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LIEBHERR

Crawler crane with lattice mast

LR 1350/1

LR 1350-1-008

Part 1 + Part 2

Operating instructions

BAL-No.: 13608-01-02

Part 1, Pages: 1009

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.
This crane is equipped with a data recording device. The following data is recorded:

– Date, time
– Selected configuration (boom configuration, ballast, outrigger extension, reeving, hook block)
– Actual load
– Percentage of loading the crane
– Working radius
– Main boom angle, luffing jib angle
– Total length of tele boom, length of each tele section
– All bridging devices

The recorded data can be real with the respective software.

Warning notes

The terms **DANGER**, **WARNING**, **CAUTION** and **ATTENTION** 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.
	ATTENTION	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.

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Sign	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

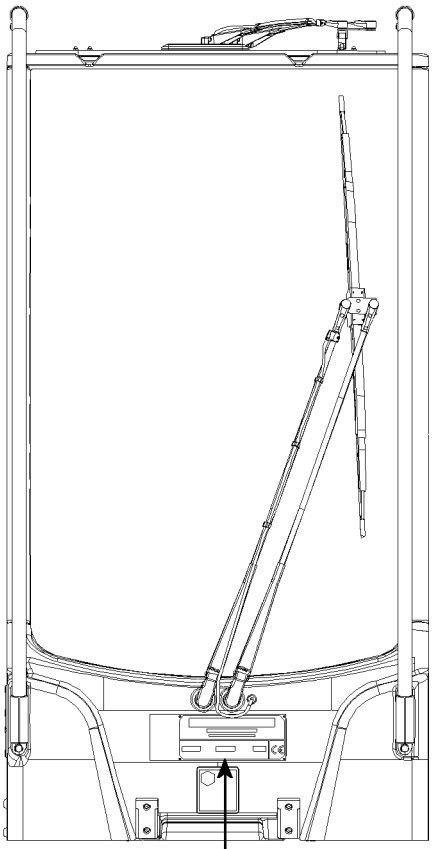
Always keep these operating instructions handy in the driver's or crane cab.
The operating manual is part of the crane!
Only operate the crane if you are well familiarized with the equipment, and always follow these operating instructions.



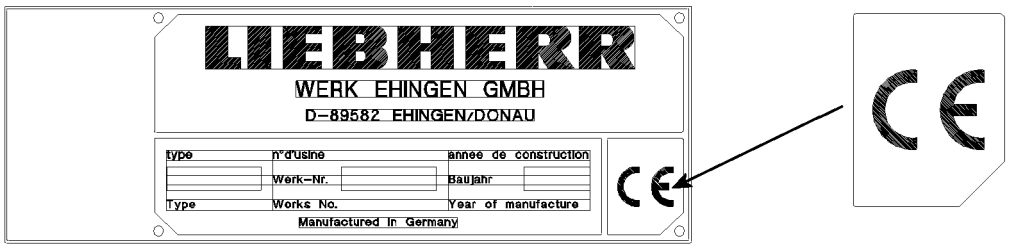
Note
▶ If you have received additional information about the crane from us, such as technical information bulletins, instructions and/or supplements to these operating instructions, then this information must also be followed and kept with the operating instructions.

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.
The information and illustrations contained in these operating instructions may not be copied or distributed, nor used for the purposes of competition. All rights are expressly reserved in accordance with copyright laws.
All accident prevention guidelines, operating instructions, etc. are based on destined use of the crane.

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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.

Note

- Crane with “CE-mark” according to the European machinery directive 2006/42/EC and the EN 13000! Illustration **1**
- It is prohibited to bring the crane into service and to operate it within the European Union without a “CE-mark”! Illustration **2**
- It is prohibited to operate cranes with a tipping load utilization of 85% which are programmed according to ASME B30.5 within the European Union or in countries which permit a lower stationary stability utilization (for example according to ISO 4305)! These cranes may not have a “CE-mark”! Illustration **2**

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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 is suspended load on the crane, is changed, for example by filling a container suspended on the load hook, except:
  - The load moment limiter was checked before for function with a known load.
  - The crane operator's cab is occupied and the crane is operational.
  - The container size is selected in such a way that an overload of the crane with full load is eliminated within the valid used load chart.

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

The 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

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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 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 *****.

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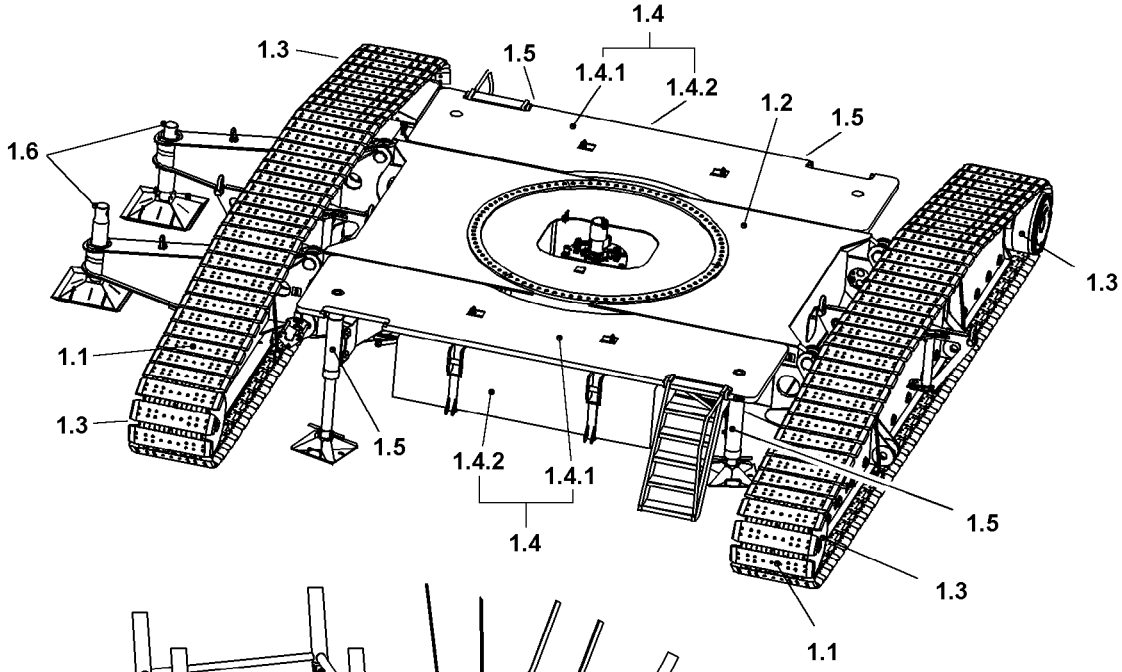
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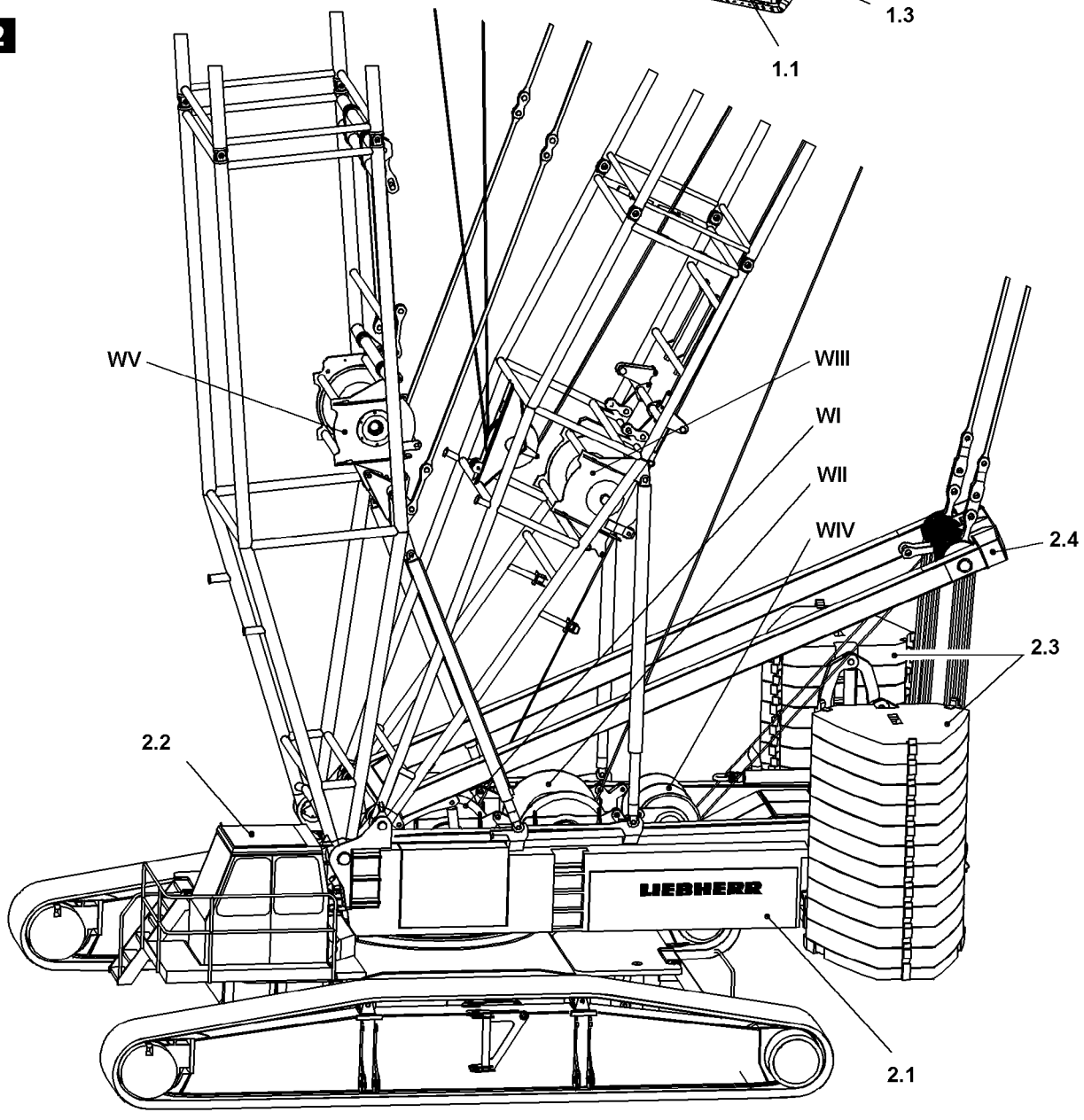
1.00 Description of crane

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1 Components

1.1 Crawler travel gear, fig.1

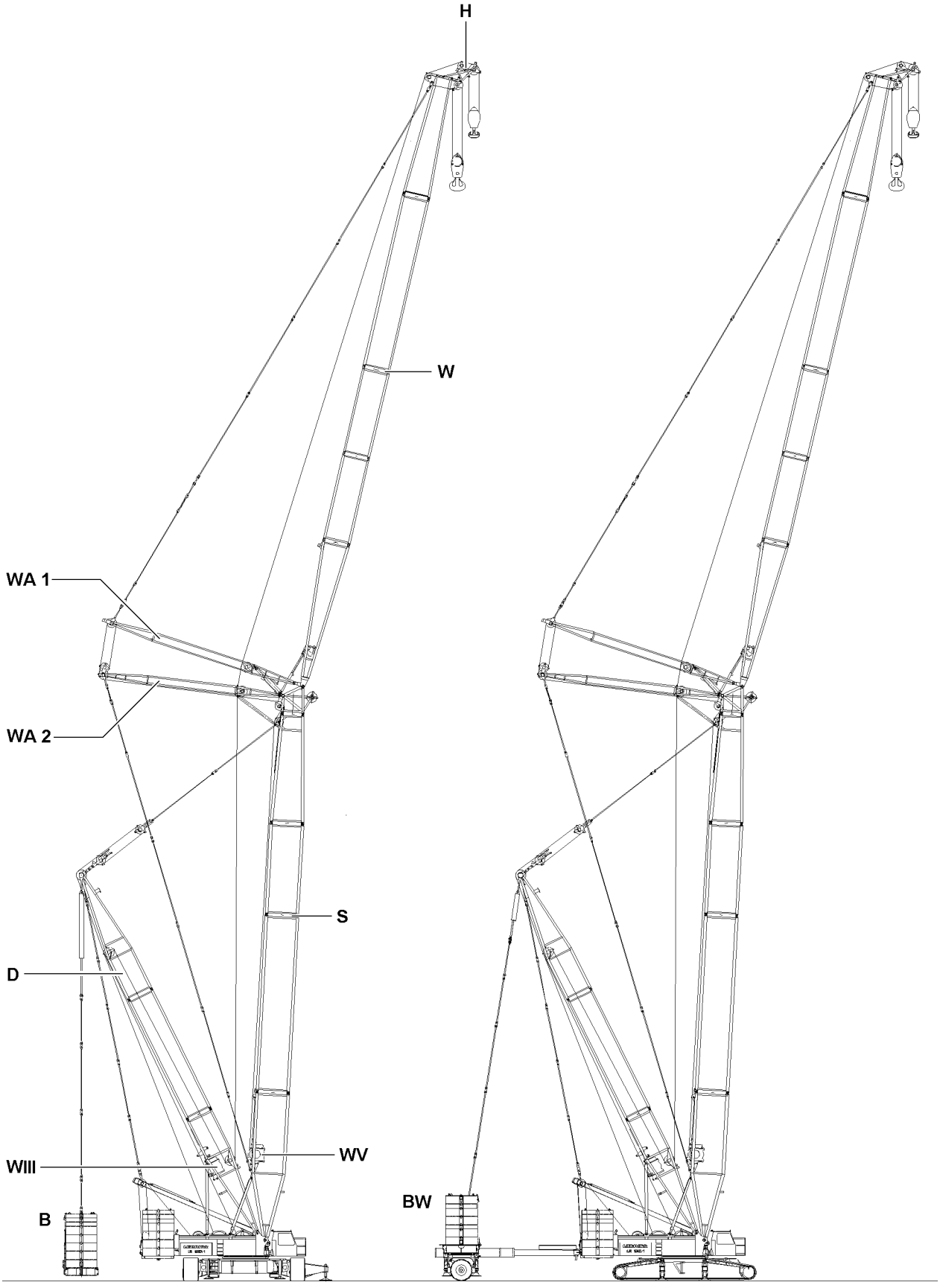
1.1 Crawler carrier
1.2 Crawler center section
1.3 Travel gear
1.4 Central ballast
1.4.1 Ballast plate 4.0 t each
1.4.2 Ballast block 7.5 t each
1.5 Hydraulic assembly support
1.6 Mechanical auxiliary support

1.2 Turntable, fig. 2

2.1 Crane engine
2.2 Crane operator's cab
2.3 Counterweight
2.4 SA-frame

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

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1.3 Boom

Note
▶ For equipment for boom systems, see chapter 5.03 in the crane operating instructions!

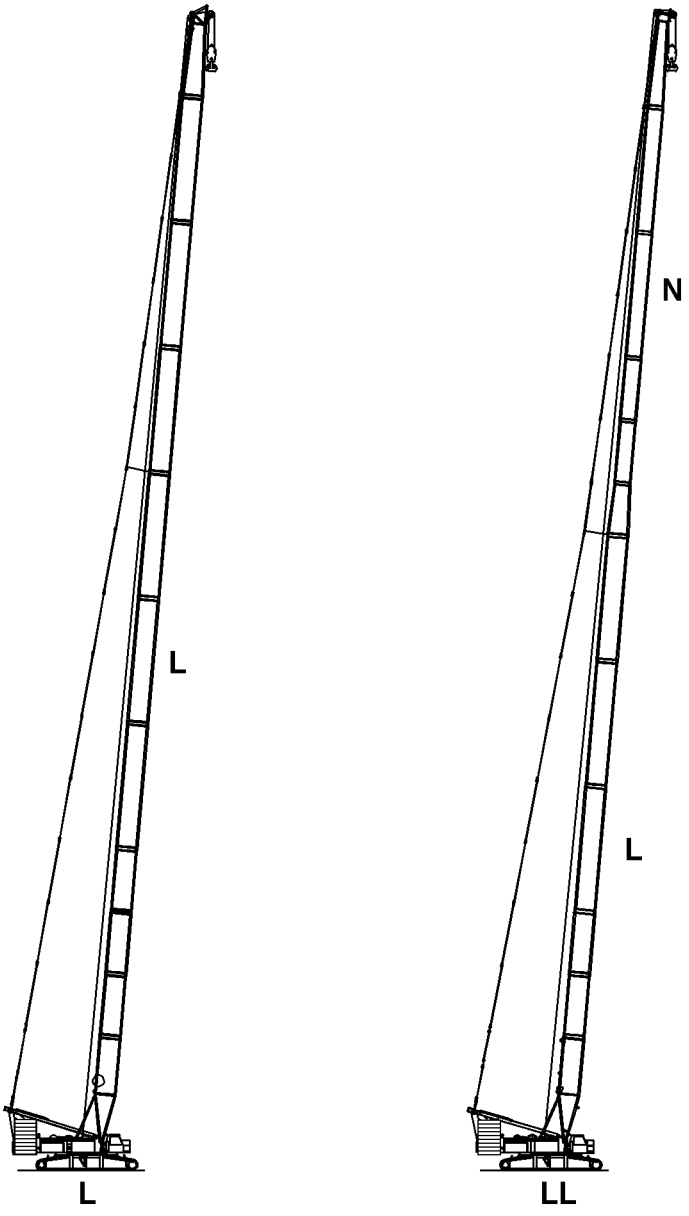
WA1 WA frame 1
WA2 WA frame 2
WIII Winch 3
WV Winch 5
H Boom nose
W Luffing lattice jib
S Main boom, heavy version
D Derrick

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

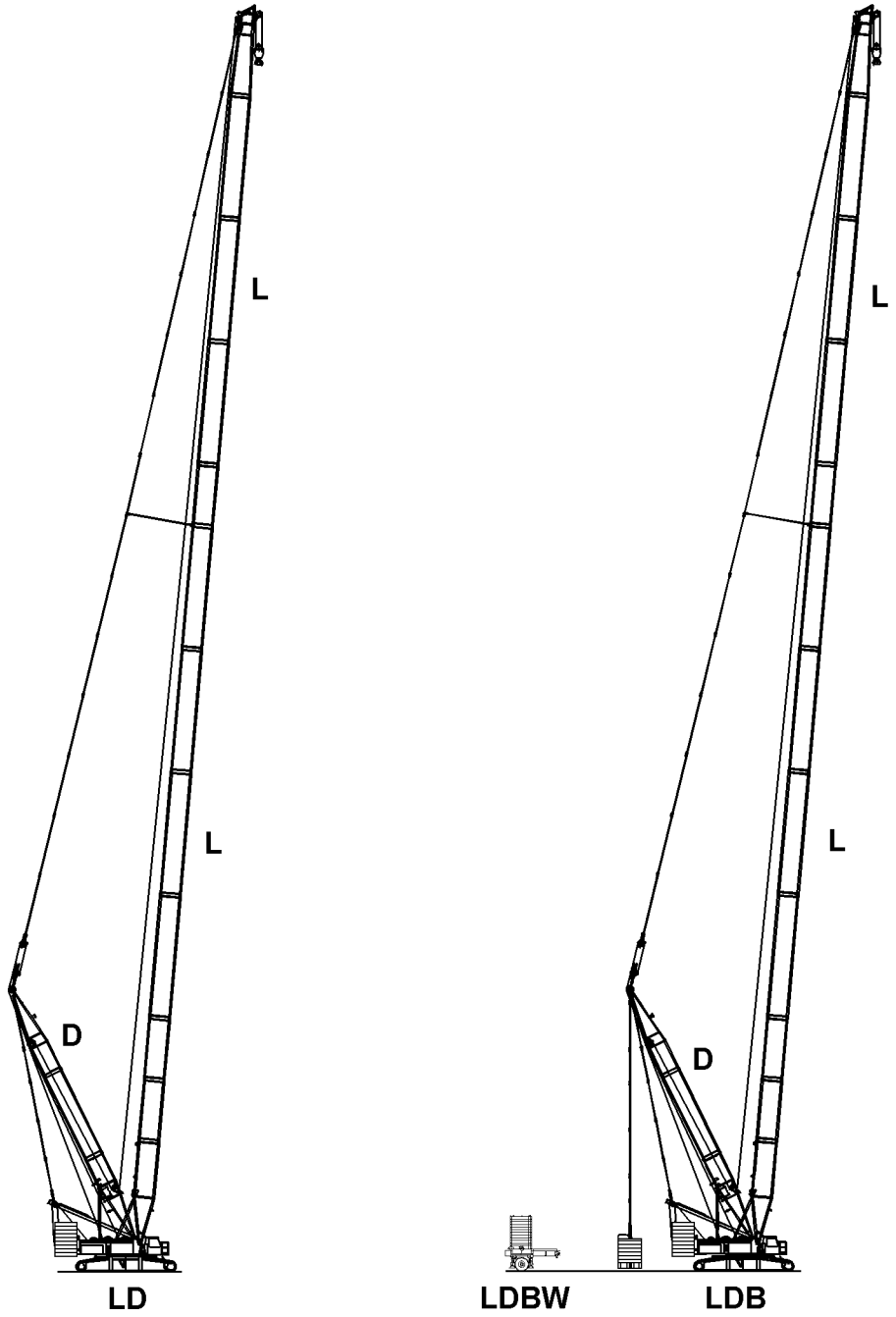
2.1 Light version

2.1.1 L/LL-boom combinations

L = Main boom
LL = Main boom, light L-version

Abbreviation	System lengths
L	L = 18.0 m to 108.0 m
LL	LL = 24.0 m to 108.0 m

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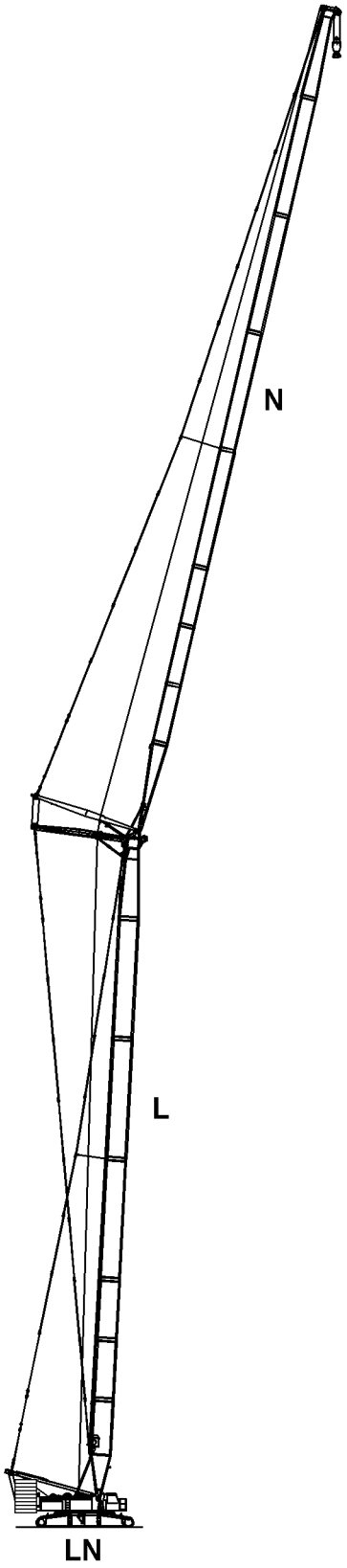
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2.1.2 LD/LDB/LDBW-boom combinations

L = Main boom
D = Derrick boom
B = Suspended ballast
BW = Ballast trailer

Abbreviation	System lengths		
LD	L	=	30.0 m to 120.0 m
	D	=	27.0 m
LDB/LDBW	L	=	30.0 m to 120.0 m
	D	=	27.0 m

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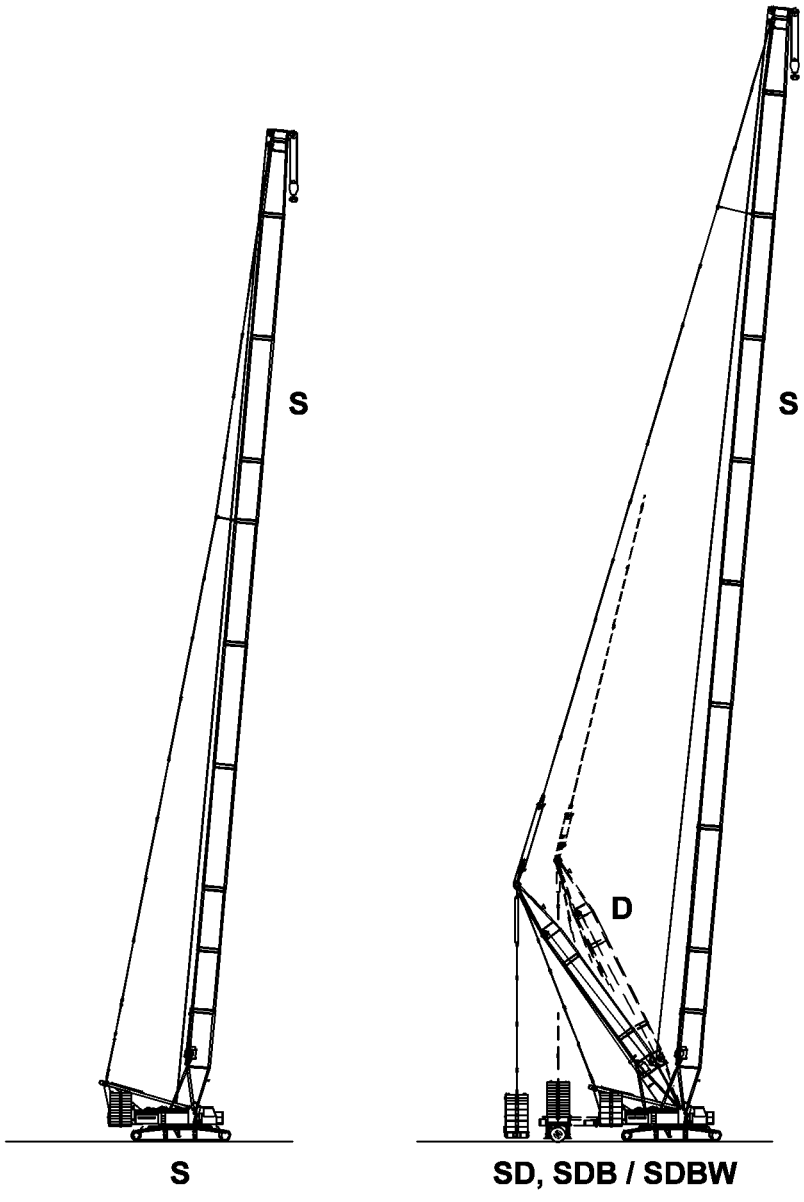
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2.1.3 LN-Boom combinations

L = Main boom
N = Jib boom, light

Abbreviation	System lengths		
LN	L	=	24.0 m to 66.0 m
	N	=	18.0 m to 84.0 m

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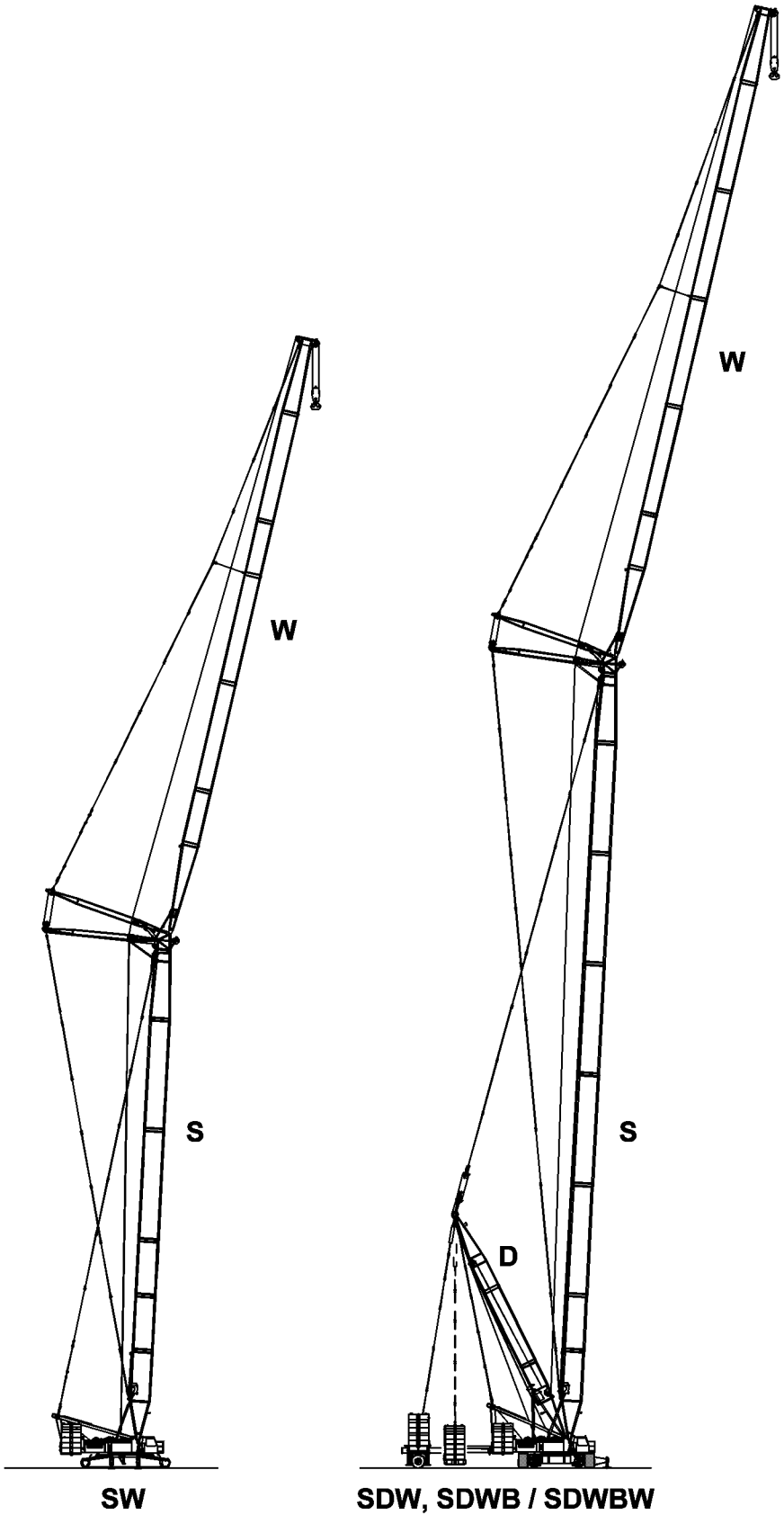
2.2 Heavy version

2.2.1 S/SD/SDB/SDBW-Boom combinations

S = Main boom
D = Derrick boom
B = Suspended ballast
BW = Ballast trailer

Abbreviation	System lengths		
S	S	=	18.0 m to 96.0 m
SD	S	=	30.0 m to 108.0 m
	D	=	27.0 m
SDB/SDBW	S	=	30.0 m to 108.0 m
	D	=	27.0 m

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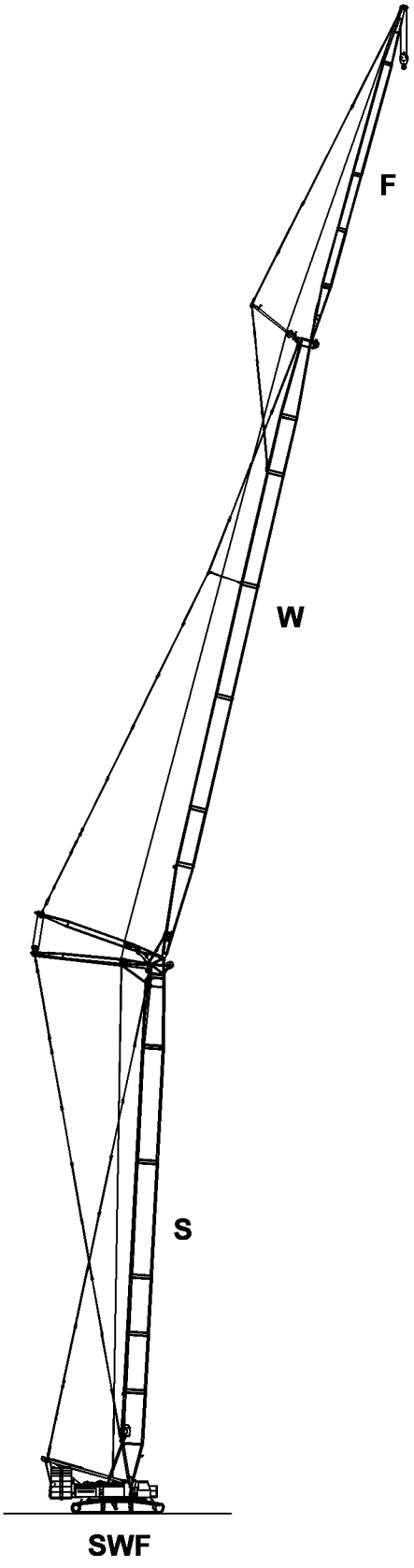
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2.2.2 SW/SDW/SDWB/SDWBW-Boom combinations

S = Main boom, heavy
W = Luffing lattice jib
D = Derrick boom
B = Suspended ballast
BW = Ballast trailer

Abbreviation	System lengths		
SW	S	=	24.0 m to 60.0 m
	W	=	24.0 m to 90.0 m
SDW	S	=	30.0 m to 84.0 m
	W	=	24.0 m to 72.0 m
	D	=	27.0 m
SDWB/SDWBW	S	=	30.0 m to 84.0 m
	W	=	24.0 m to 90.0 m
	D	=	27.0 m

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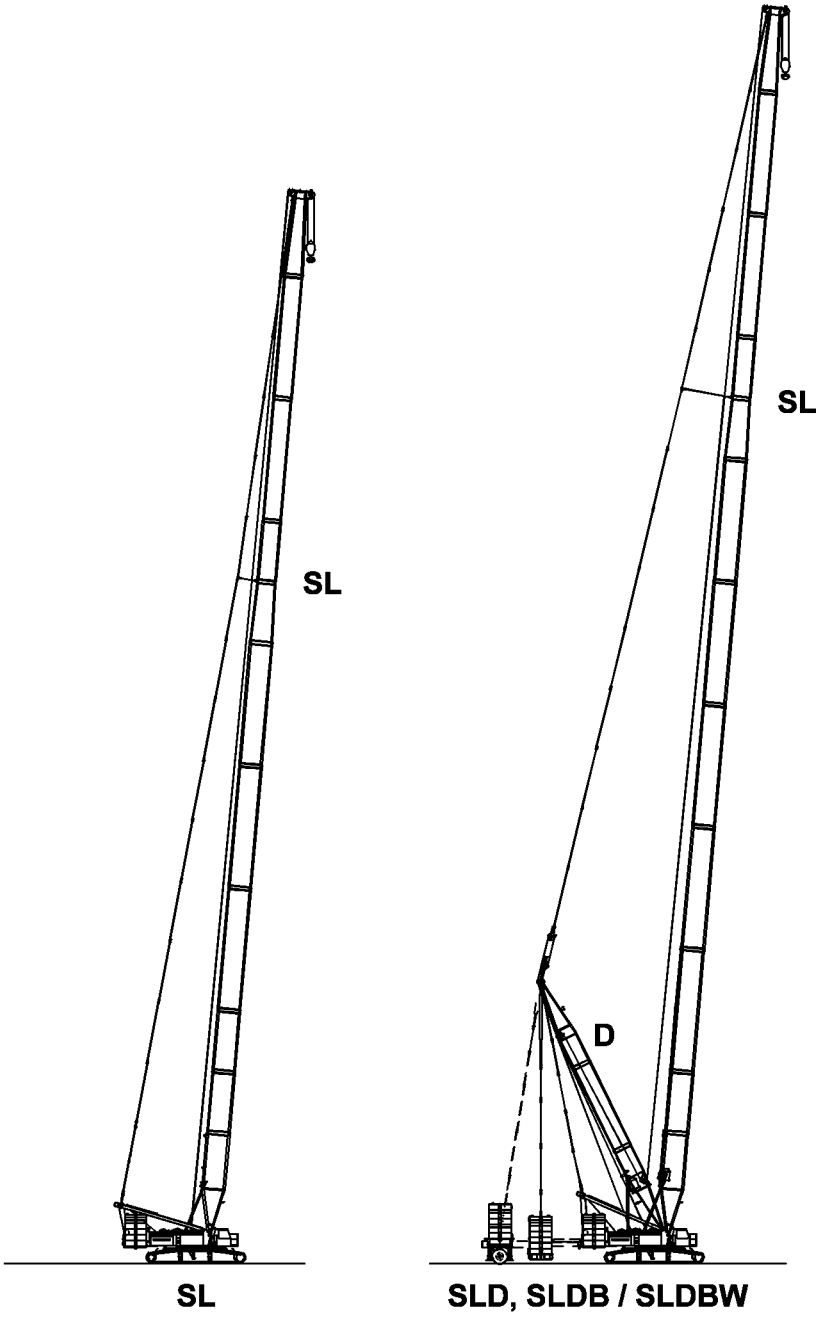
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2.2.3 SWF-Boom combinations

S = Main boom, heavy
W = Luffing lattice jib
F = Lattice jib, fixed installed

Abbreviation	System lengths		
SWF	S	=	48.0 m to 60.0 m
	W	=	42.0 m to 78.0 m
	F	=	12.0 m to 36.0 m

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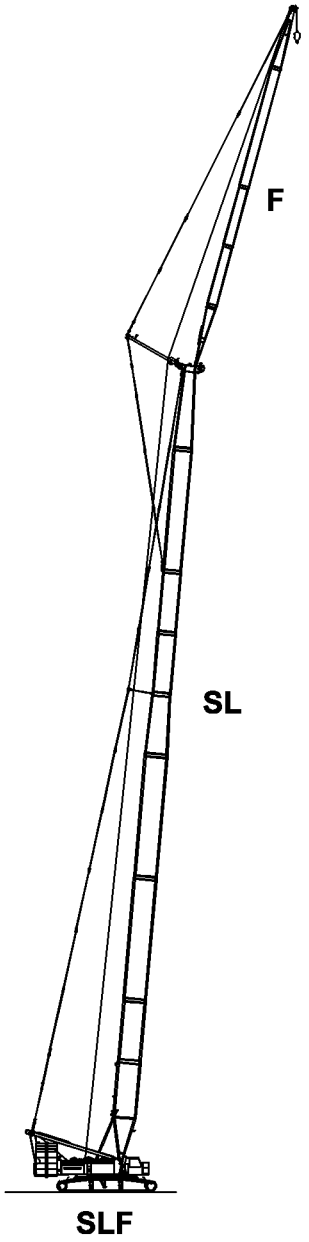
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2.2.4 SL/SLD/SLDB/SLDBW-Boom combinations

SL = Main boom, light S-version
D = Derrick boom
B = Suspended ballast
BW = Ballast trailer

Abbreviation	System lengths		
SL	SL	=	24.0 m to 102.0 m
SLD	SL	=	30.0 m to 120.0 m
	D	=	27.0 m
SDB/SDBW	S	=	30.0 m to 120.0 m
	D	=	27.0 m

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2.2.5 SLF-Boom combinations

SL = Main boom, light S-version
F = Lattice jib, fixed installed

Abbreviation	System lengths		
SLF	SL	=	36.0 m to 96.0 m
	F	=	12.0 m to 36.0 m

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1 Crawler travel gear

1.1 Frame

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

1.2 Tracks

Maintenance free, dirt protected crawler track with flat track pads.
Pad width: 1.0 m
Pad width: 1.2 m *
Pad width: 1.5 m *
Track width: 7.2 m

1.3 Central ballast

Consists of two ballast plates with 4.0 t each.
The ballast plates provide a platform, which makes the crane operator's cab accessible in every turning angle of the crane.

1.4 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.

1.5 Travel power

Stepless speed from 0 km/h to 1.63 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 D936 L A6, water cooled
Performance: 270 KW at 1900 rpm
Maximum torque: 1720 Nm at 1300 rpm
Exhaust emissions according to guidelines per 97/68/EG Stage 3A and EPA/CARB Tier 3
Fuel tank: 700 l
Fuel tank: 1200 l *

2.3 Crane drive

Hydraulic via pump distributor gear with six axial piston pumps with power regulation, closed oil circuits.

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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 Hoist gear 1

Winch 1 as hoist gear, hydraulically driven via axial piston pump and planetary gear.
Disk brakes spring loaded and hydraulically vented.

2.6 Intake gear (winch 4)

Winch 4 as intake gear, hydraulically driven via axial piston pump and planetary gear.
Disk brakes spring loaded and hydraulically vented.

2.7 Slewing gear

Hydraulically driven via axial piston fixed displacement motor and planetary gears.
Disk brake spring loaded and hydraulically vented.
Slewing speed steplessly regulated from 0 rpm to 1.85 rpm.

2.8 Crane operator's cab

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

2.9 Counterweight

85.0 t, consists of: One base plate of 15.0 t and counterweight plates with a total of 70.0 t.

2.10 Safety devices

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

2.11 Electrical system

24 V direct current voltage, two batteries with 143 Ah each.

3 Additional equipment

3.1 Hoist gear 2

Winch 2 as hoist gear, hydraulically driven via axial piston pump, Liebherr rope winch with integrated planetary gear and spring loaded retaining brake.

3.2 Hoist gear 3

Winch 3 as control winch, hydraulically driven via axial piston pump, Liebherr rope winch with integrated planetary gear and spring loaded retaining brake.

3.3 Hoist gear 5

Winch 5 to control the luffing lattice jib, hydraulically driven via axial piston pump, Liebherr rope winch with integrated planetary gear and spring loaded retaining brake.

3.4 Mechanical auxiliary support

To erect long boom combinations without derrick ballast.

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3.5 Hydraulic assembly support

Four hydraulic support cylinders on crawler center section for crane self installation.

3.6 Assembly cylinder

To assemble the crawler carrier, hoist gear 1, hoist gear 2 and the central ballast.

3.7 Ballasting device

To lift / set down the turntable ballast.

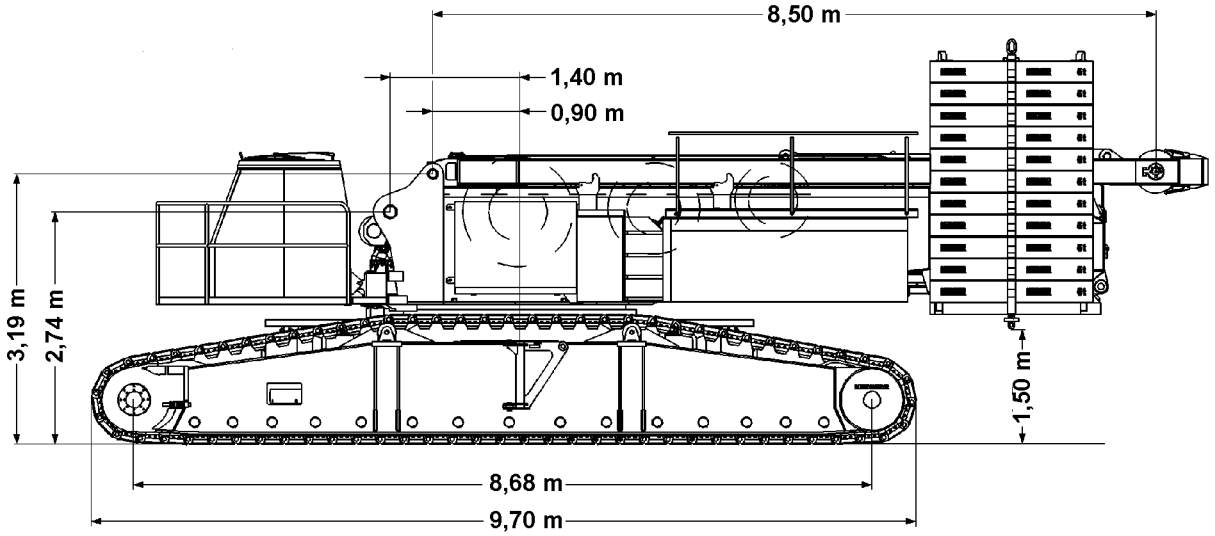
3.8 Central ballast

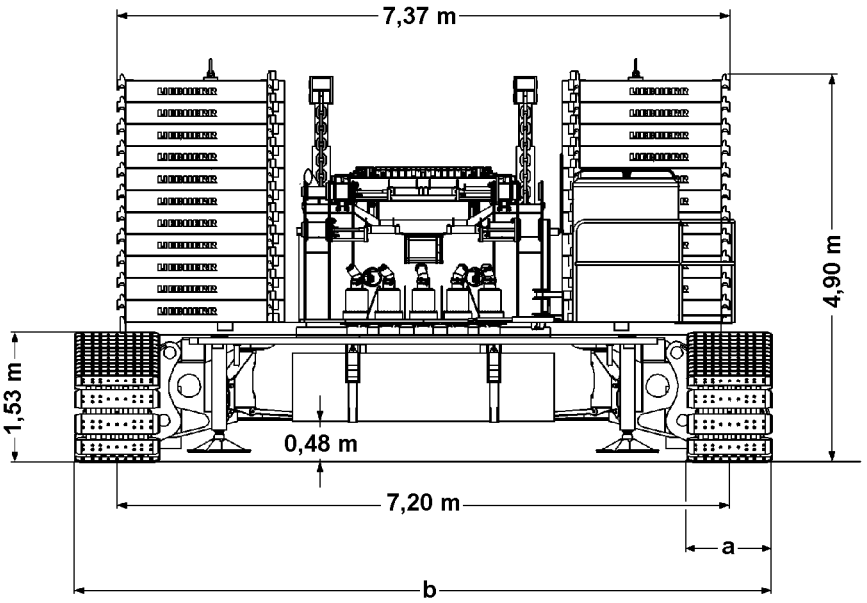
Additionally, four counterweight blocks, each with 7.5 t in total 38.0 t.

3.9 Counterweight

Additionally, eight counterweight plates, each with 5.0 t in total 125.0 t.

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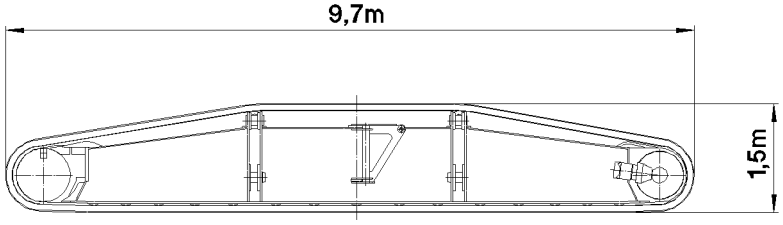
1 Dimensions and weights

1.1 Lengths of crawler track with superstructure

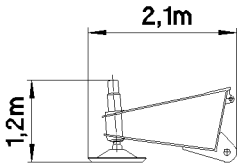
Track pad width a	Crawler track width b
1.0 m	8.2 m
1.2 m *	8.4 m
1.5 m *	8.7 m

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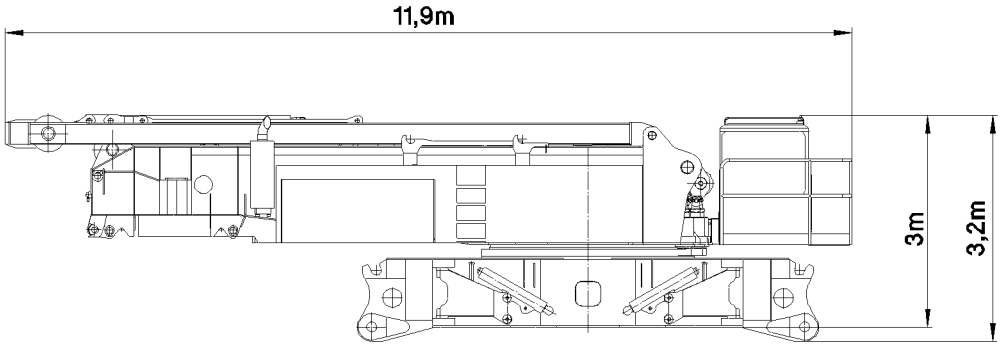
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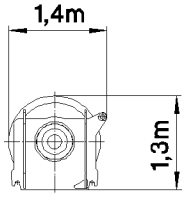
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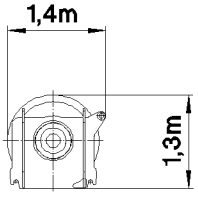
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1.2 Crawler carrier

See illustration **1**.

	Width		
Weight	**1.3 m**	**1.4 m**	**1.5 m**
With one travel drive	21.2 t	22.2 t	25.6 t
With two travel drives	22.0 t	23.0 t	26.4 t

1.3 Mechanical auxiliary support

See illustration **2**.

Component	Weight	Width
Mechanical auxiliary support with support pads	1.0 t	0.8 m
Support pad	0.13 t	0.82 m

1.4 Turntable with crawler center section

See illustration **3**.

Component	Weight	Width
Turntable without winch 1, without winch 2 and without ballasting cylinder	40.3 t	3.0 m
Turntable without winch 1, without winch 2	41.6 t	3.0 m

1.5 Winch 1

See illustration **4**.

Component	Weight	Width
Winch 1 with rope diameter 25 mm	4.9 t	1.6 m
Winch 1 with rope diameter 28 mm	7.1 t	1.6 m

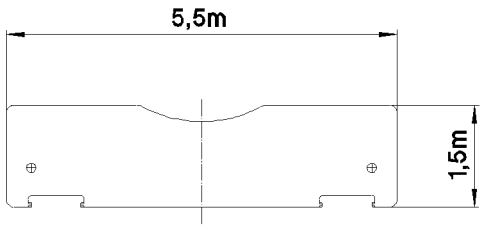
1.6 Winch 2

See illustration **5**.

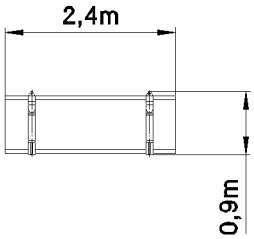
Component	Weight	Width
Winch 2 with rope diameter 25 mm	4.1 t	1.6 m

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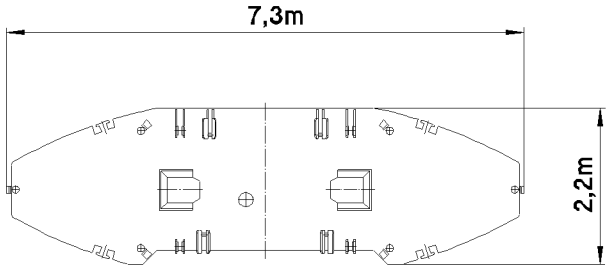
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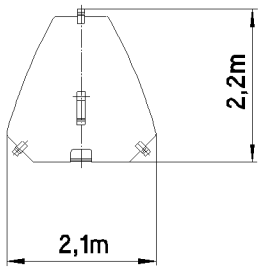
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1.7 Central ballast 1

See illustration **6**.

Component	Weight	Thickness
Central ballast 1	4.0 t	0.07 m

1.8 Central ballast 2

See illustration **7**.

Component	Weight
Central ballast 2	7.5 t

1.9 Base plate counterweight for turntable

See illustration **8**.

Component	Weight
Base plate counterweight turntable	15 t

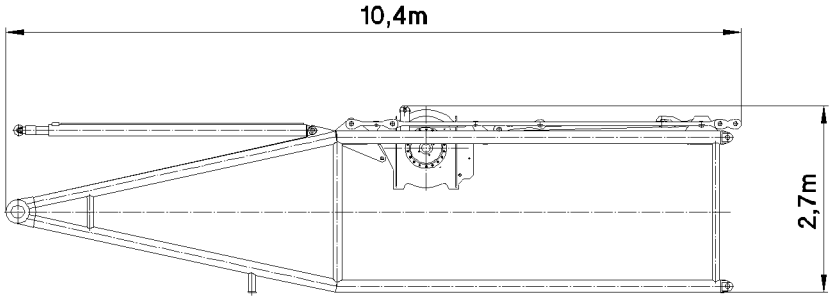
1.10 Counterweight for turntable

See illustration **9**.

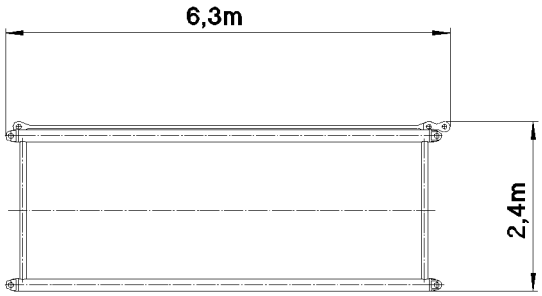
Component	Weight	Thickness
Counterweight plate	5.0 t	0.4 m

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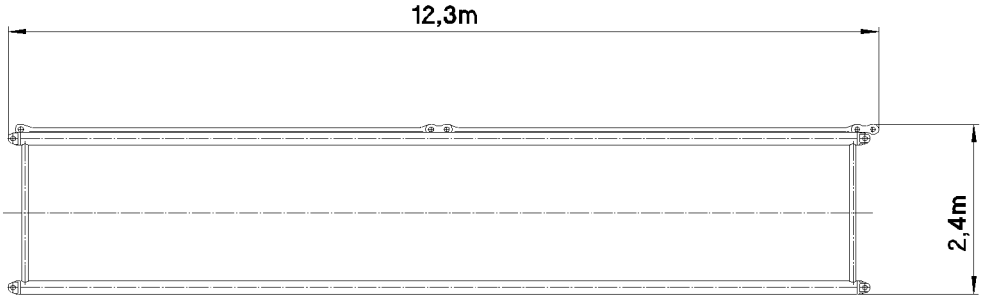
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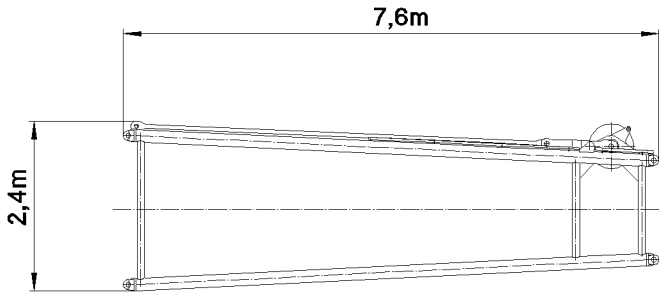
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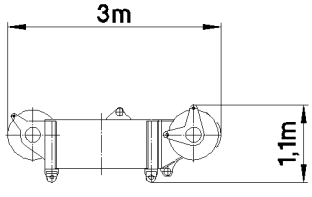
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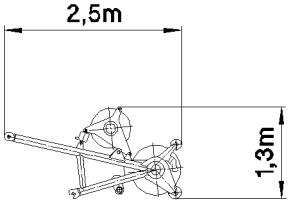
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1.11 S-pivot section

See illustration **10**.

Component	Weight	Width
S-pivot section complete	12.8 t	3.0 m
S-pivot section	6.4 t	
S-relapse retainer	0.85 t	
Winch 5 with rope	5.2 t	
Rods WA-frame 1	0.28 t	

1.12 S-intermediate section 6 m, 2821.10

See illustration **11**.

Component	Weight	Width
S-intermediate section with guy rods	2.05 t	3.0 m
S-intermediate section with guy rods and W-guy rods	2.31 t	3.0 t

1.13 S-intermediate section 12 m, 2821.10

See illustration **12**.

Component	Weight	Width
S-intermediate section with guy rods	4.13 t	3.0 m
S-intermediate section with guy rods and W-guy rods	4.55 t	3.0 t

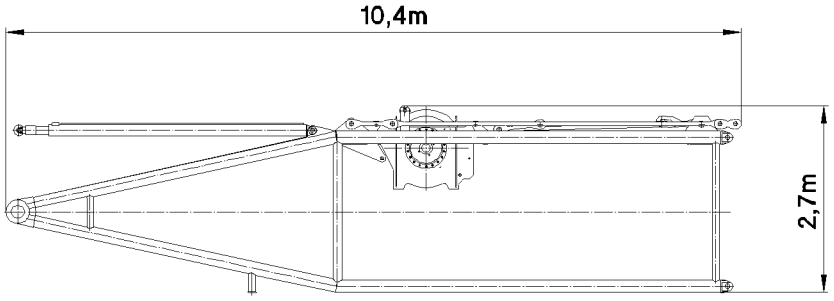
1.14 S-intermediate section 12 m, 2821.20

See illustration **12**.

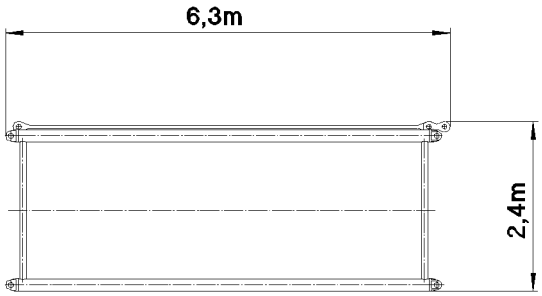
Component	Weight	Width
S-intermediate section with guy rods	4.03 t	3.0 m
S-intermediate section with guy rods and W-guy rods	4.55 m	3.0 m

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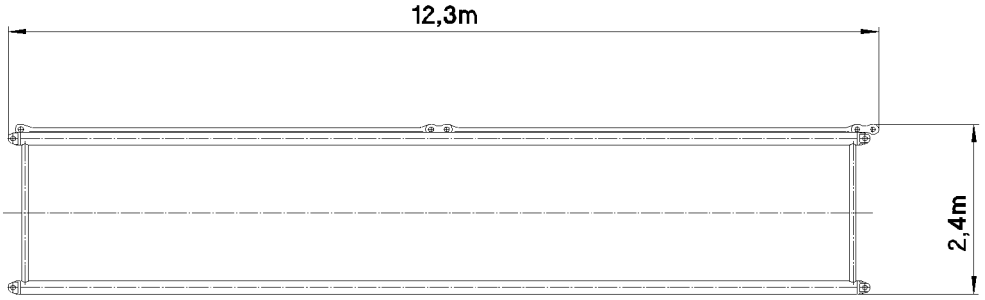
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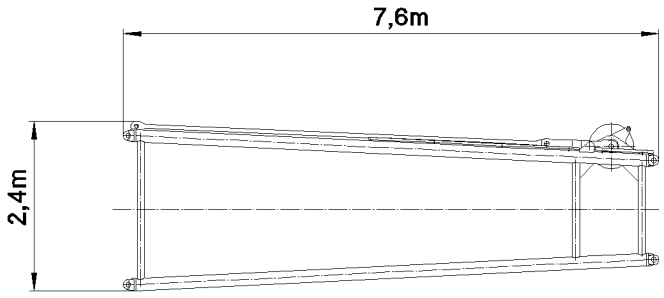
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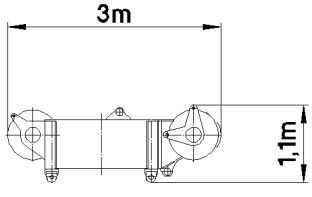
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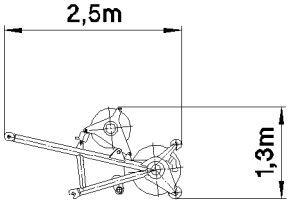
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1.15 S-adapter 7.4 m

See illustration **14**.

Component	Weight	Width
S-adapter with guy rods	4.44 t	3.0 m

1.16 S-end section

See illustration **15**.

Component	Weight	Width
S-end section	2.8 t	2.7 m

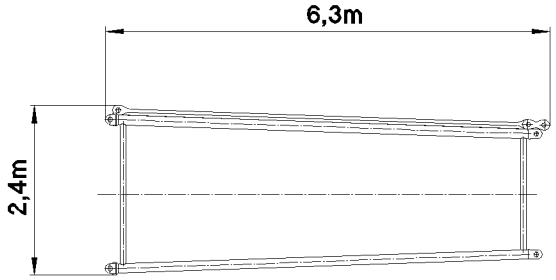
1.17 Boom nose 32 t

See illustration **16**.

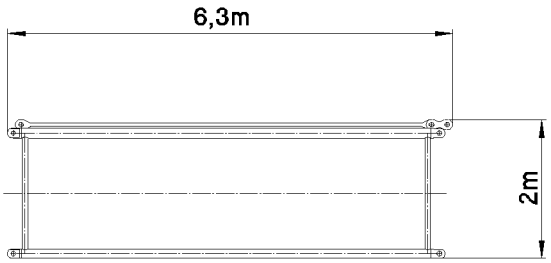
Component	Weight	Width
Boom nose 32 t	0.5 t	0.9 m

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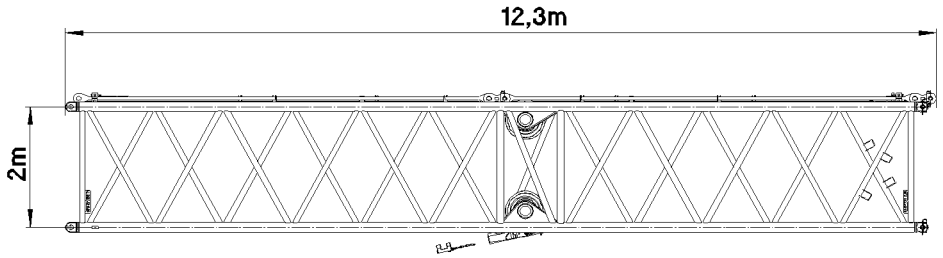
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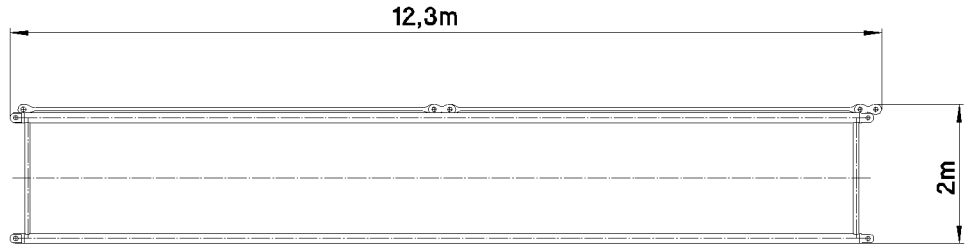
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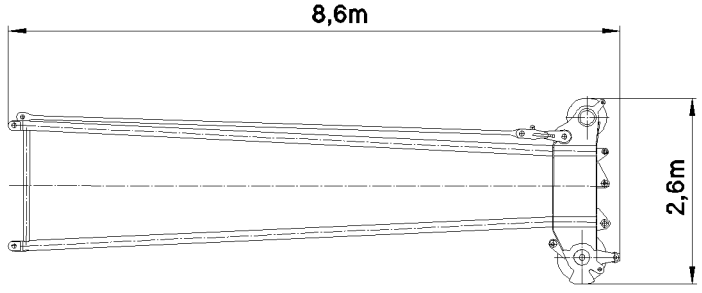
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1.18 SL-reducer section 6 m

See illustration **17**.

Component	Weight	Width
SL-reducer section without guy rods	1.6 t	3.0 m
SL-reducer section with guy rods	1.9 t	3.0 m

1.19 LI-intermediate section 6 m, 2417.10

See illustration **18**.

Component	Weight	Width
LI-intermediate section without guy rods	1.25 t	2.6 m
LI-intermediate section with guy rods	1.70 t	2.6 m

1.20 LI-intermediate section 12 m, 2417.10

See illustration **19**.

Component	Weight	Width
LI-intermediate section without guy rods	2.3 t	2.6 m
LI-intermediate section with guy rods	2.7 t	2.6 m
LI-intermediate section with guy rods and F-guy rods	3.2 t	2.6 t

1.21 LI-intermediate section 12 m, “Midfall”, 2417.10

Midfall: Intermediate section with pulley set in grill
See illustration **20**.

Component	Weight	Width
LI-intermediate section without guy rods	3.03 t	2.6 m
LI-intermediate section with guy rods	3.55 t	2.6 m

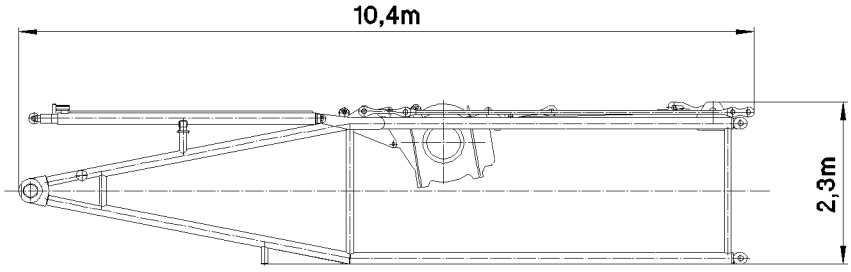
1.22 L-end section 200 t

See illustration **21**.

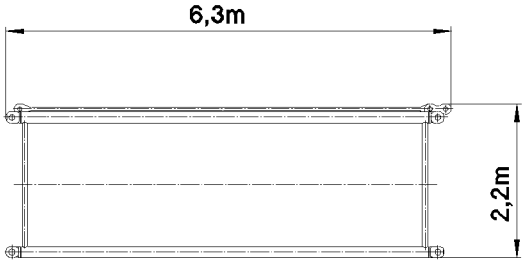
Component	Weight	Width
L-end section with guy rods	3.95 t	2.6 m

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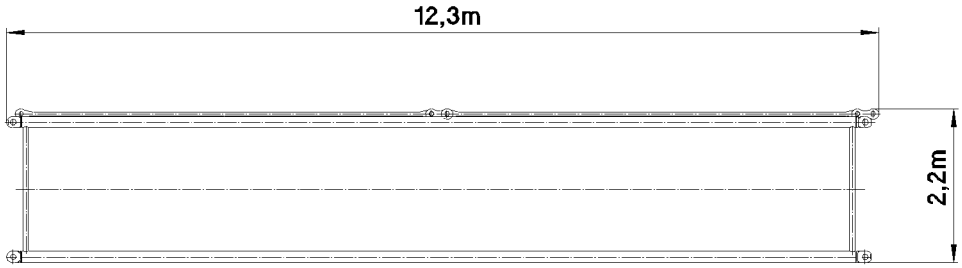
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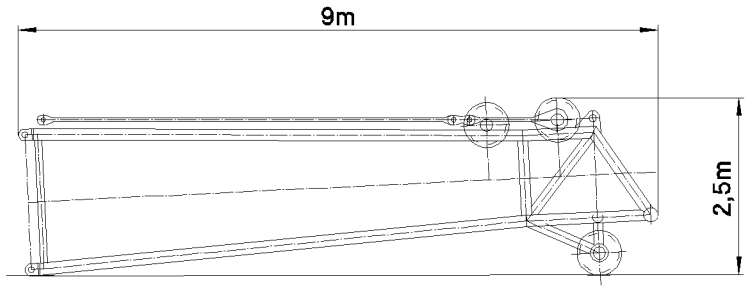
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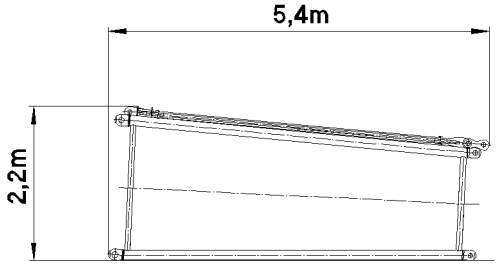
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1.23 L-pivot section

See illustration **22**.

Component	Weight	Width
S-pivot section complete	10.32 t	3.0 m
S-pivot section	5.79 t	
S-relapse retainer	0.81 t	
Winch 5 with rope	3.73 t	

1.24 L-intermediate section 6 m, 2219.10

See illustration **23**.

Component	Weight	Width
L-intermediate section without guy rods	1.60 t	2.42 m
L-intermediate section with guy rods	1.85 t	2.42 m
L-intermediate section with guy rods and N-guy rods	2.1 t	2.42 m

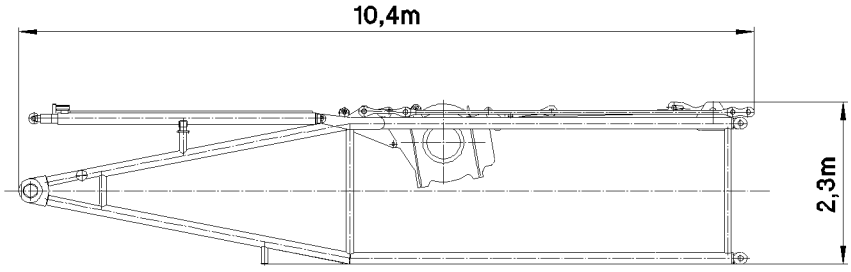
1.25 L-intermediate section 12 m, 2219.10

See illustration **24**.

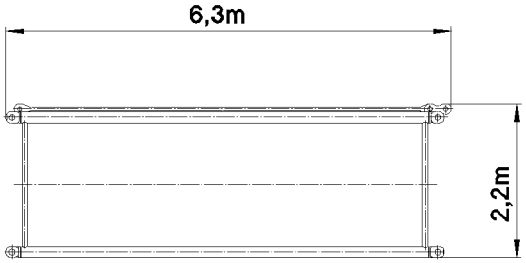
Component	Weight	Width
L-intermediate section without guy rods	2.75 t	2.42 m
L-intermediate section with guy rods	3.28 t	2.42 m
L-intermediate section with guy rods and N-guy rods	3.80 t	2.42 m

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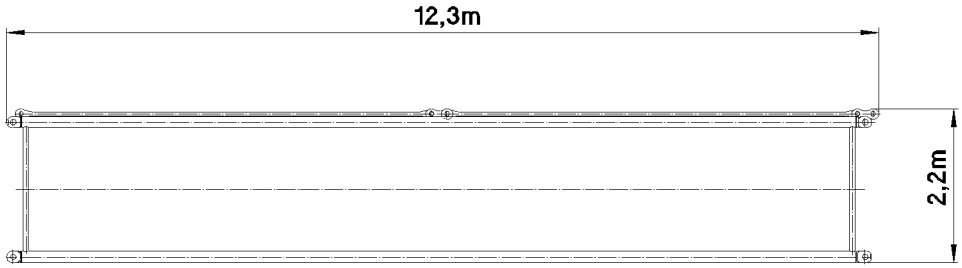
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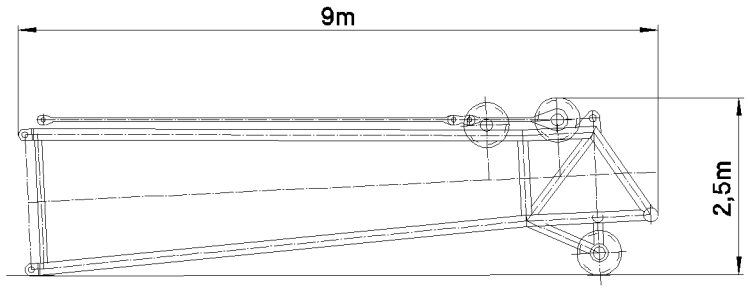
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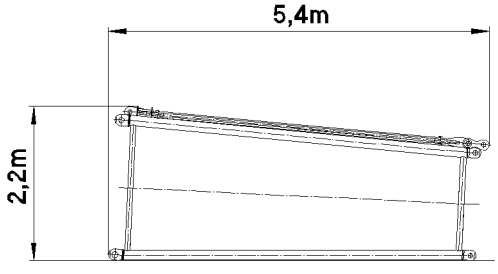
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1.26 L-end section 250 t

See illustration **25**.

Component	Weight	Width
L-end section with guy rods	5.93 t	2.42 m

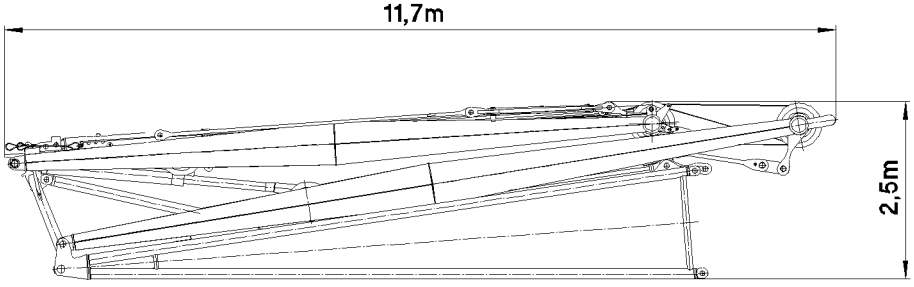
1.27 LL-reducer section 5 m

See illustration **26**.

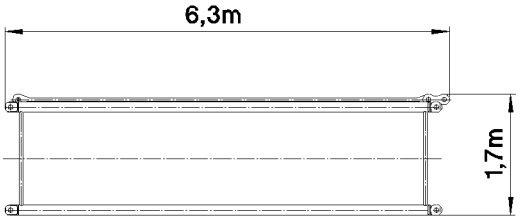
Component	Weight	Width
LL-reducer section without guy rods	0.96 t	2.42 m
LL-reducer section with guy rods	1.27 t	2.42 m

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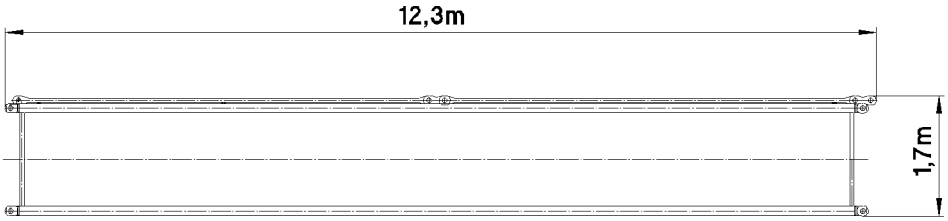
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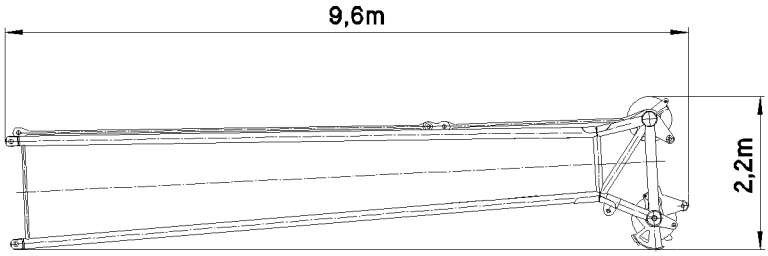
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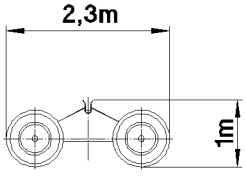
29



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1.28 N-assembly unit

See illustration **27**.

Component	Weight	Width
N-assembly unit complete	9.0 t	2.3 m

1.29 N-intermediate section 6 m, 2014.10

See illustration **28**.

Component	Weight	Width
N-intermediate section without guy rods	0.95 t	2.20 m
N-intermediate section with guy rods	1.21 t	2.20 m

1.30 N-intermediate section 12 m, 2014.10

See illustration **29**.

Component	Weight	Width
N-intermediate section without guy rods	1.67 t	2.20 m
N-intermediate section with guy rods	2.20 t	2.20 m

1.31 N-end section 150 t

See illustration **30**.

Component	Weight	Width
N-end section with guy rods	2.6 t	2.2 m

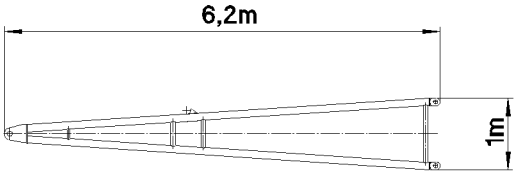
1.32 Pulley cart

See illustration **31**.

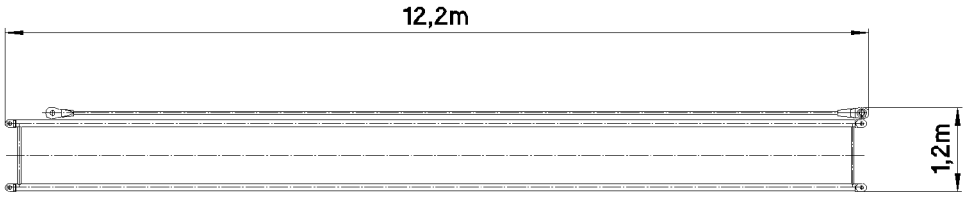
Component	Weight	Width
Pulley cart	0.7 t	2.0 m

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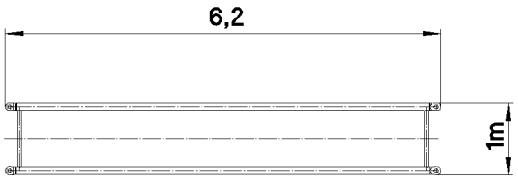
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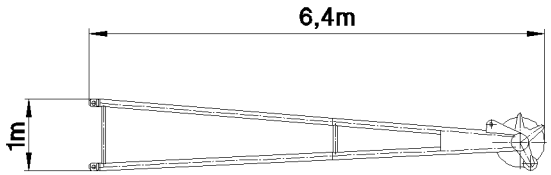
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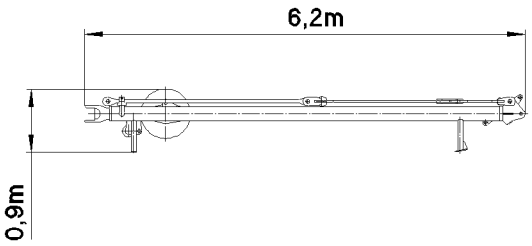
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1.33 F-pivot section 6 m

See illustration **32**.

Component	Weight	Width
F-connector head	0.7 t	1.2 m

1.34 F-intermediate section 6 m, 1109.10

See illustration **33**.

Component	Weight	Width
F-intermediate section with guy ropes	0.7 t	1.2 m

1.35 F-intermediate section 12 m, 1109.10

See illustration **34**.

Component	Weight	Width
F-intermediate section without guy rope	1.3 t	1.2 m

1.36 F-end section

See illustration **35**.

Component	Weight	Width
F-end section	1.3 t	1.2 m

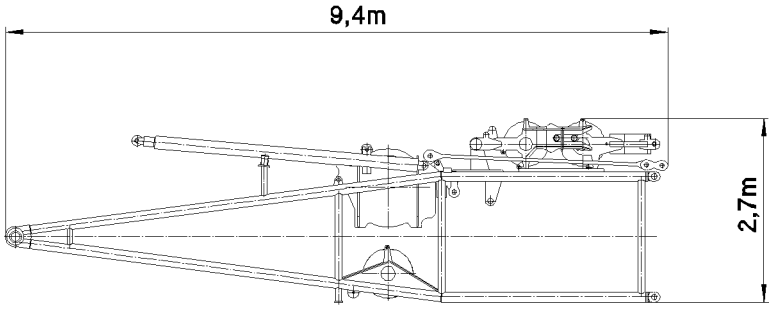
1.37 FA-frame

See illustration **36**.

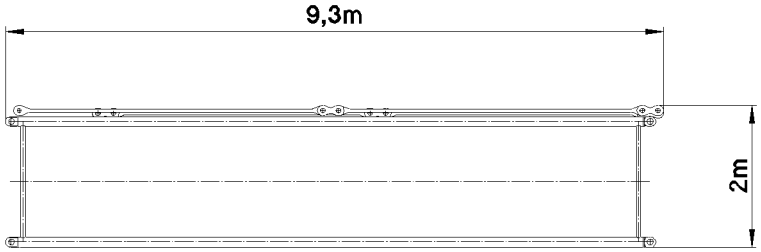
Component	Weight	Width
F-end section	1.2 t	2.6 m

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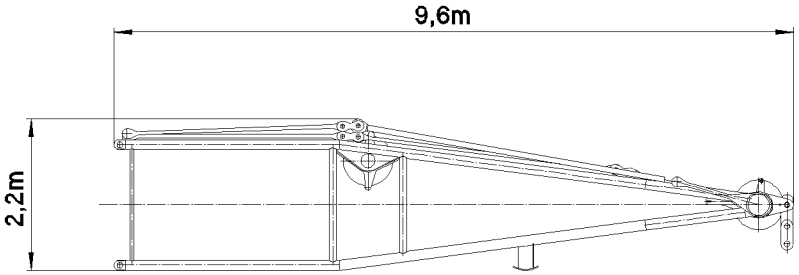
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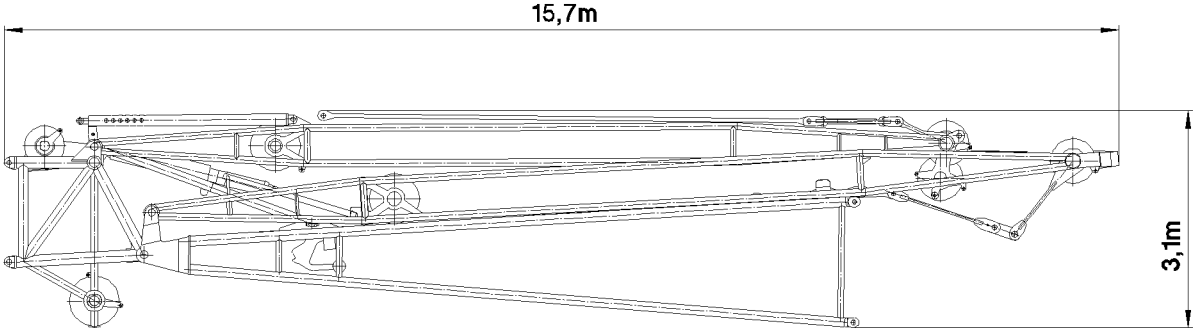
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1.38 D-pivot section

See illustration **37**.

Component	Weight	Width
D-pivot section ballast mechanical	13.9 t	2.7 m
D-pivot section ballast hydraulic	13.7 t	2.7 m
D-pivot section ballast trailer	13.5 t	2.7 m

1.39 D-intermediate section 9 m, 2417.20

See illustration **38**.

Component	Weight	Width
D-intermediate section with guy rods	3.7 t	2.6 m

1.40 D-end section

See illustration **39**.

Component	Weight	Width
D-end section ballast mechanical	5.7 t	2.7 m
D-end section ballast hydraulic	8.0 t	2.7 m
D-end section ballast trailer	6.7 t	2.7 m

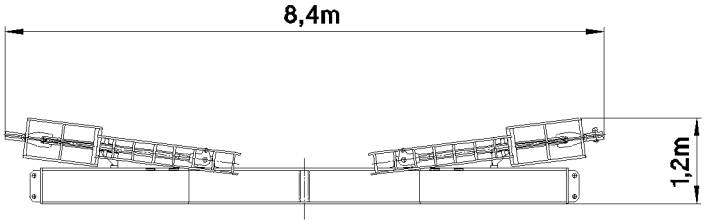
1.41 W-assembly unit

See illustration **40**.

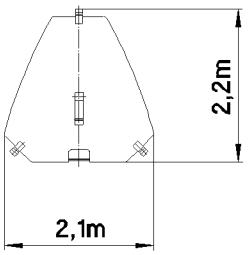
Component	Weight	Width
W-assembly unit	14.0 t	2.8 m

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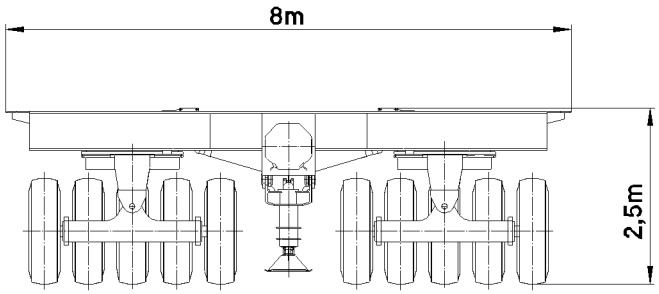
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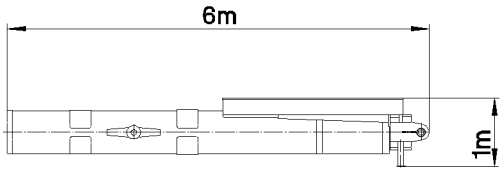
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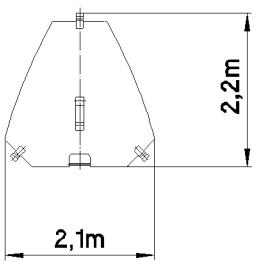
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1.42 Ballast pallet

See illustration **41**.

Component	Weight	Width
Ballast pallet	6.0 t	2.3 m

1.43 Ballast for suspended ballast

See illustration **42**.

Component	Weight	Thickness
Counterweight plate	5.0 t	0.4 m

1.44 Ballast trailer

See illustration **43**.

Component	Weight	Width
Ballast trailer, tires foamed	26.0 t	2.7 m
Ballast trailer, tires air filled	21.4 t	2.7 m

1.45 Ballast trailer guide

See illustration **44**.

Component	Weight	Width
Ballast trailer guide	7.5 t	1.9 m

1.46 Ballast for ballast trailer

See illustration **45**.

Component	Weight	Thickness
Counterweight plate	5.0 t	0.4 m

2 Load tackle

Note

▶ For load tackle, see chapter 4.06 in the crane operating instructions!

3 Ground pressure

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Maximum ground pressure	Track pad width		
	1.0 m	1.2 m *	1.5 m *
During operation	1900 kN/m²	1550 kN/m²	1200 kN/m²
At assembly	2600 kN/m²	2100 kN/m²	1650 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	74 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 160 m/min for single strand
Winch 2	0 m/min to 160 m/min for single strand
Winch 3	0 m/min to 160 m/min for single strand
Winch 4	2 x 0 m/min to 80 m/min for single strand
Winch 5	0 m/min to 160 m/min for single strand

Drives	RPM
Slewing gear	0 rpm to 1.85 rpm

6 Ropes

6.1 Hoist ropes

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	Rope diameter
Winch 1	28 mm
Winch 2	25 mm

6.2 Control ropes

	Rope diameter
Winch 3	25 mm
Winch 4	23 mm
Winch 5	25 mm

6.3 Guy ropes

	Rope diameter
Auxiliary guying	25 mm

6.4 Assembly rope

	Rope diameter
Assembly winch	8 mm

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2.00 Safety

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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 Danger zone of crane

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

WARNING
Do not stay in danger zone!
Personnel within the danger zone cane be hit by falling loads or components!
Personnel in the danger zone can be caught by moving crane components or loads!
Fatal or severe injuries can be the result!
▶ Warn any personnel within the danger zone with the warning device of the crane!
▶ After the warning is issued, wait and ensure that no personnel remains within the danger zone!
▶ If necessary, block off the danger zone with a safety distance of 0.5 m!

1.2 Exhaust systems and other heated crane components

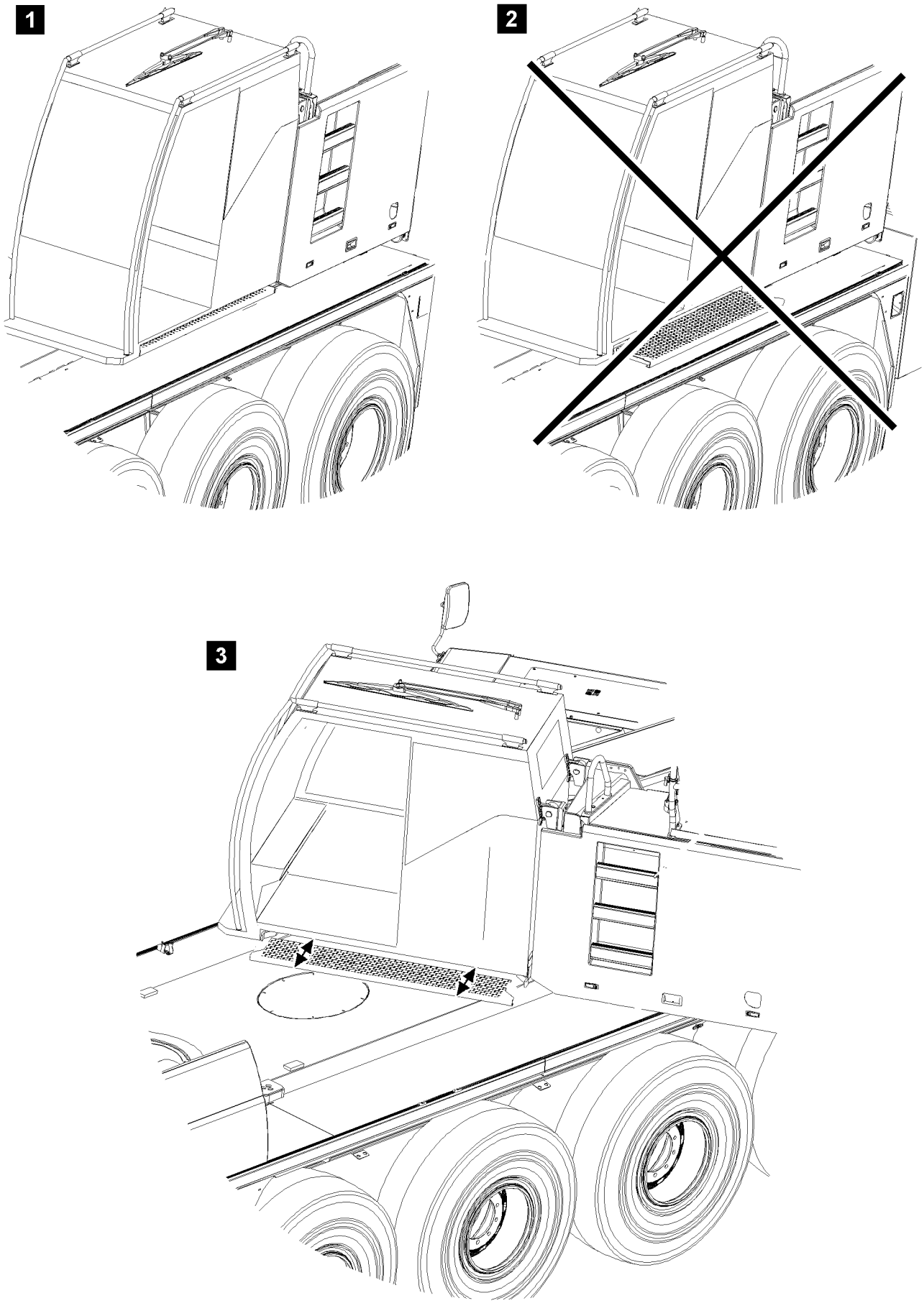
WARNING
Danger of burns!
You can get severely burnt on the surfaces of hot components!
This applies especially to exhaust systems, the engines and the respective gears in the crane chassis and in the crane superstructure!
▶ Let the components cool off before touching them!
▶ Proceed with special caution near heated crane components!

1.3 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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1.4 Crane operator's cab with retractable / extendable step

1.4.1 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!

1.4.2 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.

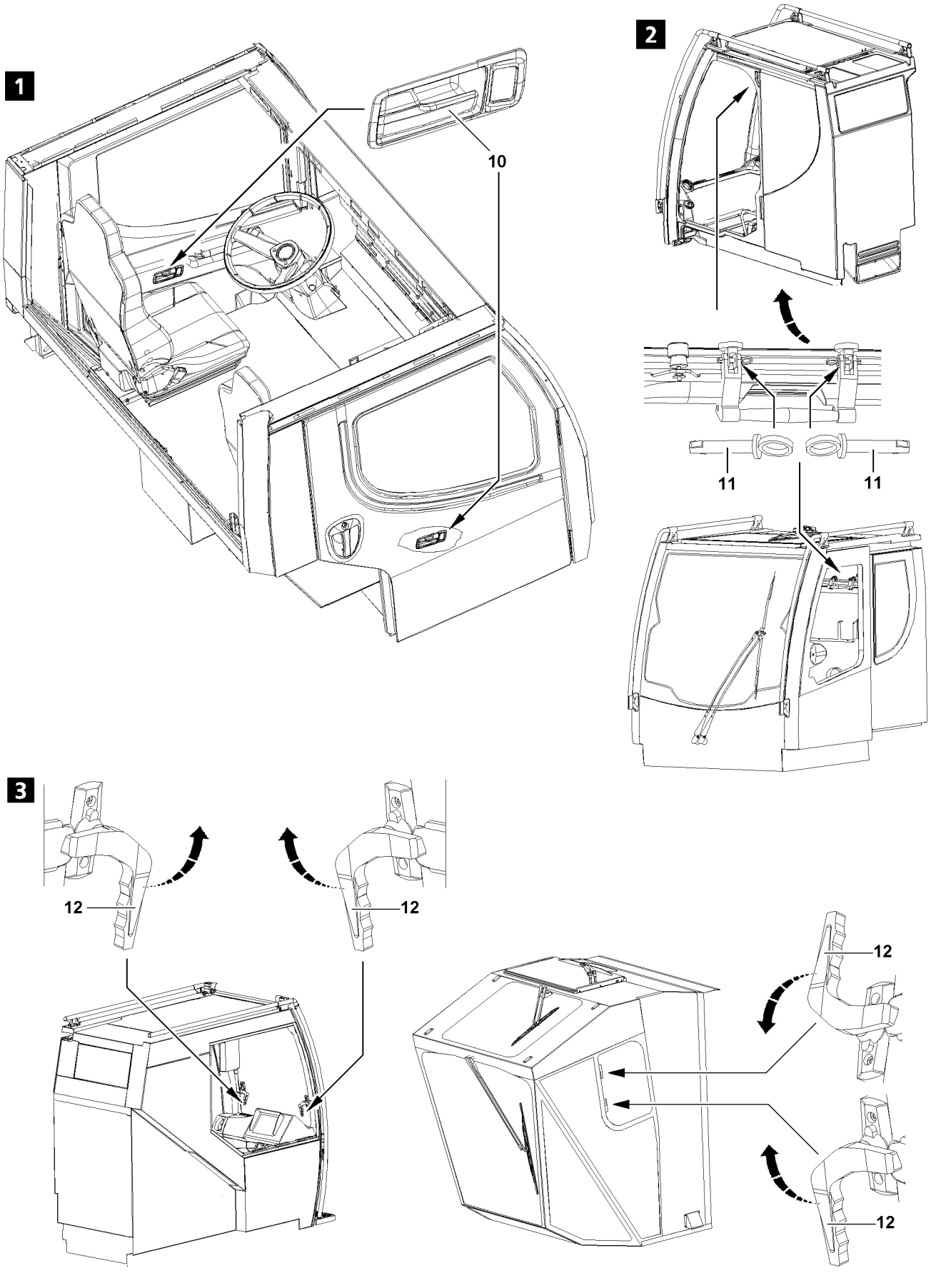
Note
▶ Use extendable step!
▶ The extended step allows comfortable entry into the crane operator's cab as well as safe exit from the crane operator's cab to the crane chassis!

1.5 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!

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

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2 Emergency exit

2.1 Emergency exit - driver's cab

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

Note

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

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!

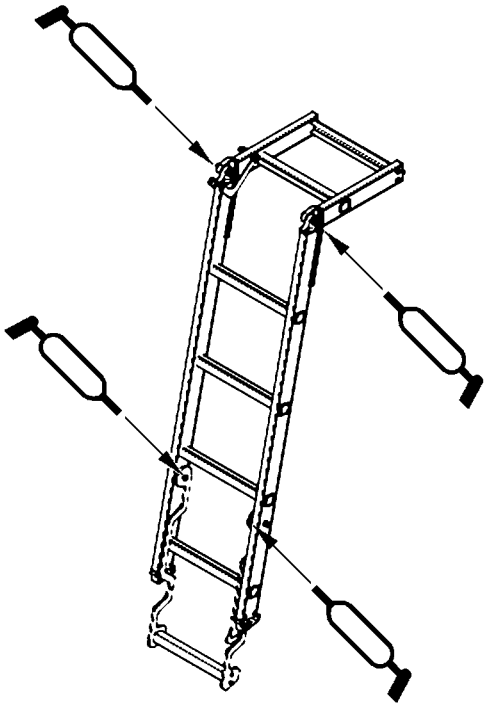
▶ If the crane operator's cab cannot be exited safely, use outside aid!

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:

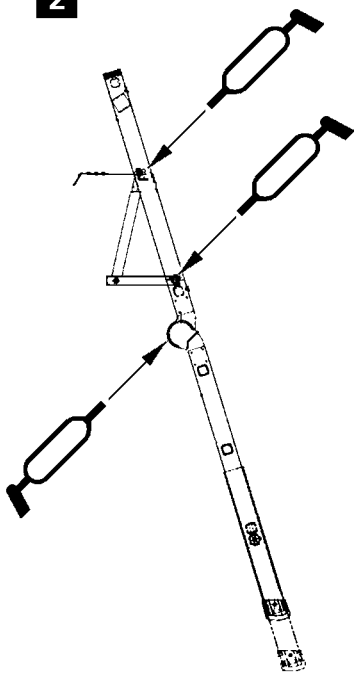
– **Roof window**, see illustration **2**: Pull the pins **11** on the left and right and open the roof window upward.
– **Rear window**, see illustration **2**: Pull the pins **11** on the left and right and open the rear window upward.
– **Front window**, see illustration **3**: Unlock the left and 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 Safety guidelines for ladders

3.1 General

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

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

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

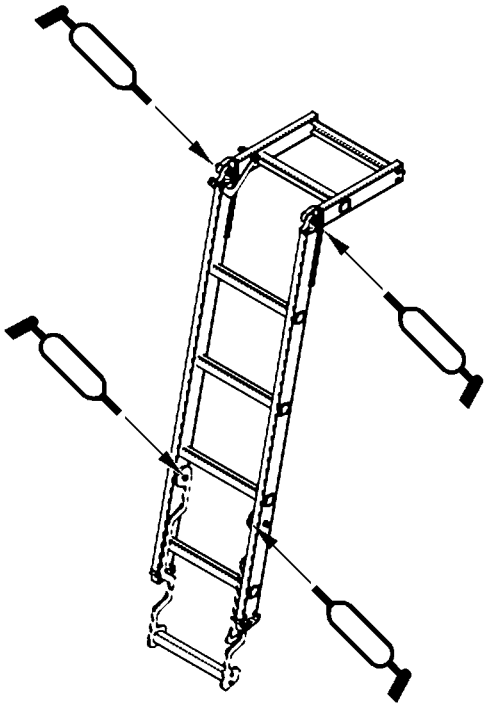
Before starting to drive / before transport, ensure that the following prerequisite is met:
- – The ladders are tightly locked and secured in the intended transport retainers.

3.2 Maintenance

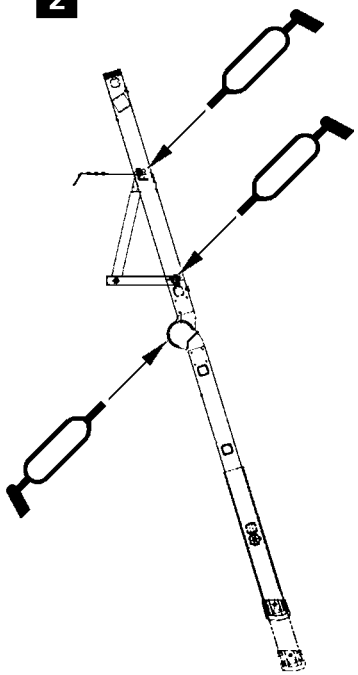
Note
- ▶ Grease joints and pivot points on the ladders regularly and check them for easy movement, see illustration **1** and illustration **2**!
- ▶ Remove any dirt on the ladders!
- ▶ The ribbing on the rungs must be clear!

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2



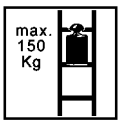
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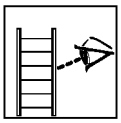
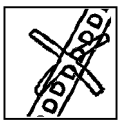
3.3 Safety signs on the ladders

Note

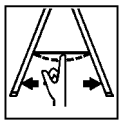
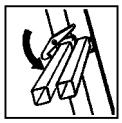
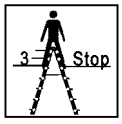
▶ All safety signs on the ladders must be complete and always legible!

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

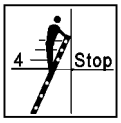
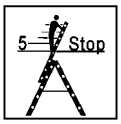
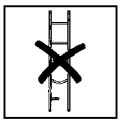
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Sign	Explanation
	Ladder overhang over the set up point
	It is not permitted to step off to the side from the ladder
	Only one person on every accessible bracket
	Visual inspection of the ladder before use
	Do not use the ladder as a bypass
	Do not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

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

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

4 Requirements of the crane operator

4.1 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.

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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.

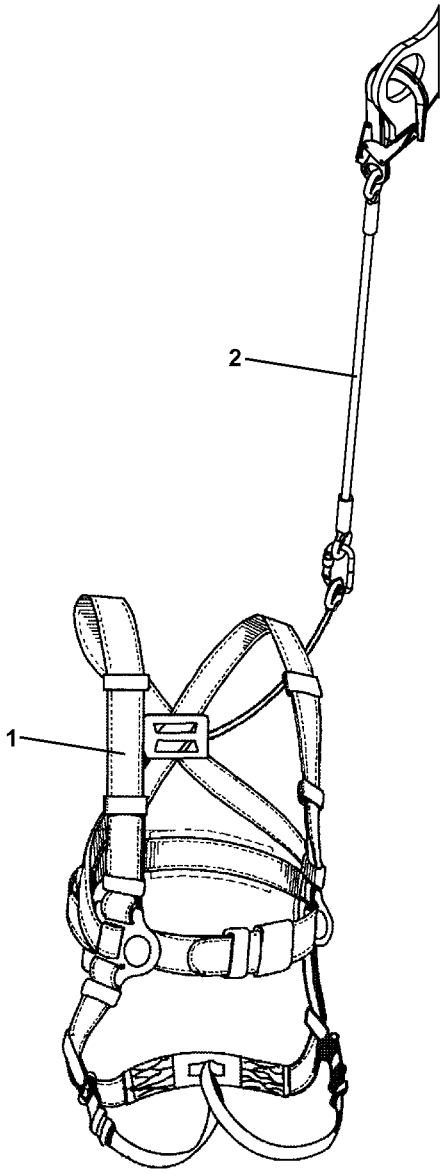
The main **operating errors**, which are made again and again while operating or driving a crane, are as follows:

- 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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4.2 Personal protective 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 fall arrest systems!
- ▶ **Only approved fall arrest systems (catch belt, connectors) may be used! These fall arrest 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 fall arrest 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.
- – Fall arrest 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 protective 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!

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

4.2.1 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.

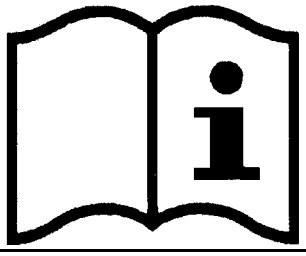
Documentation of personal protective equipment		
Product:		
Type and model / Identification	**Commercial name**	**Identification number**
Manufacturer	**Address**	**Phone and fax number, email and internet page**
Year of manufacture / expiration date	**Purchase date**	**Date of first use**
Other significant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

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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**

4.2.2 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!**	

4.3 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.

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- ▶ 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 driver's cab or cab roof and specially marked surfaces, see Crane operating instructions, chapter 2.05!

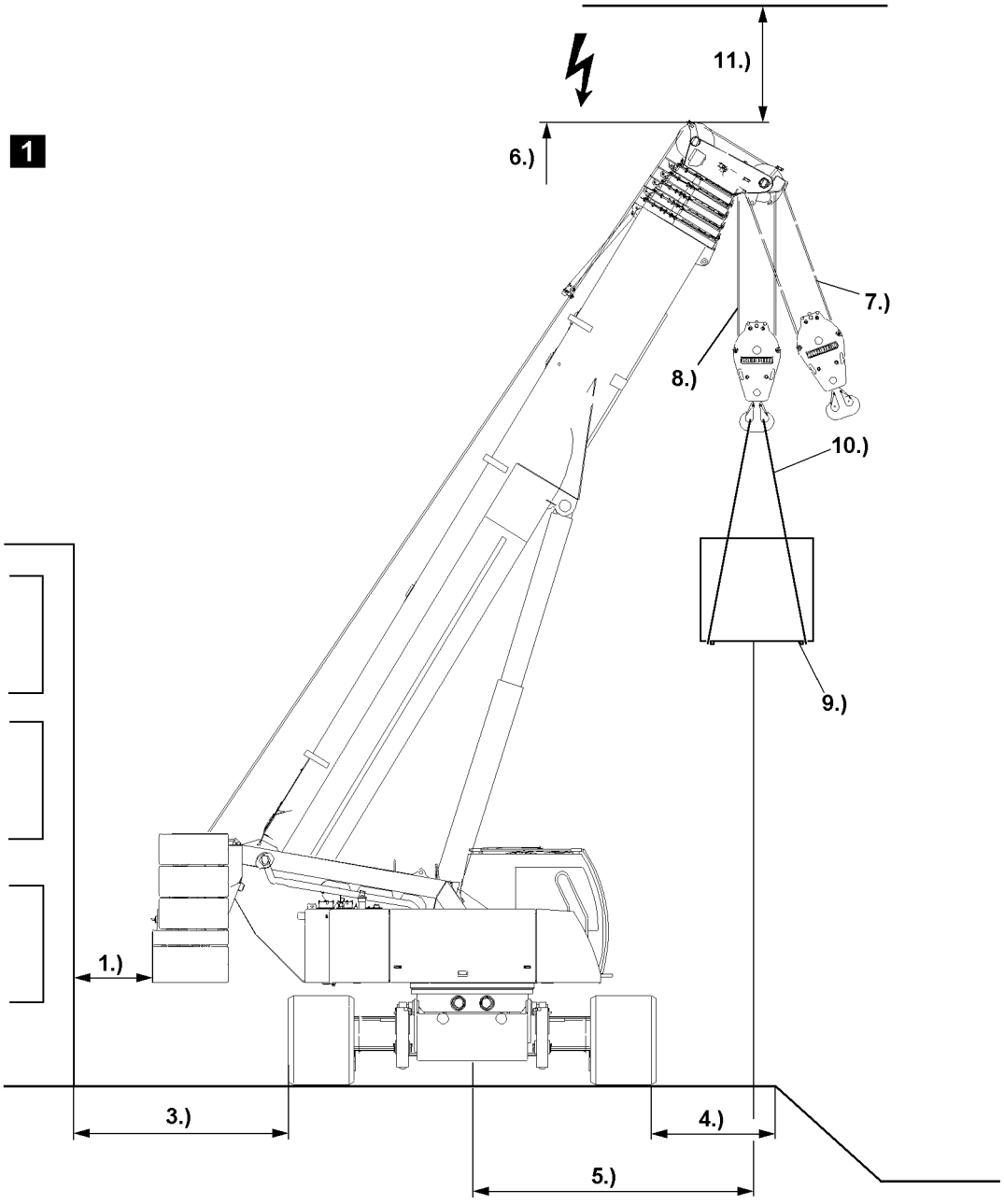
4.4 Obligations of the crane operator

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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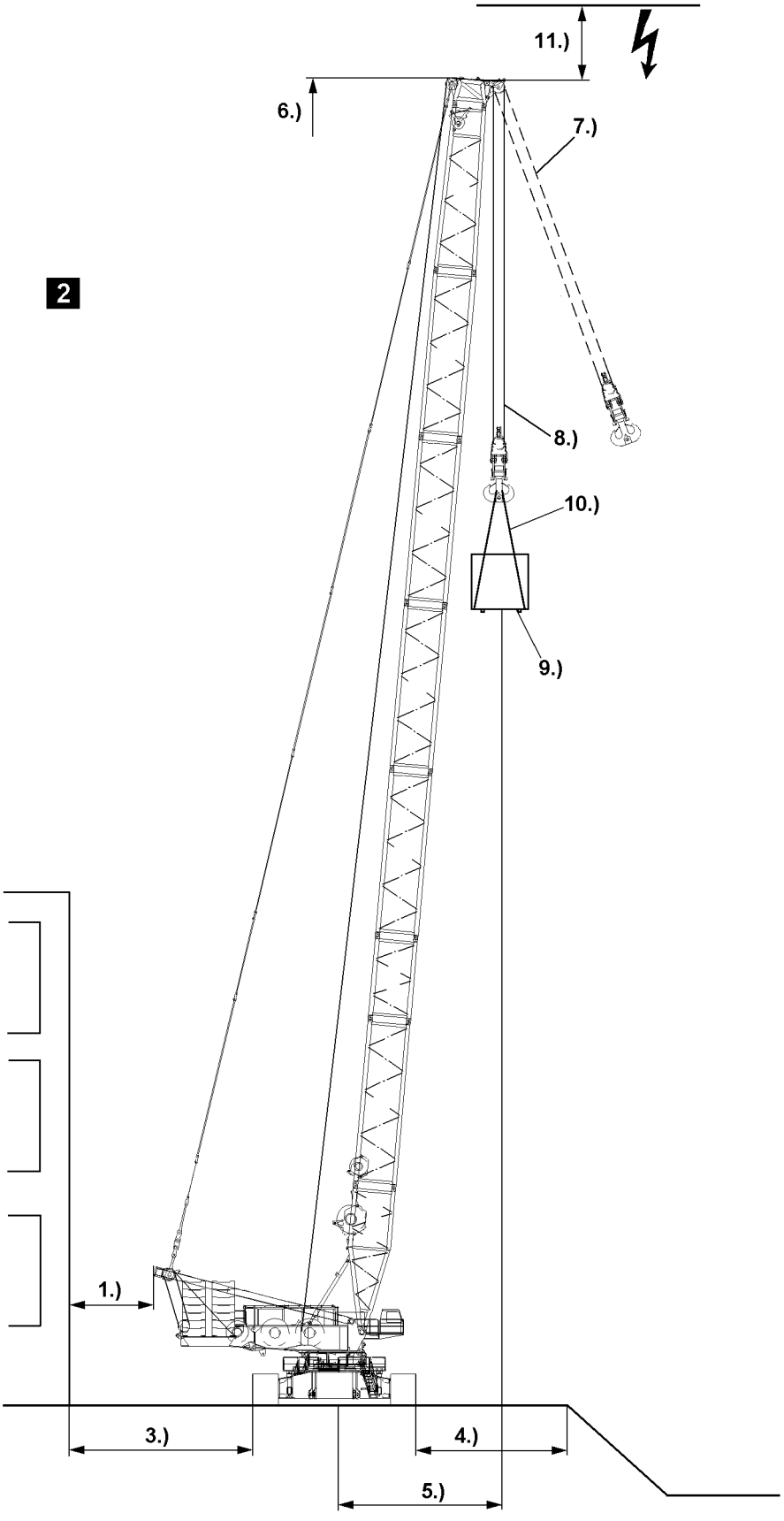
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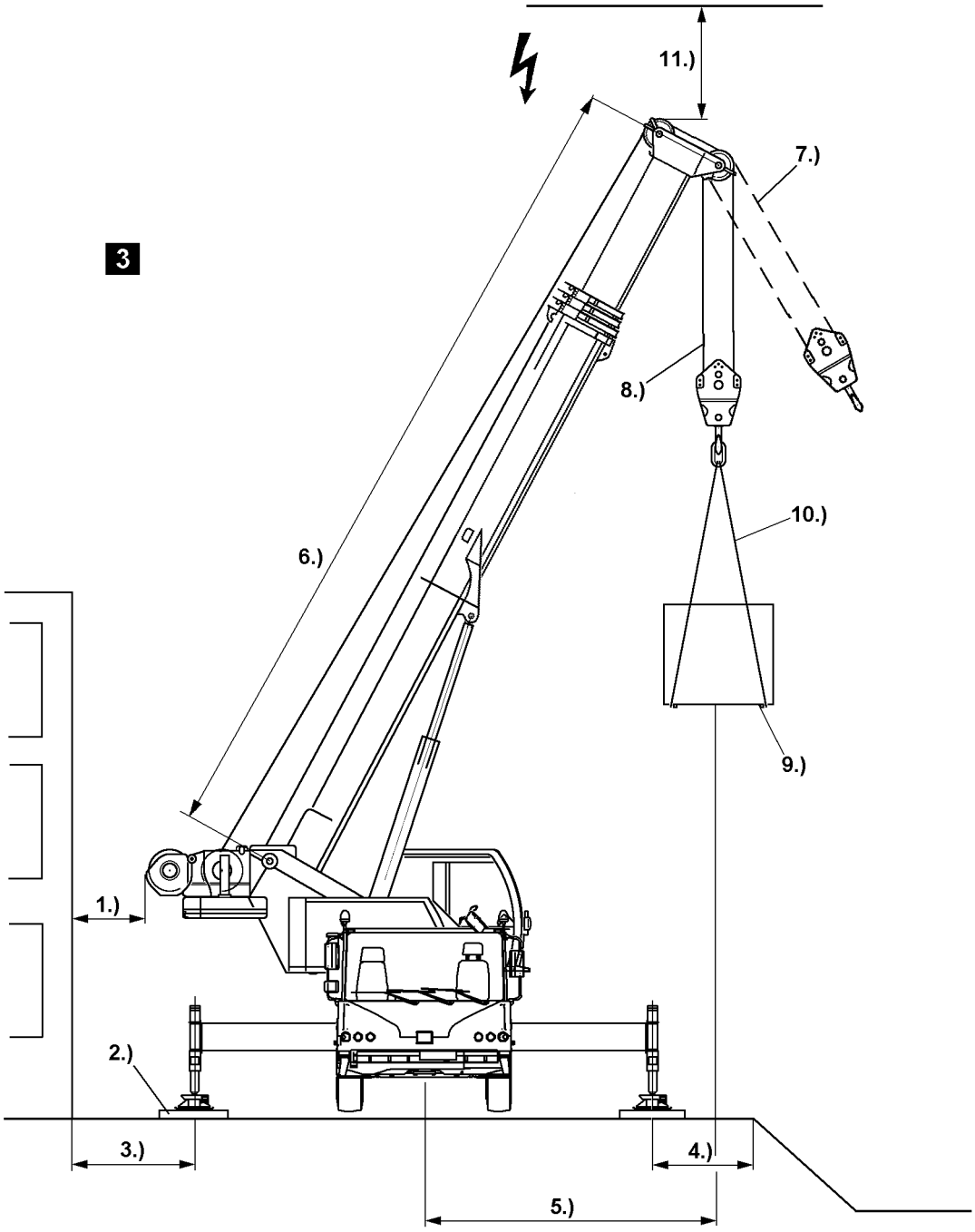
B104101 *Example for crawler crane with telescopic boom*

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B104102 *Example for crawler crane with lattice mast boom*

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B104103 *Example for mobile cranes*

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5 Selecting the location, illustrations 1 to 3

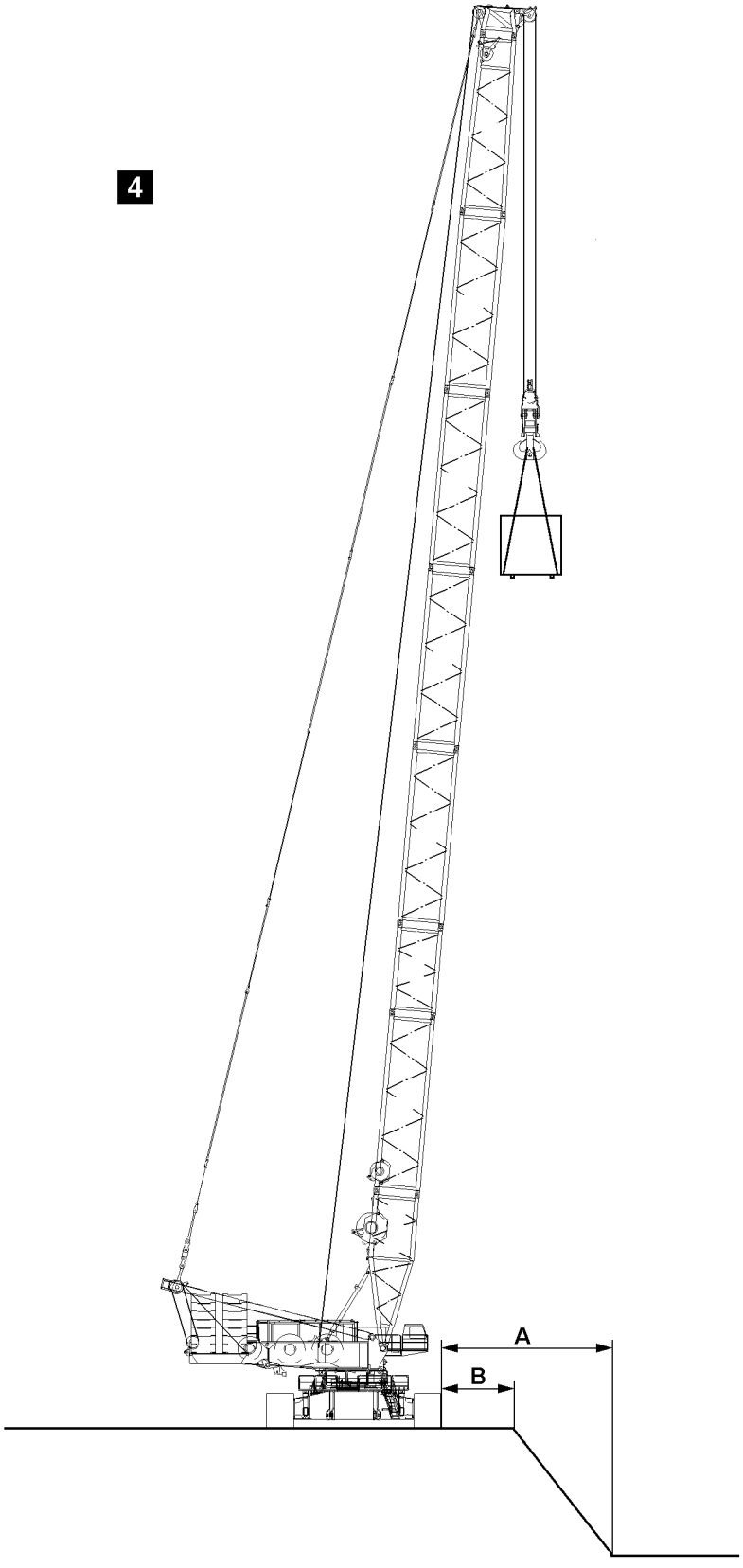
It is very important to choose an appropriate location for crane operation in order to minimize safety risks.

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 radius to as low as possible.
6.) Select the correct boom length to the load case.
7.) Angular pull is prohibited!
8.) Select the correct reeving of the hoist rope to the load case.
9.) Bear in mind the weight and the wind exposure surface of the load.
10.) Select tackle according to the weight of the load, the type of attachment and the incline angle.
11.) Keep sufficient distance to electrical overhead wiring.

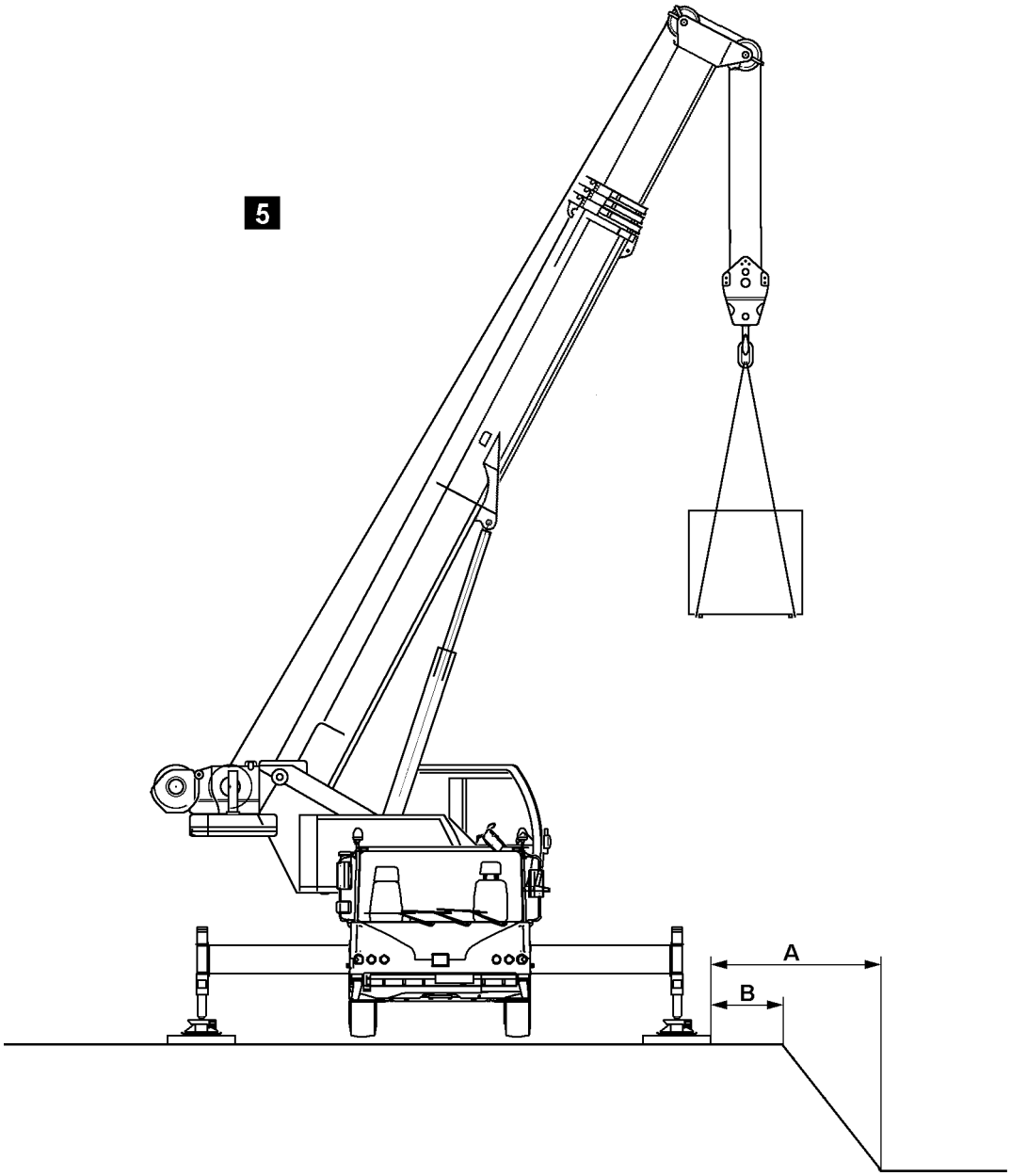
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Example for crawler cranes

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Example for mobile cranes

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6 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

7 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:	

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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.

7.1 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!

7.2 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.

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

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

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

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

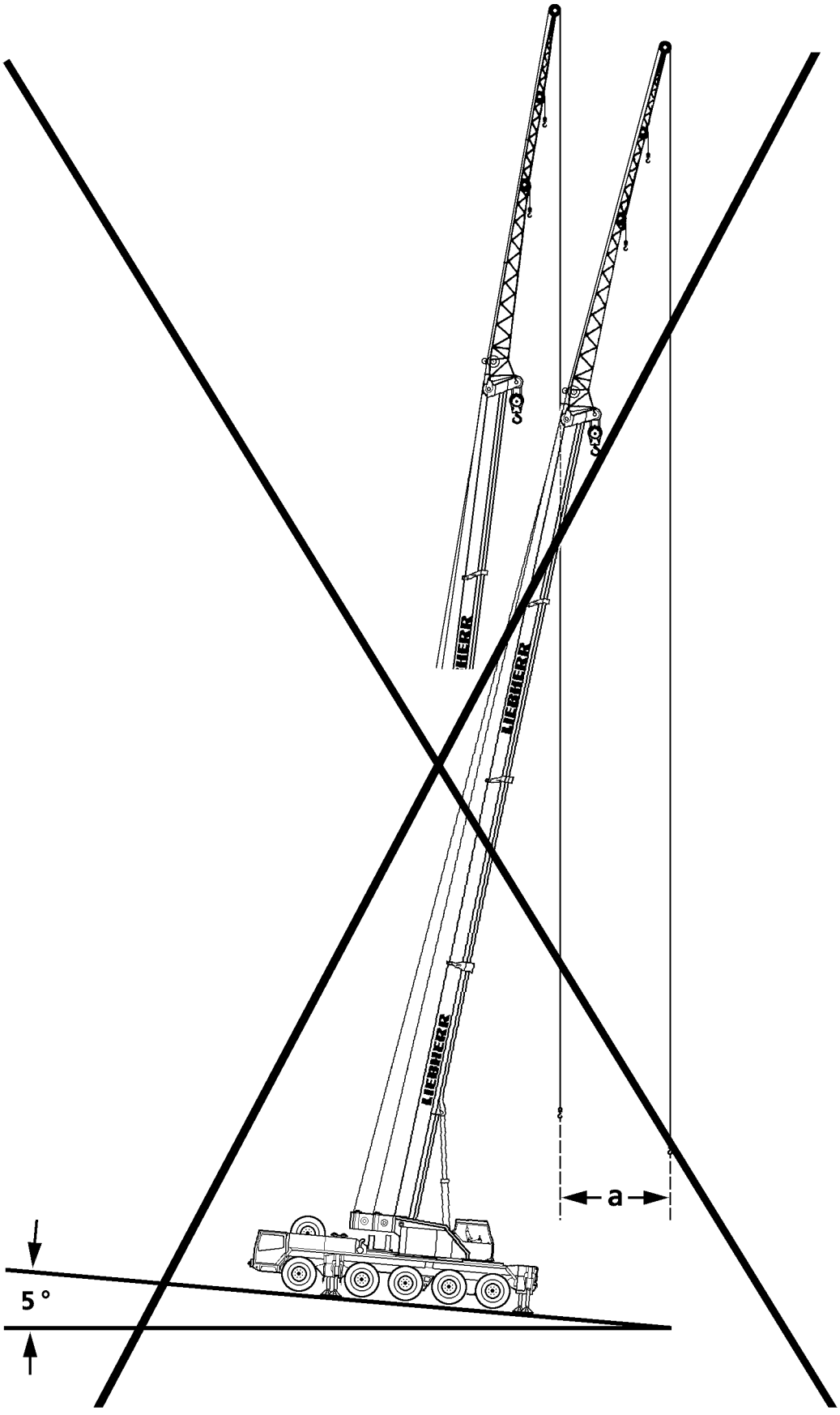
Note

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

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General example

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8 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!

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8.1 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 radius is increased as a result!

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

Personnel can be severely injured or killed!

▶ It is imperative to align the crane horizontally before starting crane operation!

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

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

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

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

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10 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 load 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** .

10.1 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!

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10.2 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!

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10.3 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 fullfil 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 plates are not supported with stable base materials sufficiently large for the ground conditions.
8.) If the load is pulled at an angle.
Angular pulling to the side is particularly dangerous, because the boom has only minimal lateral moment of resistance.
It is prohibited to pull a load at an angle.
9.) 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
More than 1 kV to 110 kV	3 m
More than 110 kV to 220 kV	4 m
More than 220 kV to 380 kV	5 m
If rated voltage is unknown	5 m

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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!

11 Lifting of personnel

11.1 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 many 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!

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- ▶ 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!

11.2 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.

12 Grounding

12.1 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

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

12.2 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.

13 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.

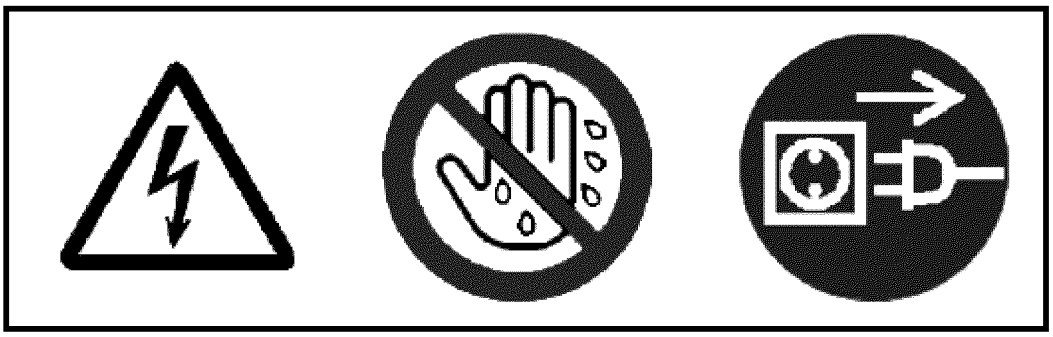
14 Welding work on the load

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.

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

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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.

16 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!

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17 Joint lifting of a load by several cranes

If a load is to be lifted by several cranes, the procedure must be previously determined by the contractor or his representatives, and must be carried out in the presence of a supervisor assigned 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.

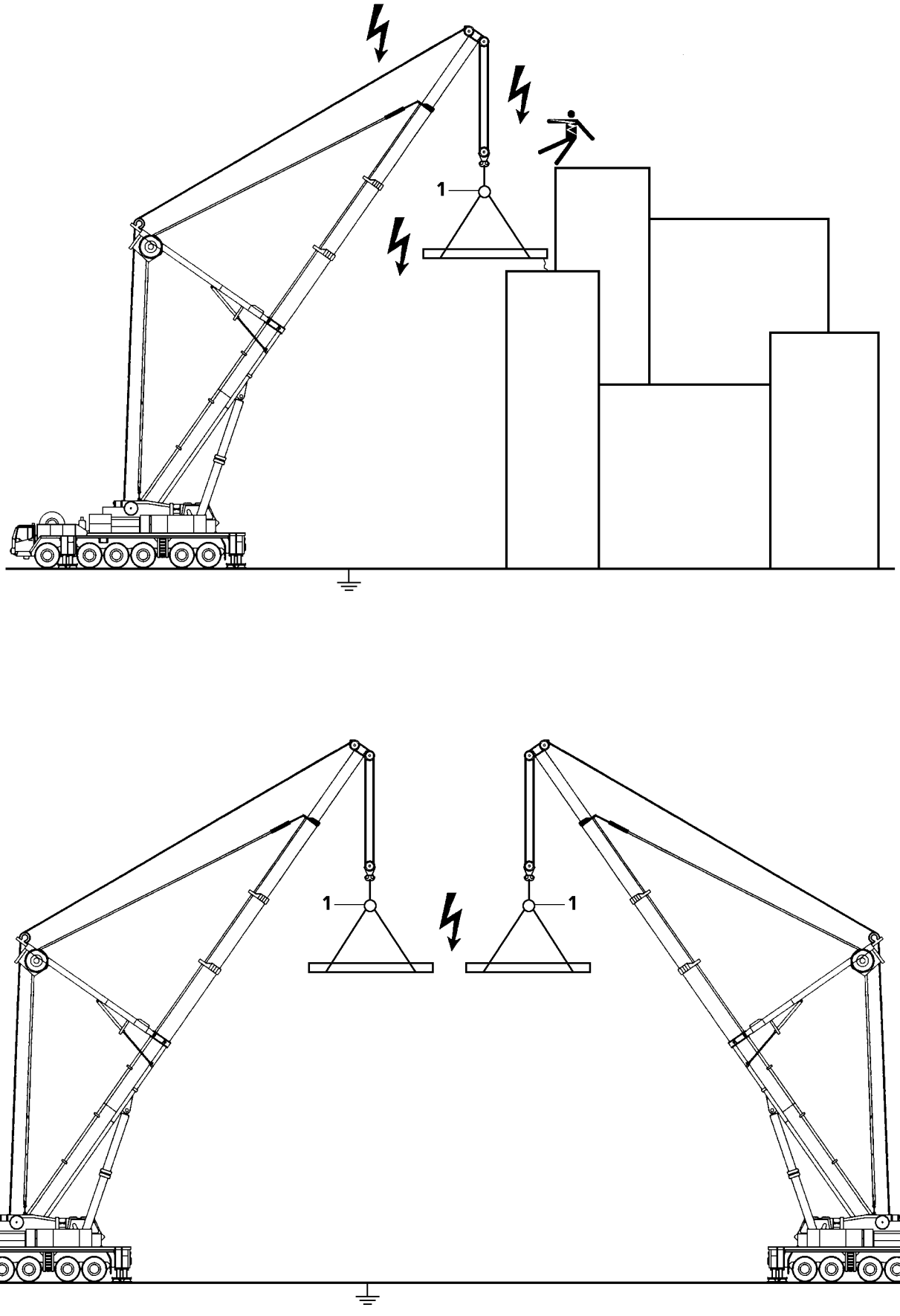
Note
▶ In the event of differing load-bearing capacities of the cranes, attach the loads in such a way as each crane is only loaded with its own permissible load-bearing capacity.

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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General example

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18 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

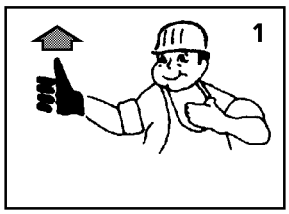


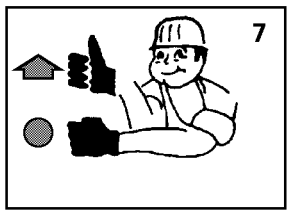
DANGER
Risk due to electromagnetic fields!
▶ Before operating a crane in the vicinity of transmitters, be sure to consult with LIEBHERR!
▶ Also consult a high frequency specialist!

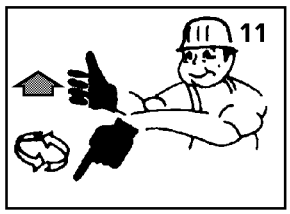
High frequency (HF) radiation from a transmitter requires supplementary work safety protection and special environmental specifications for crane operators and personnel:

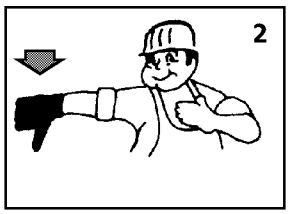
1.) Each crane must be “fully” grounded. Check visually or with a simple tester to ensure that ladder, cab and cable pulleys are grounded.
2.) All personnel working on the crane or with large metal objects must protect themselves from burns by wearing non-conductive synthetic gloves and suitable clothing 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.
For example, if 500 V can be measured on a tool at a distance of 1 cm - 2 cm, then the tool may not be touched with bare hands.
The greater the distance, the higher is the voltage on the object:
At 10 cm distance, approx. 600 V are present, at 30 cm distance approx. 2000 V are present.
13.) When refueling the crane, it must be ensured that no sparks are created within a radius of 6 m, neither by handling larger metallic parts nor by other work.
14.) To avoid secondary accidents, use personal protective equipment when working on components that are high off the ground.
15.) Any accidents and unexpected events must immediately be reported to the local construction supervisor and the safety engineer.

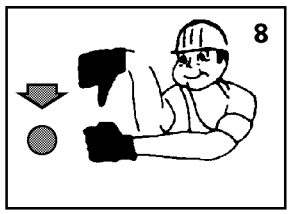
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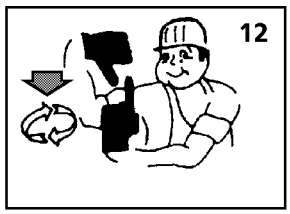


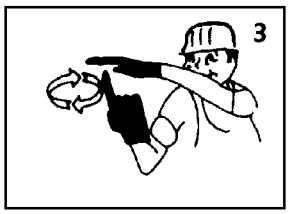


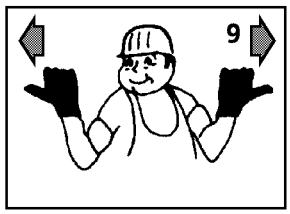


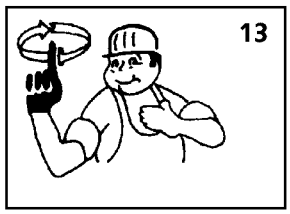


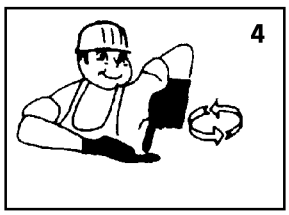


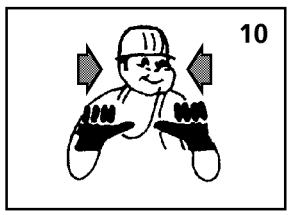


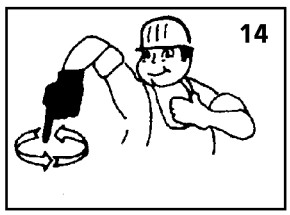


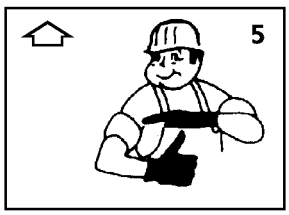


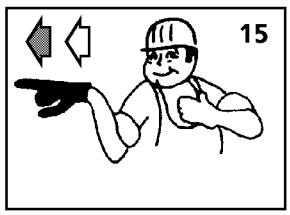


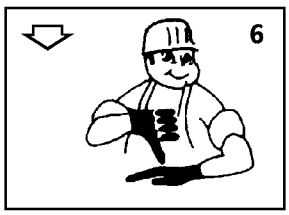


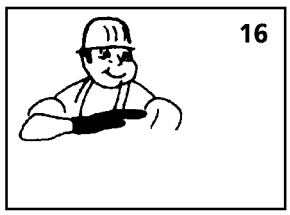


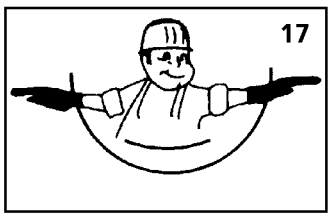












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19 Hand signals for guidance

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 the boom up **1**
Luff the boom down **2**
Lift the load slowly **3**
Lower the load slowly **4**
Luff the boom up slowly **5**
Luff the boom down slowly **6**
Luff the boom up and hold the load **7**
Luff the boom down and hold the load **8**
Telescope the boom out **9**
Telescope the boom in **10**
Luff the boom up and lower the load **11**
Luff the boom and lift the load **12**
Lift the load **13**
Lower the load **14**
Turn the load in this direction **15**
Set everything down **16**
Stop! **17**

20 Beaufort Wind chart

Note
- ▶ The influence of the wind onto the surrounding is described clearly in the Beaufort Wind chart below to provide an orientation for the crane operator!
- ▶ The determining factor for all crane work in the actual wind speed at the job site of the crane!
- ▶ The current wind speed can be checked at the nearest weather bureau!
- ▶ Note the following: The wind speed on the boom may be higher than it is near the ground!

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Wind force		Wind speed		Effect of the wind
Beaufort	Description	[m/s]	[km/h]	in the inland
0	Calm	0 to 0.2	1	No wind, smoke rises straight up
1	Slight air (draft)	0.3 to 1.5	1 to 5	Wind direction is shown only by observing the trail of smoke, not by the wind sock
2	Light breeze	1.6 to 3.3	6 to 11	Wind can be felt on the face, the leaves rustle, wind sock moves slightly
3	Gentle breeze	3.4 to 5.4	12 to 19	Leaves and thin twigs move, wind extends a small breeze flag
4	Moderate breeze	5.5 to 7.9	20 to 28	Swirls up dust and loose paper, moves twigs and thin branches
5	Fresh breeze	8.0 to 10.7	29 to 38	Small deciduous trees begin to sway, foam forms at sea
6	Strong breeze	10.8 to 13.8	39 to 49	Thicker branches move; telephone lines begin to whistle, umbrellas are difficult to use
7	Stiff wind	13.9 to 17.1	50 to 61	Entire trees swaying; difficult to walk into wind
8	Gale force wind	17.2 to 20.7	62 to 74	Breaks twigs off trees, walking becomes difficult
9	Gale	20.8 to 24.4	75 to 88	Minor damage to property (chimney tops and roofing tile are blown off)
10	Severe gale	24.5 to 28.4	89 to 102	Trees are uprooted, significant damage to property
11	Violent storm	28.5 to 32.6	103 to 117	Extensive, widespread storm damage
12	Hurricane	32,7 and more	118 and more	Major destruction

21 Consideration of wind conditions

It is imperative that the data regarding the permissible wind speeds is observed:

– For erection and take down of various boom configurations, see wind speed chart.
– For crane operation, see load chart.
– For the configured crane at “Crane not in service”, see wind speed chart.

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21.1 Wind influences during erection and take down

WARNING
The crane can topple over!
If a boom or a boom system is erected or taken down and the expected wind speeds are larger than the maximum permissible wind speeds according to the wind chart, then the crane can topple over and fatally injure personnel!
- ▶ If wind speeds are expected which are larger than the maximum permissible wind speeds for erection, then erection of the boom or the boom system is prohibited!
- ▶ If wind speeds are expected, which are larger than the maximum permissible wind speeds for take down, then the boom or the boom system must be taken down immediately!

21.2 Wind influences in 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 chart, then the 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!

21.3 Wind influences when the “crane is not in service”

WARNING
The crane can topple over!
If the crane is taken out of service in configured condition and the expected wind speeds are larger than the maximum permissible wind speeds according to the wind chart, then the crane can topple over and fatally injure personnel!
- ▶ If wind speeds are expected which are larger than the maximum permissible wind speeds for “taking the crane out of service”, then the attachments and the boom must be taken down!
- ▶ Always take the boom down for safety reasons if weather conditions are unclear, see Erection and take down charts!

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22 Interruption of crane operation

22.1 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.

23 Taking up crane operation again

23.1 Taking up crane operation again

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

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

▶ Check operating mode settings and reset, if necessary.

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24 Ending crane operation

24.1 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. Make sure that the crane operator's cab and driver's cab are not occupied. Lock the crane operator's cab and driver's cab.
- On mobile cranes:
  Secure the crane against uncontrolled rolling. See paragraph “Parking the vehicle”.

25 Turning / driving in reverse

WARNING
Danger of accidents when turning or driving in reverse!
When turning or driving in reverse, personnel can be overlooked or killed!
Objects can be severely damaged!

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

26 Parking the vehicle

Note

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

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

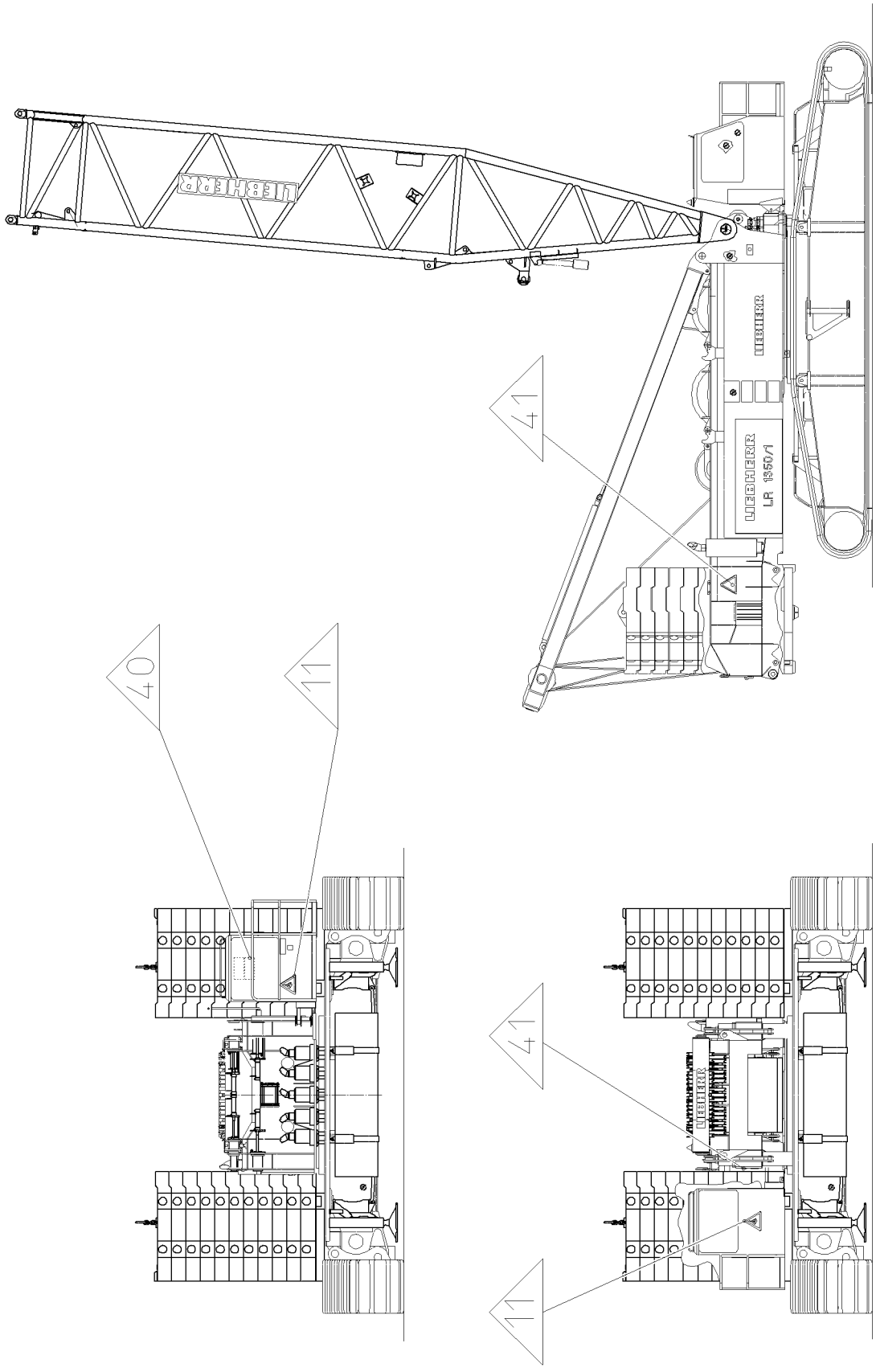
Make sure that the following prerequisites are met:
- – The vehicle is standing on level ground with sufficient load bearing capacity.
- – The parking brake is applied.

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

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1 Warning signs

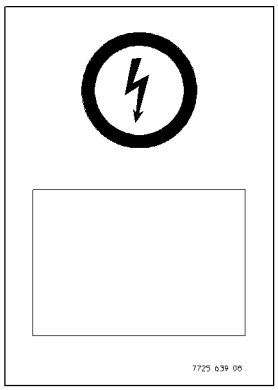
Note
- ▶ Warning signs are safety signs, which warn of a risk or danger!
- ▶ For that reason, all warning signs on the crane must be complete and always legible!
- ▶ Replace damaged warning signs immediately!

1.1 Warning of suspended load (position 11)



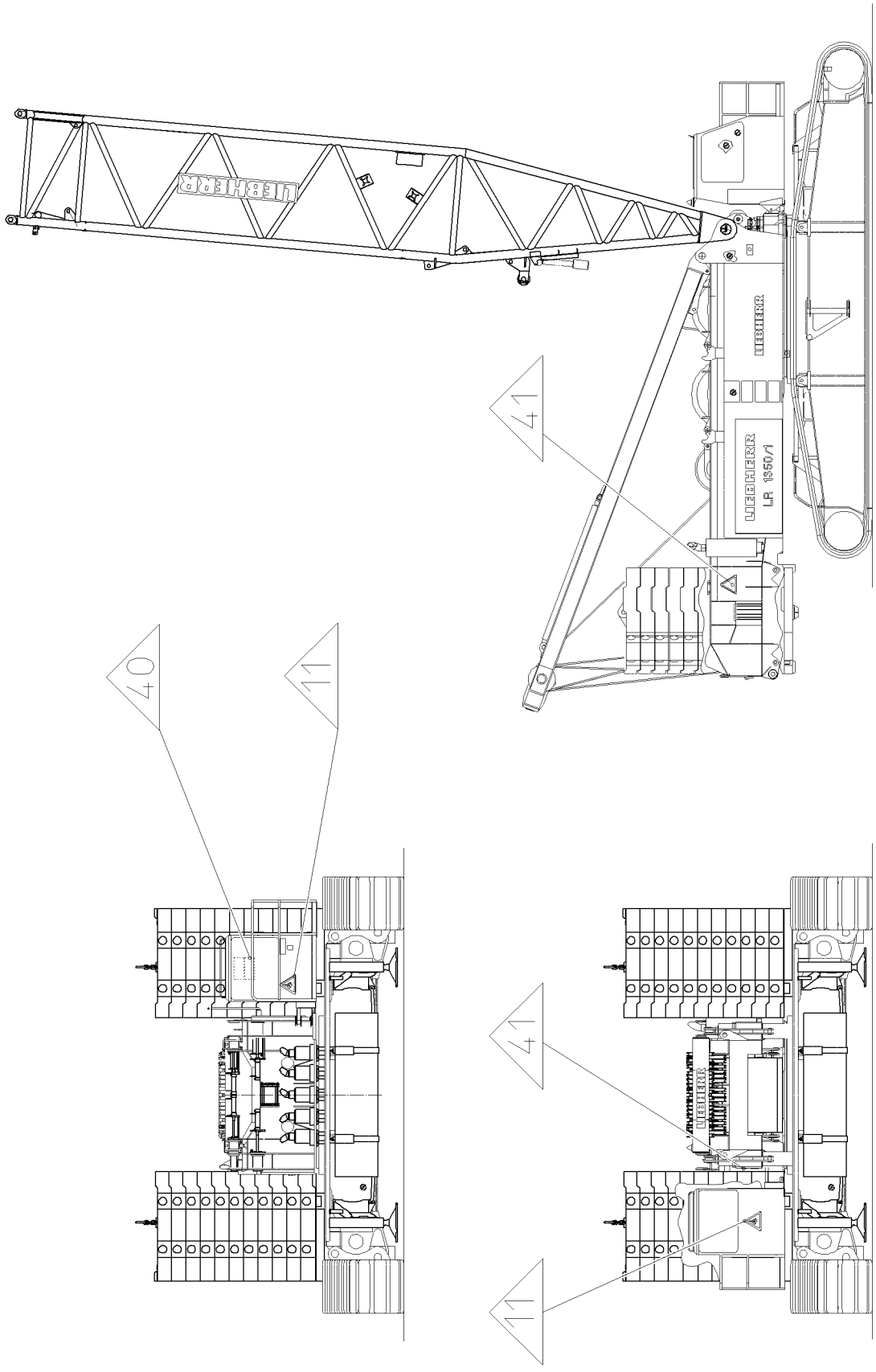
DANGER
Risk of fatal injury under suspended load!
- ▶ Standing under suspended loads is prohibited!
- ▶ Keep away from the working range of the machine!

1.2 Warning of high voltage (position 40)



Note
- ▶ Only for certain countries!

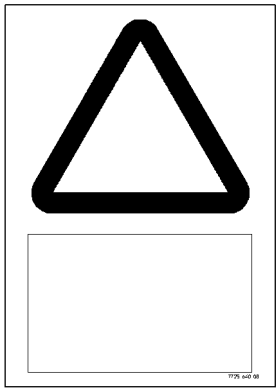
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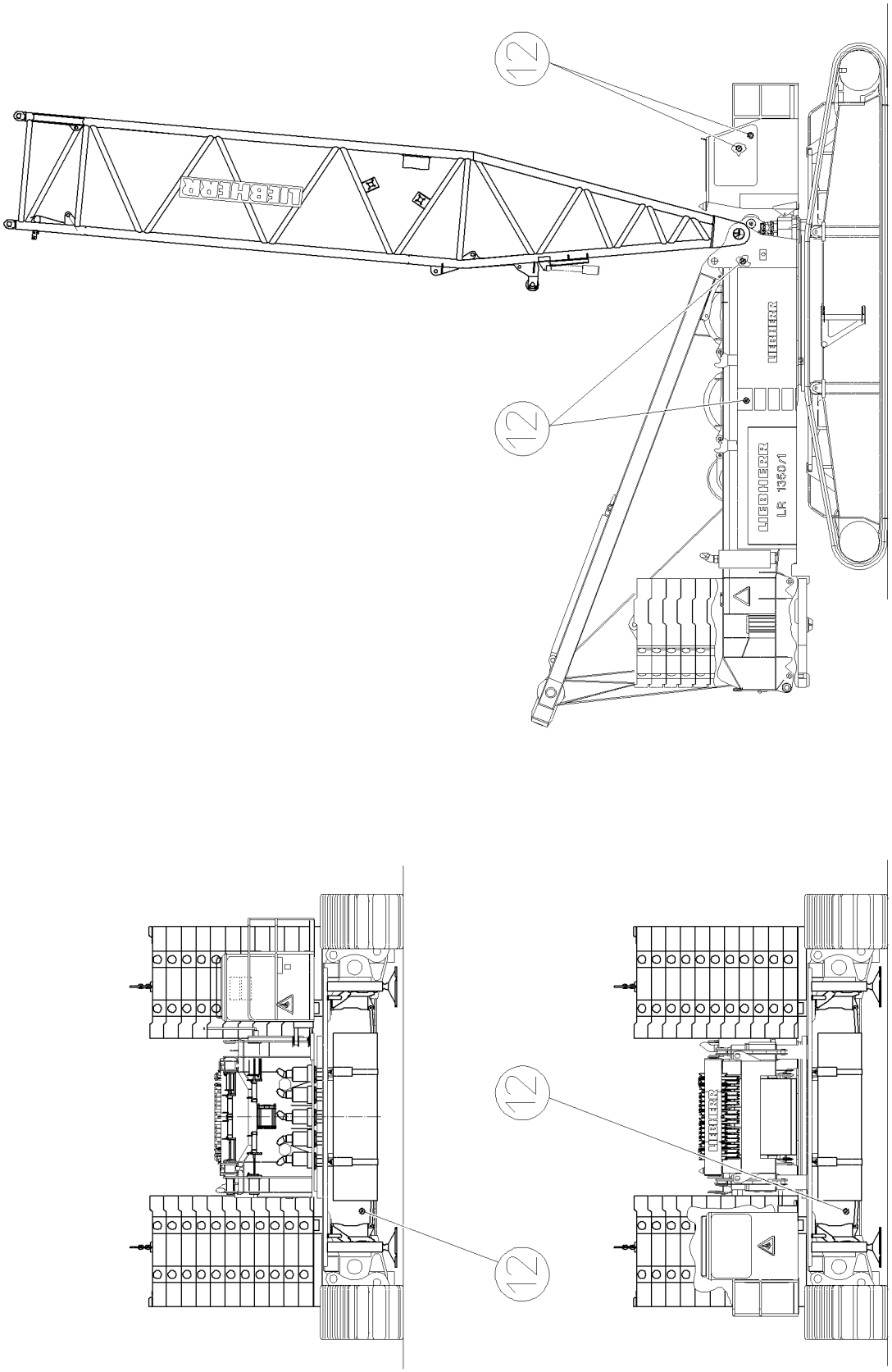
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1.3 Slewing range (position 41)



Note
▶ Only for certain countries!

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2 Command and prohibition signs

2.1 Prohibition signs

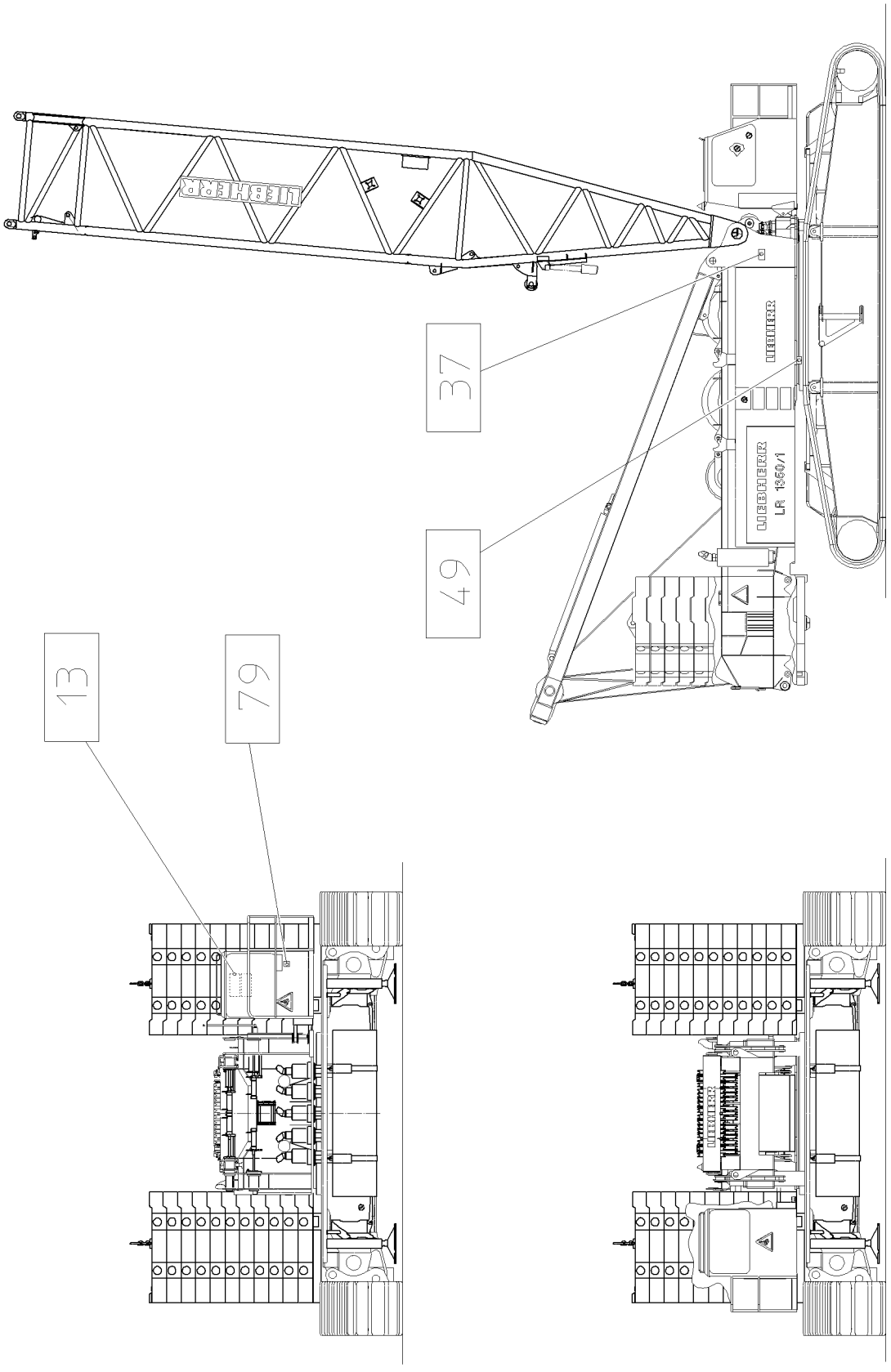
Note
- ▶ Prohibition signs are safety signs, which prohibit a behavior, which could result in danger!
- ▶ For that reason, all prohibition signs on the crane must be complete and always legible!
- ▶ Replace damaged prohibition signs immediately!

2.1.1 Access for unauthorized personnel prohibited (position 12)



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!

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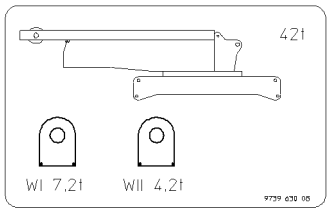
3 Notice signs

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

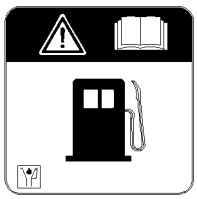
3.1 Operating instructions for cranes (position 13)

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

3.2 Transport weights of components (position 37)

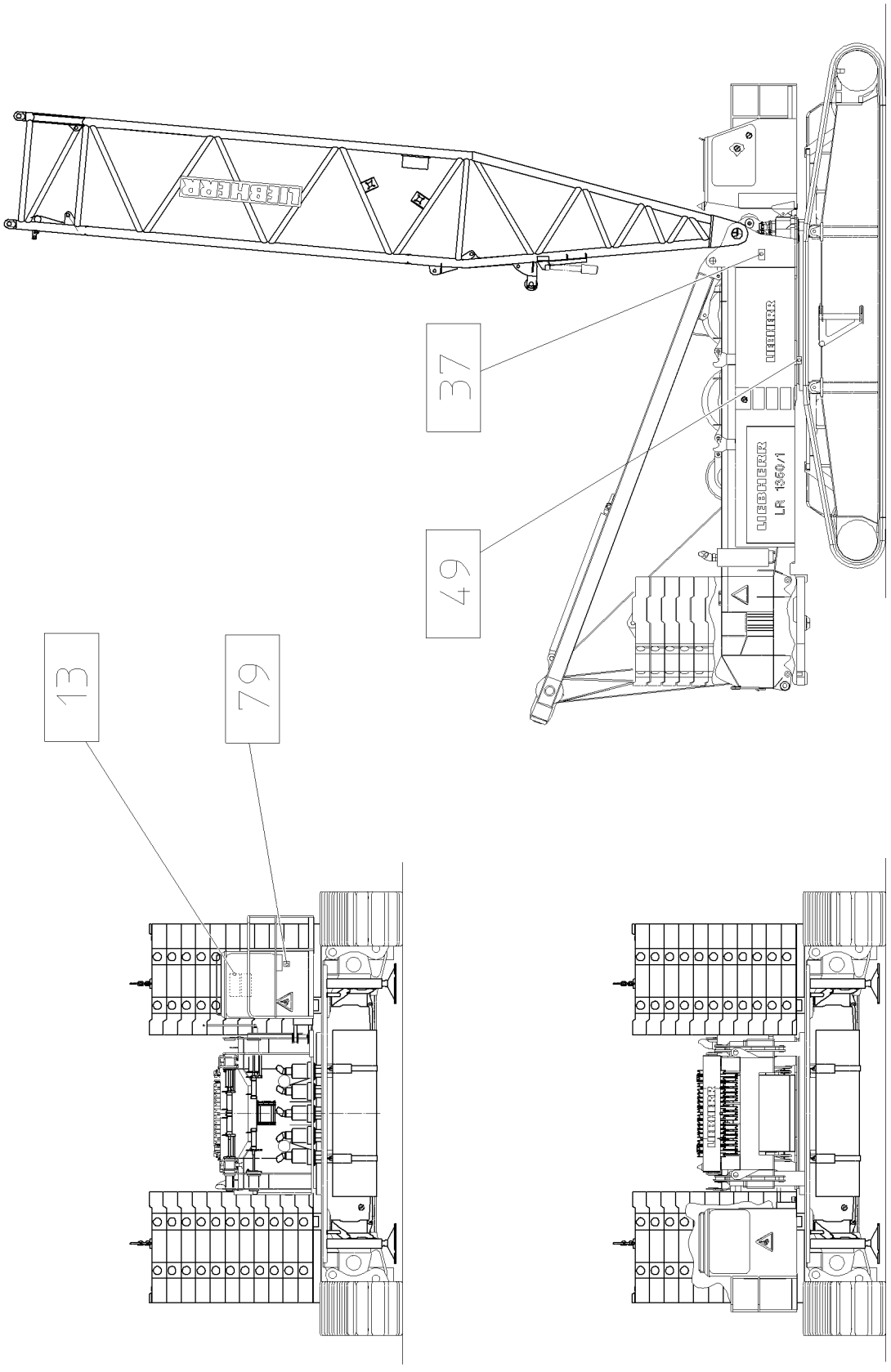


3.3 Notice sign for refueling (position 49)



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

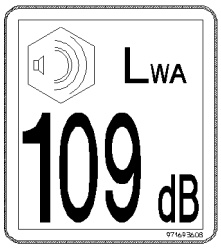
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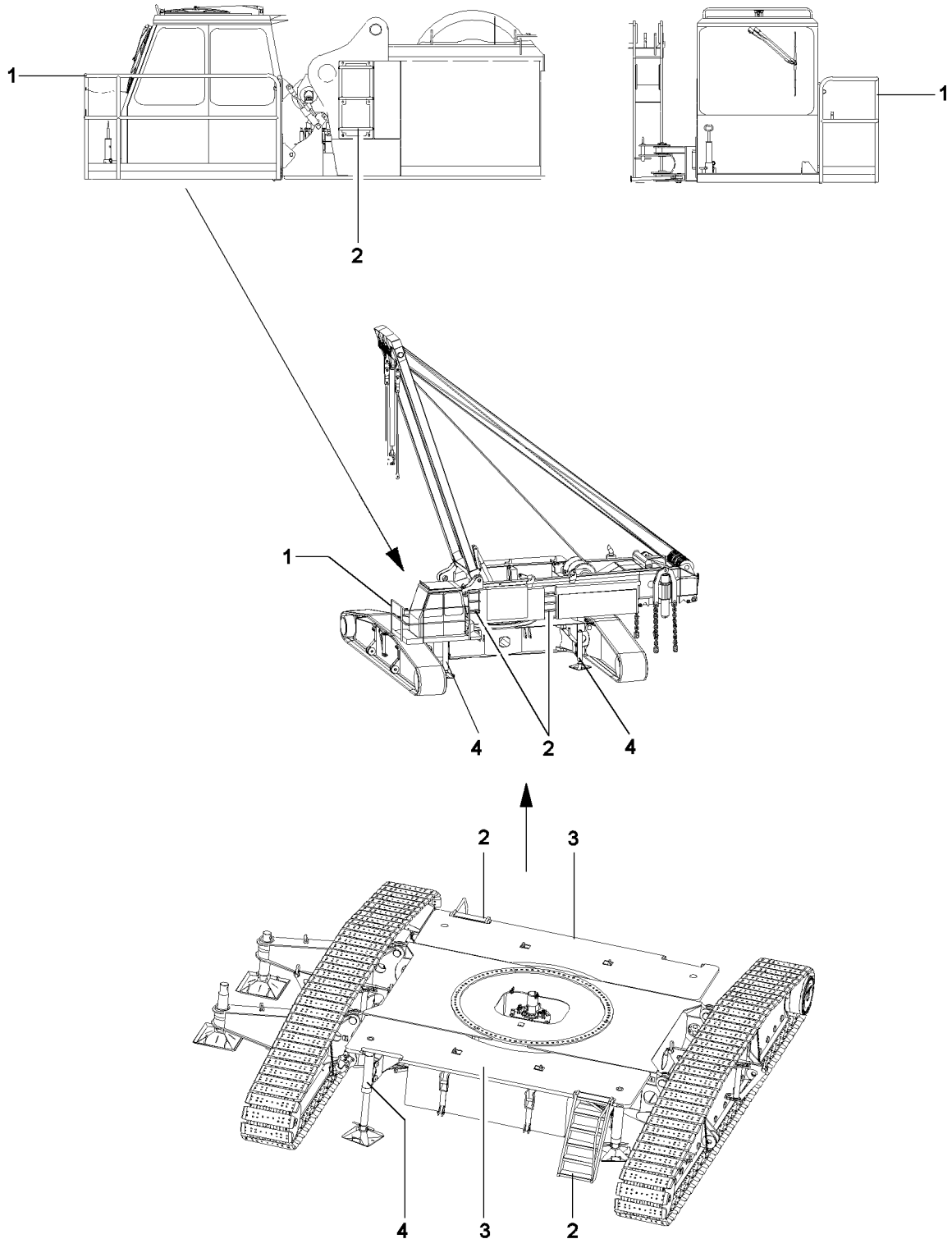
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3.4 Warranted maximum sound output level (position 79)



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1 Fall arresters on the 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 crane operating instructions, Chapter 2.04!
- ▶ Fasten personal protective equipment and permissible catch systems before all assembly / disassembly work, maintenance and testing 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, catwalks and ladders

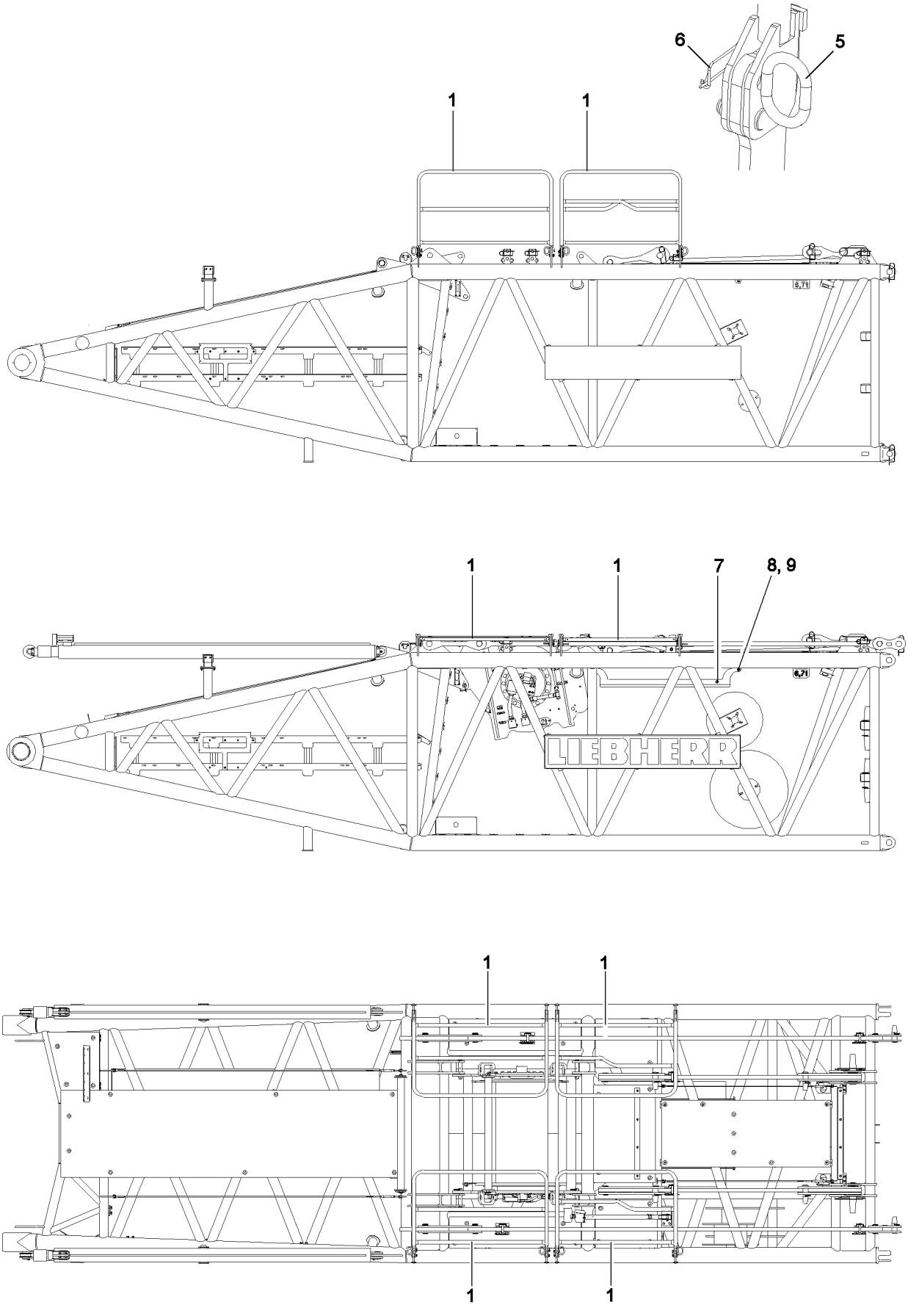
WARNING
Risk of falling!
Before any assembly / disassembly work, maintenance and testing work, the assembly personnel must apply permissible catch systems!
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling!
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
- ▶ Before assembly / disassembly work, maintenance and inspection work, install all railings **1**, ladders **2** and ballast plates **3** properly!
- ▶ Step on ladders **2** only with “clean shoes”!
- ▶ Keep ladders **2** clean and free of snow and ice!
- ▶ Replace damaged ladders immediately!
- ▶ Set up all ladders **2** stable and safe to access!

Make sure that the following prerequisites are met:
– the hydraulic assembly cylinders are swung out and pinned.

Note
- ▶ The swung out hydraulic assembly cylinders serve as support for the ballast plates **3**!
- ▶ The ballast plates **3** are also the catwalks and access to the cab!

- ▶ Assemble both ballast plates **3**, see crane operating instructions, chapter 3.03.
- ▶ Hang the ladders **2** on the ballast plates **3**.
- ▶ Install the railing **1** on the turntable.

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2 Fall arresters on pivot sections and lattice sections

2.1 Assembling the rails on the S-pivot section

WARNING
Risk of falling!
Before any assembly / disassembly work, maintenance and testing work, the assembly personnel must apply permissible 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, assemble all railings **1** and secure!
- ▶ Only step on S-pivot section with “clean shoes”!

- ▶ Swing the railing **1** on the S-pivot section into position, pin with pins **5** and secure with spring retainers **6**.

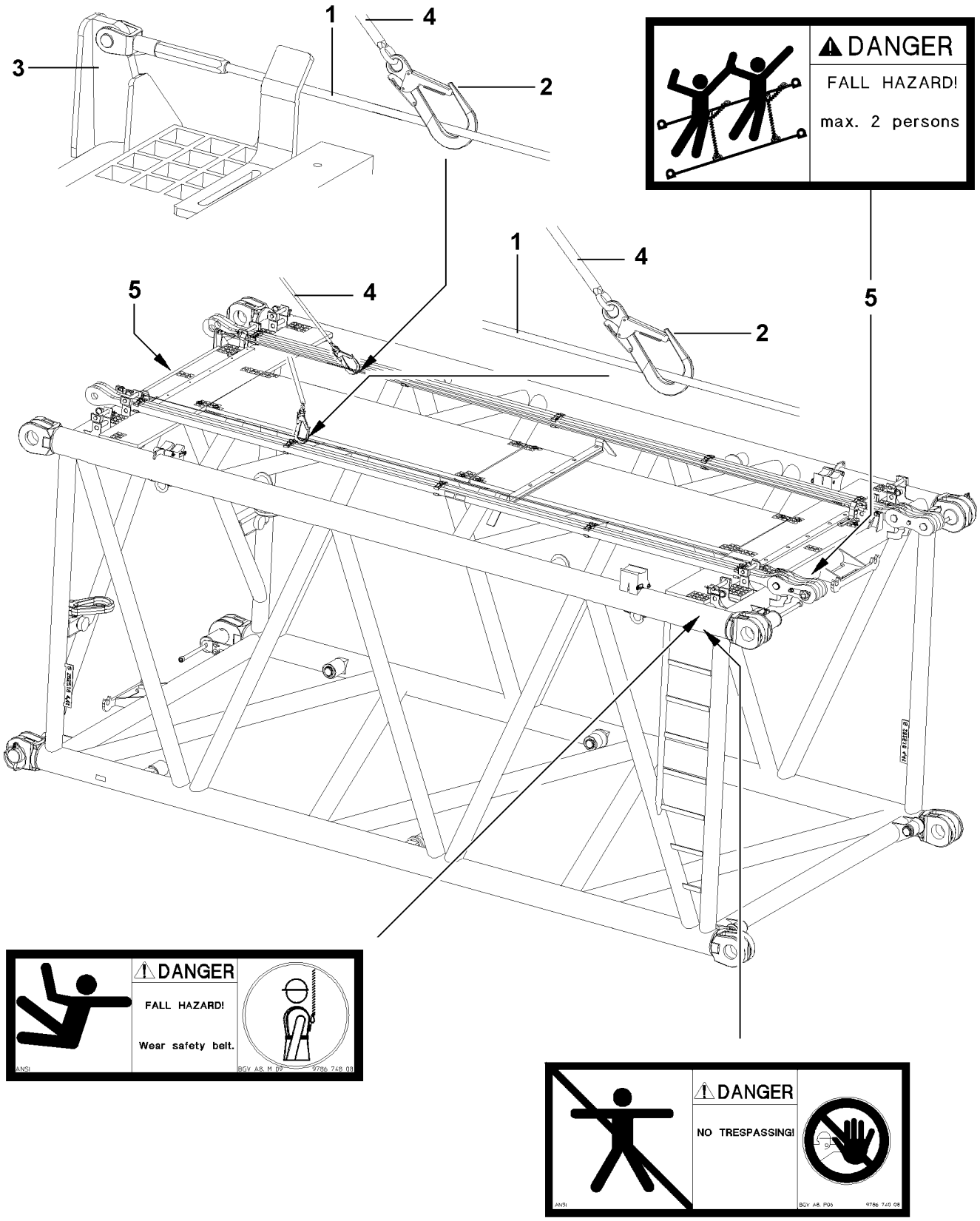
2.2 Installing the grating

Note

- ▶ If no winch is installed in the S-pivot section, then the opening must be closed off with the grating **7**!

- ▶ Bring the grating **7** from transport position into assembly position, pin with pin **8** and secure with cotter pin **9**.

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2.3 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.

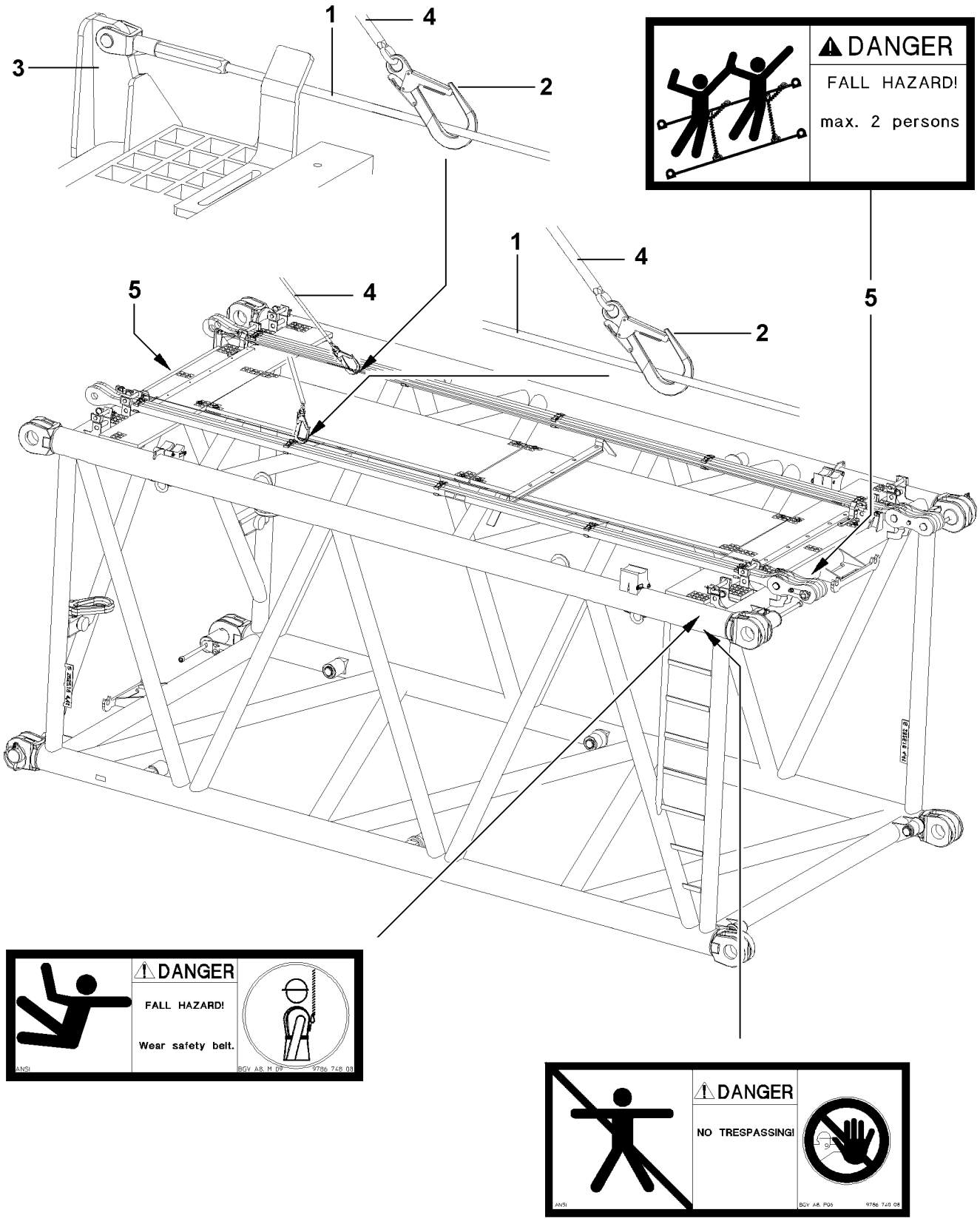
NOTICE
Danger of damage!
- ▶ Never hang loads or objects on the retaining ropes **1**.

WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved fall arrest systems **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: Fall arrester 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!

2.4 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**!

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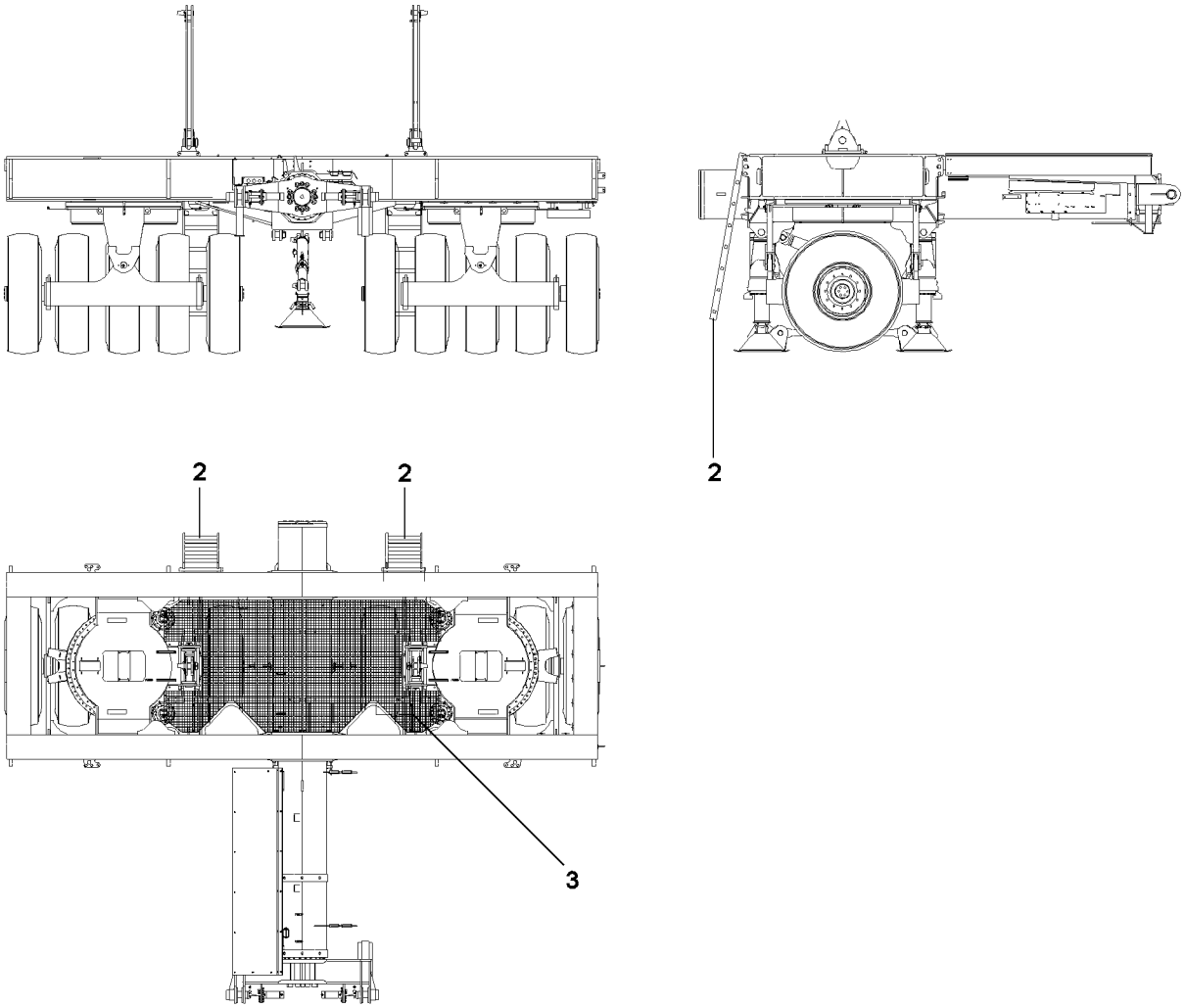
2.5 Inspection of retaining ropes and anchor points

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**!

2.6 Documenting the inspections in writing

Note
▶ The scope and results of tests must 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.

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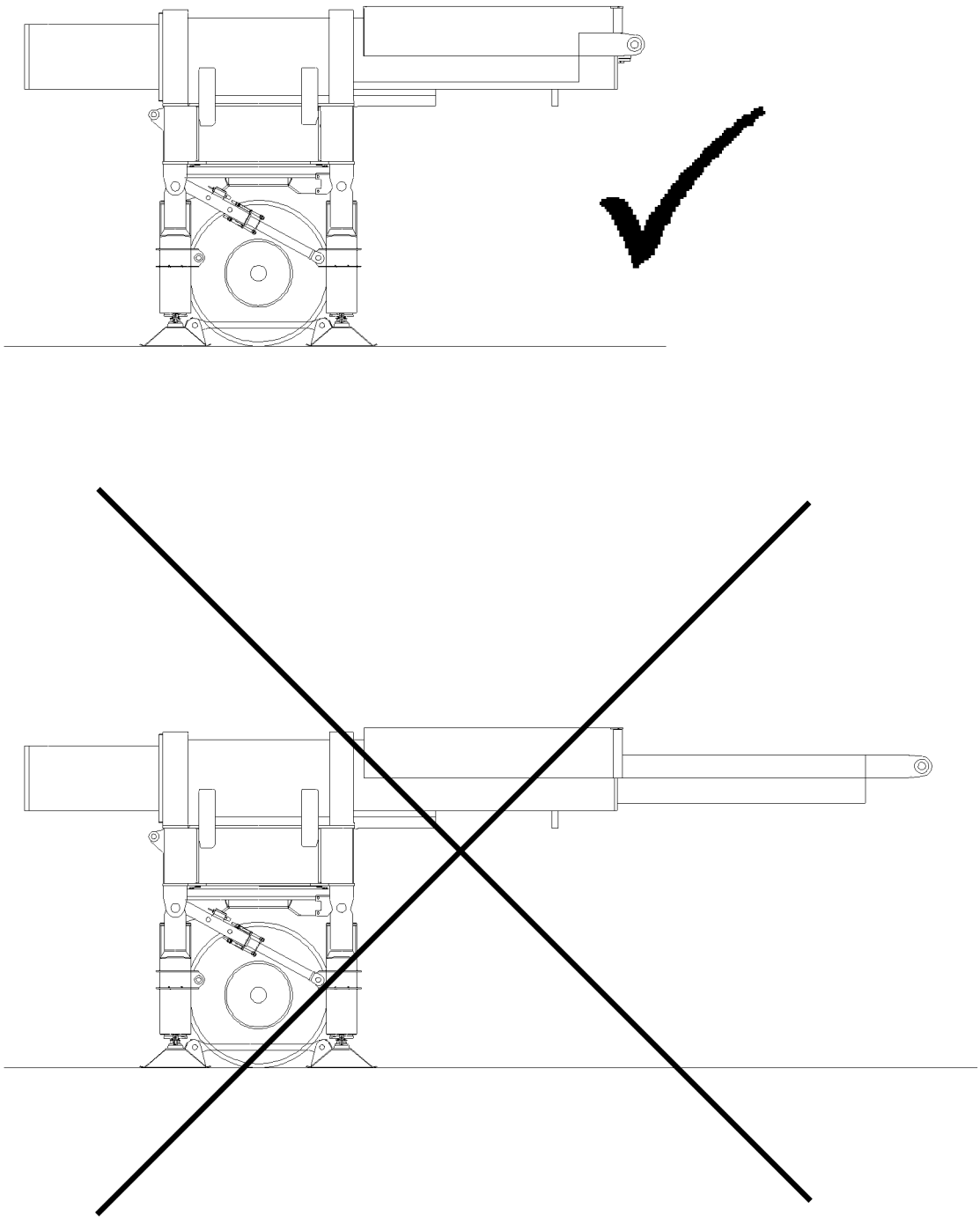
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3 Fall guards on the ballast trailer

WARNING
Risk of falling!
Before any assembly / disassembly work, maintenance and testing work, the assembly personnel must apply permissible 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!

- ▶ Before assembly / disassembly work, maintenance and inspection work, assemble and secure all railings, ladders **2** and gratings **3**!
- ▶ Only step on ladders **2** and gratings **3** with “clean shoes”!
- ▶ Keep ladders **2** and gratings **3** clean and free of snow and ice!
- ▶ Replace damaged ladders immediately!
- ▶ Set up all ladders **2** stable and safe to access!

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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!

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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!

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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.

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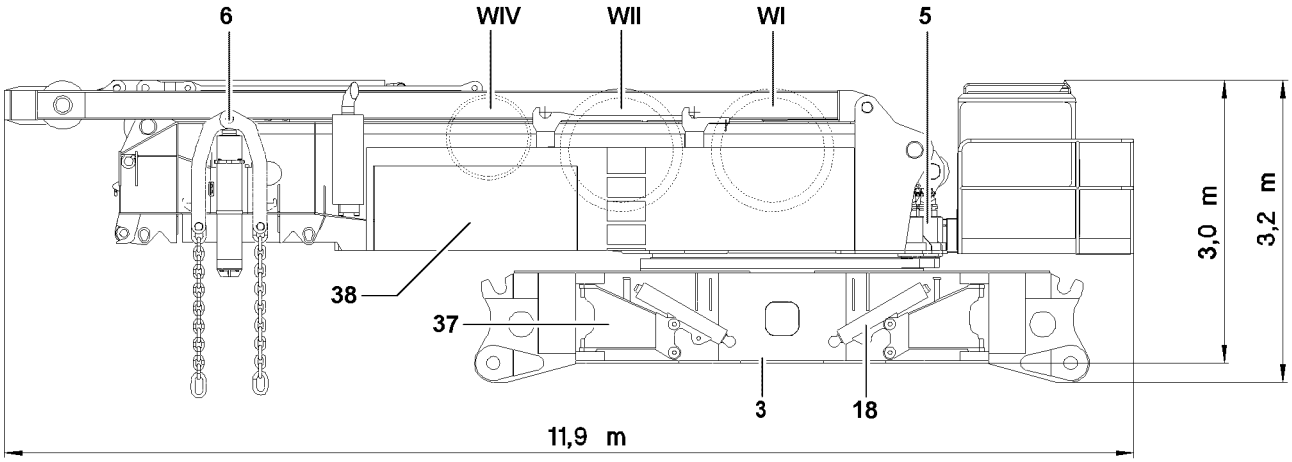
WARNING
Mortal danger when using non-approved tire foams!
Due to the use of tire foams, which are not explicitly approved by **LIEBHERR-Werk Ehingen GmbH**, uncontrollable operation conditions on the ballast trailer can occur due to the heavy load!
The tires can be destroyed and the ballast trailer as 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!

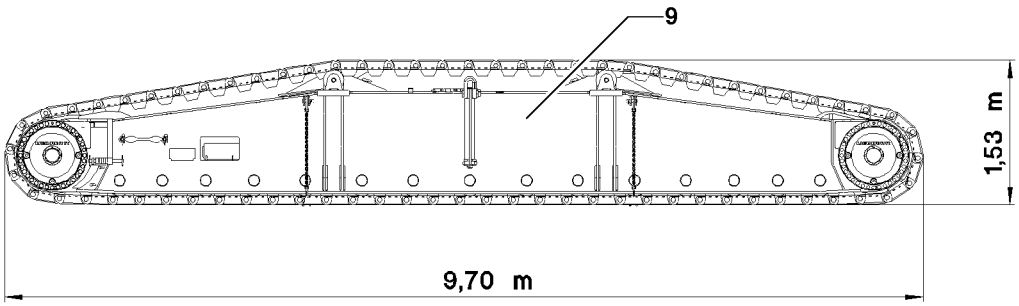
WARNING
Danger of accidents due to retreaded tires!
If tires foamed with the special foam are retreaded, the usage properties can be significantly changed negatively!
The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged!
Personnel can be severely injured 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!

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3.00 Crane assembly

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1 Component overview of turntable with crawler travel gear

3 Crawler center section with rotary connection
5 Slewing gear
6 Ballasting device
9 Crawler carrier with track pads
WI Winch 1
WII Winch 2
WIV Winch 4
18 Support cylinder
37 Support beam of hydraulic assembly supports
38 Turntable

2 Dimensions and weights

2.1 Turntable with crawler center section

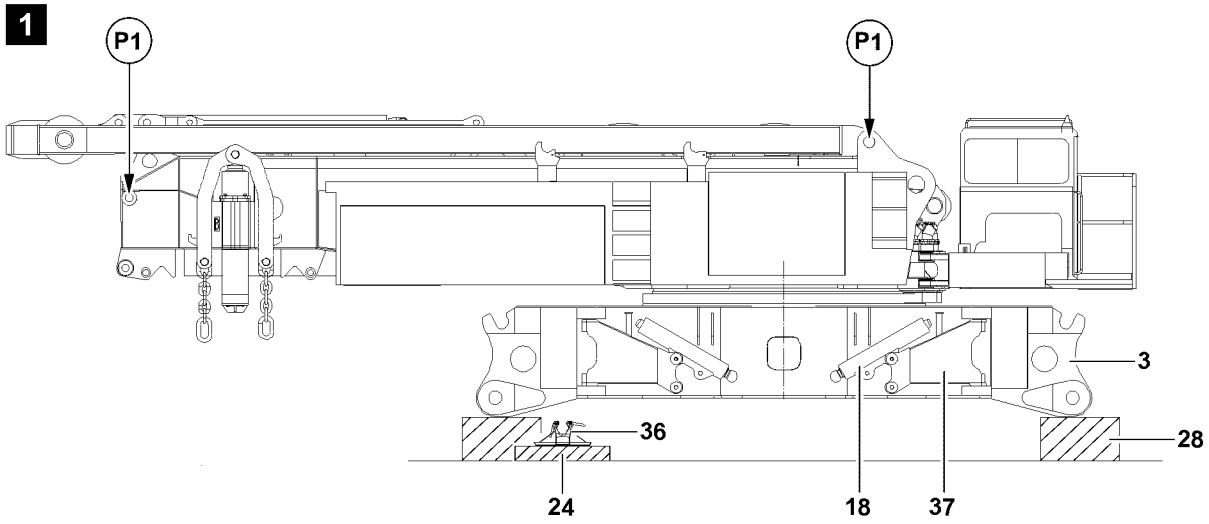
Component	Weight
Turntable with crawler center section and two slewing gears, without winches and without ballasting device	40.3 t
Operation with suspended ballast (B): One additional slewing gear	1.8 t
Operation with ballast trailer (BW): Three additional slewing gears	5.4 t
Winch 1, rope 1000 m , diameter 28 mm	7.1 t
Winch 2, rope 600 m , diameter 25 mm	4.1 t
Ballasting device	1.3 t

2.2 Crawler carrier

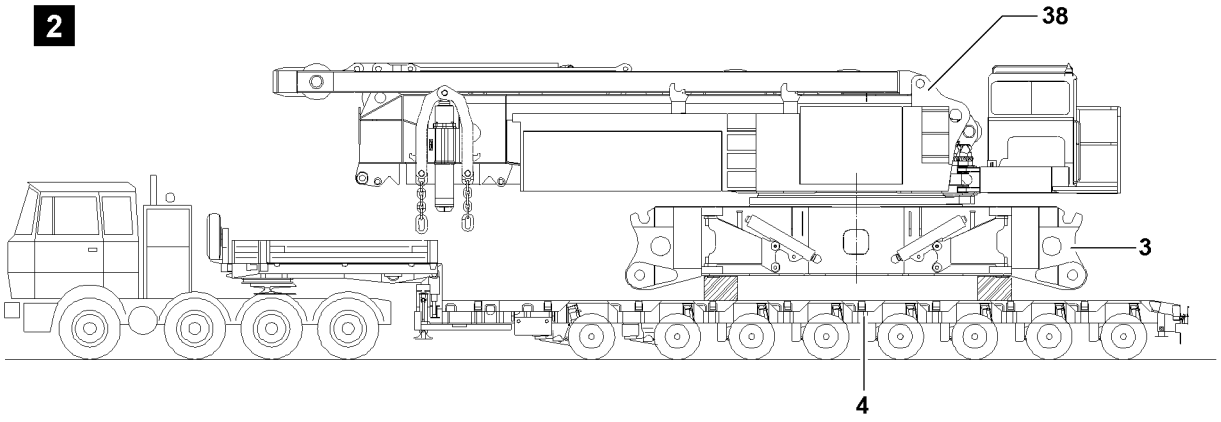
Component	Track pad width		
	1.0 m	1.2 m	1.5 m
Crawler carrier with one travel drive	21.2 t	22.2 t	25.6 t
Crawler carrier with two travel drives	24.6 t	25.6 t	26.4 t

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3 Installing the crawler center section

The following initial situations are distinguished:
– The turntable with crawler center section is set on the ground for assembly, illustration **1**.
– The turntable with the crawler center section is on the flatbed trailer, illustration **2**.

3.1 Assembling the crawler center section on the ground

3.1.1 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 Crane operating instructions, chapter 2.04!

Make sure 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 plates **36** with supporting base **24** fit under the vertically positioned support cylinders **18**!
▶ Support the crawler center section **3** with hardwood timbers (or other suitable materials) from below!

▶ Attach the tackle on the fastening brackets points **P1**.
▶ Lift the turntable with crawler center section **3** with the auxiliary crane and set it onto the support **28**.

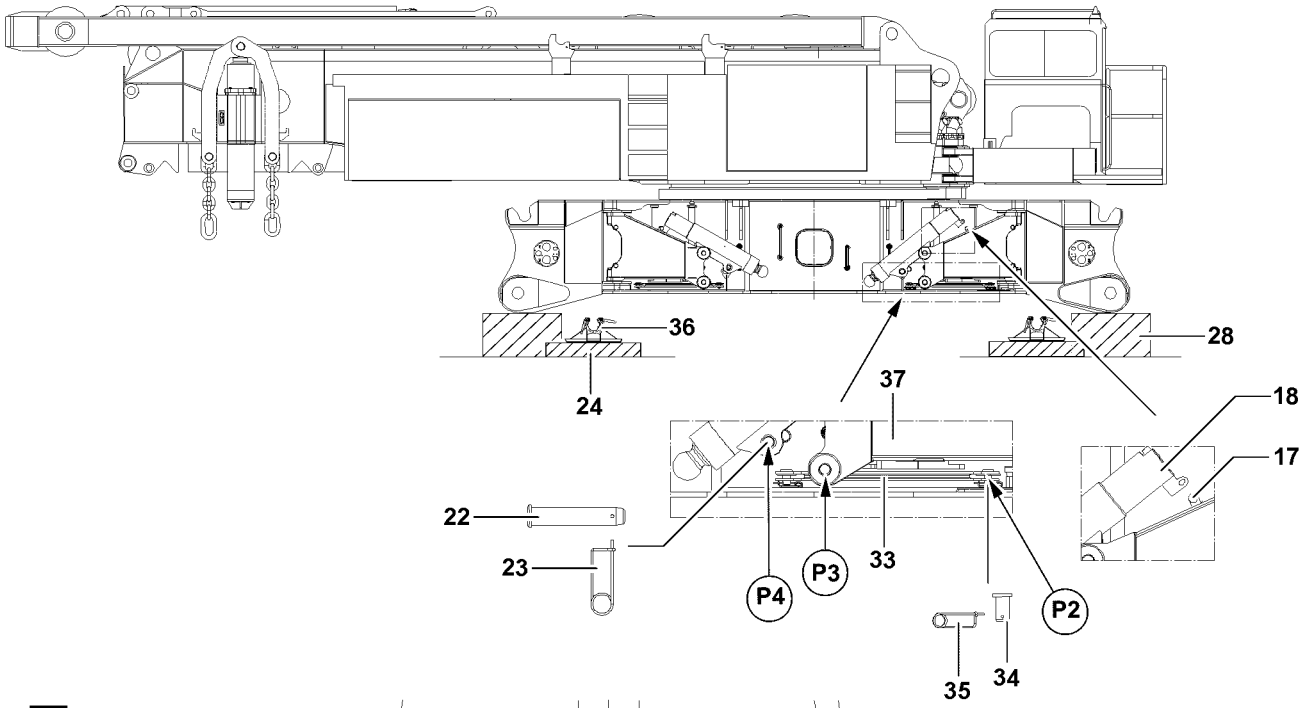
3.2 Assembling the crawler center section on the transport vehicle

WARNING
Unreleased transport retainers!
If the assembly cylinders are extended while the transport retainers are still attached, the assembly cylinders will be overloaded! The crane and the transport vehicle can be severely damaged!
Personnel can be severely injured or killed!
▶ Remove the transport retainers between the transport vehicle and the crane components!

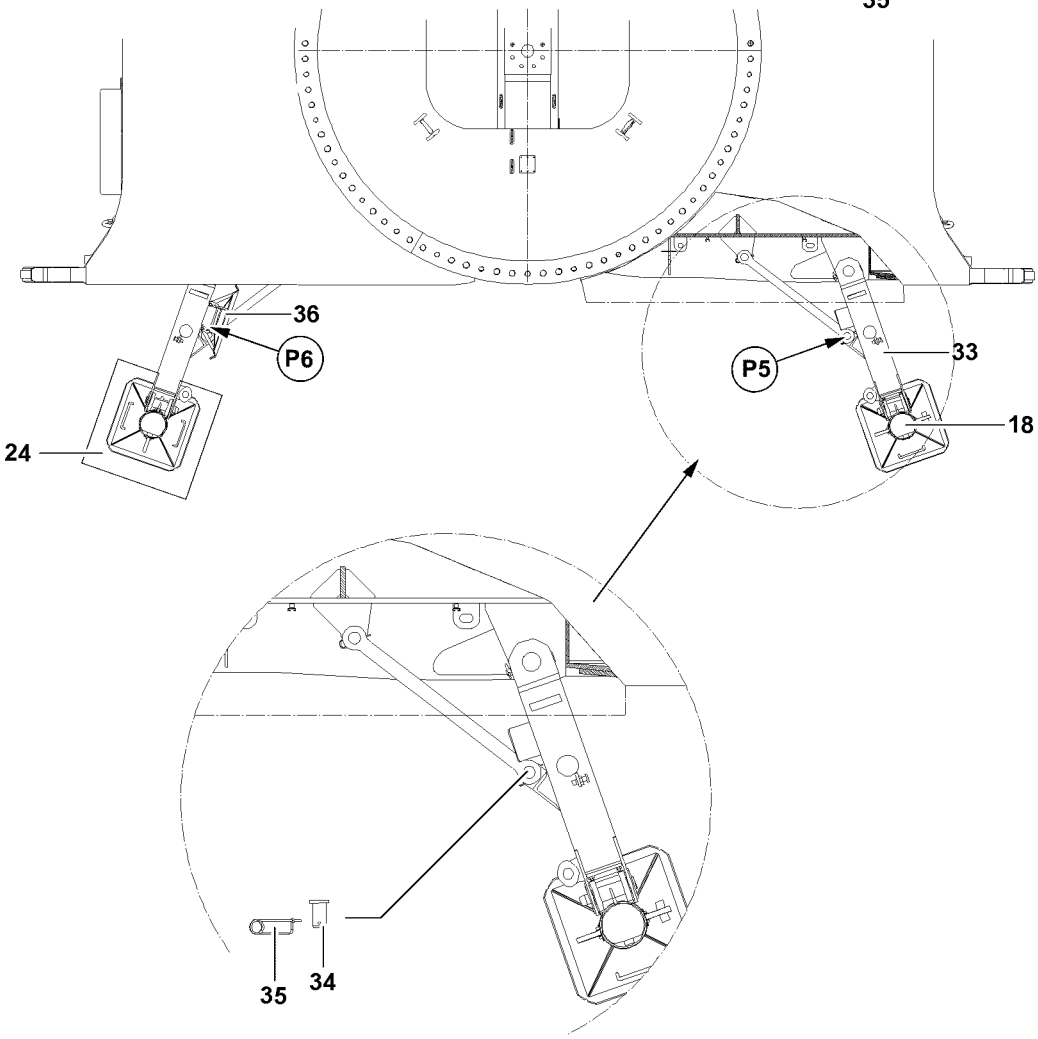
Note
▶ The placement location of the crawler center section must allow for the transport vehicle to be removed after lifting the crawler center section!

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3.3 Installing the assembly supports

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

▶ Release the transport retainer support beam: Release and unpin the pin **22** on point **P4**.

WARNING
Swinging out assembly support!
If any personnel is within the swing range of the assembly support, they can be severely injured or killed!
▶ Make sure that no persons are within the swing range of the assembly support!

▶ Swing the support beam **37** out.
▶ Unpin the strut **33** on the transport retainer: Release and unpin the pin **34** on point **P2**.
▶ Pin the strut **33** on the support beam **37**: Insert the pin **34** on point **P5** and secure with spring retainer **35**.

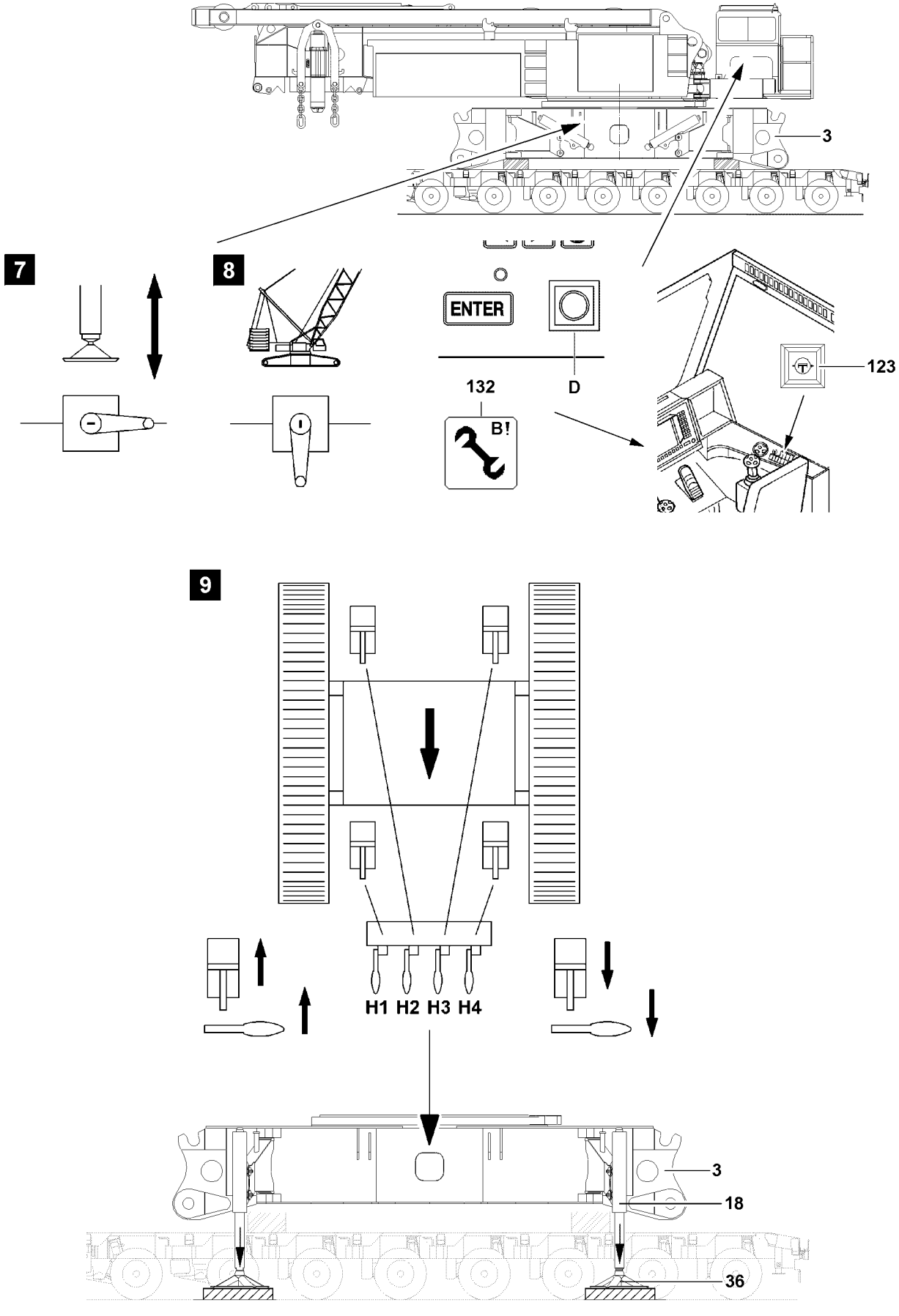
WARNING
Support cylinder folding downward!
If the support cylinder is not held after releasing it, then it will fold downward!
Personnel can be severely injured!
▶ Before unlocking, hold the support cylinder **18** and fold it down slowly!

▶ Release the support cylinder **18**: Move the spring bolt **17**.
▶ Fold the support cylinder **18** down.
▶ Lock the support cylinder **18**: Pin the pin **22** on point **P3** and secure with spring retainer **23**.

WARNING
Risk of accidents due to improper support!
If the support plates are not properly supported from below, the crane 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 Crane operating instructions, chapter 2.04!

▶ Take the support plates **36** from the transport retainer on point **P6** and place them on the supporting bases **24**.
▶ Align the support plates **36** to the hydraulic cylinders **18**.

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3.4 Preparing the assembly supports for operation

3.4.1 Operating the assembly supports from the crane cab

▶ Start the crane engine, see Crane operating instructions, chapter 4.03.

WARNING
Assembly with turned on set up key!
When the set up key is engaged, the LICCON overload protection is exceeded!
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!
Personnel can be killed!
This could result in high property damage!
▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!
▶ Crane operation with the set up key **D** turned on is strictly prohibited!

▶ Turn the set up key **D** to the right.

Result:
– The LICCON overload protection is exceeded.
– The assembly icon **132** appears in the LICCON monitor.

▶ Actuate the switch **123** to change the pressure supply to the auxiliary users.

3.4.2 Operating the assembly supports with pin pulling device

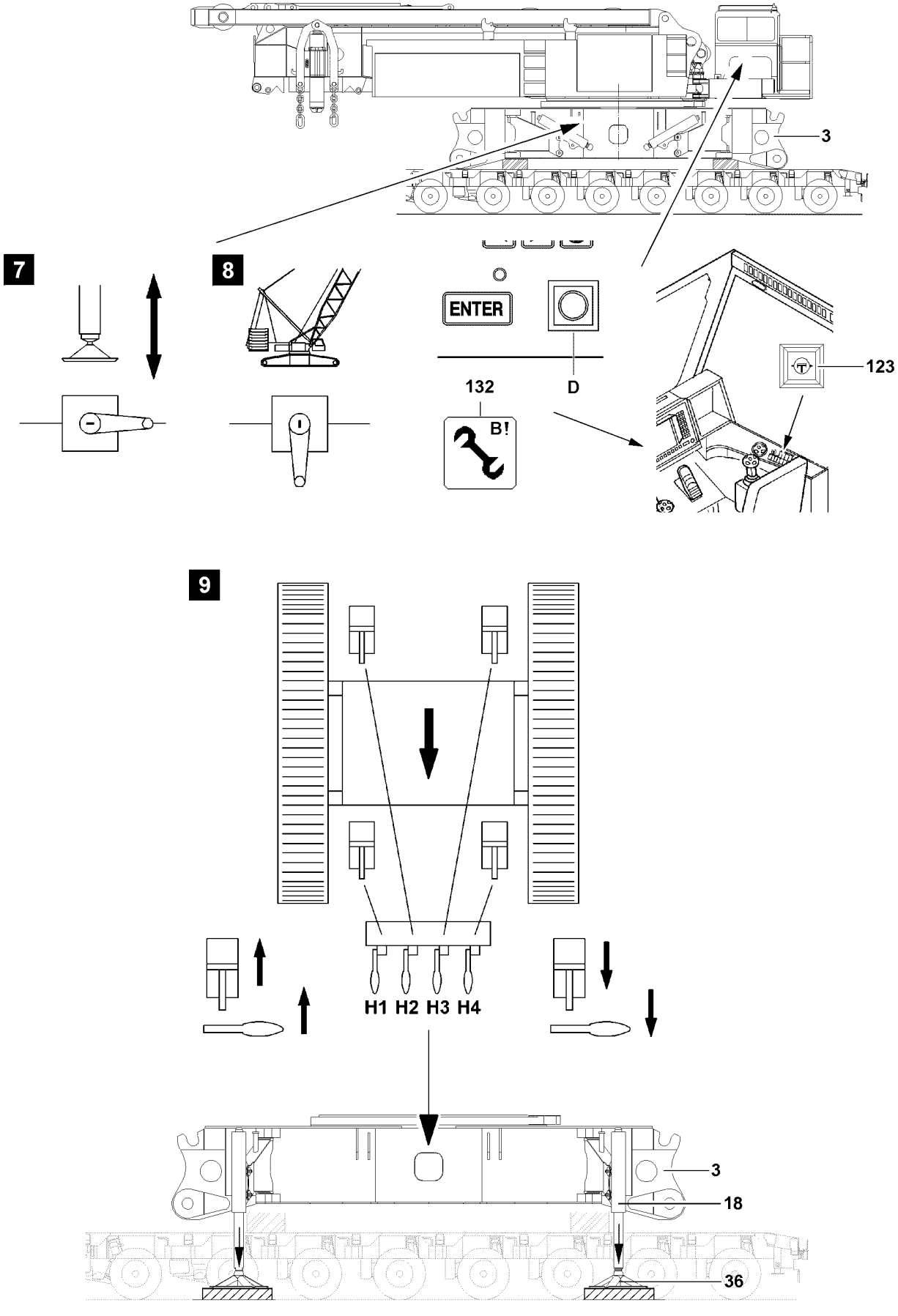
▶ Establish the hydraulic connections from the hydraulic aggregate of the pin pulling device to the crawler center section **3**, see Crane operating instructions, chapter 5.30.

3.5 Lifting the crawler center section

The crawler center section is lifted for the following reasons:
– To lift the crawler center section off from the transport vehicle
– For assembly of the crawler carriers

Make sure that the following prerequisites are met:
– The crane engine is running.
– The assembly supports are locked with braces.
– The support plates are properly supported.

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Ball valve positions	
Illustration 7	Assembly support
Illustration 8	Crane operation / crawler carrier installation with SA-frame

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

- ▶ Set the ball valve to “assembly support”, see illustration **7**.
- ▶ Actuate the manual lever and move the support cylinder **18** into the receptacle of the support plates **36**.
- ▶ Close the receptacle.

Note
- ▶ Lift the crawler center section so that the crawler carriers can be installed without restriction!
- ▶ Move the support cylinders out evenly!

WARNING
Risk of tipping the crawler center section!
If the support cylinder 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!

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

Result:
– The four support cylinders extend.

- ▶ After supporting and aligning the crawler center section, set the ball valve to “Crane operation / crawler carrier installation”, see illustration **8**.
- ▶ Remove the transport vehicle from the assembly area.

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4 Installing / removing the crawler carrier with auxiliary crane

Make sure that the following prerequisites are met:
– An auxiliary crane with sufficient load carrying capacity is available.
– The assembly supports are installed.

4.1 Installing the crawler carrier with the auxiliary crane

DANGER
The crane can topple over!
If the crane is installed on the assembly support and a central ballast or turntable ballast is installed, the crane can topple over!
Personnel can be severely injured or killed!
▶ No central ballast or turntable ballast may be installed!

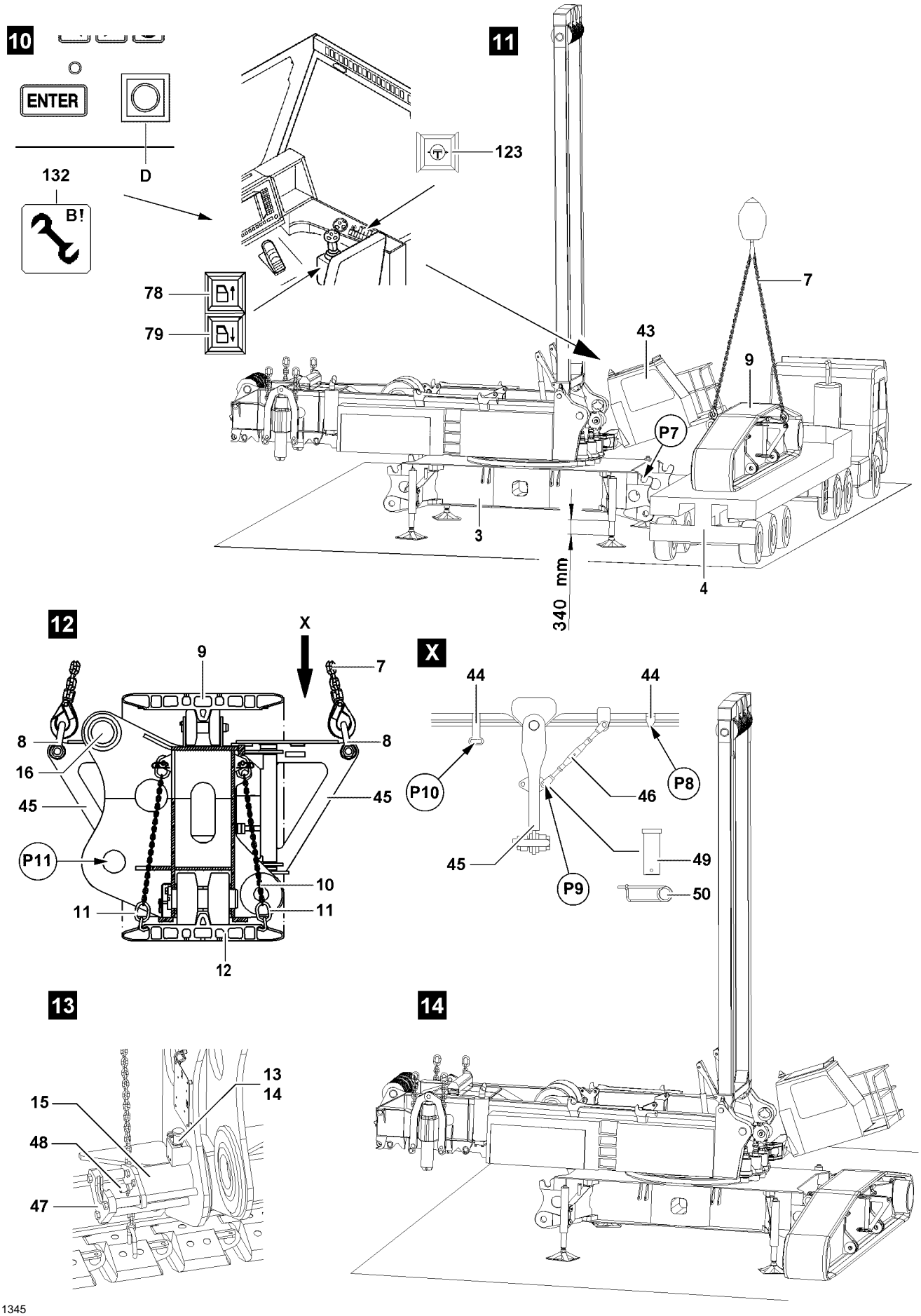
WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!
▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see Crane operating instructions chapter 2.04!
▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
▶ Step on aids and fall arresters only with clean shoes!
▶ Keep aids and fall arresters 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 a maximum 26.4 t, see section “Dimensions and weights”!
▶ The assembly support on the crawler center section is connected to the hydraulic of the turntable!

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

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Note
▶ For the assembly on supports, the SA-frame must stand 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 hydraulic support cylinders are moved out to at least 340 mm, see illustration **10**.

4.1.1 Installing the first crawler carrier

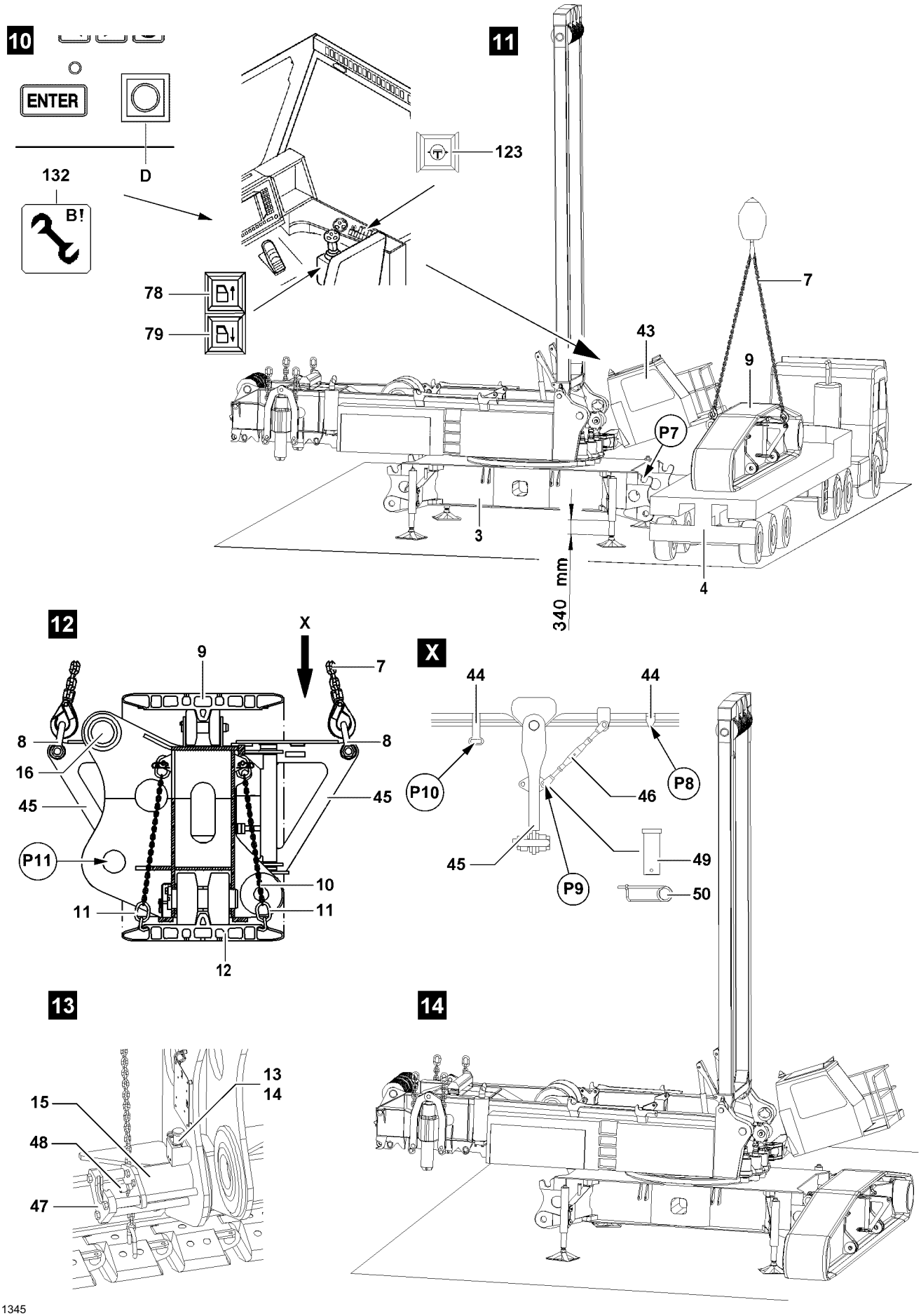
Preparing the crawler carrier for assembly

See illustration **12**.
▶ Release and unpin the transport retainers **44** on the assembly consoles **45** on point **P10** and the turnbuckle **46** on point **P8**.
▶ Fold the assembly consoles **45** out on both sides.
▶ Pin the assembly consoles **45** with the turnbuckles **46** in point **P9**: Insert the pin **49** and secure with spring retainer **50**.

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 the chains **10** with the bars **11** on the track pads **12**, see illustration. **12**.
▶ Make sure that the pins **15** are completely unpinned on both sides on the crawler carrier, see illustration **13**.

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Positioning the crawler carrier on the crawler center section

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!

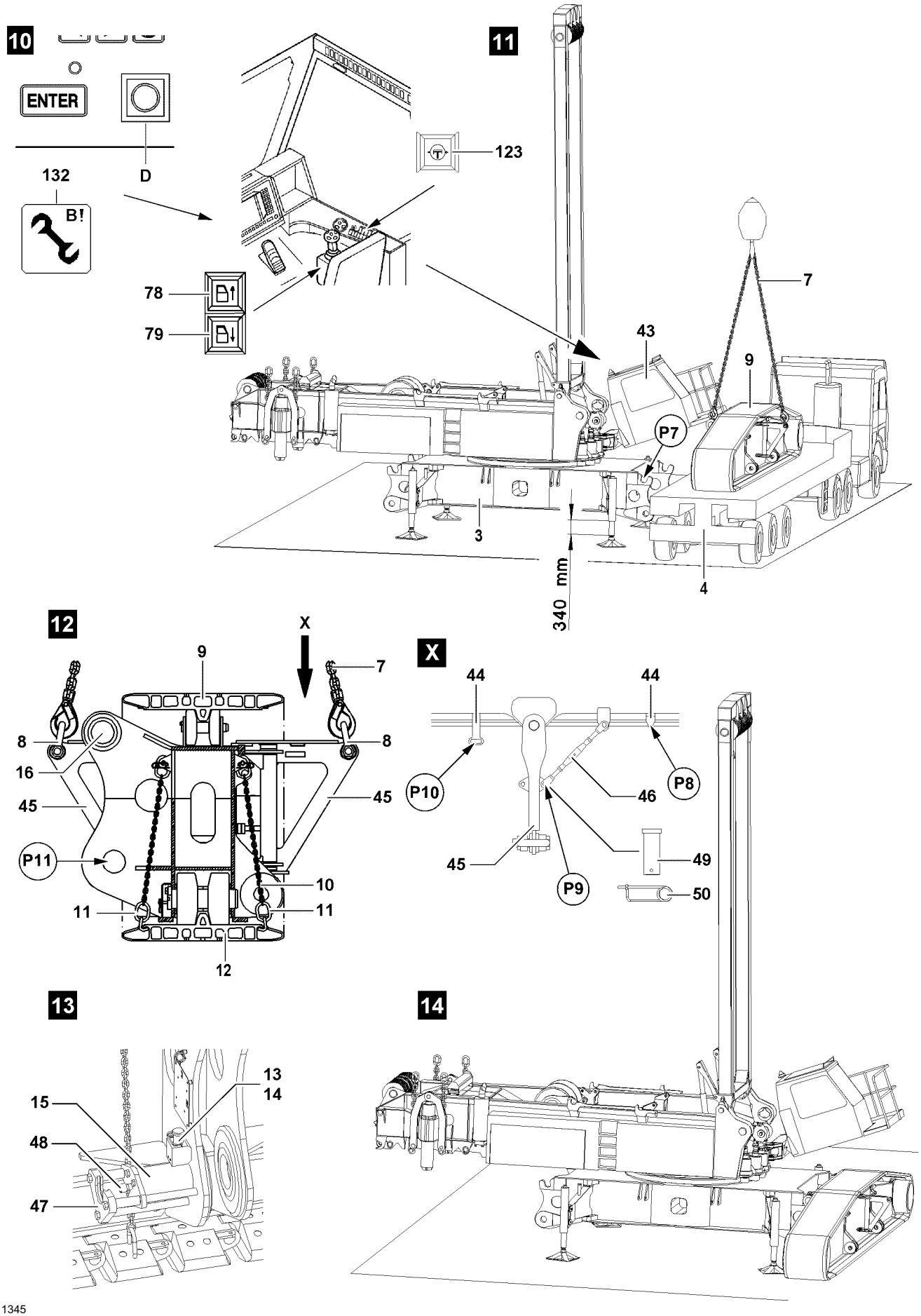
NOTICE
Collision with the crane operator's cab!
If the crane operator's cab is not luffed up when moving the crawler carrier in, a collision can occur!
The crane can be damaged!
- ▶ Luff the crane operator's cab **43** up before moving the crawler carrier **9** in!

- ▶ Luff the crane operator's cab **43** up: Press the button **78**.
- ▶ Attach the fastening ropes **7** onto the auxiliary crane.
- ▶ Position the auxiliary crane in such a way that the fastening ropes **7** hang centered above the crawler carrier **9**.
- ▶ Attach the fastening ropes **7** on the shackles **8** of the assembly consoles **45**.
- ▶ Tension the fastening ropes **7** with the auxiliary crane.

Note
- ▶ Balance the crawler carrier **9**: The center of gravity can be changed with the turnbuckles **46**!

- ▶ Lift the crawler carrier **9** with the auxiliary crane from the transport vehicle **4**.

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WARNING
Danger of crushing!
When moving the crawler carrier **9** in, there is an increased danger of accidents due to crushing!
Personnel can be severely injured or killed!
▶ It is prohibited for anyone to remain between the crawler carrier **9** and the crawler center section **3**!

▶ Swing the crawler carrier **9** with the auxiliary crane 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 the pin **16** on the points **P7**.

Pinning the crawler carrier

Note
▶ For operation of the pin pulling device, see Crane operating instructions, chapter 5.30!

NOTICE
Pin not unpinned!
If the pin **13** is not secured in “top” position for pinning, the pin pulling device can be damaged!
▶ Before inserting the pin **13** in “up” position, secure it with the spring retainer **14**!

▶ Hang the pin pulling cylinder on the screw **48** and retainer **47**, see illustration **13**.
▶ Pin the crawler carrier **9** with the crawler center section **3**: Pin the pin **15** with the pin pulling cylinder on points **P11**.
▶ Secure the pins **15**: Insert the pin **13** and secure with spring retainer **14**.
▶ Release the fastening ropes **7** from the lugs **8** on the crawler carrier **9**.
▶ Unpin the turnbuckles **46** on the assembly consoles **45**: Release and unpin the pin **49** on point **P9**.
▶ Secure the assembly consoles **45** with the transport retainer **44** on point **P10**.
▶ Secure the turnbuckles **46** with the transport retainer **44** on point **P8**.

Establishing the hydraulic connection to the crawler travel gears

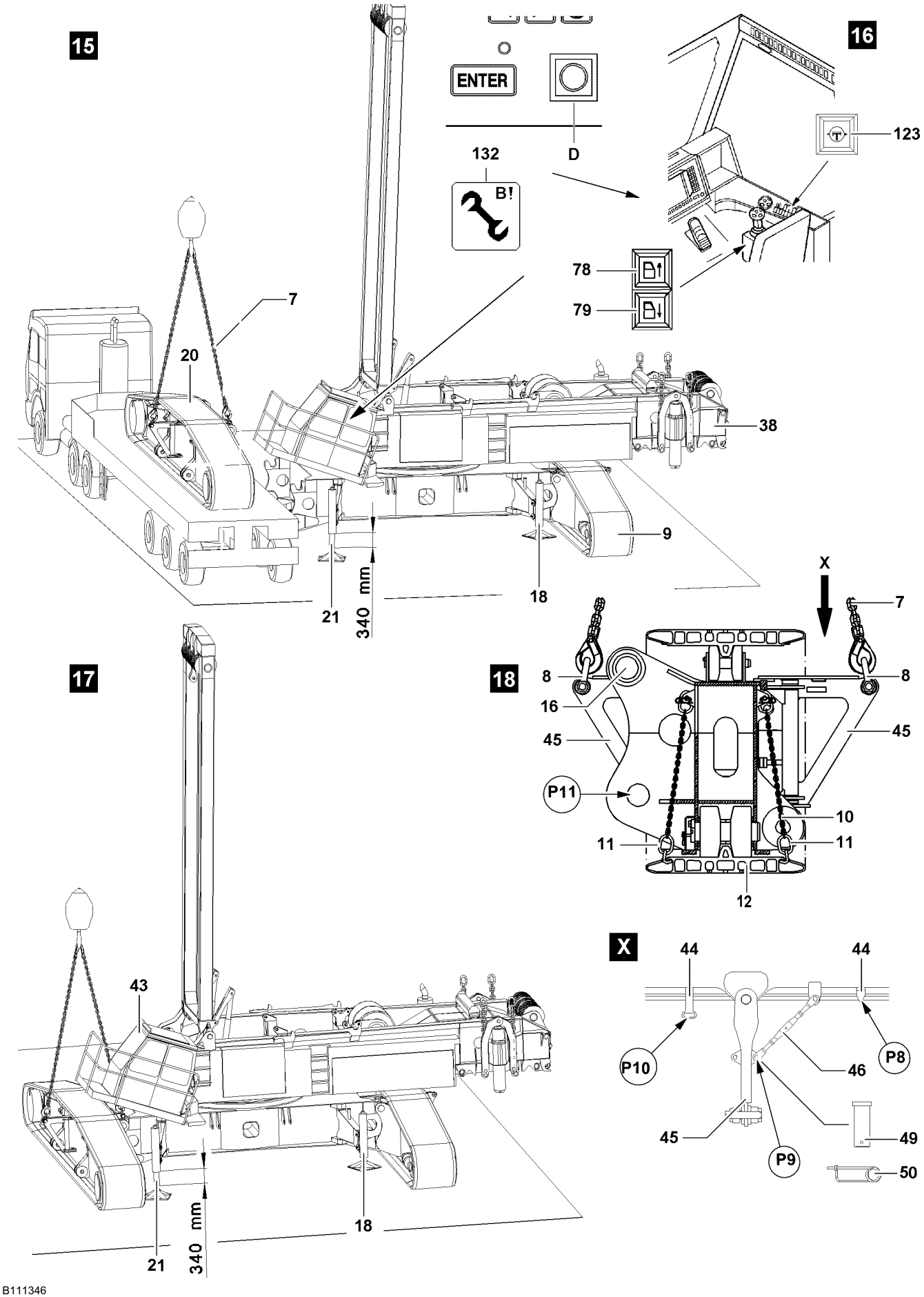
When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

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: 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 to the crawler carriers.

Establishing the electrical connection to the crawler travel gears
▶ Establish the electrical connections to the crawler carriers, see separate electrical wiring diagram.

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4.1.2 Setting the first crawler carrier on the ground

Make sure that the following prerequisites are met:
– The crane engine is running.
– The LICCON overload protection is exceeded.
– The assembly icon **132** is visible on the LICCON monitor.

▶ Set the ball valve for the support cylinder to “Assembly support”.
▶ Change the pressure supply to the auxiliary users: Actuate the switch **123**.

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 both support cylinders **18** in until the crawler carrier **9** is standing on the ground.
▶ Move the support cylinders **18** in all the way.
▶ Make sure that the angle between the ground and the crawler center section **3** is approx. 2 °.

WARNING
Danger of tipping over!
Before turning the turntable **38**, if the first installed crawler carrier **9** is not positioned on the ground, there is a danger of tipping over!
Personnel can be severely injured or killed!
▶ Before turning the turntable **38**: Set the first installed crawler carrier **9** on the ground!
▶ The hydraulic support cylinder **18** on the crawler side must be moved in all the way!

▶ Turn the turntable **38** by 180 °.

4.1.3 Installing the second crawler carrier

Make sure that the following prerequisites are met, see illustration **15**:
– The first installed crawler carrier **9** is standing on the ground.
– The hydraulic support cylinders **18** on the crawler side are fully moved in.
– The angle between the ground and the crawler center section **3** is approx. 2 °.
– The turntable **43** is turned by 180 °.

Note
▶ Procedure for assembly of the second crawler carrier **20**, see section “Installing the first crawler carrier”!

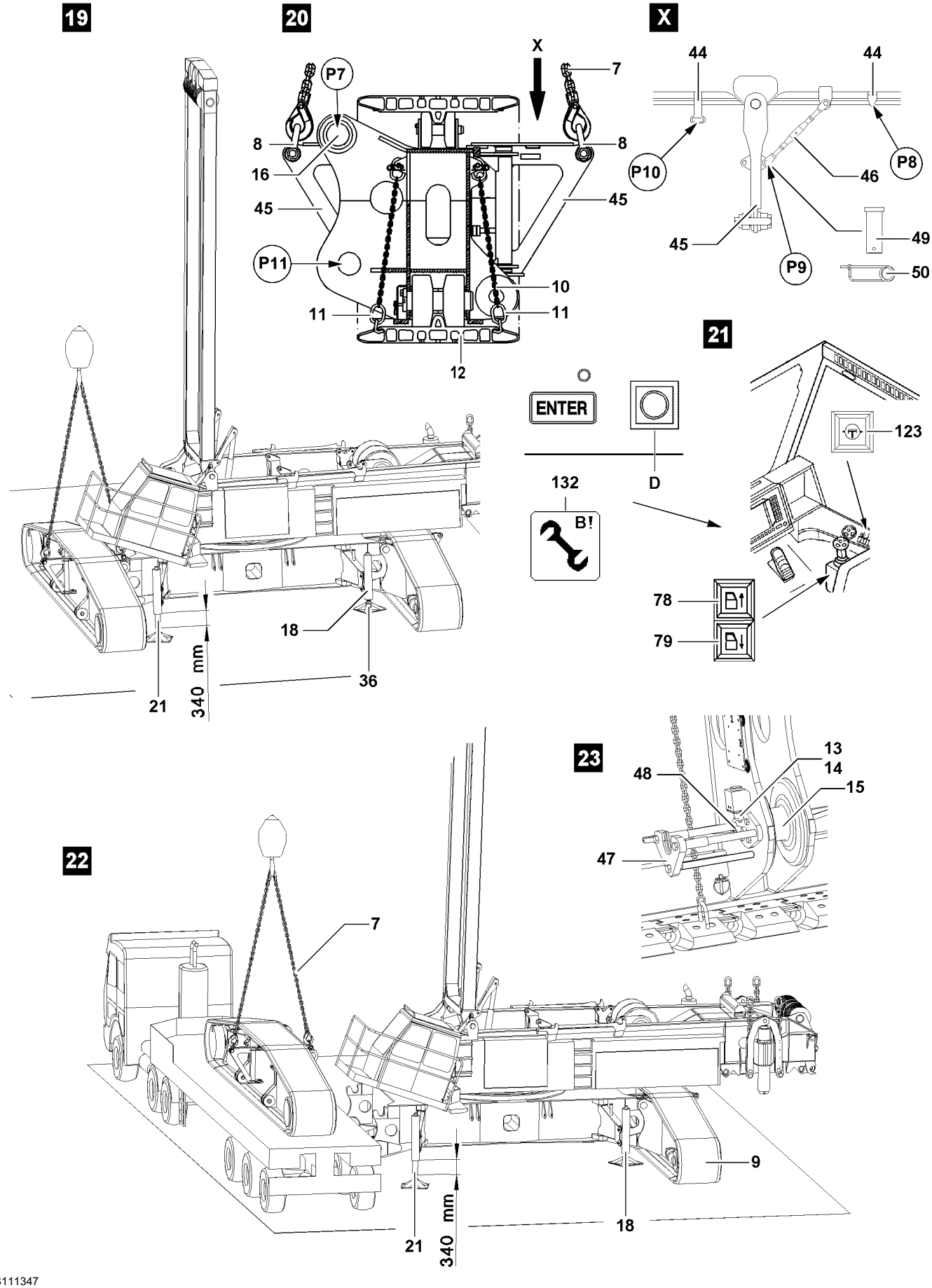
▶ When the second crawler carrier **20** is installed:
Set the second crawler carrier on the ground: Move the support cylinder **21** in evenly.
▶ Remove the chains **10** on the track pads **12** and secure on the crawler carriers, see illustration **18**.
▶ Move the support cylinders **21** in all the way.

Note
▶ The assembly support must remain swung out!

▶ Remove the fastening ropes **7** from the shackles **8** of the assembly consoles.
▶ Luff the crane operator's cab **43** down: Press the button **79**.

Result:
– The crawler carriers are assembled.

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4.2 Removing the crawler carrier with the auxiliary crane

DANGER
The crane can topple over!
If the central ballast or the turntable ballast is installed, the crane can topple over when removing the crawler carrier!
Personnel can be severely injured or killed!
▶ For removal, no central ballast or turntable ballast may be installed!

WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!
▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see Crane operating instructions chapter 2.04!
▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
▶ Step on aids and fall arresters only with clean shoes!
▶ Keep aids and fall arresters 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!

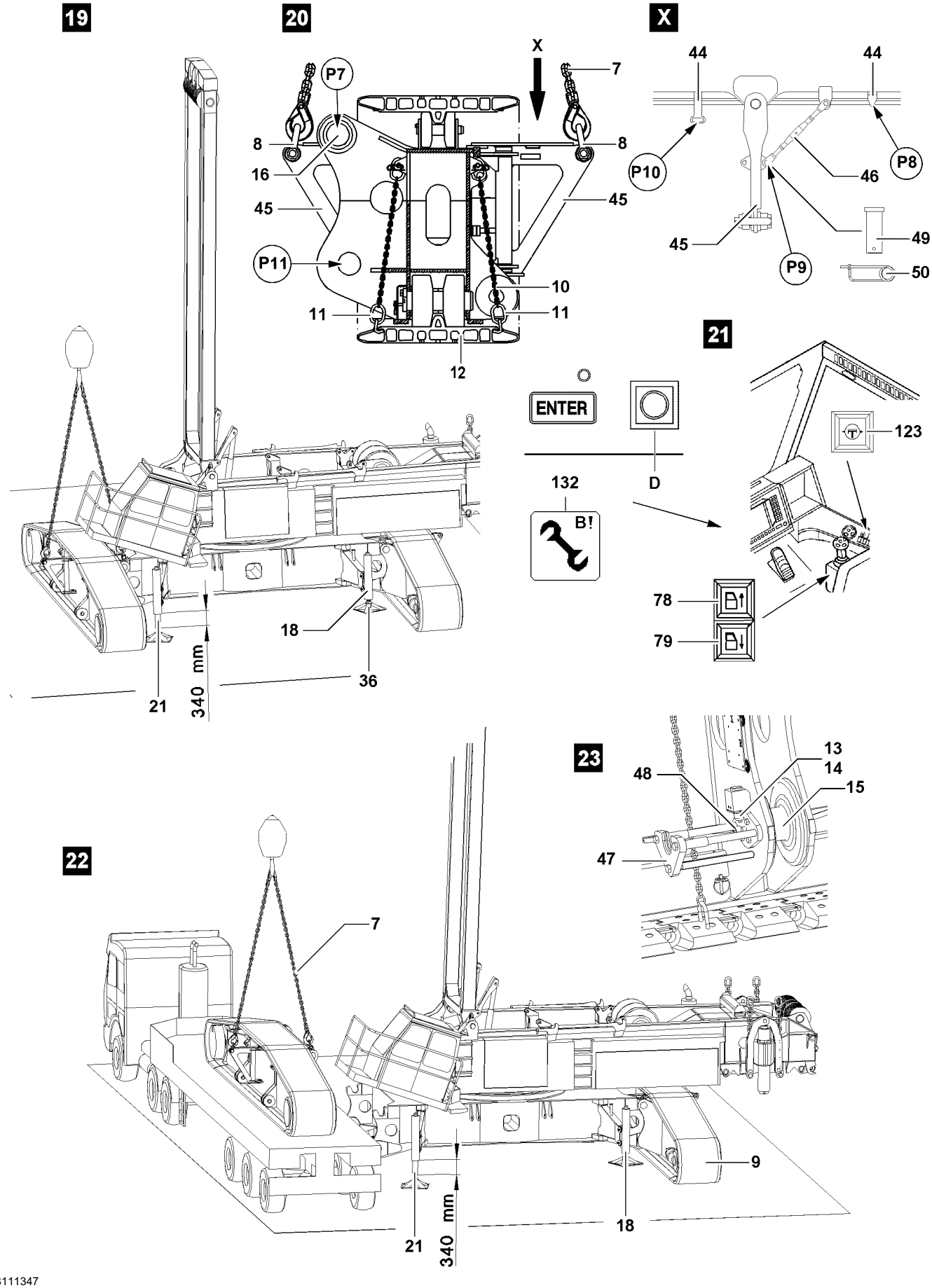
Note
▶ The weight of the crawler carrier, depending on the equipment configuration, is a maximum 26.4 t, see section “Dimensions and weights”!
▶ The assembly support on the crawler center section is connected to the hydraulic of the turntable!

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

Note
▶ For the disassembly on supports, the SA-frame must stand 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.
– Suitable material are available for the supporting base of the assembly supports.
– The support plates **36** are installed.

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4.2.1 Removing the first crawler carrier

Preparing the crawler carrier for disassembly

- ▶ Release and unpin the transport retainers **44** on the assembly consoles **45** on point **P10** and the turnbuckle **46** on point **P8**.
- ▶ Fold the assembly consoles **45** out on both sides.
- ▶ Pin the assembly consoles **45** with the turnbuckles **46**: Insert the pin **49** on point **P9** and secure with spring retainer **50**.
- ▶ Attach the fastening ropes **7** onto the auxiliary crane.
- ▶ Position the auxiliary crane in such a way that the fastening ropes **7** hang centered above the crawler carrier **9**.
- ▶ Attach the fastening ropes **7** on the shackles **8** of the assembly consoles **45**.
- ▶ Tension the fastening ropes **7** with the auxiliary crane.

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 disassembly of the crawler carrier **9** with the chains **10** to prevent them from sagging!

- ▶ Hang the chains **10** with the bars **11** on the track pads **12**, see illustration. **20**.

Unpinning the crawler carrier



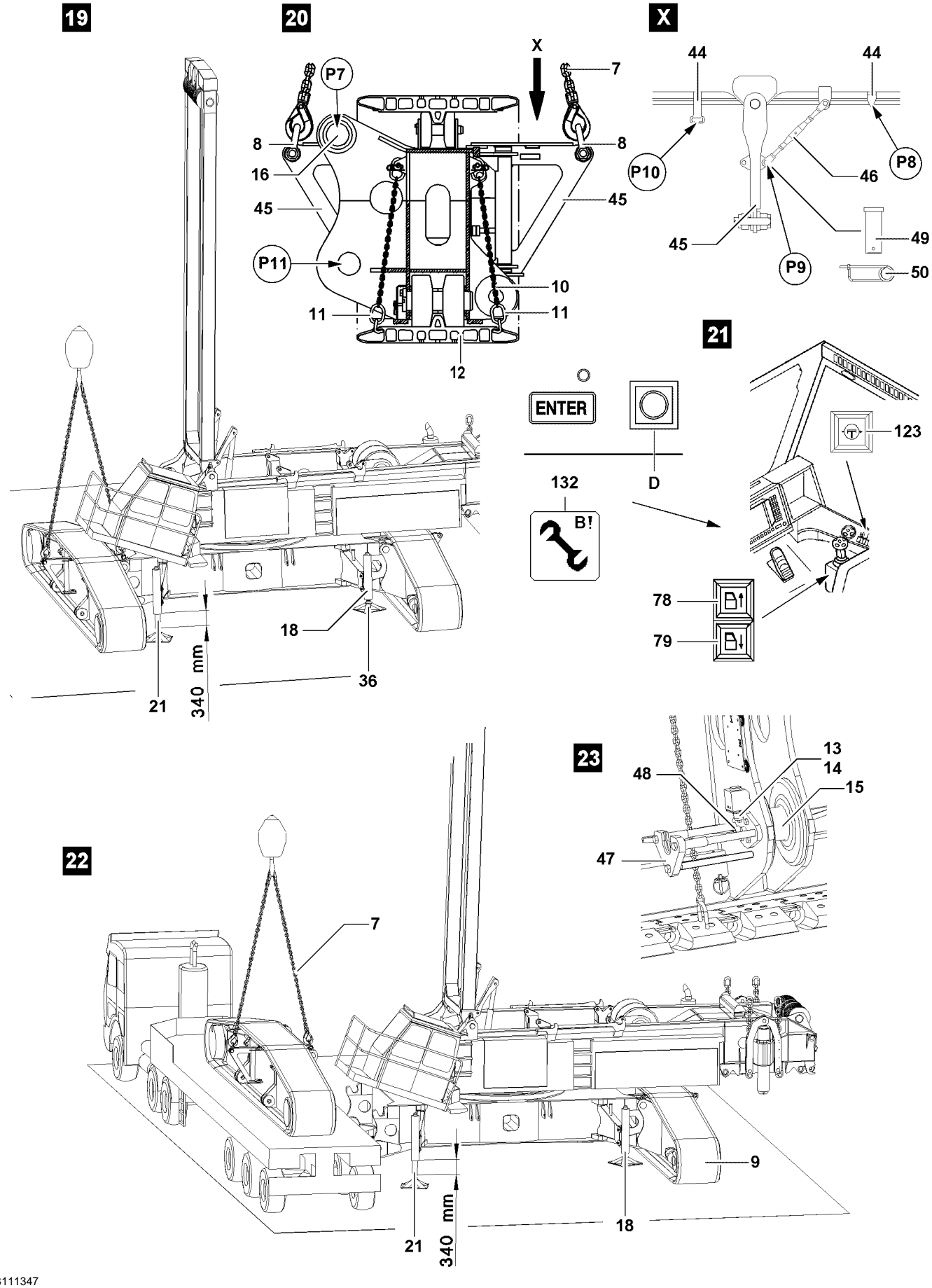
WARNING
Risk of accidents due to improper support!
If the assembly support is not properly supported from below, it can sink into the ground and severely injure personnel!
- ▶ The supporting base must take on the weight of the crawler travel gear and the turntable safely!
- ▶ The supporting base must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

Make sure that the following prerequisites are met:
- – The crane engine is running.
- – The LICCON overload protection is exceeded.
- – The assembly icon **132** is visible on the LICCON monitor.

- ▶ Luff the crane operator's cab **43** up: Press the button **78**.
- ▶ Set the ball valve for the support cylinder to “Assembly support”.
- ▶ Change the pressure supply to the auxiliary users: Actuate the switch **123**.
- ▶ Lift the first crawler carrier off the ground: Move the support cylinder **21** out until the distance between the ground and the underside of the crawler carrier is 340 mm, see illustration **19**.

NOTICE
Pin is not released!
If the pin **15** is secured with the pin **13**, when unpinning, the pin pulling device can be damaged!
- ▶ Secure pin **13** before unpinning in “up” position with spring retainer **14**, see illustration **23**!

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- ▶ Release the pin **15**: Release the pin **13** on the crawler carrier and unpin and secure in “up” with the spring retainer **14**.
- ▶ Hang the pin pulling cylinder on the screw **48** and retainer **47**, see illustration **23**.
- ▶ Unpin the crawler carrier **9** on the crawler center section **3**: Unpin the pin **15** with the pin pulling cylinder on points **P11**:

Disconnect the hydraulic connection to the crawler travel gears

When releasing hydraulic lines with quick-release couplings, make sure that the coupling procedure is carried out 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 releasing: Turn the engine off and wait for short time.
- ▶ Install the coupling components (sleeve and connector) with the hand-tightened nut.
- ▶ Disconnect the hydraulic connections to the crawler carriers.
- ▶ Properly store the hydraulic hoses on the crawler carrier.

Disconnect the electric connection to the crawler travel gears

- ▶ Disconnect the electrical connections to the crawler carriers, see separate electrical wiring diagram.

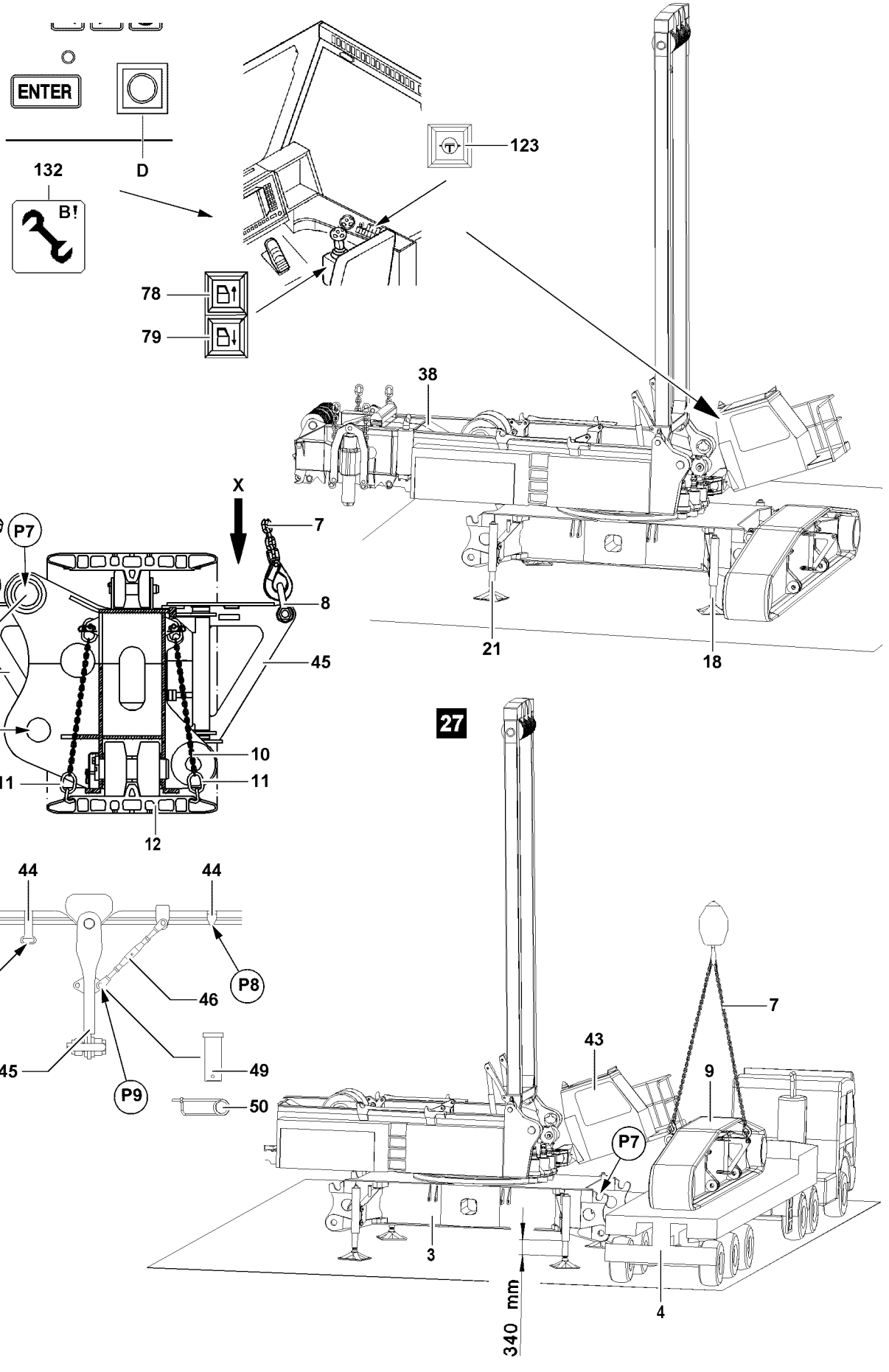
Removing the crawler carrier from the crawler center section

Make sure that the following prerequisites are met:
– The crane operator's cab is luffed up.
– The angle between the ground and the crawler center section is approx. 2 °.

NOTICE
Collision with the crane operator's cab!
If the crane operator's cab is not luffed up when removing the crawler carrier, a collision can occur!
The crane can be damaged!
- ▶ Luff the crane operator's cab **43** up before removing the crawler carrier!

- ▶ Lift the crawler carrier **9** with the auxiliary crane from the crawler center section **3**.
- ▶ Set the crawler carrier **9** with the auxiliary crane on the transport vehicle **4**.
- ▶ Release the fastening ropes **7** from the shackles **8** on the assembly consoles.
- ▶ Unpin the turnbuckles **46** from the assembly consoles **45**: Release and unpin the pin **49** on point **P9**.
- ▶ Secure the assembly consoles **45** with the transport retainer **44** on point **P10**.
- ▶ Secure the turnbuckles **46** with the transport retainer **44** on point **P8**.

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4.2.2 Moving the assembly support out

▶ Move the support cylinder **18** out evenly until the crane is in horizontal position.

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!

▶ Make sure that the support cylinders are moved out to at least 340 mm, see illustration **49**.
▶ Turn the turntable **38** by 180 °.

4.2.3 Removing the second crawler carrier

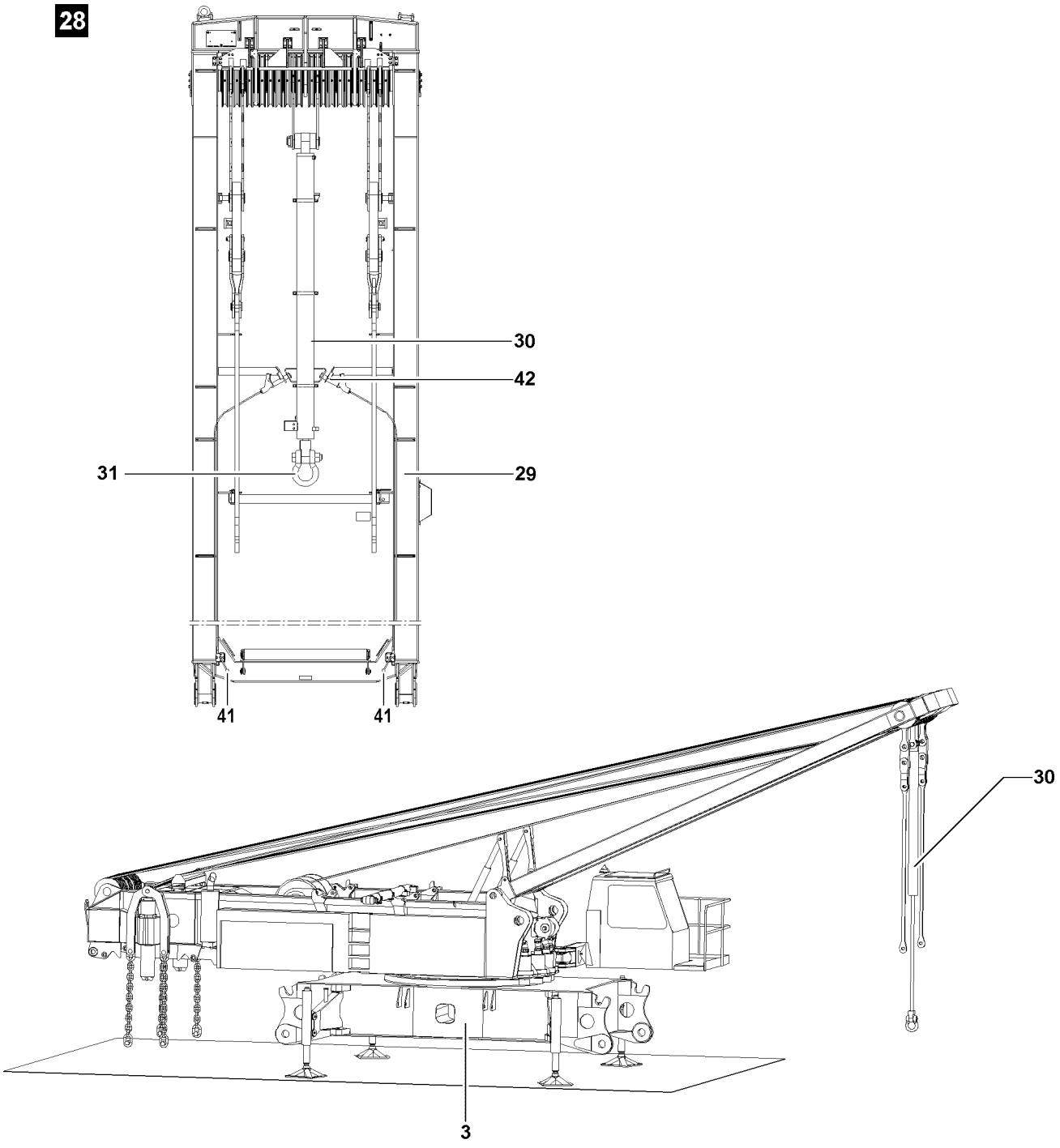
Make sure that the following prerequisites are met:
– The first crawler carrier has been removed.
– The hydraulic support cylinders are moved out to at least 340 mm.
– The turntable **38** is turned by 180 °.

Note
▶ For procedure for disassembly of the second crawler carrier **9**, see section “Disassembling the first crawler carrier”!

▶ Luff the crane operator's cab **43** down: Press the button **79**.

Result:
– The crawler carriers are removed.

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5 Assembling / disassembling the crawler carrier with SA-frame

5.1 Assembling the crawler carrier with SA-frame

DANGER
The crane can topple over!
If the crane is installed on the assembly support and a central ballast or turntable ballast is installed, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ No central ballast or turntable ballast may be installed!

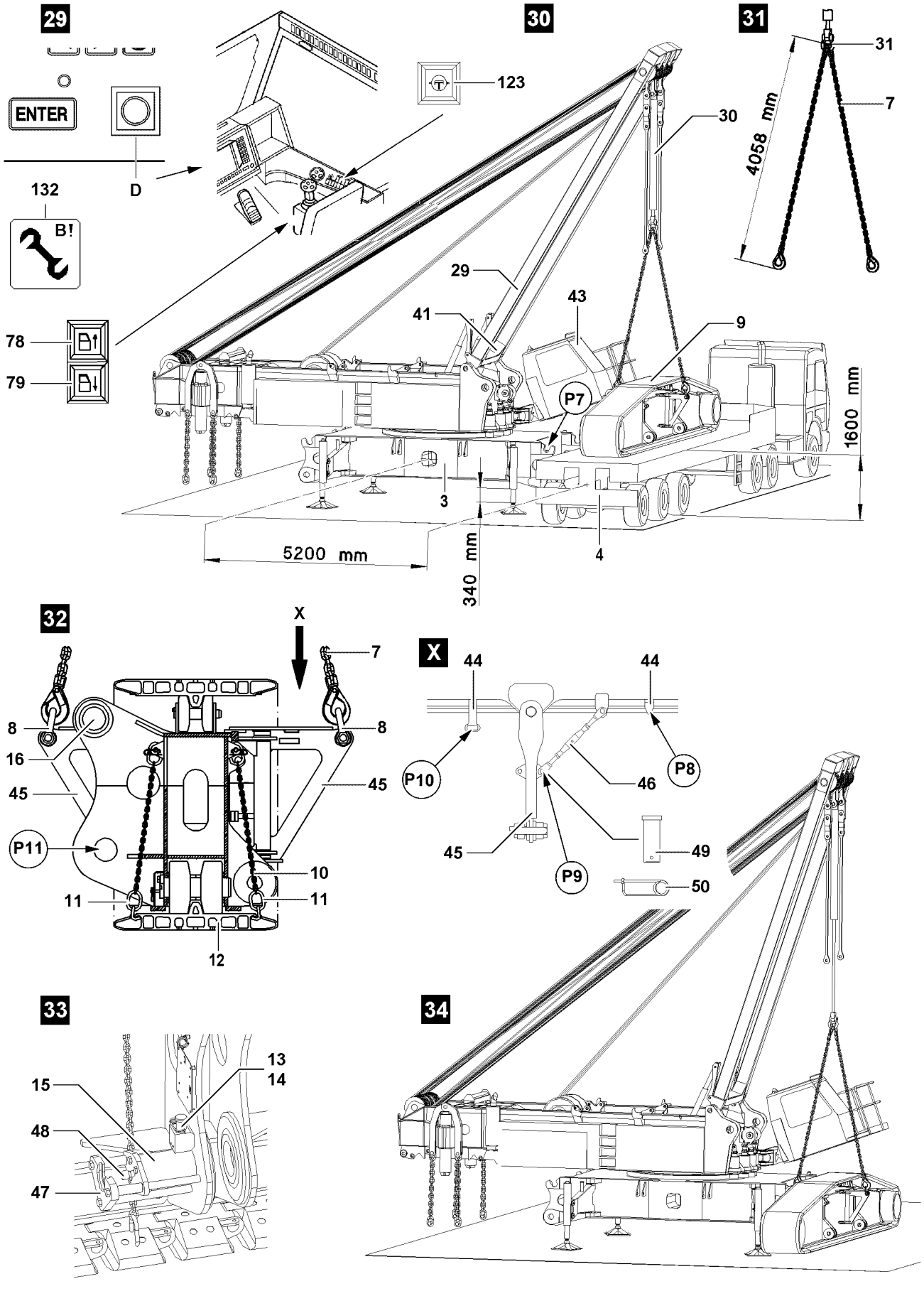
WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see Crane operating instructions chapter 2.04!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Step on aids and fall arresters only with clean shoes!
- ▶ Keep aids and fall arresters 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 assembly cylinder **30** lies secured on the SA-frame **29**!
- ▶ The assembly cylinder **30** has a hoist of maximum 2475 mm!
- ▶ The load can be measured with the assembly cylinder **30**!
- ▶ The lock **42** of the assembly cylinder **30** is unpinned by actuating the levers of the Bowden cables **41**!

WARNING
Danger of accident due to SA-frame!
There is a danger of accidents within the working range of the SA-frame!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain within the entire working range of the SA-bracket **29**!

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Note
- ▶ The weight of the crawler carrier, depending on the equipment configuration, is a maximum 26.4 t, see section “Dimensions and weights”!
- ▶ The assembly support on the crawler center section is connected to the hydraulic of the turntable!

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

Note
- ▶ For the assembly of the crawler carriers with the SA-frame, the tackle **7** with a length of 4058 mm must be used!

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 maximum height of the transport vehicle **4** may not exceed 1600 mm, see illustration **30**.
- The hydraulic support cylinders are moved out to at least 340 mm, see illustration **30**.

5.1.1 Installing the first crawler carrier

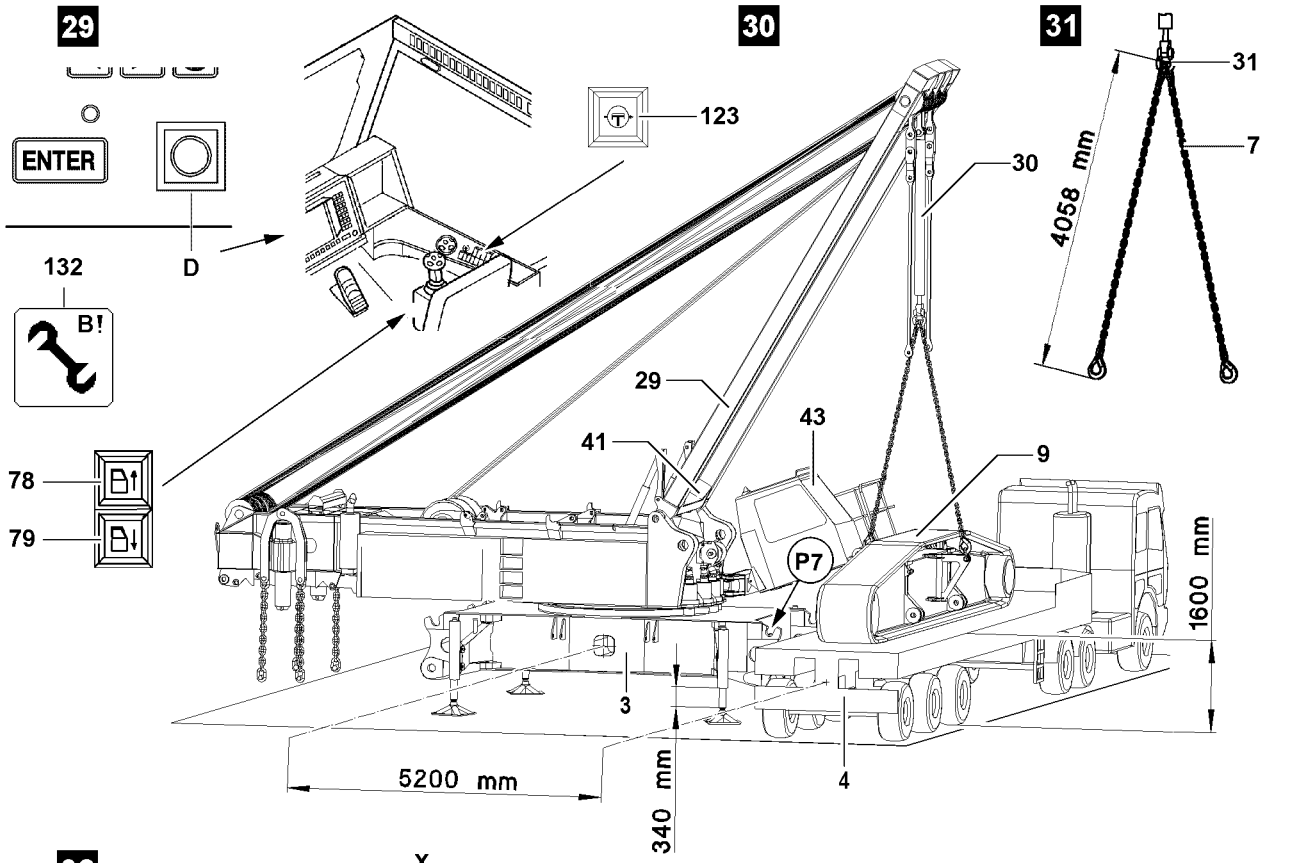
DANGER
The crane can topple over!
In operating mode crawler assembly, the overload safety shuts off on the SA-frame! If the distance between the crawler carrier and the center of the turntable exceeds 5200 mm, then the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Make sure that the crane is horizontally aligned!
- ▶ The maximum permissible distance of 5200 mm between the crawler carrier and the center of the turntable may not be exceeded, see illustration **30**!

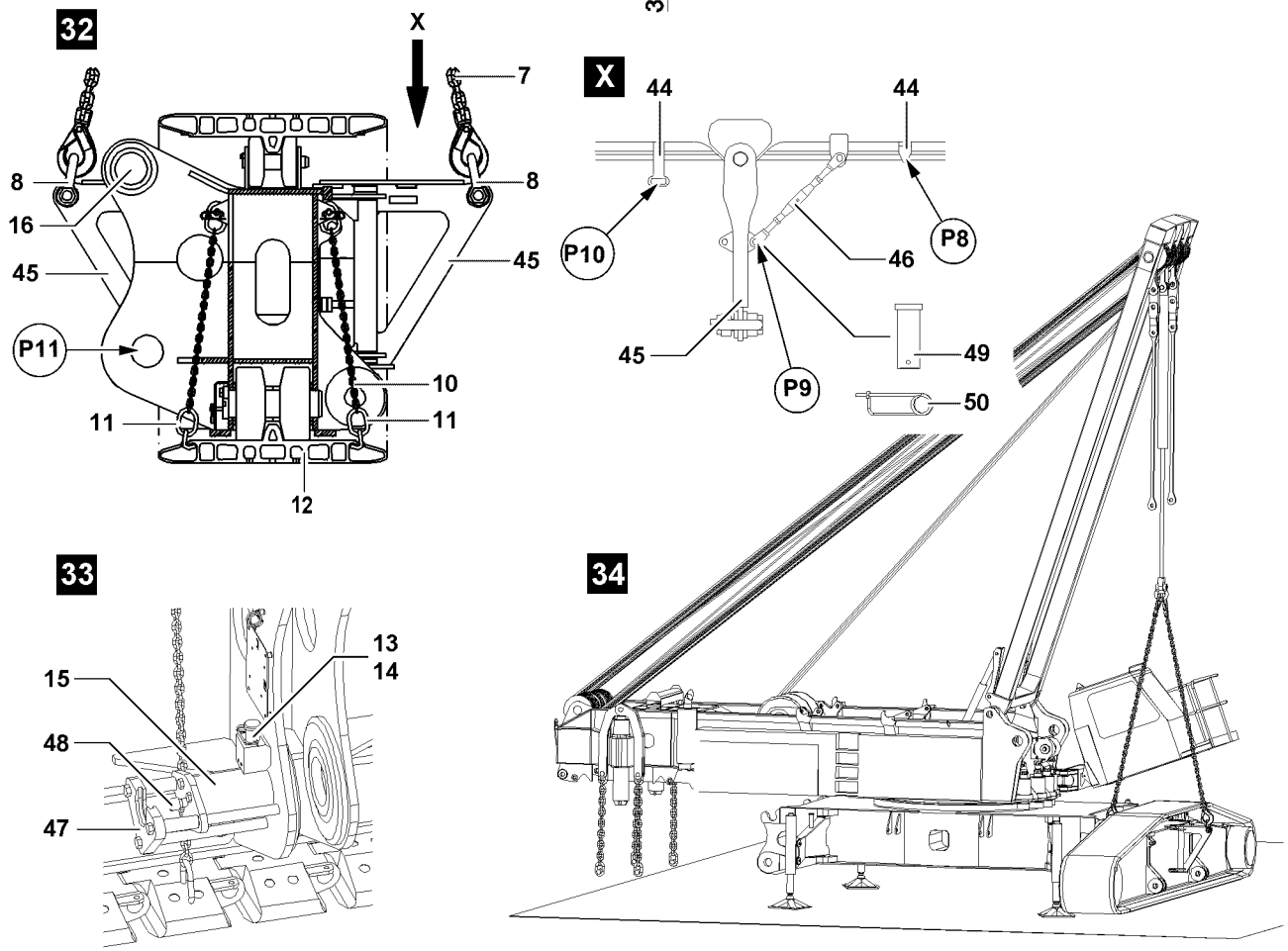
Preparing the crawler carrier for assembly
- ▶ Release and unpin the transport retainers **44** on the assembly consoles **45** on point **P10** and the turnbuckle **46** on point **P8**.
- ▶ Fold the assembly consoles **45** out on both sides.
- ▶ Pin the assembly consoles **45** with the turnbuckles **46**: Insert the pin **49** on point **P9** and secure with spring retainer **50**.

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 the chains **10** with the bars **11** on the track pads **12**, see illustration. **32**.
- ▶ Make sure that the pins **15** are completely unpinned on both sides on the crawler carrier.

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Positioning the crawler carrier on the crawler center section

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!

Make sure that the following prerequisites are met:
- – The crane engine is running.
- – The LICCON overload protection is exceeded.
- – The assembly icon **132** is visible on the LICCON monitor.

NOTICE
Collision with the crane operator's cab!
If the crane operator's cab is not luffed up when moving the crawler carrier in, a collision can occur!
The crane can be damaged!
- ▶ Luff the crane operator's cab **43** up before moving the crawler carrier **9** in!

- ▶ Luff the crane operator's cab **43** up: Press the button **78**.

WARNING
Oscillating assembly cylinder!
If the transport retainer of the assembly cylinder is released on the SA-frame, then the assembly cylinder can swing back and forth!
Personnel can be severely injured or killed!
- ▶ Before actuating the Bowden cables **41** for the assembly cylinder **30**: Set the SA-frame **29** vertically!

- ▶ Unpin the transport retainer of the assembly cylinder **30**: Operate lever of the Bowden cables **41**.
- ▶ Set the ball valve for the support cylinder to “Assembly support”.
- ▶ Change the pressure supply to the auxiliary users: Actuate the switch **123**.

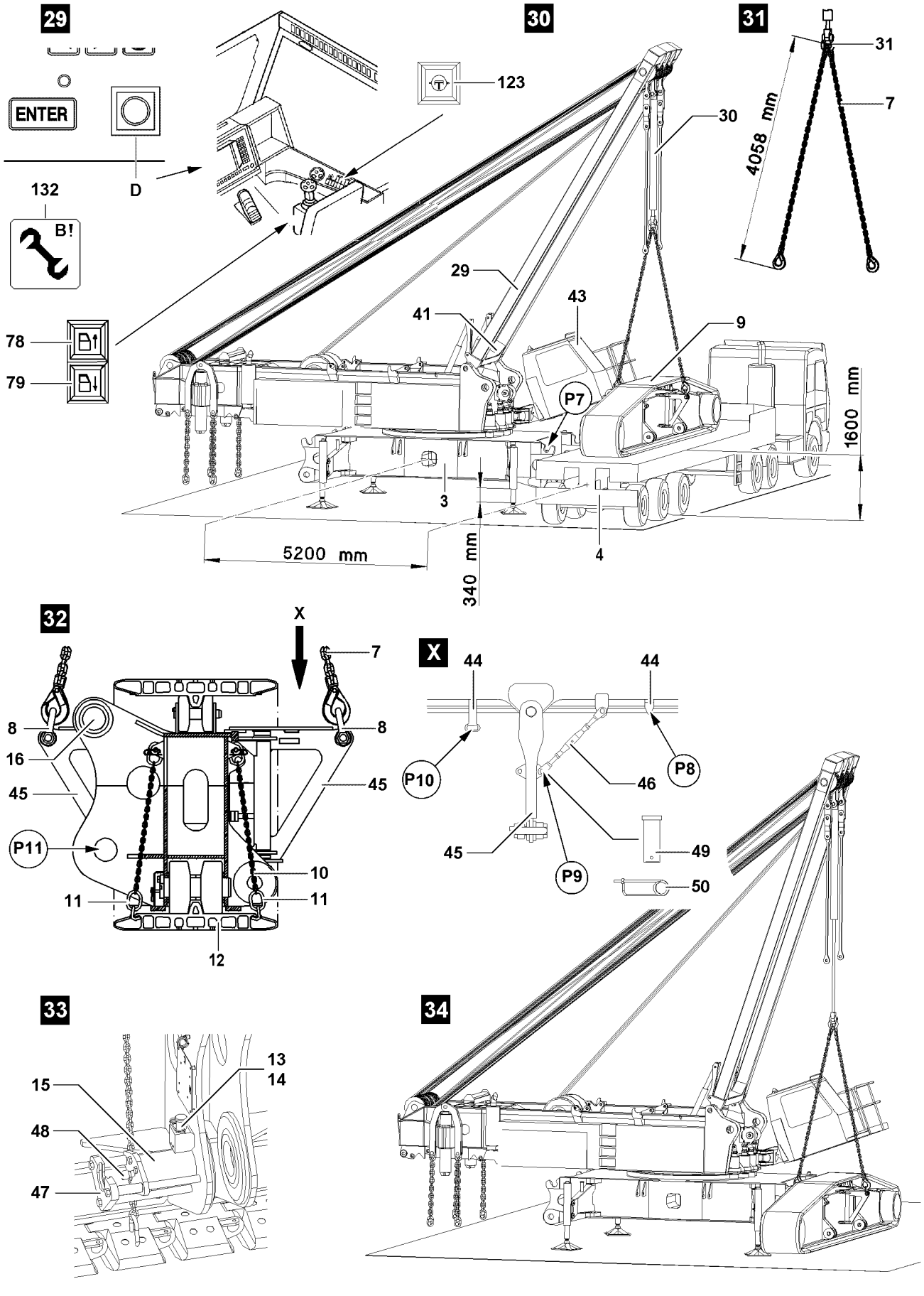
Note
- ▶ The assembly cylinder **30** may not be moved out all the way!
- ▶ If the assembly cylinder **30** is moved out all the way and the limit switch position is reached, an error display appears on the LICCON monitor and the overload shut off!

- ▶ Attach the fastening ropes **7** on the shackle **31** of the assembly cylinder **30**.
- ▶ Luff the SA-frame **29** up until the assembly cylinder **30** is centered above the crawler carrier **9**.
- ▶ Move the assembly cylinder **30** out: Actuate master switch 2.
- ▶ Attach the fastening ropes **7** on the shackles **8** of the assembly consoles **45**.
- ▶ Move the assembly cylinder **30** in until the fastening ropes **7** are tensioned: Actuate master switch 2.

Note
- ▶ Balance the crawler carrier **9**: The center of gravity can be changed with the turnbuckles **46**!

- ▶ Lift the crawler carrier **9** with the assembly cylinder **30** from the transport vehicle **4**: Slowly move the assembly cylinder **30** in with master switch 2.
- ▶ Carefully luff the SA-frame **29** up.

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WARNING
Danger of crushing!
When moving the crawler carrier **9** in, there is an increased danger of accidents due to crushing!
Personnel can be severely injured or killed!
▶ It is prohibited for anyone to remain between the crawler carrier **9** and the crawler center section **3**!

▶ Swing the crawler carrier **9** with the SA-frame **29** 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**: Move the assembly cylinder **30** out and hang the pin **16** in on points **P7**.

Pinning the crawler carrier

Note
▶ For operation of the pin pulling device, see Crane operating instructions, chapter 5.30!

NOTICE
Pin not unpinned!
If the pin **13** is not secured in “top” position for pinning, the pin pulling device can be damaged!
▶ Before inserting the pin **13** in “up” position, secure it with the spring retainer **14**, illustration **33**!

▶ Hang the pin pulling cylinder on the screw **48** and retainer **47**, see illustration **33**.
▶ Pin the crawler carrier **9** on the crawler center section **3**: Pin the pin **15** with the pin pulling cylinder on points **P11**.
▶ Secure the pins **15**: Pin in the retaining pin **13** and secure with spring retainer **14**.
▶ Release the fastening ropes **7** from the shackles **8** on the assembly consoles **45**.
▶ Unpin the turnbuckles **46** on the assembly consoles **45**: Release and unpin the pin **49** on point **P9**.
▶ Secure the assembly consoles **45** with the transport retainer **44** on point **P10**.
▶ Secure the turnbuckles **46** with the transport retainer **44** on point **P8**.

Establishing the hydraulic connection to the crawler travel gears

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

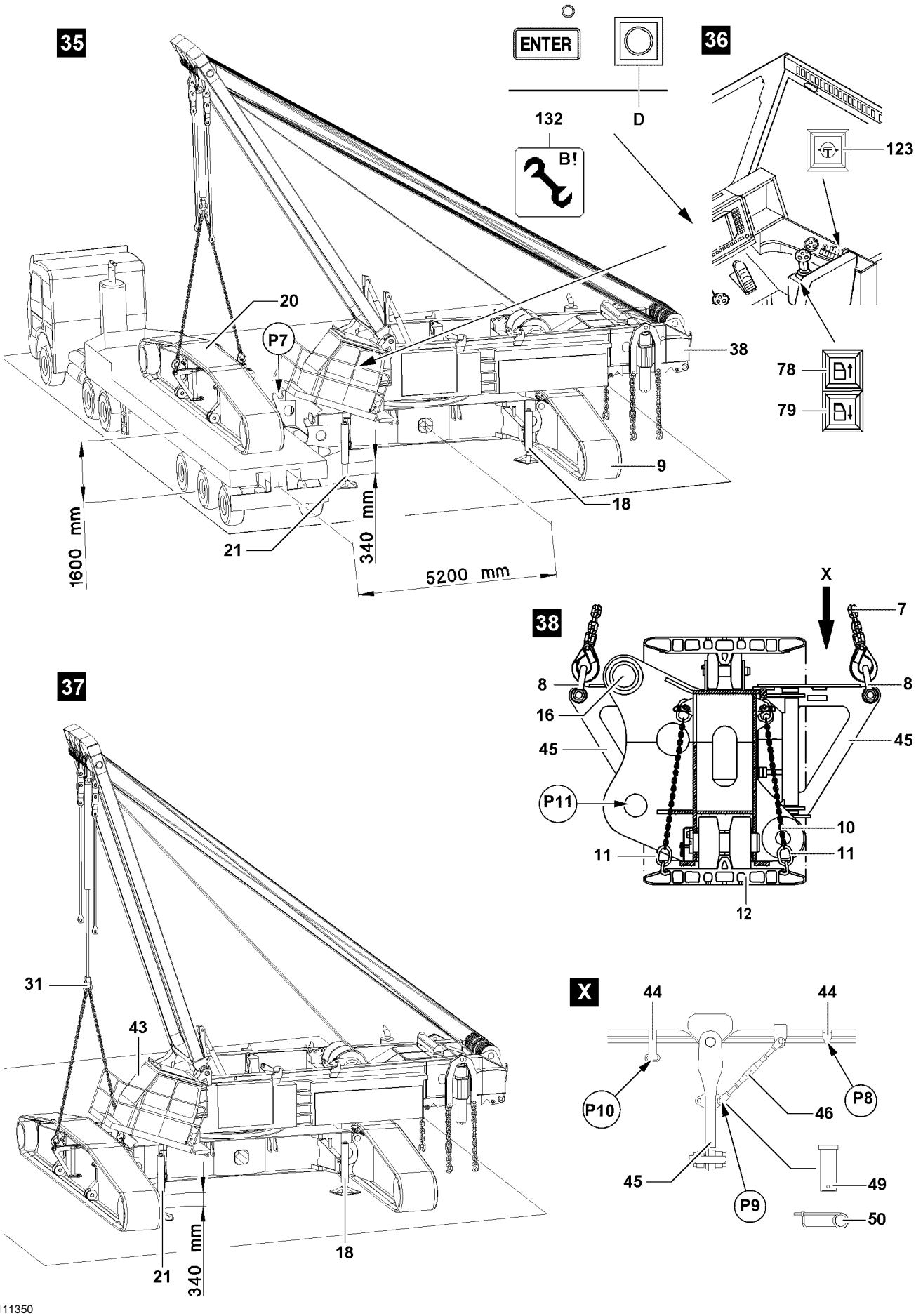
DANGER
Loss of pressure or leakage!
Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious accidents due to component failure!
▶ Check that the quick-release couplings have been properly connected before using the crane!

▶ Release the pressure in the hydraulic system before connecting: 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 to the crawler carriers.

Establishing the electrical connection to the crawler travel gears

▶ Establish the electrical connections to the crawler carriers, see separate electrical wiring diagram.

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5.1.2 Setting the first crawler carrier on the ground

Make sure that the following prerequisites are met:
– The crane engine is running.
– The LICCON overload protection is exceeded.
– The assembly icon **132** is visible on the LICCON monitor.

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 both support cylinders **18** in until the crawler carrier **9** is standing on the ground.
▶ Move the support cylinders **18** in all the way.
▶ Make sure that the angle between the ground and the crawler center section **3** is approx. 2 °.

WARNING
Danger of tipping over!
Before turning the turntable **38**, if the first installed crawler carrier **9** is not positioned on the ground, there is a danger of tipping over!
Personnel can be severely injured or killed!
▶ Before turning the turntable **38**: Set the first installed crawler carrier **9** on the ground!
▶ The hydraulic support cylinder **18** on the crawler side must be moved in all the way!

▶ Turn the turntable **38** by 180 °.

5.1.3 Assembling the second crawler carrier

Make sure that the following prerequisites are met, see illustration **35**:
– The first installed crawler carrier **9** is standing on the ground.
– The hydraulic support cylinders **18** on the crawler side are fully moved in.
– The angle between the ground and the crawler center section **3** is approx. 2 °.
– The turntable **38** is turned by 180 °.

Note
▶ Procedure for assembly of the second crawler carrier **20**, see section “Installing the first crawler carrier”!

▶ When the second crawler carrier **20** is installed:
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 **38**.
▶ Move the support cylinders **21** in all the way.

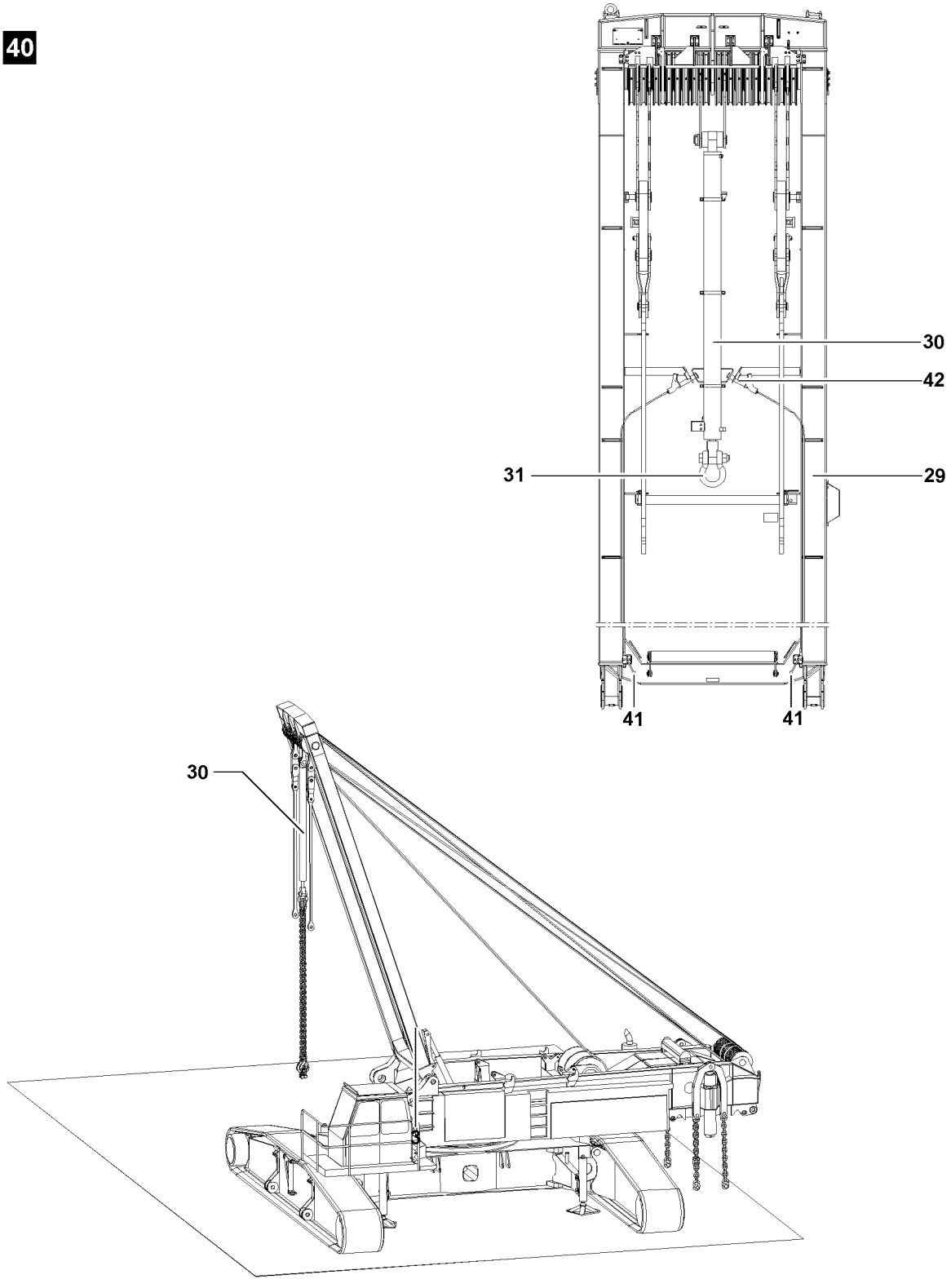
Note
▶ The assembly support must remain swung out!

▶ Remove the fastening ropes **7** on the shackles **31** of the assembly cylinder.
▶ Move the assembly cylinder **30** all the way in and secure with the Bowden cables **41**.
▶ Luff the crane operator's cab **43** down: Press the button **79**.
▶ Turn the pressure change over for the auxiliary users off: Actuate the switch **123**.

Result:
– The crawler carriers are assembled.

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5.2 Disassembling the crawler carrier with SA-frame

DANGER
The crane can topple over!
If the central ballast or the turntable ballast is installed, the crane can topple over when removing the crawler carrier!
Personnel can be severely injured or killed!
- ▶ For removal, no central ballast or turntable ballast may be installed!

WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved catch systems to avoid falling, see Crane operating instructions chapter 2.04!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Step on aids and fall arresters only with clean shoes!
- ▶ Keep aids and fall arresters clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

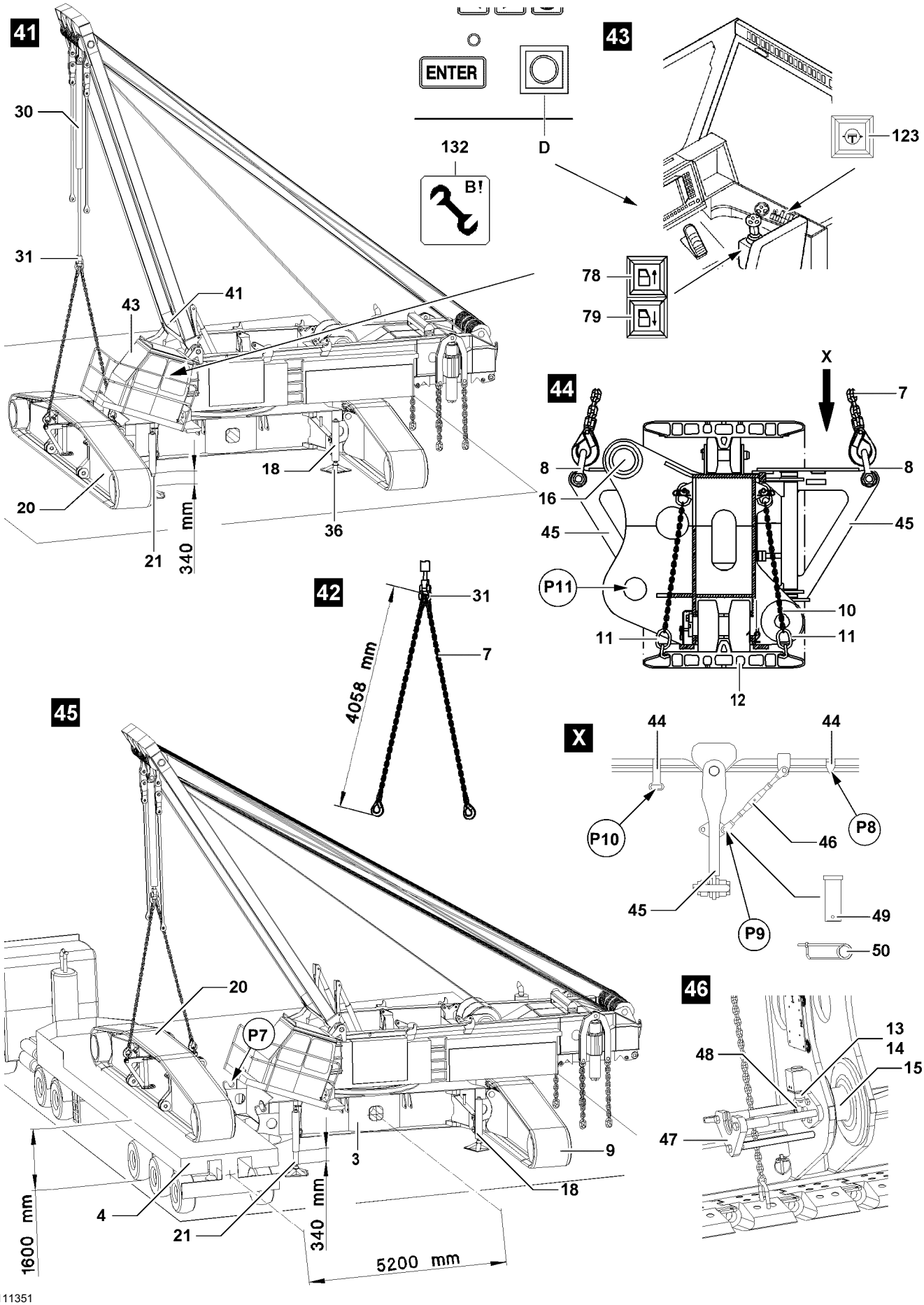
WARNING
Danger of crushing!
While assembling / disassembling crane components, body limbs can be crushed or severed by the swing movement of components!
- ▶ Make sure that the components do not swing back and forth during assembly/disassembly!

WARNING
Danger of accident due to SA-frame!
There is a danger of accidents within the working range of the SA-frame!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain within the entire working range of the SA-bracket **29**!

Note
- ▶ The weight of the crawler carrier, depending on the equipment configuration, is a maximum 26.4 t, see section “Dimensions and weights”!
- ▶ The assembly support on the crawler center section is connected to the hydraulic of the turntable!

Note
- ▶ The assembly cylinder **30** lies secured on the SA-frame **29**!
- ▶ The assembly cylinder **30** has a hoist of maximum 2475 mm!
- ▶ The load can be measured with the assembly cylinder **30**!
- ▶ The lock **42** of the assembly cylinder **30** is unpinned by actuating the levers of the Bowden cables **41**!

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

Note
▶ For the assembly of the crawler carriers with the SA-frame, the tackle **7** with a length of 4058 mm must be used!

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 maximum height of the transport vehicle **4** may not exceed 1600 mm, see illustration **45**.
– Suitable material must be available for the supporting base of the assembly supports.
– The support plates **36** are installed.

5.2.1 Removing the first crawler carrier

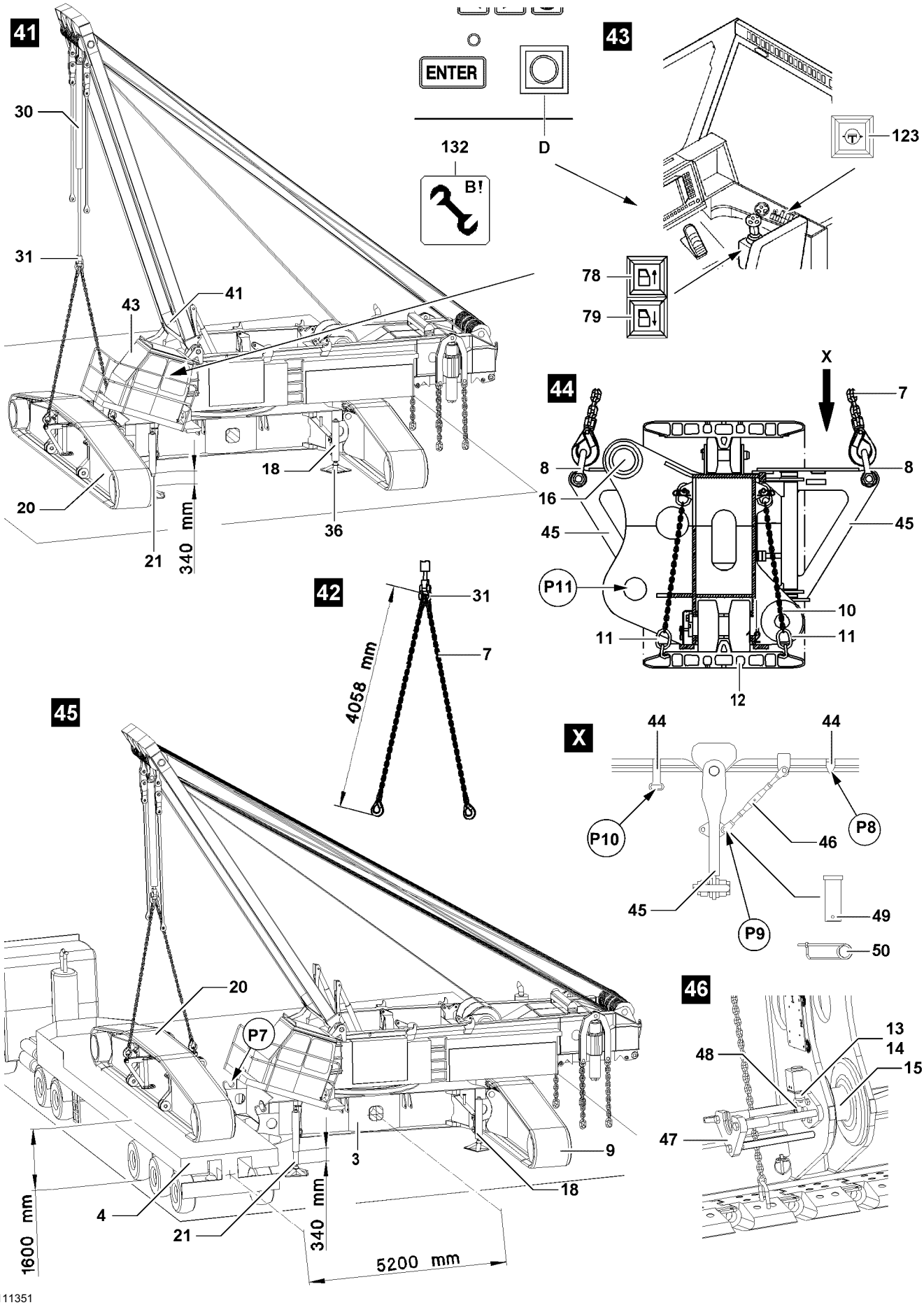
DANGER
The crane can topple over!
In operating mode “crawler assembly” , the overload safety shuts off on the SA-frame! If the distance between the crawler carrier and the center of the turntable exceeds 5200 mm, then the crane can topple over!
Personnel can be severely injured or killed!
▶ Make sure that the crane is horizontally aligned!
▶ The maximum permissible distance of 5200 mm between the crawler carrier and the center of the turntable may not be exceeded, see illustration **45**!

Preparing the crawler carrier for disassembly

WARNING
Oscillating assembly cylinder!
If the transport retainer of the assembly cylinder is released on the SA-frame, then the assembly cylinder can swing back and forth!
Personnel can be severely injured or killed!
▶ Before actuating the Bowden cables **41** for the assembly cylinder **30**: Set the SA-frame **29** vertically!

▶ Unpin the transport retainer of the assembly cylinder **30**: Actuate the Bowden cables **41**.

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- ▶ Attach the fastening ropes **7** on the shackle **31** of the assembly cylinder **30**.
- ▶ Luff the SA-frame **29** up until the assembly cylinder **30** is centered above the crawler carrier **9**.
- ▶ Move the assembly cylinder **30** out: Actuate master switch 2.
- ▶ Attach the fastening ropes **7** on the shackles **8** of the assembly consoles **45**.
- ▶ Move the assembly cylinder **30** in until the fastening ropes **7** are tensioned: Actuate master switch 2.
- ▶ Release and unpin the transport retainers **44** on the assembly consoles **45** on point **P10** and the turnbuckle **46** on point **P8**.
- ▶ Fold the assembly consoles **45** out on both sides.
- ▶ Pin the turnbuckles **46** on the assembly consoles **45**: Insert the pin **49** on point **P9** and secure with spring retainer **50**.

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 disassembly of the crawler carrier **9** with the chains **10** to prevent them from sagging!

- ▶ Hang the chains **10** with the bars **11** on the track pads **12**, see illustration. **44**.

Unpinning the 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 travel gear and the turntable safely!
- ▶ The supporting base must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see Crane operating instructions, chapter 2.04!

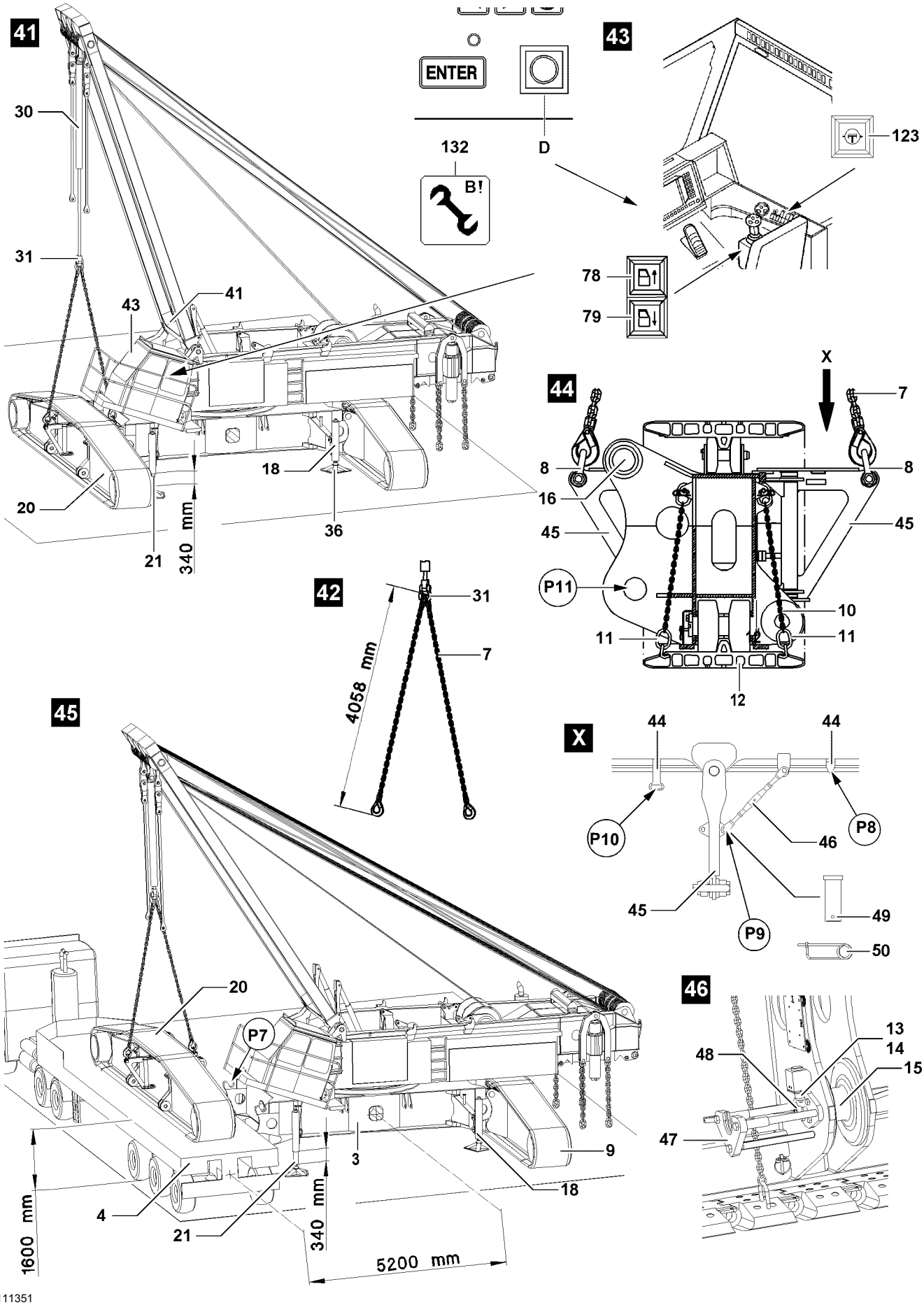
Make sure that the following prerequisites are met:
- – The crane engine is running.
- – The LICCON overload protection is exceeded.
- – The assembly icon **132** is visible on the LICCON monitor.

- ▶ Set the ball valve for the support cylinder to “Assembly support”.
- ▶ Change the pressure supply to the auxiliary users: Actuate the switch **123**.
- ▶ Lift the first crawler carrier off the ground: Move the support cylinder **21** out until the distance between the ground and the underside of the crawler carrier is 340 mm, see illustration **41**.

NOTICE
Pin is not released!
If the pin **15** is secured with the pin **13**, when unpinning, the pin pulling device can be damaged!
- ▶ Secure pin **13** before unpinning in “up” position with spring retainer **14**, see illustration **46**!

- ▶ Release the pin **15**: Release the pin **13** on the crawler carrier and unpin and secure in “up” with the spring retainer **14**.
- ▶ Hang the pin pulling cylinder on the screw **48** and retainer **47**, see illustration **46**.
- ▶ Unpin the crawler carrier **9** on the crawler center section **3**: Unpin the pin **15** with the pin pulling cylinder on points **P11**:

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Disconnecting the hydraulic connection to the crawler travel gears

When releasing hydraulic lines with quick-release couplings, make sure that the coupling procedure is carried out 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 releasing: Turn the engine off and wait for short time.
▶ Install the coupling components (sleeve and connector) with the hand-tightened nut.
▶ Disconnect the hydraulic connections to the crawler carriers.
▶ Properly store the hydraulic hoses on the crawler carrier.

Disconnecting the electric connection to the crawler travel gears

▶ Disconnect the electrical connections to the crawler carriers, see separate electrical wiring diagram.

Removing the crawler carrier from the crawler center section

Make sure that the following prerequisites are met:
– The crane engine is running.
– The LICCON overload protection is exceeded.
– The assembly icon **132** is visible on the LICCON monitor.
– The pressure supply is changed to the auxiliary users: The switch **123** is actuated.

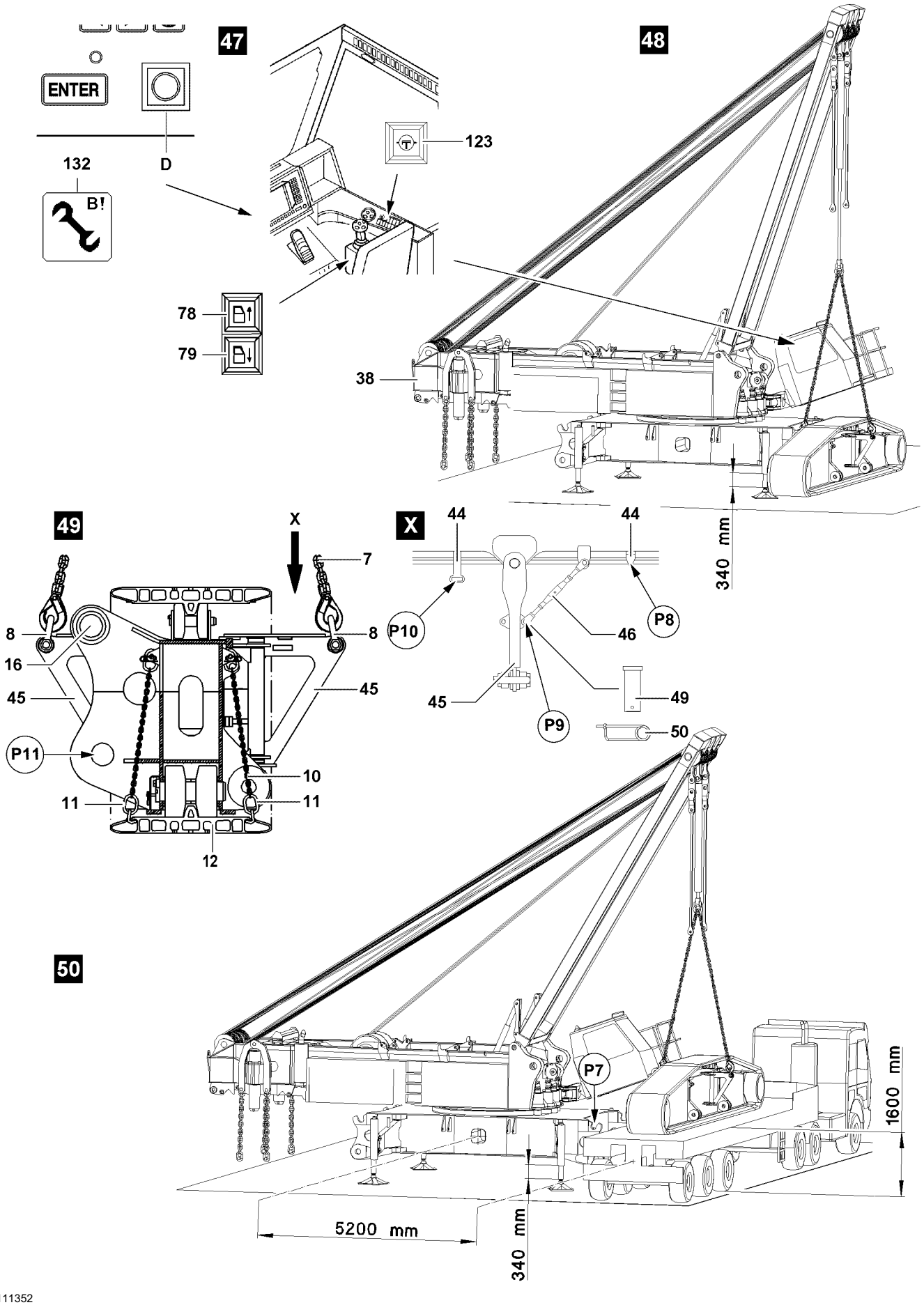
NOTICE
Collision with the crane operator's cab!
If the crane operator's cab is not luffed up when removing the crawler carrier, a collision can occur!
The crane can be damaged!
▶ Luff the crane operator's cab **43** up before removing the crawler carrier!

▶ Luff the crane operator's cab **43** up: Press the button **78**.

Note
▶ The assembly cylinder **30** may not be moved out all the way!
▶ If the assembly cylinder **30** is moved out all the way and the limit switch position is reached, an error display appears on the LICCON monitor and the overload shut off!

▶ Lift the crawler carrier **9** with the auxiliary crane from the crawler center section **3**: Slowly move the assembly cylinder **30** in with master switch 2.
▶ Carefully luff the SA-frame **29** down.
▶ Set the crawler carrier **9** on the transport vehicle **4**.
▶ Release the fastening ropes **7** from the shackles **8** on the assembly consoles **45**.
▶ Unpin the turnbuckles **46** on the assembly consoles **45**: Release and unpin the pin **49** on point **P9**.
▶ Secure the assembly consoles **45** with the transport retainer **44** on point **P10**.
▶ Secure the turnbuckles **46** with the transport retainer **44** on point **P8**.

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5.3 Moving the assembly support out

▶ Move the support cylinder **18** out evenly until the crane is in horizontal position.

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!

▶ Make sure that the support cylinders are moved out to at least 340 mm, see illustration **48**.
▶ Turn the turntable **38** by 180 °.

5.4 Removing the second crawler carrier

Make sure that the following prerequisites are met:
– The first crawler carrier has been removed.
– The hydraulic support cylinders are moved out to at least 340 mm.
– The turntable **38** is turned by 180 °.

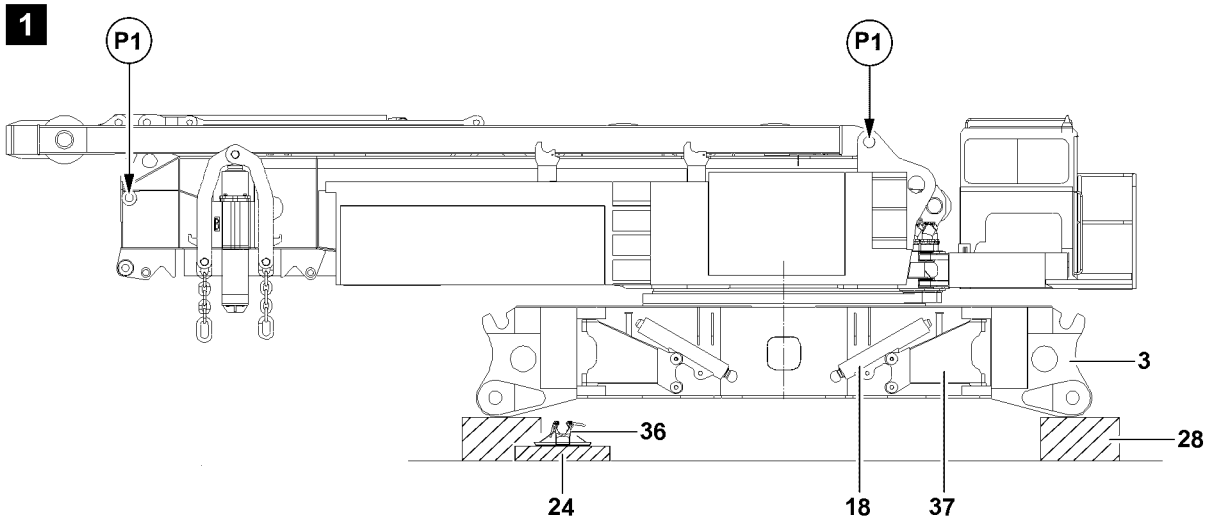
Note
▶ For procedure for disassembly of the second crawler carrier **9**, see section “Disassemble the first crawler carrier”!

▶ Luff the crane operator's cab **43** down: Press the button **79**.

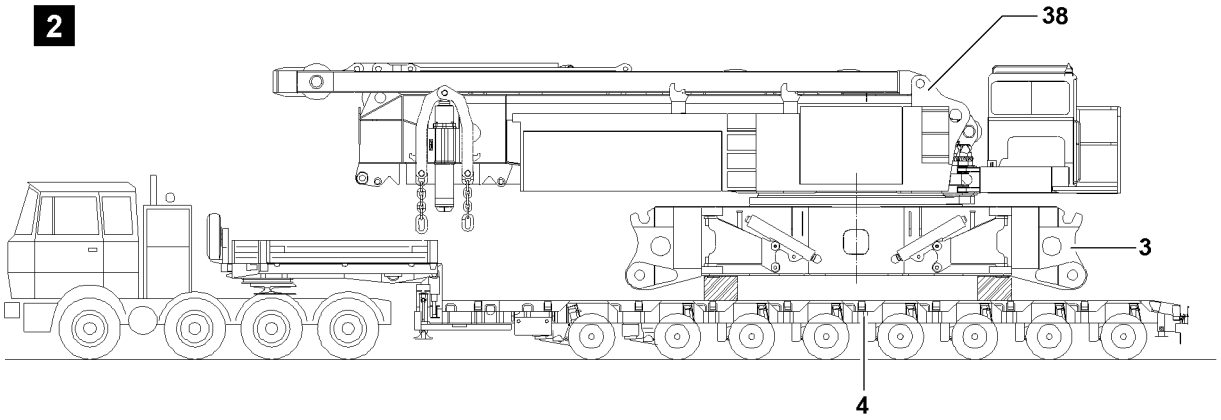
Result:
– The crawler carriers are removed.

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6 Removing the crawler center section

The following initial situations are distinguished:
– The turntable with crawler center section is set on the ground for disassembly, illustration **1**.
– The turntable with the crawler center section is set on the flatbed trailer, illustration **2**.

6.1 Preparing disassembly of the crawler center section on the ground

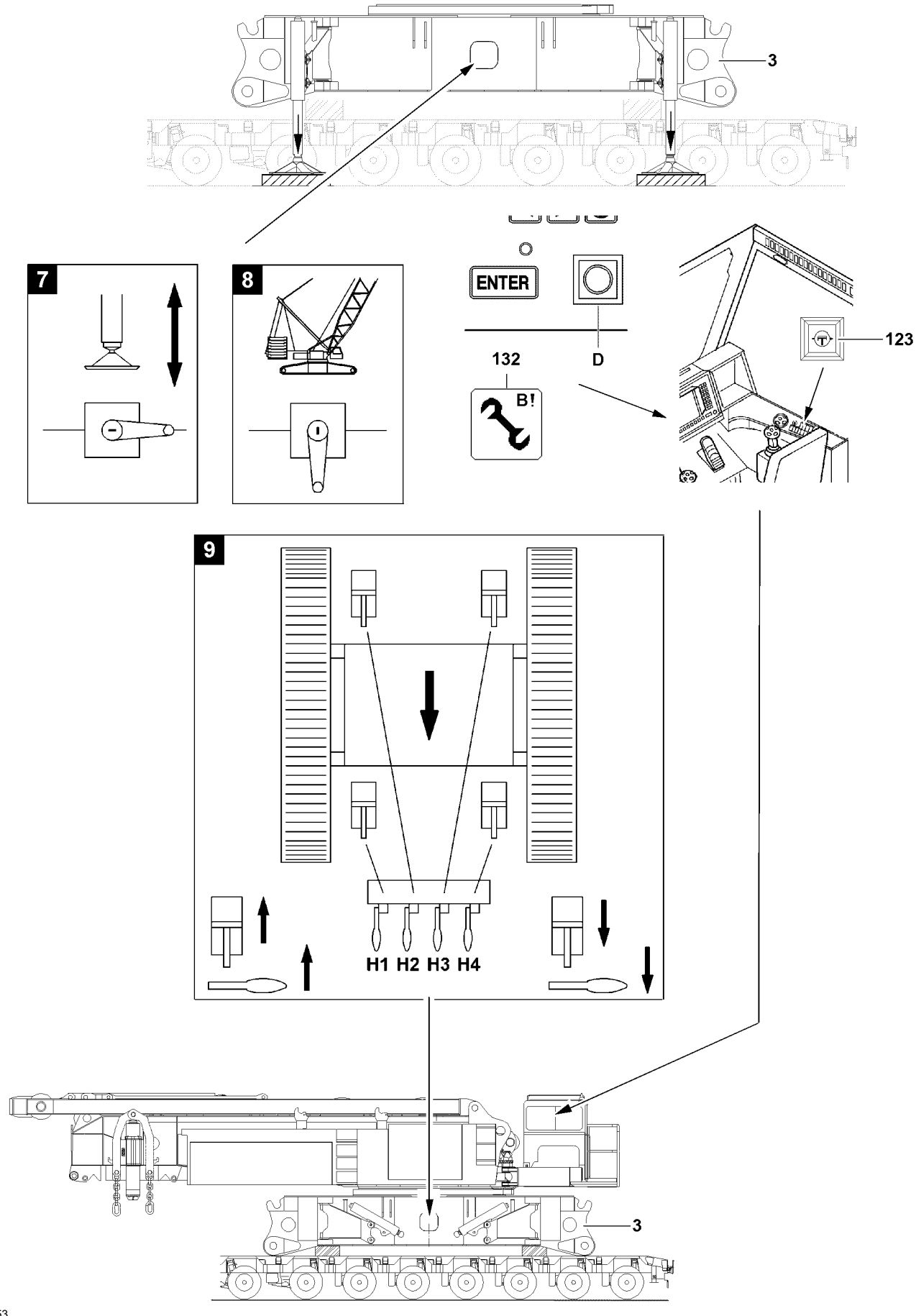
6.1.1 Supporting the crawler center section

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

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

Note
▶ The supporting base **28** must be higher than that the support plates **36** with supporting base **24** for the vertically positioned hydraulic cylinders **18**!
▶ Support the crawler center section **3** with hardwood timbers (or other suitable materials) from below!

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6.2 Preparing the assembly supports for operation

6.2.1 Operating the assembly supports from the crane cab

▶ Start the crane engine, see Crane operating instructions, chapter 4.03.

▶ Turn the set up key **D** to the right.

Result:

– The assembly icon **132** appears in the LICCON monitor.

▶ Actuate the switch **123** to change the pressure supply to the auxiliary users.

6.2.2 Operating the assembly supports with pin pulling device

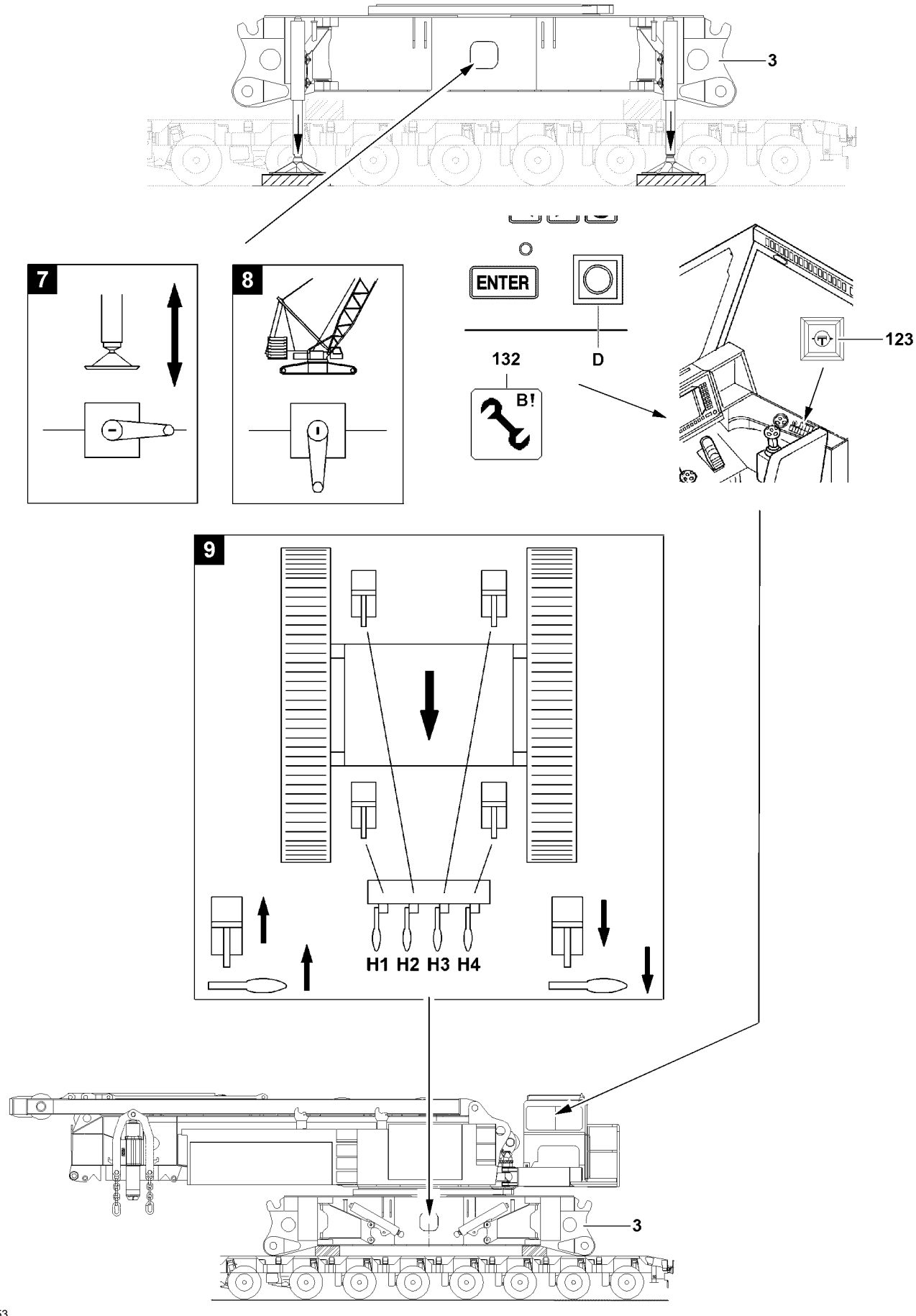
▶ Establish the hydraulic connections from the hydraulic aggregate of the pin pulling device to the crawler center section **3**, see Crane operating instructions, chapter 5.30.

6.3 Preparing disassembly of the crawler center section on the transport vehicle

Make sure that the following prerequisite is met:

– The support cylinders are extended to the point where the transport vehicle can be moved under the crawler center section, see section “Lifting the crawler center section”.

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6.4 Lowering the crawler center section

The crawler center section is lowered for the following reasons:
– To set the turntable with the crawler center section on a transport vehicle
– To set the turntable with the crawler center section on the ground
– For disassembly of the assembly supports

Make sure that the following prerequisites are met:
– When setting down on a transport vehicle: the transport vehicle is under the crawler center section
– The crane engine is running.
– The crawler carriers are removed.
– the crawler center section is properly supported

Ball valve positions	
Illustration 7	Assembly support
Illustration 8	Crane operation / crawler carrier installation with SA-frame

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

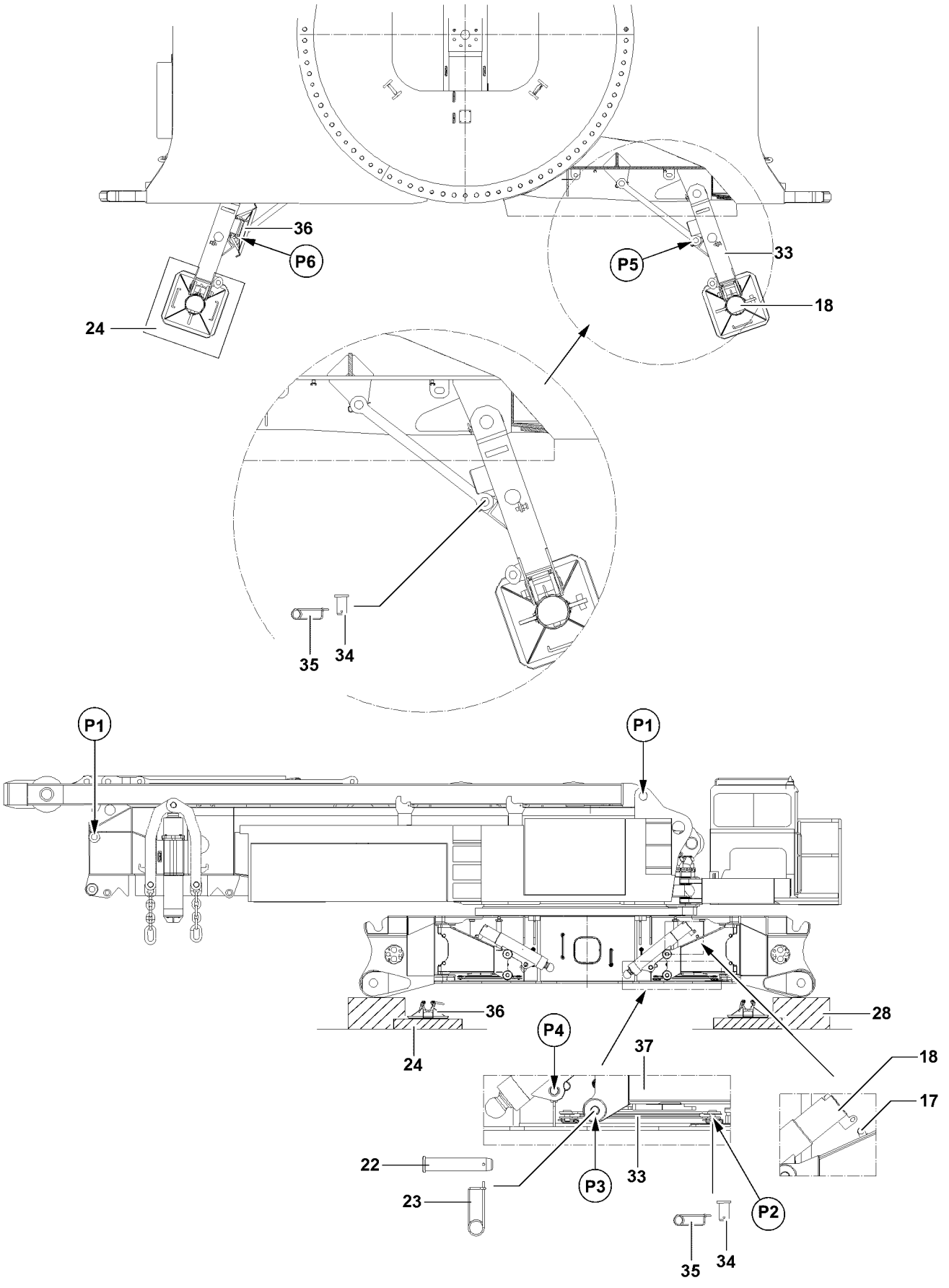
WARNING
Risk of tipping the crawler center section!
If the hydraulic cylinders **18** are moved in unevenly, the turntable with the crawler center section can tip over!
Personnel can be severely injured!
▶ When lowering the turntable with the crawler center section, pay attention to the horizontal alignment, check visually!

▶ Set the ball valve to “assembly support”, see illustration **7**.
▶ Actuate the hand lever **H1**, hand lever **H2**, hand lever **H3** and hand lever **H4**.

Result:
– The four support cylinders move in.

▶ Move the support cylinders **18** in with the support plates **36** until the crawler center section is laying on the support on the ground or on the transport vehicle.
▶ Open the receptacles on the support plates **36**.
▶ Move the support cylinders **18** in all the way.
▶ Actuate the ball valve in position “crane operation / crawler carrier installation”, see illustration **8**.

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6.5 Removing the assembly supports

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

▶ Secure the support plates **36** in the transport retainers on point **P6** on the crawler center section.

WARNING
Support cylinder folding downward!
If the support cylinder is not held when folding it up, then it will fold downward!
Personnel can be severely injured!
▶ Before unlocking, hold the support cylinder **18** and fold it up slowly!

▶ Release the support cylinder **18**: Release and unpin the pin **22** on point **P3**.
▶ Lock the support cylinder **18**: Fold the support cylinder **18** up and engage it on the spring latch **23**.
▶ Unpin the strut **33** on the support beam **37**: Release and unpin the pin **34** on point **P5**.

WARNING
Swinging in assembly support!
If any personnel is within the swing range of the assembly support, they can be severely injured or killed!
▶ Make sure that no persons are within the swing range of the assembly support!

▶ Pin the strut **33** on the transport retainer: Insert the pin **34** on point **P2** and secure with spring retainer **35**.
▶ wing the support beam **37** in.
▶ Secure the support cylinder and the support beam for transport: Insert the pin **22** on point **P4** and secure with spring retainer **23**.
▶ Attach the tackle on the fastening brackets **A**.
▶ Lift the turntable with the crawler center section **3** with the auxiliary crane.

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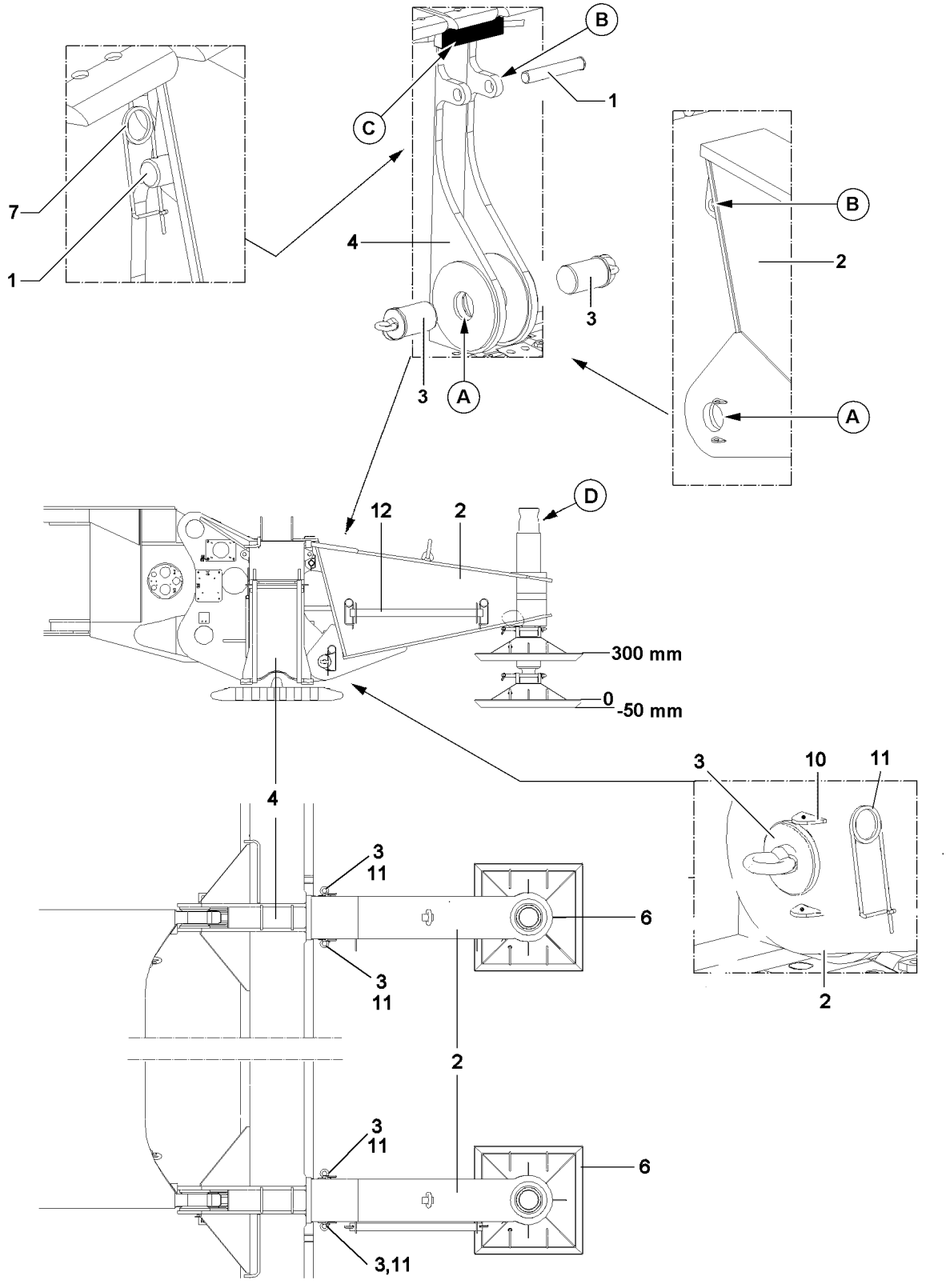
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1 Central ballast

Note

▶ See Crane operating instructions, part 2, chapter 3.03!

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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.

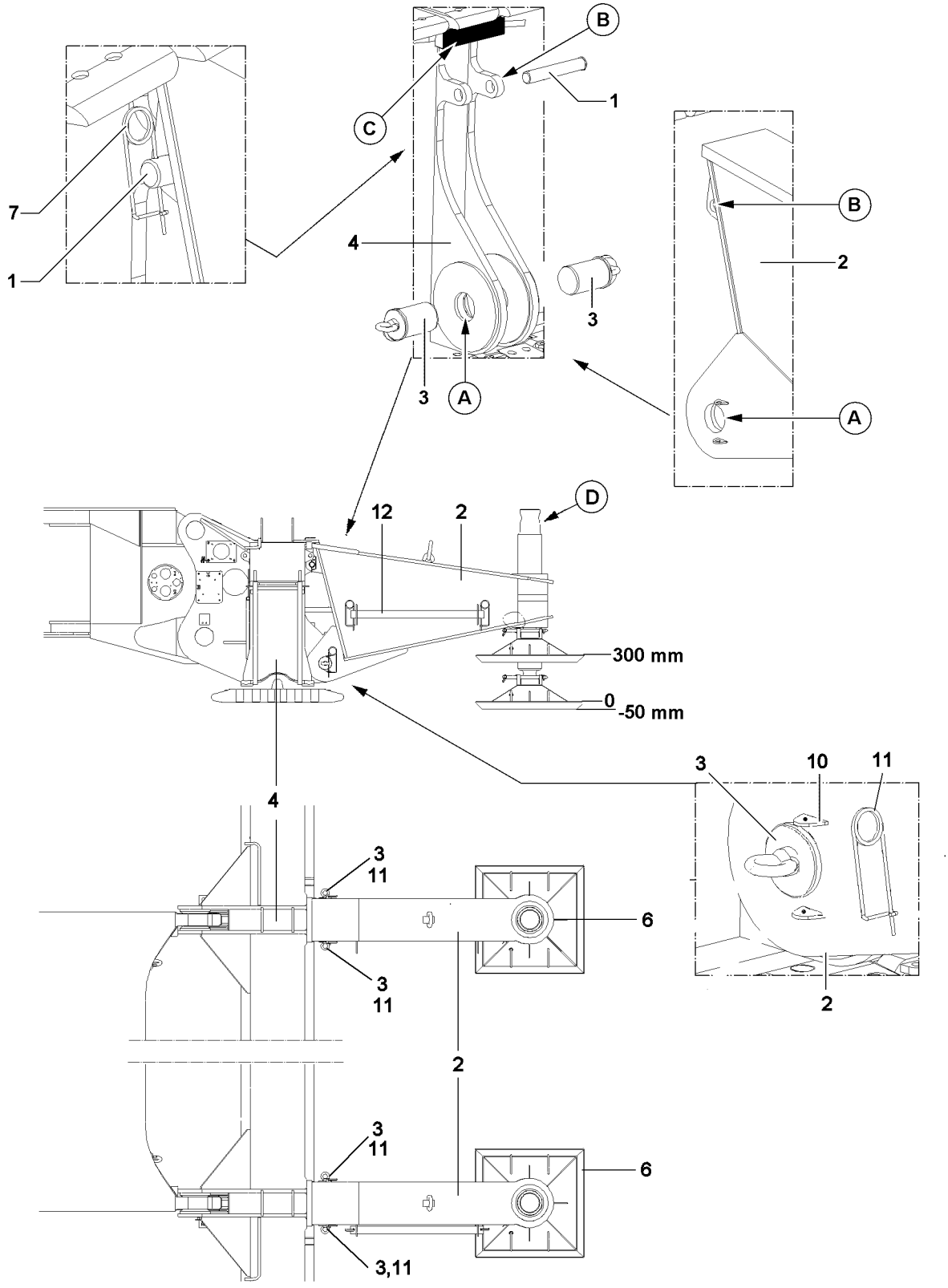
WARNING
The crane can topple over!
If long boom combinations are erected or taken down without mechanical auxiliary support **2**, then the crane can topple over. Personnel can be severely injured or killed!
▶ Observe and adhere to the data in the erection and take down charts!
▶ Pin the mechanical auxiliary 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 spring retainer **11** into brackets **10**.
▶ Insert the pin **1** on point **B** and secure with spring retainer **7**.
▶ Remove the mechanical auxiliary support from the auxiliary crane.

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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.

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1 Assembly conditions

Note
▶ See Crane operating instructions, part 2, chapter 3.06!

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1 Installation of hoist winches

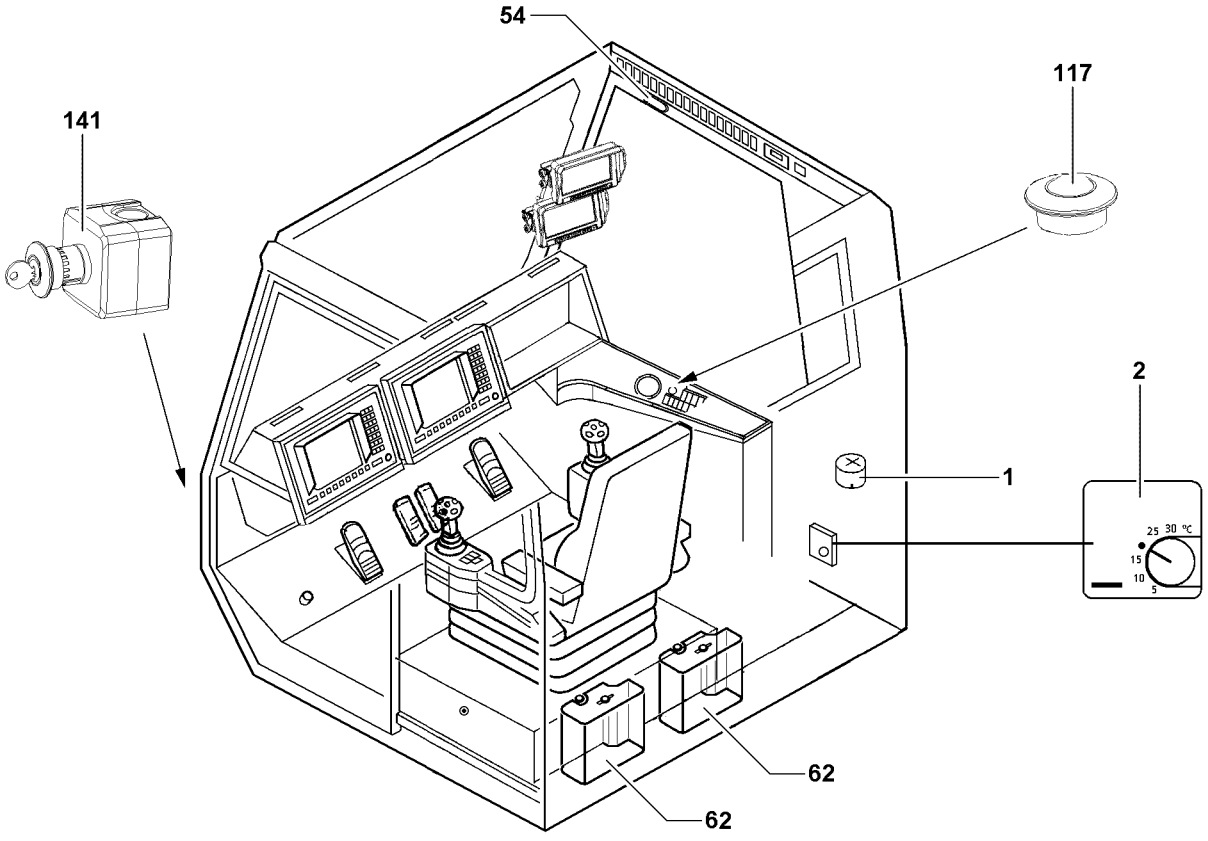
Note
▶ See Crane operating instructions, part 2, chapter 3.07!

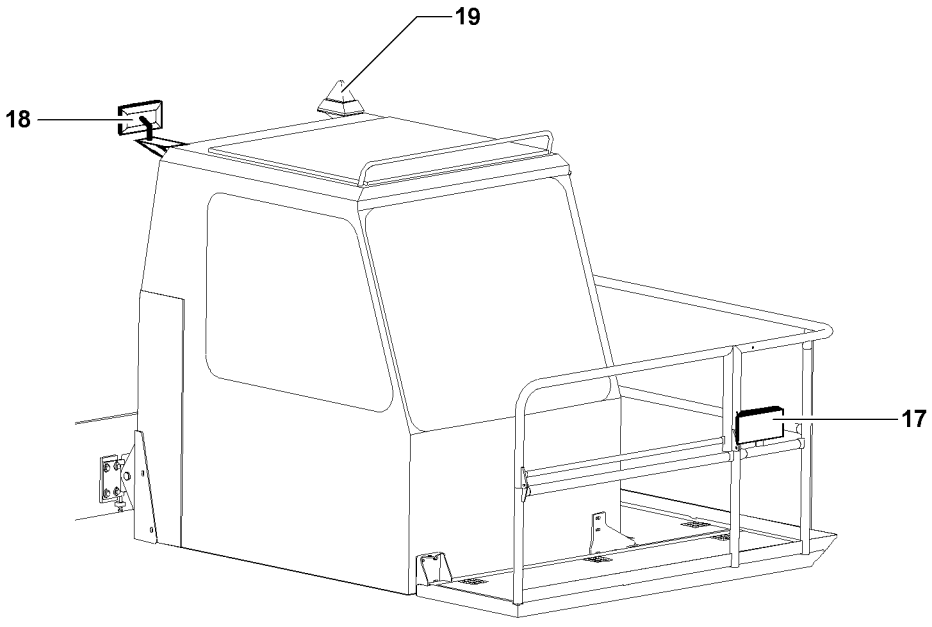
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4.00 Operation of crane superstructure

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1 Operating and control instruments

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

2 Equipment in the cab

2.1 Installations in the cab

17 Working floodlight pedestal
18 Working floodlight, rear
19 Flashing beacon
62 Reservoir for window cleaning fluid

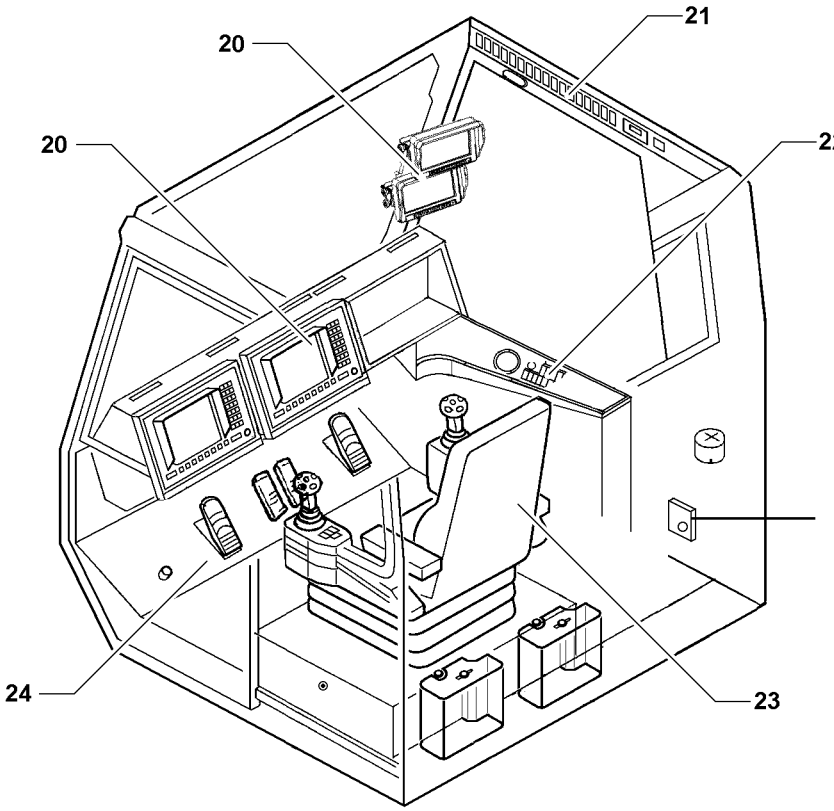
2.2 Emergency equipment

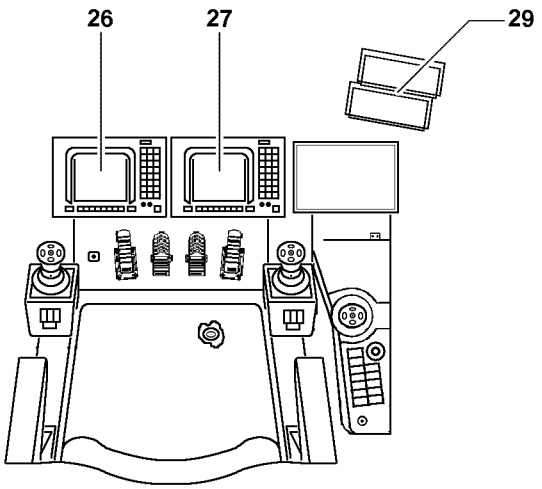
117 Palm button • EMERGENCY-OFF
141 Palm button • EMERGENCY-OFF

2.3 Interior equipment

1 Pressure gauge • Erection cylinder with A-frame
2 Thermostat • Auxiliary heater
54 Cab lighting

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3 Control units in the cab

The following control units are in the cab:

20 Monitors and displays
21 Roof console
22 Instrument panel
23 Control panel
24 Pedal carrier

3.1 Monitors and displays

3.1.1 LICCON computer system

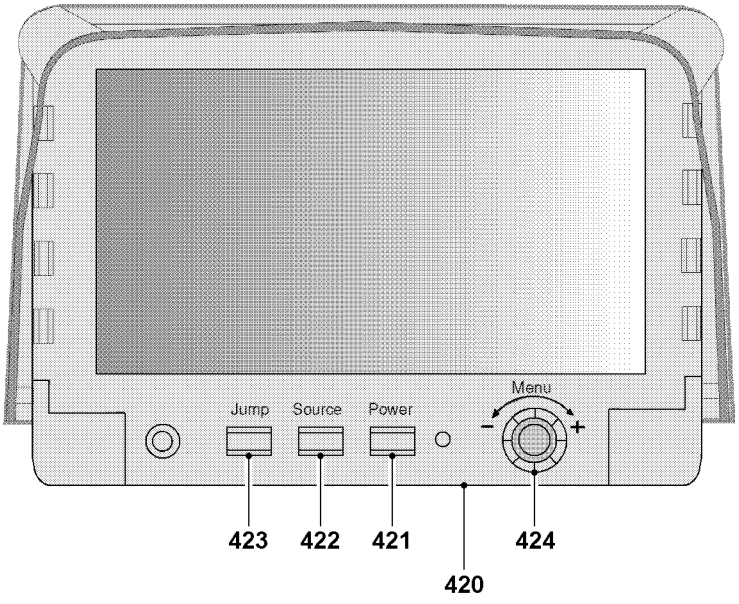
26 LICCON Monitor 1
27 LICCON Monitor 0

- User interface for operation with “derrick” boom
- User interface for entry of equipment configurations and for crane operation

3.1.2 Camera monitoring

29 Monitors camera monitor

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Monitor with rotary selection switch

420 TFT monitor

421 Key “Power”
- Monitor on / off

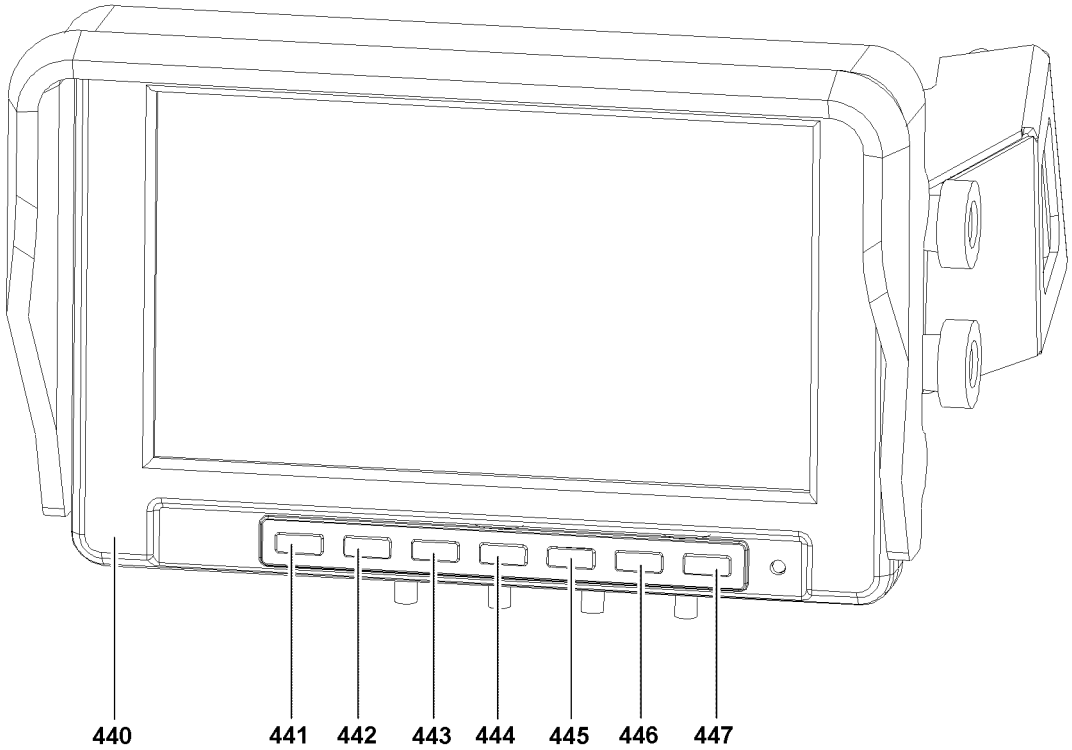
422 Button “Source”
- By pressing the “Source” key in turned on condition, the view on the monitor is changed.

423 Button “Jump”
- By pressing the “Jump” key, the preset camera inputs can be selected.

424 Selection knob / pressure switch
- The selection menu on the monitor is activated by pressing the selection knob / pressure switch.
  Note:
  If no adjustments are made after activation of selection on the monitor, then the selection turns off by itself after several seconds.
- When the selection menu is activated, a menu point can be selected by turning the selection knob / pressure switch. The selected menu point is highlighted in “yellow”. Press the selection knob / pressure switch to change the color from “yellow” to “red”. This selects the desired function.

Selection menu
- **Screen adjustments**
  Note:
  The following adjustments can be made in the menu “Screen adjustments”.
  - Brightness
  - Contrast
  - Color
  - Hue
  - Automatic brightness control
  - Direction display
  - Back
- **OSD settings**
  Note:
  The following adjustments can be made in the menu “OSD adjustments”.
  - Display
  - Distance display
  - Back
- **Camera adjustments**
  Note:
  The following adjustments can be made in the menu “Camera adjustments”.
  - Reflection
  - Change over
  - Video outlet
  - Back
- **Reset**
  - The display is reset to factory settings
- **Output**
  - OSD selection is ended

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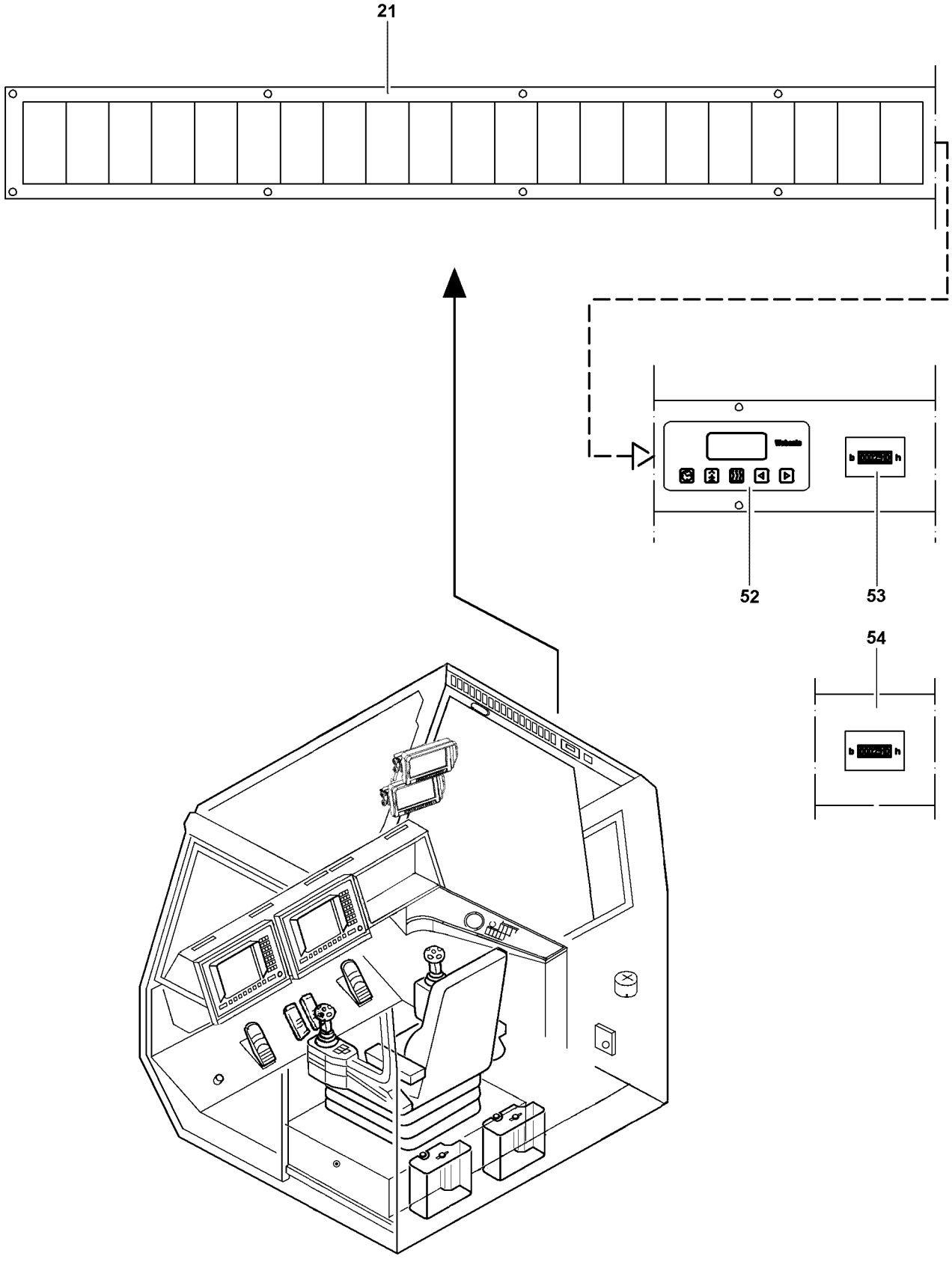
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Monitor with keypad

440	TFT monitor	
441	Button “MODE”	• By pressing the button “MODE” the system changes between the individual display modes: – Single display mode – Split display mode – Tripled or quadrupled display mode
442	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, 2/3, 3/4 and camera 4/1 – Tripled or quadrupled display mode: This button has no function.
443	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”.
444	“Minus” button	• By pressing the “Minus” button, the value of a setting is reduced.
445	“Plus” button	• By pressing the “Plus” button, the value of a setting is increased.
446	Button “Change between day / night”	• Press the button “Change over day / night” to match the brightness of the display to the time of day.
447	Key	• Monitor on / off

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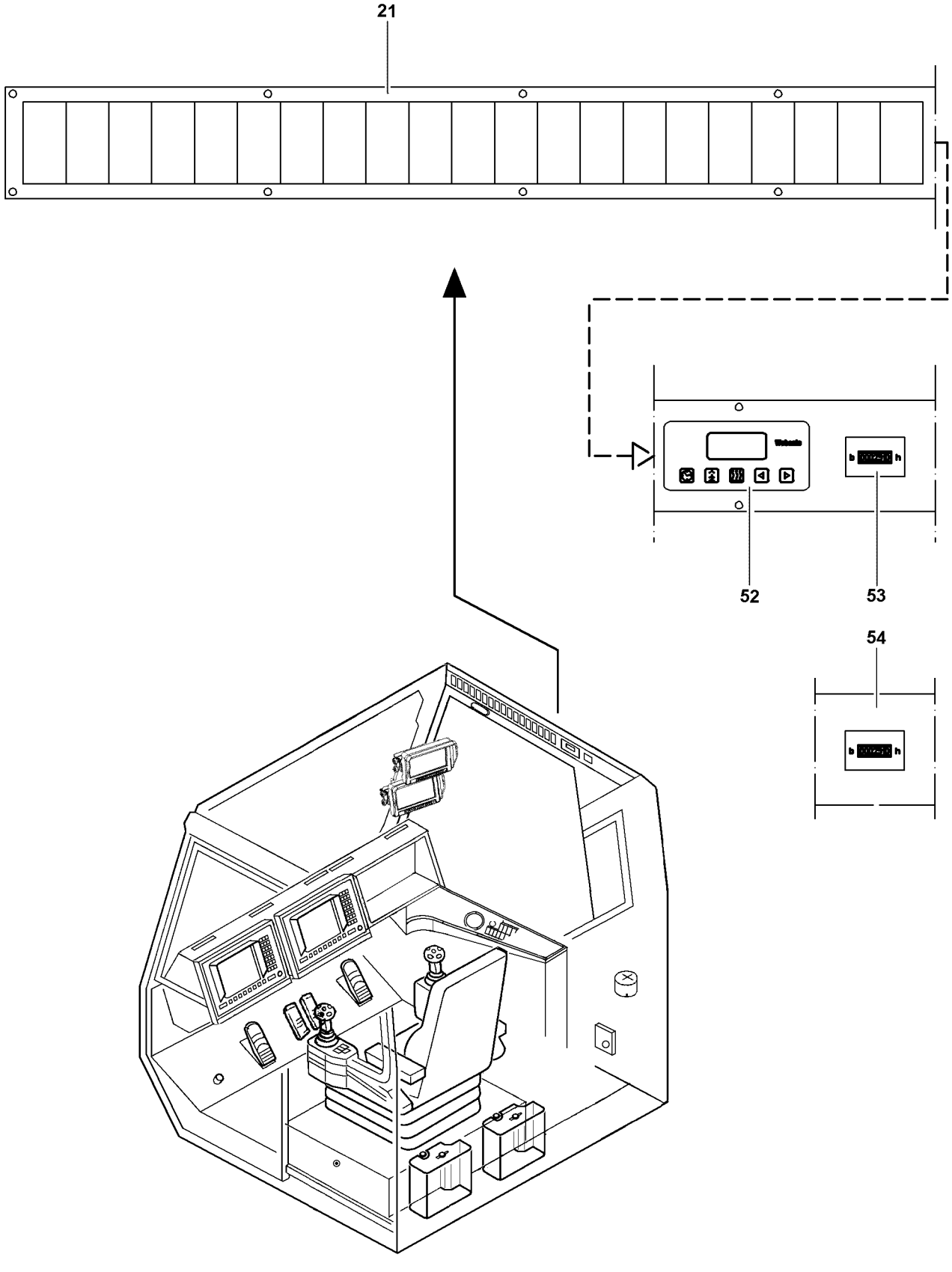
3.2 Roof console

Note

- ▶ The indicator lights as well as the operating buttons of the roof console are described in detail in the following sections!
- ▶ The number of operating buttons in the roof console depends on the respective crane equipment and can differ from crane to crane!

21 Roof console	• Housing with indicator lights and operating buttons
52 Operating section auxiliary heater	• Shown are: Time and day of the week Fault in auxiliary heating Air temperature Preselection of heating operation of auxiliary heater with three preselection times (every preselection time can be programmed in advance of up to seven days)
53 Operating hour meter	• Recording of crane operating hours
54 Operating hour meter	• Recording of crawler operating hours • **Note:** The hour meter for the crawlers is located in the switch cabinet!

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3.2.1 Indicator lights on the roof console

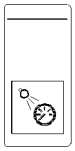
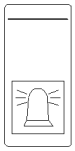
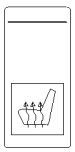
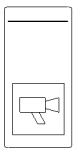
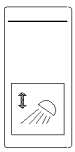
Position	Button	Light	Description
33	 	Red: blinks once after engine start	Control of function, operational readiness
		Green: blinks once after engine start	
	 	Red: Off	Pump off
		Green: lights up during the lubrication time	pump on, lubrication active
	 	Red: Blinking	Error monitoring time lubrication time
		Green: Blinking	
	  Central lubrication	Red: blinking fast	Error CPU / memory
		Green: Off	
49	 Auxiliary heater	Lights up	Auxiliary heater in operation
51	 Air conditioning system	Lights up	Air conditioning system is in operation

3.2.2 Operating buttons on the roof console

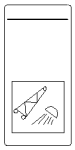
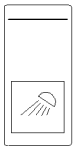
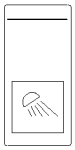
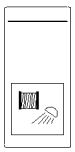
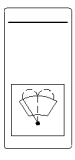
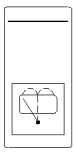
Note

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

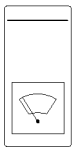
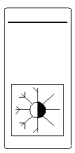
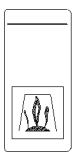
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Position	Switch	Function	Light	Description
34			**Note:**	The reading lights can be turned on and off with a separate switch on the reading light!
	Instrument panel illumination, reading light	On		by actuating the switch
		Off		by actuating the switch
35	 	Off		by actuating the switch
	Airplane warning	On		by actuating the switch
36		Off		by actuating the switch
	Seat heater	On		by actuating the switch
37				There are two different illumination areas: 0: Camera illumination “off” 1: Illumination winches “on” 2: Illumination of winches remains active and the illumination to the rear is “on” Every time the switch is actuated, the illumination stage changes. “Illumination to the rear” can only be turned on in connection with “illumination winches” .
	Camera illumination			
38				There are two swing directions: 0: Swing the floodlight “out” 1: Swing the floodlight “down” 2: Swing the floodlight “up”
	Swing the floodlight pivot section			

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Position	Switch	Function	Light	Description
				As long as the button is pressed, the floodlight swings.
39		Off		by actuating the switch
	Floodlight pivot section	On		by actuating the switch
41		Off		by actuating the switch
	Working floodlight pedestal cab	On		by actuating the switch
42		Off		by actuating the switch
	Working light roof cab rear	On		by actuating the switch
43		Off		by actuating the switch
	Mirror heater Floodlight turntable	On		by actuating the switch
46		On		Clean window: By pressing and holding the button “Front” or “Roof” . The windshield wipers are activated at the same time.
	Windshield washer system “Front”	**Note** :		After releasing the switch “Front” or “Roof” , three additional wipe movements are carried out before the wiper blades return to their original position!
44		Off		By releasing the button “Front” or “Roof”

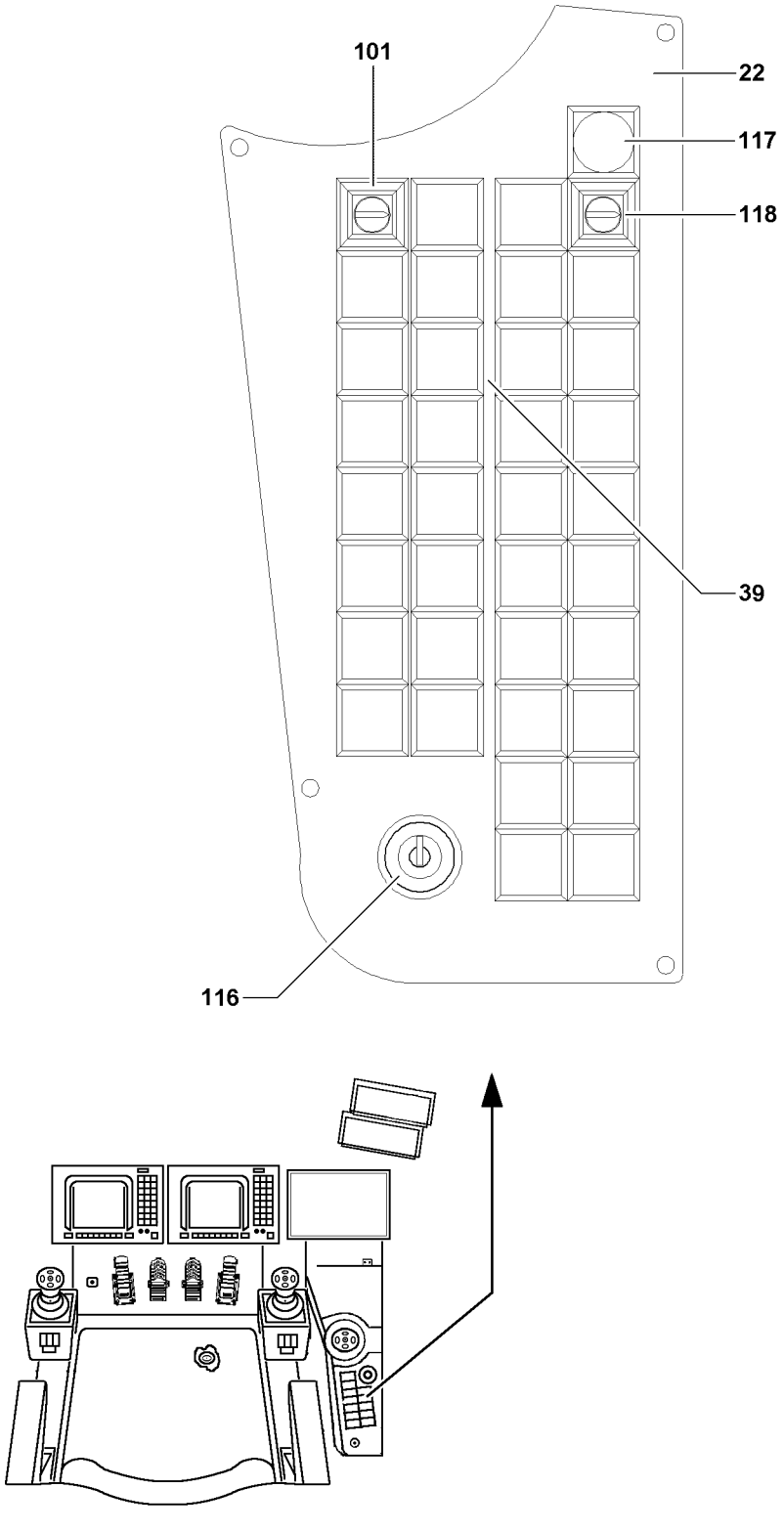
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Position	Switch	Function	Light	Description
	Windshield washer system “Roof”			
47 **45**	 Windshield wiper “Front”  Windshield wiper “Roof”			There are two different wipe stages: 0: Wiper “Off” 1: Wiper “On” : Intermittent operation 2: Continuous operation Every time the switch “Front” or “Roof” is actuated, the wipe stages change incrementally.
		On		by actuating the switch “Front” or “Roof”
		Off		by actuating the switch “Front” or “Roof”
48		Off		by actuating the switch
	Air conditioning system	On		by actuating the switch
55			**Note:**	If the timer is present, then this switch is eliminated!
	Auxiliary heater	Off		by actuating the switch
		On		by actuating the switch

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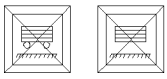
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3.3 Instrument panel

The instrument panel **22** consists of the following elements:

- **38** Micro module (Mouse)
- **39** Keypad
- **116** Ignition key switch
- **117** EMERGENCY OFF button
- • Operation LICCON job planner
- • Indicator lights and operating buttons

3.3.1 Indicator lights and operating buttons

Position	Button	Function	Light	Description
100	 *(BT) or (B)* Button with warning light “Derrick ballast lifted off”		***Note:***	*Derrick ballast: Ballast on ballast trailer (BT) or suspended ballast (B)!*
			Blinking	Briefly pressing the key button **101** activates the operating mode “Derrick ballast lifted off” (self retention). The derrick ballast icon on LICCON-Monitor 1 is represented suspended.
		Off	Off	Pressing the button momentarily deactivates the operating mode “Derrick ballast lifted off:” Ballast trailer symbol is shown on LICCON monitor 1 on the ground.
101	 Key button “Derrick ballast lifted off”		**DANGER!**	**The crane can topple over!** **If the derrick ballast lifts off the ground during towing, the turntable can turn to the side. Personnel can be severely injured or killed!** Activate **“Derrick ballast lifted off” after lift off of the ballast ballast! Carry out constant visual inspection! See chapter 5.11or 5.12 or 5.35 or 5.36 of the Crane operating instructions!**
102	 Button BT Manual steering adjustment to the left	On	Lights up	Operating mode manual steering adjustment: When pressing and holding the button, the ballast trailer wheels turn to the left to drive on tight construction sites.

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Position	Button	Function	Light	Description
103	 Button BT Manual steering adjustment to the right	On	Lights up	Operating mode manual steering adjustment: When pressing and holding the button, the ballast trailer wheels turn to the right to drive on tight construction sites.
104	 Button BT towing	On	Blinking	Pressing and holding the button sets the ballast trailer wheels in travel position
			Lights up	Ballast trailer wheels in travel position
106	 Button BT turning position	On	Blinking	Press and hold the button to turn the ballast trailer wheels in turning position
			Lights up	Ballast trailer wheels in turning position
107	 Button BT Parallel position	On	Blinking	Turn ballast trailer wheels into parallel position (dog walk)
			Lights up	Ballast trailer wheels in parallel position
108	 Button Block ballast cylinder **A**	On Off		Pressing and holding the button blocks cylinder A on the derrick ballast Releasing the button releases **cylinder A** on the derrick ballast
109	 Button Block ballast cylinder **B**	On Off		Pressing and holding the button blocks cylinder B on the derrick ballast Releasing the button releases **cylinder B** on the derrick ballast
110	 Button derrick ballast down	On Off		Pressing and holding the button lowers the derrick ballast Releasing the button interrupts the movement
111	 Button derrick ballast up	On Off		Pressing and holding the button lifts the derrick ballast Releasing the button interrupts the movement
112		On		Pressing and holding the button telescopes the derrick ballast out

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Position	Button	Function	Light	Description
	Button telescope derrick ballast in	Off		Releasing the button interrupts the movement
113	 Button telescope derrick ballast out	On Off		Pressing and holding the button telescopes the derrick ballast in Releasing the button interrupts the movement
119	 Indicator light radio remote control		Lights up	Shows that the radio remote control is activated
			Off	Shows that the radio remote control is deactivated
118	 Key button radio remote control pinning	Off		Pressing the key button deactivates the radio remote control for pinning: Position 0 (horizontal)
		On		Pressing the key button activates the radio remote control for pinning: Position 1 (vertical)
120	 Button spool the assembly winch up	On Off		Pressing and holding the button spools the assembly winch up Releasing the button interrupts the movement
121	 Button spool assembly winch out	On Off		Pressing and holding the button spools the assembly winch out Releasing the button interrupts the movement
123	 Switch pressure supply auxiliary user		**Note:**	For all functions, which are actuated with the hydraulic manual control levers, the pressure supply must be changed over.
		On	Lights up	Pressing the button establishes the pressure supply to the auxiliary users: Erection cylinder SA-frame, support cylinder assembly
		Off	Off	Pressing the button interrupts the pressure supply to the auxiliary users
124	 Button BT support front down	On Off		By pressing and holding the button the support cylinder ballast trailer front moves out Releasing the button interrupts the movement
125		On		By pressing and holding the button the support cylinder ballast trailer front moves in

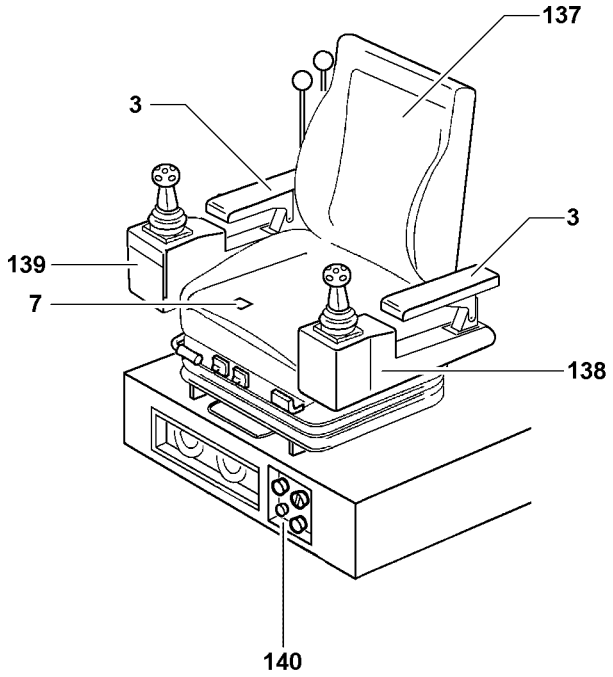
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Position	Button	Function	Light	Description
	Button BT support front up	Off		Releasing the button interrupts the movement
126	 Button BT support rear down	On Off		By pressing and holding the button the support cylinder ballast trailer rear moves out Releasing the button interrupts the movement
127	 Button BT support rear up			By pressing and holding the button the support cylinder ballast trailer rear moves in
128	 Warning light support moved in		Lights up	Shows when the support ballast trailer is moved in
130	 Switch Test system BT		**Note:**	Can only be turned on with “engine off” !
		On	Lights up	Actuating the switch switches from LICCON monitor 1 to Test system control ballast trailer
131	 Warning light		Lights up	Control ballast trailer does not run **or** One of the pressure sensors or length sensor for the ballast trailer is defective or missing, see chapter 5.11 Ballast trailer.
134	 Indicator light Engine preheating		Lights up	Engine is preheated
			Blinking	Engine is preheated and can be started
135	 Switch Fuel preheating	On	Lights up	Actuating the switch activates fuel preheating
		Off	Off	Actuating the switch deactivates fuel preheating
135				Starting aid for engine: Additional pressurized air support when starting in high altitudes

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Position	Button	Function	Light	Description
	Button Starting aid engine			
136	 Charge indicator light		Lights up	When the engine is running: Erroneous function charge regulator Before / at engine start: Voltage is present, engine can be started

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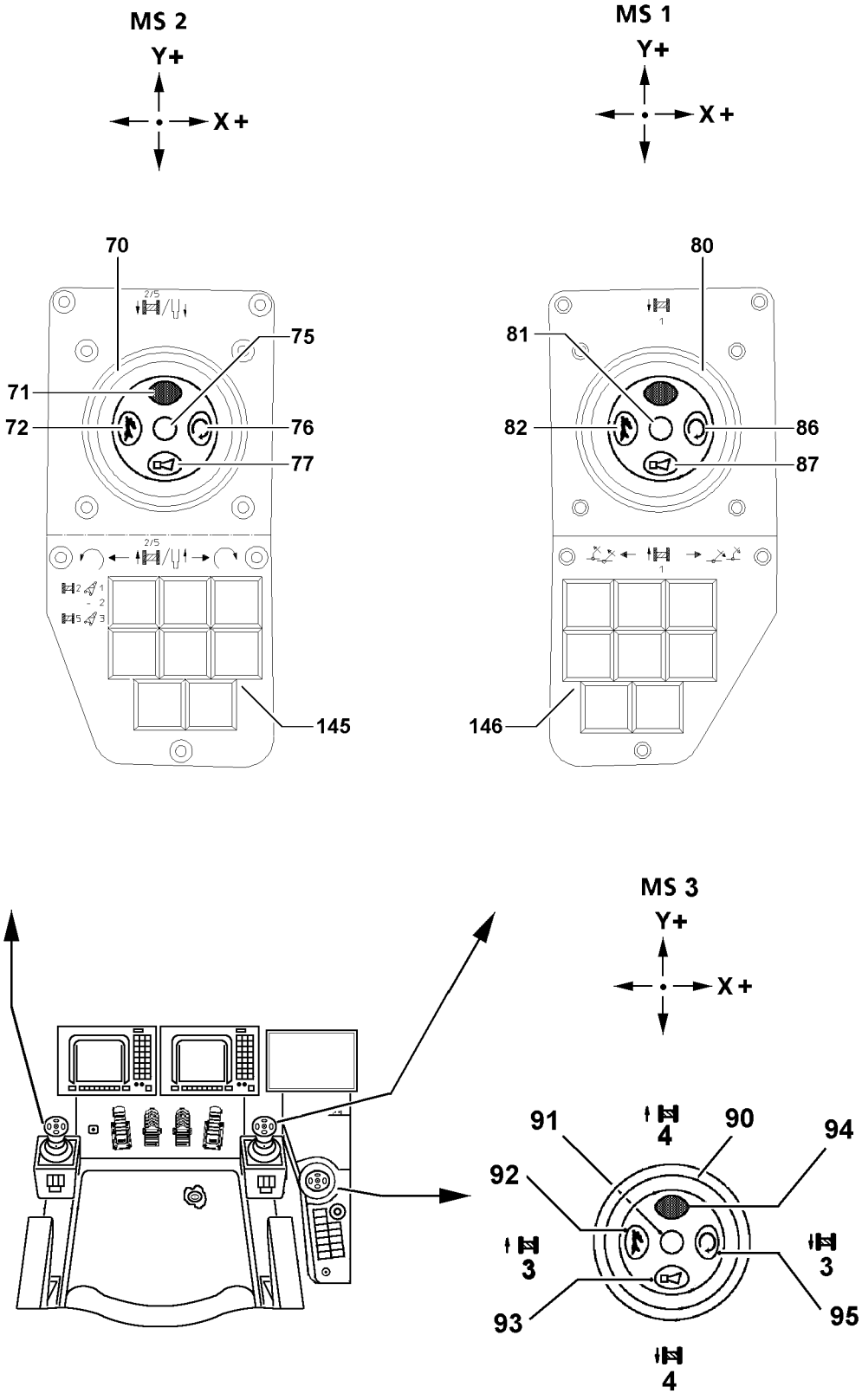
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3.4 Operating elements on control platform

The control platform consists of the following elements:

3 Armrests
7 Seat contact switch
137 Crane operator's seat
138 Control console, left
139 Control console, right
140 Air conditioning system / cab heater

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3.4.1 Operating elements on control consoles

Control console, left

Master switch assignment MS 2:

70 Master switch left (MS 2)
- **Note:**
  For assignment of master switch to operating modes, see chart, chapter 4.05.

71 Button
- Bypassing the seat contact switch. **Or** if the seat contact switch is actuated: Adding the vibration sensor **75**.

