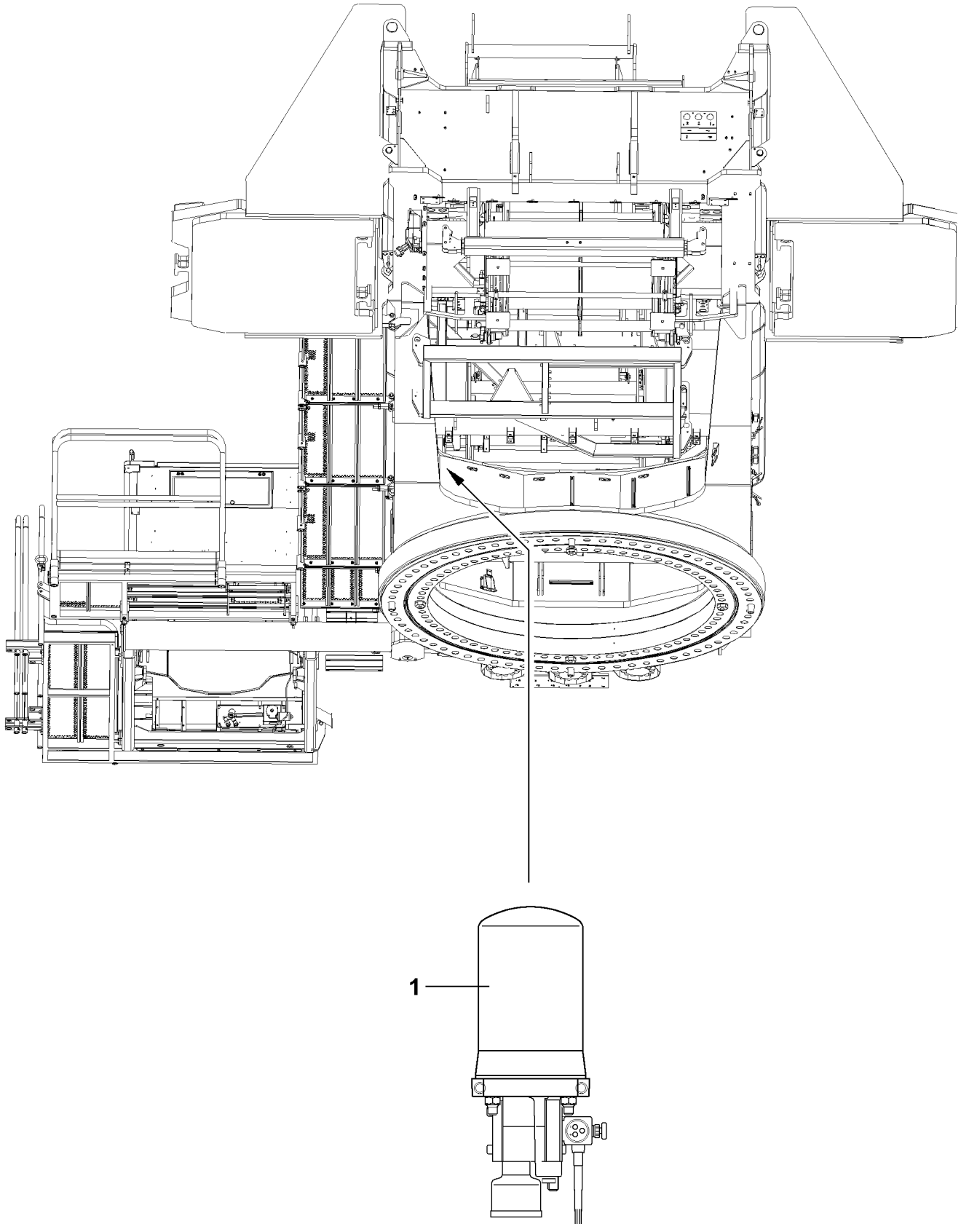
NOTICE
Danger of transmission damage!
If the oil level has dropped below the lower notch, add oil as specified in the lubrication chart until the oil level is between the two notches!
▶ Add oil and check again!

▶ Reinsert the dipstick **1**.

8.2 Changing the oil

Make sure that the following prerequisites are met:
– the crane is in horizontal position,
– the transmission has warmed up.

▶ Open the oil filler port by unscrewing the oil 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 according to the lubrication chart at the oil filler port until the oil level is between the two notches on the oil dipstick **1**.
▶ Close the oil filler port by screwing in the oil dipstick **1**.
▶ Check the oil level as described above.



B105420

9 Air dryer of the compressed air system of the crane superstructure

9.1 Replacing the granular cartridge

WARNING
Risk of accident due to pretensioned granular cartridge!
The granular cartridge **1** is under spring tension!
▶ Caution when replacing the granular cartridge!

▶ Replace the granular cartridge **1** once per year!

10 Electrical system - lighting

The maintenance of the electrical system is essentially limited to replacing defective fuses and bulbs and maintaining the batteries.

NOTICE
Damage of electrical system!
Never short circuit defective fuses with wire or similar items!
▶ Always replace defective fuses with fuses of the same amperage!

10.1 Battery maintenance

DANGER
Risk of fatal injury!
▶ Always disconnect the batteries from the power circuits when working on the electrical system of the crane and during all welding work!

▶ Keep batteries clean and dry!
▶ Do not bring oil, grease, fuel or solvents into contact with the battery casting compound!
▶ Loosen 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!
▶ With 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 best acid temperature for measuring is +20 °C.

Proceed as follows when checking the battery charge:

Spec. gravity	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.

10.2 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 mixture with 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 pouring in 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.

10.3 Removal and recharging

WARNING

Danger of body injuries!

▶ Do not place tools on batteries and keep open flames away!

10.3.1 Removal

Make sure that the following prerequisites are met:

– the engine is turned off,

– all electrical consumers have been switched 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 spark formation.

▶ Disconnect negative terminal first (ground line), then the positive terminal.

- ▶ Remove the battery.
- ▶ Avoid spark formation caused by electrostatic charge. Do this by touching the ground point in the cab.
- ▶ Do not tilt or shake the battery.

10.3.2 Recharging

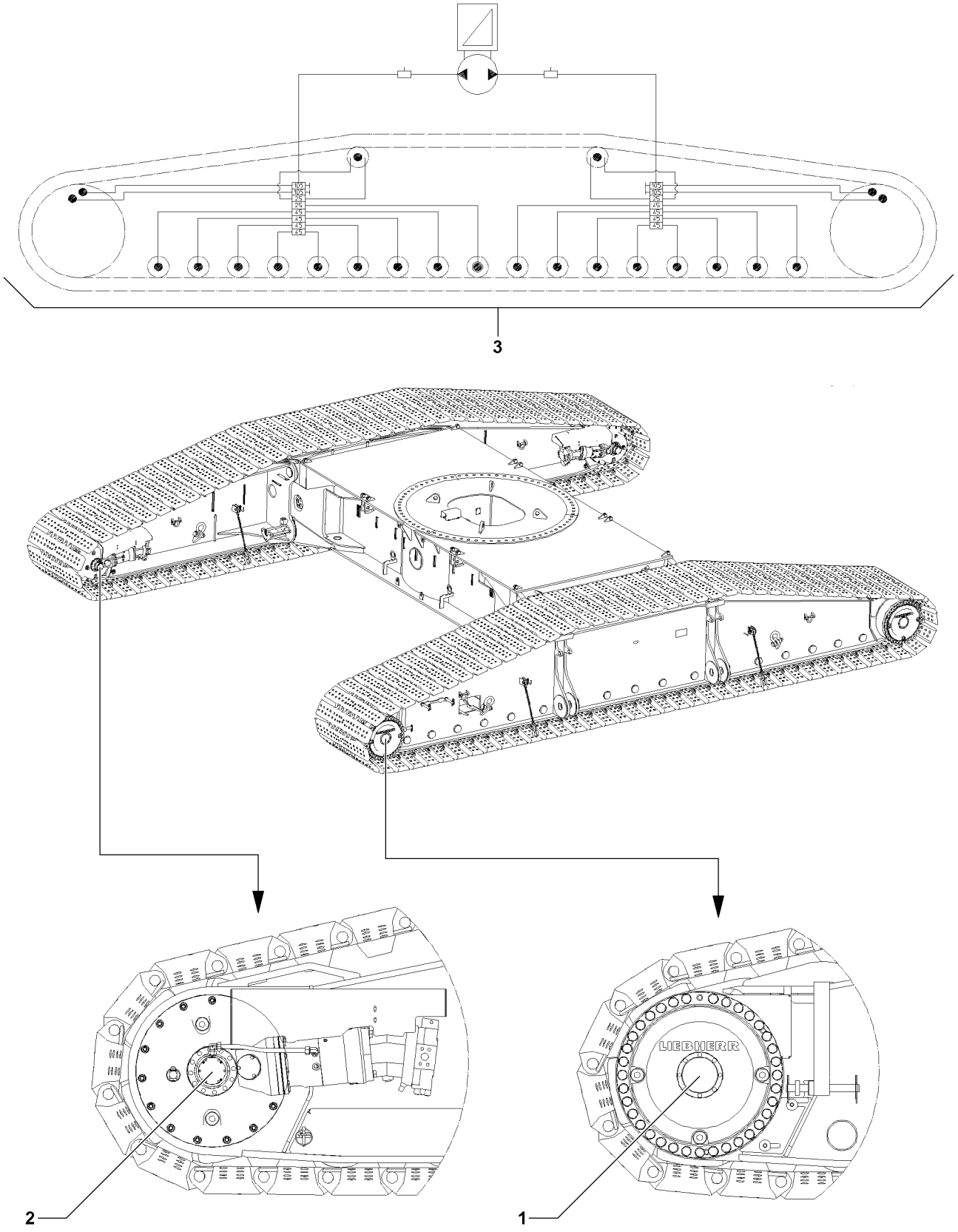
NOTICE
Damage to battery!
- ▶ Recharge only with direct current, the strength of which does not exceed 1/10 of the battery capacity!

Recharging example: A battery with 170 Ah should be charged with a maximum charge 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 (housing is more than warm to the touch).
- 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.

10.3.3 Installation
- ▶ Reinstall the battery tightly in the vehicle.
- ▶ Avoid spark formation caused by electrostatic charge. Do this by touching the ground point in the driver's cab.
- ▶ First connect the positive terminal to the battery, then the negative terminal (ground line).
- ▶ Check that the terminals are tightly seated (low contact resistance).
- ▶ Grease the terminals and end poles with acid-free and acid-resistant grease (also corrosion protection for modern maintenance-free batteries).



B108919

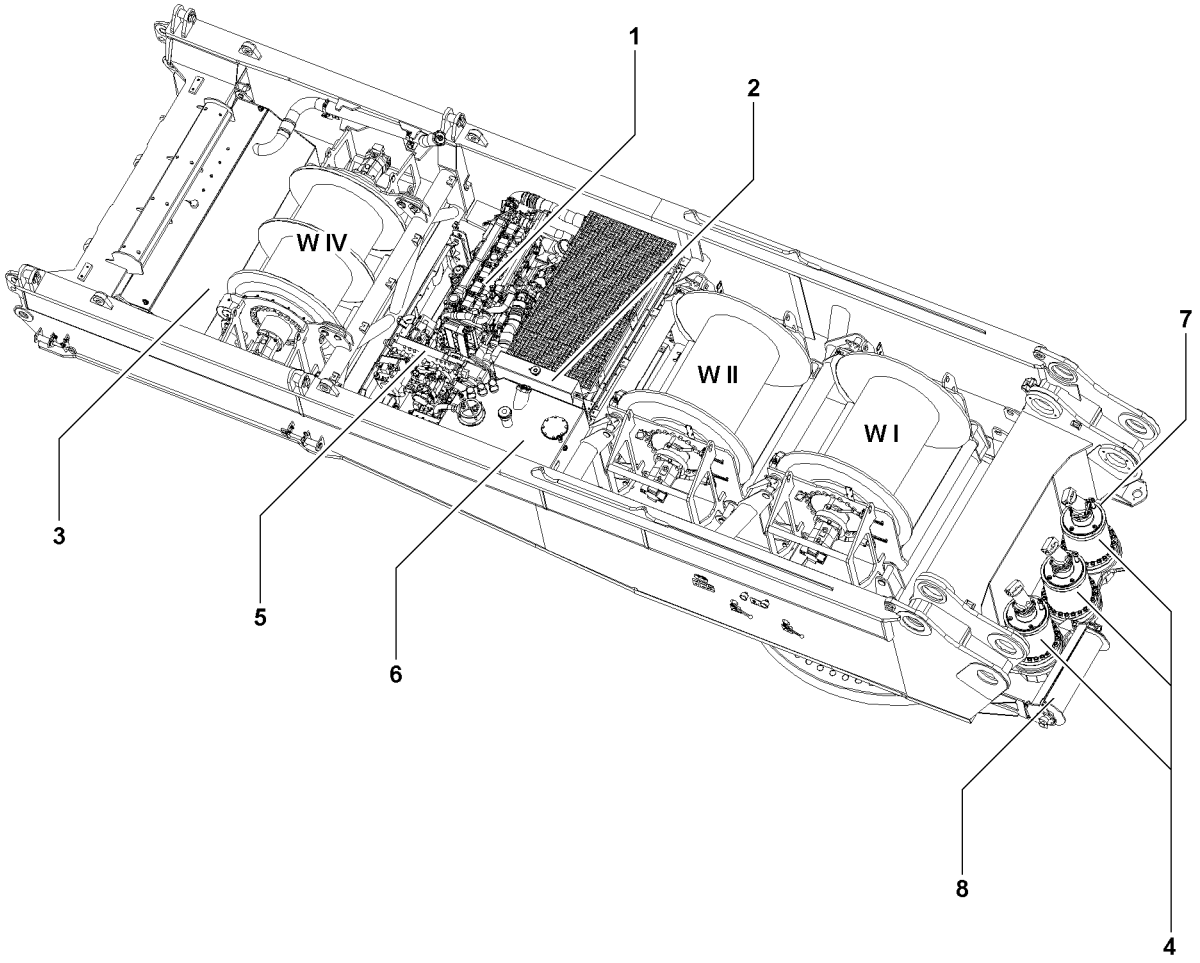
1 Fill quantities

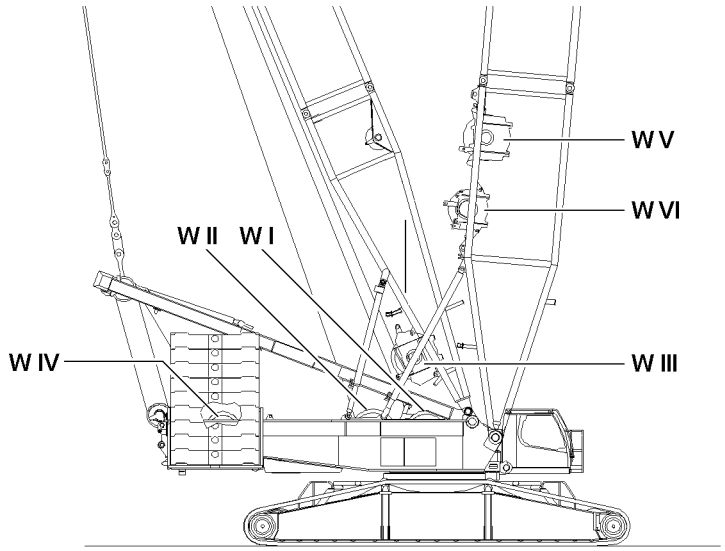
1.1 Fill quantities for crawler chassis

The specified fill quantities (change quantities) are orientation values. The marks on the dipsticks, inspection ports and sight gauges are decisive for filling.

NOTICE
Danger of property damage!
▶ Do not mix synthetic oils with mineral oils!

Position	Component	Fill quantity
1	Planetary gear	35.0 l
2	Miter gear with brake	10.0 l
3	Central lubrication system	2.5 kg





B108922

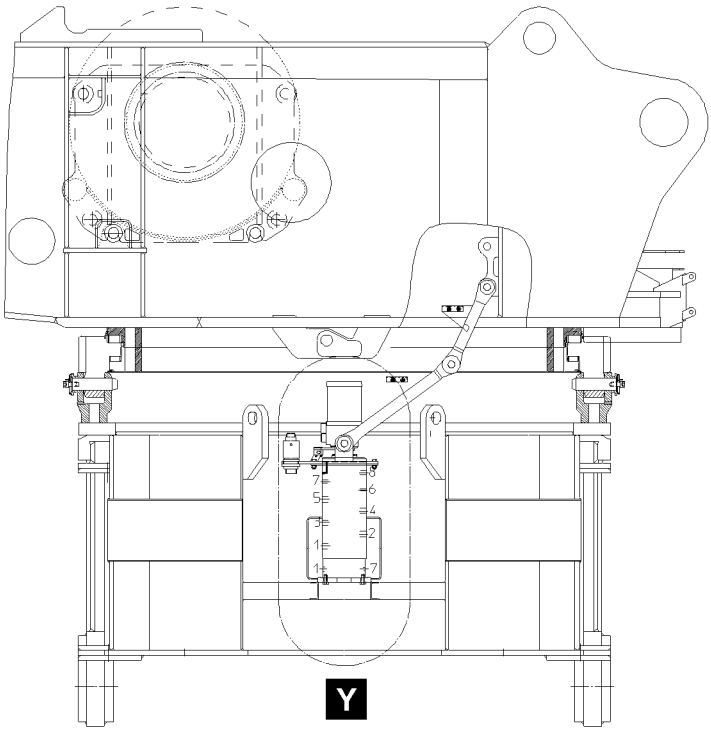
1.2 Fill quantities crane superstructure

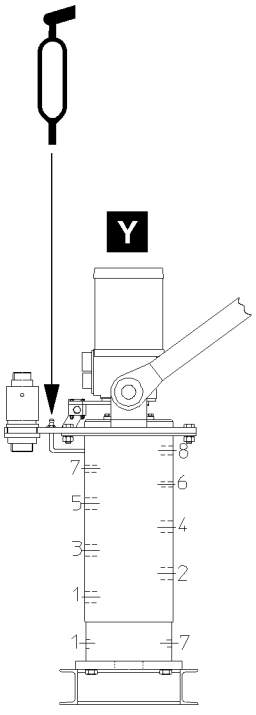
The specified fill quantities (change quantities) are orientation values. The marks on the dipsticks, inspection ports and sight gauges are decisive for filling.

NOTICE
Danger of property damage!
▶ Do not mix synthetic oils with mineral oils!

Position	Component	Fill quantity
1	Diesel engine	37.0 l
2	Cooling system	76.0 l
3	Fuel tank	1485.0 l
4	Slewing gear	23.0 l
5	Pump distributor gear	15.0 l
6	Hydraulic oil tank[1]	565.0 l
7	Central lubrication system	4.0 kg
8	Assembly winch	0.4 l
W I	Winch **W I**	12.0 l
W II	Winch **W II**	12.0 l
W III	Winch **W III**	12.0 l
W IV	Winch **W IV** (double winch)	2 x 16.0 l
W V	Winch **W V**	12.0 l
W VI	Winch **W VI**	17.0 l

[1] When the oil level is checked, all hydraulic cylinders must be retracted. The oil level must be in the center of the sight gauge.



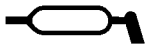


B108151

2 Lubrication schedule

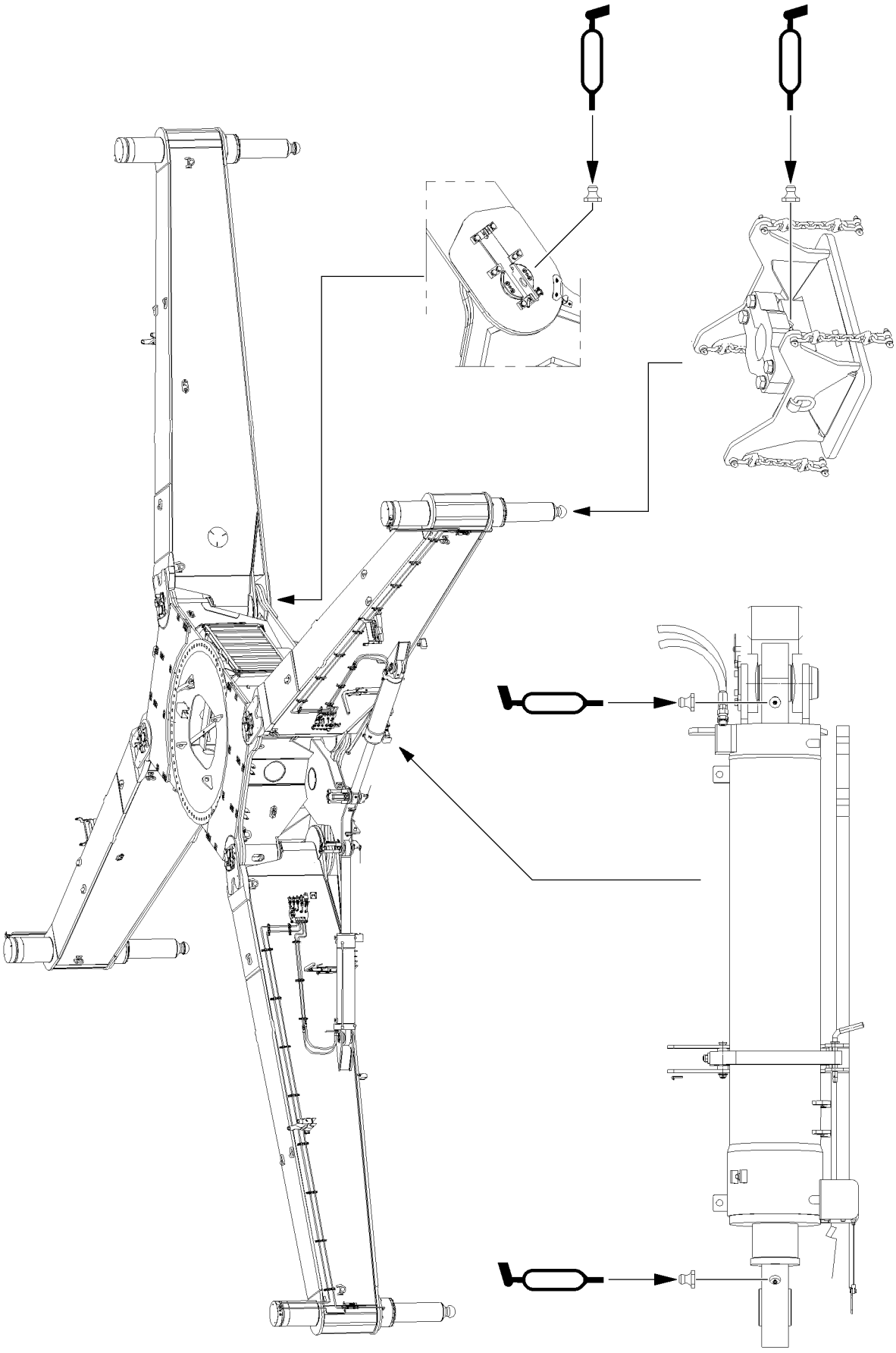
2.1 Lubrication schedule for crawler chassis

2.1.1 Rotary connection



Note

▶ The lube points are marked with this icon.



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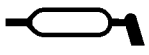
2.2 Lubrication schedule for crane support narrow crawler

2.2.1 Crane support



Note
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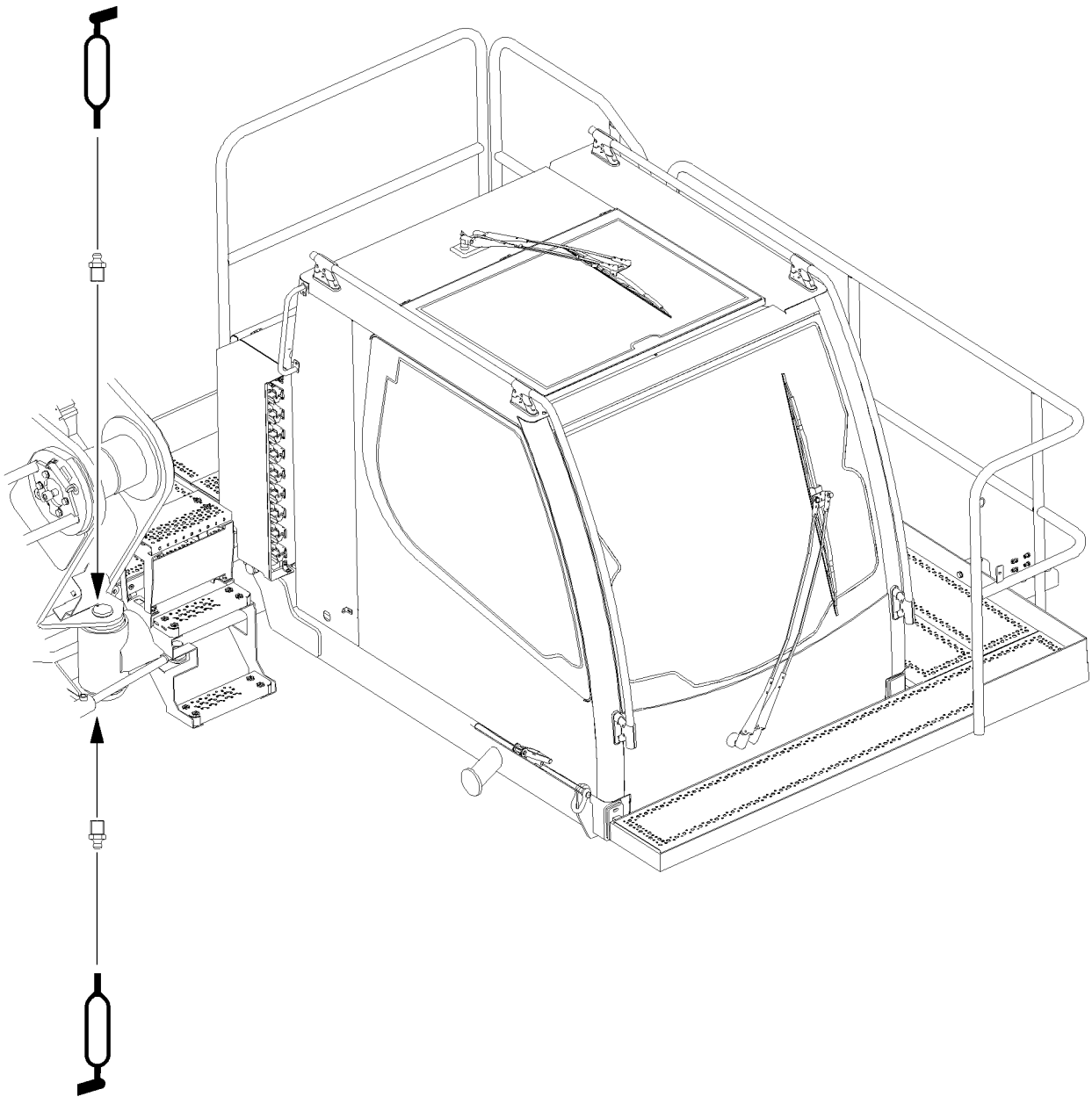

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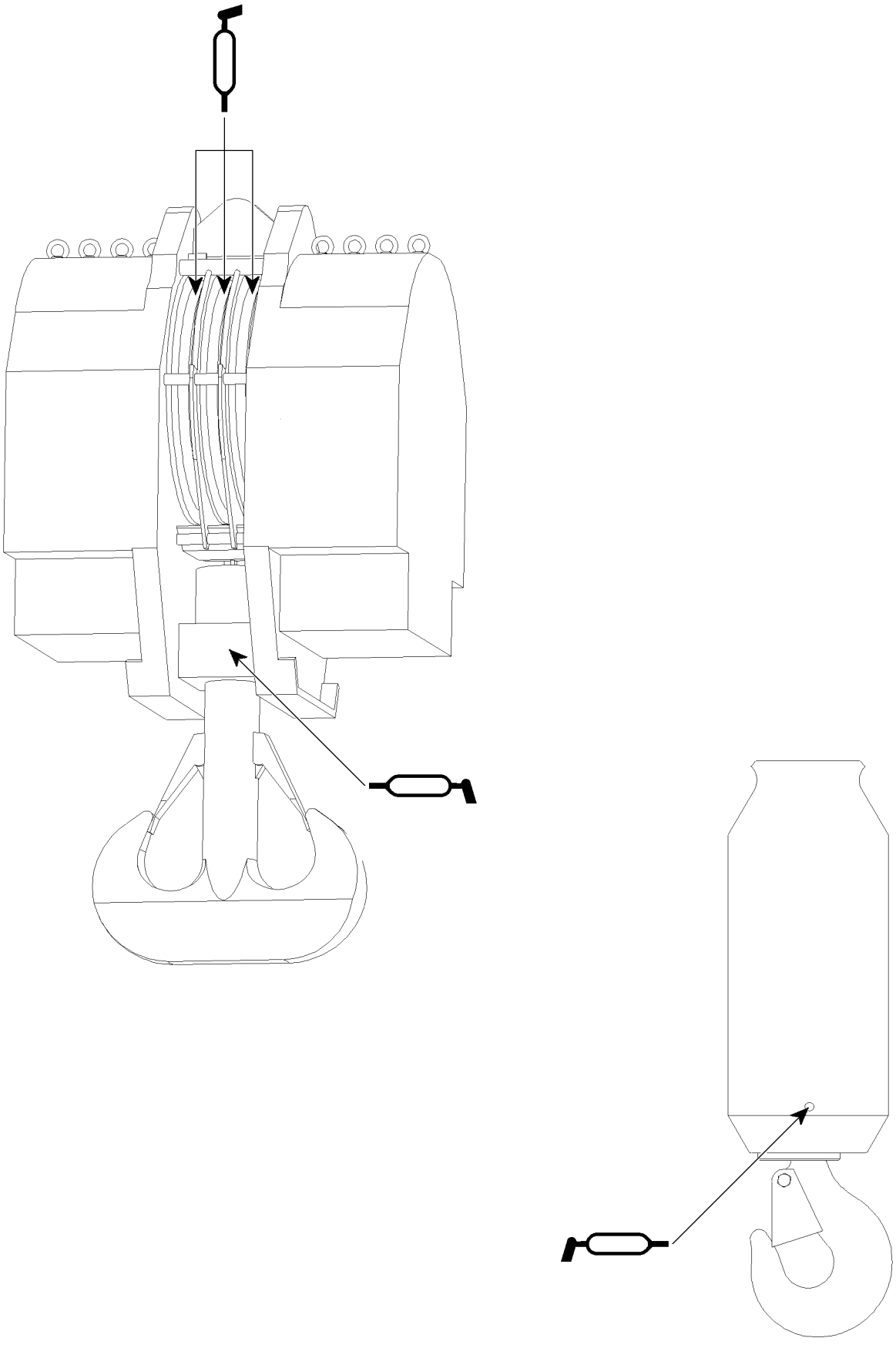
2.3 Lubrication schedule for crane superstructure

2.3.1 Swing arm crane operator's cab

Note

▶ The lube points are marked with this icon.



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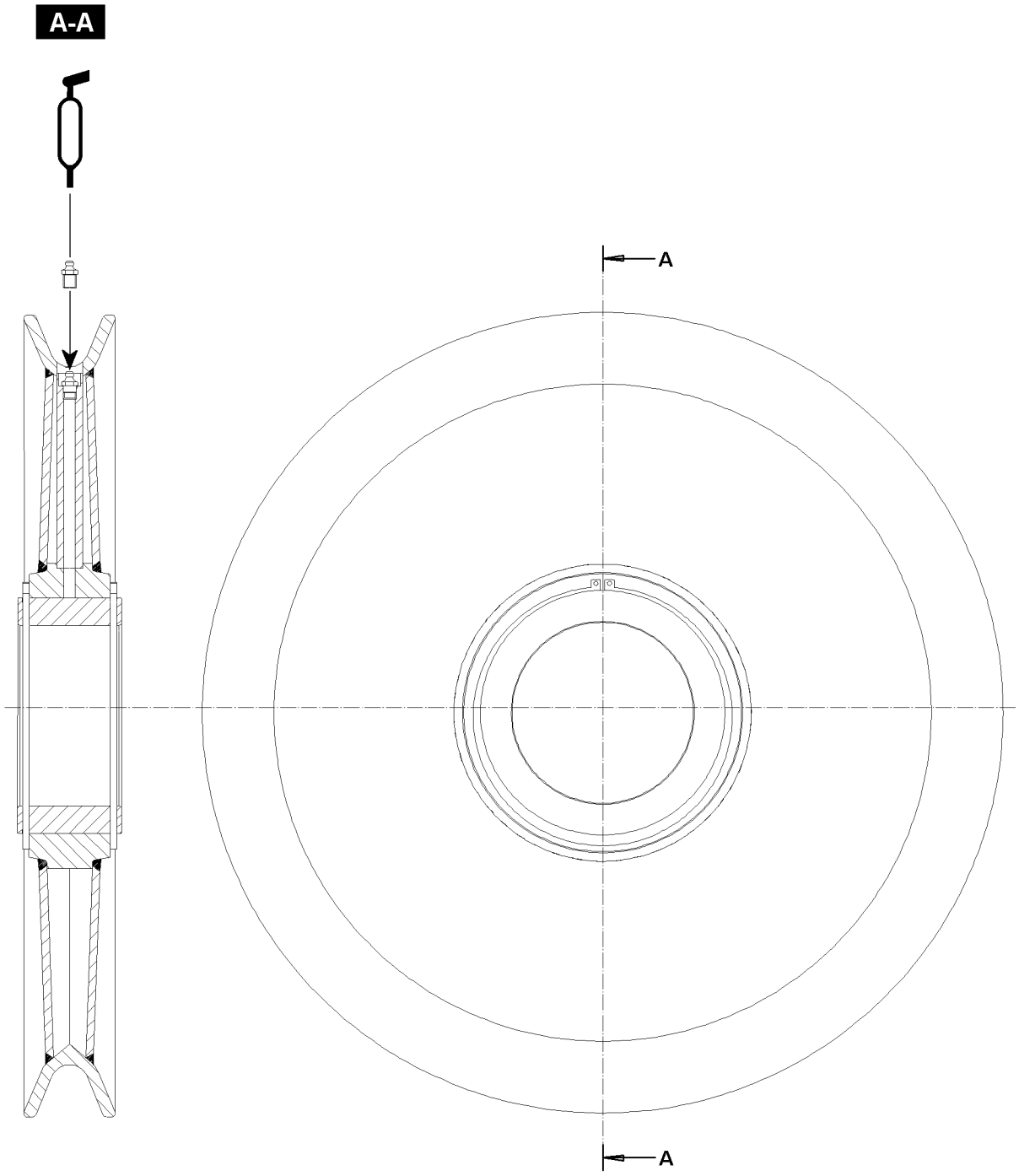
2.4 Lubrication schedule - Equipment

2.4.1 Hook block / load hook

Note

▶ The lube points are marked with this icon.



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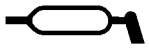
2.4.2 Cable pulley

Note

▶ The rope pulley shown in this chapter is only an example and can deviate in type and version from other rope pulleys. The lubrication schedule is generally valid for all rope pulleys.



Note

▶ The lube points are marked with this icon.

B195219

1 Service items and lubricants required 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 E4.
- **LWE Id. No.: 10425711**!

	Usage	**Ambient temperature for driving and crane operation**	
		-25 °C to +50 °C	**-40 °C to +30 °C**
1	Diesel engine	**LWE Id. No.: 8610240** SAE 10W-40 API CF ACEA E4-96 **Below -20 °C** with pre-heating	**LWE Id. No.: 8610240** SAE 10W-40 API CF ACEA E4-96 **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 ZF TE-ML 05	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5 ZF TE-ML 05
3	Axle drive ZF DK-7	**LWE Id. No.: 861901008** SAE 90 API GL 5 ZF TE-ML 05	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5 ZF TE-ML 05
4	Vehicle distributor gear KESSLER VG 1800 / 2400 /2550 / 2600 / 3750 W 3750 ZF Passau, STEYR PUCH VG 1200 / 1600 / 2000 / 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

1.2 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
5	Drop box ZF Passau, STEYR PUCH	**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
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** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!	**LWE Id. No.: 10664125** ISO VG 150, DIN 51 519 CLP PG 150, DIN 51 502 Do not mix with mineral 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
7.1	Load powershift gear box ZF torque converter WG 120, WG 150 WG 180, WG 181, WG 200, WG 201	**LWE Id. No.: 8610240** SAE 10W-40 API CF ACEA E2-96, E4-96 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ALLISON C4 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions

1.3 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
7.2	Load powershift gear box ZF torque converter WG 251* ZF ERGOPOWER WG 210, WG 260, WG 310 * also for ambient temperatures above -10 °C	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions
8	Load powershift gear box CLARK	**LWE Id. No.: 8610240** SAE 10W-40 API CF ACEA E2-96, E4-96 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ALLISON C4 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions
9	Drop box ALLISON	**LWE Id. No.: 8610240** SAE 10W-40 API CF ACEA E2-96, E4-96 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ALLISON C4 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions

1.4 Service items and lubricants (continuation)

	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 warm as described in the operating instructions	**LWE Id. No.: 861903708** CASTROL Transynd **Below -20 °C** run warm as described in the operating instructions
10.2	Automatic transmission ZF	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions
11	Automatic gear box ZF AS-Tronic ZF TC-Tronic ZF TC-Tronic 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** pre-heat gearbox as described in the operating instructions
12.1	Torque converter transmission 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** pre-heat gearbox as described in the operating instructions
12.2	Torque converter transmission ZF TC 2	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 14	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 14

1.5 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
13	Gear box ZF ECO-Split	**LWE Id. No.: 861004208** Engine oil or gear oil ZF TE-ML 02	**LWE Id. No.: 10425142** SAE 75W-90 ZF TE-ML 02
14	Rope winch	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!
15	Slewing gear	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!
16	Winch Telescopic boom guying	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!

1.6 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
17.1	Crane hydraulics Crane chassis and crane superstructure	**LWE Id. No.: 861903508** Liebherr Hydraulic 37	**LWE Id. No.: 10467552** Liebherr Hydraulic FFE 30 or **LWE Id. No.: 10293807**
17.2	Crane hydraulics LTC 1055–3.1	**LWE Id. No.: 10467552** Liebherr Hydraulic FFE 30 or **LWE-Identnr.: 10293807** Liebherr Hydraulic Plus Arctic	**LWE Id. No.: 10467552** Liebherr Hydraulic FFE 30 or **LWE-Identnr.: 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.: 10467552** Liebherr Hydraulic FFE 30 or **LWE-Identnr.: 10293807** Liebherr Hydraulic Plus Arctic	**LWE Id. No.: 10467552** Liebherr Hydraulic FFE 30 or **LWE-Identnr.: 10293807** Liebherr Hydraulic Plus Arctic
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

1.7 Service items and lubricants (continuation)

	Usage	**Ambient temperature for driving and crane operation**	
		-25 °C to +50 °C	**-40 °C to +30 °C**
20	King pin bearing Gear shaft if not maintenance-free	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS
21	Slide and roller bearing roller bearing joint	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS
22	Central lubrication system Crane superstructure	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS
23	Boom lock	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS
24	Rotary connection Roller bearing	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS
25	Support pad with equalization	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus

1.8 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
26	Plastic slide bearing Sliding beam	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus
27	Plastic slide bearing Telescopic boom	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus
28	Outer slide bearing Telescopic boom Guide rail on Telescoping cylinder	Special regulations: LIEBHERR **LWE Id. No.: 861303308** Special grease 1336 with Solvent LM (spray grease)	Special regulations: LIEBHERR **LWE Id. No.: 861303308** Special grease 1336 with Solvent LM (spray grease)
29	Inner slide bearing Telescopic boom (only during assembly)	Special regulations: LIEBHERR **LWE Id. No.: 861303308** Special grease 1336 with Solvent LM (spray grease)	Special regulations: LIEBHERR **LWE Id. No.: 861303308** Special grease 1336 with Solvent LM (spray grease)
30	Gear ring rotary connection Slewing gear pinion	**LWE Id. No.: 861301508** Adhesive grease OGPF 2 S-30, DIN 51 502 (water-resistant)	**LWE Id. No.: 861301508** Adhesive grease OGPF 2 S-30, DIN 51 502 (water-resistant)

1.9 Service items and lubricants (continuation)

	Usage	**Ambient temperature for driving and crane operation**	
		-25 °C to +50 °C	**-40 °C to +30 °C**
31	Running rope	**LWE Id. No.: 861301508** Adhesive grease OGPF 2 S-30, DIN 51 502 (water-resistant)	**LWE Id. No.: 861301508** Adhesive grease OGPF 2 S-30, DIN 51 502 (water-resistant)
32	Radiator fluid Diesel engine and heating system	Special regulations: LIEBHERR **LWE Id. No.: 861600508** 50 % antifreeze fluid with corrosion inhibitor 50 % water	Special regulations: LIEBHERR **LWE Id. No.: 861600508** 50 % antifreeze fluid with corrosion inhibitor 50 % water
33.1	Drive transmission crawler crane	see nameplate	see nameplate
33.2	Drive transmission crawler crane LTR 1100	**LWE Id. No.: 861901008** SAE 90 API GL 5	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5
34	Towing winch	see nameplate	see nameplate
35	Towing winch rope	Special regulations: **LWE Id. No.: 861008608** Motorex TW-Fluid	Special regulations: **LWE Id. No.: 861008608** Motorex TW-Fluid

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1 Procedure to follow in case of a problem

This chapter answers the following questions:
- What to do in case of a problem?
- Which data is important for communication with Liebherr Service?
- Which displays and component groups are relevant for error diagnostics?
- Which measures are to be taken in clear problem cases?
- How to proceed in case of error messages of the LICCON computer system?
- How can an error diagnostics be carried out?
- Which measures are to be taken for defective components?

DANGER
Incorrect operation!
Incorrect operation of the crane can result in death or serious injuries!
▶ The crane may only be operated by authorized and trained expert personnel!

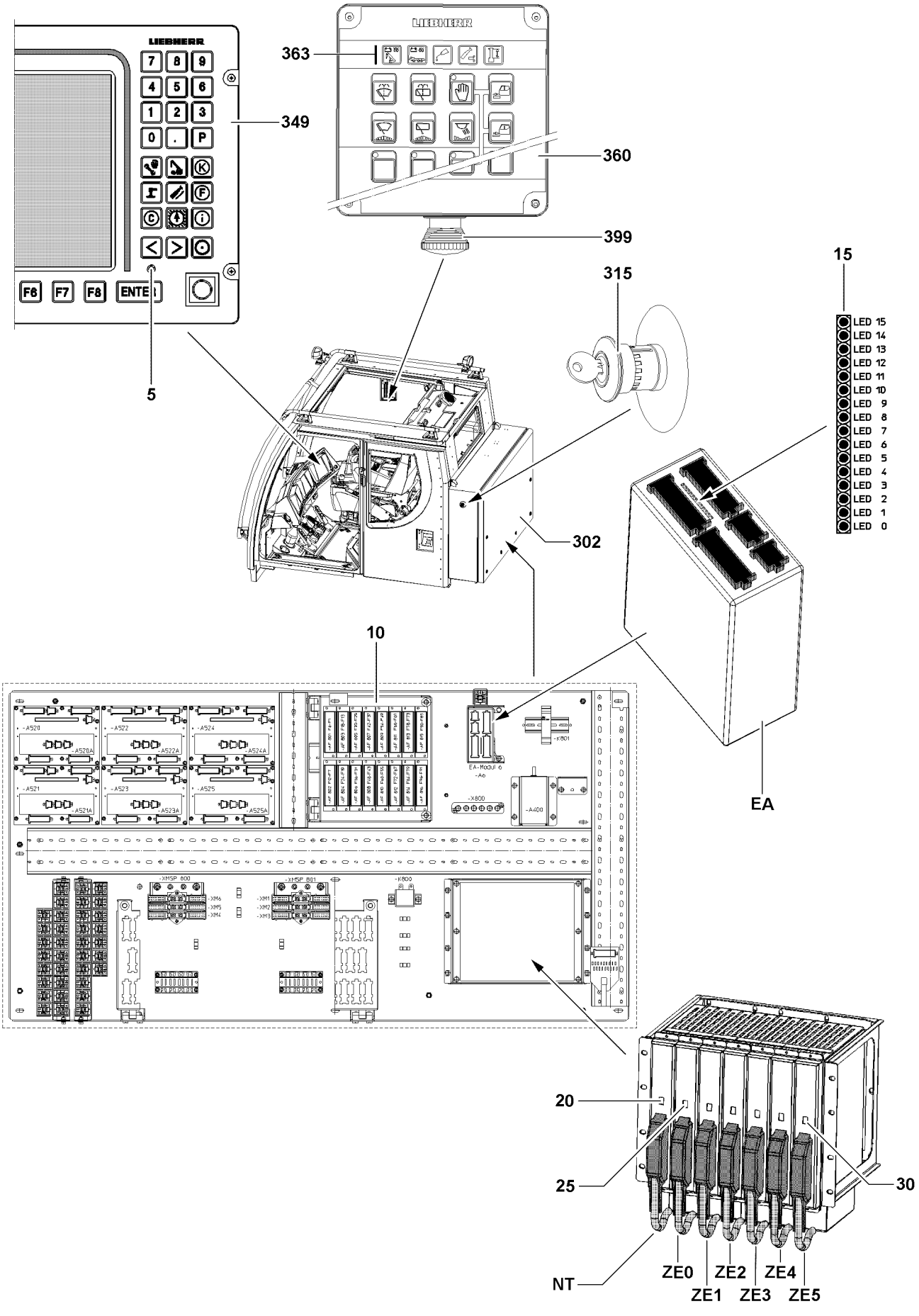
WARNING
Measures without the help of Liebherr Service!
Measures in case of a problem, which are carried out without consulting Liebherr Service can cause damage to the crane. Personnel can be severely injured or killed!
▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.

Note
Error diagnostics without the help of Liebherr Service!
▶ For information regarding error diagnostics and error remedy, see “Diagnostics manual”.

Note
▶ The monitor illustrations in this section are only examples. The error codes shown in the monitor illustrations and the corresponding error descriptions might not exactly match the crane.

1.1 Procedure to follow in case of a problem

▶ Observe and adhere to the notes and instructions in this chapter.
▶ Before contacting Liebherr Service: Determine relevant data about the problem.
▶ Carry out the error diagnostics with the aid of Liebherr Service or the “Diagnostics manual”.
▶ Follow the instructions given by Liebherr Service.
▶ After error diagnostics: Replace defective components, which are supplied as spare parts.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
F6 F7 F8 ENTER
363
349
360
399
315
15
LED 15
LED 14
LED 13
LED 12
LED 11
LED 10
LED 9
LED 8
LED 7
LED 6
LED 5
LED 4
LED 3
LED 2
LED 1
LED 0
5
302
10
EA
20
25
30
NT
ZE0
ZE1
ZE2
ZE3
ZE4
ZE5

B106378

1.2 Overview of displays and component groups for error diagnostics

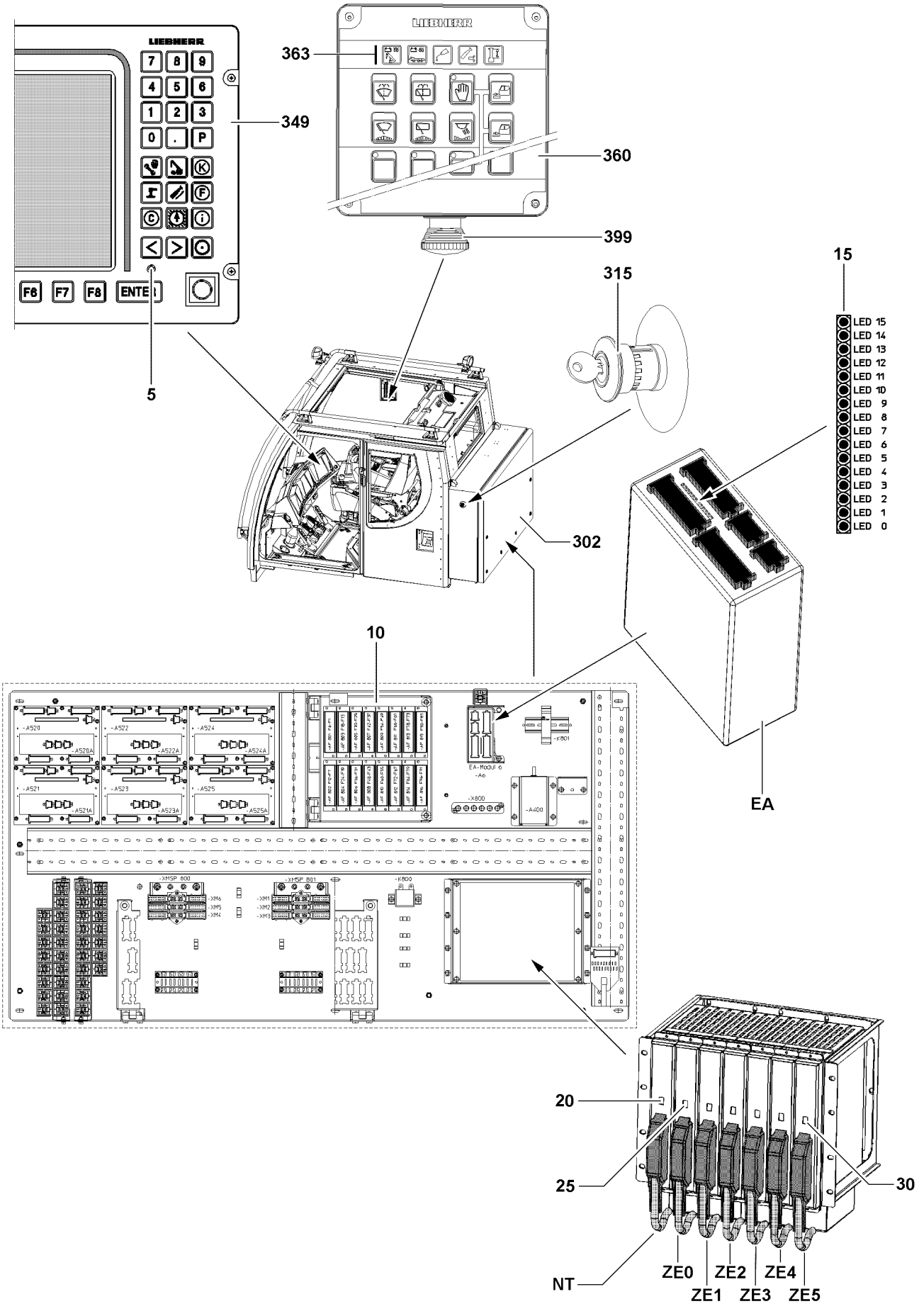
Various displays and component groups allow the crane operator:
- To localize error messages.
- To communicate quicker and more precise with Liebherr Service.
- With the aid of the “Diagnostics manual”: diagnose and remedy errors.