72 Button
- "Power Plus" addition, crane operation

75 Vibration sensor
- Turn sensor, depends on operating mode: Slewing gear and winch 2, winch 5, winch 6

76 Button
- Engine RPM lock
  Note:
  By activating the button **76** the engine RPM is locked in the current state.

77 Button
- Horn

Instruments **145** control console:

Position	Button	Function	Light	Description
63	 Switch Crawler Rapid gear	On	Lights up	Actuating the switch activates the operating mode "Rapid gear"
		Off	Off	by actuating the switch
64	 Switch parking brake slewing gear	On	Lights up	by actuating the switch
		Off	Off	by actuating the switch
65	 Switch Crawler operation		**Note:**	After crawler operation, you must switch back to crane operation!
			DANGER!	Damage of crane support! **If the crawler travel gear is turned on when using the crane support, the support will be severely damaged when actuating the pedals for the crawler travel gears! The crane can topple over! Personnel can be severely injured or killed!** When working with crane support: Turn crawler operation off!
		On	Lights up	Actuating the switch activates the operating mode "Crawler operation"
		Off	Off	by actuating the switch

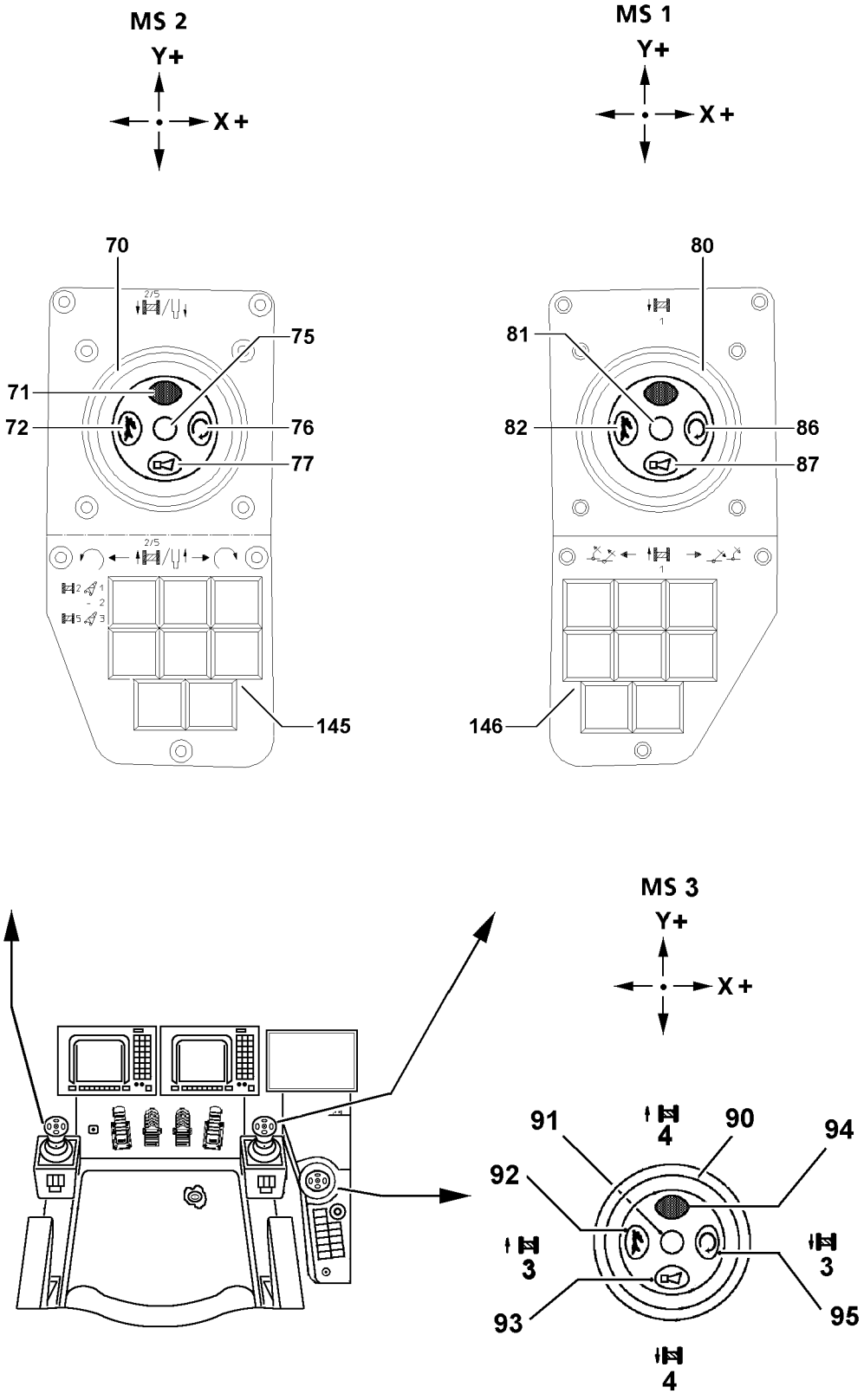
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Position	Button	Function	Light	Description
66		On	Lights up	Actuating the switch activates the operating mode “Parallel driving” : The left and right tracks move at the same speed
	Switch Crawler parallel travel	Off	Off	by actuating the switch
73		Position 1		Operating mode “SWF” : Winch 2 is reeved in on the boom nose **or** winch 2 is reeved on the pulley head of the F-lattice jib
	Switch Winch usage	Position 2		Operating mode “SWF” : Winch 1 on main boom **or** winch 1 is reeved on the pulley head of the F-lattice jib
		Position 3		Winch 5 is reeved on the boom nose
74			**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!**
	Button Bypass of over-load safety	On		Pressing the button releases luffing up at overload

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Control console, right

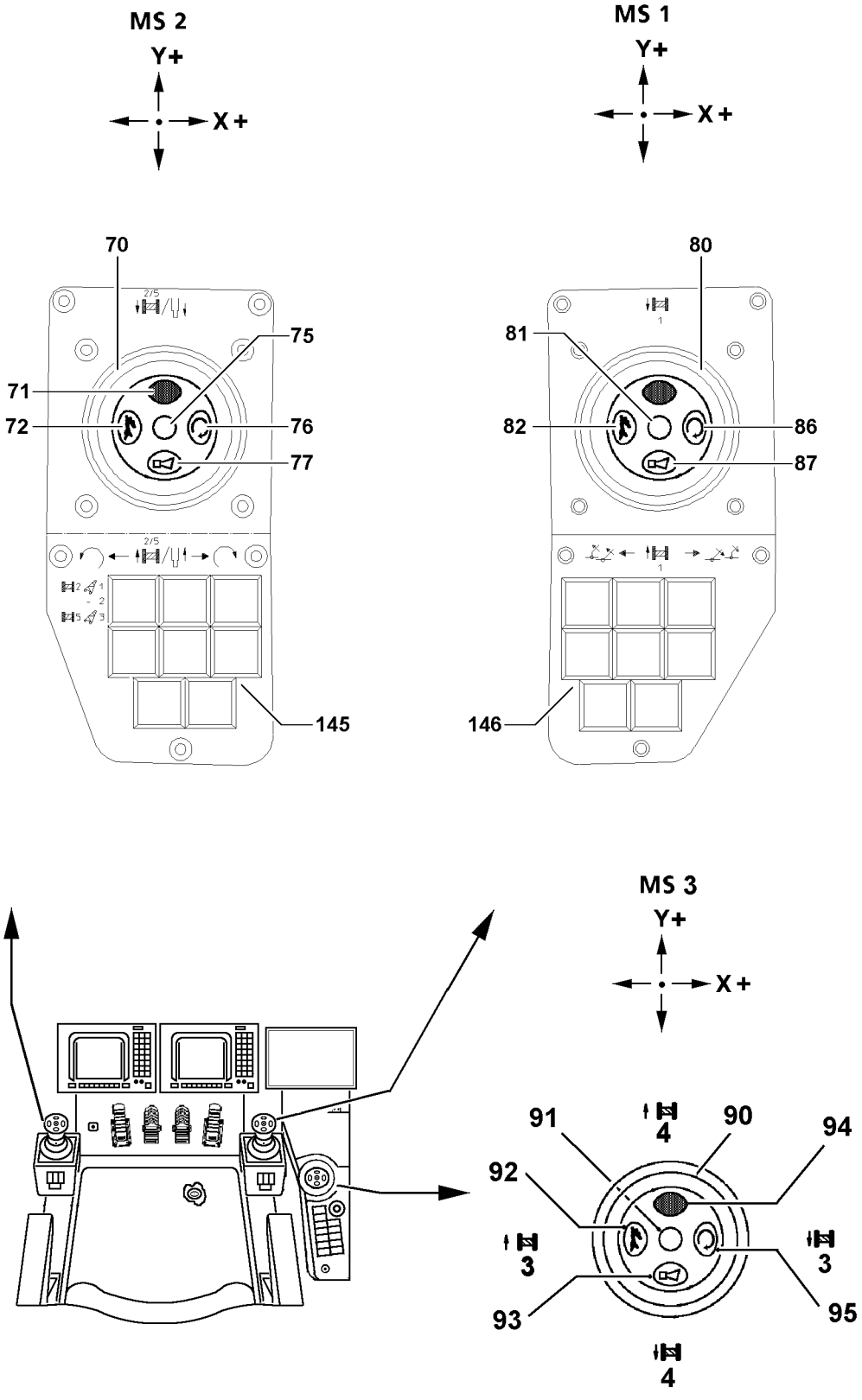
Master switch assignment MS 1:

80 Master switch - right (MS 1)	• **Note:** For assignment of master switch to operating modes, see chart, chapter 4.05.
86 Button	• Bypassing the seat contact switch. **Or** if the seat contact switch is actuated: Adding the vibration sensor **81**.
81 Vibration sensor	• Turn sensor: Slewing gear and winch 3, winch 4, winch 5
82 Button	• Power Plus addition, crane operation
83 Button	• Horn
87 Button	• Engine RPM lock **Note:** By activating the button **87** the engine RPM is locked in the current state.

Instruments **146** control console:

Position	Button	Function	Light	Description
78		Off		by releasing the button
	Button Tilt cab up	On		Pressing and holding the button tilts the cab up
79		Off		by releasing the button
	Button Tilt cab down	On		By pressing the button the cab tilts down
82		Off		by releasing the button
	Button Swing the cab in	On		Pressing and holding the button swings the cab into transport position
81		Off		by releasing the button
	Button Swing the cab out	On		Pressing the button swings the cab into working position
86		On		Pressing the button stops the engine
	Button Engine STOP			

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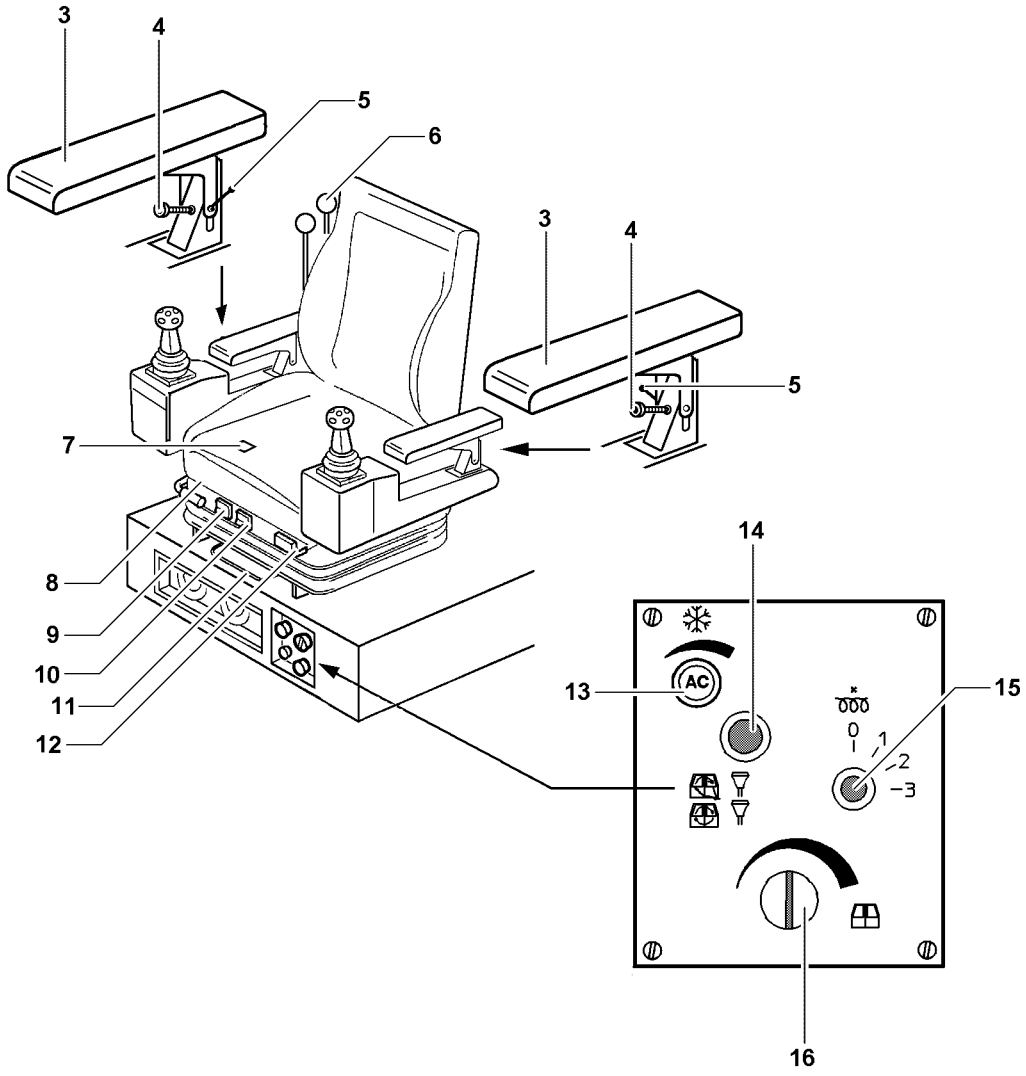
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3.4.2 Operating elements Master switch (MS) 3

90 Master switch (MS 3)	• **Note:** For assignment of master switch to operating modes, see chart, chapter 4.05.
91 Vibration sensor	• Turn sensor and winches
92 Button	• Power Plus addition, crane operation
93 Button	• Horn
94 Button	• Bypassing the seat contact switch. **Or** if the seat contact switch is actuated: Adding the vibration sensor **91**.
95 Button	• Engine RPM lock **Note:** By activating the button **95** the engine RPM is locked in the current state.

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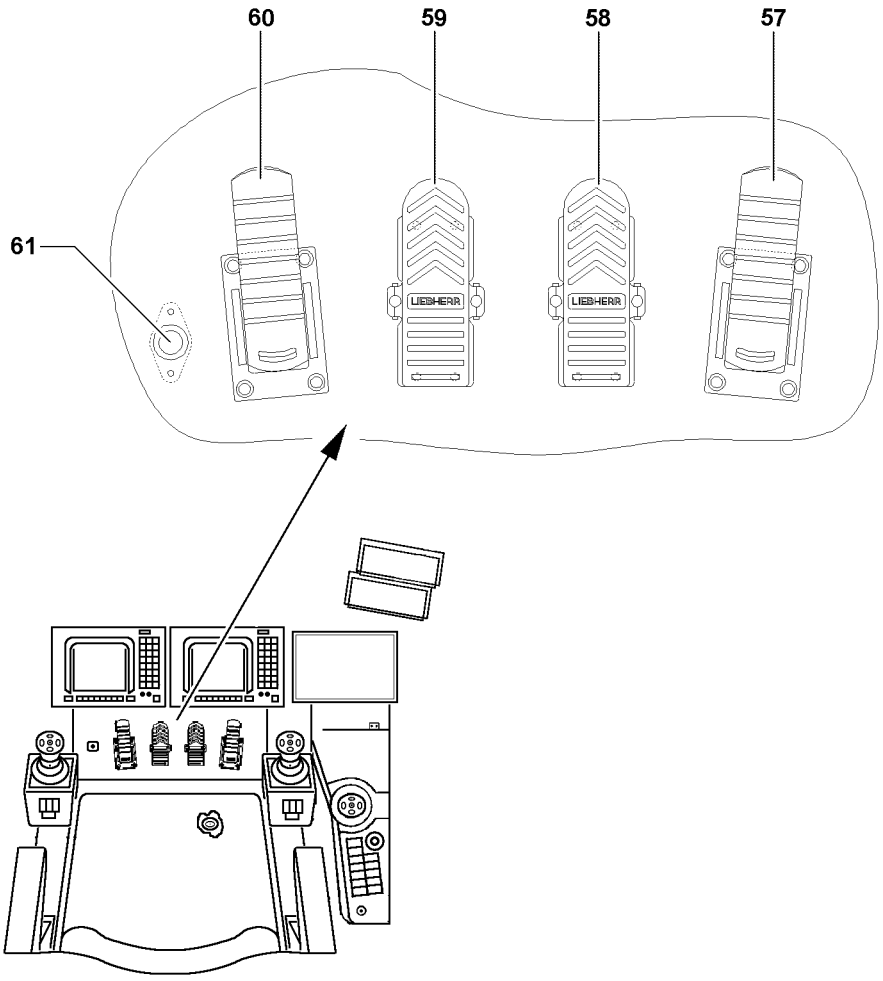
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3.4.3 Operating elements crane operator's seat

3	Armrest	
4	Set screw	• Adjustment of armrest incline
5	Locking lever	• Armrest height adjustment
6	Manual control lever	• Control Crawler travel gears left and right **Note:** The crawler travel gears can also be controlled via the manual control levers. To do so, they must be inserted into the foot rocker **58** or foot rocker **59**.
7	Seat contact switch	
8	Manual lever	• Adjustment of seat cushion angle
9	Button	• Lumbar support in lower part of backrest
10	Button	• Lumbar support in upper part of backrest
11	Manual lever	• Lock for horizontal seat adjustment
12	Manual lever	• Lock for backrest incline
13	Regulator knob	• Air conditioning system
14	Switch	• Switching between fresh air / recirculated air, air quantity
15	Rotary switch	• Blower 3-stage
16	Regulator knob	• Temperature Cab heater

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3.4.4 Pedal carrier

57	Pedal	• Engine regulation
58	Master switch foot rocker (MS 5)	• Move the crawler forward or backward on the right hand side
59	Master switch foot rocker (MS 4)	• Move the crawler forward or backward on the left hand side
60	Pedal	• Slewing gear brake
61	Foot button	• Coasting slewing gear

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1 LICCON computer system

Note
▶ See Crane operating instructions, part 2, chapter 4.02!

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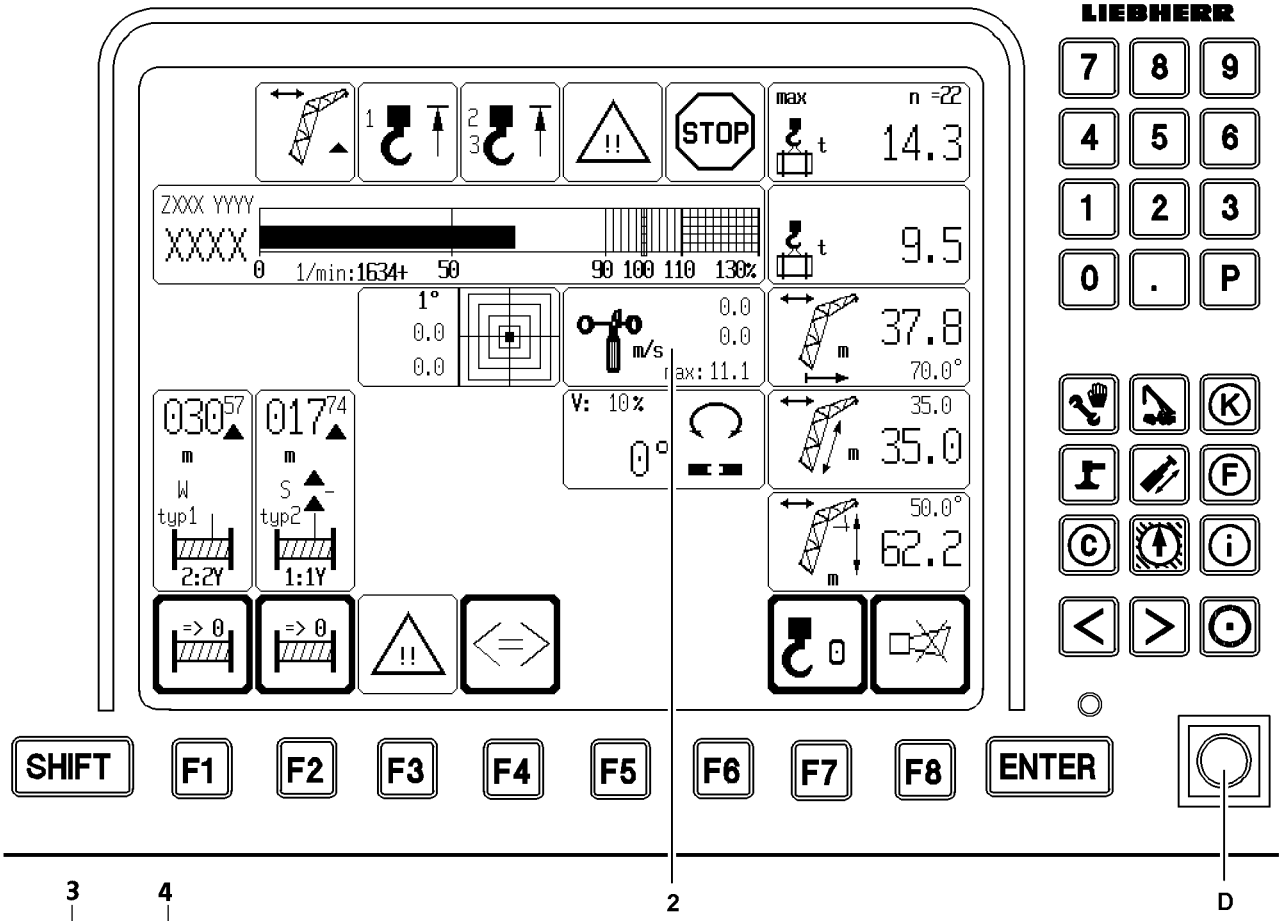
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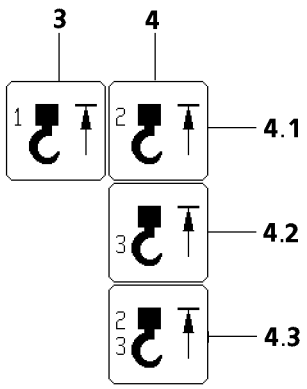
1 Start up and shut down of crane

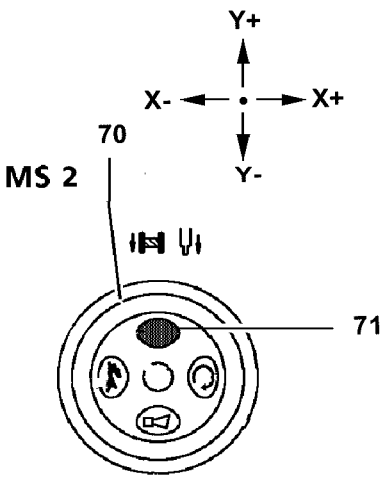
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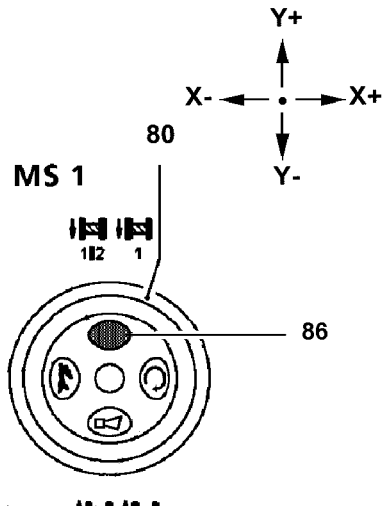
▶ See Crane operating instructions, part 2, chapter 4.03!

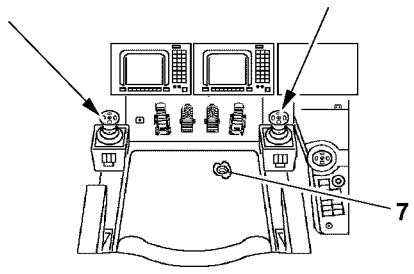
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1 Prerequisites for crane operation

1.1 Checking the safety devices

The crane operator is obligated before every crane operation to ensure that the safety devices are functioning.

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, see 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!
- ▶ Align the crane horizontally!
- ▶ Pay attention to 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 crane operating screen both graphically as well as numerically.

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 moment limiter **LMB**) there are a number of application programs that can be used for controlling and monitoring the crane movements, see Crane operating instructions, 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 moment increasing** crane movements **off** if the permissible load moment is being exceeded. Only load moment decreasing movements can then be carried out.

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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 configuration status change and/or boom configuration, the overload protection device must be reset to the corresponding configuration status and/or boom configuration!
▶ The crane operator must meet his duty of caution and attention, despite the overload protection!

2.1 Failure of the overload protection

DANGER
Danger of accident due to error on the LICCON computer system!
If the LICCON computer system is no longer functioning properly because of one or more errors, then the crane can topple over!
Personnel can be severely injured or killed!
▶ It is imperative that the next **Liebherr Service location** or **Liebherr-Werk Ehingen GmbH** is contacted immediately!

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2.2 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.

WARNING
Failure of system components!
If system components fail, such as the LICCON monitor, then safe crane operation is no longer ensured!
If the crane is operated anyway, then the crane operator bears the sole and full responsibility!
The crane can be damaged or topple over!
Personnel can be severely injured or killed!

▶ Replace defective system components immediately, in case of double, contact **Liebherr-Werk Ehingen GmbH**!
▶ In case of a defective LICCON monitor: Replace the LICCON monitor with a functioning substitute monitor!
▶ In case of a defective power supply: Replace the power supply unit with a functioning substitute power supply unit!
▶ In case of a defective LICCON monitor: Replace the LICCON monitor with a functioning substitute monitor!
▶ If system components were replaced: Check the system for functionality!

2.3 Ending a load lift

WARNING
Risk of accident due to overloading the crane!
▶ The weight of the load, including hook and attachment equipment must be known!

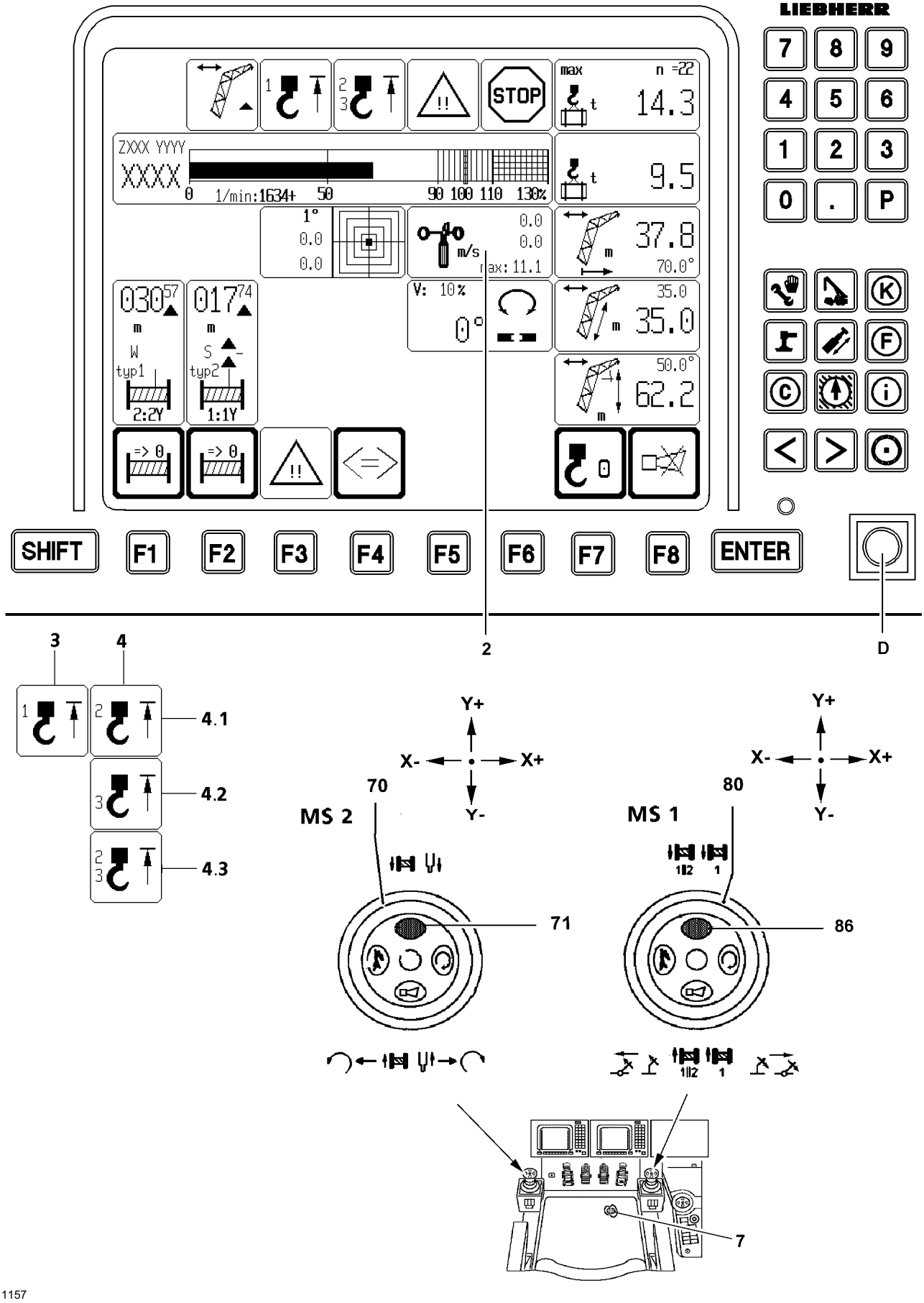
If the problem cannot be remedied using these measures, we recommend:

– Before continuing the load hoist, contact the nearest **LIEBHERR Service location** or **Liebherr-Werk Ehingen GmbH**.

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 Safety devices on the crane

3.1 Wind warning device

The wind warning appears in the crane operating screen 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. There is **no shut off** of crane movements.

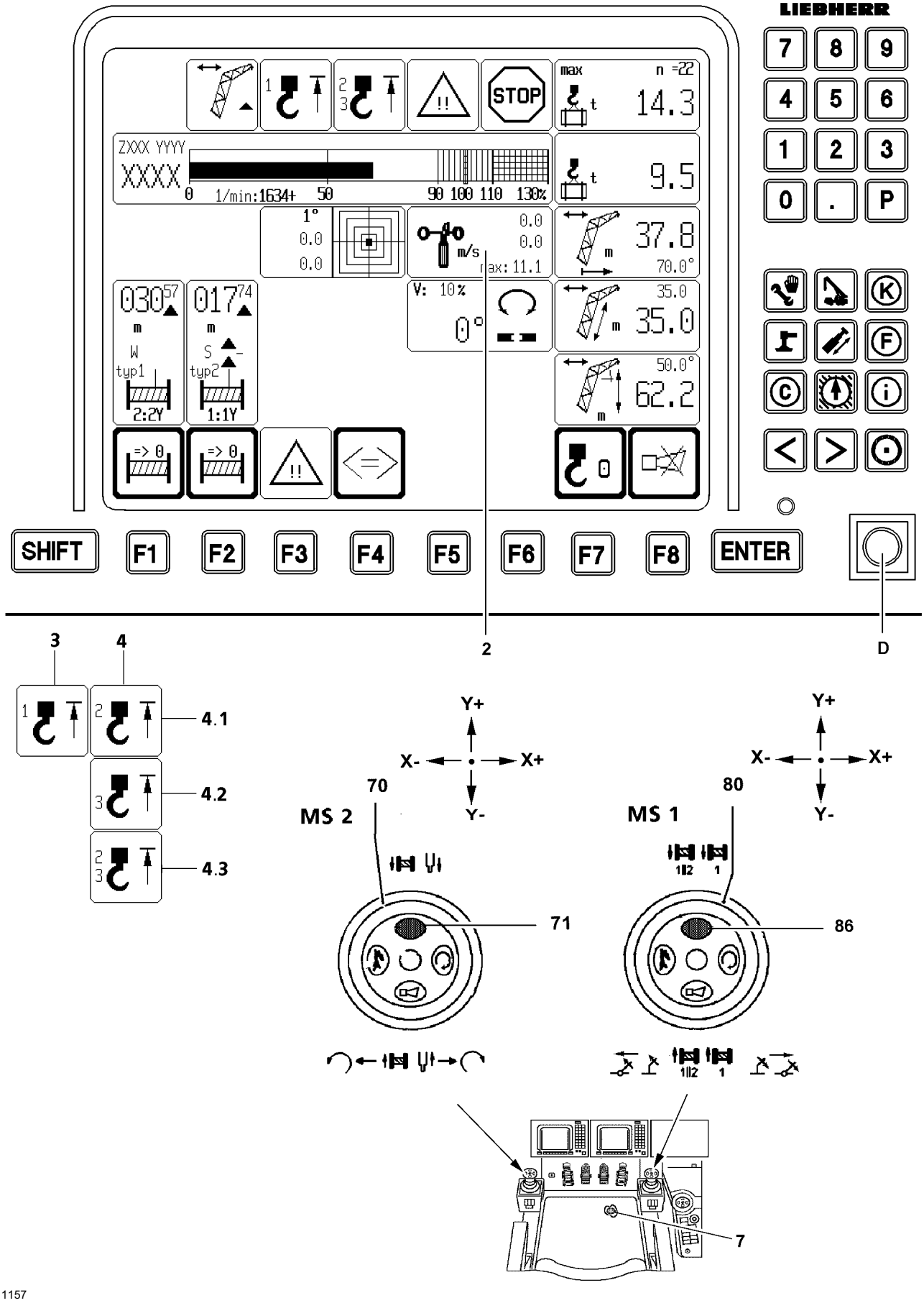
WARNING
Danger of accidents if the maximum permissible wind speed is exceeded!
There is **no** automatic shut off of crane movements!
- ▶ Stop crane operation and place down the boom!

3.2 Hoist limit switch “Hoist top”

The hoist limit switch is intended to prevent the hook block from colliding with the boom head.
Before every crane application, the function of the hoist limit switch must be checked by running against the hoist limit switch weight with the hook block.
When the hoist limit switch is actuated, the icon **3** appears in the crane operating screen. The crane movements “lift and luff down the boom” are turned off.

WARNING
Risk of accident due to crane toppling over or destruction of the crane!
- ▶ During crane operation, bypass the hoist limit switch only with the set up key **D** if a guide can 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 movement with maximum caution and minimum speed!
- ▶ In emergency situations, only an authorized person may bypass the hoist limit switch!
- ▶ Do **not** use the hoist limit switch as an operational shut off function!
- ▶ Always use the full length of the hoist limit switch weight chain!
- ▶ Install the hoist limit switch weight according to the specifications in the Crane operating instructions, chapter 4.06!

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3.3 Limit switch winch spooled out

The cam limit switches in winches 1, 2, 3 and 5 have been adjusted at the factory. If used properly, the cam limit switches will not need readjustment.

DANGER
Risk of accident due to falling load!
Due to a defective cam limit switch, the rope attachment can be ripped out, causing the load to drop!
- ▶ The cam limit switch must turn off the spool out movement of the winch as soon as the last 3 rope coils are reached!

DANGER
Risk of accident due to falling load!
If the following conditions are not observed, the cam limit switch does not turn off when the last 3 minimum rope coils are reached and the load can fall down!
Personnel can be killed or severely injured!
The cam limit switch must be readjusted!
- ▶ **Do not** pull the end of rope underneath the winch by spooling up the rope winch!
- ▶ Do **not** pull the rope from the “stationary” winch!
- ▶ The cam limit switch must be readjusted, if it is determined during operation or when changing the rope that the “spool out” winch movement is not deactivated when the minimum rope coils are reached!

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!
- ▶ Check the shut off without a load on the hook!

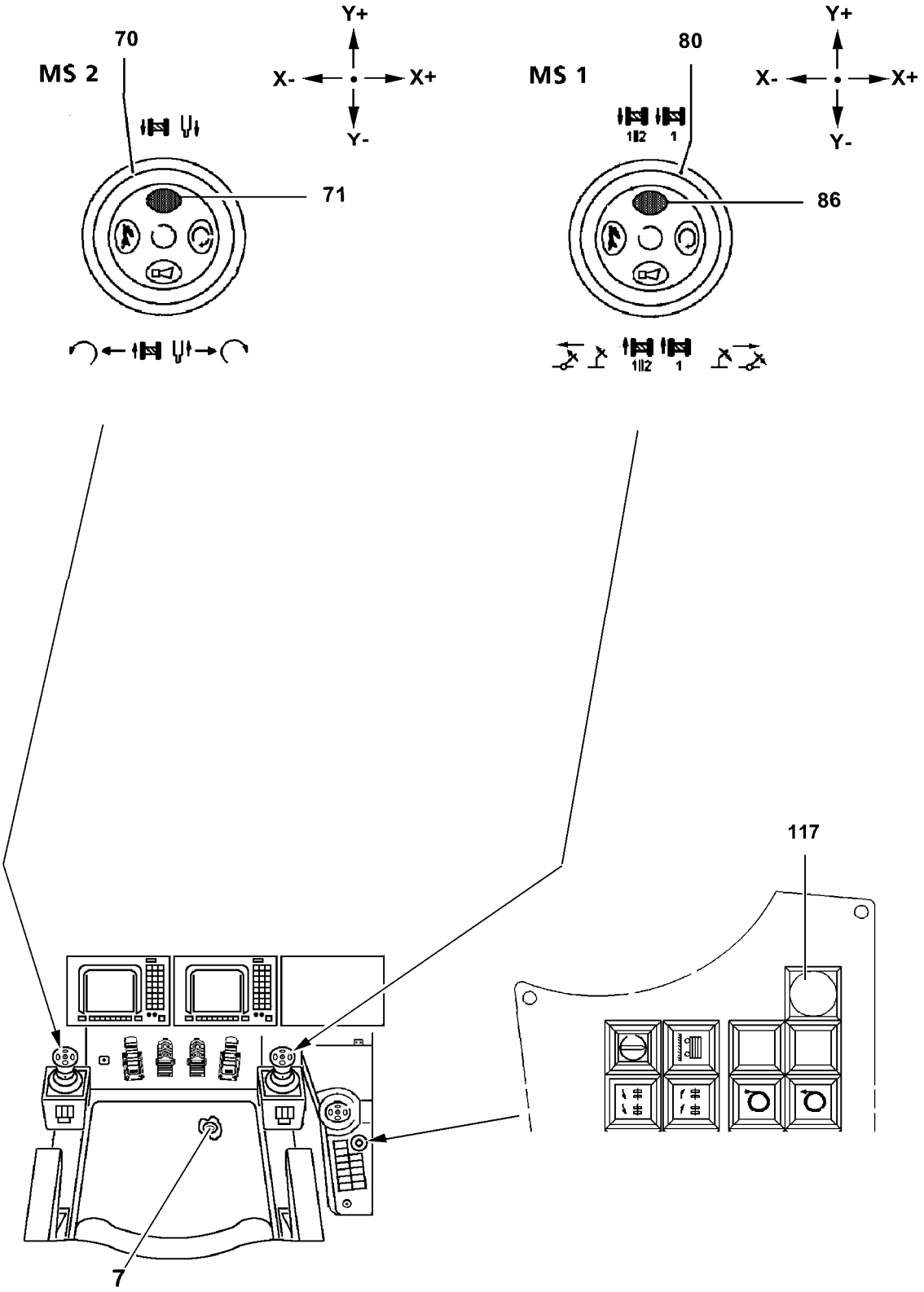
If it is found during operation or when changing a rope that there is no shut off at the minimum rope coil:
- ▶ Have the winch turn sensor readjusted by **Liebherr Service**!

3.3.1 Checking the shut off of minimum rope coils

Spool the winch out and check the shut off point by triggering it carefully.
Slowly spool out winch 1, winch 2, winch 3, and winch 5 until the shut off at 3 minimum rope coils.
Check the shut off.

Note
- ▶ If the spool out crane movement does **not** turn off when the minimum rope coils are reached, have the cam limit switch readjusted by **Liebherr Service**!

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4 Safety systems

4.1 EMERGENCY OFF button

When pressing the EMERGENCY OFF button **117**, the engine and the electric crane control are turned off. Every carried out movement can be stopped immediately.
After pressing the EMERGENCY OFF button **117**, 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 button, loads can start to swing and fall down!
Personnel can be severely injured or killed!
- ▶ Operational use of the EMERGENCY OFF button **117** is prohibited!
- ▶ Do not press the EMERGENCY OFF button **117** at maximum speed of a crane movement.
- ▶ Only use the EMERGENCY OFF button **117** in clear emergency situations!

4.2 Control release

The seat contact button **7** shuts down the crane control as soon as the crane operator gets up from the seat.
This prevents unintended crane movements by accidentally touching the master switch when getting in or out of the cab.
The button **71** and button **86** bypass the seat contact button **7** if it becomes necessary for the operator to work standing up.

4.3 Hydraulic safety valves

A distinction is made between two types:
- – Pressure limitation valves against pipe and hose breaks
- – Shut off valves in the hydraulic cylinders

4.3.1 Pressure monitoring in the relapse cylinders

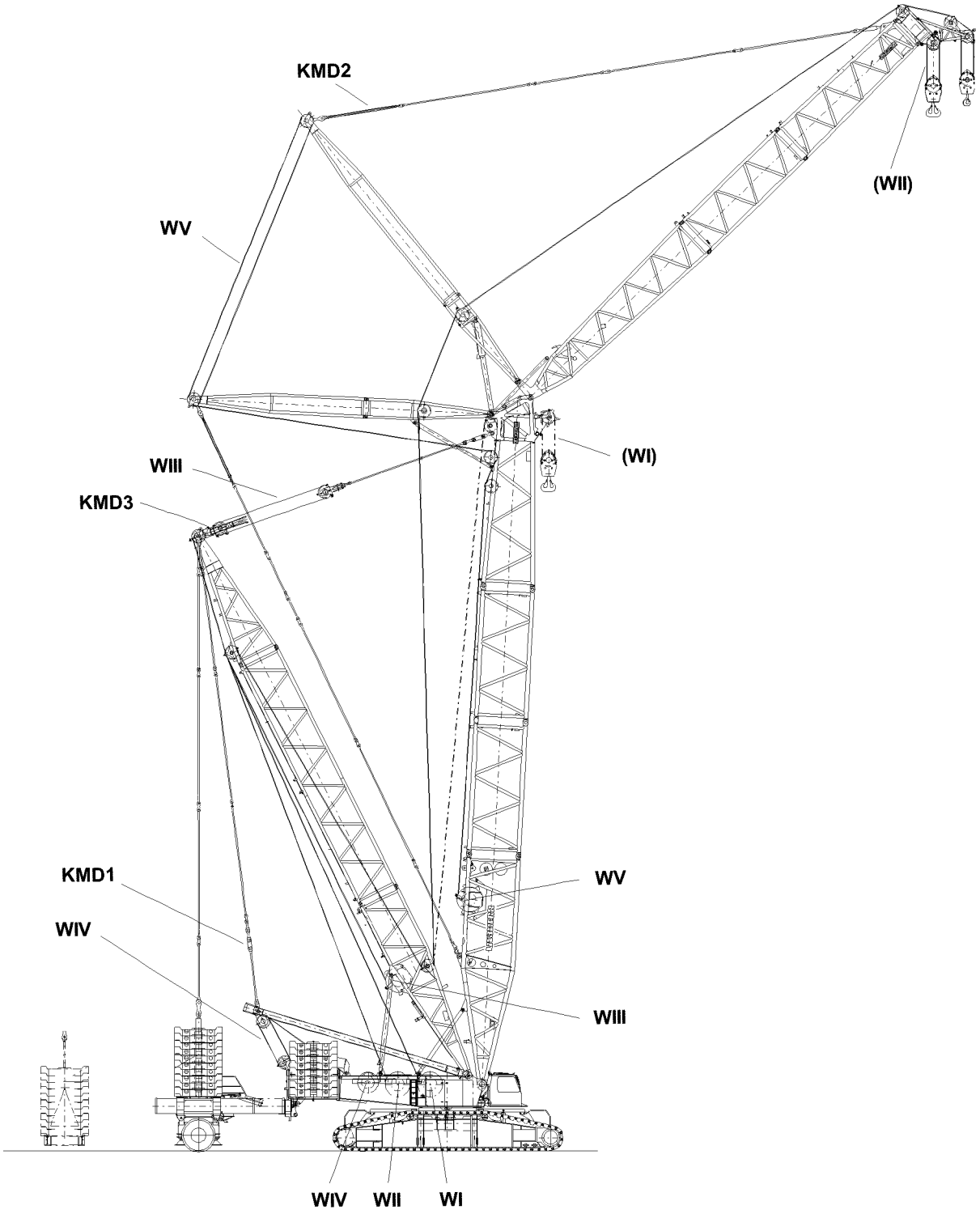
Pressure sensors are installed in the hydraulic cylinders. The pressure measured with the pressure sensor is shown on the LICCON monitor, see Crane operating instructions, chapter 4.02.

WARNING
Risk of accident due to crane toppling over or destruction of the crane!
If the pressure drops, the relapse cylinder can no longer stabilize the boom!
The crane can topple over or be destroyed!
Personnel can be severely injured or killed!
- ▶ During crane operation: Constantly monitor the pressure in the relapse cylinders!

4.3.2 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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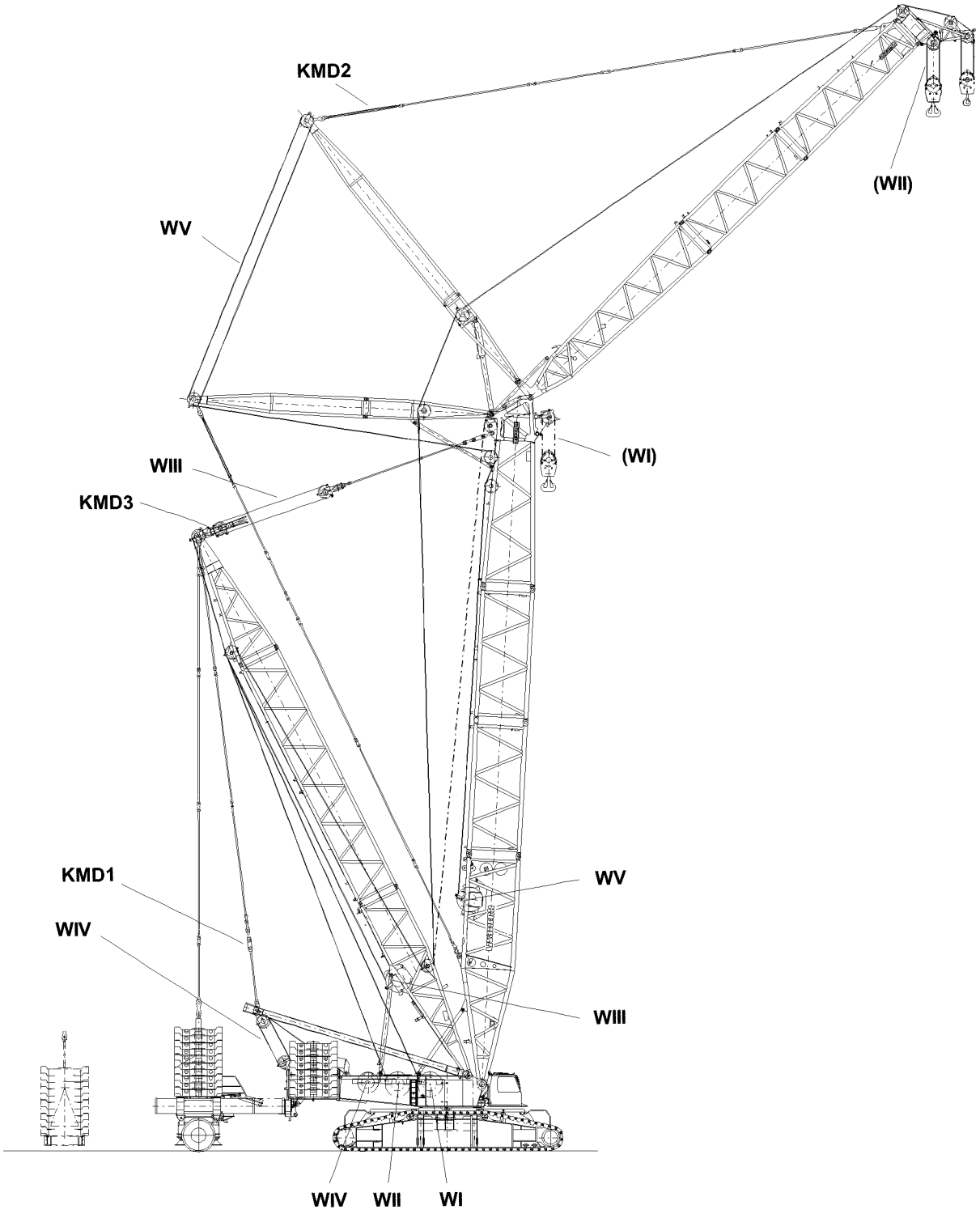
4.4 Limit switch

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	On derrick relapse cylinder
SA-frame 20 ° to the front and rear	On SA-frame

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4.5 Angle sensors

Component	Angle sensor (WG) Position
Main boom	Pivot section
Main boom	End section
Lattice jib	Pivot section
Lattice jib	End section
Derrick	Two (WG) on pivot section

Note
▶ Refer to the electrical schematic!

4.6 Test brackets (KMD=force test box)

The test brackets measure the force in the guying, which results from the load and the boom momentum.
The test brackets are located:
– **KMD 1**, in the boom guying, SA-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

5 Bypassing / exceeding safety devices

Note
▶ For an exact description about the bypass / exceedance of safety devices, see Crane operating instructions, chapter 4.20!

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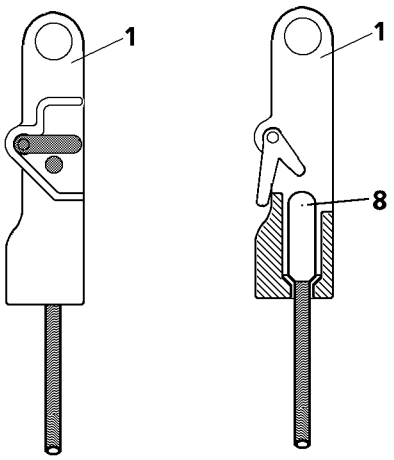
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1 Crane operation

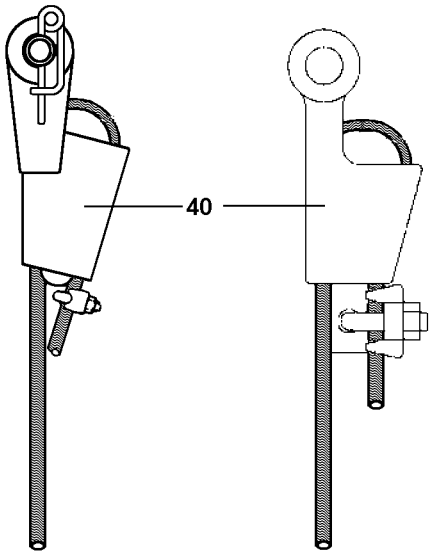
Note
▶ See Crane operating instructions, part 2, chapter 4.05!

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1 Wire ropes and rope end connections

1.1 Wire ropes

Please check if a **non-rotating** or a **rotation-resistant** rope is required for the application. The type of rope that is selected then determines the required type of rope end connections, see Crane operating instructions, chapter 8.04.

Note

▶ The correct choice and use of wire rope and rope end connections are decisive preconditions for proper and accident-free crane operation!

DANGER

Danger of serious personnel injury and equipment damage!

▶ **Never** use rotation-resistant ropes with a rotating rope end connection!

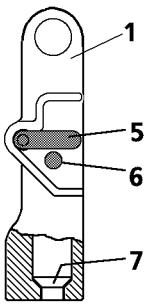
▶ **Never** install a twist compensator / swivel!

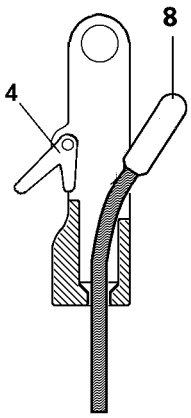
1.2 Rope end connections

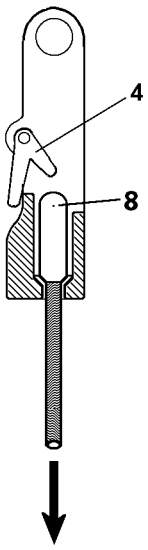
Rope end connections are grouped into:

– Rope end connections with locking clamp **8**.
  For that, use a rope lock **1**, see illustration **1**.
– Rope end connections without locking clamp.
  For that, use a wedge lock **40**, see illustration **2**.

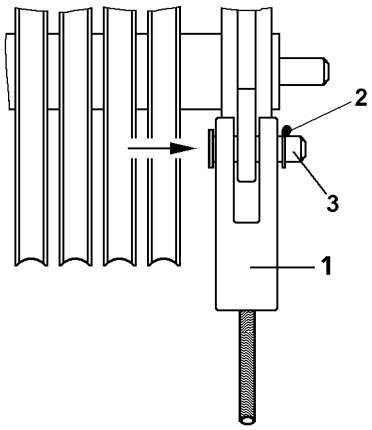
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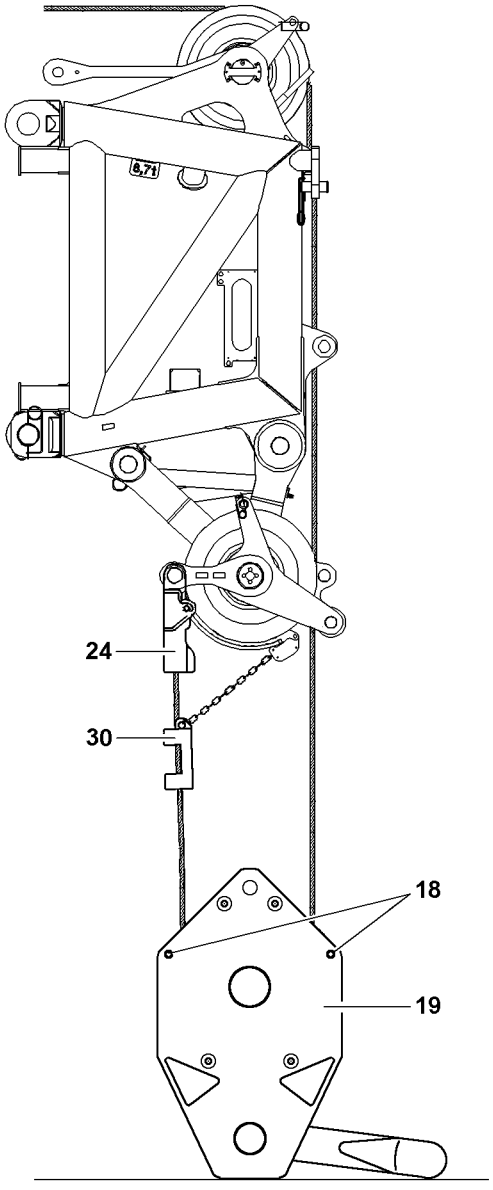






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2 Reeving the hook block in and out

WARNING
Erroneous operation of crane function and danger of slipping on the boom!
If the following notes are not observed and adhered to, personnel can be severely injured or killed!
- ▶ Step on the boom only via the catwalks!
- ▶ The assembly personnel must secure themselves for all work on the lattice mast boom with approved antifall systems, on the safety ropes or on the lattice sections, with snap hook on both sides to prevent them from falling!
- ▶ Complete the assembly work from a stable location!
- ▶ Observe and adhere to the assembly guidelines in chapter 5.01 of the crane operating instructions!

2.1 Reeving in the hook block

WARNING
The hook block can fall over!
If the pins **2** are **not** inserted into the hook block before setting the hook block down, the hook block can fall over when unreeving the hoist rope!
Personnel can be severely injured or killed!
- ▶ Pin in the pin **2**, see chapter 5.19 of the crane operating instructions!

Note
- ▶ The reeving of the hoist rope can be carried out manually or with the aid of the assembly winch!
- ▶ Make sure that no slack rope forms during reeving!

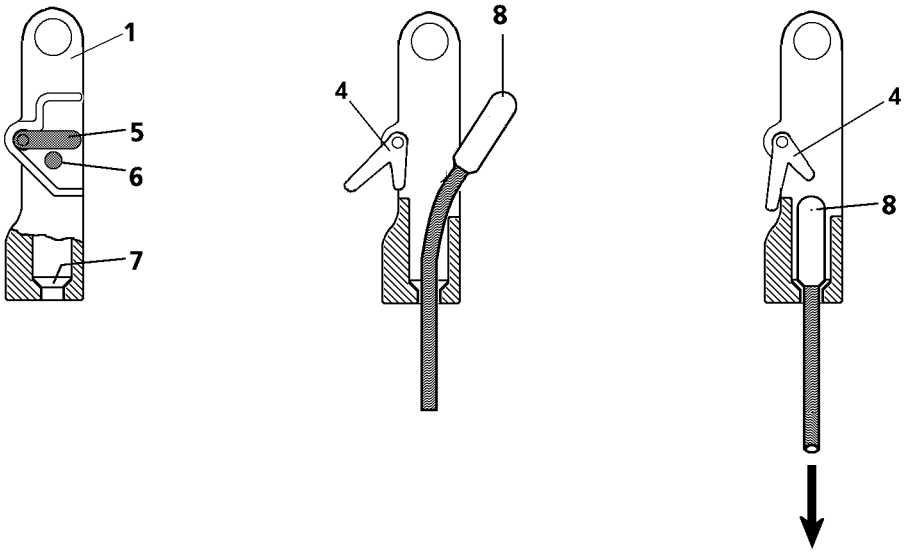
NOTICE
Damage to the hoist rope!
An incorrectly reeved hoist rope or the incorrect selection of the rope fixed point can cause the hook block not to hang vertically and thus cause damage to the hoist rope!
- ▶ Always carry out the reeving of the hoist rope according to the reeving plan!
- ▶ The rope fixed point on the hook block is to be selected in such a way that the last strand runs parallel to the remaining rope strands, as much as possible!

Make sure that the following prerequisites are met:
- – the crane is aligned in horizontal direction,
- – the hook block is set down on the ground properly,
- – the boom is luffed down to the point where the pulley head is above the hook block,
- – an assistant is present to guide the hoist rope.

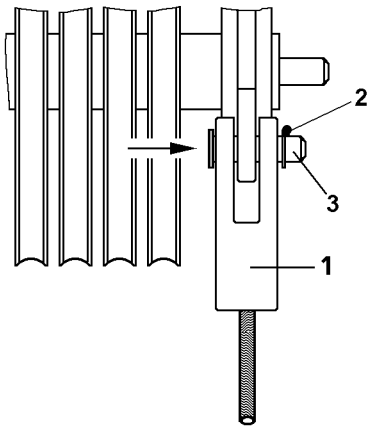
2.1.1 Procedure

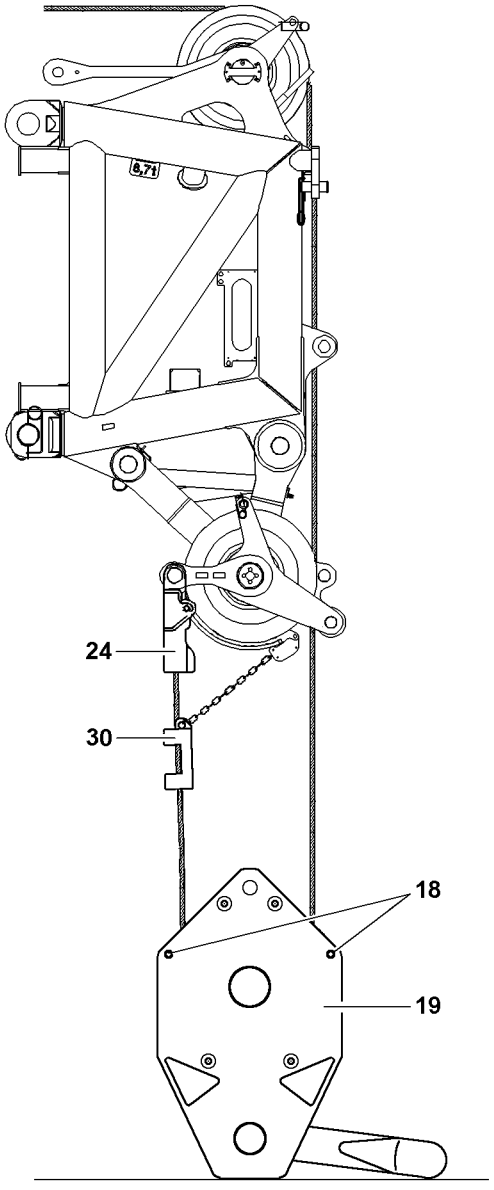
- ▶ Release and unpin the rope retaining pipe on the hook block.
- ▶ Release and unpin the rope retaining pipes on the back pulley and on the pulley head.

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2.1.2 Manual reeving

- ▶ An assistant guides the hoist rope over the boom to the pulley head and at the same time, the crane operator spools the hoist winch out.
- ▶ Place the hoist rope of the back pulley and reeve in according to the reeving plan between the pulley head and the hook block.
- ▶ When the hook block is completely reeved in:
  Insert the rope retaining pipes again and secure with spring retainers.

2.1.3 Reeving with assembly winch

- ▶ Reeve in the auxiliary rope in the reverse direction between the hook block and the pulley head.
- ▶ Connect the auxiliary rope with the hoist rope.
- ▶ Unwind the hoist rope from the hoisting winch and simultaneously wind up the auxiliary rope of the assembly winch.
- ▶ When the hook block is completely reeved in:
  Insert the rope retaining pipes again and secure with spring retainers.

2.1.4 Hook the hoist rope on the rope lock

NOTICE
Scraping of hoist rope!
If the pin **3** has been assembled incorrectly, the hoist rope may rub against the pin **3** or on the linch pin **2**!
Hoist rope, pin **3** and linch pin **2** are damaged!

- ▶ Always insert pins **3** from “inside to outside” and secure them from the outside, see illustration **1**.

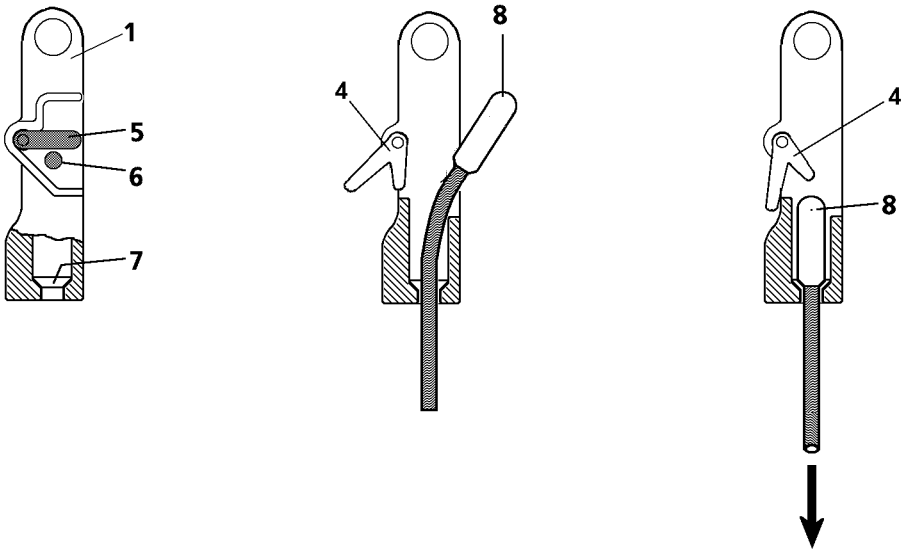
- ▶ The rope lock **1** must be pinned in either at the pulley head or on the hook block and secured with linch pins **2**, depending on reeving.
- ▶ On the rope lock **1**, push the retaining pin **6** in.
- ▶ Swing the lever **5** “down” and hold it in this position.

Result:

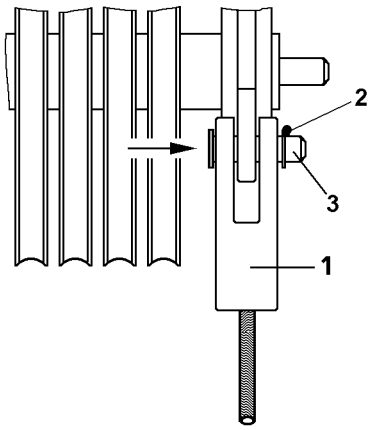
– The latch **4** will be swivelled “downward”.

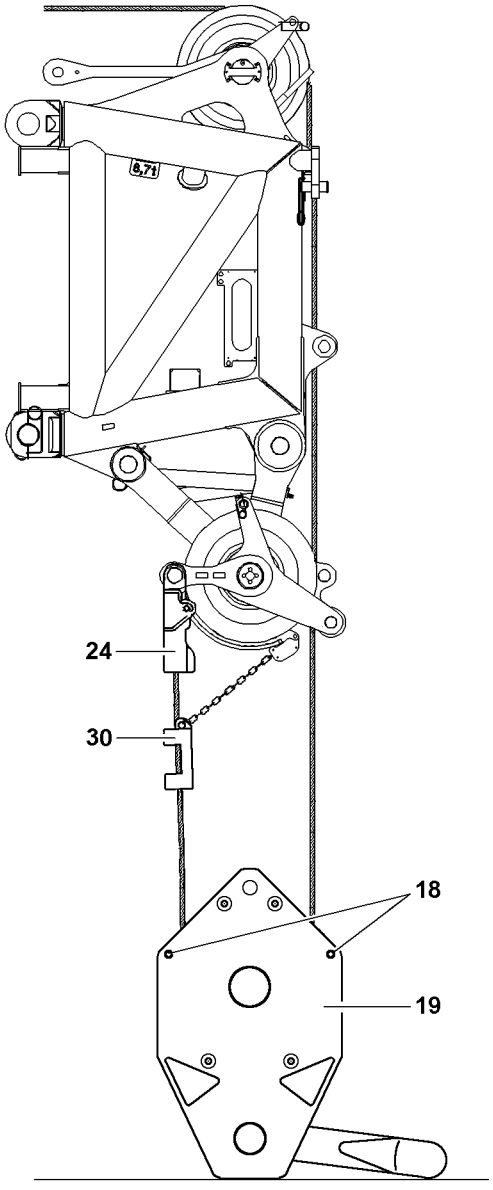
- ▶ Attach the rope end with the locking clamp **8** in the rope lock **1** and pull “down” firmly (in direction of arrow), until the locking clamp **8** is touching in the cone **7**.

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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**.

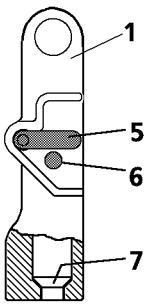
▶ Check the rope retainer. Check visually!

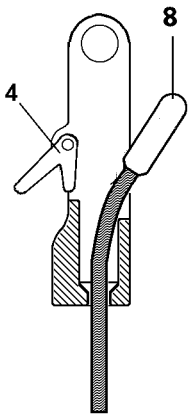
2.1.5 Preparing the hook block for crane operation

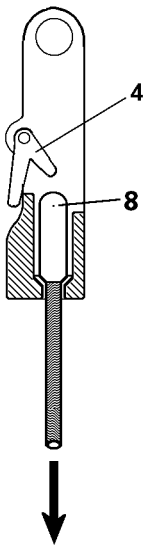
▶ Raise the boom or spool the hoist rope up until the hook block is completely lifted off the ground.

Note
▶ See chapter 5.19 of the crane operating instructions!

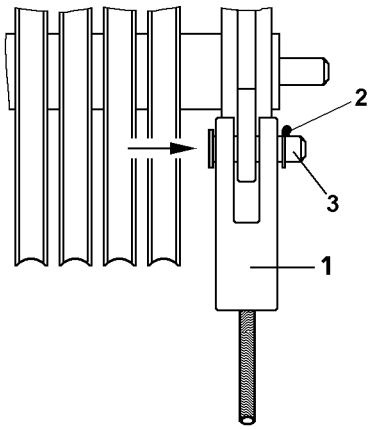
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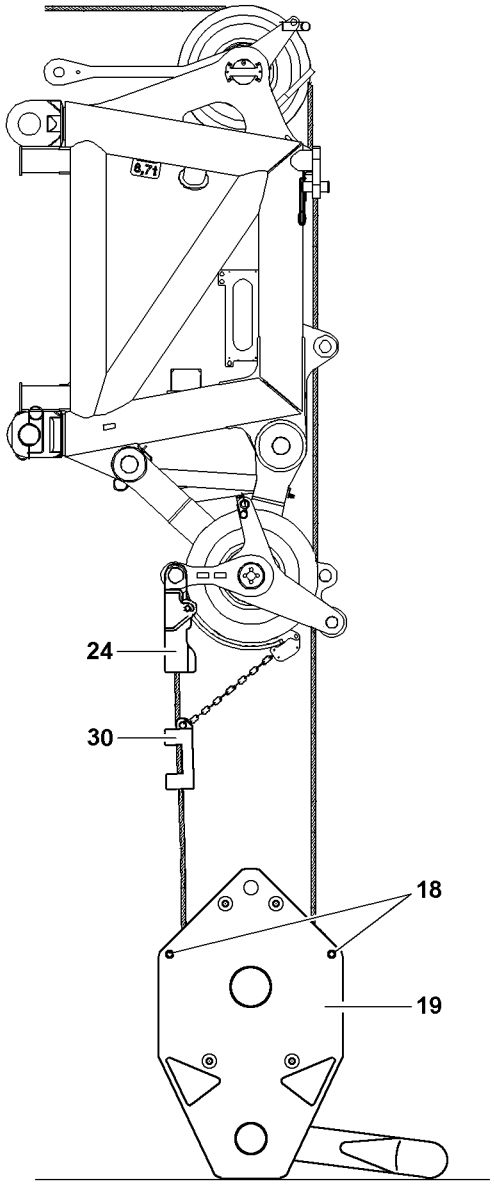






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2.2 Unreeving the hook block

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”.

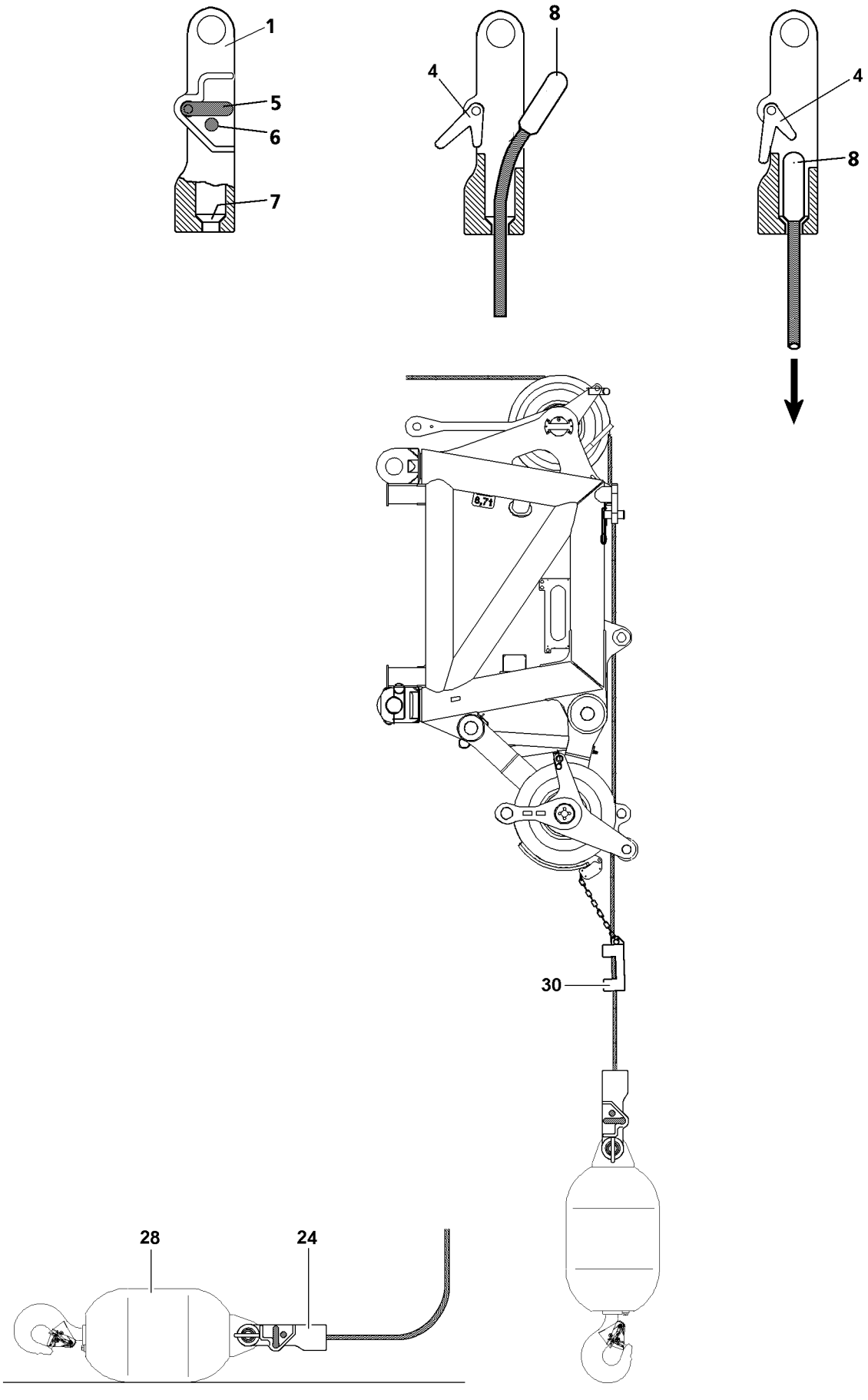
2.2.2 Detaching the hoist rope

- ▶ 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.

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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.

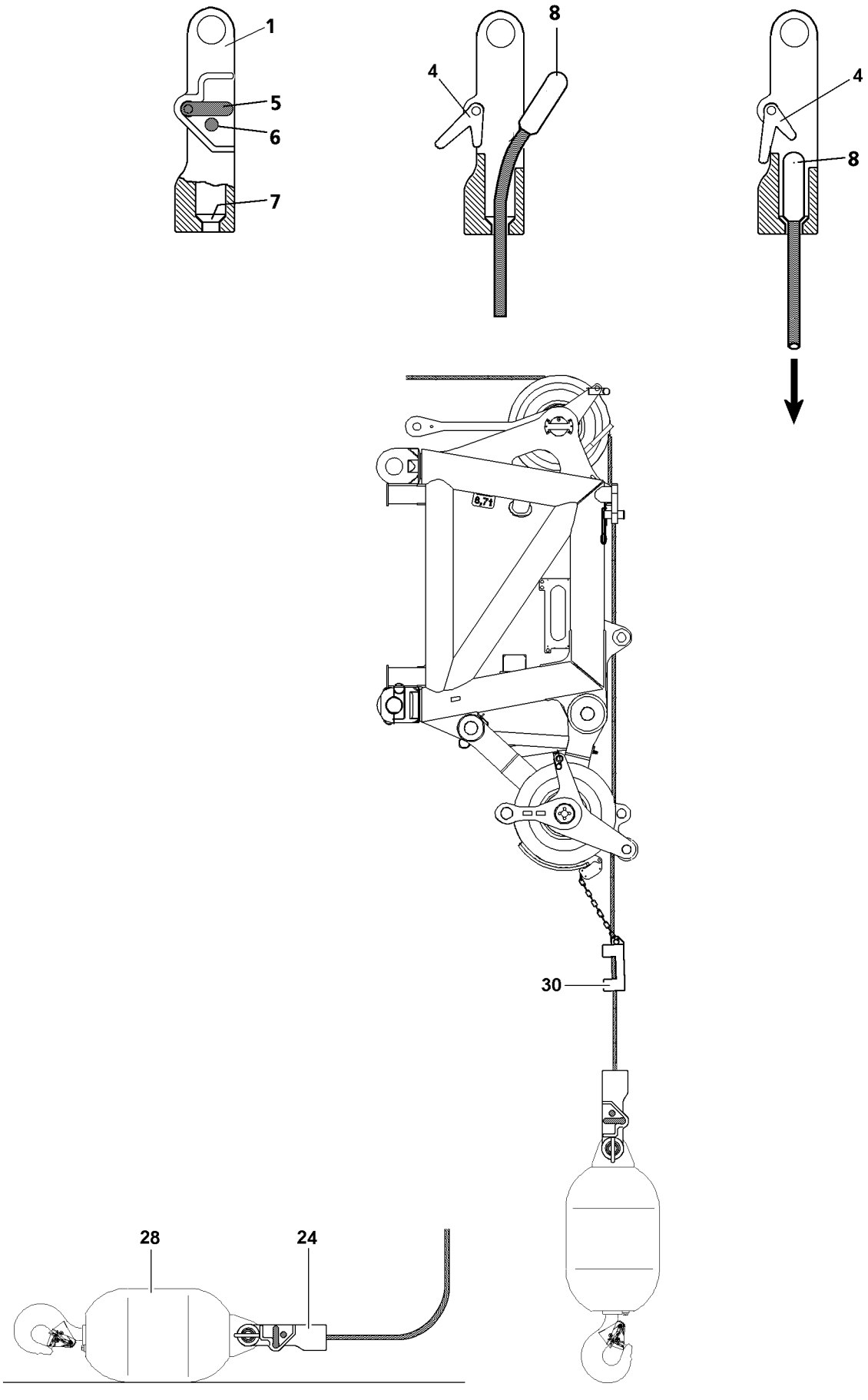
- ▶ Fasten the rope end with the locking clamp **8** in the rope lock and pull the rope firmly in the direction of the arrow, until the locking clamp **8** contacts the cone **7**.

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**.

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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”.

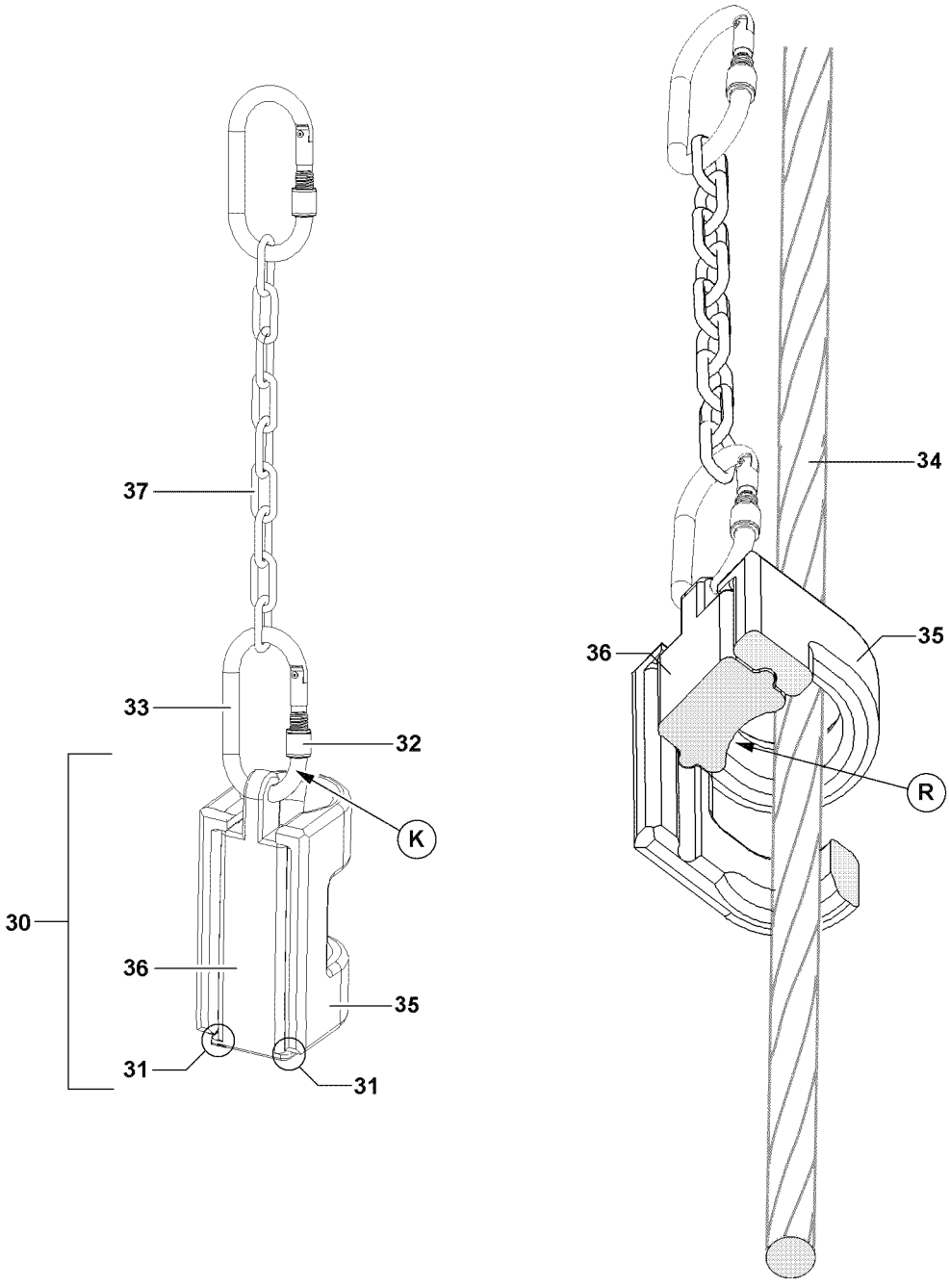
3.2.2 Detaching the hoist rope

▶ 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.

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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.

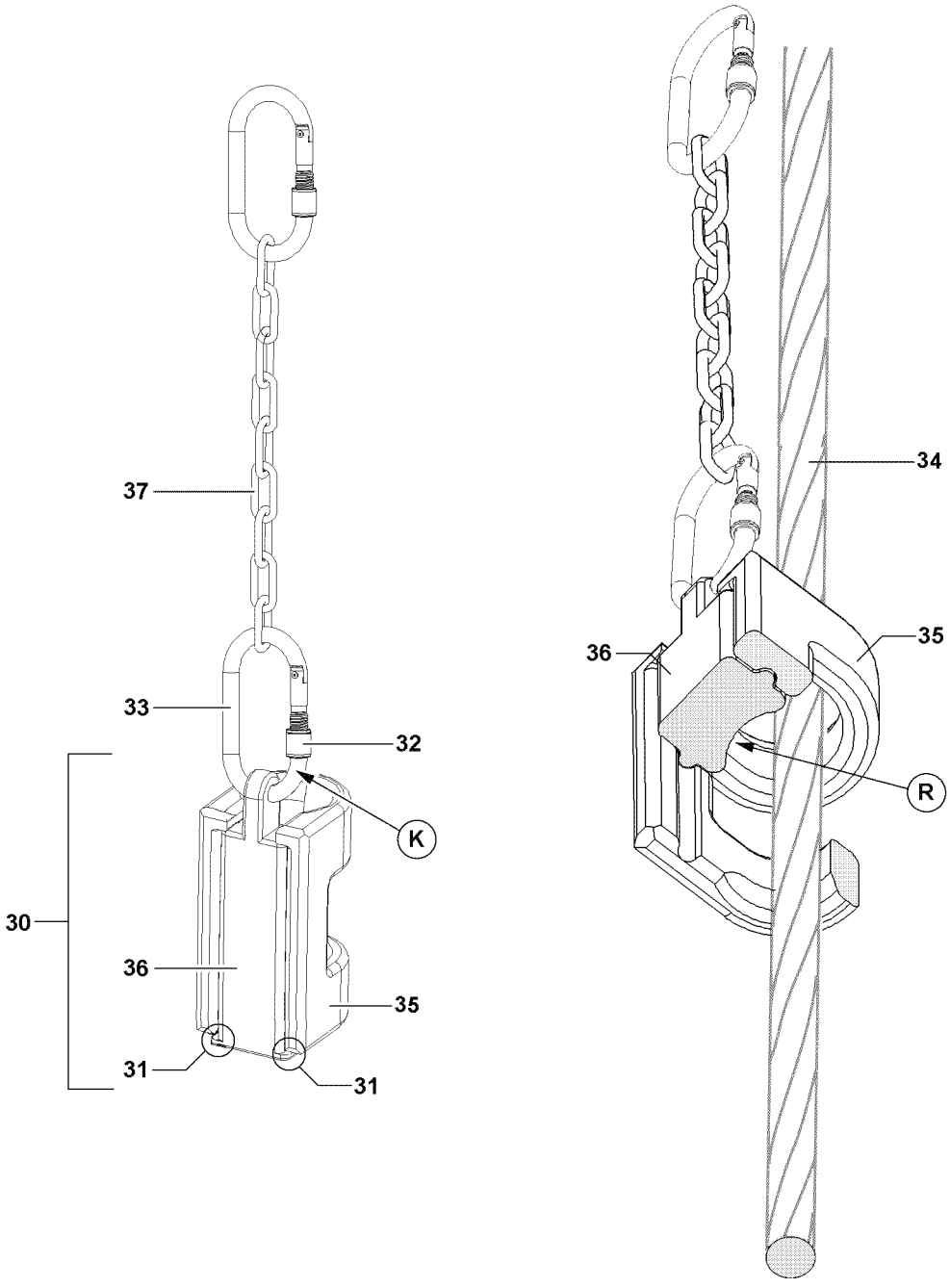
Rope fixed point on hook block:
– The hoist limit switch weight **30** is laid around the outer strand which shows the least diagonal pull, i.e. the one with the smallest angle between the hanging hoist limit switch weight and the hoist rope.

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**.

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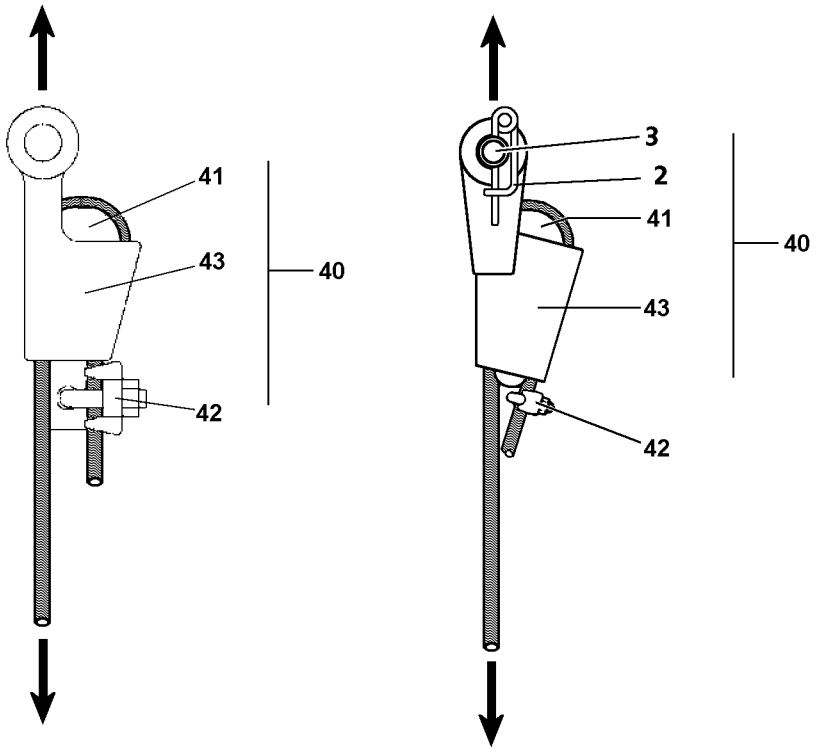
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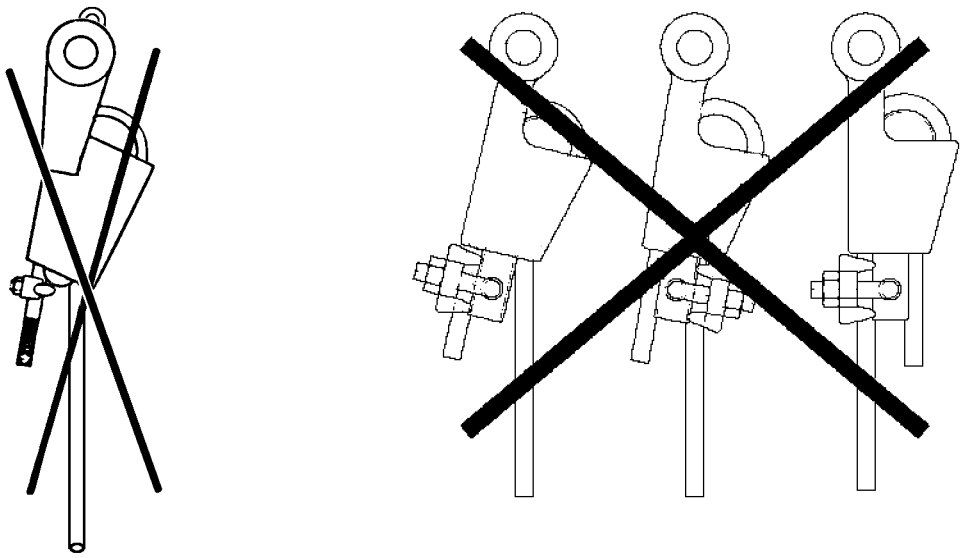
4.2 Removing the hoist limit switch weight

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.

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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.

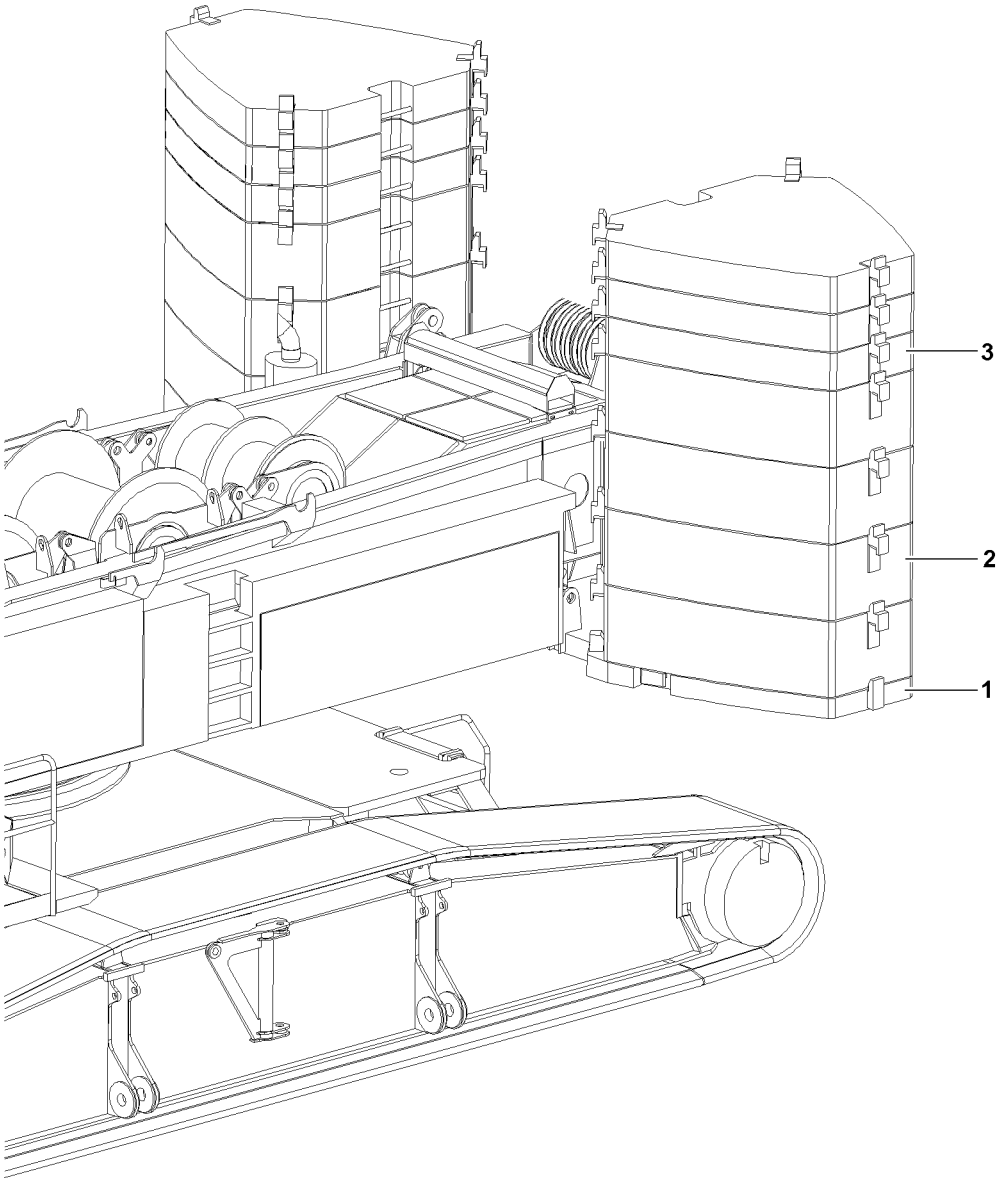
5.2 Disassembling the wedge lock

- ▶ 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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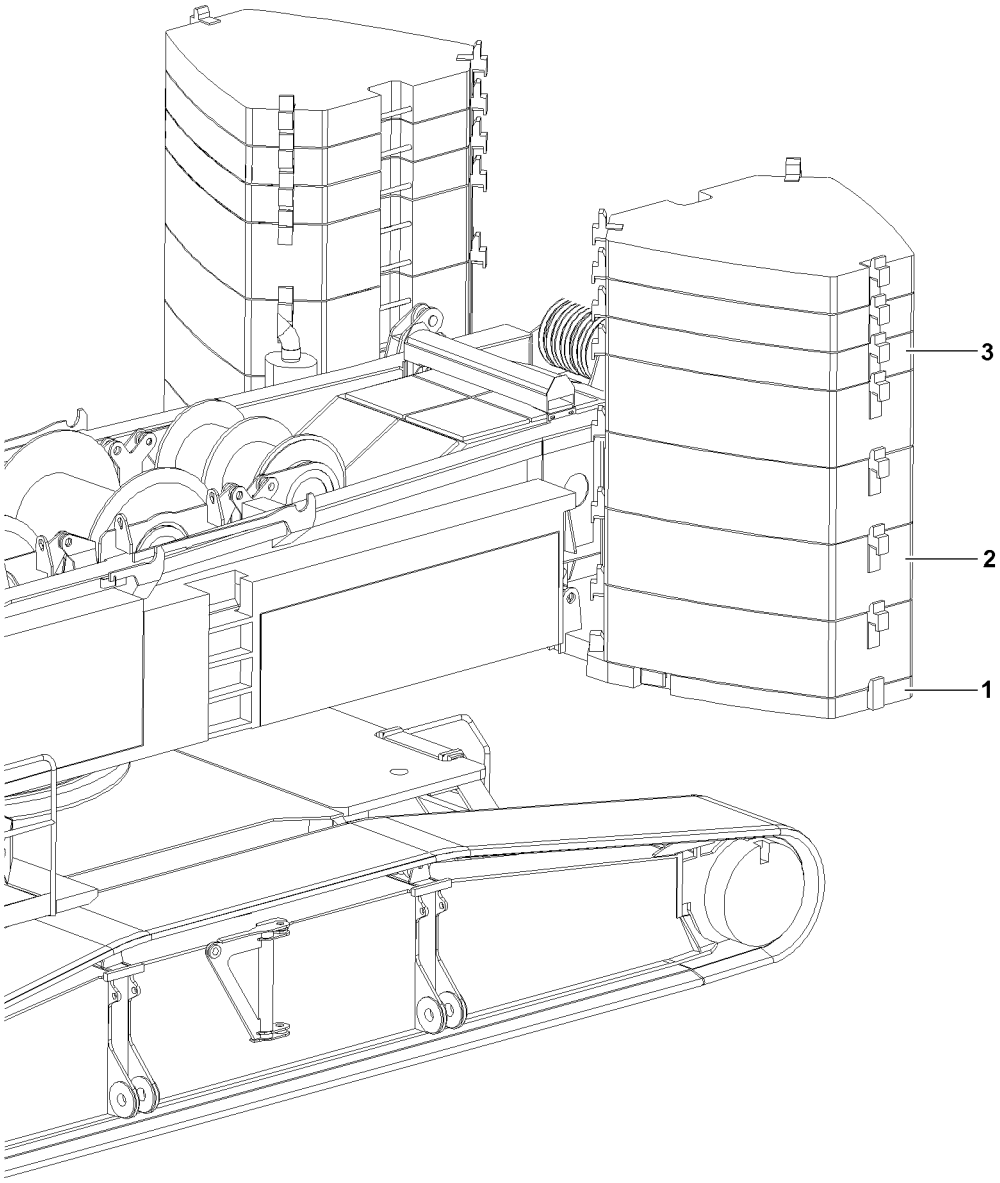
1 Base plate and counterweight plates

The base plate and the counterweight plates are marked with their own weight.

DANGER
Risk of accident due to toppling crane!
If a different counterweight than the one listed in the load chart is used, the crane may be damaged or topple over!
Personnel can be severely injured or killed!
- ▶ Attach counterweight in accordance with the information in the load chart!
- ▶ Replace damaged counterweight plates!

WARNING
The crane can topple over!
If a counterweight is placed on the turntable without the required central ballast or, depending on the assembly condition, the additionally required S-pivot section being installed on the crane, then the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Make sure, before placing the counterweight, that the central ballast and possibly the S-pivot section are installed!
- ▶ The assembly conditions in chapter 3.06 in the Crane operating instructions must be strictly observed and adhered to!

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2 Counterweight combinations

WARNING
Incorrectly calculated counterweight!
The specified counterweight from the load charts also includes the own weight of the base plate!
If the weight of the base plate is not taken into account in the calculation of the counterweight, then too much counterweight will be placed!
The crane can be severely damaged or topple over!
Personnel can be severely injured or killed!
- ▶ Make sure that for the combination of the counterweight the weight of the base plate has been taken into account!
- ▶ Observe the chart “Calculation example counterweight combination” in this chapter!

NOTICE
Incorrect placement of counterweight on the turntable!
An unsymmetrical counterweight condition of more than 20 t between the left and right counterweight stack can cause significant property damage!
- ▶ When ballasting the counterweight up or down, an unsymmetrical counterweight condition of more than 20 t is prohibited!

2.1 Assembly of counterweight combinations

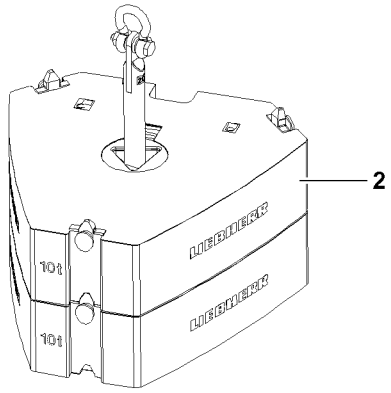
Maximum counterweight	Combination	Individual weight
125.0 t	The counterweight can be assembled from the following counterweight plates:	5.0 t 10.0 t
	Base plate	15.0 t

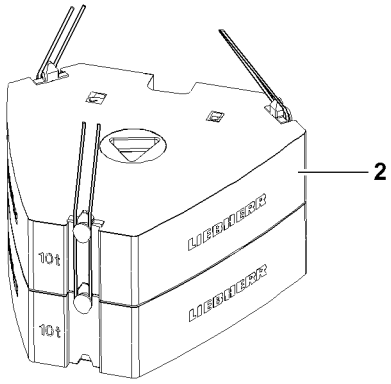
2.2 Calculation example counterweight combination

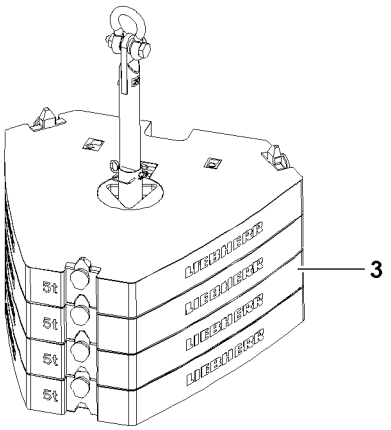
See opposite illustration!

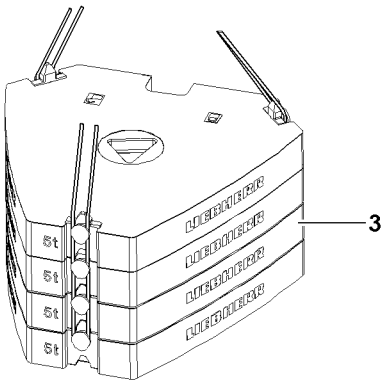
Counterweight from load chart 125.0 t			
8 x	Counterweight plate 10.0 t	=	80.0 t
6 x	Counterweight plate 5.0 t	=	30.0 t
1 x	Base plate15.0 t	=	15.0 t
Counterweight:			125.0 t

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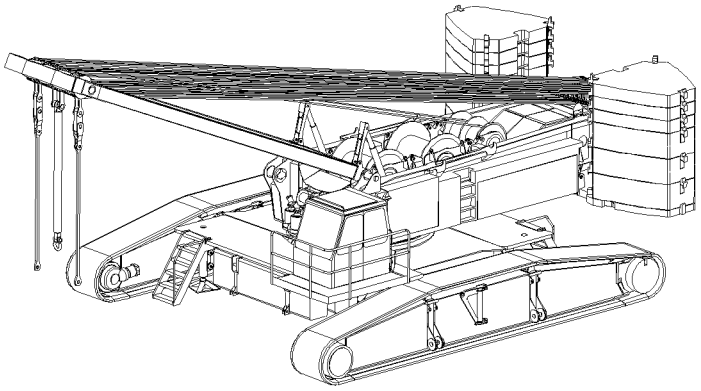
3 Permissible counterweight assemblies

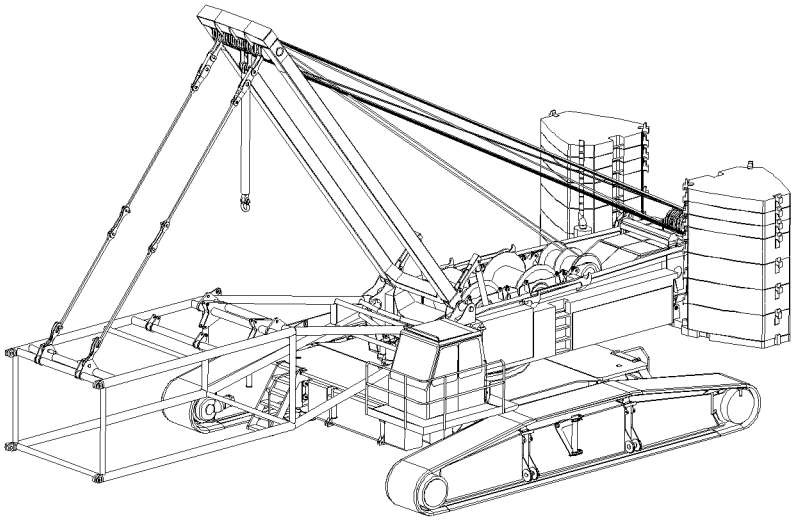
WARNING
Overload attachment points counterweight plates!
If more than the permissible number of counterweight plates are lifted together, then the attachment points can be overloaded!
The counterweight plates and components can fall down!
Personnel can be severely injured or killed!
▶ Attach only the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

WARNING
Incorrect set up of counterweight assemblies!
When lifting mixed weight counterweight assemblies, and the heavier counterweight plates are placed on top, the attachment points can be overloaded!
The counterweight plates and components can fall down!
Personnel can be severely injured or killed!
▶ Always stack the heavier counterweight plate on the bottom in the counterweight assembly!

Individual weight	Maximum number of same counterweight plates per lift over	
Counterweight plate	Twist lock	Bitt
5.0 t	4	4
10.0 t	2	2

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4 Installing the counterweight

WARNING
The crane can topple over!
By turning the turntable, the crane can topple to the rear during the ballasting procedure!
Personnel can be severely injured or killed!
- ▶ Erect the SA-bracket to more than 90° before the ballasting procedure!
- ▶ Observe and adhere to the assembly conditions in chapter 3.06 of the Crane operating instructions!
- ▶ When ballasting the maximum counterweight, the S-pivot section must be installed and tensioned by the SA-frame!

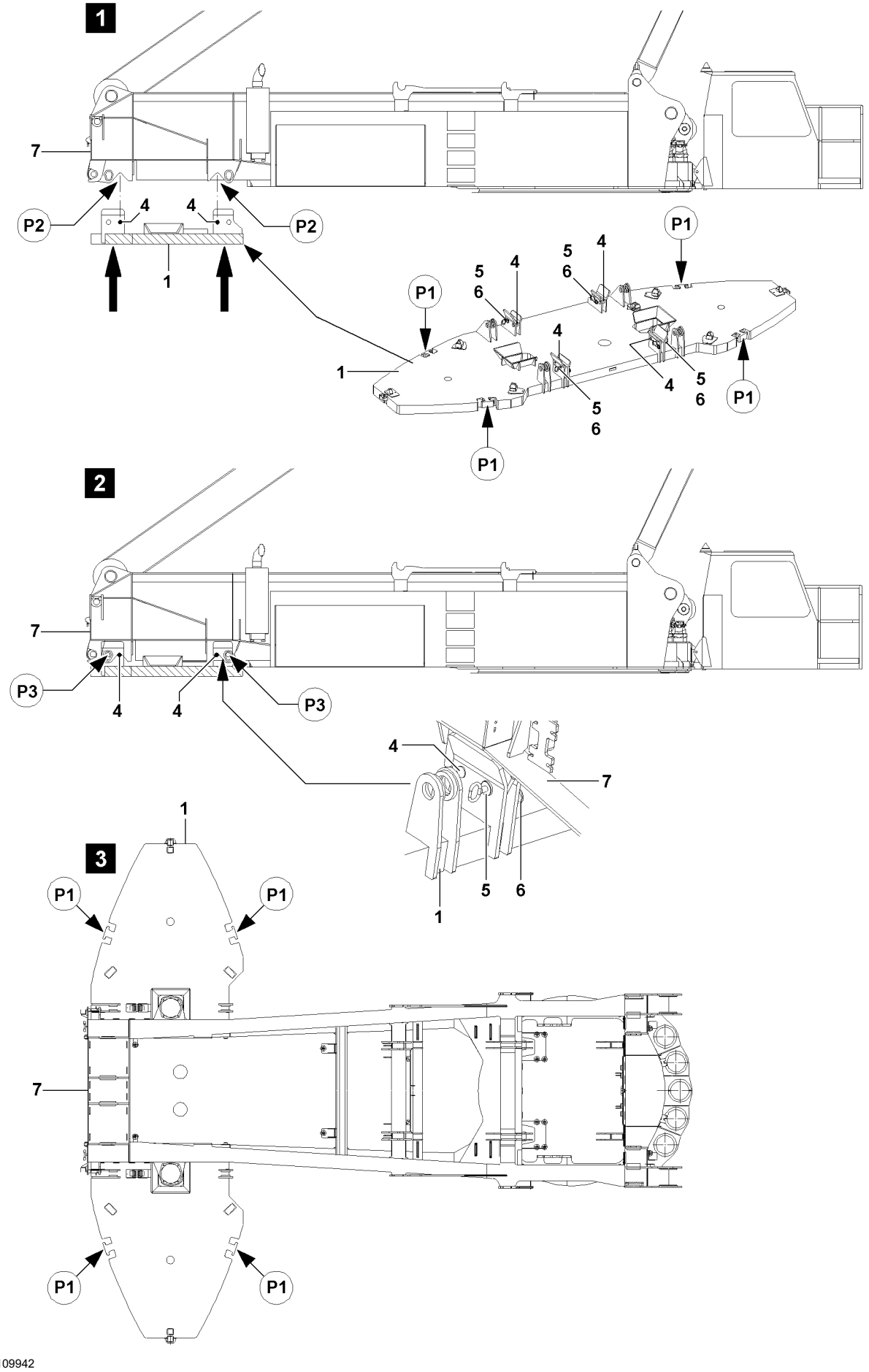
Ensure that the following prerequisite is met:
- The crane is aligned in horizontal direction.
- The central ballast is installed.
- **Depending on the assembly condition:** The S-pivot section is installed.

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
Danger of falling during assembly / disassembly work!
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 severe or fatal injuries!
- ▶ All assembly work must be carried out using suitable aids (lifting platform, ladder, 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 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
Danger of impact / crushing when working with the auxiliary crane!
When installing / removing counterweight components with the auxiliary crane, crane components can start to swing back and forth!
Personnel can be caught and severely injured or killed!
- ▶ Make sure that no persons can be caught when installing the components!
- ▶ If necessary, guide the components with suitable aids!

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4.1 Installing the base plate

Ensure that the following prerequisite is met:
– The pins **5** are unpinned, fig. **1**.

Note
▶ The weight of the base plate **1** is approx. 15 t!

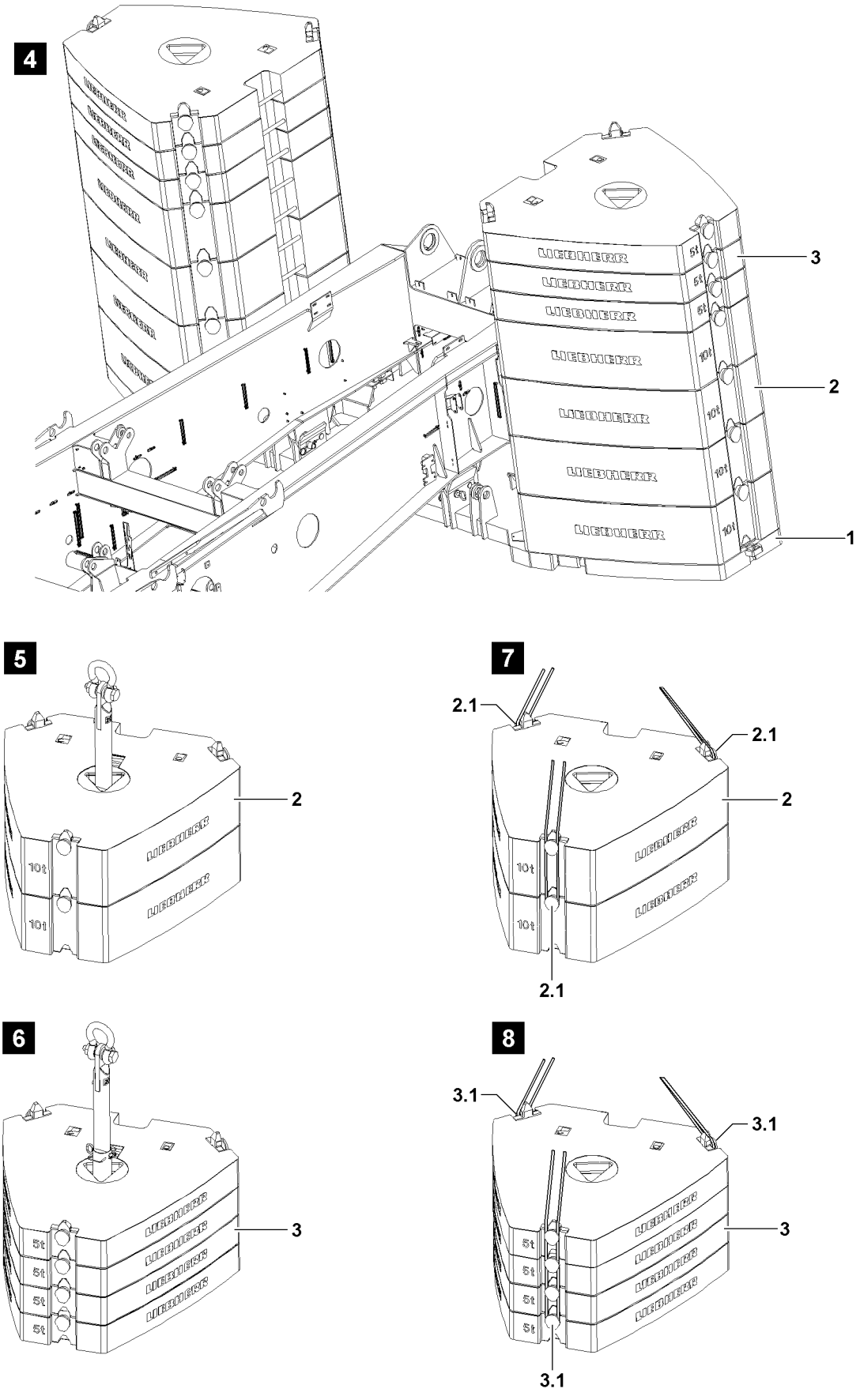
▶ Attach the base plate **1** on the bitts (points **P1**) on the auxiliary crane, illustration **1**.
▶ Swing the base plate **1** with the auxiliary crane in under the turntable **7**.

The base plate **1** must be lifted with the auxiliary point until the centering pins **4** of the base plate touch on the centerings (points **P2**) on the turntable **7**.
▶ Lift the base plate **1** with the auxiliary crane to the centerings (points **P2**).
▶ When the base plate **1** is centered on the turntable **7**:
Pin the base plate **1** on the pin points points **P3**) of the turntable **7**.
▶ Insert the pins **5** on both sides on the pin points (points **P3**).
▶ Secure the pins **5** each with spring retainers **6**, see illustration **2**.

WARNING
Base plate can fall off!
If the tackle is removed on the base plate, it can fall down!
Personnel can be severely injured or killed!
▶ Before removing the tackle, make sure that the base plate **1** is safely pinned and secured to the turntable **7**!

▶ Remove the tackle.

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4.2 Placing the counterweight

DANGER
The crane can topple over!
If the following conditions are not met before turning the turntable, then the crane will topple over!
Personnel can be severely injured or killed!
- ▶ Observe the assembly conditions in chapter 3.06 of the Crane operating instructions!
- ▶ The central ballast is installed according to the specifications in chapter 3.03 and chapter 3.06!

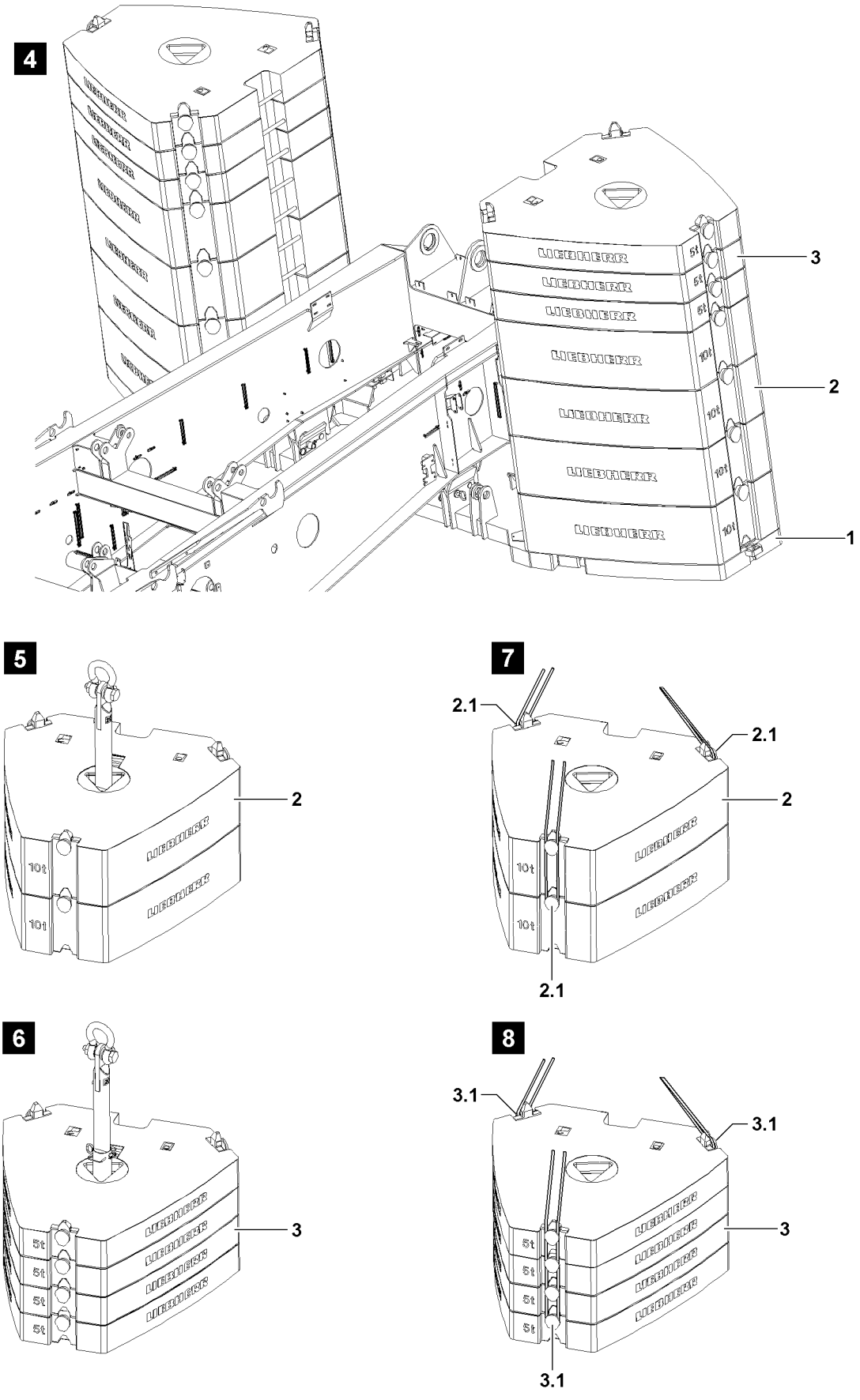
Make sure that the following prerequisites are met:
- – The crawler track is placed completely on the ground.
- – The crane is aligned in horizontal direction.
- – The central ballast is installed according to the data in the erection and take down charts.
- – The base plate **1** is pinned and secured on the turntable **7**.
- – The SA-frame is erected to more than 90°.

WARNING
The crane can topple over!
If the placed counterweight deviates from the specified data in the load charts, 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!

WARNING
The crane can topple over!
If more than 20 t are placed with one lift on the base plate **1** or on the counterweight plates 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!
- ▶ Place no more than maximum 20 t counterweight assemblies on the counterweight stack, alternately symmetrically on the left and right!

WARNING
Falling counterweight plates!
If more than the permissible loads are lifted, then the bitts **2.1** or the bitts **3.1** 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, three fastening points!
- ▶ Replace damaged counterweight plates!

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4.2.1 Placing the counterweight plates

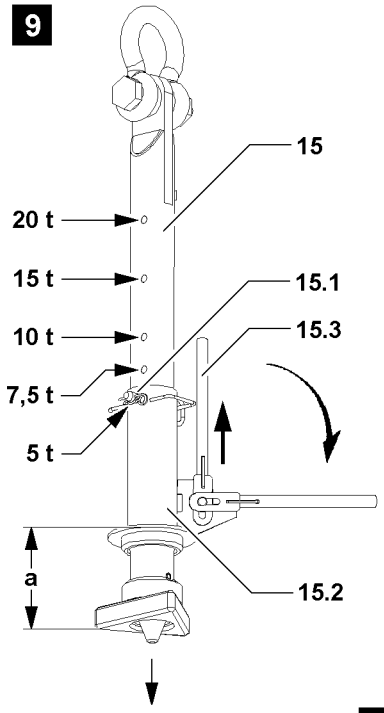
WARNING
Incorrect handling of the attachment equipment!
If attachment equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down!
Personnel can be severely injured or killed!
▶ Make sure that the tackle is correctly attached on the bitts **2.1** or the bitts **3.1** and that it is secured sufficiently to prevent it from loosening up!

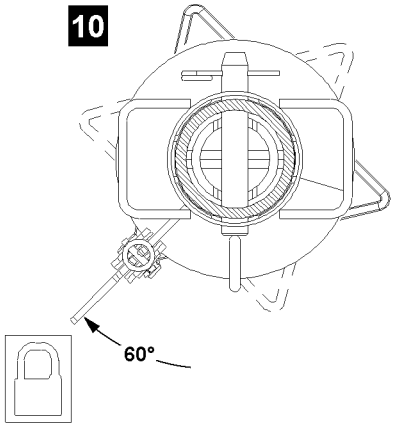
WARNING
Damaged counterweight plates!
Damage on the counterweight plates can cause the tackle to release!
The counterweight plates and components can fall down!
Personnel can be severely injured or killed!
▶ Do not use damaged counterweight plates and replace them immediately!

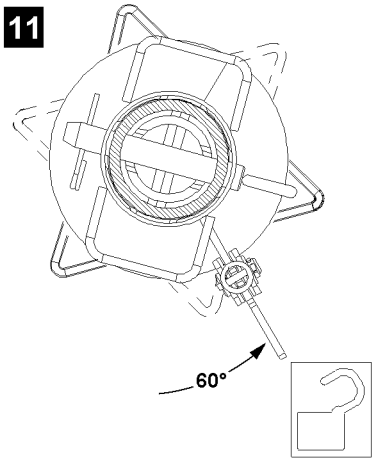
WARNING
Counterweight too low / too high!
If the placed counterweight deviates from the specified data in the load charts or the assembly conditions, then the crane can be damaged or topple over!
Personnel can be severely injured or killed!
▶ Place the counterweight according to the data in the load 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!

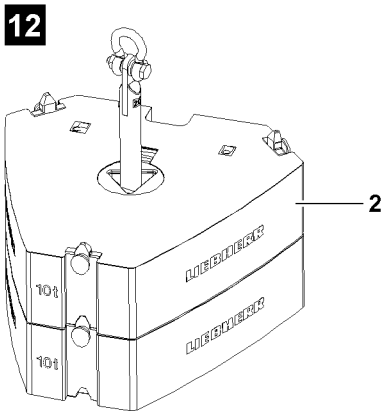
WARNING
Toppling counterweight assembly!
Lopsided stacked counterweight plates create instability in the counterweight assembly!
The counterweight plates can tip from the base plate and cause the crane to topple over!
Personnel can be severely injured or killed!
▶ Make sure that the counterweight plates are placed correctly in the centerings!

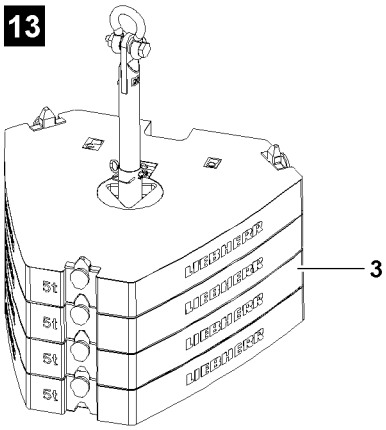
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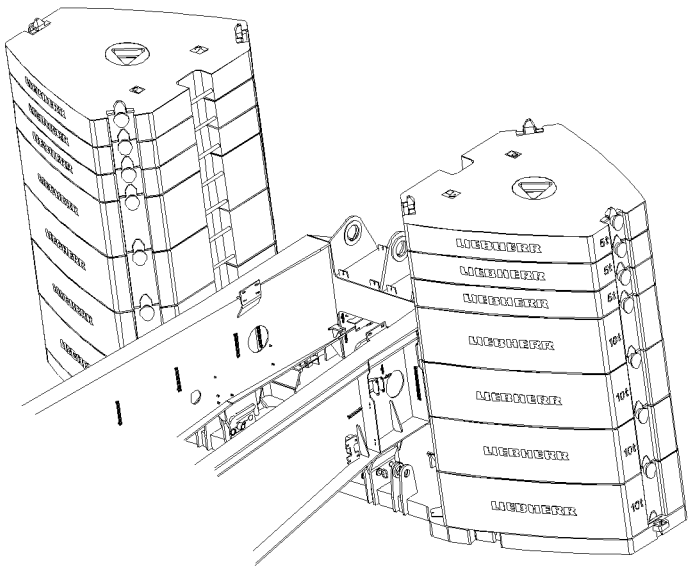












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Placing the counterweight plates, fastening system: “Twist lock”

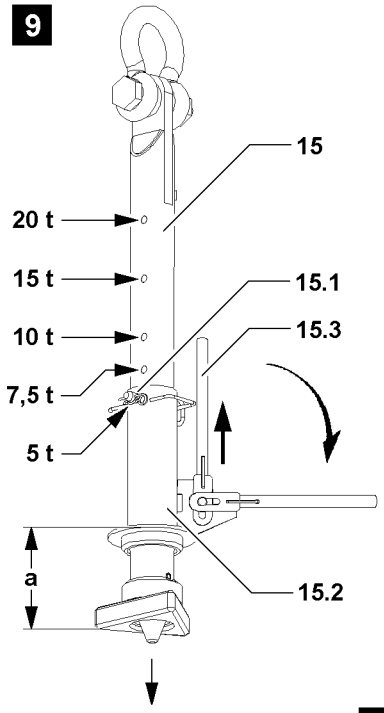
WARNING
Overload of receptacle stud and counterweight plates!
If more than the permissible number of counterweight plates are lifted with the receptacle stud **15**, the receptacle stud **15** and the counterweight plates can be overloaded and damaged!
Counterweight plates can fall down!
Personnel can be severely injured or killed!
▶ Observe the chart “Permissible counterweight assemblies” in this chapter!

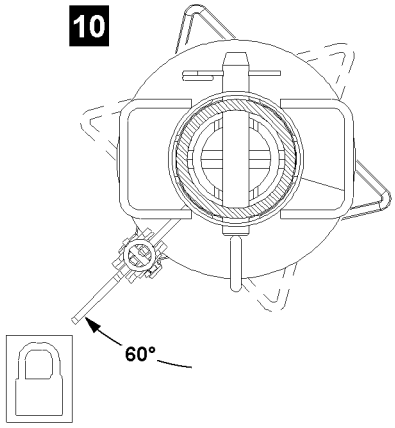
WARNING
Damage of receptacle stud and counterweight plates!
If two counterweight plates are lifted which do not lay correctly in their centerings, the receptacle stud **15** and the counterweight plates can be damaged!
Damage can cause the counterweight plates to fall down!
Personnel can be severely injured or killed!
▶ Make sure that the counterweight plates to be lifted are placed correctly in the centerings!

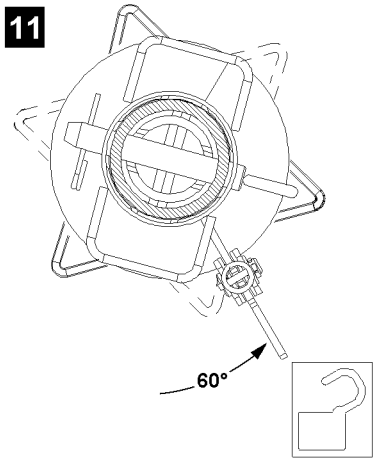
WARNING
The twist lock system opens by itself!
If the receptacle stud is not correctly locked, the Twist lock system can open by itself!
Counterweight plates can fall down!
Personnel can be severely injured or killed!
▶ Make sure, when initiating a lift, that the lever **15.3** points directly on the symbol “Locked”, illustration **10**!

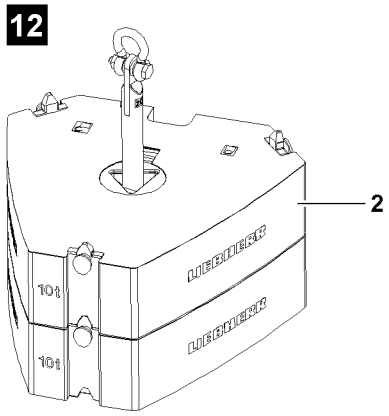
Note
▶ The counterweight plates are marked with their own weights!

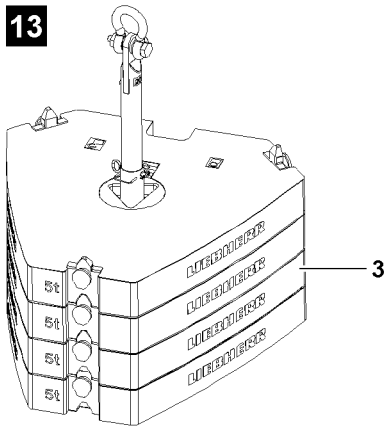
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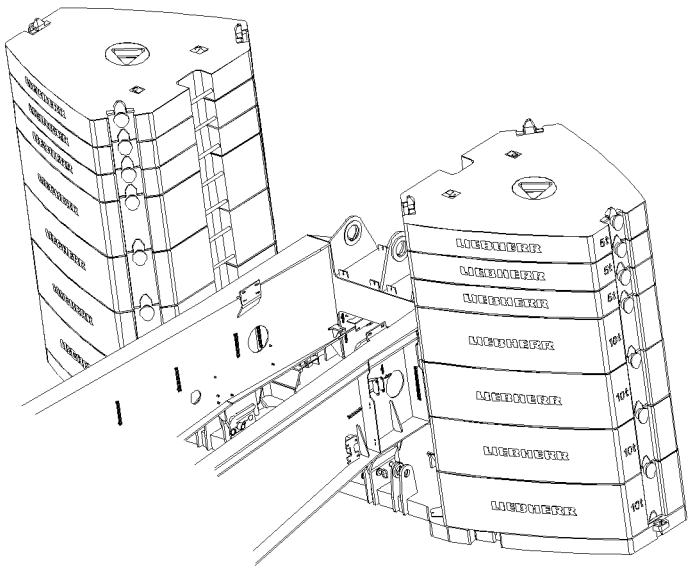












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Ensure that the following prerequisite is met:
– The base plate is pinned and secured on the turntable **1**.

Before the receptacle stud **15** is guided into the counterweight plates, it must be ensured that the insertion length **a** of the receptacle stud **15** is set correctly.
The insertion length **a** of the receptacle stud **15** for the counterweight plates can be adjusted by hand.

▶ If the insertion length **a** of the receptacle stud **15** is to be adjusted:
Release and unpin the pins **15.1**.
▶ Adjust the insertion length **a** by moving the guide sleeve **15.2** to the desired insertion length **a**, observe the stages in illustration **6**.
▶ Pin in and secure pin **15.1**.

Result:
– The receptacle stud **15** is adjusted.

▶ Attach the receptacle stud **15** on the auxiliary crane and guide it into the counterweight plate(s).
▶ Pull up the lever **15.3** and fold it down.
▶ Turn the receptacle stud **15** with the lever **15.3** by 60° until it points to the symbol “Locked” illustration **10** of the counterweight plate.

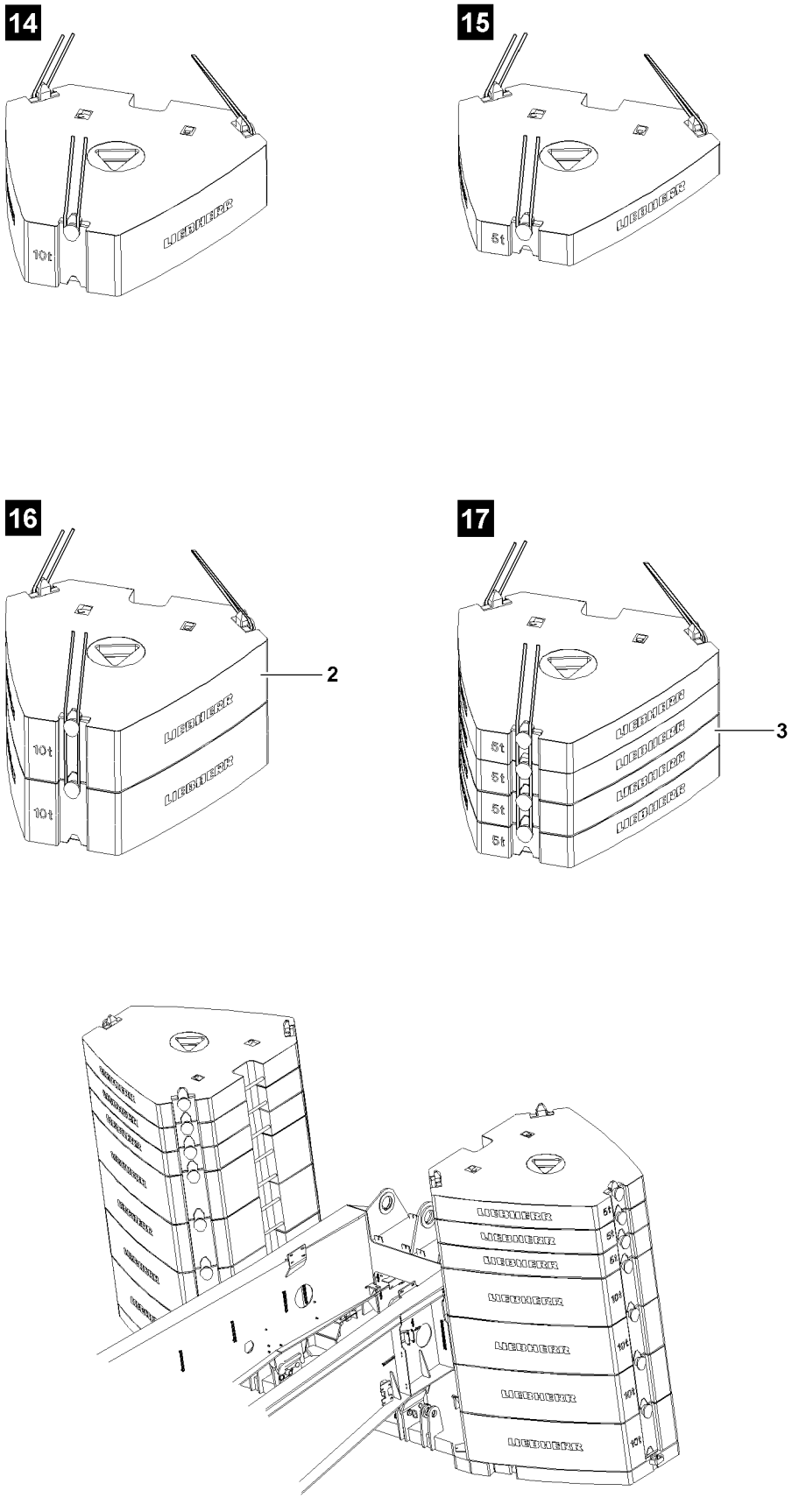
Note
▶ The receptacle stud **15** is locked by lifting the counterweight plate(s)!

▶ Lift the counterweight plate or the counterweight assembly with the receptacle stud **15** and place carefully onto the centerings on the base plate or on another counterweight plate in the counterweight assembly.
▶ When the counterweight plate(s) are placed down:
Turn the receptacle stud **15** with the lever **15.3** by 60° to the stop in direction of the symbol “unlocked”, see illustration **11**.

Result:
– The receptacle stud **15** is unlocked.

▶ Carefully pull out the receptacle stud **15**.
▶ Place the counterweight plates according to the load chart.

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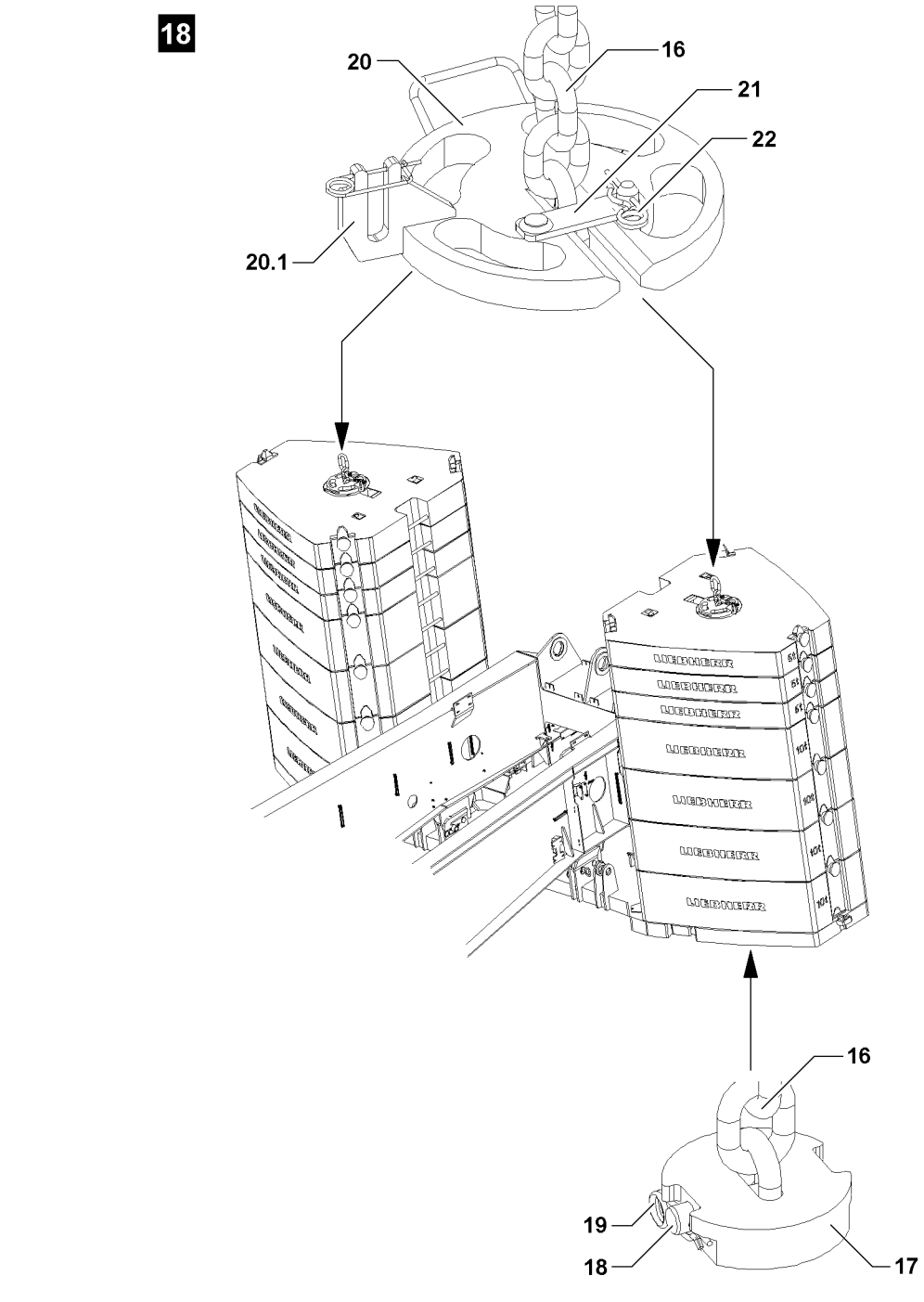
Placing the counterweight plates, attachment points: Bitt

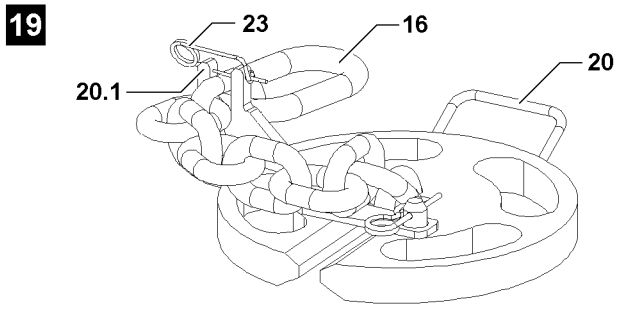
WARNING
Overloaded counterweight plates!
If more than the permissible loads are lifted, the bitts are overloaded!
The counterweight plates can be damaged and fall down!
Personnel can be severely injured or killed!
▶ Observe the chart “Permissible counterweight assemblies” in this chapter!

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

▶ Attach the counterweight plate, illustration **14** or illustration **15**, or the counterweight assembly, illustration **16** or illustration **17** on the auxiliary crane.
▶ Place the counterweight plate or the counterweight assembly on the centerings of the base plate or on another counterweight plate in the counterweight assembly.

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4.2.2 Securing the counterweight

WARNING
Unsecured counterweight plates!
If the counterweight is not or not correctly secured, then it can fall down!
Personnel can be severely injured or killed!
▶ Before starting crane operation, the complete counterweight must be secured!

Ensure that the following prerequisite is met:
– The counterweight has been stacked according to the load chart and the operating instructions.

▶ Guide the retaining chain **16** on the auxiliary crane from top through the counterweight assembly.
▶ Pin the retaining chain **16** on the bottom with the retaining plate **17**: Insert the pin **18** in the lowest chain link and secure with spring retainer **19**.
▶ Carefully tighten the retaining chain **16** with the auxiliary crane vertically.

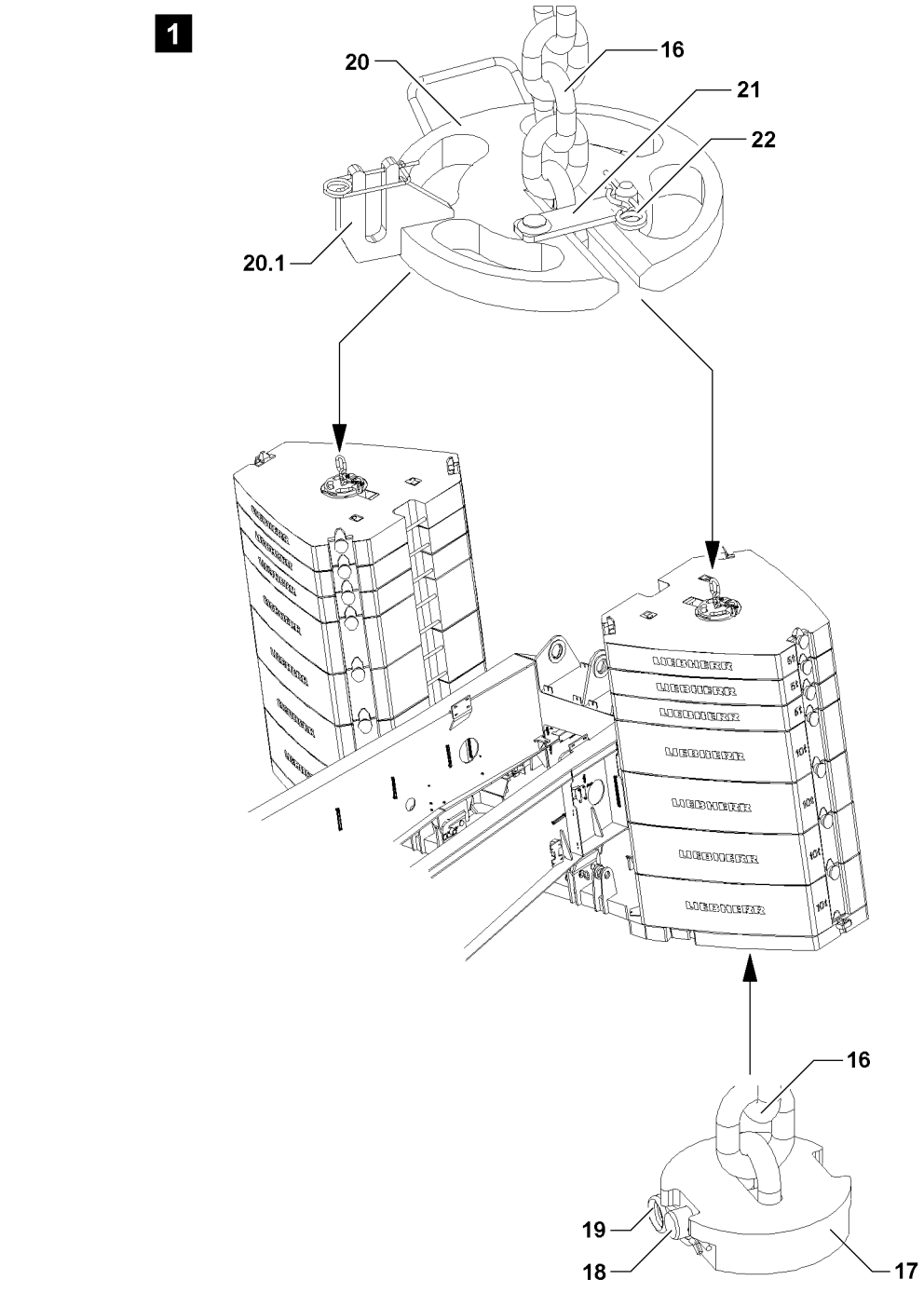
Note
▶ To optimally secure the counterweight assembly, keep the retaining chain **16** between the retaining plate **17** and the retaining plate **20** as short as possible!

▶ Push the retaining plate **20** on top on the side over the retaining chain **16**.
▶ Insert the retaining plate **21** in the retaining plate **20**.
▶ Secure the retaining plate **21** with spring retainer **22**.

WARNING
Danger of accidents due to chain overhang!
If the stack height of the counterweight plates is not high enough, the chain overhang of the retaining chain **16** on the side on the counterweight assembly **5** can fall down!
Personnel can be severely injured or killed!
▶ Secure the chain overhang from falling down!

▶ Hang the chain overhang of the retaining chain **16** into the fork **20.1** and secure with spring retainer **23** to prevent it from falling down, see illustration **19**.

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5 Removing the counterweight

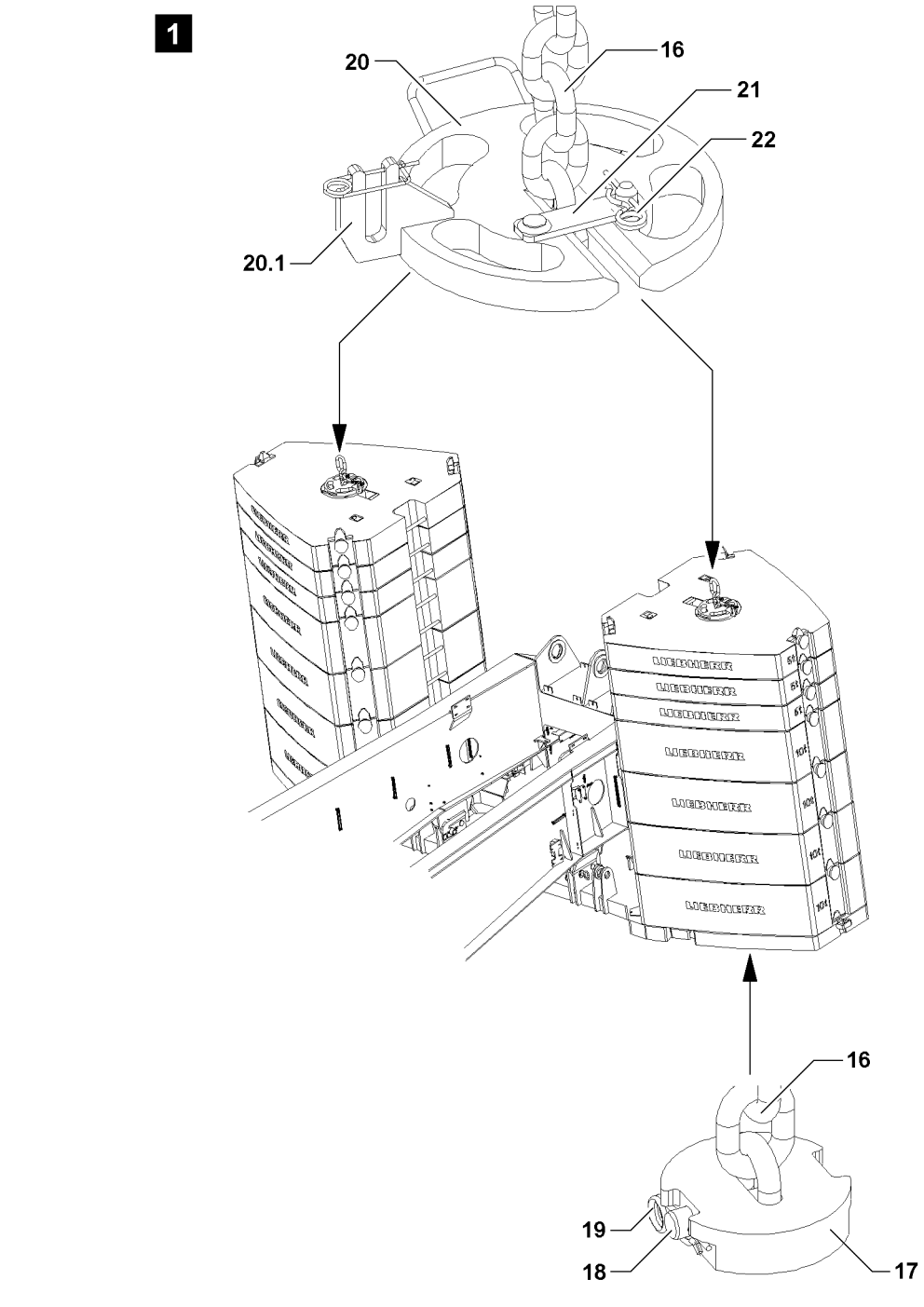
Ensure that the following prerequisite is met:
– The crane is aligned in horizontal direction.

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
Danger of falling during assembly / disassembly work!
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 severe or fatal injuries!
▶ All assembly work must be carried out using suitable aids (lifting platform, ladder, 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 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
Danger of impact / crushing when working with the auxiliary crane!
When installing / removing counterweight components with the auxiliary crane, crane components can start to swing back and forth!
Personnel can be caught and severely injured or killed!
▶ Make sure that no persons can be caught when installing the components!
▶ If necessary, guide the components with suitable aids!

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5.1 Releasing the counterweight

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The central ballast is installed.
- The SA-frame is erected, see chapter 5.02 of the Crane operating instructions.
- The boom is removed.
- **Depending on the assembly condition:** The S-pivot section is still installed on the turntable.

▶ For secured chain overhang, see illustration **2**:
Remove the spring retainer **23**, unhook the retaining chain **16** from the fork **20.1**.

▶ Chain overhang loose, see illustration **1**:
Attach the retaining chain **16** on the auxiliary crane and tension it slightly.

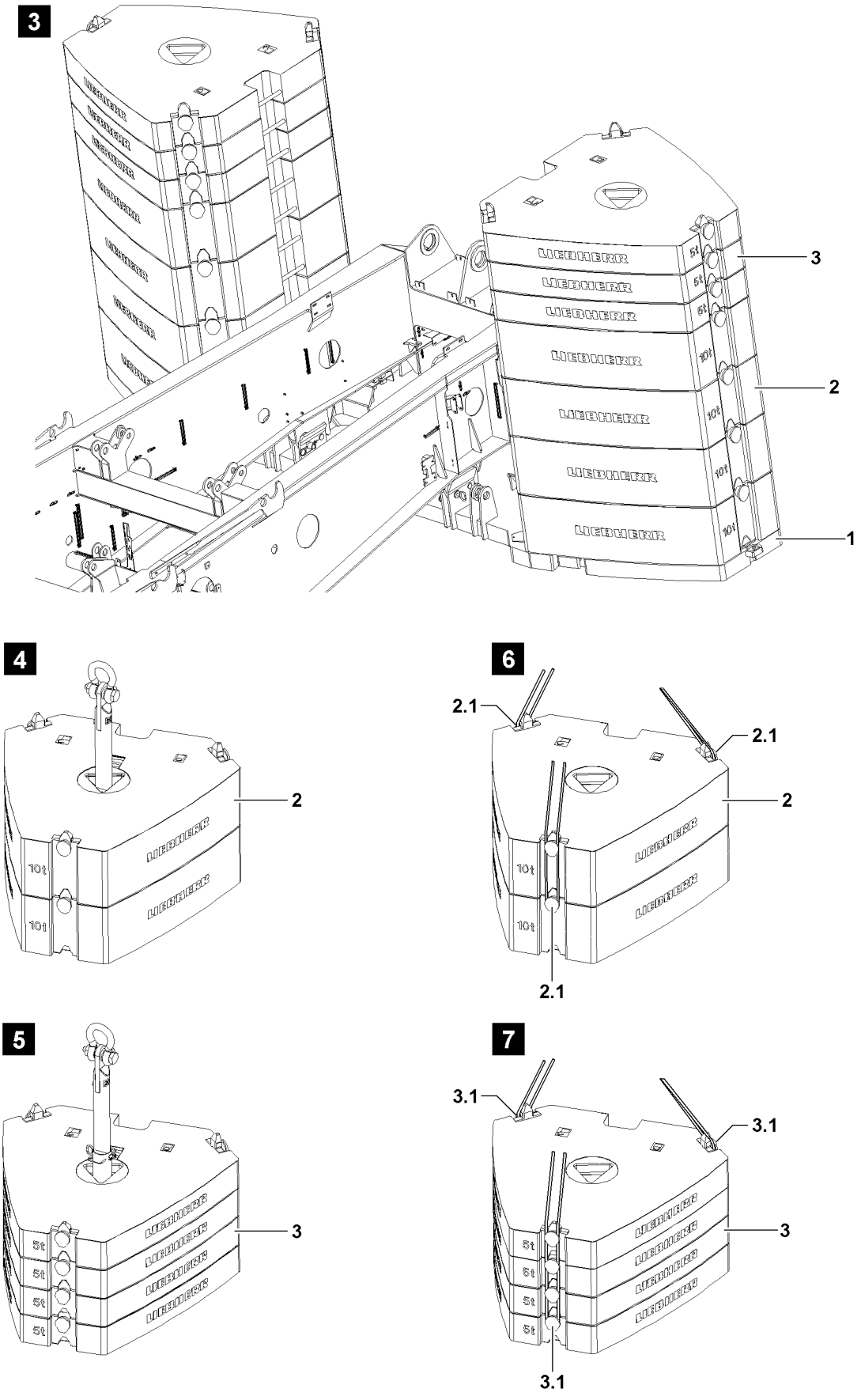
▶ Remove the retaining plate **20**: Release and remove retaining plate **21**, remove the retaining plate **20** on the side.

▶ Lower the retaining chain **16** until the lower retaining plate **17** is freely accessible.

▶ Unpin the pin **18** and remove the retaining plate **17**.

▶ Pull the retaining chain **16** with the auxiliary crane upward from the counterweight assembly and remove it.

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5.2 Removing the counterweight plates

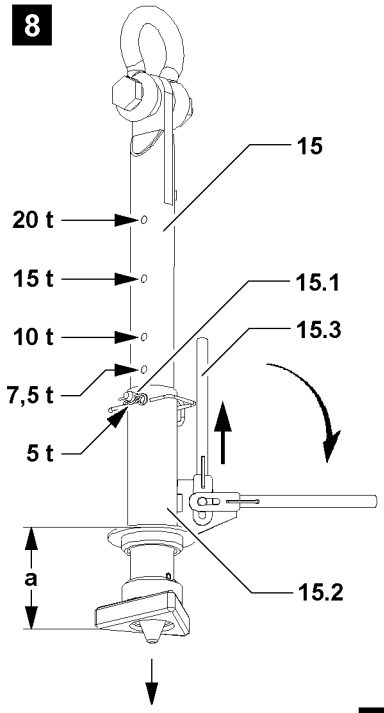
WARNING
Damaged counterweight plates!
Damage on the counterweight plates can cause the tackle to release!
The counterweight plates and components can fall down!
Personnel can be severely injured or killed!
▶ Do not use damaged counterweight plates and replace them immediately!

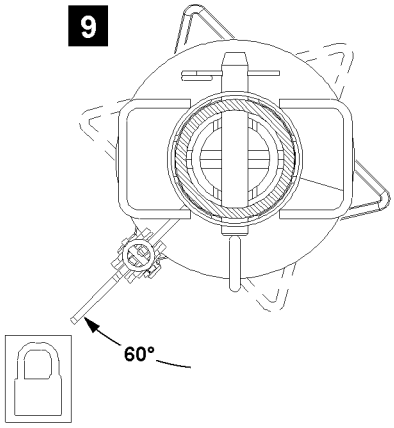
WARNING
Asymmetrical counterweight distribution!
If more than 20 t are asymmetrically placed / removed on the counterweight assemblies, the crane can topple over!
Personnel can be severely injured or killed!
▶ A weight difference between the right and left counterweight stack of more than 20 t is prohibited!
▶ Place / remove the counterweight assemblies alternately symmetrically on the left and right on the counterweight assembly!

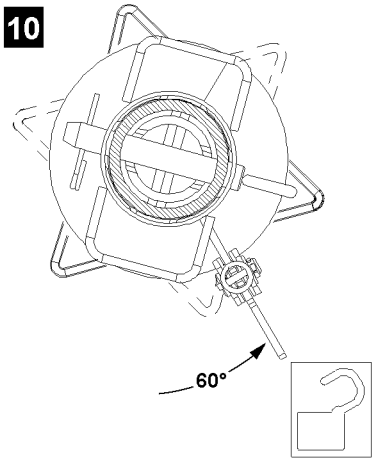
Note
▶ The counterweight plates are marked with their own weights!

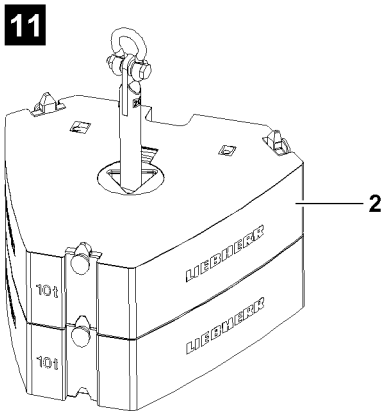
Ensure that the following prerequisite is met:
– The retaining chains are disassembled.

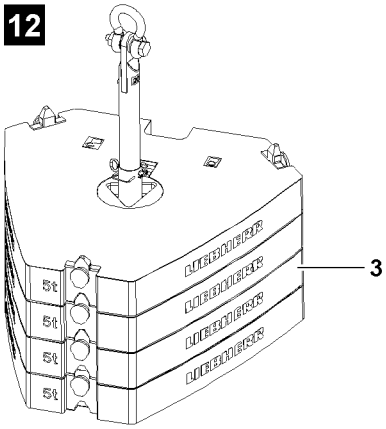
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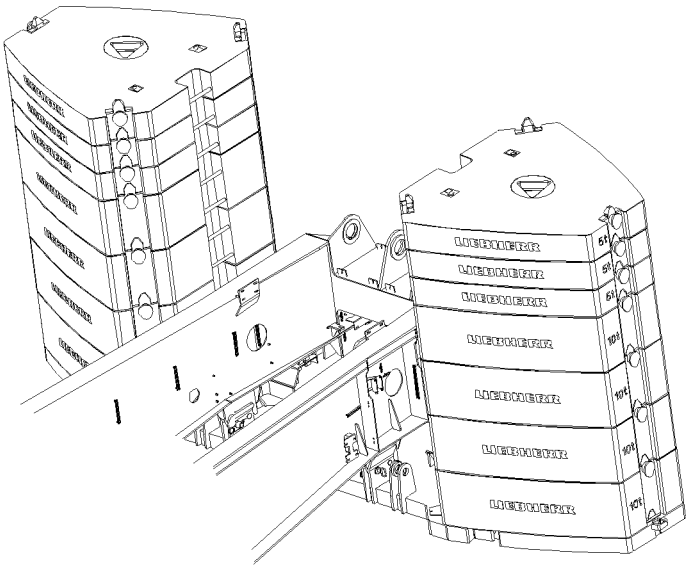












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5.2.1 Removing the counterweight plates, fastening system: “Twist lock”

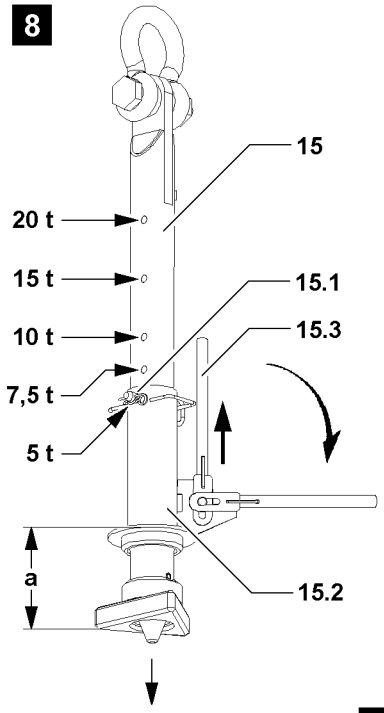
WARNING
Overload of receptacle stud and counterweight plates!
If more than the permissible number of counterweight plates are lifted with the receptacle stud **15**, the receptacle stud **15** and the counterweight plates can be overloaded and damaged!
Counterweight plates can fall down!
Personnel can be severely injured or killed!
▶ Observe the chart “Permissible counterweight assemblies” in this chapter!

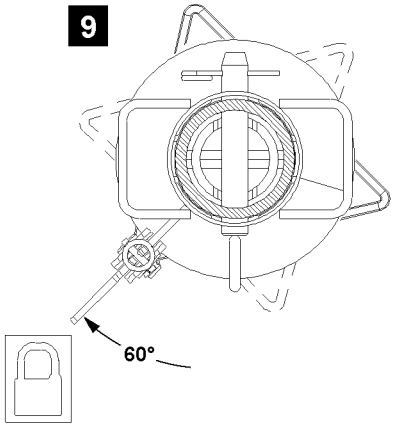
WARNING
Damage of receptacle stud and counterweight plates!
If two counterweight plates are lifted which do not lay correctly in their centerings, the receptacle stud **15** and the counterweight plates can be damaged!
Damage can cause the counterweight plates to fall down!
Personnel can be severely injured or killed!
▶ Make sure that the counterweight plates to be lifted are placed correctly in the centerings!

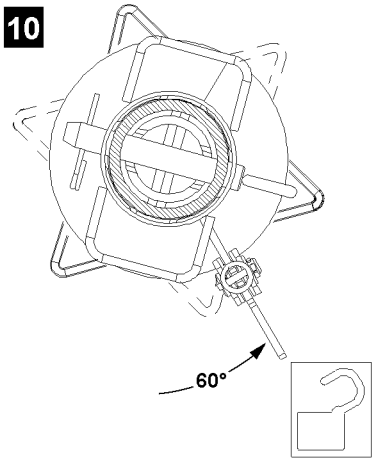
WARNING
The twist lock system opens by itself!
If the receptacle stud **15** is not correctly locked, the Twist lock system can open by itself!
Counterweight plates can fall down!
Personnel can be severely injured or killed!
▶ Make sure, when initiating a lift, that the lever points directly on the symbol “Locked”, illustration **9**!

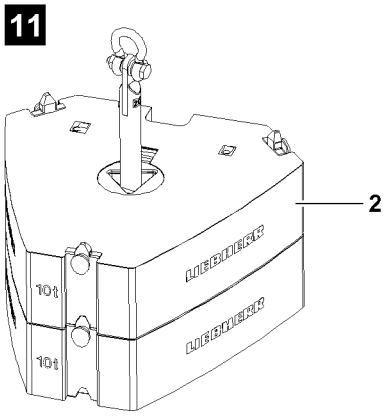
Note
▶ The counterweight plates are marked with their own weights!

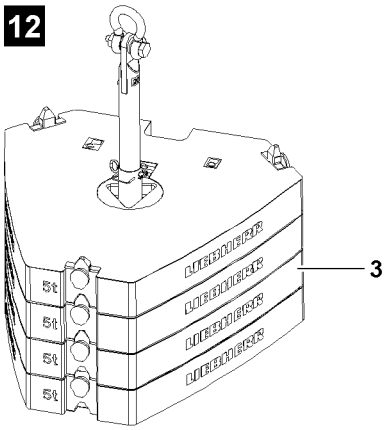
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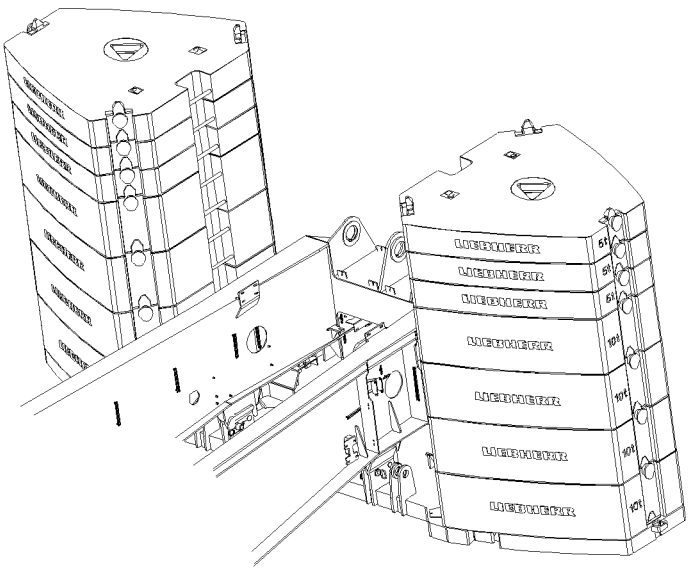












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Before the receptacle stud **15** is guided into the counterweight plates, it must be ensured that the insertion length **a** of the receptacle stud **15** is set correctly.
The insertion length **a** of the receptacle stud **15** for the counterweight plates can be adjusted by hand.

- ▶ If the insertion length **a** of the receptacle stud **15** is to be adjusted:
  Release and unpin the pins **15.1**.
- ▶ Adjust the insertion length **a** by moving the guide sleeve **15.2** to the desired insertion length **a**, observe the stages in illustration **8**.
- ▶ Pin in and secure pin **15.1**.

Result:

– The receptacle stud **15** is adjusted.

- ▶ Attach the receptacle stud **15** on the auxiliary crane and guide it into the counterweight plate(s).
- ▶ Pull up the lever **15.3** and fold it down.
- ▶ Turn the receptacle stud **15** with the lever **15.3** by 60° until it points to the symbol “Locked”, illustration **9**, of the counterweight plate.

Note

- ▶ The receptacle stud **15** is locked by lifting the counterweight plate(s)!

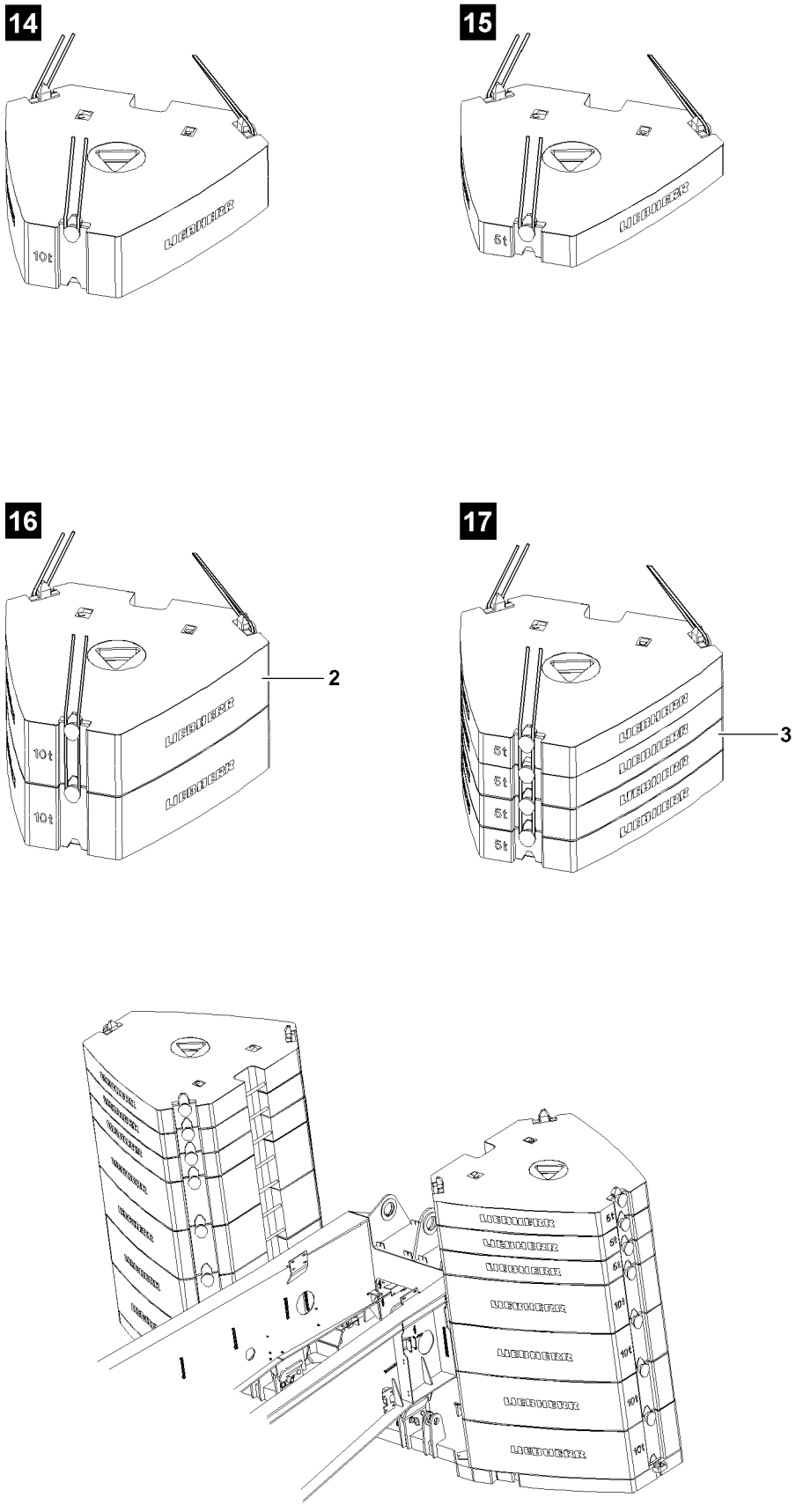
- ▶ Lift the counterweight plate(s) with the receptacle stud **15** and place them on a suitable storage location.
- ▶ When the counterweight plate(s) are placed down:
  Turn the receptacle stud **15** with the lever **15.3** by 60° to the stop in direction of the symbol “unlocked”, illustration **10**.

Result:

– The receptacle stud **15** is unlocked.

- ▶ Carefully pull the receptacle stud **15** from the counterweight plate.

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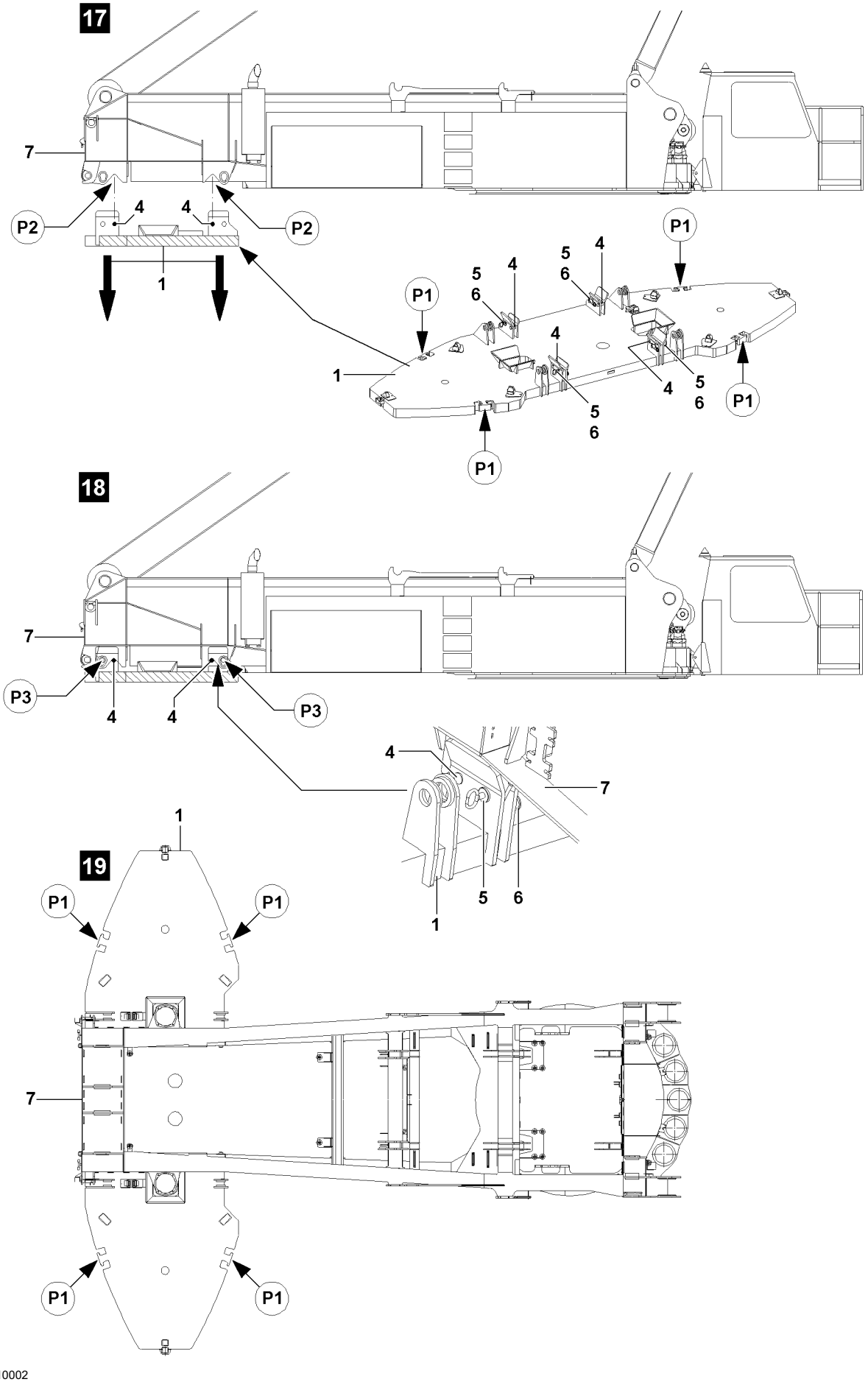
5.2.2 Removing the counterweight plates, attachment points: Bitt

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

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

▶ Attach the counterweight plate or the counterweight assembly on the auxiliary crane and place it down on a suitable storage location.

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5.3 Removing the base plate

Note

▶ The weight of the base plate is approx. 15 t!

▶ Attach the base plate **1** on the bitts **P1** to the auxiliary crane, fig. **19**.

▶ Tension the tackle carefully with the auxiliary crane until the base plate **1** is held safety by the auxiliary crane.

▶ Unpin the base plate **1** on the turntable **7**:
Remove the spring retainers **6** and unpin the pins **5** on the left and right on the base plate **1**, fig. **17**, fig. **18**.

▶ Lower the base plate **1** with the auxiliary crane from the turntable **7** and swing it out.

▶ When the base plate **1** on the turntable is removed:
Insert the pins **5** again and secure with spring retainer **6**.

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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.

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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!

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3 Crane movement - Telescoping

If the telescopic boom is telescoped, particularly with the auxiliary boom or telescopic boom extension, before the telescoping procedure, ensure that:

– The crane is properly supported and horizontally aligned.
– The telescopic boom is evenly warmed up by solar radiation.
– There is no strong side wind.



WARNING

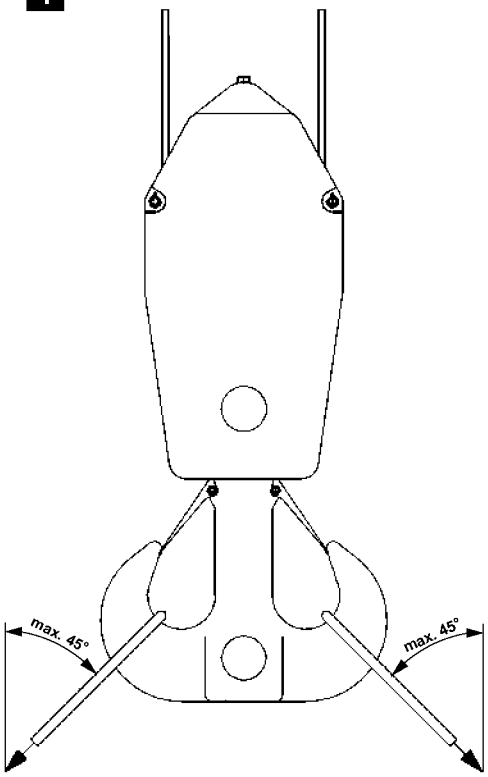
Damage of the telescopic boom or the hoist rope!

If these 3 factors are not adhered to, damage of the telescopic boom or the hoist rope can occur and lead to accidents!

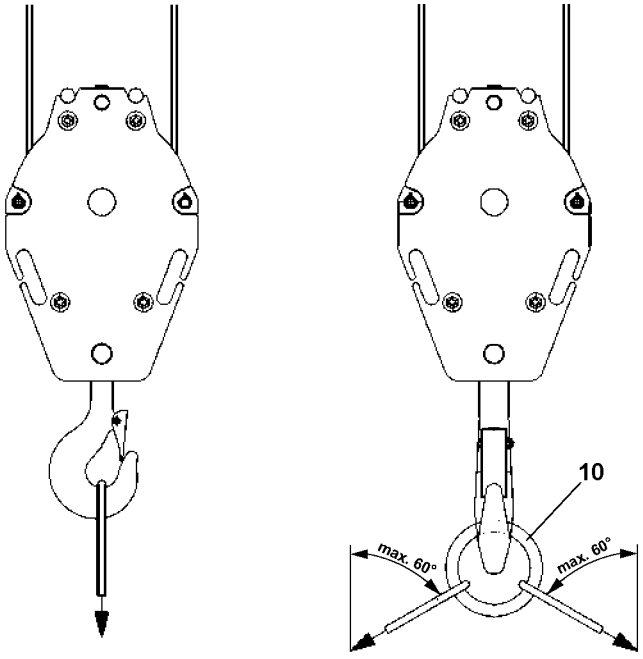
▶ Support the crane properly and align it horizontally!
▶ Keep both sides of the boom at about the same temperature!
▶ Telescope only to the permissible wind speed according to the load chart!
▶ If the actual wind speed is higher than the permissible wind speed noted on the load chart, telescoping is prohibited!

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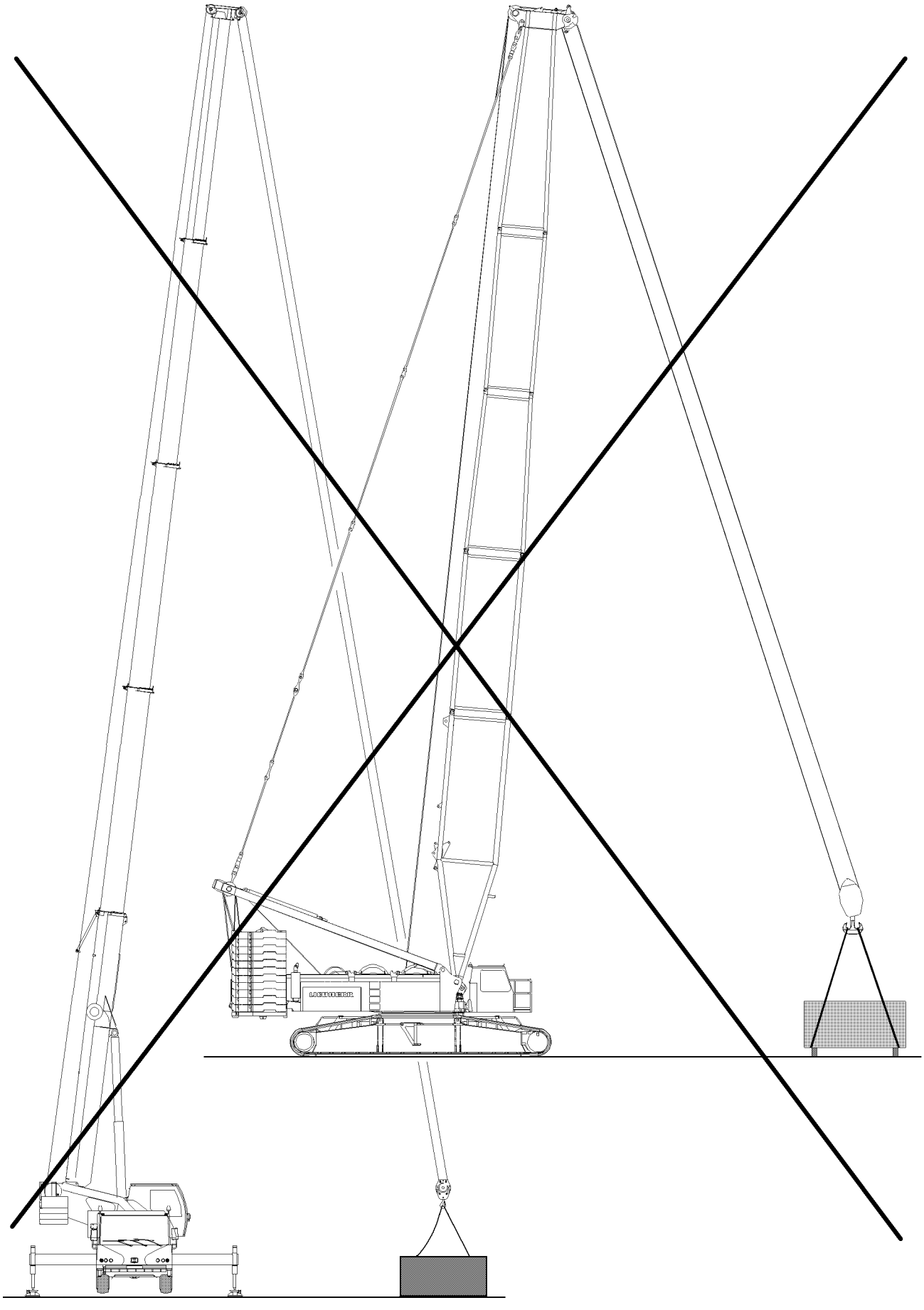
4 Taking on a load

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!

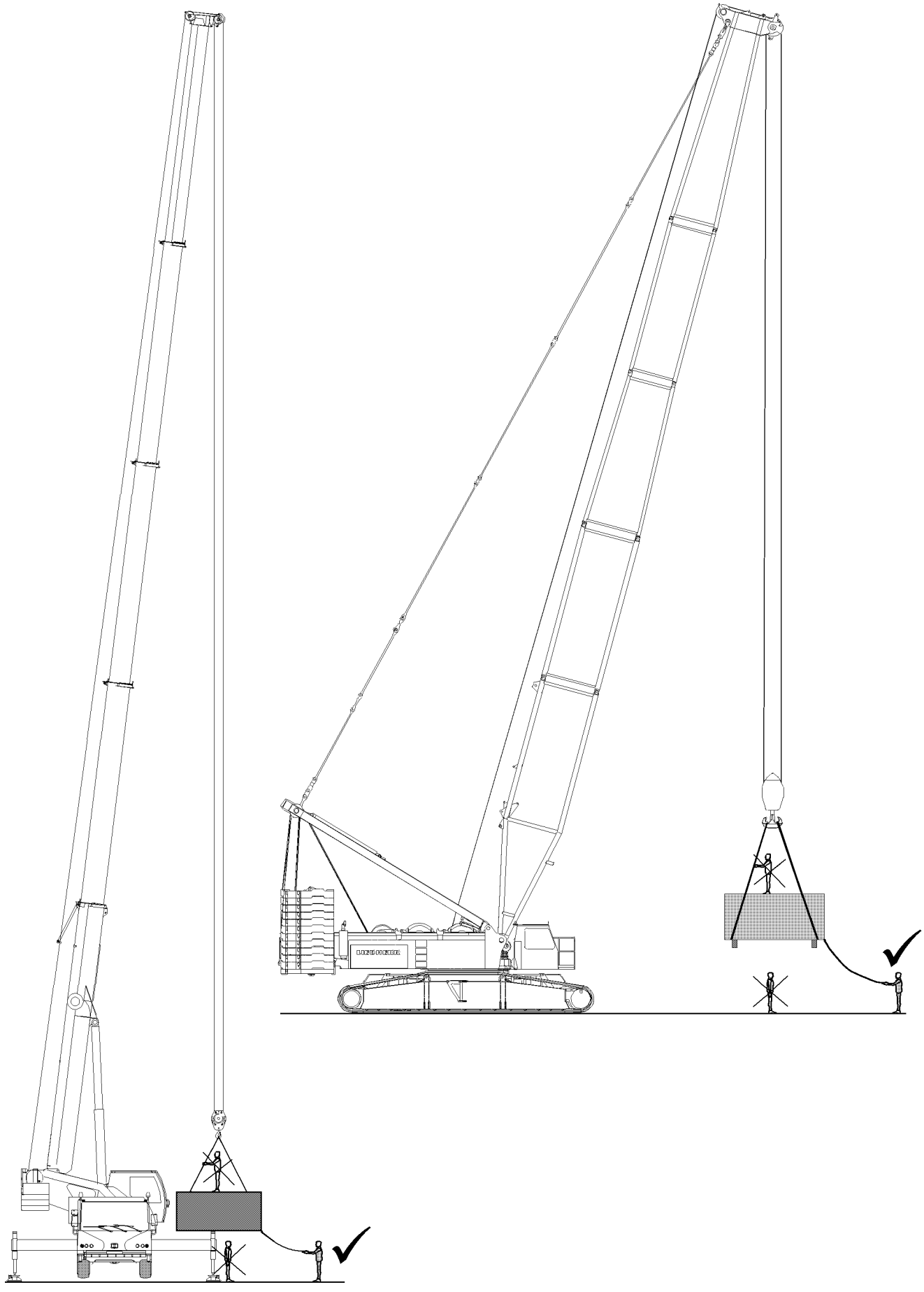
If the cable is manually attached to the load to be raised by an assistant:
- – Make sure that the assistant's hands are not crushed between the load and the cable by the tautly pulled ropes.
- – Make sure that the assistant's body parts (hands, legs etc.) are not crushed by a pendulum movement of the 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 prohibited!

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.

WARNING
Danger of accidents for cranes with luffing cylinders!
When the luffing cylinder is on block position, the overload protection is not functioning!
▶ Crane operation at block position of luffing cylinders is prohibited!

5.1 General

A suspended load must always be kept under control. A fundamental requirement for this is the safe and delicate control of the crane's functions.

WARNING
Risk of accident due to swaying loads!
A swaying load can damage the crane and cause it to topple!
▶ All crane movements must be executed slowly and delicately!
▶ Initiate all crane movements slowly!
▶ Apply the brakes slowly in all crane movements!
▶ Crane operation with swaying loads is prohibited!

NOTICE
Damage of rope pulleys!
▶ Place down hook blocks, 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!

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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

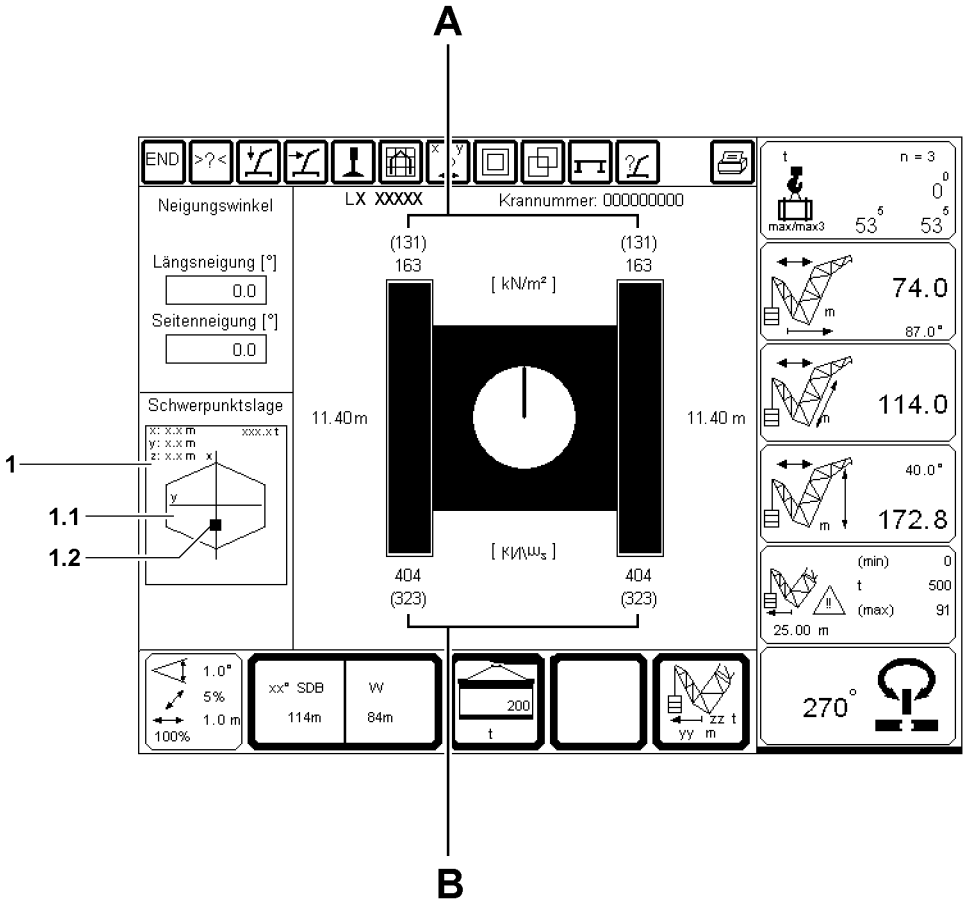
Vibration can be transmitted to the supporting steel structure of the crane during ram work or when pulling sheet piles with the crane. This vibration can cause premature fatigue of the material and therefore cracks in the supporting steel structure.

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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1 Prerequisites for crawler operation

WARNING
The crane can topple over!
If the following instructions are not observed, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Before driving the crane with the attachment, the optimum boom position must be determined with the aid of the job planner, to obtain as even a ground pressure as possible!
- ▶ The crane operator is responsible for the correct and complete data input on the job planner, for the respective equipment configuration of the crane and for the ground condition during crane application and while driving!
- ▶ When driving crawler cranes, it must be ensured that the ground can take on the ground pressures safely, which have been calculated with the job planner, over the entire intended travel route. If this cannot be ensured, the appropriate measured must be taken to be able to transfer the forced into the ground!
- ▶ An additional monitor, who is connected by radio contact with the crane operator must ensure that there are no persons or objects within the danger zone of the crane!

WARNING
Crane with narrow crawler track!
- ▶ When driving cranes with narrow tracks and corresponding equipment, special travel charts and danger notes must be observed and adhered to, see separate Manual “Driving with the equipment in place” Chapter 15.01 and Chapter 15.05!

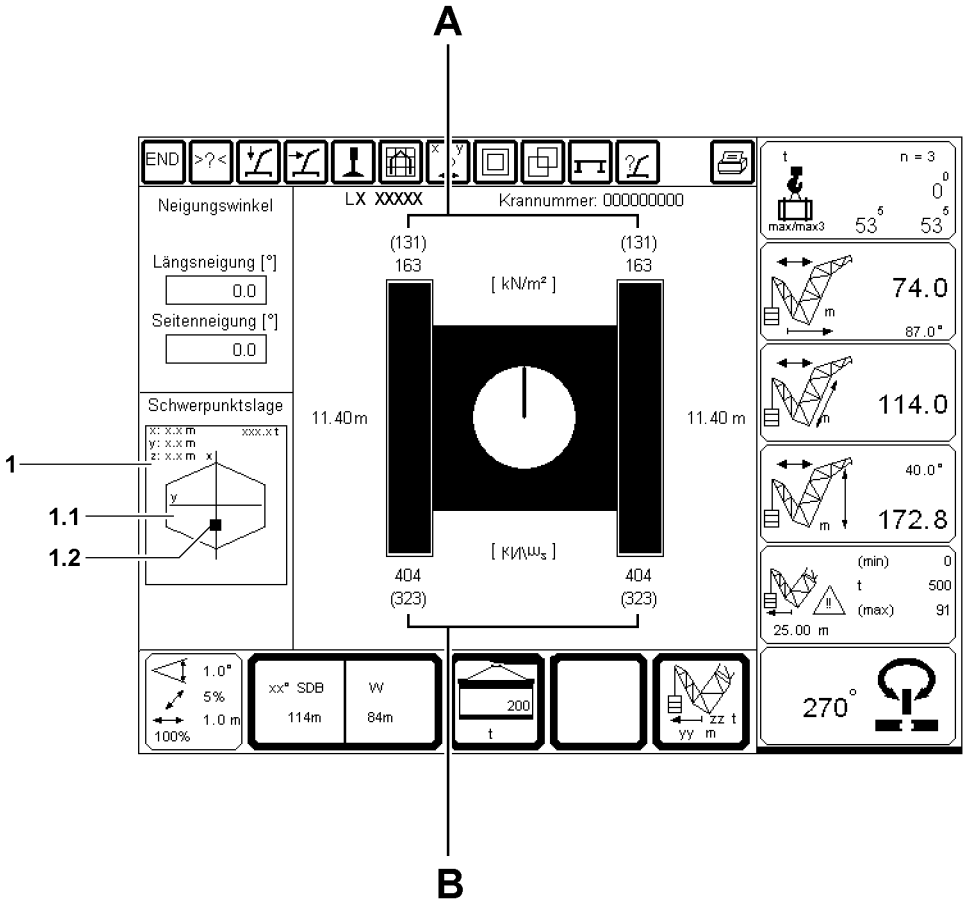
1.1 General prerequisites for driving of crawler cranes

WARNING
The crane can topple over!
If the turntable is not parallel to the crawler travel gear when driving the crane, the crawler crane can topple over!
- ▶ Make sure that the turntable is aligned parallel to the crawler travel gear in 0° or 180° position before driving the crawler crane!

Before driving on sloped terrain, it needs to be measured and a permissible equipment configuration on the crane must be established. If the display range of the inclinometer is not sufficient when driving uphill, then the actual incline can be determined with the aid of an angle sprit level. To determine the uphill angle, the angle spirit level must be placed in longitudinal direction on the slewing ring!

WARNING
The crane can topple over!
If the permissible inclines are exceeded, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Make sure that the permissible inclines are never exceeded!
- ▶ The crane operator is responsible for the adherence to the permissible inclines!

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1.1.1 For Australia, the following applies for driving crawler cranes:

Note

- In Australia, driving crawler cranes is only permitted with 66 percent of the respective nominal load, for that reason, the loads in the respective load chart must be multiplied with a calculation factor of 0.88!
- The crane operator bears the sole and full responsibility for the observation of national regulations!

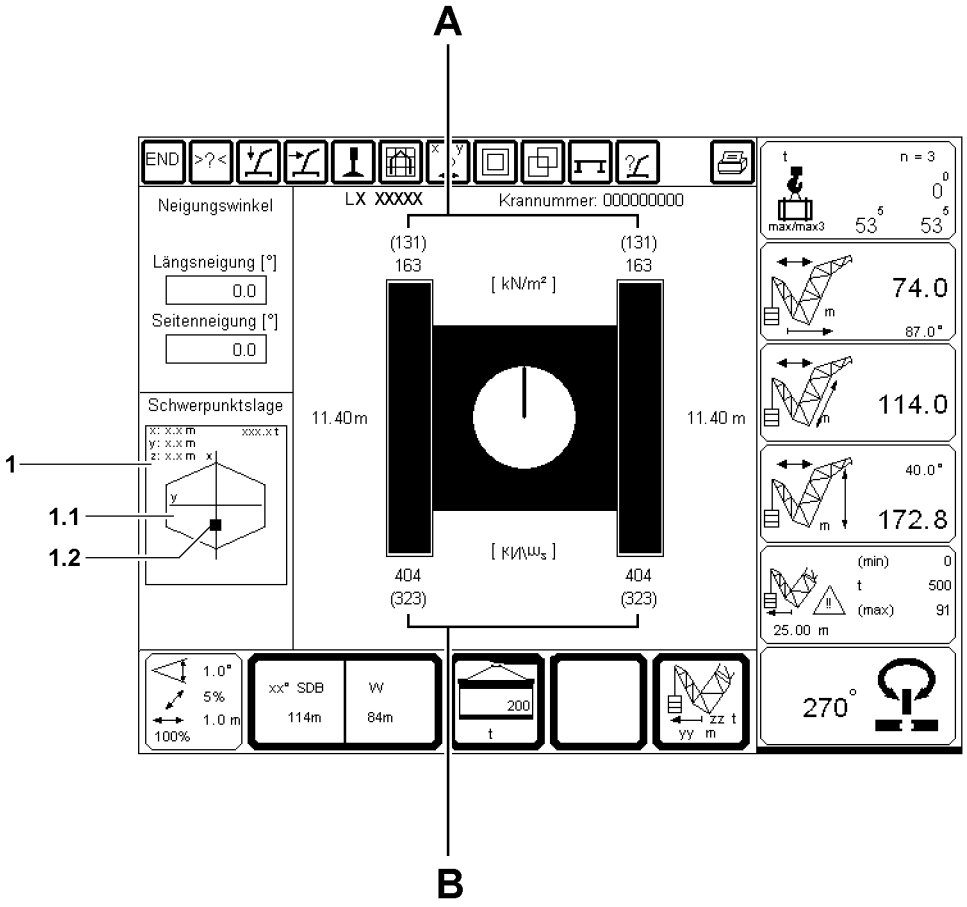
Driving crawler cranes with reduced load

Calculation formula

T_{V} [1] = $T_{ISO\ DIN}$ [2] * **0,88** [3]

1) T_{V} = maximum permissible, drivable load (= 66 percent of the nominal load) Valid only for Australia!
2) $T_{ISO\ DIN}$ = Standard load charts according to ISO DIN
3) **0.88** = Calculation factor

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1.1.2 Center of gravity display

Position	Description
1	Center of gravity display
1.1	Core surface
1.2	Center of gravity

WARNING
Center of gravity of the crane is outside the core area!
If the center of gravity **1.2** of the crane is outside the core area **1.1**, then the crane can topple over!
Personnel can be severely injured or killed!
- ▶ To drive the crane, the center of gravity **1.2** must always be within the core area **1.1**!
- ▶ If the center of gravity is outside the core area, then it is prohibited to drive the crane!

Note
- ▶ If the center of gravity **1.2** of the crane is within the core area **1.1**, then the center of gravity **1.2** is shown in green!
- ▶ If the center of gravity **1.2** of the crane is outside the core area **1.1**, then the center of gravity **1.2** is shown in red!

1.1.3 Distribution of the ground pressure

Note
- ▶ The boom must be luffed down before driving until the load is even distributed on the tracks!
- ▶ If the counterweight on the turntable is large, then it is required to position the boom in such a way that a suitable distribution of ground pressure for driving is obtained!

Note
For all driving conditions, the ratio between the front and rear or the rear and the front ground pressures should be greater than 0.3!
- ▶ A: B should be greater than 0.3!

A = maximum ground pressure of the track which has the lower load of the two tracks
B = maximum ground pressure of the track which has the higher load of the two tracks

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1.1.4 Steering ability

The steering ability depends on the following factors:

– Friction conditions under the chains
– Evenness of the ground:
  • Steering is not possible if the crawler track are only making contact with the ground at the front and rear.
– Load bearing capacity of the ground:
  • If the crawler tracks sink into the ground, then the steering ability is significantly restricted.
– Position of the total center of gravity:
  • If the total center of gravity - under consideration of the suspended load - is at the center of the crane, then steering is hard or not possible at all.

The steering ability can be improved by:

– Placing metal sheeting, sand, gravel, water underneath
– Through observation of the ground load bearing ability: Changing the position of the center of gravity by changing the radius

1.2 Prerequisites for driving with a load and / or derrick ballast

Note

▶ The permissible inclines from the load charts apply for driving with a load!
▶ Take the maximum permissible wind speed from the load charts!

Permissible inclines for driving with a load	
Overall incline	± 0.3°

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 (± 0.3°) and have adequate load bearing capacity!
▶ The ground must be able to safely take on the maximum occurring ground pressures!

WARNING

The crane can topple over!
If the crane is driven uphill with a load or derrick ballast, the crane can topple over!
Personnel can be severely injured or killed!

▶ Driving uphill with a load and / or derrick ballast is prohibited!

WARNING

The crane can topple over!
The crane can be driven with the given loads from the load charts, if the following prerequisites are met!
If the following prerequisites are not observed, the crane can topple over!
Personnel can be severely injured or killed!

▶ The maximum permissible travel speed of the crawler with load and / or derrick ballast may **not** exceed 0.05 m/s **or** 3 m/min **or** 0.18 km/h!

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- ▶ Steering the crawler with suspended load and / or installed derrick ballast is prohibited!
- ▶ Avoid jerky driving movements!
- ▶ Secure the suspended load to avoid oscillation!
- ▶ Lift the suspended ballast no more than maximum 250 mm off the ground!
- ▶ Luff the main boom up or down until a medium utilization is obtained on test point 1 (MS1)!

1.3 Prerequisites for driving without a load and without derrick ballast

Make sure that the following prerequisites are met:

- The maximum permissible oil fill quantity in the motor is present.
- The oil level in the hydraulic oil tank is lowered from the cylinders to the extent that an overflow is not possible.
- The contents of the fuel tank must be reduced so that an overflow is not possible.
- The maximum permissible wind speed of 9 m/s is not being exceeded.
- The travel speed may not exceed 0.4 m/s **or** 24 m/min **or** 1.44 km/h.
- The turntable is aligned parallel to the crawler track, 0° or 180° position.

Note

- ▶ The center of gravity for driving without a load must be constantly checked with the LICCON job planner!
- ▶ If the total center of gravity of the crane is within the core area **1.1** and the permissible inclines are observed, then the placement stability of the crane is ensured!
- ▶ By luffing the main boom up and down, the position of the center of gravity **1.2** must be corrected in such a way that the overall center of gravity remains within the core surface **1.1**!
- ▶ When driving the crane in terrain with a longitudinal and lateral slope, then the required boom position must be determined with the aid of the LICCON job planner via the position of the overall center of gravity, see section “Display of center of gravity”!

Permissible inclines for driving without a load	
Overall length of boom	**Maximum permissible lateral incline**
shorter/ equal to 96 m	± 3°
97 m to 150 m	± 2°

WARNING

The crane can topple over!

If the following conditions are not met when driving the crawler crane on a hill, then the crane can topple over!

Personnel can be severely injured or killed!

- ▶ The ground must be able to absorb the ground pressures which will occur!
- ▶ The friction coefficient between the roadway and the ground must be large enough to take on the occurring drive forces!
- ▶ Slippery ground can cause the crane to slip off to the side and therefore lead to an impermissible side slope position!
- ▶ The turntable must be parallel to the crawler carriers and secured to prevent it from turning!
- ▶ All movements and delay maneuvers must be initiated with extreme caution and at the least possible speed!

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- ▶ The transfer from the horizontal into an uphill slope and from the uphill slope into the horizontal must be made evenly, i.e.: There may be no edges which can cause the crane to topple over! The incline change must be made continuously!
- ▶ The ground pressures which will occur should be determined with the job planner before travel!
- ▶ The ground must be sufficiently load bearing and have sufficient traction to prevent the crane from slipping!
- ▶ The counterweight on the turntable must be secured with a chain, see chapter 4.07 of the Crane operating instructions!
- ▶ The center of gravity of the crane must lie within the core area **1.1** of the crane! The corresponding and permissible boom position for the respective equipment configuration must be determined with the job planner and with the help of the driving charts in the separate manual “Driving with the equipment in place”, chapter 15.05!

1.4 Prerequisites for driving on uphill slopes

1.4.1 Maximum climbing ability

The maximum climbing ability of the crawler crane is limited by the following criteria:

– The location of the center of gravity for the complete crawler crane
– The friction coefficient between roadway and track pads
– The transit between the horizontal and the incline
– The maximum uphill incline of 10° to a boom length of 150 m

1.4.2 Calculation of required length for transfers

Note

▶ The required length **L** for transfers results from the existing uphill angle **α** and the length of the crawlers **LC**!

Abbreviation	Description
L	Required length of transfers
α	Angle of uphill slope in degrees
LC	Length of crawlers between drive wheels and steering wheels

Calculation example

Given:
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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1.4.3 Prerequisites for driving under observation of the boom position

Note

- ▶ The illustrations in this section are only examples and may not match to your crane!
- ▶ The determining factor for driving uphill is the exact knowledge of the existing operational conditions on the jobsite and the ground pressures, permissible boom angles and inclines as well as the overall center of gravity which were determined from them with the job planner!

WARNING

The crane can topple over!

If the following note is not observed, the crane can topple over!

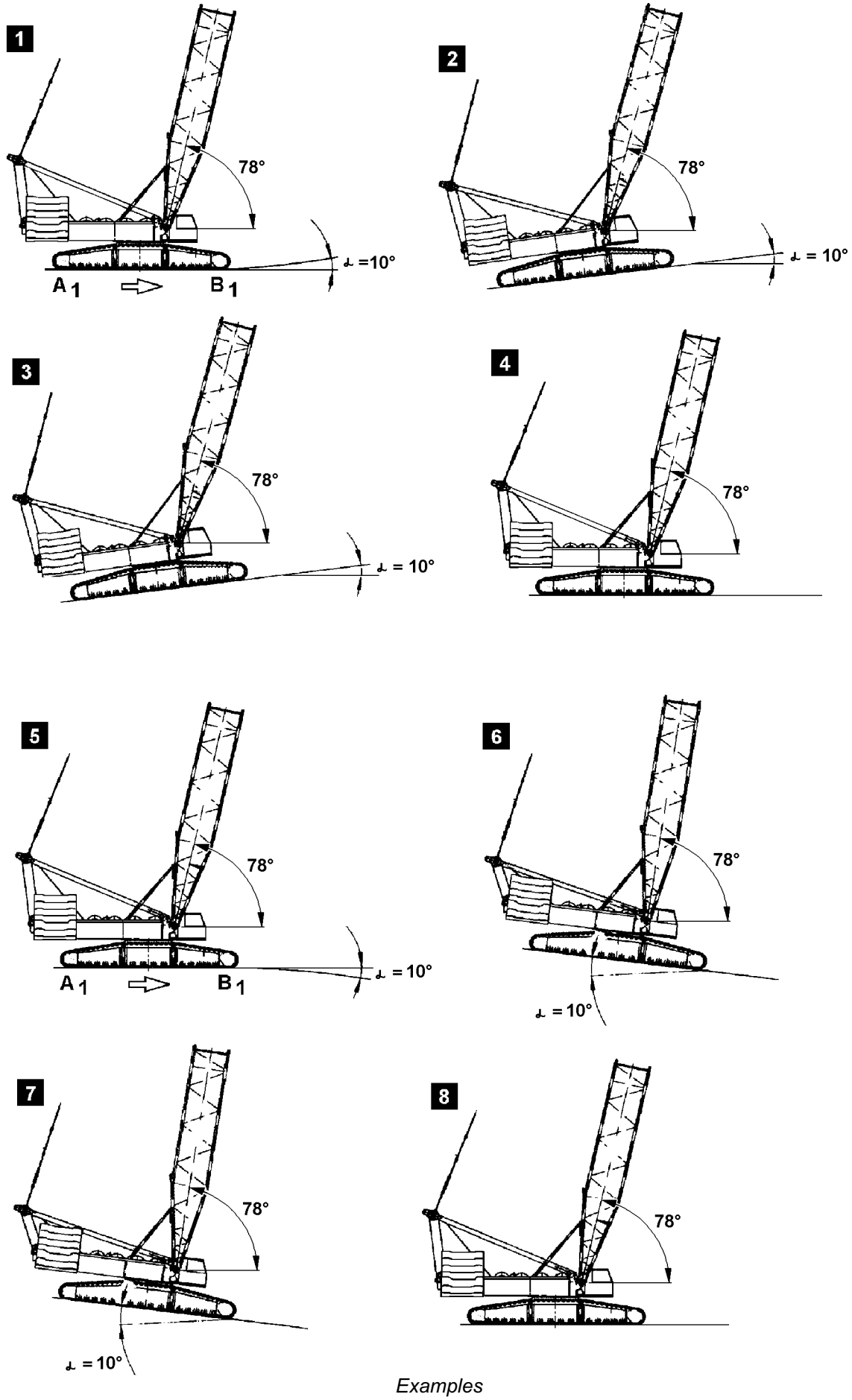
Personnel can be severely injured or killed!

- ▶ Driving uphill must always be anticipatory, with upmost caution and at the slowest speed!

There are two different possibilities to drive crawler cranes uphill (downhill):

– With main boom angle adjustment
– Without main boom angle adjustment

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Examples

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Prerequisites for driving on uphill slopes with boom angle adjustment

Note

- When driving into an uphill slope, during the transition between the horizontal into the incline, the original main boom angle must be changed continuously in such a way that the original main boom angle always remains between the main boom and the horizontal! This angle must be retained in the incline!
- When driving out of an uphill slope, during the transition between the incline into the horizontal, the original main boom angle must be changed continuously in such a way that the original main boom angle always remains between the main boom and the horizontal!
- In addition, the overall center of gravity of the crane must be observed!

WARNING

The crane can topple over!

If the crane is driven uphill with a load or derrick ballast, the crane can topple over!

If the main boom angle is not matched to the incline when driving the crane in uphill slopes, then the crane can topple over!

Personnel can be severely injured or killed!

- Driving uphill with a load and / or derrick ballast is prohibited!
- Match the main boom angle to the incline!

Positive length incline **(illustration 1 to 4)**

Note

- When driving in positive length inclines (uphill slopes), the main boom must be luffed down continuously - maximum by the **incline angle α**!

Illustration	State	Transition	Main boom angle
1	Driving on level ground (horizontal)	after uphill incline	match
2	Driving in uphill incline		
3	Driving in uphill incline	after horizontal	match
4	Driving on level ground (horizontal)		

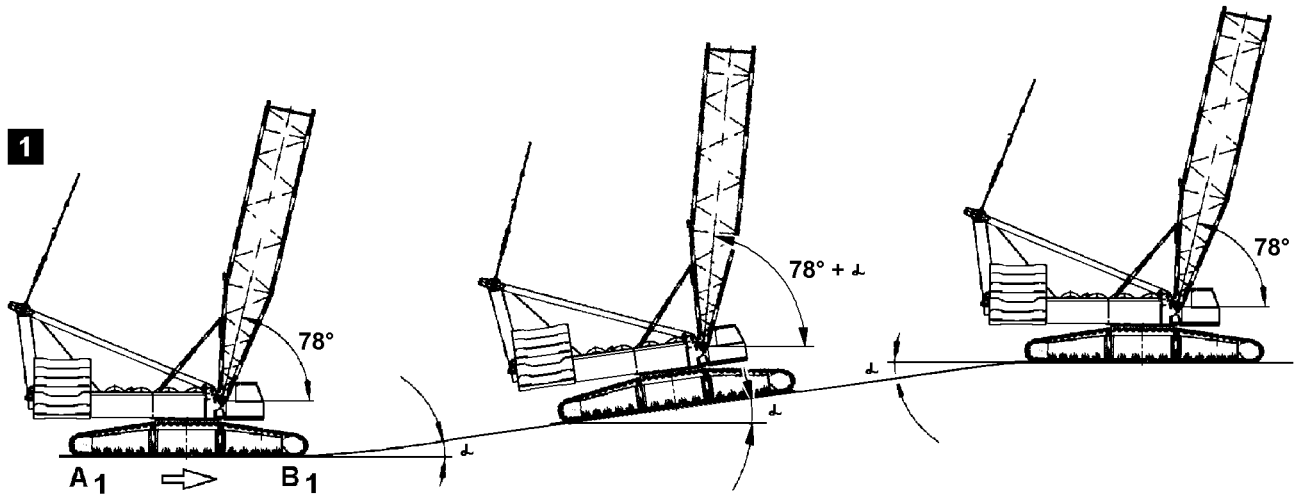
Negative length incline **(illustration 5 to 8)**

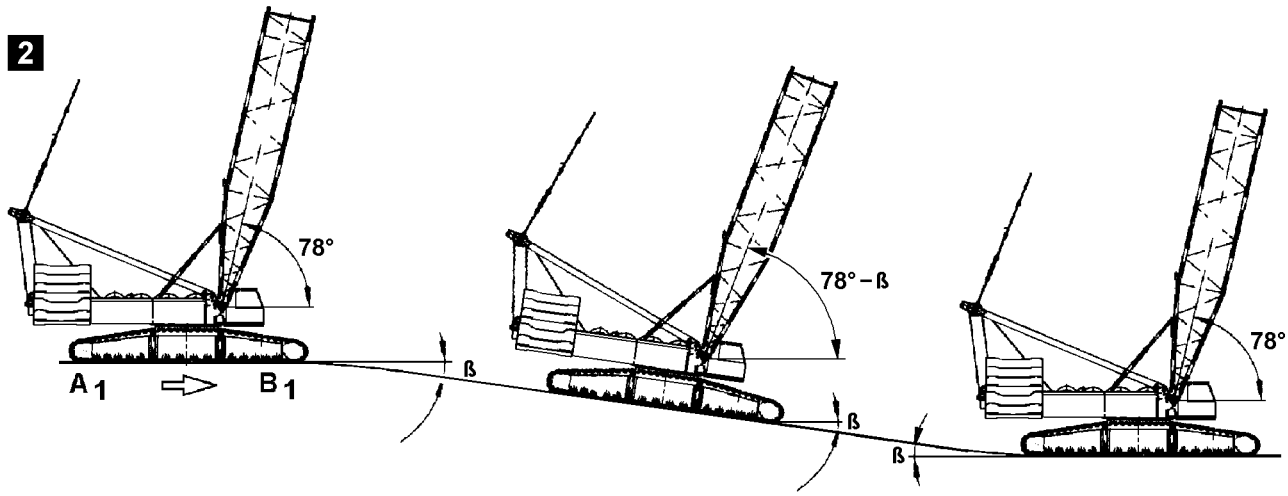
Note

- When driving in negative length inclines (downhill slopes), the main boom must be luffed up continuously - maximum by the **incline angle α**!

Illustration	State	Transition	Main boom angle
5	Driving on level ground (horizontal)	after downhill slope	match
6	Driving downhill		
7	Driving downhill	after horizontal	match
8	Driving on level ground (horizontal)		

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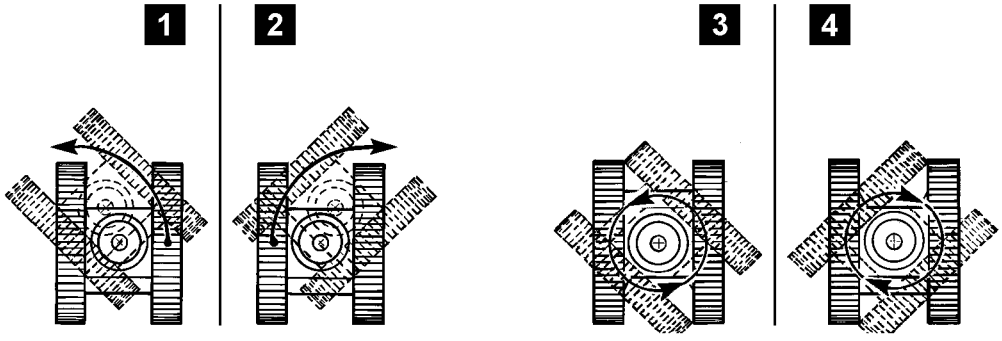
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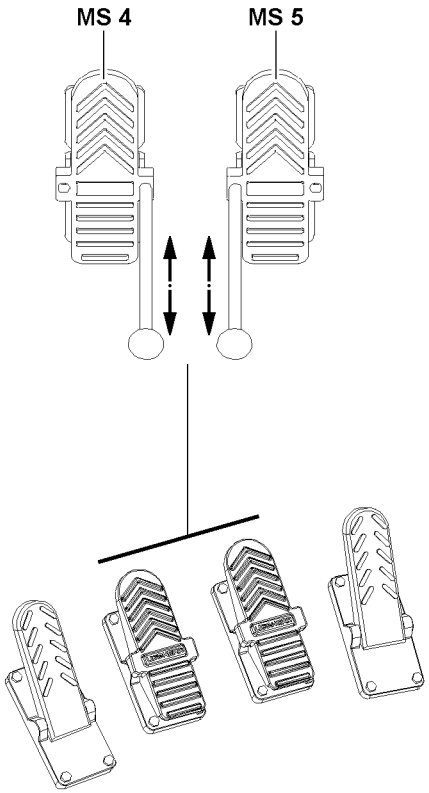
Prerequisites for driving on uphill slopes without boom angle adjustment

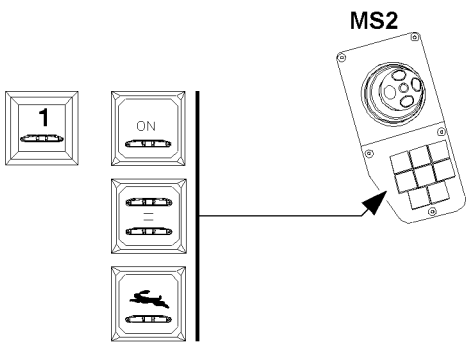
WARNING
The crane can topple over!
If the overall center of gravity of the crane is outside the core area when driving on inclines without main boom angle adjustment, then the crane can topple over!
Personnel can be severely injured or killed!

- ▶ Before driving into uphill or downhill slopes, check the change of the center of gravity with the job planner!
- ▶ To be able to approximately determine the changes of the center of gravity in uphill slopes with the job planner, the main boom angle must be increased by the incline angle αwhen driving in inclines, illustration **1**!
- ▶ To be able to approximately determine the changes of the center of gravity in downhill slopes with the job planner, the main boom angle must be decreased by the incline angle **ß** when driving in downhill slopes, illustration **2**!
- ▶ Before driving the crane, determine exactly with the job planner if the crane may drive on the intended route without changing the main boom angle!
- ▶ If the intended incline cannot be driven without changing the main boom angle, then the main boom angle must be changed to be able to drive on the incline!

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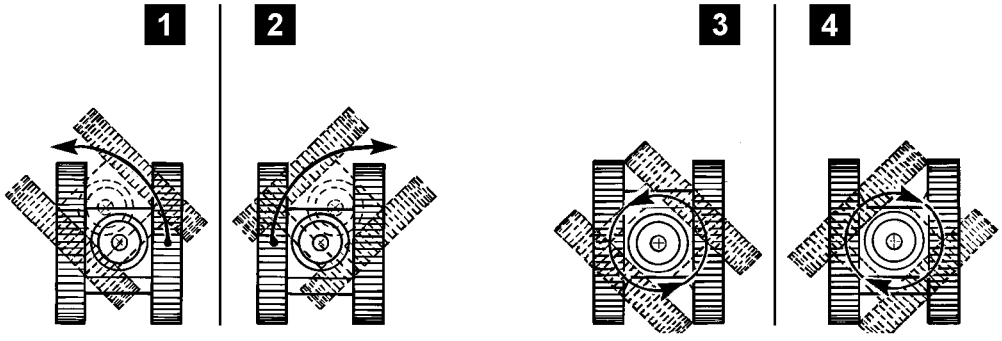
2 Driving the crawler crane

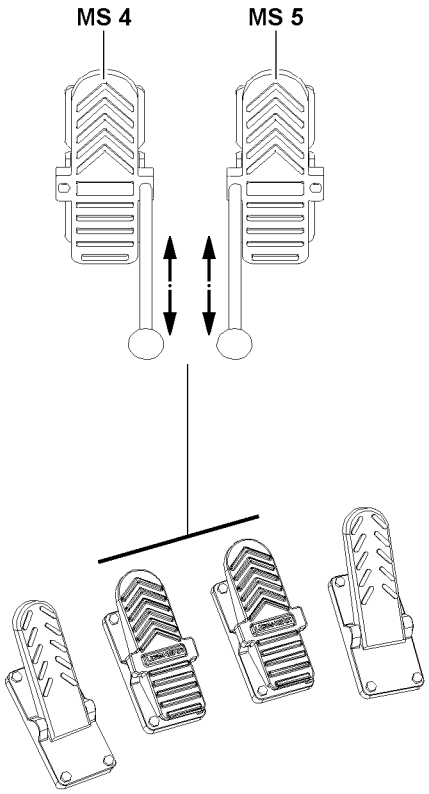
WARNING
The crane can topple over!
When driving the crane - this also applies for “circular travel” - and the ballast trailer is raised due to ground unevenness, the force on test point 1 **MS1** (F1) increases very quickly and the crane will be overloaded!
If the ballast trailer sinks while driving due ground unevenness, the force on test point 1 **MS1** (F1) drops and the ballast trailer lifts off the ground, or the entire boom system is pulled backward!
There is no LMB shut off!
The crane can topple over and personnel can be severely injured or killed!
- ▶ The crane operator must constantly observe the displays on the LICCON monitor while driving the crawler crane!
- ▶ The crane operator must correct the force changes on test point 1 **MS1** (F1) to a permissible operating range already when an advance warning occurrence on the LICCON monitor is issued by actuating the pull cylinder in the derrick ballast guying!

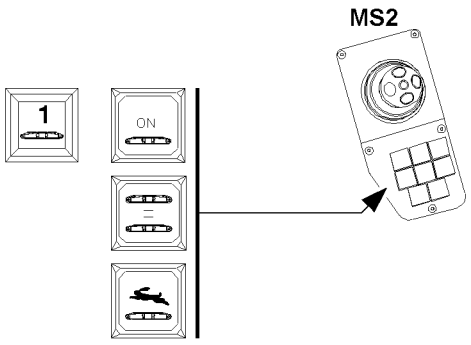
WARNING
The crane can topple over!
If the following instructions are not observed, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Before driving the crane with the attachment, the optimum boom position must be determined with the aid of the job planner, to obtain as even a ground pressure as possible!
- ▶ When driving crawler cranes, it must be ensured that the ground can take on the ground pressures, which have been calculated with the job planner, over the entire intended travel route. If this is not the case, appropriate measures must be taken to be able to discharge the forces into the ground!
- ▶ An additional monitor, who is connected by radio contact with the crane operator must ensure that there are no persons or objects within the danger zone of the crane!

Ensure that the following prerequisite is met:
– The crane engine is running.

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2.1 Operating elements for the crawler operation

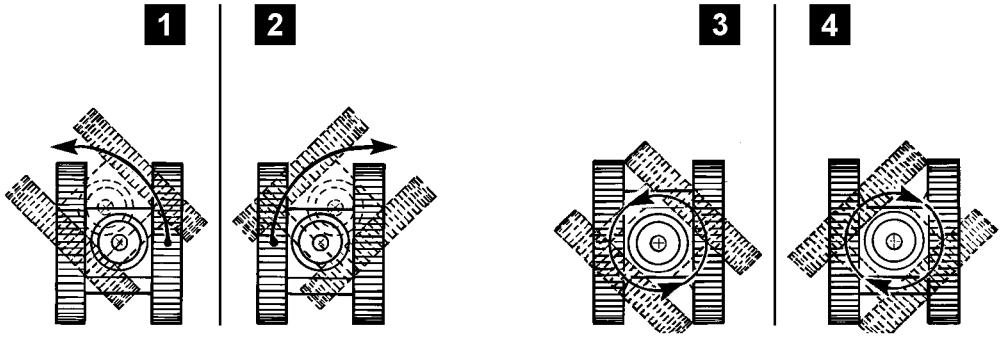
2.1.1 Pedal carrier

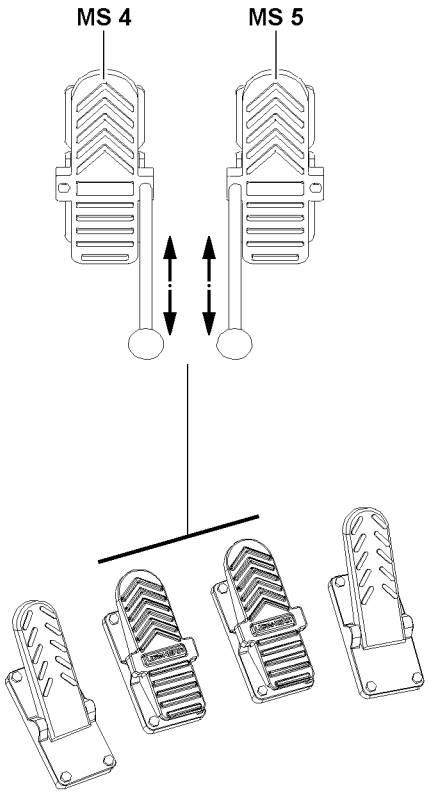
	Pedal carrier (Pedal assignment, see opposite illustration)			
	 *Pedal*	 *Foot rocker **MS 4***	 *Foot rocker **MS 5***	 *Pedal*
Function:	Slewing gear brake	Crawler travel “left”	Crawler travel “right”	Engine regulation:
	Note: Refer also to chapter 4.01 and chapter 4.05 of the Crane operating instructions.			

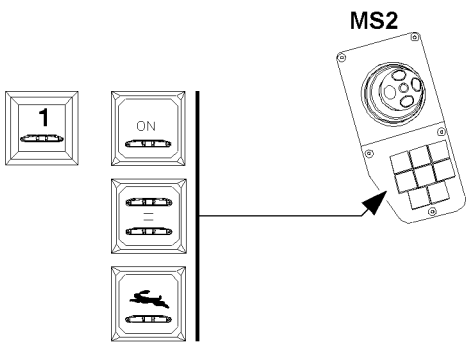
2.1.2 Switch for crawler operation

	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 light in the switch “Rapid gear” is off.

▶ Actuate the switch “Crawler operation”.

Result:
– The creeper gear is active.

2.3.2 Turning the rapid gear on

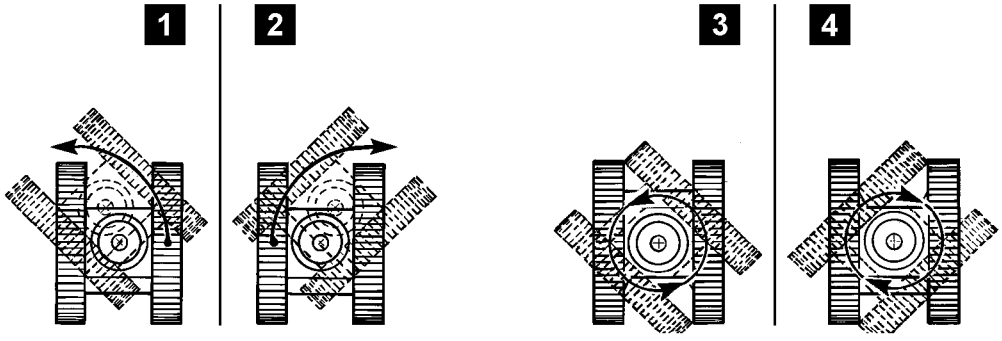
WARNING
The crane can topple over!
If the crane is driven in rapid gear with a load or derrick ballast, then the crane can topple over!
Personnel can be severely injured or killed!
▶ Travel with a load or derrick ballast in rapid gear is prohibited!

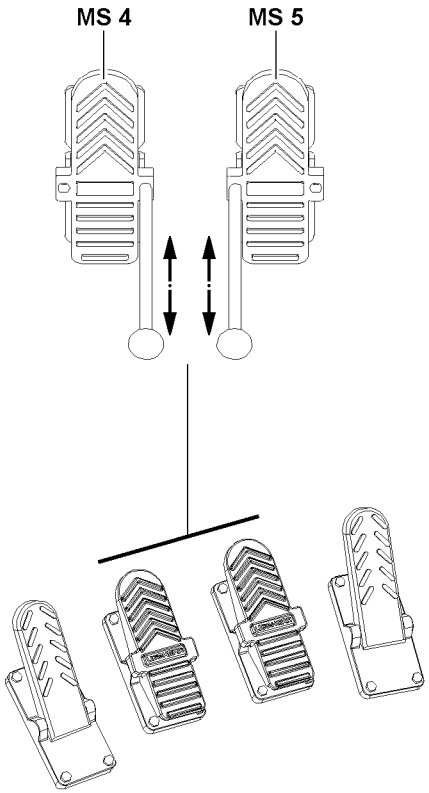
Make sure that the following prerequisites are met:
– The switch “Parallel travel” is not actuated.
– The indicator light in switch “Parallel travel” is off.
– The creeper gear is active.

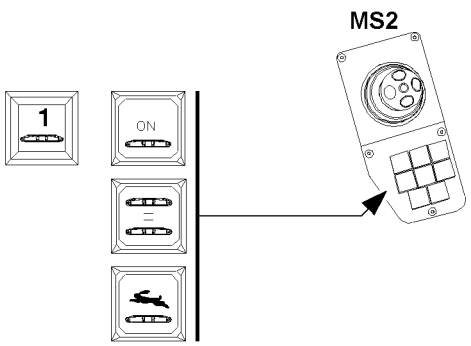
▶ To select speed stage 2:
Actuate the switch “Rapid gear”.

Result:
– The rapid gear is activated.
– The indicator light in the switch “Rapid gear” lights up.

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2.4 Driving the crawler

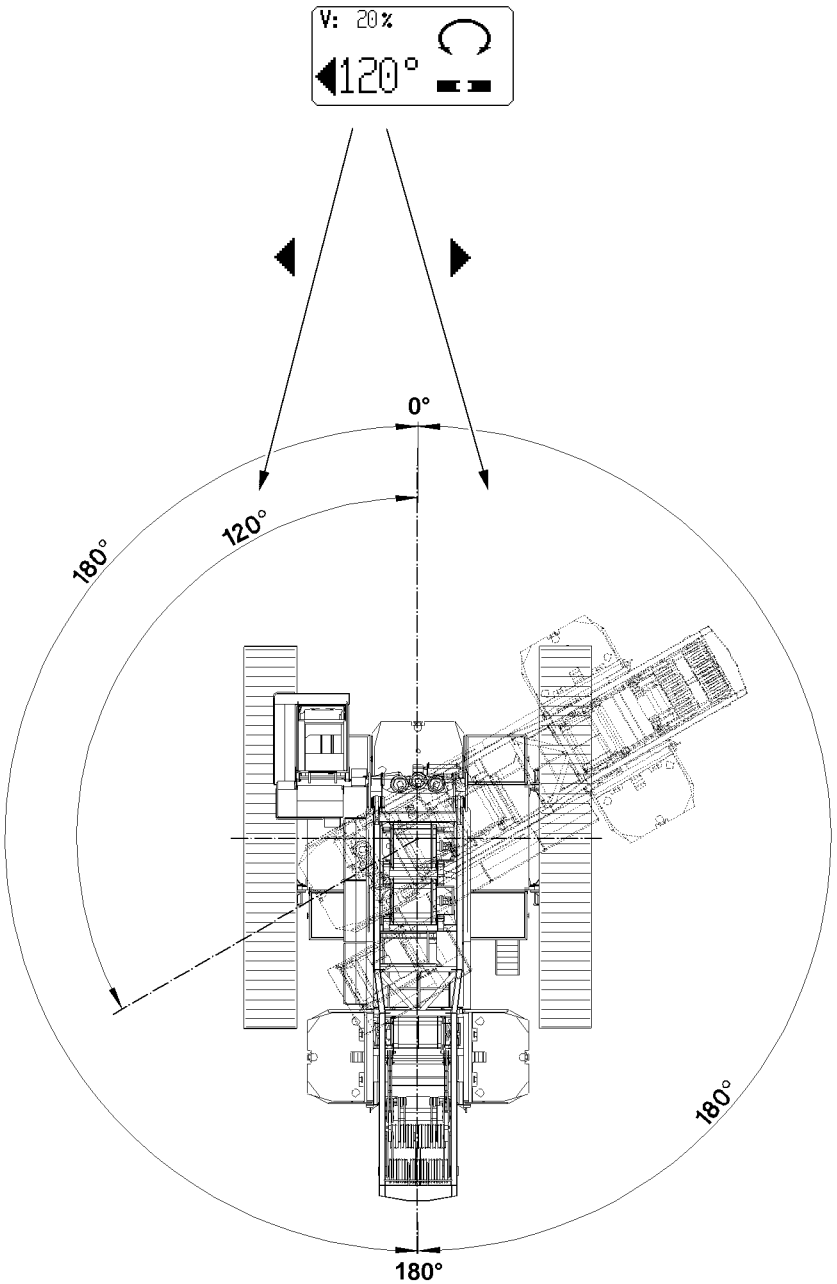
WARNING
The crane can topple over!
If the crane is driven in rapid gear with a load and / or derrick ballast, then it can topple over!
Personnel can be severely injured or killed!
- ▶ Travel with a load and / or derrick ballast in rapid gear is prohibited!
- ▶ The maximum permissible travel speed of the crawler with load and / or derrick ballast may not exceed 0.05 m/s or 3 m/h or 0.18 km/h!
- ▶ Steering the crawler with suspended load and / or installed derrick ballast is prohibited!

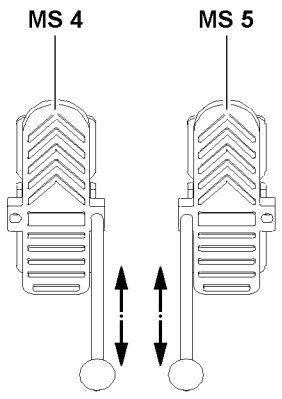
WARNING
Personnel present in danger zone!
Personnel within the danger zone of the crane can be severely injured or killed!
- ▶ An additional monitor, who is connected by radio contact with the crane operator must ensure that there are no persons or objects within the danger zone of the crane!
- ▶ The observer may not remain in the crane danger zone!

Note
- ▶ Take the manual level from the transport retainer in the crane operator's cab!
- ▶ The technical design of the manual lever is completely identical. The differentiation of the two manual levers is only in their assignment to the corresponding foot rockers 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 Changing the travel direction

Note

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

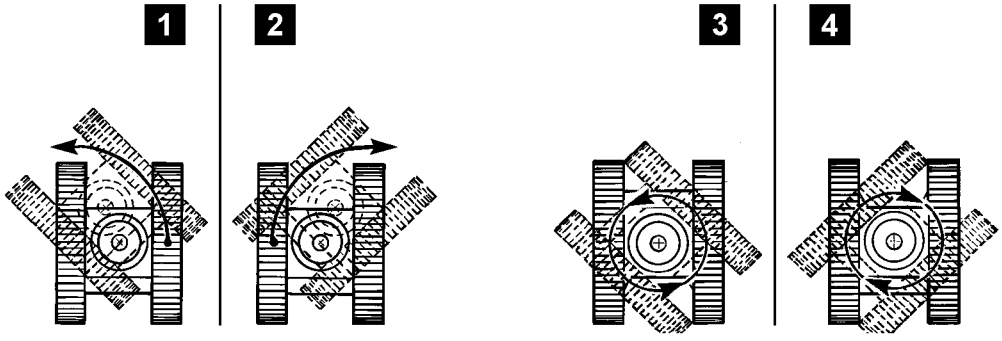
The travel direction relates to the position of the crane superstructure:

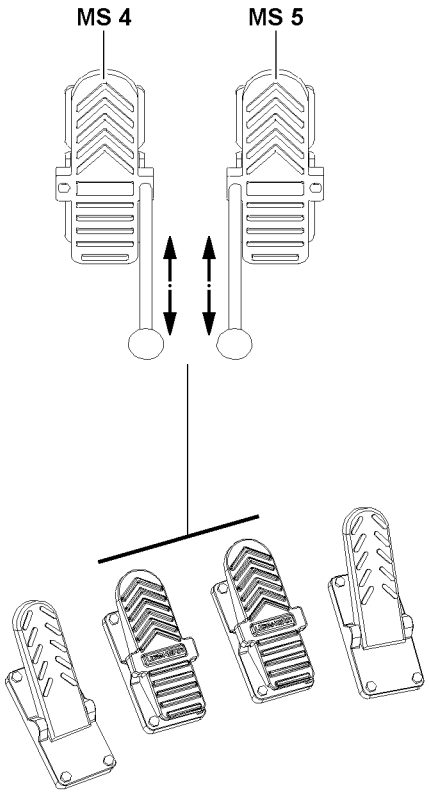
– If the crane superstructure is turned past 90°, then the “forward / reverse” travel direction changes.

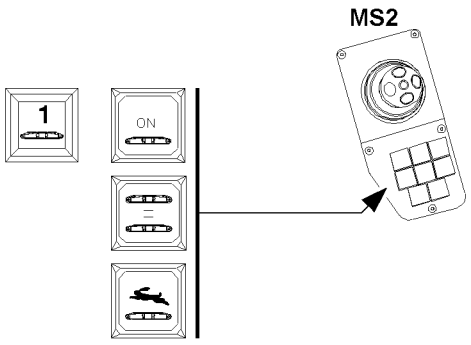
– If the crane superstructure with actuated foot rocker **MS 4** or foot rocker **MS 5** is turned past 90°, then the travel direction remains until the corresponding foot rocker / manual control lever is “returned” to neutral position.

  This means the new travel direction becomes active only if the corresponding foot rocker / manual control lever is no longer actuated.

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2.4.2 Driving the crawler forward and backward

The tracks can be operated with the foot rockers:
– Crawler track left: Foot rocker **MS4**
– Crawler track right: Foot rocker **MS5**

Alternatively, a manual lever can be installed (inserted) on the foot rocker **MS4** and the foot rocker **MS5** in order to control the travel movements of the crawler precisely.

Driving the crawler forward

▶ Push the right foot rocker **MS5** forward.

or

■ Move the manual lever on the foot rocker **MS5** forward.

Result:
– The right track moves forward.

▶ Push the left foot rocker **MS4** forward.

or

■ Move the manual lever on the foot rocker **MS4** forward.

Result:
– The left track moves forward.

Move the crawler backward

▶ Push the right foot rocker **MS5** back.

or

■ Move the manual lever on the foot rocker **MS5** backward.

Result:
– The right track moves backward.

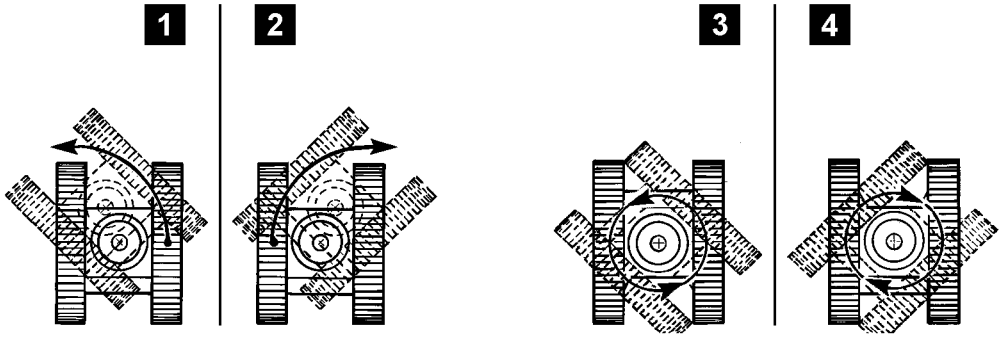
▶ Push the left foot rocker **MS4** back.

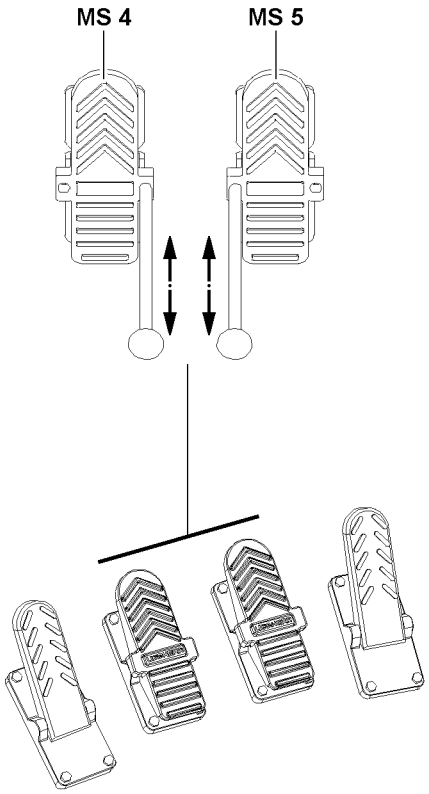
or

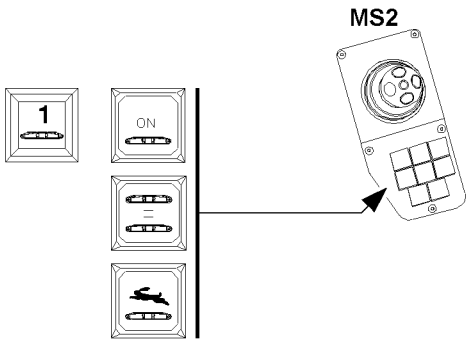
■ Move the manual lever on the foot rocker **MS4** backward.

Result:
– The left track moves backward.

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2.4.3 Activating parallel travel

If “parallel travel” is added, both tracks are simultaneously controlled by pressing down on foot rocker **MS4** or foot rocker **MS5**. The foot rocker, which is actuated first serves as the control for both crawler tracks. This makes 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:

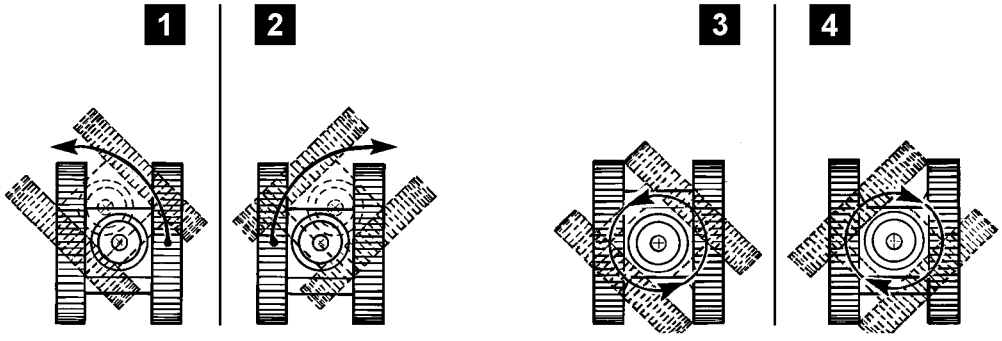
– Rapid gear is deactivated: The indicator lights in switch “rapid gear” is off.

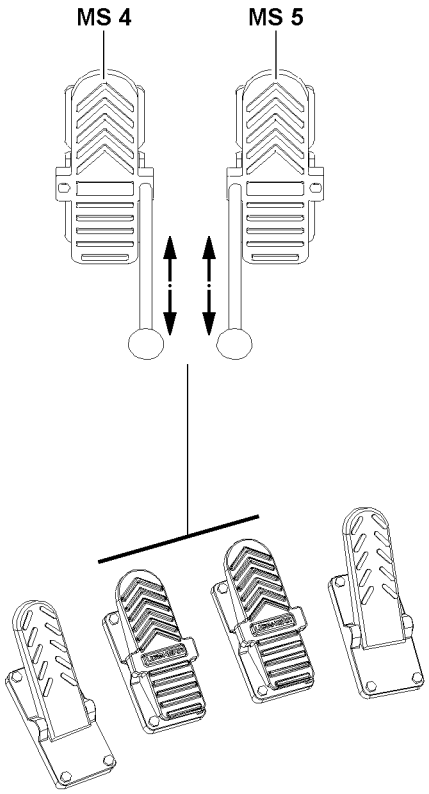
▶ Actuate the switch “parallel travel”.

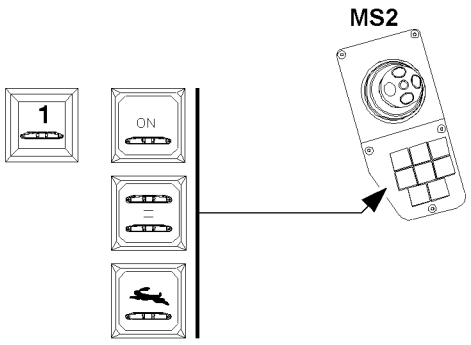
Result:

– 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!
▶ When steering the crawler, always activate the slewing gear coasting!

WARNING
The crane can topple over!
If the crawler chain sags on uneven ground, then the centering cams of the track pads can no longer be centered and guided sufficiently in the track rollers!
The centering cams will be damaged and the chain can jump out of its guide!
Personnel can be severely injured or killed!
▶ Stop steering movements immediately!
▶ Drive straight forward until all centering cams are centered again!
▶ When possible, retension the crawler chain, see chapter 7.04 of the Crane operating instructions!

WARNING
The crane can topple over!
When steering in small radii or when steering in counterrotation, the crawler tracks can “dig” into the ground and cause the crane to topple over!
Personnel can be severely injured or killed!
▶ Steer the tracks in as large a radius as possible!
▶ Avoid counterrotation!

Steering the tracks to the left

See illustration **1**.
▶ Push the right foot rocker **MS5** forward.

or

■ Move the manual lever on the foot rocker **MS5** forward.

Steering the tracks to the right

See illustration **2**.
▶ Push the left foot rocker **MS4** forward.

or

■ Move the manual lever on the foot rocker **MS4** forward.

Counter rotating the tracks to the left

See illustration **3**.
▶ Push the right foot rocker **MS5** forward and the left foot rocker **MS4** backward.

or

■ Move the manual lever on the foot rocker **MS5** forward and move the foot rocker **MS4** backward.

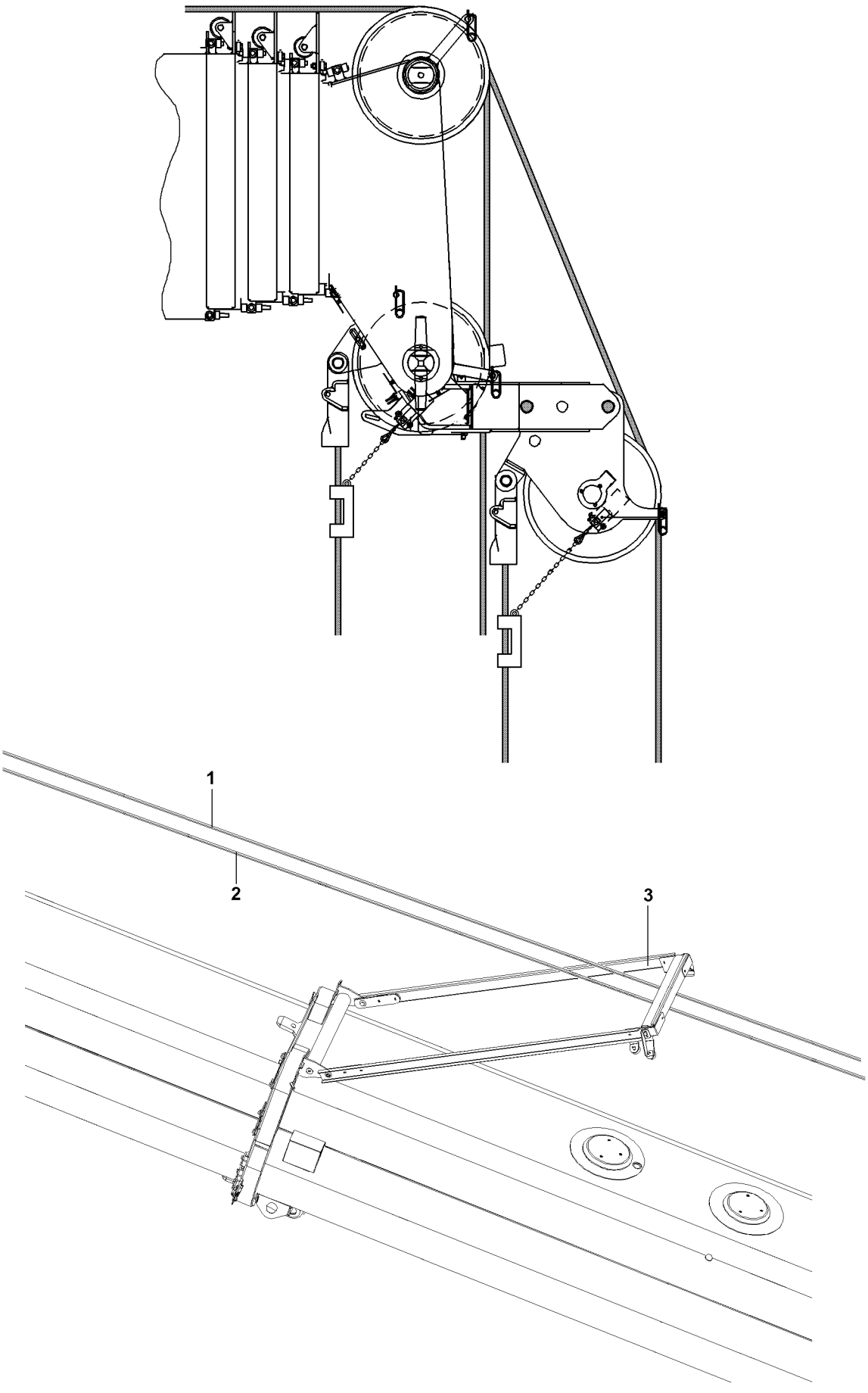
Counter rotating the tracks to the right

See illustration **4**.
▶ Push the left foot rocker **MS4** forward and the right foot rocker **MS5** backward.

or

■ Move the manual lever on the foot rocker **MS4** forward and move the foot rocker **MS5** backward.

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1 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.

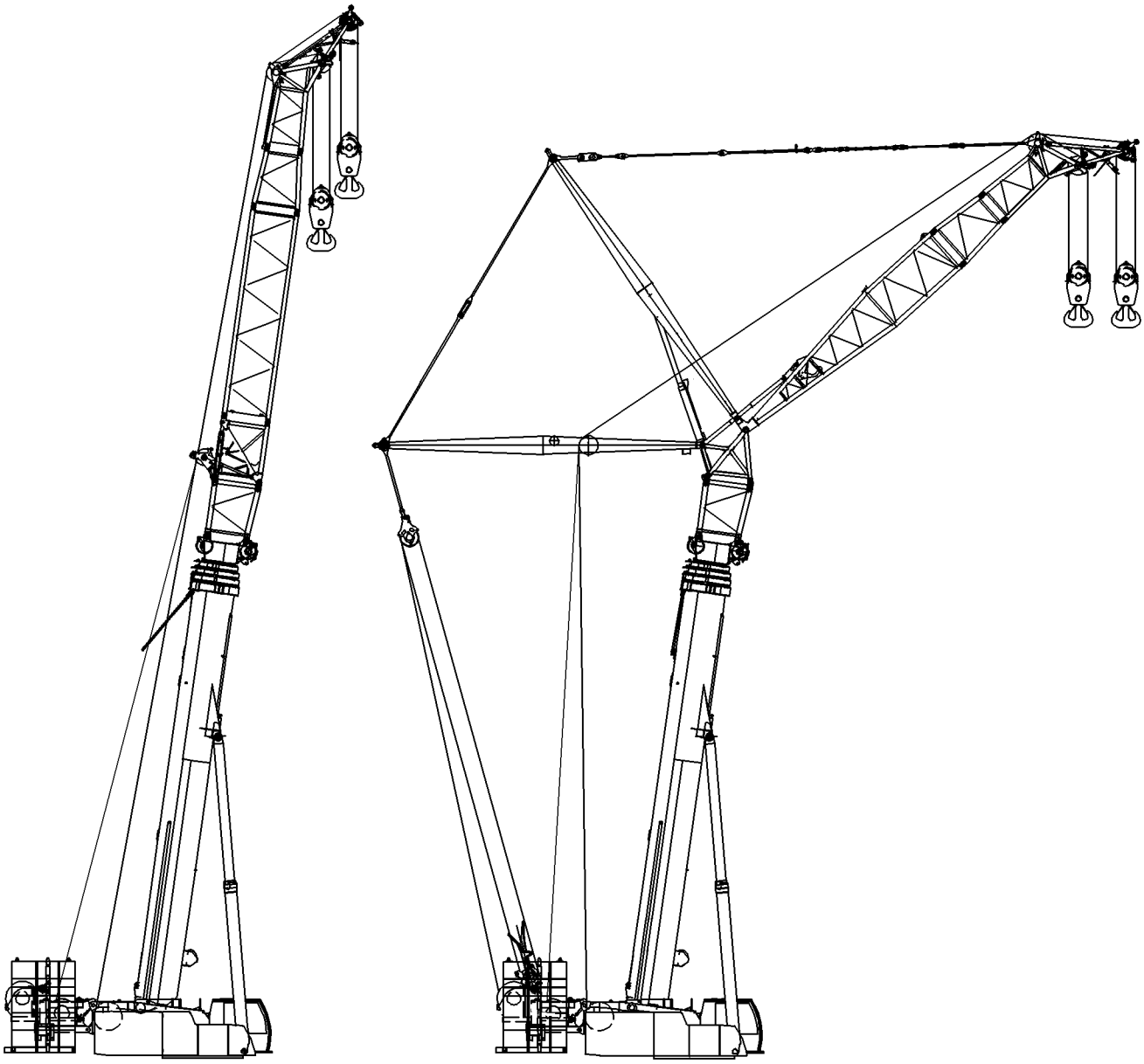
DANGER
Danger of accidents because of imprecise radius and load displays.
▶ When operating with the boom nose, the overload protection radius and load display is not precise, because the boom nose is not taken into account in the boom geometry.

▶ 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.

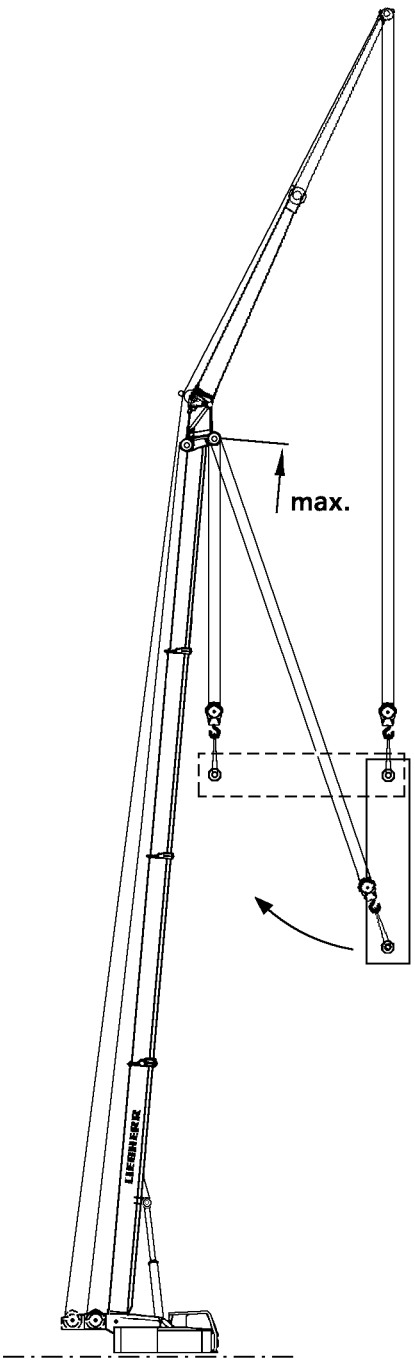
DANGER
Danger of accidents because of imprecise radius and load displays.
▶ When operating with the boom nose, the overload protection radius and load display is not precise, because the boom nose is not taken into account in the boom geometry.

▶ Set the operating mode of the lattice jib to overload protection.

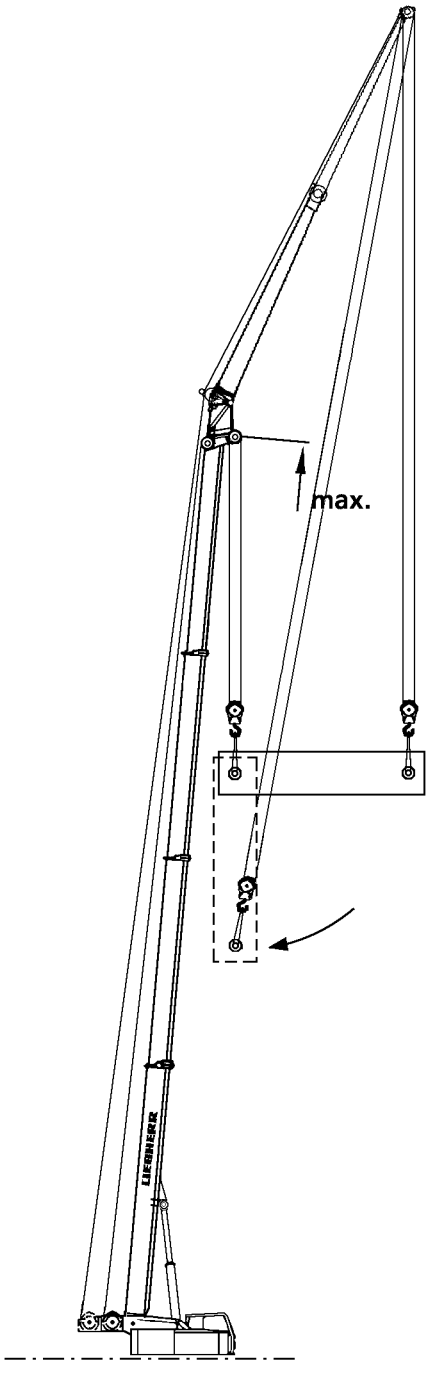
DANGER
Danger of accidents because of overloading the hoisting gear or the hoisting cable!
Overload protection is only achieved when the reeving on the lattice jib is equal to, or greater than, the reeving on the mast boom.
▶ Set the overload protection to the smaller reeving of the two hooks.

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.

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Va. 1



Va. 2

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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.

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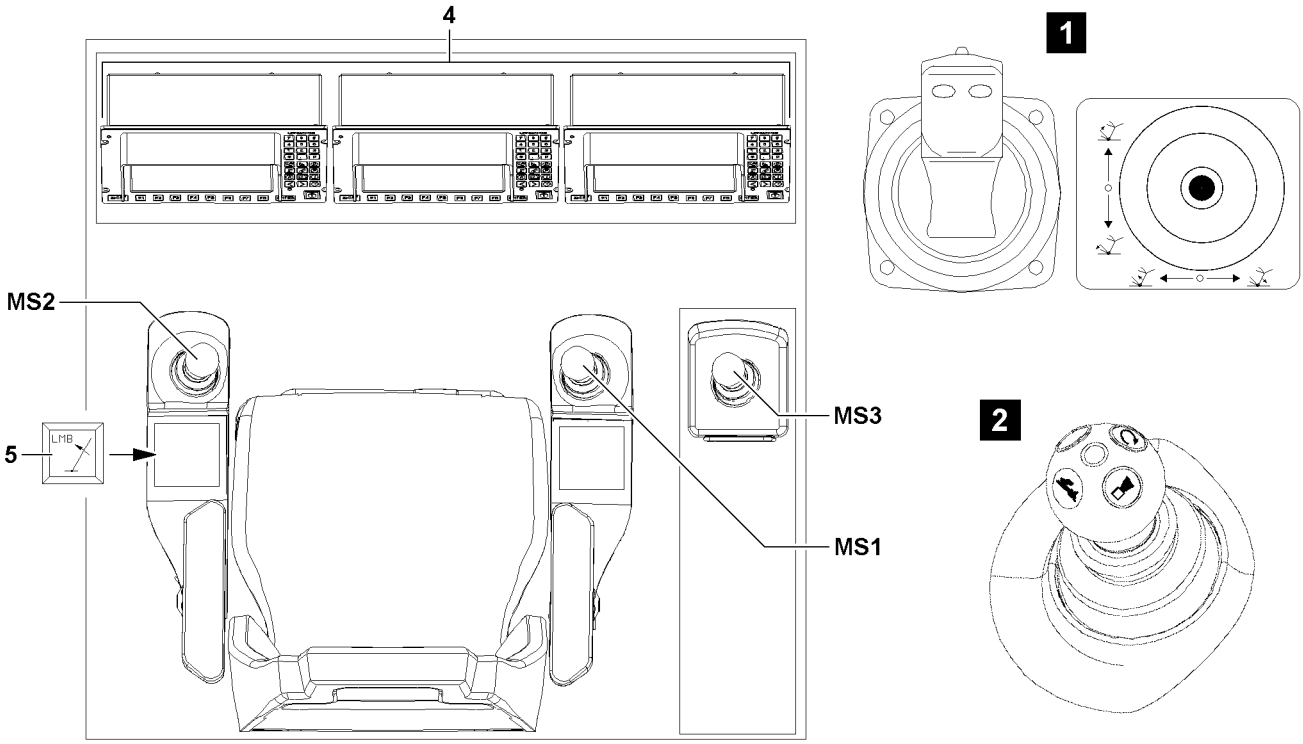
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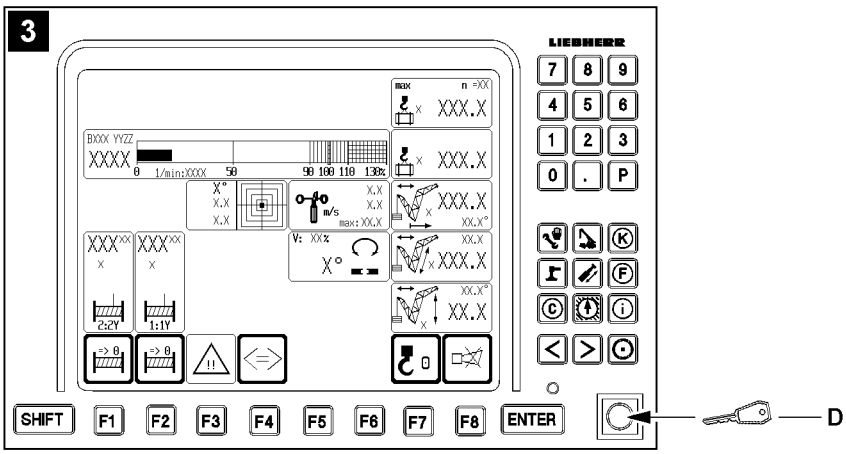
https://truckmanualshub.com/

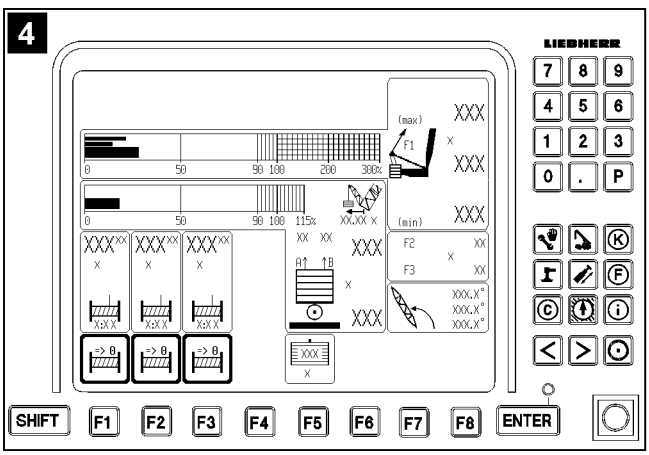
1 Reeving plans

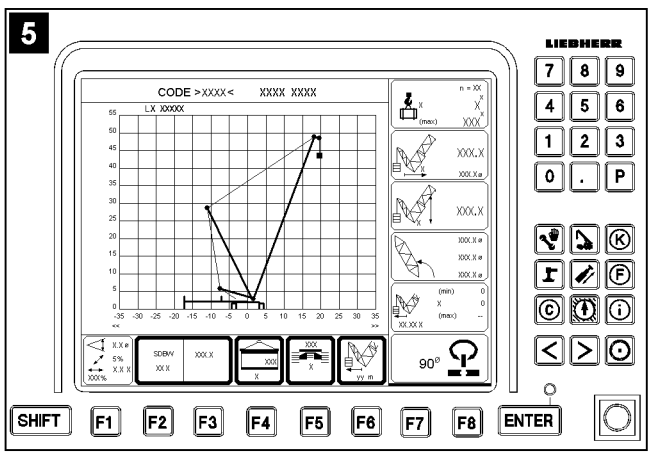
Note
▶ See separate reeving plans!

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1 General

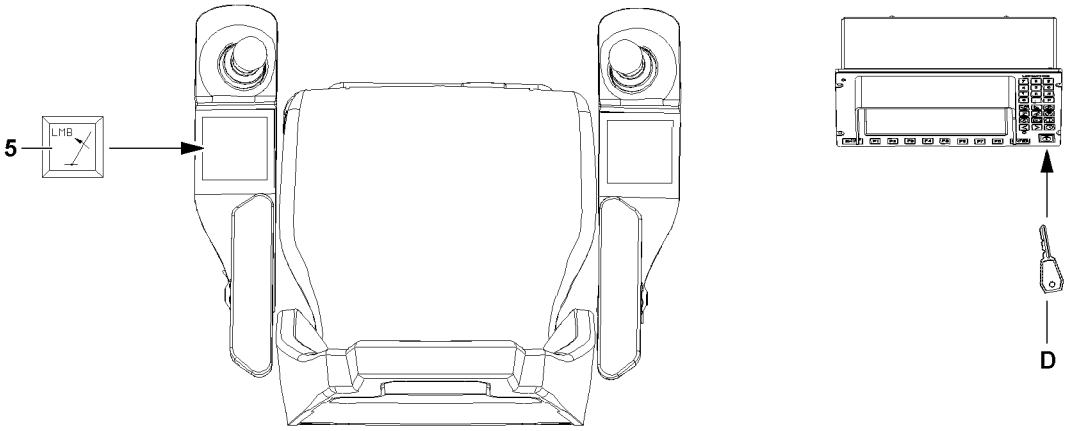
To operate the crane, three manually actuated master switches are available.
– Master switch **MS1**
  • Right control console
– Master switch **MS2**
  • Left control console
– Master switch **MS3**
  • Right instrument panel

To monitor the crane, depending on the crane type, two or three LICCON monitors **4** are in the instrument panel.
– LICCON monitor, illustration **3**
  • User interface for entry of equipment configurations and for crane operation (crane operating screen)
– LICCON monitor, illustration **4**
  • User interface for operation with “derrick” boom
– LICCON monitor, illustration **5**
  • User interface for “LICCON Job planner” (only for crane types with three monitors)

Equipment in the crane cab		
Crane type	**Manually actuated master switches**	**LICCON monitors**
LR 1350/1	three (version illustration **2**)	two
LR 1400/2	three (versions illustration **1**)	two
LR 1600/2	three (version illustration **2**)	three
LR 1750	three (version illustration **2**)	three
LG 1750	three (version illustration **2**)	three
LR 11350	three (version illustration **2**)	three

In the crane operator's cab, two buttons are installed to make it possible to bring the crane from an emergency situation after a shut off of the LICCON overload protection.
– Set up key **D** (Function “Exceeding the shut off limits for the LICCON overload protection”) on the LICCON monitor with crane operating screen, illustration **3**
– Button **5** “luffing in with suspended load” in the left control console

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The function “Exceedance of shut off limits of the LICCON overload protection”, which is activated with the set up key **D** includes the following:

– Exceedance of the maximum permissible load moment
– Bypass of the hoist top shut off
– Exceedance of limit values from load charts
– Exceedance of maximum value Test point 1 (value F1)
– Allowance of individual, limited crane movements after LML-STOP (error message)
– Completion of crane movements outside of load charts (erection / take down procedures)

NOTICE

Multi action function “Exceedance of shut off limits of the LICCON overload protection”

If the set up key **D** is actuated, then it is possible to exceed several shut off limits of the LICCON overload protection simultaneously!

The LICCON overload protection as a whole is deactivated or limited.

There is no additional protection against crane overload!

▶ When the set up key **D** is actuated, it must be taken into account that the LICCON overload protection as a whole is deactivated or limited.

Note

The set up key **D** has two functions, independent of each other:

▶ If no crane movement can be carried out due to the shut off of crane operation by the LICCON overload protection, then by pressing the set up key **D**, a 100 % utilization can be exceeded and / or an active shut off can be bypassed. The crane can thereby be controlled again in normal operating status (utilization below 100 % and no active shut off).
▶ When the set up key **D** is actuated, all erection / take down procedures can be carried out within the erection / take down charts (assembly operation).

WARNING

Danger of accident due to function “Exceedance of shut off limits of the LICCON overload protection”!

If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload!

Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

▶ The button **5** “Luffing in with suspended load” and the set up key **D** may only be actuated when it is ensured that no normal operating condition (utilization below 100% and no active shut off) can be reached without the function “Exceedance of shut off limits of the LICCON overload protection”!

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- ▶ Actuate the set up key **D** only when no normal operating condition (utilization below 100% and no active shut off) can be reached with the button **5** “Luffing in with suspended load”!
- ▶ The function “Exceedance of shut off limits of the LICCON overload protection” is only permissible in emergencies and for assembly purposes!
- ▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the function “exceedance of shut off limits of the LICCON overload protection”!
- ▶ The function “Exceedance of shut off limits of the LICCON overload protection” requires the presence of an authorized person and must be performed with utmost caution!
- ▶ Crane operation with activated function “Exceedance of shut off limits of the LICCON overload protection” is prohibited!



WARNING

Expanded working / danger zone of the crane!

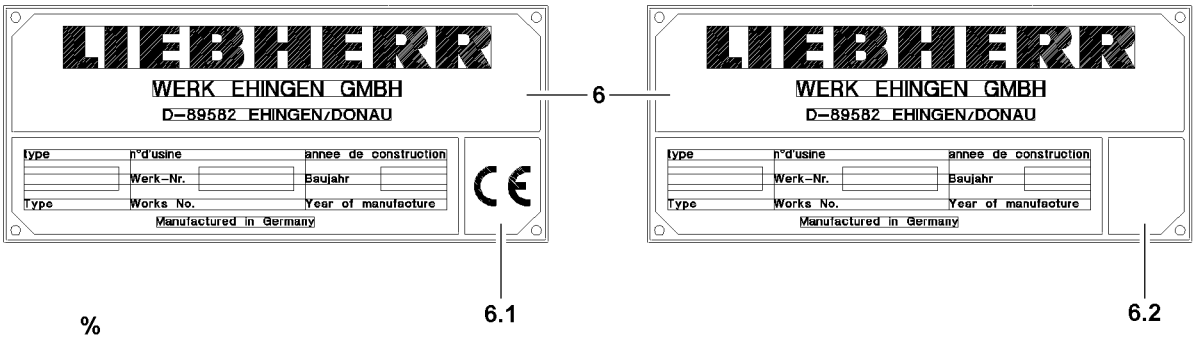
Due to the function “Exceedance of shut off limits of the LICCON overload protection” it is possible that the working / danger zone of the crane is significantly expanded!

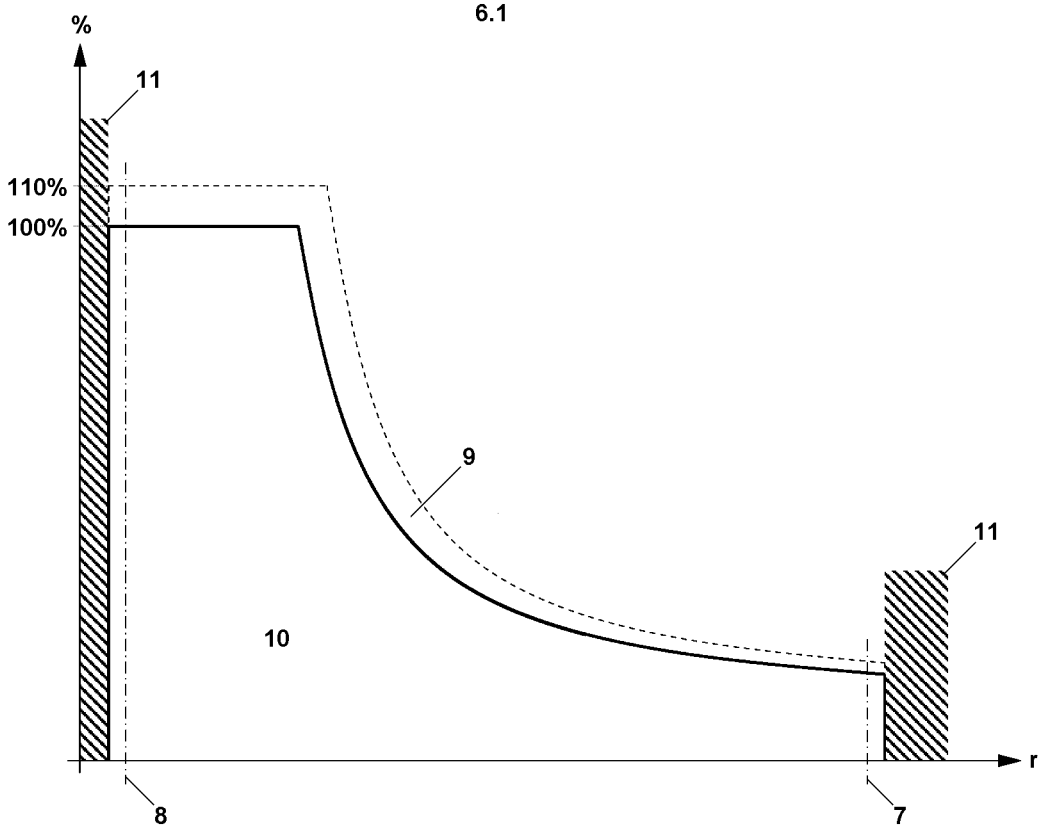
If these circumstances are not observed, collisions and accidents can occur!

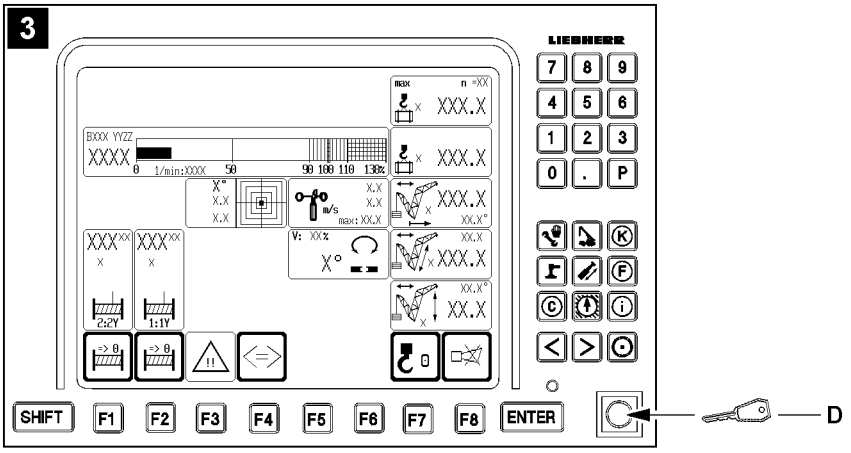
Personnel can be severely injured or killed!

- ▶ With activated function “Exceedance of shut off limits of the LICCON overload protection” take an expanded working / danger zone of the crane into account and monitor it!

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2 Instructions for resuming crane movements for cranes with CE mark

WARNING
Risk of accident!
If the following points are not observed, personnel can be severely injured or killed.
- The crane operator bears the sole and full responsibility for the adherence to measures to be taken in case of shut off of crane movement!
- The crane operator must make sure, before crane operation, that he is using the correct description for the current programming!

Note
- Check the data tag **6** to determine if your crane has a CE mark!
- The following section applies to a crane with CE mark, see data tag **6.1**!
- If your crane does not have a CE mark, see data tag **6.2**, then you must observe the description in section “Instructions for resuming a crane movement for cranes without CE mark”!

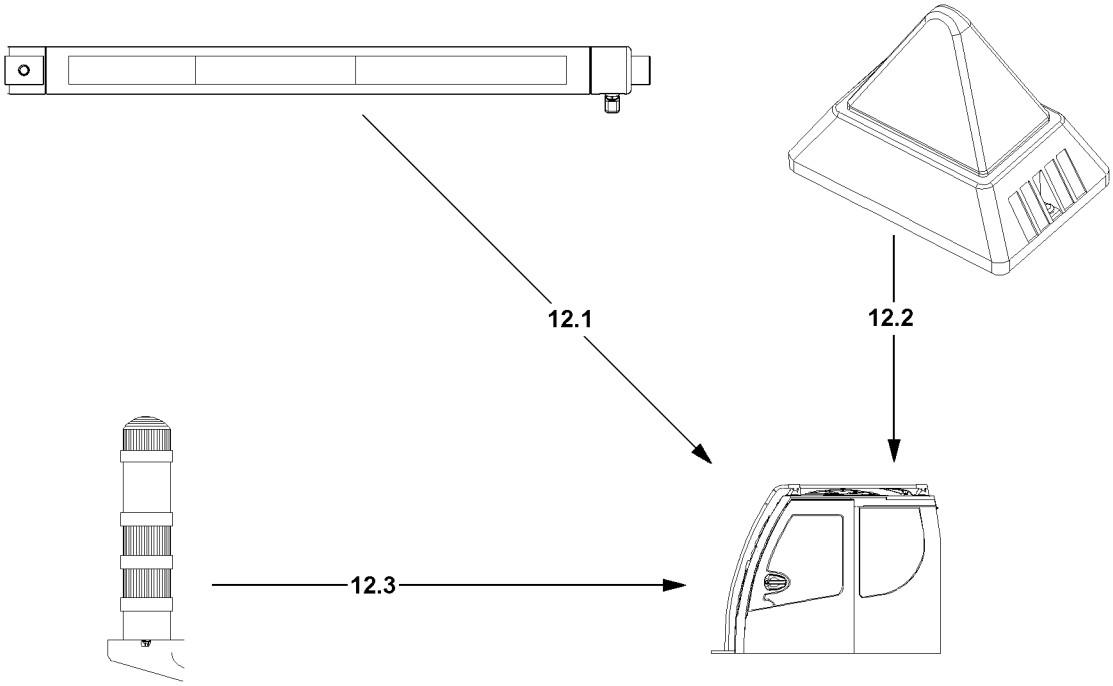
2.1 Overview load chart for cranes with CE mark

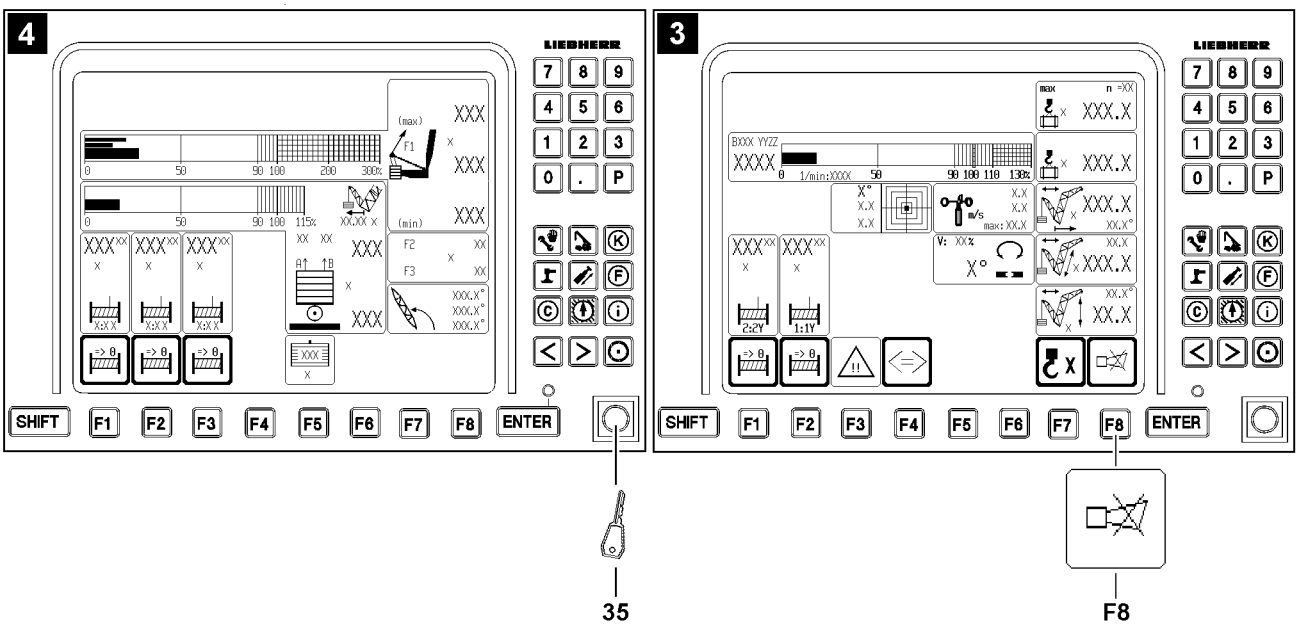
Axle	Description
r	Radius boom (Working radius)
%	Utilization of the crane in percentages

Position	Description
7	Lower limit angle load chart
8	Upper limit angle load chart
9	Utilization up to 110% with reduced working speed
10	Area “Load chart available”
11	Area “no load chart available”

Note
- If the set up key **D** (LICCON monitor with crane operating screen, illustration **3**) is actuated in the area “load chart available”, then the working speed is reduced and all displays of the LICCON overload protection remain functional!
- If the set up key **D** is actuated in the area “no load chart available”, then the working speed is not reduced!

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2.2 Overview of acoustic / visual warnings for cranes with CE mark

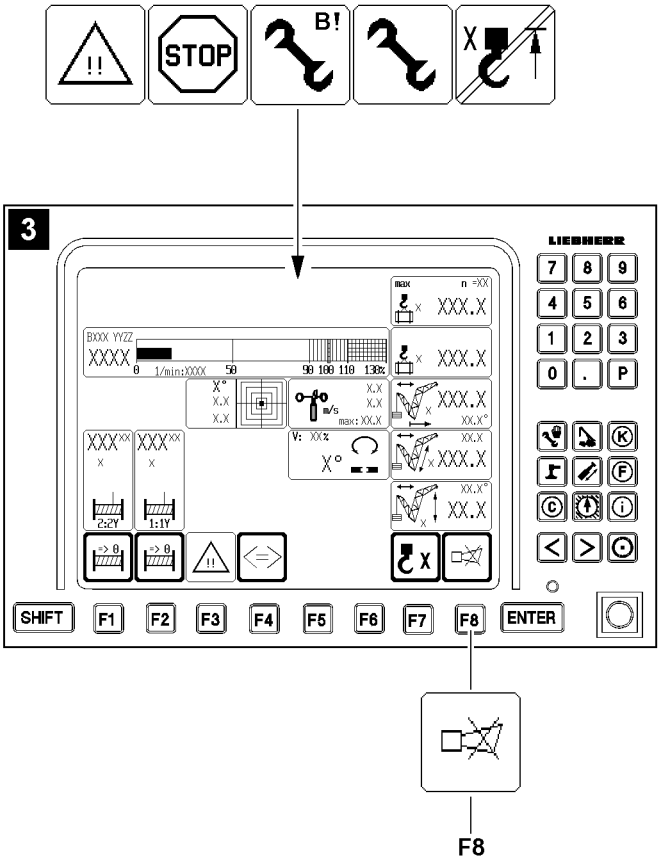
– Depending on the crane type, either a warning light **12.1** or a flashing beacon **12.2** or a combination of flashing beacon **12.2** and warning light* **12.3** are installed.
– The acoustic warnings within the crane operator's cab are turned off by pressing the button **F8** on the LICCON monitor with crane operating screen (illustration **3**).
– The acoustic warnings outside the crane operator's cab are turned off by actuating the key button **35** on the LICCON monitor with derrick operating screen (illustration **4**).

2.2.1 Description of acoustic / visual warnings

The case numbers from the chart “Case number key” is valid for the following charts in this chapter:
– “Acoustic / visual warnings on the LICCON monitor”
– “Warning light 12.1”
– “Flashing beacon 12.2”
– “Warning light 12.3”

Case number key	
Description Case	**Case num-ber**
Utilization of crane from 0 % to 89 %	**Case 001**
Utilization of crane from 90 % to 100 %	**Case 002**
Utilization of crane over 100 %	**Case 003**
Shut off of crane movements - LML Stop	**Case 004**
Luffing in with suspended load	**Case 005**
Participating sensor (LML) defective	**Case 006**
Exceeding the shut off limits of the LICCON overload protection	**Case 010**
Bypass of shut off hoist top	**Case 011**
Bypass of shut off boom / luffing down the attachment, “load chart available”	**Case 016**
Bypass of shut off boom / luffing down the attachment, “no load chart available”	**Case 018**
Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures, “no load chart available”	**Case 020**

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2.2.2 Acoustic / visual warnings within the crane operator's cab

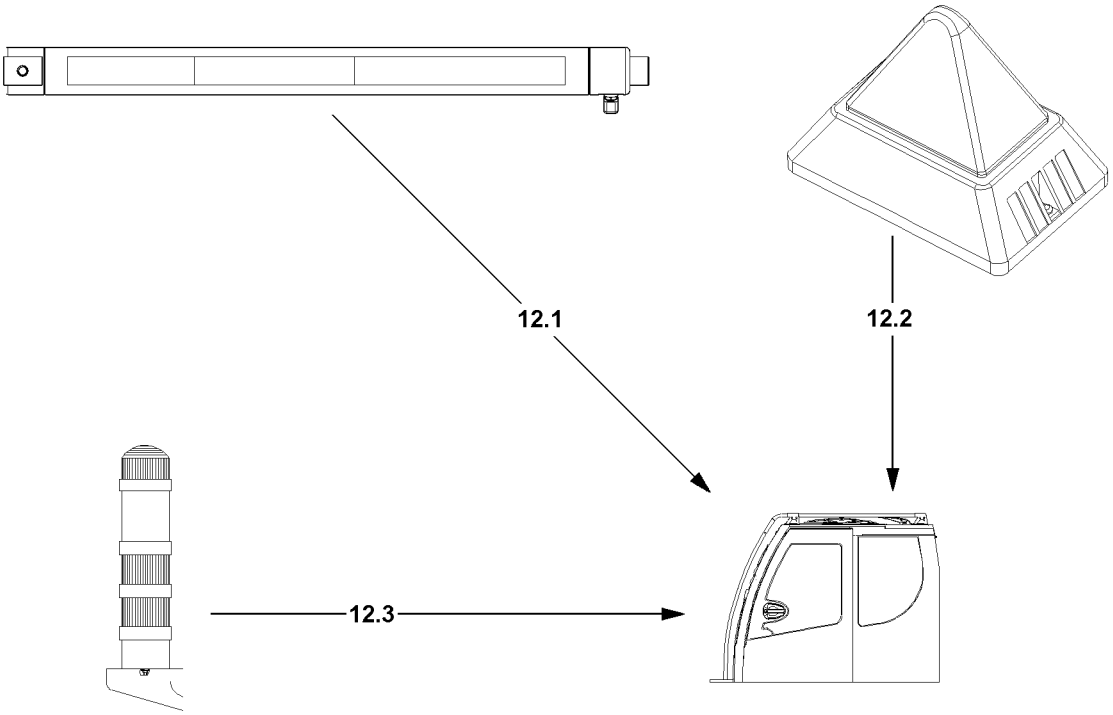
Acoustic / visual warnings on the LICCON monitor									
Case number	**Acoustic warning LICCON monitor at utilization of crane**			**Visual warning LICCON monitor**					
	Short sound	**Long sound**	**Long sound**	**Utilization of crane**		**Occurrence**			
	From 90 %	**Above 100 %**	**Always**	**From 90 %**	**Above 100 %**	**LMB Stop**	**Appears if the set up key D is actuated**		
									
Case 001							—	—	—
Case 002	X[2]			O			—	—	—
Case 003		X[2]		O	O		—	—	—
Case 004			X[2]		O		—	—	—
Case 005	X[2]	X[2]		O	O		—	—	—
Case 006			X[2]			O	Cannot be bypassed[5]		
Case 010	X[2]	X[2]		O	O		O		
Case 011			X[2]	O	O	O	O		O
Case 016	X[2]	X[2]		O	O		O		
Case 018			X[2]			O		O	
Case 020			X[2]			O		O	

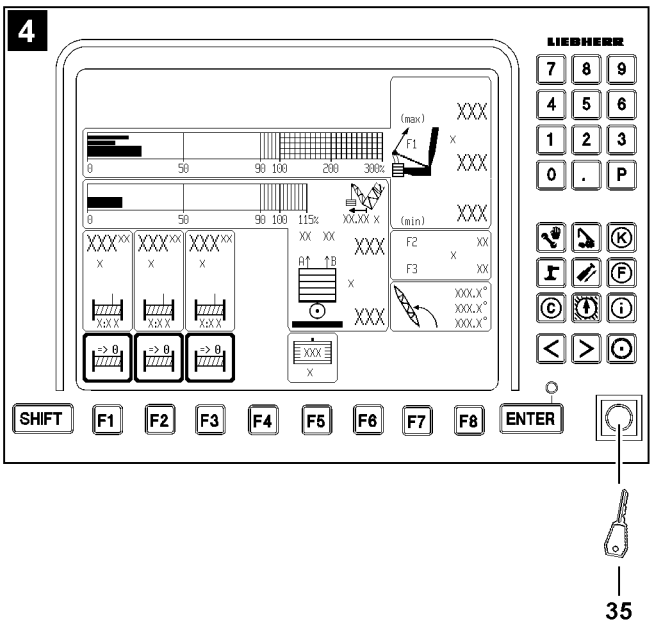
O = Cannot be turned off

X[2] = Can be turned off immediately on the LICCON monitor key **F8**

cannot be bypassed[5] = Contact Liebherr Service

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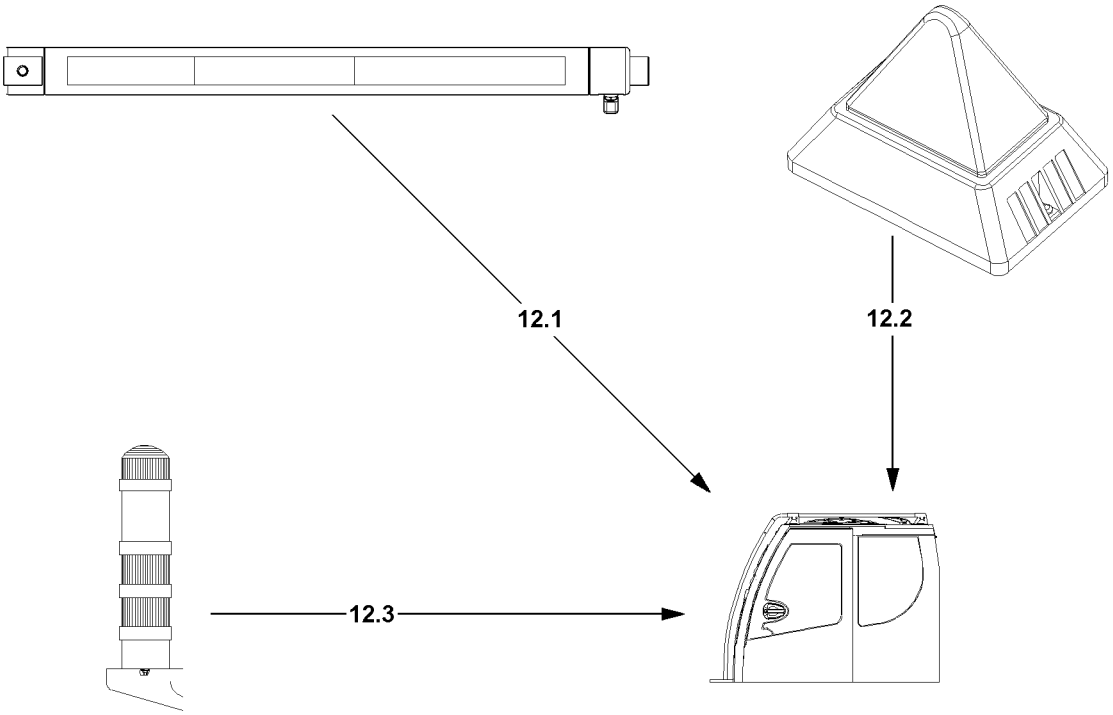
https://truckmanualshub.com/

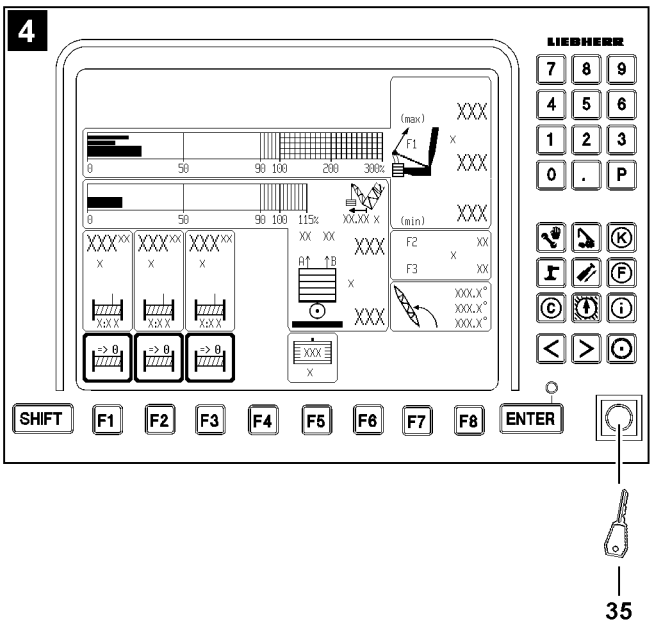
2.2.3 Acoustic / visual warnings outside the crane operator's cab

Warning light 12.1					
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**		
		Signal turntable	**Green**	**Yel-low**	**Red**
Case 001	From 0 % to 89 %		O^1		
Case 002	From 90 % to 100 %			O^1	
Case 003	Above 100 %	X^1			O^1
Case 004	-				O^1
Case 005	From 0 % to 89 %		O^1		
Case 005	From 90 % to 100 %			O^1	
Case 005	Above 100 %	X^1			O^2
Case 006	-				O^1
Case 010	From 0 % to 89 %		O^1		
Case 010	From 90 % to 100 %			O^1	
Case 010	Above 100 % to 110 %			O^2	
Case 010	Above 110 %	X^1			O^1
Case 011	Up to 110 %			O^2	
Case 011	Above 110 %	O			O^2
Case 016	From 0 % to 89 %		O^1		
Case 016	From 90 % to 100 %			O^1	
Case 016	Above 100 % to 110 %			O^2	
Case 016	Above 110 %	X^1			O^1
Case 018	No value available			O^2	
Case 020	No value available			O^2	

O = Cannot be turned off
O^1 = Warning light **12.1** lights up
O^2 = Warning light **12.1** blinks
X^1 = Can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

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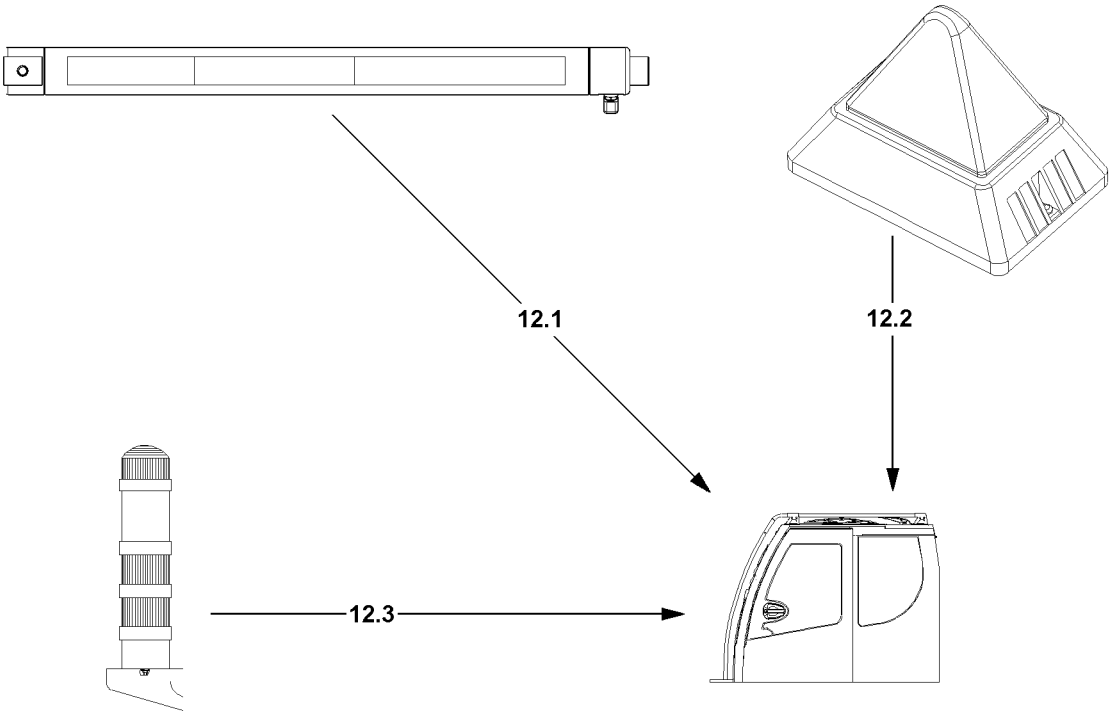
Flashing beacon 12.2			
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**
		Signal turntable	**Red**
Case 003	Above 100 %	X[1]	O[2]
Case 004	-		O[2]
Case 005	Above 100 %	X[1]	O[2]
Case 006	-		O[2]
Case 010	Above 110 %	X[1]	O[2]
Case 011	Above 110 %	X[1]	O[2]
Case 016	Above 110 %	X[1]	O[2]
Case 018	No value available		O[2]
Case 020	No value available		O[2]

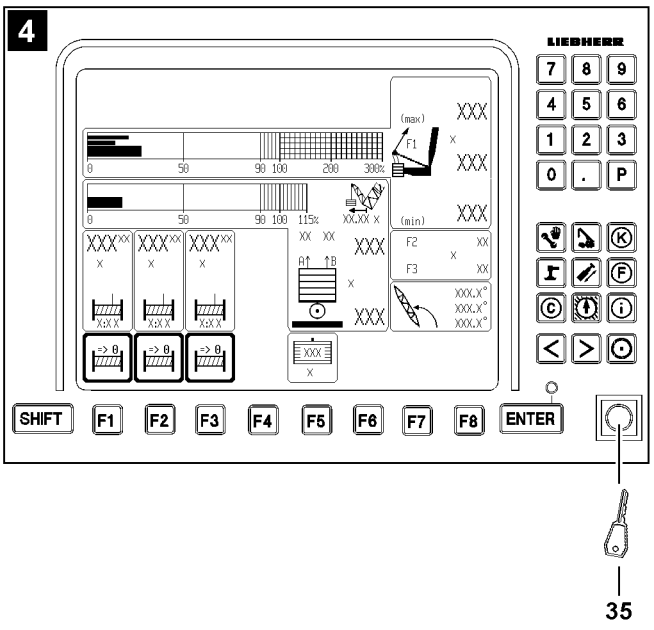
O = Cannot be turned off

O[2] = Flashing beacon **12.2** blinks

X[1] = Can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

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Warning light 12.3					
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**		
		Signal turntable	**Green**	**Yel-low**	**Red**
Case 001	From 0 % to 89 %		O^1		
Case 002	From 90 % to 100 %			O^1	
Case 003	Above 100 %	X^1			O^2
Case 004	-				O^2
Case 005	From 0 % to 89 %		O^1		
Case 005	From 90 % to 100 %			O^1	
Case 005	Above 100 %	X^1			O^2
Case 006	-				O^2
Case 010	From 0 % to 89 %		O^1		
Case 010	From 90 % to 110 %			O^1	
Case 010	Above 110 %	X^1			O^2
Case 011	Up to 110 %			O^1	
Case 011	Above 110 %	X^1			O^2
Case 016	From 0 % to 89 %		O^1		
Case 016	From 90 % to 110 %			O^1	
Case 016	Above 110 %	X^1			O^2
Case 018	No value available				O^2
Case 020	No value available				O^2

O = Cannot be turned off
O^1 = Warning light **12.3** lights up
O^2 = Warning light **12.3** blinks
X^1 = Can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

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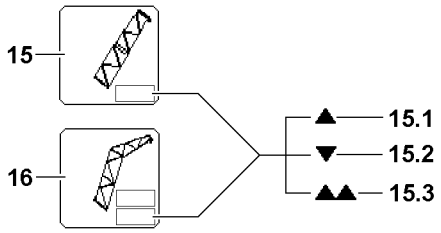
2.3 Shut off of crane movement

Note
- ▶ If the LICCON overload protection turns the crane movement off, then the exact cause for the shut off must be determined first.
- ▶ As a first step, try to rescind the crane movement which has caused a shut off.
- ▶ If it is not possible to rescind the affected crane movement, then the additional steps are described in the respective sections.

Note
- ▶ For detailed description of the individually listed icons, see Crane operating instructions, chapter 4.02.

The LICCON overload protection carries out the following shut offs if a limit value is exceeded in crane operation:
- – Shut off Luffing the main boom up / down
- – Shut off Luffing the attachment up / down
- – Shut off maximum / minimum value Test point 1 (value F1)
- – Shut off spooling the winch up / out
- – Shut off hoist top
- – Shut off Crane movement with danger of tipping to the rear*
- – Shut off due to error message

2.3.1 Shut off Luffing the main boom up / down



In icon **15** or icon **16** (lower field) arrow **15.1** or arrow **15.2** blink and the LICCON overload protection has shut off the crane movement.
“Luffing the main boom up” (arrow **15.1**) or “Luffing the main boom down” (arrow **15.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded or fallen below.

Note
- ▶ If the utilization of the crane is more than 95 % and the maximum load according to the load chart (falling load capacity) drops by continuing to luff up the boom, then the arrow **15.1** and the crane movement “luffing the main boom up” is turned off.

If the double arrow **15.3** appears blinking in the icon **15** or icon **16** (lower field), then: the main boom relapse cylinders were luffed up on one limit switch or the limit switch has turned off the crane movement “luffing the main boom up”.

The arrow **15.1** blinks and the crane movement “luffing the main boom up” was turned off:
- ▶ Luff the main boom down.

Result:
- – Crane operation is possible again.

The arrow **15.2** blinks and the crane movement “luffing the main boom down” was turned off:
- ▶ Luff the main boom up.

Result:
- – Crane operation is possible again.

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The double arrow **15.3** blinks and the crane movement “luffing the main boom up” was turned off:

▶ Luff the main boom down.

Result:

– Crane operation is possible again.

Troubleshooting

The double arrow **15.3** does not turn off after luffing down?

There is an error in one limit switch of the main boom relapse cylinders.

▶ Stop crane operation and remedy the error in the limit switch immediately.

WARNING

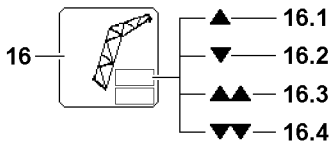
Limited warning functions

If one of the double version limit switches is not ok and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited!

▶ The crane can only be operated in an emergency after failure of a double version limit switch!

▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

2.3.2 Shut off Luffing the attachment up / down



In the icon **16** (upper field) the arrow **16.1** or arrow **16.2** blink and the LICCON overload protection has shut off the crane movement.

“Luffing the attachment up” (arrow **16.1**) or “Luffing the attachment down” (arrow **16.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded or fallen below.

If the double arrow **16.3** appears blinking in the icon **16** (upper field), then:

– **either** the attachment relapse cylinders were luffed up on one limit switch or the limit switch has turned off the crane movement “luffing the attachment up”,
– **or** the mechanical relapse support has turned off the crane movement “luffing the attachment up”,
– **or** there is an error on one of the limit switches of the attachment relapse cylinders.

If the double arrow **16.4** appears blinking in the icon **16** (upper field), then:

– **either** it was luffed down to a limit switch “attachment bottom” and the limit switch has turned off the crane movement “luffing the attachment up”,
– **or** there is an error on one of the limit switches “Attachment bottom”.

The arrow **16.1** blinks and the crane movement “luffing the attachment up” was turned off:

▶ Luff the attachment down

Result:

– Crane operation is possible again.

The arrow **16.2** blinks and the crane movement “luffing the attachment down” was turned off:

▶ Luff the attachment up

Result:

– Crane operation is possible again.

The double arrow **16.3** blinks and the crane movement “luffing the attachment up” was turned off:

▶ Luff the attachment down

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Result:

– Crane operation is possible again.

The double arrow **16.4** blinks and the crane movement “luffing the attachment down” was turned off:

▶ Luff the attachment up

Result:

– Crane operation is possible again.

Troubleshooting

The double arrow **16.3** does not turn off after luffing down?

There is an error in one limit switch of the attachment relapse cylinders.

▶ Remedy the error in the limit switch.

WARNING

Limited warning functions

If one of the double version limit switches is not ok and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited!

▶ The crane can only be operated in an emergency after failure of a double version limit switch!

▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

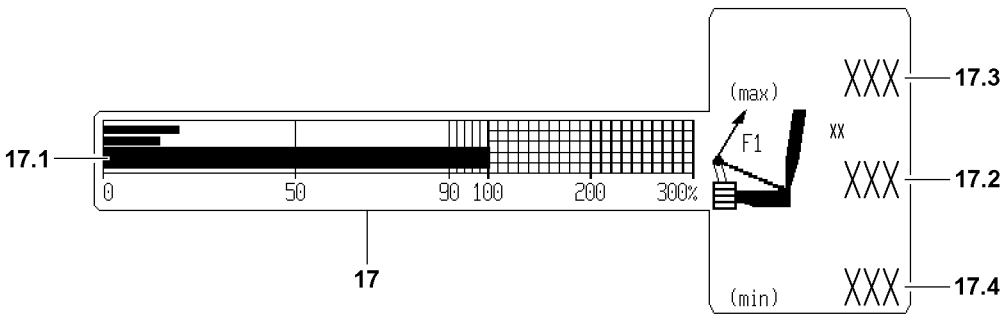
2.3.3 Shut off maximum / minimum value Test point 1 (value F1)

Note

▶ The value Test point 1 is described as value F1.

▶ The values are shown as number values as well as a utilization bar/ bar display in the icon **17**.

Shut off maximum value F1



In the icon **17** (display value F1) the utilization bar $F1_{actual}$ **17.1** exceeds the 100% mark and the LICCON overload protection has shut off the crane movement. The number value $F1_{actual}$ **17.2** has exceeded the number value $F1_{max}$ **17.3** by more than 20 t (for crane types to 1000 t) or 40 t (for crane types above 1000 t.

All further movements, which directly lead to an increase of the value $F1_{actual}$ are shut off.

▶ Reverse any crane movement which has caused the shut off.

or

■ Initiate an alternative crane movement, which lowers the value $F1_{actual}$.

Result:

– Crane operation is possible again.

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Troubleshooting

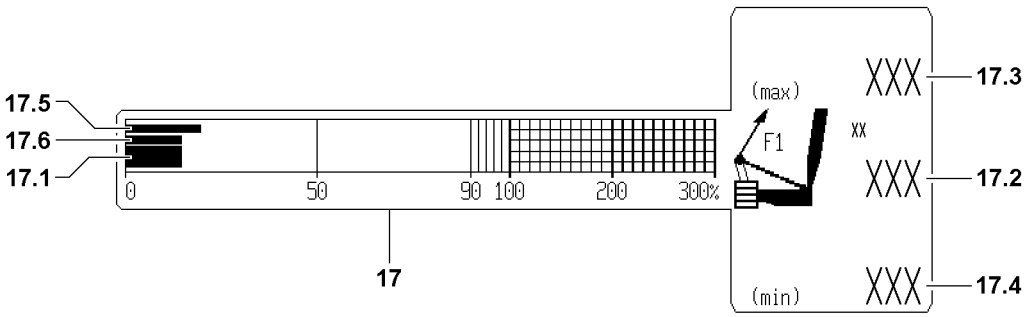
The crane operation is limited because the maximum value F1 apparently is being reached too early?

- ▶ Make sure that a valid configuration status has been entered on the LICCON computer system!
- ▶ Make sure that the crane is assembled according to the assembly drawings!
- ▶ Make sure that the actual configuration status and the entered configuration status of the crane match!
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed!
- ▶ Make sure that the boom system is free of snow and ice!
- ▶ Make sure that the wind influence onto the boom is not too great!
- ▶ If no irregularities can be found:
  Contact LIEBHERR Service.

Shut off minimum value F1

Note

- ▶ A shut off by value $F1_{min}$ only occurs in operating modes with derrick ballast. The status value $F1_{actual}$ just as value $F1_{min}$ cannot be reached in all other operating modes.



In the icon **17** (display value F1), when falling below the bar display $F1_{min\ warning}$ **17.5**, a warning of the upcoming shut off is issued by the utilization bar $F1_{actual}$ **17.1**.
If the utilization bar $F1_{actual}$ **17.1** falls below the bar display $F1_{min}$ **17.6**, then the LICCON overload protection shuts off the crane movement. The number value $F1_{actual}$ **17.2** has fallen below the number value $F1_{min}$ **17.4**.
All further movements, which directly lead to a decrease of the force F1 are shut off.

- ▶ Reverse any crane movement which has caused the shut off.

or

- ■ Initiate an alternative crane movements which increases the force F1.

Result:

– Crane operation is possible again.

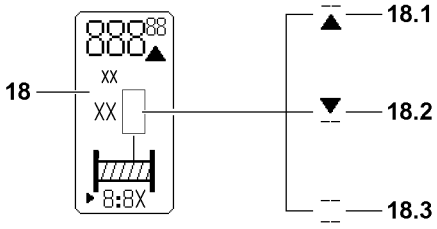
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Troubleshooting

The crane operation is limited because the minimum value F1 apparently is being reached too early?

- ▶ Make sure that a valid configuration status has been entered on the LICCON computer system!
- ▶ Make sure that the crane is assembled according to the assembly drawings!
- ▶ Make sure that the actual configuration status and the entered configuration status of the crane match!
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed (weight)!
- ▶ Make sure that the boom system is free of snow and ice (weight)!
- ▶ Make sure that the wind influence onto the boom is not too great!
- ▶ If no irregularities can be found:
  Contact LIEBHERR Service.

2.3.4 Shut off spooling the winch up / out



In the icon **18**, the line / arrow **18.1**, arrow / line **18.2** or line / arrow **18.3** blink and the LICCON overload protection has shut off the crane movement.
“Spooling the winch out” (line / arrow **18.1**) or “spooling the winch up” (arrow / line **18.2**) was shut off because the upper / lower limit angle of the rope for the selected winch was exceeded or fallen below.
If line / line **18.3** appears blinking in the icon **18**, then the affected winch is deactivated.

The line / arrow **18.1** blinks and the crane movement “spooling the winch out” was turned off:

- ▶ Spool the winch up.

Result:

– Crane operation is possible again.

The line / arrow **18.2** blinks and the crane movement “spooling the winch up” was turned off:

- ▶ Spool the winch out.

Result:

– Crane operation is possible again.

Line / line **18.3** blinks and the winch is deactivated:

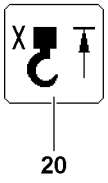
- ▶ Activate the winch, see Crane operating instructions, chapter 4.02.

Result:

– Crane operation is possible again.

2.3.5 Shut off hoist top





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The icon **19** and Hoist top icon **20** appear in the LICCON monitor and the LICCON overload protection has turned off crane movement.
Spooling the hoist winch up was turned off because the hook block or the load hook has run against a hoist limit weight during the upward movement and the affected hoist limit switch was triggered.

Note

▶ After shut off of spooling the hoist winch up (hoist top), the crane movements “telescoping the boom out”, “luffing the boom down”, “luffing the attachment down” and possibly additional movements which have an effect on the length of the hoist rope are also shut off. This should minimize the risk that the crane can be damaged due to erroneous operation.

▶ Spool the hoist winch out.

Result:

– Crane operation is possible again.

2.3.6 Shut off Crane movement with danger of tipping to the rear

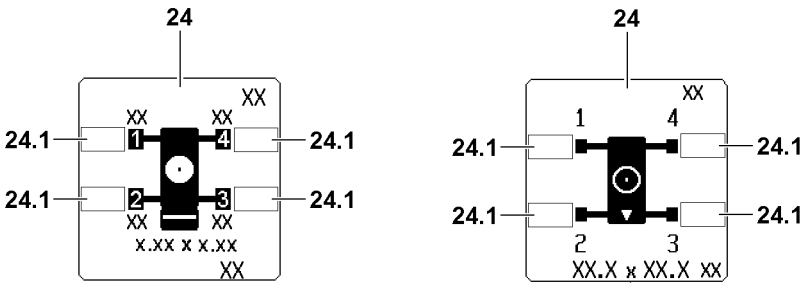
Note

▶ Applies only for cranes with support force monitoring*.

WARNING

Danger of tipping over!
When reaching the programmed minimum / maximum support force limits there is **no** automatic shut off of crane movements!
Exception: When the two supports with the lowest forces are in boom direction, then some crane movements which increase the “danger of tipping to the rear” significantly are turned off!

▶ If there is a “danger of tipping to the rear”, luff the boom down carefully until the support limit forces are again within the minimum / maximum values!



Icon **24** (depending on the crane similar as on the left or right illustration) is shown in the LICCON monitor with blinking values in both fields **24.1** of the supports with the lowest forces, an acoustic signal sounds and the LICCON overload protection has turned off the crane movement.
Crane movements which increase the “danger of tipping to the rear” significantly were turned off.

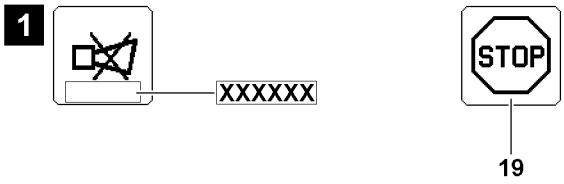
▶ Luff the boom down carefully until the support limit forces are again within the minimum / maximum values and no value in the fields **24.1** blinks any longer.

Result:

– Crane operation is possible again.

2.3.7 Shut off due to error message

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An error message appears in the “horn” icon, illustration **1**, the icon **19** appears in the LICCON monitor and the LICCON overload protection has turned the crane movement off.

- ▶ Determine existing errors with the LICCON error code from the field in illustration **1**, see Diagnostics manual.
- ▶ Remedy the error.
- ▶ If the error cannot be remedied:
  Contact LIEBHERR Service.

Troubleshooting

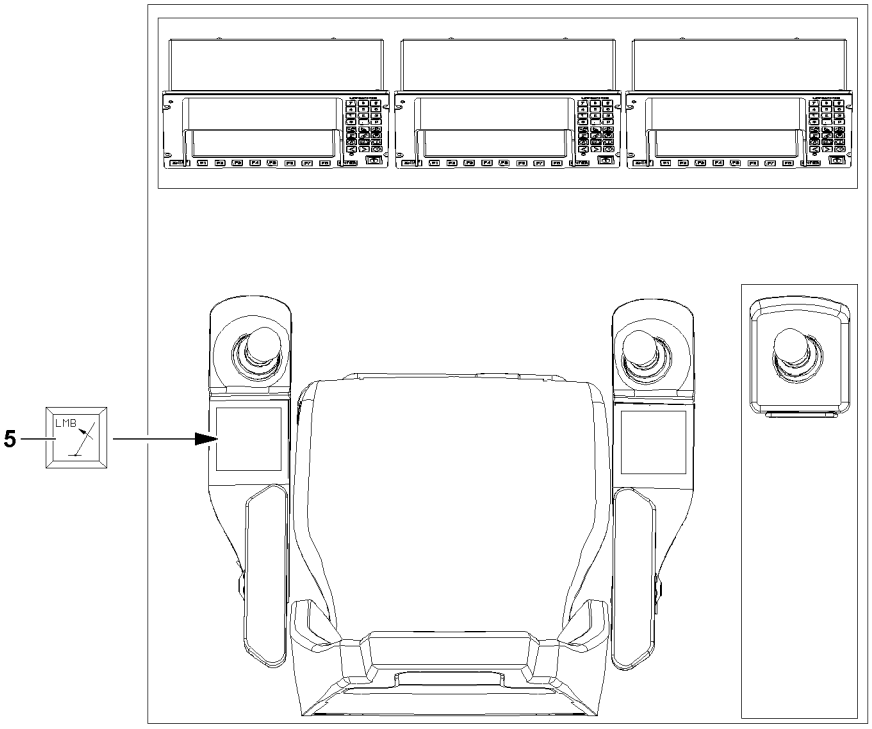
The erection of the crane, for example after assembly on a new job site or with another equipment configuration, is not possible due to an error message?

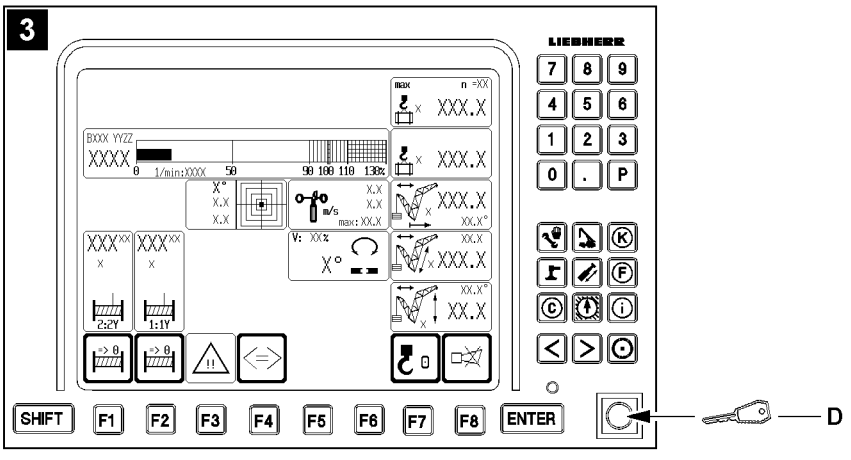
- ▶ As the first step, make sure that all electrical connections have been made.
- ▶ Check if all sensors or dummy plugs with integrated electric have been connected properly.

Note

- ▶ If there is a defect on a participating sensor (LML), then the crane can no longer be operating in normal operating condition. Contact Liebherr Service and fix / replace the sensor.

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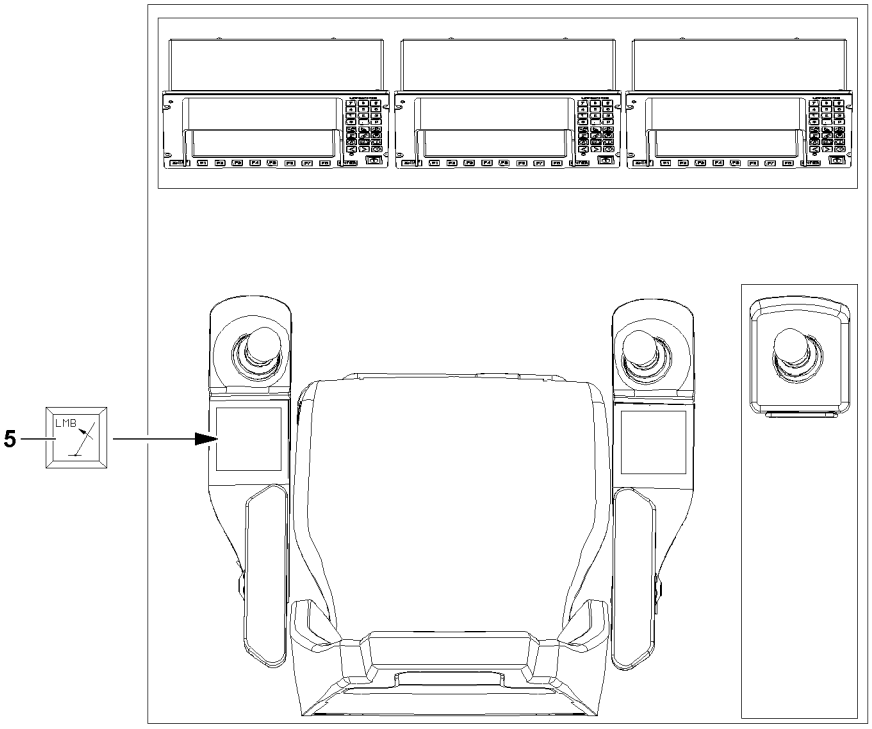
2.4 Shut off of crane movement: LML-STOP by LICCON overload protection

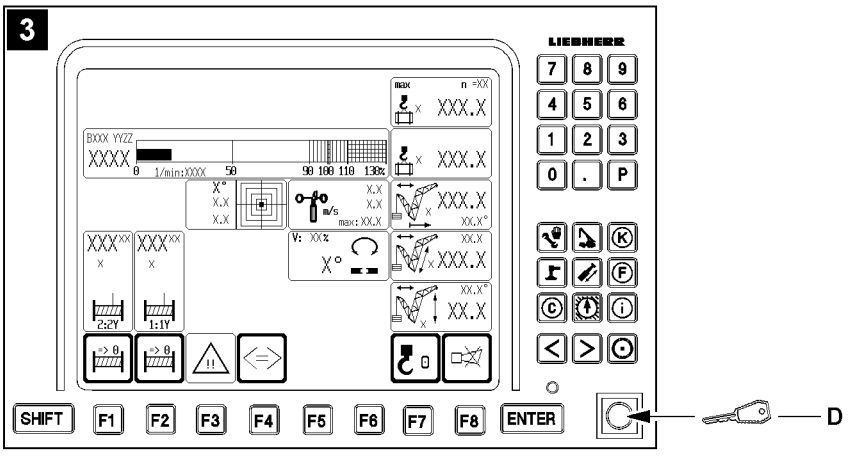
WARNING
Risk of overload and toppling the crane!
If the shut off limits of the LICCON overload protection are exceeded without knowing the exact cause for the shut off by the LICCON overload protection, then the crane can be overloaded and topple over!
Personnel can be severely injured or killed!
- ▶ Before activating the function “Exceedance of shut off limits of the LICCON overload protection” determine the exact cause for the shut off!

WARNING
Danger of accident due to function “Exceedance of shut off limits of the LICCON overload protection”!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload!
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over!
Personnel can be severely injured or killed!
- ▶ The button **5** “Luffing in with suspended load” and the set up key **D** may only be actuated when it is ensured that no normal operating condition (utilization below 100% and no active shut off) can be reached without the function “Exceedance of shut off limits of the LICCON overload protection”!
- ▶ Actuate the set up key **D** only when no normal operating condition (utilization below 100% and no active shut off) can be reached with the button **5** “Luffing in with suspended load”!
- ▶ The function “Exceedance of shut off limits of the LICCON overload protection” is only permissible in emergencies and for assembly purposes!
- ▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the function “exceedance of shut off limits of the LICCON overload protection”!
- ▶ The function “Exceedance of shut off limits of the LICCON overload protection” requires the presence of an authorized person and must be performed with utmost caution!
- ▶ Crane operation with activated function “Exceedance of shut off limits of the LICCON overload protection” is prohibited!

WARNING
Expanded working / danger zone of the crane!
Due to the function “Exceedance of shut off limits of the LICCON overload protection” it is possible that the working / danger zone of the crane is significantly expanded!
If these circumstances are not observed, collisions and accidents can occur!
Personnel can be severely injured or killed!
- ▶ With activated function “Exceedance of shut off limits of the LICCON overload protection” take an expanded working / danger zone of the crane into account and monitor it!

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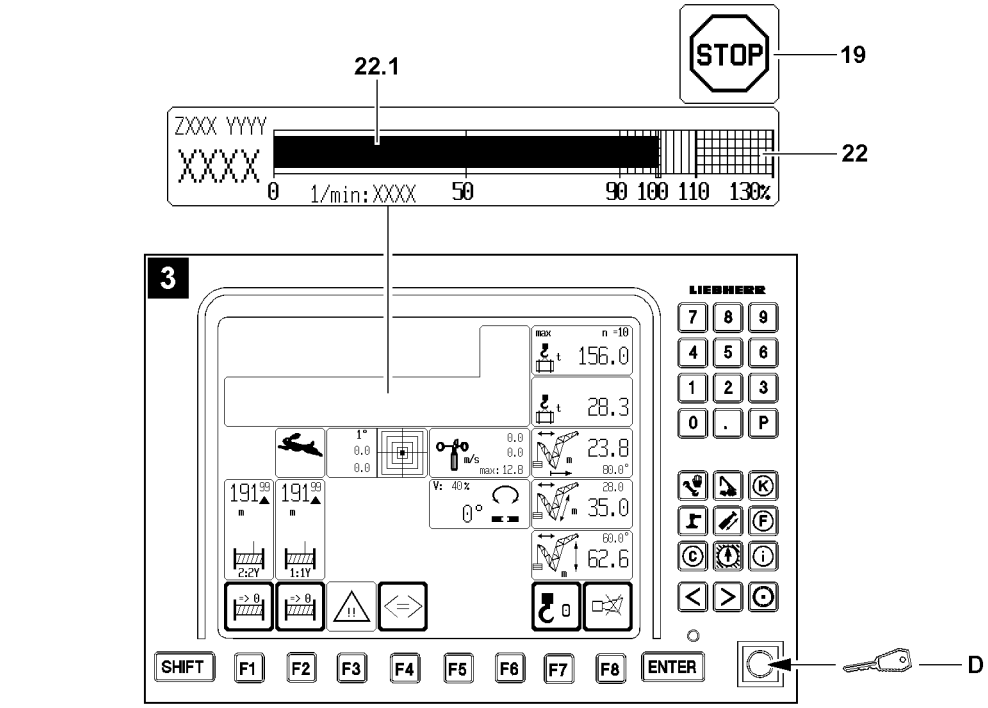
WARNING
Failure of hoist gear!
If a load is lifted by luffing the boom up, after the hoist gear has been shut off by the load moment limiter when trying to lift the load, then the hoist gear can be overloaded and fail!
This could result in serious accidents!
Personnel can be severely injured or killed!
- ▶ Actuate the button **5** “luffing in with suspended load” only if the LICCON overload protection reports no overload on the hoist gear with freely suspended load, the load is not reduced by luffing up and the minimum radius is not fallen below!

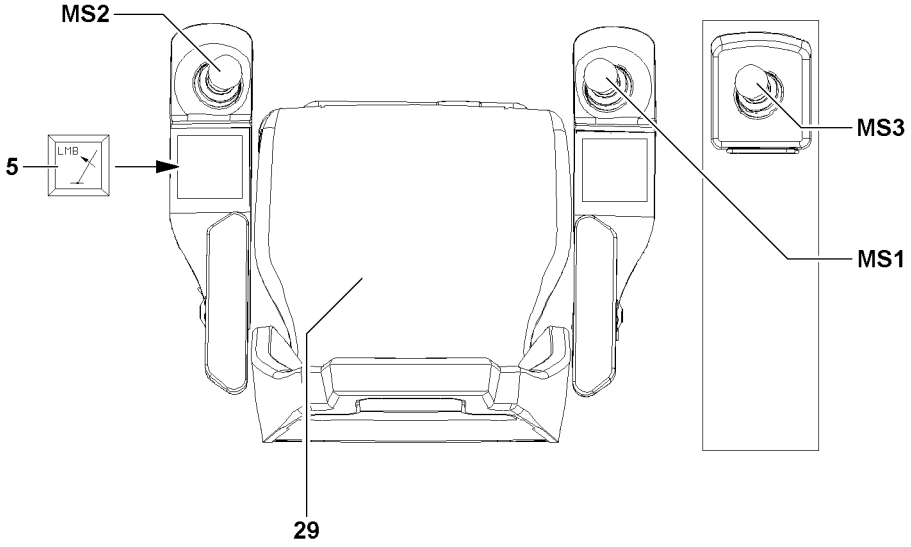
Note
- ▶ If the set up key **D** is actuated in the area “load chart available”, then the working speed is reduced!
- ▶ If the set up key **D** is actuated in the area “no load chart available”, then the working speed is not reduced!

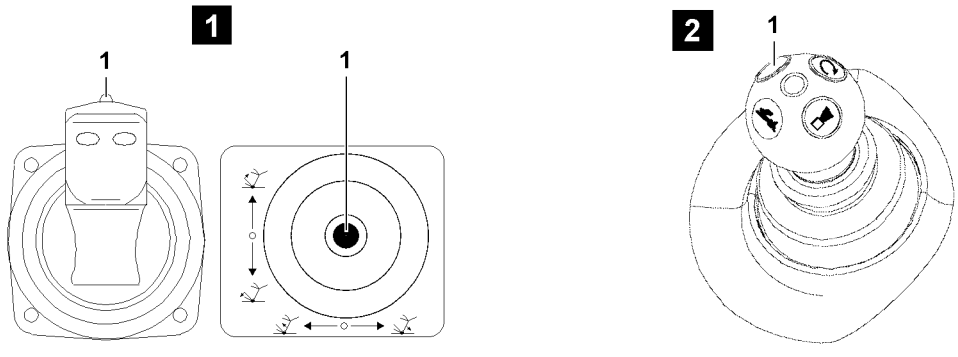
There are two possibilities to exceed the shut off limits of the LICCON overload protection after LML-STOP:
- – With button **5** “luffing in with suspended load” in the left control console
- – With the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**

NOTICE
Danger of mix up!
The function “Exceedance of shut off limits of LICCON overload protection” can only be activated with the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**!
The key switches on the other monitors are not assigned with this function!
- ▶ Do not mix up the set up key **D** with the other key switches!
- ▶ In case of mix up: Deactivate the activated function!

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2.4.1 Luffing in with suspended load

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment.
In the icon **22** (load moment display) the utilization bar **22.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**
This shut off limit can be exceeded by actuating the button **5** “luffing in with suspended load”.
Make sure that the following prerequisites are met:
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.

Note
▶ If the load is reduced by luffing up, then the button **5** “luffing in with suspended load” is not functioning.
▶ For the procedure when the button **5** “luffing in with suspended load” is not functioning, see section “Exceedance of maximum permissible load moment”.

▶ Press the function key **5** “luffing in with suspended load” and hold it.

Result:
– The LICCON overload protection is inactive.

▶ Luff the load in.

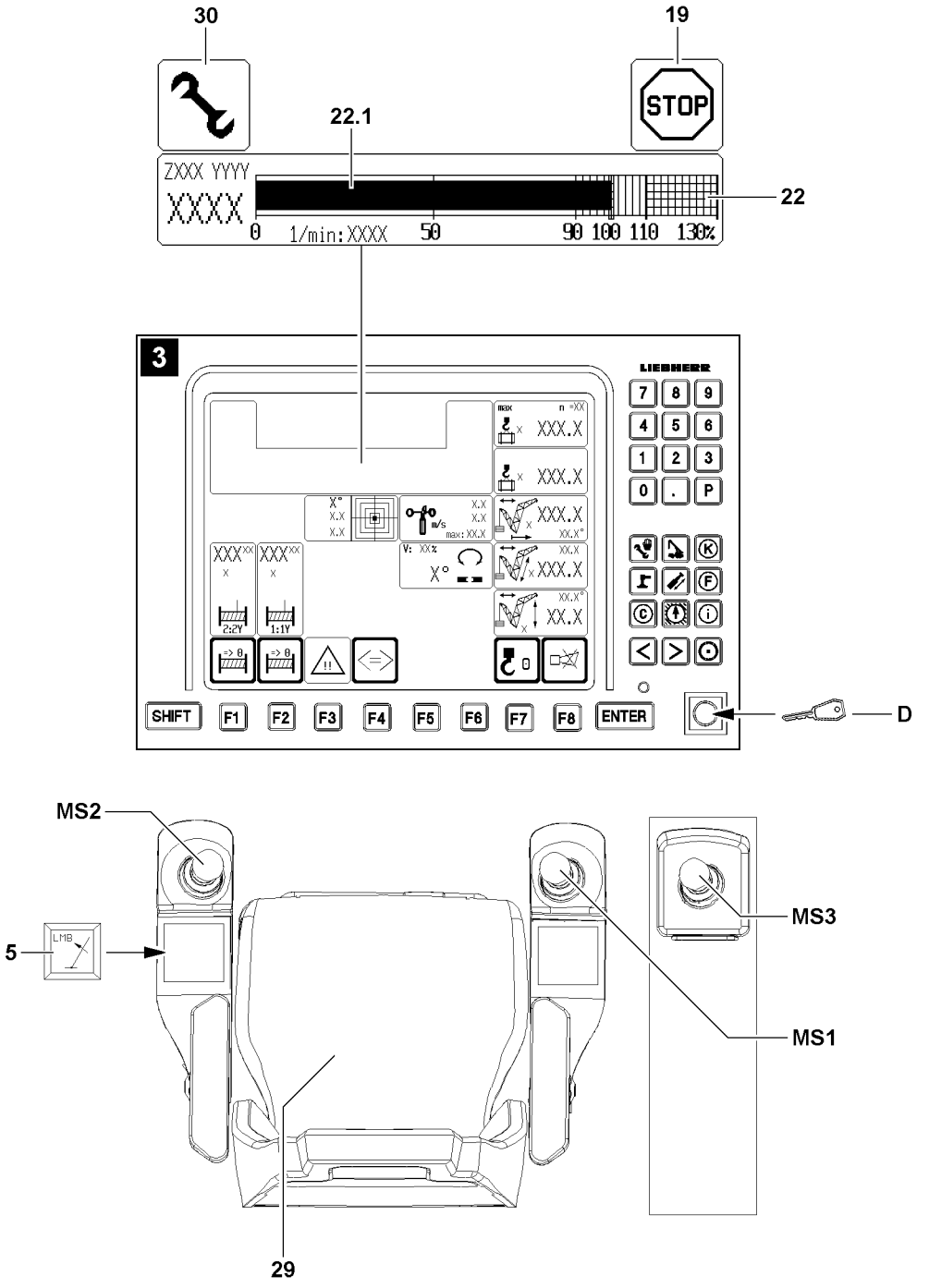
Result:
– If the crane reaches a normal operation status (utilization below 100 % and no active shut off) then the icon **19** turns off, normal crane operation is possible again.

The function “luffing in with suspended load” is also deactivated:
– When the function key **5** “luffing in with suspended load” is not longer actuated
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If the standby mode on the LICCON monitor is active
– In case of defect of an associated sensor (LML)
– At engine stop

The function “luffing in with suspended load” is deactivated:
– The LICCON overload protection is active.

▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

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2.4.2 Exceedance of the maximum permissible load moment

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment.
In the icon **22** (load moment display) the utilization bar **22.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**
This shut off can be exceeded by the configuration button **D** in the “right touching” position.

Note

▶ In emergency situations, the function “Exceedance of shut off limits of the LICCON overload protection” can be activated with the set up key **D** and the maximum permissible load moment can be exceeded by 10% to maximum 110 %.

The set up key **D** on the LICCON monitor has two positions:
– Operating position (not pressed): Crane is in normal operation.
– Position to right (touching): The maximum permissible load moment (100%) can be exceeded, the assembly icon **30** in the LICCON monitor blinks.

Make sure that the following prerequisites are met:
– With the button **5** “Luffing in with suspended load” no normal operating condition (utilization below 100% and no active shut off) can be reached.
– The master switches and the set up key **D** are **not** actuated.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
– Radio operation* is not active.
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– The utilization of 110 % has not been reached and a load chart is available.

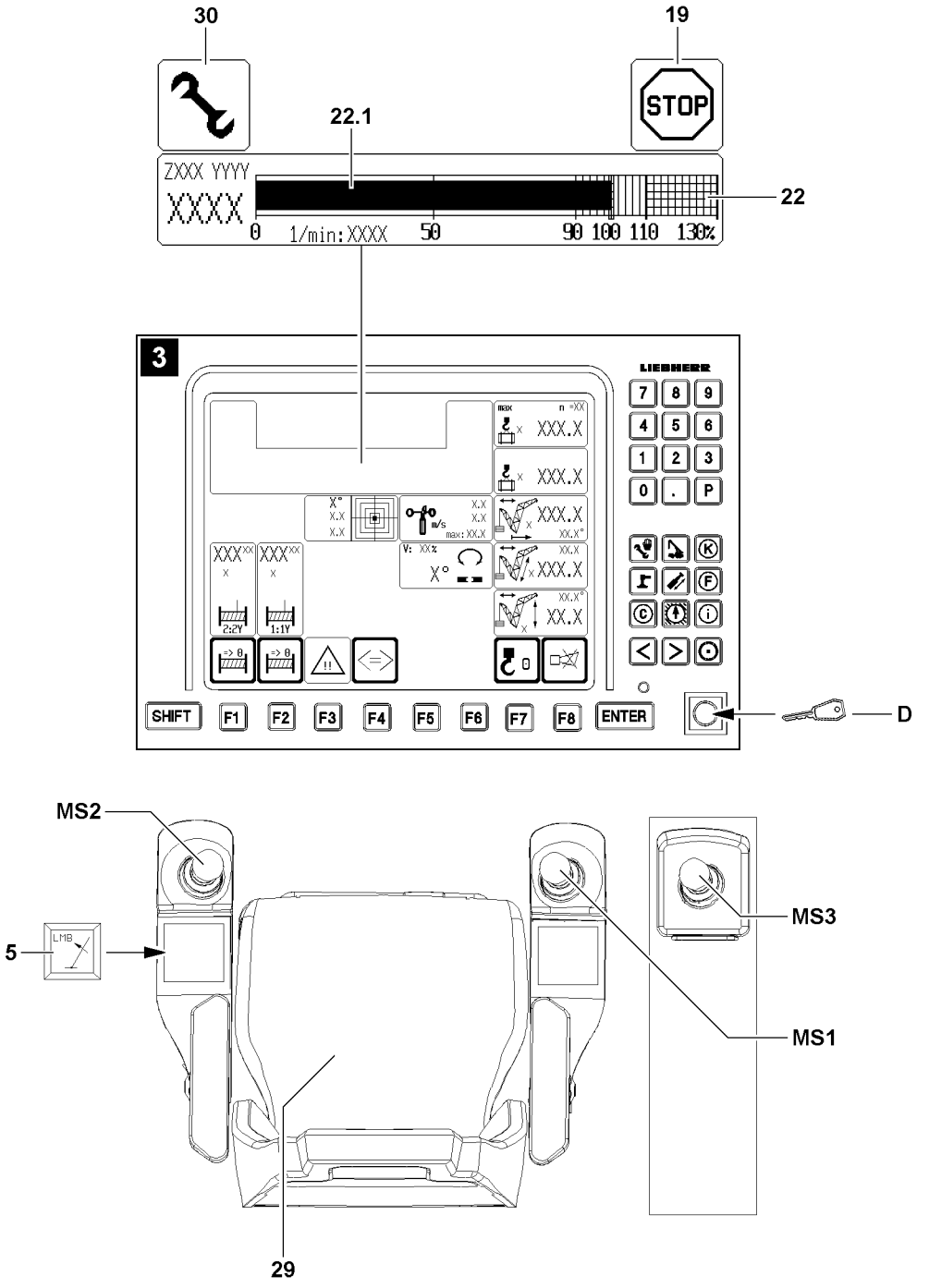
▶ Turn the set up key **D** to the right (touching).

Result:
– The LICCON overload protection is inactive.
– The assembly icon **30** in the LICCON monitor blinks.
– The working speed in the area “load chart available” is reduced for all functions.

Troubleshooting

When it is not possible to exceed the maximum permissible load moment by actuating the set up key **D**?
▶ Contact LIEBHERR Service.

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▶ Initiate crane movements which directly lead to a normal operating status (utilization below 100 % and no active shut off).

Result:

– If a crane reaches a normal operation status (utilization below 100 % and no active shut off), then the function “exceedance of shut off limits of the LICCON overload protection” shuts off, the assembly icon **30** and icon **19** in the LICCON monitor turn off.

In addition, the function “exceedance of shut off limits of LICCON overload protection” turns off:

– If the set up key **D** is pressed again
– If all master switches are in neutral position for 10 seconds (with load chart available)
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If the standby mode on the LICCON monitor is active
– If radio operation* is activated
– At engine stop
– During shut off transition hoist top clear / not clear
– During transition boom not steep / steep
– During transition lower limit angle clear / not clear
– During transition upper limit angle clear / not clear
– In case of defect of an associated sensor (LML)
– When the maximum value Test point 1 (value F1) is reached
– When a utilization of 100% is reached

Note

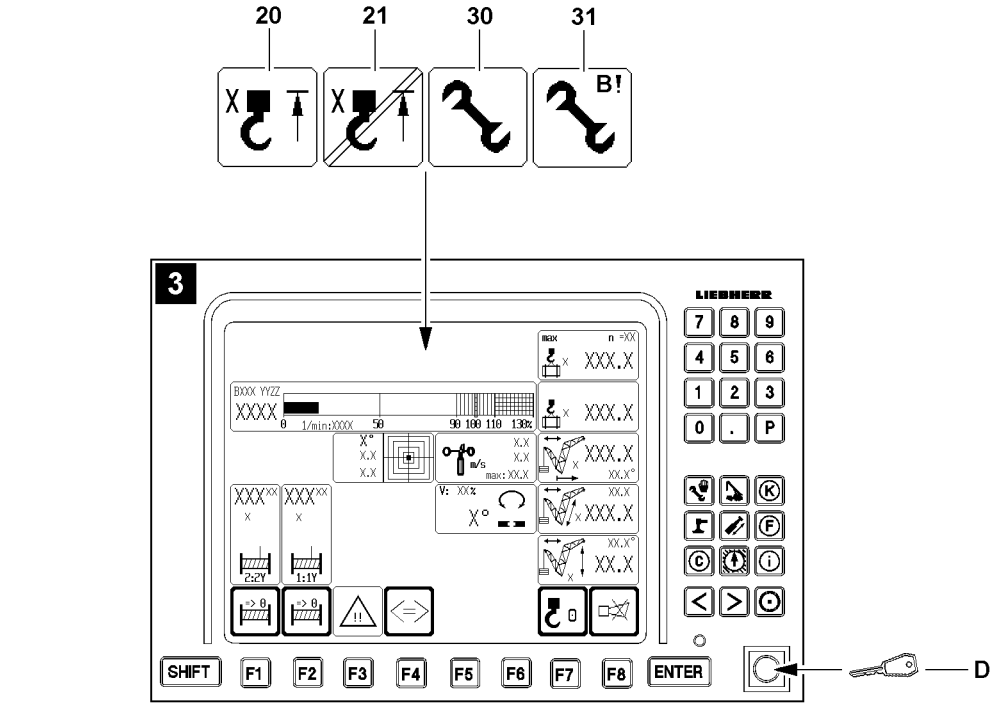
▶ The function “exceedance of shut off limits of the LICCON overload protection” is only turned off when the assembly icon **30** in the LICCON monitor turns off.
▶ If the function “exceedance of shut off limits of the LICCON overload protection” does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

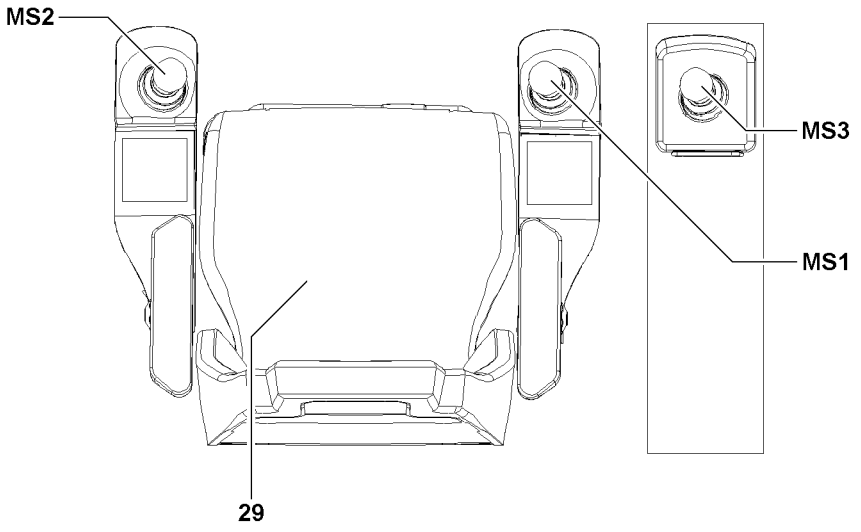
The function “exceedance of shut off limits of the LICCON overload protection” has / was shut off:

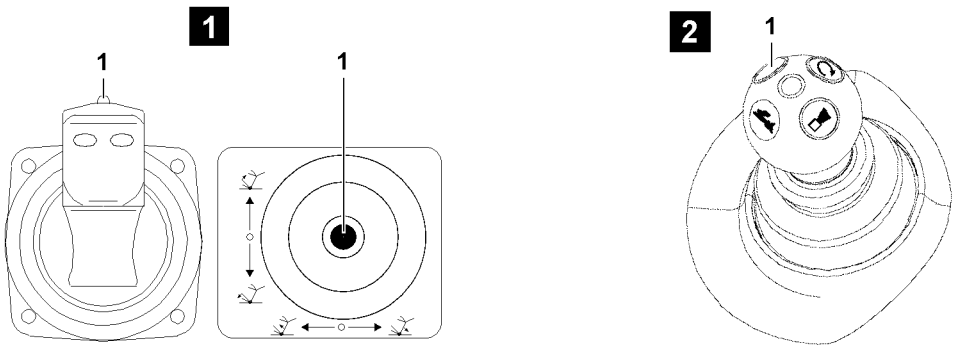
– The assembly icon **30** in the LICCON monitor turns off.
– The working speed is reduced until all master switches are in zero position at the same time.

▶ Make sure that the assembly icon **30** does no longer appear in the LICCON monitor.
▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

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2.5 Bypass of the hoist top shut off

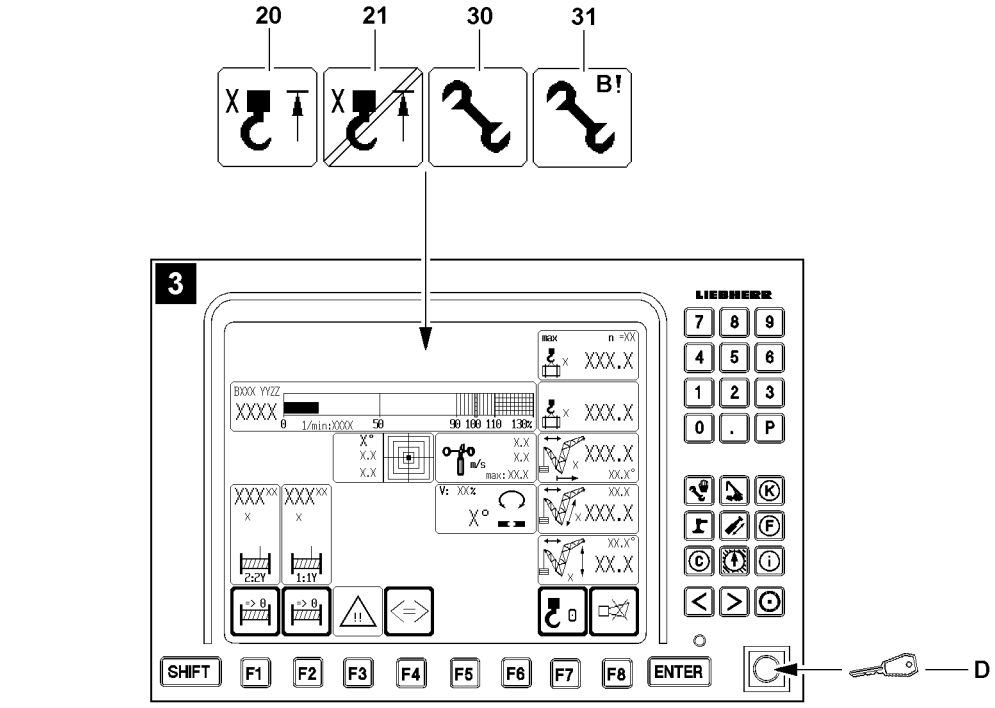
WARNING
Improper use of the function “bypass of hoist top shut off”!
- ▶ The function “bypass of hoist top shut off” may never be used to increase the lifting height during crane operation!

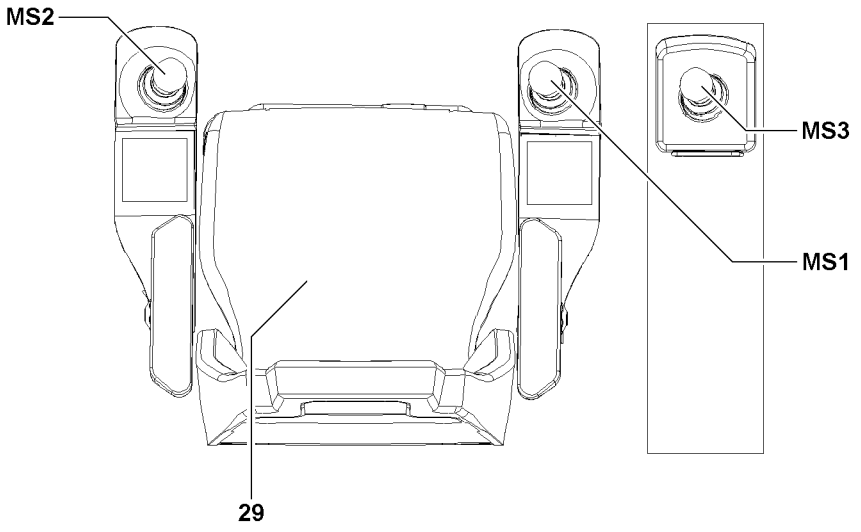
WARNING
Property damage and falling load!
If the function “bypass of hoist top shut off” is activated, there is the danger that the hook block or the load hook is pulled against the pulley head!
This danger exists especially when the hoist winch is continued to be spooled up and for crane movements which have an influence on the hoist rope, for example telescoping or luffing the boom, the attachment or the derrick boom!
Property damage and falling load can result!
Personnel can be severely injured or killed!
- ▶ The function “bypass of hoist top shut off” may only be carried out by an authorized person, along with a guide. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block / load hook and the boom head!
- ▶ Carry out all crane movements with utmost caution!

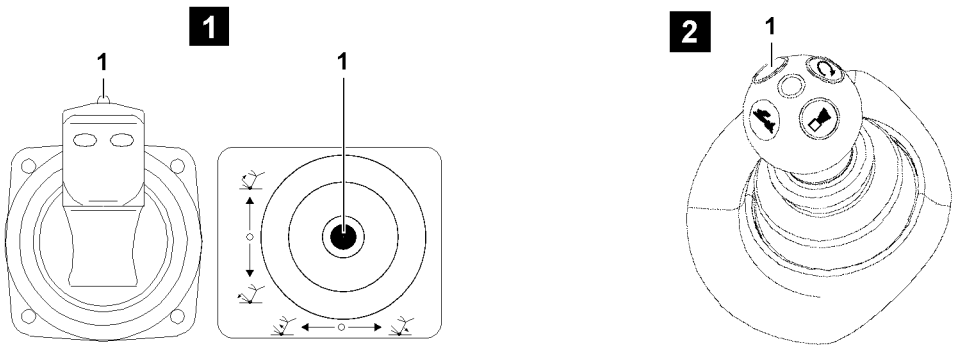
Note
- ▶ The activation of the function “bypass of hoist top shut off” is only possible if the hoist limit switch was touched and the hoist top shut off has occurred.
- ▶ If the hoist limit switch is triggered when the set up key **D** is actuated (function “exceedance of shut off limits of the LICCON overload protection” is active, the assembly icon **30** or the assembly icon **31** blink), then a hoist top shut off occurs and the function “exceedance of shut off limits of the LICCON overload protection” is deactivated.
- ▶ For assembly purposes or in emergency cases, if the activation of the function “bypass of hoist top shut off” **and** activation of the function “Exceedance of shut off limits of the LICCON overload protection” is necessary, then the set up key **D** must be actuated until the icon **21** and assembly icon **30** or assembly icon **31** (assembly operation) appear.

Make sure that the following prerequisites are met:
- – A hoist top shut off has occurred, the hoist top icon **20** appears in the LICCON monitor.
- – Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
- – The master switches are **not** deflected.
- – The crane engine is running.
- – The radio operation* is not active.
- – The standby mode on the LICCON monitor is not active.

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▶ Turn the set up key **D** to the right (touching).

Result:

– The assembly icon **30** or the assembly icon **31** (assembly operation) in the LICCON monitor blink.
– The Hoist top icon **20** in the LICCON monitor changes to the icon **21**.
– The working speed is reduced for all functions (if load chart is available).
– All hoist limit switches are bypassed (also two hook operation).

▶ Carry out a crane movement with bypassed hoist limit switches with upmost caution and by taking the safety guidelines into account.

The function “bypass of the hoist top shut off” turns off:

– If the set up key **D** is pressed again
– When no master switch is deflected for 10 seconds
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If there is no longer a shut off of a hoist limit switch
– If the stand by mode on the LICCON monitor is active
– If the radio operation* is active
– At engine stop

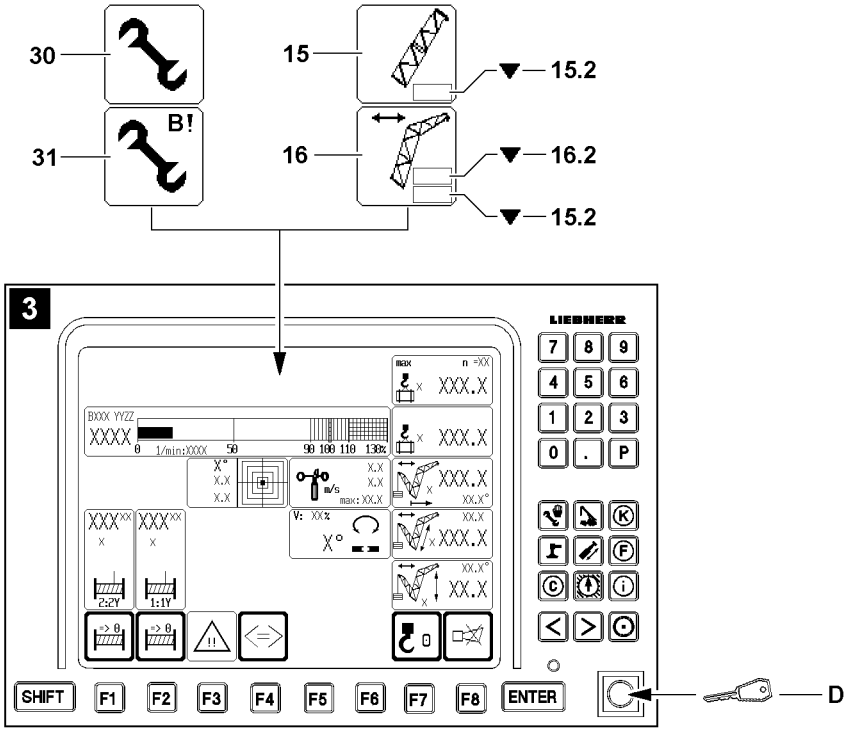
The function “bypass of the hoist top shut off” has / was turned off:

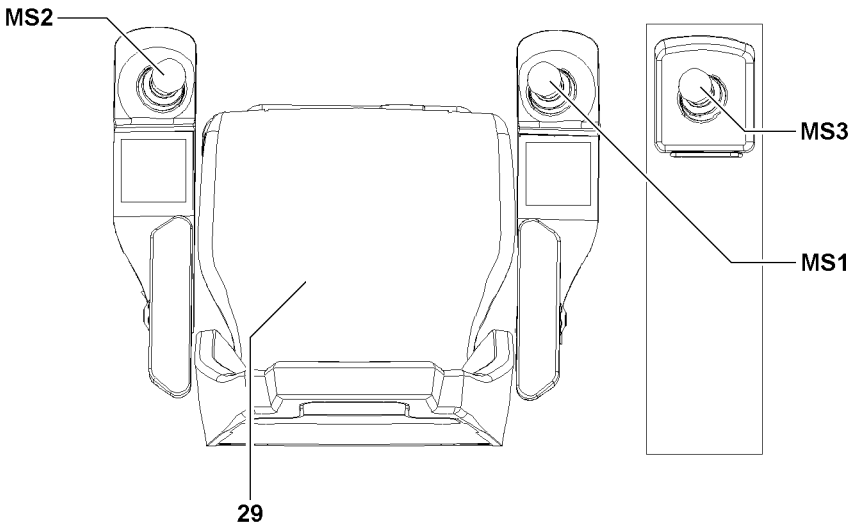
– The assembly icon **30** or the assembly icon **31** (assembly operation) in the LICCON monitor turn off.
– The icon **21** on the LICCON monitor turns off.
– The working speed is reduced until all master switches are in zero position at the same time.

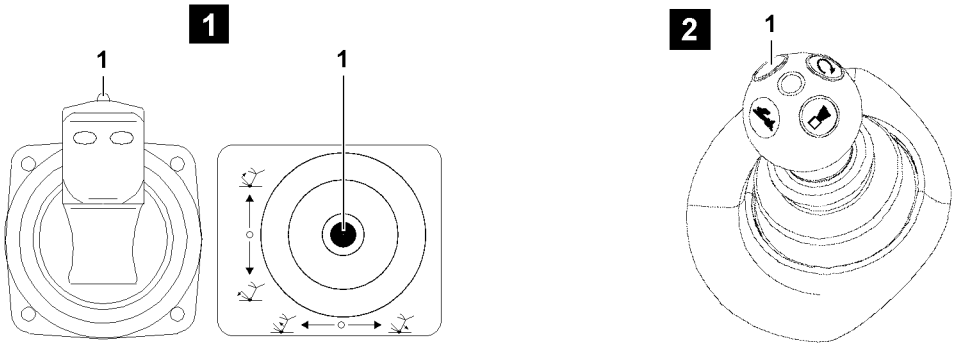
▶ Make sure that the assembly icon **30** or the assembly icon **31** (assembly operation) as well as the icon **21** no longer appear in the LICCON monitor.

▶ Carry out the crane movements in such a way that no repeated hoist top shut off occurs.

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2.6 Bypass of shut off luffing the main boom / attachment down

WARNING
Increased danger of accidents due to bypass of shut off luffing the main boom / attachment down!
When the shut off luffing the main boom / attachment down is bypassed, then the LICCON overload protection as a whole is deactivated or limited.
When the shut off luffing the main boom / attachment down is bypassed and the main boom and / or the attachment is further luffed down, then there is no load chart available any longer!
Crane operation with bypassed shut off luffing the main boom / attachment down is prohibited, since severe accidents can result!
Personnel can be severely injured or killed!
- ▶ Activate the bypass of the shut off luffing the main boom / attachment down only in emergency cases or for erection / take down procedures with erection / take down charts!
- ▶ Carry out all crane movements with utmost caution!

Make sure that the following prerequisites are met:
- In icon **15** or icon **16** the arrow **15.2** or arrow **16.2** blink and the LICCON overload protection has shut off the crane movement.
- Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
- The master switches are **not** deflected.
- The crane engine is running.
- The radio operation* is not active.
- The standby mode on the LICCON monitor is not active.

▶ Turn the set up key **D** to the right (touching).

Result:
- The assembly icon **30** in the LICCON monitor blinks.
- The function “exceedance of shut off limits of the LICCON overload protection” is activated and has bypassed the shut off luffing the main boom / attachment down.

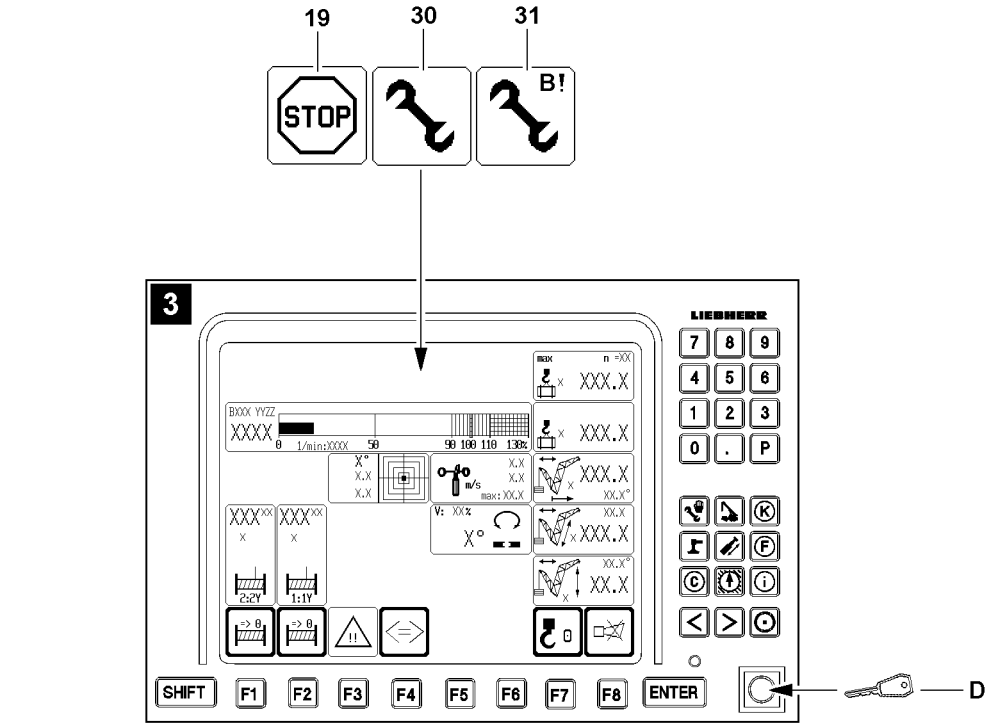
Note
▶ When leaving the area “load chart available”, the assembly icon **30** turns off and the assembly icon **31** appears.

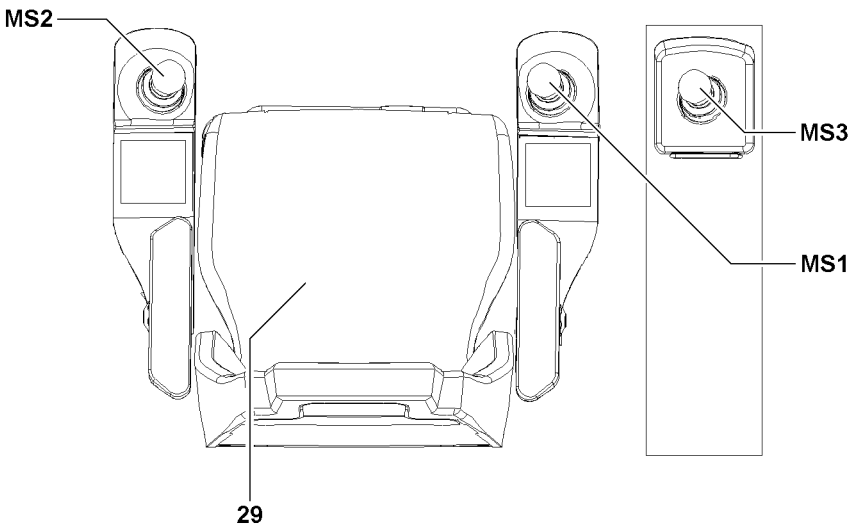
The bypass of the shut off luffing the main boom / attachment down turns off:
- If the set up key **D** is pressed again
- When no master switch is deflected for 10 seconds
- When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
- When an area with existing load chart is reached
- If the stand by mode on the LICCON monitor is active
- If the radio operation* is active
- At engine stop

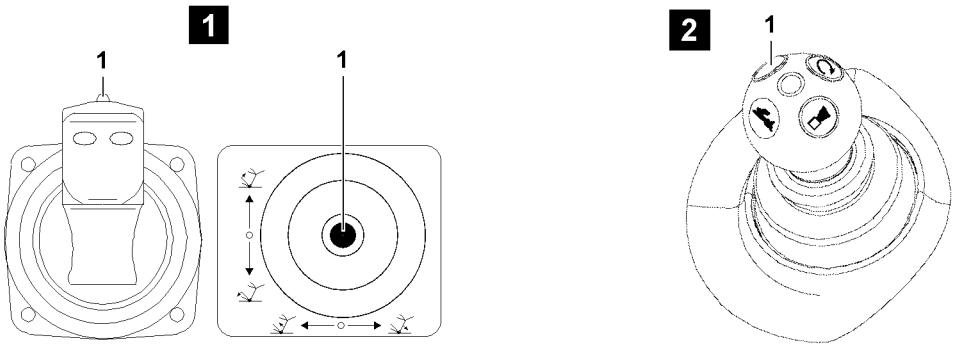
The bypass of the shut off luffing the main boom / attachment down has / was turned off:
- The assembly icon **31** or the assembly icon **30** in the LICCON monitor turns off.
- The working speed is reduced until all master switches are in zero position at the same time.

▶ Make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.

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2.7 Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures (assembly operation)

Note

- If the crane is in the area “no load chart available”, there is a shut off of crane operation by the LICCON overload protection and the icon **19** appears in the LICCON monitor.
- By an actuated set up key **D**, the function “exceedance of shut off limits of the LICCON overload protection” can be activated, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available.

WARNING

Danger of accident during erection / take down procedures!

If the erection / take down charts are not observed, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

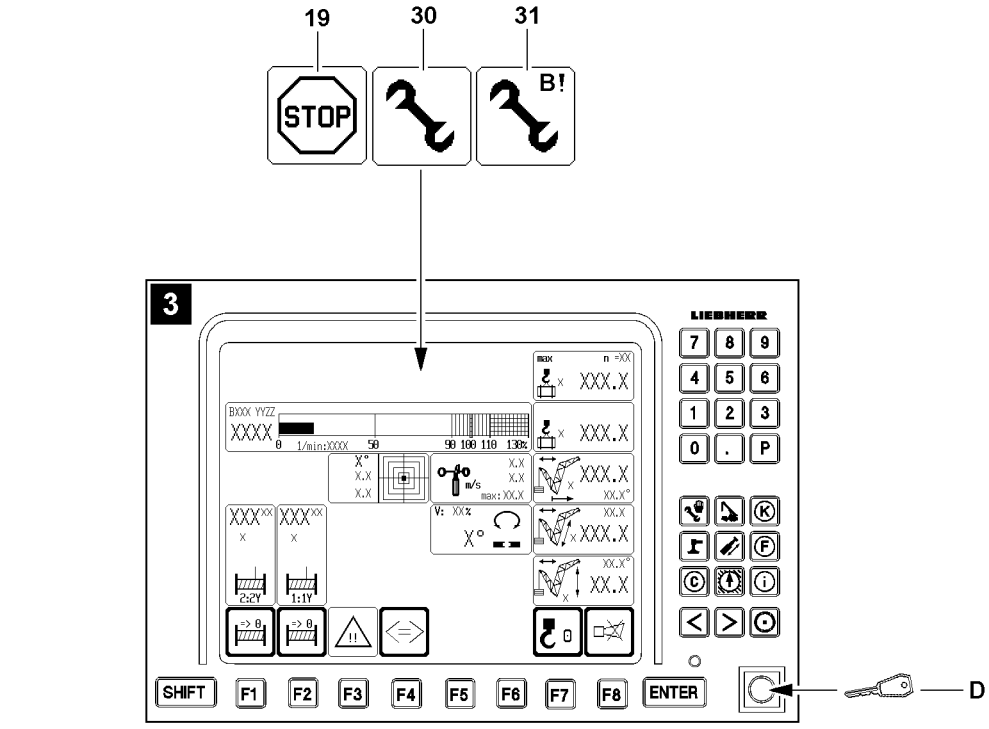
- The erection / take down charts must be observed!
- Press the set up key **D** only when the configuration status has been entered correctly in the LICCON computer system and matches the actual situation!

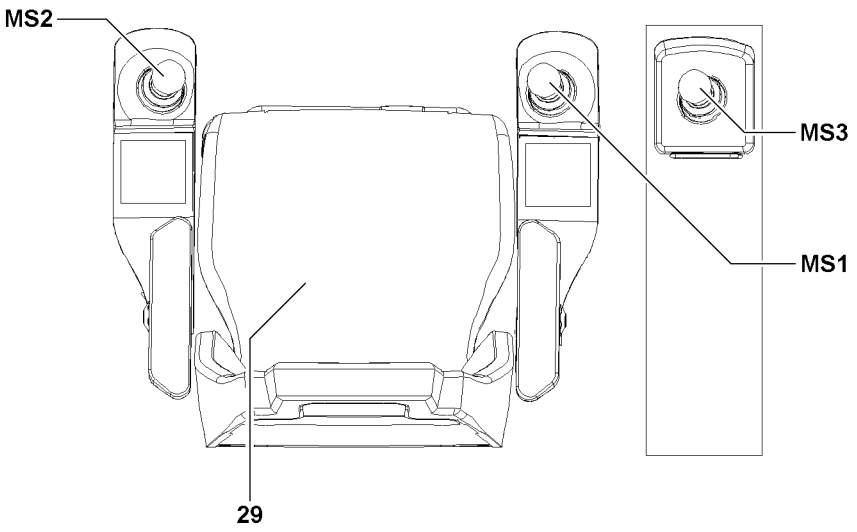
2.7.1 Carrying out the erection / take down procedures (assembly operation)

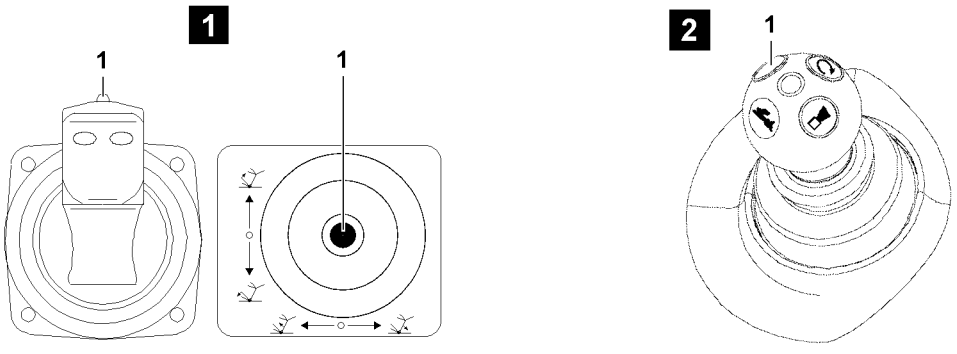
Make sure that the following prerequisites are met:

- The master switches and the set up key **D** are **not** actuated.
- Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
- Radio operation* is not active.
- The crane engine is running.
- The standby mode on the LICCON monitor is not active.
- The erection / take down charts are adhered to.
- The configuration status has been entered correctly into the LICCON computer system.

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▶ Turn the set up key **D** to the right (touching).

Result:

– The assembly icon **30** appears in the area “load chart available”.
– The assembly icon **31** appears in the area “no load chart available”.
– The erection / take down procedures can be carried out.

Troubleshooting

The erection / take down procedure cannot be carried out due to shut off “Maximum value F1 exceeded”?

▶ See section “Exceedance of maximum value Test point 1 (value F1)”.

Troubleshooting

The function “exceedance of shut off limits of the LICCON overload protection” can not be activated during erection / take down procedures?

▶ Contact LIEBHERR Service.

The function “exceedance of shut off limits of the LICCON overload protection” turns off:

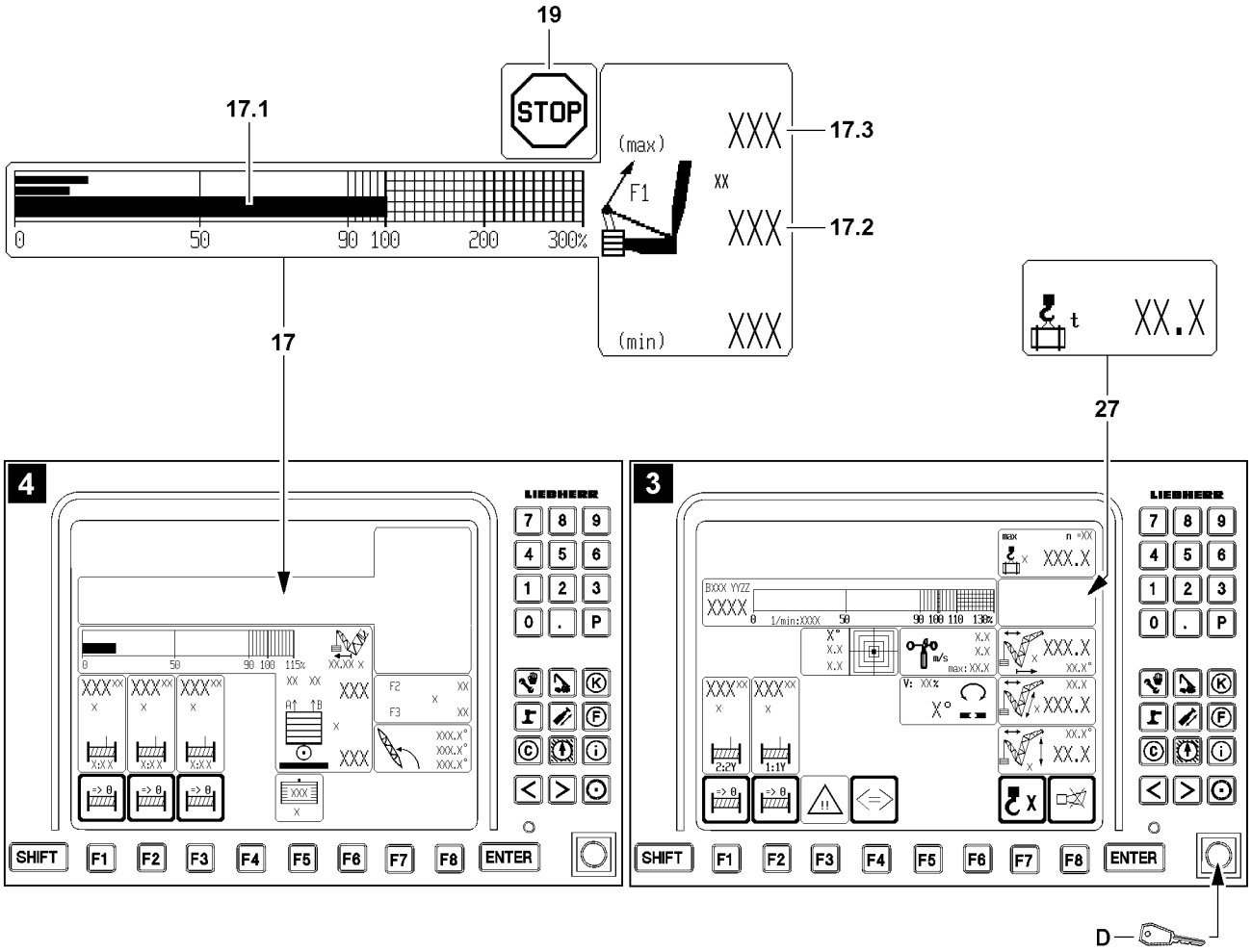
– If the set up key **D** is pressed again
– When all master switches are for 10 seconds after actuation of the set up key **D** in neutral position (with “load chart available”)
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– At engine stop
– When an area with existing load chart is reached (erection procedure)

The function “exceedance of shut off limits of the LICCON overload protection” has / was shut off:

– The assembly icon **30** or the assembly icon **31** in the LICCON monitor turns off.

▶ After completion of the erection / take down procedures, make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.

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2.7.2 Exceedance of maximum value Test point 1 (value F1)

Note
- ▶ The value Test point 1 is described as value F1.
- ▶ The values are shown as number values as well as a utilization bar/ bar display in the icon **17**.
- ▶ For detailed description of test point 1 and other test points on the boom system, see Crane operating instructions, chapter 4.02.

In the icon **17** (display value F1) the utilization bar $F1_{actual}$ **17.1** exceeds the 100% mark and the LICCON overload protection has shut off the crane movement. The number value $F1_{actual}$ **17.2** has exceeded the number value $F1_{max}$ **17.3**.
All further movements, which directly lead to an increase of the value $F1_{actual}$ are shut off.
In the LICCON monitor with the derrick operating screen (illustration **4**) appears the icon **19**.
Before subsequent steps is must be ensured that:
- – A valid configuration status has been entered on the LICCON computer system.
- – The crane is assembled according to the assembly drawings.
- – The actual configuration status and the entered configuration status of the crane match.
- – All attachment parts and guy rods on the boom system, which are not needed, have been removed (weight).
- – The boom system is free of snow and ice (weight).
- – The wind influence onto the boom is not too great.

Note
- ▶ The exceedance of the maximum value test point 1 (value F1) can only be activated when the value in the display field “current load” **27** is smaller than the permissible hook block weight according to the erection / take down chart.
- ▶ The permissible hook block weight were entered in the “winch - pulley head assignment screen”, see Crane operating instructions, chapter 4.02.
- ▶ If the value in the display field “current load” **27** is higher than it actually should be, then there may be a weighing error. Correction of weighing errors, see Crane operating instructions, chapter 4.02.

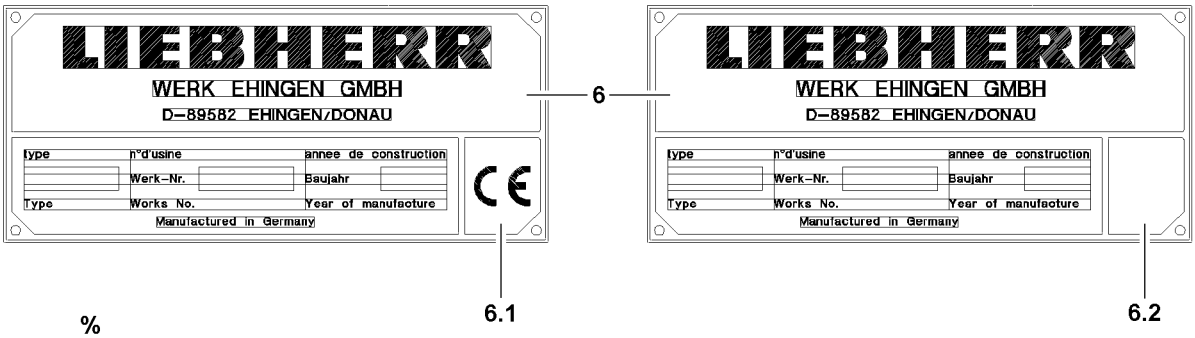
Make sure that the following prerequisites are met:
- – The value in the display field “current load” **27** is smaller than the permissible hook block weight according to the erection / take down chart.
- – The prerequisites from section “carrying out the erection / take down procedures (assembly operation)” are met.
- – The erection / take down procedure cannot be carried out due to shut off “Maximum value F1 exceeded”.

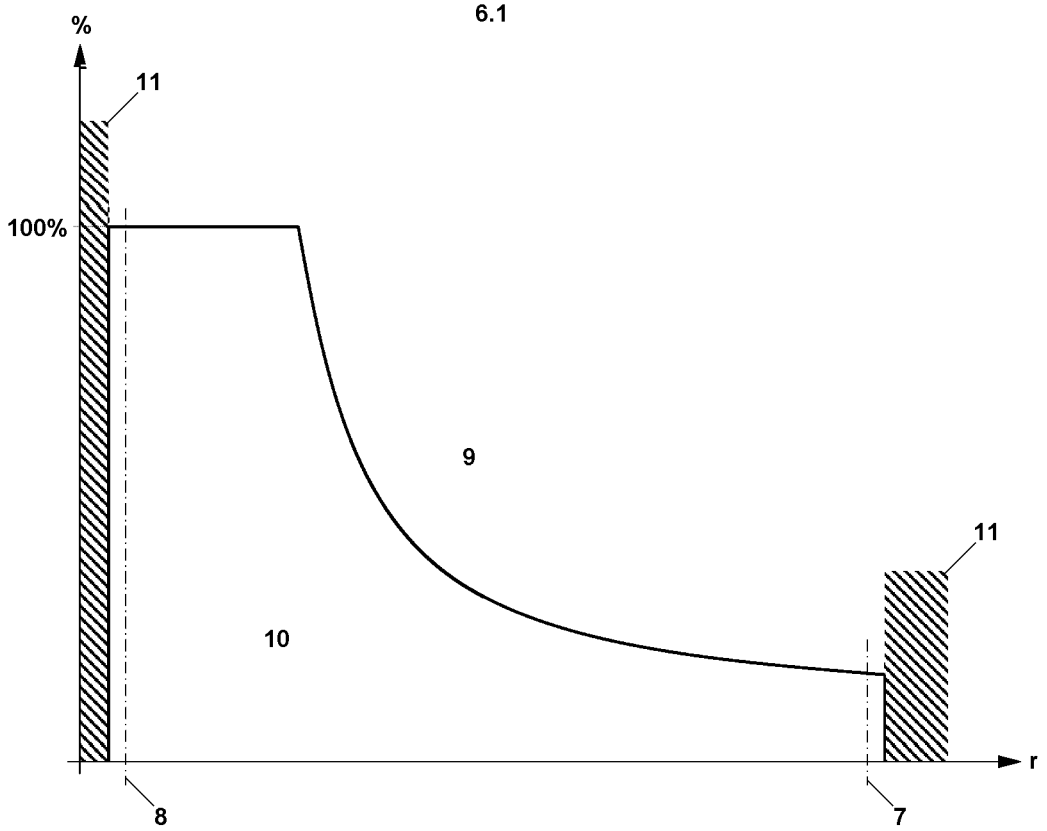
▶ Turn the set up key **D** to the right (touching).

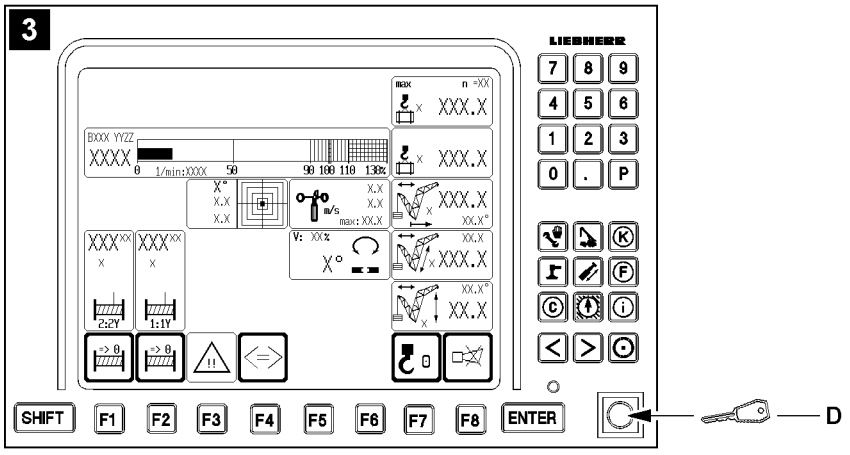
Result:
- – The function “exceedance of shut off limits of the LICCON overload protection” is activated in connection with the function “Exceedance of the maximum value test point 1”.
- – Maximum value test point 1 can be exceeded.
- – The erection / take down procedures according to the erection / take down charts can be carried out.
- – For further procedure, see section “Carrying out the erection / take down procedures (assembly operation)”.

Troubleshooting
When it is not possible to exceed the maximum value test point 1 by actuating the set up key **D**?
▶ Contact Liebherr Service.

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3 Instructions for resuming crane movements for cranes without CE mark

WARNING
Risk of accident!
If the following points are not observed, personnel can be severely injured or killed.
- The crane operator bears the sole and full responsibility for the adherence to measures to be taken in case of shut off of crane movement!
- The crane operator must make sure, before crane operation, that he is using the correct description for the current programming!

Note
- Check the data tag **6** to determine if your crane has a CE mark!
- The following section applies to a crane without CE mark, see data tag **6.2**!
- If your crane does have a CE mark, see data tag **6.1**, then you must observe the description in section “Instructions for resuming a crane movement for cranes with CE mark”!

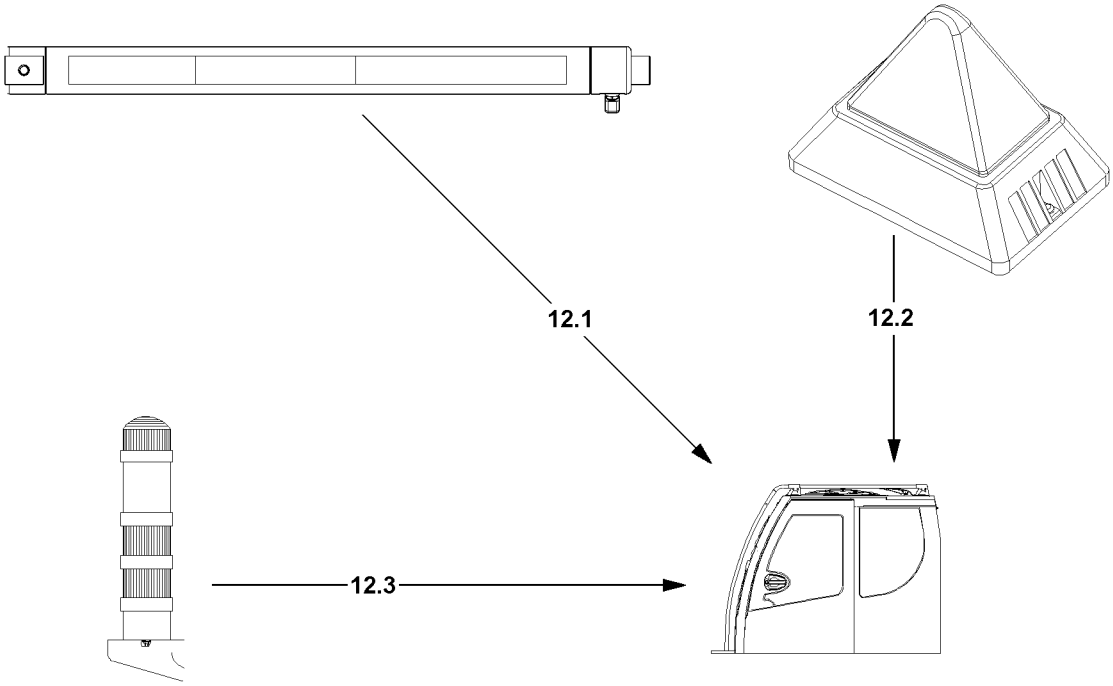
3.1 Overview load chart for cranes without CE mark

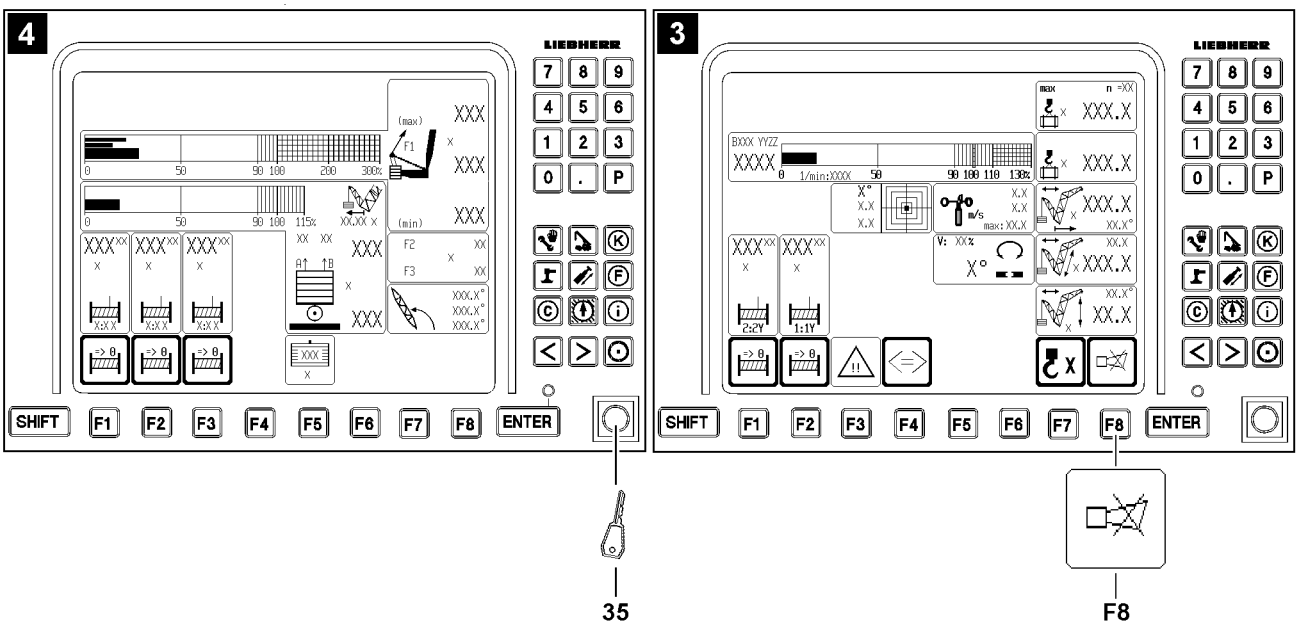
Axle	Description
r	Radius boom (Working radius)
%	Utilization of the crane in percentages

Position	Description
7	Lower limit angle
8	Upper limit angle
9	Area “Exceeding the overload protection”
10	Area “Load chart available”
11	Area “no load chart available”

Note
- If the set up key **D** (LICCON monitor with crane operating screen, illustration **3**) is actuated, the working speed is not reduced!

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3.2 Overview of acoustic / visual warnings for cranes without CE mark

- Depending on the crane type, either a warning light **12.1** or a flashing beacon **12.2** or a combination of flashing beacon **12.2** and warning light* **12.3** are installed.
- The acoustic warnings within the crane operator's cab are turned off by pressing the button **F8** on the LICCON monitor with crane operating screen (illustration **3**).
- The acoustic warnings outside the crane operator's cab are turned off by actuating the key button **35** on the LICCON monitor with derrick operating screen (illustration **4**).

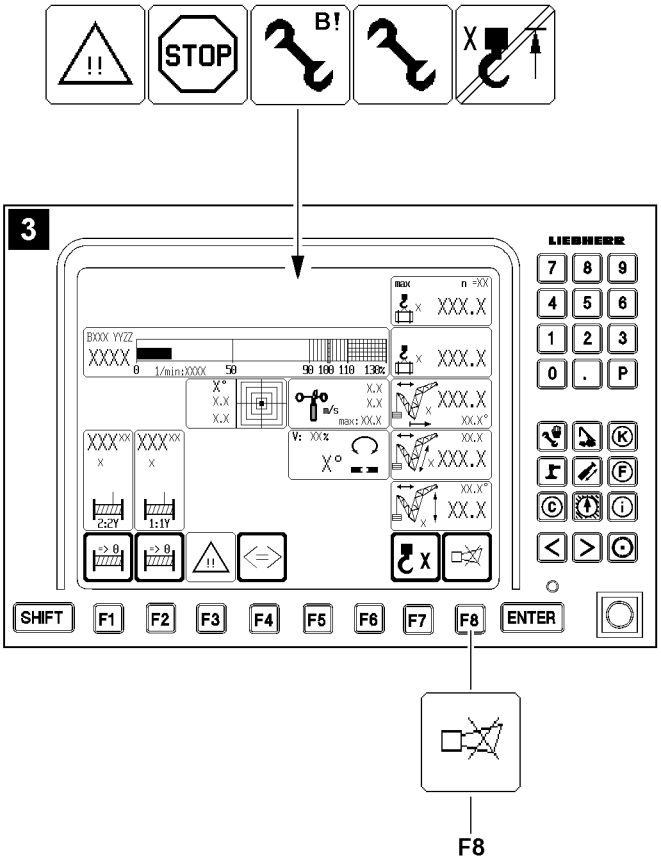
3.2.1 Description of acoustic / visual warnings

The case numbers from the chart “Case number key” is valid for the following charts in this chapter:

- “Acoustic / visual warnings on the LICCON monitor”
- “Warning light 12.1”
- “Flashing beacon 12.2”
- “Warning light 12.3”

Case number key	
Description Case	**Case num-ber**
Utilization of crane from 0 % to 89 %	**Case 001**
Utilization of crane from 90 % to 100 %	**Case 002**
Utilization of crane over 100 %	**Case 003**
Shut off of crane movements - LML Stop	**Case 004**
Luffing in with suspended load	**Case 005**
Participating sensor (LML) defective	**Case 006**
Exceeding the shut off limits of the LICCON overload protection	**Case 010**
Bypass of shut off hoist top	**Case 011**
Bypass of shut off boom / luffing down the attachment, “load chart available”	**Case 016**
Bypass of shut off boom / luffing down the attachment, “no load chart available”	**Case 018**
Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures, “no load chart available”	**Case 020**

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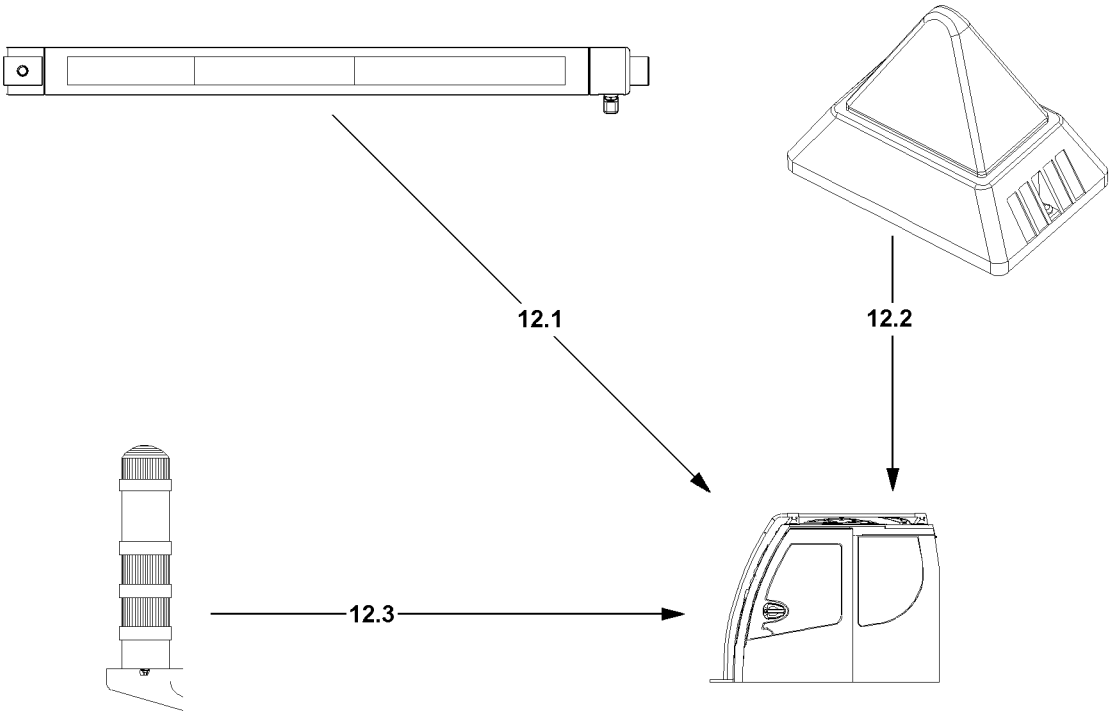
3.2.2 Acoustic / visual warnings within the crane operator's cab

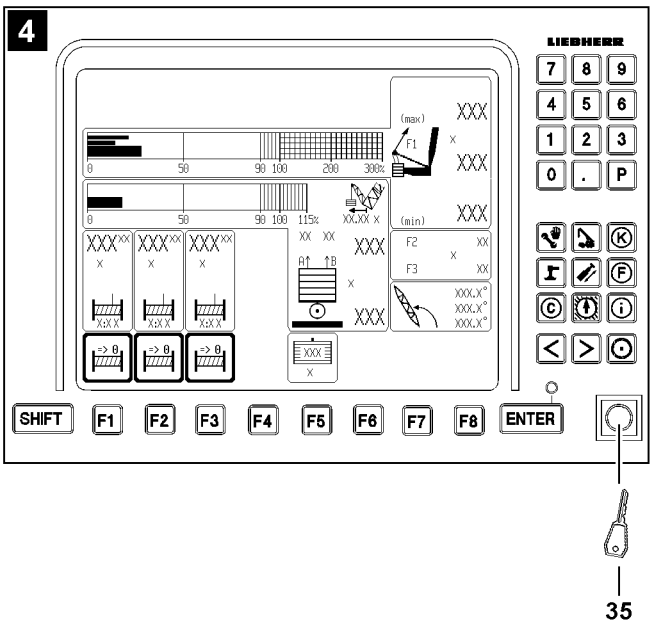
Acoustic / visual warnings on the LICCON monitor									
Case number	**Acoustic warning LICCON monitor at utilization of crane**			**Visual warning LICCON monitor**					
	Short sound	**Long sound**	**Long sound**	**Utilization of crane**		**Occurrence**			
	From 90 %	**Above 100 %**	**Always**	**From 90 %**	**Above 100 %**	**LMB Stop**	**Appears if the set up key D is actuated**		
									
Case 001							—	—	—
Case 002	X²			O			—	—	—
Case 003		X²		O	O		—	—	—
Case 004			X²		O		—	—	—
Case 005	X²	X²		O	O		—	—	—
Case 006			X²			O		O	
Case 010	X²	X²		O	O		O		
Case 011			X²	O	O	O	O		O
Case 016	X²	X²		O	O		O		
Case 018			X²			O		O	
Case 020			X²			O		O	

O = Cannot be turned off

X² = Can be turned off immediately on the LICCON monitor key **F8**

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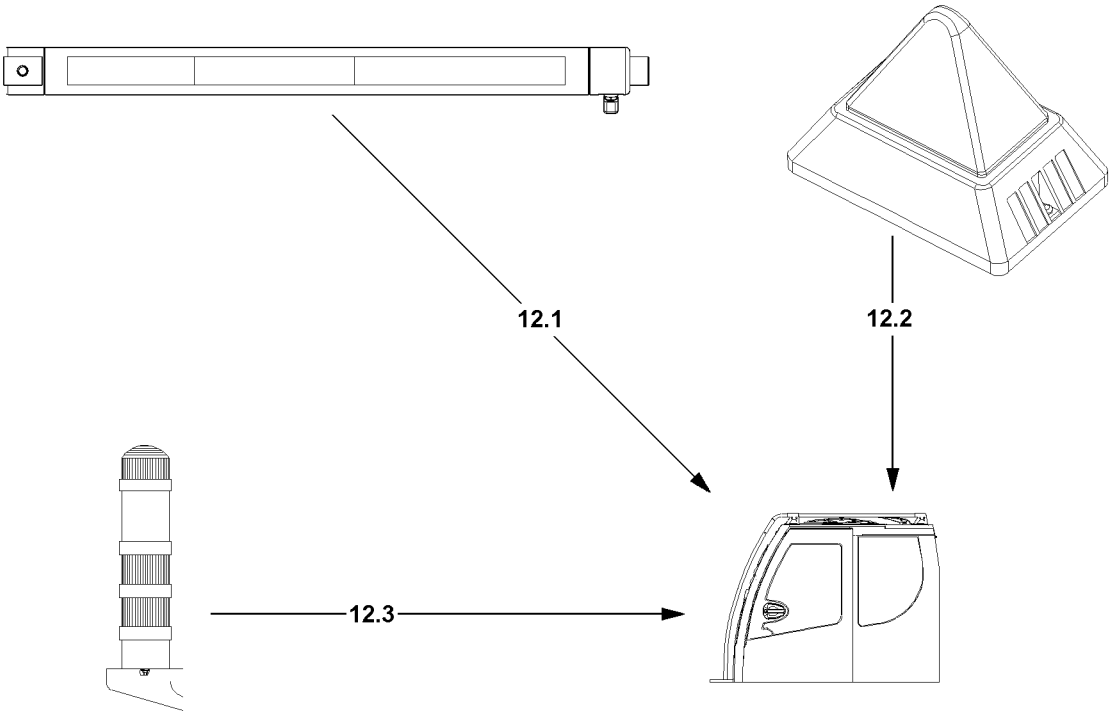
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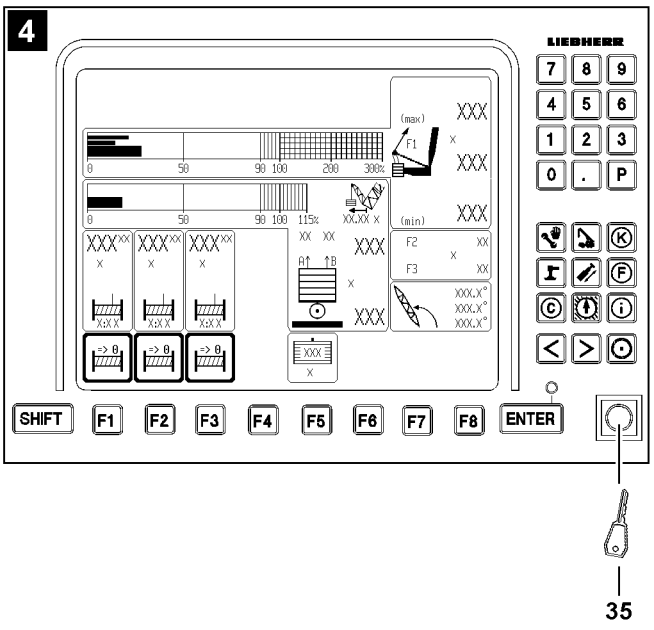
3.2.3 Acoustic / visual warnings outside the crane operator's cab

Warning light 12.1					
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**		
		Signal turntable	**Green**	**Yel-low**	**Red**
Case 001	From 0 % to 89 %		O[1]		
Case 002	From 90 % to 100 %			O[1]	
Case 003	Above 100 %	X[1]			O[1]
Case 004	-				O[1]
Case 005	From 0 % to 89 %		O[1]		
Case 005	From 90 % to 100 %			O[1]	
Case 005	Above 100 %	X[1]			O[2]
Case 006	-			O[2]	
Case 010	From 0 % to 89 %		O[1]		
Case 010	From 90 % to 100 %			O[1]	
Case 010	Above 100 %	O			O[2]
Case 011	From 0% to 100 %			O[2]	
Case 011	Above 100 %	O			O[2]
Case 016	Up to 90 %		O[1]		
Case 016	Above 100 % to 110 %			O[1]	
Case 016	Above 100 %	O			O[2]
Case 018	No value available			O[2]	
Case 020	No value available			O[2]	

O = Cannot be turned off
O[1] = Warning light **12.1** lights up
O[2] = Warning light **12.1** blinks
X[1] = Can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

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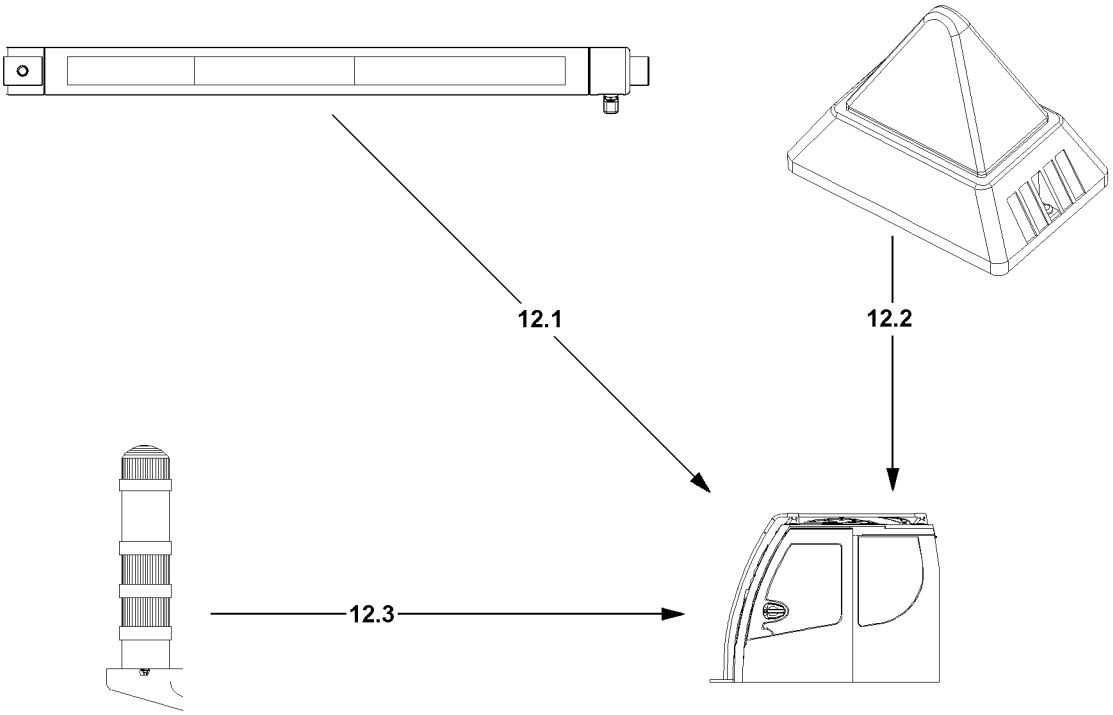
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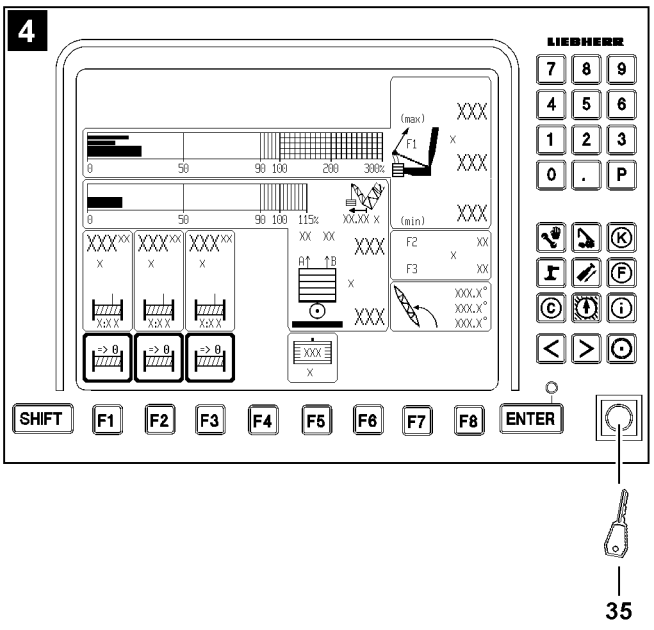
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Flashing beacon 12.2			
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**
		Signal turntable	**Red**
Case 003	Above 100 %	X[1]	O[2]
Case 004	-		O[2]
Case 005	Above 100 %	X[1]	O[2]
Case 006	-		O[2]
Case 010	Above 100 %	O	O[2]
Case 011	Above 100 %	O	O[2]
Case 016	Above 100 %	O	O[2]
Case 018	No value available		O[2]
Case 020	No value available		O[2]

O = Cannot be turned off
O[2] = Flashing beacon **12.2** blinks
X[1] = Can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

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Warning light 12.3					
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**		
		Signal turntable	**Green**	**Yel-low**	**Red**
Case 001	From 0 % to 89 %		O^1		
Case 002	From 90 % to 100 %			O^1	
Case 003	Above 100 %	X^1			O^2
Case 004	-				O^2
Case 005	From 0 % to 89 %		O^1		
Case 005	From 90 % to 100 %			O^1	
Case 005	Above 100 %	X^1			O^2
Case 006	-				O^2
Case 010	From 0 % to 89 %		O^1		
Case 010	From 90 % to 100 %			O^1	
Case 010	Above 100 %	O			O^2
Case 011	From 0% to 100 %			O^1	
Case 011	Above 100 %	O			O^2
Case 016	From 0 % to 89 %		O^1		
Case 016	From 90 % to 100 %			O^1	
Case 016	Above 100 %	O			O^2
Case 018	No value available				O^2
Case 020	No value available				O^2

O = Cannot be turned off
O^1 = Warning light **12.3** lights up
O^2 = Warning light **12.3** blinks
X^1 = Can be turned off by actuating (right touching) the key button **35** on the LICCON monitor with the derrick operating screen (illustration **4**), effective after at least 5 seconds

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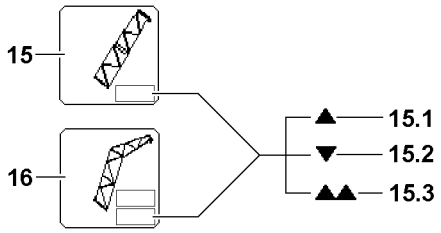
3.3 Shut off of crane movement

Note
- ▶ If the LICCON overload protection turns the crane movement off, then the exact cause for the shut off must be determined first.
- ▶ As a first step, try to rescind the crane movement which has caused a shut off.
- ▶ If it is not possible to rescind the affected crane movement, then the additional steps are described in the respective sections.

Note
- ▶ For detailed description of the individually listed icons, see Crane operating instructions, chapter 4.02.

The LICCON overload protection carries out the following shut offs if a limit value is exceeded in crane operation:
- – Shut off Luffing the main boom up / down
- – Shut off Luffing the attachment up / down
- – Shut off maximum / minimum value Test point 1 (value F1)
- – Shut off spooling the winch up / out
- – Shut off hoist top
- – Shut off Crane movement with danger of tipping to the rear*
- – Shut off due to error message

3.3.1 Shut off Luffing the main boom up / down



In icon **15** or icon **16** (lower field) arrow **15.1** or arrow **15.2** blink and the LICCON overload protection has shut off the crane movement.
“Luffing the main boom up” (arrow **15.1**) or “Luffing the main boom down” (arrow **15.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded or fallen below.

Note
- ▶ If the utilization of the crane is more than 95 % and the maximum load according to the load chart (falling load capacity) drops by continuing to luff up the boom, then the arrow **15.1** and the crane movement “luffing the main boom up” is turned off.

If the double arrow **15.3** appears blinking in the icon **15** or icon **16** (lower field), then: the main boom relapse cylinders were luffed up on one limit switch or the limit switch has turned off the crane movement “luffing the main boom up”.

The arrow **15.1** blinks and the crane movement “luffing the main boom up” was turned off:
- ▶ Luff the main boom down.

Result:
- – Crane operation is possible again.

The arrow **15.2** blinks and the crane movement “luffing the main boom down” was turned off:
- ▶ Luff the main boom up.

Result:
- – Crane operation is possible again.

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The double arrow **15.3** blinks and the crane movement “luffing the main boom up” was turned off:

▶ Luff the main boom down.

Result:

– Crane operation is possible again.

Troubleshooting

The double arrow **15.3** does not turn off after luffing down?

There is an error in one limit switch of the main boom relapse cylinders.

▶ Stop crane operation and remedy the error in the limit switch immediately.

WARNING

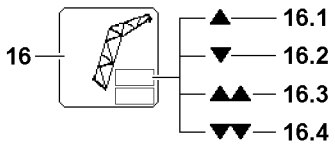
Limited warning functions

If one of the double version limit switches is not ok and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited!

▶ The crane can only be operated in an emergency after failure of a double version limit switch!

▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

3.3.2 Shut off Luffing the attachment up / down



In the icon **16** (upper field) the arrow **16.1** or arrow **16.2** blink and the LICCON overload protection has shut off the crane movement.

“Luffing the attachment up” (arrow **16.1**) or “Luffing the attachment down” (arrow **16.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded or fallen below.

If the double arrow **16.3** appears blinking in the icon **16** (upper field), then:

– **either** the attachment relapse cylinders were luffed up on one limit switch or the limit switch has turned off the crane movement “luffing the attachment up”,
– **or** the mechanical relapse support has turned off the crane movement “luffing the attachment up”,
– **or** there is an error on one of the limit switches of the attachment relapse cylinders.

If the double arrow **16.4** appears blinking in the icon **16** (upper field), then:

– **either** it was luffed down to a limit switch “attachment bottom” and the limit switch has turned off the crane movement “luffing the attachment up”,
– **or** there is an error on one of the limit switches “Attachment bottom”.

The arrow **16.1** blinks and the crane movement “luffing the attachment up” was turned off:

▶ Luff the attachment down

Result:

– Crane operation is possible again.

The arrow **16.2** blinks and the crane movement “luffing the attachment down” was turned off:

▶ Luff the attachment up

Result:

– Crane operation is possible again.

The double arrow **16.3** blinks and the crane movement “luffing the attachment up” was turned off:

▶ Luff the attachment down

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Result:

– Crane operation is possible again.

The double arrow **16.4** blinks and the crane movement “luffing the attachment down” was turned off:

▶ Luff the attachment up

Result:

– Crane operation is possible again.

Troubleshooting

The double arrow **16.3** does not turn off after luffing down?

There is an error in one limit switch of the attachment relapse cylinders.

▶ Remedy the error in the limit switch.

WARNING

Limited warning functions

If one of the double version limit switches is not ok and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited!

▶ The crane can only be operated in an emergency after failure of a double version limit switch!

▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

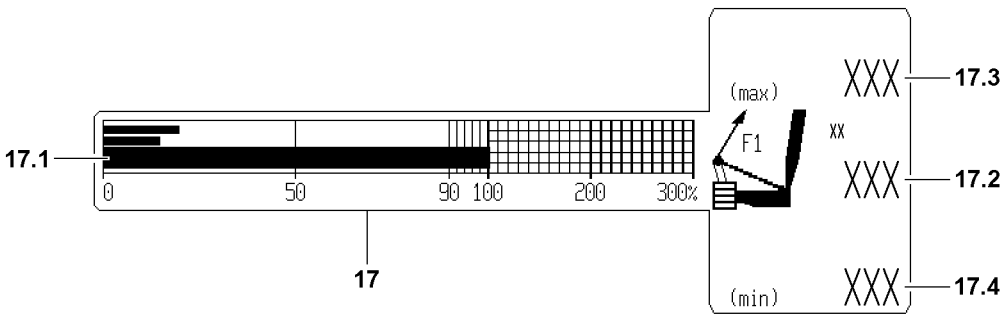
3.3.3 Shut off maximum / minimum value Test point 1 (value F1)

Note

▶ The value Test point 1 is described as value F1.

▶ The values are shown as number values as well as a utilization bar/ bar display in the icon **17**.

Shut off maximum value F1



In the icon **17** (display value F1) the utilization bar $F1_{actual}$ **17.1** exceeds the 100% mark and the LICCON overload protection has shut off the crane movement. The number value $F1_{actual}$ **17.2** has exceeded the number value $F1_{max}$ **17.3** by more than 20 t (for crane types to 1000 t) or 40 t (for crane types above 1000 t.

All further movements, which directly lead to an increase of the value $F1_{actual}$ are shut off.

▶ Reverse any crane movement which has caused the shut off.

or

■ Initiate an alternative crane movement, which lowers the value $F1_{actual}$.

Result:

– Crane operation is possible again.

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Troubleshooting

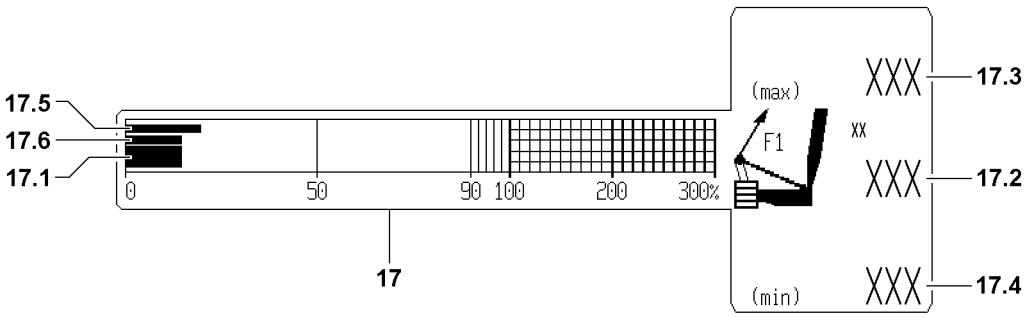
The crane operation is limited because the maximum value F1 apparently is being reached too early?

- ▶ Make sure that a valid configuration status has been entered on the LICCON computer system!
- ▶ Make sure that the crane is assembled according to the assembly drawings!
- ▶ Make sure that the actual configuration status and the entered configuration status of the crane match!
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed (weight)!
- ▶ Make sure that the boom system is free of snow and ice (weight)!
- ▶ Make sure that the wind influence onto the boom is not too great!
- ▶ If no irregularities can be found:
  Contact LIEBHERR Service.

Shut off minimum value F1

Note

- ▶ A shut off by value $F1_{min}$ only occurs in operating modes with derrick ballast. The status value $F1_{actual}$ just as value $F1_{min}$ cannot be reached in all other operating modes.



In the icon **17** (display value F1), when falling below the bar display $F1_{min\ warning}$ **17.5**, a warning of the upcoming shut off is issued by the utilization bar $F1_{actual}$ **17.1**.
If the utilization bar $F1_{actual}$ **17.1** falls below the bar display $F1_{min}$ **17.6**, then the LICCON overload protection shuts off the crane movement. The number value $F1_{actual}$ **17.2** has fallen below the number value $F1_{min}$ **17.4**.
All further movements, which directly lead to a decrease of the force F1 are shut off.

- ▶ Reverse any crane movement which has caused the shut off.

or

- ■ Initiate an alternative crane movements which increases the force F1.

Result:

– Crane operation is possible again.

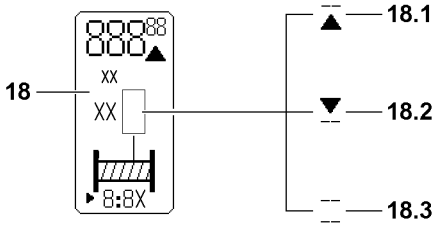
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Troubleshooting

The crane operation is limited because the minimum value F1 apparently is being reached too early?

- ▶ Make sure that a valid configuration status has been entered on the LICCON computer system!
- ▶ Make sure that the crane is assembled according to the assembly drawings!
- ▶ Make sure that the actual configuration status and the entered configuration status of the crane match!
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed!
- ▶ Make sure that the boom system is free of snow and ice!
- ▶ Make sure that the wind influence onto the boom is not too great!
- ▶ If no irregularities can be found:
  Contact LIEBHERR Service.

3.3.4 Shut off spooling the winch up / out



In the icon **18**, the line / arrow **18.1**, arrow / line **18.2** or line / arrow **18.3** blink and the LICCON overload protection has shut off the crane movement.
“Spooling the winch out” (line / arrow **18.1**) or “spooling the winch up” (arrow / line **18.2**) was shut off because the upper / lower limit angle of the rope for the selected winch was exceeded or fallen below.
If line / line **18.3** appears blinking in the icon **18**, then the affected winch is deactivated.

The line / arrow **18.1** blinks and the crane movement “spooling the winch out” was turned off:

- ▶ Spool the winch up.

Result:

– Crane operation is possible again.

The line / arrow **18.2** blinks and the crane movement “spooling the winch up” was turned off:

- ▶ Spool the winch out.

Result:

– Crane operation is possible again.

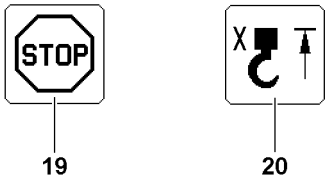
Line / line **18.3** blinks and the winch is deactivated:

- ▶ Activate the winch, see Crane operating instructions, chapter 4.02.

Result:

– Crane operation is possible again.

3.3.5 Shut off hoist top



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The icon **19** and Hoist top icon **20** appear in the LICCON monitor and the LICCON overload protection has turned off crane movement.
Spooling the hoist winch up was turned off because the hook block or the load hook has run against a hoist limit weight during the upward movement and the affected hoist limit switch was triggered.

Note

▶ After shut off of spooling the hoist winch up (hoist top), the crane movements “telescoping the boom out”, “luffing the boom down”, “luffing the attachment down” and possibly additional movements which have an effect on the length of the hoist rope are also shut off. This should minimize the risk that the crane can be damaged due to erroneous operation.

▶ Spool the hoist winch out.

Result:

– Crane operation is possible again.

3.3.6 Shut off Crane movement with danger of tipping to the rear

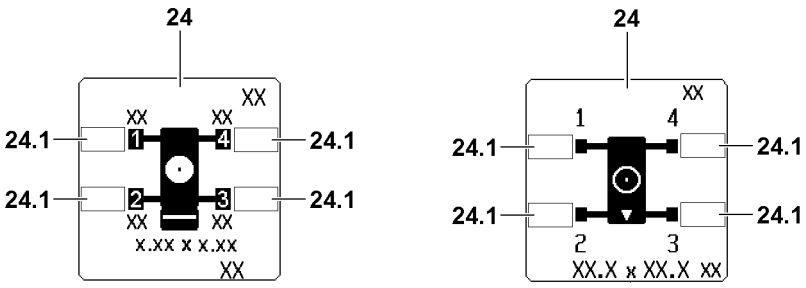
Note

▶ Applies only for cranes with support force monitoring*.

WARNING

Danger of tipping over!
When reaching the programmed minimum / maximum support force limits there is **no** automatic shut off of crane movements!
Exception: When the two supports with the lowest forces are in boom direction, then some crane movements which increase the “danger of tipping to the rear” significantly are turned off!

▶ If there is a “danger of tipping to the rear”, luff the boom down carefully until the support limit forces are again within the minimum / maximum values!



Icon **24** (depending on the crane similar as on the left or right illustration) is shown in the LICCON monitor with blinking values in both fields **24.1** of the supports with the lowest forces, an acoustic signal sounds and the LICCON overload protection has turned off the crane movement.
Crane movements which increase the “danger of tipping to the rear” significantly were turned off.

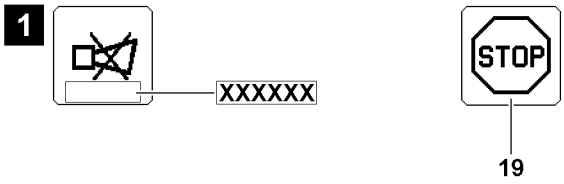
▶ Luff the boom down carefully until the support limit forces are again within the minimum / maximum values and no value in the fields **24.1** blinks any longer.

Result:

– Crane operation is possible again.

3.3.7 Shut off due to error message

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An error message appears in the “horn” icon, illustration **1**, the icon **19** appears in the LICCON monitor and the LICCON overload protection has turned the crane movement off.

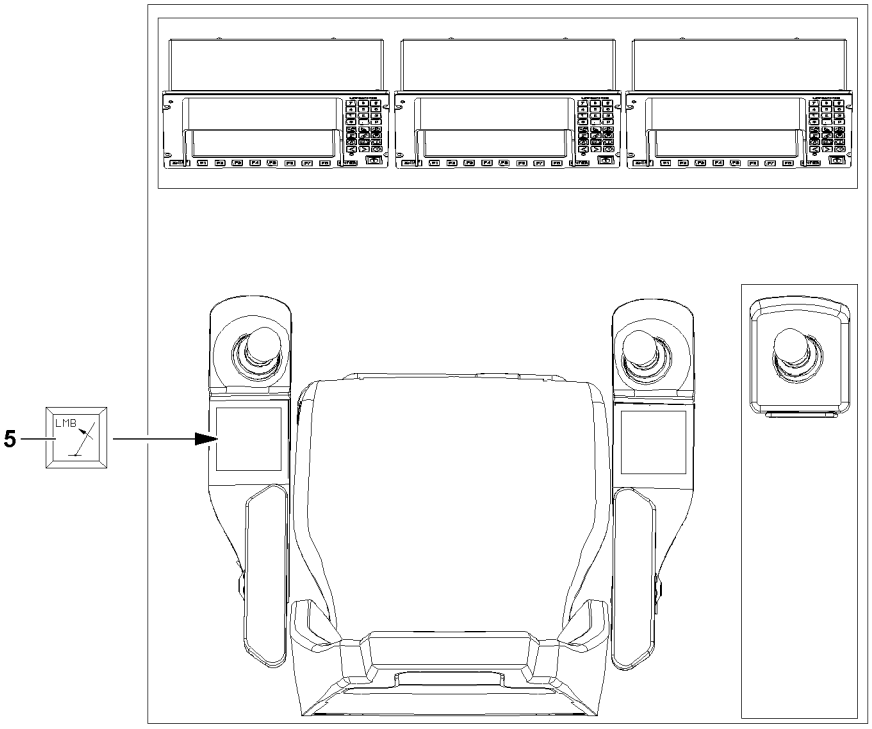
WARNING
Limited warning functions
If there is a defect on a participating sensor (LML) and the crane is continued to be operated by bypassing the sensor other otherwise, then the warning functions and the shut offs of the LICCON overload protection are deactivated!
- ▶ If there is a defect on a participating sensor (LML), then the crane may not be operated further!
- ▶ Fix / replace the sensor before starting crane operation again!

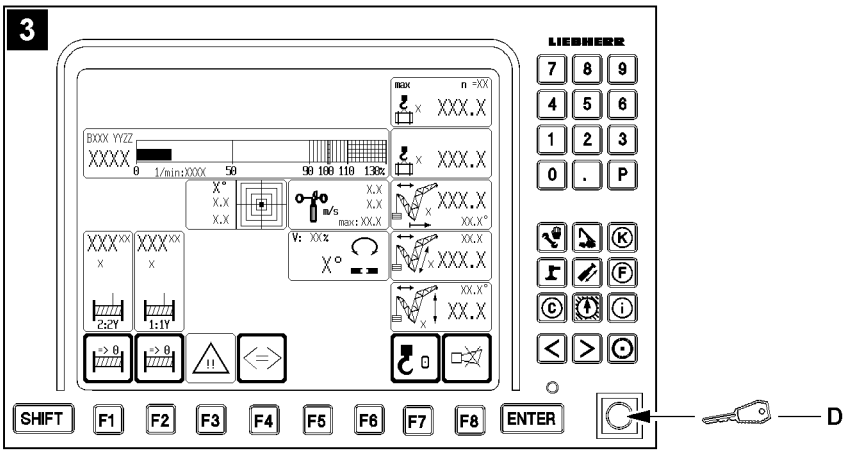
- ▶ Determine existing errors with the LICCON error code from the field in illustration **1**, see Diagnostics manual.
- ▶ Remedy the error.

Troubleshooting
The erection of the crane, for example after assembly on a new job site or with another equipment configuration, is not possible due to an error message?
- ▶ As the first step, make sure that all electrical connections have been made.
- ▶ Check if all sensors or dummy plugs with integrated electric have been connected properly.

- ▶ If the error cannot be remedied:
  Contact LIEBHERR Service.

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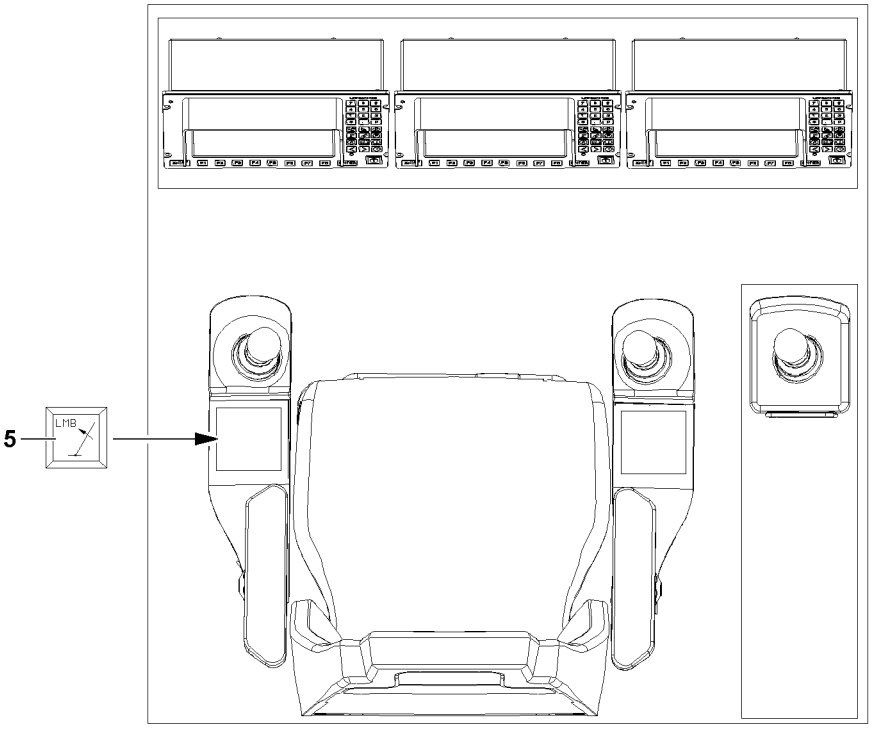
3.4 Shut off of crane movement: LML-STOP by LICCON overload protection

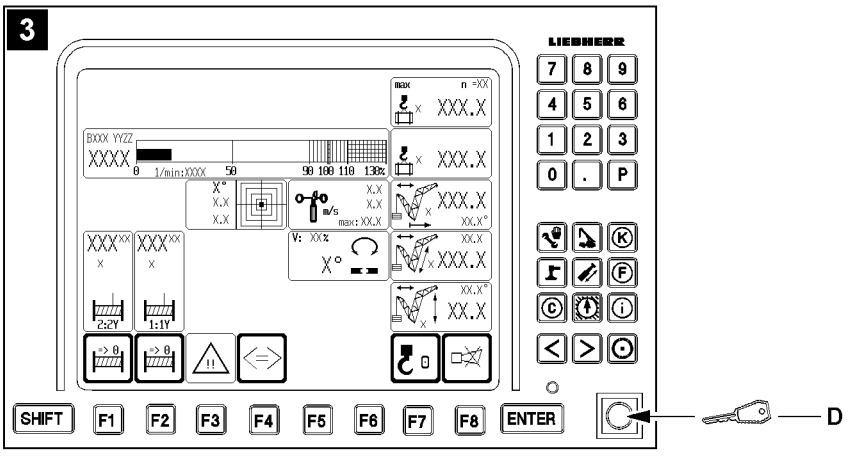
WARNING
Risk of overload and toppling the crane!
If the shut off limits of the LICCON overload protection are exceeded without knowing the exact cause for the shut off by the LICCON overload protection, then the crane can be overloaded and topple over!
Personnel can be severely injured or killed!
- ▶ Before activating the function “Exceedance of shut off limits of the LICCON overload protection” determine the exact cause for the shut off!

WARNING
Danger of accident due to function “Exceedance of shut off limits of the LICCON overload protection”!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload!
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over!
Personnel can be severely injured or killed!
- ▶ The button **5** “Luffing in with suspended load” and the set up key **D** may only be actuated when it is ensured that no normal operating condition (utilization below 100% and no active shut off) can be reached without the function “Exceedance of shut off limits of the LICCON overload protection”!
- ▶ Actuate the set up key **D** only when no normal operating condition (utilization below 100% and no active shut off) can be reached with the button **5** “Luffing in with suspended load”!
- ▶ The function “Exceedance of shut off limits of the LICCON overload protection” is only permissible in emergencies and for assembly purposes!
- ▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the function “exceedance of shut off limits of the LICCON overload protection”!
- ▶ The function “Exceedance of shut off limits of the LICCON overload protection” requires the presence of an authorized person and must be performed with utmost caution!
- ▶ Crane operation with activated function “Exceedance of shut off limits of the LICCON overload protection” is prohibited!

WARNING
Expanded working / danger zone of the crane!
Due to the function “Exceedance of shut off limits of the LICCON overload protection” it is possible that the working / danger zone of the crane is significantly expanded!
If these circumstances are not observed, collisions and accidents can occur!
Personnel can be severely injured or killed!
- ▶ With activated function “Exceedance of shut off limits of the LICCON overload protection” take an expanded working / danger zone of the crane into account and monitor it!

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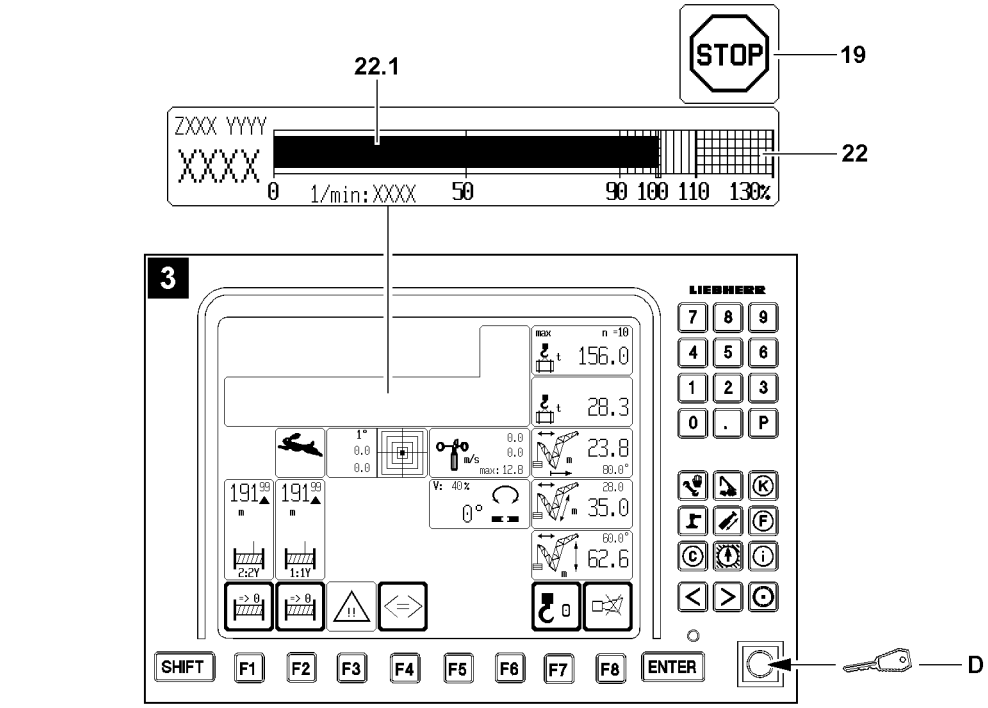
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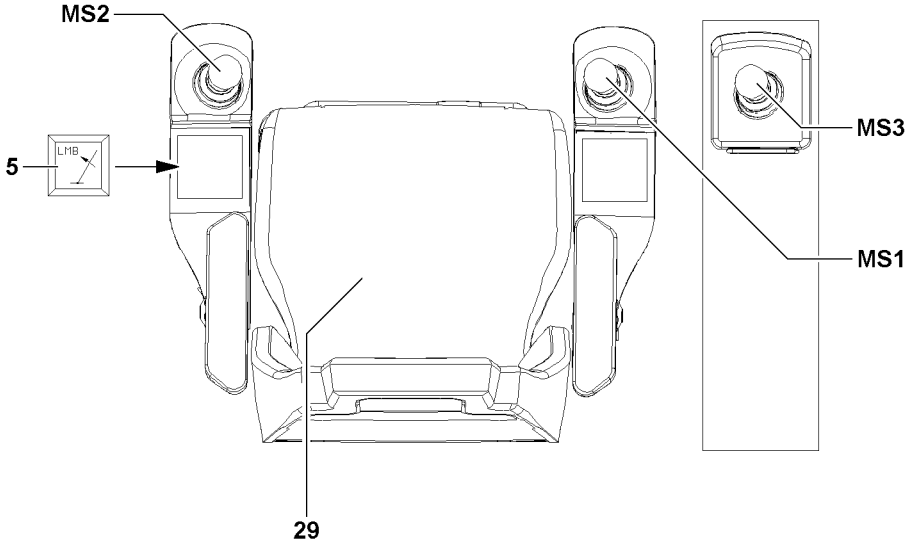
WARNING
Failure of hoist gear!
If a load is lifted by luffing the boom up, after the hoist gear has been shut off by the load moment limiter when trying to lift the load, then the hoist gear can be overloaded and fail!
This could result in serious accidents!
Personnel can be severely injured or killed!
▶ Actuate the button **5** “luffing in with suspended load” only if the LICCON overload protection reports no overload on the hoist gear with freely suspended load, the load is not reduced by luffing up and the minimum radius is not fallen below!

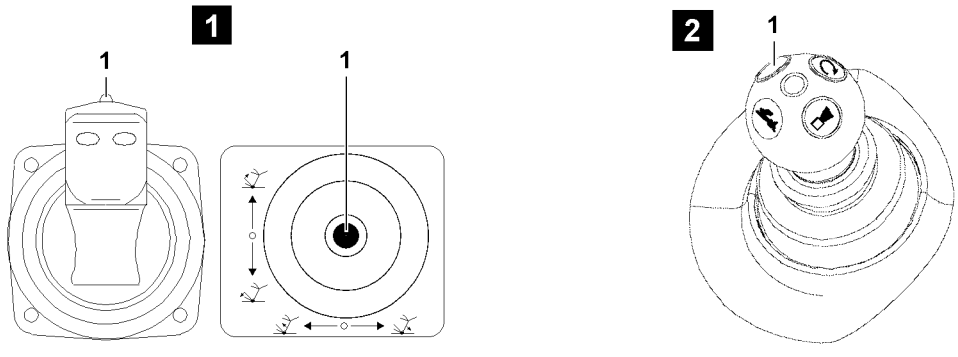
There are two possibilities to exceed the shut off limits of the LICCON overload protection after LML-STOP:
– With button **5** “luffing in with suspended load” in the left control console
– With the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**

NOTICE
Danger of mix up!
The function “Exceedance of shut off limits of LICCON overload protection” can only be activated with the set up key **D** on the LICCON monitor with crane operating screen, see illustration **3**!
The key switches on the other monitors are not assigned with this function!
▶ Do not mix up the set up key **D** with the other key switches!
▶ In case of mix up: Deactivate the activated function!

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3.4.1 Luffing in with suspended load

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment.
In the icon **22** (load moment display) the utilization bar **22.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**
This shut off limit can be exceeded by actuating the button **5** “luffing in with suspended load”.
Make sure that the following prerequisites are met:
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.

Note
▶ If the load is reduced by luffing up, then the button **5** “luffing in with suspended load” is not functioning.
▶ For the procedure when the button **5** “luffing in with suspended load” is not functioning, see section “Exceedance of maximum permissible load moment”.

▶ Press the function key **5** “luffing in with suspended load” and hold it.

Result:
– The LICCON overload protection is inactive.

▶ Luff the load in.

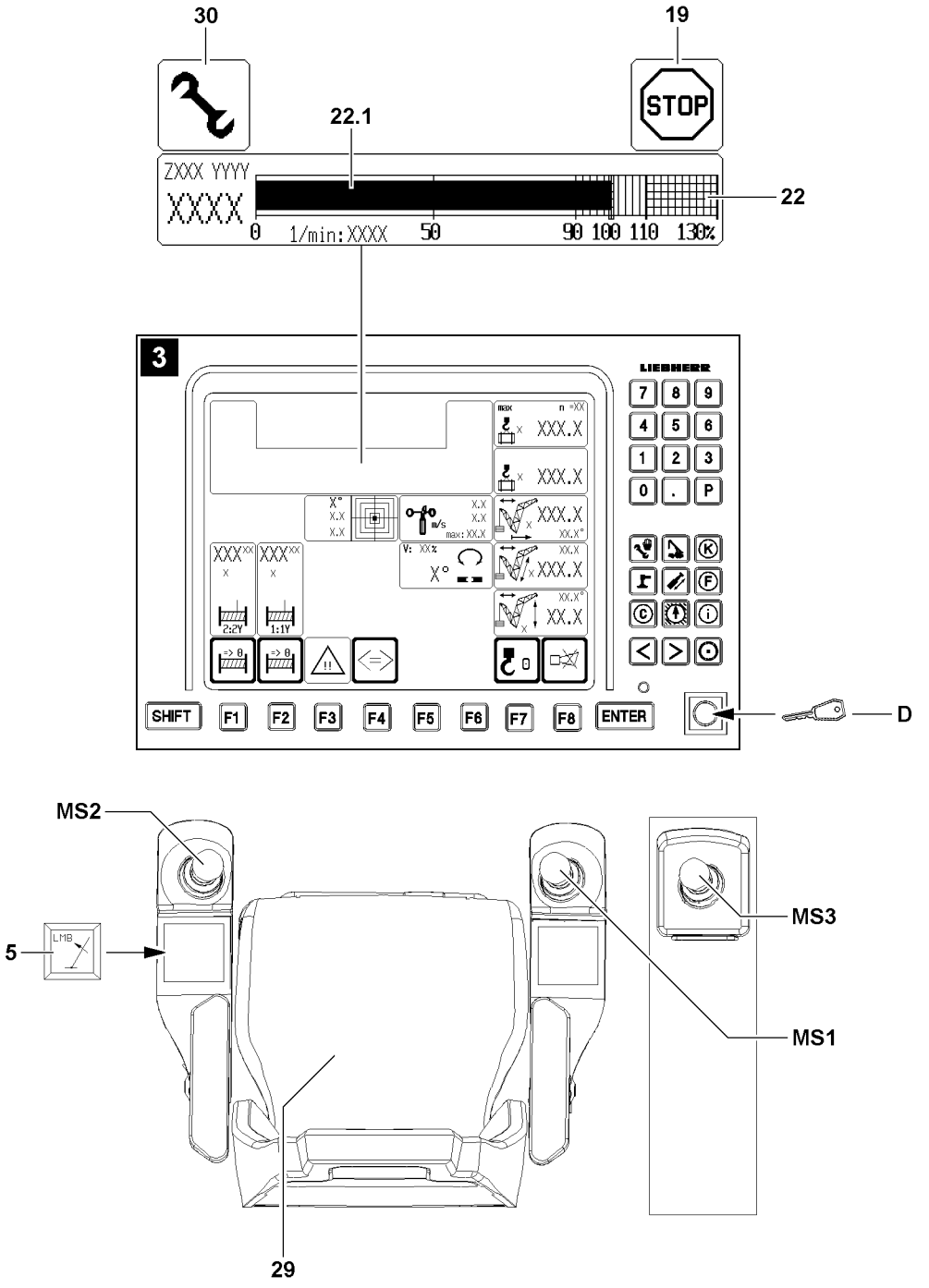
Result:
– If the crane reaches a normal operation status (utilization below 100 % and no active shut off) then the icon **19** turns off, normal crane operation is possible again.

The function “luffing in with suspended load” is also deactivated:
– When the function key **5** “luffing in with suspended load” is not longer actuated
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If the standby mode on the LICCON monitor is active
– At engine stop

The function “luffing in with suspended load” is deactivated:
– The LICCON overload protection is active.

▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

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3.4.2 Exceedance of the maximum permissible load moment

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment.
In the icon **22** (load moment display) the utilization bar **22.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**.
This shut off can be exceeded by the configuration button **D** in the “right touching” position.

Note

▶ In emergency situations, the function “Exceedance of shut off limits of the LICCON overload protection” can be activated with the set up key **D** and the maximum permissible load moment of 100 % can be exceeded.

The set up key **D** on the LICCON monitor has two positions:
– Operating position (not pressed): Crane is in normal operation.
– Position to right (touching): The maximum permissible load moment (100%) can be exceeded, the assembly icon **30** in the LICCON monitor blinks.

Make sure that the following prerequisites are met:
– With the button **5** “Luffing in with suspended load” no normal operating condition (utilization below 100% and no active shut off) can be reached.
– The master switches and the set up key **D** are **not** actuated.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
– Radio operation* is not active.
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.

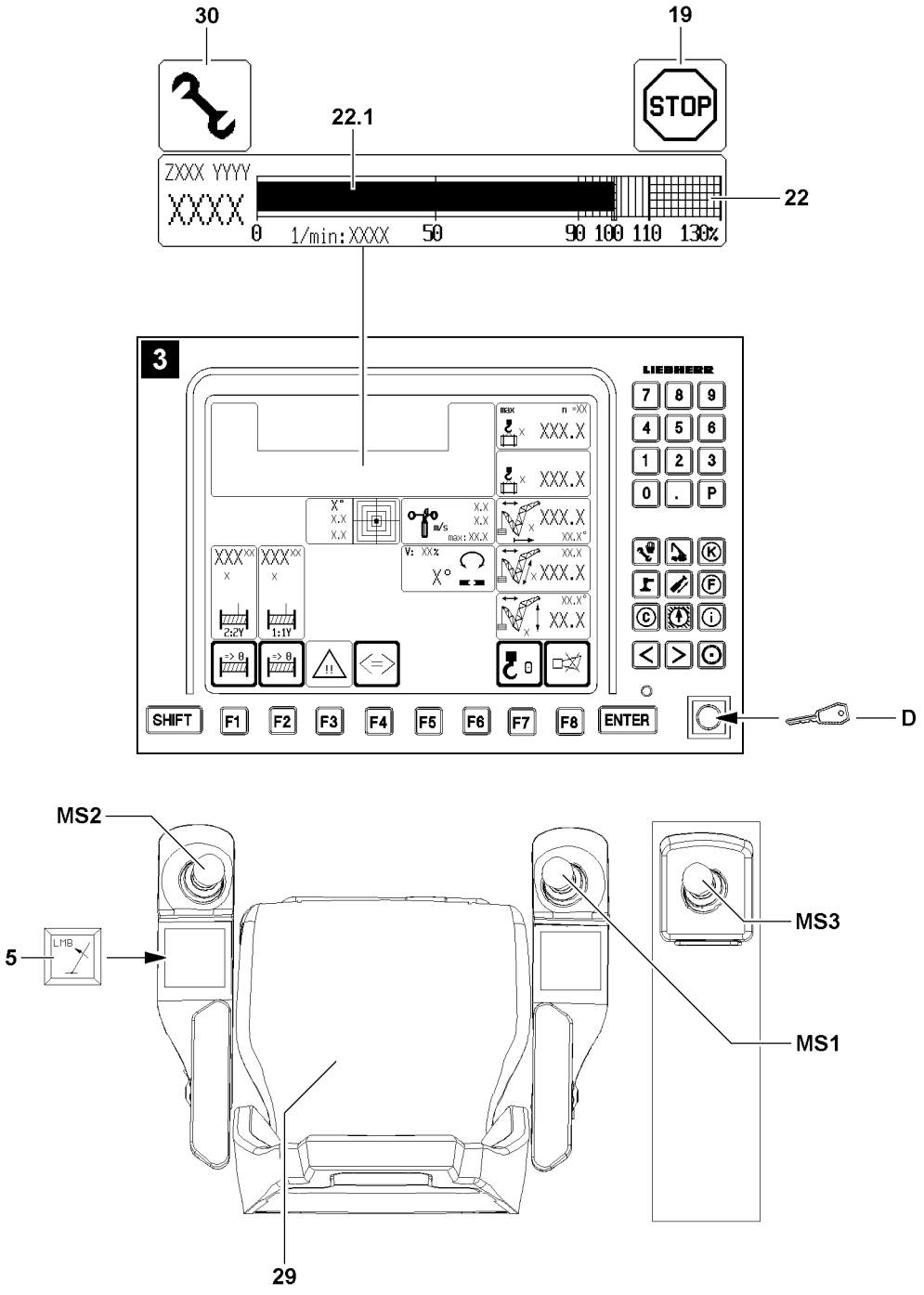
▶ Turn the set up key **D** to the right (touching).

Result:
– The LICCON overload protection is inactive.
– The assembly icon **30** in the LICCON monitor blinks.

Troubleshooting

When it is not possible to exceed the maximum permissible load moment by actuating the set up key **D**?
▶ Contact LIEBHERR Service.

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▶ Initiate crane movements which directly lead to a normal operating status (utilization below 100 % and no active shut off).

Result:

– If a crane reaches a normal operation status (utilization below 100 % and no active shut off), then the function “exceedance of shut off limits of the LICCON overload protection” shuts off, the assembly icon **30** and icon **19** in the LICCON monitor turn off.

In addition, the function “exceedance of shut off limits of LICCON overload protection” turns off:

– If the set up key **D** is pressed again
– If all master switches are in neutral position for 10 seconds (with load chart available)
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If the standby mode on the LICCON monitor is active
– If radio operation* is activated
– At engine stop
– During shut off transition hoist top clear / not clear
– During transition boom not steep / steep
– During transition lower limit angle clear / not clear
– During transition upper limit angle clear / not clear
– When the maximum value Test point 1 (value F1) is reached

Note

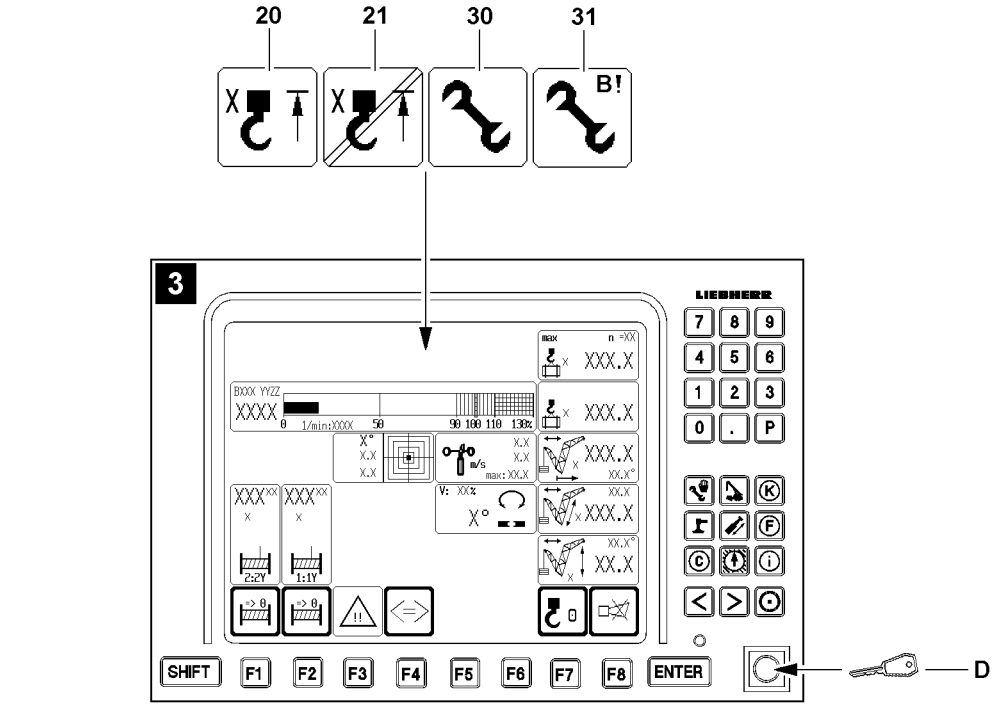
▶ The function “exceedance of shut off limits of the LICCON overload protection” is only turned off when the assembly icon **30** in the LICCON monitor turns off.
▶ If the function “exceedance of shut off limits of the LICCON overload protection” does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

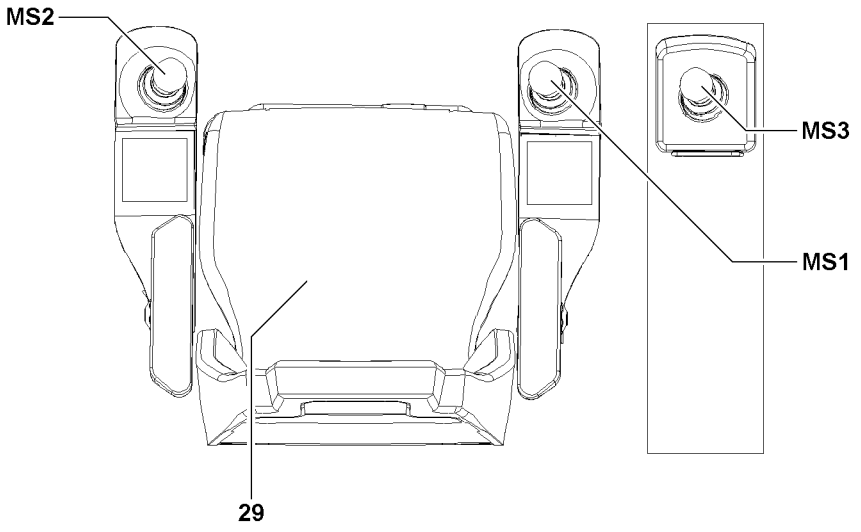
The exceedance of the shut off limits of the LICCON overload protection has / was shut off:

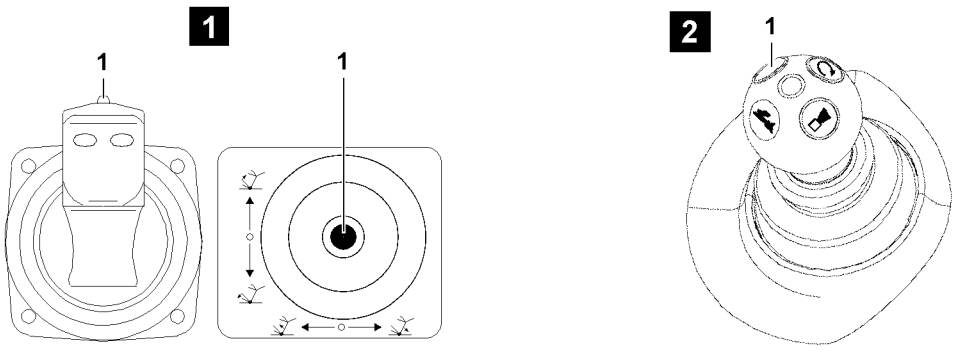
– The assembly icon **30** in the LICCON monitor turns off.

▶ Make sure that the assembly icon **30** does no longer appear in the LICCON monitor.
▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

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3.5 Bypass of the hoist top shut off

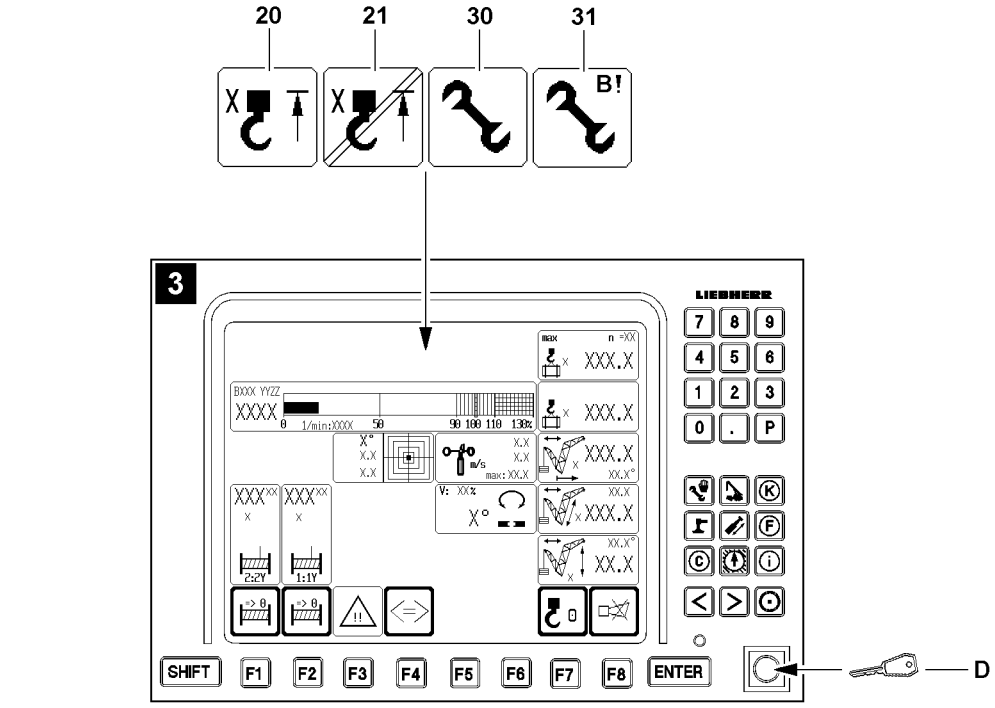
WARNING
Improper use of the function “bypass of hoist top shut off”!
- ▶ The function “bypass of hoist top shut off” may never be used to increase the lifting height during crane operation!

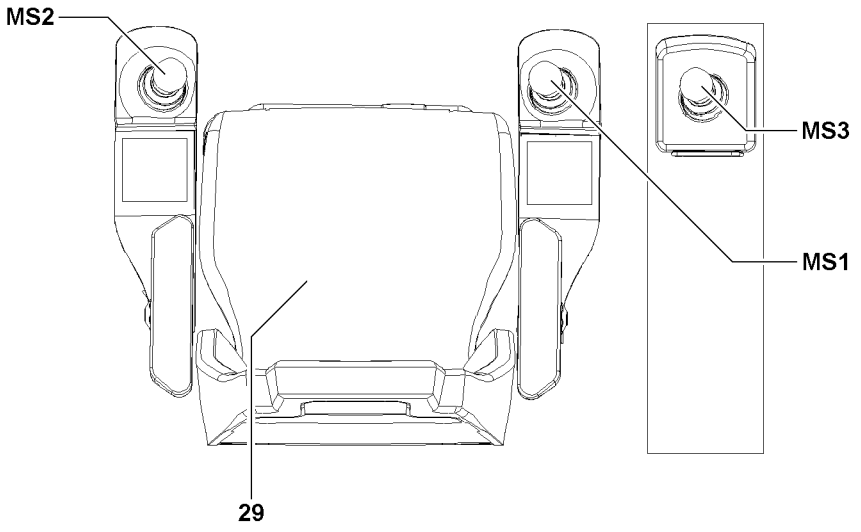
WARNING
Property damage and falling load!
If the function “bypass of hoist top shut off” is activated, there is the danger that the hook block or the load hook is pulled against the pulley head!
This danger exists especially when the hoist winch is continued to be spooled up and for crane movements which have an influence on the hoist rope, for example telescoping or luffing the boom, the attachment or the derrick boom!
Property damage and falling load can result!
Personnel can be severely injured or killed!
- ▶ The function “bypass of hoist top shut off” may only be carried out by an authorized person, along with a guide. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block / load hook and the boom head!
- ▶ Carry out all crane movements with utmost caution!

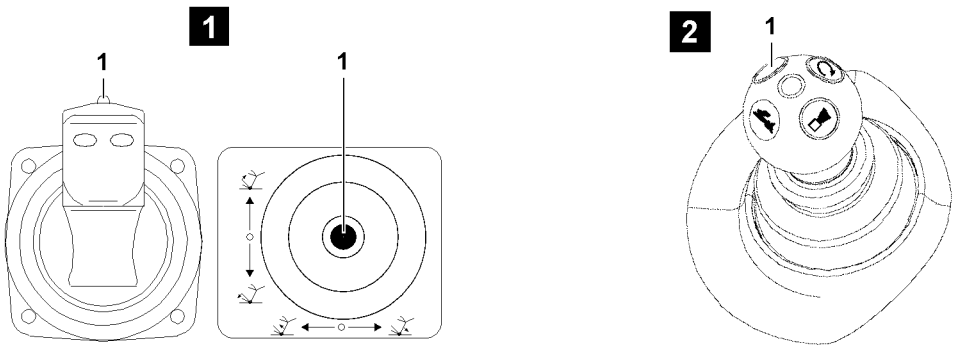
Note
- ▶ The activation of the function “bypass of hoist top shut off” is only possible if the hoist limit switch was touched and the hoist top shut off has occurred.
- ▶ If the hoist limit switch is triggered when the set up key **D** is actuated (function “exceedance of shut off limits of the LICCON overload protection” is active, the assembly icon **30** or the assembly icon **31** blink), then a hoist top shut off occurs and the function “exceedance of shut off limits of the LICCON overload protection” is deactivated.
- ▶ For assembly purposes or in emergency cases, if the activation of the function “bypass of hoist top shut off” **and** activation of the function “Exceedance of shut off limits of the LICCON overload protection” is necessary, then the set up key **D** must be actuated until the icon **21** and assembly icon **30** or assembly icon **31** (assembly operation) appear.

Make sure that the following prerequisites are met:
- – A hoist top shut off has occurred, the hoist top icon **20** appears in the LICCON monitor.
- – Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
- – The master switches are **not** deflected.
- – The crane engine is running.
- – The radio operation* is not active.
- – The standby mode on the LICCON monitor is not active.

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▶ Turn the set up key **D** to the right (touching).

Result:

– The assembly icon **30** or the assembly icon **31** (assembly operation) in the LICCON monitor blink.
– The Hoist top icon **20** in the LICCON monitor changes to the icon **21**.
– All hoist limit switches are bypassed (also two hook operation).

▶ Carry out a crane movement with bypassed hoist limit switches with upmost caution and by taking the safety guidelines into account.

The function “bypass of the hoist top shut off” turns off:

– If the set up key **D** is pressed again
– When no master switch is deflected for 10 seconds
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If there is no longer a shut off of a hoist limit switch
– If the stand by mode on the LICCON monitor is active
– If the radio operation* is active
– At engine stop

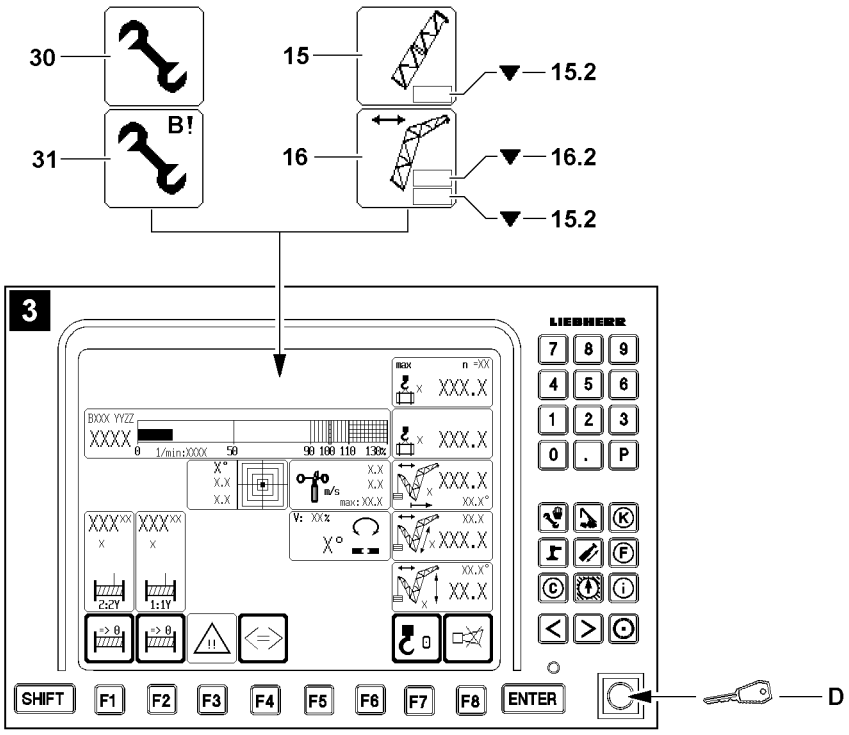
The function “bypass of the hoist top shut off” has / was turned off:

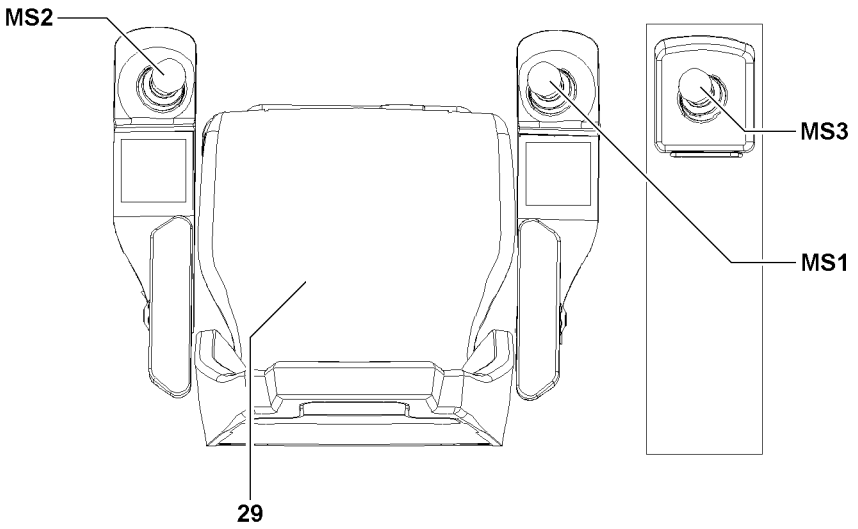
– The assembly icon **30** or the assembly icon **31** (assembly operation) in the LICCON monitor turn off.
– The icon **21** on the LICCON monitor turns off.

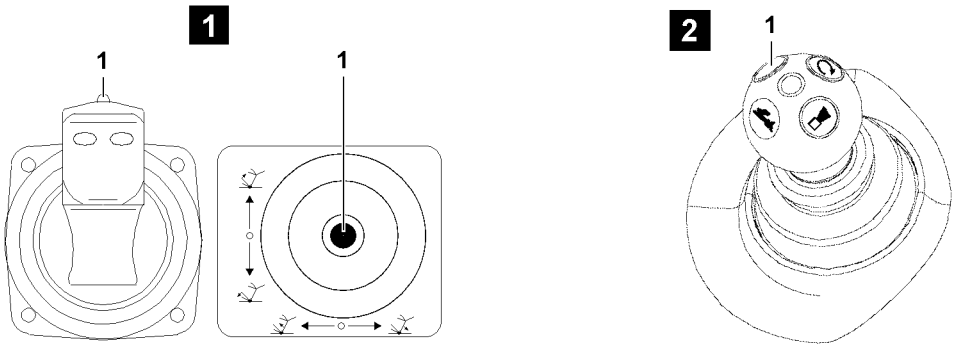
▶ Make sure that the assembly icon **30** or the assembly icon **31** (assembly operation) as well as the icon **21** no longer appear in the LICCON monitor.

▶ Carry out the crane movements in such a way that no repeated hoist top shut off occurs.

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3.6 Bypass of shut off luffing the main boom / attachment down

WARNING
Increased danger of accidents due to bypass of shut off luffing the main boom / attachment down!
When the shut off luffing the main boom / attachment down is bypassed, then the LICCON overload protection as a whole is deactivated or limited.
When the shut off luffing the main boom / attachment down is bypassed and the main boom and / or the attachment is further luffed down, then there is no load chart available any longer!
Crane operation with bypassed shut off luffing the main boom / attachment down is prohibited, since severe accidents can result!
Personnel can be severely injured or killed!
- ▶ Activate the bypass of the shut off luffing the main boom / attachment down only in emergency cases or for erection / take down procedures with erection / take down charts!
- ▶ Carry out all crane movements with utmost caution!

Make sure that the following prerequisites are met:
- – In icon **15** or icon **16** the arrow **15.2** or arrow **16.2** blink and the LICCON overload protection has shut off the crane movement.
- – Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
- – The master switches are **not** deflected.
- – The crane engine is running.
- – The radio operation* is not active.
- – The standby mode on the LICCON monitor is not active.

▶ Turn the set up key **D** to the right (touching).

Result:
- – The assembly icon **30** in the LICCON monitor blinks.
- – The function “exceedance of shut off limits of the LICCON overload protection” is activated and has bypassed the shut off luffing the main boom / attachment down.

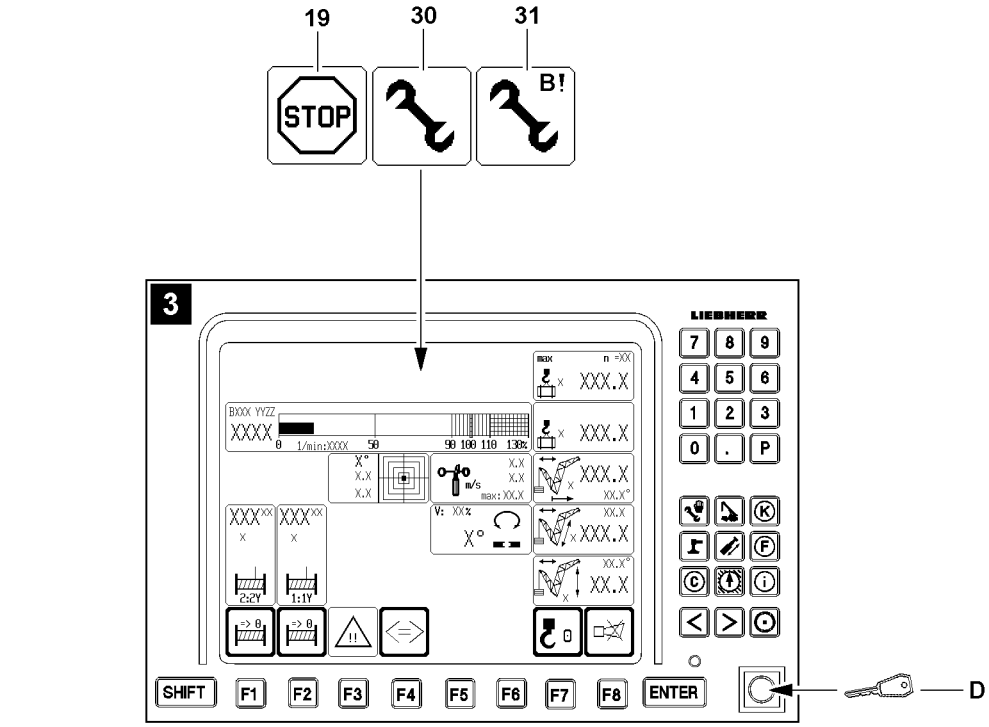
Note
▶ When leaving the area “load chart available”, the assembly icon **30** turns off and the assembly icon **31** appears.

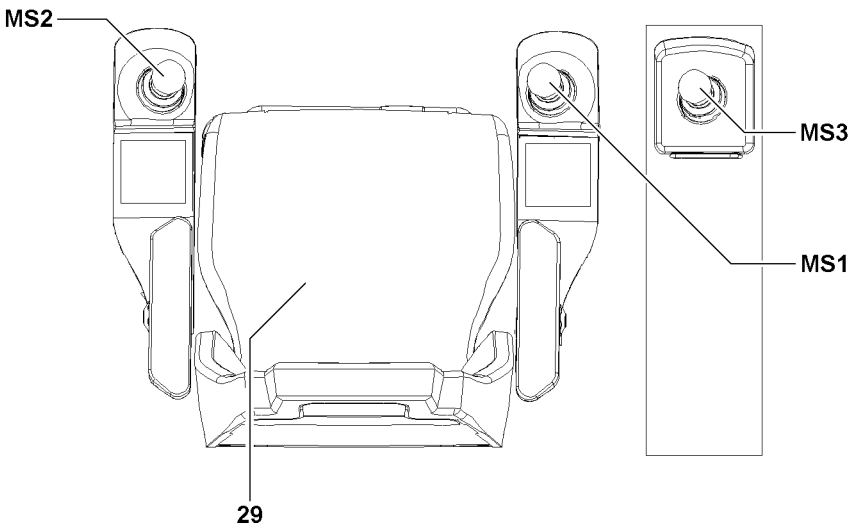
The bypass of the shut off luffing the main boom / attachment down turns off:
- – If the set up key **D** is pressed again
- – When no master switch is deflected for 10 seconds
- – When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
- – When an area with existing load chart is reached
- – If the stand by mode on the LICCON monitor is active
- – If the radio operation* is active
- – At engine stop

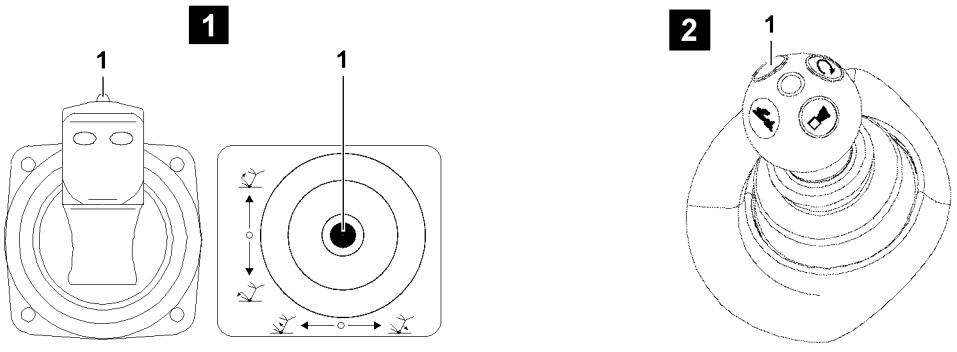
The bypass of the shut off luffing the main boom / attachment down has / was turned off:
- – The assembly icon **31** or the assembly icon **30** in the LICCON monitor turns off.

▶ Make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.

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3.7 Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures (assembly operation)

Note

- If the crane is in the area “no load chart available”, there is a shut off of crane operation by the LICCON overload protection and the icon **19** appears in the LICCON monitor.
- By an actuated set up key **D**, the function “exceedance of shut off limits of the LICCON overload protection” can be activated, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available.

WARNING

Danger of accident during erection / take down procedures!

If the erection / take down charts are not observed, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

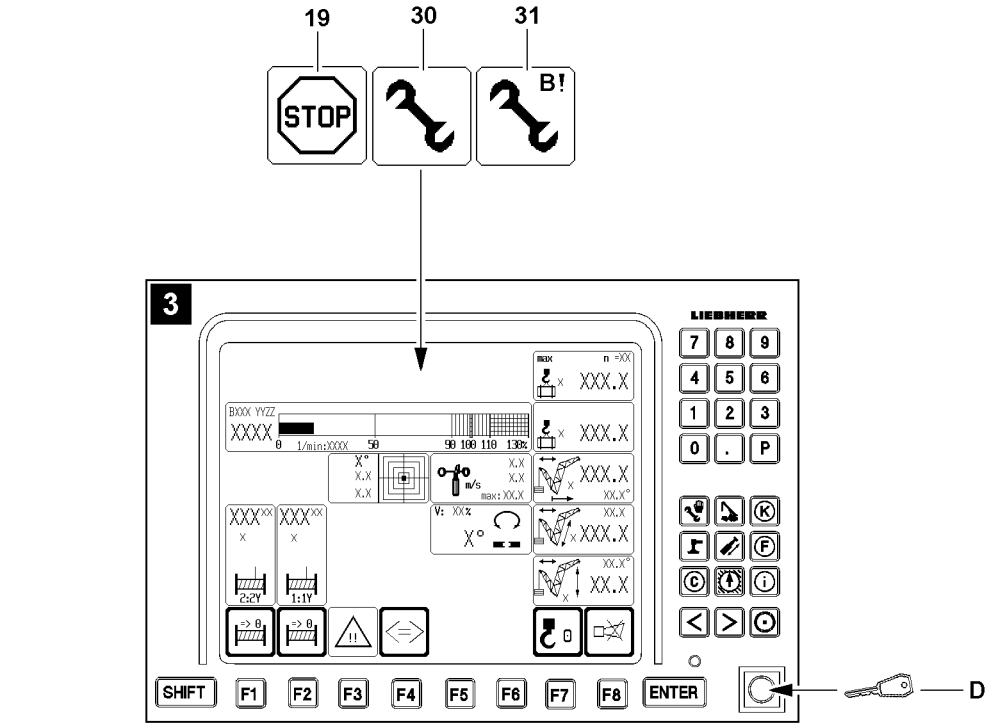
- The erection / take down charts must be observed!
- Press the set up key **D** only when the configuration status has been entered correctly in the LICCON computer system and matches the actual situation!

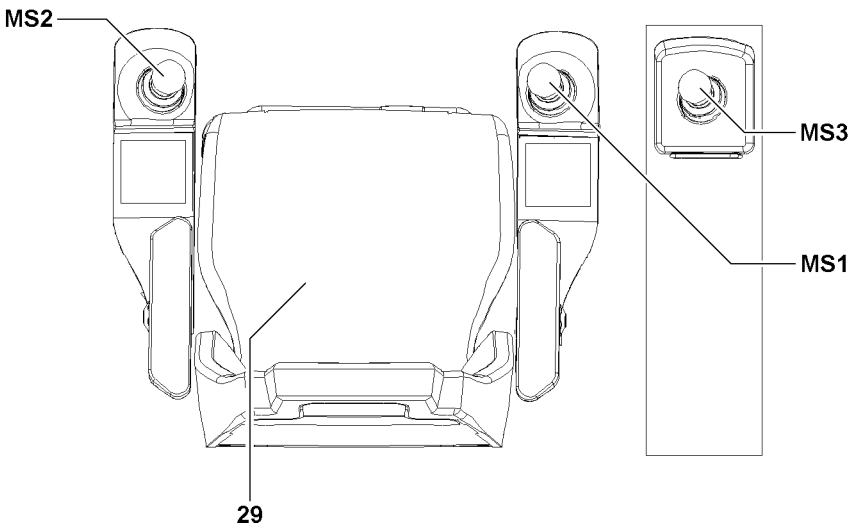
3.7.1 Carrying out the erection / take down procedures (assembly operation)

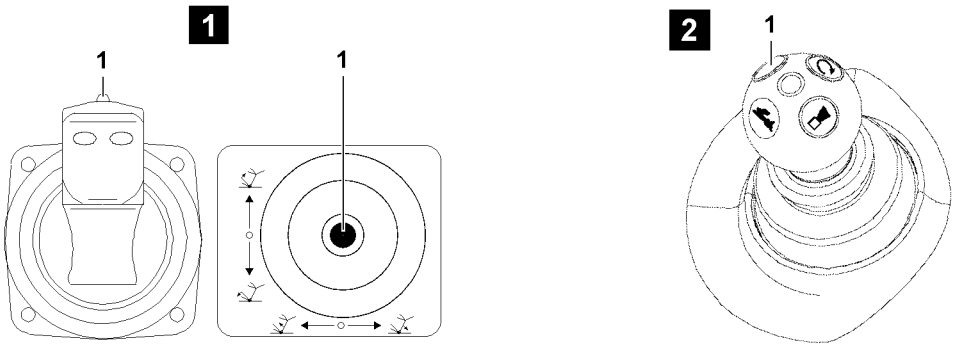
Make sure that the following prerequisites are met:

– The master switches and the set up key **D** are **not** actuated.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
– Radio operation* is not active.
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– The erection / take down charts are adhered to.
– The configuration status has been entered correctly into the LICCON computer system.

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▶ Turn the set up key **D** to the right (touching).

Result:

– The assembly icon **30** appears in the area “load chart available”.
– The assembly icon **31** appears in the area “no load chart available”.
– The erection / take down procedures can be carried out.

Troubleshooting

The erection / take down procedure cannot be carried out due to shut off “Maximum value F1 exceeded”?

▶ See section “Exceedance of maximum value Test point 1 (value F1)”.

Troubleshooting

The function “exceedance of shut off limits of the LICCON overload protection” can not be activated during erection / take down procedures?

▶ Contact LIEBHERR Service.

The exceedance of the shut off limits of LICCON overload protection turns off:

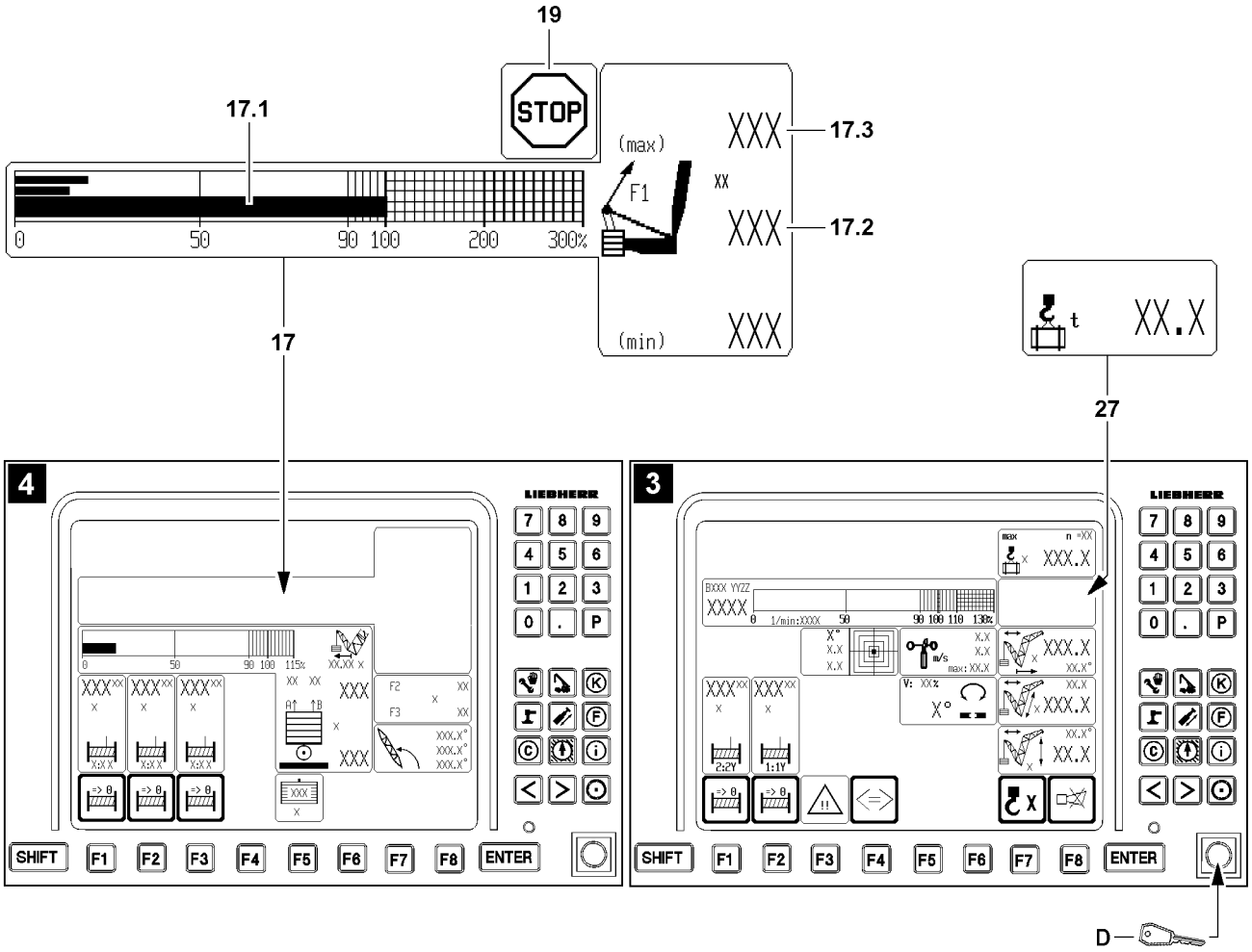
– If the set up key **D** is pressed again
– When all master switches are for 10 seconds after actuation of the set up key **D** in neutral position (with “load chart available”)
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– At engine stop
– When an area with existing load chart is reached (erection procedure)

The function “exceedance of shut off limits of the LICCON overload protection” has / was shut off:

– The assembly icon **30** or the assembly icon **31** in the LICCON monitor turns off.

▶ After completion of the erection / take down procedures, make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.

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3.7.2 Exceedance of maximum value Test point 1 (value F1)

Note
- ▶ The value Test point 1 is described as value F1.
- ▶ The values are shown as number values as well as a utilization bar/ bar display in the icon **17**.
- ▶ For detailed description of test point 1 and other test points on the boom system, see Crane operating instructions, chapter 4.02.

In the icon **17** (display value F1) the utilization bar $F1_{actual}$ **17.1** exceeds the 100% mark and the LICCON overload protection has shut off the crane movement. The number value $F1_{actual}$ **17.2** has exceeded the number value $F1_{max}$ **17.3**.
All further movements, which directly lead to an increase of the value $F1_{actual}$ are shut off.
In the LICCON monitor with the derrick operating screen (illustration **4**) appears the icon **19**.
Before subsequent steps is must be ensured that:
- – A valid configuration status has been entered on the LICCON computer system.
- – The crane is assembled according to the assembly drawings.
- – The actual configuration status and the entered configuration status of the crane match.
- – All attachment parts and guy rods on the boom system, which are not needed, have been removed (weight).
- – The boom system is free of snow and ice (weight).
- – The wind influence onto the boom is not too great.

Note
- ▶ The exceedance of the maximum value test point 1 (value F1) can only be activated when the value in the display field “current load” **27** is smaller than the permissible hook block weight according to the erection / take down chart.
- ▶ The permissible hook block weight were entered in the “winch - pulley head assignment screen”, see Crane operating instructions, chapter 4.02.
- ▶ If the value in the display field “current load” **27** is higher than it actually should be, then there may be a weighing error. Correction of weighing errors, see Crane operating instructions, chapter 4.02.

Make sure that the following prerequisites are met:
- – The value in the display field “current load” **27** is smaller than the permissible hook block weight according to the erection / take down chart.
- – The prerequisites from section “carrying out the erection / take down procedures (assembly operation)” are met.
- – The erection / take down procedure cannot be carried out due to shut off “Maximum value F1 exceeded”.

▶ Turn the set up key **D** to the right (touching).

Result:
- – The function “exceedance of shut off limits of the LICCON overload protection” is activated in connection with the function “Exceedance of the maximum value test point 1”.
- – Maximum value test point 1 can be exceeded.
- – The erection / take down procedures according to the erection / take down charts can be carried out.
- – For further procedure, see section “Carrying out the erection / take down procedures (assembly operation)”.

Troubleshooting
When it is not possible to exceed the maximum value test point 1 by actuating the set up key **D**?
- ▶ Contact Liebherr Service.

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5.00 Equipment

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Note
▶ These chapters are in the Crane operating instructions, part 2!

1 Chapter 5.04: L / LL / S / SL - BOOM COMBINATION

2 Chapter 5.05: LD / SD - BOOM COMBINATION

3 Chapter 5.06: SW / SDW - BOOM COMBINATION

4 Chapter 5.08: LN - BOOM COMBINATION

5 Chapter 5.13: AUXILIARY JIB F - FIXED

6 Chapter 5.14: SWF - BOOM COMBINATION

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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 Rope pulleys

WARNING
Danger of crushing due to rotating rope pulleys!
Arms and legs can be crushed or severed between the rope pulley and the rope due to rotating rope pulleys!
▶ It is prohibited to touch the ropes or rope pulleys during operation!
▶ Adhere to the safety distance to ropes and rotating rope pulleys!

3 Checking the ropes

The ropes must be checked by an expert before assembly and checks must be performed at regular intervals in order to detect possible damage or wear and tear at an early stage. See Crane operating instructions, chapter 8.04.
The ropes must be removed immediately if any of the following damage is detected:
– Breakage of a strand
– Wire breaks
– Broken wire nests
– Reduction in the rope diameter by 10 % or more of the nominal size.
– Rope deformations

3.1 Placing the hoist 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!

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3.1.1 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!

3.1.2 Cranes with winch turn sensor

The winch turn sensor is calibrated in the factory to switch off when only 4 hoist rope coils are left on the winch. If used properly, the winch turn sensor will not need to be readjusted.

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.
- ▶ The winch turn sensor must be set to turn off when only 4 hoist rope coils remain on the winch!

Note
Avoid the following situations otherwise the winch speed 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.

4 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!

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4.1 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 that the set up button is not active.
- 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.

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4.2 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 that the set up button is not active.
- **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.

5 Dangerous conditions without shut off

5.1 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!

6 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.

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6.1 Transporting lattice sections

If the lattice sections are pushed inside each other for transportation purposes, they must each be secured with 2 chains.

7 Pneumatic springs for assembly support of components

Pneumatic springs are installed on various components to simplify the installation or removal of these components.

WARNING
Danger of crushing!
Defective pneumatic springs no longer provide the supporting properties on the movable components!
Due to falling components, personnel can be killed or severely injured!
High risk of accident!

- ▶ Always check pneumatic springs for external damage before actuating the corresponding components!
- ▶ Do not use components with defective pneumatic springs! Replace defective pneumatic springs!
- ▶ 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!

8 Manual rope winches for assembly support of components

Manual rope winches are installed on various components to simplify the installation or removal of these components.

WARNING
Danger of crushing!
Defective manual rope winches no longer provide the supporting action on the movable components!
Due to falling components, personnel can be killed or severely injured!
High risk of accident!

- ▶ Always check manual rope winches for external and functional damage before actuating the respective components!
- ▶ Check the rope of the manual rope winch for damage!
- ▶ At least two rope coils must always remain on the drum!
- ▶ Do not use components with defective manual rope winches! Replace defective manual rope winches!
- ▶ It is strictly prohibited for personnel or objects to remain within the movement range of the components, which are supported by the manual rope winch!
- ▶ It is prohibited for personnel or objects to remain within the danger zone of the moveable components!

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9 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!

10 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:

10.1 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!

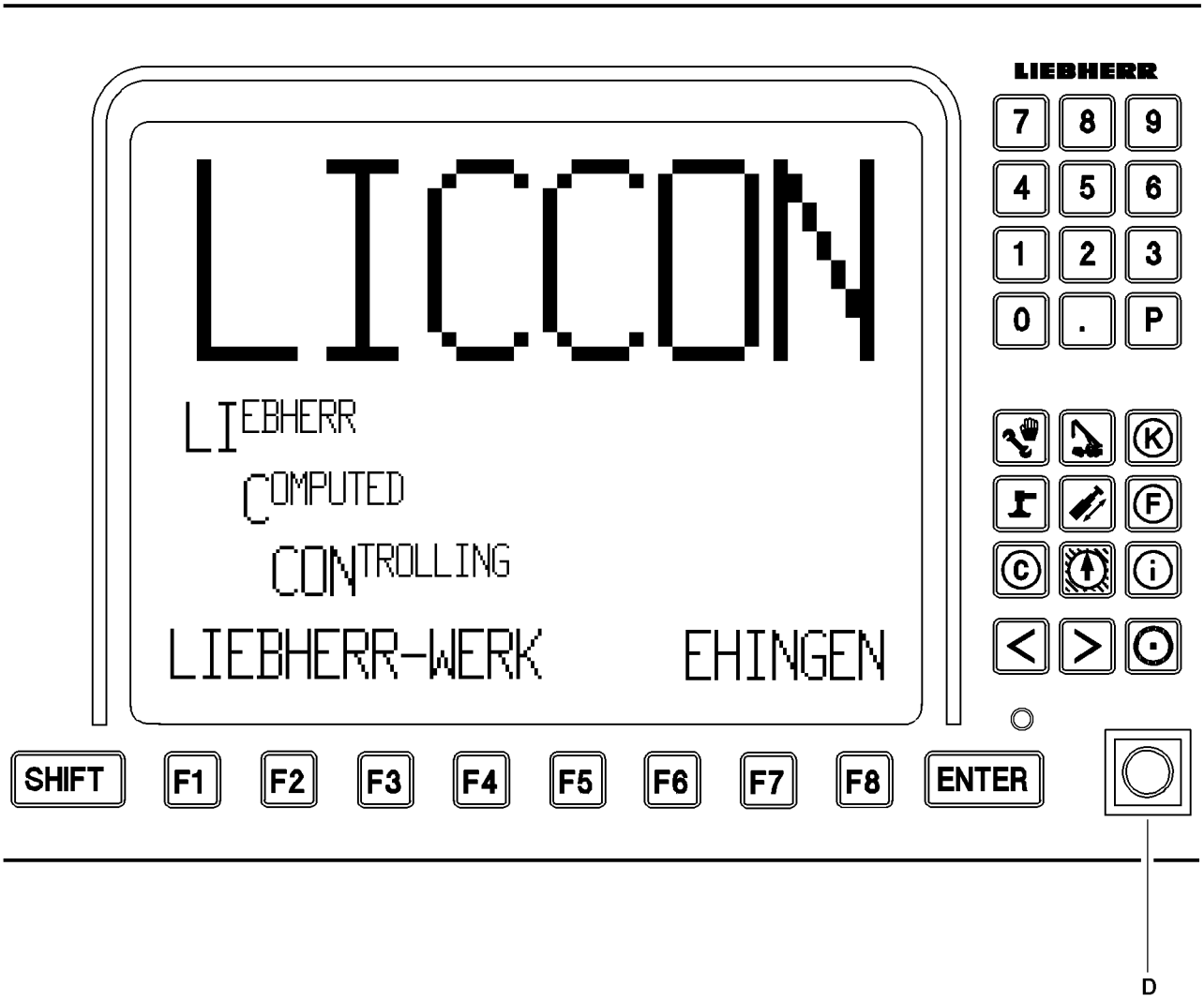
10.2 Reduction of load carrying capacity with placed guy rods

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*

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11 Exceeding the overload protection

DANGER

Increased accident risk when exceeding 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.

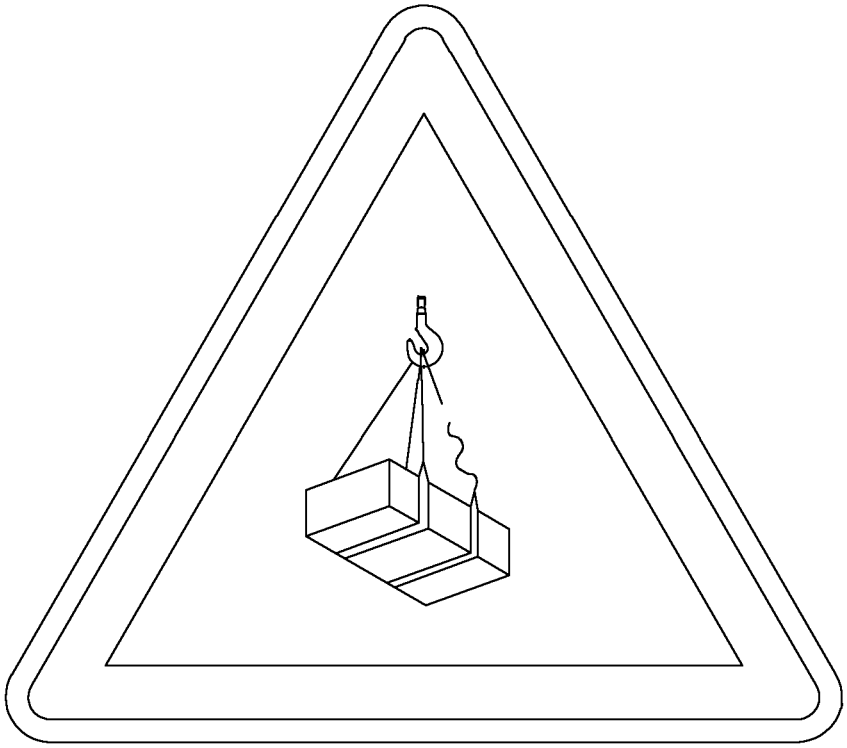
Impermissible crane operation with exceeded overload protection – with the aim of increasing the maximum load-bearing capacity of the crane above the rated value in the load chart, or to extend the designated working range of the crane – does not constitute a **sensibly foreseeable erroneous operation**, 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!

- ▶ Actuate the set up button **D** on according to the operating instructions!
- ▶ Any other use of the set up button than that described in the operating instructions is prohibited!

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12 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 and trained expert personnel!

Note
- ▶ For assembly / disassembly of individual components, also refer to the chapters relating to those components!
- ▶ Only use the auxiliary winch (installation or reeving winch) for installation 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 and 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 / 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 (lifting platform, scaffolding, ladder, 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 fastening 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!

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12.1 Assembly / disassembly of booms

If lattice sections are not in contact with the ground during assembly / disassembly, then 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!
- Angular pull is prohibited!

WARNING

Danger of accident at assembly / disassembly of booms!

The disassembling of unsecured or unsupported booms may result in fatal injury or mutilation.

- Never unpin the pins under unsecured or unsupported booms!
- Never unpin the connecting pins 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.

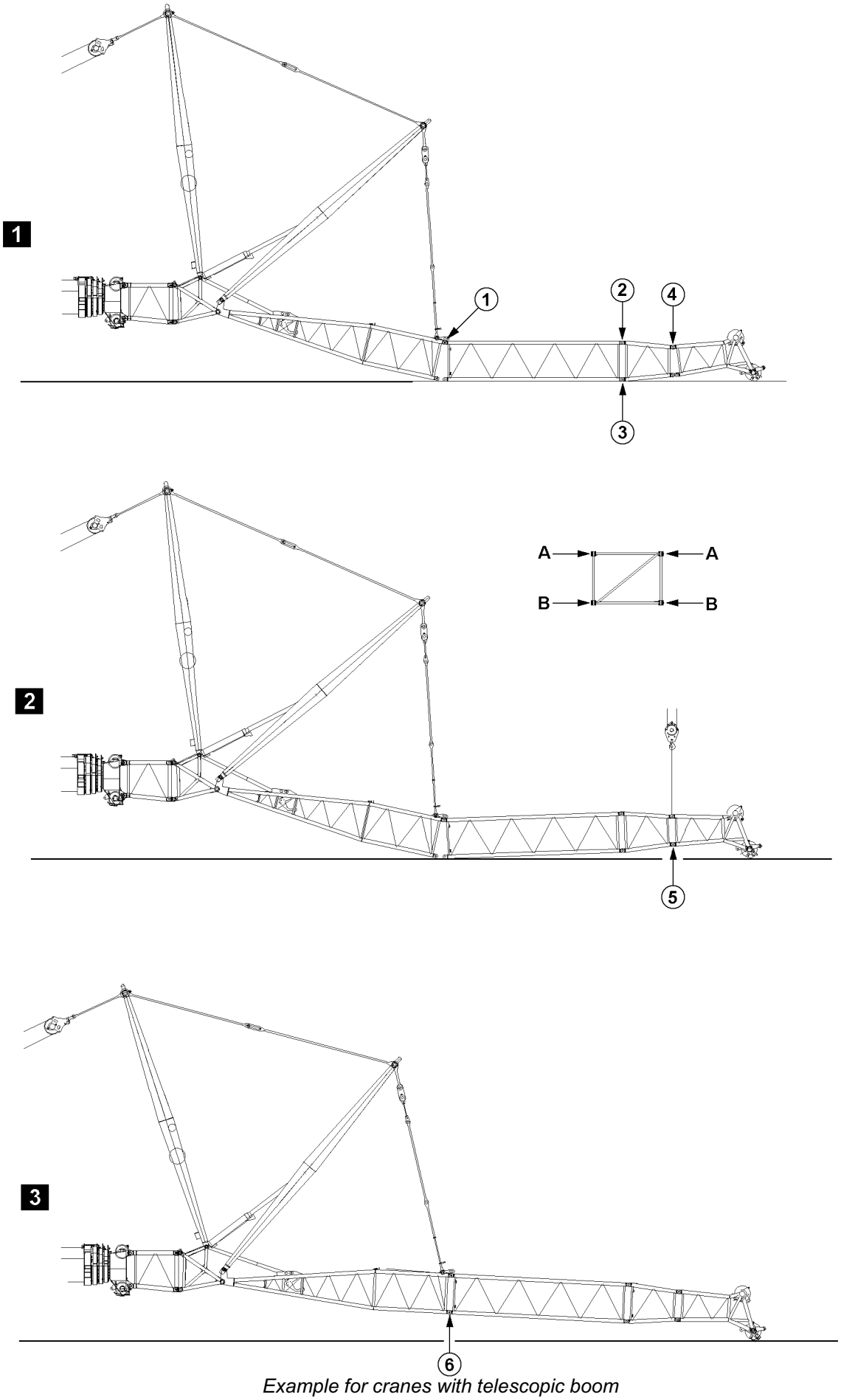
- When the pins are unpinned, the “lifting force” of the crane must be adapted to the “weight” of the parts being lifted!
- Do **not** remove difficult to remove pins by force!
- Remove the reason for the distortion!

Note

Instructions for pinning and unpinning:

- Pin or unpin both pins at the same horizontal level, i.e. **left and right**!
- Insert the lower pins from the **inside to outside** and unpin from the **outside to inside**!
- Insert and unpin horizontally installable double cone pins from the **outside to inside**!
- Insert and unpin vertically installable double cone pins from **top to bottom**!

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Example for cranes with telescopic boom

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12.2 Assembly of lattice sections for telescopic cranes

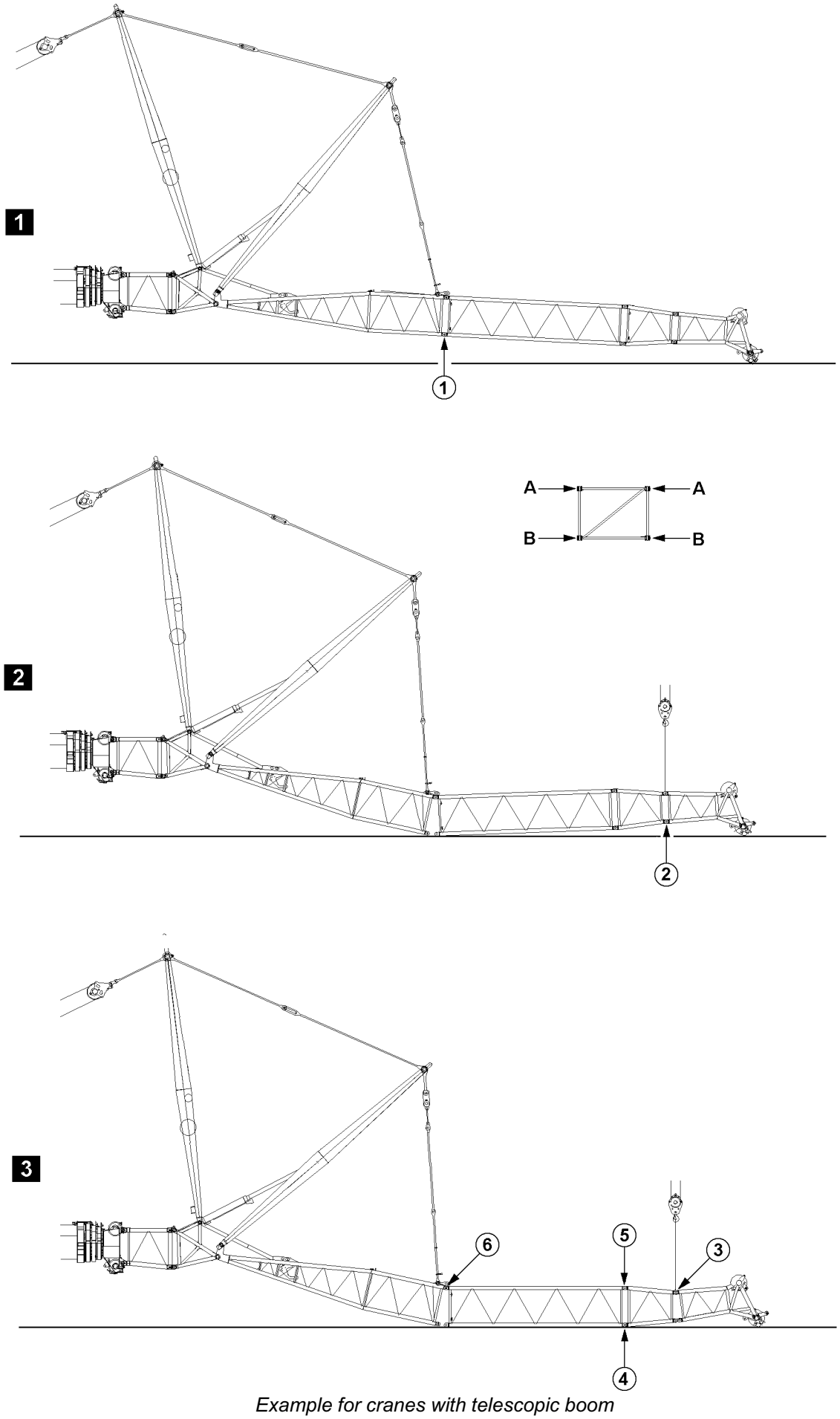
12.2.1 Assembly of lattice sections for guyed auxiliary boom with an auxiliary crane

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.

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Example for cranes with telescopic boom

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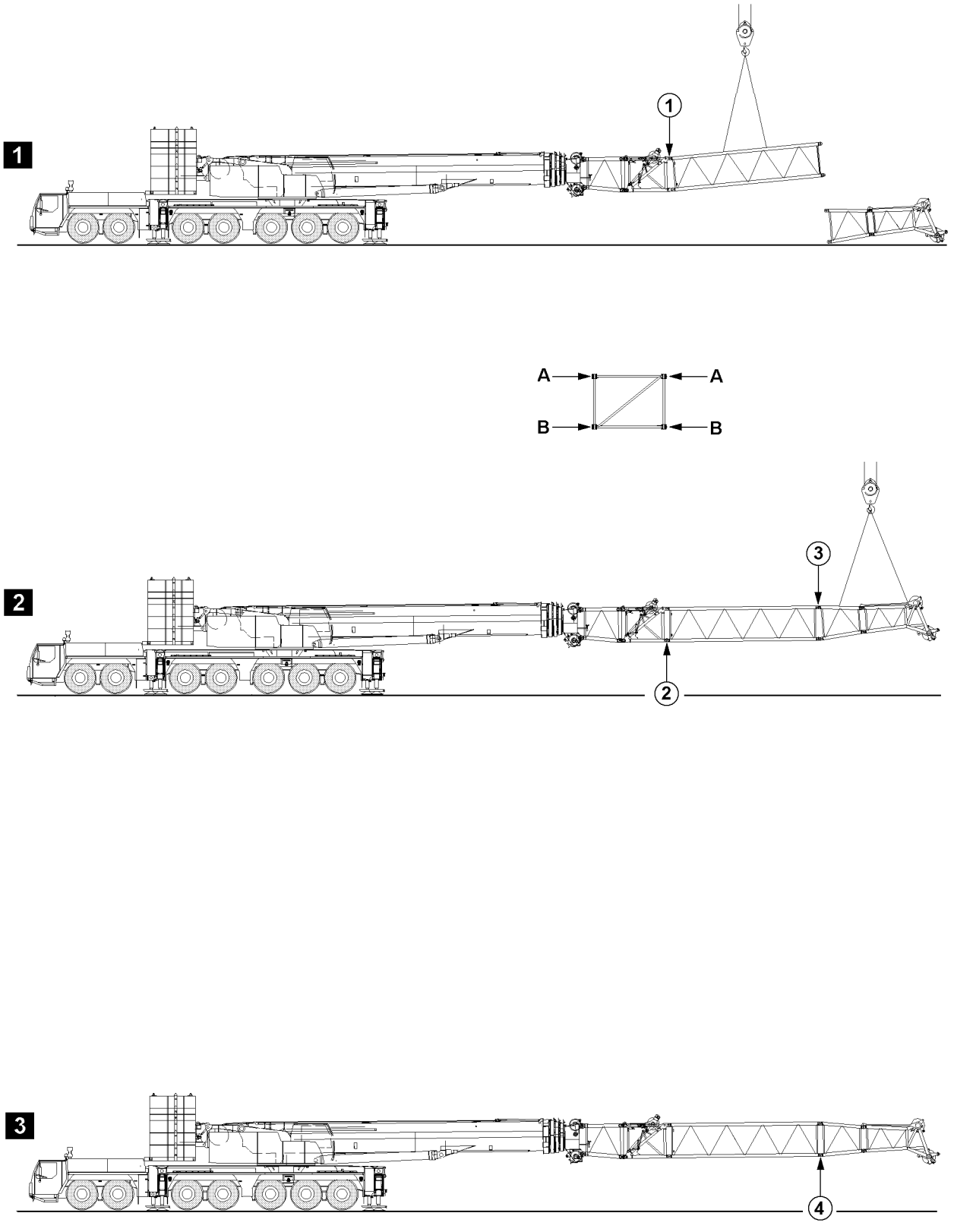
12.2.2 Disassembly of lattice sections for guyed auxiliary boom with an auxiliary crane

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.

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B197705 *Example for cranes with telescopic boom*

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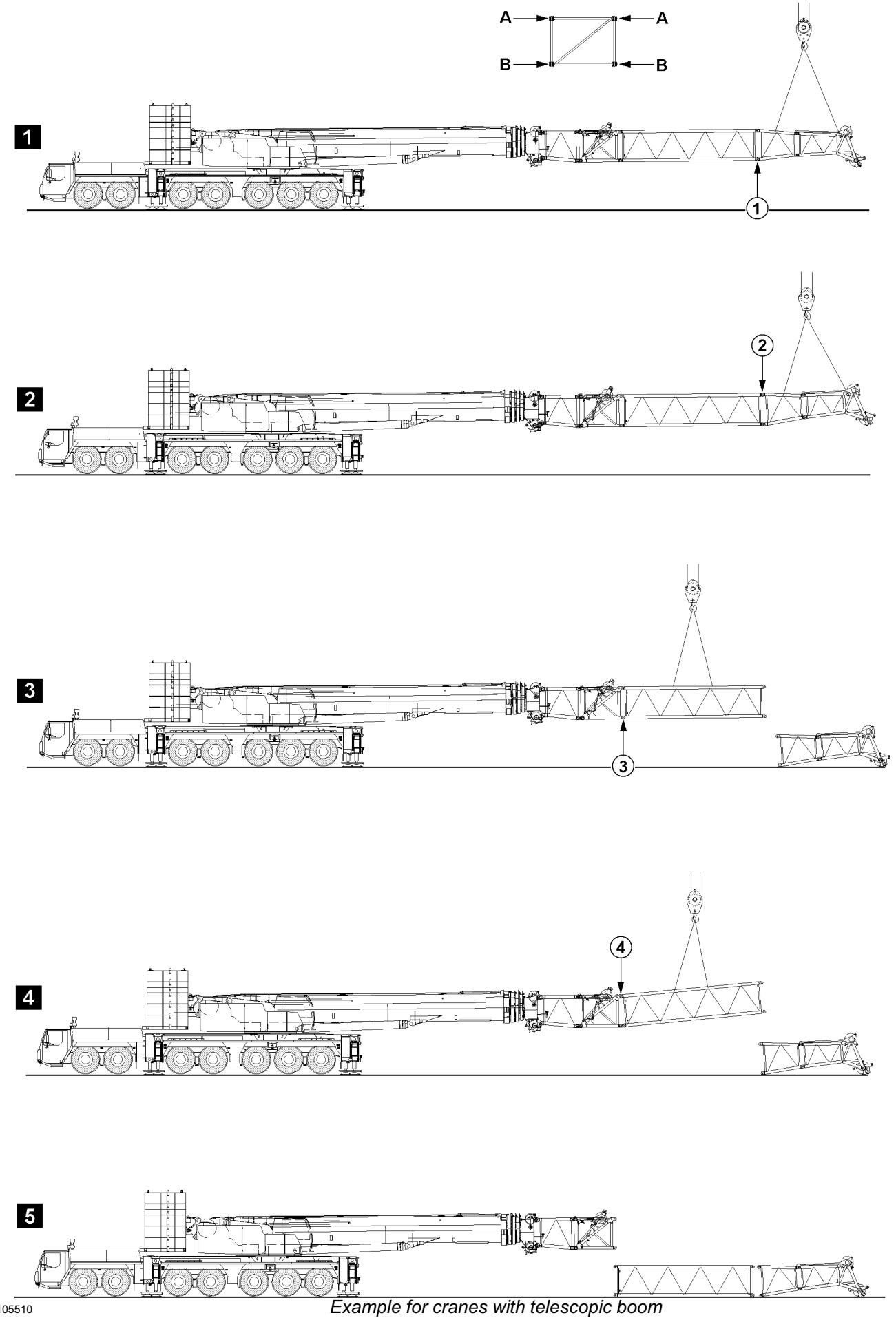
12.2.3 Assembly of lattice sections on self-supporting auxiliary booms using an auxiliary crane

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.

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Example for cranes with telescopic boom

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12.2.4 Disassembly of lattice sections on self-supporting auxiliary booms using an auxiliary crane

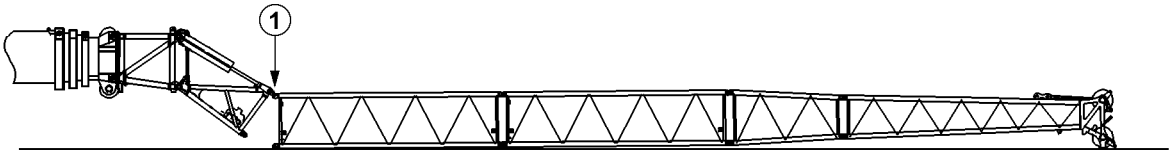
The illustrations serve as examples. The illustrations may differ depending on the crane.

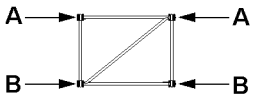
WARNING
Risk of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

- ▶ 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.

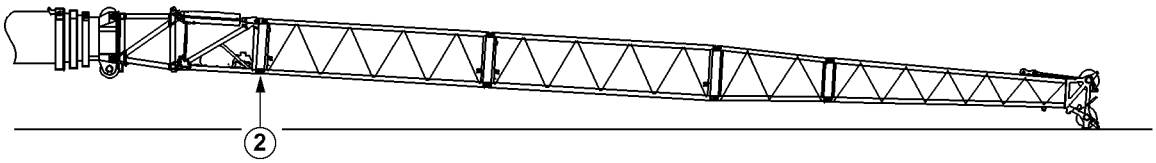
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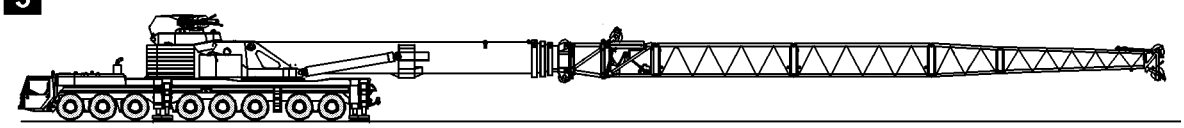




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B197712 *Example for cranes with telescopic boom*

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12.2.5 Assembly of lattice sections on self-supporting auxiliary booms without using an auxiliary crane

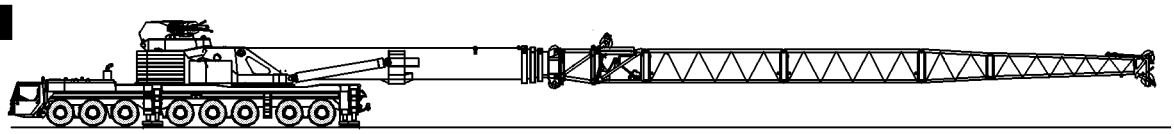
The illustrations serve as examples. The illustrations may differ depending on the crane.

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!

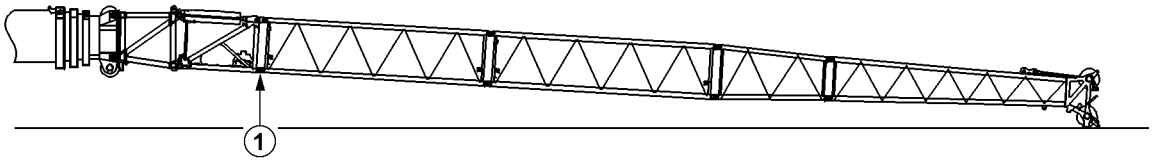
For cranes with hydraulic angle adjustment and self-supporting auxiliary boom, the assembly / disassembly of additional lattice sections may be performed using the crane itself.
In order to do so, proceed as follows.
▶ Assemble the lattice sections to the required length.
▶ Pin in and secure pins at 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.

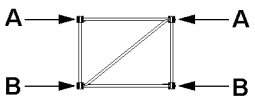
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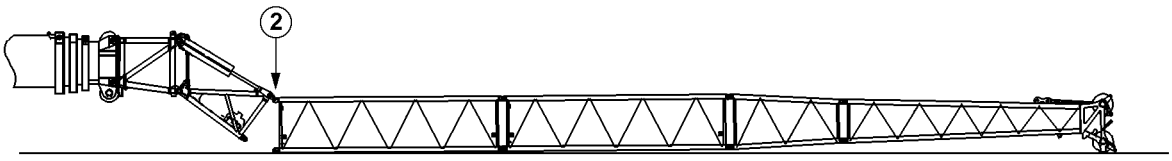


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B197713 *Example for cranes with telescopic boom*

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12.2.6 Disassembly of lattice sections on self-supporting auxiliary booms without using an auxiliary crane

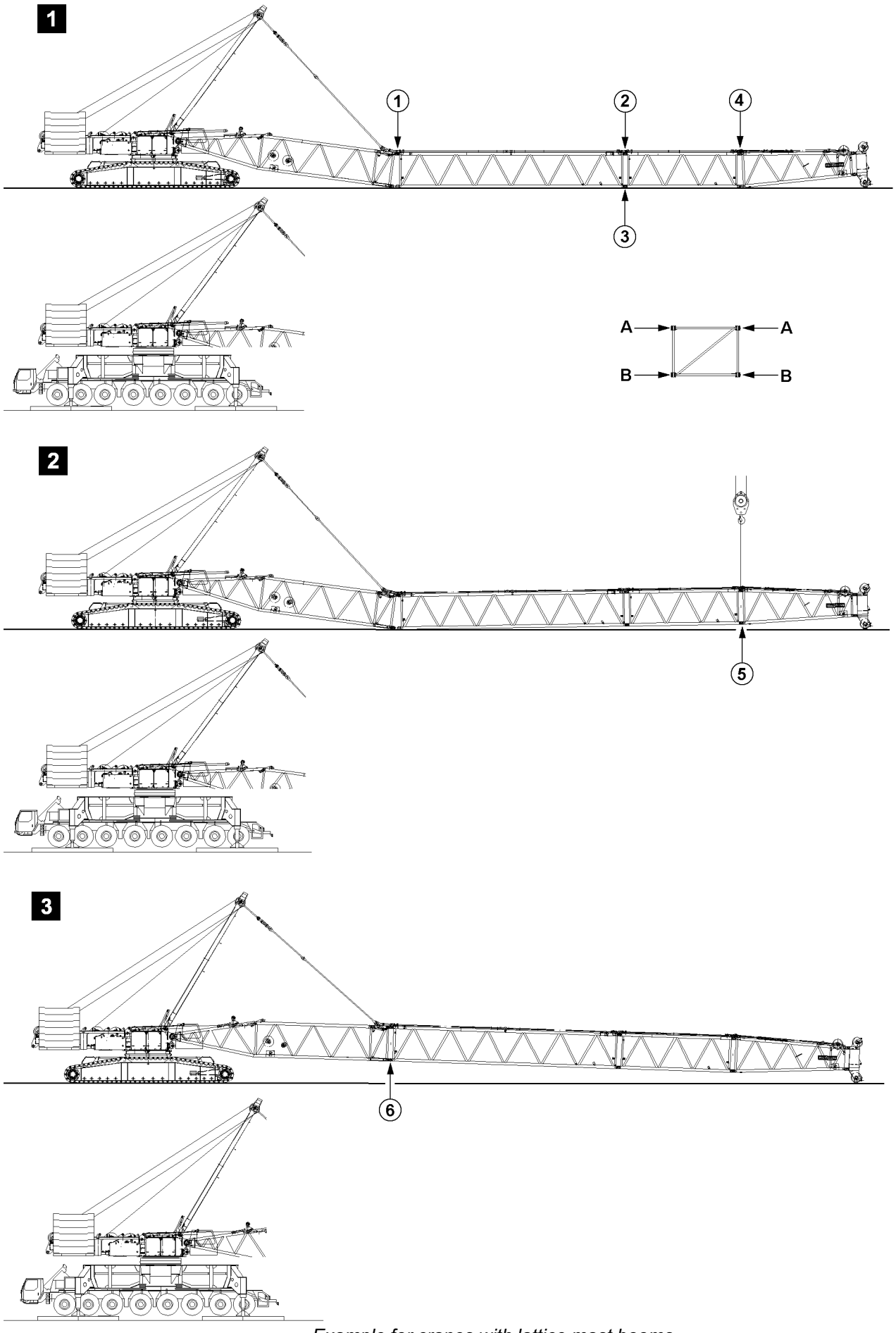
The illustrations serve as examples. The illustrations may differ depending on the crane.

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.

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B197710 *Example for cranes with lattice mast booms*

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12.3 Assembly of lattice sections for lattice mast cranes

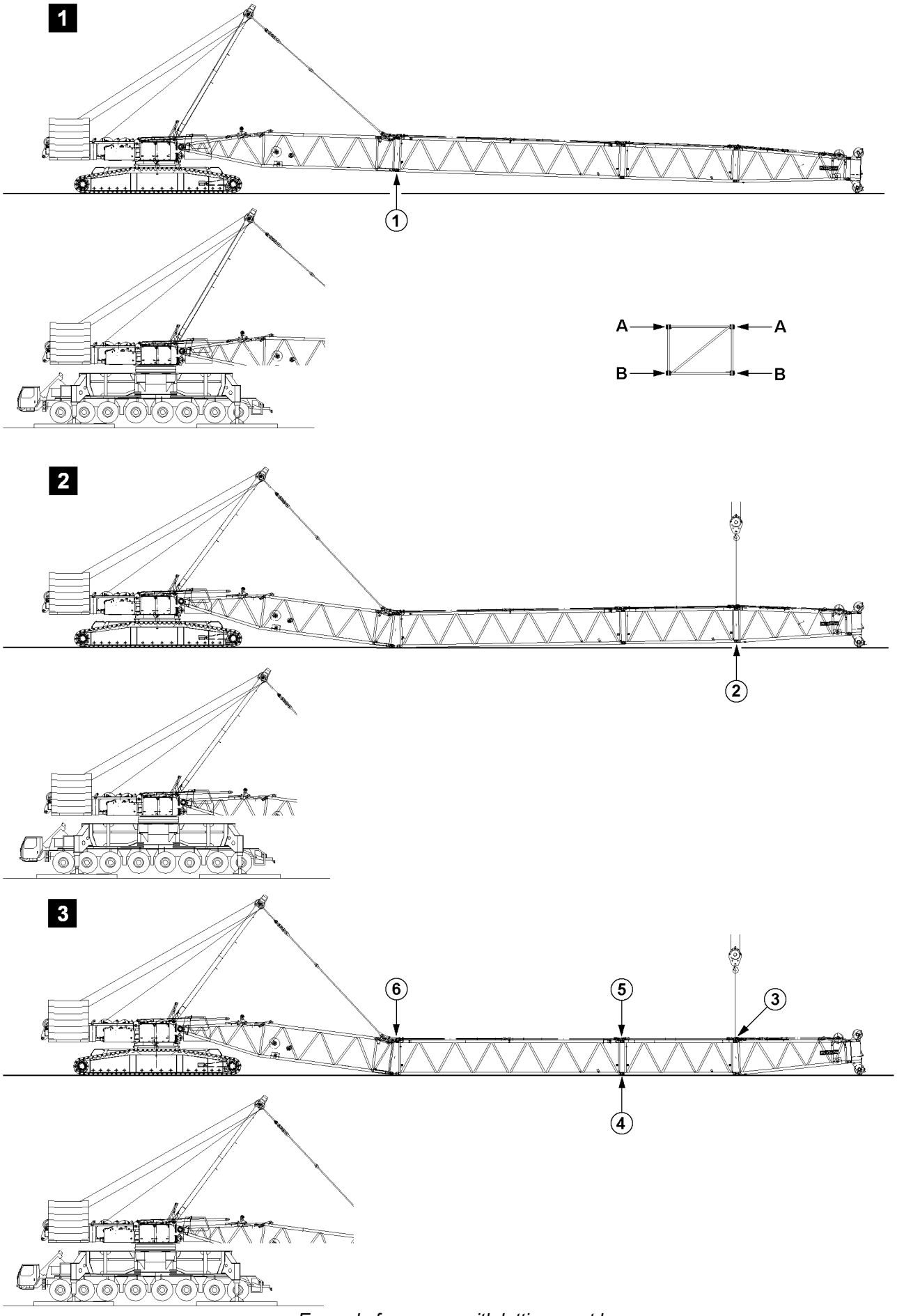
12.3.1 Assembly of lattice sections

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.

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B197711 *Example for cranes with lattice mast booms*

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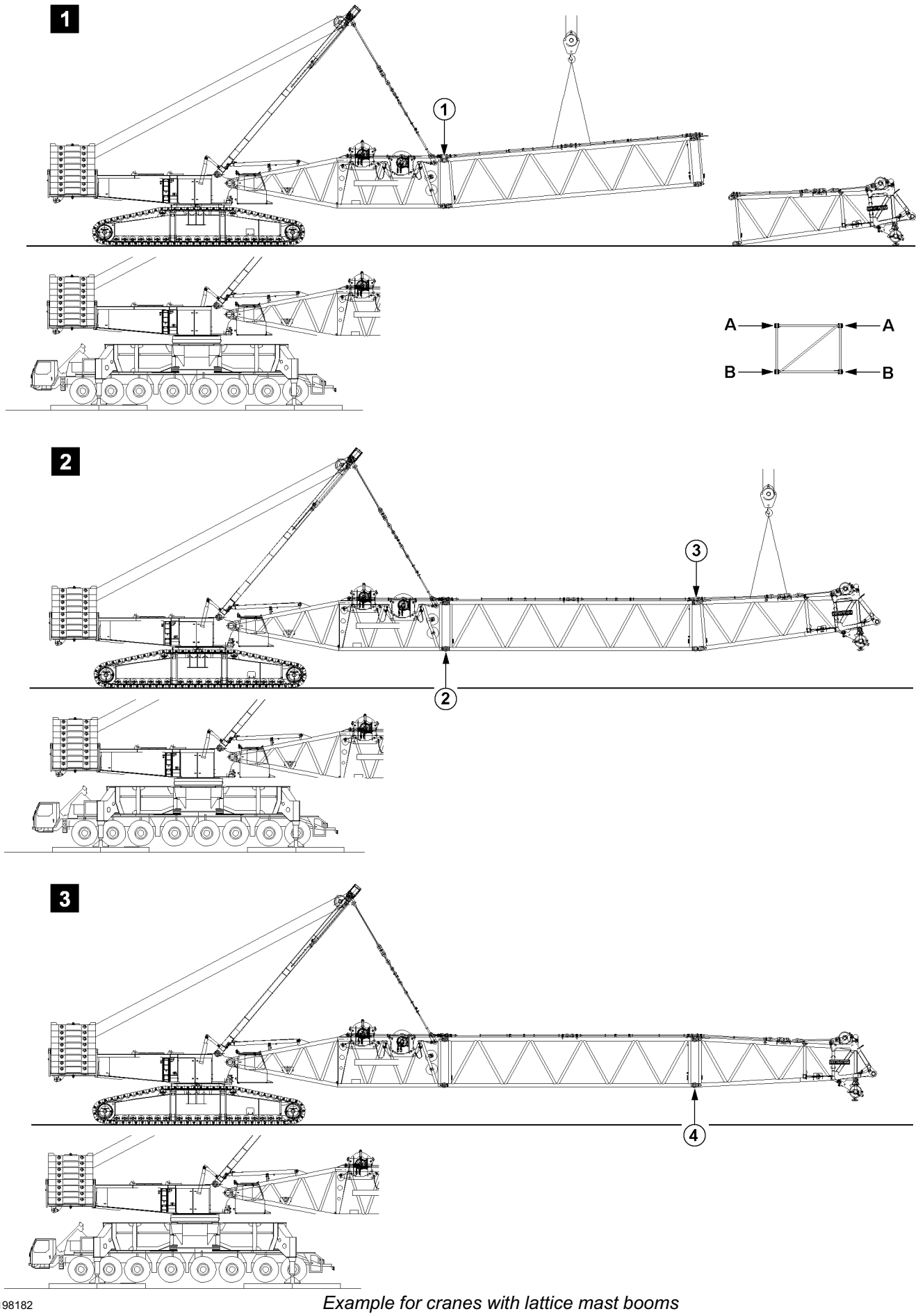
12.3.2 Disassembly of lattice sections

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.

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B198182 *Example for cranes with lattice mast booms*

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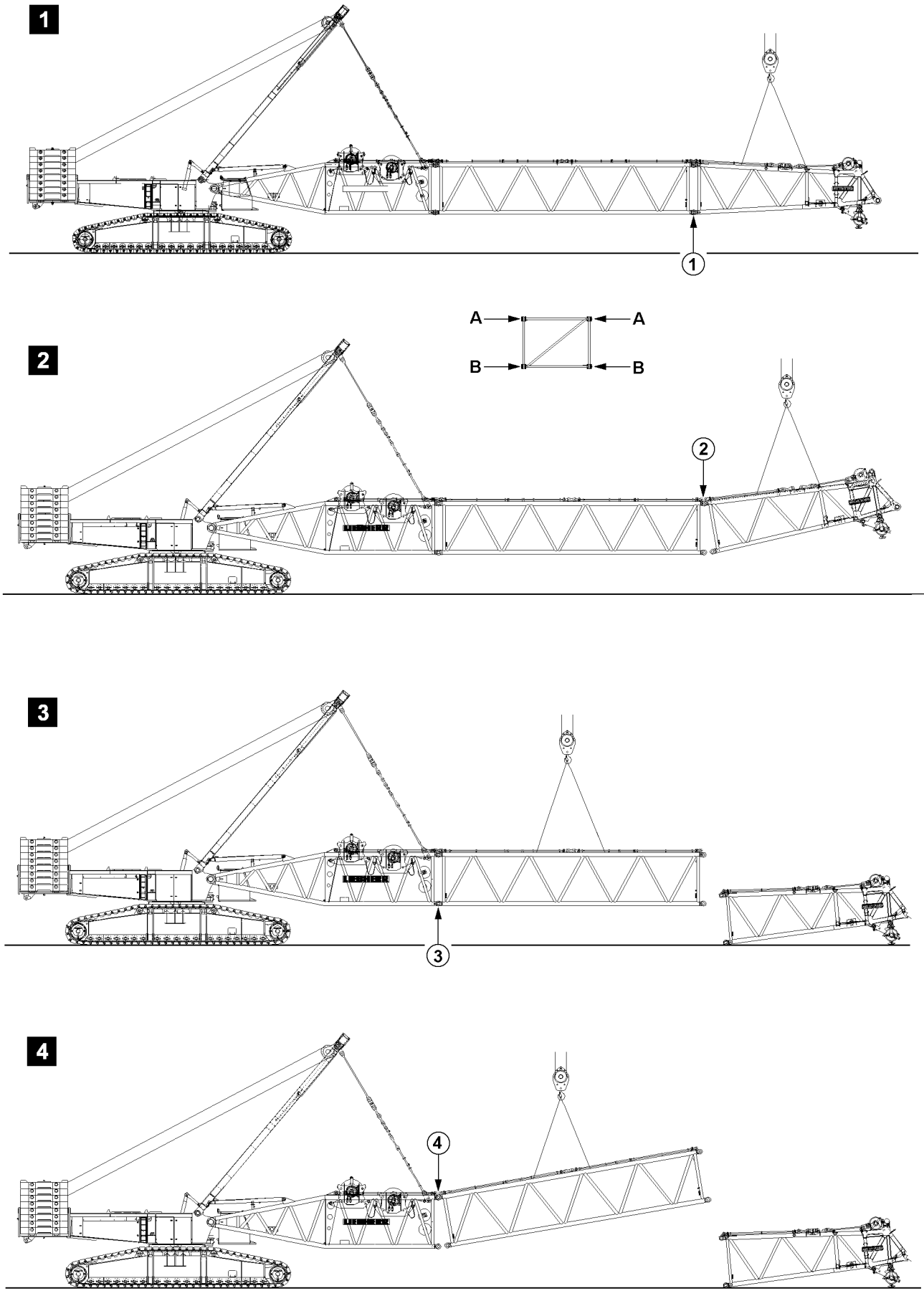
12.3.3 Flying assembly of lattice sections

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.

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Example for cranes with lattice mast booms

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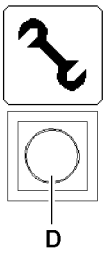
12.3.4 Flying disassembly of lattice sections

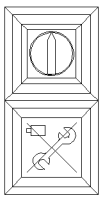
The illustrations serve as examples. The illustrations may differ depending on the crane.

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.

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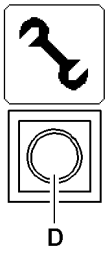
B111000 *Example for cranes with LICCON overload protection*

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12.4 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 set up button is pressed.
– The assembly icon on the LICCON monitor lights up.

WARNING

High risk of injury in case of actuated crawler assembly key button!

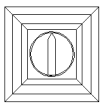
Operating the crawler assembly key button bypasses the overload protection! No shut off at overload will occur in assembly mode or in crane operations!

In the event of deliberate misuse, the crane can topple over!

Personnel can be killed!

This could result in high property damage!

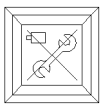
▶ The crawler assembly key button may only be actuated for assembly tasks!
▶ All other usage of the crawler assembly key button other than as described in the operating instructions is prohibited!
▶ Operating the crane with the crawler assembly key button enabled is strictly prohibited!



▶ 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.

12.5 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.

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- ▶ 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.

13 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!

13.1 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.

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13.2 Erection / take down for crawler cranes

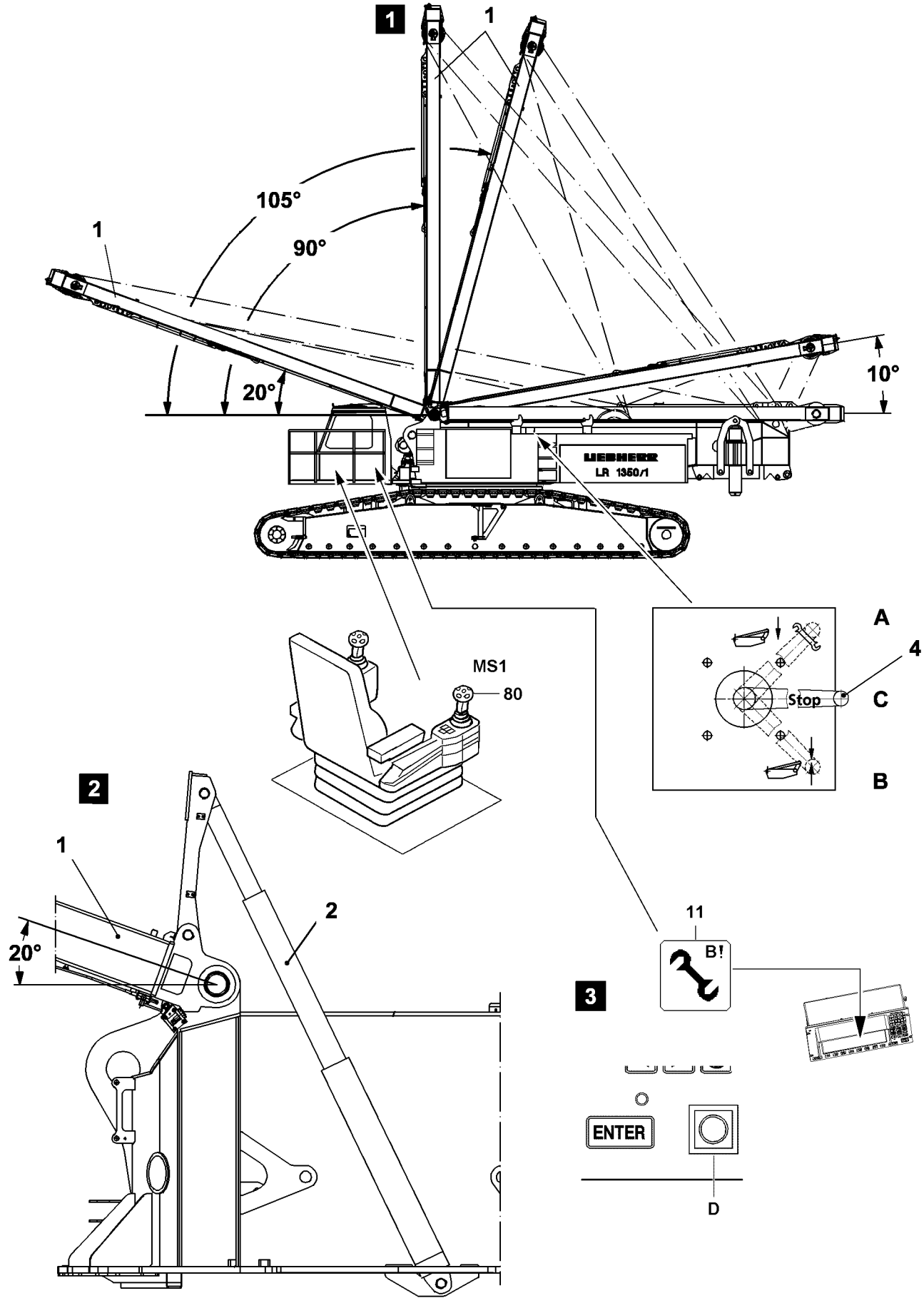
Make sure that the following prerequisites are met:

- 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.

13.3 Checking the prerequisites

▶ Check if all prerequisites have been met.

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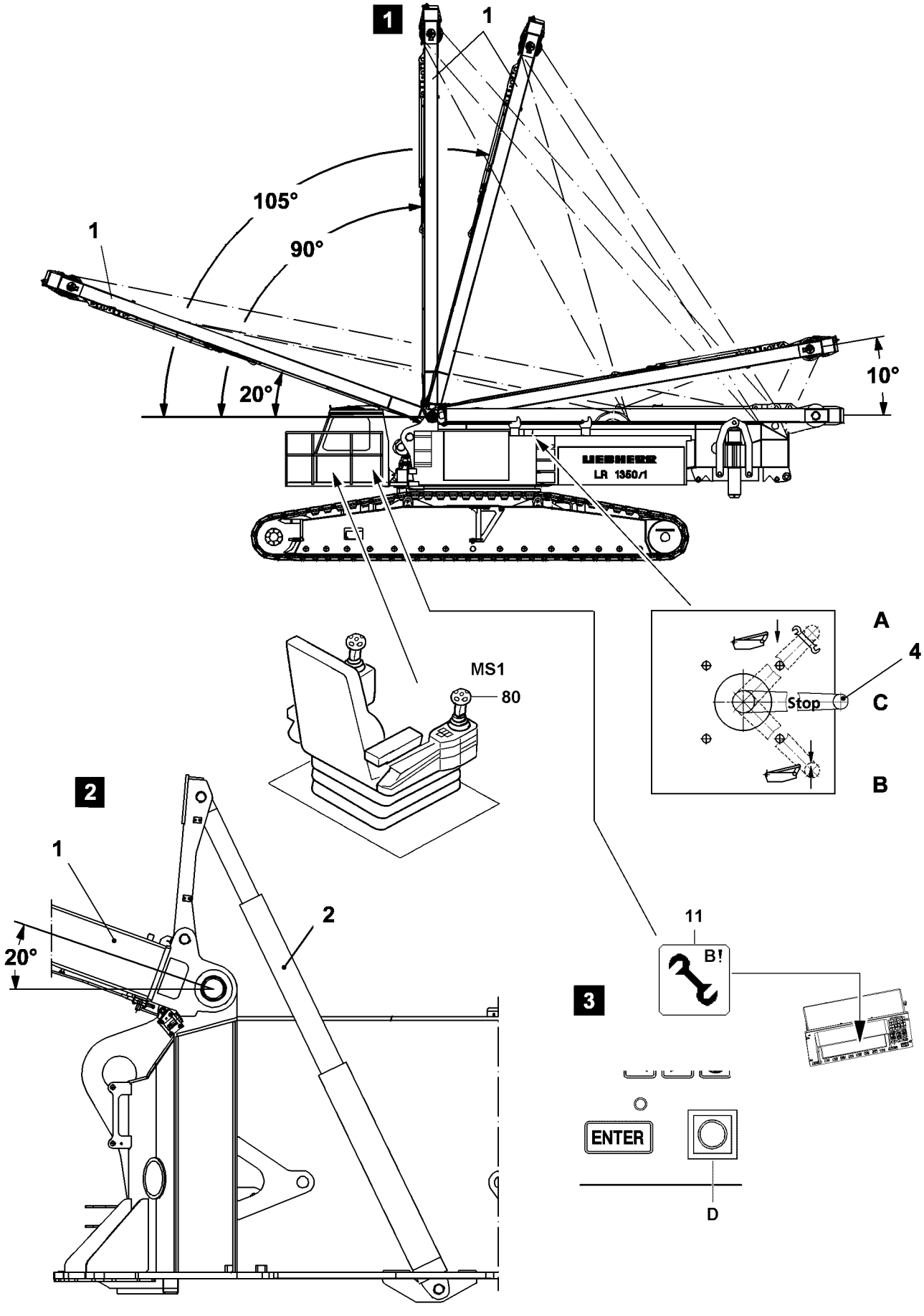
1 SA-frame

Note

- The SA-frame is used for assembly operation to install the crawler travel gear as well as for the installation of winch 1 and winch 2, see Crane operating instructions, chapter 3.01!
- In addition, the SA-frame is used in assembly operation for closing boom systems and for guying the boom in flying assembly of lattice sections, see Crane operating instructions, chapter 5.38!

Switch positions of the ball valve 3:		
Switch position	**Function**	
A	Lower the SA-frame	Transport position
C	SA-frame stop, cylinder stop,	Erection cylinders are blocked
B	Erecting the SA-frame	Assembly and operating position

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1.1 Erecting the SA-frame

1.1.1 Erection procedure

Make sure that the following prerequisites are met:

– The turntable is assembled.
– The SA-frame is in transport position.
– There is no counterweight on the turntable.
– Winch 4 is reeved on the roller set of the SA-frame.
– The engine is running.
– The set up key **D** is actuated, the assembly icon **11** on the LICCON monitor blinks.
– The SA-operating mode has been set and confirmed on the LICCON computer system.

WARNING

Assembly with turned on set up key!

When the set up key is engaged, the LICCON overload protection is exceeded!

In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be killed!

This could result in high property damage!

▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!

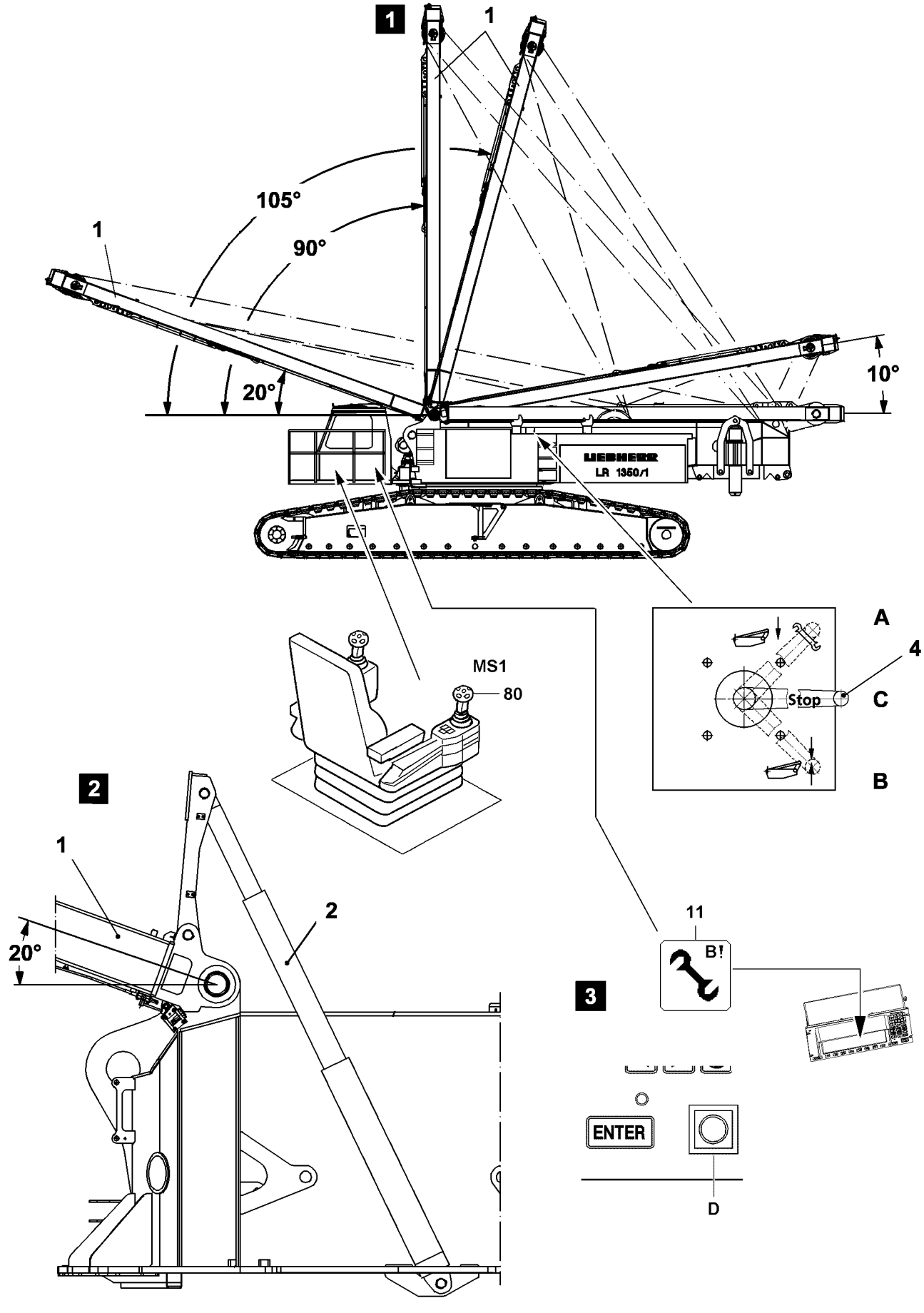
NOTICE

Danger of slack rope formation!

If winch 4 is spooled out too quickly during the erection procedure of the SA-frame, slack rope can form!

▶ The intake rope of winch 4 must be tensioned during the entire erection procedure!
▶ The spool out speed of winch 4 must be matched to the erection speed of the erection cylinders!

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WARNING
Independent lowering of the SA-frame!
By a false stop-cock setting during the erection procedure, the SA-frame can lower backward by itself!
Personnel can be severely injured or killed!
It can result in slack rope build-up!
- ▶ The ball valve **4** must be positioned in position **B** during assembly and crane operation!
- ▶ Ball valve position **A** “lower” and ball valve position **C** “stop” are only permissible when lowering the SA-frame onto the turntable (transport position)!

- ▶ Set the ball valve **4** into position **B**.
- ▶ Secure the ball valve **4** in position **B**, for example with a padlock, against unauthorized activation!
- ▶ Move master switch MS1 **80** in direction X+.

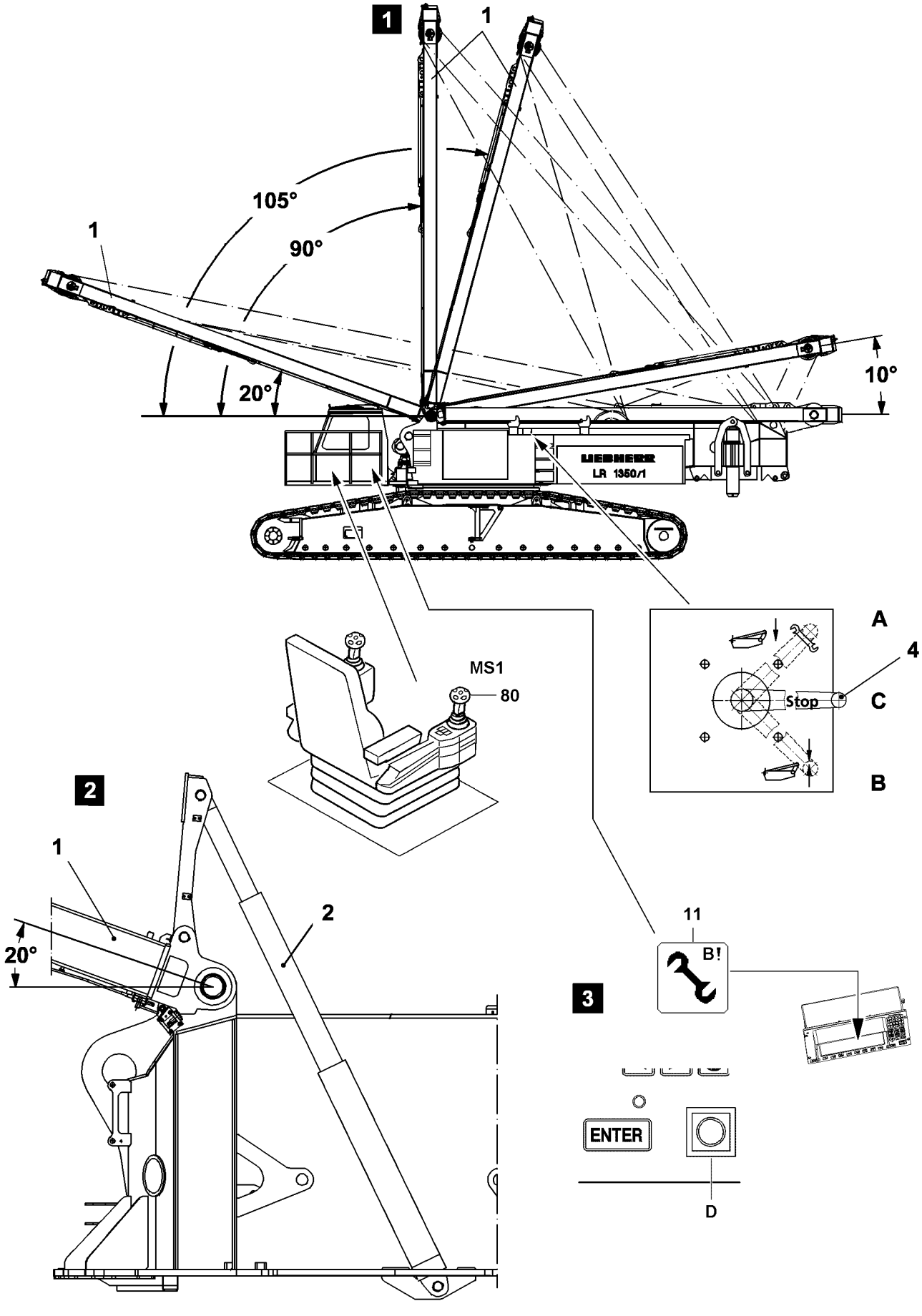
Result:
– Spool out winch 4 **WIV** and the SA-frame **1** is erected through the erection cylinder **2**, see illustration **1**.

Note
- ▶ Erect the SA-frame until it is in vertical position!
- ▶ The SA-frame is now in SA-operating range approx. 20 ° to 105 °, this is shown on the LICCON monitor! The **???** turn off and the SA-operating mode is shown!

- ▶ When the SA-frame has reached the vertical position:
  Move master switch MS1 **80** in direction X+.

Result:
– Due to the own weight of the SA-frame and by spooling out winch 4 simultaneously, the SA-frame is lowered to the front!

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1.2 Placing the SA-frame onto the turntable

1.2.1 Take down procedure

Make sure that the following prerequisites are met:
– The SA-Operating mode is turned on.
– The ball cock **4** is in position **B**.
– The ball valve **4** is secured in position **B** against unauthorized operation.
– The SA-frame is in the SA-operating range.
– The erection cylinders **2** are completely extended.

▶ Luff up the SA-frame **1** in SA-operating mode to approx. 105 °.

Result:
– Winch 4 spools up.
– The SA-frame **1** is pulled back against the pressure in the erection cylinder.

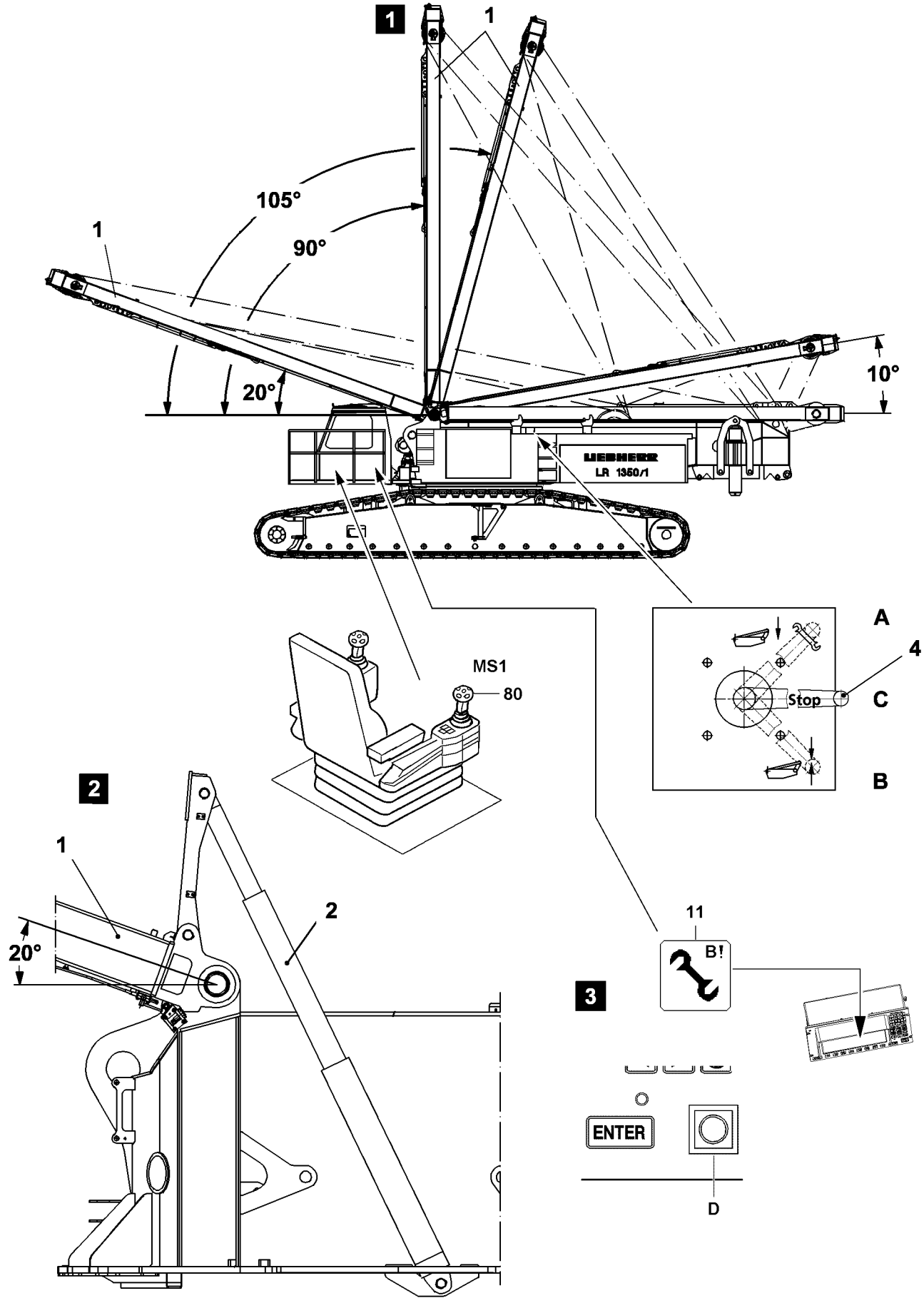
Note
▶ When the SA-frame reaches the position 105 ° when luffing up, an **error message** and **LMB-STOP** is shown on the LICCON monitor!
▶ Spooling up of winch 4 is turned off!

WARNING
Assembly with turned on set up key!
When the set up key is engaged, the LICCON overload protection is exceeded!
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!
Personnel can be killed!
This could result in high property damage!
▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!

▶ Turn the set up key **D** to the right.

Result:
– The LICCON overload protection is exceeded.
– The assembly icon **11** appears on the LICCON monitor.

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WARNING
Danger of fatal injury from SA-frame!
During the take down of the SA-frame, personnel can be severely injured or killed!
▶ The crane operator must make sure that no persons or objects are within the danger zone!

WARNING
Independent lowering of the SA-frame!
Through a false ball valve setting, the SA-frame can lower backward by itself!
Personnel can be severely injured or killed!
It can result in slack rope build up and to destruction of crane components!
▶ The ball valve **4** must be positioned in position **B** during assembly and crane operation!
▶ Ball valve position **A** “lower” and ball valve position **C** “stop” are only permissible when lowering the SA-frame onto the turntable (transport position)!

▶ When the LICCON overload protection is exceeded:
Move master switch MS1 **80** in direction X-.

Result:
– Due to the own weight of the SA-frame and by spooling up winch 4 simultaneously, the SA-frame is lowered to the rear against the pressure in the erection cylinders!

▶ When the SA-frame is at approx. 10 °:
Switch over ball valve **4** from position **B** after position **A**.

Result:
– The SA-frame **1** lowers itself slowly on the turntable due to its own weight.

▶ When the SA-frame **1** is lowered completely onto the turntable:
Carefully spool out winch 4 in order to avoid slack cable build up.
▶ Secure the ball valve **4** in position **C**, for example with a padlock, against unauthorized operation.

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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 2821.10:

– The first number signifies the system dimension (2821).
– The second number signifies the grade (10).

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!

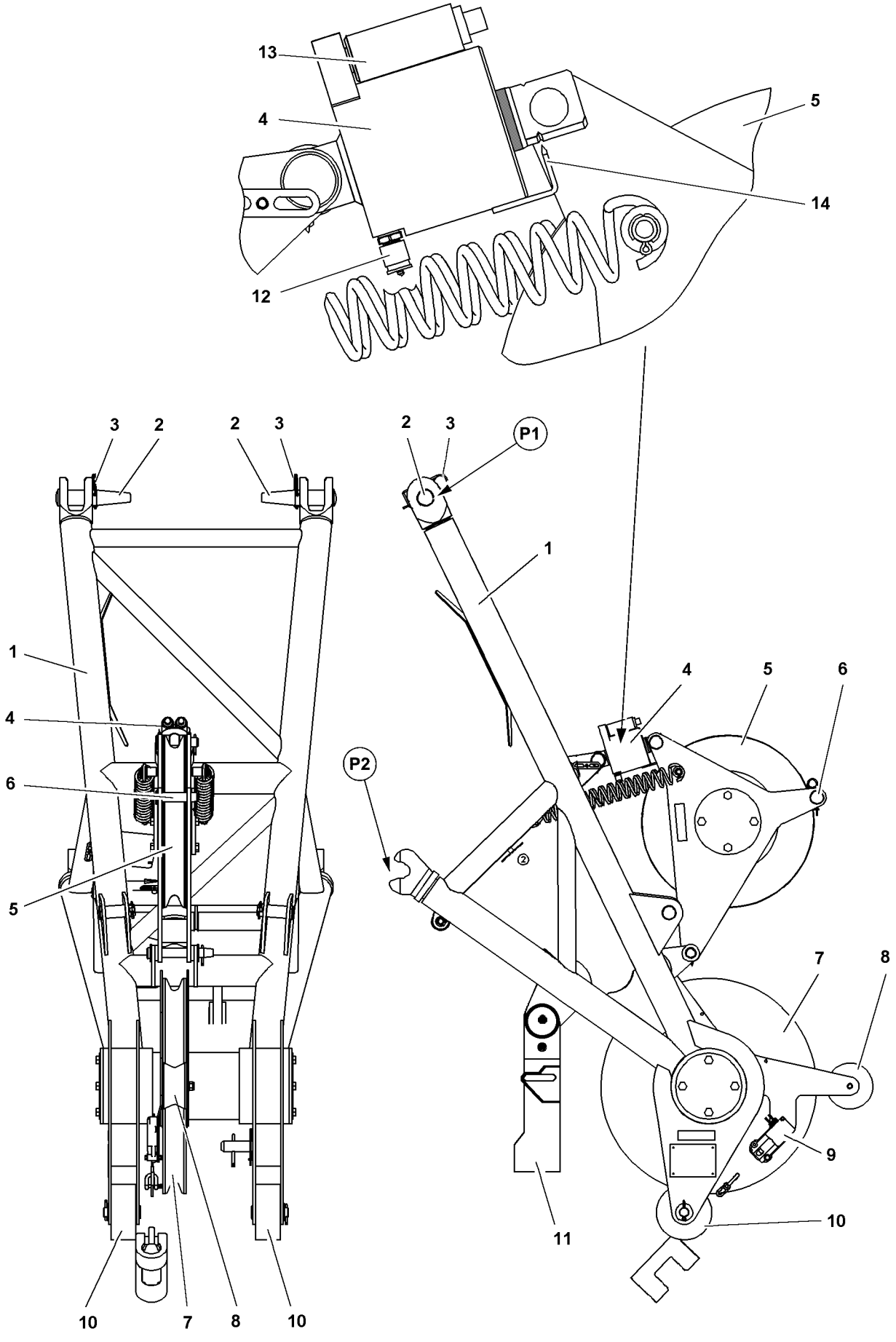
For the combination of the lattice sections with the same system number and the same grade, the following rules apply:

– Two intermediate sections 6 m can be replaced with one intermediate section 12 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.

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1 Overview of boom nose components

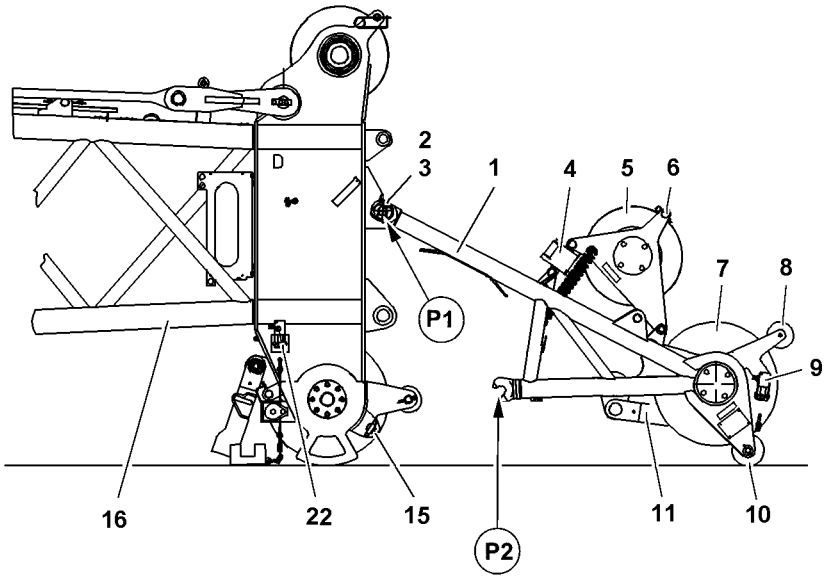
The 32 t boom nose **1** can be installed and operated on the L- (W-) end section and on the S -end section.
The weight of the boom nose **1** is approximately 520 kg.

Position	Description
1	Boom nose, 32 t
2	Pin
3	Spring retainer
4	Test cylinder
5	Rope pulley
6	Rope retaining pin
7	Rope pulley
8	Rope retaining pulley
9	Hoist limit switch
10	Roller
11	Rope fixed point (rope lock)
12	Test connection
13	Pressure sensors
14	Pointer

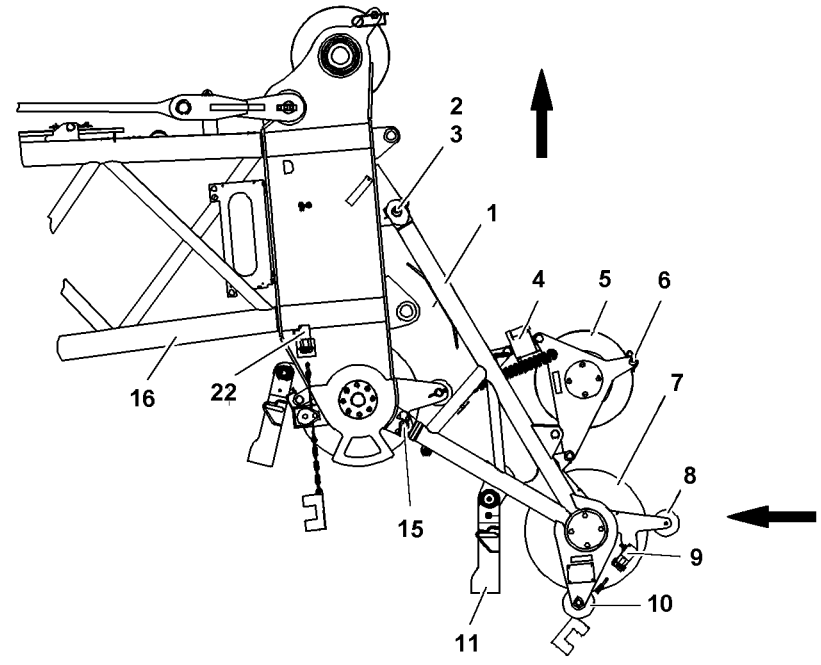
WARNING
Risk of accident from unnoticed overloading the crane!
Before operation of the boom nose **1** on the crane it must be ensured that the pointer **14** is on the zero mark (notch) of the test cylinder **4**!
If the pointer **14** is not on the zero mark (notch) of the test cylinder **4**, then the load display on the LICCON monitor does not match the actual load on the hook block!
There is a risk of accident from unnoticed overloading the crane!
Personnel can be severely injured or killed!
▶ If the pointer **14** is not on the zero mark (notch) of the test cylinder **4**, contact Liebherr Service!

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1



2



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2 Installing the boom nose 32 t on the L- (W-) end section

Position	Description
15	Stop pin
16	L-end section 200 t
22	Hoist limit switch

WARNING
Risk of falling!
During assembly / disassembly work, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!
- ▶ All assembly work must be carried out using suitable aids (lifting platforms, scaffolding, ladder, 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! The personal fall arrest system must be attached in the corresponding fastening 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!

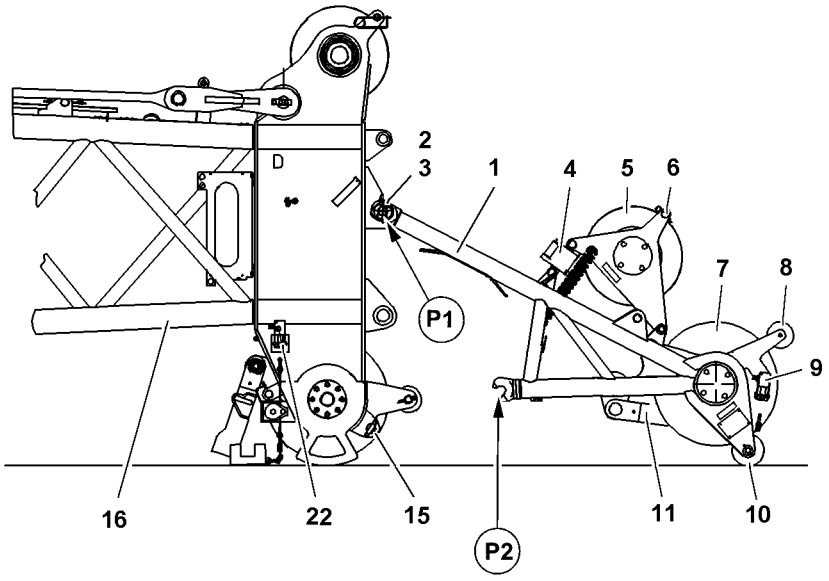
WARNING
Incorrect or missing fall guard!
Using inappropriate aids to secure the assembly personnel at assembly can result in a fall. Personnel can be severely injured or killed!
- ▶ Secure yourself and others during all assembly work with suitable aids (lifting platforms, scaffolding, ladders, auxiliary 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!

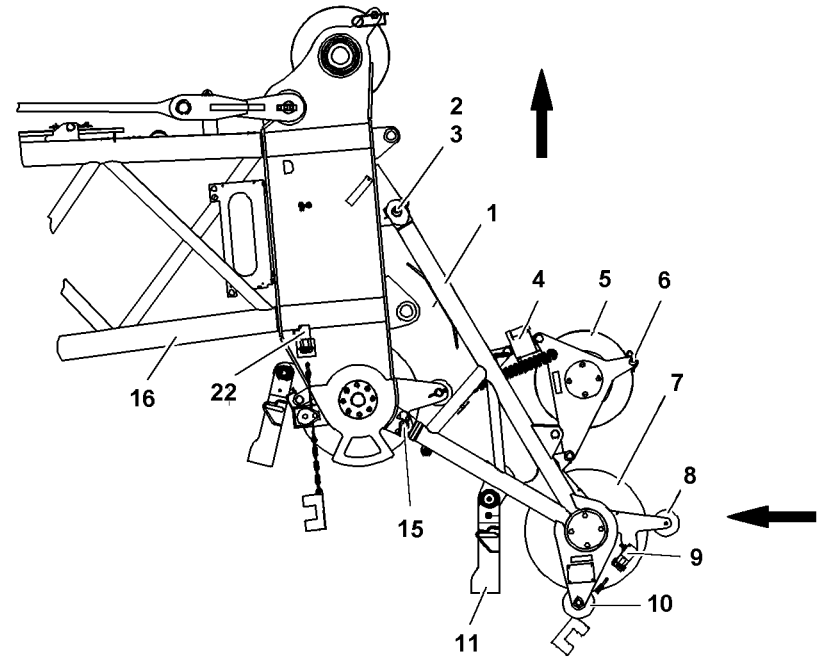
WARNING
Danger of impact / crushing!
When installing / removing counterweight components with the auxiliary crane, crane components can start to swing back and forth!
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!
Personnel can be caught and severely injured or killed!
- ▶ Make sure that personnel cannot be caught by components!
- ▶ When working in danger zones: Use aids to protect limbs!
- ▶ Guide components with suitable aids to minimize oscillation!

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1



2



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Note
▶ Observe the safety guidelines for the assembly, see Crane operating instructions, chapter 5.01!

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 pallet 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 boom is placed down, the boom head is laying on the ground, see illustration **1**.
– An auxiliary crane is available.

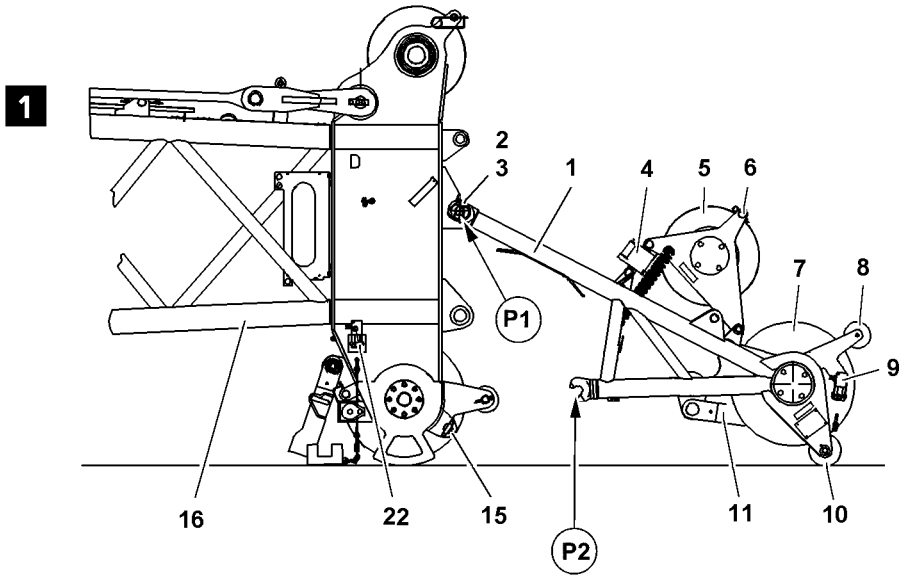
WARNING
The crane can topple over!
During erection of the boom, the crane can be overloaded and topple over!
Personnel can be severely injured or killed!
▶ Observe the data in the erection and take down charts!

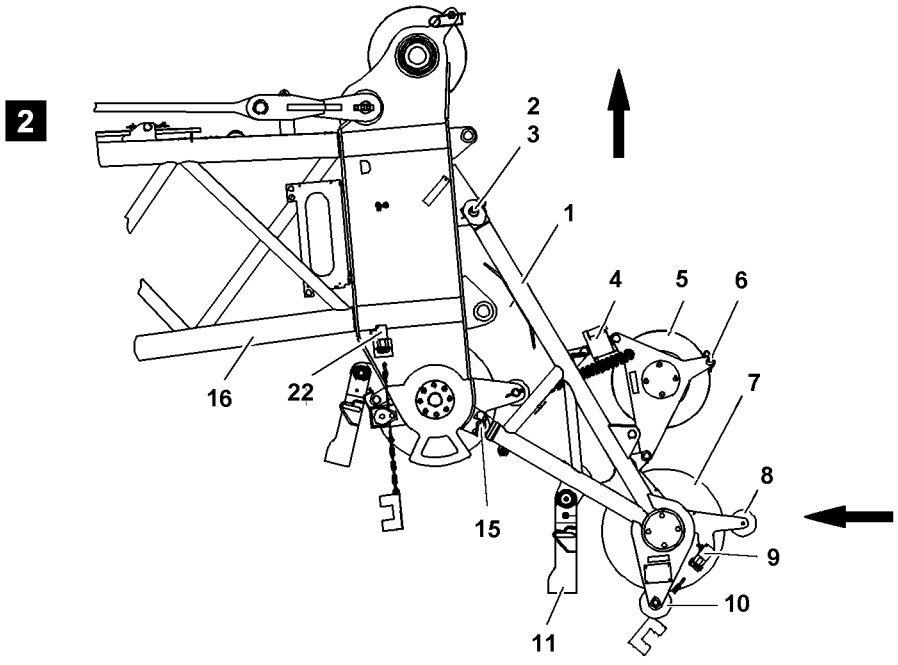
▶ Hang the boom nose **1** onto the auxiliary crane.
▶ Position the boom nose **1** with the auxiliary crane on the end section in such a way that the pin bores align in point **P1**, see illustration **1**.
▶ When the pin bores align:
Insert the pin **2** on the end section at point **P1** and secure with spring retainer **3**.
▶ Lower the boom nose **1** to the ground with the auxiliary crane.
▶ Remove the auxiliary crane.
▶ Release and unpin the rope retaining pin **6**.
▶ Pull the hoist rope over the rope pulley on the end section **16** and the rope pulley **5** on the boom nose **1**. Rope reeving, see Reeving plans.

Note
▶ If no hoist rope is reeved on the end section **16**, then attach the hoist limit switch weight on the hoist limit switch **22** of the L-end section so that the overload protection “releases” the hoist limit switch **22**!

▶ Insert and secure the rope retaining pin **6**.
▶ Guide the hoist rope between the rope pulley **7** and the rope retaining pulley **8**.

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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 **10** in direction of the boom head.

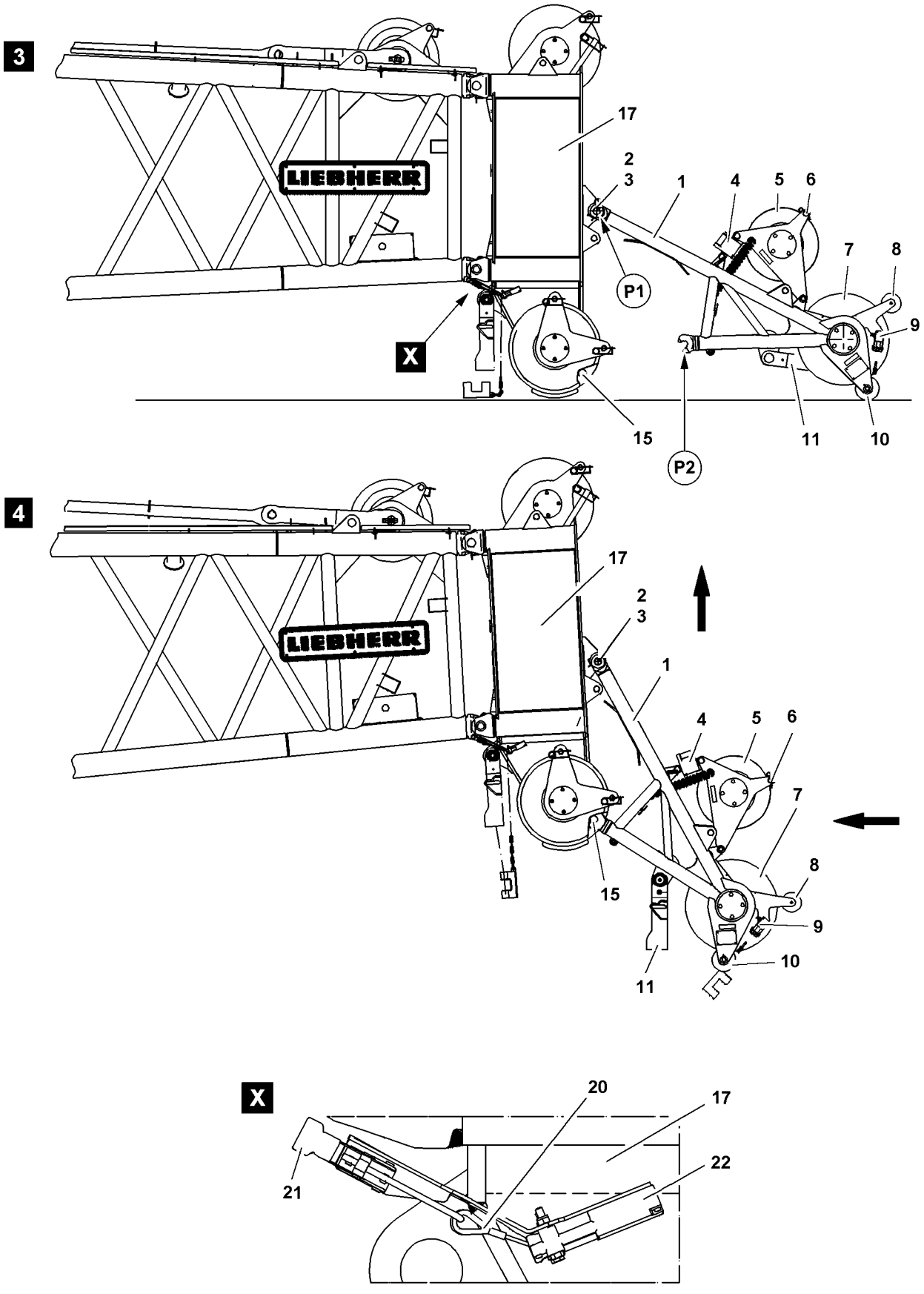
▶ Continue to luff up the boom until the fork head point **P2** is placed on the stop pin **15** of the pulley set.

2.2 Establishing the electrical connections

Make sure that the following prerequisite is met:
– The boom nose is completely assembled.

▶ Establish the electrical connections, see Electric wiring diagram.

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3 Installing the boom nose 32 t on the S-end section

Position	Description
15	Stop pin
17	S-end section 300 t
20	Hoist limit switch rope
21	Hook lock
22	Hoist limit switch

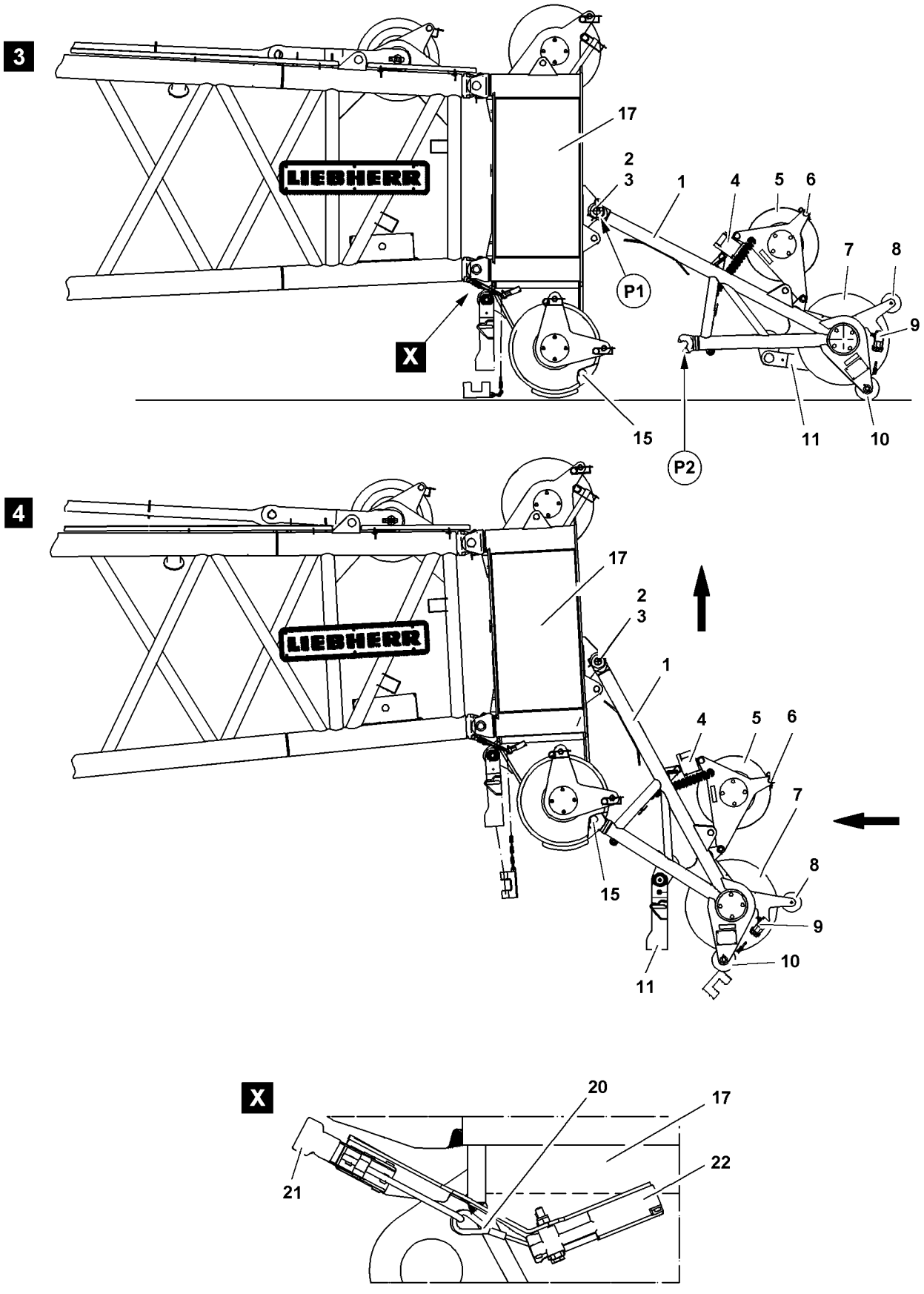
WARNING
Risk of falling!
During assembly / disassembly work, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!
- ▶ All assembly work must be carried out using suitable aids (lifting platforms, scaffolding, ladder, 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! The personal fall arrest system must be attached in the corresponding fastening 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
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!

WARNING
Danger of impact / crushing!
When installing / removing counterweight components with the auxiliary crane, crane components can start to swing back and forth!
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!
Personnel can be caught and severely injured or killed!
- ▶ Make sure that personnel cannot be caught by components!
- ▶ When working in danger zones: Use aids to protect limbs!
- ▶ Guide components with suitable aids to minimize oscillation!

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Note
▶ Observe the safety guidelines for the assembly, see Crane operating instructions, chapter 5.01!

3.1 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 pallet 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 boom is placed down, the boom head is laying on the ground, see illustration **3**.
– An auxiliary crane is available.

WARNING
The crane can topple over!
During erection of the boom, the crane can be overloaded and topple over!
Personnel can be severely injured or killed!
▶ Observe the data in the erection and take down charts!

Note
▶ The assembly of the boom nose **1** is made on the S-end section in the same sequence as the assembly of the boom nose **1** on the L- (W-) end section, see section “Installing the boom nose 32 t on the L- (W-) end section.”

Note
▶ Attach the hoist limit switch rope **20** with the hook lock **21** under “tension” so that the overload protection “releases” the hoist limit switch **22**, see illustration **X**!

▶ Make sure that the fork head point **P2** lays on the stop pin **15** of the pulley set.

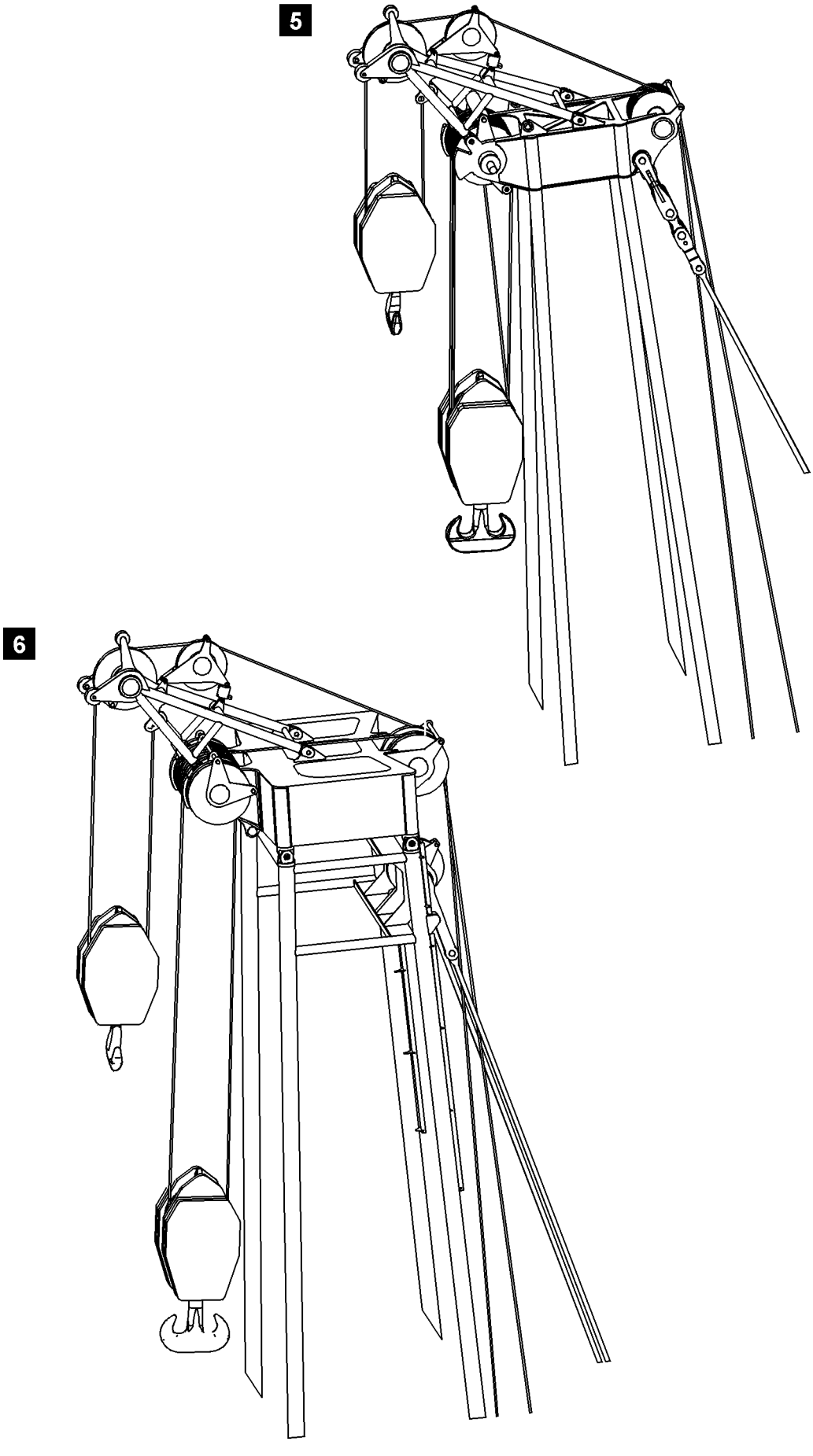
3.2 Establishing the electrical connections

Make sure that the following prerequisite is met:
– The boom nose is completely assembled.

Note
▶ The hoist limit switch **22** on the S-end section must always be connected on the LICCON system bus!

▶ Establish the electrical connections, see Electric wiring diagram.

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4 Erection

WARNING
The crane can topple over!
During erection or take down of the boom, the crane can be overloaded or topple over!
Personnel can be severely injured or killed!
- ▶ The specifications in the load charts must be adhered to!
- ▶ Observe the data in the erection and take down charts!

5 Crane operation

Make sure that the following prerequisites are met:
- – The LICCON overload protection has been set according to the data in the load chart.
- – The required operating mode has been set and confirmed on the LICCON computer system.
- – The electrical connections to the boom nose are established.

The operation with the boom nose is designed for quick lifts with winch 2 at S, SL, SD, SLD, SW, SDWB-operation. The hook block can remain reeved with winch 1 on the L-end section or on the S-end section.

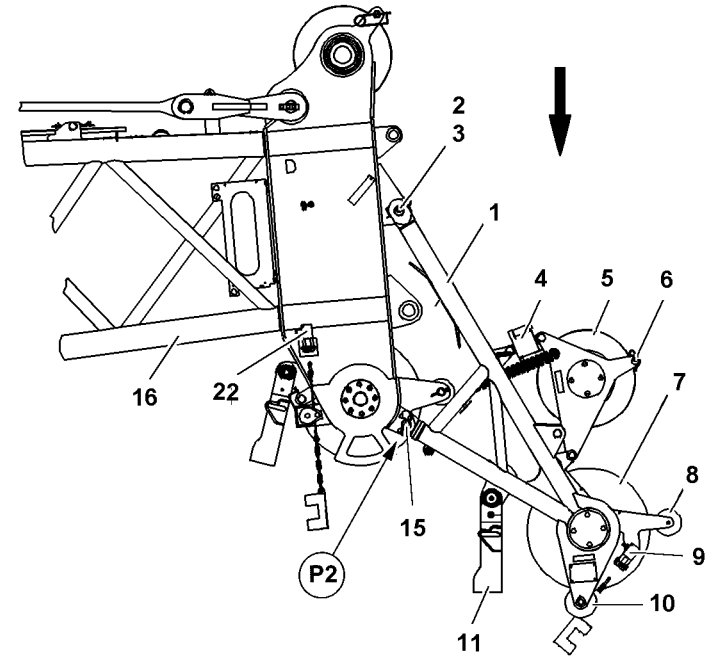
DANGER
Risk of accident!
If the hook block on the boom head and the hook block on the boom nose are operated simultaneously, there is a danger of accidents!
Personnel can be severely injured or killed!
- ▶ Simultaneous operation of the hook block on the boom head and the hook block on the boom nose is prohibited!

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!

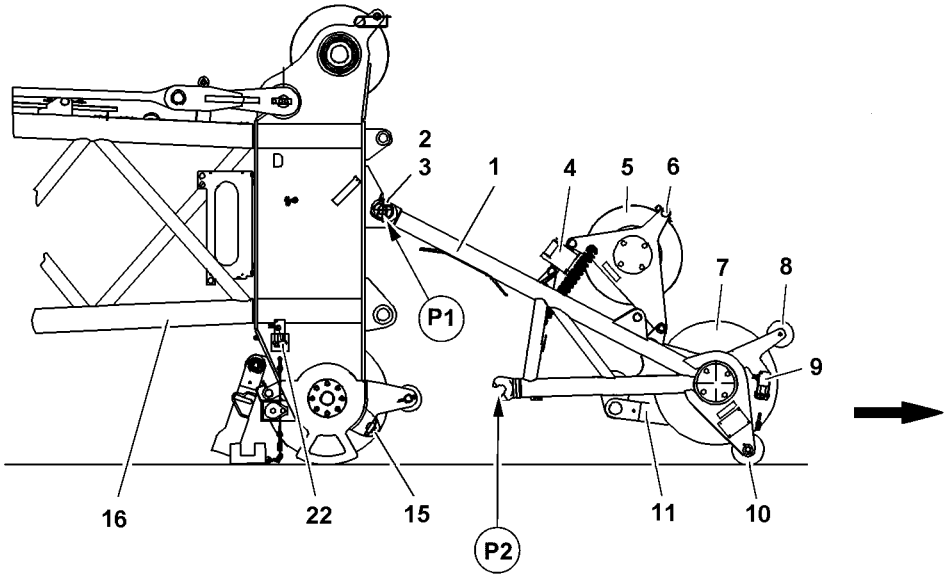
WARNING
Risk of accident!
If a hoist limit switch with another bus address or software version is installed on the boom nose, then the boom nose cannot be monitored sufficiently and can be overloaded unnoticed!
Risk of accident!
Personnel can be severely injured or killed!
- ▶ Match the hoist limit switch to the correct bus address before installation!
- ▶ When replacing or changing the hoist limit switch, the hoist limit switch must have the correct bus address and the correct software version in order to be detected by the LICCON system bus!

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5.1 Checking the settings

▶ Check the hoist limit switch by running against the hoist limit switch weight.

6 Disassembling the 32 t boom nose

6.1 Luff the boom down

Make sure that the following prerequisites are met:

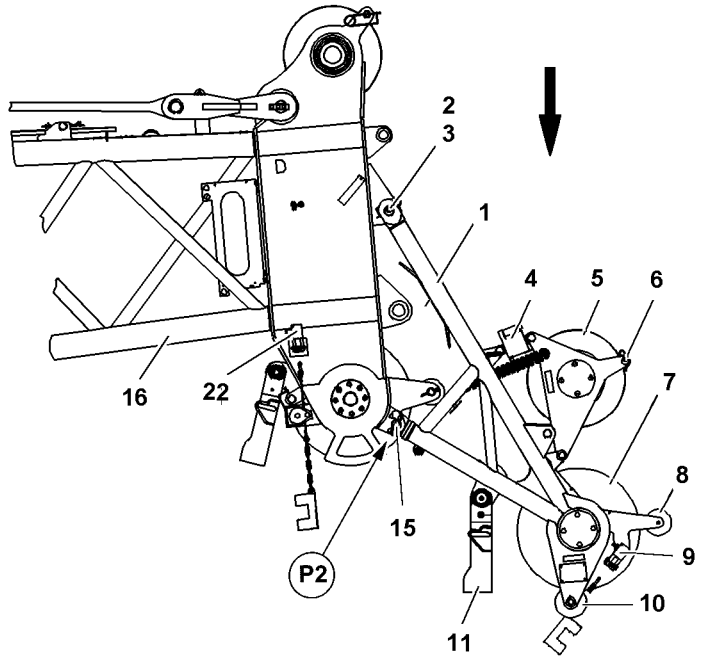
– The crane is aligned in horizontal direction.
– The counterweight has been installed on the turntable according to the erection and take down chart.
– The derrick ballast is placed on the suspended ballast or the ballast trailer according to the erection and take down chart.
– The LICCON overload protection has been set according to the data in the load chart.
– An auxiliary crane is available.

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 notes, see Crane operating instructions, chapter 5.01!
▶ Observe the data in the erection and take down charts!

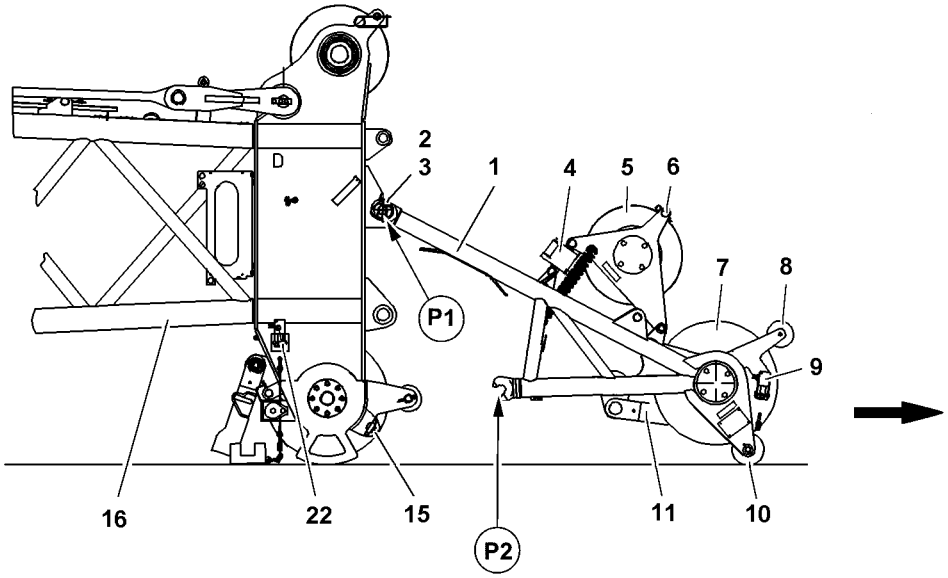
NOTICE
Hoist winch not spooled out!
If the hoist winch is not spooled out sufficiently when the boom is luffed down, then the hook block will collide with the boom nose!
When the boom is luffed down:
▶ Spool the hoist winch out simultaneously!

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▶ Luff the boom down according to the erection and take down chart until the hook block touches the ground.

Note

▶ Observe the description for disassembly of the hoist limit switch weight and the hook block, see Crane operating instructions, chapter 4.06!

▶ Remove the hoist limit switch weight and unreeve the hook block.

▶ Disconnect the electrical connections, see Electric wiring diagram.

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 **10** is laying on the ground, see illustration **8**.

▶ Luff the boom down slowly.

Result:

– The boom nose moves on the pulleys **10** toward the “outside”.

▶ When the boom head is fully placed down:
Release and unpin the rope retaining pin **6**.

▶ Remove the hoist rope.

6.2 Disassembling the 36 t boom nose on the end section

Make sure that the following prerequisites are met:

– The boom nose **1** is laying on the ground with the pulley set **10**.
– The boom head is fully placed down.
– The electrical connections are separated.
– The hoist rope is removed.

▶ Attach the tackle on the intended fastening points.

▶ Bring the tackle to “tension”.

▶ Release the pin **2** at the end section in point **P1** 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.

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1 Ballast trailer

Note
▶ See Crane operating instructions, part 2, chapter 5.11!

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1 Ballast trailer

Note
▶ See Crane operating instructions, part 2, chapter 5.11!

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1 Minimum required hook block weight

WARNING
Falling components and hook block!
If the chosen hook block weight is not large enough. then the hoist rope pulls the hook block between the boom head and the winch from a certain hoisting height suddenly upward. As a result, the boom head and the hook block can be damaged. Damaged components and the hoist rope between the boom head and the winch can fall down.
If slack rope forms between the winch and the boom head when spooling the winch out, then the hook block can suddenly fall down.
Personnel can be severely injured or killed!
- ▶ Calculate the minimum required hook block weight before lifting the load!
- ▶ Select the weight of the hook block depending on the calculation!

If the weight of the hook block is not sufficient:
- ▶ Select a heavier hook block or increase the weight of the hook block with fastening items, load tackle, auxiliary weights or modification kits!

NOTICE
Rope damage due to insufficient weight of the hook block!
If the hook block is operated with a higher reeving than is required by the load on the respective boom length, the minimum required hook block weight increases.
If the hook block weight is too low to tighten the hoist rope sufficiently, spooling problems may occur on the winches when lowering and lifting the hook block due to slack rope formation. Rope damage can result.
If no minimum system-related hoist reeving is required for the operating mode:
- ▶ Reeve the hook block at the minimum depending on the maximum rope pull and the weight of the load to be lifted!

If the weight of the hook block is not sufficient:
- ▶ Select a heavier hook block or increase the weight of the hook block with fastening items, load tackle, auxiliary weights or modification kits!

Note
Recommendation for selection of hook block weight!
If the maximum load capacity for the respective boom configuration is not exceeded by an additional weight increase of the hook block:
- ▶ Increase the minimum required hook block weight additionally by at least 10%!

If an additional weight increase of the hook block due to the maximum load capacity for the respective boom configuration is not possible:
- ▶ Lower the hook block only with utmost caution!

Note
Observe the permissible hook block weights for erection and take down of the boom system!
If the permissible hook block weight for erection and take down of the boom system is exceeded due to the own weight increase of the hook block, then the boom system cannot be erected or taken down with this hook block weight.
- ▶ Observe the permissible hook block weights for erection and take down in the erection and take down charts!

If the permissible hook block weight for erection and take down is exceeded:
- ▶ Remove auxiliary weights for the erection and take down of the boom system!

1.1 Calculating the minimum required hook block weight

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$$G = L \times M \times N \times F$$

Formula to determine the minimum required hook block weight

Abbreviation	Description	Unit
G	Minimum required hook block weight	kg
L	Overall boom length	m
M	Rope weight	kg/m
N	Reeving	-
F	Factor	-

Explanation of variables to calculate the minimum required hook block weight

1.2 Determining the rope weight for the rope diameter

Rope diameter	Rope weight M
13 mm	0.85 kg/m
15 mm	1.12 kg/m
17 mm	1.45 kg/m
19 mm	1.81 kg/m
21 mm	2.24 kg/m
23 mm	2.67 kg/m
25 mm	3.09 kg/m
28 mm	3.94 kg/m
30 mm	4.46 kg/m
32 mm	5.09 kg/m
38 mm	7.21 kg/m
40 mm	7.99 kg/m
52 mm	13.50 kg/m

Rope diameter and rope weight

1.3 Determining the factor for reeving

Reeving N	Factor F
1	1.31
2	1.34
3	1.36
4	1.39
5	1.41
6	1.44
7	1.46

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Reeving N	Factor F
8	1.49
9	1.52
10	1.54
11	1.57
12	1.60
13	1.63
14	1.65
15	1.68
16	1.71
17	1.74
18	1.77
19	1.80
20	1.83
21	1.87
22	1.90
23	1.93
24	1.96
25	2.00
26	2.03
27	2.06
28	2.10
29	2.13
30	2.17

Reeving and factor

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1.4 Calculation examples

1.4.1 Calculating the required hook block weight for crane operation with 1 hoist rope winch in single operation with single hook block

Crane configuration:

– Length of main boom: 70 m
– Length of auxiliary boom: 28 m
– Rope diameter: 28 mm
– Reeving: 12 rope strands

Variables for calculation:

L = overall boom length = 98 m
M = rope weight for rope diameter 28 mm = 3.94 kg/m
N = reeving = 12
F = Factor for 12 rope strands = 1.60

Calculation:

G = **L** x **M** x **N** x **F**
G = 98 m x 3.94 kg/m x 12 x 1.60
G = 7414 kg
The minimum required hook block weight must be 7414 kg and must be increased additionally by at least 10 % (741 kg) to 8155 kg. The maximum load capacity for the respective boom configuration may not be exceeded by the additional weight increase of the hook block.

1.4.2 Calculating the required hook block weight for crane operation with 2 hoist rope winches in parallel operation with double hook block

Crane configuration:

– Length of main boom: 70 m
– Length of auxiliary boom: 28 m
– Rope diameter: 28 mm
– Reeving: 2 x 8 rope strands

Variables for calculation:

L = overall boom length = 98 m
M = rope weight for rope diameter 28 mm = 3.94 kg/m
N = reeving = (2 x 8)
F = Factor for 8 rope strands = 1.49

Calculation:

G = **L** x **M** x (**2** x **N**) x **F**
G = 98 m x 3.94 kg/m x (2 x 8) x 1.49
G = 9205 kg
The minimum required hook block weight must be 9205 kg and must be increased additionally by at least 10 % (921 kg) to 10126 kg. The maximum load capacity for the respective boom configuration may not be exceeded by the additional weight increase of the hook block.

2 Procedure in case of slack rope

2.1 Lowering the hook block if slack rope forms

If the hook block can no longer be lowered due to slack rope formation, then the following steps must be carried out.

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2.1.1 Spooling op loose hoist rope

▶ Spool up loose hoist rope between the boom head and the wind carefully onto the winch.

Note

▶ A slight rope slack must remain between the boom head and the winch!

2.1.2 Luffing the boom down

NOTICE

Risk of collision!

When luffing the boom down, the hoist rope length can shorten and pull the hook block against the boom head.

▶ Monitor the distance of the hook block to the boom head!

▶ Luff the boom down carefully.

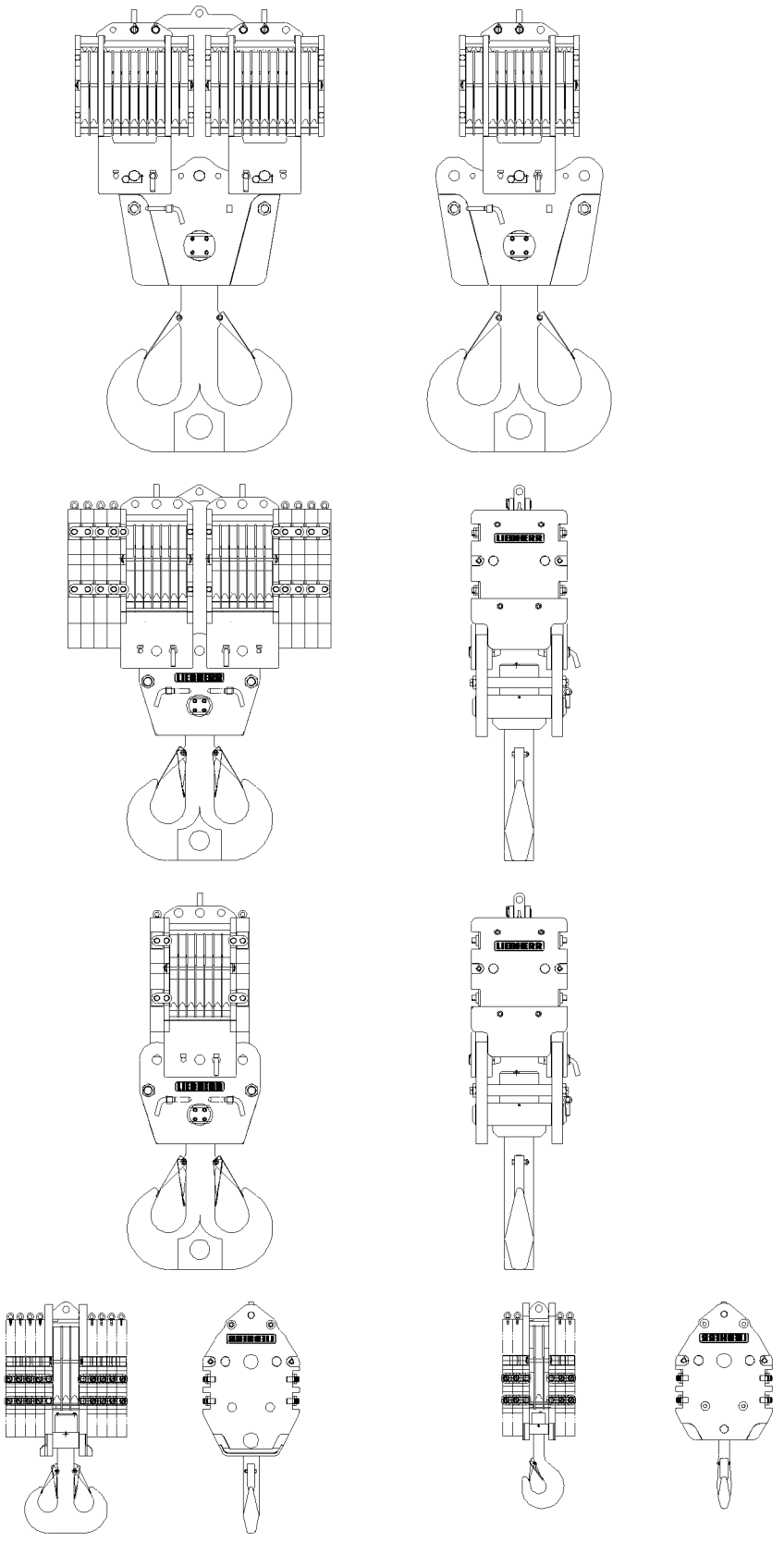
Result:

– The hoist rope between the boom head and the winch is tensioned.

2.1.3 Lowering the hook block

▶ Lower the hook block carefully with the hoist gear.

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3 Hook block overview

3.1 Handling of hook blocks

Note

- For the load hooks and hook blocks approved for this crane type refer to the separate load chart manual!
- The hook blocks shown in this chapter are only examples and can differ from your hook block in type and number of rope pulleys. The different assembly and disassembly procedures are therefore only an example of the description for a number of different hook blocks!

DANGER

Hook block weights!

If the data in the erection and take down charts as well as the load charts are not observed, dangerous situations up to toppling of the crane can occur!

Personnel can be severely injured or killed, in addition, high property damage can result!

- Observe the data in the erection and take down charts!
- The specifications in the load charts must be adhered to!
- The crane operator bears the sole and full responsibility for the adherence to the data in the erection and take down charts as well as the load charts!

Differently sized hook blocks can be used for various loads.

NOTICE

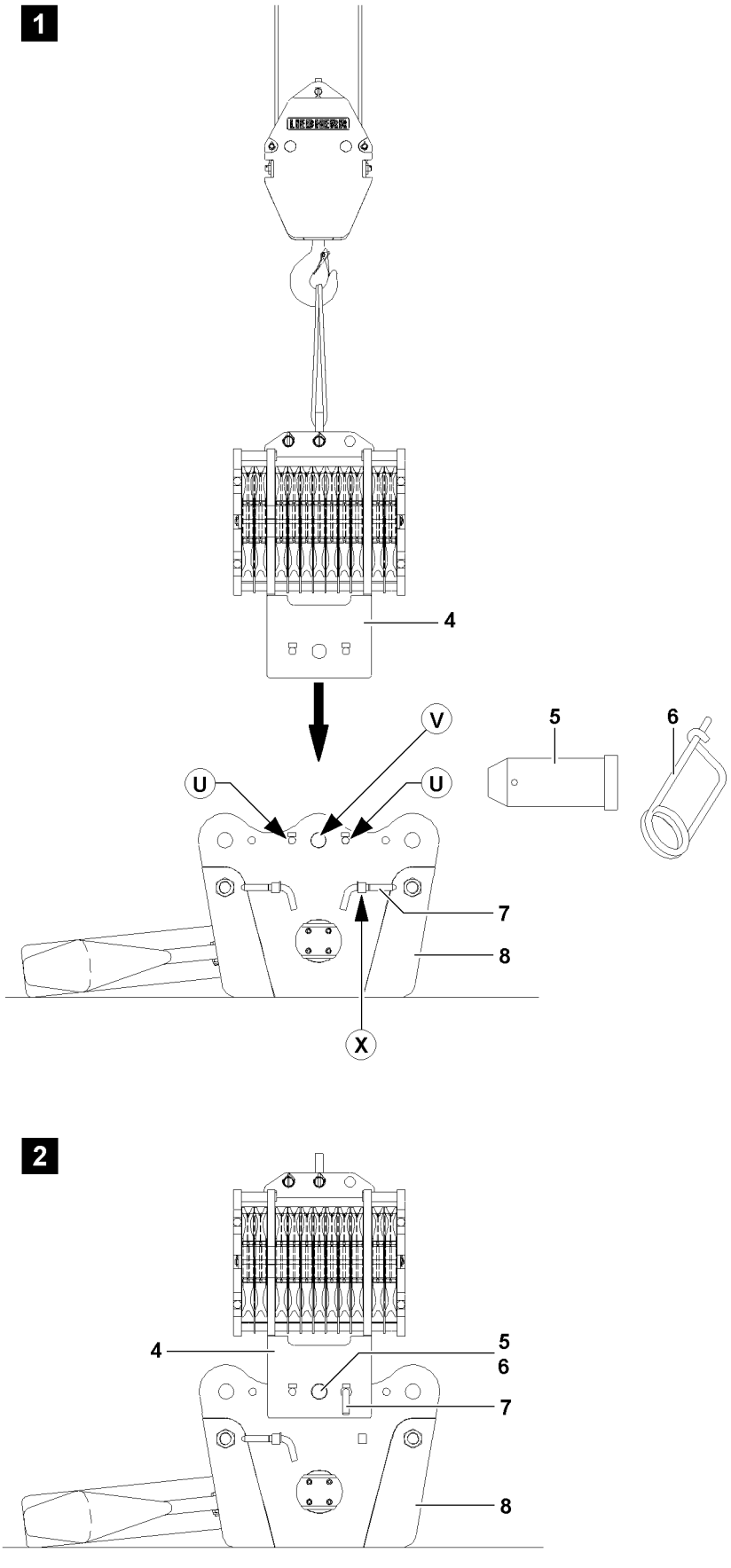
Rope damage due to insufficient hook block weight!

If the hook block weight is too low to tighten the hoist rope sufficiently, spooling problems may occur on the winches when lowering and lifting the hook block due to slack rope formation!

The hoist rope can be damaged!

- In order to prevent spooling problems on the winches, the hook block weight may be increased with auxiliary weights, if necessary!
- If problems develop in the assembly and set up conditions due to the weight increase of the hook block, auxiliary weights must be removed again!

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4 Installing a double hook block for single operation

4.1 Installing the hook block

If the hook blocks are to be used in single operation, then the pulley block **4** must be installed centered on the cross brace **8**.

4.1.1 Installing the pulley block on cross brace

Make sure that the following prerequisites are met:

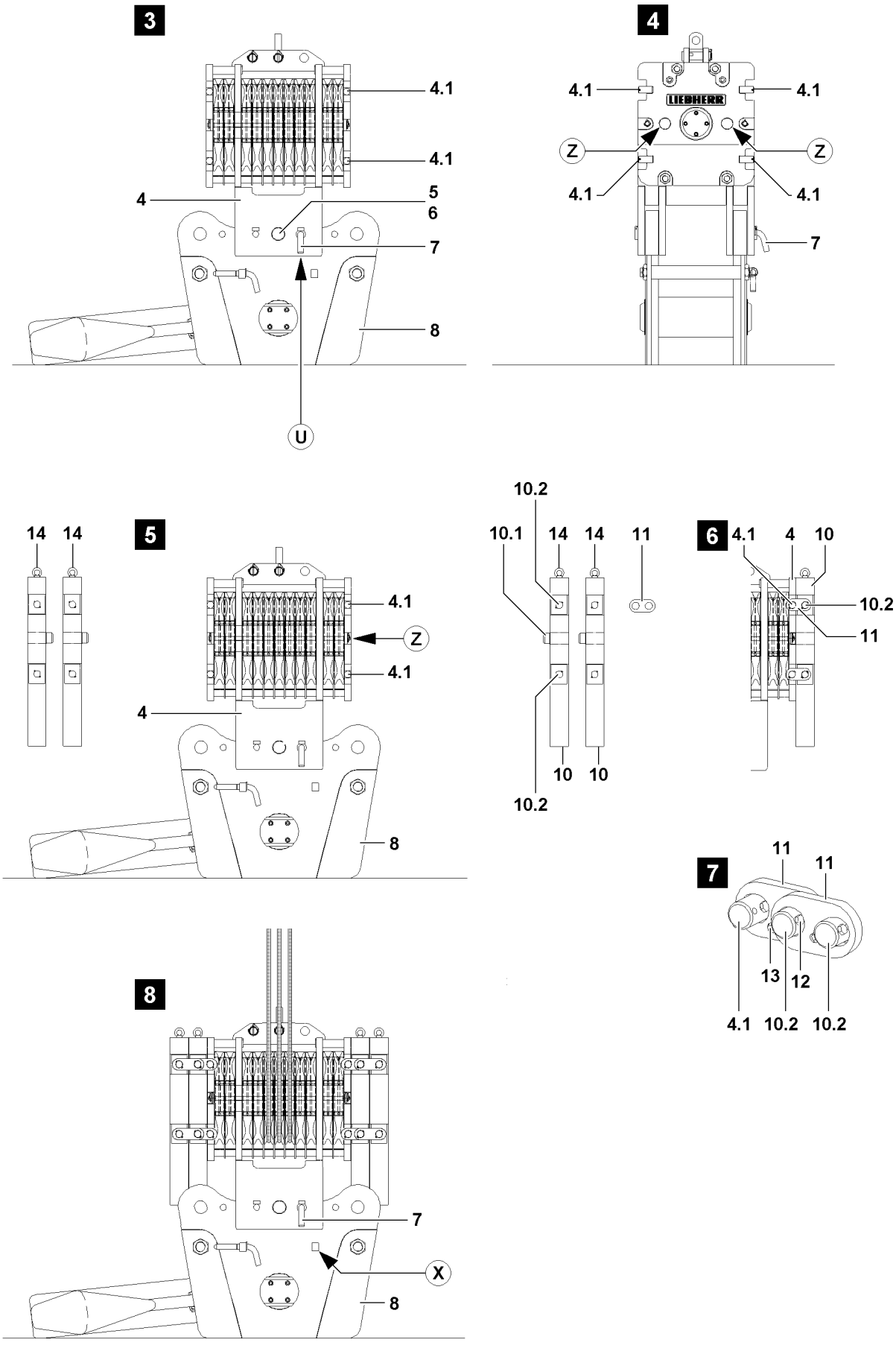
– The ground is sufficiently load bearing to take on the weight of the hook block safely.
– The ground is level and horizontal.
– The cross brace **8** is placed on the ground, see illustration **1**.

DANGER
Risk of tipping the pulley block!
If the retaining pins **7**, during assembly of the pulley block **4** are not pinned on the cross brace, then the pulley block tips to the side when the auxiliary crane is removed!
Personnel remaining in the danger zone can be severely injured or killed!

▶ Insert 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**.
▶ Insert the pin **5** on point **V** and secure with spring retainer **6**.
▶ Unpin the retaining pin **7** from the transport receptacle (point **X**).
▶ Insert the retaining pins **7** into one of the bores (point **U**) on the cross brace **8**, illustration **1**.
▶ When the pulley block **4** is secured by the retaining pins **7** at point **U**:
Remove the auxiliary crane.

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4.1.2 Installing the auxiliary weights

Note
▶ Each auxiliary weight's own weight is marked on the auxiliary weight!

WARNING
Toppling of hook block!
If the auxiliary weights are installed one-sided, the hook block can topple over!
Personnel can be severely injured or killed!
▶ The auxiliary weights may only be installed **individually** and alternating left and right on the pulley block!
▶ When the required auxiliary weight is installed on the hook block, the difference between the left and right side may never be more than one auxiliary weight!
▶ Asymmetrical installation of auxiliary weights is prohibited!

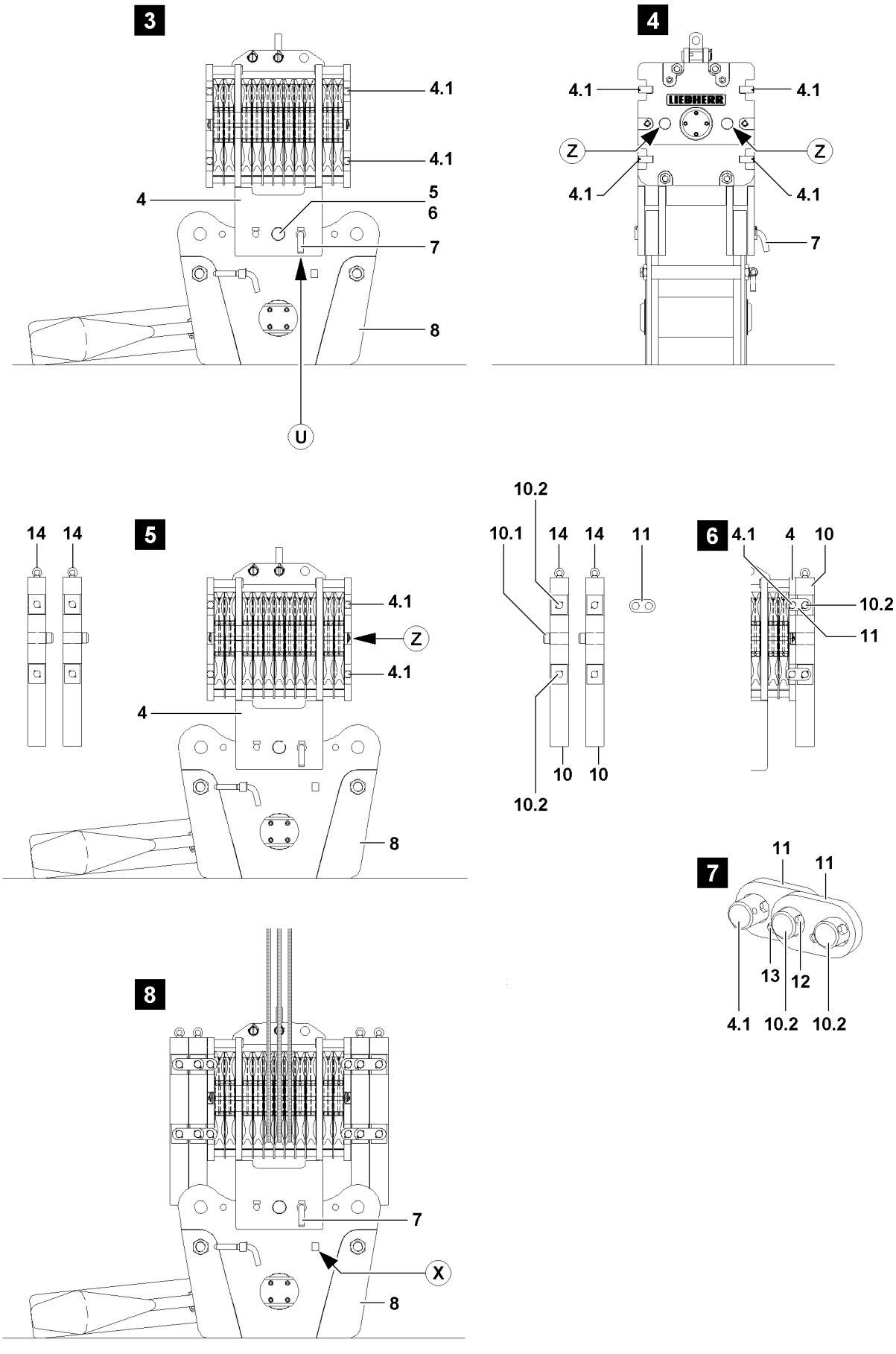
Make sure that the following prerequisites are met:
– The hook block is placed on the ground.
– The pulley block **4** is properly installed and secured.
– The retaining pin **7** is pinned and secured at point **U**.

WARNING
Falling auxiliary weights!
If the auxiliary weights are not properly installed on the pulley block, then they can fall down during installation or in crane operation!
Personnel can be severely injured or killed!
▶ Standing under a suspended auxiliary weight is prohibited!
▶ Make sure that the auxiliary weights are properly installed and secured!
▶ Crane operation with insufficiently secured auxiliary weights is prohibited!

▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane, illustration **5**.

WARNING
Danger of crushing!
When swinging the auxiliary weights to the pulley block, personnel can be severely injured or killed!
Fingers, hands and arms can be crushed or severed!
▶ It is prohibited for anyone to remain between the pulley block and the auxiliary weight!
▶ Swing auxiliary weights in to the pulley block with utmost caution and at the least possible speed!

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- ▶ Align the auxiliary weight **10** on the pulley block **4**.
- ▶ Move the centering pin **10.1** of the auxiliary weight into the centering bores **Z** on the pulley block **4**, illustration **6**.

WARNING
Falling auxiliary weights!
If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets alternately!

- ▶ Install the mounting brackets **11** on the side and connect the pulley block **4** with the auxiliary weight **10**, illustration **7**.
- ▶ Secure the mounting brackets **11** with screws **12** and lock nuts **13**, illustration **7**.

Note
- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

WARNING
Falling auxiliary weights!
The auxiliary weights can fall down by removing the auxiliary crane!
Personnel can be severely injured or killed!
- ▶ Remove the auxiliary crane only when it is ensured that the auxiliary weight **10** is properly secured with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly installed and secured:
  Remove the auxiliary crane.

4.1.3 Preparing the hook block for crane operation

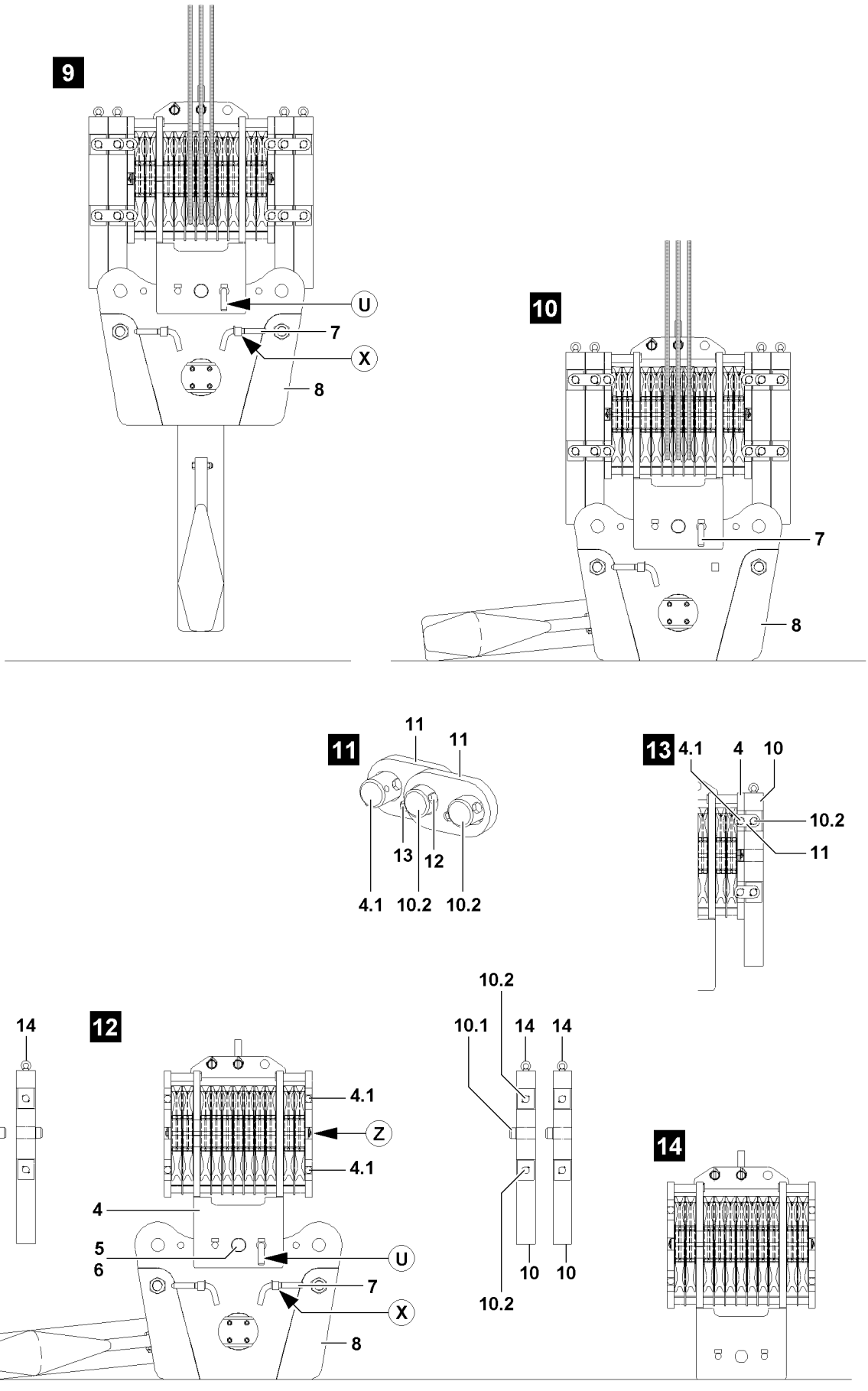
Note
- ▶ The reeving of the hook blocks is described in chapter 4.06 of the Crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

- ▶ Reeve the hoist rope according to the instructions in chapter 4.06 of the Crane operating instructions and the separate reeving plans!

NOTICE
Retaining pins **7** pinned when lifting the load!
If the retaining pin **7** is not unpinned before crane operation, then the retaining pin **7** may be shorn off when lifting 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 off the ground:
  Unpin the retaining pin **7** and pin and secure into the transport receptacle (point **X**), illustration **8**.

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4.2 Removing the hook block

4.2.1 Preparing the hook block for removal

Note
- ▶ The unreeving of the hook blocks is described in chapter 4.06 of the Crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

NOTICE
Retaining pin **7** unpinned when setting down the hook block!
If the retaining pin **7** - before setting the hook block on the ground - is not pinned, then the pulley block tips away to the side when it is set down!
Personnel can be severely injured or killed!
- ▶ Insert and secure the retaining pin **7**, before setting the hook block on the ground, at point **U**!

Make sure that the following prerequisites are met:
- – The ground is sufficiently load bearing to take on the weight of the hook block and the auxiliary weights safely.
- – The ground is level and horizontal.

- ▶ Lower the hook block completely to the ground.
- ▶ When the hook block was placed down on the ground properly:
  Unreeve the hoist rope according to chapter 4.06 of the Crane operating instructions!

4.2.2 Removing the auxiliary weights

Note
- ▶ Each auxiliary weight's own weight is marked on the auxiliary weight!

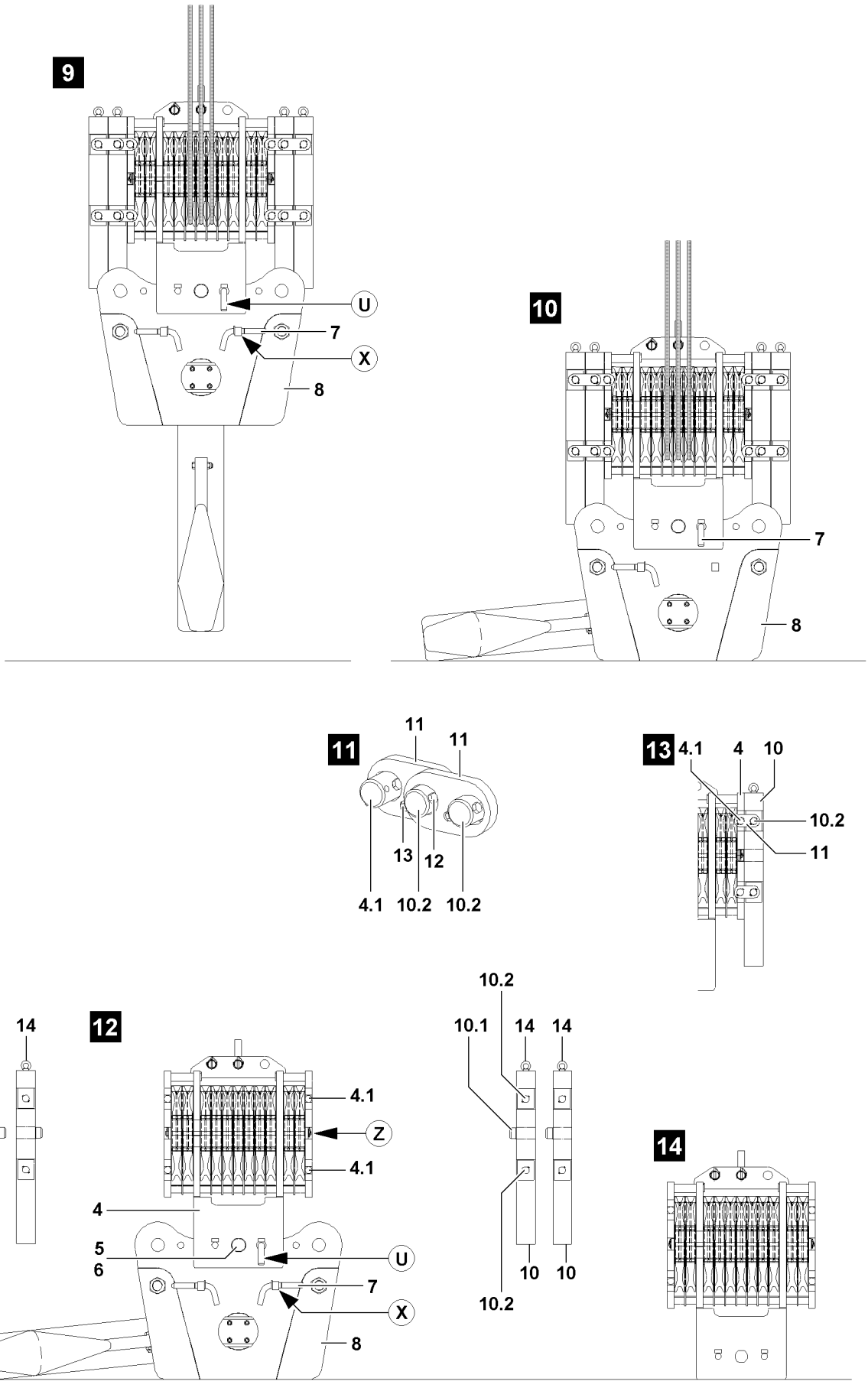
WARNING
Toppling of hook block!
If the auxiliary weights are removed one-sided, the hook block can topple over!
Personnel can be severely injured or killed!
- ▶ The auxiliary weights may only be removed **individually** and alternating left and right on the pulley block!
- ▶ The difference between the left and the right side at removal of the auxiliary weights may never be more than one auxiliary weight!
- ▶ Asymmetrical removal of auxiliary weights is prohibited!

Make sure that the following prerequisite is met:
- – The retaining pin **7** is pinned and secured at point **U**.

WARNING
Falling auxiliary weights!
If the auxiliary weights on the pulley block are not properly removed, then they can fall down at removal!
Personnel can be severely injured or killed!
- ▶ Standing under a suspended auxiliary weight is prohibited!

- ▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.
- ▶ Tension the tackle carefully.

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WARNING
Oscillating auxiliary weights!
During the removal of the auxiliary weights, the auxiliary weights can start to swing back and forth!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Make sure that the auxiliary weight which is being removed is properly attached on the auxiliary crane before releasing the mounting brackets!
- ▶ Angular pull is prohibited!

- ▶ When the tackle is tensioned on the auxiliary weight:
  Release the screw connection on the mounting brackets of the outermost auxiliary weight and remove the screws.

WARNING
Falling auxiliary weights!
If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets alternately!

- ▶ Pull the mounting brackets **11** off to the side.

WARNING
Falling auxiliary weights!
If additional auxiliary weights which are being removed are released, then these auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure, before removing the outermost auxiliary weight, that the other auxiliary weights are secured with the mounting brackets!

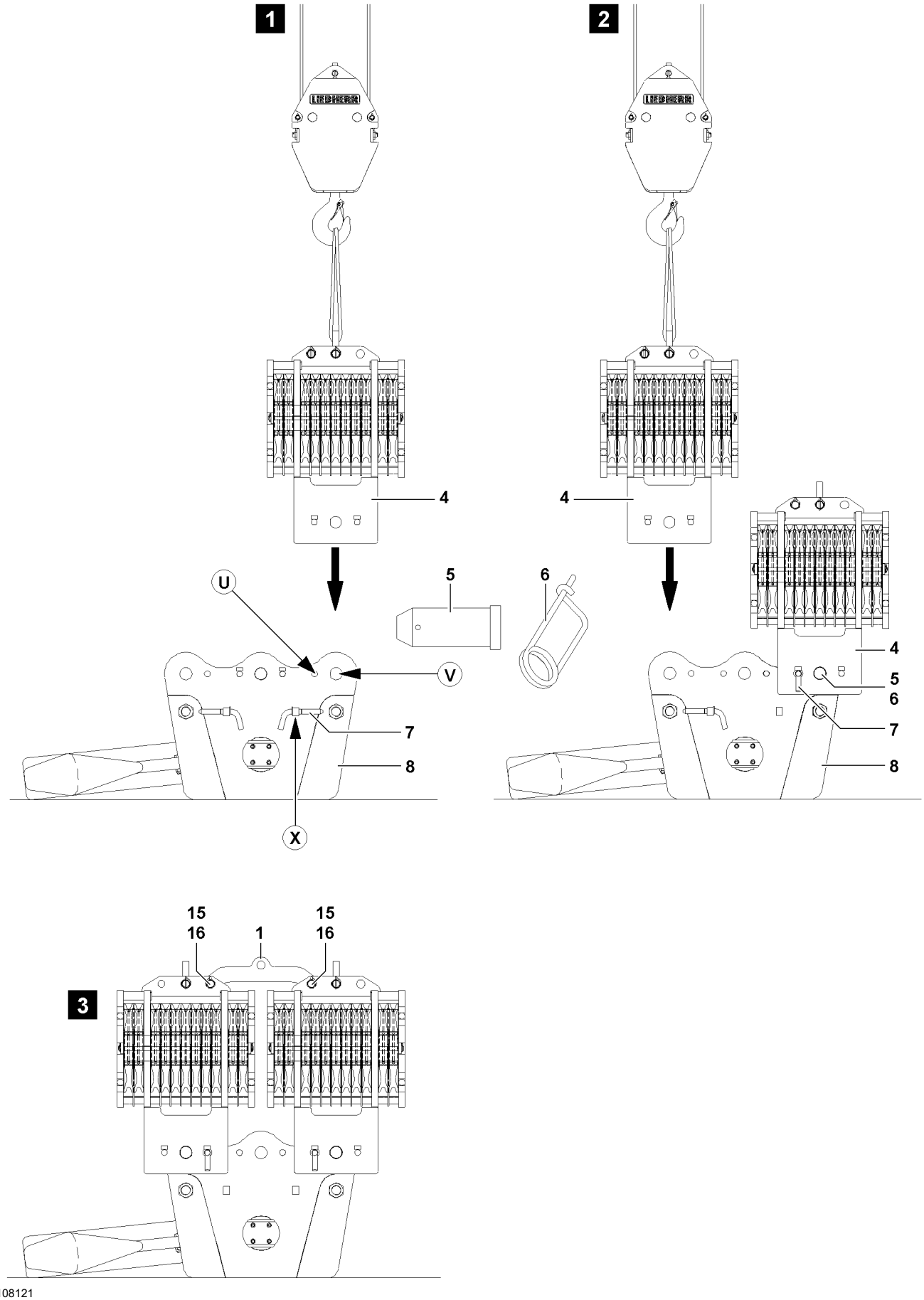
- ▶ If additional mounting brackets must be removed to release the outermost auxiliary weight:
  Reinstall the mounting brackets again immediately, so that only the auxiliary weight which is being removed is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the pulley block.
- ▶ Place the auxiliary weight onto the ground.
- ▶ Remove the auxiliary crane.
- ▶ Remove additional auxiliary weights as described above.

4.2.3 Removing the pulley block on cross brace

Make sure that the following prerequisite is met:
– The auxiliary weights have been removed.

- ▶ Attach the pulley block **4** on the auxiliary crane.
- ▶ Tension the tackle carefully.
- ▶ Unpin the retaining pin **7** at point **U** and pin into the transport receptacle on the cross brace, point **X**, illustration **12**.
- ▶ Release and unpin the pin **5**.
- ▶ Swing the pulley block **4** out with auxiliary crane.
- ▶ Place the pulley block **4** on the ground, illustration **14**.
- ▶ Remove the auxiliary crane.

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5 Installing a double hook block for parallel operation

5.1 Installing the hook block

If the hook blocks are to be used in parallel operation, then the pulley blocks **4** must be installed on the left and right on the cross brace **8**.

5.1.1 Installing the pulley blocks on the 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 ground is level and horizontal.
– The cross brace **8** is placed on the ground, see illustration **1**.

DANGER
Risk of tipping the pulley blocks!
If the retaining pins **7**, during assembly of the pulley blocks **4** are not pinned on the cross brace, then the pulley blocks tip to the side when the auxiliary crane is removed!
Personnel remaining in the danger zone can be severely injured or killed!
▶ Insert 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 installation of two pulley blocks **4** is identical and is described on the example of one pulley block!

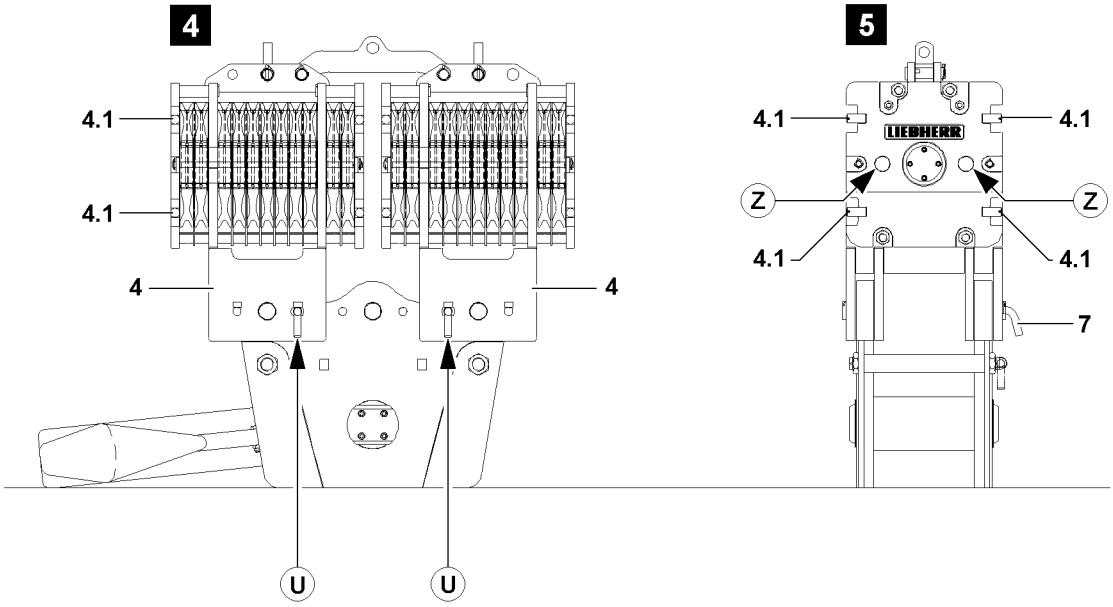
▶ Attach the pulley block **4** onto the auxiliary crane, illustration **1**.
▶ Position pulley block **4** on the cross brace **8** and align the pin bore **V**.
▶ Insert the pin **5** on point **V** and secure with spring retainer **6**.
▶ Unpin the retaining pin **7** from the transport receptacle (point **X**).
▶ Insert the retaining pins **7** into the bores (point **U**) on the cross brace **8**, illustration **1**.
▶ When the pulley block **4** is secured by the retaining pins **7** at point **U**:
Remove the auxiliary crane, illustration **2**.
▶ Install the second pulley block.

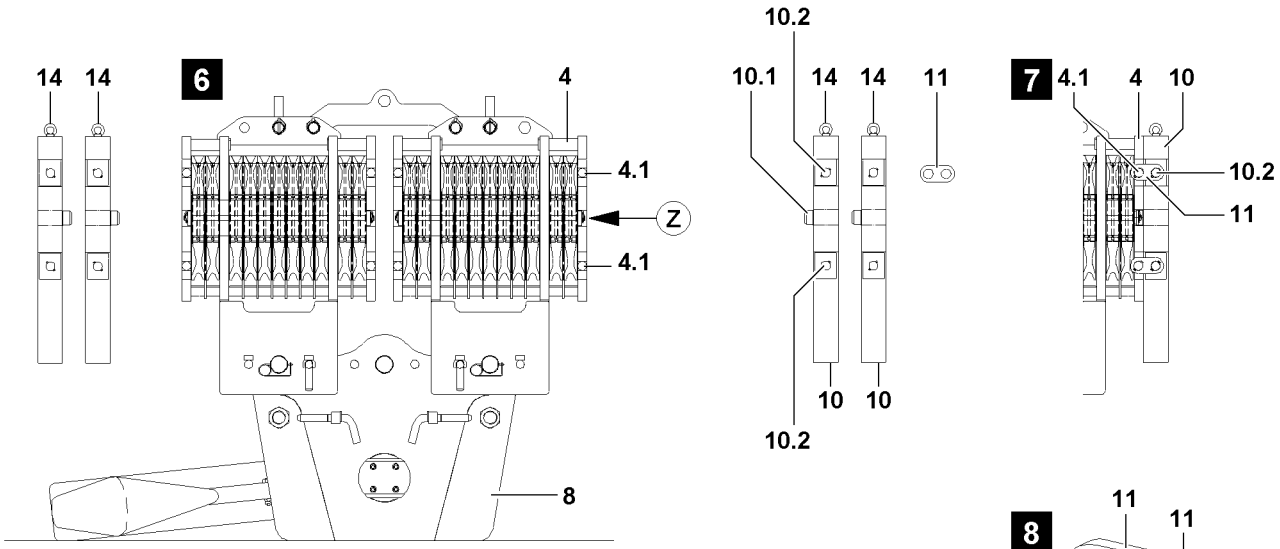
5.1.2 Installing the block connector

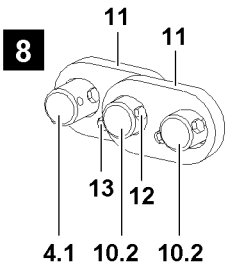
Make sure that the following prerequisite is met:
– The two pulley blocks **4** are installed and secured on the cross brace **8**.

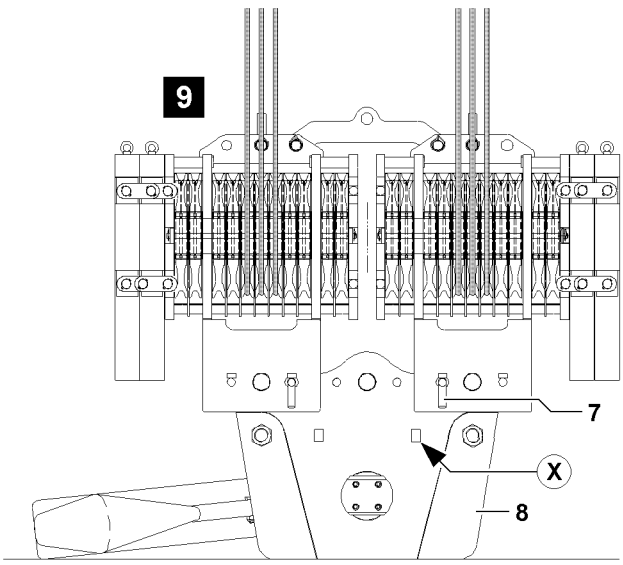
Both pulley blocks **4** are pinned with the block connector **1**.
▶ Attach the block connector **1** on the auxiliary crane.
▶ Position the block connector **1** with auxiliary crane in pin position, illustration **3**.
▶ Insert the pins **15** on both sides on the pulley blocks **4** and secure with linch pin **16**, illustration **3**.
▶ When the block connector **1** is pinned and secured properly:
Remove the auxiliary crane.

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5.1.3 Installing the auxiliary weights

Note
▶ Each auxiliary weight's own weight is marked on the auxiliary weight!

WARNING
Toppling of hook block!
If the auxiliary weights are installed one-sided, the hook block can topple over!
Personnel can be severely injured or killed!
▶ The auxiliary weights may only be placed **individually** and alternating left and right on the pulley blocks of the hook block!
▶ When the required auxiliary weight is installed on the hook block, the difference between the left and right side may never be more than one auxiliary weight!
▶ Asymmetrical installation of auxiliary weights is prohibited!

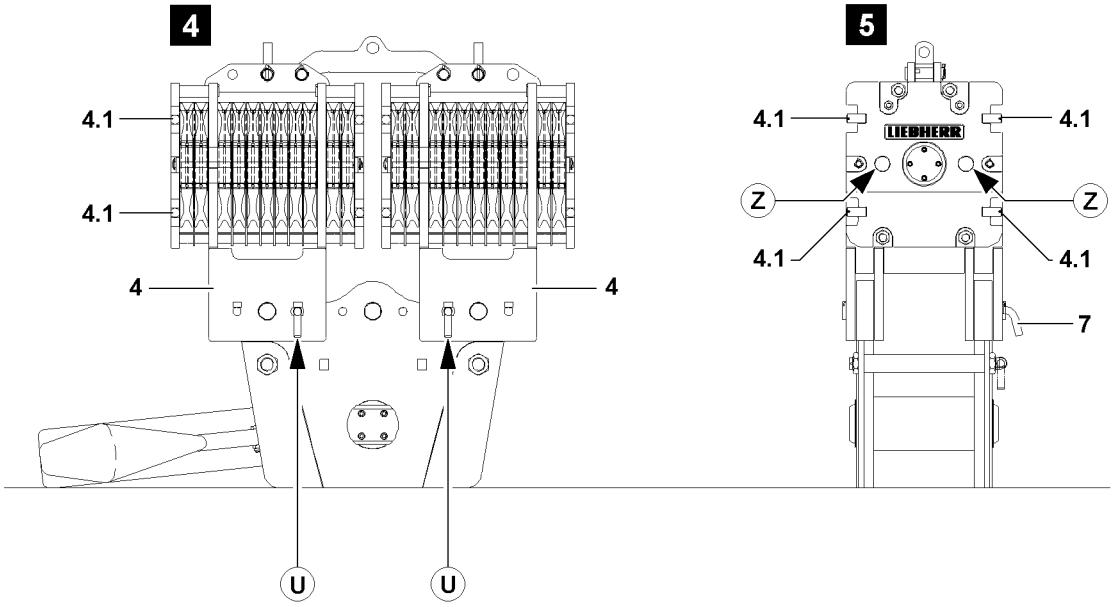
Make sure that the following prerequisites are met:
– The hook block is placed on the ground.
– The pulley blocks **4** are properly installed and secured.
– The retaining pins **7** are pinned in and secured at point **U**.
– The block connector **1** is properly installed and secured.

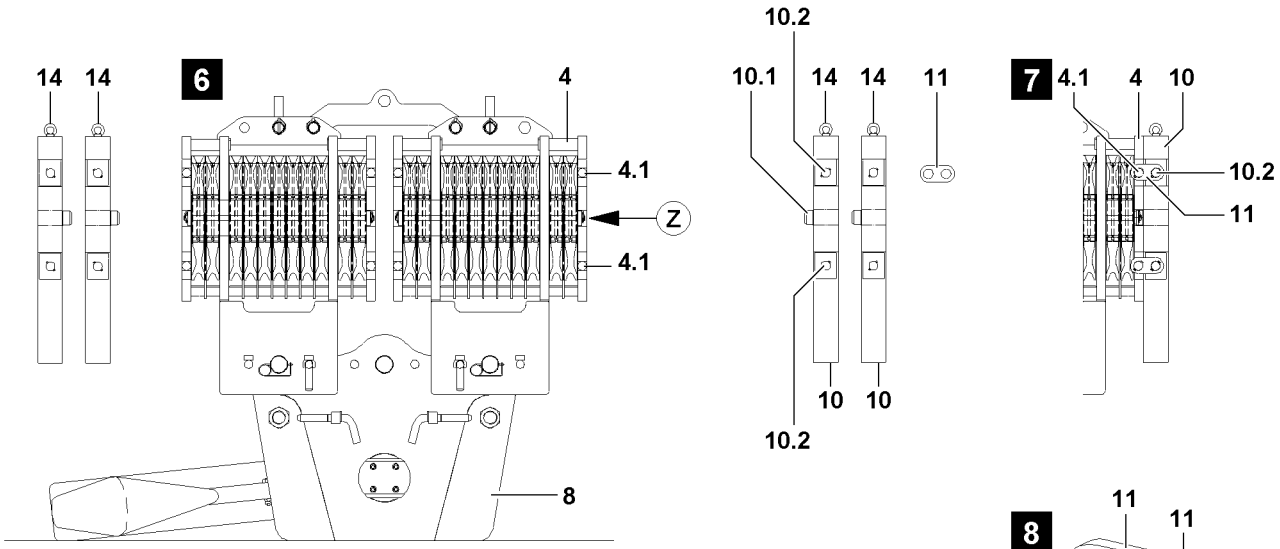
WARNING
Falling auxiliary weights!
If the auxiliary weights on the pulley blocks are not properly installed, then they can fall down during installation or during crane operation!
Personnel can be severely injured or killed!
▶ Standing under a suspended auxiliary weight is prohibited!
▶ Make sure that the auxiliary weights are properly installed and secured!
▶ Crane operation with insufficiently secured auxiliary weights is prohibited!

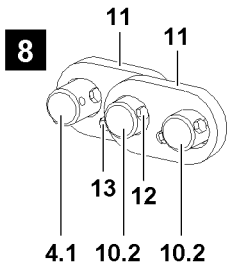
▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.

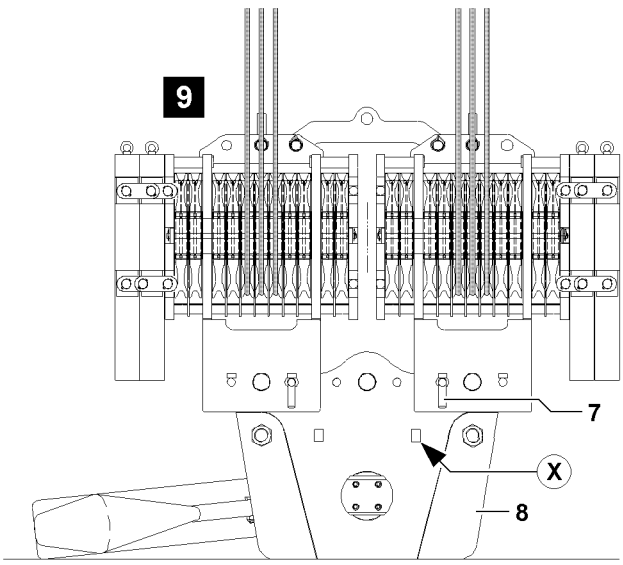
WARNING
Danger of crushing!
When swinging the auxiliary weights to the pulley block, personnel can be severely injured or killed!
Fingers, hands and arms can be crushed or severed!
▶ It is prohibited for anyone to remain between the pulley blocks and the auxiliary weight!
▶ Swing auxiliary weights in to the pulley block with utmost caution and at the least possible speed!

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- ▶ Align the auxiliary weight **10** on the pulley block **4**.
- ▶ Move the centering pin **10.1** of the auxiliary weight into the centering bores **Z** on the pulley block **4**, illustration **7**.

WARNING
Falling auxiliary weights!
If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets alternately!

- ▶ Install the mounting brackets **11** on the side and connect the pulley block **4** with the auxiliary weight **10**, illustration **8**.
- ▶ Secure the mounting brackets **11** with screws **12** and lock nuts **13**, illustration **8**.

Note
- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

WARNING
Falling auxiliary weights!
The auxiliary weights can fall down to the side when the auxiliary crane is removed!
Personnel can be severely injured or killed!
- ▶ Remove the auxiliary crane only when it is ensured that the auxiliary weight **10** is properly secured with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly installed and secured:
  Remove the auxiliary crane.

5.1.4 Preparing the hook block for crane operation

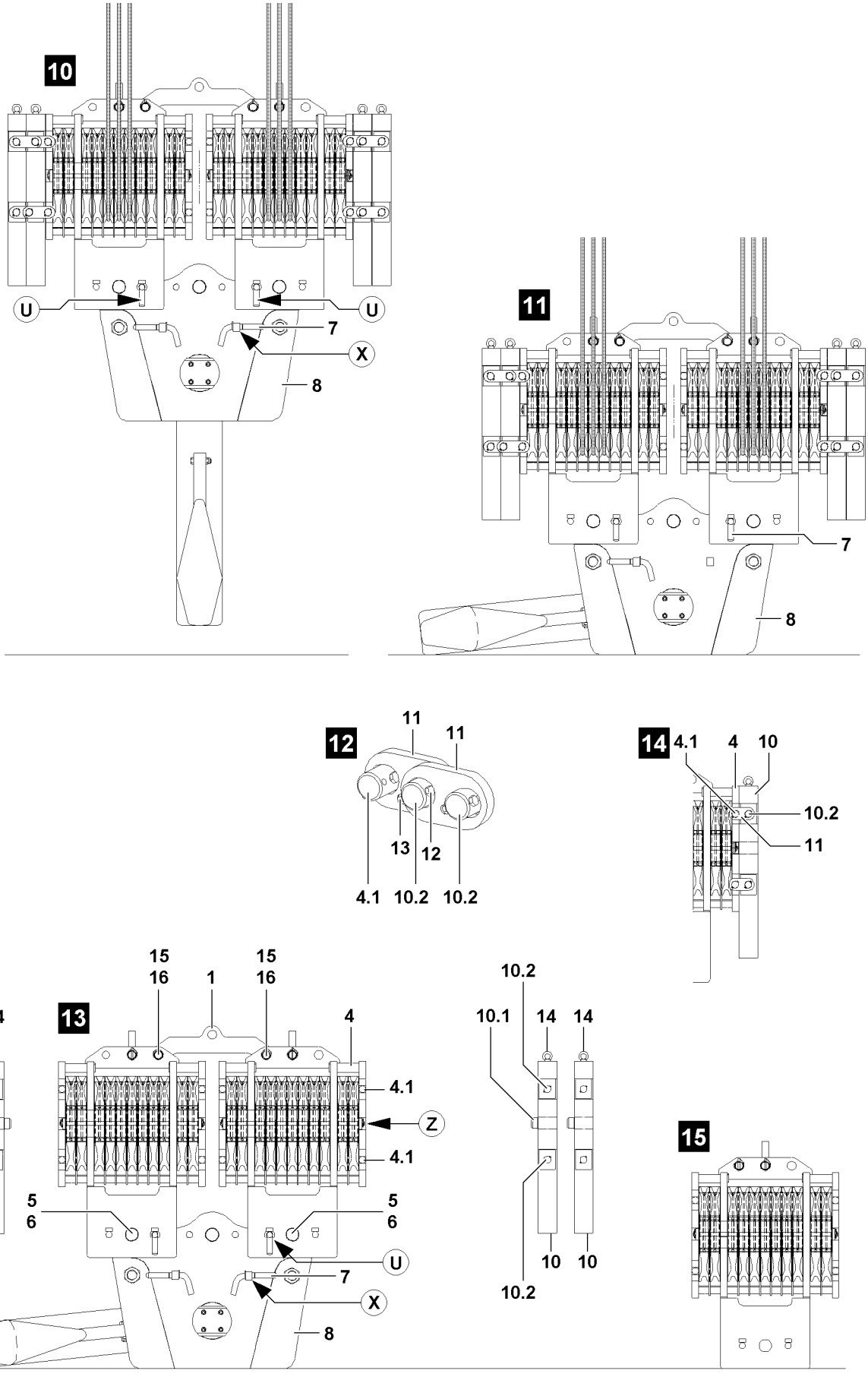
Note
- ▶ The reeving of the hook blocks is described in chapter 4.06 of the Crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

- ▶ Reeve the hoist rope according to the instructions in chapter 4.06 of the Crane operating instructions and the separate reeving plans!

NOTICE
Retaining pins **7** pinned when lifting the load!
If the retaining pins **7** are not unpinned prior to the crane operation, then the retaining pins **7** may be shorn off when lifting 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 off the ground:
  Unpin the retaining pin **7** and pin and secure into the transport receptacle (point **X**), illustration **9**.

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5.2 Removing the hook block

5.2.1 Preparing the hook block for removal

Note
- ▶ The unreeving of the hook blocks is described in chapter 4.06 of the Crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

NOTICE
Retaining pin **7** unpinned when setting down the hook block!
If the retaining pin **7** - before setting the hook block on the ground - is not pinned, then the pulley blocks tip away to the side when the hoist rope is unreeved!
Personnel can be severely injured or killed!
- ▶ Before setting the hook block on the ground, insert and secure the retaining pins **7** on both pulley blocks at point **U**!

Make sure that the following prerequisites are met:
- – The ground is sufficiently load bearing to take on the weight of the hook block and the auxiliary weights safely.
- – The ground is level and horizontal.

- ▶ Lower the hook block completely to the ground.
- ▶ When the hook block was placed down on the ground properly:
  Unreeve the hoist rope(s) according to chapter 4.06 of the Crane operating instructions!

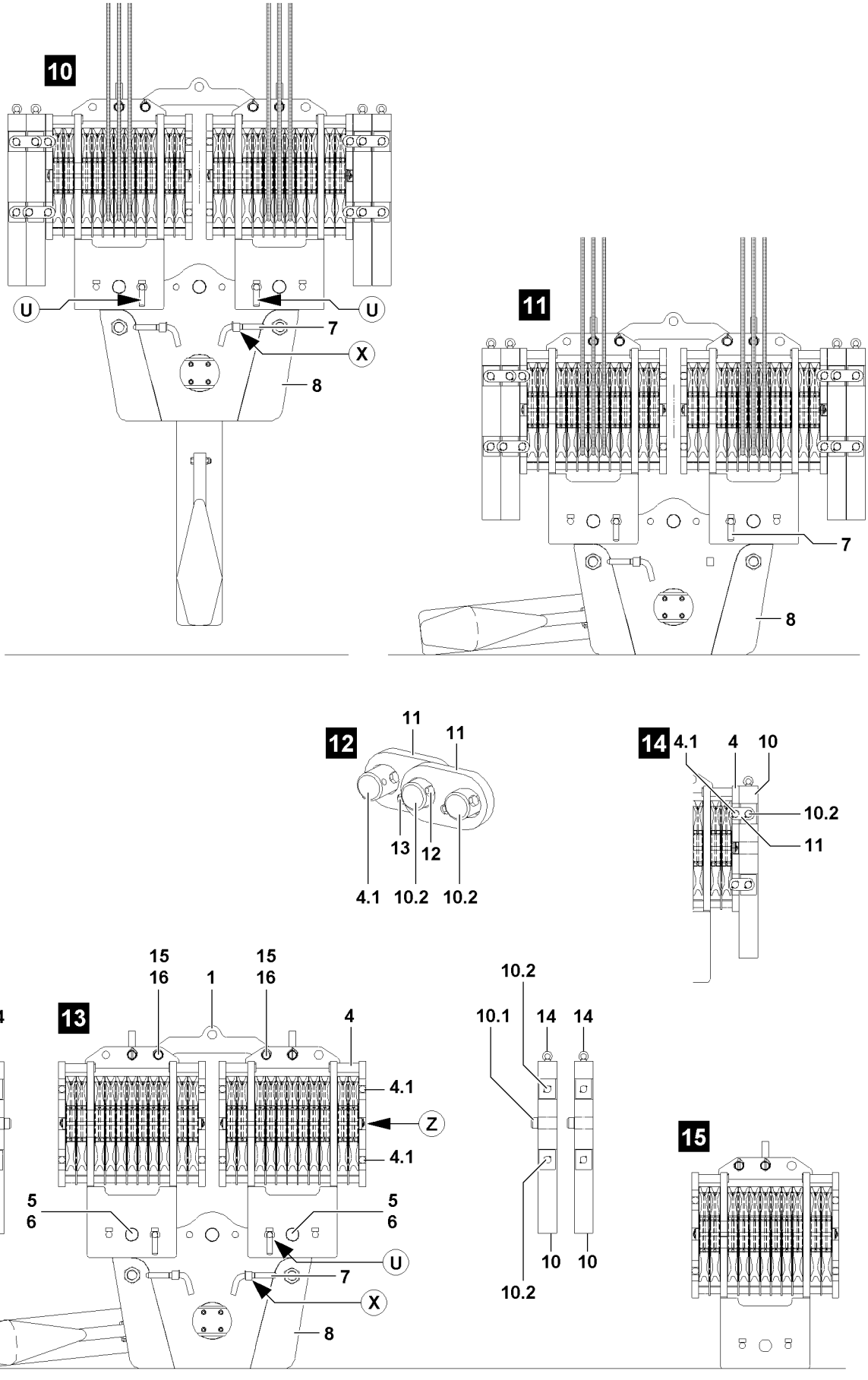
5.2.2 Removing the auxiliary weights

Note
- ▶ Each auxiliary weight's own weight is marked on the auxiliary weight!

WARNING
Toppling of hook block!
If the auxiliary weights are removed one-sided, the hook block can topple over!
Personnel can be severely injured or killed!
- ▶ The auxiliary weights may only be removed **individually** and alternating left and right on the pulley blocks of the hook block!
- ▶ The difference between the left and the right side at removal of the auxiliary weights may never be more than one auxiliary weight!
- ▶ Asymmetrical removal of auxiliary weights is prohibited!

Make sure that the following prerequisites are met:
- – The retaining pins **7** are pinned and secured on both sides at point **U**.
- – The block connector **1** has been removed.

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WARNING
Falling auxiliary weights!
If the auxiliary weights on the pulley blocks are not properly removed, then they can fall down at removal!
Personnel can be severely injured or killed!
- ▶ Standing under a suspended auxiliary weight is prohibited!

- ▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.
- ▶ Tension the tackle carefully.

WARNING
Oscillating auxiliary weights!
During the removal of the auxiliary weights, the auxiliary weights can start to swing back and forth!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Make sure that the auxiliary weight which is being removed is properly attached on the auxiliary crane before releasing the mounting brackets!
- ▶ Angular pull is prohibited!

- ▶ When the tackle is tensioned on the auxiliary weight:
  Release the screw connection on the mounting brackets of the outermost auxiliary weight and remove the screws.

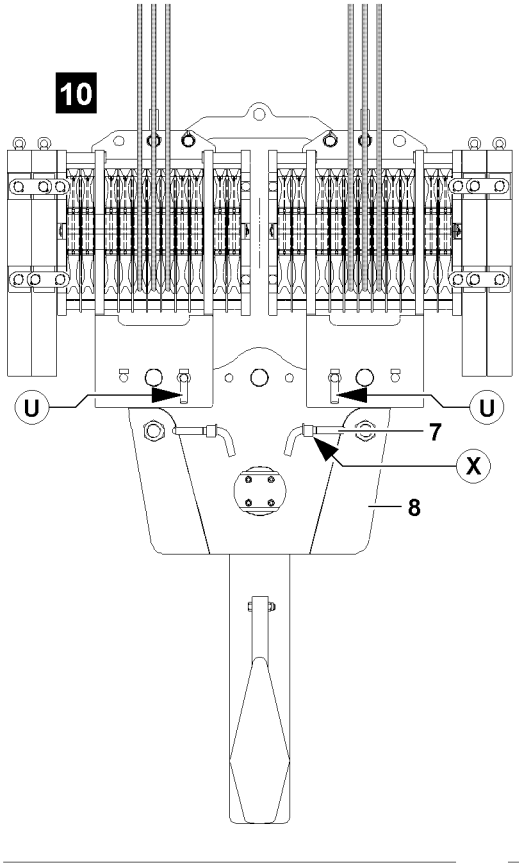
WARNING
Falling auxiliary weights!
If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets alternately!

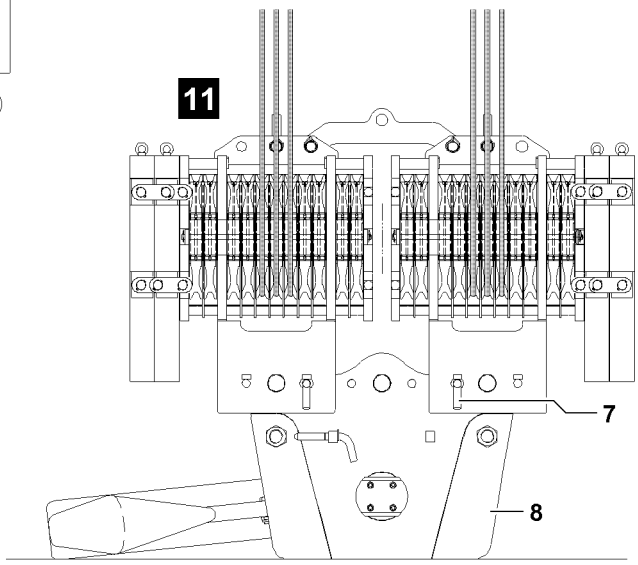
- ▶ Pull the mounting brackets **11** off to the side.

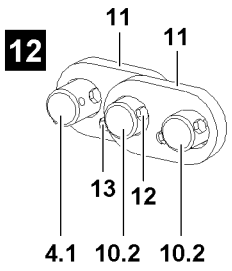
WARNING
Falling auxiliary weights!
If additional auxiliary weights which are being removed are released, then these auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure, before removing the outermost auxiliary weight, that the other auxiliary weights are secured with the mounting brackets!

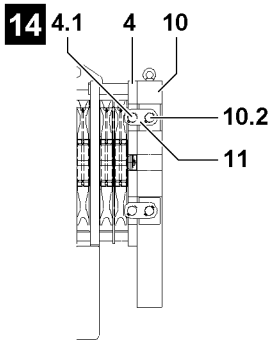
- ▶ If additional mounting brackets must be removed to release the outermost auxiliary weight:
  Reinstall the mounting brackets again immediately, so that only the auxiliary weight which is being removed is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the pulley block.
- ▶ Place the auxiliary weight onto the ground.
- ▶ Remove the auxiliary crane.
- ▶ Remove additional auxiliary weights as described above.

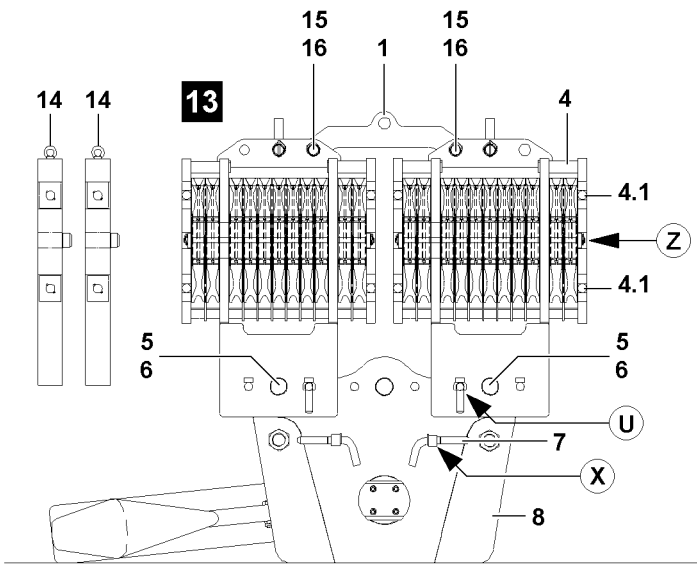
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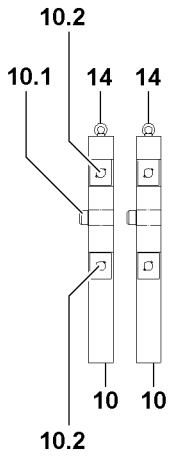


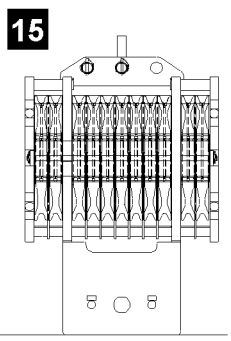












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5.2.3 Removing the block connector

▶ Attach the block connector **1** on the auxiliary crane.

DANGER
Risk of tipping the pulley blocks!
If the retaining pins **7**, during removal of the block connector **1** are not pinned on the pulley blocks, then the pulley blocks tip to the side when the block connector is removed!
Personnel remaining in the danger zone can be severely injured or killed!
▶ Insert 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 on the pulley blocks **4**.
▶ Remove the block connector **1** on the auxiliary crane.
▶ Place the block connector **1** onto the ground.
▶ Remove the auxiliary crane.

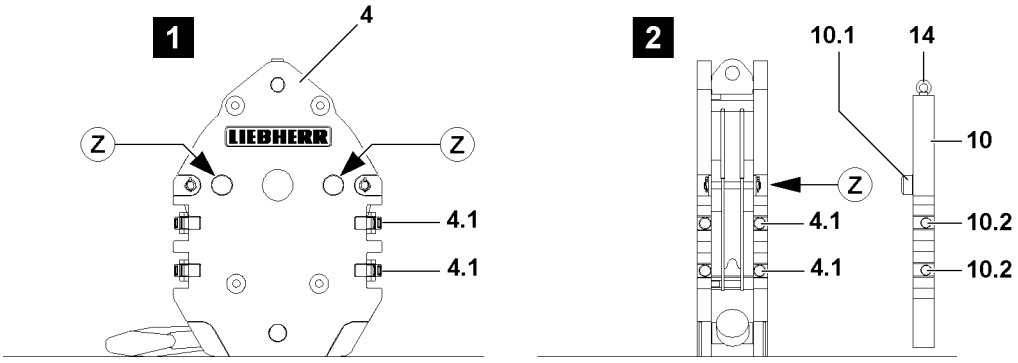
5.2.4 Removing the pulley blocks on the cross brace

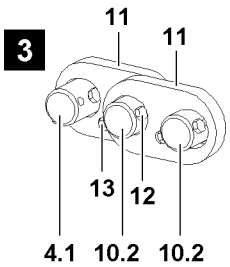
Note
▶ The removal of two pulley blocks is identical and is described on the example of one pulley block!

Make sure that the following prerequisites are met:
– The auxiliary weights have been removed.
– The block connector has been removed.

▶ Attach the pulley block **4** on the auxiliary crane.
▶ Tension the tackle carefully.
▶ Unpin the retaining pin **7** at point **U** and pin into the transport receptacle on the cross brace, point **X**, illustration **13**.
▶ Release and unpin the pin **5**.
▶ Swing the pulley block **4** out with auxiliary crane.
▶ Place the pulley block **4** on the ground.
▶ Remove the auxiliary crane.
▶ Remove the second pulley block.

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6 Single hook blocks

6.1 Installing the single blocks

6.1.1 Installing the auxiliary weights

Note
▶ Each auxiliary weight's own weight is marked on the auxiliary weight!

WARNING
Toppling of hook block!
If the auxiliary weights are installed one-sided, the hook block can topple over!
Personnel can be severely injured or killed!
▶ The auxiliary weights may only be installed **individually** and alternately on the left and right on the hook block!
▶ When the required auxiliary weight is installed on the hook block, the difference between the left and right side may never be more than one auxiliary weight!
▶ Asymmetrical installation of auxiliary weights is prohibited!

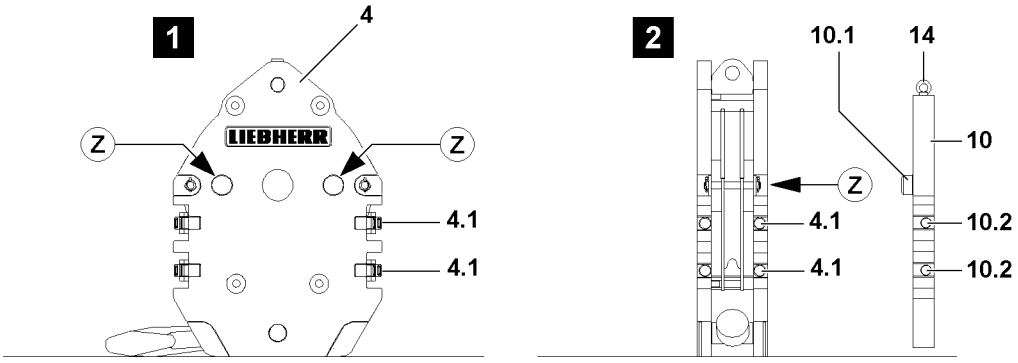
Make sure that the following prerequisite is met:
– The hook block is placed on the ground.

WARNING
Falling auxiliary weights!
If the auxiliary weights are not properly installed on the hook block, then they can fall down during installation or in crane operation!
Personnel can be severely injured or killed!
▶ Standing under a suspended auxiliary weight is prohibited!
▶ Make sure that the auxiliary weights are properly installed and secured!
▶ Crane operation with insufficiently secured auxiliary weights is prohibited!

▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.

WARNING
Danger of crushing!
When swinging the auxiliary weights to the hook block, personnel can be severely injured or killed!
Fingers, hands and arms can be crushed or severed!
▶ It is prohibited for anyone to remain between the hook block and the auxiliary weight!
▶ Swing auxiliary weights in to the hook block with utmost caution and at the least possible speed!

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- ▶ Align the auxiliary weight **10** on the hook block.
- ▶ Move the centering pin **10.1** of the auxiliary weight into the centering bores **Z** on the hook block.

WARNING
Falling auxiliary weights!
If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets alternately!

- ▶ Install the mounting brackets **11** on the side and connect the hook block with the auxiliary weight **10**, illustration **3**.
- ▶ Secure the mounting brackets **11** with screws **12** and lock nuts **13**, illustration **3**.

Note
- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

WARNING
Falling auxiliary weights!
The auxiliary weights can fall down by removing the auxiliary crane!
Personnel can be severely injured or killed!
- ▶ Remove the auxiliary crane only when it is ensured that the auxiliary weight **10** is properly secured with the mounting brackets **11**!

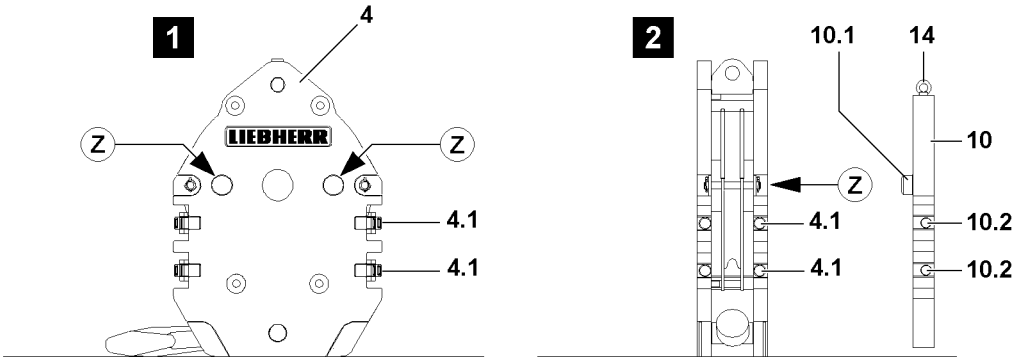
- ▶ When the respective auxiliary weight is properly installed and secured:
  Remove the auxiliary crane.

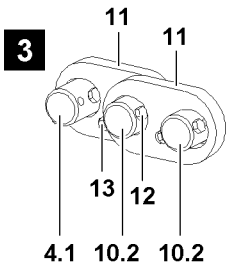
6.1.2 Preparing the hook block for crane operation

Note
- ▶ The reeving of the hook blocks is described in chapter 4.06 of the Crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

- ▶ Reeve the hoist rope according to the instructions in chapter 4.06 of the Crane operating instructions and the separate reeving plans!

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6.2 Removing the single blocks

6.2.1 Preparing the hook block for removal

Note
- ▶ The unreeving of the hook blocks is described in chapter 4.06 of the Crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

Make sure that the following prerequisites are met:
- – The ground is sufficiently load bearing to take on the weight of the hook block and the auxiliary weights safely.
- – The ground is level and horizontal.

- ▶ Lower the hook block completely to the ground.
- ▶ When the hook block was placed down on the ground properly:
  Unreeve the hoist rope according to chapter 4.06 of the Crane operating instructions!

6.2.2 Removing the auxiliary weights

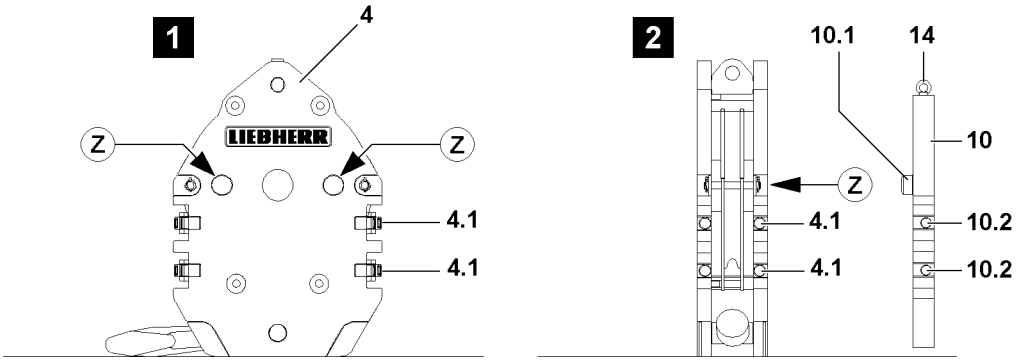
Note
- ▶ Each auxiliary weight's own weight is marked on the auxiliary weight!

WARNING
Toppling of hook block!
If the auxiliary weights are removed one-sided, the hook block can topple over!
Personnel can be severely injured or killed!
- ▶ The auxiliary weights may only be removed **individually** and alternately on the left and right on the hook block!
- ▶ The difference between the left and the right side at removal of the auxiliary weights may never be more than one auxiliary weight!
- ▶ Asymmetrical removal of auxiliary weights is prohibited!

WARNING
Falling auxiliary weights!
If the auxiliary weights on the pulley block are not properly removed, then they can fall down at removal!
Personnel can be severely injured or killed!
- ▶ Standing under a suspended auxiliary weight is prohibited!

- ▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.
- ▶ Tension the tackle carefully.

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WARNING
Oscillating auxiliary weights!
During the removal of the auxiliary weights, the auxiliary weights can start to swing back and forth!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Make sure that the auxiliary weight which is being removed is properly attached on the auxiliary crane before releasing the mounting brackets!
- ▶ Angular pull is prohibited!

- ▶ When the tackle is tensioned on the auxiliary weight:
  Release the screw connection on the mounting brackets of the outermost auxiliary weight and remove the screws.

WARNING
Falling auxiliary weights!
If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets alternately!

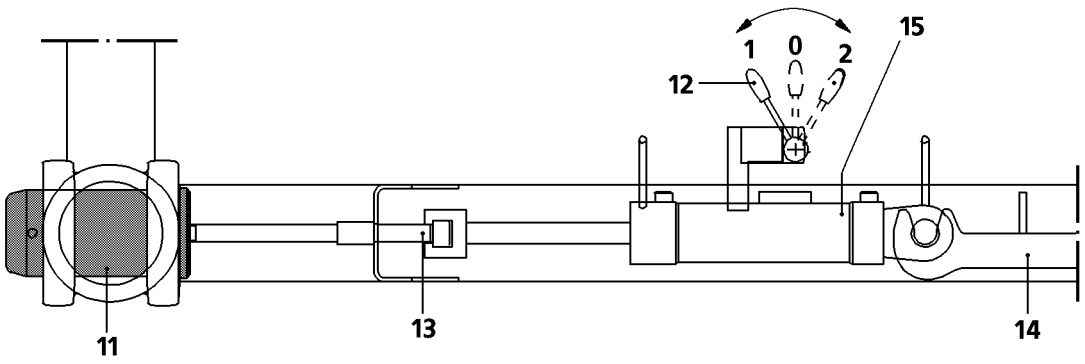
- ▶ Pull the mounting brackets **11** off to the side.

WARNING
Falling auxiliary weights!
If additional auxiliary weights which are being removed are released, then these auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure, before removing the outermost auxiliary weight, that the other auxiliary weights are secured with the mounting brackets!

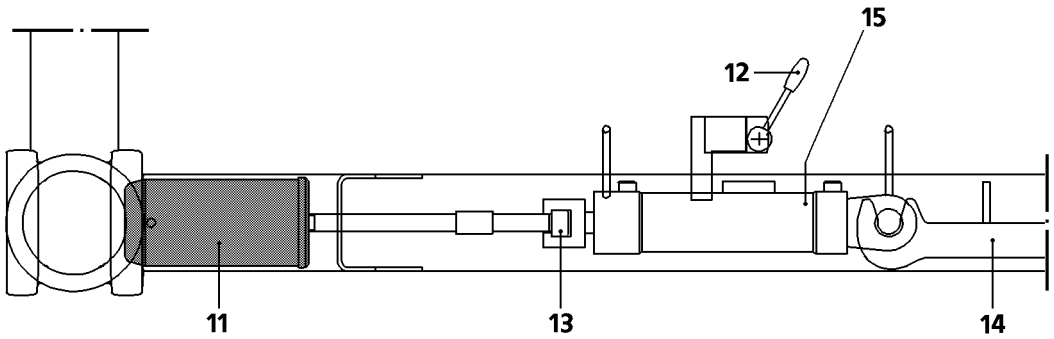
- ▶ If additional mounting brackets must be removed to release the outermost auxiliary weight:
  Reinstall the mounting brackets again immediately, so that only the auxiliary weight which is being removed is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the hook block.
- ▶ Place the auxiliary weight onto the ground.
- ▶ Remove the auxiliary crane.
- ▶ Remove additional auxiliary weights as described above.

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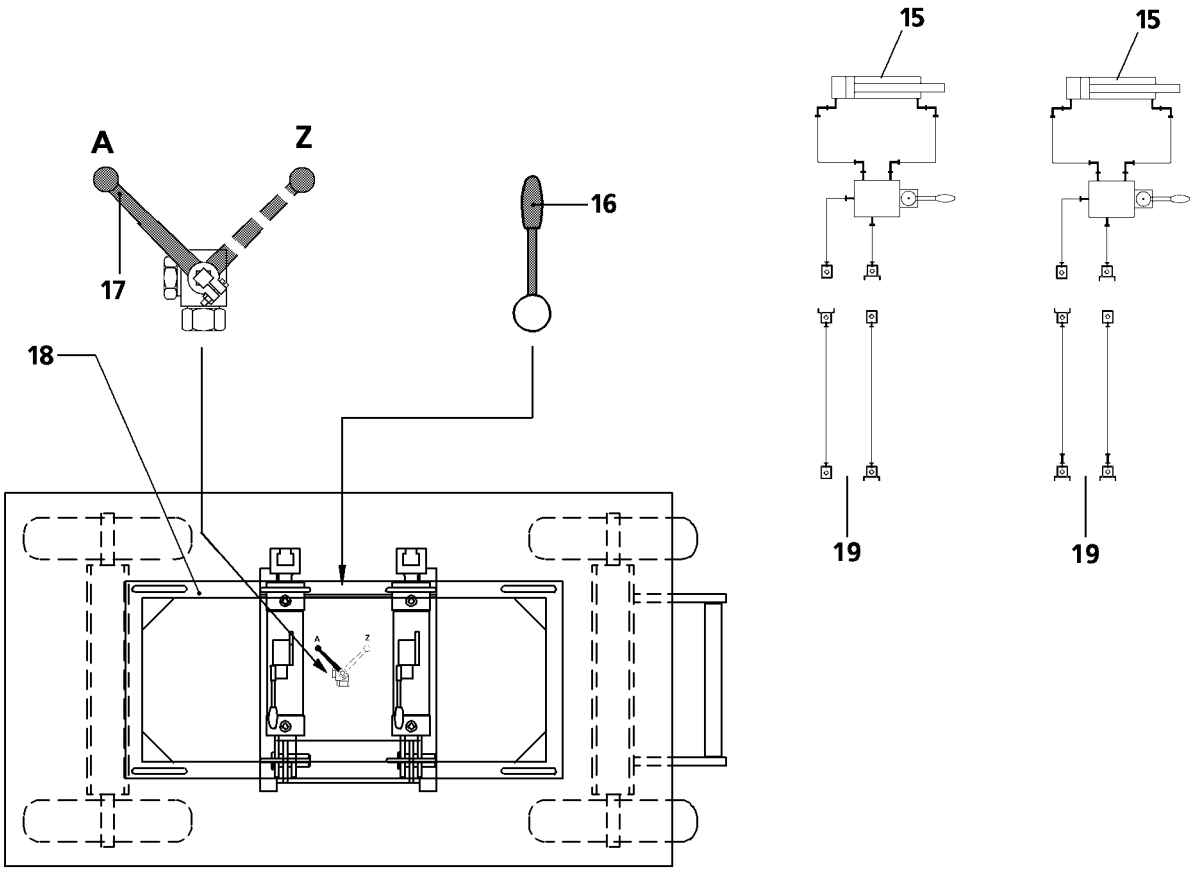
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1 Pin pulling device

The pin pulling device consists of:
– Pin pulling cylinder **15**, see illustration **1**.
– Hydraulic component **18**, see illustration **3**.

1.1 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!
▶ While pinning / unpinning of boom parts, the pin pulling cylinder **15** must be used with engaged lever **12**.

Note
▶ Observe the information in the Operating and Maintenance manual of the hydraulic aggregate **18**!
▶ The engine RPM can be adjusted using a separate RPM regulator on the hydraulic aggregate **18**.

1.1.1 Pinning and unpinning the pins on the boom components

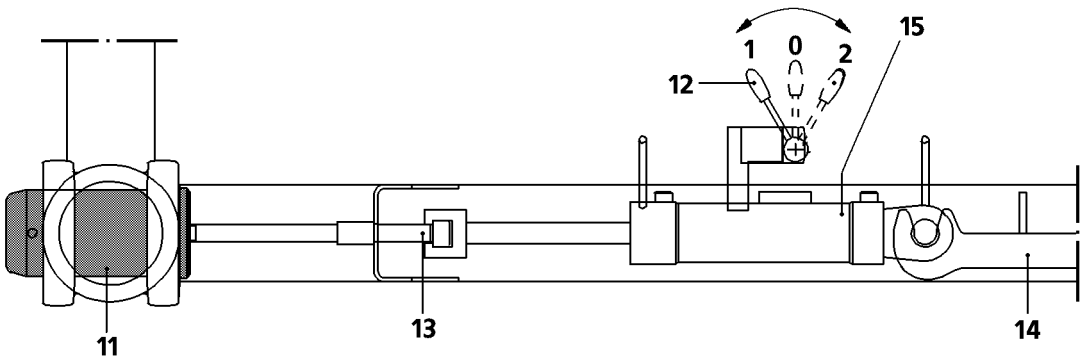
Make sure that the following prerequisites are met:
– the hydraulic connections **19** from the hydraulic aggregate **18** to the pin pulling cylinders **15** are produced, see illustration **3**,
– the levers **12** on the pin pulling cylinders **15** are set on **position 0**, see illustration **1**.

▶ Fasten pin pulling cylinder **15** between retainer **14** and pull screw **13**, see illustration **1**.
▶ Start motor from hydraulic component **18**, see illustration **3**.
▶ Switch over ball valve **17** on position **Z**, see illustration **3**.

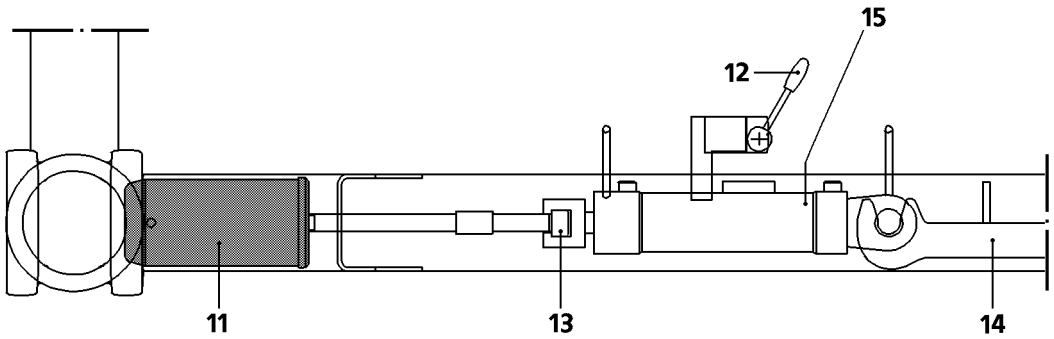
WARNING
Falling components!
When pinning / unpinning the pins on the lattice sections, components can fall down. Personnel can be killed or seriously injured.
▶ During the pinning / unpinning procedure of the lattice sections, do not step into the danger zone!
▶ Actuate pin pulling cylinder **15** exclusively for pinning and unpinning on the hydraulic aggregate **18** with lever **16**, see illustration **3**.

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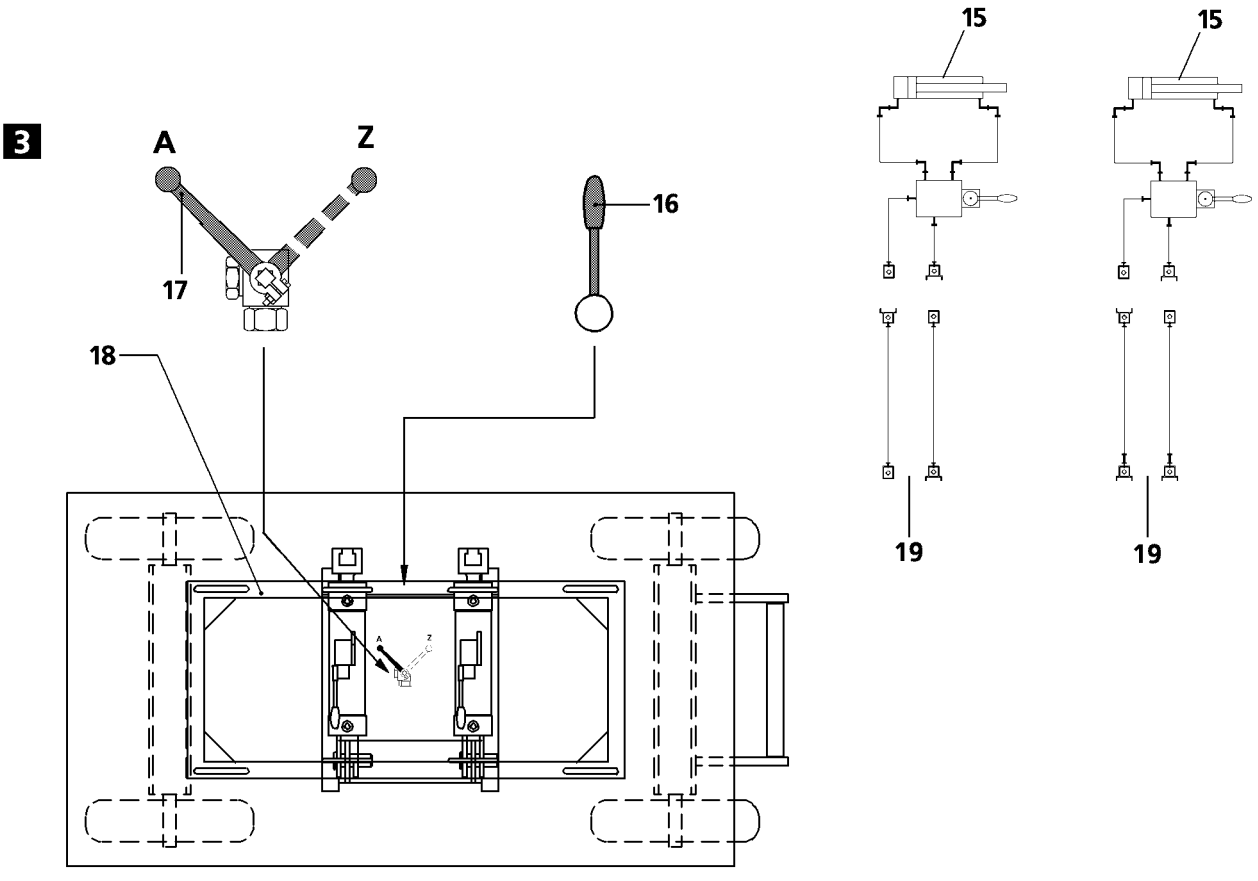
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- ▶ When it should be pinned in (illustration **1**):
  Set the lever **12** on the pin pulling cylinders **15** to **position 1**.
- ▶ When it should be pinned in (illustration **2**):
  Set the lever **12** on the pin pulling cylinders **15** to **position 2**.

Result:

– Pin pulling cylinders **15** are ready for use

Note

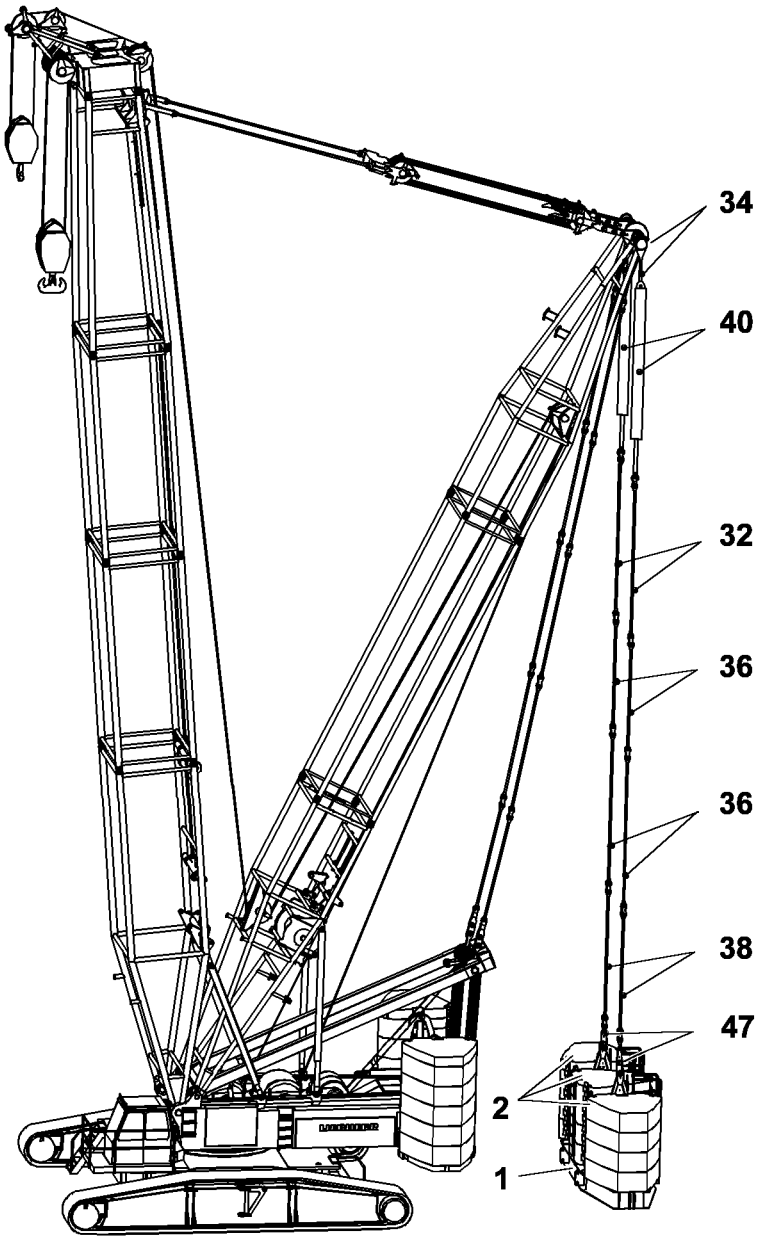
- ▶ Ensure that the levers **12** are set on the correct position.

- ▶ Pin / unpin pin **11** with hydraulic aggregate **18**:
  Actuate lever **16** on the hydraulic aggregate **18**, with the right operating mode.

1.2 End operation with pin pulling device

- ▶ The levers **12** on the pin pulling cylinders **15** are set on **position 0**, see illustration **1**.
- ▶ Turn off engine from hydraulic aggregate **18**.
- ▶ Close ball valve **17** on position **A**, see illustration **3**.
- ▶ Remove hydraulic connections **19** and protect connections from contamination.
- ▶ Remove pin pulling cylinder **15** between retainer **14** and pull screw **13**, see illustration **1**.

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1 Description and component overview

1.1 Description

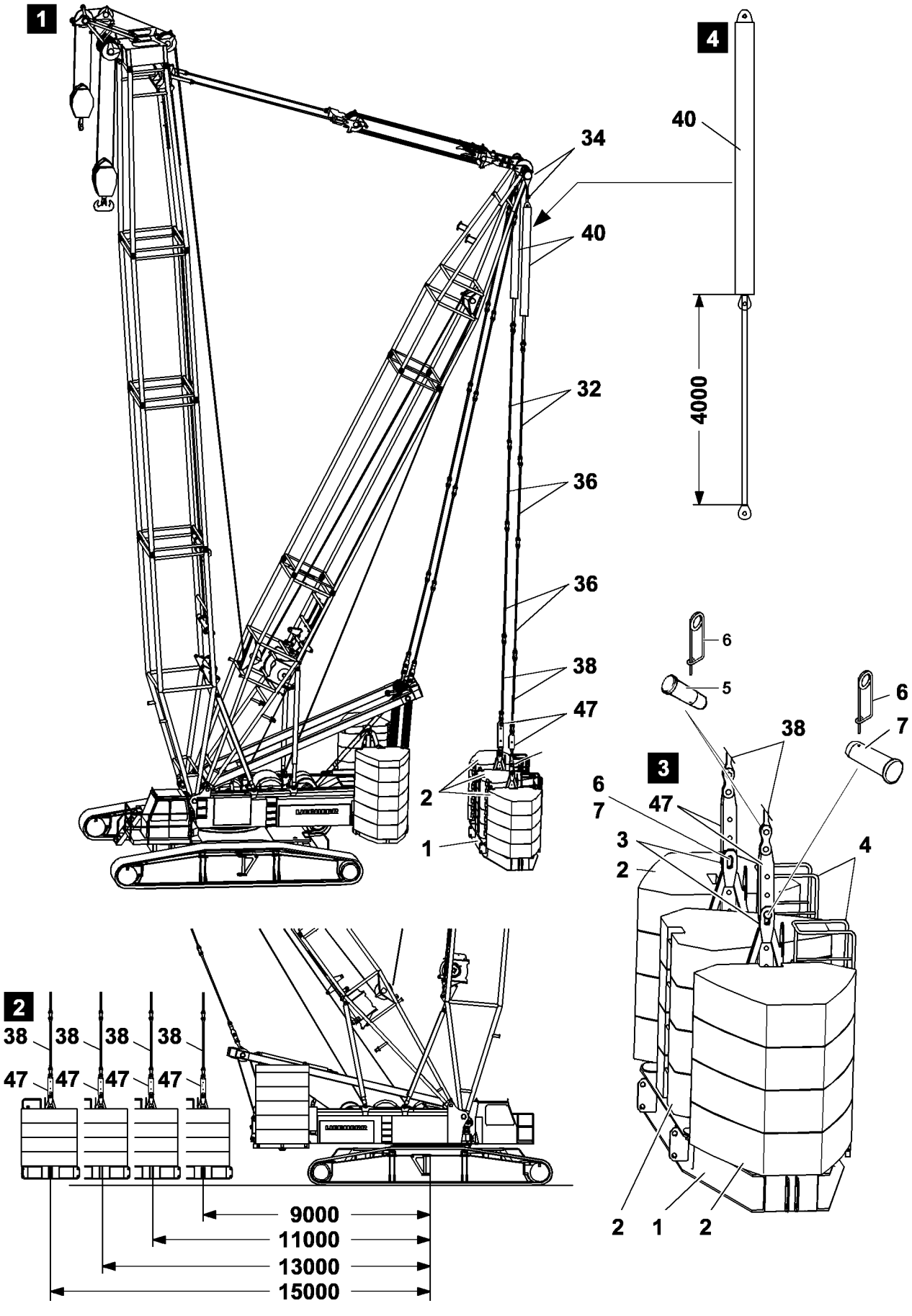
Note
- The suspended ballast and ballast trailer are generally referred to as the derrick ballast!
- The fixed compensation weight which is assembled on the turntable is generally referred to as the counterweight!

By luffing the derrick boom up or down, the derrick ballast radius can be steplessly changed between 9.0 m and 15.0 m. The derrick ballast radius, the derrick boom angle, the derrick ballast weight and the derrick ballast utilization are displayed on LICCON monitor 1. With the pull cylinder in the derrick guying it is possible to install the ballast plate, standing on the ground, on the guying and to lift it off the ground with the pull cylinders.

WARNING
Danger of accidents when driving the crane!
If the crane is driven even though the suspended ballast is still on the ground, then the crane can topple over!
Personnel can be severely injured or killed!
- If the suspended ballast is on the ground, then it is prohibited to drive the crane!
- Driving the crane is only permissible if the suspended ballast is lifted completely off the ground and all other prerequisites to drive with the suspended ballast are adhered to!

For crane operation with derrick ballast, see Crane operating instructions, chapter 4.02.

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1.2 Components overview

See opposite illustrations!

Position	Components
1	Ballast pallet
2	Ballast plates
2.1	Ballast plates 5.0 t
2.2	Ballast plates 10.0 t
3	Erection rack
4	Platform

Guying	
Position	**Components**
32	Guy rod 3.25 m
34	Guy rod 1.19 m
36	Guy rod 4.50 m
38	Guy rod 2.10 m
40	Pull cylinder (hoist 4.00 m)
47	Guy rod 1.94 m

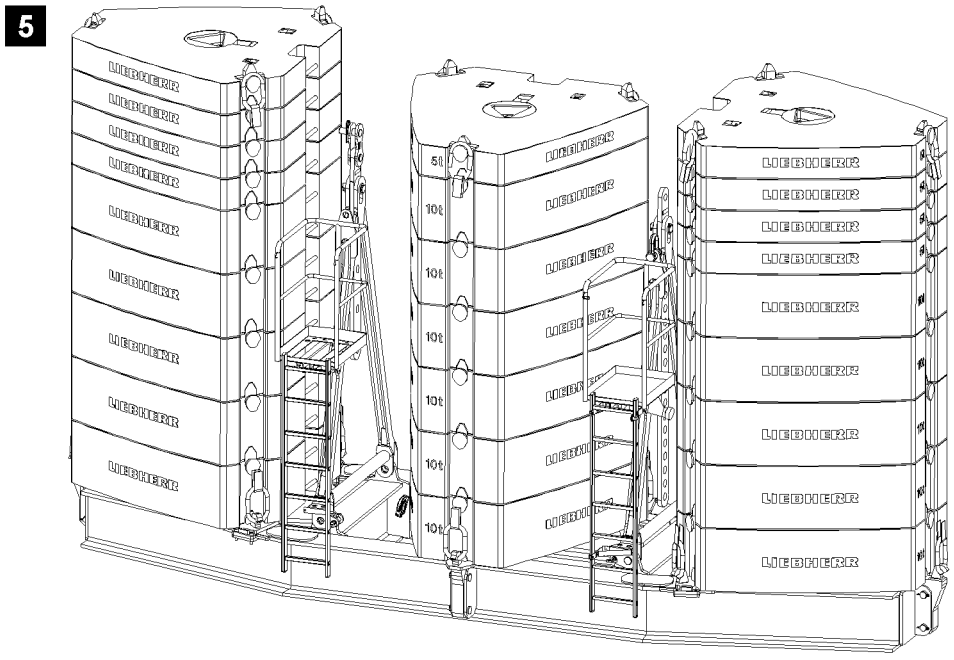
1.3 Ballast plates

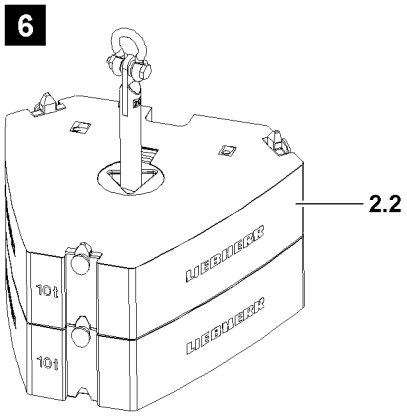
Note

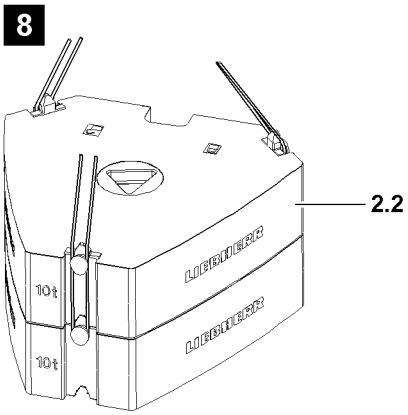
▶ The ballast plates are marked with their own weights!

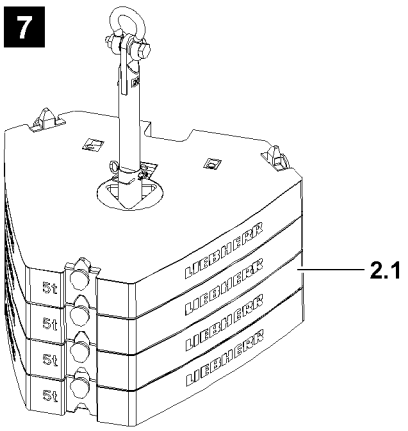
The ballast plates are placed as a ballast assembly on the ballast pallet.
Ballast plates are available with individual weights of 5.0 t and 10.0 t.

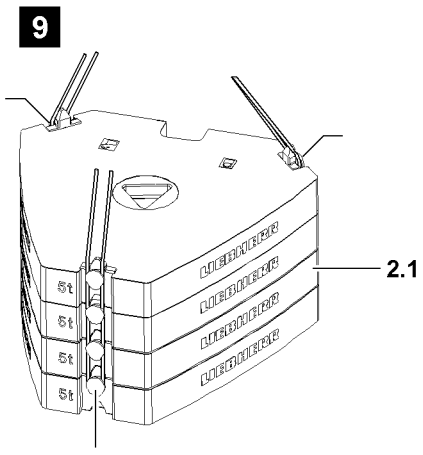
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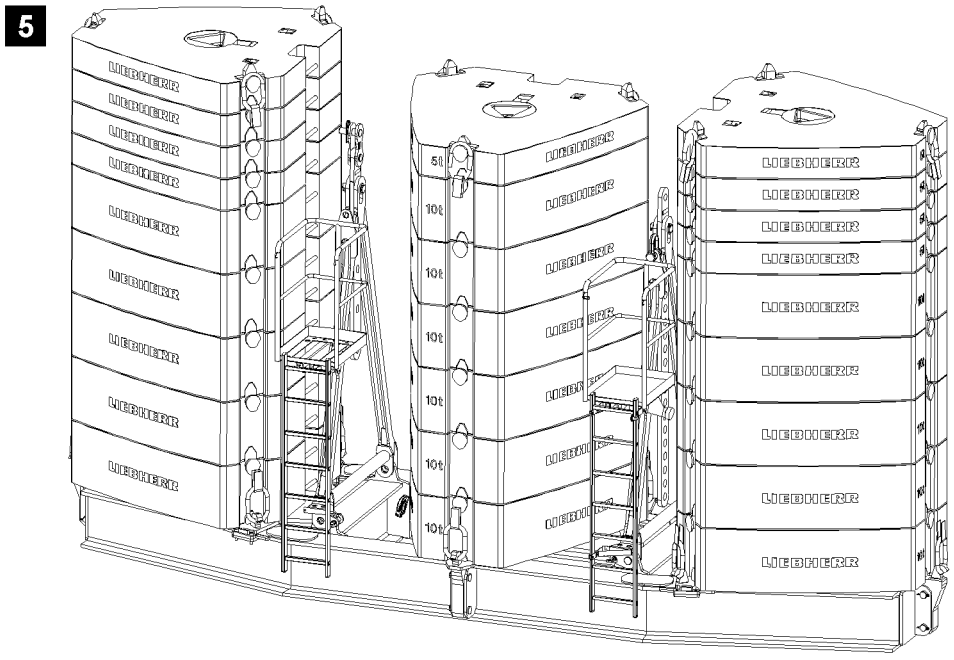
2 Permissible ballast assemblies

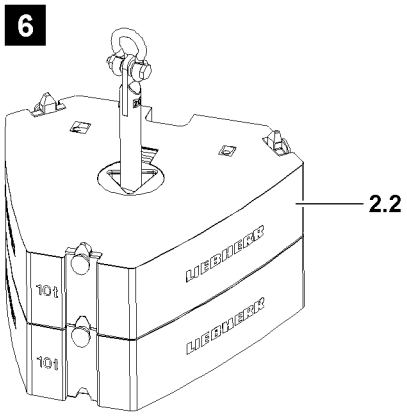
WARNING
Overload fastening points ballast plates!
If more than the permissible number of ballast plates are lifted together, then the fastening points can be overloaded!
The ballast plates and components can fall down!
Personnel can be severely injured or killed!
▶ Attach only the maximum permissible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

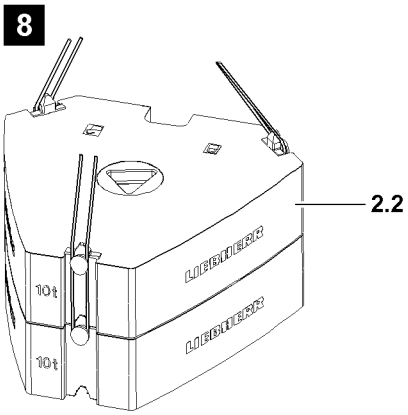
WARNING
Incorrect set up of ballast assemblies!
When lifting mixed weight ballast assemblies and the heavier ballast plates are placed on top, the fastening points can be overloaded!
The ballast plates and components can fall down!
Personnel can be severely injured or killed!
▶ Always stack the heavier ballast plate on the bottom in the ballast assembly!

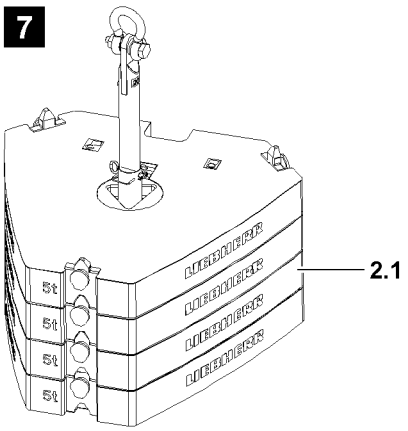
Individual weight	Maximum number of same ballast plates per lift over	
Ballast plate	Twistlock	Bitt
10.0 t	2	2
5.0 t	4	4

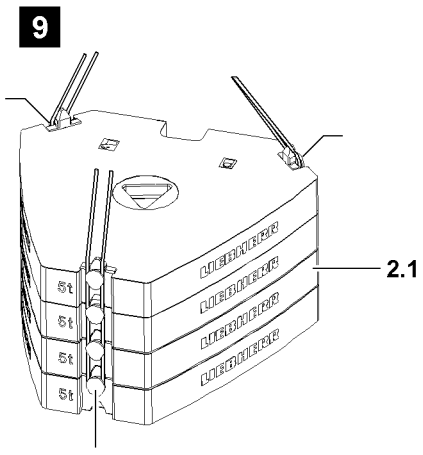
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3 Derrick ballast combinations

WARNING
Incorrectly calculated derrick ballast combination!
The specified derrick ballast from the load charts also includes the own weight of the ballast pallet!
If the weight of the ballast pallet is not taken into account in the calculation of the derrick ballast, then too much ballast will be placed!
The crane can be severely damaged or topple over!
Personnel can be severely injured or killed!
- ▶ Make sure that for the combination of the derrick ballast the weight of the ballast pallet has been taken into account!
- ▶ Observe the chart “Calculation example derrick ballast combination” in this chapter!

NOTICE
Incorrect placement of derrick ballast on the ballast pallet!
An unsymmetrical ballast condition of more than 5 t between the left and right ballast stack can cause significant property damage on the crane!
- ▶ When ballasting the derrick ballast up or down, an unsymmetrical ballast condition of more than 5 t is prohibited!

3.1 Assembly of derrick ballast combinations

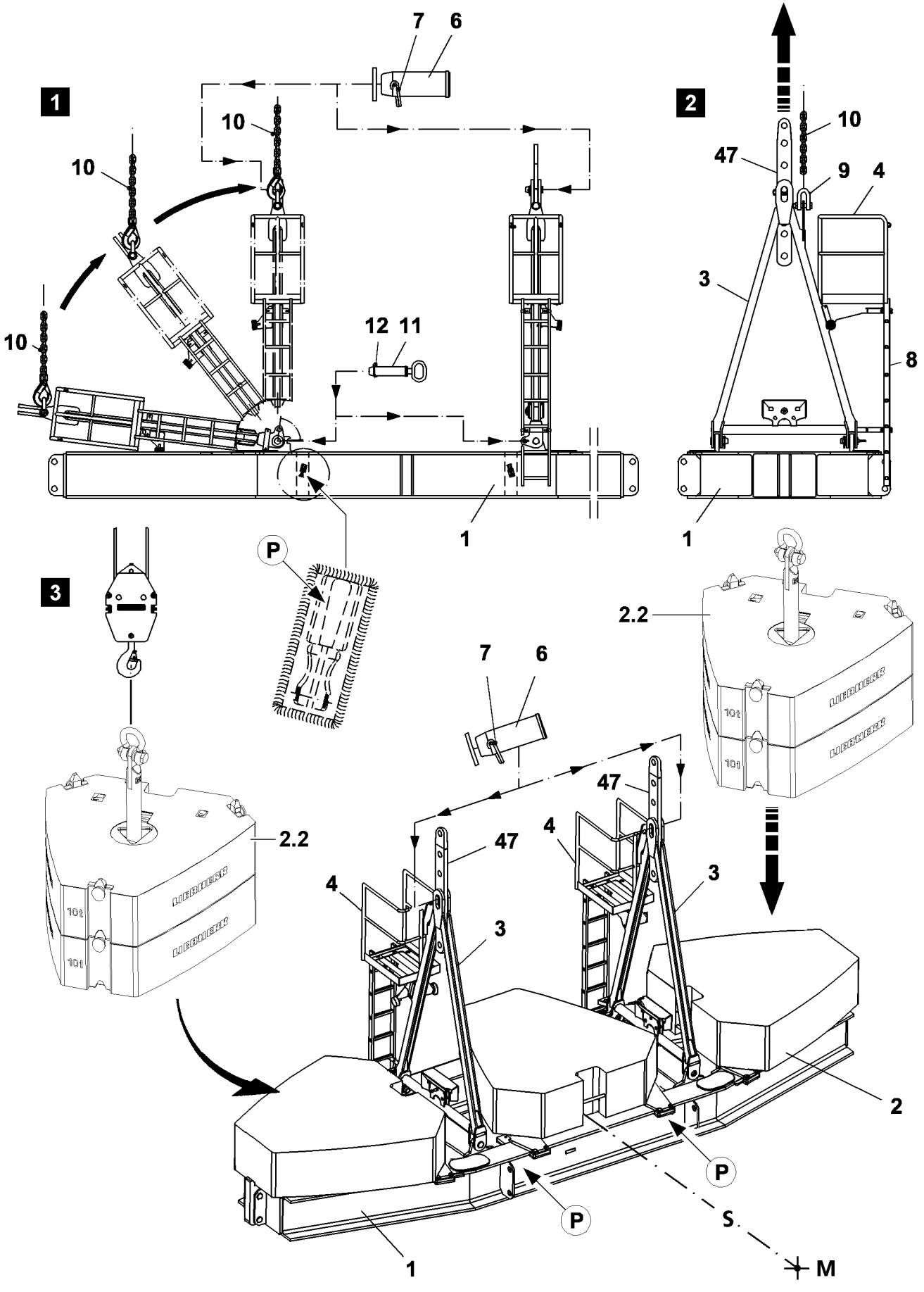
Maximum derrick ballast	Combination	Individual weight
210.0 t	The derrick ballast can be assembled from the following ballast plates:	5.0 t 10.0 t
	Ballast pallet	5.0 t

3.2 Calculation example derrick ballast combination

See opposite illustration!

Counterweight from load chart 210.0 t			
16 x	Ballast plate 10.0 t	=	160.0 t
9 x	Ballast plate 5.0 t	=	45.0 t
1 x	Ballast pallet 5.0 t	=	5.0 t
Derrick ballast:			210.0 t

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4 Assembly

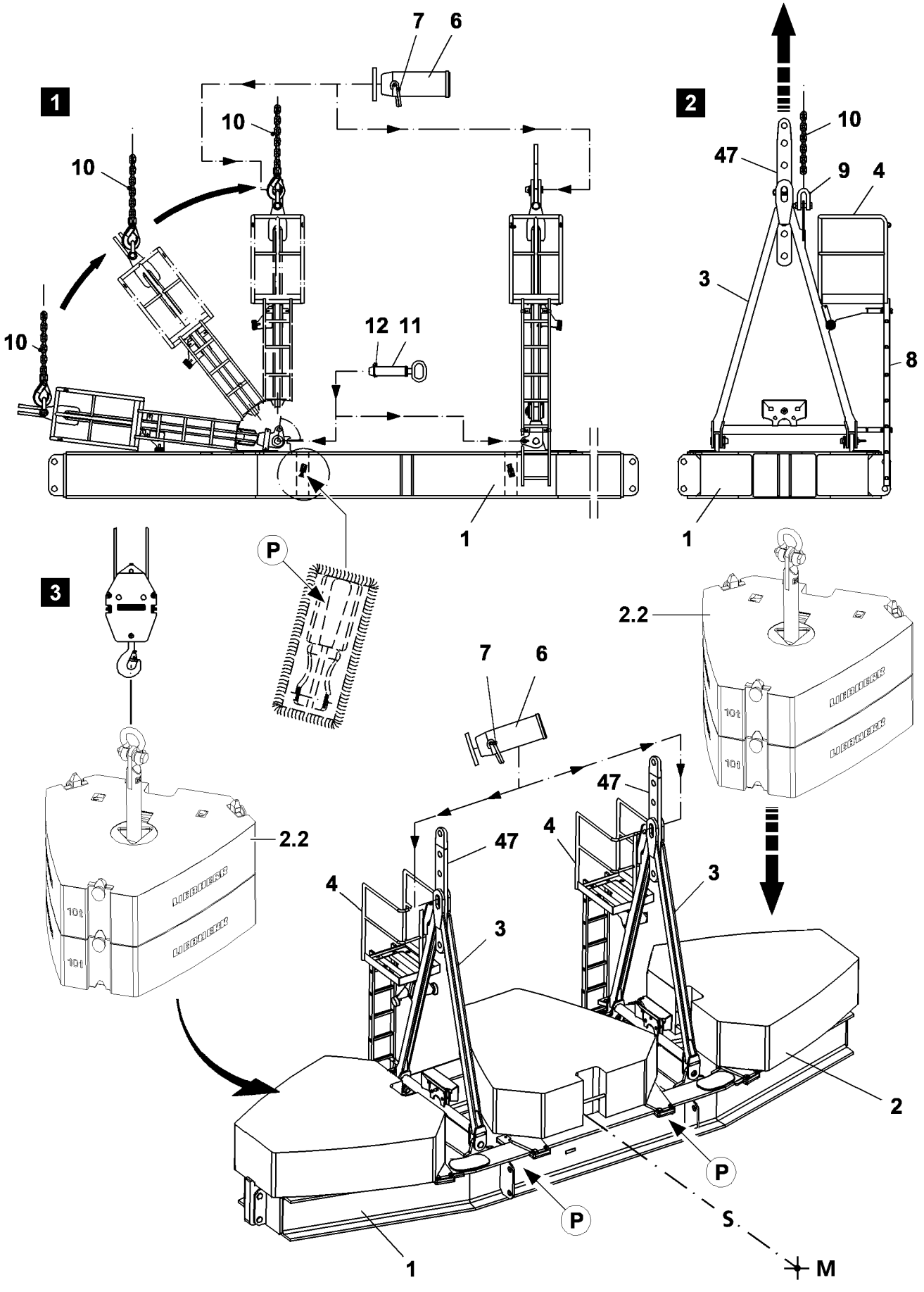
WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If 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! The personal fall arrest system must be attached in the corresponding fastening 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!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

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!

WARNING
Falling crane components!
If a crane component is disengaged from the auxiliary before it is properly assembled and secured, it can fall down!
Personnel can be severely injured or killed!
- ▶ Only disengage the auxiliary crane after the relevant crane component is properly assembled and secured, visual inspection!

Make sure that the following prerequisites are met:
- – The crane is aligned in horizontal direction.
- – The boom and the derrick boom are assembled on the turntable.
- – The guy rods of the D-lattice sections for the derrick ballast are pinned together and secured.
- – The derrick boom is in operating position.
- – The electrical connections to the pull cylinders are established.
- – The hydraulic connections to the pull cylinders are established.
- – 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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4.1 Preassembling 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!
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

4.1.1 Placing the ballast pallet in the assembly position

Note
- ▶ The suspension points point **P** to transport the ballast pallet are in the inside of the ballast pallet frame **1**!

- ▶ Attach ballast pallet on the four suspension points point **P** on the auxiliary crane.
- ▶ Set the derrick boom to the required derrick boom radius.

Note
- ▶ The assembly of the D-guy rods on the ballast pallet **1** is simplified if the center axis **S** of the ballast pallet **1** and the center axis of the turntable **M** align!

- ▶ Attach the ballast pallet **1** onto the auxiliary crane and position it within the slewing range of the crane under the D-guy rods on the derrick.
- ▶ Make sure that the ballast pallet **1** is aligned horizontal on the ground.

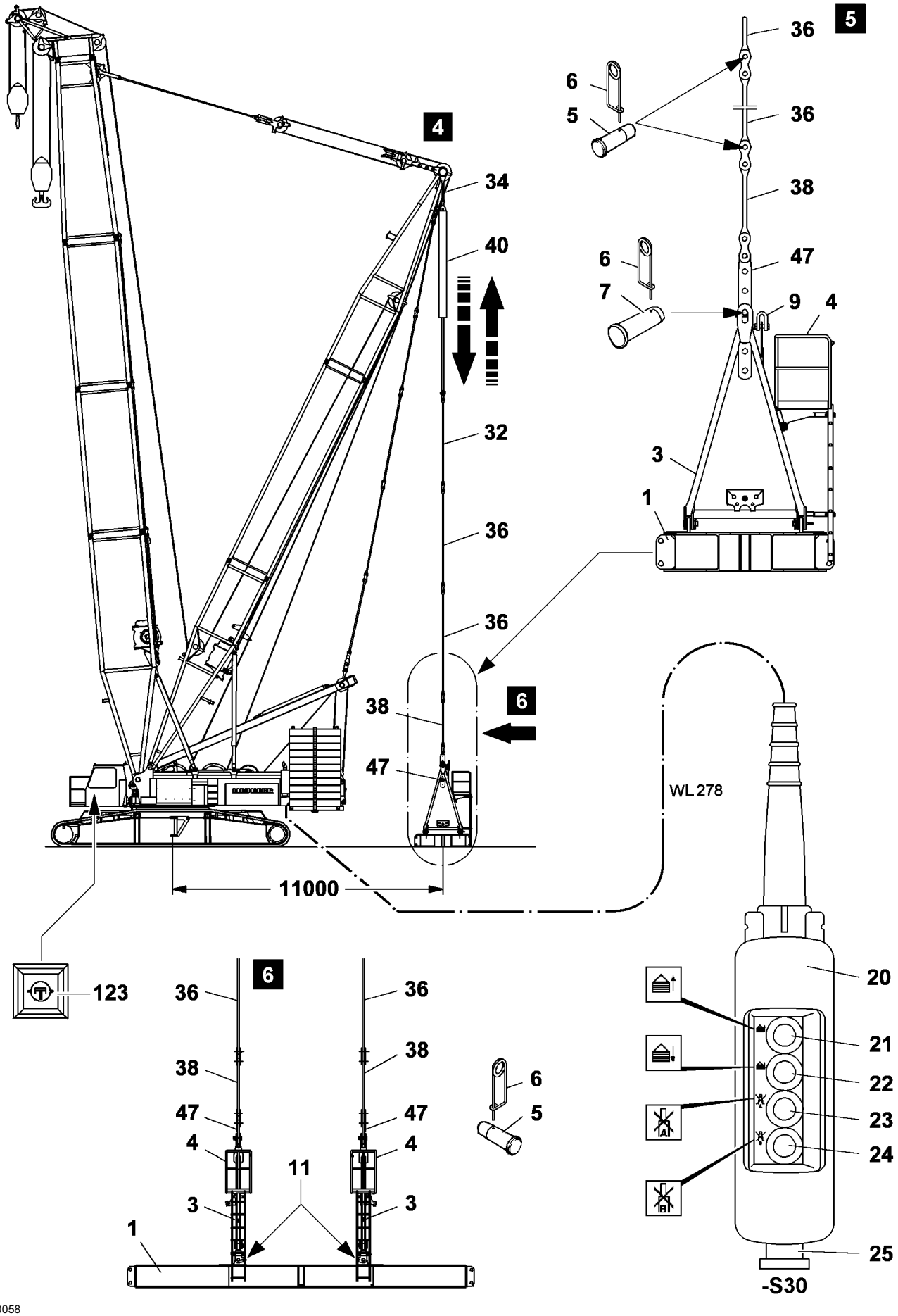
4.1.2 Setting up the erection racks

- ▶ Hang the erection rack **3** on the shackle **9** onto the auxiliary crane.
- ▶ Set the erection rack **3** vertically with the auxiliary crane.

DANGER
Danger of accidents when assembling / disassembling the erection racks!
The erection racks must be attached 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 with the retaining pins **11**! Only then may the auxiliary crane be removed!
- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks!
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

- ▶ Insert the retaining pins **11** on the erection racks **3** on both sides.
- ▶ Secure the retaining pins **11** with linch pins **12**.

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4.1.3 Retracting / extending the pull cylinder on the derrick end section

Operator controls on control panel - S30

WARNING
Misuse of control panel **-S30**!
If the pull cylinders are actuated during crane operation from the control panel, then any upcoming warnings on the LICCON monitors may not be recognized and realized!
The crane can be overloaded unnoticed and topple over!
Personnel can be severely injured or killed!
▶ During crane operation, lifting and lowering the derrick ballast is only permissible from the crane operator's cab!

Position		Description
20	Housing	Control panel
21	Button	Move pull cylinder in in the derrick guying (lift)
22	Button	Move pull cylinder out in the derrick guying (lower)
23	Button	Block the pull cylinder A on the left
24	Button	Block the pull cylinder B on the right
25	Switch	EMERGENCY-OFF

Moving the pull cylinder in / lifting the derrick ballast

▶ Press the button **21**.

Result:

– The derrick ballast is raised.

Moving the pull cylinder out / lower the derrick ballast

▶ Press the button **22**.

Result:

– The derrick ballast is lowered.

Stopping pull cylinder A

▶ Press the button **23**.

Result:

– The pull cylinder (A) in the derrick ballast guying is stopped.

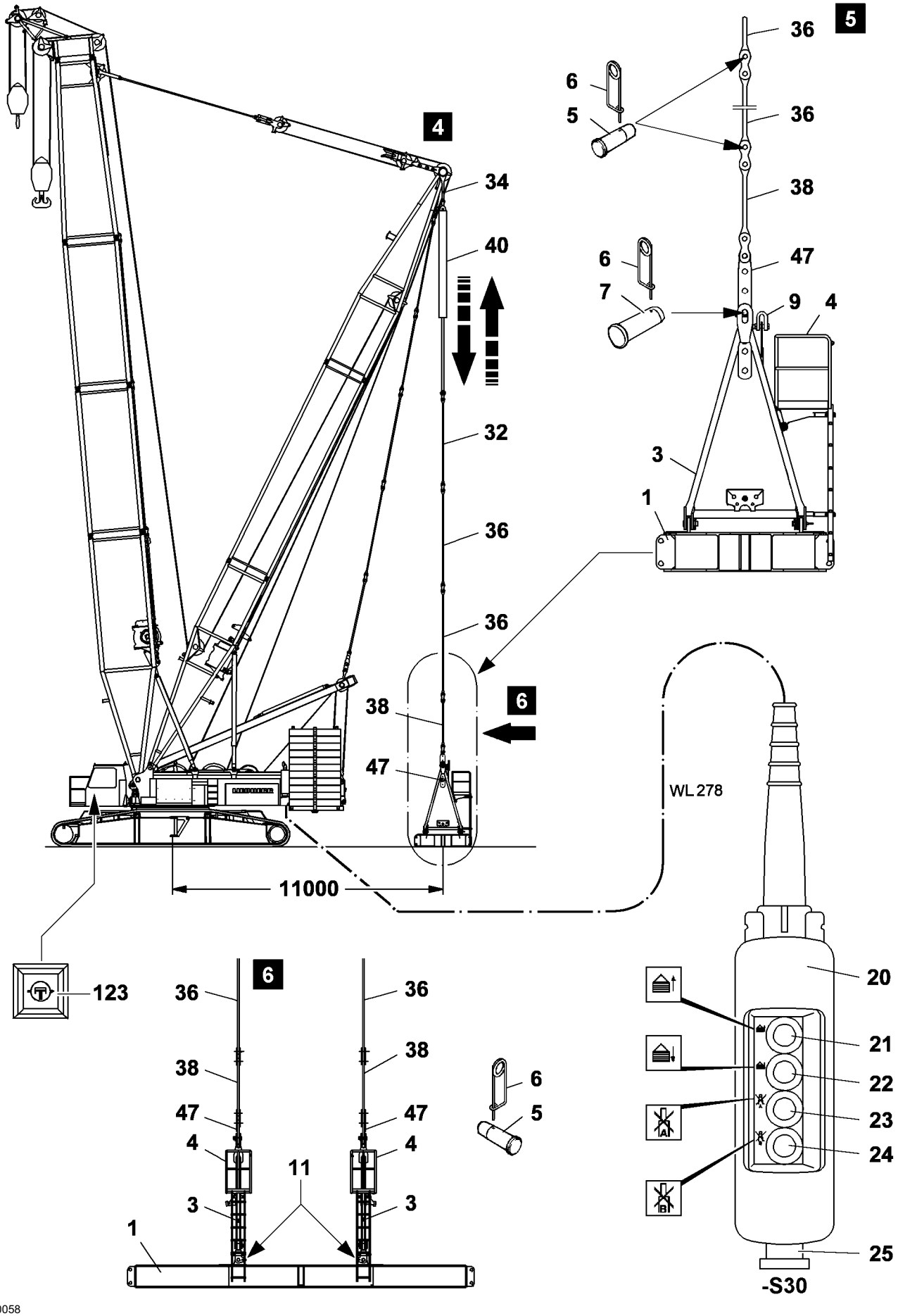
Stopping pull cylinder B

▶ Press the button **24**.

Result:

– The pull cylinder (B) in the derrick ballast guying is stopped.

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4.1.4 Installing the D-guy rods on the erection racks

Make sure that the following prerequisites are met:
- The ballast pallet is in assembly position.
- The erection racks are erected, properly pinned and secured.
- The crane is aligned in horizontal direction.
- No load is attached on the main boom.
- The control panel **20** is plugged into the socket on the rear of the turntable with the cable **WL278**, illustration **8**.
- The derrick boom is set to the required derrick boom radius.
- The crane engine is running.

Note
- ▶ The D-guy rods **47** must be lowered by moving the pull cylinders out and by positioning on the pin points of the erection racks **3**!

▶ Lower the D-guy rods **47** to the height of the pin points until the D-guy rods **47** can be pinned with the pin points.

WARNING
D-guy rods are not secured!
If the pin points between the D-guy rods **47** and the erection frames are not secured, then the ballast pallet can tip over during crane operation!
Personnel can be severely injured or killed!
- ▶ Make sure that all guy rods are pinned from the inside to the outside and secured with spring retainers!

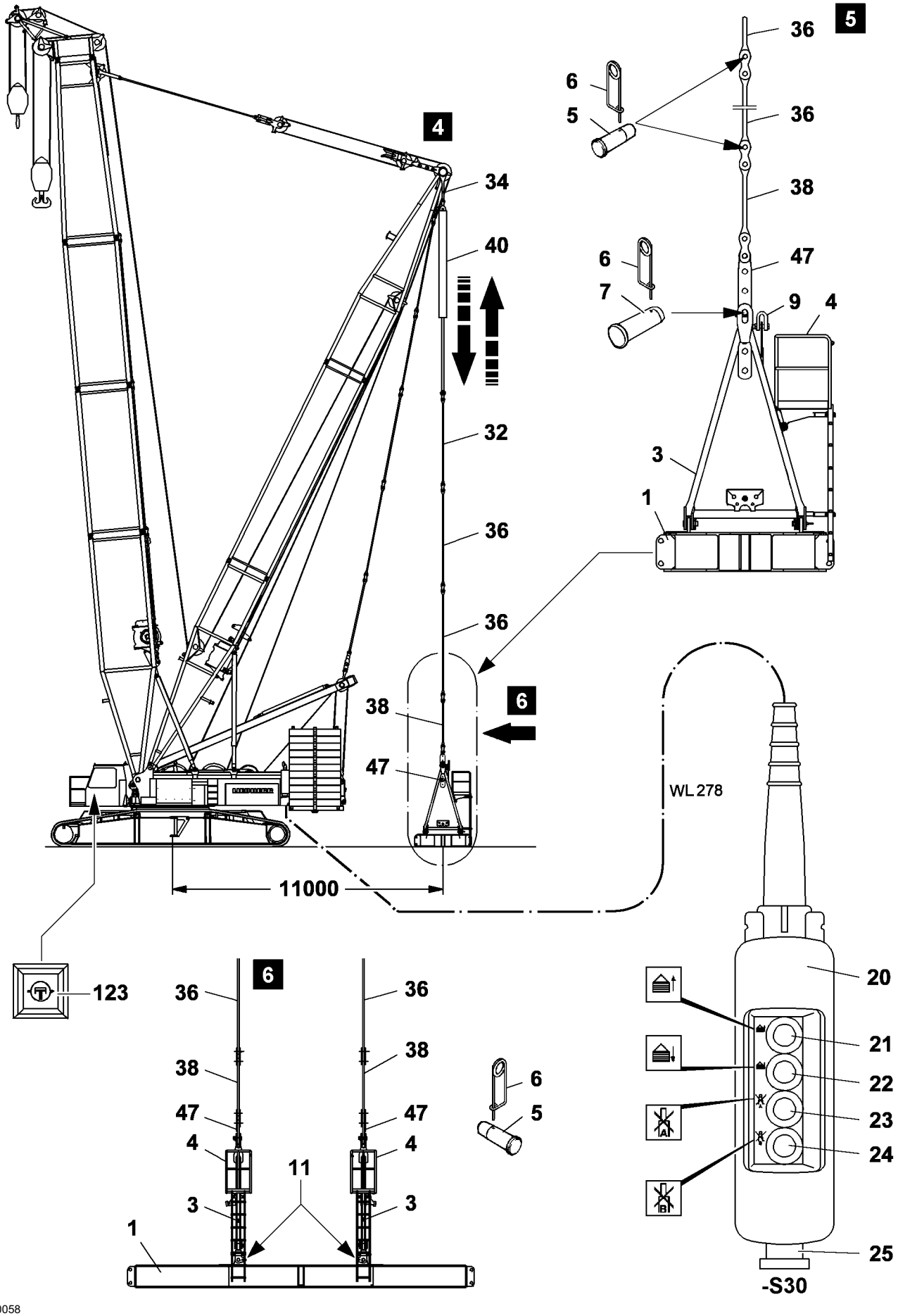
Note
Pull cylinder on derrick end section!
- ▶ Select the pin points of the D-guy rods in such a way that the cylinder stroke of the pull cylinders is sufficient to lift the ballast pallet on the assembly location off the ground and to set it down again on the ground on the disassembly location!
- ▶ Depending on the derrick ballast radius, the extension condition of the pull cylinders and the selected pin points on the D-guy rods. the ballast pallet may possibly not be lifted off the ground completely, or set down on the ground for disassembly!
- ▶ Take the above mentioned points into account during job planning!
- ▶ Observe the danger notes in section “Lift / lower the derrick ballast with the pull cylinders off the ground”!

Pin and secure the D-guy rods **47** on both sides on the erection racks **3**.
- ▶ Insert the pin **7** and secure with spring retainer **6**.

NOTICE
Damage to the retaining pins!
If the retaining pins **11** are not unpinned before crane operation, then they can be damaged in crane operation!
- ▶ Unpin the retaining pins **11** before start of crane operation!

▶ When the ballast pallet is pinned and secured on the D-guying:
Release the retaining pins **11** on the erection racks **3** on both side and unpin.

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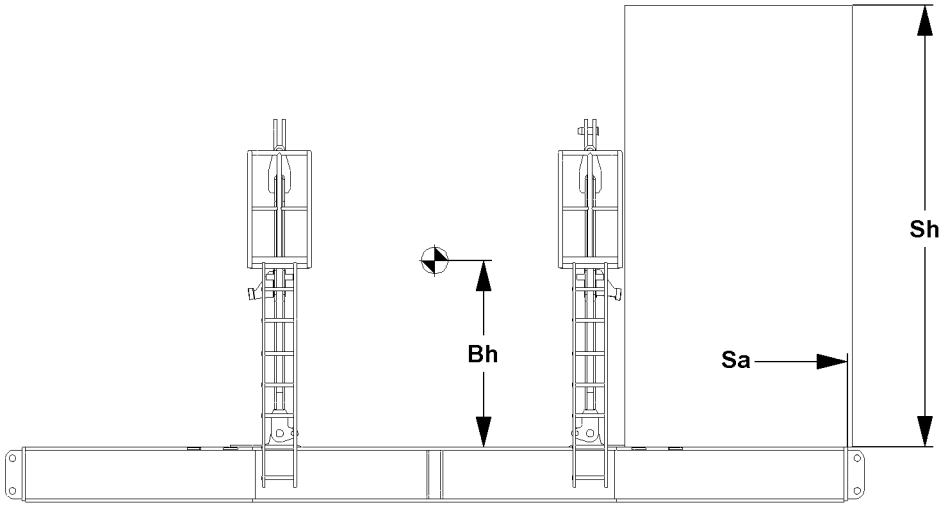
WARNING
Uncontrolled oscillation of the ballast pallet!
When the ballast pallet is raised, it can start to swing!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Secure the ballast pallet **1** with auxiliary ropes!

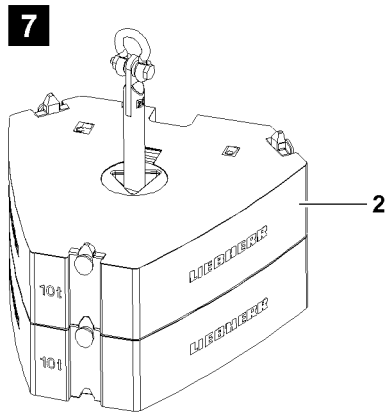
Note
- ▶ The ballast pallet must be lifted off the ground before ballasting with the pull cylinders and then lowered again onto the ground! This ensures that the ballast pallet is aligned exactly to the center axis of the crane and that no tensions in the D-guy rods occur!

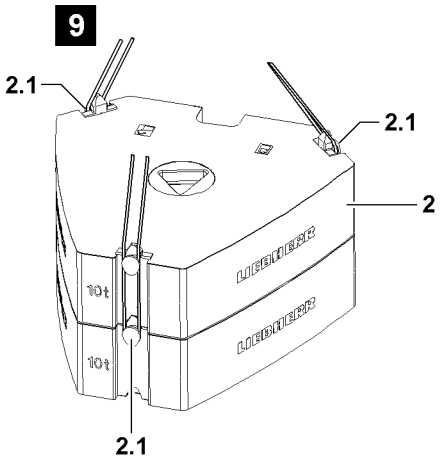
- ▶ Lift the empty ballast pallet off: Press the button **21**.
- ▶ Make sure that the ballast pallet **1** is horizontally aligned.
- ▶ Lower the empty ballast pallet: Press the button **22**.

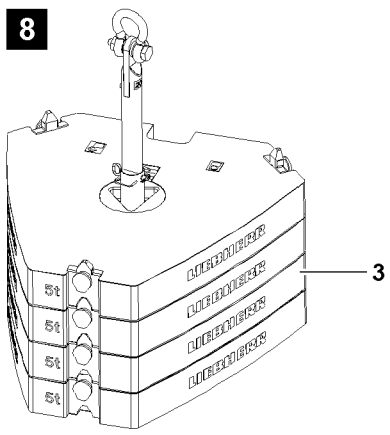
Result:
– The empty ballast pallet is precisely placed vertically under the derrick head.

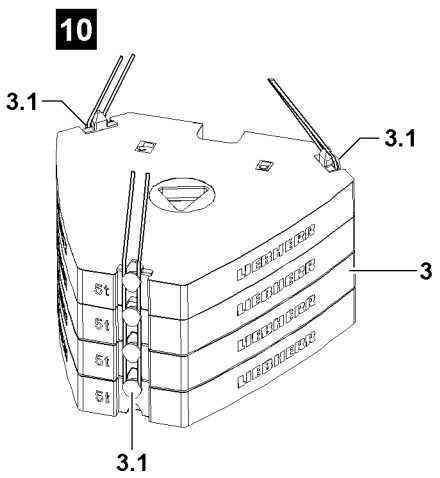
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4.2 Ballasting the ballast pallet

WARNING
The crane can topple over!
If the following specifications 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!
- ▶ The outer 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!
- ▶ Make sure that the ballast plates are placed correctly in the centerings of the ballast pallet!
- ▶ The maximum permissible ballast center of gravity height **Bh** of 2000 mm may not be exceeded!
- ▶ The permissible stack height **Sh** of 4100 mm may not be exceeded!
- ▶ The maximum permissible total weight of the suspended ballast may not exceed 205 t without ballast pallet!
- ▶ Secure all ballast plates so they cannot move and fall down!
- ▶ The distances of the center of gravity of the outer ballast stacks are to be maintained and must be identical between left and right ballast stack, see the following chart!
- ▶ Secure all ballast plates so they cannot move and fall down!
- ▶ Replace damaged ballast plates immediately with new ballast plates!

	Maximum permissible ballast weight per stack (left / right)	
Center of gravity distance **Sa**	90 t	100 t
800 mm	**X**	
1000 mm		**X**

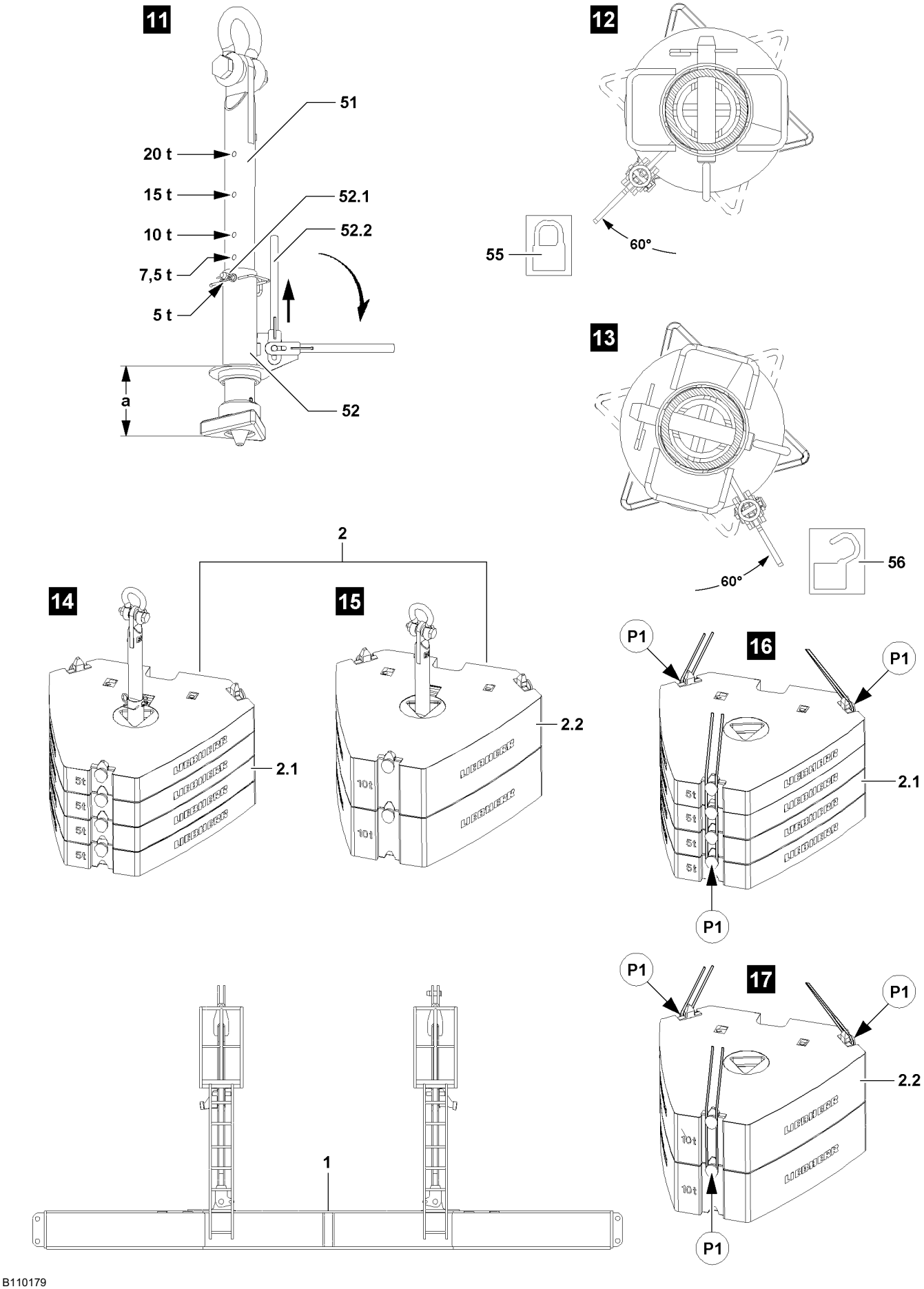
WARNING
Suspended ballasting!
If the following specifications are not observed for suspended ballasting, then the ballast pallet can tip over and the ballast stacks can fall down!
Personnel can be severely injured or killed!
- ▶ The sequence how the ballast plates must be placed on the ballast pallet in suspended condition must be observed!
- ▶ Ballast first one 20.0 t ballast stack in the center of the ballast pallet!

When the required 20.0 t have been placed on the center ballast stack:
- ▶ Ballast the outer ballast stack alternately - with a maximum permissible difference of 10.0 t!

Note
- ▶ If the ballast pallet is standing completely on the ground during ballasting, then the ballast assemblies of 20 t can already be placed at the start!

Make sure that the following prerequisites are met:
- – The ballast pallet is properly pinned and secured to the D-guying.
- – An auxiliary crane is available.

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4.2.1 Placing the ballast plates, fastening system: “Twistlock”

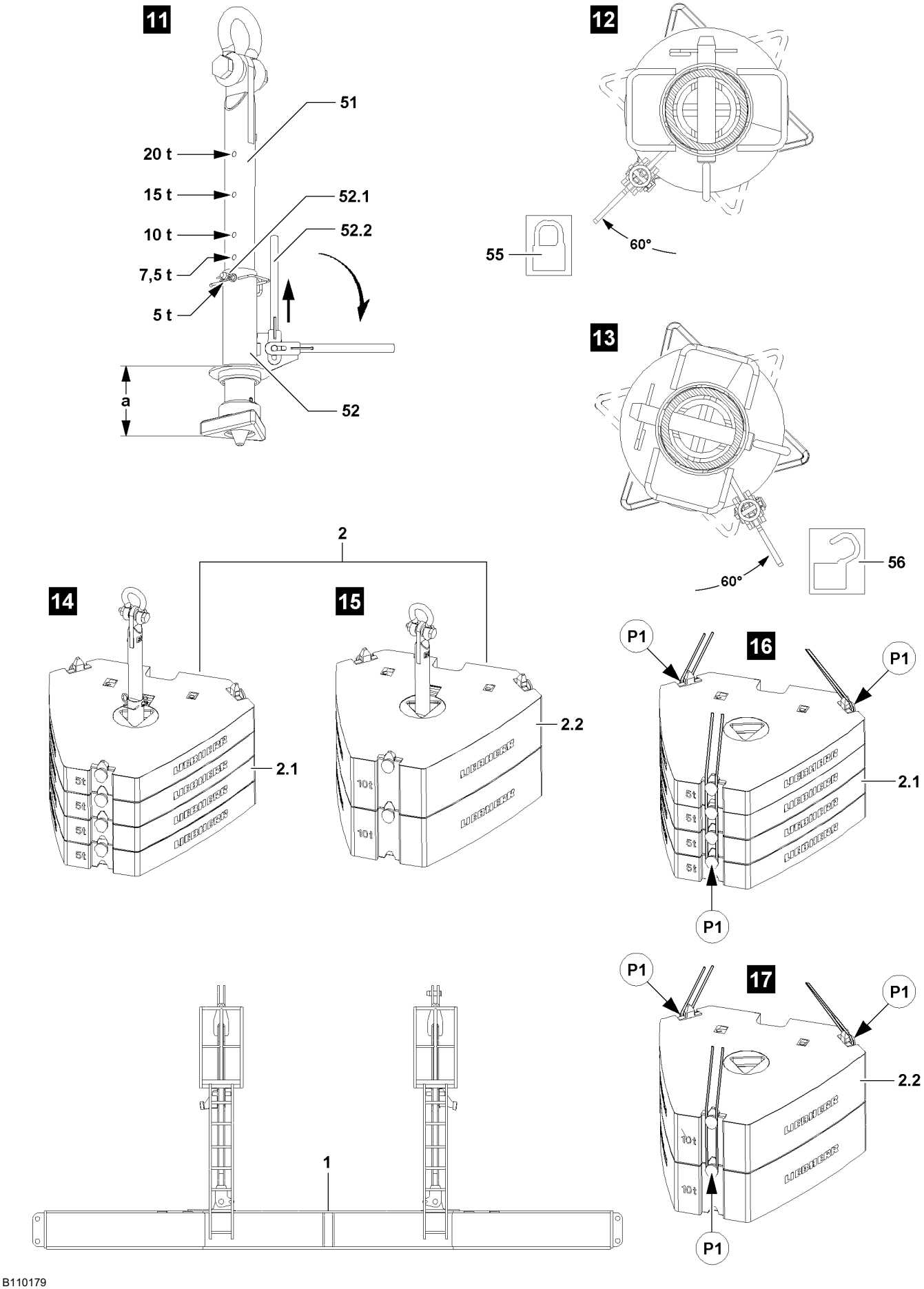
WARNING
Overload of receptacle stud and ballast plates!
If more than the permissible number of ballast plates are lifted with the receptacle stud **51**, the receptacle stud **51** and the ballast plates can be overloaded and damaged!
The ballast plates can fall down!
Personnel can be severely injured or killed!
▶ Observe the section “Permissible ballast assemblies” in this chapter!

WARNING
Damage of receptacle stud and ballast plates!
If two ballast plates are lifted which do not lay correctly in their centerings, the receptacle stud **51** and the ballast plates can be damaged!
Damage can cause the ballast plates to fall down!
Personnel can be severely injured or killed!
▶ Make sure that the ballast plates to be lifted are placed correctly in the centerings!

WARNING
The twist lock system opens by itself!
If the receptacle stud **51** is not correctly locked, the Twist lock system can open by itself!
The ballast plates can fall down!
Personnel can be severely injured or killed!
▶ Make sure, when initiating a lift, that the lever **52.2** points directly on the symbol “Locked” **55** of the ballast plates **2**!

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

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Before the receptacle stud **51** is guided into the ballast plate(s), it must be ensured that the insertion length **a** of the receptacle stud **51** is set correctly.
The insertion length **a** of the receptacle stud can be adjusted by hand.

- ▶ If the insertion length **a** of the receptacle stud **51** is to be adjusted:
  Release and unpin the pins **52.1**.
- ▶ Adjust the insertion length **a** by moving the guide sleeve **52** to the desired insertion length **a**, observe the stages in illustration **11**.
- ▶ Insert and secure pin **52.1**.

Result:

– The receptacle stud **51** is adjusted.

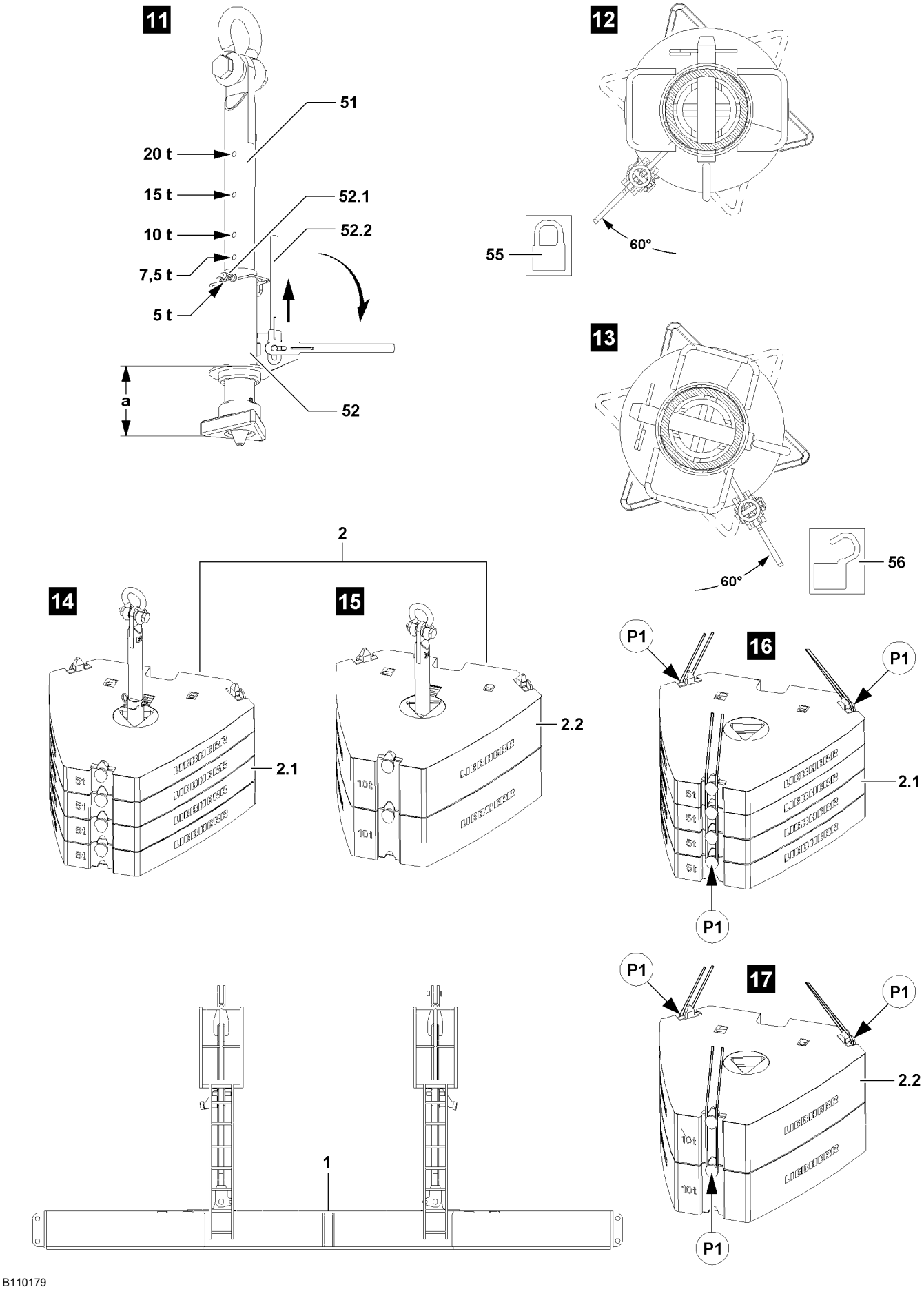
- ▶ Attach the receptacle stud **51** on the auxiliary crane and guide it into the ballast plate(s).
- ▶ Pull the lever **52.2** up and fold it down.
- ▶ Turn the receptacle stud **51** with the lever **52.2** by 60° until it points to the symbol “Locked” **55** of the ballast plate, see illustration **12**.
- ▶ Lift the ballast plate(s) or the ballast assembly with the receptacle stud **51** and place it carefully on the centerings on the ballast pallet or on another ballast plate in the ballast assembly.
- ▶ When the ballast plates are placed down:
  Turn the receptacle stud **51** with the lever **52.2** by 60° to the stop in direction of the symbol “unlocked” **56** of the ballast plate, see illustration **13**.

Result:

– The receptacle stud **51** is unlocked.

- ▶ Carefully pull out the receptacle stud **51**.
- ▶ Secure all ballast plates so they cannot move and fall down.

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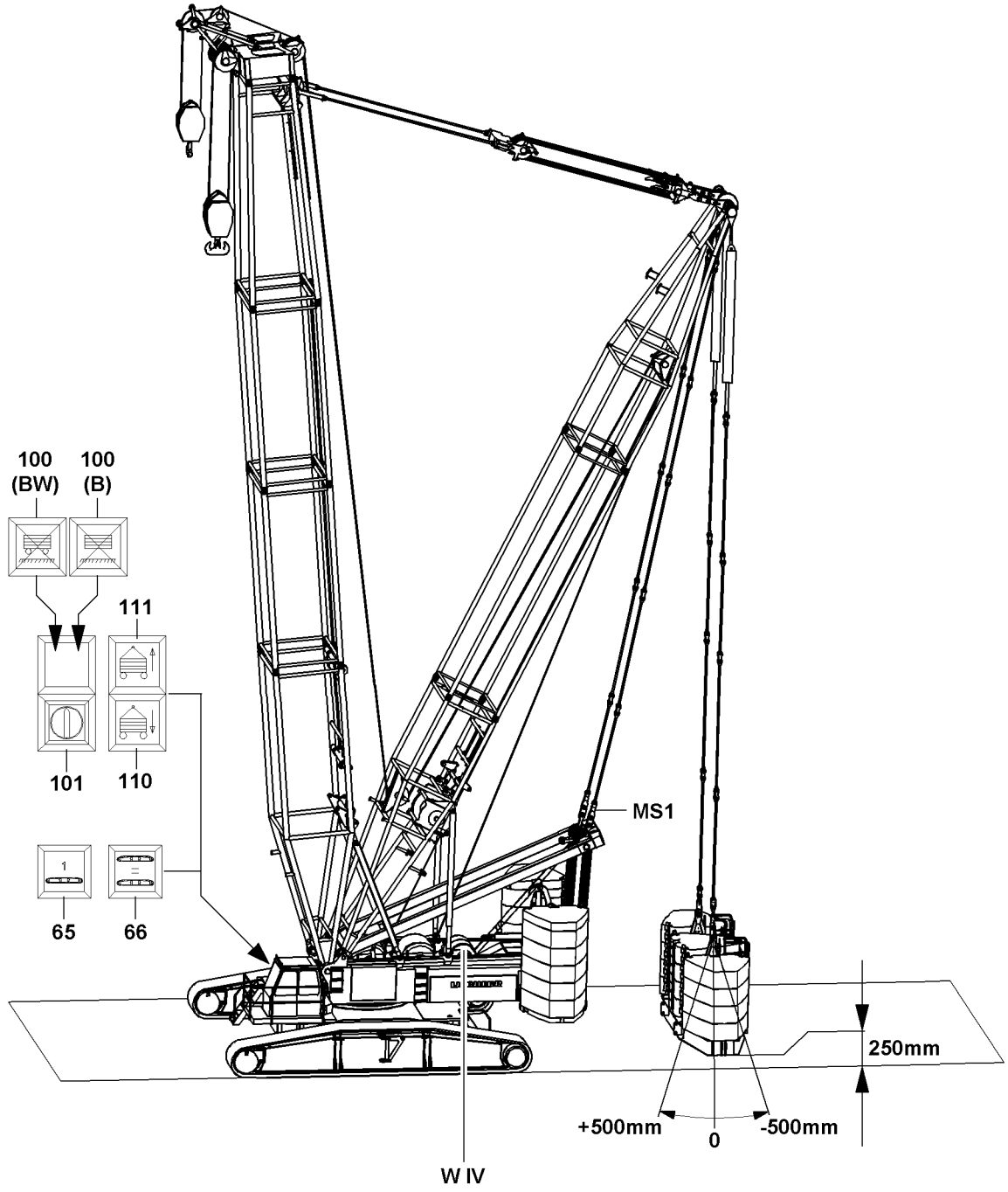
4.2.2 Placing the ballast plates, fastening points: Bitt

WARNING
Overloaded ballast plates!
If more than the permissible loads are lifted, the bitts **P1** are overloaded!
The ballast plates can be damaged and fall down!
Personnel can be severely injured or killed!
▶ Observe the section “Permissible ballast assemblies” in this chapter!