Note
Error diagnostics without the help of Liebherr Service!
▶ For information regarding error diagnostics and error remedy, see “Diagnostics manual”.

349	LICCON Monitor 0	
5	LED monitor 0	
360	Operating and control unit (BKE)	
302	Switch box	
399	EMERGENCY OFF switch in the cab	
315	EMERGENCY OFF switch on the switch box	
10	Fuses	
EA	I / O module	
15	LED display I / O module	
NT	Power supply	
20	LED display power supply	
ZE	CPUs	• CPU 0 **ZE0** to CPU 5 **ZE5**
	LED displays CPU	• LED display CPU0 **25** to LED display CPU5 **30**

1.3 Which data is required by Liebherr Service?

If the assistance of Liebherr Service is required, always provide the following information:
- Crane type
- Crane number
- Complete error code and any error message displayed on the LICCON monitor 0 **349**
- For certain errors: LED displays of power supply **NT** and CPUs **ZE**
- Application conditions of crane
- Action during which the error occurs
- Frequency of error


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
F6 F7 F8 ENTER
363
349
360
399
315
15
LED 15
LED 14
LED 13
LED 12
LED 11
LED 10
LED 9
LED 8
LED 7
LED 6
LED 5
LED 4
LED 3
LED 2
LED 1
LED 0
5
302
10
EA
20
25
30
NT
ZE0
ZE1
ZE2
ZE3
ZE4
ZE5

B106378

2 Measures in clear problem cases

Measures, which are taken in clear problem cases, are described in this section.

Note
- ▶ If a problem occurs, which is not described in this chapter:
- ▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

Clear problem cases are:
- – Engine does not start.
- – Hydraulic, electric or engine failed.
- – An alarm function occurs.
- – LICCON computer system shows an error message.

2.1 The engine does not start?

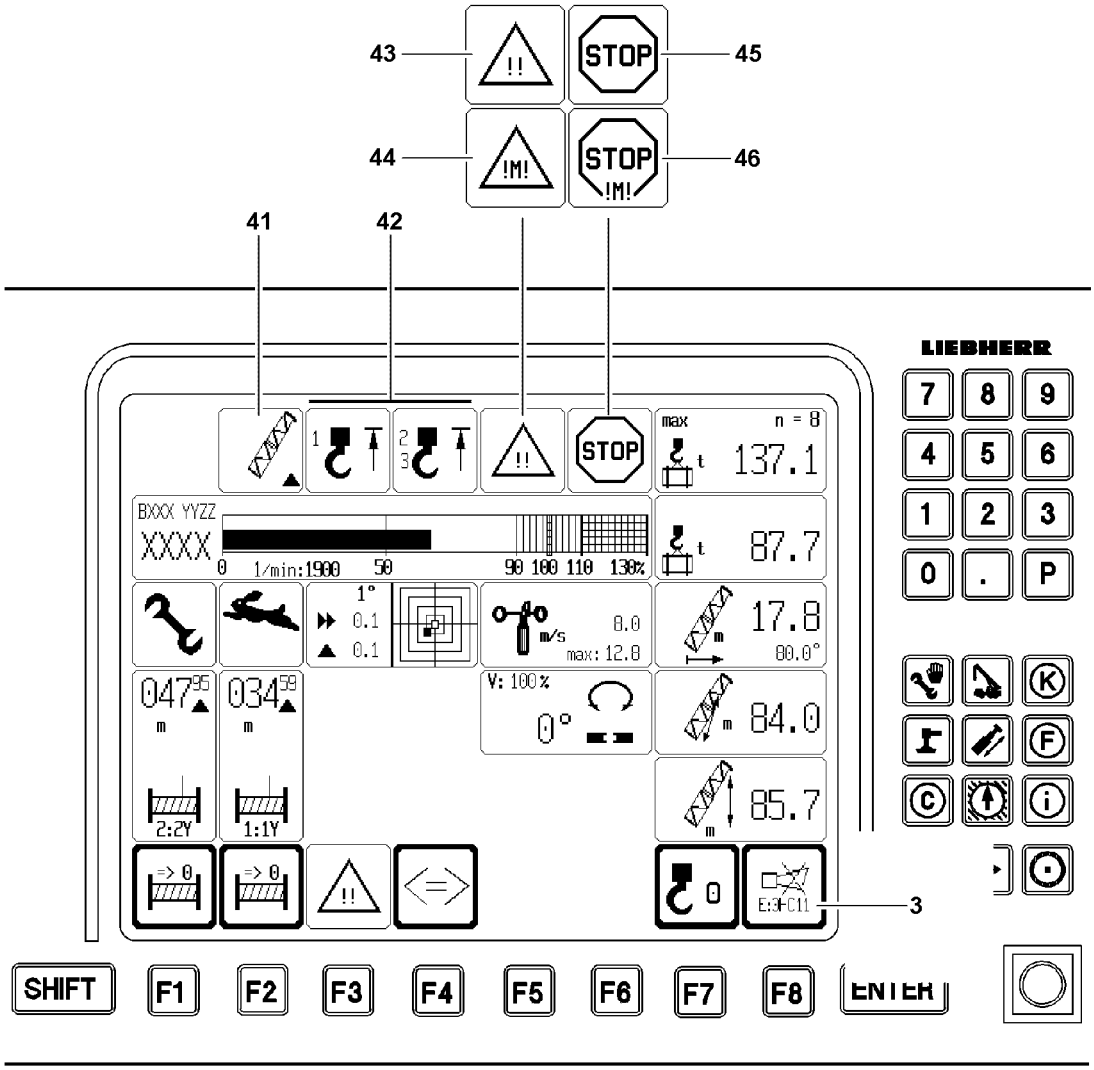
- ▶ Make sure that the EMERGENCY OFF switch **399** on the BKE and the EMERGENCY OFF switch **315** on the switch box are not actuated.
- ▶ Make sure that the crane operator is seated on the crane operator's seat.
- ▶ Turn the ignition off.
- ▶ Start the engine again.
- ▶ If the engine still cannot be started:
  Watch the indicator lights **363** on the BKE **360**.

Note
- ▶ For Problem remedy, see chapter 4.03, section “Starting the engine and turning it off”.

- ▶ If the error cannot be remedied:
  Contact Liebherr Service to determine the cause of the problem and further procedure.

2.2 Have the hydraulic, electric or engine failed?

Note
- ▶ Is the equipment for hydraulic emergency control part of the scope of delivery, the crane can be taken down when the crane hydraulic, crane electric and crane engine failed.
- ▶ For emergency control, see chapter 6.05.


43
45
44
46
41
42
STOP
!M!
LIEBHERR
max
n = 8
137.1
87.7
17.8
84.0
85.7
3
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B106382

2.3 Did an alarm function occur?

Note

- ▶ For a detailed description of alarm functions, see chapter 4.02.
- ▶ In case of an alarm function, an error message **3** with LICCON error code appears at the same time.

The following alarm functions are indicated by blinking icons on the LICCON monitor 0:

– Boom limitation **41**
– Hoist top limit switch **42**
– Advanced warning load **43** / Advanced warning engine **44**
– Stop load **45** / Stop engine **46**

The limit ranges of the crane movements are monitored by:

– Hoist limit switch
– Angle sensors
– Pressure sensors
– Pull test brackets (force measuring boxes)
– Wind sensor
– Inductive sensors

If the limit ranges for these sensors are exceeded, the crane movements are turned off (LMB-STOP). The load moment limiter (LMB) is a program of the LICCON computer system to monitor the permissible load moment. If the permissible load moments of the load chart are exceeded, the LMB-STOP turns the crane movements off.

Note

- ▶ In case of certain shut offs, you can only continue to work by bypassing the safety devices.

WARNING

Risk of accident!

Personnel can be severely injured or killed!

- ▶ All instructions and data in chapter 4.04 must be observed and adhered to!

DANGER

Bypassing the overload protection!

If the overload protection is bypassed, there is no further protection against crane overload!

In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

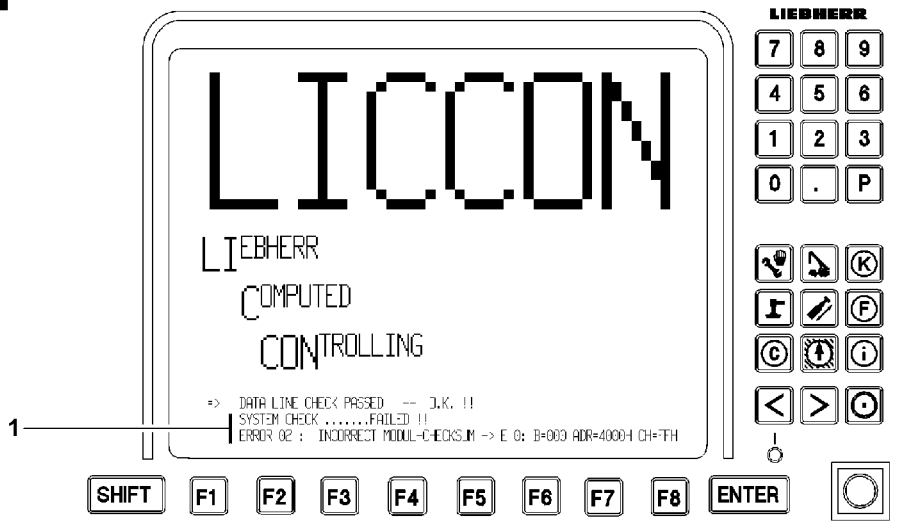
Personnel can be severely injured or killed!

This could result in high property damage!

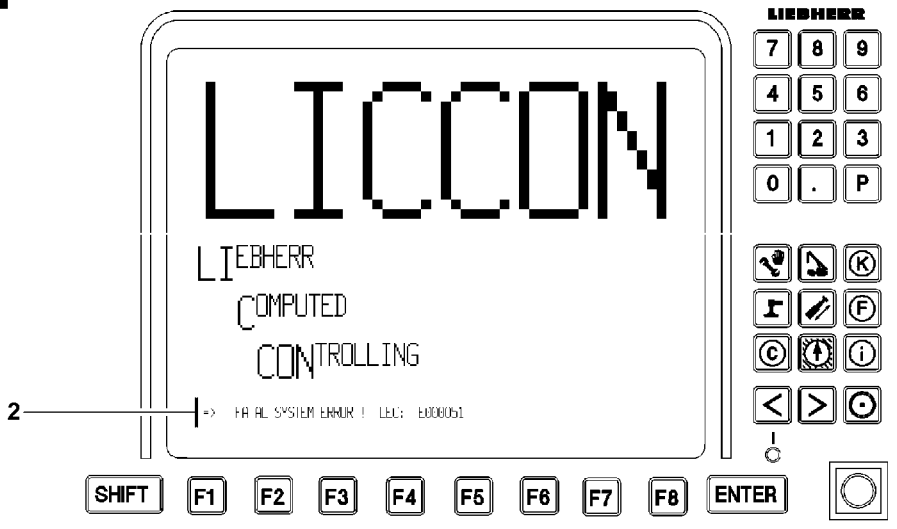
- ▶ It is only permitted to bypass the overload protection during assembly or in emergencies!
- ▶ The bypass may only be carried out by persons who are aware of the effects of their acts regarding the bypass of the overload protection!
- ▶ Bypassing the overload protection requires the presence of the crane supervisor and must be performed with utmost caution!
- ▶ Crane operation with bypassed overload protection is prohibited!
- ▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

- ▶ If a LMB-STOP occurs due to boom limitation:
  Carry out load moment reducing crane movements.

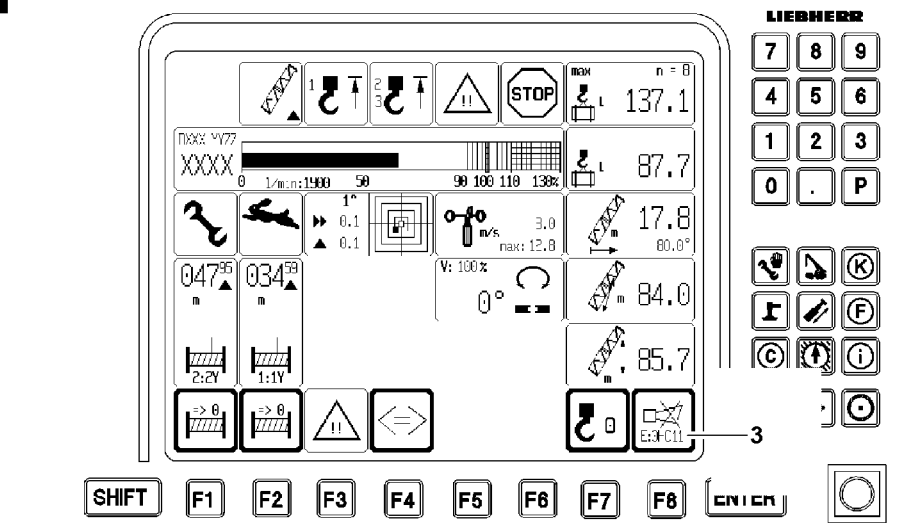
1


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK .....FAILED !!
ERROR 02 : INCORRECT MODUL-CHECKSUM -> E 0: B=000 ADR=40004 CH=TH
1
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

2


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> FATAL SYSTEM ERROR ! LEC: E000061
2
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

3


LIEBHERR
STOP
137.1
87.7
17.8
84.0
85.7
XXXX
3
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8

B106380

2.4 LICCON computer system shows an error message?

DANGER
Risk of accident!
Personnel can be severely injured or killed!
The crane can be severely damaged or destroyed!
▶ All instructions and data in chapter 4.04 must be observed and adhered to!

Examples of error messages:
– While the LICCON computer system starts up, see error display fig. **1**, example **1**.
– During operation, see error display fig. **2**, example **2**.
– During operation, see operating screen fig. **3**, example **3**.

Differentiation of error messages on the LICCON monitor:
– Error without LICCON Error Code (LEC), see example **1**.
– Error with LICCON Error Code (LEC), see example **2** and example **3**.

Differentiation of errors in crane operation:
– Errors which lead to shut down: the shut down icon is shown.
– Errors which do not lead to shut down: the crane operator is warned.

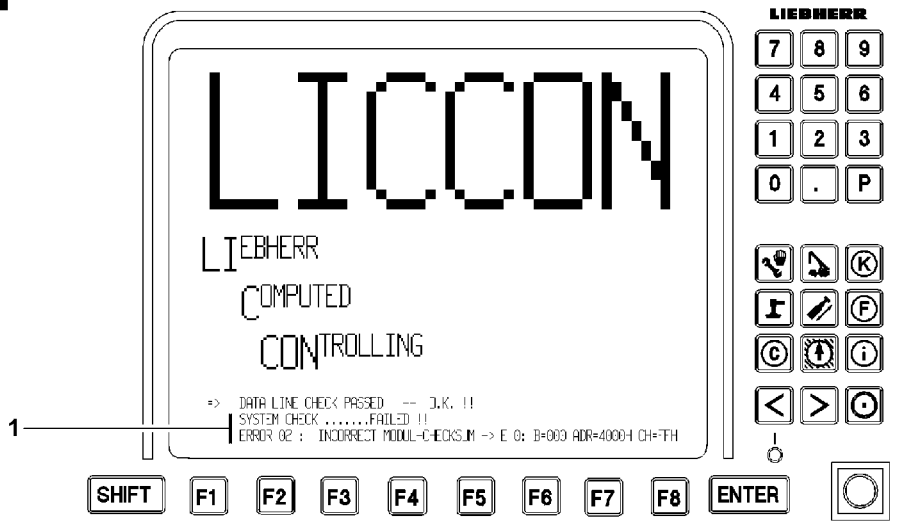
2.4.1 Remedy temporary errors during system start

Note
▶ While the LICCON computer system starts, temporary errors can occur, see fig. **1**.

Errors, which occur temporarily, can have the following causes:
– Loosen contact.
– Fluctuations in the power supply.
– Error message can be a subsequent error.

▶ Turn the LICCON computer system off and restart it after waiting for at least 5 s.
▶ Repeat this procedure up to three times (wait 2 min after 3 start attempts).
▶ If the same error view appears several times:
Turn the LICCON computer system off.
▶ Call up the test system, see section “Calling up the test system program”.
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

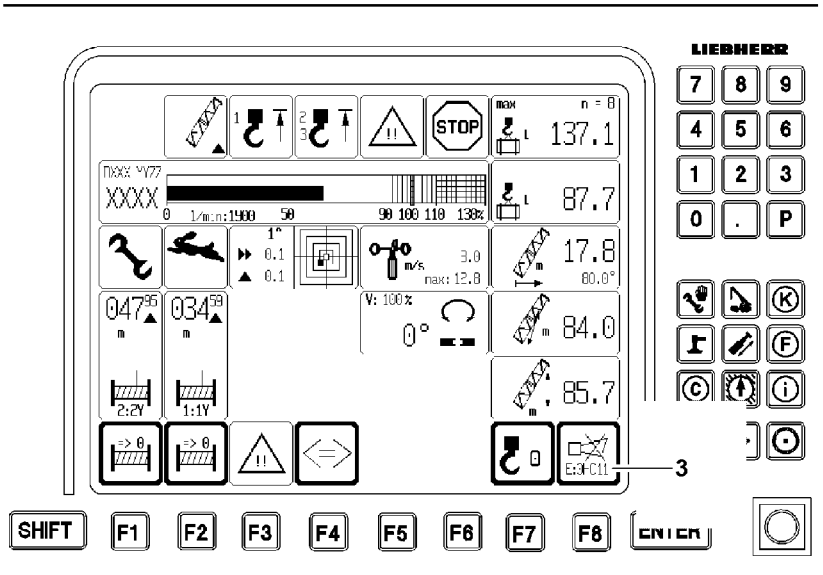
1


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK .....FAILED !!
ERROR 02 : INCORRECT MODUL-CHECKSUM -> E 0: B=000 ADR=40004 CH=TH
1
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

2


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> FATAL SYSTEM ERROR ! LEC: E000061
2
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

3


LIEBHERR
STOP
137.1
87.7
17.8
84.0
85.7
3
SHIFT F1 F2 F3 F4 F5 F6 F7 F8

B106380

2.4.2 Procedure in case of error messages with LEC

Two different types of errors are differentiated with the LEC:

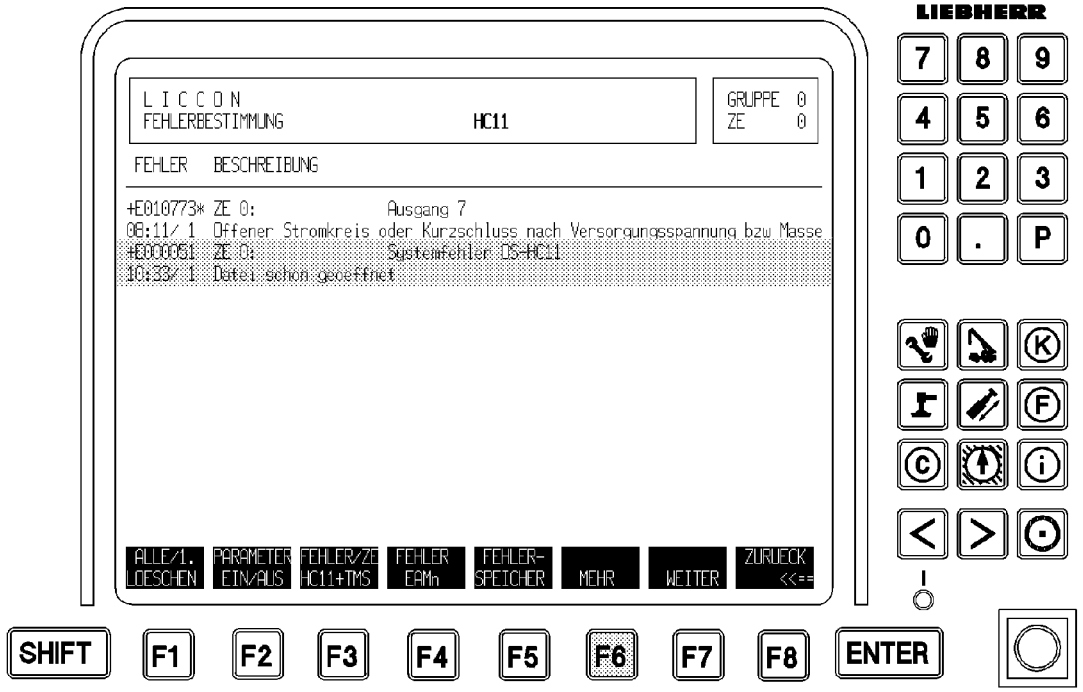
– Operating errors - Error code starts with a “B”.
– System errors / application errors - Error code starts with an “E”.

A LEC is always 6-digit.

Example of an error code: E:OHC11	
Element	**Description**
E:	Error class
0	CPU
HC11	I / O module and number, or processor of CPU

▶ If an error code starts with a “B”:
Correct the operating error.
▶ If an error code starts with an “E”:
Call up the test system, see section “Calling up the test system program”.
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

4


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG
HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E000081 ZE 0: Systemfehler DS-HC11
10:33/ 1 Datei schon geoeffnet
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
MEHR
WEITER
ZURUECK <<==
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B106381

2.4.3 Calling up the “Test system” program

Error messages of the LICCON computer systems with LEC are described in the error determination screen, fig. **4**. To do so, change into the test system program.
Listed errors in the error determination screen are differentiated by:
– Active errors - Error code starts with a “+”.
– Inactive errors - Error code starts with a “-”.

Note
▶ Active errors have higher priority than inactive errors and must be taken care of.

Calling up the “Test system” from the operating screen

Make sure that the following prerequisites are met:
– Error message visible in the symbol element “Horn”, see fig. **3**.
– Warning signal “Horn” is audible.

▶ Press function key **F8** once.

Result:
– Horn is turned off.

▶ Press function key **F8** twice.

Result:
– Change into the error determination screen.
– Listing of errors with LEC and error text.

Calling up the “Test system” after an error screen

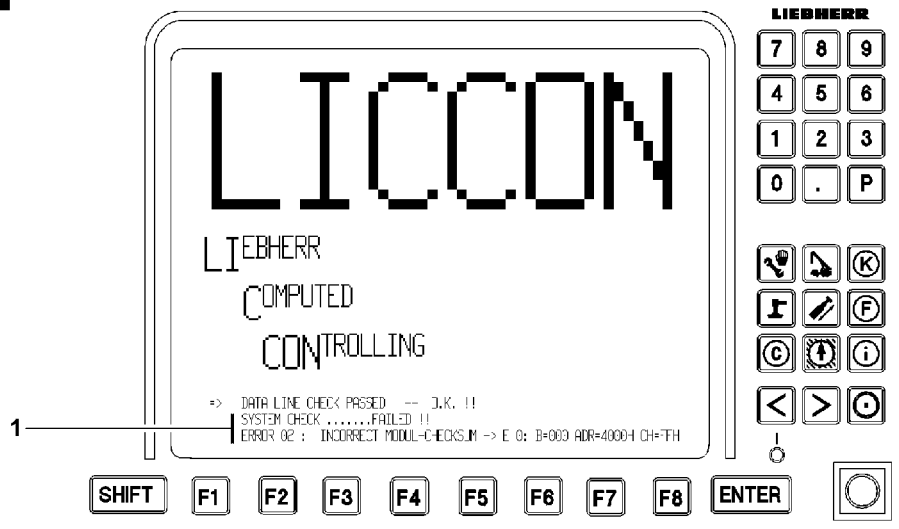
Make sure that the following prerequisites are met:
– The operating screen changes into the error screen (system error), see fig. **2**.
– Crane functions are interrupted.

or:
– Error screen, while the LICCON computer system starts up, see fig. **3**.

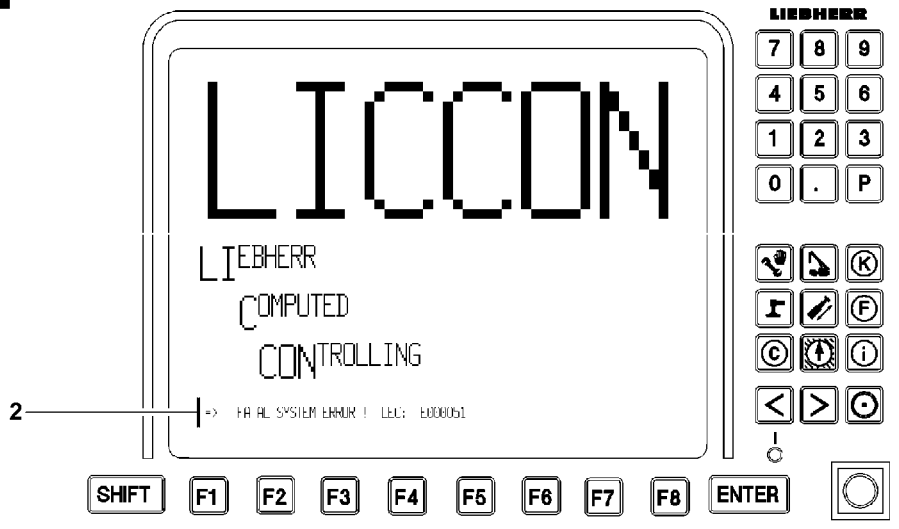
▶ Turn the LICCON computer system off.
▶ Turn the LICCON computer system back on after approx. 5 s.

Result:
– Change into the error determination screen.
– Listing of errors with LEC and error text.

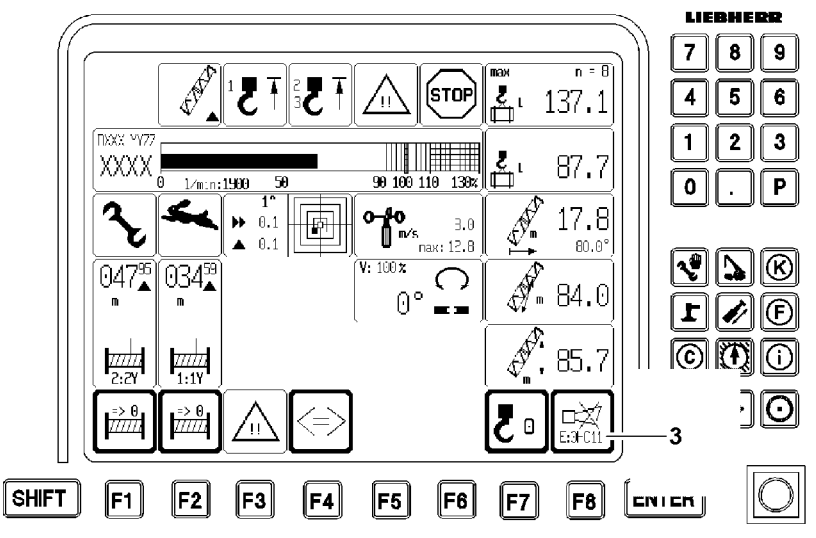
1


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK .....FAILED !!
ERROR 02 : INCORRECT MODUL-CHECKSUM -> E 0: B=000 ADR=40004 CH=TH
1
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

2


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> FATAL SYSTEM ERROR ! LEC: E000061
2
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

3


LIEBHERR
STOP
137.1
87.7
17.8
84.0
85.7
XXXX
047
034
3
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8

B106380

3 Carrying out an error diagnostics

Several possibilities exist for an error diagnostics:
– With the help of Liebherr Service.
– With the help of Liebherr Service via remote diagnostics.
– Without the help of Liebherr Service.

3.1 Error diagnostics with the help of Liebherr Service

3.1.1 Error diagnostics by phone

▶ Contact Liebherr Service to determine the cause of the problem and further procedure.
▶ Follow the instructions given by Liebherr Service.

3.1.2 Remote diagnostics

The remote diagnostics makes it possible for Liebherr Service to check Liebherr cranes from a remote location in case of problems.

Activation of the remote diagnostics device is first carried out by Liebherr Service.
Make sure that the following prerequisites are met:
– The crane operator has a valid SIM-card (telephone card for mobile telephones) from a current mobile network operator.
– The telephone number of the data service is known.
– The PIN code request of the SIM-card is deactivated.
– The SIM-card is built into the GSM module.
– For information for remote diagnostics, see “Diagnostics manual”.
– Follow the instructions given by Liebherr Service.

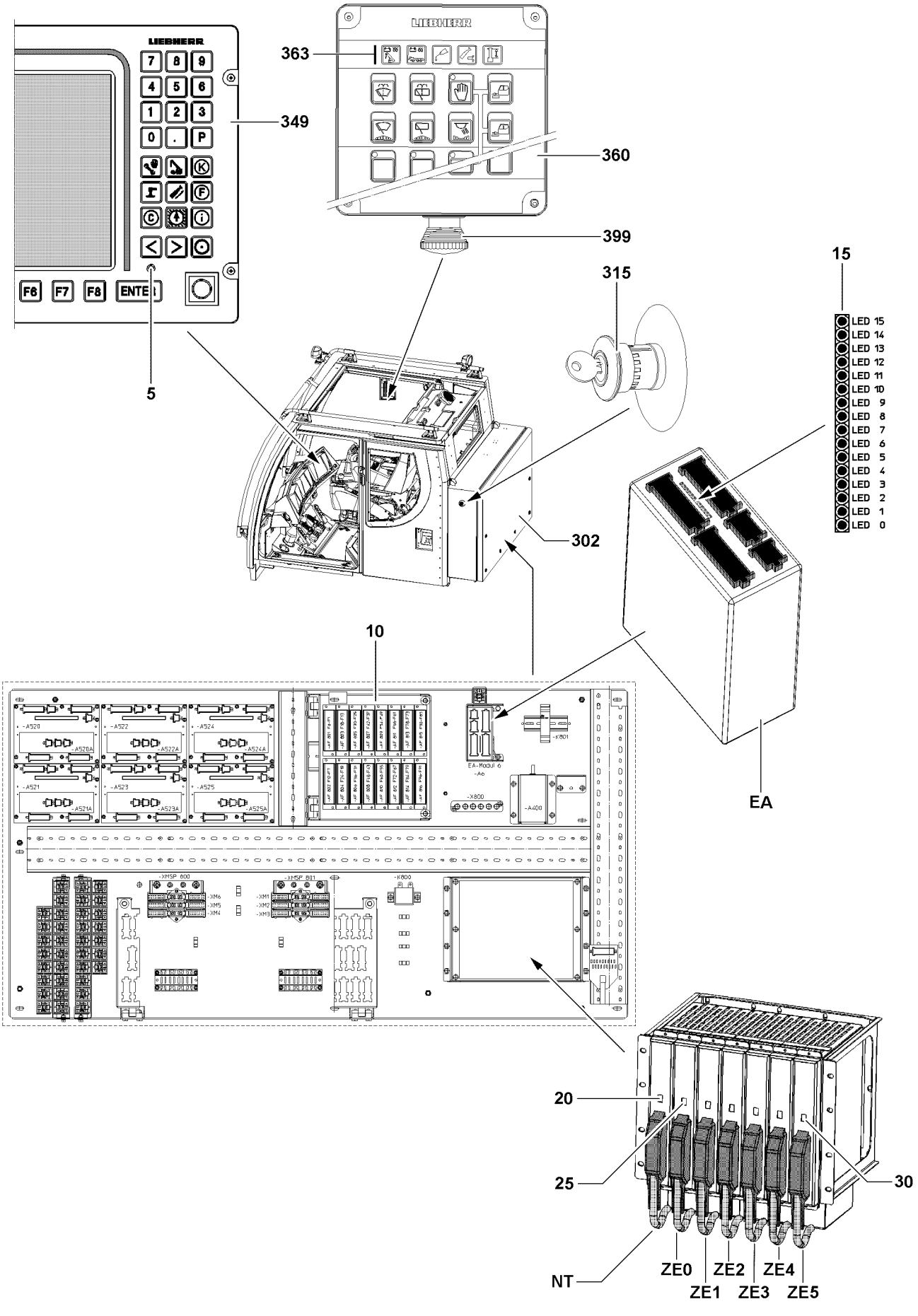
Note
▶ For information for remote diagnostics, see “Diagnostics manual”.

▶ Follow the instructions given by Liebherr Service.

3.2 Error diagnostics without the help of Liebherr Service

WARNING
Measures without the help of Liebherr Service!
Measures in case of a problem, which are carried out without consulting Liebherr Service can cause damage to the crane. Personnel can be severely injured or killed!
▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.

Note
Error diagnostics without the help of Liebherr Service!
▶ For information regarding error diagnostics and error remedy, see “Diagnostics manual”.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
F6 F7 F8 ENTER
5
363
349
360
399
315
15
LED 15
LED 14
LED 13
LED 12
LED 11
LED 10
LED 9
LED 8
LED 7
LED 6
LED 5
LED 4
LED 3
LED 2
LED 1
LED 0
302
10
EA
20
25
30
NT
ZE0
ZE1
ZE2
ZE3
ZE4
ZE5

B106378

4 Measures for defective components

The following components are part of the scope of delivery as spare parts:
– LICCON monitor **349**
– Power supply **NT**
– CPU **ZE**

DANGER
Danger to life if original attachment parts are **not** used!
If the crane is operated with attachment parts, which are **not** original, then the crane can fail and cause fatal accidents!
Crane components can be damaged!
▶ Operate the crane only with original attachment parts!
▶ Crane operation with attachment parts, which do **not** belong to the crane is prohibited!

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

Note
▶ For instructions describing the replacement of a defective LICCON monitor **349**, a defective power supply **NT** or a defective CPU **ZE**, see “Diagnostics” manual.

Make sure that the following prerequisites are met:
– Error diagnostics has been carried out.
– Defective component has been determined.

4.1 Is the LICCON monitor defective?

▶ Replace the LICCON monitor **349** with a functioning substitute monitor.

4.2 Is the power supply defective?

▶ Replace the power supply **NT** with a functioning power supply.

4.3 Is the CPU defective?

▶ Replace the CPU **ZE** with a functioning spare CPU.

4.4 Is the electrical connection of a cable drum interrupted?

WARNING
Interrupted electrical connection!
If the electrical connection of a cable drum is interrupted, then this causes a shut off (LMB STOP). No further crane movements are possible.
▶ Contact Liebherr Service to determine further procedure.

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4.5 Is a sensor or limit switch defective?

Certain crane functions are monitored with two sets of sensors and limit switches.

Note

- For double version: If only one of the two limit switches or sensor defective, then work can continue with the crane.

- Replace the defective limit switch or sensor.

Note

- For single version: If a limit switch or sensor is defective, then this causes a shut off (LMB STOP).
- For double version: If both limit switches or sensors are defective, then this causes a shut off (LMB STOP).

DANGER

Bypassing the overload protection!

If the overload protection is bypassed, there is no further protection against crane overload!

In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

This could result in high property damage!

- It is only permitted to bypass the overload protection during assembly or in emergencies!
- The bypass may only be carried out by persons who are aware of the effects of their acts regarding the bypass of the overload protection!
- Bypassing the overload protection requires the presence of the crane supervisor and must be performed with utmost caution!
- Missing values must be monitored manually and must match the load chart.
- Crane operation with bypassed overload protection is prohibited!
- Contact Liebherr Service to determine the cause of the problem and further procedure.
- All instructions and data in chapter 4.04 must be observed and adhered to!

- Contact Liebherr Service to determine further procedure.

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 latest 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 such cases, the operator must have the crane inspected 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. He is adequately familiar with the relevant national work safety regulations, accident prevention regulations, and standards that he is able to evaluate the operational safety of the equipment (for example cranes). Responsible employees from specialist workshops and customer service engineers may be considered as experts.

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. He is adequately familiar with the relevant national work safety regulations, accident prevention regulations, and standards that he is able to evaluate the operational safety of the equipment (for example cranes). He is to test the technical equipment and is able to certify the equipment as safe. 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, wherein 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 inspectors must be documented, remedied, 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!

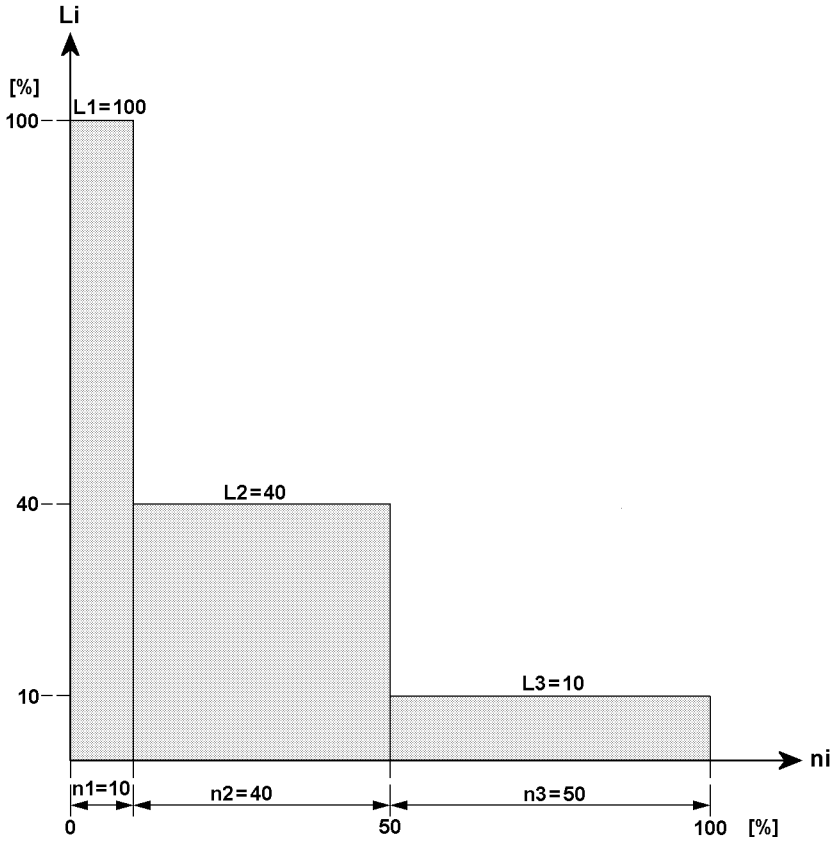
- Adhere to the following inspection guidelines and intervals.

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 constructions must be checked by an expert or an authorized inspector at least once a year!
- Shorten the inspection intervals if the crane is subjected to above-average duty cycles, for example when handling large material quantities or frequently erecting long boom systems.
- If 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, primered 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 assembly operation and can only perform a limited number of stress cycles. They are designed for special movement characteristics. For example: Continuous deployment of drive forces, occasional operation and load conditions according to DIN 15018:1984 Part 3 or EN 13000:2004.
Example of a duty cycle according to the grouping for Liebherr mobile and crawler cranes:



Li: Load proportion in relation to maximum load [in %]
ni: Load cycles in relation to maximum number [in %]

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!

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 sketches 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 **Liebherr-Werk Ehingen GmbH** (hereinafter called LWE), **Customer Service Department**.
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 the following persons or companies:
  - **LWE** personnel, or third-party personnel contracted by **LWE**, with appropriate qualifications according to EN 287-1 for the subject material (3.2) and welding method.
  - Companies whose suitability is verified according to DIN18800, Part 7, DIN 15018, and DIN 4132 with an endorsement for cranes, crane runways and the following high and ultra-high-tensile fine-grained construction steel:
    Metal sheeting S690QL1 W.No.1.8988
    Metal sheeting S690QL W.No.1.8928
    Metal sheeting S700MC W.No.1.8974
    Metal sheeting S960QL W.No.1.8933
    Metal sheeting S960MC W.No.–
    Metal sheeting S1100QL W.No.1.8942
    S770QL W.No.1.8938 pipe
    S890QL1 W.No.1.8925 pipe
    Experience in repairing mobile and crawler cranes using the appropriate materials and application of welding methods in accordance with MAGM (135), especially manual arc welding E (111), are absolutely essential.
– Repair instructions that identify the basic material, along with the required welding accessories and supplementary materials, must be requested from **LWE** before starting the repair. The required non-destructive tests must be carried out and documented.
– 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 shall be obtained from **LWE**, Customer Service!
  Successful test results shall 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 serious personnel injury and equipment damage!
▶ Comply absolutely with all recommendations, particularly welding specifications!

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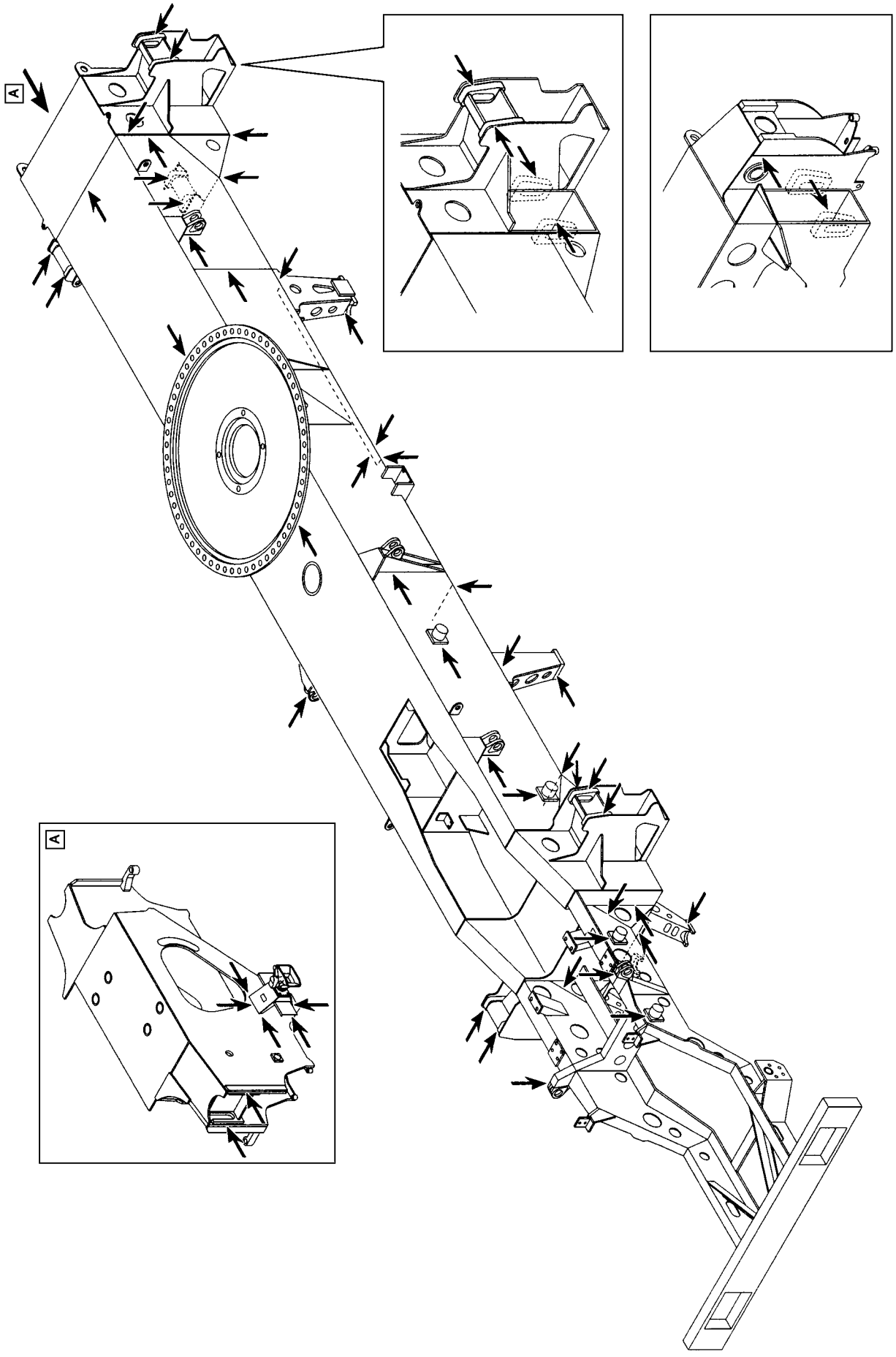
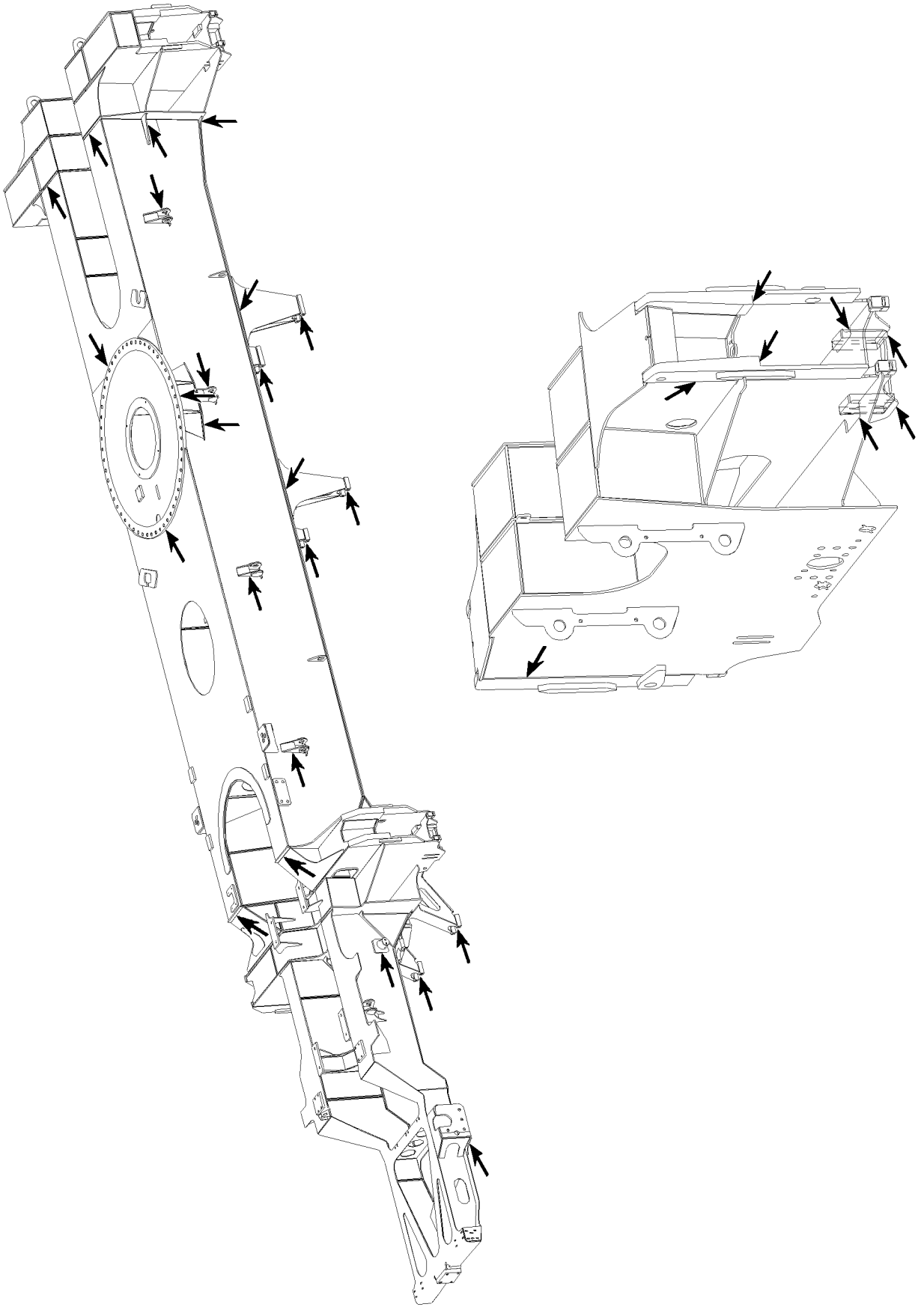