WARNING
Incorrect handling of the fastening equipment!
If tackle cannot be attached correctly and / or if it is not secured sufficiently to prevent it from loosening up, the ballast plates can fall down!
Personnel can be severely injured or killed!
▶ Make sure that the fastening equipment is correctly attached on the bitts **P1** and that it is secured sufficiently to prevent it from loosening up!

▶ Attach the ballast plates individually or as a ballast assembly, illustration **16** or illustration **17** on the auxiliary crane.
▶ Lift the ballast plates or the ballast assembly and place it carefully on the centerings on the ballast pallet or on another ballast plate in the ballast assembly.

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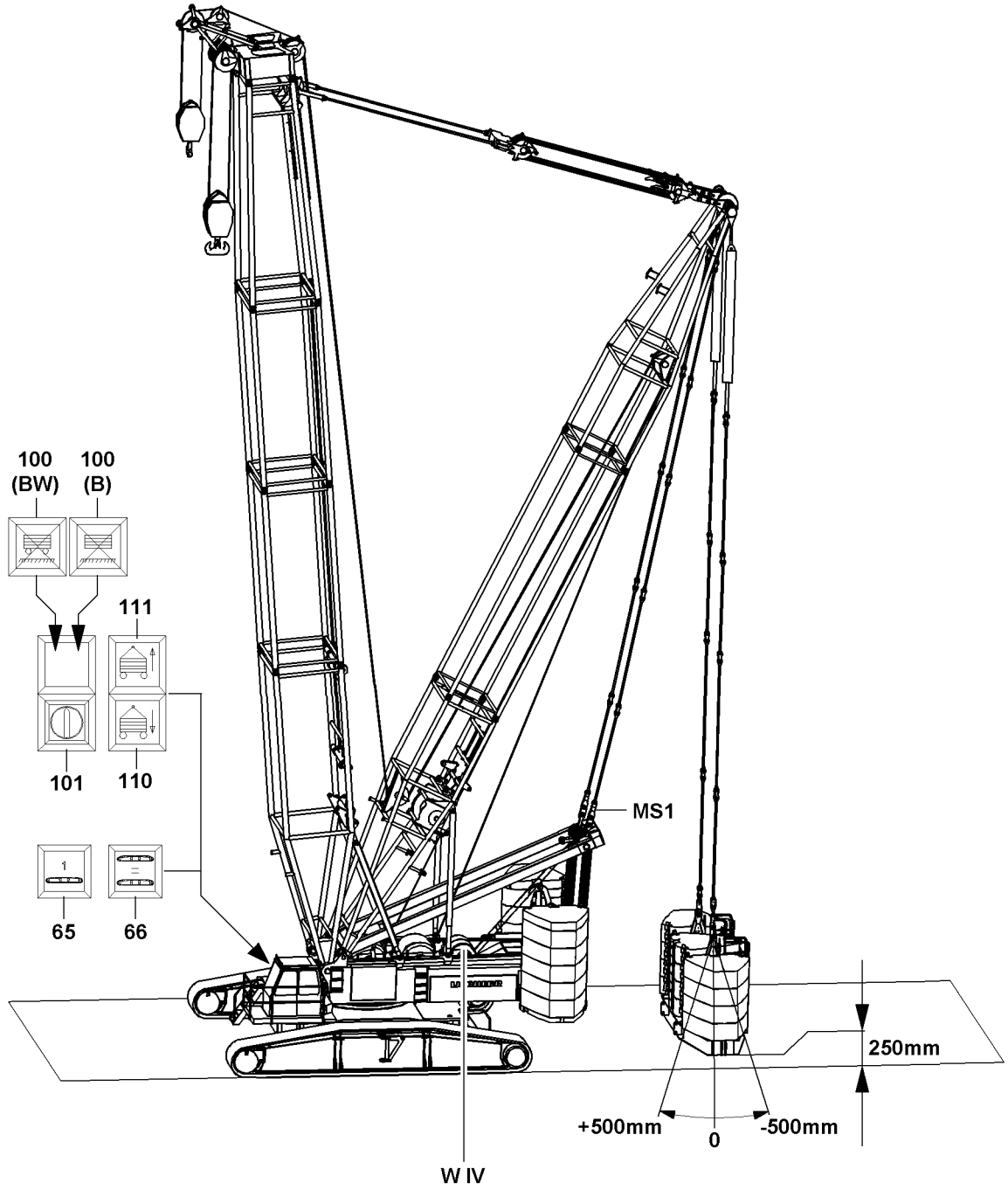
4.3 Lifting / lowering the derrick ballast with the pull cylinder off the ground

WARNING
The crane can topple over!
If the derrick ballast is lifted up by the **maximum permissible** 250 mm from the ground, the crane can be topple over to the rear f the load rips off!
If the following notes are not observed, personnel can be severely injured or killed!
- There may be no personnel, objects or obstacles within the entire slewing range of the crane, derrick ballast and the load!
- Do not lift derrick ballast more than 250 mm from the ground!
- The subsoil in the entire working area of the crane - including the derrick ballast and the load - must be even and of sufficient load carrying capacity, in order to be able to securely accept the encountered ground pressures and weight loads!

Note
- Lifting of the derrick ballast is to be observed by a guide!

WARNING
The crane can topple over!
If the minimal force F1-min, with derrick ballast turned off on the ground and derrick guying without power, is fallen below, the boom system can abruptly move forward with increasing load moment and suddenly lift the derrick ballast from the ground!
This will result in the load swinging violently, whereby the crane can topple or be severely damaged!
Personnel can be severely injured or killed!
- The guying between the SA frame and the derrick end section, test point 1 **MS1**, may never be without power!
- The minimal force F1-min may not be fallen below!
- When taking on the load, the guying of the derrick ballast to the derrick end section must be without force or slightly tensioned, so that the minimum force F1-min on test point 1 **MS1**, is exceeded!

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4.3.1 Lifting the derrick ballast off the ground

▶ Press the button **111** in the crane operator's cab.

▶ When the derrick ballast is lifted completely off the ground:
Press key button **101** “Derrick ballast lifted off”.

Result:

– Operating mode “Derrick ballast lifted off” is turned on, self-retention.
– The warning light in the button **100** blinks.
– The suspended ballast is shown in suspended condition on the LICCON monitor.

4.3.2 Lowering the derrick ballast to the ground

▶ Press the button **110** in the crane operator's cab.

▶ When the derrick ballast is completely set down onto the ground:
Press the button with warning light **100** “Derrick ballast lifted off”.

Result:

– Operating mode “Derrick ballast lifted off” is deactivated.
– The warning light in button **100** turns off.
– The suspended ballast is shown on the ground on the LICCON monitor.

4.3.3 Blocking the pull cylinder

For horizontal alignment of the derrick ballast, the pull cylinders A and B can be blocked individually.

Blocking the pull cylinder A

▶ Press the button **108** in the crane operator's cab.

Result:

– The “pull cylinder A” is blocked.

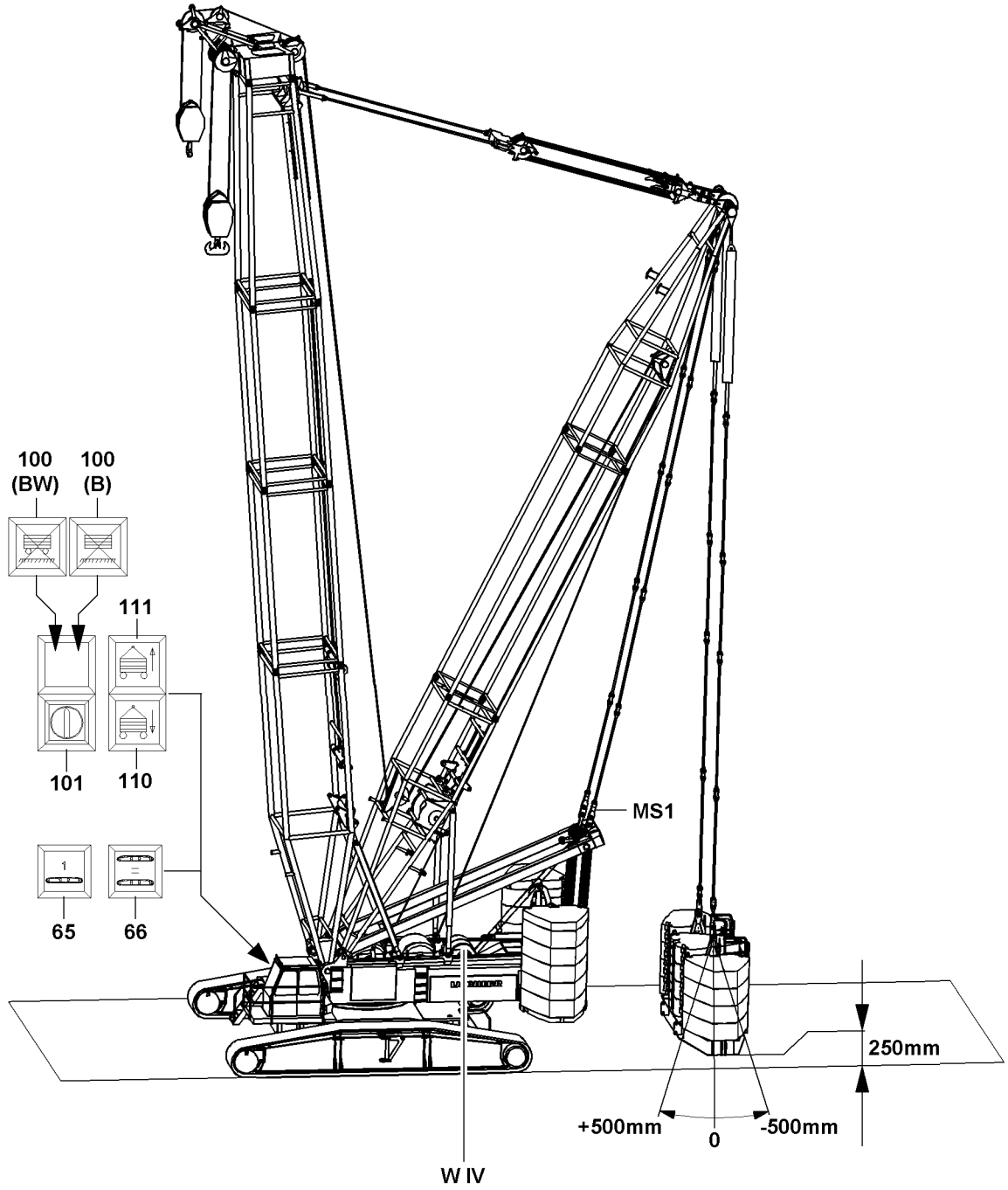
Blocking the pull cylinder B

▶ Press the button **109** in the crane operator's cab.

Result:

– The “pull cylinder B” is blocked.

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5 Adjusting the derrick boom

The derrick ballast radius required for crane operation is set by luffing the derrick boom up or down.

Note

- If the derrick ballast utilization reaches a value of more or equal to 50% in crane operation, then the luffing speed of the Derrick boom is slowly reduced by reduction of speed on winch 4 **WIV** via a ramp!
- If the derrick ballast utilization drops below 50% in crane operation, then the luffing speed of the derrick boom is not automatically increased by a speed adjustment on winch 4 **WIV**!
- Only after winch 4 **WIV** was stopped - bring master switch **MS3** in zero position - the full maximum speed, which was set via the “Control parameter”, is available again, in as far as the derrick ballast utilization after setting the master switch to zero is still less than 50%!

5.1 Adjustment procedure

Make sure that the following prerequisite is met:

– The derrick ballast is lifted off the ground completely via the pull cylinders.

WARNING

The crane can topple over!

If the luffing movements on the derrick boom are initiated too fast, the derrick ballast can start to swing!

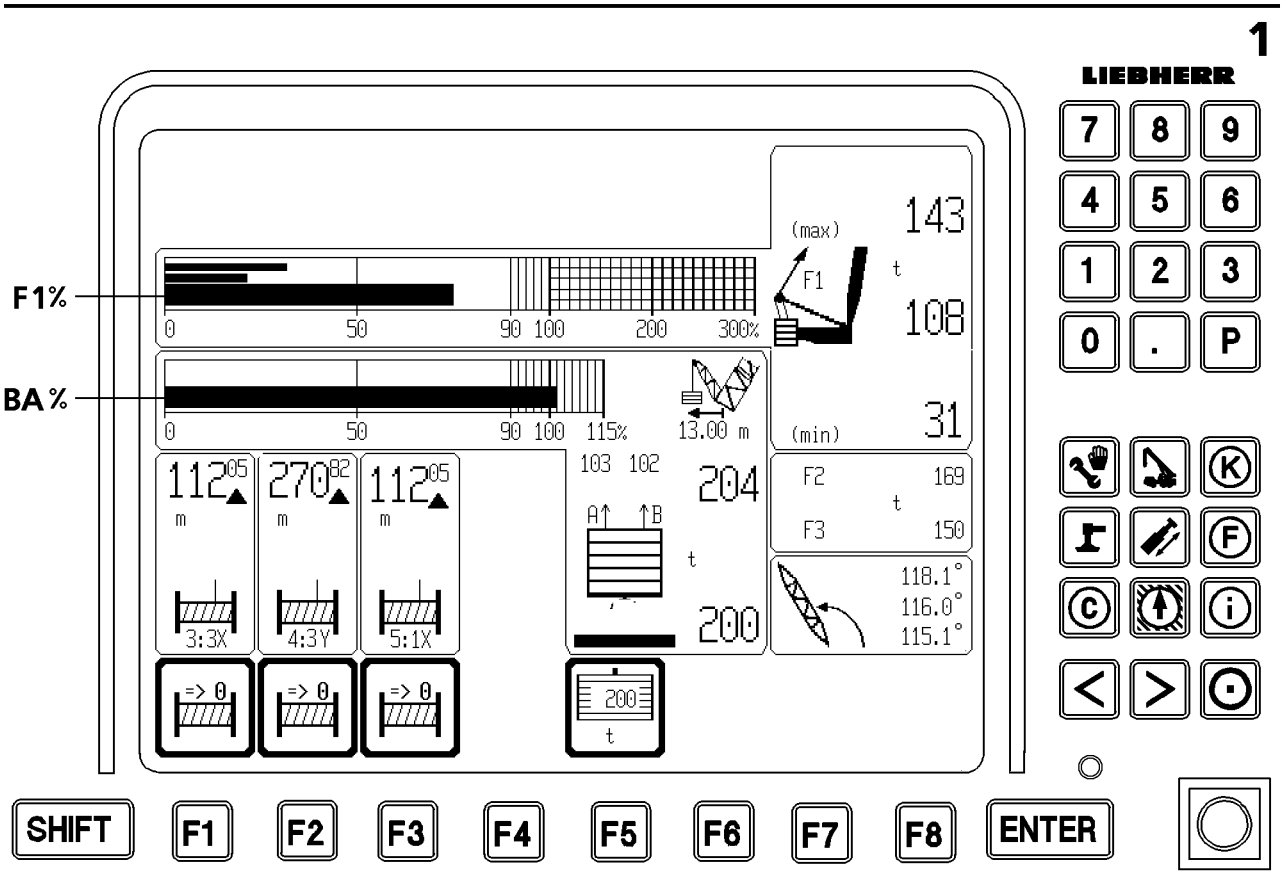
The crane can topple over or crane components can be significantly damaged!

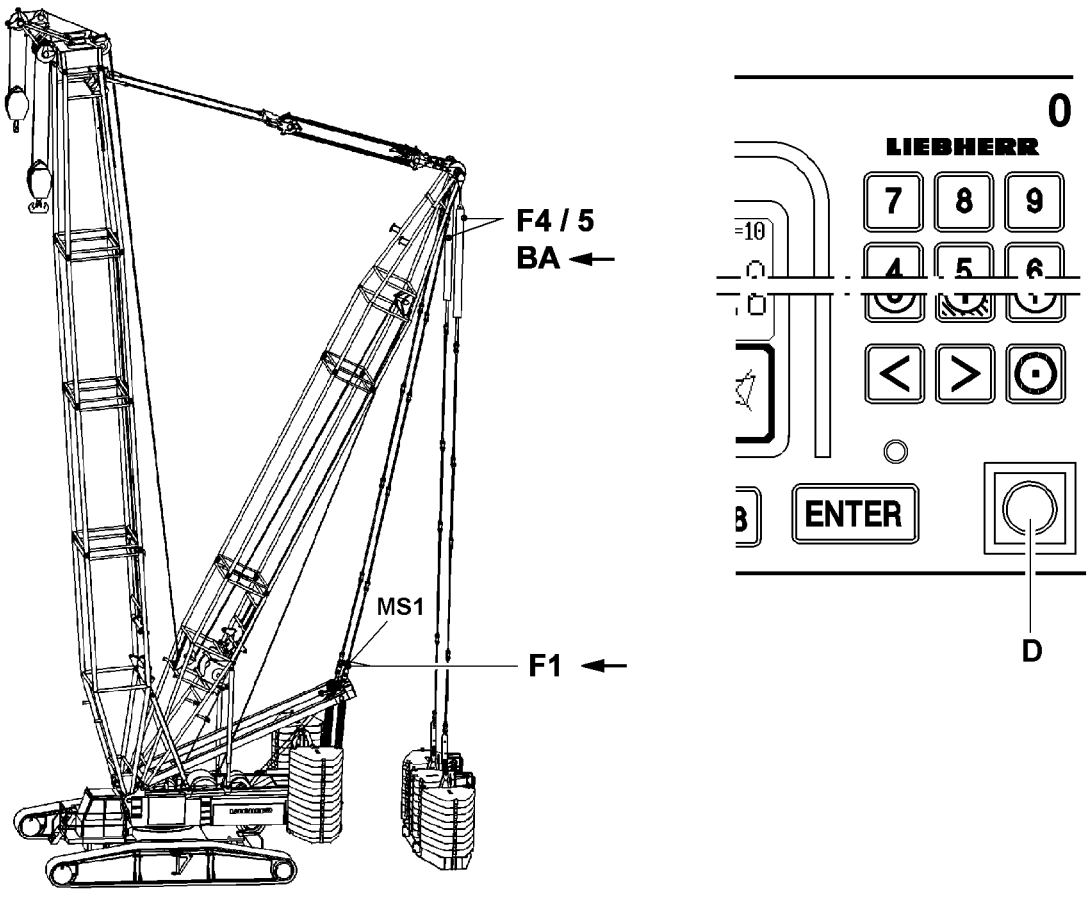
Personnel can be severely injured or killed!

- Carry out the actuation of winch 4 - luffing the derrick boom up or down - must always be carried out sensitively and with utmost caution!
- If the derrick ballast starts to swing by more than ± 0.5 m despite all efforts set the derrick ballast on the ground as fast as possible via the pull cylinders! **The upper threshold on test point 1 MS1** may hereby not be exceeded!

- Luff the derrick boom up or down to the required derrick boom radius.

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6 Crane operation with derrick ballast

Make sure that the following prerequisites are met:
– The test points are checked for function.
– The crane is aligned in horizontal direction.
– The weight of the load to be lifted is known.
– The required derrick ballast is placed according to the load chart.
– The derrick boom is in operating position.

6.1 Settings

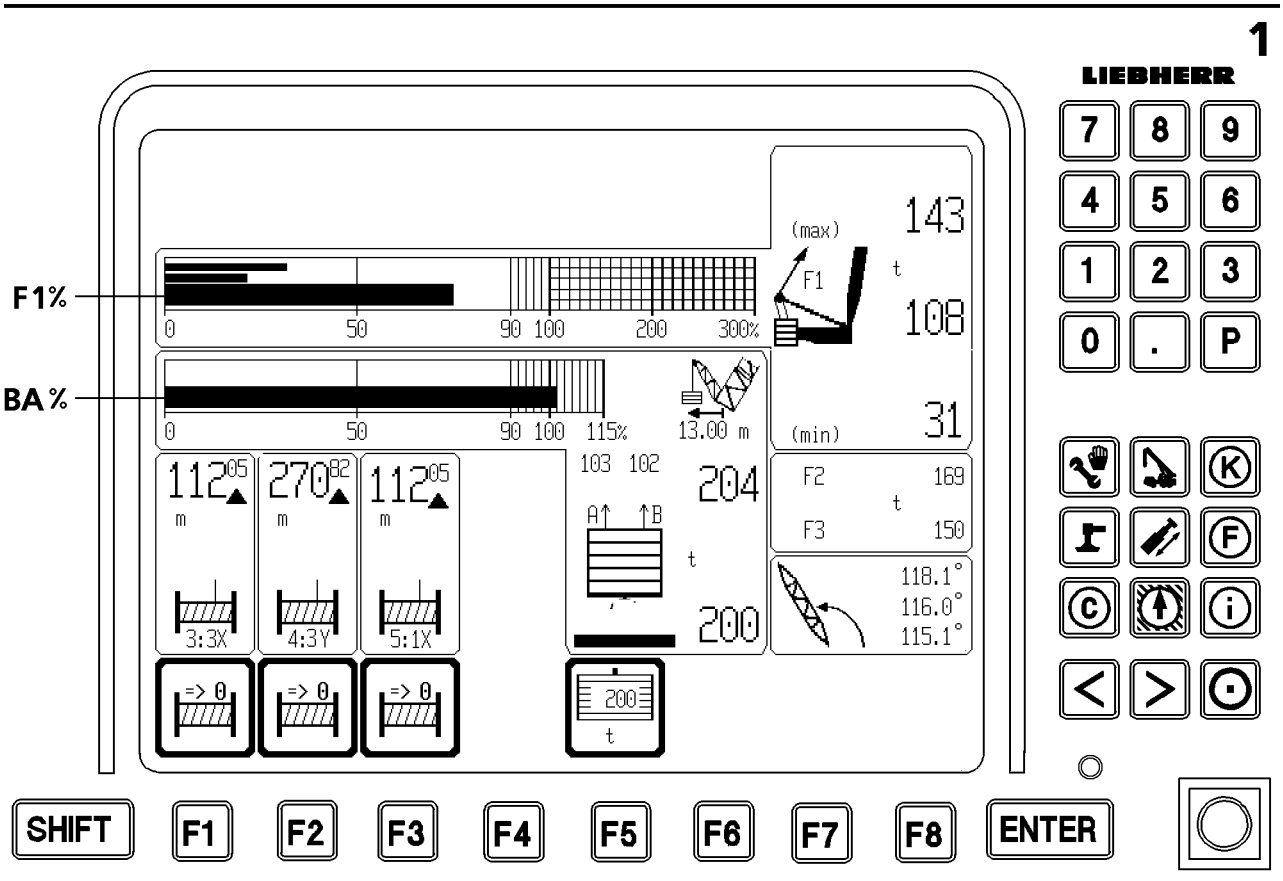
▶ Set and confirm the load chart for the upcoming crane operation on the LICCON monitor.
▶ Set and confirm the weight of the actually placed derrick ballast on the LICCON monitor.

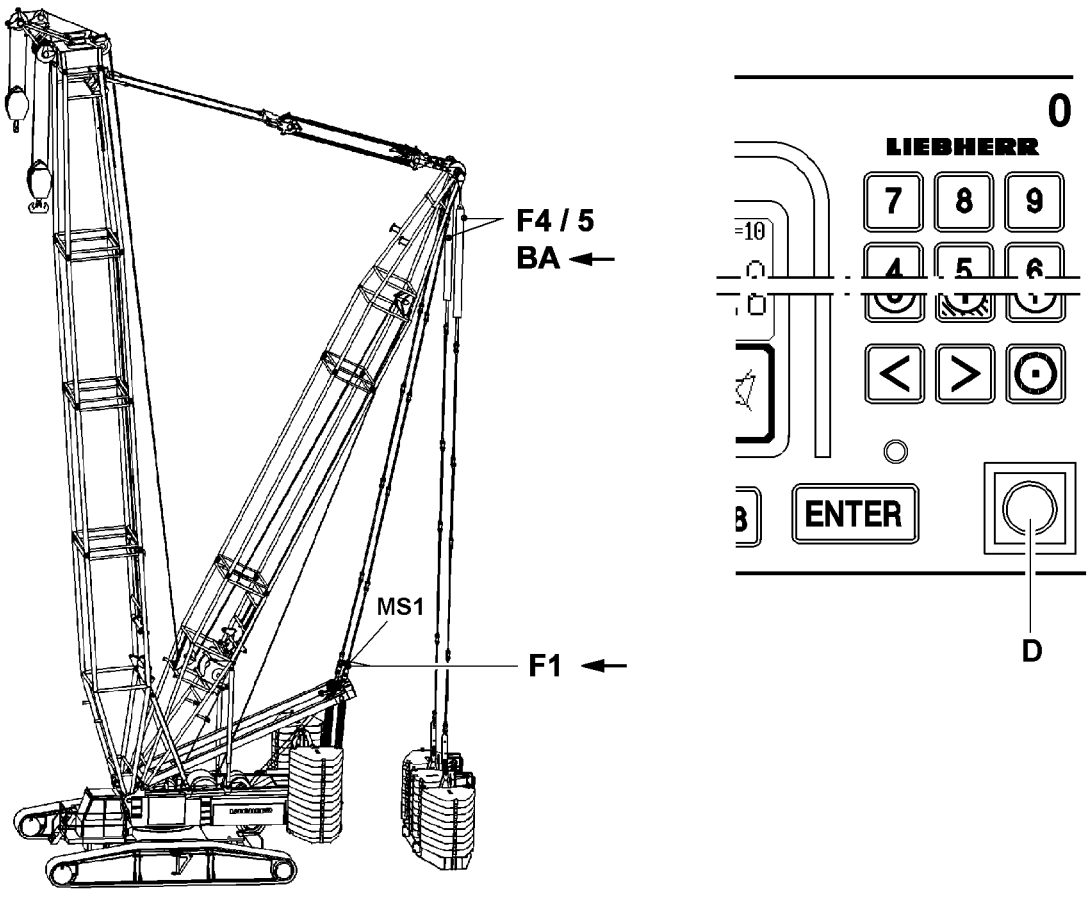
Note
▶ To set the derrick ballast, see Crane operating instructions, chapter 4.03!
▶ The required derrick ballast must be recorded according to the data in the load chart or by the crane job planner!

WARNING
The crane can topple over!
An incorrect entry of the derrick ballast weight can result in dangerous operational situations!
▶ The set derrick ballast must match the actually placed derrick ballast!

▶ Compare the set derrick ballast against the actual derrick ballast!

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6.2 Crane operation

Note

▶ For crane operation with derrick ballast, the data in the Crane operating instructions, chapter 4.02 must be observed and adhered to!

WARNING

The crane can topple over!

The jerky execution / braking of turning maneuvers can cause the load or suspended derrick ballast to swing!

This can lead to severe property damages or cause the crane to topple over!

Personnel can be severely injured or killed!

▶ There may be no persons, objects or obstacles within the slewing range of the derrick ballast!

▶ During the turn, a guide must monitor the boom, derrick boom and derrick ballast for any danger of collision.

▶ When turning with a load and suspended derrick ballast, the turning movement must be initiated or slowed down extremely carefully!

▶ Do not lift derrick ballast more than 250 mm from the ground!

Note

▶ If the suspended derrick ballast has to swing above any obstructions or be set down at a different level to the crane, it is possible to raise or lower the suspended derrick ballast using the pull cylinders!

WARNING

The crane can topple over!

If the derrick ballast is operated in crane operation via the control panel **-S30**, important crane data cannot be viewed on the LICCON monitor!

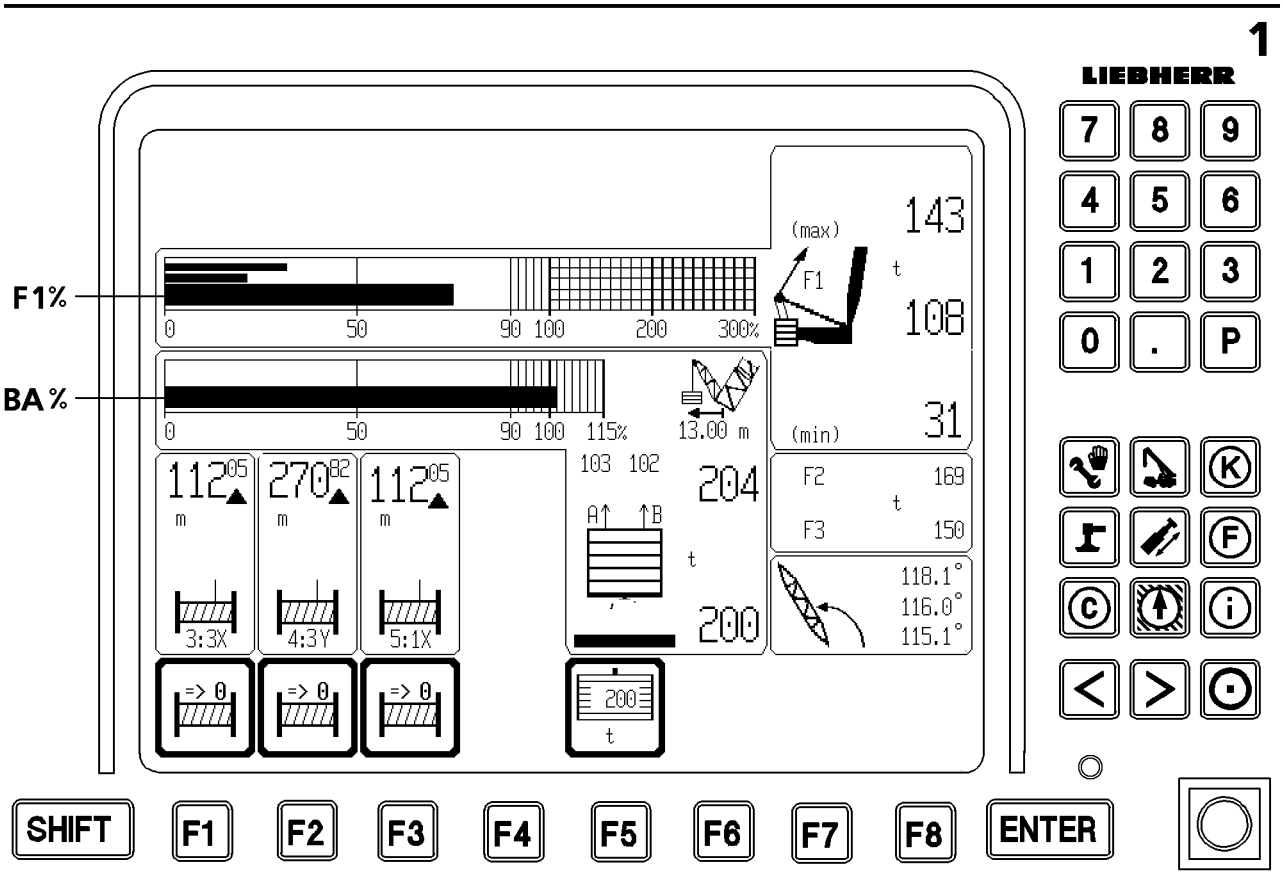
The crane can topple over and personnel can be severely injured or killed!

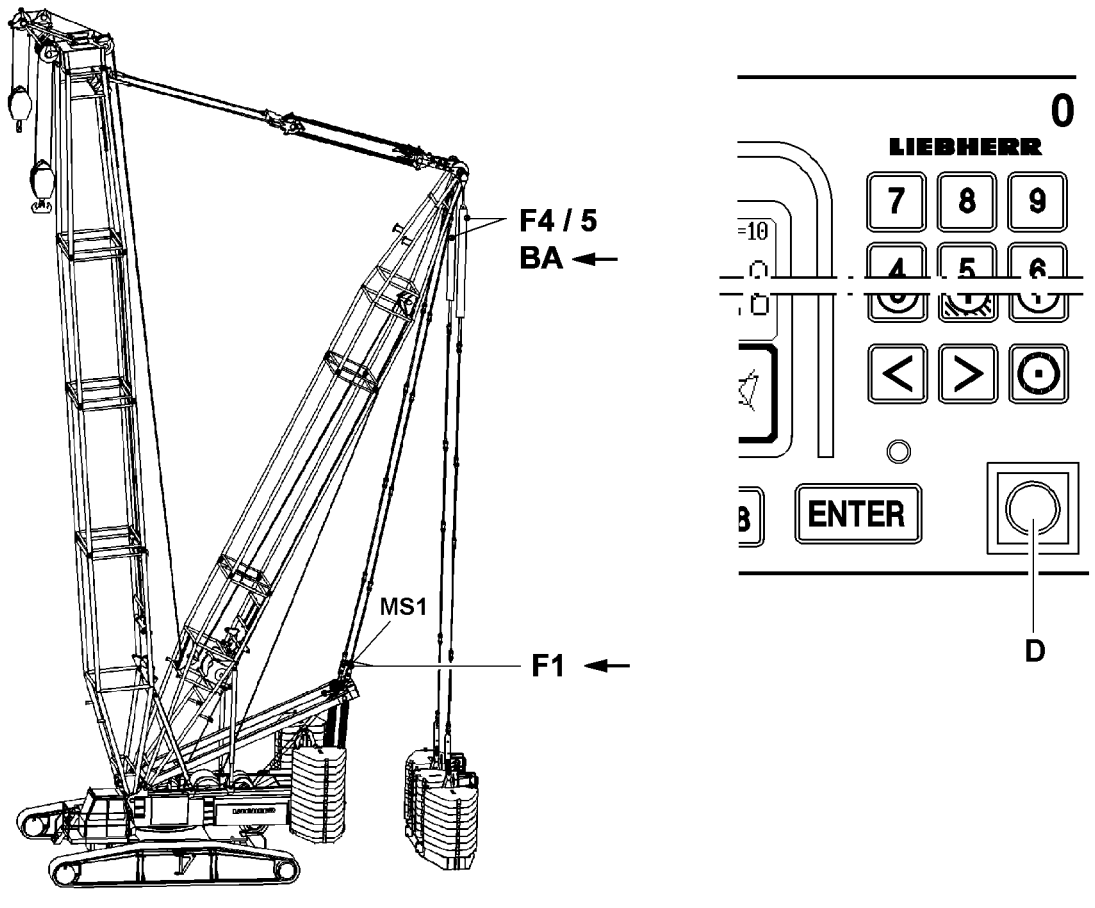
▶ It is prohibited to operate the derrick ballast in crane operation from the control panel **-S30**!

▶ The derrick ballast must always be maintained in a horizontal position when it is raised or lowered using the pull cylinders!

▶ The crane operator must ensure that the pull cylinders extend / retract uniformly!

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6.3 Determining the forces in operating modes with derrick ballast

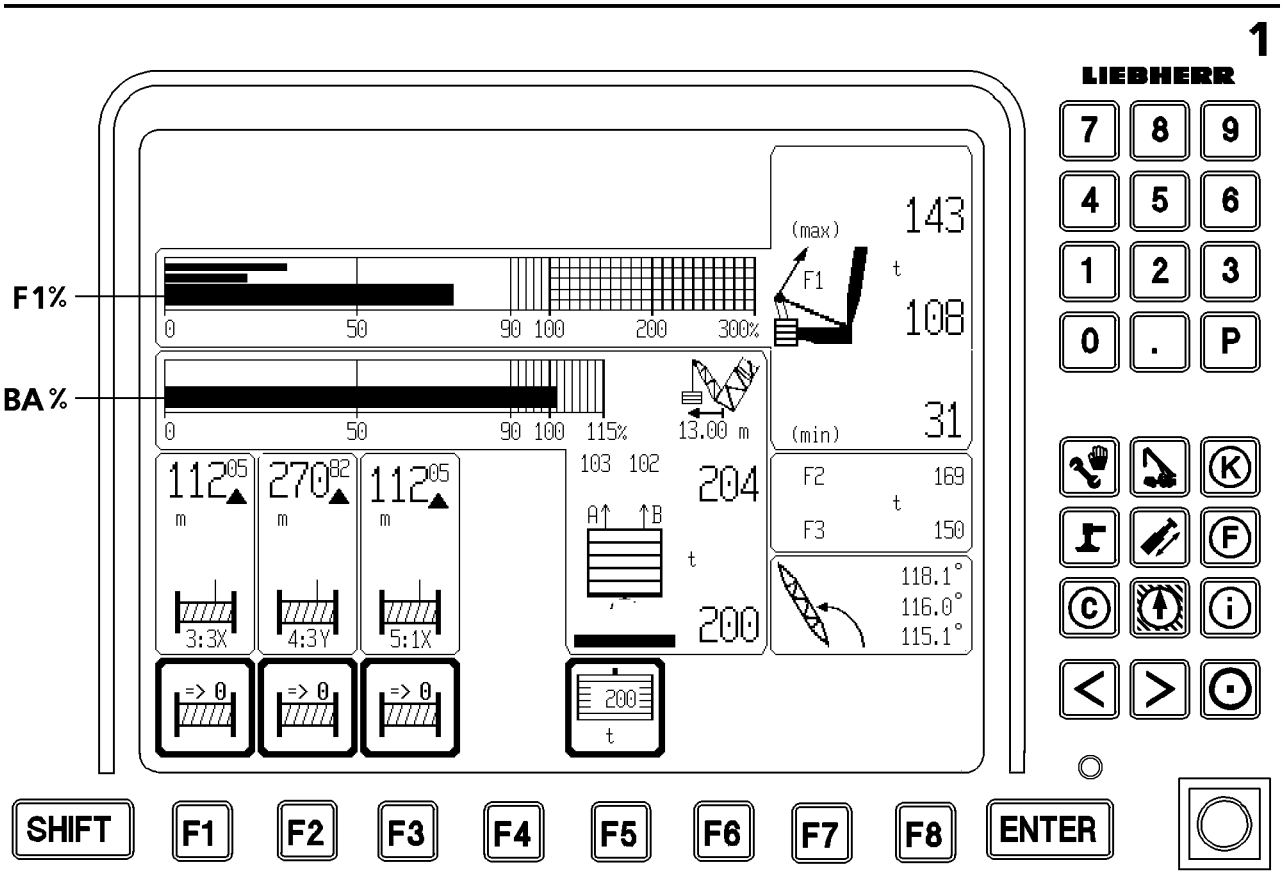
In all operating modes with derrick ballast, the load is divided between the guy rods from the derrick head to the SA-frame – test point 1 **MS1** (F1) – and to the derrick ballast **MS4/MS5**.
The load of the crane is monitored by test point 1 **MS1** (F1), in the guying from the SA-frame to the derrick head. If the force becomes too high, then all movements, which increase the load momentum are turned off.
The force distribution can change due to the following procedures:

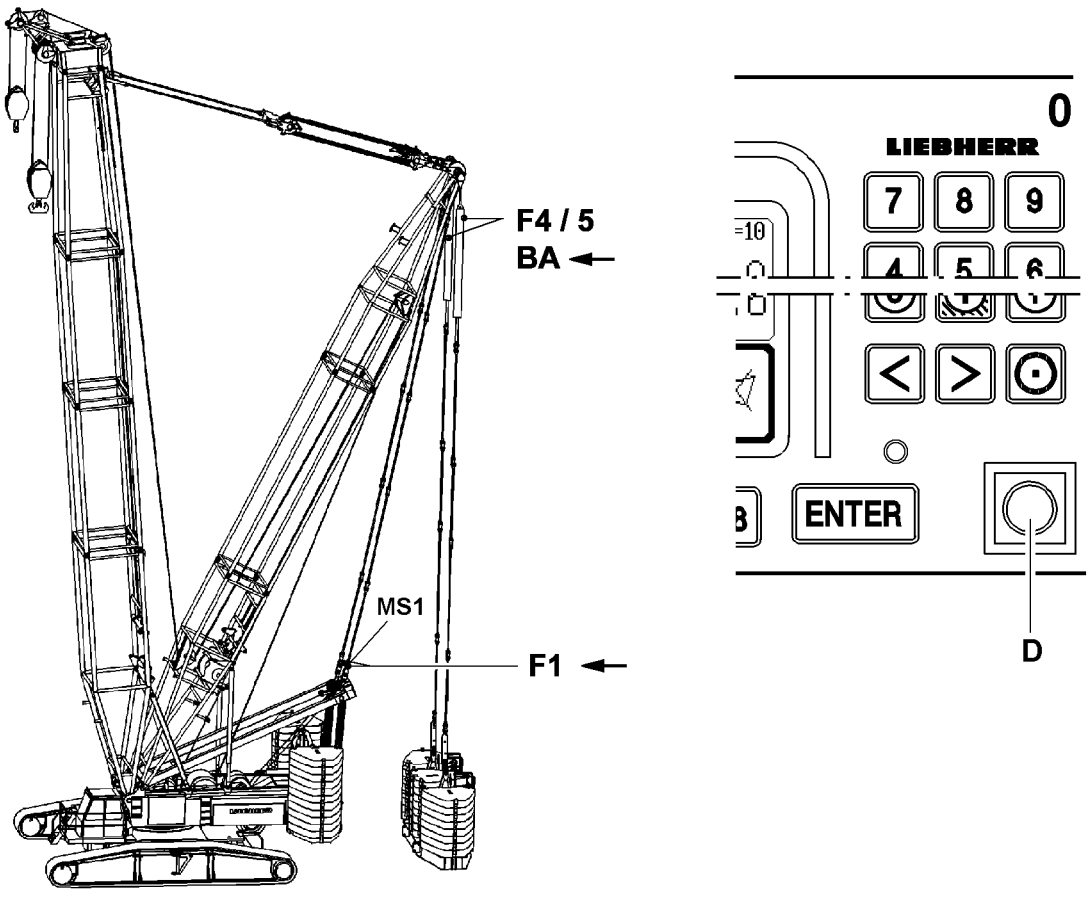
– Taking on the load: By flexing of the turntable
– By raising or lowering the derrick ballast with the pull cylinders
– by ballasting the derrick ballast plates on or off

WARNING
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!

– Make sure that there are no persons, objects or obstacles within the slewing range of the crane, ballast trailer, suspended derrick ballast and load.
– When picking up the load, **make sure** to avoid diagonal pull, i.e. the derrick ballast, the center of rotation of the turntable and the load must be in one line! To ensure this, operate the cylinder to lift and set down the derrick ballast (ballast pallet) before adding any ballast plates.

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6.4 Monitoring of minimum force F1

If more than fifty percent of the set derrick ballast is drawn (ballast utilization bar shows a ballast utilization of greater than fifty percent) and if the minimum force F1-min **MS1** (F1) is too low, if all load moment increasing crane movements are switched off.

DANGER
The crane can topple over!
- ▶ It is prohibited to let the minimum force F1-min **MS1** (F1) fall below if more than 50 % of the derrick ballast is pulled. If this is not observed, guying without force from test point 1 **MS1** (F1) and “derrick ballast on the ground” by increasing the load torque of the derrick ballast suddenly by lifting from the ground!
- ▶ Simultaneously, the boom system can move suddenly forward!
- ▶ This causes the load to swing strongly!
- ▶ The crane can topple over and personnel can be severely injured or killed!

If more than ninety percent of the set derrick ballast is drawn (ballast utilization bar shows a ballast utilization of greater than ninety percent) and if the minimum force F1-min **MS1** (F1) is too low, if all load moment increasing crane movements are switched off. The hoist gear “down” movement is also turned off.

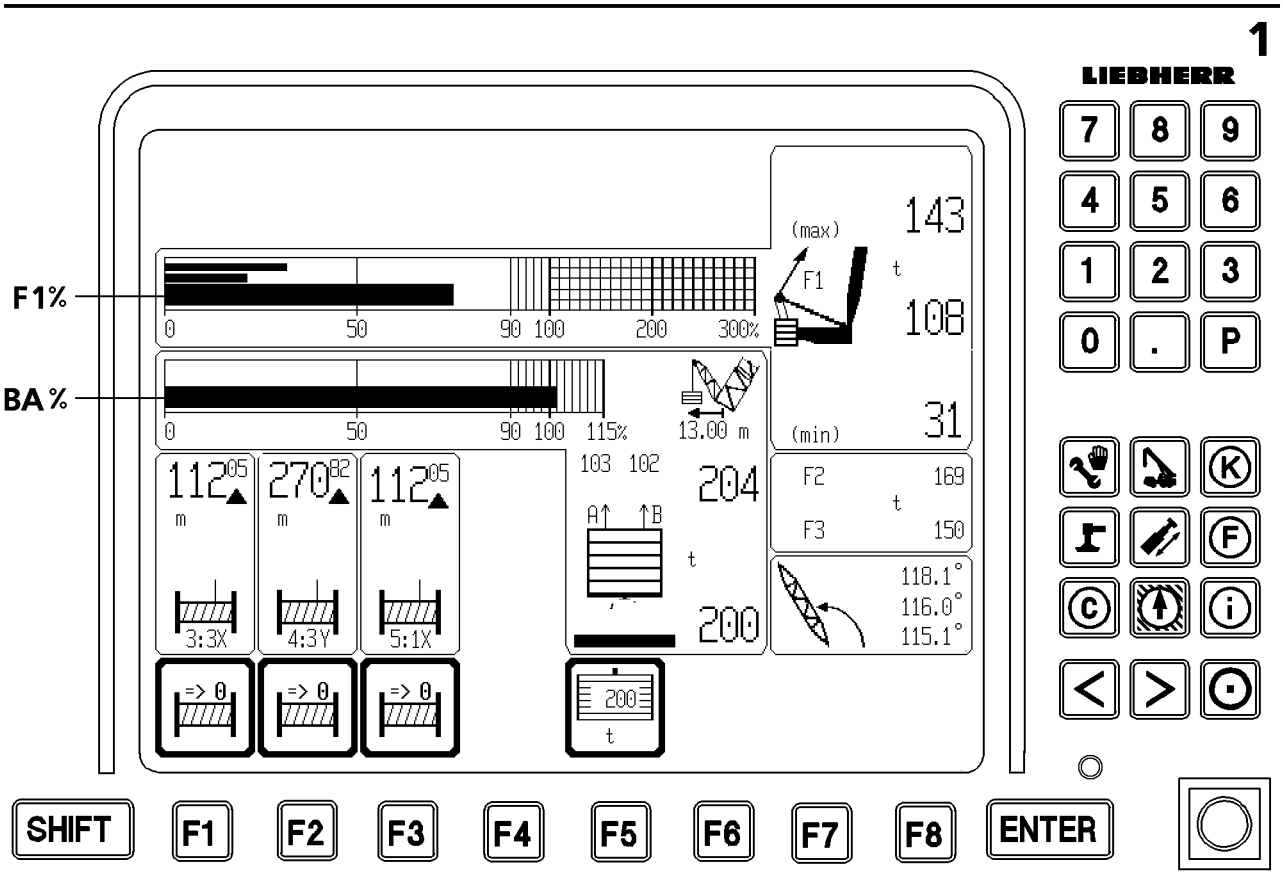
DANGER
The crane can topple over!
- ▶ It is prohibited to fall below the minimum force F1 min **MS1** (F1) if more than 90 % of the derrick ballast is pulled. If this is not observed,the slack guying from measuring point **MS1** (F1) and the “suspended derrick ballast”, drops by reducing the load torque of the derrick ballast suddenly to the ground, and the boom system suddenly lurches backward!
- ▶ Thereby the relapse cylinders can be pressed on block and be overloaded!
- ▶ The relapse cylinders on the boom and derrick may become damaged!
- ▶ This causes the load to swing strongly!
- ▶ The crane can topple over and personnel can be severely injured or killed!

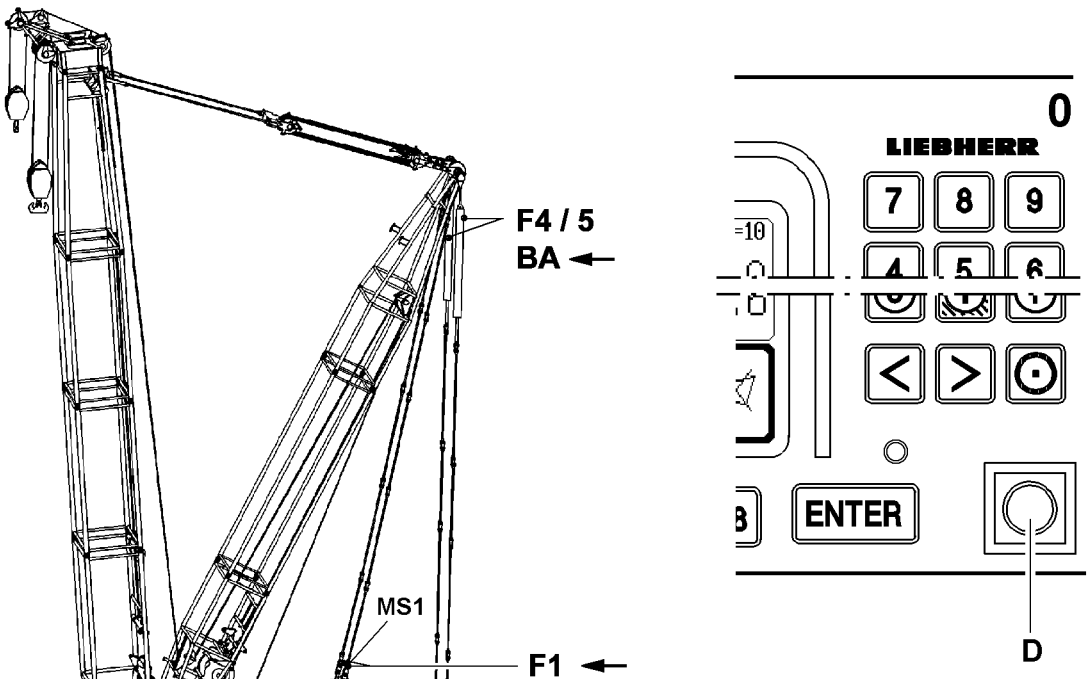
This danger condition can only be overcome :
– By lowering the suspended derrick ballast to the ground using the pull cylinders

or:
– Ballast plates are unloaded in order to reduce the derrick ballast utilization and to increase the load at test point 1 **MS1** (F1)

DANGER
The crane can topple over!
Due to deliberate improper use of the set up key **D**, the crane can collapse, the boom can break off or the crane can topple over!
Personnel can be severely injured or killed!
- ▶ The crane operator must have understood the function and effects of an actuation before actuating the set up key **D**, see Crane operating instructions, chapter 4.20!

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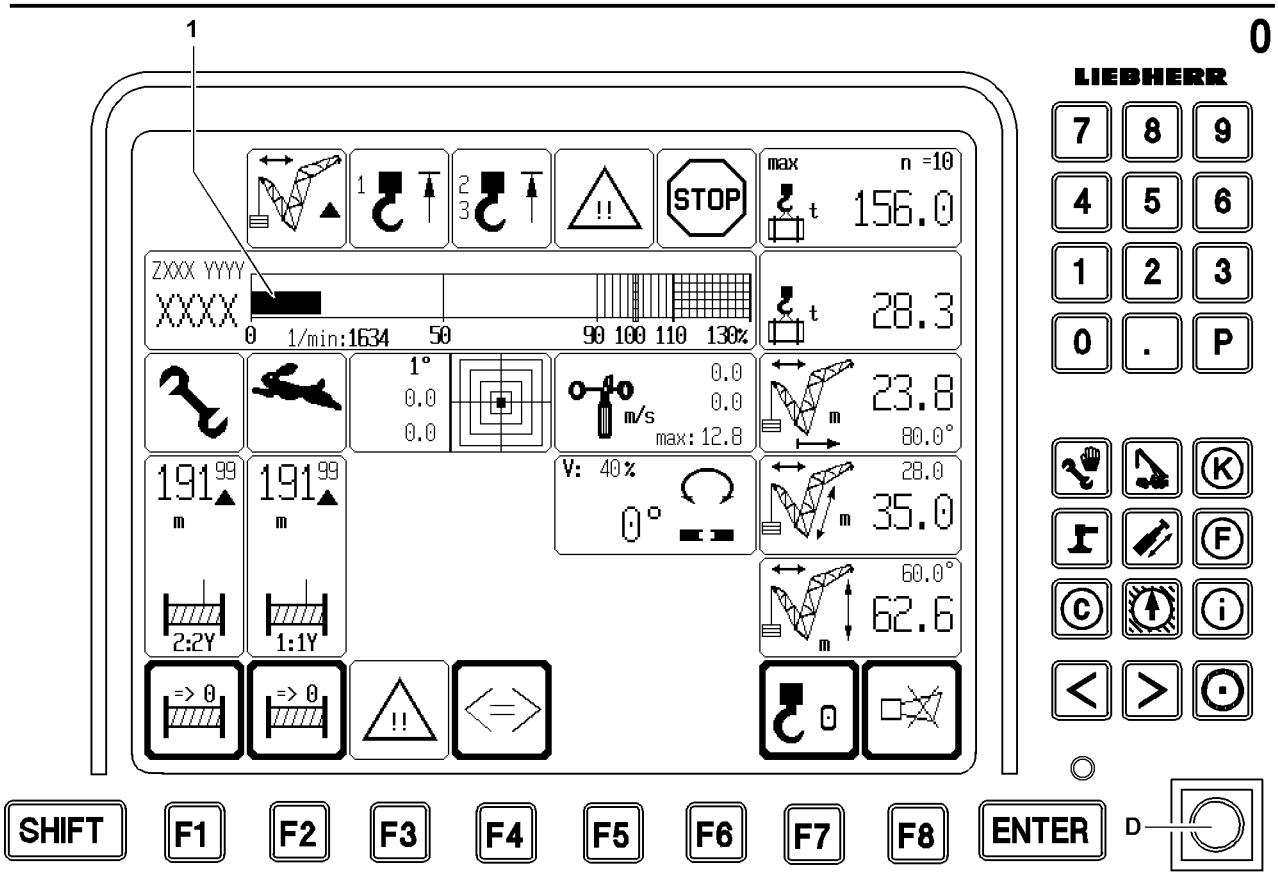
6.5 Force F1 (Test point 1) between guying SA-frame - Derrick end section

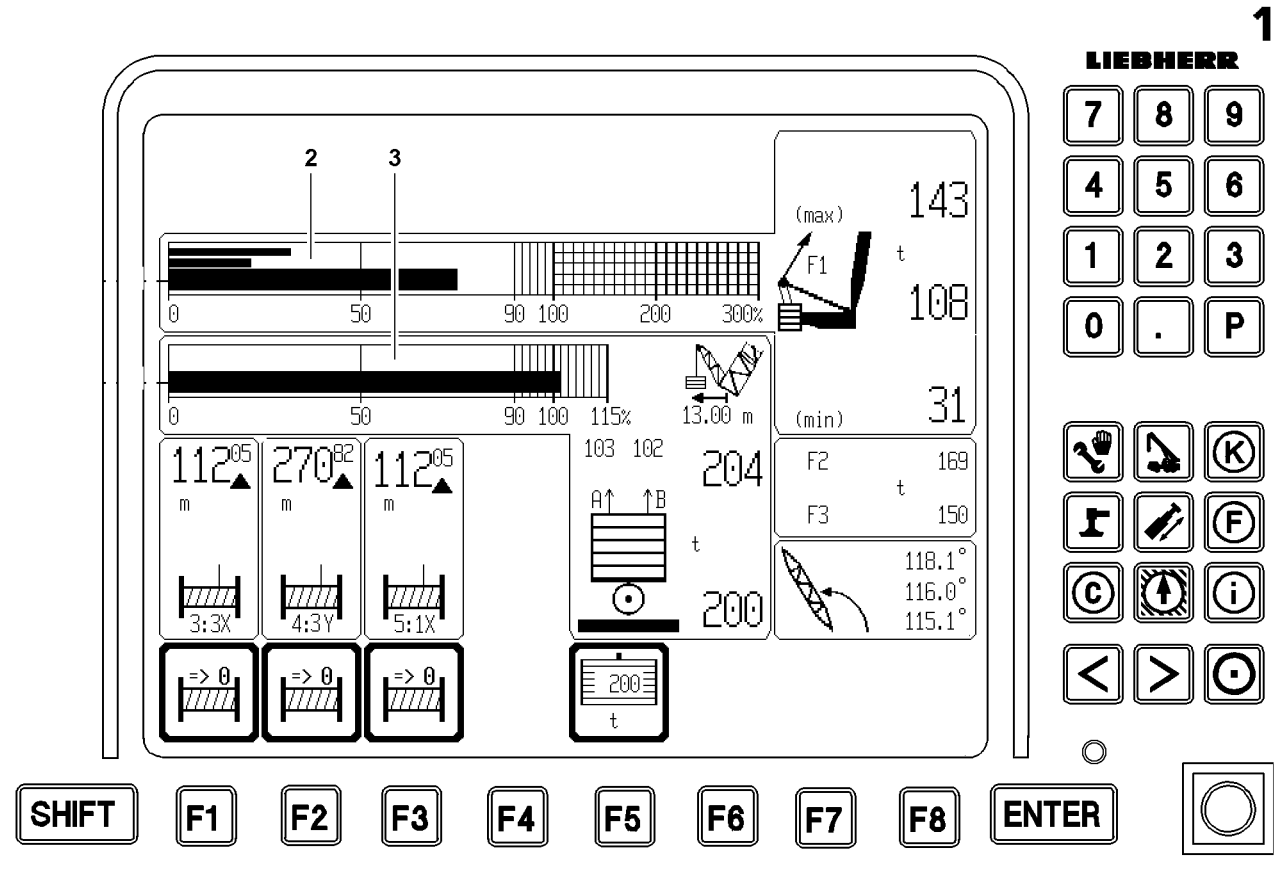
The force F1 **MS1** is determined in the guy rods from the SA-frame to the derrick head via 2 force test boxes and is shown on the LICCON monitor as total force of the guying.
From the operating force F1 and the force F1-operational maximum force results the F1 utilization.
This is shown on the LICCON monitor in the utilization bar **F1** (in %).

6.6 Force F4/F5 (MS4/MS5) guying derrick ballast - Derrick end section

The forces F4 **MS4** and F5 **MS5** exert 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 three pressure sensors, which are installed on the pull cylinders and shown in the LICCON monitor as individual forces.
The pulled derrick ballast is calculated from the forces of the individual guying, which means the part of the derrick ballast pulled upward 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 in the utilization bar **BA** (in %).

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6.7 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

6.7.1 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 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

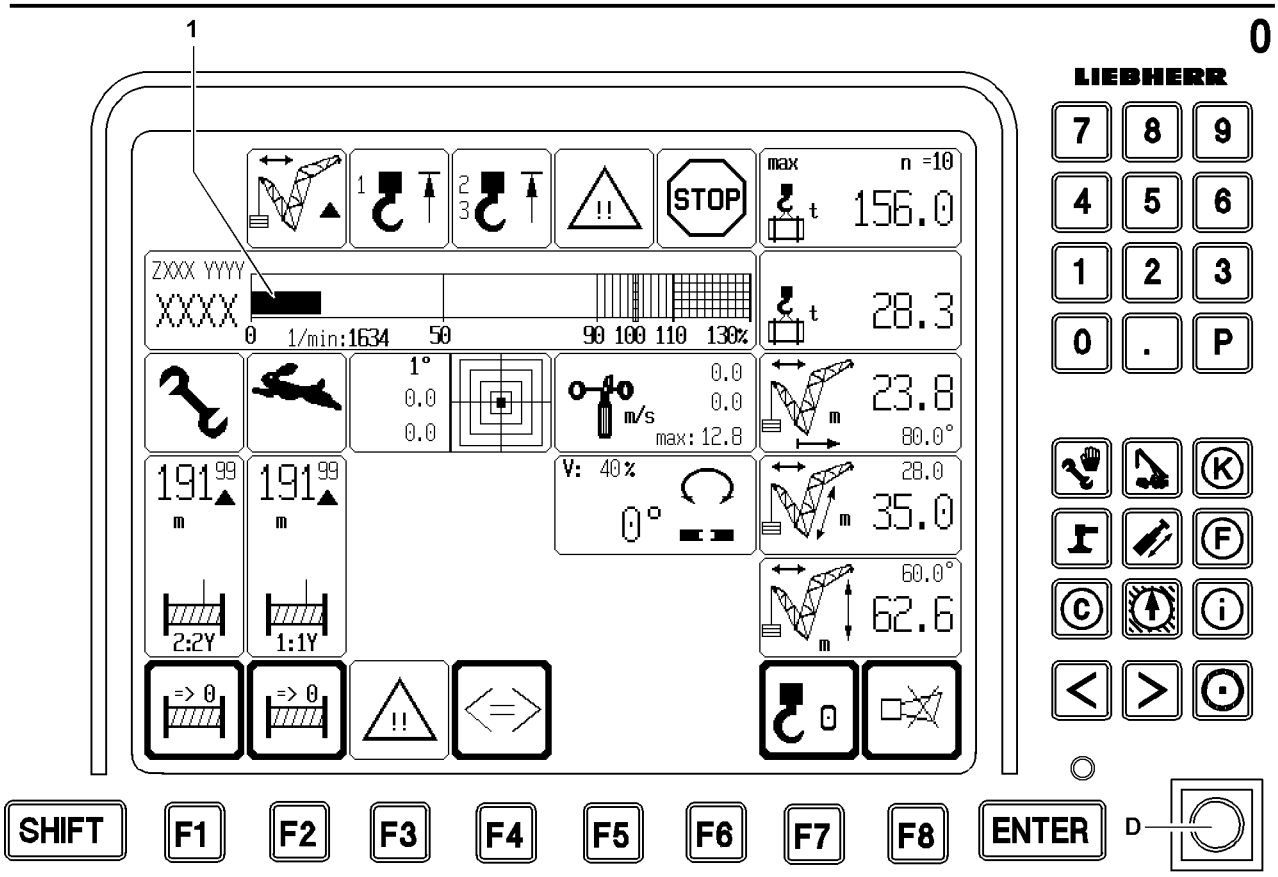
▶ The “maximum load of the current crane condition” can possibly be increased further, refer to section utilisation conditions!

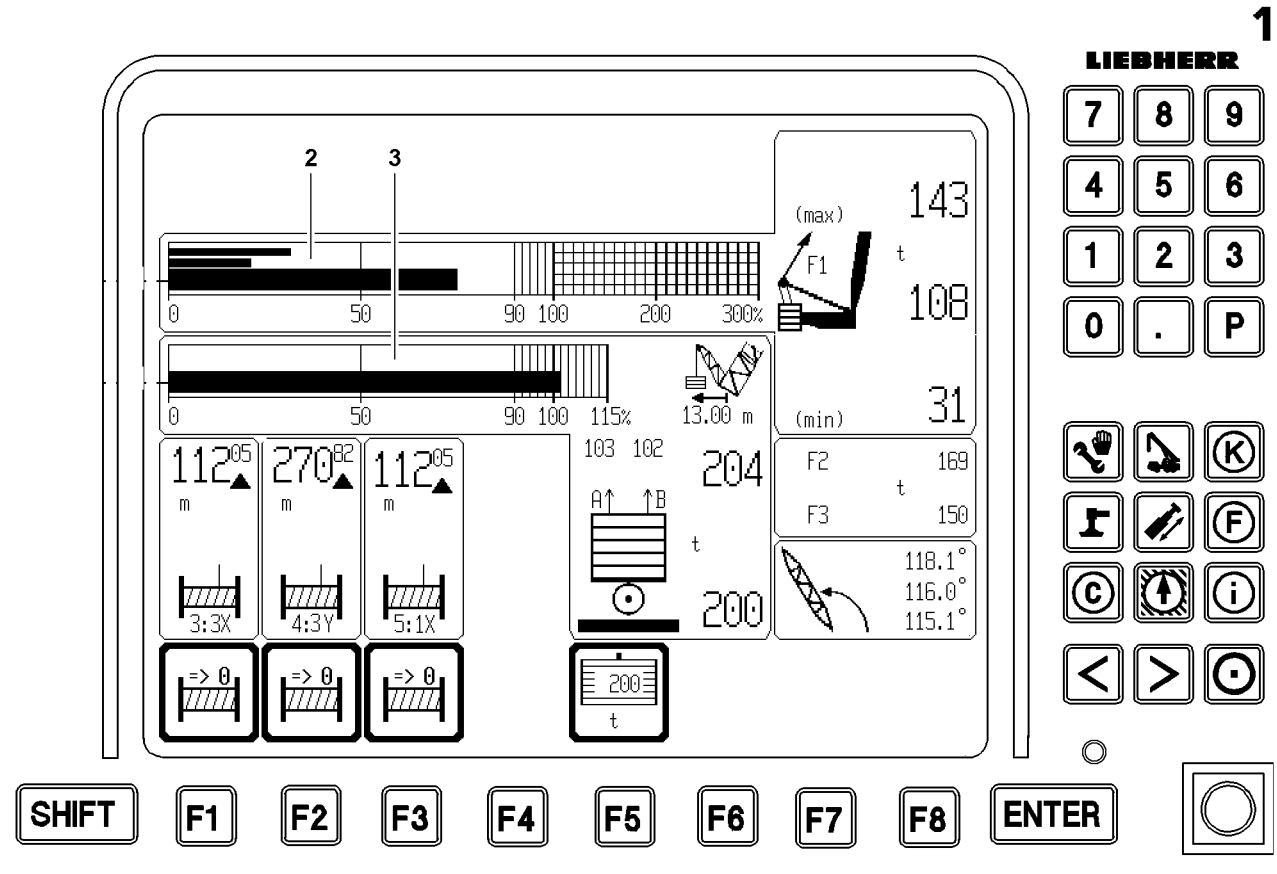
6.7.2 Monitoring of test point 1-operational maximum force (= F1 max)

It is displayed on monitor 1.
At ninety percent $F1_{max}$ -utilization **2** an advance warning is given in the form of a caution icon and a “SHORT HORN” on LICCON-Monitor 1.
At hundred percent $F1_{max}$ -shut off of all load moment increasing movements take place with the “Stop-icon” and the acoustic warning “HORN” on LICCON-Monitor 1.
If the “maximum load according to the load chart and the reeving” is not reached (utilization bar **1**), then the “maximum load of the current crane condition” can still be increased by:

– 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
– Luffing the derrick boom down and thereby increasing the derrick ballast radius, if the placed derrick ballast is still less than the optimum derrick ballast
– Increasing the derrick ballast by adding additional ballast plates if the placed ballast is still smaller than the optimum ballast

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Note

- The “test point 1-operational maximum force” (=$F1_{max}$) depends in operating modes without moveable accessories (W-luffing jib) for example SDB, SDBW-operation, not only from the equipment configuration but also from the force of the pulled ballast measured with the ballasting cylinders!
- If the pulled derrick ballast increases, the maximum permitted $F1_{max}$ removes force and vice-versa!
- Monitor and check the ballast weighing and the value for the pulled derrick ballast carefully to see if the value can even be right!

WARNING

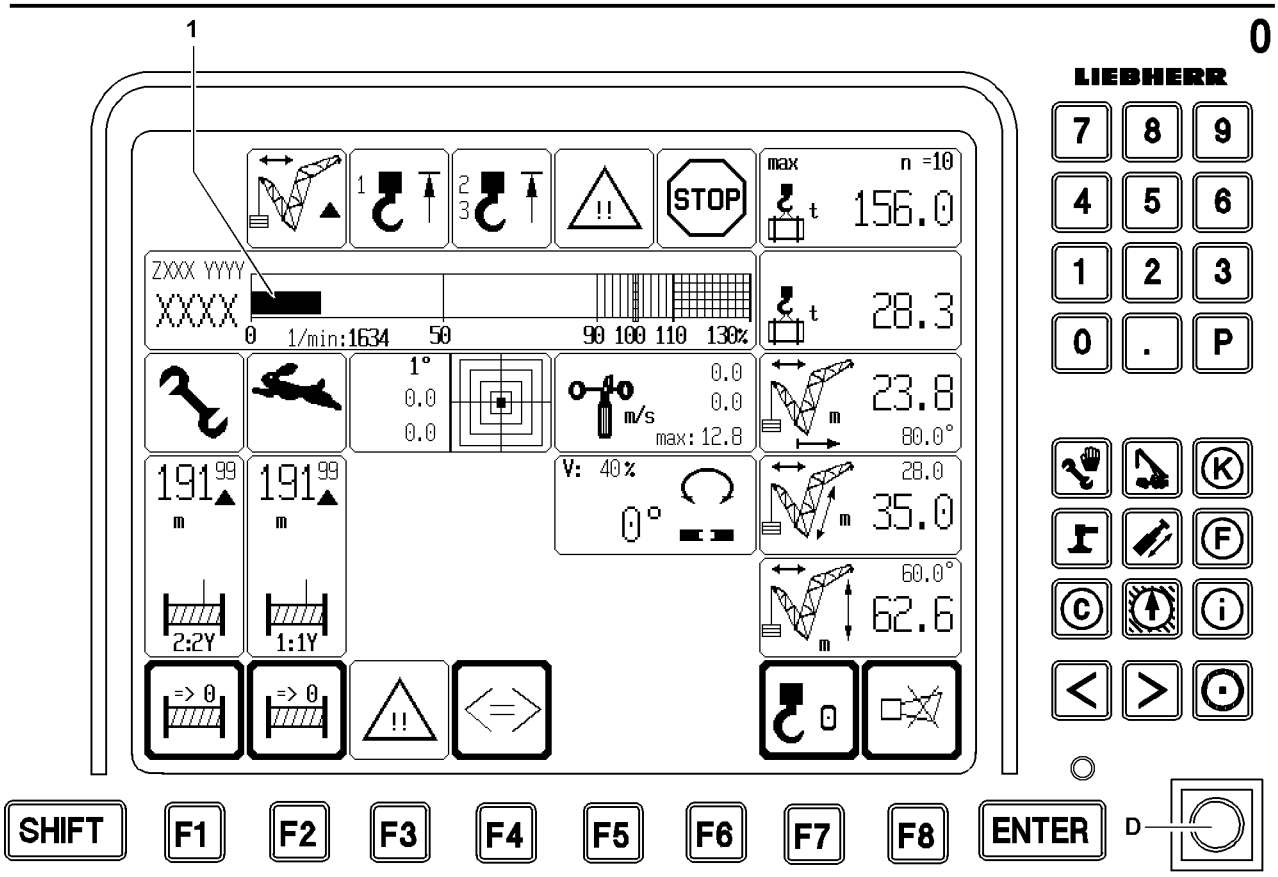
Overload of crane!

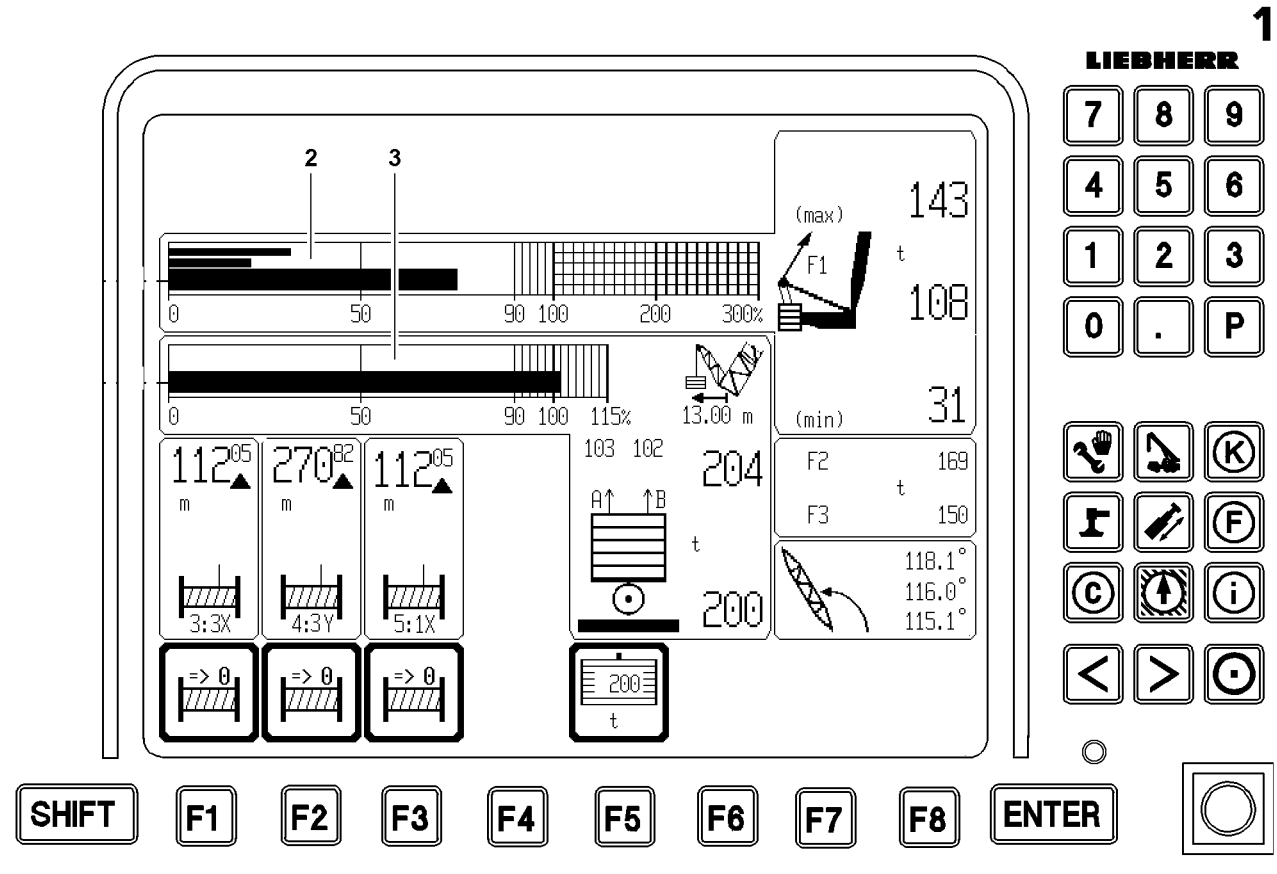
If the pulled derrick ballast value has been incorrectly determined and is too low, the calculated $F1_{max}$ may be too high and the crane could be overloaded without this becoming evident!

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

- Monitor and check the ballast weighing and the value for the pulled derrick ballast carefully to see if the value can even be right!

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6.8 Utilization conditions

The current utilization of the crane results from the load utilization bar **1** on LICCON monitor 0 and the F1-utilization bar **2** on LICCON monitor 1.

The “maximum load of the current **crane condition** ” is reached when the load utilization bar **1** has reached 100 % or when the F1- utilization bar **2** has reached 100 %.

The “maximum load of the current **crane equipment** ” is reached when the load utilization bar **1** has reached 100 % or when the F1- utilization bar **2** has reached 100 % and the derrick ballast is suspended (ballast utilization bar **3** at 100 %, if the ballast input value and the ballast weighing are correct).

The “maximum load according to the load chart and the reeving” (100 % limit of load utilization bar) and the maximum load according to $F1_{max}$ operation (100 % limit of the F1 utilization bar) can be bypassed by the following measure:

– Set up key **D** on LICCON monitor 0:
  For function and effects of the set up key **D**, see Crane operating instructions, chapter 4.20.

DANGER

The crane can topple over!

Due to deliberate improper use of the set up key **D**, the crane can collapse, the boom can break off or the crane can topple over!

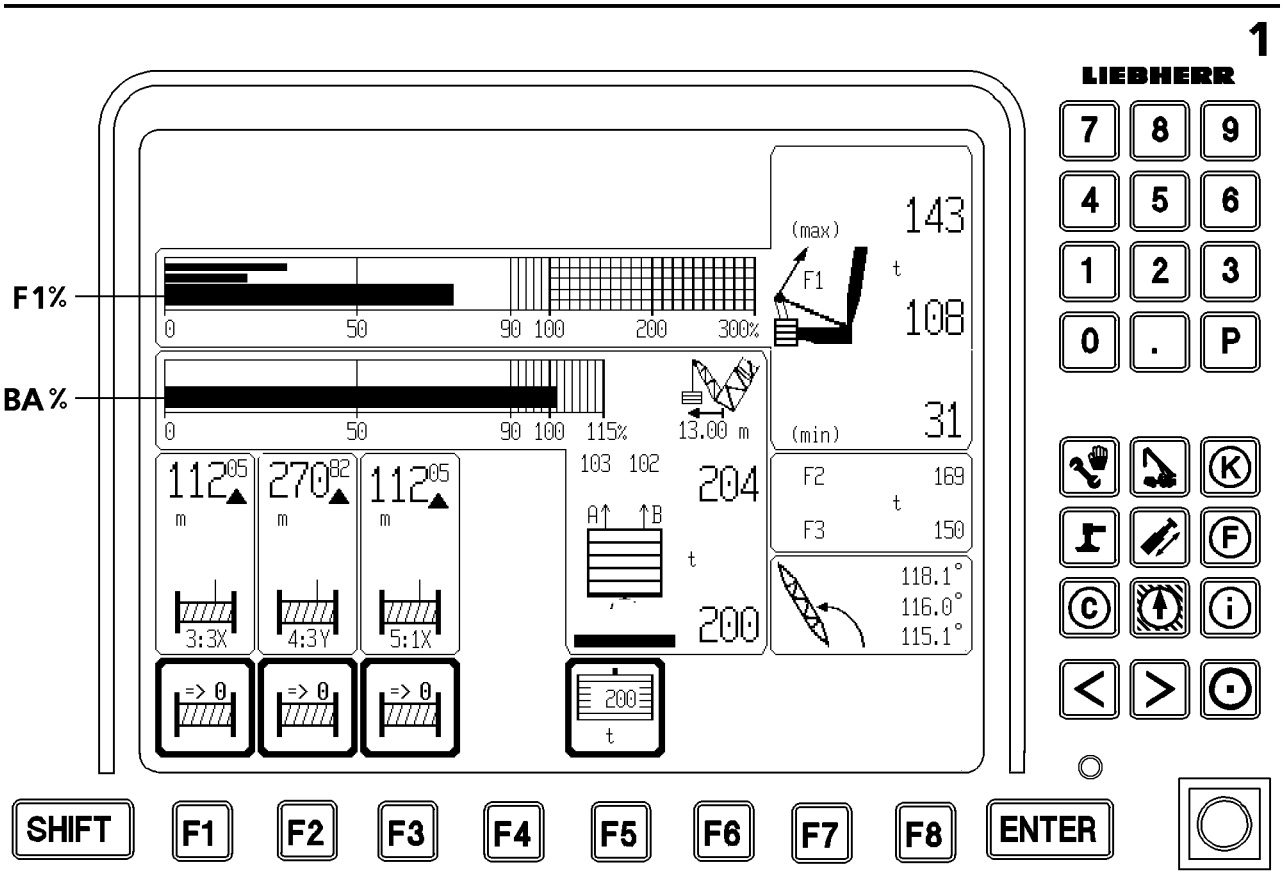
Personnel can be severely injured or killed!

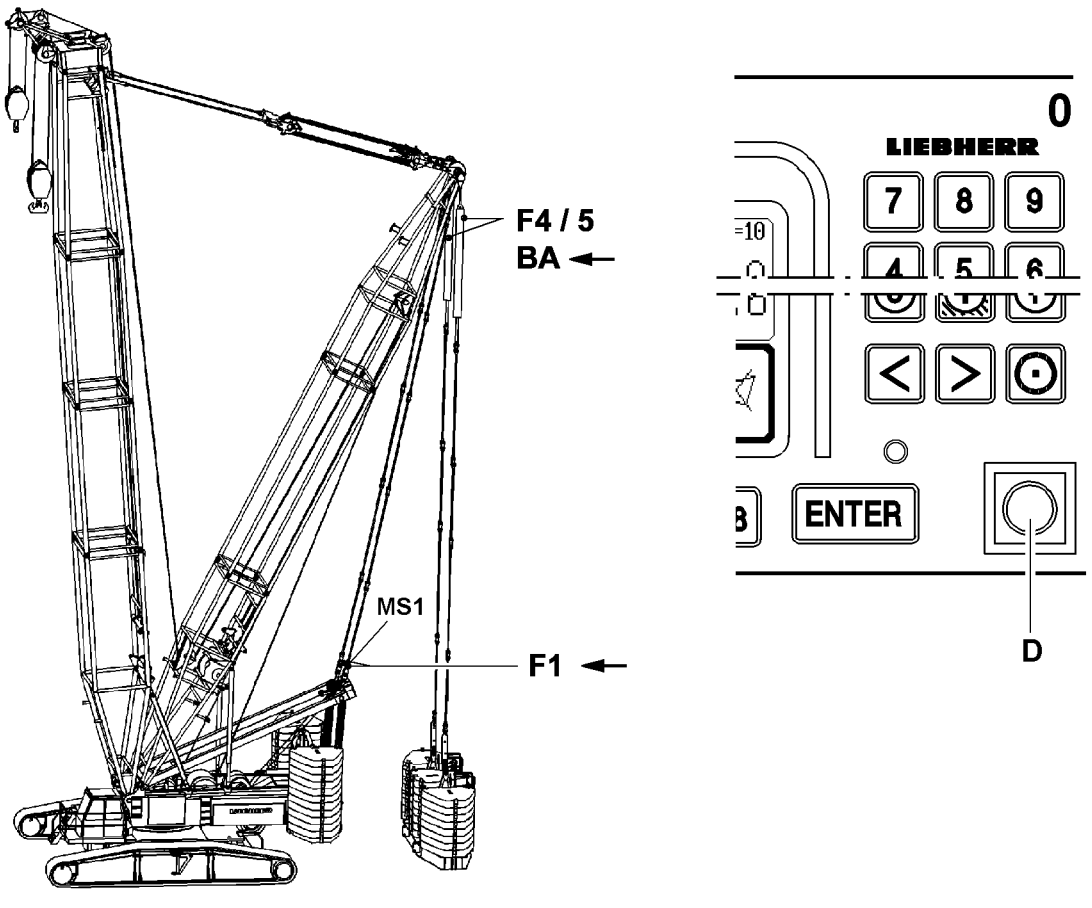
▶ The crane operator must have understood the function and effects of an actuation before actuating the set up key **D**, see Crane operating instructions, chapter 4.20!

Note

▶ The movement “raise ballast” or “lower ballast” requires utmost attention by the crane operator!

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6.9 Differential force monitoring for derrick ballast guying

In operating modes with derrick ballast, the difference between the forces on derrick guyings 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!
- ▶ The maximum permissible length difference A and B, in relation to the extension conditions on the pull cylinders, may not exceed 40 mm!

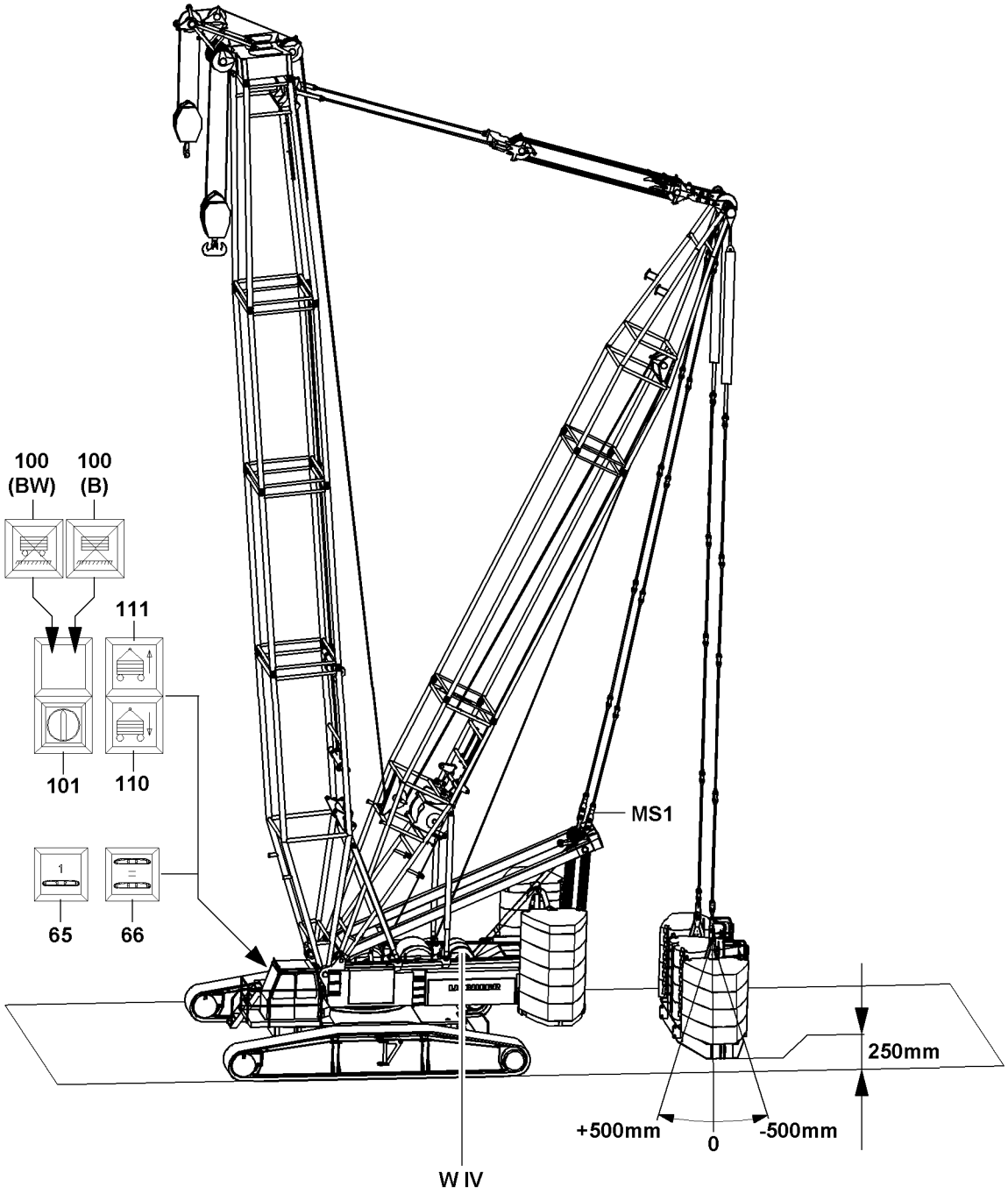
Exceeding the limit value can have the following causes:

- – Flexing on the turntable.
- – The ground under the derrick ballast is uneven.
- – The crane is leaning to one side.
- – The derrick ballast has been loaded one-sided.
- – The force measurement in one derrick ballast guying is incorrect.

The crane driver must recognize the correct cause and take countermeasures:

- – Error message appears.
- – The error, which caused the one-sided force, must be remedied.
- – In case of small ground unevenness only, the following measure is permissible:
  Lock one pull cylinder and with the other pull cylinder activate lift the derrick ballast or “lower the derrick ballast” until the difference between the forces A and B becomes 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.

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7 Crawler operation with derrick ballast

7.1 Driving the crawler

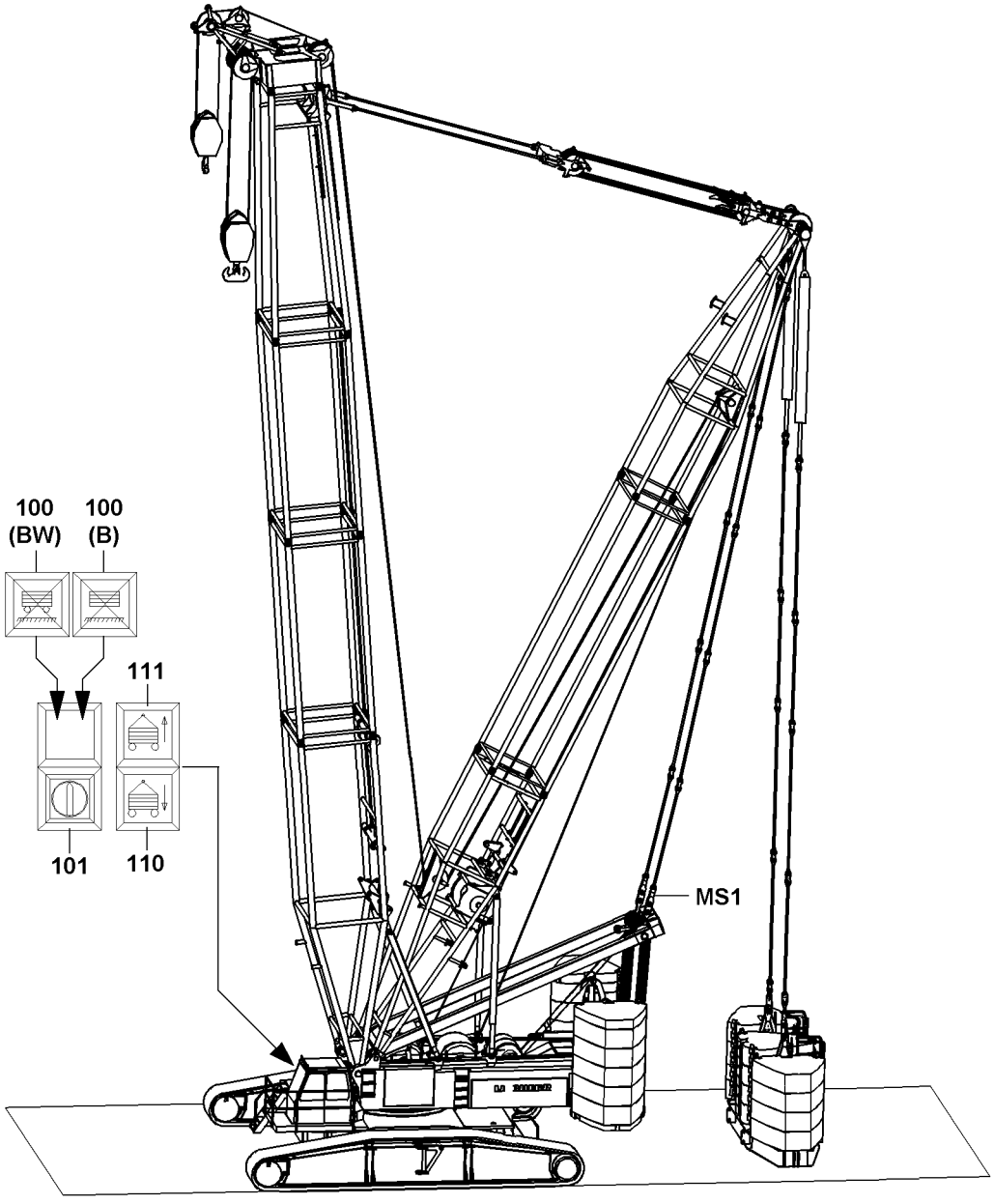
WARNING
The crane can topple over!
If the crane is driven even though the suspended ballast is still on the ground, then the crane and the ballast pallet can topple over!
Personnel can be severely injured or killed!
- ▶ Driving the crane is only permissible if the suspended ballast is completely lifted off the ground!
- ▶ Make sure, before driving the crane, that the key button **101** “Derrick ballast lifted off” is actuated and the warning light **100** in the instrument panel blinks!

Make sure that the following prerequisites are met:
- – The derrick ballast has been lifted off the ground completely.
- – The switch **65** “crawler operation” is actuated.
- – The switch **66** “Crawler parallel travel” is actuated, the indicator light in the switch lights up.
- – The key button **101** “Derrick ballast lifted off” is actuated.
- – The warning light **100** “Derrick ballast lifted off” in the instrument panel blinks.
- – The derrick ballast icon on LICCON monitor 1 is shown in 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 described danger notes, see Crane operating instructions, chapter 4.10 must be observed and adhered to!
- ▶ The release for driving the crawler is issued when the key button **101** “Derrick ballast lifted off” is actuated!

DANGER
Risk of accident!
If the following conditions are not observed, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ The ground is sufficiently load bearing to safely take on the weight of the crane - including load and suspended ballast!
- ▶ There are no persons or objects in the danger zone!
- ▶ The travel range must be monitored by cameras or a supervisor!
- ▶ Only drive at the lowest possible speed!
- ▶ Avoid jerky driving movements!
- ▶ The attached load and suspended derrick ballast must be secured to prevent it from swinging! If the derrick ballast swings by more than ±0.5 m, set the derrick ballast quickly on the ground with the pull cylinders! Hereby, the upper load threshold on test point 1 **MS1** 1 (F1) may not be exceeded!
- ▶ Steering maneuvers are prohibited!
- ▶ Uphill or downhill travel is prohibited!

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8 Disassembly

WARNING
Danger of crushing!
During disassembly, hands can be crushed or even severed due to swing movements of the components!
▶ Make sure that the components do not swing back and forth during disassembly!

Make sure 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 placement surface for the derrick ballast must be level, horizontal and of sufficient load bearing capacity, otherwise the ballast stacks can tip over!
Personnel can be severely injured or killed!
▶ Check the horizontal position of the crane during the set down procedure!
▶ Check the horizontal position of the derrick ballast during the set down procedure!
▶ Constantly check the differential forces in the 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!

8.1 Setting the ballast pallet down

Make sure that the following prerequisite is met:
– A guide or crane operator must monitor the setting down of the derrick ballast and the load.

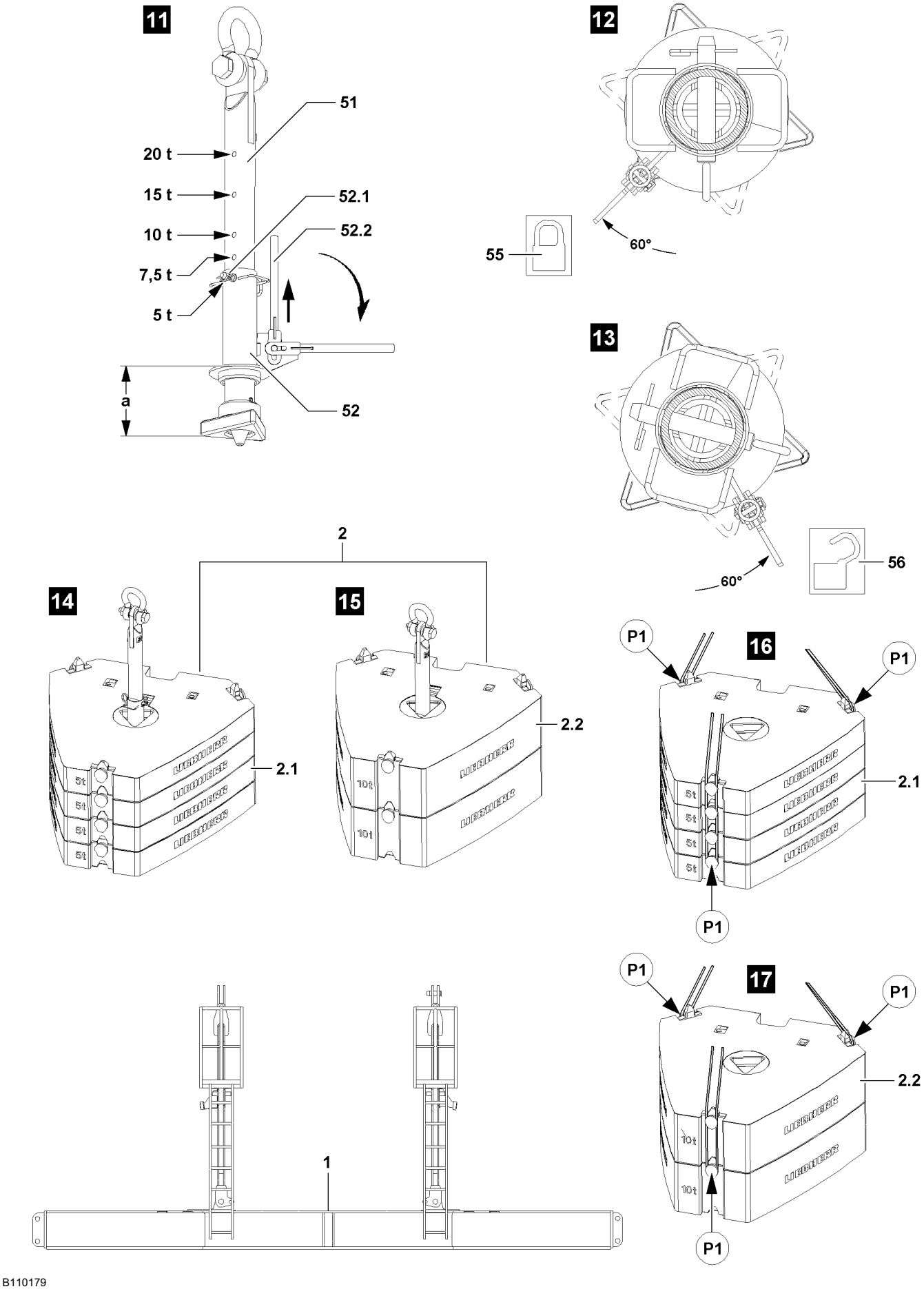
▶ Press the button **110**.

Result:
– The piston rods of the pull cylinders move out.
– The derrick ballast is lowered.

▶ When the derrick ballast is completely set down onto the ground:
Press button **100** “Derrick ballast lifted off” in the instrument panel.

Result:
– Operating mode “Derrick ballast lifted off” is deactivated.
– The warning light in button **100** “Derrick ballast lifted off” turns off.

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8.2 Removing the ballast plates

WARNING
The crane can topple over!
If the following specifications 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 off must be level and have adequate load-bearing capacity!
- ▶ Remove the ballast plates always symmetrically, in reference to the longitudinal axis!
- ▶ Replace damaged ballast plates immediately with new ballast plates!

WARNING
Suspended ballasting!
If the following specifications are not observed for suspended ballasting, then the ballast pallet can tip over and the ballast stacks can fall down!
Personnel can be severely injured or killed!
- ▶ The sequence how the ballast plates must be removed from the ballast pallet in suspended condition must be observed!
- ▶ Ballast the outer ballast stack off alternately - with a maximum permissible difference of 10.0 t!

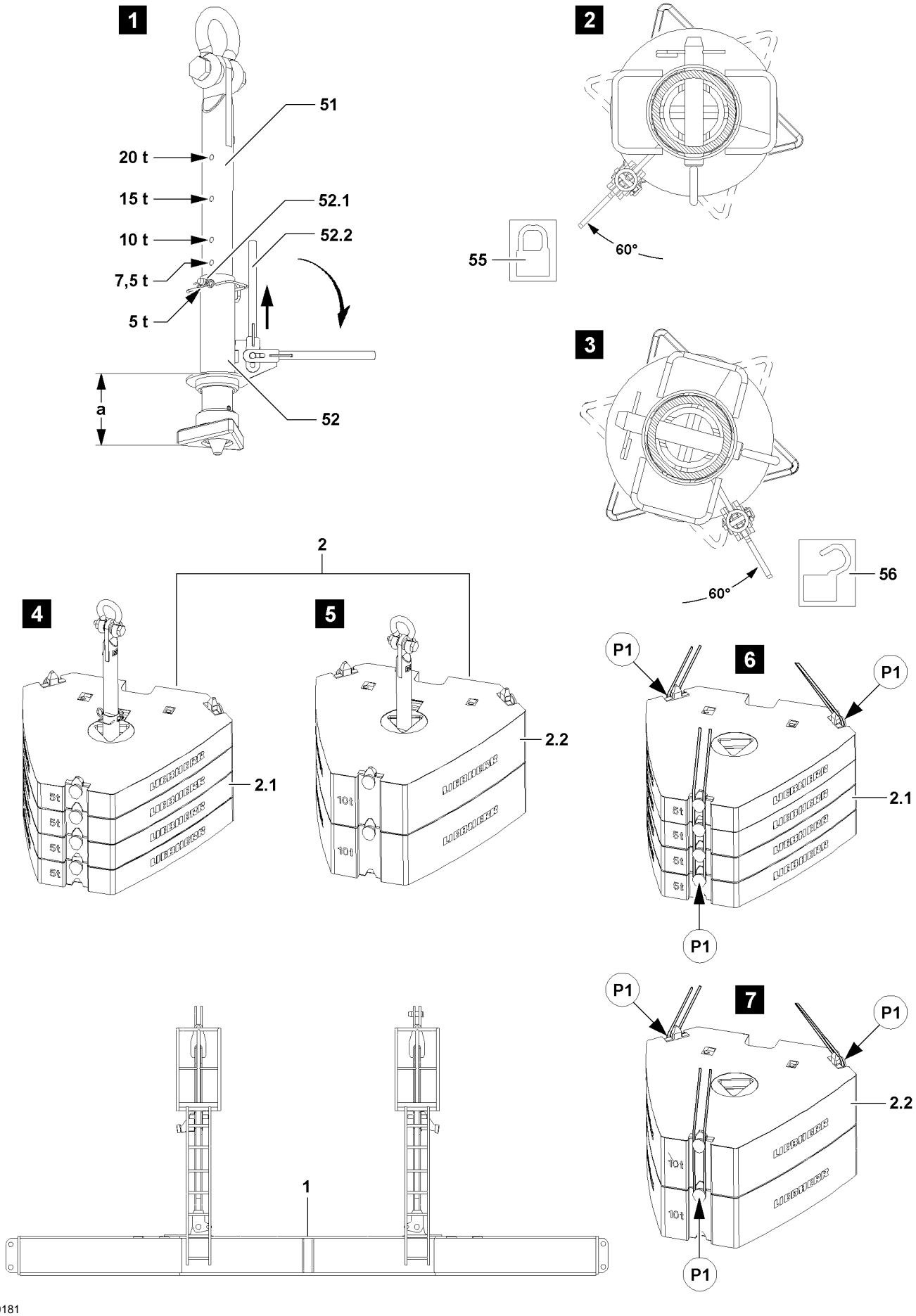
When the outer ballast stacks are completely removed:
- ▶ Remove the center ballast stack!

Make sure that the following prerequisite is met:
– The retaining chains are removed.

Note
- ▶ The ballast plates are marked with their own weights!

Note
- ▶ If the ballast pallet is standing completely on the ground during ballasting off, then the ballast assemblies of 20 t can already be removed at the start!

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8.2.1 Removing the ballast plates, fastening system: “Twistlock”

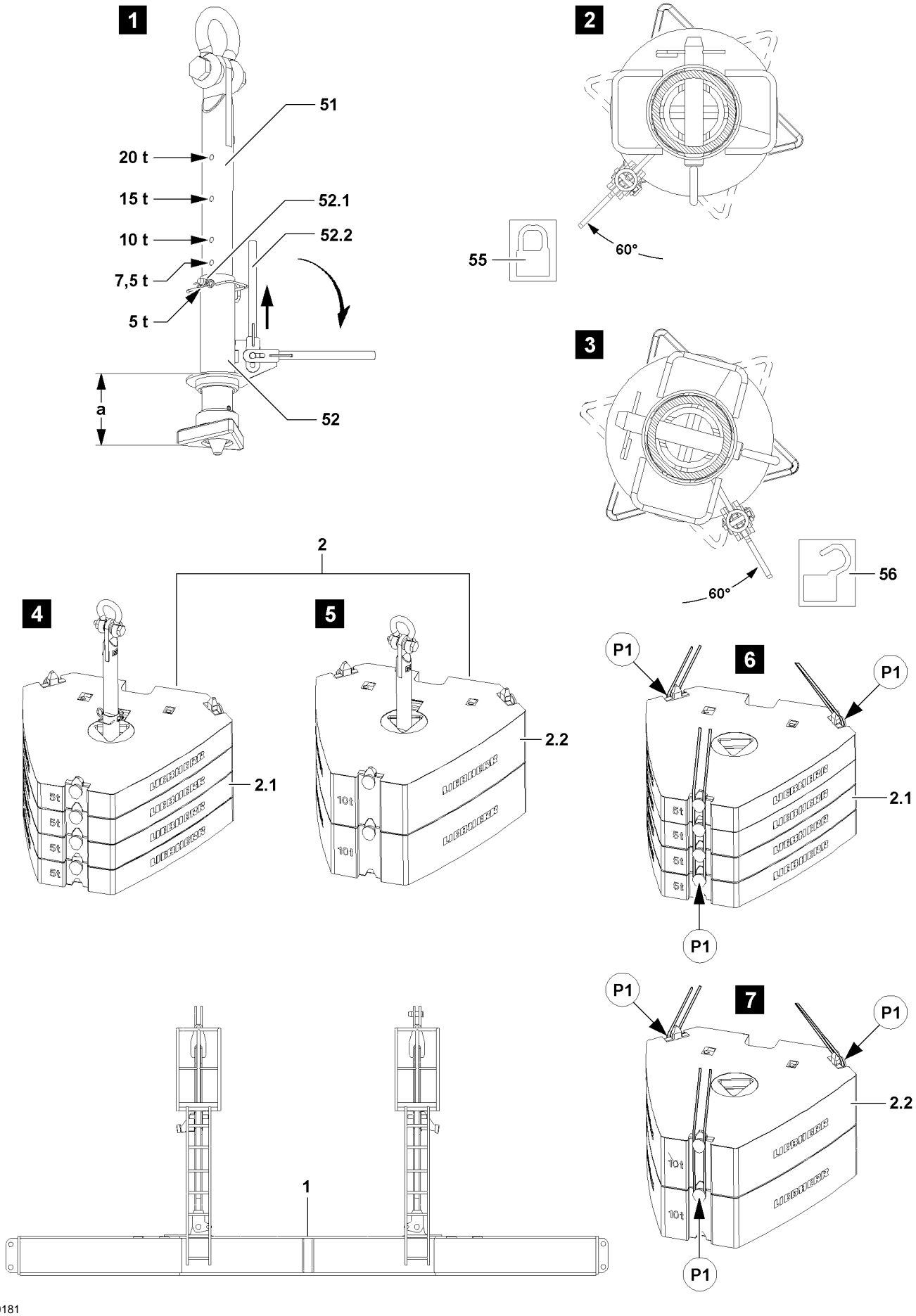
WARNING
Overload of receptacle stud and ballast plates!
If more than the permissible number of ballast plates are lifted with the receptacle stud **51**, the receptacle stud **51** and the ballast plates can be overloaded and damaged!
The ballast plates can fall down!
Personnel can be severely injured or killed!
▶ Observe the section “Permissible ballast assemblies” in this chapter!

WARNING
Damage of receptacle stud and ballast plates!
If two ballast plates are lifted which do not lay correctly in their centerings, the receptacle stud **51** and the ballast plates can be damaged!
Damage can cause the ballast plates to fall down!
Personnel can be severely injured or killed!
▶ Make sure that the ballast plates to be lifted are placed correctly in the centerings!

WARNING
The twist lock system opens by itself!
If the receptacle stud **51** is not correctly locked, the Twist lock system can open by itself!
The ballast plates can fall down!
Personnel can be severely injured or killed!
▶ Make sure, when initiating a lift, that the lever **52.2** points directly on the symbol “Locked” **55** of the ballast plates **2**!

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

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Before the receptacle stud **51** is guided into the ballast plate(s), it must be ensured that the insertion length **a** of the receptacle stud **51** is set correctly.
The insertion length **a** of the receptacle stud can be adjusted by hand.

- ▶ If the insertion length **a** of the receptacle stud **51** is to be adjusted:
  Release and unpin the pins **52.1**.
- ▶ Adjust the insertion length **a** by moving the guide sleeve **52** to the desired insertion length **a**, observe the stages in illustration **11**.
- ▶ Insert and secure pin **52.1**.

Result:

– The receptacle stud **51** is adjusted.

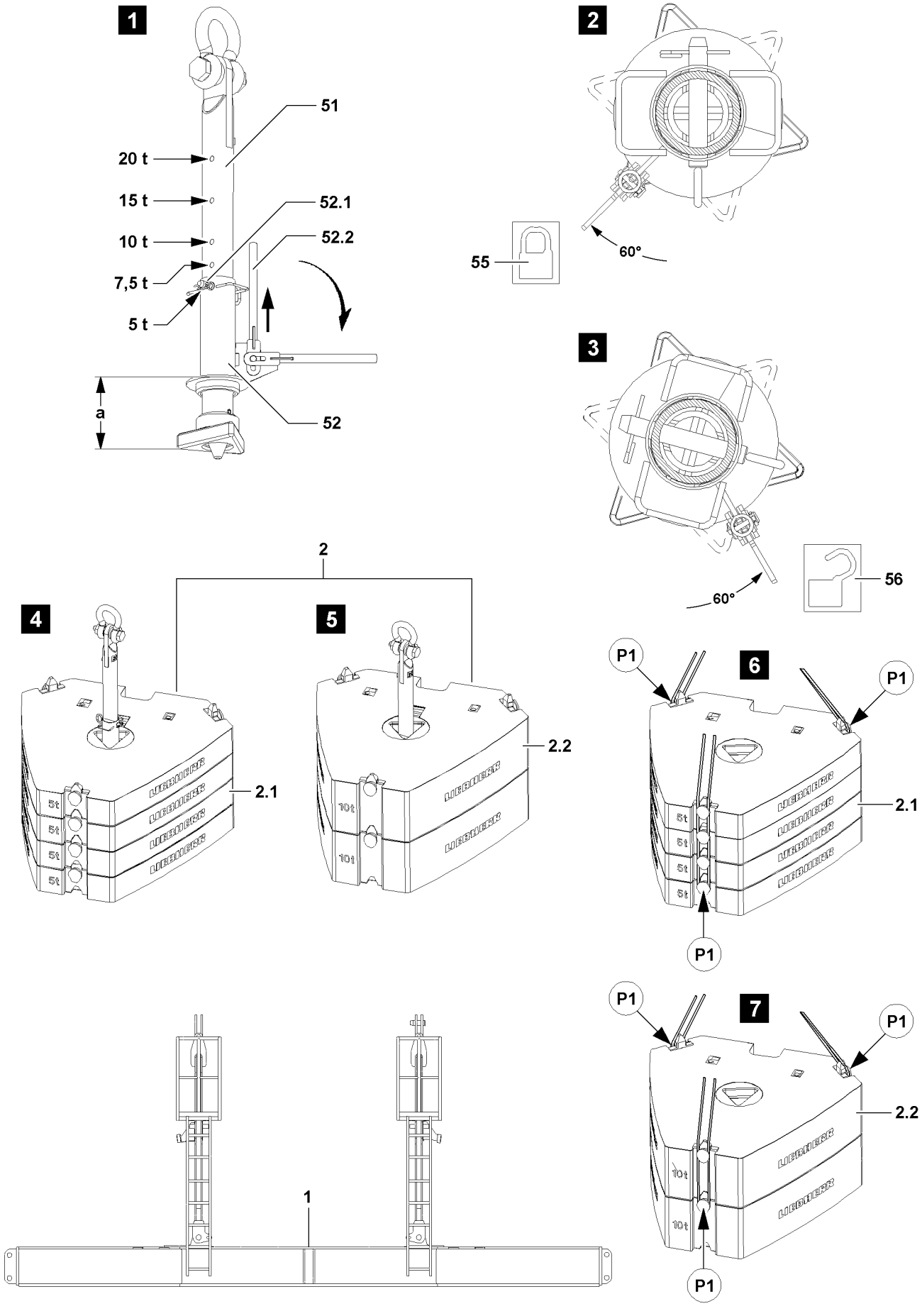
- ▶ Attach the receptacle stud **51** on the auxiliary crane and guide it into the ballast plate(s).
- ▶ Pull the lever **52.2** up and fold it down.
- ▶ Turn the receptacle stud **51** with the lever **52.2** by 60° until it points to the symbol “Locked” **55** of the ballast plate, see illustration **2**.
- ▶ Lift the ballast plate(s) or the ballast assembly with the receptacle stud **51** and place it carefully on the centerings on the ballast pallet or on another ballast plate in the ballast assembly.
- ▶ When the ballast plates are placed down:
  Turn the receptacle stud **51** with the lever **52.2** by 60° to the stop in direction of the symbol “unlocked” **56** of the ballast plate, see illustration **3**.

Result:

– The receptacle stud **51** is unlocked.

- ▶ Carefully pull out the receptacle stud **51**.

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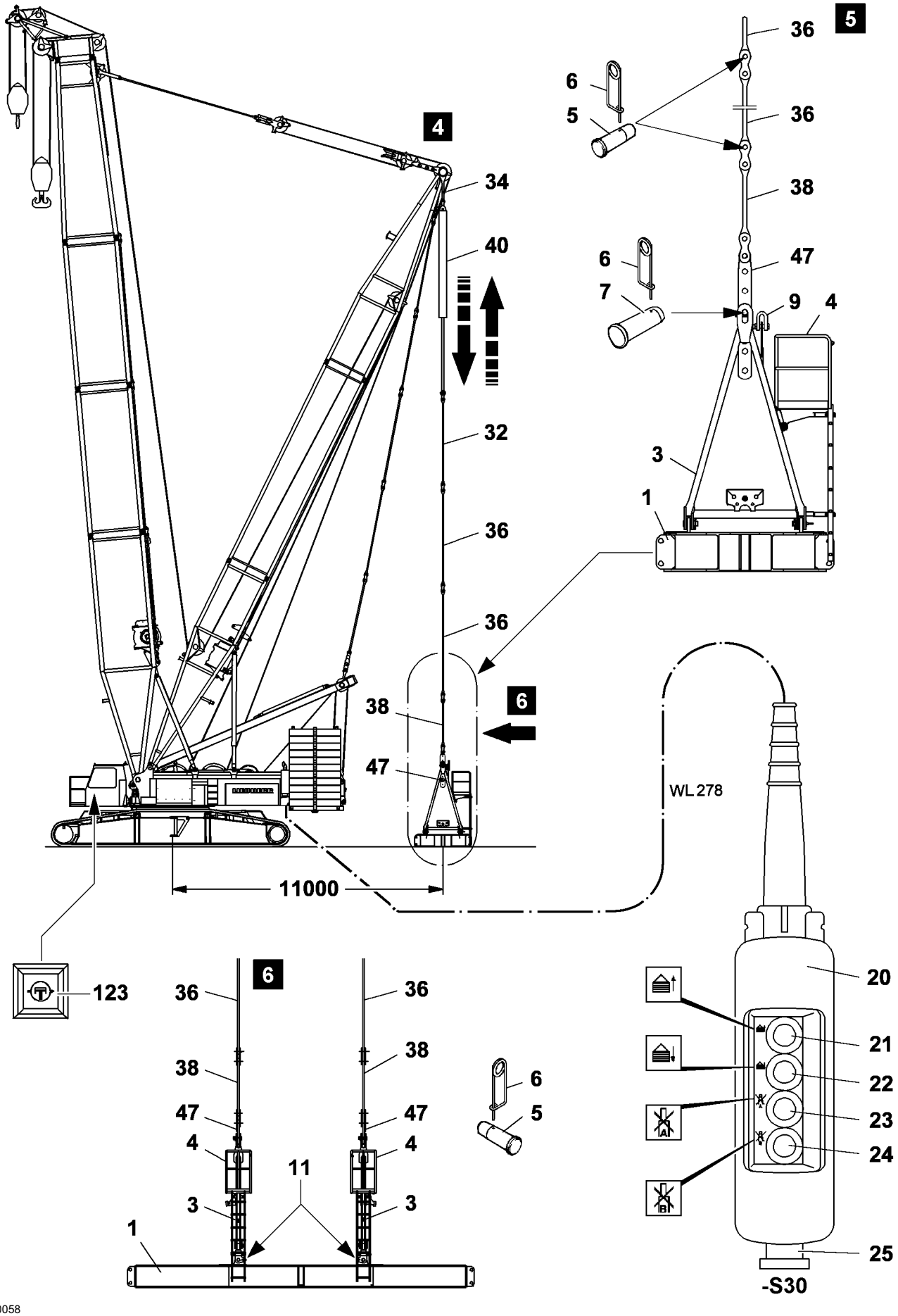
8.2.2 Removing the ballast plates, fastening points: Bitt

WARNING
Overloaded ballast plates!
If more than the permissible loads are lifted, the bitts **P1** are overloaded!
The ballast plates can be damaged and fall down!
Personnel can be severely injured or killed!
▶ Observe the section “Permissible ballast assemblies” in this chapter!

WARNING
Incorrect handling of the fastening equipment!
If tackle cannot be attached correctly and / or if it is not secured sufficiently to prevent it from loosening up, the ballast plates can fall down!
Personnel can be severely injured or killed!
▶ Make sure that the fastening equipment is correctly attached on the bitts **P1** and that it is secured sufficiently to prevent it from loosening up!

▶ Attach the ballast plates individually or as a ballast assembly, illustration **6** or illustration **7** on the auxiliary crane.
▶ Lift the ballast plates or the ballast assembly and place it carefully on the centerings on the ballast pallet or on another ballast plate in the ballast assembly.

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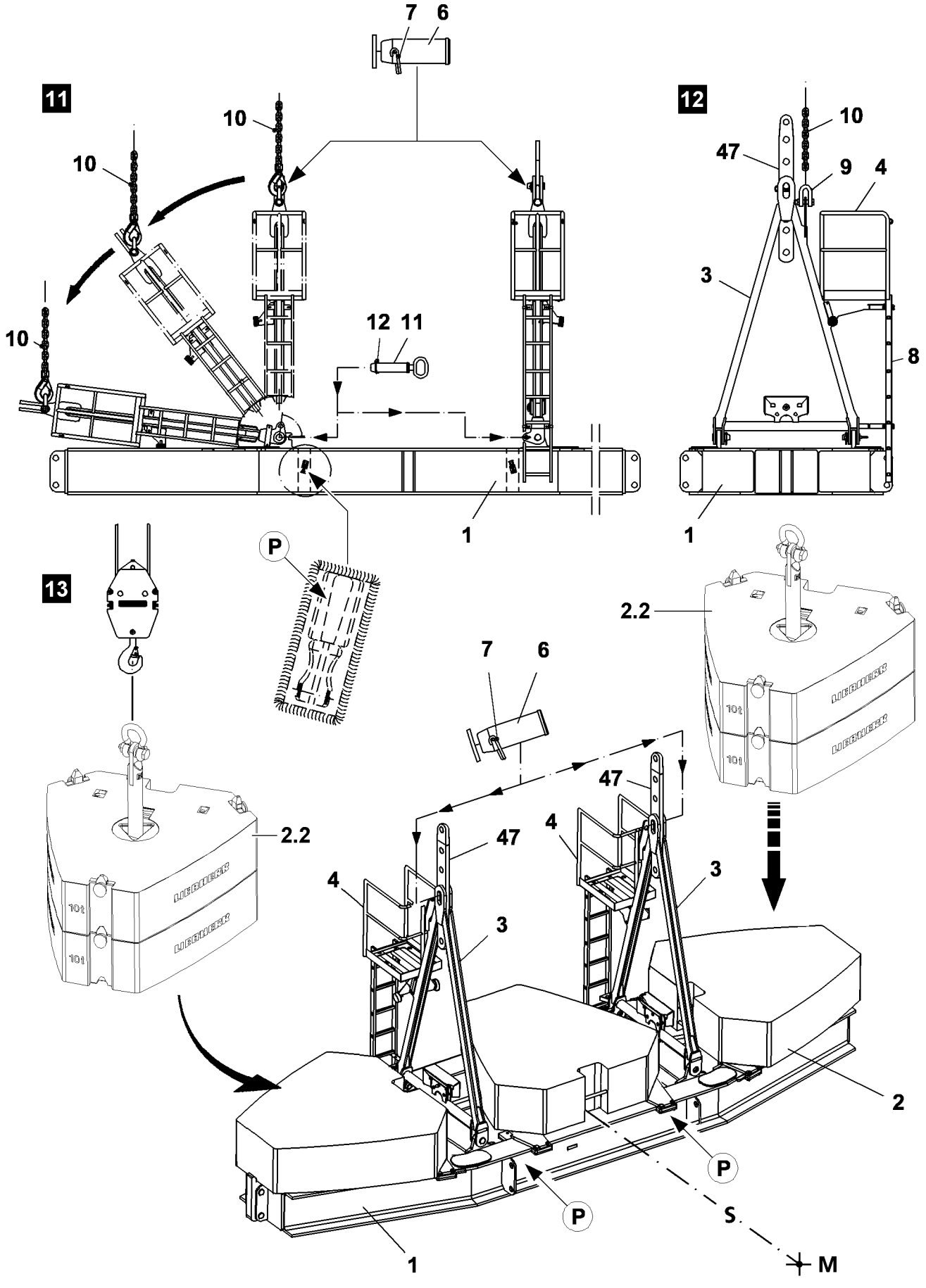
8.3 Disassembly of D-guy rods on ballast pallet

DANGER
Danger of accidents when unpinning the derrick ballast guying!
Before unpinning the derrick ballast guy rods on the erection racks, the erection racks must be secured with retaining pins, otherwise the erection racks will tip over!
Personnel can be severely injured or killed!
- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks!
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

Make sure that the following prerequisites are met:
– The erection racks are secured with the retaining pins **11** to prevent them from tipping.

- ▶ When the retaining pins **11** are pinned and secured on the erection racks **3** on both sides: Release and unpin the pins **7** on both sides.
- ▶ Lift the guying upward by moving the piston rods in on the pull cylinders
- ▶ Repeat the process on second erection rack.

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8.4 Placing down the erection racks

Make sure that the following prerequisite is met:

– The erection rack **3** is attached and held by the auxiliary crane.

DANGER

Accident risk when disassembling the erection racks!

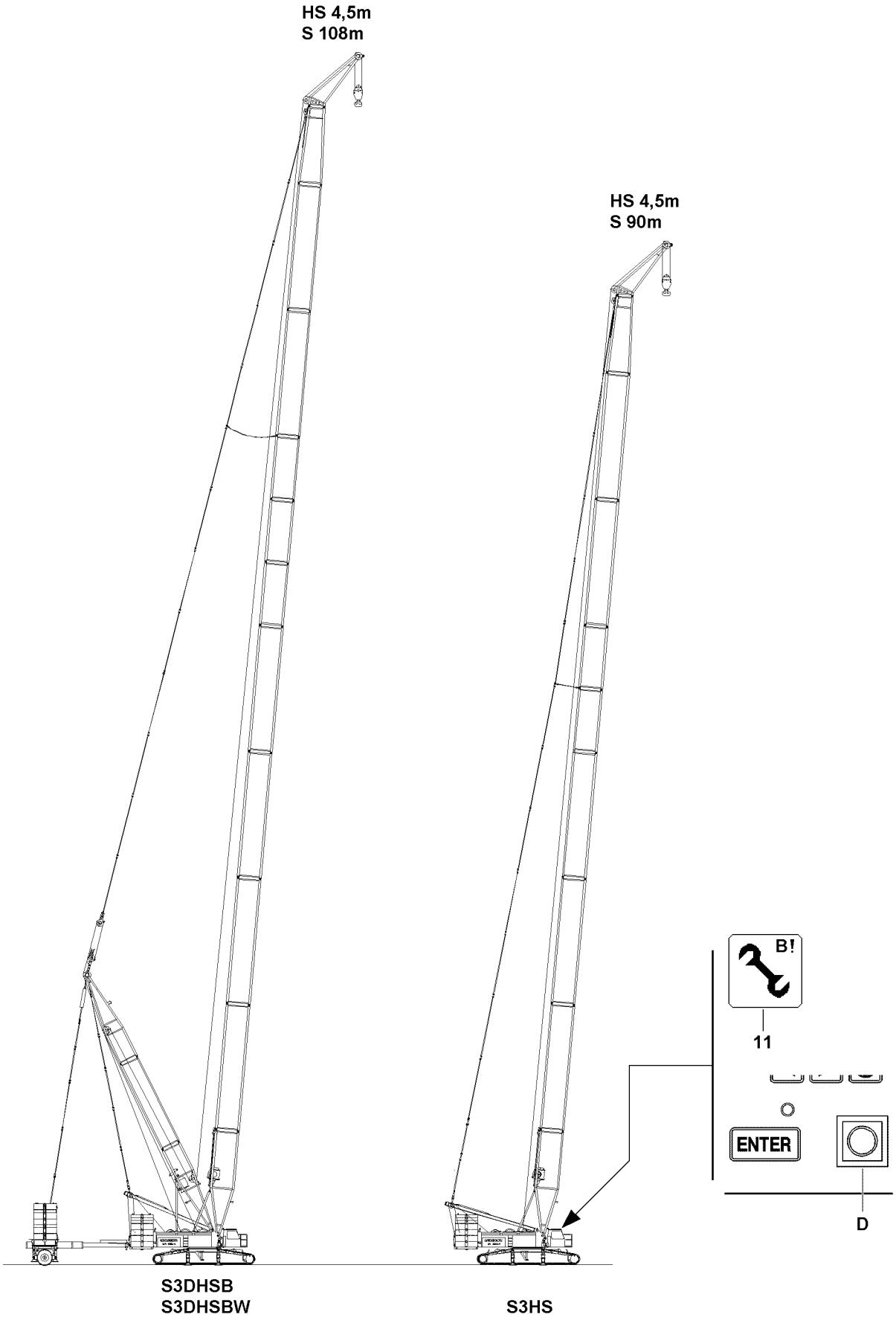
Before unpinning the retaining pins **11**, the erection racks must hang securely on the auxiliary crane, otherwise the erection racks can tip over!

Personnel can be severely injured or killed!

- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks!
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

- ▶ Release the retaining pins **11** and unpin at both sides.
- ▶ Place the erection rack **3** down with the auxiliary crane on the ballast pallet.

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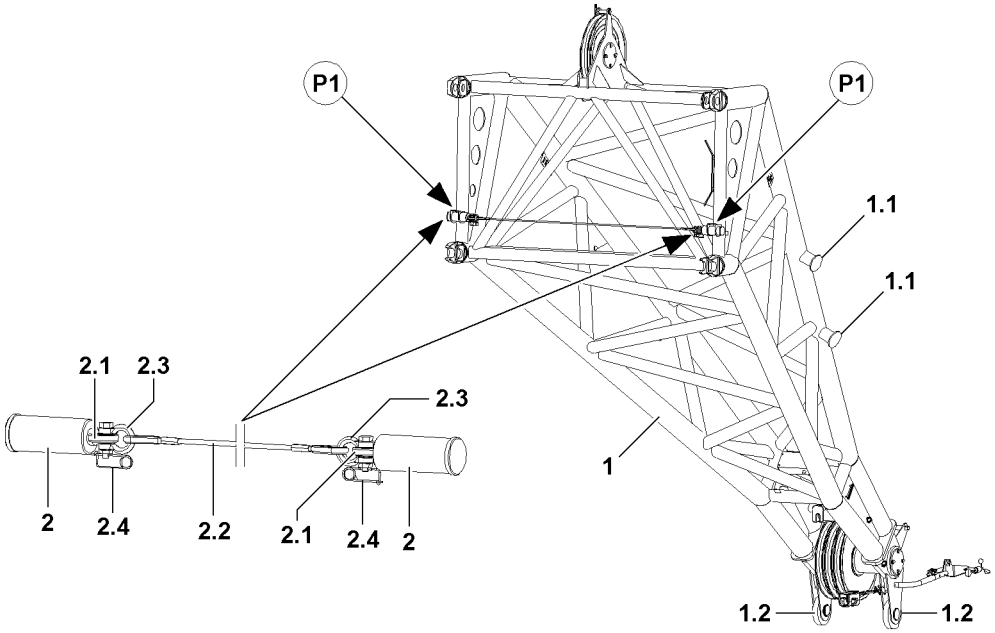
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1 Auxiliary jib “HS”

Note

▶ The auxiliary jib “HS” is always installed directly on the S-adapter on boom systems S3HS and S3DHSB/BW!

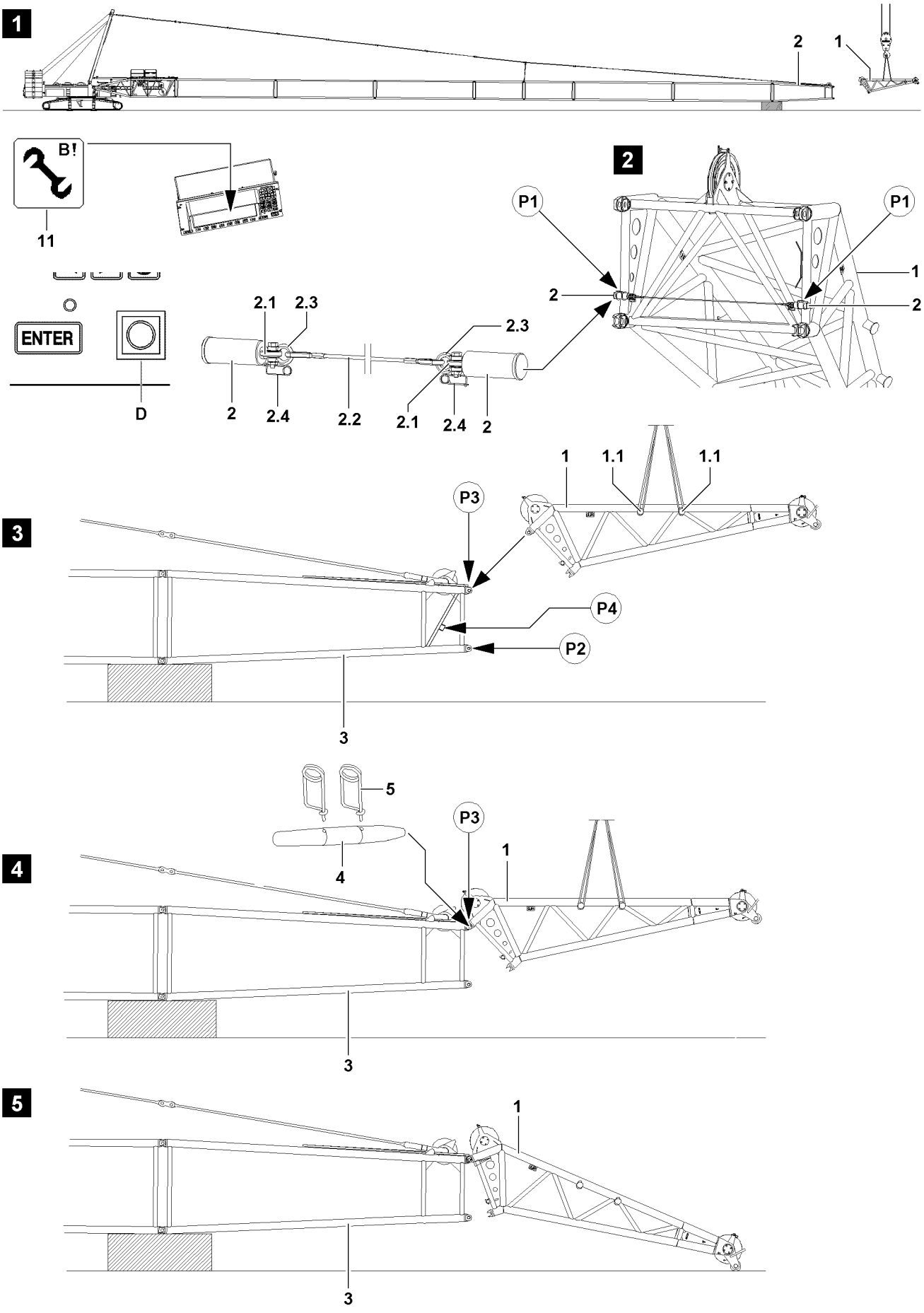
1.1 Component overview of auxiliary jib “HS”



Auxiliary jib “HS”

Position	Component	Weight
1	Auxiliary jib “HS”	2.9 t
1.1	Bitt	
1.2	Roller	
2	Stop pin	
2.1	Eyebolt	
2.2	Rope	
2.3	Shackle	
2.4	Spring retainer	

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2 Installing the auxiliary jib “HS” on the S3-boom

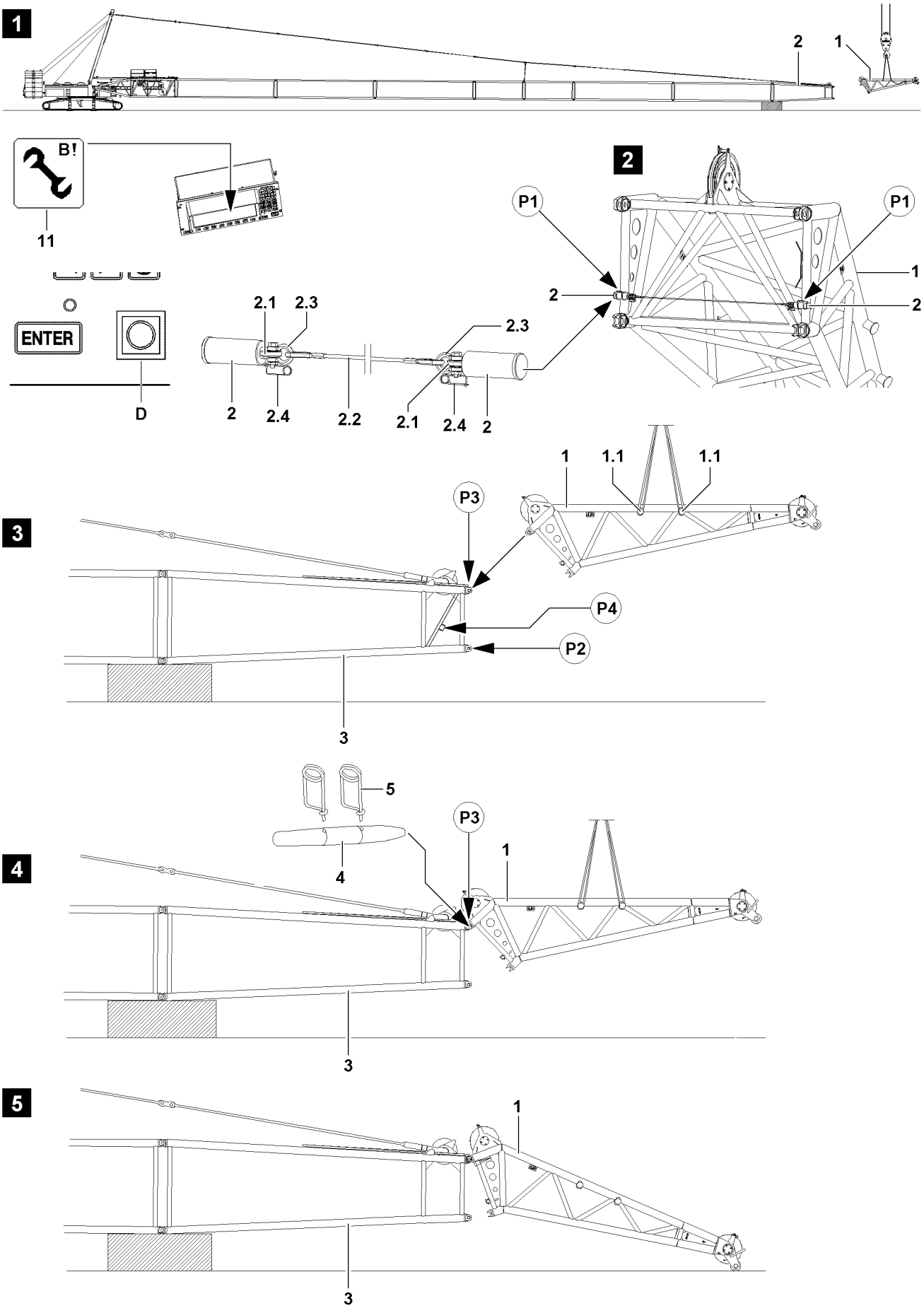
2.1 Installing the auxiliary jib “HS”

WARNING
Risk of falling!
During assembly / disassembly work, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example lifting platform, scaffolding, ladder, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved fall arrest systems to avoid falling, see Crane operating instructions, Chapter 2.04!
- ▶ Approved fall arrest systems must be hung into the respective fastening 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!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel and crane operation is prohibited!

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!
- ▶ Pin or unpin both pins that lie in one horizontal level, i.e. **left** and **right**!
- ▶ Secure the pins in the bearing points and in the receptacles!
- ▶ Do not disengage the auxiliary crane until each component is pinned on and secured!
- ▶ It is prohibited to lean a ladder against the component being disassembled!

WARNING
Danger of impact / crushing!
When installing / removing counterweight components with the auxiliary crane, crane components can start to swing back and forth!
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!
Personnel can be caught and severely injured or killed!
- ▶ Make sure that personnel cannot be caught by components!
- ▶ When working in danger zones: Use aids to protect limbs!
- ▶ Guide components with suitable aids to minimize oscillation!

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Note

- ▶ The S3-boom combinations in connection with the auxiliary jib “HS” must be installed according to the separately supplied rod and assembly plans!
- ▶ For assembly of the S3-boom combination, the data in the Crane operating instructions, chapter 5.04 must be observed and adhered to!

The auxiliary jib“HS” **1** can be installed on the following basic configurations:

– S3
– S3DB/BW

WARNING

Assembly with turned on set up key!

When the set up key is engaged, the LICCON overload protection is exceeded!

In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be killed!

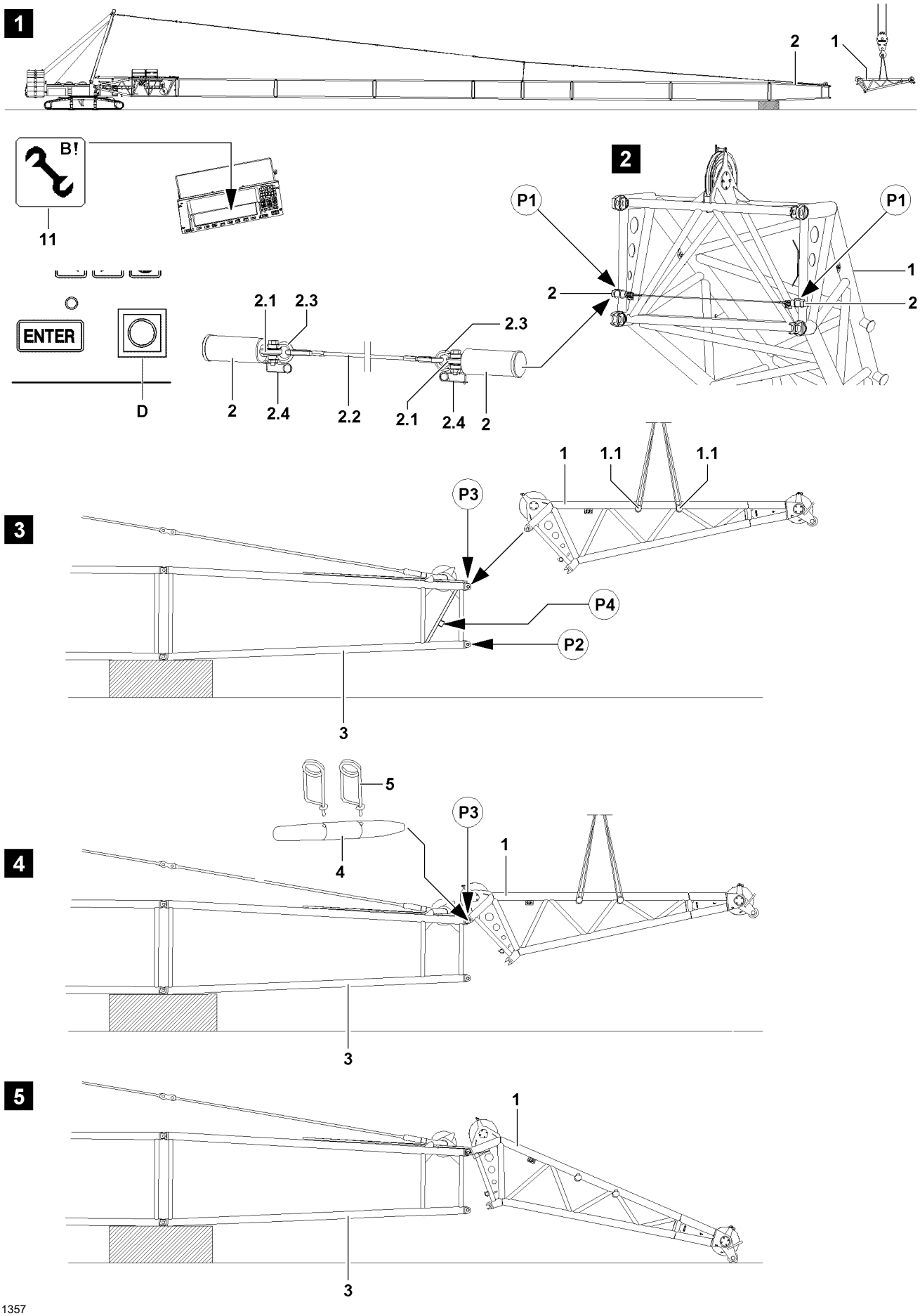
This could result in high property damage!

- ▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
- ▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with the set up key **D** turned on is strictly prohibited!

Make sure that the following prerequisites are met:

– The crane is aligned in horizontal direction.
– The S3-boom is assembled.
– The S3-boom is placed on a load-bearing support.
– In S3D.B/BW operation: The derrick boom and derrick ballast are assembled.
– On the S3-boom, the S-adapter **3** - **without** S-end section - is installed.
– The counterweight has been installed to the turntable according to the load chart.
– The derrick ballast is placed on the suspended ballast pallet or the ballast trailer, according to the load chart.
– The LICCON overload protection has been set according to the data in the load chart.
– The LICCON overload protection is exceeded.
– The assembly icon **11** is visible on the LICCON monitor.
– An auxiliary crane is available.

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2.1.1 Preparing the S-adapter for assembly

See illustration **2**.
Make sure that the following prerequisites are met:
– The cone pins **4** on the S-adapter **3** are unpinned on both sides on point **P3**.
– The cone pins **4** of point **P2** are pinned on both sides in transport receptacle at point **P4**.

▶ Attach the auxiliary jib “HS” **3** on the bitts **1.1**.
▶ Position the auxiliary jib “HS” **3** near the S-adapter **3**.
▶ Unpin the stop pin **2** from the transport retainer, point **P1** on the auxiliary jib “HS” **3**.
▶ Insert the stop pin **2** on the S-adapter **3** on both sides at point **P2** from the “outside” to the “inside”.
▶ When the stop pins **2** are pinned on both sides:
Secure the stop pin **2** with shackle **2.3** and rope **2.2** on the eyebolts **2.1**, see illustration **2**.
▶ When the screw pins are screwed in on the shackle **2.3** and secured with the nut:
Secure the nut with spring retainer **2.4** on the pin.

2.1.2 Installing the auxiliary jib “HS” on the S-adapter

Make sure that the following prerequisite is met:
– The stop pins **2** are installed and secured on the S-adapter **3**.

▶ Swing the auxiliary jib “HS” **1** with the auxiliary crane in to the pin points, point **P3**, on the S-adapter **3**.
▶ Pin the auxiliary jib “HS” **1** on the S-adapter **3** on both sides at point **P3** “on top”: Use cone pins **4**.
▶ Secure the cone pins **4** on both sides with spring retainers **5**.
▶ Carefully place the auxiliary jib “HS” **1** with the auxiliary crane on the ground.
▶ Remove the auxiliary crane.
▶ Pull the hoist rope over the rope pulleys of the auxiliary jib “HS” **1**, see separate reeving plan.

2.2 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-adapter, 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-adapter and then the electrical connection from the terminal box in the S-pivot section to the cable drum in the S-pivot section!

Note
▶ To establish the electrical connections, use the separate electrical wiring diagram!

Make sure that the following prerequisites are met:
– The S3HS-boom is completely assembled.
– The airplane warning light and the wind speed sensor are assembled.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.

2.3 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**!

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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 terminal boxes or the components itself must be checked!
- ▶ If no visible connection errors or component defects can be found, contact **LIEBHERR** Service!

Make sure that the following prerequisites are met:
– All electrical connections have been made.
– The crane engine is running.
– The corresponding operating mode is set on the LICCON monitor.

2.3.1 Checking the wind speed sensor

▶ Test the movement and the function of the wind speed sensor.

2.3.2 Checking the airplane warning light

▶ Turn the airplane warning light on.
▶ Visually check functionality.

2.3.3 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.
– Limit switch is functioning.

2.3.4 Checking the limit switch S-boom “steepest position”

Note
- ▶ The limit switch functions have to be checked individually before erection!

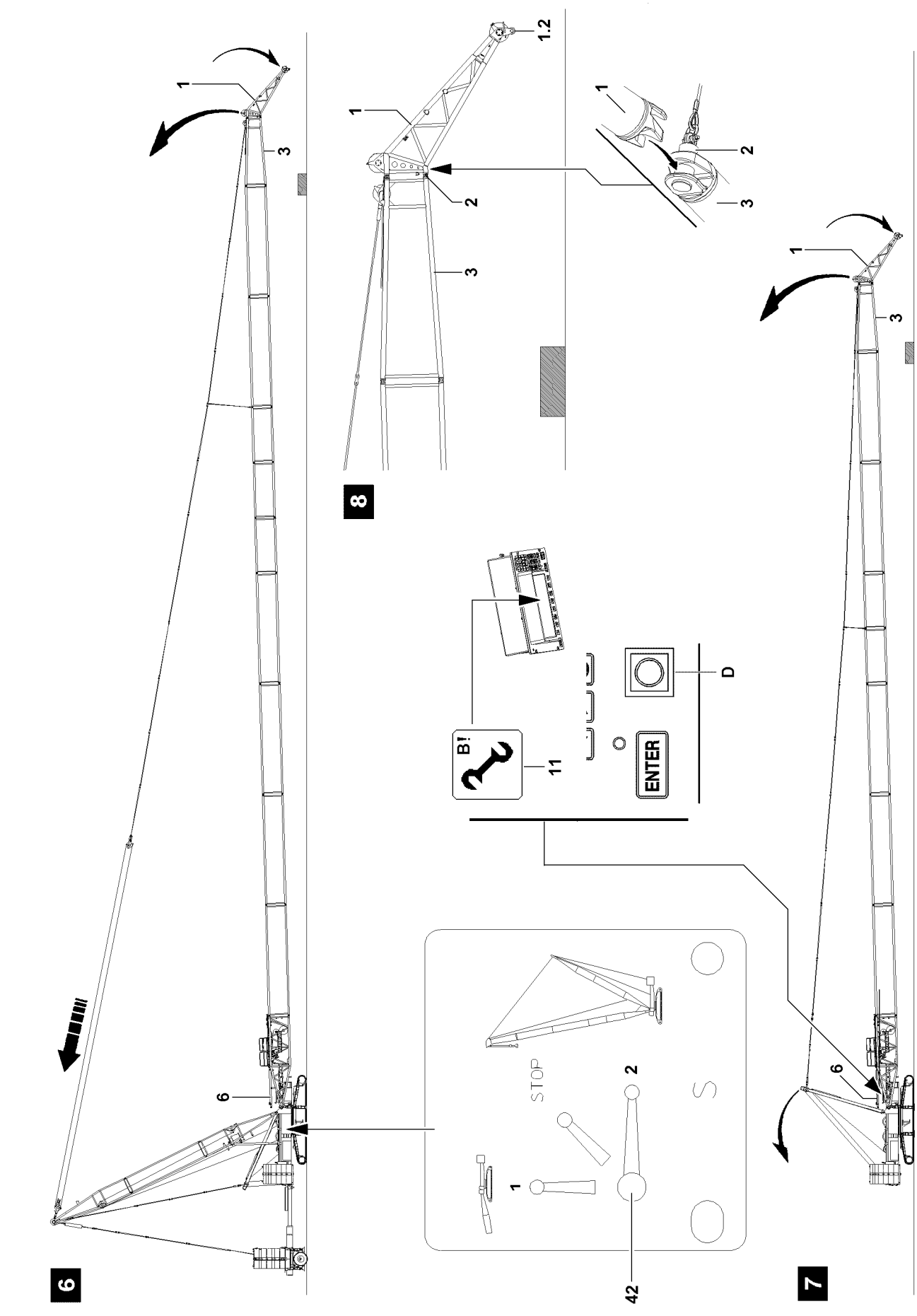
▶ Cover the limit switch initiators on the S-relapse cylinder individually with a metal plate.

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.
– Limit switch is functioning.

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2.4 Lifting the S3-boom off the ground

WARNING
The crane can topple over!
During erection of the S3HS-boom, the crane can be overloaded and topple over!
Personnel can be severely injured or killed!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is prohibited to turn the crane superstructure while erecting the boom!

▶ Carefully luff the S3HS-boom up.

Result:
– Due to its own weight, the auxiliary jib“HS” **1** runs on the rollers **1.2** slowly toward the “inside”.

▶ Luff the S3HS-boom up until the auxiliary jib “HS” **1** lifts off the ground.

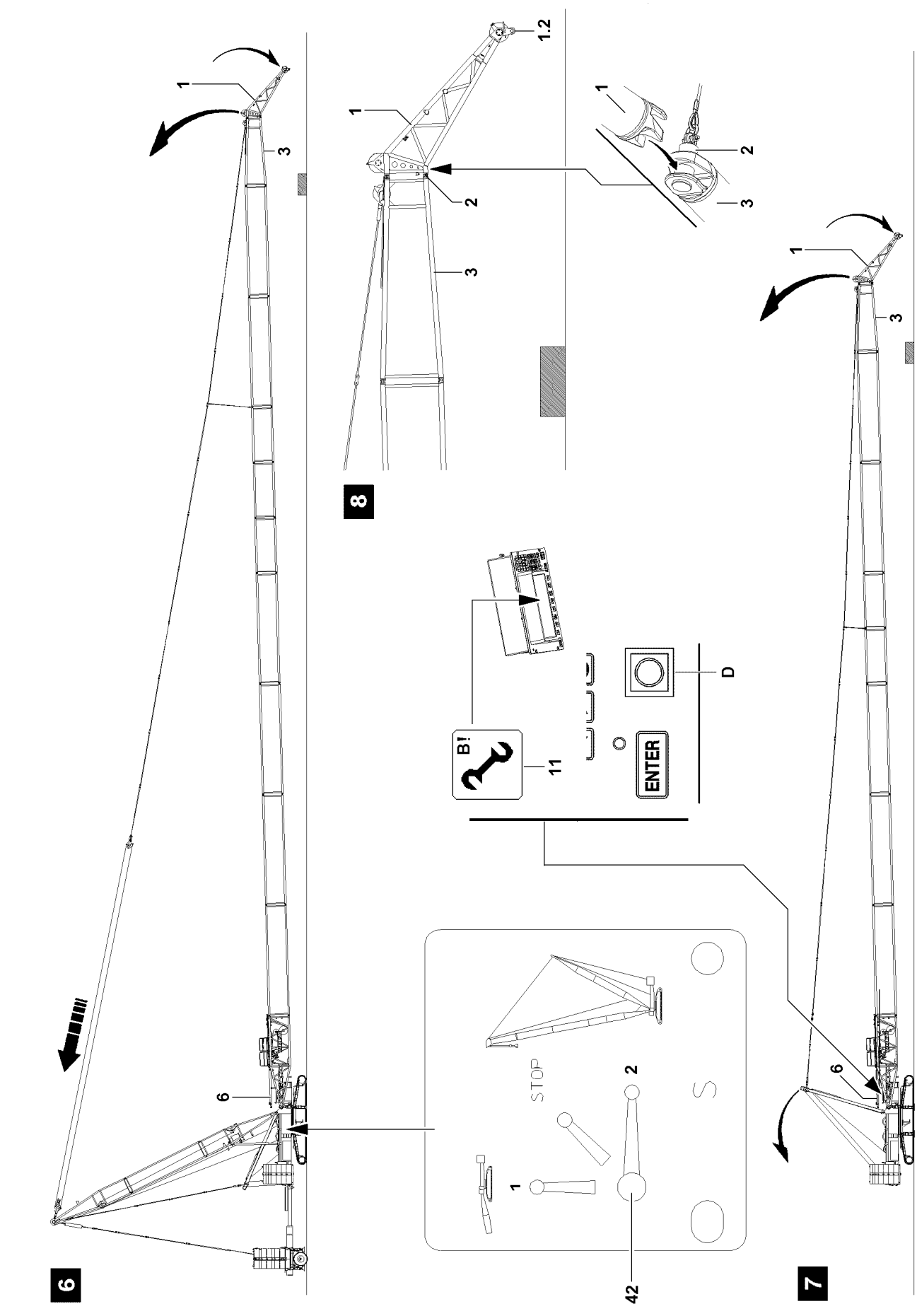
Result:
– The fork connection of the auxiliary jib “HS” **1** supports itself on the stop pins **2** on the S-adapter **3**, illustration **8**.

NOTICE
Damage of auxiliary jib “HS”!
After the auxiliary jib “HS” **1** has been lifted off the ground, the boom combination may only be placed on the ground very carefully, otherwise the auxiliary jib “HS” **1** can be damaged severely!
- ▶ Place the boom combination on the ground with upmost caution!

▶ Carefully place the boom combination down.

Result:
– The auxiliary jib “HS” **1** folds out automatically from the fork connection, illustration **8** and runs on the rollers **1.2** toward the “outside”.

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3 Erecting the S3-boom

3.1 Erection procedure

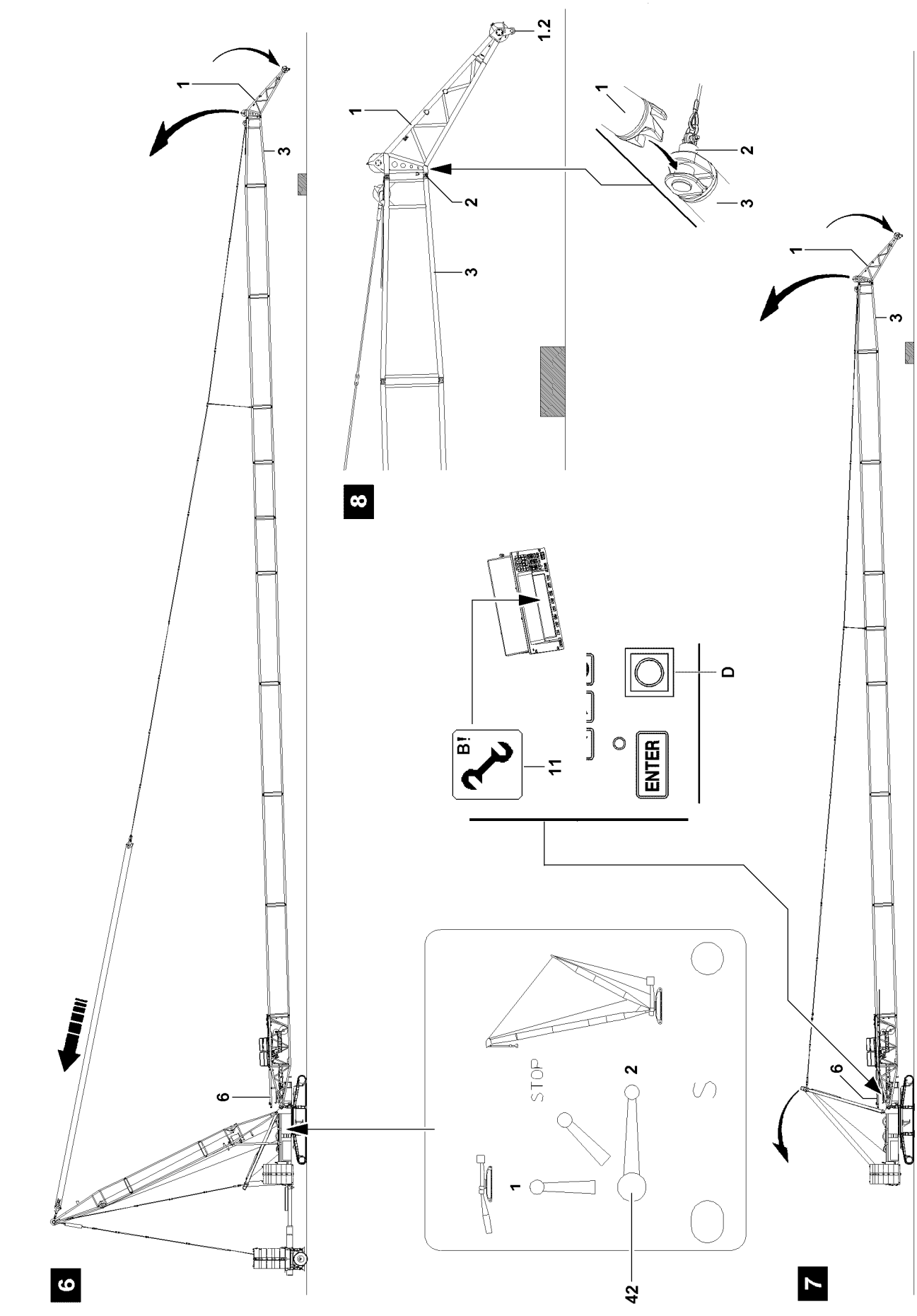
DANGER
The crane can topple over!
- ▶ It is prohibited to turn the crane superstructure while erecting the boom!
- ▶ Observe the data in the erection and take down charts!

WARNING
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Observe the Safety technical notes, see Crane operating instructions, chapter 5.01!
- ▶ Extend the S-relapse cylinder **6** before erecting the boom combinations!
- ▶ Do not allow slack cable to build up on the control winch!

WARNING
Falling hoist rope!
If the hoist rope is not reeved before the erection procedure with the corresponding length on the auxiliary jib “HS” **1**, then it can fall down backward due to its own weight!
Personnel can be severely injured or killed!
- ▶ Reeve the hoist rope with sufficient length on the auxiliary jib “HS” **1** before the erection procedure!
- ▶ The hoist rope must be constantly monitored during erection procedure!
- ▶ 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 established.
- – All limit switches are functioning.
- – The counterweight has been installed to the turntable according to the data in the erection and take down chart.
- – For S3DHSB/BW: The derrick ballast is placed according to the data in the erection and take down charts.
- – For S3DHSB/BW: The derrick boom is erected, see Crane operating instructions, chapter 5.05.
- – 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 LICCON overload protection is exceeded.
- – The assembly icon **11** is visible on the LICCON monitor.

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3.1.1 Extending the S-relapse cylinder

WARNING
The crane can topple over!
If the S-relapse cylinders **6** 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 **6** before erecting the S3-boom!
- ▶ Secure the ball valve **42** during crane operation to prevent inadvertent actuation!

Ball valve positions	
2	Crane operation, extend the piston rod
1	Assembly, retract the piston rod
STOP	The piston rod cannot be retracted / extended

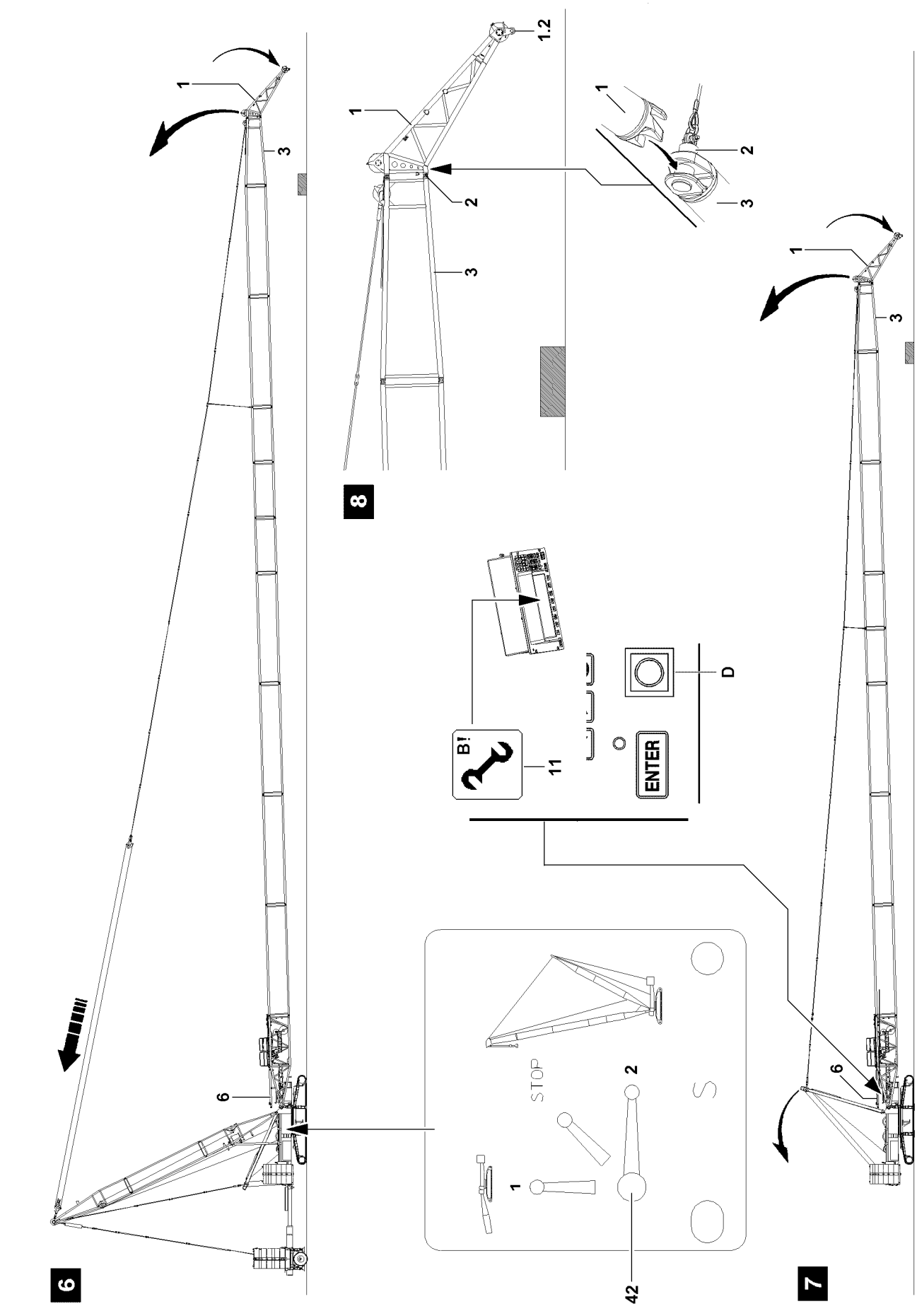
Extend the piston rods on the S-relapse cylinders **6** by actuating the ball valve **42**.
- ▶ Set the ball valve **42** to **Position 2**.

Result:
– The piston rods of the S-relapse cylinders **6** extend.

Note
- ▶ The ball valve **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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3.1.2 Erecting the boom

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 “HS” **1** 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, see section Crane operating instructions, chapter 4.06.

Erecting the boom

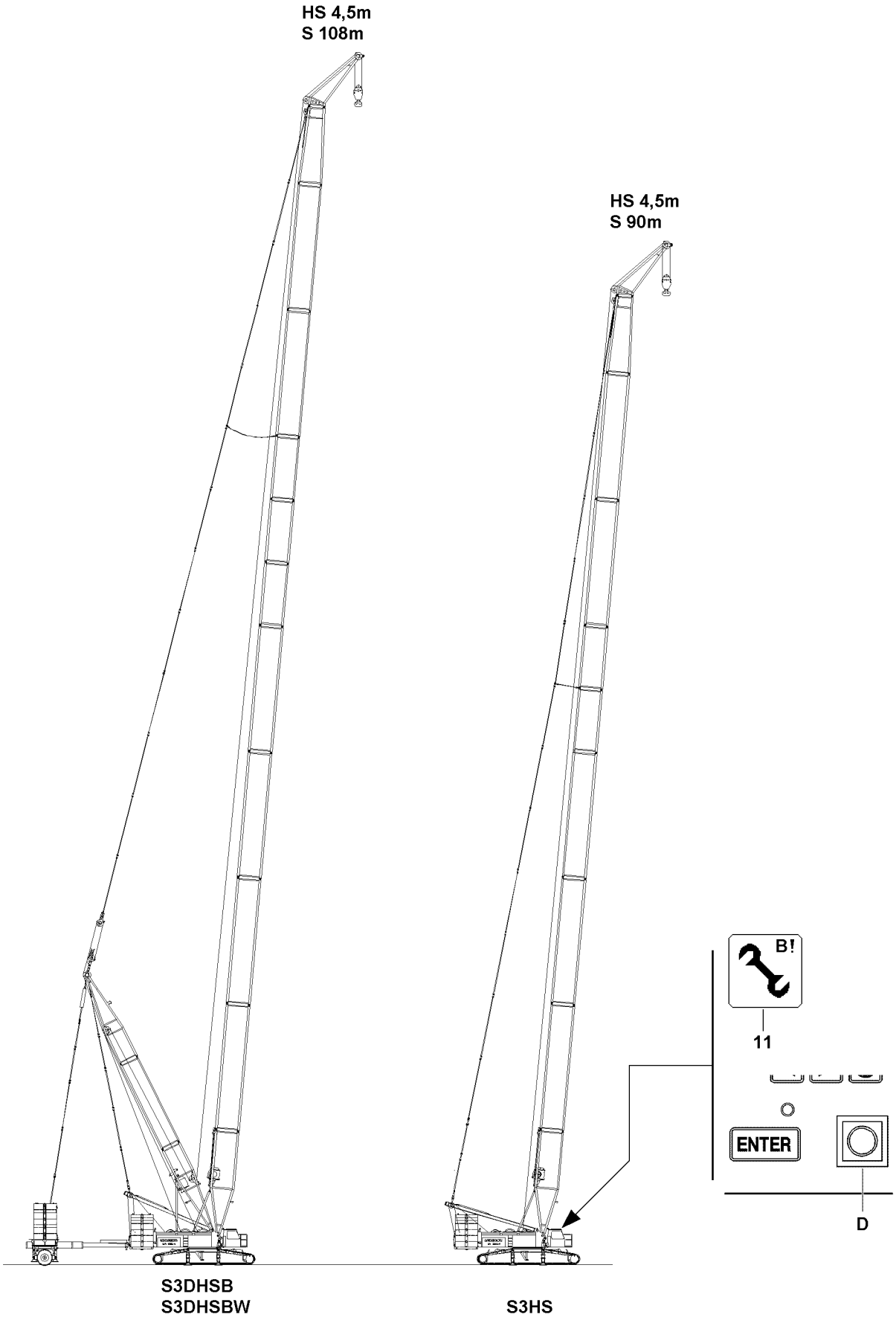
WARNING
The crane can topple over!
In crane operation with exceeded LICCON overload protection, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

Note
- ▶ When the lowest operating position of the boom is reached, the LICCON overload protection is activated!
- ▶ In the maximum load icon appears a load number in “t” instead of the display “???”!

- ▶ Luff the boom up to the lowest operating position.
- ▶ When the boom has reached the lowest operating position:
  Make sure that the assembly icon **11** turns off on the LICCON monitor.

Result:
– The LICCON overload protection is active.

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4 Operating the crane

4.1 Preparing for crane operation

Note

▶ Observer the notes, see Crane operating instructions, chapter 4.05, chapter 4.08 and chapter 5.01!

Make sure that the following prerequisites are met:
– The LICCON overload protection is active.
– The LICCON overload protection has been set according to the data in the load chart.

WARNING

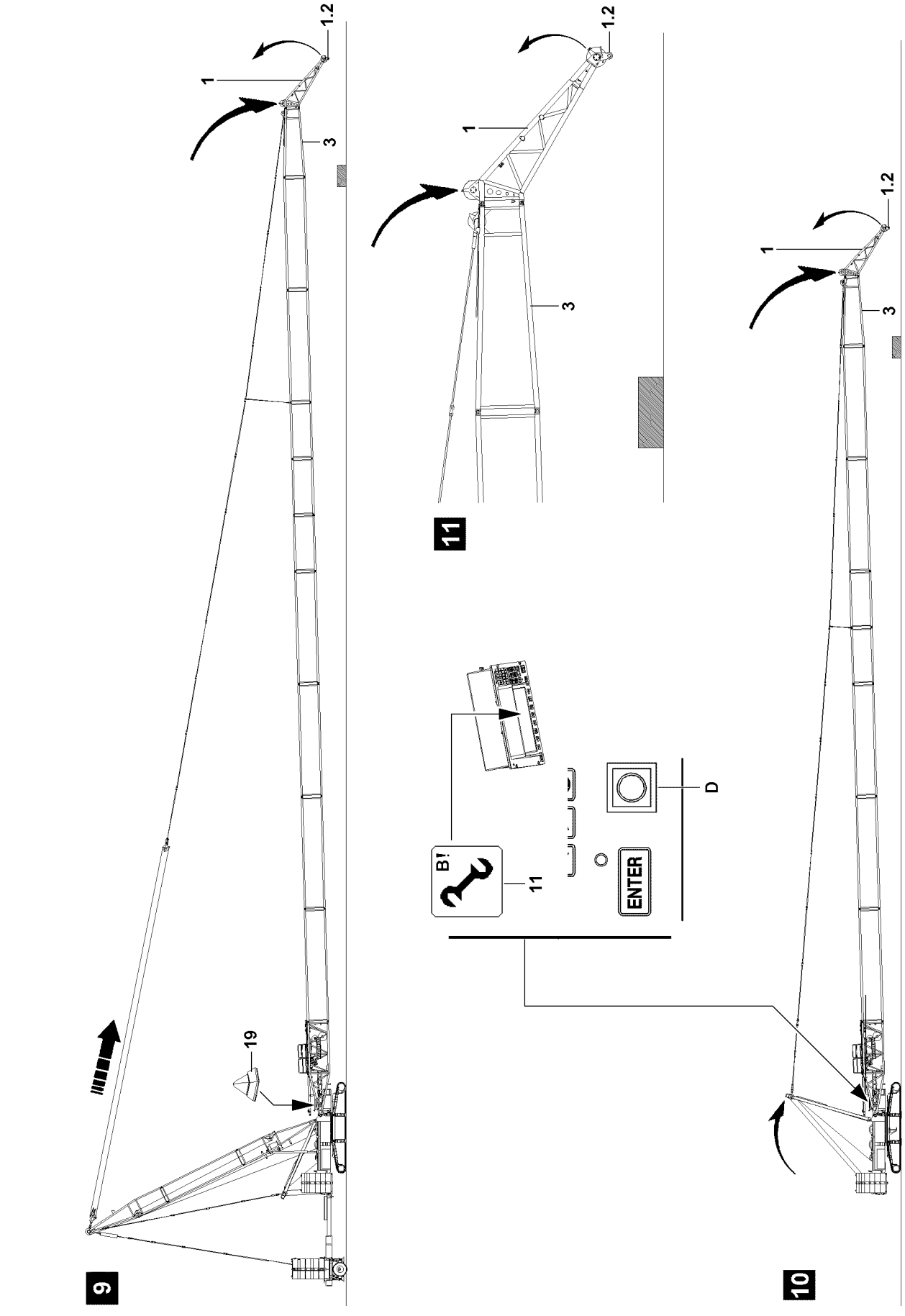
The crane can topple over!

▶ Check the horizontal position of the crane before and during operation!
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation!

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 Removing the auxiliary jib “HS”

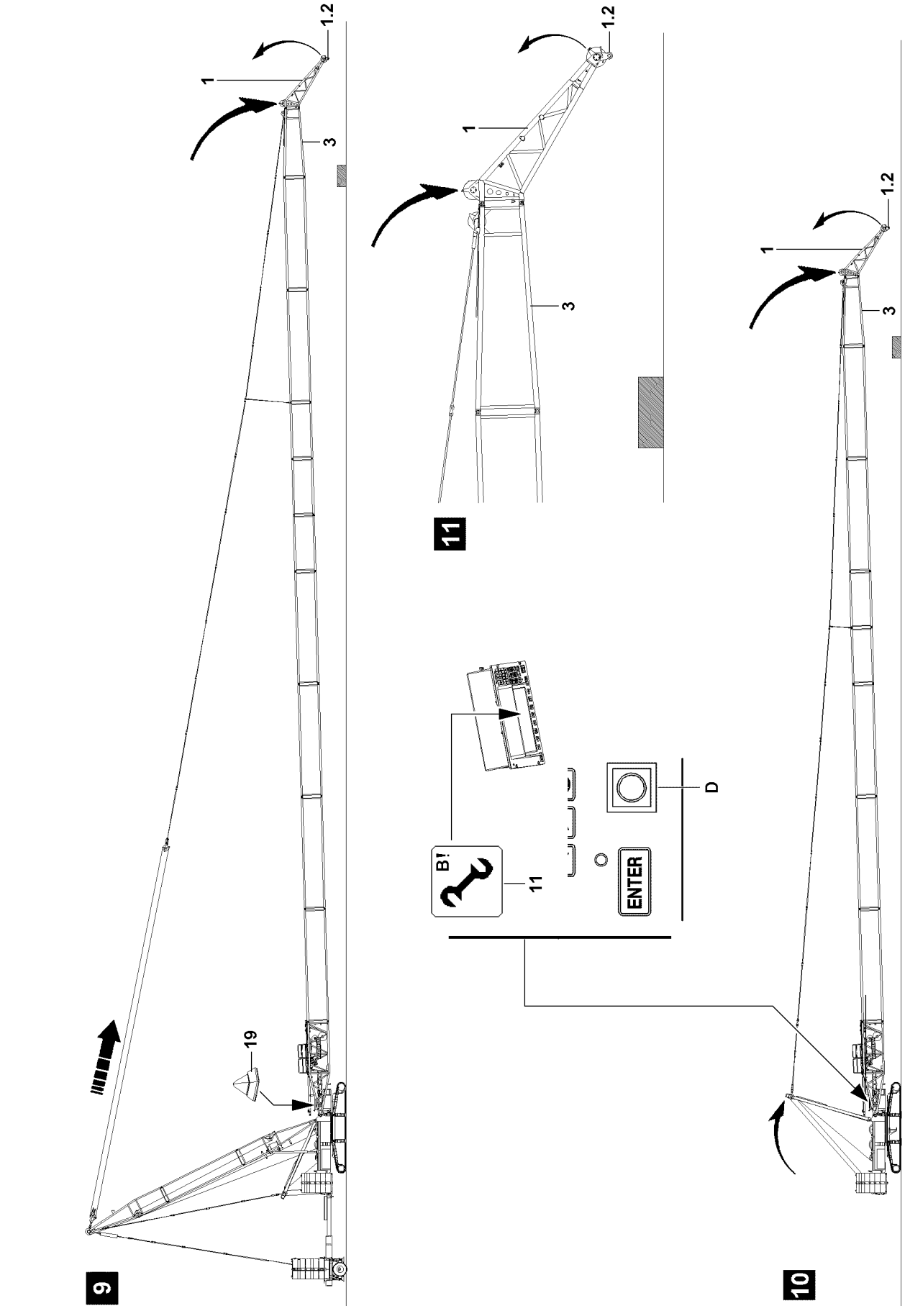
WARNING
Risk of falling!
During assembly / disassembly work, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example lifting platform, scaffolding, ladder, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved fall arrest systems to avoid falling, see Crane operating instructions, Chapter 2.04!
- ▶ Approved fall arrest systems must be hung into the respective fastening 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!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel and crane operation is prohibited!

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel!
- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**!
- ▶ Do not stand under the 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!
When assembling crane components, limbs can be crushed or even severed due to oscillation of 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!

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5.1 Placing 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 and fatally injure personnel!
- ▶ Observe the Safety technical notes, see Crane operating instructions, chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head. 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 of the S-boom is reached!
- ▶ When the lowest operating position of the S-boom is reached, the load display in the maximum load icon turns off and instead of the load display appears the display “???”!
- ▶ In the crane operating screen appear alarm functions!

▶ Luff the S-boom down to the lowest operating position.

Result:
– The luffing movement is turned off.
– The “STOP” icon appears on the LICCON monitor.
– The horn icon appears on the LICCON monitor.

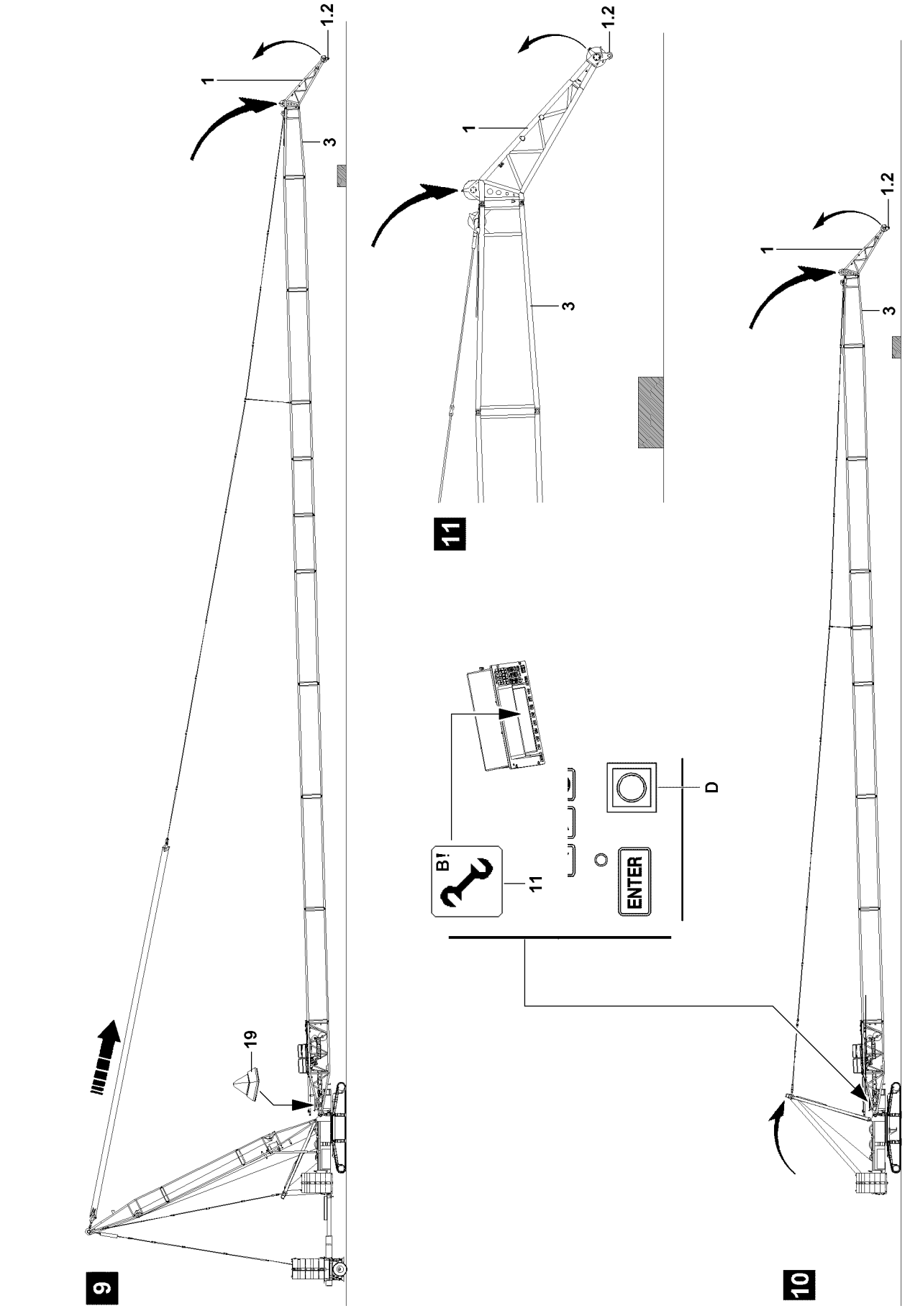
WARNING
Assembly with turned on set up key!
When the set up key is engaged, the LICCON overload protection is exceeded!
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!
Personnel can be killed!
This could result in high property damage!
- ▶ The set up key **D** may only be actuated by persons who know the effects of a bypass!
- ▶ Press the set up key **D** only when the set up status was correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with the set up key **D** turned on is strictly prohibited!

▶ Turn the set up key **D** to the right.

Result:
– The LICCON overload protection is deactivated.
– The assembly icon **11** appears on the LICCON monitor.

▶ 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.
- ▶ Carefully luff the S3-boom down until the auxiliary jib “HS” **1** just touches the ground with the rollers **1.2**.
- ▶ When the rollers **1.2** are touching the ground:
  Luff the S3-boom down slowly until the auxiliary jib “HS” **1** folds out of the fork connection.
- ▶ Continue to luff the S3-boom down.

Result:

– The auxiliary jib “HS” **1** runs on the rollers **1.2** toward the “outside”.

5.1.3 Spooling the hoist rope up

WARNING
Falling hoist rope!
By spooling the hoist rope up, personnel can be severely injured or killed!

- ▶ All rope retaining pins / pipes on the auxiliary jib “HS” **1** have been removed!
- ▶ All rope retaining pins / pipes on the S-adapter **3** and on the S-boom have been removed!
- ▶ 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 changes!
A new adjustment by **LIEBHERR Service** must be made!

- ▶ Stop the winch in time, with sufficient rope reserve!
- ▶ Do not over spool the winch!

- ▶ Spool up the hoist rope.

5.2 Disconnecting the electrical connections

Make sure that the following prerequisite is met:

– The S-boom has been placed down.

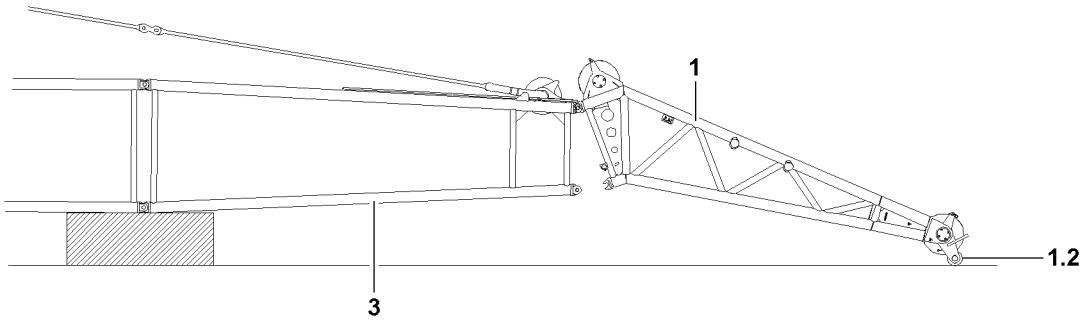
NOTICE
Damage to the electrical connections on the cable drum!
If the electrical connection from the cable drum on the S-pivot section to the terminal box on the S-adapter is disconnected and spooled up, then the electrical connection from the cable drum to the terminal box on the S-pivot section can be damaged!

- ▶ Disconnect the electrical connection from the cable drum to the terminal box on the S-pivot section first and then the electrical connection from the cable drum to the terminal box on the S-adapter!

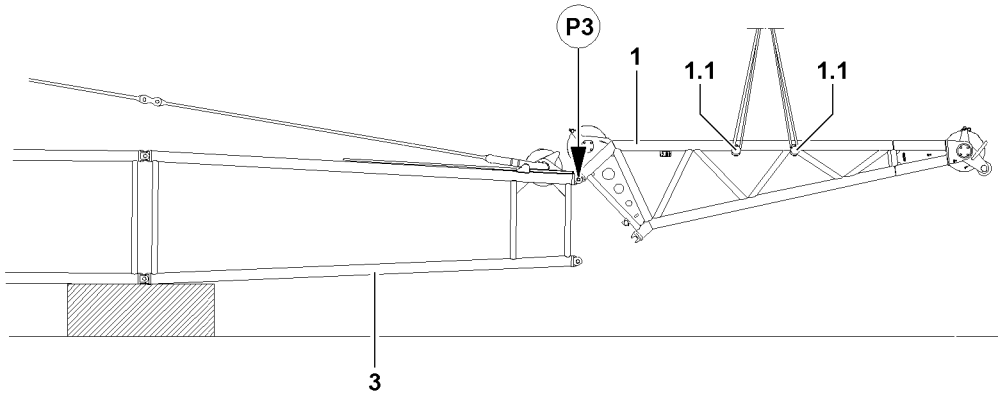
- ▶ Store the cable from the terminal box on the S-pivot section properly.
- ▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.

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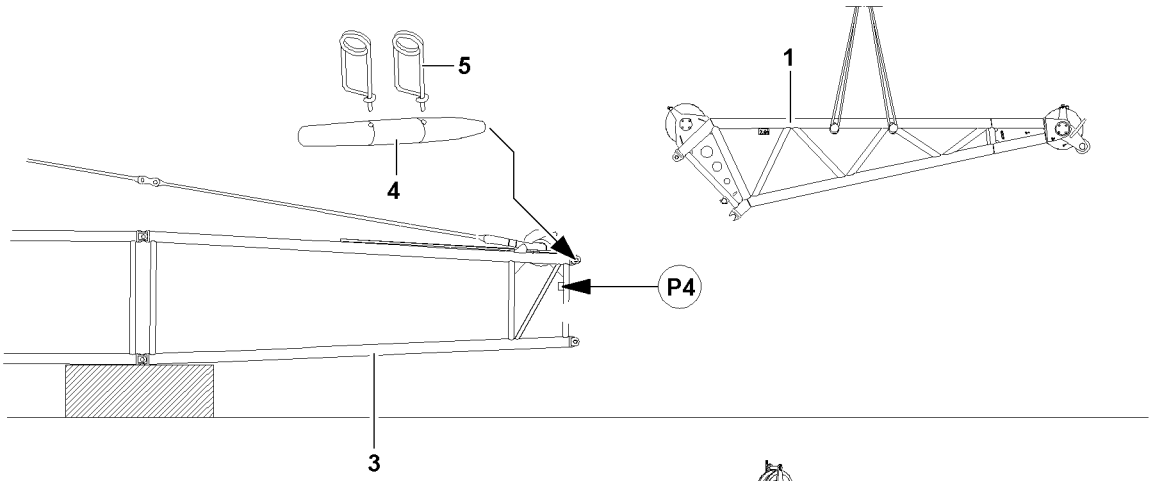
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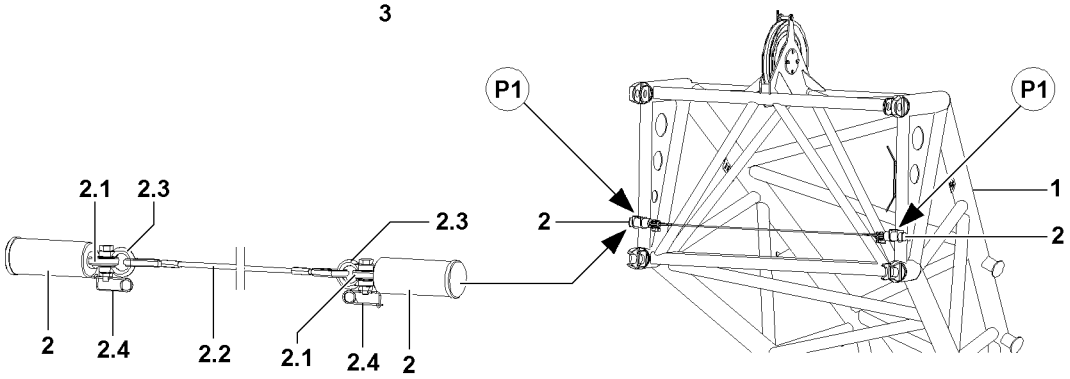


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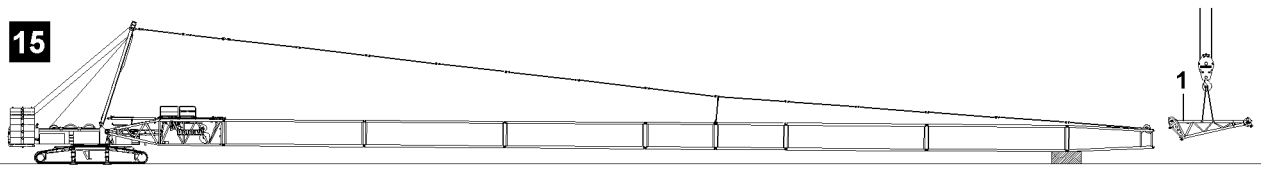


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5.3 Removing the auxiliary jib “HS”

WARNING
Folding down boom!
If the following conditions are not met before disassembling the auxiliary jib “HS” **1**, the boom can fold down!
Personnel can be severely injured or killed!
▶ Support the S-boom during disassembly with suitable materials!

Make sure that the following prerequisites are met:
– The S3-boom is placed on a load-bearing support.
– The auxiliary jib “HS” **1** is laying on the ground.
– All electrical connections on the S-boom are disconnected.

▶ Attach the auxiliary jib “HS” **1** on the auxiliary crane.
▶ Lift the auxiliary jib “HS” **1** with the auxiliary crane until the auxiliary jib “HS” **1** hangs horizontally.
▶ Release and unpin cone pin **4** on the auxiliary jib “HS” **1** at point.
▶ When the cone pins **4** are unpinned:
Remove the auxiliary jib “HS” **1** with the auxiliary crane.
▶ Insert the cone pins **4** in the transport receptacle on the S-adapter **3**.
▶ Release and unpin the stop pin **2** on the S-adapter **3**.
▶ Insert and secure the stop pins on the auxiliary jib “HS” **1** in the transport retainer.

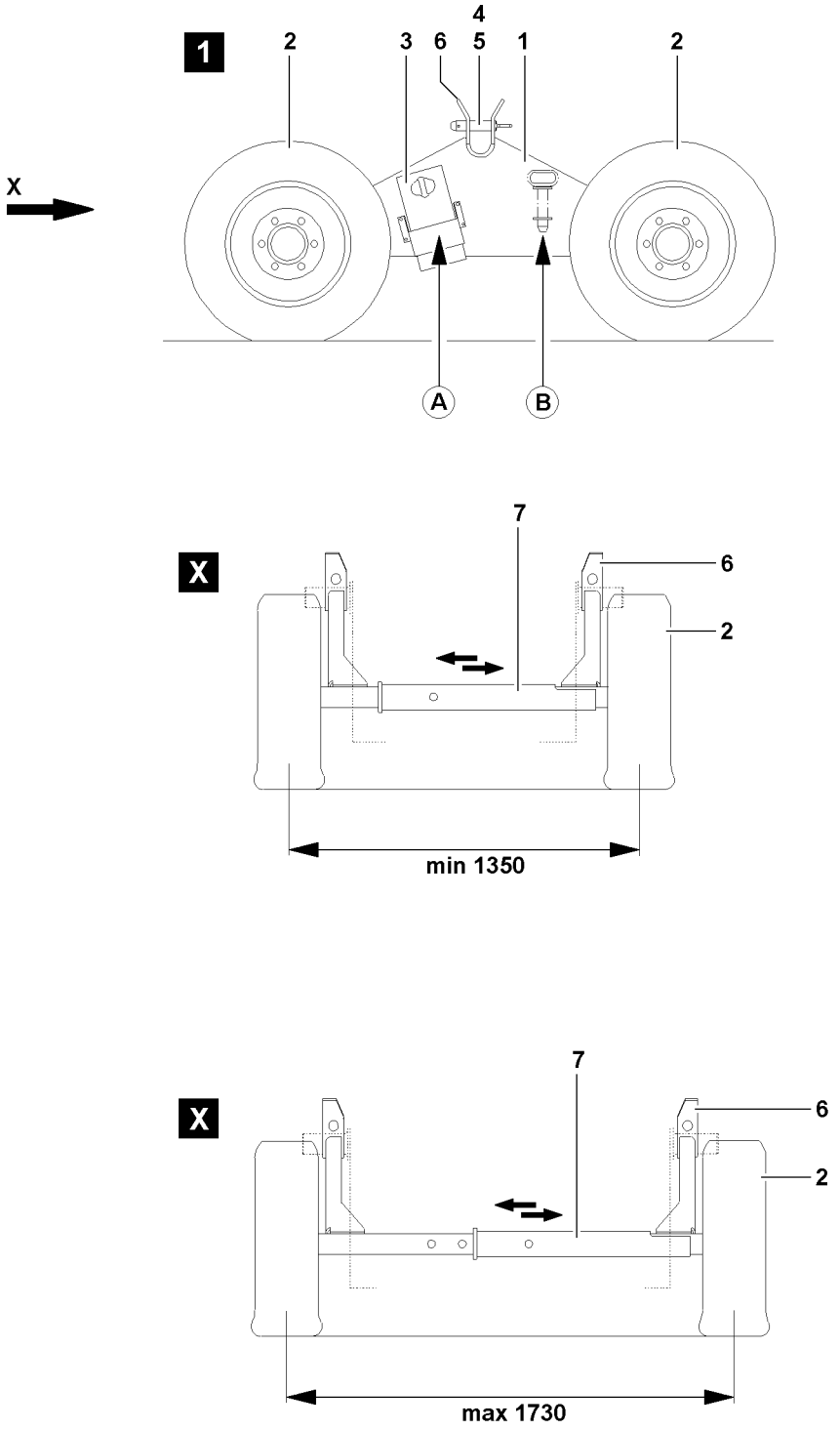
Note
▶ For disassembly of the S-boom, the data in the Crane operating instructions, chapter 5.04 must be observed and adhered to!

▶ Disassemble the S-boom.

5.4 Removing the stop pins on the S-adapter

The stop pins **2** must be unpinned on the S-adapter **3** after completion of crane work and pinned on the auxiliary jib “HS” **1** in the transport retainers.
▶ Release and unpin the screw pins on the shackle **2.3**.
▶ When the screw pins are released and removed:
Unpin the stop pin **2** and pin on the auxiliary jib “HS” **1** at point **P1**.
▶ Secure the stop pin **2** with rope **2.2** and shackle **2.3** on the eyebolts **2.1**.
▶ Make sure that the stop pins **2** are correctly pinned and secured for transport.

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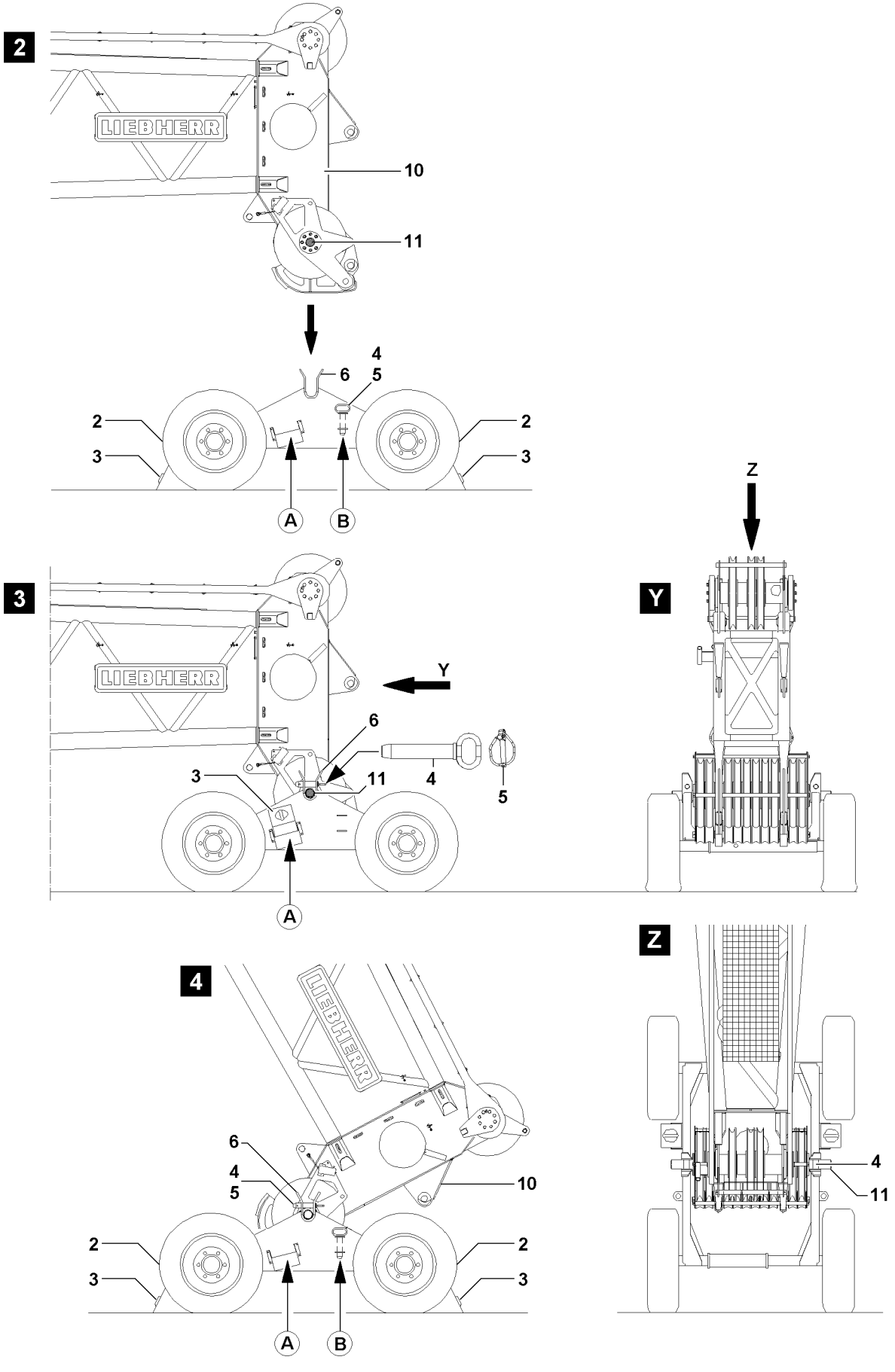
1 Components of pulley cart

Position	Description
1	Pulley cart (steel construction)
2	Tires
3	Wedge
4	Retaining pin
5	Linch pin
6	Receptacle
7	Axle (telescopeable)

1.1 Adjusting the track width on the pulley cart

The track width of the pulley cart can be telescoped out via the telescopeable axles **7** to the width of the corresponding end section and affixed in this position with set screws.

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1.2 Installing the pulley cart

Place the pulley cart **1** under the W-end section and affix with wedges **3**.

- ▶ Remove the wedges **3** from the transport retainer (point **A**) on the pulley cart.
- ▶ Secure the pulley cart **1** with wedges **3** to prevent it from rolling off: Push the wedges **3** on the left and right hand side tightly under the wheels **2**, illustration **2**.
- ▶ Slowly lower the W-boom until the studs **11** of the W-end section **10** are placed in the receptacles **6** of the pulley cart, fig. **3**.

Secure the studs **11** in the receptacles **6** of the pulley cart **1**.

- ▶ Unpin the retaining pin **4** from the transport receptacle (point **B**).
- ▶ Insert the pin **4** at receptacles **6** and secure with linch pin **5**, illustration **3**.
- ▶ Remove the wedges **3** on the wheels.
- ▶ Remove the wedges **3** on the transport receptacle (point **A**) on the pulley cart.

1.3 Removing the pulley cart

When the boom system has reached a certain angle between the S-boom and the W-lattice jib, then the pulley cart is no longer required. Before luffing the boom system all the way up, remove the pulley cart on the W-end section.

WARNING
Overload of crane!
If the pulley cart is not removed before erecting the boom system all the way, the crane can be overloaded and topple over!
Personnel can be severely injured or killed!

- ▶ Remove the pulley cart before lifting the boom system from the ground!

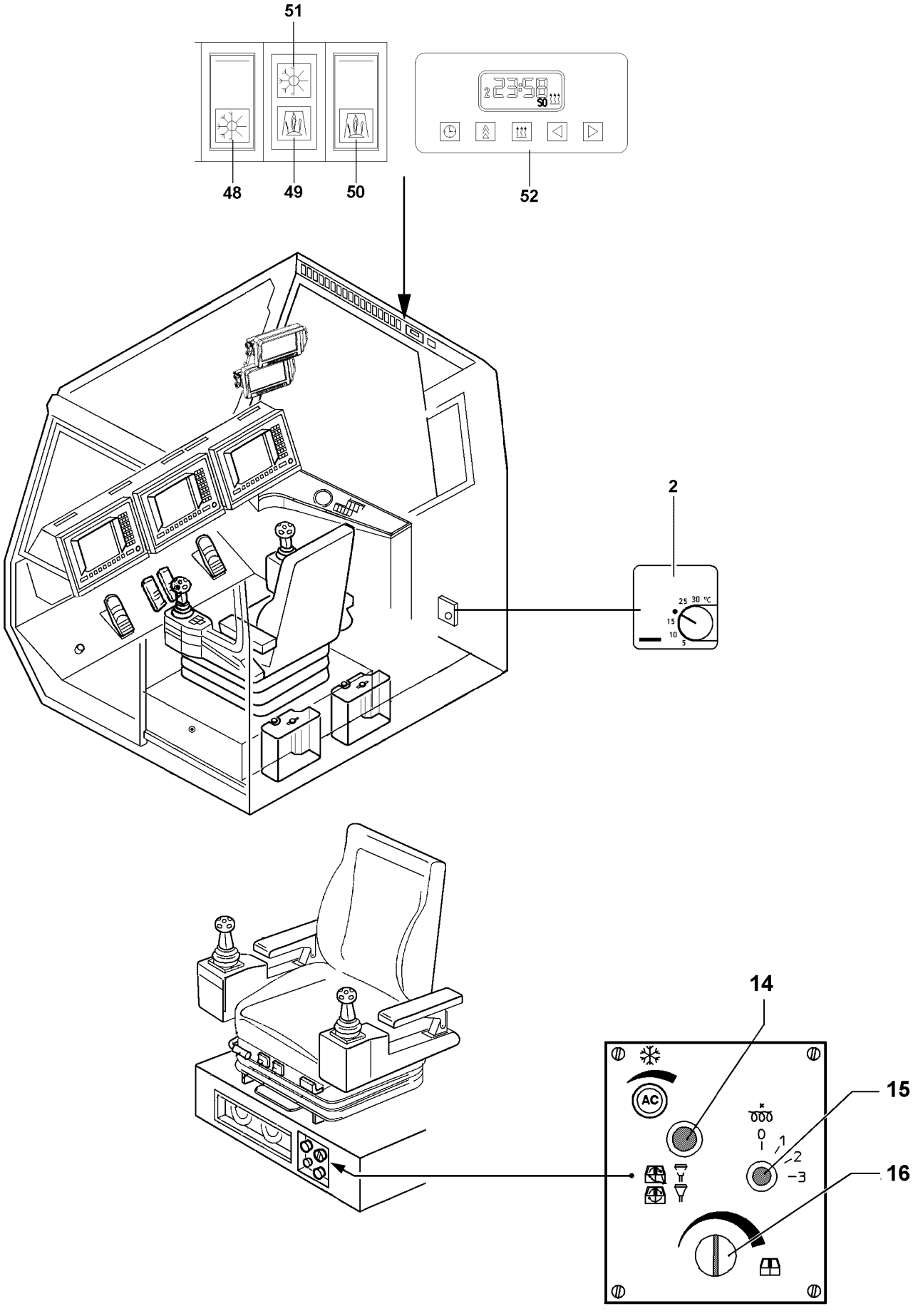
- ▶ Remove the wedges **3** from the transport retainer (point **A**) on the pulley cart.
- ▶ Secure the pulley cart **1** with wedges **3** to prevent it from rolling off: Push the wedges **3** on the left and right hand side tightly under the wheels **2**, illustration **4**.
- ▶ Release the retaining pin **4**: Remove the linch pin **5**.
- ▶ Unpin the retaining pin **4** on the receptacle **6** and insert it into the transport receptacle (point **B**).
- ▶ Secure the retaining pin **4** in the transport receptacle (point **B**) with linch pin **5**.
- ▶ Luff the boom system up.
- ▶ When the boom system is luffed up:
  Remove the wedges **3** on the wheels.
- ▶ Remove the wedges **3** on the transport receptacle (point **A**) on the pulley cart.
- ▶ Remove the pulley cart.

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6.00 Additional equipment

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1 Heating the crane operator's cab

The cab can be heated with two heaters, which are independent of each other:
– Engine-dependent heater.
– Engine-independent auxiliary heater, for outside temperatures of up to -40 °C, WEBASTO; Thermo 90 S.*

The individual adjustment of the heater (for both engine-dependent and engine-independent auxiliary heaters*) is carried out with the control elements under the crane operator's seat as well as via switches and indicator lights on the instrument panel.

NOTICE
Risk of damage to the heater control units* when carrying out electrical welding work on the crane!
▶ Disconnect the negative and positive cables from the batteries and connect the positive cables to the vehicle ground.

1.1 Heater operation

1.1.1 Adjusting the temperature

The cab is heated with the engine coolant.
▶ Set the knob **16**.

1.1.2 Adjusting the ventilation

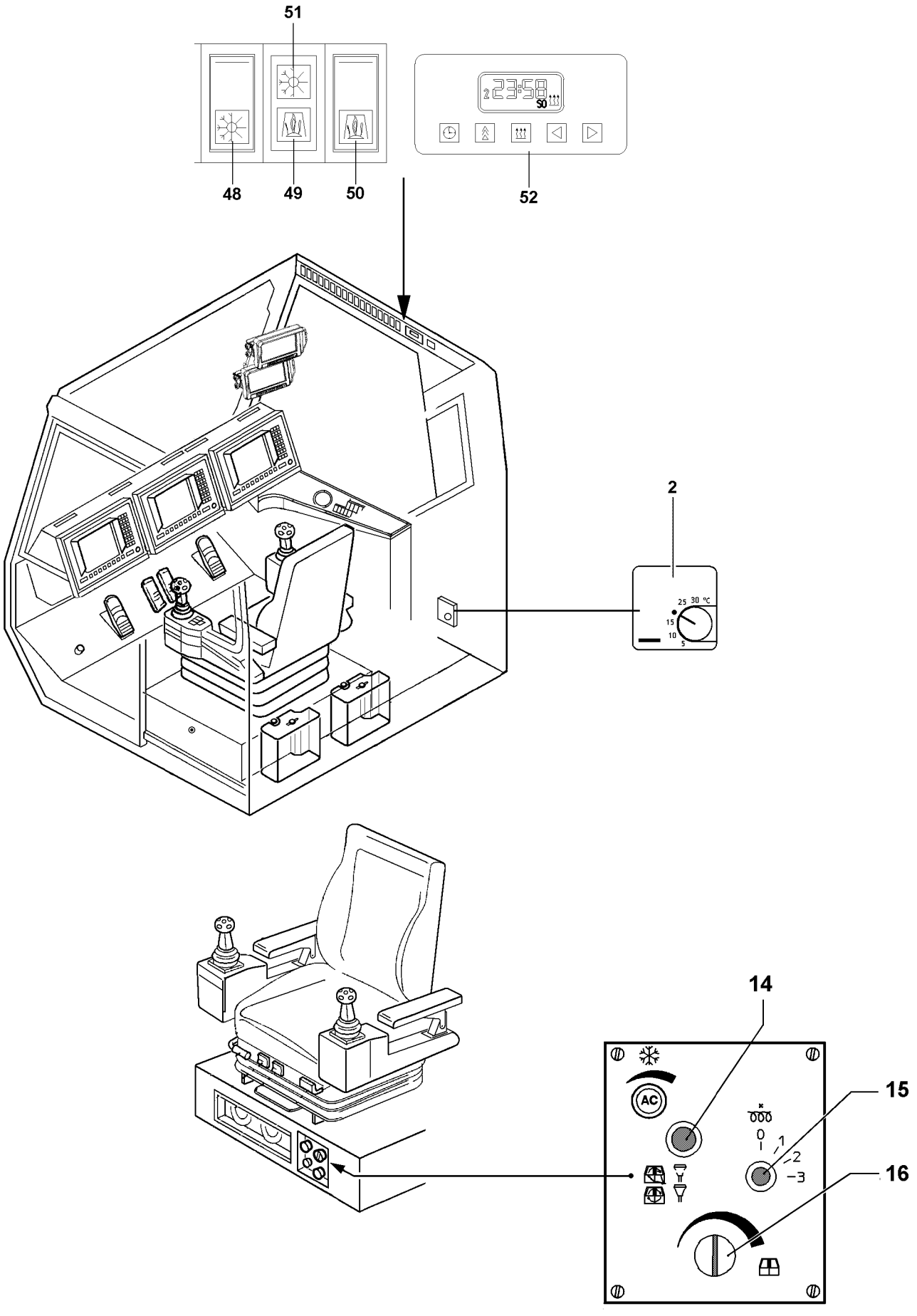
▶ Set the blower with the 3-stage rotary switch **15**.

Result:
– The air volume will be regulated.

1.1.3 Adjusting the recirculated air / fresh air

▶ Actuate the changeover switch **14**.

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1.2 Operating the engine-independent auxiliary heater*

The engine-independent auxiliary heater is used to heat the cab when the engine is turned off and as auxiliary heater* at low ambient temperatures, if the engine-dependent heating is insufficient.
For detailed description of the auxiliary heater* refer to the enclosed manufacturer's operating instructions.
In summer run the auxiliary heater* once a month for approx. 15 to 20 minutes.
Carry out maintenance work on the auxiliary heater* as outlined in the enclosed manufacturer's operating instructions.

1.2.1 Start up

NOTICE
Risk of damage to 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 heater, even with a timer, only in closed areas such as garages or workshops if an exhaust suction system is present.



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 off the heater.

▶ Set the knob **16** to “warm”.
▶ Actuate the switch **50**.
Result:
– The function control on the switch **50** lights up.
– The indicator light **49** lights up.

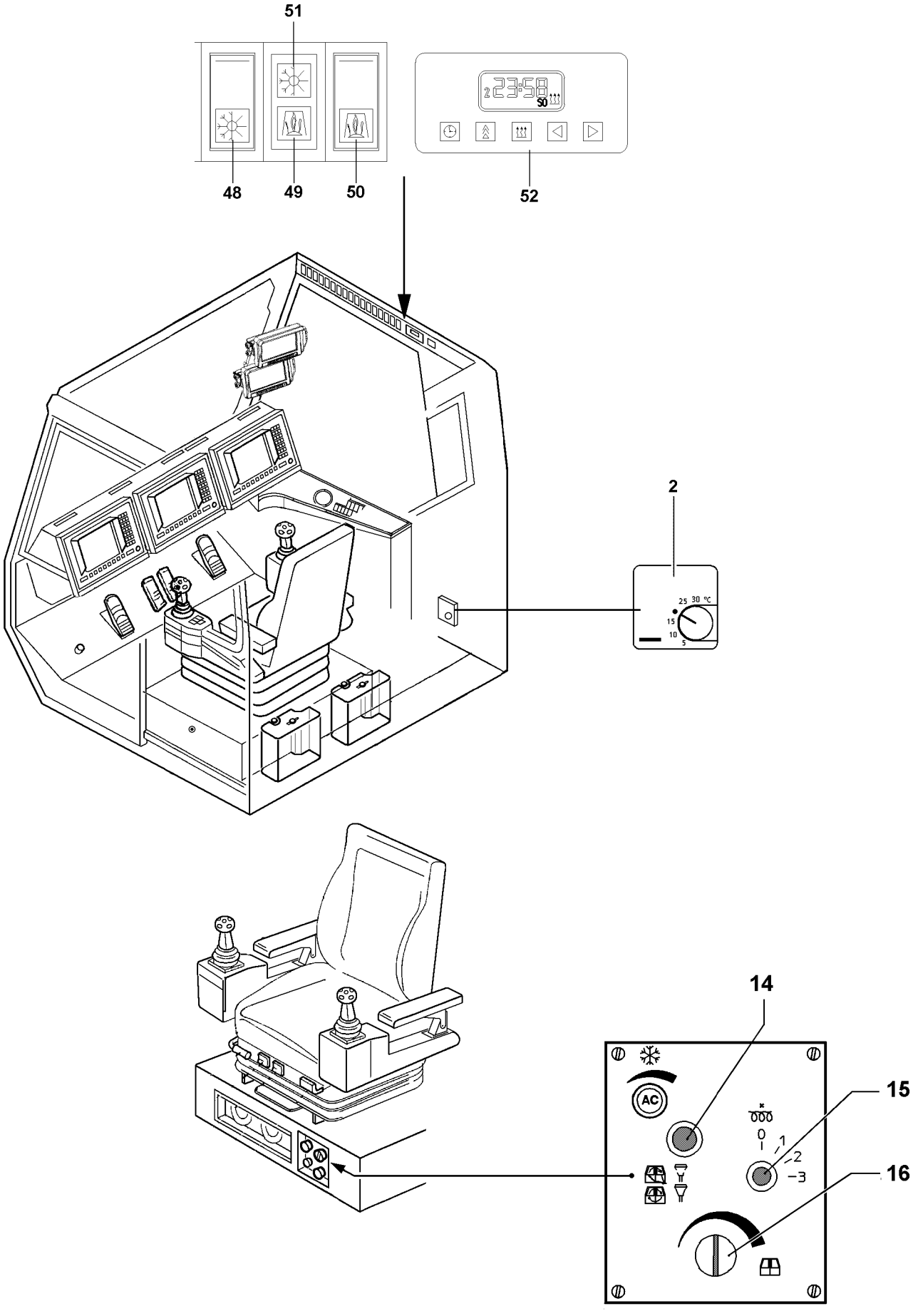
1.2.2 Turning off

▶ Actuate the switch **50**.
Result:
– The function control on the switch **50** turns off.
– Each time the auxiliary heater is turned off, it continues to run up to 150 seconds longer.

NOTICE
Danger of property damage!
▶ Turn the battery master switch off only when the heater after run is over.

– When the after run is over:
The indicator light **49** turns off.

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1.2.3 Operation with timer*

For a detailed description of the timer **52** refer to the enclosed manufacturer's operating instructions.

▶ Set the required turn-on time, temperature and duration of heater operation on the timer **52**.

▶ Open or close the air vents, as desired.

Result:

– Upwards or downwards air distribution will be selected.

▶ Set the knob **16** to “warm”.

1.2.4 Operating the thermostat*

Ensure that the following prerequisite is met:

– the knob **16** is set to “warm”.

▶ Turn the thermostat **2** to the desired temperature.

1.2.5 Venting the system

When refilling the system, it should be carefully vented.

▶ Add coolant into the expansion tank for the heater system according to the lubricant chart.

▶ Start the engine.

▶ Set the knob **16** to “warm”.

▶ Check the expansion tank for air bubbles.

Result:

– The heating system is vented as soon as no more air bubbles rise up.

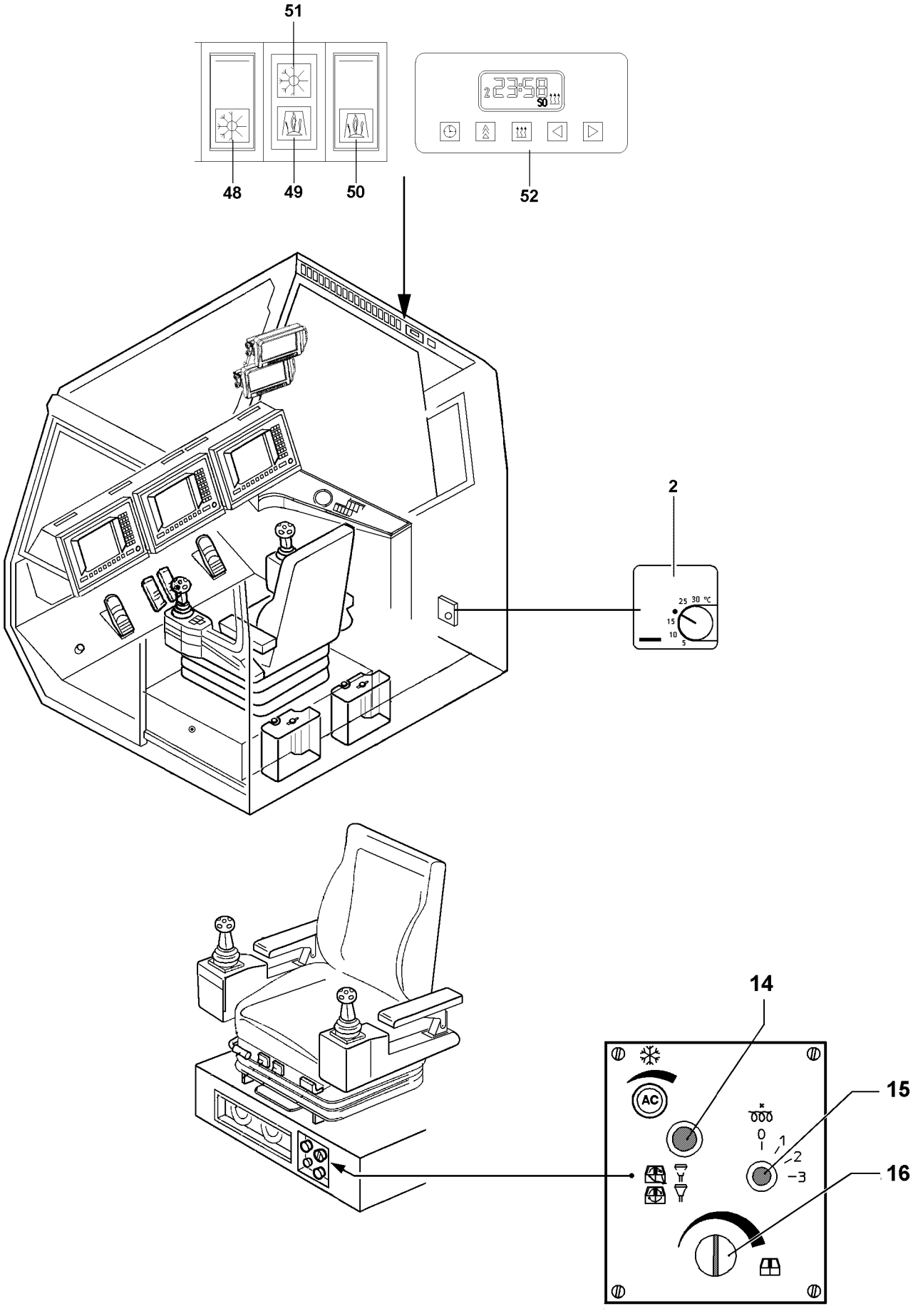
▶ Set the knob **16** to “cold”.

▶ Check the expansion tank for air bubbles.

Result:

– The circuit is vented as soon as no more air bubbles rise up.

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1.3 Air conditioning system* operation

For a detailed description of the air conditioning system*, refer to the enclosed manufacturer's operating instructions.
Carry out maintenance work on the air conditioning system* according to the enclosed manufacturer's operating instructions.

1.3.1 Start up

Make sure that the following prerequisites are met:
– the battery master switch is turned on
– the engine is running
– the air intake opening for recirculated air operation is clear

▶ Open or close the air vents, as desired.

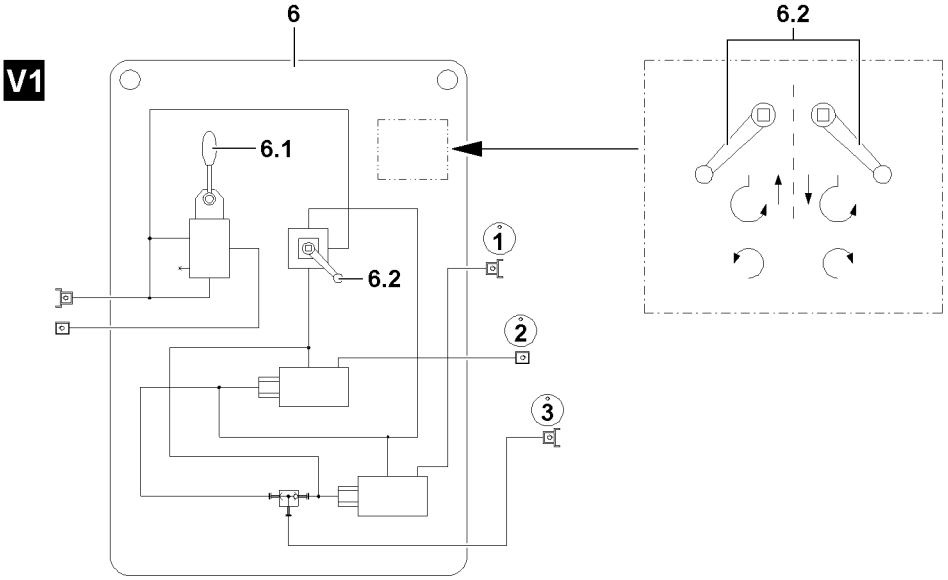
Result:
– Upwards or downwards air distribution will be selected.

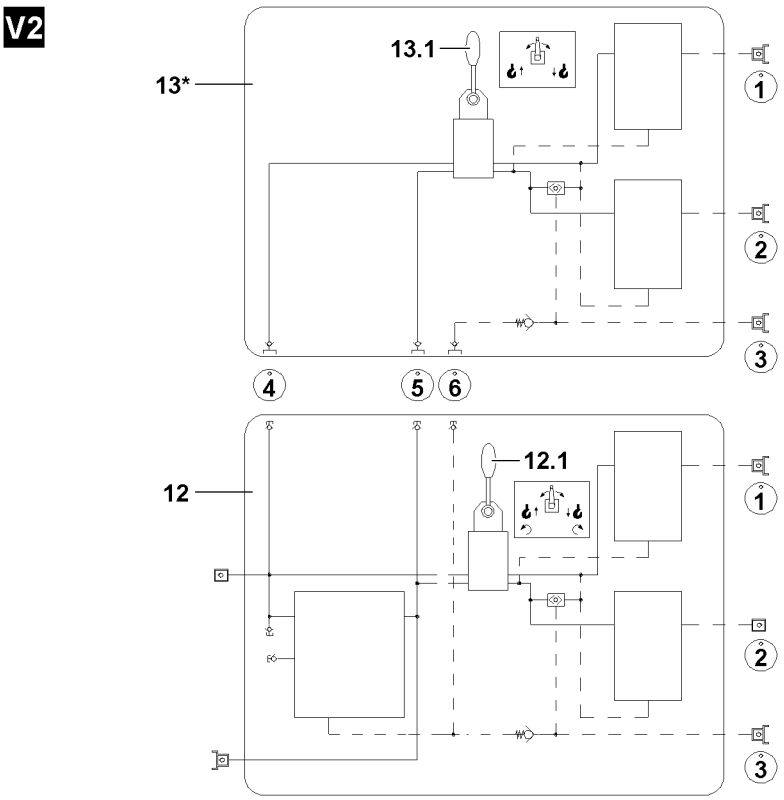
▶ Close both windows and the cab door.
▶ Set the changeover switch **14** for fresh air / recirculated air to recirculated air operation.
▶ Actuate the switch **48**.

Result:
– The indicator light **51** lights up.
– The air conditioning system* is turned on and ready to operate.

▶ Open the appropriate air vent for upward air distribution.
▶ Turn on the fan with the rotary switch **15**.
▶ Regulate the temperature with the knob **16**.

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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!

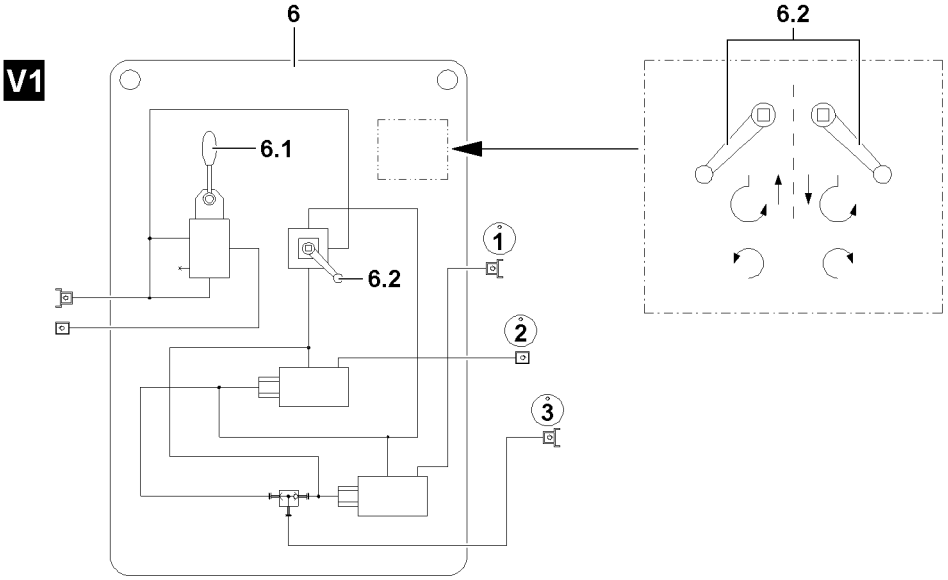
There are two **different** variations of assembly plates.
With variation 1 **V1**, all winches, which are equipped with the respective auxiliary hydraulic for emergency operation and the slewing gear can be actuated, each individually.
With variation 2 **V2**, which consists of two assembly plates, 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.

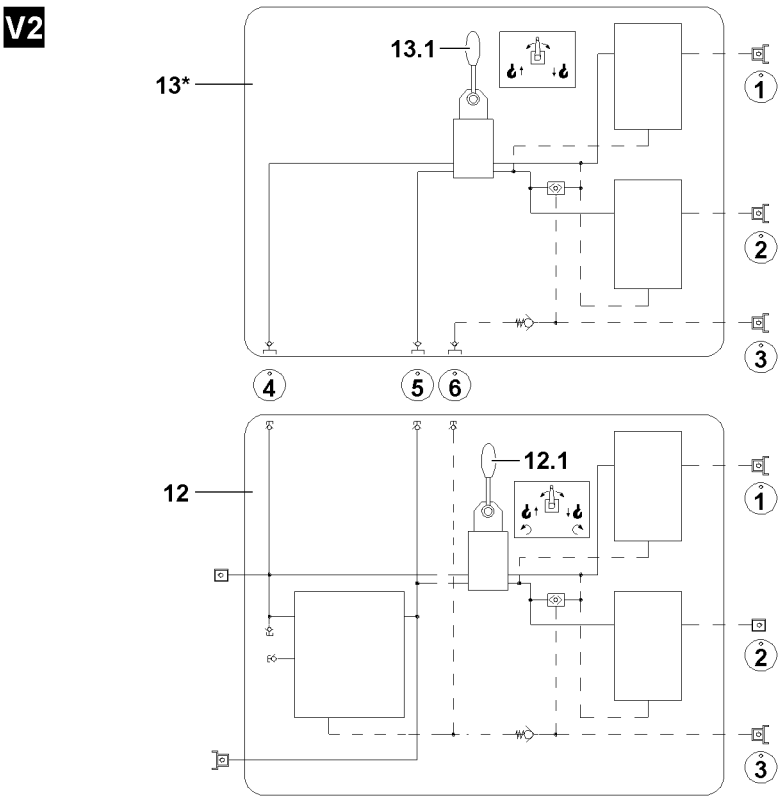
Note
▶ Observe the following charts!

	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)

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1.1 General danger notes

DANGER
Significant accident risk during emergency operation!
During an emergency operation, crane movements are no longer monitored by the LICCON computer system!
In the event of improper operation or deliberate misuse, the crane can topple over!
There is an increased risk of accident if the following danger notes are not observed!
Personnel can be severely injured or killed!
This could result in high property damage!
▶ All hazard warnings are to be observed and maintained!

General danger notes!

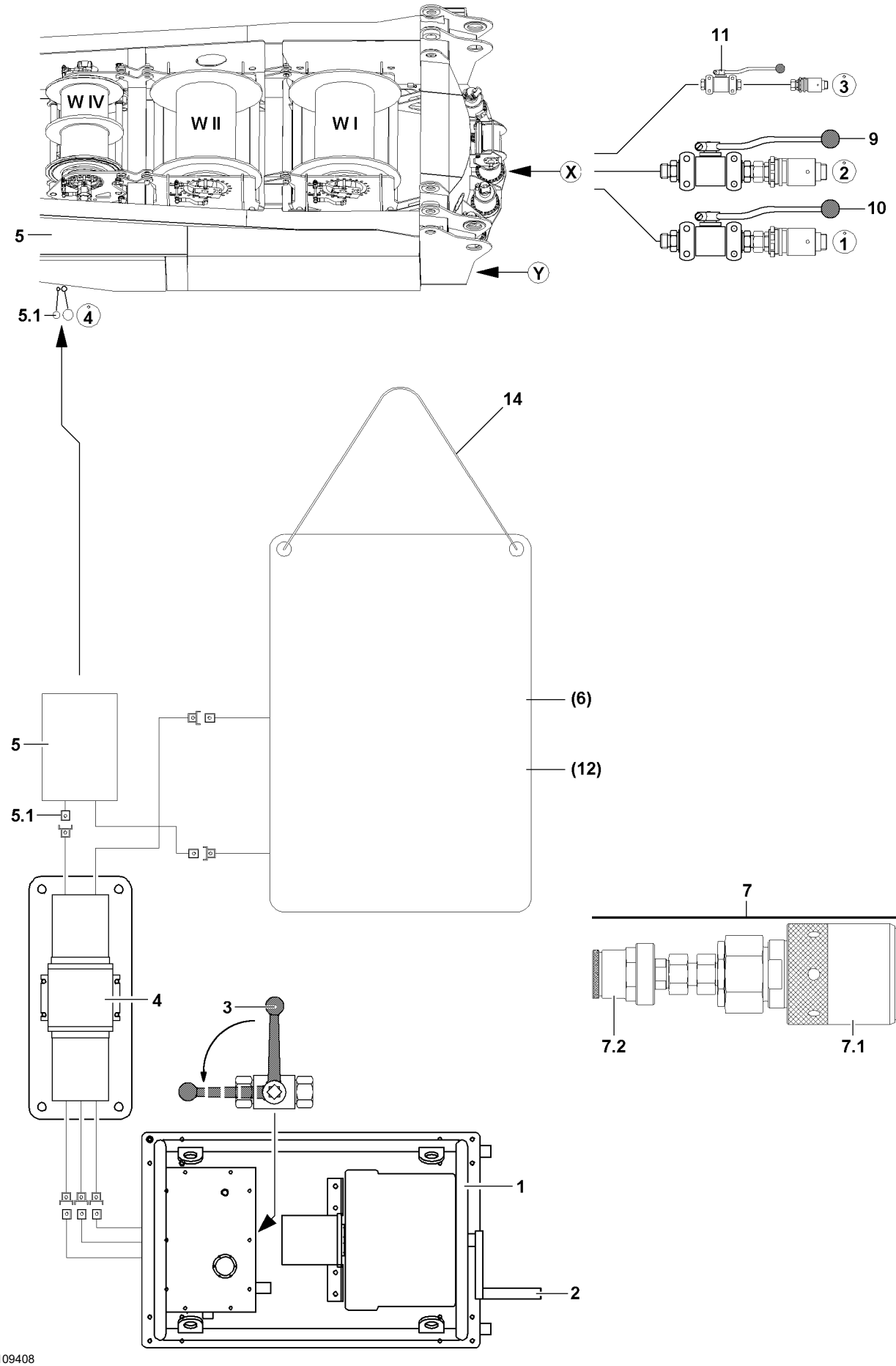
1.) **Emergency operation of the crane superstructure may only be carried out:**
- **To remove a dangerous situation.**
- **After consultation with customer service at LIEBHERR-Werk Ehingen GmbH.**
- **By authorized personnel who are knowledgeable of the hydraulic circuit diagram, the connection diagram and carrying out emergency operation.**
- **By authorized personnel who are aware of the risks of emergency operation.**
- **To carry out load reducing movements.**

2.) **The danger zone must be blocked off!**
3.) **No persons or objects may remain in the danger zone!**
4.) **If a load is on the hook, then it must first be set down to relieve the boom!**
5.) **During emergency operation, all safety devices, with the exception of “winch spooled out” are automatically bypassed**!
6.) **In the event of a defect or failure of the LICCON computer system, each step must be carried out and monitored with extreme caution and care, since a visual check on the LICCON monitor is no longer possible. Visual check!**
7.) **All crane movements must be travelled with extreme caution and at the lowest speed!**
8.) **The crane operator must be in visual contact with auxiliary personnel or guides person!**

Note
Please note!
▶ The hydraulic supply for the crane can, to the extent that the crane has been equipped, take place through an emergency unit*. If this is not the case, the crane must be taken down by using additional auxiliary cranes!

WARNING
The crane can topple over!
▶ The boom may only be luffed down if the stability of the crane permits this action, observe information in the load tables and maintain them!
▶ When taking down the boom, the information in the Erection and take down charts are to be observed and followed!

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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!

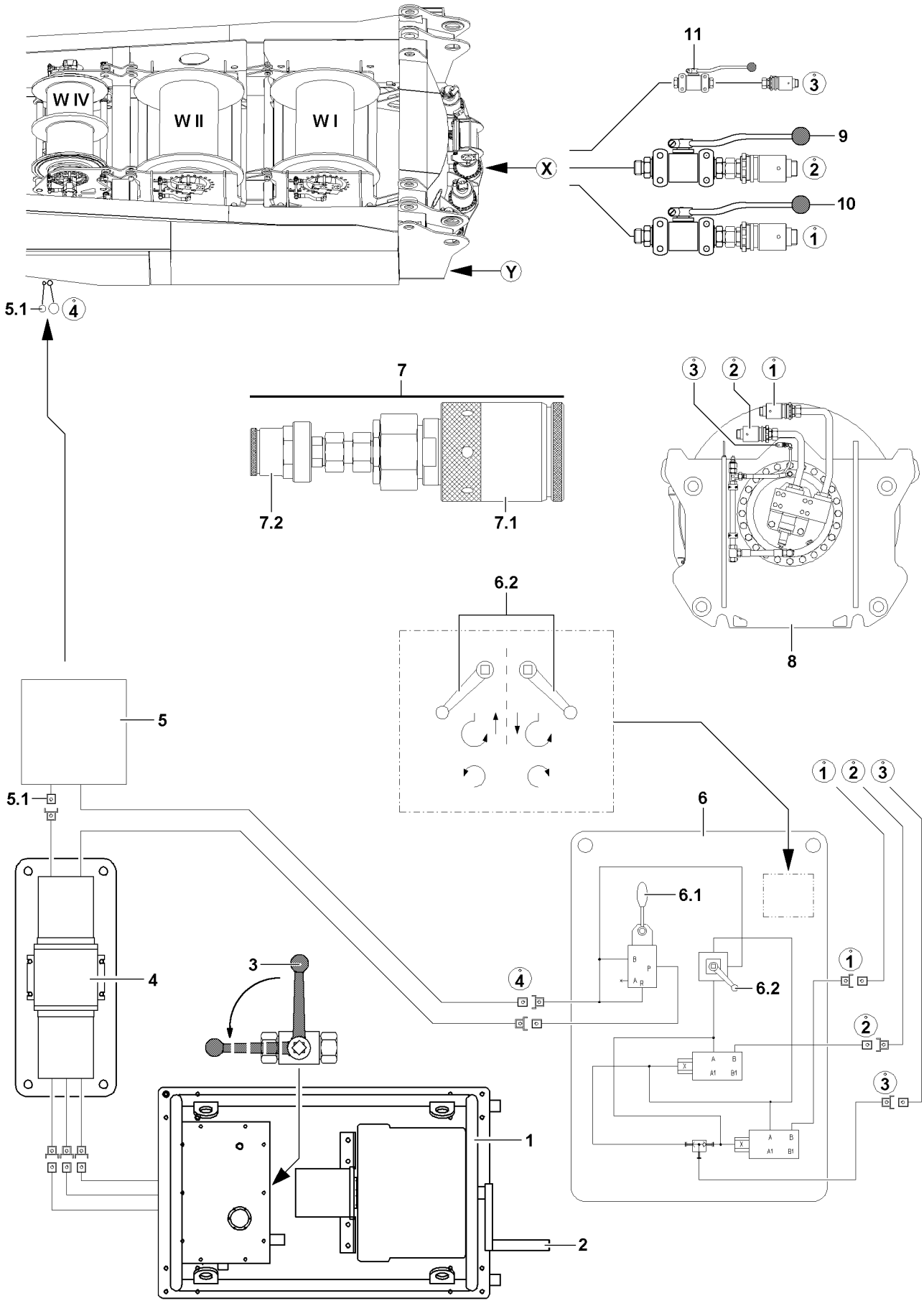
Make sure that the following prerequisites are met:
- The hydraulic circuit diagram is available.
- The hydraulic system is operative.
- An emergency operation aggregate **1** is available.
- A “hydraulic transformer **4** ” is available.
- The assembly plate(s) are available.
- Reducer sections **7** (adapter) are available.
- The dust plugs for the hydraulic connections are removed.

1.4 Establishing the hydraulic connections

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines are pressurized when releasing the connections, it can lead to severe injuries to assembly personnel!
- ▶ Relieve the pressure in the hydraulic lines before releasing!

- ▶ Establish the hydraulic connections from the emergency operation aggregate* **1** to the transformer **4**.
- ▶ Establish the hydraulic connection from the transformer **4** to the (suction line) on the turntable **5** of the crane, connection **5.1**.
- ▶ Hydraulic connection (return line, number **4**) from the turntable of the crane to the assembly plate **6** or to the assembly plate **12**.
- ▶ Establish the hydraulic connection (pressure line) from the transformer **4** to the assembly plate **6** or to the assembly plate **12**.

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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 the crank **2** on the emergency operation aggregate* **1**.
▶ Switch the ball valve **3** to “horizontal” position.

Note
▶ The engine rpm on the emergency operation aggregate can be set via a separate speed regulator!

2.3 Emergency operation winches

2.3.1 Establishing the hydraulic connections to the winch

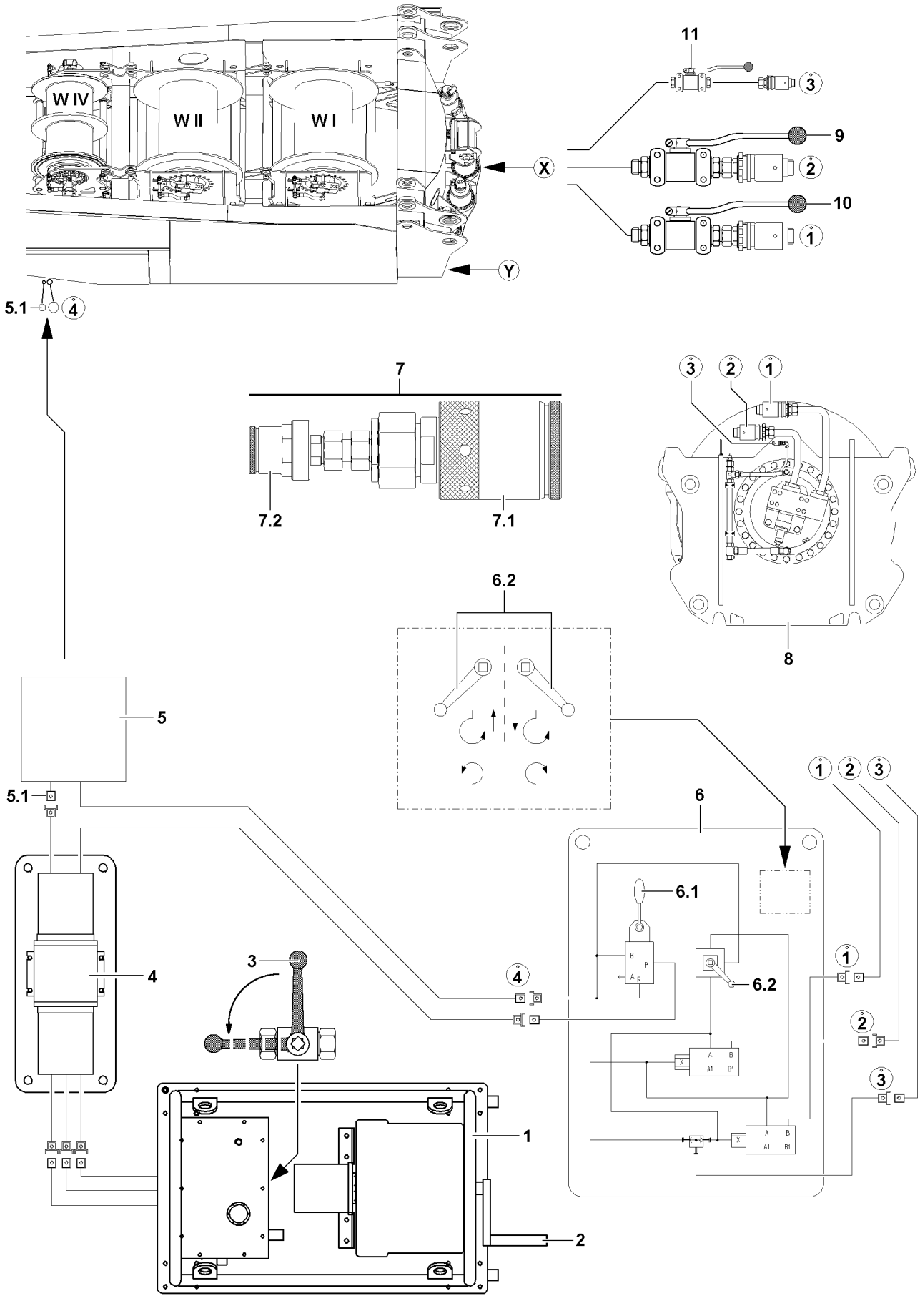
Ensure that the following prerequisite is met:
– The pressure in the hydraulic system has been relieved.

▶ Release the hydraulic connections on the corresponding winch.
▶ Install the reducer sections **7** (adapter) with coupling sleeve **7.1** on the connection **1** and on the connection **2** of the winch **8**.

Note
▶ Observe the numbering of the hydraulic lines!

▶ Establish the hydraulic connections for the assembly plate **6** (connection **1**, connection **2** and brake **3**) to the winch **8**.

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2.3.2 Spooling the winch out

▶ Set the 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 the 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 pressure in the hydraulic system has been relieved.

▶ Disconnect the hydraulic connections from the winch **8** to the assembly plate **6**.

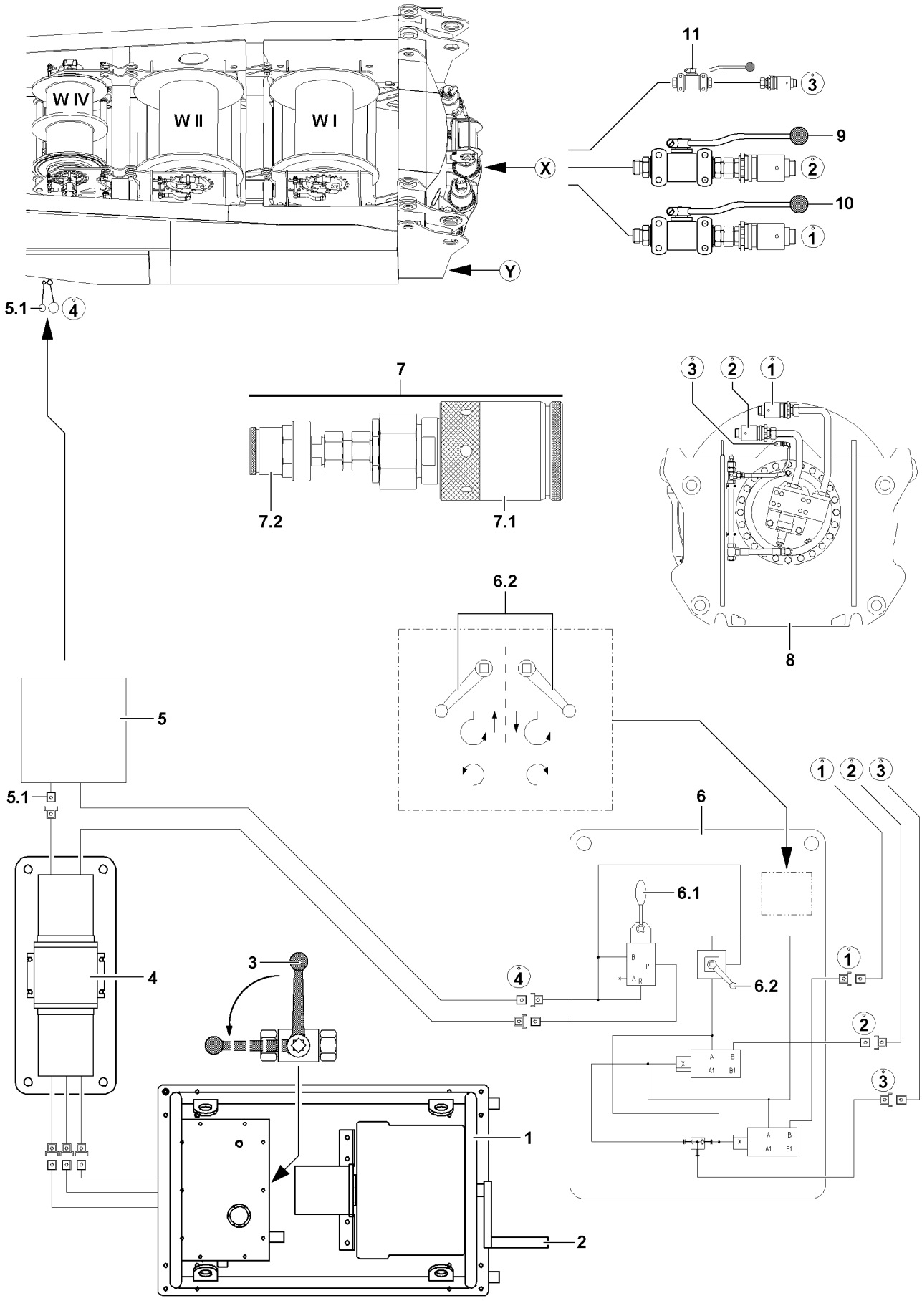
▶ Remove the reducer sections **7** (adapter).

▶ Close off the hydraulic connections of the winch **8** with dust caps.

or

■ Reconnect the winch **8** onto the hydraulic system of the crane.

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3 Emergency operation of slewing gear(s) with assembly plate Variation 1 (V1)

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines are pressurized when releasing the connections, it can lead to severe injuries to assembly personnel!
▶ Relieve the pressure in the hydraulic lines before releasing!

Note
▶ For each crane type, the installation position of the ball valves for emergency operation of the slewing gear on the turntable varies!
▶ Possible installation positions of the ball valve: Point **X** or point **Y**!

3.1 Establishing the hydraulic connection to the slewing gears

Ensure that the following prerequisite is met:
– The pressure in the hydraulic system has been relieved.

Note
▶ Observe the numbering of the hydraulic lines!

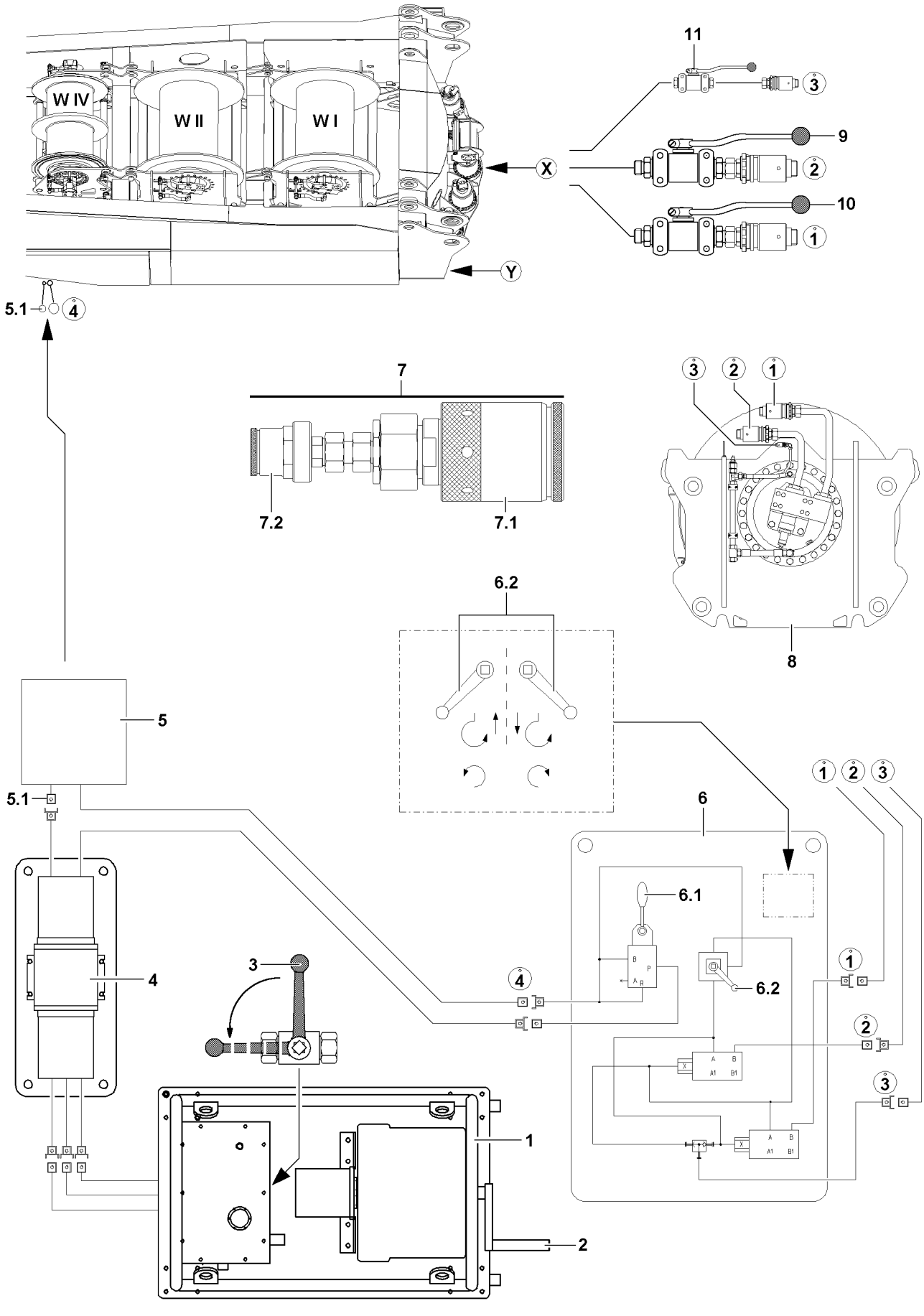
▶ Establish the hydraulic connections of the assembly plate **6** (connection **1**, connection **2** and brake **3**) to the “ball valves” on the turntable.

3.2 Turning the turntable to the left

▶ Set the ball valve **9** into emergency operation position.
▶ Set the ball valve **10** into emergency operation position.
▶ Set the ball valve **11** into emergency operation position.
▶ Set the ball valve **6.2** for the assembly plate **6** on “turn left”.
▶ Move the manual lever **6.1** carefully.

Result:
– The turntable turns to the left.

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3.3 Turning the turntable to the right

- ▶ Set the ball valve **9** into emergency operation position.
- ▶ Set the ball valve **10** into emergency operation position.
- ▶ Set the ball valve **11** into emergency operation position.
- ▶ Set the ball valve **6.2** for the assembly plate **6** on “turn right”.
- ▶ Move the manual lever **6.1** carefully.

Result:

– The turntable turns to the right.

3.4 Disconnecting the hydraulic connections

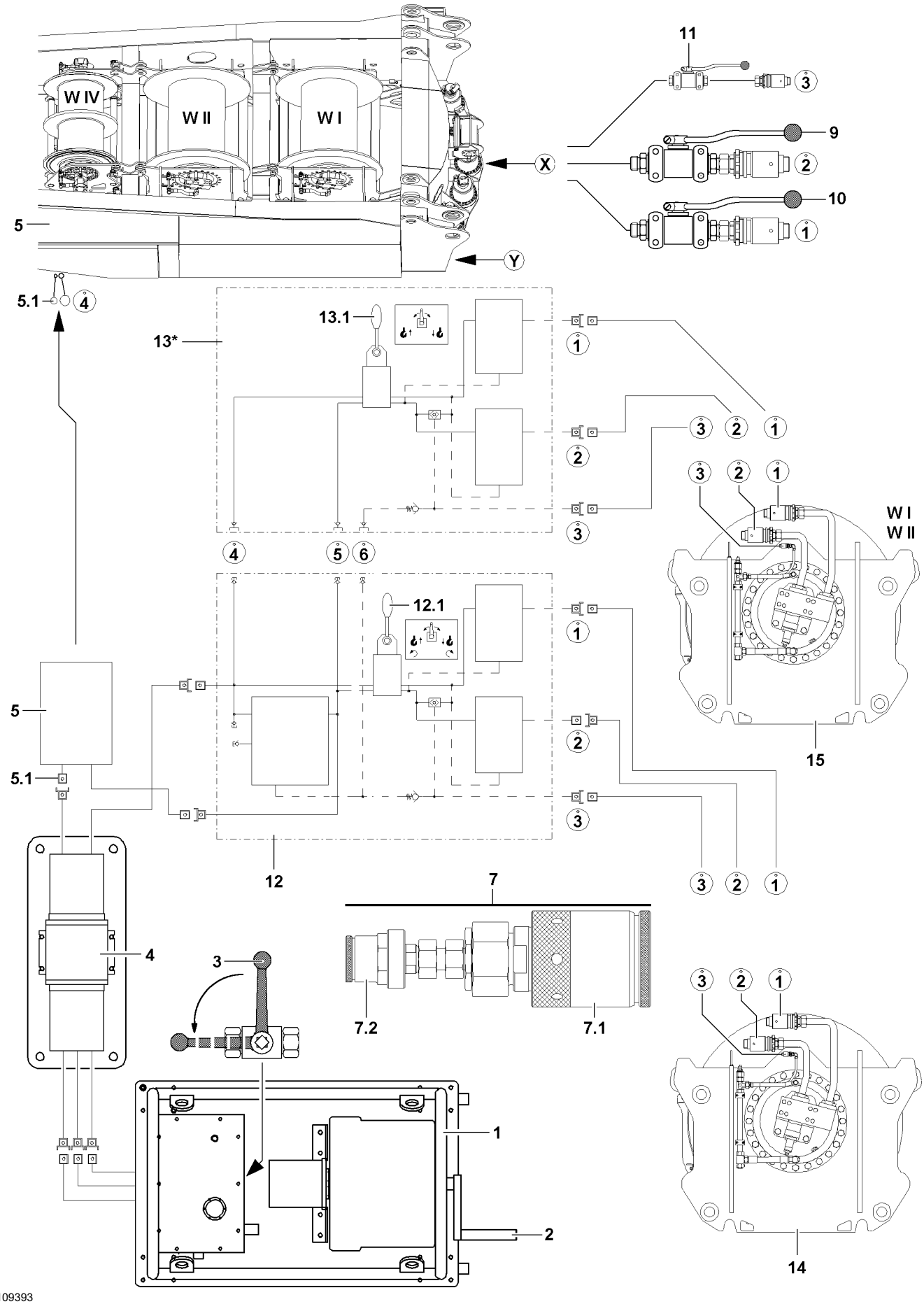
Make sure that the following prerequisites are met:

– The emergency operation is completed.
– The pressure in the hydraulic system has been relieved.

Disconnect the hydraulic connections to the assembly plate **6**.

- ▶ Reposition the ball valve **9** in position for crane operation.
- ▶ Reposition the ball valve **10** in position for crane operation.
- ▶ Reposition the ball valve **11** in position for crane operation.
- ▶ When the ball valve **9**, ball valve **10** and ball valve **11** are repositioned into crane operation position:
  Disconnect the hydraulic connections to the assembly plate **6**.
- ▶ Close off the hydraulic connections with dust plugs.

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4 Emergency operation with assembly plate(s) Variation 2 (V2)

Note
▶ 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 the crank **2** on the emergency operation aggregate* **1**.
▶ Switch the ball valve **3** to “horizontal” position.

Note
▶ The engine rpm on the emergency operation aggregate can be set via a separate speed regulator!

4.2 Emergency operation of 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 pressure in the hydraulic system has been relieved.

▶ Release the hydraulic connections on the corresponding winch.
▶ Install the reducer sections **7** (adapter) with coupling sleeve **7.1** on the connection **1** and on the connection **2** of the respective winch.

Note
▶ Observe the numbering of the hydraulic lines!

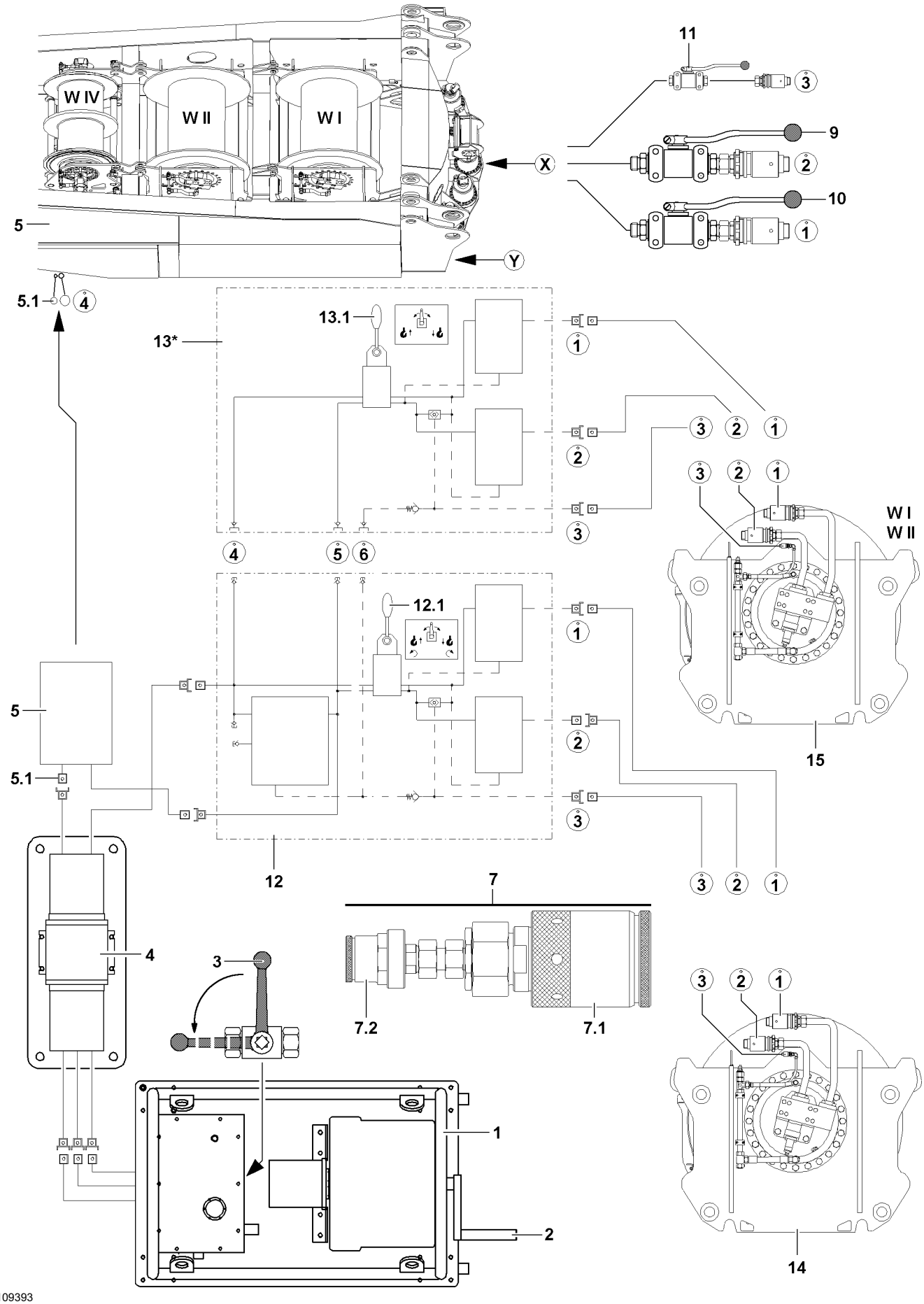
▶ Establish the hydraulic connection of the assembly plate **12** (connection **1**, connection **2** and brake **3**) to the respective winch.

4.2.2 Spooling the winch out

▶ Set the ball cock **12.1** for the assembly plate **12** on “lower”.

Result:
– The winch spools out.

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4.2.3 Spooling the winch up

▶ Set the 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 pressure in the hydraulic system has been relieved.

▶ Separate the hydraulic connections from the respective winch to the assembly plate **12**.
▶ Remove the reducer sections **7** (adapter).
▶ Close off the hydraulic connections of the winch with dust plugs.

or

■ Reconnect the winch to the hydraulic system of the crane.

4.3 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

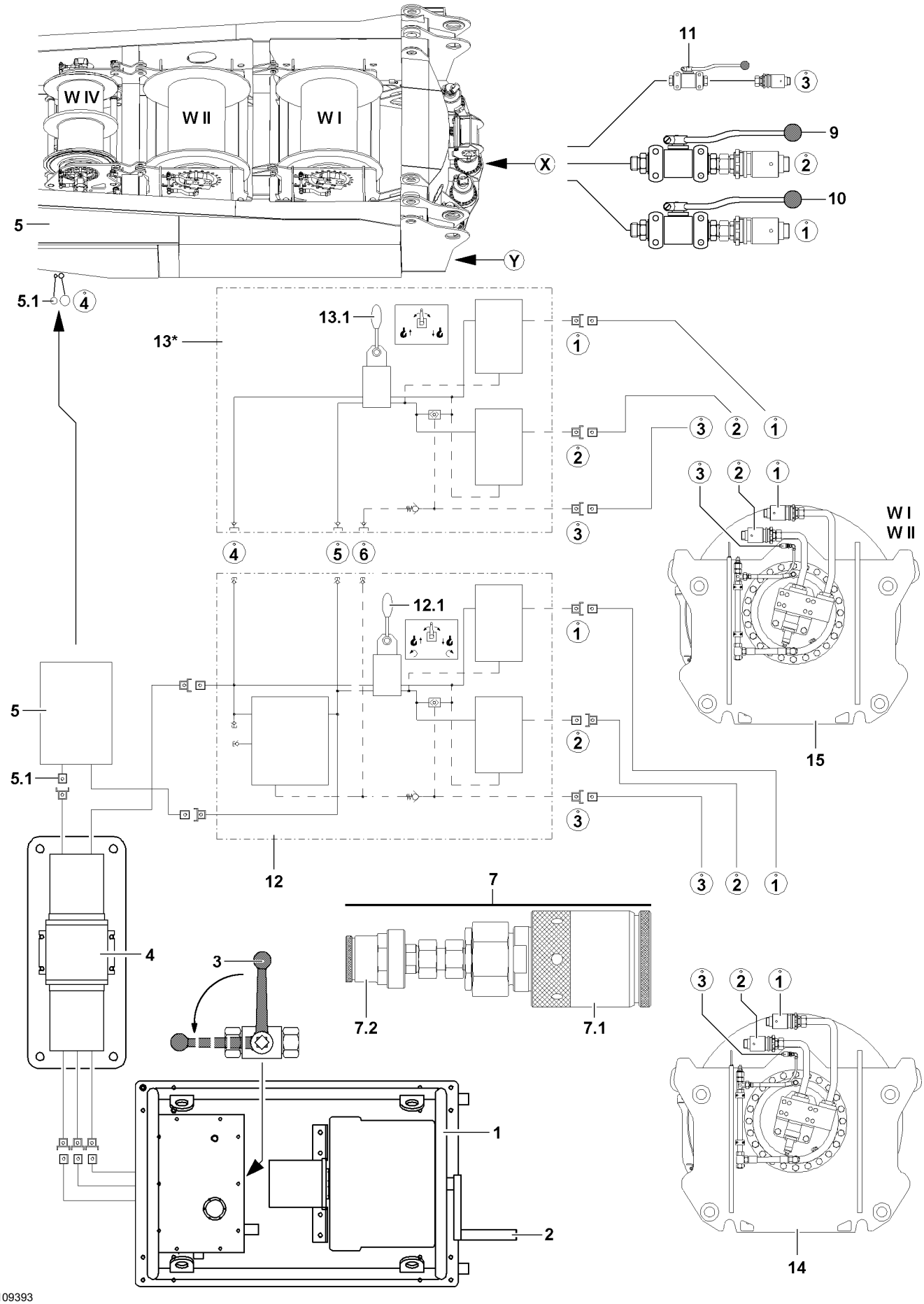
Risk of accident!

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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4.3.1 Establishing the hydraulic connections to the winches

Ensure that the following prerequisite is met:

– The pressure in the hydraulic system has been relieved.

▶ Release the hydraulic connections on winch 1 and winch 2.

▶ Install the reducer sections **7** (adapter) with coupling sleeve **7.1** on the connection **1** and on the connection **2** of the respective winch.

Note

▶ Observe the numbering of the hydraulic lines!

▶ Establish the hydraulic connections for the assembly plate **12** (connection **1**, connection **2** and brake **3**) to winch 1.

or

■ Establish the hydraulic connections for the assembly plate **12** (connection **1**, connection **2** and brake **3**) to winch 2.

▶ Establish the hydraulic connections for the assembly plate **13** (connection **1**, connection **2** and brake **3**) to winch 1.

or

■ Establish the hydraulic connections for the assembly plate **13** (connection **1**, connection **2** and brake **3**) to winch 2.

4.3.2 Spooling the winches out

Note

▶ Check which winch you have connected to which assembly plate!

▶ Set the ball cock **12.1** for the assembly plate **12** on “lower”.

Result:

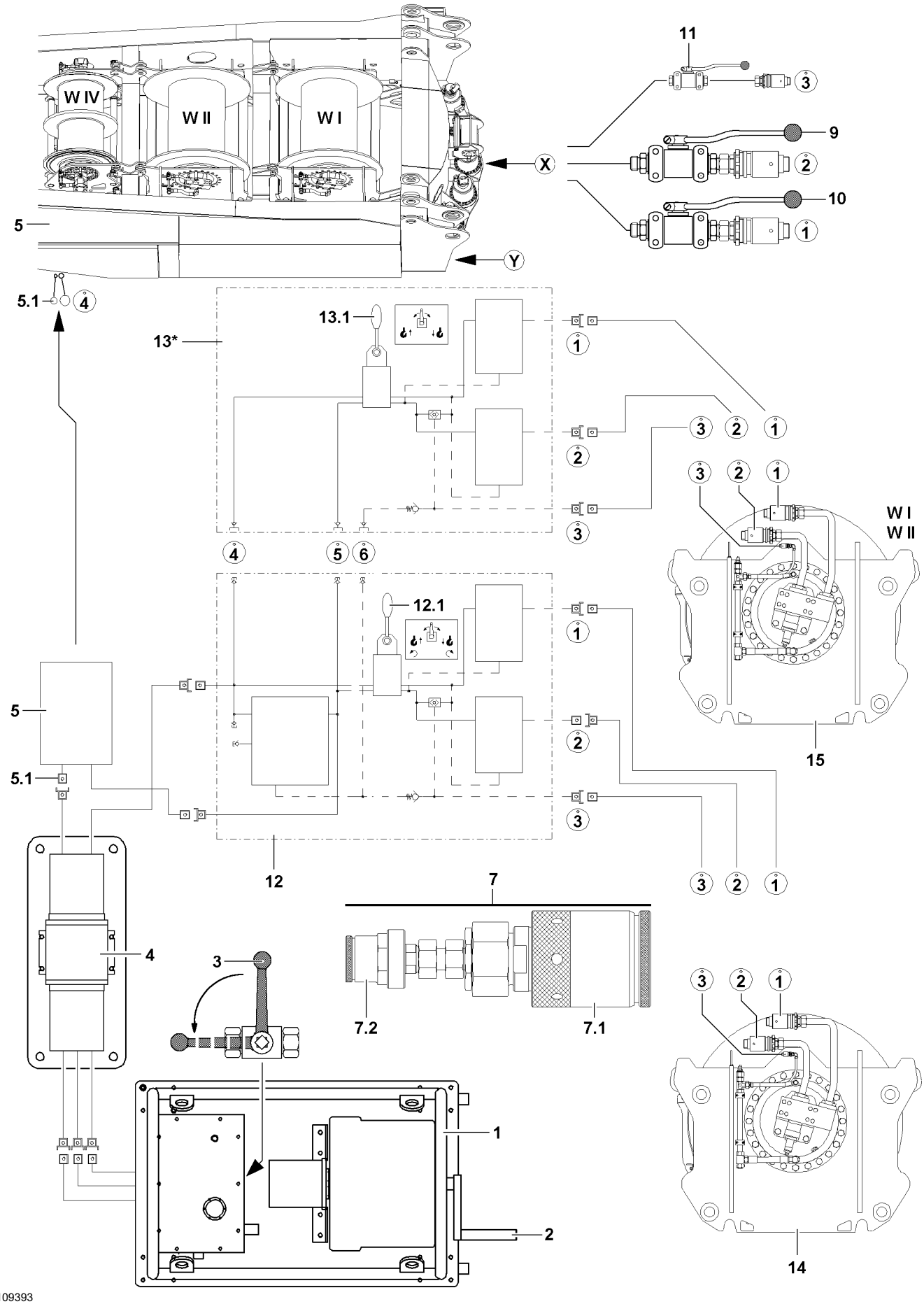
– Winch 1 **or** winch 2 spools out.

▶ Set the ball cock **13.1** for the assembly plate **13** on “lower”.

Result:

– Winch 2 **or** winch 1 spools out.

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4.3.3 Spooling the winches up

▶ Set the ball cock **12.1** for the assembly plate **12** on “lift”.

Result:

– Winch 1 **or** winch 2 spools up.

▶ Set the 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:

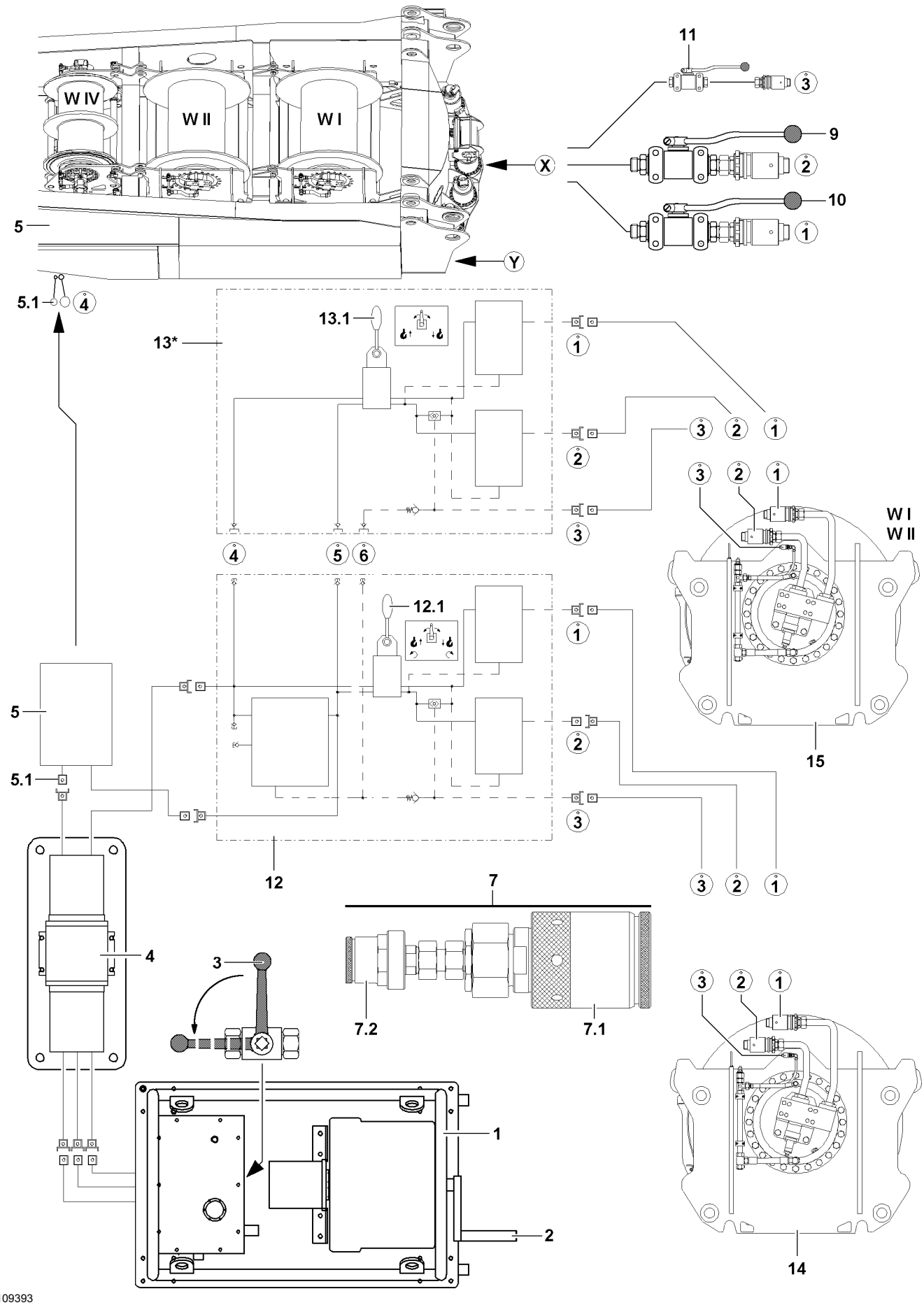
– The emergency operation is completed.
– The pressure in the hydraulic system has been relieved.

▶ Disconnect the hydraulic connections of winch 1 and winch 2 to the respective assembly plates.
▶ Remove the reducer sections **7** (adapter).
▶ Close off the hydraulic connections of the winches with dust plugs.

or

■ Reconnect the winches to the hydraulic system of the crane.

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5 Emergency operation slewing gear(s) with assembly plate(s) Variation 2 (V2)

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines are pressurized when releasing the connections, it can lead to severe injuries to assembly personnel!
▶ Relieve the pressure in the hydraulic lines before releasing!

Note
▶ For each crane type, the installation position of the ball valves for emergency operation of the slewing gear on the turntable varies!
▶ Possible installation positions of the ball valve: Point **X** or point **Y**!

Note
▶ The slewing movement is actuated and the speed of the slewing movement is determined via the ball valve **12.1**!

5.1 Establishing the hydraulic connection to the slewing gears

Ensure that the following prerequisite is met:
– The pressure in the hydraulic system has been relieved.

Note
▶ Observe the numbering of the hydraulic lines!

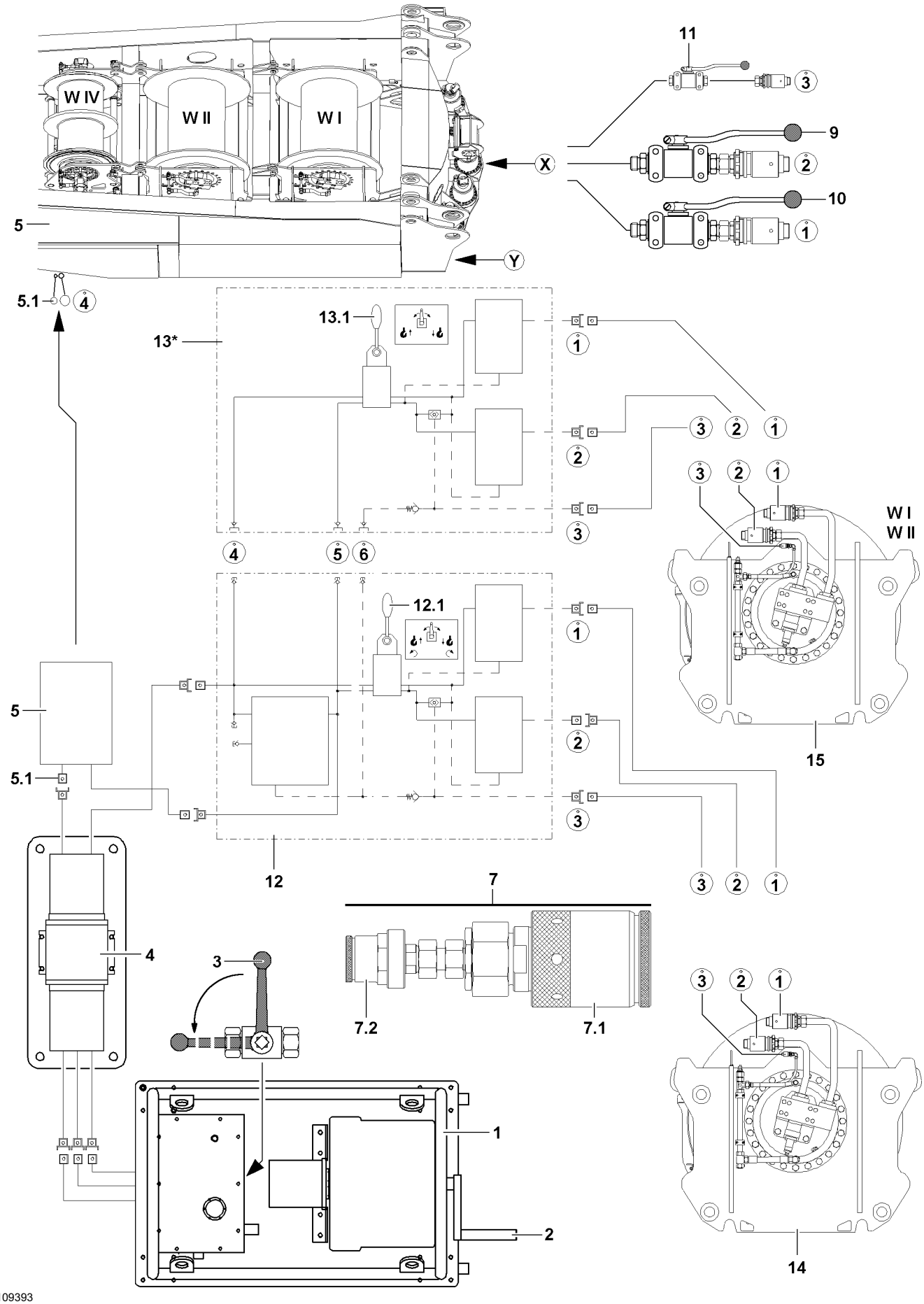
▶ Establish the hydraulic connections of the assembly plate **12** (connection **1**, connection **2** and brake **3**) to the “ball valves” on the turntable.

5.2 Turning the turntable to the left

▶ Set the ball valve **9** into emergency operation position.
▶ Set the ball valve **10** into emergency operation position.
▶ Set the ball valve **11** into emergency operation position.
▶ Set the ball valve **12.1** for the assembly plate **12** on “turn left”.

Result:
– The turntable turns to the left.

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5.3 Turning the turntable to the right

- ▶ Set the ball valve **9** into emergency operation position.
- ▶ Set the ball valve **10** into emergency operation position.
- ▶ Set the ball valve **11** into emergency operation position.
- ▶ Set the ball valve **12.1** for the assembly plate **12** on “turn right”.

Result:

– The turntable turns to the right.

5.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

– The emergency operation is completed.
– The pressure in the hydraulic system has been relieved.

Disconnect the hydraulic connections to the assembly plate **12**.

- ▶ Reposition the ball valve **9** in position for crane operation.
- ▶ Reposition the ball valve **10** in position for crane operation.
- ▶ Reposition the ball valve **11** in position for crane operation.
- ▶ When the ball valve **9**, ball valve **10** and ball valve **11** are repositioned into crane operation position:
  Disconnect the hydraulic connections to the assembly plate **12**.
- ▶ Close off the hydraulic connections with dust plugs.

6 Completing emergency operation

6.1 Procedure

- ▶ Turn the emergency operation aggregate* **1** off.
- ▶ Close the ball valve **3**.
- ▶ Disconnect the hydraulic connections and close them off with dust plugs.

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7.00 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 mobile crane components according to the data in the maintenance intervals, the maintenance notes and the lubrication chart!
- ▶ Replace damaged crane components immediately!

NOTICE
Damage of crane components!
If mobile crane components are not maintained according to the maintenance intervals and maintenance guidelines in the individual chapter, or if other lubricants are used than specified in the lubrication chart, the respective crane components can be damaged and/or functionally fail!
The warranty for the respective crane components are voided!
- ▶ Maintain mobile crane components according to the data in the maintenance intervals, the maintenance notes and the lubrication chart!

1.1 Liebherr Customer Service is for you

Liebherr mobile cranes - whether truck-mounted, mobile or crawler cranes - are technically advanced products, which demonstrate daily crane use, even under tough conditions.
The high technical standards of these cranes provide functional security, offer functional security, resistance to failure and ease of maintenance.
Liebherr is continuously developing the drive and control components. The combination of well proven units and modern manufacturing methods produces cranes that are safe to operate and easy to maintain.
Several hundred cranes are built every year for the international market, supported by international service.
Liebherr's “After Sales Service” plays an important role in ensuring operational readiness and high crane availability.
With Liebherr, service begins when the crane is handed over. Your crane operators will be professionally trained in line with their level of knowledge, and we devote much time to this.
We also train your workshop staff in all crane-specific matters, because we know that they can deal with more than just minor repairs themselves. Often there are specialists who can quickly and reliably carry out crane repairs.
We 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 refund 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 crane operational use, and may be used without risking safety!

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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 components!
▶ Only use Original Liebherr replacement parts!

1.2 Checking the battery voltage

Note
▶ The battery voltage must be checked in regular intervals and recharged, if necessary! Especially if a crane is taken “out of service” and a user, such as the airplane warning light is turned on.

1.3 Checking the antislip coverings

Check the antislip coverings regularly regarding their antislip properties and cleanliness. Clean antislip coverings regularly with a strong brush to retain the antislip properties. To clean the surfaces, use a commercially available cleaner and flush with water.

WARNING
Risk of falling!
If the following measures are not observed, personnel can fall down and be killed or severely injured!
▶ Keep antislip coverings clean and free of snow and ice!
▶ Only step on antislip coverings with clean shoes!
▶ Replace or renew missing or damaged antislip coverings!

2 Cleaning and care of the crane

2.1 Instructions for sound damping (soundproofing)

Sound damping in the area of engines and other noise sources is an integral part of 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
Sound damping (soundproofing) damage!
By using unsuitable tools or cleaning methods, sound damping can be destroyed or damaged during cleaning!
▶ Remove severe contamination with suitable tools, for example with soft plastic scrapers!
▶ Do not use tools with sharp edges!
▶ Only use steam cleaners with extreme care and with a sufficient distance for sound damping and low water pressure!
▶ Do **not** use **solvents** for cleaning!

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WARNING
Impurities from solvents or foreign substances!
For example, if sound damping is polluted by solvents, motor oils, gear oils, hydraulic oils or fuels, such substances can ignite and significantly detrimentally change the fire performance of the sound damping!
- ▶ If such soiling of the sound damping occurs, **remove immediately** and replace with **original parts**!

2.2 Care instructions for the cab and the crane operator's cabin

Note
- ▶ The steering wheel, centre 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 dishwashing detergent!
- ▶ Do not use any scouring agents!

3 Measures taken upon work interruption or transport

3.1 Hydraulic cylinder

NOTICE
Corrosion danger to the hydraulic cylinders!
When using cranes under aggressive environmental conditions, for example at places with maritime climates and particularly salty air, hydraulic cylinders can corrode and thereby be destroyed or severely damaged!
Expensive and extensive repairs can result!
- ▶ If the crane is out of order for an extended period: Dismantle the crane!
- ▶ Fully retract all crane hydraulic cylinders! If the hydraulic cylinders can not be completely retracted, protect exposed areas of the piston rod from corrosion, for example by greasing!
- ▶ Carefully grease particularly free areas on the piston rods, for example 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 or boom, personnel must be secured with appropriate safety measures to prevent them from falling! If this is not observed, working personnel can fall and be killed or severely injured!
- ▶ For all work on the crane where there is a danger of falling, suitable safety measures must be taken!
- ▶ The crane superstructure or boom may not be accessed without suitable aids!
- ▶ Suitable aids are, for example: Lifting platforms, scaffoldings, ladders, assembly platforms, auxiliary crane.

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- ▶ If railing are present on the crane superstructure, then they must be swung into operating position and secured for all work, see crane operating instructions, chapter 2.06!
- ▶ Only step on such aids with clean shoes!
- ▶ Keep aids clean and free of snow and ice!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the maintenance personnel must secure themselves with approved fall arrest systems to avoid falling, see Crane operating instructions, chapter 2.04!
- ▶ It is prohibited to step on the driver's cab or cab roof and specially marked surfaces, see Crane operating instructions, chapter 2.05!

5 Maintenance and inspection guidelines

Note

- ▶ The maintenance and inspection work on the crane chassis are carried out according to operating hours or by kilometres travelled!
- ▶ The maintenance and inspection work on the crane superstructure are carried out entirely according to 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 service intervals for all maintenance work. Only the relevant work is to be carried out.
[2] For individual components, the manufacturer's specifications must be observed.

WARNING

Danger of accidents during maintenance and inspection of crane components!

During maintenance and inspection work on crane components, there exists increased danger of accidents upon failure to observe maintenance and inspection guidelines!

Personnel can be severely injured or killed!

- ▶ Observe and adhere to the following listed warning notes and the generally applicable safety rules!

5.1 Warning notes

- Maintenance work may only be carried out by authorized and especially trained technical personnel.
- Unauthorized personnel are strictly prohibited from standing in the danger zone.
- Turn the engine off in the crane superstructure and the crane chassis.
- 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.
- Carrying out maintenance or inspection work during travel or crane operation are strictly prohibited.

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5.1.1 Warning notes on risk of burns

WARNING
Risk of burns during maintenance or inspection work!
While carrying out maintenance or inspection work, you can get severe burns on hot surfaces of the crane components! This applies especially for the exhaust system or the travel gear!
- ▶ Let any components to be maintained or inspected cool off!
- ▶ Do not spill any service fluids over the hot components!
- ▶ Avoid short circuits in the electrical system, especially on the battery!

5.1.2 Warning notes regarding turning parts

WARNING
Risk from turning parts!
If inspection work must be carried out while the engine is running, there is an increasing danger from turning parts and from the ignition system!
Personnel can be severely injured!
- ▶ Be particularly careful and do not grab into turning parts!
- ▶ Never reach into the cooler fan when the engine is warm! The cooler fan could turn on suddenly!

5.1.3 Warning notes on scalding risk

WARNING
Risk of scalding during maintenance or inspection work!
Upon opening the coolant reservoir, hot coolant can escape explosively!
The most severe scalding on the entire 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 hot steam of hot coolant, cover the cap with a large rag when opening!

5.1.4 Warning notes on fire danger

DANGER
Danger of fire!
While working on fuel systems or on electrical systems, there exists an increased danger of fire upon disregarding general safety rules!
Personnel can be severely injured or killed!
This can result in increased property damage!
- ▶ Disconnect the battery from the power supply!
- ▶ Do not smoke!
- ▶ Do not work near open flames!
- ▶ Keep a functioning fire extinguisher ready!

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5.1.5 Improper maintenance

NOTICE
Damage of components!
In case of incorrect maintenance, severe functional defects and damage on the components can occur!
- ▶ Add correct and sufficient service fluids during maintenance!
- ▶ For all maintenance work, observe utmost cleanliness to prevent dirt from entering the inside of the components!
- ▶ Check components in regular intervals for leaks!
- ▶ Have leaking components sealed immediately and properly!

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1 Crane chassis maintenance and inspection schedule

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				

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	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		

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	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 after	Regular maintenance, every 10 h	Regular maintenance, every 100 h	Regular maintenance, every 1000 h	Minimum maintenance Annually	Checks Daily	Checks 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 expansion tank							X	
Replace coolant						Every 2 years		
Engine independent heater								
Check the fluid level in the expansion tank							X	
Change the fluid for the heating system						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	

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	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	after	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
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		
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		

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	First maintenance after	Regular maintenance, every 125 h	250 h	500 h	1500 h	Minimum maintenance Annually	Checks Daily	Weekly
Relapse supports								
Lubricate bearings				X		X		
Check the oscillation guard for easy movement	X[2, 6]							
Relapse cylinder								
Check for leaks	X[2, 6]							
Check pretension pressure (nitrogen)	X[2, 6]			X		X		
Check the oil quantity	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		

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	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	after	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Lubricate rope pulleys					X	X		
Crane ropes								
Visual inspection for cracks and deformation							X	
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								

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	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	after	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Check cable connections and battery acid levels						X[3]		
Fuel system								
Check for leaks							X	
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

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	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	after	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Replace servo pressure and replenishing pressure filter inserts	250 h			X		X		
Replace return filter inserts (only for cranes with open hydraulic circuit)	250 h			X		X		
Replace bleeder filter of hydraulic tank	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		

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	First maintenance after	Regular maintenance, every 125 h	250 h	500 h	1500 h	Minimum maintenance Annually	Checks Daily	Weekly
Telescopic boom with cable mechanism								
Check telescopic boom for distortions and cracks						X		
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		

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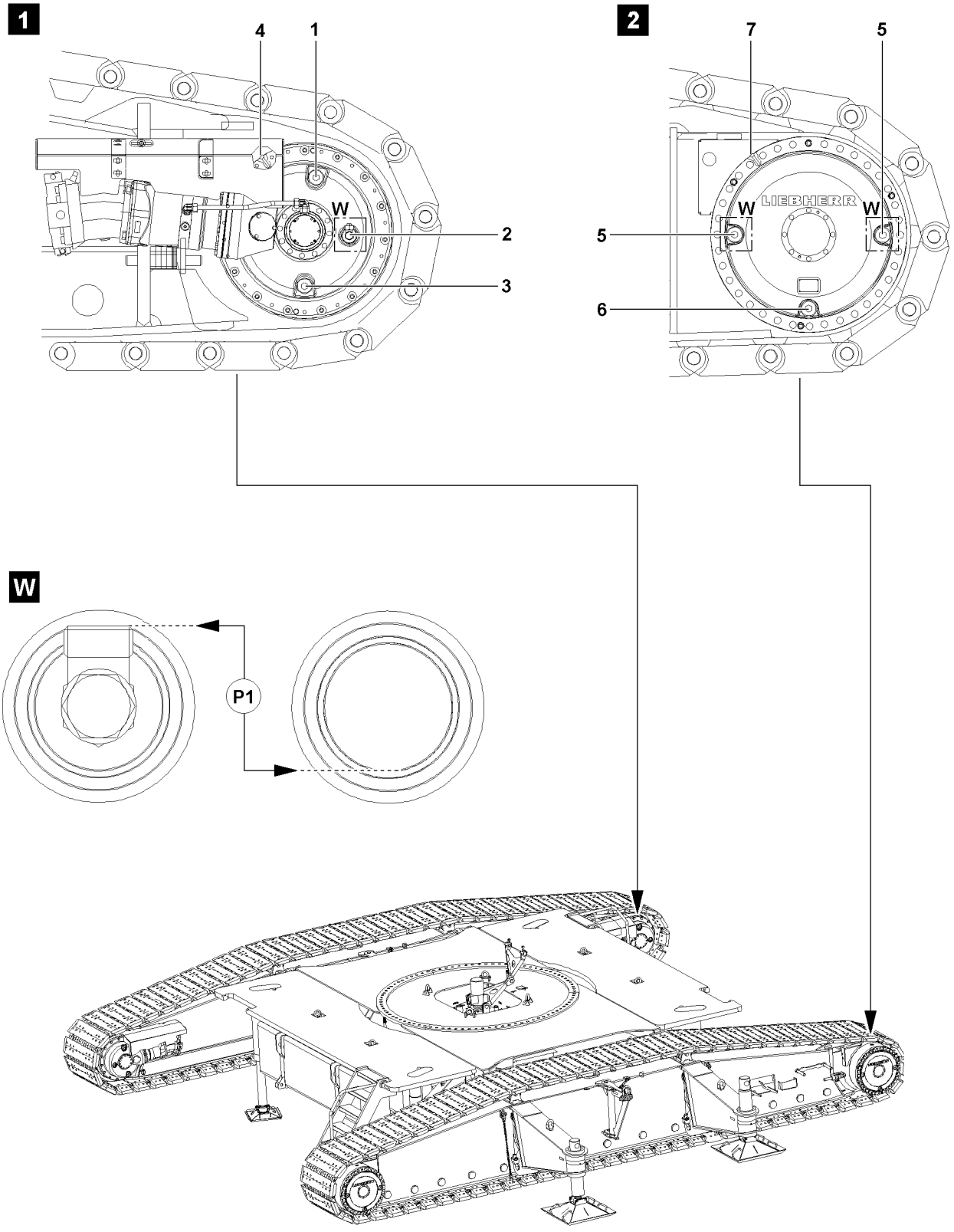
	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	after	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Check mounting screws of push out cylinder for tight seating						X		
Check twist guard of cylinder pinning and telescopic boom pinning						X		
Check push out rod for proper 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								

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	First maintenance after	Regular maintenance, every 125 h	250 h	500 h	1500 h	Minimum maintenance Annually	Checks Daily	Weekly
Check frame, suspension and guide section for distortion and cracks						X		
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
[3] in hot climates 2x a year
[4] note chapter 7.05, Crane superstructure maintenance instructions
[5] and as necessary
[6] during assembly

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1 Servicing the travel gear

Note
- ▶ Use service items and lubricants according to the chart, see Crane operating instructions, chapter 7.07!
- ▶ Observe the maintenance intervals, see Crane operating instructions, chapter 7.02!

The travel gear consists of:
– Miter gear with brake, illustration **1**
– Planetary gear, illustration **2**

WARNING
Danger of burns during maintenance and inspection work!
Severe burns can 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 during maintenance work!

The following maintenance openings are on the miter gear with brake, see fig. **1**:

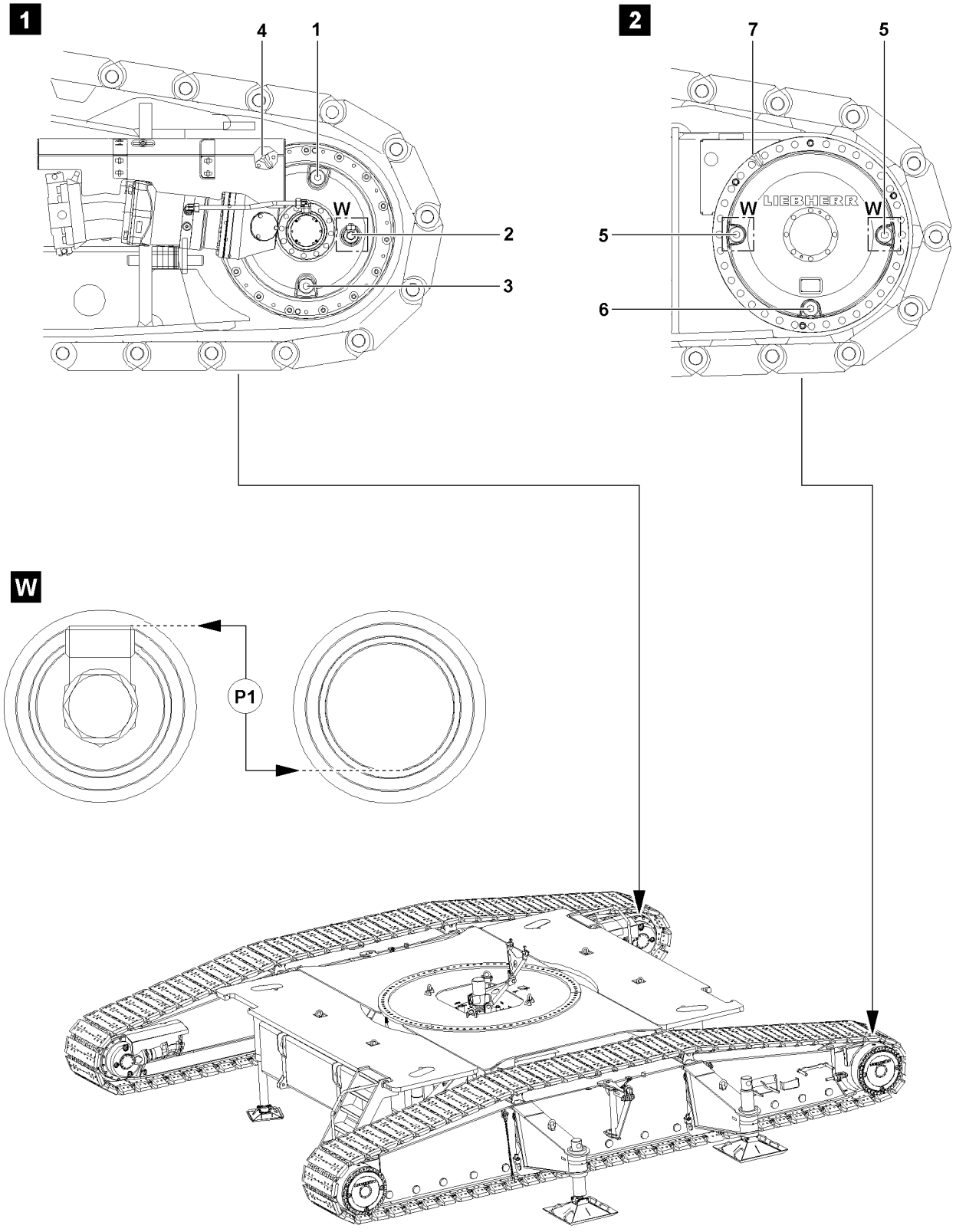
1 Oil filler plug, oil filler port
2 Oil level plug, oil level port
3 Oil drain plug, oil drain port
4 Grease lubrication miter gear

The following maintenance openings are on the planetary gear, see fig. **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!

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1.1 Checking for leaks

▶ Check visually to ensure that the travel gears do not leak.

1.2 Checking the oil level

NOTICE
Damage to the travel gear!
If seals are used repeatedly, it can result in loss of oil!
Due to loss of oil, the travel gears can wear significantly and / or be damaged!
▶ Use the seals on the maintenance ports only once!

NOTICE
Varying oil level in planetary gear!
Depending on the position of the gears in the planetary gear, the oil level can vary slightly upward!
When opening the oil level plug, oil can emerge despite correct fill quantity!
▶ The fill height must be at least on the height of the point **P1**!
▶ If any oil emerged during the check, replace the same amount!

Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The travel gears are at a standstill.

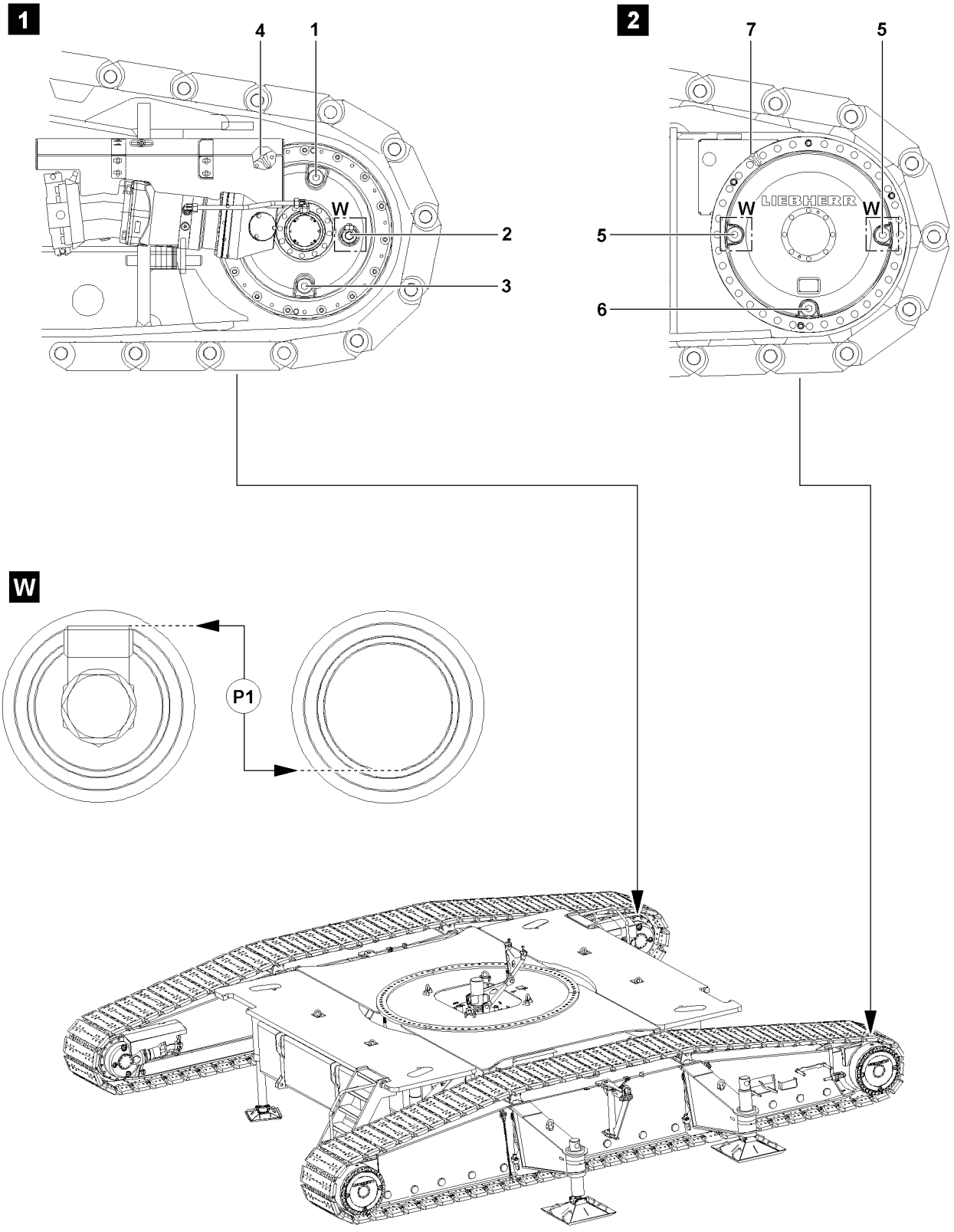
Note
▶ To ensure a reliable oil level check, it must be ensured that the travel gears have been at a standstill for at least two minutes. This ensures that the oil has returned to the oil chamber completely!

▶ Open the oil level port carefully.

NOTICE
Insufficient oil fill quantity!
If the oil level drops below the fill level on point **P1**, the travel gears can be damaged!
▶ Add gear oil until the oil level is again on the fill level on point **P1**!

▶ If gear oil must be added:
Add oil on the oil filler port.
▶ If the oil level is on the fill level on point **P1**, then the oil level on the travel gear is OK.
▶ Close the maintenance ports tightly.

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1.3 Changing the oil

NOTICE
Damage to the travel gear!
If seals are used repeatedly, it can result in loss of oil!
Due to loss of oil, the travel gears can wear significantly and / or be damaged!
▶ Use the seals on the maintenance ports only once!

1.3.1 Changing oil on the miter gear

Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The travel gear must be at a standstill.
– The travel gear is at operating temperature.
– A container to catch the used oil is available.

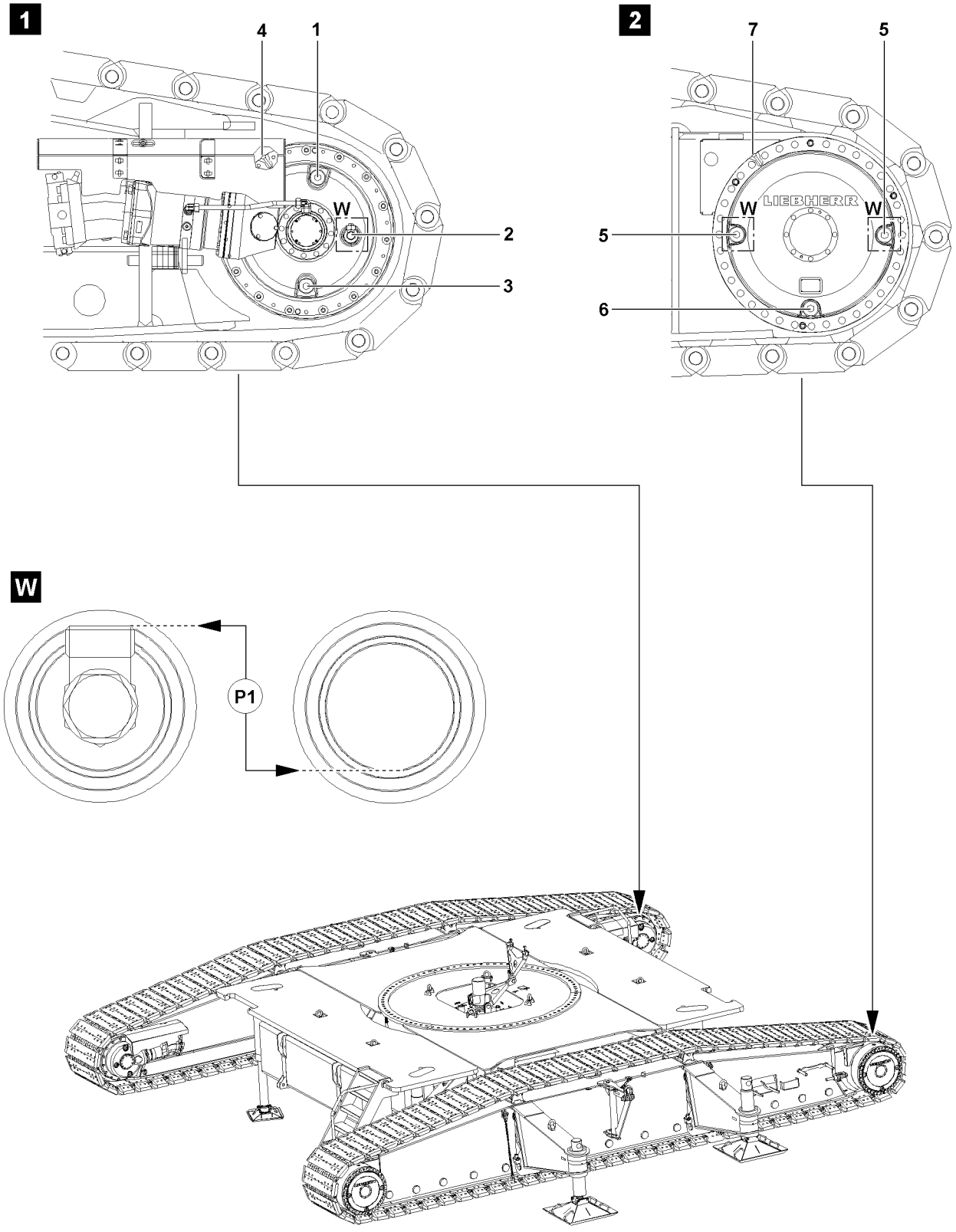
Note
▶ When selecting the container to catch the use oil, make sure that the container is sufficiently sized to be able to catch all the used oil!
▶ For fill quantity of miter gear, see Crane operating instructions, chapter 7.06!

▶ Remove the oil filler plug **1**.
▶ Remove the oil drain plug **3** and drain oil into a suitable container.

Note
▶ Allow the miter gear to empty completely!

▶ Clean the oil drain plug **3** and the sealing surface.
▶ Close off the oil drain port **3** tightly.
▶ Open the oil level port **2**.
▶ Add oil on the oil filler port **1** until it “stands” at the height of the fill level on point **P1** of the oil level port **2** or until it starts to run over.
▶ Clean the sealing surfaces.
▶ Close off the oil level port **2** tightly.
▶ Close off the oil fill port **1** tightly.

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1.3.2 Changing oil on the planetary gear

Make sure that the following prerequisites are met:
- The crane is in horizontal position.
- The travel gear must be at a standstill.
- The travel gear is at operating temperature.
- A container to catch the used oil is available.

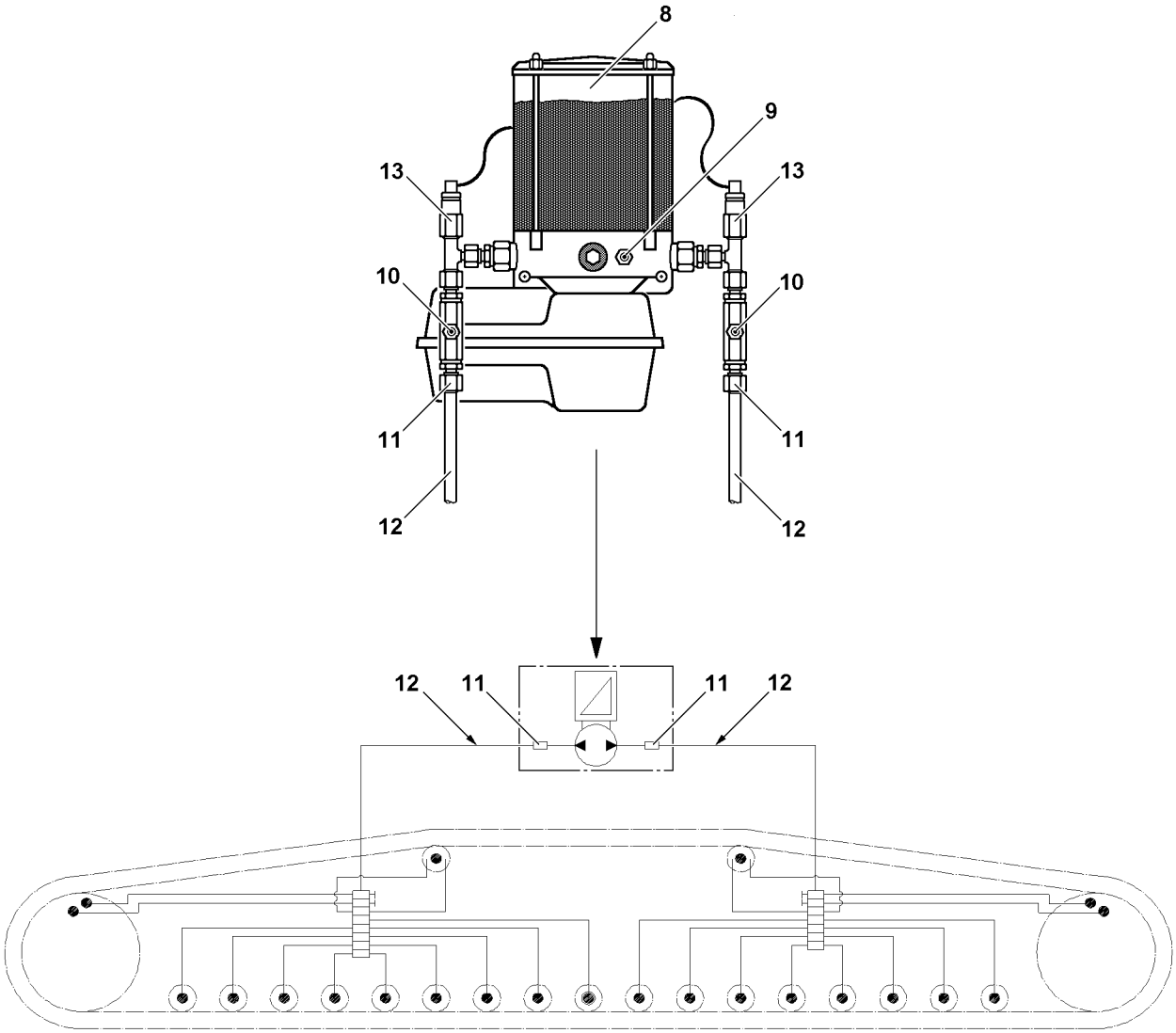
Note
- ▶ When selecting the container to catch the use oil, make sure that the container is sufficiently sized to be able to catch all the used oil!
- ▶ For fill quantity of planetary gear, see Crane operating instructions, chapter 7.06!

- ▶ Remove the oil level plugs **5**.
- ▶ Remove the oil drain plug **6** and drain oil into a suitable container.

Note
- ▶ Allow the planetary gear to empty completely!

- ▶ Clean the oil drain plug **6** and the sealing surface.
- ▶ Close off the oil drain port **6** tightly.
- ▶ Add oil on the oil level port **5** until it “stands” at the height of the fill level **P1** of the oil level ports **5** or until it starts to run over.
- ▶ Clean the sealing surfaces.
- ▶ Close off the oil level ports **5** tightly.

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2 Servicing the central lubrication system of the crawler carrier

Note
- ▶ The illustrations in this chapter are examples and may not apply exactly to your crane!
- ▶ Use service items and lubricants according to the chart, see Crane operating instructions, chapter 7.07!
- ▶ Observe the maintenance intervals, see Crane operating instructions, chapter 7.02!

If the crane is driven via the crawler travel gear, then the central lubrication system for the crawler carrier turns on automatically and supplies all grease points with the correct amount of grease.

NOTICE
Insufficient lubrication!
The lubrication film is removed over time due to environmental influences!
Due to insufficient lubrication, the crawler carriers are exposed to significant wear and can be damaged!
- ▶ If the crawler carriers are not moved for a period of more than three months, then it must be lubricated every quarter, possibly with an external grease pump!

Note
- ▶ When putting the crane back into service after an extended downtime, check the central lubrication system for function!
- ▶ When working on the central lubrication system, observe utmost cleanliness!
- ▶ Every crawler carrier has a separate grease pump with several lubrication circuits!
- ▶ Every lubrication circuit has its own main line **12**!

On the grease pump, see illustration, there are the following maintenance relevant components:

8 Grease container
9 Grease fitting
10 Grease fitting
11 Main line connection
12 Main line
13 Pressure relief valve

- Filling the grease container
- Filling the lube lines

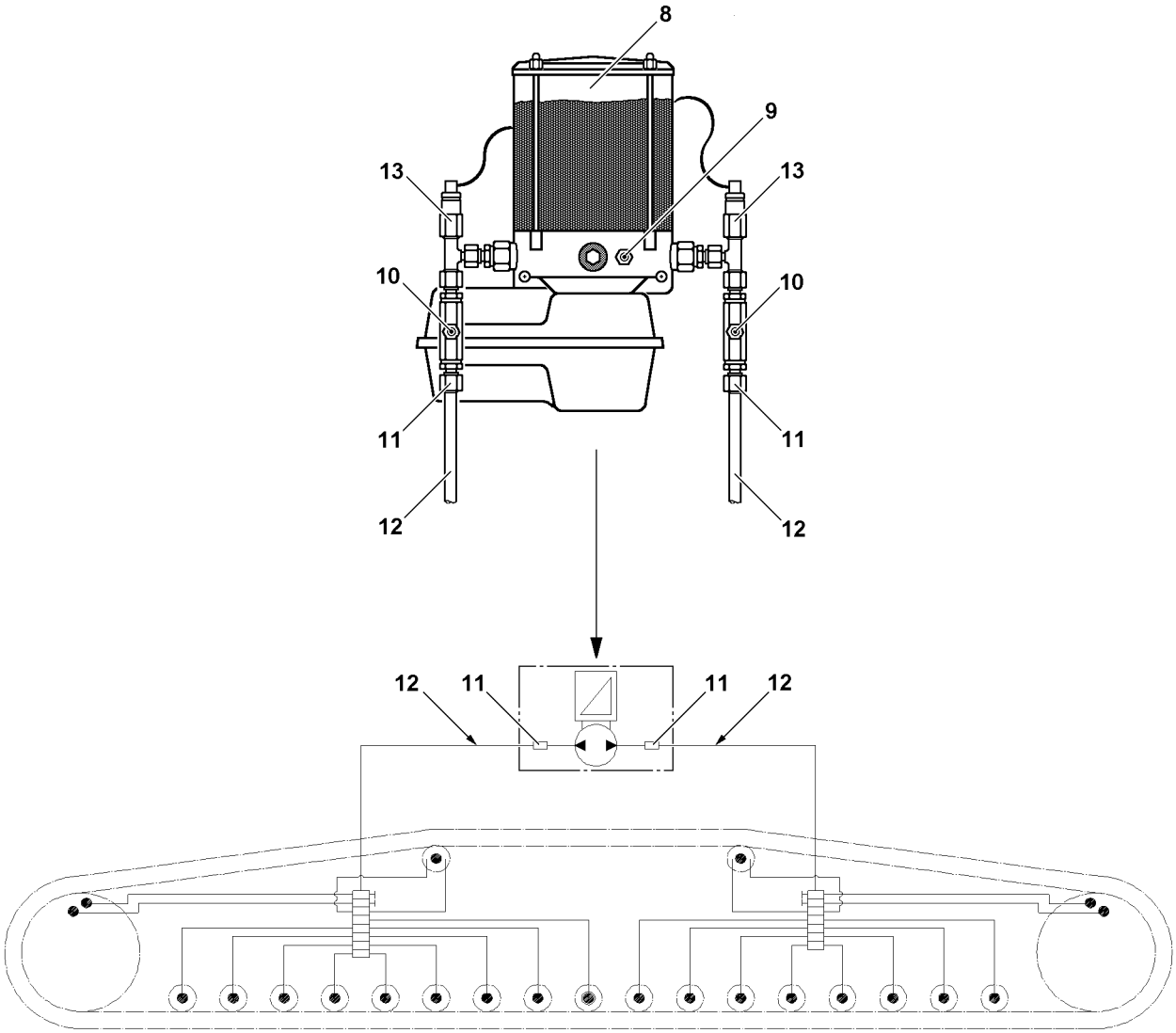
2.1 Filling the grease container

NOTICE
Insufficient lubrication!
In case of insufficient lubrication, the grease lubrication points can run dry!
This could result in high property damage!
- ▶ Fill the grease container **8** before it is completely empty!

Note
- ▶ Do not deplete the grease container **8**!
- ▶ If the grease container **8** is empty, the central lubrication system must be bled!

- ▶ Fill the grease container **8** using an external grease pump via the grease fitting **9**.

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2.2 Bleeding the central lubrication system

NOTICE
Insufficient lubrication!
If there is air in the grease pump, lubrication points can run dry!
▶ Bleed the central lubrication system carefully!

The central lubrication system of the crawler travel gear can be bled two ways:
– By actuation of the grease pump by simulating the crawler operation
– By separate actuation of the grease pump with the aid of the electric wiring plan

2.2.1 Bleeding by simulating crawler operation

WARNING
Crane can start to drive unintentionally!
If the foot rocker in the crane operator's cab or the manual control lever on the radio remote control console* is moved too far while bleeding the grease pump, then the track chain can start to move!
The crane can start to drive and catch personnel!
Personnel can be severely injured or killed!
▶ Actuate the foot rocker carefully while bleeding the grease pump!
▶ Watch the emergence of grease from the grease pump for a safe position!

▶ Fill the grease container **8** using an external grease pump via the grease fitting **9**.
▶ Fill the main lines **12** with an external grease pump via the grease fittings **10** until grease free of air bubbles emerges on all grease points.

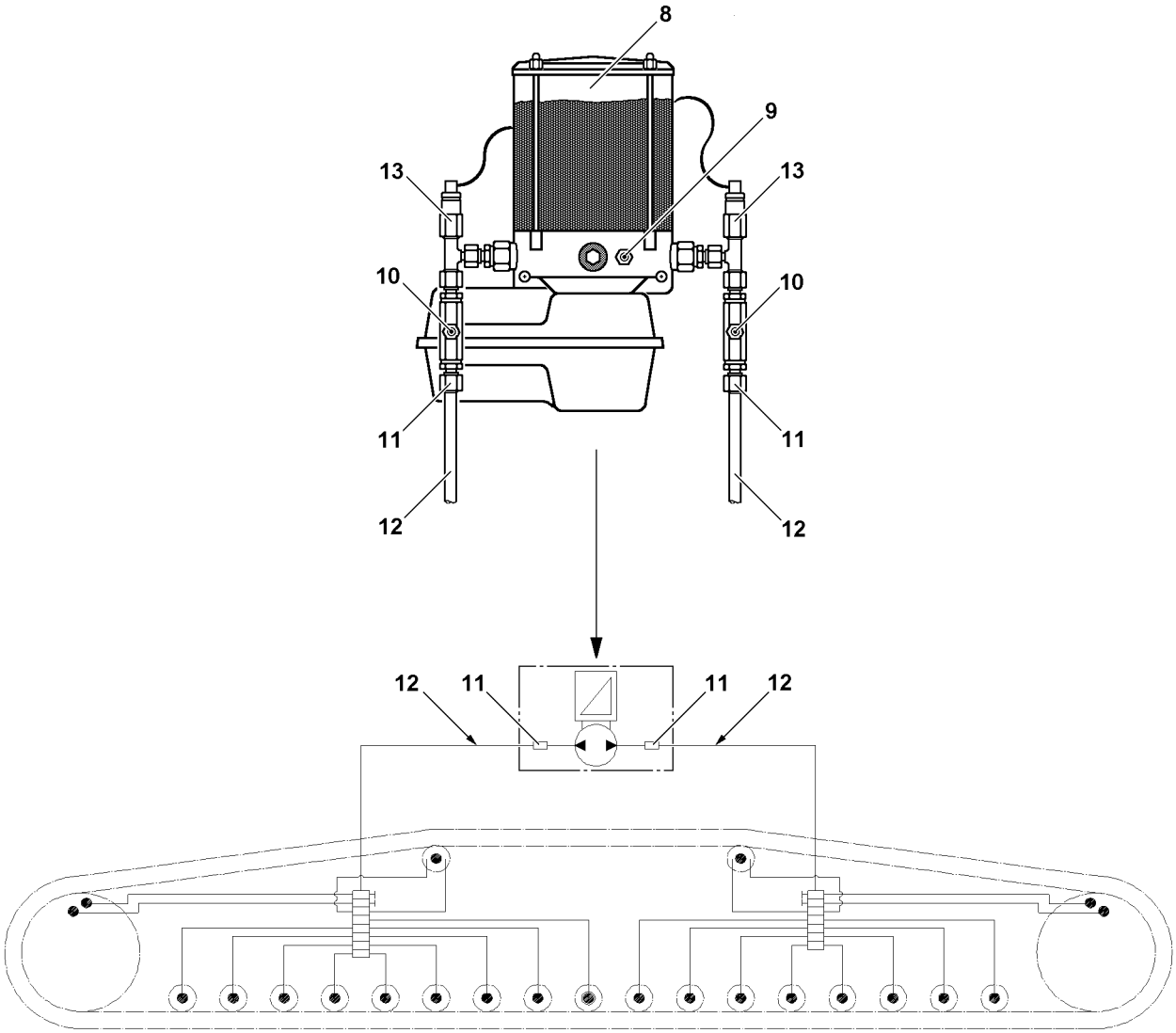
Note
▶ Carry out the bleeding procedure individually for each main line connection **11**!
▶ Every crawler carrier has a separate grease pump!

▶ Unscrew the main line **12** from the main line connection **11**.
▶ Start the crane engine.
▶ Select crawler operation.
▶ Actuate the foot rocker / manual control lever of the crawler carrier of the grease pump which is being bled only so far that the track chain does not start to move.

Result:
– The grease pump starts to supply.
– The acoustic signal crawler operation sounds.

▶ Actuate the foot rocker / manual control lever only until grease free of air bubbles emerges on the main line connection **11**.
▶ Connect the main line **12** again.
▶ Actuate the foot rocker / manual control lever again until grease emerges again on at least one of the grease points in the bled lubrication circuit.

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2.2.2 Bleeding by separate actuation of the grease pump

Note
▶ Work on the electrical system of the crane may only be carried out by authorized and trained expert personnel!

Make sure that the following prerequisite is met:
– The separate electric wiring diagram of the crane is available.

▶ Fill the grease container **8** using an external grease pump via the grease fitting **9**.
▶ Fill the main lines **12** with an external grease pump via the grease fittings **10** until grease free of air bubbles emerges on all grease points.

Note
▶ The bleeding procedure must be carried out individually for each main line connection **11**!
▶ Every crawler carrier has a separate grease pump!

▶ Unscrew the main line **12** from the main line connection **11**.
▶ Actuate the grease pump separately, see crane electric wiring plan.

Result:
– The grease pump starts to supply.

▶ Actuate the grease pump until grease free of air bubbles emerges on the main line connection **11**.
▶ Connect the main line **12** again.
▶ Actuate the grease pump again until grease emerges again on at least one of the grease points in the bled lubrication circuit.

2.3 Bleeding repaired lubrication lines

NOTICE
Insufficient lubrication!
If there is air in the lube lines, lubrication points can run dry!
▶ If the lubrication lines are repaired or replaced, make sure that they are completely filled with grease!

▶ Fill lubrication lines completely with grease before installation.
▶ Check repaired lubrication lines for function and leaks.

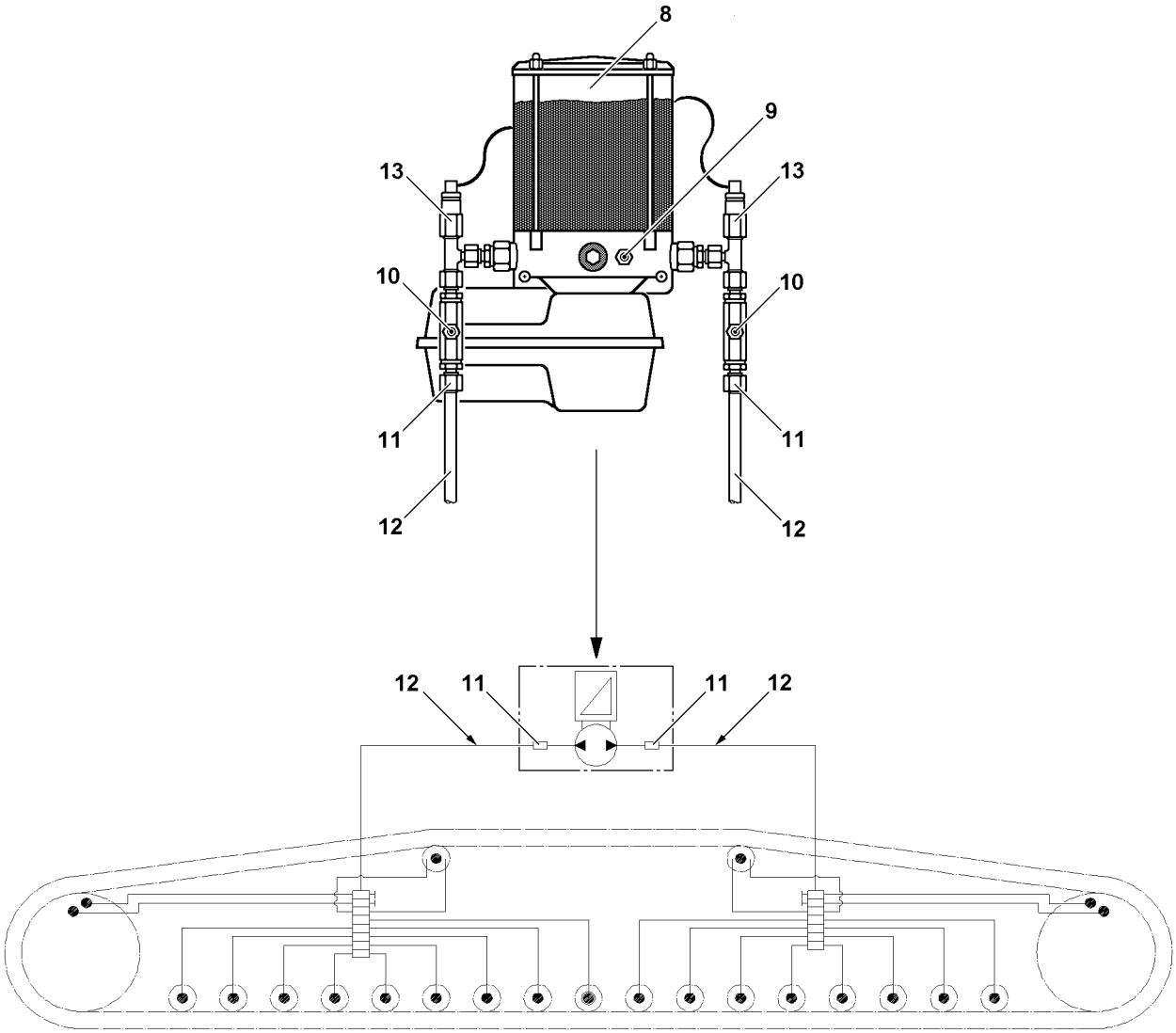
2.4 Intermediate lubrication of crawler carriers

▶ Fill the main line **12** with an external grease pump via the grease fitting **10** until grease free of air bubbles emerges on all grease points.

or

■ Actuate the foot rocker / manual control lever in crawler operation until the grease pump starts to supply, but the track chain does not yet start to move. Continue actuation until grease emerges on all lube points.

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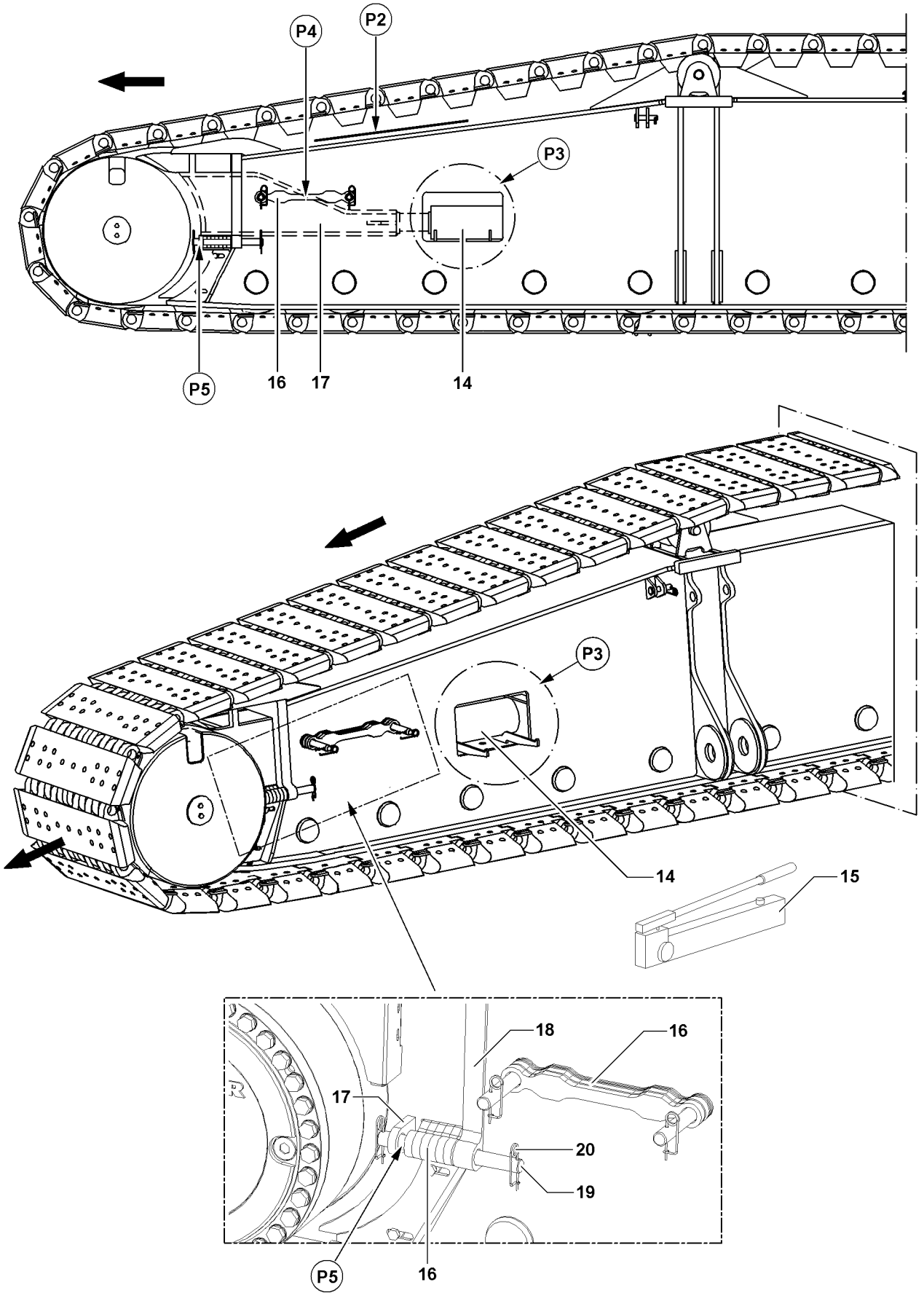
2.5 Troubleshooting on the central lubrication system

Problem	Cause	Remedy
The grease pump does not work	Electrical line interrupted, grease pump defective	Fix or replace the electrical line, replace the grease pump
Grease pump operates, but does not deliver	Air cushion in delivery piston, minimum fill level fallen below, grease pump element defective	Bleed grease pump, fill reservoir, replace grease pump element
No grease collar on all lube points	Grease pump does not work, system blocked	See “Grease pump does not work” or “Grease emerges via pressure relief valve”
No grease collar on several lube points	Supply lines to secondary distributors broken or leaking, screw connections leaking	Replace lines, tighten or replace screw connections
No grease collar on one lube point	Associated lube line broken or leaking, screw connection leaking	Replace line, tighten or replace screw fitting
Grease pump speed reduced	Higher system pressure, lower ambient temperature	Check system / bearing points, no damage: Lubricate once or twice in between if necessary [1)]
Grease escapes at the pressure relief valve	System pressure too high, distributor blocked, system blocked, defective valve spring on pressure relief valve	Check system, replace distributor, repair blocked / seized bearing point, replace pressure relief valve

1) See section “Intermediate lubrication of crawler carriers”.

If a problem cannot be remedied, contact the Service Dept. at Liebherr-Werk Ehingen.

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3 Servicing the track chain

Note
▶ The illustrations in this chapter are examples and may not apply exactly to your crane!

In crawler operation, the components of the track chain wear and must therefore be checked in specified intervals, see Crane operating instructions, chapter 7.02 and replaced with new components, if necessary.

3.1 Tensioning the track chain

NOTICE
Damage to the track chain!
If the chain tension is not checked within the specified maintenance intervals, the track chain or the steel structure of the crawler carrier can be damaged!
▶ Observe the maintenance intervals, see Crane operating instructions, chapter 7.02!
▶ If the track chain of the steel structure of the crawler carrier gets close to point **P2** or if it has already made contact with the steel structure, then the track chain must be retensioned **immediately**!

Note
▶ By extending the tension cylinder **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!

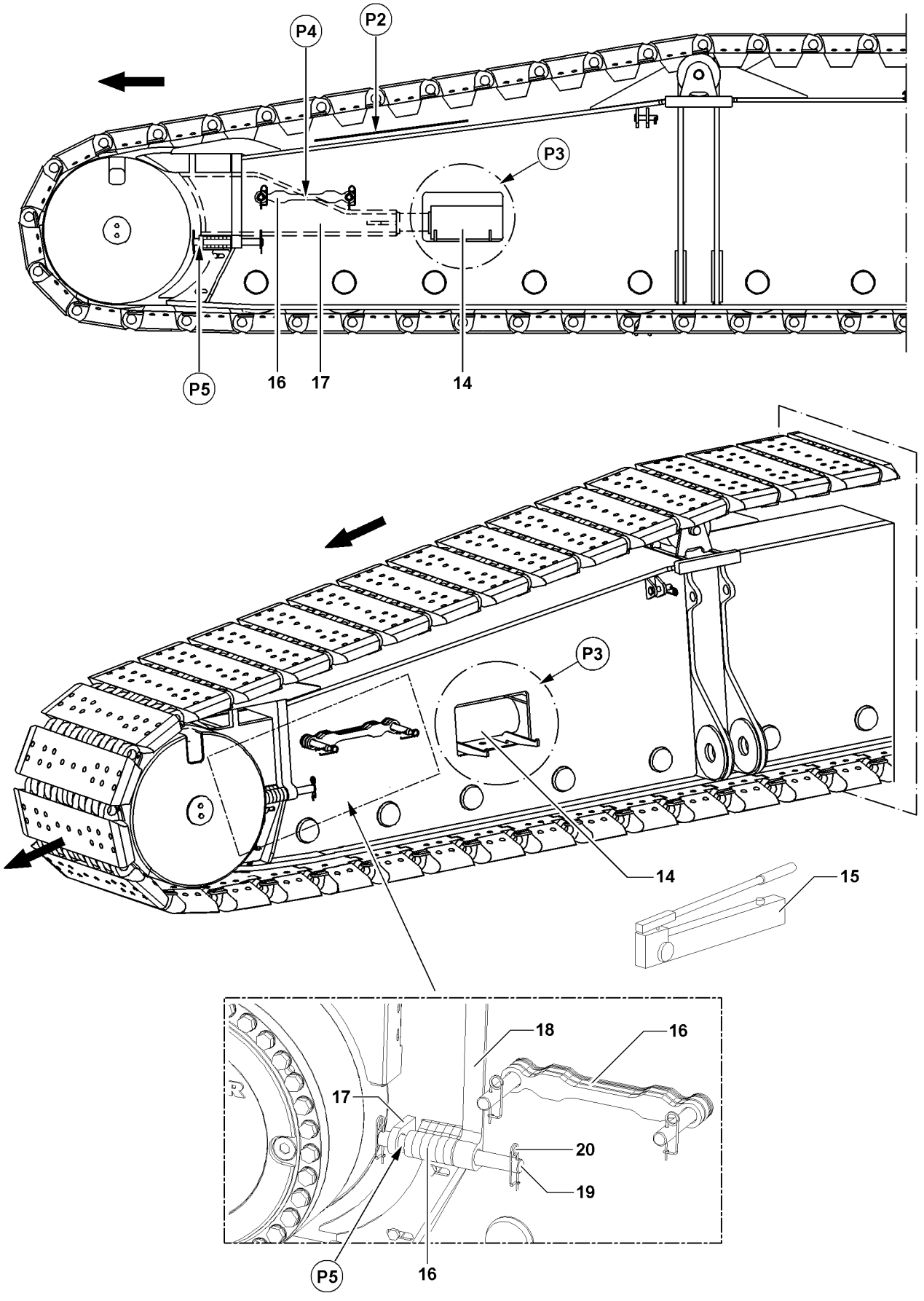
Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The tension cylinder **14** is placed into the cylinder receptacle on point **P3**, see illustration.

▶ 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 pin **19** and spring retainer **20**.

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WARNING
Danger of crushing!
When releasing the tension cylinder **14**, body parts, such as: fingers, hands and arms can be crushed or severed!
▶ When relieving the tension cylinder **14**, nearly all work on the crawler carrier is prohibited!

▶ Relieve the tension cylinder **14** again.
▶ After the tension procedure, drive the crawler back and forth about one crawler length in operating mode “straight forward travel”.

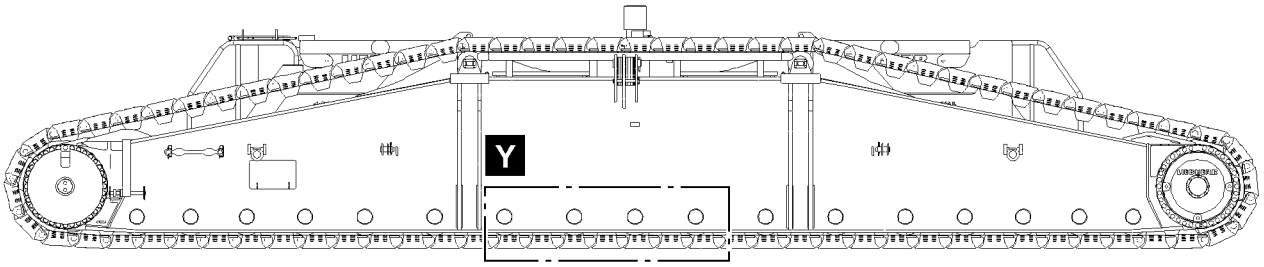
Result:
– The tension of the track chain is reduced.

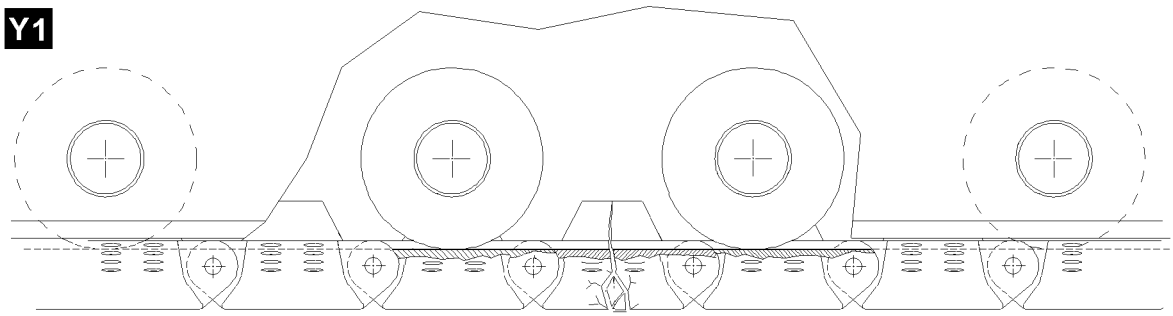
▶ Check the distance of the track chain to the steel construction of the crawler carrier again at point **P2**.

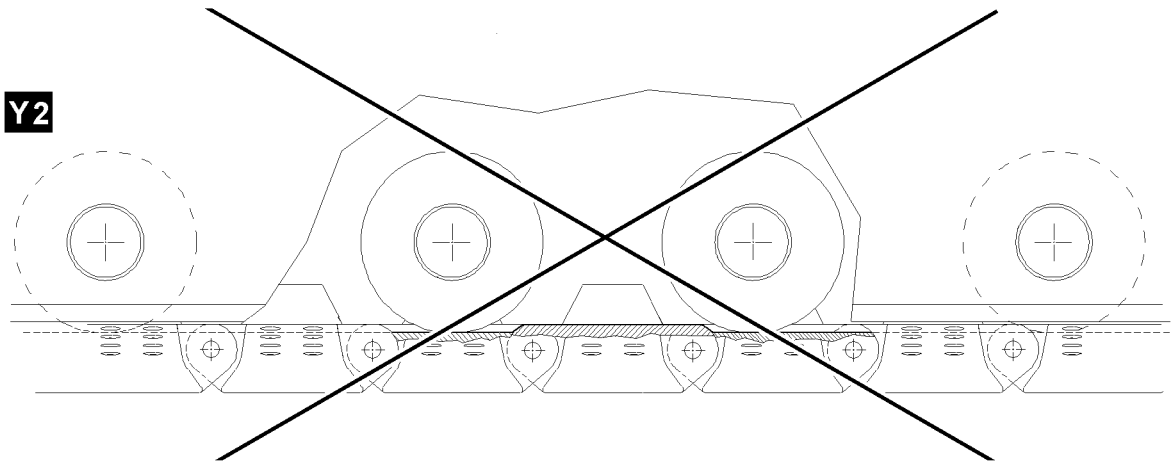
Note
▶ If necessary, repeat the tension procedure of the track chain and insert additional spacer plates **16**!
▶ If the lift on the tension cylinder **14** is no longer sufficient to tension the track chain, then trained expert personnel must remove one track pad!

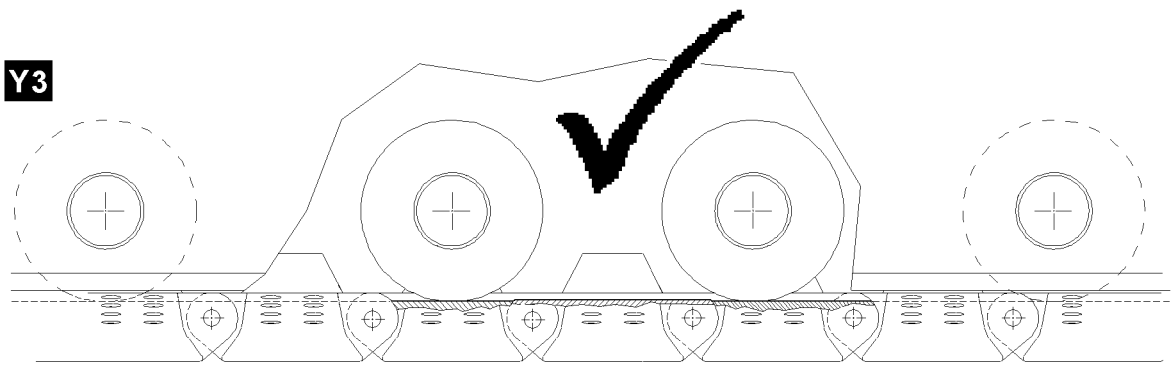
▶ Take the relieved tension cylinder **14** from the cylinder receptacle on the crawler carrier **P3**.

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3.2 Checking wear on the track chain

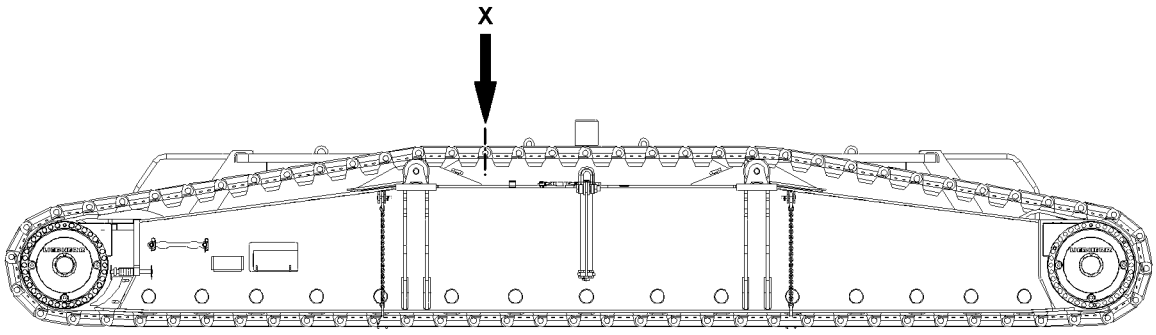
WARNING
Track chain can be ripped off!
If the wear limit on the track pads **21**, bolts **22** or track rollers **23** is exceeded, then the track chain can break off during crawler operation!
The crane can topple over and personnel can be severely injured or killed!
- ▶ Random checks of the track pads **21**, bolts **22** and track rollers **23** must be carried out within the specified intervals!
- ▶ During the random inspection of the track rollers, the first and last track roller on the crawler carrier must be included in the inspection!
- ▶ If a wear limit on the component is reached, then the component must be replaced or remachined!

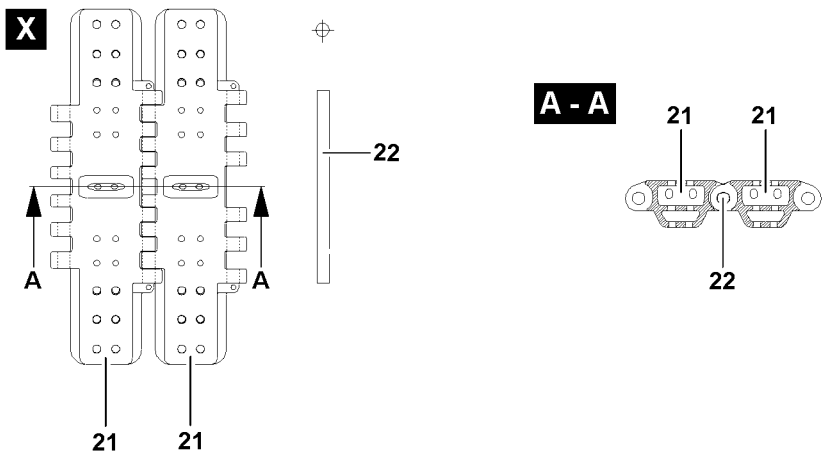
NOTICE
Significant wear of crawler travel gear!
If an individual track pad **21** must be replaced then it may not be replaced with a track pad **21** which shows a much lower degree of wear!
Significant height differences between the individual track pads **21**, see illustration **Y2**, lead to an increased mechanical stress on the track pads **21** and the track rollers **23** of the crawler carrier!
- ▶ Replace a defective track pad **21** with a track pad **21** which shows a similar degree of wear, see illustration **Y3**!

Note
- ▶ Due to the break-in period of the components toward each other, a larger stretch of the track chains occurs on a new crawler travel gear. For that reason, it may be necessary to remove a track pad **21** earlier to be able to tension the track chain correctly!

The wear of the track pad **21**, bolts **22** and track rollers **23** depends a various factors:
- Length of travel route
- Frequency of driving in curves
- Friction ratios track pad **21** - ground
- Evenness of the ground
- Type of ground
- Load bearing capacity of the ground / base
- Position of the total center of gravity
- Load on the hook
- Placed ballast on the crane

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3.2.1 Checking the wear on the connections of the track pads

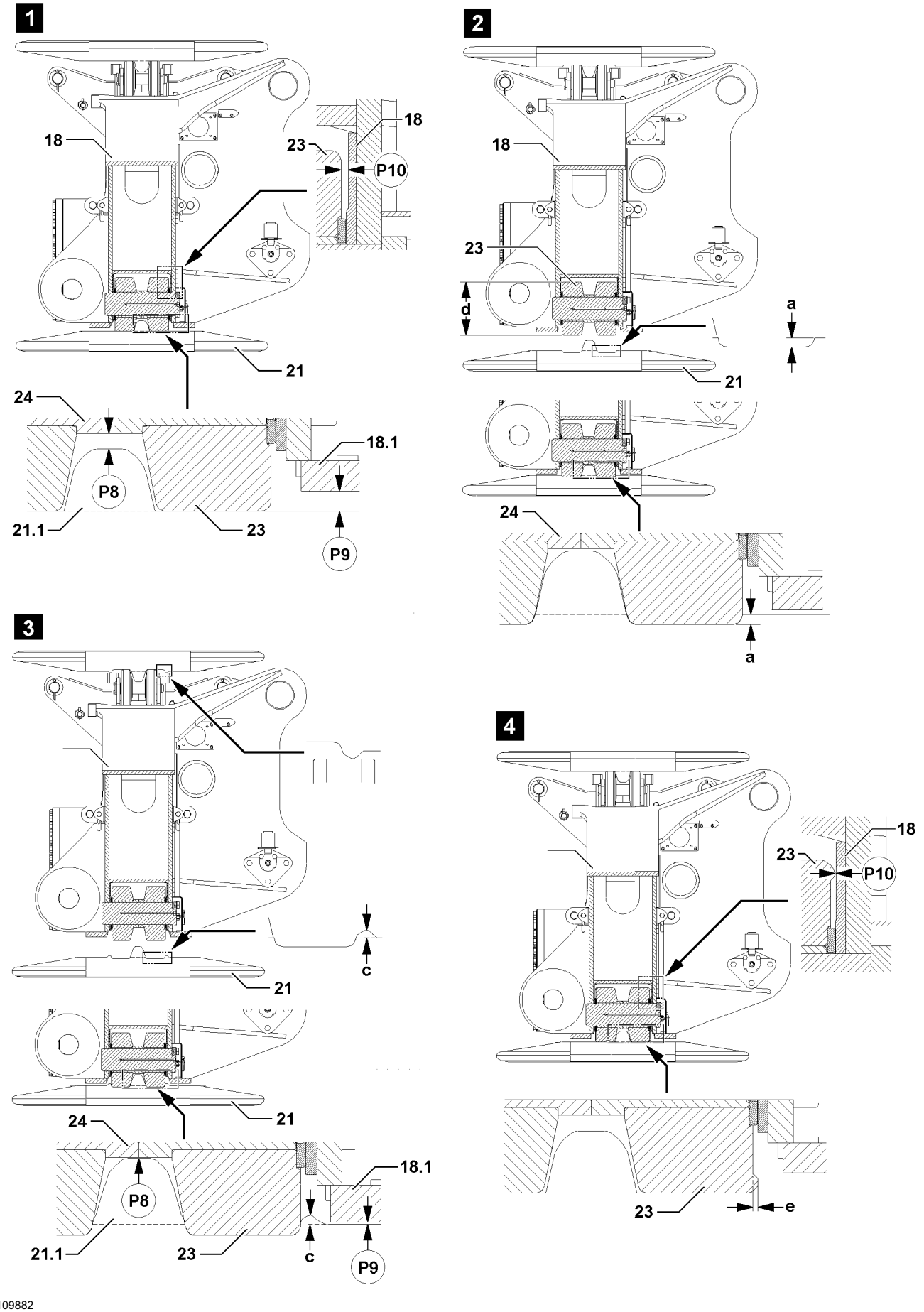
NOTICE
Damage to the sprocket!
If the wear limit on the connections to the track pads is achieved, it can lead to increased wear on the sprocket and on the transporting lugs of the track pads due to excessive chain stretch!
Expensive and extensive repairs can result!
- ▶ The random inspection of the bolt diameter must be made within the specified intervals!
- ▶ If one bolt **22** falls below the minimum permissible dimension, then it must be replaced with a new bolt **22**!
- ▶ The random inspection of the bore diameter must be made within the specified intervals!
- ▶ If the bore diameter exceeds the maximum permissible dimension, then the track pad **21** must be replaced!

The track pads **21** of the crawler track are connected by bolts **22**.

Wear limit bore track pad	
Initial diameter	48 mm
Maximum permissible upper limit	51 mm

Wear limit bolt	
Initial diameter	45 mm
Maximum permissible minimum dimension	44 mm

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3.2.2 Checking the wear on the roll off surfaces of the track pads / track rollers

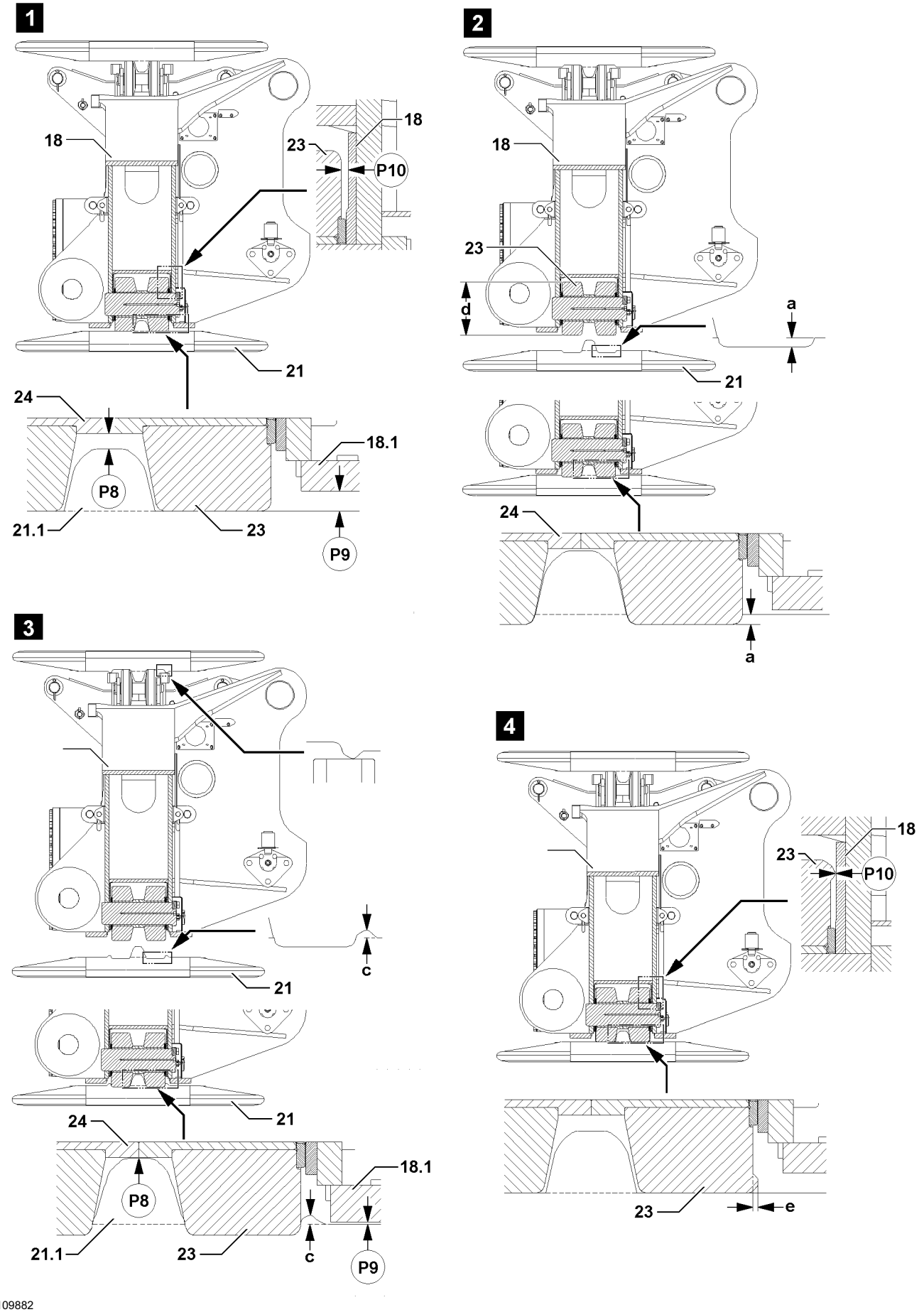
NOTICE
Destruction of track pad!
If a track pad **21** is not fixed or replaced after reaching the wear limit, then the track pad **21** will be destroyed and can cause damage to the crawler carrier **18**!
This could result in high property damage!
▶ Fix or replace the track pad **21** after reaching the wear limit!

NOTICE
Failure of track rollers!
If the track rollers **23** are not replaced after reaching the wear limit, then they can fail and cause damage to the crawler carrier **18** and track pad **21**!
This could result in high property damage!
▶ Replace track rollers **23** after reaching the wear limit!

NOTICE
Increased wear!
If the bulges on the track pads **21** and the track rollers **23** become too large, see illustration **3** and illustration **4**, then it results in increased wear on the crawler travel gear!
This could result in high property damage!
▶ Grind off / remove bulges in time!

If the wear limits are not adhered to, the minimum distances are fallen below:
– On point **P8** between the transporting lugs **21.1** and track roller body **24**
– On point **P9** between the track pad **21** and base belt **18.1**
– On point **P10** between the track rollers **23** and crawler carrier **18**

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Wear limit track pad	
Maximum permissible run in depth a	10 mm
Maximum permissible bulge c	1)

Wear limit track roller	
Initial diameter	320 mm
Permissible minimum diameter d (Measured in the center of the running surface)	316 mm
Maximum permissible bulge e	3 mm 2)

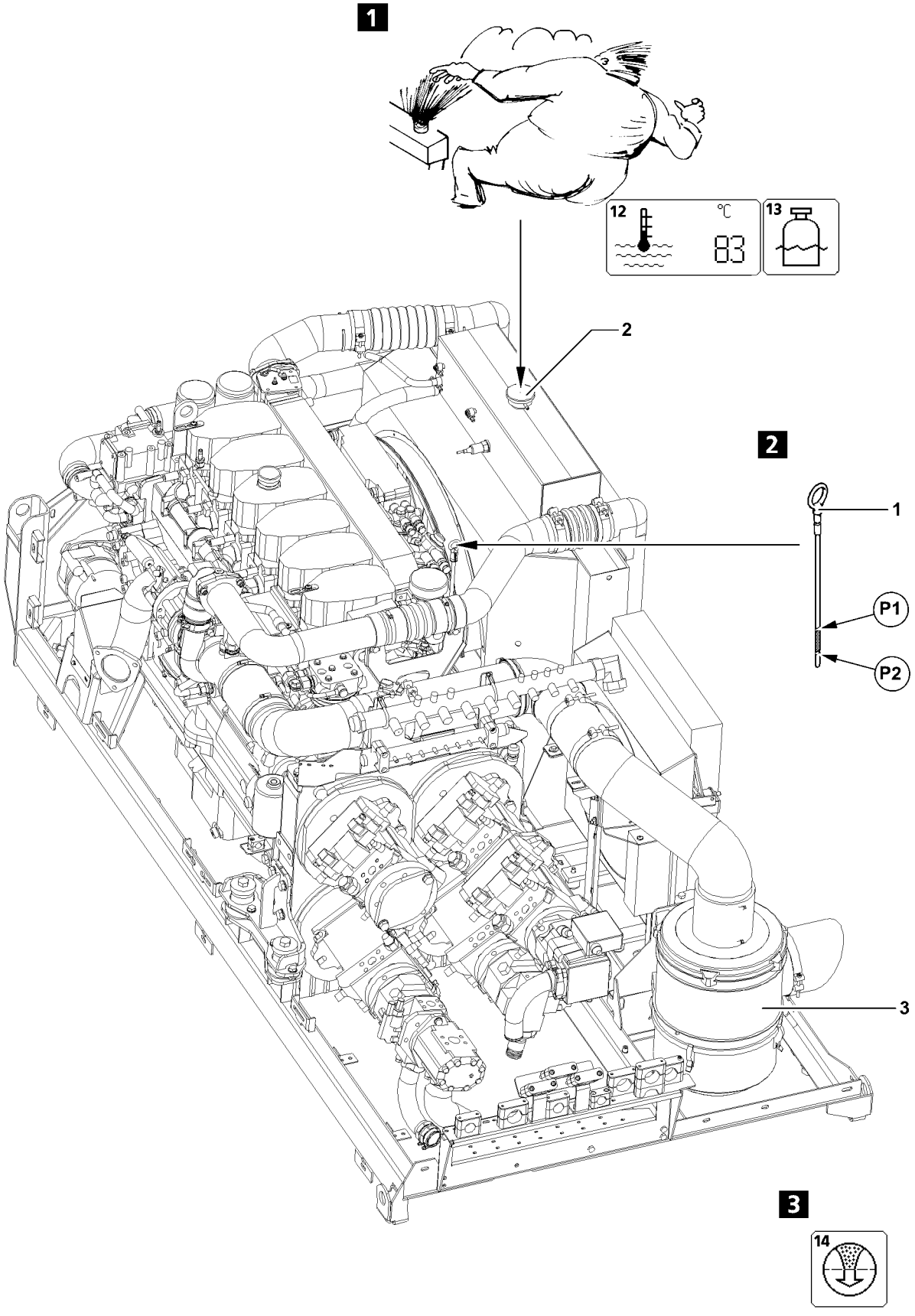
1) As soon as the bulge scrapes on the base belt of the crawler carrier, **grind bulge off**!
2) Valid for all travel gear systems: If bulge is more than 3 mm , **grind off bulge**!

WARNING
Danger of injury due to improper procedure!
▶ All work on the track chains must be carried out by trained expert personnel!

Note
▶ Track pads, which have reached the maximum run in depth or whose running surface is heavily worn can be repaired by repair welds according to welding guideline or repair instructions of **LIEBHERR-Werk Ehingen GmbH**!
▶ Damage on sprocket and track pads - caused by operational wear - can be repaired by repair welds according to welding guidelines or repair instructions of **LIEBHERR-Werk Ehingen GmbH**!
▶ Please contact the Service Dept. at **LIEBHERR-Werk Ehingen GmbH**!

▶ Replace worn track rollers **23**.
▶ Grind off excessive bulges, see illustration **3** and illustration **4**.

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1 Servicing the crane engine

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!

NOTICE
Damaged fuel lines!
If fuel lines are damaged during maintenance and repair work in the engine area, then leaks can occur. Fuel can emerge and contaminate the environment!
- ▶ Never step on fuel lines during maintenance and repair work!

1.1 Changing the oil

1.1.1 Checking the oil level

Make sure that the following prerequisites are met:
- – The crane is in horizontal position.
- – The engine is turned off and the oil has collected in the oil pan.

- ▶ Remove the dipstick **1** and wipe it off.
- ▶ Reinsert the dipstick **1** and pull it out again.

The oil must be between the minimum mark on point **P2** and the maximum mark on point **P1** on the dipstick **1**.

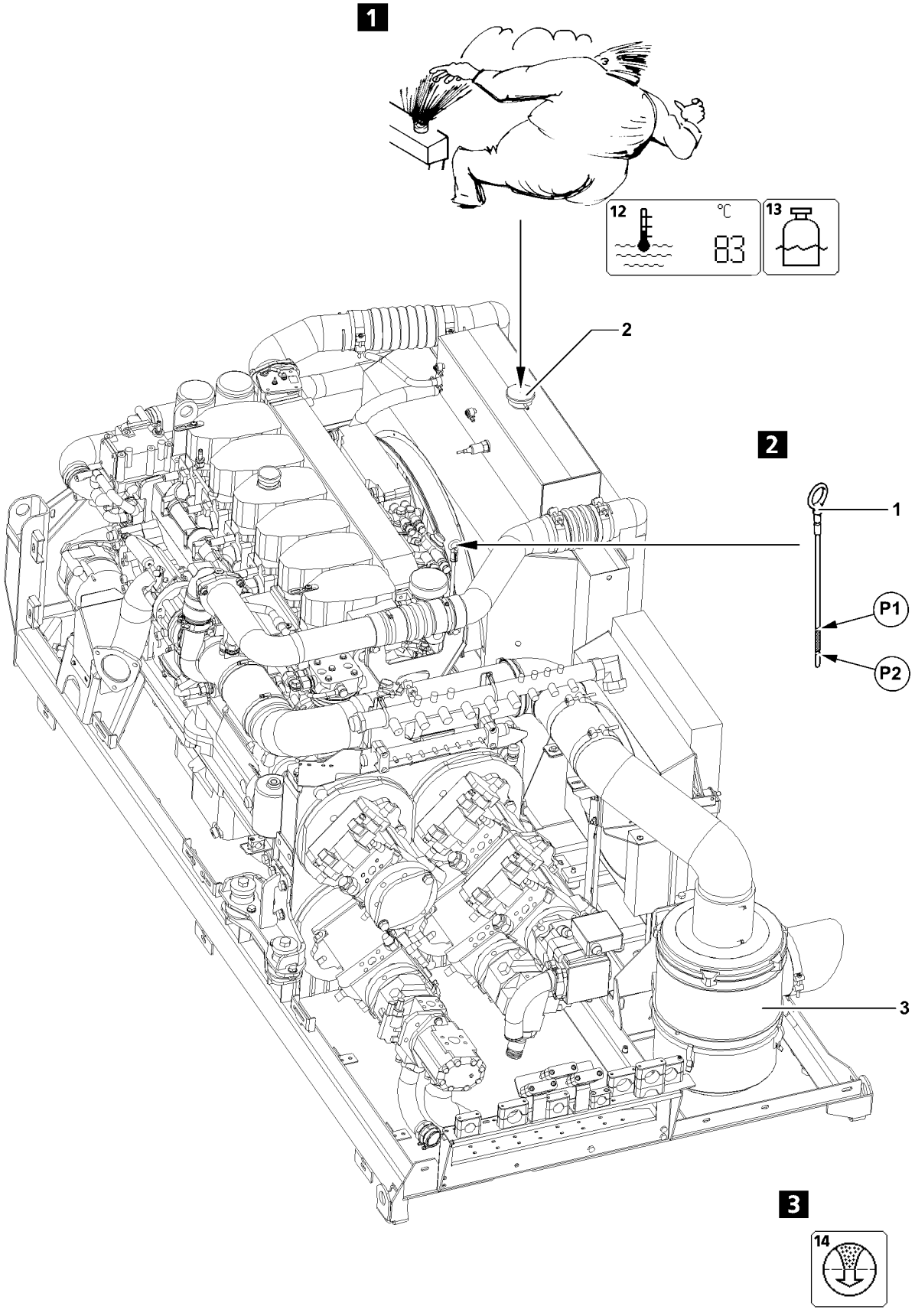
NOTICE
Danger of damaging the engine!
If the oil level has dropped below the minimum mark, add engine oil as specified in the lubrication chart until the oil level is between the minimum mark on point **P2** and the maximum mark on point **P1**!
- ▶ Add engine oil and check again!

- ▶ Check the oil level.
- ▶ Reinsert the dipstick **1**.

1.1.2 Changing the oil

Refer to the separate operating instructions for “LIEBHERR Diesel engines”.

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1.2 Adding 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!

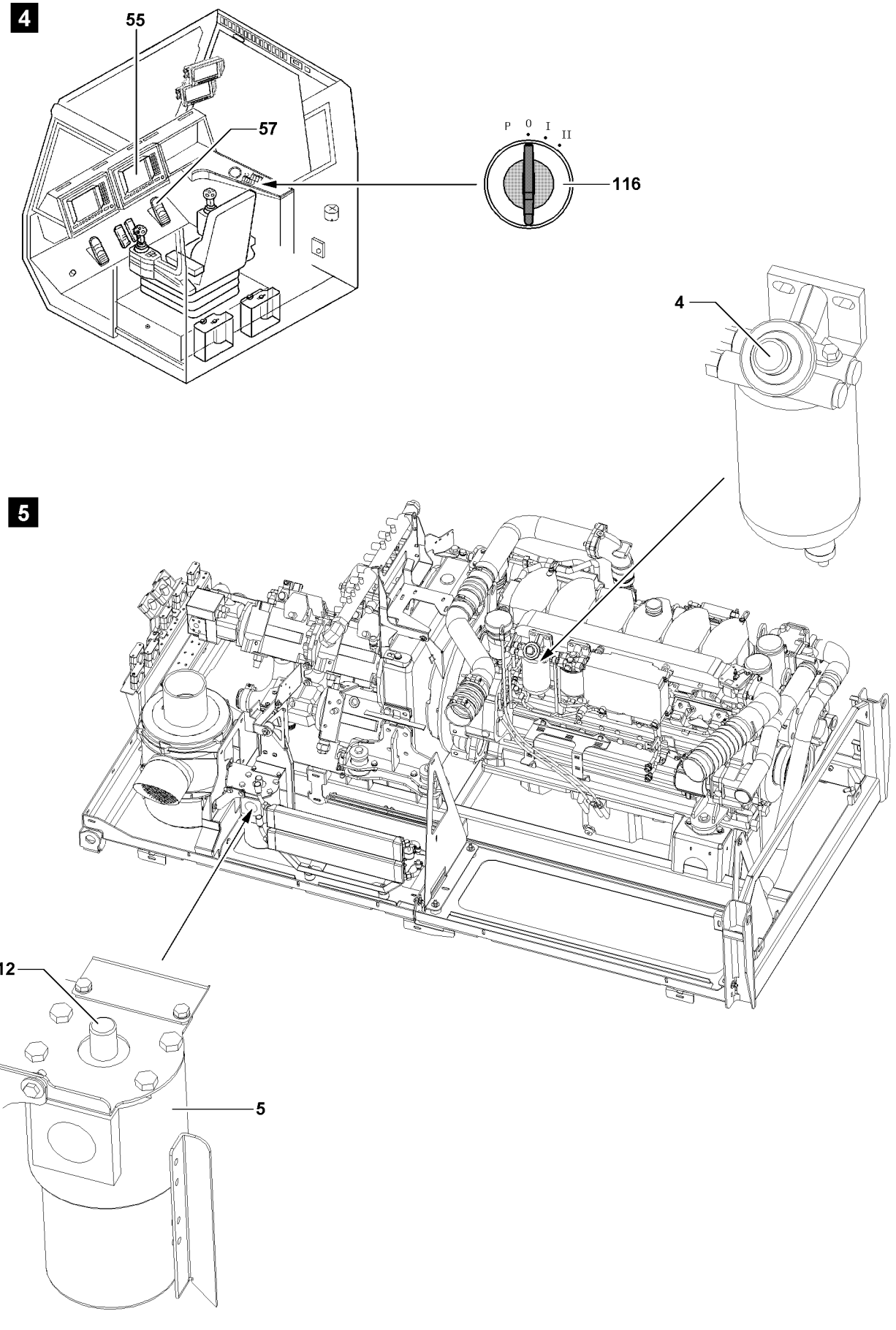
▶ Turn the cap **2** on the filler neck of the water cooler expansion tank to the 1st notch.
▶ Release excess pressure.
▶ Remove the cap **2**.
▶ Check the coolant level.

Add coolant as specified in the lubrication chart only on the filler neck of the water cooler expansion tank.
▶ Add coolant to overflow level if necessary.
▶ Close the cover **2** tightly.

1.3 Servicing the air filter

The air filter **3** 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.

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1.4 Bleeding the injection lines

Note

▶ Two persons are required to bleed the injection lines!

Make sure that the following prerequisites are met:

– The diesel engine is turned off.
– The ignition switch in the crane operator's cab is in the “0 position” (OFF).
– The diesel engine is easily accessible.

DANGER

Risk of falling!

During the bleeding process of the injection lines, the assembly personnel must be protected from falling with suitable aids, depending on the turntable position. If this is not observed, assembly personnel could fall and suffer life-threatening injuries!

▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (scaffolding, ladders, etc.)! The height above which assembly / maintenance work must be carried out with aids depends on national regulations. The national regulations must be adhered to!

1.4.1 Activating the bleeding of the injection lines

The bleeding function is activated from the crane operator's cab.

A high injection rate is required to bleed the injection lines on the diesel engine. It is therefore necessary to operate the manual feed pump **4** on the diesel engine during the bleeding process.

▶ Turn the ignition on in the crane operator's cab: Turn the ignition switch **116** to “position I”.
▶ When the ignition is turned on:
Floor the engine regulation **57** within 10 s.
▶ Repeat this step within the next 10 s: Release the engine regulation **57** and floor it again.
▶ To activate the bleeding function: Repeat this procedure five times.

Result:

– The bleeding function is now activated.
– The LICCON monitor **55** displays an operating error message with the text: “Bleeding function activated”.

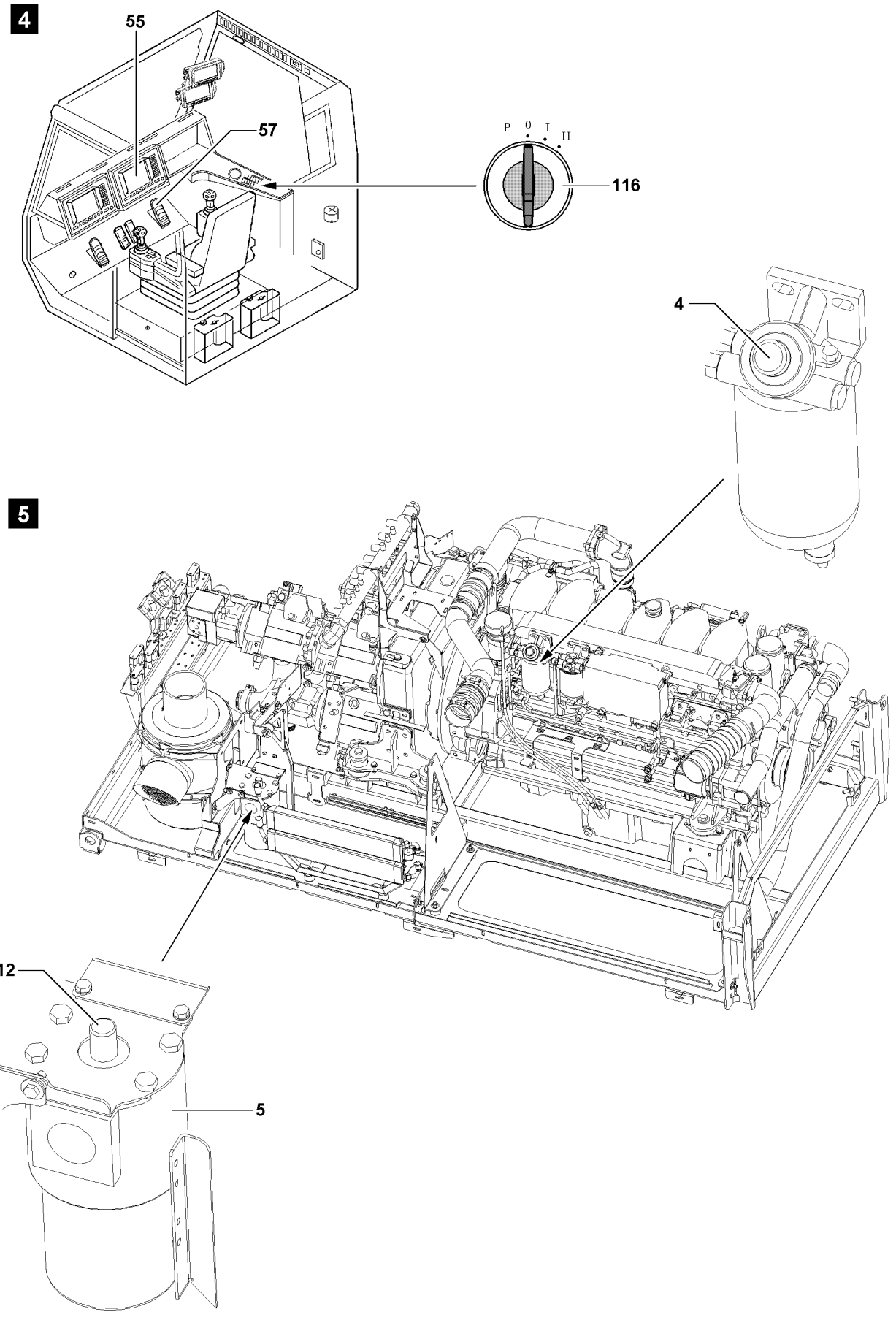
Troubleshooting

If the LICCON monitor **55** does not display an operating error message with the text: “Bleeding function activated”?

The bleeding function has not been correctly carried out or the specified time has been exceeded.

▶ Turn the ignition off: Turn the ignition switch **116** to “position 0”.
▶ Repeat the procedure according to the description.

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1.4.2 Bleeding the injection lines

Note
▶ Do **not** operate the engine regulation during the bleeding procedure!

Make sure that the following prerequisites are met:
– The bleeding function is activated.
– The operating error message is displayed on the LICCON monitor.

Pump the manual feed pump **4** to operate it during the entire engine start procedure (approx. 20 s).
▶ Turn the ignition switch **116** in the crane operator's cab to “position II” and hold it for approx. 20 s in “position II”.
▶ When the ignition switch **116** is actuated:
Immediately pump the manual feed pump **4** for approx. 20 s and at least as long as the ignition switch is being turned.

Result:
– The injection lines are bled.
– The diesel engine starts up and runs at low idle speed after a successful bleeding procedure.
– The bleeding function will be deactivated.
– The system switches over to normal operation.

Troubleshooting
The injection lines are not bled and the diesel engine does not run at low idle speed?
The ignition switch **116** was not operated long enough or the manual feed pump **4** was used incorrectly.
▶ Hold the ignition switch **116** for 20 s in “position II”.
▶ Continuously pump the manual feed pump **4**.

Note
▶ The starter block is deactivated if the bleeding function has been activated!
▶ Several starting attempts can be made without turning the “ignition OFF”!

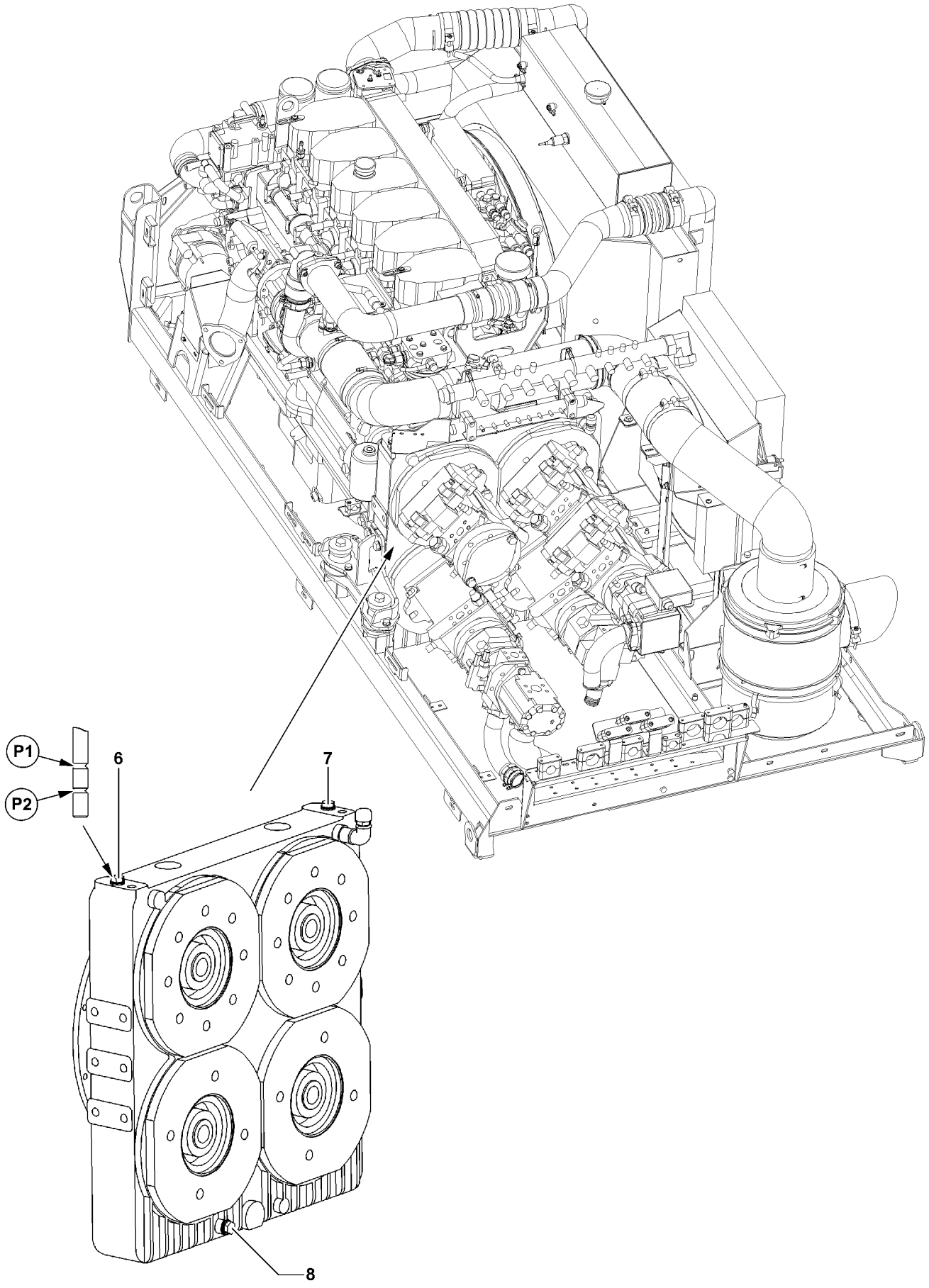
1.4.3 Deactivating the bleeding function

Note
▶ The bleeding function is automatically deactivated after successfully bleeding the injection lines or when the ignition is turned off!