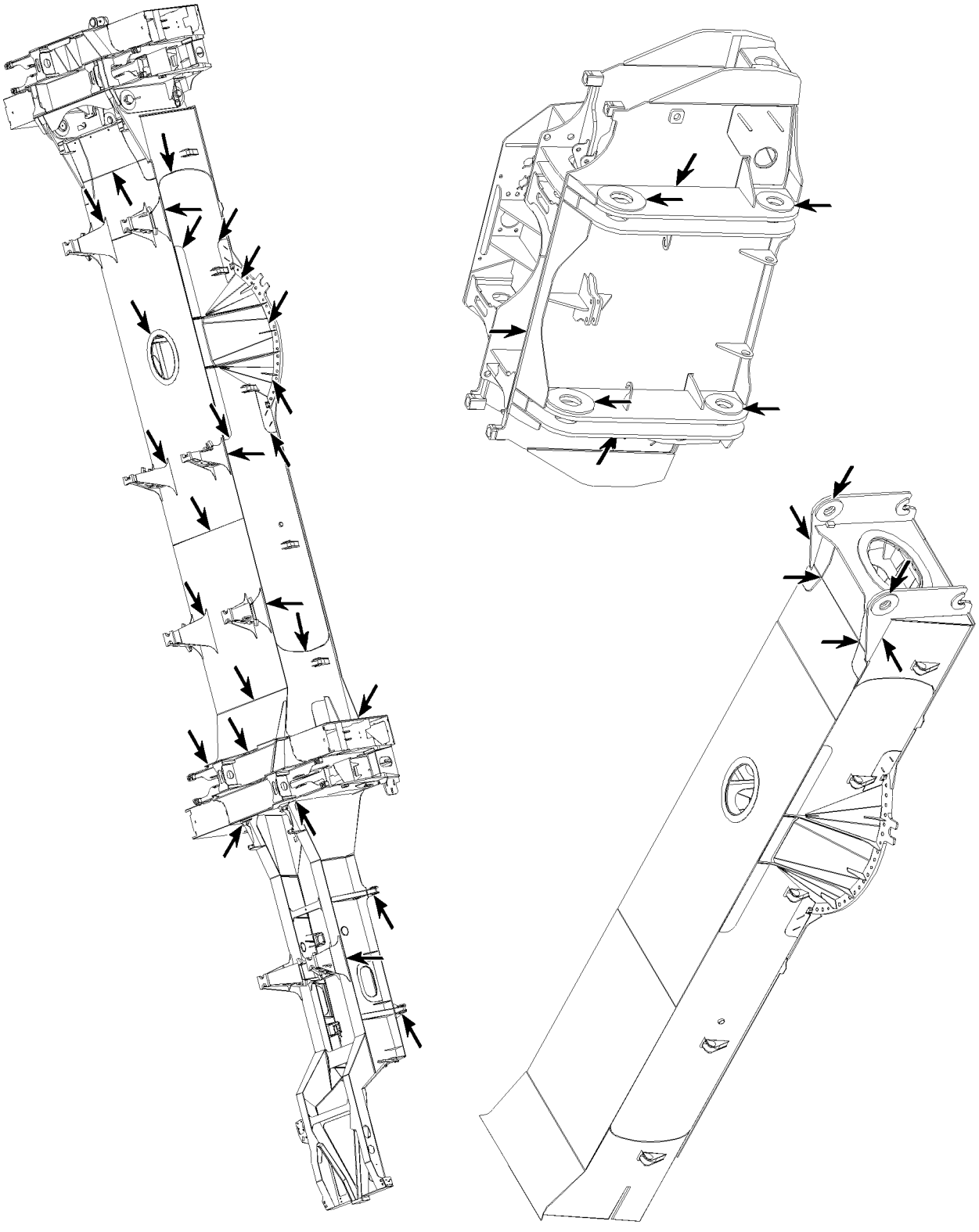
B185046

Example for vehicle frame



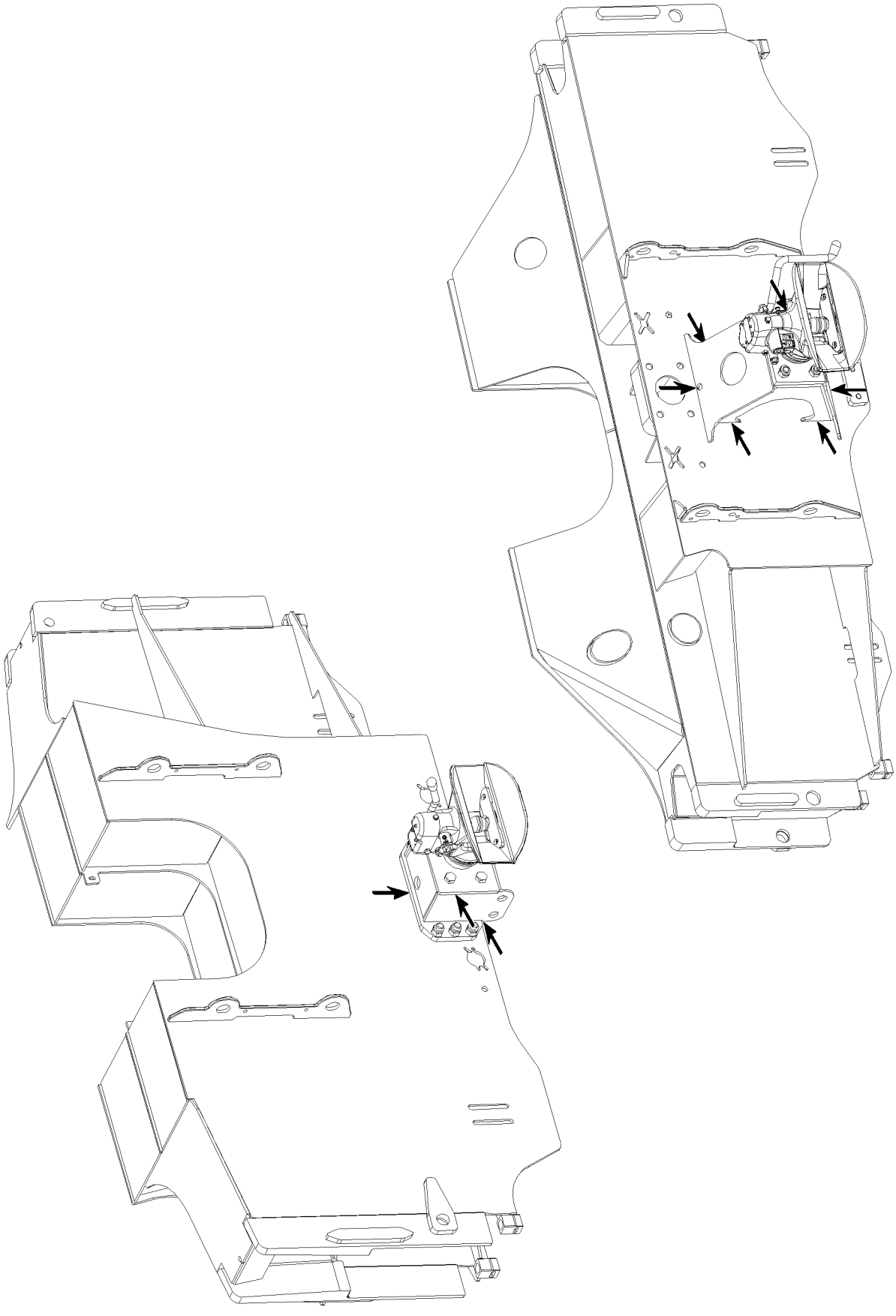
B105702

Example for vehicle frame



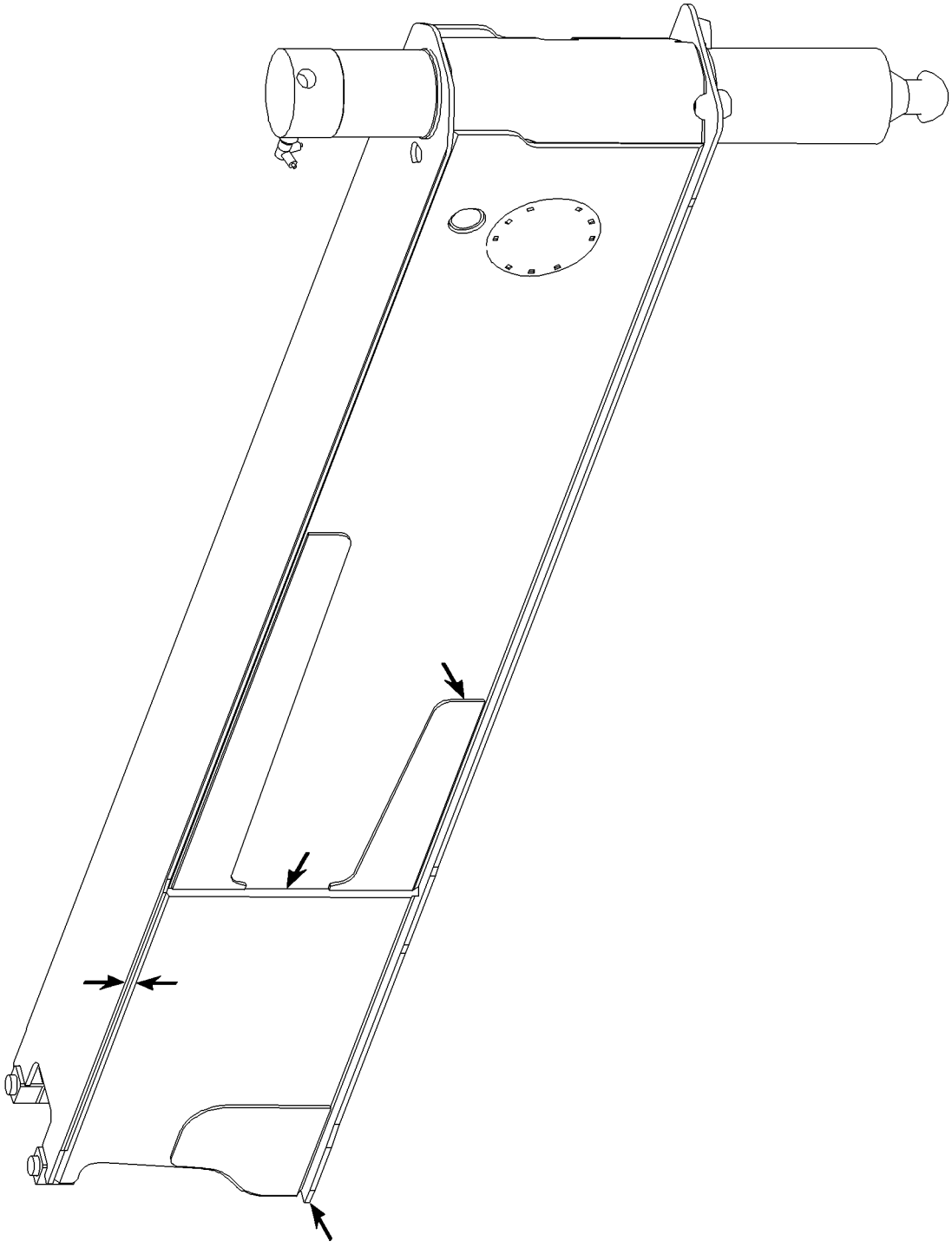
B105719

Example for vehicle frame

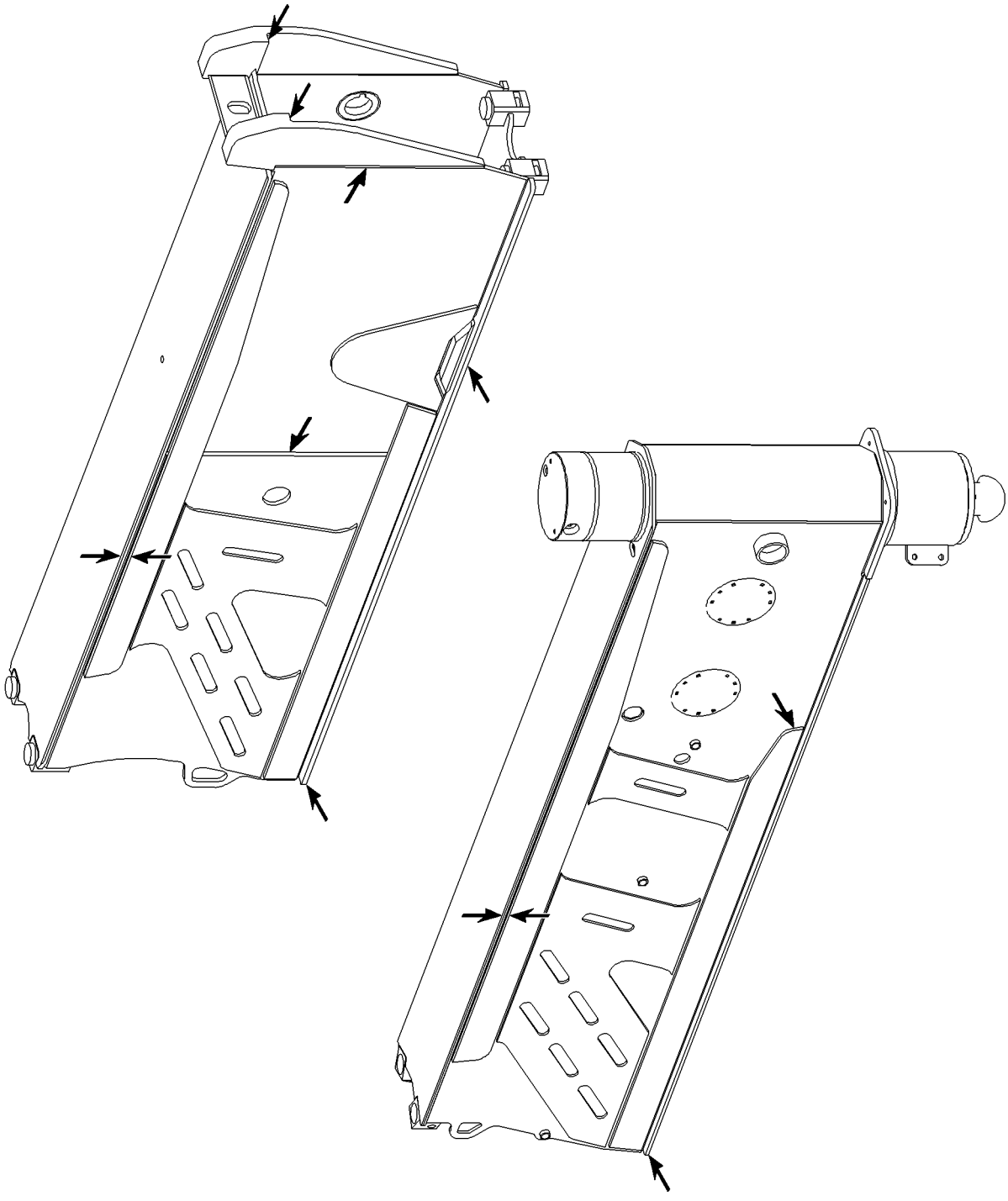


B105687

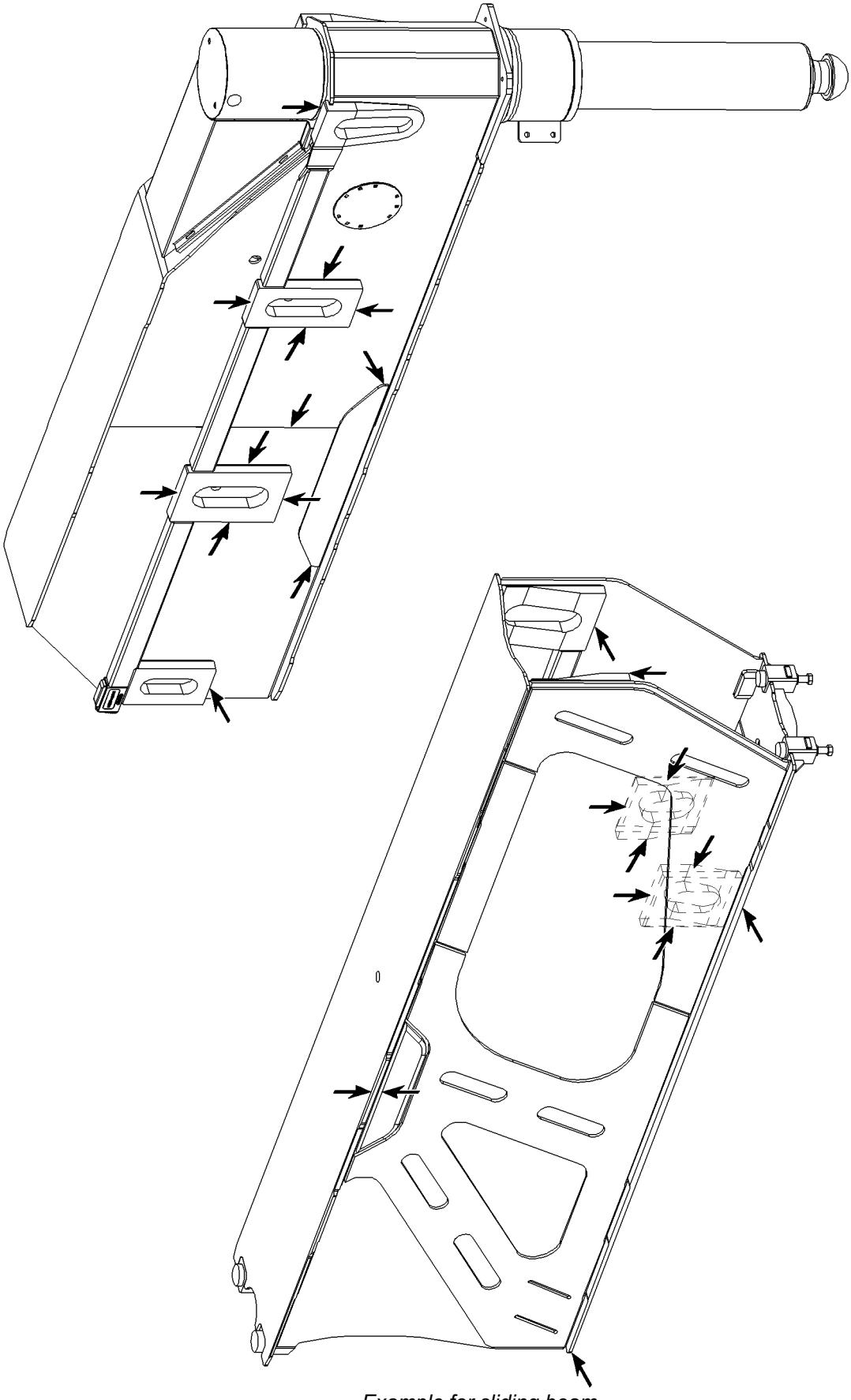
Example for tow coupling



B105698 *Example for sliding beam*

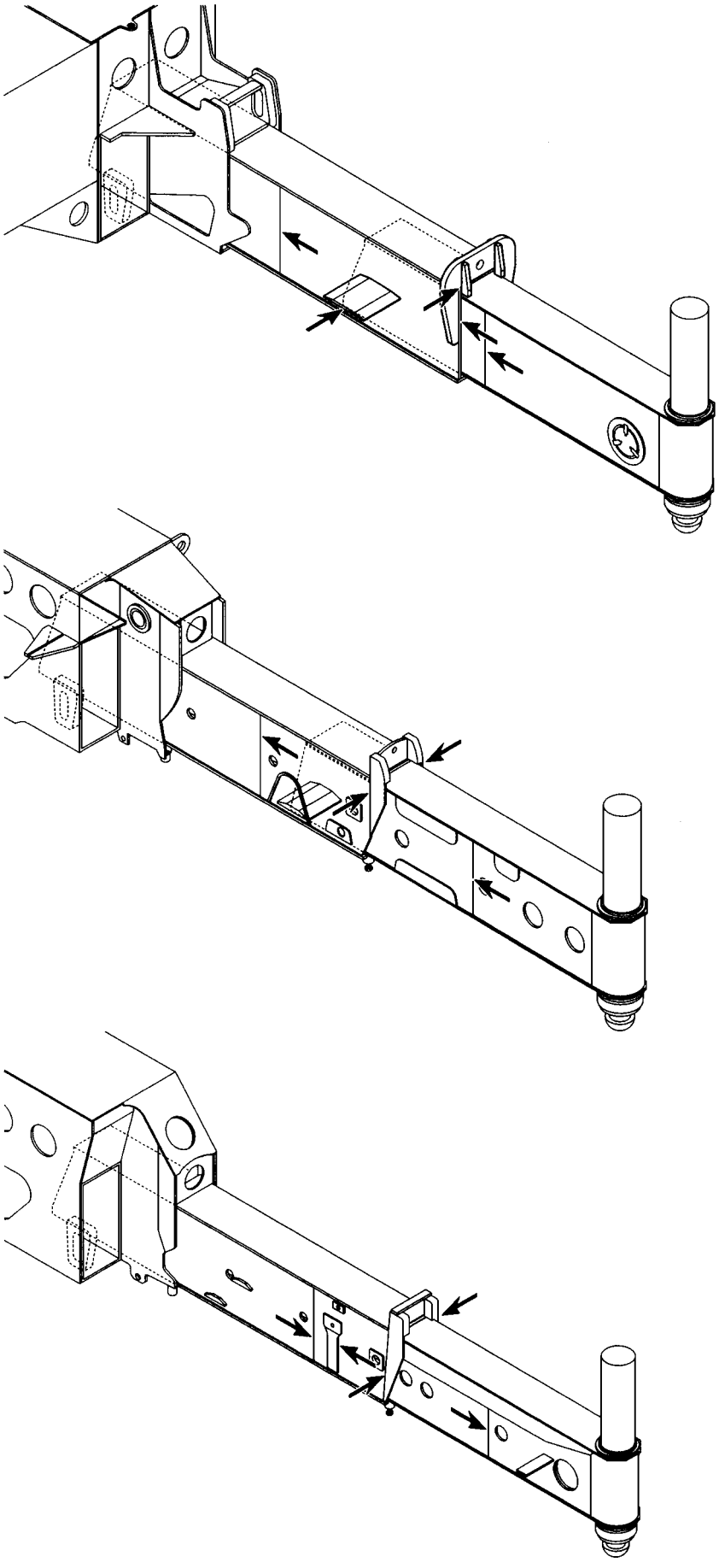


B105717 *Example for sliding beam*



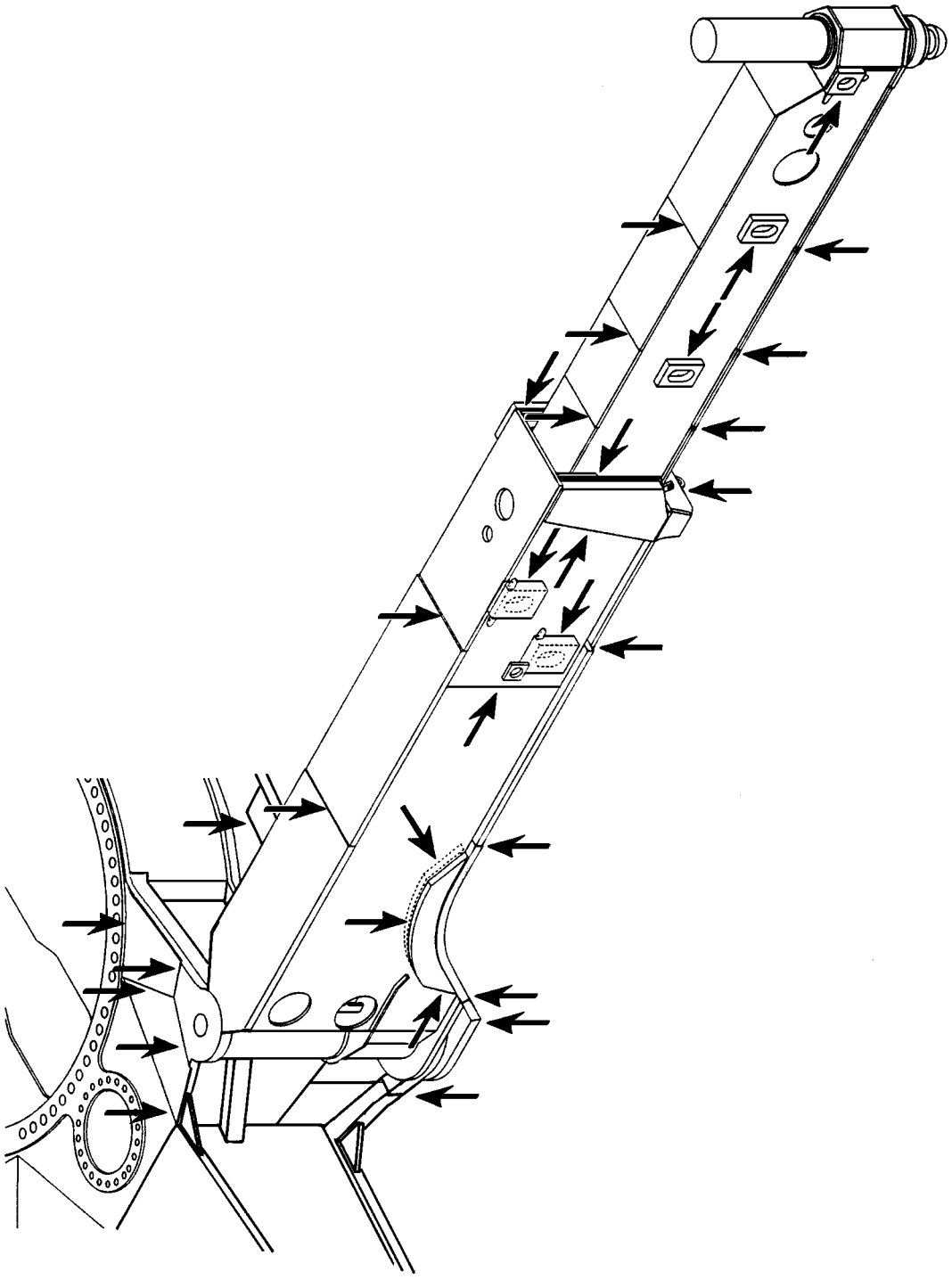
B105718

Example for sliding beam

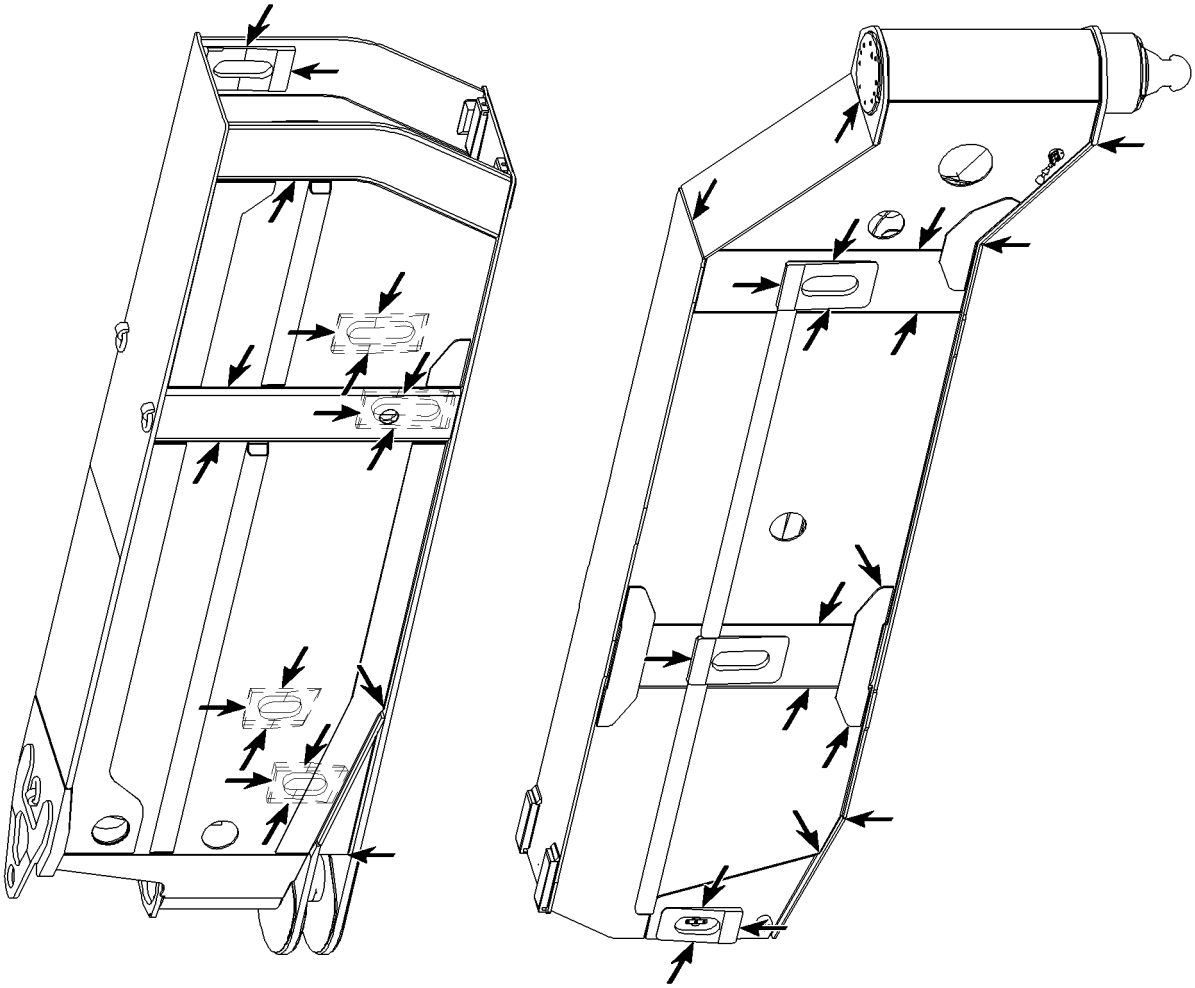


B185047

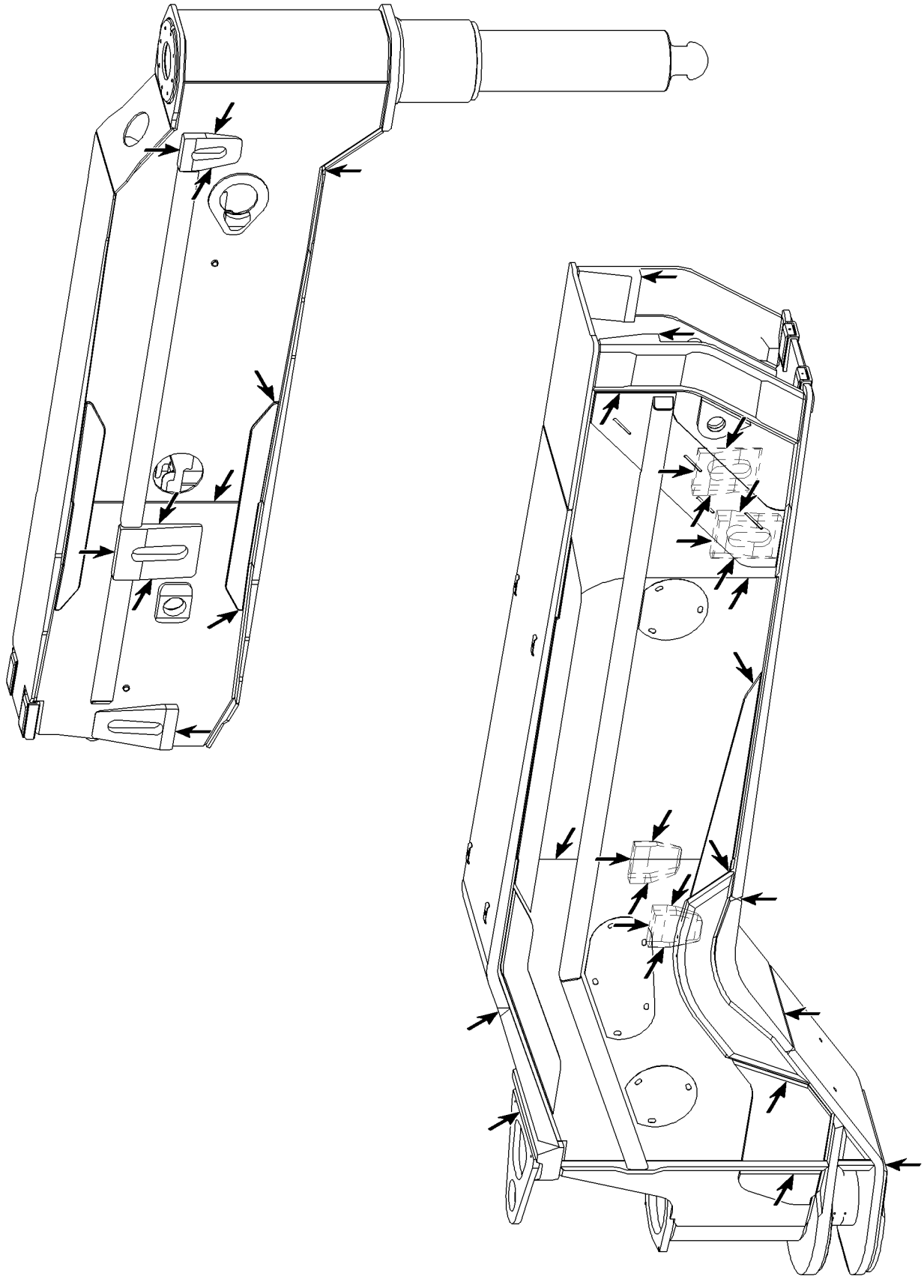
Example for sliding beam



B185060 *Example for slewing sliding beam*

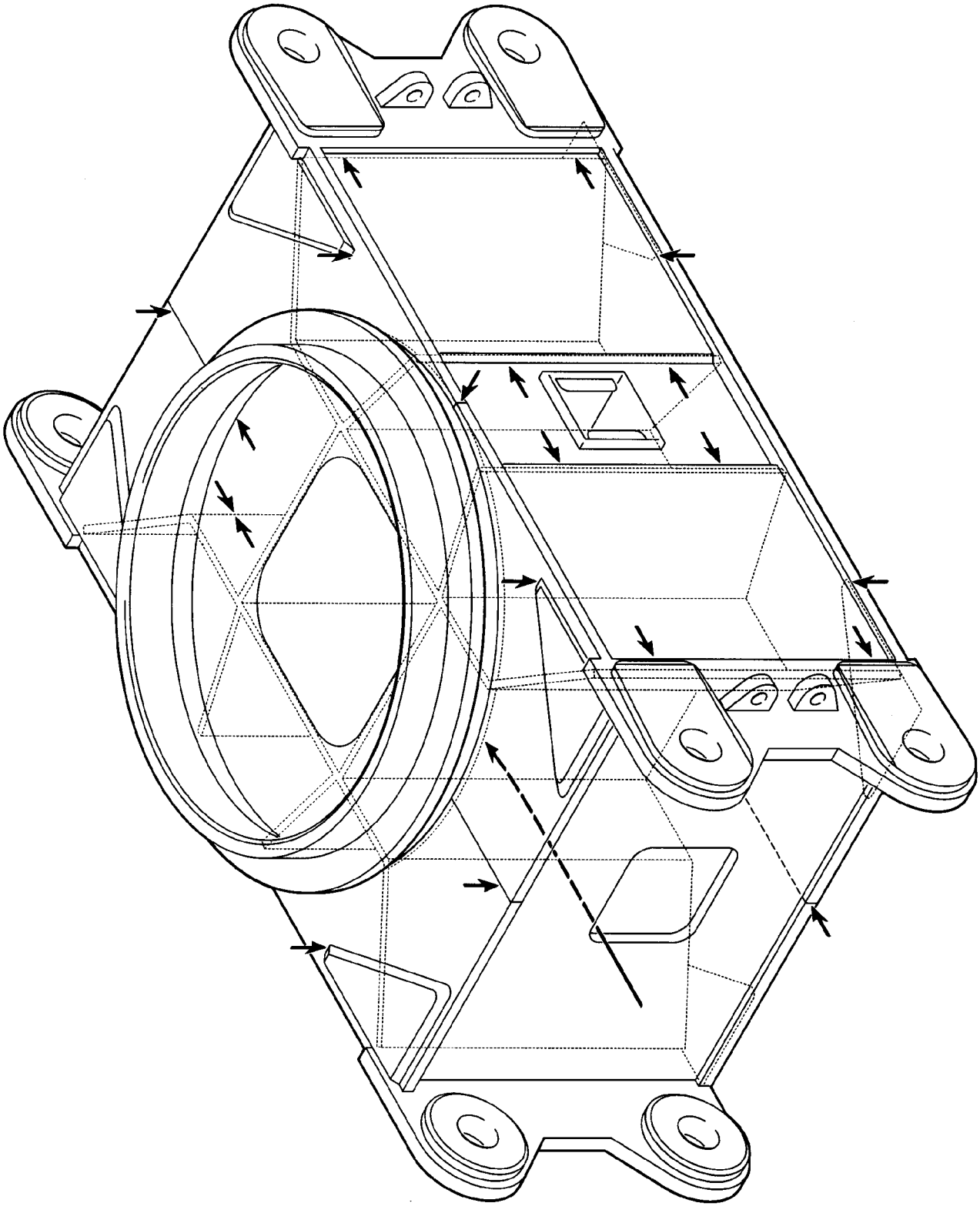


B105690 *Example for slewing sliding beam*

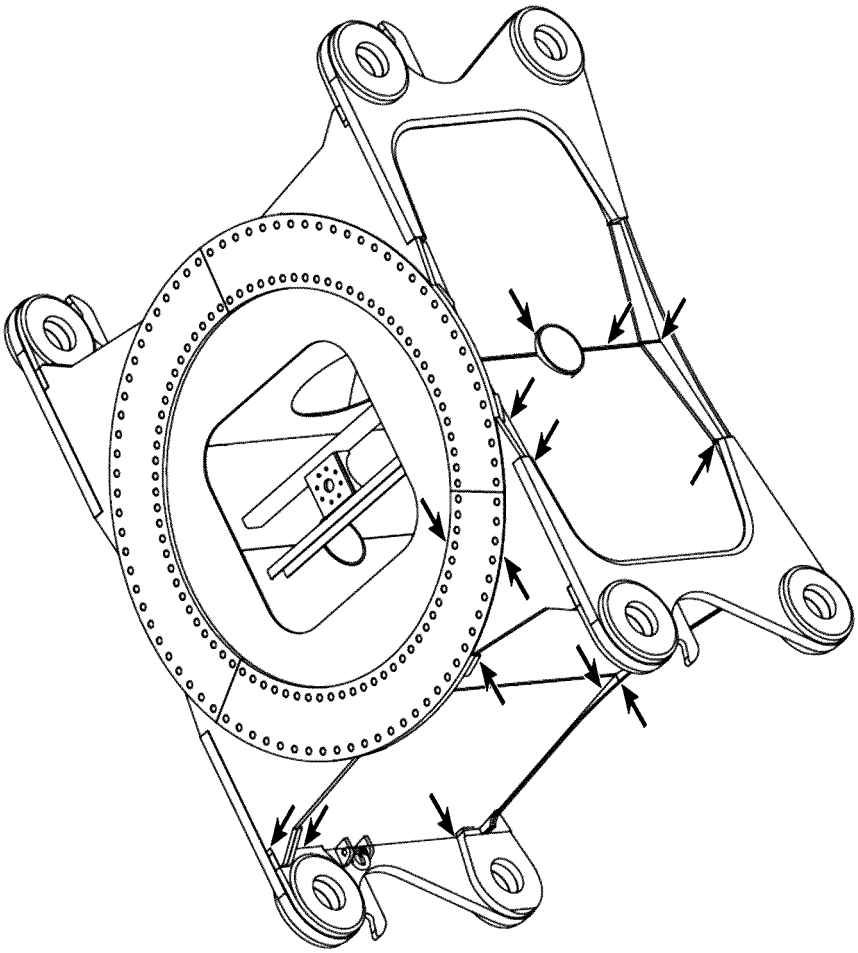


B105704

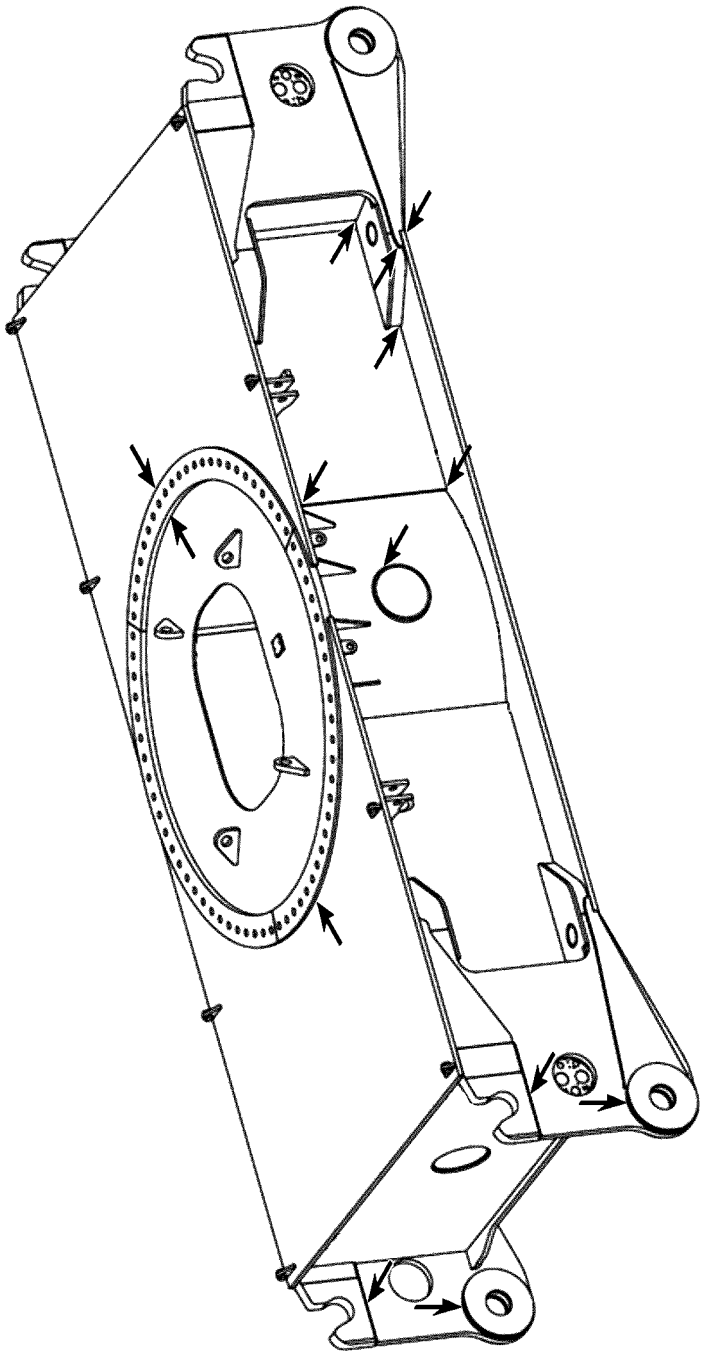
Example for slewing sliding beam



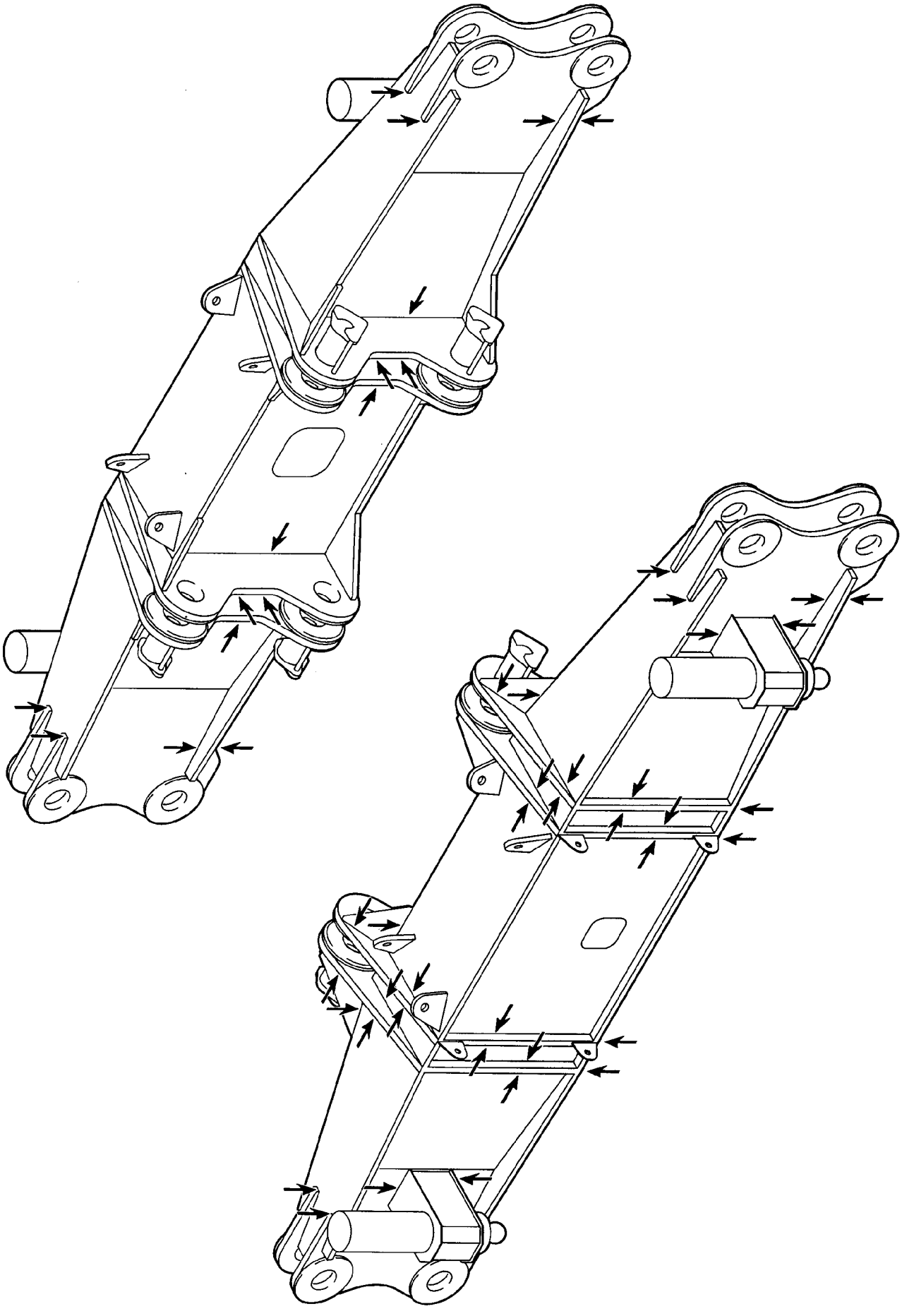
B187347 *Example for crawler center section*