Once the injection lines have been successfully bled, the diesel engine is regulated by the engine electronic to low idle speed after a short period and the bleeding function is automatically deactivated.
▶ Turn the ignition off: Turn the ignition switch **116** to “position 0”.

Result:
– The diesel engine is turned off.
– The bleeding function is deactivated.

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2 Servicing the pump distributor gear

Note
▶ Please maintain utmost cleanliness during all work to prevent any dirt from getting into the gear!

2.1 Checking the oil level

Ensure that the following prerequisites are met:
– The crane is in horizontal position.
– The gear is warm.

The oil must be between the minimum mark on point **P2** and the maximum mark on point **P1** on the dipstick **6**.
▶ Unscrew, remove and wipe off the dipstick **6**.
▶ Reinsert the dipstick **6** and pull it out again.

NOTICE
Oil level too low!
If the oil level has dropped below the minimum mark on point **P2**, gear damage can occur!
▶ Add oil as specified in the lubrication chart until the oil level is between the minimum and maximum marks!
▶ Add oil and check again!

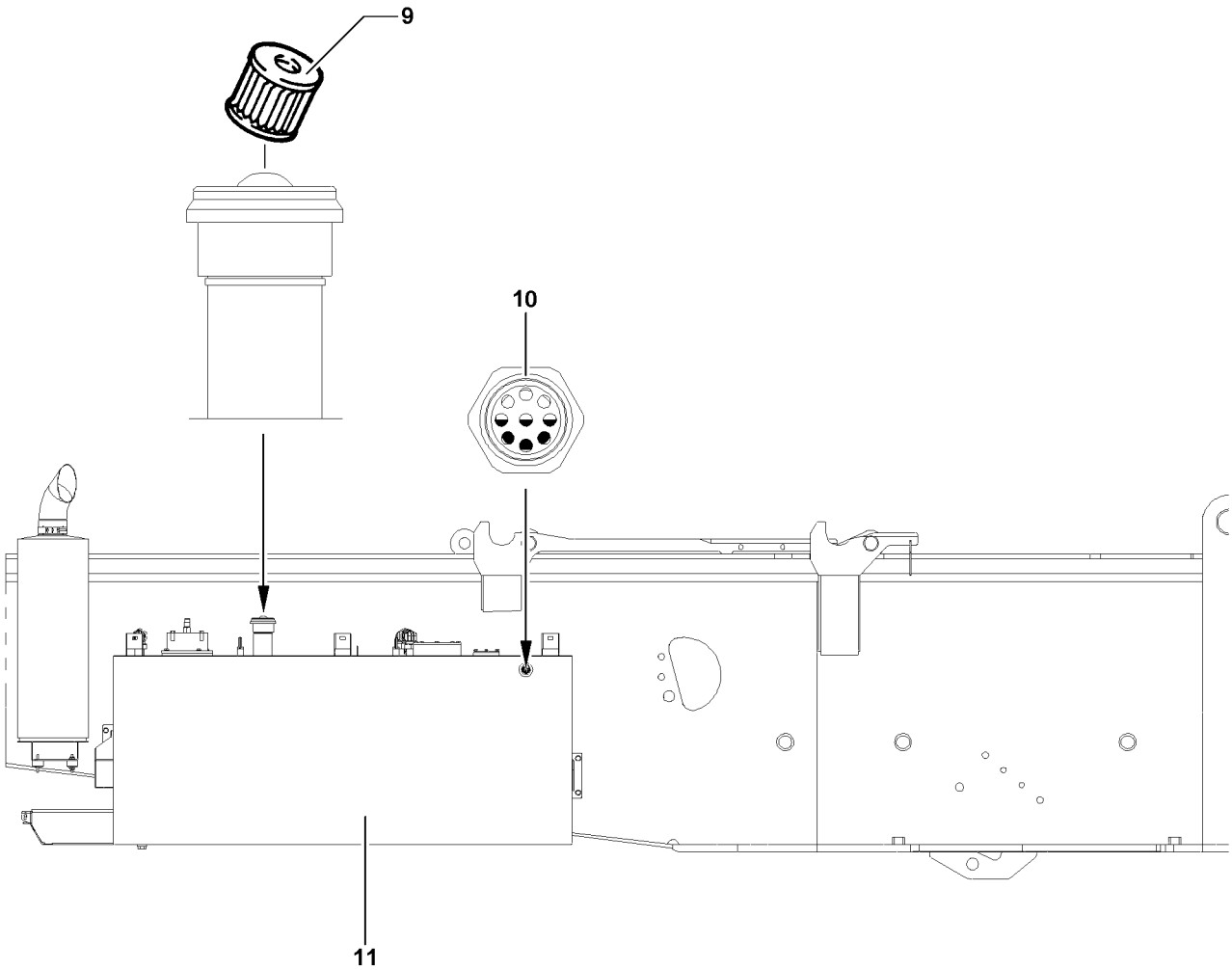
▶ Check the oil level.
▶ Insert the dipstick **6**.

2.2 Changing the oil

Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The gear is warm.

▶ Remove the dipstick **6** and the breather screw **7**.
▶ Remove the oil drain plug **8** and drain the oil.
▶ Clean the oil drain plug **8** and the sealing surfaces.
▶ Install the oil drain plug **8** with new seal and tighten.
▶ Add oil as specified on the lubrication chart on the oil filler plug **2** until the oil is between the minimum mark on point **P2** and the maximum mark on point **P1** on the dipstick **6**.
▶ Install the dipstick **6** and the breather screw **7** with new seal.
▶ Check the oil level.

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3 Servicing the hydraulic system

Note
▶ When adding oil, observe utmost cleanliness!

3.1 Servicing the hydraulic oil tank

3.1.1 Checking the oil level

NOTICE
Damage to the hydraulic oil tank!
If the hydraulic cylinders are not completely retracted when checking the oil level, there is a danger of overfilling!
When retracting the hydraulic cylinders, excess oil is discharged via the tank breather!
If the hydraulic cylinders are retracted too quickly, the hydraulic oil tank can be destroyed!
▶ Make sure that all hydraulic cylinders are completely retracted before checking the oil!

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 **10**.

NOTICE
Oil level too low!
If the oil level has dropped below the center of the oil level sight gauge **10**, the pumps can be damaged and the cylinders cannot be extended completely!
▶ Add oil as specified in lubrication chart using a fine mesh strainer until the oil level is visible in the middle of oil level sight gauge **10**!

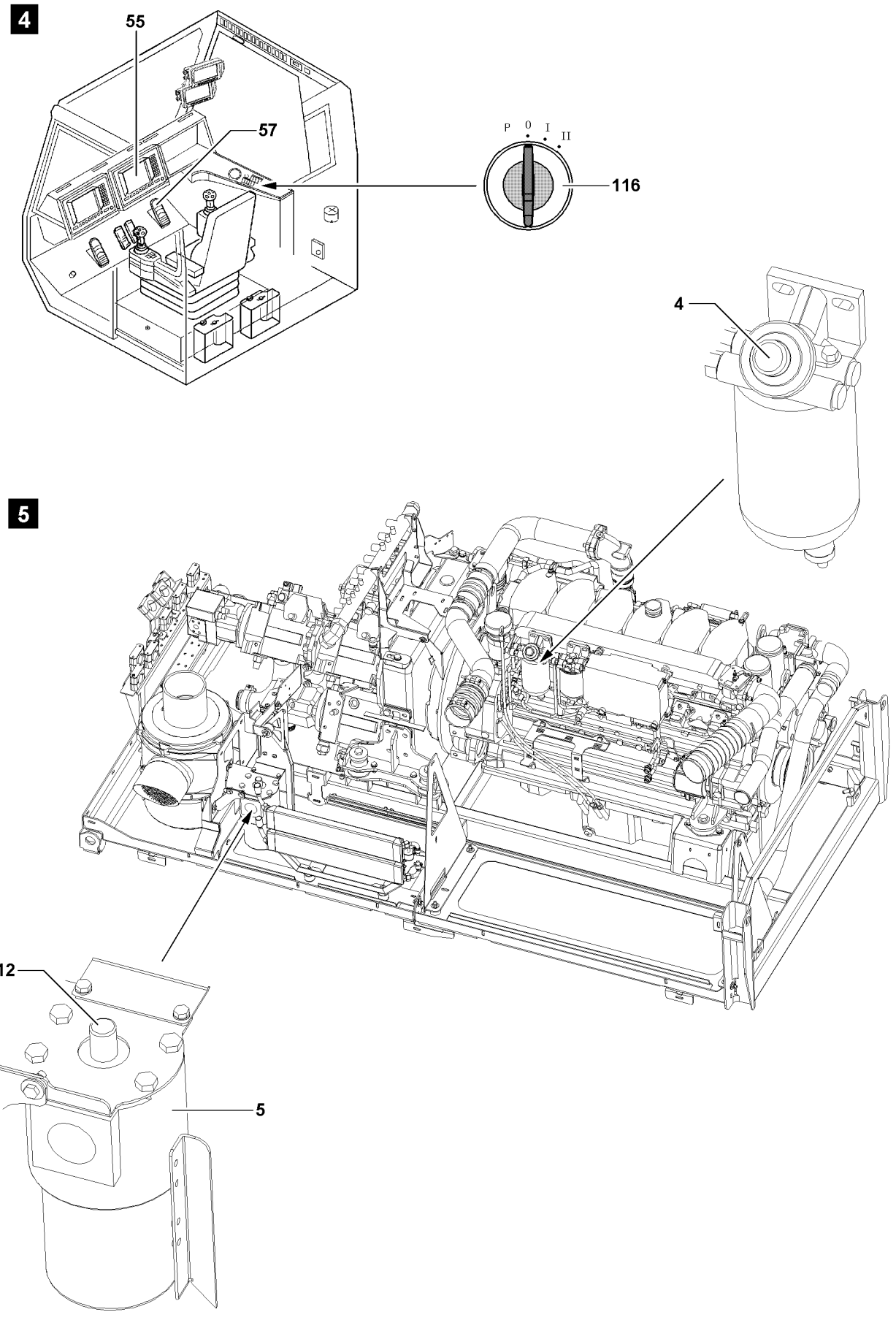
▶ Check the oil level on the oil level sight gauge **10** of hydraulic oil tank.

Note
▶ After adding oil, wait approx. two minutes until the oil is distributed evenly in the hydraulic oil tank **11**!
▶ Possibly recheck the oil level again!

3.1.2 Checking the vent / breather filter

▶ Open the cover with the turn lock on the hydraulic oil tank **11**.
▶ Check the filter **10** for impurities (visual inspection).
▶ In the event of heavy contamination:
Replace the filter **10**.
▶ Close the cover with the turn lock again.

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3.2 Servicing the pressure filter of the crane hydraulic

The pressure filter **5** is equipped with a maintenance indicator **12**. 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 it, if necessary.

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3.4 Hydraulic hose lines

The hydraulic hose lines must be checked according to ISO 9927-1 by an **experienced technician** or **expert mechanic**, as required, depending on the duration of use and the operating conditions, but at least once a year.

Experienced technicians are persons who:

– possess sufficient knowledge about cranes due to their professional background and experience,
– are familiar with the relevant settings to detect any abnormal deviations,
– 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 check whether the hydraulic hoses are in a safe condition. The crane must be inspected by an **authorized inspector** every four years from the day it was first licensed. After the 12th year of operation, the crane must be inspected 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.

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3.4.2 Examples of possible defects in hose lines

DANGER
Risk of fire or accident!
If problems are discovered during inspections, then they must be remedied immediately or suitable measures are to be taken. Failure to do this can result in serious injury to persons, death or damage to property!
▶ Remedy problems or take suitable measures!

- Damage to the outer layer as far as the intermediate layer (e.g. chafing, cuts and cracks)
- Outer layer brittleness (crack formation of the hose material)
- Deformation that differs from the natural shape of the hose or hose line, in depressurized as well as in pressurized condition or in bends, for example layer separation, bubbling, crushing or kinking
- Leaks
- Failure to follow installation instructions
- Damage or deformation of hose fittings that inhibit the function and strength of the fitting or the hose / fitting connection
- Hose slipping out of fitting
- Fitting corrosion that inhibits function and strength
- Storage time or usage period exceeded

3.4.3 Maintenance of hose lines

- We recommend to check all hoses, hose lines and screw fittings daily, but at least every two weeks for leaks and externally recognizable signs of damage.
- Damaged parts must be replaced immediately! Oil spray can lead to injuries and fires!
- Hydraulic lines and hoses may not be repaired!
- Hoses that have already been used in a hose system may not be reinstalled in hose systems.
- Always use original Liebherr spare parts when replacing hoses and hose systems.
- Always ensure that the hoses are routed free of torsion. If high pressure hoses are being used, attach screws of half clamps or full flange at both ends of hose and then tighten.
- When using high pressure hoses with a bent fitting, tighten the end with the bent fitting first when tightening the flanges, then the end with the straight fitting.
- Any mounting clamps in the hose center may be attached and tightened only thereafter.
- Route the hoses in such a way that chafing with other hoses or other structures is prevented. Maintain a minimum clearance of approximately ½ the outer diameter of the hose to other parts. The clearance may never be less than 10 to 15 mm.

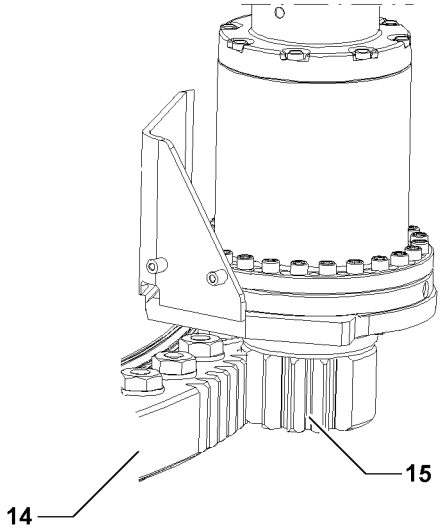
3.4.4 Changing hose lines

DANGER
Risk of fire or accident!
Failure to replace hose lines at appropriate intervals can cause serious injury to persons, death or damage to property!
▶ Replace hose lines at appropriate intervals!

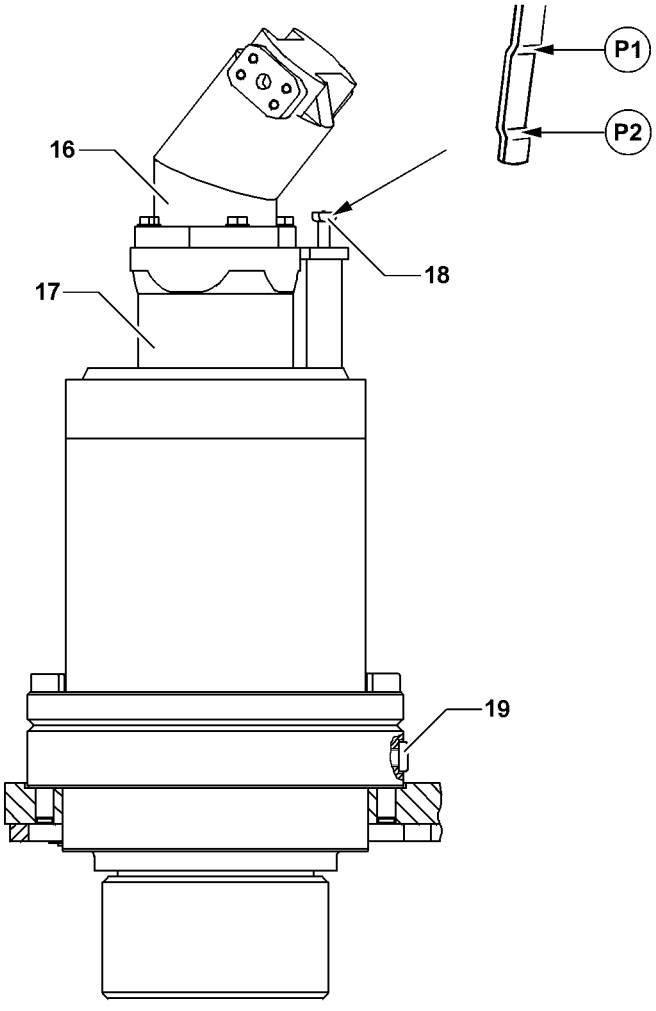
This must be documented in the crane's log book by the **expert** or the **authorized inspector**.
The service life of a hose system may not exceed six years, including a storage period of a maximum of two years (observe the manufacturing date on the hoses). The duration of use can also be defined by the **expert** or **authorized inspector** in accordance with existing test and empirical data in the individual application areas, taking the usage conditions into consideration.

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4 Servicing the rotary connection

4.1 Lubricating 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 **14** and the slewing gear pinion **15** to ensure the best possible protection from corrosion.

▶ Grease the gear ring **14** and the slewing gear pinion **15** externally.

4.3 Checking the tilting 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**!

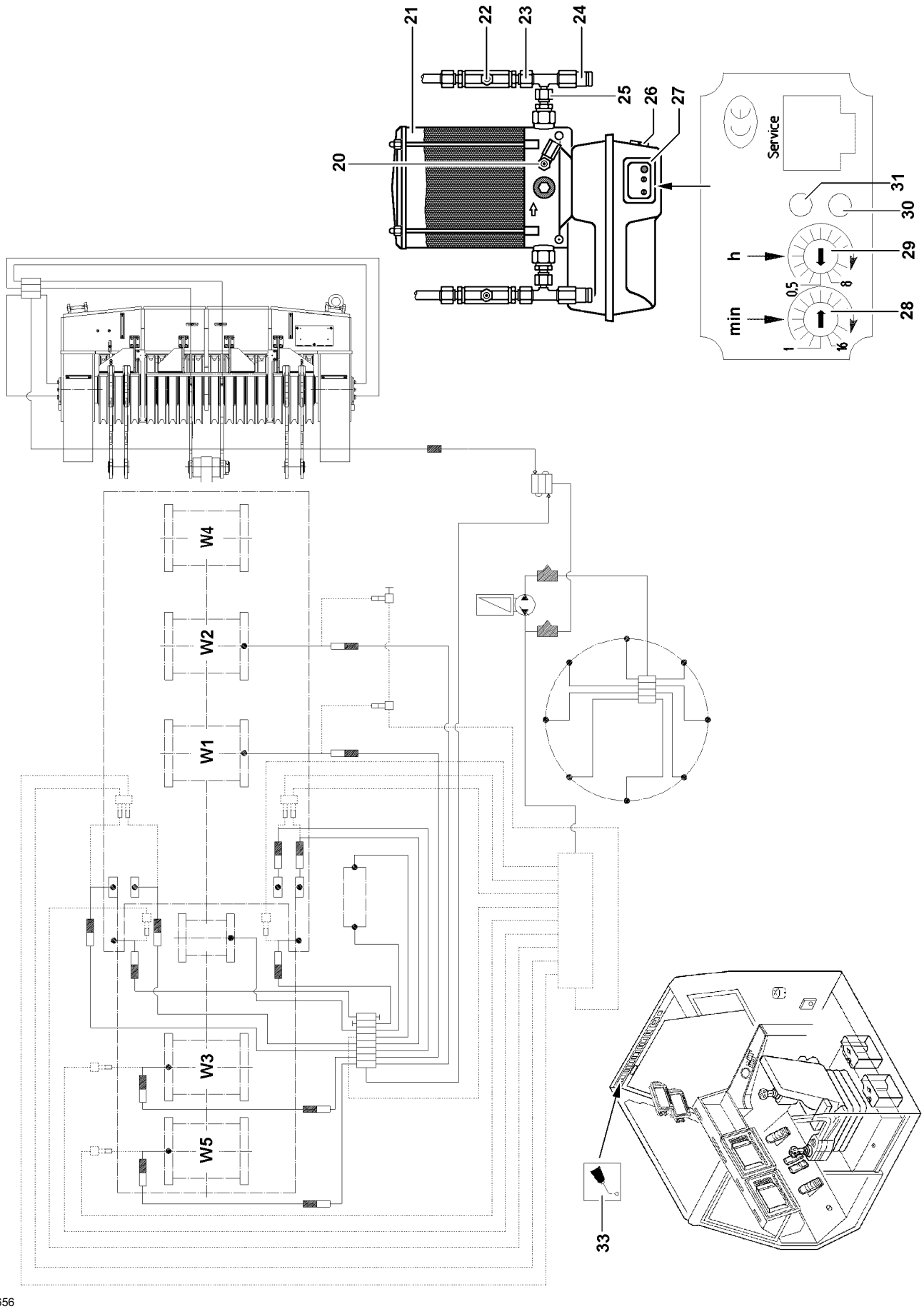
▶ Contact the Service Dept. at **Liebherr-Werk Ehingen GmbH** for **test instructions**!

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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5 Servicing the central lubrication system

5.1 Overview of central lubrication system

The crane superstructure is equipped with a central lubrication system.

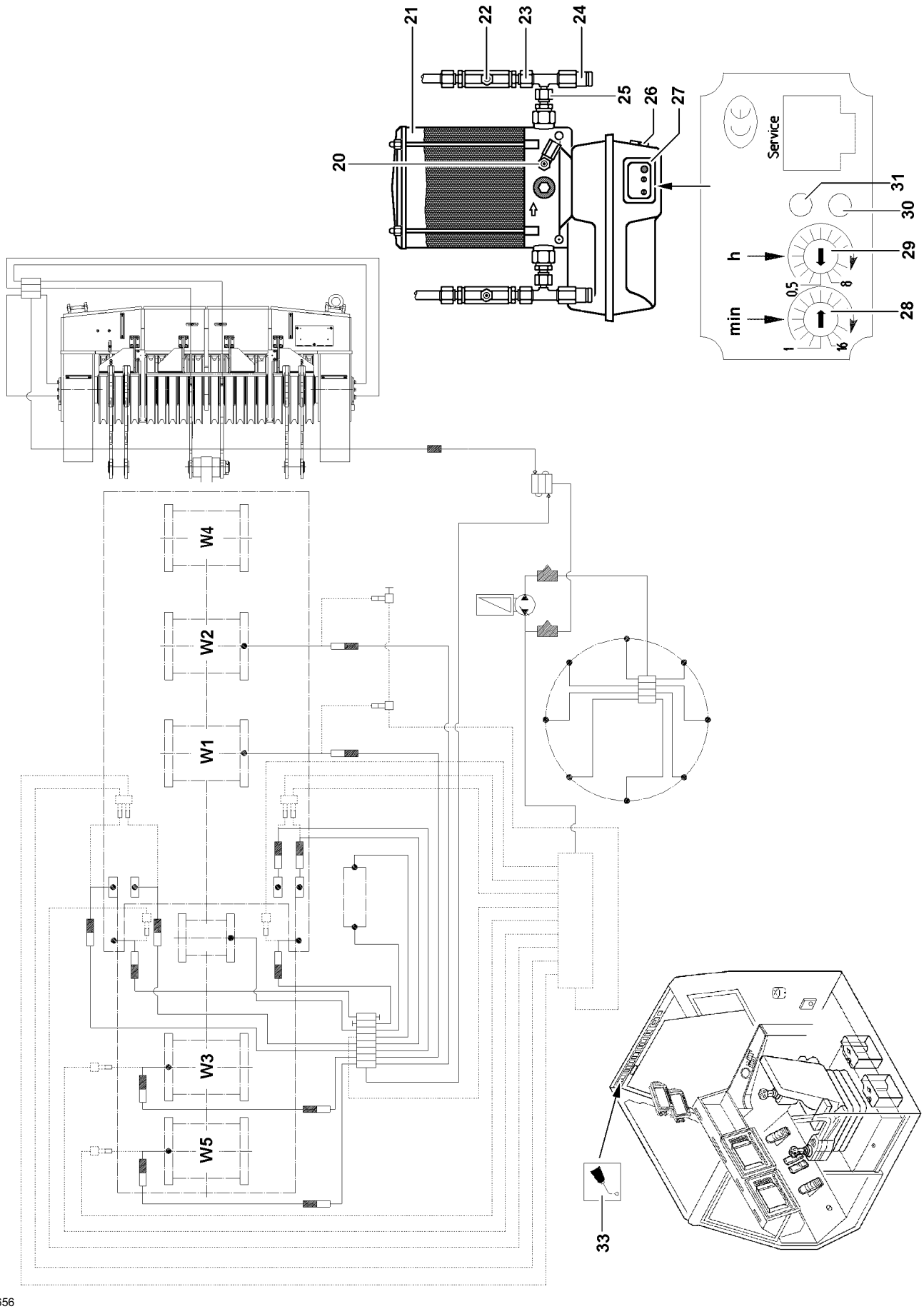
NOTICE
Dirty lubricant!
If the crane is not moved for longer than 3 months, then contaminants adhere to the lubricant!
Components are exposed to increased wear!
If the crane has not been moved for longer than three months:
▶ Lubricate the grease fitting with an external grease pump until lubricant emerges 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:

20	Grease fitting	• Filling the central lubrication pump
21	Grease container	
22	Grease fitting	• Filling the lube lines
23	Pump outlet	
24	Pressure relief valve	
25	Pump element	
26	Push button	
27	Control	
28	Latched switch	• Lube time in cycles
29	Latched switch	• Pause time (h)
30	Green LED	• Function display
31	Red LED	• Fault display

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5.2 Indicator lights of the central lubrication system

Position	Beacon	LED condition	Description
33		Red: blinks once after engine start	Control of function, operational readiness
		Green: blinks once after engine start	
31		Red: blinks once after engine start	
30		Green: blinks once after engine start	
33		Red: Off	Lube pump off
		Green: lights up during the lubrication time	Grease pump on, lubrication active
31		Red: Off	
30		Green: On	
33		Red: Blinking	Error monitoring time lubrication time
		Green: Blinking	
31		Red: Blinking fast	
30		Green: Blinking fast	
33		Red: Blinking fast	Error CPU / memory

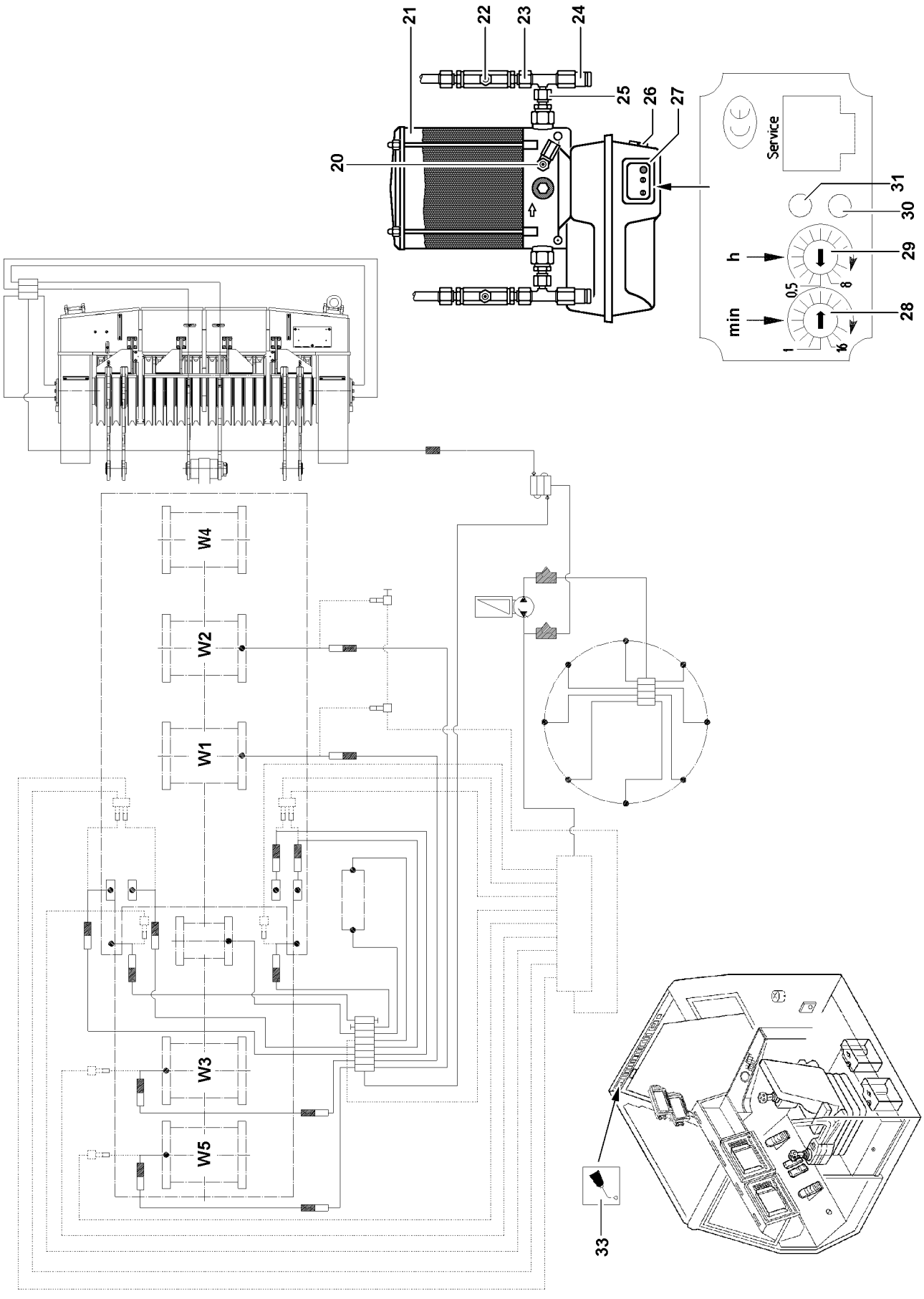
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Position	Beacon	LED condition	Description
		Green: Off	
31		Red: blinking very fast	
30		Green: Off	

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5.3 Servicing the central lubrication system

5.4 Setting the lubrication and break periods

Note
- ▶ The lube pump running time is 9 cycles!
- ▶ The pause time is 0.5 hours!
- ▶ During the lubrication procedure, the green LED **30** on the engine protection housing lights up!

The lubrication and pause time is set at the factory.
- ▶ Turn on the engine ignition.
- ▶ Set the lubricating time: Turn the latched switch **28**.
- ▶ Set the pause time: Turn the latched switch **29**.
- ▶ Check functional readiness: Turn on the engine ignition.

Result:
- – When turning the ignition on: The green LED **30** and the red LED **31** light up for approx. 2 s.
- – The control **27** is functionally ready .

5.5 Checking the function of the central lubrication system
- ▶ Start the engine.
- ▶ Trigger 2 or 3 grease pulses via the push button **26**.

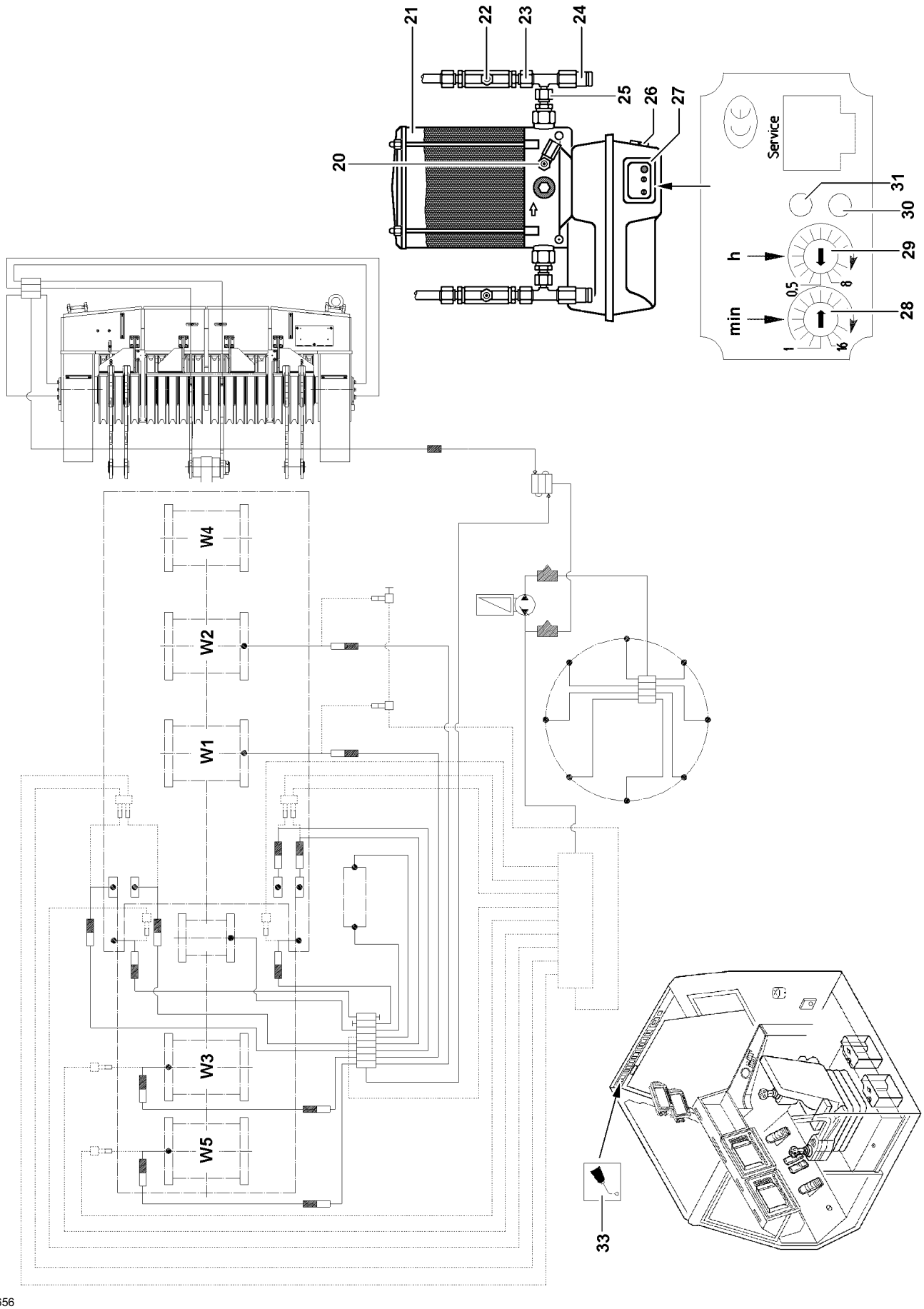
Result:
- – Grease emerges on the grease points.
- – If the system is blocked but the electric pump is properly functioning, the grease emerges through the pressure relief valve **24**.

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 **26** on the engine protection housing of the grease pump.

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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 **21**!
- ▶ Observe utmost cleanliness when filling the grease container **21**!

- ▶ Fill the grease container **21** with a grease pump via the grease fitting **20** on the central lubrication pump.

5.8 Bleeding the central lubrication system

If the grease container **21** has been emptied, then it may be necessary to bleed the central lubrication system.
- ▶ Fill the grease container **21**.
- ▶ Unscrew the main line from the pump outlet **23**.
- ▶ Trigger additional lubricating pulses until there are no more air bubbles in the emerging grease at the pump outlet **23**.
- ▶ Reconnect the main line.
- ▶ Trigger an additional lubricating process.

5.9 Filling the lubrication lines

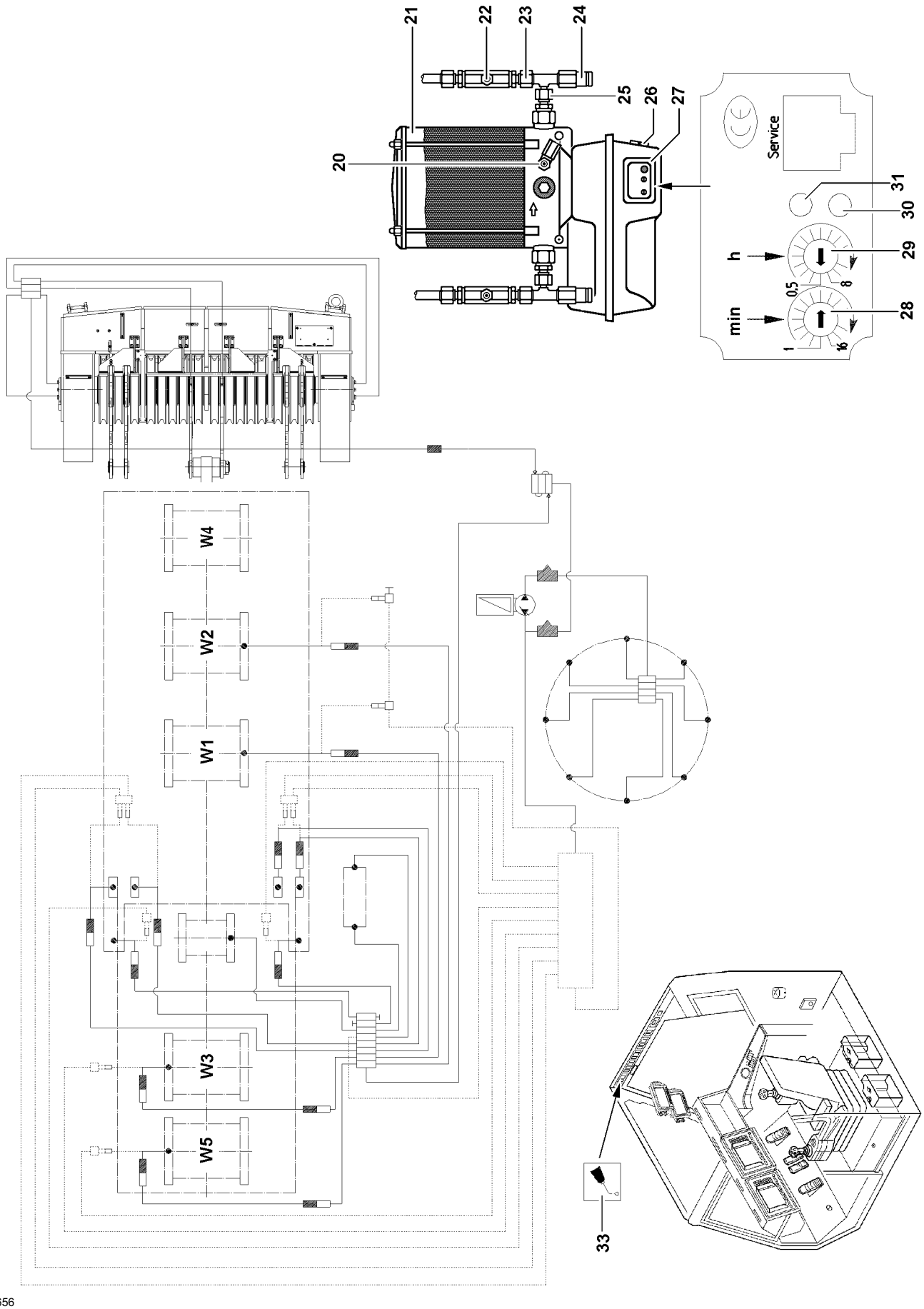
NOTICE
Risk of damage due to insufficient lubrication!
The lubrication lines must be refilled after any repair on components, which are lubricated with grease. If this is not observed, the component may run dry!
- ▶ Sufficient grease must be available in the grease lines after every repair on greased components!
- ▶ Observe utmost cleanliness when filling the grease lines!

- ▶ Add grease with an external grease pump via the grease fitting **22**.

or

- With the ignition turned on, press the push button **26** on the engine protection housing of the pump.

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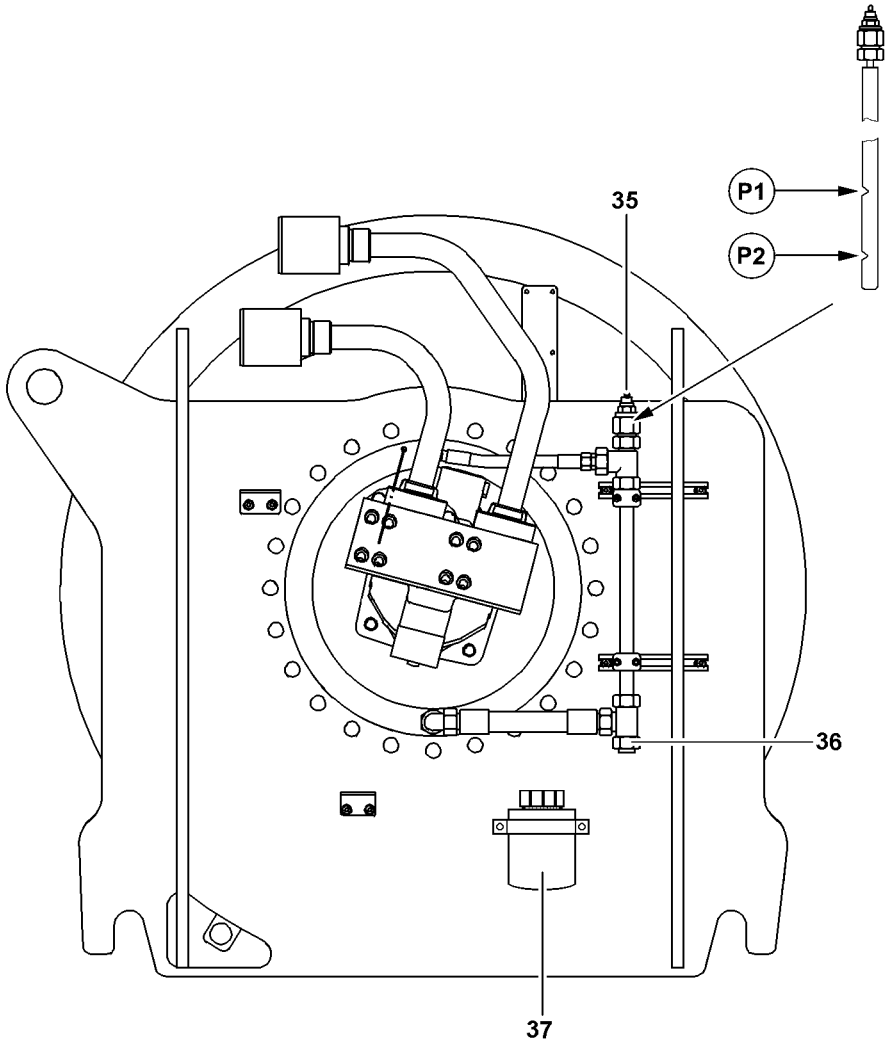
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5.10 Troubleshooting on the central lubrication system

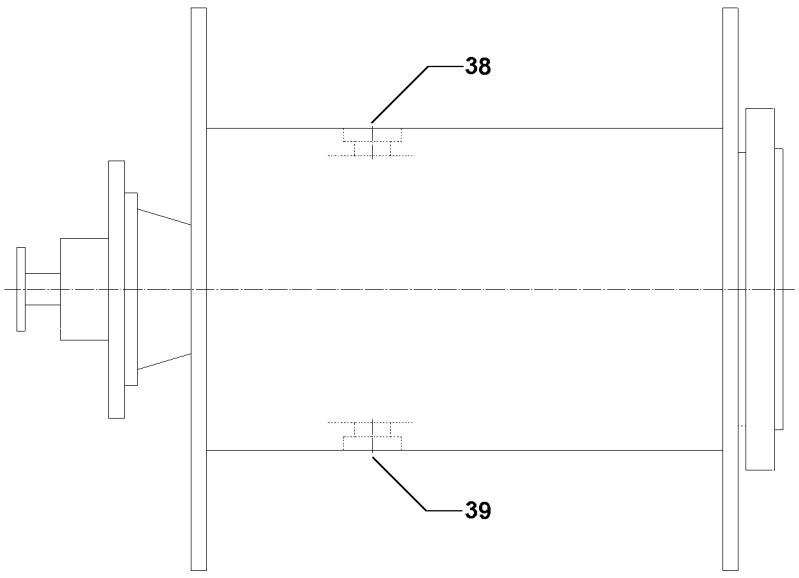
Problem	Cause	Remedy
The grease pump does not work	Integrated electronic control defective, electrical line interrupted, grease pump defective	Replace lower part of motor protection housing, replace electrical line, replace grease pump
Grease pump operates, but does not deliver	Air cushion in delivery piston, minimum fill level fallen below, grease pump element defective	Bleed grease pump, fill reservoir, replace grease pump element
No grease collar on all lube points	Grease pump not operating, interval time too high or cycle time too short, system blocked	See “Grease pump not operating” , reduce interval time or increase number of cycles, refer to “Grease emerges on pressure relief valve”
No grease collar on several lube points	Supply lines to secondary distributors broken or leaking, screw connections leaking	Replace lines, tighten or replace screw connections
No grease collar on one lube point	Associated lube line broken or leaking, screw connection leaking	Replace line, tighten or replace screw fitting
Grease pump speed reduced	Higher system pressure, lower ambient temperature	Check system / bearing points, no damage: Grease intermediately once or twice, if necessary
Grease escapes at the pressure relief valve	System pressure too high, progressive distributor blocked, system blocked, defective valve spring	Check system, replace distributor, repair blocked / seized bearing point, replace pressure relief valve
The red LED blinks very fast	Error CPU / memory	Consult Liebherr Service
The red LED and the indicator light blink fast	Error in the monitoring period from cycle start	The proximity switch is defective, consult Liebherr Service

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6 Servicing the hoist gear

The statements in this section refer to hoist gear 1 to hoist gear 6.

Note
▶ Please maintain utmost cleanliness during all work to prevent any dirt from getting into the gear!

6.1 Emptying the overflow container

When the oil is warmed up in the hydro motor of the winches, the oil can flow via a check valve into the overflow container **37**.
▶ Empty the overflow container **37** regularly and dispose of the oil.

6.2 Servicing the 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

The oil must be between the minimum mark on point **P2** and the maximum mark on point **P1** on the dipstick **35**.
▶ Unscrew, remove and wipe off the dipstick **35**.

Note
▶ Do not insert the dipstick **35** to measure!

▶ Reinsert the dipstick **35** and pull it out again.

NOTICE
Oil level too low!
If the oil level has dropped below the minimum mark on point **P2**, gear damage can occur!
▶ Add oil as specified in the lubrication chart until the oil is between the minimum mark on point **P2** and the maximum mark on point **P1** on the dipstick **35**!
▶ Add oil and check again!

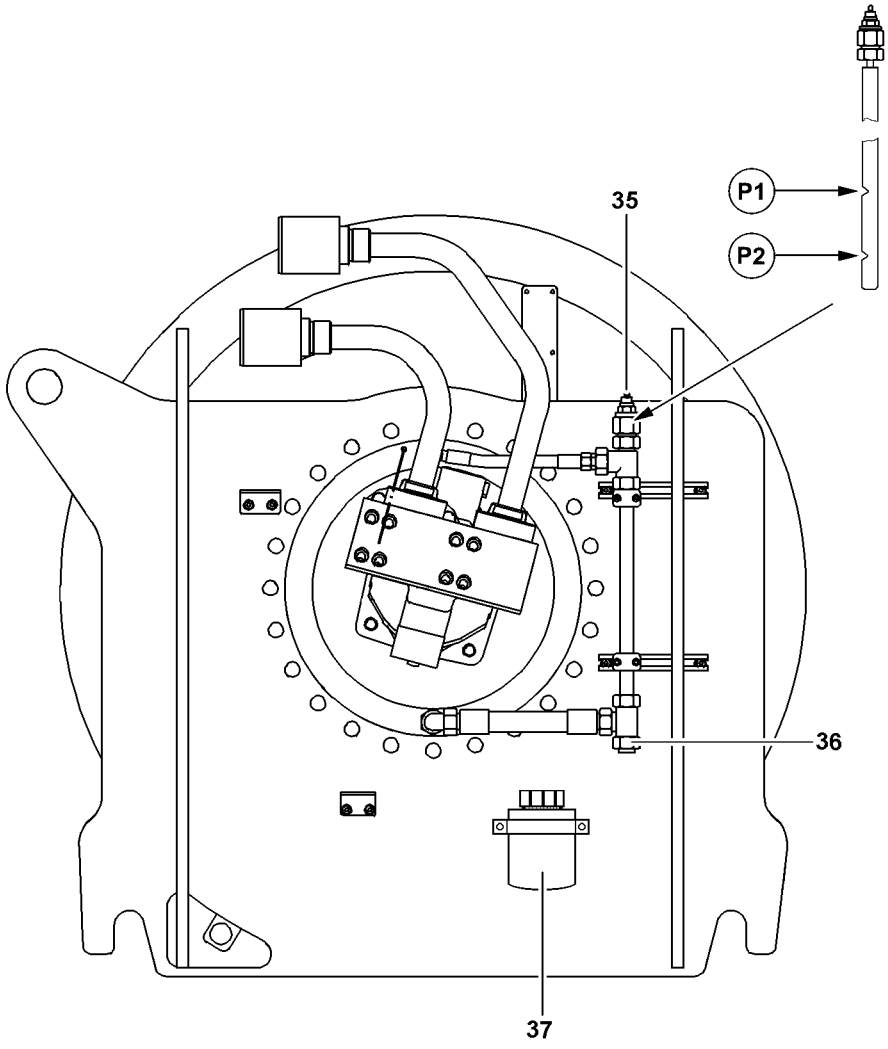
▶ Check the oil level.
▶ Install the dipstick **35** and tighten.

6.2.2 Checking the oil

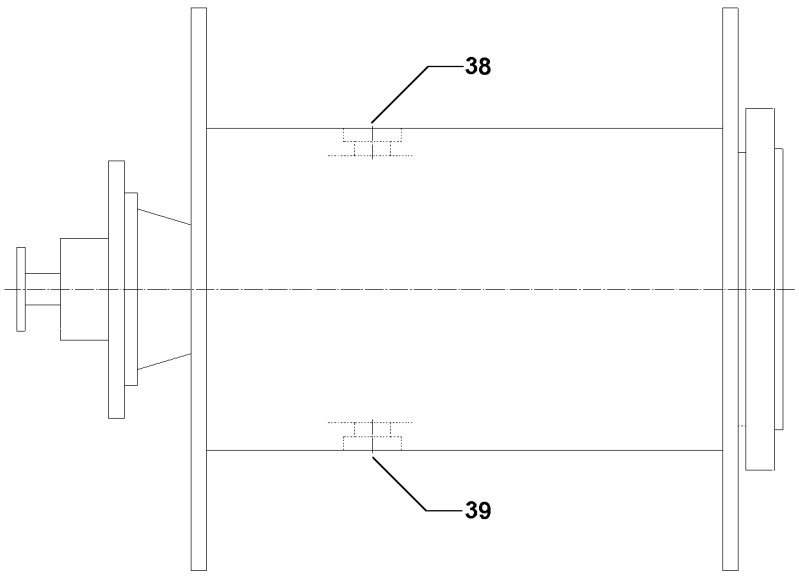
▶ Turn the dipstick **35** and pull it out.
▶ Remove the oil drain plug **36** and drain the oil into a suitable container.
▶ Install the oil drain plug **36** with new seal and tighten.
▶ Add oil as specified on the lubrication chart on the oil filler port until the oil is between the minimum mark on point **P2** and the maximum mark on point **P1** on the dipstick **35**.
▶ Check the oil level as described above.
▶ Install the dipstick **35** and tighten.

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7 Servicing the assembly winch

7.1 Changing the oil

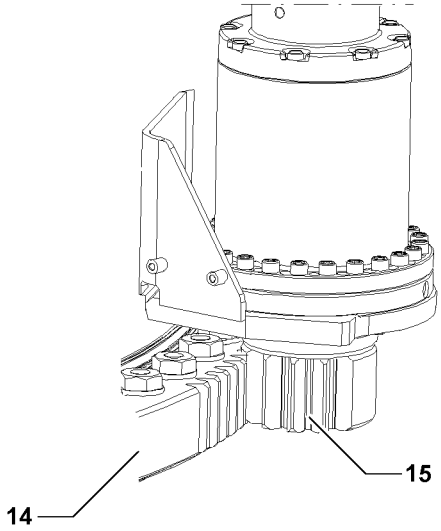
Make sure that the following prerequisite is met:

– The assembly winch is spooled out.

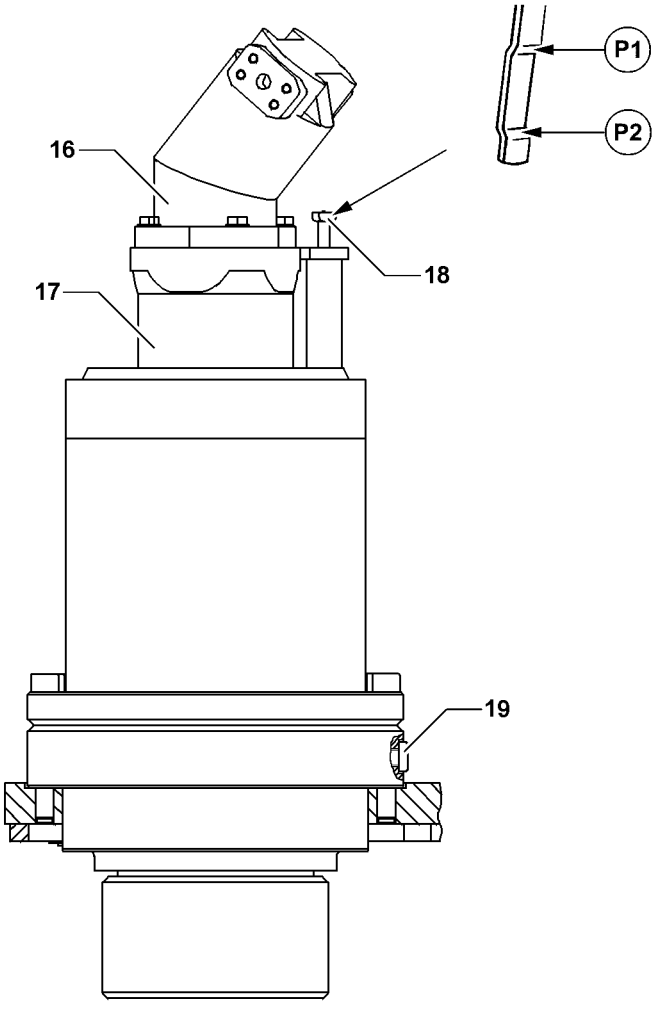
- ▶ Remove the oil filler plug **38**.
- ▶ Remove the oil drain plug **39** and drain the oil into a suitable container.
- ▶ Install the oil drain plug **39** with new seal and tighten.
- ▶ Add oil as specified on the lubrication chart on the oil filler plug **38**.
- ▶ Install the oil filler plug **38** with a new seal and tighten.

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8 Servicing the slewing gear

Note
▶ Please maintain utmost cleanliness during all work to prevent any dirt from getting into the gear!

8.1 Checking the oil level

Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The slewing gear is inactive.

The oil must be between the minimum mark on point **P2** and the maximum mark on point **P1** on the dipstick **18**.

NOTICE
Oil level too low!
If the oil level has dropped below the minimum mark on point **P2**, gear damage can occur!
▶ Add oil as specified in the lubrication chart until the oil level is between the minimum mark on point **P2** and the maximum mark on point **P1**!
▶ Add oil and check again!

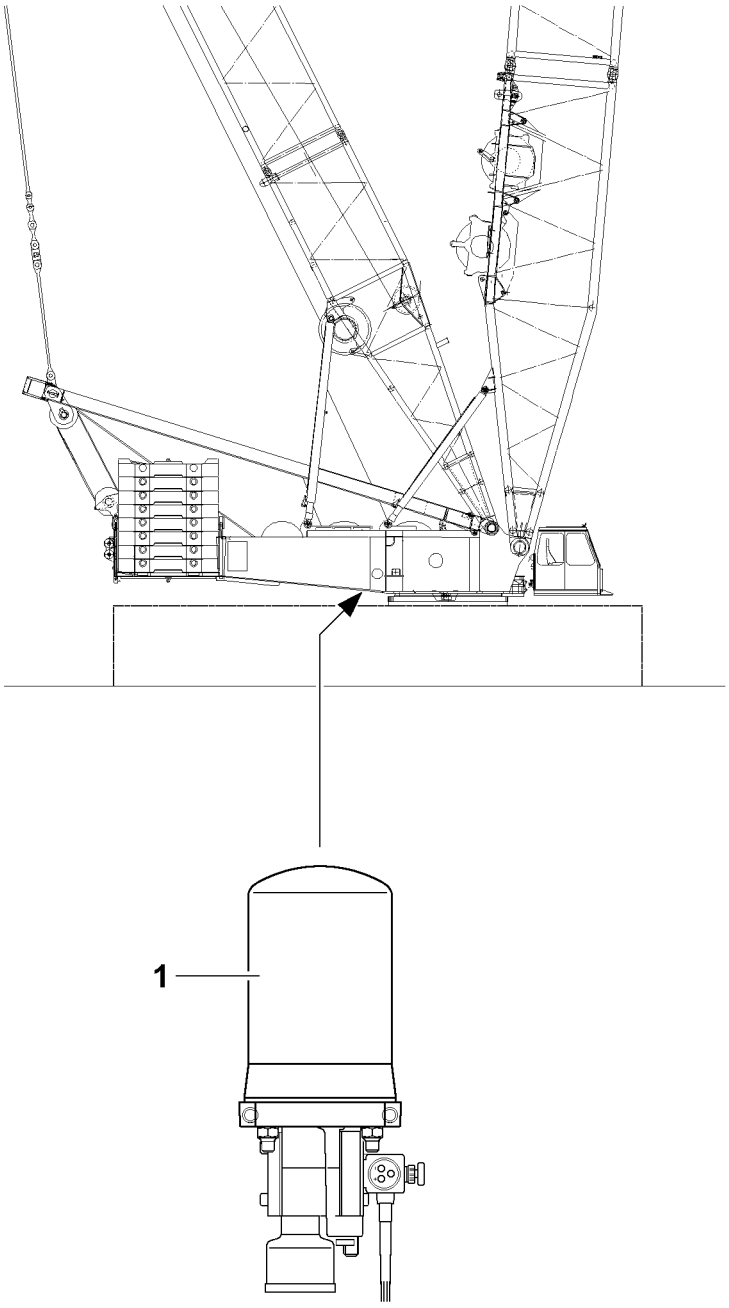
▶ Check the oil level.

8.2 Changing the oil

Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The gear has warmed up.

▶ Unscrew and remove the dipstick **18**.
▶ Remove the oil drain plug **19** with the seal ring and drain the oil.
▶ Clean the oil drain plug **19** and sealing surface on the housing.
▶ Install the oil drain plug **19** with new seal ring and tighten.
▶ Add oil as specified in the lubrication chart on the oil filler port **18** until the oil level is between the minimum mark on point **P2** and the maximum mark on point **P1**.
▶ Check the oil level as described above.
▶ Insert the dipstick **18**.

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9 Servicing the air drier of the compressed air system for the crane superstructure

9.1 Replacing the granular cartridge

CAUTION
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 to electrical system!
Never short circuit defective fuses with wire or similar items!
▶ Always replace defective fuses with fuses of the same amperage!
▶ If there is a repeat problem with the same fuse, check the electrical system!

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 dry and clean.
▶ Do not bring oil, grease, fuel or solvents into contact with the battery casting compound.
▶ Release dirty terminals, clean and grease them with an acid-free and acid-resistant grease.
▶ Check the acid levels in batteries at least once a year. In summer and in hot climate zones, check it at least twice a year.
▶ On conventional batteries, check electrolyte level at regular intervals and add distilled water to the specified “max mark”, if necessary.
▶ When adding distilled water:
Measure the acid concentration only after 30 minutes. The acid temperature for measuring should be + 20 °C if possible.

Proceed as follows when checking the battery charge:

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Specific weight	Charge condition
1.28/1.23*	Well charged
1.20/1.16*	Semi-charged, recharge
1.12/1.08*	Discharged, recharge immediately

* in tropical countries

Reduced battery performance requires greater power requirements.

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

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 the mixture with an acid-proof stick (glass or plastic).

Desired acid concentration kg/l	1.23	1.24	1.25	1.26	1.27	1.28
Volume ratio of concentrated sulphuric acid (96%) to distilled water	1:3.8	1:3.6	1:3.4	1:3.2	1:3.0	1:2.8

When adding the battery acid, the acid level should be 15 mm above the top edge of the battery plates and the temperature of the acid should be approximately 15 °C.

▶ Add battery acid to battery.

Wait approximately 20 minutes before connecting the battery. By that time, it will be balanced out.

▶ Connect the battery after approximately 20 minutes.

10.3 Removing and recharging the battery

WARNING

Danger of injuries!

▶ Do not place tools on batteries and keep open flames away!

10.3.1 Removing the battery

Make sure that the following prerequisites are met:

– The engine is turned off.

– All electrical consumers are turned off.

NOTICE

Damage to alternator!

▶ Do not disconnect batteries unless the engine has been turned off!

▶ Carry out work in well ventilated rooms and avoid sparks.

▶ Disconnect the negative terminal first (ground cable), then the positive terminal.

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- ▶ Remove the battery.
- ▶ Avoid spark formation caused by electrostatic charge. To avoid this, touch the ground support point in the driver's cab.
- ▶ Do not tilt or shake the battery.

10.3.2 Recharging the battery

NOTICE
Damage to battery!
- ▶ Recharge only with direct current, the strength of which does not exceed 1/10 of the battery capacity!

Recharging example: A battery with 170 Ah should be charged with a maximum charging current of 17.0 A.
- ▶ Frozen batteries must be thawed out before charging.
- ▶ Remove all plugs before charging.
- ▶ Provide ventilation during charging (risk of oxyhydrogen gas explosion!).
- ▶ Connect the battery to a battery charger (positive to positive and negative to negative).
- ▶ Turn on the battery charger after connecting the battery.

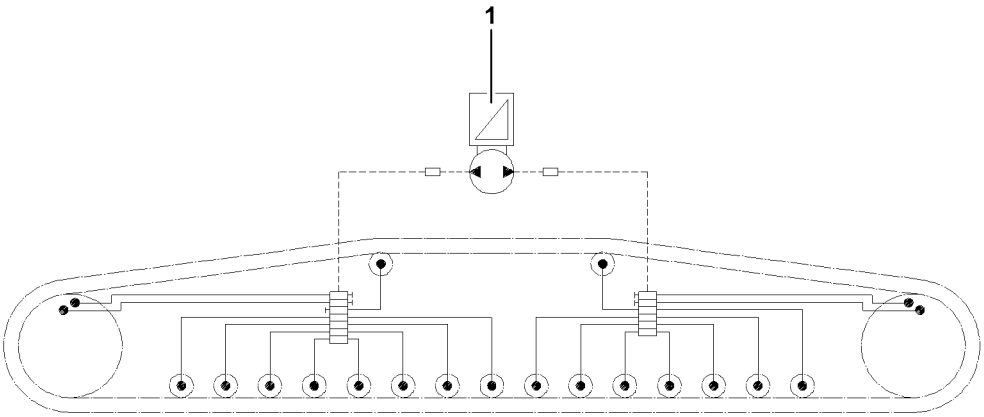
Stop charging immediately if:
- The acid temperature exceeds 55 °C (casing more than warm to the touch).
- The battery starts to give off gas.
- The acid concentration or the charging voltage has not changed for 2 hours.

- ▶ Turn the battery charger off after charging, then remove the connector cables individually from battery and battery charger.

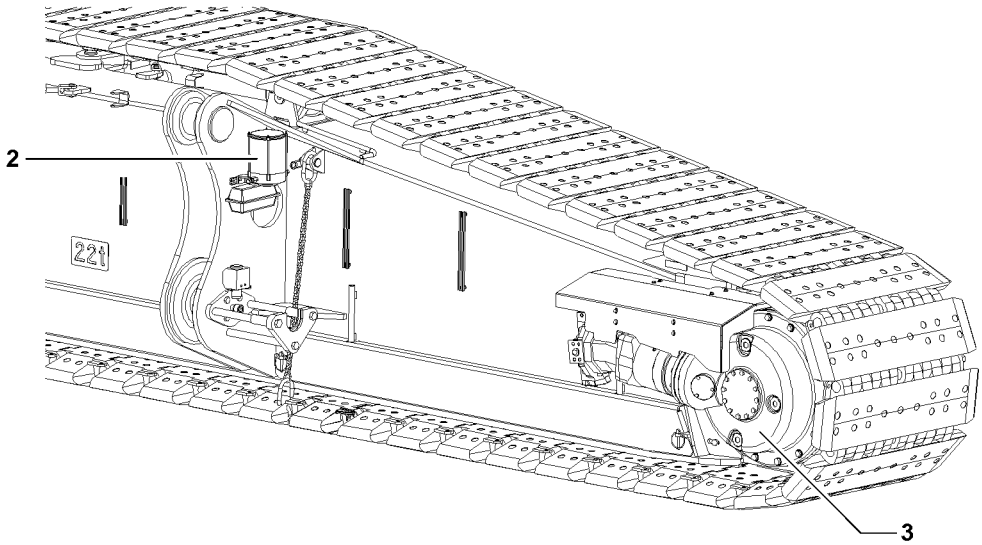
10.3.3 Installing the battery
- ▶ Reinstall the battery tightly in the vehicle.
- ▶ Avoid spark formation caused by electrostatic charge. To avoid this, touch the ground support point in the driver's cab.
- ▶ Connect the positive terminal to the battery first, then the negative terminal (ground cable).
- ▶ Check that the terminals are tightly seated (low contact resistance).
- ▶ Grease the terminals and terminal posts with acid-free and acid-resistant grease (use corrosion protection even for modern maintenance-free batteries).

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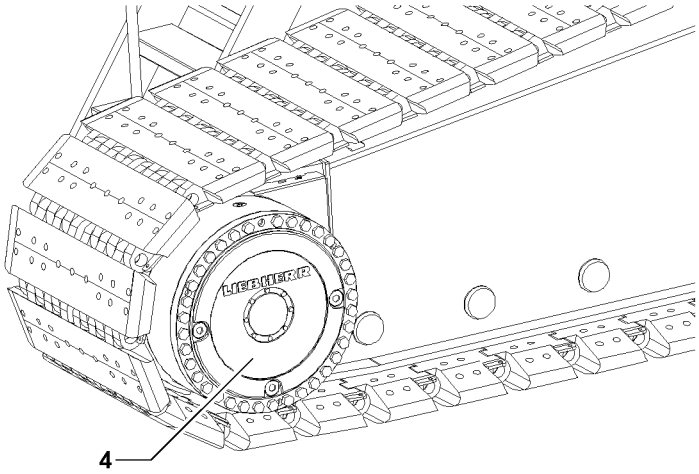
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1 Fill quantities

1.1 Crawler chassis fill quantities

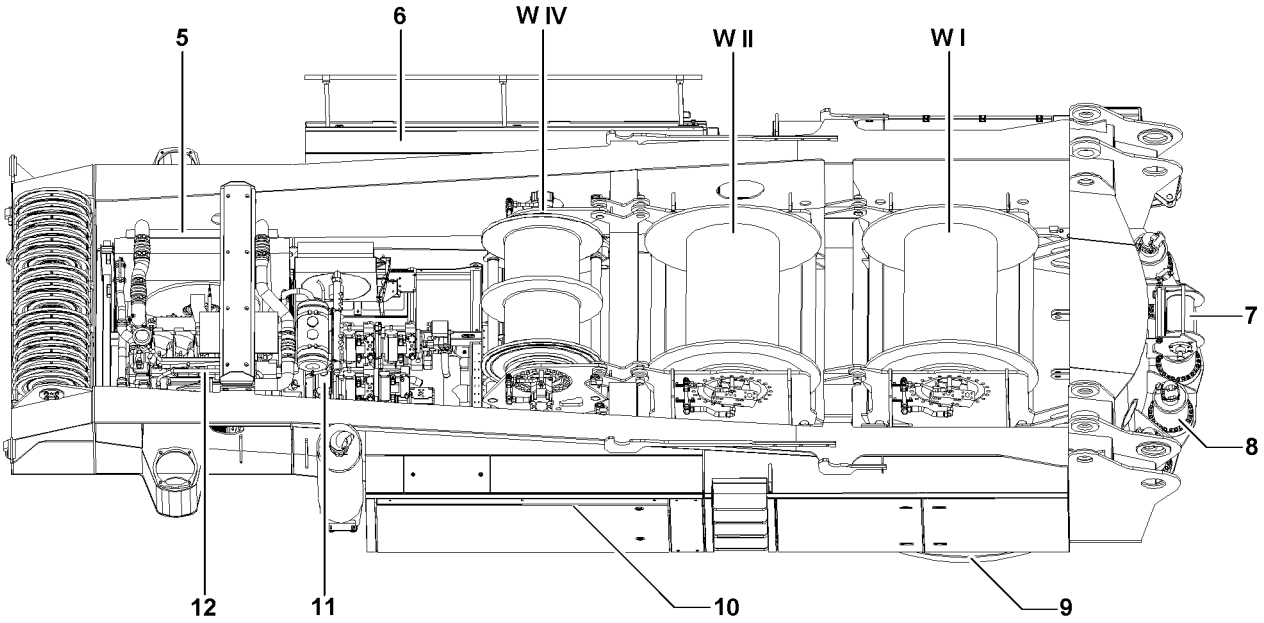
The specified fill quantities (change quantities) are orientation values. The marks on the dipsticks, inspection ports and sight gauges are decisive for filling.

NOTICE
Danger of property damage!
▶ Do not mix synthetic oils with mineral oils!

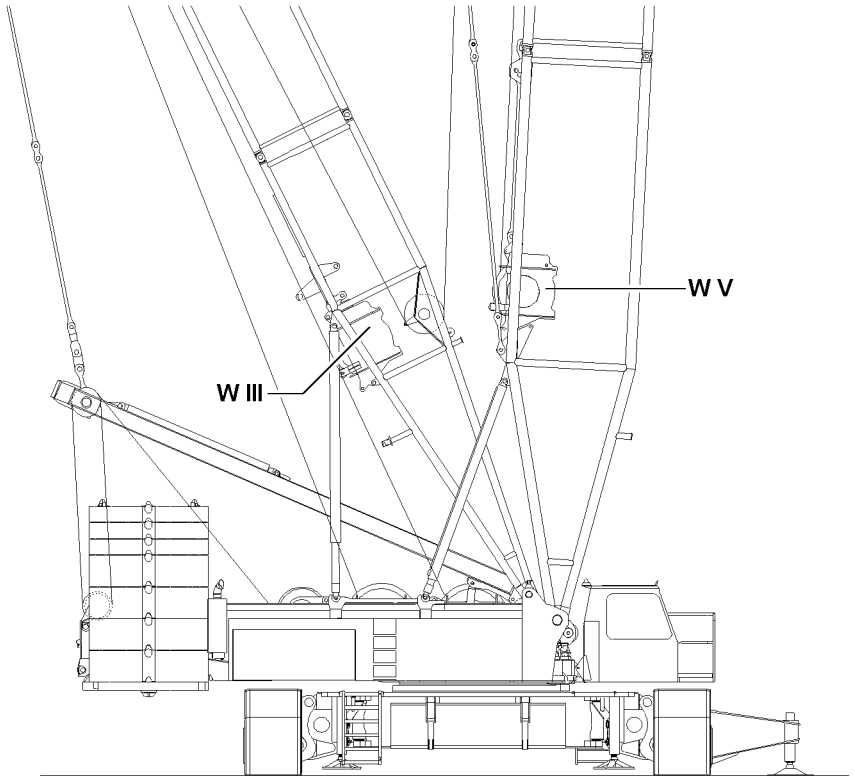
Position	Component	Fill quantity
1	Central lubrication system	
2	Container for central lubrication system	2.5 kg / crawler carrier
3	Miter gear	8.0 l
4	Planetary gear	35.0 l

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1.2 Fill quantities crane superstructure

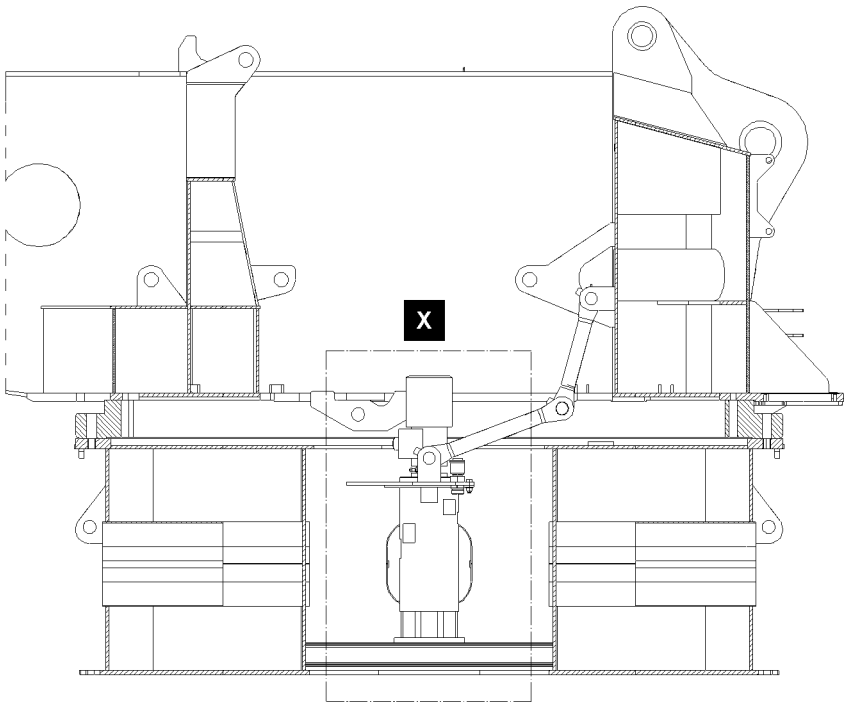
The specified fill quantities (change quantities) are orientation values. The marks on the dipsticks, inspection ports and sight gauges are decisive for filling.

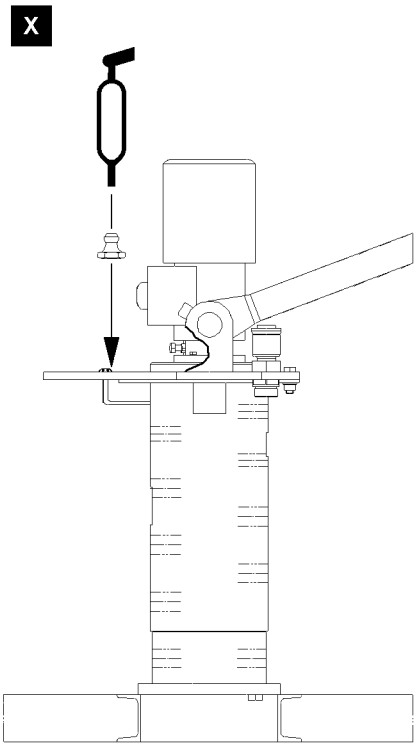
NOTICE
Danger of property damage!
▶ Do not mix synthetic oils with mineral oils!

Position	Component	Rope diameter	Fill quantity
5	Cooling system		60 l
6	Fuel tank		700 l 1200 l
7	Assembly winch		0.4 l
8	Slewing gear		5.7 l
9	Central lubrication system		4.0 kg
10	Hydraulic oil tank[1]		550.0 l
11	Pump distributor gear		9.2 l
12	Diesel engine		40.0 l
W I	Winch **W I**	25 mm	16.5 l
		28 mm	22.0 l
W II	Winch **W II**	25 mm	9.5 l
		28 mm	22.0 l
W III	Winch **W III**		16.5 l
W IV	Winch **W IV**		24.0 l
W V	Winch **W V**		16.5 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.

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2 Lubrication schedule

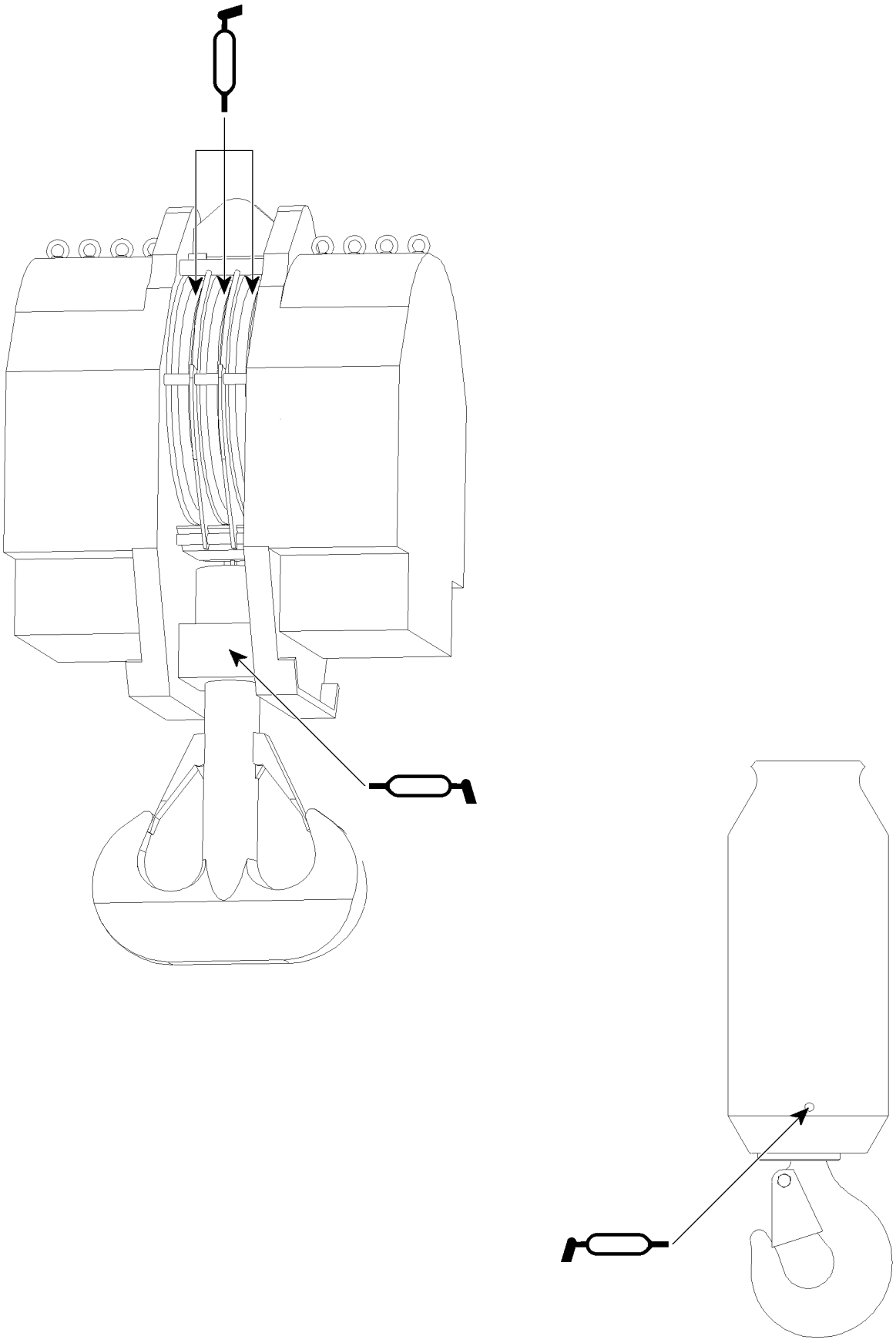
2.1 Lubrication schedule - Crawler chassis

2.1.1 Lubrication schedule rotary connection



Note
▶ The lube points are marked with this icon.

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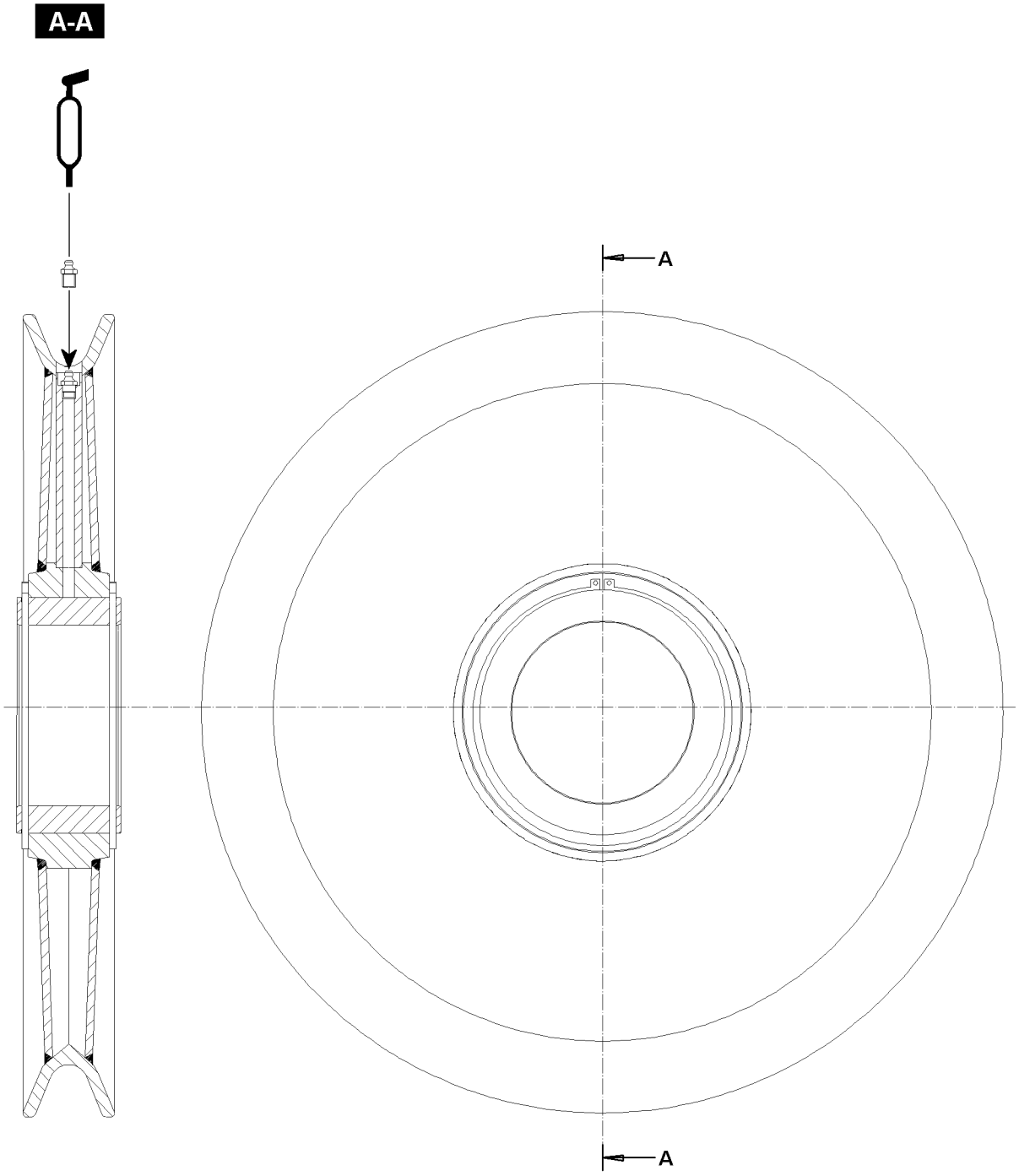
2.2 Lubrication schedule - Equipment

2.2.1 Lubrication schedule Hook block / load hook



Note
▶ The lube points are marked with this icon.

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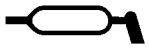


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2.2.2 Lubrication schedule for rope pulley

Note
▶ The rope pulley shown in this chapter is only an example and can deviate in type and version from other rope pulleys. The lubrication schedule is generally valid for all rope pulleys.



Note
▶ The lube points are marked with this icon.

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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

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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

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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

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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

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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!

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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

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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	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

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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)

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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?

WARNING
Incorrect operation!
Incorrect operation of the crane can result in death or serious injuries!
▶ The crane may only be operated by authorized expert personnel trained on mobile cranes by Liebherrwerk Ehingen!

WARNING
Measures without the help of Liebherr Service!
Measures in case of a problem, which are carried out without consulting Liebherr Service can cause damage to the crane. Personnel can be severely injured or killed!
▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.

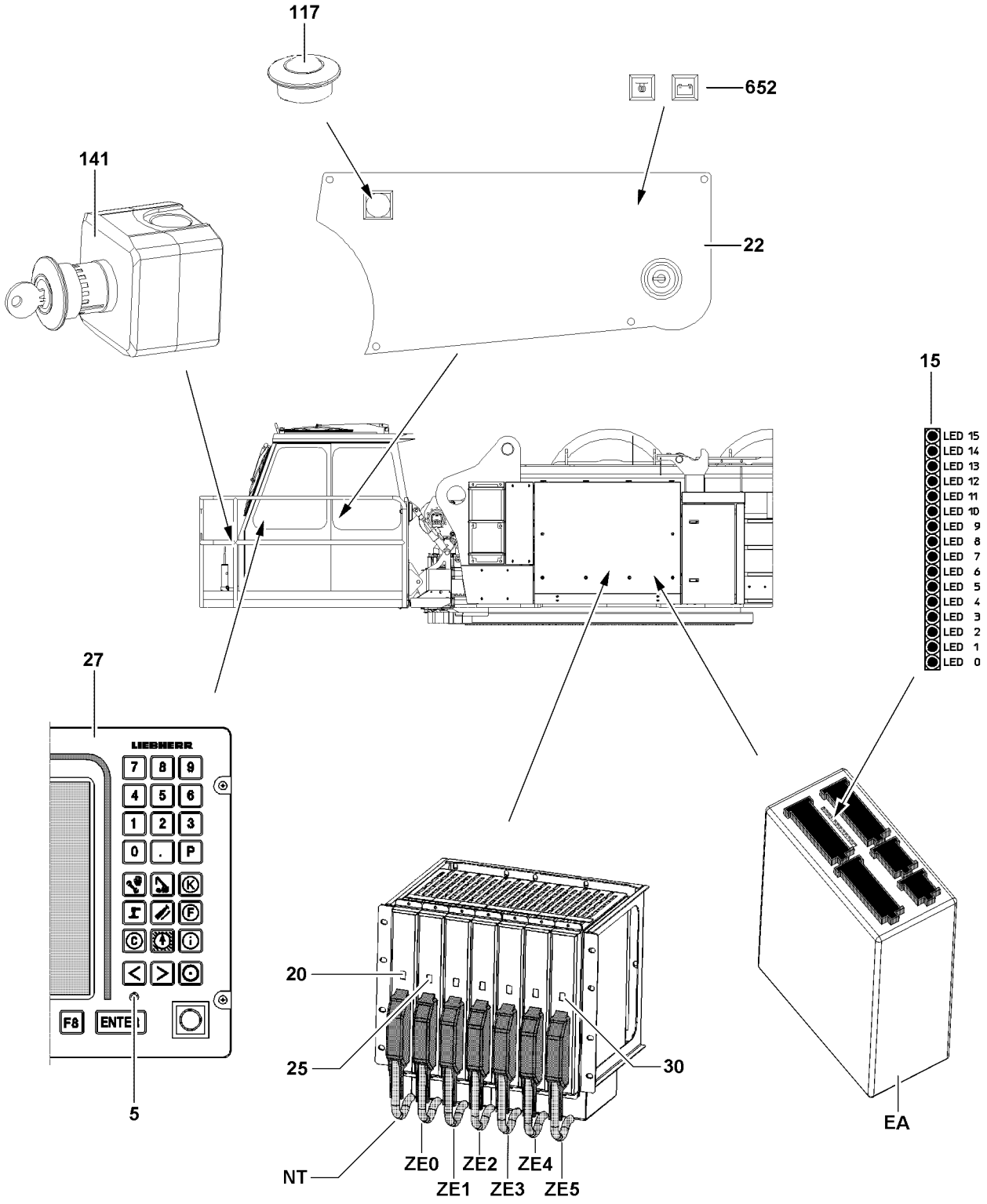
Note
Error diagnostics without the help of Liebherr Service!
▶ For information regarding error diagnostics and error remedy, see “Diagnostics manual”.

Note
▶ The monitor illustrations in this section are only examples. The error codes shown in the monitor illustrations and the corresponding error descriptions might not exactly match the crane.

1.1 Procedure to follow in case of a problem

▶ Observe and adhere to the notes and instructions in this chapter.
▶ Before contacting Liebherr Service: Determine relevant data about the problem.
▶ Carry out the error diagnostics with the aid of Liebherr Service or the “Diagnostics manual”.
▶ Follow the instructions given by Liebherr Service.
▶ After error diagnostics: Replace defective components, which are supplied as spare parts.

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1.2 Overview of displays and component groups for error diagnostics

Various displays and component groups allow the crane driver:
- To localize error messages
- To communicate quicker and more precise with Liebherr Service
- With the aid of the “Diagnostics manual”: Diagnostics and remedy errors

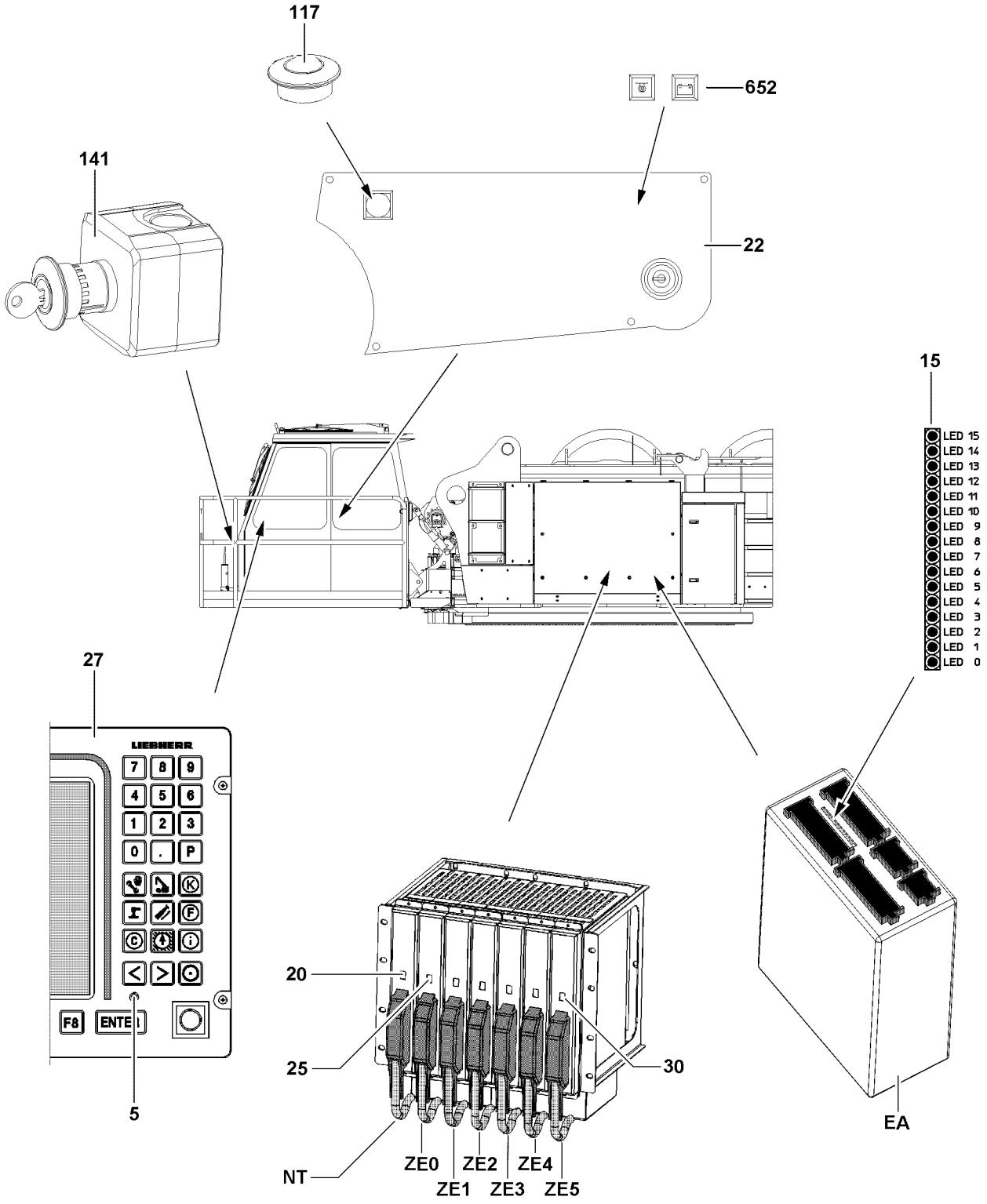
Note
Error diagnostics without the help of Liebherr Service!
▶ For information regarding error diagnostics and error remedy, see “Diagnostics manual”.

5	LED	
15	LED display I / O module	
20	LED display power supply	
22	Instrument panel	
27	LICCON monitor	
117	EMERGENCY OFF switch in the crane operator's cab	
141	EMERGENCY OFF switch on the crane operator's cab	
EA	I / O module	
NT	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 number and any error message displayed on the LICCON monitor **27**
- For certain errors: LED displays of power supply **NT** and CPUs **ZE**
- Application conditions of the crane
- Action during which the error occurs
- Frequency of error

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2 Measures in clear problem cases

Measures, which are taken in clear problem cases, are described in this section.

Note
- ▶ If a problem occurs, which is not described in this chapter:
- ▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

Clear problem cases are:
- – Engine does not start.
- – Hydraulic, electric or engine failed.
- – An alarm function occurs.
- – LICCON computer system shows an error message.

2.1 The engine does not start?

- ▶ Make sure that the EMERGENCY OFF switch **117** and the EMERGENCY OFF switch **141** are not actuated.
- ▶ Make sure that the crane driver is seated on the crane driver's seat.
- ▶ Turn the ignition off.
- ▶ Start the engine again.
- ▶ If the engine still cannot be started:
  Monitor the indicator lights **652** on the instrument panel **22**.

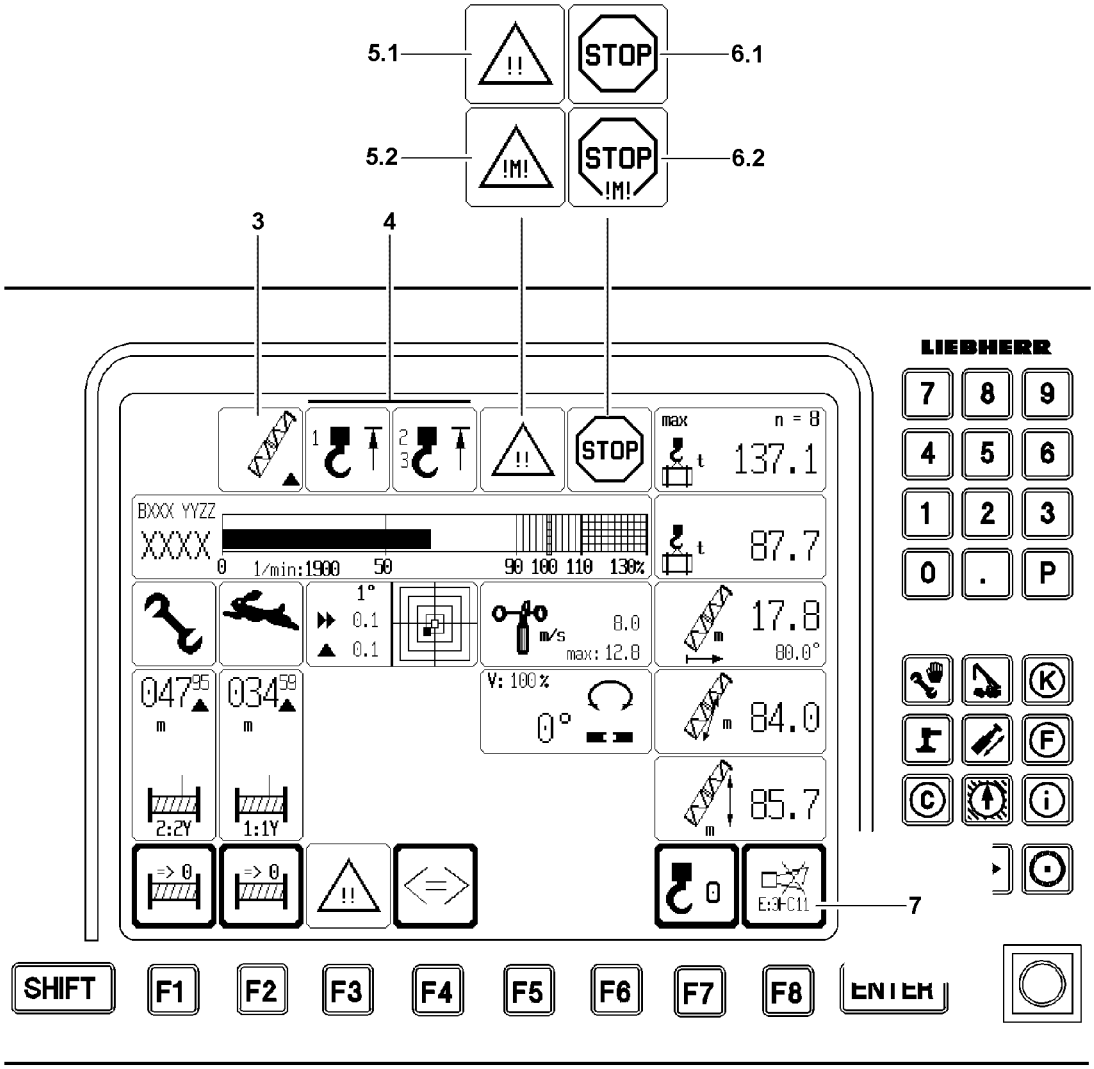
Note
- ▶ For Problem remedy, see chapter 4.03, section “Starting the engine and turning it off”.

- ▶ 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.

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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 **7** 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 **3**
- Hoist top limit switch **4**
- Advance warning load **5.1** / Advance warning engine **5.2**
- Stop load **6.1** / Stop engine **6.2**

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.

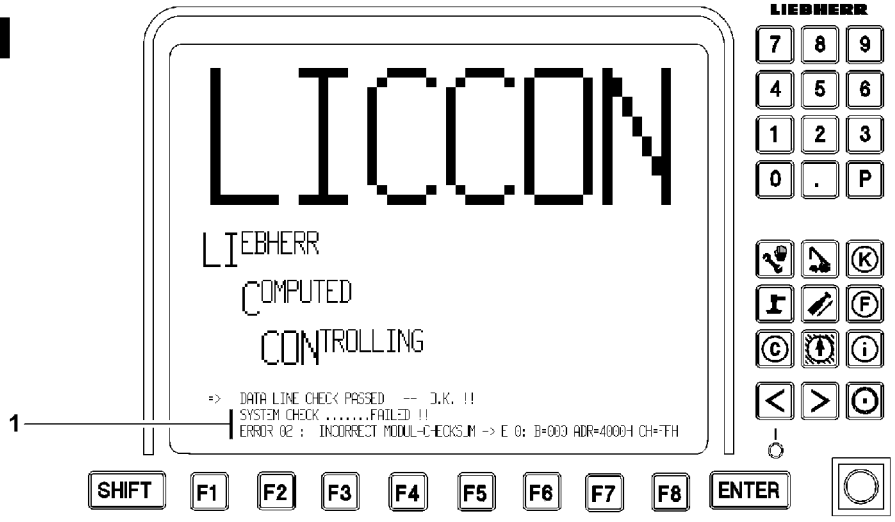
WARNING
Risk of accident!
Personnel can be severely injured or killed!
- ▶ All instructions and data in chapter 4.04 must be observed and adhered to!

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 safety device 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 safety device is prohibited!
- ▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

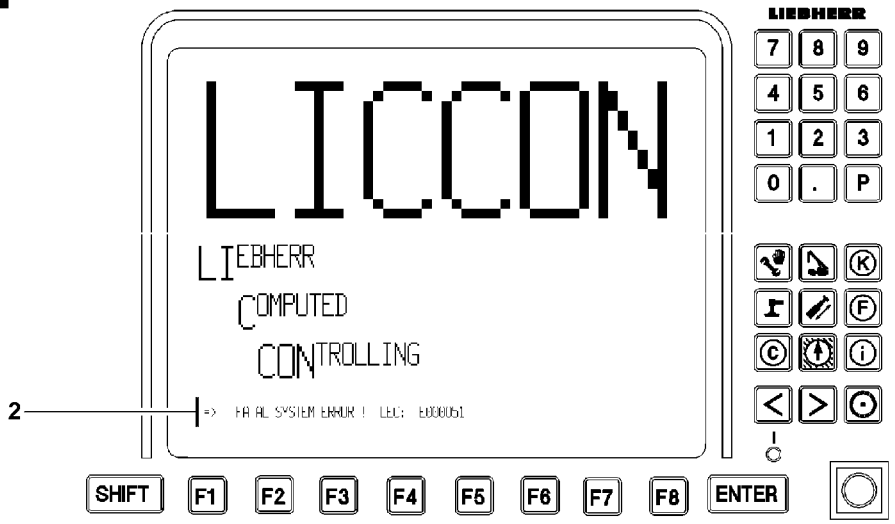
- ▶ If a LMB-STOP occurs due to boom limitation:
  Carry out load moment reducing crane movements.

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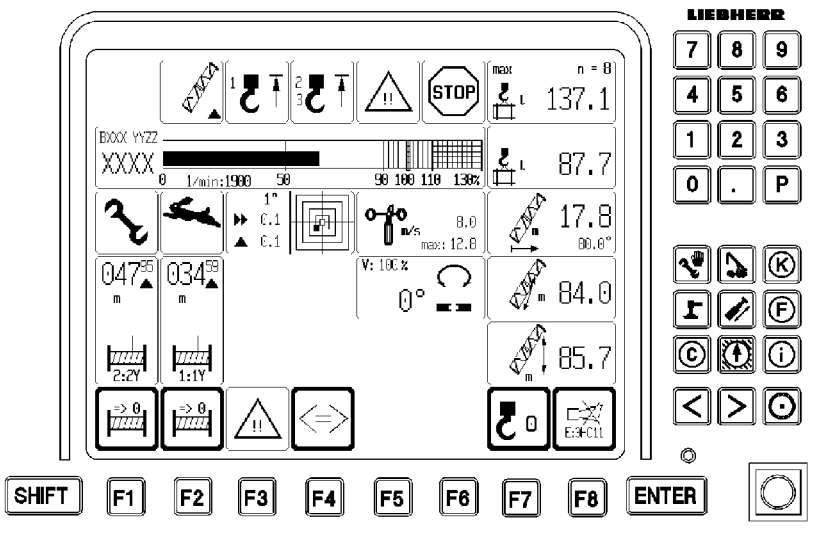
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2.4 LICCON computer system shows an error message?

WARNING
Risk of accident!
Personnel can be severely injured or killed!
The crane can be severely damaged or destroyed!
▶ All instructions and data in chapter 4.04 must be observed and adhered to!

Examples of error messages:
– While the LICCON computer system starts up, see error display illustration **1**, example **1**.
– During operation, see error display illustration **2**, example **2**.
– During operation, see operating screen illustration **3**, example **3**.

Differentiation of error messages on the LICCON monitor:
– Error without LICCON Error Code (LEC), see example **1**.
– Error with LICCON Error Code (LEC), see example **2** and example **3**.

Differentiation of errors in crane operation:
– Errors which lead to shut down: The shut down icon is shown.
– Errors which do not lead to shut down: The crane operator is warned.

2.4.1 Remedying temporary errors during system start

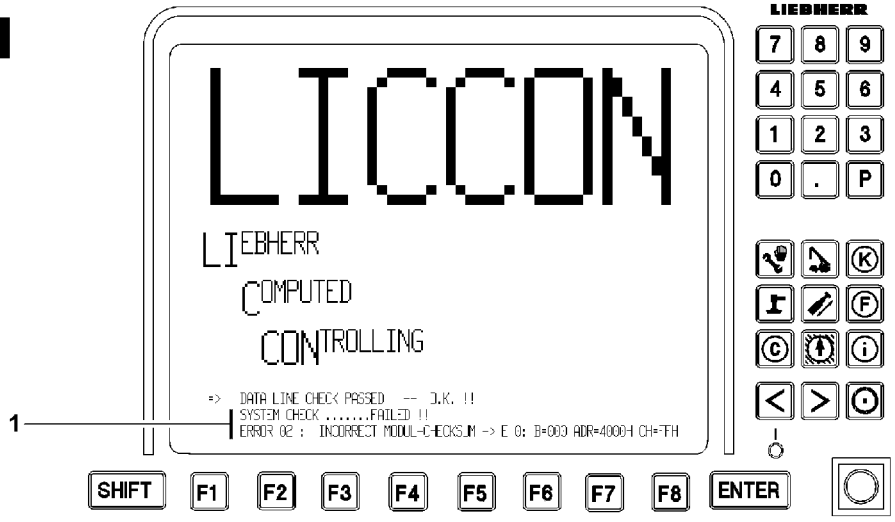
Note
▶ While the LICCON computer system starts, temporary errors can occur, see illustration **1**.

Errors, which occur temporarily, can have the following causes:
– Loosen contact
– Fluctuations in the power supply
– Error message can be a subsequent error

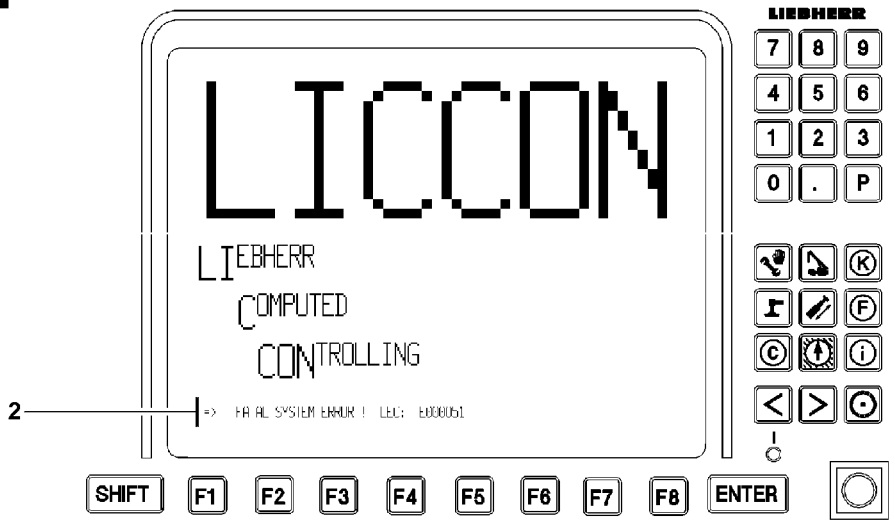
▶ Turn the LICCON computer system off and restart it after waiting for at least 5 s.
▶ Repeat this procedure up to three times (wait 2 min after 3 start attempts).
▶ If the same error view appears several times:
Turn the LICCON computer system off.
▶ Call up the test system, see section “Calling up the test system program”.
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

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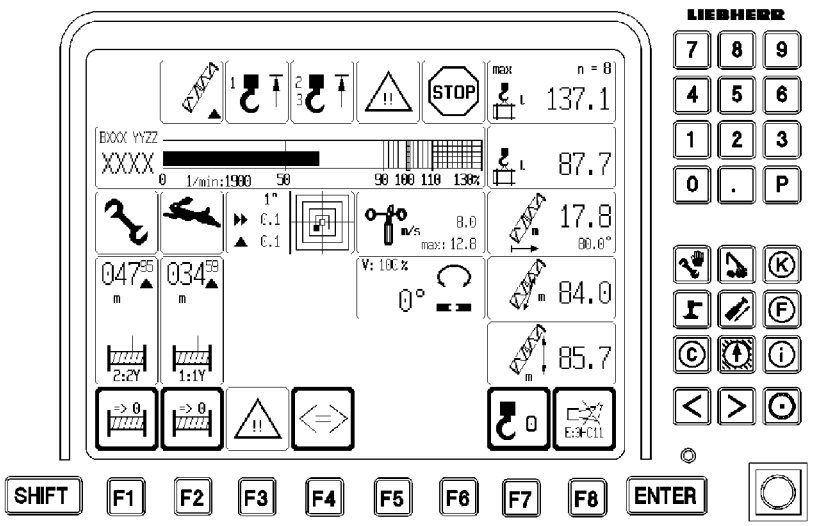
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2.4.2 Procedure in case of error messages with LEC

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”.

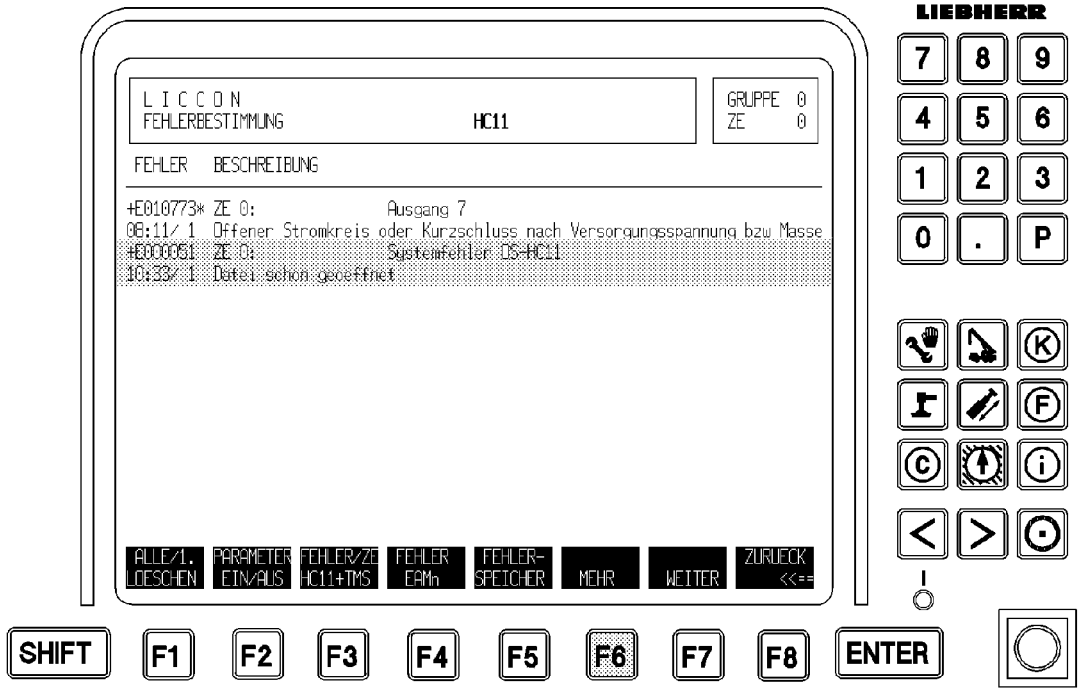
A LEC is always 6-digit.

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.

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2.4.3 Calling up the “Test system” program

Error messages of the LICCON computer systems with LEC are described in the error determination screen, illustration **4**. To do so, change into the test system program.
Listed errors in the error determination screen are differentiated by:
– Active errors - Error code starts with a “+” .
– Inactive errors - Error code starts with a “-” .

Note
▶ Active errors have higher priority than inactive errors and must be taken care of.

Calling up the “Test system” from the operating screen

Make sure that the following prerequisites are met:
– Error message visible in the icon element “Horn”, see illustration **3**.
– Warning signal “Horn” is audible.

▶ Press function key **F8** once.

Result:
– Horn is turned off.

▶ Press function key **F8** twice.

Result:
– Change into the error determination screen.
– Listing of errors with LEC and error text.

Calling up the “Test system” after an error screen

Make sure that the following prerequisites are met:
– The operating screen changes into the error screen (system error), see illustration **2**.
– Crane functions are interrupted.

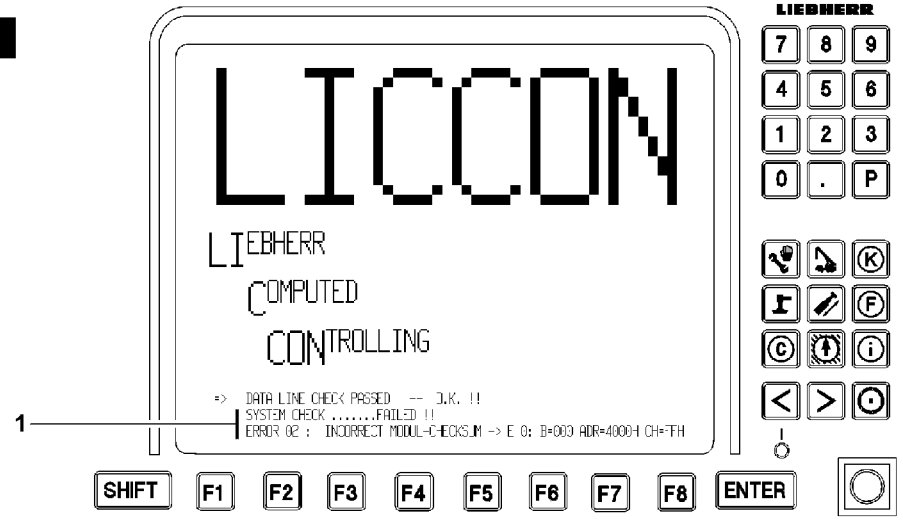
or:
– Error screen, while the LICCON computer system starts up, see illustration **3**.

▶ Turn the LICCON computer system off.
▶ Turn the LICCON computer system back on after approx. 5 s.

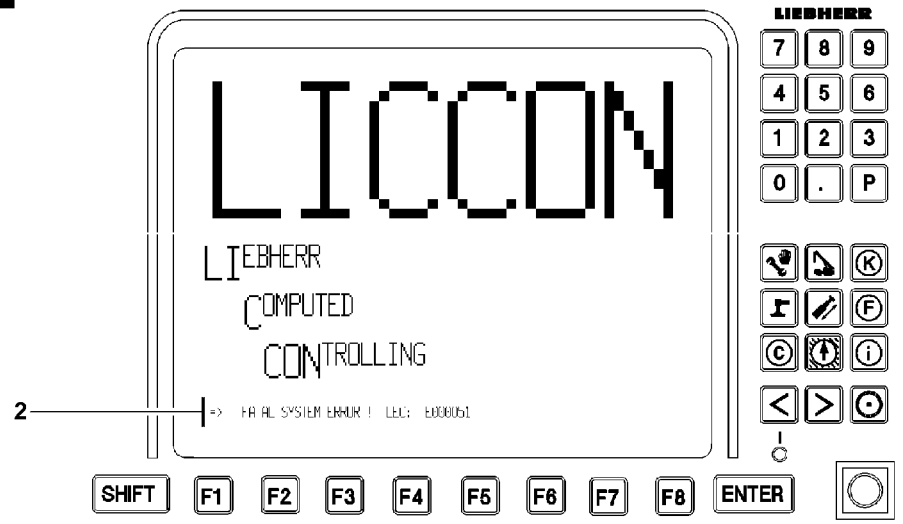
Result:
– Change into the error determination screen.
– Listing of errors with LEC and error text.

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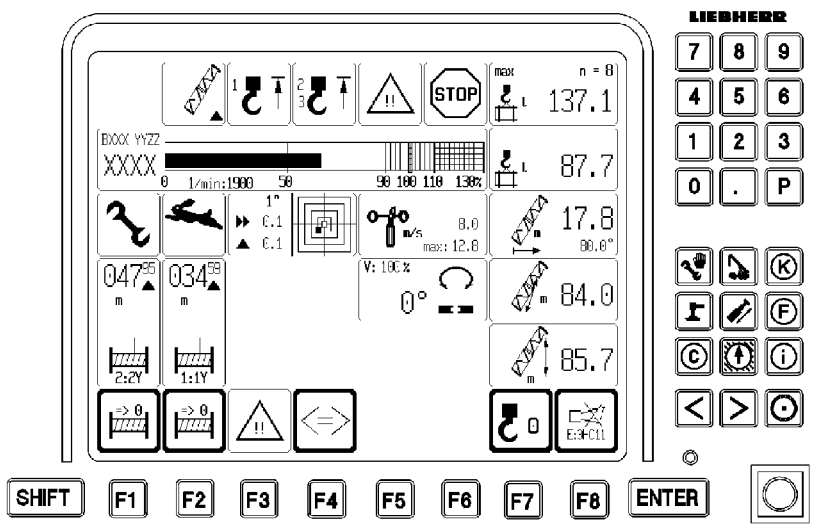
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3 Carrying out an error diagnostics

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 installed in the GSM module.
– For information for remote diagnostics, see “Diagnostics manual”.
– Follow the instructions given by Liebherr Service.

Note
▶ For information for remote diagnostics, see “Diagnostics manual”.

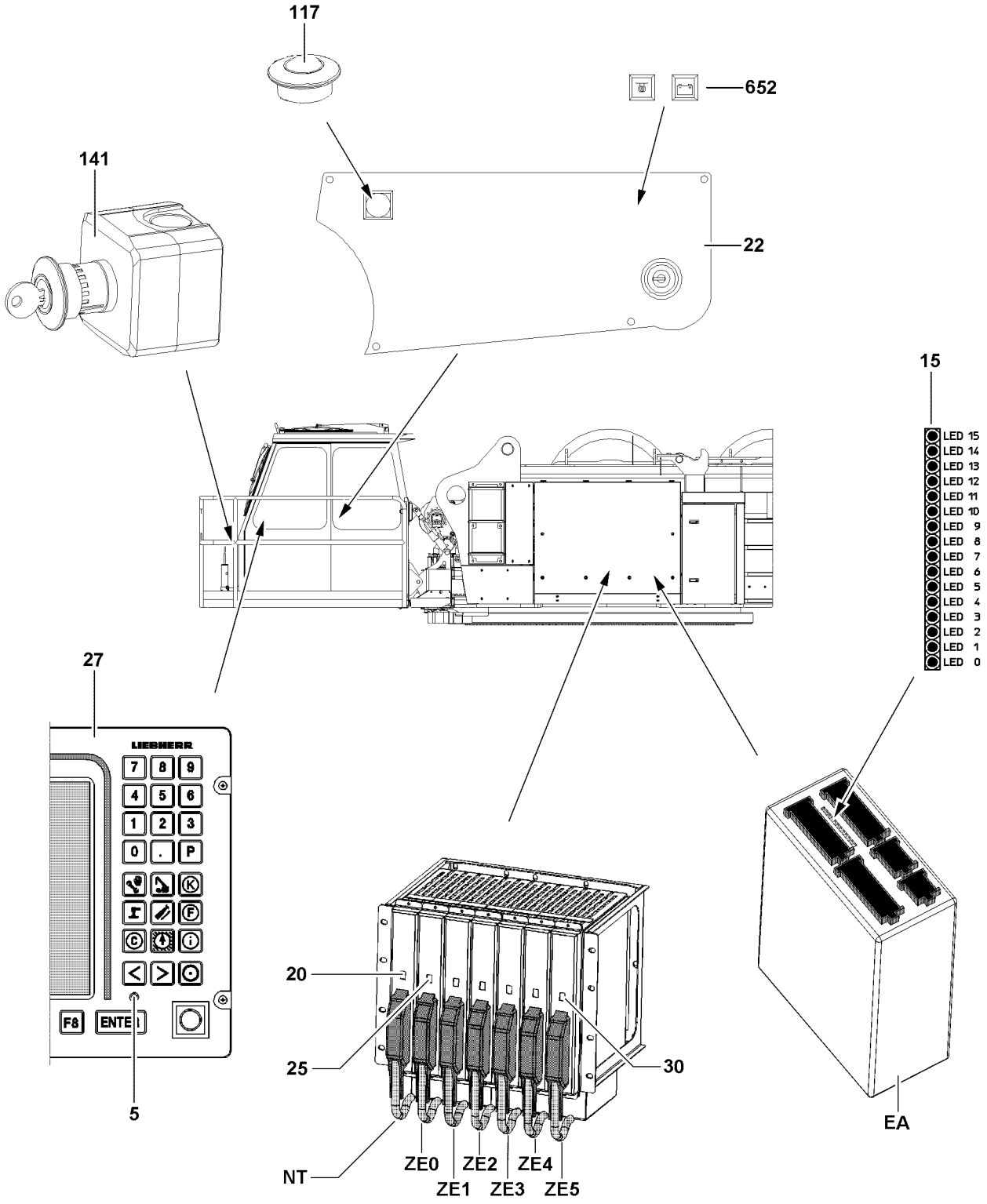
▶ Follow the instructions given by Liebherr Service.

3.2 Error diagnostics without the help of Liebherr Service

WARNING
Measures without the help of Liebherr Service!
Measures in case of a problem, which are carried out without consulting Liebherr Service can cause damage to the crane. Personnel can be severely injured or killed!
▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.

Note
Error diagnostics without the help of Liebherr Service!
▶ For information regarding error diagnostics and error remedy, see “Diagnostics manual”.

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4 Measures for defective components

The following components are part of the scope of delivery as spare parts:
– LICCON monitor **27**
– Power supply **NT**
– CPU **ZE**

WARNING
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, 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 LICCON monitor with a functioning substitute monitor.

4.2 Is the power supply defective?

Note
▶ When replacing the power supply unit **NT**, transfer the Common memory of the removed power supply **NT**.
▶ A spare power supply unit is located in the switch cabinet crane control.
▶ The power must be turned off when replacing the power supply **NT**. When pulling out the power supply unit plug from the socket, the stand-by power supply of the module will be interrupted. In other words, a cold start results. The stored set-up state data and the adjusting events will be lost.

▶ Replace the power supply **NT** with a functioning power supply.

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4.3 Is the CPU defective?

Note
- When replacing the central processing unit **ZE**, transfer the program memory of the removed central processing unit **ZE**.
- A spare central processing unit is located in the switch cabinet crane control.
- The power must be turned off when replacing the central processing unit **ZE**. When pulling out the central processing unit **ZE** from the module carrier, the stand-by power supply of the module will be interrupted. In other words, a cold start results. The stored set-up state data and the adjusting events will be lost.

- 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.

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).

WARNING
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 for 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 safety device 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.

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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.

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Note

▶ The inspection may not be solely limited to the following positions shown in the sample construction illustrations. Rather the **entire** crane structure must be subjected to a careful inspection!

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.

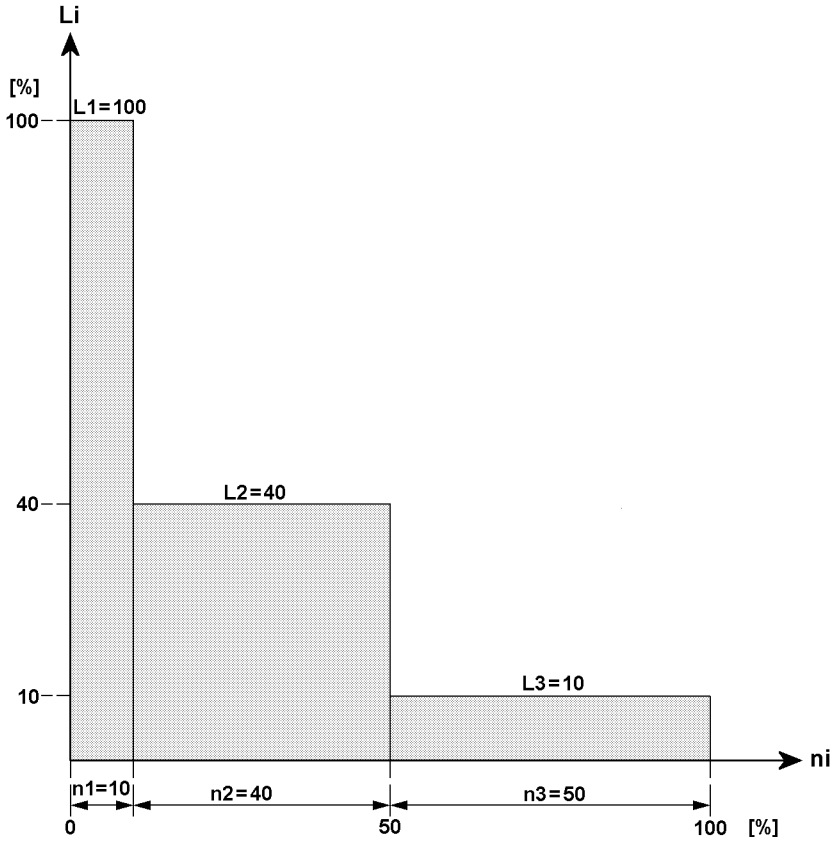
2 Inspection of carrying crane structures, especially steel structures

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:

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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!

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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”!

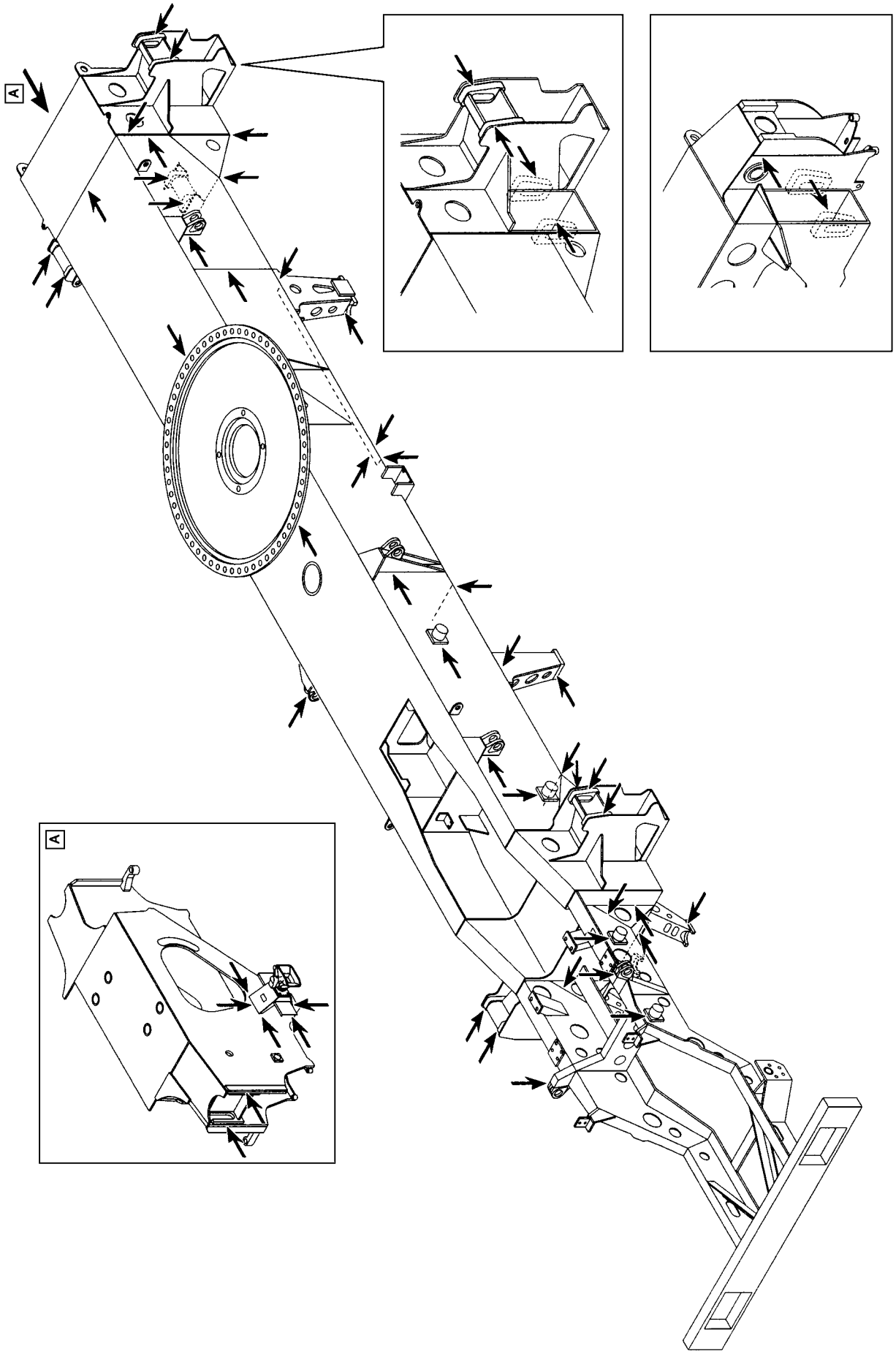


WARNING
Danger of serious personnel injury and equipment damage!
▶ Comply absolutely with all recommendations, particularly welding specifications!

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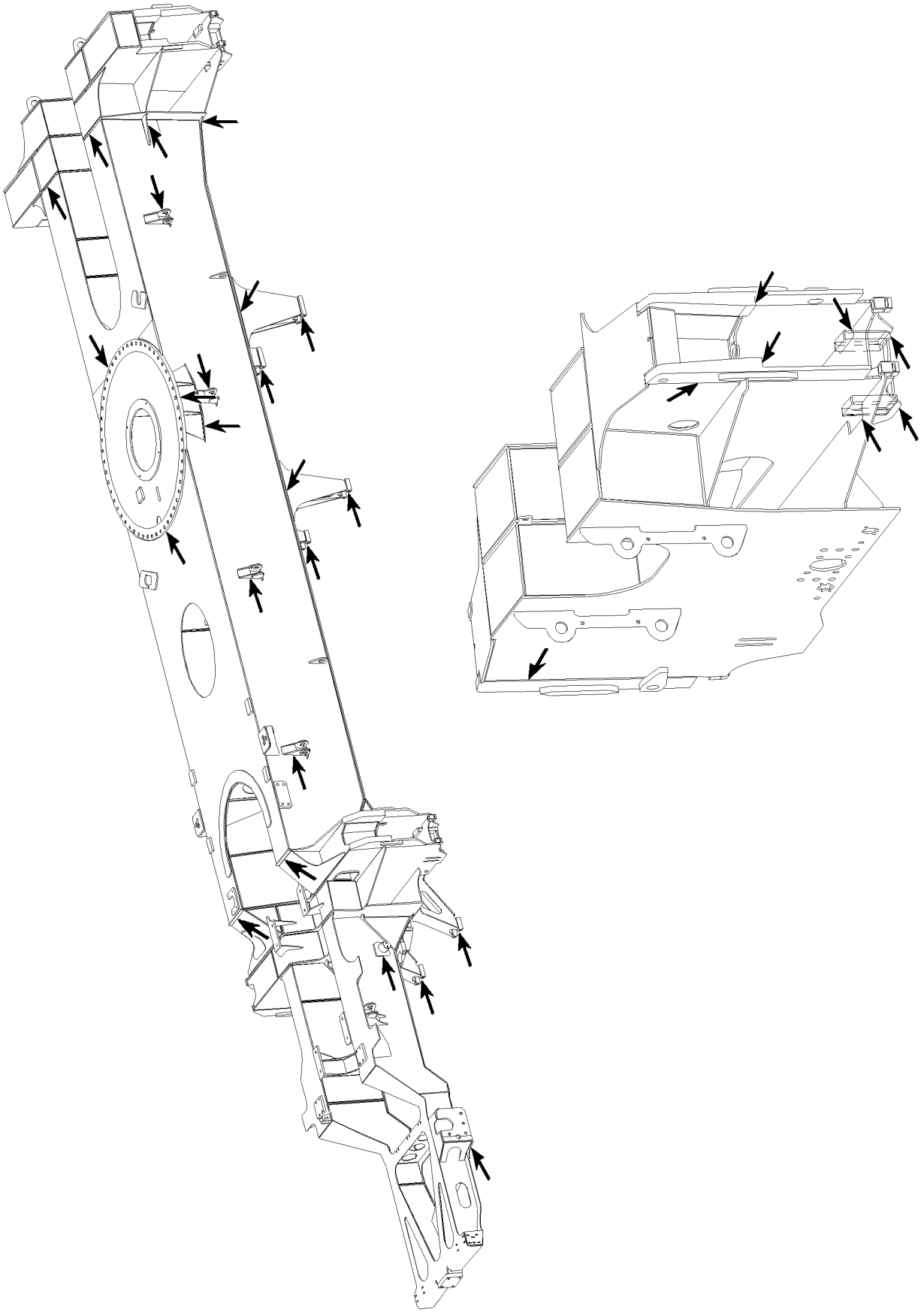
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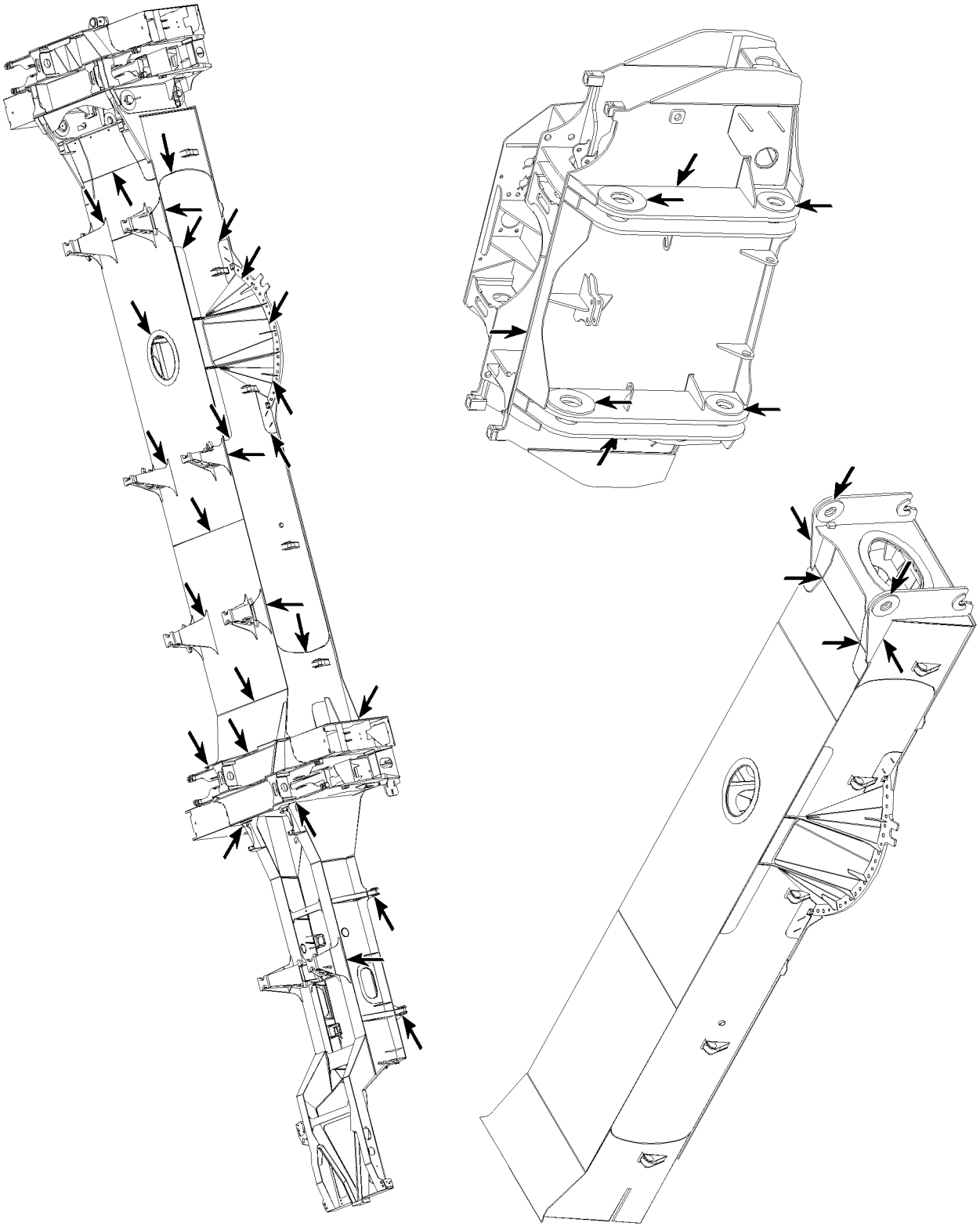
Example for vehicle frame

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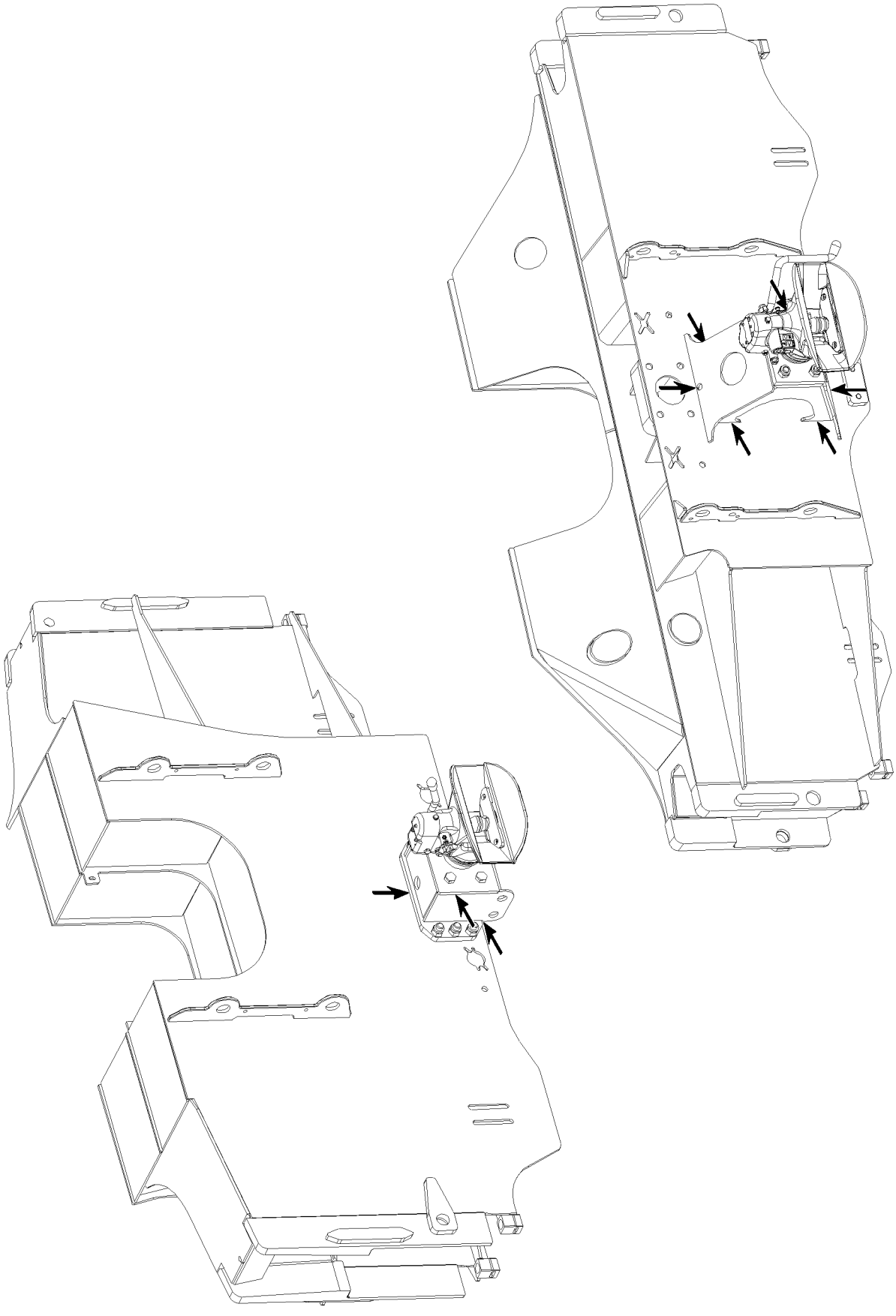
B105702 *Example for vehicle frame*

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B105719 *Example for vehicle frame*

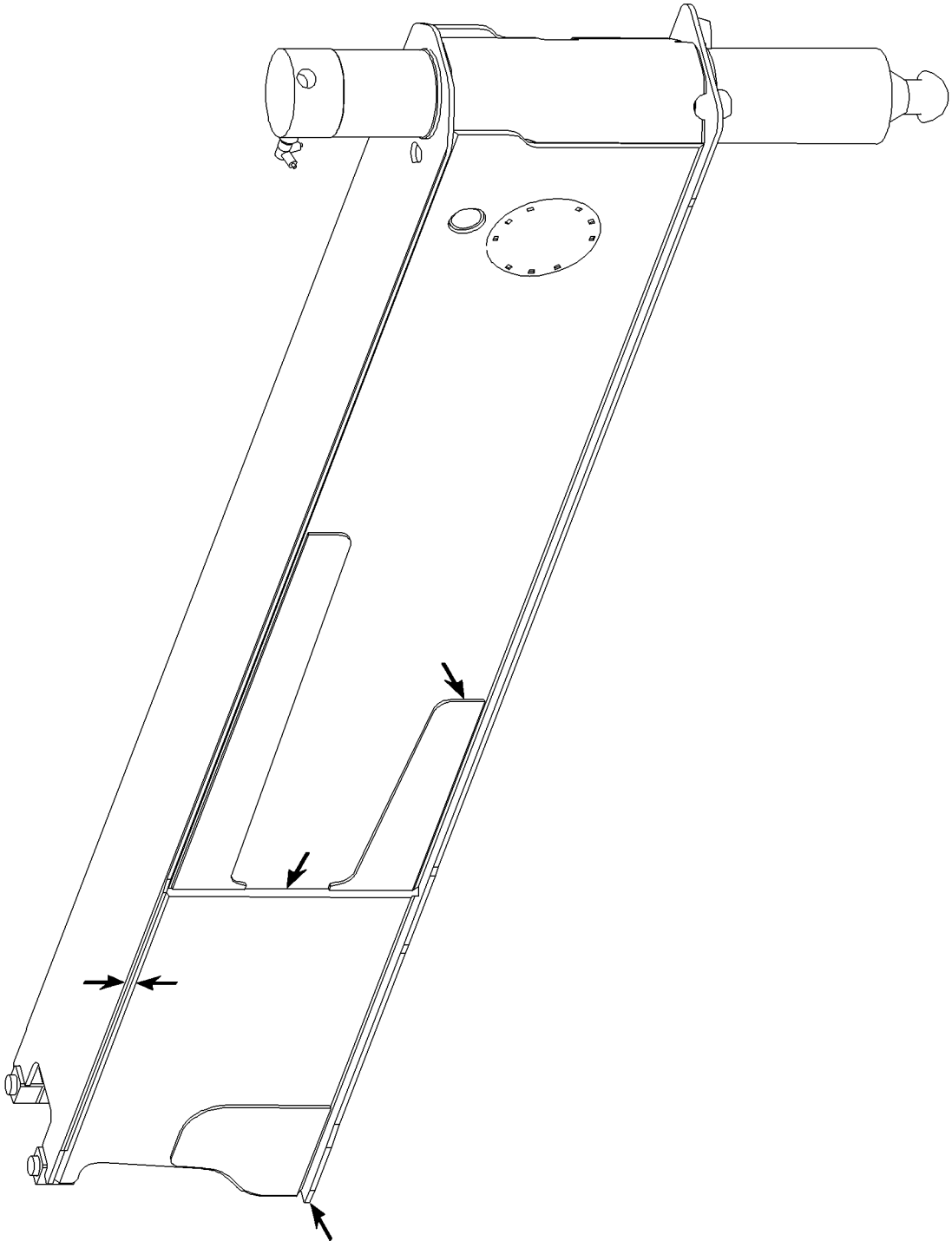
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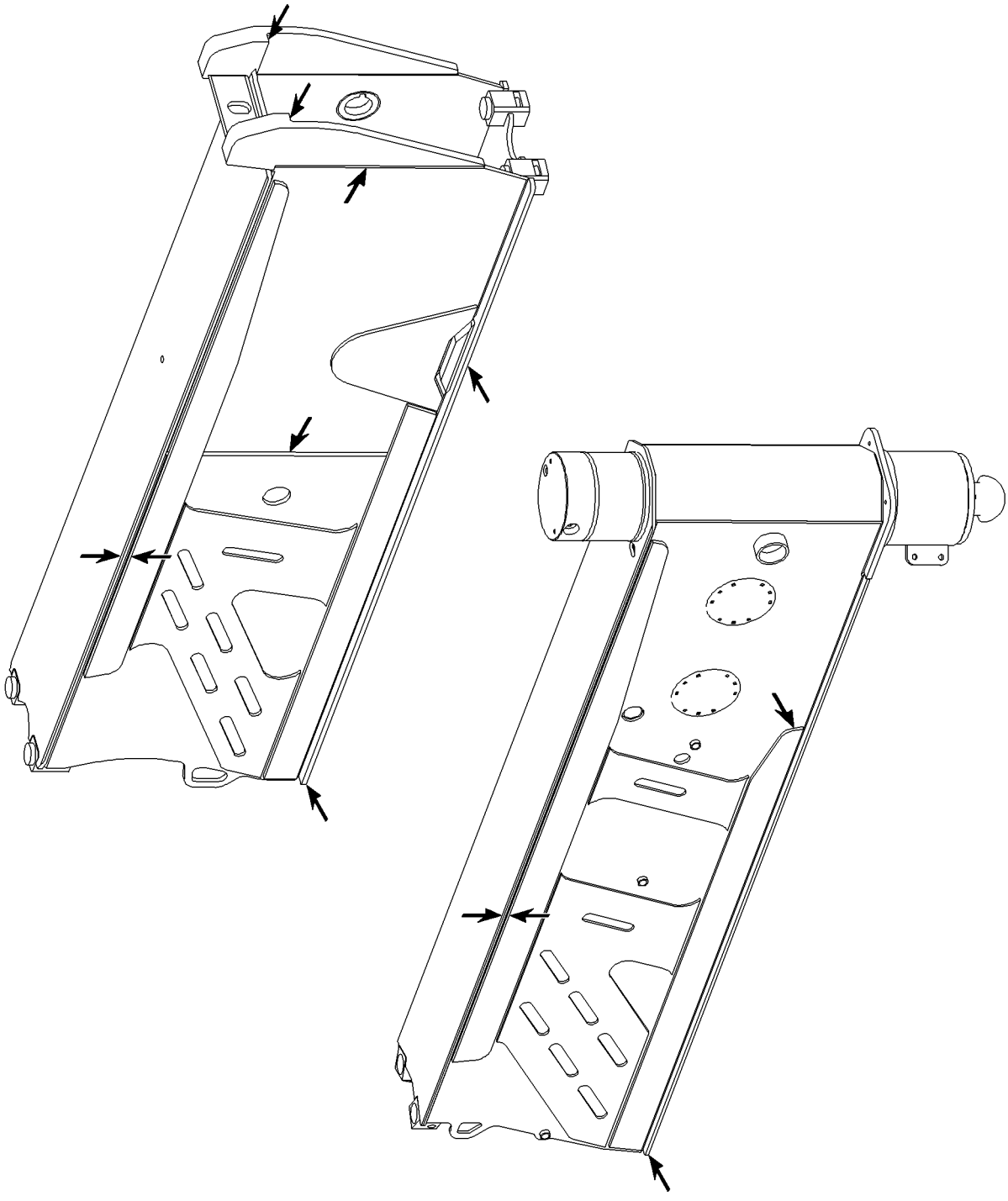
Example for tow coupling

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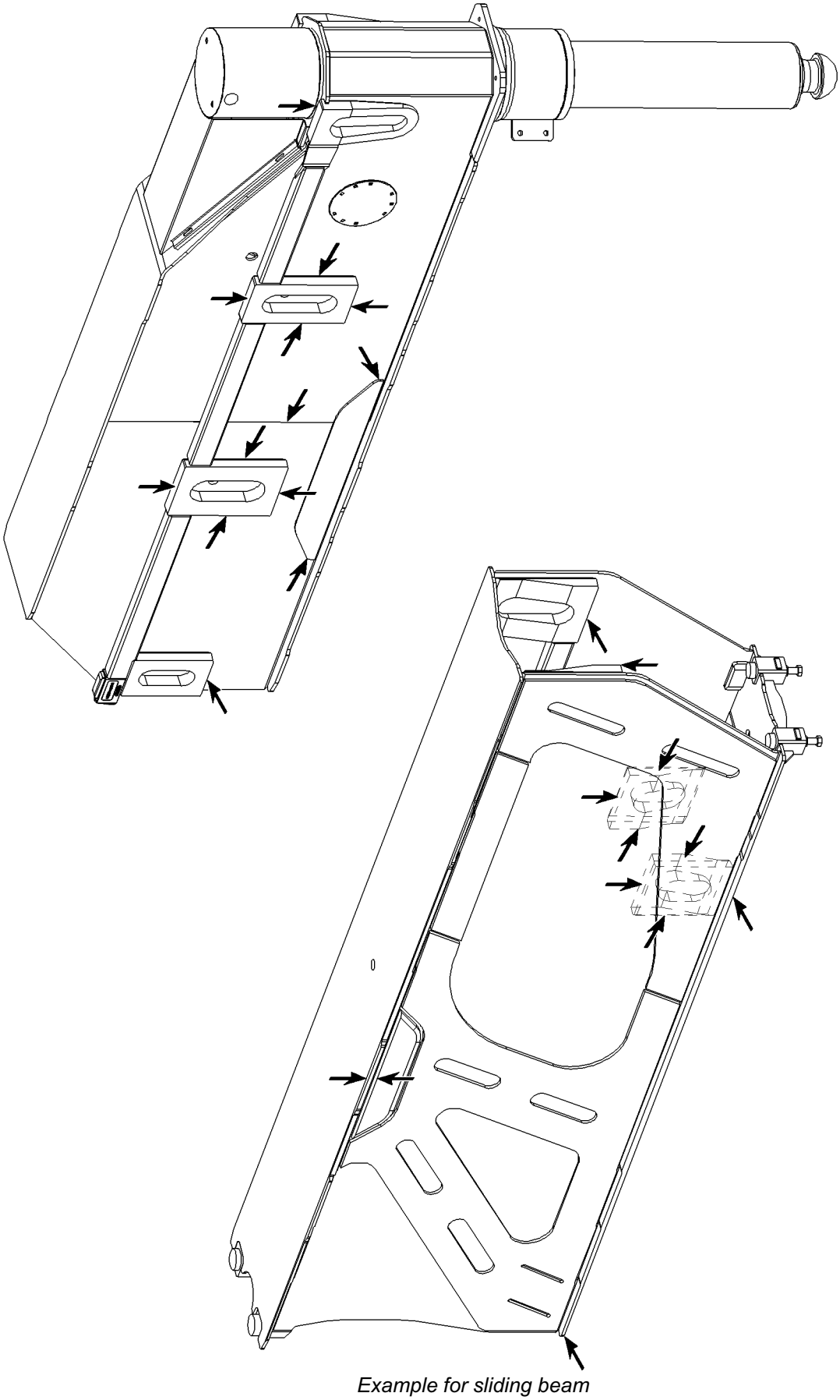
B105698 *Example for sliding beam*

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B105717 *Example for sliding beam*

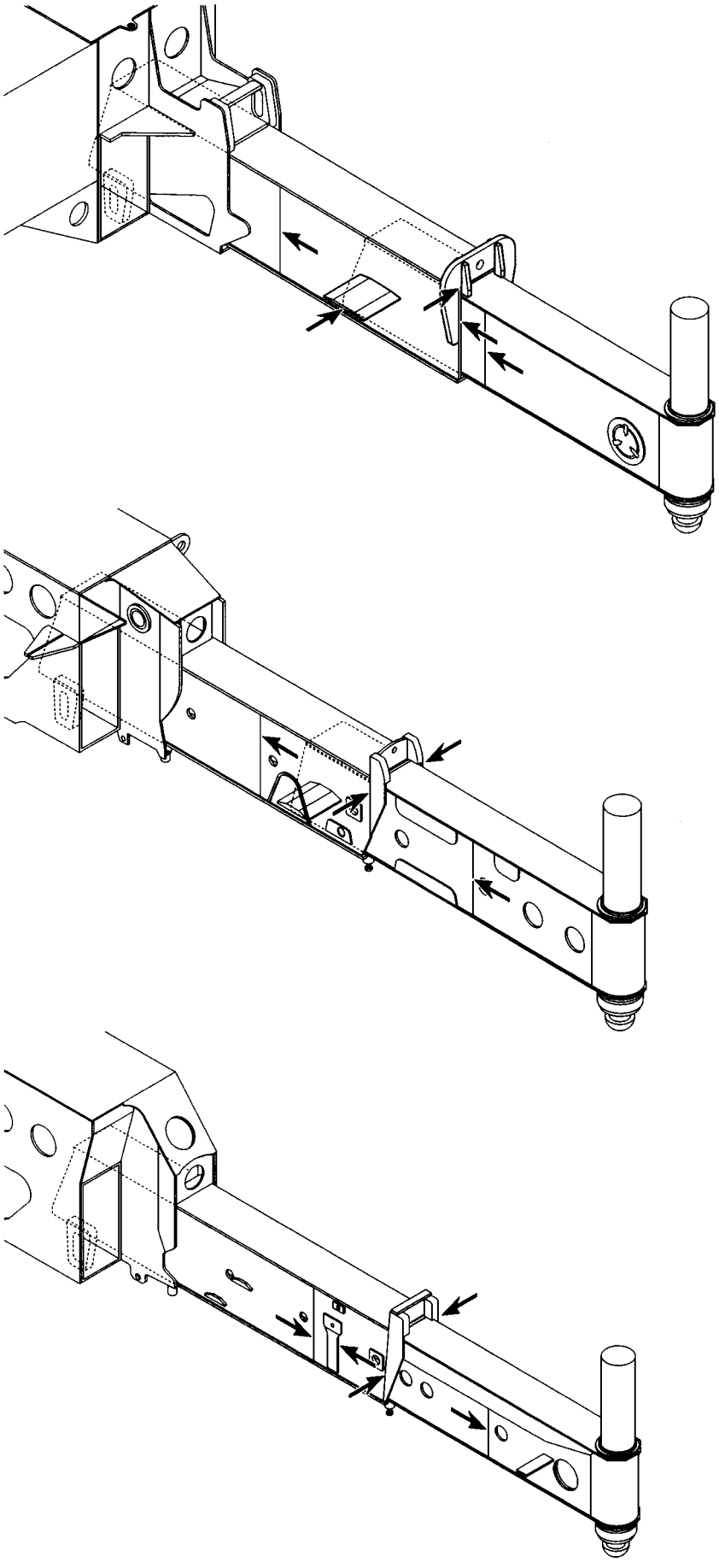
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Example for sliding beam

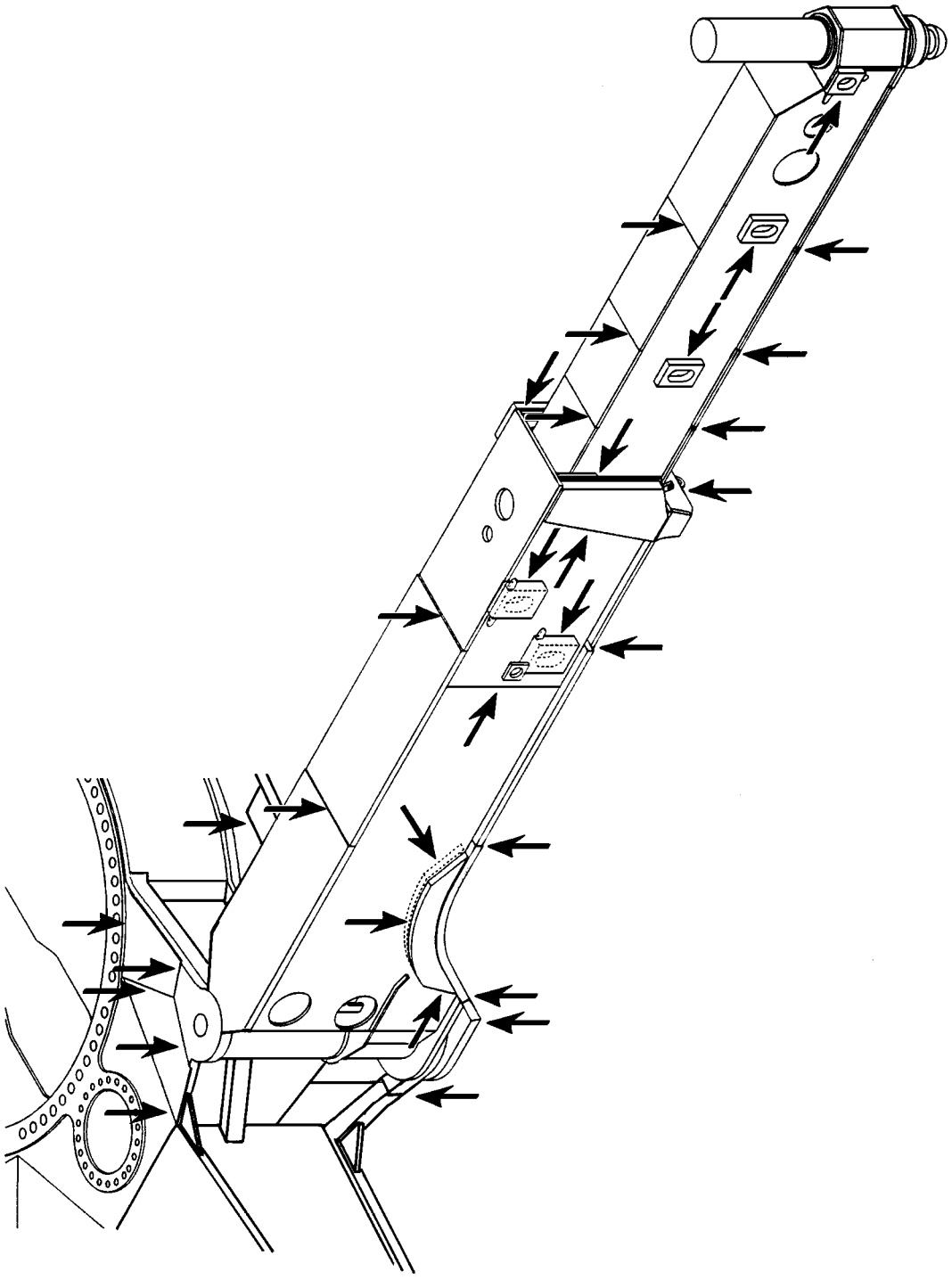
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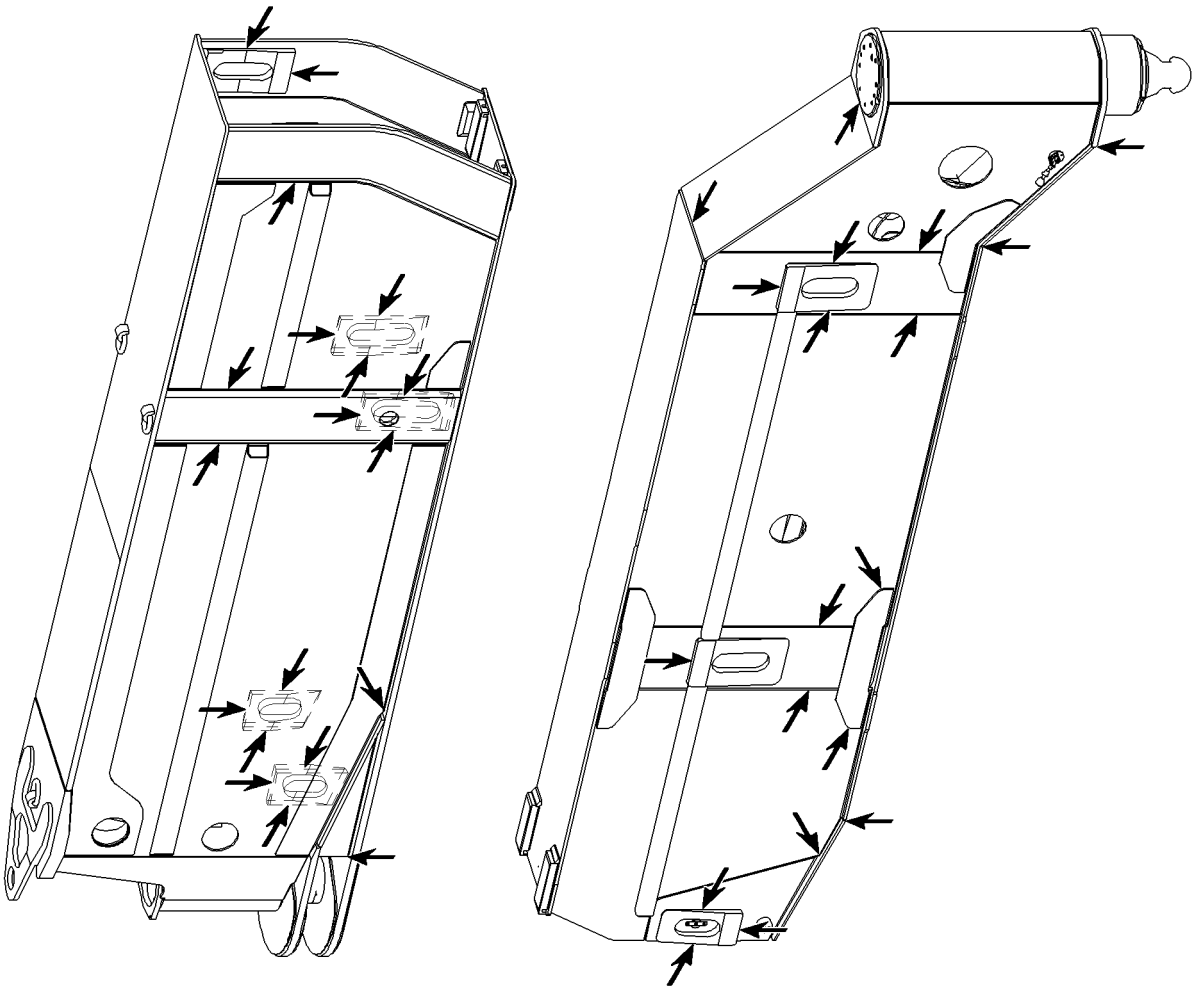
Example for sliding beam

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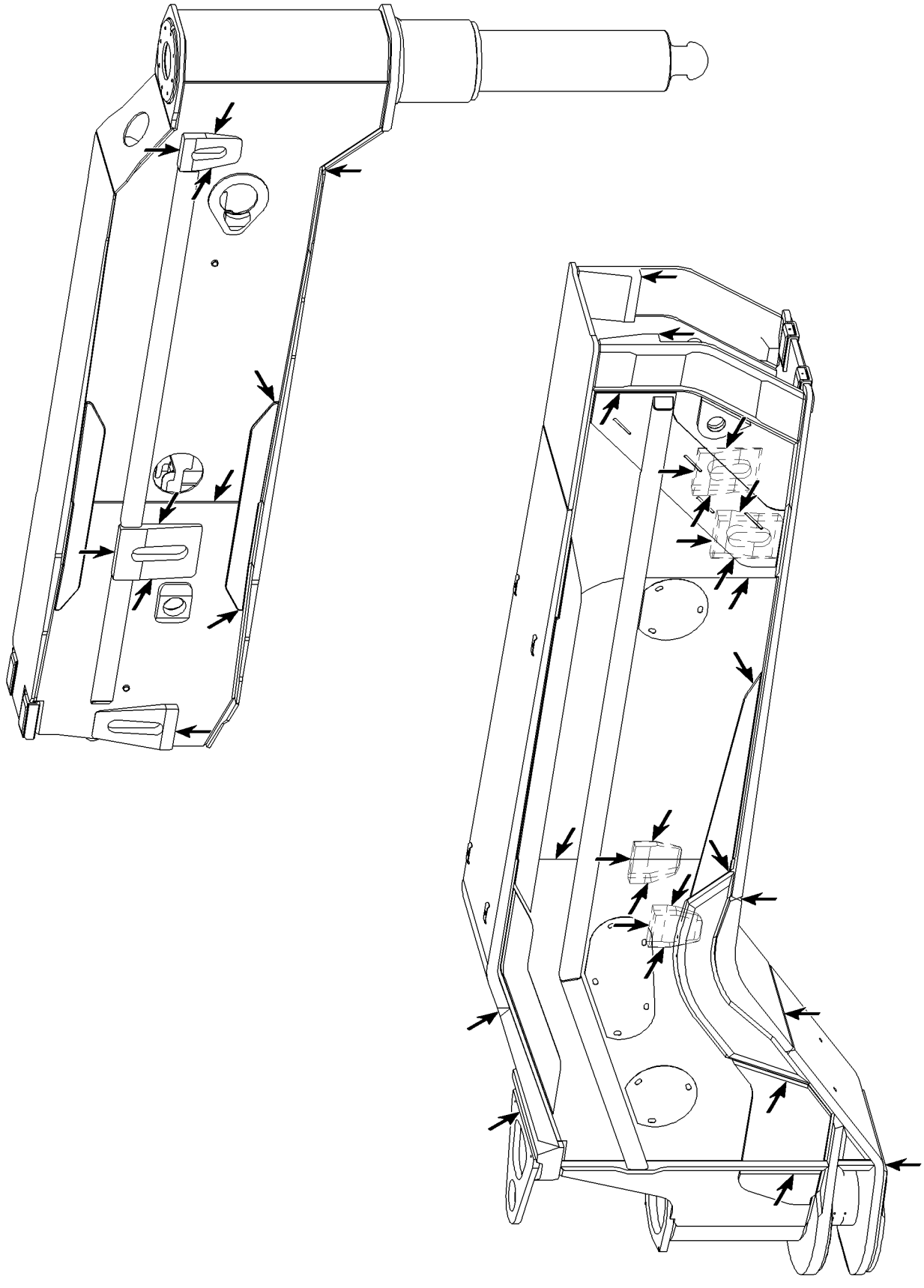
B185060 *Example for slewing sliding beam*

https://truckmanualshub.com/



B105690 *Example for slewing sliding beam*

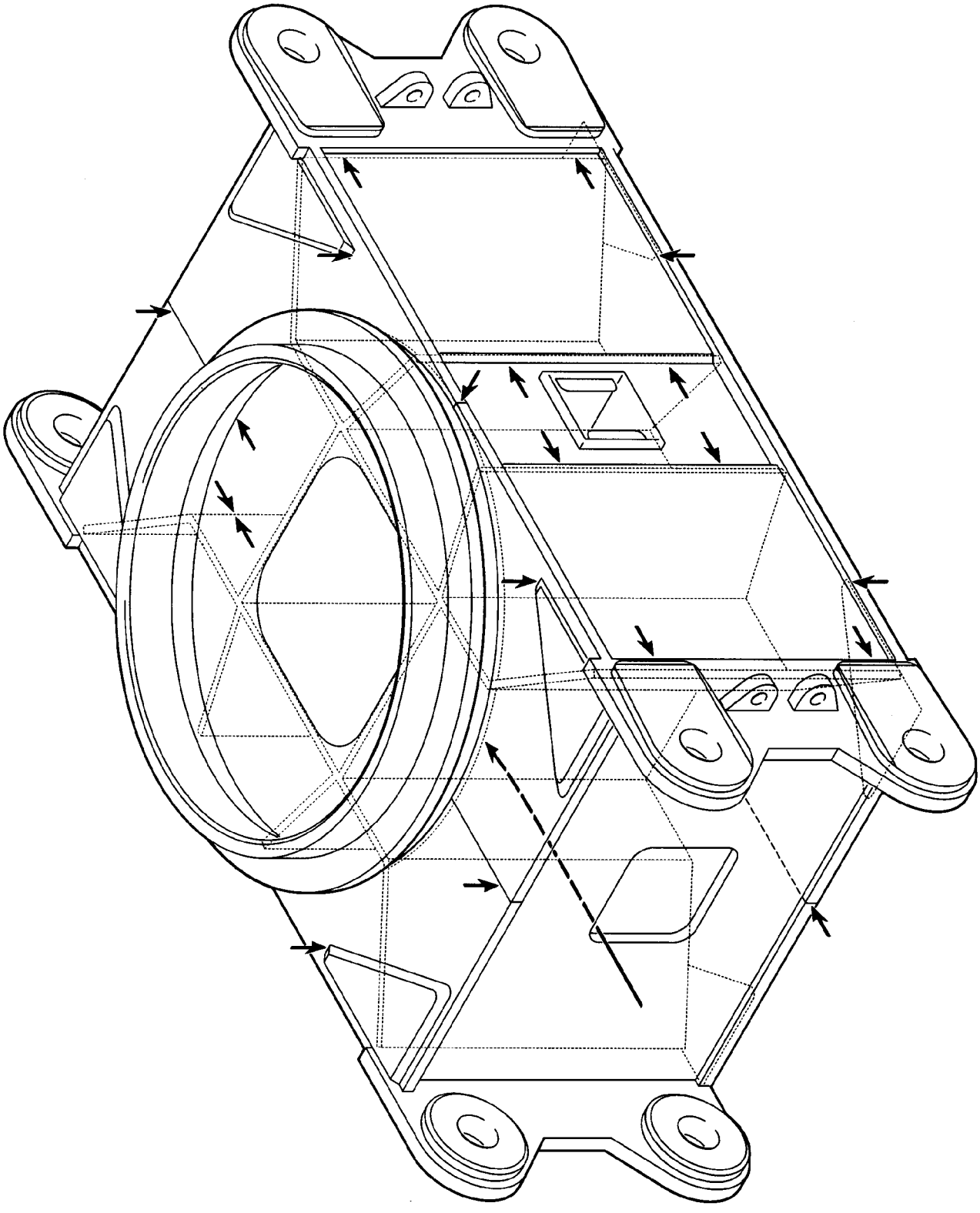
https://truckmanualshub.com/



B105704

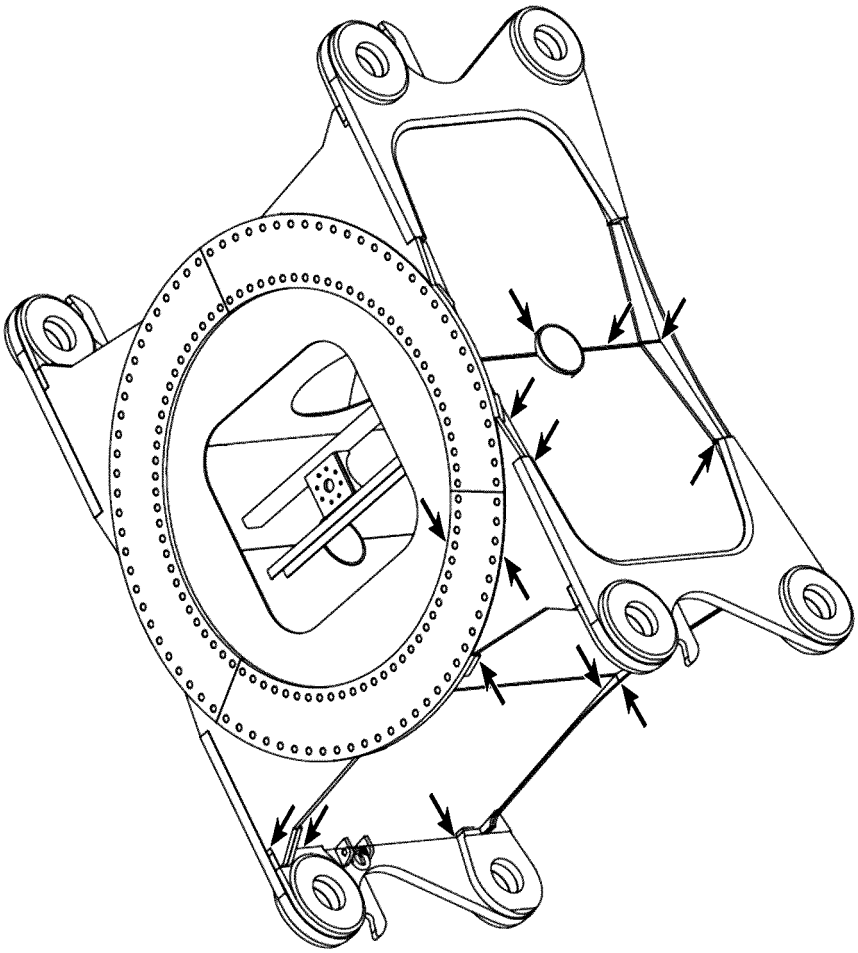
Example for slewing sliding beam

https://truckmanualshub.com/



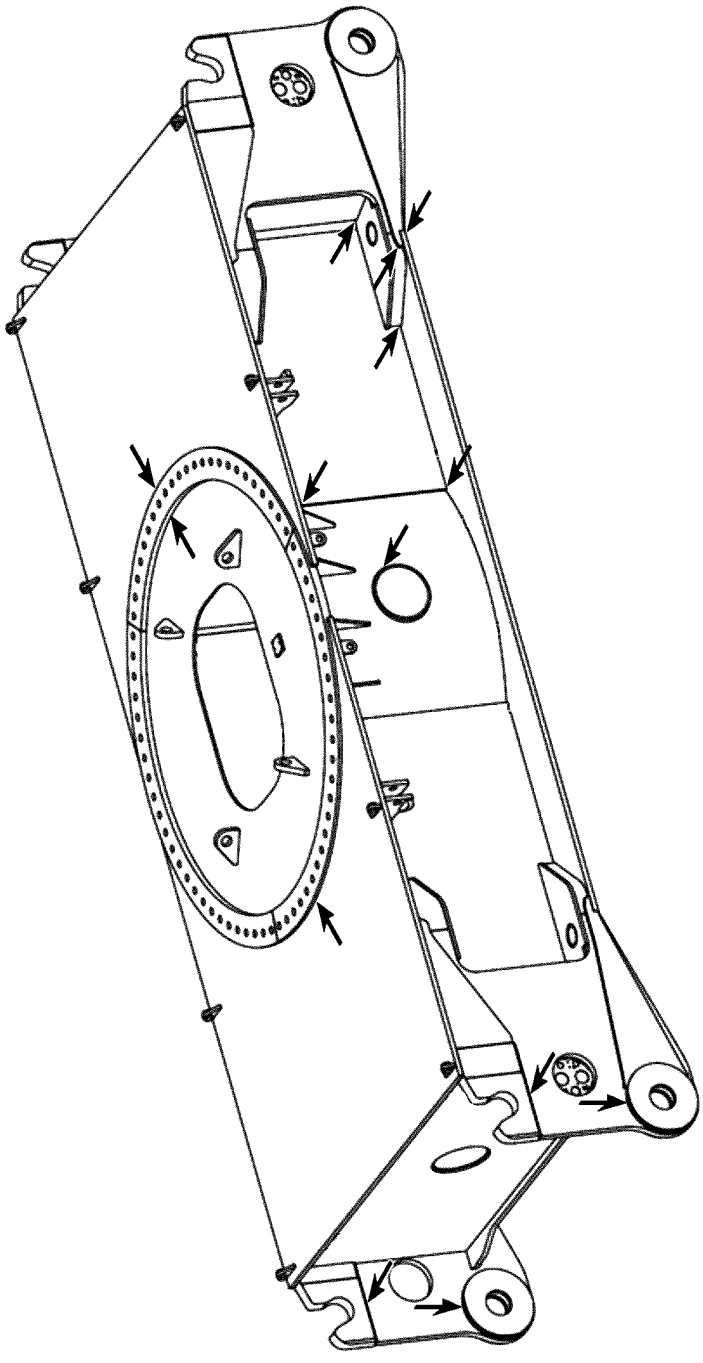
B187347 *Example for crawler center section*

https://truckmanualshub.com/



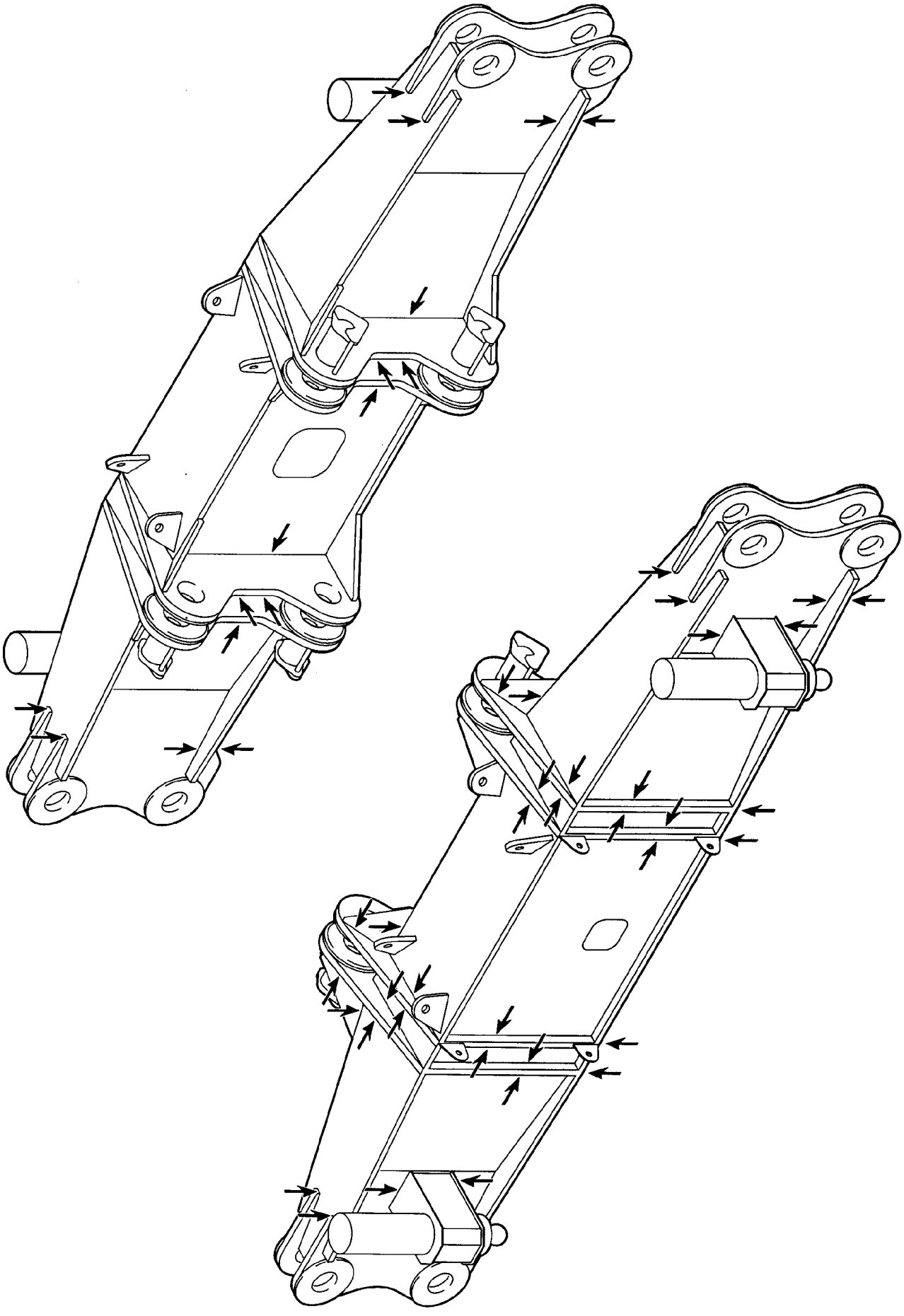
B105725 *Example for crawler center section*

https://truckmanualshub.com/



B105726 *Example for crawler center section*

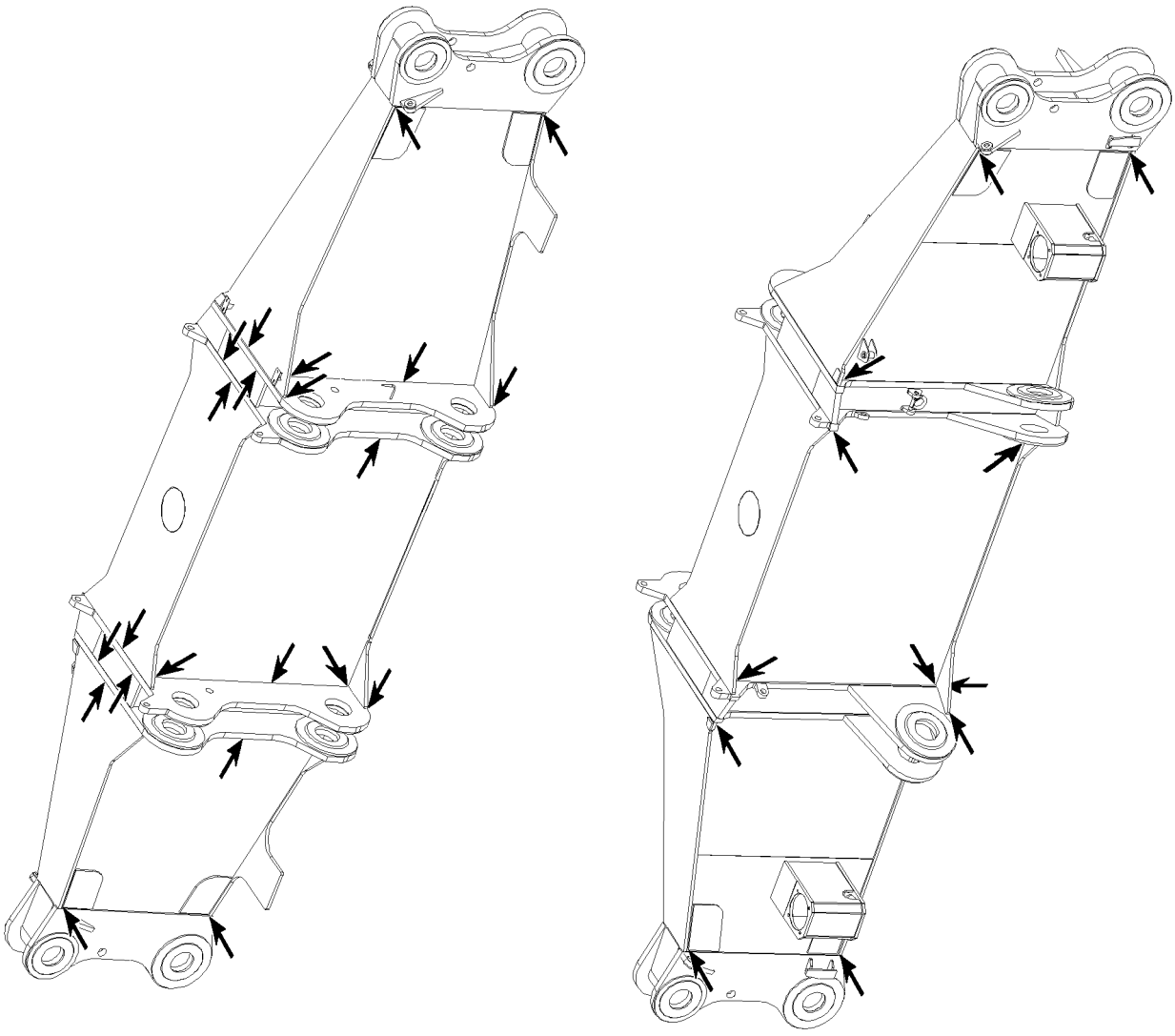
https://truckmanualshub.com/



B187348

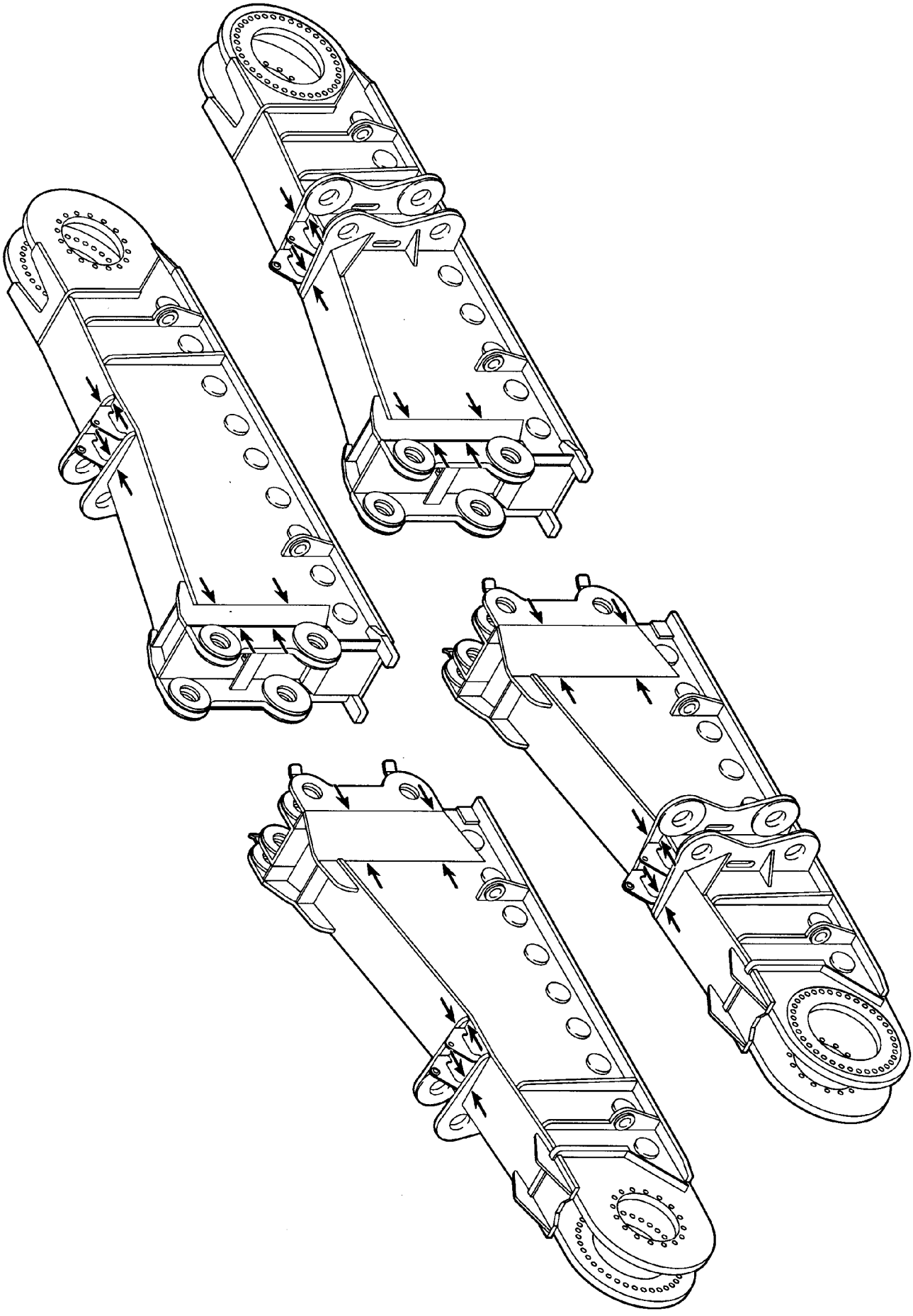
Example for cross carrier

https://truckmanualshub.com/



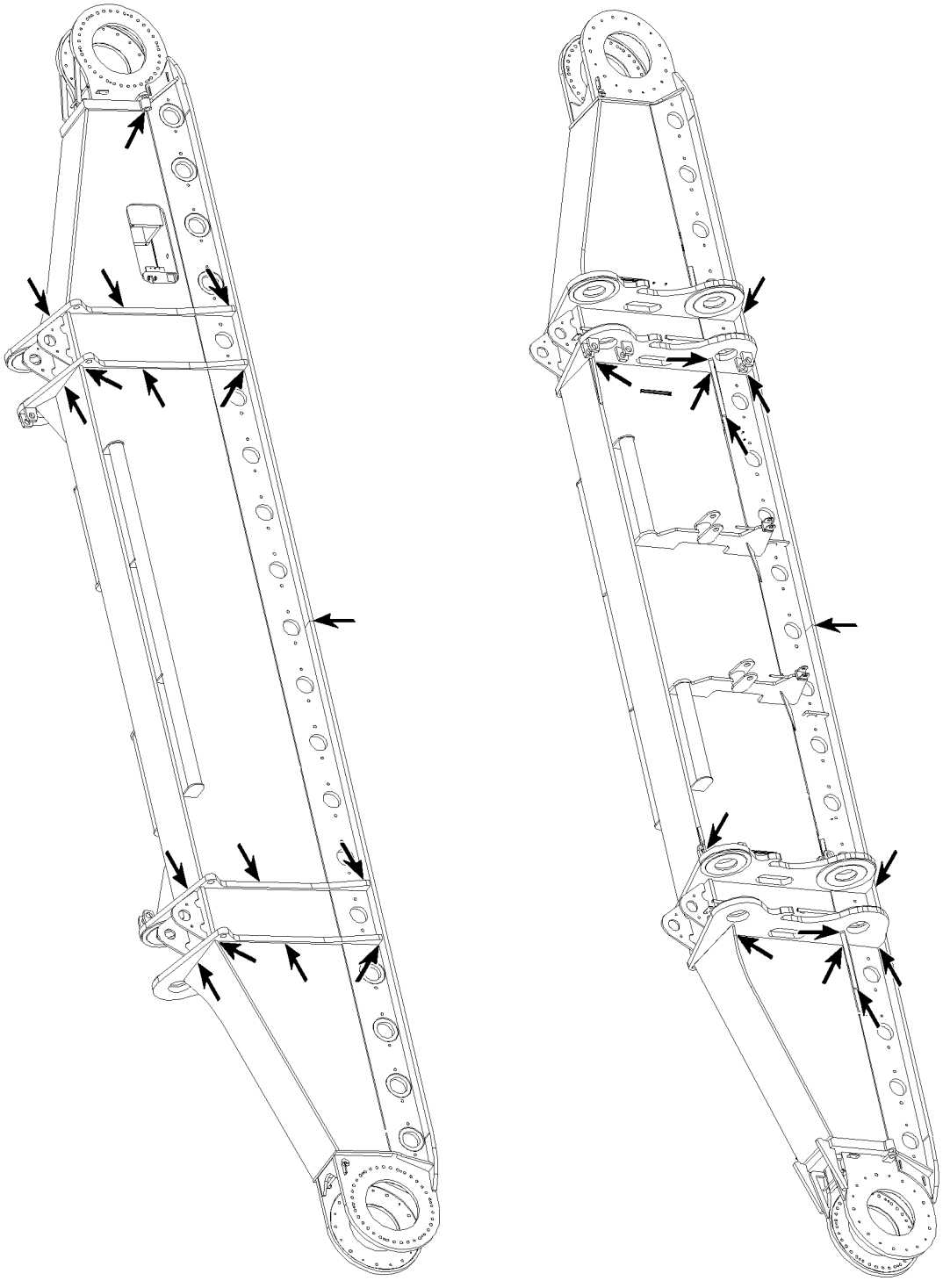
B105727 *Example for cross carrier*

https://truckmanualshub.com/



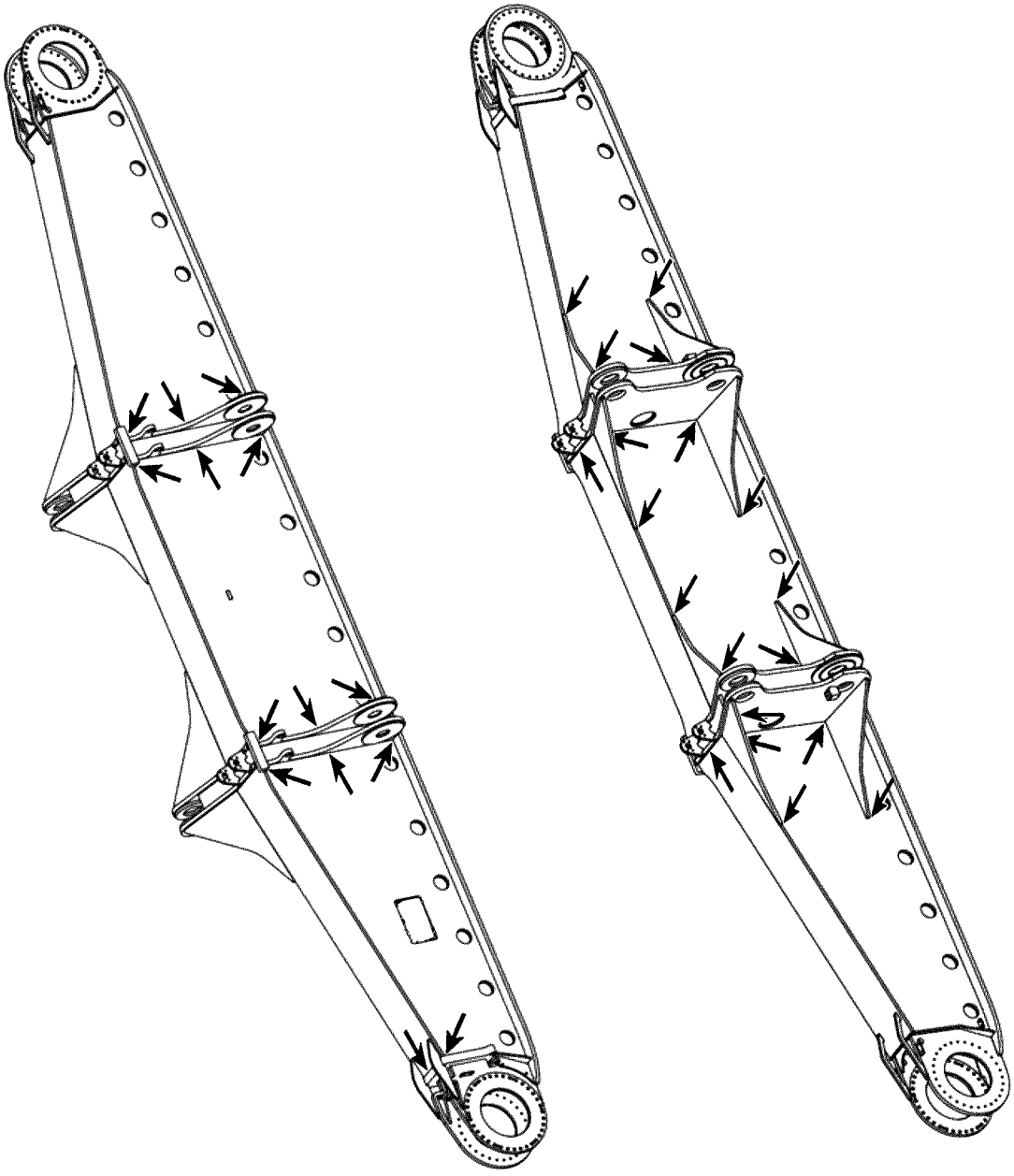
B187349 *Example for crawler carrier*

https://truckmanualshub.com/



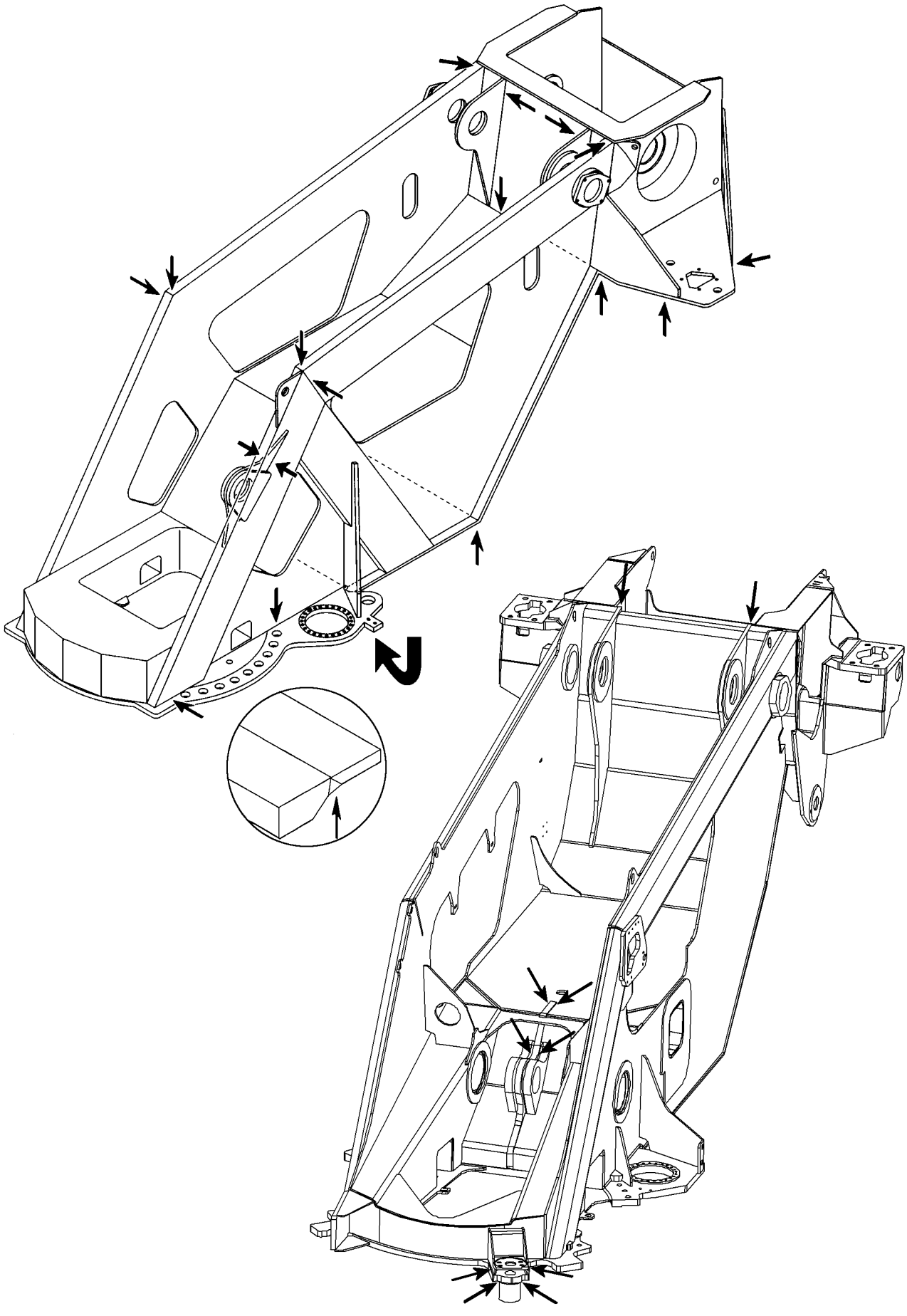
B105728 *Example for crawler carrier*

https://truckmanualshub.com/



B105729 *Example for crawler carrier*

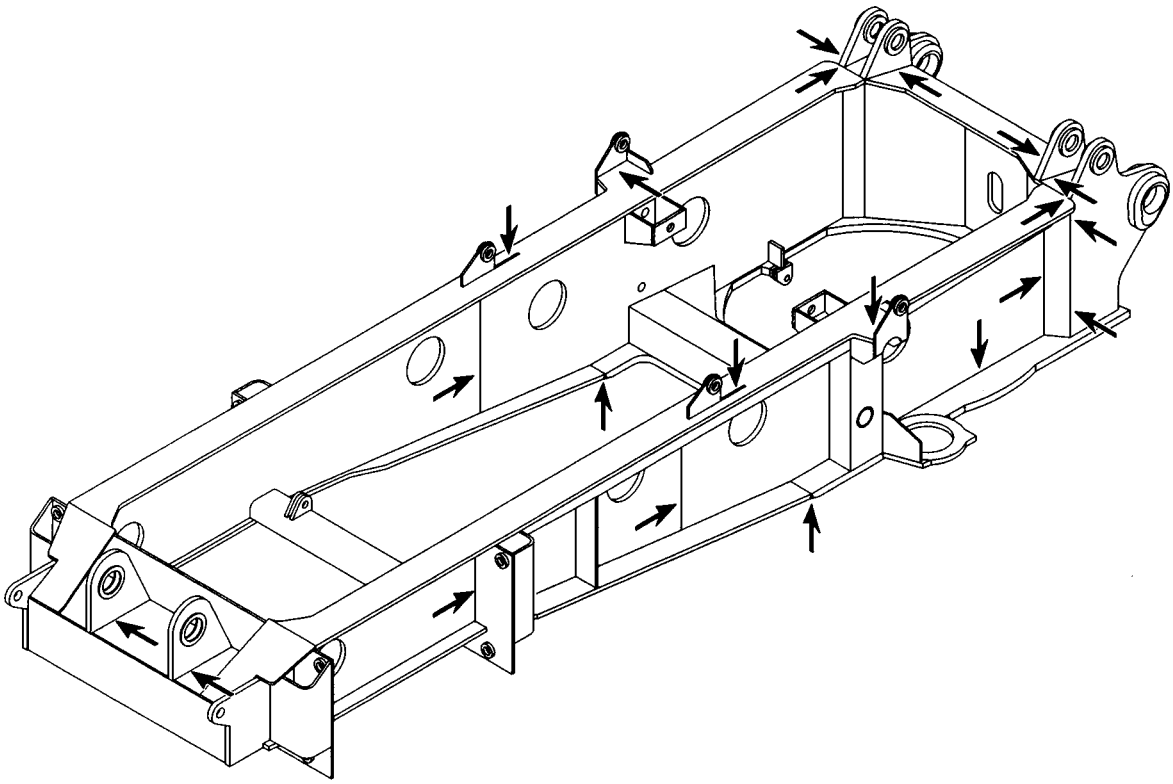
https://truckmanualshub.com/



B185048

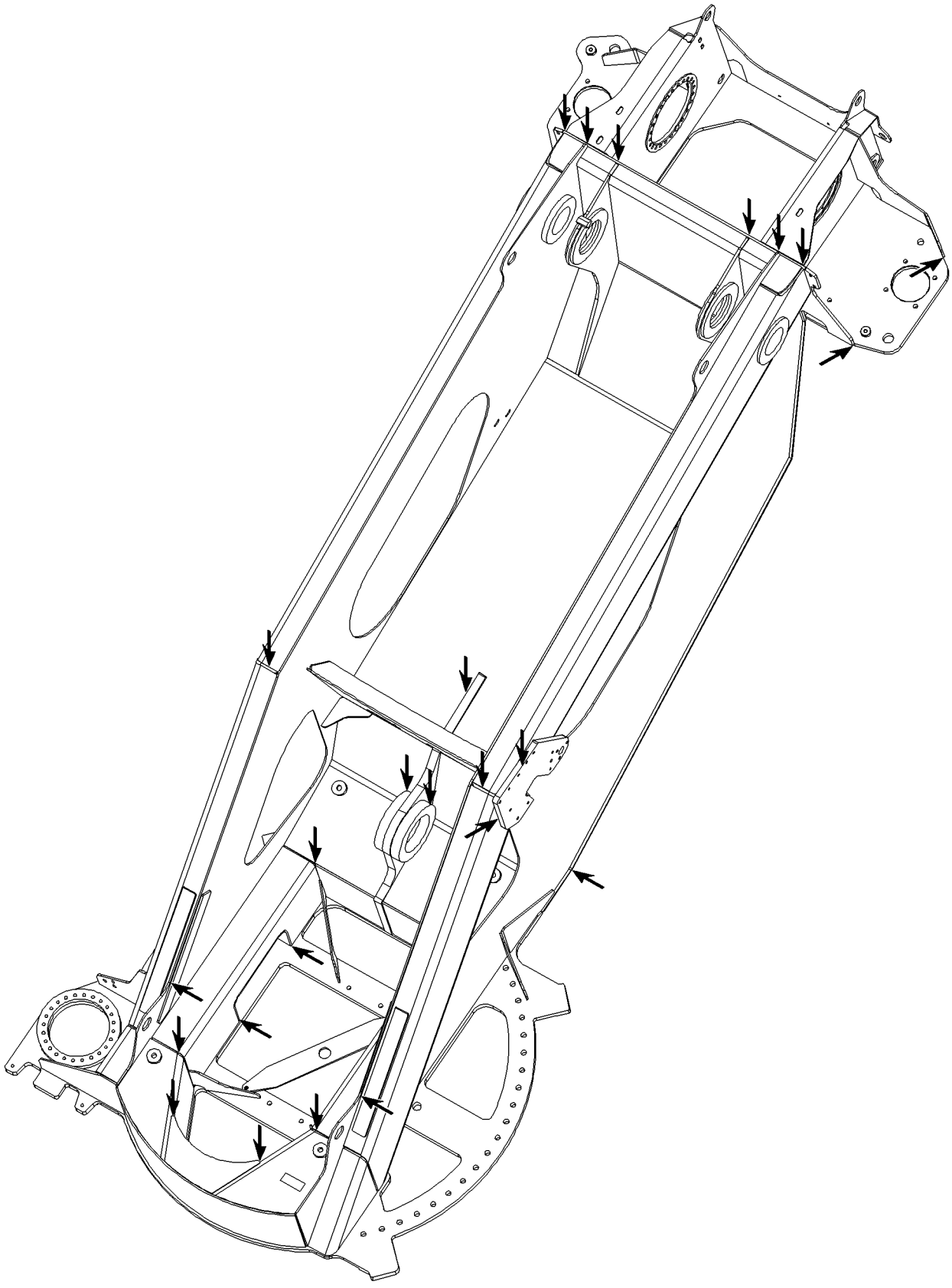
Example for turntable frame

https://truckmanualshub.com/



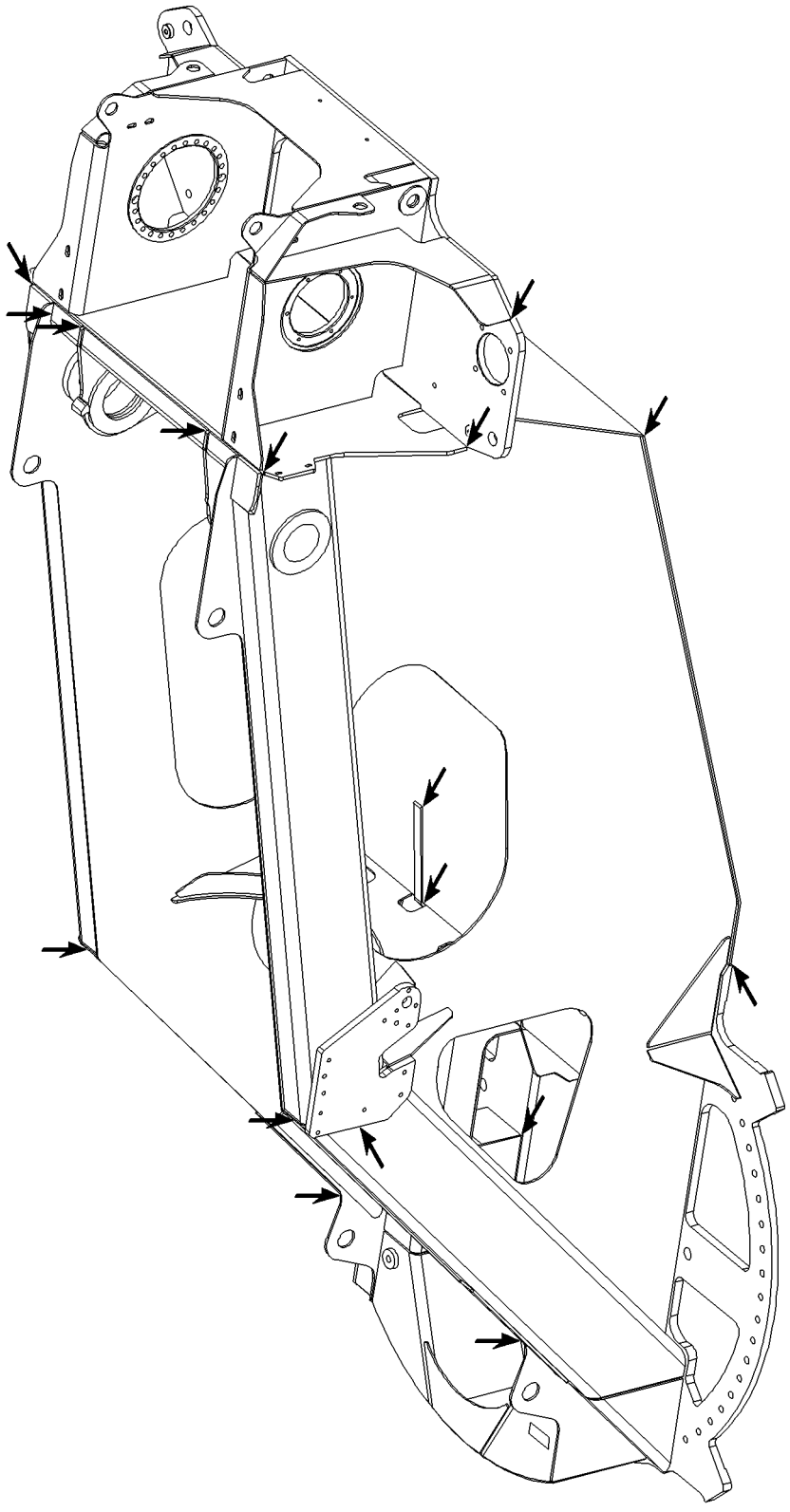
B185049 *Example for turntable frame*

https://truckmanualshub.com/



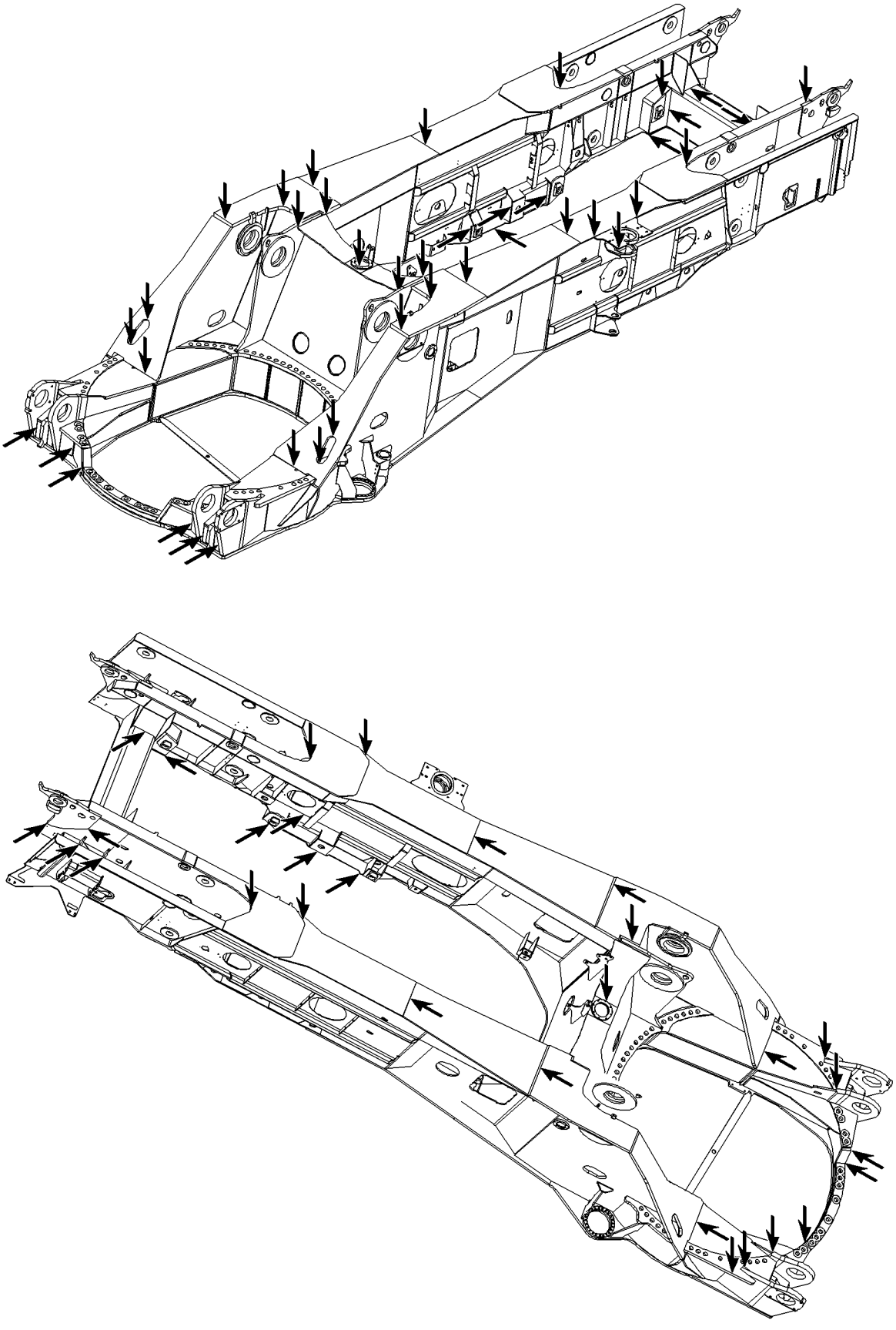
B105700 *Example for turntable frame*

https://truckmanualshub.com/



B105701 *Example for turntable frame*

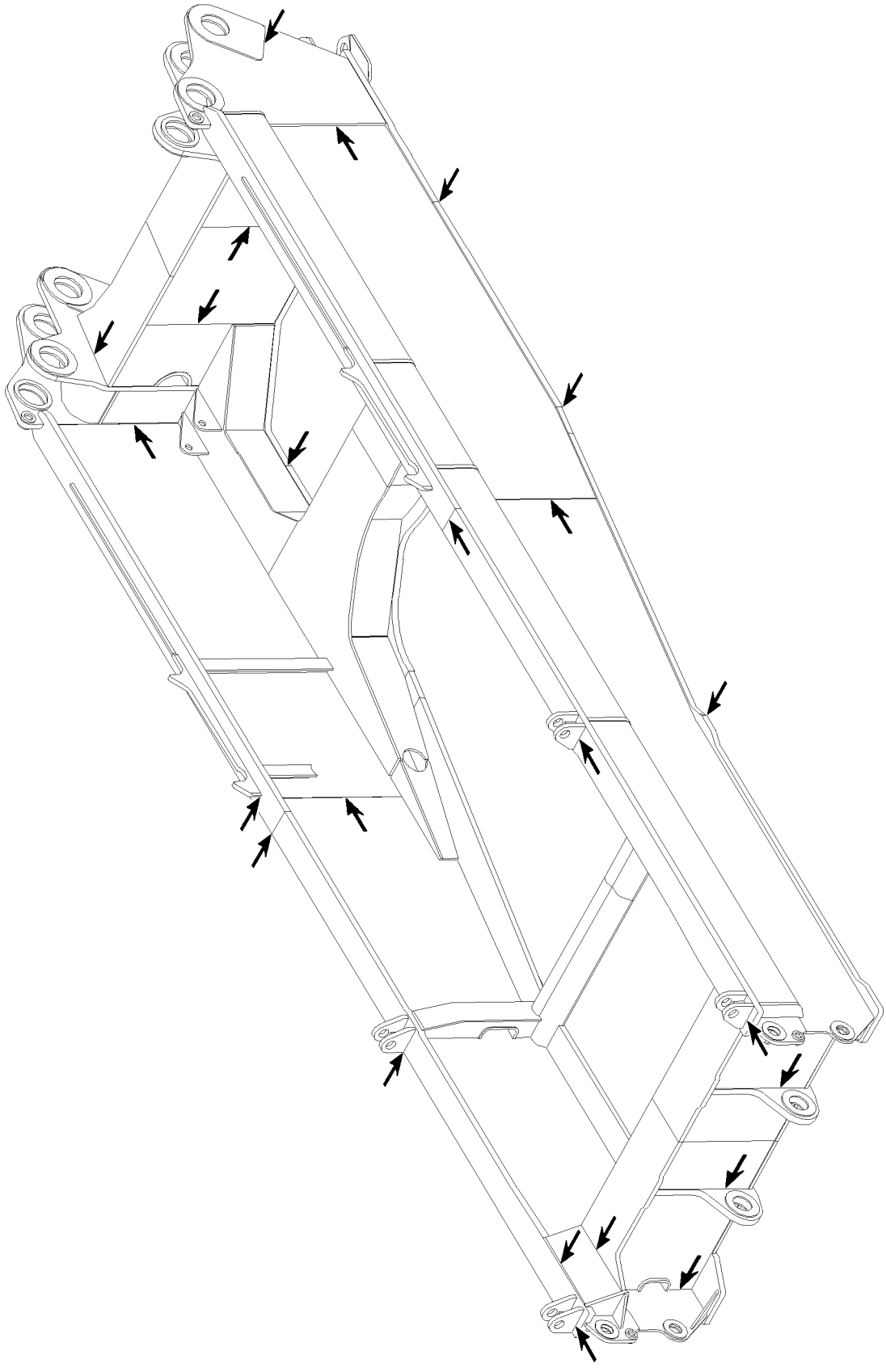
https://truckmanualshub.com/



B105706

Example for turntable frame

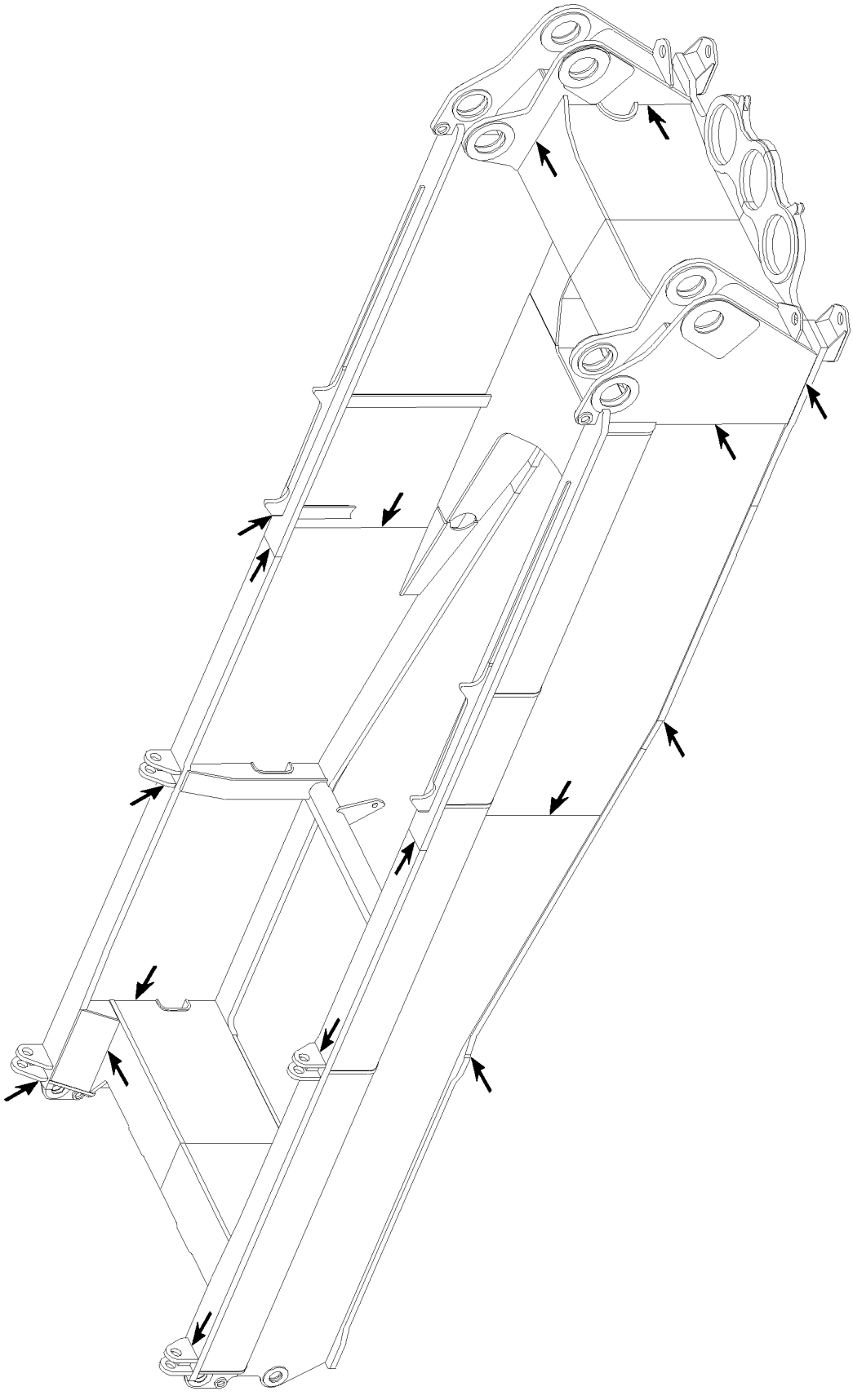
https://truckmanualshub.com/



B105694

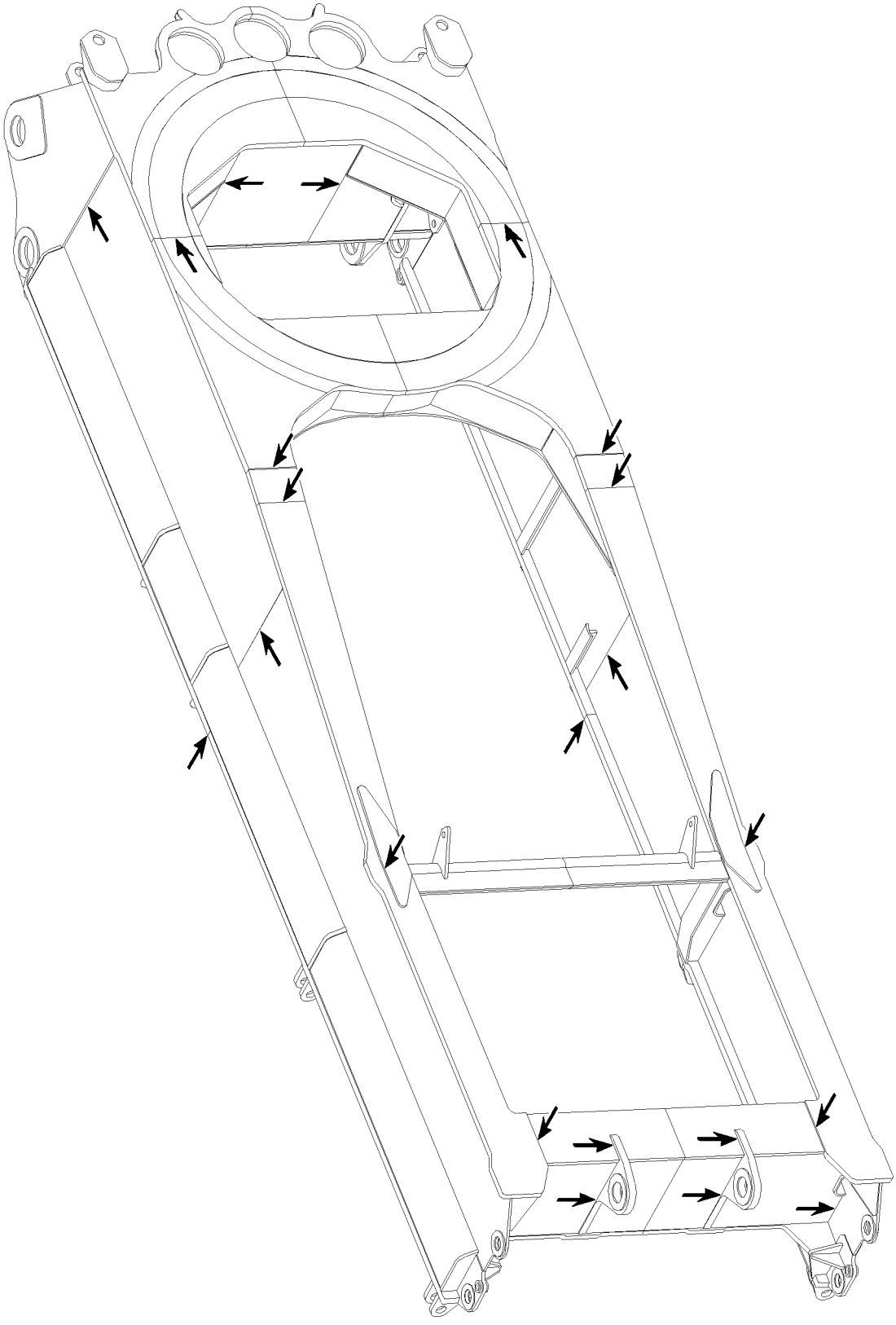
Example for turntable frame

https://truckmanualshub.com/



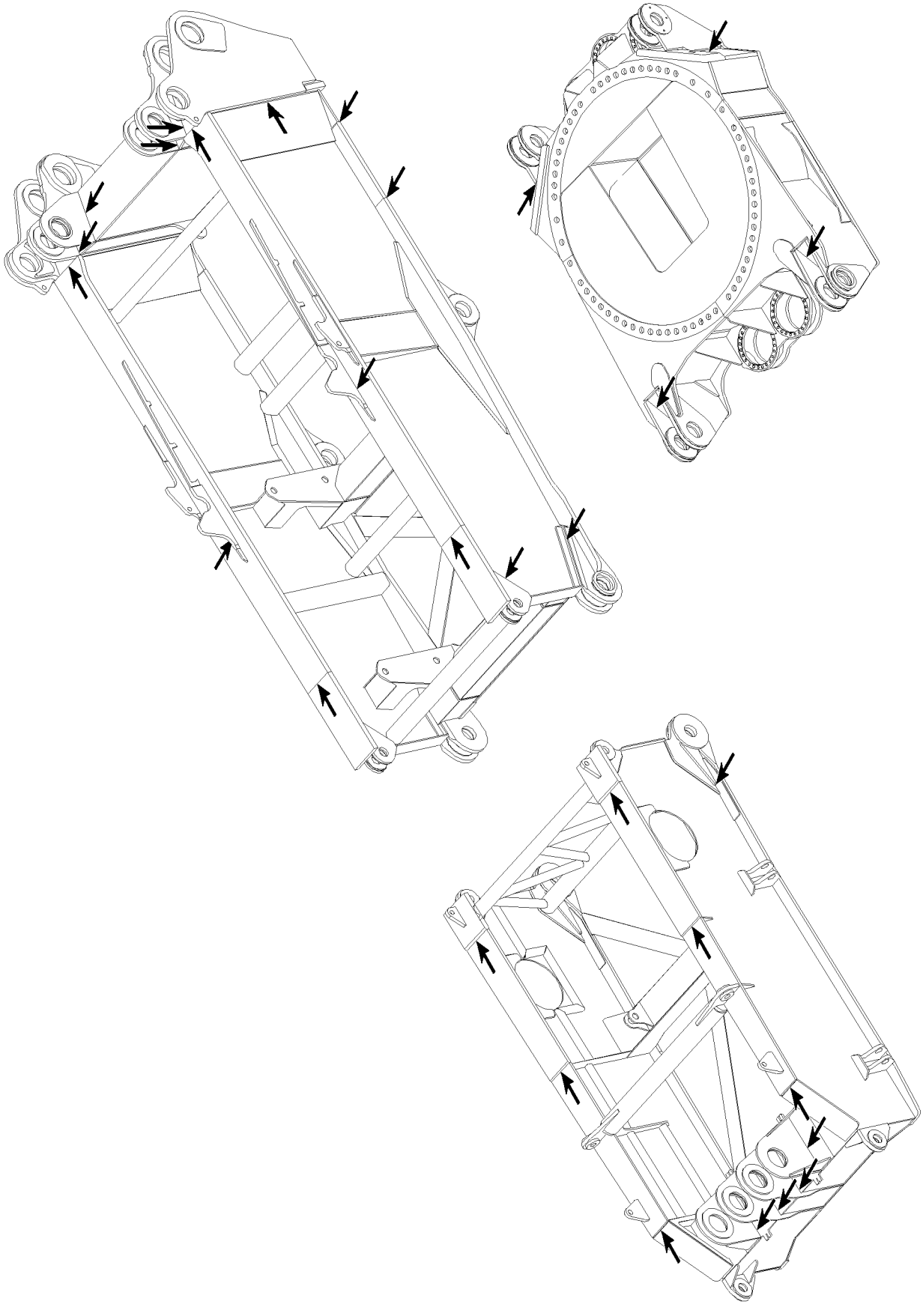
B105695 *Example for turntable frame*

https://truckmanualshub.com/



B105696 *Example for turntable frame*

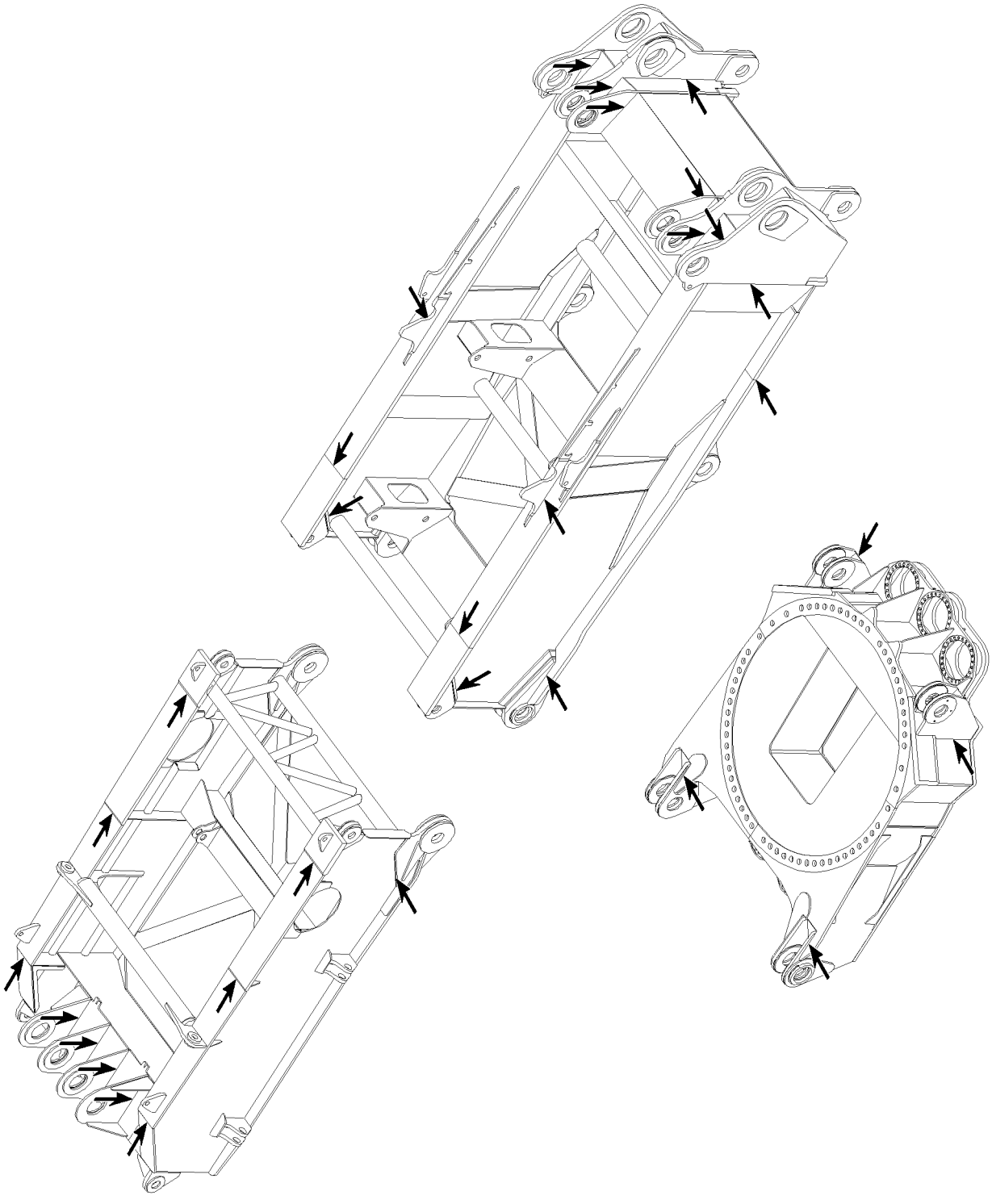
https://truckmanualshub.com/



B105691

Example for turntable frame

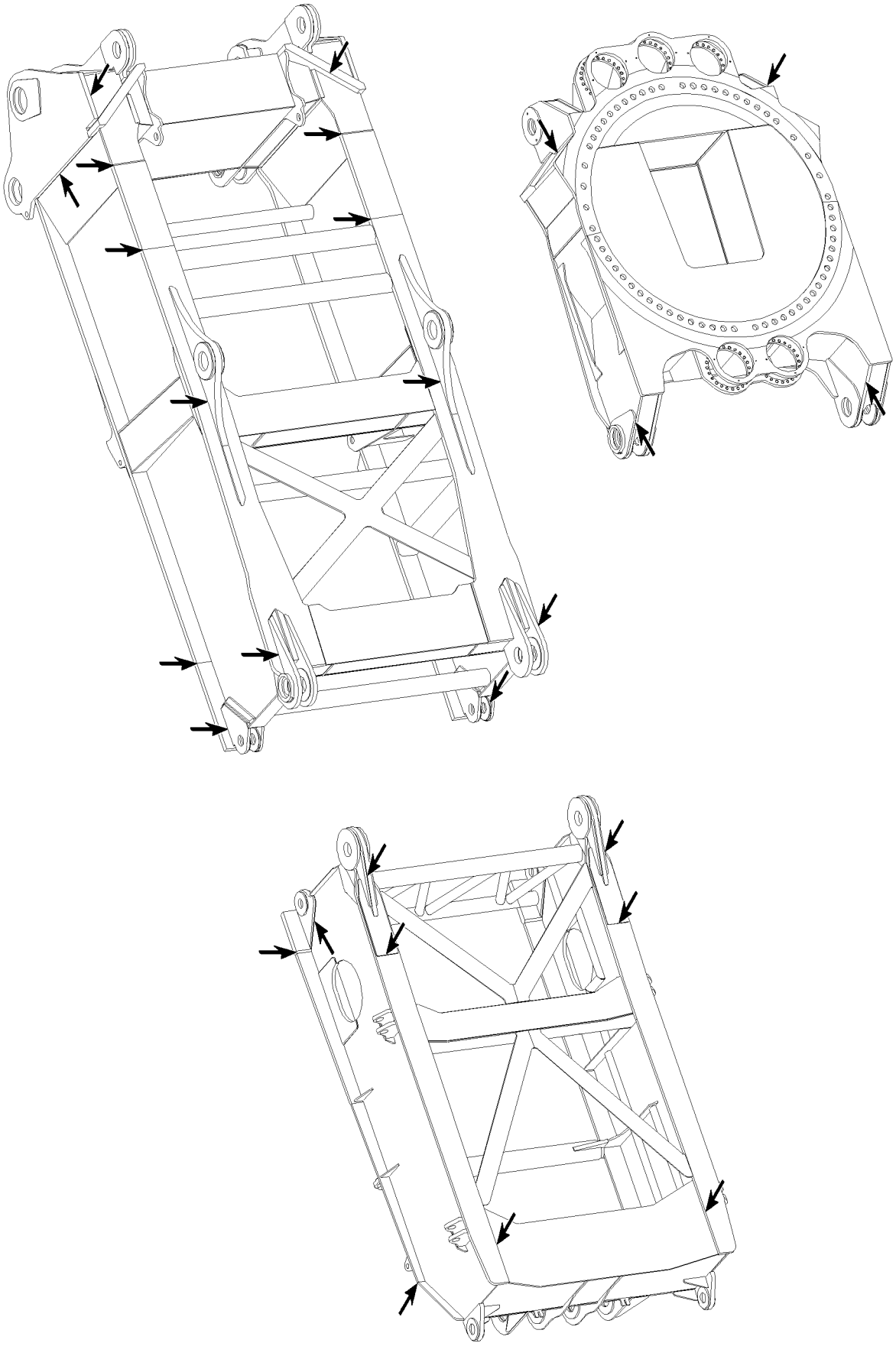
https://truckmanualshub.com/



B105692

Example for turntable frame

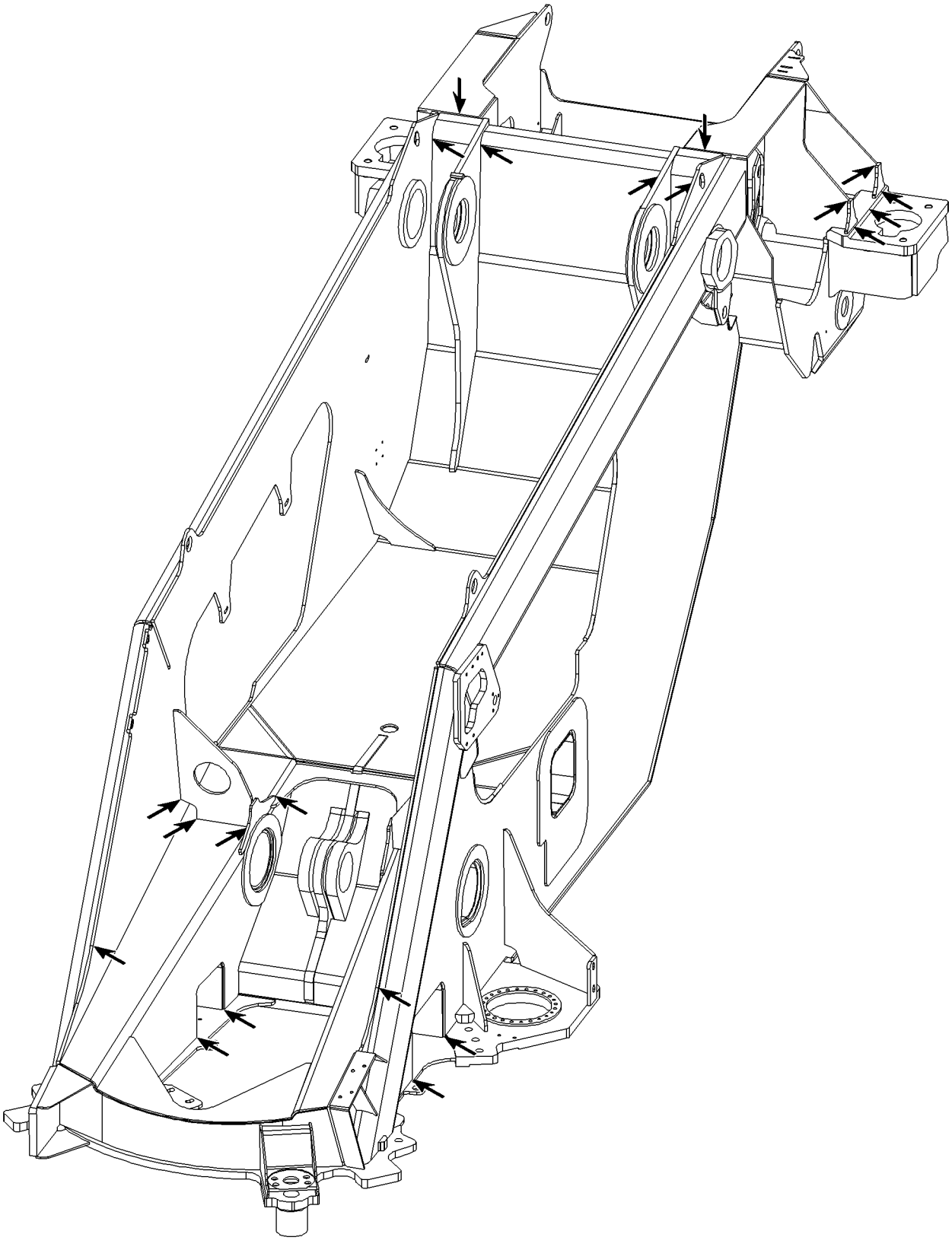
https://truckmanualshub.com/



B105693

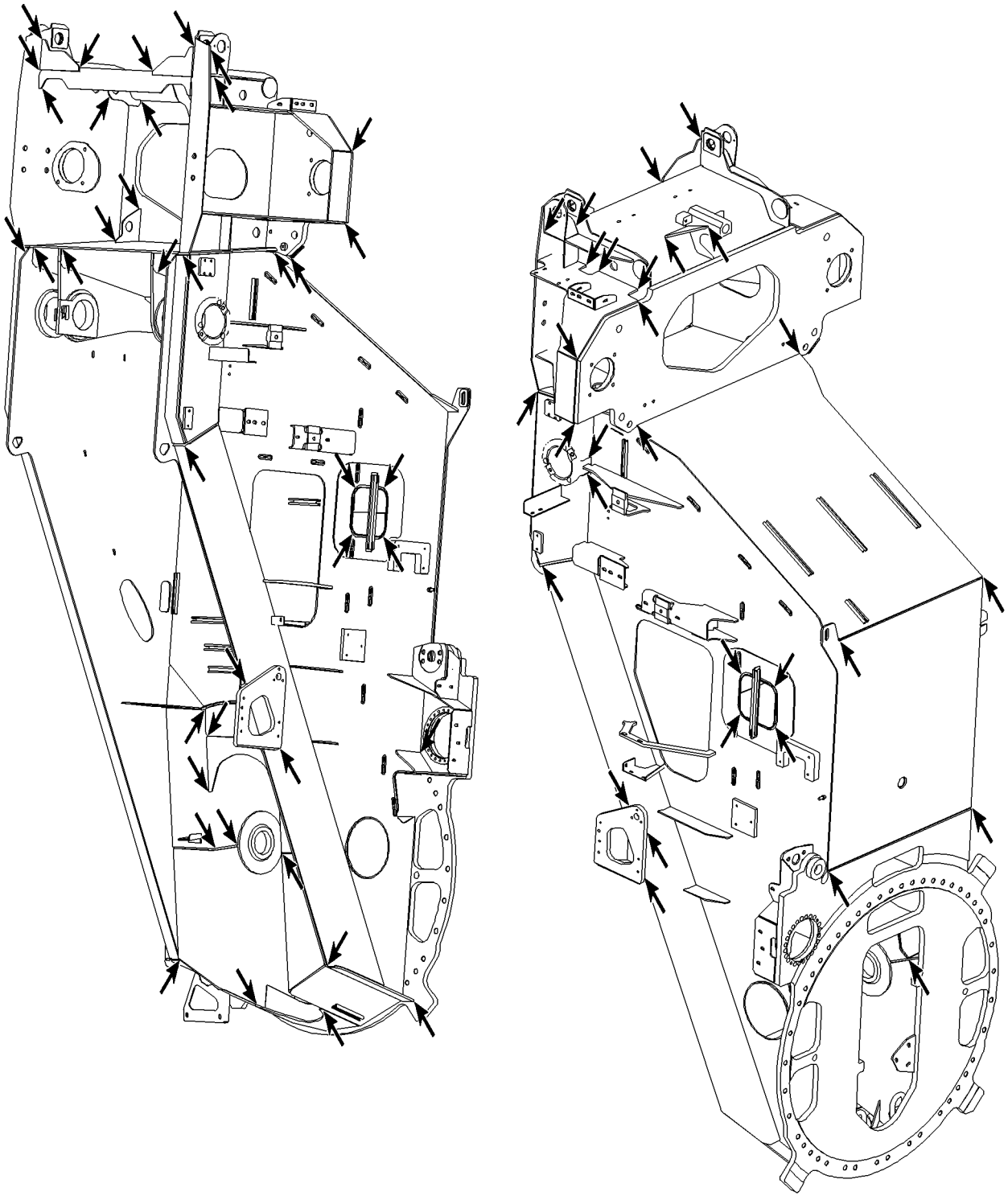
Example for turntable frame

https://truckmanualshub.com/



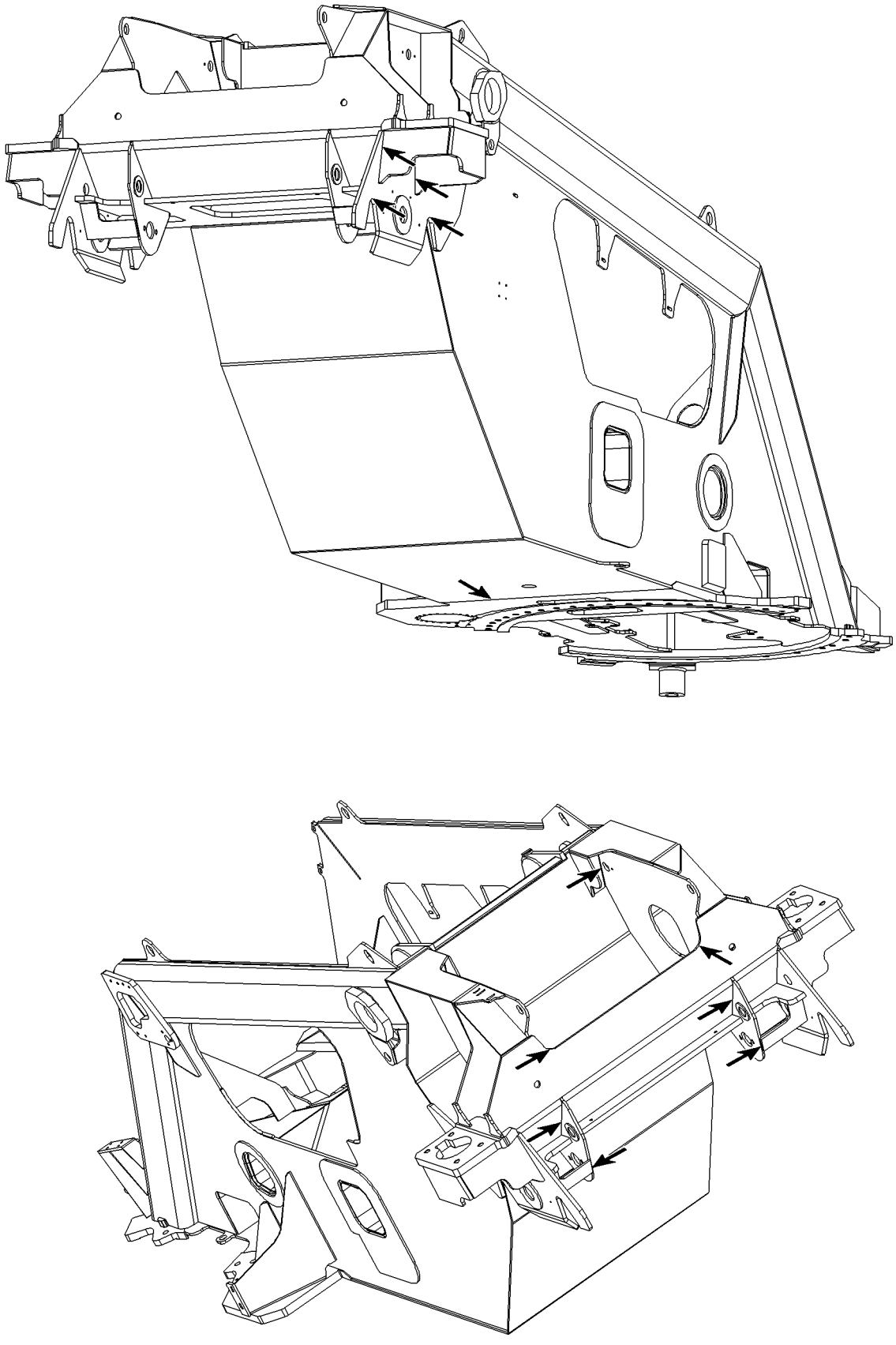
B105722 *Example for turntable frame*

https://truckmanualshub.com/



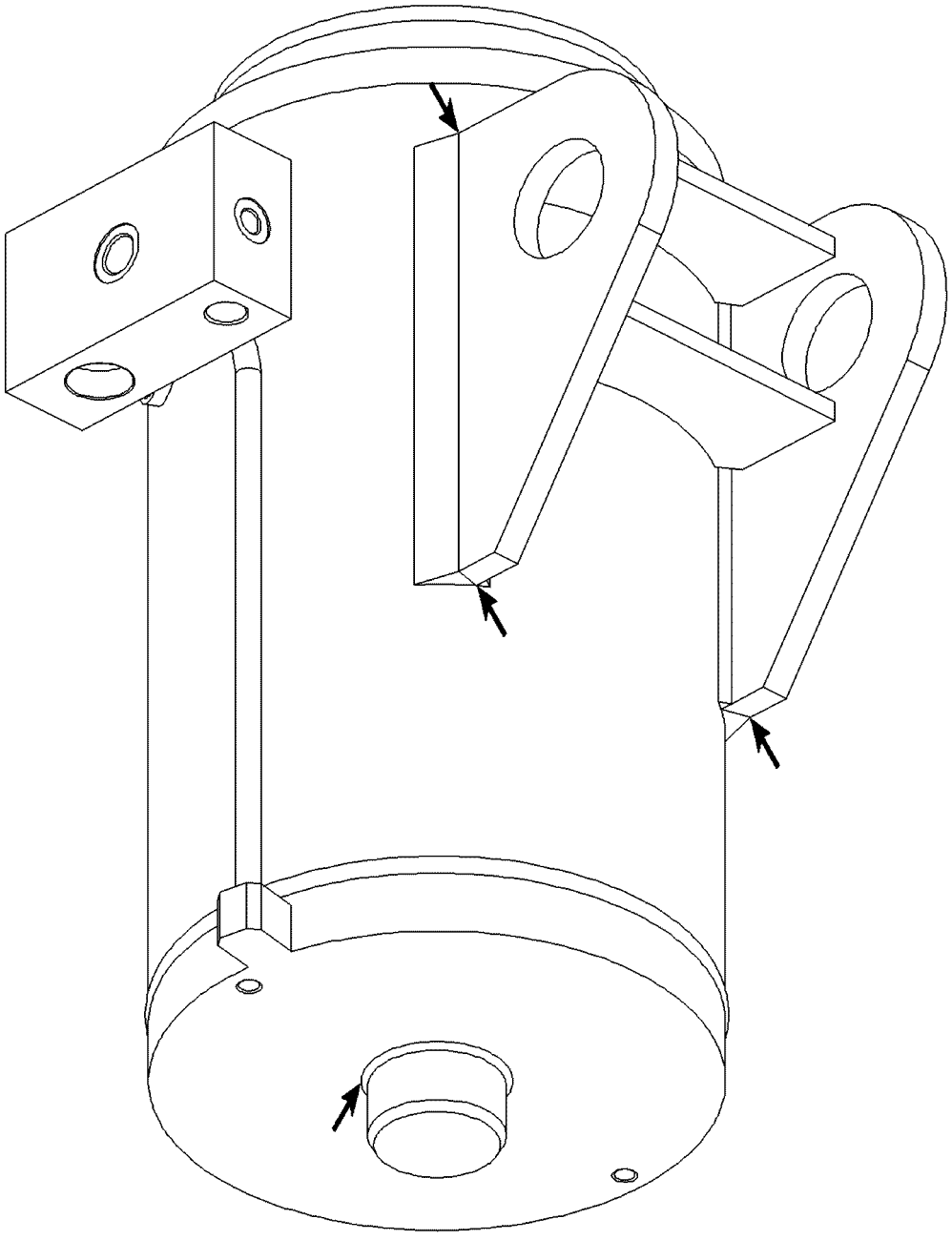
B105932 *Example for turntable frame*

https://truckmanualshub.com/



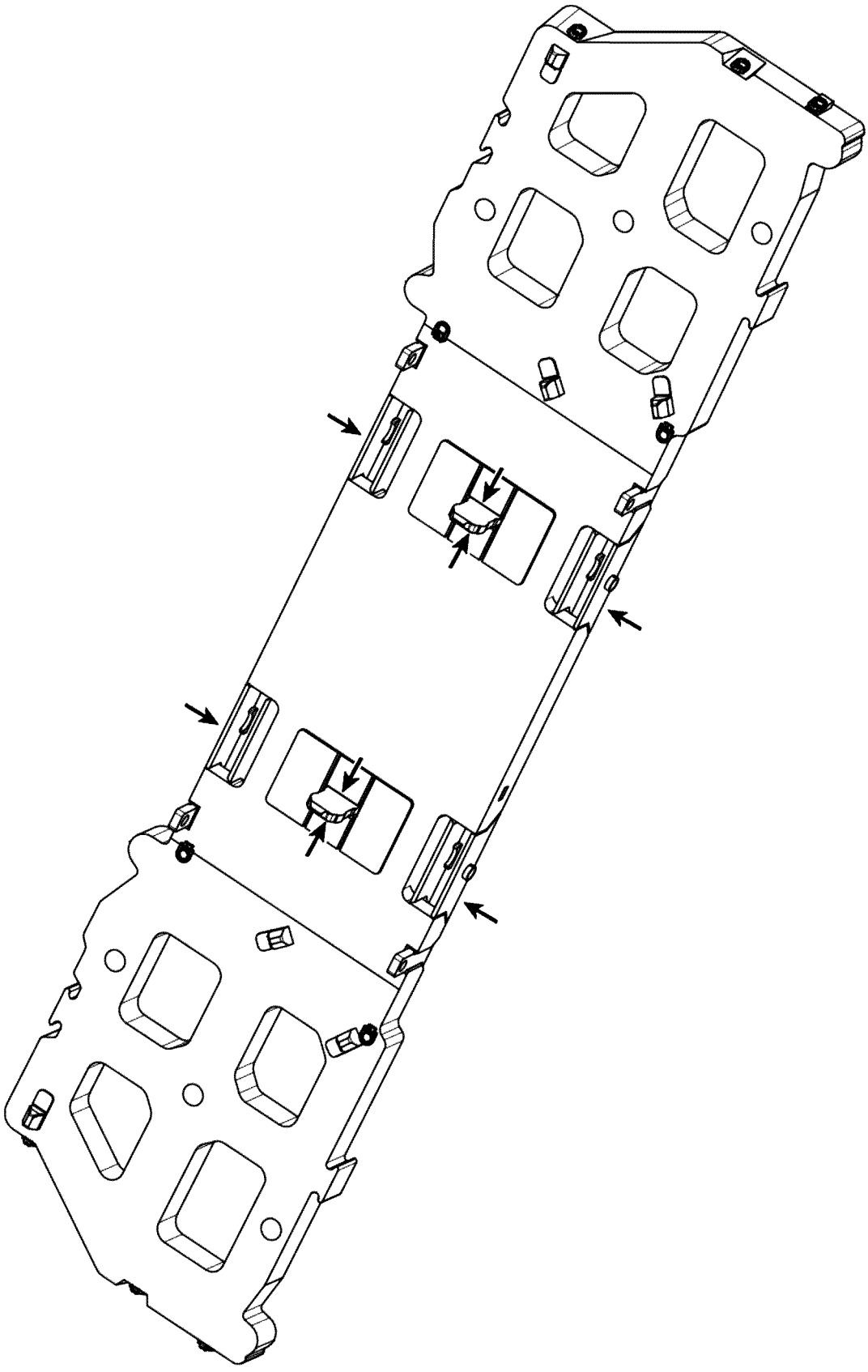
B105723 *Example for turntable frame*

https://truckmanualshub.com/



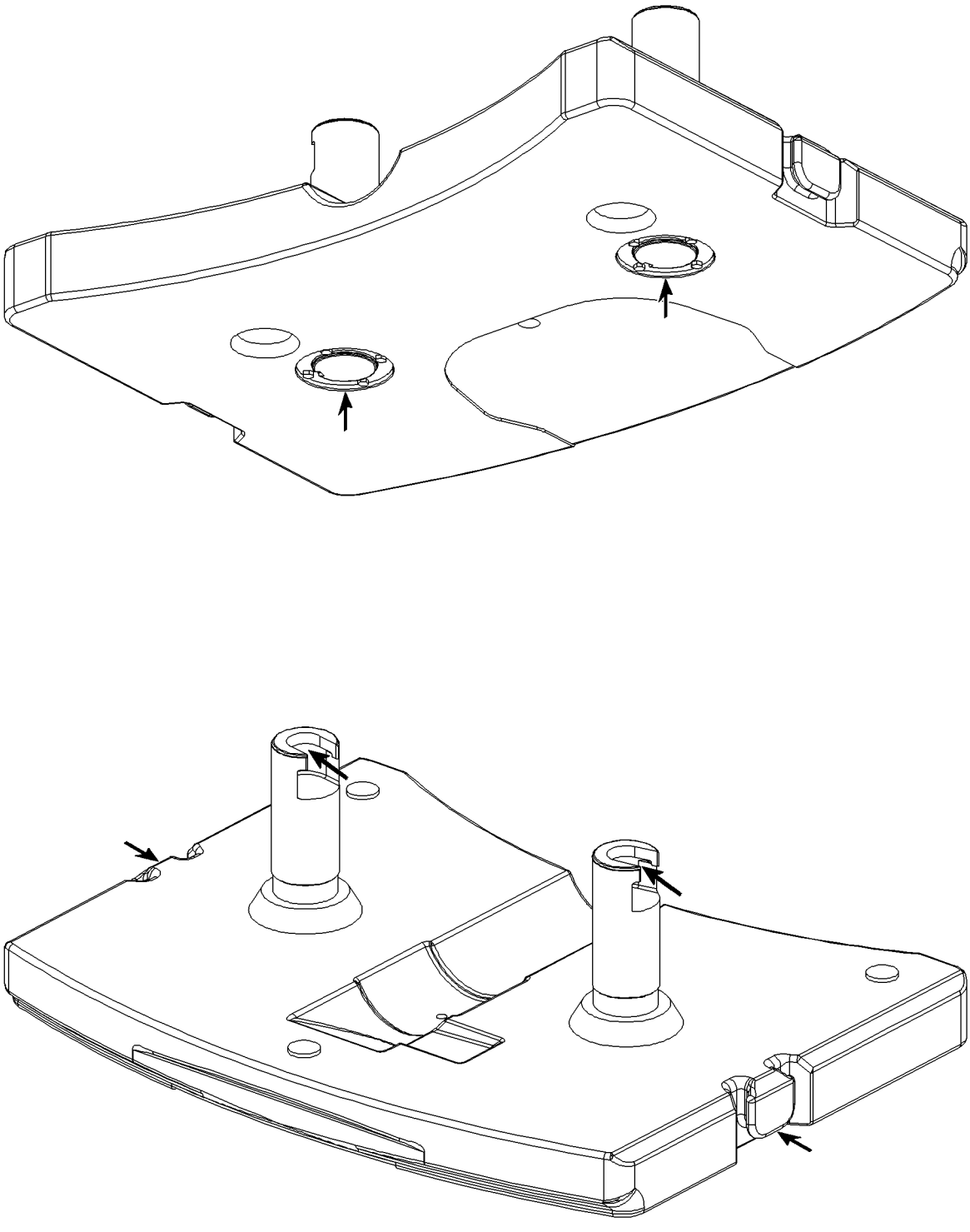
B105801 *Example for ballasting cylinder*

https://truckmanualshub.com/



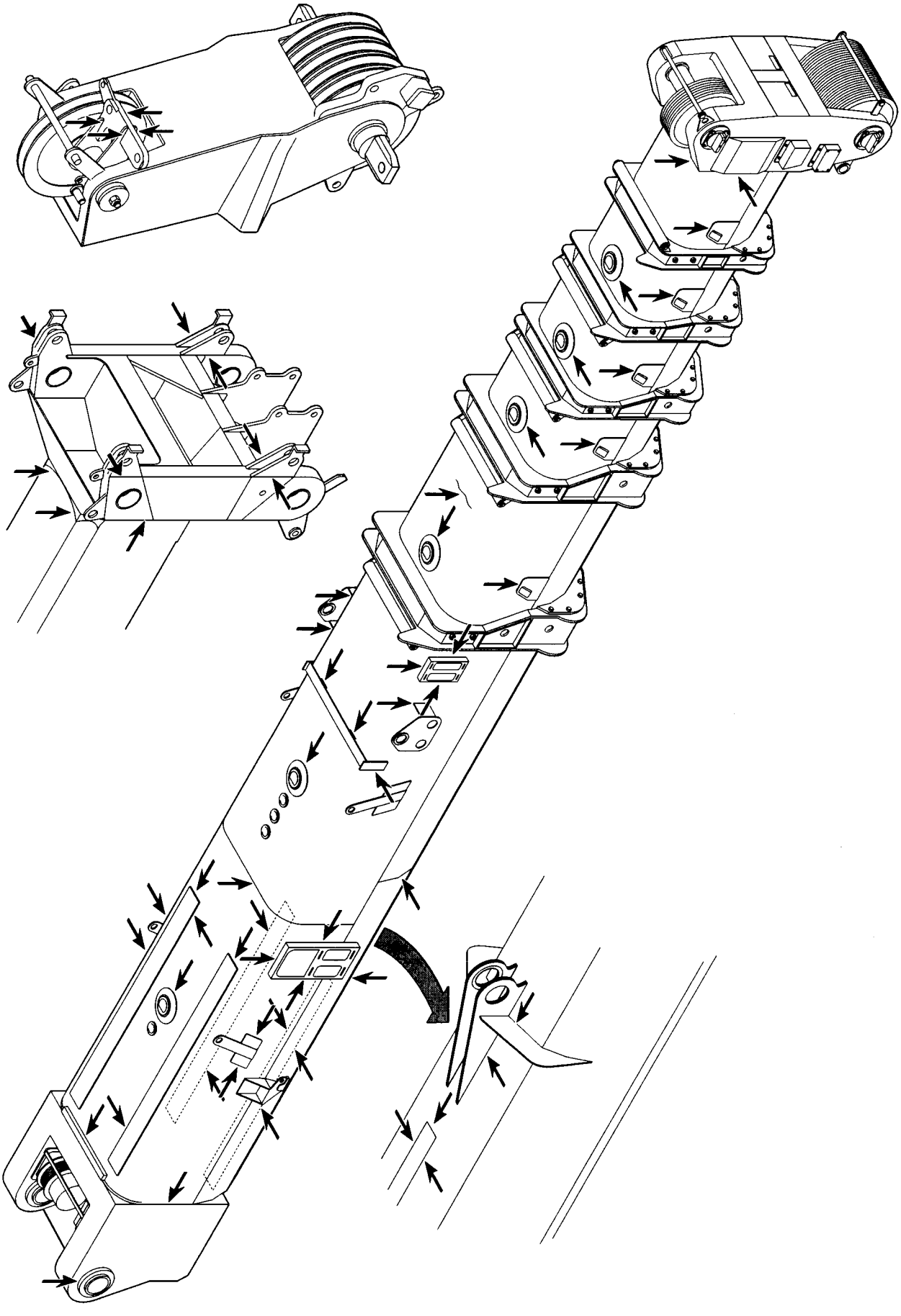
B105705 *Example for mounting plate*

https://truckmanualshub.com/



B105807 *Example for base plate*

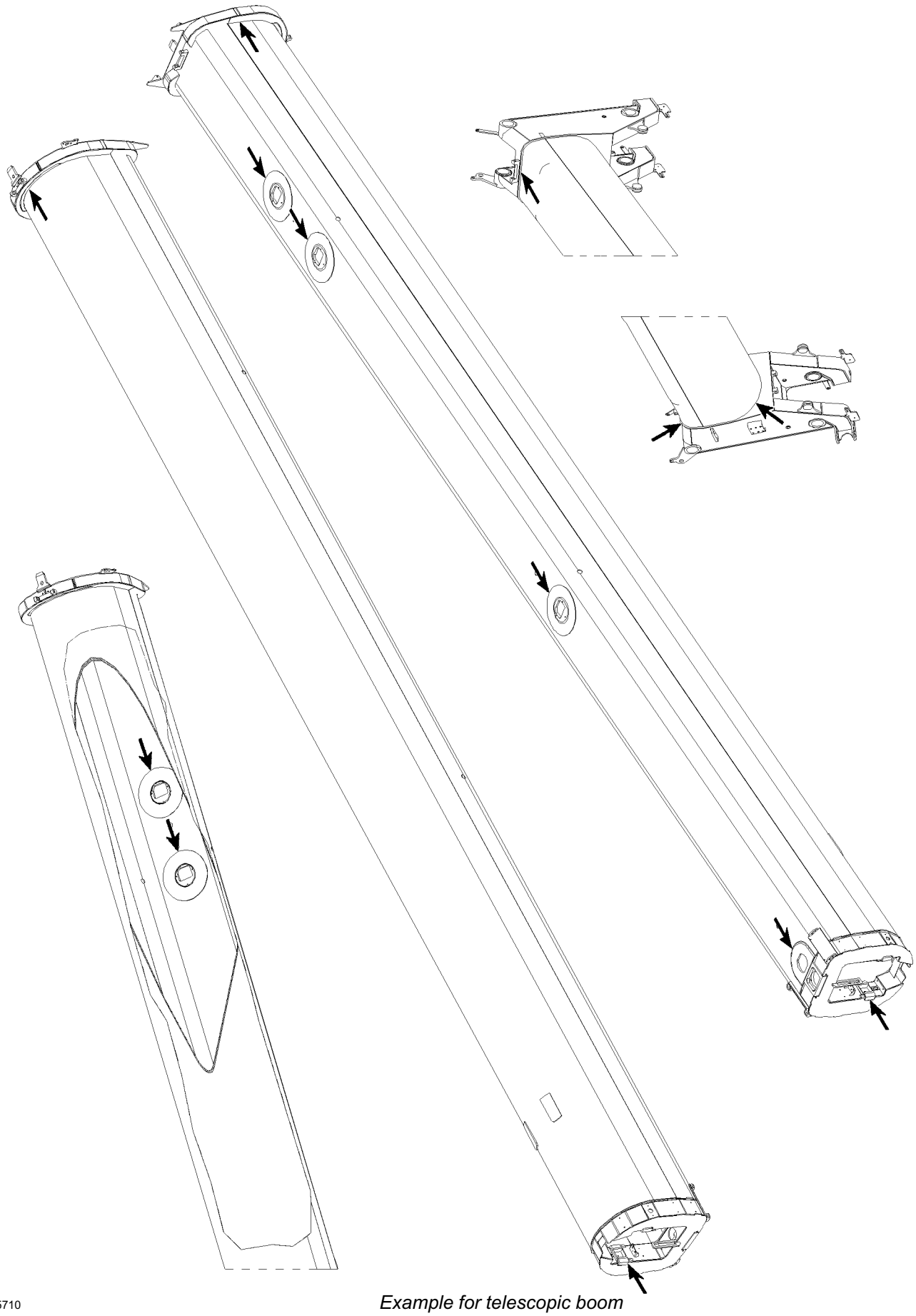
https://truckmanualshub.com/



B185050

Example for telescopic boom

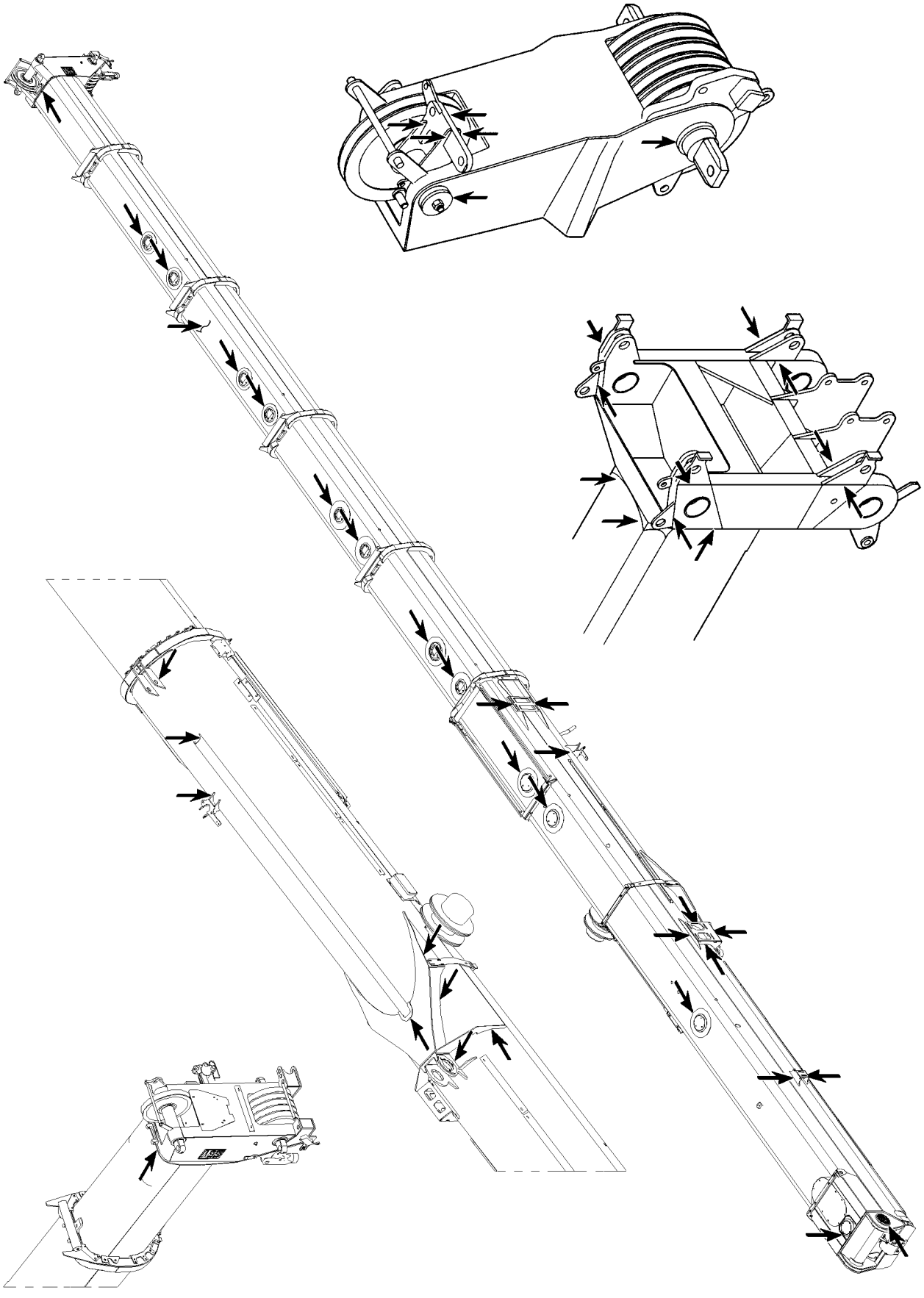
https://truckmanualshub.com/



B105710

Example for telescopic boom

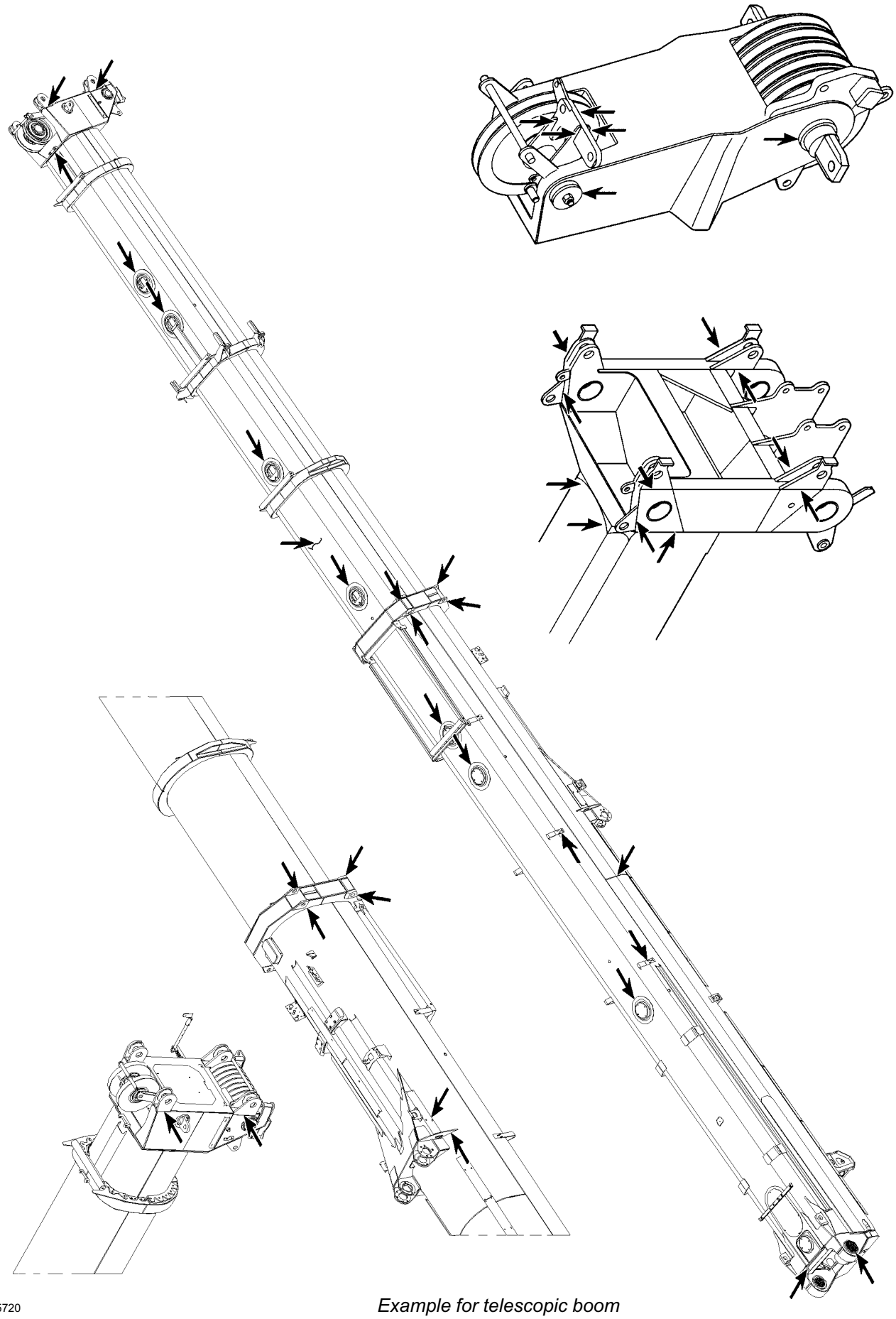
https://truckmanualshub.com/



B105711

Example for telescopic boom

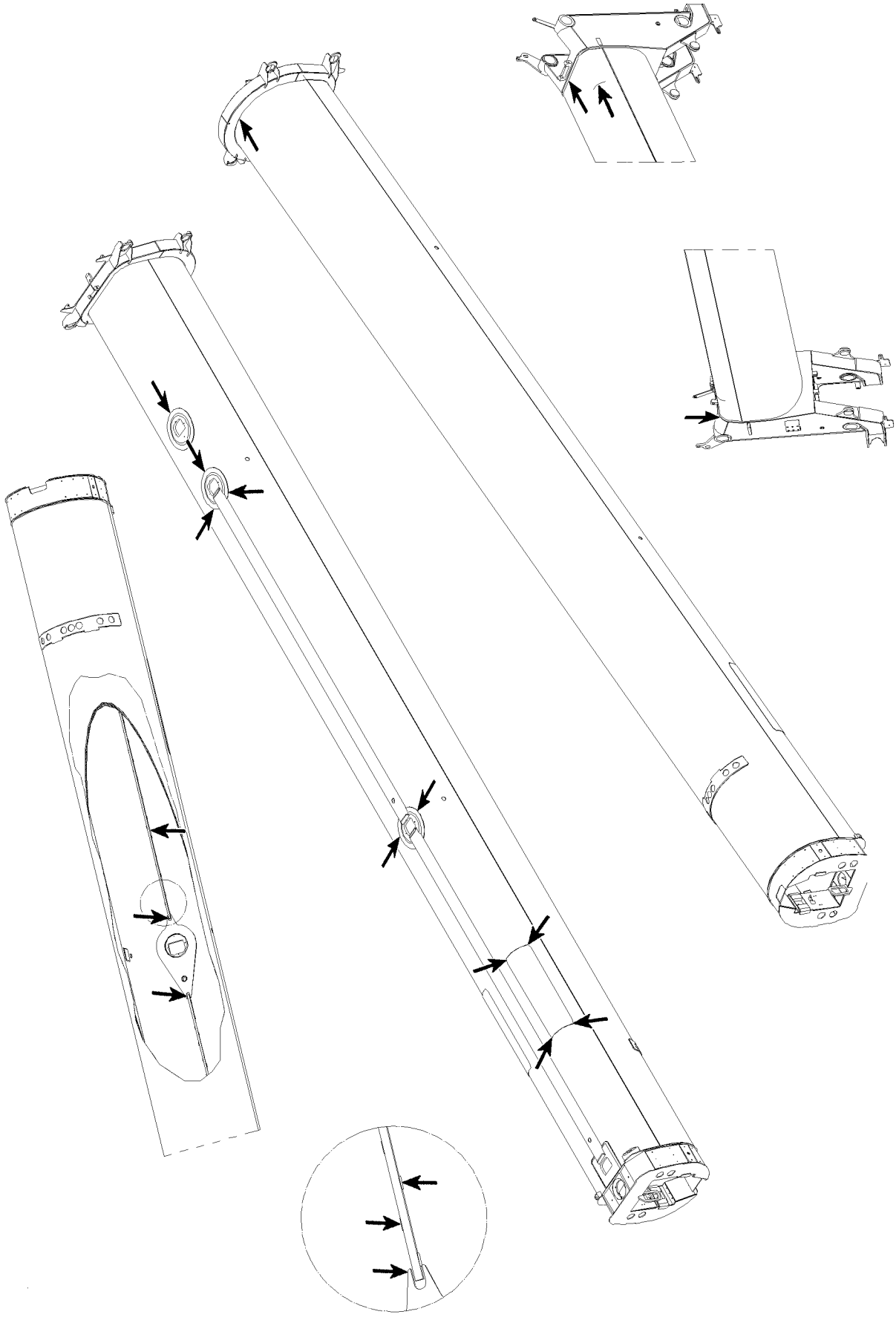
https://truckmanualshub.com/



B105720

Example for telescopic boom

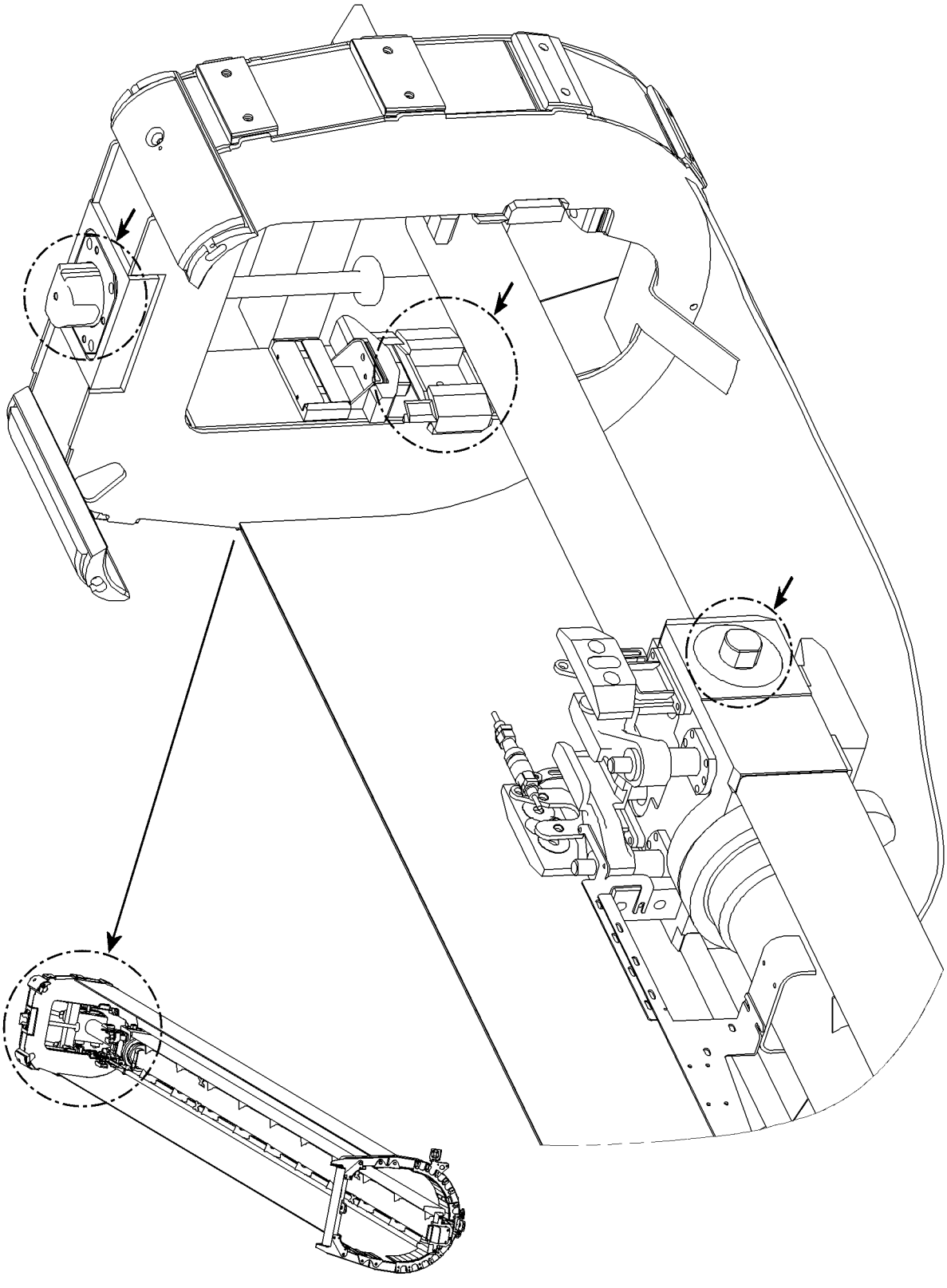
https://truckmanualshub.com/



B105721

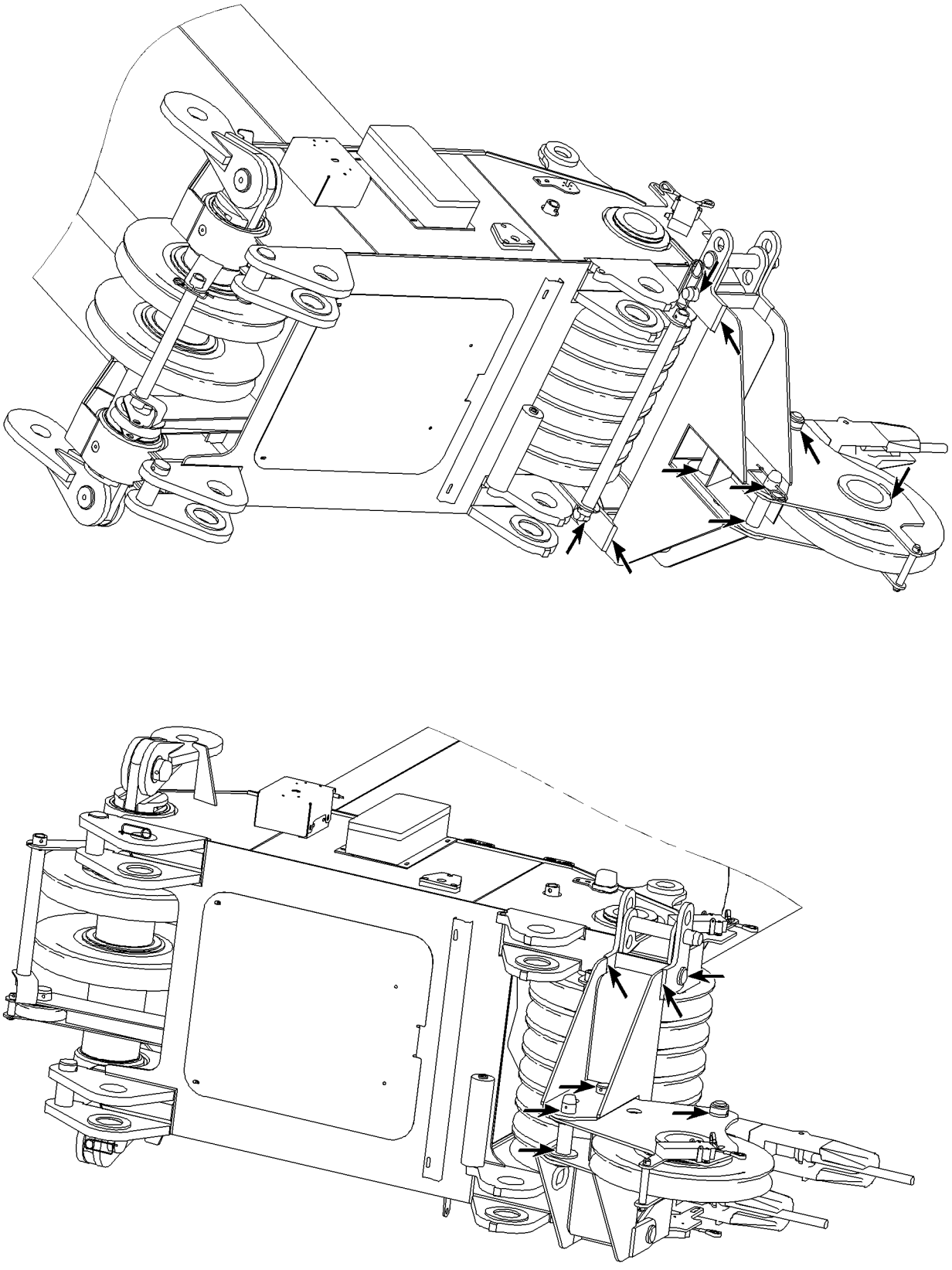
Example for telescopic boom

https://truckmanualshub.com/



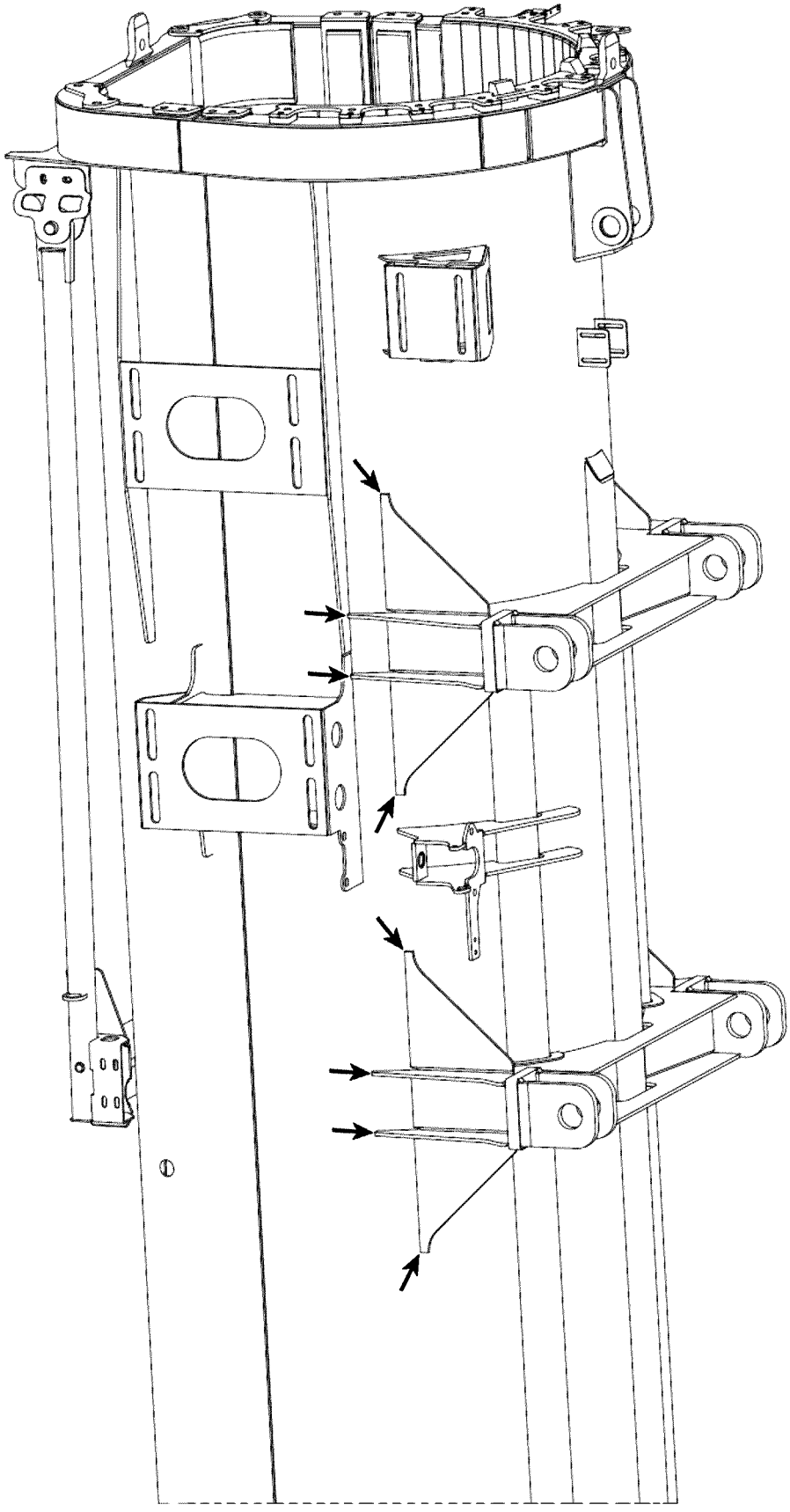
B105891 *Example for push out mechanics telescopic boom*

https://truckmanualshub.com/



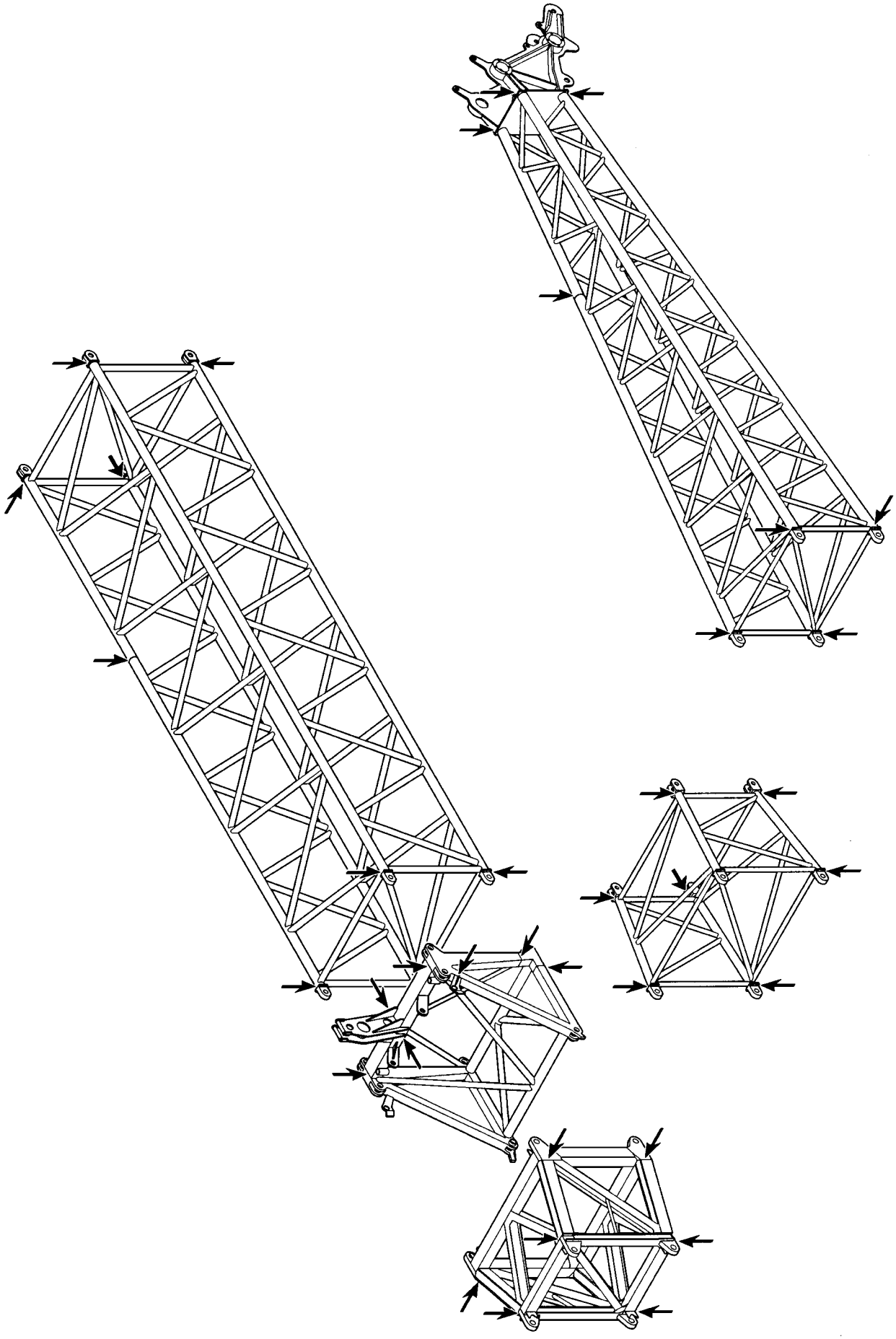
B105892 *Example for boom nose*

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B105689 *Example for dolly console*

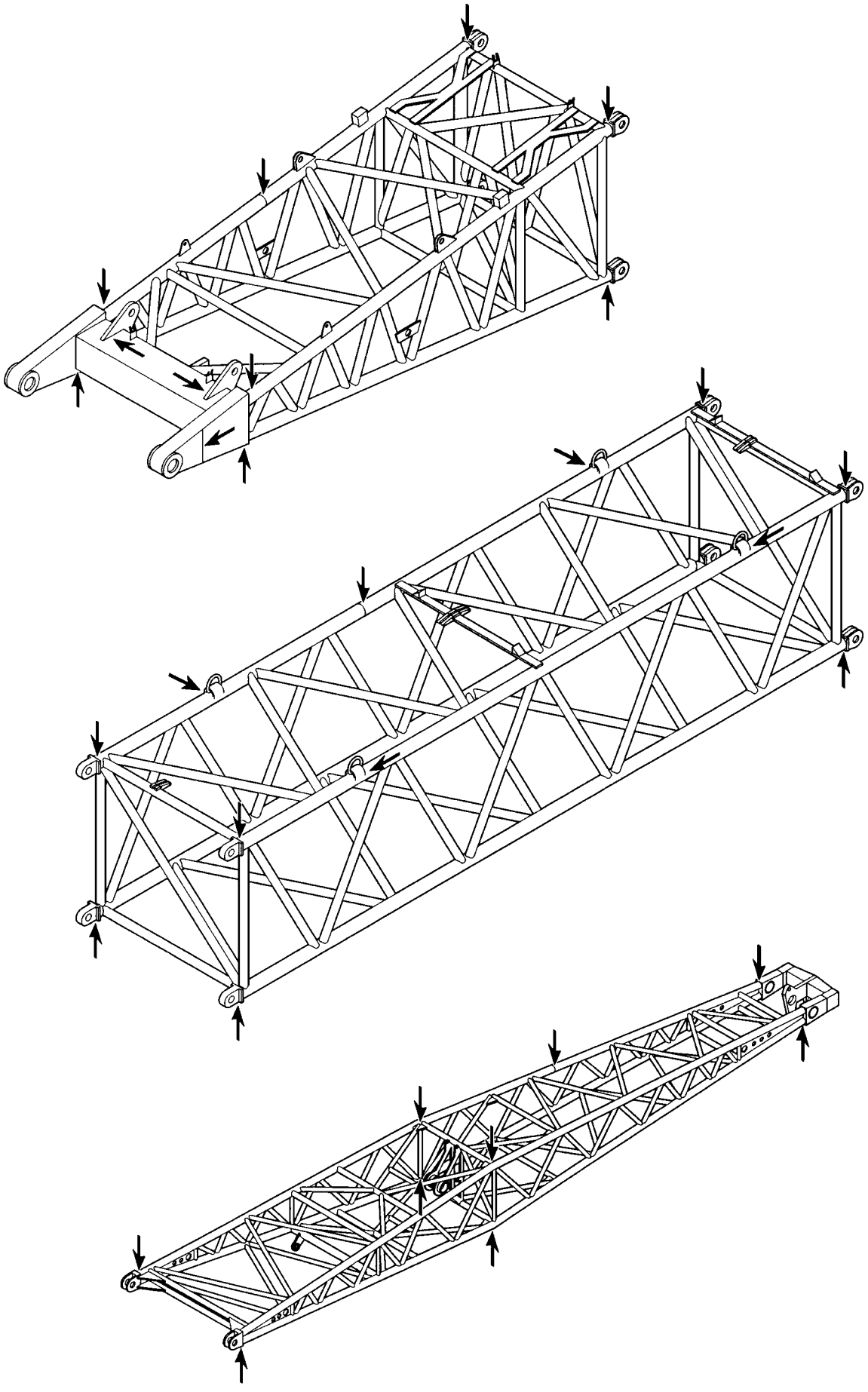
https://truckmanualshub.com/



B185051

Example for lattice jib

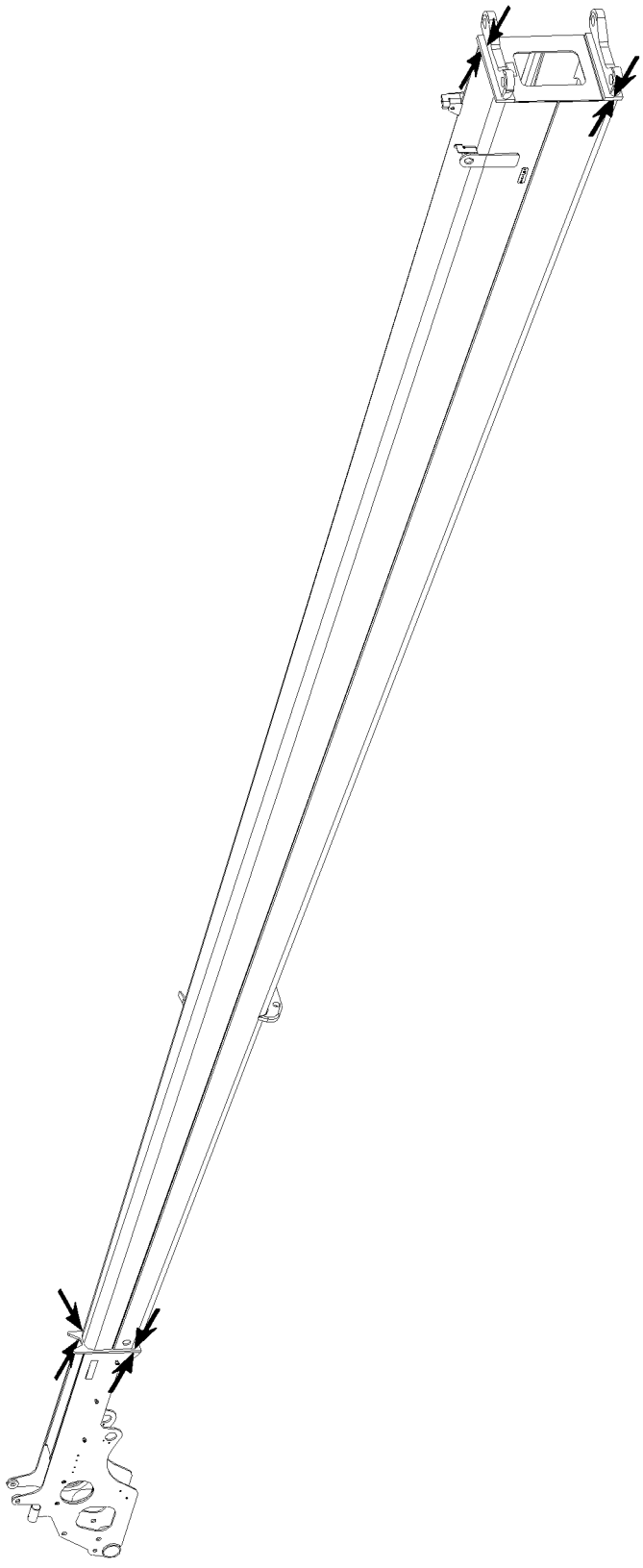
https://truckmanualshub.com/



B185052

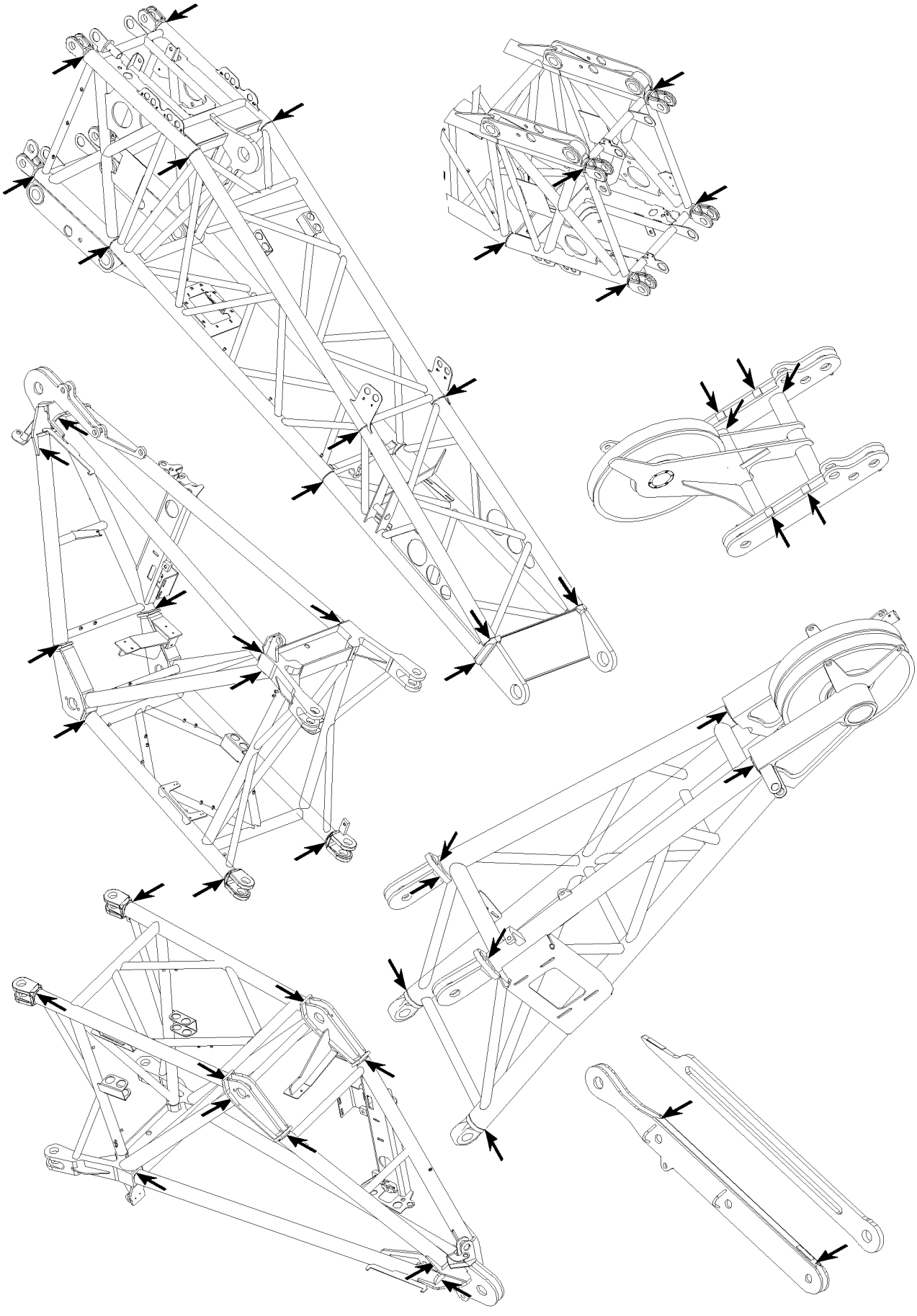
Example for NA / WA frame

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B105713 *Example for end section*

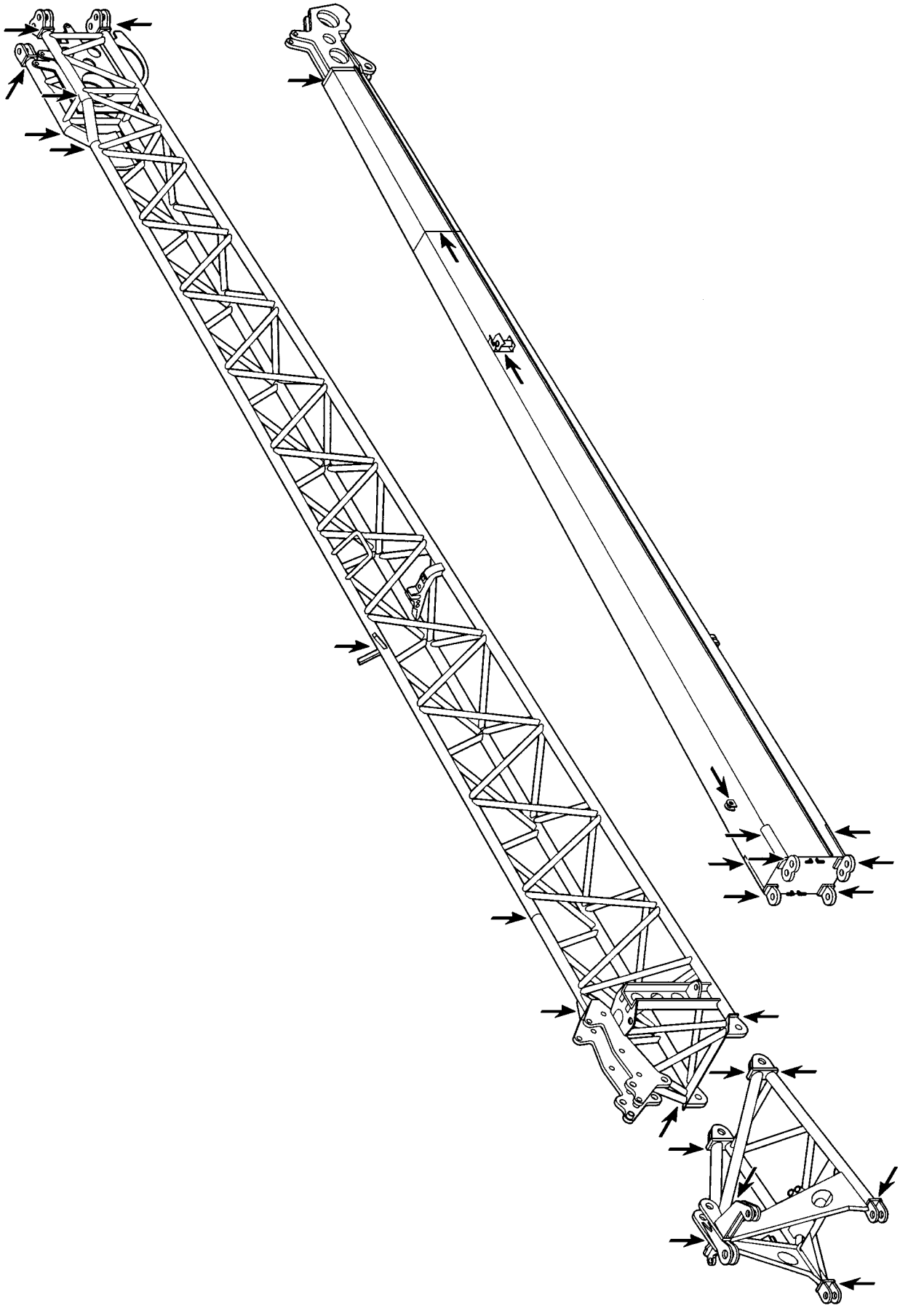
https://truckmanualshub.com/



B105836

Example for pivot section, adapter and boom nose

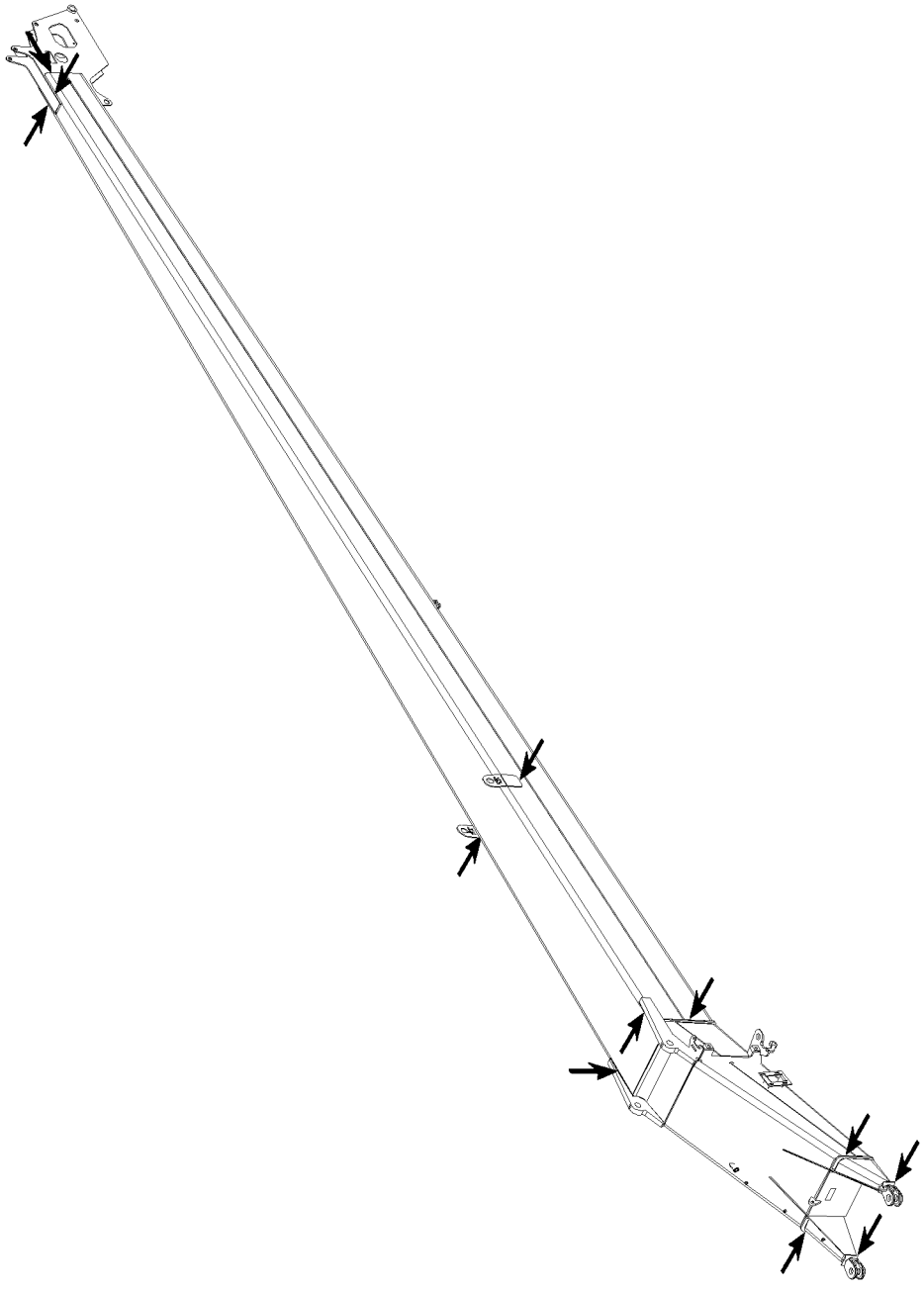
https://truckmanualshub.com/



B185058

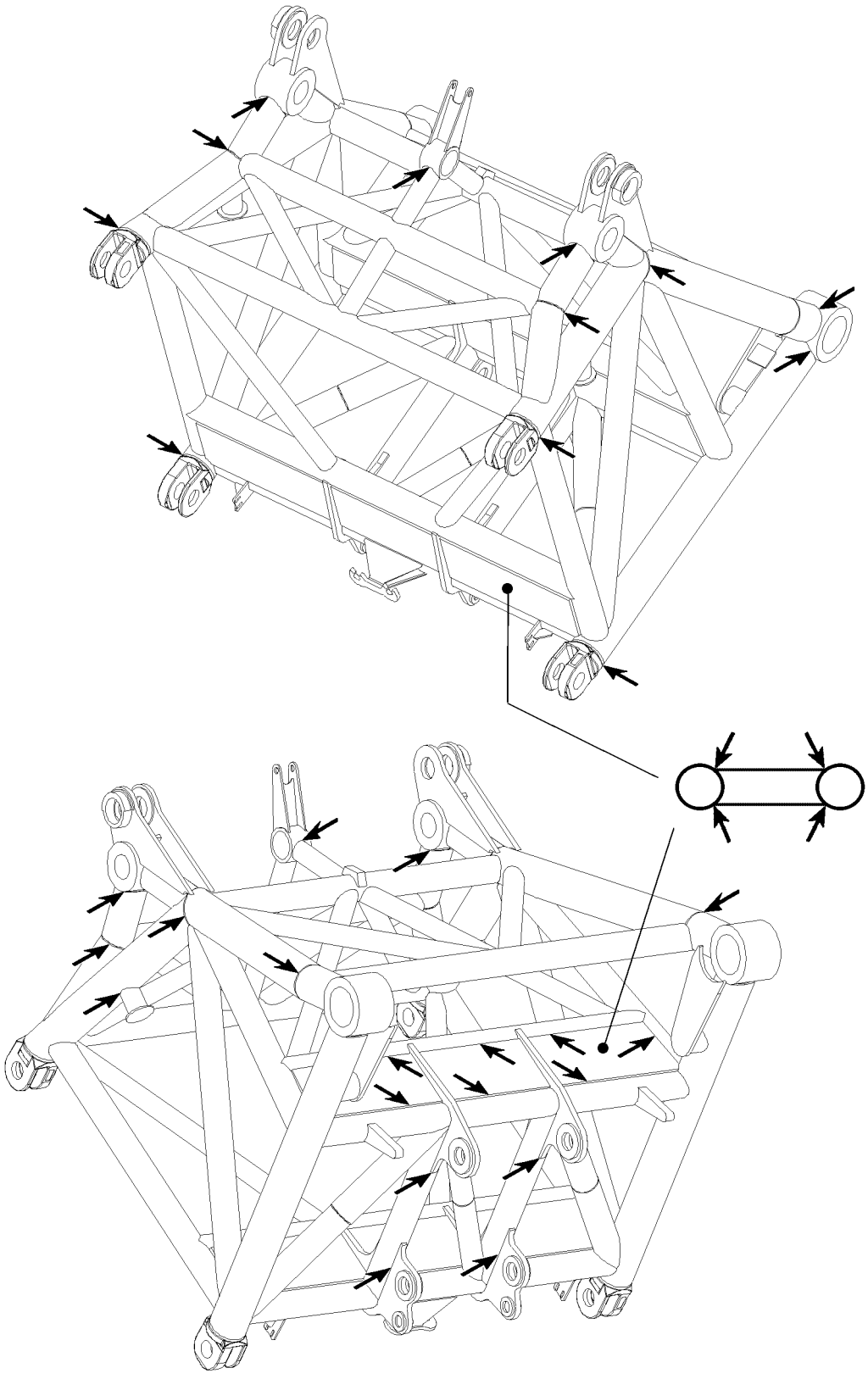
Example for folding jib

https://truckmanualshub.com/



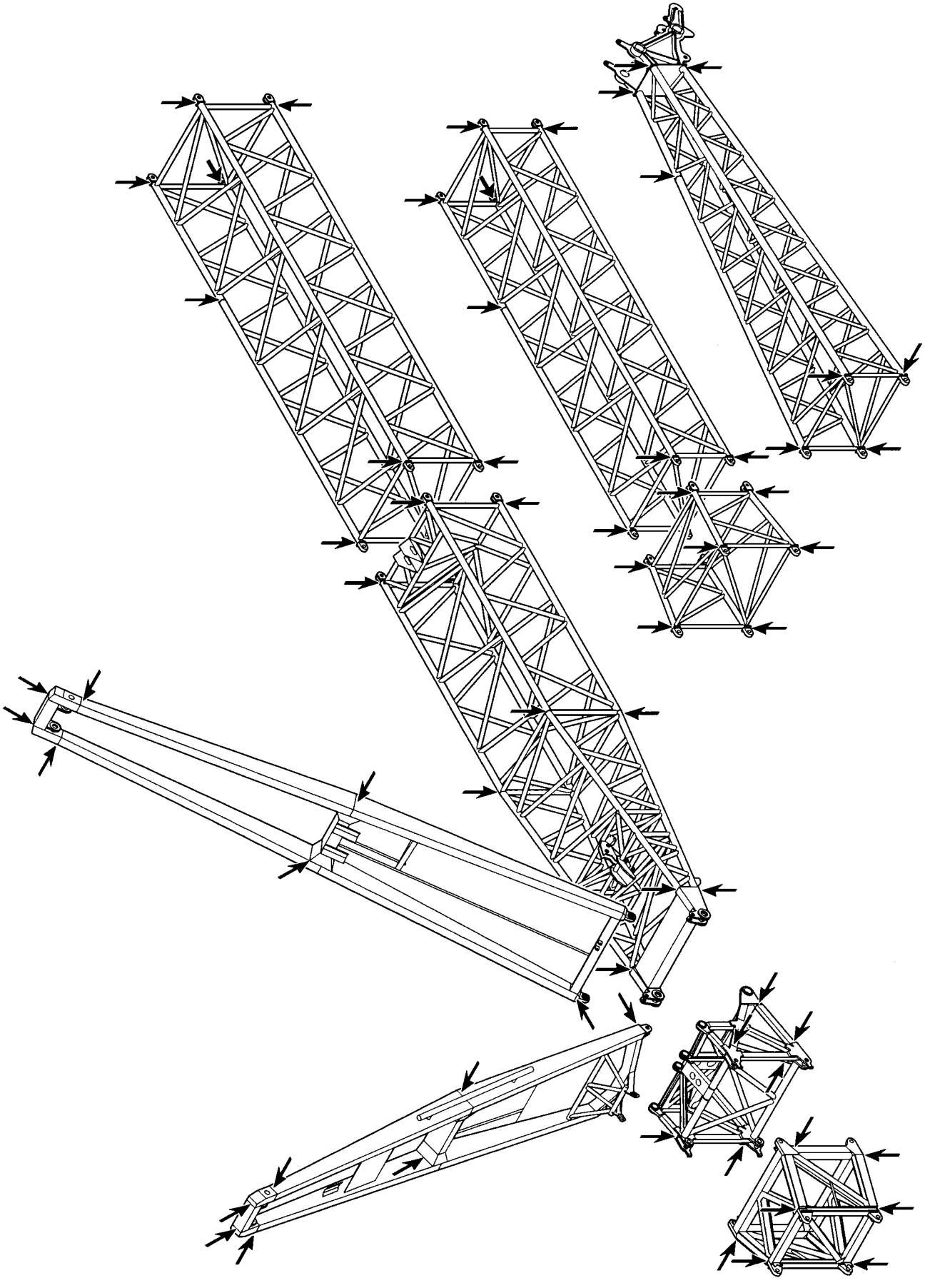
B105697 *Example for folding jib*

https://truckmanualshub.com/



B105732 *Example for W-connector head*

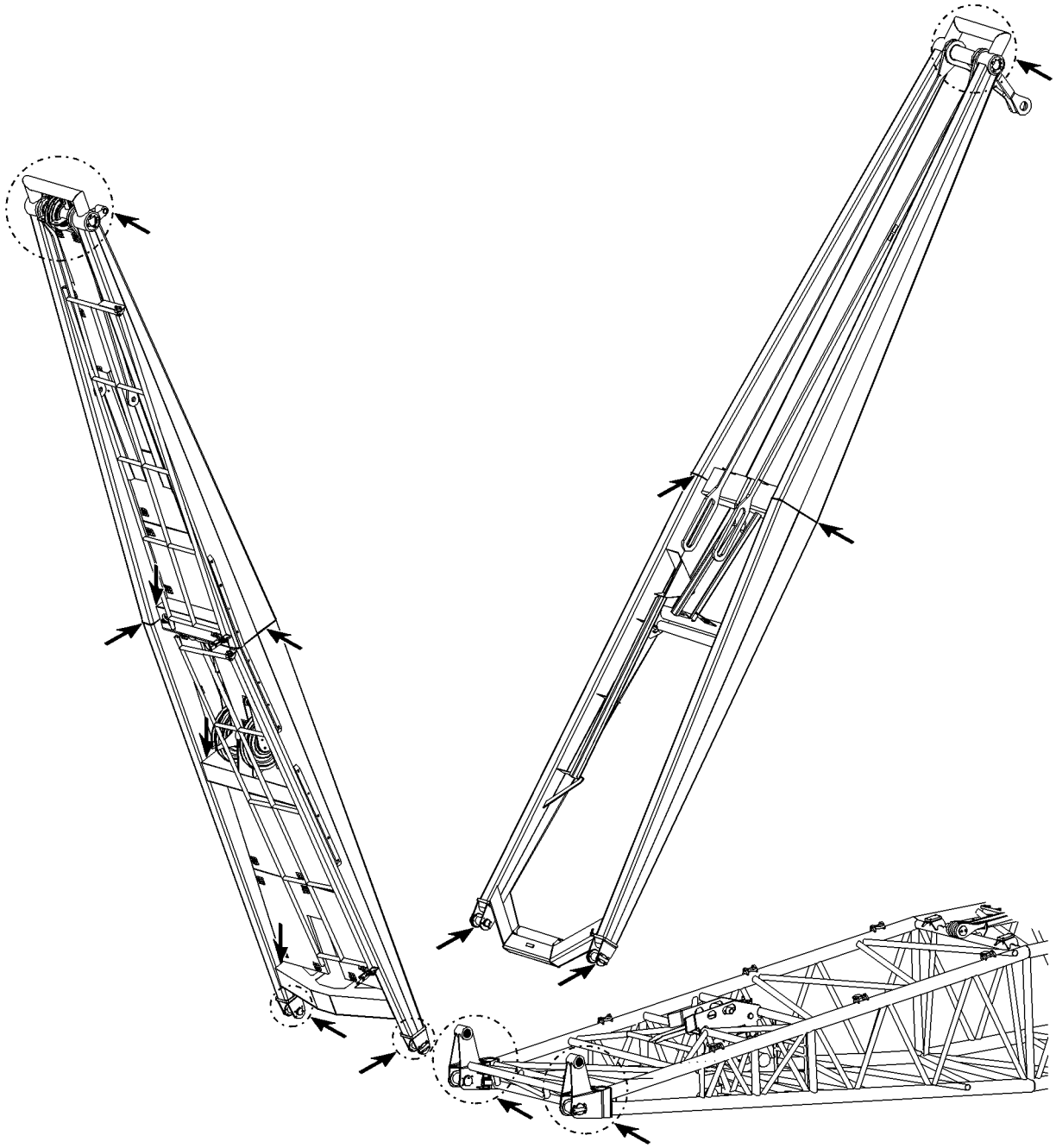
https://truckmanualshub.com/



B185053

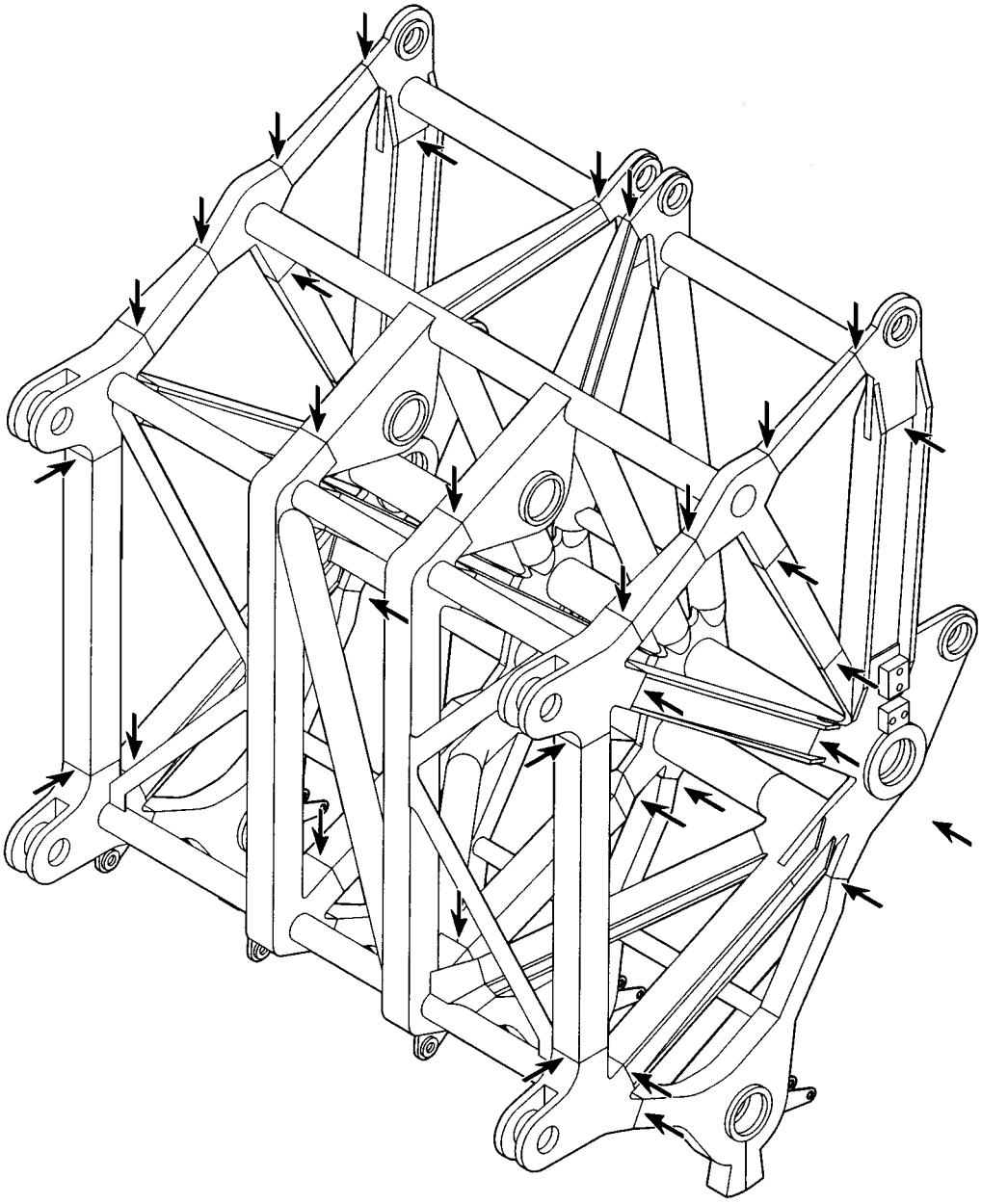
Example for assembly unit with lattice jib

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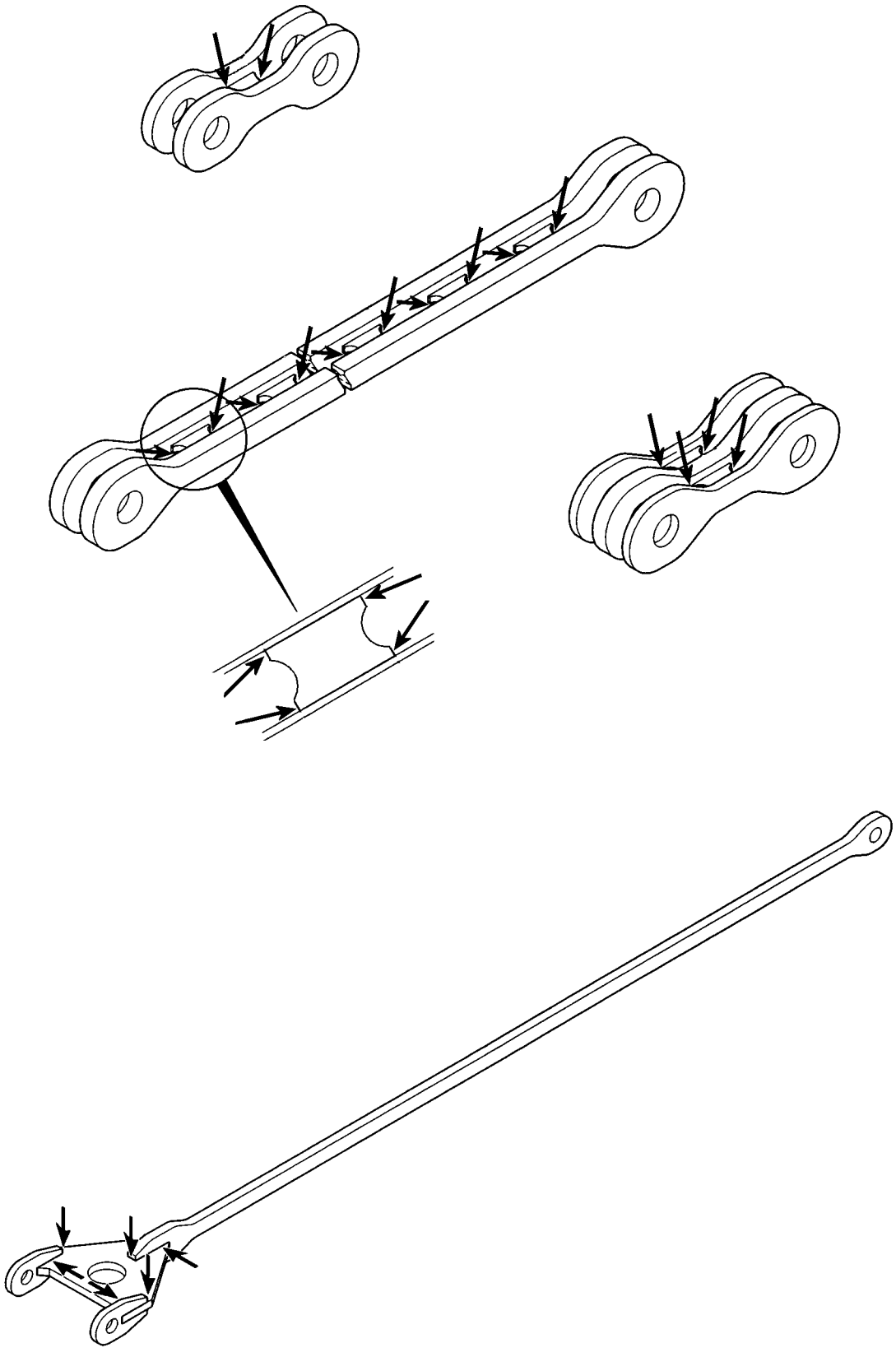
B105838 *Example for NA frames*

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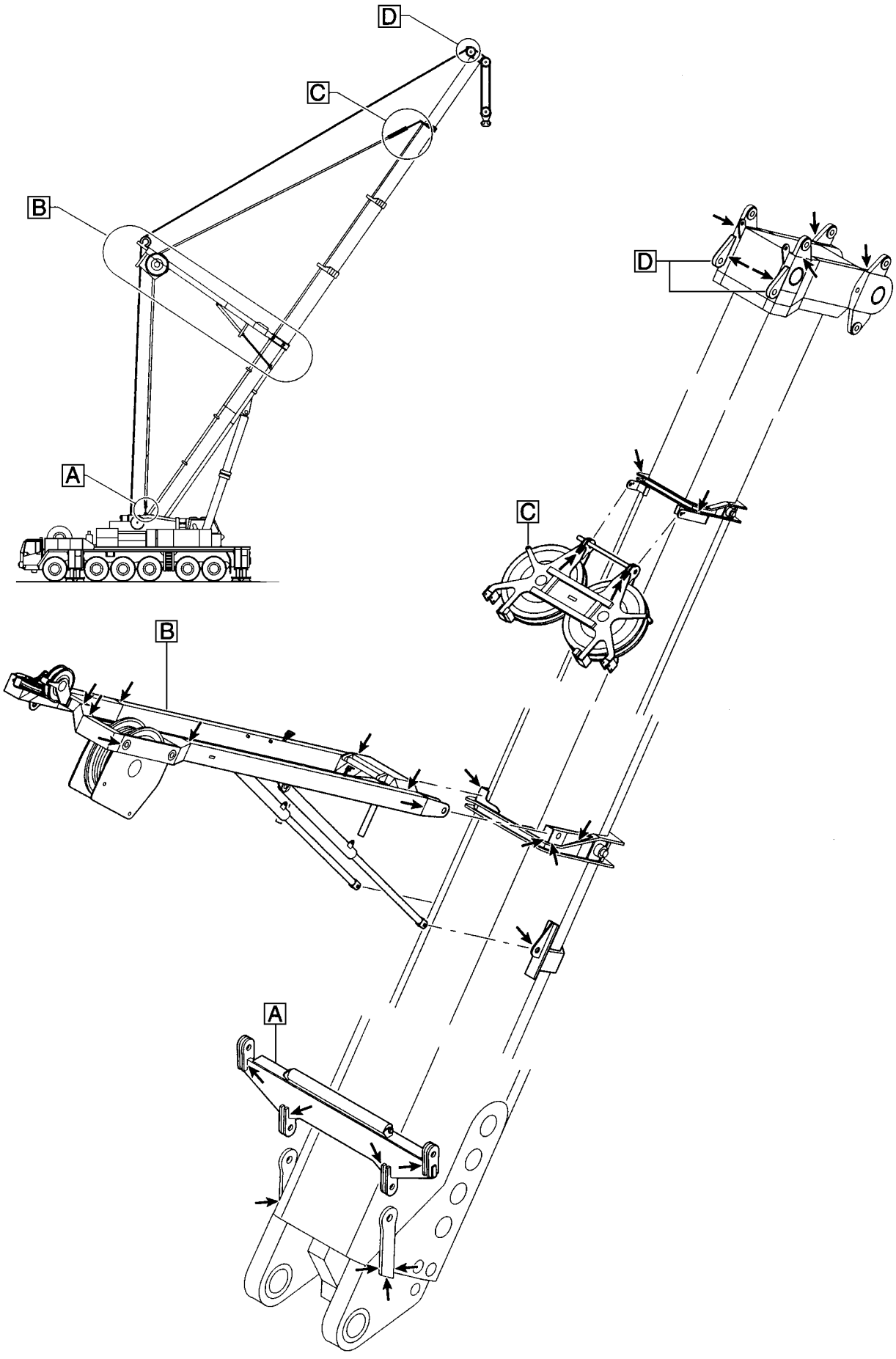
B185054 *Example for pulley head*

https://truckmanualshub.com/



B185055 *Example for guy rod*

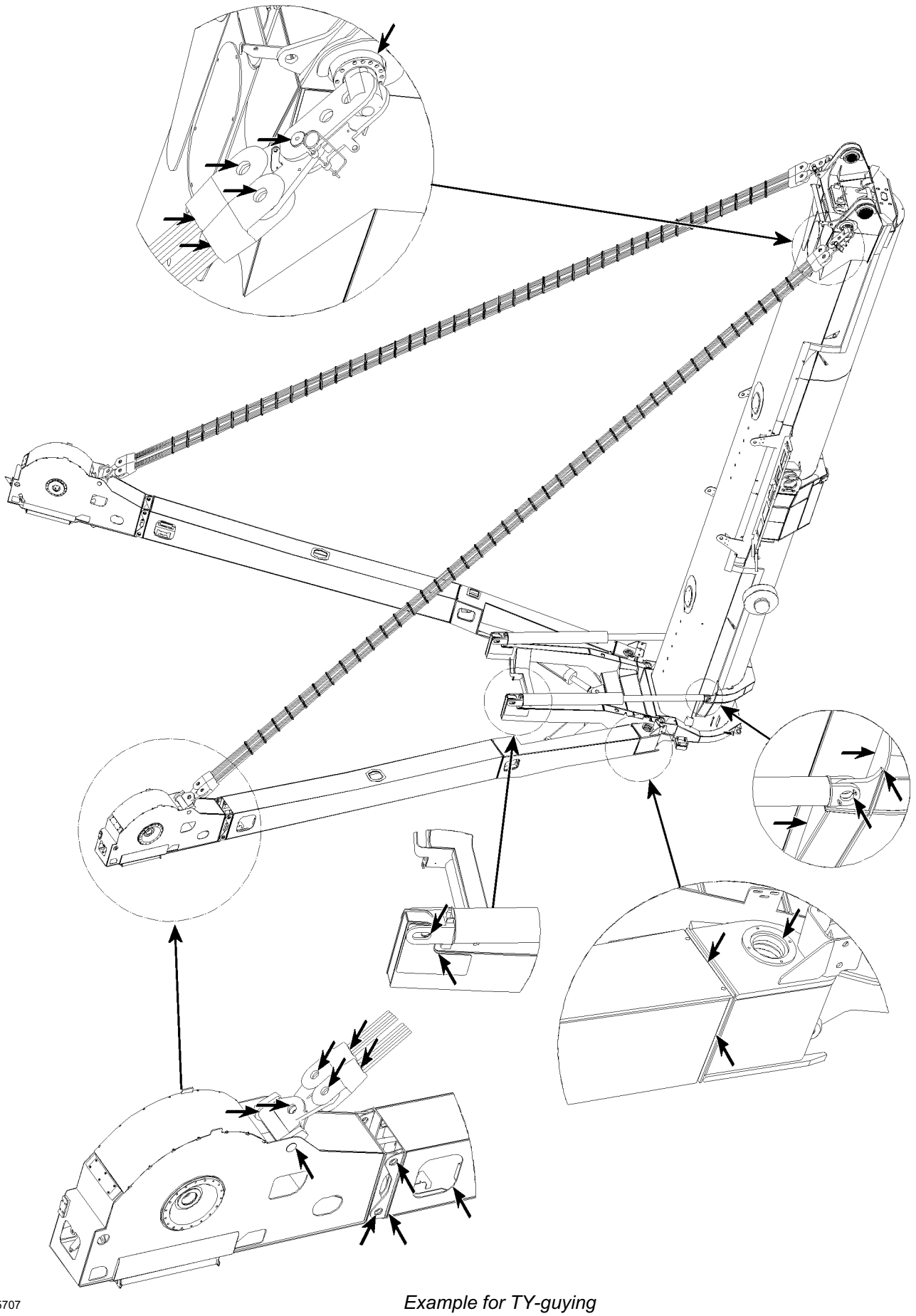
https://truckmanualshub.com/



B185059

Example for TA-guying

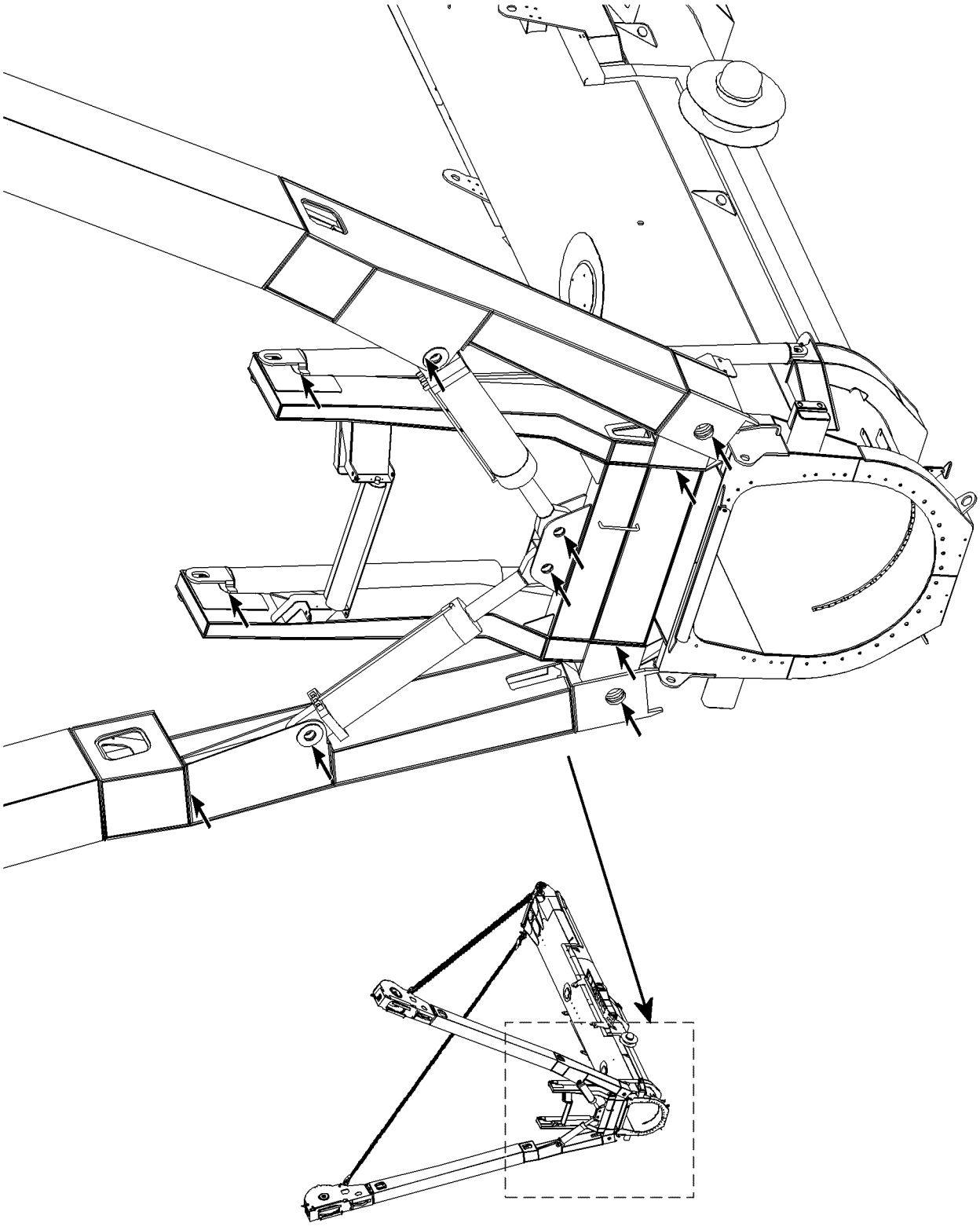
https://truckmanualshub.com/



B105707

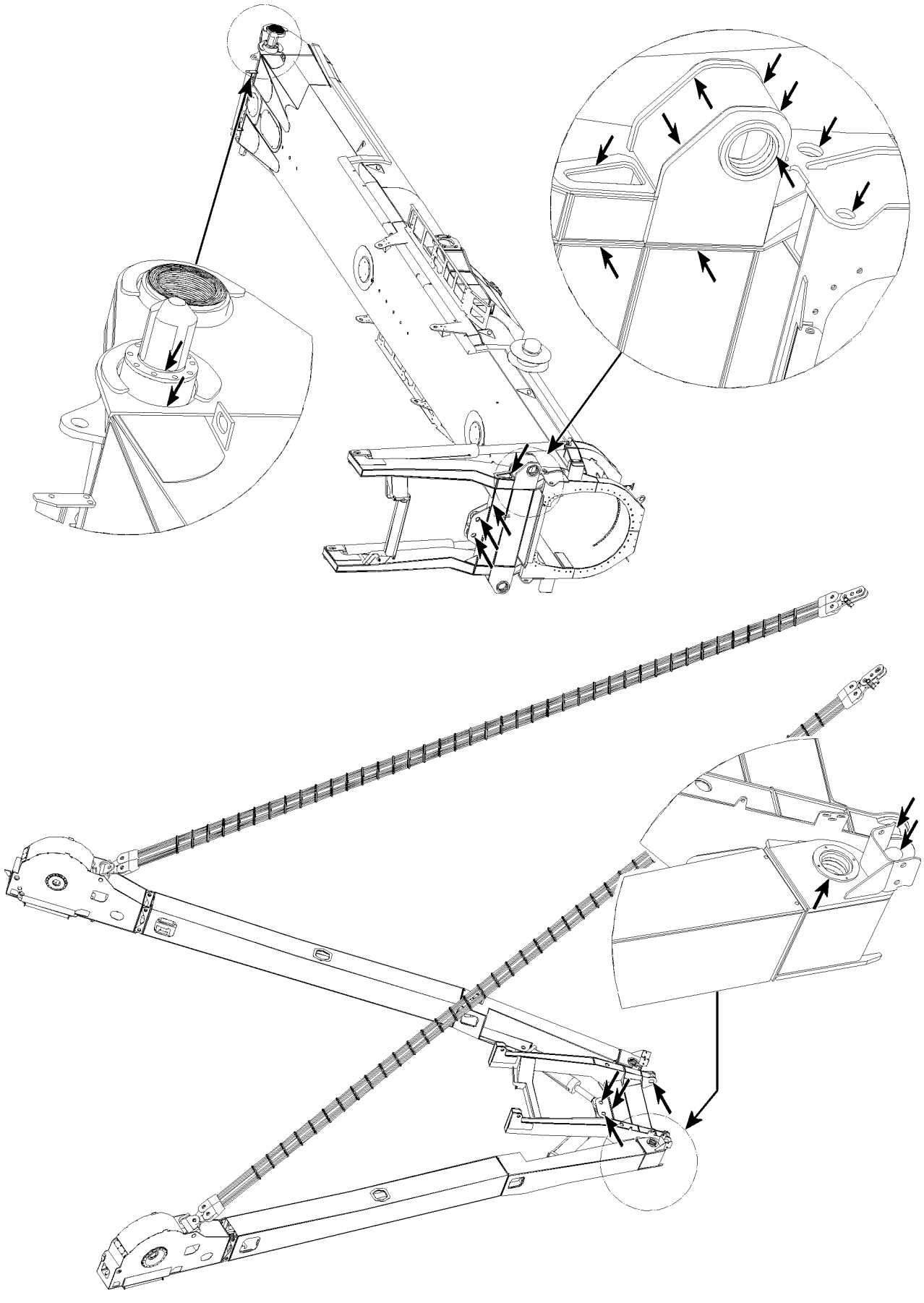
Example for TY-guying

https://truckmanualshub.com/



B105708 *Example for TY-guying*

https://truckmanualshub.com/



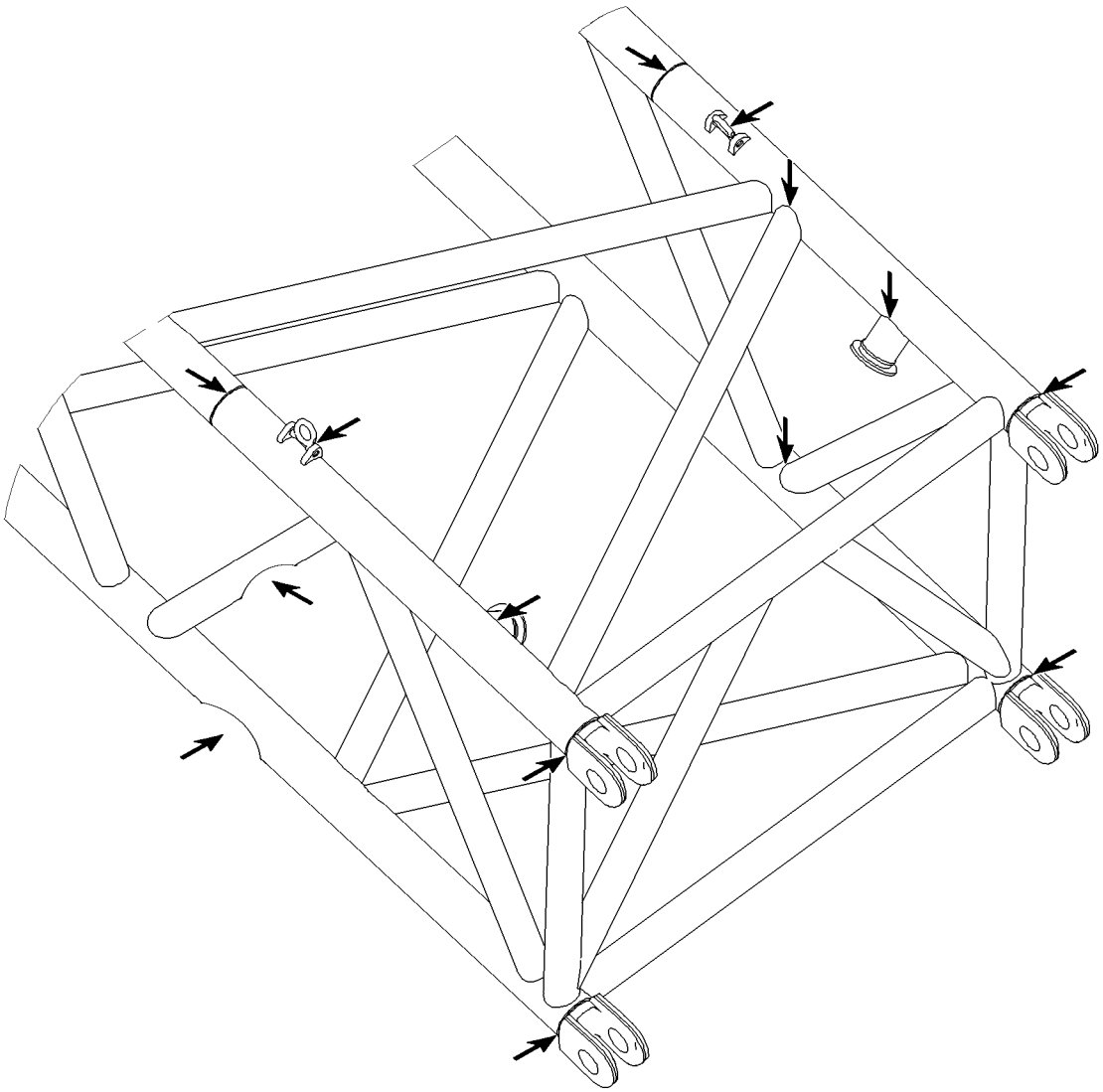
B105709

Example for TY-guying

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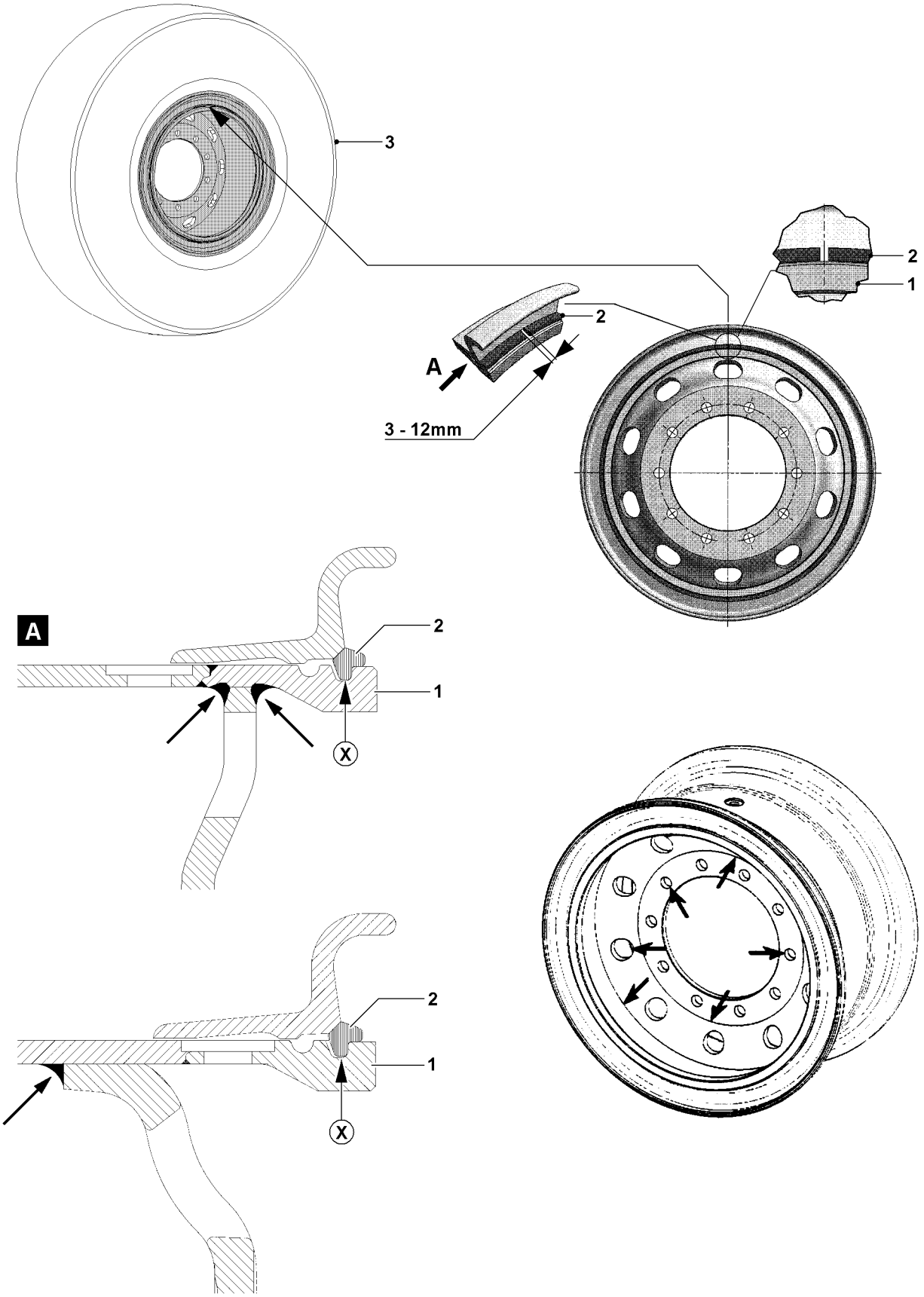
2.2 Inspection of lattice sections

Note
- ▶ The illustration is only an example and is valid for all lattice sections!
- ▶ Check all diagonal and frame pipe connections!



Example for lattice sections

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3 Inspection of tires and disk wheels

3.1 Inspection of tires

WARNING
Risk of accident if incorrect tires are used!
The use of improper tires and tires which do **not** meet the license permits may result in serious accidents with fatal injuries!
- ▶ Only tire types and sizes approved for this crane may be assembled on the crane.
- ▶ Regularly check the tires for damage, tread depth, foreign particles and tire pressures!
- ▶ Carefully remove any foreign particles stuck or wedged in the tire tread before starting to travel (for example: rocks 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.

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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.

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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.

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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

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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:

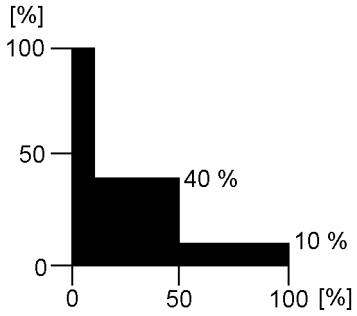
10 % of the time at maximum load (dead load and 1/1 working load)
40 % of the time with dead load and 1/3 working load
50 % of the operating time, with dead load only

Factor of load spectrum:

Km = 0.125

Graphic view:

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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.

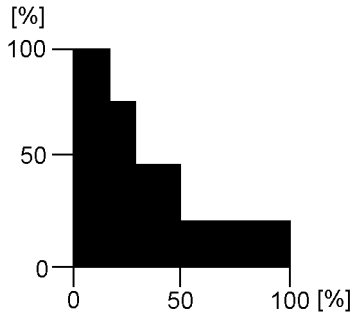
Operating time rates:

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:

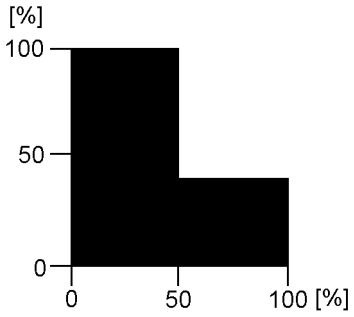
10 % of the time at maximum load (dead load and 1/1 working load)
50 % of the operating time, with dead load only

Factor of load spectrum:

Km = 0.5

Graphic view:

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Duty cycle class: Very heavy L4

Definition:

Power train or parts thereof are regularly subjected to near maximum load.

Operating time rates:

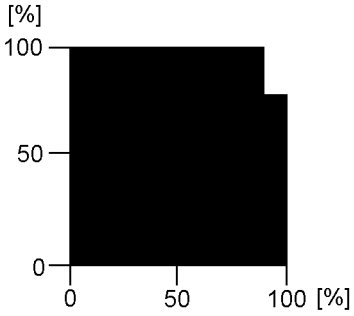
90 % of the time at maximum load (dead load and 1/1 working load)

10 % of the operating time, with dead load only

Factor of load spectrum:

Km = 1

Graphic view:



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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.

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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:
$D_2 = 3040\ \text{h} - 1920\ \text{h} = 1120\ \text{h}$

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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 : .....

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Chart to determine the remaining theoretical service life of winch No. ....

Crane type: .....
Fabrication No.: .....
Put in service: .....
Serial number of winch according to data tag: .....
Last general overhaul performed on: .....
Configuration data of winch (see Operating Manual): .....
Drive gear group: M.....
Load collective: Q.....(L.....)
Factor of load collective Km: .....
Theoretical service life D: .....

S_i = Used part of theoretical service life since last inspection
D_i = Remaining theoretical service life
D_{i-1} = Remaining theoretical service life after previous inspection
Km = Factor of load collective, which was taken for calculation of winch. This factor is to be taken from the Operating Manual
Km_i = Factor of load collective in inspection interval i
T_i = Effective operating hours in inspection interval i

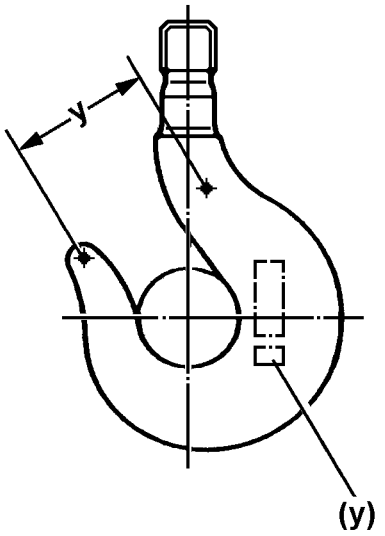
*) In the following pages, carry over the last line from the previous page.

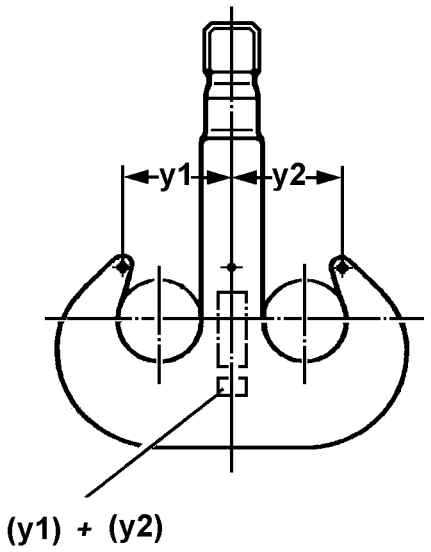
Inspection interval No. (max. annually) i	Date of initial service data of inspection	Operating conditions since last inspection (load collective)	Factor of load connective Km_i	Total crane operating hours [h]	Operating hours of super-structure [h]	Operating hours of super-structure since last inspection [h]	Operating hours of winch [h]	Operating hours of winch since last inspection T_i [h]	Used part of theoretical service life D: $S_i = \frac{Km_i}{Km} \times T_i$ [h]	Remaining theoretical service life $D_i = D_{i-1} - S_i$ [h]	Name of inspector	Signature	Remarks	Name of expert	Signature
(*)															

C A U T I O N : Perform general overhaul at least once every 10 years. In case of deviation, see guidelines in this chapter.

General overhaul last performed on : .....

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5 Inspecting load hooks

The load hooks must be visually inspected annually by a competent inspector.
This inspection must be carried out by an authorized expert every 4 years.
The purpose of the inspections is to avoid accidents by detecting deficiencies in a timely fashion.
Any deficiencies determined by the inspector must be documented, corrected, and subsequently reinspected.

5.1 Inspection and monitoring procedure

5.1.1 Deformation

The hook should be inspected for distortion as required, but at least once a year; e.g., at the hook jaw.
The original dimensions, (y) or (y1) and (y2), are given on the load hook itself.
Measure between the punch marks.

DANGER
Risk of accident!
Hook jaw 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

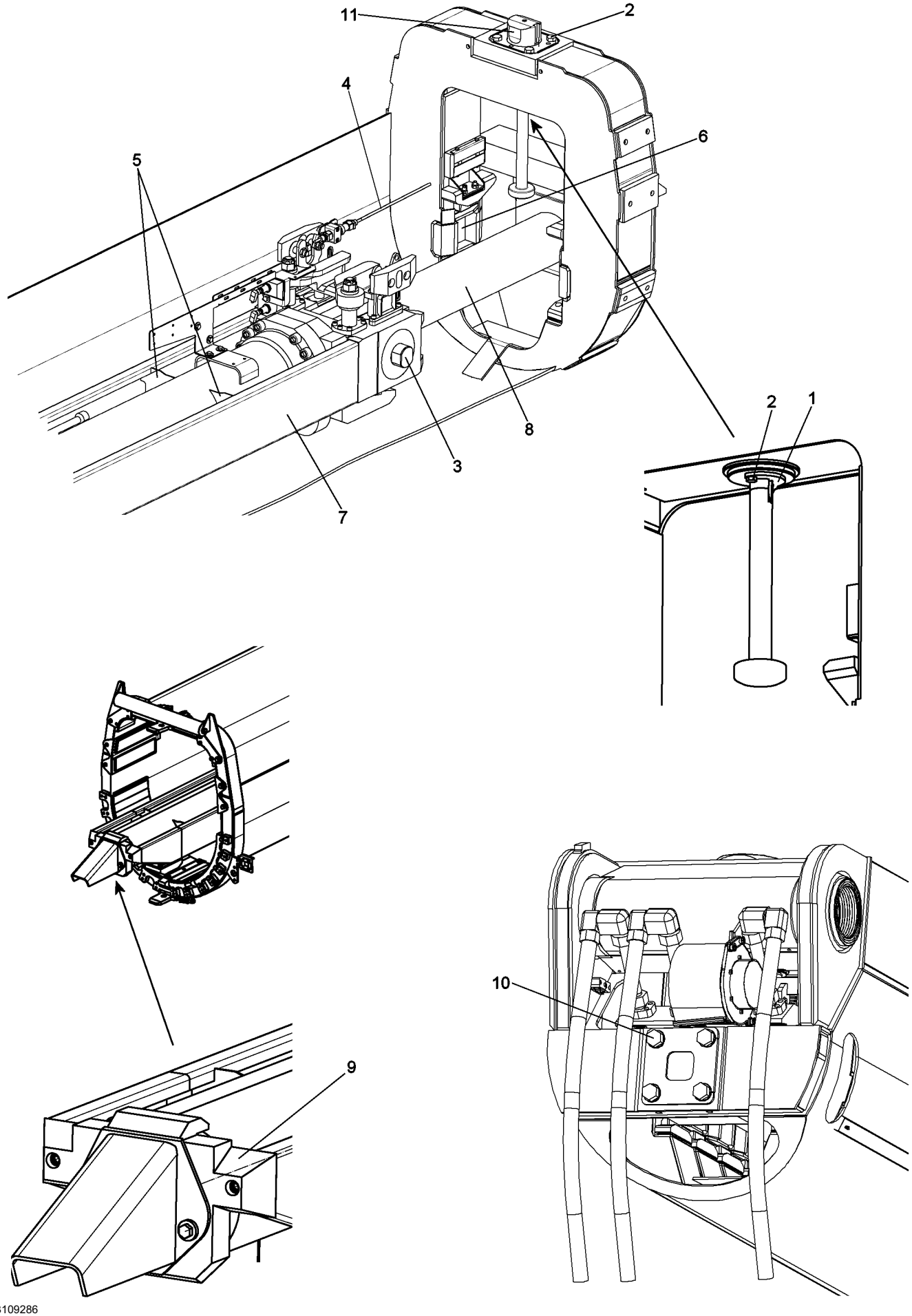
DANGER
Risk of accidents caused by thread corrosion / wear and tear!
▶ Stop using the load hook!
▶ Contact the Service Dept. at Liebherr-Werk Ehingen GmbH!

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.

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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!

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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.

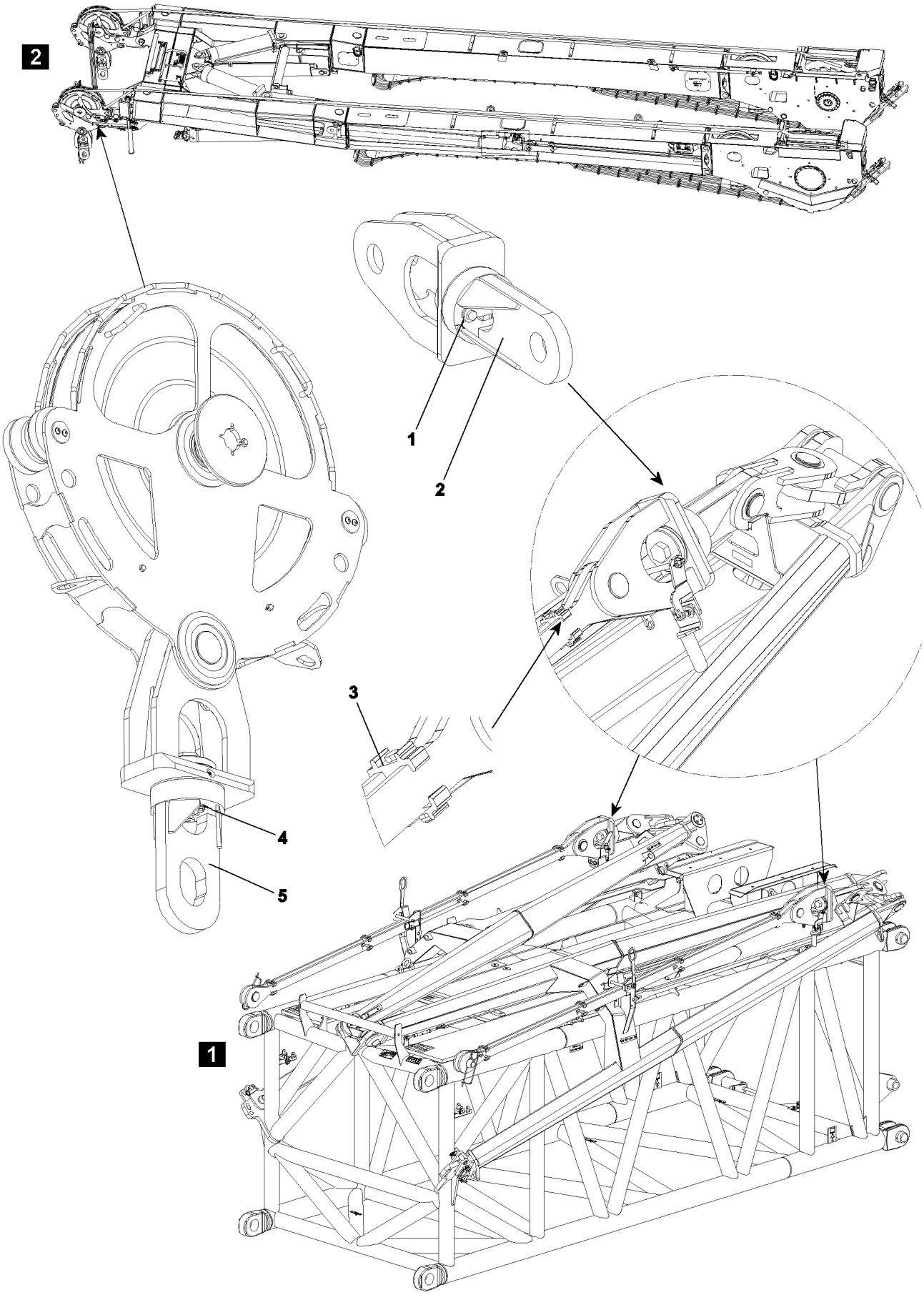
14 Inspecting the mounting of the load bearing equipment

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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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.

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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						

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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						

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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						

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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						

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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						

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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						

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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						

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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						

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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

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Evaluation:
Satisfactory = x
Unsatisfactory = -
Not required = 0

Comments:
[1] Inspection of the crane carrier vehicle road worthiness is also fulfilled if it has already been certified by the road traffic department certification authority. For cranes that are not certified for use on public roads, an expert or authorized inspector must conduct the required tests to validate the vehicle's road worthiness.
[2] These inspections must be carried out by an authorized inspector even if it has passed the road traffic department test and is certified.
[3] Inspection of the winches regarding the used portion of the theoretical service life.

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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.

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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

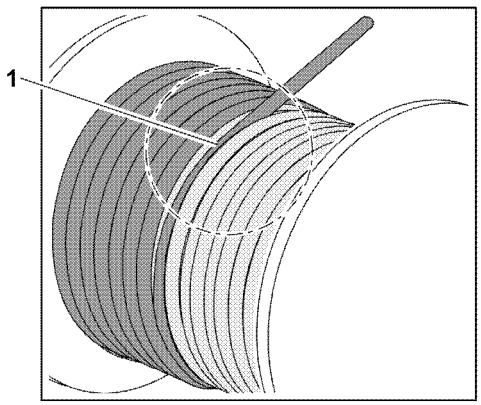
▶ If a rope is newly placed, then it must be pretensioned and placed with a pretension of at least 10 % of the maximum rope pull.

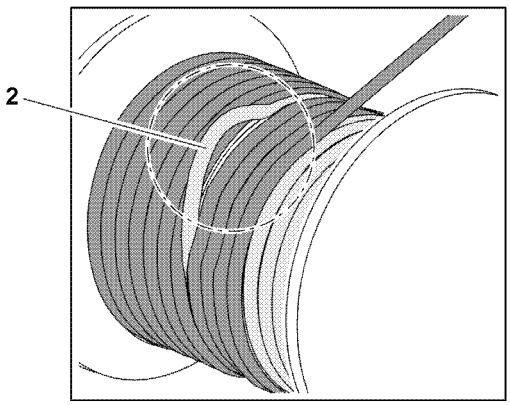
Special inspection as described in section “Points to check on the rope”

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**

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2.4.3 Points to check on the rope

General

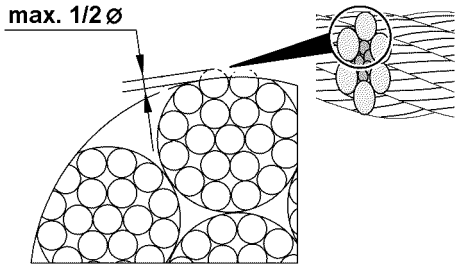
Although the entire length of the rope must be checked, particular attention must be paid to checking the following areas:

– 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.

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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.

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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.

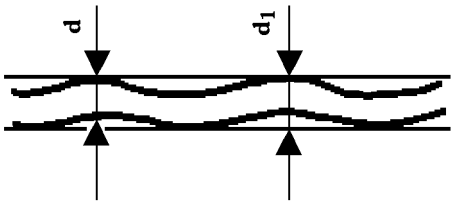
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2.5.8 Rope deformation

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.

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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.

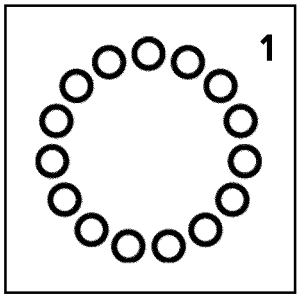
7.1 Rotation-resistant ropes and their rope end connections

Rotation-resistant ropes are special ropes that produce extremely little torque and twisting at the rope end connection when they are under strain.

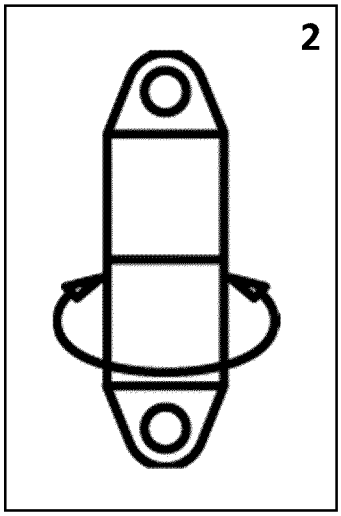
Note
▶ Rotation-resistant ropes are used as **hoist ropes**.

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1



2



3



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!

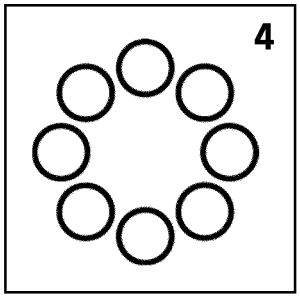
Note
Usage warning notes
▶ The usage warning notes on the rotating PFEIFER link with pulley indicates that this rope end connection may **not** be used for non-rotation free ropes (see table **3**)!

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**.

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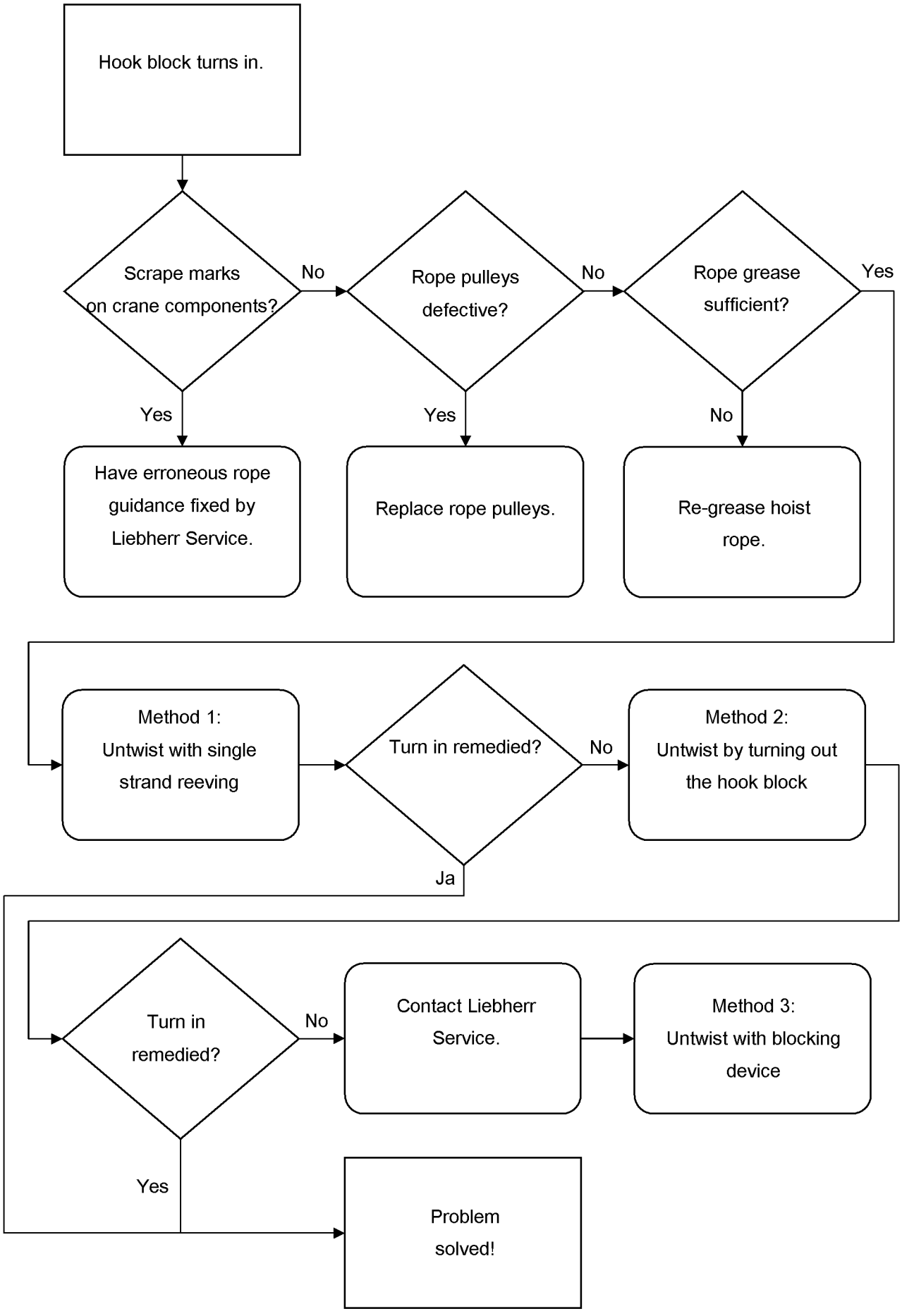
Typical non-rotation free wire rope structures are ropes with 8 to 10 outer strands. Twisting ropes are symbolically depicted with 8 outer strands (circles) (see table **4**).
Non-rotation free ropes can only be used with the following rope end connections:

– 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**)!

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8 Twisting caused by stretching in rotation-resistant ropes and its remedy

For procedure, see illustration opposite.

WARNING
Damage to the rope!
▶ Please proceed with extreme caution when performing the following actions.
▶ 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.

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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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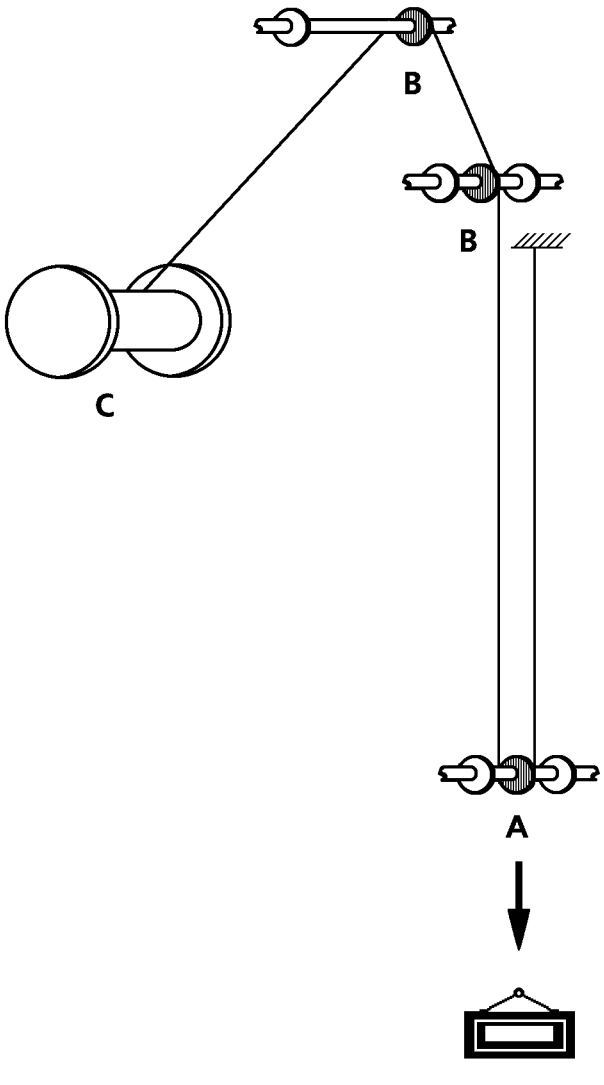


Fig. 1

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A Hook block **B** Cable pulley **C** Rope drum

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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

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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.

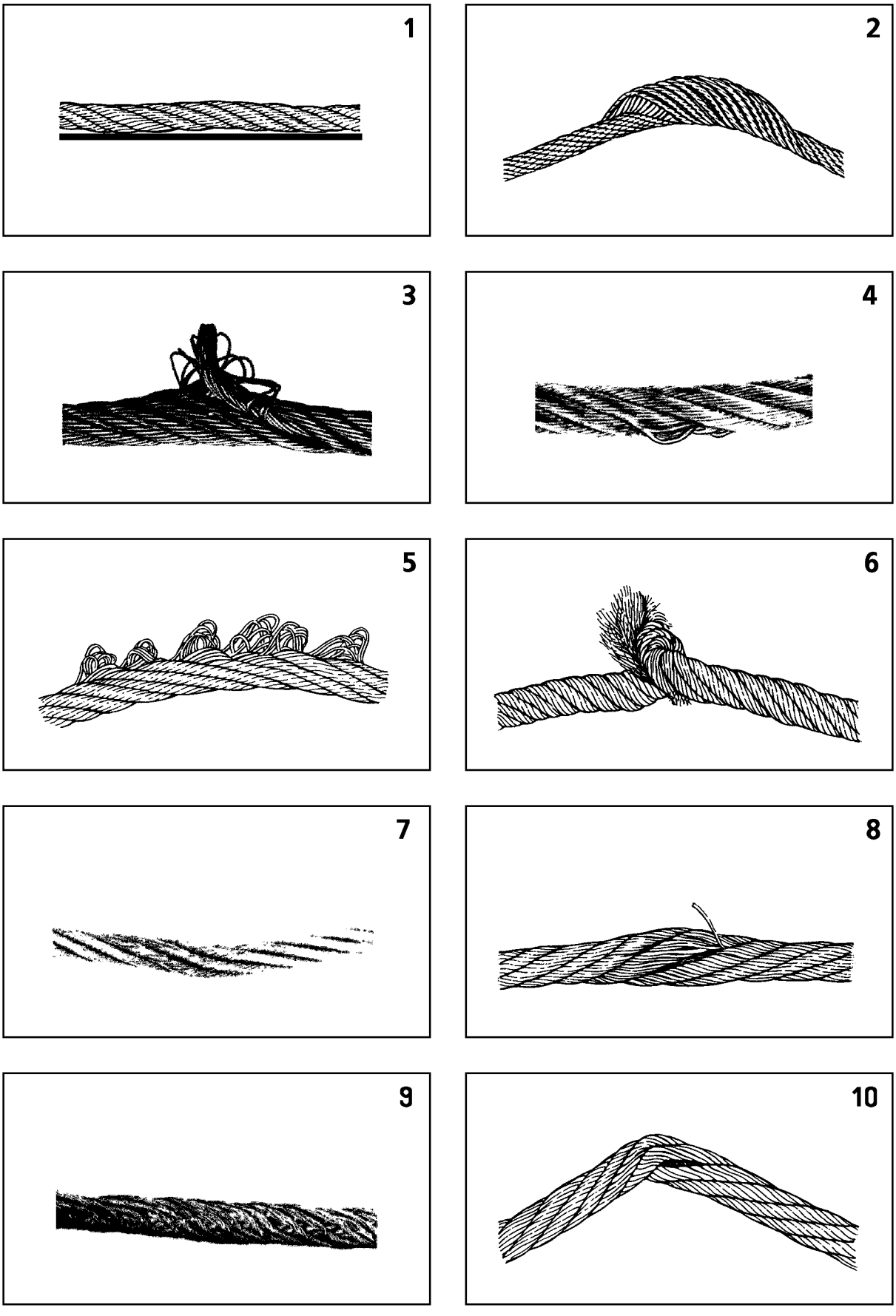
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10 Appendix 2

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

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12.1 Wire ropes

12.1.1 Hoist ropes

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	2	4

Note

- If a rotation resistant hoist rope is placed on winch 5, then it can be used for the jib adjustment or as a hoist rope for the boom nose!

WARNING

Use the hoist rope as control rope!

Frequent jib adjustment movements with a rotation resistant hoist rope lead to significant wear and require premature take down of the hoist rope!

If is is not recognized in time that the rope needs to be taken down, the hoist rope can rip!

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

- In case of frequent jib adjustment movements, a non-rotation free control rope must be placed!
- Make sure that no spin stabiliser / swivels are used as rope end connections when using a non-rotation free control rope!
- Remove spin stabiliser or swivels!

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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WARNING

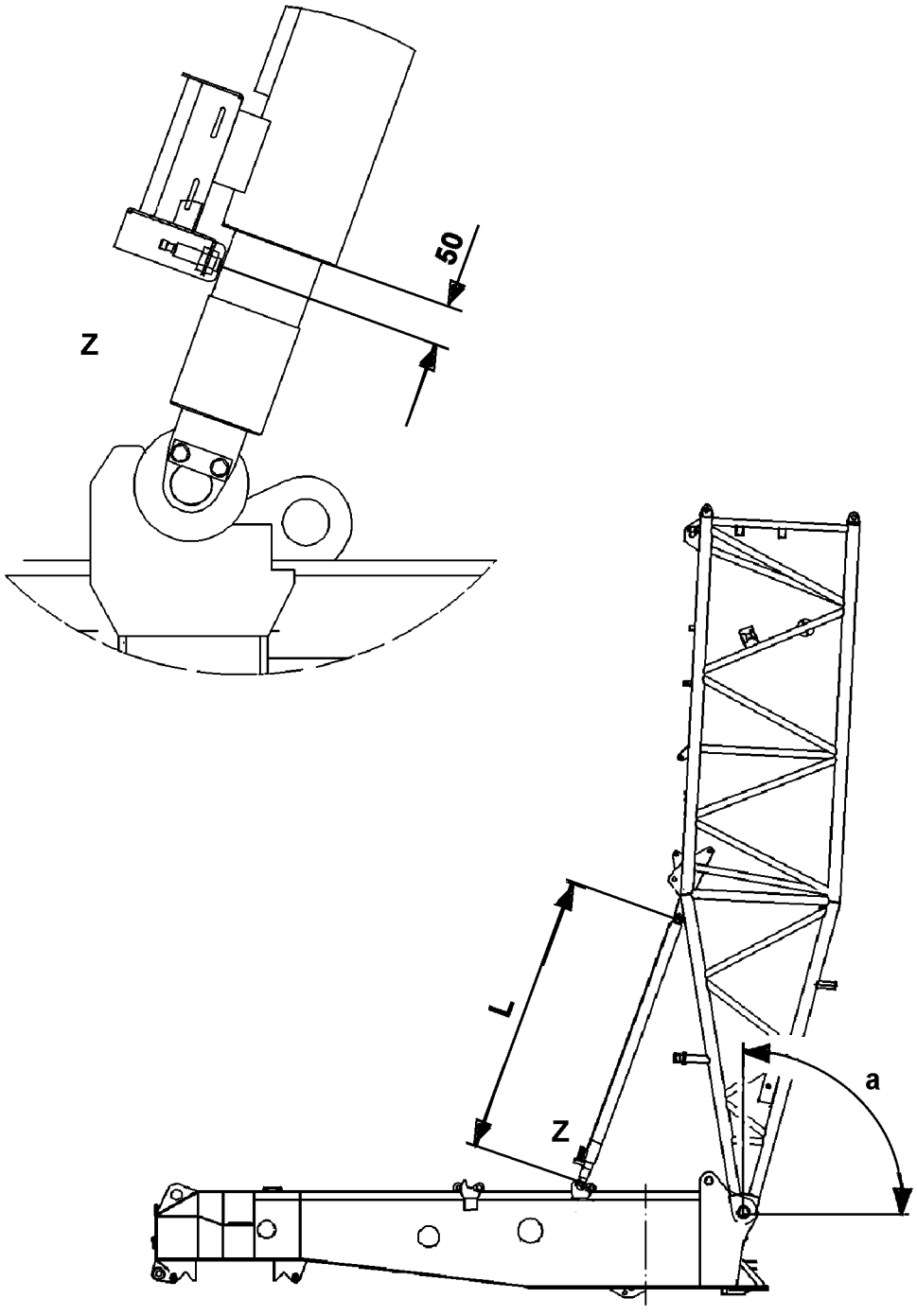
Non-rotation free control ropes can rip off!

If a non-rotation free control rope is used in connection with a rotating rope end connection, the rope damage can occur or the control rope can rip off!

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

- ▶ Make sure that no spin stabiliser / swivels are used as rope end connections when using a non-rotation free control rope!
- ▶ Remove spin stabiliser or swivels!

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1 Check safety controls on relapse supports

1.1 Check relapse retainers on S/L-boom

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.

Note

▶ In steepest boom position, the luffing up movement is turned off by the actuated limit switches on the cylinders!

Checking the limit switch initiators for function

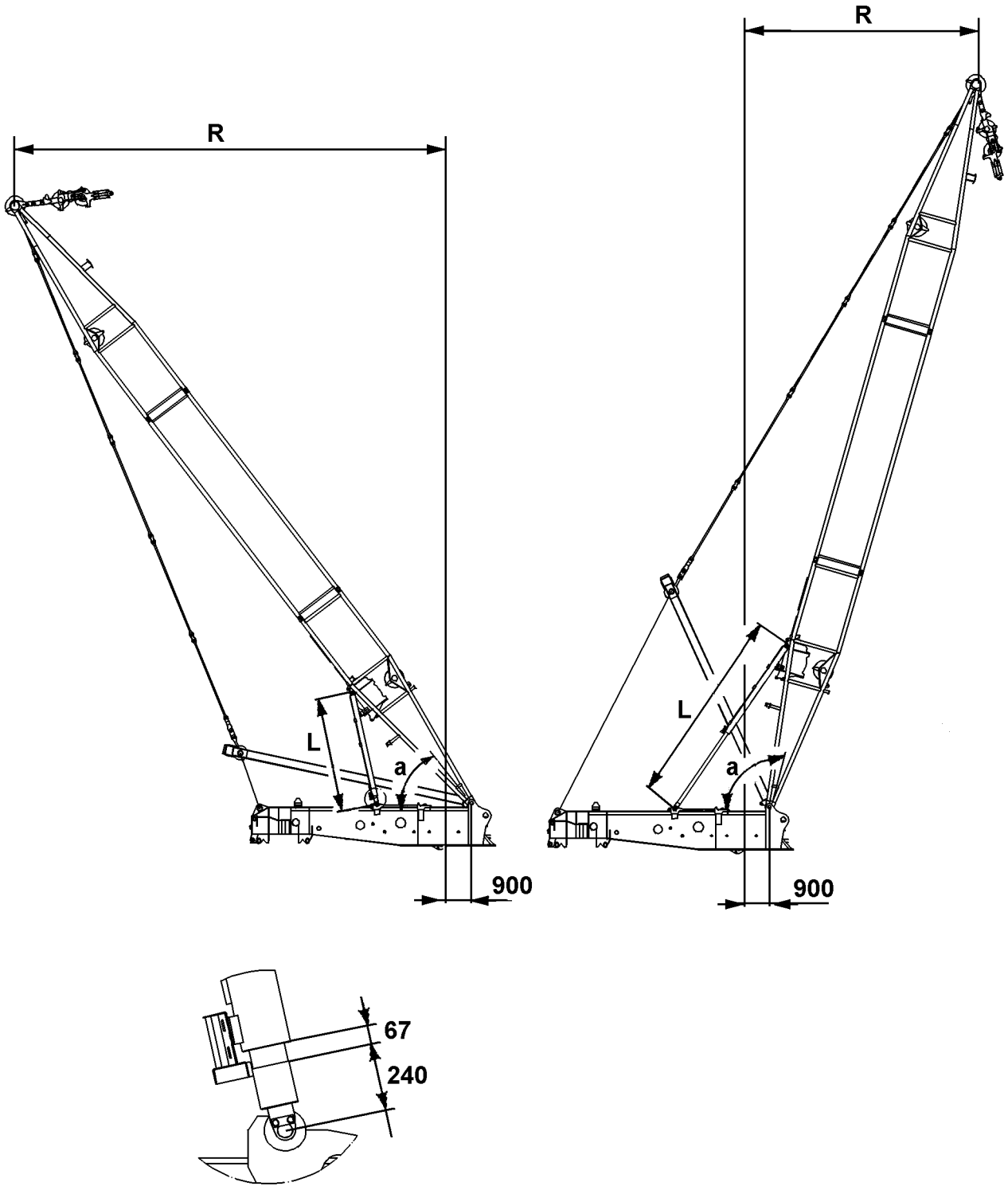
	Angle a	Cylinder length L
Flattest position	29°	6000 mm
Steepest position	87°	4052 mm
Electric switch position	88°	4010 mm
Block position	89°	3970 mm

▶ Cover limit switch initiators on the S-relapse cylinder individually with a metal plate.

Note

▶ The S-boom movement “luff up” must turn off!
▶ The icon must appear on the LICCON monitor!

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1.2 Checking the relapse retainers on the derrick boom

Two hydraulic cylinders prevent the derrick boom from falling backward.

Note

▶ If the limit switches on the cylinders are actuated, the winch 4 “spool up” movement is turned off!

Checking the limit switch initiators for function

	Slewing radius R	Angle a	Cylinder length L
Cylinder extended	-8.3 m	105,9°	7100 mm
R min. only LD,SLD,SD	9.0 m	68,5°	5046 mm
Nominal position	11.0 m	63,9°	4771 mm
Nominal position	13.0 m	59,0°	4484 mm
Nominal position	15.0 m	53,9°	4184 mm
Electric switch position	15.5 m	52,6°	4107 mm
Block position	15.9 m	51,6°	4050 mm

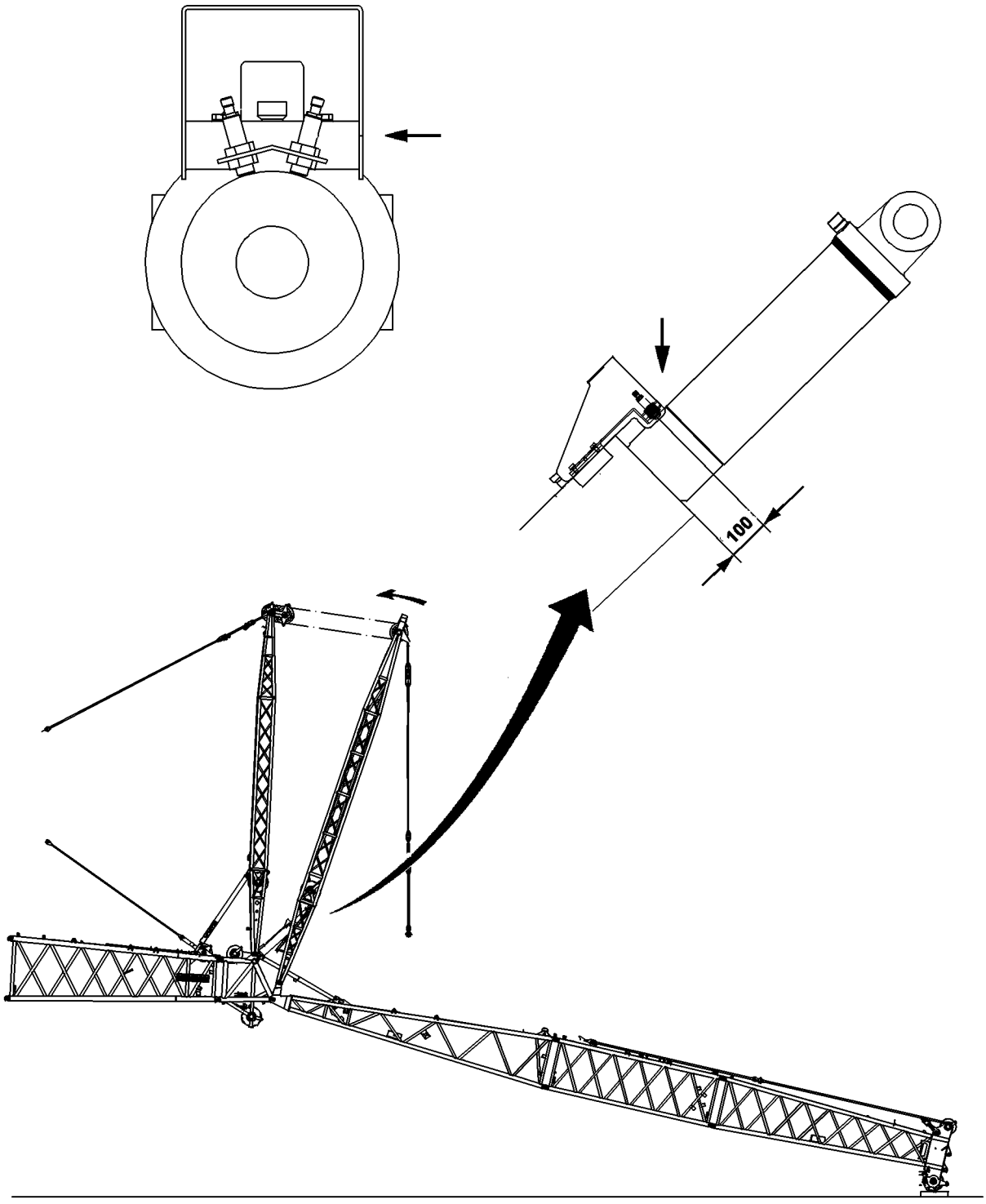
▶ Cover limit switch initiators on the D-relapse cylinder individually with a metal plate.

Note

▶ The derrick movement “luff up”,“spool up” winch 4, must turn off!

▶ The icon must appear on the LICCON monitor!

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1.3 Checking the safety controls on the W-lattice jib

1.3.1 Checking the relapse retainers on the W-lattice jib

Checking the limit switch initiators for function

▶ Cover the limit switch initiators on the W-relapse cylinder individually with a metal plate.

Note

▶ The control winch movement “spool up” must turn off!
▶ The icon must appear on the LICCON monitor!

Checking the limit switch initiators on switch point “steepest position”

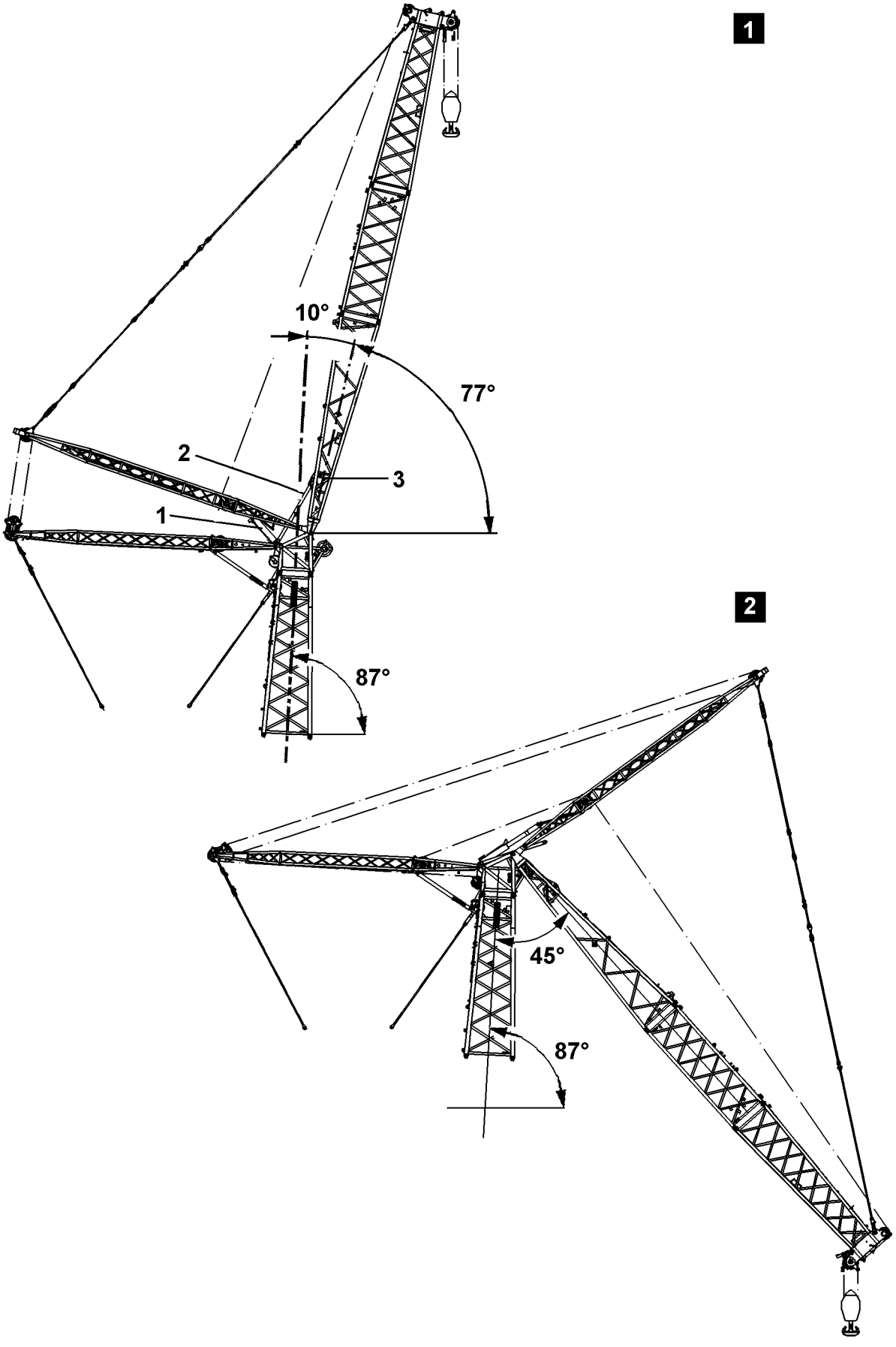
▶ Before erection of the boom: Check the function of the limit switch initiators in installed condition.
▶ Pull up both WA-frames to the specified dimension until the switch contact opens, see illustration.

Note

▶ The control winch movement “spool up” must turn off!
▶ The icon must appear on the LICCON monitor!

▶ After successful check: Reset the WA-frames back to the set up condition.

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Switch position W-lattice jib “top”

See fig. **1**.

Note

▶ The control winch movement “spool out” must turn off!

	Angle
Steepest operating position, switch position, relapse support **2** in flap **3**	10°
Block position, relapse support **2** in flap **3** on block	7°

Switch position W-lattice jib “bottom”

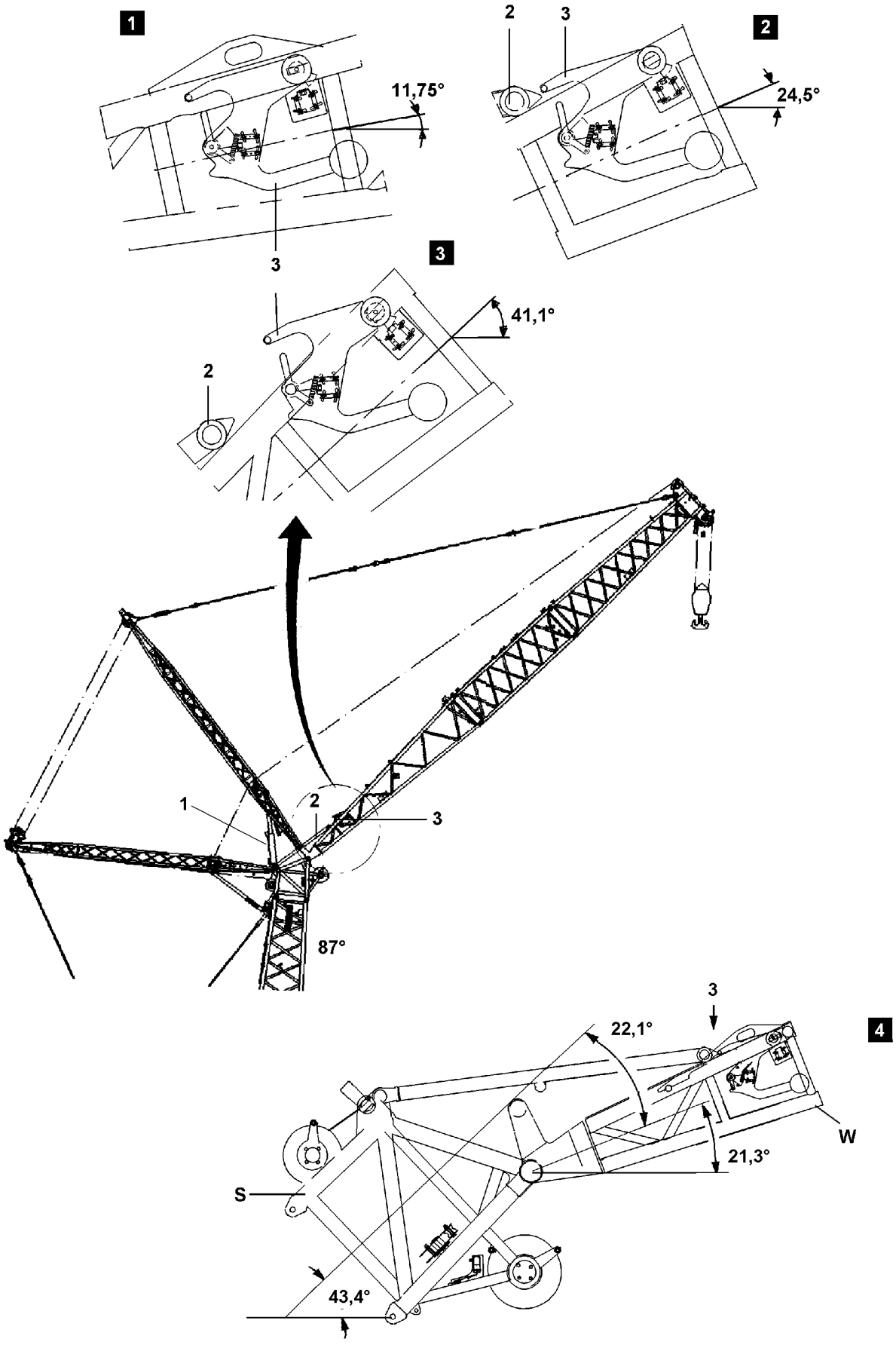
See fig. **2**.

Note

▶ The control winch movement “spool out” must turn off!

	Angle
W-lattice jib “bottom”	45°
Theoretical block position	40°

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1.3.2 Checking the mechanical relapse retainers on the W-lattice jib

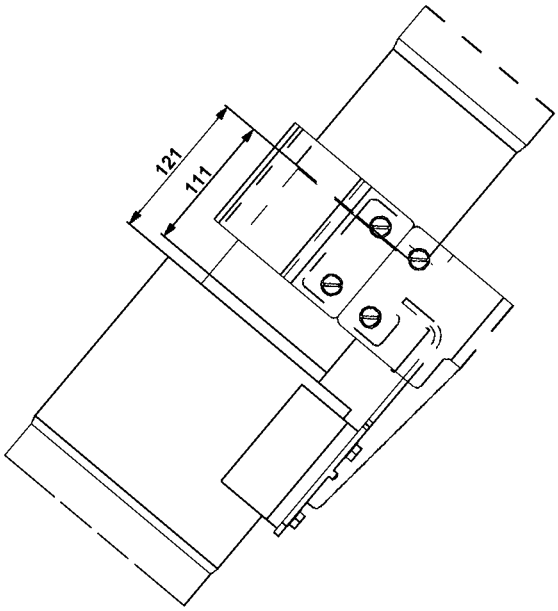
In addition to the relapse cylinders, the lattice jib is also secured by a mechanical relapse support **2**, which engages in steepest lattice jib position into the flap of the oscillating guard. The luffing up movement is turned off by the actuated limit switches on the oscillation guard.

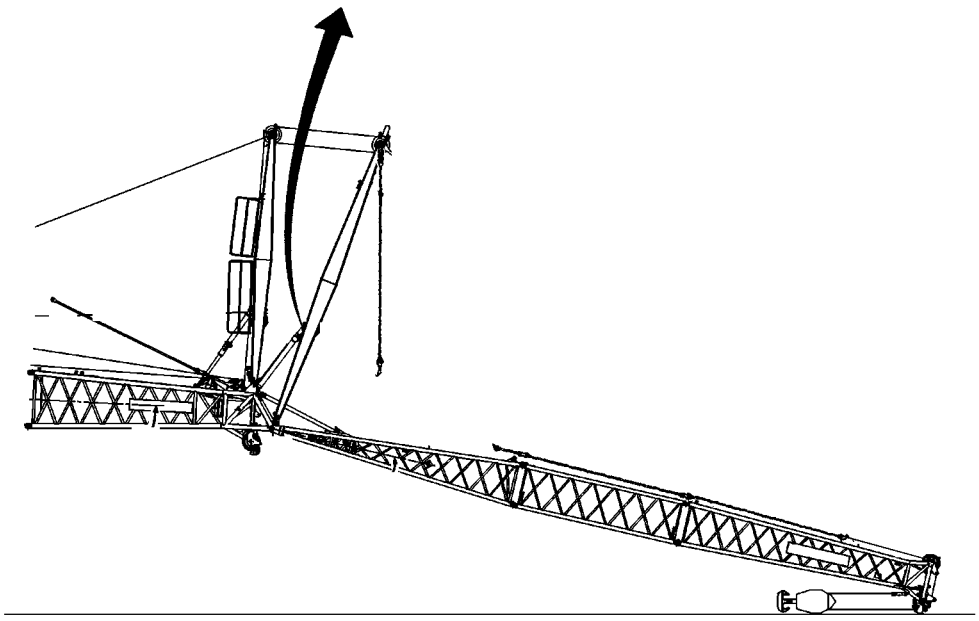
WARNING
Danger of tipping over if the oscillation guard is hard to move!
If the oscillation guard is hard to move, the mechanical relapse retainer will no longer function. The W-lattice jib can tip backwards uncontrolled and cause the crane to topple over!
- ▶ Crane operation with hard to move oscillation guard is prohibited!
- ▶ Before erection, the pendulum of the mechanical relapse retainer must be checked for easy movement over the complete swing range of the pendulum.

WARNING
Risk of collision!
If the angle between the boom and the lattice jib is smaller than or equal to 21.3° , the mechanical relapse support **2** will collide with the flap on the oscillating guard **3**. The lattice jib can tip backward uncontrolled and cause the crane to topple over!
Personnel can be killed!
- ▶ Never exceed the angle 21.3° when luffing up!
- ▶ Carry out visual inspection!

Depending on the lattice jib position (boom position = 87°), the flap on the oscillation safety is swung out by the weight of the pendulum:
- – 11.7° the flap is swung in, see fig. **1**.
- – 24.5° the flap can be pushed open, see fig. **2**.
- – 41.1° the flap is swung out, see fig. **3**.
- – 21.3° the flat is at collision, see fig. **4**.

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1.4 Checking the safety controls on the N-lattice jib

1.4.1 Checking the limit switch initiators for function

▶ Cover the limit switch initiators on the N-relapse cylinder individually with a metal plate.

Note

▶ The control winch movement “spool up” must turn off!

1.4.2 Checking the limit switch initiators on switch point “steepest position”

▶ Before erecting the boom, check the function of the limit switch initiators in installed condition.

▶ Pull up both NA-frames to the specified dimension until the switch contact opens, see illustration.

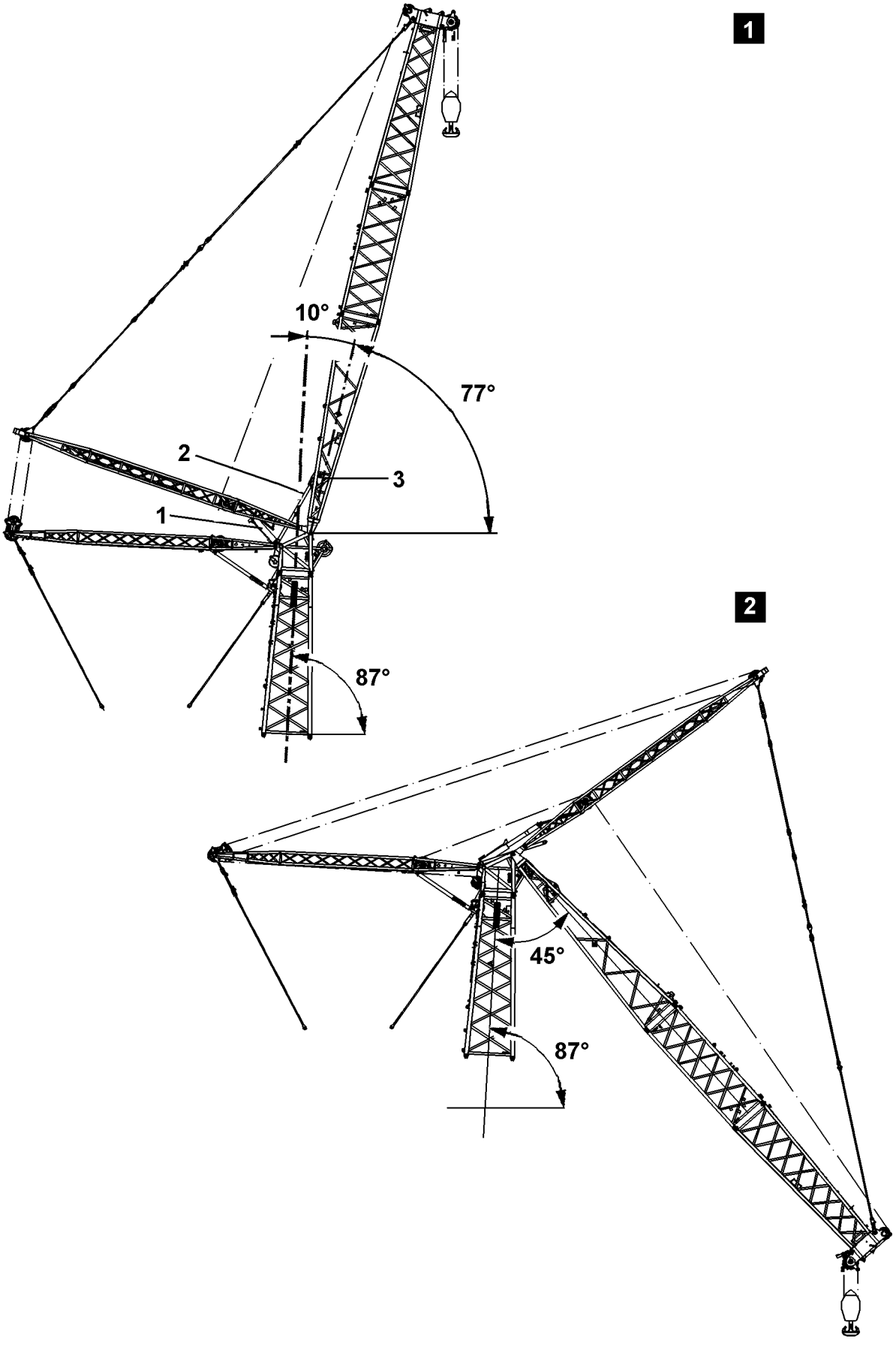
Note

▶ The control winch movement “spool up” must turn off!

▶ The icon must appear on the LICCON monitor!

▶ After successful check: Reset the NA-frames back to the set up condition.

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1.4.3 Switch position N-lattice jib “top”

See fig. **1**.

Note
▶ The control winch movement “spool out” must turn off!

	Angle
Steepest operating position: Switch position, relapse support **2** in flap **3**	10°
Block position: Relapse support **2** in flap **3** on block	6,5°

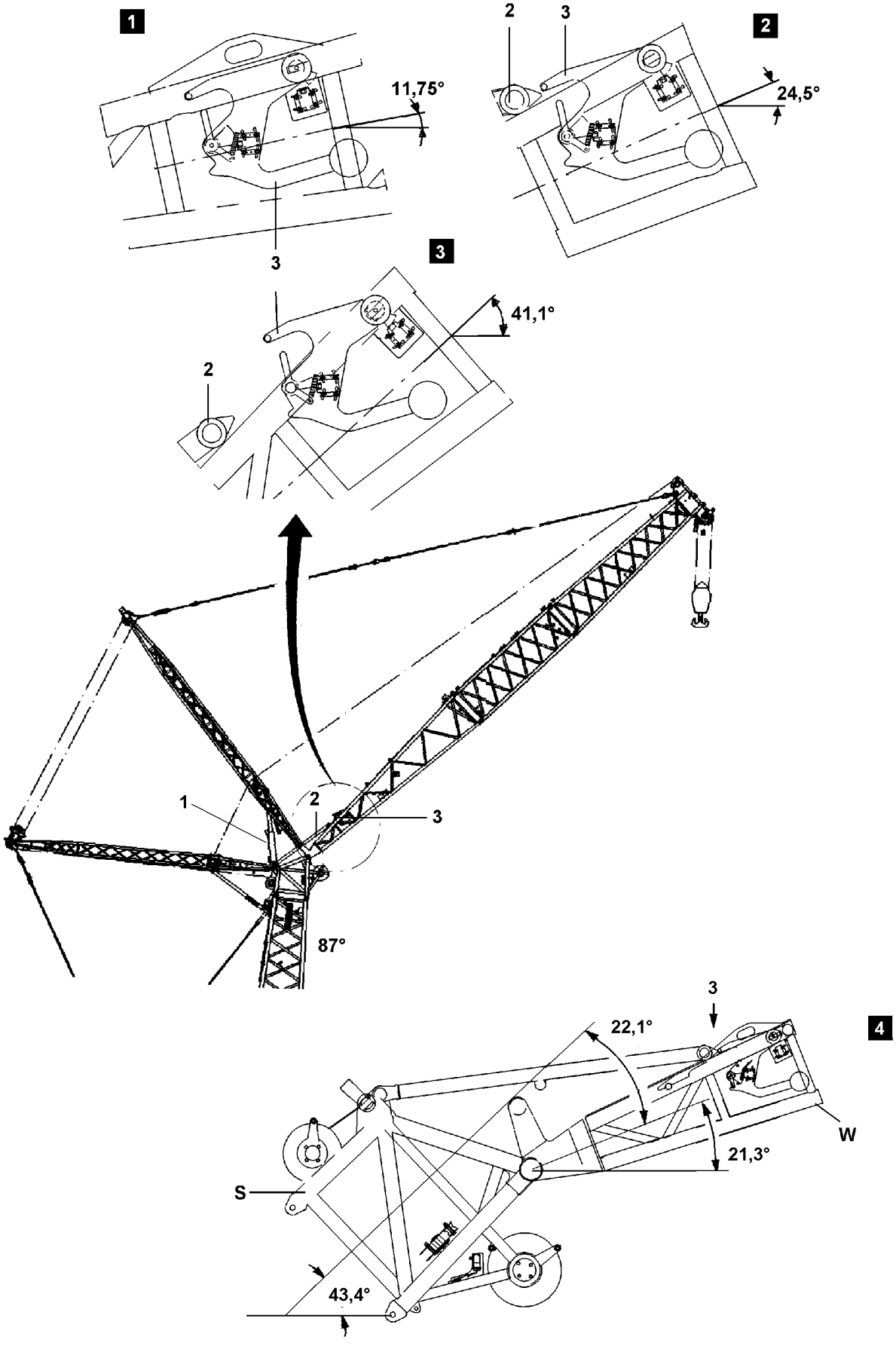
1.4.4 Switch position W-lattice jib “bottom”

See fig. **2**.

Note
▶ The movement, W-adjusting winch “spool out” must switch off!

	Angle
W-lattice jib “bottom”	45°
Theoretical block position	41,5°

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1.4.5 Checking the mechanical relapse retainers on the N-lattice jib

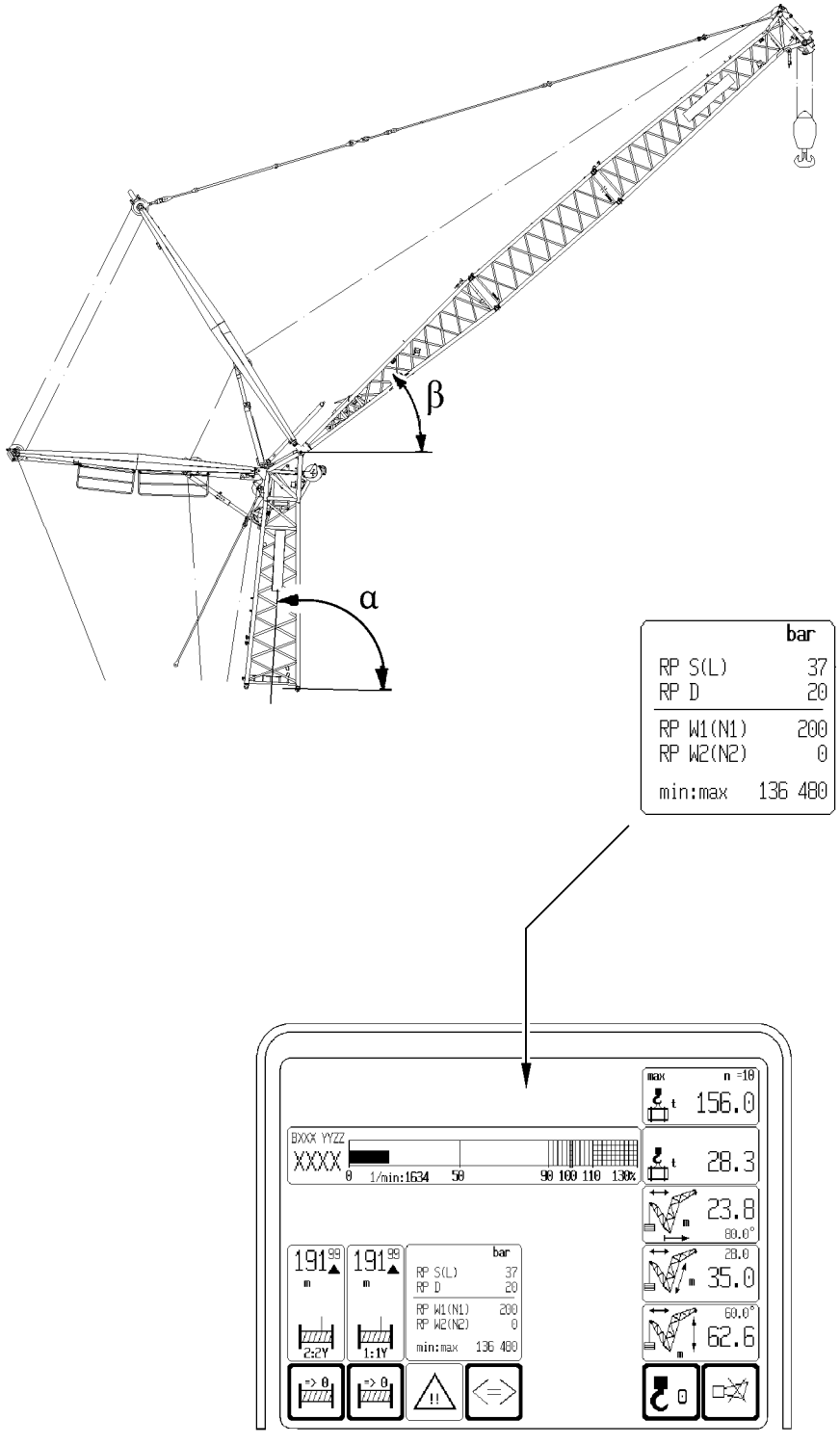
In addition to the relapse cylinders, the lattice jib is also secured by a mechanical relapse support **2**, which engages in steepest lattice jib position into the flap of the oscillating guard. The luffing up movement is turned off by the actuated limit switches on the oscillation guard.

WARNING
Danger of tipping over if the oscillation guard is hard to move!
If the oscillation guard 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!
- ▶ Before erection, the pendulum of the mechanical relapse retainer must be checked for easy movement over the complete swing range of the pendulum.

WARNING
Risk of collision!
If the angle between the boom and the lattice jib is smaller than or equal to 20.8° , the mechanical relapse support **2** will collide with the flap on the oscillating guard. The lattice jib can tip backward uncontrolled and cause the crane to topple over!
Personnel can be killed!
- ▶ Never exceed the angle 20.8° when luffing up!
- ▶ Carry out visual inspection!

Depending on the lattice jib position (boom position = 87°), the flap on the oscillation safety is swung out by the weight of the pendulum:
- – 15.7° the flap is swung in, see fig. **1**.
- – 22.9° the flap can be pushed open, see fig. **2**.
- – 41.4° the flap is swung out, see fig. **3**.
- – 20.8° the flat is at collision, see fig. **4**.

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1 Checking the accumulator pressure in the relapse cylinder

The accumulator pressure in the relapse cylinder must be checked before and during crane operation via the LICCON operating screen, see “Diagnostics manual”.
The actual pressure shown in the LICCON operating screen must match the nominal pressure in the chart.

Note
- ▶ The specified nominal pressure depends on the ambient temperature!
- ▶ The maximum permissible difference between the actual and the nominal pressure is +/- 10 bar!

The accumulator pressure in the relapse cylinder is checked as follows:
– Check the accumulator pressure with the “relapse cylinder fully extended”
– Check the accumulator pressure with the “relapse cylinder in test position”

1.1 Checking the accumulator pressure for the N-relapse retainer

1.1.1 Check the accumulator pressure with the “relapse cylinder fully extended”

– Set the main boom and the lattice jib to the angle specified in the chart
– Compare the nominal pressure in the chart with the actual pressure in the LICCON operating screen.

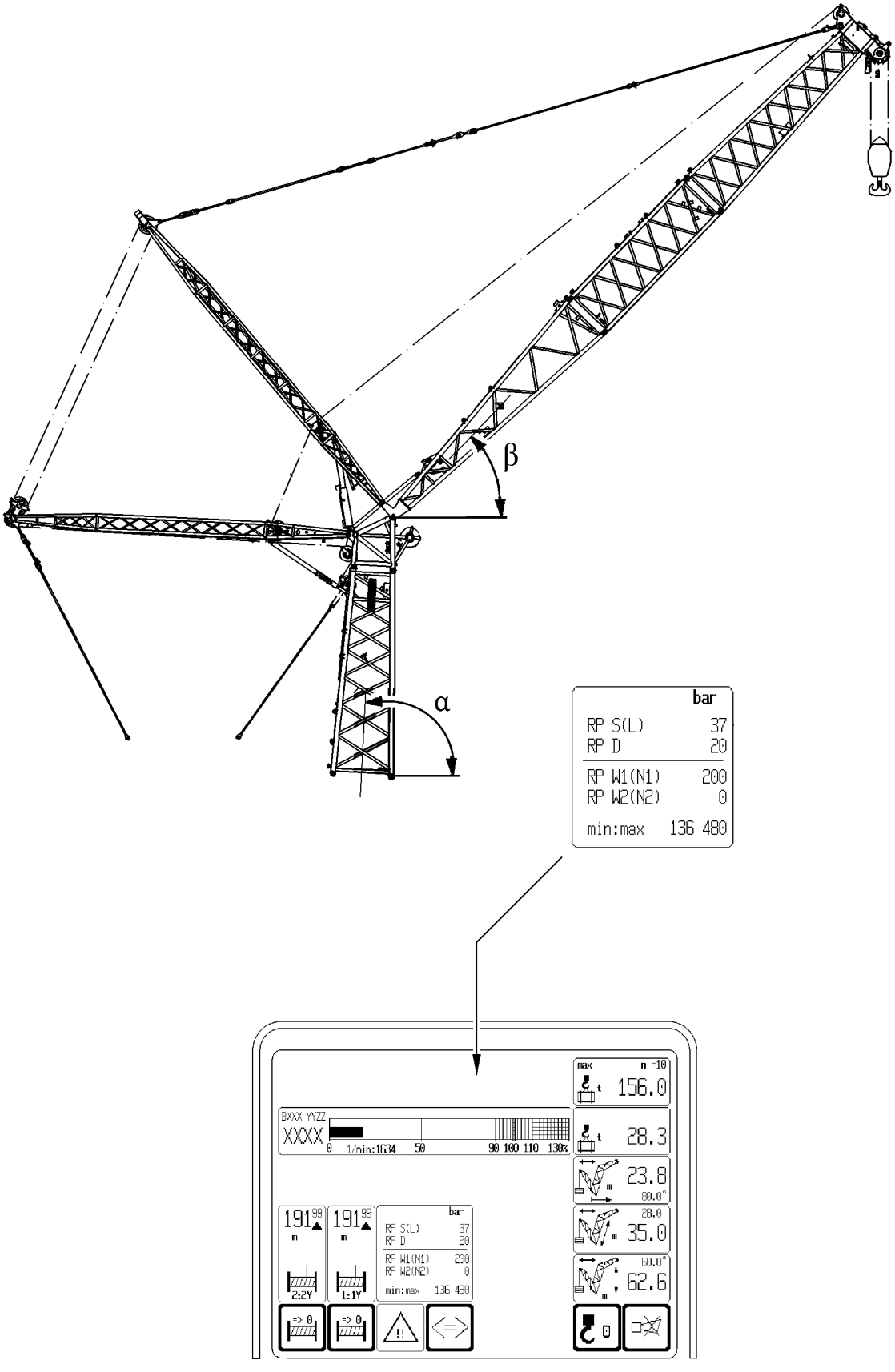
“Extend the relapse cylinder fully”								
Boom angle α	Lattice jib angle β	Cylinder length	Stroke	Nominal pressure				
				-40 °C	-20 °C	0 °C	20 °C	40 °C
87°	38,5°	5250 mm	1150 mm	134.4 bar	145.9 bar	157.9 bar	169.0 bar	180.5 bar

1.1.2 Check the accumulator pressure with the “relapse cylinder in test position”

– Set the main boom and the lattice jib to the angle specified in the chart
– Compare the nominal pressure in the chart with the actual pressure in the LICCON operating screen.

“Relapse cylinder in test position”								
Boom angle α	Lattice jib angle β	Cylinder length	Stroke	Nominal pressure				
				-40 °C	-20 °C	0 °C	20 °C	40 °C
87°	41°+2°	5185 mm	1085 mm	138.8 bar	151.3 bar	163.5 bar	174.9 bar	186.2 bar

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1.2 Checking the accumulator pressure for the W-relapse retainer

1.2.1 Check the accumulator pressure with the “relapse cylinder fully extended”

– Set the main boom and the lattice jib to the angle specified in the chart
– Compare the nominal pressure in the chart with the actual pressure in the LICCON operating screen.

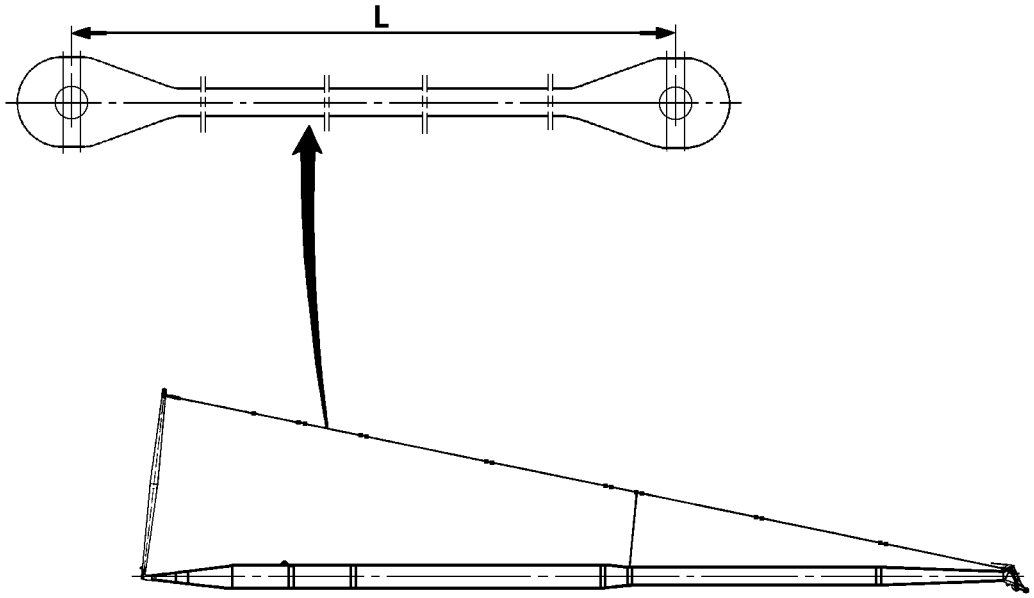
“Extend the relapse cylinder fully”						
Boom angle α	**Lattice jib angle β**	**Cylinder length**	**Stroke**			
				-20 °C	**20 °C**	**40 °C**
87°	44,5°	3350 mm	1000 mm	63.5 bar	73.5 bar	78.5 bar

1.2.2 Check the accumulator pressure with the “relapse cylinder in test position”

– Set the main boom and the lattice jib to the angle specified in the chart
– Compare the nominal pressure in the chart with the actual pressure in the LICCON operating screen.

“Relapse cylinder in test position”						
Boom angle α	**Lattice jib angle β**	**Cylinder length**	**Stroke**			
				-20 °C	**20 °C**	**40 °C**
87°	46°+2°	3308 mm	958 mm	66.4 bar	76.6 bar	81.8 bar

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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.

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9.00 General notes

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1 Checks before start up

We recommend to carry out the following visual inspections in the engine compartment before start up:

– Check if all oil and fuel lines are leak-free and dry.
– Check if the injection pump, fuel and oil filters are leak-free.
– Check if the hydraulic units, the hydraulic motors for the fan drives and their supply lines are leak-free.
– Check if the exhaust system and exhaust flange are leak-free.
– Check if the exhaust flap retention flap is moveable.
  The return springs that open the exhaust flaps must function properly, because seized (therefore closed) exhaust flaps during engine operation will result in considerable overheating.
– Inspect electrical wiring and ensure that there is sufficient clearance to hot exhaust system piping and that it is properly fastened and that there is no insulation damage.
– Inspect the soundproofing mats for soiling from solutions and large quantities of oil or fuel, as well as other damage.
  Immediately remove any soundproofing mats that are excessively damaged or soiled and replace them with original parts.
  When cleaning the engine and gear compartments, observe the care instructions for the sound insulation, see Crane operating instructions, chapter 7.01.

2 Repair and maintenance tasks

Note

▶ Repair and maintenance tasks are to be carried out carefully!

Take particular precautions regarding cleanliness when replacing diesel and oil filters. Remove any diesel fuel or oil that has leaked. Perform a test run on the systems to ensure that there are no leaks.
The diesel engine V-room must be inspected regularly, and any oil or diesel fuel must be cleaned up, particularly after repairs and servicing. Any fuel that has collected in V-room can spread throughout the engine room while the crane is travelling on the road and can ignite if it comes into contact with hot surfaces.
We stress that all electrical wiring must be installed according to the regulations and must be properly fastened. Immediately repair any wiring insulation that exhibits signs of chafing or brittleness as a result of operational activities. Any wiring that is not in perfect condition is to be immediately and professionally replaced.
We would like to particularly emphasise that over time fuel and oil lines can become brittle or porous as they age. Any hoses that appear to be excessively porous should be replaced immediately, see crane maintenance chapter.

3 Important servicing

The following service tasks are to be carried out regularly:

– Check gearbox and engine oil levels regularly.
  Add oil as required during normal operation. If oil consumption or loss is unusually high, determine the cause and correct.

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4 Maintenance notes for replacement parts

The following is to be considered when replacing drive components such as engine, gearbox or axles:

– Before start up, be sure to refill with the correct type of oil to the center of the min. - max. marks. For type of oil, refer to the data tag and service items and lubricants.
– Conduct initial maintenance according to chapter “Maintenance intervals”; thereafter, maintain in accordance with the specified periodic maintenance intervals.
– Maintain break-in instructions, see Crane operating instructions, chapter 2.02.

5 Recommendations for travel operation

NOTICE
Risk of engine damage!
If the permissible engine speed in exceeded, the engine can be seriously damaged!
▶ Do not exceed the permissible engine rpm!

6 Disposal of fuels and greases

Note
Engine, gearbox and hydraulic oils, brake fluids, grease and fuels are dangerous waste materials!
▶ These materials must be disposed of separately!
▶ These materials may not be disposed of in the ground or in any bodies of waters: wastewater systems, sewers or groundwater!
▶ Comply with the regulations specified by local authorities before disposing of any of these items or substances!

Note
Radiator fluid for diesel motors and heating systems are dangerous waste materials!
▶ Undiluted antifreeze / corrosion inhibitor must be handled as dangerous waste materials!
▶ Follow the regulations of the local authorities when disposing of used cooling fluids (mixture of antifreeze / corrosion inhibitor and tap water).

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LIEBHERR

LATTICE BOOM CRAWLER TRACK CRANE

LR 1350/1

LR 1350-1-008

Part 2

Operating instructions

BAL-No. **13608-01-02**

pages : 1 up to 485

Crane number	
Date	

The operating instructions are part of the crane !

Always keep on hand !

Comply with road travel and crane operating regulations !

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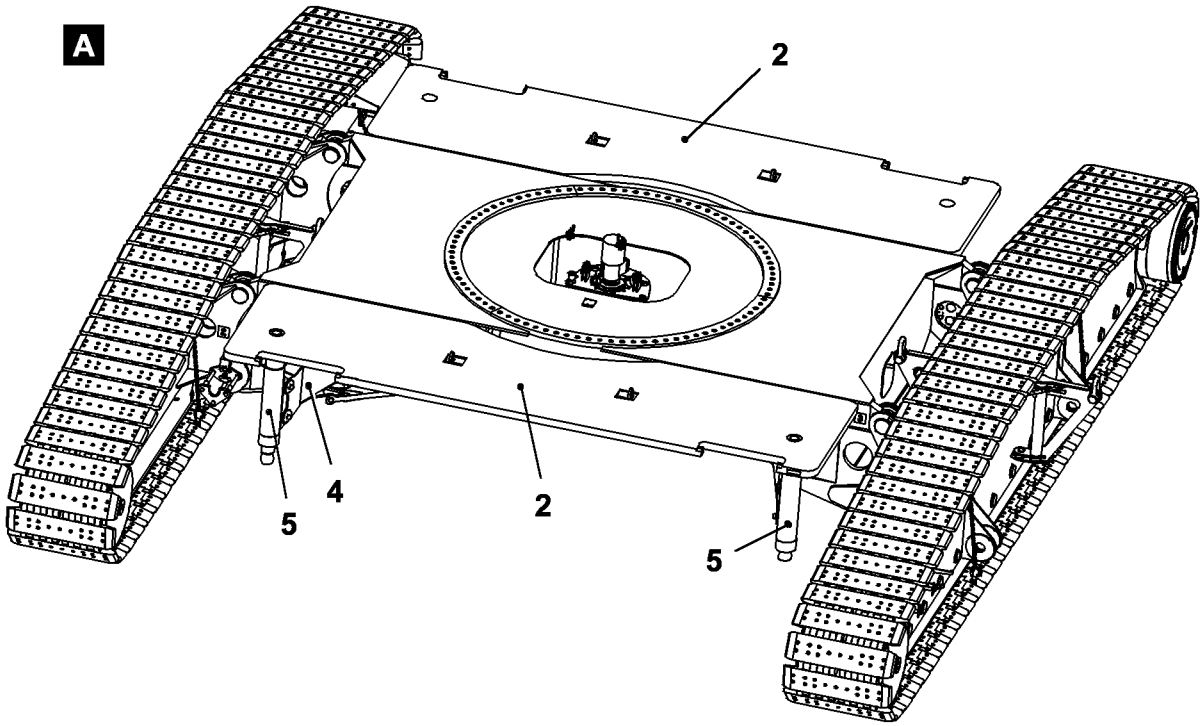
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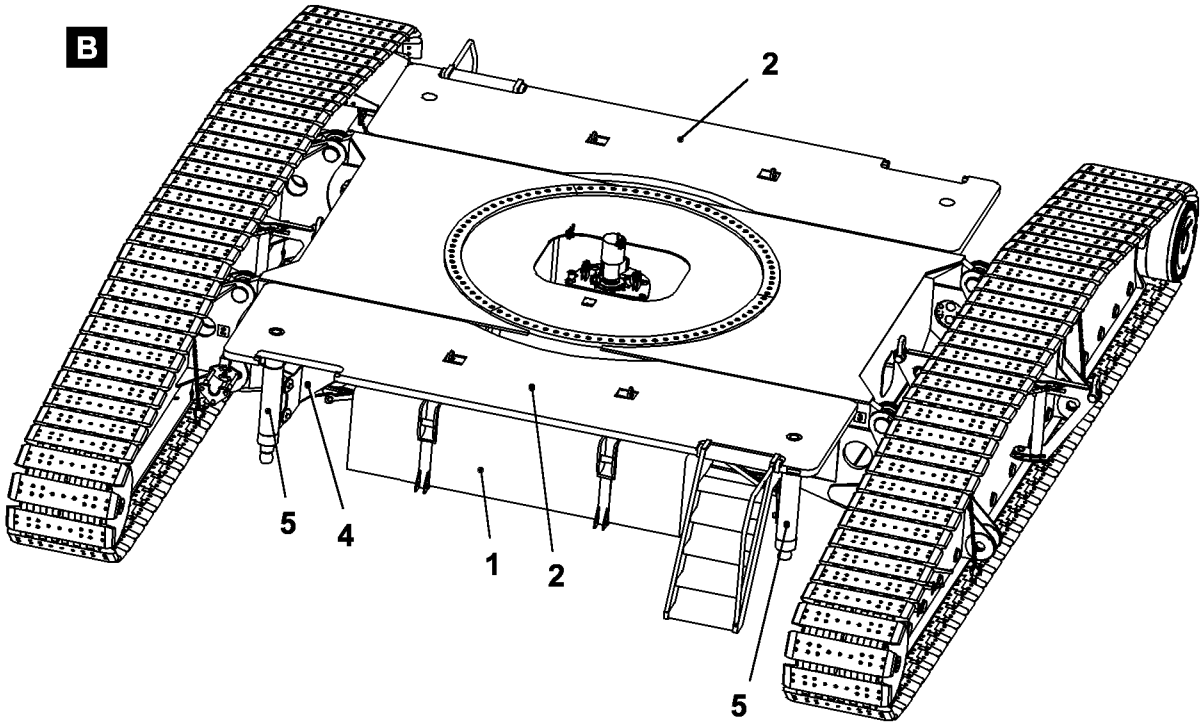
Chapter 3

Crane assembly

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3.03 CENTRAL BALLAST 025404-00





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1. Installation of central ballast

Prerequisites:
- Installation of crawler carrier (chapter 3.01) is completed.
- All connections between the crawler center section and the crawler carriers are pinned and secured.
- The hydraulic support (4) **must** be swung out, locked and pinned.
- The hydraulic support cylinders (5) are fully retracted.
- Both crawler carriers are on the ground .
- The crane engine is running (see chapter 4.03).
- The operating mode "SA- bracket " is set and confirmed (see chapter 4.02).

D A N G E R: The operating mode "SA - bracket" is only permitted for installation or installation of crane equipment, such as crawler carriers, winches, central ballast.
Do not use the operating mode "SA - bracket" to lift loads!
If this is not observed, there is a danger of accidents !

- Set ballast blocks (1) and ballast plates (2) of the central ballast as close as possible to the crane .
- Install the central ballast only according to the load charts .

D A N G E R: The central ballast may only be installed according to the load charts!
If this is not observed, there is a danger of accidents !

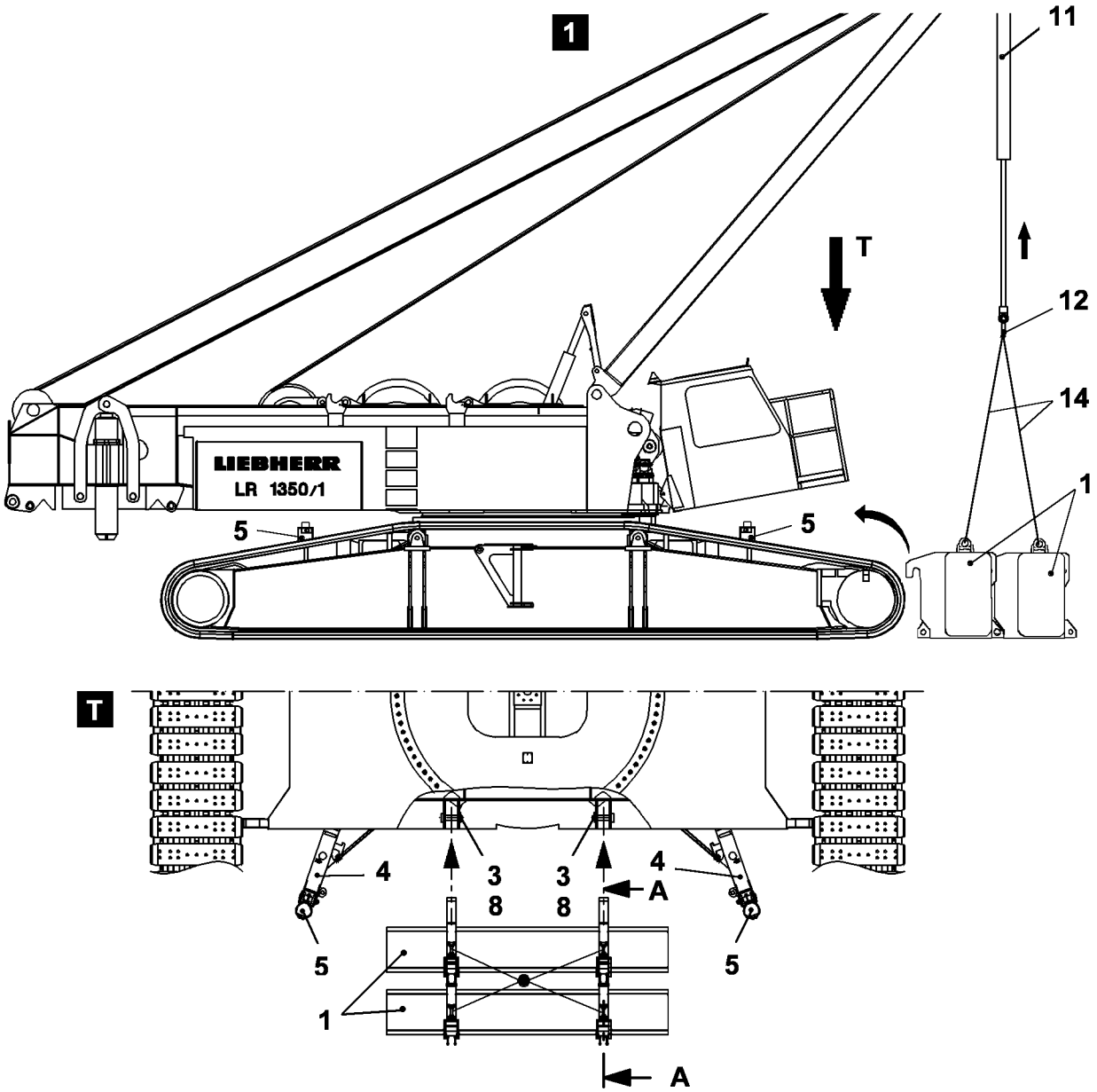
1.1 Components for the installation of the central ballast (ZB) :

Pos.	Description	Qty.
1	Ballast block 7.5 t	4
2	Ballast plate 4.0 t	2
4	Hydr. support	4
5	Hydr. cylinder	4

1.2 Combination of central ballast (ZB)

ZB 8 t:	2	**x**	Ballast plate	4.0 t	Pos. 2	(fig. A)
ZB 38 t:	4	**x**	Ballast block	7.5 t	Pos. 1	(fig. B)
	2	**x**	Ballast plate	4.0 t	Pos. 2	

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2. Installation of central ballast (ZB) 38 t

The crawler crane can be operated with two different central ballast variations , **8 t** and **38 t** (see 1.2 combination of central ballast).

The crane is designed in such a way that the central ballast can be installed with the SA bracket . It is required that the operating mode "SA-bracket" is set and confirmed.

The ballast blocks (1) must be attached to the pins (3) of the crawler center section (fig. T).

The ballast blocks can be installed in the "package" (fig. W // fig. A-A) .

Prerequisites

- The pins (3) are installed on the crawler center section and secured with the spring retainer (8) .
- It must be ensured that the ballast blocks are interconnected correctly at (Z) and are additionally secured with pins (9) and hinge pin (10) (fig. A-A // fig. W).

D A N G E R: **The central ballast may only be installed according to the load charts!**
It must be ensured that the ballast blocks are interconnected correctly, pinned and secured.
If this is not observed, there is a danger of accidents!

Installation procedure for ballast blocks:

- Luff the SA-bracket down until the installation cylinder (11) is at the center over the ballast blocks (fig. 1).
- Extend the installation cylinder with the master switch (MS) 2 . Attach the tackle (14) on the shackle (12) of the installation cylinder and on the ring brackets (6) of the ballast blocks (1) .

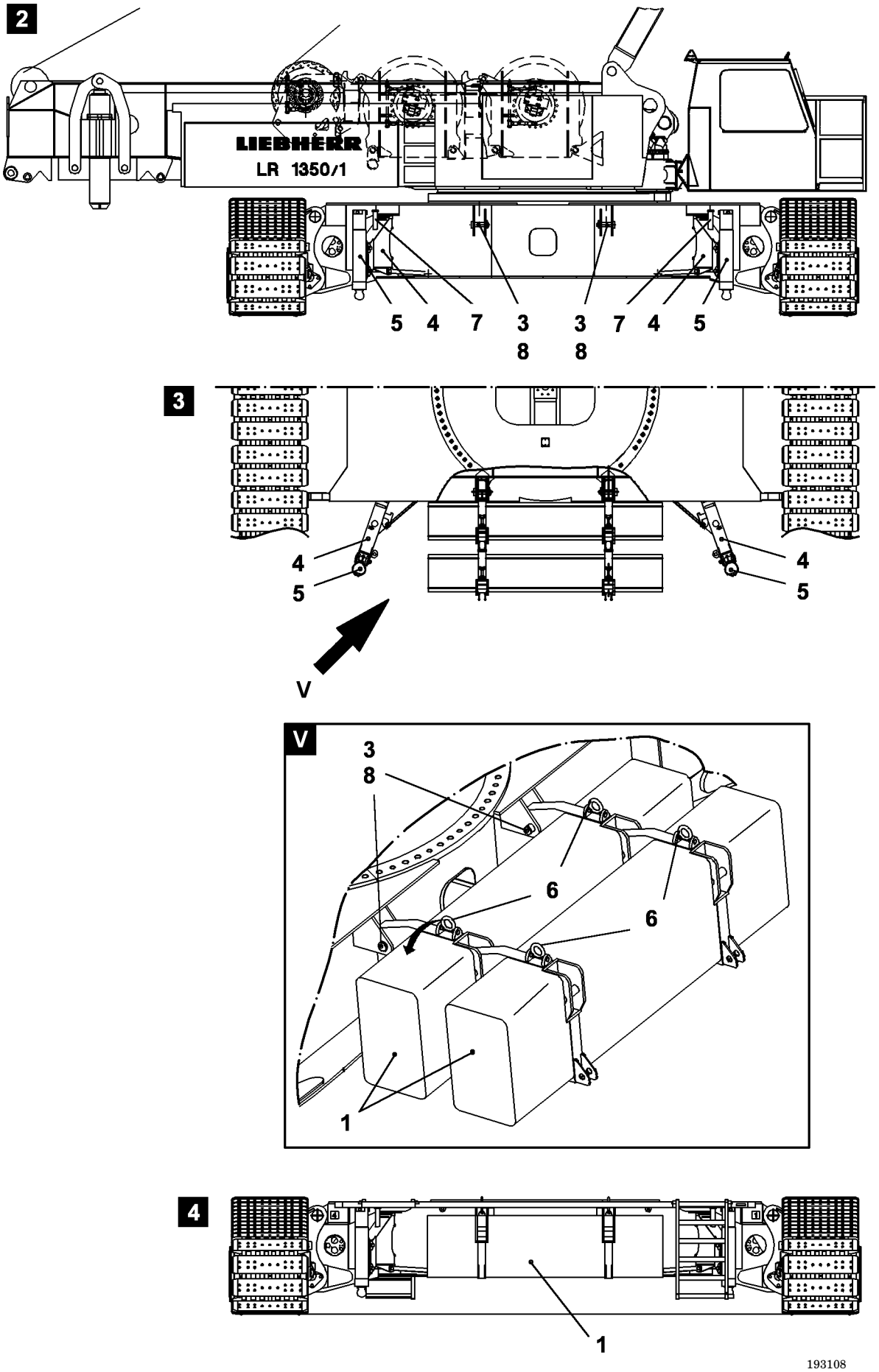
D A N GE R: **It must be ensured that the ballast blocks are attached correctly and are secured sufficiently!**
If this is not observed, there is a danger of accidents!

Note: The installation cylinder (11) may **not** be fully extended!
If the installation cylinder is extended all the way and the limit switch position is reached, an **error message** and the **LML Stop** is shown on the LICCON monitor **.**

- Lift the ballast blocks. To do so, slowly retract the installation cylinders with the master switch (MS) 2 .
- Luff up the SA-bracket and swing the ballast blocks (1) to the crawler center section until the isntallation brackets (Y) are positioned over the pins (3) .

D A N G E R: **No one may remain between the ballast blocks and the crawler center section or the crawler carriers when retracting the ballast blocks! This is strictly prohibited!**
There is an increased danger of accidents due to crushing !

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- Slowly extend the installation cylinders (11) with the master switch (MS) 2 .
- Attach the ballast blocks with the brackets (Y) on pins (3) .
- Lower the ballast blocks all the way, until the tackle devices are relieved.
- Do not remove the tackle until it is ensured that both brackets of the ballast blocks have been attached correctly on the pins (3) of the crawler center section.

D A N G E R: It must be ensured that the ballast blocks (1) are attached correctly on the pins (3) of the crawler center section.
If this is not observed, there is a danger of accidents!

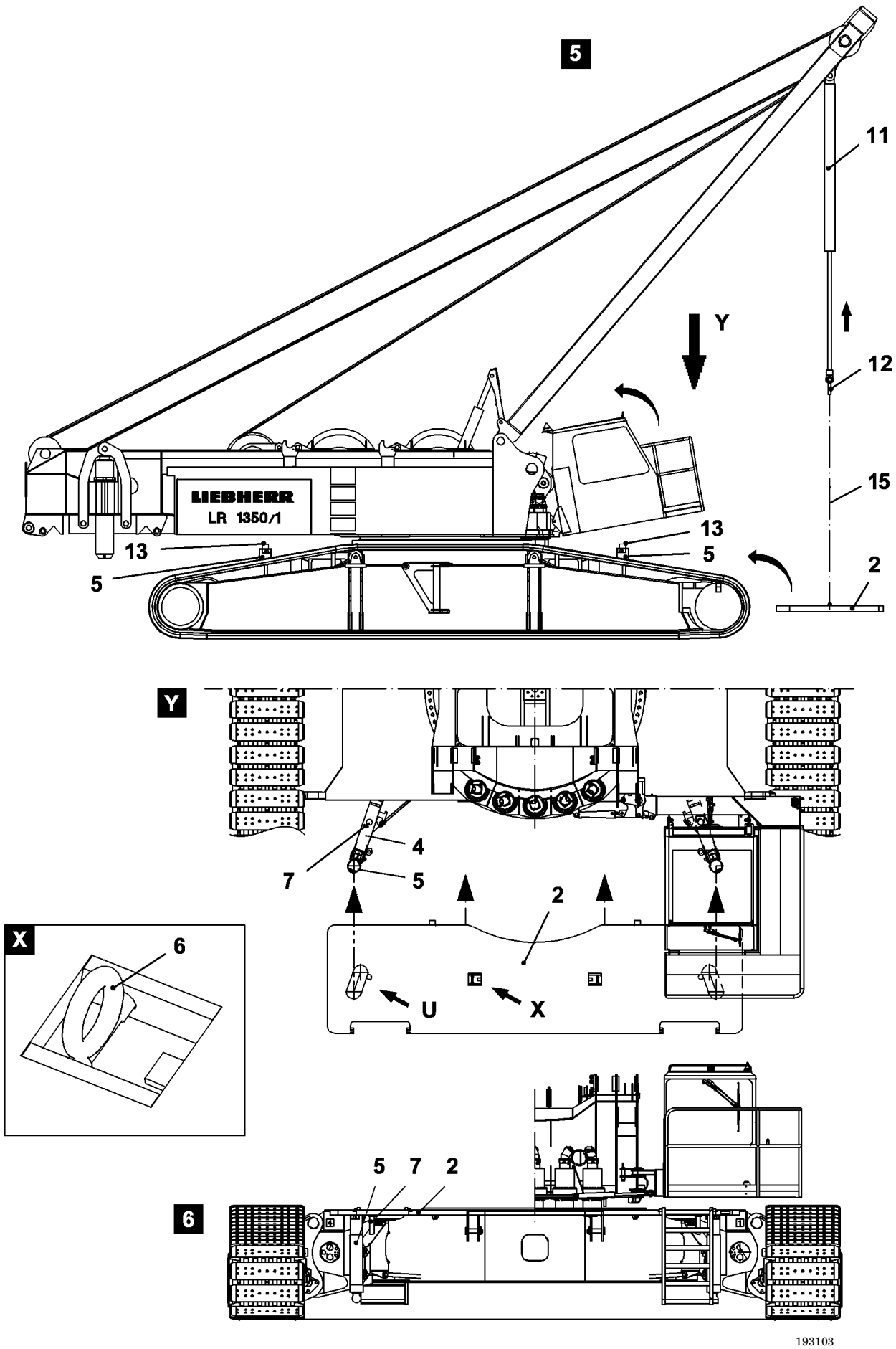
- Fold the ring brackets (6) of the ballast blocks (1) after installation to the side (fig. V).
- Install the base plates (2) (see **3. Installation of ballast plates**).

2.1 Removal of central ballast (ZB) 38 t

- First remove the **ballast plates** (see 3.1)
- Luff down the SA-bracket until the installation cylinder (11) is centered above the ballast blocks.
- Extend the installation cylinders. **Observe the guidelines for the installation procedure**!
- Attach the tackle (14) on the shackle (12) of the installation cylinder and on the ring brackets (6) of the ballast blocks (1) .
- Raise the ballast blocks slowly with the installation cylinder over the pins (3) and carefully extend them by luffing down the SA-bracket.

D A N G E R: No one may remain between the ballast blocks and the crawler carriers while extending the ballast blocks.
There is a danger of accidents due to crushing !

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3. Installation of ballast plates (ZB 8 t)

The ballast plates serve as central ballast and - when installed - they provide a platform to ensure access to the crane operator's cab with the slewing platform in any swing angle (fig. A).
The data in the load charts must be obser ved.

The ballast plates (2) must be installed or placed on the hydraulic cylinders (5) and the supports (7) of the hydraulic supports (4) . The ballast plates are centered "on top" on the receptacle studs (13) of the hydraulic cylinders (5) and the supports (7) . The hydraulic supports must be folded out, locked, pinned and secured.

D A N G E R: The central ballast may only be installed according to the load charts!
It must be ensured that the ballast plates and the ballast blocks of the central ballast are attached correctly and are properly secured to prevent them from loosening up!
If this is not observed, there is a danger of accidents!

Installation procedure for ballast plates:

- Luff down the SA-bracket until the installation cylinder (11) is centered over the ballast plate (fig. 5).
- Extend the installation cylinder with the master switch (MS) 2 . Attach the tackle device (15) on the shackle (12) of the installation cylinder and on the ring brackets (6) of the ballast plate (2) (fig. 5 // fig. X).

Note: The installation cylinder (11) may **not** be fully extended!
If the installation cylinder is extended all the way and the limit switch position is reached, an **error message** and the **LML Stop** is shown on the LICCON monitor **.**

- Luff up the SA-bracket and run in the ballast plate to the "stop" on the crawler center section (fig. 5). Equalize the run in height of the ballast plate with the installation cylinder .

C A U T I O N : The crane operator's cab must be swung up before running the ballast plate (2) in, due to the space conditions in this area (fig. 5) !
If this is not observed, the crane can be damaged!

D A N G E R: No one may remain between the ballast plate and the crawler center section or the crawler carriers while running in the ballast plate!
There is an increased danger of accidents due to crushing !

- Position the ballast plate, lower it slowly onto the hydraulic cylinder (5) or onto the receptacle studs (13) and the supports (7) of the hydraulic support and center (fig. 5 // fig. 6).
- Remove the tackle device (15) .

3.1 Removal of the ballast plates (ZB 8 t):

- Swing the crane operator's cab up.
- Luff down the SA-bracket until the installation cylinder (11) is centered over the ballast plate.
- Extend the installation cylinder . **Observe the guidelines for the installation procedure**!
- Attach the tackle (15) on the shackle (12) of the installation cylinder and on the ring brackets (6) of the ballast plate (2) .
- Raise the ballast plate slowly with the installation cylinder and carefully extend them by luffing down the SA-bracket.

D A N G E R: No one may remain between the ballast blocks and the crawler carriers while extending the ballast plates.
There is a danger of accidents due to crushing !

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3.06 INSTALLATION CONDITIONS 025412-00

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1. Installation conditions

- Installation of slewing platform ballast on crawler base 7.40 m x 7.40 m
- Crawler plate width 1.00 m

Chart 1 and **chart 2** must be viewed together!

Chart 1:

Installation conditions	SA - bracket	Winch I	Winch II	Winch IV
1	placed down	----------	----------	**with cable**
2	90°	----------	----------	**with cable**
3	90°	**without cable** (∅ = 28mm)	----------	**with cable**
4	90°	**with cable** (∅ = 28mm)	----------	**with cable**
5	90°	**with cable** (∅ = 28mm)	**with cable** (∅ = 25mm)	**with cable**
6 *	121°	**with cable** (∅ = 28mm)	**with cable** (∅ = 25mm)	**with cable**

***** = The S - pivot section **must** be bolted on and tensioned before installation of the slewing platform ballast.

Chart 2:

Installation conditions	(DB / ZB) 45 t / 8 t	(DB / ZB) 65 t / 8 t	(DB / ZB) 85 t / 8 t	(DB / ZB) 105 t / 38 t	(DB / ZB) 125 t / 38 t
1	**X**	**X**	-----	-----	-----
2	**X**	**X**	-----	**X**	-----
3	**X**	**X**	-----	**X**	-----
4	**X**	**X**	**X**	**X**	-----
5	**X**	**X**	**X**	**X**	-----
6 *	**X**	**X**	**X**	**X**	**X**

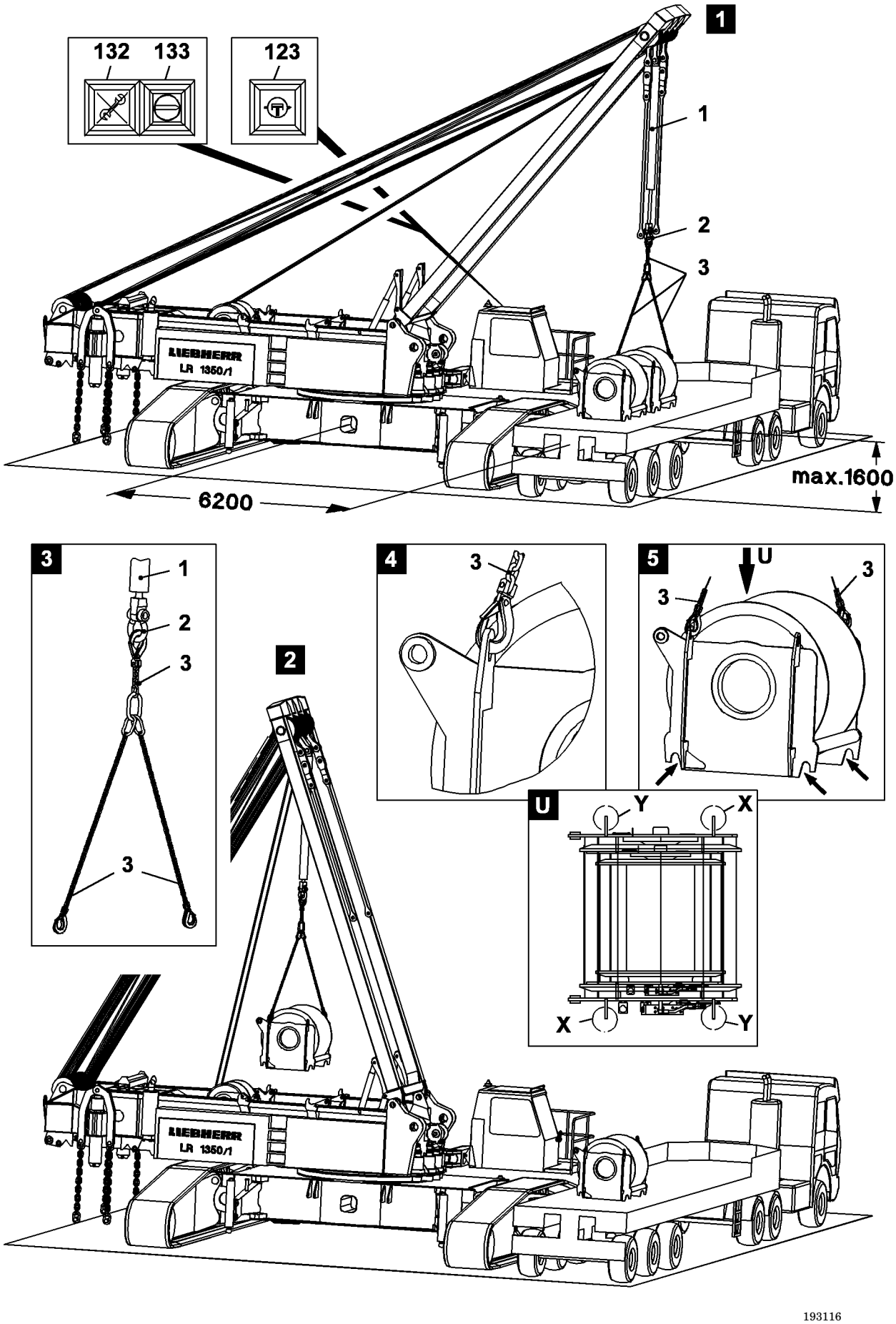
***** = The S - pivot section **must** be bolted on and tensioned before installation of the slewing platform ballast .

DB = Slewing platform ballast

ZB = Central ballast

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3.07 INSTALLATION OF HOIST WINCHES 025406-01



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1. Hoist winch types

There are two different types of hoist winches:

Hoist winch	Winch weight (t)	Hoist cable ∅ (mm)	Hoist cable length (m)
Type **I**	approx. 7.0	28	1000
Type **II**	approx. 4.0	25	600

2. Installation of hoist winches I and II (W I and W II)

Prerequisite:
- The installation of the crawler gear is completed (chapter 3.01)
- Both crawler carriers are on the ground.
- The crane is horizontally aligned.
- The crane engine is running (see chapter 4.03)
- The operating mode "SA-bracket " is set and confirmed (see chapter 4.02)

D A N G E R: **The operating mode "SA bracket " is only permitted for set up or installation of crane components, such as crawler carriers, winches, central ballast. The installation of crane components may only be carried out according to the load chart "SA operation". It is strictly prohibited to lift loads in operating mode "SA bracket" ! If this is not observed, there is a danger of accidents!**

- The pressure supply change over switch to the auxiliary users (123) must be turned on in the crane operator's cab.
- The transport vehicle with winches I and II (W I and W II) must be moved as close as possible to the crane. The distance between the winch and the slewing platform center point must be approx. 6200mm (fig. 1).
- The maximum height of the flatbed trailer may **not** exceed 1600 mm (fig. 1).

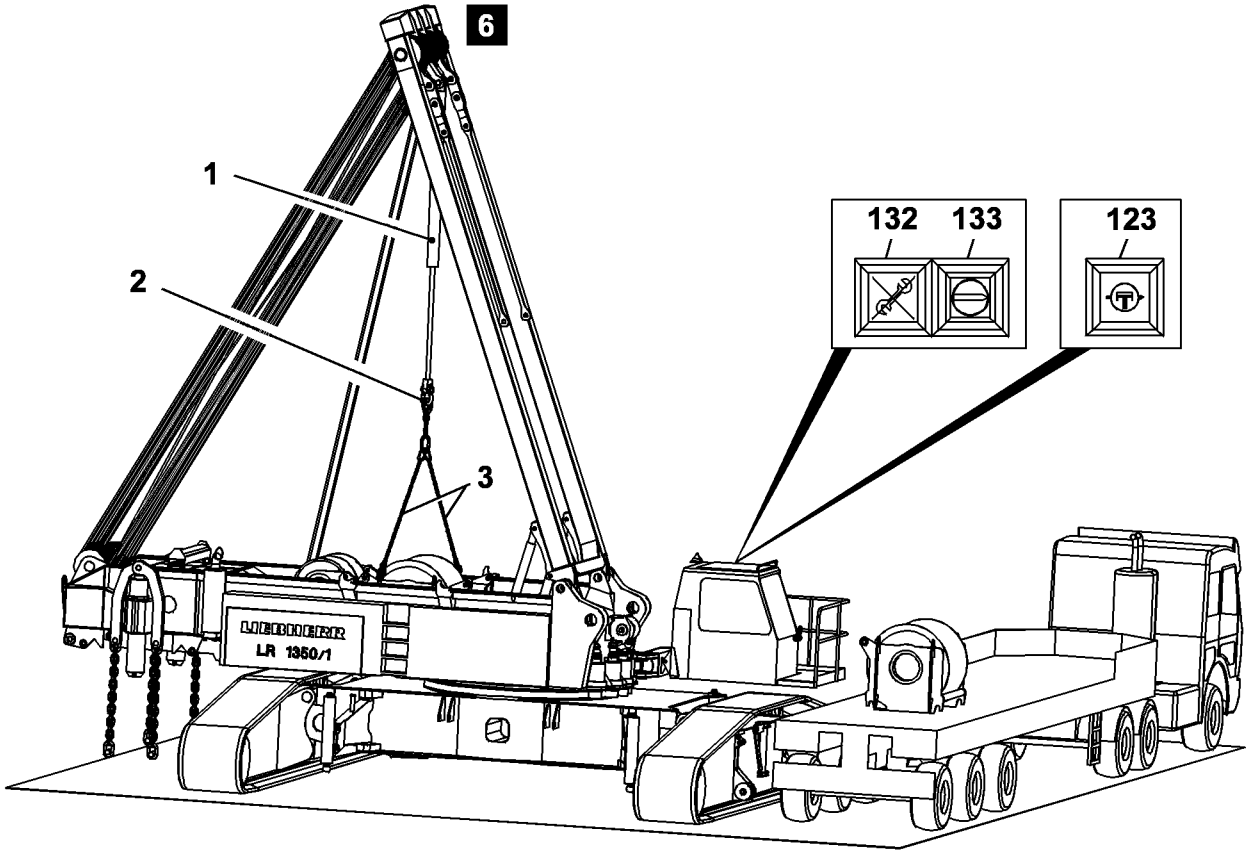
C A U T I O N : **Make sure the crane is horizontally aligned! The distance of 6200 mm may not be exceeded!**

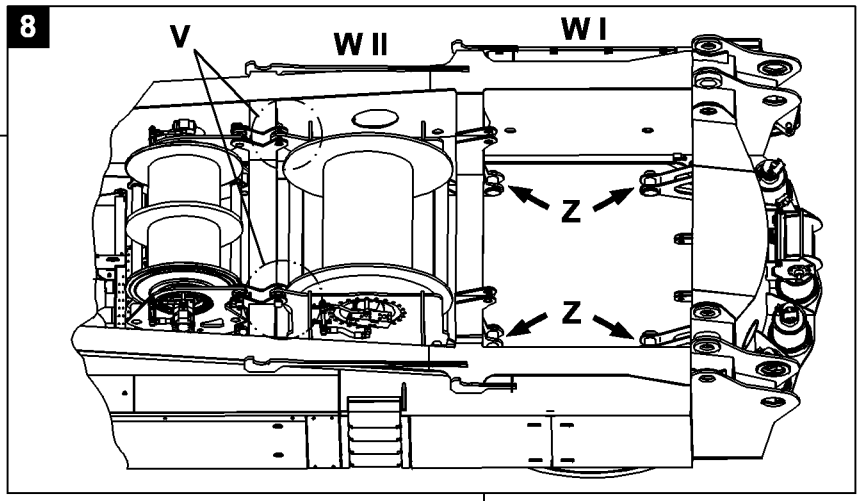
Installation procedure of the first winch:
- Luff the SA bracket down until the installation cylinder (1) is centered over the winch which is to be installed.
- Remove the transport retainer between the flatbed trailer and the winch.
- Extend the installation cylinder (1) with the master switch (MS) 2.

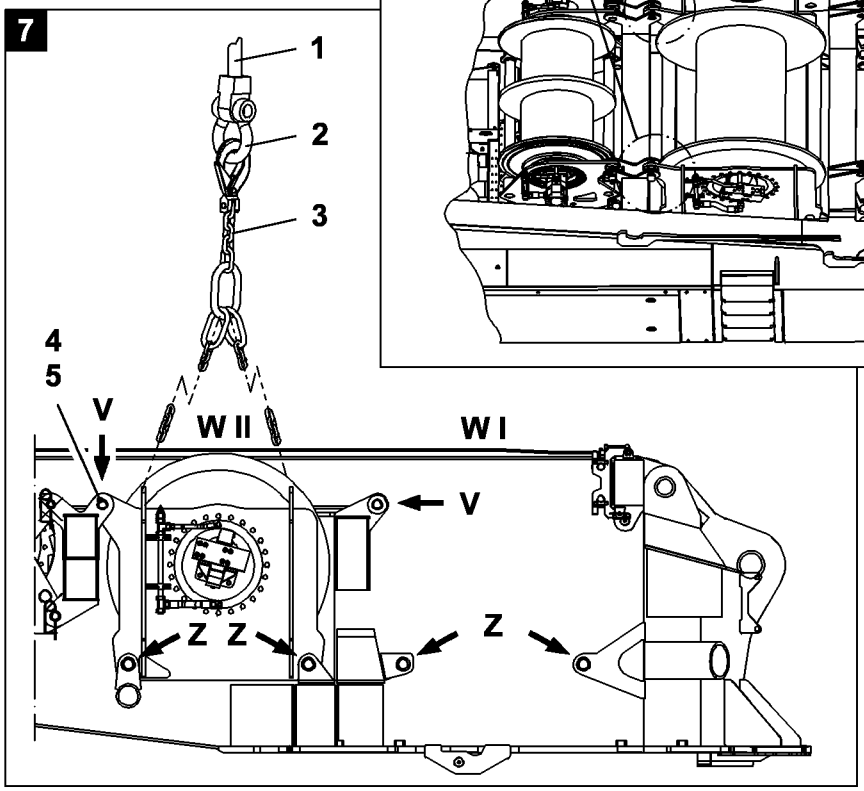
Note: The installation cylinder may **not** be extended all the way! If the installation cylinder is fully extended and the limit switch position is reached, an **error message** and **LMB - Stop** is shown on the LICCON monitor.

- Attach the tackle (3) to the shackle (2) of the installation cylinder (1) (fig. 1 // fig. 3) and on the winch (fig. 5) . Make sure that the tackle (3) is always attached diagonally , at X - X or Y - Y (fig. U).

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- Retract the installation cylinder (1) with the master switch (MS 2) until the tackle is tensioned.
- Lift the winch with the installation cylinder from the transport vehicle. Fully retract the installation cylinder (1) with the master switch (MS) 2 .
- Carefully luff up the SA bracket.

D A N G E R : It is strictly prohibited for anyone to remain within the complete swing range of the SA bracket!
There is a danger of accidents!

- When luffing up the SA bracket via the vertical SA bracket position, the winch is swung by the SA bracket (fig. 2 // fig. 6). It must be ensured , when luffing up the SA bracket, that the winch is in installation position (fig. 2 // fig. 5).

C A U T I O N : When swinging the winch through the SA bracket, make sure that the winch does not hit the SA bracket.
If this is not observed, the crane or the winch can be damaged!

- Luff up the SA bracket until the winch is centered over the installation position (fig. 2).
- Carefully lower the winch with the centering receptacle (fig. 5 / arrows) onto the receptacle pins (Z) on the slewing platform (fig. 6 // fig. 7). To do so, extend the installation cylinder (1) with the master switch (MS) 2.

D A N G E R : When lowering the winch, it must be ensured that there are no persons underneath or next to the winch.
There is a danger of accidents!

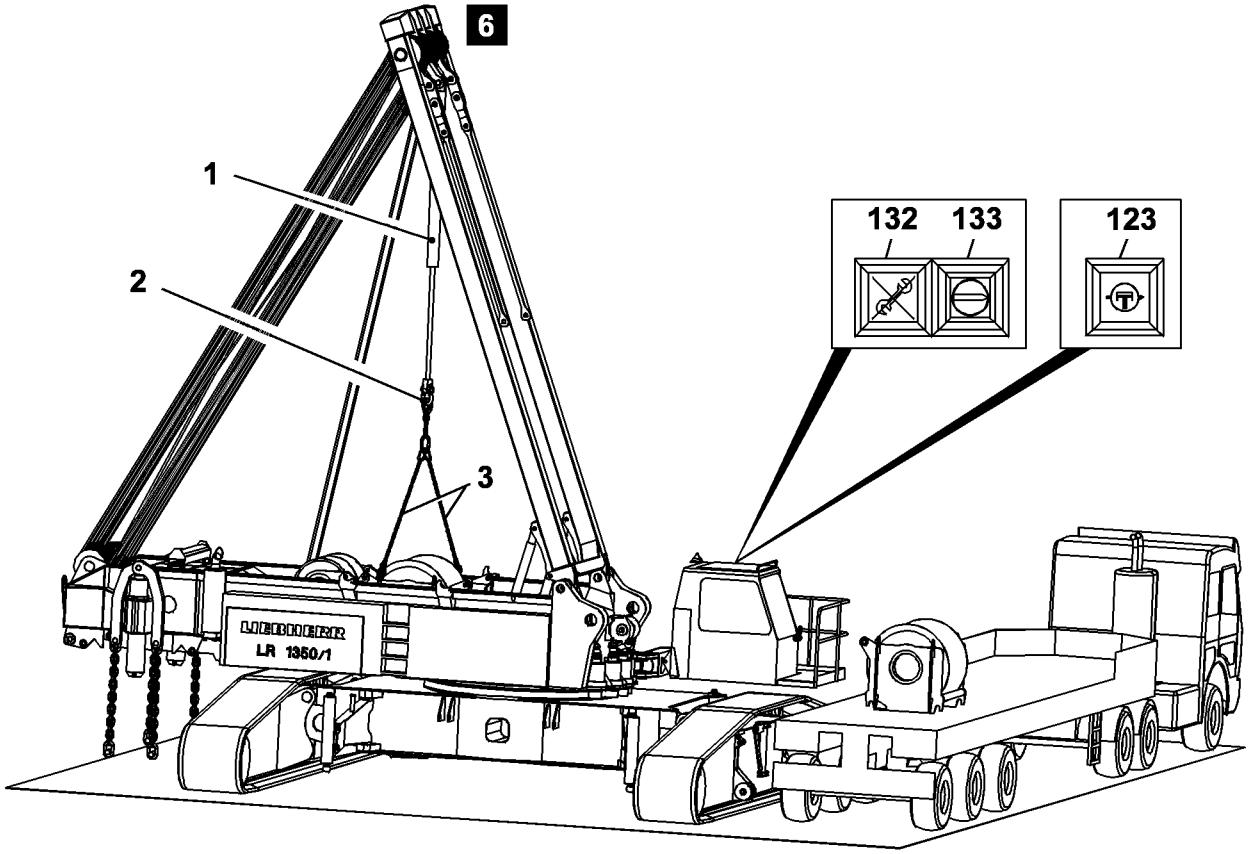
- After the winch has been lowered onto the receptacle pins (Z), the winch must be secured on the pin points (V) with pins (4) and secured with spring retainers (5) (fig. 7 // fig. 8).
- Remove the tackle (3) from the winch.
- Fully retract the installation cylinder (1) with the master switch (MS 2) .
- Turn off the pressure supply change over switch (123) in the crane operator's cab.

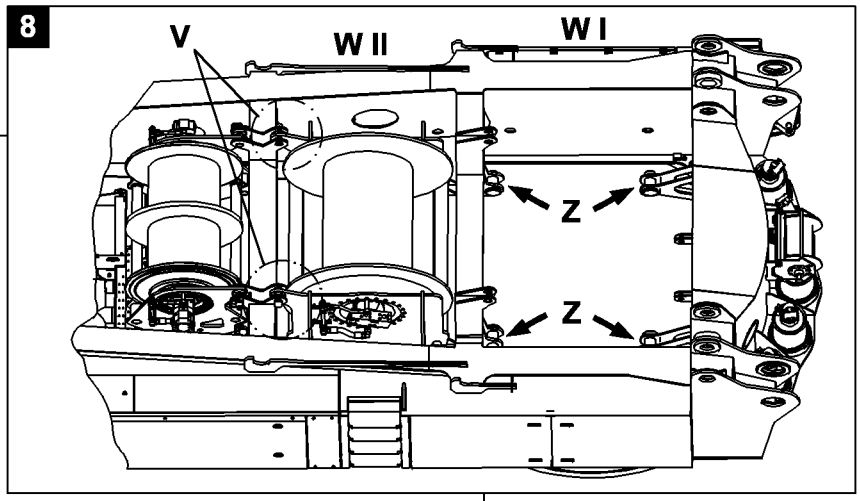
C A U T I O N : Before retracting the installation cylinder, the tackle must be removed!
If this is not observed, the crane can be damaged!

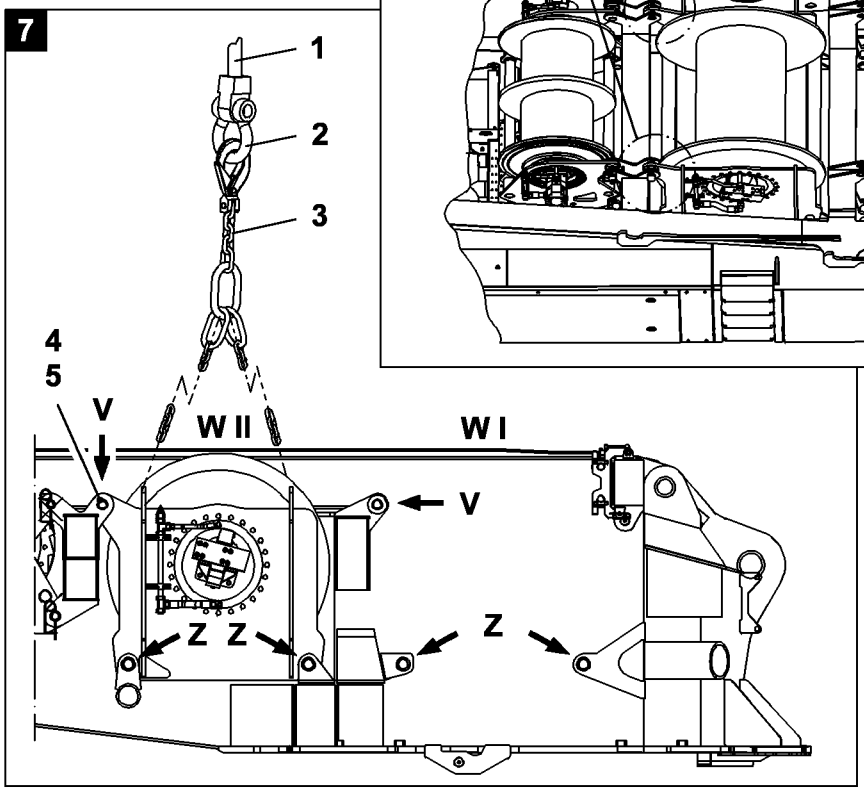
- Luff down the SA bracket.

Installation procedure of the second winch :
Install the second winch according to the installation of the first winch.

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3. Establish the hydraulic / electrical connections .

3.1 Hydraulic connection

The hydraulic connection to the winches is made via quick couplings.

Note: The corresponding quick couplings are marked.

Connect or release the hydraulic lines with quick couplings

D A N G E R : When connecting or releasing hydraulic lines with quick couplings, it must be ensured that the coupling procedure is carried out correctly.

Prerequisite for correct coupling connection is:
- **The pressure must be released from the hydraulic system before connecting or releasing the couplings (turn the engine off, wait for approx. 5 minutes).**
- **Interconnect the coupling sections (sleeve and plug) and connect them with the hand nut.**
- **Tighten the nut past the O-ring until you can feel a firm stop.**
- **The couplings may only be tightened by hand - without tools (or couplings will be damaged).**
- **Improperly connected couplings can cause loss of pressure or sudden leakage and therefore can cause accidents!**

3.2 Electrical connection

Establish the electrical connection to the winches.

Note: The LICCON recognizes the type of winch via a coding in the winch plug.
For description of winch types, see chapter 4.02.
For description of selector switch for winch use, see chapter 4.01.

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4.00 OPERATION OF THE SUPERSTRUCTURE 021677-00

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Chapter 4

Operation of the Superstructure

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4.02 LICCON COMPUTER SYSTEM 028458-00

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1. General

Note: The monitor illustrations in this chapter are only excamples. The number values in the individual symbol elements and charts might not match the crane. In addition, some illustrations show the maximum assignment of the LICCON monitor with symbol elements. In normal crane operation, an identical view might not appear on the LICCON monitor.

The LICCON computer system is a computer system to control and monitor mobile cranes. In addition to overload safety (**L**oad Moment Limiter ⇒ LMB) there are a number of other application programs used to control and monitor the crane movements. At this time, the LICCON computer system includes the following application programs:

Application programs
- The "Set up" program
- The "Operation" program
- The "Control Parameter" program
- The "Engine monitoring" program
- The "Operation on monitor 1" program (optional)

Overload safety device system (LMB)
The overload safety is carried out on the micro processor unit 0 for basic component group 0. The LICCON Computer system operates according to the principle of comparison between the actual load and the maximum permissible load according to the load capacity chart and reeving.

Actual load
The actual load is determined by obtaining changing values:
The load of the crane is a combination of load momentum and boom momentum. It affects a force in the boom luffing cylinder, which is measuredby pressure sensors.

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

The radius is determined on hand of the angle sensor information (boom angle), the length sensor information (boom length), and the geometric data of the adjusted operating mode. The boom flexation due to its own weight and the weight of the load is taken into account.

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

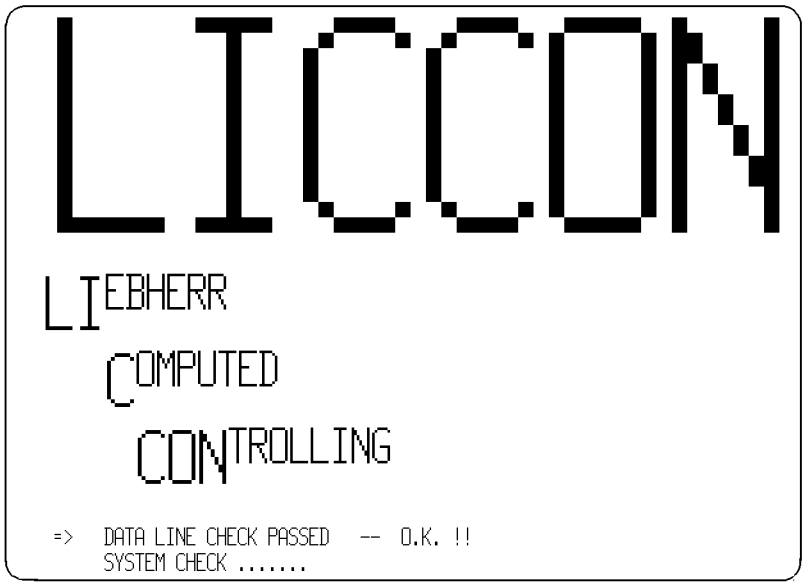
Maximum load according to load capacity chart and reeving
The crane data as well as load capacity charts, boom weights and geometric data are stored in the central data bank of the LICCON Computer system.
From the load capacity charts , the "maximum load according to the load capacity chart and reeving" is constantly being determined for the entered equipment configuration, the entered reeving and the calculated radius.

Comparison
The actual load and the "maximum load according to the load capacity chart and reeving" is compared. When the value gets close to the given limit, a prewarning is given. If this limit is reached or exceeded, the overload warning device (STOP) is triggered and the load moment increasing crane movements are turned off.

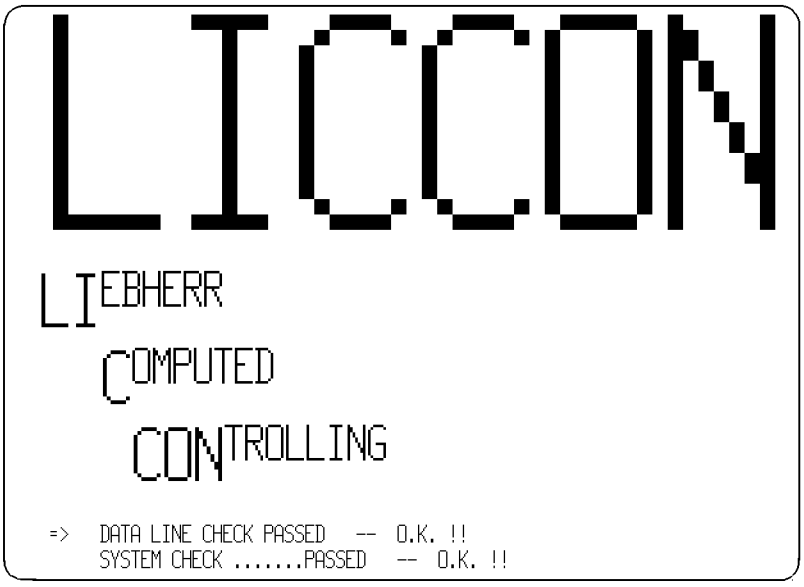
The integration of electric and electronic components in the chassis and the crane superstructure is handled via data bus transfer technology (Liebherr-System-Bus ⇒LSB).

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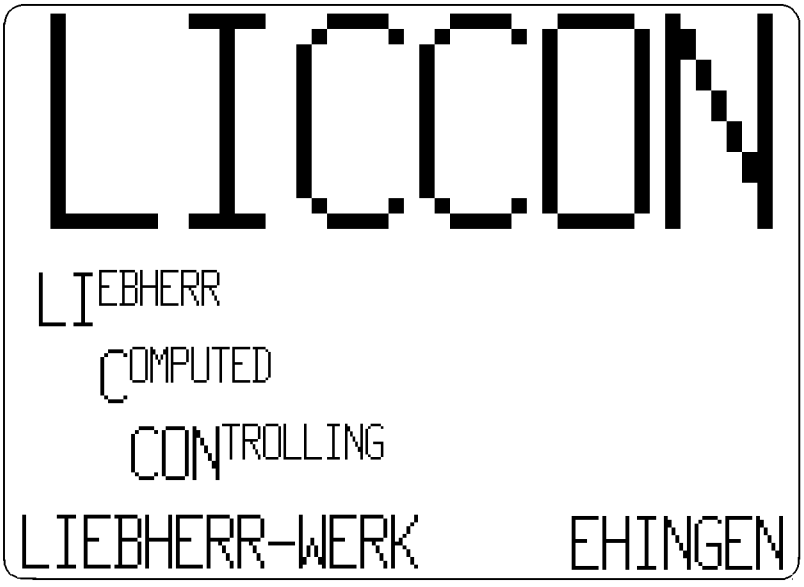
1



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3. Booting up the LICCON computer system after turning it on

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

The connections from the micro processor central units (CPUs) to the monitor are checked first. If no error was found, the following is shown on the monitor:

⇒ DATA LINE CHECK PASSED -- O.K. !! (fig. 1)
SYSTEM CHECK . . . . . .

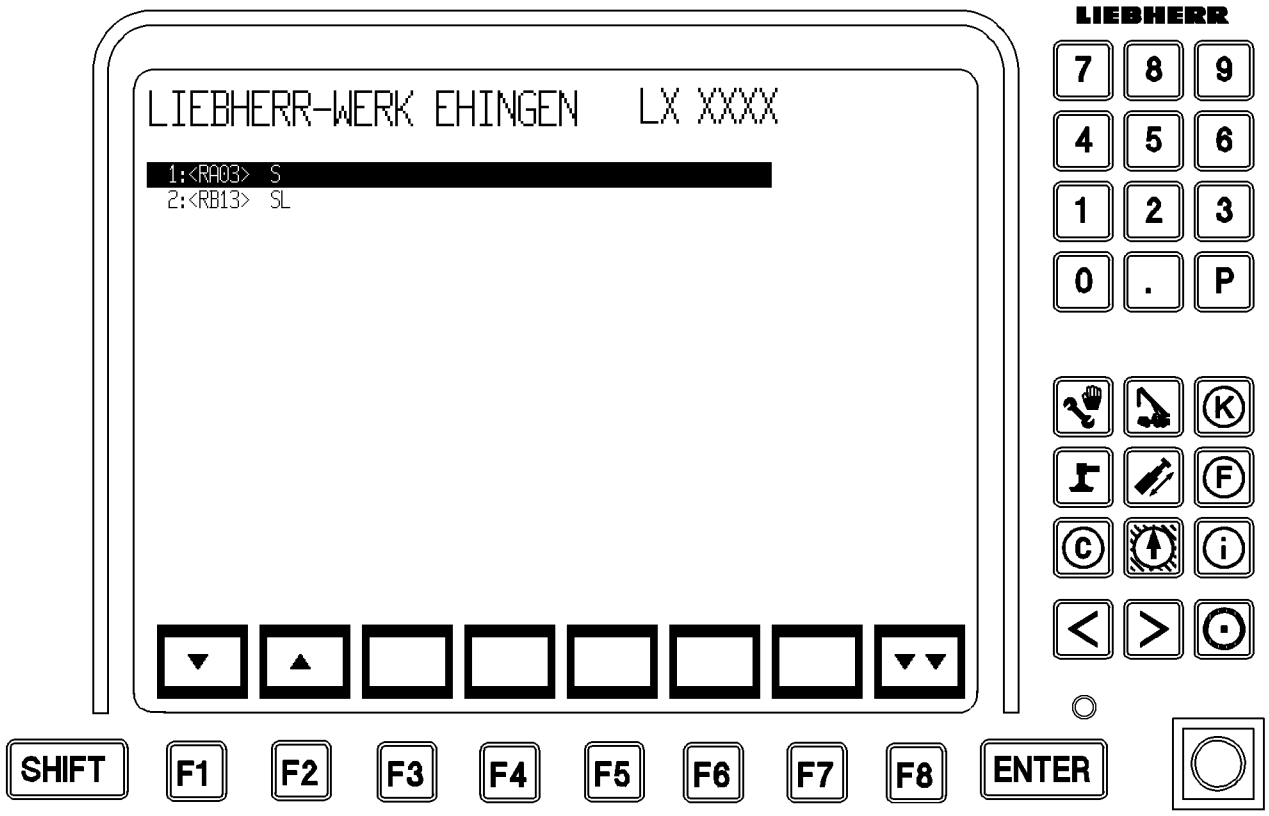
If no problems were found on the connections, a system test is carried out on all micro processor central units (CPUs). The step by step run of the self test can be viewed on the 7segment indicators of the CPUs. If no error was found during the system test, the following is shown on the monitor :

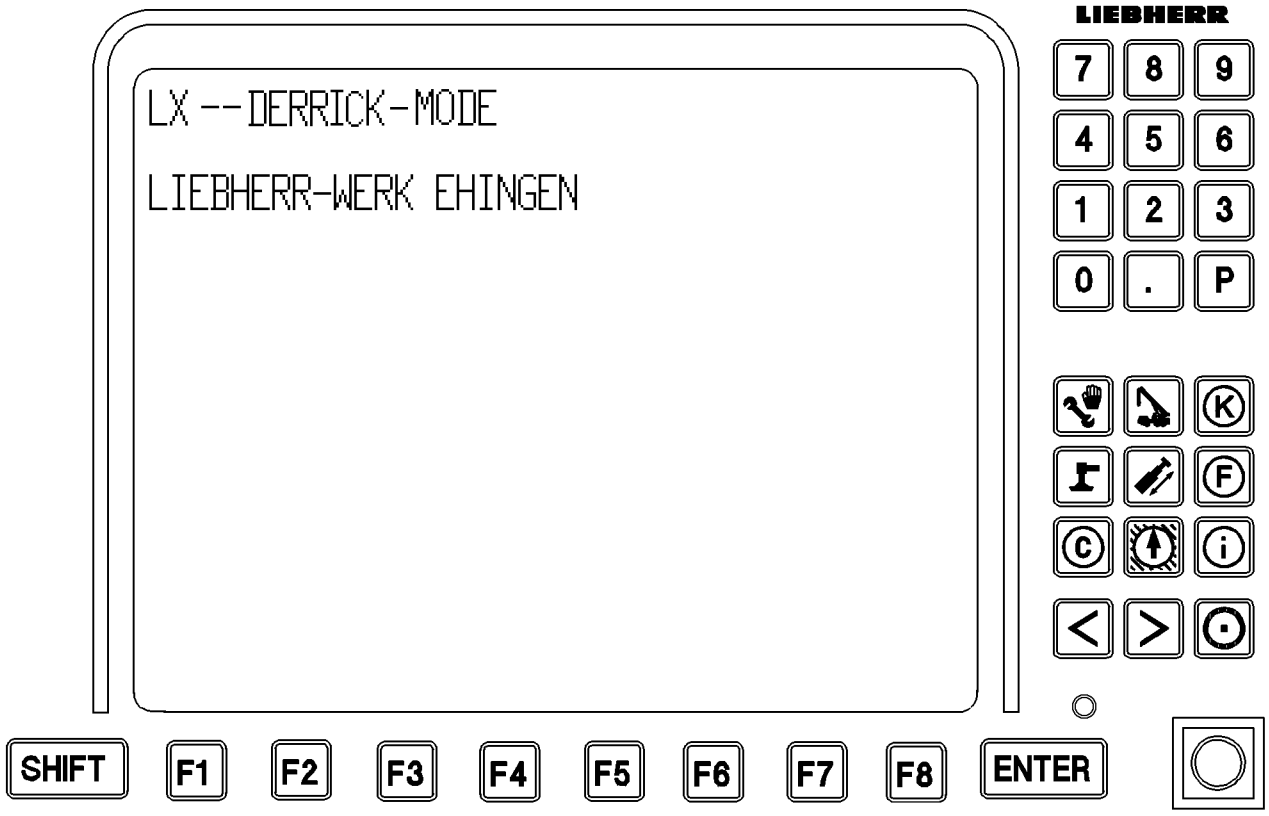
⇒ DATA LINE CHECK PASSED -- O.K. !! (fig. 2)
SYSTEM CHECK . . . . . PASSED -- O.K. !!

Then the general initialization view appears on the monitor for a short time:

LIEBHERR-WERK EHINGEN (fig. 3)

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Booting up the LICCON computer system (continuation)
If the starting procedure is completed successfully and the LICCON computer system has run through the self test , the following appears :

Monitor 0 The program to preselect the operating modes.

Note: Normally, the last used operating mode group is shown , which was used before the LICCON computer system was turned off. Only in case of a data loss, for example due to a cold boot (after a change of the battery or one of the CPUs, etc.) appears the 1st valid equipment configuration with the 1st valid operating mode.

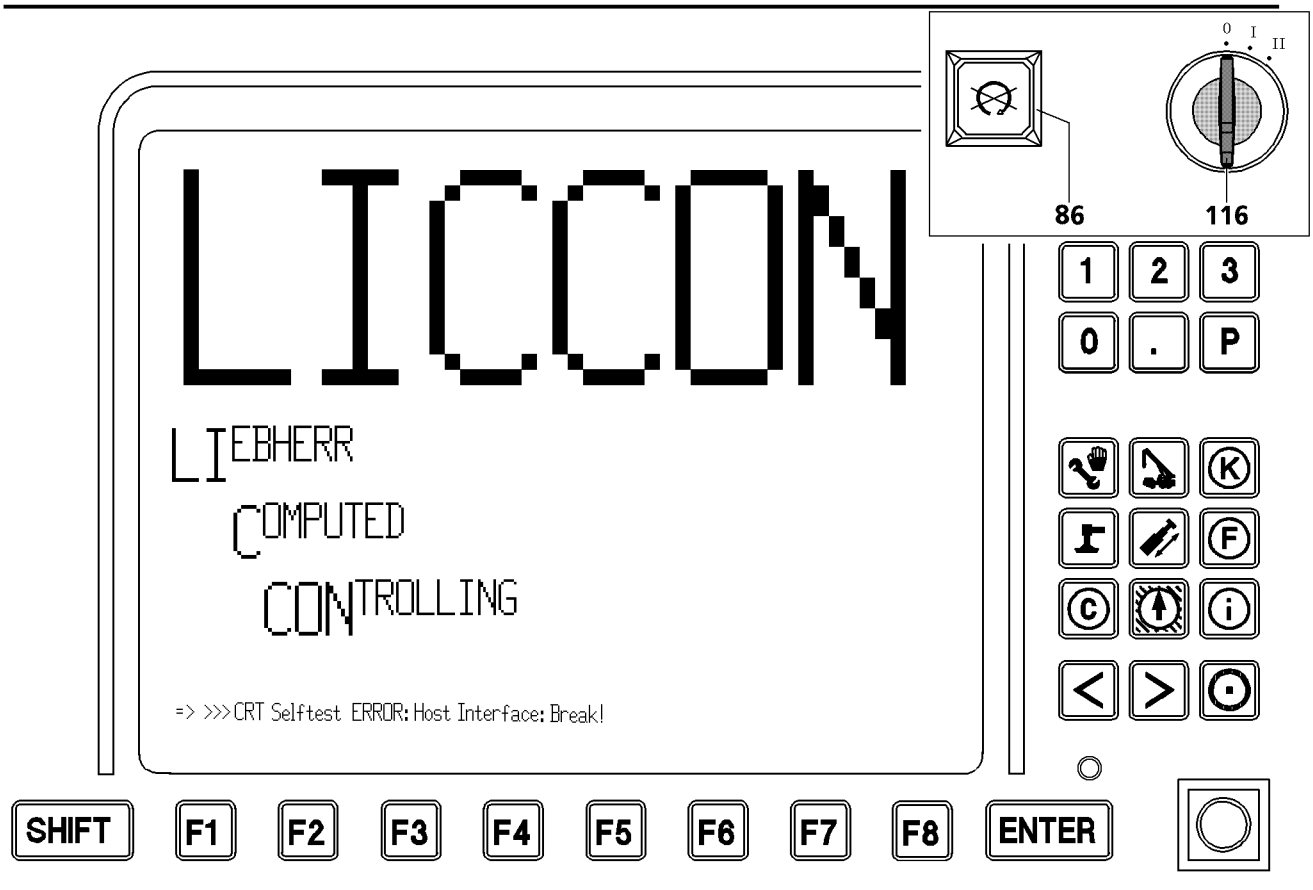
- Move the cursor up or down with function key "F1" or "F2" to preselect the desired operating mode preselection group.
- Confirm the preselection with the "F8" key or "ENTER".
  The "Set up / equipment configuration" program appears.

Note: If no new operating mode group is selected within 3 seconds, then the former operating mode group remains and the system changes into the "Set up" program. This means that if the previously set operating mode group is to remain, no entry is necessary.

Monitor 1 The monitor 1 title view (Derrick mode).

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4. LICCON computer system in stand-by mode

LICCON stand-by operation is obtained by:

1. **Starting the LICCON computer system without the engine**
   - Turn the ignition key (116) to position I.
     If the ignition key (116) remains in position I, the LICCON computer system runs and the monitor shows the equipment configuration view or the engine monitoring view in engine Stop /warning /prewarning.
   - Change to the "Operation" program by pressing the "F8" key (O.K.).

2. **Shut off the engine with the engine Stop key**
   - Turn the engine off with button (86), the ignition key (116) remains in position I.

Note: To start the engine, turn the ignition key momentarily to position II.

4.1 Active stand-by operation / alarm

Note: The operation programs as well as the monitor indicators function as for the turn on procedure of the LICCON computer system with engine start (crane operation).

C A U T I O N : **No crane movements are possible. If a crane movement is selected anyway, a message is shown on the LICCON monitor, for example:**

Operation slewing shutoff crane engine not running

Note: The stand-by operation is in effect for 15 minutes, with 3 minutes in stand-by alarm. The control of the LICCON computer system during the stand-by operation extends the stand-by time automatically.

If **no** key is actuated on the monitor in stand-by operation, then the stand-by alarm (horn) is reached after 12 minutes. On the monitor appears the view:

STANDBY

Note: If now any button on the LICCON monitor is actuated, the system shifts back into the interrupted program. The stand-by time is extended by another 15 minutes.

If no button is actuated on the monitor during the stand-by alarm period (which lasts for 3 minutes), then the LICCON computer system shuts off completely. The shut off is noted by an acoustical signal, 60 seconds in advance (short horn) and 30 seconds in advance (long horn). The power supply unit of the LICCON computer system turns off. On the LICCON monitor appears the view :

>>> CRT Selftest: ERROR: Host Interface: Break!

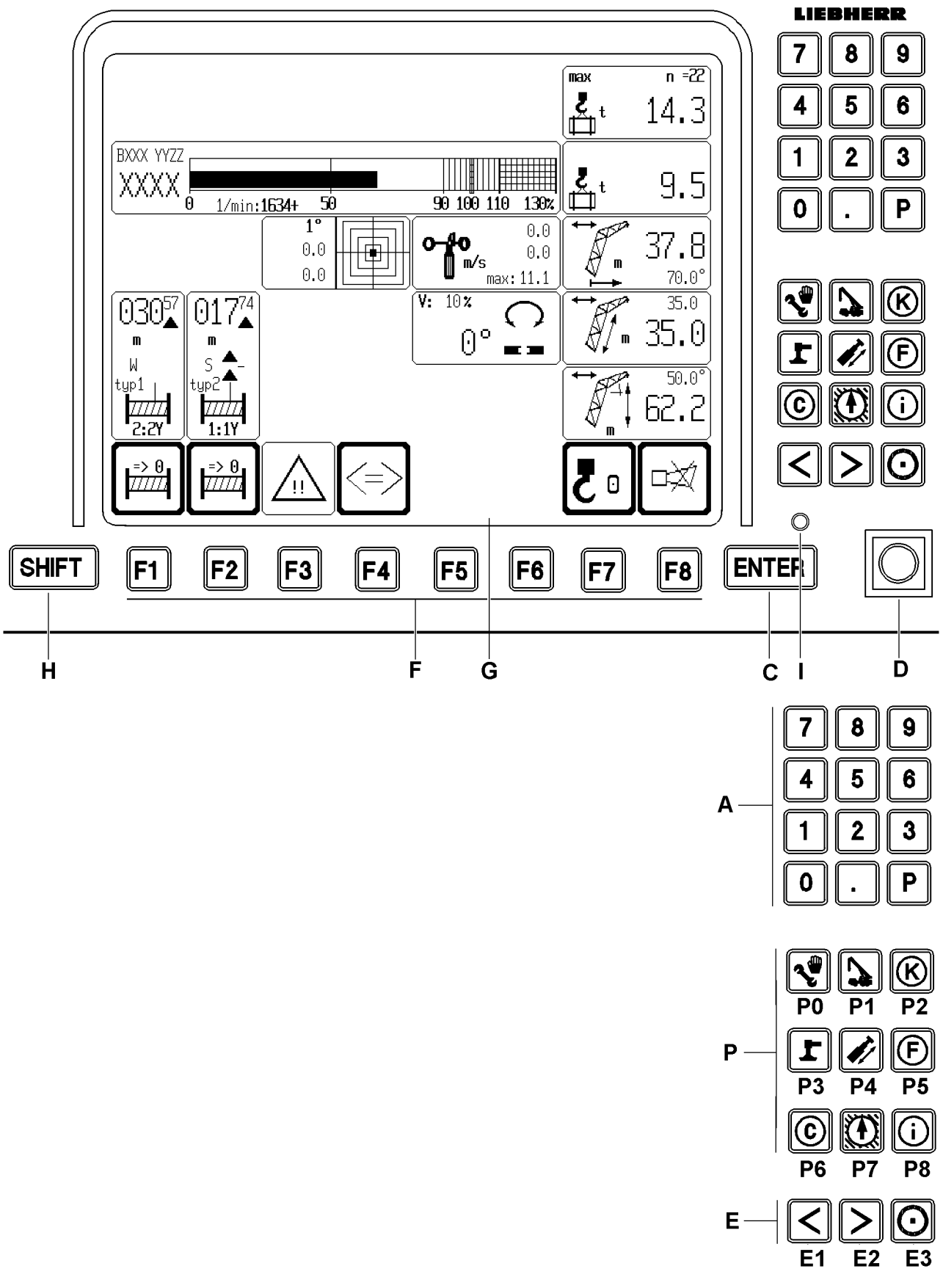
and the indicator lights 86, 134 and 136 blink.

Note: In this case, no error message is shown on the LICCON computer system, the error message on the monitor appears only due to the interruption of monitor and CPU.

4.1.1 Start prevention

- To restart the engine after the LICCON computer system has shut down completely, the ignition switch (116) must first be turned back to position 0.
- Turn the ignition starter switch (116) to position I (note the preglow time).
- Start the engine by turning the ignition switch (116) momentarily to position II.

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9. The control elements of the LICCON computer system on monitor 0

A Alpha numeric keyboard

P Program keys
To start the individual LICCON programs
P0: Set up /Equipment configuration program
P1: Operating program
P5: Winch -pulley head assignment (input window)
P6: Control Parameter

C Input key "ENTER"
To confirm changes.

D Configuration button
- Position to right (touching) ⇒Hoist limit switch bypassed and shut off of load moment limiter exceeded

Note: By actuating the configuration button **D**, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available!

- Operating position (self retaining) ⇒Normal operation

E Special function keys

Brightness adjustment of monitor
The brightness level of the monitor can be adjusted with this key.
- "E3" + "E1" background illumination ON /OFF
- "E3" + "E2" brightness adjustment in three stages

Note: Additional functions of special function keys depend on the program and will be explained in detail in the description of the individual LICCON programs.

F Function keys (F1 to F8)
The function keys must always be viewed together with the function key symbol line shown on the monitor above.

G Monitor
Shows individual program views (example : Operating view).

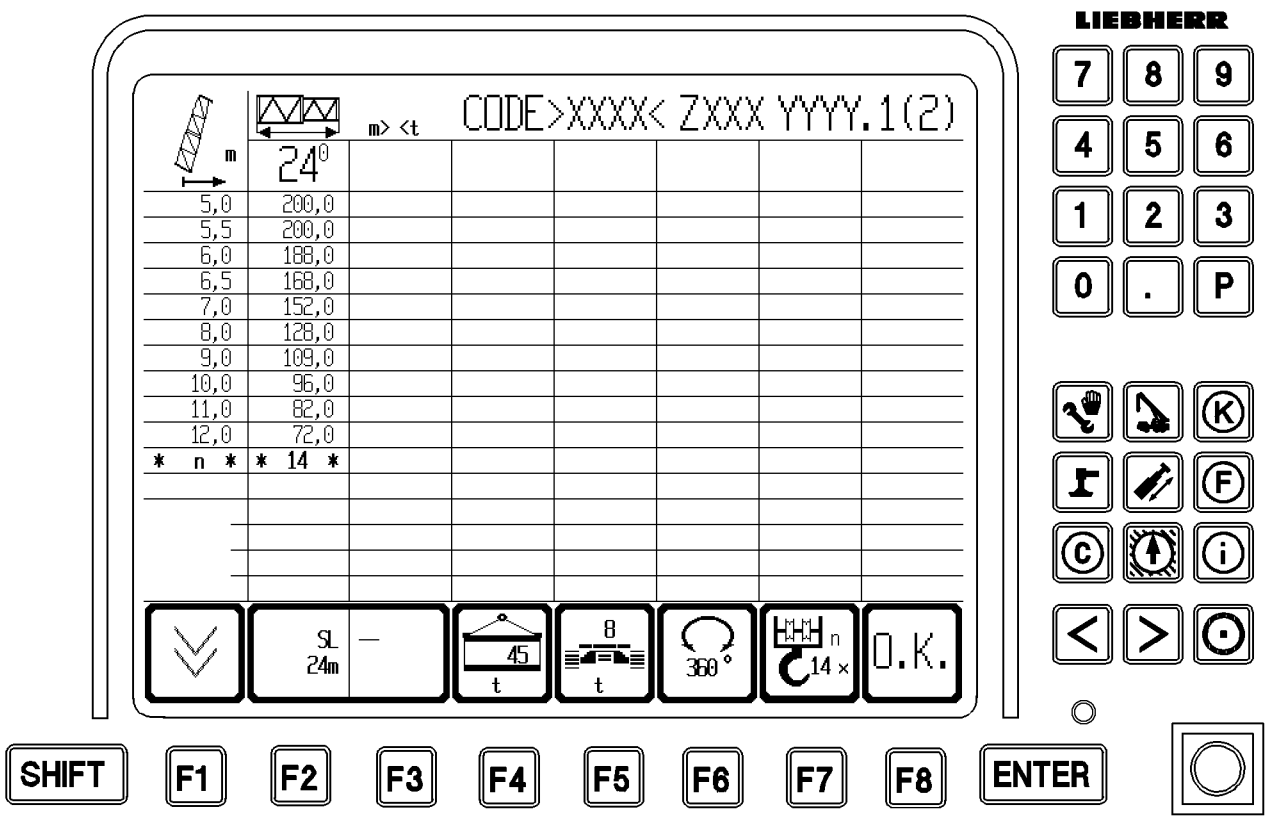
H SHIFT key
Key assignment on 2nd level, "Supervisory function".

I LED indicators
Power supply for monitor available.

Note: The function of the individual monitor control elements depends on the program, which means it might differ depending on the currently executed LICCON program. It will be explained in detail in the description of the individual LICCON programs..

* Optional

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10. The ”Set up” program

After turning it on, and after the LICCON computer system is booted up and the operating mode group is preselected, the system changes automatically into the "Set up" program.

Note: If an equipment configuration fromthe same operating mode group was set before the LICCON computer system was turned off, then this last used equipment configuration and the reeving used at that time is automatically reset and shown.
If another operating mode group was selected before the LICCON computer system was shut off, or if the LICCON computer system is turned on for the first time, or in case of data loss (memory loss due to cold boot), then, after this operating mode is confirmed, the first valid equipment configuration of the first valid operating mode appears in the equipment configuration view.

C A U T I O N : In case of cold boot, the setting for the hoist cable reeving is set to ”0” !

Note: All entries and settings, which are made in the ”Set up” program can only be made on monitor 0.

Setting the operating mode and the equipment configuration

The operating mode and the equipment configuration can be set two ways:

1. With function keys :
   "F2" Setting the main geometric condition
   "F3" Setting the auxiliary equipment
   "F4" Setting the slewing platform weight
   "F5" Setting the central ballast or support
   "F6" Setting the slewing range in operating modes with various slewing ranges
   - Confirm settings with the "ENTER" key.

2. With the short code:
   - Enter the 4-digit short code with the alpha-numeric key on monitor 0.
   - Confirm settings with the "ENTER" key.

After entry, the data for the selected load capacity chart can be viewed.

Setting the hoist cable reeving

Press "F7" to set the **"Hoist cable reeving"**

Press "F8" to end the "set up" program and take over the entered parameters into the "Operation" program.

Note: If an equipment configuration has been confirmed at least once with the "O.K." key, than the "set up" program can also be ended by pressing one of the program keys ("P1" - "P8"). In that case, the LICCON computer system drops all setting made in the "set up" program and uses the previous operating condition, which had last been confirmed with "O.K."

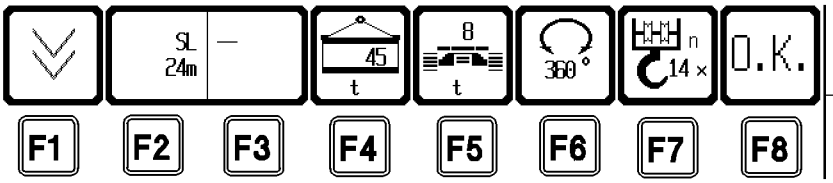
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10.1

m	24°						
5,0	200,0						
5,5	200,0						
6,0	188,0						
6,5	168,0						
7,0	152,0						
8,0	128,0						
9,0	109,0						
10,0	96,0						
11,0	82,0						
12,0	72,0						
* n *	* 14 *						

10.2



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The monitor in the equipment configuration view is divided into three areas :

10.1 General information line

10.2 Indicator area for the values of the load capacity chart

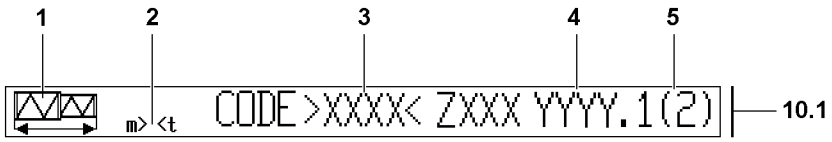
10.3 Function key bar

10.4 Other control elements

Note: The monitor illustrations in this chapter are only examples. The numeric values in the individual symbol elements and charts might not match this particular crane. The programmed load capacity charts for the crane apply.

In addition, some views on the monitor show the maximum possible assignment of the LICCON monitor with symbol elements. In normal crane operation, such an identical view would not appear on the LICCON monitor.

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10.1 General information line

1) The symbol ”Main boom length” (the same for all operating modes)

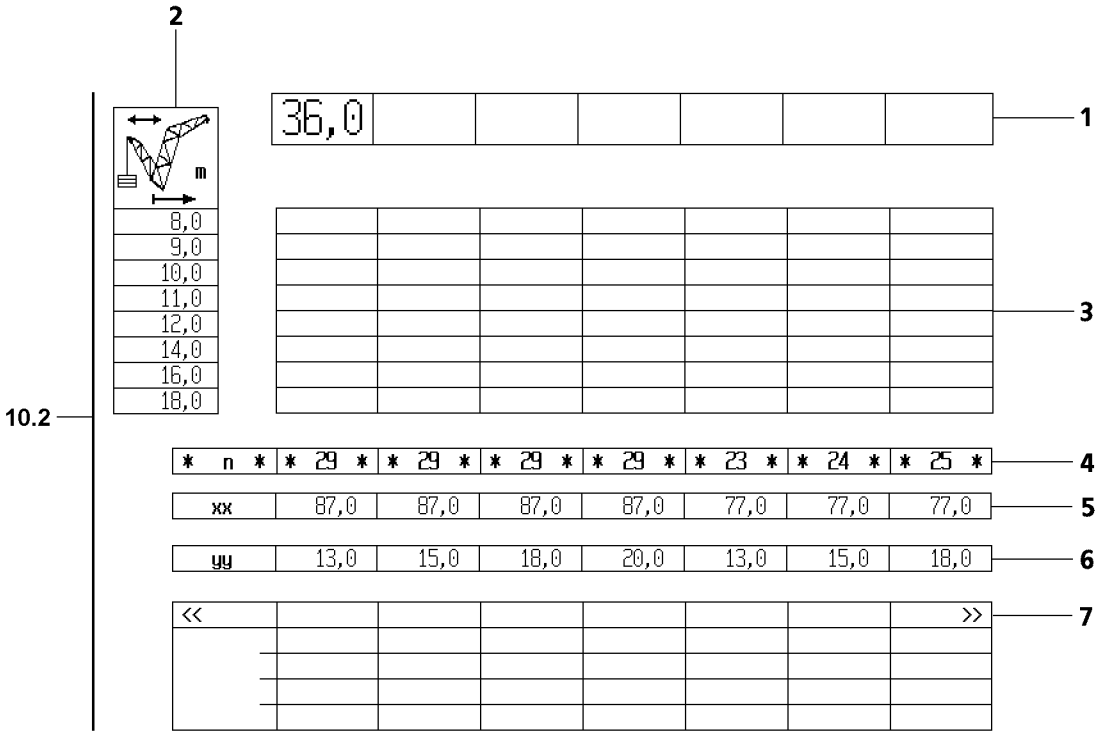
2) Abbreviations for programmed length units (LE) and weight units (GE). Possible length units are meters [m] and feet [ft]. Possible weight units are tons [t] and pounds [lbs].

3) Next to the word ”CODE” is a 4 digit short code (XXXX) in parenthesis (> <). Each short code describes an equipment configuration for the crane. The valid equipment configurations for the crane and the corresponding short code numbers are listed in the load capacity chart manual for the crane.

4) Organization number
For internal Liebherr load chart administration

5) The page number of the currently shown section of the load capacity chart is separated by a point ”.” from the organization number, the total number of pages of this chart is shown in parenthesis ( ).

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10.2 Indicator range for load capacity chart values

1) Main boom lengths in length units (LU) of meters ([m] or feet [ft]) in max. 7 columns per page. They form the horizontal axle of the load capacity value field.

2) The operational mode dependent symbol element ”radius” in length units (LU) of meters ([m] or feet [ft]), below maximum 10 lines of radius values. They form the vertical axle of the load capacity value field.

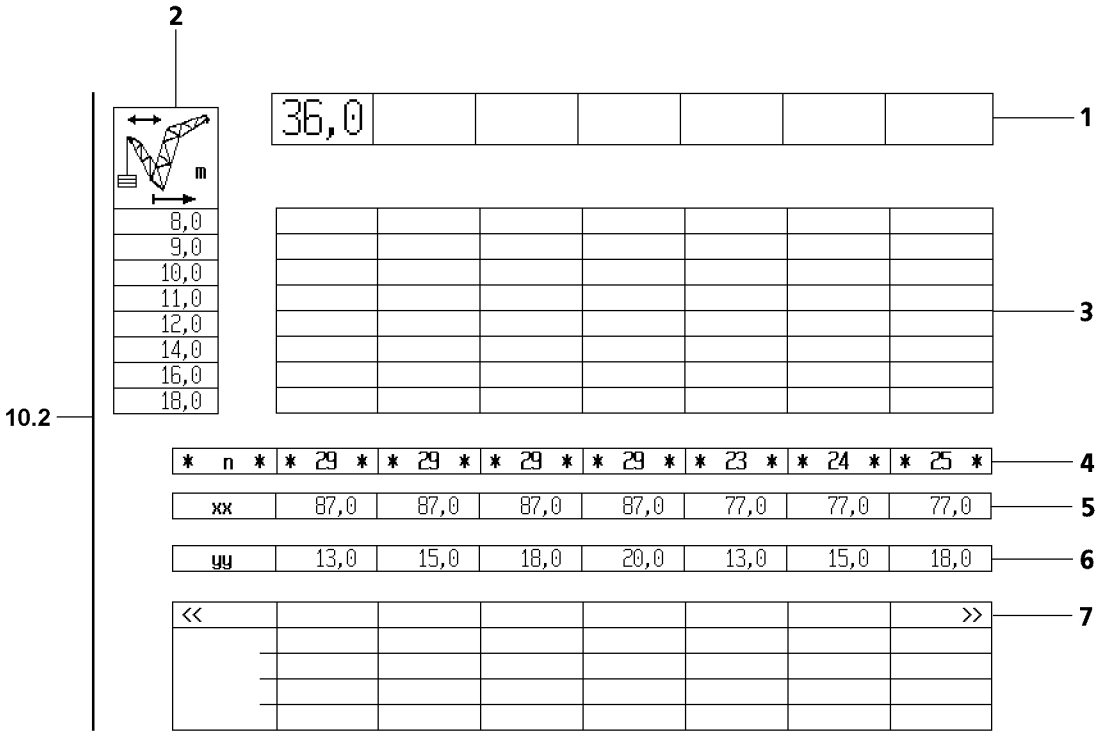
3) Load capacity value field
In columns below the main boom lengths and in lines to the right of the radius values are the **load capacity values**, depending on the boom length and the radius.

4) Line * **n** * = Hoist cable reeving
The numbers in this line show how often the hoist cable must be reeved between the boom head and the hook block (n), to be able to lift the maximum load according to the load chart column.

   Note: If the load capacity value in the column exceeds the load which can be lifted with the maximum possible reeving, then an exclamation mark (”!”) is next to the reeving number, to show that special equipment is necessary to lift this load.

   Note: For parallel operation of hoist winches, an even reeving number must be used and entered. If the minimum value happens to be uneven, then the next higher reeving number must be used for parallel operation of the hoist winches.

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5) Line **xx** = Main boom angle in [°]
Appears only in operating modes with luffing lattice jib.

a) If "xx°" appears in the symbol element main geometry (for example **xx° SDBW**) , then xx° = main boom angle in [°]. The main boom angles, which must be set to be able to lift the load values according to the corresponding load chart column are shown in columns next to each other.

b) If "xx°" appears in symbol element auxiliary geometry (for example **WV xx°**), then xx° = jib relative angle in [°]. This means the jib angle in relation to the main boom angle (main boom angle on pulley head jib angle bottom).

The jib relative angles, which must be set to be able to lift the load values according to the corresponding load chart column are shown in columns next to each other.

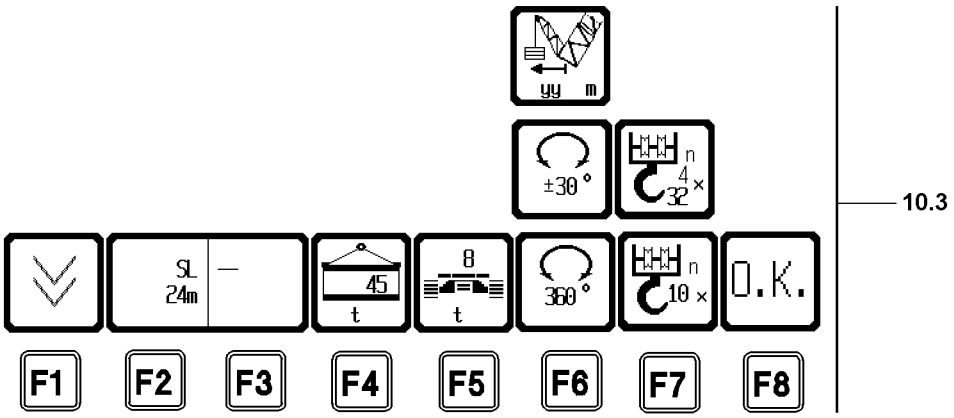
6) Line **yy** = Derrick ballast radius in [m]
Appears only in operating modes with derrick ballast.

The columns show the derrick ballast distances, which must be set to be able to lift the load values shown on the corresponding load chart column.

7) Line for special indicators
If a load capacity chart consists of more than 7 columns, then it cannot be shown completely due to the size of the monitor. In this case, arrows in the 1st field (<<) or in the 7th field (>>) in this line show that there are additional columns to the left or right, which can be viewed by pressing the arrow keys "<" or ">".

Note: Page to the left or right by 7 load chart columns (1 page) by using key combination "SHIFT" + "<" or "SHIFT" + ">".

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10.3 The function keybar

The function key bar contains 8 symbol elements, which correspond to the function keys underneath, which means they either depict a function, which can be triggered with the function keys ("F1" to "F8") or they change their image or their text contents and show a change of operating mode or equipment configuration.

"F1" Vertical paging
Due to the size of the monitor, maximum 10 load chart lines can be shown at the same time. If the chart consists of more than 10 lines, then the view is split to several pages. By pressing the key, the next page of the load capacity chart is shown, and the number of the current page in the ”General information line ” is increased by 1. When the last page is reached, and "F1" is pressed again, page 1 reappears.

"F2" Setting the operating mode "Main geometry condition)
The various main boom operating modes and main boom lengths can be set here. The types are described in the symbol by abbreviation and length data.
For example **xx° SL, 24 m** = Main boom , heavy / light

"SHIFT"+ "F2" Previous main geometry condition

"F3" Setting the operating mode "Auxiliary equipment"
The crane operator can select the various types of auxiliary crane equipment, if available. The types are described in the symbol by abbreviation and angle and length data,
for example **W 18 m** = Luffing lattice jib, 18 m

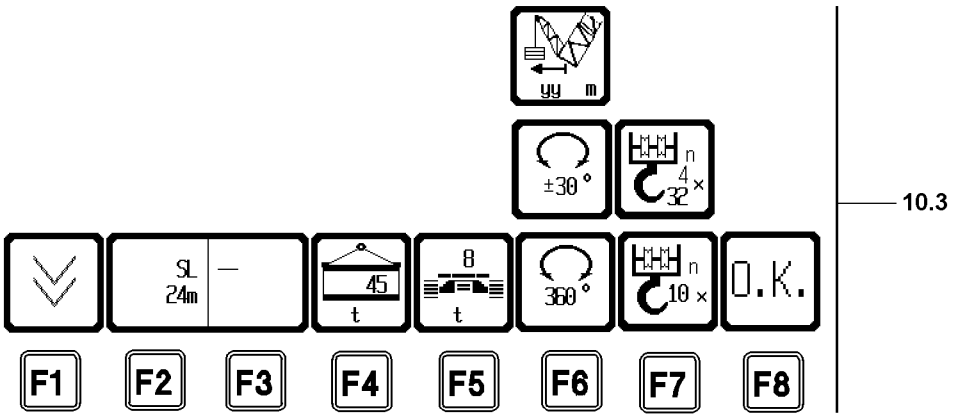
"SHIFT" +"F3" Previous auxiliary equipment condition.

Note: If function keys "F2" and / or "F3" are pressed, all operating mode and equipment configuration dependent data is deleted from the monitor and sets the short code in the ”General information line ” to ”CODE >????<”.

Operating mode dependent data are:
- Boom length symbol in the General information line
- Length units and weight units
- Organization number of load capacity chart
- Radius symbol
- Boom length data

Equipment configuration dependent data are:
- Numbering for current page number and total page number of load capacity chart
- Radius values in length units
- Load chart values in weight units.

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"F4" Setting the equipment configuration "Counterweight" (slewing platform)
By pressing this key, the LICCON computer system is set to the current counterweight on the slewing platform. By pressing the key, the symbol with text is shown in the counterweight symbol.

"F5" Setting the equipment configuration "Chassis" (crawler, central ballast)
In operating modes, which have various chassis versions, such as ballast on chassis, variable support), the configuration can be set with the F5 key.

"F6" Setting the equipment configuration "slewing range of the crane superstructure"
In operating modes with various slewing ranges.

1) 360° working range
Unlimited turning of crane superstructure possible, the same load carrying value is valid for the complete 360° working range.

2) ±30° working range*
For the limit slewing angle range (±30° to the side), there are increased load charts. If the crane turns past this angle range, the Load Moment Limiter (LMB) automatically shifts to the lower 360° load chart.

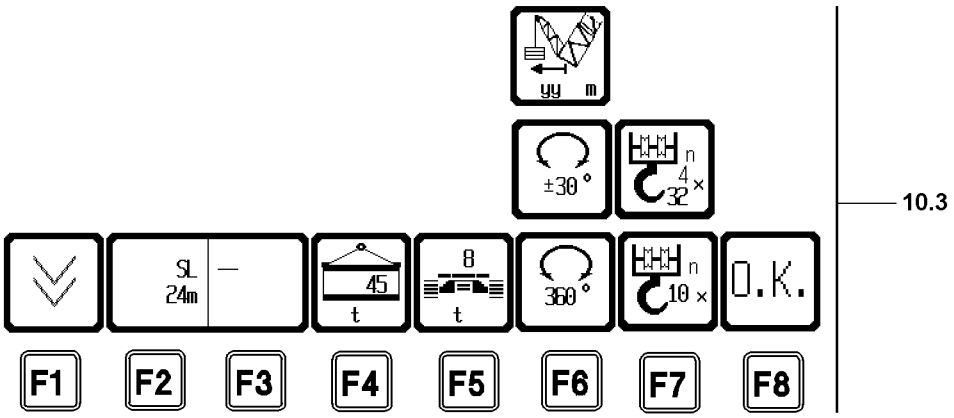
Note: If the current load can only be lifted in limited slewing angle range (±30° to the side), then the slewing speed is reduced to the limit of the slewing range, until "Zero" (slewing range shut off). This eliminates overloading the crane due to slewing.
See paragraph 40, Automatic slewing range change over.

Setting the equipment configuration "Derrick ballast radius"
In operating modes with derrick ballast.

Note: When pressing "F4", "F5" or "F6", all operating mode dependent data is shown (if they were first deleted and the selected operating mode exists). The short code is then always Code>????<.

* Optional

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"F7" Setting the "Hoist cable reeving"
Press the "F7" key to set the number of hoist cable strands, which is reeved on the corresponding pulley head (boom, boom nose).

Note: The reeving for the boom nose (upper number) is only shown if the boom nose is installed. If the boom nose is installed while the operation program is running, then the reeving of the boom nose must be entered correctly in the "Set up" program.

"F7" The number of the **hoist cable reeving of the boom** shown in the symbol can be increased by 1 by pressing the key, to the maximum value for the corresponding operating mode; then the counter starts again at the minimum value for this operating mode.

Note: For parallel operation of hoist winches (1ll2), at hoist rope reeving, enter the total reeving of winch 1 and winch 2 on the LICCON computer system (Example: Winch 1 and winch 2 are each reeved 7-ways, the total reeving is therefore n = 14).
The total reeving **must** always show an even number value in parallel operation!

"SHIFT" + "F7" The number of the **hoist cable reeving of the boom** shown in the symbol can be decreased by 1 by pressing the key, to the maximum value for the corresponding operating mode; then the counter starts again at the minimum value for this operating mode.

"E3" + "F7" The input value (upper number) for the **hoist cable reeving of the boom nose** can be increased by 1 by pressing the key.
(See "F7")

"SHIFT" + "E3" + "F7" The input value (upper number) for the **hoist cable reeving of the boom nose** can be decreased by 1 by pressing the key.
(See "SHIFT" + "F7")

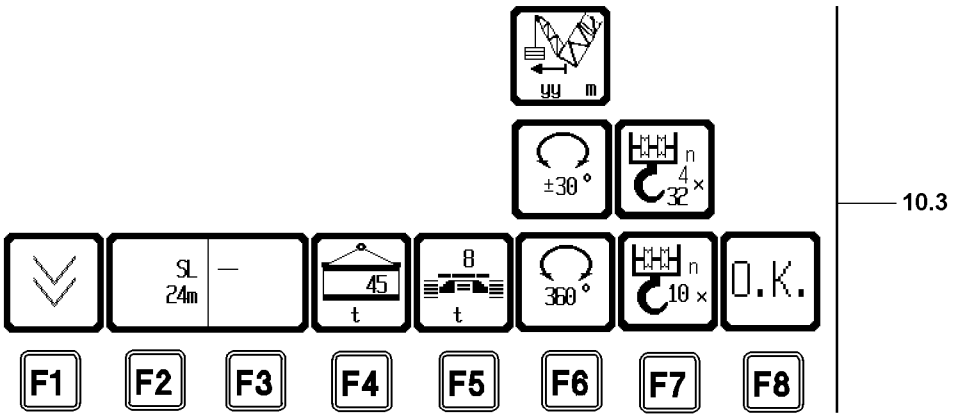
Note: If the set value is within this range (minimum value ≤ actual value ≤ maximum value), when changing over, then it retains its validity. Otherwise the input value is set to the minimum value of the new operating mode.

C A U T I O N: For parallel operation of hoist winches an even reeving must always be used and entered. If the minimum value is uneven, then the next higher reeving number must be set for parallel operation of hoist winches.

Note: After a "cold start" (for example data loss in memory bank), the indication of hoist cable reeving is on "0".

* Optional

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"F8" 1) Confirmation of entered equipment configuration
By pressing the ""F8 / O.K." key, the selected equipment configuration and the selected reeving is confirmed and the parameters are transferred to the "Operation" program.
The following must be observed:
- The setting of the equipment configuration must be completed, which means a valid short code is shown and in the chart field are load capacity values.
- The external conditions for this equipment configuration, if stipulated, must also be met (for example: slewing platform lock).
- The crane may not be utilized by more than 20%, or the load hanging on the hook may not be heavier than 0.5 t.

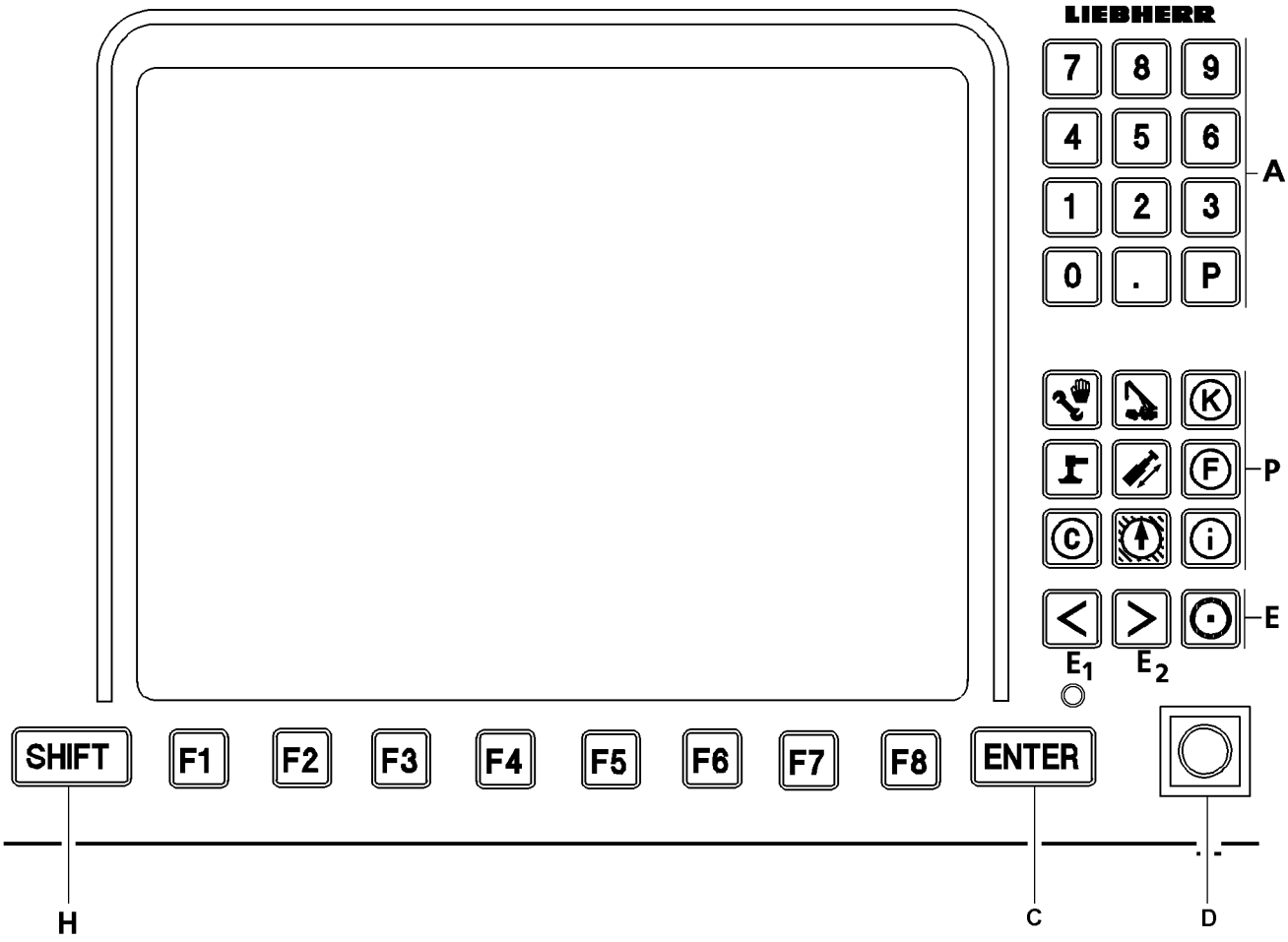
Otherwise, change over to the "Operation" program can only be made via the program key "P1". In this case, the new settings for the equipment configuration are not taken over.

Note: It must be ensured that the selected equipment configuration (short code) and the hoist cable reeving (s) have been accepted after shifting into the operation view.

2) Indication of operating errors, which were caused in the "Set up" program.
Operating error, which were created in the "Set up" program are shown for approx. 5 seconds in the symbol element above the "F8" key. If the "F8" key is pressed within 5 seconds, then the system changes automatically to the error determination view in the test system, where the error is documented. Operating errors are not stored.

Note: Operating errors are always on top of the error stack.

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10.4 Other control elements

The other control elements on the LICCON indicator and control unit, which are located in the ”set up” program have the following functions :

A Alpha numeric keyboard

With the keys "1" to "9" of the alpha-numeric key block, direct access is provided to the short code field in the General information line and the short code is entered..

Note: Using the alpha-numeric keys deletes all operating mode and equipment configuration dependent data from the monitor.

The keys ”P” and ”.” have no function in the ”set up ” program.

P Program keys

With the program keys you can select between the various programs. The settings entered in the equipment configuration program are thrown out and the system continues to use the equipment configuration and the reeving which had been confirmed last with "O.K.".

Note: The currently running program **cannot be recalled** by pressing its program key.

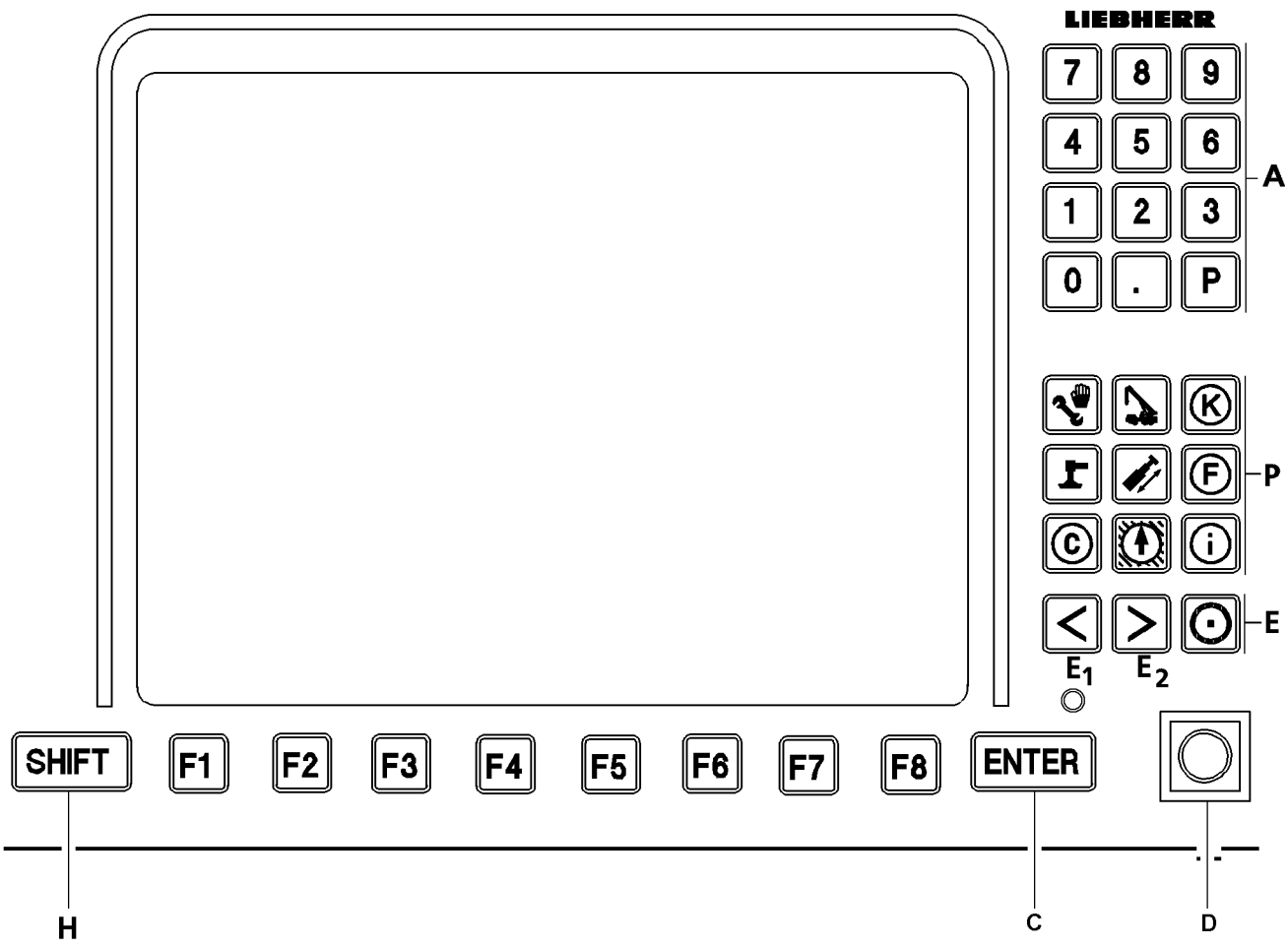
C Input key "ENTER"

- "ENTER" is the input confirmation when entering the short code as well as when changing the equipment configuration via the function keys.
- "ENTER" after short code input searches the short code in all stored load capacity charts. If the corresponding load capacity chart has been programmed into the system, then it is shown completely (including the lettering on the symbols in the function key bar), otherwise there is an error message in the form of question marks ”????” in the 2nd part of the organization number (see General information line) and the horn can be heard.
- "ENTER" after changing the operating mode via the function keys searches for this operating mode, in case of success it sets the 1st equipment configuration and shows the corresponding load capacity chart and its short code. In case of an error, the short code indication remains on CODE >???<, ”B xx????” is shown as the organization number and the horn can be heard.
- "ENTER" after changing the equipment configuration with function keys "F4", "F5", "F6" shows that load capacity chart,if available, with short code on the monitor. In case of an error, the short code remains on CODE>???< and the horn can be heard.

D Configuration button

- Has no function in the "Configuration" program

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E Horizontal paging "E1" and "E2"
If a load capacity chart consists of more than 7 columns, then columns 1 to 7 are always shown during the first display of the equipment configuration.

A double arrow on the rear / front edge of the line shows that there are still additional columns in this direction.

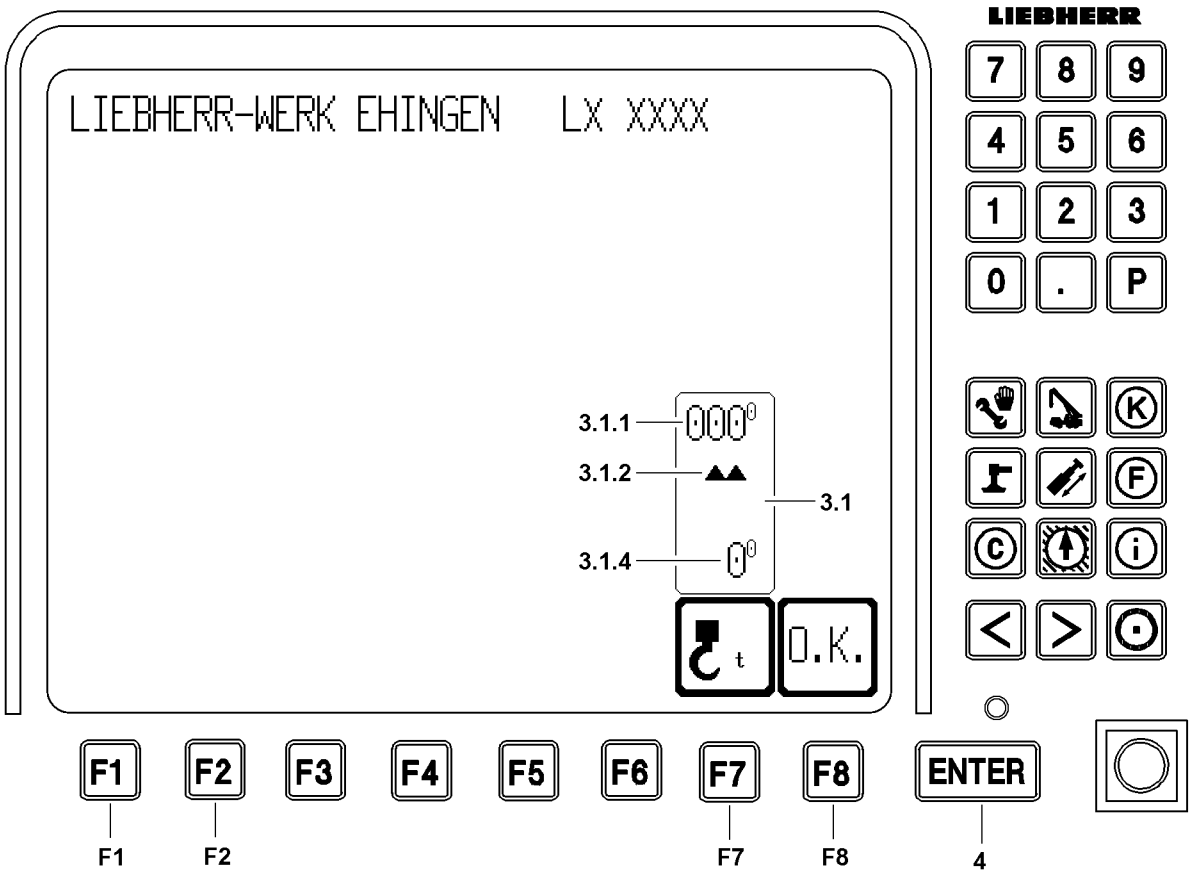
Press "E2" , the next column to the right is shown.
Press "E1" , the next column to the left is shown.

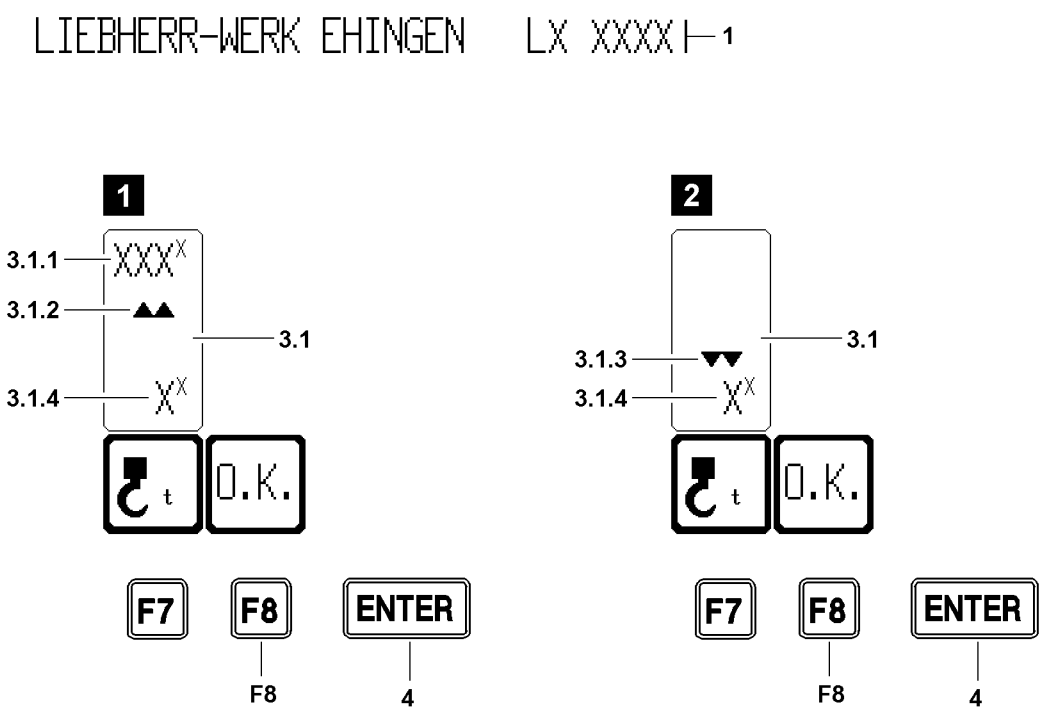
Note: The keys "E1" and "E2" are only functioning if it is noted in the ”line for special indications”.

Brightness adjustment of monitor
See paragraph 10

H SHIFT key
By pressing the "SHIFT" key and a function key at the same time, the previous main geometry condition, auxiliary equipment geometry condition and the previous reeving number are reset.
See paragraph 11.3 The function keybar.

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11. Input window hook block weight

After the set equipment configuration has been confirmed in the "Configuration" program with the function key **F8** (OK), the configuration parameters are taken over by the LICCON computer system and the input window "hook block weight" appears automatically.

11.1 Starting the input window - hook block

In the input window for the hook block weight, the crane operator must determine a hook block weight appropriate for the operating mode to erect and take down the boom or the boom systems according to the erection and take down charts.

By pressing the function key **F8** (OK) in the "Configuration" program, the LICCON computer system changes automatically to the input window for the hook block weight.

Press the function key **F8** in the configuration screen,

or

press the program key **P5**.

Areas in the input window for the hook block weight

1. Crane type identification
2. Function key line

11.2 User interface

1 Crane type identification

3 Function key line

3.1 Hook block weight icon

3.1.1 Input field for the hook block weight

3.1.2 Double arrow pointing up
- Input field is active

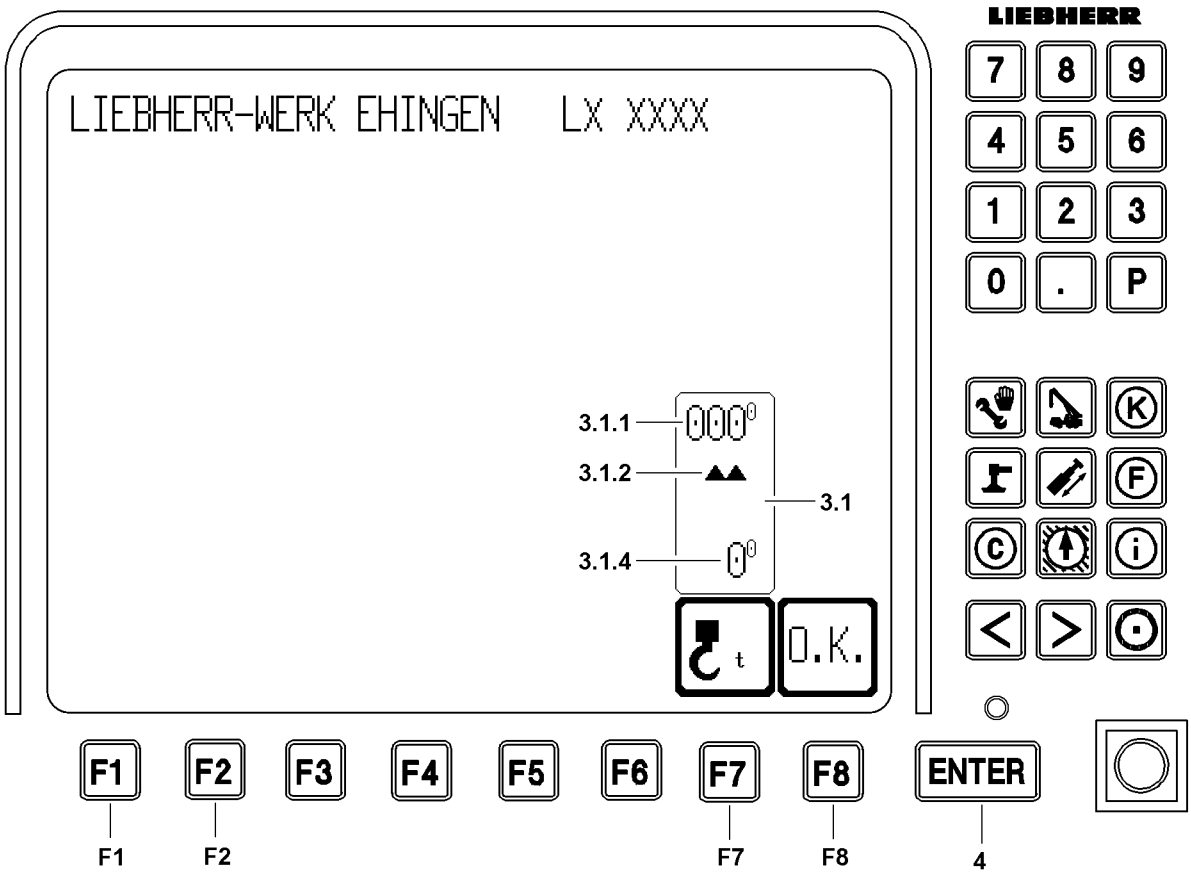
3.1.3 Double arrow pointing down
- Current input value is active

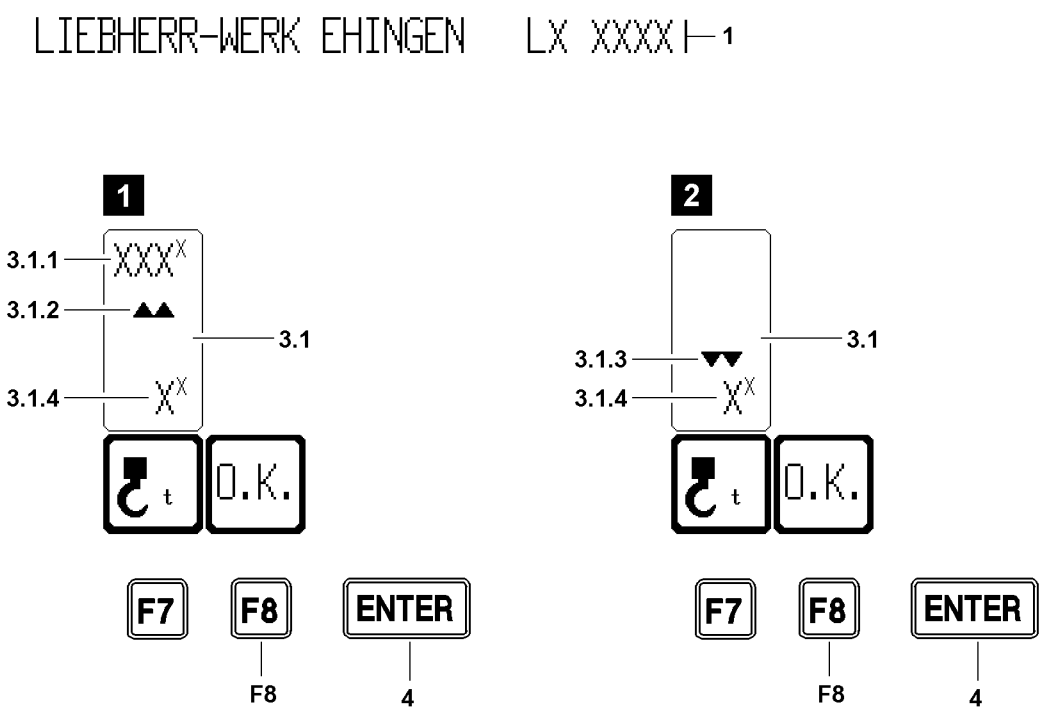
3.1.4 Current input value of hook block weight

F8 Function key "OK"
- Confirmation of settings in "Winch – pulley head – assignment screen" and acceptance of settings into the "Crane operation" program

4 ENTER
- The entered hook block weight is accepted after pressing the "ENTER" key from the input field into the current input value.

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11.3 Enter the hook block weight

To be able to erect / take down a boom or a boom system, a valid hook block weight must be entered and confirmed first in the "Winch – pulley head – assignment screen" on the LICCON computer system. Take the weight of the hook block – for the selected configuration status – from the erection and take down charts.

Note: Weighing error!
The boom system must be raised off the ground before erecting the boom or the boom system, without the hook block. If a load weight is available, then it might be an erroneous weighing insofar the following prerequisites are adhered to!
If an erroneous weighing is present, then the boom or the boom system cannot be erected / taken down!
- Make sure that a valid equipment status has been entered on the LICCON computer system!
- Make sure that the boom / the boom system has been installed according to the assembly drawings!
- Make sure that the installed boom or the installed boom system match the entered configuration status of the crane!
- Make sure that all attachment parts on the boom have been removed!
- Make sure that there are no guy rods on the boom!
- Make sure tht the boom is free of snow and ice!
- Make sure that the wind influence onto the boom from the rear is not too great!
- Make sure that the weighing error is plausible and comprehensible!

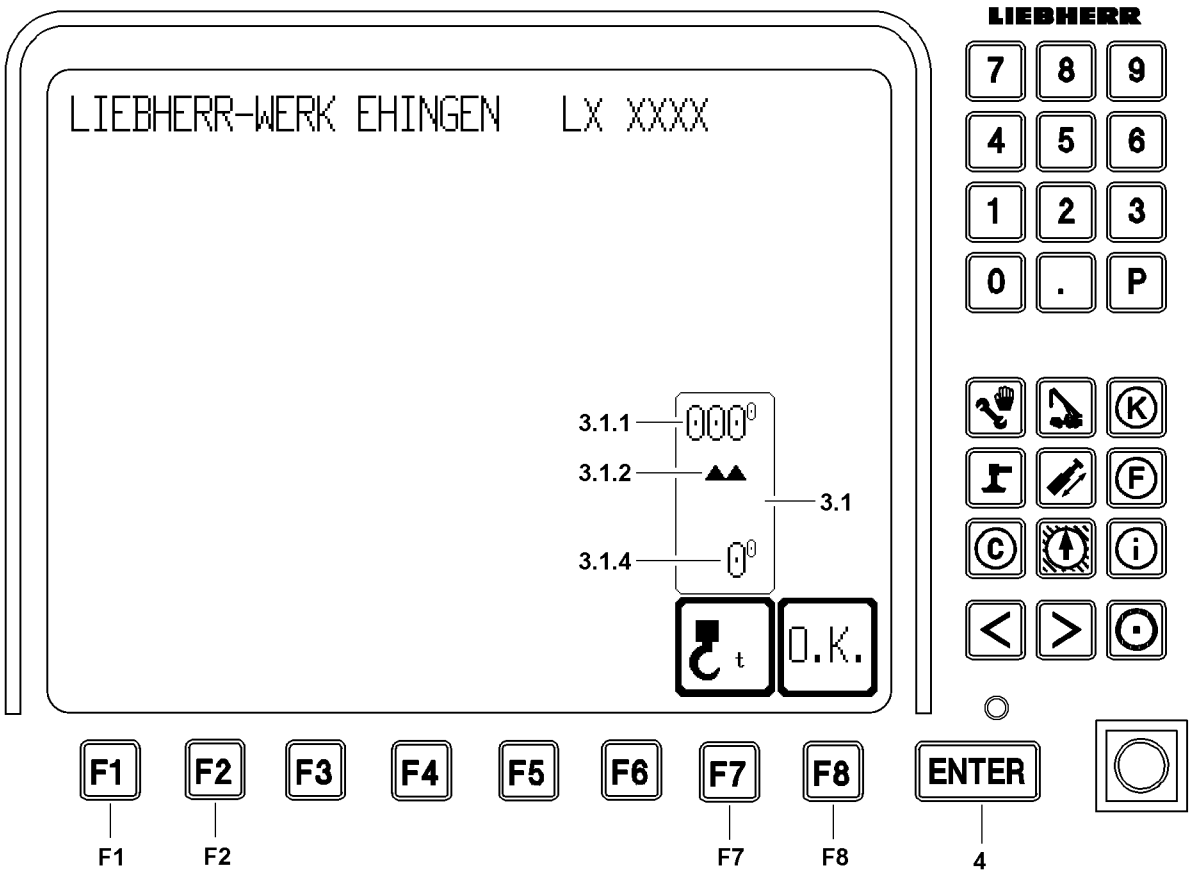
If the above listed prerequisites are adhered to, then the determined weighing error may be added to the permissible hook block weight and entered in the hook block weight icon.

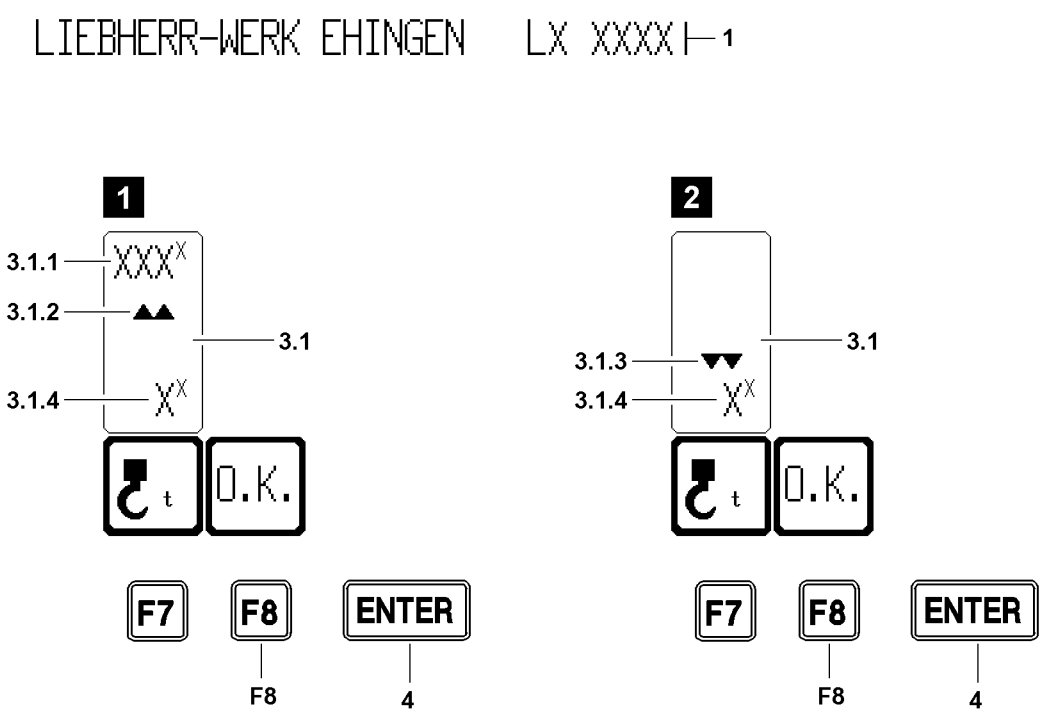
D A N G E R : The crane can topple over!
If an incorrect value is entered by the crane operator in the "hook block weight" icon, then the crane can be overloaded and topple over!
Personnel can be severely injured or killed!
- **By entering the hook block weight and accepting the value with the function key "OK", the crane operator confirms that the above described notes have been adhered to!**
- **The entered hook block weight is recorded with the data logger!**

Prerequisite:
- Avalid configuration status is entered and confirmed.
- The above listed prerequisites have been adhered to.

Note: The hook block weight is to be entered via the keypad on the LICCON monitor!

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The entered hook block weight can be seen after entry and confirmation with the ENTER key in the current input value **3.1.4**!

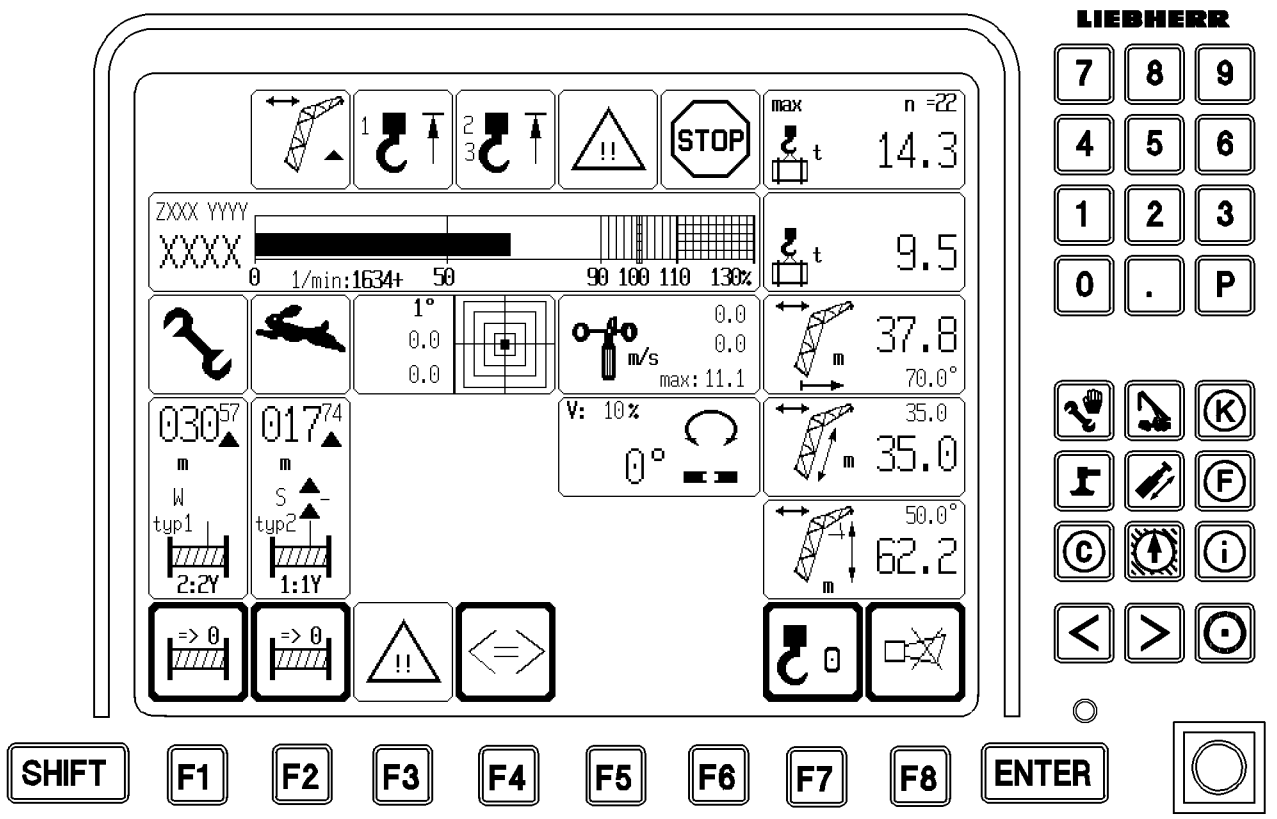
Enter the hook block weight via the keypad.
Press the "ENTER" key.

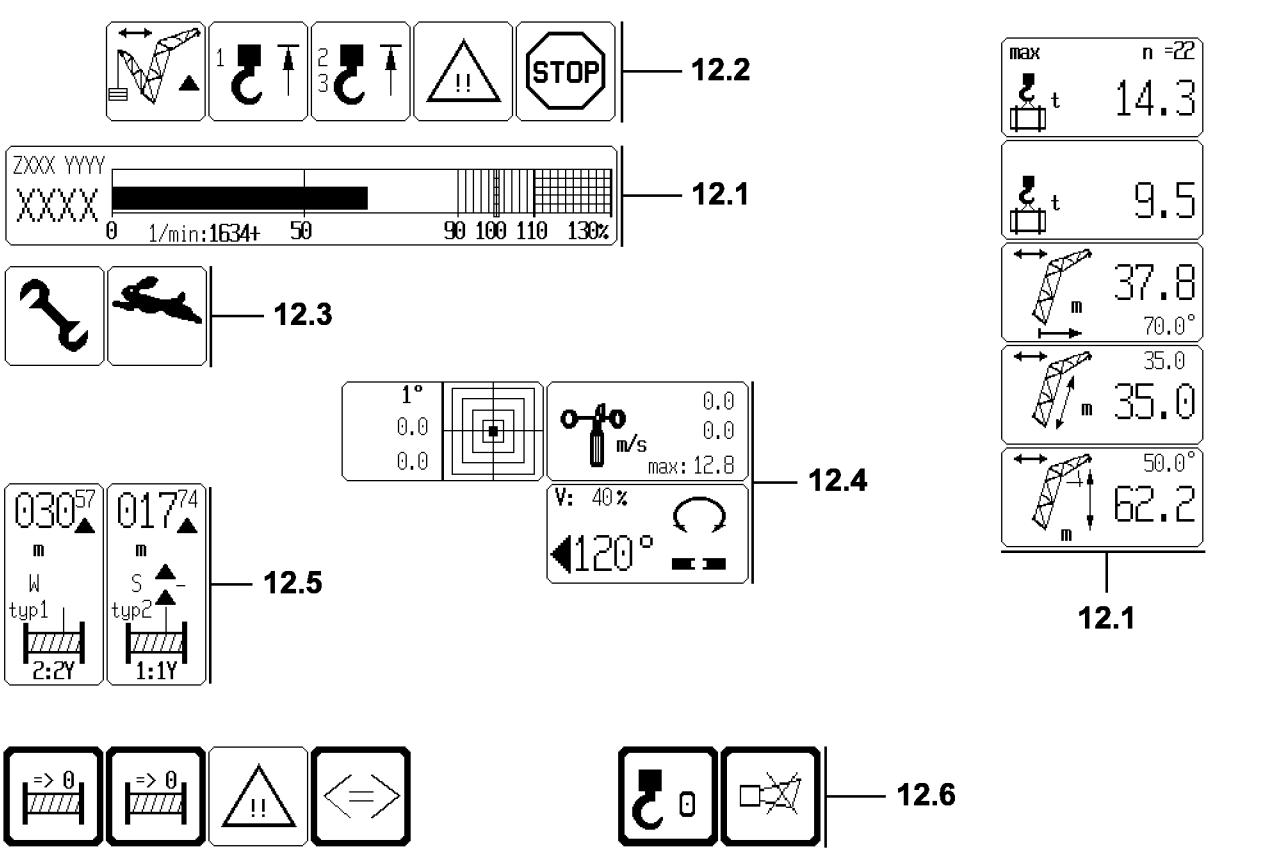
Note: Incorrect hook block weight!
If a hook block weight is entered which is not permissible for erection / take down of the installed boom, then a beeping sound can be heard!
The entered hook block weight is **not** accepted into the current input value **3.1.4**!
- Enter only permissible hook block weights!

When the hook block weight has been accepted, the LICCON computer system changes to the crane operating screen after pressing the function key **F8**!

Press the function key **F8**.

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12. The "Operation" program Monitor 0

The LICCON ”Operation” program supports the crane operator by displaying relevant data for crane operation on monitor 0, in a clear view. In addition, the crane operator is alerted about upcoming overload conditions. In case of an overload and a number of error conditions, which could endanger crane operation, the crane is shut down.

The monitor is divided into six areas in the "Operation" program:

12.1 Information about crane geometry and load

12.2 Alarm functions

12.3 Special functions

12.4 Monitored added functions

12.5 Winch indication Winch 1 and 2

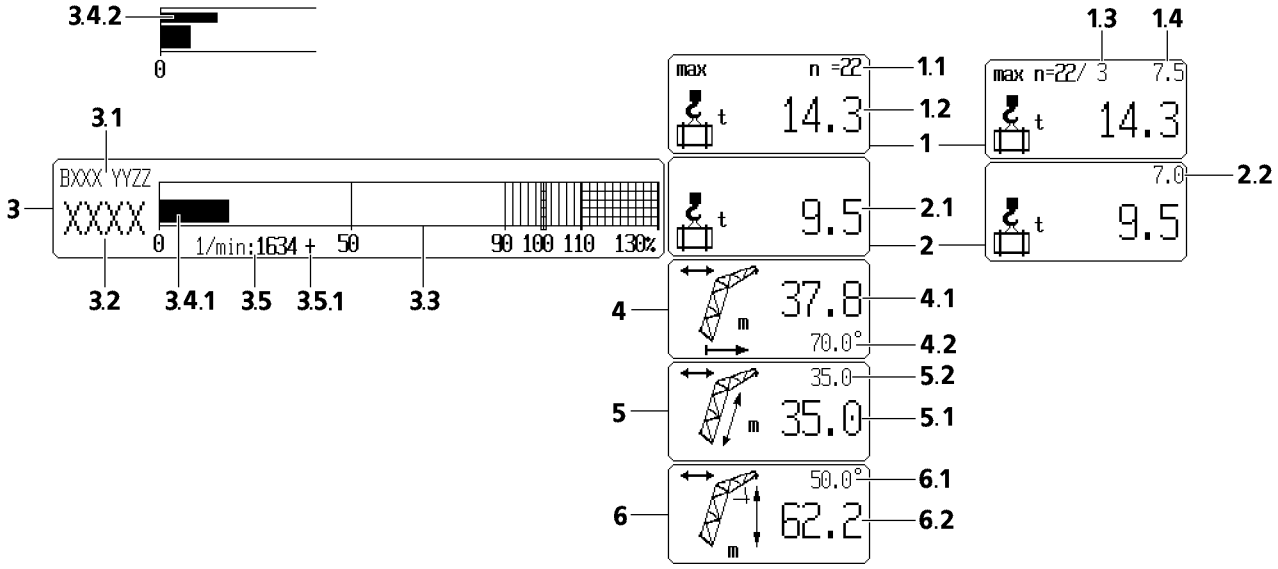
12.6 Function keybar symbol line

12.7 Other control elements

Note: The monitor illustrations in this chapter **are only examples**. The numeric values in the individual symbol elements and charts might not match this particular crane. The configuration of the LICCON monitor with the symbol elements is only used to describe the system.

In addition, some illustrations of the monitor show the maximum possible assignment of the LICCON monitor with symbol elements. In normal crane operation, an identical display would not appear on the LICCON monitor.

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12.1 Information about crane geometry and load

1) Symbol elements "Maximum load capacity" in weight unit in tons (t) or pounds [lbs]

1.1 The reeving number of the hoist cable which is reeved for the pulley head, which has been selected via the load chart.

1.2 Maximum load in [t] or [lbs], which can be carried on the selected pulley head of the boom, according to load capacity chart and reeving is shown in the indicated weight unit of tons [t] or pounds [lbs].
The "maximum load which can be carried according to the load capacity chart and reeving" depends:
- on the selected operating mode
- on the selected equipment configuration (→ Load capacity chart)
- on the radius
- on the main boom angle or jib relative angle*
- on the derrick ballast radius *
- on the reeving of the hoist cable

Note: The "maximum load carrying capacity according to the load chart and reeving" is independent of the size of the derrick ballast.

In operating modes with derrick ballast, the "maximum load carrying capacity according to the load chart " is the load, which the crane can lift in the current operating condition **with** the optimum (large) derrick ballast. The calculation of the optimum derrick ballast is described in the load chart manual. If the derrick ballast is smaller than the optimum ballast, then the load shown in 1.2 cannot be lifted. The system shuts off before via test point 1 - Operation maximum force.

Note: "? ? . ?" is shown if no load capacity chart value is available, for example if the crane is not within the range of the load capacity chart or one or more sensor errors or defects occurred, and the radius cannot be calculated.

Note: For operating mode SA, the maximum load carrying capacity is shown in [t] or [lbs] on the SA-bracket according to the load chart.

1.3* Reeving number of the hoist cable, which is reeved on the pulley head fo the boom nose * selected via the load chart.

Note: At operating mode SA, the reeving number is 0. The reeving number cannot be changed in operating mode SA.

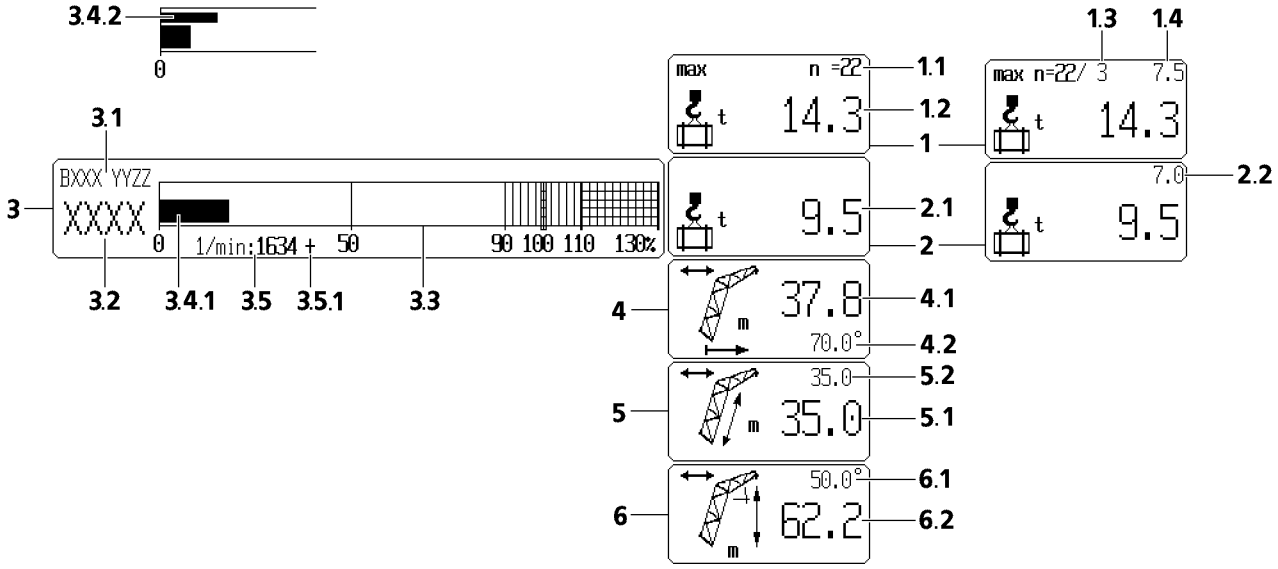
1.4* Maximum load on the installed boom nose *

Note: The maximum load carrying capacity on the boom nose depends only on the set reeving of the boom nose.

C A U T I O N : Both load carrying capacities (as described in paragraph 1.2 and 1.4) are monitored at the same time. If the load carrying capacity of the boom is being exceeded, then the LMB-Stop is triggered. The hoist gear up function is shut off in all hoist gears. The luff down function is shut off on all booms.

* Optional

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2) Symbol elements "current load" in weight unit in tons [t] or pounds [lbs]

2.1 Current load (actual load indication) on the boom

= Load (in weight unit in tons [t] or pounds [lbs], which is currently suspended from the crane hook.

The calculated total load on the boom is shown, including hook block and tackle, but without the nominal weight of the hoist cable.

Note: Nominal weight of hoist cable = Reeving × pulley head height × specific hoist cable weight

See chapter 4.03.

If the function key "Tara" is pressed (see description of function key "F7" in section "Function key line") ,then the indication can be changed over to net load indication. In this case, the word "net" appears in the symbol, and the description of the weight unit is next to the load symbol.

Note: "? ? ? . ?" is shown if one or more sensors are missing or are defective, so that the current load cannot be calculated.

Note: In operating mode SA, the current load on the SA bracket is calculated and shown via the pressure sensor on the installation cylinder.

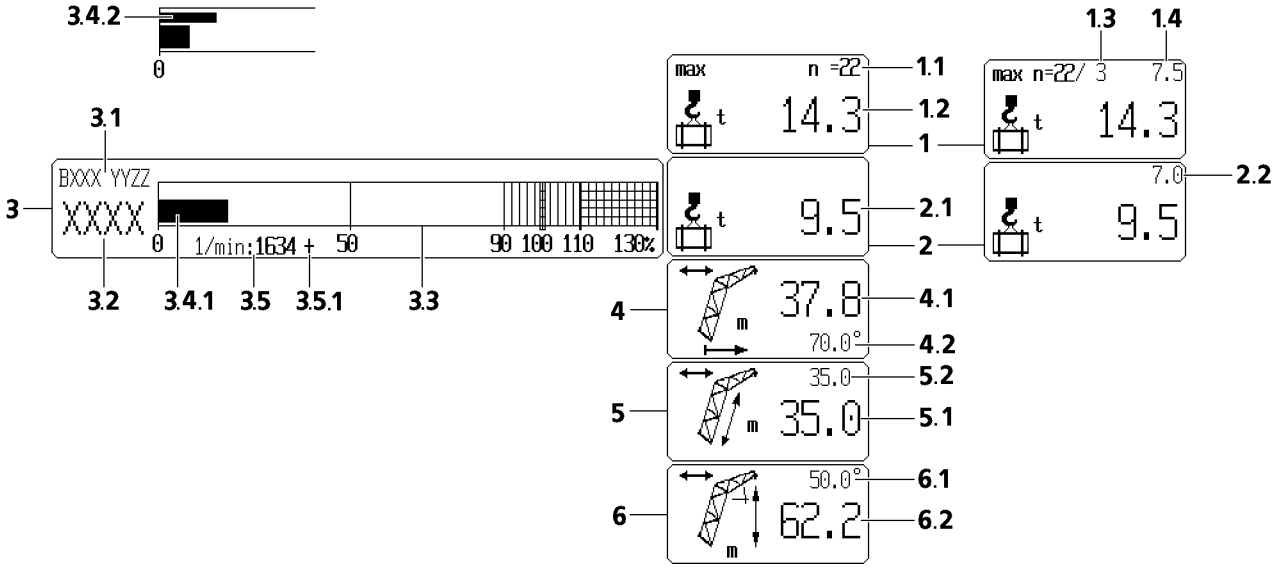
2.2 Current load (actual load indication) on the boom nose *

The calculated total load on the boom nose is shown, including the weight of the hoist cable, hook block and tackle.

If the function key "Tara" is pressed (see description of function key "F7" in section "Function key line") ,then the indication can be changed over to net load indication. In this case, the word "net" appears in the symbol, and the description of the weight unit is next to the load symbol.

Note: "? ? ? . ?" is shown if one or more sensors are missing or are defective, so that the current load cannot be calculated.

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3) Symbol element "Utilization" [%]

3.1 Organization number
- For internal Liebherr load chart administration

3.2 Short code (CODE >Zahl / number<) of the set equipment configuration ,

3.3 Utilization scale
The utilization scale is marked on important points by percentages.
- Prewarning from 90 % utilization
- STOPshut off at 100 %utilization

3.4 Utilization bar

3.4.1 Utilization bar of the crane according to load chart and reeving

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

Note: In operating modes with derrick ballast, the utilization bar shows the utilization of the crane with optimum ballast. With partial derrick ballast, there is still another measurement of the utilization of the crane on test point 1 (see paragraph 21.4).

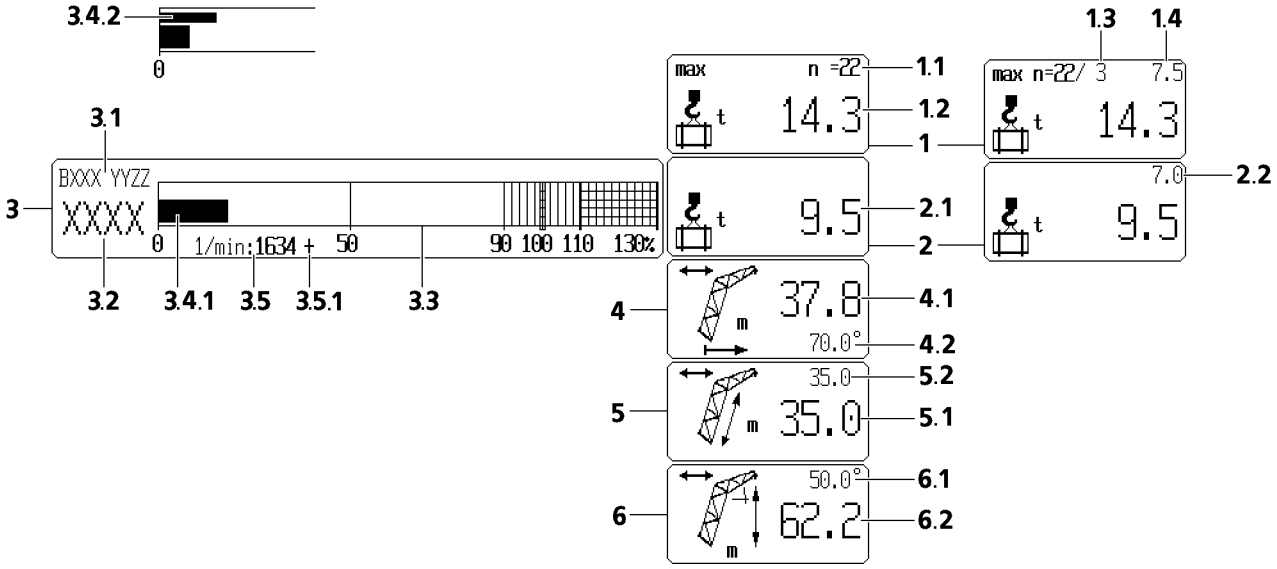
C A U T I O N : In operating modes without derrick ballast, this utilization bar is the only measurement for the utilization of the crane.

3.4.2 Utilization bar of the boom nose *

$$\text{Utilization of the boom nose} = \frac{\text{Current load on the boom nose}}{\text{maximum load on the boom nose}}$$

Note: The current load carrying capacity on the boom nose is the capacity, which the boom nose is able to lift alone, at sufficiently high maximum load carrying capacity on the boom head and in operating modes with derrick ballast at sufficiently high F1-operating max-limit.

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3.5 Current engine RPM in [1/min]

Note: "????" is shown in case of an invalid RPM value (for appro. 10 seconds). If there is a problem, the system changes to fixed RPM. The indicator blinks, in addition, an error message is issued.

3.5.1 Lock the engine RPM
The engine RPM can be locked / retained with the button on the master switch. In case of a locked engine RPM, the symbol " + " appears after the RPM data.

4) Symbol element "Radius" with length unit in meters [m] or feet [ft]

4.1 Radius in [m] or [ft]
= horizontal distance of load on the load hook for the operating mode from the turning axle of the crane superstructure, measured on the ground. The boom flexation due to its own weight and the suspended load has been taken into consideration.

Note: "? ? ? ?" is shown if the geometric data or sensor values are missing , so that the current radius cannot be calculated.

4.2 Main boom angle to the horizontal in degrees [°]
The value of the angle sensor in the main boom pivot section is shown. If this angle sensor value is invalid, then the value for the angle sensor on the main boom pulley head is shown.

Note: "???" is shown if both angle sensor values are invalid or if the difference of the two angle sensor is unbelievably large.

Note: In operating mode SA, the SA bracket angle is shown as main boom angle to the horizontal in degrees [°] (±Bereich).

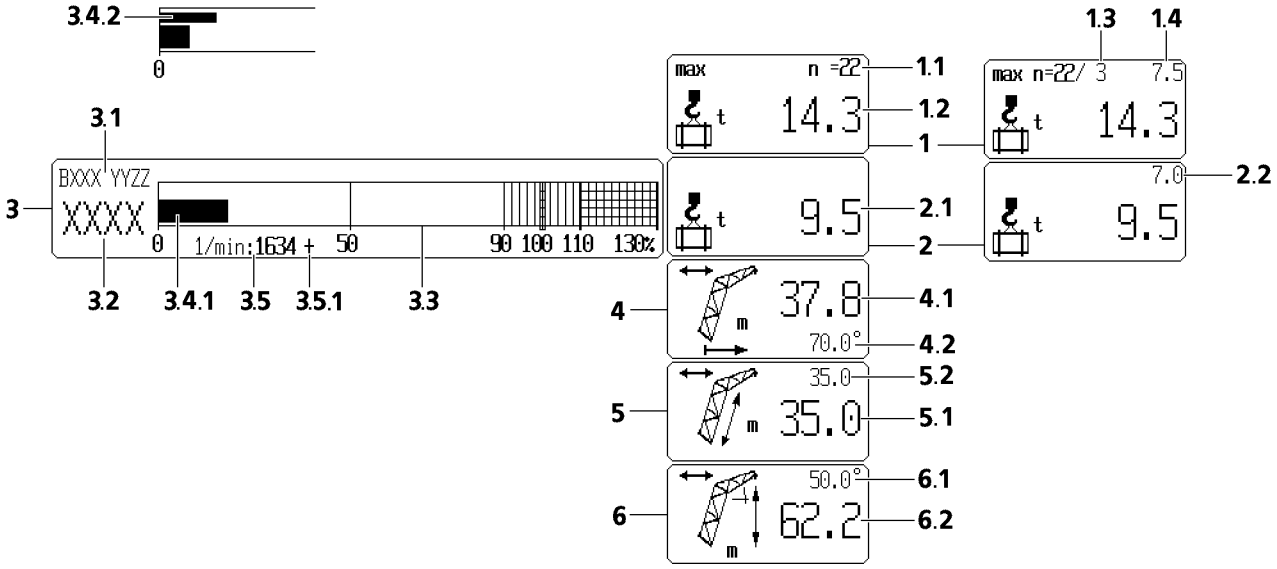
5) Symbol element "Main boom length " in length unit of meters [m] or feet [ft]

5.1 Length of main boom in [m] or [ft]

Note: In operating mode SA, the SA bracket length (to the installation cylinder pivot point) is shown in [m] or [ft] as main boom length.

5.2 Length of auxiliary equipment, such as lattice jib in [m] or [ft]

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6) Symbol element "Pulley head height" in length unit of meters [m] or feet [ft]

6.1 Angle of lattice jib to the horizontale in [°]
Shown is the value of the angle sensor in the pivot section of the lattice jib (bottom). If his angle sensor value is invalid, then the value for the angle sensor on the pulley head of the lattic jib is shown.

Note: "???" is shown if both angle sensor values are invalid or if the difference of the two angle sensor is unbelievably large.

or

Relative angle between main boom angle (α) and jib angle (β)
(=α - β) in [°]

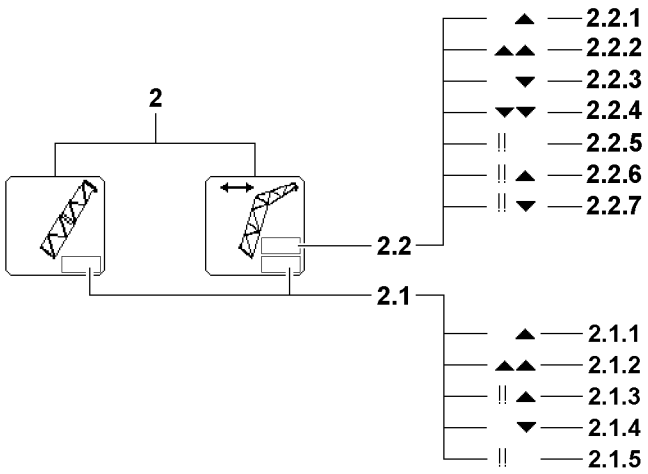
Note: Indication of relative angle alwazs in operating modes with load chart for fixed defined jib relative angle (for example WV)

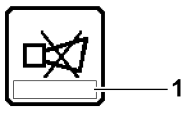
Note: "???" is shown if the relative angle cannot be calculated.

6.2 Pulley head height in [m] or [ft]
= vertical distance from ground surface of the crane to the selected pulley head axle, which is valid for the indicated maximum load capacity.

Note: "????" is shown if geometric data or sensor values are missing, so that the pulley head height cannot be calculated.

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12.2 Alarm functions

The crane movements are monitored in their limit ranges. When these limits are reached, the crane operator is alerted to that fact by blinking symbol elements:

If a LICCON error code is shown in the field **1** "Horn icon", then the present error can be determined through it, see Diagnostics manual.

2) Symbol element "Boom limitation "
The luffing range of the boom is limited upward as well as downward. If the end position, which is assigned by the selected load capacity chart, is reached, the operating mode dependent symbol element "Boom limitation " appears.

2.1 Limitation signs for main boom

2.1.1 An arrow pointing upward shows that the shut off of the crane movement "luff up main boom " has been made:
- by triggering the upper load chart limit or
- by utilization >95% and lowered load carrying capacity when luffing up the boom

Note: The crane movement "luff down main boom" remains possible.

2.1.2 Two arrows pointing upward show that the shut off of the crane movement "luff up main boom " has been made: :
- by triggering a block limit switch on the main boom
  Relapse cylinders left / right or
- by an error in a block limit switch relapse cylinders.

Note: The crane movement "luff down main boom " remains possible, the crane movement "luff up main boom " is shut off and **cannot be bypassed**.

2.1.3 Two exclamation marks and an arrow pointing up show that an associated sensor is defective and that the shut of of the crane movement occurred:
- By triggering a block limit switch of the main boom relapse cylinders left / right

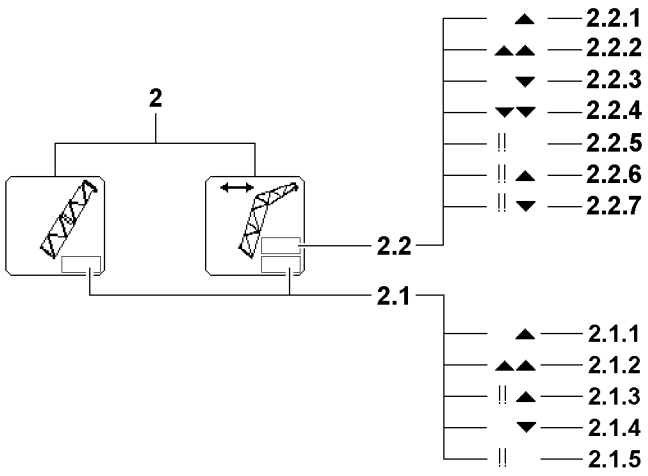
2.1.4 An arrow pointing downward shows that the shut off of the crane movement "luff down main boom " has been made by reaching the lower load chart limit.

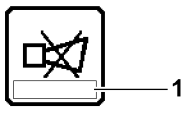
Note: The crane movement "luff up main boom " remains possible.

2.1.5 Two exclamation marks show that an associated sensor is defective.

* Optional

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2.2 Limit signs for attachment (luffing jib*, fixed jib*)

2.2.1 An arrow pointing upward shows that the shut off of the crane movement "luff up attachment" has been made by reaching the upper load chart limit.

Note: The crane movement "luff down attachment" remains possible.

2.2.2 Two arrows pointing upward show that the shut off of the crane movement "luff up attachment" has been made by :
- triggering a block limit switch on the relapse cylinder luffing jib, the relapse flap or
- by an error on this limit switch.

Note: The crane movement "luff down attachment" remains possible, the crane movement "luff up attachment " is shut off and **cannot be bypassed**.

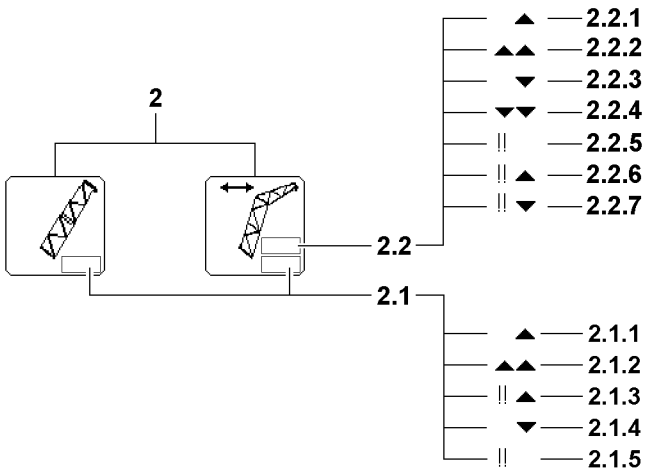
2.2.3 An arrow pointing downward shows that the shut off of the crane movement "luff down attachment" has been made by reaching the lower load chart limit.

Note: The crane movement "Ausrüstung aufwippen" remains possible.

2.2.4 Two arrows pointing downward show that the shut off of the crane movement "luff down attachment" has been made by :
- triggering a block limit switch for the monitor "Attachment lower left / right"
- an error on this limit switch.

Note: The crane movement "luff up attachment" remains possible, the crane movement "luff down attachment " is shut off and **cannot be bypassed**.

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2.2.5 Two exclamation marks show that one or both limit switches or angle sensors of the attachment do no longer report on the LSB (LICCON-System-Bus) or are defective.

Note: If both limit switches are defective or are missing on the LSB, then the corresponding luffing movement is shut off and **cannot be bypassed**. When deflecting the master switch, a control error message is given, which shows which limit switches are missing on the LSB or are defective.

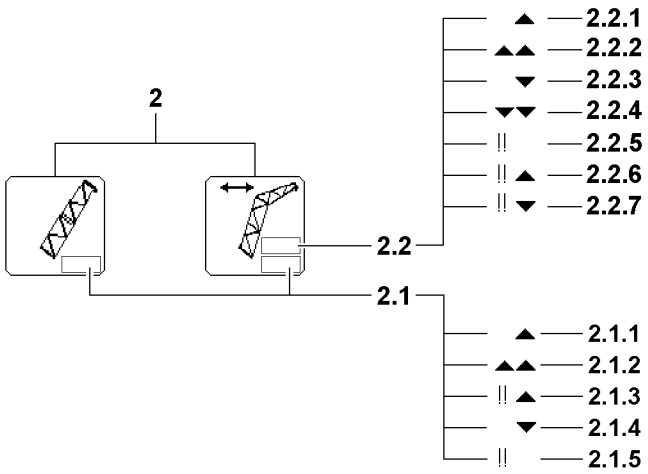
C A U T I O N: **If only one limit switch or angle sensor is not working properly, then the crane can still continue to be operated with "normal functions". However, the crane must be operated with utmost care, because only one of the double limit switches is functioning. The error must be fixed immediately. At the same time, a system error message will be issued.**

2.2.6 Two exclamation marks and one arrow pointing upward show that the shut off of the crane movement "luff up attachment" was made by:
- triggering the upper load chart limit
- triggering a block limit switch of the relapse cylinder luffing jib or relapse flap.
  In addition, one or both limit switches or angle sensors of the attachmetn do not report to the LSB or are defective.

Note: The crane function "luff down attachment" remains possible.

C A U T I O N: **If only one limit switch or angle sensor is not working properly, then the crane can still continue to be operated with "normal functions". However, the crane must be operated with utmost care, because only one of the double limit switches is functioning. The error must be fixed immediately. At the same time, a system error message will be issued.**

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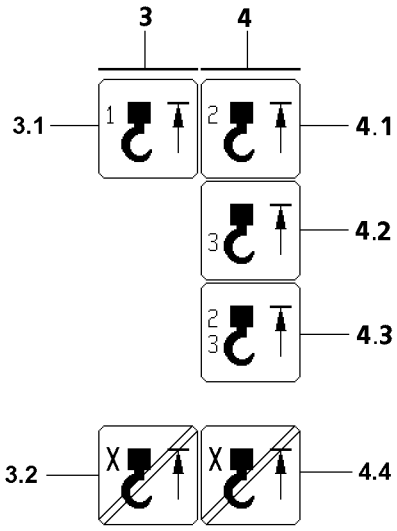
2.2.7 Two exclamation marks and an arrow pointing downward dhow that the shut off of the crane movement "luff down attachment" was made by
- triggering the lower load chart limit
- triggering a block limit switch of the monitor "Attachment lower left or right. "
  In addition, one or both limit switches or angle sensors of the attachment do not report to the LSB or are defective.

Note: The crane function "luff up attachment" remains possible.

C A U T I O N : If only one limit switch or angle sensor is not working properly, then the crane can still continue to be operated with "normal functions". However, the crane must be operated with utmost care, because only one of the double limit switches is functioning. The error must be fixed immediately. At the same time, a system error message will be issued.

* Optional

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3) or 4) Symbol elements "Hoist top"

General
To prevent that the crane is operated without hoist top limit switch (HES), a minimum hoist top limit switch configuration is constantly being monitored to ensure it is present. If a required limit switch for a certain operating mode is not plugged in, which means it is also not active on the LSB-Bus System, then an LMB-STOP is triggered, in addition to an operating error message.

Possible hoist limit switches:

HES	**Main boom**	
HES 1A / HES 1B	Main boom (S-end section)	Bus address "27" / "28"
HES 1B	Main boom (L-end section)	Bus address "28"
HES 1A	Main boom (S-end section 100 t)	Bus address "27"

HES	**Auxiliary equipment**	
HES 2A	Auxiliary equipment (fixed jib)	Bus address "27"
HES 2B	Auxiliary equipment (luffing jib W, L-end section)	Bus address "28"

HES	**Boom nose**	
HES 3	**Main boom** boom nose 1	Bus address "24"
HES 3	**Main boom** boom nose 2	Bus address "25"
HES 3	**Main boom** boom nose 3	Bus address "26"
HES 3	**Auxiliary equipment** boom nose 1	Bus address "24"
HES 3	**Auxiliary equipment** boom nose 2	Bus address "25"
HES 3	**Auxiliary equipment** boom nose 3	Bus address "26"

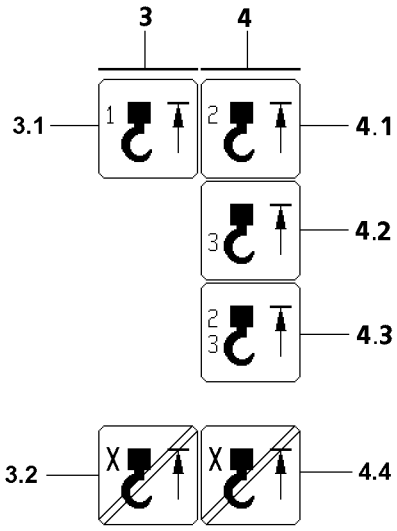
3.1 Symbol element "Hoist top on main boom"; HES 1 (1A /1B)

The symbol element appears if :
- The hookblock runs against the HES 1A and / or 1B on the end section main boom ,
- HES 1A and / or 1B not active, even though its presence is required ,
- HES 1A and / or 1B have an internal error.
  The crane movements spool up hoist winches and luff down main boom as well as luff down derrick are shut off.

Note: In all operating modes with installed main boom, the HES1 must also be plugged in and turns off the same functions are the required hoist limit switch, which must be present.

3.2 "Hoist top" icon on boom bypassed
The icon element appears if:
- The hoist top shut off is bypassed.

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4) Symbol element "hoist top on auxiliary equipment"

4.1 Symbol element HES 2 (2A / 2B)
Luffing jib

The symbol element appears if:
- the hookblock runs against the HES 2A and / or HES 2B on the end section of the luffing jib,
- HES 2A and / or 2B not active, even though its presence is required ,
- HES 2A and / or 2B have an internal error.

The crane movements spool up hoist winches, luff down main boom and luffing jib as well as derrick are turned off.

Note: The HES 2A/B must be plugged in in all luffing jib operating modes. If this is not the case, an ”LMB-STOP" (paragraph 6.1) is triggered and in addition, the control error message "ZE (CPU) 0: LMB STOP: HES2 A/B not connected" is issued.

4.2 Symbol element HES 3
The symbol element appears if:
- the hookblock runs against the HES 3 on the boom nose ,
- HES 3 not active, even though its presence is required,
- HES 3 have an internal error.

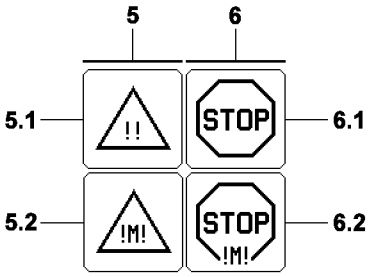
The crane movements spool up hoist winches, luff down main boom, luffing jib and derrick are turned off.

Note: The HE3 must be plugged in if the boom nose is installed. If this is not the case, an ”LMB-STOP" (paragraph 6.1) is triggered and in addition, the control error message "ZE (CPU) 0: LMB-STOP: HES not connected" is issued.

4.3 Symbol element HES 2 and HES 3
The symbol element HES 2 and HES 3 appears if the symbol elements HES 2 (see 4.1) and HES 3 (see 4.2) appear at the same time.

4.4 "Hoist top" icon on boom bypassed
The icon element appears if:
- The hoist top shut off is bypassed.

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5) Symbol element "Pre-warning"

5.1 Load carrying capacity utilization
The symbol element appears:
- if the current utilization of the crane according to load chart and reeving has exceeded the programmed limit for a prewarning (for example 90 %), or
- if the current utilization of the boom nose * has exceeded the programmed limit for prewarning (for example 90 %).

5.2 Engine monitoring
If a warn occurence happens in the engine monitoring system, then the symbol element "Prewarning - engine monitoring" appears on the LICCON monitor.
(See paragraph 16, Engine monitoring)

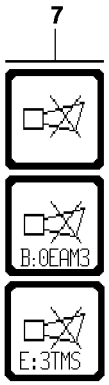
6) Symbol element "STOP"

6.1 Load carrying capacity exceeded
The symbol element "STOP" appears:
- if the current load carrying capacity on the boom head has exceeded the maximum load carrying capacitz and reeving according to the load chart (100%), or
- if the current load carrying capacity on the boom nose has exceeded the maximum load carrying capacity of the boom nose.

Note: All load moment increasing crane movements are shut off.

6.2 Engine monitoring
If a STOP occurrence happens in engine monitoring, the system switches over automatically from operating view to engine monitoring view.
(See paragraph 16, Engine monitoring)

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7) Symbol element "Horn" (accoustical signal)

Any operational errors on monitor 0, which cause the shut down of a movement and application errors with an error number (such as sensor errors, which occurred due to insufficient sensor signals or defective sensors) are shown optically and are also reported by an acoustical signal "HORN" on the monitor 0. "HORN" is a 0.5 second long sound, which is repeated in one second intervals.

Operational errors shown on monitor 0 are:
- overload
- Boom outside the angle range of the load chart
- Boom outside the radius range of the load chart

Monitored sensor are:
- Hoist limit switch
- Length sensor
- Angle sensor
- Pressure sensor
- wind sensor
- pull test brackets
- Battery voltage
- Inductive sensors

"Short horn"
Error messages, which have no error number and which do not cause a crane movements shut down by the LICCON system are also reported by an an acoustical signal ”SHORT HORN” , in addition to the optical indication. ”SHORT HORN” is a 0.1 second long sound, which is repeated in two second intervals.

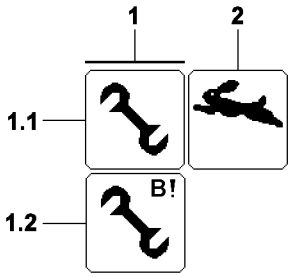
Monitored errors:
- maximum permissible wind velocity speed has been exceeded
(only if wind velocity sensor is activated)
- maximum support force has been exceeded or fallen below minimum support force
(only if support force monitor * is activated)
- prewarning threshold for crane utilization is reached.
"CAUTION" at 90%

Priority and "Horn off”
The alarm "Horn" has a higher priority than the alarm ”SHORT HORN”, which means ”Horn” surpasses "SHORT HORN".

- ”Horn” as well as ”SHORT HORN” can be turned off by the monitor via the function key "F8".
- By pressing the function key "F8" again, the system automatically changes to the error determination view in the test system. The error is documented in the error determination view.

Note: "HORN" as well as "SHORT HORN" become active again if a new error occurs.

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12.3 Special functions

1) **Note:** The various icons **1** are shown only on a defined position on the LICCON monitor!
Only one icon at a time can be shown on the LICCON monitor!

1.1 Exceed shut off limits for overload protection / "Hoist top"
The icon element blinks:
- When the overload protection is exceeded via the configuration button **D**

Note: The crane operation program is locked, meaning, no other program can be turned on via the program keys.

or

- When the crane control is exceeded or bypassed in active shut off (overload protection load moment limiter, "Hoist top") via the configuration button **D**.

1.2 No load chart is present
The icon element blinks:
- When the crane control is bypassed in active shut off (overload protection load moment limiter, "Hoist top") via the configuration button **D** and no load chart is available.

Note: By actuating the configuration button D, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available!

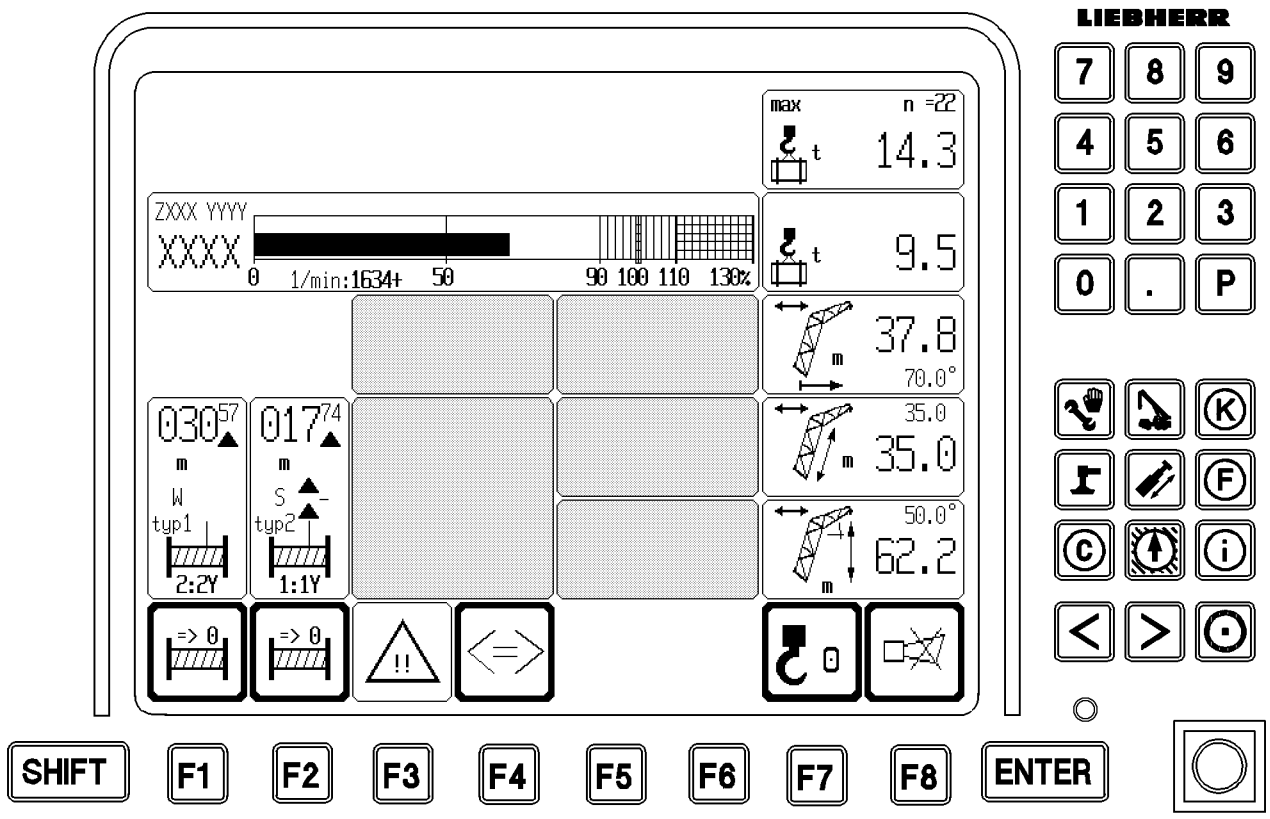
2) Symbol element "Rapid gear " (Power Plus)
The speed increase can be added for various crane movements via master switches MS1, MS2 or MS3. The symbol element "rapid gear" appears in the operating view.

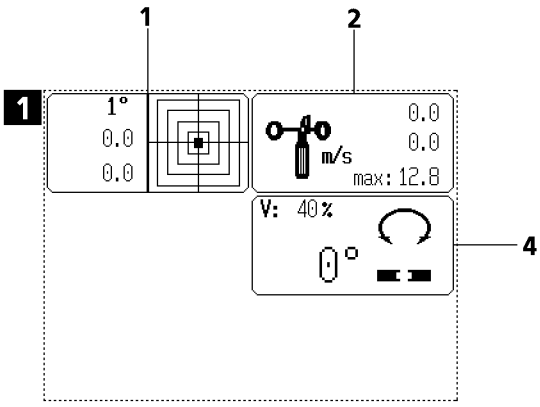
Note: If a crane movement has reached its maximum speed due to its current utilization, then no speed increase is possible by adding the rapid gear.

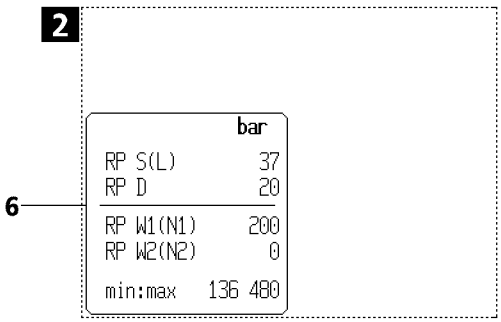
If the total power of all actuated crane movements is higher than the available power, then the speed for the crane movement which requires the highest power is reduced.

C A U T I O N : If another crane movement is added to one or more actuated crane movements, then it influences the other movements. For that reason, in situations where the individual crane movements are influenced, we recommend not to add the rapid gear (Power Plus) or to turn the rapid gear (Power Plus) off.

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12.4 Monitored added functions

Via function key "F3", additional monitored added functions can be turned on. The symbol elements of the monitored added function are assigned to a fixed place on the LICCON monitor. Since not all symbol elements can be shown on one page, they are split to two pages. The symbol elements on page 2 can be viewed via the function key "F4".

Page 1	1	Crane incline	(Fig. 1)
	2	Wind speed	
	3	Support force indicator *	
	4	Slewing range	
Page 2	6	Relapse cylinder monitor	(Fig. 2)

If an error occurs in one or more of these monitored functions, then this is shown in the crane operating view as follows:

a) Monitored added functions turned off "F3"

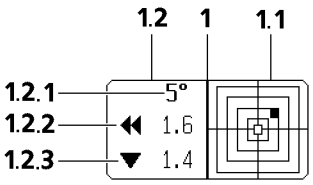
- Error of one function on page 1 ⇒ Symbol element shown on page 1
- Error of one function on page 2 ⇒ Symbol element shown on page 2
- Error of one function on page 1 and 2 ⇒ Symbol element shown on page 1 and symbol element above "F4" blinks = Note error on page 2

b) Monitored added functions turned on "F3"

- No error ⇒ the optional symbol elements (Optional) are shown, if there are some on page 2, then the symbol element "change page" of key "F4" is actuated = to show change over possibility.
- Error of one function on page 1 ⇒ Symbol element is already shown
- Error of one function on page 2 ⇒ Symbol element "change page" blinks = Note error on other page
- Error of one function on page 1 and 2 ⇒ Symbol element shown on page 1. Symbol element "change page" blinks = Note error on other page

* Optional

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12.4.1 Added function "crane incline" Page 1

In this symbol element, the incline of the crane superstructure to the horizontal is shown in lengthwise and crosswise direction. The indication is graphic as well as numeric.

Note: The incline of the crane superstructure is determined with the aid of the incline sensor crane chassis and slewing sensor.

? ? is shown if the value of the slewing sensor is not correct.

1.1 Graphic section

The graphic view has the shape of a sight gauge, in which a dot (small square), which depicts the air bubble, moves. The center of the dot shows the exact incline value.

1.2 Numeric section

1.2.1 Incline range 1° or 5°

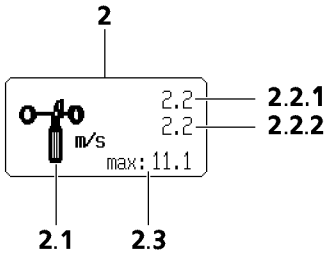
This value [°] depicts the graphic view, and can take on only the two values ”1” or ”5”.If the crane slopes in crosswise direction and in lengthwise direction is more than <1° , then the gauge is in the 1° range. If at least one value exceeds the 1° range, then it shifts into the 5° range.

Note: The range shift occurs automatically.

1.2.2 Incline of crane in degrees [°] in crosswise direction
The double arrows shows the direction of incline:
Double arrow left =Crane is sloped to the left
Double arrow right = Crane is sloped to the right

1.2.3 Incline of crane in degrees [°] in lengthwise direction
The arrows shows the direction of incline:
Arrow points up =Crane is sloped to the front
Arrow points down = Crane is sloped to the rear

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12.4.2 Added function "Wind velocity"

The wind speeds are shown depending on the unit used in the load capacity chart, in meters per second [m/s] or feet per second [ft/s].

2.1 Symbol "Wind velocity " in meters per second [m/s] or feet per second [ft/s]

2.2 Current wind speed
- 2.2.1 Wind sensor 2 Wind sensor - auxiliary equipment (luffing jib)
- 2.2.2 Wind sensor 1 Wind sensor - main boom

Note: No wind sensor can be installed on the boom nose *.

	Main boom	**Auxiliary equipment**
Wind sensor 1 available	Current wind speed is shown by wind sensor 1	Current wind speed is shown by wind sensor 1
Wind sensor 1 not available	"???" is shown at wind sensor 1 (static)	"???" is shown at wind sensor 1 (static)
Wind sensor 2 available	no indication	Current wind speed is shown by wind sensor 2
Wind sensor 2 not available	no indication	"???" is shown (static)

2.3 Maximum permissible wind speed with symbol text "max:"
The value depends on the operating mode and the set up condition / equipment configuration.

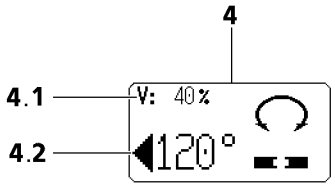
Note: If access to a load chart is no longer possible, the maximum value blinks as invalid value (???) and an acoustical alarm "SHORT HORN" can be heard.

If a current value of the wind speed exceeds the indicated maximum value (Wind sensor 1 or 2 > maximum value), then the maximum value blinks as invalid value (???) and an acoustical alarm "SHORT HORN" can be heard.

C A U T I O N :The crane movements are not shut off!

* Optional

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12.4.3 Added function "Slewing range" **Page 1**

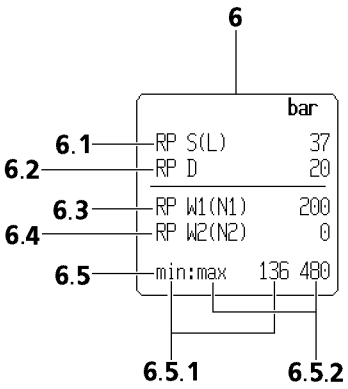
4.1 Maximum slewing speed V: [%]
= current (selected) "maximum slewing speed" of the slewing gear at fully deflected manual control lever, in relation to the maximum obtainable slewing speed of the slewing gear at 100% speed preselection.
In the LICCON program "Control Parameter" (see paragraph 13), this value can be preselected in fixed percentage stages.

D A N G E R : The preselection must be carried out according to the data given in the load chart manual. If the slewing speed is too high, there is an increased risk of having a serious ACCIDENT!

4.2* Current position of the crane superstructure in relation to the direction to the front (chain tension side). The arrow in front of the value shows the direction of deviation. The value increases up to a value of 180°.

0°	Position exactly to the front
> 179°	Turn to the right
< 179°	Turn to the left
180°	Position exactly to the rear

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12.4.4 Added function „Relapse cylinder monitor" Page 2

6.1 Pressure [bar] in S or L boom relapse cylinders

6.2 Pressure [bar] in Derrick relapse cylinders

6.3 Pressure [bar] in W1 lattice jib relapse cylinder (=RPW1) in W operation or
Pressure [bar] in N1 lattice jib relapse cylinder (=RPN1) in N operation

6.4 Pressure [bar] in W2 lattice jib relapse cylinder (=RPW2) only in W operation, if available.
Pressure [bar] in N2 lattice jib relapse cylinder (=RPN2) only in W operation, if available.

6.5 Monitored relapse cylinder (RP) - pressure limits in jib - RP (W/N)
Minimum / maximum pressure for RPW1 (N1) and RPW2 (N2)

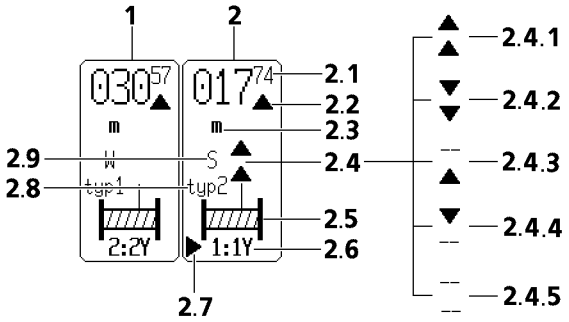
6.5.1 Minimum pressure [bar] for jib - RP (W/N).
This monitored minimum pressure is calculated from the angle of the main boom and the jib. If one of the angles is invalid and the indication is shown with "???", then there can also be no monitoring for minimum pressure.

6.5.2 Maximum pressure for jib - RP (W/N).
If a pressure limit value is exceeded, then it is shown with a blinking actual pressure value and also as an error message.

Note: Pressure indication = 0, if this relapse cylinder (s) is (are) not available for the set operating mode.

Pressure indication = ???, if the pressure sensor is not correct , (broken wire or short circuit). An error indication is issued with error number.

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12.5 Symbol element "Winch indication winch 1 and 2"

1. Symbol element "Winch 2"
   The meaning of the individual symbols for winch 1 and winch 2 is identical and is explained on symbol element "Winch 1".

2. Symbol ement "Winch 1"

   2.1 If the winches operate individually with the reeving set in the equipment configuration view, or if the winch is operated in parallel operation, then the indicated value is the completed hook path (for parallel operation: path of the pulleyblock) from a predetermined zero point in the indicated length unit of meters ([m] or feet [ft]).
   The numbers in front of the comma (point) are shown with maximum 3 large numbers.
   The numbers after the comma (point) are shown with small numbers. (See also chapter 12.6, description of function keys "F1" and "F2").

   As a prerequisite for correct indication, the entered value must match the actual number of cable reevings between boom head and hook block.

   If the adjusted reeving does not match the reeving of the corresponding winch , then the correct hook path can be calculated from the indicated hook path as follows:.

$$\text{correct hook path} = \frac{\text{indicated hook path} \times \text{adjusted reeving}}{\text{actual reeving}}$$

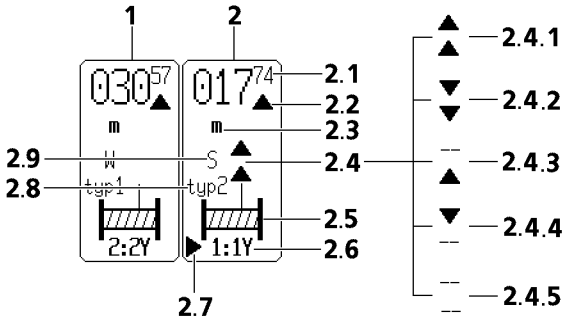
   The hook path calculation works only if the load is suspended freely, and if the boom is not luffed up or down during the hoisting procedure. Boom flexation and cable stretch are not taken into account.

   C A U T I O N : The length indication (hook path indication) is only correct and the coil jump is only taken into account correctly if the winch has been adjusted and if there was no CPU power interruption since then ("Cold start"). The adjustment of the hook path indication is done by spooling the cable on / off until the adjusting switch is triggered.

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

   2.3 Length unit for hook path indication : [m] or [ft]

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Symbol element "Winch indication winch 1 and 2" (continuation)

2.4 Winch status indication
The following winch status symbols are available (all blinking) :

2.4.1 Spool out

2.4.2 Spool up

2.4.3 Spooled out → spool out is locked

2.4.4 Spooled up → spool up is locked

2.4.5 Winch is deactivated → spool up and spool out is locked (via the "Control Parameter" program)

Note: If no winch status symbol appears then the active winch is at a standstill and is neither spooled up nor out.

2.5 Winch symbol (with cable end for winch status symbol)

2.6 Assignment of master switch and winch

Example: **1 : 1 Y**

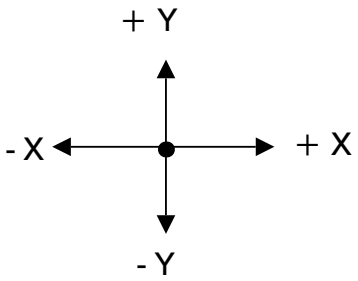
Control direction of master switch

Master switch number

Winch number

- - -
1: - -

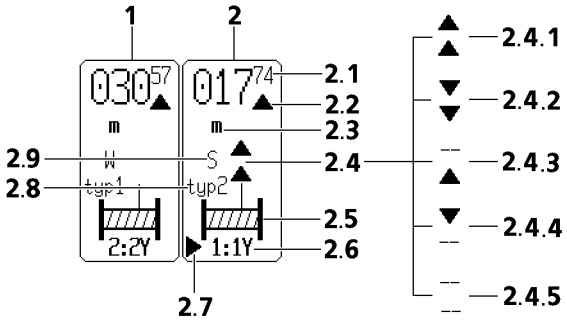
Due to incorrect settings , an assignment of master switch and winch is not possible!



2.7 Vibration sensor
If the vibration sensor for a winch is added on the master switch, then the symbol " ▸ " (2.7) appears in the winch symbol element for the added vibration sensor.

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

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Symbol element "Winch indication winch 1 and 2" (continuation)

2.8 Winch type
In cranes with different hoist winch types, the winch type is shown in symbol element "Winch indication".

typ1	(static)	=	Winch 1 is type 1
typ2	(static)	=	Winch 1 is type 2
typ1	(blinking)	=	Winch 1 is undefined by type LMB calculates the weakest winch for winch 1, here type 1
typ2	(blinking)	=	Winch 1 is undefined by type LMB calculates the weakest winch for winch 1, here type 1
	(No indication)	=	Winch 1 is not described in detail by type The crane can only be operated with one winch type, in this case type 1.

Note: If the LICCON computer system cannot recognize the winch type clearly, then an error is issued in the LICCON-Error-Code (LEC) . The LICCON computer system then calculates with the weakest hoist winch type and shows this type in blinking mode.

Note: For winch 2, the same applies as for winch 1.

2.9 Reeved in boom
To check the adjustment of the selector switch (73) for winch use at various hoist winches, the symbol for the boom , on which the winch must be reeved, is shown in the symbol element "Winch indicator, winch 1, 2 and 5".

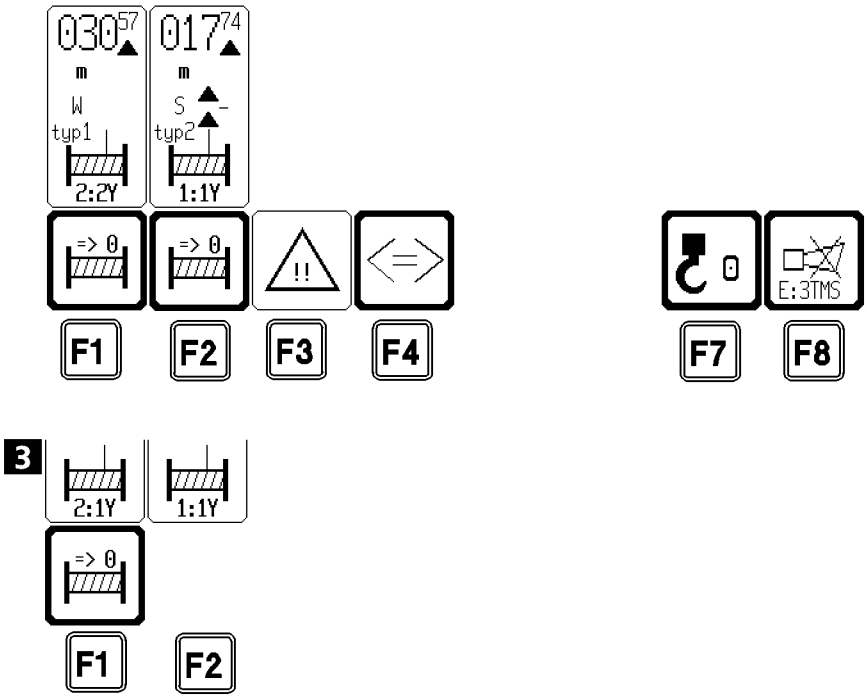
S	=	Winch reeved on pulley head of S-main boom
W	=	Winch reeved on pulley head of W- luffing jib
H	=	Winch reeved on pulley head of boom nose
F	=	Winch reeved on pulley head of F-jib, at mode SWF
- -	=	Winch not reeved
??	=	Winches not clearly reeved (In case of error, incorrect switch positioin of selector switch for winch use)

Note: The LICCON computer system monitors if the set switch position of the selector switch for winch use (73) and the set operating mode match. If the settings are incorrect, an error message is issued.

C A U T I O N : The LICCON computer system does not recognize which hoist winch is reeved on which pulley head. The crane operator must make sure that the selector switch (73) for winch use is correctly set.

D A N G E R : If the setting of the selector switch for winch use (73) is incorrect, the individual winches can be overloaded without noticing it. There is a danger of accidents!

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12.6 Function keybar symbol line

The function keybar symbol line contains up to 8 symbol elements, which correspond to the function keys "F1" to "F8" below, which means they either describe a function, which can be triggered with the corresponding key and / or change their view and their meaning when the key is pressed.

"F1" Zero point for hook path indication of winch 2
Press key "F1" to show the symbol "Set winch indication to zero", which means if the key is pressed, the hook path indication of winch 2 is set in the winch symbol above to ”000,00” and the path is measured from this point on.

"F2" Zero point for hook path indication of winch 1
As described for "F1" for winch 1.

Note: If winch 1 and winch 2 work in **parallel operation**, then the length indications of winch 1 and 2 can only be set together with the "F1" key to 000,00. The function key "F2" has then no function and the corresponding symbol element is blended out (Fig. 3).

"F3" Turn monitoring symbol element on or off
With function key "F3", all symbol elements of the monitored added functions can be turned on and off. The symbol element changes accordingly:
Thick frame = Added function symbols turned off
Thin frame = Added function symbols turned on

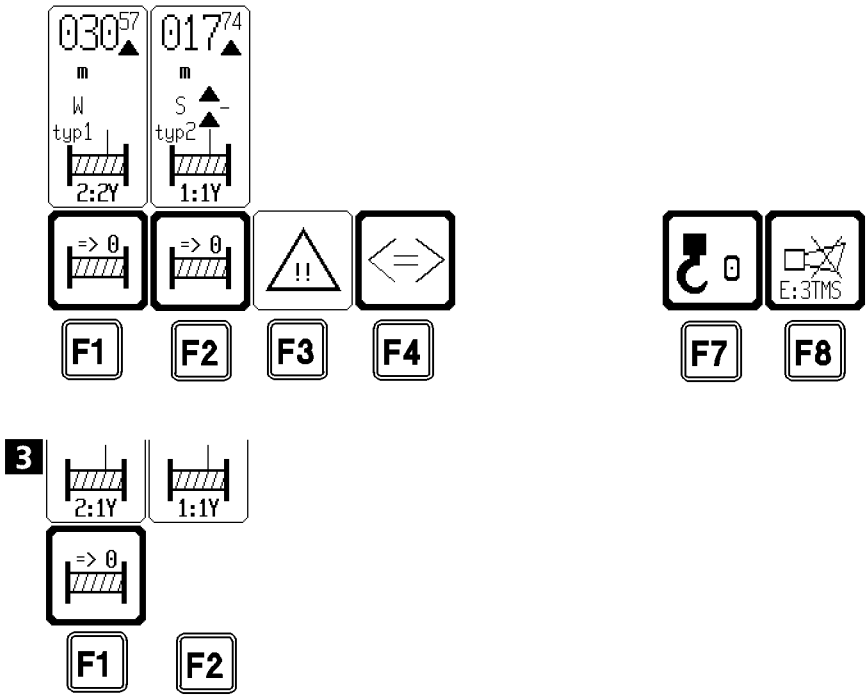
Note: The added function monitor function is always turned on; only the symbol elements can be turned off. In case a monitored limit is being exceeded, an acoustical warning can be heard (horn) and the corresponding symbol element is shown, even if the monitoring symbols had been turned off. (See also paragraph 12.4, "Monitored added functions.)

"F4" Switch over to monitoring page , if available.
(See also paragraph 12.4, "Monitored added functions.)

"F5" not used

"F6" not used

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"F7" Tara

If the function key "F7" is pressed, the actual load indication is set to "Zero". At the same time, the word ”net” appears in the symbol element of the actual load indication. This function makes it possible to eliminate the weights of hoist cable, load carrying components, load receptacles and tackle and to show only the weight of the load to be lifted (net load). This tare function can be stopped 3 ways:

1. press the "F7" key again,
2. Luff by more than ± 4 °

The word ”net ” disappears from the symbol element for actual load indication and the gross load value is shown again.

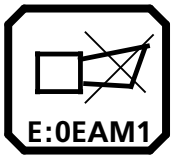
Note: The "F7" key is effective with installed boom nose as well as actual load indication of the boom nose.

"F8" Horn OFF / Error diagnostics

1) Turn off the acoustical warning
   The acoustical warning signals "Horn" and "SHORT HORN" can be turned off by pressing the "F8" key.

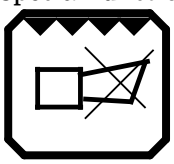
   Note: A new error will turn the acoustical warning system on again.

2) Error messages in the symbol element "Horn"



If a system application or operating error occurs, an error message appears in the symbol element "Horn" , such as E:0EAM1
By pressing the " F8" key twice, the acoustical warning is turned off and changes to the "Test system", program, error determination view, where the error is documented.

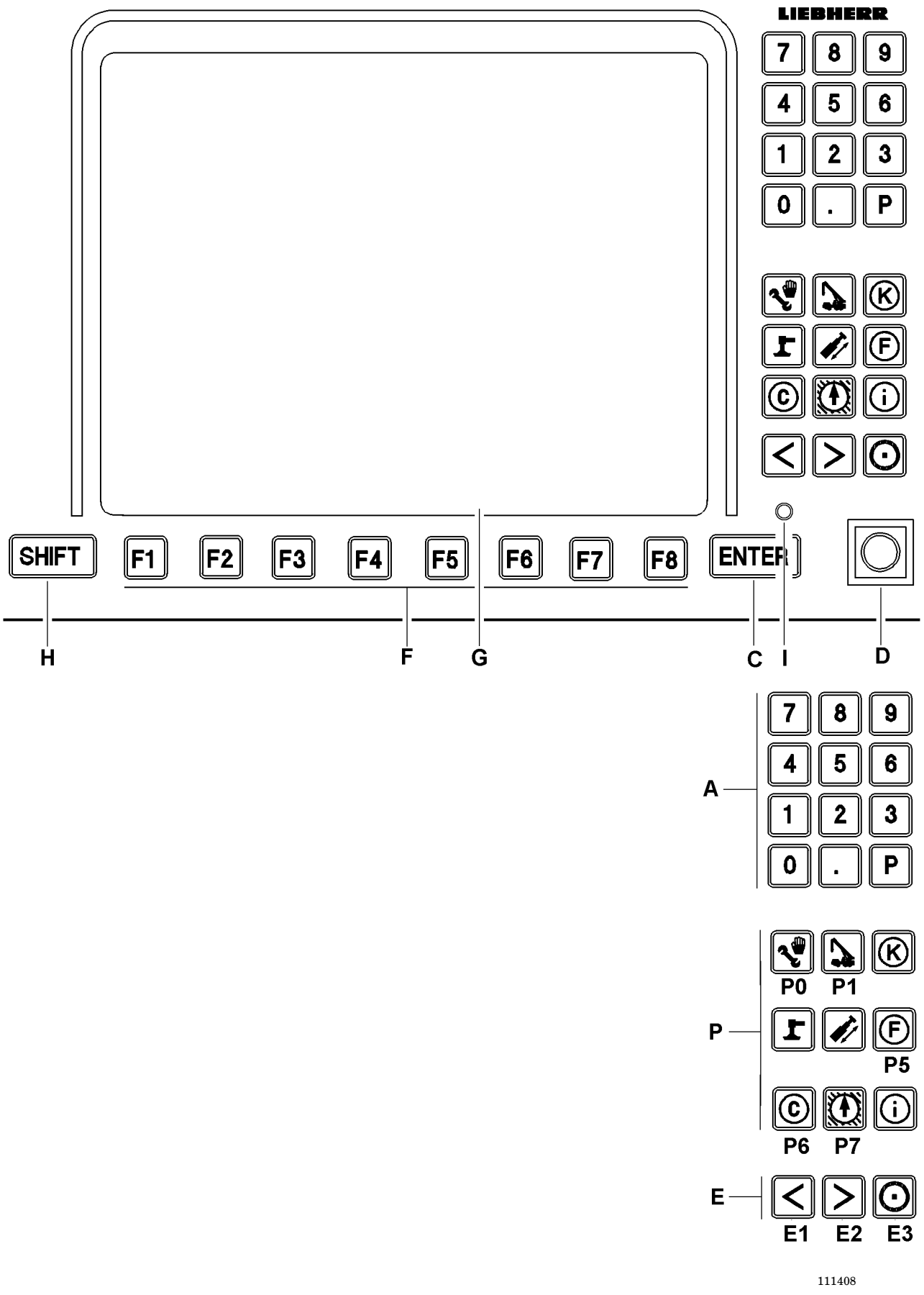
3) Special function Symbol element "Horn"



For crane delivery, a special program is available in the LICCON computer system. After the crane has been delivered to the new owner, this program is locked. If an additional mark (claw) appears in the symbol element Horn, then this means that the delivery program has not yet been locked. In this case, contact LIEBHERR Service immediately.

C A U T I O N : To prevent error functions, access to the special program is only given to trained LIEBHERR personnel.

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12.7 Other control elements

The other control elements on the indicator and control unit of the LICCON computer system are assigned the following functions in the ”Operation” program:

A Alpha numeric keyboard

- Keys "0" to "9", "P"
  have no function in the ”Operation” program.

- Keys "SHIFT" + "."
  With the key "." the so-called test view functions are turned on / off, which means all existing symbol elements appear with an erroneous indicator value on the monitor.

  Note: However, the monitored added functions must be shown on the desired page, if they are to appear in the test view. After 10 seconds or after pressing the ”.” key again, the normal operating view will reappear.

P Program keys

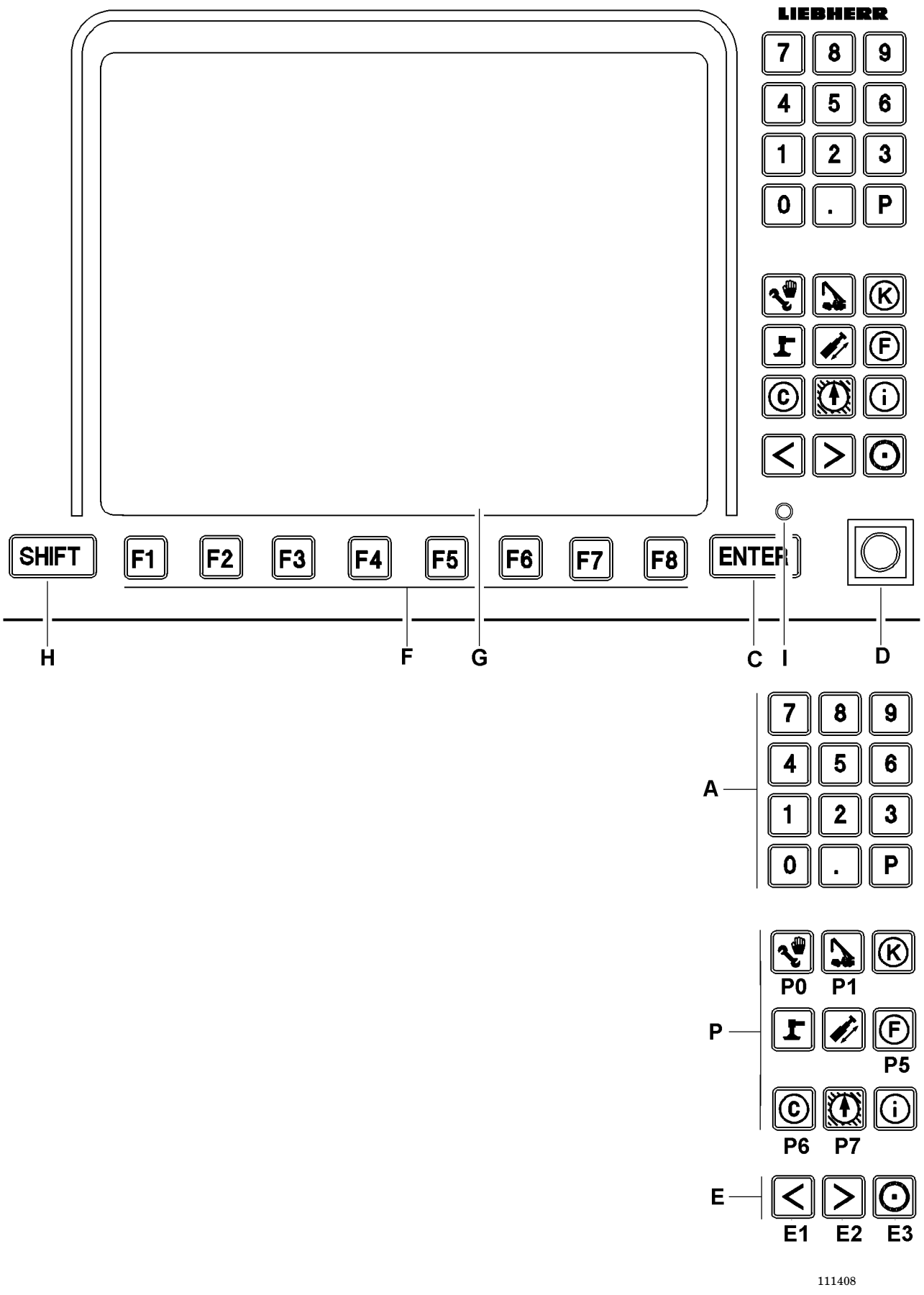
Use the program keys to select between the individual programs. However, the program specific peculiarities must be noted, such as shifting from ”SET UP” to ”Operation” by pressing 1× O.K..

Note: The currently running program **cannot** be called up again via its program key. The programs can only be called up with their program keys when no by-pass function is active and the overload safety is not exceeded.

C "ENTER" key

This key has no function in the ”Operation” program.

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D Configuration button

- Position to right (touching):
  Bypass hoist limit switch and exceed shut off of load moment limiter (if shut off available)

  Note: By actuating the configuration button **D**, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available!

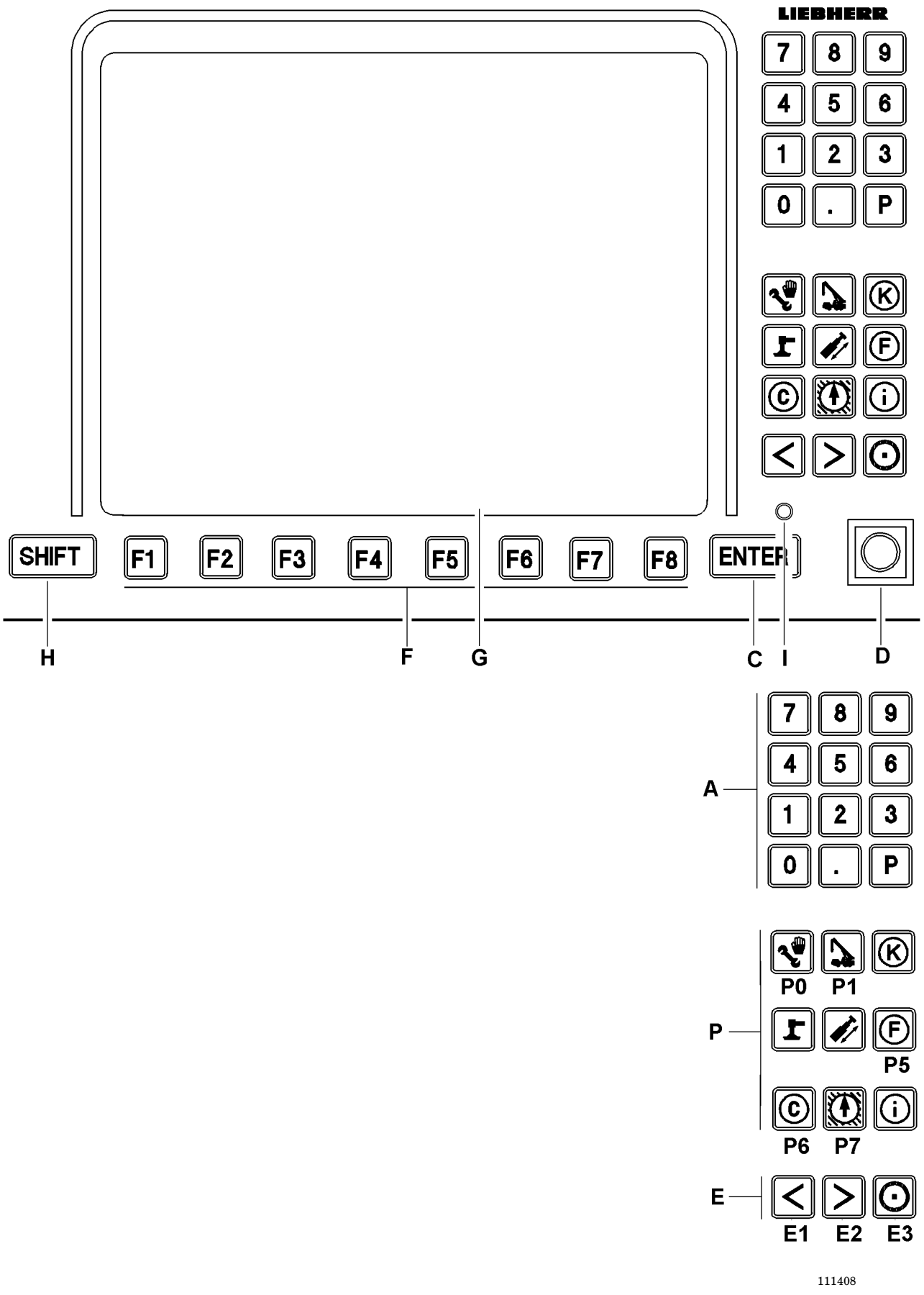
- Operating position (self-retaining):
  Normal operation

- **Exceed shut off limits of overload protection:**
  If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment. This shut off can be exceeded by the configuration button D in the "right touching" position.

D A N G E R : **Increased accident risk when exceeding the overload protection!**
If the overload protection is exceeded, there is no additional protection against crane overload!
All LICCON overload protection displays remain functional!
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 exceed the overload protection for assembly purposes or in emergencies!**
- **The configuration button D may only be actuated by persons who know the effects of exceedance!**
- **Exceeding the overload protection may only be done if the crane supervisor is present and with utmost caution!**
- **Crane operation with overload protection exceeded is prohibited!**

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- **Bypass of 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 the winch up", "luff the boom down" are shut off. This shut off can be bypassed by the configuration button **D** in the "right touching" position, at a reduced working speed (forced neutral position).

D A N G E R : **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!**

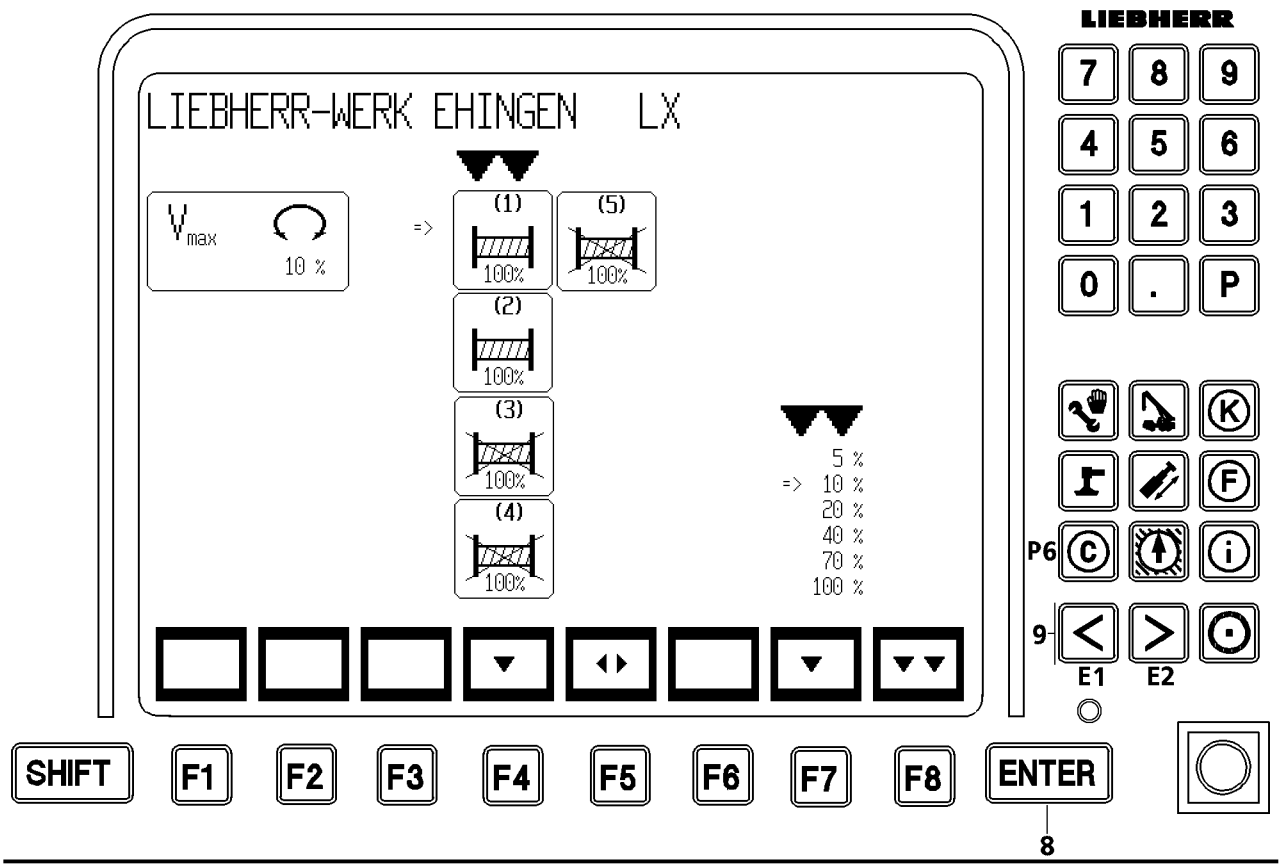
- **Bypassing hoist up switch-off must only be done if the crane supervisor is present, and with the help of a "guide". The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block and the boom head!**
- **Carry out all crane movements with maximum care and minimum speed!**

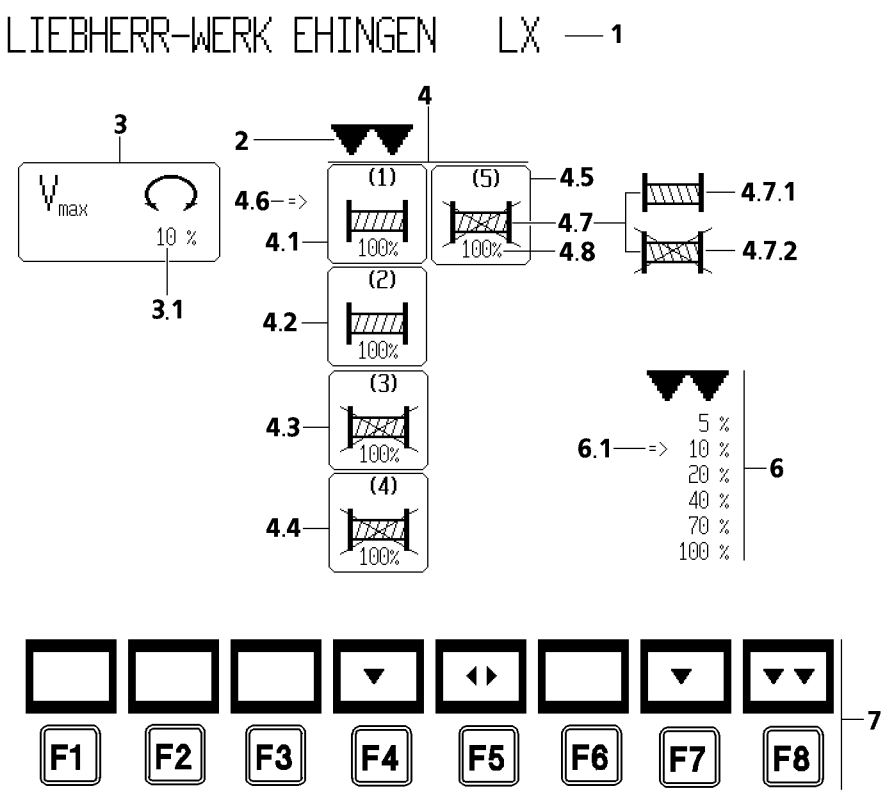
E Special function keys

Brightness adjustment of the monitors
See section "Operating elements of the LICCON computer system on monitor0".

H "SHIFT" key
- Key assignment 2nd level.
  Program call up engine monitoring with "SHIFT" + "P0"

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13. The "ControlParameter" program

The "Control-Parameter " program offers the possibility to:
- preselect the maximum slewing speed of the slewing gear
- preselect the maximum slewing speed of the winches as well as to activate or deactivate the individual winches.

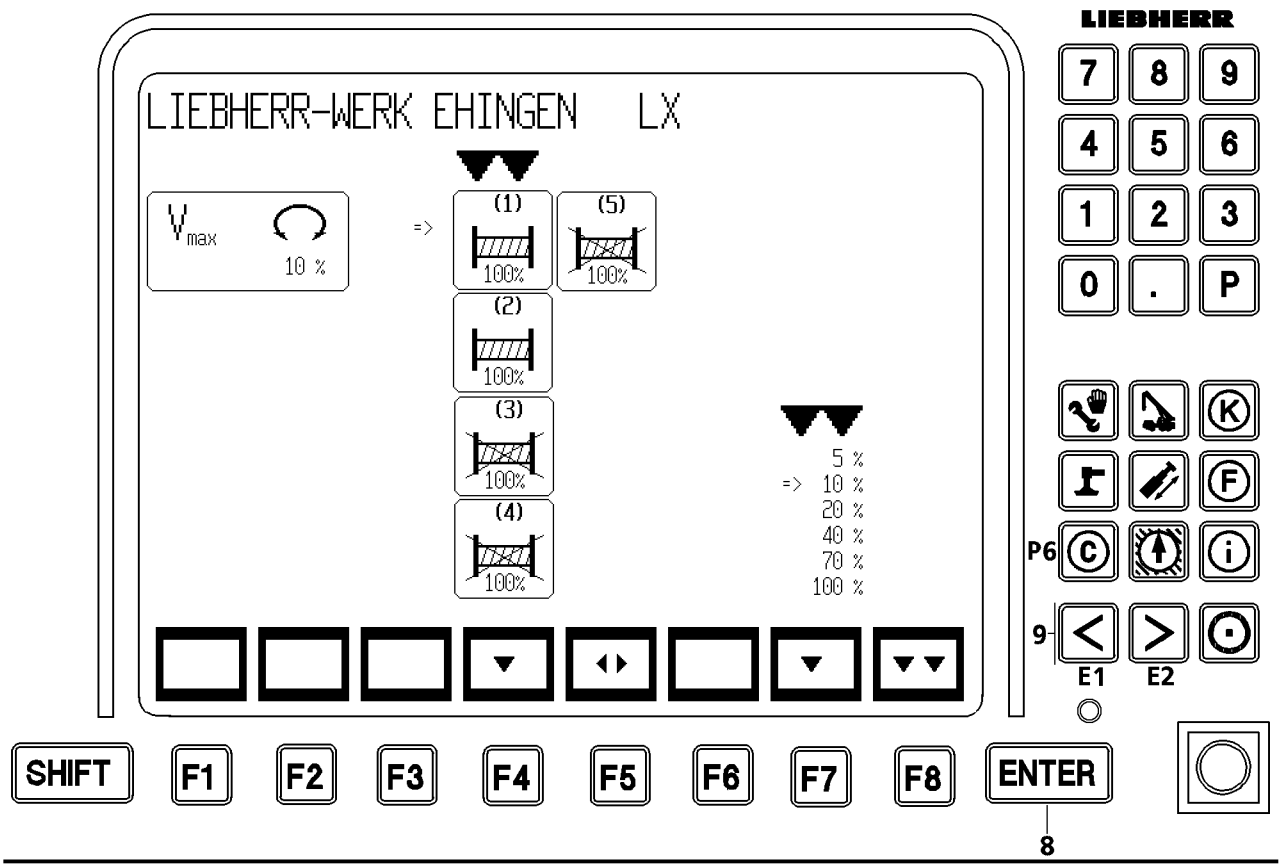
Note: During the "Control-Parameter" program, the installation and bypass switches are monitored. If one of these switches is actuated during the program, then the system shifts back immediately into the "Operation" program.

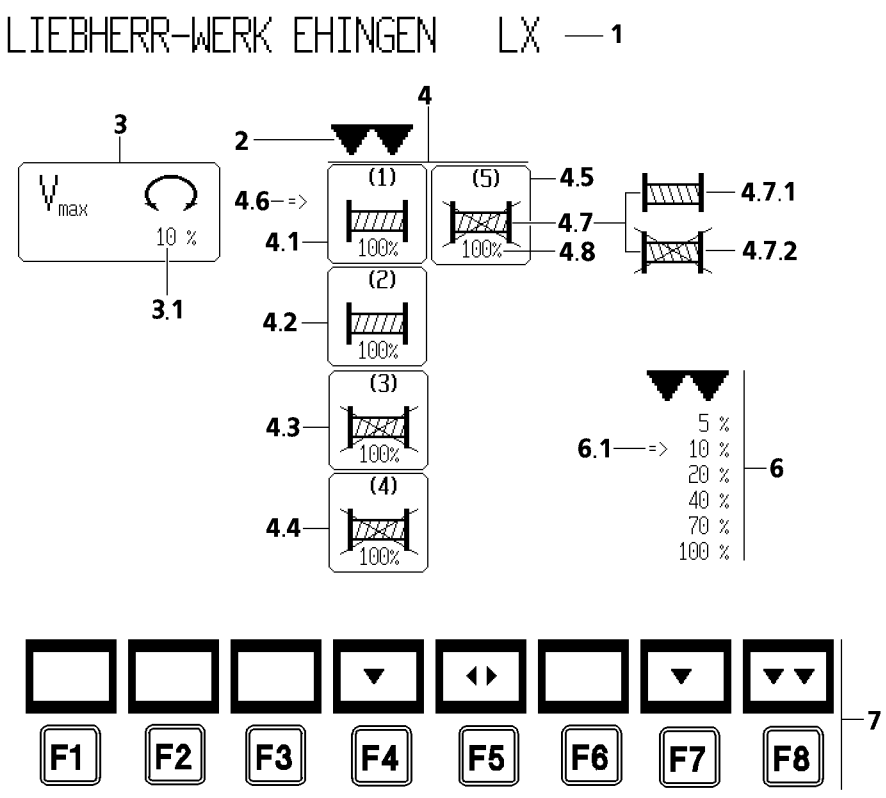
C A U T I O N : A change of maximum speed as well as activation / deactivation of the winches may not be made during a control of a crane movement.

13.1 Starting the program

- start with program key "P6"

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13.2 Control surface of "Control-Parameter" program

1) Crane type

2) Selector (double arrow) to select symbol elements

3) Symbol element Slewing gear
   3.1 maximm slewing speed: V_{max} in [%]

4) Symbol element group cable winches
   4.1 Winch 1
   4.2 Winch 2
   4.3 Winch 3
   4.4 Winch 4
   4.5 Winch 5
   4.6 Selector (=>) to select winches
   4.7 Winch symbol
      4.7.1 Winch activated
      4.7.2 Winch deactivated
   4.8 Speed in [%]
      See value field with selector.

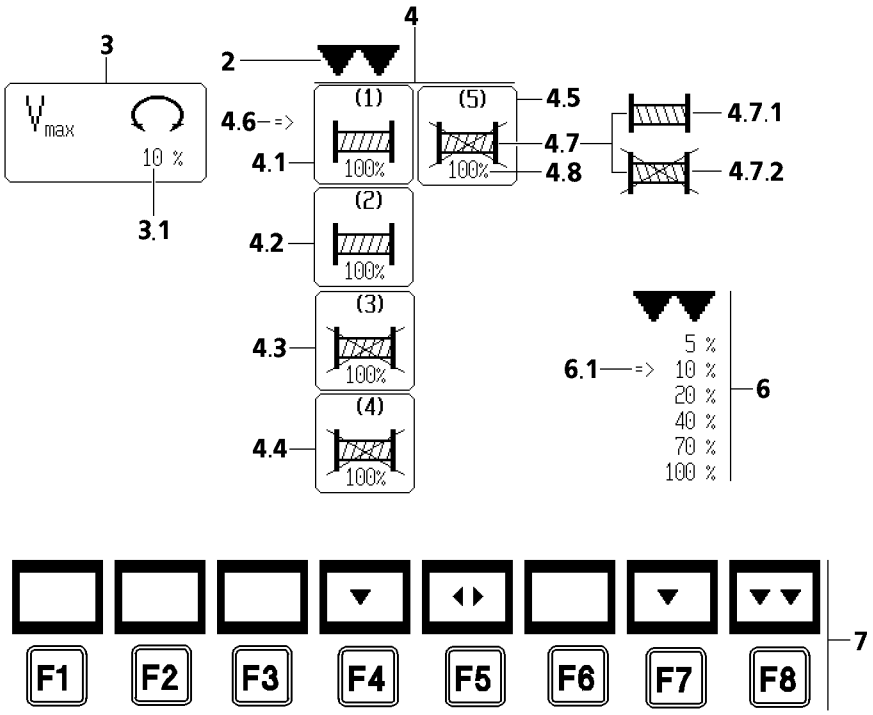
6) Value field with selector (=>)
   The percentage values describe the speed at maximum deflection of manual control lever. Always refers to maximum obtainable speed of drive, at a speed preselection of 100%. 6 stages can be preselected.

7) Function keys
   "F1" not used
   "F2" not used
   "F3" not used
   "F4" Selection of winches
   "F5" deactivate or activate selected cable winches
   "F6" not used
   "F7" Selection of percentage value for corresponding speed in value field
   "F8" Shift back to "Operation" program and take over parameters

8) ENTER key
   Take over selected speed setting for the preset functions.

9) Special function keys
   "E1" moves the selector (2) to select symbol elements to the left
   "E2" moves the selector (2) to select symbol elements to the right

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13.3 Change maximum slewing speed - slewing gear

- Select symbol element "max. slewing speed (3) "with keys "E1" or "E2".
  Selector (2) appears above the symbol element group.
- Select maximum slewing speed in [%] with key "F7",
  Selector (6.1) points to the selected percentage value.
- Confirm the selected maximum slewing speed with the "ENTER" key.
- Entry taken over.

D A N G E R : **The maximum slewing speeds (according to load capacity charts) which depend on the boom length and the operating mode, may NOT be exceeded during crane operation with a load !**

The larger the boom length, the heavier the equipment and the larger a load, the smaller the set "maximum slewing speed" must be.

At maximum load, the master switch for the slewing gear may not be moved to the stop.

13.4 Change the maximum slewing speed - winches

- Select symbol element "Winches" (4) with keys "E1" or "E2".
  Selector (2) appears above the symbol element group.
- Select symbol element for winch 1, 2, 3, 4 or 5 with key "F4",
  Selector (4.6) points to the selected winch.
- Select maximum slewing speed in [%] with key "F7",
  Selector (6.1) points to the selected percentage value.
- Confirm the selected maximum slewing speed with the "ENTER" key
- Entry taken over.

13.4.1 Activate / deactivate the individual winches

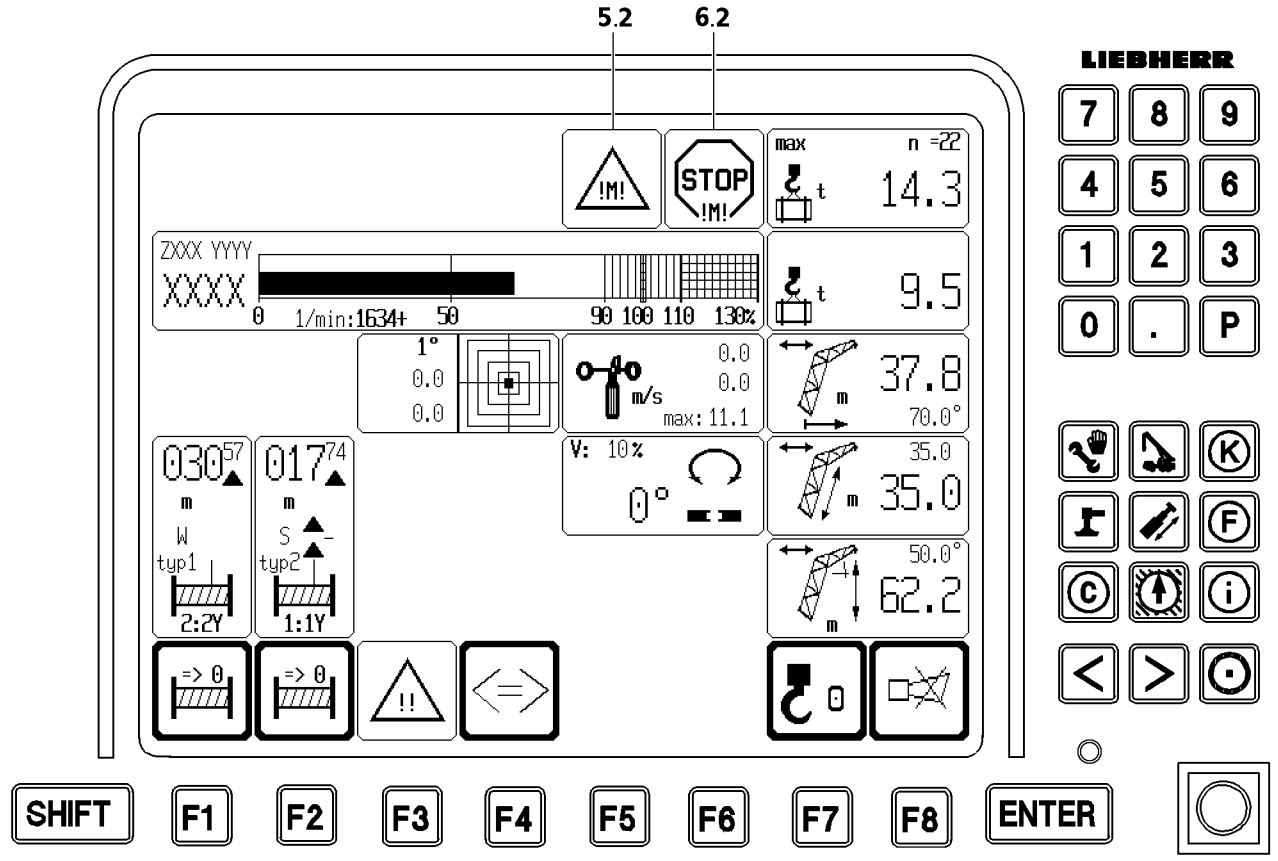
To prevent inadvertent movement of a winch, which is currently not required, the individual winches can be deactivated.

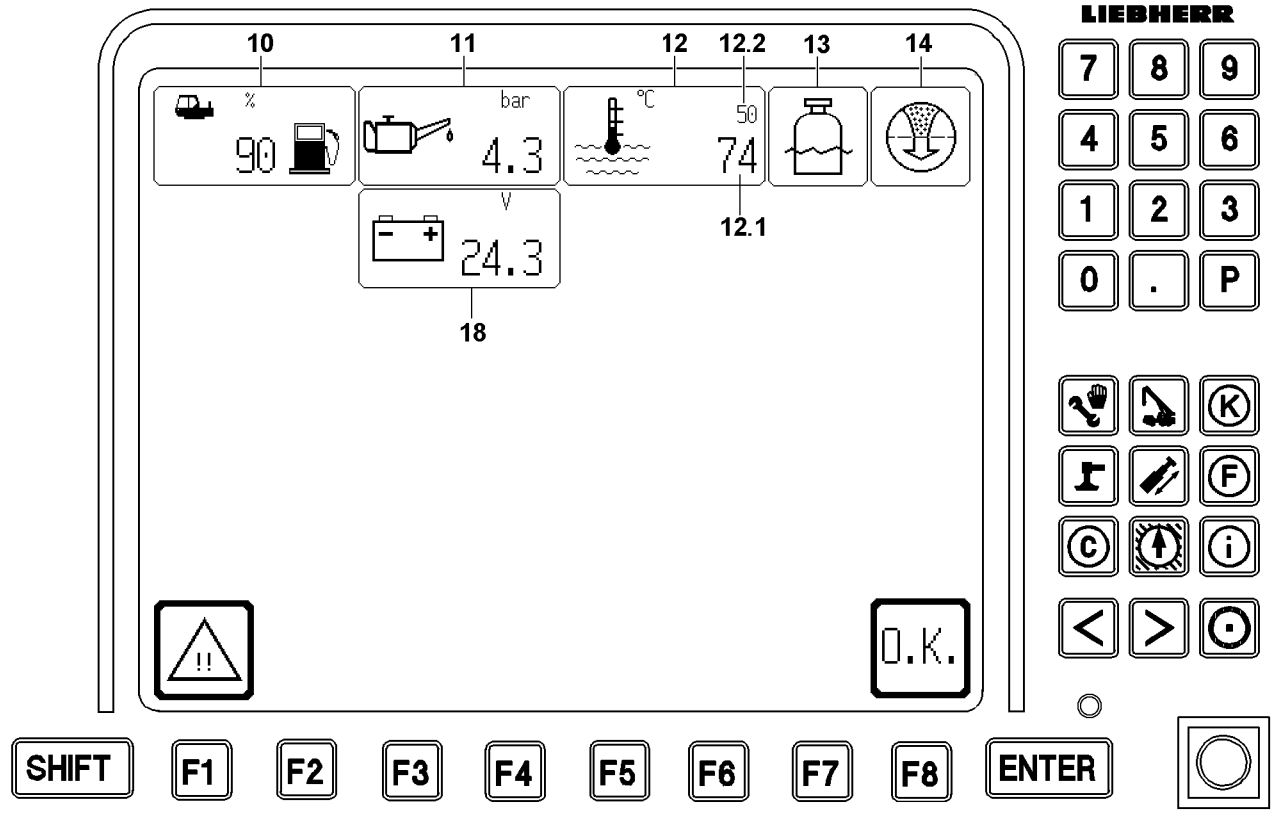
- Select symbol element group "Winches" with keys "E1" or "E2".
  Selector (2) appears above the symbol element group.
- Select symbol element for winch 1, 2, 3, 4 or 5 with key "F4",
  Selector (4.6) points to selected winch.
- Activate or deactivate the selected winch with key "F5".
  The winch symbol in the symbol element changes as follows:
  Winch symbol crossed out = Winch deactivated (4.7.2)
  Winch symbol not crossed out = Winch active (4.7.1)

13.5 Shift back into the crane operating view

- with function key "F8"
  The previously parameters, which were confirmed with the "ENTER" key are taken over.

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16. Engine monitor

16.1 Start the program

automatic:
- **Once**, if a STOP occurrence happens
- In case of a prewarning, warning or STOP occurrence while the LICCON computer system boots up

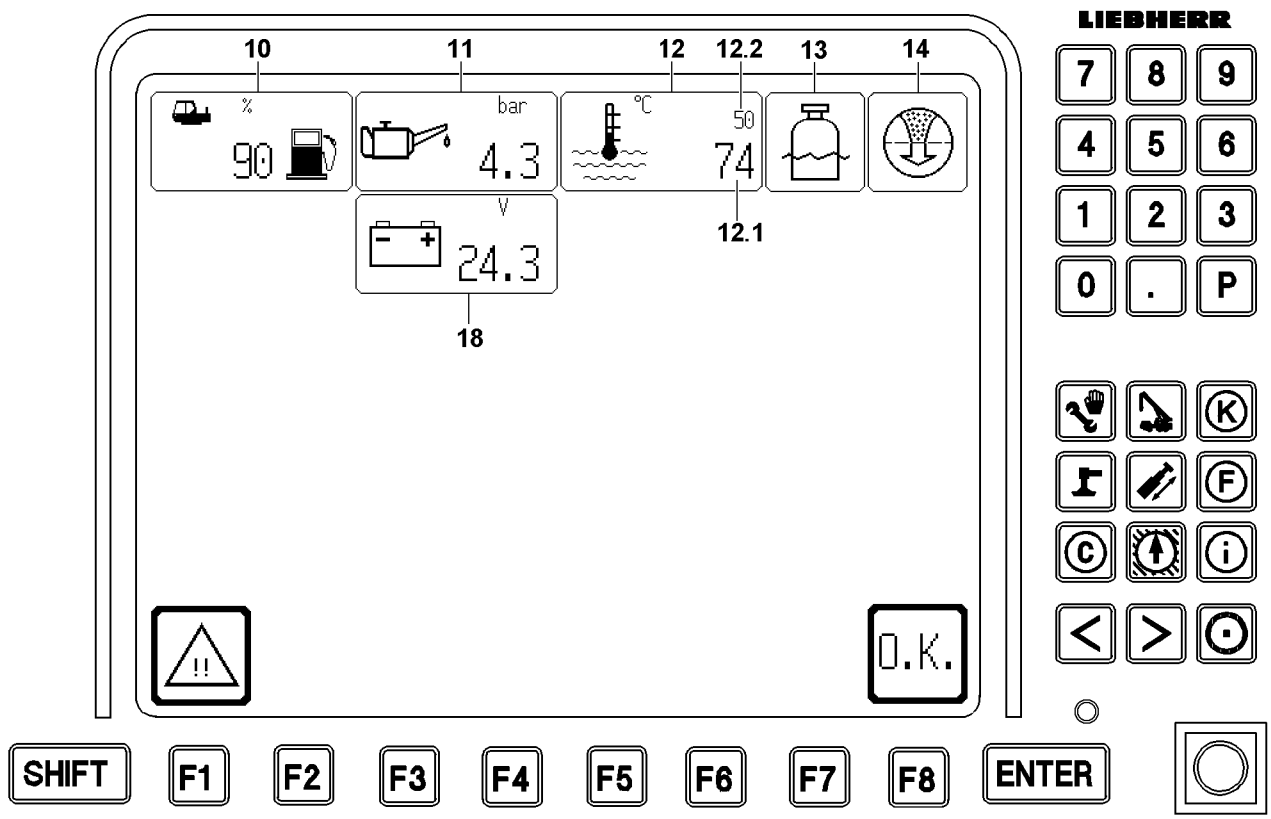
On request :
- with key combination "SHIFT" + "P0"

16.2 Possible prewarning, warning, STOP occurences of engine monitor

Occurences	**Pos.**	**Pre-warning at engine start**	**Warning** (5.2)	**STOP** (6.2)
Engine oil pressure (Indicator value) is missing	11		x	
Engine oil pressure (Indicator value) erroneous			x	
Engine oil pressure Warning active				x
Coolant temperature / Charger air temperature (Indicator value) is missing	12		x	
Coolant temperature / Charger air temperature (Indicator value) is erroneous			x	
Coolant temperature / Charger air temperature Warning is active				x
Coolant level Warning active				x
Air filter check	13		x	
Battery voltage (Indicator value) is missing	18	x		
Battery voltage (Indicator value) erroneous		x		
Battery voltage ≤ 16 V or ≥ 36V		x		
Fuel reserves (Indicator value) is missing	10	x		
Fuel reserves (Indicator value) erroneous		x		
Fuel reserves (Indicator value) ≤ 10 %		x		
Fuel reserves (Indicator value) ≤ 6 %			x	
Fuel reserves (Indicator value) 1 %				x

If an engine STOP occurrence happens and you switch to the "Engine monitoring" program, then there is the possibility to hold the engine monitoring view within 3 seconds. If the engine monitoring view is not retained, then the system shifts back into the "Operation" program.

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16.3 Hold the engine monitoring view

- Press function key "F1", the symbol element frame is shown as a thin line.

Note: All crane movements are shut off.

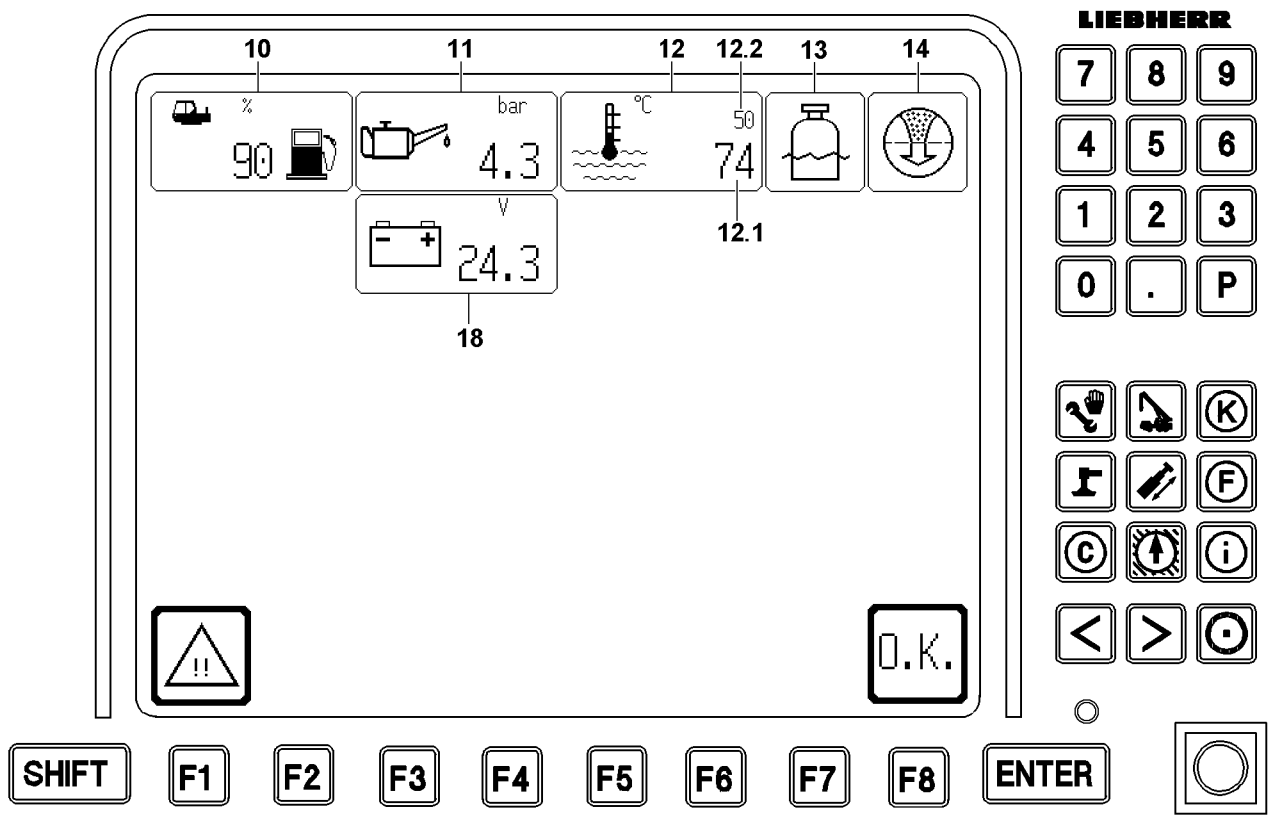
- Return to the "Operation" program by pressing the "F8" key.

Note: The shut off of the crane movement is eliminated. However, in the "Operation" program the warning or STOP symbol element is still shown.

Note: The automatic change over to the engine monitoring view is made only from the "Operation" program.
If a monitored occurrence in the engine monitoring view has been confirmed with "F8", there will be **no** automatic change to the engine monitoring view, if the same occurrence happens again.
When shifting back to the operating view, the STOP symbol element (6.2) or the warning symbol element (5.2) appears.
Pre-warnings are not noted in the "Operation" programs.

C A U T I O N : If you worked for a longer period of time in other programs, such as "set up", "test system", change over to the engine monitoring view every once in a while to ensure, that no engine monitoring occurrences have happened, which could cause engine damage or destruction.
The engine or crane functions are not turned off! For that reason, DO NOT ignore STOP occurrences, as this could cause serious engine damage!

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16.4 Symbol elements for engine monitoring

10) Tank contents in [%]
Symbol element blinks if the fuel reserves is < 5%.

11) Oil pressure in [bar]
Number indicator in the symbol element blinks if the engine oil pressure is too low.

12) Coolant temperature/Charged air temperature in [°C]
12.1 Coolant temperature
The number indicator in the symbol element blinks if the coolant temperature is too high.

12.2 Charger air temperature
The number indicator in the symbol element blinks if the charger air temperature is too high.

13) Coolant level too low
Symbol element appears if the coolant level is too low.

14) Air filter contaminated
Symbol element appears if the air filter is contaminated.

16) Added function battery voltage in [V]
Number indicator in symbol element blinks if the operating voltage is < 16 Volt or > 36 Volt.

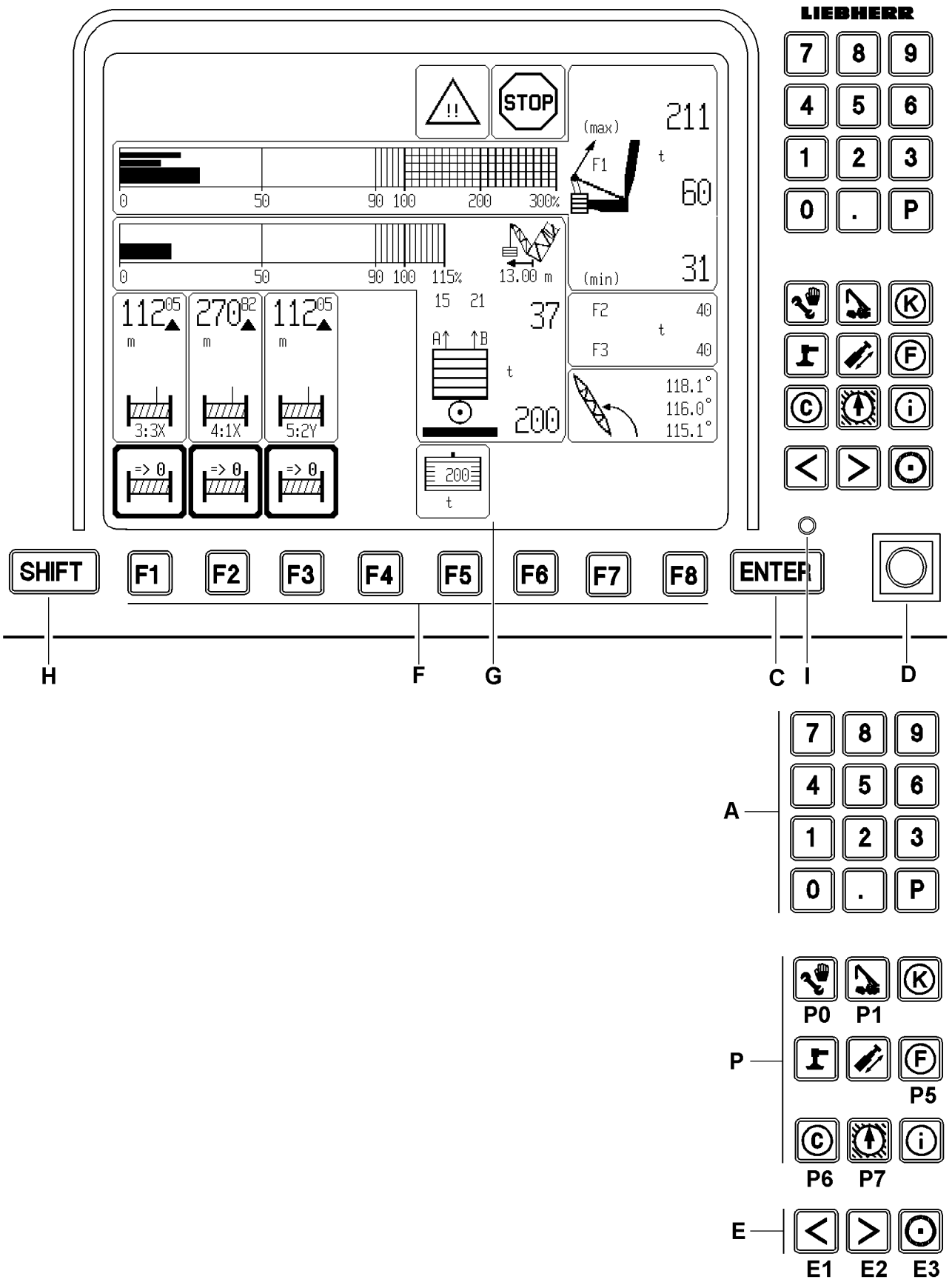
16.5 Function keys

"F1" Hold the engine monitoring view

"F2" to "F7" not used

"F8" Return to the crane operating view.

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20. The control elements of the LICCON computer systems on monitor 1

A Alpha numeric keyboard
To edit the derrickballast input values

P Program keys
No function

C Input key "ENTER"
To confirm changes.

D Keyed switch
Turn the acoustical signal - turntable off.

E Brightness adjustment
see brightness adjustment on monitor 0

F Function keys
The function keys must always be viewed together with the function key symbol line shown on the monitor above.

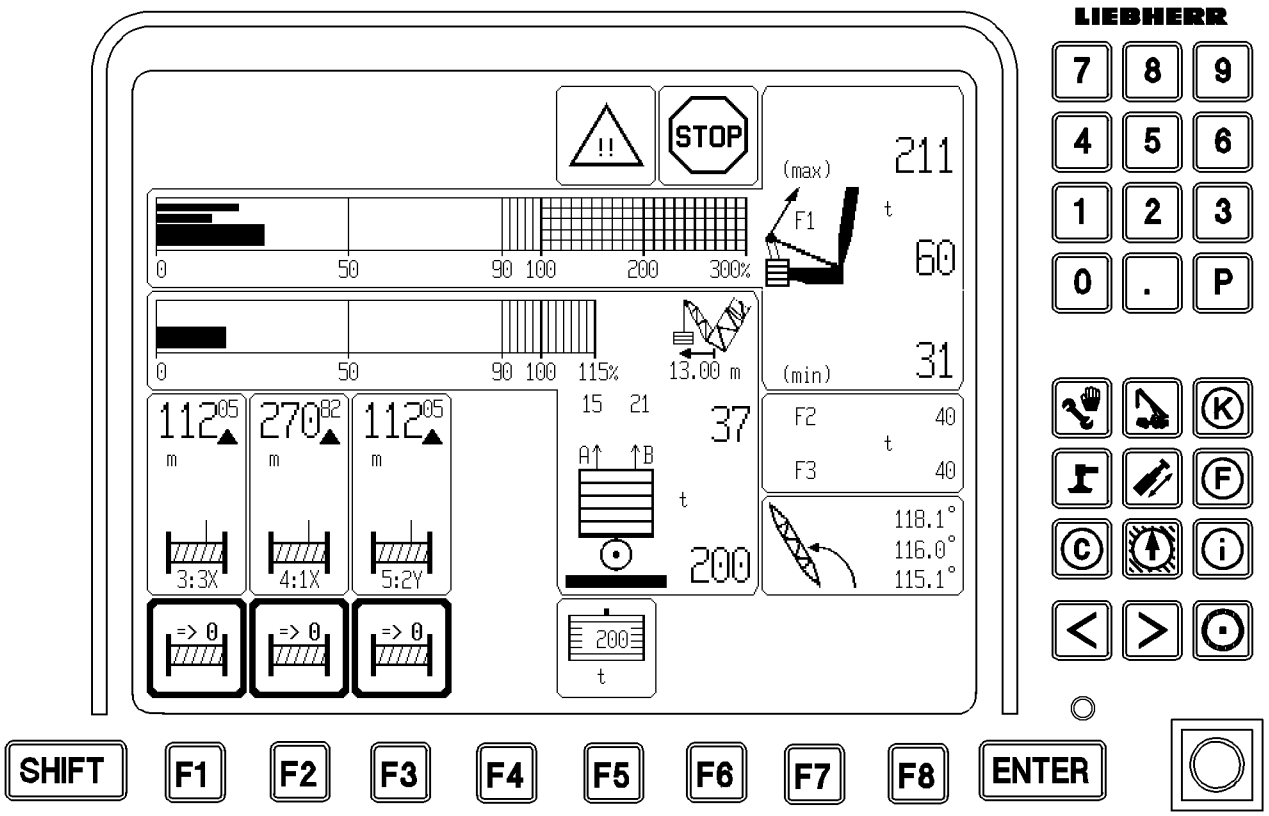
G Monitor
Monitor 1 normally shows the operating view of Monitors 1.

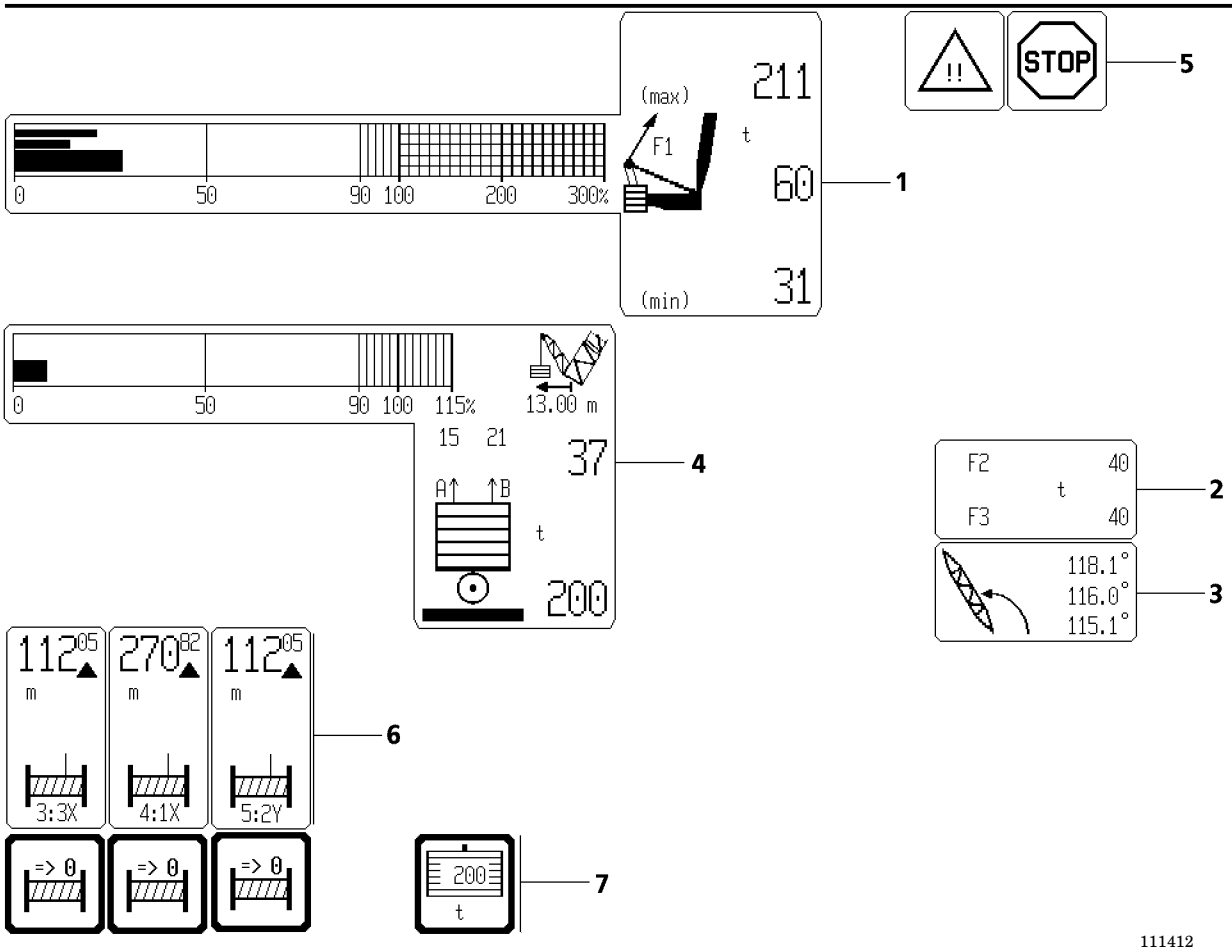
Note: For diagnostics purposes, monitor 1 can be assigned for ballast trailer control.

H SHIFT key
No function

I LED indication
Supply voltage for monitor available.

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21. The "Operation am Monitor 1" program

On cranes with derrick ballast *, the required maximum and minimum load for crane balance can be increased or reduced even during operation and under load by increasing or recuing the derrick ballast.

Note: **Ballast** is the derrick ballast, which means the suspended ballast or the ballast trailer.
Counterweight is the fixed compensation weight installed on the slewing platform.

If only a partial load is lifted, then, most of the time, only a partial derrick ballast is used. In this case, the maximum load shut off is made by the derrick overload safety device on CPU1, with the aid of value $F1_{max\text{-}Operation}$. The corresponding values are shown on monitor 1, see illustration on the left.

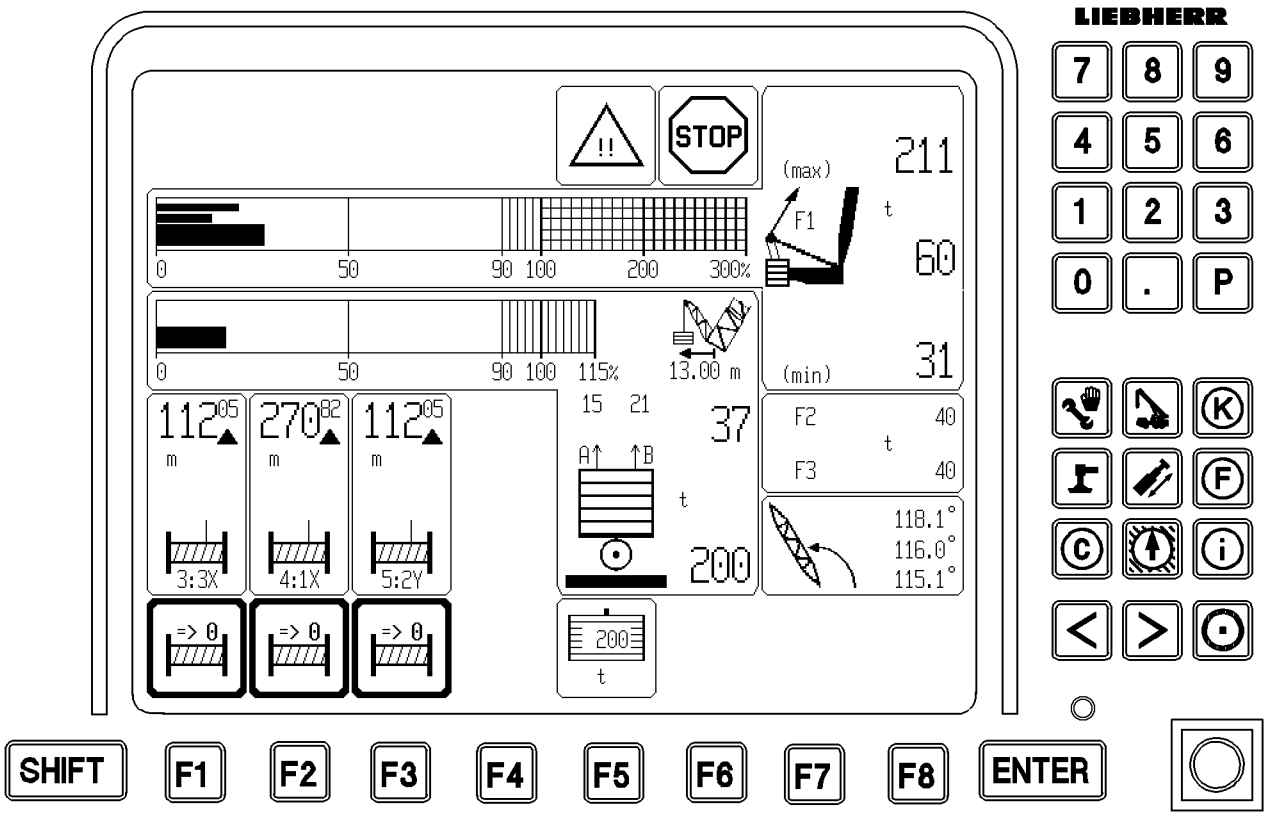
The monitor 1 in the "Operation am Monitor 1" program is split into 7 areas :

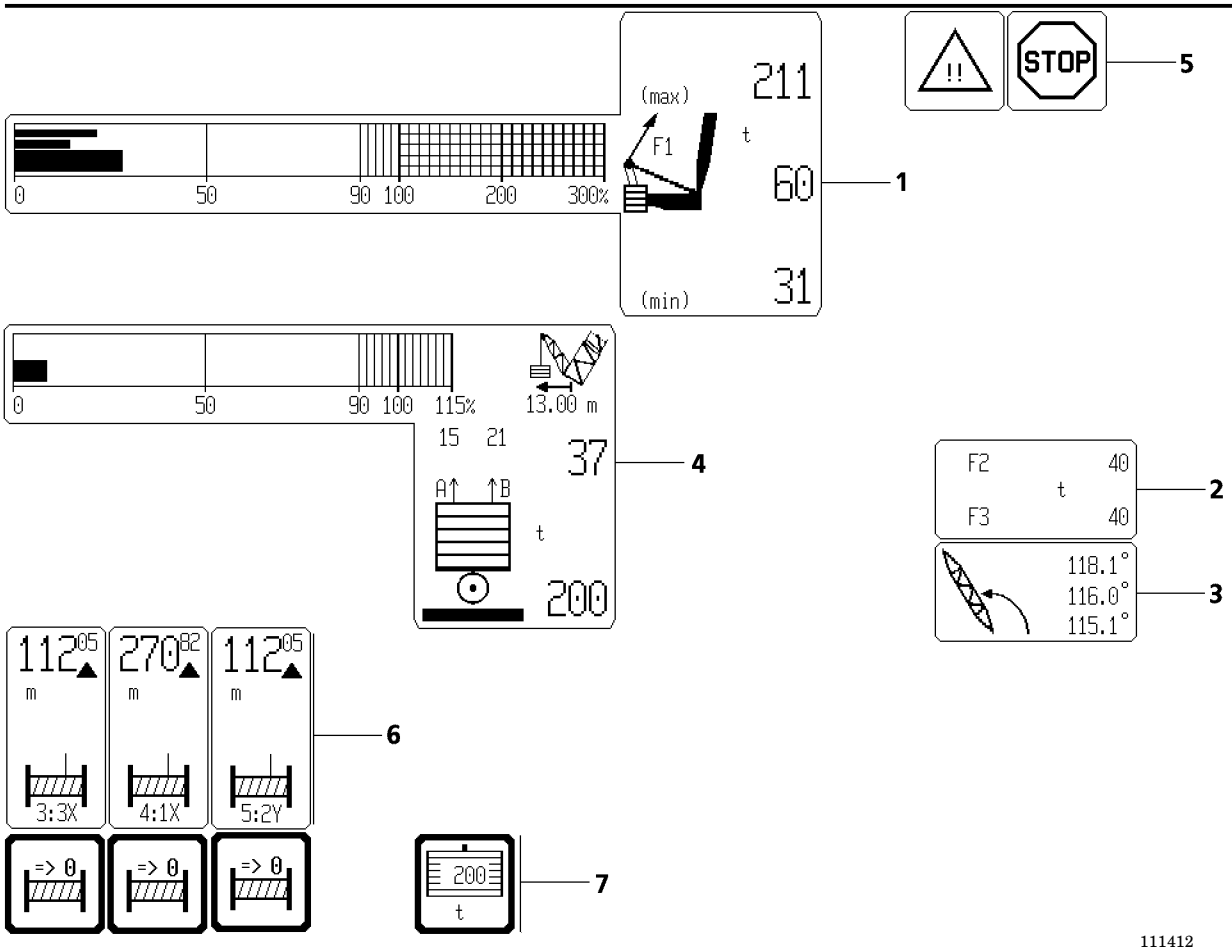
1 Test point 1 =F1 Pull test brackets Test point 1A and 1B in A - Bracket guying
2 Test point 2 =F2 Pull test brackets Test point 2A and 2B in N/W guying
Test point 3 =F3 Pull test brackets Test point 3A and 3B in S- guying in derrick operation
3 Derrick boom angle
4 Derrick ballast, weight and utilization
5 Alarm functions
6 Winch indication winch 3*, 4 and 5*
7 Function keybar symbol line

Note: The monitor illustrations in this chapter are only examples. The number values in the individual symbol elements might not match your particular crane.

In addition, some illustrations show the maximum possible assignment of the LICCON monitor with symbol elements. In normal crane operation, an identical view would not appear on the LICCON monitor.

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21.1 Test point 1 = F1

Installation maximum force values

The monitoring function of test point 1 carried out by the LICCON computer system provides an additonal safety function. Due to the complexity of the installation procedure, the installation limits are not always valued or exact.

D A N G E R : **This means that the crane cannot be utilized to this installation limit without danger. The crane may always only be erected without a load, as noted in the Operation Manual.**

F1- installation maximum force values in operating modes without derrick
In operating modes without derrick, there are 2 different F1- installation maximum force values.

1. F1- installation maximum force value outside the operating range
   For erection and installation of the crane.

2. F1- installation maximum force value inside the operating range
   Within the boom angle range with load chart and a few angle degrees next to it.
   Maximum not bypassable F1-max limit in operating range.

Note: For statistical reasons, the F1- installation maximum force value can be higher in operating range with load chart (and a few angle degrees next to it) than outside the operating range, for example when lifting off the main boom jib or fly jib from the ground.

C A U T I O N : **The selection of the F1- installation maximum force values for inside or outside the operating range is made on the basis of values of angle sensor main boom and angle sensor fly jib.**
In operating range, the current F1- force may be above the F1- installation maximum force outside the operating range.

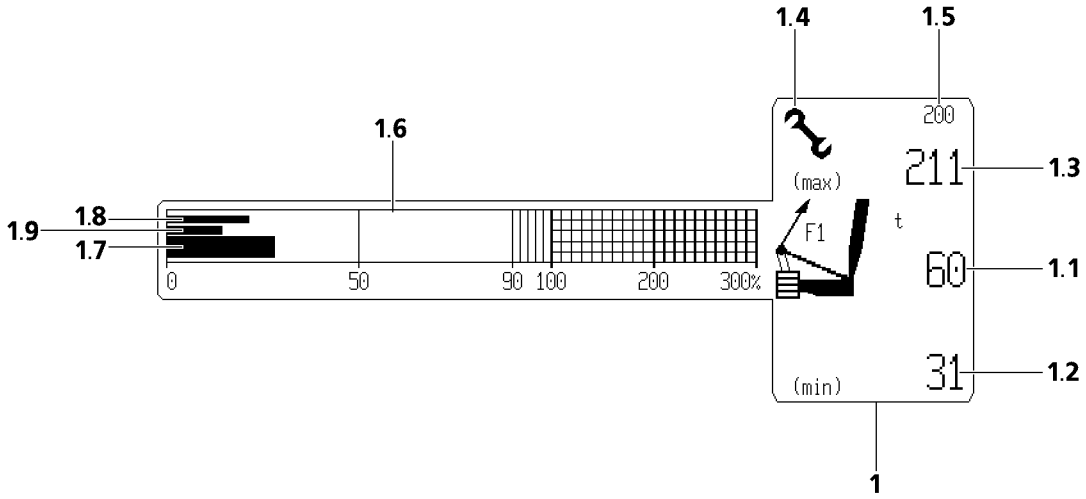
If both angle sensor on the main boom for the LMB are erroneous or are missing or both angle sensors on the fly jib are erroneous or are missing, then the LMB cannot determine if the boom if within the operating range or not.
So that in this case the F1- installation maximum force shut off is not shut off and cannot be bypassed, the F1- installation maximum force value of the operating range is used for the shut off.

D A N G E R : **If both angle sensors on the main boom for the LMB are erreonous or are missing or both angle sensors on the fly jib are erroneous or are missing, then the LMB will use the higher F1- installation maximum force value inside the operating range for the non-bypassable F1- installation force shut off.**

This ensures that the crane can be set up and taken down even in case of erroneous or missing sensors. However, the F1- installation maximum force value outside the operating range (F1max limit) for the erection is no longer shown and monitored. If the crane is not taken down exactly as noted in the Operating Manual, then it can be overloaded. In this case, there is an increased chance of having a serious accident!

* Optional

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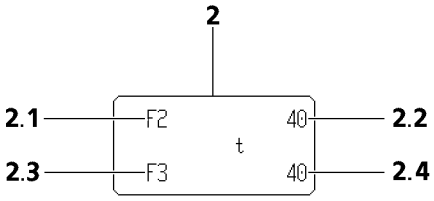
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Test point 1 = F1 (continuation)
Pull test brackets Test point 1A and 1B in the A- bracket guying

Pos.	Symbols / Indicator values	Type of indication	is shown
1	Symbol element "Test point 1" = F1 in units [t] or [kips]	static	always
1.1	Actual force $=F1=F1_{ist}$ F1 = F1A + F1B F1A = Kraft Test point 1A (A-Bock links) F1B = Kraft Test point 1B (A-Bock rechts)	static	for valid value
		??? blinking	for invalid value
1.2	Minimum force $=F1_{min}$	static	always **Note:** A shut off by $F1_{min}$ is only made in operating modes with suspended ballast / ballast trailer , in all other operating modes $F1_{min}=0$, for these operating modes, the condition $F1=F1_{min}$ cannot be reached during operation.
1.3	Maximum operating force $=F1_{max\text{-}Operation}$	static	in operating modes with suspended ballast / ballast trailer
1.4	Installation symbol	static	For "Installation"
1.5	Maximum installation force $=F1_{max\text{-}Montage}$	static	For "Installation" and $F1<F1_{max\text{-}Montage}$"
		blinking	For "Installation" and $F1\geq F1_{max\text{-}Montage}$"
1.6	F1 - Utilization scale in [%]	static	always
1.7	F1 - Utilization bar indicator = F1 / $F1_{max\text{-}Operation}$ 0% for: $F1_{max\text{-}Operation}$ =0 or F1 = invalid.	dynamic	in operating modes with suspended ballast / ballast trailer
1.8	F1-Min-Warning bar = $F1_{min\text{-}Warn\text{-}Wert}$ / $F1_{max\text{-}Operation}$ ($F1_{min\text{-}Warn\text{-}Wert}$ = $F1_{min}$ + 20 t). 0 % for: $F1_{max\text{-}Operation}$ = 0 or $F1_{max\text{-}Operation}$ = invalid	dynamic	in operating modes with suspended ballast / ballast trailer
1.9	F1-Min-Stop bar $=F1_{min}$ / $F1_{max\text{-}Operation}$ 0% for: $F1_{max\text{-}Operation}$ = 0 or $F1_{max\text{-}Operation}$ = invalid	dynamic	in operating modes with suspended ballast / ballast trailer

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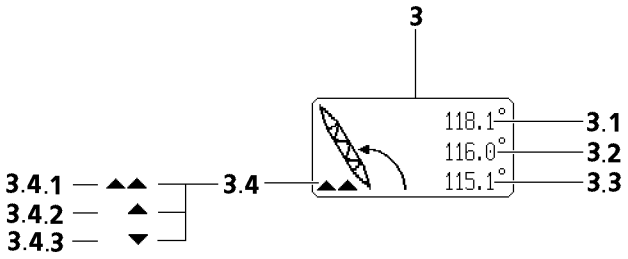
21.2 Test point 2 = F2 / Test point 3 = F3

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

Pos.	Symbols / Indicator values	Type of indication	is shown
2	Symbol element for N/W guy force and main boom S-guy force for derrick operation in measuring unit [t] or [kips]	static	in operating modes with lattice jib or with derrick
2.1	Symbol F2 for N/W Guy force Test point 2	static	in operating modes with lattice jib
2.2	F2-actual value F2 = F2A + F2B Test point 2A/B is in jib guying on jib head Test point 2 A = left Test point 2 B = right	static	in operating modes with lattice jib and valid F2-value
		??? blinking	in operating modes with lattice jib and invalid F2-value
2.3 *	Symbol F3 for main boom S-guy force Test point 3	static	in operating modes with derrick
2.4 *	F3- actual value F3 = F3A + F3B Test point 3A/B is in the derrick main boom guying on the main boom head Test point 3 A = left Test point 3 B = right	static	in operating modes with derrick and valid F3-value
		??? blinking	in operating modes with derrick and invalid F3-value

* in operating modes with derrick and main boom

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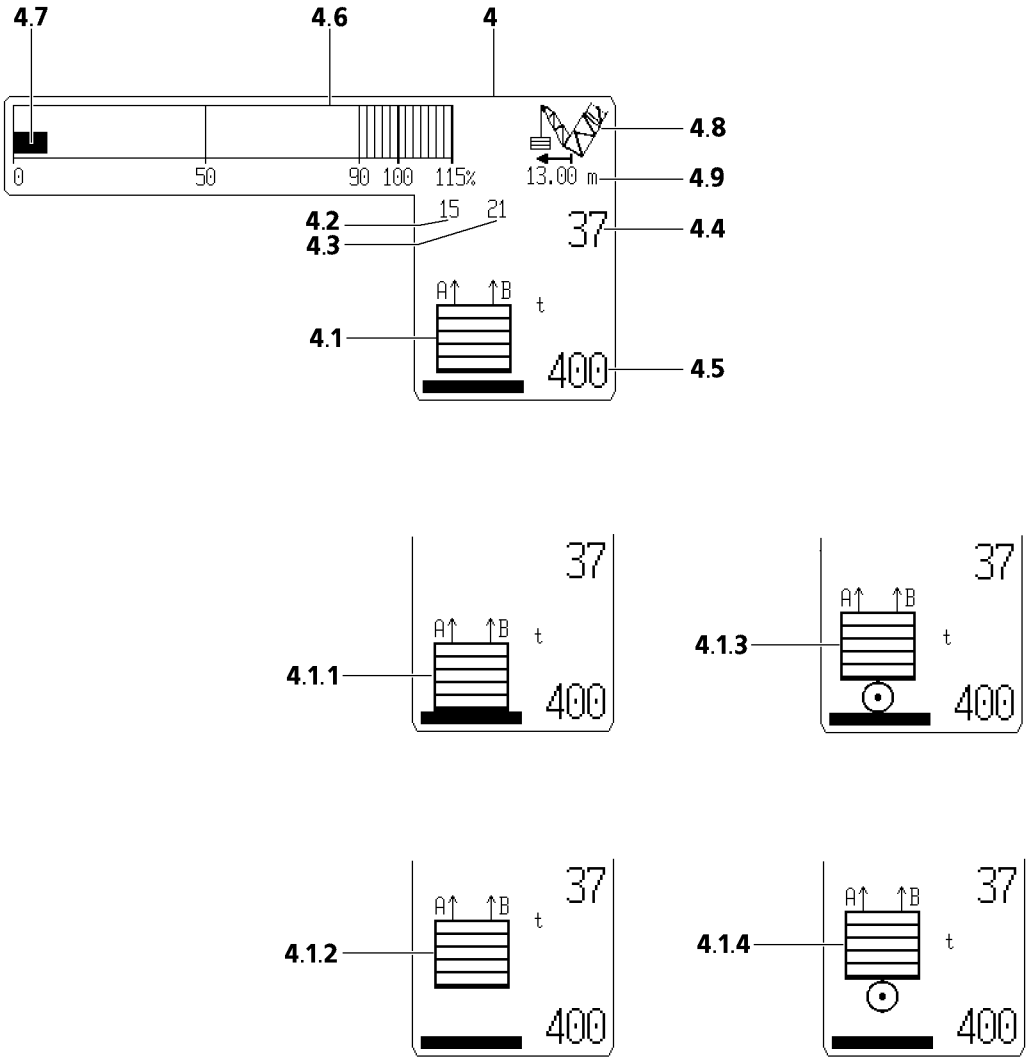
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21.3 Derrick boom angle

Pos.	Symbole / Indicator values	Tzpe of indication	is shown
3	Symbol element "Derrick boom angle"	static	in operating modes with derrick
3.1	Maximum derrickwinkel in operation ($\measuredangle_{Dmax}$) in [°]	static	in operating modes with derrick and $\measuredangle_{Dakt} \leq \measuredangle_{Dmax}$
		blinking	in operating modes with derrick and $\measuredangle_{Dakt} > \measuredangle_{Dmax}$
3.2	Current derrick angle ($\measuredangle_{Dakt}$) in [°]	static	in operating modes with derrick and valid value
		??? blinking	in operating modes with derrick and invalid value
3.3	Minimum derrick angle in operation ($\measuredangle_{Dmin}$) in [°]	stastic	in operating modes with derrick und $\measuredangle_{Dakt} \geq \measuredangle_{Dmin}$
		blinking	in operating modes with derrick und $\measuredangle_{Dakt} < \measuredangle_{Dmin}$
3.4	Limitation of relapse cylinder derrick boom condition symbols		
3.4.1	2 arrows upward	static	Relapse cylinder on block one limit switch actuated or erroneous
3.4.2	Arrow up	static	at $\measuredangle_{Dakt} > \measuredangle_{Dmax}$
3.4.3	Arrow down	static	at $\measuredangle_{Dakt} < \measuredangle_{Dmin}$

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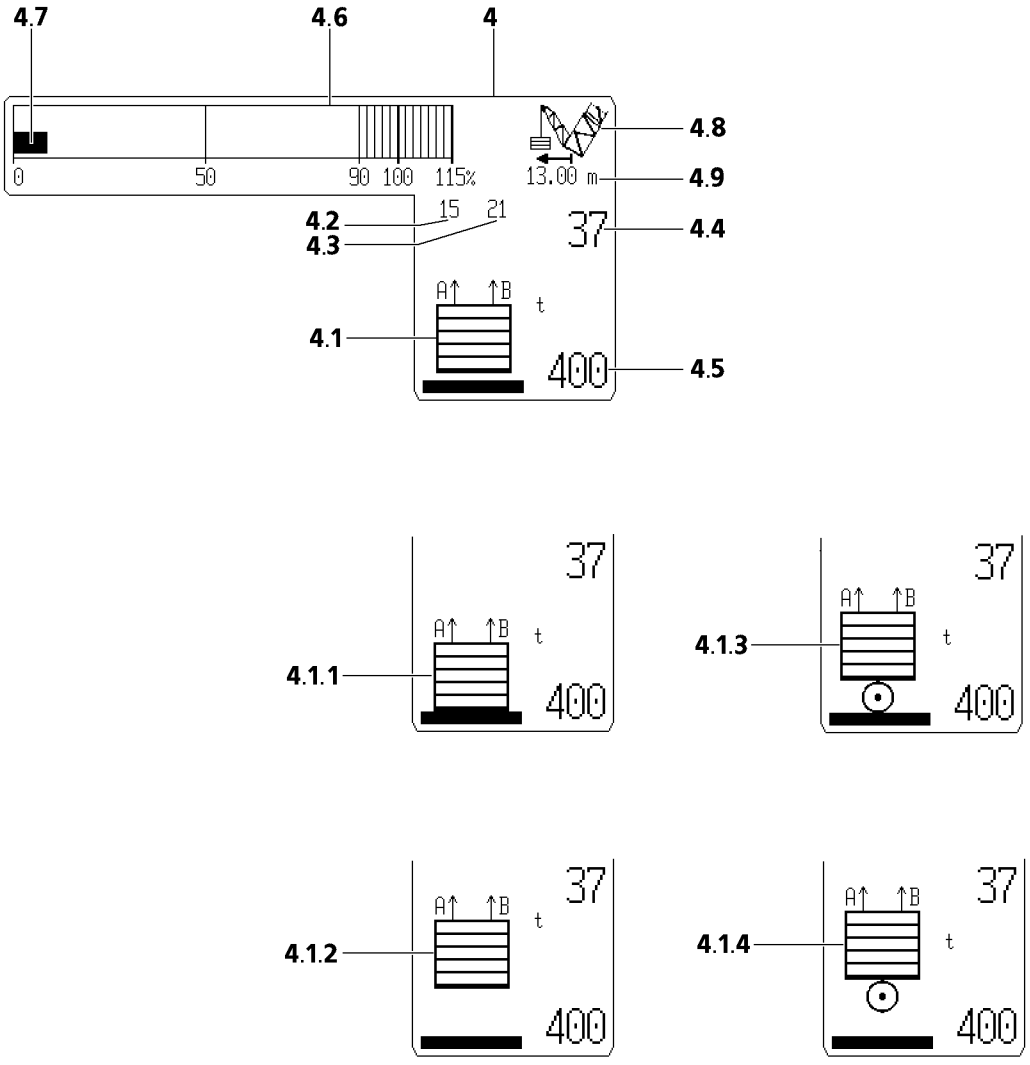
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21.4 Derrick ballast, weight and utilization

Pos.	Symbols / Indicator values	Type of indication	is shown
4	Symbol element "Derrick ballast, weight and utilization "	static	always
4.1	Symbol "Derrick ballast" in unit [t] or [kibs]. **Note:** This force unit is valid for all values shown in the frame.	static	in operating modes with suspended ballast / ballast trailer depending on type and condition of derrick ballast (see 4.1.1 - 4.1.4).
4.1.1	Symbol "Suspended ballast on ground"	static	in operating modes with suspended ballast and suspended ballast not suspended according to limit switch
4.1.2	Symbol "Suspended ballast suspended"	static	in operating modes with suspended ballast and suspended ballast suspended according to limit switch
4.1.3	Symbol "Ballast trailer on ground"	static	in operating modes with ballast trailer and ballast trailer not suspended according to keyed switch
4.1.4	Symbol "Ballast trailer suspended"	static	in operating modes with ballast trailer and ballast trailer suspended according to keyed switch
4.2	Force in derrick ballast guying A (left) =F4A5 = F4A - F5 Test point 4A = Pressure sensor ring surface left, Test point 5 = Pressure sensor piston surface right and left, if t est point 5 is invalid , when F5=0 is used F4A =Force 4A on ring surface left F4B =Force 4B on ring surface right F5 =Force F5 on piston surface	static	in operating modes with suspended ballast / ballast trailer and F4A valid
		blinking	in operating modes with suspended ballast / ballast trailer and F4A and F4B valid and the difference between the guy force A and B is larger than permissible (45t)
		??? blinking	in operating modes with suspended ballast / ballast trailer and F4A invalid
4.3	Force in derrick ballast guying B (right) =F4B5 = F4B - F5 Test point 4B = Pressure sensor ring surface right, Test point 5 = Pressure sensor piston surface right and left, if test point 5 is invalid , then F5=0 is used	static	in operating modes with suspended ballast / ballast trailer and F4A valid
		blinking	in operating modes with suspended ballast / ballast trailer and F4A and F4B valid and difference between guy force A and B is larger than permissible (45t)
		??? blinking	in operating modes with suspended ballast / ballast trailer and F4B invalid

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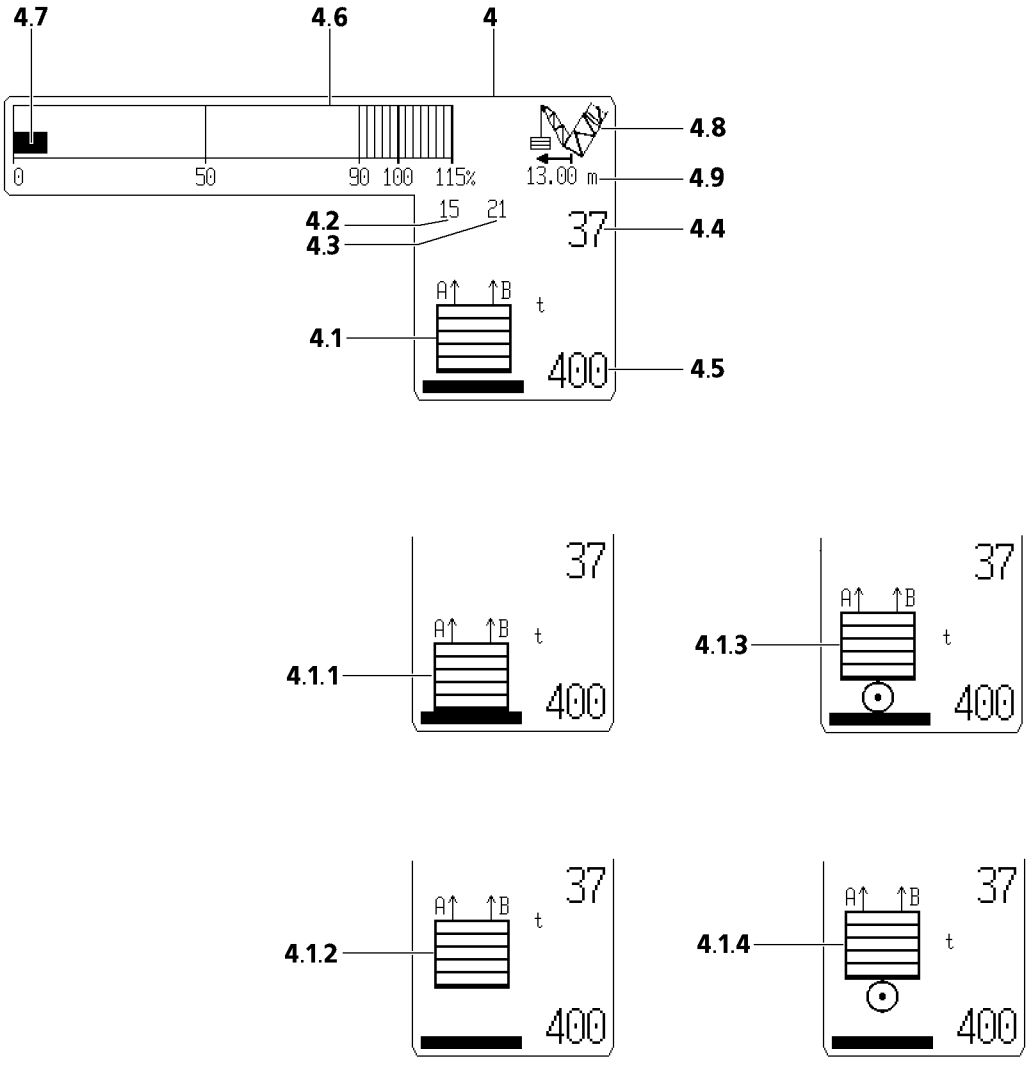
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Derrick ballast, weight and utilization (continuation)

Pos.	Symbols / Indicator values	indication	is shown
4.4	Pulled derrick ballast = $BA_{gezogen}$ = vertical force components of force in derrick ballast guying (=F4A5+ F4B5) calculated from test points 4A, 4B and 5. **Note:** The sum of forces F4A5 and F4B5 is larger or the same as the pulled derrick ballast = $BA_{gezogen}$	static	in operating modes with suspended ballast / ballast trailer, if valid
		??? blinking	in operating modes with suspended ballast / ballast trailer, if value is invalid, or M4A or M4B defective or derrick ballast radius invalid **Note:** in case of M5 defect , the pressure is calculated as M5 = 0 → Indication remains static
4.5	Placed derrickballast = $BA_{aufgelegt}$ **Note:** This value has been entered by hand and confirmed with the "ENTER" key. The value is stored when the system is turned off and is valid again after turning it on again, until it is changed with the "F5" function key.	static	in operating modes with suspended ballast / ballast trailer, if value for $BA_{aufgelegt}$ is not permissible
		blinking	in operating modes with suspended ballast / ballast trailer, if value for $BA_{aufgelegt}$ is questionable,
		??? blinking	in operating modes with suspended ballast / ballast trailer, if value for $BA_{aufgelegt}$ < 0 or > 9999
4.6	Ballast utilization scale	static	in operating modes with suspended ballast / ballast trailer
4.7	Derrick ballast utilization bar indication = $BA_{gezogen}$ / $BA_{aufgelegt}$ in percentages (%), The bar is "0" when: $BA_{aufgelegt}$ < 5 t or $BA_{gezogen}$ = invalid The bar can show maximum 115 %.	dynamic	in operating modes with suspended ballast / ballast trailer

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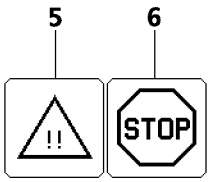
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Derrick ballast, weight and utilization (continuation)

Pos.	Symbols / Indicator values	Type of indication	is shown
4.8	Symbol ”Derrick ballast radius symbol”	static	in operating modes with suspended ballast / ballast trailer with variable derrick ballast radius
4.9	Indication "Derrick ballast radius” [m] or [ft]	static	in operating modes with suspended ballast / ballast trailer with variable derrick ballast radius and derrick ballast radius value valid
		blinking	in operating modes with suspended ballast / ballast trailer with variable derrick ballast radius and derrick ballast radius value invalid

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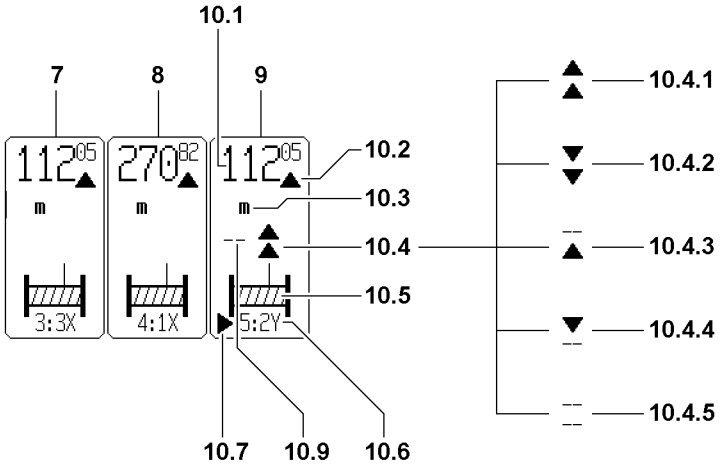
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21.5 Alarm functions

Pos.	Symbols / Indicator values	Type of indication	is shown
5	Symbol element "ACHTUNG / CAUTION"	blinking	for M1min-prewarning ($F1_{ist} < F1_{min\text{-}Warnwert}$) or for $F1_{max\text{-}Operation}$ - Vorwarnung / Prewarning (90%) ($F1 \geq F1_{max\text{-}Operation}$ warning value) or for $F1_{min\text{-}Stop\text{-}Nachlauf}$ / afterrun or for $F1_{max\text{-}Operation\text{-}Stop\text{-}Nachlauf}$ / afterrun
6	Symbol element "STOP"	blinking	bei $F1_{min\text{-}Stop}$ ($F1_{ist} < F1_{min}$, with afterrun 3 sec.) or $F1_{max\text{-}Operation\text{-}Stop}$ ($F1 \geq F1_{max\text{-}Operation}$) with afterrun 3 sec.) or $F1_{max\text{-}Montage\text{-}Stop}$ ($F1_{ist} \geq F1_{max\text{-}Montage}$) with afterrun 3 sec.)

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21.6 Winch indication

The symbol elements for winches 3* 5* are shown only on monitor 1 if the crane is equipped with these winches.

The indication of winch 3* to 5* functions the same way as indiation for winch 1 and 2 on monitor 0.

In addition, the following applies:
If winch 5* or winch 6* is used as hoist winch, then the **hook path** is shown in the winch symbol. The value calculated by the corresponding function key is shown even after turning the system on or off or after an operating mode change.

If one of the winches is used as a control winch, then the **current cable length on the winch drum** is shown, not the path of the hookblock. Tare can be calculated, but after turning the system on or off and after an operating mode change, the original value "Cable length on the cable drum" is shown again.

C A U T I O N : The indication only has 3 digits in front of the comma, digits further in front are cut off. For that reason, it must be estimated if 200 m or 1200 m cable are on the winch. The indication is in both cases "200^{00}".
The length indication is only exact if the winch has been adjusted and no data loss has occurred since then.

Pos.	Symbols / Indicator values	Type of indication	is shown
7	Winch indication Winch 3*	static	if winch 3 is installed
8	Winch indication Winch 4 *	static	if winch 4 is installed
9	Winch indication Winch 5*	static	if winch 5 is installed
10.1	Hook path = Cable length on winch / Hoist cable reeving according to entry by hand or = Cable length on winch drum (for intake gear, the cable length is even for the left and the right half of the cable drum)	static static	if winch is calculated as hoist winch if winch is calculated as control winch
		??? blinking	in case of error in winch path measurement → adjust winch again

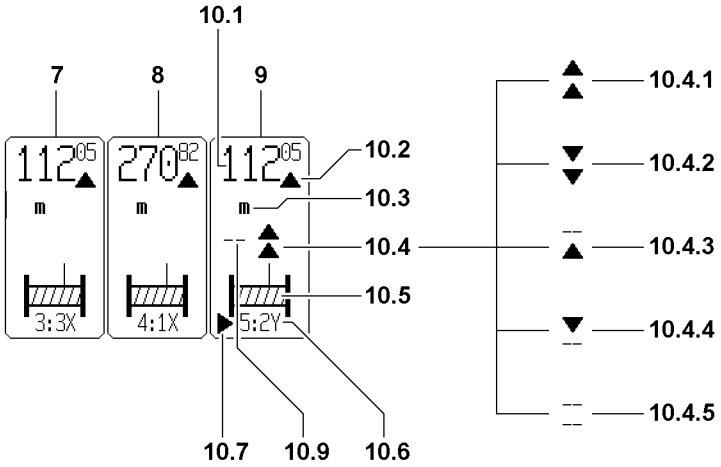
Winch 3 and 4 are always calculated as control winch.
Winch 5 is calculated as control winch, in operating system with jib / luffing jib.
Winch 5 is calculated as hoist winch, in operating system without jib / luffing jib.

Note: Winch 5 is always winchtype 2. It takes place therefore no winch type indication.

Note: When winch 5 is calculated as hoist winch and no boom nose is installed, then the hook path calculation is made with the reeving of the boom. If the boom nose is installed, the hook path calculation is made with the reeving of the boom nose.

*if installed

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Symbol element "Winch indication"

10.2 The arrows on the length value show the direction of the hook movement in relation to the zero point :
Arrow upward = Hook has moved upward from the zero point,
Arrow downward = Hook has moved downward from the zero point.

10.3 Length unit for hook path indication : [m] or [ft]

10.4 Winch status indication
The following winch status symbols are shown (all blinking) :

10.4.1 Spool out

10.4.2 Spool up

10.4.3 Spooled out → Spool out function is locked

10.4.4 Spooled up → Spool up function is locked

10.4.5 Winch is deactivated or unplugged → Spool up and out is locked
or (via "Control parameter program)
Winch is spooled up and out
at the same time, according to the sensor

Note: If no winch status symbol appears, then the activated winch is standing still and is neither spooled up nor out.

10.5 Winch symbol (with cable end for winch status symbol)

10.6 Assignment of master switch and winch

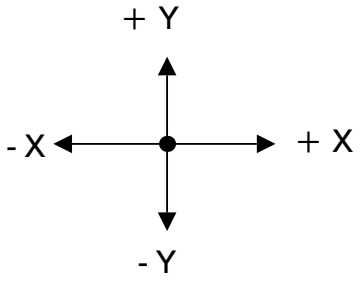
Ex.: **5 : 2 Y**

Actuation direction of master switch

Master switch number

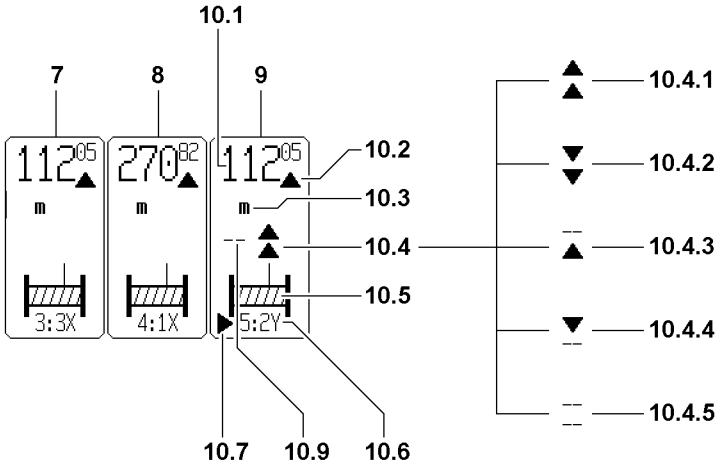
Winch number

5 : - - Due to incorrect setting, an assignment of the master switch and winch is not possible!



10.7 Vibration sensor
If the vibration sensor for a winch is added on the master switch, then the symbol " ▸ " (10.7) for the added vibration sensor appears in this winch symbol element.

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10.9 Reeved in boom

To check the adjustment of the selector switch (73) for winch use at various hoist winches, the symbol for the boom , on which the winch must be reeved, is shown in the symbol element "Winch indicator, winch 1, 2 and 5".

S = Winch reeved on pulley head of S-main boom

W = Winch reeved on pulley head of W- luffing jib

H = Winche reeved on pulley head of boom nose

F = Winch reeved on pulley head of F-jib, at mode SWF

- - = Winch not reeved

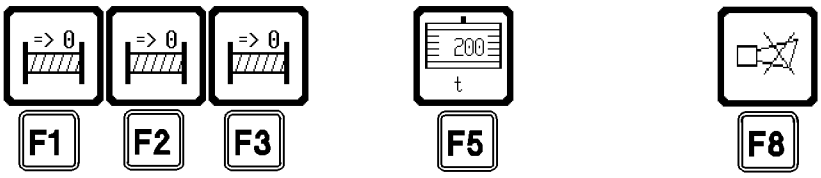
?? = Winches not clearly reeved
(In case of error, incorrect switch positioin of selector switch for winch use)

Note: The LICCON computer system monitors if the set switch position of the selector switch for winch use (73) and the set operating mode match. If the settings are incorrect, an error message is issued.

C A U T I O N : Which hoist winch is reeved on which pulley head is not recognized by the LICCON computer system. The crane operator must make sure that the selector switch (73) for winch use is correctly set.

D A N G E R : If the setting of the selector switch for winch use (73) is incorrect, the individual winches can be overloaded without noticing it. There is a danger of accidents!

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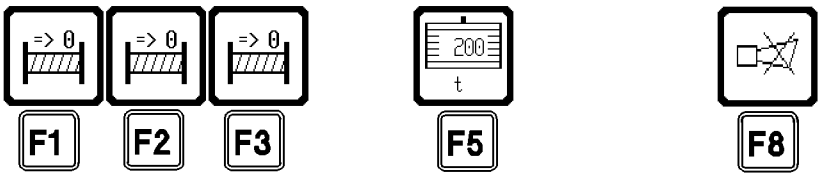
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21.7 Function keybar symbol line

Pos.	Function, function keybar symbol line	Type of indication	is shown
F1	Tare the length indication of winch 3 * **Note:** Tare = Length indication is set to 0^{00}	static	if winch indication for winch 3 is shown
F2	Tare the length indication of winch 4	static	if winch indication for winch 4 is shown
F3	Tare the length indication of winch 5*	static	if winch indication for winch 5 is shown
F4	not used		
F5	* Ballast editing key When pressing the "F5" key, the thick symbol frame changes into a thin symbol frame. A blinking cursor appears in the ballast editing field. The value for the placed ballast can now be entered in the given weight unit [t] or [kips] via the numeric keybar A on monitor 1. The ballast editing can be completed : - by pressing the "ENTER" key = take over value. The entered value now appears as value for the placed ballast ($BA_{aufgelegt}$) in the ballast symbol or - by pressing the "F5" key = brake off editing. The change is dumped. The old value of $BA_{aufgelegt}$ remains in the ballast symbol. **CAUTION: When editing the ballast, the notes in chapter. 4.03 , paragraph 8 must be observed.**	static	in operating modes with suspended ballast / ballast trailer
F5	Ballast input value (BA_{edit}) * = edited ballast value in function key symbol of "F5"	static	for **valid** ballast input value
		blinking (???)	for **invalid** ballast input value
F6-F7	not used		
F8	Symbol element "Horn" - Turn off the acoustical signal "Horn" on monitor 1 by pressing the "F8" key	blinking	if acoustical signal "Horn" sounds on monitor 1 ertönt (see paragraph 21.8)

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21.8 Acoustical warning on monitor 1

"HORN"
For some of the operational errors found on CPU 1, which possibly lead to shut down of a movement, it is important to look at the Operating view on monitor 1. In addition to the optical view, these errors are also reported acoustically via the "HORN".

Note: "HORN" is a sound which lasts approx. 0.5 seconds, and is repeated in one second intervals.

Operational erros with "HORN" on monitor 1 without LEC error are :
- Exceeding of test point 1 - Installation - maximum threshold (only lattice jib)
- Exceeding of test point 1 - Operational maximum threshold
- Falling below test point 1 - Minimum threshold
- Exceeding of maximum derrick angle
- Falling below maximum derrick angle

Additional errors with "HORN" on monitor 1and LEC errors are :
- Derrick ballast input error
- Derrick ballast guy force: Difference between right (A) and left (B) is too large

Note: The sensors (pull test bracket, pressure sensor, angle sensor) which are monitored by the CPU 1 are shown in case of an error via a LEC error on monitor 0. No acoustical signal "HORN" is issued on monitor 1.

"SHORT HORN" on monitor 1
Error without LEC (LICCON Error Code), which do not immediately lead to shut off of crane movement by the LICCON overload safety are also reported by the acoustical signal "SHORT HORN" in addition to the optical indication.

Note: "SHORT HORN" is a sound which lasts approx. 0.1 seconds, and is repeated in two second intervals.

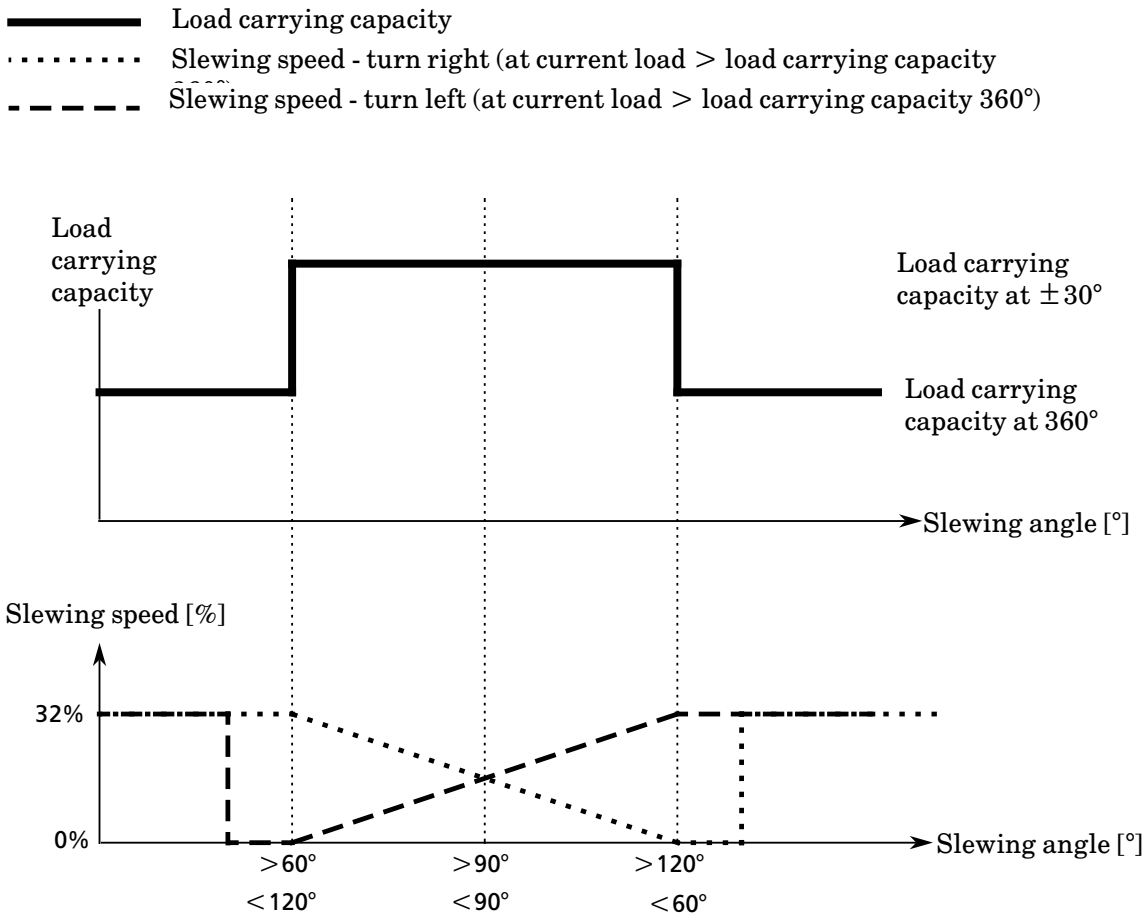
Monitored errors are :
- Prewarning threshold of test point 1 - Operational maximum force is reached ("CAUTION" at 90%)
- Prewarning threshold of test point 1 - Minimum force is reached ("CAUTION" at approx. 15 t over $F1_{min}$)

Priority of acoustical warnings
The alarm "HORN" has a higher priority than the alarm "SHORT HORN".

Turn acoustical warnings off
- "HORN" as well as "SHORT HORN" can be turned off via the function key "F8". If an error occurs again, then the acoustical warning "HORN" or "SHORT HORN" becomes active again.

Note: Errors with LEC are indicated on monitor 0 in operating view, above the "F8" key.

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40. Automatic slewing range change over

40.1 General

There are set up conditions, which have different load carrying capacities for different angle positions of the slewing platform.
There is a stronger load chart for the large support base, in an angle range of ±30° to the side. This load chart for the limited slewing angle range is called the ±30°- load chart. There are also load charts for the remaining angle range (360° load chart).

40.2 Setting the load chart

In the "Set up" program, each load chart can be selected with the function keys or the short code and "ENTER". The selected load chart is shown.

Note: If the 360° chart is selected, then there is no slewing range change over. Only the load shown in the 360° chart can be lifted in the complete 360° slewing range.

If the ±30° chart is selected and confirmed with "F8" (OK), the slewing range change over becomes active.

C A U T I O N : Before selecting the ±30° chart, the ±30° chart and the corresponding 360° chart must be checked to see which load the crane can lift in which slewing range.

If the crane is in the±30° range with selected slewing range change over,then the load carrying capacity in the±30° chart applies, otherwise the load carrying capacity listed in the 360° chart applies.

After changing over from the "Operation" program to the "set up" program, always that chart is shown, which was previously confirmed with "OK".

Note: To be able to check in the "Set up" program, which load can be lifted in the current angle position, the current slewing angle must be read in the "Operation" program and the corresponding load chart (360° or ±30°) must be selected in the "Set up" program.

40.3 Slewing gear control

If the slewing range change over is set and a load is lifted in the ±30° range which is in the **> 360° load chart**, then - depending on the current slewing angle - the maximum slewing speed for "Turning left / right" is calculated, as shown on the illustration on the left, and the slewing movement to the edge of the ±30° range is reduced more and more until the shut off.

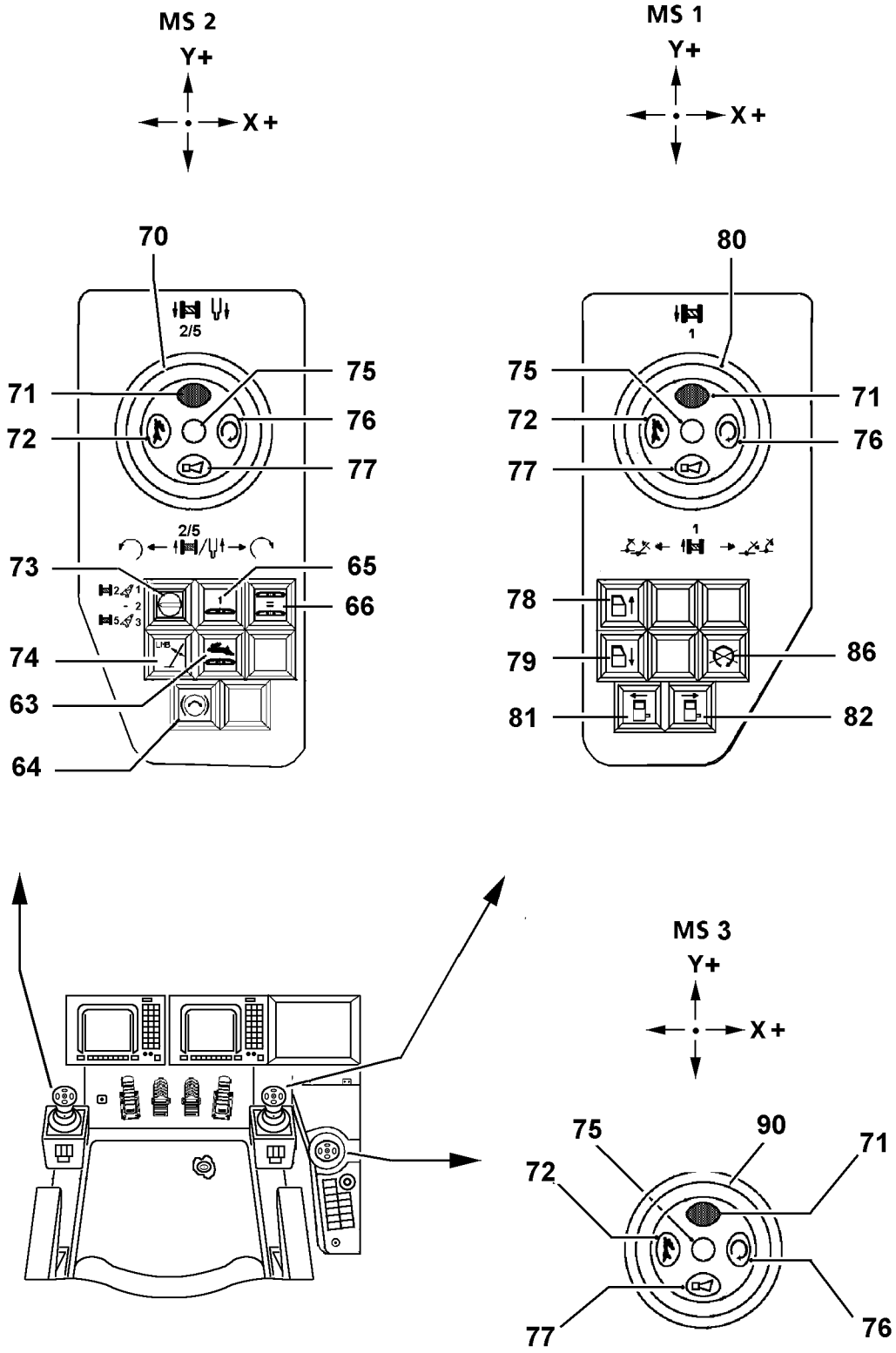
Note: A slewing speed reduced by the LMB can only be lifted after removing the overload in the 360° slewing angle range if the crnae movement "slewing" is not actuated.

40.4 Coasting the slewing gear

At a set slewing range change over and >360° load carrying capacity, coasting the "slewing gear" by pressing the foot button is not possible.

Note: If the slewing range change over is set and the coasting slewing gear is actuated, then the load carrying capacity from the 360° chart is valid.

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1. General crane condition

Before starting up the crane, the operator must ensure that the following conditions are met:
- The crane is horizontally aligned
- The gear on the slewing ring must be clean and greased.
- The air intake for oil coolant and radiator is "clear / unobstructed".
- The side covers are closed and locked.
- There are no persons or objects within the danger zone of the crane.
- The cable and rope drums as well as the limit switches are free of ice and snow.
- There are no loose parts on the slewing platform and the boom.

D A N G E R : Before the boom is erected, the operator must ensure that there are no loose parts on the boom, such as pins, spring retainers or ice. If this is not observed, there is a DANGER OF ACCIDENTS due to falling items.

2. Crane operator's cab adjustment

From transport to operating position

The cab is swung in front of the slewing platform during transport.
Press button (81) and swing out the cab into operating position.
Press button (78,79) and incline the cab to the desired operating position.

From operating position to transport position

Press button (78,79) and move the cab into horizontal position.
Press button (82) and swing the cab all the way in.

D A N G E R: Make sure that no one remains in the swing range. There is a danger of crushing!

3. Checks before start up

Before start up, the following checks must be made :

Note: For detailed description of the below listed check, see chapter 7.05, "MAINTENANCE GUIDELINES"

Check the oil level and filters
- Check the oil level on the crane engine
- Check the oil level on the hydraulic tank for crane hydraulic
- Check the filter on the hydraulic tank

Fuel level

On the LICCON monitor, the tank contents is given in percentages [%] in numerical form.

C A U T I O N : Do not wait until the fuel tank is empty before refueling, otherwise the fuel system must be cleaned and bled.

Coolant level

The coolant reservoir must be filled until the coolant runs over on the filler neck.

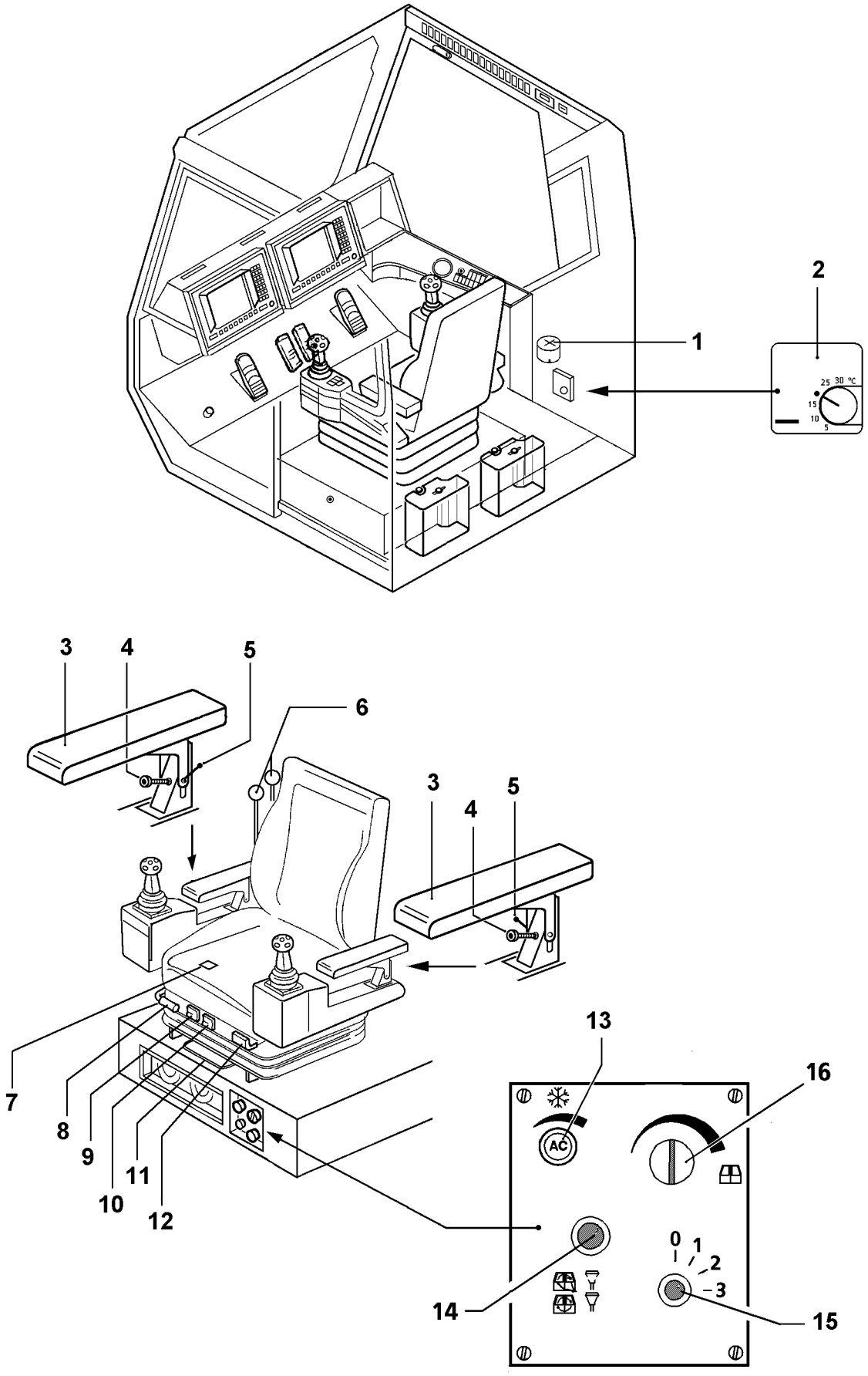
D A N G E R : Check and add coolant only when the engine is cold There is a DANGER OF SERIOUS SKIN BURNS AND SCALDING!!

Central lubrication system

It must be assured that the grease container is always filled with grease, according to the lubrication chart.

Note: See also chapter 7.05 "MAINTENANCE GUIDELINES, CRANE SUPERSTRUCTURE"

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4. Crane operator's cab

4.1 Adjust the seat

The suspended crane operator's seat can be adjusted to any body size.

- Adjustment of arm rest incline (5)
- Adjustment of seat surface incline (8)
- Adjustment of backrest incline (12)
- Release for horizontal seat adjustment (11)
- Adjustment of back support in the upper area of the backrest (10)
- Adjustment of back support in the lower area of the backrest (9)

4.2 Heater / ventilation

The crane operator's cab can be heated or ventilated, depending on the desired temperature.
The control elements for the heater / ventilation are below the crane operator's seat .
For detailed description, refer to chapter 6.01, HEATER .

Heat

- Switch change over switch (14) to air circulation.
- Turn on the blower with the knob (15) .
- Regulate the temperature with the knob (16) .

Ventilation

- Switch change over switch (14) to fresh air.
- Turn on the blower with the knob (15) .

4.3 Seat heater *

- The crane operator's cab can heated by turning on the switch (36) .

4.4 Adjust the crane operator's cab

The crane operator's cab can be "tilted upward" hydraulically by approx. 15° to increase the field of visibility for the operator.

D A N G E R : When the crane operator's cab is tilted, nobody may step on the step in front or next to the cab! This is strictly prohibited!
After completion of crane operation, the cab must be returned to horizontal position, otherwise the operator cannot leave the cab safely.

Tilt the crane operator's cab "upward"

- Press the button (78) and hold it until the desired field of visibility is reached.

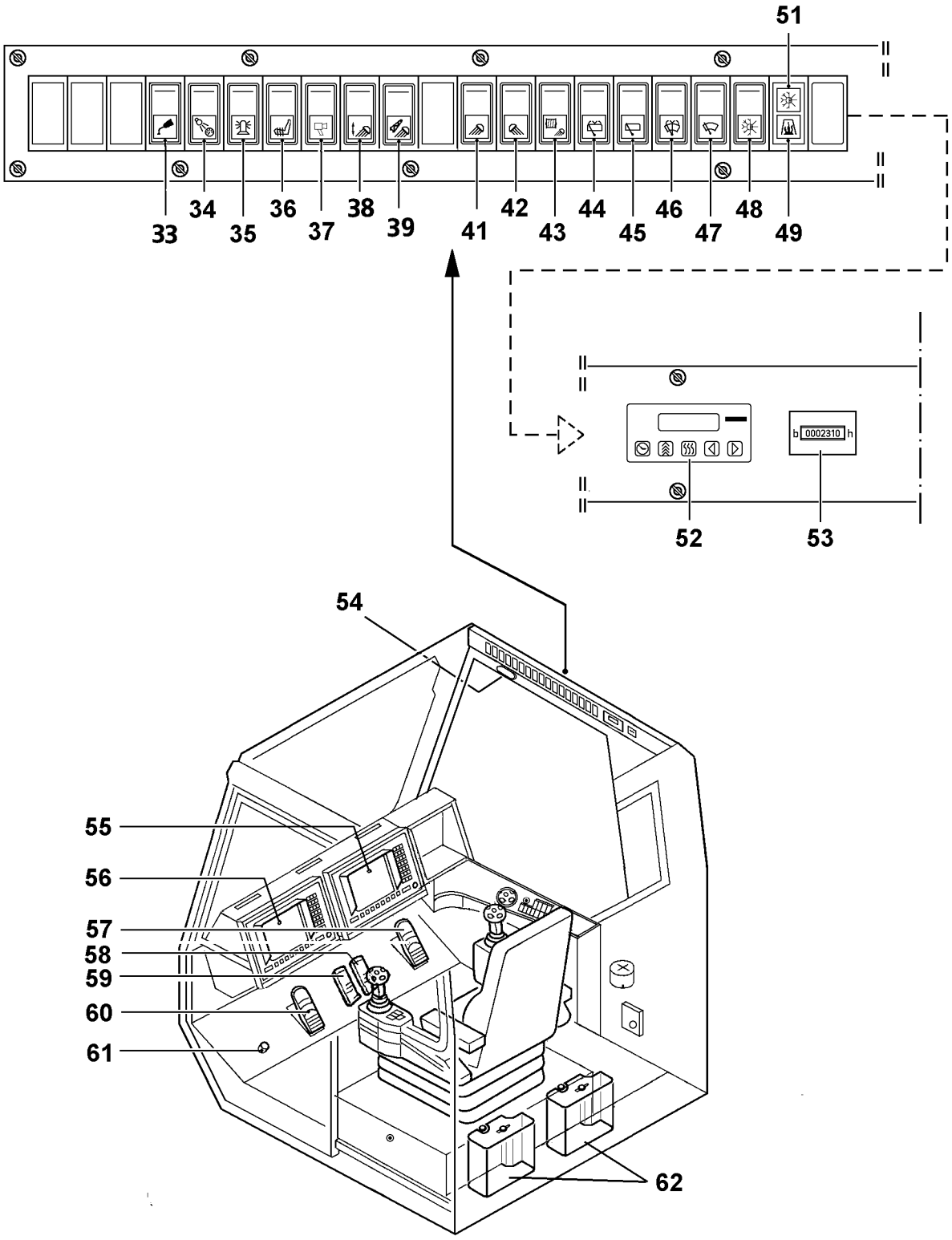
C A U T I O N : When the crane operator's cab is tilted and the cab door is opened, it will run back quickly at an increased speed due to its own weight. For that reason, hold the door by the handle and open it slowly.

Set the crane operator's cab to horizontal position

- Press the button (79) and hold it until the horizontal position is reached.

*customers request

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4.5 Windshield wiper / windshield washer system

4.5.1 Windshield wiper

The windshield wipers on the front window as well as on the roof window can be actuated with the 2 stage switch
(1. Stage - Intermittent, 2. Stage - wipe).
- Windshield wiper on front window - switch (47)
- Windshield wiper on roof window - s witch (45).

4.5.2 Windshield wiper / windshield washer system

The windshield wipers on the front window as well as on the roof window can be enhanced with a windshield washer system .

Note: Before begin of the cold season, the reservoir for the windshield cleaning fluid must be filled with commercially available antifreeze fluid.

- Windshield wiper / washer on front window - button (46)
- Windshield wiper / washer on roof window - button (44).

4.6 Front window

The front window can be opened by simply pushing against it from the inside, a pair of nitrogen cylinders aids in the hoist movement.
If the window is to be opened only partially, then it can be held at any angle by holding it with the installed perforated belt.

D A N G E R : Be careful with your hands when closing the front window to prevent injury .