B105725 *Example for crawler center section*

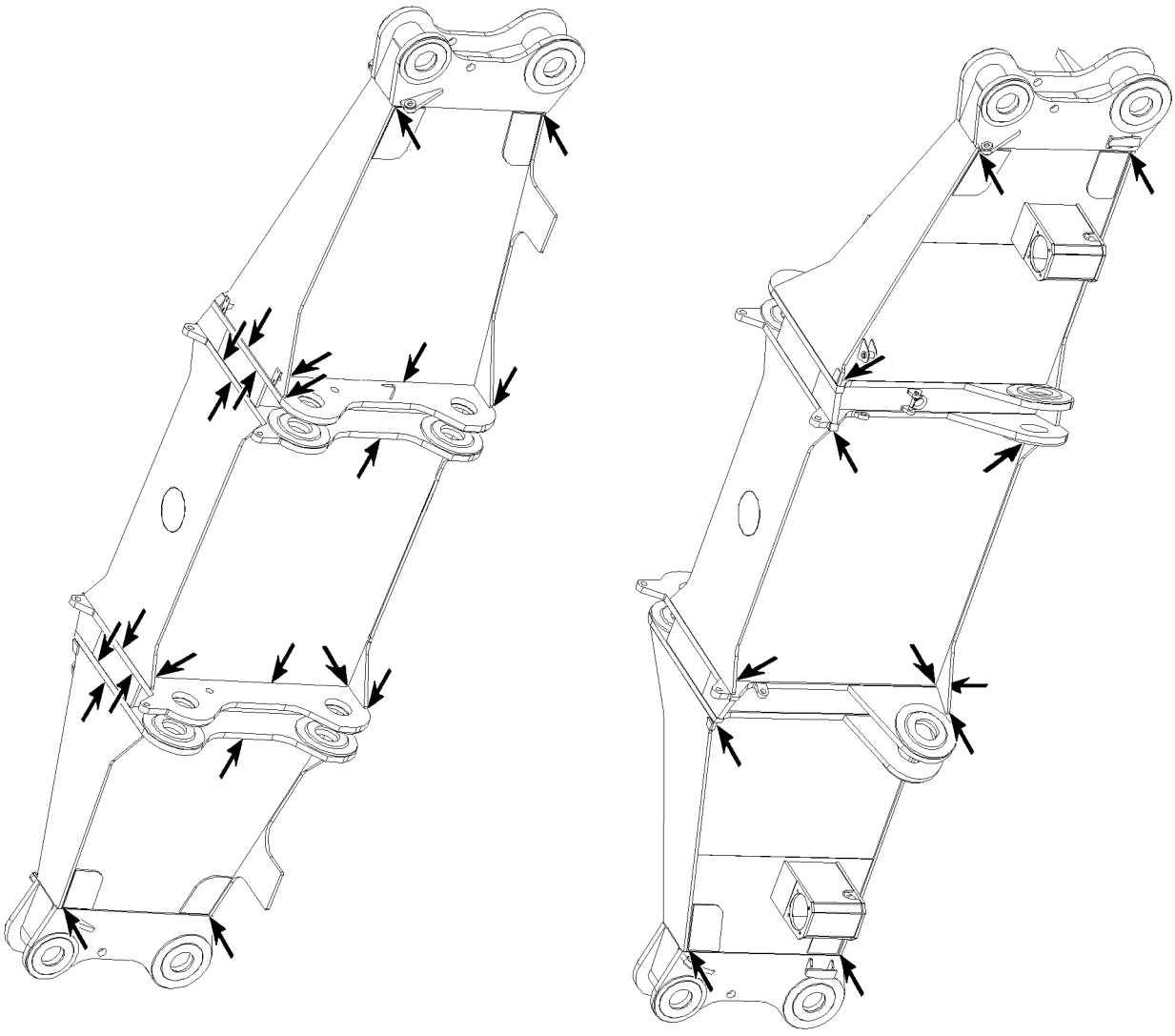


B105726 *Example for crawler center section*

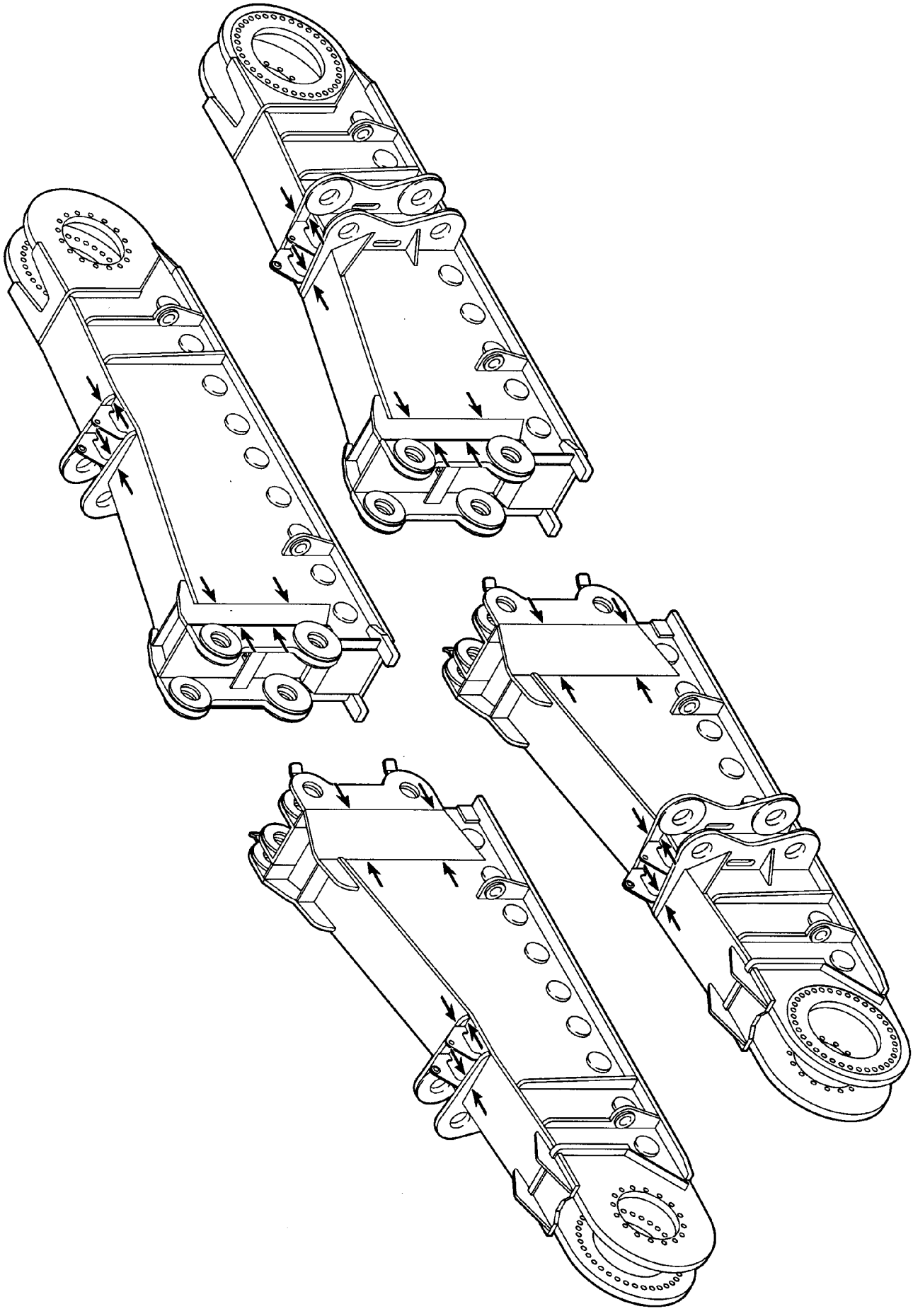


B187348

Example for cross carrier

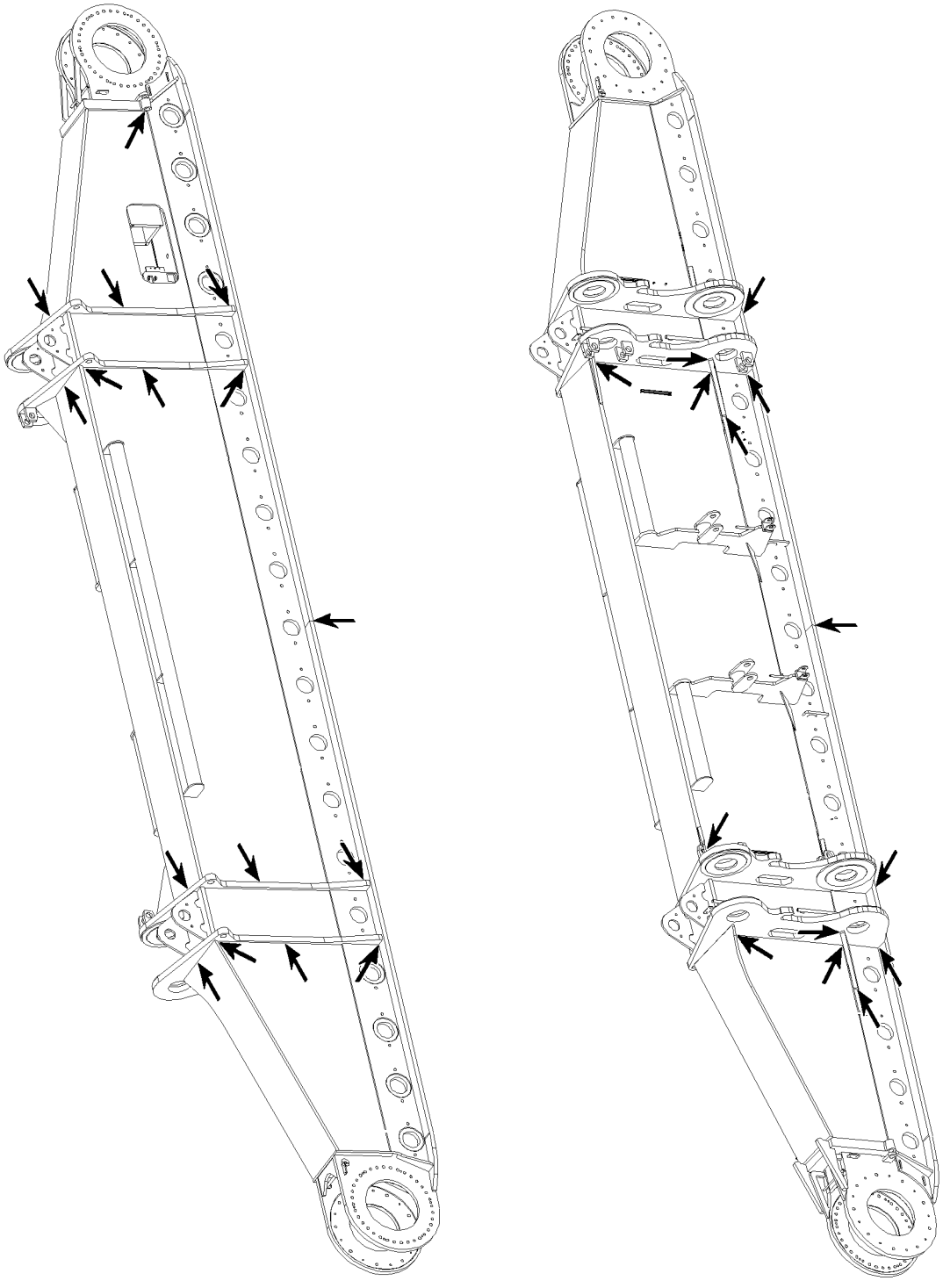


B105727 *Example for cross carrier*



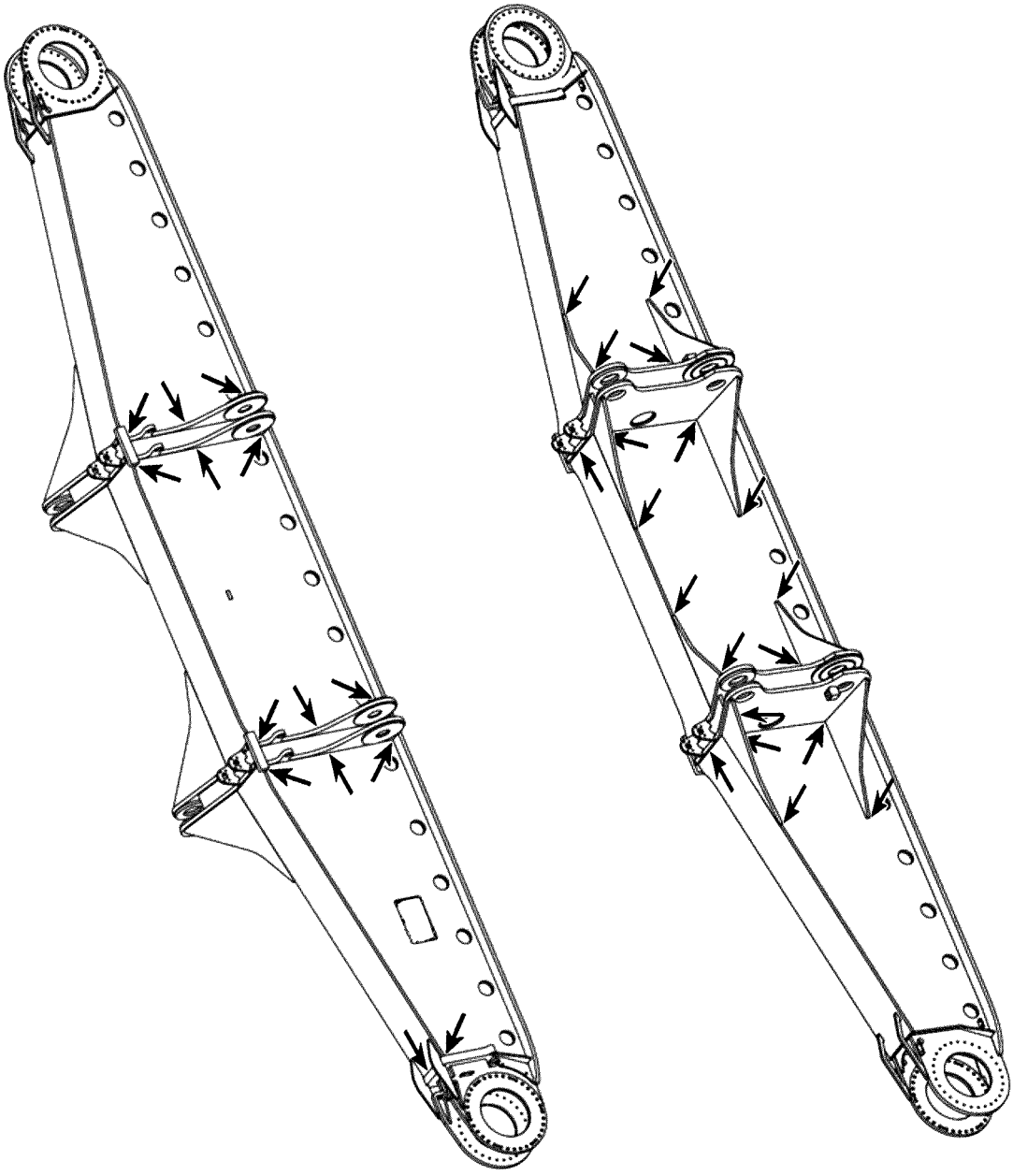
B187349

Example for crawler carrier

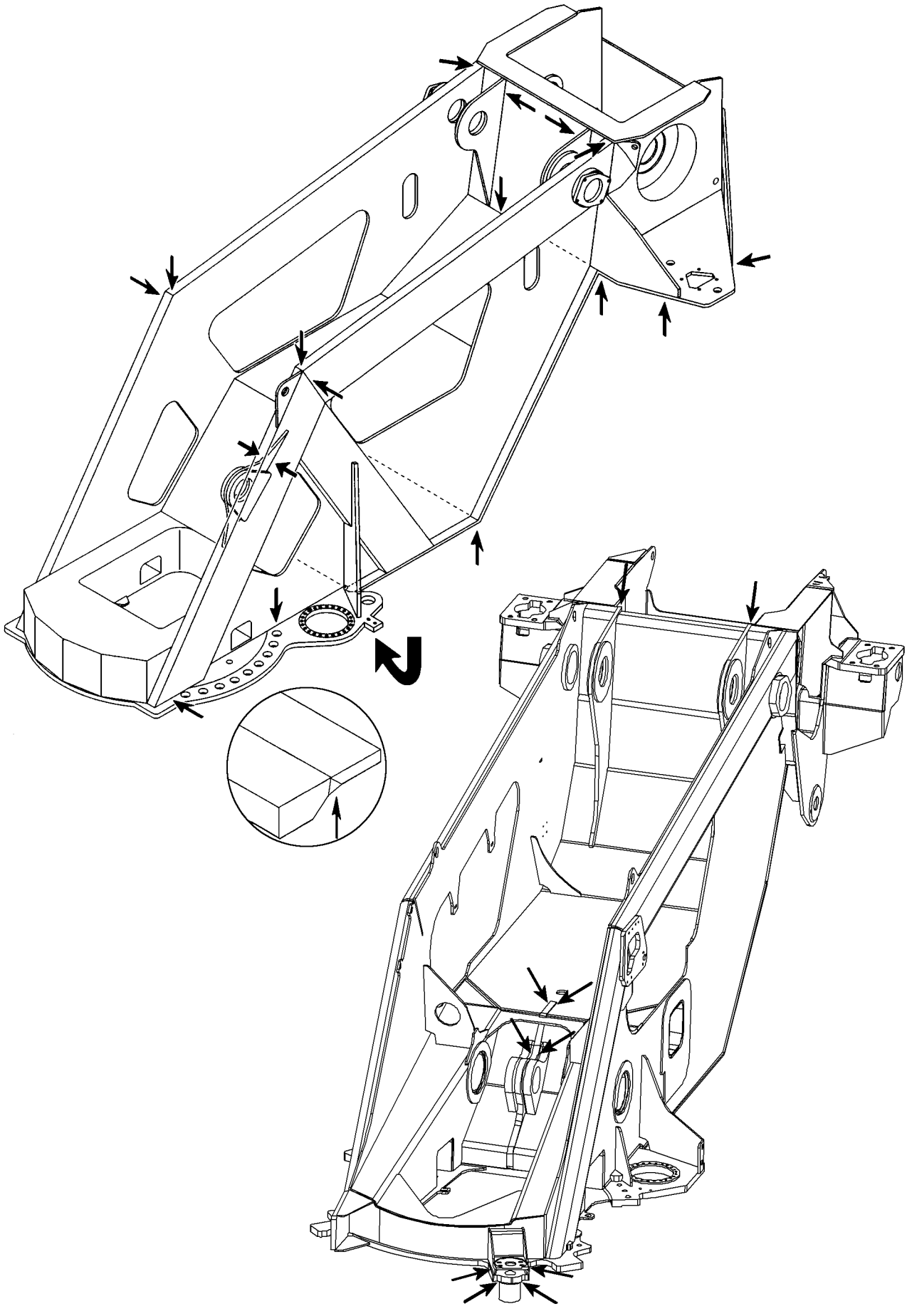


B105728

Example for crawler carrier

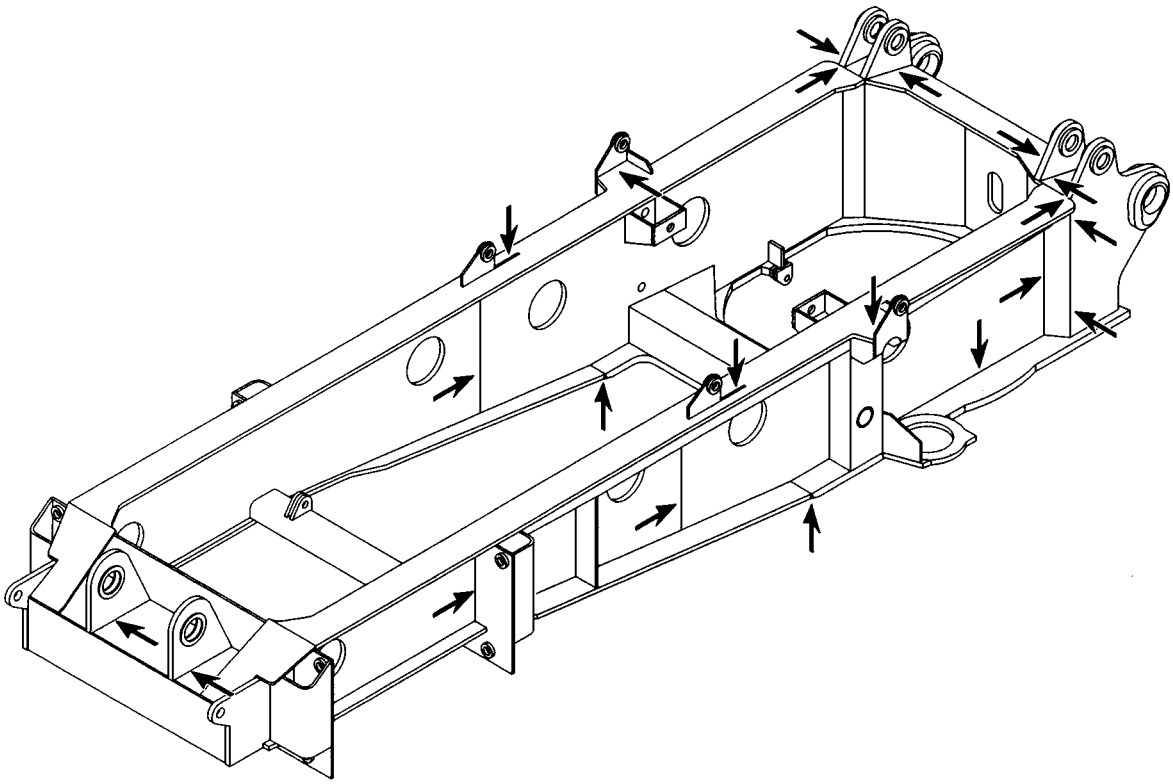


B105729 *Example for crawler carrier*

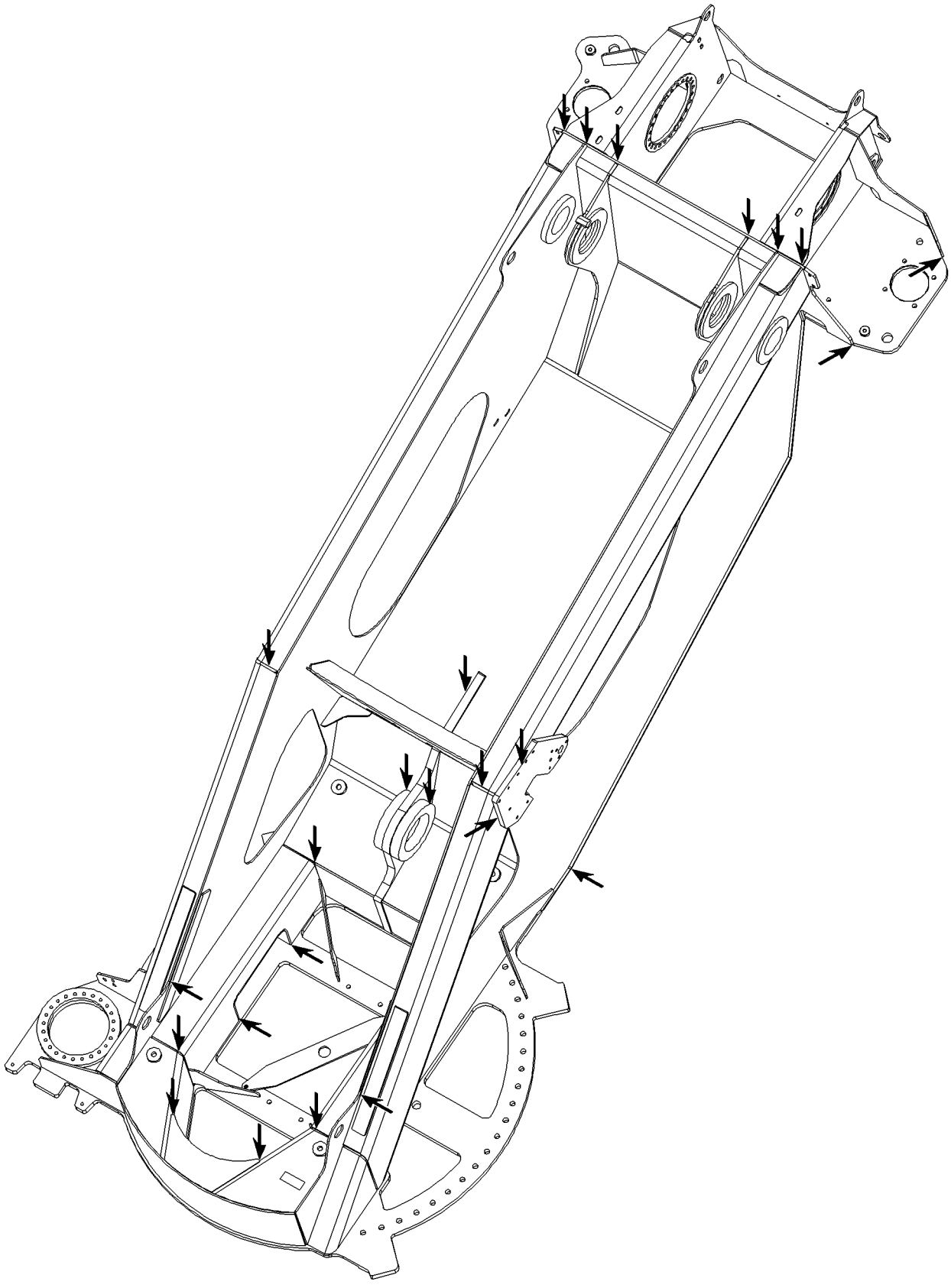


B185048

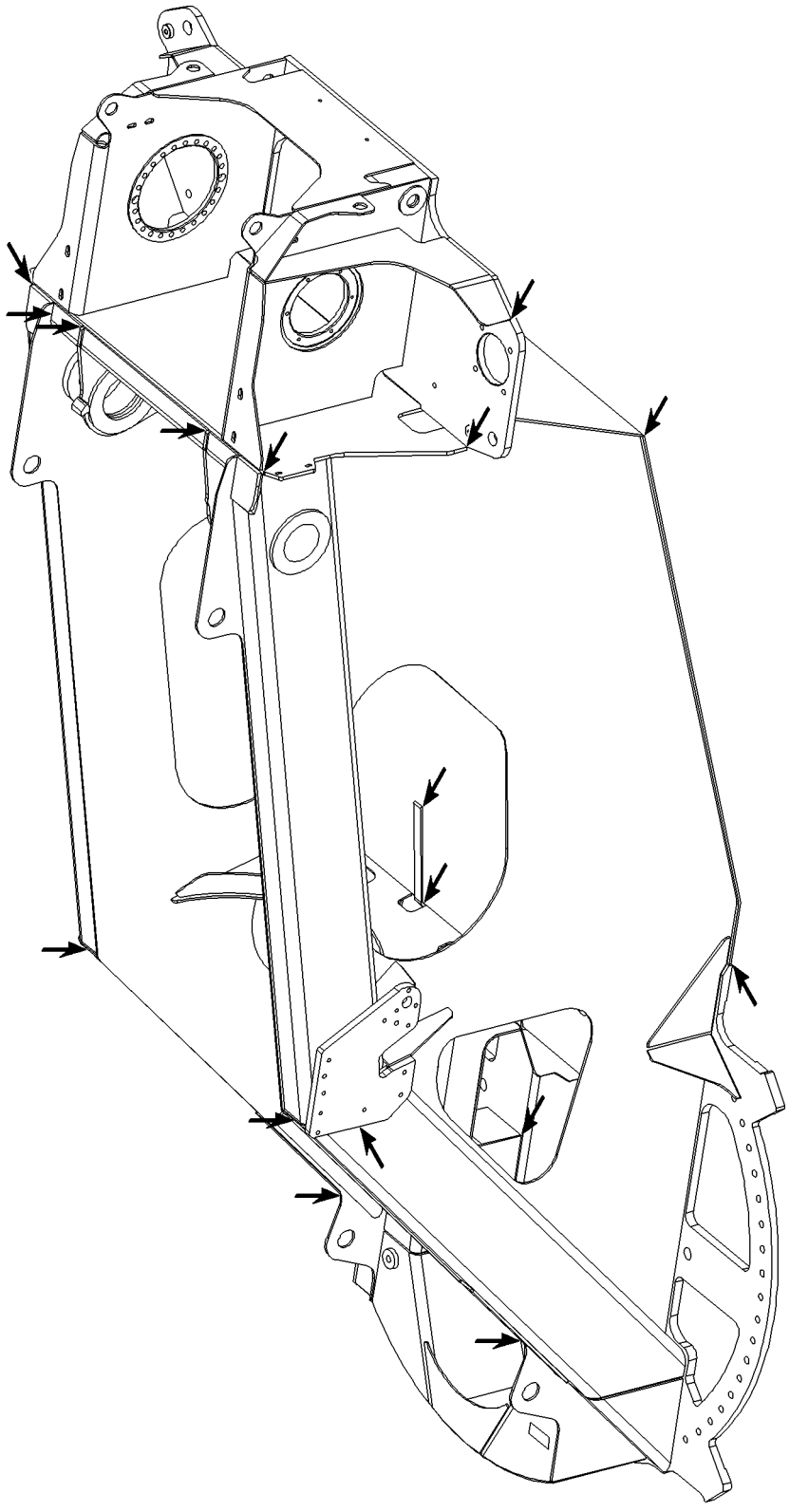
Example for turntable frame



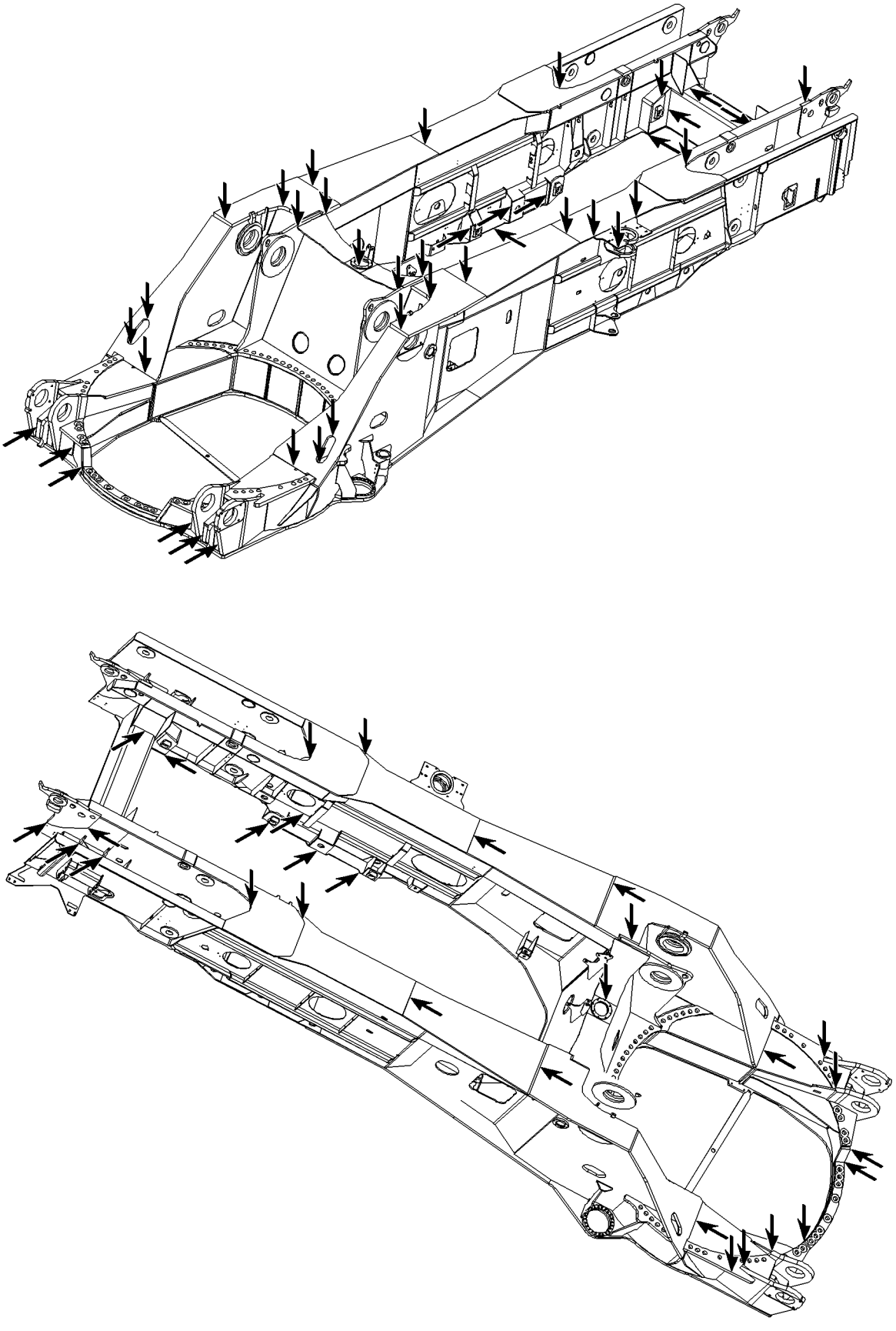
B185049 *Example for turntable frame*



B105700 *Example for turntable frame*

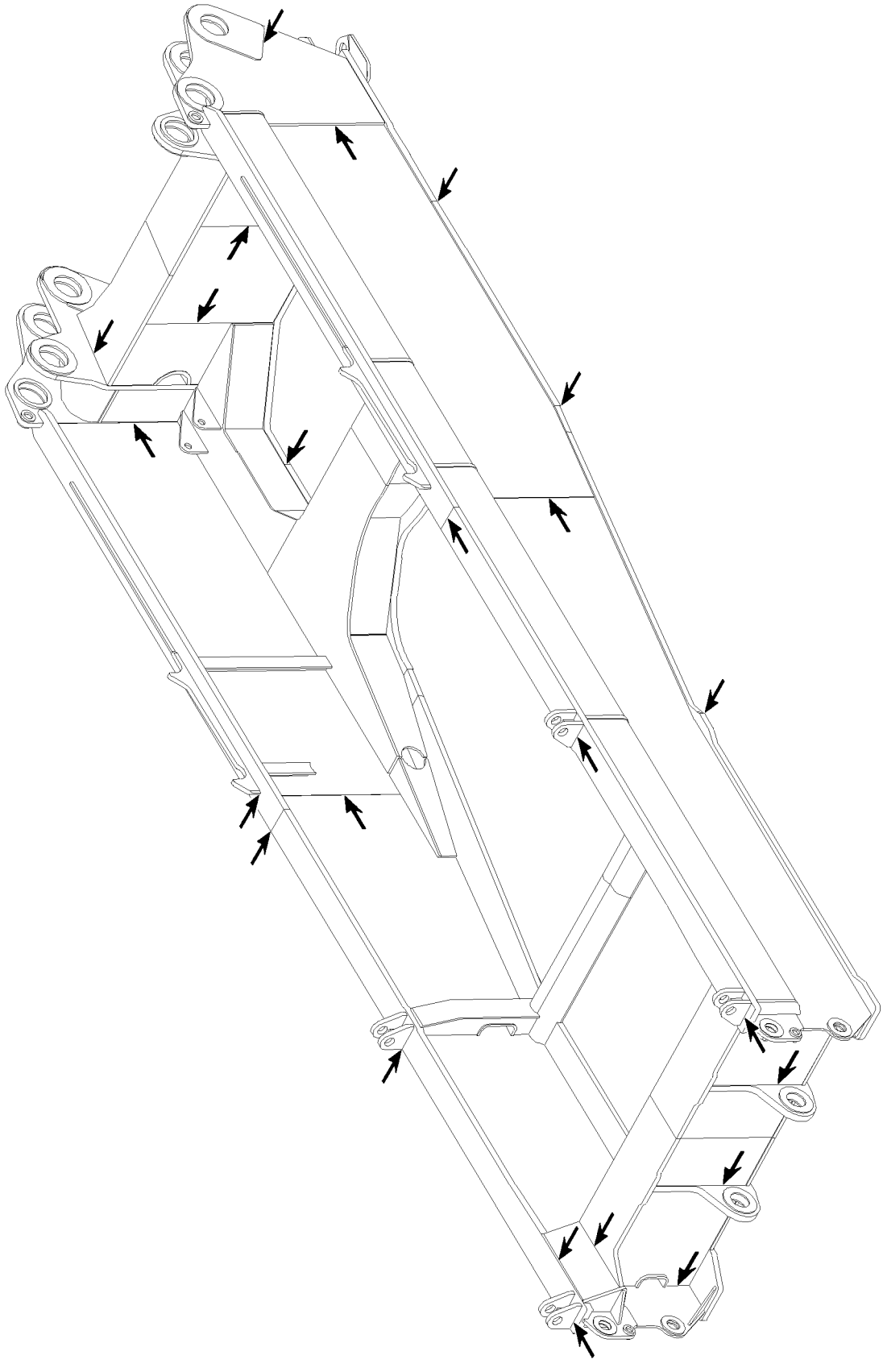


B105701 *Example for turntable frame*



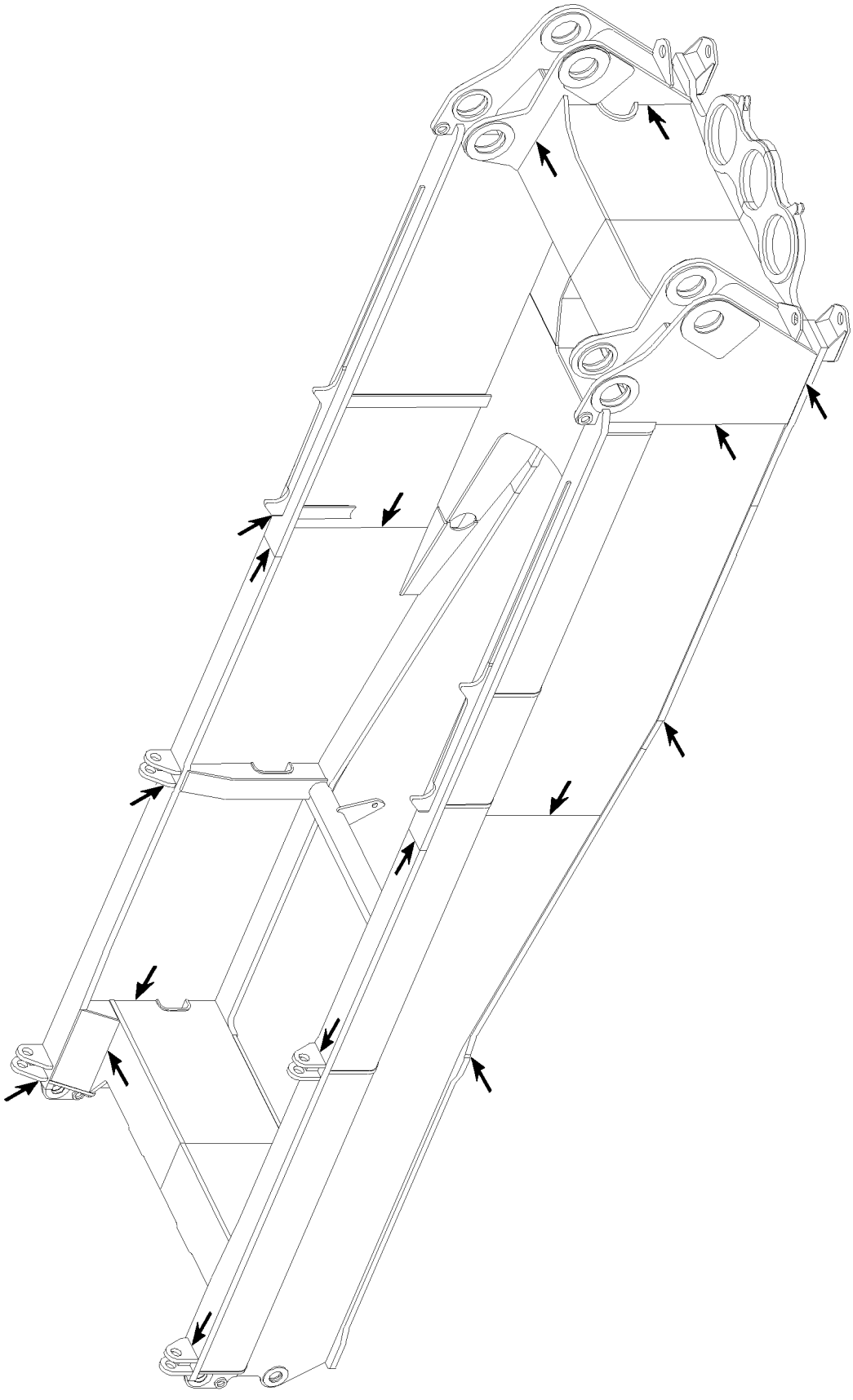
B105706

Example for turntable frame



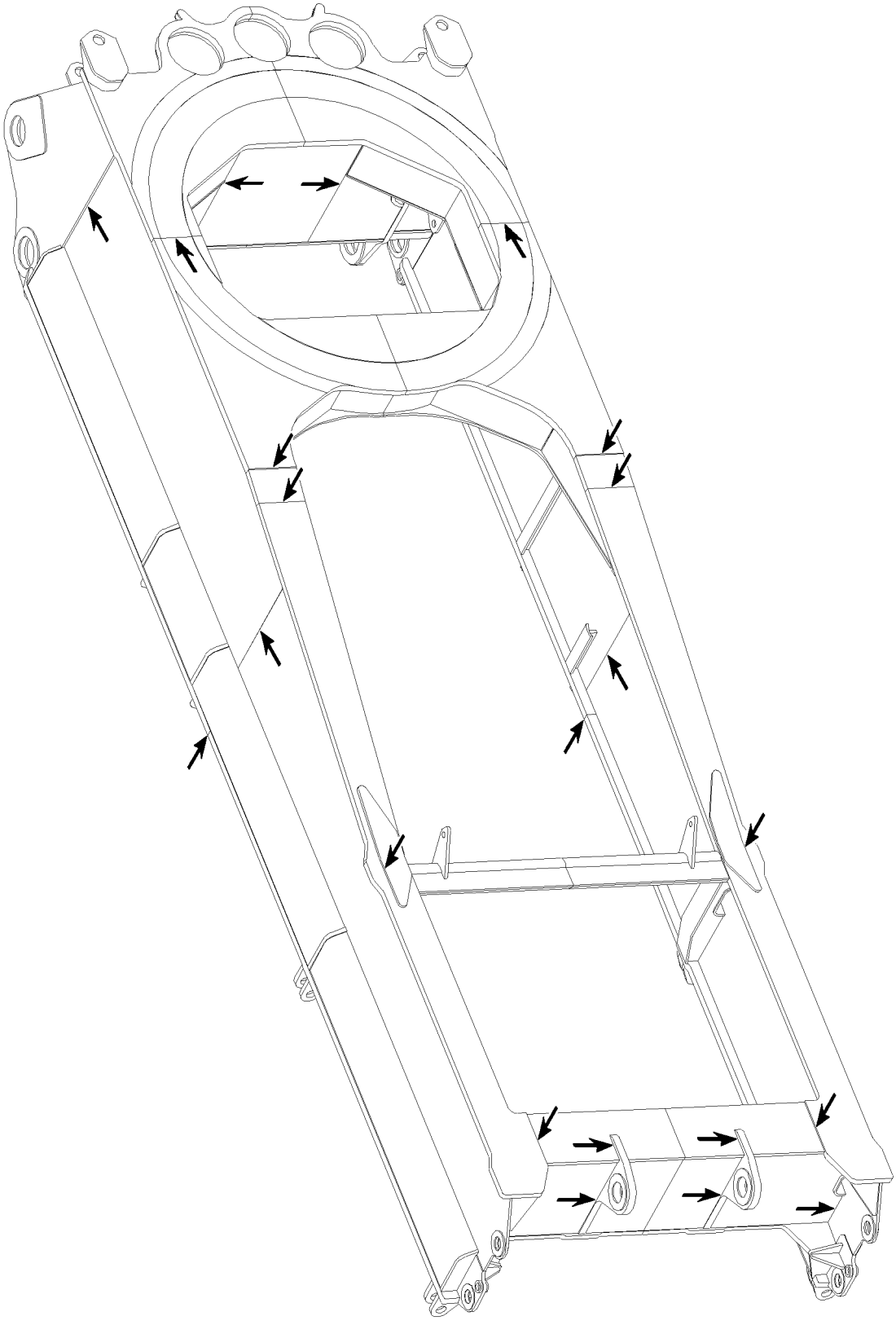
B105694

Example for turntable frame



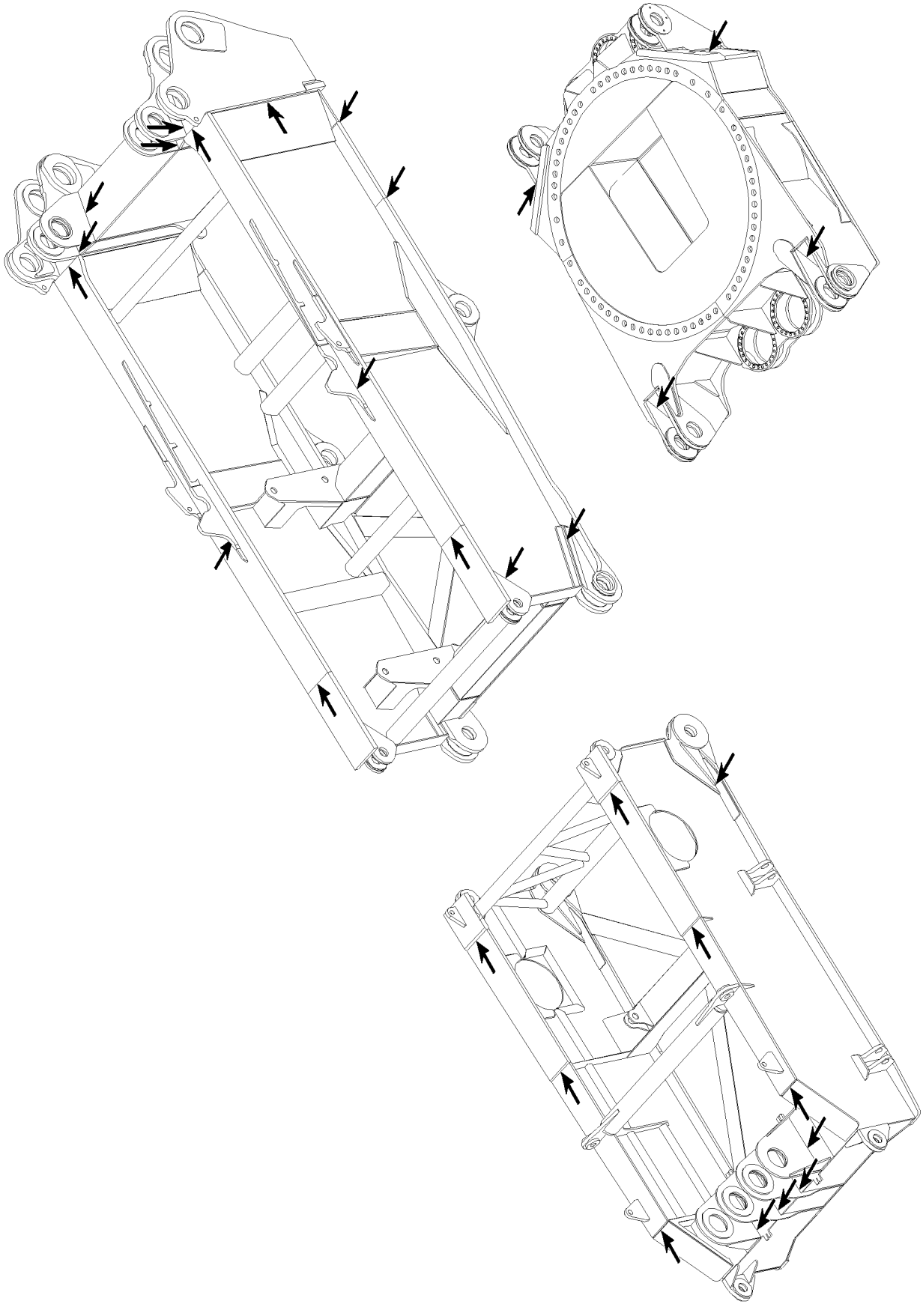
B105695

Example for turntable frame



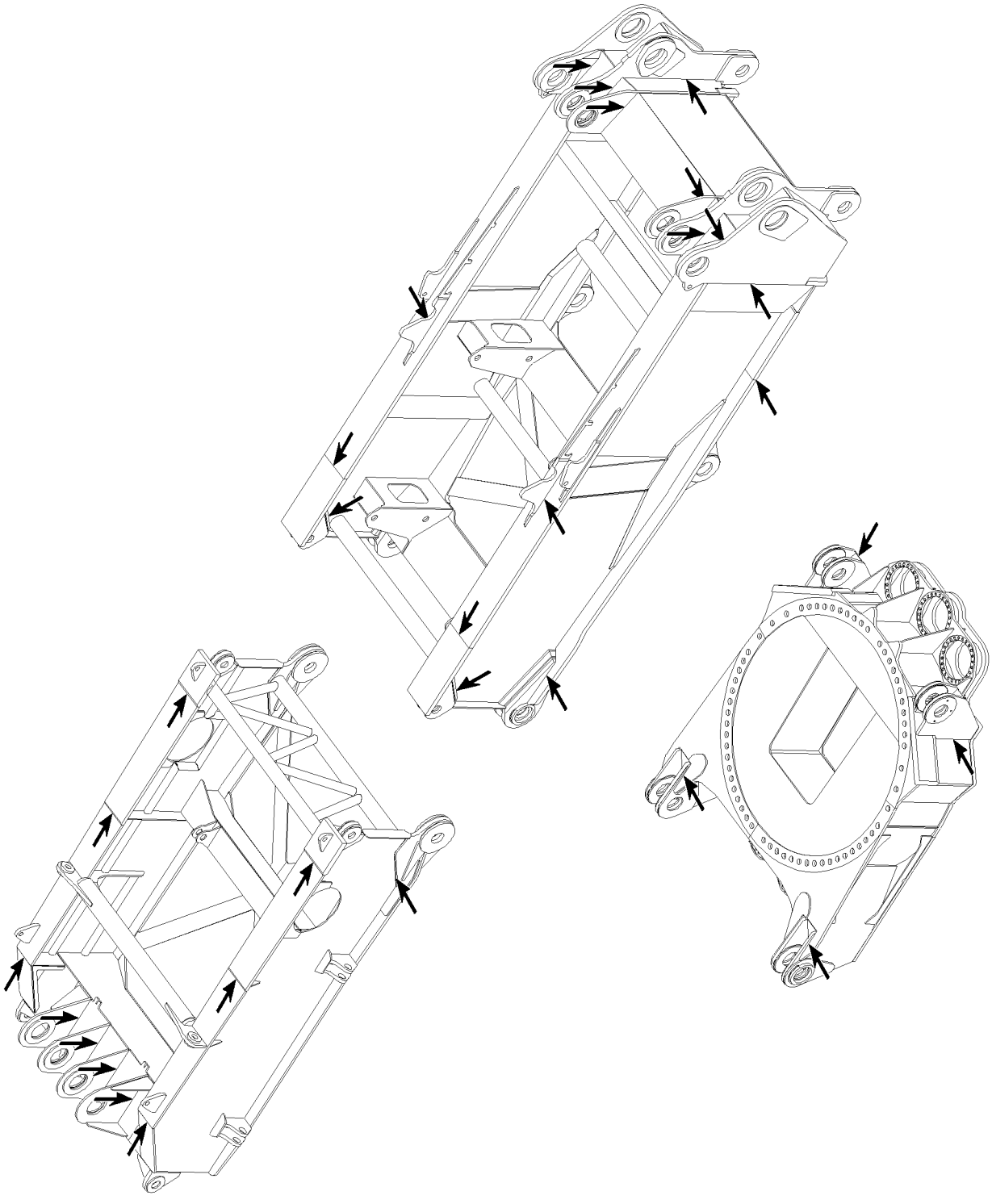
B105696

Example for turntable frame

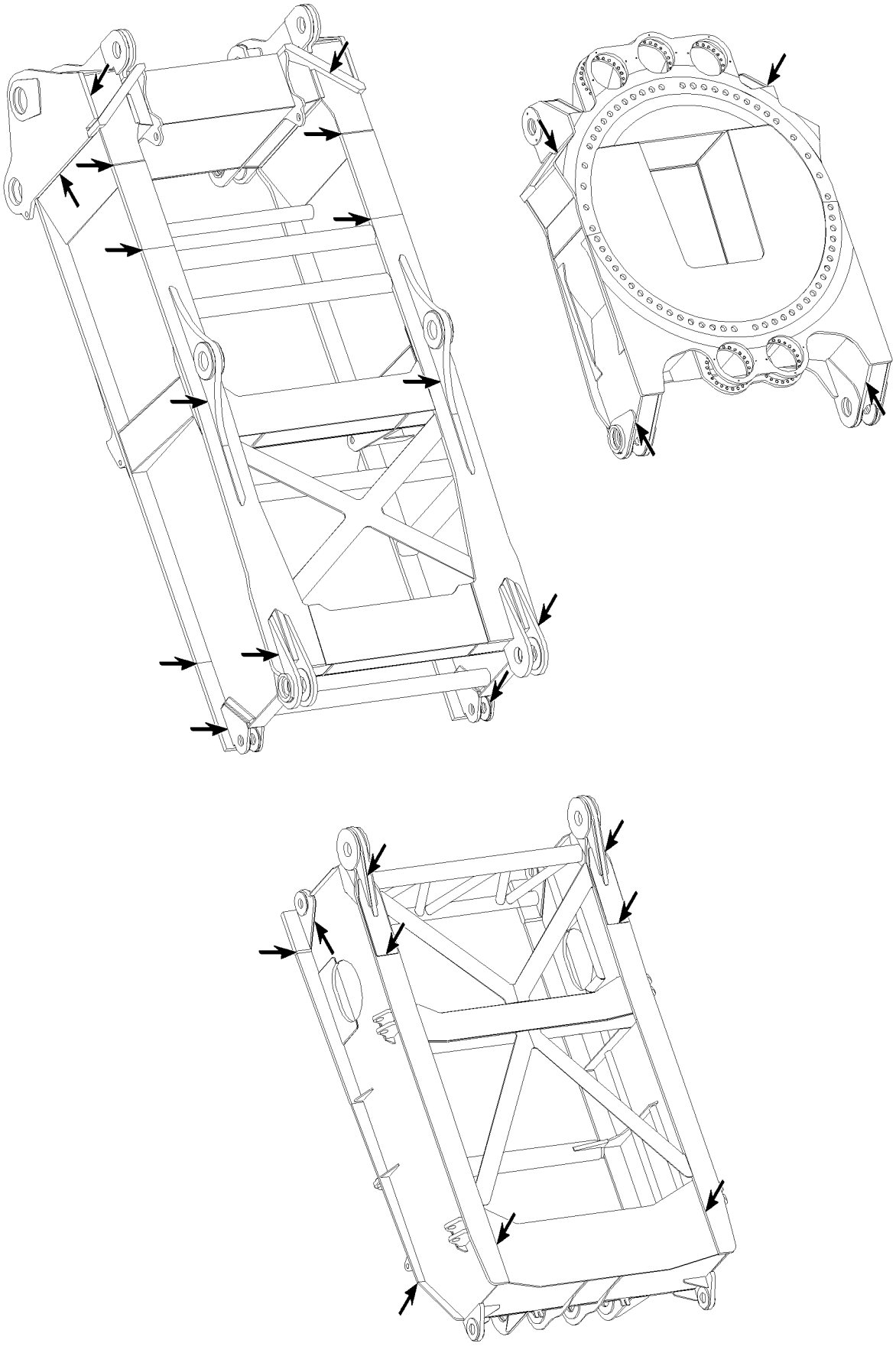


B105691

Example for turntable frame

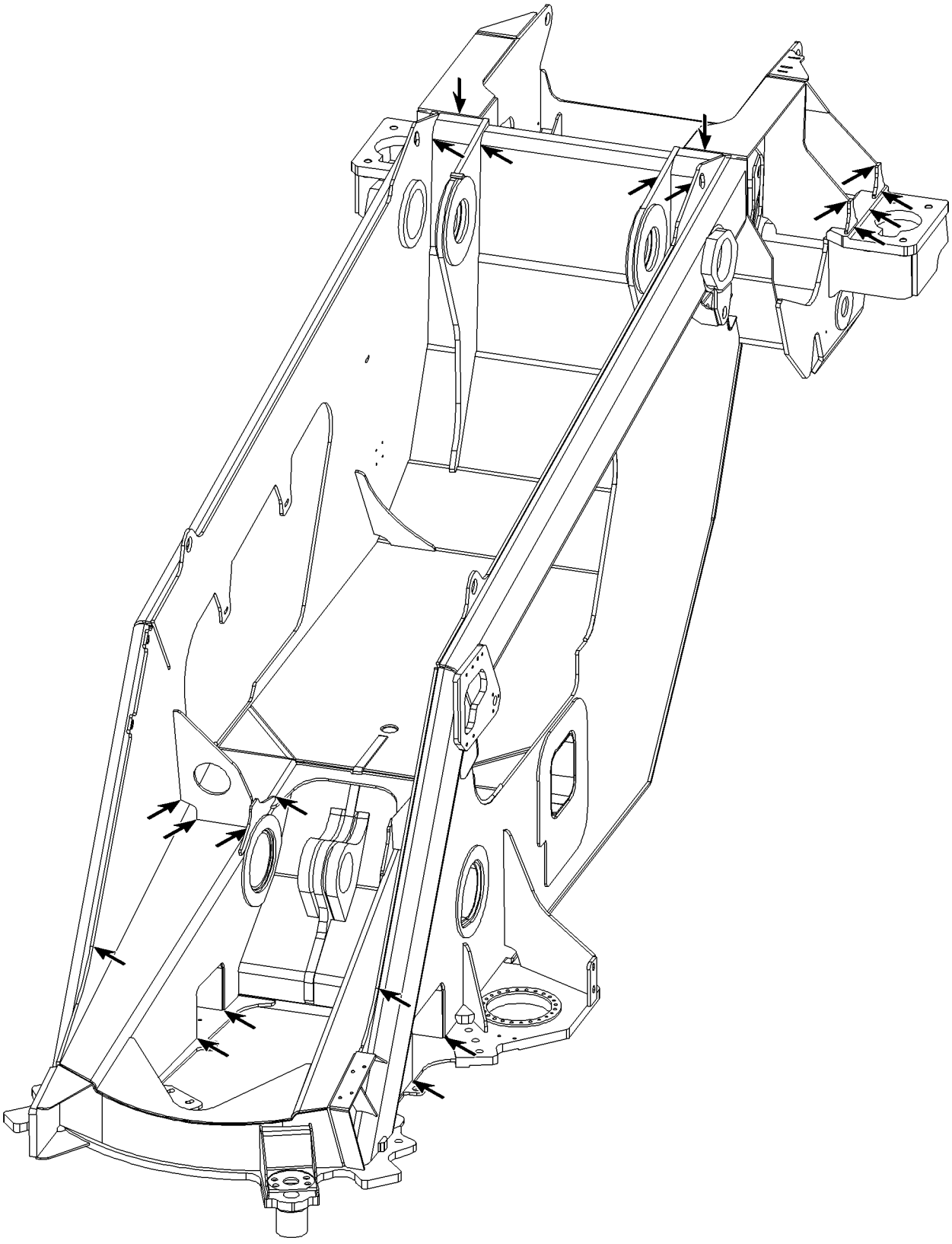


B105692 *Example for turntable frame*



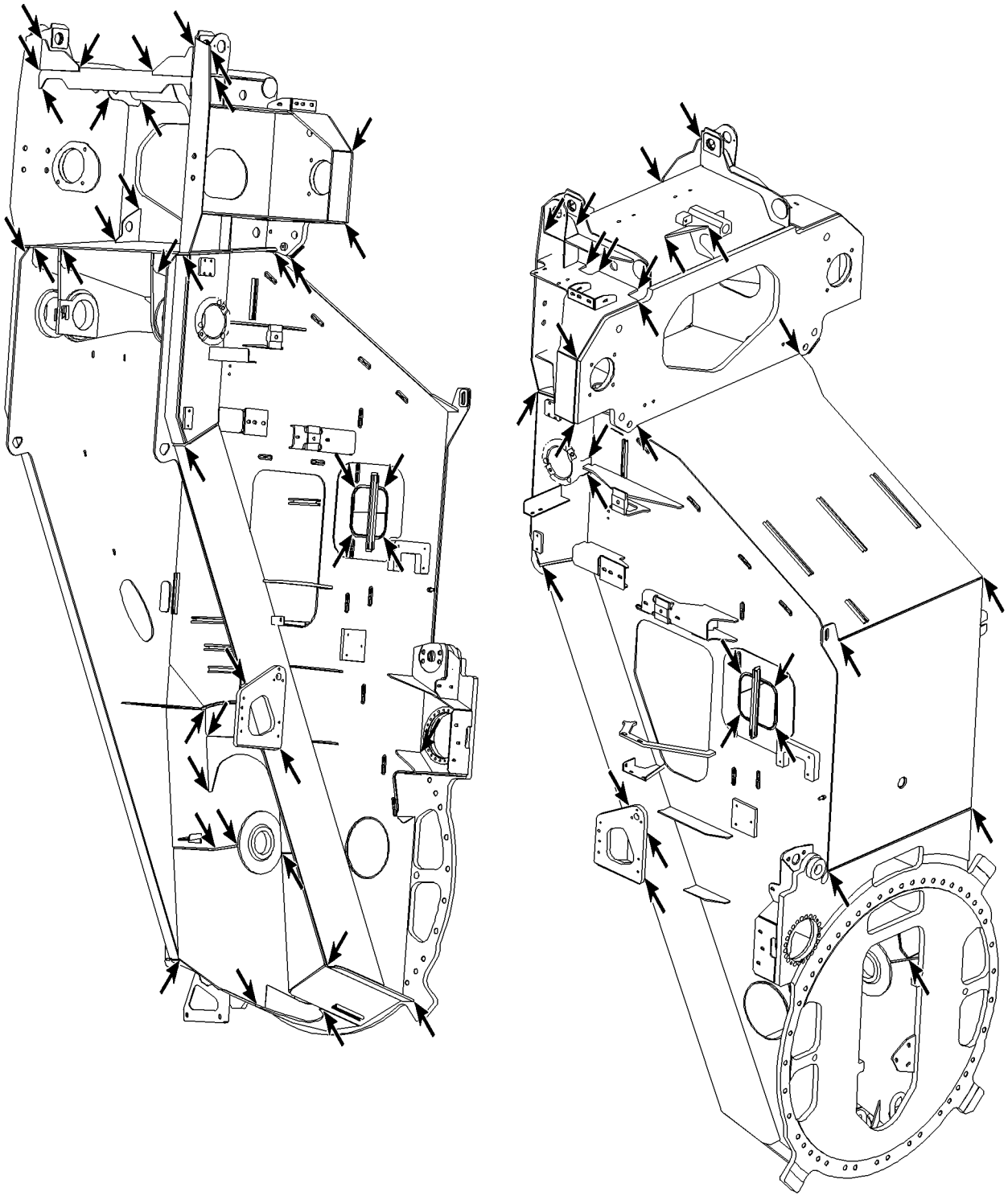
B105693

Example for turntable frame

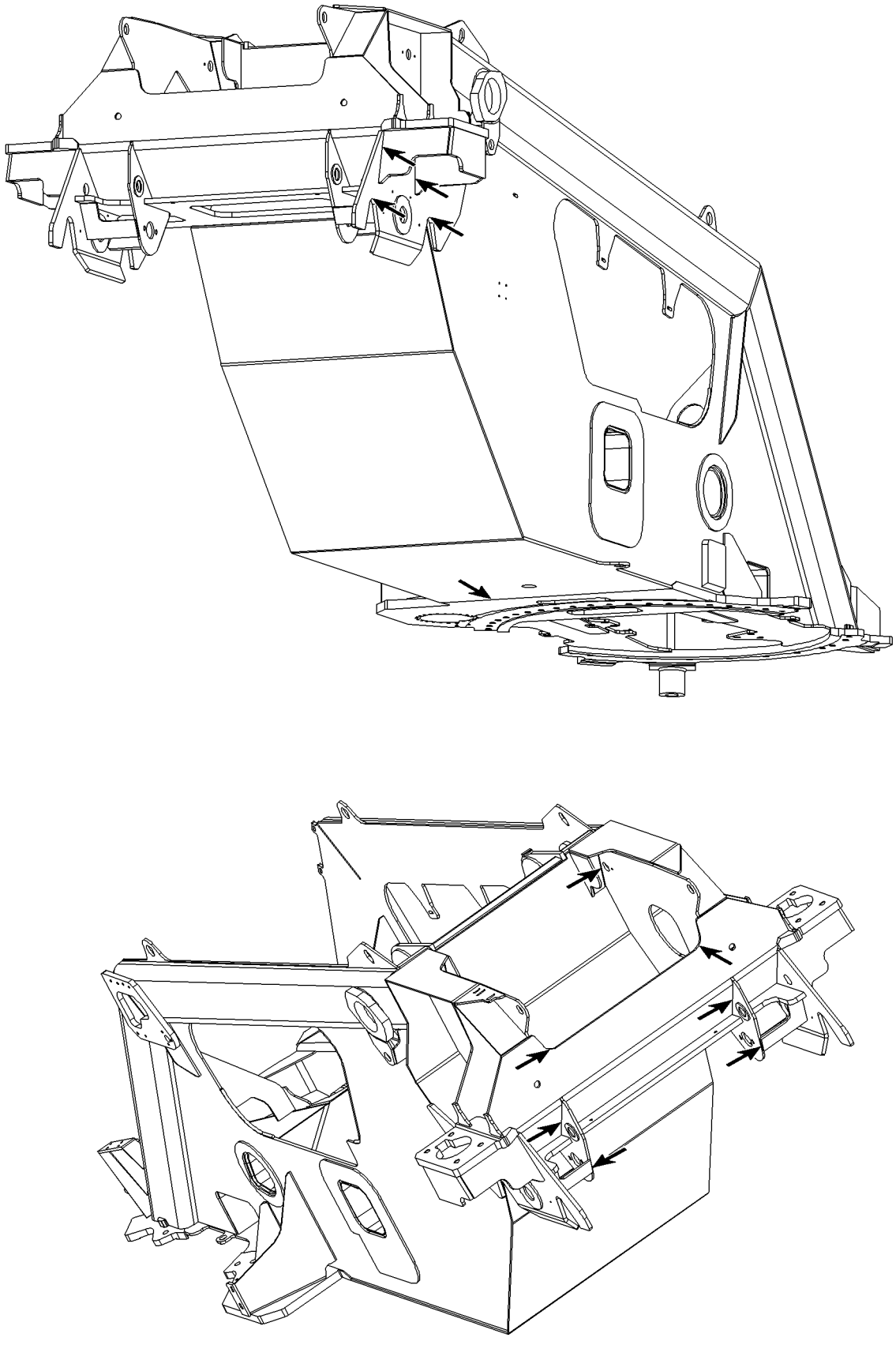


B105722

Example for turntable frame

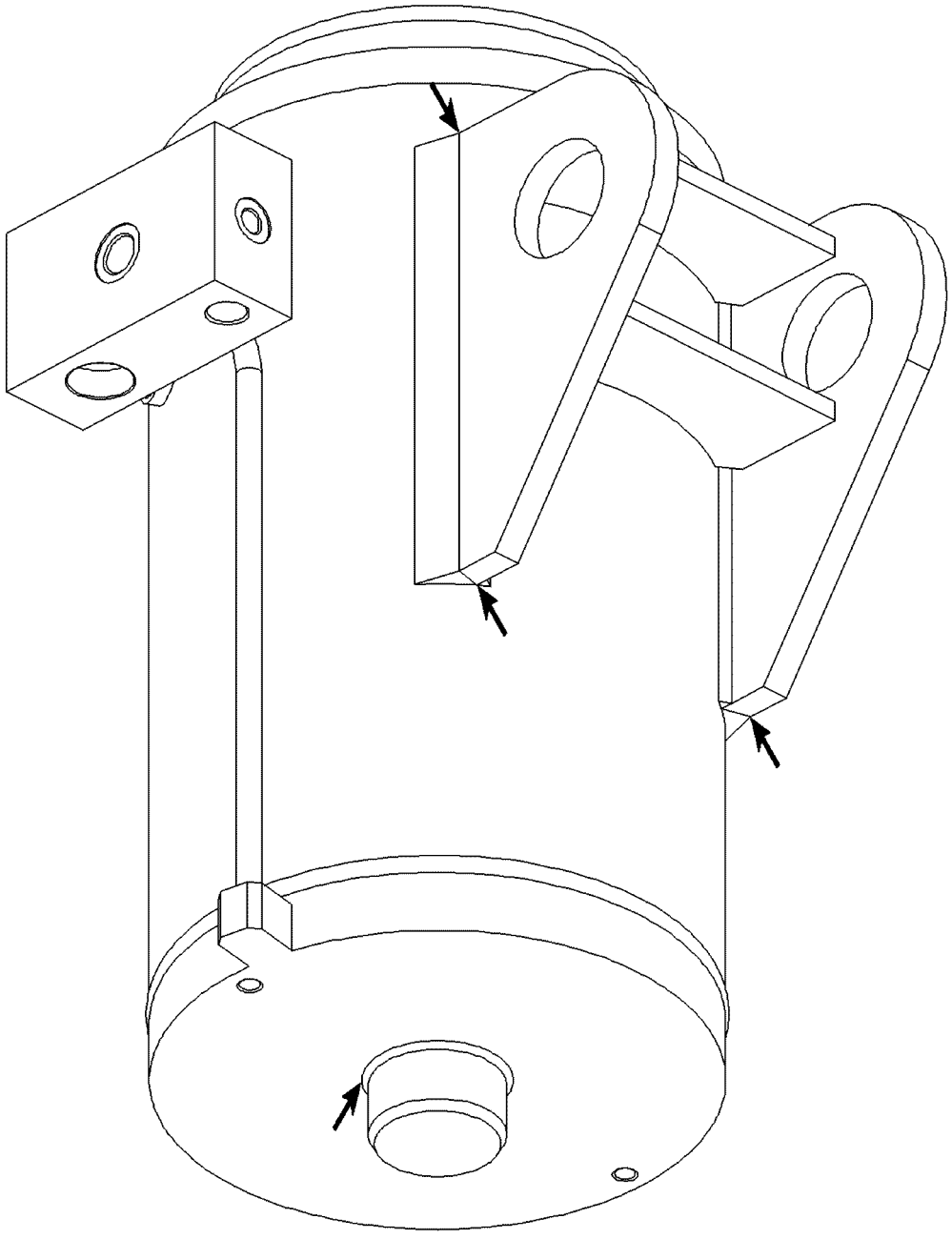


B105932 *Example for turntable frame*

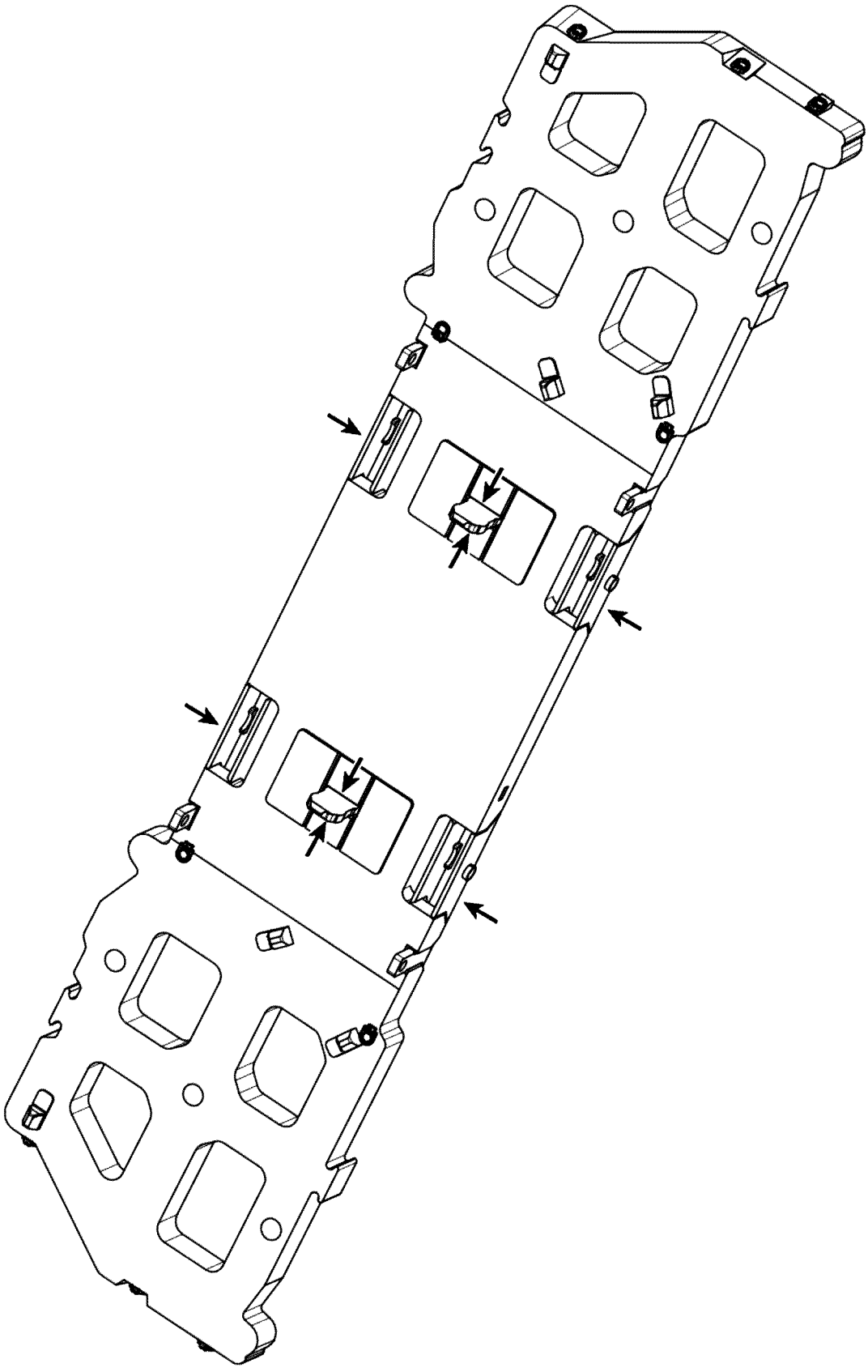


B105723

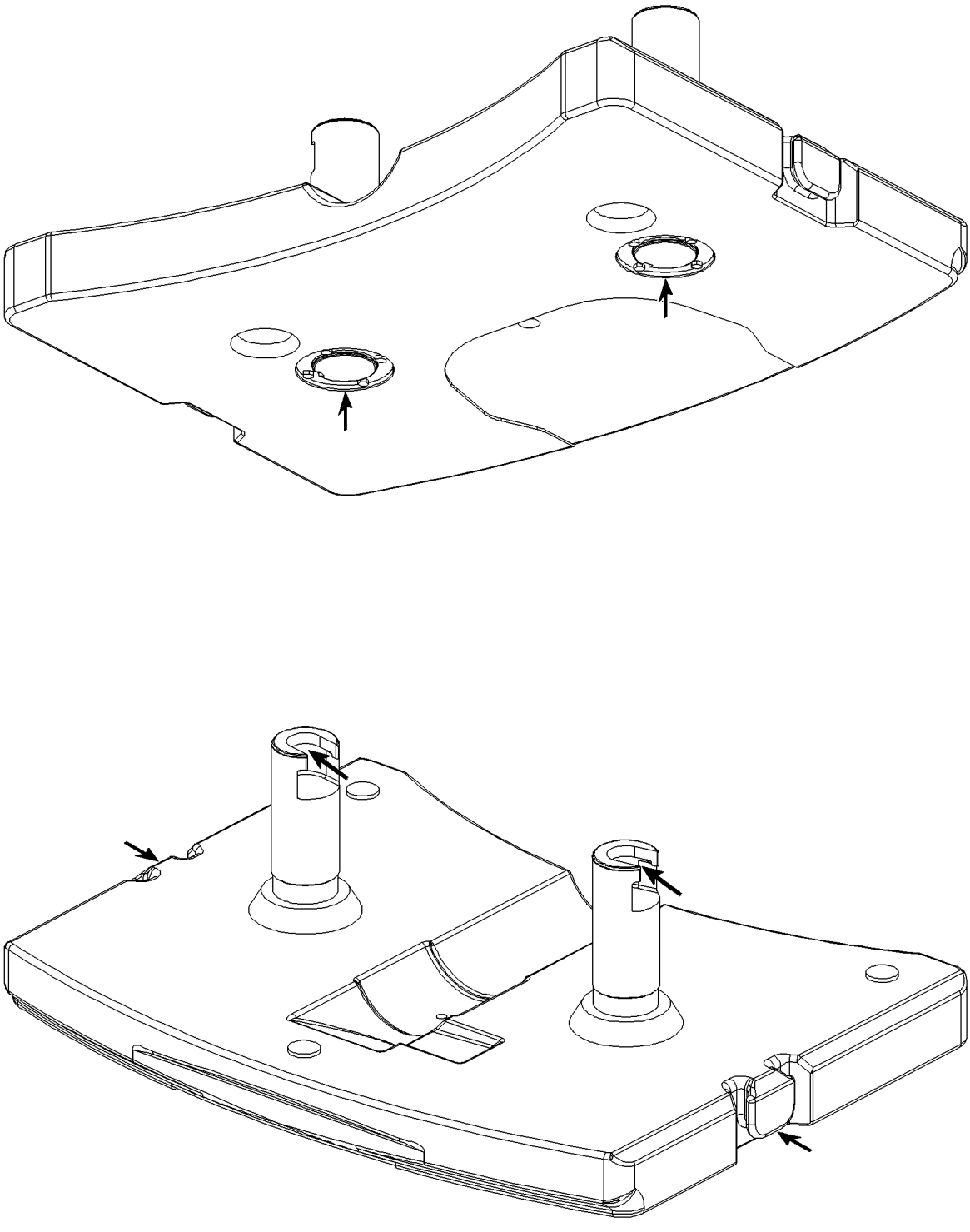
Example for turntable frame



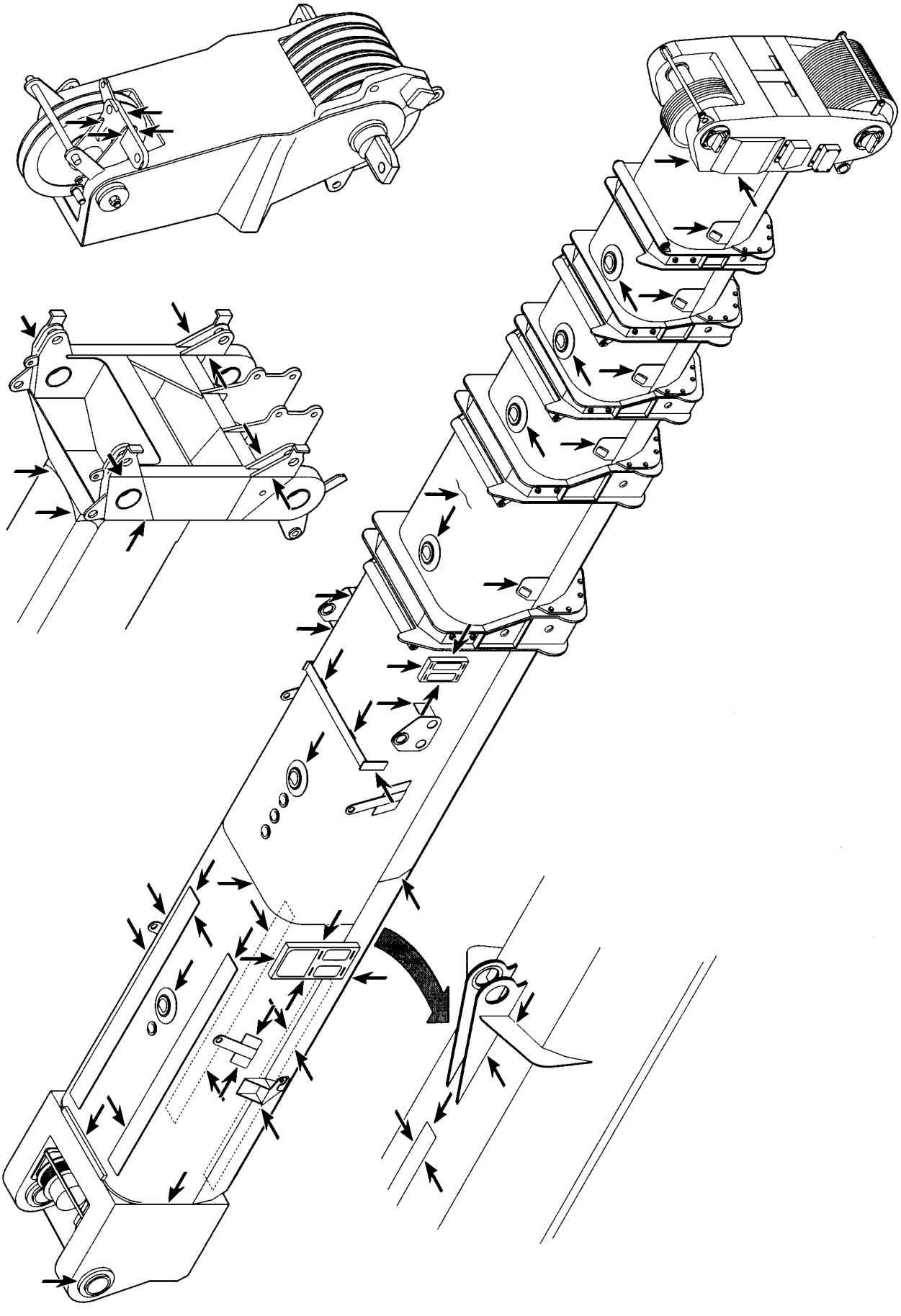
B105801 *Example for ballasting cylinder*



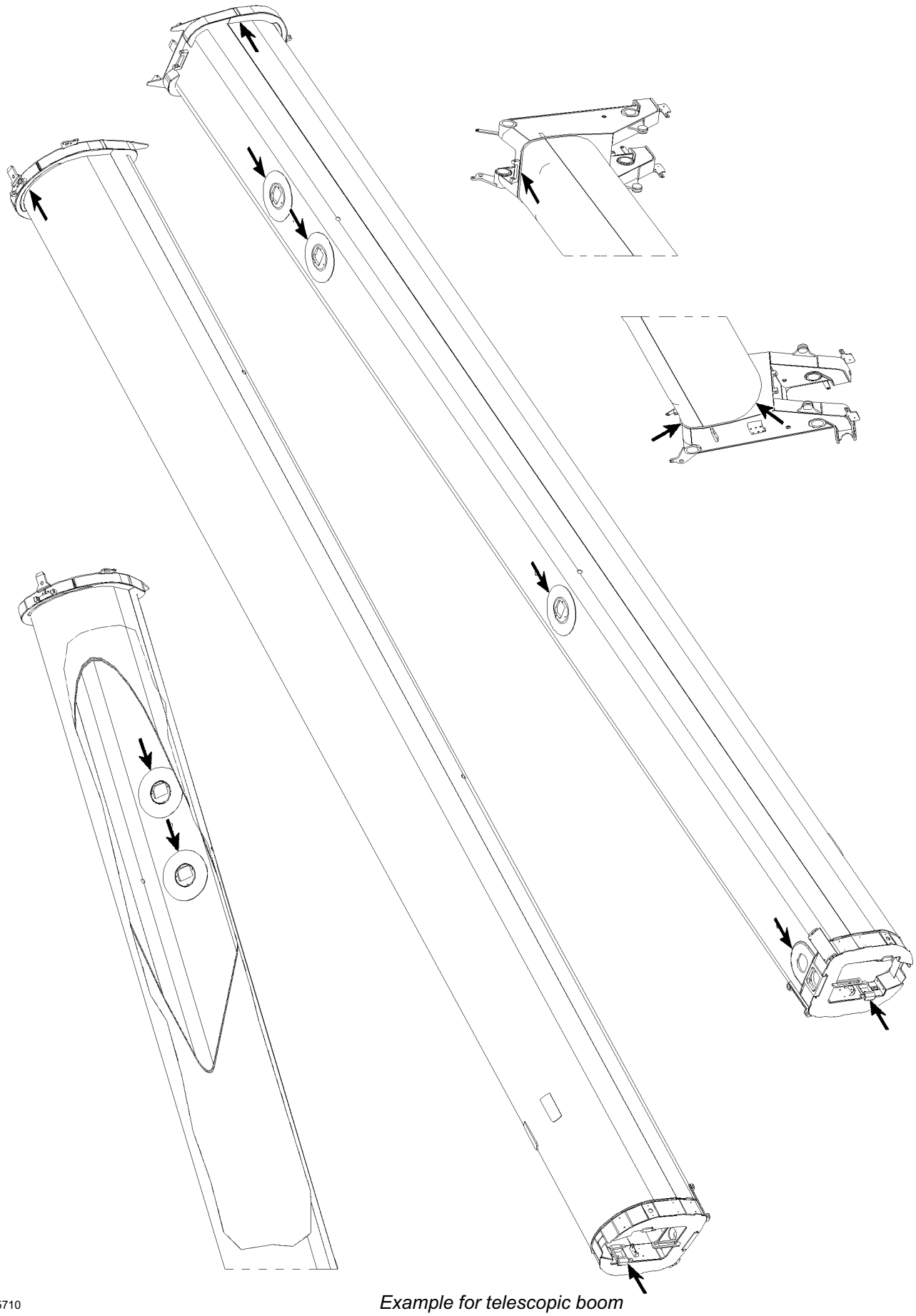
B105705 *Example for mounting plate*



B105807 *Example for base plate*

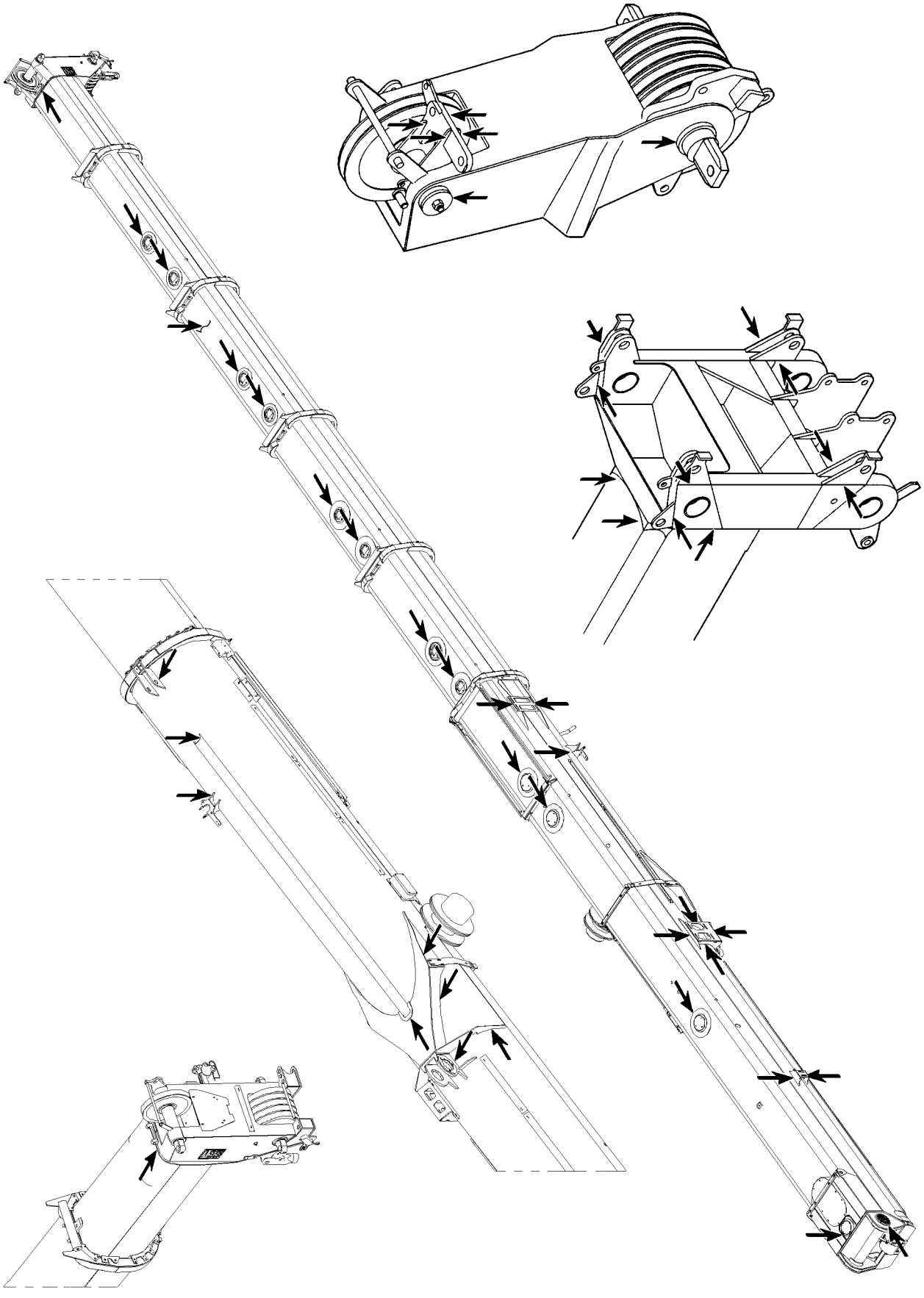


B185050 *Example for telescopic boom*



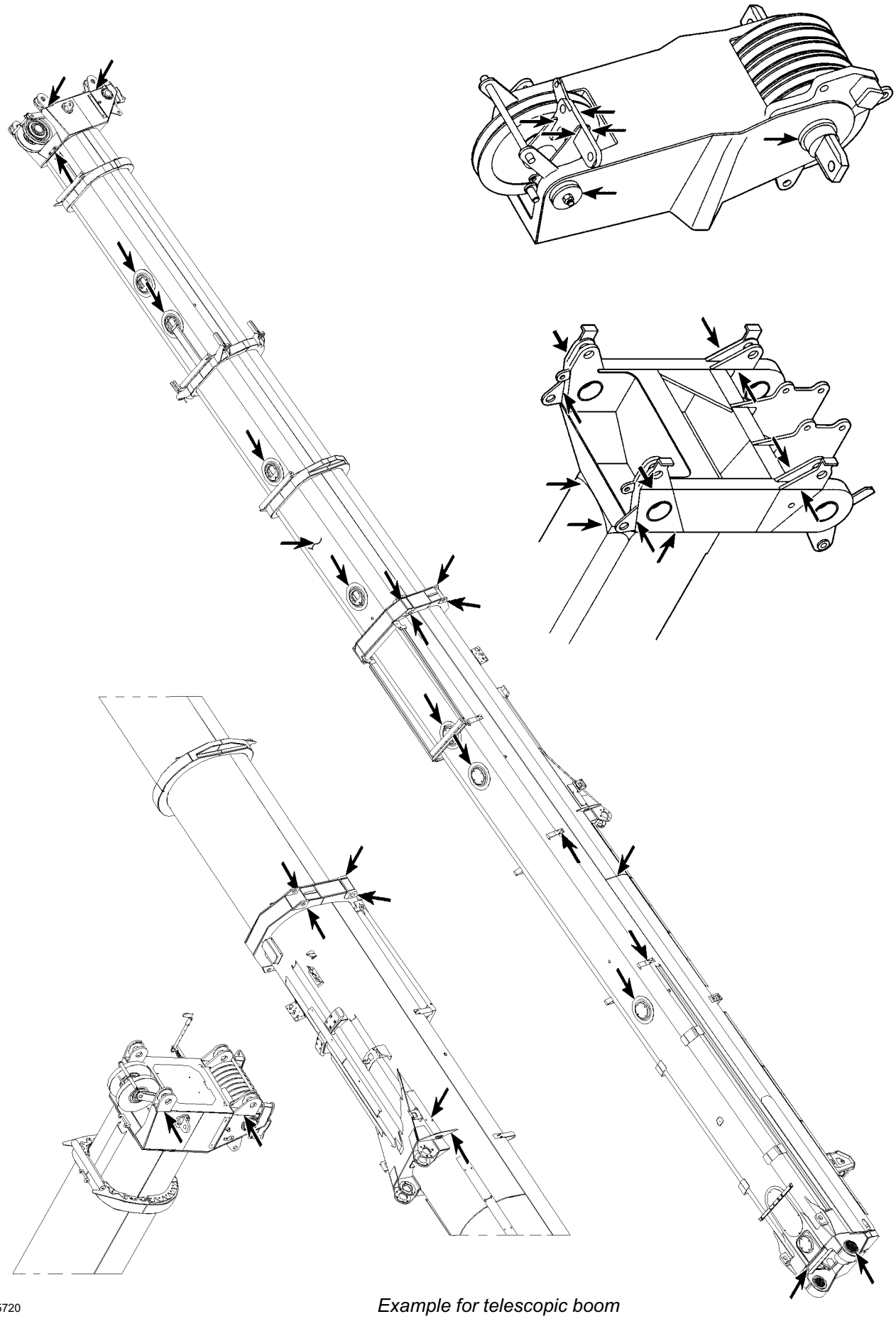
B105710

Example for telescopic boom



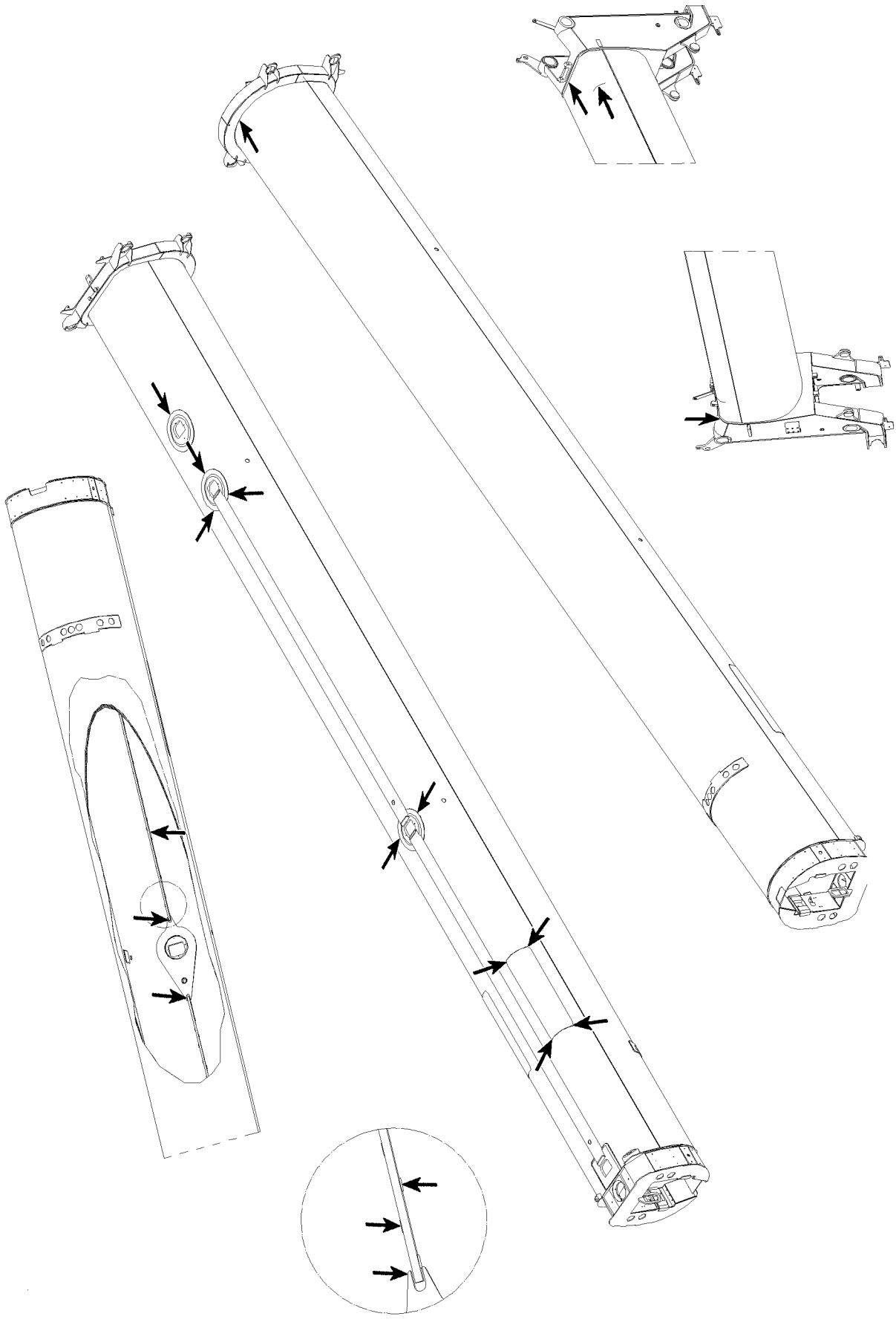
B105711

Example for telescopic boom



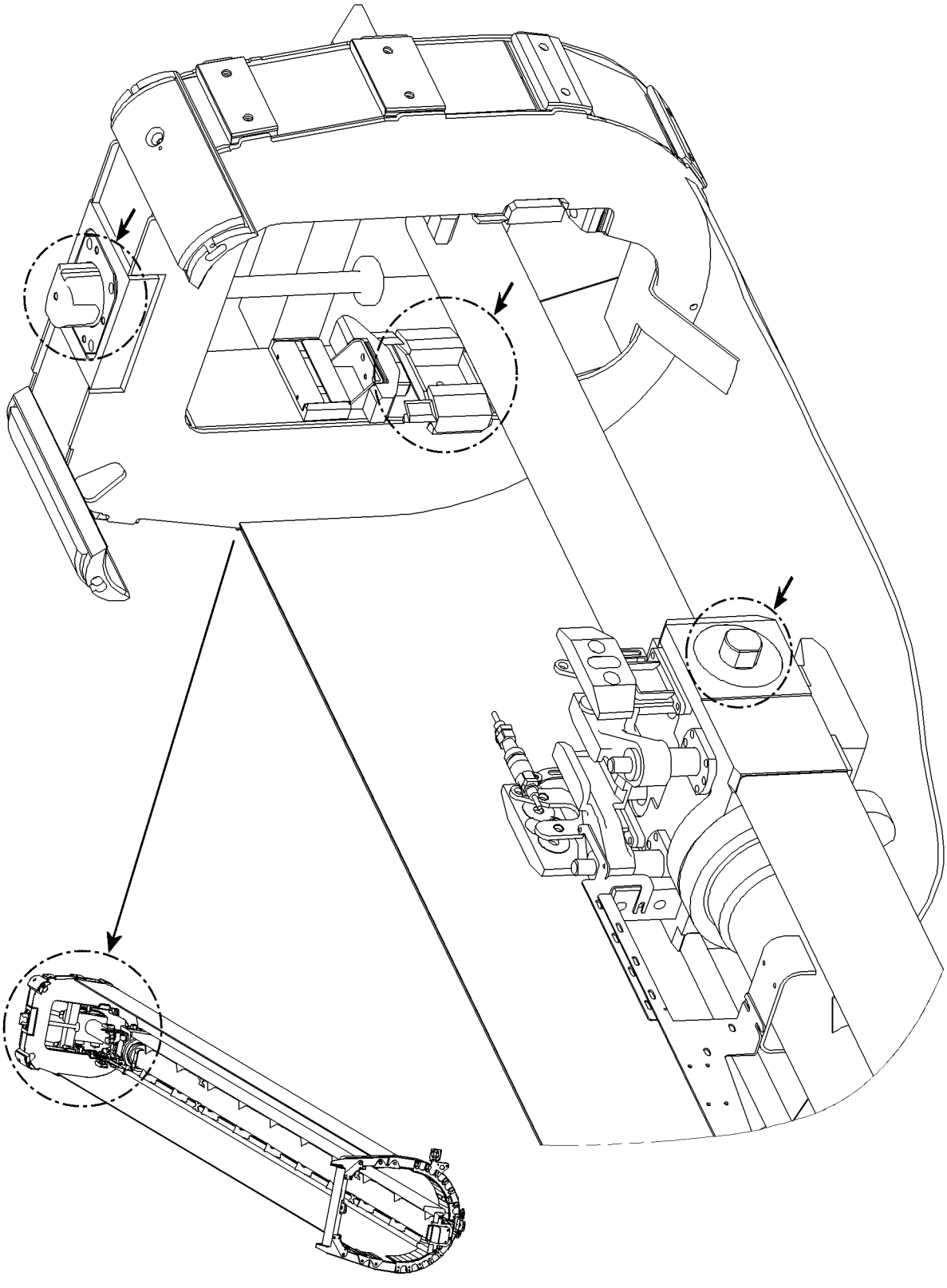
B105720

Example for telescopic boom

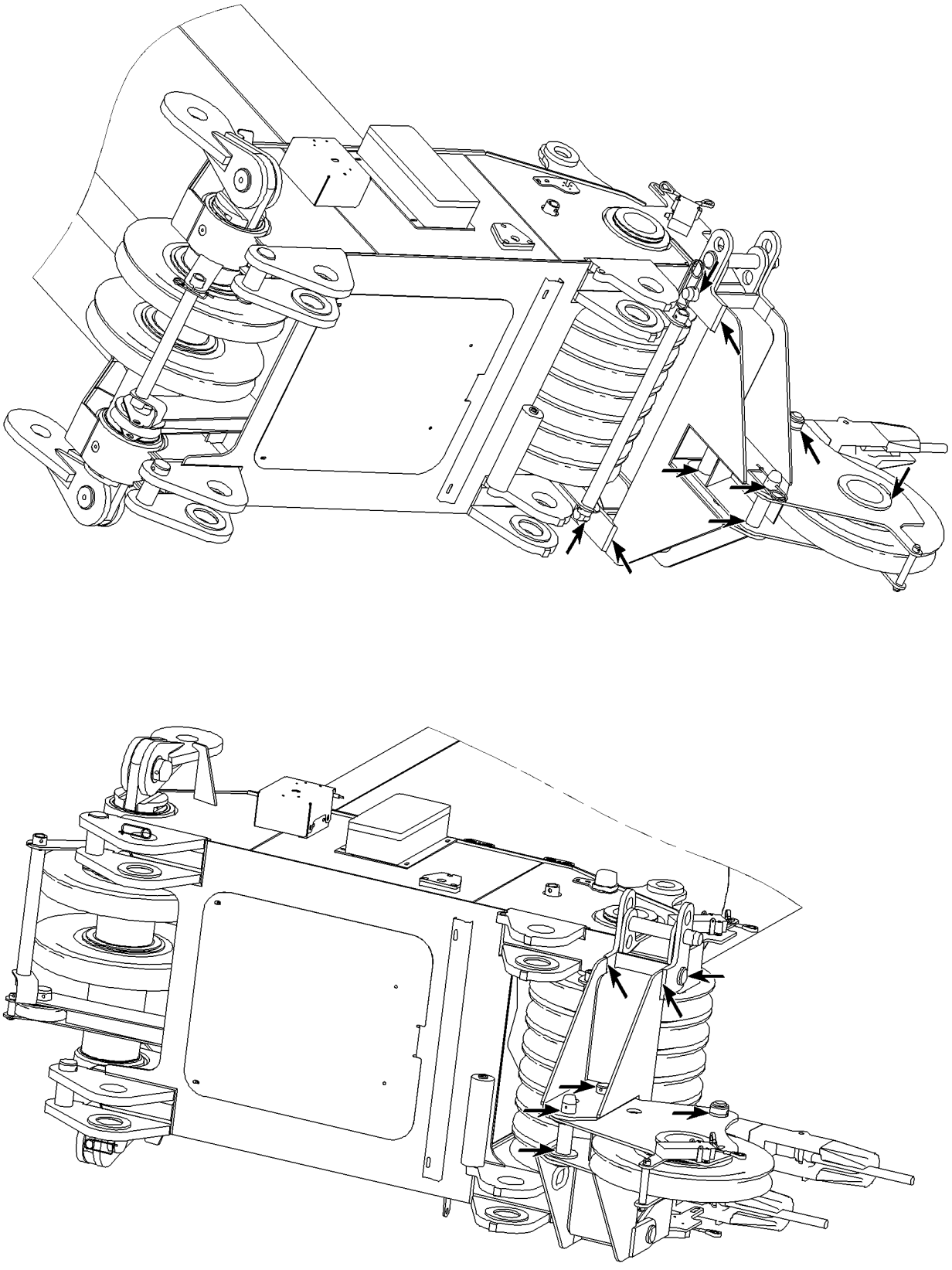


B105721

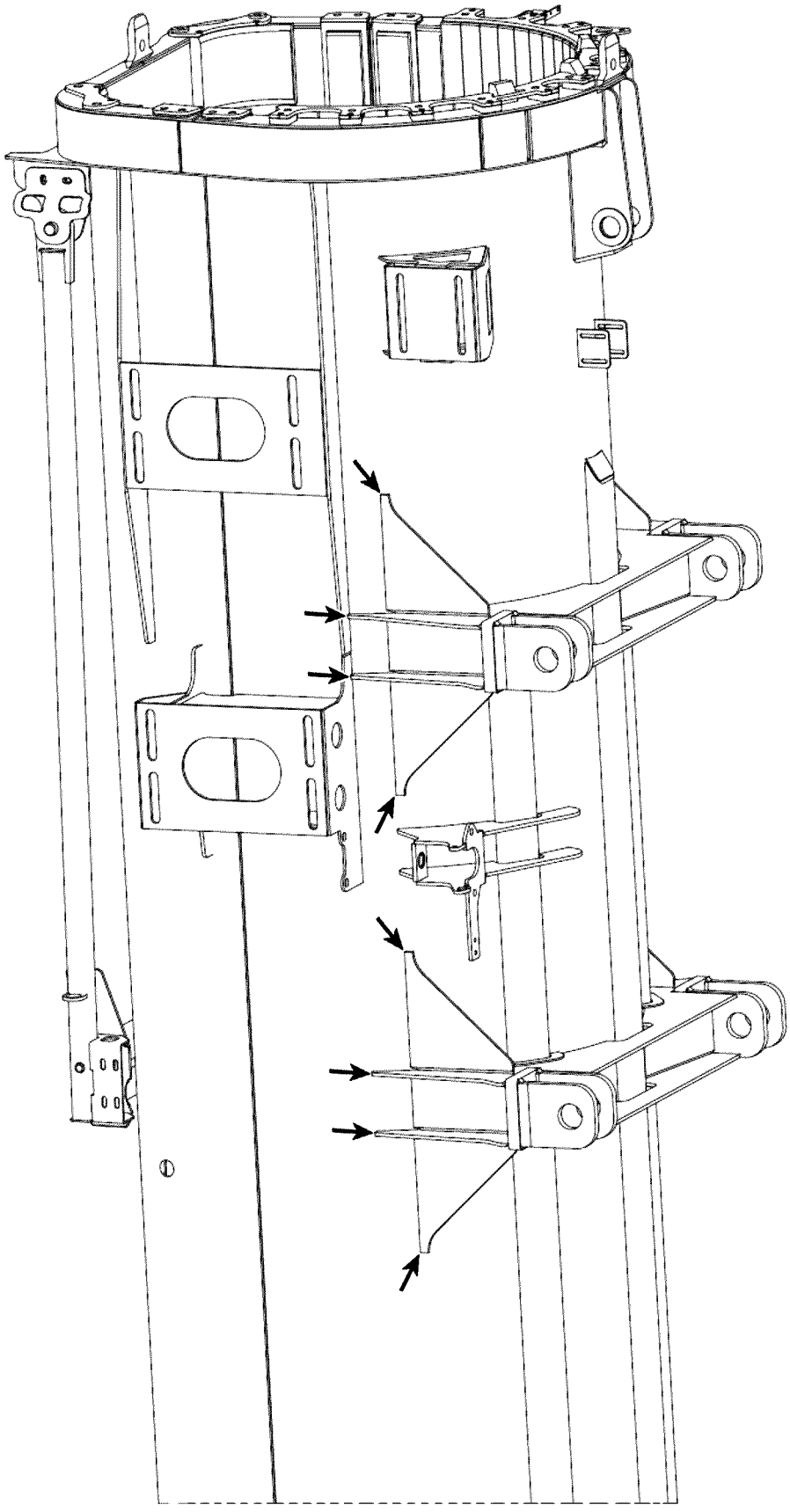
Example for telescopic boom



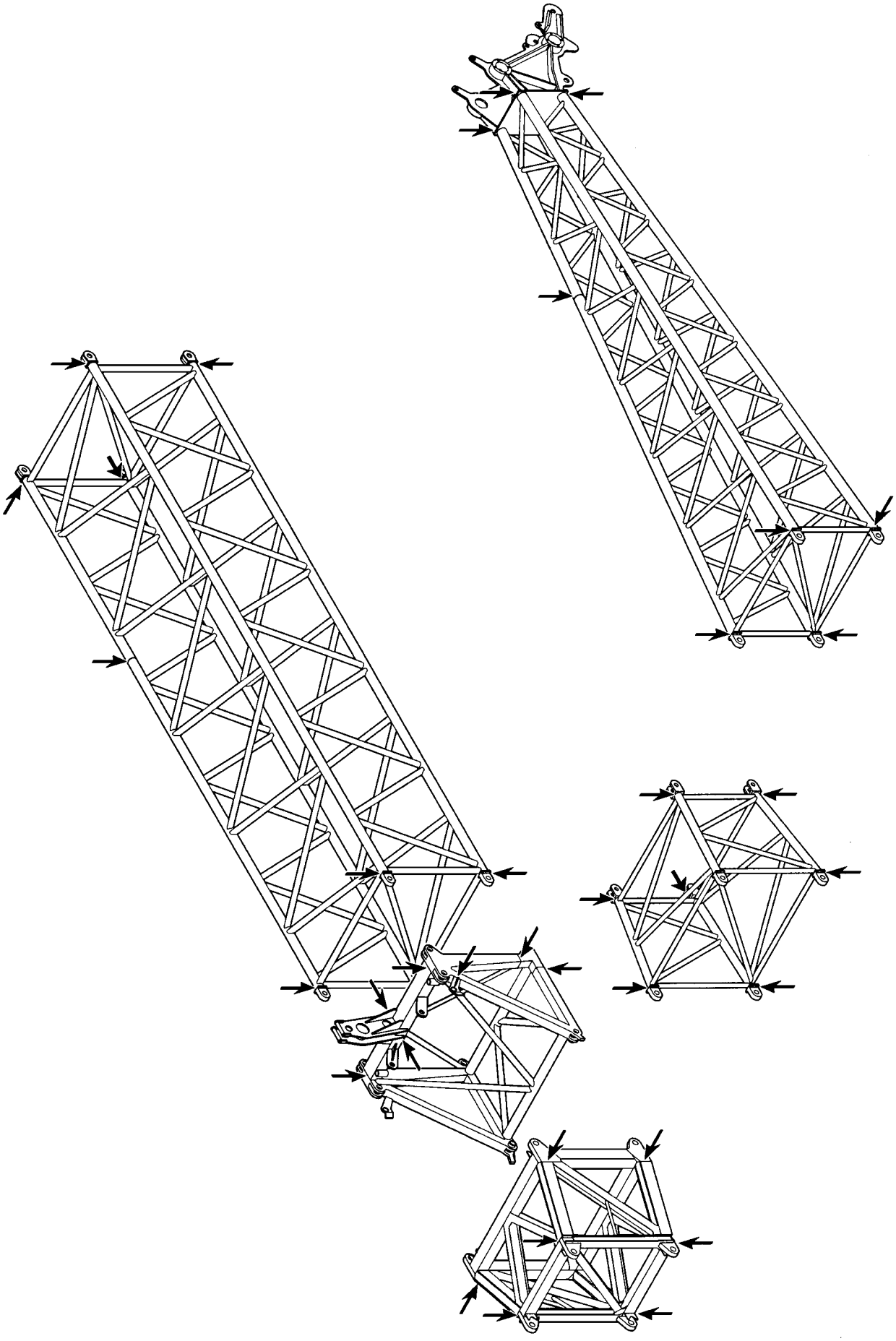
B105891 *Example for push out mechanics telescopic boom*