4.7 Horn

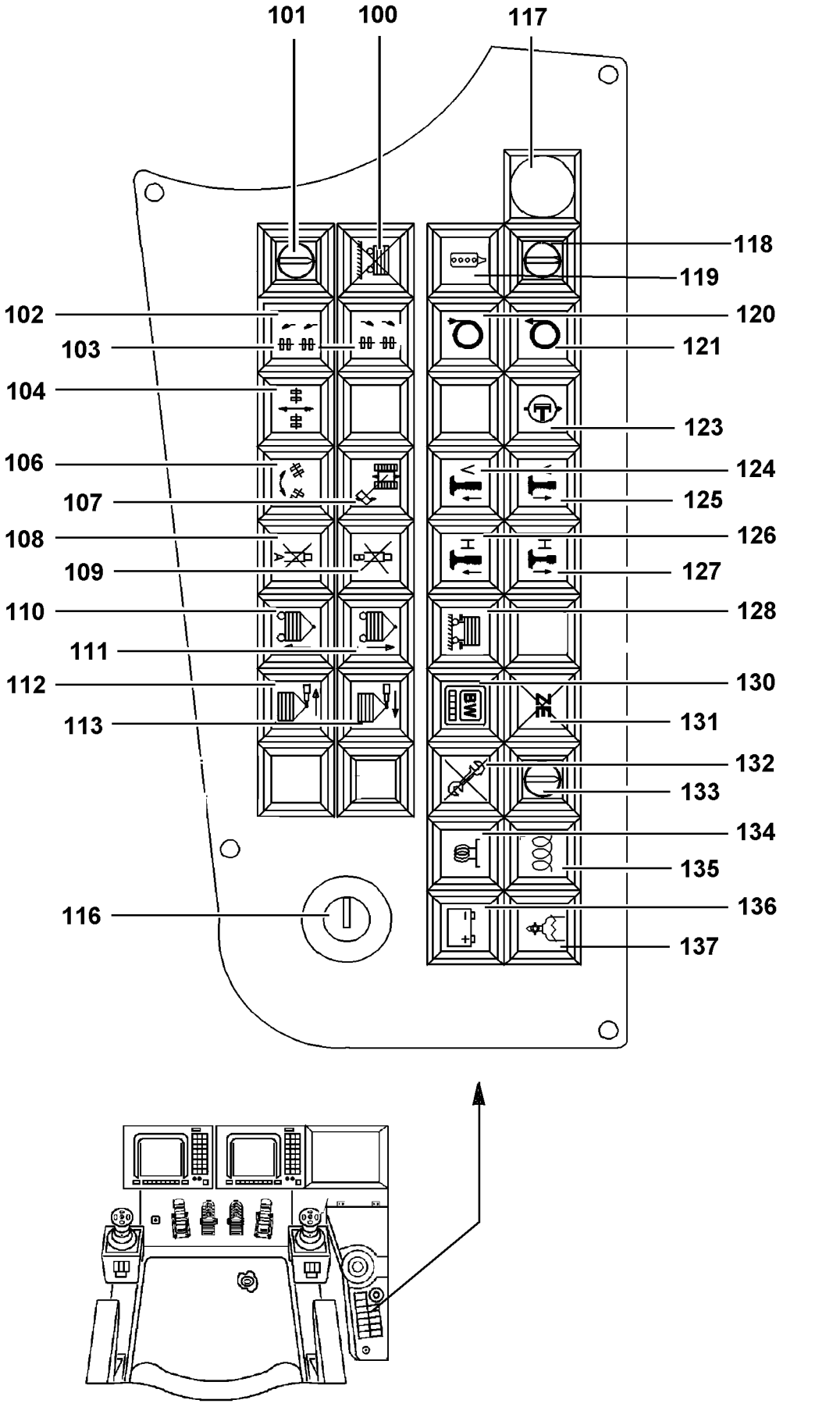
Before starting to work, check the horn for proper function .

D A N G E R: The horn may only be used in danger situations, to retain its warning effectiveness!

4.8 Turn the lights on / off

34	Switch	Instrument panel illumination
35	Switch	Airplane warning light
41	Switch	Working floodlight, on cab base
42	Switch	Working floodlight , front and rear of cab roof
43	Switch	Working floodlight for hoist winch and mirror heater

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5. Start and turn the crane engine off

5.1 Start the crane engine

- Turn the ignition starter switch (116) to position "1" .
  The indicator light (134) blinks, the engine is ready to start .
- Turn the ignition starter switch to position "2" and start the engine.

C A U T I O N : The engine may only be started if :
- the charge indicator light (136) lights up.
- the indicator light for the flame start system (134) blinks.

If the engine does not start after max. 10 seconds, wait for 1 minute.
Do not crank the starter more than 3 times per starting procedure, with a one minute break between each attempt .

If the engine starts but stops again after 4 seconds, then there is a sensor defect in the engine control.
To prevent the engine from "turning off", turn the ignition starter switch to position "0" . Then prglow the engine for **approx. 10 seconds** , then start. The engine control now runs with default values. Howerver, the error message must be observed.

5.1.1 Start the crane engine with the flame start system

The engine is equipped with a flame start system to improve the col start procedure and the warm up phase. It automatically turns on at a coolant temperature of ≤20° C.
The flame start system does not turn on at a coolant temperature above 20° C .

- Turn the ignition starter switch (116) to position "1" drehen.
  The indicator light (134) lights up and starts to blink.
  the engine is ready to start.
- Turn the ignition starter switch to position"2" and start the engine.

The flame start system turns off automatically if :
- the engine is not started during the starting readiness period,
- the engine is started while the indicator light (134) lights up,
- the coolant temperature reaches 25° C with the engine running.

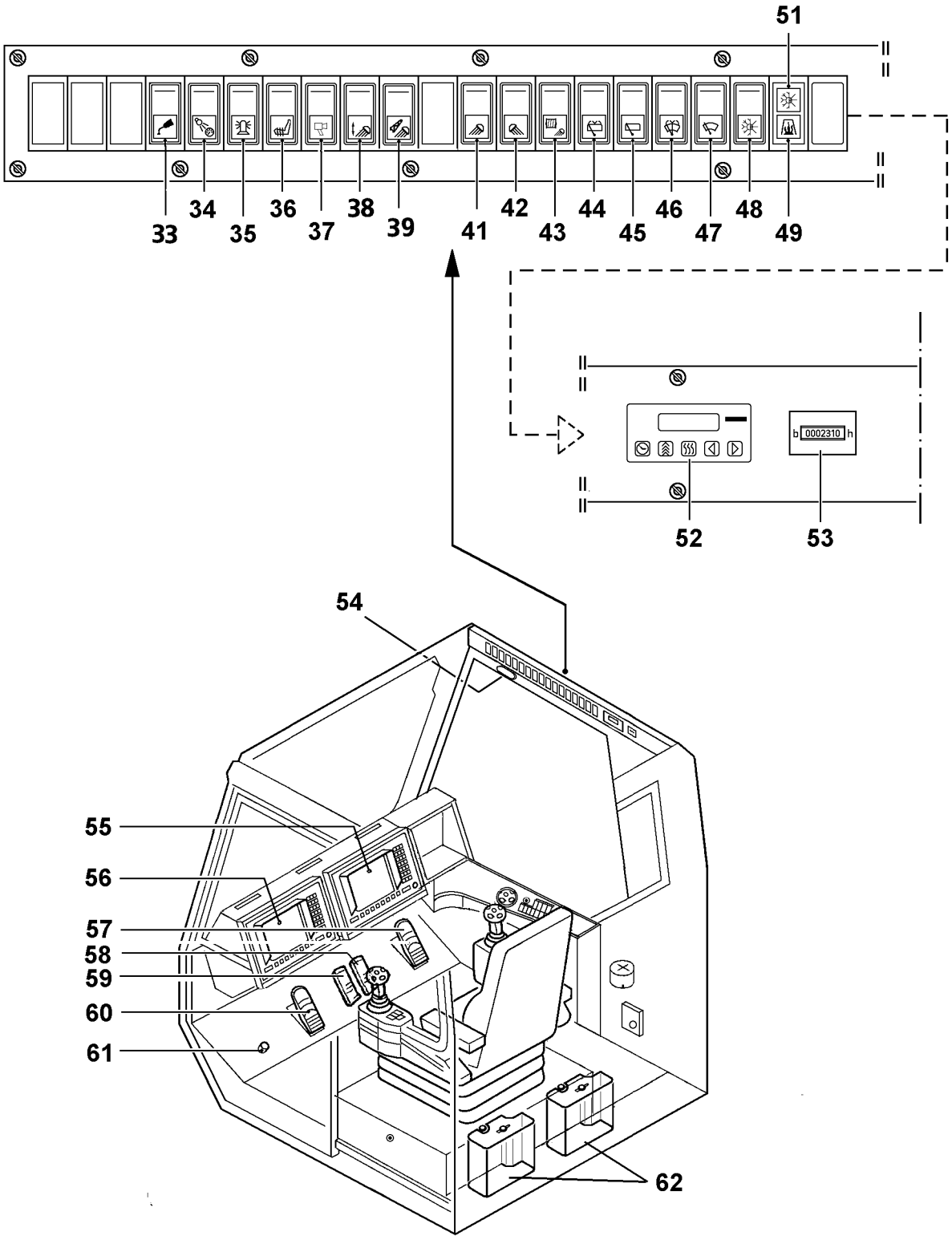
Error recognition

The flame start control unit recognizes errors on the flame start system and shows that there is an error by **rapidly** blinking the indicator light (134) .

Recognized errors are :
- interruption of flame glow plug heater coils.
- missing power supply on terminal 30.
- Defective fuse for flame start control unit.

Note: Pay special attention to the batteries during the cold season.
The starting capacity is greatly reduced in cold temperatures; for example, at -10°C it is only 66% of its normal capacity. For that reason, after the engine is turned off, the batteries should be stored in a heated room.

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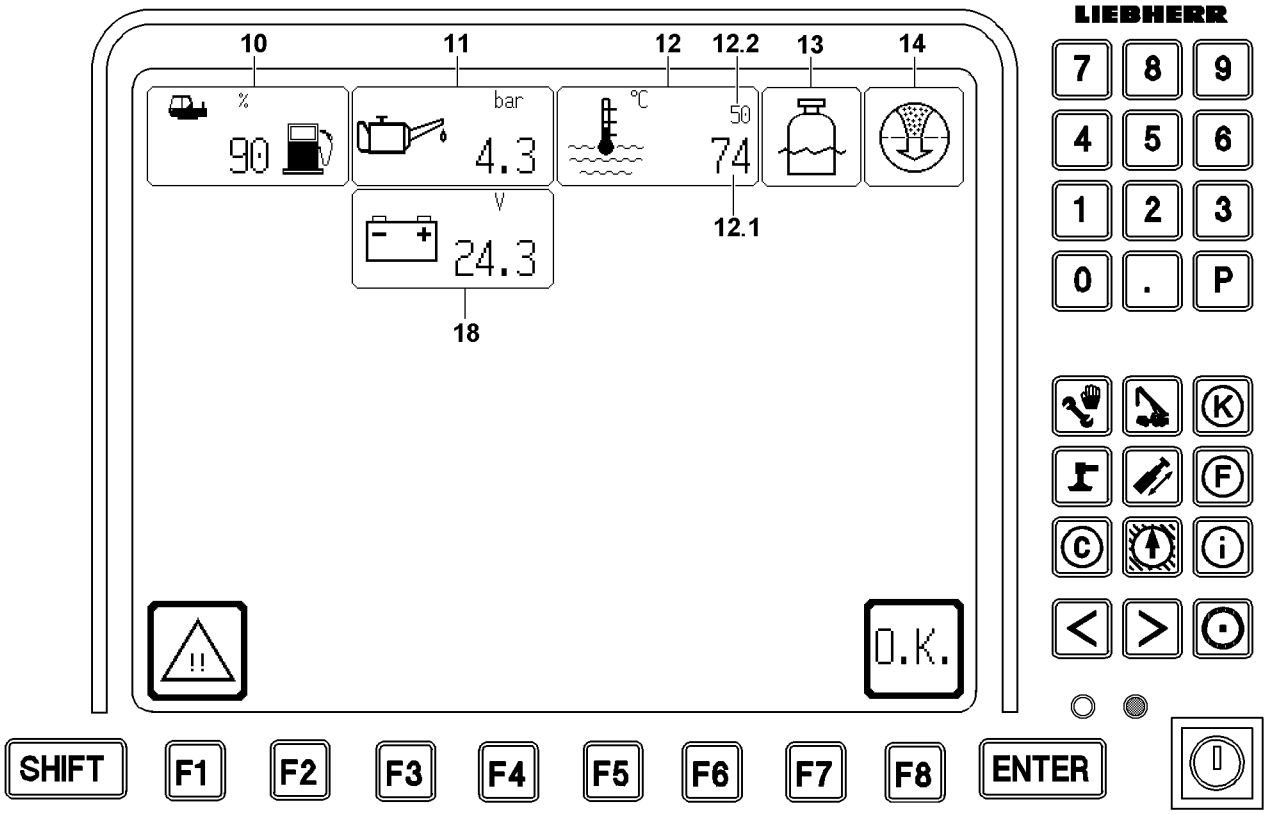
5.1.2 Engine preheating with timer

Note: See separately issued WEBASTO operating manual, Operation with timer *.

- Turn on the battery master switch .
- Depending on the ambient temperature, turn the auxiliary heater on with the timer (52) up to approx. 75 minutes before starting the engine, the indicator light (49) lights up.
- 10 to 25 seconds after turning it on (prerun), the auxiliary heater starts , the auxiliary heater runs in automatic regulation.

Turn the auxiliary heater off after completion of the preheat time
- Turn the auxiliary heater off on the timer (52) .
  The auxiliary heater continues to run for up to 150 seconds.

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5.2 Check the instruments after the start

5.2.1 The engine is running

As soon as a stable voltage is available, the electric crane control and the LICCON Computer system turns on automatically. The micro processor system runs through a self test; after a few seconds, the equipment configuration view appears on the monitor (see chapter 4.02) .

Note: If no prewarning or STOP occurence of the engine monitoring system is present, then the system does not switch to the engine monitoring view, but directly into the equipment configuration view.

5.2.2 Check the instruments

Note: To check the instrument, switch into the engine monitoring view by pressing key combination "SHIFT" + "Po" .

When the engine is running, the battery charge indicator light (136) must run off:
The number indicator for engine oil pressure in symbol element "Engine oil pressure" (11) on the LICCON Monitor may not blink.

The following symbol elements on the **monitor** must be checked when the crane engine is running:
- Tank contents (10)
- Coolant temperature (12)
- Coolant level (13)
- Air filter (14)
- Battery voltage (16)

C A U T I O N : If the number indicator for engine oil pressure in the symbol element "Engine oil pressure" still blinks after approx. 10 seconds, or if the indicator starts to blink during crane operation, then the engine oil pressure is too low. Turn the engine off immediately and find the cause! If this is not observed, the engine can be damaged due to insufficient oil pressure.

If the number indicator for the coolant temperatures in the symbol element "coolant temperature" blinks during operation, then it is too high. Turn the engine off immediately, increased coolant temperature can damage the engine .

Do not put a full engine load on the engine until it is at operating temperature!

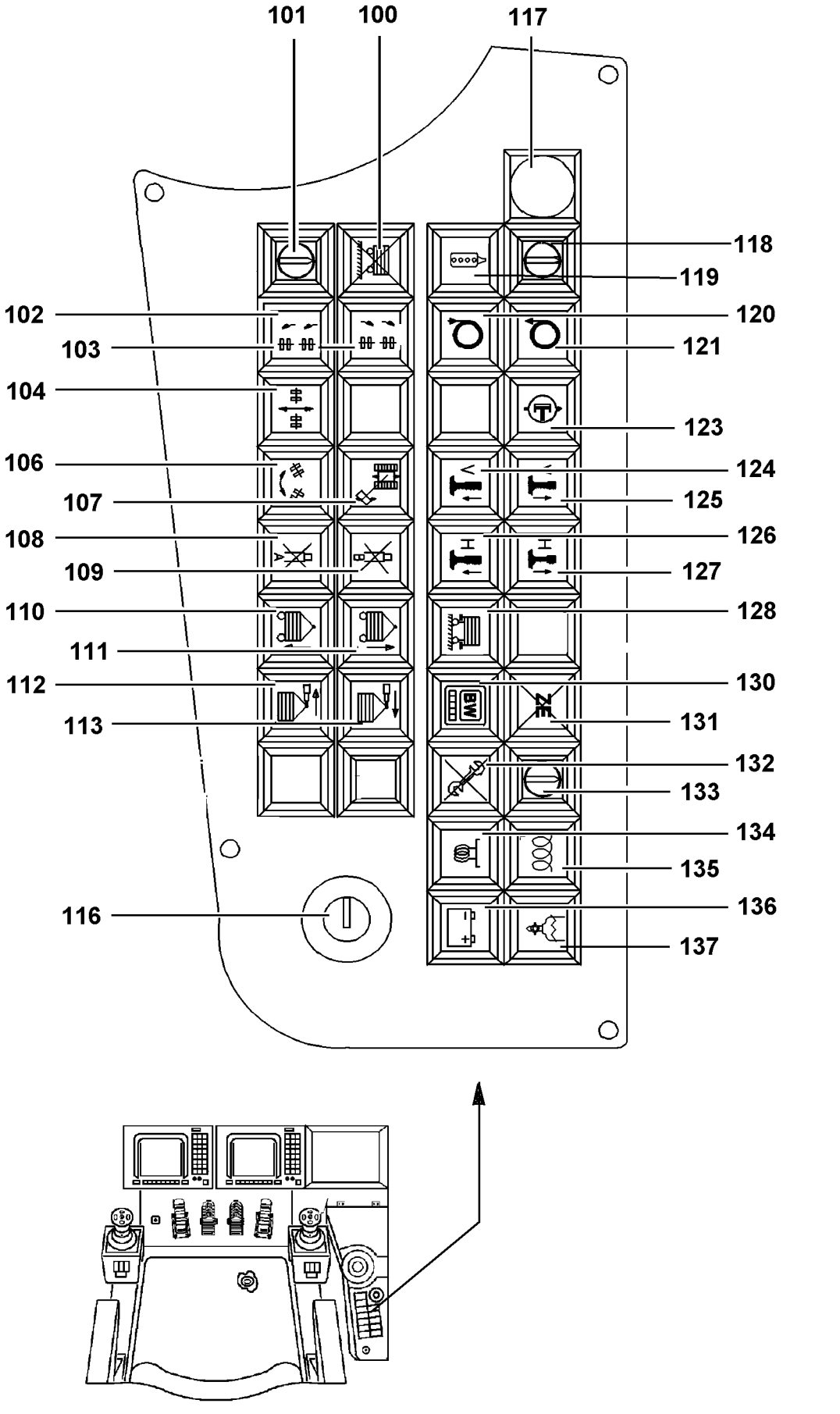
5.3 Engine monitoring

5.3.1 General

Start the program
on request:
- with key combination "SHIFT"+"P"

automatic:
- if a STOP occurrence happens
  or
- if a prewarning, warning or STOP occurrence happens during the boot up phase of the LICCON computer system

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5.4 Turn the crane engine off

- Turn the ignition starter switch (116) back to the stop,
- pull the ignition starter switch (116) and store it.

Note: After operation with full engine power or in case of increased coolant temperature over 95°C, let the engine run for 1-2 minutes without load in low idle speed.

5.5 Turn the engine off in case of danger

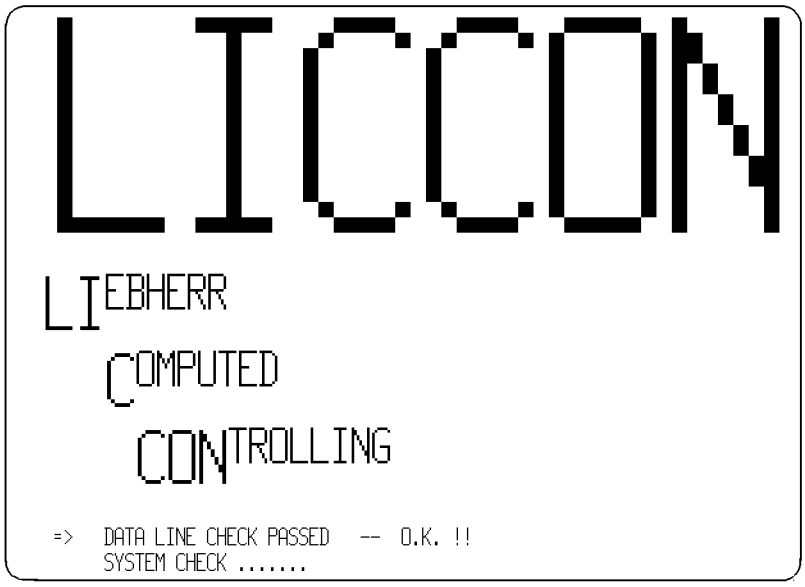
In case of danger, turn the engine off by pressing the EMERGENCY "OFF" button (117) .

- Push the button (117), the crane is turned off immediately.

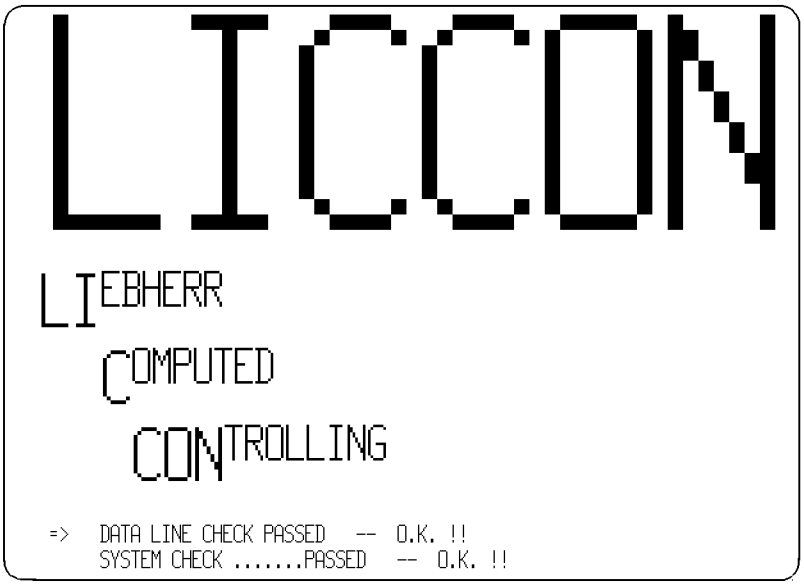
C A U T I O N : The emergency "OFF" button (117) may only be used in true emergency situations. The emergency OFF button may not be used to turn the engine off during normal operation, this is strictly prohibited!

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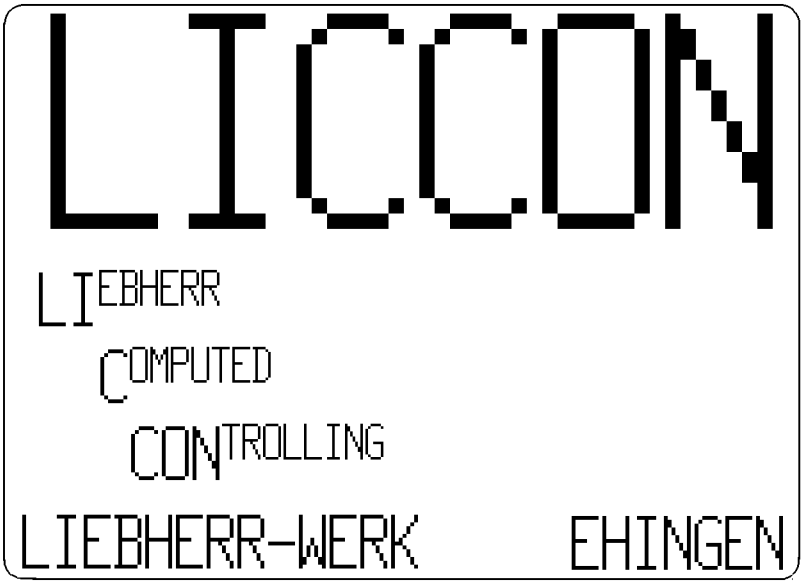
1



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3



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6. LICCON computer system after engine start

6.1 Boot up phase

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

Note: See chapter 4.02, LICCON COMPUTER SYSTEM.

If the starting procedure is completed successfully, then the view to preselect the operating mode (operating mode preselection view, see next page) appears for a short time on the **Monitor** .

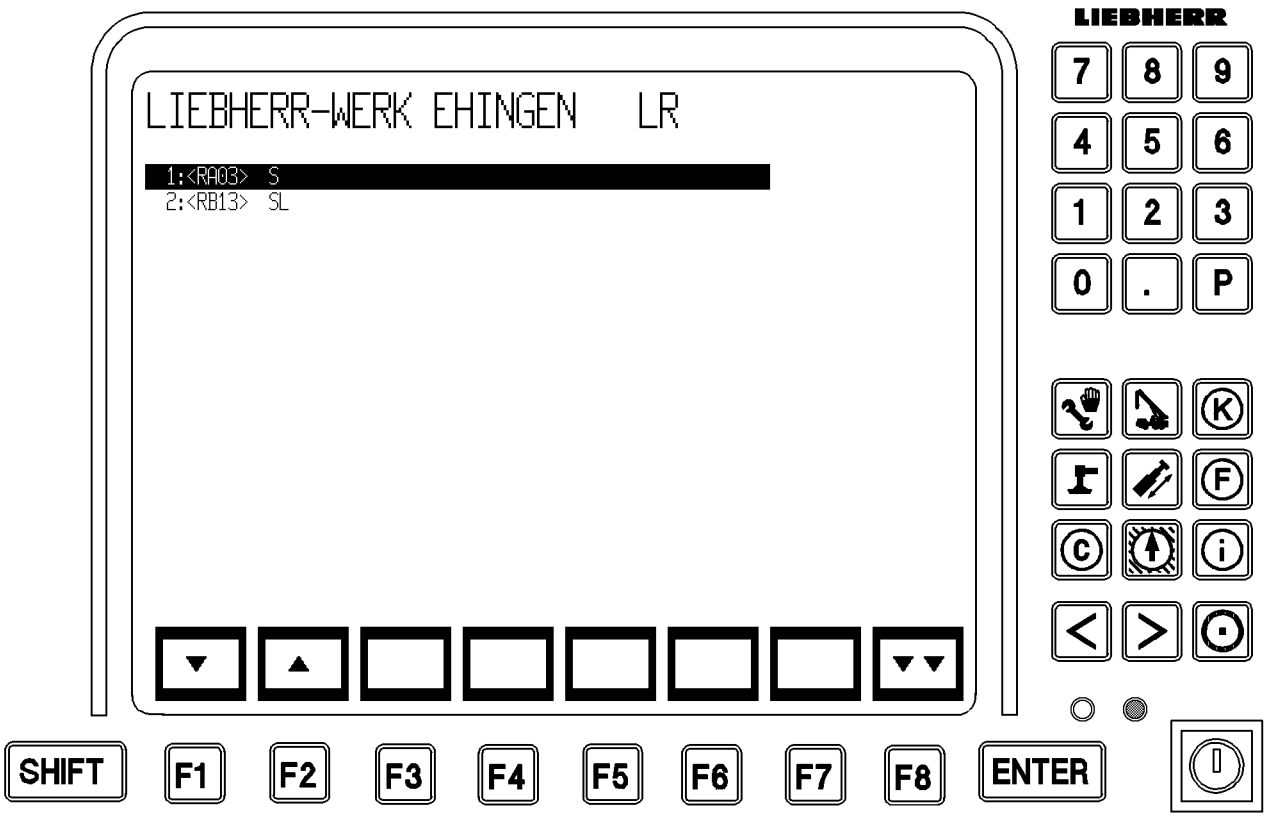
Note: In normal cases, the operating mode preselection group is set on the operating mode preselection view which had been chosen before the LICCON computer system had been turned off. Only if there was a loss of data in the memory, for example due to a cold boot (change of battery or CPU, etc.) then the first operating mode preselection group is placed.

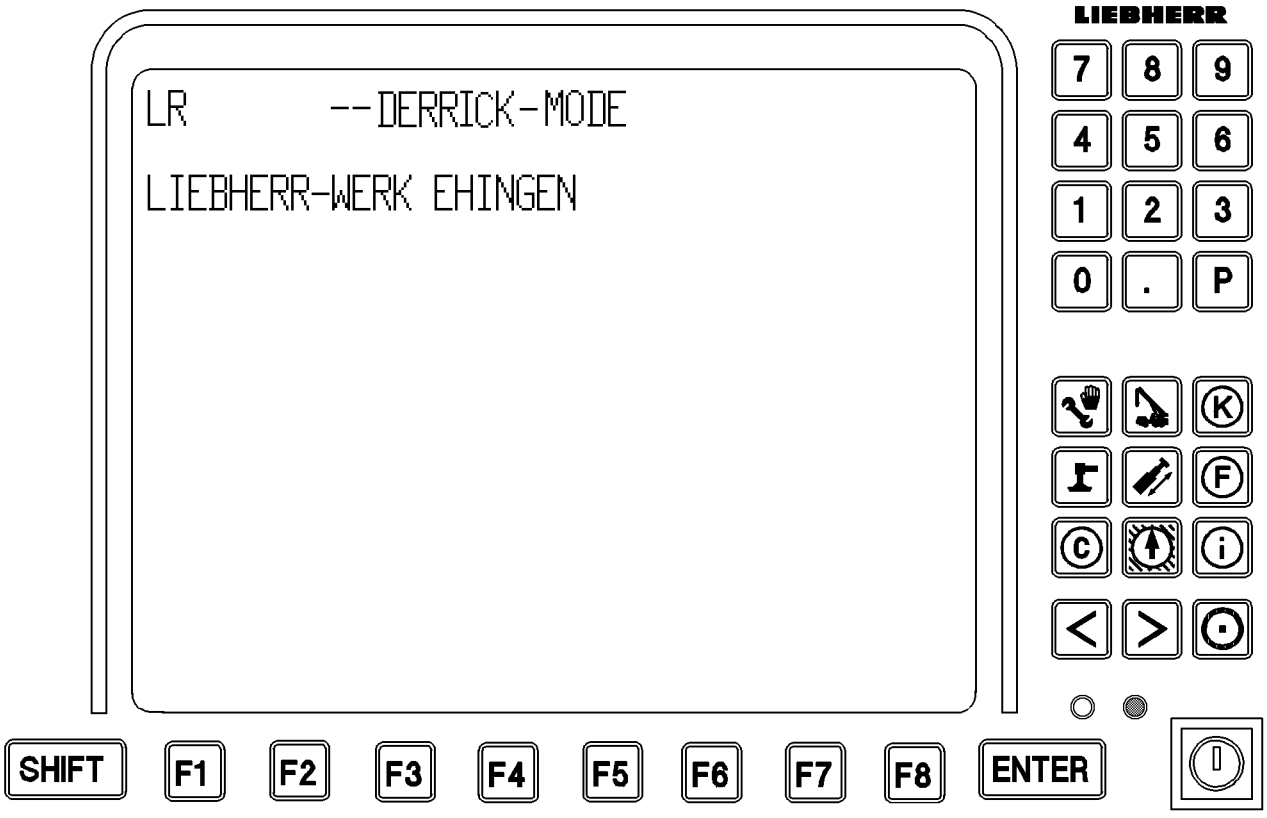
- Select the desired operating mode preselection group with the function key "F1" (move cursor down) or "F2" (move cursor up) .
- With "F8" or "ENTER", confirm the preselection .
  The equipment configuration view appears .

Note: If no operating mode preselection group is selected within 3 seconds, the previous operating mode preselection group remains, and the equipment configuration view is shown without having to enter anything. This means, if the previous operating mode preselection group is to remain, no entry is necessary.

Note: If during the boot up phase of the computer system a master switch (manual control lever) is moved from the zero position, then the boot up phase is interrupted.

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6.2 Set the operating condition with the crane engine at a standstill

Initial condition :
Crane engine is off

6.2.1 Start the crane engine

- Turn the ignition starter switch to stage 2.

Note: After turning it on, the LICCON computer system runs through a self test. If the starting procedure is completed successfully, then the view to preselect the operating mode (operating mode preselection view) appears for a short time on the **Monitor** . (For detailed description of the boot up function, see paragraph 6.1)

6.2.2 Make the operating mode preselection

- Select the desired operating mode preselection group with the function key "F1" (move cursor down) or "F2" (move cursor up) , which corresponds to the actual crane set up.

- With "F8" or "ENTER", confirm the preselection .
The equipment configuration view appears with the selected operating mode preselection group.

Note: If an equipment configuration from the same operating mode preselection group had been set before the LICCON was turned off, then this equipment configuration view appears again, i.e. the previous equipment configuration and the previous reeving will be automatically reset.

6.2.3 Set the operating mode and the equipment configuration

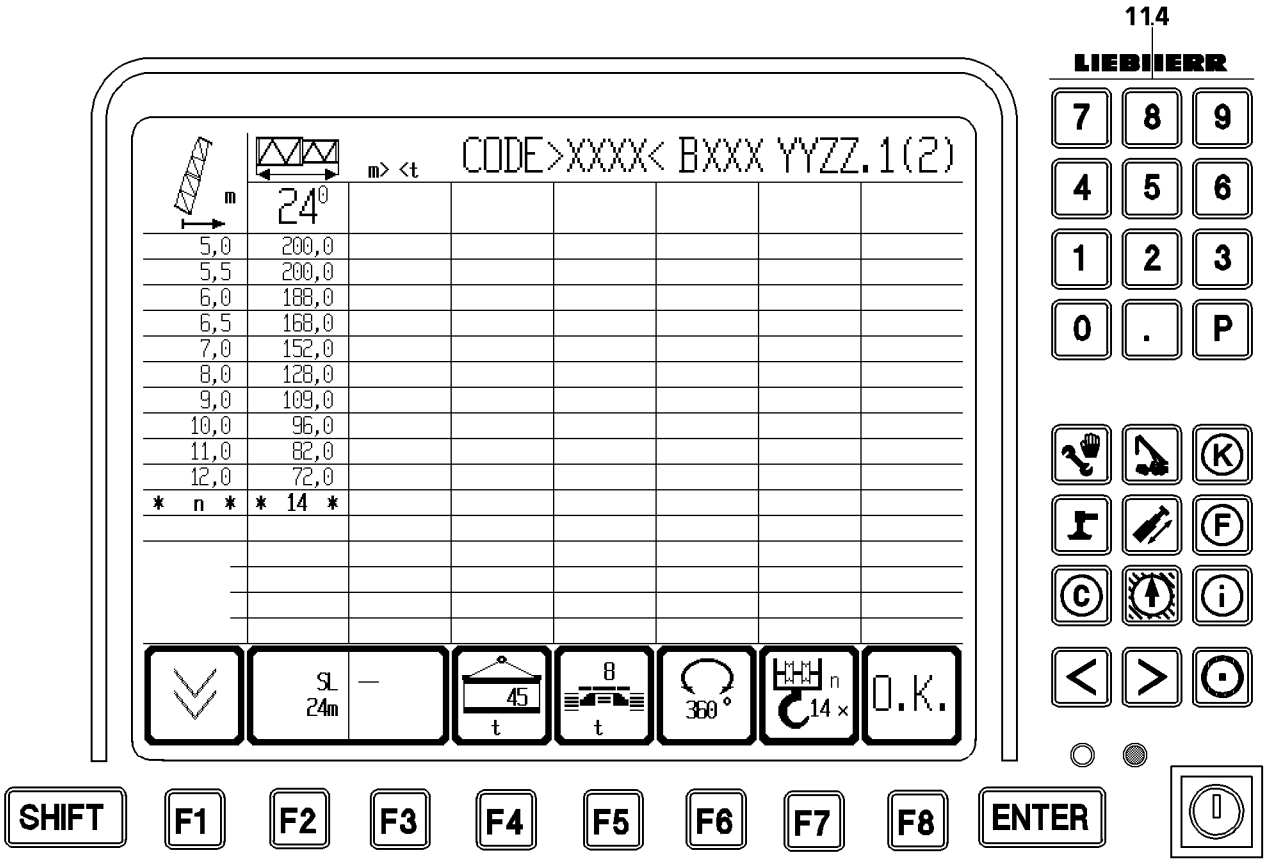
If the previously set and shown operating mode or the previous equipment configuration is to be changed, it can be done two ways:

1. with function keys:
   "F2" Adjust operating mode main geometry condition
   "F3" Adjust operating for selected mode equipment condition,
   "F4" Adjust equipment configuration slewing platform counterweight
   "F5" Adjust equipment configuration undercarriage (crawler,/supports, central ballast)
   "F6" Adjust slewing range of slewing platform
   - Confirm settings by pressing the "ENTER" key

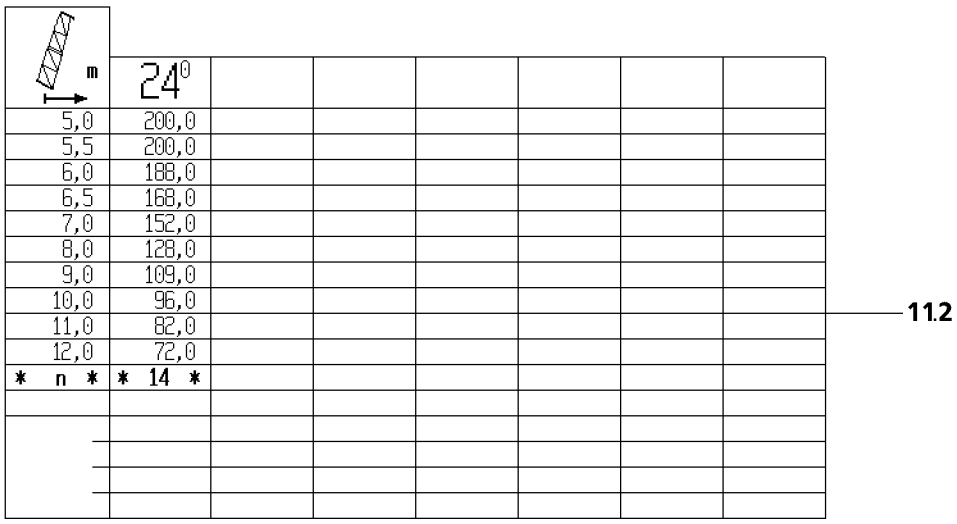
2. with short code:
   - Enter the 4 digit short code with numberic keys on monitor 0.
   - Confirm settings by pressing the "Enter" key.

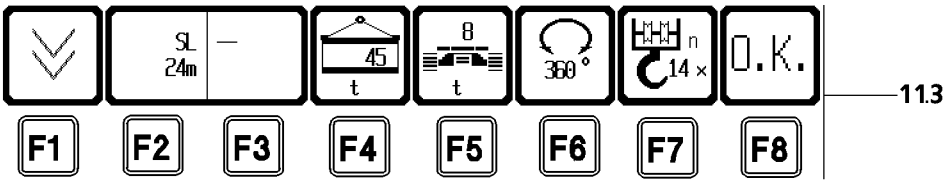
- Check the selected load capacity chart.
- Check the adjusted reeving,

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6.2.4 Set the hoist cable reeving number

"F7" Push the function key "F7" until the current reeving on the current pulley head is set.

6.2.5 Take over setting and check

- Push the function key "F8" (OK), if the set equipment configuration and the reeving have been checked.
  The "SET UP" program is completed and the adjusted parameters are taken over into the re-started "OPERATION" program.
- Check that the short code and the reeving that has been set in the operating view as intended by the crane operator.

Note: For detailed description of the **"SET UP" program, see chapter 4.02, LICCON COMPUTER SYSTEM.**

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6.3 Set the new operating condition, when the engine is running

Initial condition:
The crane engine is running.
The LICCON computer system is in the Operating View.
The new operating conditions is part of the selected operating mode preselection group, but the operating mode, equipment configuration or reeving must be changed.

Note: If the new operating condition is part of another operating mode preselection group, then the engine must be turned off for selection, and the LICCON computer system must be rebooted.

6.3.1 Change the operating mode and the equipment configuration

- Press the program key "P0" to start the "Set up" program .
- Set the operating mode and equipment configuration with function keys or with short code.
- Press the "ENTER" key.
  Then the data in the selected load capacity chart can be viewed.
- Check the selected load capacity chart.

6.3.2 Change the reeving

- Set the reeving number of the hoist cable by pressing the function key "F7" until the desired reeving is selected.

6.3.3 Take over the setting and check

- Push the function key "F8" ="O.K.", when the selected equipment configuration and the reeving has been checked.
  The "Set up" program is completed and the selected parameters are taken over into the restarted "OPERATION" program.
- Check that the correct short code and the correct reeving has been set in the Operation view.

Note: For detailed description of the **"Set up" program, see chapter 4.02, LICCON Computer system.**

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6.4 Set the previous operating condition, the engine is not running

Initial condition :
The crane engine is not running.

6.4.1 Start the crane engine
- Turn the ignition starter switch to stage 2.

Note: After turning it on, the LICCON computer system runs through a self test. When the starting procedure has been completed successfully, then the operating mode preselection view appears for a short time on the **monitor**. The last used equipment configuration and the last used reeving are selected. (For detailed description of the boot procedure, see paragraph 4.1)

6.4.2 Make operating mode preselection
- Check the selected operating mode preselection group.

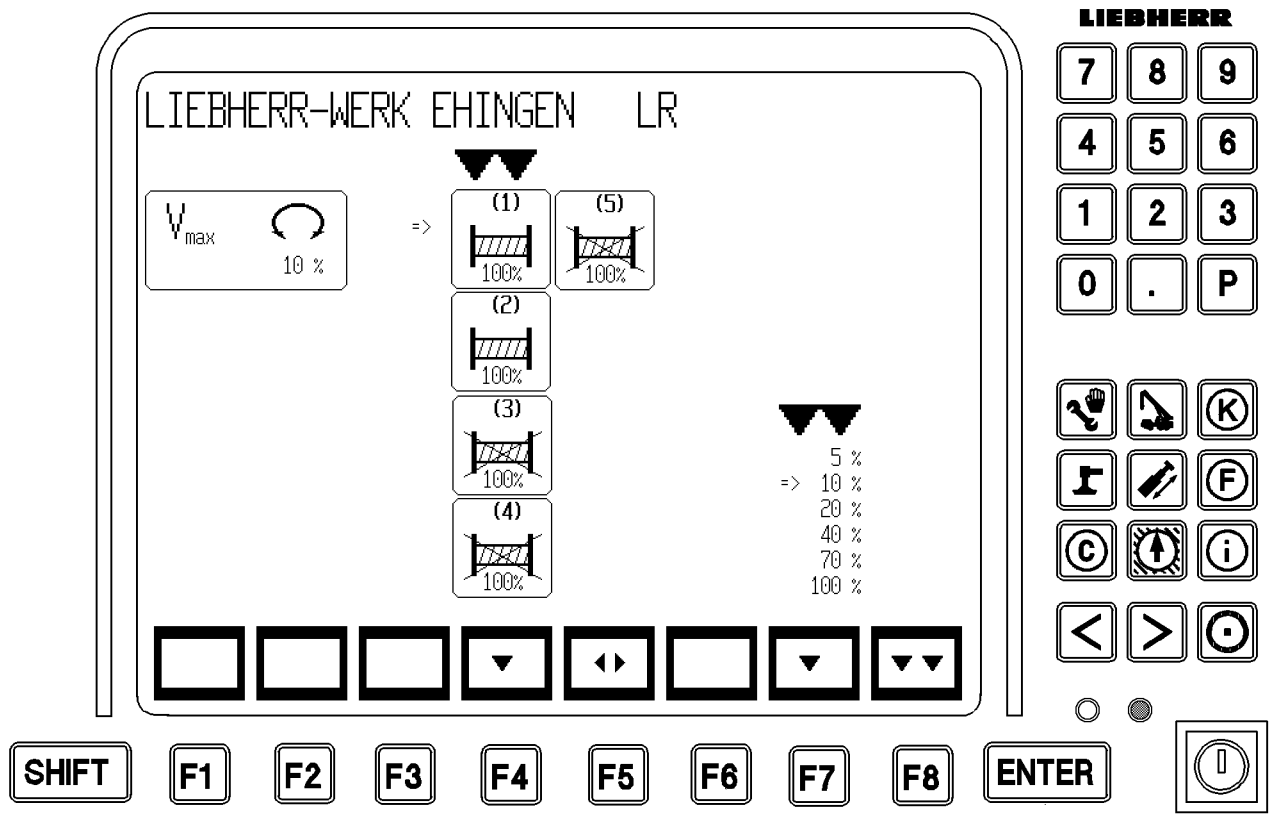
Note: If not operating mode preselection group is selected within 3 seconds, then the previous operating mode preselection group remains, and the equipment configuration view is shown without entry.

6.4.3 Set the operating mode and the equipment configuration view
- Check the selected load capacity chart.
- Check the adjusted reeving,

6.3.4 Take over the setting and check
- Push the function key "F8" ="O.K.".
  The "Set up" program is completed and the selected parameters are taken over into the restarted "OPERATION" program.
- Check that the correct short code and the correct reeving has been set in the Operation view.

Note: For detailed description of the **"Set up" program, see chapter 4.02, LICCON Computer system.**

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7. Set the control parameters

The crane operater must:
- preselect and check the maximum slewing speed of the slewing gear
- preselect and check the maximum slewing speed of the winches
- as well as to activate or deactivate the individual winches.

Note: During the "Control-Parameter" program, the installation and bypass switches are monitored. If one of these switches is actuated during the program, then the system shifts back immediately into the "Operation" program.

Symbol elements
1) Header line, crane type
2) Selector to select the symbol elements
3) Symbol element max. slewing speed
4) Symbol element group, cable winches
6) Value field with selector

Function keys
"F4" Select the winches
"F5" deactivate or activate the cable winches
"F7" Select the percentage values of the corresponding speed
"F8" Shift back to the Operation program

"ENTER" Take over the selected speed setting

Special function keys
" < "," > " Move selector to the left or right

D A N G E R : **The maximum slewing speeds (according to load capacity charts) which depend on the boom length and the operating mode, may NOT be exceeded during crane operation with a load !**

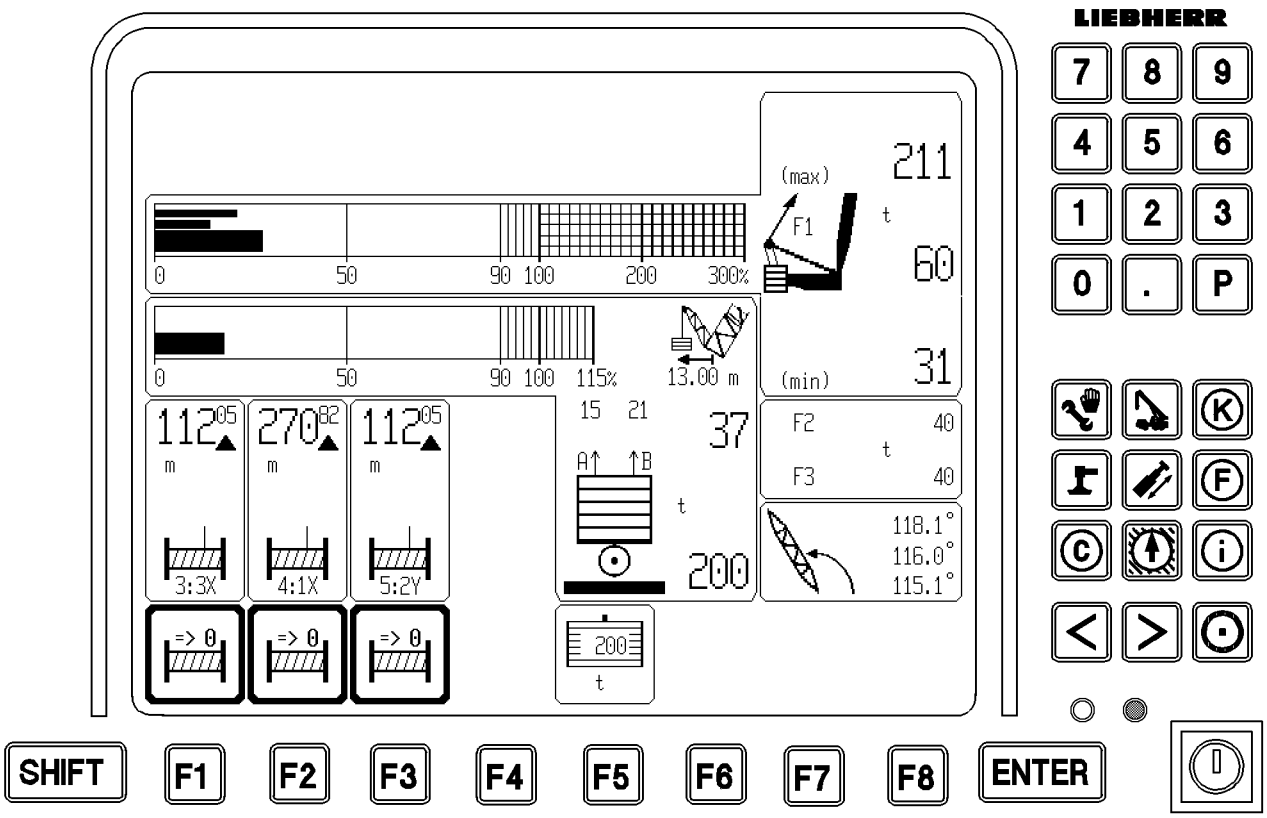
The larger the boom length, the heavier the attachment and the larger the load the smaller the adjusted "maximum slewing speed" must be.

With maximum load, the manual control lever for the slewing gear may not be deflected all the way to the stop.

A change of the maximum speeds as well as activation / deactivation of winches may not be made while a crane movement is carried out.

Note: For a detailed description to set the control parameters, **see chapter 4.02, LICCON COMPUTER SYSTEM.**

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8. Setting the derrickballast

When operating the crane with derrickballast, the current size of the derrick ballast **must** always be set. The corresponding weight of the emptz ballast palette (or the empty ballast trailer) and the weight of the derrick ballast plates .

Control:

- **Press the F5 key** → on symbol above F5, the thick symbol frame is exchanged against the thin symbol frame and a blinking cursor appears in the ballast editing field.

- **Enter the value for the placed ballast** with the numberic keys on the monitor in the given weight unit ([t] or [kips])

- **Press "ENTER" = to take over the value** → The entered value now appears as the value for the placed ballast (=BA_AUF) in the ballast symbol

(**Press the F5 key = to discontinue editing** → The change is dumped. The old value of the placed ballast (BA_AUF) remains in the ballast symbol .)

D A N G E R: **During ballast editing, the remaining indications on the monitor cannot be shown. The operating view on the monitor is frozen and can therefore show incorrect data.**
For that reason, complete the ballast editing function quickly.
(If a manual control lever is actuated during ballast editing, then ballast editing is automatically interrupted. The old value of the placed ballast (BA_AUF) remains in the ballast symbol).

The set derrick ballast value must match the actually installed derrick ballast weight.

If a derrick ballast weight is set, which is too low, then the derrick ballast utilization indicator is too large, then the 90% warning occurs too soon.

If a derrick ballast weight is set, which is too large, then the derrick ballast utilization indicator is too small and the ballast utilization dependent safety shut offs of test point 1 (F1min) are ineffective .

There is a danger!

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9. Adjust winches

General

All cable winches are equipped with an increment counter to measure the relative path (measurement of the relative turning angle). So that the LICCON can calculate the absolute path or the cable length in length units, the system must know the cable length in a certain winch position (adjusting position) . The data belonging to this winch position (cable length and current angle radius) are stored with the remaining geometric data on the program memory cards of CPUs 0 and 1 .
An adjusting switch (cam limit switch) of winch 1 - 5recognizes when the winch is in this adjusting position .

Note: Winch 4 has no cam limit switch.

The adjusting switch of the winches is set in such a way that it shifts in this adjusting position from 0 to 1 when the cable spools out .

9.1 When do the winches need to be adjusted:

The winches must be adjusted when the hook path indicator / cable length indicator is to be correct.
The winches must always be adjusted when the absolute path information of the incremental sensor in the memory is lost, for whatever reason.

This is the case,

- if the LICCON is separated from the power supply (when disconnecting the LICCON from the battery), → all winches must be readjusted
- if the power for LICCON basic component group 0 is pulled → all winches must be readjusted
- if one of the following CPUs is pulled:

CPU 1 pulled: → adjust winch 1 and 2 again
CPU 3 pulled: → adjust winch 3 and 4 again
CPU 4 pulled: → adjust winch 5 again

- if an error in the winch calculation or on the incremental sensor occurred, then the winch might have to be readjusted.

If the winch is not adjusted, then no absolute path calculation can be made. In that case, a relative path calculation is shown, which can be very incorrect and not exact, because the current angle radius is not known.
The winches must always be adjusted correctly, so that the control can calculate the current winch angle radius and thereby the winch momentum. If the winch is adjusted incorrectly or not at all, then it can happen that the control uses a slightly incorrect winch momentum, which can cause the winch to start out with a slight jerk, because the brake of the winch opened too early or too late.

Note: The adjusting positions have been set in such a way that they can be actuated in crane operation, see chart on the next page.

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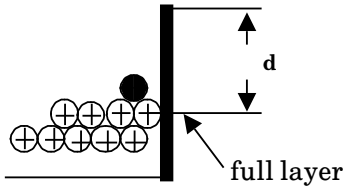
9.2 Carry out adjustment of winch 1, 2, 3, 5

- Spool the winch up / out until the adjusting position (condition layer No. X full, see chart)
- run over the adjusting point by some turns, if winch is being spooled up
- then run over the adjusting switch when **spooling out**
- check the winch indicator.

Carry out adjustment of winch 4

- Spool the winch up / out until the adjusting position (condition layer No. X full, see chart)
- Push the adjusting button in the control box 1× by hand.
- check the winch indicator.

Adjusting positions:



Winch	Adjusting position at	Distance **d** (full layer until disk edge)	full layer has: (for intake gear, the left drum half applies)
Winch 1	Layer 7 full	mm	
Winch 2	Layer 7 full	mm	
Winch 4	Layer 4 full	mm	
Winch 5	Layer 5 full	mm	

Explanation: A cable layer is full if the cable diameter is for the first time in the layer over a full layer .

C A U T I O N: When changing the cable, the cable may not be pulled from a standing winch nor may the empty winch be turned. This is especially dangerous for limit switches "Winch spooled up" and "Winch spooled out" . Otherwise the cam limit switch of the winch must be reset again.

Before the winch is taken into operation, the crane operator must check if the hook path indication is exact, before he uses it.

* Optional

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10. Load weighing and load indication

D A N G E R: The crane operator must know the weight of the load, before he can lift it. The crane operator must check, before lifting the load, if he may even lift the load.

10.1 Weighing the load

Prerequisites for exact load indication:

D A N G E R: If the load is not weighed exactly, then there is a danger! The crane can be overloaded, because the exact weight is not known!

- The boom positions, where the relapse cylinders (RFP) are actuated must be recognized exactly by the LICCON via the sensors , because the relapse cylinders (RFP) would otherwise have too much effect onto the load (weighing error to 10 t)
  In addition, the angle sensor in themain boom pivot section and the incline sensor length and crosswise in the chassis and the angle sensor in the slewing platform must be functioning.
  If only one of these sensor is not functioning, then the load and especially there where the main boom relapse cylinder enter are not exact.

- Both angle sensors on the main boom must be functioning.
  If only one angle sensor on the boom is not functioning properly, the LEC error is shown, but the calculation is made anyway, and the result will not be correct.

Note: If the load has been raised far above the ground level, then the weight of the hoist cable from the load to the ground is not reflected in the load indication, which is then too low.

- The number of reevings must be correctly set on the LICCON, but the reeving may not be more than the nominal reeving, otherwise the hoist cables reeved over the nominal reeving count to the load.

Note: The nominal reeving determines, for which maximum reeving the load carrying capacities of a load chart are valid.

- For the calcuation of the indicated load, the weight of the hoist cable from the pulley head to the ground is deduced from the total load, which is suspended on the pulley head.
  The number of reevings (set on the LICCON) is taken into account, however, the maximum number is the nominal reeving
  Exception: If the crane is in a position outside the load chart, then the hoist cable is added to the load, because no nominal reeving is known outside the load chart.

- As a result :

Lifting overhead

If the load is lifted above the crane level (for example a **skyscraper or high building**), then the hoist cable to the ground is always deducted, this causes the load to be lighter than on the ground, when it is lifted. For that reason, in high heights, a somewhat larger load can be **lifted** than on the ground, without triggering the LML overload shut off decive at 100% .
This is not dangerous because the load for the crane is the same, when, for example, 200 t load on the bottom and 2t cable or 202t load on top and 0t cable hang on the pulley head.

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Lifting below ground

If the load is lowered under the crane level (for example in a ditch) , then the hoist cable **underneath the crane level** is calculated and shown .

D A N G E R: It must be ensured that the load indication is right when lifting below ground, the overload of the crane is also shown in the utilization bar, but there is no shut off of the lowering movement!

The values of the load chart cannot be reached underneath the crane level.

D A N G E R: At LML overload, all crane movements, which would increase the overload, are shut off, however, the load down function remains at 100%-LML shut off, because it is assumed that the overload was caused by lifting the load. Especially with high reevings with large hoist cable weight on the pulley head, the crane is also overloaded when the load is lowered. The crane operator must know this, so that he can relieve the crane by carefully lifting the load in this certain case, even though the lifting action automatically causes a shut off again and not the lowering action .

10.2 Possible weighing errors

For exact load weighing, exact signals fromthe pull test brackets, angle sensors and pressure sensors are required.
Since all sensor values are always within a certain tolerance, a weighing error can occur.

The weighing error becomes increasing larger, **if :**
- the hoist winch sits in the slewing platform instead in the main boom
- the reeving is small
- the host winch sits far behind the slewing platform
- 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 in a steep position.

D A N G E R: If prerequisites for small weighing errors are not given, use special care!

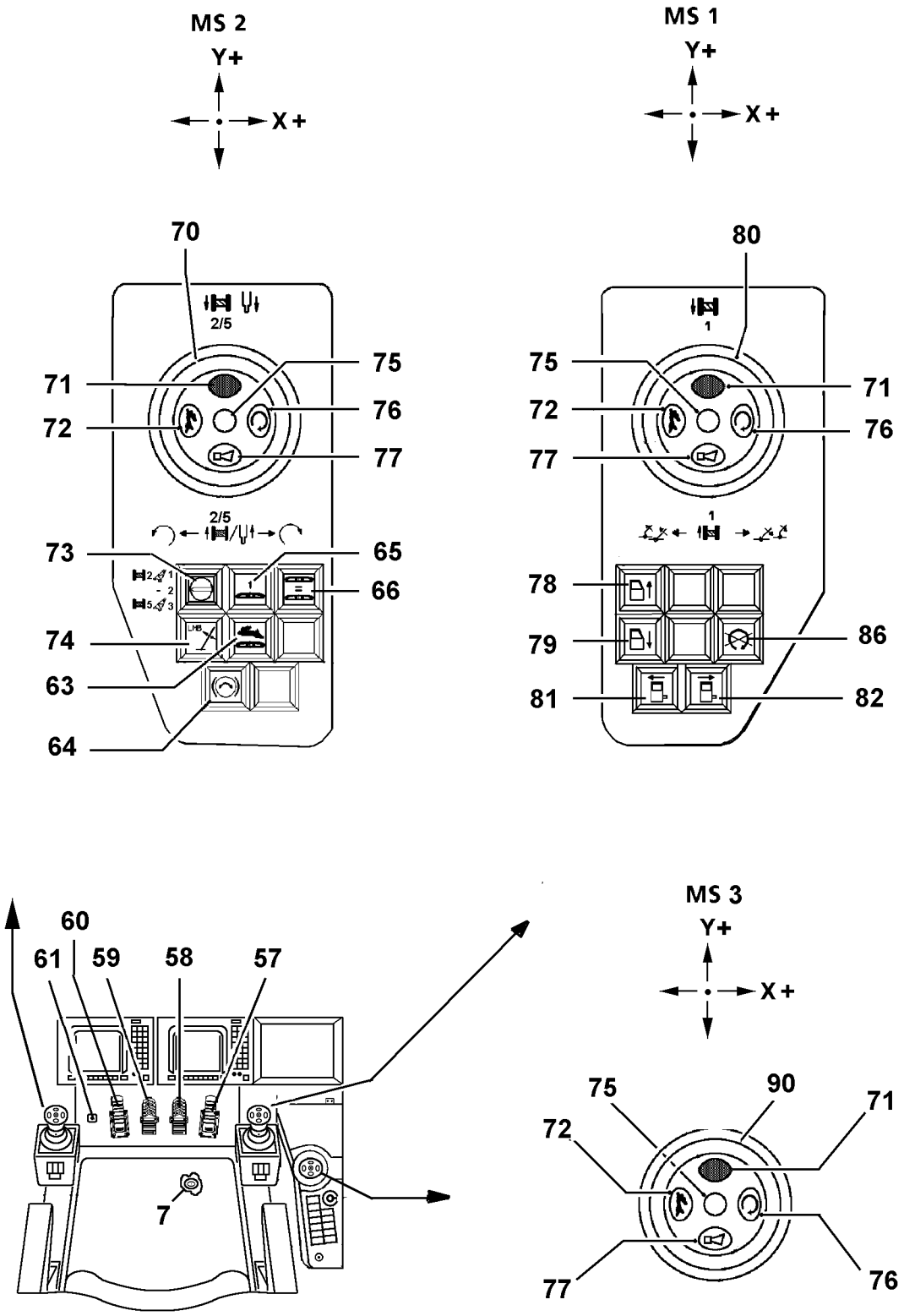
10.3 Lastanzeige

Note: In the LMB calculation, winch 2 is not used, but always the hoist cable lever arm of winch 1.
For that reason, to lift the load on the main boom and on the fixed attachment (such as the fixed jib), winch 1 must be used to receive an exact load weight.

C A U T I O N : When winch 2 is used for lifting the load on the fixed attachment (such as the fixed jib). because the cables of winch 1 and winch 2 would cross, then one must be aware that the load indication is too small, especially in small reevings. For that reason, especially for small radii, a large reeving must be selected for winch 2!
Select at least the reeving which is required for the maximum load carrying capacity in this working radius .

D A NG E R: If the load cannot be weighed exactly, there is the danger of overloading the crane without recognizing it !

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1. Crane operation

Prerequisites
- The crane is horizontally aligned.
- The counterweight is installed and secured, as noted on the load charts.
- The Diesel engine is running.
- The hook block is reeved, according to the reeving plan.
- The selector switch for winch use is set.
- All safety devices have been set according to the data in the load charts.
- All equipment configuration data and reeving have been set on the LICCON and have been confirmed, see chapter 4.03. Monitor 0 and Monitor 1 show the operating view.
- There are no persons or objects within the danger zone.
- Crawler "OFF".

Note: The crane operator must ensure that the selector switch (73) for winch use is set correctly.

C A U T I O N : If the selector switch for winch use (73) is set incorrectly, individual winches can be overloaded without noticing it. There is a danger of accidents!

Always operate the master switch slowly and sensitively.
This action spares the crane and reduces the possibility of accidents.

D A N G E R : Before any crane movements, make sure that no obstacles are within the working range of the crane and that there are no persons in the danger zone.
Give a warning signal (horn) before initiating a crane movement!
There is a danger of accidents!

2. LICCON Computer system

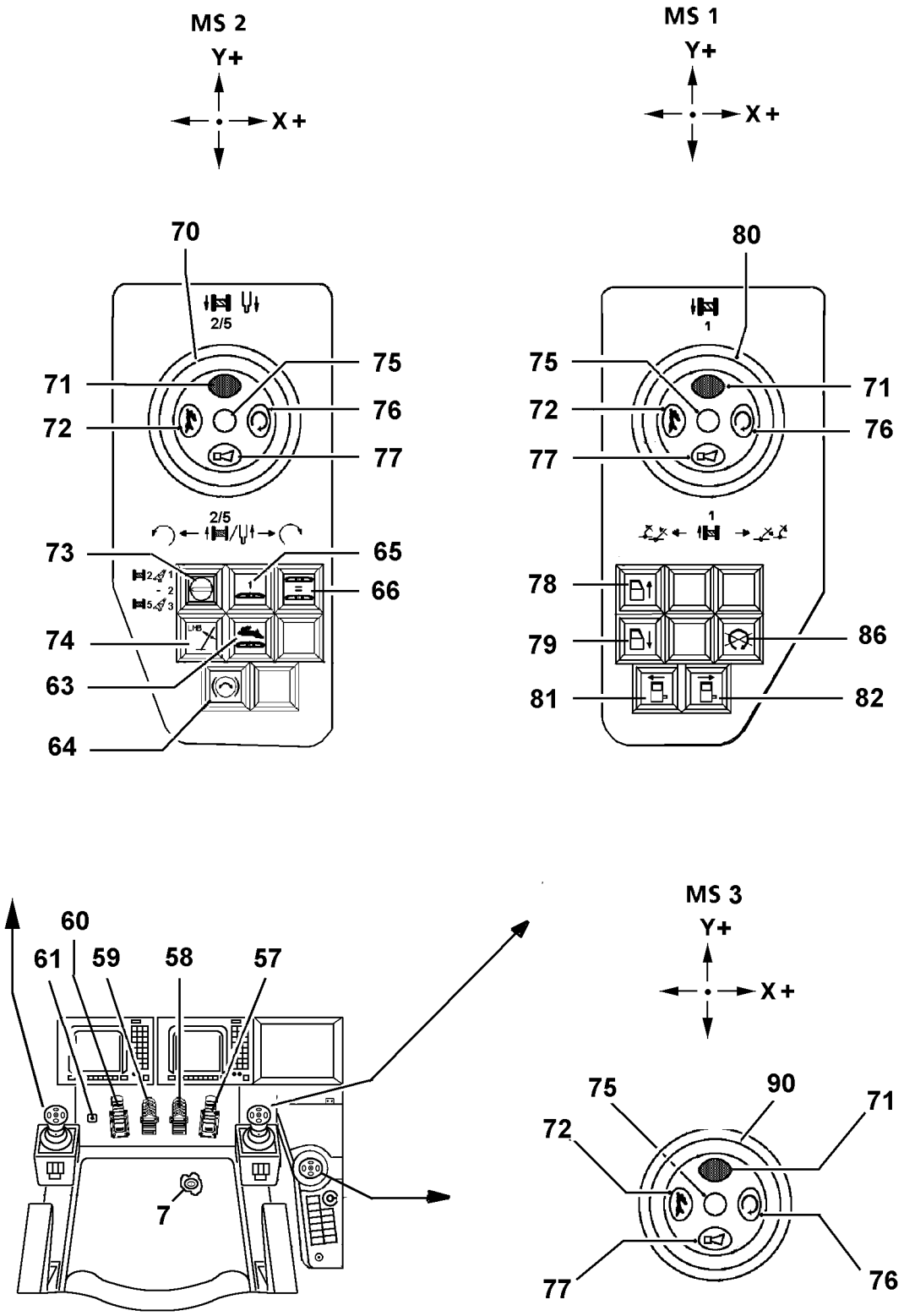
During operation, the indicators on the LICCON monitor must be observed. When carrying out a crane movement, the changing utilization condition and the changes in force should be seen. The overload condition should be recognized early and the crane movements should be slowed down accordingly.

The indicators must be monitored especially during a "turn slewing platform" und ”drive crawler” movement, because these movements have no automatic shut off at overload.

The crane operator must constantly estimate if the data shown in the operating view can even be right. The crane operator may not blindly trust the system, he must think for himself and recognize a possible error.

D A N G E R : When bypassing the safety devices, there is a danger of accidents!

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3. Release of crane control

In order to prevent inadvertent crane movements when entering and leaving the cab by inadvertently actuating the master switch, the crane control is shut off by a seat contact switch (7) as soon as the crane operator gets up from his seat.

Note: If the crane operator must work while standing, then the seat contact switch can be bypassed with button (71) on the corresponding master switch (70, 80 or 90).

4. Engine monitoring
- see chapter 4.02.

During crane operation, monitor the engine monitoring view by changing to it occasionally:
- Engine oil pressure
- Coolant temperature
- Charge air temperature
- Coolant level
- Fuel level
- Air filter
- Battery voltage

4.1 Engine RPM

A constant engine RPM can be set. This relieves the crane operator if the crane is operated for a longer period of time.

- Press the pedal for engine regulation (57) until the desired engine RPMs are reached.
- Press the button (76) on master switch (70 or 80,90), this sets a constant engine RPM, even though the pedal (57) is released.

By pushing the buttons (76) the current engine RPM, which was preselected via the foot pedal (57) is saved and held by the control until a new selection is made.
If a higher engine RPM is selected via the foot pedal (57) then the currently stored engine RPM, then the engine RPM will be increased according to the foot pedal pressure.
If the foot pedal is released again, the previously set engine RPM will be reset.

Release the engine RPM lock
- Press the pedal for engine regulation (57) again, the engine RPM lock is released.

5. Winch operation

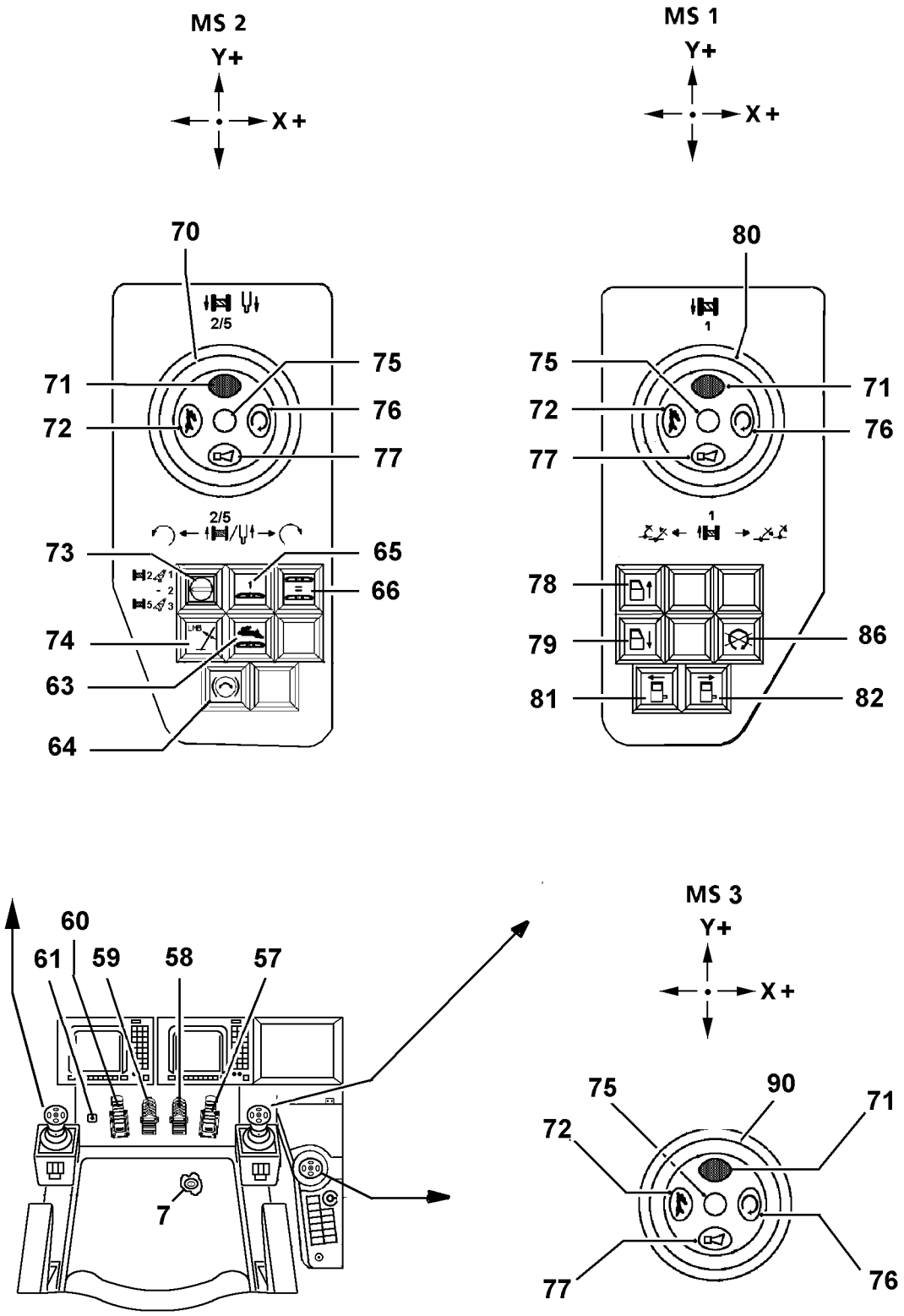
With long booms and lattice jibs, with empty hook operation and when spooling it up or out, it must be checked that no slack cable forms on the winch.

C A U T I O N : When spooling the hoist cable up / out, it must be checked that no slack cable forms on the winch (check winch visually).
Slack cable can lead to cable damage.

6. Winches, pumps and master switch (MS) assignment to operating modes

Note: The crane operator must know and observe the assignment, see electric wiring diagram!

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7. Control of crane movements

C A U T I O N : When spooling the hoist cable up / out, it must be checked that no slack cable forms on the winch (check winch visually).
Slack cable can lead to cable damage.

7.1 Crane movement "main boom control " in operating modes: S, SL

The boom control is made via master switch (80), MS1x in these operating modes.

Deflect master switch (80) to the left	=	Luff up boom
Deflect master switch (80) to the right	=	Luff down boom

Crane movement "main boom control" in operating modes: SW

The boom control is made via master switch (90), MS3y in these operating modes.

Deflect master switch (90) to the rear	=	Luff up boom
Deflect master switch (90) to the front	=	Luff down boom

Crane movement "lattice jib control " in operating modes : SDW

The lattice jib control is made via master switch (80), MS1x in these operating modes.

Master switch (80) deflect to the left	=	Luff up lattice jib
Master switch (80) deflect to the right	=	Luff down lattice jib

Crane movement "Derrick control "in all derrick operating modes

The boom control is made via master switch (90), MS3y in these operating modes.

Deflect master switch (90) to the rear	=	Luff up derrick
Deflect master switch (90) to the front	=	Luff down derrick

7.2 Crane movement "Lift / lower " hoist gear 1 - Winch 1

Deflect master switch (80), MS1y, to the front	=	Hoist down
Deflect master switch (80), MS1y, to the rear	=	Hoist up

Crane movement "Lift / lower " hoist gear 2 - Winch 2

Deflect master switch (70), MS2y, to the front	=	Hoist down
Deflect master switch (70), MS2y, to the rear	=	Hoist up

Note: The speed of the crane movement is regulated via the deflection of the manual control lever and the engine regulation.
The winch symbol on the LICCON monitor as well as a vibration sensor in the master switch show, that the winch turns, even if no hook movement can be seen due to multiple reeving and slow speed.

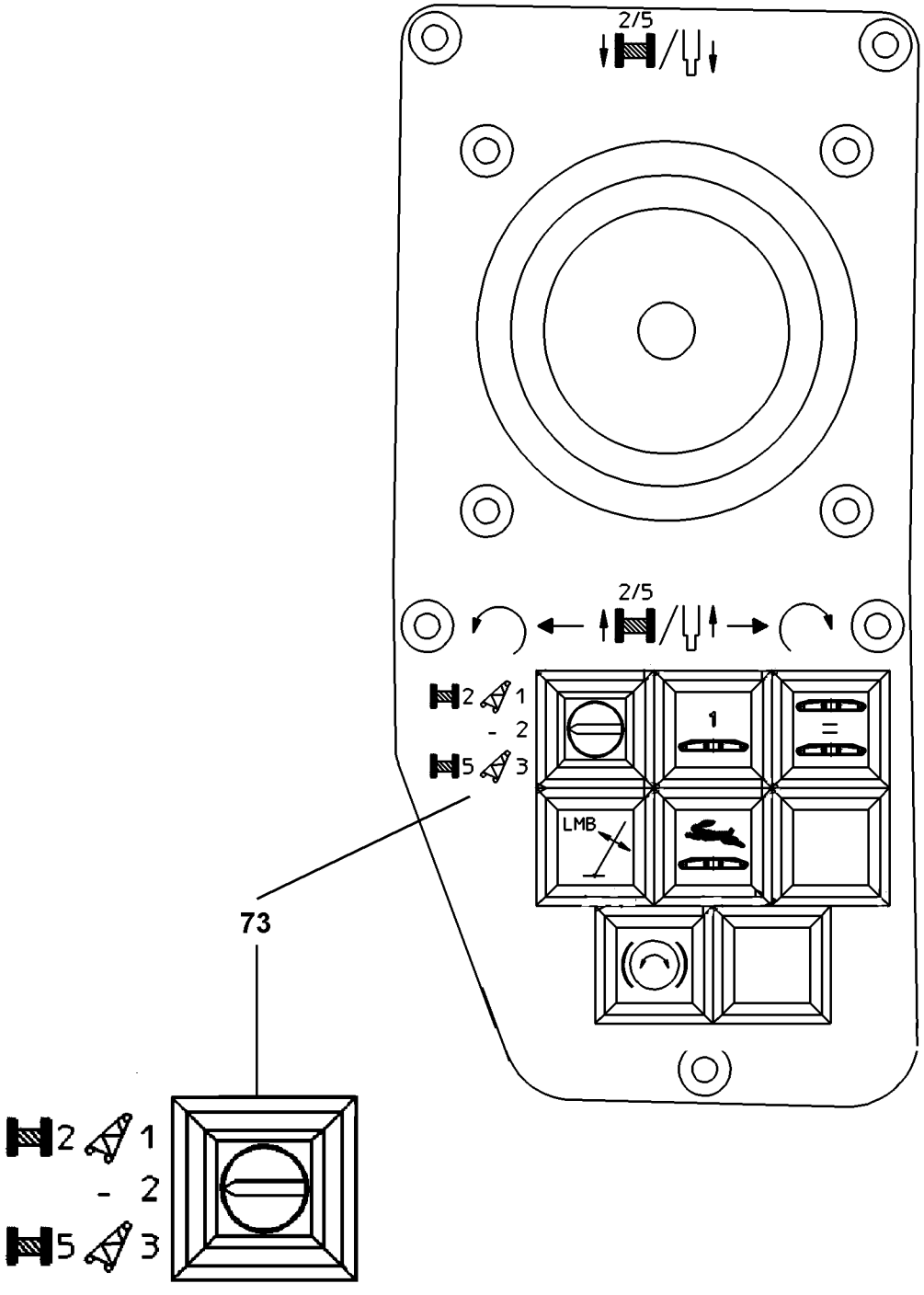
7.3 Preselection of maximum slewing speed of winches as well as deactivation / activation of the individual winches

In the "Control-Parameter" program it is possible to preselect the maximum turning speed of the individual winches or to deactivate / activate the individual winches.

Note: See chapter 4.02.

C A U T I O N : The maximum turning speed as well as deactivation or activation of the winches may not be made as long as a crane movement is carried out.

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7.4 Selector switch for winch use (73)

Position 1: S1
Position 2: S2
Position 3: S3

Equipment operation mode	Pulley head main boom S	Pulley head midfall section M	Pulley head luffing fly jib W	Pulley head fixed jib F	Pulley head boom nose H	Stipulated selector switch position:
S...(H)	**W1**	--	--	--	W2	S1 or S2
S...(H)	**W1**	--	--	--	W5	S3
S...W	--	--	**W1**	--	W2	S1
S...W	W1	--	**W2**	--	--	S2
S...WF	--	--	W1	**W2**	--	S1
S...WF	--	--	W2	**W1**	--	S2
S...WMF (Midfall) =S..W +Midfall	--	**W2**	W1	--	--	S1 or S2
S...WMFF (Midfall) =S..WF +Midfall	--	**W2**	--	W1	--	S1 or S2
(S) S...W	**W1**	--	W2	--	--	S2
S...F	--	--	--	**W1**	--	S1
S...F	W1	--	--	**W2**	((W5))	S2 or S3
(S) S...F	**W1**	--	--	W2	((W5))	S2 or S3

Notes for chart

S...(H) S-main boom possibly with derrick, B or BW and boom nose H.

Note: S . . . = -, D, DB, DBW
(H) = boom note without load chart
A load is hanging on the marked winches,which are observed by load charts.

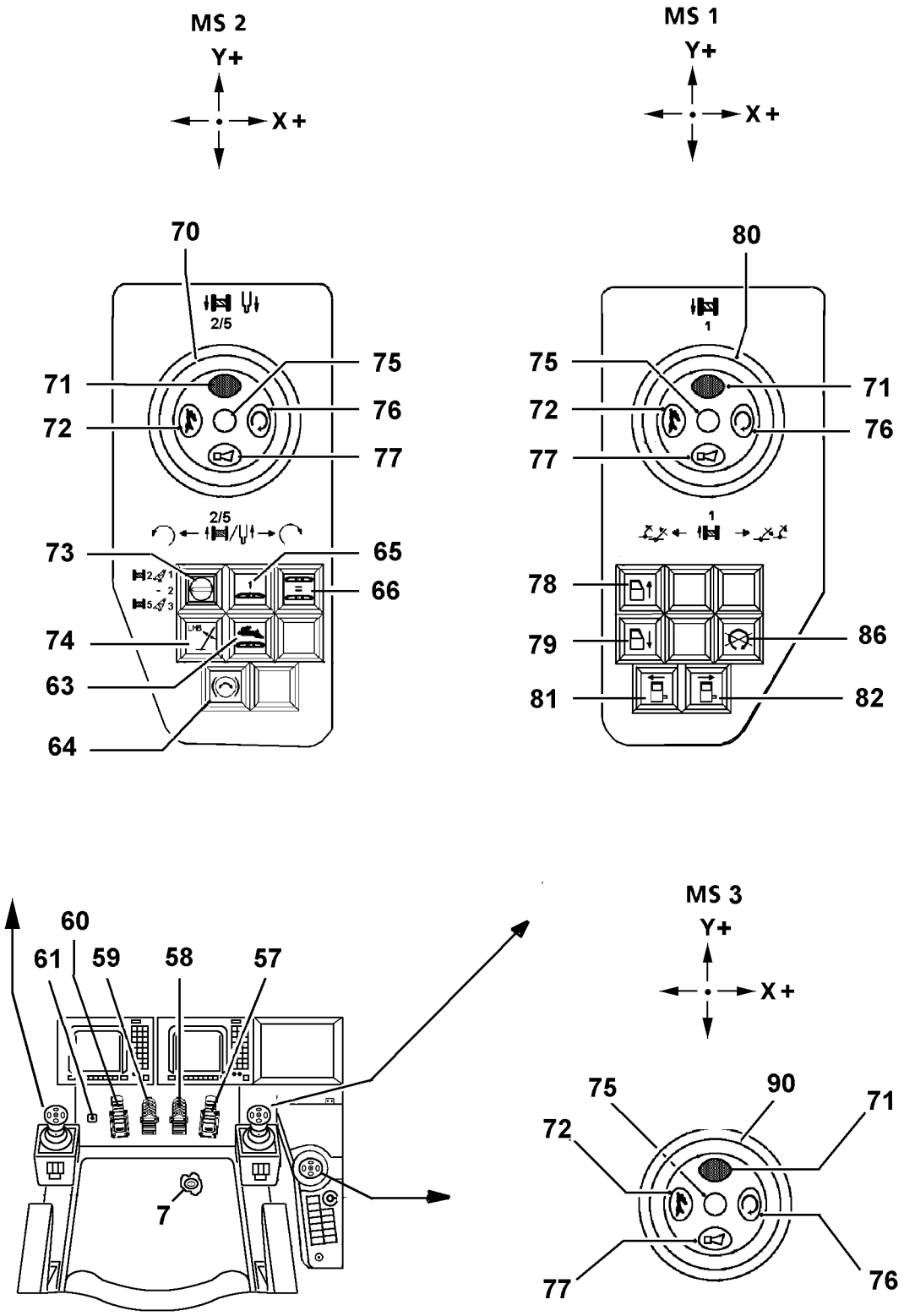
SW...(H) S - main boom with fly jib (W), possibly with derrick, B or BW and boom nose H.

F is for fixed jib instead of luffing fly jib (W).

WF: is for fixed jib (F) mounted to the luffing fly jib W

Note: For detailed description, see chapter 4.02.

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7.4 Crane movement "slewing"

The slewing speed range must be preselected on the LICCON monitor in percentages (%) according to the data in the load chart manual - see chapter 4.02.

D A N G E R : **Before initiating the crane movement "slewing", the crane operator must make sure that there are no persons or obstacles within the slewing range. Before initiating the crane movement, the crane operator must make sure that there are no persons or obstacles within the slewing range. In addition, he must sound the warning signal (horn).**
If this is not observed, there is a DANGER OF ACCIDENTS!

Deflect the master switch (70), MS2x, to the right = to turn to the right
Deflect the master switch (70), MS2x, to the left = to turn to the left

Note: The speed of the crane movement is controlled via the deflection of the manual control lever and the engine regulation.

D A N G E R : **When turning with a load, the slewing movement or braking movement must be initiated extremely sensitively.**
If a slewing movement or braking movement is initiated too suddenly or jerkily, the load can start to swing back and forth. A swinging load can cause the boom to brake or the crane to topple over.

7.4.1 Preselection of slewing speed

In the load chart manual, the maximum slewing speeds are given in percentages.

C A U T I O N : **These values depend on the boom length and the operating mode and may not be exceeded during crane operation with a load.**

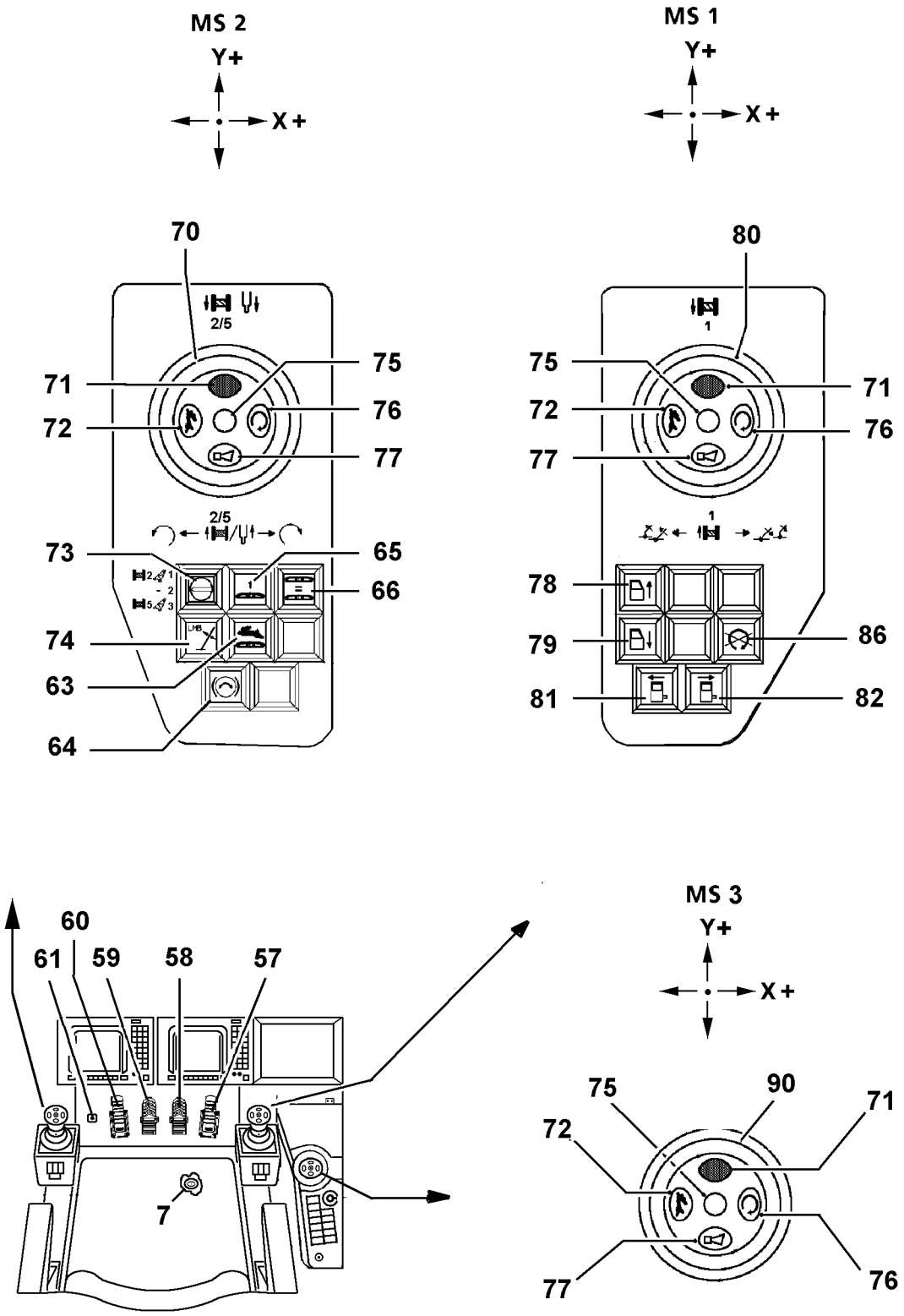
Note: The maximum slewing speeds can be set and adjusted in the "Control Parameter" program. See chapter 4.02.

C A U T I O N : **The maximum slewing speed may not be changed as long as a crane movement is actuated.**

The following applies:

Longer boom
Larger load
} slower speed

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7.4.2 Coasting of slewing gear

Press the foot button (61) to switch the swing gear to coasting. This makes is easier to position the boom above the load to be lifted. The master switch 2 (70) may not be deflected.

D A N G E R : **If the crane superstructure turns inadvertently (for example due to wind), then proceed as follows:**

- **Do not release the foot button (61)!**
  If the foot button is released immediately, the crane superstructure stops suddenly. This can cause the load to swing to the "rear" and can damage the crane.
- **Deflect the master switch 2 (70) in turning direction, then release the foot button. Now the turning movement can be slowed down by slowly moving the master switch.**

Note: The slewing gear cannot be switched to coasting if:
- the slewing gear is shut off by the LML,
- the working range limitation is activated.

7.4.3 Slewing gear block

An additional pedal (60) to block the slewing gear is installed in the crane. If the crane is turned while strong side winds are blowing and with long boom system against the wind, then the crane superstructure turns into the opposite direction, due to leakage in the hydraulic motor. This can be prevented by actuating the pedal to block the slewing gear (60) and by deflecting the master switch 2 (70) into the desired turning direction. By slowly releasing the pedal (60), the superstructure turns into the desired direction.

The slewing gear block may only be used at minimum slewing speed, i.e. with the master switch 2 (70) almost in zero position and for the following applications:

1. Starting to drive with strong side wind
   Actuate the pedal for slewing gear block (60) and deflect the master switch 2 (70) into the desired turning direction. Slowly release the pedal (60) until the crane superstructure turns into the desired direction.

2. Stopping the slewing movement with strong side wind
   With the master switch 2 (70), slow down the crane to the minimum speed. Carefully actuate the pedal (60) for the slewing gear block, until the crane comes to a standstill at the desired point.

C A U T I O N : **The slewing gear block may never be used as an additional slewing gear brake.**
If this is not observed, the slewing gear brake can be destroyed. This in turn can damage the slewing gear or the rotary connection.

D A N G E R : **If the swing movement of the crane is slowed down by swinging back into the zero position with the master switch, then this causes crane overload. Danger of accident!**

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8. Crane operation

Observe the general notes in this chapter!

Prerequisites:
- The LICCON overload safety system is set according to the data given in the load chart.
- The overload protection is not bypassed.
- The selector switch for winch use is set.

Note: The crane operator must ensure that the selector switch (73) for winch use is set correctly.

C A U T I O N : If the selector switch for winch use (73) is set incorrectly, individual winches can be overloaded without noticing it. There is a danger of accidents!
Check the horizontal position of the crane before and during operation.
Even if the crane operator leaves the cab for only a short time, then he is obligated, before starting to work again, to check the operating mode setting and to reset them, if necessary.
There is a danger of accidents!

8.1 Adjustments / checks

Check the function of the overload safety system, by actuating the operating positions ”top” and ”bottom”.
Check the function of the hoist limit switch ”on top” by actuating the hoist limit switch.
Check the function of the limit switch ”Boom steep” by actuating the relapse cylinders.
Check the function of the limit switch ”Derrick” by actuating the relapse cylinders.
Check the function of the limit switch ”lattice jib steep” by actuating the relapse cylinders.
Check the function of the limit switch on the flap (pendulum).
Check the retraction of the mechanical relapse support into the flap.

D A N G E R : Before erection, the easy movement of the pendulum of the mechanical relapse support must be checked over its complete swing range. If this is not observed, the mechanical relapse support does not engage in step lattice jib position.
There is a danger of accidents because the lattice jib may tip backward!

8.2 Guy rods on lattice sections in crane operation

If the guy rods are not needed for the present boom combination, then they can remain on the lattice sections. However, the following must be observed:

Note: If the guy rods are not removed, then the load capacity values given in the load chart must be reduced accordingly.

8.3 Danger conditions without shut off

Block position relapse cylinder - Lower load

D A N G E R : If the crane actuates the block position of the relapse cylinders with the boom or derrick, with attached and freely suspended load, then there is danger that the boom or relapse cylinder will be damaged when setting down the load on the ground. By setting down the load, the boom is relieved, which causes the boom system to move backward.

There is no shut off of the hoist gear down function. For that reason, the opposite direction of the movement, which caused the block position, must be actuated to release the block position again.

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Chapter 5

Equipment

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5.04 L / LL / S / SL - BOOM COMBINATION 028462-00

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1. Assembling the L / LL / S / SL / S2 / SL2 boom combinations

Note: The boom combinations listed above are assembled in the same way.

D A N G E R : The relevant assembly drawings and rod plans must always be used when carrying out the assembly.
Taking the respective system dimensions into account, make sure that the lattice sections, e.g. S2821.10, are always assembled in accordance with the assembly drawings and rod plans.
The assembly may tip and damage the crane components if the assembly is not done in accordance with the assembly drawings and rod plans!

D A N G E R : For the installation and removal work
- a safe installation scaffolding / working platform must be used. There is a danger of accidents due to falling.
- Improvisations are prohibited.
- The lattice sections must be supported from below with suitable, stable materials.
- No one may remain under the lattice jib during pinning and unpinning procedure of the lattice sections. This is strictly prohibited!

Prerequisites:
- The crane is horizontally aligned.
- An auxiliary crane as well as an installation scaffolding / working platform are available.
- The LICCON system is set according to the data given in the load charts.
- The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
- The configuration status has been entered into the LICCON computer system.

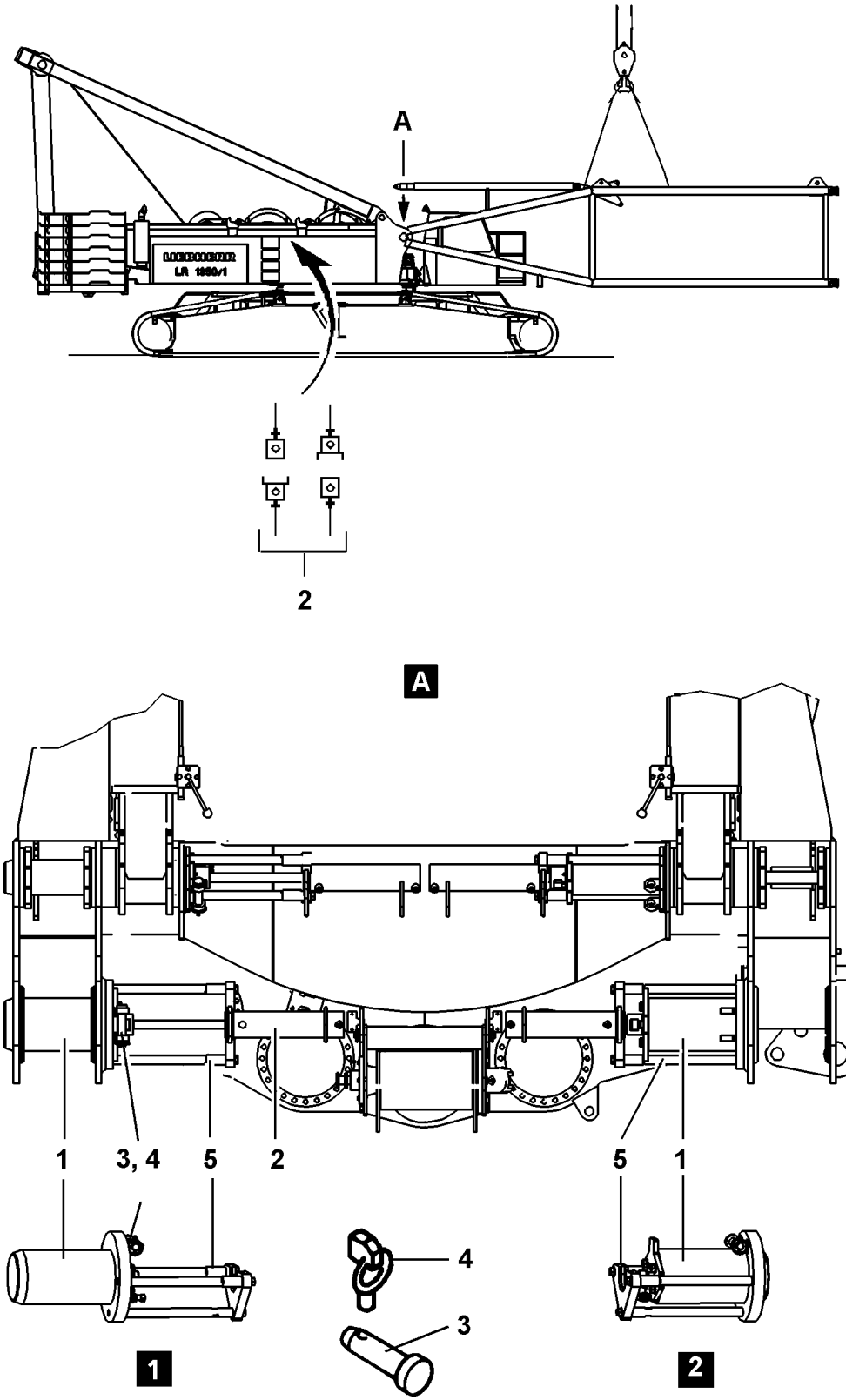
1.1 Installation - boom

Turn the slewing platform until it is positioned in length axle of the crawler gear or to the side.

Note: Observe the data given in the erection and take down charts.

D A N G E R : Before turning the slewing platform without derrick or boom, the following must be observed:
- the crawler gear with installed slewing platform is horizontal.
- the maximum permissible ballast variations in chapter 3.06, Installation conditions.
If this is not observed, there is a danger of tipping over!

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2. Install the pivot section

Lift the pivot section with the auxiliary crane and swing it in to the pin points on the slewing platform.

Weights:

Component	Weight
S- pivot section	5890 kg
Relapse cylinder	811 kg
Winch V with cable	5127 kg
W - guy rods, NA/WA - Bock I	952 kg
S- pivot section compl.	**12780 kg**

Weights:

Component	Weight
L- pivot section	5313 kg
L-relapse cylinder	811 kg
Winch V with cable	3723 kg
N - guy rods, NA - Bock I	276 kg
L- pivot section compl.	**10123 kg**

Establish the hydraulic connection, 2× quick couplings, to the hydraulic cylinder (2) of the pin pulling device (5) on the slewing platform.

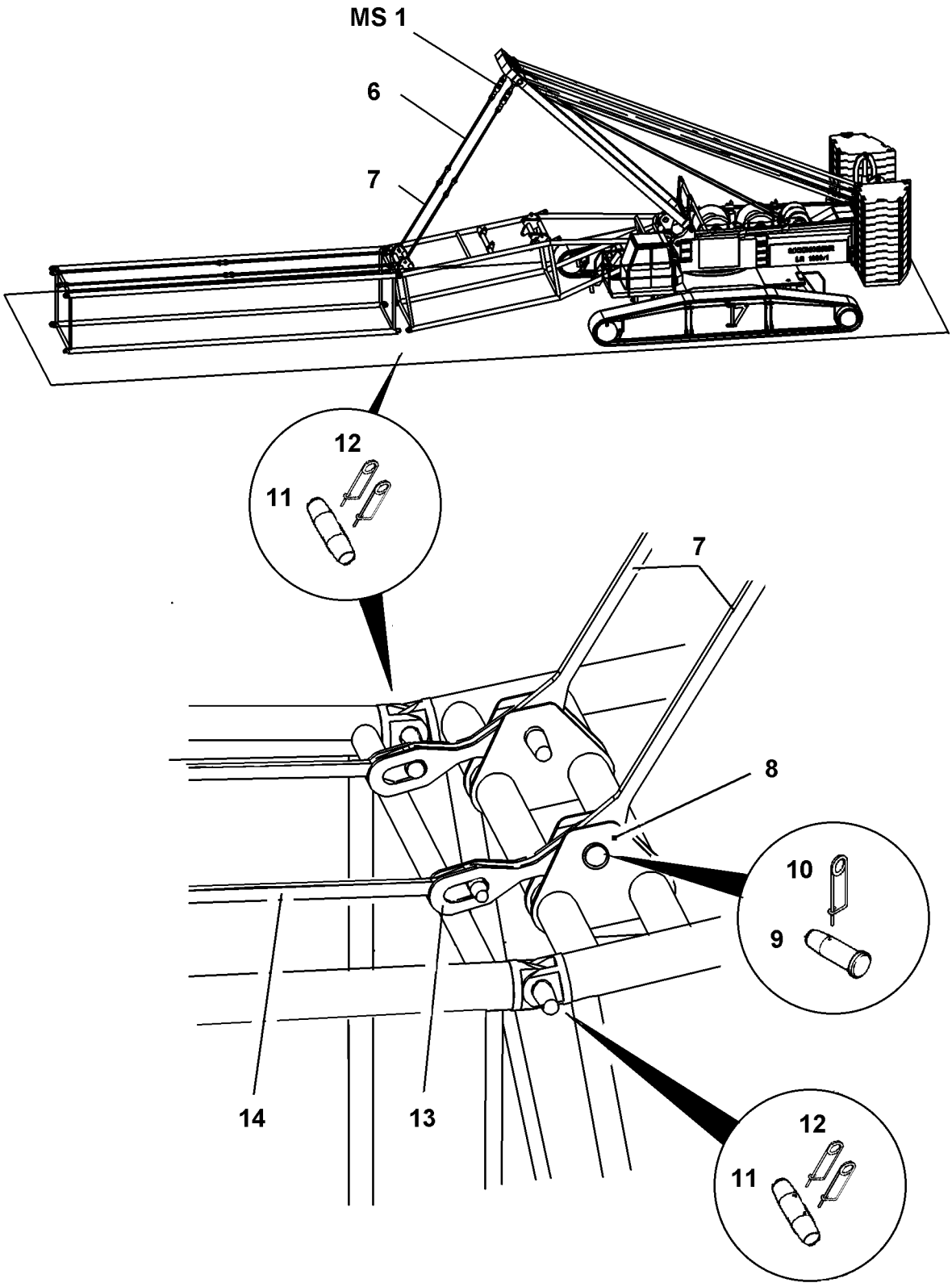
Connect the electric remote control panel.
Attach the hydraulic cylinder (2) on the pin pulling device (5).
Actuate the remote control panel and pin Pivot section.
The connector pins (1) are pinned with the hydraulic cylinders (2) and secured with retaining pins (3) and hinge pins (4).

D A N G E R : To prevent inadvertent unpinning, the connector pins (1) must be secured with retaining pins (3) and hinge pins (4).

Place the pivot section on the base support on the ground and remove the auxiliary crane.

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5.04 L / LL / S / SL - BOOM COMBINATION 028462-00



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3. Install the boom

Components

6 Guy rods from the SA -bracket

7 Guy rods from the Pivot section

8 Brackets

9 Pin

10 Spring retainer

11 Conical pin

12 Spring retainer

13 Guy rods

14 Guy rods

Installing

Lower the SA - bracket to the front, see chapter 5.02.
Pin the guy rods (6) from the SA -bracket with the guy rods (7) from the Pivot section and secure.
Release the transport retainer of the guy rods.
Pin the guy rods (7) to the bracket (8) on the S - pivot section and secure. Use pins (9) and spring retainers (10).
Assemble the boom and the corresponding guy rods to the required length, pin and secure.

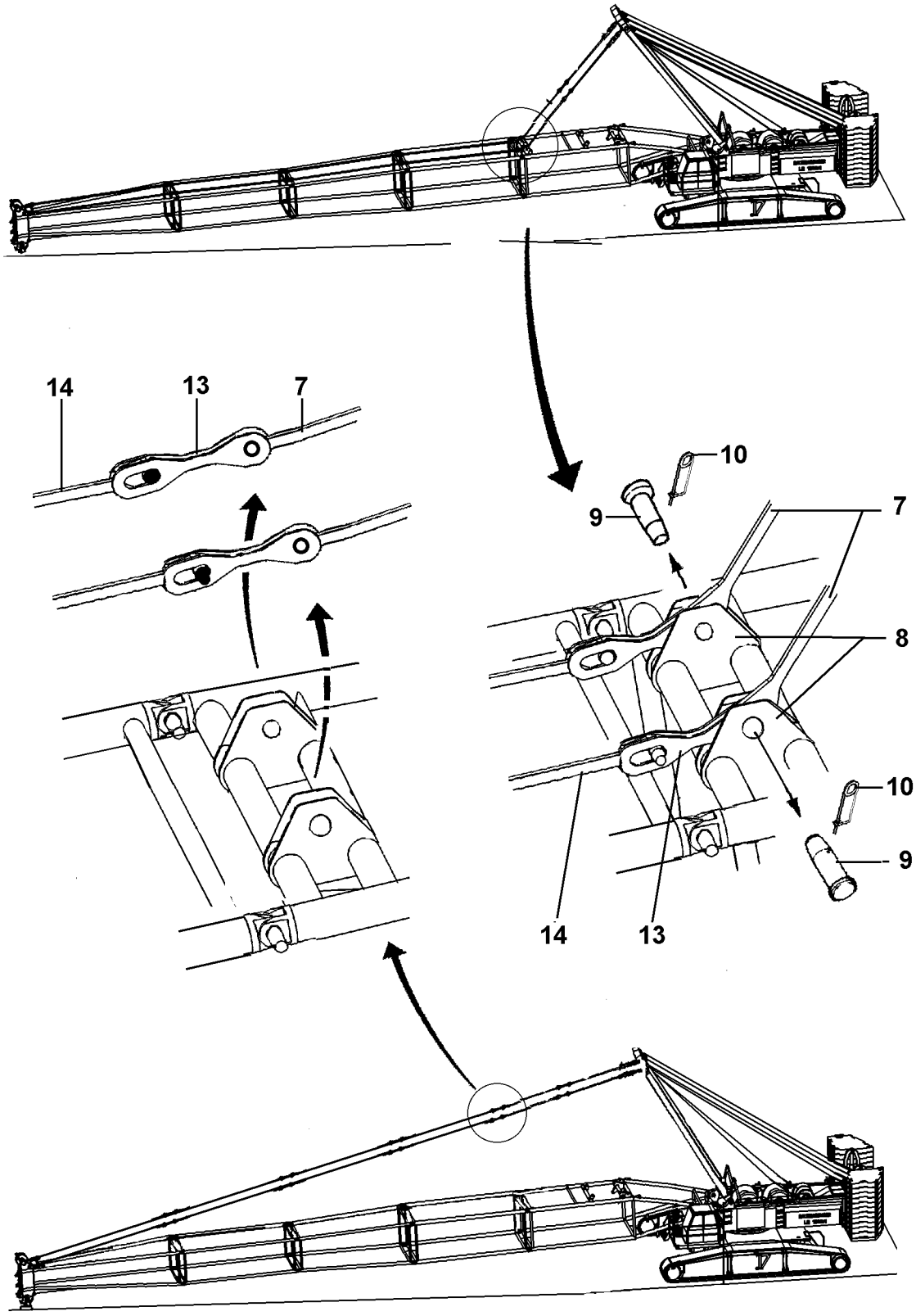
Pin the first intermediate section on the S-pivot section **"on top"** with conical pin (11) and secure with spring retainers (12).

Pull up the Pivot section with the SA-bracket (winch 4) until it can be pinned **"on the bottom"**.
Pin Pivot section **"on the bottom"** with conical pin (11) and secure with spring retainers (12).

Note: Note the test point 1 (MS1) - "IST" (Actual) force of monitor 1 in this position, so one knows when removing the boom, which force must be used to secure when unpinning.

D A N G E R : The maximum permissible total force on test point 1 = F ≤ 35 t.
With the SA-bracket, the following maximum boom lengths can be lifted, when pin pivot section "on the bottom" :
- S 96 m with installed S - and WA-bracket II guy rods
- SL 102 m, only with installed S- guy rods
- L 108 m, only with installed L- guy rods
- LL 108 m, only with installed L- guy rods
The end section may not be raised, it must lie on the ground.
If this is not observed, severe damage can occur!

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3.1 Installation of the guy rods

Relieve the guy rods (6, 7) by lowering the SA- bracket.
Unpin the guy rods (7) from the brackets (8) on the Pivot section. Release spring retainers (10) and unpin pin (9).

D A N G E R : **Before unpinning the guy rods (7) from the brackets (8) on the Pivot section, the boom must be pinned "on the bottom".**
Otherwise there is a danger of accidents, as the boom might suddenly fold down!
The lattice sections must be supported from below with suitable, stable materials.
Due to safety reason pining and unpinning of the pins must be done from o u t to i n s i d e!
No one may remain under the lattice jib during pinning and unpinning procedure of the lattice sections. This is strictly prohibited!
There is a danger of accidents!

Connect brackets (13) to the guy rods (14) from the boom, pin and secure.

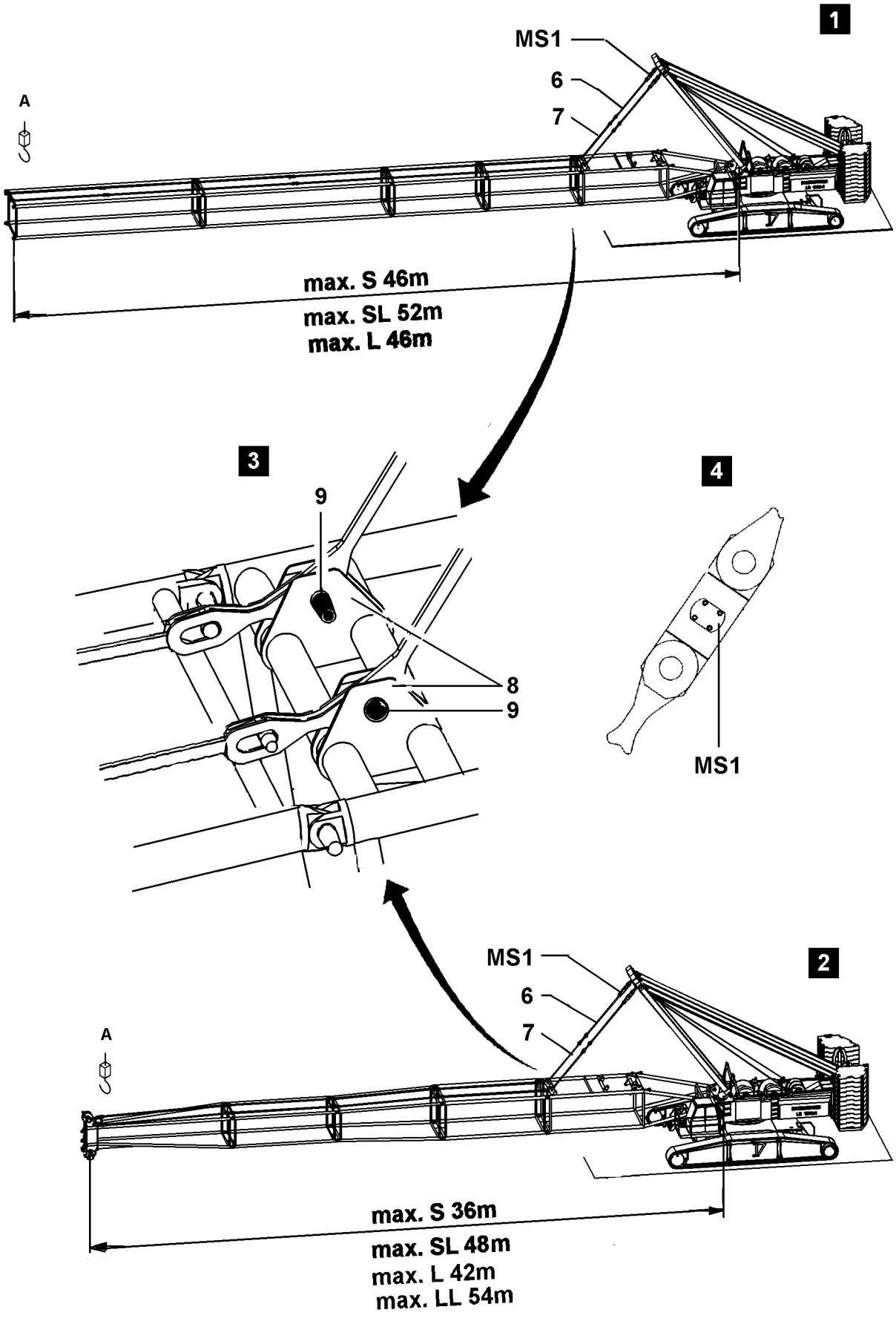
Note: The guy rods must be installed and secured according to the installation drawings in **chapter 5.03**.
Make sure to compare the numbers in the installation drawing with the numbers on the guy rod.

D A N G E R : **The pins of the guy rods must be inserted from the inside to the outside. If this is not observed, the hoist cable will scrape on the pins.**
The guy rods must be checked regularly, see chapter " Inspection and maintenance of guy rods".

Actuate the winch IV and tension the guy rods between the SA-bracket and the head end section.

Guide the hoist cable over the cable pulley on the head end section.

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3.2 Flying installation of the L / LL / S / SL / S2 / SL2 - boom

Installation

If space is severely limited at the job site for the installation of the boom or is restricted due to nearby buildings, etc. then it is possible to install the boom up to a **max. length** in flying mode:

Fig. 1
- **max. S 46 m**
- **max. SL 52 m**
  - **without end section, without hook block**
  - **with S - and WA-bracket II guy rods**
- **max. L 46 m**
  - **without end section, without hook block with L - and NA-bracket II guy rods**
  - **min. slewing platform ballast 45t**
  - **min. central ballast 8t**
  - **max. permissible total force 70 t on test point MS 1.**

Fig. 2
- **max. S 36 m**
- **max. SL 48m**
  - **with end section, without hook block**
  - **with S - and WA-Bock II guy rods**
- **max. L 42 m**
- **max. LL 54 m**
  - **with end section, without hook block with L - and NA-Bock II guy rods**
  - **min. slewing platform ballast 45t**
  - **min. central ballast 8t**
  - **max. permissible total force 70 t on test point MS 1.**

Note: The pivot section is pinned and secured on the guy rods (6, 7) of the SA - bracket and the brackets (8) and pulled up to horizontal position.

C A U T I O N : Note max. permissible total force on test point MS 1.

For a flying installation, the intermediate sections can be pinned and secured piece by piece with the auxiliary crane or the completely assembled boom can be pinned and secured on the pivot section.
Pin and secure the pin "**on top**" and "**on the bottom**".
Attach the auxiliary crane (A) on the head section of boom or support it from below with stable materials.

D A N G E R : Note the maximum permissible boom lengths and the max. permissible total force for flying installation on test point MS 1.
If this is not observed, there is danger of accidents!

Installation of the guy rods

Lower the guy rods (6, 7) to relieve the SA- bracket and unpin guy rods (7) from brackets (8) on the Pivot section. Release spring retainers (10) and unpin pin (9).

D A N G E R : The boom must be held with an auxiliary crane (A) or supported from below, before the guy rods (6, 7) are unpinned from the brackets (8) on the Pivot section.
No one may remain under the lattice jib during pinning and unpinning procedure of the lattice sections. This is strictly prohibited!
Otherwise there is a danger of accidents, as the boom might suddenly fold down!
The lattice sections must be supported from below with suitable, stable materials.
There is a danger of accidents!

Connect brackets (13) to the guy rods (14) from the boom, pin and secure.
Actuate the winch IV and tension the guy rods between the SA-bracket and the head end section.
Detach auxiliary crane on boom head section

D A N G E R : The guy rods between the SA-bracket and the head end section must be tensioned and the boom is held by the guying, before detaching the auxiliary crane!

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5.04 L / LL / S / SL - BOOM COMBINATION 028462-00

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4. Make electrical and hydraulic connections

4.1 S / SL / S2 / SL2-boom

Note: Make electrical connections, see separate electrical wiring diagram.

4.2 L / LL-boom

Note: Make electrical connections, see separate electrical wiring diagram.

4.3 Hydraulic connections

Establish the hydraulic connection (2× quick couplings) to the relapse cylinders.

5. Function check

Prerequisites:
- All electrical connections are established.
- The engine is running.

Airplane warning light
Turn on the airplane warning light, check function visually.

Wind speed sensor
Check the movement and function of the wind speed sensor.

Limit switch

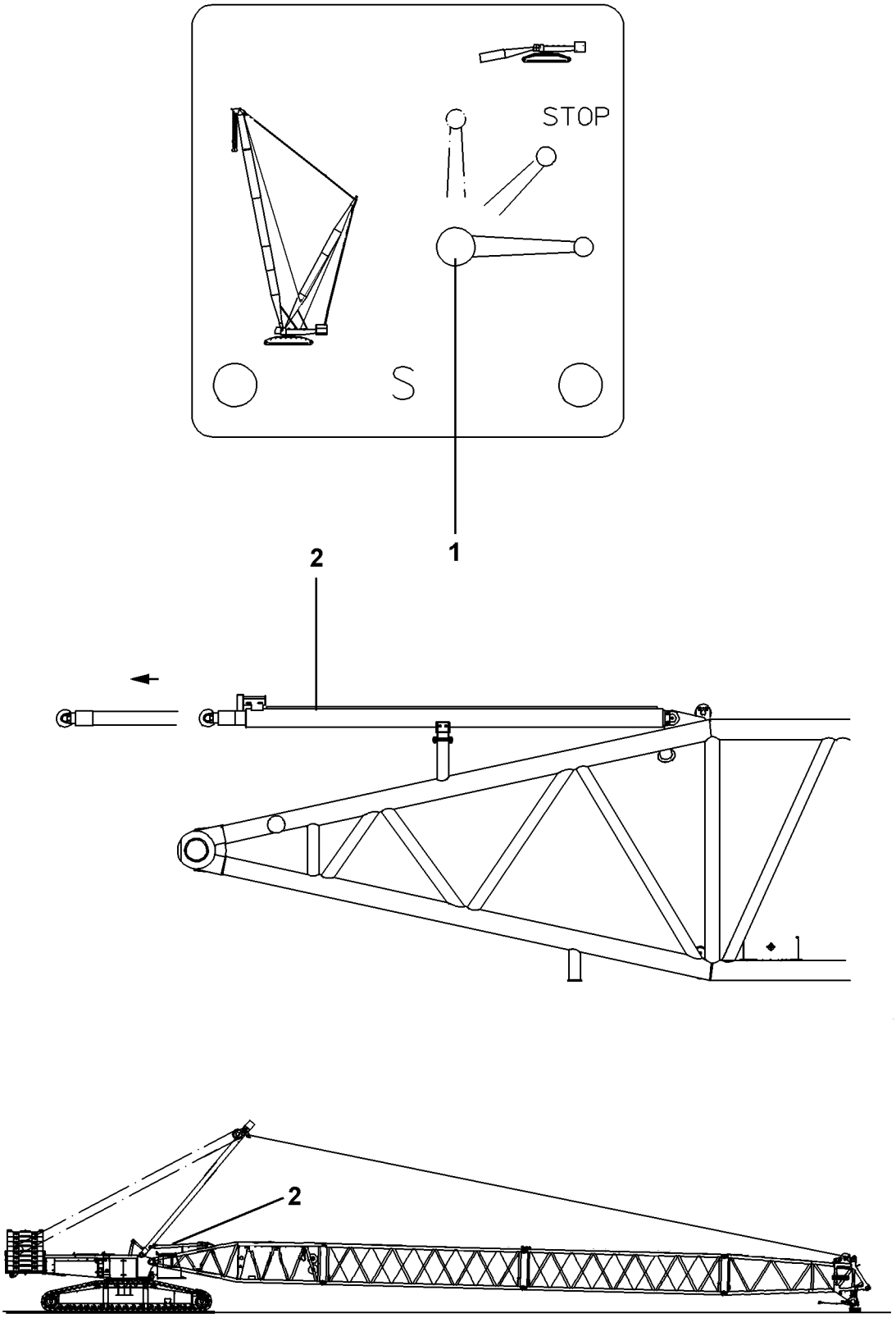
C A U T I O N : The limit switch functions must be checked individually before crane operation.
The manual procedure is described below.
The function of the individual limit switch initiators must be determined in the test system - see chapter 7.10 Diagnostics manual.

Hoist limit switch
Actuate the hoist limit switch manually.
The hoist winch must turn off when lifting.
The hoist ”top” symbol on the LICCON indicator must blink.

Relapse cylinder
Cover the limit initiators individually on the relapse cylinders with a metal plate.
The S - control winch movement **"spool up"** must turn off.
The symbol must appear on the LICCON monitor.

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5.04 L / LL / S / SL - BOOM COMBINATION 028462-00



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6. Erection / take down procedure

The boom combinations must be erected or taken down according to the **Erection and take down charts.**

D A N G E R : The erection and take down procedure must be made according to the data in the erection and take down chart.
If this is not observed, the crane can be overloaded or topple over.

Prerequisites:
- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform according to the load chart.
- The boom is installed according to the load chart and the operating manual.
- All limit switches are installed correctly and fully functioning.
- All pin connections are secured.
- The hoist cable is placed correctly into the cable pulleys and secured with cable retaining pins to prevent them from jumping out.
- There are no persons within the danger zone.
- There are no loose parts on the boom and the lattice jib.
- In the cold season: Is the boom and the lattice jib and their components (limit switch, cable drum, airplane warning light, wind speed sensor, etc.) free of snow and ice.

D A N G E R : Incorrectly installed and non-functioning limit switches as well as falling parts (pins, spring retainers, ice, etc.) can cause accidents!

6.1 Extend the L/S- relapse cylinder (2]

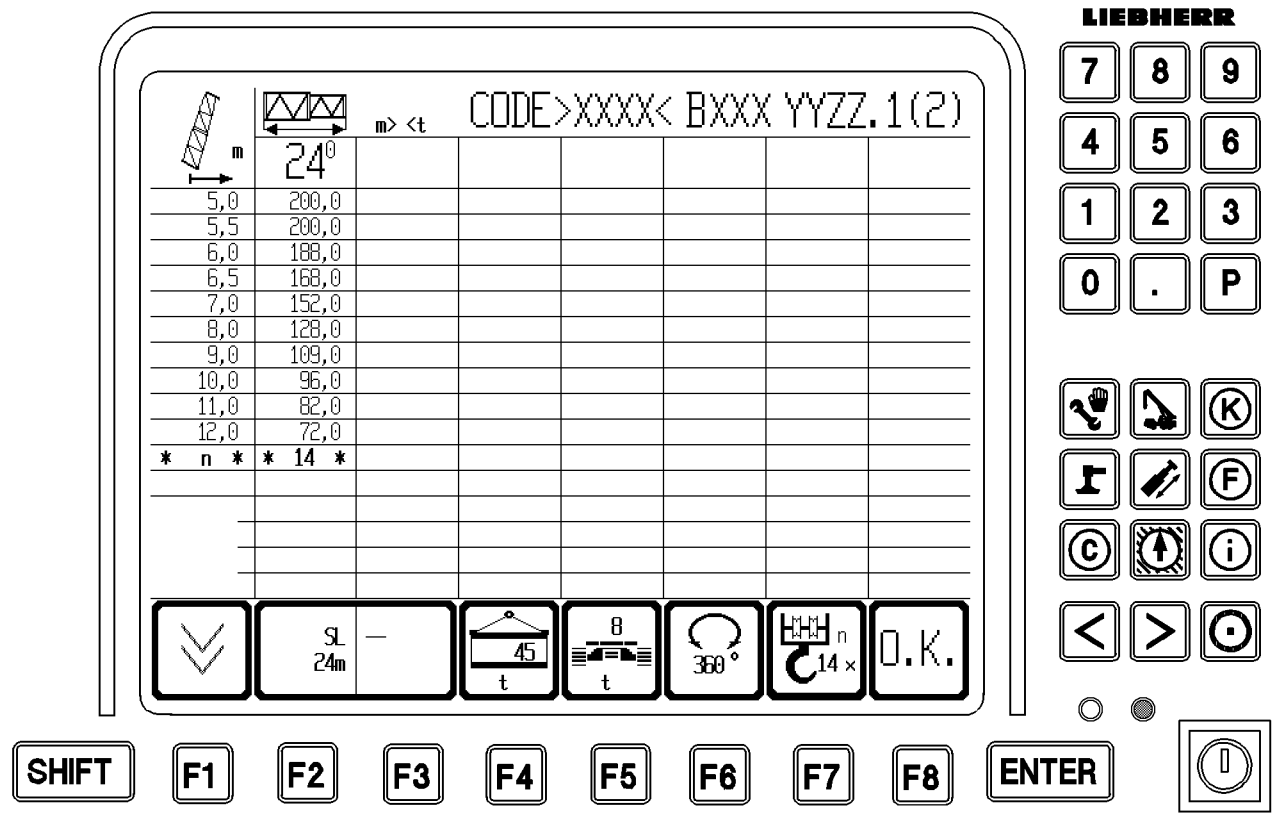
Establish the hydraulic connection from the slewing platform to the relapse cylinders.
Move the ball cock lever (1) into horizontal position and extend the piston rod of the relapse cylinder.

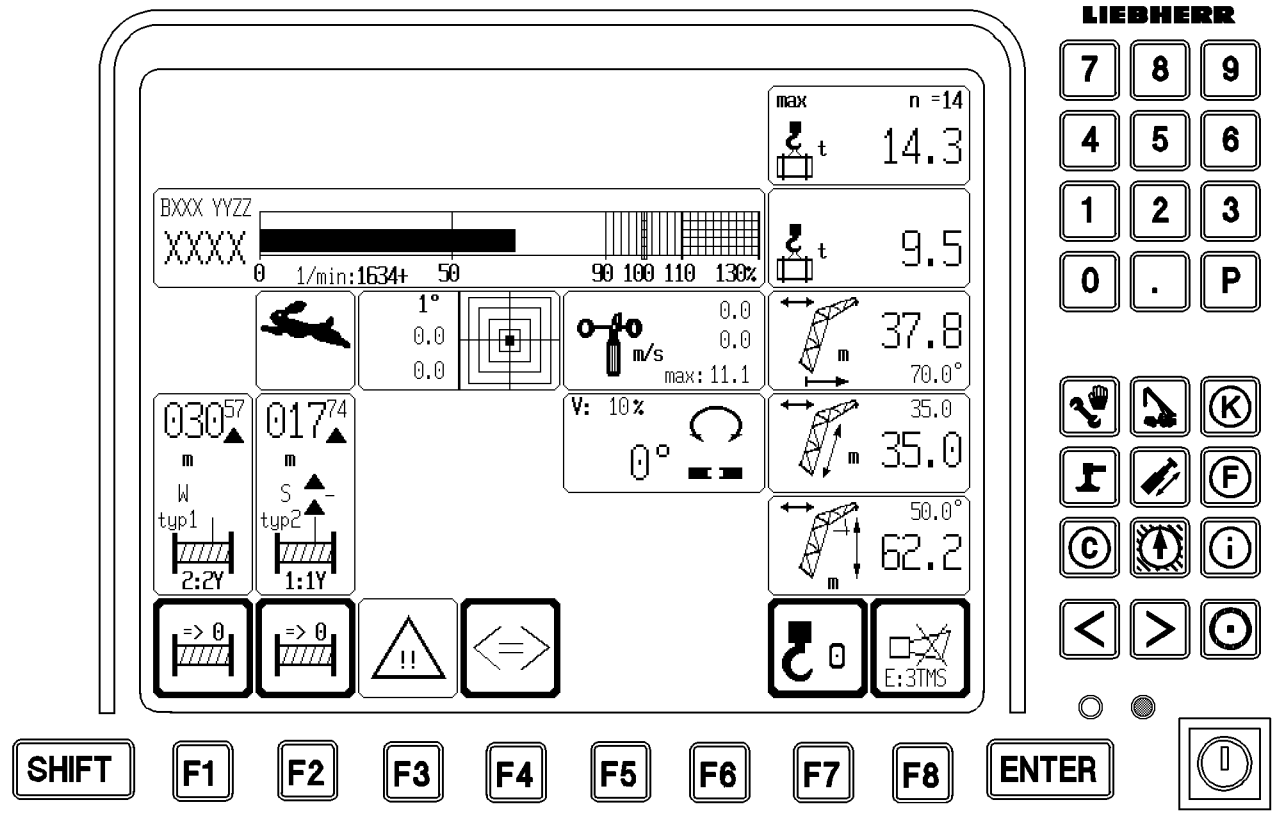
Lever positions:

Lever horizontal	=	Crane operation, extend piston rod
Lever vertical	=	Installation, retract piston rod
Lever 45°	=	Piston rod cannot be extended or retracted

D A N G E R : The relapse cylinders must be extended before erection.
The ball cock lever must be in horizontal direction, and must be secured to prevent it from inadvertent actuation during crane operation.

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6.2 Erection procedure

Note: Carry out the erection procedure according to the erection and take down charts.

The LICCON overload protection has been set according to the data in the load chart.
The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
The configuration status has been entered into the LICCON computer system.
- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

Erection
Luff up the boom until the end section lifts off the ground.
Reeve the hoist rope between the pulley head on the end section and the hook block and secure on the fixed point – see **Reeving plans**.
Attach the hoist limit switch weight.
Luff the boom up to the **lowest** operating position.

D A N G E R : When erecting long booms, the hook block must remain on the ground up to a certain boom angle range to the horizontal, otherwise the crane will be overloaded!
Boom angle range – see Erection and take down charts.

Note: If a range is reached during erection which is monitored by the load chart, then the LICCON overload protection is activated.
The lowest operating position has been reached if the displays turn off and a load value - t - appears in the “MAX. LOAD” icon instead of question marks (???).
- The Assembly icon in the LICCON monitor turns off.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
The set up key (D) bypasses the safety devices!
The radii specified in the load chart may not be exceeded nor fallen below, even if there is no load on the hook!
Crane operation with deactivated overload protection is prohibited!

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5.04 L / LL / S / SL - BOOM COMBINATION 028462-00

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7. Place down the L / S / S2 - boom

Note: Carry out the take down procedure according to the erection and take down charts.

The LICCON overload protection has been set according to the data in the load chart.
The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
The configuration status has been entered into the LICCON computer system.

Luff the S-boom down until just before the lowest operating position.

Note: When the **lowest** operating position is reached, the luff down movement is shut off.

- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

C A U T I O N : When luffing down, the hoist winch must be spooled out at the same time to prevent the hook block from colliding with the pulley head.

Actuate the manual control lever and continue to luff down the boom until the hook block touches the ground.

D A N G E R : When taking long booms down, the hook block must be lowered to the ground at a certain boom angle range to the horizontal, otherwise the crane will be overloaded!
Boom angle range – see Erection and take down charts.

Remove the hoist limit switch weight. Unreeve the hook block.

D A N G E R : When unreeving the hoist cable, no persons may be within the danger zone.

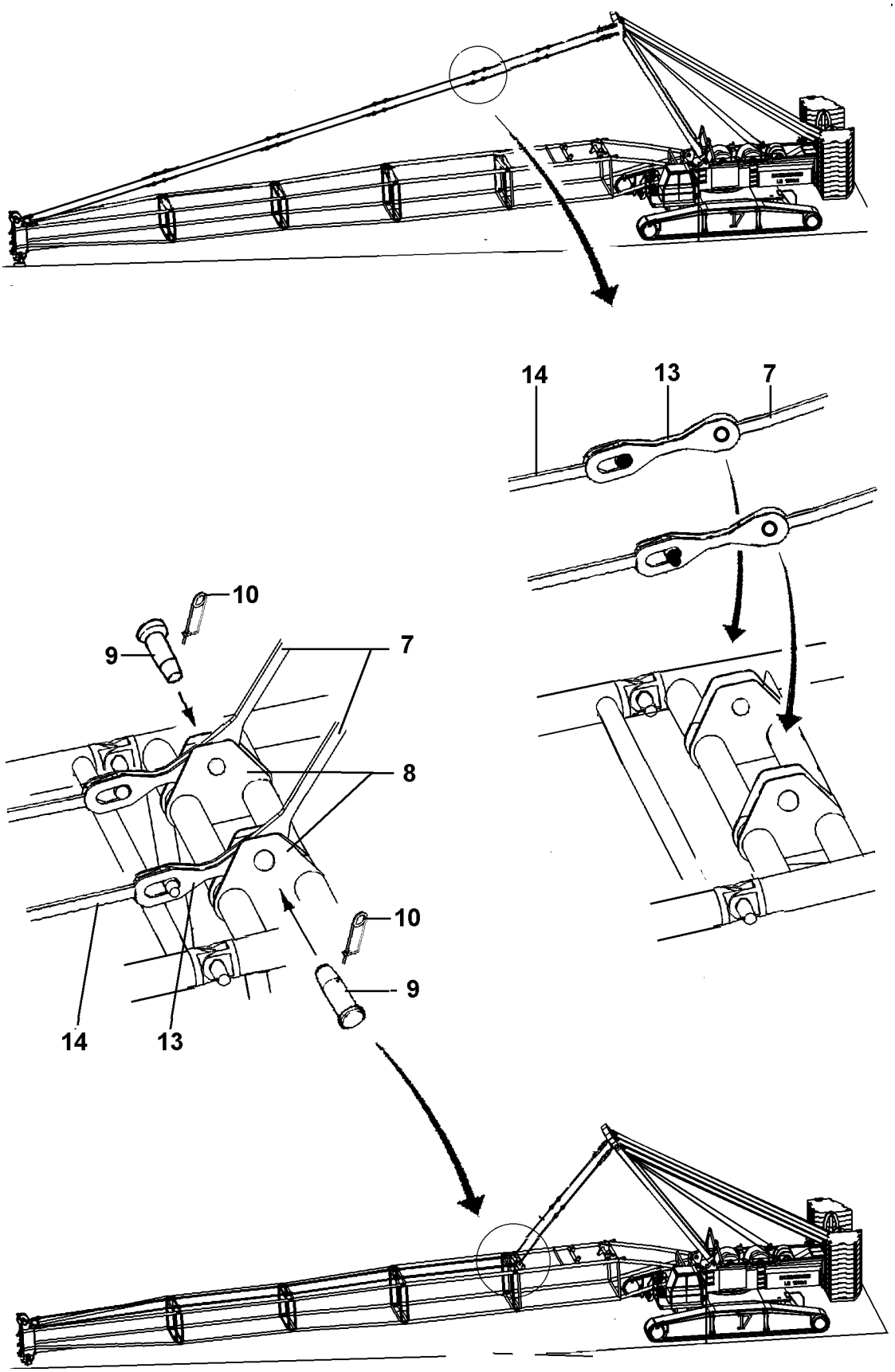
Spool the hoist cable back to the winch.

D A N G E R : Do not overspool the winch! If the cable is pulled under the winch when spooling it up, the setting of the cam limit switch, which is to ensure that a minimum of 3 coils remains on the drum, is no longer correct.
The cam limit switch must be readjusted after any work on the cable or on the winch.

Continue to luff down the boom until the end section lies on the ground.

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5.04 L / LL / S / SL - BOOM COMBINATION 028462-00



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Removal of the L / S / S2 - boom
Lower the SA - bracket to the front, see chapter 5.02.
Pin guy rods (7)to the bracket (8) on the Pivot section. Use pins (9) and spring retainers (10).

Unpin guy rods (14) on the brackets (13).

Note: With the intake winch, pull until the same F1 - "IST" actual force the test point 1 (MS1) is set as was noted during installation.

D A N G E R : The maximum permissible total force on test point 1 = F ≤ 35 t.
With the SA-bracket, the following maximum boom lengths can be lifted, when pin pivot section "on the bottom":
- S 96 m with installed S - and WA-bracket II guy rods
- SL 102 m, only with installed S- guy rods
- L 108 m, only with installed L- guy rods
- LL 108 m, only with installed L- guy rods
The end section may not be raised, it must lie on the ground.
If this is not observed, severe damage can occur!

Unpin the pivot section **"on the bottom"** and lower it all the way.

D A N G E R : Before unpinning the Pivot section, the guy rods (7) on the bracket (8) on the Pivot section must be pinned and secured.
Otherwise there is a danger of accidents, as the boom might suddenly fold down!
During the removal and installation, the lattice sections must be supported from below with suitable, stable materials.
No one may remain under the lattice jib during pinning and unpinning procedure of the lattice sections. This is strictly prohibited!
There is a danger of accidents!

Unpin the Pivot section and the intermediate section **"on top"**.

Relieve the guy rods (6, 7) by lowering the SA - bracket and unpin.
Place down the guy rods (7) on the Pivot section and secure.
Unpin the lattice sections and remove.
Remove the Pivot section with the auxiliary crane on the slewing platform.

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5.05 LD/SD - BOOM COMBINATION 028463-00

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1. Installation

D A N G E R : For installation and removal work:

- A safe installation scaffolding / working platform must be used. There is a danger of accidents due to falling.

- Improvisations are prohibited.

- The lattice sections must be supported underneath with suitable, stable materials.

- Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections.

Prerequisites:
- The crane is horizontally aligned.
- An auxiliary crane as well as an installation scaffolding / working platform are available.
- The LICCON overload safety system is set according to the data given in the load charts.
- The boom is not installed.
- The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
- The configuration status has been entered into the LICCON computer system.

1.1 Installation D - Derrick

Turn the slewing platform until it is in lengthwise direction to the crawler travel gear or to the side.

Note: Observe the data given in the erection and take down charts.

D A N G E R : Before turning the slewing platform without derrick or boom, the following must be observed:

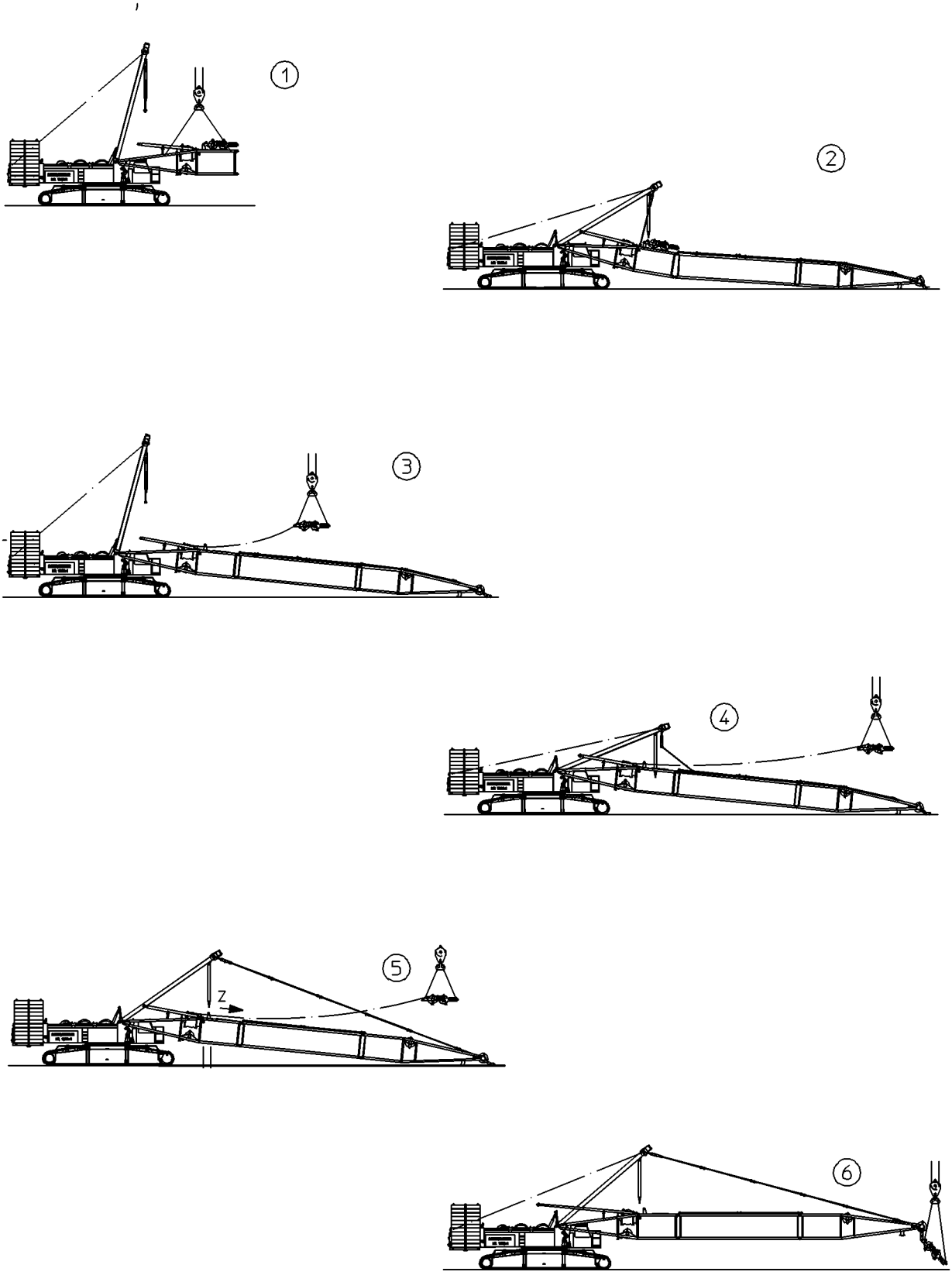
- the crawler gear with installed slewing platform is in horizontal position.

- the max. permissible ballast variations in chapter 3.06, Installation conditions.

If this is not observed, there is a danger of accidents as the crane can topple over!

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1.2 Installation procedure

Fig. 1
Installation D-pivot section

Fig. 2
Pin and secure the guy rods from the SA-bracket on the brackets on the D-pivot section.
Pin and secure the D-intermediate section and the D-end section on the D-pivot section.

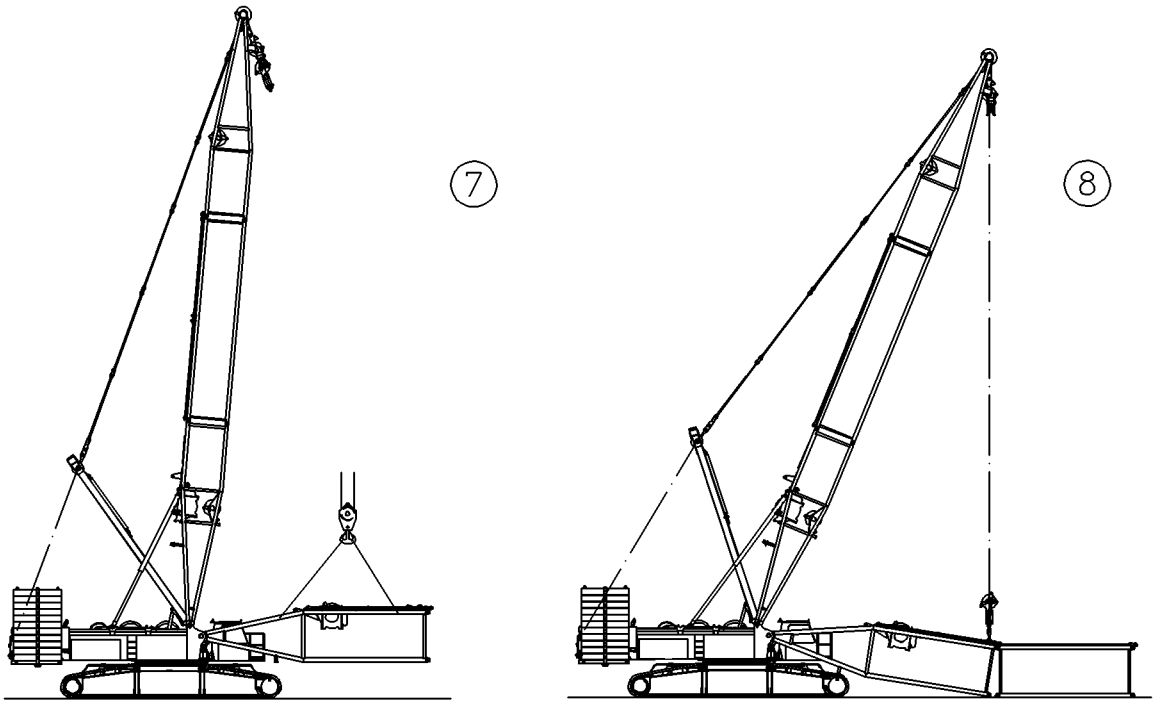
Fig. 3
Pull the pulley block with the auxiliary crane to the D-end section.

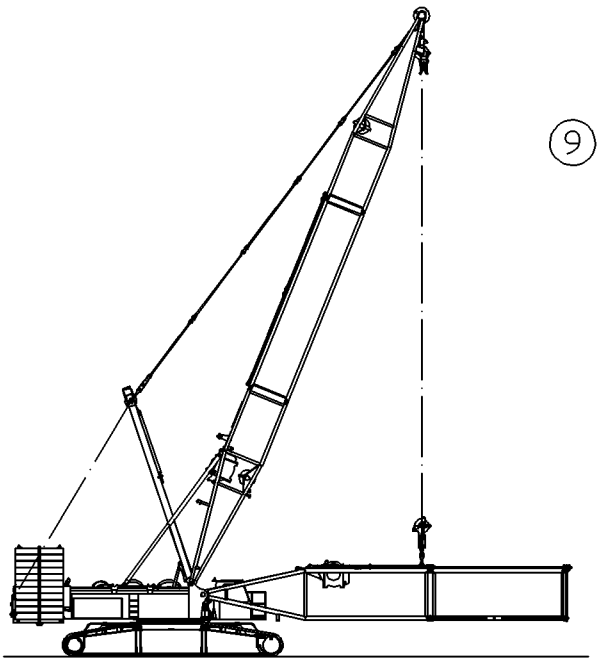
Fig. 4
Pin and secure the guy rods.

Fig. 5
Tension the guy rods.

Fig. 6
Extend the relapse cylinder.
Pull up the derrick.
Pin and secure the pulley block on the D-end section.

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1.2 Installation procedure (continuation)

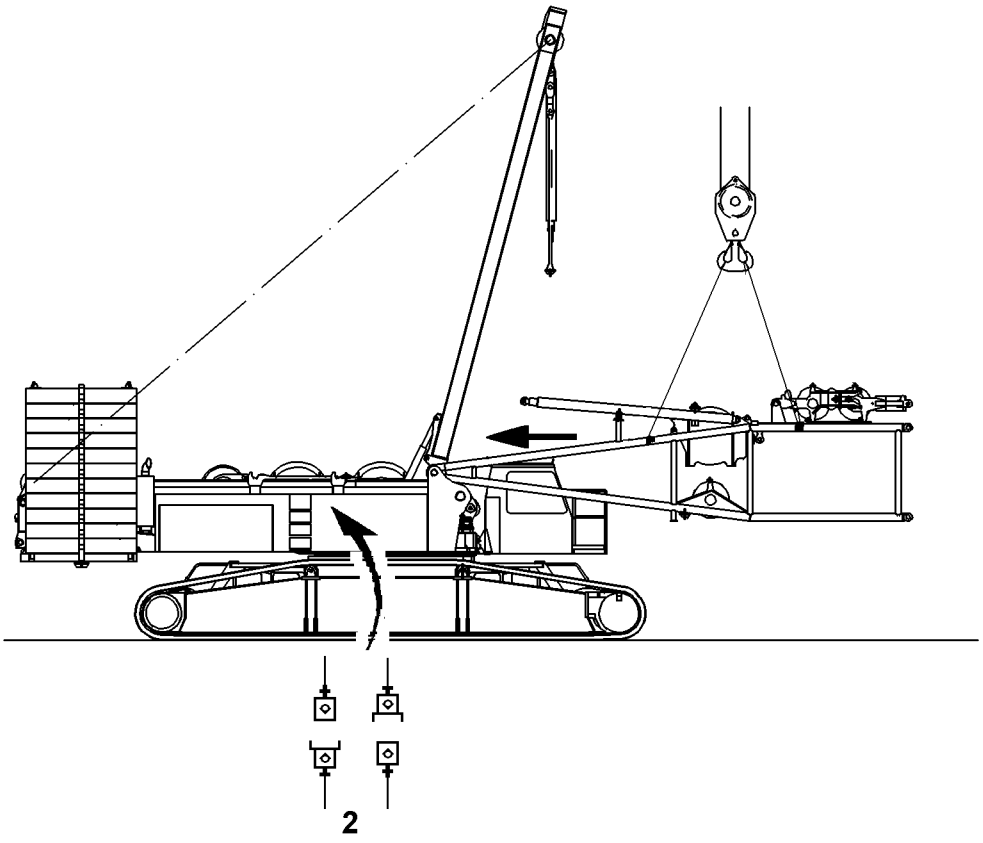
Fig. 7
Luff up the derrick.
Installation S-pivot section

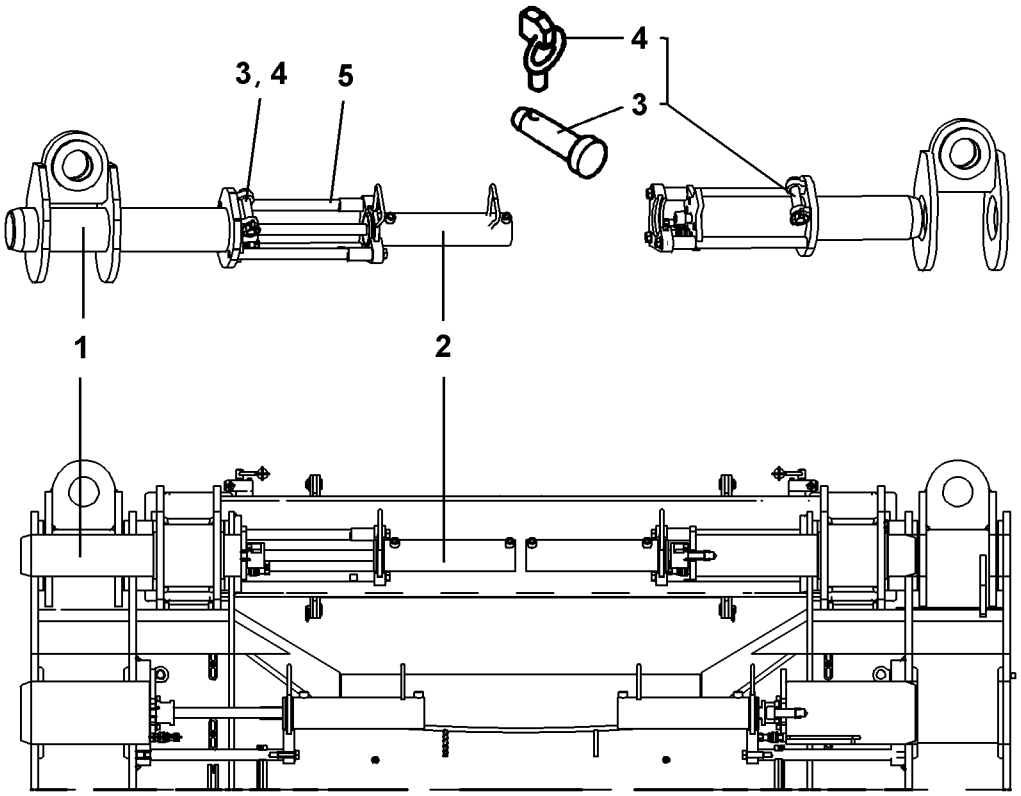
Fig. 8
Pin and secure the S-intermediate section on the S-pivot section.
Pin and secure the pulley block on the D-pivot section.

Fig. 9
Install the S-boom.

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2. Install the D - pivot section

Lift the D - pivot section with the auxiliary crane and swing it in to the pin points on the slewing platform.

Weights:

Component	Weight
D - pivot section	4400 kg
Relapse cylinder	1240 kg
Winch III with cable	5135 kg
Pulley blocks	2540 kg
D - pivot section, complete	**13300 kg**

Establish the hydraulic connection, 2× quick couplings, to the hydraulic cylinder (2) of the pin pulling device (5) on the slewing platform.

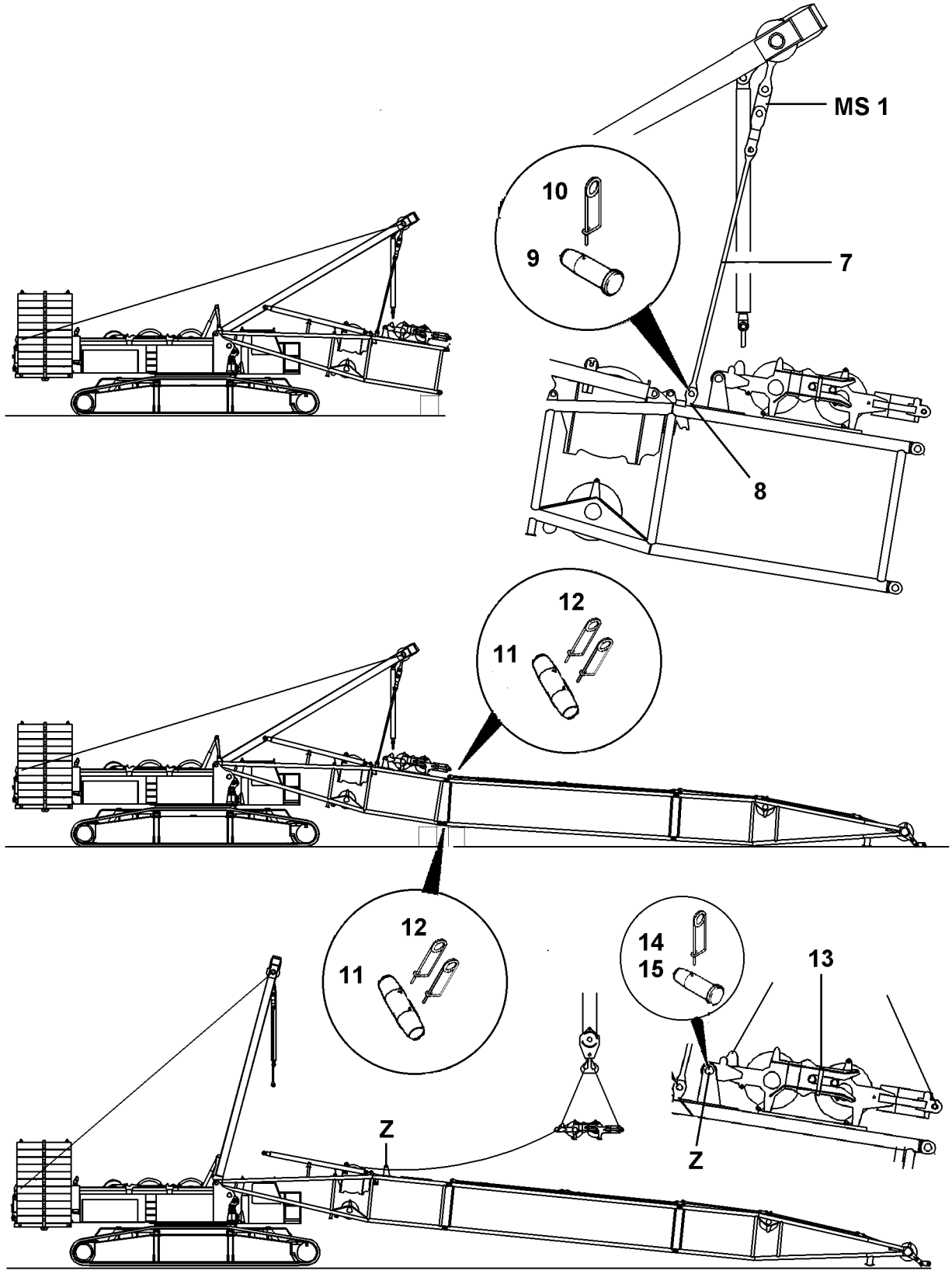
Connect the electric remote control panel.
Hang the hydraulic cylinder (2) on the pin pulling device (5).
Actuate the remote control panel and pin the D-pivot section.
The connector pins (1) are pinned with the hydraulic cylinders (2) and secured with the retaining pin (3) and hinge pin (4).

D A N G E R : To prevent inadvertent unpinning, the connector pins (1) must be secured with the retaining pins (3) and the hinge pins (4).

Place the D-pivot section on the support on the ground and remove the auxiliary crane.

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2.1 Install the derrick and the guy rods

Components

7 Guy rods from SA-bracket
8 Installation brackets
9 Pins
10 Spring retainer
11 Cone pin
12 Spring retainer
13 Pulley block
14 Spring retainer
15 Pin

Installation

Erect the SA - bracket and lower it to the front, see chapter 5.02.
Swing the installation brackets (8) up.

Pin the guy rods (7) from the SA-bracket on the installation brackets (8) on the D-pivot section and secure. Use pin (9) and spring retainer (10).

Assemble the derrick and the corresponding guy rods to the required length, pin and secure.
Pin the D- intermediate section on the D-pivot section **"on top"** with cone pin (11) and secure with spring retainer (12).
Pull up the D-pivot section with the SA-bracket (winch 4) until it can be pinned **"on the bottom"**.

Note: Note the test point 1 - "IST (ACTUAL) " - force from monitor 1 in this position, so that one knows with which force one must secure during unpinning when the derrick is removed.

Pin the D-pivot section **"on the bottom"** with cone pin (11) and secure with spring retainer (12).

Luff down the SA - bracket and unpin the guy rods (7) on the installation bracket (8) on the D-pivot section.

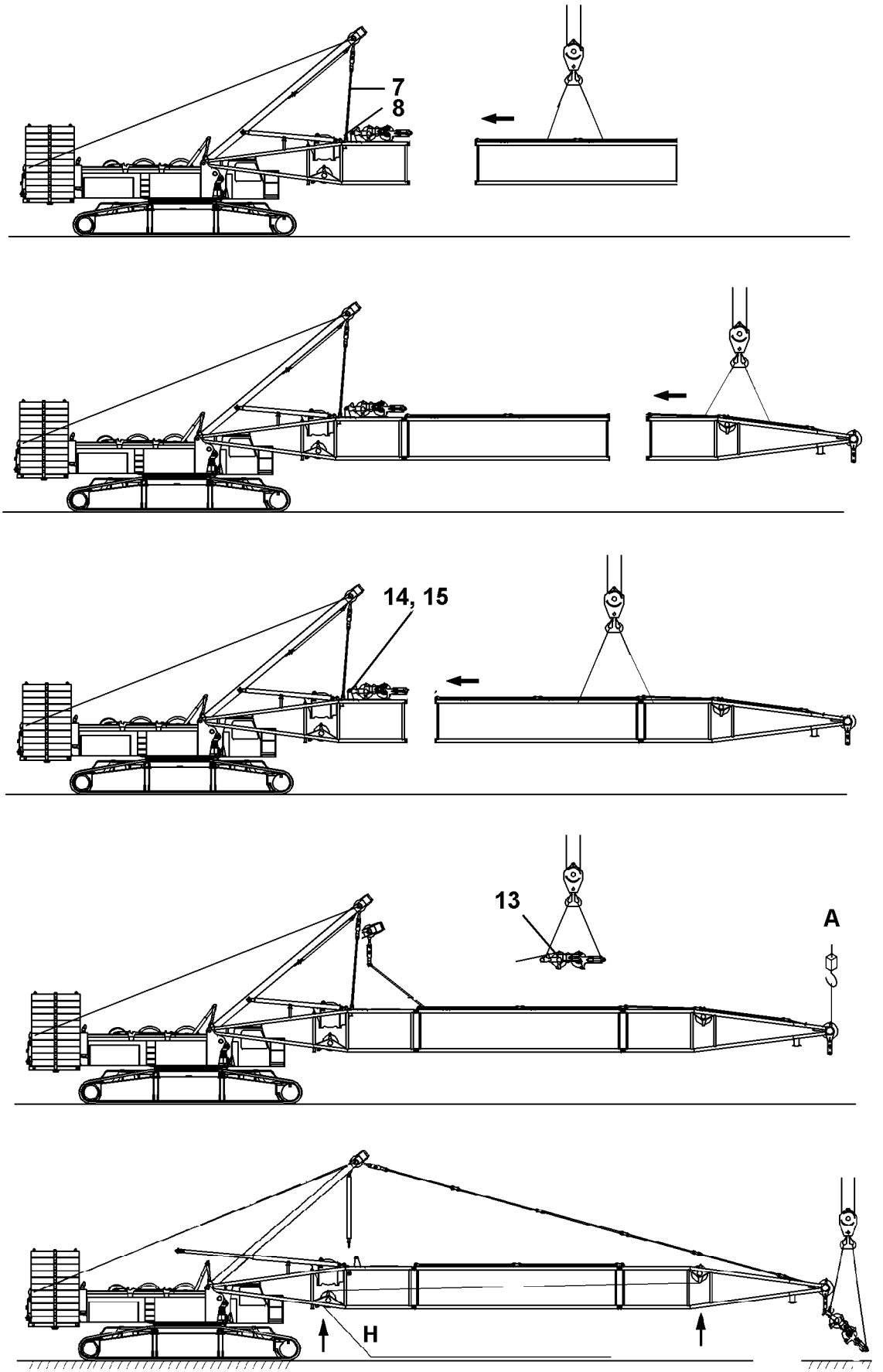
D A N G E R : Before unpinning the guy rods on the installation bracket (8) on the D - pivot section, the derrick must be pinned "on the bottom".
Nobody may remain under the lattice jib during the unpinning procedure.
There is a danger of accidents, as the derrick can suddenly fold down.

Luff up the SA-bracket and attach the auxiliary crane on the pulley block (13) and tension slightly.
Unpin the pulley block (13) on the receptacle (Z) on the D - pivot section. Loosen the spring retainer (14) and unpin the pin (15).

Note: The weight of the pulley block is approx. 2600 kg.
The pulley blocks are reeved with the rope from winch 3, see Reeving plan.

Pull the pulley block with the auxiliary crane forward while spooling out the winch at the same time, to make room for the installation of the guy rods.

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2.2 Flying assembly of the derrick boom

Assembly
If the space requirements at the job site for the assembly of the derrick are restricted or limited by buildings, then flying assembly of the derrick is possible:

Prerequisite:
- The D-pivot section hangs on the guy rods (7).
- The guy rods are pinned and secured on the assembly brackets (8) on the D-pivot section.

Installation
For flying assembly use the auxiliary crane to pin and secure the D-intermediate section and the D-end section individually or the complete D-intermediate section and the D-end section.
Insert and secure the pin **"on top" and "bottom"**.

Note: For weights of lattice sections with placed guy rods, **see Crane operating instructions, chapter 1.03 or chapter 5.03.**

D A N G E R : It is prohibited for any one to stand under the lattice sections during the assembly procedure.
Danger of accidents.

Hang the D-end section onto the auxiliary crane (A) or support it with stable materials.

Luff the SA-frame down to relieve the guy rods (7).
Unpin the guy rods (7) on the assembly brackets on the D-pivot section.

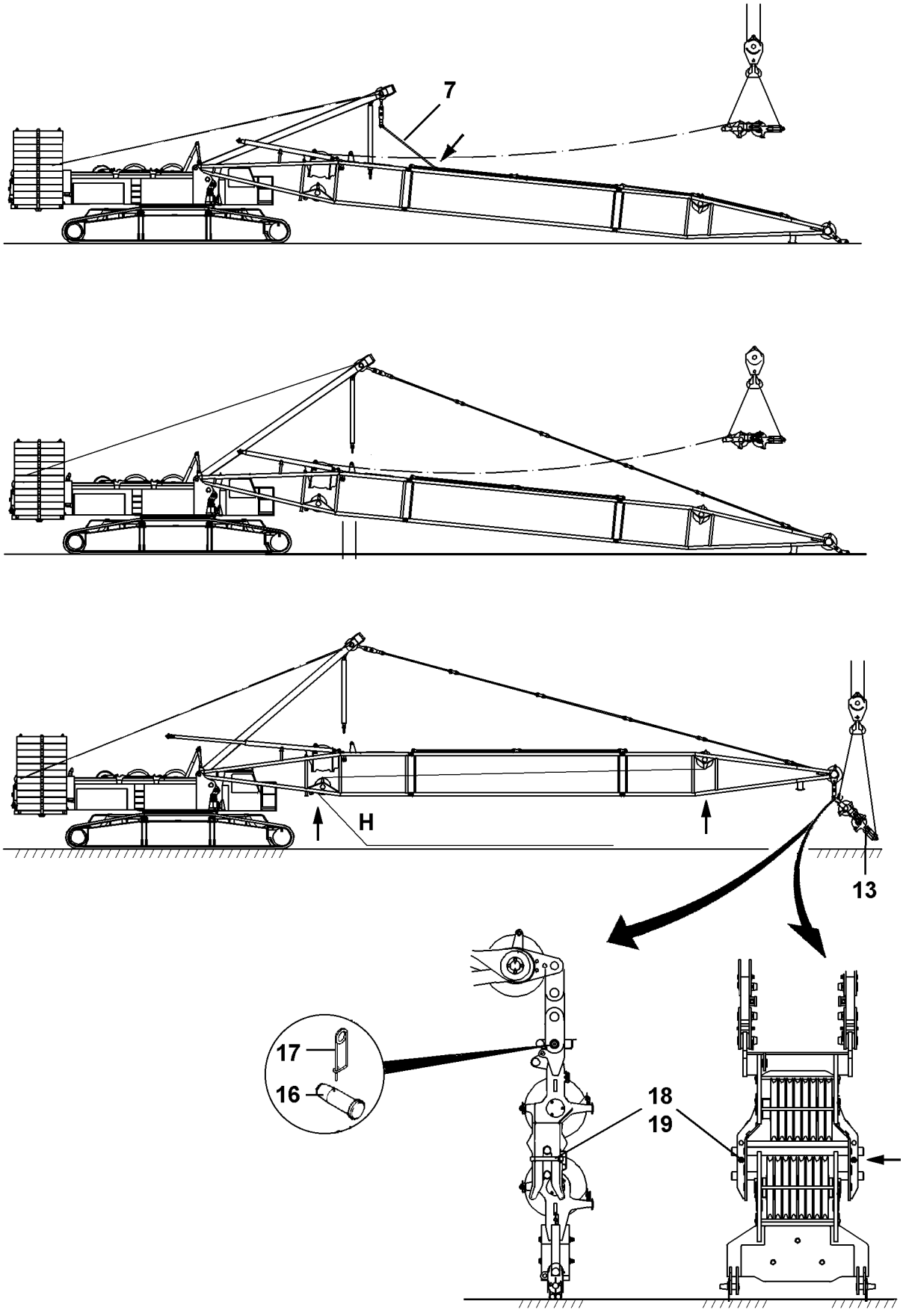
D A N G E R : The derrick must be held with an auxiliary crane (A) or be supported before the guy rods (7) may be unpinned on the assembly brackets (8) on the D-pivot section.
It is prohibited for anyone to remain under the derrick during the procedure!
Risk of accident if the derrick folds down suddenly!

Attach the auxiliary crane on the pulley block (13) and tension is slightly.
Unpin the pulley block (13) on the receptacle on the D-pivot section. Release the spring retainer (14) and unpin the pin (15).

Note: The weight of the pulley block is approx. 2600 kg.
The pulley blocks are reeved with the rope from winch 3, see Reeving plan.

Pull the pulley block with the auxiliary crane forward while spooling the control winch out simultaneously to make room for the assembly of the guy rods.

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2.3 Assembly of the guy rods

Pin and secure the guy rods from the D-end section with the guy rods (7) from the SA-frame.
The guy rods must be assembled and secured according to the assembly drawings. The numbering on the assembly drawing must be compared to the numbering on the guy rod.

D A N G E R : The pins of the derrick guy rods must be inserted from the outside to the inside.
The guy rods must be inspected regularly, see chapter 8.15.

Actuate winch IV until the guy rods are tensioned between the SA-frame and the D-end section and pull the derrick up to the horizontal.

2.4 Assembly of the pulley block

Secure the pulley block (13) on the D-end section with pin (16) and with spring retainer (17).

Lower the pulley block (13) on the ground with the auxiliary crane.
Release the spring retainers (19) on both sides and unpin the transport pin (18).

C A U T I O N : The “lower” and the “upper” pulley blocks (13) are interconnected for transport by the transport pin (18).
The pulley blocks must be lying on the ground before the transport pins may be removed.
They must be unpinned during crane operation.

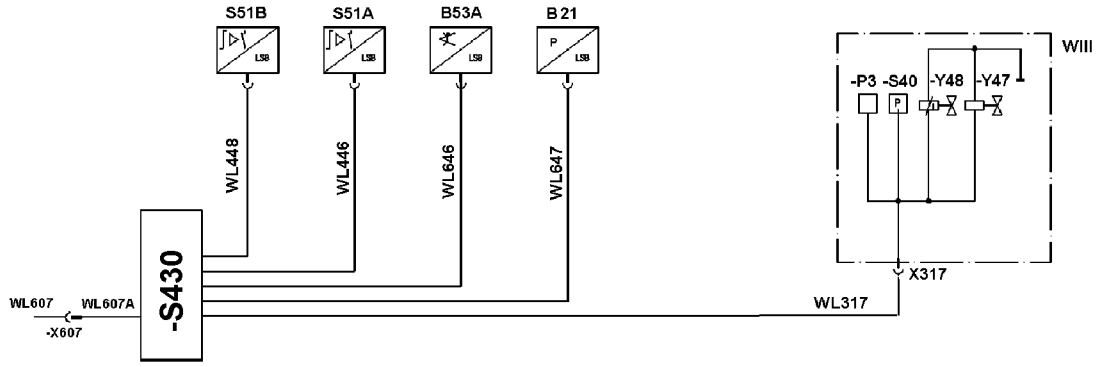
Unhook the auxiliary crane.
Pull the hoist rope (H) over the rope pulleys on the D-end section and the D-pivot section with the auxiliary winch.

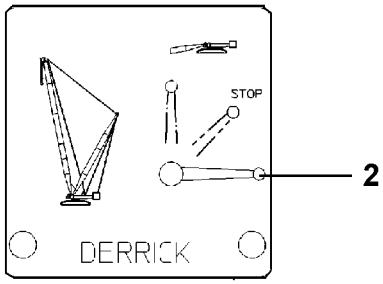
Note: For rope run, see chapter 4.15.

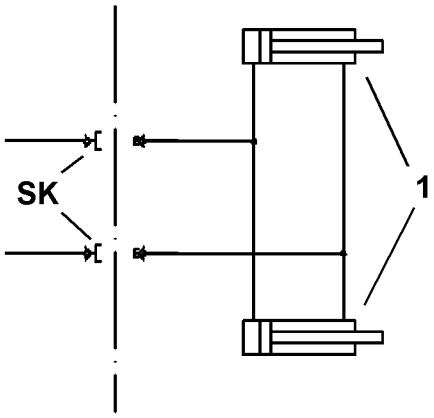
D A N G E R : Enough hoist rope must be guided over the rope pulleys to prevent the hoist rope from being pulled back due to its own weight when subsequently erecting the derrick!
Otherwise there is a risk of accident!

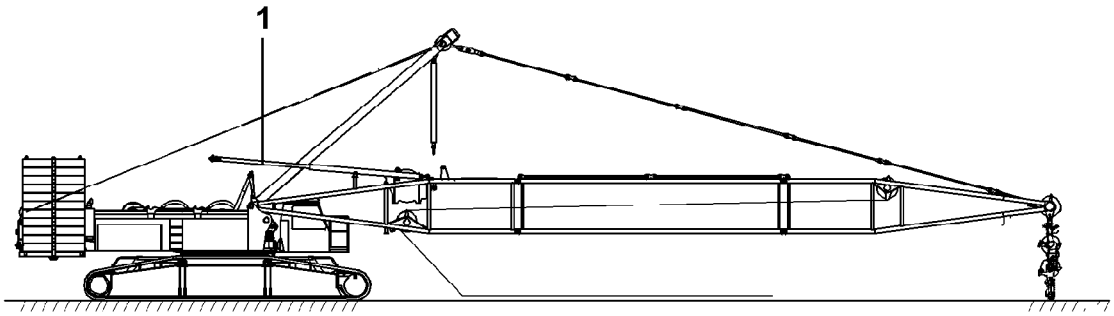
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3. Electrical connections

-S51A D-relapse cylinder on block, left
-S51B D-relapse cylinder on block, right
-B53A D- angle sensor, left
-B21 D-relapse cylinder pressure sensor

Establish the electrical connection (W607A) from the control box (S1) on the slewing platform to the connector box (-S430).
Plug in the cable plug (WL317 in -X317) for replenishing pressure switch winch III.

Hydraulic connections
Establish the hydraulic connection (2× quick couplings) to the D - relapse cylinders.

4. Function check of limit switches

Prerequisites:
- All electrical connections are established.
- The engine is running.

Function check
Cover the limit switch initiators individually on the D - relapse cylinders with a metal plate.
The D - winch movement (W IV) **"spool up"** must turn off.
The symbol must appear on the LICCON monitor.

C A U T IO N : The limit switch functions must be checked individually before crane operation.
Check the manually as described below.
The function of the individual limit switch initiators must be checked in the test system - See chapter 7.10 Diagnostics, paragraph 3.

5. Extend the D - relapse cylinder(1)

Extend the piston rod of the relapse cylinders by actuating the ball cock lever (2).

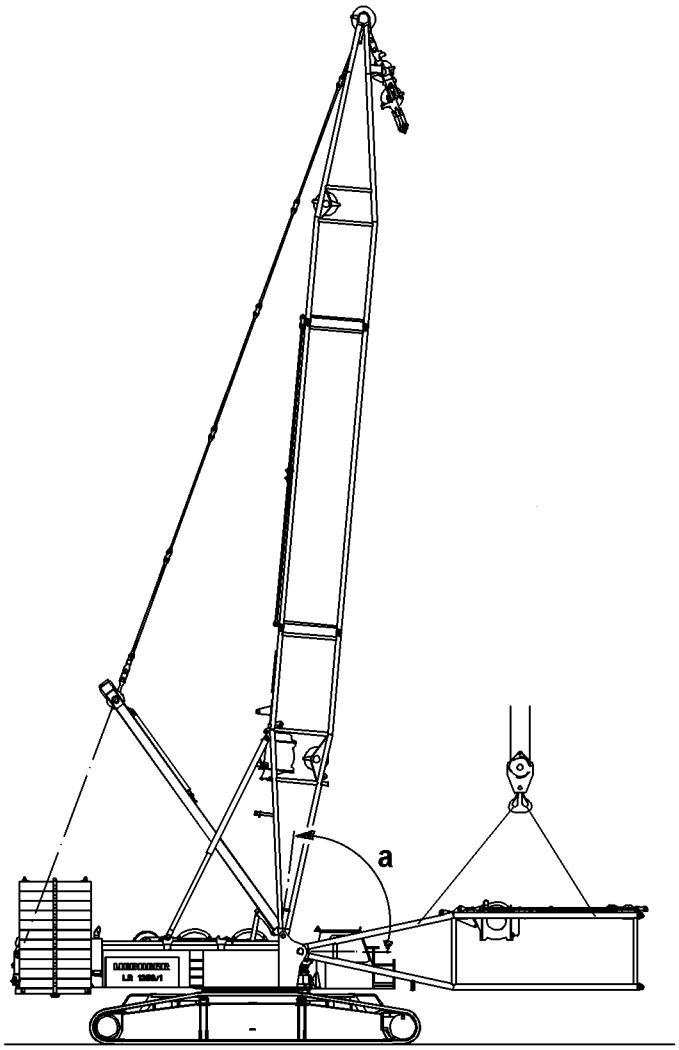
Lever positions:

Lever horizontal	=	Crane operation, extend relapse cylinder
Lever vertical	=	Installation, retract relapse cylinder
Lever 45°	=	Relapse cylinder-STOP- cannot be extended or retracted

D A N G E R : The relapse cylinders must be extended before erection.
The ball cock lever must be secured in horizontal position to prevent it from being moved inadvertently during crane operation.

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6. Erect the derrick

Erect the derrick to the point (approx. 75° to max. 85°), where the boom can be installed without restriction.

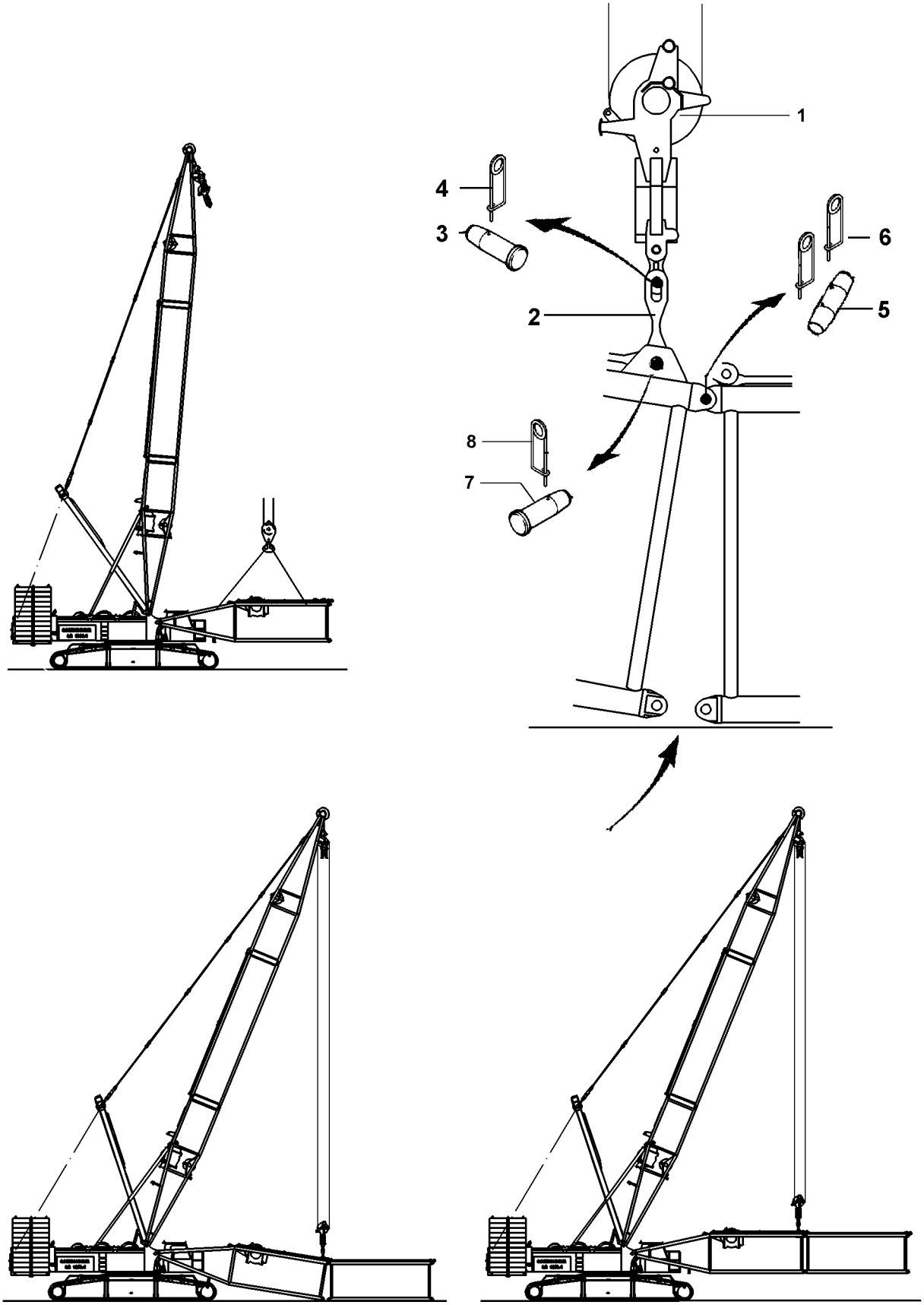
D A N G E R: The derrick may not be erected to more than max. 85 ° to the horizontal. Otherwise there is a danger of tipping the crane over!

7. Install the S-pivot section

Note: For installation of the S-pivot sections, see chapter 5.04, S/SL- boom combination.

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7.1 Install the boom

Prerequisite:
The guy rods (2) are pinned and secured on the brackets. Pin (7) is pinned and secured with spring retainer (8).

Installation
Lower the derrick to the front and lower the lower pulley block (1) until it is over the short guy rods (2).
Pin and secure the pulley block (1) on the guy rods (2).
Use pin (3) and spring retainer (4).

Assemble, pin and secure the boom to the required length.

Note: For installation of boom, **see chapter 5.04**, L/LLS/SL-boom combination.

Pin the first intermediate section on the L/S - pivot section **"on top"** with cone pin (5) and secure with spring retainers (6).
Pull up the boom on the L/S - pivot section with the pulley block and pin **"on the bottom"** with cone pin (5) and secure with spring retainers (6).

Note: Note the test point 1 - "IST (ACTUAL) " - force from monitor 1 in this position, so that one knows with which force one must secure during unpinning when the boom is removed.

C A U T I O N: Max. permissible total force 43t on test point MS 1

D A N G E R: The pins on the lattice sections must be secured with spring retainers.
The following maximum boom lengths can be lifted with the pulley block :

- S 108m, SL 120m and L 108m, only with S-guy rods

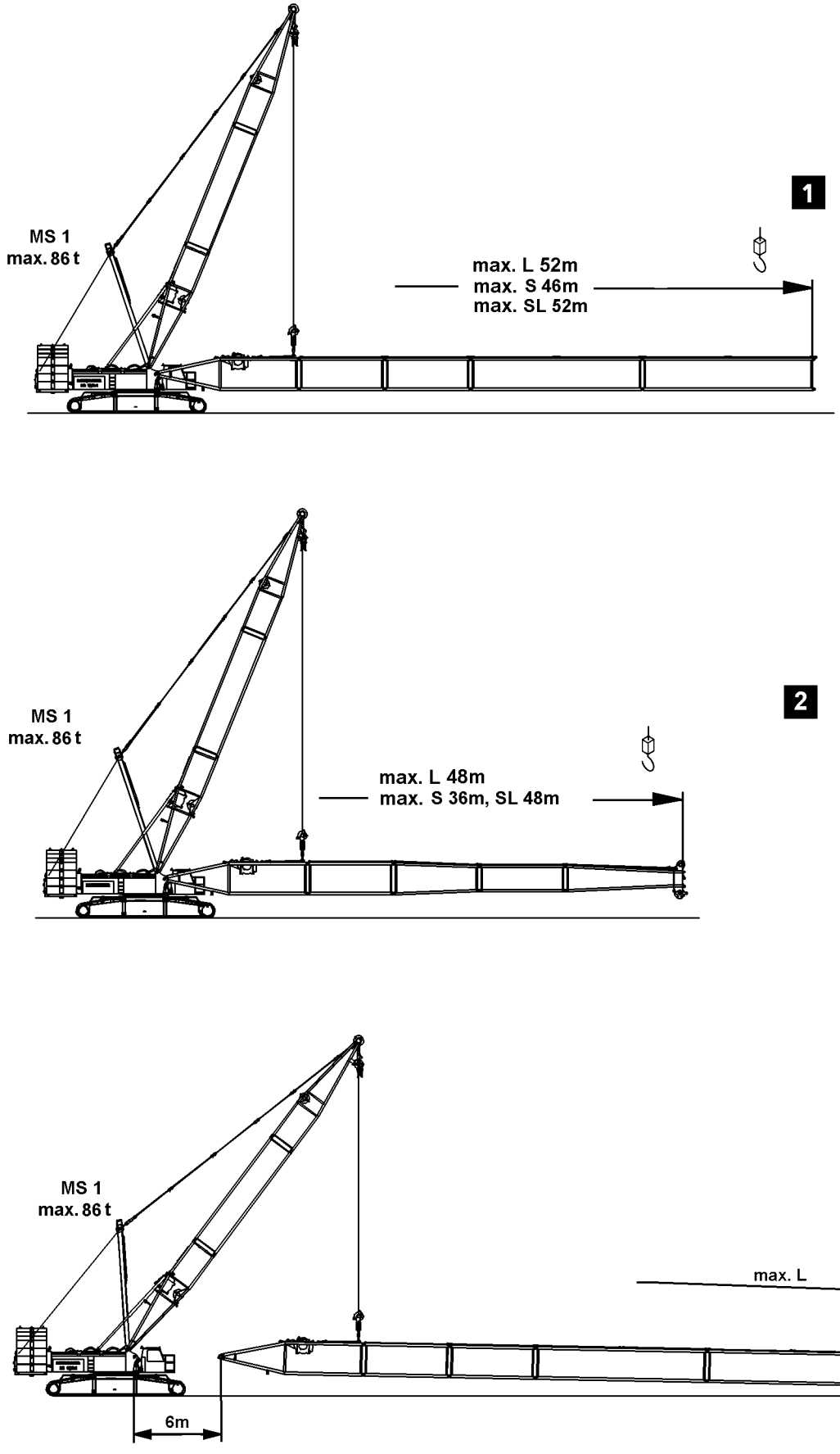
The end section may not be lifted, it must remain on the ground.
If this is not observed, damage can occur.

Relieve the guy rods (2) by lowering the pulley block (1) and unpinning the pulley block (1).

D A N G E R: Before unpinning the pulley block, the boom must be pinned "on the bottom".
Otherwise there is a danger of accidents, as the boom can suddenly fold down.
For removal and installation of the lattice sections, they must be supported with suitable, stable materials.
Nobody may remain under the lattice jib during the pinning and unpinning procedure.
There is a danger of accidents!

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7.2 Flying installation of the L/LLSL / S -boom

Installation
If space is severely limited at the job site for the installation of the derrick, or is restricted due to nearby buildings, etc. then it is possible to install the boom up to a **max. lengtht**in flying mode:

Fig. 1	**- max. S 46 m**	
	- max.SL 52m	
	- max.L 52m	**- without end section, without hook block**
		- with S - and WA-bracket II guy rods
		- slewing platform ballast 65t
		- min. central ballast 8t
		- max. permissible total force 86t on test point MS 1
Fig. 2	**- max. S 36 m**	**- with end section, without hook block**
		- with S - and WA-bracket II guy rods
	- max. SL 48m	**- with S - guy rods**
	- max. L 48m	**-with L - and NA- bracket II guy rods**
		- slewing platform ballast 65t
		- min. central ballast 8t
		- max. permissible total force 86t on test point MS 1
Fig. 3	**- max. S 84 m**	**- with end section, without hook block**
		- with S - and WA- bracket II guy rods
	- max. S 108m	**- with S - guy rods**
	- max. SL 120m	**- with S - guy rods**
	- max. L 108m	**- with L - and NA- bracket II guy rods**
		- max. permissible total force 86 t on test point MS 1 with slewing platform ballast 65 t and central ballast 8 t

Prerequisites:
- The pivot section is pinned on the guy rods of the pulley block and the installation brackets (2), secured and pulled up into horizontal position.

Installation
For a flying installation, the intermediate sections can be pinned and secured piece by piece with the auxiliary crane or the completely assembled boom can be pinned and secured on the pivot section.
Pin and secure the pin "**on top**" and "**on the bottom**".

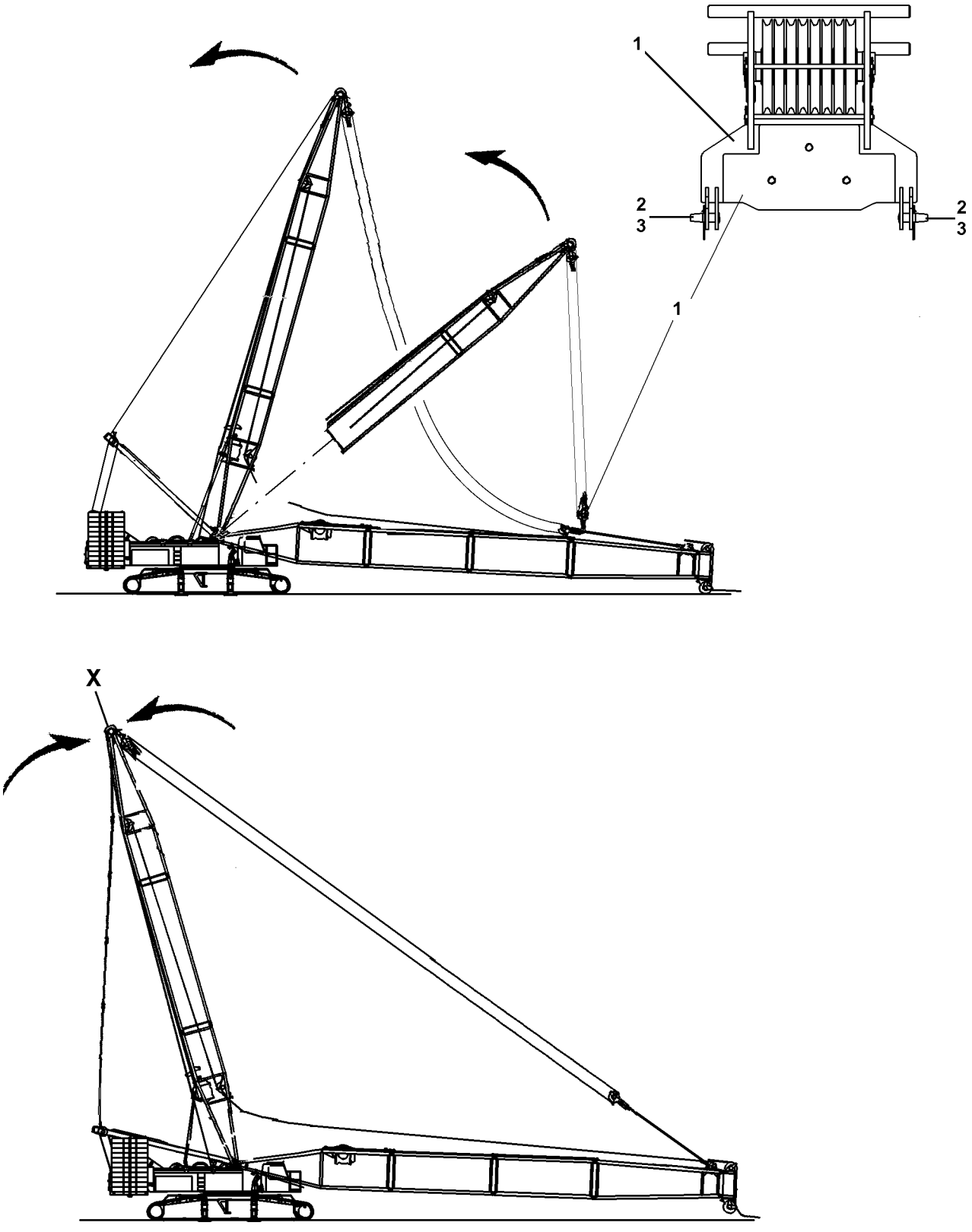
Note: For the weight of the lattice sections with placed guy rods, see chapter 5.03

D A N G E R: **Note the maximum permissible boom lengths for flying installation. If this is not observed, there is danger of accidents!**

Attach the boom on the front on the auxiliary crane or support it from below with stable materials. Relieve the pulley block by lowering it, unpin the guy rods on the pivot section and pin and secure with the guy rods from the end section.

D A N G E R: **The boom must be held with an auxiliary crane or supported from below, only then may the pulley block on the installation bracket (2) on the pivot section be unpinned.**
Nobody may remain under the lattice jib during the unpinning procedure of the lattice sections. This is strictly prohibited!
There is a danger of accidents, as the lattice section might suddenly fold down!

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8. Installation of the guy rods

When the boom is installed, lower the derrick to the front, until the pulley block is above the guy rods from the L/S end section, which are to be connected.
Lower the pulley block (1) by spooling out the winch III to the boom and pin and secure with the guy rods.
Use pin (2) and spring retainer (3).

C A U T I O N: The guy rods must be installed and secured according to the installation drawings. Compare the numbers on the installation drawing with the numbers on the guy rod.

D A N G E R: The pins of the guy rods must be inserted from the inside to the outside. If this is not observed, the hoist cable will scrape on the pins.
The guy rods must be checked regularly, see chapter "Inspection and maintenance of the guy rods".

Erect the derrick to the corresponding operating position (X °, 111,1°/115°/126°) while spooling out the winch III (S- boom adjustment) at the same time so that the boom is not pulled up.
When the derrick is in operating position, the guying between the derrick and the boom head must be tensioned.

Guide the hoist cable over the cable pulley on the end section.

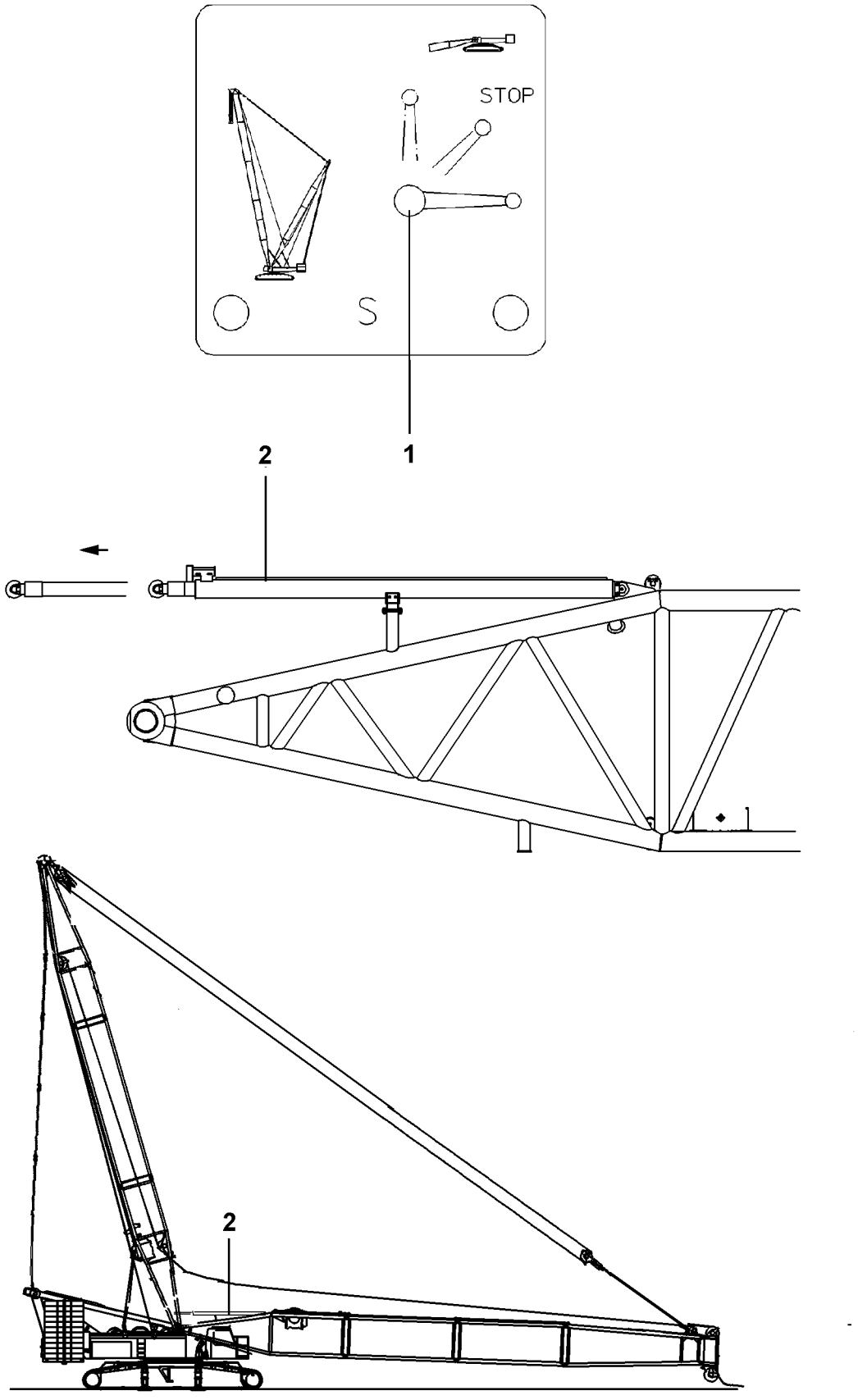
Flying installation

Remove the auxiliary crane on the boom head.

D A N G E R : For flying installation, the boom must be held with the auxiliary crane (A) until the guying between the derrick and the boom head is tensioned and the auxiliary crane is relieved.
Only then may the auxiliary crane be removed!

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9. Erection / take down

The boom combinations must be erected or taken down according to the **erection and take down charts**.

D A N G E R: The erection and take down procedure must be carried out according to the data given in the erection and take down charts!
If this is not observed, the crane will be overloaded or tip over.

Prerequisites:

- The crane is horizontally aligned.
- The counterweight has been installed on the slewing platform, according to the load chart.
- The boom is installed according to the load chart and the instructions given in the operating manual.
- All limit switches are correctly installed and fully functioning..
- All pin connections are secured.
- The hoist cable has been placed into the cable pulleys correctly, and is secured with the cable retaining pins to prevent it from jumping out.
- There are no persons within the danger zone
- There are no loose items on the boom and the lattice jib.
- In winter: The boom and the lattice jib and their components (limit switches, cable drums, airplane warning light, wind velocity sensor, etc.) must be free of snow and ice.

D A N G E R : Incorrectly mounted or non-functioning limit switches as well as falling items, such as pins, spring retainers, ice, etc. can cause accidents!
The derrick must be in operating position and the S - relapse cylinder (2) must be extended before the boom may be pulled up.
During the erection procedure, it must be ensured that the hoist cable is not pulled up too and falls to be rear!

9.1 Extend the S - relapse cylinder (2)

Establish the hydraulic connection from the slewing platform to the S - relapse cylinders.
Move the ball cock lever (1) into horizontal position and extend the piston rod of the S - relapse cylinder.

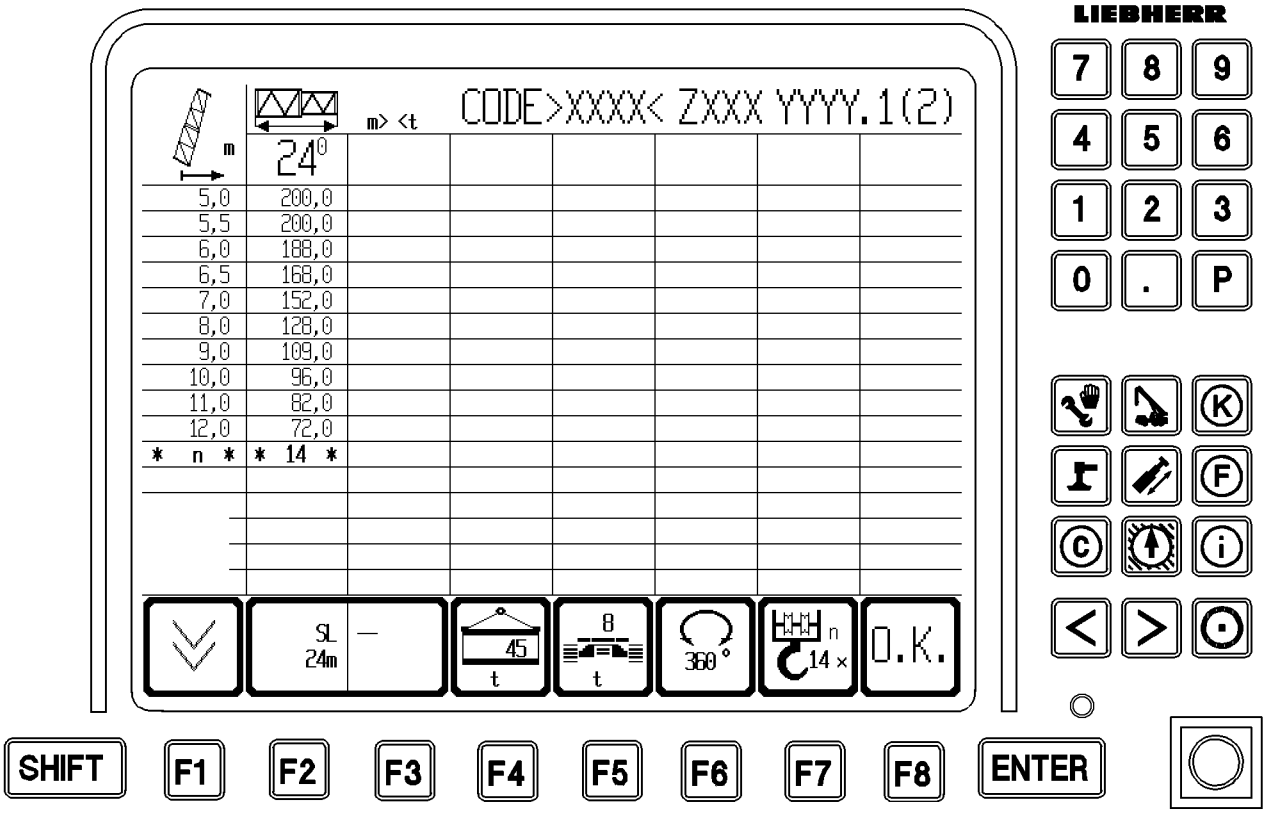
Lever positions:

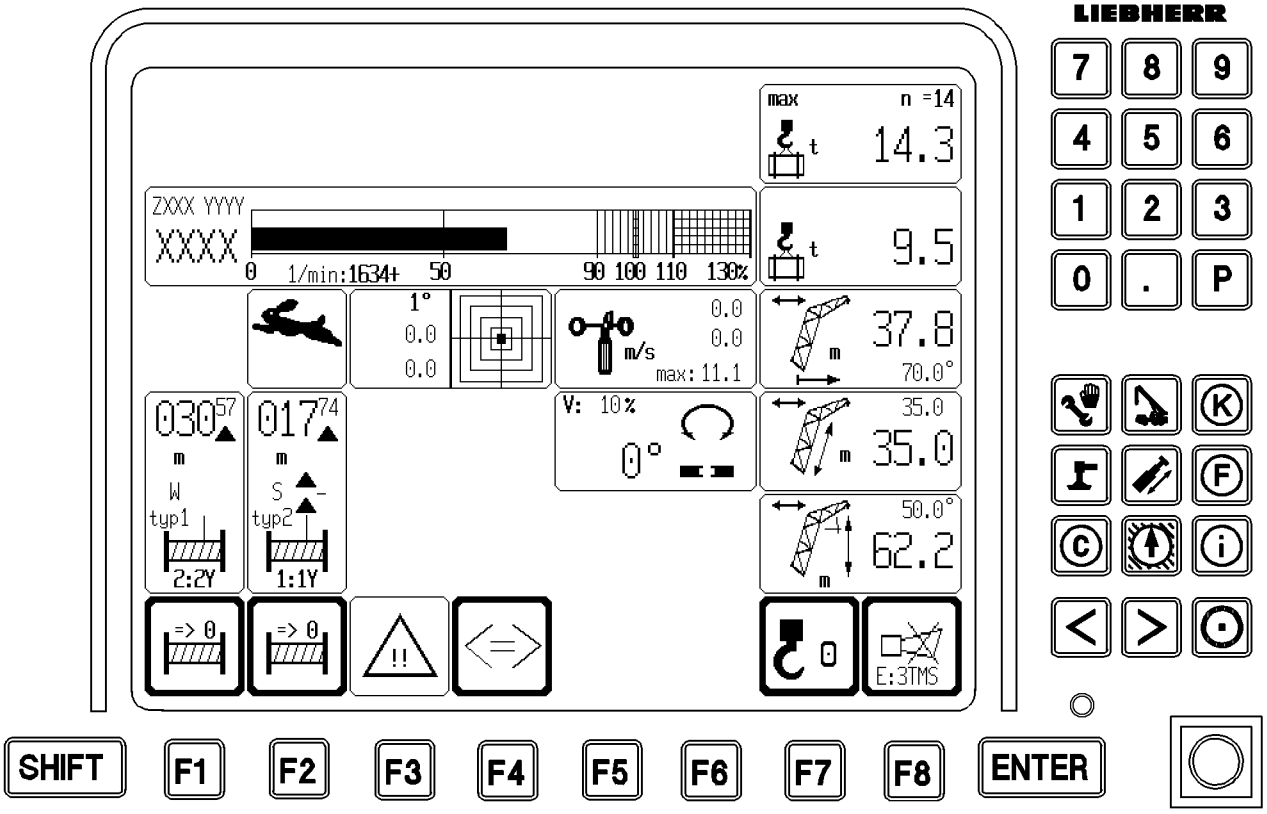
Lever horizontal	=	Crane operation, extend relapse cylinder
Lever vertical	=	Installation, retract relapse cylinder
Lever 45°	=	Relapse cylinder-STOP- cannot be retracted or extended

C A U T I O N : The relapse cylinders may only be extended if the derrick is fully erected. If this is not observed, they will collide with the D - relapse cylinders.

D A N G E R : The relapse cylinders must be extended before erection.
The ball cock lever must be secured in horizontal position to prevent it from being moved inadvertently during crane operation.

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9.2 Erection procedure

Note: Carry out the erection procedure according to the erection and take down charts.

The LICCON overload protection has been set according to the data in the load chart.
The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
The configuration status has been entered into the LICCON computer system.
- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.

D A N G E R : **Danger of toppling or destroying the crane!**
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

9.2.1 Erection

Luff up the boom until the end section lifts off the ground.
Reeve the hoist rope between the pulley head on the end section and the hook block and secure on the fixed point – see **Chapter 4.06 and the Reeving plans**.
Attach the hoist limit switch weight.
Luff the boom up to the **lowest** operating position.

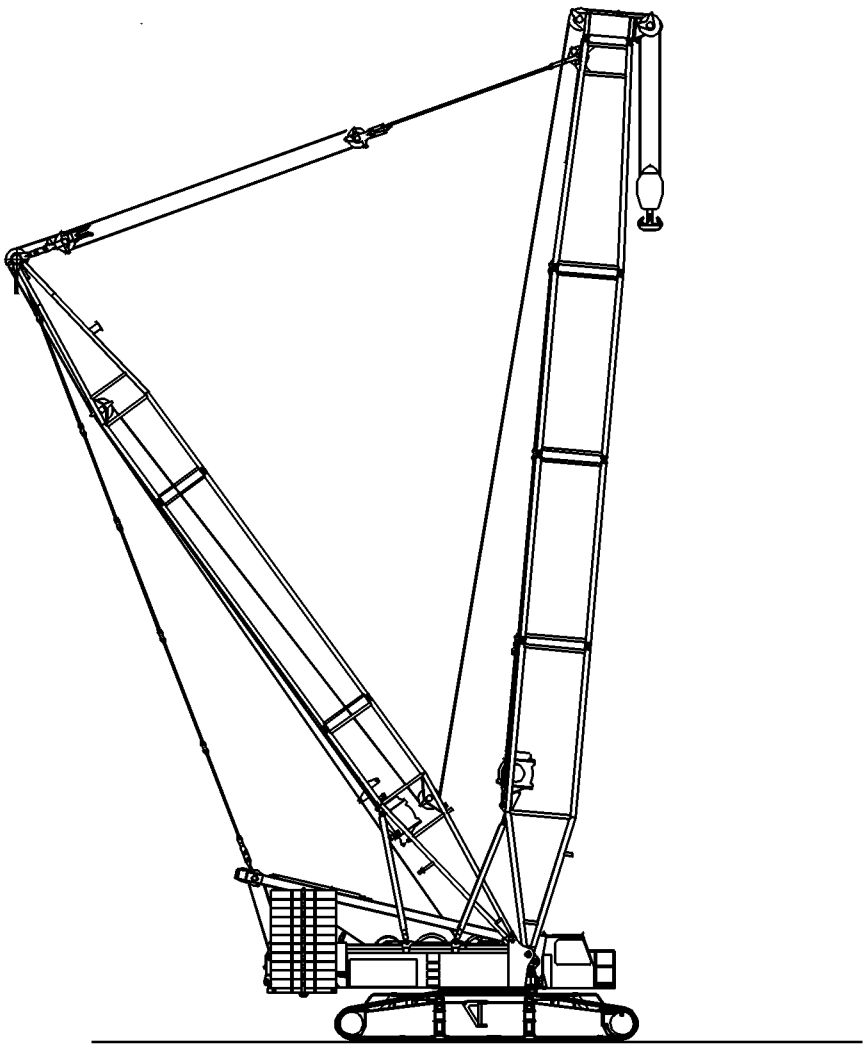
D A N G E R : **When erecting long booms, the hook block must remain on the ground up to a certain boom angle range to the horizontal, otherwise the crane will be overloaded!**
Boom angle range – see Erection and take down charts.

Note: If a range is reached during erection which is monitored by the load chart, then the LICCON overload protection is activated.
The **lowest** operating position has been reached if the displays turn off and a load display - t - appears in the “MAX LOAD” icon instead of question marks (“? ? ? ?”).
The Assembly icon in the LICCON monitor turns off.

D A N G E R : **Danger of toppling or destroying the crane!**
If the overload protection is deactivated, there is no additional protection against crane overload!
The set up key (D) bypasses the safety devices!
The radii specified in the load chart may not be exceeded nor fallen below, even if there is no load on the hook!
Crane operation with deactivated overload protection is prohibited!

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10. Crane operation with D - boom combination

D A N G E R: The notes in:
Chapter 4.02 "LICCON overload safety system,
Chapter 4.05 "CRANE OPERATION " and
Chapter 4.08 "WORKING WITH A LOAD "
must be observed.

Prerequisites :
- The LICCON overload protection has been adjusted according to data in the load chart.,
- The current configuration status corresponds to the data in the respective load chart.
- The configuration status has been entered into the LICCON computer system.
  The Assembly icon on the LICCON monitor turns off.
  The LICCON overload protection is activated.

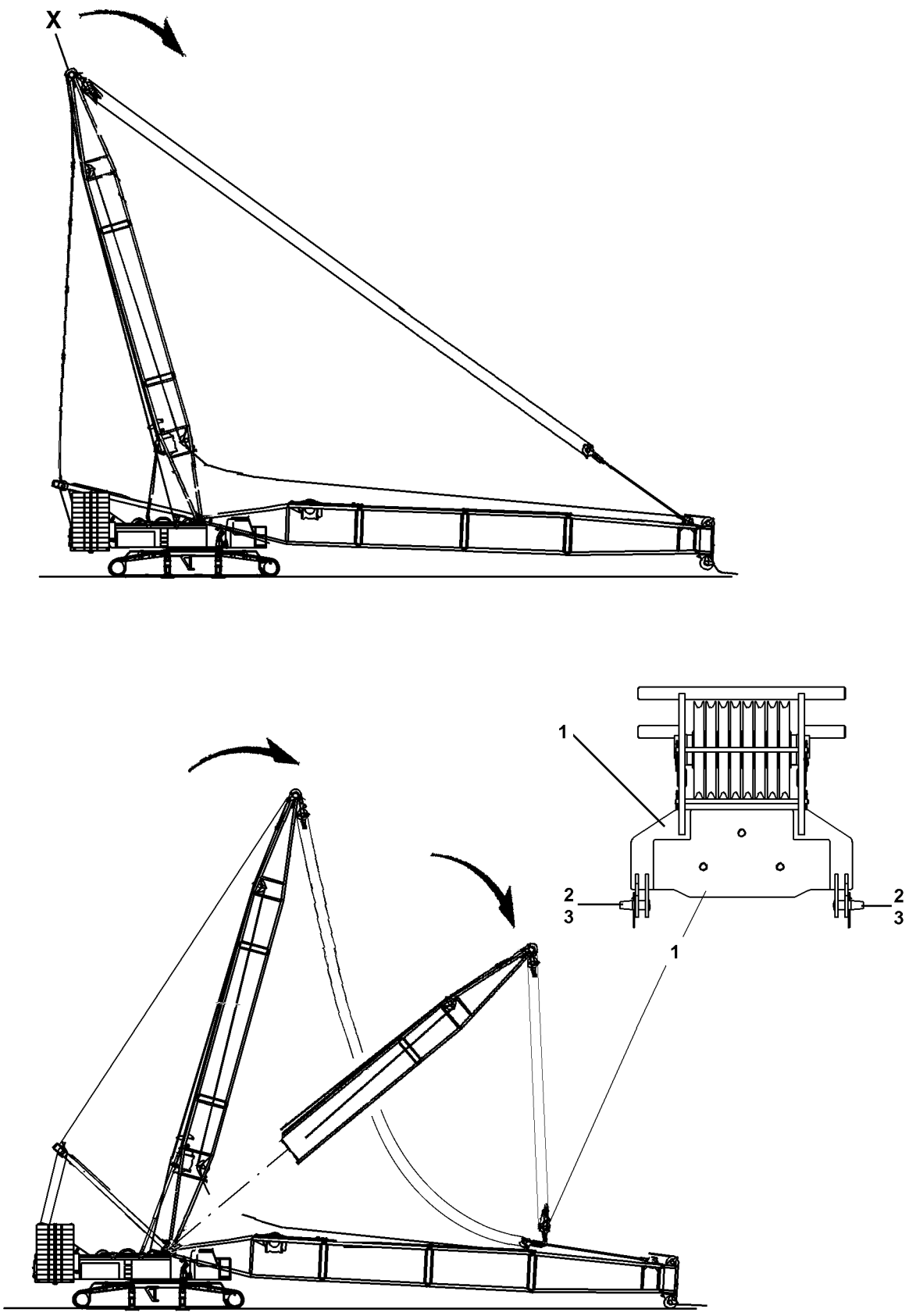
D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

D A N G E R: Check the horizontal position of the crane before and during operation.
If the crane operator leaves the cab, even if only for a short time, then he is obligated, before starting to work again, to check the operating mode settings and to readjust them, if necessary.

Adjustments / checks
Check the function of the overload safety system by actuating the operating positions **"top"** and**"bottom"**.
Check the function of the hoist limit switch **"top"** by running against the hoist limit switch weight.
Check the function of the limit switch **"boom steep"** by running against the relapse cylinders.

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11. Place down the L/S - boom

Note: Carry out the take down procedure according to the erection and take down charts.

The LICCON overload protection has been set according to the data in the load chart.
The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
The configuration status has been entered into the LICCON computer system.

Luff the L/S-boom down until just before the **lowest** operating position.

Note: When the **lowest** operating position is reached, the luff down movement is shut off.

- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

C A U T I O N: When luffing down, the hoist winch must be spooled out at the same time to prevent the hook block from colliding with the pulley head.

Actuate the manual control lever and continue to luff down the boom until the hook block touches the ground.

D A N G E R: When taking down long booms, the hook block must be lowered to the ground in a certain boom angle range to the horizontal, otherwise the crane will be overloaded!
Boom angle range - see Erection and take down charts.

Remove the hoist limit switch weight. Unreeve the hook block.

D A N G E R : When unreeving the hoist cable, no persons may be within the danger zone.

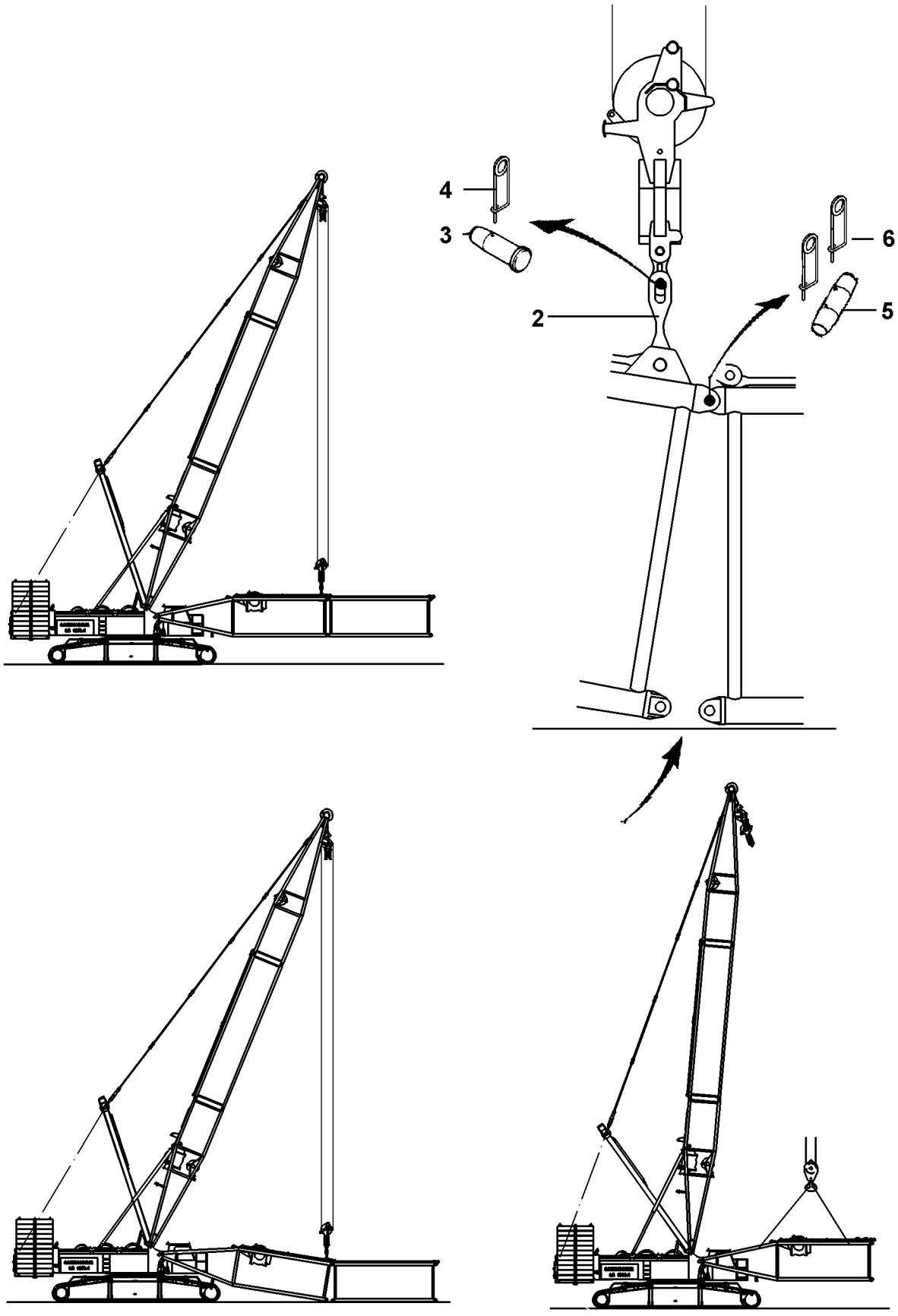
Continue to luff down the S- boom until the end section lies on the ground.

C A U T I O N: The derrick must remain in operating position until the end section lies on the ground.

Luff down the derrick
By spooling out winch 4, luff down the derrick to the front until the guy rods (X) are lying on the lattice sections.
Unpin the pulley block (1) on the guy rods. Remove the spring retainer (3) and unpin the pin (2).
Place the guy rods for transport on the corresponding lattice sections and secure.

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11.1 Remove the L/S-boom

Erect the derrick again until the lower pulley block is over the L/S - pivot section.
Pin and secure the pulley block (1) on the guy rods (2).
Use pin (3) and spring retainer (4).
Hold the L/S - pivot section with the pulley block (1) and unpin the pivot section **"on the bottom"**.

Note: With the intake gear, pull until the same F1 - "Ist" - force is set as was noted at installation.
The pin can then be pulled easier.
Otherwise pins and eyes on the lattice sections will wear prematurely or the pin can get stuck.

C A U T I O N: Max. permissible total force 43t on test point MS 1

Set the L/S - pivot section on the ground and unpin the intermediate section on the pivot section **"on top"**.

D A N G E R: Before unpinning, the boom must hang on the pulley block (1).
Otherwise there is a danger of accidents, as the boom can suddenly fold down.
Nobody may remain under the lattice jib during the pinning and unpinning procedure. This is strictly prohibited!
With the S - pulley block, the following max. boom lengths can be lowered:
- S 108m and SL 120m, only with S-guy rods
There is a danger of accidents!

Unpin the pulley block (1) on the guy rods (2).
Unpin the lattice sections and remove.

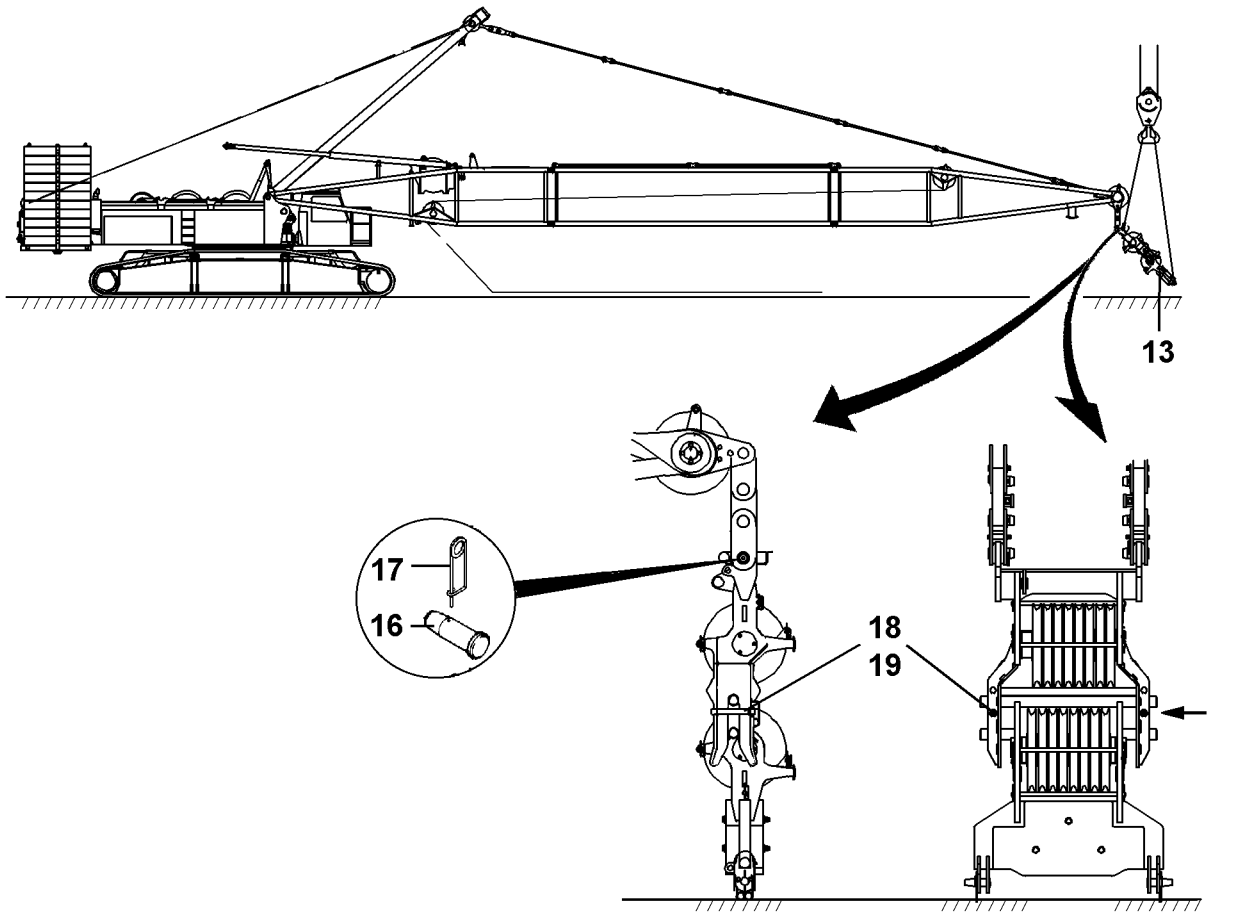
Remove pivot section
Erect the derrick to the point (approx. 75° to max. 85°) where the pivot section can be removed without restrictions.
Remove the pivot section with the auxiliary crane on the slewing platform.

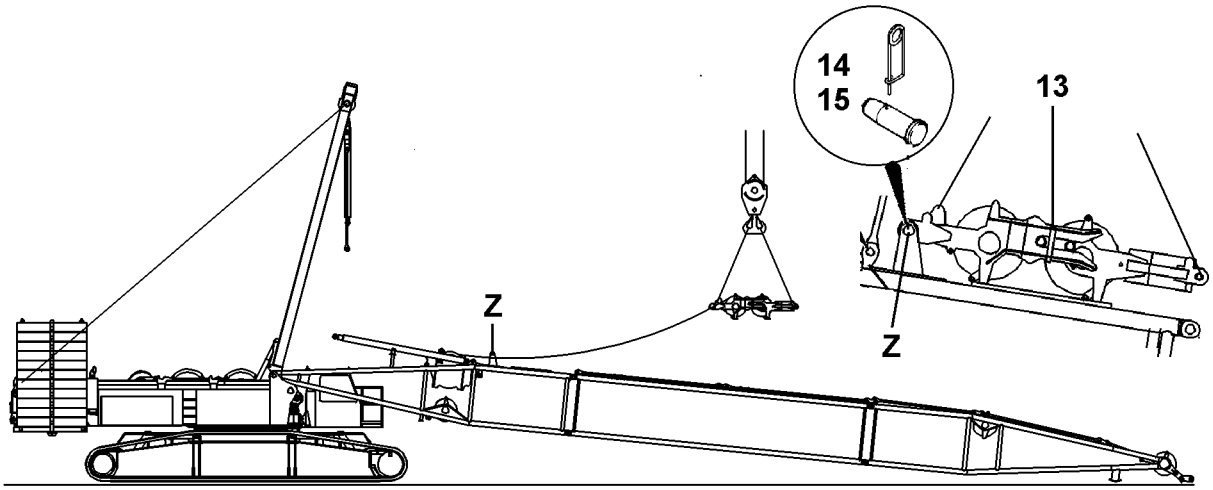
Note: The removal of the pivot section is in reverse order as for installation.

C A U T I O N: The warning and danger notes for installation must also be observed for removal!

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12. Place down and remove the derrick

12.1 Remove the pulley block and the guy rods

Pull the pulley block (13) to the upper pulley block on the D - end section by spooling up winch III.

C A U T I O N : A guide must watch and monitor the spooling up of winch III. When spooling up winch III, there is a danger of collision between the pulley block and the D - end section!

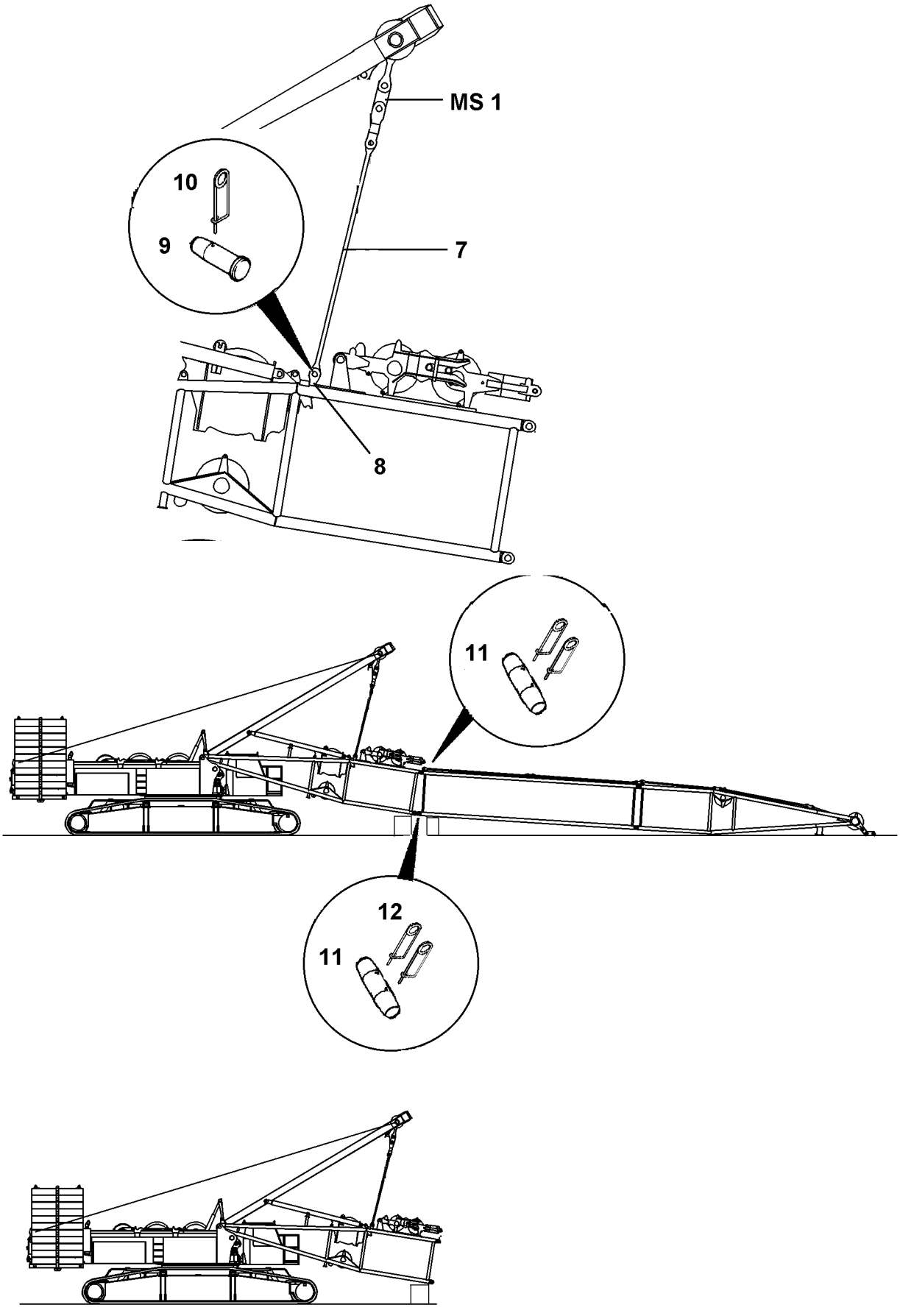
Lower the derrick to the horizontal.
Connect the "lower" and "upper " pulley block with the transport pin (18) on both sides.
Hang the S - pulley blocks (13) on the auxiliary crane and unpin on the D - end section. Release the spring retainer (17) and unpin the pin (16).

Note: The weight of the pulley blocks is approx. 2600 kg.

Continue to luff down the derrick until the end section is on the ground or on the support.
Remove the guy rods. Place them on the lattice sections and secure.
Pull the pulley block to the D-pivot section while spooling up winch III at the same time, pin and secure in the receptacle (Z).
Use pin (15) and spring retainer (14).
Remove the auxiliary crane.

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12.2 Remove the derrick

Lower the SA - bracket to the front, **see chapter 5.02**.
Pin and secure the guy rods (7) from the SA - bracket on the installation bracket (8) on the D - pivot section.
Use pin (9) and spring retainer (10).
Luff up the SA - bracket and tension the guy rods (7).

Note: With the intake gear, pull until the same F1 - "Ist" - force is set as was noted at installation.
The pin can then be pulled easier.
Otherwise pins and eyes on the lattice sections will wear prematurely or the pin can get stuck.

Unpin and release the D-pivot section **"on the bottom"**.

D A N G E R: Before unpinning the D - pivot sections "on the bottom", the guy rods (7) must be pinned and tensioned on the installation bracket (8).
Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections.
The pivot section must be supported
This is strictly prohibited.
There is a danger of accidents, as the derrick might suddenly fold down!

Place the D - pivot section onto the support on the ground.

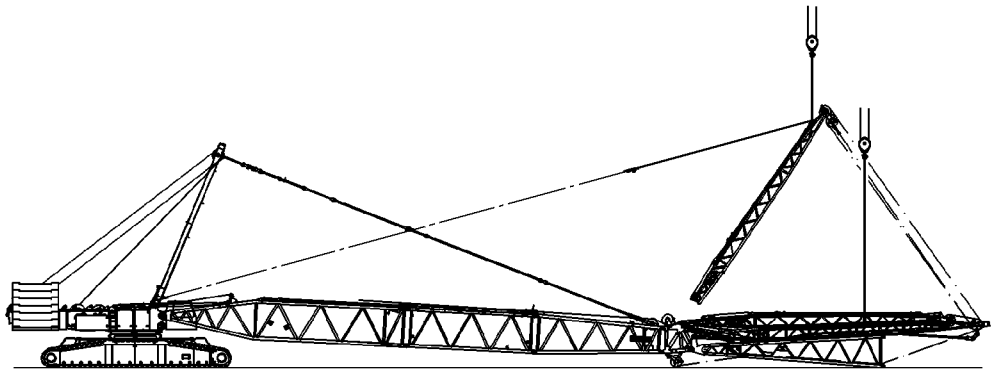
C A U T I O N: The pivot section must be supported, so that it does not lie on the slewing platform and is damaged!

Remove the D - end section and the D - intermediate section.

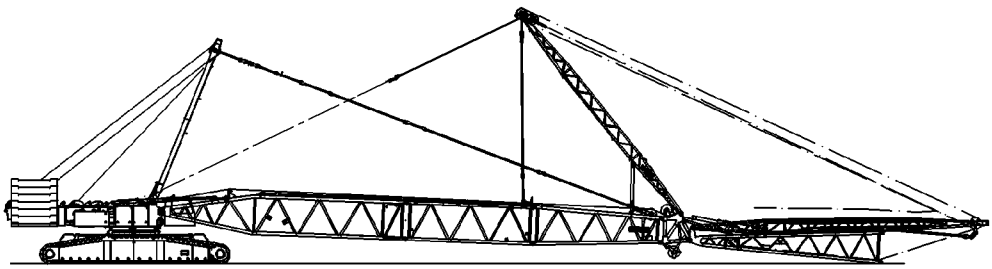
Note: The removal of the lattice sections is in reverse order as for installation.

C A U T I O N: The warning and danger notes for installation must also be observed for removal!

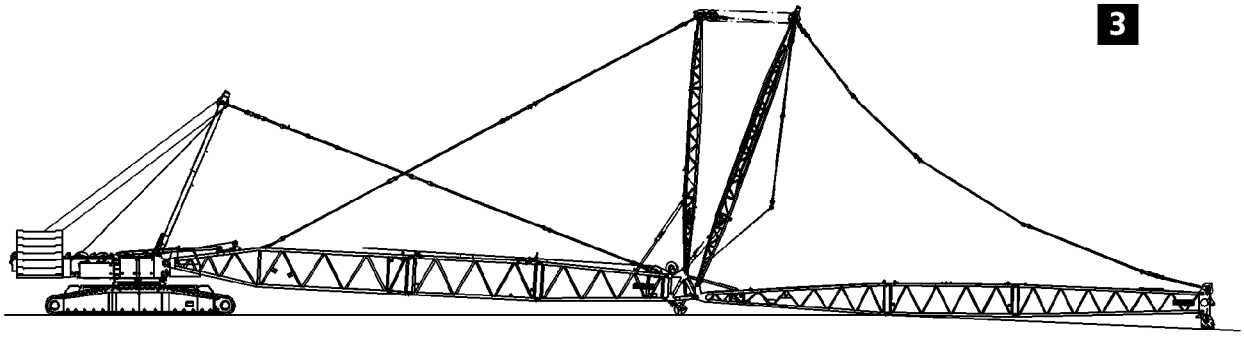
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1. Installation procedure

Fig. 1

1.0 - Pin the W - installation unit on the S-boom.
1.1 - Reeve the W - adjustment rope between the WA-bracket I and II.

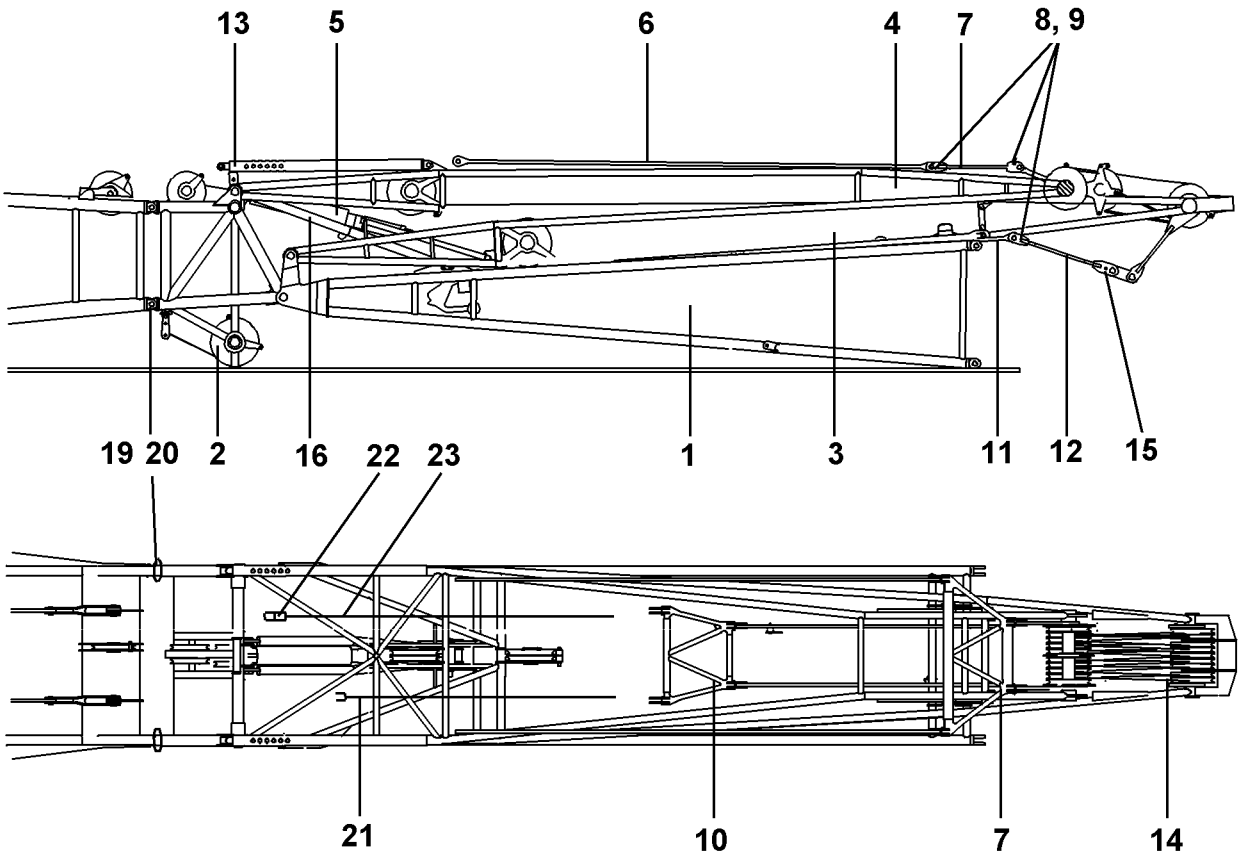
Fig. 2

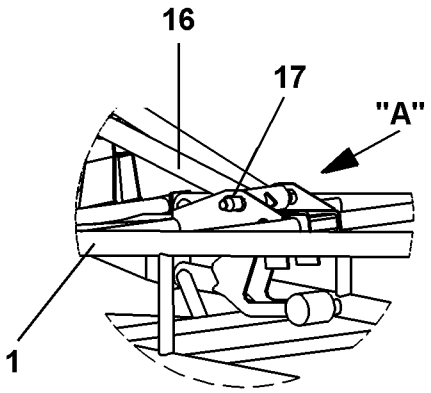
2.0 - Installation of guy rods from the WA-bracket II to the S-pivot section.

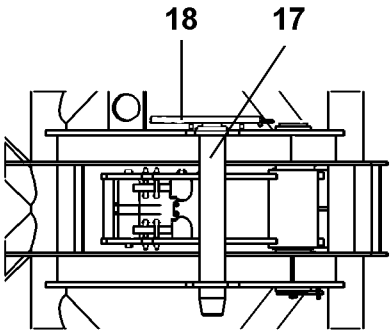
Fig. 3

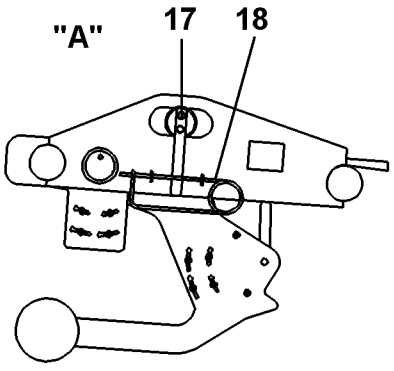
3.0 - Erect WA-brackets and tension the guy rods from the WA-bracket II to the S-pivot section.
3.1 - Install the lattice jib and guy rods from the WA-bracket I to the W-end section.

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2. Installation

D A N G E R : For installation and removal work:

- **A safe installation scaffolding / working platform must be used. There is a danger of accidents due to falling.**
- **Improvisations are prohibited.**
- **The lattice sections must be supported underneath with suitable, stable materials.**
- **Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections. This is strictly prohibited!**

Prerequisites:

- The boom is installed.
- The crane is horizontally aligned.
- An auxiliary crane as well as an installation scaffolding / working platform is available.
- The LICCON system is set according to the data given in the load charts.
- The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
- The configuration status has been entered into the LICCON computer system.

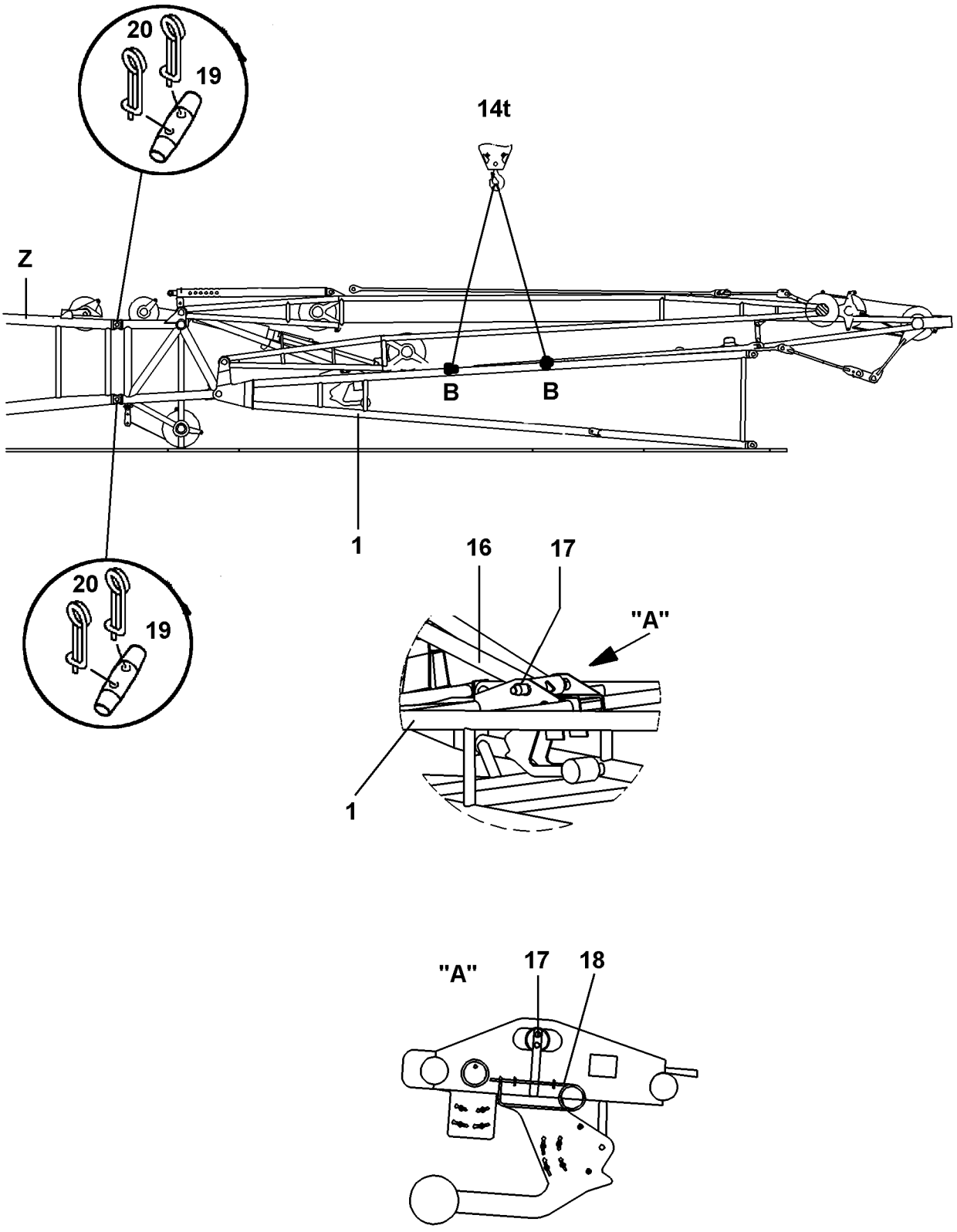
2.1 Installation unit

(Total weight approx. 14.0 t)

Component overview

1 W - pivot section
2 S-end section 100t
3 WA-bracket I
4 WA-bracket II
5 W-relapse cylinder
6 Guy rod 6,84m
7 Traverse II
8 Pin, connection guy rods
9 Retaining ring
10 Traverse I
11 Guy rod 3,99m
12 Guy rod 1,50m
13 WA-bracket II relapse support
14 Installation reeving cable ∅ 8×28m
15 Test bracket
16 W-relapse support, mechanical
17 Pin, lock for mechanical relapse support
18 Spring retainer
19 Cone pin
20 Spring retainer
21 Installation cable
22 Cable lock
23 Installation cable

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3. Pin the W - installation unit on the S-boom

Take on the W - installation unit with the auxiliary crane on the tackle points (B) on the W-pivot section (1).

Note: The total weight of the W-installation unit is approx. 14.0t.

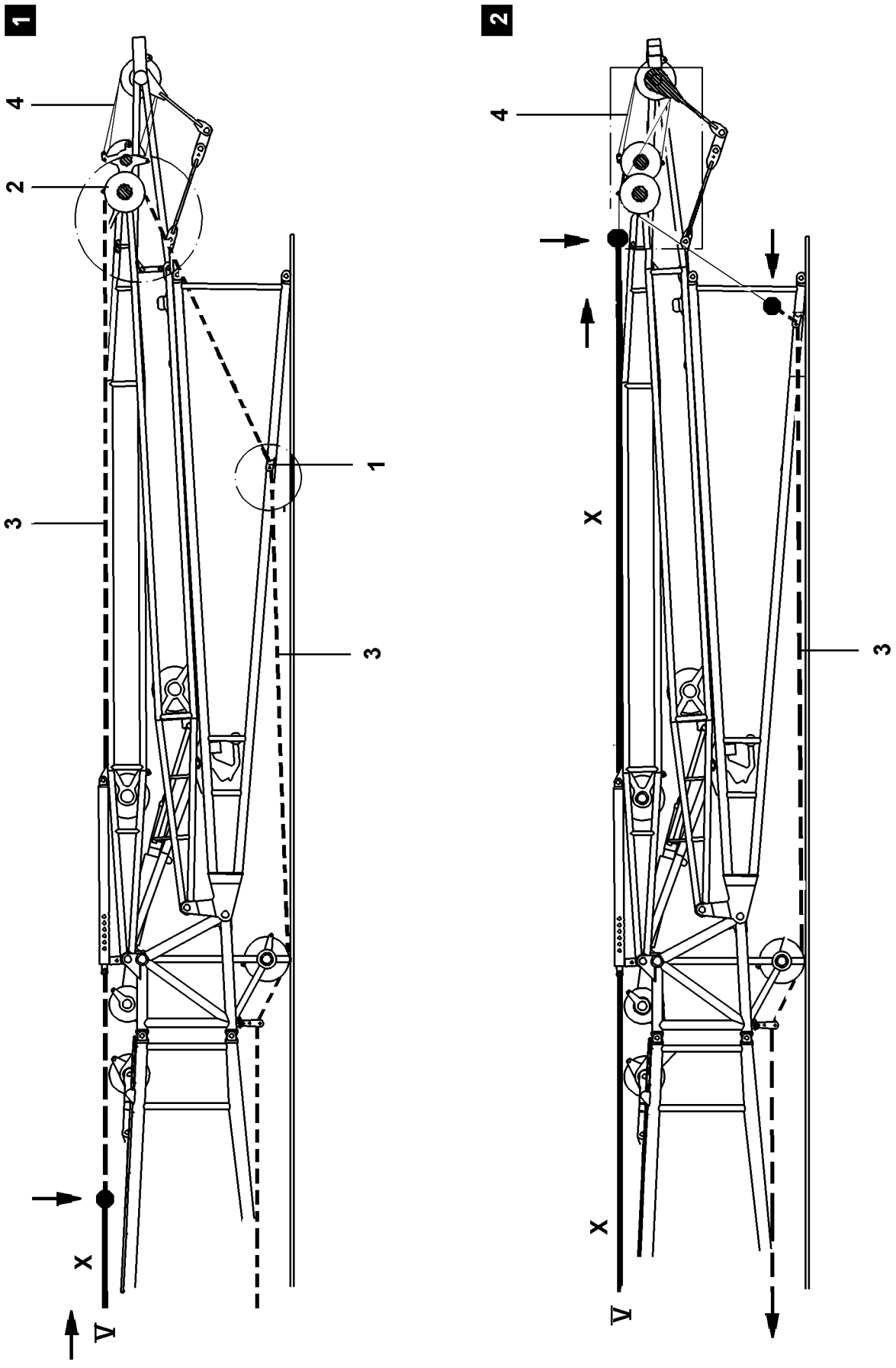
Pin the W - installation unit on the S- adapter (Z) with the cone pin (19), on top and on the bottom, and secure with spring retainer (20).

Remove the spring retainer (18) and unpin the pin (17) on the mechanical W-relapse support (16).
Lower the W-installation unit with the auxiliary crane until it rests on the ground.
Support the W - pivot section (1) from below.

**D A N G E R : Before unpinning the pin (17) on the mechanical W-relapse support (16), it must be ensured that the installation unit still hangs on the auxiliary crane.
Otherwise the pivot section folds down.
Nobody may remain under the installation unit during the pinning and unpinning procedure.
There is a danger of accidents.**

Remove the auxiliary crane.

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4. Reeve the W - adjustment rope between the WA-bracket I and II

X W-adjustment rope from winch V
1 Change over pulley in the W-pivot section
2 Change over pulley in the WA-bracket II
3 Auxiliary cable from the auxiliary winch
4 Installation cable already reeved for transport

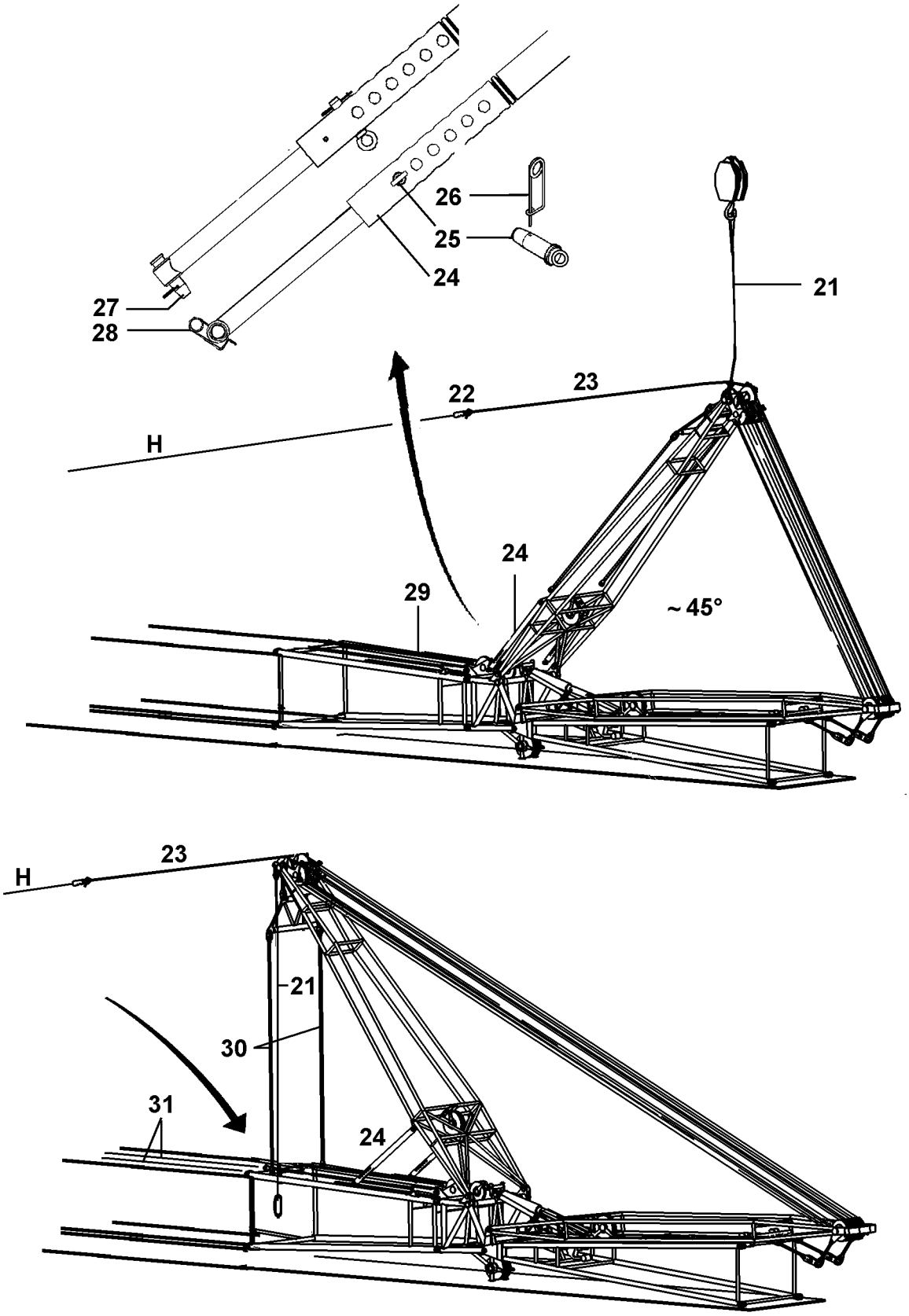
Fig. 1 Auxiliary cable run when getting the W-adjustment ropes (X)
Pull the auxiliary cable (3) of the auxiliary winch over the change over pulleys (1 + 2) to the slewing platform.
Connect the auxiliary cable (3) with the W - adjustment rope (X) from winch V.
Spool up the auxiliary winch and spool out winch V at the same time and pull the W - adjustment rope (X) to the WA-bracket II

Fig. 2 Auxiliary cable run when reeving the W-adjustment ropes (X)
Connect the W - adjustment rope (X) and the auxiliary cable (3) with the installation cable (4), which was already reeved between WA-bracket I and II.
Spool up the auxiliary winch and spool out winch V at the same time and reeve the W - adjustment rope (X) between WA-bracket I and II - **see Reeving plans**.

C A U T I O N : When spooling out the cable, make sure no slack cable forms! This could damage the cable!

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5.06 SW/SDW - BOOM COMBINATION 028464-00



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5. Erect the WA-bracket II

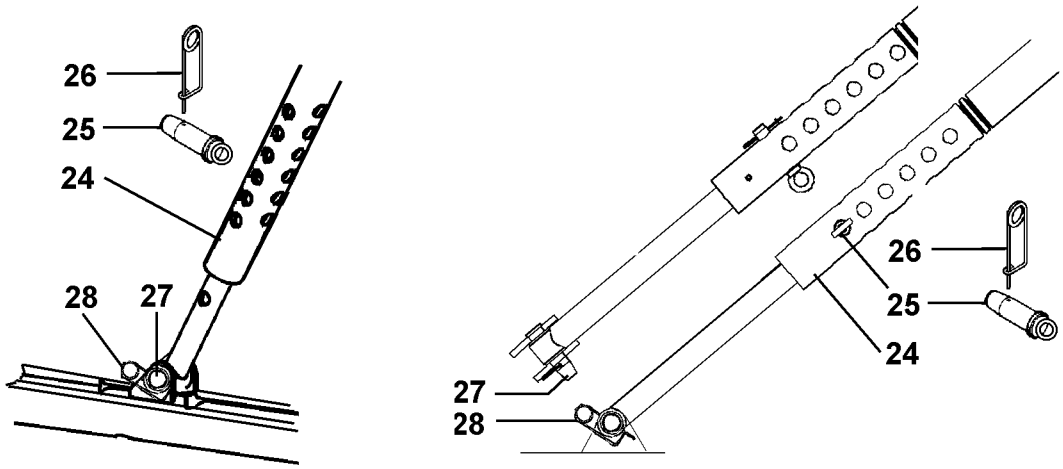
Erection
Attach the auxiliary crane on the installation cable (21).
Engage the hoist cable into the cable lock (22) on the installation cable (23).
Unpin the pin (25) on the WA - bracket II relapse support (24). Pull the relapse support apart to the rail (29) and repin.
Erect the WA-bracket II to approx. 45° and then continue to pull with the hoist cable (H).

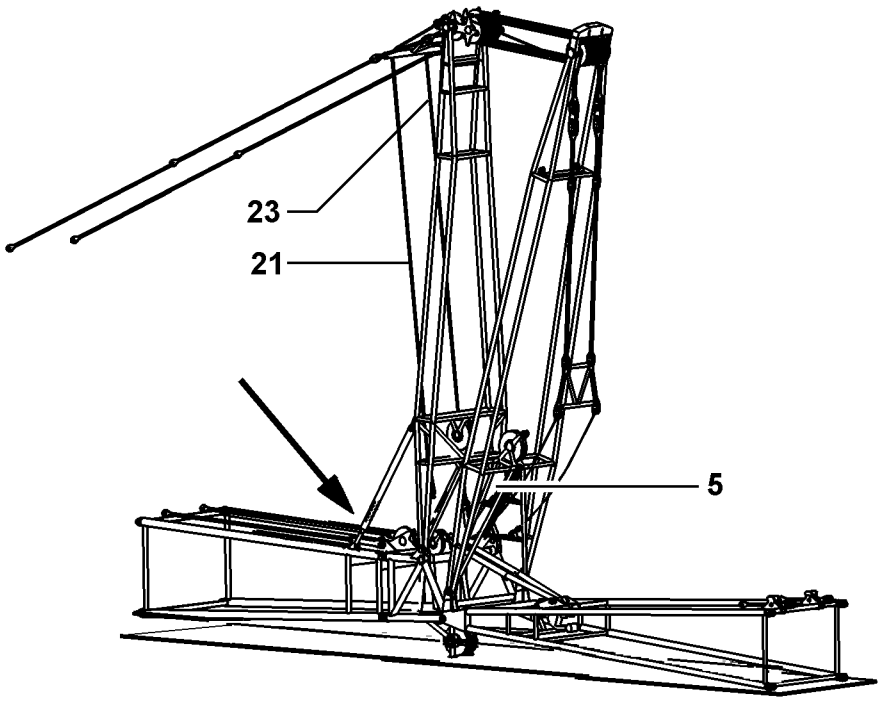
C A U T I O N : The WA-bracket II must be erected to approx. 45° with an auxiliary crane.

Installation of the guy rods from the WA-bracket II to the S-pivot section
Spool up the hoist winch while **spooling out** the W-control winch at the same time and pull the WA - bracket II back until the guy rods (30) from the WA-bracket II can be pinned and secured with the guy rods (31).

Note: To prevent the WA-bracket I from pulling up, the control winch must be spooled out at the same time.

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5.1 Tension the guy rods from the WA-bracket II to the S-pivot section

When the guy rods are pinned and secured to each other, the hoist winch (H) must be **spooled out** and the W- control winch must be **spooled up** until the WA-bracket II- guying is tensioned by the counter pressure of the W-relapse cylinder (5).

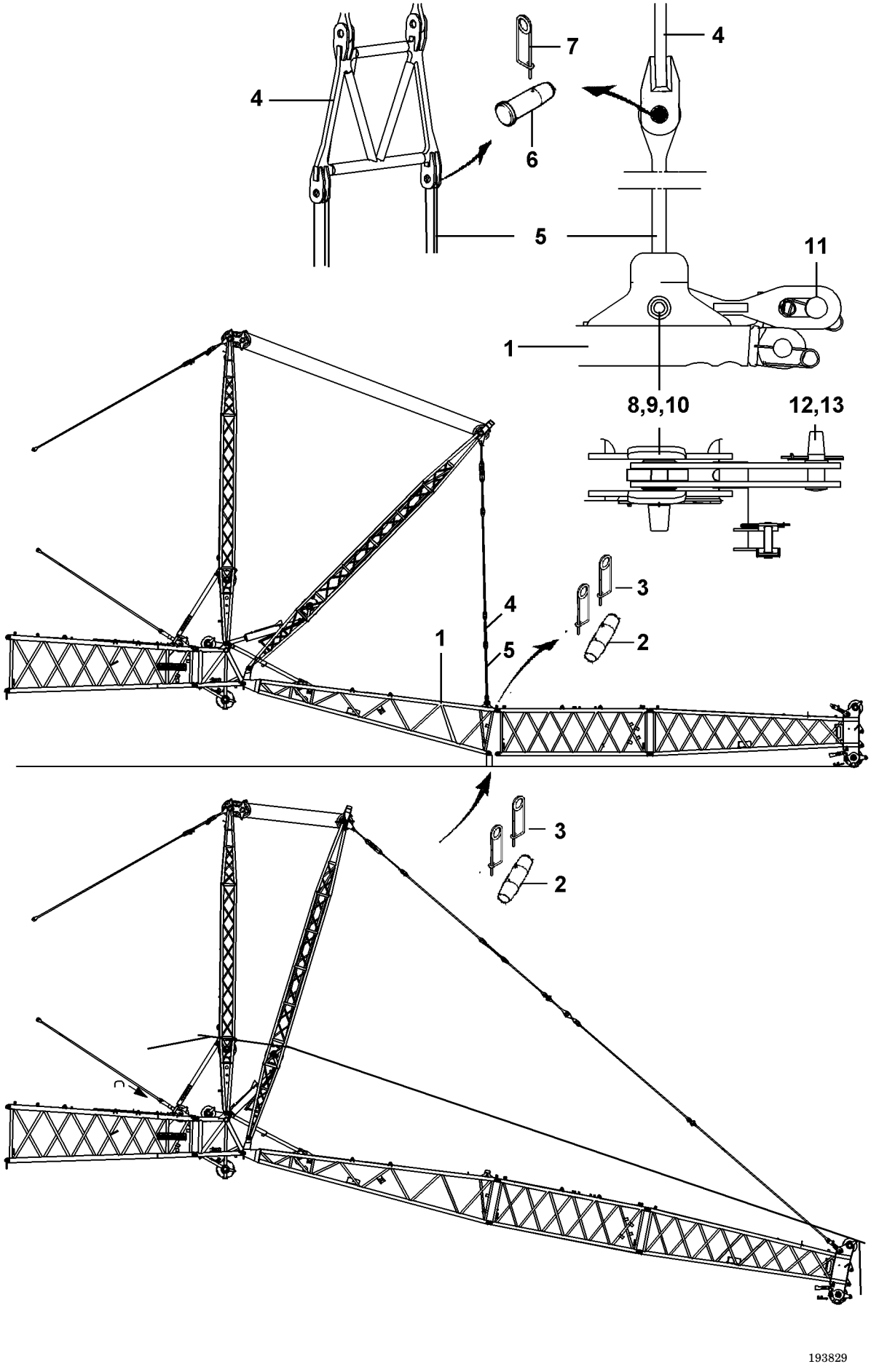
Unpin the pin (25) on the relapse supports (24).

Pin the mechanical relapse supports (24) on the S-adapter with pins (27) and secure with spring retainers (28).

Pin the WA-bracket II relapse support (23) in max. possible length on the next hole with pin (25) and secure with spring retainer (26).

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6. Install the W-lattice jib

Assemble the lattice jib to the required length, pin on the W-pivot section **"on top"** with the cone pin (2) and secure with spring retainer (3).

Note: The guy rods are placed and attached for transport on the intermediate section. The transport retainers must be released for installation.

D A N G E R : **The pins on the lattice sections must be secured with spring retainers.**
For removal and installation of the lattice sections, they must be supported from below with suitable, stable materials.
Make sure that there are no persons under the lattice jib during the pinning and unpinning procedure. This is strictly prohibited.

Pin the guy rod (4) from the WA-bracket I on the guy rods (5) with pins (6) and secure with spring retainer (7).

Note: The guy rods (5) and brackets (9) must be pinned on the **hollow axle** (8) on the pivot section with pins (9) and secured with spring retainers (10).

Pull up the pivot section (1) and pin the lattice jib on the pivot section **"on the bottom"** with cone pin (2) and secure with spring retainer (3).

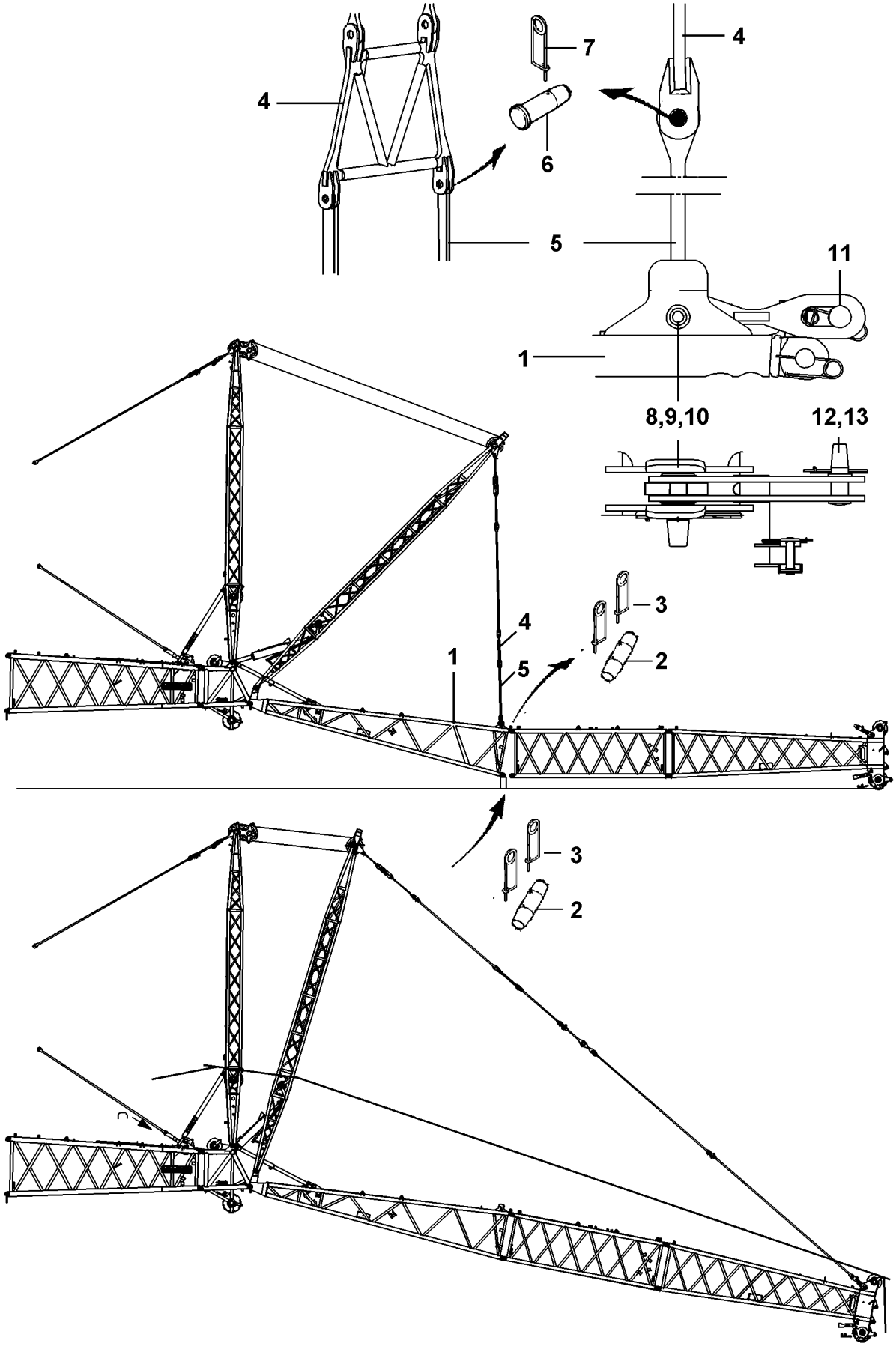
Note: Test point 1 (MS1) - note "IST" (ACTUAL) force from the monitor 1 in this position so that one knows when the boom is removed with which force one has to secure during unpinning.

D A N G E R : **The end section may not be lifted, it must remain on the ground.**
If this is not observed, it can be damaged.
Make sure that there are no persons under the lattice sections during the pinning and unpinning procedure. This is strictly prohibited.

Pull the hoist cable to the W-end section and attach there.
Install the pulley cart on the W-end section.

Note: Pulley cart tire pressure = **9 bar**.

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6.1 Install the guy rods from the WA-bracket I to the W-end section

Assemble the guy rods according to the lattice jib length, pin and secure.

Note: The guy rods are placed and attached for transport on the intermediate section. The transport retainers must be released for installation.

Pin and secure the guy rods from the W - end section with the guy rods from the WA-bracket I.

Note: The guy rods must be installed and secured according to the installation drawings. The numbers on the installation drawing must be compared with the numbers on the guy rod.

D A N G E R : All pins of the guy rods must be secured.
The guy rods must be checked regularly.

Relieve the guy rods (5) by lowering from the WA-bracket I.
Unpin the guy rods (5) and brackets (11) on the pivot section (1) - **hollow axle (8)** -. Remove the spring retainer (10) and unpin the pin (9).

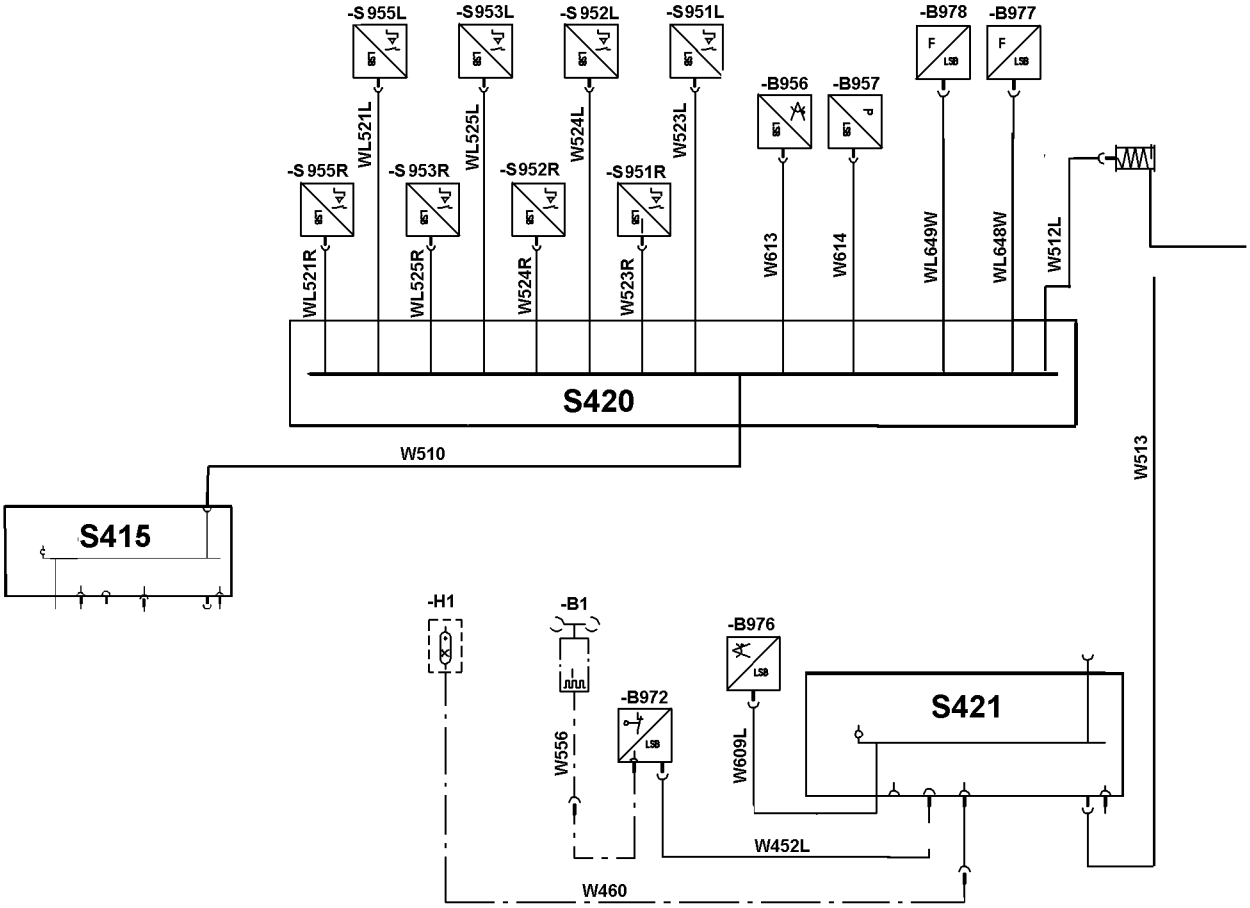
C A U T I O N : Unpin the guy rods (5) and brackets (11) on the pivot section (1) - hollow axle (8) -, before tensioning the guying.

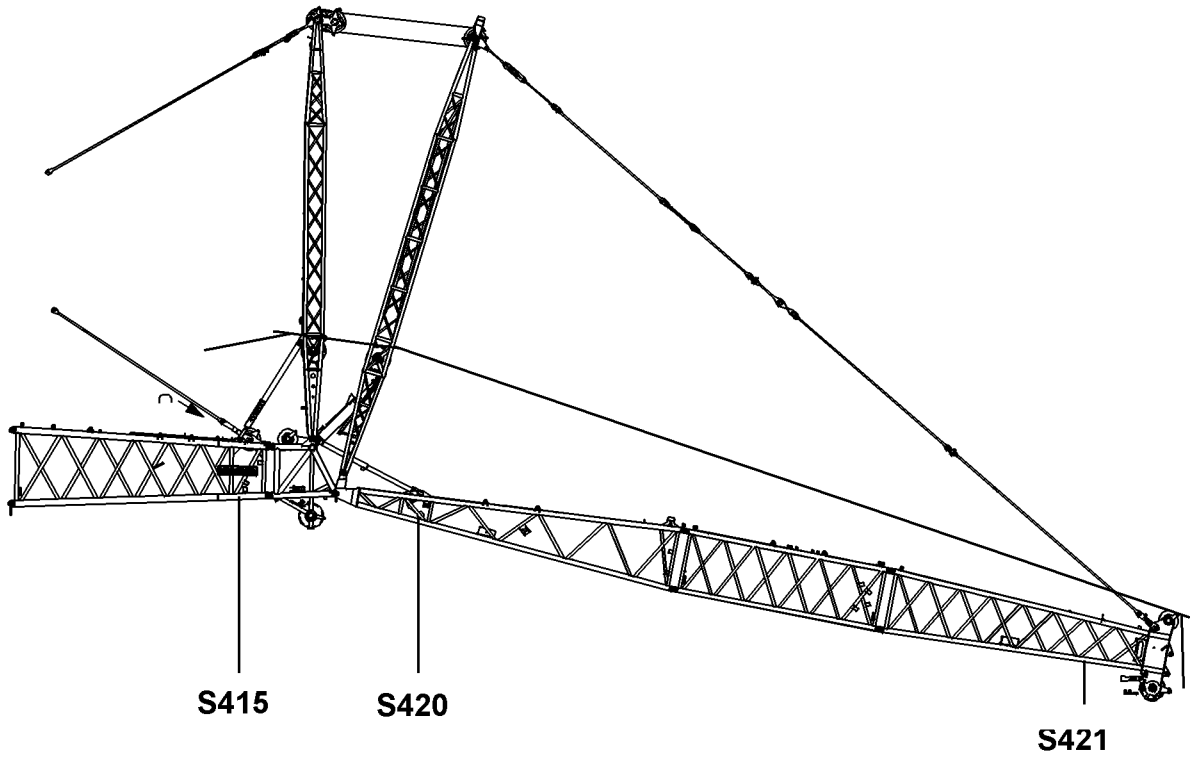
D A N G E R : Before unpinning the guy rod, the lattice jib must be pinned and secured ”on the bottom”.
Otherwise there is a danger of accidents as the lattice jib could suddenly fold down.
Make sure that there are no persons under the lattice jib during the pinning and unpinning procedure.

Actuate the W- control winch and tension the guy rods between the WA- bracket I and the W-end section.

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7. Electrical connections

Establish the electrical connection from the connector box (S 415) to (S 420). Plug in the cable plug (W510) on the connector box (S 415).

Establish the electrical connection from the cable drum in the W-pivot section to the connector box (S 421). Plug in the cable plug (W513) on the connector box(S 421).

Establish the electrical connection from the connector box(S 420) to the cable drum in the W-pivot section. Plug in the cable plug (WL512) into the cable drum socket.

Note: Establish the electrical connection from the connector box(S 420) to the cable drum only when the cable from the cable drum to the connector box(S 421) is spooled out.

Electrical connection on the **connector box (S 421)**

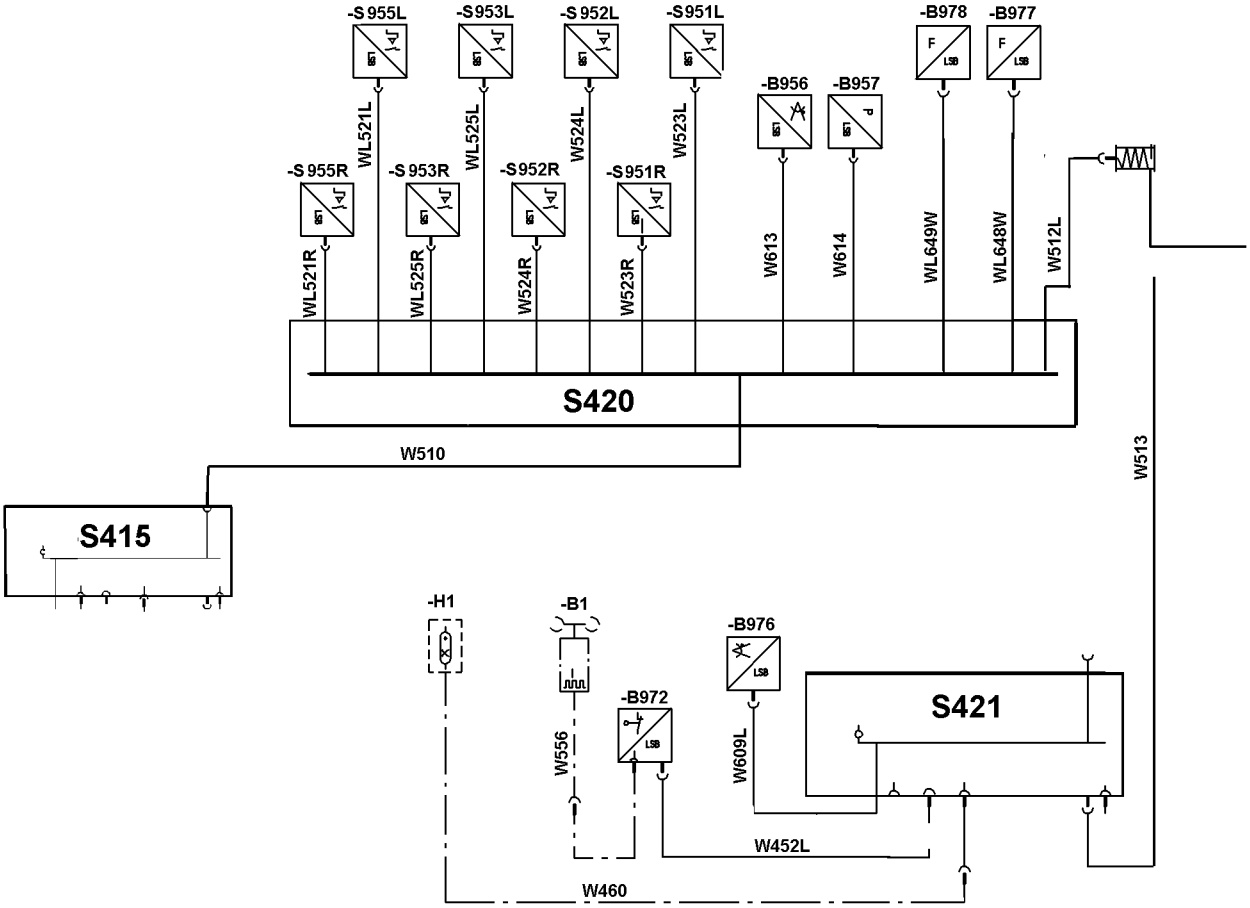
-S972	W452L	Hoist limit switch
-H1	W460	Beacon
-B976	W609L	Angle sensor, luffing jib on top
-B1		Wind sensor

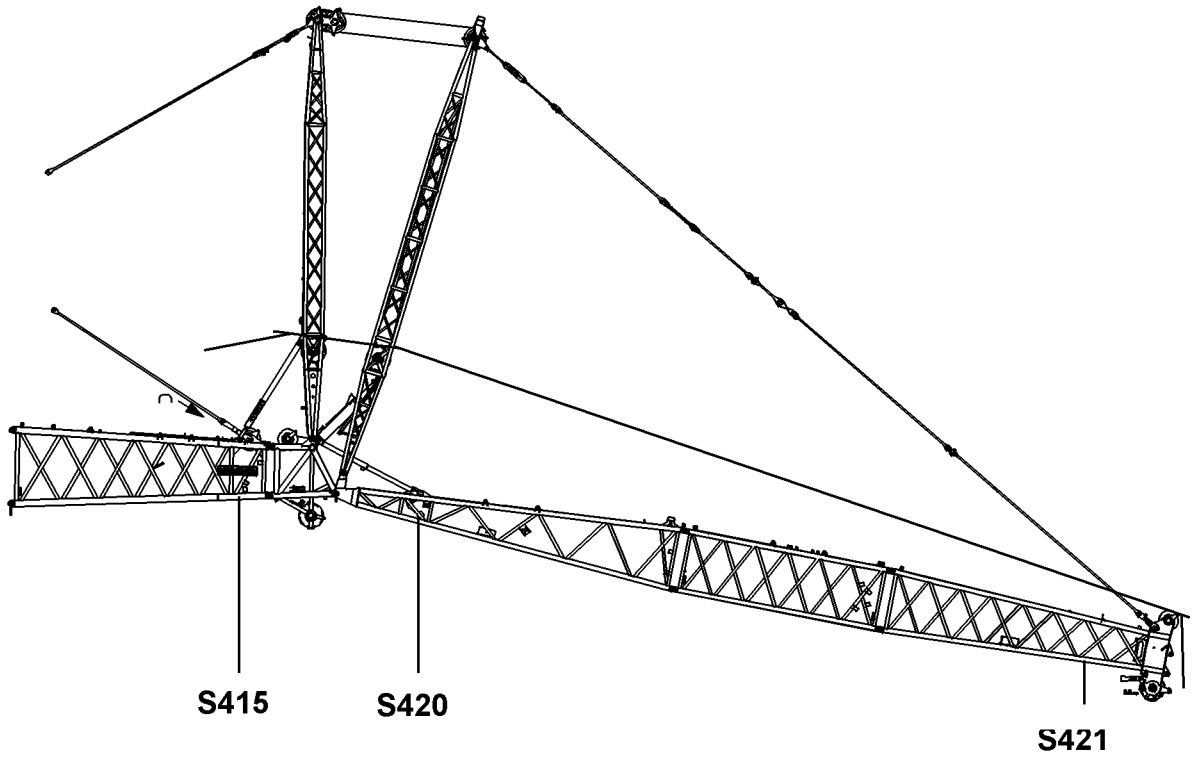
Electrical connection on the **connector box (S 420)**

-B977	WL648W	Pull test bracket 2A right
-B978	WL649W	Pull test bracket 2A left
-B957	W614	Pressure sensor W-relapse support, left
-B956	W613	Angle sensor luffing jib on the bottom
-S951L	W523L	Flap in position
-S951R	W523R	Flap in position
-S952L	W524L	Relapse support on block left
-S952R	W524R	Relapse support on block right
-S953L	WL525L	Angle sensor left, luffing jib on the bottom
-S953R	WL525R	Angle sensor right, luffing jib on the bottom
-S955L	WL521L	Flap left
-S955R	WL521R	Flap right

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7.1 Function check

Prerequisite :
- All electrical connections are established.
- The engine is running.

Air plane warning light
Turn on the air plane warning light, check visually for function.

Wind speed sensor
Check the wind speed sensor for easy movement and function.

Limit switch

C A U T I O N : The limit switch functions must be checked individually before crane operation.
Check manually as described below.
In the test system, the function of the individual limit switch initiators must be checked.

Hoist limit switch
- Actuate the hoist limit switch manually.
- The hoist winch must turn off in upward movement.
- The hoist ”on top” symbol on the LICCON indicator must blink.

Limit switch W-lattice jib, ”on top”, relapse cylinder
- The W- control winch movement **”spool up”** must turn off.
- The symbol on the LICCON monitor must appear.

Limit switch W-lattice jib, ”on the bottom”, relapse cylinder
- The W- control winch movement **”spool out”** must turn off.
- The symbol on the LICCON monitor must appear.

Note: The switch point of the limit switch on the relapse cylinder must be checked before erection - **see chapter 8.12.**

Limit switch - flap in position and lattice jib, ”steepest ” position, mechanical relapse support
- Cover the limit switch initiators individually with a metal plate.
- The W-control winch movement **”spool up ”** must turn off.
- The symbol on the LICCON monitor must appear.

D A N G E R : Before erection, the easy movement of the pendulum of the mechanical relapse retainer must be checked over the complete swing range of the pendulum. If this is not observed, the mechanical relapse support will not engage in steepest lattice jib position.
There is a danger of accidents as the lattice jib can tip backward!

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8. Erection / take down

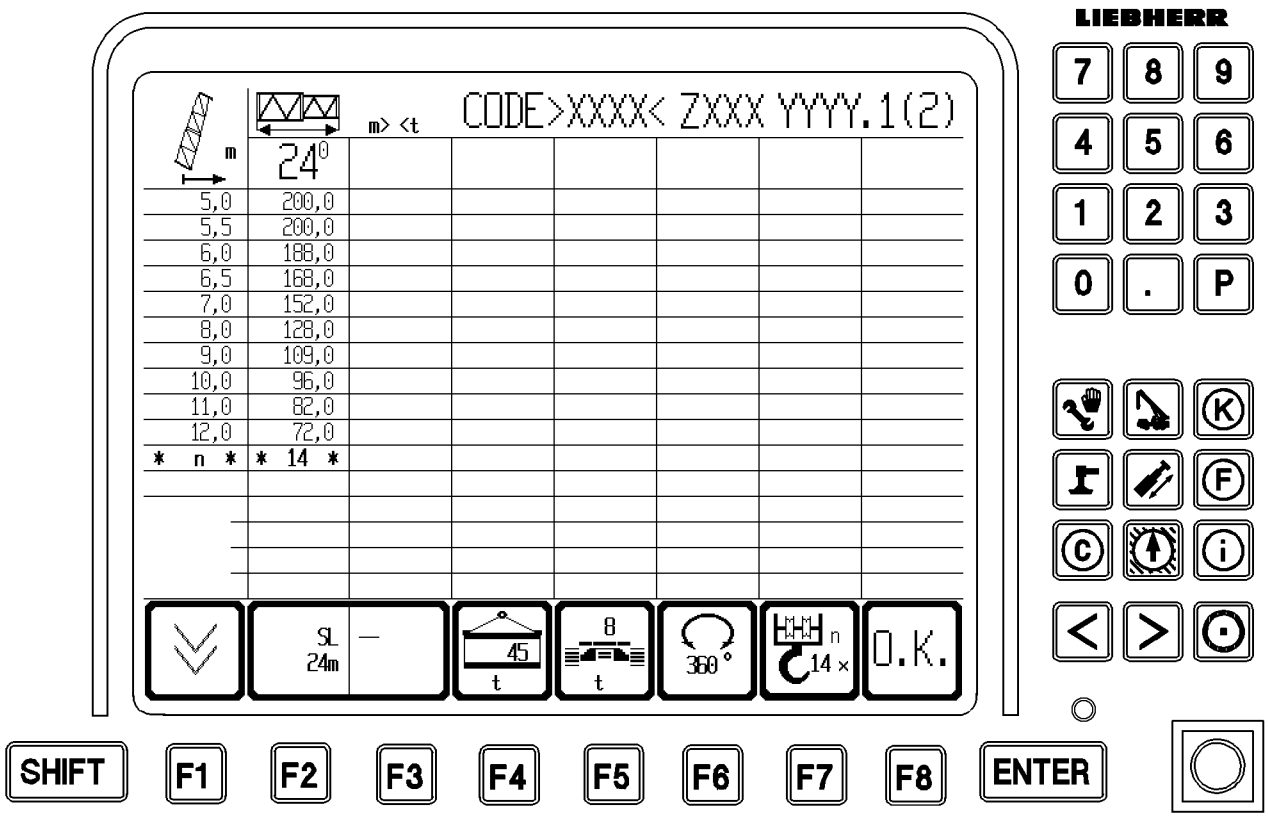
The boom combinations must be erected or taken down according to the erection and take down charts (see separate chart manual).

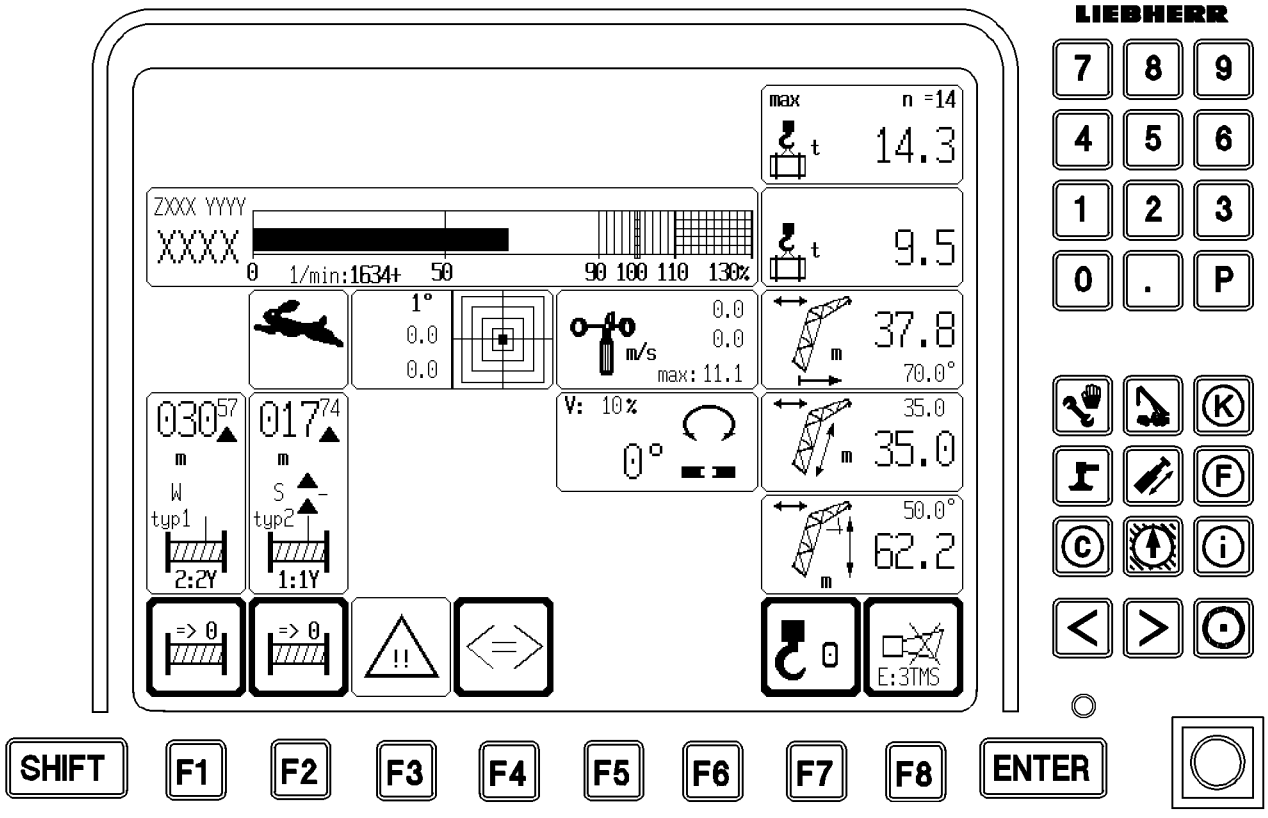
D A N G E R : The erection and take down procedure must be made according to the data in the erection and take down chart.
If this is not observed, the crane will be overloaded and can topple over!

Prerequisite :
- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform, according to the load chart.
- The derrick ballast is placed according to the erection and take down charts.
- The lattice jib is assembled according to the load chart and the operating manual.
- All limit switches are correctly installed and fully functioning.
- Before erection, the pendulum of the mechanical relapse retainer must be checked over the complete swing range of the pendulum.
- All pin connections are secured.
- The hoist cable has been correctly placed into the cable pulleys and secured with cable retaining pins to prevent it from jumping out.
- There are no persons within the danger zone.
- There are no loose parts on the boom and the lattice jib.
- In winter: Is the boom and the lattice jib and their components (limit switches, cable drum, air plane warning light, wind speed sensor etc.) free of ice and snow.

D A N G E R : Incorrectly installed or non-functioning limit switches as well as falling parts (pins, spring retainers, ice, etc.) can cause accidents!
Before erection, the pendulum of the mechanical relapse cylinder must be checked for easy movement over the complete swing range of the pendulum.
If this is not observed, the mechanical relapse support does not engage in steep lattice jib position.
There is a danger of accidents, as the lattice jib may tip backward!

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8.1 Erection procedure

- Attach the hoist cable on the end section.

C A U T I O N : **If the hoist cable is not attached, then it can fall backward due to its own weight during erection.**
During erection, it is prohibited to turn!

Note: Carry out the erection procedure according to the erection and take down charts.

The LICCON overload protection has been set according to the data in the load chart.
The current configuration status corresponds to the data in the erection and take down charts and the respective load chart
The configuration status has been entered into the LICCON computer system.
- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.

D A N G E R : **Danger of toppling or destroying the crane!**
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

Note: If a range is reached during erection which is monitored by the load chart, then the LICCON overload protection is activated.
The lowest operating position has been reached if the displays turn off and a load display - t - appears in the “MAX LOAD” icon instead of question marks (“? ? ? ?”).
- The Assembly icon in the LICCON monitor turns off.

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8.2 Erection

Actuate the manual control lever and luff up the boom.
Spool out the lattice jib control winch at the same time to keep the lattice jib with theW-end section placed on the pulley cart on the ground.

D A N G E R : **The lattice jib must roll on the ground with its complete weight.**
Lower the lattice jib control in such a way, that the guy rods always hang through slightly.
Make sure that no slack cable forms on the control winch!
If this is not observed, the crane will be overloaded or topple over!

Carry out this procedure until the S-boom and the W-lattice jib form an angle of 45° or the W-end section has lifted off the ground.

Remove the pulley cart on the W-end section.

Now only luff up the S-boom and lift the W-lattice jib off the ground.
Release the hoist cable on the end section and reeve between the pulley head on the end section and the hook block and secure on the fixed point - **see Reeving plans.**
Attach the hoist limit switch weight.
Luff up the boom into the steepest position.

C A U T I O N : **During erection, the hoist winch must be spooled out at the same time to prevent the hook block from colliding with the end section of the lattice jib.**

Luff up the lattice jib to the operating position.

Note: If a range is reached during erection which is monitored by the load chart, then the LICCON overload protection is activated.
- The Assembly icon in the LICCON monitor turns off.

D A N G E R : **Danger of toppling or destroying the crane!**
If the overload protection is deactivated, there is no additional protection against crane overload!
The set up key (D) bypasses the safety devices!
The radii specified in the load chart may not be exceeded nor fallen below, even if there is no load on the hook!
Crane operation with deactivated overload protection is prohibited!

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9. Crane operation

C A U T I O N : Observe all notes in
Chapter 4.02 " LICCON COMPUTER SYSTEM",
Chapter 4.05 ” CRANE OPERATION ”
Chapter 4.08 ” WORKING WITH A LOAD ”.

Prerequisite:
- The LICCON overload safety device is set according to the data in the load chart.
- The current configuration status corresponds to the data in the respective load chart.
- The configuration status has been entered into the LICCON computer system.
  The Assembly icon on the LICCON monitor turns off.
  The LICCON overload protection is activated.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

D A N G E R : Check the horizontal position of the crane before and during operation.
If the crane operator leaves the crane operator's cab, even if only for a short time, then he is obligated to check all operating mode settings and to reset them, if necessary, before starting to work again.

Adjustments / checks
Check the function of the overload system by running against the ”top” and ”bottom” operating positions.
Check the function of the hoist limit switch ”on top” by running against the hoist limit switch weight.
Check the function of the limit switch ”lattice jib steep” by running against the relapse retainer.

Set the boom to 67° or 77°
Before changing the boom to 67° or 77°, the boom must be erected to the steepest position of 87° and the lattice jib must also be in steepest operating position.

D A N G E R : When changing to 67° or 77° in SDWB - operation, the derrick ballast might be required, even without a load on the hook.

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10. Take down procedure

The boom remains in steepest position, 87°.
Actuate the manual control lever and luff down the W-lattice jib to just before the lowest operating position.

Note: When reaching the **lowest** operating position, the luffing down movement is shut off.

C A U T I O N : When luffing down, the hoist winch must be spooled out at the same time to prevent the hook block from colliding with the pulley head.

- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

Continue to luff down the W-lattice jib until an angle of approx. 45° between the S-boom and der W-lattice jib is reached. The shut off occurs via the limit switch "W-lattice jib on the bottom".
The limit switch symbol on the LICCON indicator blinks.

C A U T I O N : When luffing down the lattice jib, make sure that the hook block does not collide with the end section!
The hook block may not be pulled along the ground.

Luff down the S-boom until the hook block touches the ground.
Remove the hoist limit switch weight.
Unreeve the hook block.

D A N G E R : When unreeving the hoist cable, nobody may remain in the danger zone.

Luff down the S-boom until the end section of the W-lattice jib can be installed on the pulley cart.

Note: If the W-lattice jib is lying vertically on the pulley cart, the W-guying must be tensioned a little so that the pulley cart rolls forward.

Continue to luff down the S-boom.

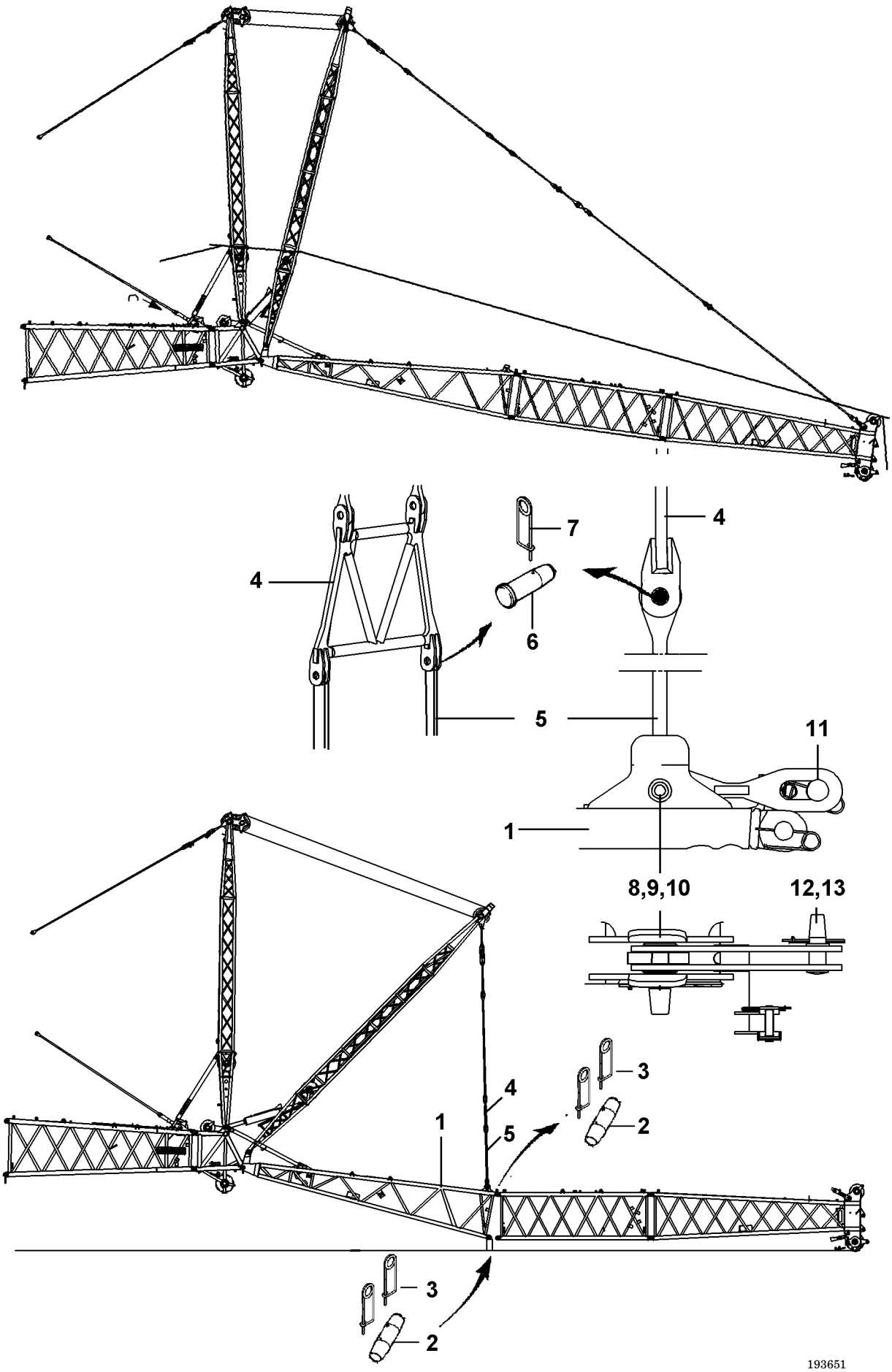
D A N G E R : The lattice jib must roll with its complete weight on the ground.
Lower the lattice jib control in such a way that the guy rods always hang through slightly.
Watch for slack cable formation on the control winch!
If this is not observed, the crane will be overloaded or the crane can topple over!

Remove the hoist cable.

D A N G E R : When removing the hoist cable, make sure that there are no persons within the danger zone!

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11. Remove the W-lattice jib

Spool back the hoist cable over the cable pulleys in the WA- brackets until the S-end section.

D A N G E R : Lower the hoist cable with the auxiliary cable safely and slowly over the cable pulleys to the rear to the S-end section.
Make sure that there are no persons within the danger zone.
There is a danger of accidents!

Spool out the W - control winch and lower the WA- bracket I to the front until the guy rods from the end section are lying on the intermediate sections.

Note: The guy rods are placed for transport on the intermediate sections and attached with the transport retainers.

Disconnect the guy rods from the end section on brackets (11). Release the spring retainer (13) and unpin the pin (12).

C A U T I O N : Pin the guy rods (5) and brackets (11) on the pivot section (1) - hollow axle (8) - with pins (9) and secure with spring retainers (10).

Note: With the W- control winch, pull until the same F1 - "IST" (ACTUAL) force is set on test point MS1 as was noted at installation.

D A N G E R : The W-end section may not be lifted, it must remain on the ground.
If this is not observed, it can be damaged!

Unpin the W-pivot section **"on the bottom"**. remove the spring retainers (3) and unpin the cone pin (2).

Lower the W-pivot section until it lies on the ground.

Unpin the W-pivot section **"on top"**, remove the spring retainers (3) and unpin the cone pin (2).

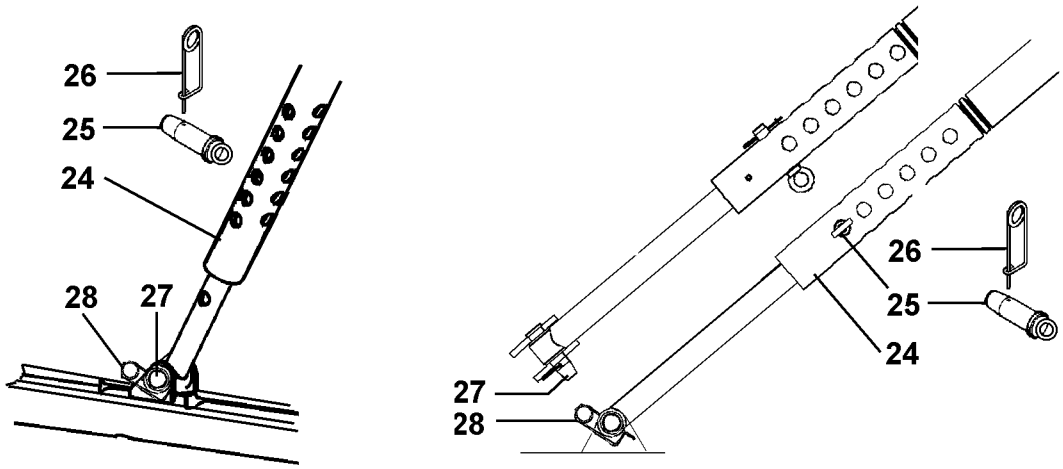
Remove the lattice jib.

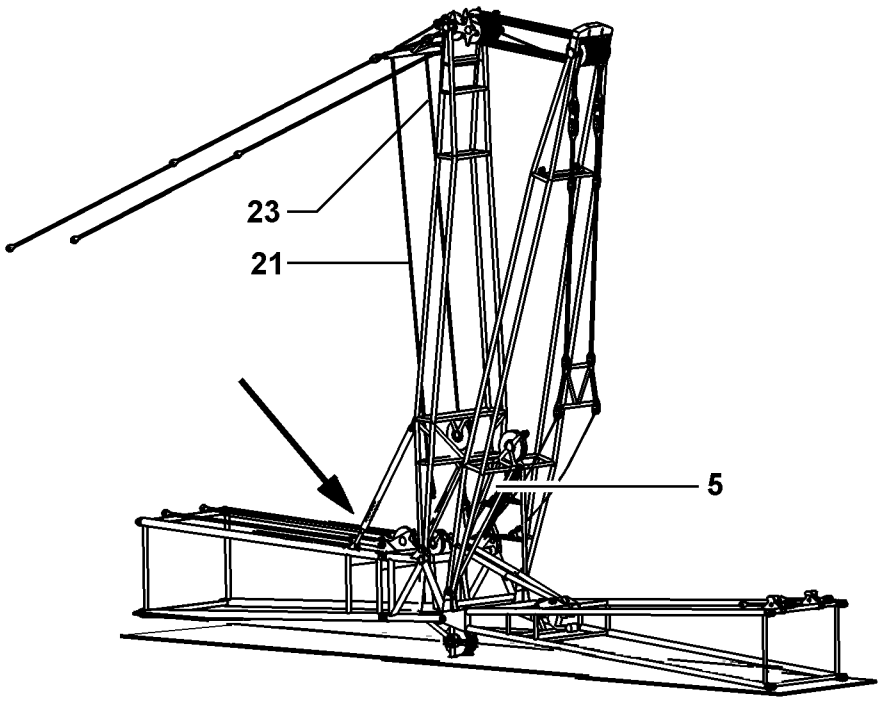
Relieve the guy rods (4, 5) by lowering the WA-bracket I.

Disconnect the guy rods (4) and (5), remove the spring retainer (7) and unpin the pin (6).

D A N G E R : Before unpinning, it must be ensured that the pivot section (1) on the hollow axle (8) is pinned with pin (9) and held by the guy rods (5,11).
Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections.
If this is not observed, there is a danger of accidents as the lattice jib might suddenly fold down.

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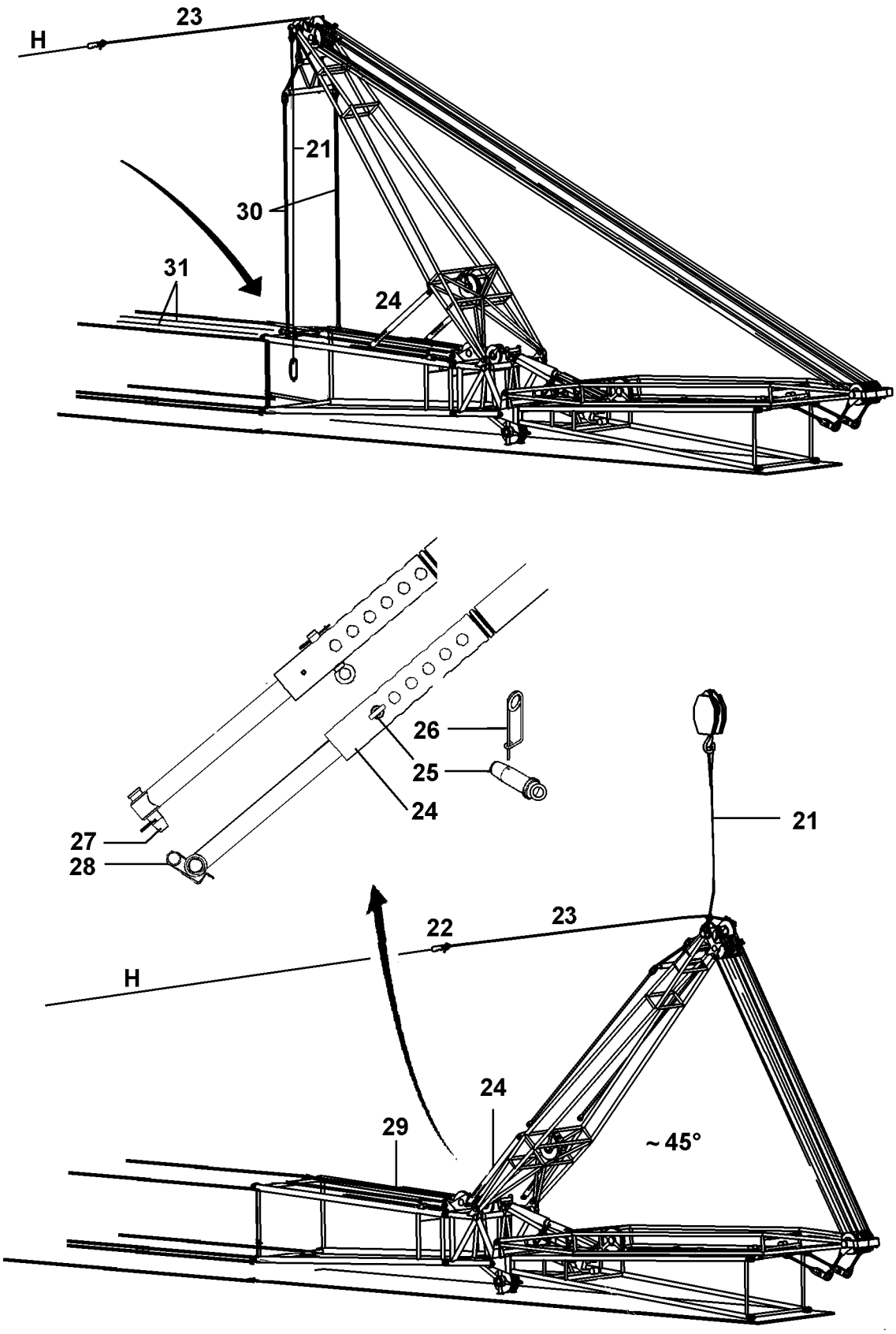
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12. Unpin the mechanical relapse support

Spool up the W-control winch and pull up the WA- bracket I until the guying from the WA-bracket II to the S-pivot section is tensioned by the counter pressure of the relapse cylinders (5).
This allows the unpinning of the mechanical relapse support (24). Remove the spring retainer (26) and pin (25).
Push the mechanical relapse support (24) together and pin again with pins.

C A U T I O N : When pulling up, the limit switch on the W-relapse cylinder (5) can be actuated and turn off the spool up of the W - control winch, which prevents pull on block.
The electrical connection to the limit switches on the W-relapse cylinder must have been established.

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13. Removal of the guy rods from the WA-bracket II to the S-pivot section

Lower the WA - bracket I until it is placed on the W-pivot section.
Hang the hoist cable into the cable lock (22) on the installation cable (23).
Spool up the hoist winch while **spooling out** the W-control winch at the same time and pull the WA - bracket II to the rear and unpin the guy rods (30) from the WA-bracket II on the guy rods (31) to the S-pivot section.
Place the guy rods on the lattice sections and secure.

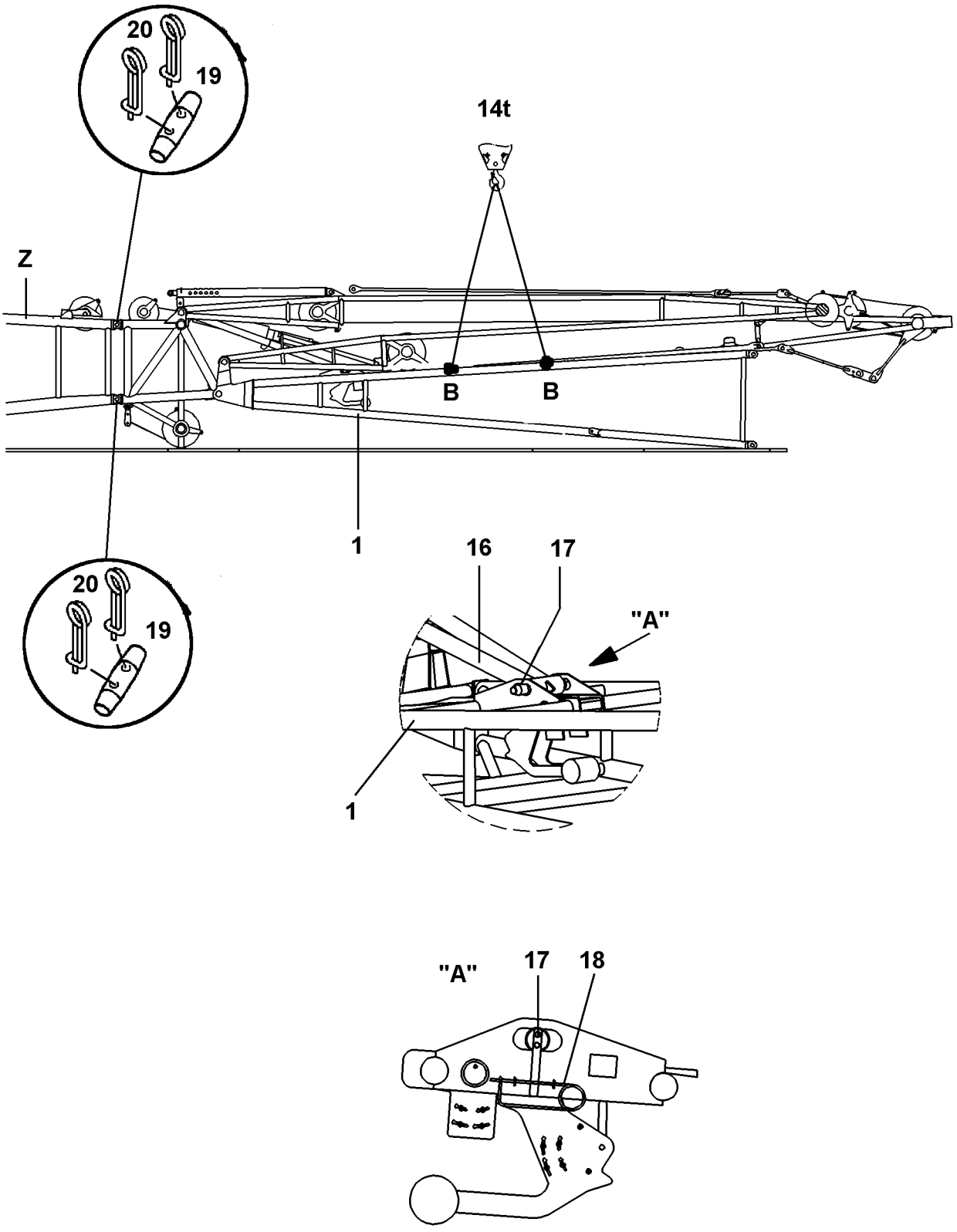
C A U T I O N : Before pulling the WA-bracket II to the rear, make sure the pin (25) is unpinned and pinned again when pushed together.
If this is not observed, damage can occur.

Unpin the mechanical relapse support (24) on the S-end section. remove the pin (27) and spring retainer (28).
Pull the WA- bracket II to vertical position and on to approx.45° to the front by spooling out the hoist winch at spooling up the W- control winch at the same time.
From approx. 45°, attach the auxiliary crane on the installation cable (21).
Lower the WA- bracket II by spooling up the W- control winch and simultaneously spooling out the hoist cable until the WA- bracket II lies on the WA- bracket I.

D A N G E R : From approx 45° to the horizontal to the front, the WA- bracket II must be held with the auxiliary crane and lowered along with it.
Otherwise the WA-bracket II folds downward.
There is a danger of accidents.

Detach the hoist cable on the cable lock (22) of the installation cable (23) and hang the installation cable on the WA-bracket II.
Detach the installation cable (21) on the auxiliary crane and attach on the WA-bracket II.
Unreeve the W-adjustment rope and at the same time, reeve in the auxiliary cable for the reeving.

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14. Unpin the W - installation unit on the S-boom

Take on the W - installation unit with the auxiliary crane on the tackle points (B) on the W-pivot section (1).

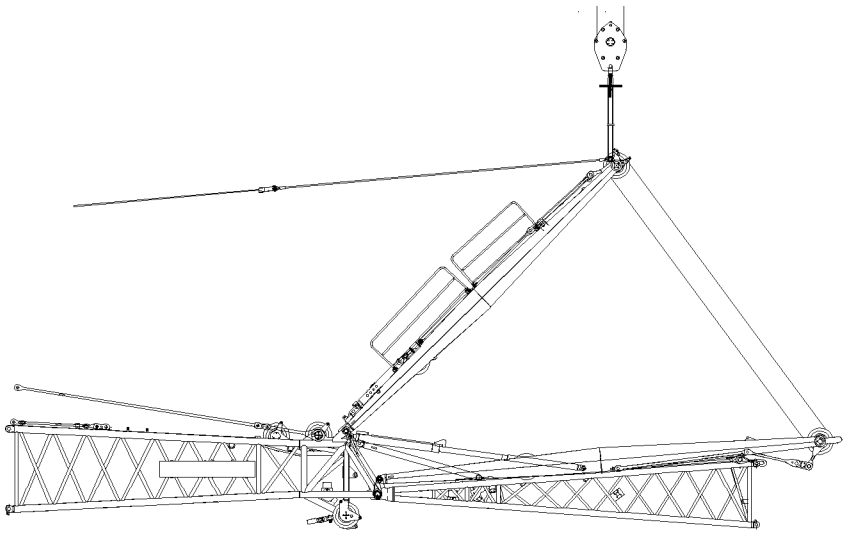
Note: Total weight of W-installation unit is approx. 14.0t.

Pin the mechanical W-relapse support (16) on the W-pivot section (1). Pin the pin (17) and secure with spring retainer (18).
Unpin the W - installation unit on the S- adapter (Z), on top and on the bottom, remove the spring retainer (20) and unpin the cone pin (19).

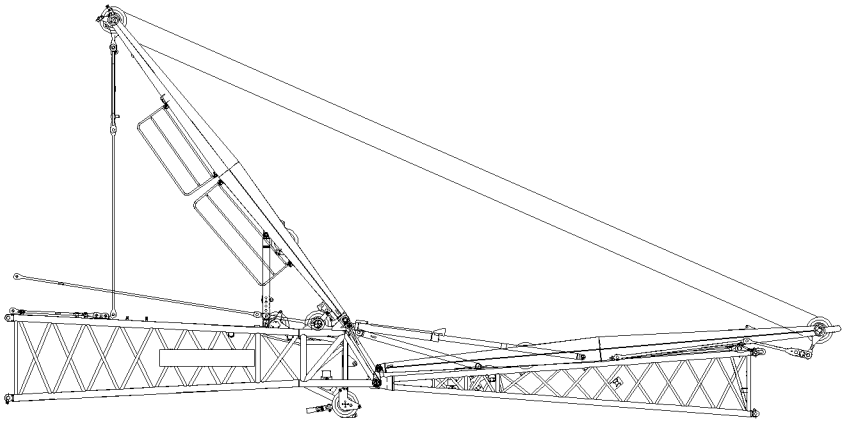
D A N G E R : The pin (17) must be pinned before unpinning the installation unit on the mechanical W-relapse support (16).
Otherwise the pivot section folds downward.
Nobody may remain under the installation unit during the pinning and unpinning procedure. This is strictly prohibited!
Support the pivot section with suitable, stable materials.
Otherwise there is a danger of accidents.

Lower the W-installation unit with the auxiliary crane until it lies on the ground.
Support the W - pivot section (1) from below.
Remove the auxiliary crane.

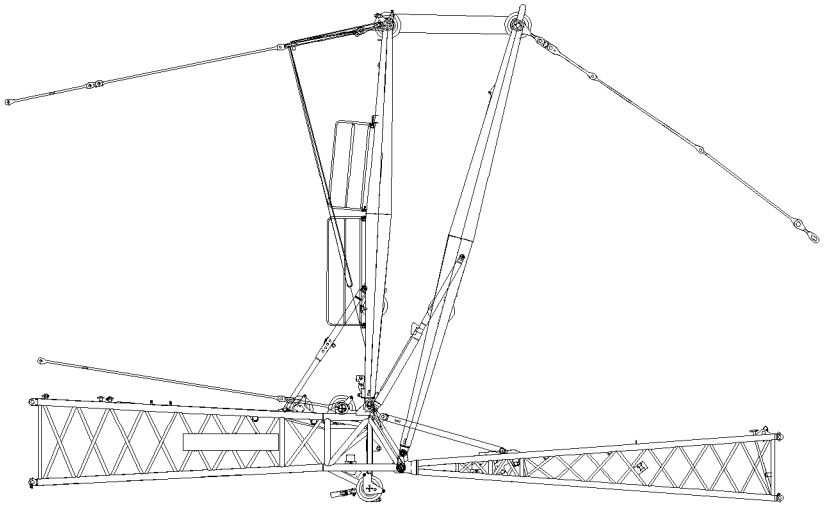
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1. Installation procedure

Fig. 1

1.0 - Pin N - installation unit on L - boom.
1.1 - Reeve in N - control cable between NA - bracket I and II.

Fig. 2

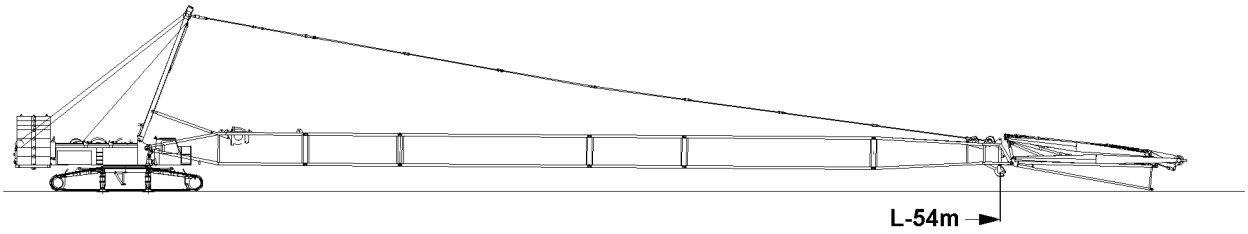
2.0 - Installation of guy rods from NA - bracket II to L - pivot section.

Fig. 3

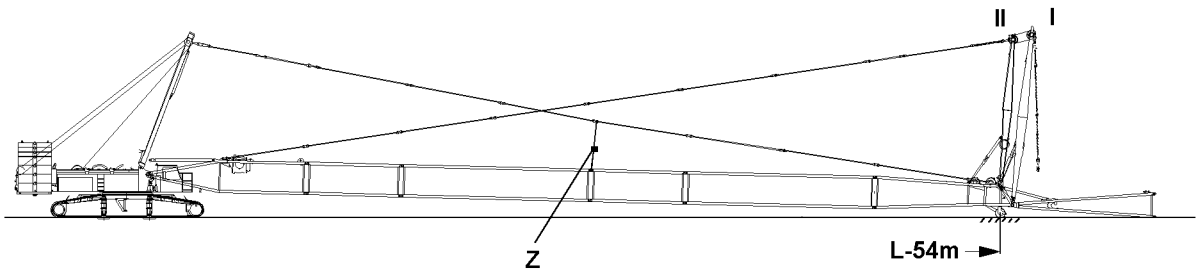
3.0 - Erect the NA - brackets and tension the guy rods from the NA - bracket II to the L - pivot section.
3.1 - Install the lattice jib and guy rods from the NA - bracket I to the N-end section.

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1.1 Installation procedure

Fig. 4

Install the L - boom without auxiliary guying (up to max. L-66m)
Do not support the L-end section from below.
Install the N-installation unit on the L-end section

Note: For installation of N-installation unit, see paragraph 3.

Fig. 5

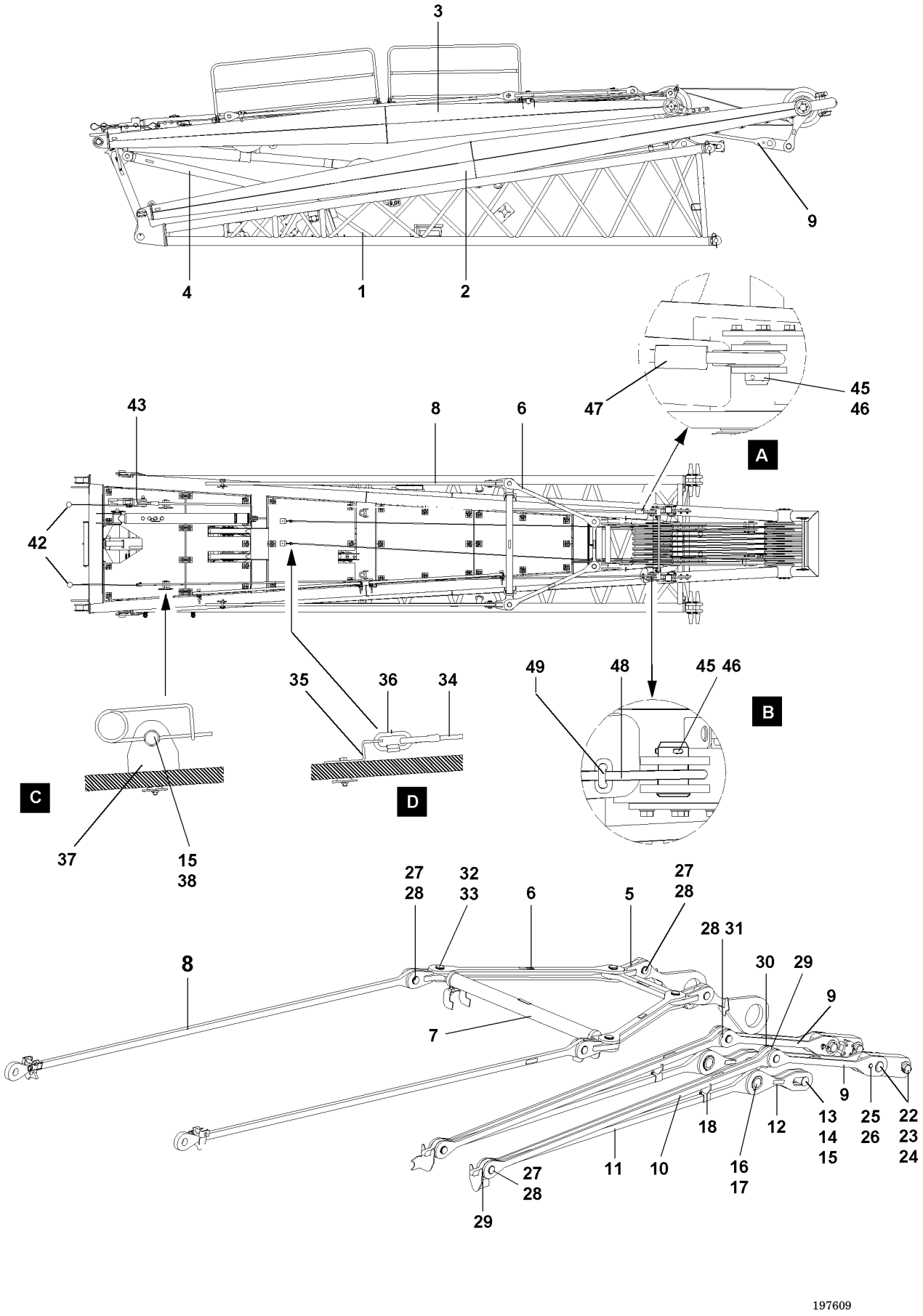
Luff the L - boom down and place the L-End section on the ground.
Install and tension the NA - bracket II guy rods.

Note: For installation and tensioning of the NA - bracket II guy rods - see paragraph 5.

Relieve the L-guying and install the L- auxiliary guying (Z).

Note: For L-auxiliary guying - see Rod plan.

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2. Installation

D A N G E R :For the installation and removal work:

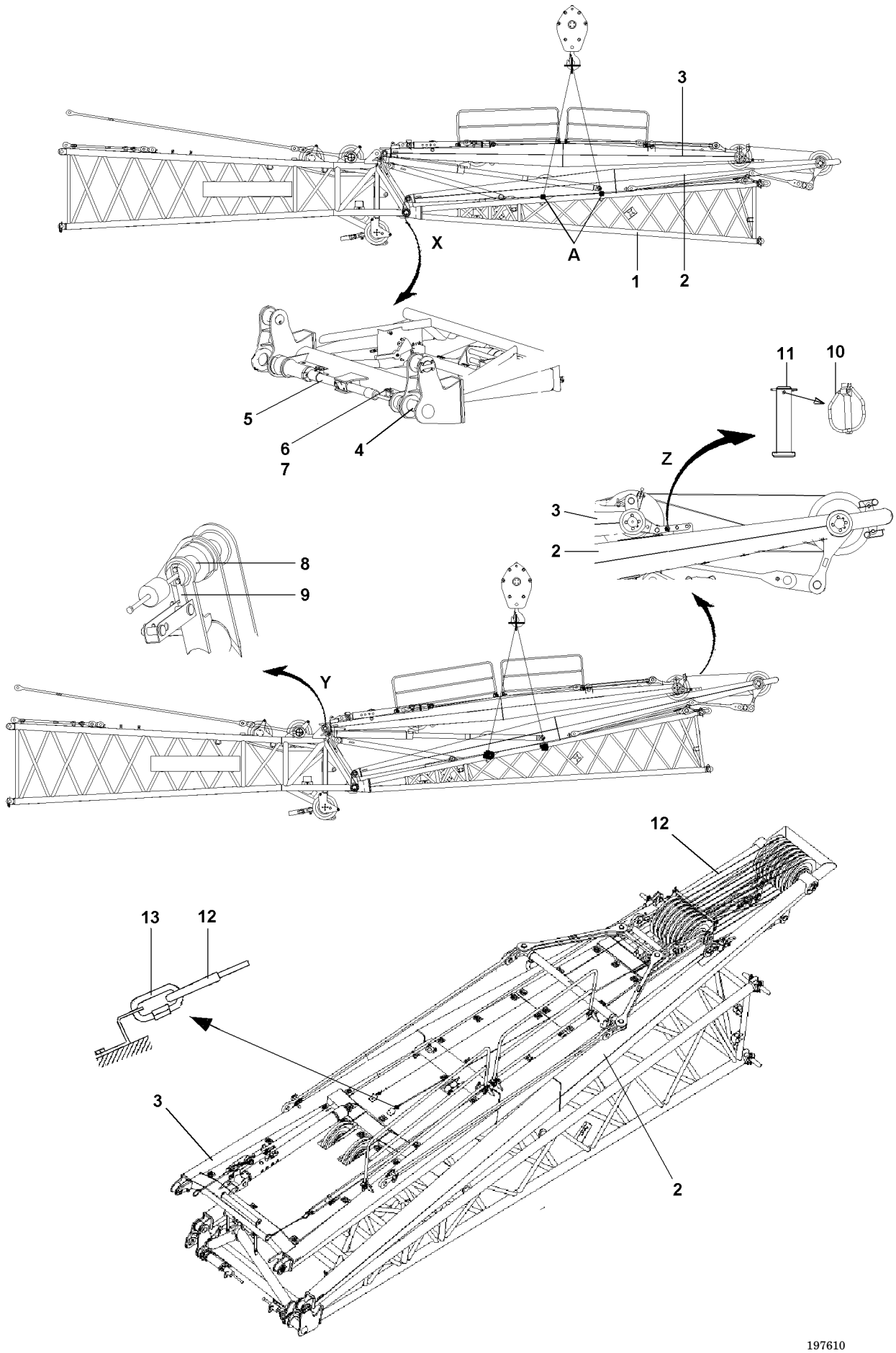
- **use a safe installation scaffolding - working platform. There is a danger of accidents due to falling.**
- **do not improvise, this is strictly prohibited.**
- **the lattice sections must be supported with suitable, stable materials.**
- **do not allow any one to remain under the lattice jib during the pinning and unpinning procedure of the lattice sections. This is strictly prohibited.**

Prerequisites:

- The boom is installed..
- The crane is horizontally aligned..
- An auxiliary crane as well as a installation scaffolding / working platform are available.
- The LICCON overload safety system is set according to the data in the load chart.
- The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
- The configuration status has been entered into the LICCON computer system.

2.1 Installation unit (Weight approx. 10,00 t)	Component overview
1 N - pivot section	26 Cotter pin
2 NA - bracket I	27 Pin
3 NA - bracket II	28 Retaining ring
4 N-relapse support mechanical	29 Thrust washer
5 Cross beam	30 Rohr
6 Guy rod	31 Pin
7 Cross beam	32 Pin
8 Guy rod	33 Retaining ring
9 Guy rod	34 Installation reeving cable ∅ 8×28m
10 Guy rod	35 Screw bracket
11 Guy rod	36 Chain lock
12 Guy rod	37 Screw bracket
13 Pin, connection guy rods	38 Pin
14 Washer	41 Shackle
15 Spring retainer	42 Latching cable
16 Axle	43 Pocket lock
17 Retaining ring	45 Pin
18 Support	46 Cotter pin
22 Pin	47 Installation cable
23 Cotter pin	48 Latching cable
24 Washer	49 Cable clamp
25 Pin	

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3. Pin N - installation unit on L - boom

Take on the N - installation unit with the auxiliary crane on the tackle points (A) on the N-pivot section (1).

Note: Total weight of the N- installation unit is approx. 10,0t.

Pin the N -pivot section (1) on the L-end section on the bottom (X).
Pin and secure the pin (4) with the pin pulling device (5).
Insert the retaining pin (6) and secure with the spring retainer (7).

After pinning the N-pivot section (1) on the L-end section on the bottom (X), lift the N-installation unit with the auxiliary crane and pin the NA - bracket II (3) on the L-end section on top (Y). Insert pin (8) and secure with the axle retainer.

Loosen the transport retainer between the NA - bracket I (2) and the NA - bracket II (3). Remove the hinge pin (10) and unpin the retaining pin (11).

D A N G E R : After pinning the N-installation unit on the L-end section on top, the transport retainer between the NA - bracket I (2) and the NA - bracket II (3) must first be released and only then may the N-installation unit be lowered!
There is a danger of accidents.

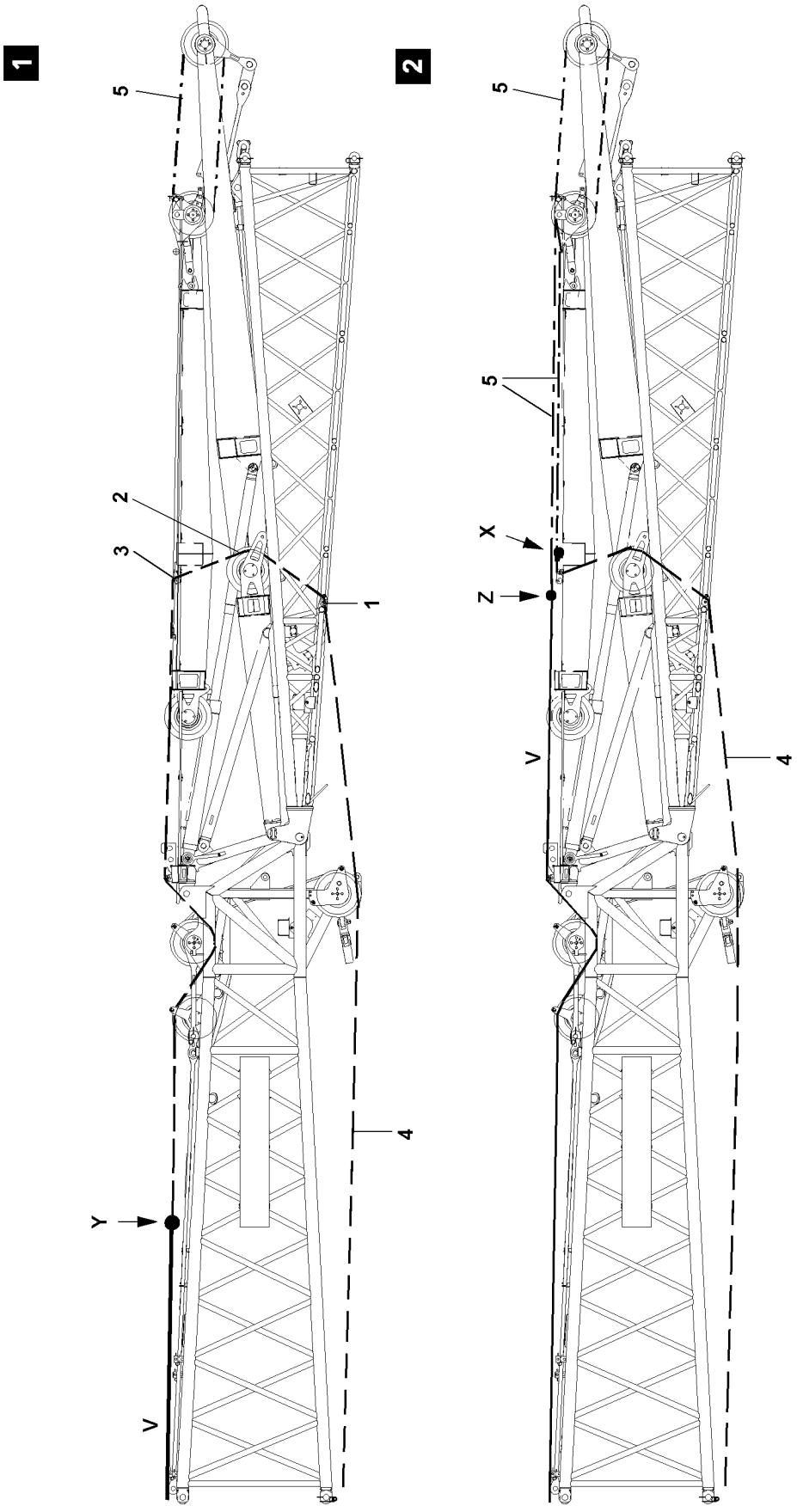
Loosen the installation reeving cable (12) on the right side on the NA - bracket II. Open the chain lock (13).

Place the N - installation unit down with the auxiliary crane.

D A N G E R : do not allow any one to remain under the installation unit during the pinning and unpinning procedure of the lattice sections. This is strictly prohibited.
There is a danger of accidents.

Remove the auxiliary crane.

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4. Reeve in the N-control cable between the NA - bracket I and II

V N-control cable from the control winch
1 Change over pulley in the N-Pivot section
2 Change over pulley in the NA - bracket I
3 Change over pulley in the NA - bracket II
4 Auxiliary cable from auxiliary winch
5 For installation cable already reeved for transport

Fig. 1 Auxiliary cable routing when getting the N-control cables (V)
Pull the auxiliary cable (4) from the auxiliary winch over the change over pulleys (1, 2 and 3), to the N-control cables (V) of the N-control winch.
Connect the auxiliary cable (4) with the N - control cable (V).
Spool up the auxiliary winch and spool out the N-control winch at the same time and pull the N - control cable (V) to the NA - bracket II (Z)

Fig. 2 Reeving the N-control cables (V)
Release the N-control cable (V) on the auxiliary cable (4) and connect with the installation cable (5), already reeved in between the NA - bracket I and II, (Z).
Connect the auxiliary cable (4) from the auxiliary winch with the other end of the already reeved in installation cable (5) (X).
Spool up the auxiliary winch and spool out the control winch at the same time and reeve in the N - control cable (V) between the NA - bracket I and II.

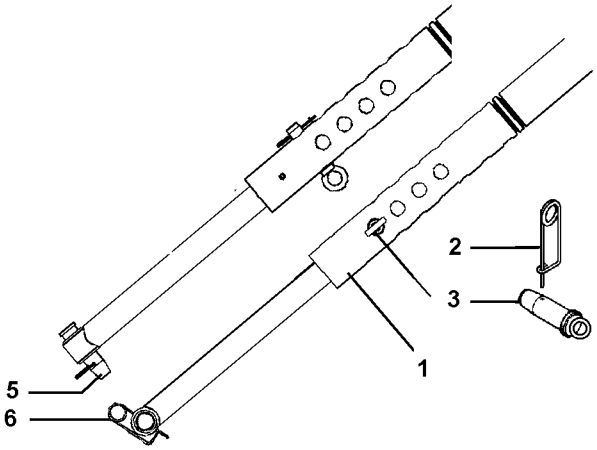
Note: Reeving, see **Reeving plans.**

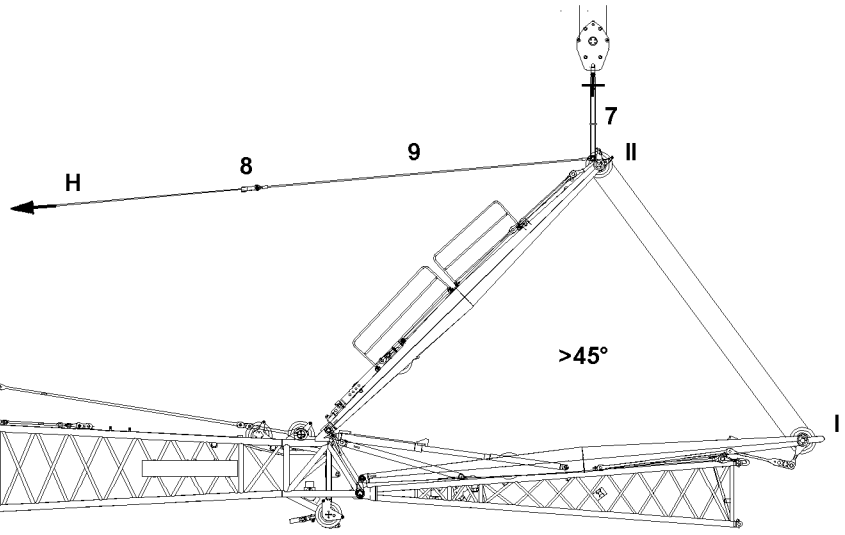
C A U T I O N : When spooling out the cable, make sure that no slack cable forms. Cable damage!

Release the auxiliary cable (4) on the installation cable (5) and spool up the auxiliary winch.

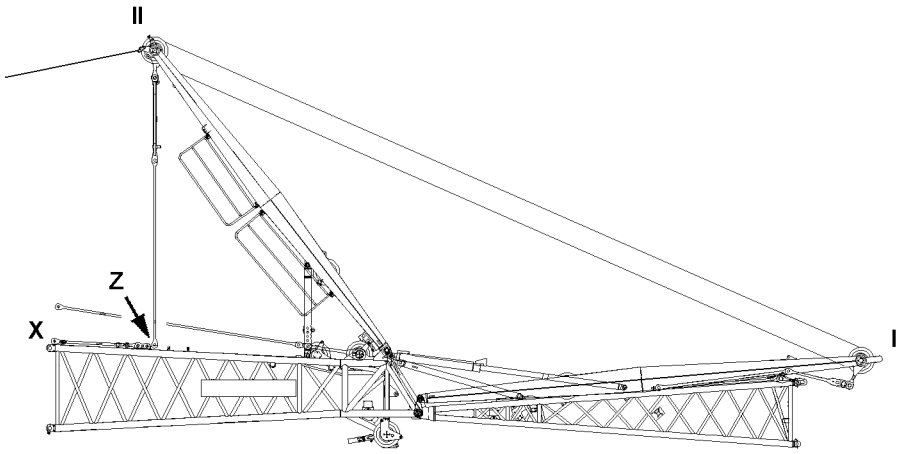
Release the installation cable on the N-control cable.

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5. Erect the NA - bracket II

Erection

Release the transport retainer of the NA - bracket II relapse support (1) on the NA - bracket II.

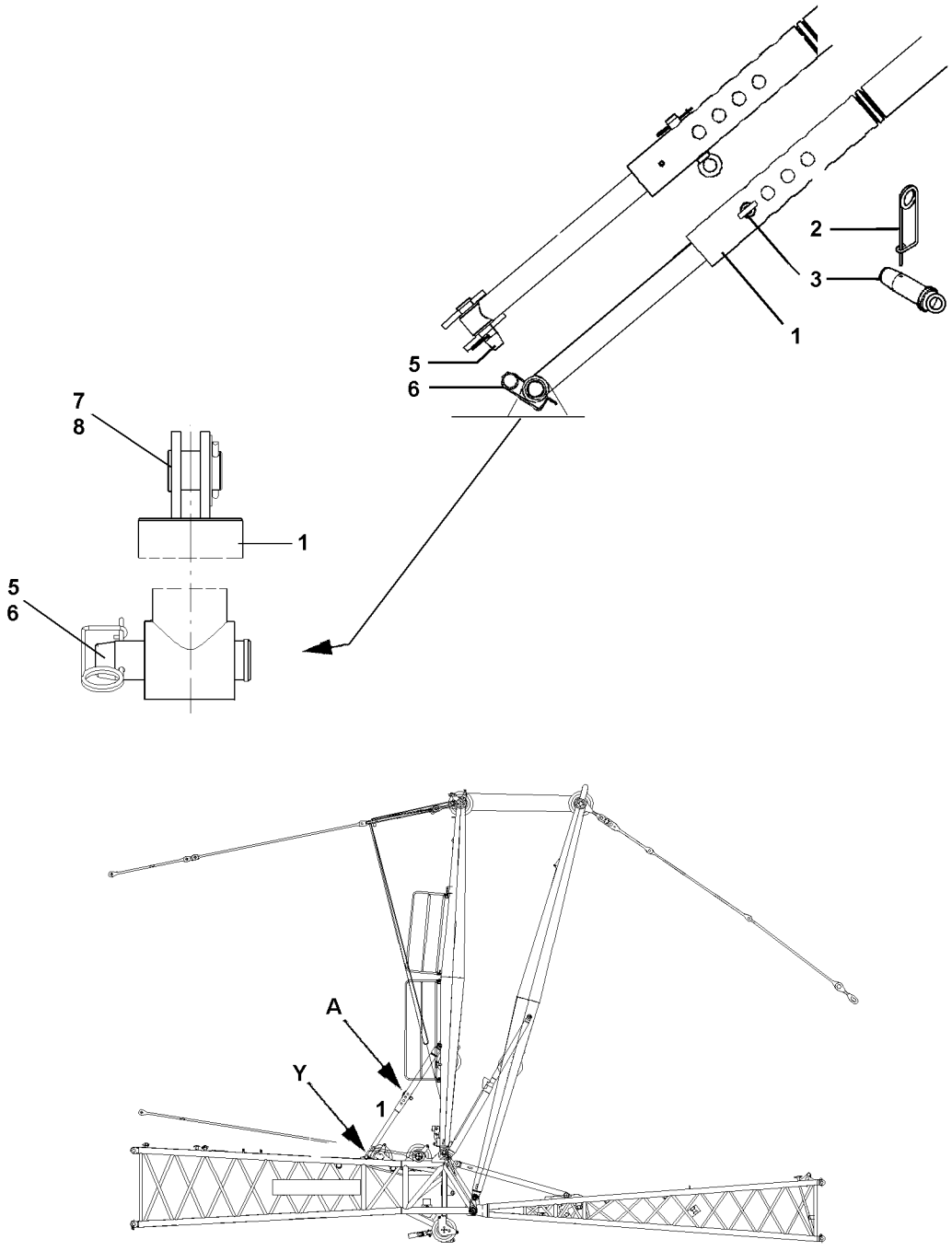
Attach the auxiliary crane on the installation cable (7).
Attach the hoist cable in the pocket lock (8) on the installation cable (9).
Remove the spring retainer (2) and unpin the pin (3) on the NA - bracket II relapse support (1). Pull the relapse support apart.
Erect the NA - bracket II with the auxiliary crane to approx. 45° and then continue to pull it with the hoist cable (H).

C A U T I O N : The NA - bracket II must be erected to approx. 45° with the auxiliary crane.

Installation of the guy rods from the NA - bracket II to the L - pivot section
Spool up the hoist winch, while **spooling out** the N-control winch at the same time, and pull the NA - bracket II to the rear and pin and secure the guy rods (Z) from the NA - bracket II with the guy rods (X) on the L-end section.

Note: To prevent the NA - bracket I from pulling up, the control winch must be spooled out at the same time.

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5.1 Tension the guy rods from the NA - bracket II to the L - pivot section

The mechanical relapse support (1) is pinned on the NA - bracket II with pin (7) and secured with cotter pin (8).
Pin the mechanical relapse support (1) on the L-end section with pin (5) and secure with spring retainer (6).

When the guy rods are pinned to each other and secured, the hoist winch (H) must be **spooled out** and the N-control winch must be **spooled up** at the same time, until the NA - bracket II-guying is tensioned by the counter pressure of the N-relapse cylinder (10).

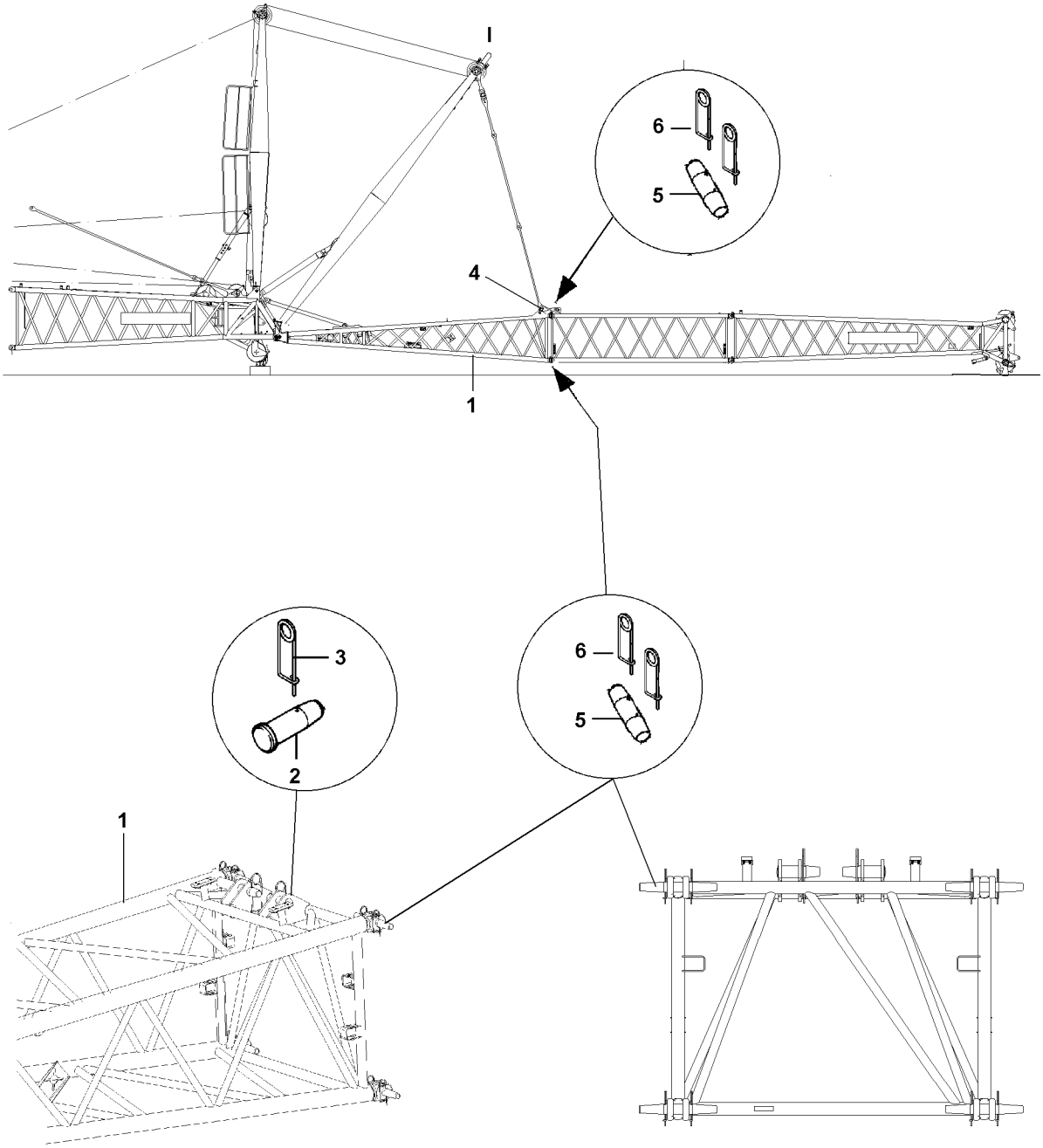
C A U T I O N : Before tensioning the NA - bracket II-guying, the pins (3) on the N-relapse supports (1) must be unpinned.

Pin the NA - bracket II relapse support (1) in max. possible length on the next hole, pin with pin (3) and secure with spring retainer (2).

Attach the latching cable and the installation cable again on the NA - bracket II.

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6. Install the N- lattice jib

Pin the guy rod from the NA - bracket I, on the brackets on the N-pivot section (1), with pin (2) and secure with spring retainer (3).

Note: The guy rods must be pinned on the **hollow axle** (4) on the N-Pivot section (1) with pin (2) and secured with spring retainer (3).

Assemble the lattice jib to the required length, pin on the N-pivot section **"on top"** with the cone pin (5) and secure with spring retainers (6).

Note: The guy rods are placed for transport on the intermediate sections and attached. Before installation, release the transport retainers.

D A N G E R : The pins on the lattice sections must be secured with spring retainers. For removal and installation of the lattice sections, they must be supported from below with suitable, stable materials. Make sure that on one is under the lattice jib during the pinning and unpinning procedure of the lattice sections. This is strictly prohibited.

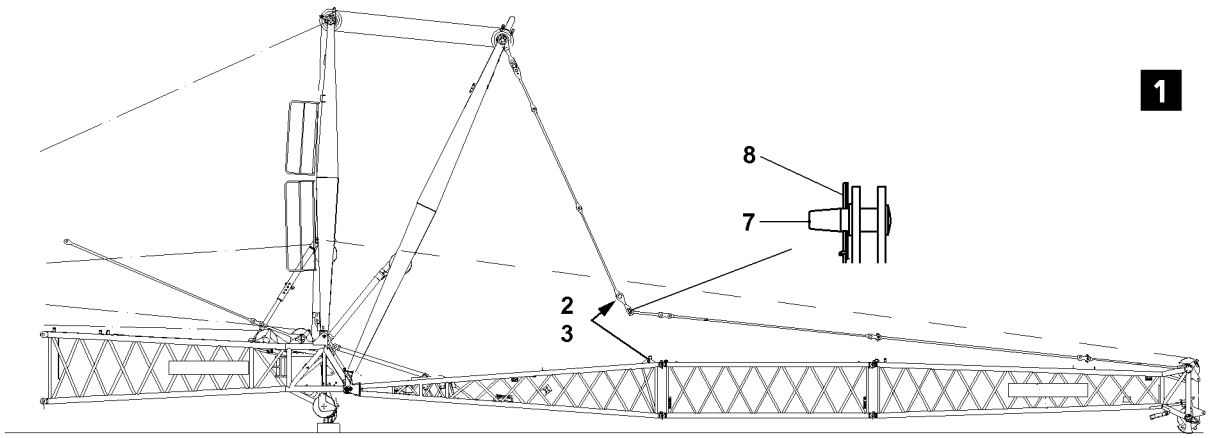
Pull up the N-pivot section (1) and pin the N-Lattice jib on the pivot section **"on the bottom"** with the cone pin (5) and secure with spring retainers (6).

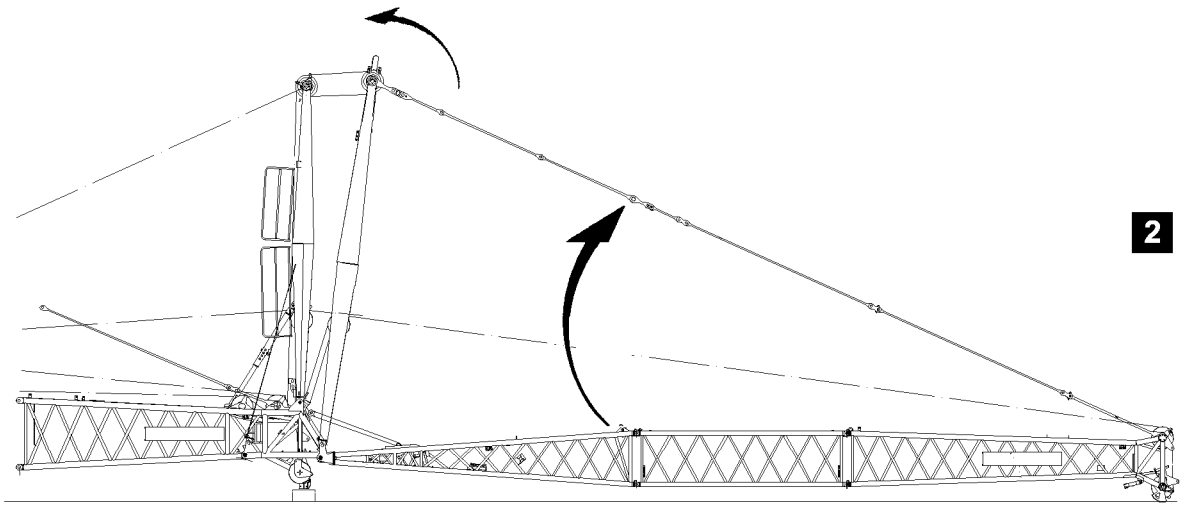
Note: Note the test point 1 (MS1) - "IST / ACTUAL" force from Monitor 1 in this position, so that one knows at removal of the boom with what force one must secure at unpinning.

D A N G E R : The N-End section may not be raised, it must remain on the ground. If this is not observed, damage can occur. Make sure that on one is under the lattice jib during the pinning and unpinning procedure of the lattice sections. This is strictly prohibited

Pull the hoist cable to the N-end section and attach it there.

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6.1 Install the guy rods from the NA - bracket I to the N-end section

Assemble, pin and secure the guy rods depending on the lattice jib length.

Note: The guy rods are placed and attached for transport on the intermediate sections. For installation, the transport retainers must be released.

Pin the guy rods from the N-end section with the guy rods from the NA - bracket I, with pin (7) and secure with spring retainer (8).

Note: The guy rods must be installed and secured according to the installation drawings. Compare the numbers on the installation drawing with the numbers on the guy rods.

D A N G E R : All pins of the guy rods must be secured.
The guy rods must be inspected regularly, see chapter 8.15.

Relieve the guy rods from the NA - bracket I, by lowering the NA - bracket I.
Unpin the guy rods and brackets on the N-Pivot section (1) - **hollow axle (4)** -. Remove the spring retainer (2) and unpin the pin (3).

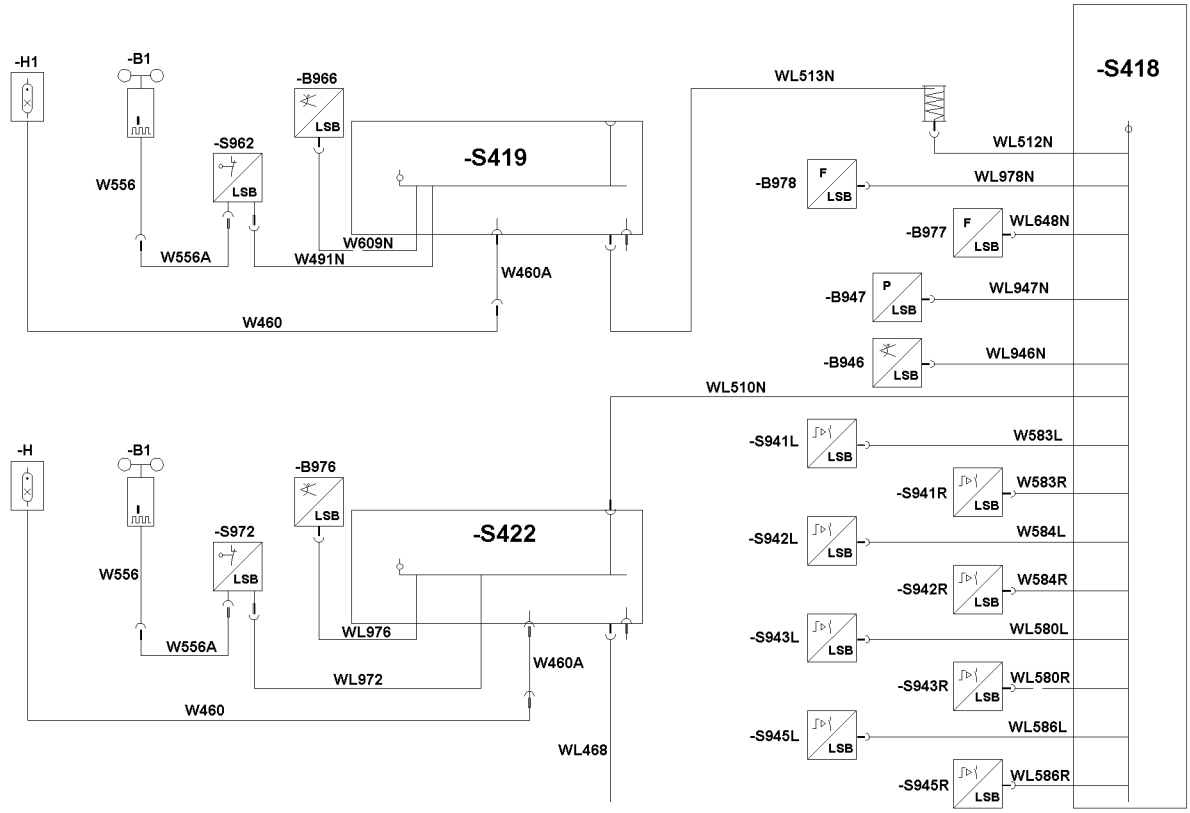
C A U T I O N : The guy rods from the NA - bracket I to the N-pivot section (1) must be unpinned before tensioning the N-guying.

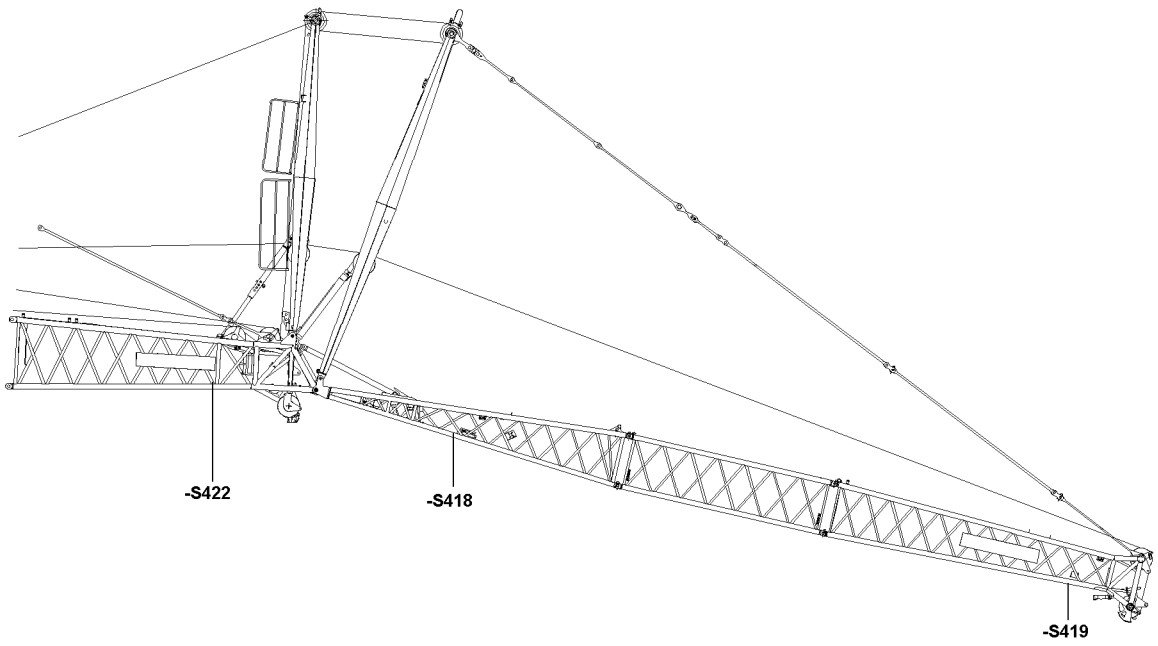
D A N G E R : Before unpinning the guy rod, the lattice jib must be pinned and secured ”on the bottom”.
Otherwise there is a danger of accidents, as the lattice jib could suddenly fold down.
Make sure that no one remains under the lattice jib during the pinning and unpinning procedure. This is strictly prohibited.

Actuate the N-control winch and tension the guy rods between the NA- bracket I and the N-end section.

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7. Electrical connections

Establish the electrical connection from the connector box (-S422) to (-S 418). Plug in the cable plug (WL510N) on the connector box (-S422).

Establish the electrical connection from the cable drum in the N-pivot section, to the connector box (-S 419). Plug in the cable plug (WL513N) on the connector box (-S 419).

Establish the electrical connection from the connector box (-S 418) to the cable drum in the N-pivot section. Plug in the cable plug (WL512N) in the cable drum socket.

Note: Establish the electrical connection from the connector box (-S 418) to the cable drum only if the cable from the cable drum to the connector box (-S 419) is spooled out.

Electrical connection on **Connector box (-S 419)**

-S962	W451N	Hoist limit switch
-H1	W460	Beacon
-B966	W609N	Angle sensor, Luffing jib on top
-B1	W556	Wind sensor

Electrical connection on **Connector box (-S 422)**

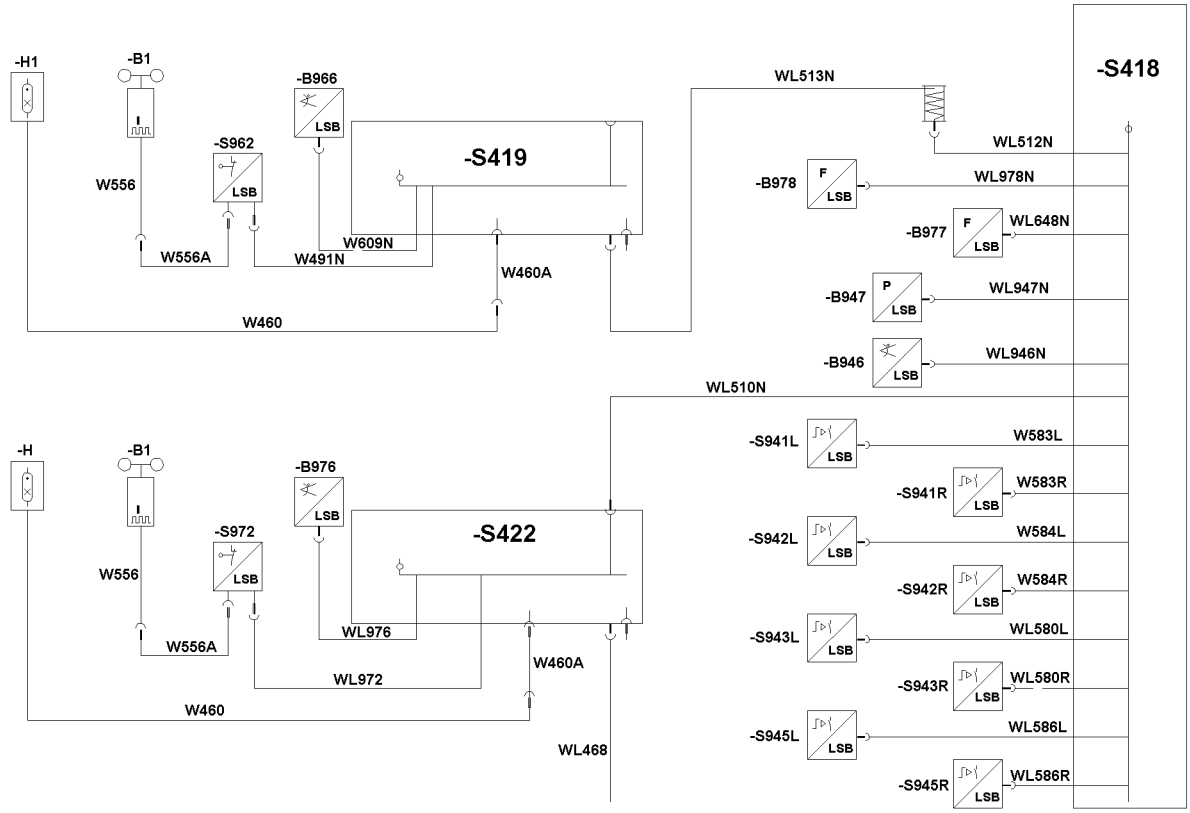
-S972	WL972	Hoist limit switch
-H	W460	Beacon
-B976	WL976	Angle sensor, Luffing jib on top
-B1	W556	Wind sensor

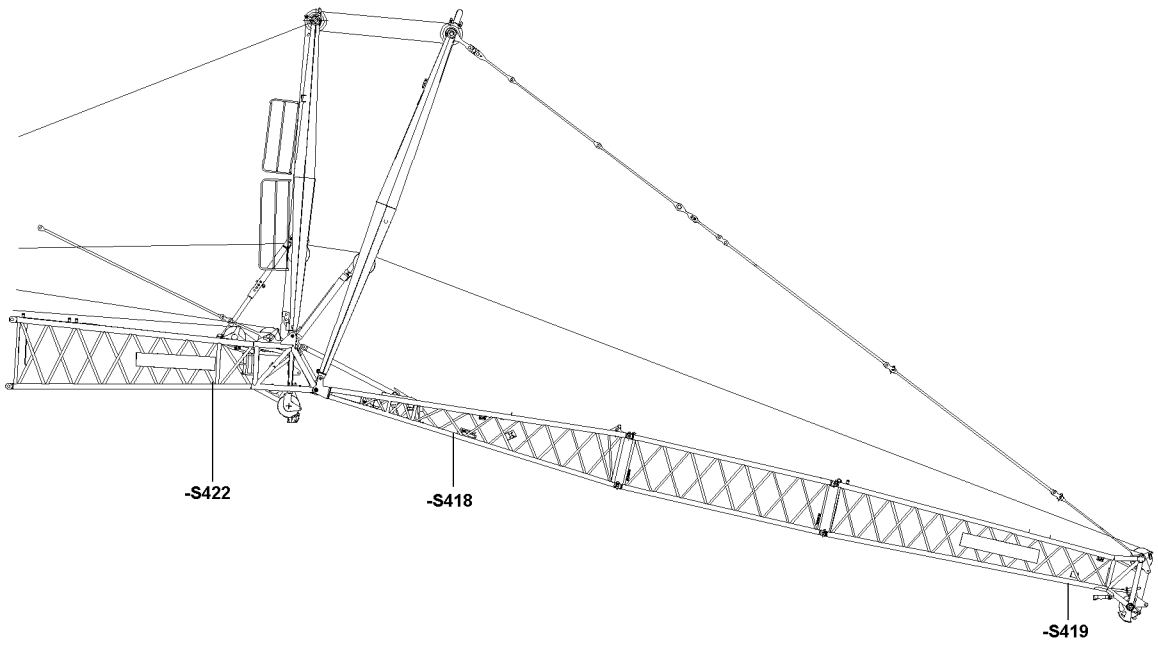
Electrical connection on **Connector box (-S 418)**

-B977	WL648N	Pull test bracket2A right
-B978	WL978N	Pull test bracket2A left
-B947	WL947N	Pressure sensor N-relapse support, left
-B946	WL946N	Angle sensor luffing jib on the bottom
-S941L	W583L	Flap in position
-S941R	W583R	Flap in position
-S942L	W584L	Relapse support on block left
-S942R	W584R	Relapse support on block right
-S943L	WL580L	Angle sensor left, luffing jib on the bottom
-S943R	WL580R	Angle sensor right, luffing jib on the bottom
-S945L	WL586L	Flap left
-S945R	WL586R	Flap right

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7.1 Function check

Prerequisites:
- All electrical connections are made.
- The engine is running.

Airplane warning light
Turn on the airplane warning light, check visually for function.

Wind speed sensor
Check easy movement and function of wind speed sensor.

Limit switch

C A U T I O N : The limit switch functions must be individually checked before crane operation.
Carry it out manually as described below.
In the test system, the function of the individual limit switch initiators must be determined.

Hoist limit switch
- Manually actuate the hoist limit switch.
- The hoist winch must turn off in upward movement.
- The hoist ” top” symbol on the LICCON indicator must blink.

Limit switch N-Lattice jib, ”on top”, Relapse cylinder
- The N-control winch movement **”spool up”** must turn off.
- The symbol on the LICCON monitor must appear.

Limit switch N-Lattice jib, ”on the bottom”, Relapse cylinder
- The N-control winch movement **”spool out”** must turn off.
- The symbol on the LICCON monitor must appear.

Note: The shift point of the limit switch on the r elapse cylinder must be checked before erection - **see chapter 8.12.**

Limit switch-Flap in position and lattice jib, ”steepest ” position, mechanical relapse support
- Cover the limit switch initiators individually with a metal plate.
- The N-control winch movement **”spool up”** must turn off.
- The symbol on the LICCON monitor must appear.

D A N G E R : Before erection, check the easy movement of the pendulum of the mechanical relapse retainer over the complete swing range of the pendulum. If this is not observed, the mechanical relapse support will not engage in steep lattice jib position.
There is a danger of accidents as the lattice jib might tip backward!

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8. Erection / take down

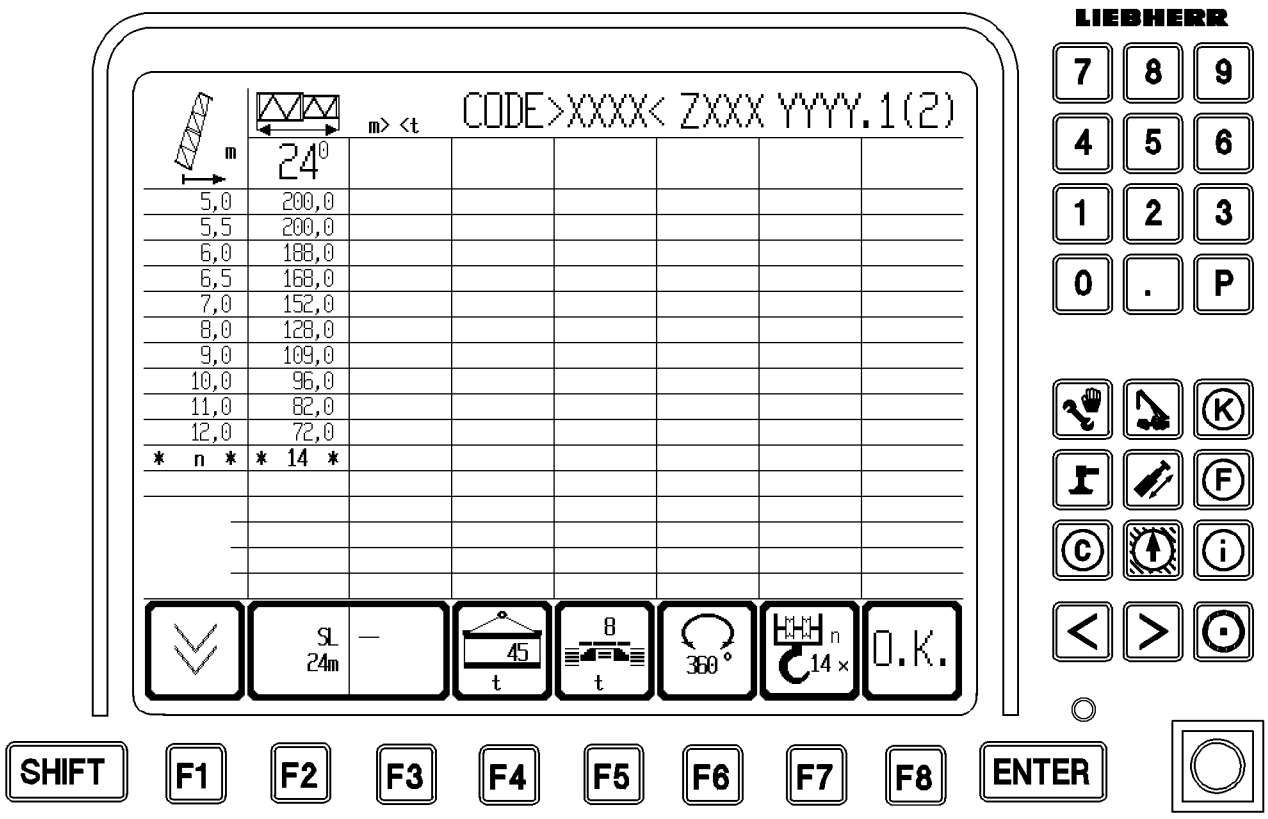
The boom combinations must be erected or taken down according to the erection and take down chart (separate chart manual).

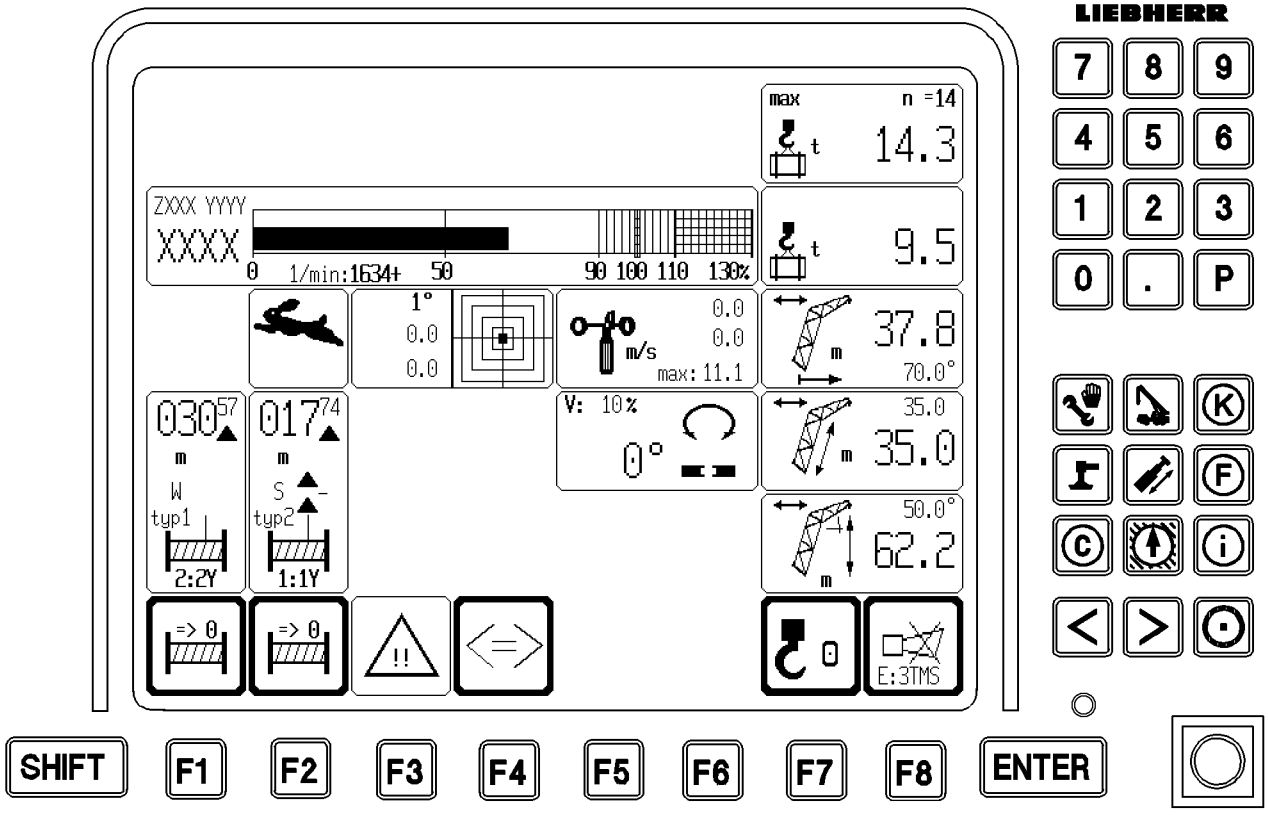
D A N G E R : The erection and take down procedure must be made according to the data in the erection and take down chart.
If this is not observed, the crane will be overloaded and can topple over!