B105892 *Example for boom nose*

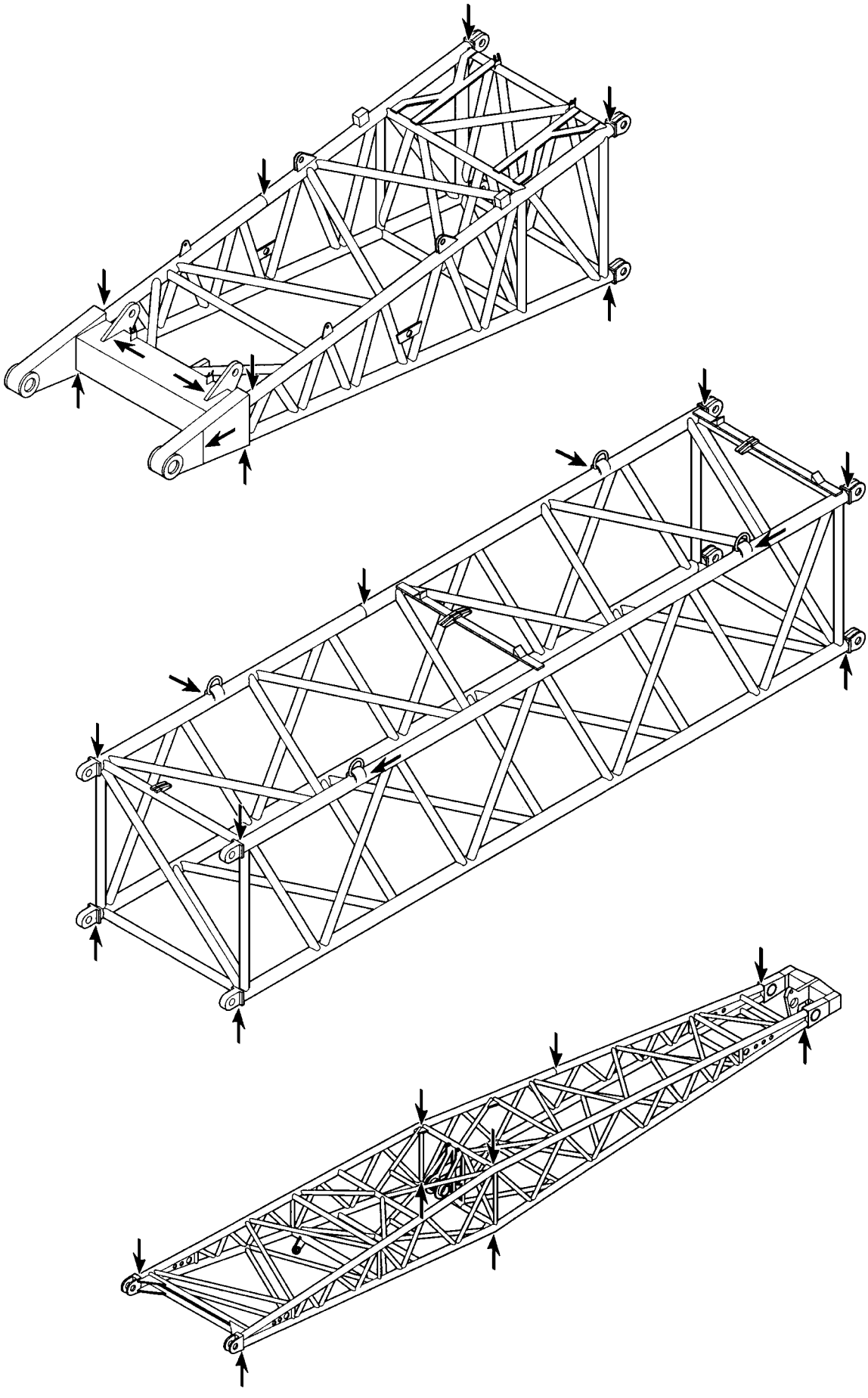


B105689 *Example for dolly console*



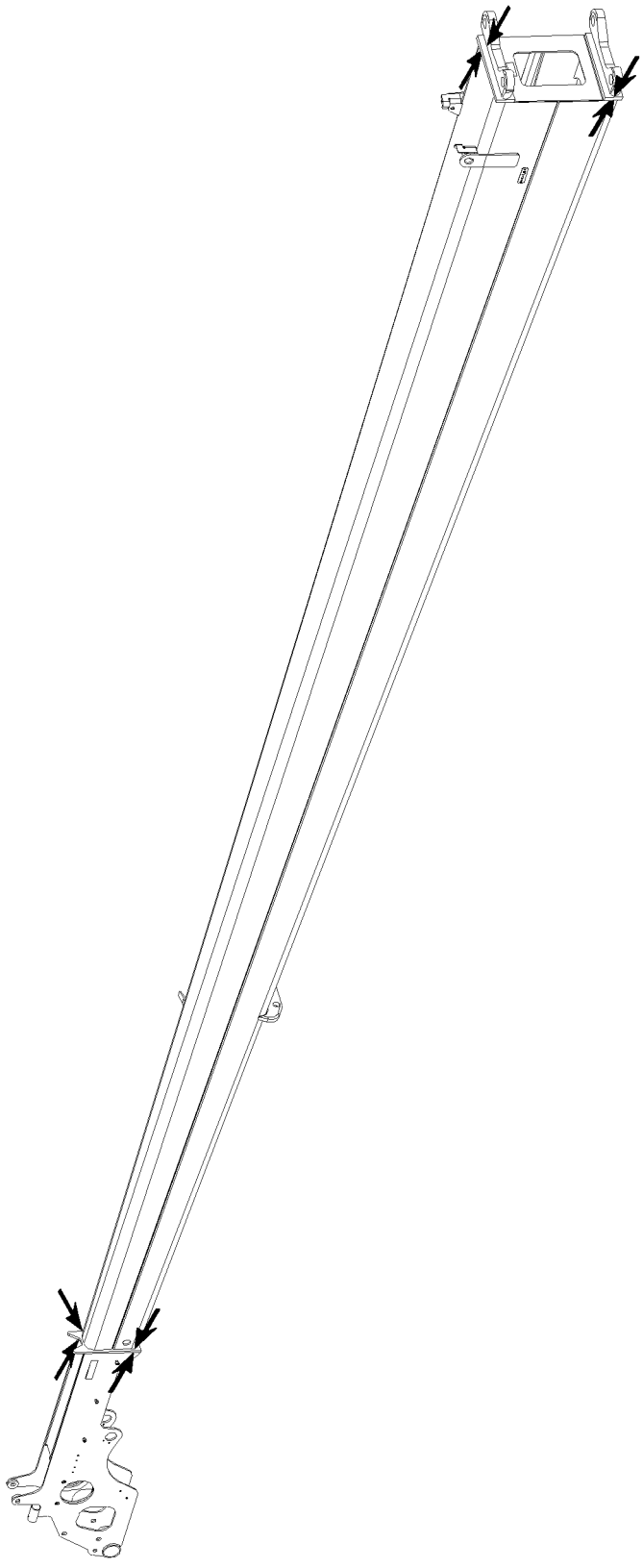
B185051

Example for lattice jib



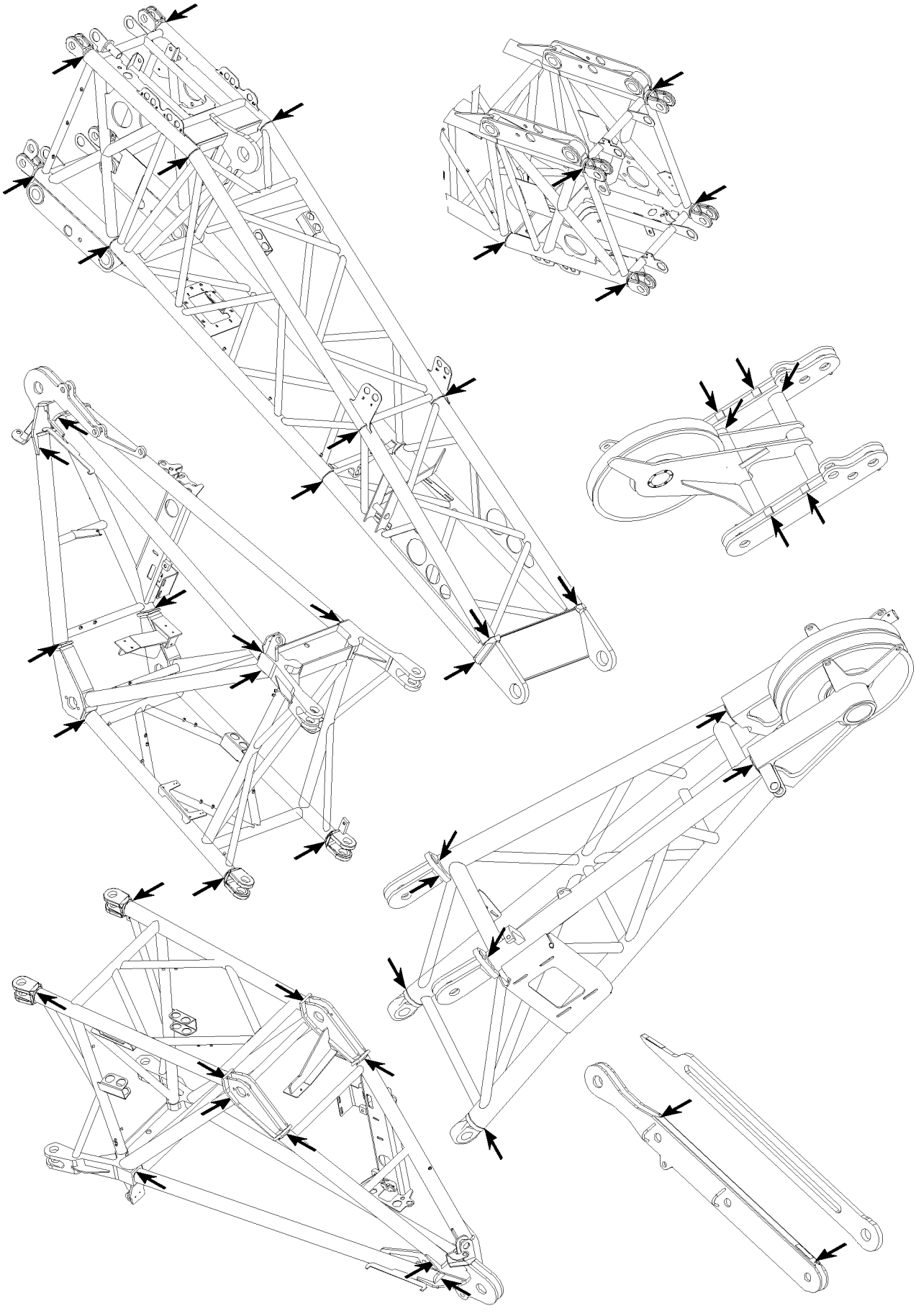
B185052

Example for NA / WA frame



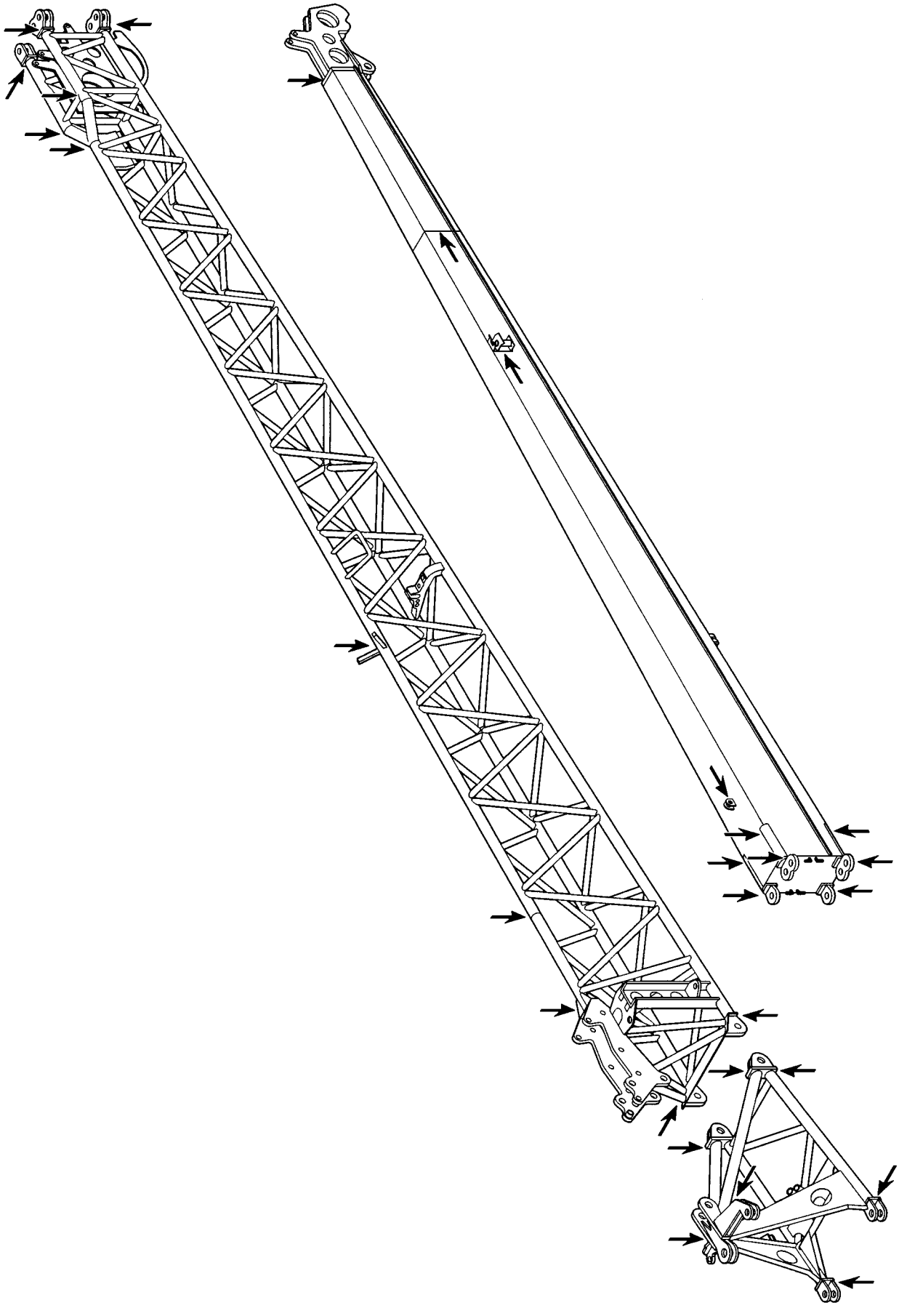
B105713

Example for end section



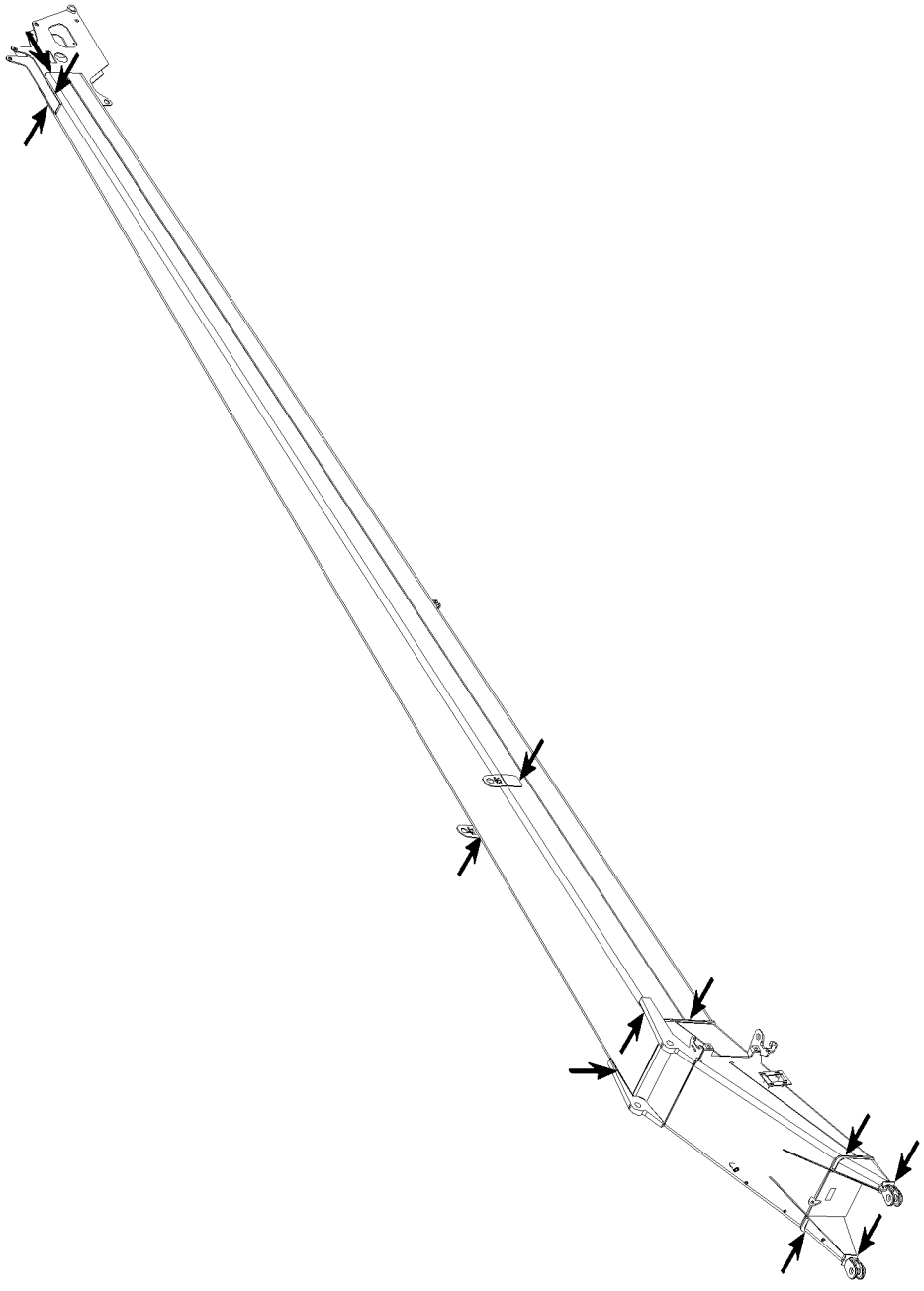
B105836

Example for pivot section, adapter and boom nose

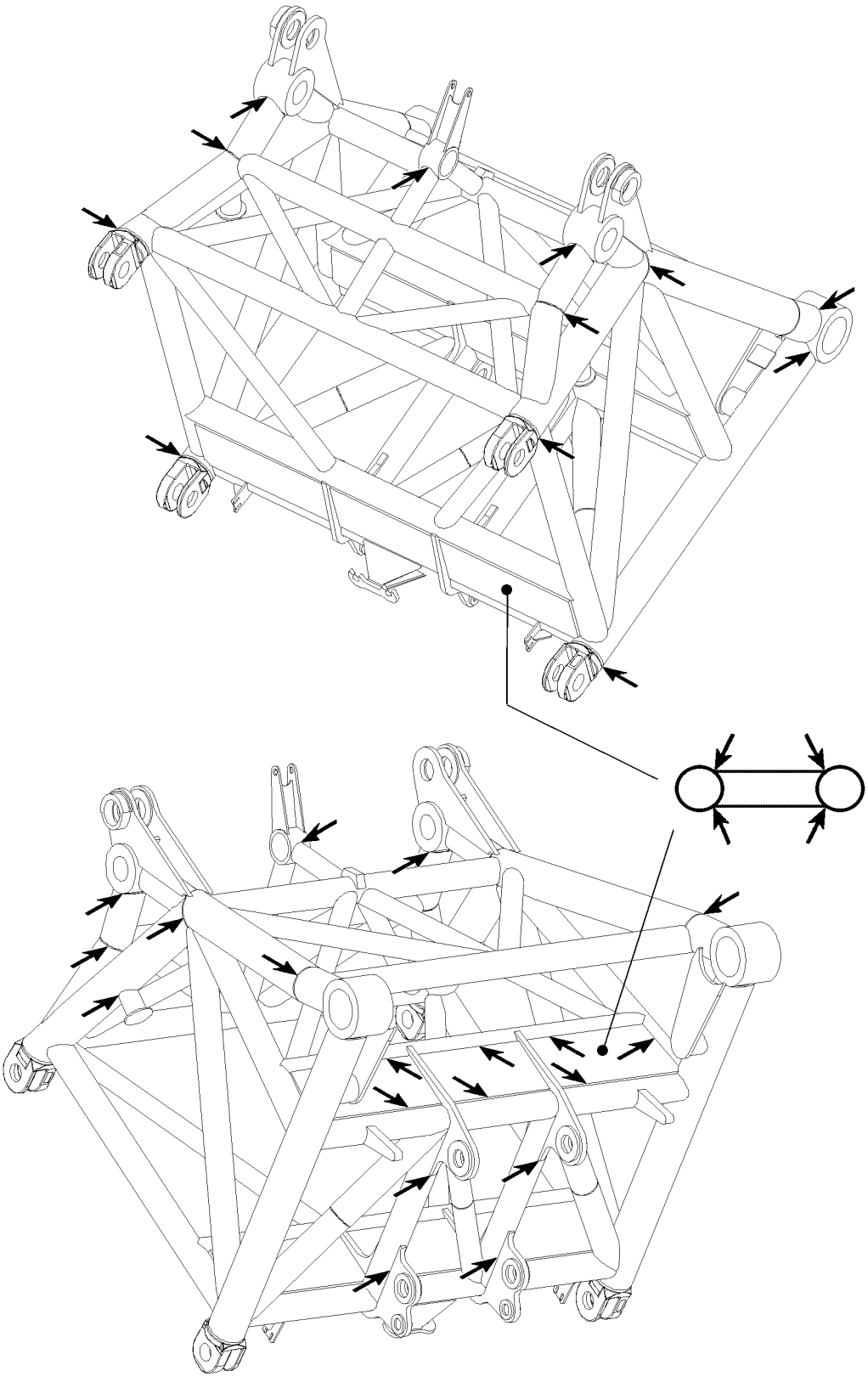


B185058

Example for folding jib

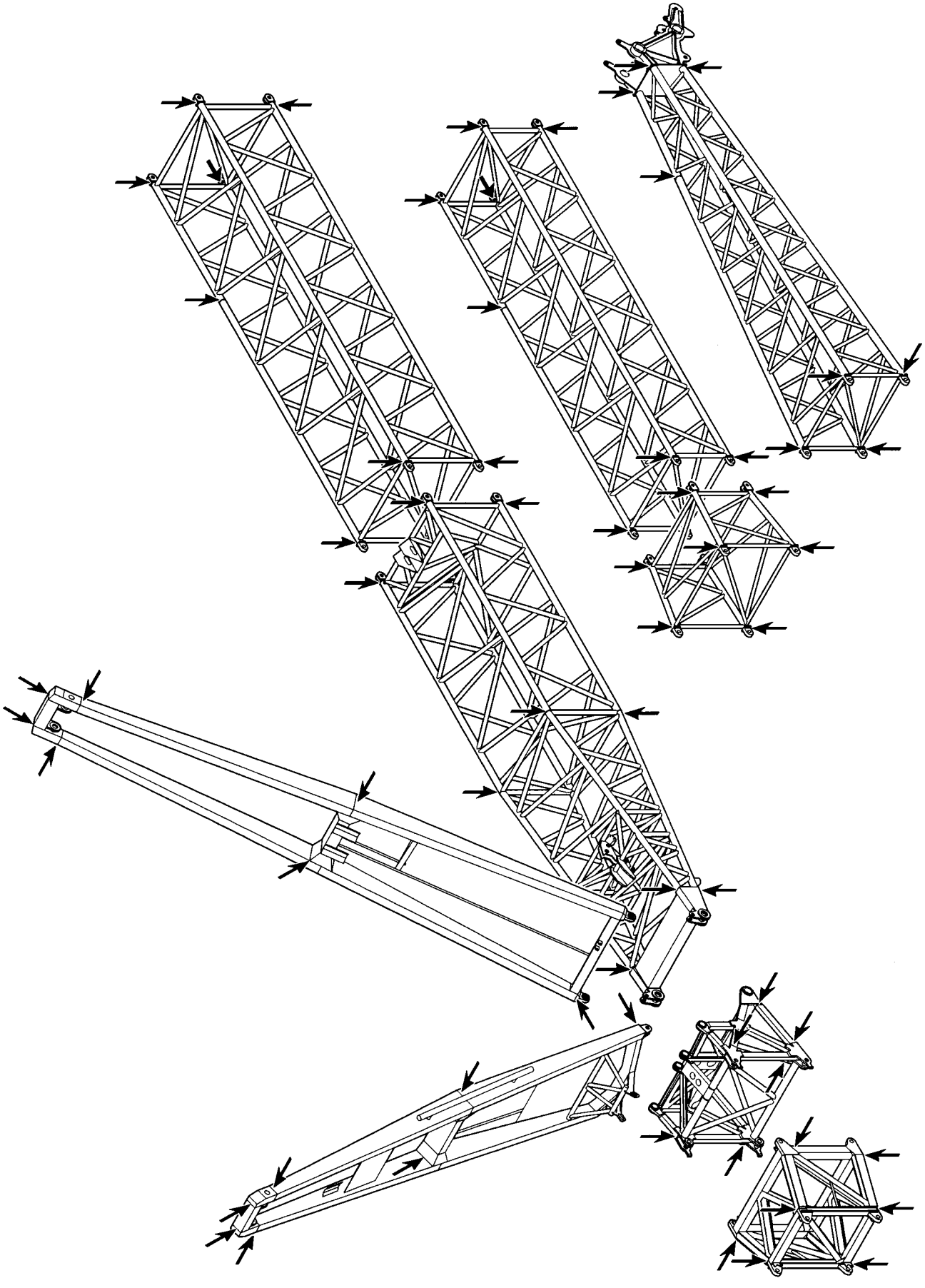


B105697 *Example for folding jib*



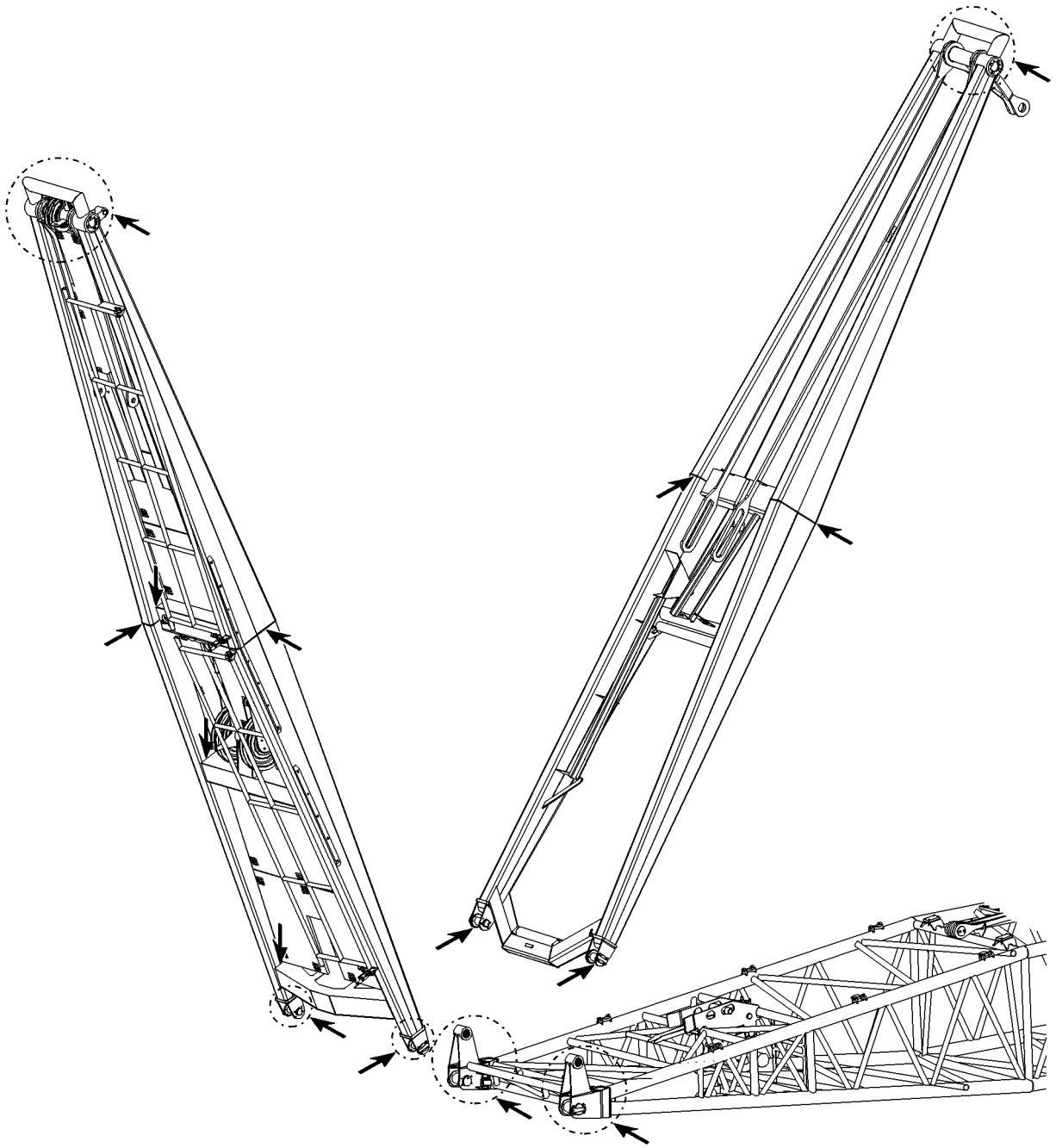
B105732

Example for W-connector head



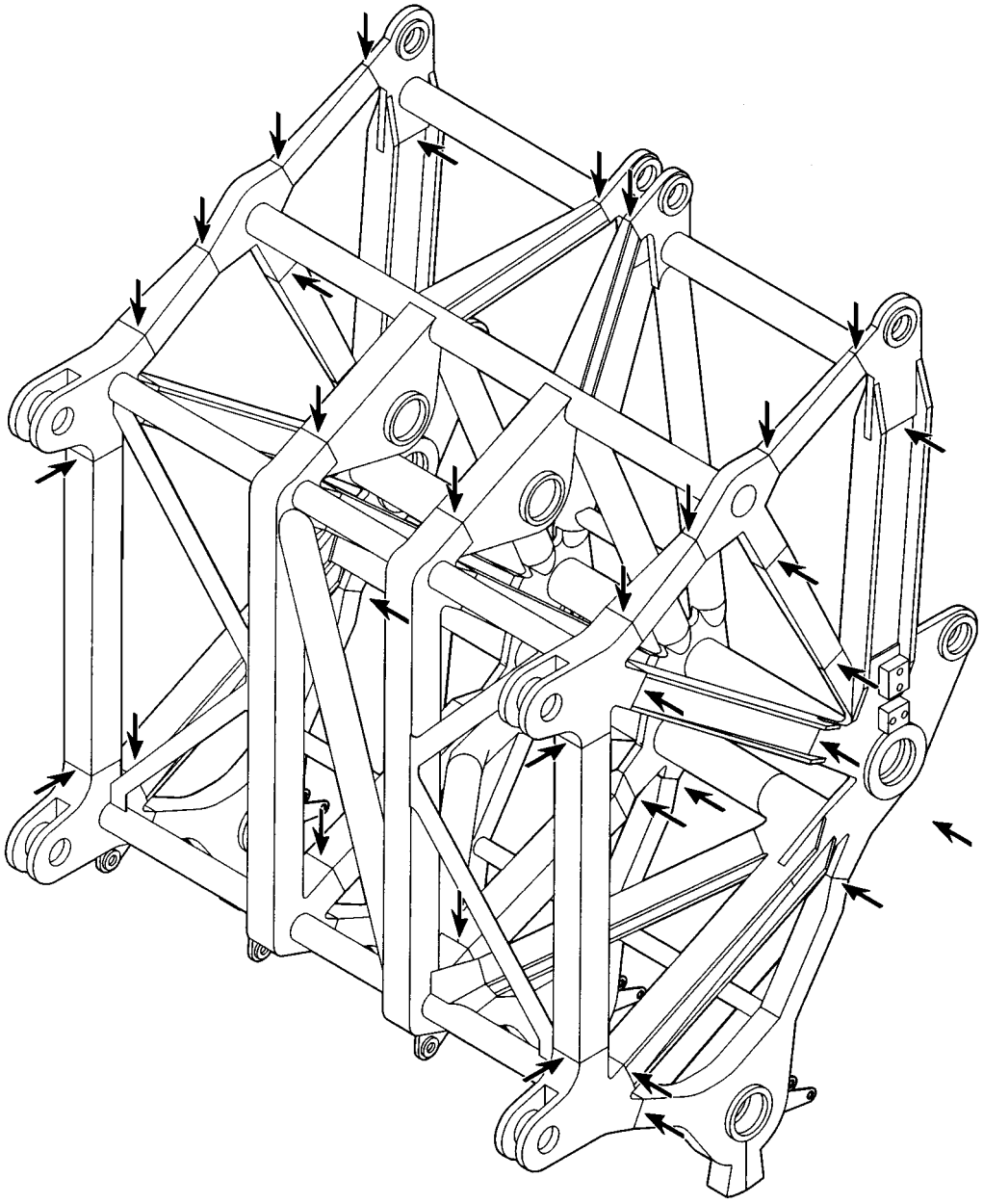
B185053

Example for assembly unit with lattice jib

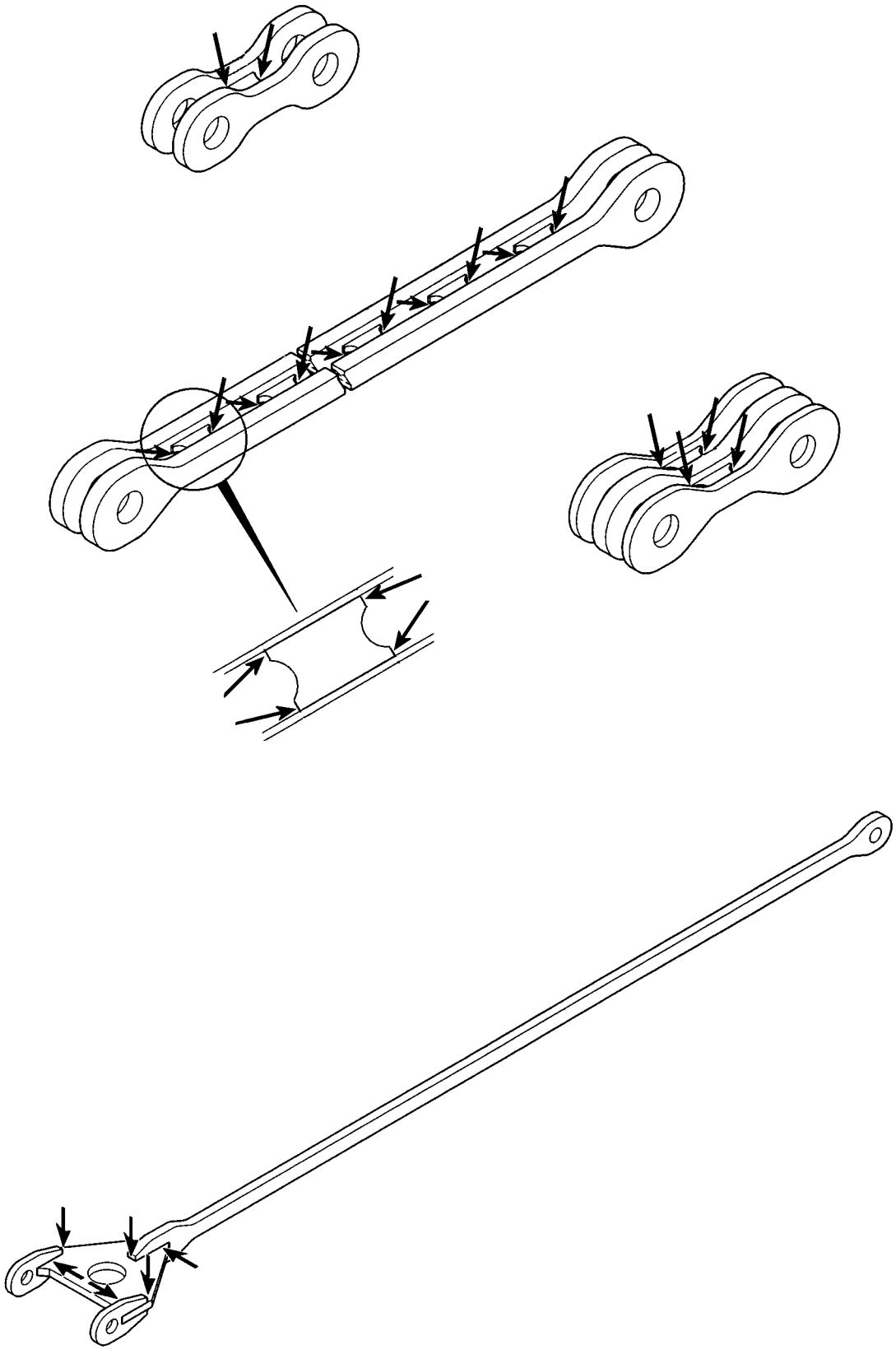


B105838

Example for NA frames

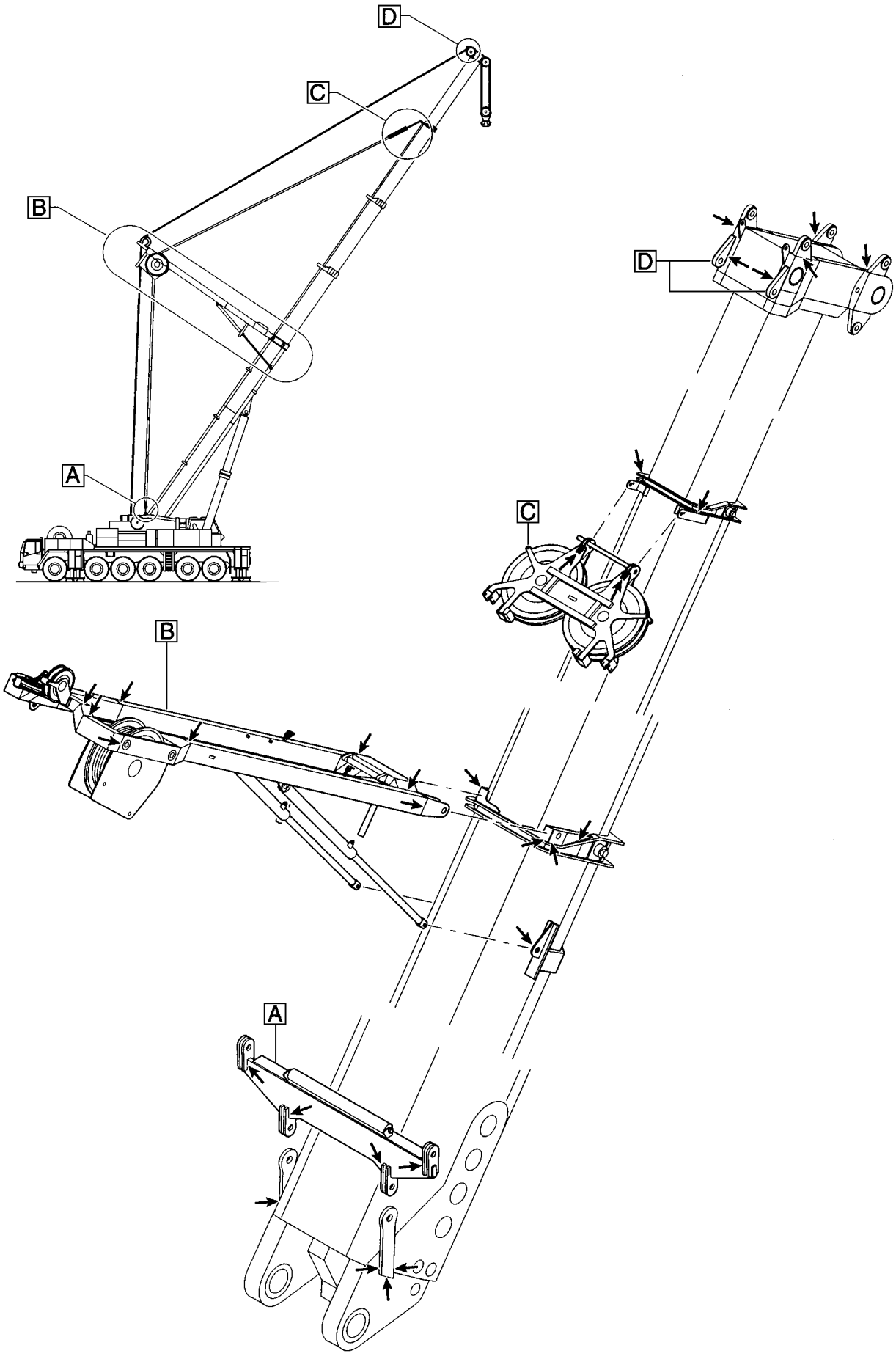


B185054 *Example for pulley head*



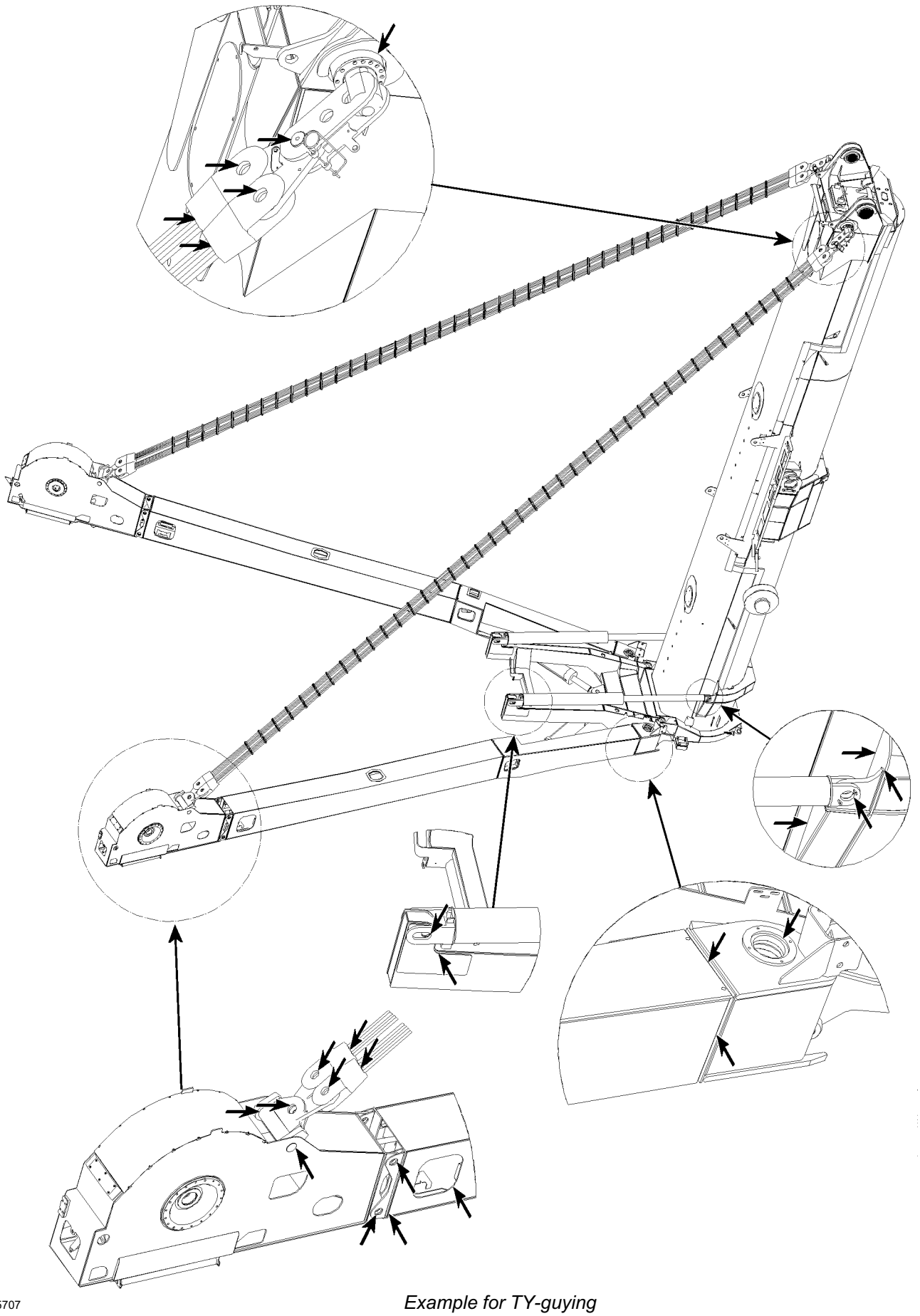
B185055

Example for guy rod



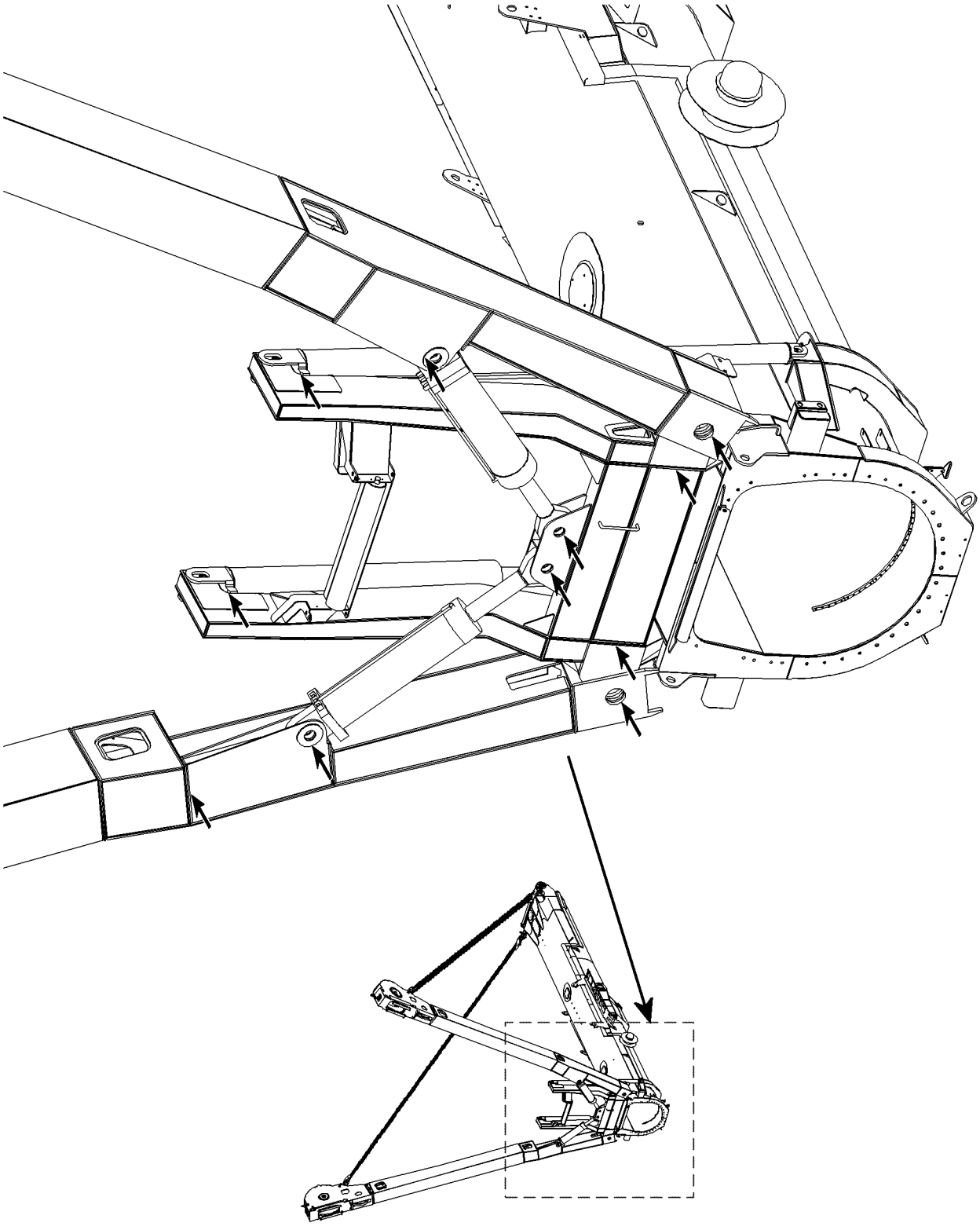
B185059

Example for TA-guying



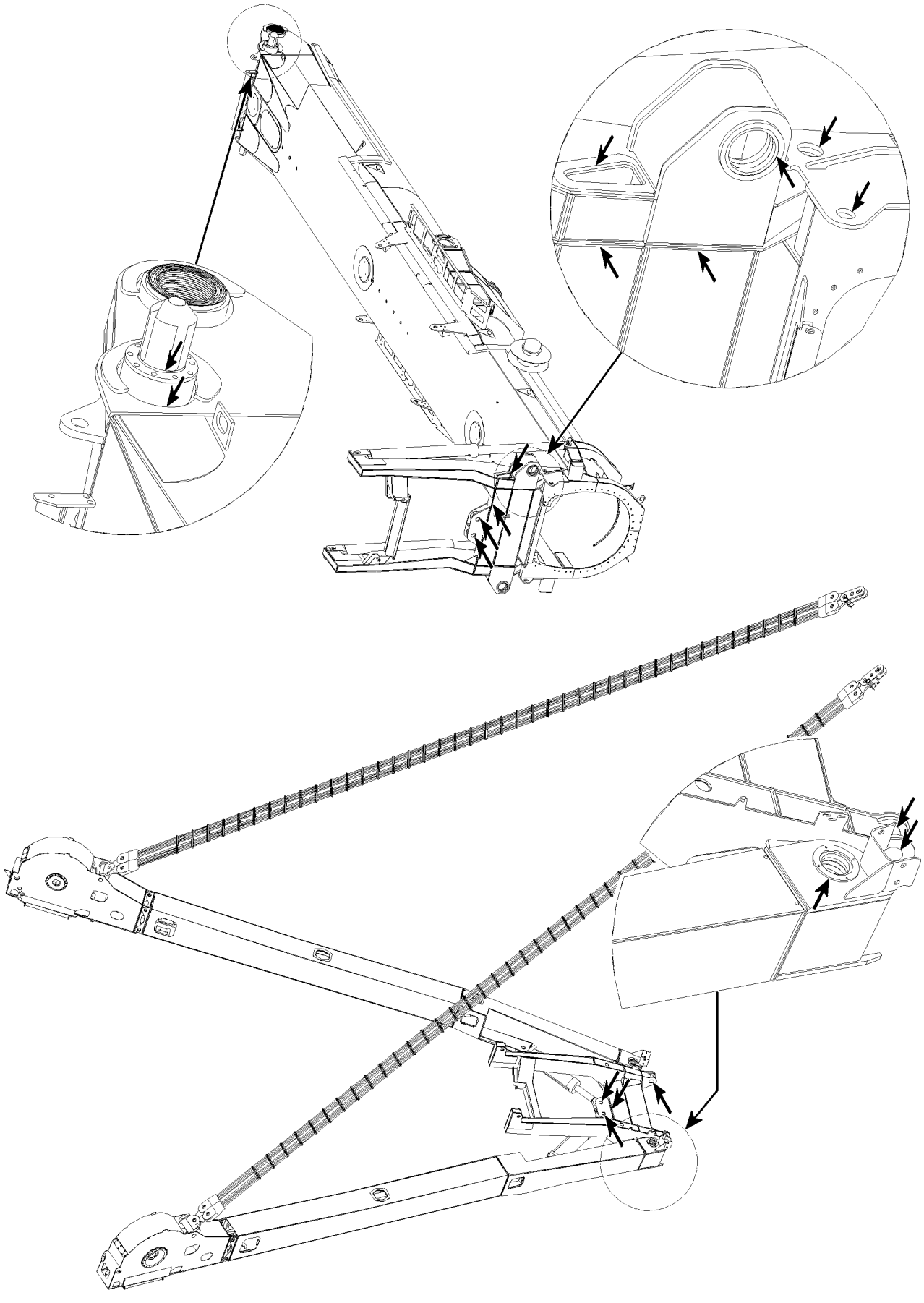
B105707

Example for TY-guying



B105708

Example for TY-guying



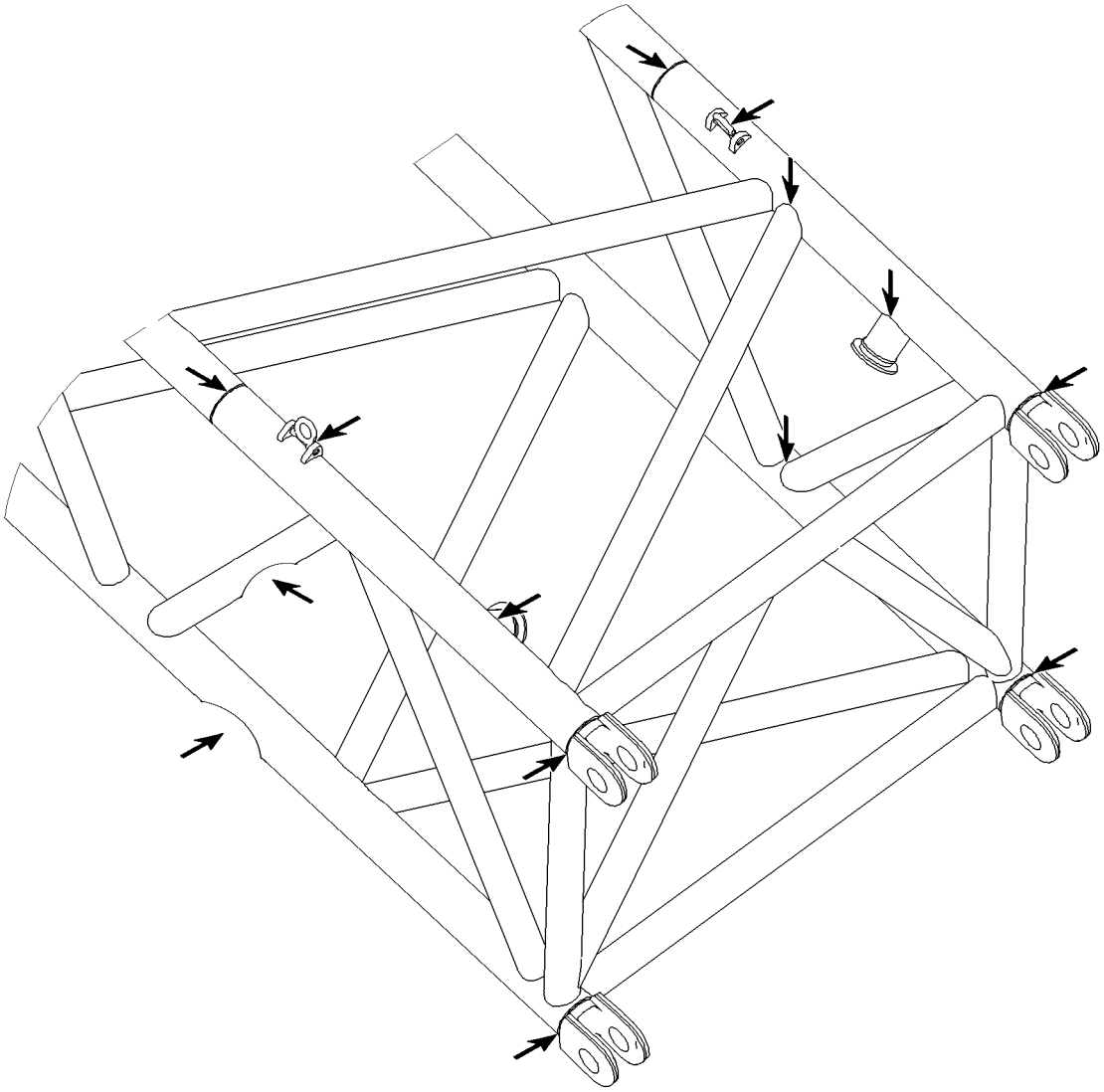
B105709

Example for TY-guying

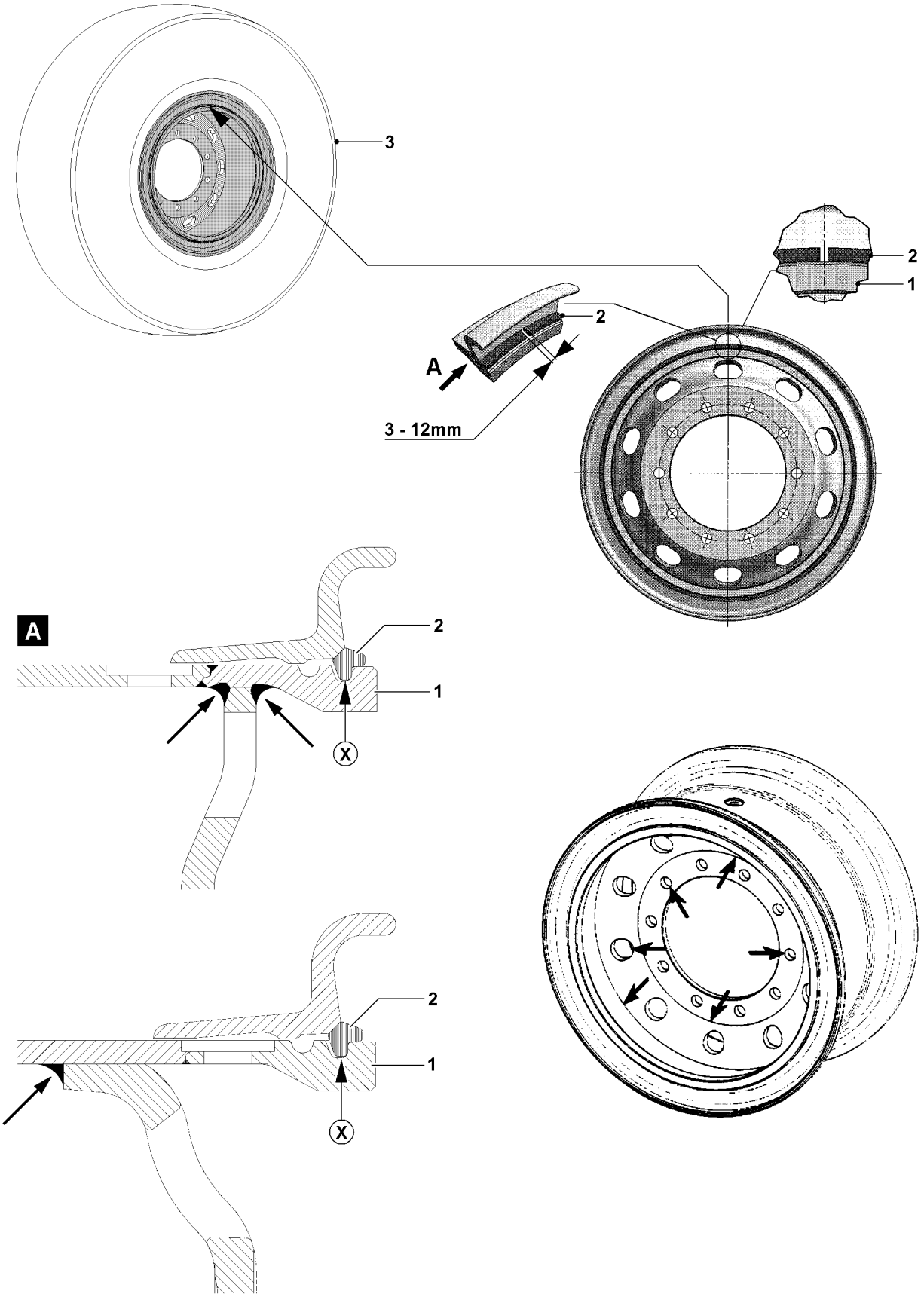
2.2 Inspection of lattice sections

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



B107378

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 or gravel)!

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 assembled 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 inspected 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 duty cycle.
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 in the brake drum fastening on the inside or outside of the disk wheel.
– Weld seam connection on inside or outside of disk wheel.
– Damage to side and locking rings.
– Damaged wheel bolts 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:
  Make good the wheels by removing the rust using commercially available paint. Pay special attention to having a perfect surface in the tire seating areas.

4 Inspecting the hoist and luffing winches

The hoist and luffing winches are designed using integrated planetary gears. 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, if 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

The used oil is to be dribbled on special filter fleece. Visual inspection using 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 damages!

- ▶ Repairs may only be carried out by specialists with appropriate technical knowledge!

4.1.5 Visual inspection for leaks

The gearboxes shall be checked for leakage, since loss of oil, in addition to polluting the environment, can lead to gearbox failure.

4.1.6 Inspecting the gearbox brakes

Check the brakes each time the gearboxes are inspected.
Proceed as follows:

– Attach a load, which creates the maximum rope pull in the uppermost layer of the winding, and raise it just off the ground.
– Remove the plug on the brake lifting 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 Dept. 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 damages!
▶ 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, shall be documented by the competent or authorized inspector, including attachments from the inspection labs and qualified service companies if any.
This documentation shall be filed in the crane inspection log under the heading "Periodic inspections".

4.2 Requirements for monitoring the winches

4.2.1 Design life

The designer of your crane used a theoretical total operating time when designing and sizing the winches. This resulted in the design 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 “design life” is not equal to the real (true) 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 braking of the load.
  • Load falling onto the cables.
– Improper maintenance:
  • Using the wrong type of oil.
  • Too much or too little oil.
  • Contamination during oil changes.
– Assembly errors during repair and maintenance.
– Undetected leakage.
– Incorrectly set safety devices.
– Hidden damage from accidents.
– Extreme environmental conditions:
  • Extreme temperatures.
  • Corrosive atmosphere.
  • Dust and dirt.

4.2.2 Actual usage component of the design life

The crane operator is obligated to carry out an inspection of the crane at least once a year.
At this time, the actual usage component of the design life shall be calculated. If necessary, the crane operator must contract an authorized inspector.
The actual operating conditions (duty cycle) and the winch operating hours at each inspection interval are required to determine the proportion of the design life that has actually been used. The operator is responsible for the documentation in the crane inspection log.

Determining the operating conditions (duty cycle)

The load spectrum of the crane is divided into groups, please refer to ISO 4301/1.
One of the following duty cycles shall be selected and recorded in the crane inspection log for the respective inspection interval based on knowledge of the actual operating conditions. A more precise determination of the load spectrum is permissible.

Duty cycle class: Light L1

Definition:

Power train or parts thereof are subjected to maximum loading in exceptional cases, but normally only operate at very light loads.

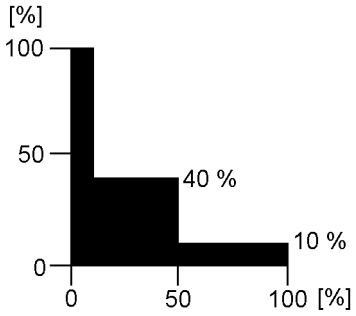
Operating time rates:

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 operating time, with dead load only

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 loading relatively often, but normally only operate at light load.

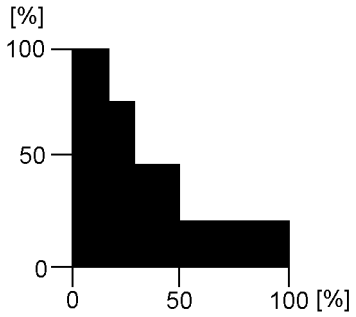
Operating time rates:

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 operating time, with dead load only

Factor of load spectrum:

Km = 0.25

Graphic view:



Duty cycle class: Heavy L3

Definition:

Power train or parts thereof are frequently subjected to maximum loading and normally operate at medium load.

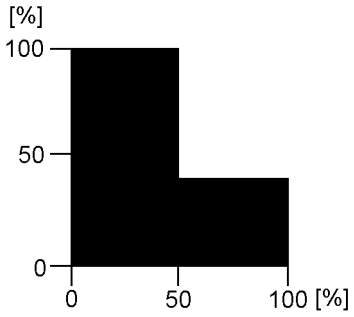
Operating time rates:

10 % of the time at maximum load (dead load and 1/1 working load)
50 % of the operating time, with dead load only

Factor of load spectrum:

Km = 0.5

Graphic view:



Duty cycle class: Very heavy L4

Definition:

Power train or parts thereof are regularly subjected to near maximum load.

Operating time rates:

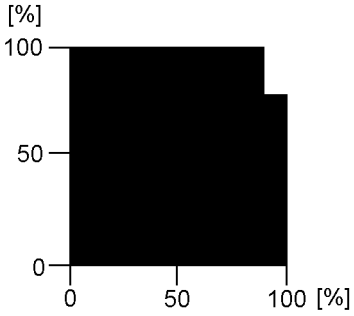
90 % of the time at maximum load (dead load and 1/1 working load)

10 % of the operating time, with dead load only

Factor of load spectrum:

Km = 1

Graphic view:



Determining the effective operating hours T_i

The effective operating hours calculated using the following method shall be entered into 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 % in relation to 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 actual usage proportion of the design life

For an inspection interval i (max. 1 year), the actually used proportion S_i of the theoretical design 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 hours proportion is subtracted from the remaining design life D_i after each inspection interval (see example).
If the remaining design life is not long enough to cover the next projected operating period, a general overhaul of the winch is required.

If the design life D has been reached (see chapter on “Design life”), 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 shall 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.
If the design life has not been reached after 10 years, continued operation of the winch without a general overhaul is acceptable, provided that 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:

– Outer visual inspection (leakage, damage, deformation, etc.).
– Oil inspection, particularly looking for metal residues.
– Load test at minimum and maximum cable tension, at maximum 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
– Design life: D = 3200 h

Actual usage proportion S of the design 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:
Duty cycle 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 design life at the time of the first inspection is therefore:

$$S_1 = \frac{0{,}125}{0{,}125} \times 160\ \text{h} = 160\ \text{h}$$

Remaining design life:
$D_1 = 3200\ \text{h} - 160\ \text{h} = 3040\ \text{h}$
The above values are recorded in the crane inspection log.

Second inspection (second year)

The crane was used at a harbor for unloading work:
Duty cycle 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 design life at the time of the second inspection is therefore:

$$S_2 = \frac{0{,}5}{0{,}125} \times 480\ \text{h} = 1920\ \text{h}$$

Remaining design life:
$D_2 = 3040\ \text{h} - 1920\ \text{h} = 1120\ \text{h}$

Third inspection (third year)

The crane was used for assembly work and occasionally at a harbor for unloading work:
Duty cycle 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 design life at the time of the third inspection is therefore:

$$S_3 = \frac{0,25}{0,125} \times 300 \text{ h} = 600 \text{ h}$$

Remaining design 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 : .....

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: .....

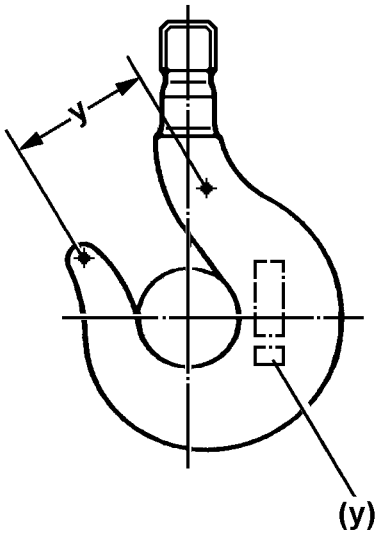
S_i = Used part of theoretical service life since last inspection
D_i = Remaining theoretical service life
D_{i-1} = Remaining theoretical service life after previous inspection
Km = Factor of load collective, which was taken for calculation of winch. This factor is to be taken from the Operating Manual
Km_i = Factor of load collective in inspection interval i
T_i = Effective operating hours in inspection interval i

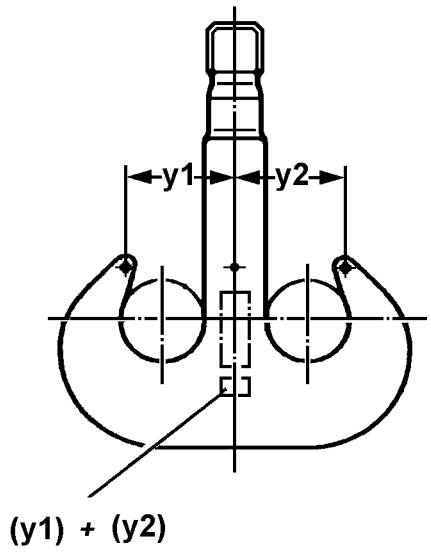
*) In the following pages, carry over the last line from the previous page.

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 expansion 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 Dept. at Liebherr-Werk Ehingen GmbH!

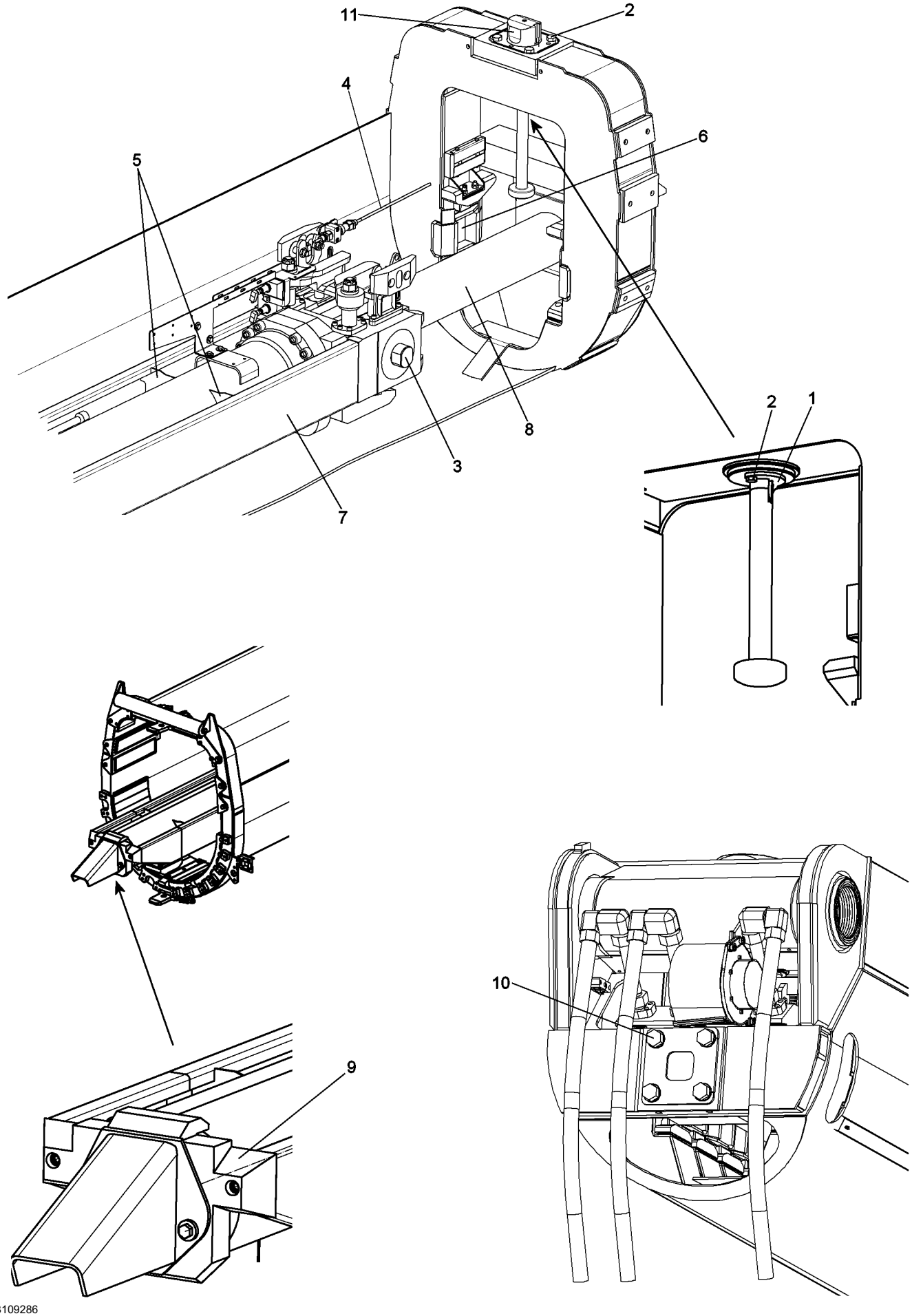
5.1.2 Corrosion

DANGER
Risk of accidents caused by thread corrosion / wear and tear!
- ▶ Stop using the load hook!
- ▶ Contact the Service Dept. at Liebherr-Werk Ehingen GmbH!

Unscrew the nut from the hook shank every 4 years so that the threads can be inspected for corrosion and wear by the inspection through 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.


11
2
4
6
5
8
3
7
2
1
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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

8 Inspection of membrane accumulator

Note
▶ The national regulations for pressurized container inspection must be observed!

The inspection of the membrane accumulators for specified gas pressure must be carried out by authorized and trained expert personnel, see Crane operating instructions, chapter 7.04, 7.05.

9 Inspection of relapse cylinders

9.1 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!

9.2 Checking the gas pressure and oil fill

9.2.1 Checking the gas pressure

Note
▶ The gas pressure may only be checked by an expert for pressurized containers!

9.2.2 Checking the oil fill

Note
▶ The oil fill may only be checked by an expert for pressurized containers!

10 Inspection of the safety controls on the relapse cylinders

For inspection of the safety control or limit switches on the relapse cylinders and the boom A-frames, see Crane operating instructions, chapter 8.12.

11 Inspecting the cable pulleys

DANGER
Risk of accident when damaged or cracked!
▶ Replace rope pulley immediately!

Inspect the rope pulleys all around once a year for damage and cracks.
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.

12 Inspecting the overload protection operation

Position the longest boom at minimum and maximum radius: Check the load indicator, using the hook block as a test load.
The indicator reading shall not deviate 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.

13 Inspecting the roller slewing ring

For tilt play dimension, see Crane operating instructions, chapter 7.05.

14 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.
Slewing ring connection mounting bolts are pre-stressed at the factory, so that no loosening of the bolted connections will occur during normal crane operation.
However, the bolted 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.
Completely remove loose bolts, plus the two adjacent ones, and immediately check for damage.
Inspect the screws, particularly for cracks or permanent distortion. If a screw has been stretched by more than 0.2 % (in relation to its original length) or if cracks or other damage are detected, then the damaged screws must be replaced. If the screws have been stretched or there is other damage, then the adjacent screws must also be replaced.

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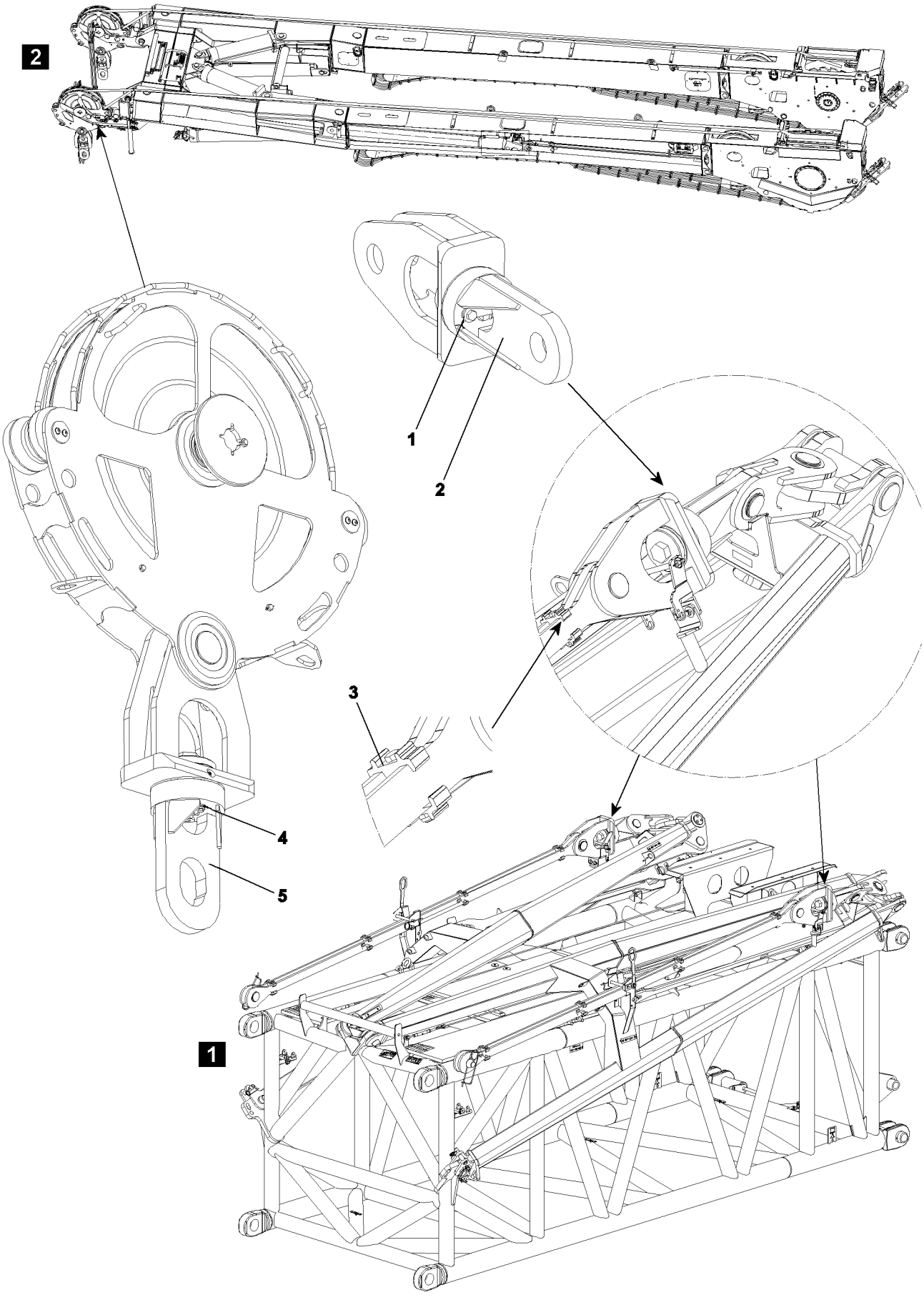

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15 Inspection of the tele extension with eccentric, illustration 1

– Inspection of twist guard **1** for damage and loose screw connection
– Inspection of rotator **2** for easy turnability
– Inspection of all clamps **3** for damage and function

16 Inspection of change over pulleys, illustration 2

– Inspection of twist guard **4** for damage and loose screw connection
– Inspection of rotator **5** for easy turnability

17 Inspecting the oil and fuel reservoirs

Visually check the oil and fuel tanks at least once a year for leaks and safe mounting.
Repairs shall only be carried out by trained and knowledgeable specialists.
Improper repairs; e.g., welding, hard or soft soldering is not permitted, particularly if the Service Department at Liebherr-Werk Ehingen GmbH has not been consulted!

18 Inspection of the auxiliary reeving winch, towing winch and spare wheel winch

Determine the design life of the auxiliary reeving, towing and spare wheel winches from their respective original manufacturer.

19 Appendix

The following is a checklist to assist the inspector during the periodic inspections of Liebherr mobile and crawler cranes.

19.1 Inspection recommendations for periodic inspections of Liebherr mobile and crawler cranes

Company:	**Checked by:**
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 / windshields						
Windshields wiper						
Mirrors						
Seat						
Heater						
Ventilation						
Sound-proofing						
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-proofing						
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						
Illumination						
Brake lights						
Indicator lights						
Tail lights						
Working lights						
Signaling systems						
Indicator lights						
Battery switch						
Limit switches: Transmission, steering, drivetrain						
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						
Rotary connection: Tilt play						
Rotary connection: Mounting screws						
Rotary connection: Gearing						
Slewing gear: Mounting screws						
Slewing gear: Gearing						

12. Inspection category: Superstructure - crane operator's cab						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Doors						
Windows / windshields						
Windshields wiper						
Mirrors						
Seat						
Heater						
Ventilation						
Sound absorber						
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 - engine						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Combustion engine						
Exhaust system						
Fuel tank						
Filter						
Sound-proofing						
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						
Illumination						

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 - load 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 switching 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						
Operating range limiter						
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 rope is of another type, then 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. Unless 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”.
In the event that 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

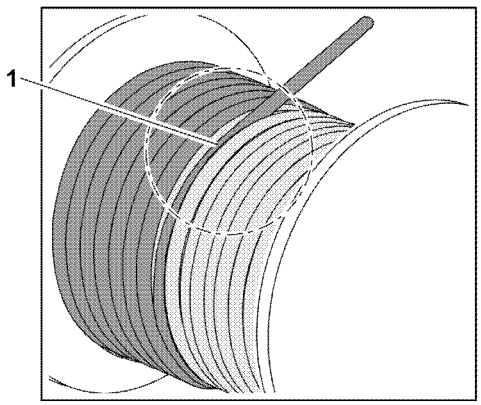
▶ If a rope is newly placed, then it must be pretensioned and placed with a pretension of at least 10 % of the maximum rope pull.

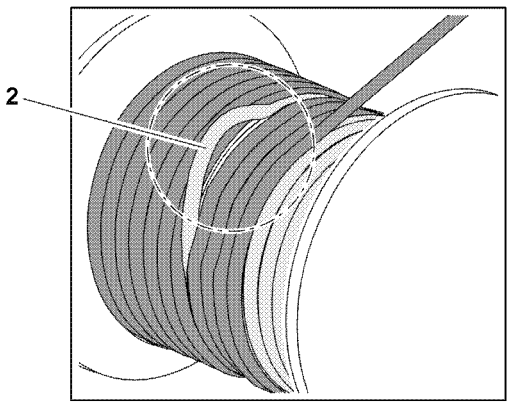
Special inspection as described in section “Points to check on the rope”

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

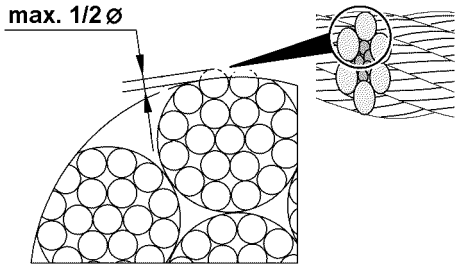
Although the entire length of the rope must be checked, particular attention must be paid to checking the following areas:

– 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 can 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 continue to be used.
The checker must investigate whether the deterioration has been caused by a fault in the system; if this is the case remedial action should be recommended before fitting 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. If 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 table, the area in which the most broken wires are found is marked to 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 table, 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 that 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.

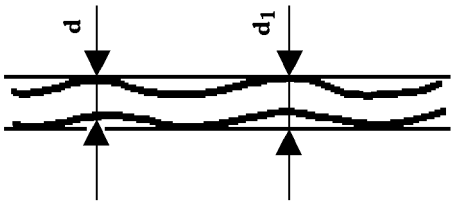
DANGER
Occurrence of internal corrosion!
▶ If the suspicion of extreme internal corrosion is confirmed, the rope must be taken down immediately.

2.5.8 Rope deformation

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 rope deformation on the basis of the rope 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 colouring that it causes, must be taken down.

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

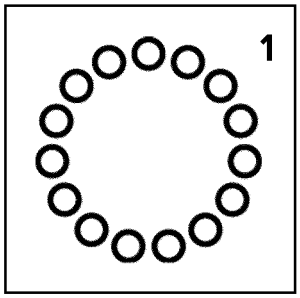
DANGER
Risk of accident!
▶ Correct choice and use of the wire rope and the rope end connections are a decisive precondition for proper and accident-free crane operation.

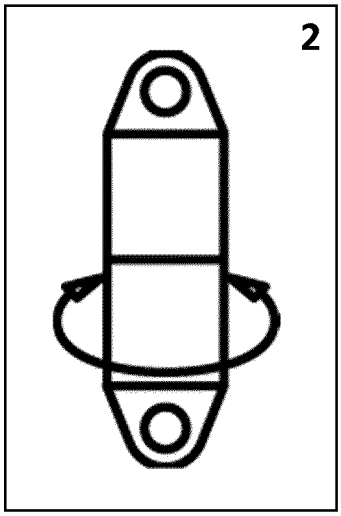
The wire ropes and rope end connections selected in accordance with their usage. It must be determined whether a rotation-resistant or non-rotation free rope is required. The type of rope that is selected then determines the type of rope end connections that are used.

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**).

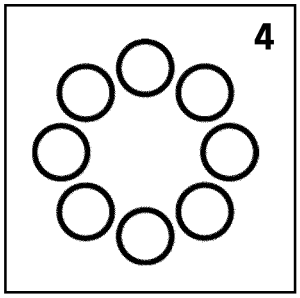
DANGER
Danger of serious personnel injury and equipment damage!
▶ **Never** use rotating rope end connections with non-rotation free ropes!

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**.

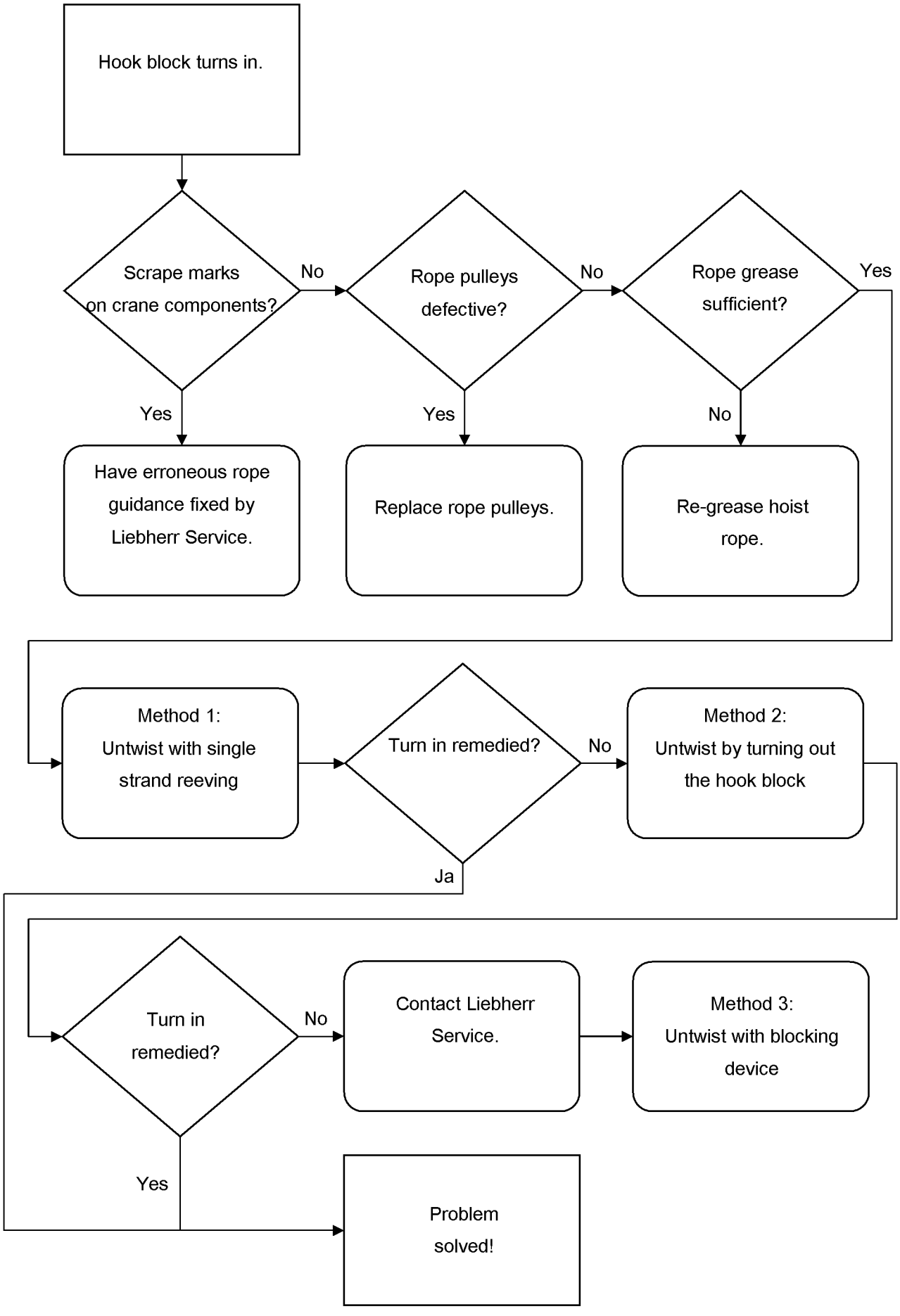


Typical non-rotation free wire rope structures are ropes with 8 to 10 outer strands. Twisting ropes are symbolically depicted with 8 outer strands (circles) (see table **4**).
Non-rotation free ropes can only be used with the following rope end connections:

– 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 serious personnel injury and equipment 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**)!


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!

B106181

8 Twisting caused by stretching in rotation-resistant ropes and its remedy

For procedure, see illustration opposite.

WARNING
Damage to the rope!
▶ Please proceed with extreme caution when performing the following actions.
▶ Please heed the following instructions to the letter.

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 features.

– 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: Spin 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.
   - **NOTICE:**
     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 the problem is not remedied by this, contact Liebherr Service.

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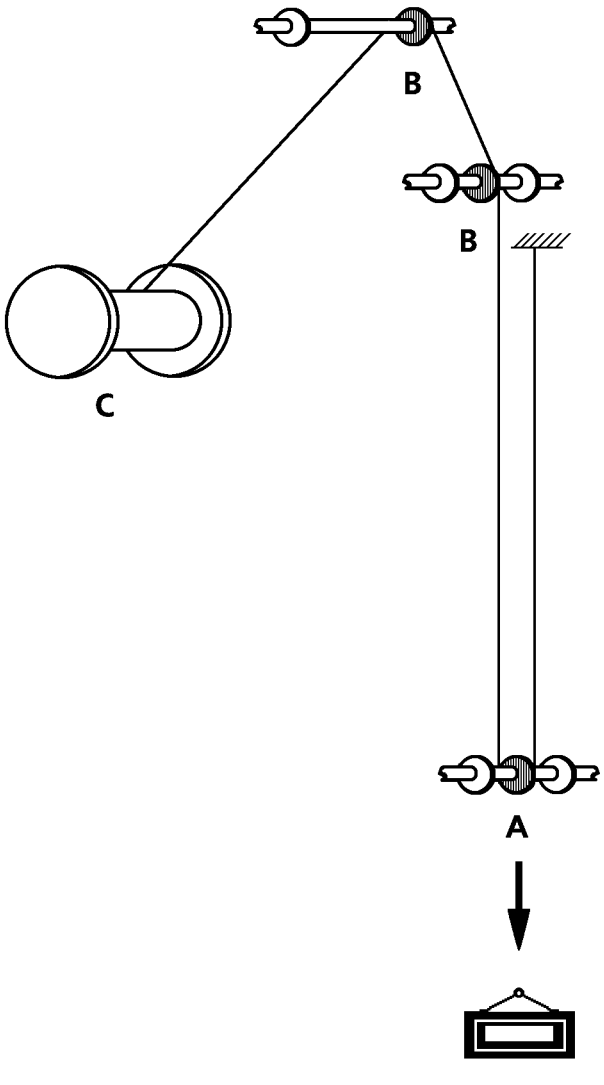

Fig. 1

B193940

A Hook block **B** Cable 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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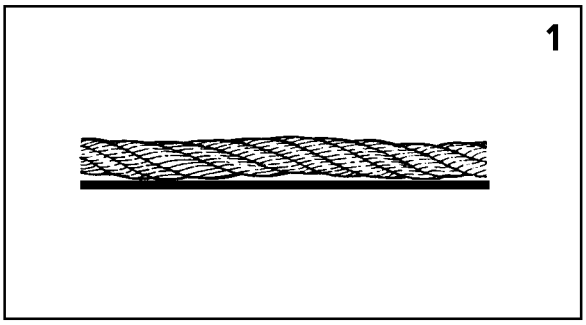
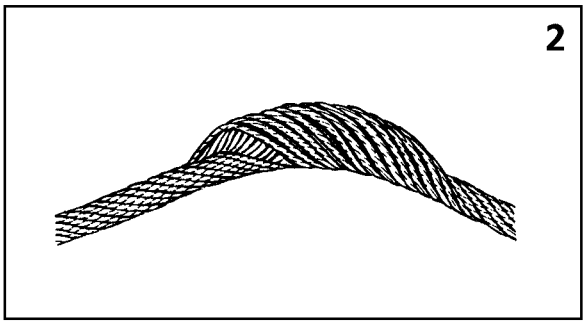
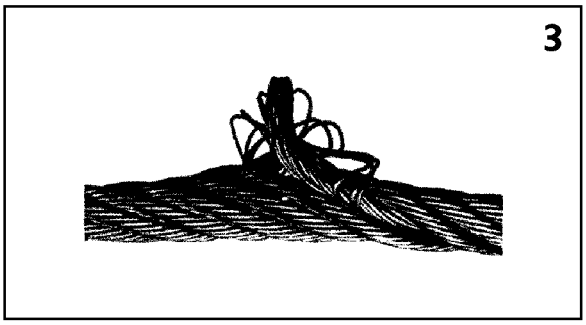
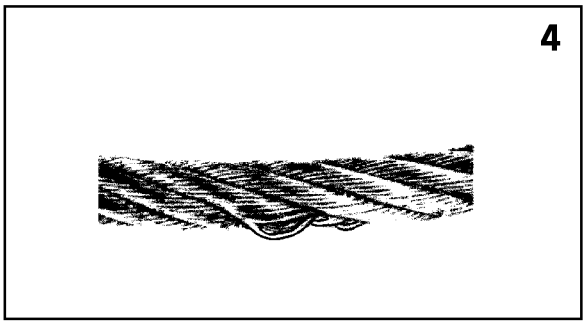
10 Appendix 2

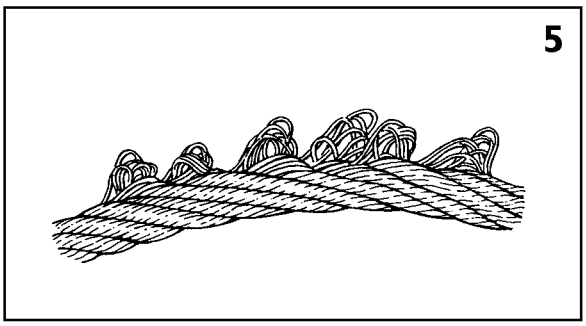
Typical example for an inspection log

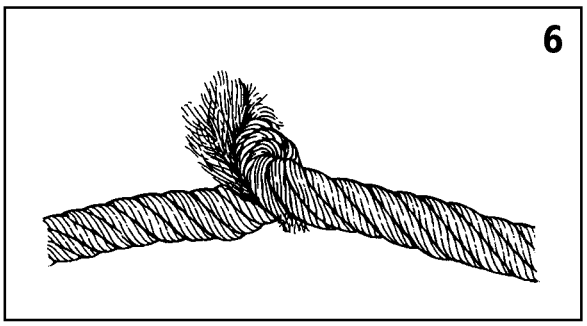


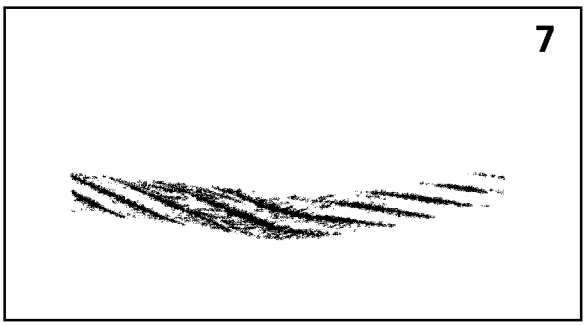


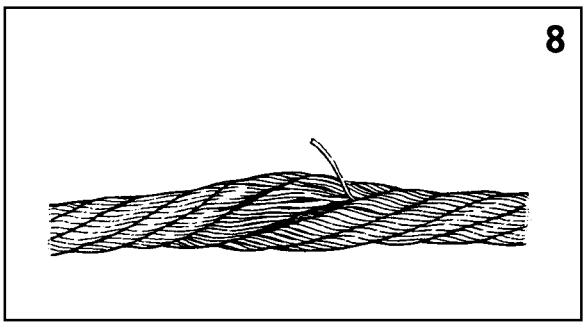


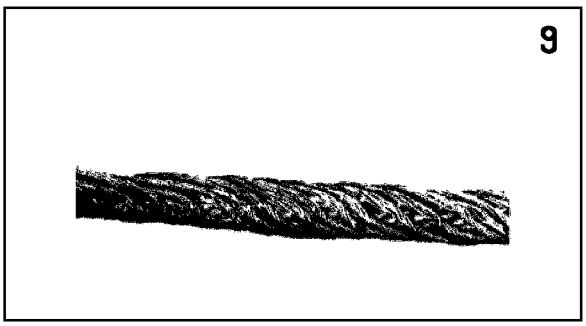


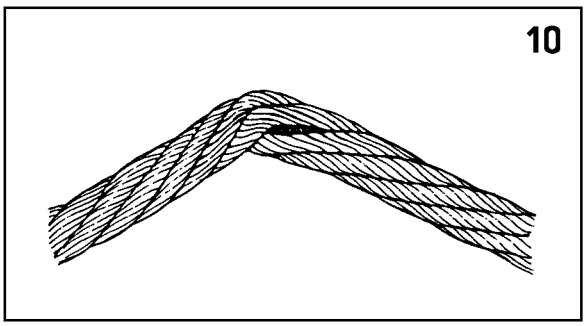












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11 Appendix 3

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

12.1.2 Assembly 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

12.1.3 Guy ropes, control 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	6	13

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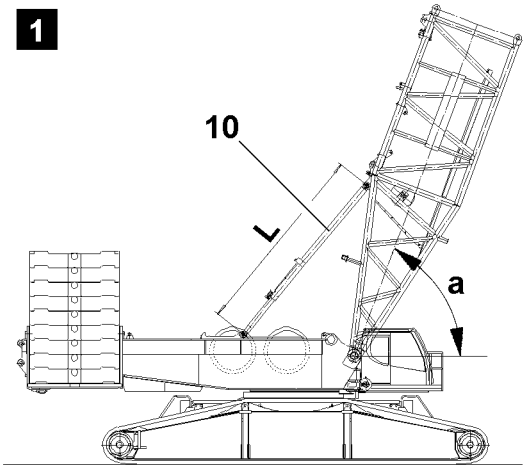

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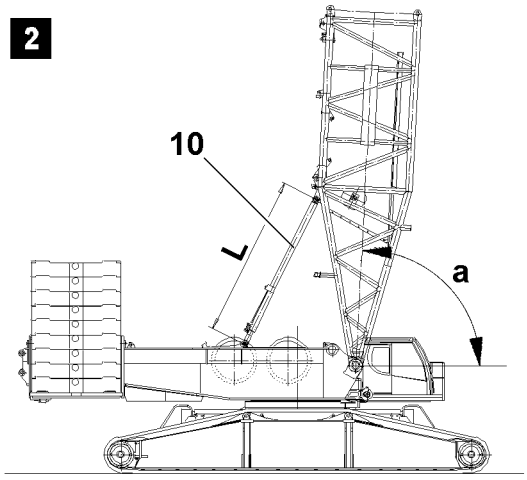

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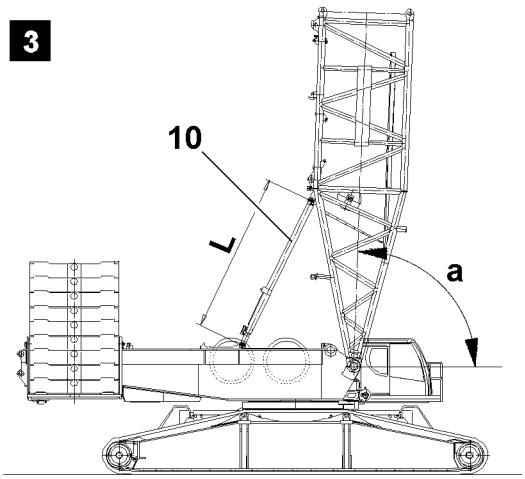

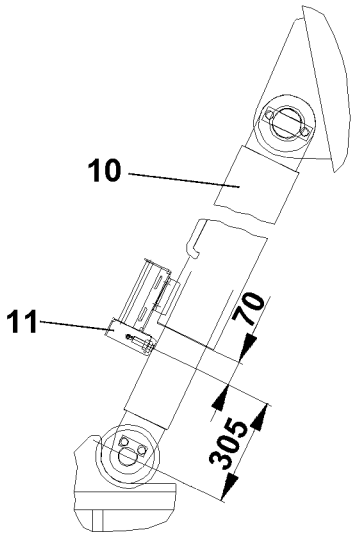

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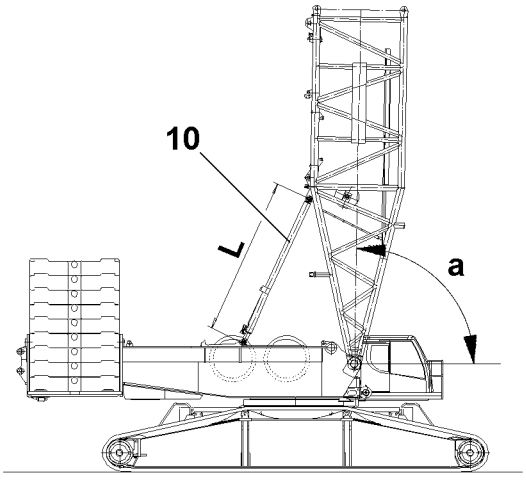
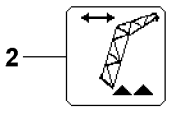




B105322

1 S-boom relapse retainer

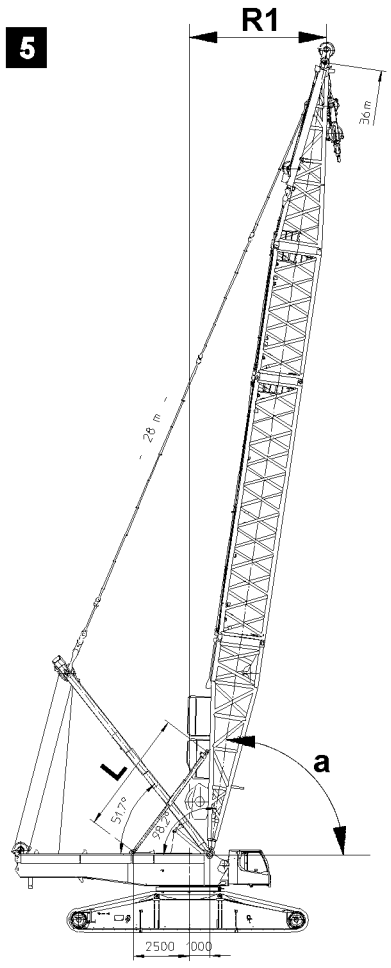
Two hydraulic cylinders prevent the boom from falling backward.
They are controlled on high or low pressure, depending on the operating mode or boom length.
In steepest boom position, the luffing up movement is turned off by the actuated limit switches in the cylinders **10**

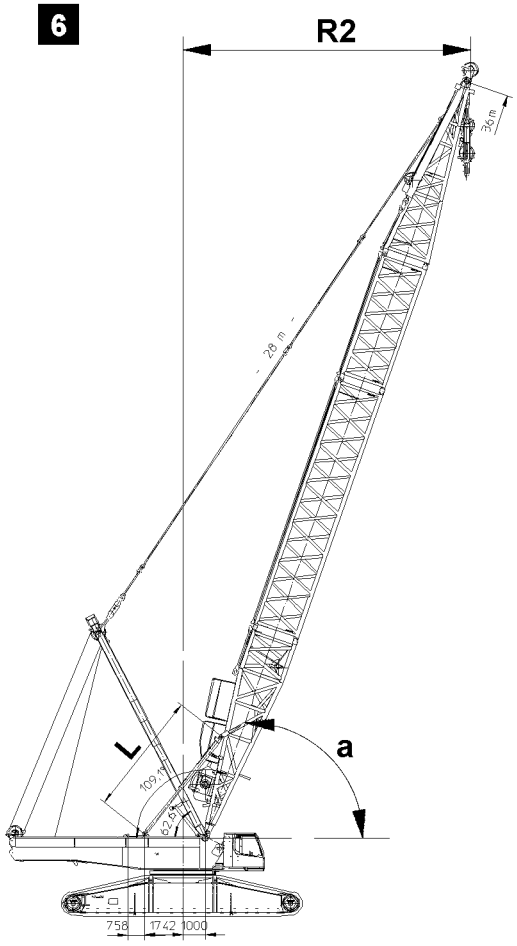
1.1 Checking limit switch initiators for function

Cover limit switch initiators **11** on the S-relapse cylinder **10** individually with a metal plate.

– The S-boom “luffing up” movement must turn off.
– The icon **2** must appear on the LICCON monitor.

	Angle a	**Cylinder length L**
Figure 1, cylinder extended	69,7°	5486 mm
Figure 2, steepest position	87°	4595 mm
Figure 3, electric shut off	88°	4541 mm
Figure 4, block position	89°	4486 mm


5
R1
36 m
28 m
L
a
2500
1000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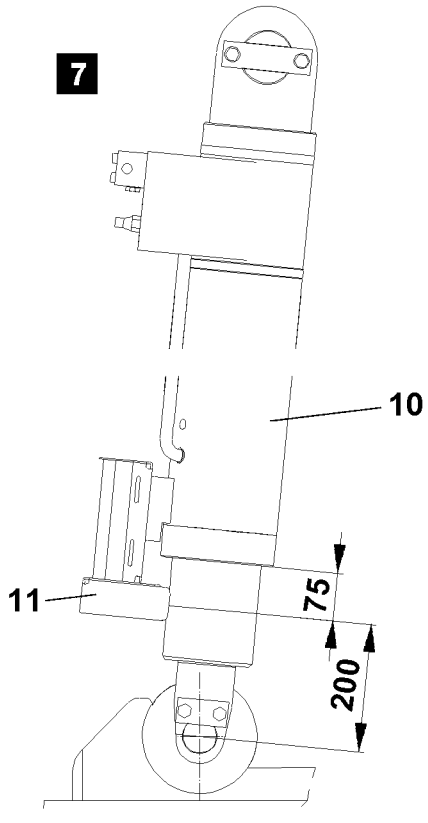
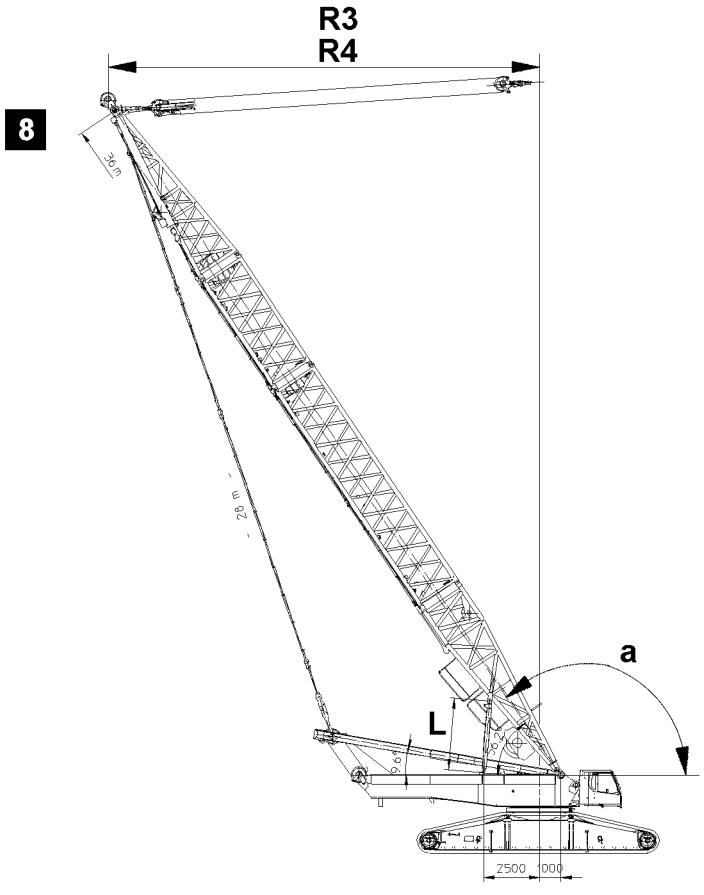
R2
36 m
28 m
L
a
758
1742
1000


7
10
11
75
200


8
R3
R4
36 m
28 m
a
L
2500
1000

B105323

2 Derrick relapse retainer

Two hydraulic cylinders prevent the derrick from falling backward.

– If the limit switches on the cylinders are actuated, the winch 4“spool up” movement is shut off.

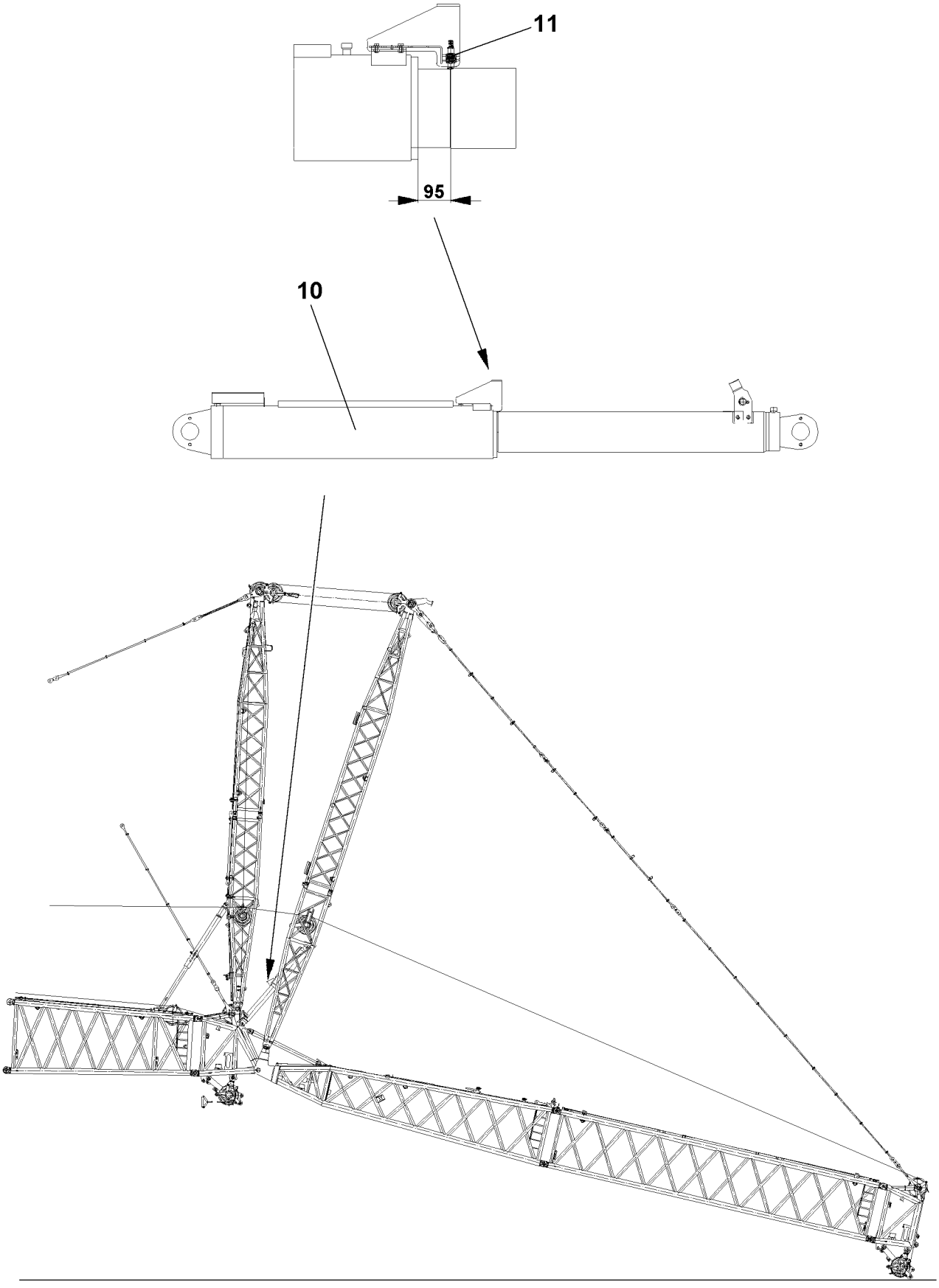
2.1 Checking limit switch initiators for function

Cover limit switch initiators **11** on the D-relapse cylinder **10** individually with a metal plate.

– The D-boom “luffing up” movement must turn off.

2.2 Illustration

	Radius R	D 36 m	D 30 m	Angle a	Cylinder length L
Figure 5, cylinder extended	R 1	6,3 m	5,4 m	81,8°	5645 mm
Figure 6, installing position	R 2	13,1 m	11,1 m	70,9°	5645 mm
Figure 7, electric shut off	R 3	19,0 m	15,7 m	122,8°	3307 mm
Figure 8, block position	R 4	19,5 m	16,2 m	123,8°	3245 mm



B105324

3 W-lattice jib

3.1 Checking limit switch initiators for function

Cover limit switch initiators **11** on the W-relapse cylinder **10** individually with a metal plate.

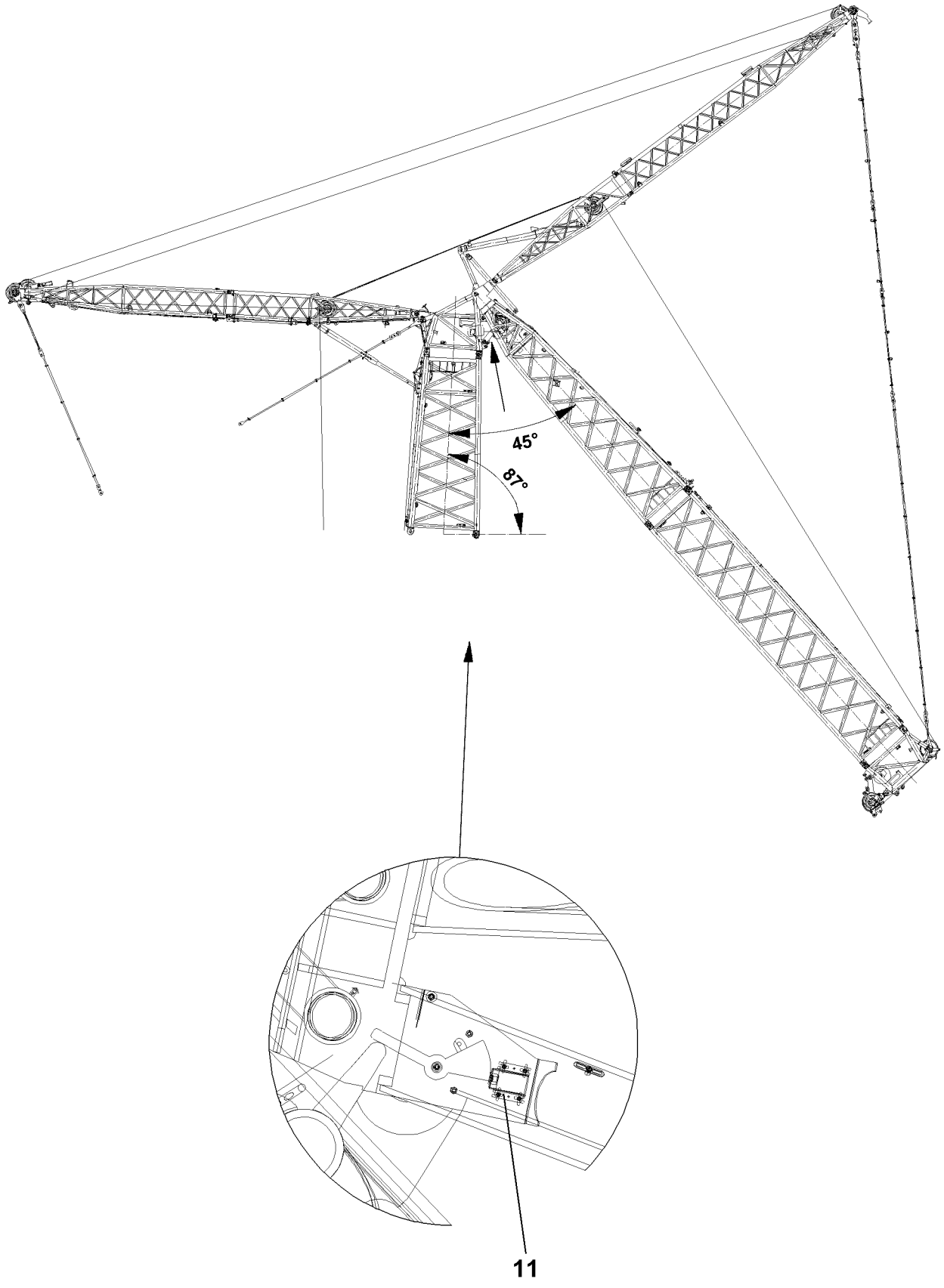
– The W-control winch “spool up” movement must turn off.

3.2 Checking limit switch initiators on switch point “steepest position”

Before erecting the boom, check the function of the limit switch initiators **11** in installed condition. Pull up both SA-brackets to the specified dimension (see illustration) until the switch contact opens.

– The W-control winch “spool up” movement must turn off.
– The icon must appear on the LICCON monitor.

After successful check, reset the SA-brackets to set-up condition.



B105325

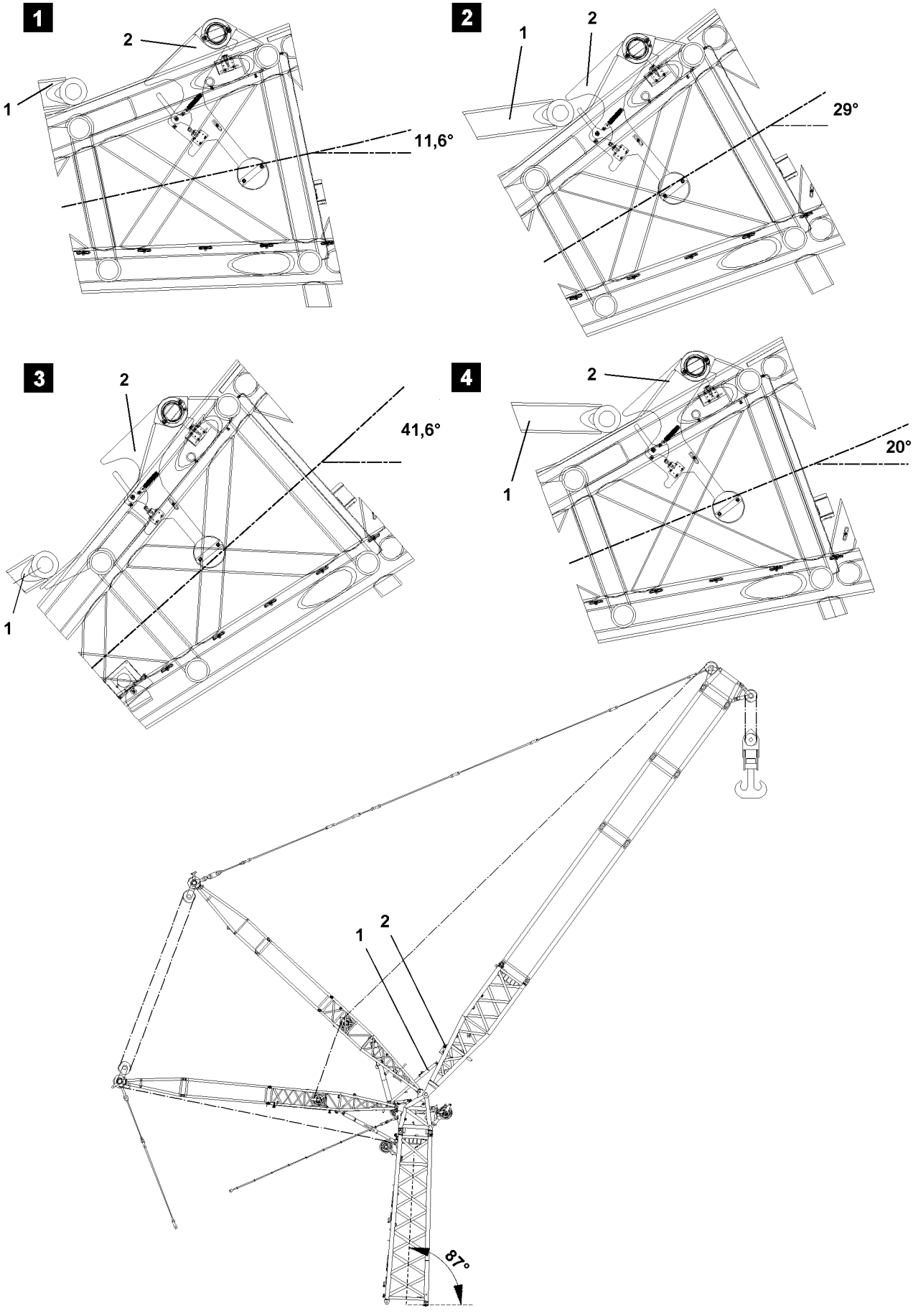
3.3 W-lattice jib “bottom”

3.3.1 Checking limit switch initiators for function

Cover the limit switch initiators **11** individually with a metal plate.

– The W-control winch “reel off” movement must turn off.

– Switch position “luffing jib bottom”, approx. 45°.
Limit switch initiators **11**, see illustration.



B102346

3.4 Function check of limit switch initiators on the mechanical relapse retainer

Mechanical relapse support **1**
Oscillating safety **2** for mechanical relapse support

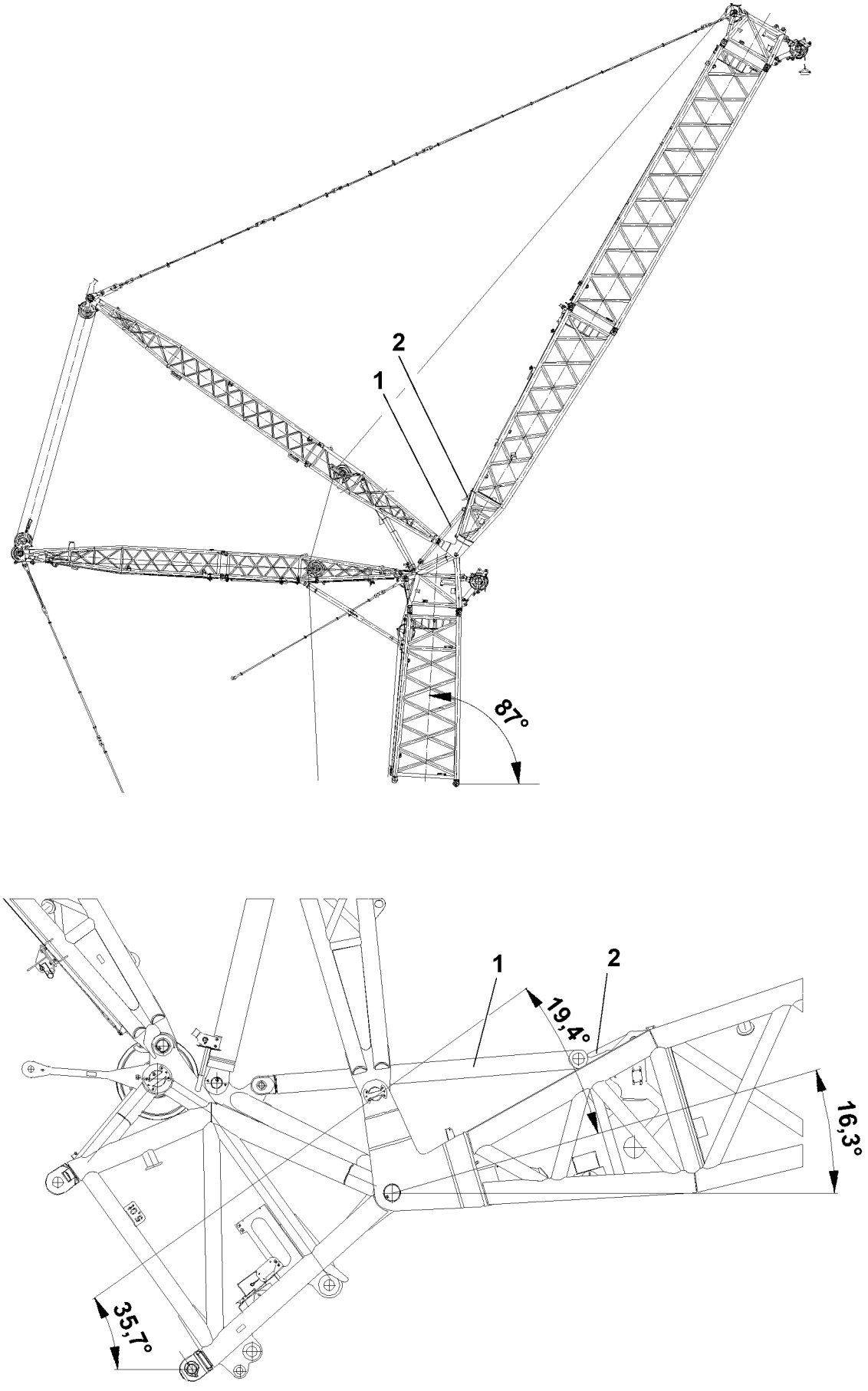
In addition to the relapse cylinders, the lattice jib is also secured by a mechanical relapse support **1**, which engages in steepest lattice jib position into the flap of the oscillating safety **2**. The luffing up movement is turned off by the actuated limit switches on the oscillating safety.

WARNING
Danger of tipping over if the oscillating safety is hard to move!
If the oscillating safety **2** is hard to move, the mechanical relapse retainer will no longer function. The W-lattice jib can tip backwards uncontrolled and cause the crane to topple over!

- ▶ Crane operation with hard to move oscillation safety **2** is prohibited!
- ▶ Before erection, the pendulum of the mechanical relapse retainer must be checked for easy movement over the complete swing range of the pendulum.

Depending on the lattice jib position (boom position = 87°), the flap on the oscillation safety is swung out by the weight of the pendulum:

- 16,4° the flap can be pushed closed , see illustration **1**
- 29° the flap can be pushed open, see illustration **2**
- 45° the flap is swung out, see illustration **3**
- 5,0° the flap is swung in , see illustration **4**

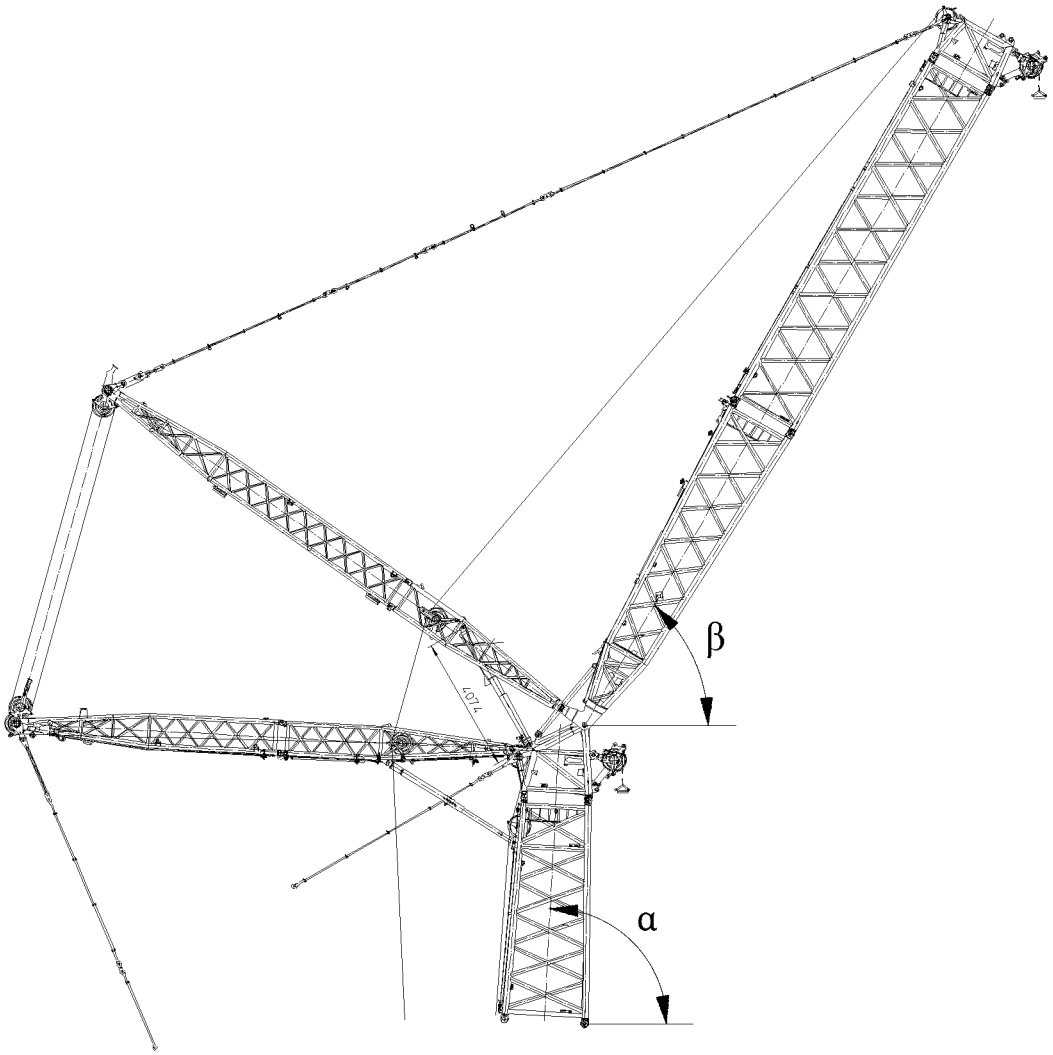


B105380

3.5 Flap of oscillating safety 2 on collision with mechanical relapse support 1

WARNING
Risk of collision!
If the angle between the boom and the lattice jib is smaller than or equal to 19,4°, the mechanical relapse support **1** will collide with the flap on the oscillating safety **2**. The lattice jib can tip backwards uncontrolled and cause the crane to topple over!

- ▶ Never fall below an angle of 19.4° when luffing up!
- ▶ Check visually!



B105350

1 Checking jib stop cylinder pressure

The jib stop cylinder pressure must be checked using the LICCON operation display before and after crane operation, “see diagnosis”.
The actual pressure displayed on the LICCON operation display must correspond with the target pressure in the table.

Note
- ▶ The specified target pressure depends on the outside temperature.
- ▶ The maximum permitted difference between the target pressure and the actual pressure is +/- 10 bar.

The jib stop cylinder pressure is checked as follows:
– Checking cylinder pressure with “jib stop extended to maximum limit”
– Checking cylinder pressure with “jib stop in test position”

1.1 Checking cylinder pressure with “jib stop extended to maximum limit”

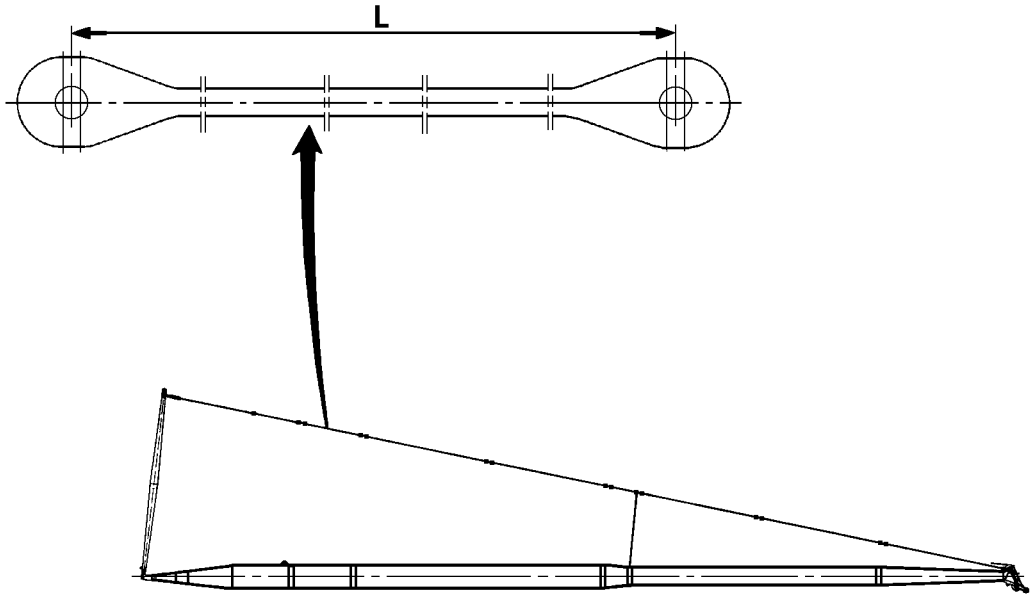
– Set main boom and lattice jib to angles specified in table.
– Compare target pressure in table with actual pressure in LICCON operation display.

“Extend jib stop to maximum limit”								
Boom angle α	**Lattice jib angle β**	**Cylinder length**	**Stroke**	**Target pressure**				
				-40° C	**-20° C**	**0° C**	**20° C**	**40° C**
87°	42,9°	4600 mm	1100 mm	119,3 bar	129,5 bar	139,8 bar	150,0 bar	160,2 bar

1.2 Testing cylinder pressure with “jib stop in test position”

– Set main boom and lattice jib to angles specified in table.
– Compare target pressure in table with actual pressure in LICCON operation display.

“Jib stop in test position”								
Boom angle (α)	**Lattice jib angle (β)**	**Cylinder length mm**	**Stroke mm**	**Target pressure**				
				-40° C	**-20° C**	**0° C**	**20° C**	**40° C**
87°	60°	4074 mm	574 mm	431,2 bar	468,4 bar	505,4 bar	542,4 bar	579,5 bar



B180875

1 General

Always check the entire length of the guy rods before every assembly.
Also check the concealed bearing surfaces and bores.

2 Repeat inspection of guy rods

The guy rods must be checked at least once a year by an expert according to VGB D6.
The inspection must be carried out by an authorized expert every 4 years.
If a load was dropped or if the crane was overloaded, an additional inspection by an expert is required.
The inspections must be documented.

DANGER
Risk of accident in case of guy rod failure!
▶ If the following damage is found, the guy rods may no longer be used and must be replaced immediately!

2.1 Cracks and dents

The guy rods must be thoroughly inspected visually for cracks and dents.
If cracks are present, the guy rods must be replaced. Repairs are not permitted.

Note
▶ In case of doubt, the relevant areas must be carefully examined, for example with magnetic crack detection!

2.2 Stretching

Check for guy rod stretching by measuring the guy rods.
The stretch may be no more than max. 0.2 %, for example 14 mm, for an initial dimension (L) of 7000 mm.

Note
▶ The initial dimension (L) of the guy rods is noted in the separate rod diagram!

2.3 Wear

Check the bores, pins and pin retainers for signs of wear.

2.4 Damaged paint

Check the paint on the guy rods at regular intervals (signs of corrosion).
Repair damaged paint.

Note
▶ The guy rods may not be stored in aggressive media, such as salt water!

2.5 Ductile distortion

After a ductile distortion, such as bending, the guy rods must be replaced.

9.00 General notes

B195219

1 Daily checking

The following checks are to be carried out daily and before each start-up:

– Check that all oil and fuel lines are leak-free and dry.
– Check that the injection pump, fuel and oil filters are leak-free.
– Check that the hydraulic units, fan drive hydraulic motors and their supply lines are leak-free.
– Check that the exhaust system and exhaust flange are leak-free.
– Check whether the exhaust flap retention flap is free.
  The return springs that open the exhaust flaps must function properly, because seized, and 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 new ones.
  Observe the care instructions in the maintenance chapter regarding sound damping when cleaning the engine or gearbox room.

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 re-starting, be sure to refill with the correct type of oil to the centre of the min. - max. markings.
  Refer to the nameplate and operating materials and lubricants to determine the oil type.
– Conduct initial maintenance according to chapter “Maintenance intervals”; thereafter, maintain in accordance with the specified maintenance intervals.
– Maintain break-in instructions, see chapter 2.02.

5 Instructions for travel operation

NOTICE
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 / anti-corrosion agents must be handled as dangerous waste materials!
▶ Follow the regulations of the local authorities when disposing of used cooling fluids (mixture of antifreeze / anti-corrosion agents solution and tap water).

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