Prerequisites:
- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform, according to the load chart.
- The derrick ballast is placed according to the erection and take down chart.
- The lattice jib is assembled according to the load chart and the operating manual.
- All limit switches are correctly installed and fully functioning.
- Before erection, the pendulum of the mechanical relapse retainer must be checked for easy movement over the complete swing range of the pendulum.
- All pin connections are secured.
- The hoist cable has been correctly placed into the cable pulleys and secured with cable retaining pins to prevent it from jumping out.
- There are no persons within the danger zone.
- There are no loose parts on the telescopic boom and the lattice jib.
- In winter, the telescopic boom, the lattice jib and their components (limit switches, cable drum, airplane warning light, wind velocity sensor, etc.) are free of ice and snow.

D A N G E R : Incorrectly installed or non-functioning limit switches as well as falling parts (pins, spring retainers, ice, etc.) can cause accidents!
Before erection, the pendulum of the mechanical relapse cylinder must be checked for easy movement over the complete swing range of the pendulum.
If this is not observed, the mechanical relapse support does not engage in steep lattice jib position.
There is a danger of accidents, as the lattice jib may tip backward!

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8.1 Erection procedure

- Attach the hoist cable on the end section.

C A U T I O N : **If the hoist cable is not attached, then the hoist cable can fall backward due to its own weight during erection.**
During erection, the crane may not be turned.

Note: Carry out the erection procedure according to the erection and take down charts.

The LICCON overload protection has been set according to the data in the load chart.
The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
The configuration status has been entered into the LICCON computer system.
- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.

D A N G E R : **Danger of toppling or destroying the crane!**
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

Note: If a range is reached during erection which is monitored by the load chart, then the LICCON overload protection is activated.
The lowest operating position has been reached if the displays turn off and a load display - t - appears in the “MAX LOAD” icon instead of question marks (" ? ? ? ? ").
- The Assembly icon in the LICCON monitor turns off.

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8.2 Erection

Actuate the manual control lever and luff up the boom.
At the same time, spool out the lattice jib control winch to hold the lattice jib, with the N-end section, on the ground.

D A N G E R : **The lattice jib must remain on the ground with its complete weight.**
Lower the lattice jib control in such a way that the guy rods always hang through slightly.
Watch for slack cable formation on the control winch!
If this is not observed, the crane can be overloaded or topple over!

Carry out this procedure until the L - boom and the N-lattice jib form an angle of (45°) or the N-end section has lifted off the ground.

Only now luff up the L - boom and lift the N-lattice jib off the ground.

Release the hoist cable on the end section, reeve in between the pulley head on the end section and the hook block and secure on the fixed point - **see reeving plans**.

Attach the hoist limit switch weight.

Luff the boom up to the steepest position.

C A U T I O N : **During the erection, the hoist winch must be spooled up at the same time to prevent a collision of the hook block with the end section of the lattice jib.**

Luff up the lattice jib until it is at operating position.

Note: If a range is reached during erection which is monitored by the load chart, then the LICCON overload protection is activated.
- The Assembly icon in the LICCON monitor turns off.

D A N G E R : **Danger of toppling or destroying the crane!**
If the overload protection is deactivated, there is no additional protection against crane overload!
The set up key (D) bypasses the safety devices!
The radii specified in the load chart may not be exceeded nor fallen below, even if there is no load on the hook!
Crane operation with deactivated overload protection is prohibited!

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9. Crane operation

C A U T I O N : Observe the notes in
Chapter 4.02 " LICCON COMPUTER SYSTEM",
Chapter 4.05 ” CRANE OPERATION ”
Chapter 4.08 ” WORKING WITH A LOAD ”.

Prerequisites:
- Set the LICCON overload safety system according to the data given in the load chart.
- The current configuration status corresponds to the data in the respective load chart.
- The configuration status has been entered into the LICCON computer system.
  The Assembly icon on the LICCON monitor turns off.
  The LICCON overload protection is activated.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

D A N G E R : Check the horizontal position of the crane before and during operation.
If the crane operator leaves the crane operator's cab, even if only for a short time, then he is obligated to check all operating mode settings and to reset them, if necessary, before starting to work again.

Adjustments / checks
Check the function of the overload safety system by triggering the operating positions ”on the top” and ”on the bottom”.
Check the function of the hoist limit switch ”top” by running against the hoist limit switch weight.
Check the function of the limit switch ”Lattice jib steep”, by running against the relapse retainer.

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5.08 LN - BOOM COMBINATION 028465-00

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10. Take down procedure

The boom remains in steepest position, 87°.
Actuate the manual control lever and luff the N-lattice jib down until just before the lowest operating position.

Note: When the **lowest** operating position is reached, the luff down movement is shut off.

C A U T I O N : When luffing down, the hoist winch must be spooled out at the same time to prevent a collision between the hook block and the pulley head.

- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

Continue to luff down the N-lattice jib until an angle of approx.45° between the L - boom and the N-lattice jib is reached. The shut off is made by the limit switch ”N-lattice jib on the bottom”.
The limit switch symbol on the LICCON indicator blinks.

C A U T I O N : When luffing down the lattice jib, make sure that the hook block does not collide with the end section!
The hook block may not be pulled along on the ground.

Luff down the L - boom until the hook block touches the ground.
Remove the hoist limit switch weight.
Unreeve the hook block.

D A N G E R : When unreeving the hoist cable, make sure that there are no persons within the danger zone.

Luff the L - boom down until the end section of the N-lattice jib is laying on the ground.

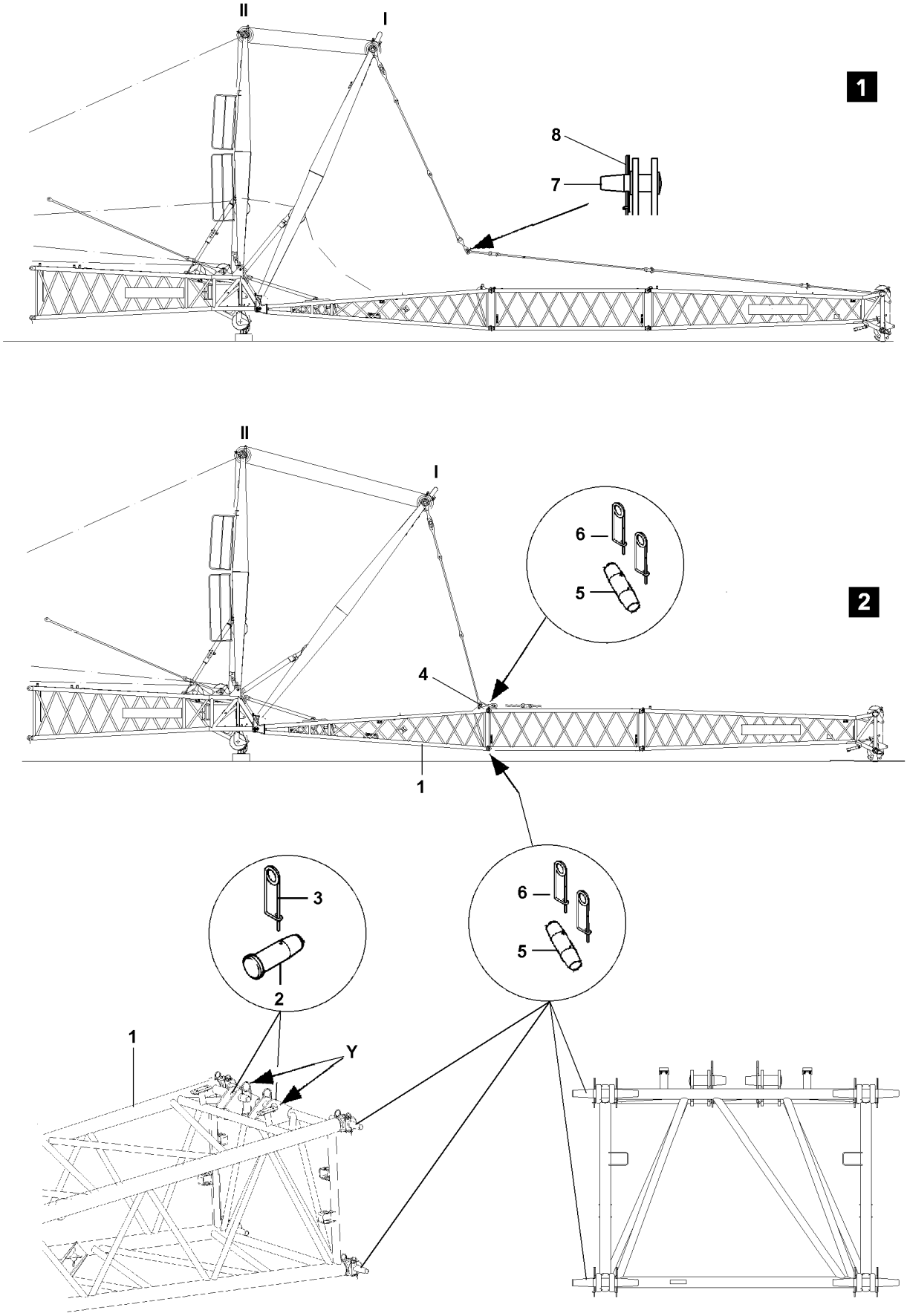
Continue to luff down the L - boom.

D A N G E R : The lattice jib must be on the ground with its complete weight.
Lower the lattice jib control in such a way that the guy rods always hang through slightly.
Watch for slack cable formation on the control winch!
If this is not observed, the crane will be overloaded or the crane can topple over!

Remove the hoist cable.

D A N G E R : During the removal of the hoist cable, make sure that there are no persons within the danger zone!

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11. Remove the N-lattice jib

Spool back the hoist cable over the cable pulleys in the NA- brackets I and II, until the L-end section.

D A N G E R : **Secure the hoist cable with the auxiliary cable and lower it slowly via the cable pulleys to the rear to the L-end section.**
Make sure that there are no persons within the danger zone.
There is a danger of accidents!

Spool out the N-control winch and lower the NA- bracket I to the front until the guy rods from the N- end section lay on the intermediate sections.

Note: The guy rods are placed for transport on the intermediate sections and attached with the transport retainers.

Disconnect the guy rods from the N- end section from the guy rods from the NA - bracket I (X). Release the spring retainer (8) and unpin the pin (7).
Pin the guy rods on the N-pivot section (1) - **hollow axle (4)** -. Insert the pin (2) and secure with spring retainer (3).

C A U T I O N : **Pin the guy rods from the NA - bracket I on the brackets (Y) on the pivot section (1) with pin (2) and secure with spring retainer (3).**

Note: Pull with the N-control winch until the same F1 - "IST" Kraft is set on test point MS1 as was already noted at installation.

D A N G E R : **The N-end section may not be lifted up, it must remain on the ground.**
If that is not observed, damage can occur!

Unpin the N-pivot section **"on the bottom"**. Remove the spring retainers (6) and unpin the cone pin (5).

Lower the N-pivot section until it rests on the ground.

Unpin the N-pivot section **"on top"**. Remove the spring retainers (6) and unpin the cone pin (5).

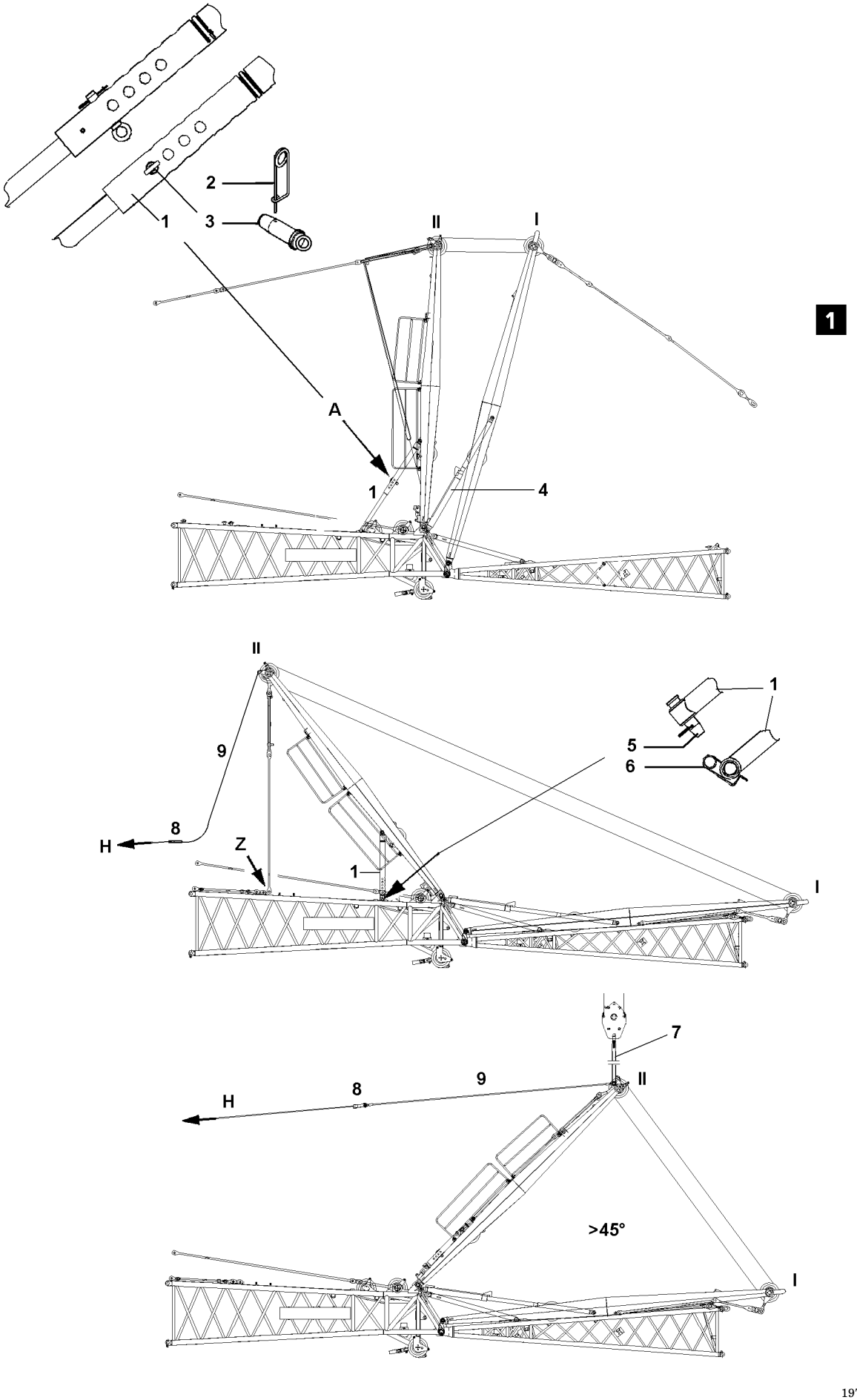
D A N G E R : **Before unpinning, it must be ensured that the pivot section (1) is pinned with pin (2) and is held by the guy rods from the NA - bracket I.**
Make sure that no one is under the lattice jib during the unpinning and pinning procedure of the lattice sections.
If this is not observed, there is a danger of accidents as the lattice jibs could suddenly fall down.

Remove the lattice jib.

Relieve the guy rods from the NA - bracket I, by lowering it.

Unpin the guy rods on the pivot section (1).

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12. Unpin the mechanical relapse support

Spool up the N-control winch and pull up the NA- bracket I until the guying between the NA - bracket II and L - pivot section is tensioned due to the counter pressure of the N-relapse cylinder (4).
Then the pin (3) on the mechanical relapse support (1) can be unpinned.
Remove the spring retainer (2) and unpin the pin (3).

C A U T I O N : When pulling up, the limit switch on the N-relapse cylinder (4) can be actuated and shut off the spooling up of the N-control winch, which prevents that it is pulled on block.
The electrical connection to the limit switches on the N-relapse cylinder must be established.

13. Removal of the guy rods from the NA - bracket II to the L - pivot section

Lower the NA - bracket I until it lays on the N-pivot section.
Hang the hoist cable into the pocket lock (8) on the installation cable (9).
Spool up the hoist winch, while **spooling out** the N-control winch at the same time, pull the NA - bracket II to the rear and unpin the guy rods from the NA - bracket II on the guy rods to L - pivot section (Z).
Place the guy rods on the lattice sections and secure.

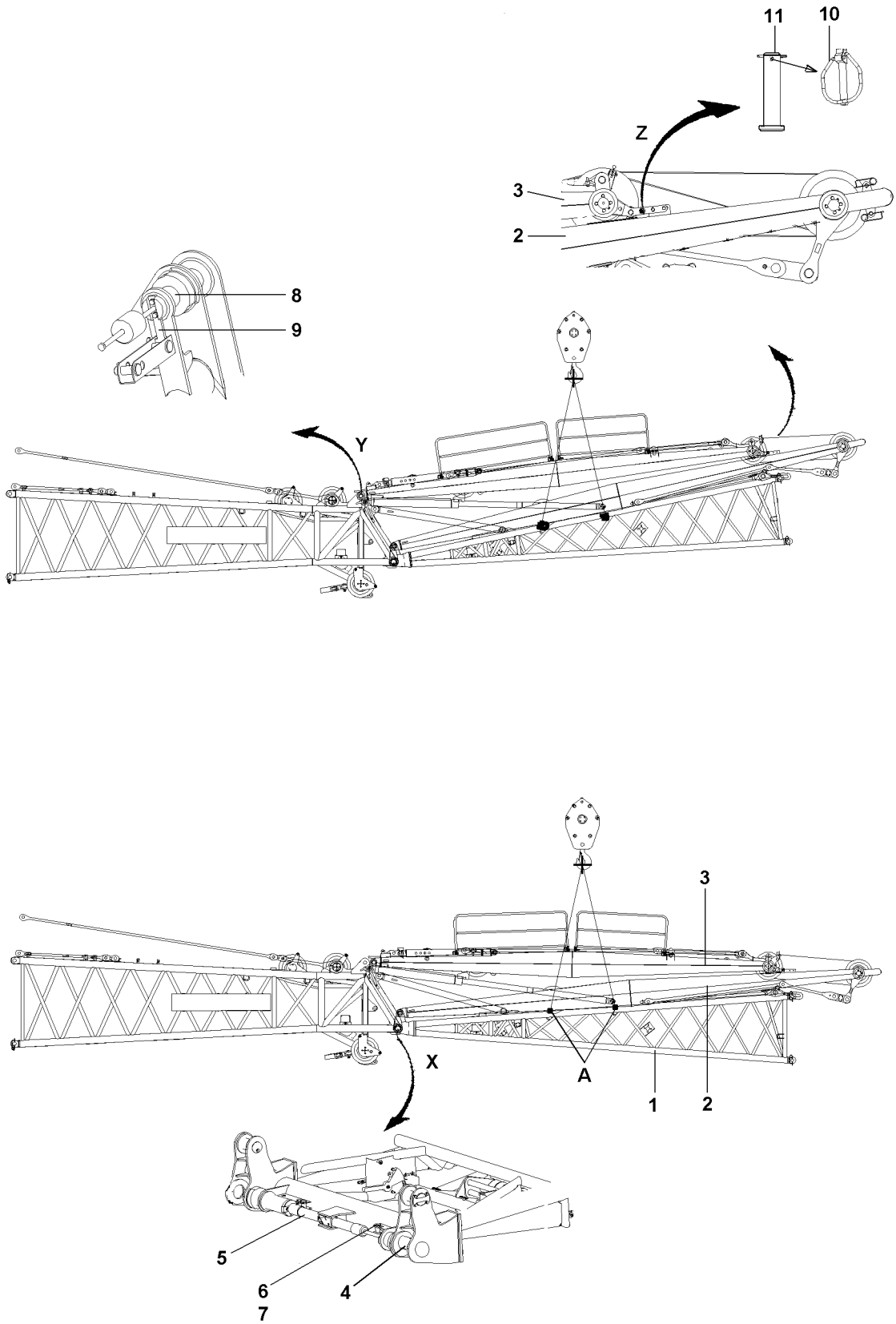
C A U T I O N : Before pulling the NA - brackets II back, the pin (3) must be unpinned and repinned in pushed together condition.
If this is not observed, damage can occur.

Unpin the mechanical relapse support (1) on the L-end section. Remove the pin (5) and spring retainer (6).
Pull the NA- bracket II to the front by spooling out the hoist winch and simultaneously spooling up the N-control winch, to the vertical and on until approx. 45°.
From approx. 45°, attach the auxiliary crane on the installation cable (7).
Lower the NA- bracket II by spooling up the N-control winch and simultaneously spooling out the hoist cable, NA- bracket II until it lays on the NA- bracket I.

D A N G E R : From approx. 45° to the horizontal towards the front, the NA- bracket II must be held with the auxiliary crane and lowered with it further.
Otherwise the NA - bracket II folds to down.
There is a danger of accidents.

Detach the hoist cable on the pocket lock (8) of the installation cable (9) and hang the installation cable on the NA - bracket II.
Detach the installation cable (7) on the auxiliary crane and attach on the NA - bracket II.
Unreeve the N-control cable and reeve in the auxiliary cable for the reeving.

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14. Unpin the N - installation unit on the L - boom

Take on the N - installation unit with the auxiliary crane on the tackle points (A) on the N-pivot section (1).

Note: The total weight of the N-installation unit is approx. 10,0t.

Pin the transport retainer between NA - bracket I (2) and NA - bracket II (3). Pin the retaining pin (11) and secure with the folding pin (10).

D A N G E R : The transport retaining pin (11), between the NA - bracket I (2) and the NA - bracket II (3), must be pinned before unpinning the installation unit on the L-end section on top.
Otherwise the two NA-brackets will move.
Make sure that no one is under the installation unit during the pinning and unpinning procedure. This is strictly prohibited.
Support the pivot section from below with suitable, stable materials.
There is a danger of accidents.

Unpin the N-installation unit on the L-end section on top (Y). Remove the axle retainer (9) and unpin the pin (8).

Unpin the N -pivot section (1) on the L-end section on the bottom (X).
Remove the spring retainer (7), remove the retaining pin (6) and unpin the pin (4) with the pin pulling device (5).

Place the N - installation unit down with the auxiliary crane.

D A N G E R : Make sure that no one is under the installation unit during the pinning and unpinning procedure. This is strictly prohibited.
There is a danger of accidents.

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5.11 BALLAST TRAILER 028466-00

1. Ballast trailer BW

1.1 General

1.2 Dimensions, radii

1.3 Weights

1.4 Stability and tipping safety in case of non-installed ballast trailer on the turntable

2. Control elements on control panels

3. Installation of ballast trailer

3.1 Pin the ballast trailer guide (3) on the ballast trailer

3.2 Pin the ballast trailer guide on the crane

3.3 Install the derrick / ballast trailer guying

3.4 Ballasting the ballast trailer

3.5 Lifting and lowering the ballast trailer with the pull cylinder

4. Telescoping the ballast trailer in or out

5. Driving with the ballast trailer

5.1 General

5.2 Driving in turns

5.3 Towing

5.4 Parallel driving

5.5 Manual resteering

5.6 Manual operation for installation

6. Max. permissible uneven ground for towing, parallel driving, driving in turns and manual resteering

6.1 Compensation for maximum permissible uneven ground via pull cylinder

7. Safety guidelines for travel operation

7.1 Relapse cylinder

7.2 Block position of relapse cylinder

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8. LICCON overload safety system

8.1 General

8.2 Safety guidelines

8.3 Determination of forces in operating mode with derrick ballast

8.4 Overload monitoring in operating mode with derrick ballast

8.7 Checking the cable length sensor on the ballast trailer

8.8 Difference force monitoring for ballast guying

9. Removal of ballast trailer

9.1 Remove the derrick / ballast trailer guying

9.2 Unpin the ballast trailer guide on the crane

9.3 Release the supply lines

9.4 Unpin the ballast trailer guide (3) on the ballast trailer (1)

10. Emergency operation

10.1 General

10.2 Emergency operation - towing

10.3 Emergency operation - driving in turns

11. Maintenance

11.1 Ballast trailer tires

11.2 Hydraulic hose lines

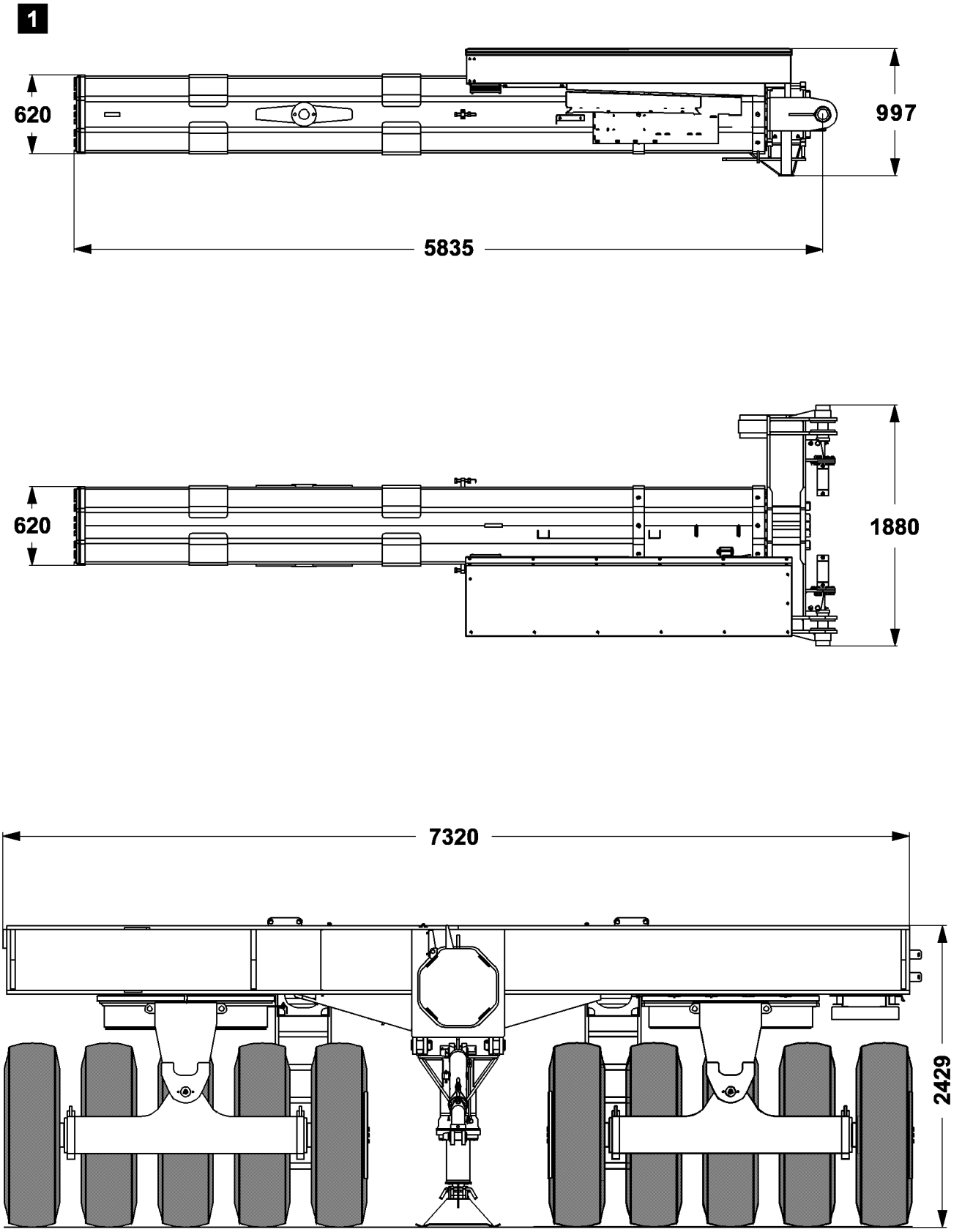
11.3 Slewing gear

11.4 Central lubrication system

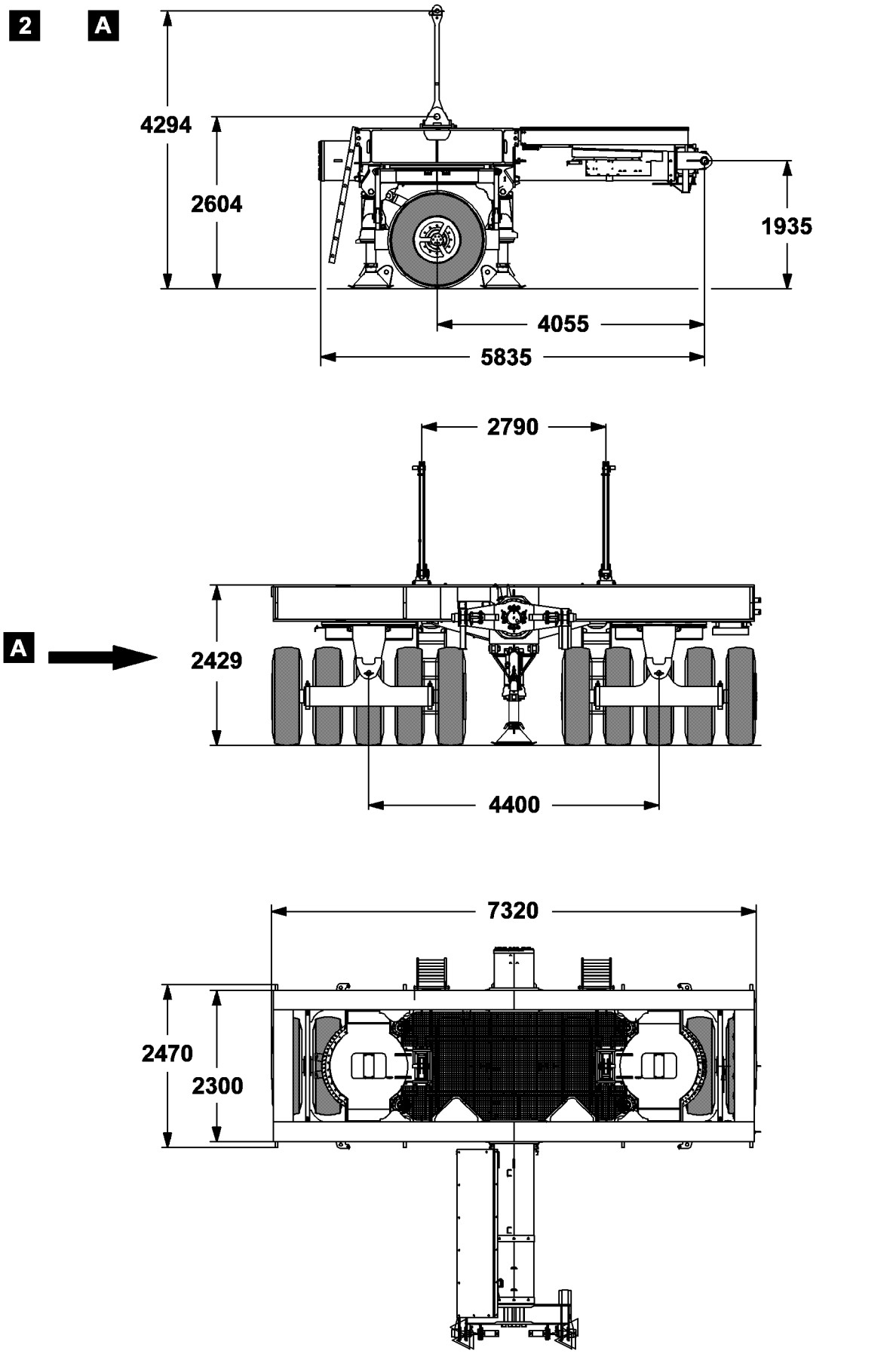
11.5 Fill quantities for ballast trailer

11.6 Lubrication schedule

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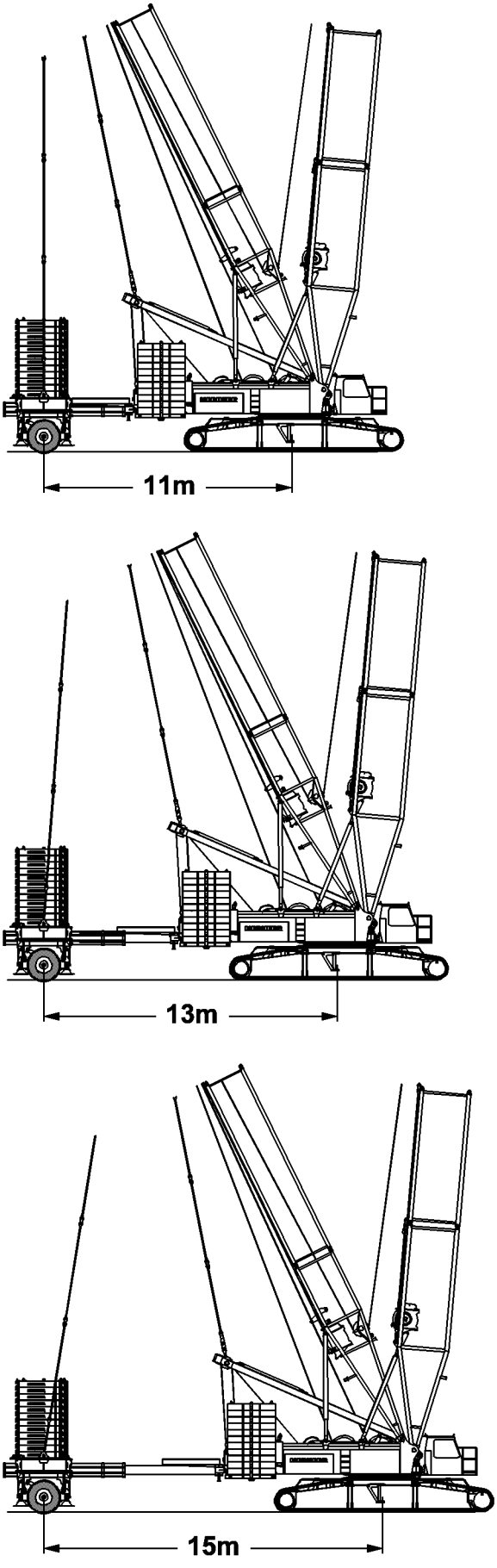
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1. Ballast trailer BW

1.1 General

The ballast trailer consists of:

2 axle lines, with one oscillating axle each

10 tires, size 16.00 R 25

Hydraulic / mechanical steering, electronically adjustable for

- Towing
- Driving in turns
- Parallel driving
- Manual resteering

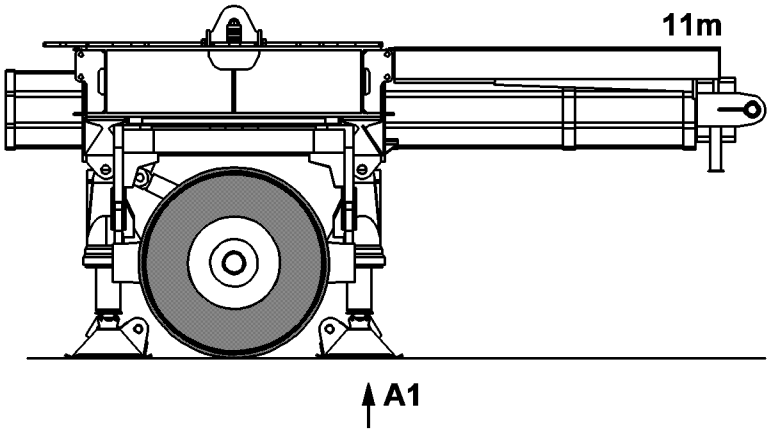
- Hydraulically telescopeable guide for ballast trailer radii of 11m - 15m.
- Guy rods ballast trailer - Derrick boom.
- The pull cylinders for the ballast trailer are installed on the derrick end section and can be actuated under load.

1.2 Dimensions [m], Fig. 1 and 2
Radii [m], Fig. 3

1.3 Weights [t], Fig. 1 and 2

Ballast trailer	ca.	20.8 t
Guide tube, complete	ca.	7.5 t
Ballast trailer, complete	ca.	**28.3 t**

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1.4 Stability and tipping safety if the ballast trailer is n o t installed on the turntable

D A N G E R : **If the ballast trailer is n o t installed on the crane, then it must be ensured that the locking pin (19) is pinned and secured on the strut (18) of the ballast trailer (1) (see 3.2.5).**

If the locking pin (19) is n o t pinned, then the ballast trailer can tip over.

The ballast trailer guide must be fully moved in before disassembly of the ballast trailer on the turntable!

If this is not observed, there is an increased chance of having an accident!

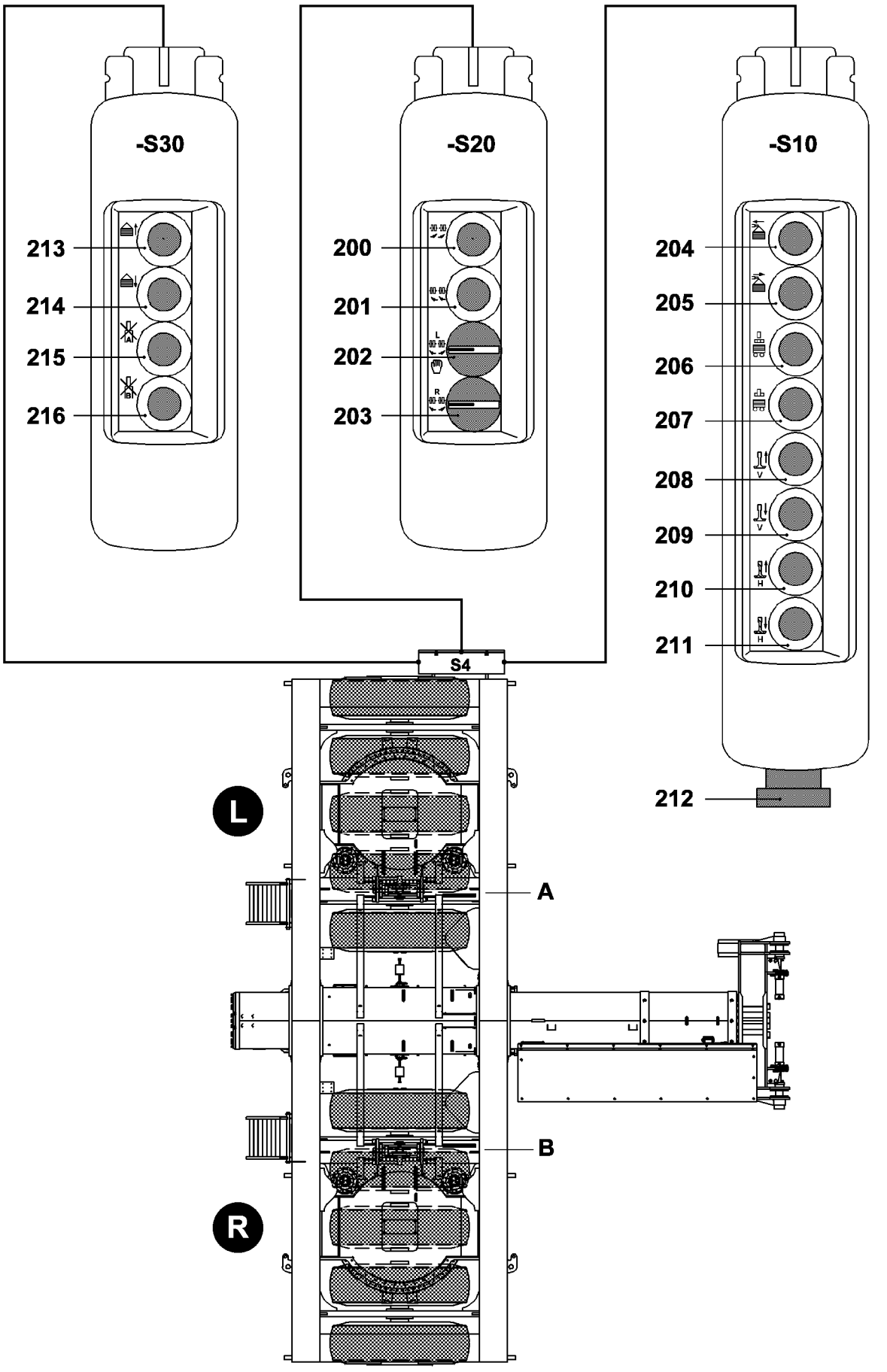
Note: For stability and tipping safety, additionally observe chapter 2.15!

Fig. 1:

- Guide retracted - pinned to turning radius R - 11m.
- Ballast trailer horizontally supported.
- No ballast required.

Max. support pressure
A1
approx. 19,0 (t)

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2. Control elements on the control panels

Control panel - S10

Pos.:

204	Button	-	Ballast trailer, retract the sliding cylinder
205	Button	-	Ballast trailer, extend the sliding cylinder
206	Button	-	Unpin the pinning ballast trailer slewing platform
207	Button	-	Pin the pinning ballast trailer slewing platform
208	Button	-	Support cylinder, retract on the front
209	Button	-	Support cylinder, extend on the front
210	Button	-	Support cylinder, retract on the rear
211	Button	-	Support cylinder, extend on the rear
212	Switch	-	**EMERGENCY OFF**

Control panel - S20

Pos.:

200	Button	-	Turn the ballast trailer wheels to the left, manual resteering
201	Button	-	Turn the ballast trailer wheels to the right, manual resteering
202	Knob	-	Turn the ballast trailer wheels on the left side right / left, manual operation for installation or emergency operation
203	Knob	-	Turn the ballast trailer wheels on the right side to the right / left, manual operation for installation or emergency operation

Control panel - S30

Pos.:

213	Button	-	Derrick ballast "UP"
214	Button	-	Derrick ballast "DOWN"
215	Button	-	Block cylinder (A) on derrick ballast
216	Button	-	Block cylinder (B) on derrick ballast

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5.11 BALLAST TRAILER 028466-00

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3. Installation of ballast trailer

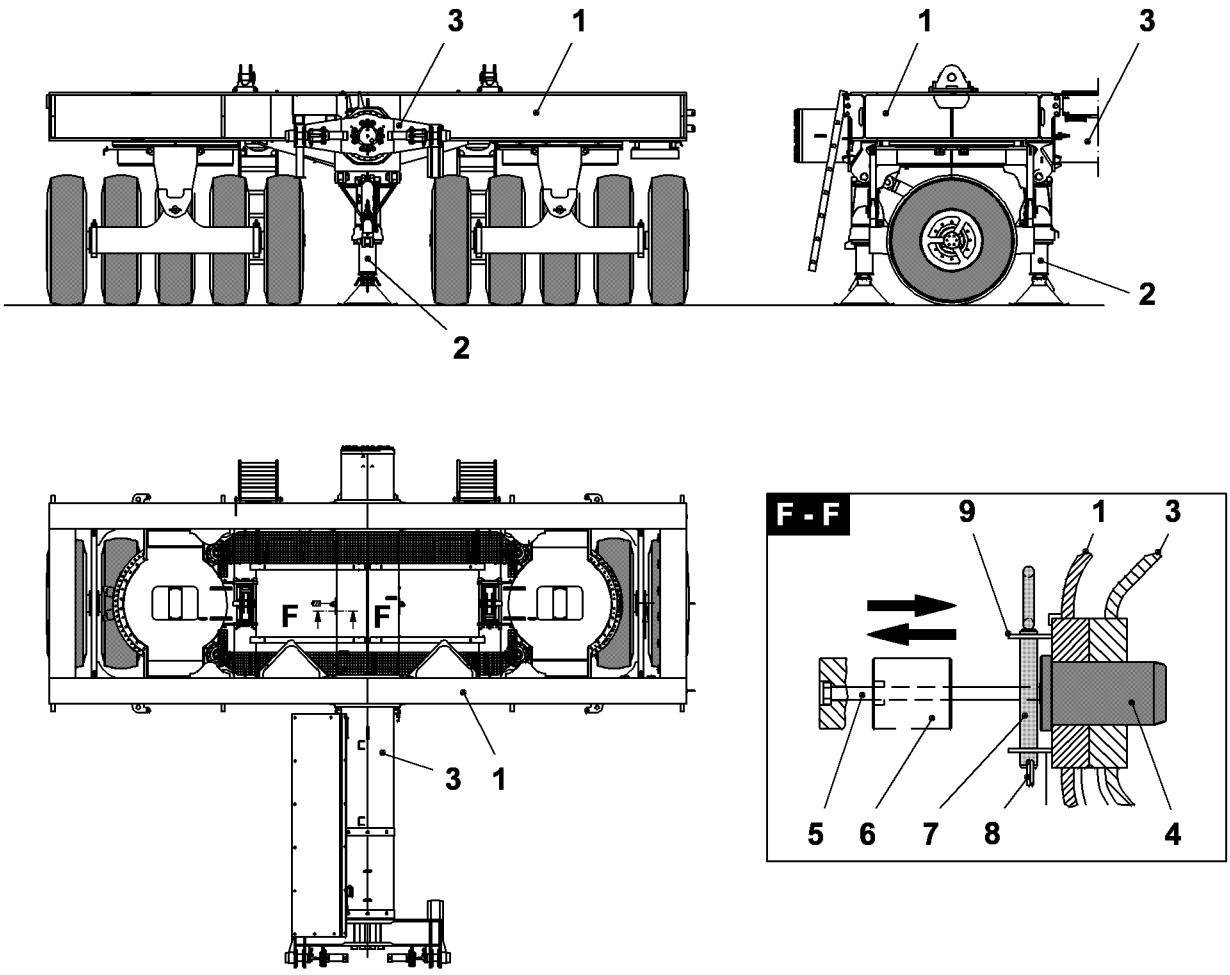
D A N G E R : The ballast trailer is n o t equipped with its own braking system. For that reason, it is imperative that it is supported if it is n o t installed.

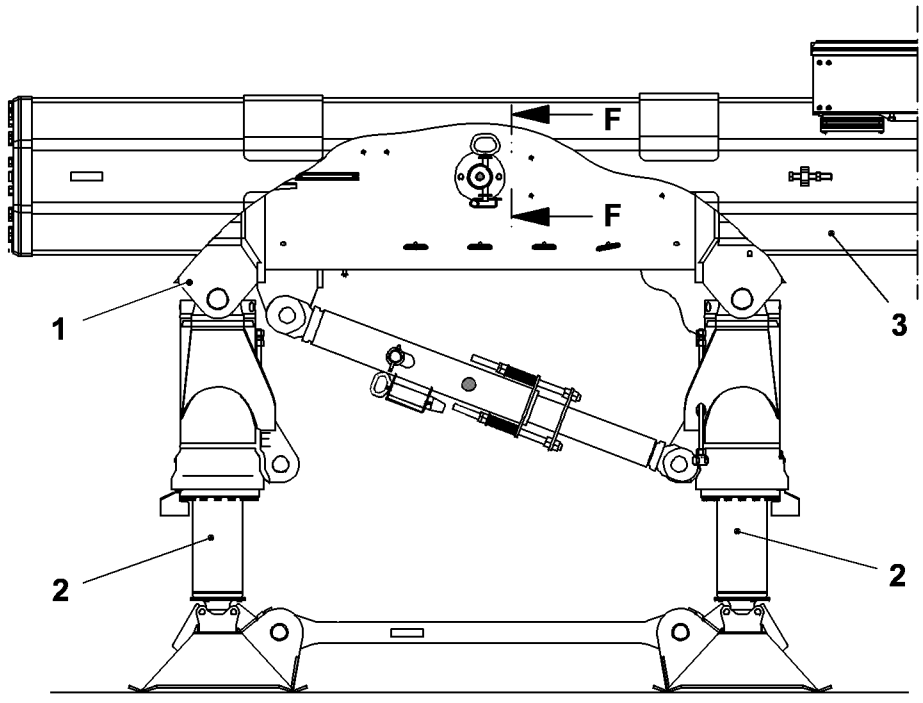
The installation of the ballast trailer may only be carried out on level ground of sufficient load carrying capacity and only by authorized persons.

Components

Pos.	Description			
1	Ballast trailer			
2	Support cylinder			
3	Ballast trailer guide			
4	Pin	∅ 100 x 160mm		
5	Screw	M16 x 300mm	DIN931	(mech. pin pulling device)
6	Axle	∅ 90 x 100mm		(mech. in pulling device)
7	Retaining pin			
8	Spring retainer			
9	Pin carrier plate			
10	Limit switch initiator, left			
11	Limit switch initiator, right			
12	Pin plate			
13	Retaining pin	∅ 35 x 178mm		
14	Spring retainer	∅ 4,5		
15	Pin	∅ 105 x 210mm		
16	Pin pulling device (Hydro cylinder)			
17	Slewing platform frame			
18	Strut			
19	Locking pin			
20	Spring retainer			
21	Transport receptacle for pin (19)			
22	Return spring			

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5.11 BALLAST TRAILER 028466-00

3.1 Pin ballast trailer guide (3) **on the ballast trailer**

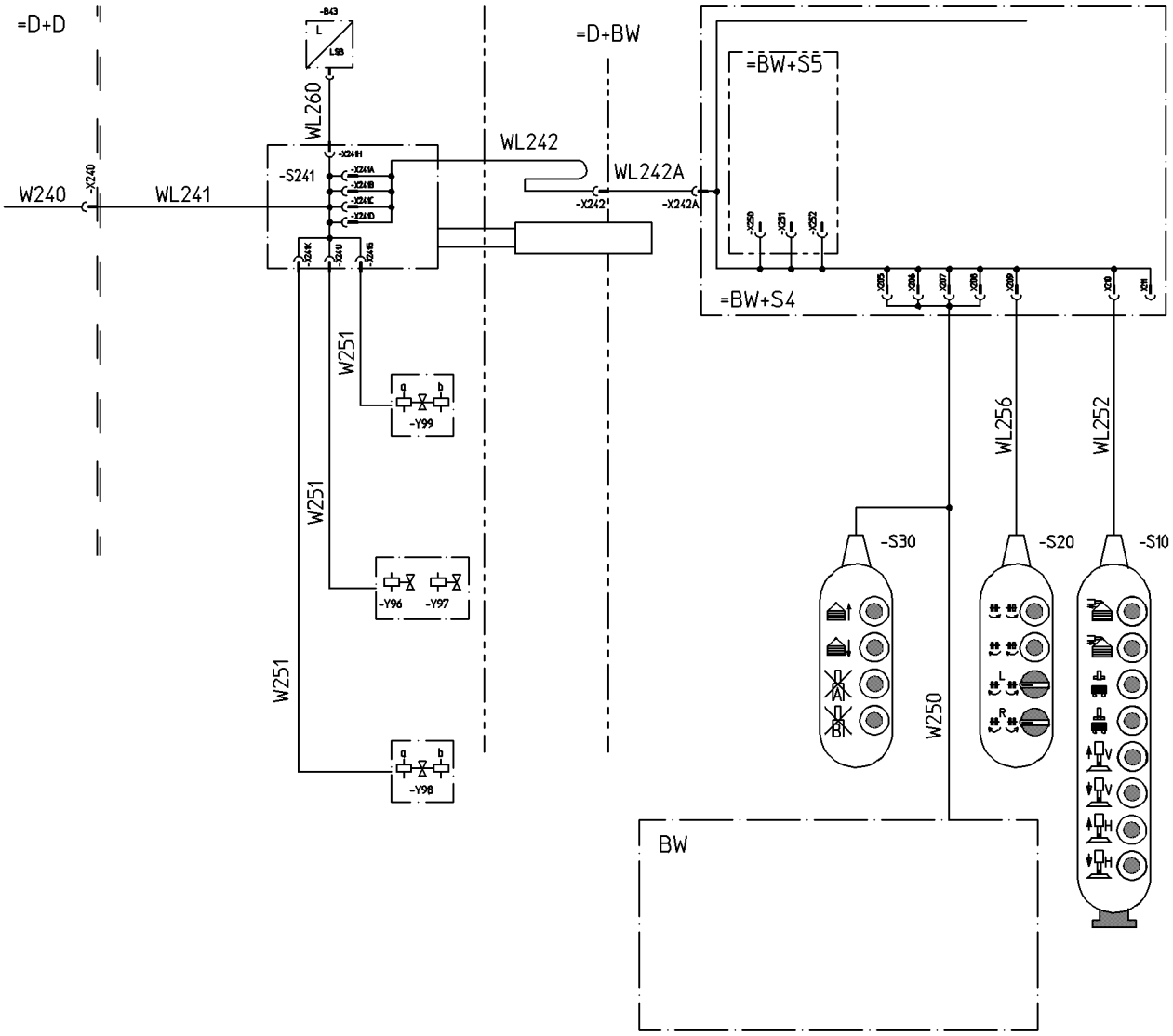
- Unload the ballast trailer (1) with the auxiliary crane from the flatbed trailer
- The ballast trailer must be supported.
- Unload the ballast trailer guide (3) with the auxiliary crane and slide into the ballast trailer frame.
- Pin the pins (4) on both sides on the ballast trailer frame (fig. F-F)
- Pin the retaining pins (7) on the pin carrier plates (9) and secure with spring retainers (8).

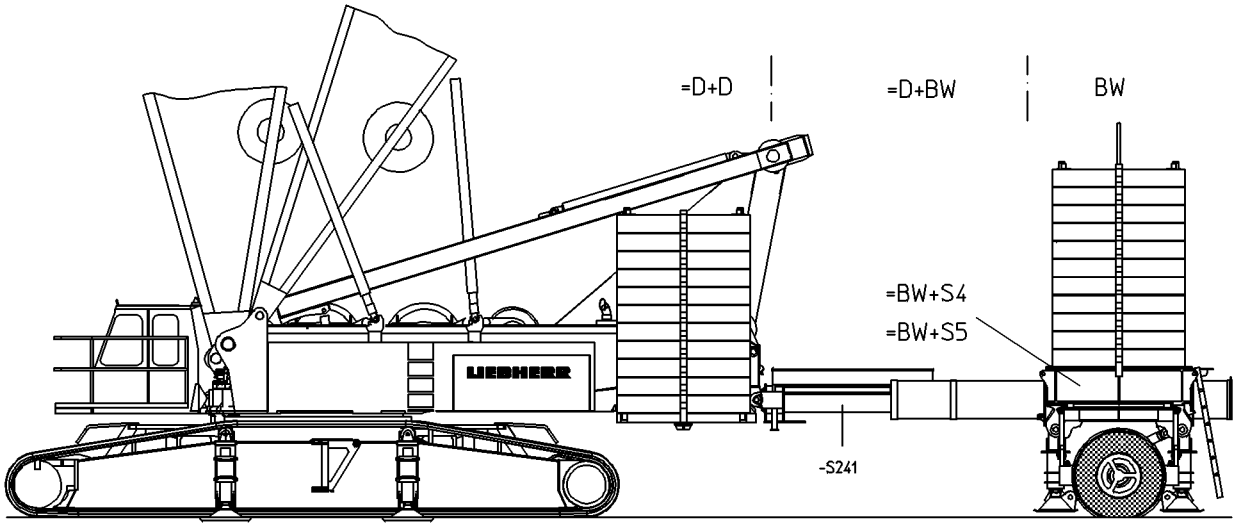
C A U T I O N : The ballast trailer guide (3) must be held with the auxiliary crane until it is pinned and secured on the ballast trailer.

The auxiliary crane may only be removed if the stability and tipping safety of the ballast trailer is ensured (see chapter 2.15).

Otherwise there is a danger of tipping over!

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3.2 Pin the ballast trailer guide on the crane

- Drive the crane as close as possible to the ballast trailer guide.
- Turn the engine off.
- Connect the supply lines.

Note: For installation, the electrical connection can be established to be able to move the support cylinders as well as the pull cylinders, if necessary.
The releases "Ballast UP / DOWN" is available, if the conditions of the shut off diagrams are fulfilled, independent if the ballast trailer is installed.
The release "Ballast UP" allows retraction of the pull and support cylinders.
The release "Ballast DOWN" allows extension of the pull and support cylinders.
This means that the support cylinders and the pull cylinders can be moved at the same time, even if the signal "Ballast trailer pinned" has not yet been given.

3.2.1 Establish the electrical connection

- Remove the dummy plug on the socket -X 240.
- Plug the cable WL 241 into socket -X 240.
- Plug the cable WL 242 into socket -X 242.

3.2.2 Establish the hydraulic connections

The hydraulic quick couplings, which belong together, are marked.

D A N G E R : When connecting or releasing the hydraulic lines with quick couplings, it must be ensured that the coupling procedure is carried out properly.

Prerequisite for correct coupling connection is:

- The pressure must be released from the hydraulic system before connecting or releasing the couplings (turn the engine off, wait for approx. 5 minutes).

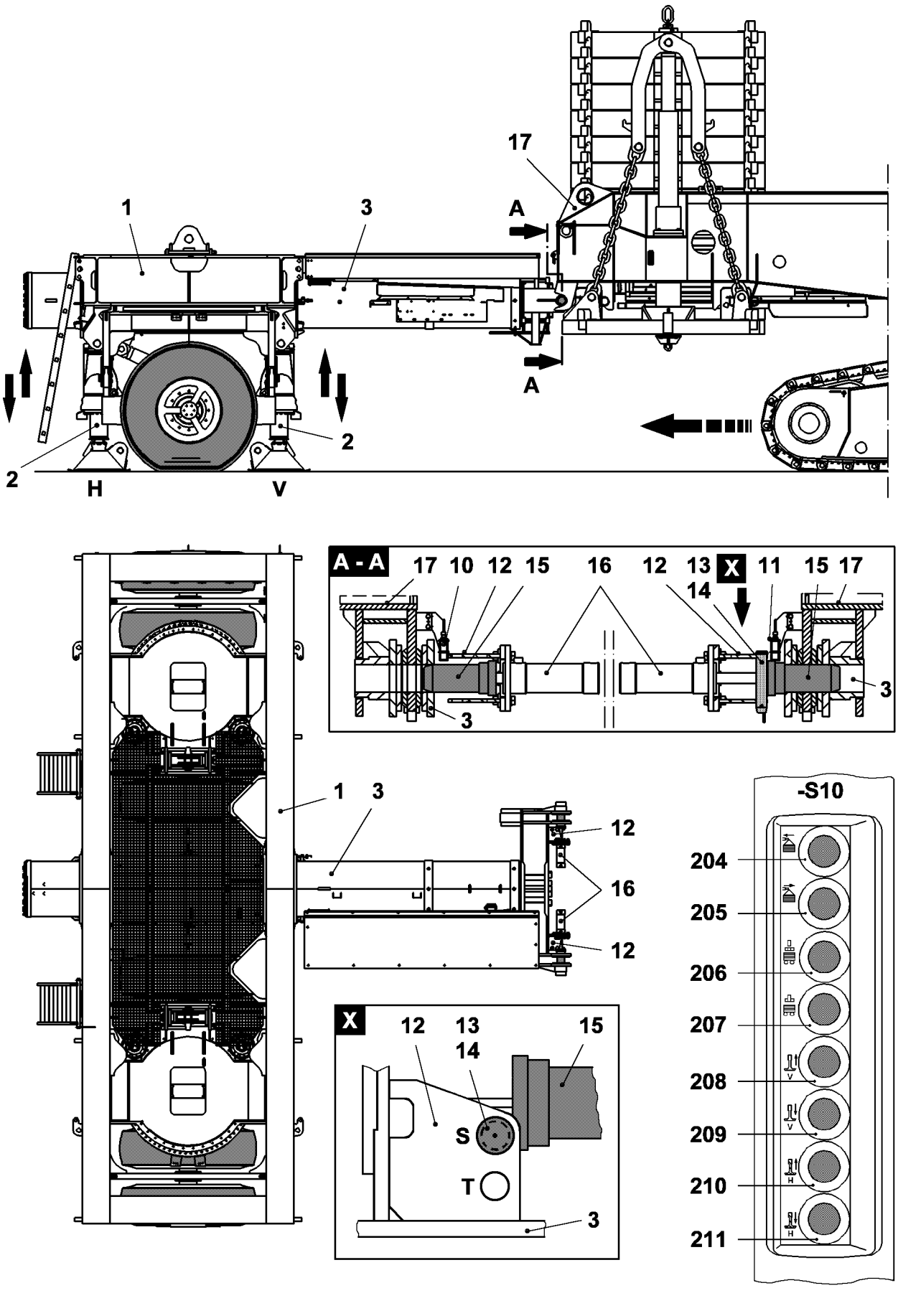
- Interconnect the coupling sections (sleeve and plug) and connect them with the hand nut.

- Tighten the nut past the O-ring until you can feel a firm stop.

- The couplings may only be tightened by hand - without tools (or couplings will be damaged).

Improperly connected couplings can cause loss of pressure or sudden leakage and therefore can cause accidents!

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3.2.3 Align the ballast trailer

Drive the crane backwards onto the ballast trailer.
The ballast trailer (1) must be aligned by raising or lowering the two support cylinders (2) in such a way that the pins (15) can be pinned

- Press button (208) to retract the support cylinder on the front
- Press button (209) to extend the support cylinder on the front
- Press button (210) to retract the support cylinder on the rear
- Press button (211) to extend the support cylinder on the rear

3.2.4 Pinning procedure

- Press the button (207), the ballast trailer guide (3) is pinned on both sides on the rear of the slewing platform (17). The pins (15) are pinned on both sides with the pin pulling device (hydro cylinder).
- Then pin the retaining pin (13) from (T) to (S) and secure with spring retainer (14).

S = Pin bore for retaining pin (13).
T = Transport receptacle for retaining pin (13).

Note: The crane control recognizes with the limit switch initiators on the left (10) and right (11), if the pins (15) are pinned completely on the slewing platform.

Retract the support cylinder (2) :
- Press the button (208) to retract the support cylinder all the way on the front
- Press the button (210) to retract the support cylinder all the way on the rear

D A N G E R : **After pinning, it must be checked again if both pins are properly pinned and secured and if the connector lines are fully and correctly connected.**

If both pins are fully and correctly pinned, the crane control receives the message "Ballast trailer pinned", i.e. the slewing platform c a n n o t be turned and the crawler c a n n o t be driven.

Only when the ballast trailer wheels are in the required position :

- driving in turns

- towing

- parallel driving

will the release be issued.

As long as only one pin is pinned, the crane control receives n o message "Ballast trailer pinned", i.e. the slewing platform c a n be turned and the crawler c a n be driven, so that pinning of the 2nd pin is possible.

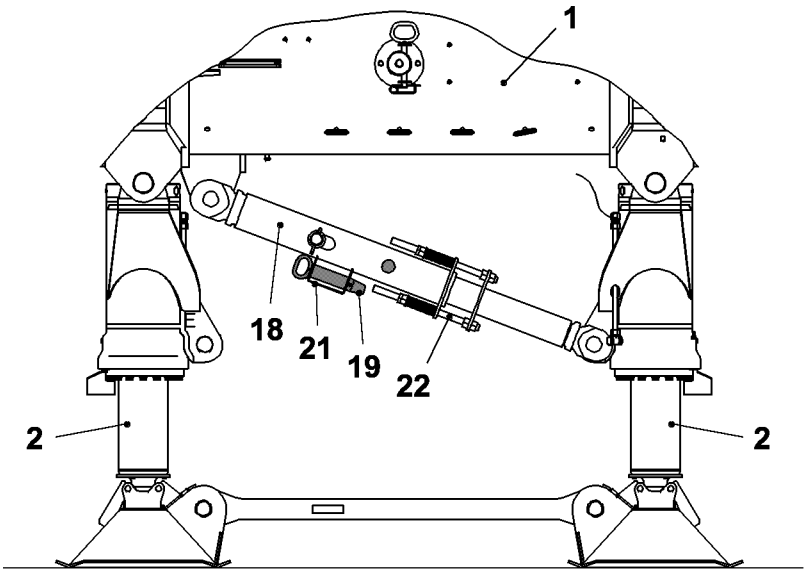
These movements must be carried out with utmost care and caution!

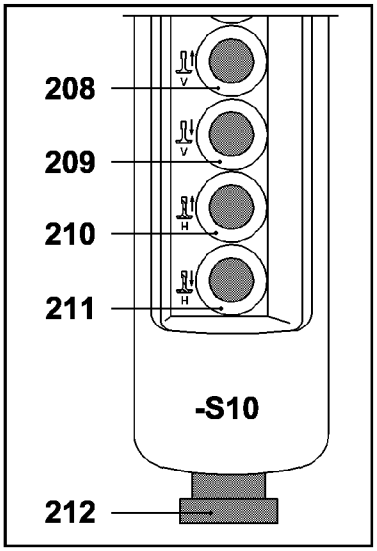
If this is not observed, the crane or the ballast trailer can be damaged!

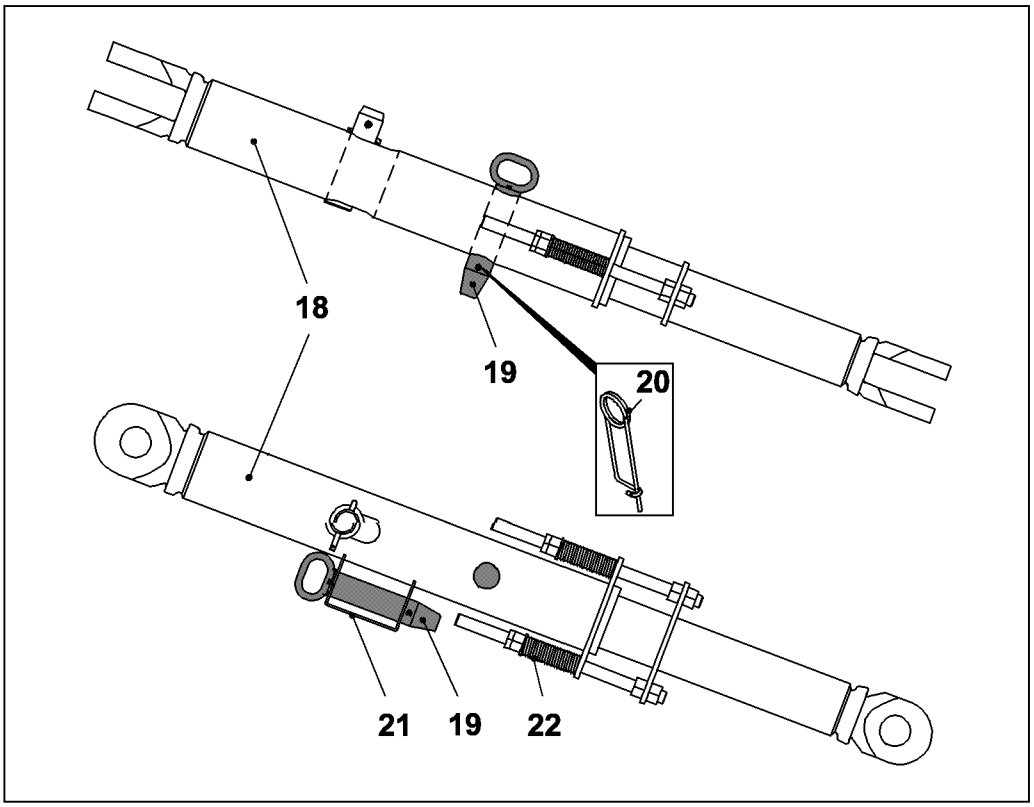
There is an increased chance of having an accident!

Note: The support cylinders can be retracted and extended via the corresponding buttons in the crane operator's cab.

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3.2.5 Retract the support cylinder(2), unpin the locking pin (19) on the strut (18)

When the pinning procedure (3.2.4) between the ballast trailer and the slewing platform is completed, retract the support cylinders (2).

Prerequisite :
- The ballast trailer must be pinned and secured on the slewing platform.

Retract the support cylinder (2) :
- Press the button (208), the support cylinder on the front retracts.
- Press the button (210), the support cylinder on the rear retracts.

Remove the spring retainer (20) on the locking pin (19).
Unpin the locking pin (19) on the strut (18).
Insert the locking pin (19) into the transport receptacle (21) and secure with spring retainer (20).

Note: The locking pin (19) can only be unpinned if the support cylinders (2) are retracted.

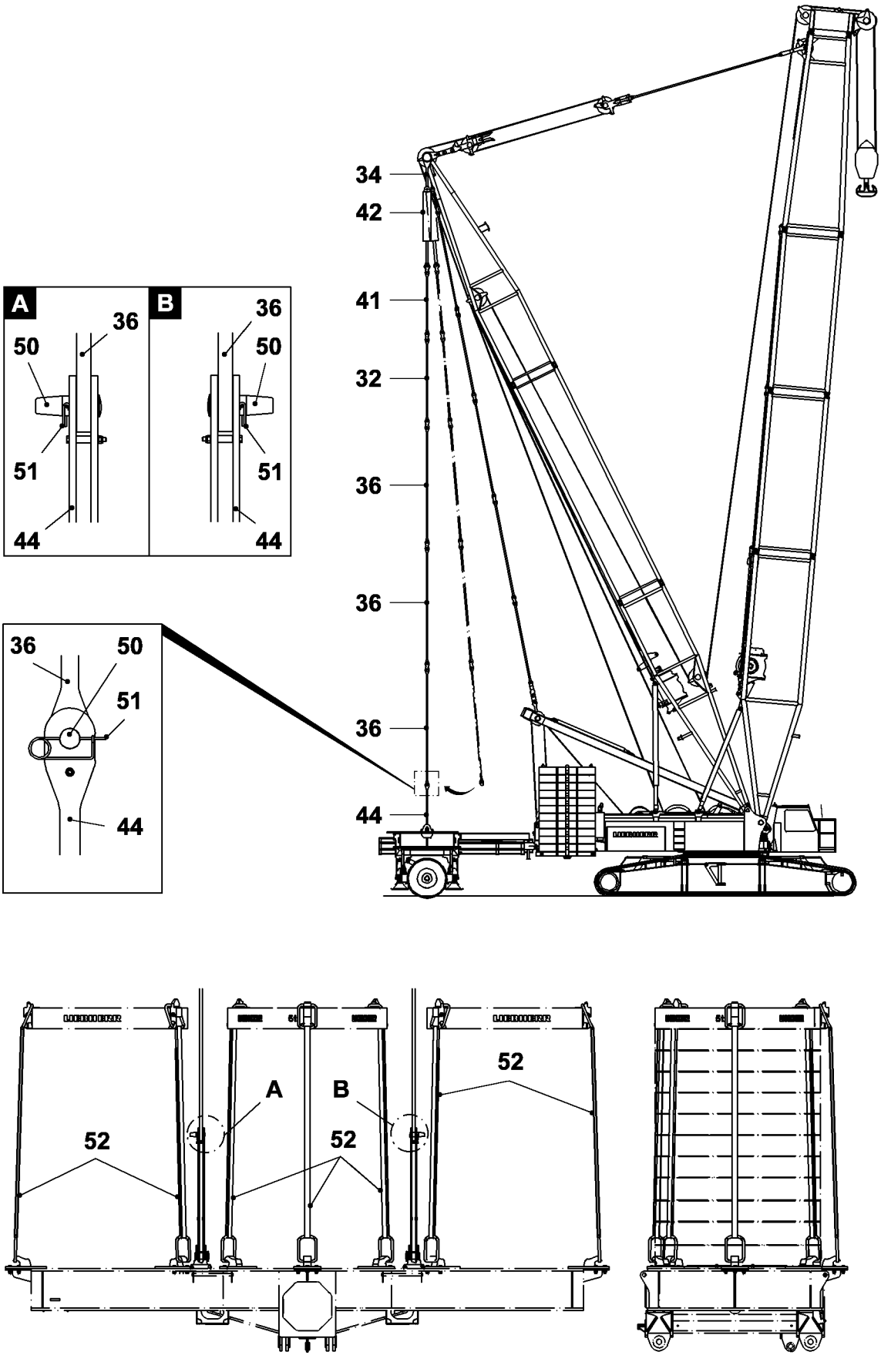
C A U T I O N : Before placing the ballast plates on the ballast trailer installed on the crane, it must be ensured that the support cylinders (2) are retracted and the locking pin (19) is unpinned on the strut (18).

The locking pin (19) m u s t be unpinned before supporting the installed ballast trailer, for example to change the wheel position.

This is necessary, for the supported and ballasted ballast trailer, so that there is a level compensation between the strut(18) and the support cylinders (2).

If this is not observed, the ballast trailer can be damaged!

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3.3 Install the derrick / ballast trailer guying

Components

Pos.	Description		Length (m)
32	Guy rod	(installed on the D - end section)	3,25
34	Guy rod	(installed on the D - end section)	1,19
36	Guy rod		4,50
41	Guy rod	(installed on the D - end section)	2,50
42	Pull cylinder	(Lift 1500 mm)	2,07
44	Guy rod	(installed on the ballast trailer)	1,60
50	Pin ∅ 65 x 195mm		
51	Spring retainer 6		
52	Rigging belt		

Installation
- Run the derrick boom to a derrick radius of 11m.
- Run the ballast trailer to a ballast trailer radius of 11m.

D A N G E R : **The guy rods swing out by themselves, as soon as the derrick boom is lowered past the vertical to the rear, to derrick radius of 11 m (fig. 1).**
No one may remain under the ballast trailer during the lowering procedure of the derrick boom - this is strictly p r o h i t i b e d!

There is an increased danger of accidents!

- Pin and secure the guy rods (36) with the guy rods (44). using pin (50) and spring retainer (51) (Fig. A // Fig. B).

3.4 Ballasting of the ballast trailer

C A U T I O N : **Before placing the ballast plates on the ballast trailer, it must be ensured that the support cylinders (2) are retracted. Unpin the locking pin (19) on the strut (18).**

If the support cylinders (2) are not retracted and the locking pin (19) is not unpinned, the ballast trailer can be damaged!

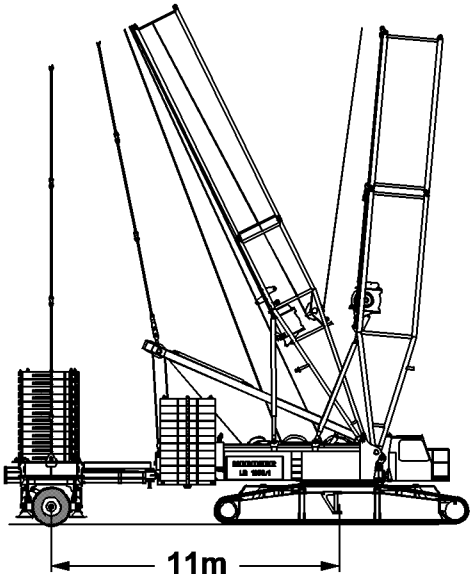
Maximum ballast for ballast trailer: 36 plates each 5.0t

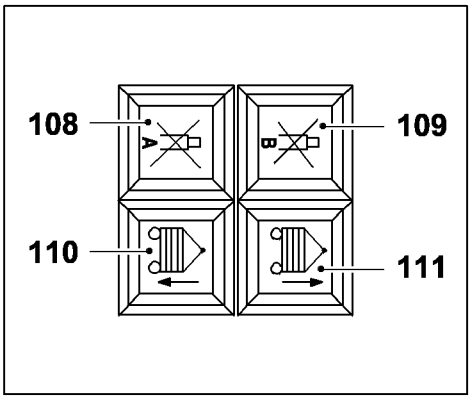
Place the ballast plates with the auxiliary crane onto the ballast trailer.

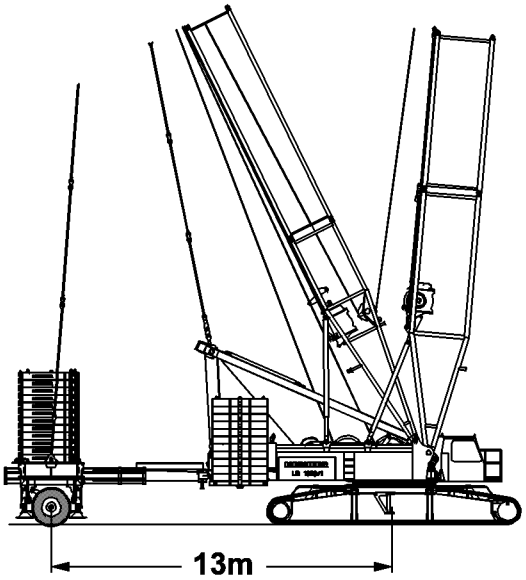
D A N G E R : **When loading the ballast trailer, make sure the ballast plates are placed correctly. The ballast plates must be placed on the ballast trailer evenly distributed and then secured with rigging belts (52) on the ballast trailer. If this is not observed, there is an increased danger of accidents!**

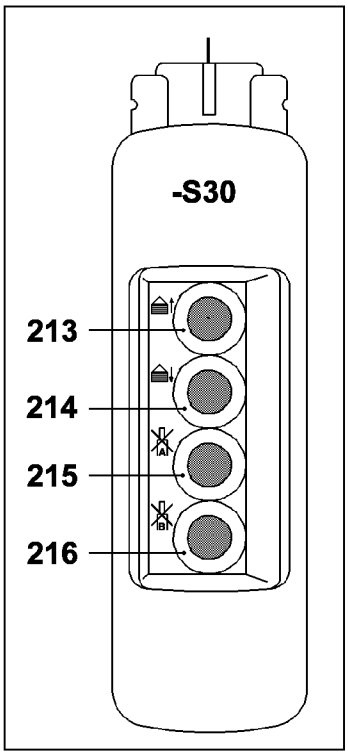
Note: To determine the correct ballast weight, use the LICCON job planner.

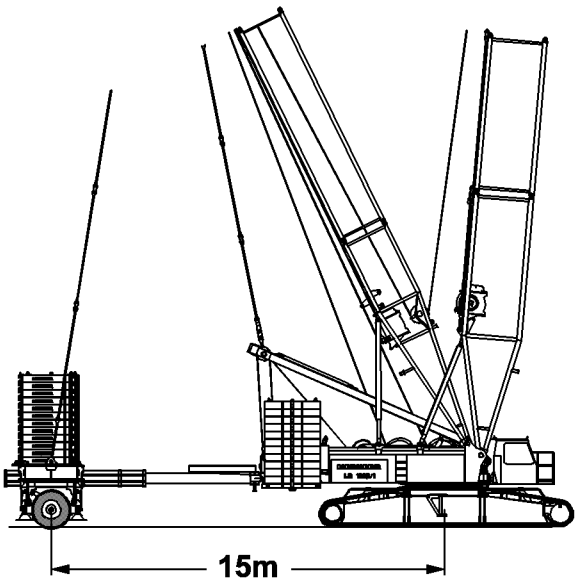
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3.5 Lifting and lowering the ballast trailer with the pull cylinder

from the crane cab / from the control panel:
- Press the button (111 / 213) in the cab, the ballast trailer is raised with the pull cylinders;
- Press the button (110 / 214) in the cab, the ballast trailer is lowered with the pull cylinders;

D A N G E R : When the ballast trailer is raised or lowered, it must be ensured that the ballast trailer remains in horizontal position.

If the ballast trailer is only actuated via button (111 / 213) - "Derrick ballast UP", or button (110 / 214) - "Derrick ballast DOWN", w i t h o u t simultaneously pressing button (108 / 215) - "block cylinder (A) on the derrick ballast ", or button (109 / 216) - " block cylinder (B) on the derrick ballast ", then the horizontal alignment of the ballast trailer is regulated with a level sensor.

At a ballast utilization of > 90%, the level sensor regulates the ballast trailer level to ± 0,5°.

At a ballast utilization of < 90%, the level sensor regulates the ballast trailer level to ± 2,5°.

If the button (108 / 215) - "Block cylinder (A) on derrick ballast ", or button (109 / 216) - "Block cylinder (B) on derrick ballast " is actuated, the level sensor is bypassed and the ballast trailer can be set at an angle on purpose. This is only permitted to set down the ballast trailer on uneven ground and only if utmost care and caution is exercised!

If this is not observed, there is an increased danger of accidents!

- Press the button (108 / 215) in the cab, the left ballasting cylinder (A) is blocked;
- Press the button (109 / 216) in the cab, the right ballasting cylinder (B) is blocked.

D A N G E R : The control panel on the ballast trailer may only be used for installation.

During crane operation, the crane operator may n o t lift or lower with the control panel on the ballast trailer, because he cannot see the monitors from that point.

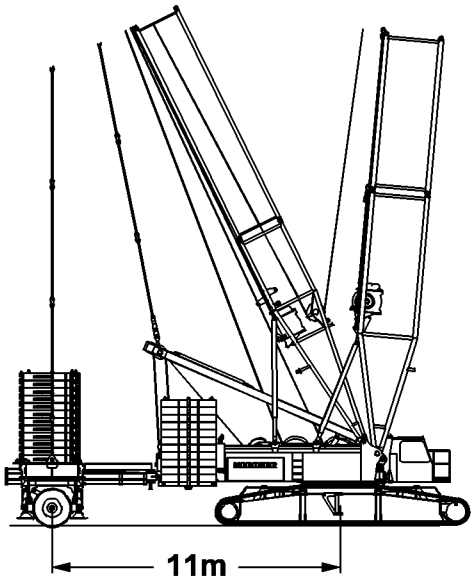
Raising or lowering during crane operation may o n l y be done from the cab.

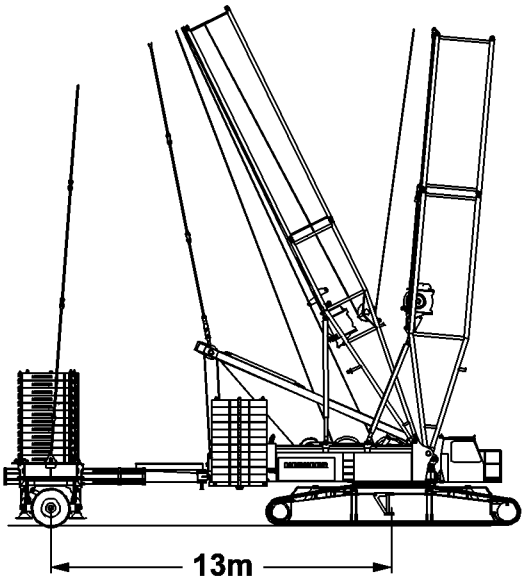
When lifting or lowering the ballast trailer, it must be ensured that the difference of forces in the ballast guying is not too large.

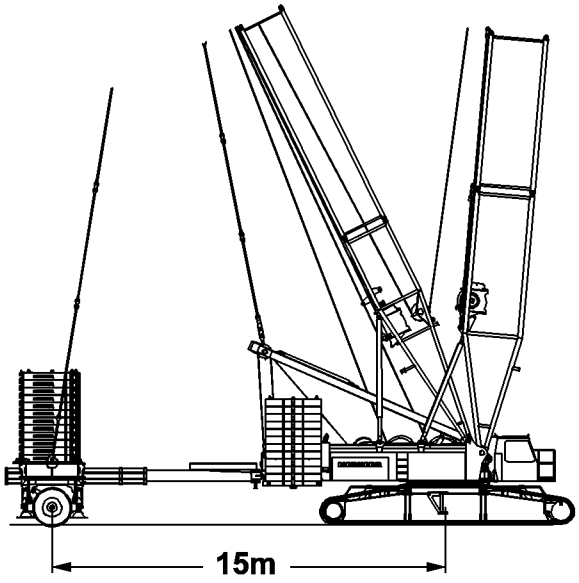
The LICCON shows both forces and sends a warning if the difference of forces is too large.

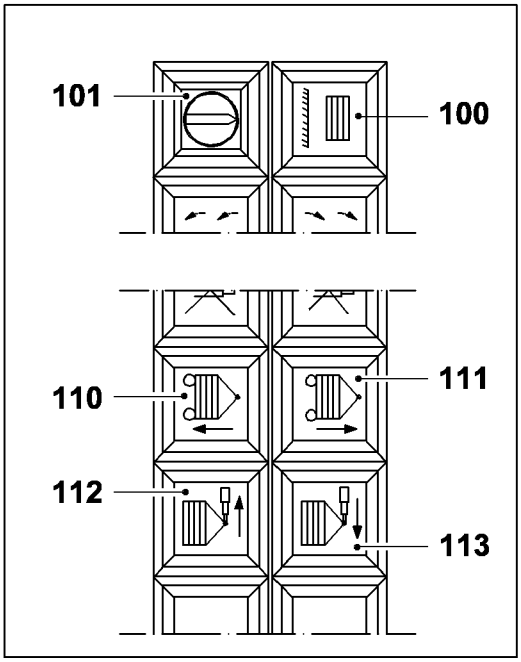
See also paragraph 8.8.

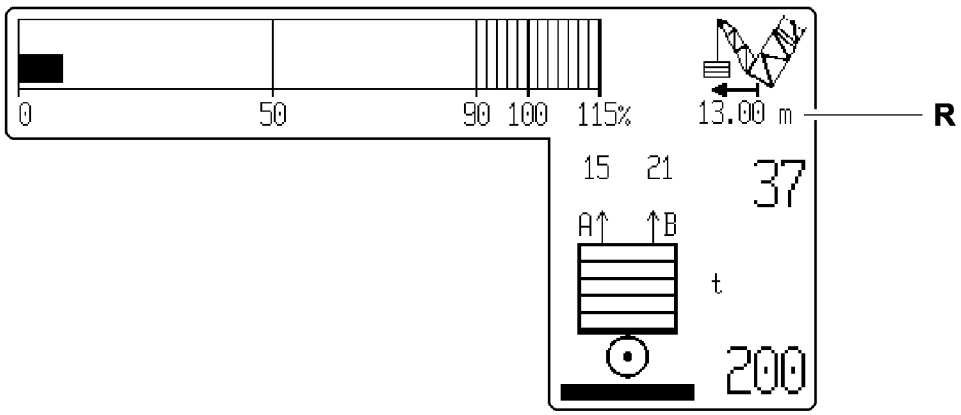
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4. Telescoping the ballast trailer out and in

The ballast trailer is equipped with a telescopeable ballast trailer guide. This makes it possible to match the ballast trailer radius to the corresponding surrounding or hoist task.

The ballast trailer guide can be telescoped steplessly to the following derrick ballast radii:
- 11m
- 13m
- 15m

The corresponding derrick ballast radius (**R**) is shown on the monitor (fig.).

D A N G E R : The data in the load charts must be observed.
If this is not observed, there is a danger of accidents!

Note: Telescoping out and in is only possible if the wheels of the ballast trailer are set on towing or when the ballast trailer is suspended and if the keyed button (101) is switched to **"ballast trailer lifted off"**.
The warning light (100) **"ballast trailer lifted off" blinks** when the keyed button (101) is turned on.

D A N G E R : When telescoping the ballast trailer out or in, it must be ensured that :

- the wheels of the ballast trailer are positioned in towing mode,

or

- the keyed button (101) "ballast trailer lifted off" is turned on and it must be ensured that the wheels of the ballast trailer are also actually lifted off the ground.

If this is not observed, the ballast trailer can be severely damaged.

There is an increased danger of accidents!

- Press the button (113), the ballast trailer will be telescoped out;
- Press the button (112), the ballast trailer will be telescoped in.

D A N G E R : Make sure that there are no persons or objects within the danger zone of the ballast trailer.
There is a danger of accidents!

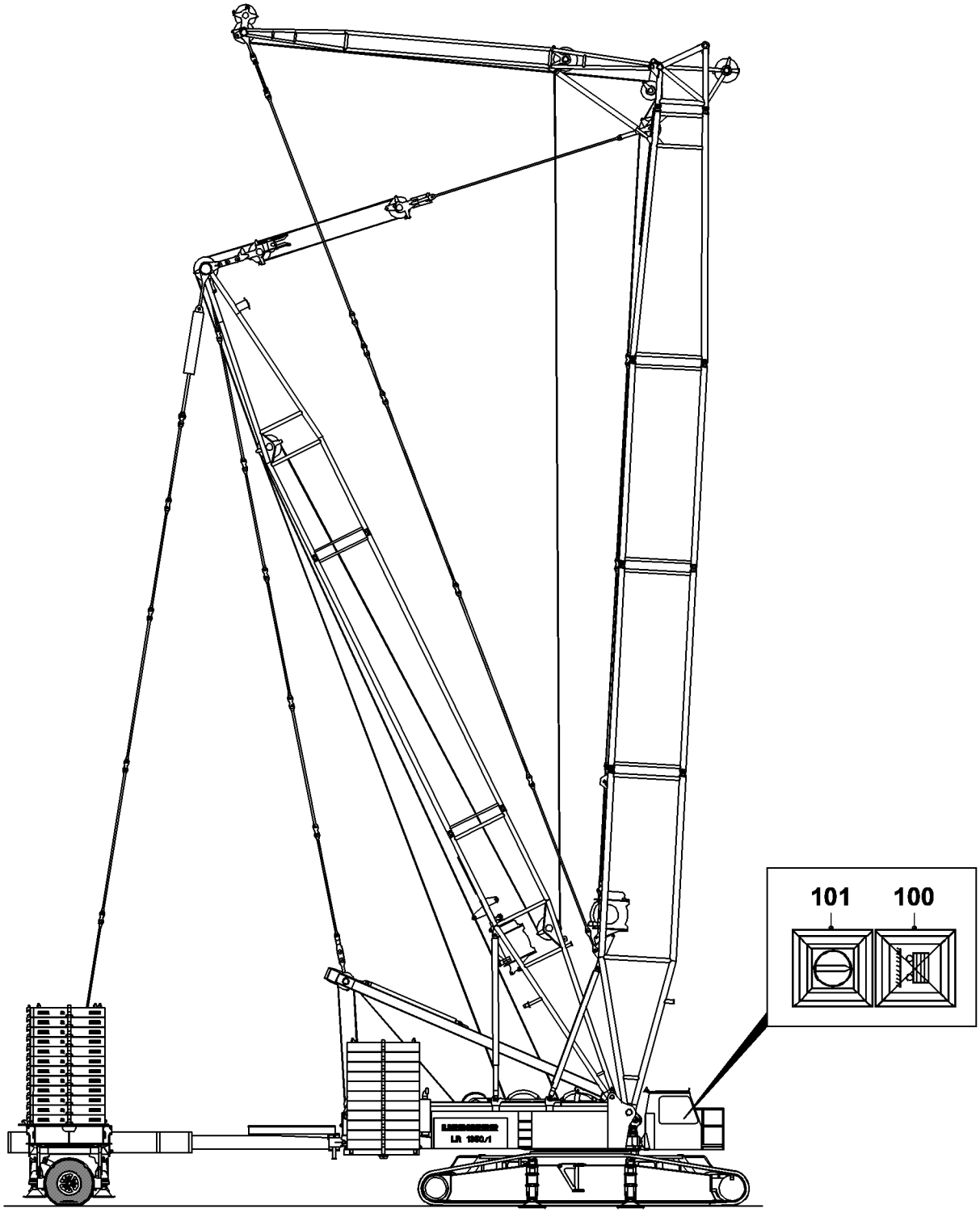
C A U T I O N : When telescoping the ballast trailer in and out, the indicated actual length (R) must be checked.

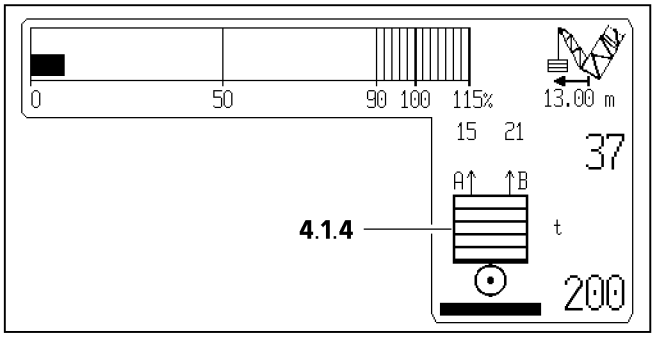
The crane operator may not blindly rely on the derrick ballast radius dimension, but he must think for himself and check if the measurement is still correct.

See also paragraph 8.7.

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5. Driving with the ballast trailer

The ballast trailer is equipped with a computer controlled steering program.
- Driving in turns;
- Towing;
- Parallel driving;
- Manual resteering ;
- Manual operation for installation.

5.1 General

The computer controlled steering programs driving in turns, towing and parallel driving **can only be actuated from the cab**.

D A N G E R : **The ballast trailer may be raised a max. 250 mm on firm ground featuring sufficient load carrying capacity. Should this point be neglected, the crane could topple backwards if the load is suddenly released (e.g. lifting tackle or slinging points breaking)!**
There is a RISK OF FATALITIES!

Manual resteering and the support cylinders can be actuated from the cab **and from the control panels** - on the ballast trailer -.

D A N G E R : **Ballast Up / Down can be actuated from the cab and from the control panel (-S30) - on the ballast trailer.**
Use the control panel only for installation purposes!
If this is not observed, there is a danger of accidents!

The manual operation for installation purposes can only be actuated from the control panel.

Prerequisites

- The wheels of the ballast trailer must be in the required driving position;

Note: If the ballast trailer is operated on the ground, the wheels must be in the correct driving position.
If the ballast trailer is suspended, the wheels can be in any position, if the keyed button (101) is switched to **"ballast trailer lifted off"**. The crane operator must ensure in any case that the wheels do not scrape on the ground.

D A N G E R : **If the ballast trailer is on the ground, the wheel position is n o t correct and the keyed button (101) has been switched to "ballast trailer lifted off", then the wheels of the ballast trailer and possibly the crane can be damaged when "driving the crawler".**

- The travel route for the crane and the ballast trailer must be level, in horizontal position and of sufficient load carrying capacity;

Note: While driving and when turning, a guide must monitor the crane, the luffed up boom as well as the possibly raised load.
Driving with a load, see chapter 4.05.

- The crane may only be driven at minimum speed, with the least possible acceleration as well as careful braking action.

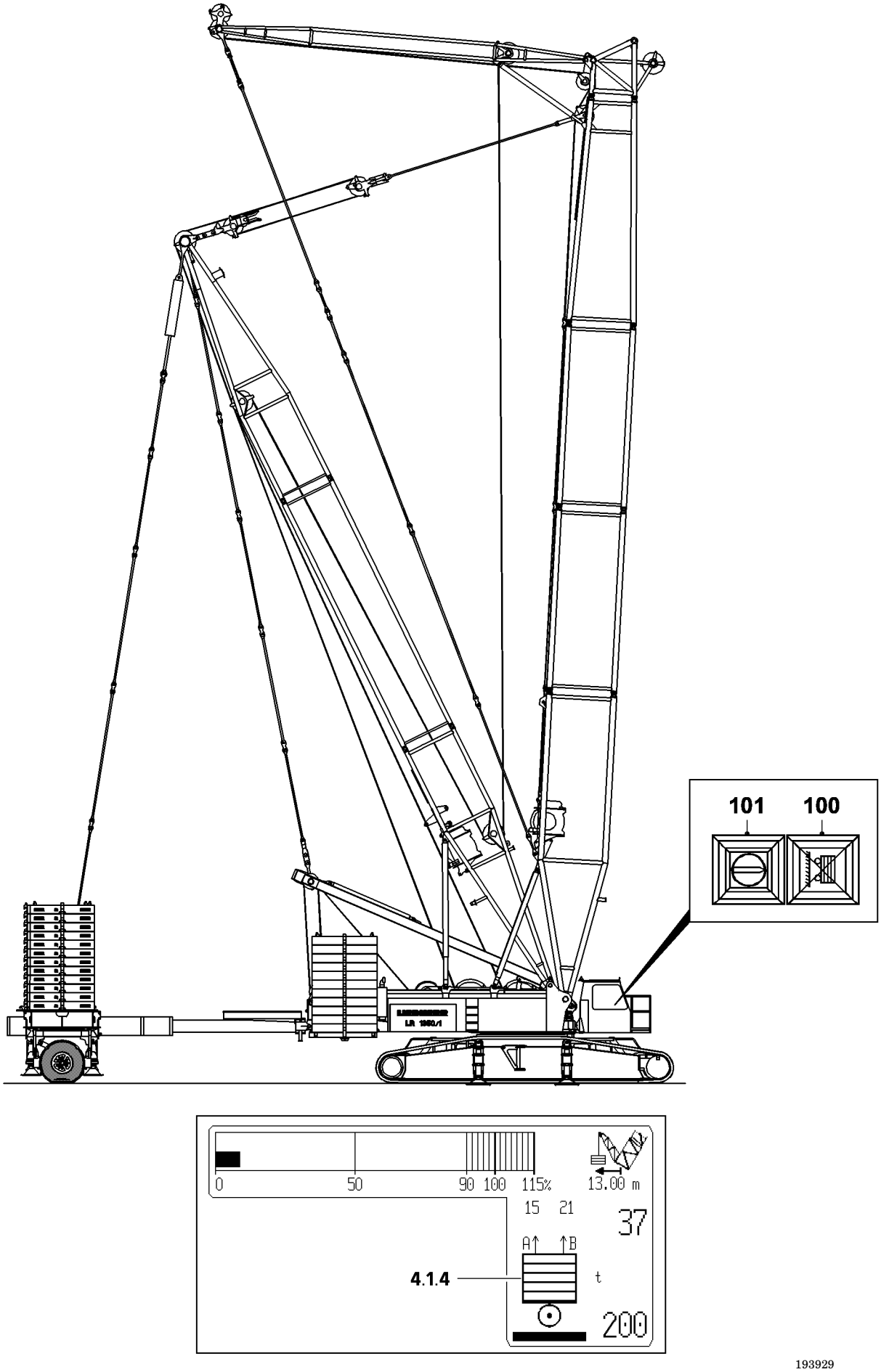
Note: If the ballast trailer is not loaded, the axles can be moved without relieving the tired.
If the ballast trailer is loaded, the tires **must** be relieved by supporting the ballast trailer.

C A U T I O N : **When supporting the loaded ballast trailer, it must be ensured that the locking pin (19) on the strut (18) is unpinned.**
Otherwise the ballast trailer will be damaged.

D A N G E R : **Make sure that there are no persons or objects within the turning or driving range of the ballast trailer.**
There is a danger of accidents!

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5.11 BALLAST TRAILER 028466-00

5.1.1 Keyed button (101) ”ballast trailer lifted off”

When "driving the crawler" and the keyed button (101) is **not** actuated, and the "ballast trailer not lifted off", the slewing brake as well as the hydraulic slewing gear coasting is released.

If "driving the crawler " with lifted off ballast trailer (constant visual check), the keyed button (101), "ballast trailer lifted off" must be turned on.

D A N G E R : If the ballast trailer is lifted off the ground (constant visual check), there is the danger that the wind turns the slewing platform away when "driving the crawler". For that reason, as soon as the ballast trailer lifts off, the keyed button (101), ”ballast trailer lifted off” must be turned on.
In this case, the slewing brake remains closed when "driving the crawler", the hydraulic slewing gear coasting remains released.

When "driving the crawler", the ballast trailer scrapes or gets stuck on the ground, so that the slewing platform with the ballast trailer turns against the crawler gear, the slewing brake will slip. The slewing gear will not be damaged. However, if the wheels of the ballast trailer are not positioned for towing, the ballast trailer or the crane will be damaged.

C A U T I O N : With turned on function "ballast trailer lifted off", the indicator light (100) blinks, it is possible to turn the crane superstructure or to drive the crane, even though the wheels of the ballast trailer are not set to driving in turns, towing or parallel driving.

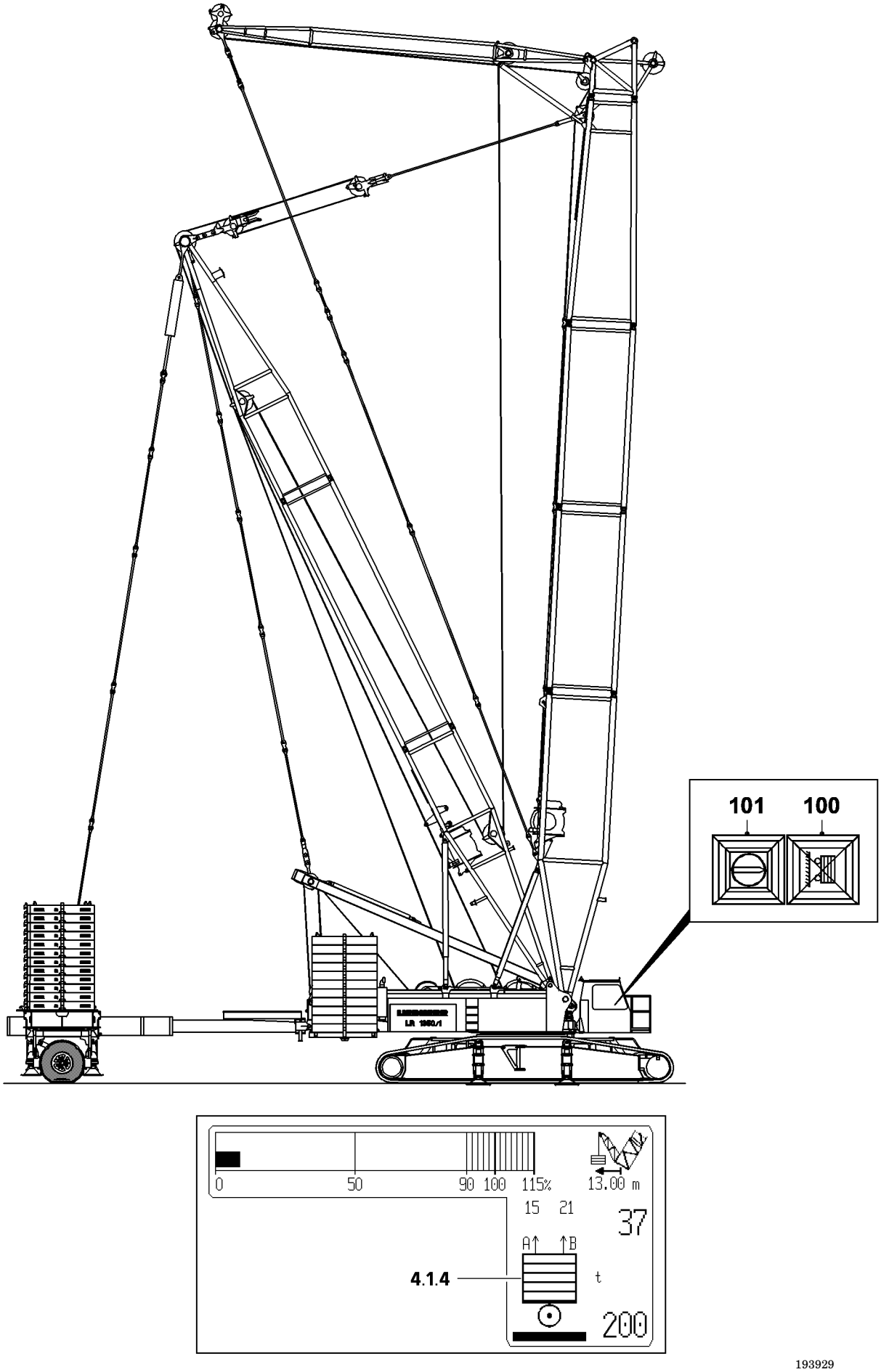
If the keyed button (101) "ballast trailer lifted off" is turned on, the blinking warning light (100) indicates this fact.

In addition, the ballast trailer symbol (4.1.4) on monitor 1 is shown in suspended condition (see chapter 4.02)

To shut off ”ballast trailer lifted off”, the button (100) must be pressed.

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5.1.1.1 Defined operation of the ballast trailer

The ballast trailer may **n o t** be lifted off or set down during travel, this must be done before starting to travel.

The ballast trailer should either,

1) defined to be set on the ground (keyed button (101) **n o t** pressed "ballast trailer not lifted off"). This means that the ballast trailer is resting on the ballast trailer tires with a remaining load. This remaining load is so large that the wind cannot turn the crane superstructure when the slewing brake is released for driving the crawler.

or

2) defined to be lifted off the ground (keyed button (101) pressed "ballast trailer lifted off"). This means that the slewing brake is not released for driving the crawler. As a result, the wind cannot turn the superstructure away when driving the crawler.

D A N G E R : The ballast trailer must always be defined (safely lifted off or safely on the ground). It is strictly prohibited to operated the ballast trailer in a non-defined range.
If the ballast trailer is set down in non-defined (fixed) mode, and if the ballast trailer is lifted off in non-defined mode, there is an increased danger of accidents!

C A U T I O N : If the lifted off ballast trailer wheels scrape on the ground, they can be damaged despite the setting "ballast trailer lifted off".

5.1.1.2 Non-defined operation of the ballast trailer (P R O H I B I T E D)

D A N G E R : The ballast trailer must always be operated in defined mode.

Example:
Ballasted ballast trailer is still standing on the ground with 1 ton ballast.

1) With keyed button (101) **not** actuated "ballast trailer not lifted off"
The slewing brake opens when driving the crawler. The wind can turn the superstructure, causing the load to start to swing.

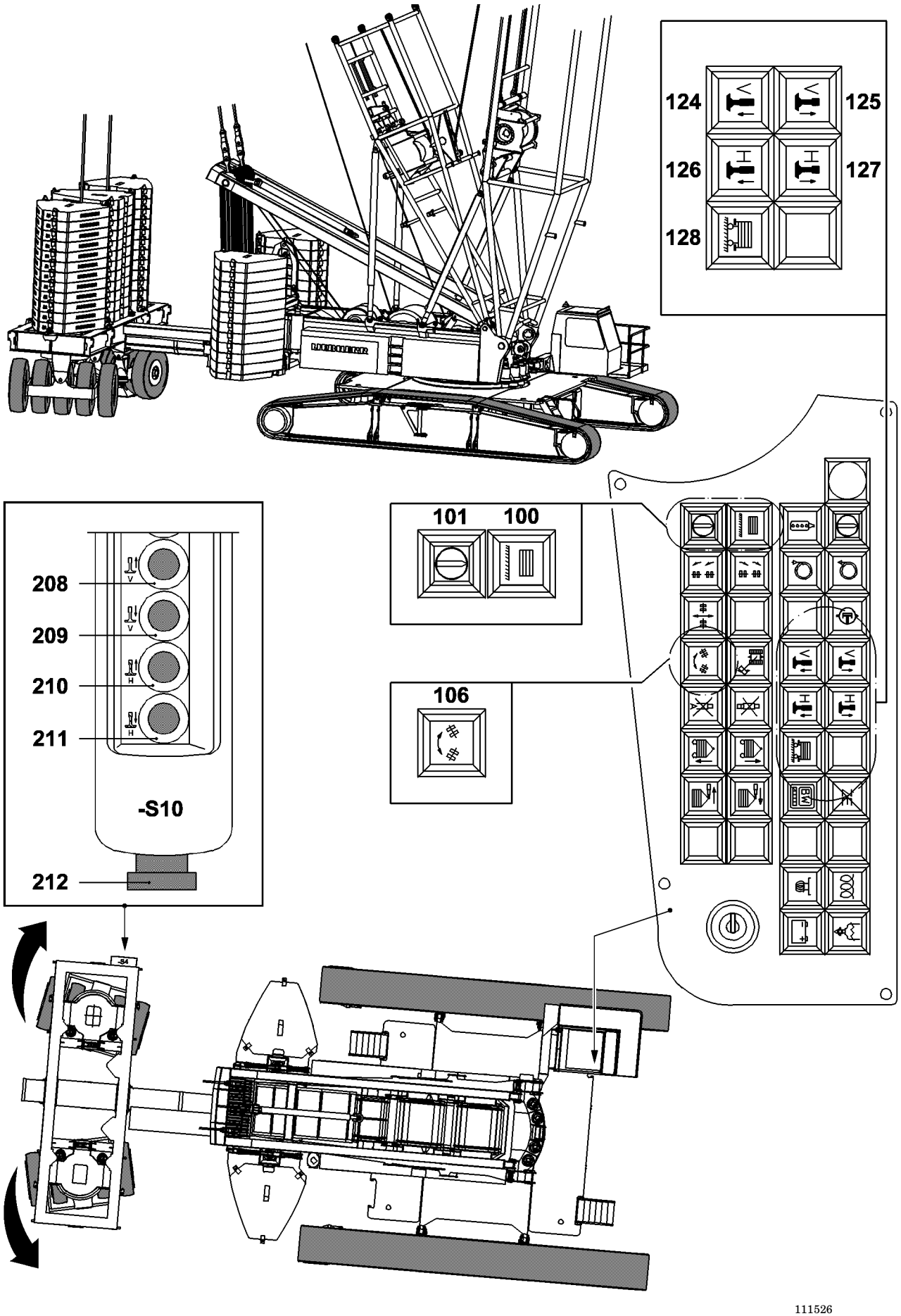
D A N G E R : There is an increased danger of collision.

or

2) With keyed button (101) actuated "ballast trailer lifted off"
The slewing brake for driving the crawler remains applied. When driving the crawler (in turns), the tires of the ballast trailer or the slewing brake slip.

C A U T I O N : There is a danger that the ballast trailer or the slewing gear will be damaged due to wear.

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5.2 Driving in turns

By telescoping the ballast trailer guide, various turning radii are possible.

Prerequisites

- The crane is at a standstill.
- The ballast trailer is properly installed.

Note: If the ballast trailer is operated on the ground, the wheels must be in the correct travel position. See also paragraph 5.2.1 to 5.2.3.

If the ballast trailer is suspended, the wheels can be in any position if the keyed button (101) was switched to "ballast trailer lifted off". In this case, the crane operator must monitor that the wheels do not scrape on the ground.

D A N G E R : If the ballast trailer is on the ground, the wheel position is not correct and the keyed button (101) is switched to "ballast trailer lifted off", then the wheels of the ballast trailer can be damaged when turning!

5.2.1 Lift the ballast trailer with the support cylinder

- Press button (124 and 126) **or**
  button (209 and 211).

The front and rear support cylinders extend.

5.2.2 Set the axles to driving in turns

- Press the button (106), the axles are turned in turning direction;
  The indicator light in the button blinks until the turning direction is reached;
  the indicator light in the button lights up when the turning direction is reached.

Note: If one of the wheel sets leaves the given angle, the indicator light in the button (106) blinks and the axles must be reset as described above.

5.2.3 Lower the ballast trailer with the support cylinders

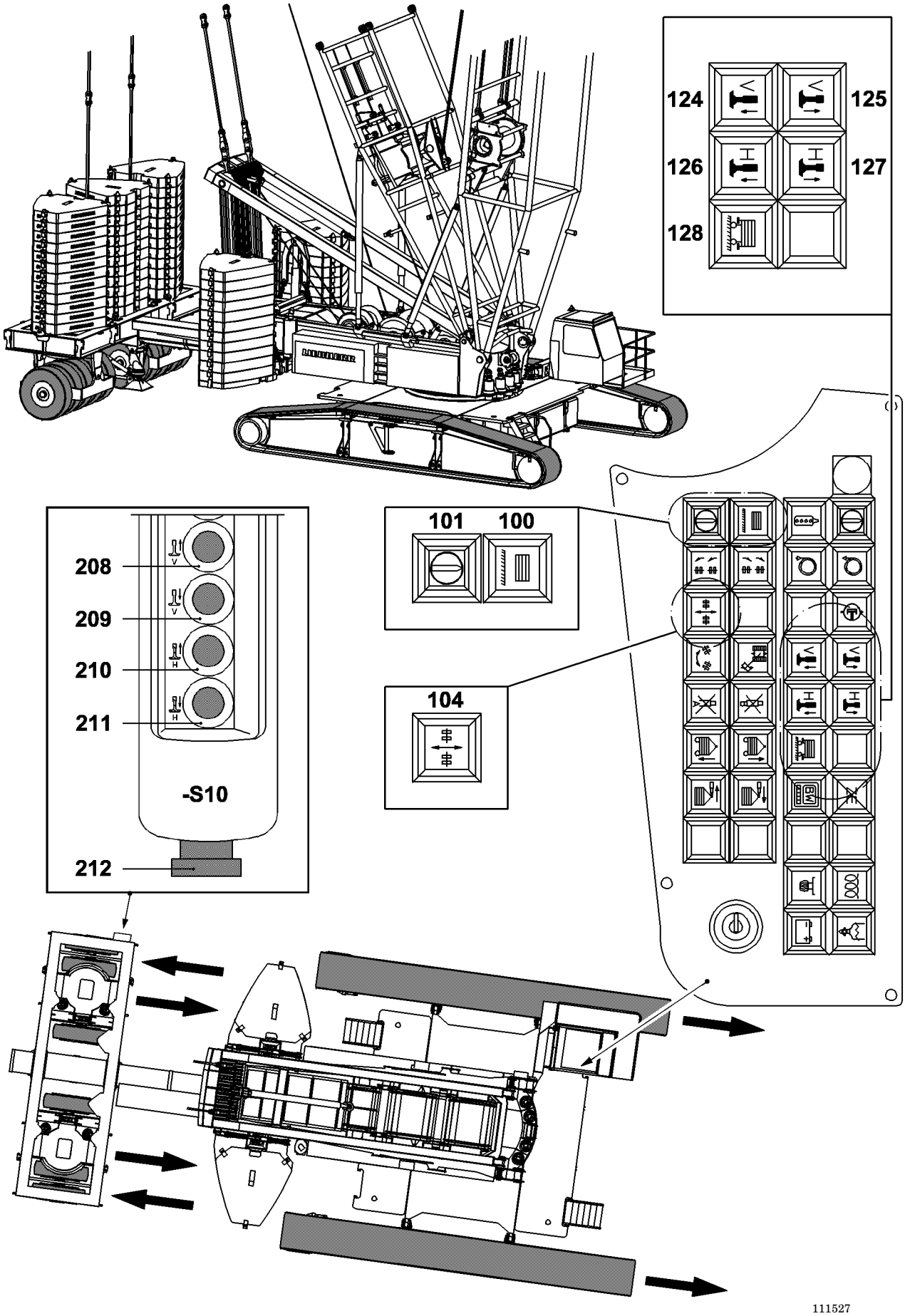
- Press the button (125 and 127) **or**
  Press the button (208 and 210).

Fully retract the support cylinders on the front and rear.

- The indicator light (128) "Supports for ballast trailer are retracted", lights up.

Note: The release for ”turning the slewing platform” is made only after the two axles are in turning direction and the support cylinders are retracted.

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5.3 Towing

Prerequisites
- The crane is at a standstill.
- The ballast trailer is properly installed;
- With the switch (65) turn on crawler operation (see chapter 4.01). The indicator light in the switch (65) lights up.

Note: If the ballast trailer is operated on the ground, the wheels must be in the correct travel position. See also paragraph 5.3.1 to 5.3.3.
If the ballast trailer is suspended, the wheels can be in any position if the keyed button (101) was switched to "ballast trailer lifted off". In this case, the crane operator must monitor that the wheels do not scrape on the ground.

D A N G E R : If the ballast trailer is on the ground, the wheel position is not correct and the keyed button (101) is switched to "ballast trailer lifted off", then the wheels of the ballast trailer can be damaged when turning!

5.3.1 Lift the ballast trailer with the support cylinder
- Press button (124 and 126) **or**
  button (209 and 211).

The front and rear support cylinders extend.

5.3.2 Set the axles to towing position
- Press the button (104), axles are turned to towing position.
  The indicator light in the button blinks until the towing position is reached;
  the indicator light in the button lights up when the towing position is reached.

Note: After reaching the towing position, telescoping the ballast trailer is possible.
Changing from operating mode "Towing", after reaching the towing position to operating mode "manual resteering" and back is possible while driving the crawler.
If operating mode "Towing" is selected from the operating mode "manual resteering", the indicator light blinks in the button (104) until the towing position is reached.

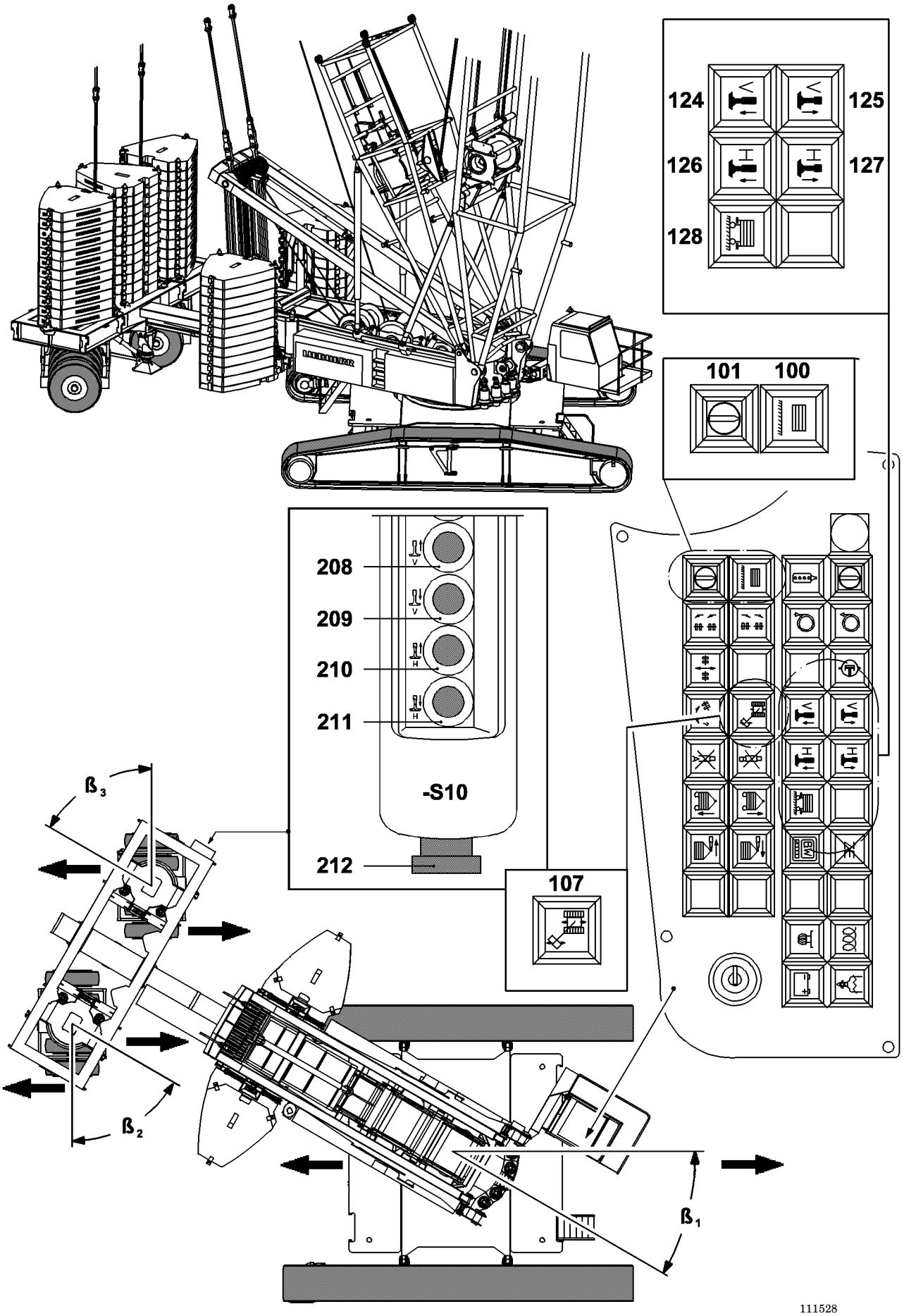
If one of the wheel sets leaves the given angle, the indicator light blinks in the button (104) and the axles must be reset as described above.

Generally the following applies : The wheel sets move in towing mode only when either button (102, 103 or 104 - see chapter 4.01) is pressed in the corresponding operating mode or when the crawler is driven.

5.3.3 Lower the ballast trailer with the support cylinder
- Press button (125 and 127) **or**
  button (208 and 210), the front and rear support cylinders retract;
- The indicator light (128), supports for ballast trailer are retracted, lights up

Note: The release for ”Towing” is only made if the two axles are in driving position (zero position) the the support cylinders are retracted.

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5.4 Parallel driving

Prerequisites
- The crane is at a standstill.
- The ballast trailer is properly installed.
- With the switch (65) turn on crawler operation (see chapter 4.01). The indicator light in the switch (65) lights up.

Note: In any case, either "ballast trailer on the ground" or "ballast trailer suspended", the ballast trailer must be in wheel position for parallel driving.
In any other wheel position, the control switches over to shut offs as for towing.

D A N G E R : If the ballast trailer is on the ground, the wheel position is not correct and the keyed button (101) is switched to "ballast trailer lifted off", then the wheels of the ballast trailer can be damaged when turning!

5.4.1 Lift the ballast trailer with the support cylinder
- Press button (124 and 126) **or**
  button (209 and 211).

The front and rear support cylinders extend.

5.4.2 Set the axles into parallel position
- Press button (107), axles are turned in parallel position.
  The indicator light in the button blinks until the parallel position is reached.
  The indicator light in the button lights up when the parallel position is reached.

Note: If one of the wheel sets leaves the given angle, the indicator light blinks in the button (107) and the axles must be reset, as described above.

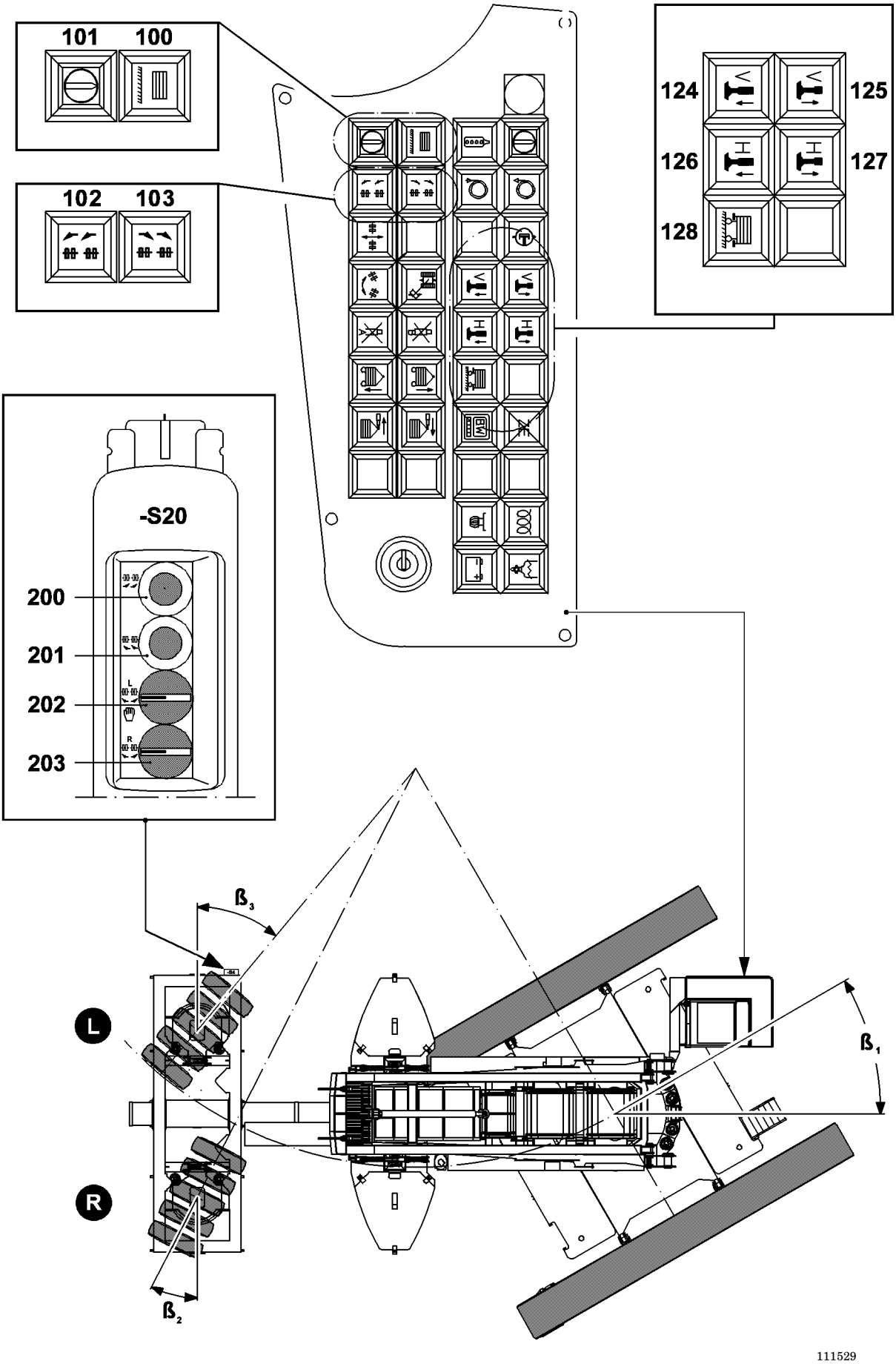
5.4.3 Lower the ballast trailer with the support cylinder
- Press the button (125 and 127) **or**
  button (208 and 210), the front and rear support cylinder retract;
- The indicator light (128), "Supports for ballast trailer are retracted", lights up.

Note: The travel drive of the crawler is locked until the axles are in parallel position.
For "drive the crawler", the slewing brake of the crane remains applied, the hydraulic coasting is opened.
If the angles β_2, β_3 in relation to β_1 deviate by more than the permissible limit value, the crawler travel gear is stopped.
The indicator light (107) blinks.
The crawler travel gear is only released if the axles are turned to the angle as described above.
By turning on the switch (66) "Parallel operation of crawler" (see chapter 4.01), the crawler drives exactly straight forward, if the ground is appropriate. This simplifies driving with the ballast trailer in operating mode "Parallel driving"!

C A U T I O N : For parallel driving, steering the crawler is p r o h i b i t e d , but not locked! If it is steered anyway, the mechanical slewing brake can slip until the crawler gear is stopped due to the angle deviation.
The side tire deformation must be observed by a guide. If the deformation is larger than 100 mm, the position of the axles must be corrected, as described above.

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5.5 Manual resteering

Prerequisites
- The ballast trailer is properly installed;
- With the switch (65) turn on crawler operation (see chapter 4.01). The indicator light in the switch (65) lights up.

5.5.1 Steer and resteer the axles

Prerequisites
- The operating mode "Towing" was selected.
  and ballast trailer axles have reached towing position.

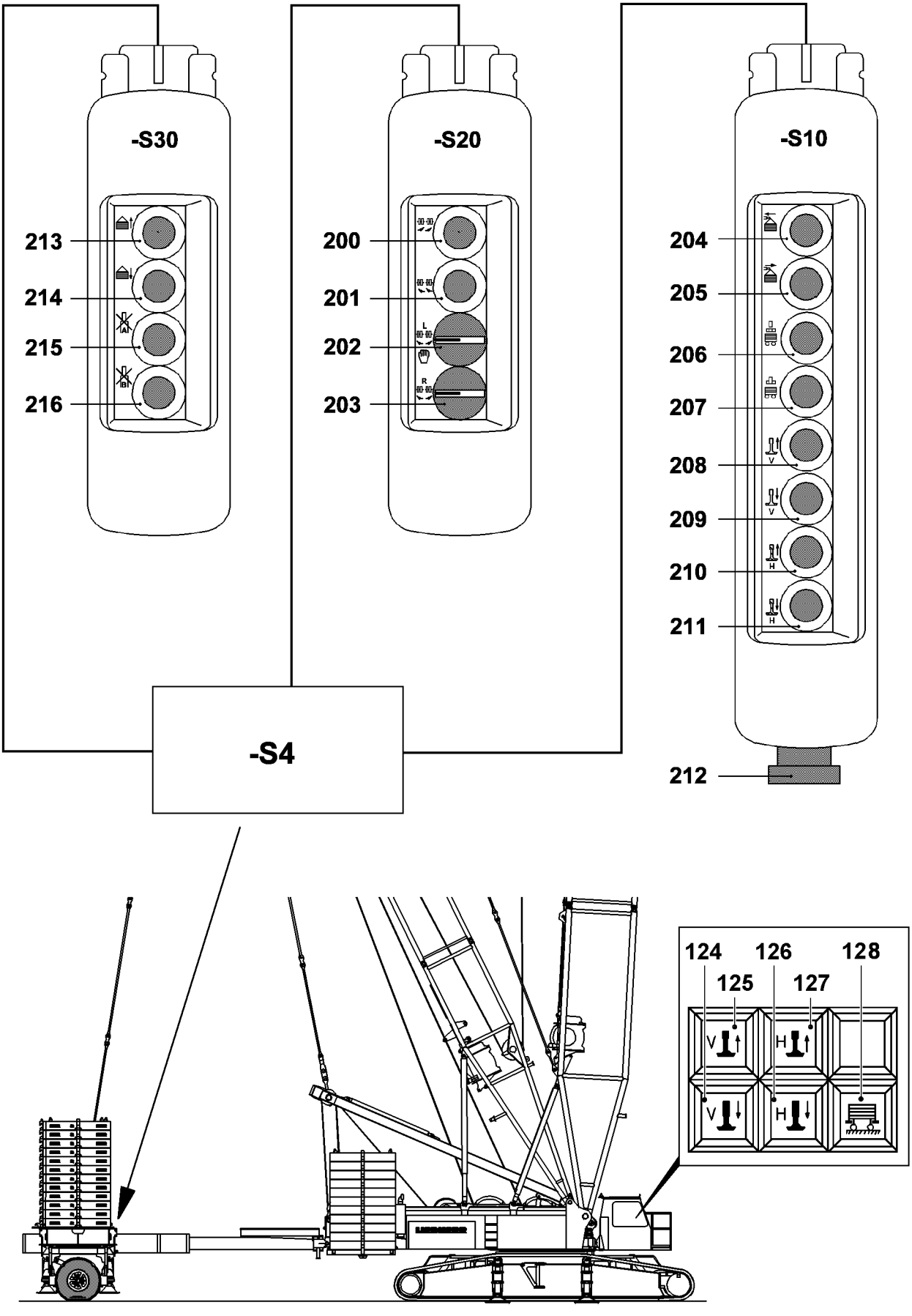
- Button (102) **or** (200) is pressed,
the ballast trailer wheels turn to the left.
- Button (103) **or** (201) is pressed,
the ballast trailer wheels turn to the right.

The right wheel set is regulated by the computer controlled steering program in such a way that there is always one steering center. The angle **ß1** is determined by driving the crawler and the angle **ß3** by the steering motion of the operator, whereby the angle **ß2** is continuously re-regulated.
Changing from operating mode "manual resteering" to operating mode "Towing" and back, after reaching the towing position, is possible while driving the crawler. If operating mode "manual resteering" is selected from operating mode "Towing", the indicator lights in the buttons (102 and 103) light up.

Note: The left wheel set can be steered to the given angle $ß_3$. Additional steering past this limit is not possible.
The right wheel set is readjusted according to the steering center. If the resteered right wheel set cannot follow the left wheel set, then the steered left wheel set is stopped until the right wheel set has caught up. If the right wheel set leaves the given angle anyway, then the indicator lights in the buttons (102 and 103) blink and towing must be restarted.
If the angle $ß_1$ of the slewing platform exceeds the given dimension, then the system changes automatically to operating mode "Towing". The indicator lights in the buttons (102, 103 and 104) blink. When the towing position is reached, it can be manually resteered. The indicator lights in the buttons (102 and 103) lights up.

Generally the following applies : The wheel sets move in towing mode only when either button (102 or 103 or 104) or resteer buttons (200 or 201) on the control panel (-S20) in the corresponding operating mode is pressed or when the crawler is driven.

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5.6 Manual operation for installation

The ballast trailer is equipped with a program which makes it possible to turn each ballast trailer axle individually.

Prerequisites

- The crane is at a standstill.
- The ballast trailer is properly installed.

5.6.1 Lift the ballast trailer with the support cylinder

- Press button (124 and 126) **or**
  button (209 and 211).

The front and rear support cylinders extend.

5.6.2 Set the axles

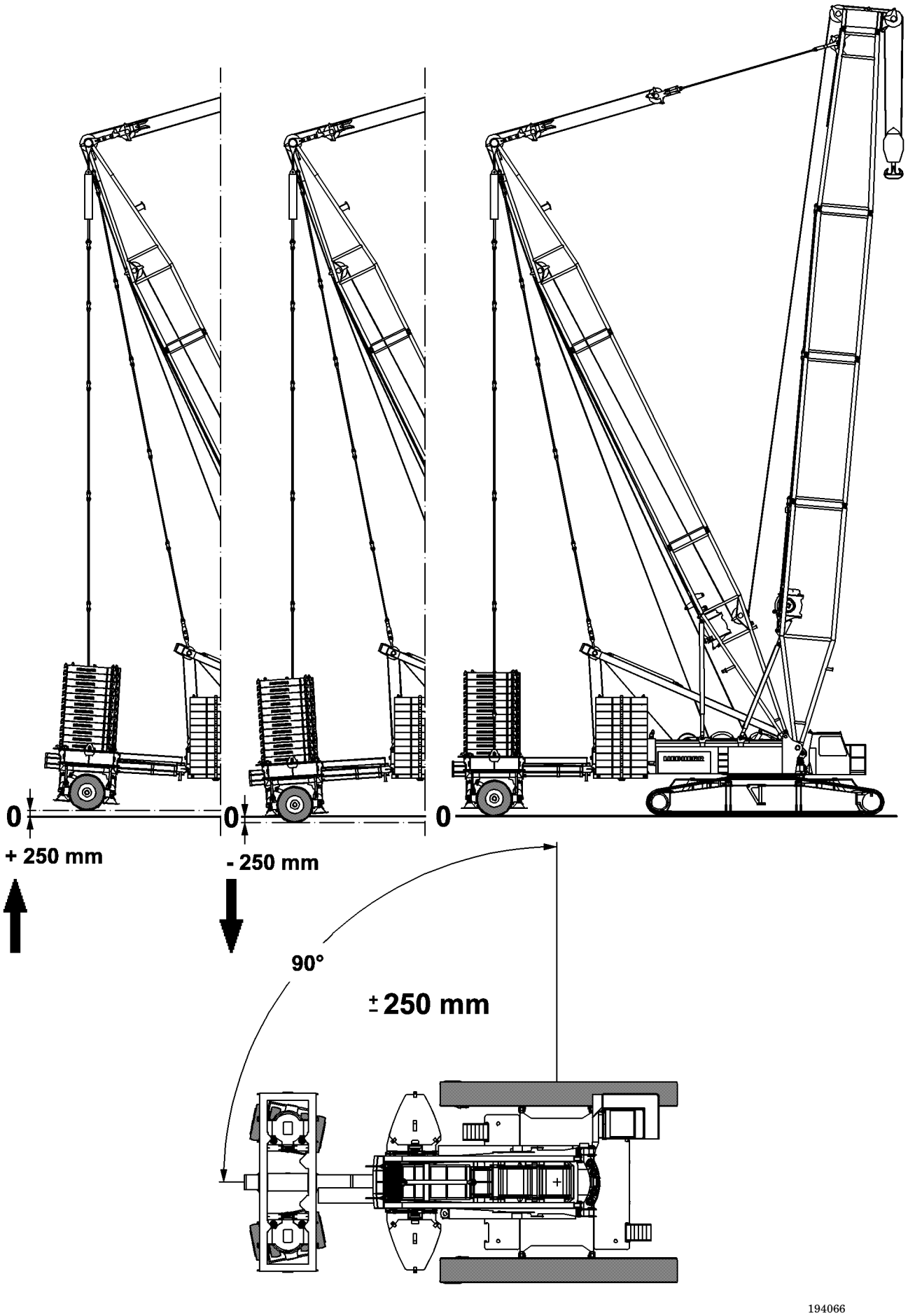
- Turn the knob (202) to the right,
  the left axle turns to the right.
- Turn the knob (202) to the left,
  the left axle turns to the left.
- Turn the knob (203) to the right,
  the right axle turns to the right.
- Turn the knob (203) to the left,
  the right axle turns to the left.

5.4.3 Lower the ballast trailer with the support cylinders

Press the button (125 and 127) **or**
button (208 and 210), the front and rear support cylinder retract;

- The indicator light (128), "Supports for ballast trailer are retracted", lights up.

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6. Max. permissible uneven ground for towing, parallel driving, driving in turns and manual resteering

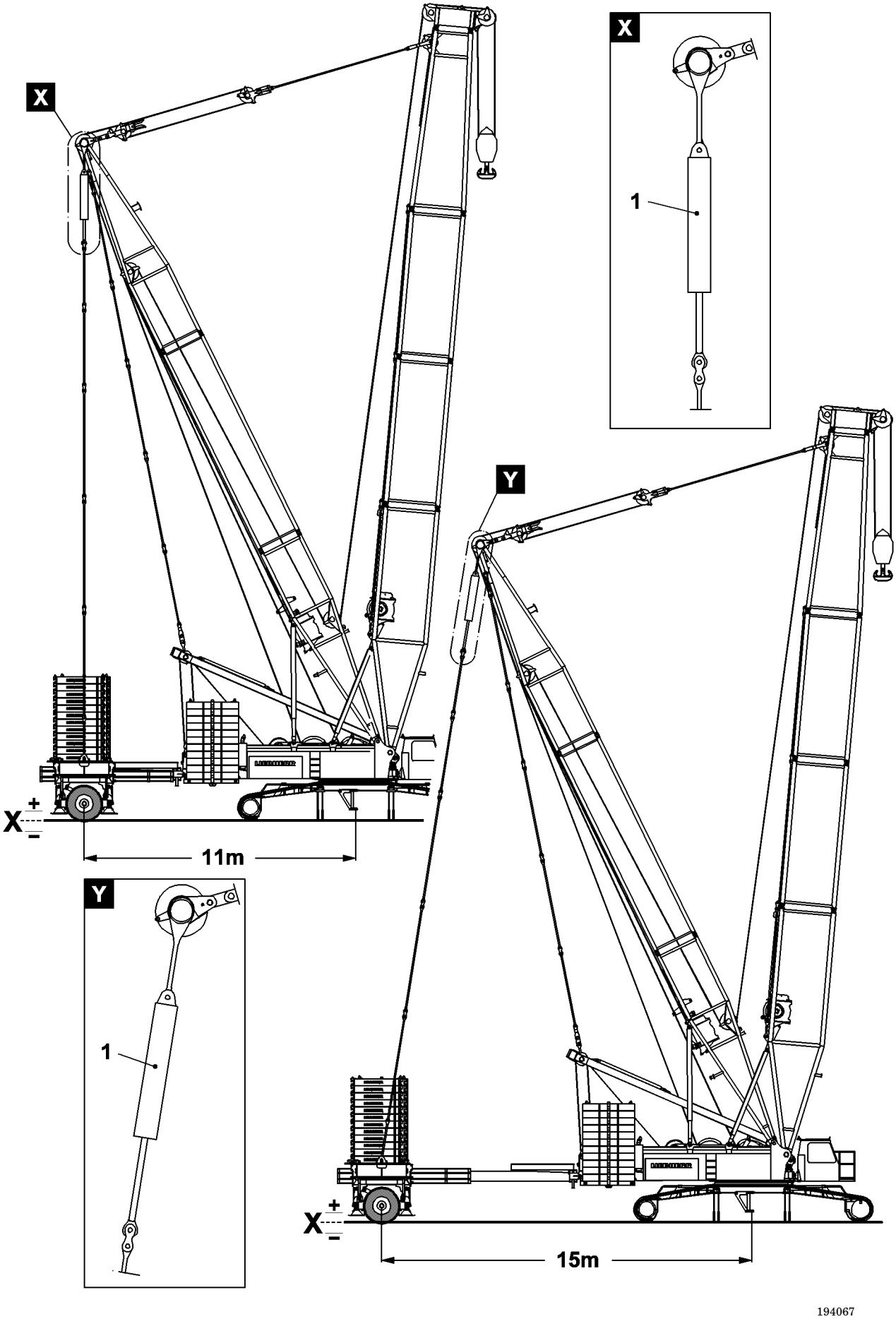
Level changes between the standing surface of the crane and the ballast trailer when driving or turning.

D A N G E R : The level difference, in relation to the ballast trailer travel route to the crane travel route for towing and parallel driving may not be more than max. ± 250 mm.

The level difference, in relation to the ballast trailer travel route to the crane travel route for driving in turns may be no more than max., ± 250 mm (constant incline or decline / uphill or downhill) over 90° turning range.

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6.1 Compensation of max. permissible uneven ground conditions by the pull cylinder (1)
By lifting and lowering the pull cylinder (1), the maximum permissible ground unevenness can be compensated for.

Ballast trailer radius 11 m

Ballast trailer radius **R 11 m**	Cylinder stroke **(mm)**	Dimension X **(mm)**
Max. permissible ground unevenness		± 250
Pull cylinder retracted	0	800
Pull cylinder nominal position	800	0
Pull cylinder extended (max.)	1500	-700

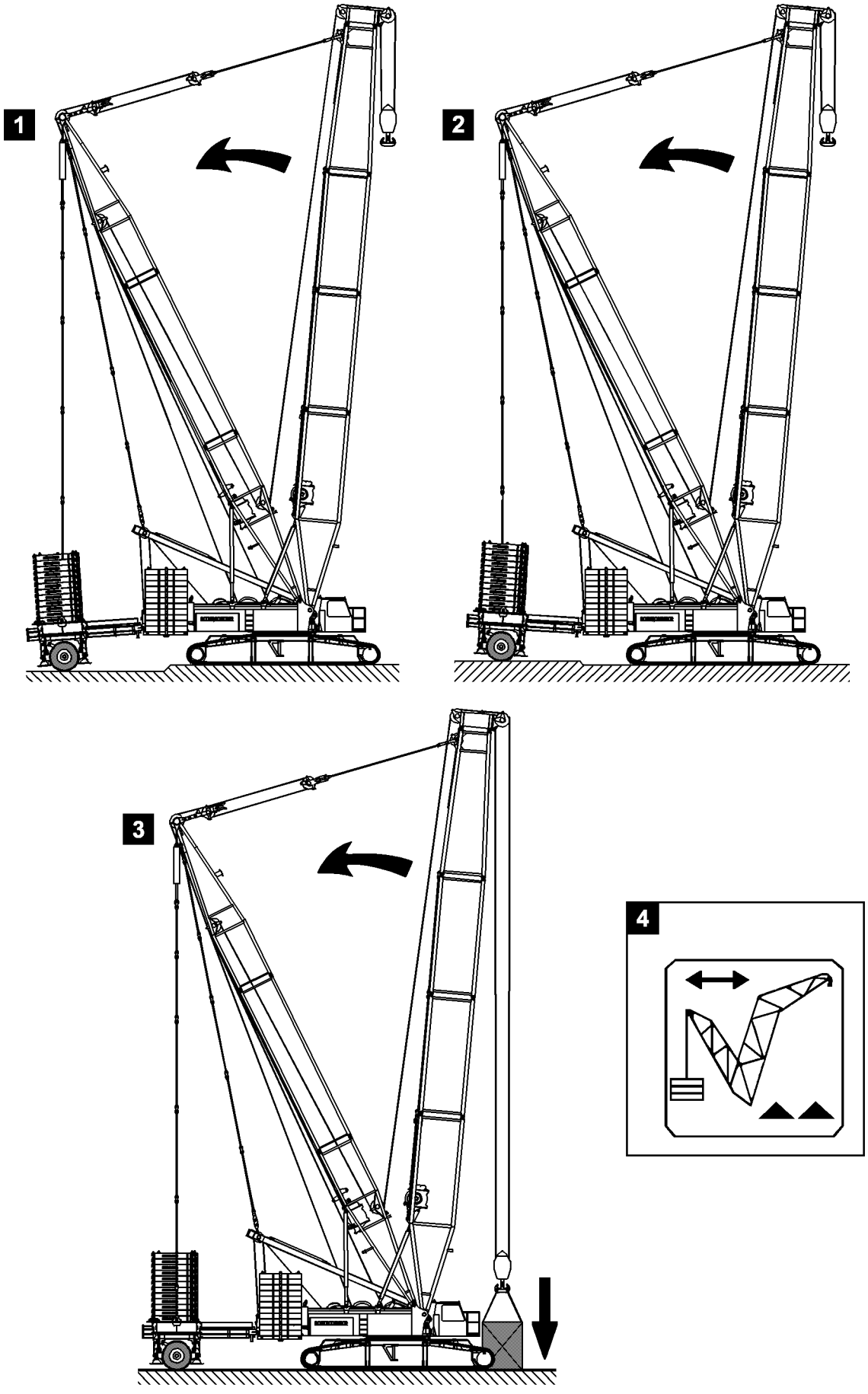
Ballast trailer radius 13 m

Ballast trailer radius **R 13 m**	Cylinder stroke **(mm)**	Dimension X **(mm)**
Max. permissible ground unevenness		± 250
Pull cylinder retracted	0	890
Pull cylinder nominal position	890	0
Pull cylinder extended (max.)	1500	-610

Ballast trailer radius 15 m

Ballast trailer radius **R 15 m**	Cylinder stroke **(mm)**	Dimension X **(mm)**
Max. permissible ground unevenness		± 250
Pull cylinder retracted	0	1100
Pull cylinder nominal position	1100	0
Pull cylinder extended (max.)	1500	-400

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7. Safety guidelines for travel operation

7.1 Relapse cylinder

Luffing up the main boom is turned off in all operating modes in the steepest operating position via the overload safety system. This moves the winches to a standstill, which affects a further reduction of the radius.

Note: However, there are cases where the relapse cylinders move into block position due to a movement of the complete crane system to the rear.

7.2 Block position of relapse cylinders

In normal crane operation without bypass of the overload safety system, a block position is not possible. Should a block position occur anyway, then "luffing up" the winch movement or the luffing movement is turned off due to the block limit position switch and the boom limit symbol (fig. 4) in the operating view shows which block position was triggered (see 4.02).

Using the boom limit symbol, it must be determined which limit switch on which relapse cylinder has been actuated.
The last movement which was carried out must be retracted, until the corresponding limit switch is released again.

7.2.1 **Case 1**, fig. 1

When driving or turning the crane with steeply positioned main boom, the level of the crane can change if the terrain slopes uphill.
This pulls the complete boom system to the rear. There is a **danger** that the relapse cylinder moves in block position.

Note: Due to the signals "Main boom relapse cylinder on block" or "Derrick relapse cylinder on block", the movements "Driving the crawler " and " turning " are automatically shut off in operation with ballast trailer.

7.2.2 **Case 2**, fig. 2

If the level under the crane is increased, then the boom system is also pulled backwards. There is a **danger** that the relapse cylinder moves in block position.

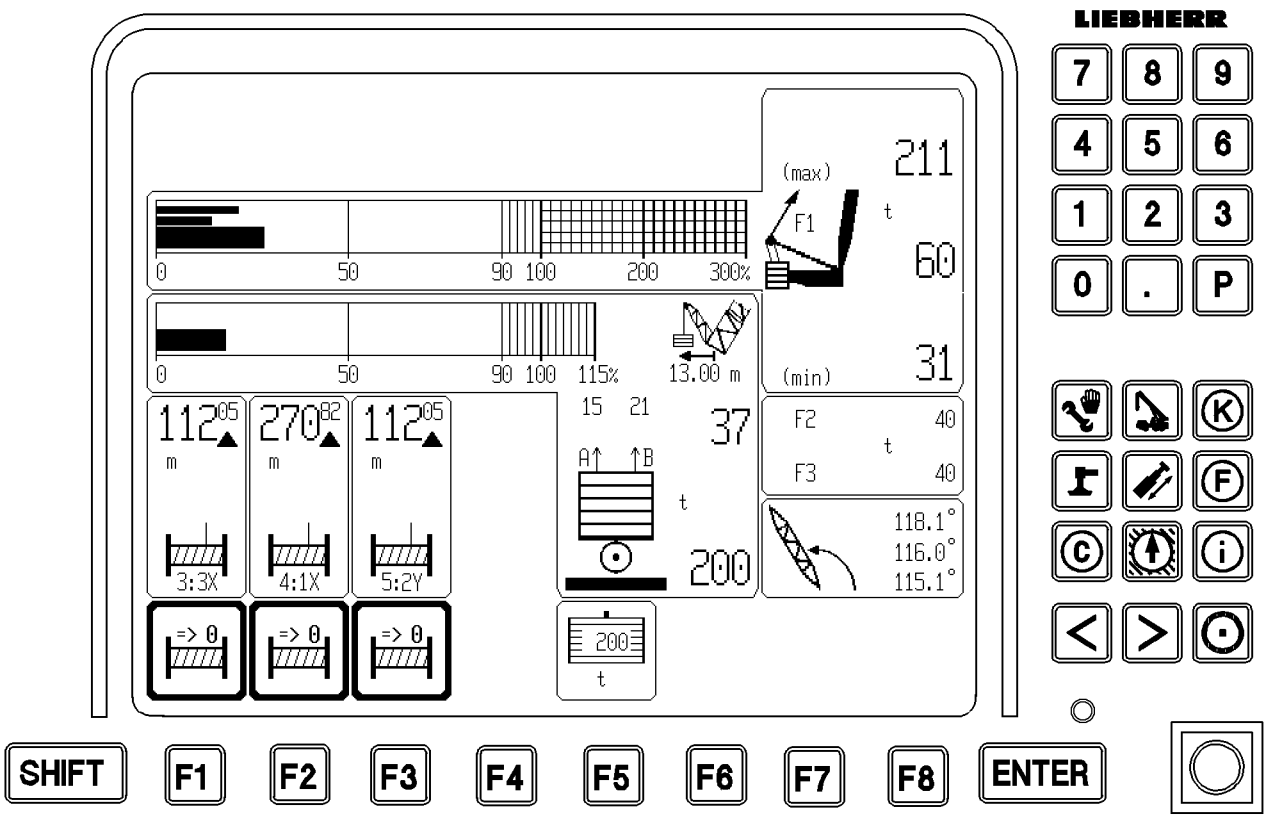
The same **danger** occurs when turning, if the ballast trailer drops down due to level differences.

Note: Due to the signals "Main boom relapse cylinder on block" or "Derrick relapse cylinder on block", the movements "Driving the crawler " and " turning " are automatically shut off in operation with ballast trailer.

7.2.3 **Case 3**, fig. 3

When setting down the load with the hoist gear, the crane is relieved. This causes the boom to move backward. **There is no shut off of the hoist gear.**

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8. LICCON overload safety system

8.1 General

Prerequisite:
- The required derrick ballast according to the load chart is placed ;
- the derrick boom is in operating position.

8.1.1 Preadjustments
- Set the LICCON overload safety system according to the data in the load chart and confirm;
- Enter the actually present derrick ballast weight into the LICCON.

Note: Set the derrick ballast - see chapter 4.03.
Take the required derrick ballast from the load chart.

D A N G E R : **The set derrick ballast must match the actually installed derrick ballast weight.**
An incorrect ballast weight entry can lead to dangerous operating situations.

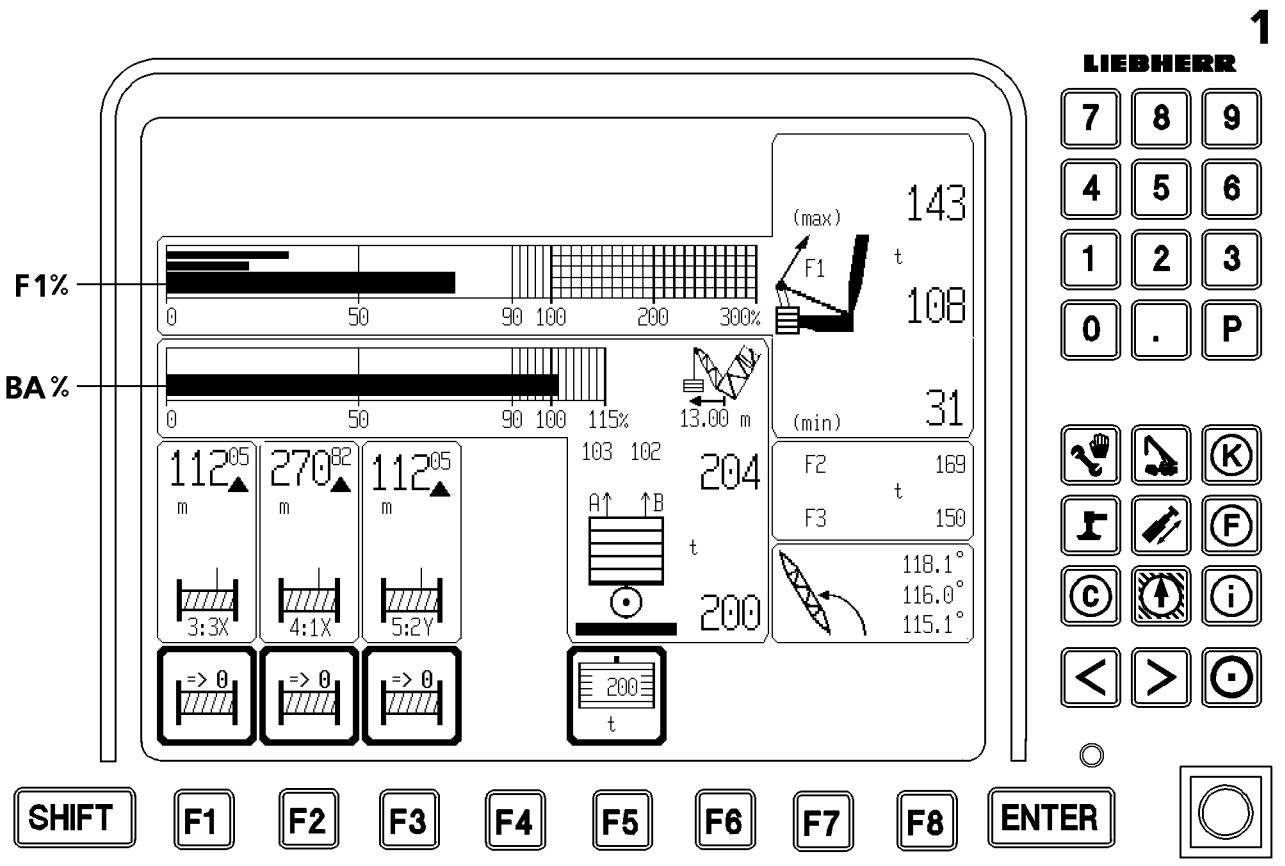
8.1.2 Operation
For the operation with derrick ballast, all data in chapter 4.02 must be observed!

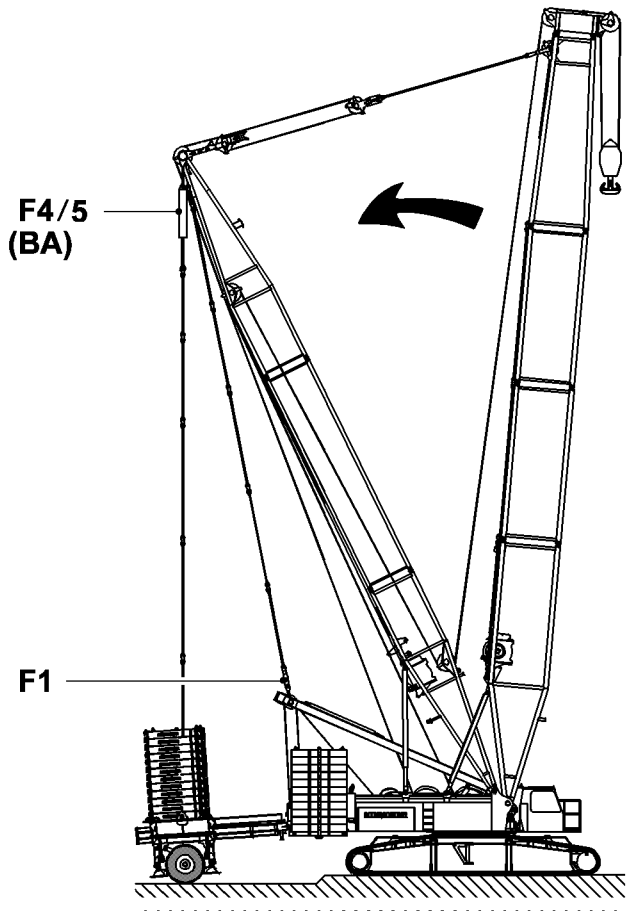
D A N G E R : **There may be no persons or obstacles within the turning range of the derrick ballast.**
During the turning movement, a guide must monitor the boom, derrick and derrick ballast to prevent a collision.
When turning with a load and raised ballast trailer, the turning movement or the braking movement must be initiated extremely sensitively. If the turning or braking movement is initiated jerkily, then the load or the raised ballast trailer can start to swing. This could cause the boom to break and / or cause the crane to topple over.

Note: If the **raised ballast trailer** must be moved over any obstacles or must be lowered on a different level than the crane is, then there is the possibility to raise or lower the **raised ballast trailer** with the pull cylinders.
See paragraph 3.5 and 8.8.

D A N G E R : **The derrick ballast must always be in horizontal position when raising or lowering with pull cylinders, otherwise there is a danger of tipping over.**
Monitor the extension condition of the ballasting cylinders.

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8.2 Safety guidelines

- The test points must be checked for proper function before crane operation.
- The crane must be aligned in horizontal direction at the job site.
- The weight of the load to be lifted must be known.
- The placement surface of the derrick ballast may be no more than max. 250 mm above or 250 mm below the standing surface of the crane.
- The placement surface of the suspended derrick ballast at the end of the load lift must be level, horizontal and of sufficient load carrying capacity to take on the weight safely.

C A U T I O N : Before setting down the load and suspended derrick ballast, the crane operator must make sure that he can safely do so.

- There may be no obstacles within the slewing and turning range of crane, derrick ballast and load.
- A guide or the crane operator himself must watch the derrick ballast, if it is to be lifted.

- When taking on a load, **make sure to avoid** diagonal pull, which means the derrick ballast, center of rotation of the slewing platform and the load must always be on one line!

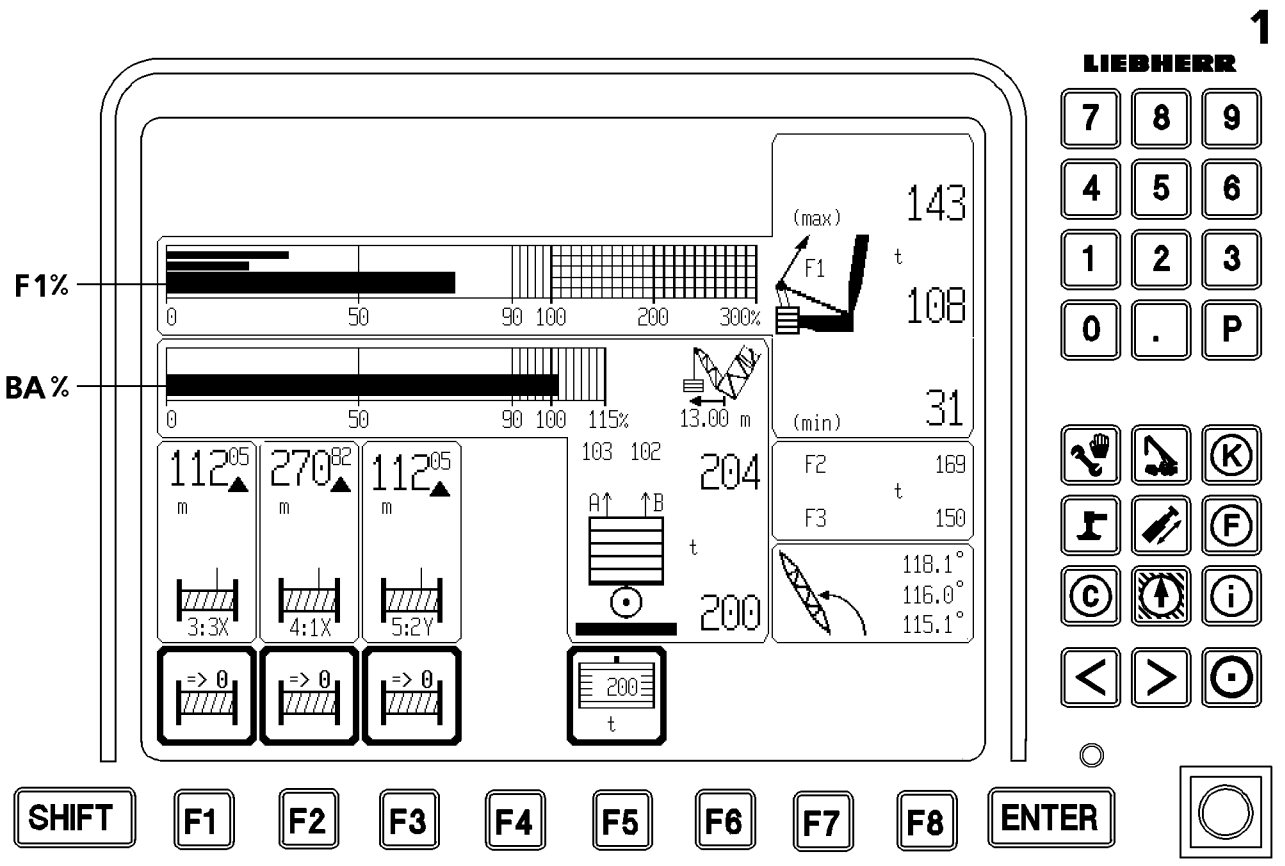
  To ensure this, actuate the pull cylinders to lift the derrick ballast off the ground and set it down again **before** placing the ballast plates.

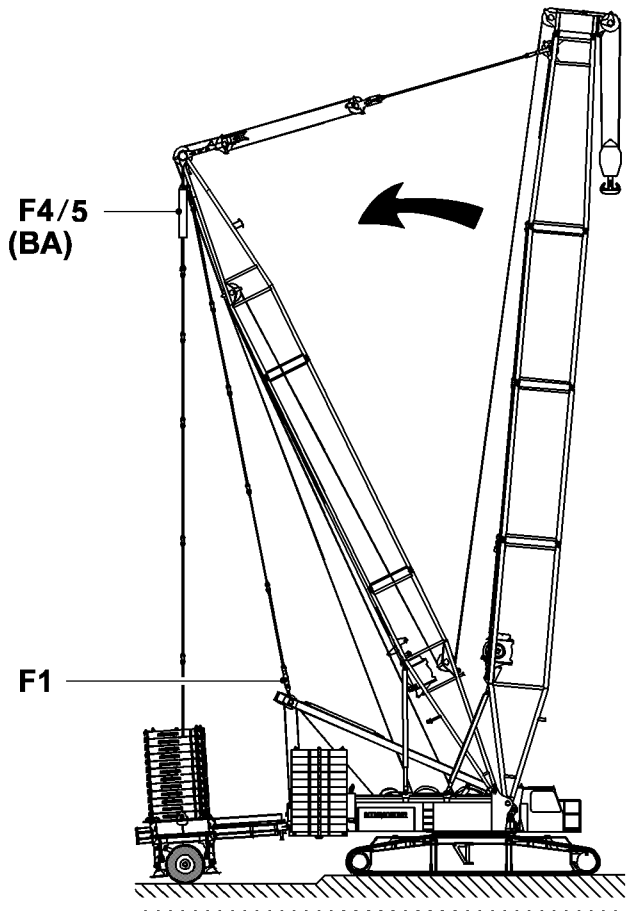
D A N G E R : If this is not observed, there is a danger of tipping over when lifting the placed ballast plates, which can cause the crane to topple over.

- When taking on a load, the guying from the derrick ballast to the derrick end section must be relieved to the point where the **test point 1 - actual force** is larger than the **F1- minimum force** (F1-min).
- The guying between the A- bracket and the derrick end section **test point 1** may **never** be untensioned.

D A N G E R : This could lead to uncontrolled movements of the boom system, which could cause a serious accident.

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8.3 Determination of forces in operating mode with derrick ballast

In all operating modes with derrick ballast, the load is distributed onto the guy rods from the derrick end section to the A-bracket (F1) and to the derrick ballast (F4/5).

Note: See also the more detailed description in chapter 4.02.

8.3.1 Force F1 (Test point 1) between guying A-Bracket - derrick end section

Force F1 (test point 1) is determined in the guy rods from the A-bracket to the derrick end section via 2 force test boxes and indicated on the LICCON as total force at the guying.

The F1 utilization is determined from operating force F1 and force F1- operation - max. force. This value is shown on the LICCON via a utilization bar graph (F1 %).

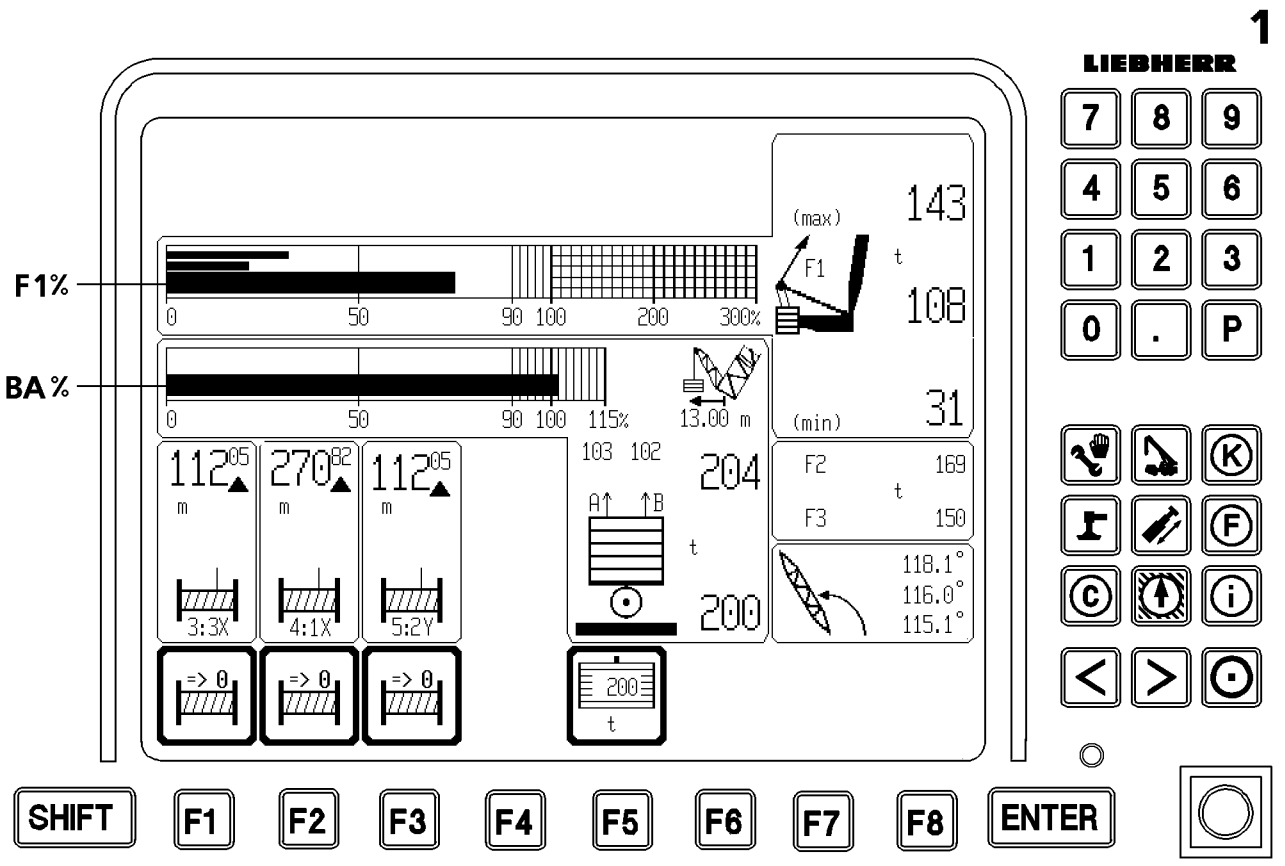
8.3.2 Force F4 / 5 (Test point 4 / 5) guying derrick ballast - derrick end section

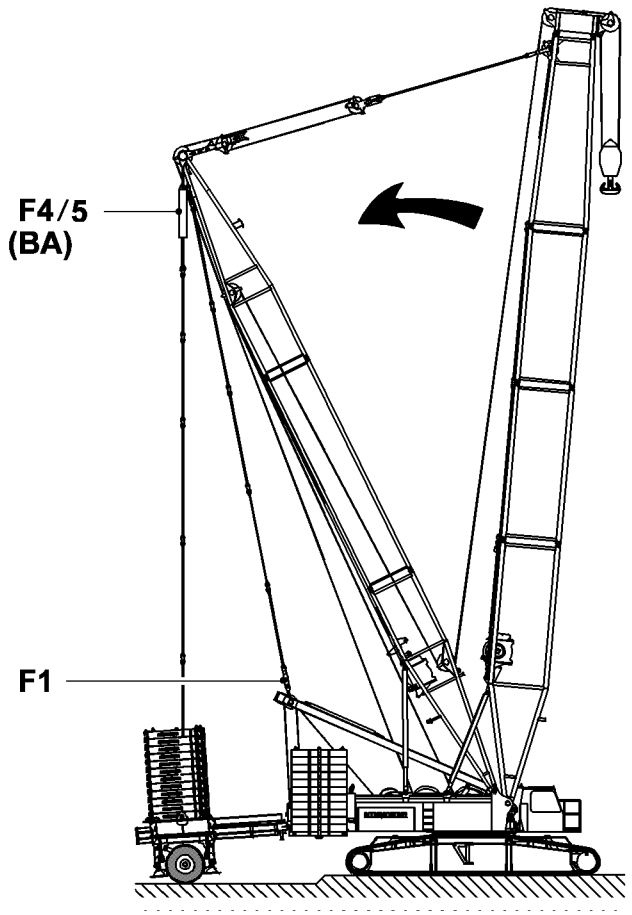
Forces F4 / 5 (test point 4 / 5) acts in the guy rods from derrick ballast to derrick end section.

The existing forces in the guy rods (A = left and B = right) are calculated from three pressure sensors, which are installed on the pull cylinders and shown in the LICCON as individual forces.

From the forces of the individual guying, the pulled ballast is calculated, i..e. the part of the ballast which is pulled upward by the guying. The remaining part lays on the ground. The derrick ballast utilization is calculated from the pulled ballast and the placed ballast. This value is shown on the LICCON via a utilization bar graph (BA %).

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8.3.3 Monitoring of minimum force F1 (Test point 1), F1 min.

If more than 50% is pulled by the set derrick ballast (ballast utilization bar > 50 %) and the minimum force F1 min (Test point 1) is fallen below, all **load moment increasing** crane movements are shut off.

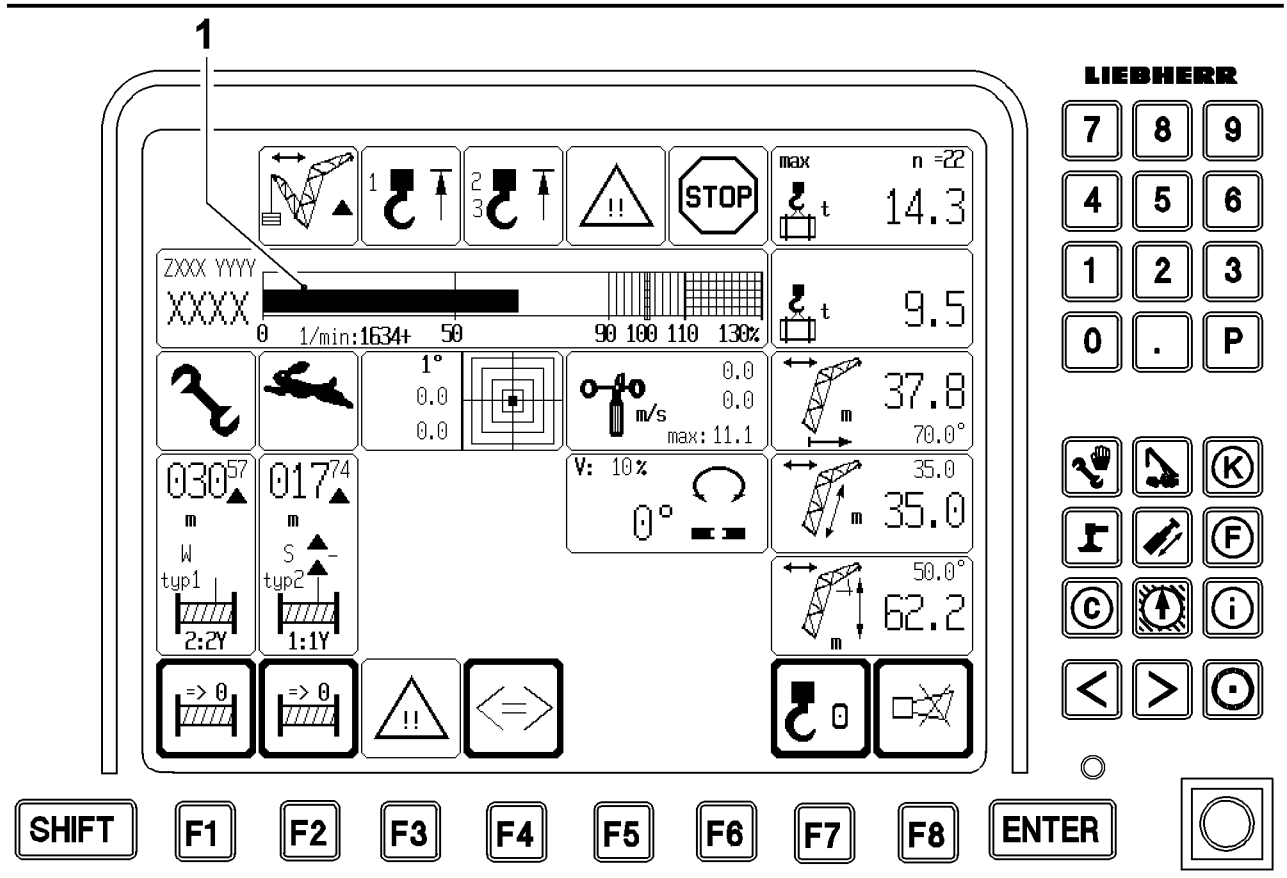
D A N G E R : **It is prohibited to fall below the minimum force F1 min (test point 1) if more than 50 % of the derrick ballast is being pulled. If this is not observed, the derrick ballast may lift off the ground suddenly at slack guying from test point 1 (F1) and derrick ballast on the ground due to increasing load momentum and the boom system will suddenly move forward!**
This will cause the load to swing strongly, which can damage the boom and the crane.

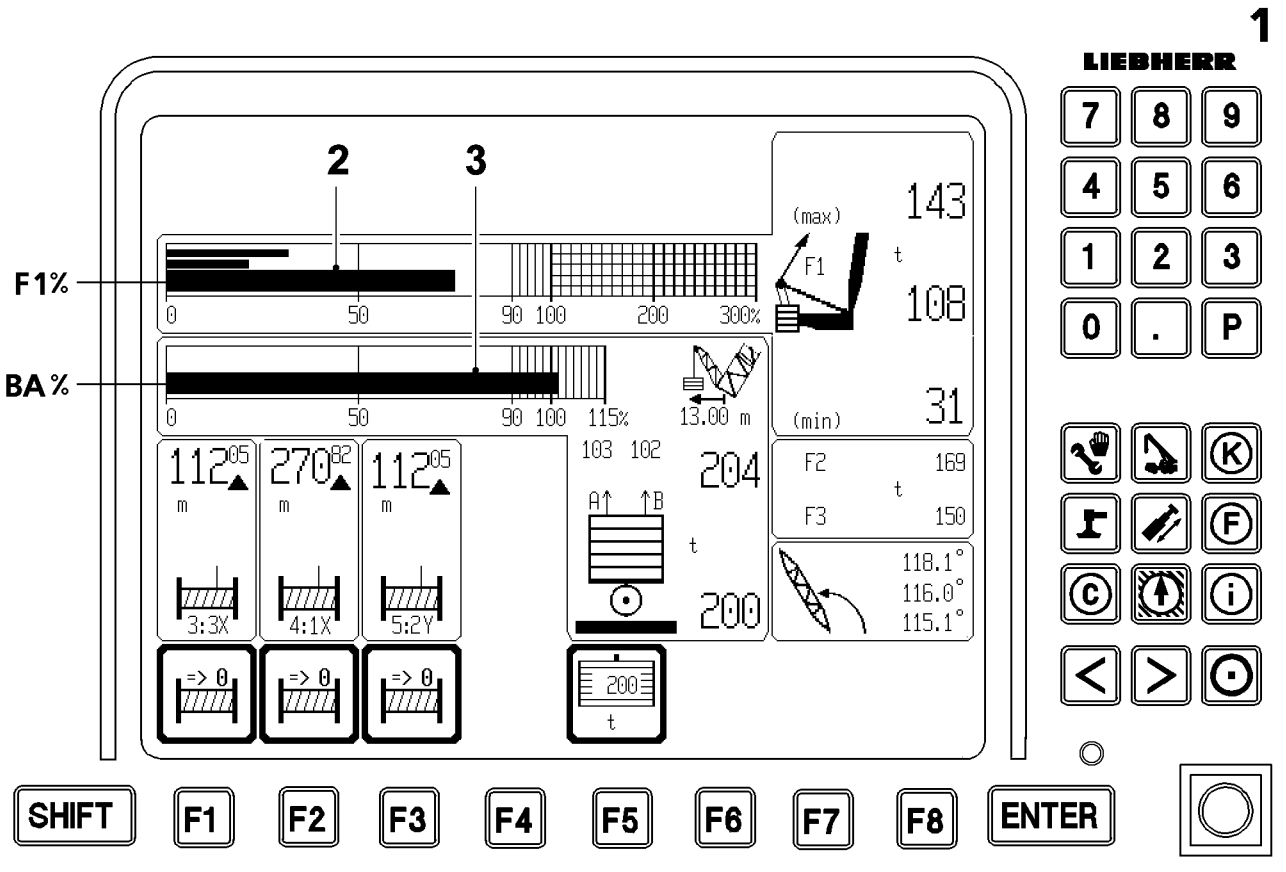
If more than 90% is pulled by the set derrick ballast (ballast utilization bar > 90 %) and the minimum force F1 min (Test point 1) is fallen below, all **load moment increasing and all load moment decreasing** crane movements are shut off.
The hoist gear ”down” is also shut off.

D A N G E R : **It is prohibited to fall below the minimum force F1 min (test point 1) if more than 90 % of the derrick ballast is being pulled. If this is not observed, the derrick ballast may set down on the ground suddenly at slack guying from test point 1 (F1) and suspended derrick ballast due to decreasing load momentum and the boom system will suddenly move backward!**
This can press the relapse cylinder on block and overload them. There is a danger of damage to the relapse cylinders boom and derrick.
This also will cause the load to swing strongly, which can damage the boom and the crane.

One can only get out of this situation :
- by lowering the suspended derrick ballast via the pull cylinders onto the ground;
- **or** the ballast plates are unloaded to reduce the derrick ballast force and to increase the load on test point 1 (F1).

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8.4 Overload monitoring in operating mode with derrick ballast

Note: All words marked with quotation marks (" ") are explained in chapter 4.02

In operating modes with derrick ballast, the monitoring of "maximum load of current crane condition" consists of 2 parts:
1. Monitoring of maximum load by LML overload safety system.
2. Monitoring of test point 1- operating maximum force by derrick ballast overload safety system.

8.4.1. The LML overload safety system monitors the "maximum load according to the load chart and reeving".

In operating modes with derrick ballast, this is the maximum load of the current crane condition with optimum derrick ballast. It is shown on monitor 0. The current utilization of the crane with optimum derrick ballast results from the load utilization bar (1) on monitor 0.

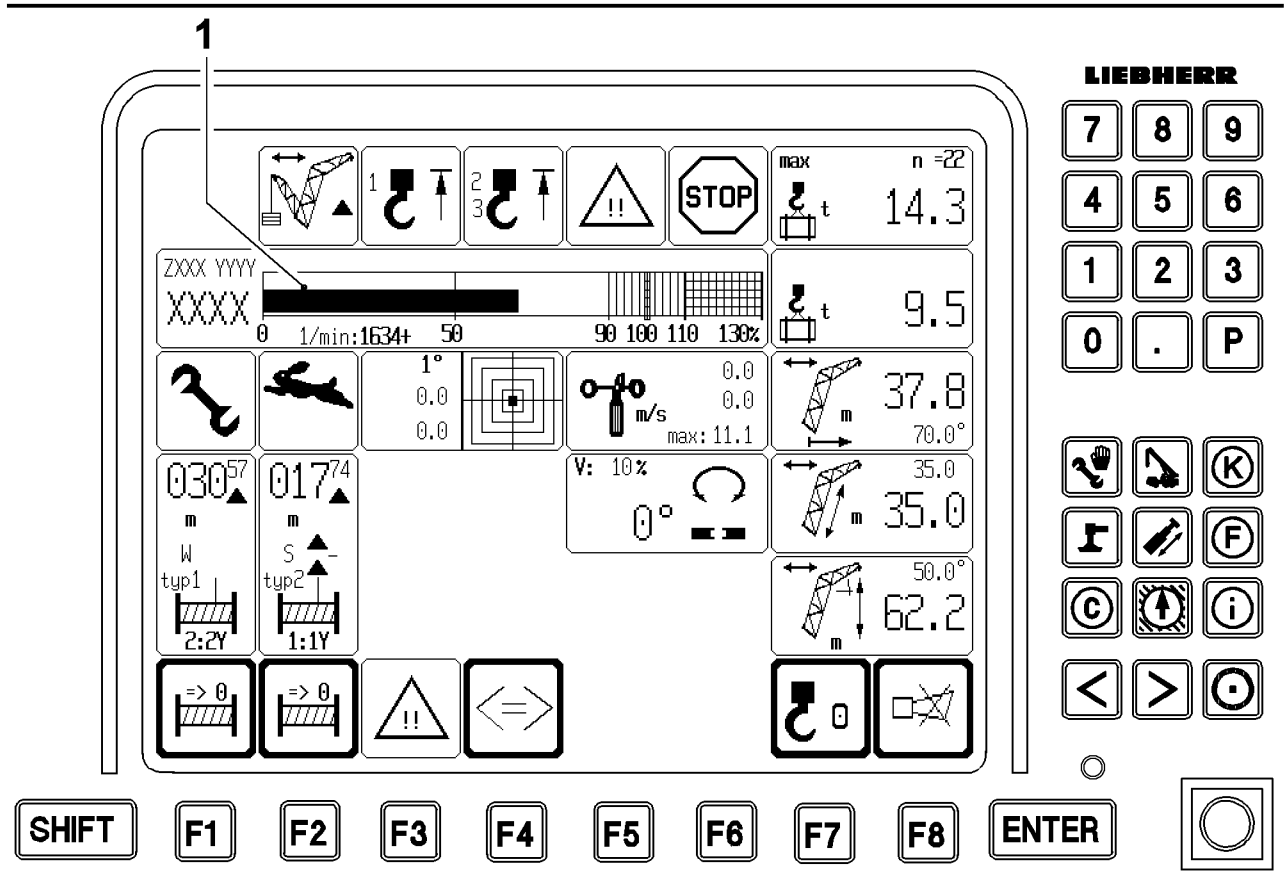
At 90 % on the load utilization bar there is a prewarning with caution symbol and "SHORT HORN" on monitor 0.
At 100%on the load utilization bar there is a shut off of all load moment increasing movements with stop symbol and acoustical warning "HORN" on monitor 0.
The "maximum load of the current crane condition" can no longer be increased.

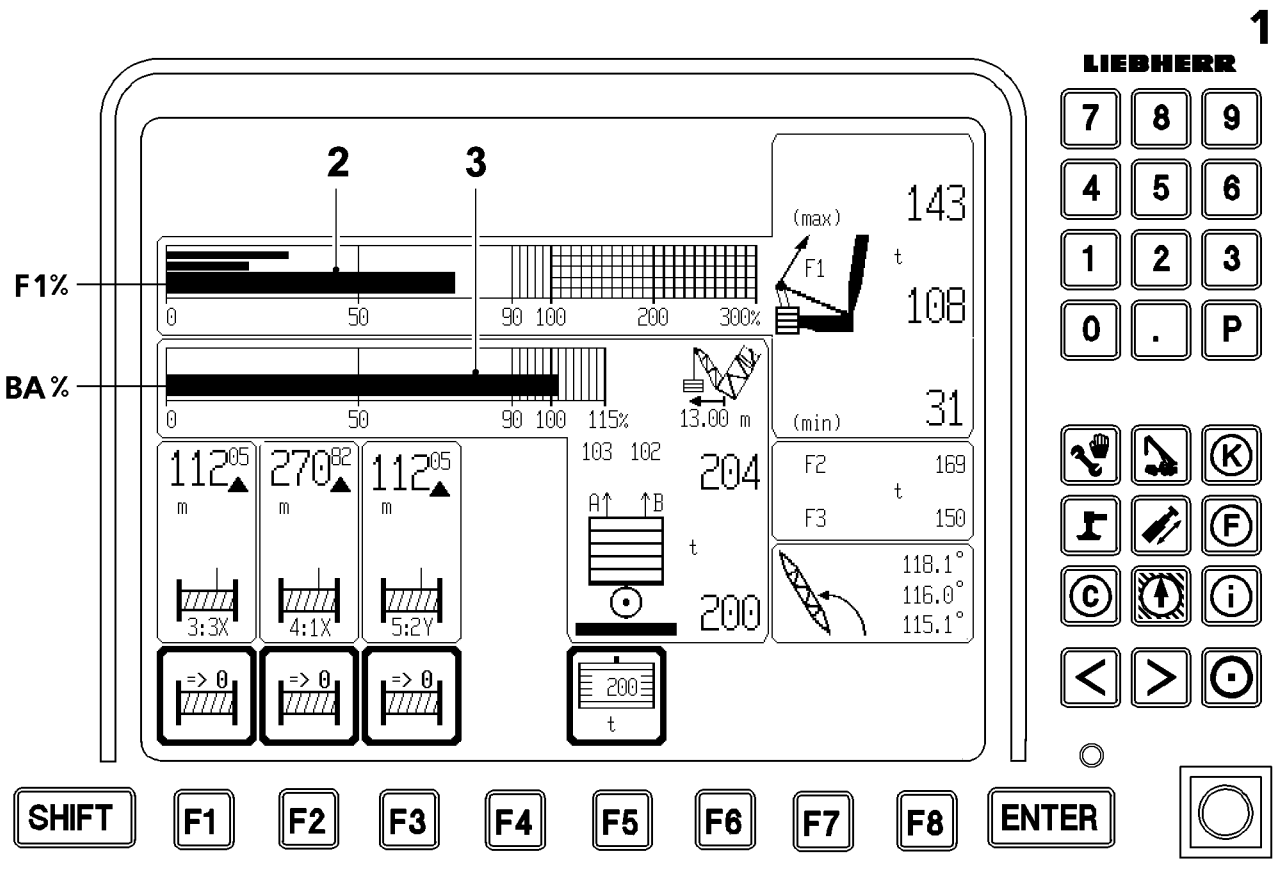
8.4.2 The derrick ballast overload safety system monitors the "Test point 1- operating maximum force (=F1max)".

It is shown on monitor 1.
At 90 % F1max- utilization (utilization bar (2)), a prewarning is issued with caution symbol and "SHORT HORN" on monitor 1.
At 100% F1max- utilization, there is a shut off of all load moment increasing movements with stop symbol and acoustical warning "HORN" on monitor 1.
If the "maximum load according to load chart and reeving" is not yet reached (Utilization bar (1)), then the "maximum load of current crane condition" can still be increased by:

- pulling up the derrick ballast, if the derrick ballast is not yet suspended and the currently pulled ballast is still smaller than the optimum ballast;
- telescoping out the derrick ballast if the placed ballast is still smaller than the optimum ballast;
- increasing the derrick ballast by adding additional ballast plates, if the place ballast is still smaller than the optimum ballast.

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8.4.3 Utilization conditions

The current utilization of the crane results from the load utilization bar (1) on monitor 0 **and** the F1-utilization bar (2) on monitor 1.

The "maximum load of the current **crane condition** " is reached when the load utilization bar (1) reaches 100 % **or** when the F1-utilization bar (2) reaches 100 %.

The "maximum load of the current **crane equipment** " is reached when the load utilization bar (1) reaches 100% **or** when the F1-utilization bar (2) reaches 100% and the derrick ballast is suspended (ballast utilization bar (3) at 100 %, when the ballast input value and the ballast weight is correct).

The "maximum load according to the load chart and reeving" (100%-limit of load utilization bar) and F1max STOP can only be exceeded by 1. and 3.:

1. With button (74), "Luffing in with suspended load", the overload protection can be exceeded, see chapter 4.01, chapter 4.02 and chapter 4.20.
2. Press the set up key (D):
   The LICCON overload protection is deactivated, see chapter 4.01, chapter 4.02 and chapter 4.20.

Note: The test point 1-Assembly-Maximum force (F1max) is described in detail in chapter 4.20.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

The movement "Ballast up" or "Ballast down" requires utmost attention.

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8.7 Check the length sensor value on the ballast trailer

When telescoping the derrick ballast in and out, carefully monitor the derrick ballast radius indicator.
When telescoping the derrick ballast, the indicator must change according to the movement. The crane operator can recognize immediately if the length sensor cable drum would get stuck when spooling up or out.
If the derrick ballast is fully extended or retracted, the derrick ballast indicator must show almost exactly the end position, for example: radius = 11 m or 15 m.
The crane operator may not blindly rely on the derrick ballast radius measurement, but he must think for himself and check if the measurement even still works correctly.

D A N G E R : If the derrick ballast radius is measured incorrectly then a too large maximum load and a too large test point 1 -Operations-max-force can be calculated due to the incorrect radius.
The crane can be overload without recognizing it.
There is an increased danger of accidents!

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8.8 Difference force monitor of ballast guying

In operating modes with derrick ballast, the difference of forces from the derrick ballast guying A and B, monitor 1, is monitored.

D A N G E R : If the difference of these forces is too high, the derrick end section or other crane components will be damaged.
There is a danger of accidents!

The forces in the derrick ballast guying A and B are shown on monitor 1 and compared. If the difference exceeds an impermissible value, an acoustical warning is given and the two force values blink. However, there is **no** shut off of movements.

If the difference of the forces of the derrick ballast guying A and B exceeds the given limit value, then this can have different causes:

- Take on the load,
  by relieving the tires on the ballast trailer or by flexation of the slewing platform ;
- The ground under the derrick ballast is uneven;
- The crane is positioned at a side incline;
- The derrick ballast is loaded onesided;
- By one sided lifting or lowering of the derrick ballast with the pull cylinders;
- The force measurement in the guying is incorrect.

The crane operator must recognize the correct cause and take counter -measures:

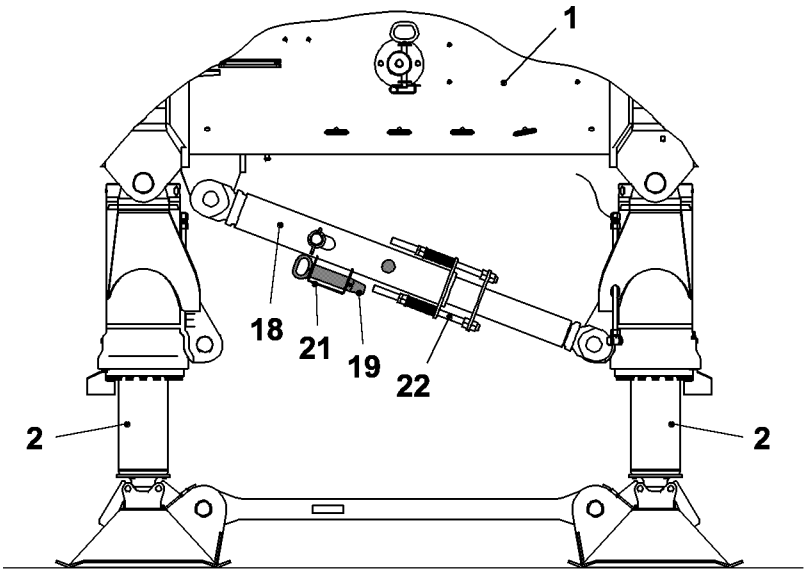
1. The error, which led to the one sided force must be removed.
2. The following measure is permitted only in **small** uneven ground conditions :
   Lock a ballast cylinder and actuate with the other ballast cylinder "lift the ballast " or " lower the ballast " in such a way that the difference between the forces gets smaller. It must be ensured that the derrick ballast is not brought into an impermissible incline position in relation to the crane, otherwise the derrick ballast guide and components will be damaged.

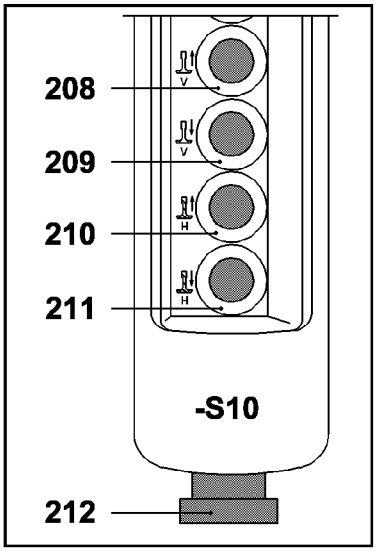
D A N G E R : The derrick ballast cylinder A may be extended by maximal 40 mm more or less than cylinder B!
There is a danger of accidents!

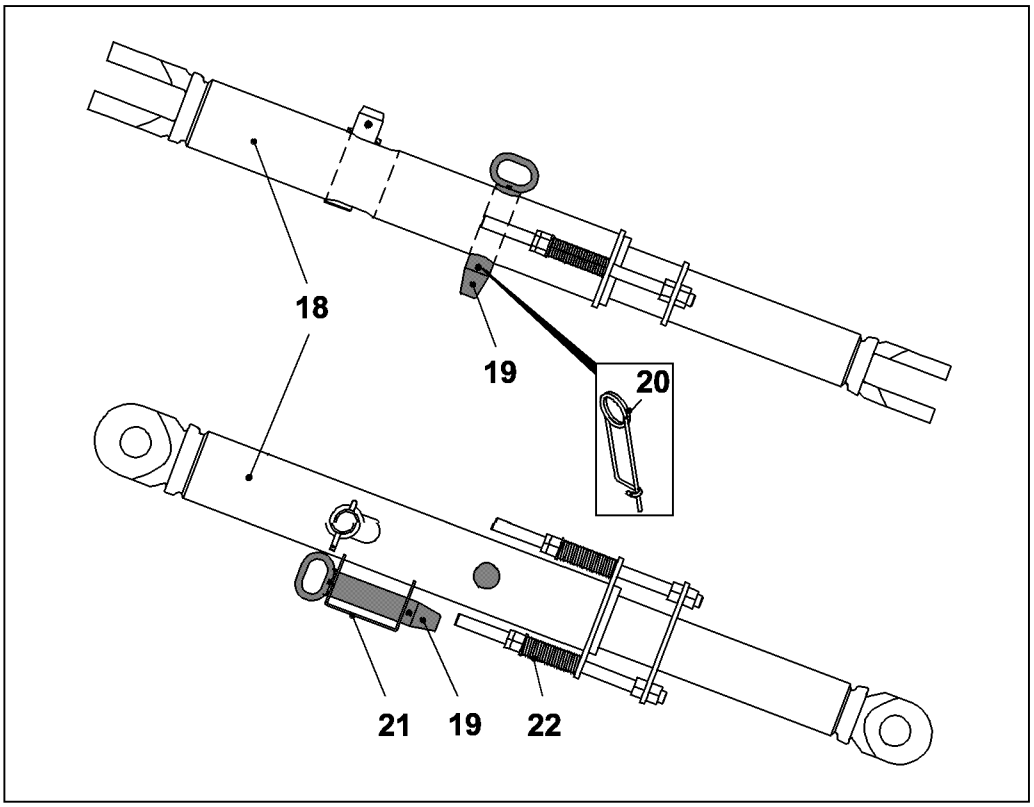
3. If the sensor values don't seem to be plausible:

   Check if the pressure sensor for the ballast weighing or the inputs of the ballast weighing are defective. If necessary, pull the sensor or replace the CPU.

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9. Removal of the ballast trailer

D A N G E R : The ballast trailer may only be removed on level ground of sufficient load carrying capacity and only by authorized persons.

When unpinning the ballast trailers from the slewing platform, make sure that no persons are in the danger zone.

If this is not observed, there is a danger of accidents!

Prerequisite:
- Ballast trailer guide is retracted.
- Ballast plates are removed.

Support the ballast trailer
- The ballast trailer **m u s t** be supported before unpinning on the slewing platform.
- The locking pins (19) **must** be pinned before supporting the ballast trailer on the strut (18) and secured with spring retainer (20).

Extend the support cylinder (3) :
- Press the button (209) to extend the support cylinder on the front
- Press the button (211) to extend the support cylinder on the rear

D A N G E R : Before setting down the ballast trailer, the crane operator or an authorized person must make sure that the conditions for setting the ballast trailer down are fulfilled.

1.) To set down the ballast trailer, the location must be of sufficient load carrying capacity, it must be horizontal and even.

2.) The locking pin (19) m u s t be pinned and secured on the strut (18).

3.) The support cylinders (2) of the ballast trailer support are extended.

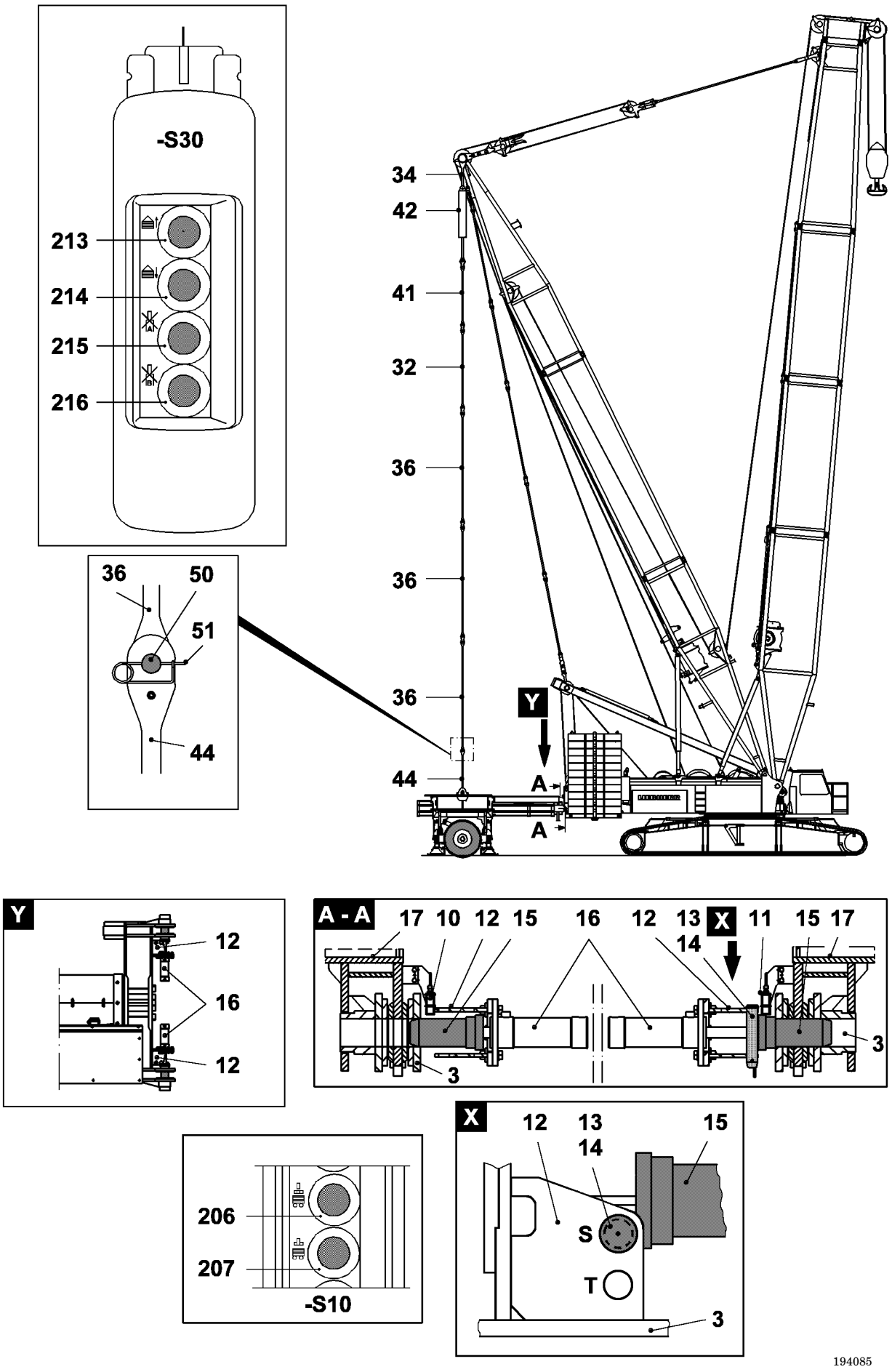
4.) The ballast plates have been removed.

C A U T I O N : The data in chapter 2.15 must be observed!

With extended guide on turning radius R = 15m, a minimum ballast of 2 ballast plates, each 5.0 t, is required to set down.

If this is not observed, there is an increased chance of having an accident due to tipping the ballast trailer over!

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9.1 Remove the derrick and ballast trailer guying

- Extend the pull cylinder (42) a little to relieve the guying.
- The guy rod (44) must be held before unpinning.
- Remove the spring retainer (51) and unpin the pin (50).
- Place the guy rod (44) on the ballast trailer.
- Fully retract the pull cylinder (42).

Actuate the button (213) on the control panel,

- the pull cylinders (42) retract.

9.2 Unpin the ballast trailer guide on the crane

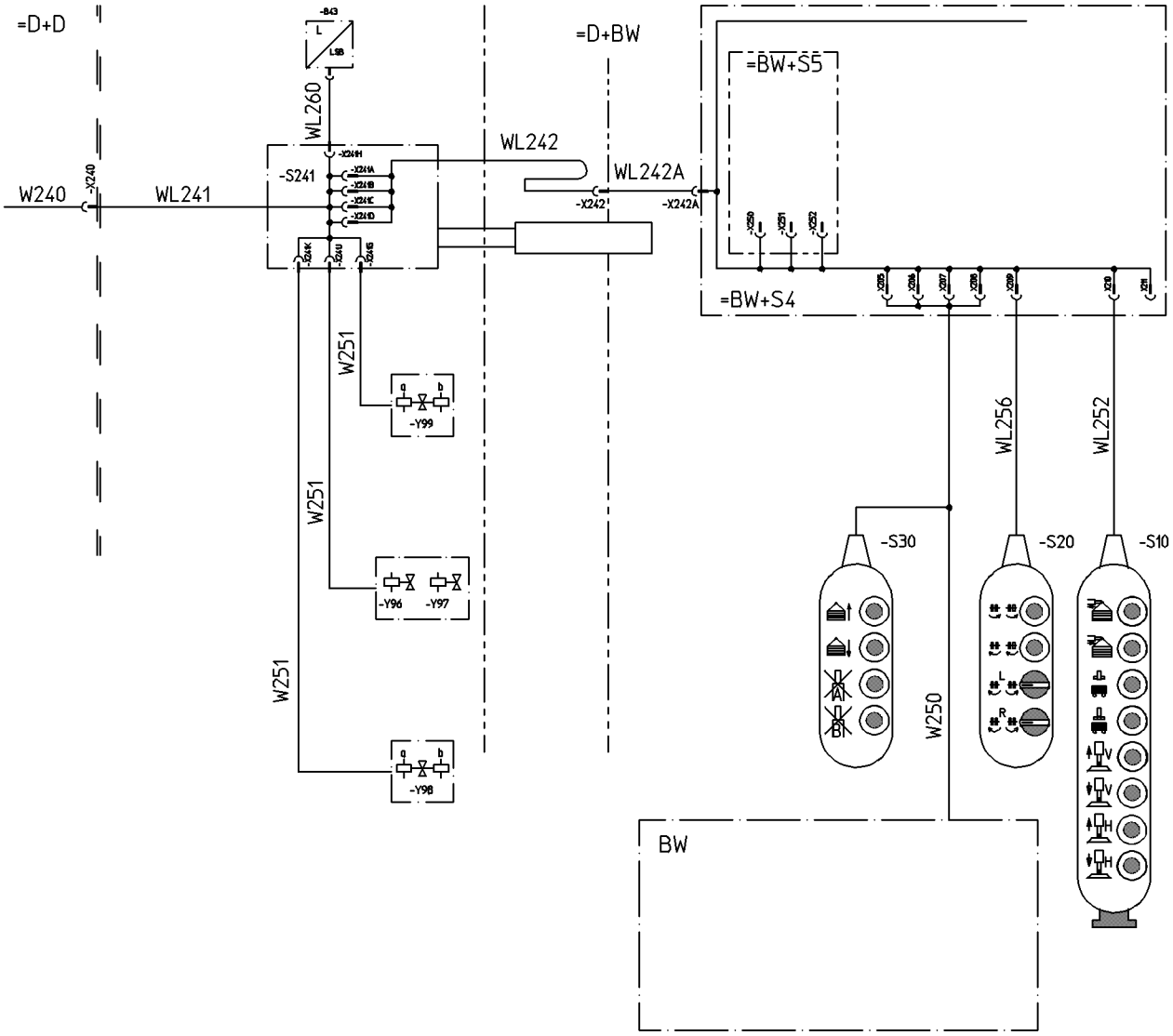
- Remove the spring retainer (14) on the retaining pin (13) (Fig. X // Fig. A-A).
- Pin the retaining pin (13) from bore (S) to the transport receptacle (T) and secure with spring retainer (14).

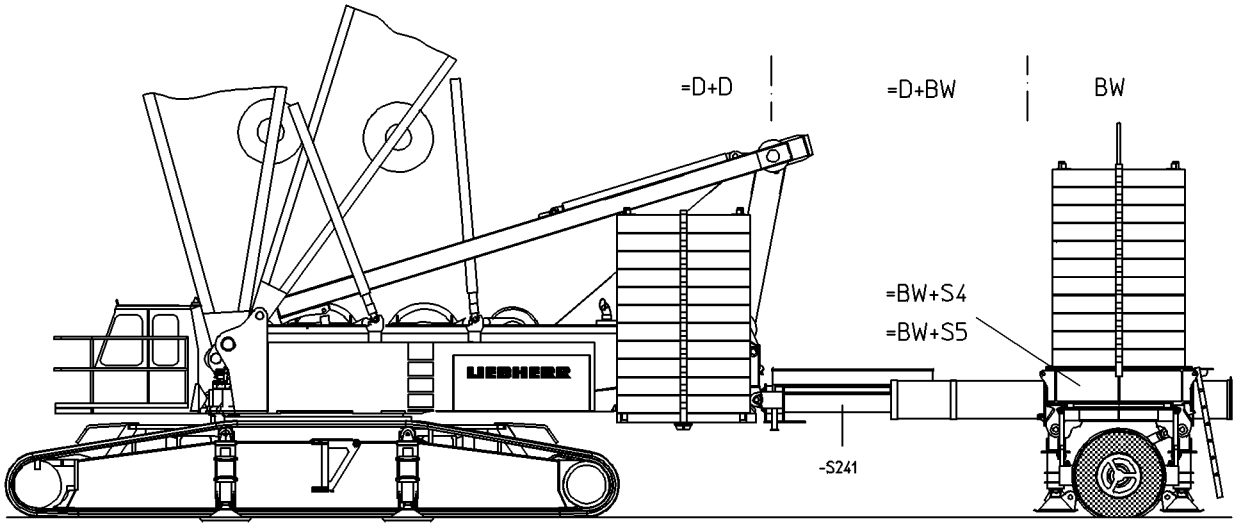
Press the button (206) on the control panel.

- The pins (15) are pinned on both sides with the pin pulling device (16) on the rear of the slewing platform (Fig. Y // Fig. A-A).

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9.3 Loosen the supply lines
- Turn the engine off.

9.3.1 Release the pneumatic and hydraulic connections
- Loosen the coupling connections ;
- Screw the coupling connections with the plug.

D A N G E R : When connecting or releasing the hydraulic lines with quick couplings, it must be ensured that the coupling procedure is carried out properly.

Prerequisite for correct coupling connection is:

- The pressure must be released from the hydraulic system before connecting or releasing the couplings (turn the engine off, wait for approx. 5 minutes).
- Interconnect the coupling sections (sleeve and plug) and connect them with the hand nut.
- Tighten the nut past the O-ring until you can feel a firm stop.
- The couplings may only be tightened by hand - without tools (or couplings will be damaged).

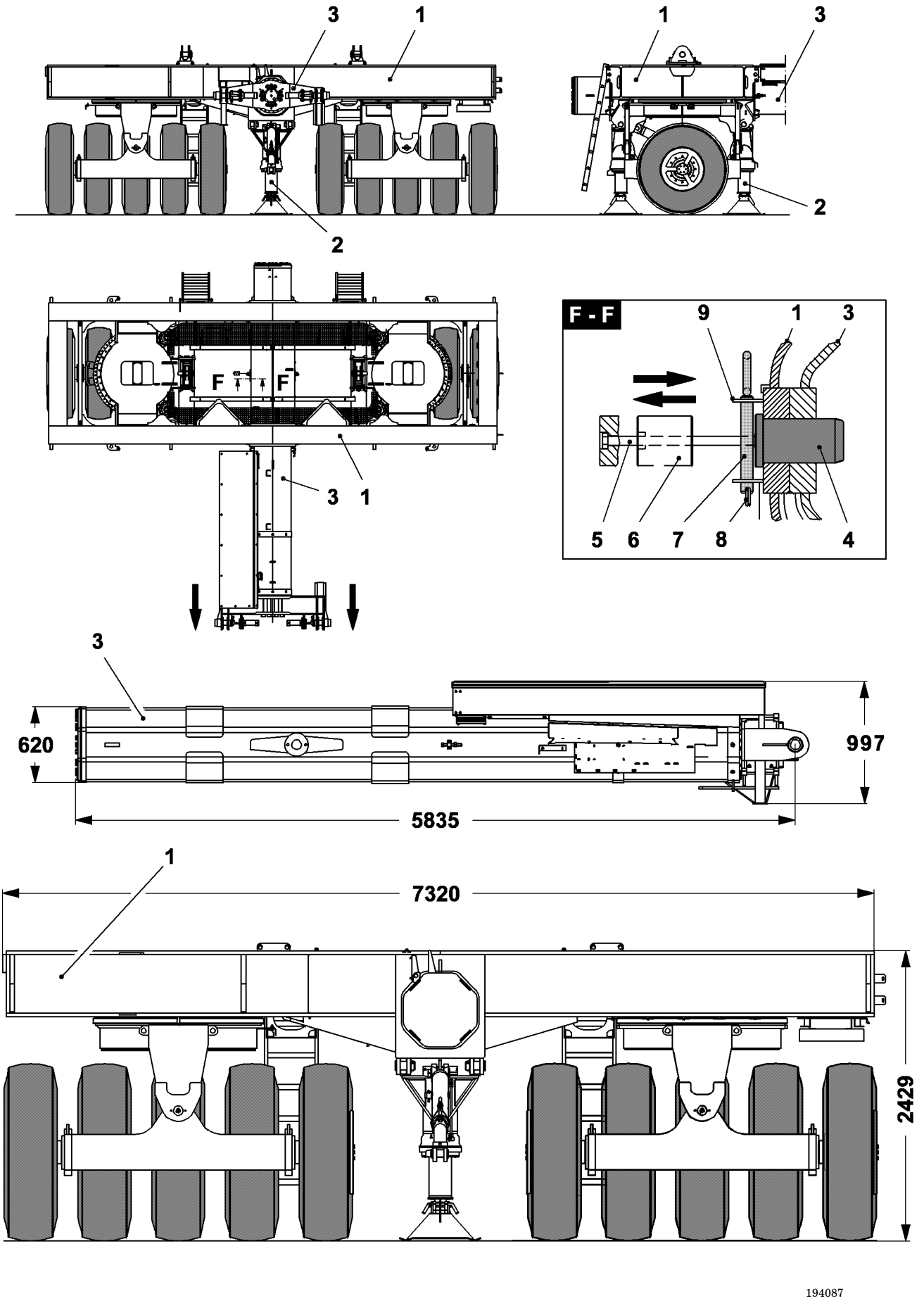
Improperly connected couplings can cause loss of pressure or sudden leakage and therefore can cause accidents!

9.3.2 Release the electrical connection
- Unplug the cable WL 241 from socket -X 240
- Unplug the cable WL 242 from socket -X 242
- Insert the dummy plug in socket -X 240.

D A N G E R : The electrical connections may only be released and the dummy plug inserted if the ballast trailer guide is all the way unpinned on the crane. As soon as one of the two pins is unpinned from the guide frame, the crane control no longer recognizes that the ballast trailer is installed. Now, the crane can be turned and driven even though the ballast trailer is still installed on the crane (ballast trailer is still connected with a pin with the crane).
There is a danger of damaging the ballast trailer or the crane if the crawler is driven off or the crane superstructure is turned.

9.3.3 Drive away the crane
To be able to remove the ballast trailer guide, the crane must be driven off.

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9.4 Unpin the ballast trailer guide (3) on the ballast trailer (1)

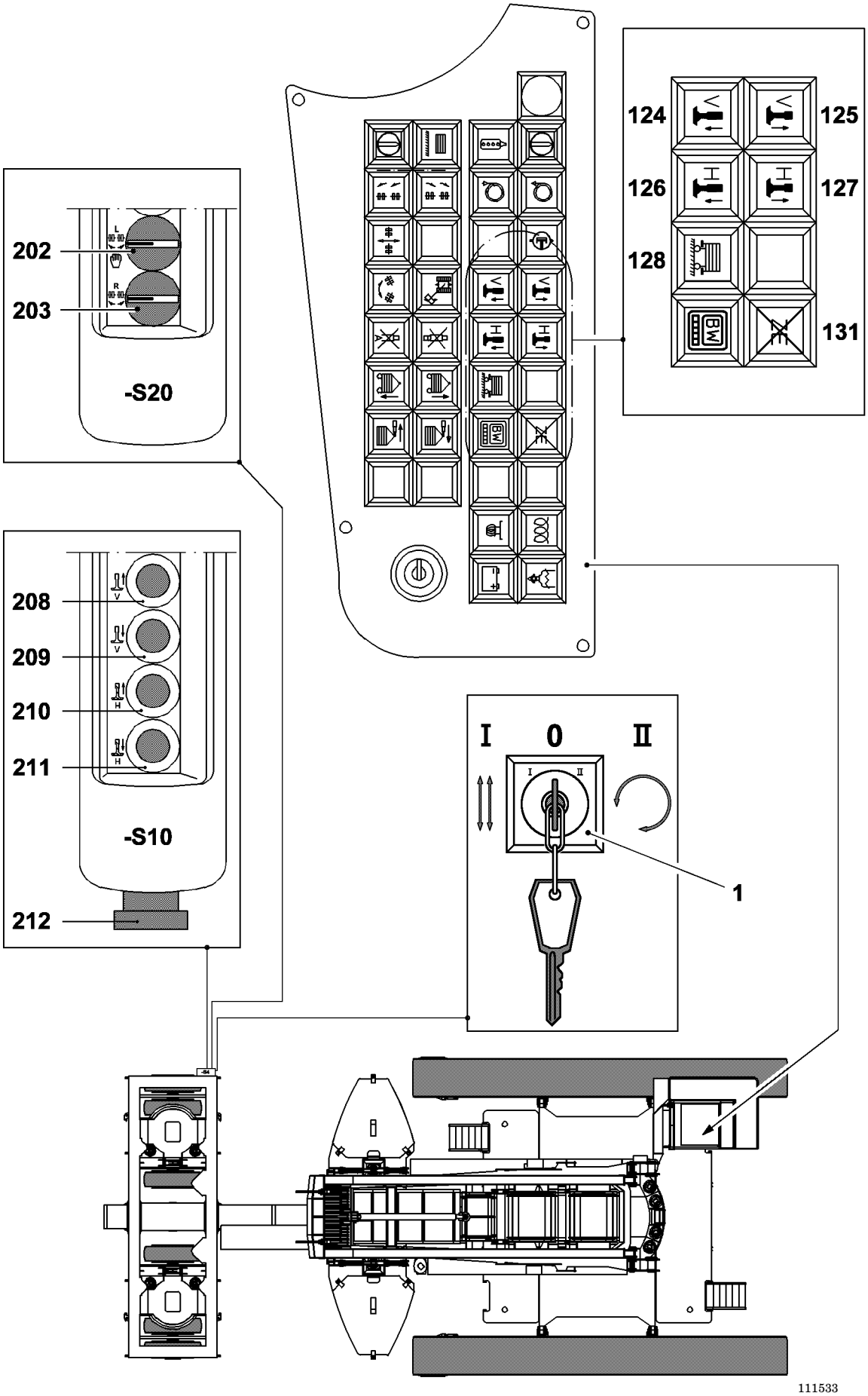
- Hold the ballast trailer guide with the auxiliary crane.
- Remove the spring retainer (8) on the retaining pin (7).
- Unpin the retaining pin (7).
- Unpin the pin (4) with the mechanical pin pulling device, consisting of screw (5) and axle (6) on both sides.
- Extend the ballast trailer guide (3) with the auxiliary crane from the ballast trailer frame.
- Place down the ballast trailer guide onto the transport vehicle.
- Set down and secure the ballast trailer onto the transport vehicle.

D A N G E R : The ballast trailer (1) and the ballast trailer guide (3) must be attached properly for transport. The ballast trailer must be supported.

If this is not observed, there is a danger of tipping over!

The ballast trailer is n o t e q u i p p e d with its own brake system. For that reason, it must be supported when not installed.

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10. Emergency operation

10.1 General

In case of failure or defect of a central processing unit (CPU) on the ballast trailer (warning light 131 lights up), the electronic steering of the ballast trailer can not be actuated.
The signal **towing** and **driving in turns** can no longer be sent from the ballast trailer control to the crane control.
However, the CPU can be bypassed by actuating the keyed switch (1) on the ballast trailer.

Switch positions of keyed switch (1):

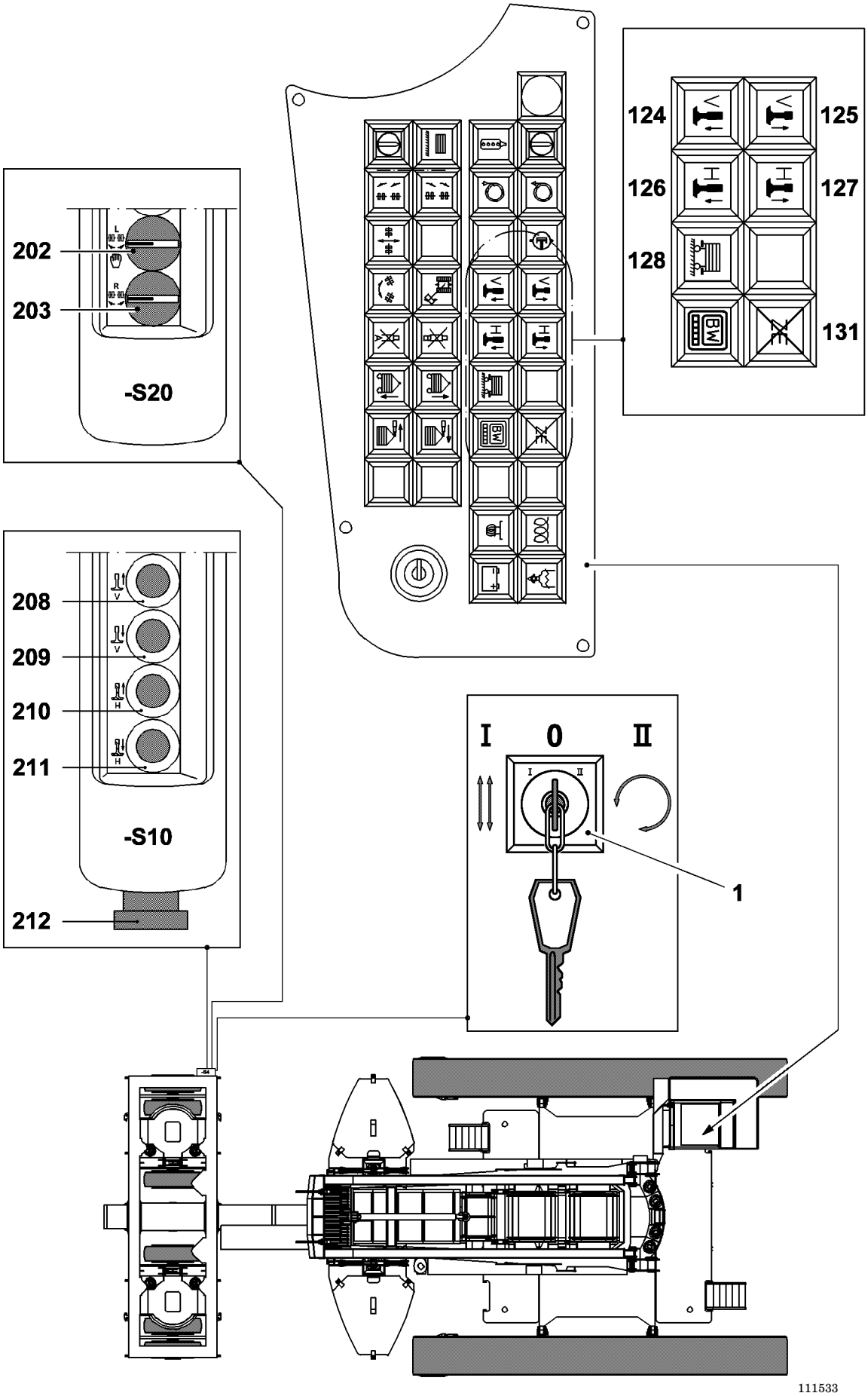
0	(center)	=	No emergency operation
I	(left)	=	Emergency operation towing
II	(right	=	Emergency operation driving in turns

D A N G E R : **The following points must be observed for emergency operation :**

- **The emergency operation may only be carried out by authorized persons.**
- **No other persons may be within the danger zone of the ballast trailer.**
- **Each individual travel movement may only be carried out:**
  - **> with utmost caution and care**
  - **> at the least possible acceleration and**
  - **> with careful braking action.**
- **The keyed switch (1) may only be actuated in case of failure of the electronic!**
- **The signal "Towing" and "Driving in turns" is released to the crane, even though the wheels might be in the wrong position.**
- **The wheel position must be monitored manually. Watch the angle scale on the ballast trailer!**

Note: In crane operation (not emergency operation), the keyed switch (1) must be switched to position 0 (center position).

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10.2 Emergency operation - Towing

Prerequisites
- The crane is at a standstill
- The ballast trailer is properly installed
- With the switch (65) turn on crawler operation (see chapter 4.01). The indicator light in the switch (65) lights up.

10.2.1 Lift the ballast trailer with the support cylinder

- Switch the keyed switch (1) on the ballast trailer to **position I** (left).

Note: **By turning the keyed switch** (1) to **position I**, the command **"towing operation "** is forwarded to the crane and the emergency operation is turned on.

Press the button (209 and 211), the support cylinders on the front and rear extend.
In emergency operation, the support can only be moved from the control panel on the ballast trailer.

10.2.2 Set the axles in towing position

- Switch the keyed switch (1) on the ballast trailer to **position I** (left).

Note: **By turning the keyed switch** (1) to **position I**, the command **"towing operation "** is forwarded to the crane and the emergency operation is turned on.

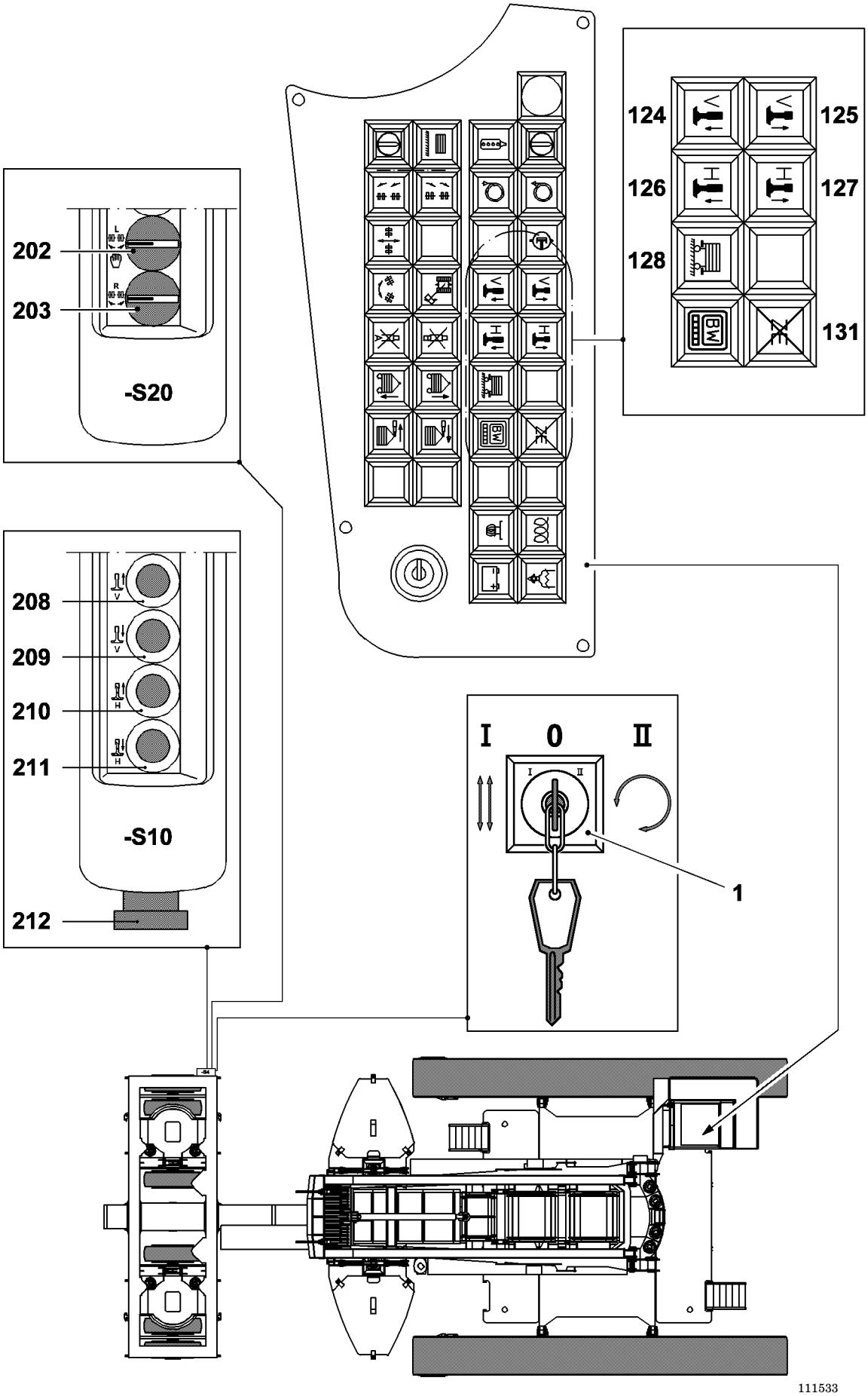
- Actuate the knob (202) to bring the left set of wheels to towing position ;
- Actuate the knob (203) to bring the right set of wheels to towing position.

D A N G E R : **The wheel position of the set of wheels must be constantly monitored during travel. Watch the angle scale on the ballast trailer.**
In case of excessive deformation of the tires, readjust the wheel position.

10.2.3 Lower the ballast trailer with the support cylinders

- Press the button (208 and 210), the front and rear support cylinders retract;
- the indicator light (128), "supports ballast trailer are retracted", lights up.

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10.3 Emergency operation - driving in turns

By telescoping the ballast trailer, various turning radii are possible.

Prerequisites

- The crane is at a standstill
- The ballast trailer is properly installed.

10.3.1 Lift the ballast trailer with support cylinders

- Switch the keyed switch (1) on the ballast trailer to **position II** (right).

Note: **By turning the keyed switch** (1) to **position II**, the command **"driving in turns "** is forwarded to the crane and the emergency operation is turned on.

Press the button (209 and 211), the support cylinders on the front and rear extend.
In emergency operation the supports can only be moved from the control panel on the ballast trailer.

10.3.2 Set the axles to driving in turns position

- Actuate the knob (202) to bring the left set of wheels to driving in turns position until the marks according to the ballast trailer radius align ;

- Actuate the knob (203) to bring the right set of wheels to driving in turns position until the marks according to the ballast trailer radius align.

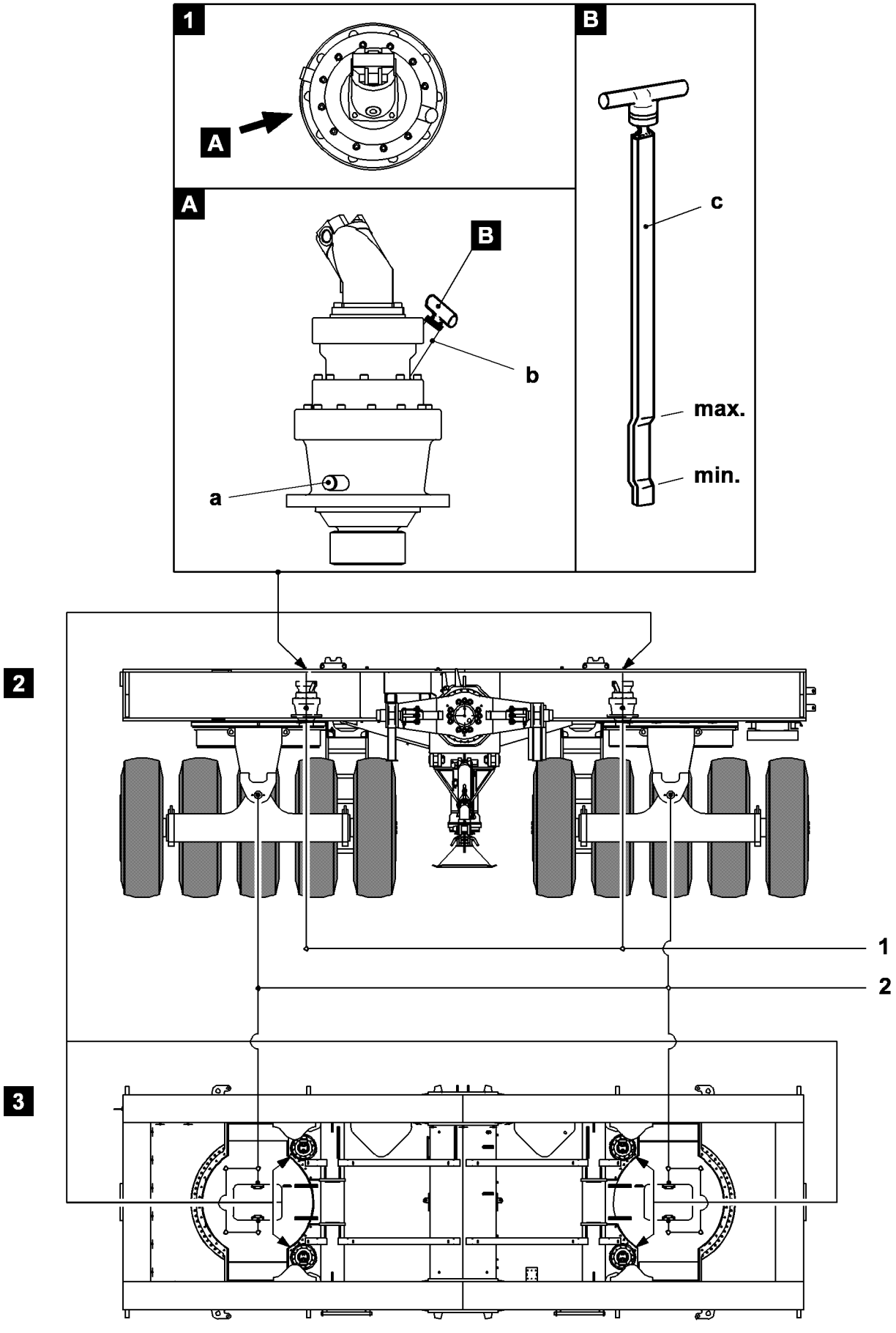
D A N G E R : **The wheel position of the set of wheels must be constantly monitored during travel. Watch the marks on the ballast trailer.**
In case of excessive deformation of the tires, readjust the wheel position.

10.3.3 Lower the ballast trailer with the support cylinders

- Press the button (208 and 210), the front and rear support cylinders retract;
- the indicator light (128), "supports ballast trailer are retracted", lights up.

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11. Maintenance

11.1 Ballast trailer tires

11.1.1. Ballast trailer tires

Note: See chapter 2.15!

11.1.2 Ballast trailer tires and disk wheels

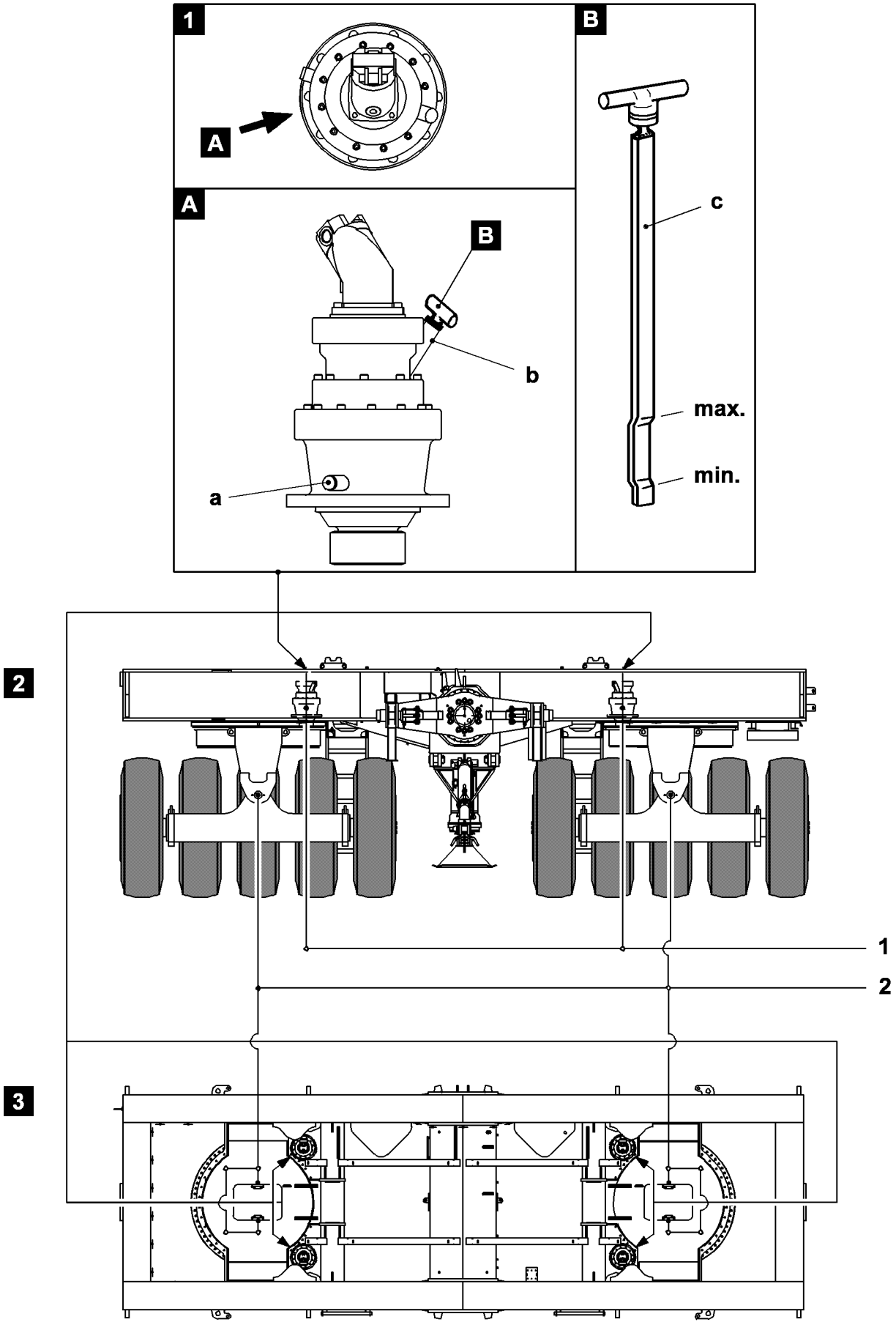
Note: See chapter 8.01!

11.2 Hydraulic hose lines

Note: See chapter 7.05!

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11.3. Slewing gear (Fig. 1 // Fig. A)
Check the oil level on the dipstick (c) (Fig. B).

C A U T I O N : Observe utmost cleanliness to ensure that no dirt and contamination gets into the inside of the gear.

a = Oil drain

b = Oil filler port

c = Dipstick

d = Bleeder valve

11.3.1 Check the oil level

Prerequisites:
- with the crane in horizontal position
- with the slewing gear at a standstill

The oil level on the dipstick (c) must be between the **Min** and **Max** mark.

C A U T I O N : If the oil level has dropped below the MIN mark, then oil must be added according to the lubrication chart, until the oil level is again between the MIN and MAX mark.
If no oil is added, the gear may be severely damaged!

11.3.2 Change the oil

Prerequisites:
- with the crane in horizontal position
- with the slewing gear at a standstill

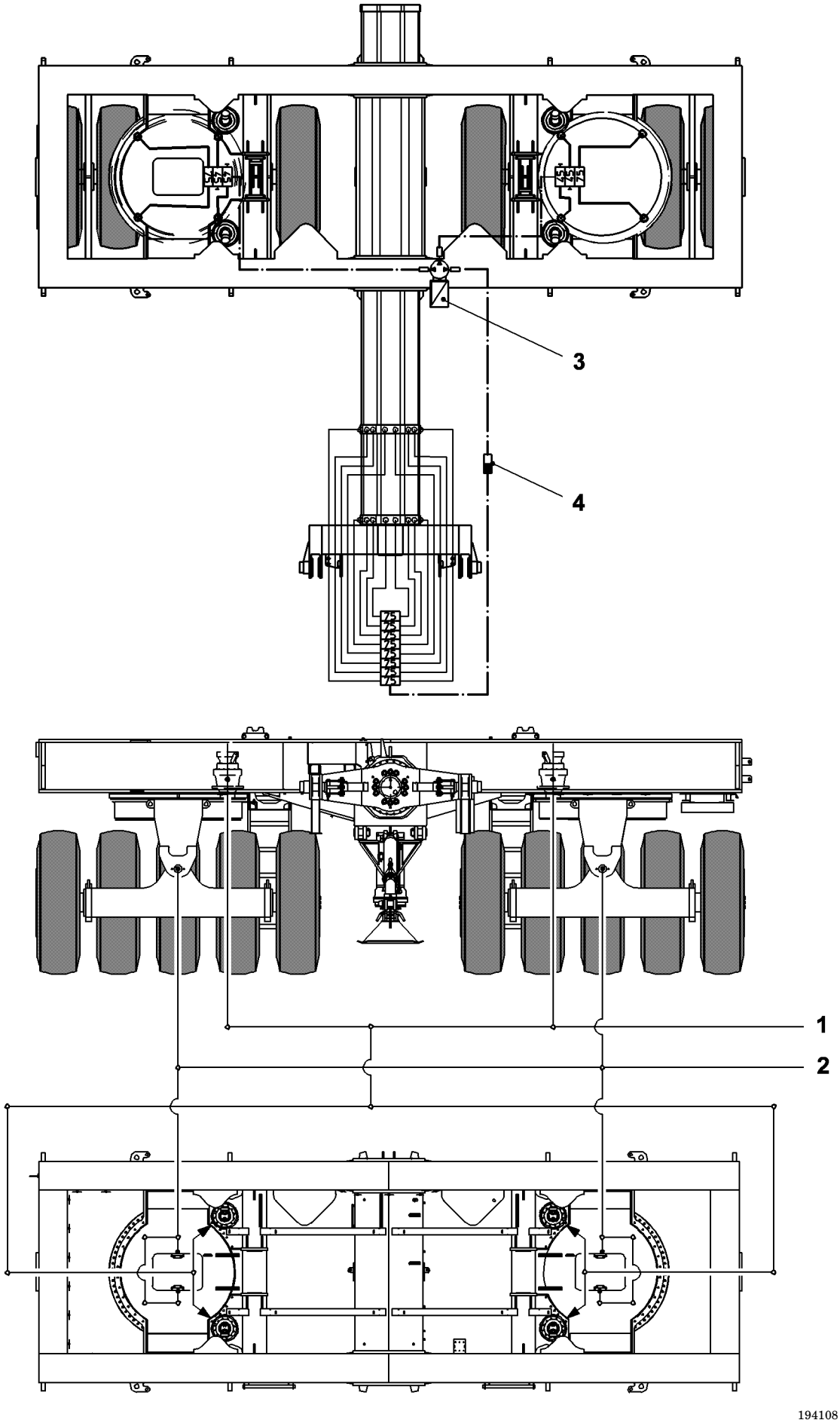
Procedure:
- Pull out the dipstick (c) from the oil filler port (b)
- Remove the oil drain plug (a) with seal ring and drain the oil into a suitable container.
- Clean the oil drain plug (a) and the sealing surface on the housing.
- Reinstall the oil drain plug (a) with new seal ring and tighten.
- Add oil according to the lubrication chart on the oil filler port (b) until the oil level is in the center of the dipstick (Fig. B).
- Insert the dipstick (c) into the oil filler port (b).
- Check the oil level, as described above.
- After checking the oil level, push the dipstick tightly into the test point and close off the oil filler port.

11.4 Central lubrication system

Note: See chapter 7.05!

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11.5 Fill quantities for ballast trailer

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Slewing gear	3.0 l
Central lubrication system	2.0 kg

C A U T I O N : Danger of property damage!
Do not mix synthetic oils with mineral oils!

C A U T I O N : The given values are orientation values.
The marks on the dipstick and the control ports or sight gauges are the valid marks for the fluid levels.

11.6 Lubrication schedule

1 Synthetic gear oil

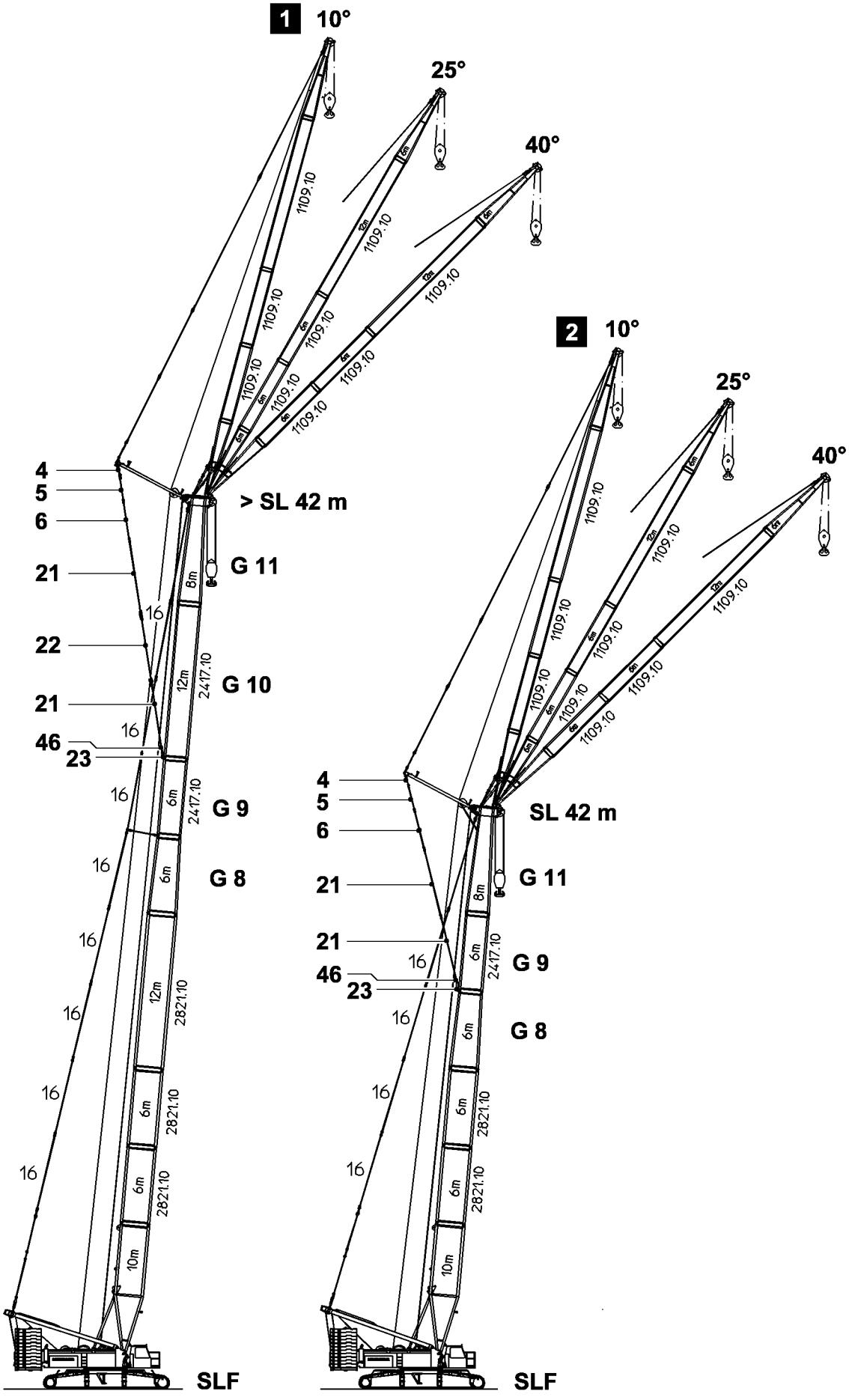
2 Grease

3 lubrication pump

4 coupling box, screw connection

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5.13 AUXILIARY JIB F - FIXED GUYED 028467-00



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1. Assembly of attachments for auxiliary jib F

The guying between the FA - bracket (1) and the SL - boom (fig. 1 // fig. 2) differs depending on SL- boom length, length or assembly of guying. For boom lengths SL 36m and SL 42m, the **"short"** guying is used, for boom lengths above SL 42m, the **"long"** guying is used (fig. 1 - **"long"** guying // fig. 2 - **"short"** guying).

D A N G E R : The data in the load charts must be observed.
If this is not observed, there is a danger of accidents!

1.1 Lattice sections SL - boom

	Description	System	Length (m)	Weight (t)
G 8	SL - reducer section		6,0	1,90
G 9	LI - intermediate section	2417**.10**	6,0	1,60
G 10	LI - intermediate section	2417**.10**	12,0	2,70
G 11	L - end section (200 t)		8,0	3,80

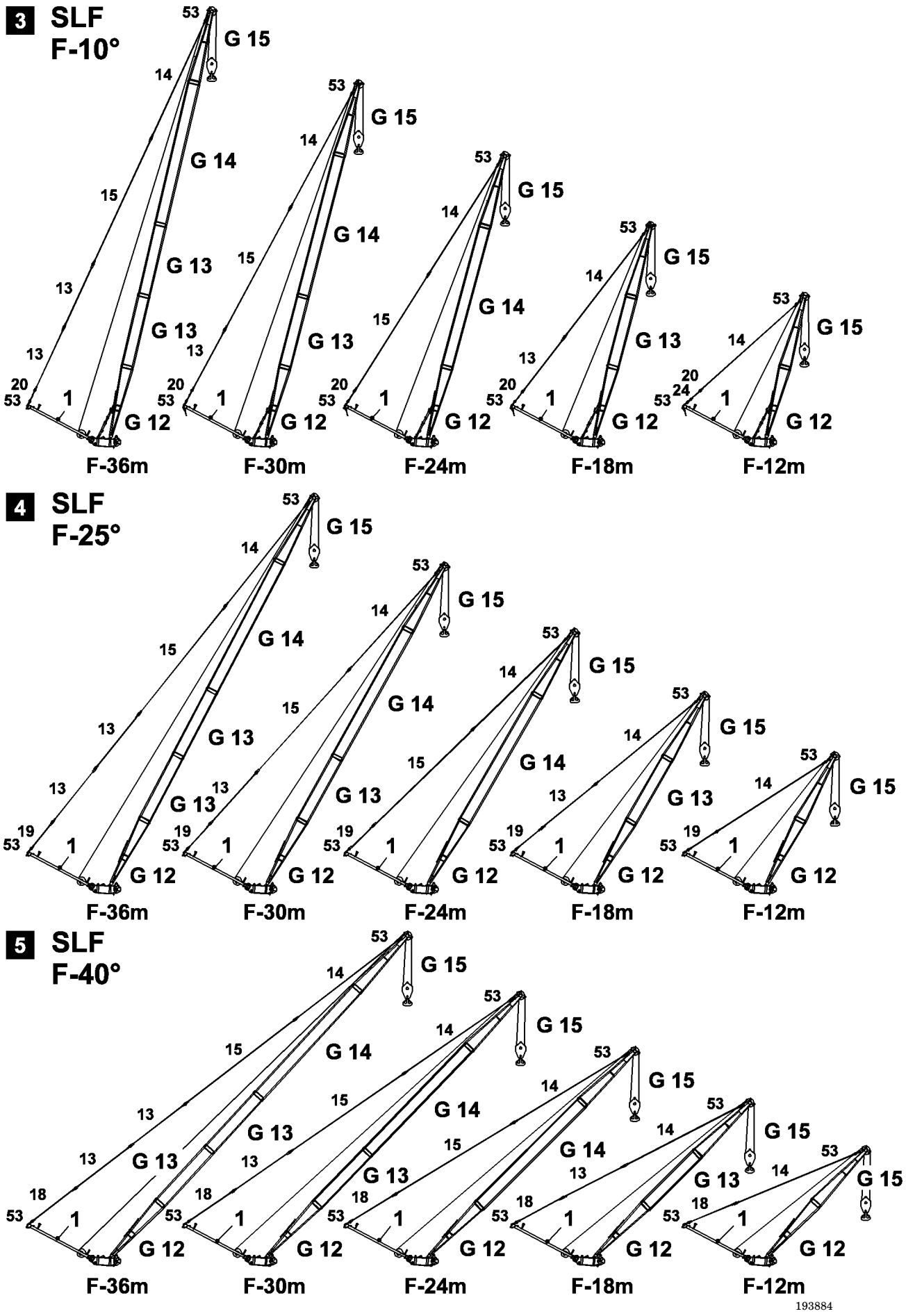
Note: For example: 2417**.10** = **.10** (welded on plate on intermediate section)
For two 6 m long intermediate sections, one 12 m long intermediate section my be installed.

Components for guying between the FA - bracket and the SL - boom

Pos.	Description	Length (m)
4	Swing 1 (installed on FA-bracket)	0,75
5	Swing 2 (installed on FA-bracket)	2,11
6	guy rod (installed on FA - bracket)	2,82
21	Guy rod, complete	5,39
22	Guy rod, complete (only for long guying)	5,77
23	Bracket	0,61
46	Bracket	0,20

D A N G E R : It is not permitted to assemble the lattice sections and the guy rods in any other way than is described in the operating manual or on the installation drawings.
There is the danger that the intermediate sections, which are differently sized but do not differ externally, will be mixed up!
Externally, they only differ by the welded on plates (.8, .10, .20)
During installation of the boom is must be ensured that the intermediate sections are installed according to their description (see chapter 5.03)
If this is not observed, there is a danger of accidents!

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1.2 Lattice sections auxiliary jib F

	Description	System	Length (m)	Weight (t)
G 12	F - pivot section		6,0	0,70
G 13	F - intermediate section	1109**.10**	6,0	0,70
G 14	F - intermediate section	1109**.10**	12,0	1,30
G 15	F - end section (60 t)		6,0	1,00

Note: For example: 1109**.10** = **.10** (welded on plate on intermediate section)
For two 6 m long intermediate sections, one 12 m long intermediate section my be installed.

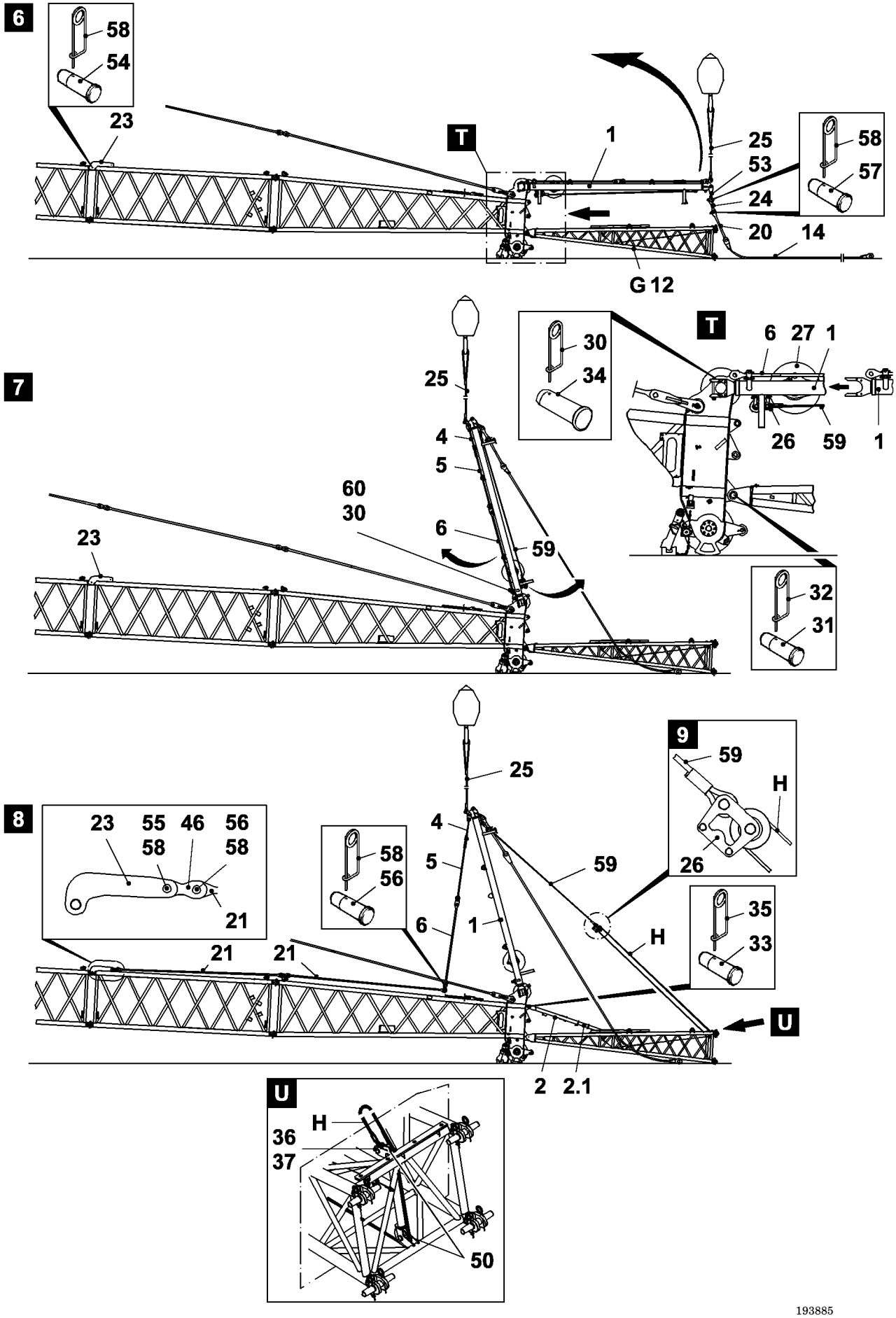
Components for guying between FA - bracket (1) and F - end section (G 15)

Pos.	Description		Length (m)
13	Guy rope		5,70
14	Guy rope		10,64
15	Guy rope		11,40
18	Guy rope	(only in 40° - position)	4,30
19	Guy rope	(only in 25° - position)	2,80
20	Bracket		1,00
24	Bracket	(only for F - 12m, at 10°)	0,40
53	Bracket (installed on FA-bracket)		0,43

The auxiliary jib F, can be operated in jib angles of 10°, 25° and 40°, with various jib lengths from 12 to 36 m (fig. 3 // fig. 4 // fig.5).

D A N G E R : It is not permitted to assemble the lattice sections and the guy rods in any other way than is described in the operating manual or on the installation drawings.
There is the danger that the intermediate sections, which are differently sized but do not differ externally, will be mixed up!
Externally, they only differ by the welded on plates (.8, .10, .20)
During installation of the boom is must be ensured that the intermediate sections are installed according to their description (see chapter 5.03)
If this is not observed, there is a danger of accidents!

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2. Installation

Description of auxiliary jib F (60 t)

The auxiliary jib F is fixed guyed via the FA - bracket (1), which is installed on the L - end section (G 11), to the SL - boom and to the F - end section (G 15).

The auxiliary jib F is **not** adjustable during crane operation.

The auxiliary jib F can be installed at an angle of **10°** (fig. 3), **25°** (fig. 4), and **40°** (fig. 5) to the SL - boom. Auxiliary jib lengths of 12m to 36m are possible.

On the auxiliary jib F, a differentiation is made between two guyings. Depending on the SL - boom length, the length of the guying between the FA - bracket and the SL - boom changes (fig. 1 // fig. 2).

2.1 Component overview

Pos.	Description	Length (m)
1	FA - bracket	
2	F - support (installed on F-pivot section)	
2.1	Plunger	
3	FAB - support (installed on FA-bracket)	
3.1	Adjustment nut	
25	Cable ∅ 16 (installed on FA-bracket)	6,000
26	Cable pulley retainer	
27	Cable pulley	
30	Spring retainer∅ 4	
31	Pin ∅ 75 x 185 mm	
32	Spring retainer∅ 8	
33	Pin ∅ 55 x 140 mm	
34	Pin ∅ 45 x 290 mm	
35	Spring retainer ∅ 4,5	
36	Pin ∅ 40 x 75 mm	
37	Hinge pin 8 x 60 DIN 11023	
38	Pin ∅ 45 x 135 mm	
39	Spring retainer∅ 5 mm	
40	Pin ∅ 40 x 165 mm	
41	Flap (in the F - pivot section)	
42	Pin ∅ 45 x 135 mm	
43	Pin ∅ 55 x 334 mm	
44	Pin ∅ 65 x 120 mm	
45	Hinge pin	
47	Rod	
48	Spring retainer∅ 3 mm	

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5.13 AUXILIARY JIB F - FIXED GUYED 028467-00

Component overview

Pos.	Description	Length (m)
50	Cable pulley	
51	Pin ∅ 20 x 170 mm DIN 1444	
52	Line drum	
54	Pin ∅ 70 x 380 mm	
55	Pin ∅ 55 x 170 mm	
56	Pin ∅ 55 x 125 mm	
57	Pin ∅ 70 x 170 mm	
58	Spring retainer∅ 6	
59	Cable ∅ 16 (installed on FA-bracket)	4,940
60	Pin 20 x 80 x 72 DIN 1444	

2.2 Installation of auxiliary jib F

D AN G E R : A safe installation scaffolding / working platform must be used for installation and removal work. There is a danger of accidents due to falling!

Prerequisites:
- The crane is horizontally aligned.
- The SL - boom is installed.
- The guy bracket (23) is installed on the SL boom, pinned with pin (54) and secured with spring retainer (58) (fig. 6).
- The LICCON overload protection has been set according to the data in the load chart.
- The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
- The configuration status has been entered into the LICCON computer system.
- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.
- The SL - boom is luffed down to the rear or to the side.
- An auxiliary crane as well as an installation scaffolding / working platform is available.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

2.2.1 Installation of F - pivot section

- Pin and secure the F - pivot section (G 12) on the L - end section (G 11). Use pin (31) and spring retainer (32) (fig. 6 // fig. T). Place the F - pivot section on the ground.

D A N G E R : It is strictly prohibited for anyone to remain under the F - pivot section during installation.
There is a danger of accidents!

Note: The F - support (2) is in transport position on the F - pivot section, secured with pin (33).

- Unpin the pin (33) on the transport retainers for the F - support (fig. 6).
- Lift the F - support (2) and pin on the L - end section (G 11).
- Use pin (33) and spring retainer (35) (fig. 6).

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2.2.2 Installation FA - bracket

Description:
Lift the FA - bracket (1) complete (with swing 1 and 2 (4 / 5), guy rod (6) and bracket (53)], with the auxiliary crane and install on the L - end section (G 11).

Procedure:
- Enter the fork head of the FA - bracket (1) on the stud of the L - end sections (G 11) (fig. T).
- Pin the pin (34) on the pin hole of the fork head and secure with spring retainer (30) (fig. T).
- Hang the FA - bracket on the cable (25) with the auxiliary crane. To do so, remove the transport retainer (shackle) for the cables (25) on the FA - bracket and hang cable (25) with the sling on the auxiliary crane (fig. 6).
- Pin and secure the added bracket (24) to bracket (53). Use pin (57) and spring retainer (58) (fig. 6).

Note: The added bracket (24 // 0,4 m) may **only** be installed to a jib length of F - 12 m and a F - jib angle of 10°.

- Pin and secure bracket (20 // 1,0 m) on added bracket (24). Use pin (57) and spring retainer(58) (fig. 6).
- Pin and secure the guy rope (14) with pin (44) and hinge pin (45) on bracket (20). Place the end of the cable onto the ground (fig. 6).
- Erect the FA - bracket (1) with the auxiliary crane and pull past the vertical to the rear. (fig. 6 // fig. 7).

2.2.3 Installation of SL / FA - bracket - guying

- On the FA - bracket (1), remove the spring retainer (30) and remove the transport retaining pins (60).
- The guy unit swings outward! **D A N G E R !**

D A N G E R : When unpinning the transport retaining pin (46) it must be ensured that there are no persons within the swing range of the guy unit.
If this is not observed, there is a danger of accidents!

- Remove the transport retainer for the guy rods on the L - lattice sections.

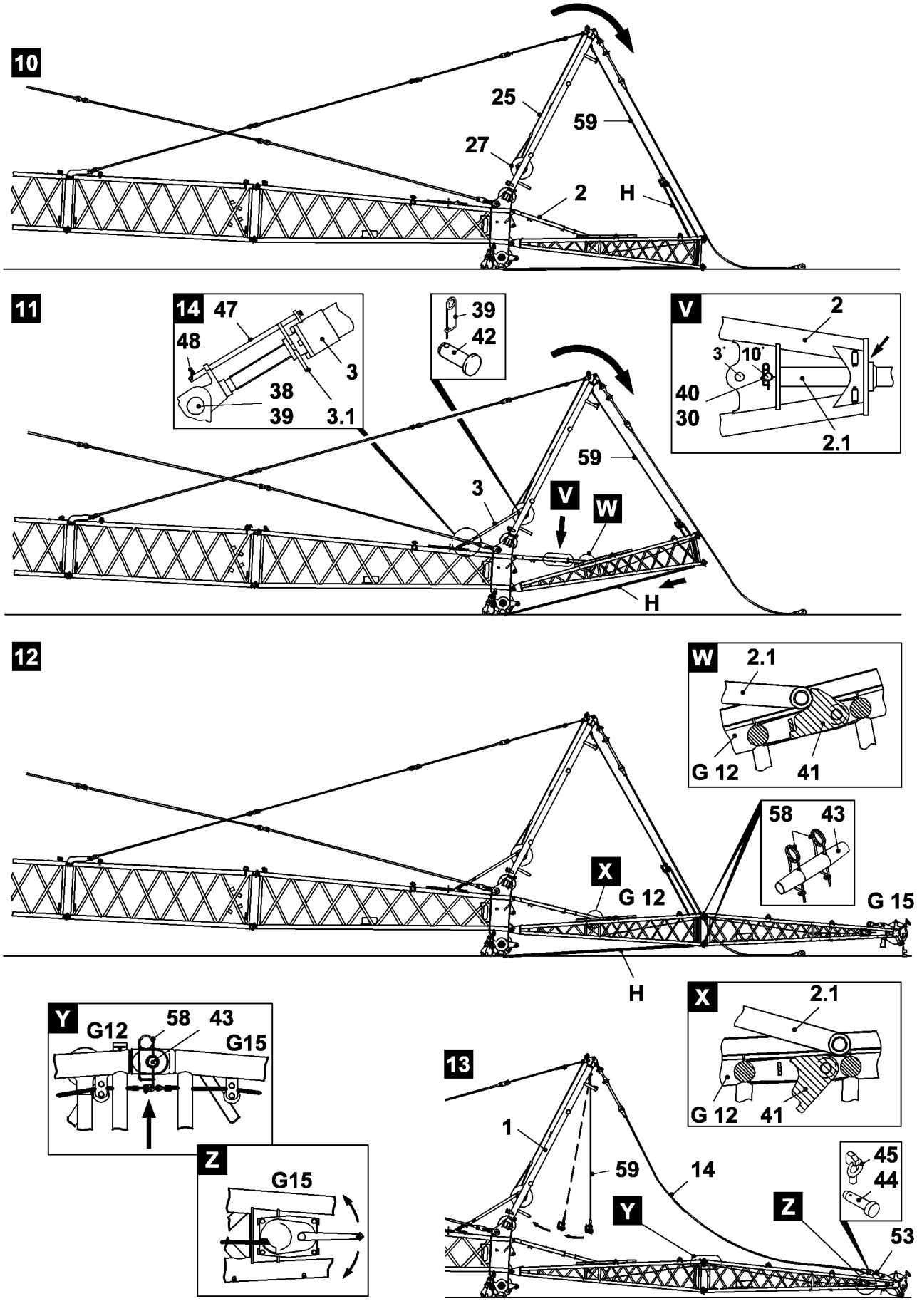
Note: The guy rods for the SL / FA - bracket - guying are attached in the transport retainers of the L - lattice sections.

- Pin and secure the guy rods (21) with bracket (46), with guy bracket (23) and guy rod (6). Use pin (55 / 56) and spring retainer (58) (fig. 8).
- Pull the FA - bracket with the auxiliary crane past the vertical to the front.
- Unpin the cable pulley retainer (26) (fig. 9) on the transport retainer of the FA - bracket.
- Spool out the auxiliary winch and pull the auxiliary winch cable (H) to the F - pivot section.
- Guide the auxiliary winch cable (H) over the cable pulleys (50) on the F - pivot section (fig. U) and the cable pulley on the cable pulley retainer (26) (fig. 9).
- Pin the auxiliary winch cable (H) on the F - pivot section by using pin (36) and secure with hinge pin (37) (fig. U).
- Slowly spool up the auxiliary winch until the auxiliary winch cable (H) and cable (59) are tensioned (fig. 8).
- Remove the auxiliary crane and attach the cable (25) on the transport retainer (shackle) next to the cable pulley (27) on the FA - bracket.

D A N G E R : Before removing the auxiliary crane, the crane operator must make sure that:
- **the guy rods between the SL - boom and the FA - bracket are properly pinned and secured.**
- **the cable (59) is tensioned and does not hang through.**

If this is not observed, there is a danger of accidents!

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2.2.4 Tensioning the SL / FA - bracket - guying

- Release the pinning between the plunger (2.1) and the F - support (2). Remove the spring retainer (30) and unpin the pin (40) (fig. V).
- With the auxiliary winch, pull the FA - bracket forward until the SL / FA - bracket - guying is tensioned (fig. 10) and the plunger (2.1) presses against the flap (41) (fig. W) in the F - pivot section (fig. 11).

Note: The F - pivot section is lifted off the ground when the guying is tensioned by spooling up the auxiliary winch (fig. 11).

D A N G E R : No one may remain within the danger zone.
If this is not observed, there is a danger of accidents!

C A U T I O N : Tension the SL / FA - bracket - guying until :
- the plunger (2.1) presses on the flap (41) in the F - pivot section (G 12)
- the auxiliary winch is at a standstill.

2.2.5 Installation FAB - support

The FAB - supports (3) are pinned and secured in transport position on the FA - bracket (1).

Description:
During crane operation, the FAB - supports keep the SL / FA - bracket - guying tensioned and at the same time serve as relapse supports for the FA - bracket. The length of the FAB - supports can be adjusted with the adjustment nut (3.1) (fig. 14).

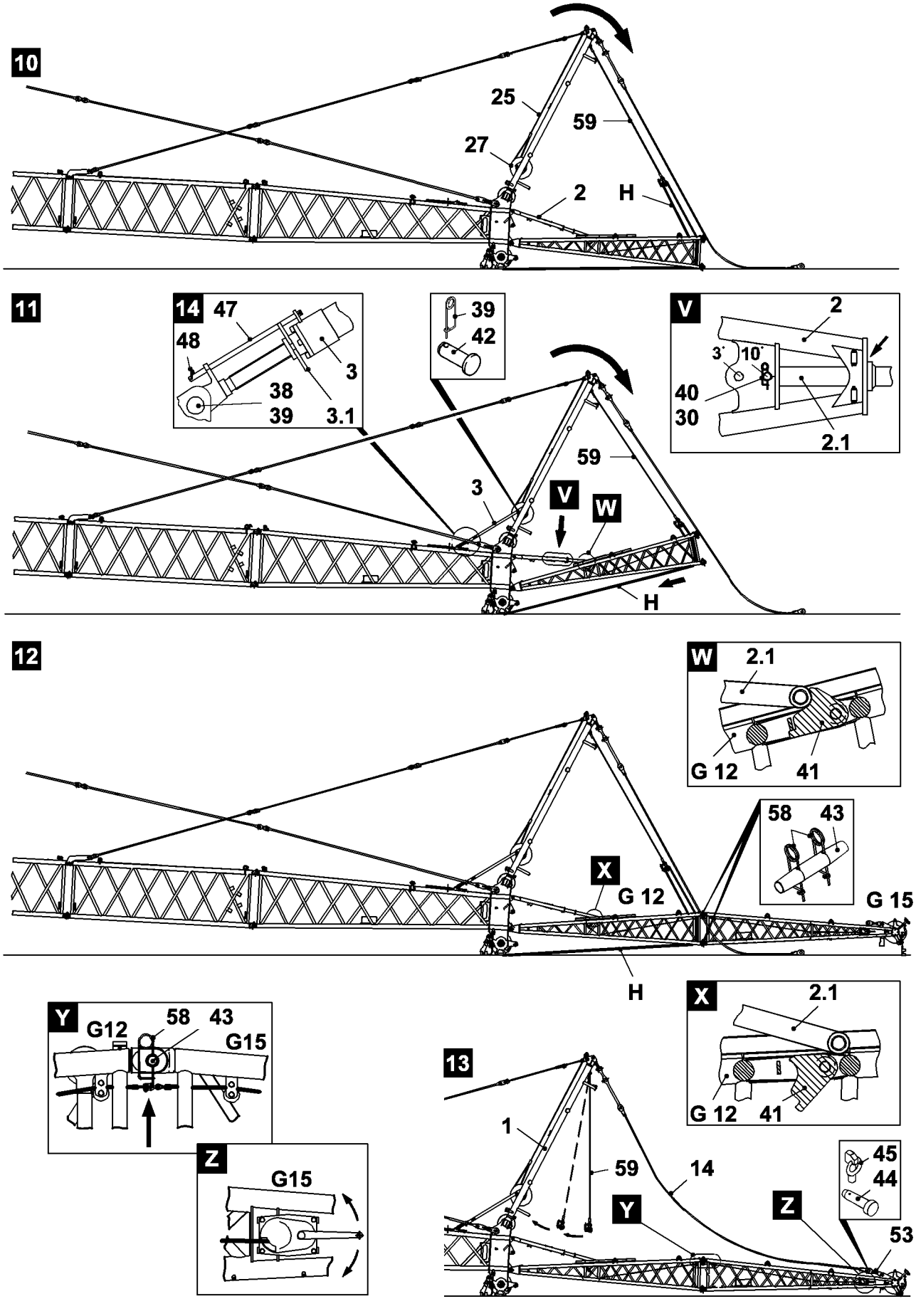
Installation
- Unpin the transport retaining pin (51) for the FAB - supports on the FA - bracket.
- Fold down the FAB - supports, pin and secure on the L - end section (G 11). Use pin (38) and spring retainer (39) (fig. 11 // fig. 14).

Note: The SL / FA - bracket - guying must be tensioned with the auxiliary winch, before the FAB - support is adjusted with the adjustment nut (3.1).

- Tighten the adjustment nut (3.1) as much as possible and secure with rod (47) and spring retainer (48) to prevent it from loosening up (fig. 14).

D A N G E R : It must be ensured that the adjustment nut (3.1) is tightened correctly and secured to prevent it from loosening up.
If this is not observed, there is a danger of accidents!

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2.2.6 Installation of F - intermediate sections / F - end section

- Spool the auxiliary winch out again and lower the F - pivot section to the support (fig. 12).
- Release and unpin the pin (36) (fig. U).
- Unreeve the auxiliary winch cable (H) on the cable pulley retainer (26) (fig. 9).
- Pin the cable (59) with the cable pulley retainer (26) on the FA - bracket - transport position (parking position) (fig. 13).

Depending on the required jib length, now 6 m or 12 m F - intermediate sections (G 13 // G 14) plus F - end section (G 15) or only the F - end section (G 15) are installed on the F - pivot section (G 12). For assembly of auxiliary jib F, see fig. 3.

Installation example:
Auxiliary jib F with 12 m length and jib angle of10°

- Hang the F - end section (G 15) onto the auxiliary crane and pin and secure on the F - pivot section (G 12). Use pin (43) and spring retainer (58) (fig. 12).

Note: For two 6 m long intermediate sections, one 12 m long intermediate section can be installed.

D A N G E R : It is not permitted to assemble the lattice sections, the guy rods and the guy ropes in any other way than is described in this chapter or on the installation drawings!

- Connect the cable from the F - pivot section (G 12) and F - end section (G 15) to adjust the flap (41) (fig. 13 // fig. Y // arrow). The connection of the cables is made with shackles.
- With the manual winch in the F - end section (fig. Z), release the flap (41) in the F - pivot section (fig. W).
- Pin the plunger (2.1) on the F - support (2). Pin the pin (40) into pin hole (10°) and then secure pin (40) with spring retainer (30) (fig. V).

C A U T I O N : The pin (40) must be pinned for all F - jib angles (10° / 25° / 40°), since the F - support (2) also serves as relapse support for the auxiliary jib - F.

- Pin the guy rope (14) on bracket (53) on the F - end section (G 15). Use pin (44) and hinge pin (45) (fig. 13).

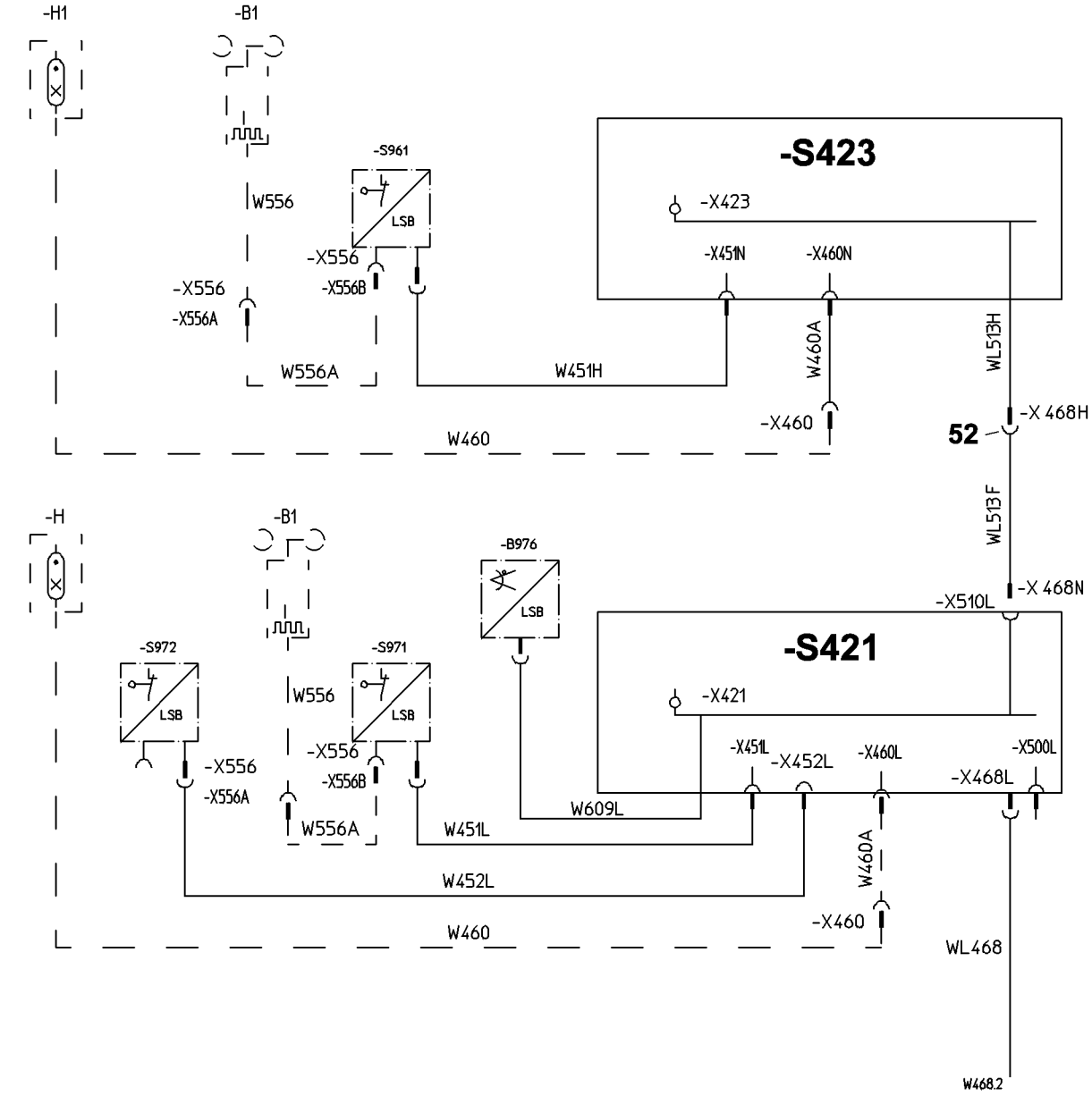
D A N G E R : Before erecting the SLF-boom combination, the crane operator must make sure that :

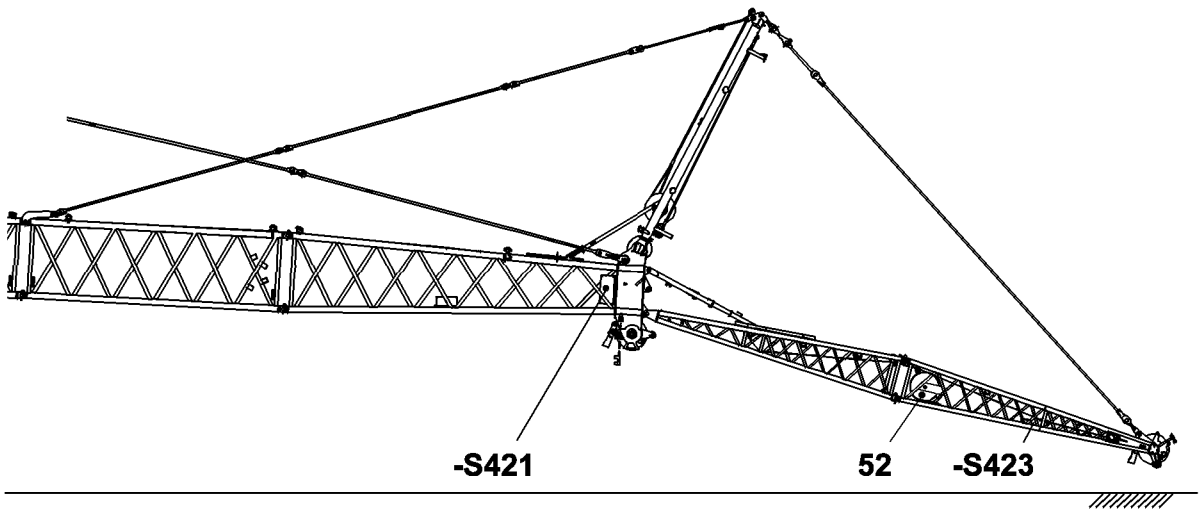
- the pin (40) on the F - support is correctly pinned and secured with spring retainer (30) (fig. V).

- the flap (41) is released.
It must fold up by itself when the SLF -boom combination is erected (fig. W).
The relapse retainer of the auxiliary jib F is "activated" by the flap (41).

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3. Electrical connections

- Install the airplane warning light (-H1) and the wind speed sensor (-B1) on the F - end section.

- Establish the electrical connection from the terminal box (-S421) on the L - end section (G 11) to the terminal box (-S423) on the F - end section (G 15).
- Guide the line (WL 513F) with cable plug (-X468N) from the line drum (52) in the F - end section to the terminal box (-S421) in the L - end section and plug in socket (-X510L).
- Plug in the cable plug (-X468H) from the terminal box (-S423) in line drum (52).

C A U T I O N : When establishing the electrical connection from the terminal box (-S421) to the terminal box (-S423), the connection from the line drum (52)to the L - end section must always be made first.
Then establish the electrical connection from the terminal box (-S423) to the line drum (52).
If this is not observed, the electrical lines can be damaged!

- Plug the cable plug (W460A) in socket (-X460N) on the terminal box (-S423).
- Plug the cable plug (W 460) for the airplane warning light into socket (-X460) on the connector cable (W460A).
- Plug the cable plug (W451H) into socket (-X451N) on the terminal box (-S423).
- Plug the cable plug (W451H) into the hoist limit switch (-S961).
- Plug the connector cable (W556A) with cable plug (-X556B) into socket (-X556) on the hoist limit switch (-S961).
- Establish the electrical connection to the wind speed sensor (-B1).
- Plug the cable plug (-X556A) into socket (-X556) of the wind speed sensor (-B1).

4. Function check

Prerequisite:
- All electrical connections are established.
- The engine is running.
- The actuator levers of the limit switch have been checked for easy movement and have been lubricated.

Airplane warning light
Turn on the airplane warning light, check visually for function.

Wind speed sensor
Check the wind speed sensor for easy movement and function.

Limit switch

C A U T I O N : The limit switch functions must be checked individually before operation.
Check manually as described below.
In the test system, the function of the individual limit switch initiators must be determined - see Diagnostics manual.

Hoist limit switch
Actuate the hoist limit switch manually.
The hoist winch must turn off in upward movement.
The hoist ”top” Symbol on the LICCON indicator must blink.

5. Erection / take down

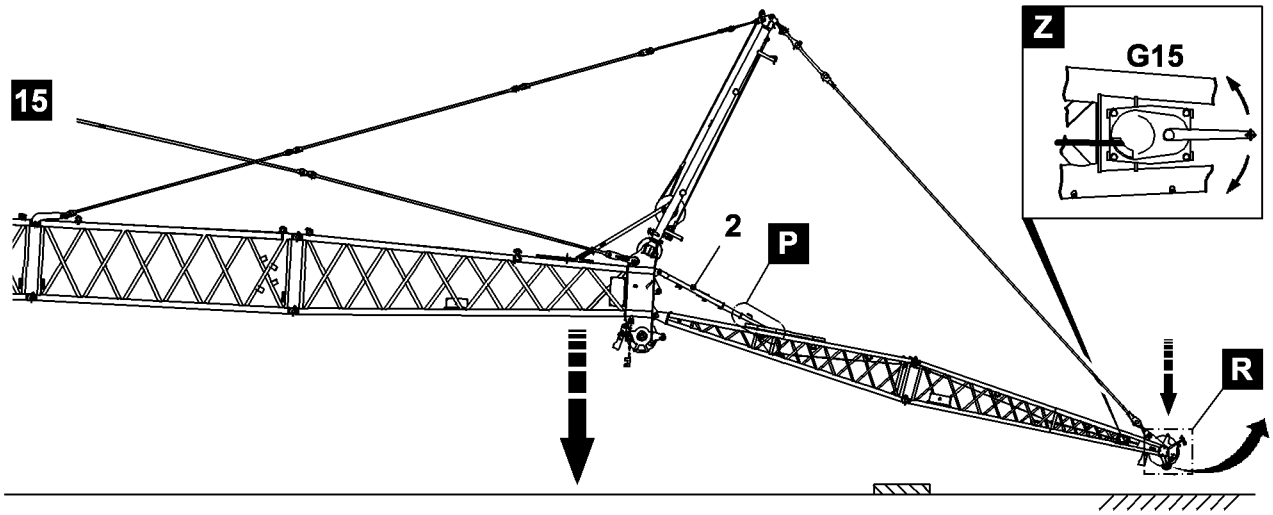
see chapter 5.04.

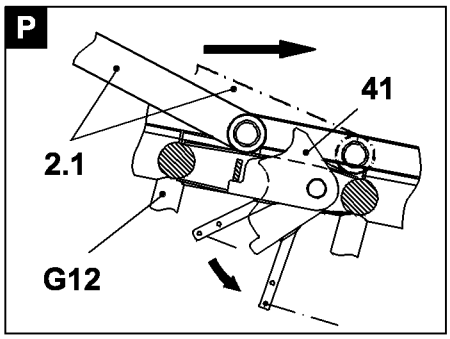
5.1 Erection procedure

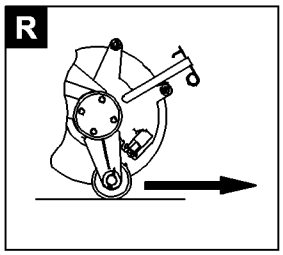
see chapter 5.04.

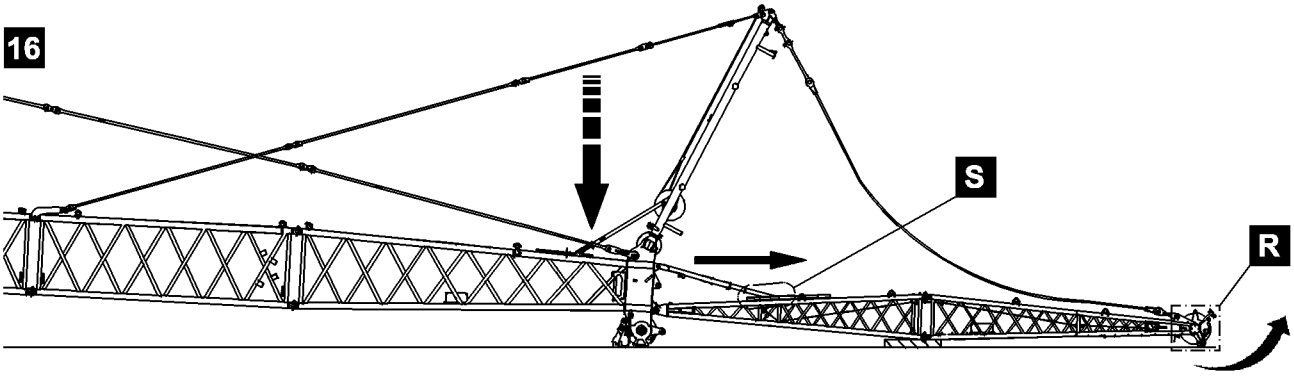
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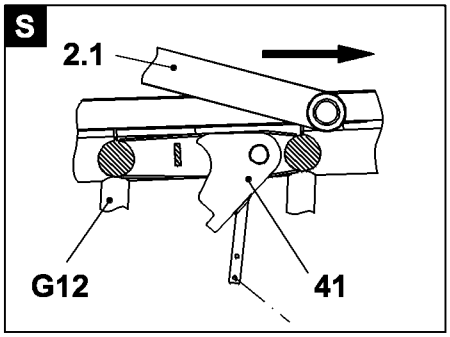
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6. Reeving F - end section / Hoist cable routing in SLF - operation (see Reeving plans)

7. Take down

The boom combinations must be erected or taken down according to the **erection and take down charts**.

D A N G E R : The erection and take down procedure must be carried out according to the data given in the erection and take down charts!
If this is not observed, the crane will be overloaded or tip over.

Luff down the SL - boom to the **lowest** operating position.

Note: When the **lowest** operating position is reached, the luff down movement is shut off.

C A U T I O N : When luffing down, the hoist winch must be spooled out at the same time to prevent the hook block from colliding with the pulley head.

Press the set up key (D):
- The Assembly icon appears in the LICCON monitor.
- The LICCON overload protection is deactivated.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

Actuate the master switch and continue to luff down the boom until the hook block touches the ground.
Remove the hoist limit switch weight.
Unreeve the hook block.

D A N G E R : When unreeving the hoist cable, there may be no persons in the danger zone. There is a danger of accidents!

Spool the hoist cable back to the winch.

D A N G E R : Do not overspool the winch ! If the cable is pulled under the winch when spooling it up, the setting of the cam limit switch, which is to ensure a minimum number of 3 coils on the drum, will no longer be correct.
After any work on the cable or on the winch, the cam limit switch must be reset.

Luff down the boom until the pulley head of the auxiliary jib F "floats" just above the ground (fig. 15).

D A N G E R : It is prohibited to luff down the SL - boom to the point where the pulley head of the auxiliary jib F lays on the ground.
There is a danger of accidents due to overloading the F - supports (2) or the flaps (41).

When taking down, bring the flap (41) in the F - pivot section (fig. P) with the crank of the manual winch in the F - end section (G 15) (fig. Z) in **"bottom"** position (fig. P // fig. S). The plunger (2.1) can "glide" in the guide in the F - pivot section, over the flap (41) (fig. S).
The boom combination can now placed all the way down on the ground (fig. 16).

Note: The auxiliary jib F "runs" with pulleys on the pulley head to the outside (fig. R) when the boom combination is taken down.

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8. Removal

Electrical connections

- Disconnect the electrical connection between the terminal box (-S421) on the L - end section (G11) and the terminal box (-S423) on the F - end section.

C A U T I O N : When disconnecting the electrical connection, the connection from the terminal box (-S423) to the line drum (52) must always be disconnected first. Then disconnect the electrical connection from the line drum (52)to the L - end section.
If that is not observed, the electrical lines can be damaged!

- Disconnect the electrical connections from the terminal box (-S423) to the users - wind speed sensor, airplane warning light, hoist limit switch and angle sensor.

8.1 Removal of the auxiliary jib F

C A U T I O N : The warning and danger notes given for installation of the auxiliary jib F must also be observed for the removal procedure!

- Continue to luff down the SL - boom until the L - end section is on the ground.
- Hang the FA - bracket (1) onto the auxiliary crane, use cable (25).
- Release, unpin and remove the guying FA - bracket to the F - end section.
- Release and unpin the FAB - supports on the L - end section.
- Place down, pin and secure the FAB - support into the transport retainer on the FA - bracket.

Note: If the FAB - supports (3) on the L - end section cannot be unpinned, release the adjustment nuts (3.1) first.

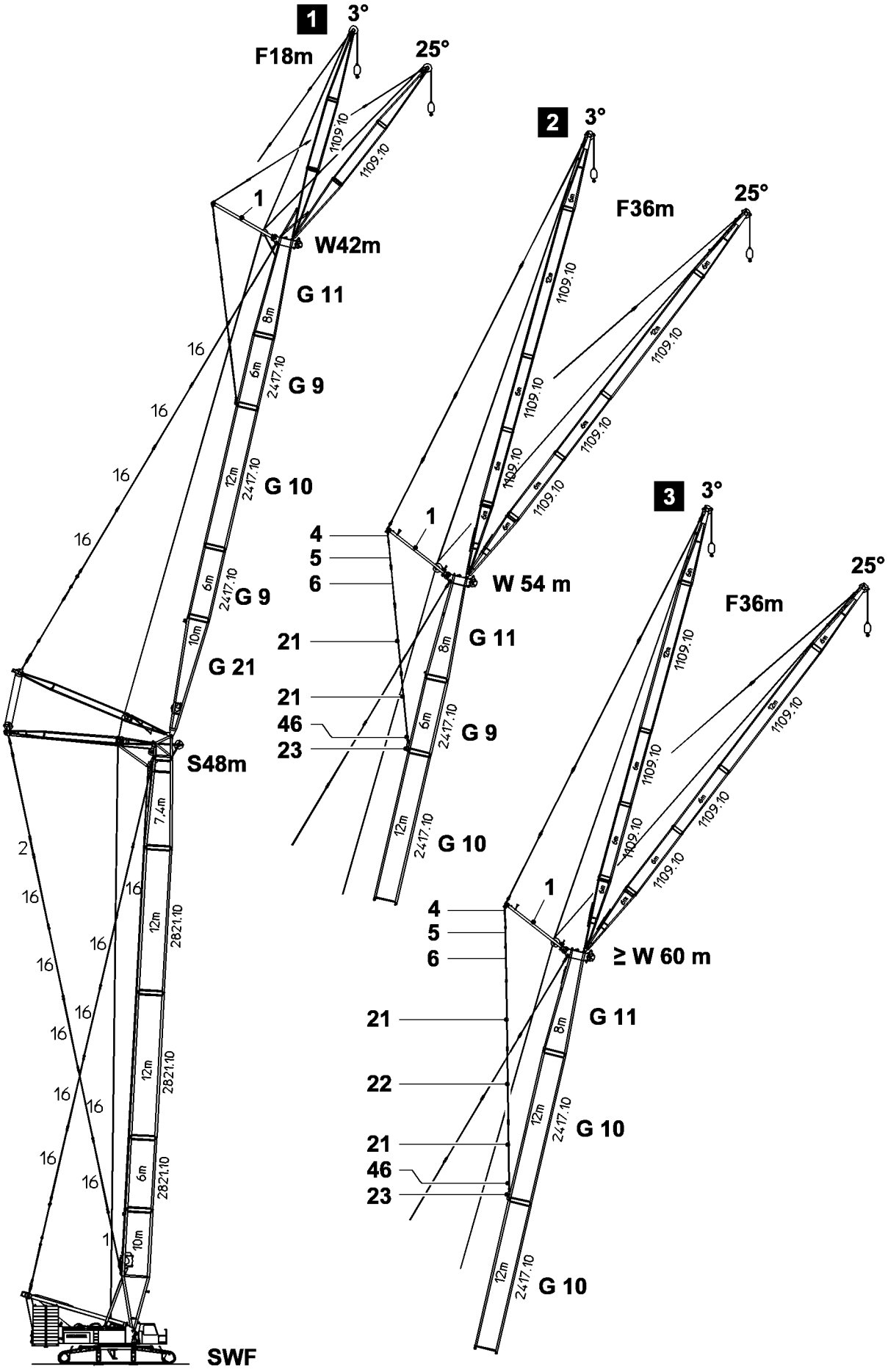
- Pull the FA - bracket (1) with the auxiliary crane past the vertical to the rear so that the SL / FA - bracket - guying lays on the lattice sections.
- Release, unpin the SL / FA - bracket - guying.
- Place down and pin the guy rods into the transport retainers on the L - lattice sections.
- Pull the FA - bracket with the auxiliary crane to the front so that the tension unit, consisting of swing 1 / 2 (4 / 5) and guy rod (6) lays on the FA - bracket. Pin and secure the tension unit into the transport retainers.
- Remove the FA - bracket with the auxiliary crane, loosen the pinning and remove the FA - bracket with the auxiliary crane.
- Unpin the F - support on the L - end section and pin and secure into the transport retainers on the F - pivot section.
- Remove the F - lattice sections.

D A N G E R : Before unpinning any of the crane parts, such as guying, FAB - supports, F - support, FA - bracket etc., it must be ensured that the corresponding components are secured with the auxiliary crane to prevent them from falling down or tipping over.

If this is not observed, there is a danger of accidents!

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5.14 SWF - BOOM COMBINATION 028468-00



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1. Assembly of attachment for auxiliary jib F

The guying between the FA - bracket (1) and the lattice jib W (fig. 2 // fig. 3) differs, depending on the W-lattice jib length, the length or combination of guying. In lattice jib lengths up to W54 m, then the **"short"** and in lattice jib lengths from or above W60m, the **"long"** guying is used (fig. 2 - **"short"** guying // fig. 3 - **"long"** guying).

Note: In operating mode SWF, pay attention to the sectioning of the lattice sections for the W - lattice jib! (see chapter 5.03)

D A N G E R : The data in the load charts must be strictly observed.
If this is not observed, there is a danger of accidents!

1.1 Lattice sections W - lattice jib

	Description	System	Length (m)	Weight (t)
G 9	LI - Intermediate section	2417**.10**	6,0	1,60
G 10	LI - Intermediate section	2417**.10**	12,0	2,70
G 11	W (L) - End section (200 t)		8,0	3,80

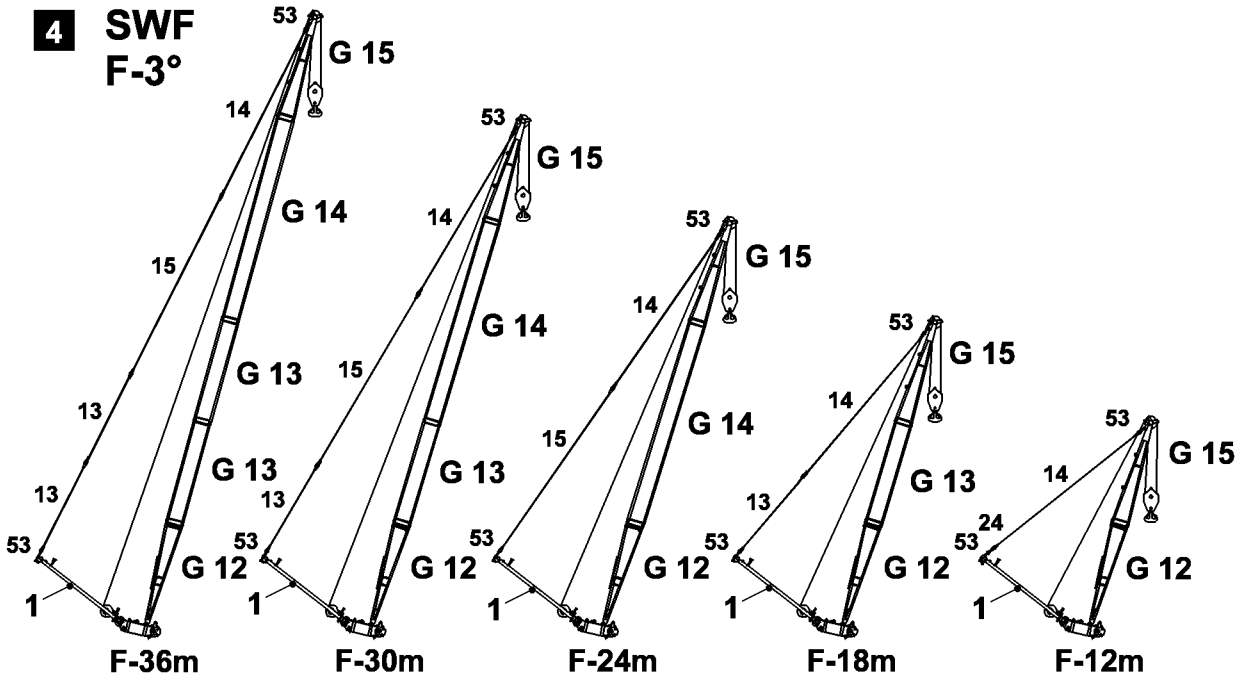
Note: Example: 2417**.10** = **.10** (welded on plate on intermediate section)
For two 6 m long intermediate sections, a 12 m long intermediate section can be installed.

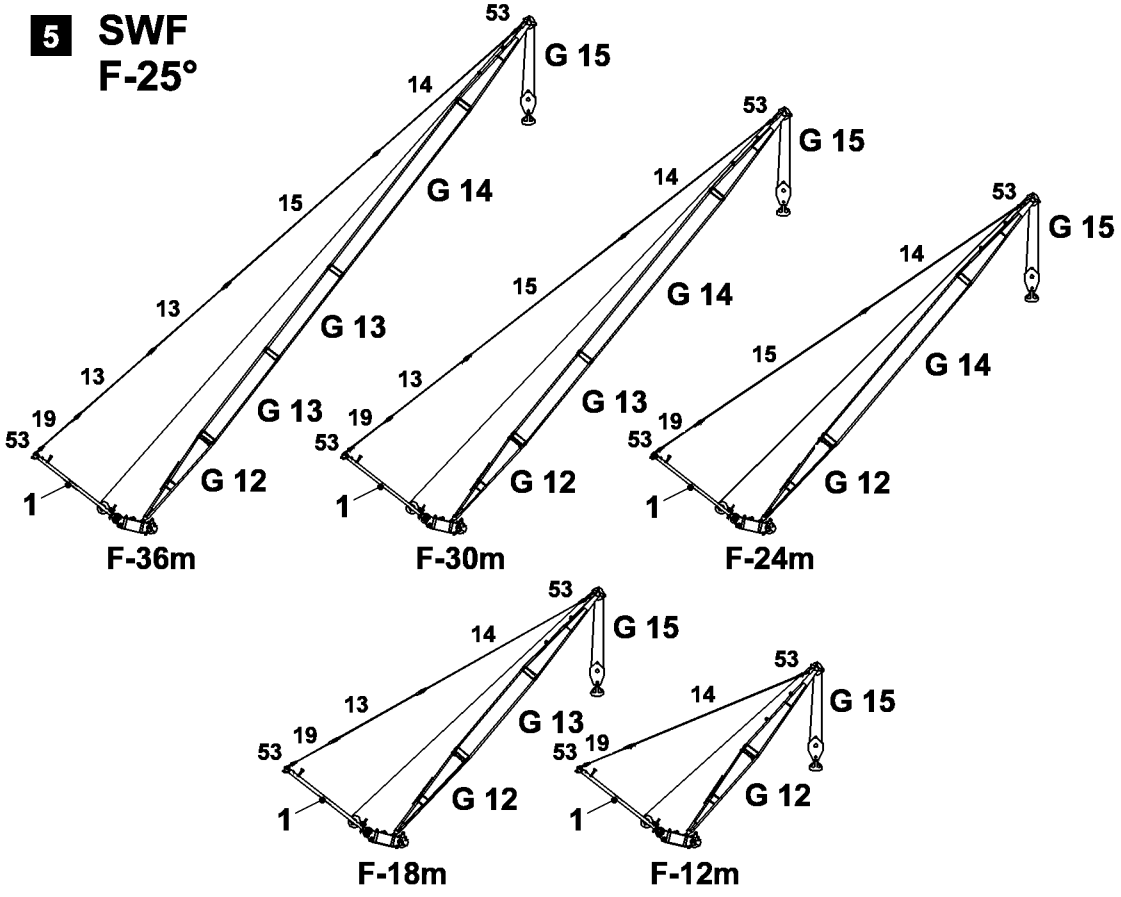
Components for guying between FA-bracket and W - lattice jib

Pos.	Description	Length (m)
4	Arm 1 (installed on FA - bracket)	0,75
5	Arm 2 (installed on FA - bracket)	2,11
6	Guy rod (installed on FA - bracket)	2,82
21	Guy rod, complete	5,39
22	Guy rod, complete (only for long guying)	5,77
23	Bracket	0,61
46	Bracket	0,20

D A NG E R : It is prohibited to assemble the lattice sections, the guy rods and the guy ropes in any other way than is noted in the Operating manual or the installation drawings!
There is a danger that the intermediate sections, which are differently sized and do not differ externally, are mixed up!
Externally they differ only by the welded on plates (.8, .10, .20).
When installing the boom, it must be ensured that the intermediate sections are installed according to their description (see chapter 5.03)
If this is not observed, there is a danger of accidents!

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1.2 Lattice sections - Auxiliary jib F

	Description	System	Length (m)	Weight (t)
G 12	F - pivot section		6,0	0,70
G 13	F - Intermediate section	1109**.10**	6,0	0,70
G 14	F - Intermediate section	1109**.10**	12,0	1,30
G 15	F - End section (60 t)		6,0	1,00

Note: Example: 1109**.10** = **.10** (welded on plate on intermediate section)
For two 6 m long intermediate sections, a 12 m long intermediate section can be installed.

Components for guying between FA - bracket (1) and F - end section (G 15)

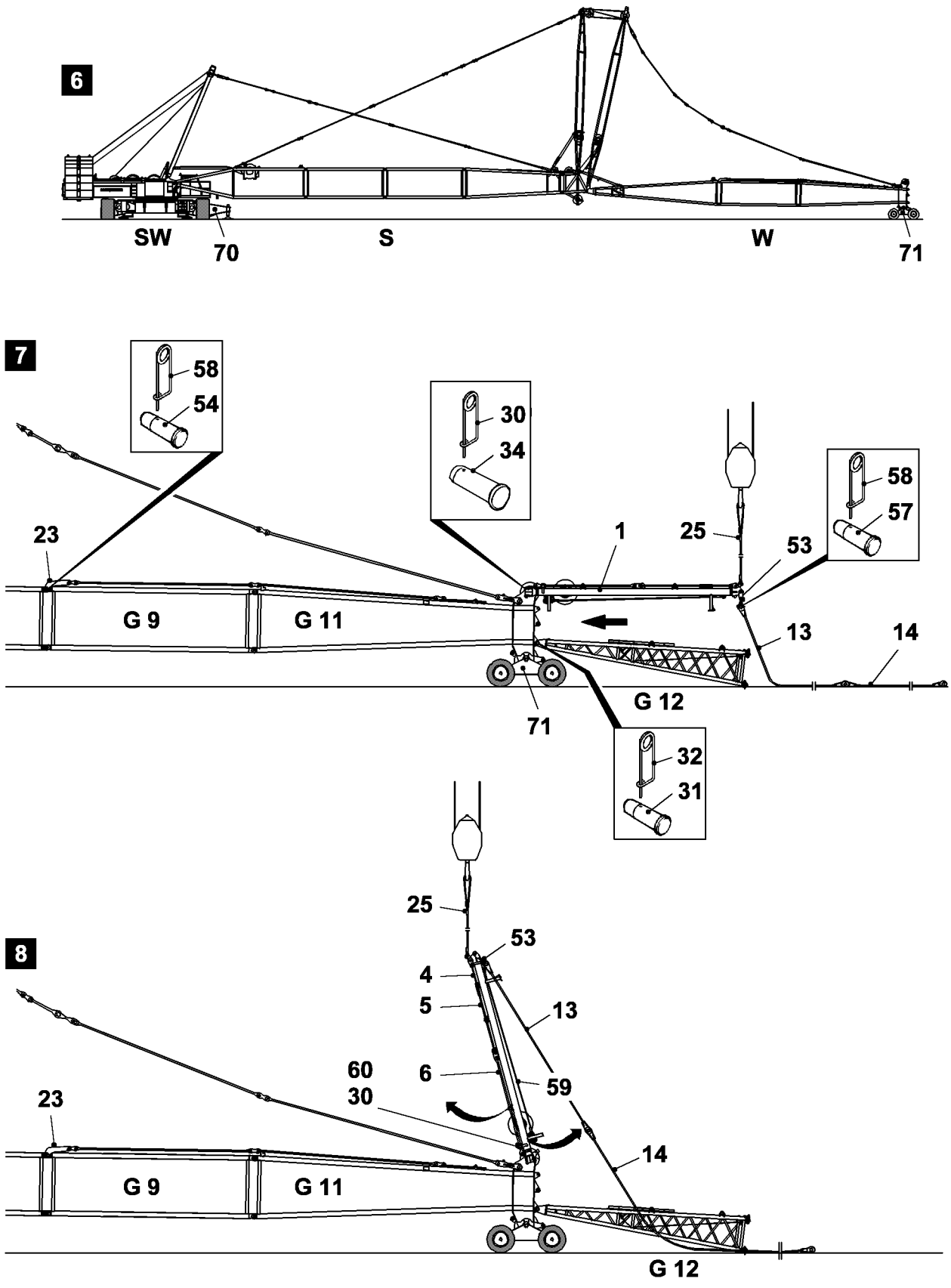
Pos.	Description		Length (m)
13	Guy rope		5,70
14	Guy rope		10,64
15	Guy rope		11,40
19	Guy rope	(only for 25° position)	2,80
24	Bracket	(only for F - 12m, at 3°)	0,40
53	Bracket	(installed on FA - bracket)	0,43

The auxiliary jib F can be operated in jib angles of 3° and 25°, with different jib lengths of 12 to 36 m (fig. 4 // fig. 5).

D A N G E R : It is prohibited to assemble the lattice sections, the guy rods and the guy ropes in any other way than is noted in the Operating manual or the installation drawings!
There is a danger that the intermediate sections, which are differently sized and do not differ externally, are mixed up!
Externally they differ only by the welded on plates (.8, .10, .20).
When installing the boom, it must be ensured that the intermediate sections are installed according to their description (see chapter 5.03)
If this is not observed, there is a danger of accidents!

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2. Installation

Description of auxiliary jib F (60 t)

The auxiliary jib F is fixed guyed via the the FA - bracket (1), which is installed on the W (L) - end section (G 11) to the W - lattice jib and to the F - end section (G 15) (fig. 1).

The auxiliary jib F is **not** adjustable in crane operation.

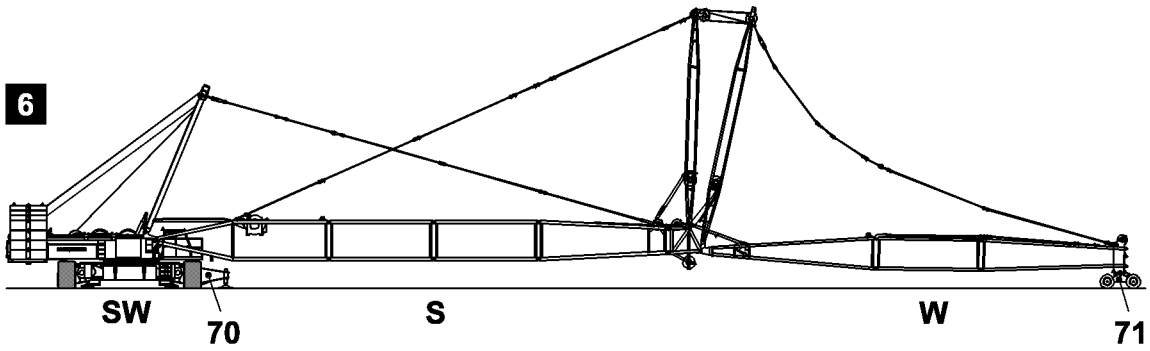
The auxiliary jib F can be installed at an angle of **3°** (fig. 4) and **25°** (Fig. 5) to the W - lattice jib. F-auxiliary jib lengths of 12m to 36m are possible.

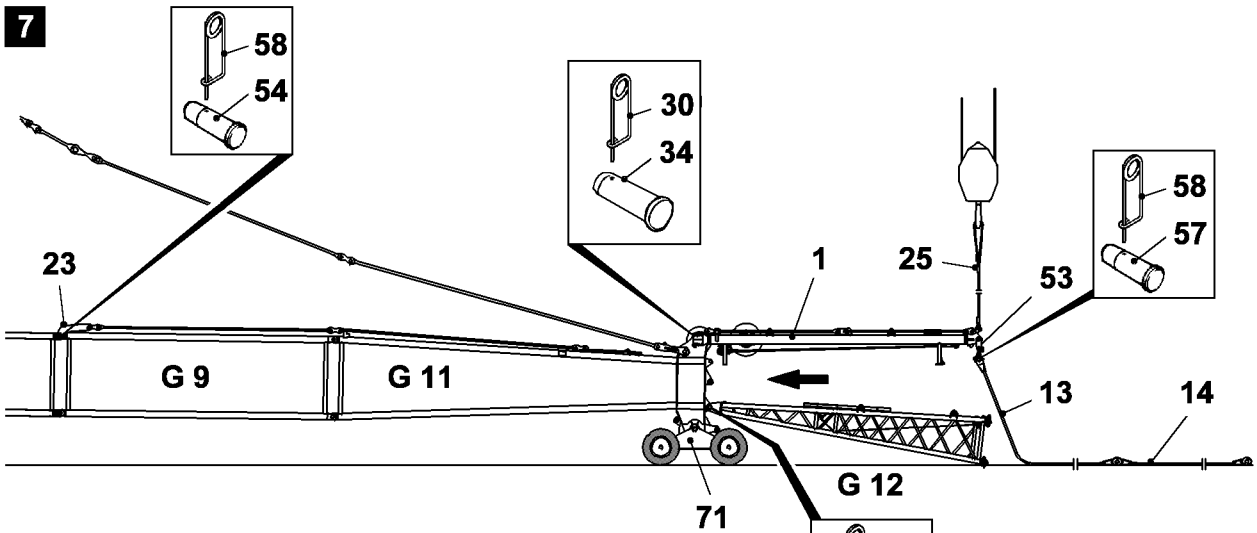
On the auxiliary jib F, a differentiation is made between two guyings. Depending on the W - lattice jib length, the length of the guying between the FA - bracket and the W-lattice jib changes (Fig. 2 // Fig. 3).

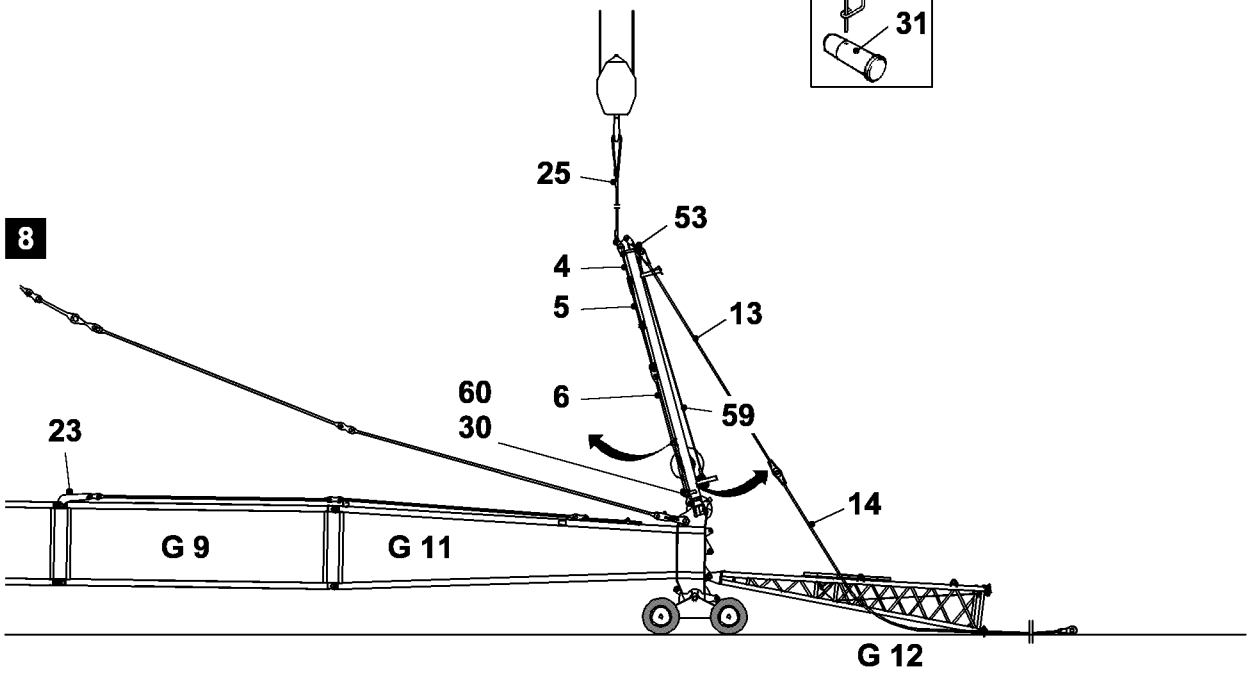
2.1 Component overview

Pos.	Description	Length (m)
1	FA - bracket	
2	F - support (installed on F-pivot section)	
2.1	Ram	
3	FAB - support (installed on FA - bracket)	
3.1	Adjustment nut	
25	Cable ∅ 16 (installed on FA - bracket)	6,000
26	Cable pulley retainer	
27	Cable pulley	
30	Spring retainer ∅ 4	
31	Pin ∅ 75 x 185 mm	
32	Spring retainer ∅ 8	
33	Pin ∅ 55 x 140 mm	
34	Pin ∅ 45 x 290 mm	
35	Spring retainer ∅ 4,5	
36	Pin ∅ 40 x 75 mm	
37	Hinge pin 8 x 60 DIN 11023	
38	Pin ∅ 45 x 135 mm	
39	Spring retainer ∅ 5 mm	
40	Pin ∅ 40 x 165 mm	
41	Flap (in the F - pivot section)	
42	Pin ∅ 45 x 135 mm	
43	Pin ∅ 55 x 334 mm	
44	Pin ∅ 65 x 120 mm	
45	Hinge pin	
47	Rod	
48	Spring retainer ∅ 3 mm	

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Component overview

Pos.	Description	Length (m)
50	Cable pulley	
51	Pin ∅ 20 x 170 mm DIN 1444	
52	Line drum	
54	Pin ∅ 70 x 380 mm	
55	Pin ∅ 55 x 170 mm	
56	Pin ∅ 55 x 125 mm	
57	Pin ∅ 70 x 170 mm	
58	Spring retainer ∅ 6	
59	Cable ∅ 16 (installed on FA - bracket)	4,940
60	Pin 20 x 80 x 72 DIN 1444	
70	Mechanical auxiliary support	
71	Pulley cart for W - lattice jib	
72	Lever	
73	Pull spring	
74	Limit switch	

2.2 Installation of auxiliary jib F

2.2.1 For boom combination - S48 W42 F12 to S54 W66 F36

S48	S54
S48 W42 F12 - F36	**S54 W42 F12 - F36**
S48 W48 F12 - F36	**S54 W48 F12 - F36**
S48 W48 F12 - F36	**S54 W54 F12 - F36**
S48 W54 F12 -F 36	**S54 W60 F12 - F36**
S48 W60 F12 - F36	**S54 W66 F12 - F36**
S48 W66 F12 - F36	
S48 W72 F12 - F24	
S48 W78 F12 - F18	

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2.2.1 For boom combination - S48 W42 F12 to S54 W66 F36 (continuation)

D A N G E R : For installation and removal work, a safe installation scaffolding / working platform must be used.
There is a danger of accidents due to falling!

Prerequisites:
- The crane is horizontally aligned.
- The mechanical auxiliary support (70) is properly installed and supported on the ground.
- The SW - boom combination is installed on the crane, complete (**see chapter 5.06**).
- The SW - boom combination has been placed down to the side via the mechanical auxiliary support (Fig. 6).

D A N G E R : The data in the erection and take down chart must be strictly observed.
If this is not observed, the crane will be overloaded and can topple over!
There is an increased danger of having an accident!

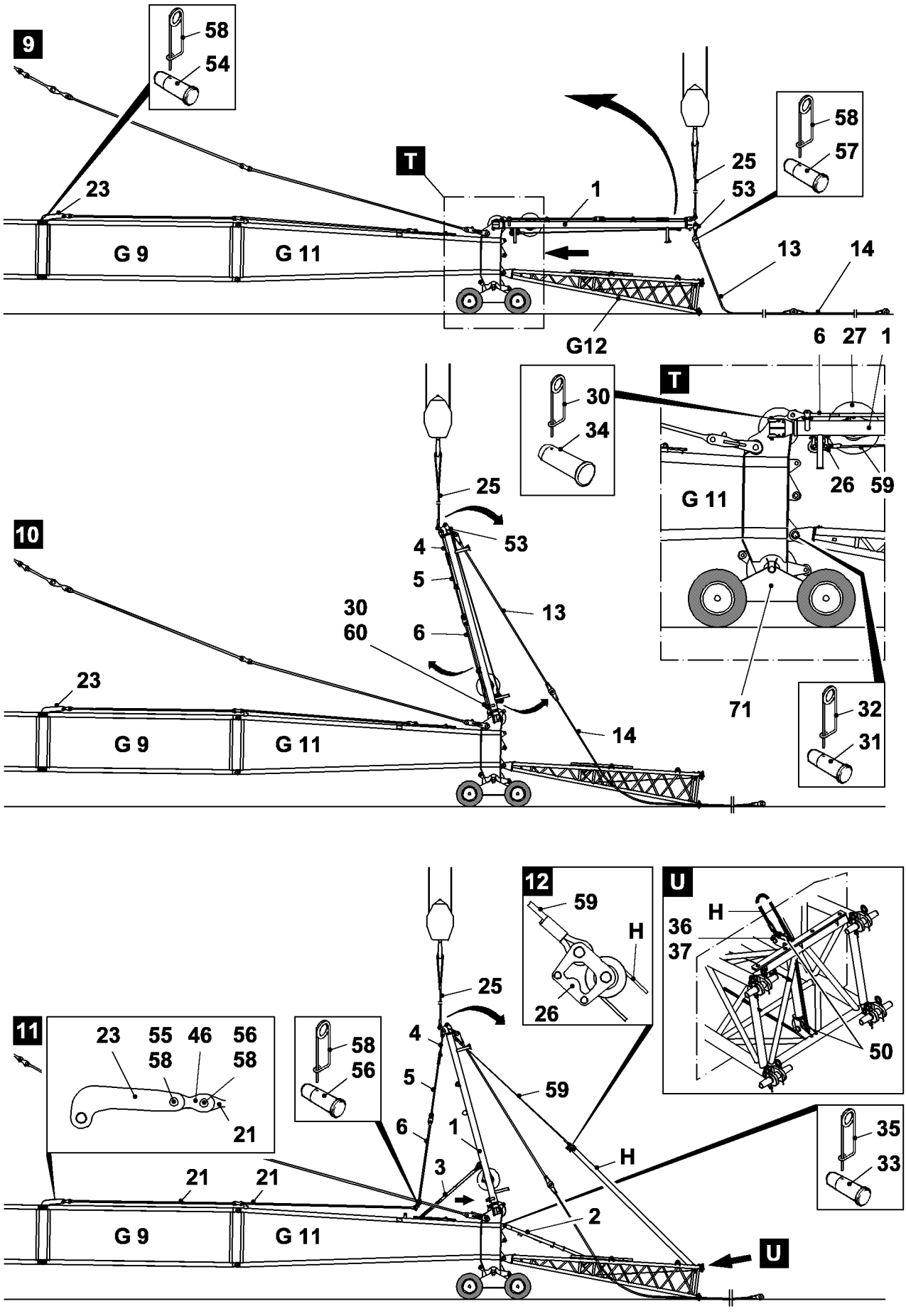
C A U T I O N : The W - (L -) end section of the lattice jib - W, must be placed down on the pulley cart (71) and secured with retaining pins.
If this is not observed, the boom can be damaged!

- The guy bracket (23) is installed on the W - lattice jib, has been secured with pin (54) and with spring retainer (58) (Fig. 7).
- The LICCON overload protection has been set according to the data in the load chart.
- The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
- The configuration status has been entered into the LICCON computer system.
- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.
- An auxiliary crane as well as an installation scaffolding / working platform is available.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

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2.2.1.1 Installation F - pivot section

- Pin and secure the F - pivot section (G 12) on the W - (L -) end section (G 11). Use pin (31) and spring retainer (32) (Fig. 9 // Fig. T). Place the F - pivot section on the ground.

D A N G E R : **It is strictly prohibited to remain under the F - pivot section during installation.**
There is a danger of accidents!

Note: The F - support (2) is secured in transport position on the F - pivot section with pin (33) (not shown).

- Unpin the pin (33) on the transport retainers for the F - support.
- Lift the F - support (2) and pin on the W - (L -) end section (G 11).
- Use pin (33) and spring retainer (35) (Fig. 11).

2.2.1.2 Installation FA - bracket

Description:
Lift the FA - bracket (1) complete with arm 1 and 2 (4 / 5), guy rod (6) and bracket (53)) with the auxiliary crane and install on the W - (L -) end section (G 11).

Procedure:
- Enter the fork head of the FA - bracket (1), on the stud of the W - (L -) end sections (G 11) (Fig. T).
- Pin the pin (34) on the pin hole of the fork head and secure with spring retainer (30) (Fig. T).
- Attach the FA - bracket on the cable (25) with the auxiliary crane. To do so, remove the transport retainer (shackle) of the cable (25) on the FA - bracket and hang the cable (25) with the loop on the auxiliary crane (Fig. 7).

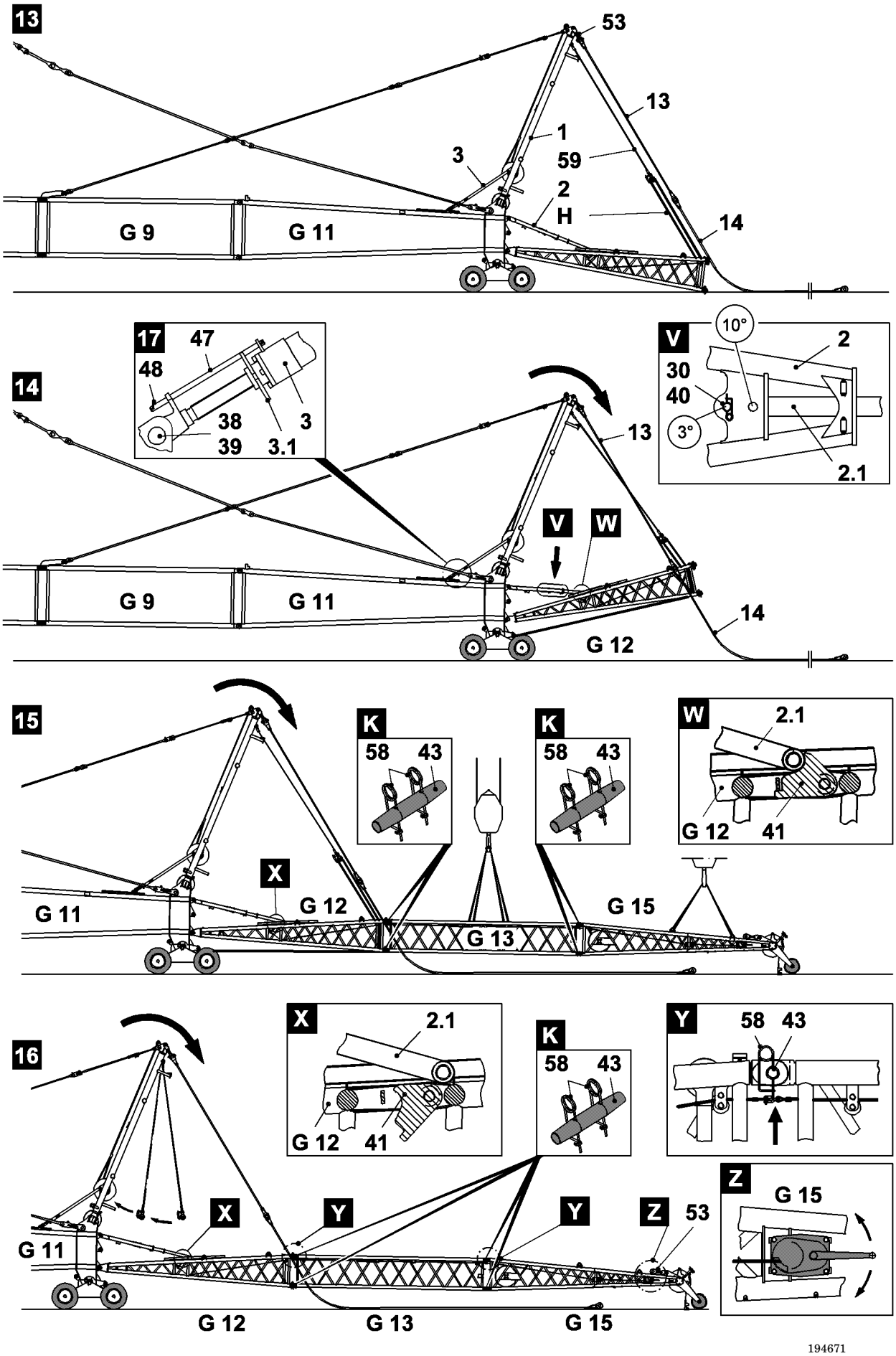
Note: The added bracket (24 // 0,4 m) may **only** be installed for a jib length of F - 12 m and a F - jib angle of 3° (Fig. 4).

- Pin and secure the guy rope (13) on bracket (53). Place the cable end on the ground (Fig. 9).
- Pin and secure the guy rope (14) on guy rope (13). Place the cable end on the ground (Fig. 9).
- On the FA - bracket (1), remove the spring retainer (30) and remove the transport retaining pin (60) of the tension unit, which consists of arm of the tension unit, which consists of arm 1 (4) and arm 2 (5) as well as guy rods (6).
- When the FA-bracket is being erected, the guy unit swings out slowly.

D A N G E R : **When erecting the FA - bracket, it must be ensured that there are no persons within the swing range of the tension unit, since it can swing out suddenly. If this is not observed, there is a danger of accidents!**

- Erect the FA - bracket (1) with the auxiliary crane and pull it back past the vertical line. (Fig. 8).

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2.2.1.3 Installation W / FA - bracket guying

- Remove the transport retainers of the guy rods (21) on the L - lattice sections (Fig. 11).

Note: The guy rods for the W / FA - bracket guying are attached in the transport retainers of the W - lattice jib.

- Pin and secure the guy rods (21) with bracket (46) with the guy bracket (23) and guy rod (6). Use pin (55 / 56) and spring retainer (58) (Fig. 11).
- Pull the FA - bracket with the auxiliary crane past the vertical position towards the front.
- Unpin the cable pulley retainer (26) (Fig. 12) on the transport retainer of the FA - bracket.
- Spool out the auxiliary winch and pull the auxiliary winch cable (H) to the F - pivot section.
- Guide the auxiliary winch cable (H) over the cable pulleys (50) on the F - pivot section (Fig. U) and the cable pulley on the cable pulley retainer (26) (Fig. 12).
- Pin the auxiliary winch cable (H) on the F - pivot section by using pin (36) and secure with hinge pin (37) (Fig. U).
- Slowly spool up the auxiliary winch until the auxiliary winch cable (H) and cable (59) are tensioned (Fig. 11).
- Remove the auxiliary crane and attach the cable (25) on the transport retainer (shackle next to cable pulley (27)) on the FA - bracket.

D A N G E R : Before the auxiliary crane is removed, the crane operator must ensure that:
- **the guy rods between the W - lattice jib and the FA - bracket are properly pinned and secured.**
- **the auxiliary winch cable (H) on the F - pivot section is properly pinned and secure.**
- **the cable (59) is tensioned and does not hang down.**

If this is not observed, there is a danger of accidents!

2.2.1.4 Installation FAB - support

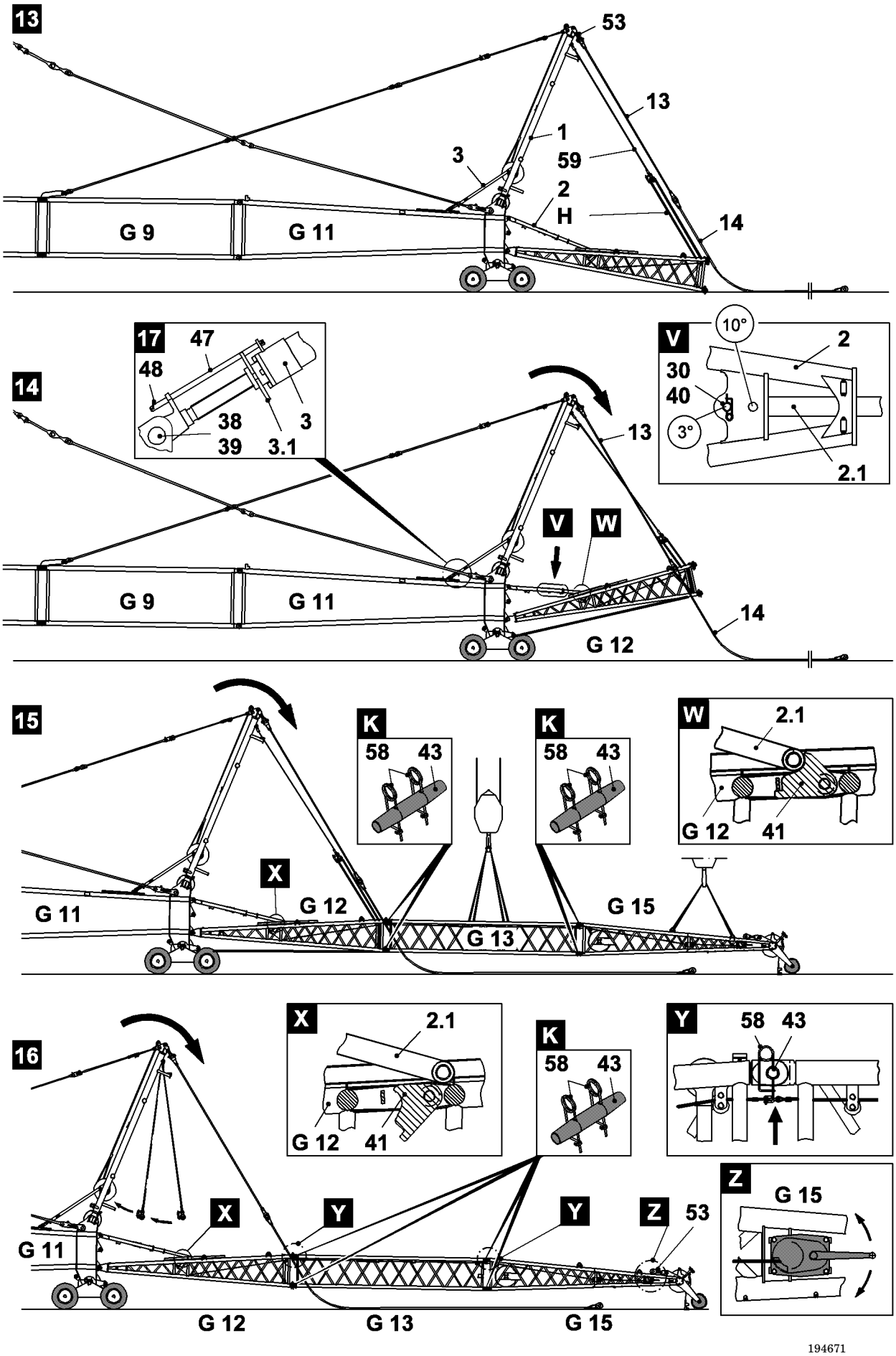
The FAB - supports (3) are pinned and secured on the FA - bracket (1) (not shown).

Description:
In crane operation, the FAB - supports hold the W / FA - bracket guying tensioned and at the same time, they serve as relapse support for the FA - bracket. The FAB - supports can be changed in length via the adjustment nut (3.1) (Fig. 17).

Installation
- Unpin the transport retaining pins (51) of the FAB - supports on the FA - bracket (not shown).
- Fold down the FAB - supports.
- The FAB - supports are placed down into the "rails" on the W - (L -) end section and guided in the rails when the W / FA - bracket guying is tensioned.

Note: The W / FA - bracket guying must be tensioned with the auxiliary winch before the FAB - support is pinned and tightened with the adjustment nut (3.1).

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2.2.1.5 Tensioning the W / FA - bracket guying

- Loosen the pin between the ram (2.1) and the F - support (2), remove the spring retainer (30) and unpin the pin (40) (Fig. 14 // Fig. V).
- With the auxiliary winch, pull the FA - bracket forward until the W / FA - bracket guying is tensioned and the ram (2.1) pushes against the flap (41) (Fig. W) in the F - pivot section (Fig. 14).
- Set the length of the FAB - support with the adjustment nut (3.1) in such a way that the bore of the FAB - support and the bore of the pin point on the W - (L -) end section align (Fig. 17).
- Insert the pin (38) and secure with the spring retainer (39) (Fig. 17).
- Tighten the adjustment nut (3.1) as far as possible so that the W / FA - bracket guying remains tensioned.
- Secure the adjustment nut (3.1). Use rod (47) and spring retainer (48) (Fig. 17).

Note: The F - pivot section is lifted off the ground when the W / FA- bracket guying is tensioned, because the auxiliary winch spools up (Fig. 14).

D A N G E R : No one may remain in the danger zone, this is strictly prohibited. If this is not observed, there is a danger of accidents!

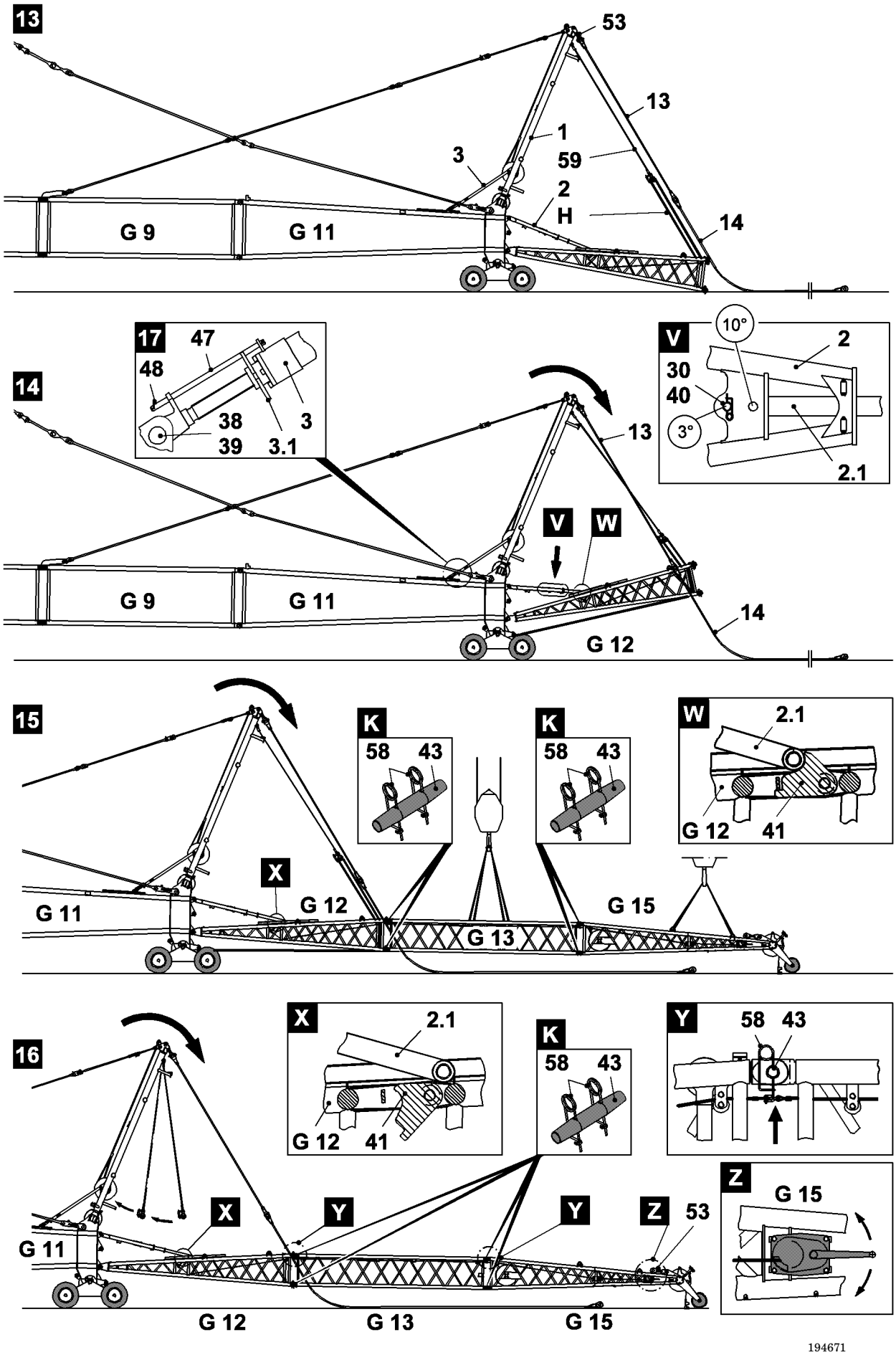
C A U T I O N : Tension the W / FA - bracket guying until:

- the ram (2.1) pushes on the flap (41) in the F - pivot section (G 12)

- the auxiliary winch stops.

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2.2.1.6 Installation of F - Intermediate sections / F - end section

- Spool out the auxiliary winch and lower the F - pivot section onto the ground (Fig. 15).
- Release and unpin the pin (36) (Fig. 11 // Fig. U).
- Unreeve the auxiliary winch cable (H) on the cable pulley retainer (26) (Fig. 12).
- Pin the cable (59) with the cable pulley retainer (26) on the FA - bracket - transport position (parking position) (Fig. 16).

Depending on the required jib length, 6 m or 12 m long F - intermediate sections (G 13 // G 14) plus F - end section (G 15) or only the F - end section (G 15)are now installed on the F - pivot section (G 12). Assembly of auxiliary jib F (see Fig. 4 // Fig. 5).

INSTALLATION EXAMPLE:
Auxiliary jib F with a length of 18 m and a jib angle of 3°

- Attach the F - intermediate section (G 13) on the auxiliary crane and pin and secure on the F - pivot section (G 12). Use pin (43) and spring retainer (58) (Fig. 15).
- Attach the F - End section (G 15) on the auxiliary crane and pin and secure on the F - intermediate section (G 13). Use pin (43) and spring retainer (58) (Fig. 15).

Note: For two 6 m long intermediate sections, a 12 m long intermediate section can be installed.

D A N G E R : It is prohibited to assemble the lattice sections, the guy rods and the guy ropes in any other way than is noted in this chapter or the installation drawings!

- Connect the ropes from the F - pivot section (G 12) to the F - intermediate section (G 13) and from the F - intermediate section (G 13) to the F - end section (G 15) (Fig. 16 // Fig. Y // arrow). Connect the ropes with the shackle. The rope is used to change the flap (41) in the F - pivot section.
- With the manual winch in the F - end section (Fig. Z) release the flap (41) in the F - pivot section (Fig. W).
- Pin the ram (2.1) on the F - support (2). Pin the pin (40) in pin hole (3°) and then secure pin (40) with spring retainer (30) (Fig. V).

C A U T I O N : The pin (40) must be pinned for the F - jib angle of 3° in the 3° pin bore and for the F - jib angle 25° in the 10° pin bore, since the F - support (2) serves as the relapse support for the auxiliary jib and this can only be ensure by pinning the ram (2.1) (Fig. V).

- Pin the guy rope (14) on bracket (53) on the F - end section (G 15). Use pin (44) and hinge pin (45).

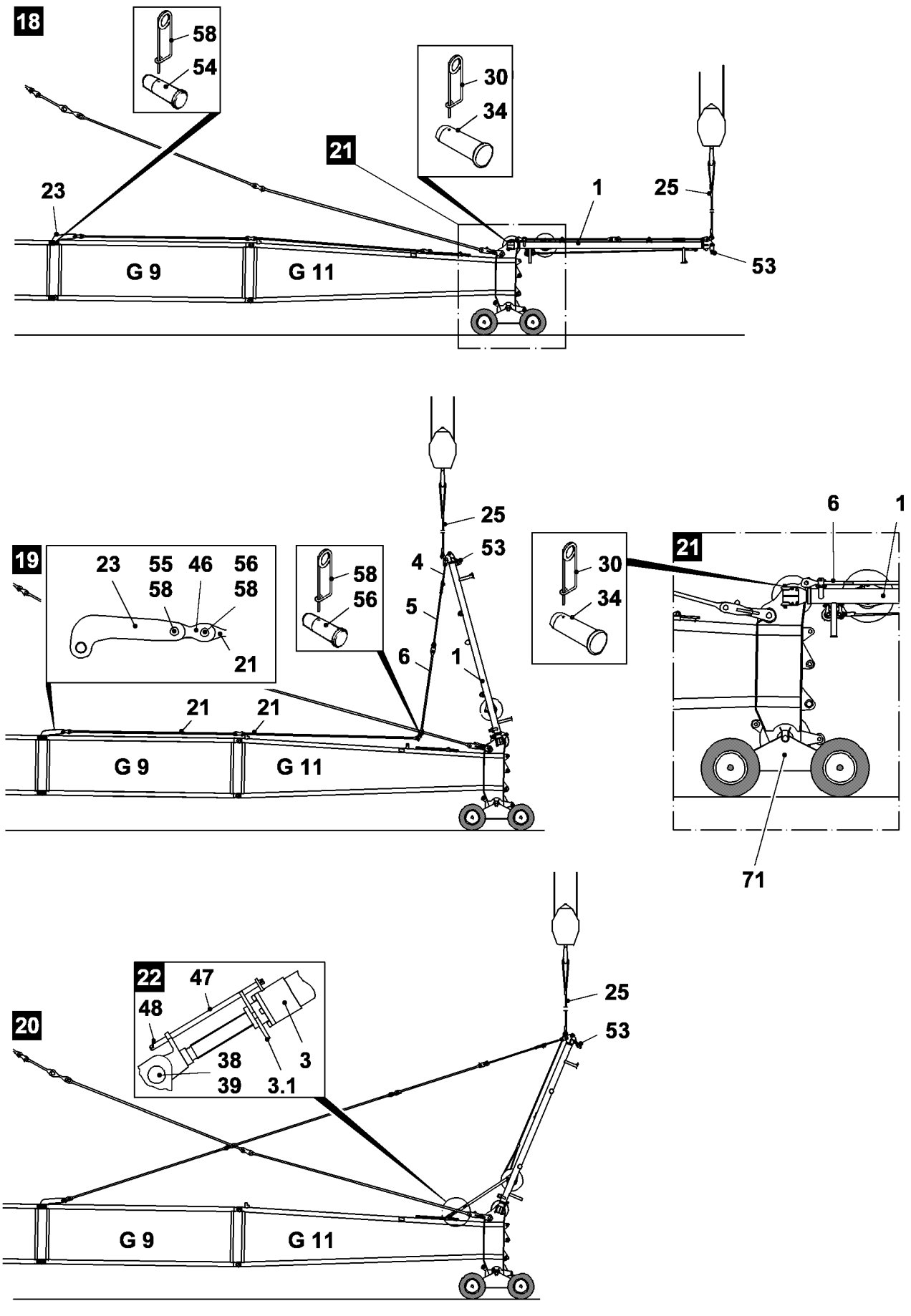
D A NG E R : Before erecting the SWF- boom combination, the crane operator must ensured that :

- the pin (40) is pinned correctly on the F - support and is secured with spring retainer (30) (Fig. V).

- the flap (41) is released.
It must fold up by itself when the SWF - boom combination is erected (Fig. W). Due to the flap (41), the relapse retainer for the auxiliary jib F becomes "active".

- the limit switch (74) in the F - pivot section (G12) and the bell must be fully functioning.

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2.2.2 For boom combination - S60 W42 F12 - F24

D A N G E R : For installation and removal work, a safe installation scaffolding / working platform must be used.
There is a danger of accidents due to falling!

Prerequisites:
- The crane is horizontally aligned.
- The mechanical auxiliary support (70) is properly installed and supported on the ground.
- The SW - boom combination is installed on the crane, complete.
- The SW - boom combination has been placed down to the side via the mechanical auxiliary support (Fig. 6).

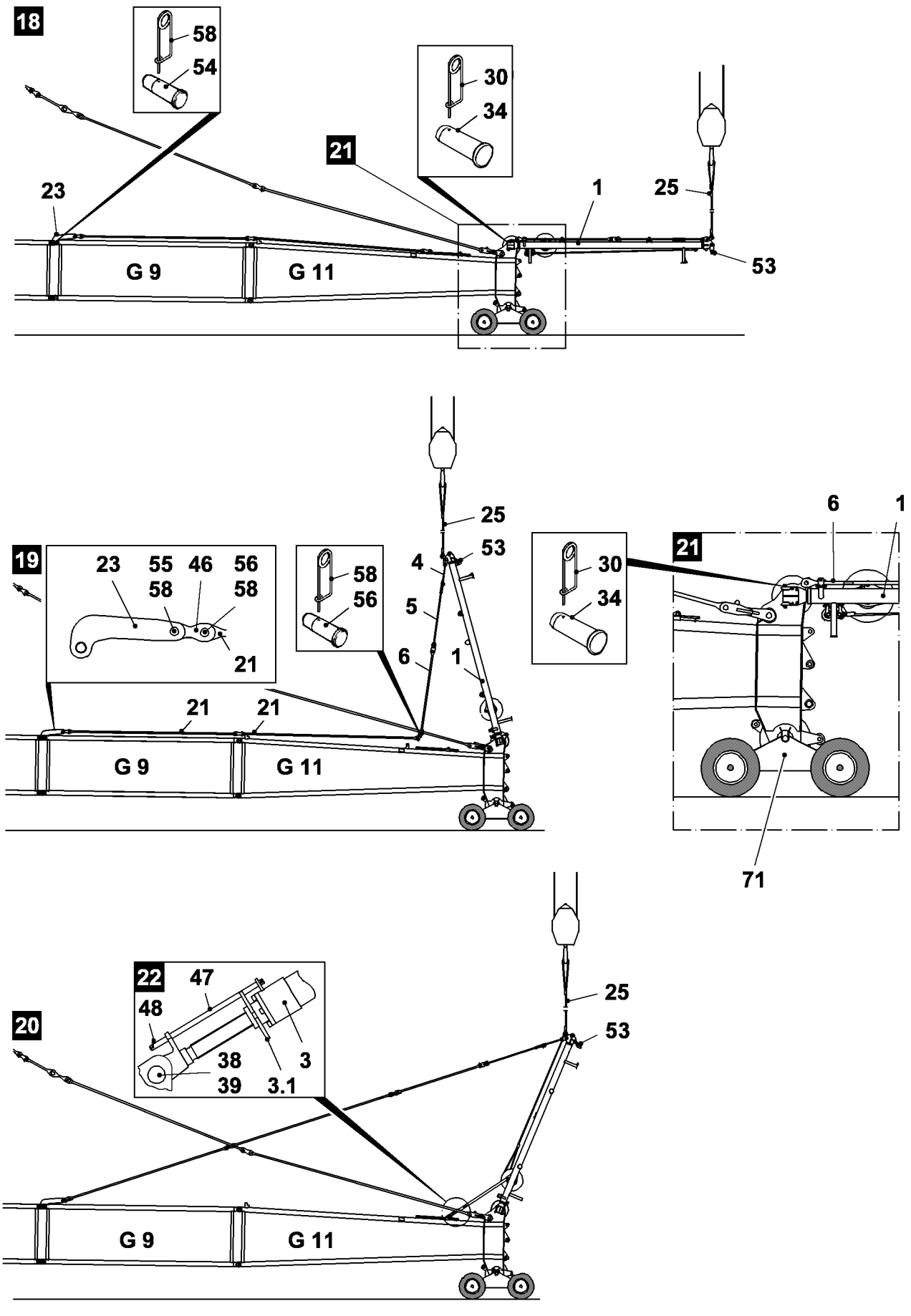
D A N G E R : The data in the erection and take down chart must be strictly observed.
If this is not observed, the crane will be overloaded and can topple over!
There is an increased danger of having an accident!

C A U T I O N : The W - (L -) end section of the lattice jib - W must be placed down on the pulley cart (71) and secured with retaining pins.
If this is not observed, the boom can be damaged!

- The guy bracket (23) is installed on the W - lattice jib, has been secured with pin (54) and with spring retainer (58) (Fig. 18// Fig. 19).
- The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
- The configuration status has been entered into the LICCON computer system.
- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.
- An auxiliary crane as well as an installation scaffolding / working platform is available.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

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2.2.2.1 Installation FA - bracket

Description:
Lift the FA - bracket (1) complete with arm 1 and 2 (4 / 5), guy rod (6) and bracket (53)) with the auxiliary crane and install on the W - (L -) end section (G 11) (Fig. 18 // Fig. 19 // Fig. 21).

Procedure:
- Enter the fork head of the FA - bracket (1), on the stud of the W - (L -) end sections (G 11) (Fig. 21).
- Pin the pin (34) on the pin hole of the fork head and secure with spring retainer (30) (Fig. 21).
- Attach the FA - bracket on the cable (25) with the auxiliary crane. To do so, remove the transport retainer (shackle) of the cable (25) on the FA - bracket and hang the cable (25) with the loop on the auxiliary crane (Fig. 18).

Note: The added bracket (24 // 0,4 m) may **only** be installed for a jib length of F - 12 m and a F - jib angle of 3°.

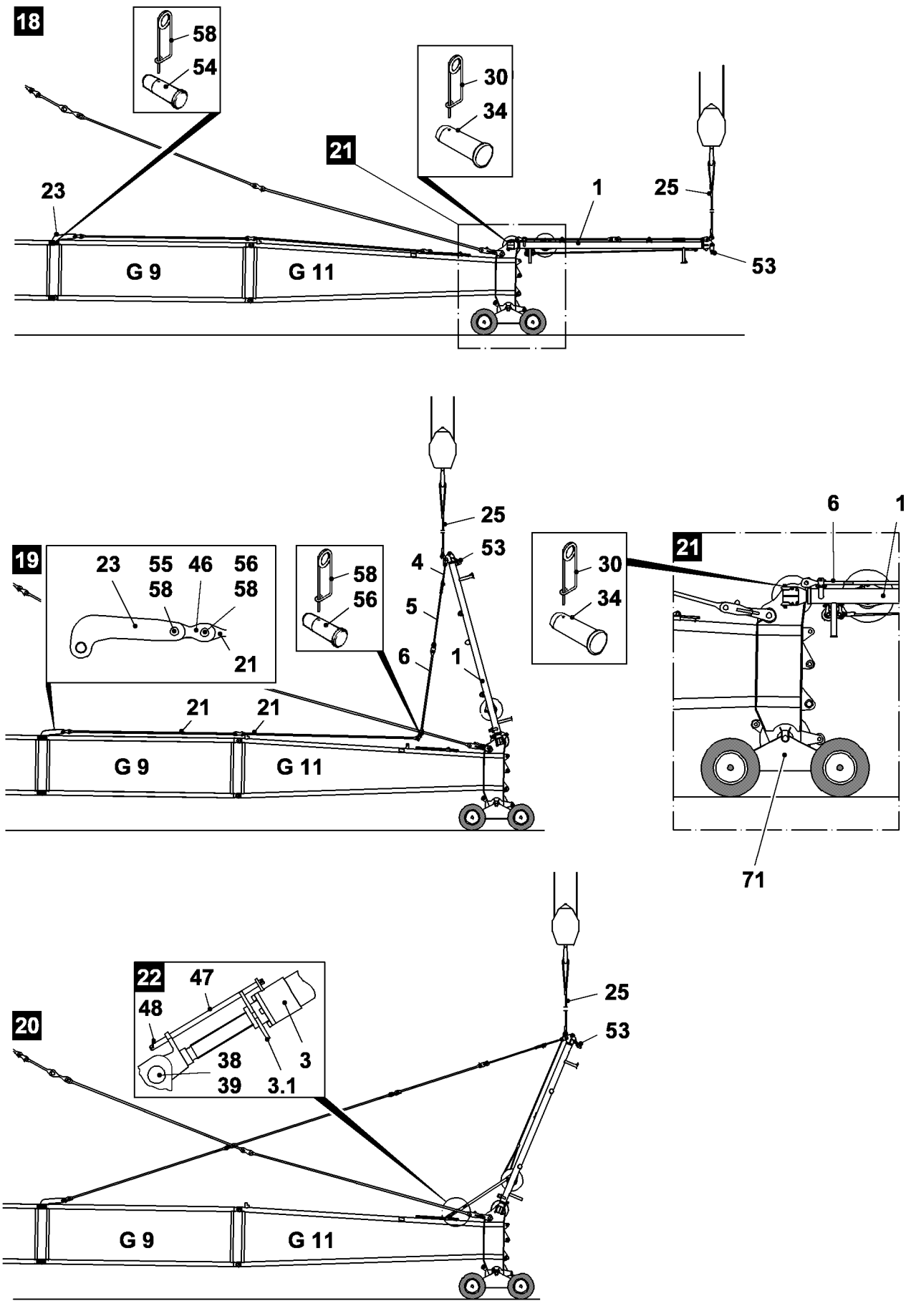
- On the FA - bracket (1), remove the spring retainer (30) and remove the transport retaining pin (60) of the tension unit, which consists of arm of the arm 1 (4) and arm 2 (5) as well as guy rods (6).
- When the FA-bracket is being erected, the guy unit swings out slowly.

D A N G E R : When erecting the FA - bracket, it must be ensured that there are no persons within the swing range of the tension unit, since it can swing out suddenly. If this is not observed, there is a danger of accidents!

- Erect the FA - bracket (1) with the auxiliary crane and pull it back past the vertical line (Fig. 19).

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2.2.2.2 Installation W / FA - bracket guying

- Remove the transport retainers of the guy rods (21) on the L - lattice sections (Fig. 19).

Note: The guy rods for the W / FA - bracket guying are attached in the transport retainers of the W - lattice jib.

- Pin and secure the guy rods (21) with bracket (46) with guy bracket (23) and the guy rod (6). Use pin (55 / 56) and spring retainer (58) (Fig. 19).
- Pull the FA - bracket with the auxiliary crane past the vertical position towards the front until the W / FA - bracket guying is tensioned (Fig. 20).

D A N G E R : The crane operator must ensure that:
- the guy rods between the W - lattice jib and the FA - bracket are properly pinned and secured.
If this is not observed, there is a danger of accidents!

2.2.2.3 Installation FAB - support

The FAB - supports (3) are pinned and secured in transport position on the FA - bracket (1).

Description:
In crane operation, the FAB - supports hold the W / FA - bracket guying tensioned and at the same time, they serve as relapse support for the FA - bracket. The FAB - supports can be changed in length via the adjustment nut (3.1) (Fig. 22).

Installation
- Unpin the transport retaining pins (51) for the FAB - supports on the FA - bracket.
- Fold down the FAB - supports.
- The FAB - supports are placed down into the "rails" on the W - (L -) end section and guided in the rails when the W / FA - bracket guying is tensioned.

Note: The W / FA - bracket guying must be tensioned with the auxiliary winch before the FAB - support is pinned and tightened with the adjustment nut (3.1).

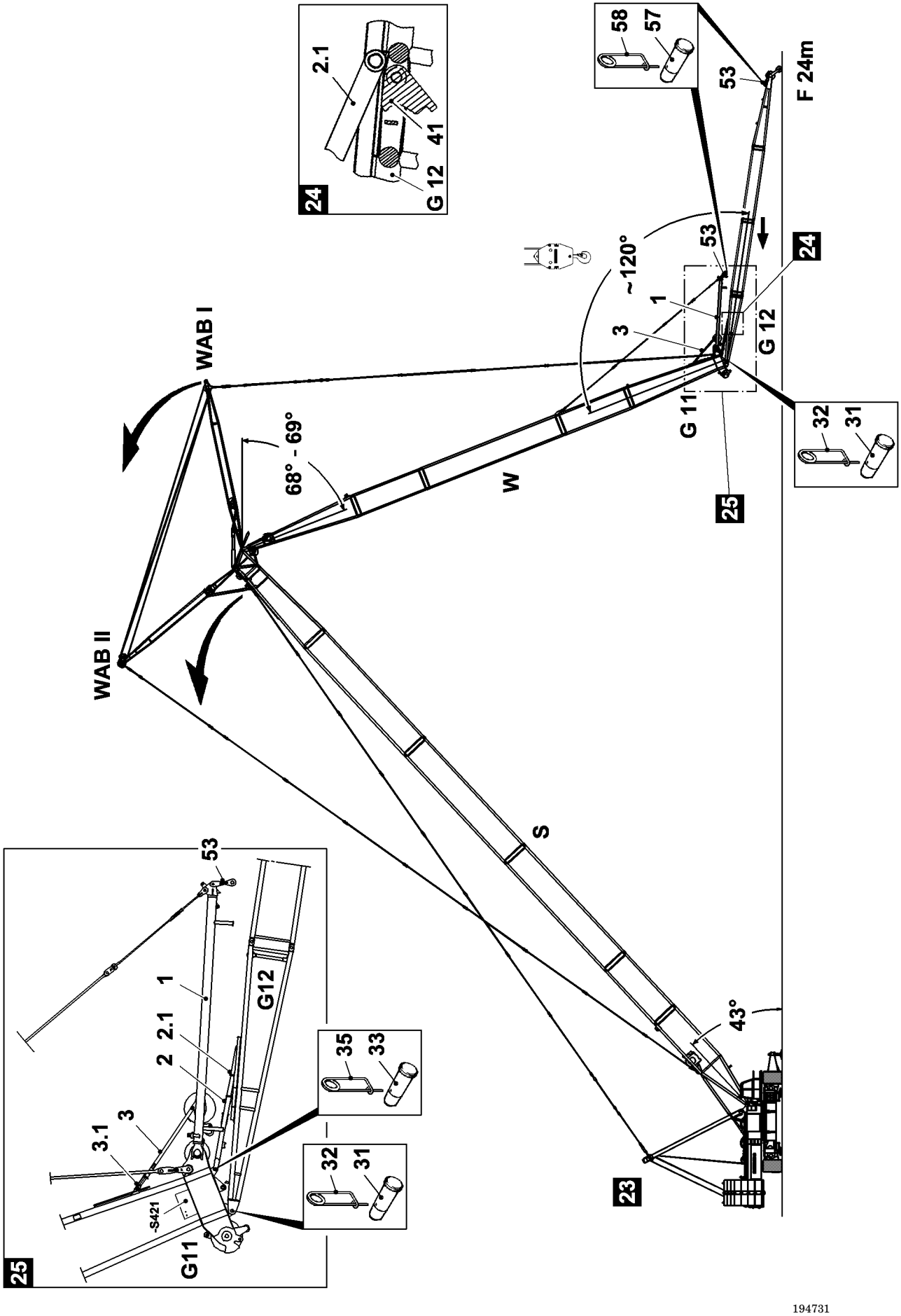
2.2.2.4 Tension the W / FA - bracket guying

- With the auxiliary crane, pull the FA - bracket forward until the W / FA - bracket guying is tensioned.
- Set the length of the FAB - support with the adjustment nut (3.1) in such a way that the bore of the FAB - support and the bore of the pin point on the W - (L -) end section align (Fig. 20 // Fig. 22).
- Insert the pin (38) and secure with the spring retainer (39) (Fig. 22).
- Tighten the adjustment nut (3.1) as far as possible so that the W / FA - bracket guying remains tensioned.
- Secure the adjustment nut (3.1). Use rod (47) and spring retainer (48) (Fig. 22).

D A N G E R : No one may remain in the danger zone, this is strictly prohibited.
If this is not observed, there is a danger of accidents!

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2.2.2.5 Installation of the auxiliary jib F

C A U T I O N : It is prohibited to assemble the lattice sections, the guy rods and the guy ropes in any other way than is noted in this chapter or the installation drawings!

Prerequisites:
- The SW - boom combination is completely installed.
- The FA - bracket (1) and FAB - supports (3) are installed on the W - end section (G11) (Fig. 25).
- The SW - boom combination is erected to the shown position (Fig. 23) (S 43° / W 68° - 69°).

Description:
Install the auxiliary jib F in the required combination / length by using an auxiliary crane near the crane. Erect the SW - boom combination to the shown position (Fig. 23) - main boom angle to the horizontal, 43° and W - lattice jib angle to the horizontal 68° - 69° -. For the boom combination S60 W42 F12 - F24, the auxiliary jib F is completely installed on the W (L) - end section of the SW - boom combination.

C A U T I O N : The flap (41) in the F - pivot section (G12) must be in position "down" (Fig. 23 // Fig. 24).

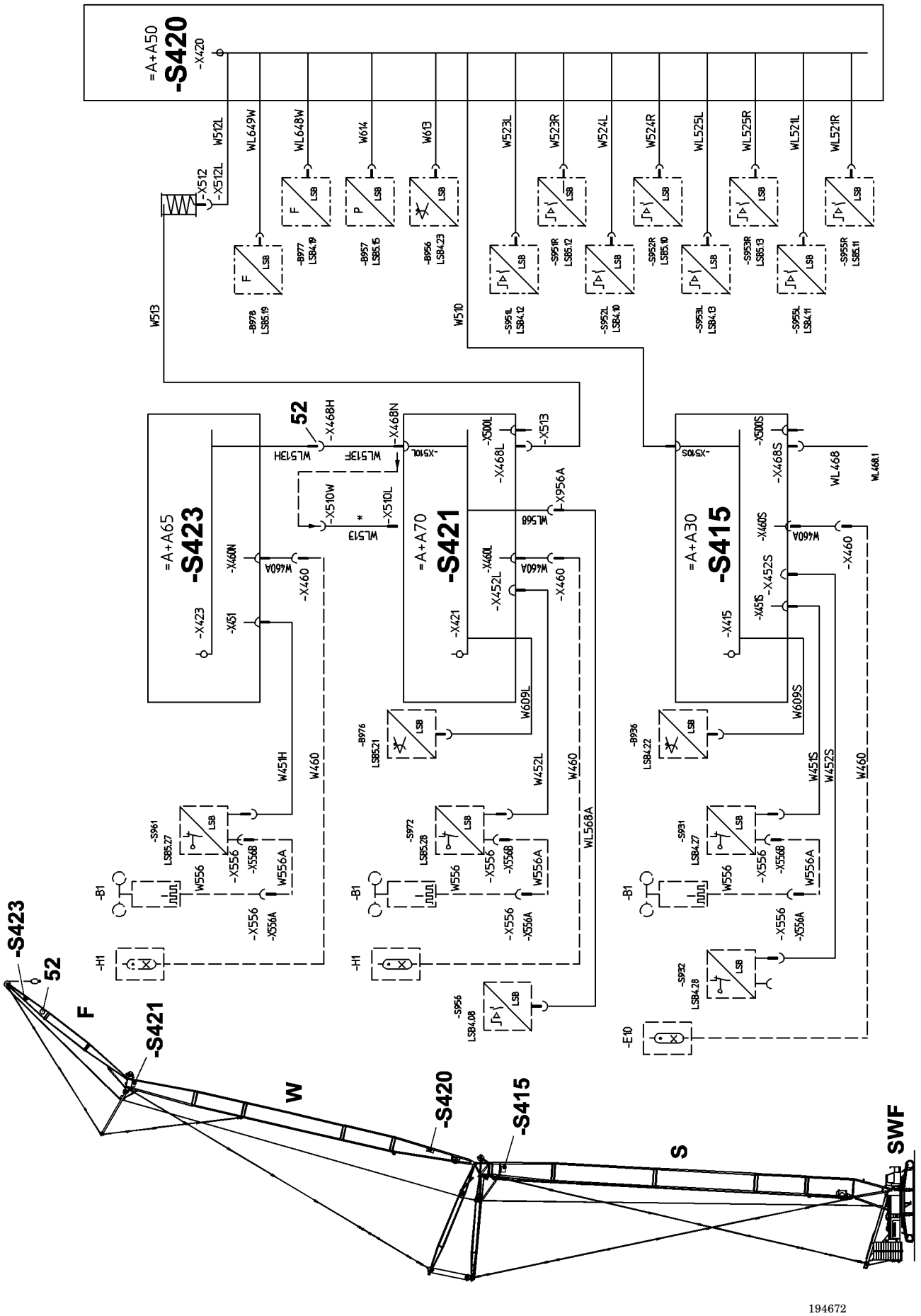
D A N G E R : The installation and pinning of the auxiliary jib F on the W - lattice jib must be made with the aid of a safe cherry picker or a scaffolding.
There is a danger of accidents due to falling!

Procedure:
- Place the F - pivot section (G12) on the ground.
- Install the F - intermediate sections (G13) or the intermediate section (G 14) on the F - pivot section, pin the pin (43) and secure with spring retainer (58).
- Connect the rope of the F - pivot section with the rope of the F - intermediate sections with a shackle (Fig. 16 // Fig. Y // arrow).
- Install the F - end section (G15) on the F - intermediate section (G13 or G14), pin with pin (43) and secure with spring retainer (58).
- Connect the rope of the F - intermediate sections with the rope of the F - end sections with a shackle (Fig. 16 // Fig. Y).
- With the manual winch in the F - end section, bring the flap (41) in the F - pivot section to position **"down"** (Fig. 24).
- Install the auxiliary jib F with the auxiliary crane on the W (L) - end section (G11), pin with pin (31) and secure with spring retainer (32) (Fig. 23 // Fig. 25).
- Pin the F - support (2) on the W (L) - end section (G11) by using pin (33) and secure with spring retainer (35) (Fig. 25).
- Pin and secure the guy ropes from the FA - bracket (1) to the F - end section (G15).

D A N G E R : After the F - support (2) is installed on the W (L) - end section (G11), the flap (41) in the F - pivot section (G12) m u s t be released again with the manual winch in the F - End section.
If this is not observed, there is a danger of accidents!

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2.3 Electrical connections

Note: The electrical connections from the S - end section (-S415) to the W - pivot section (-S420) and on to the W (L) - end section (-S421) are described in chapter **- 5.06**.

Description
Establish the electrical connections from the terminal box (-S423) to the terminal box (-S421).

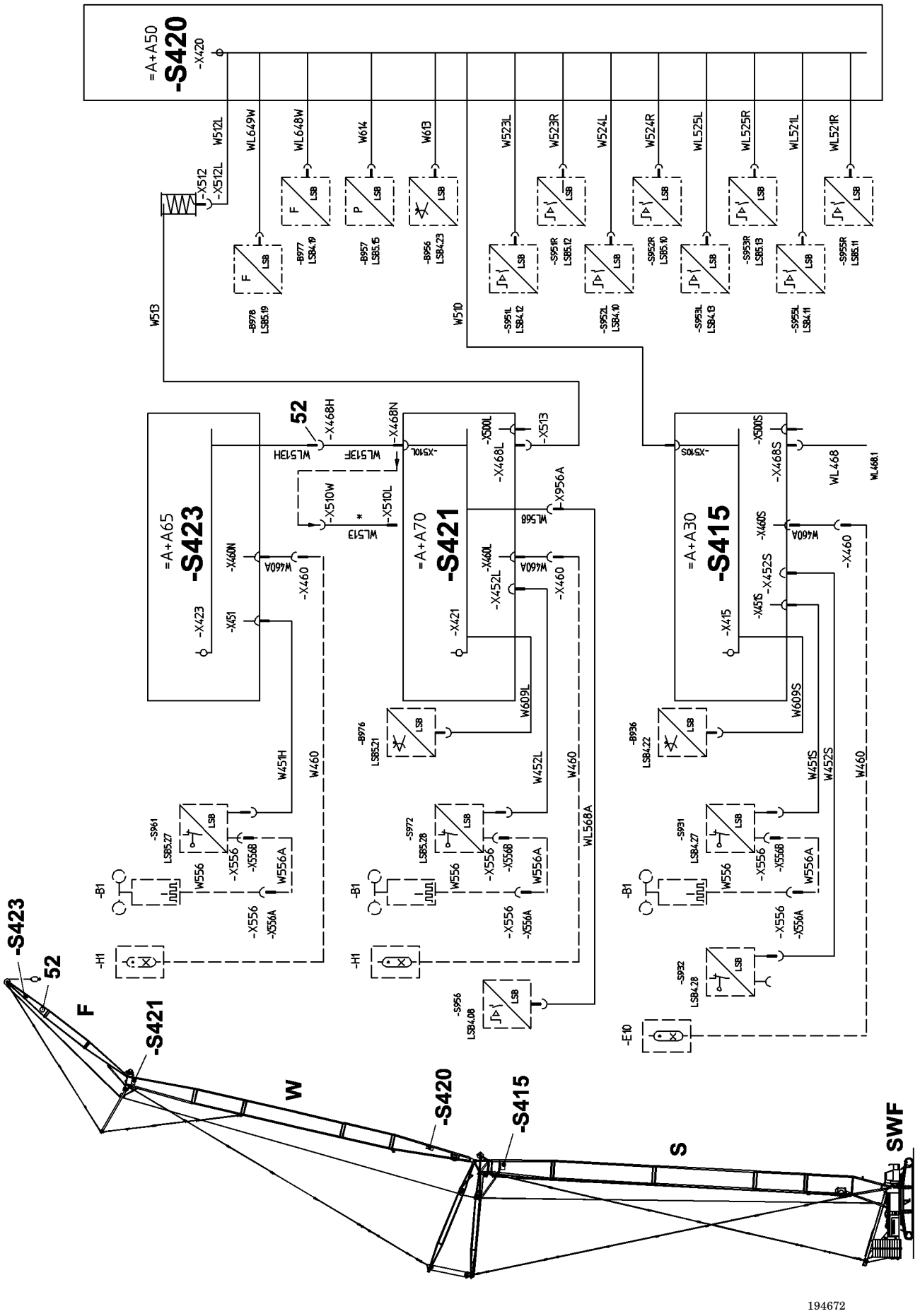
- Install the airplane warning light (-H1) and the wind speed sensor (-B1) on the F - end section.
- Establish the electrical connection from the terminal box (-S421) on the W - (L -) end section (G 11) to the terminal box (-S423) on the F - end section (G 15).
- Guide the line (WL 513F) with plug (-X468N) from the line drum (52) in the F - end section to the terminal box (-S421) in the W - (L -) end section and plug into socket (-X510L).
- Plug in the cable plug (-X468H) from the terminal box (-S423) into the line drum (52).

C A U T I O N : When establishing the electrical connection from the terminal box (-S423) to the terminal box (-S421), always establish first the connection from the line drum (52) to the W - (L -) end section.
Then establish the electrical connection from the terminal box (-S423) to the line drum (52).
If this is not observed, the electrical lines can be damaged!

- Plug the cable plug (W460A) into socket (-X460N) on the terminal box (-S423).
- Plug the cable plug (W 460) for the airplane warning light into socket (-X460) on the connector cable (W460A).
- Plug cable plug (W451H) into socket (-X451) on the terminal box (-S423).
- Plug cable plug (W451H) into the hoist limit switch (-S961).
- Plug in the connector cable (W556A) with cable plug (-X556B) into socket (-X556) on the hoist limit switch (-S961).
- Establish the electrical connection to the wind speed sensor (-B1).
- Plug the cable plug (-X556A) into socket (-X556) of the wind speed sensor (-B1).

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2.4 Function check

Prerequisite:
- All electrical connections have been made.
- The engine is running.
- The actuator levers of the limit switch have been checked for easy movement and have been lubricated with grease.

Airplane warning light
Turn on the airplane warning light, check visually for function.

Wind speed sensor
Check the wind speed sensor for easy movement and function.

Limit switch

C A U T I O N : The limit switch functions must be checked individually before operation. The manual procedure is carried out as described below. In the test system, the function of the individual limit switch initiators must be determined.

Hoist limit switch
Manually actuate the hoist limit switch.
The hoist winch must turn off in upward movement.
The hoist ”top” symbol on the LICCON indicator must blink.

Limit switch W - lattice jib, ”top”, relapse cylinder
- The W- control winch movement **”spool up”** must turn off.
- The symbol must appear on the LICCON monitor.

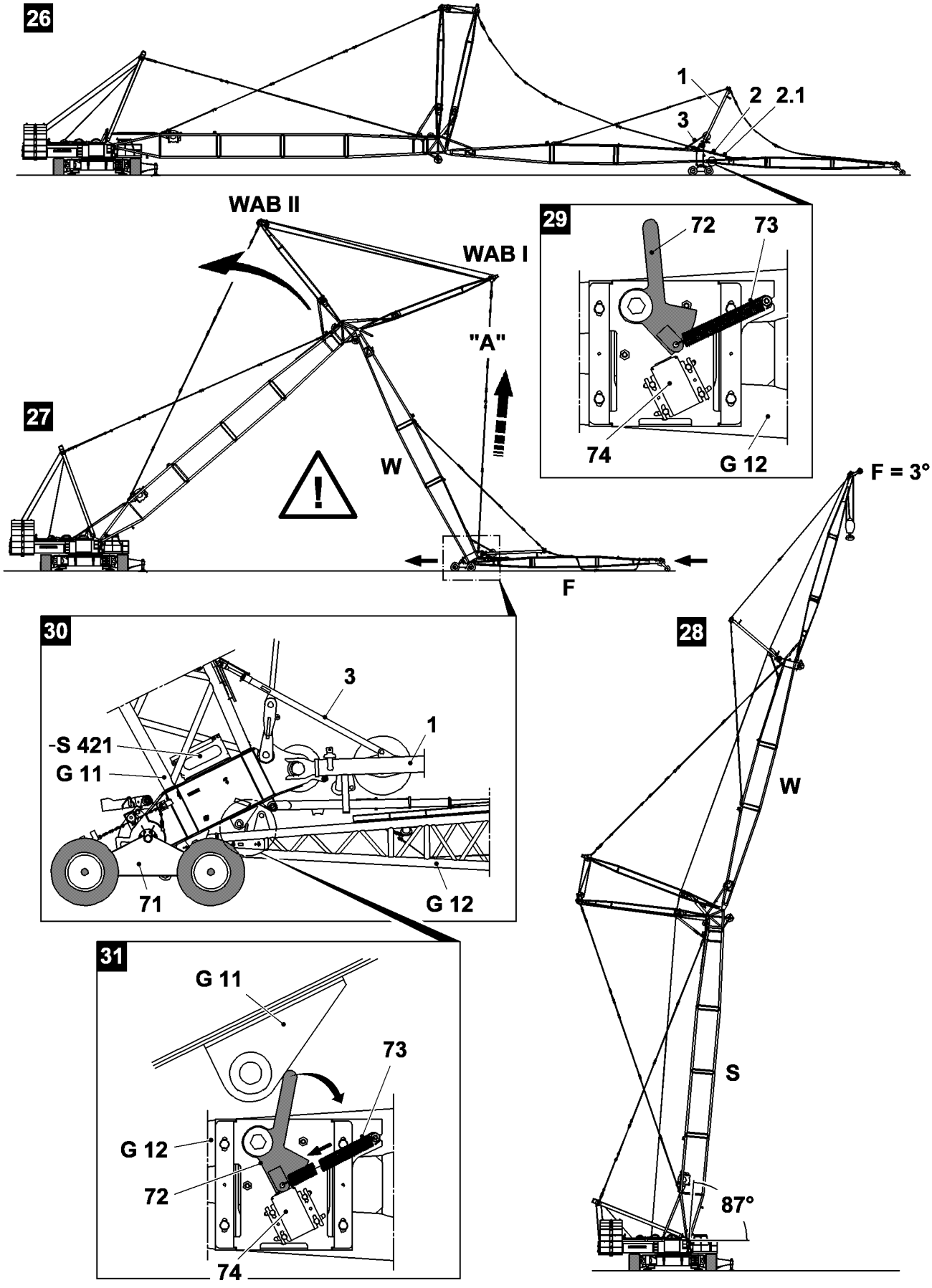
Limit switch W - lattice jib, ”bottom”
- The W- control winch movement **”spool out”** must turn off.
- The symbol must appear on the LICCON monitor.

Note: The switch point of the limit switch on the relapse cylinder must be checked before erection - **see chapter 8.12.**

Limit switch-flap in position and lattice jib, ”steepest” position, mechanical relapse support
- Cover the limit switch initiators individually with a metal plate.
- The W-control winch movement **”spool up”** must turn off.
- The symbol must appear on the LICCON monitor.

D A N G E R : Before erection, the pendulum of the mechanical relapse safety must be checked within the complete swing range of the pendulum. If this is not observed, the mechanical relapse support will not engage in the steepest lattice jib position. There is a danger of accidents, as the lattice jib can tip backward!

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2.5 Erection of the SWF - boom combination

2.5.1 Erection of boom combination - S48 W42 F12 to S54 W66 F36

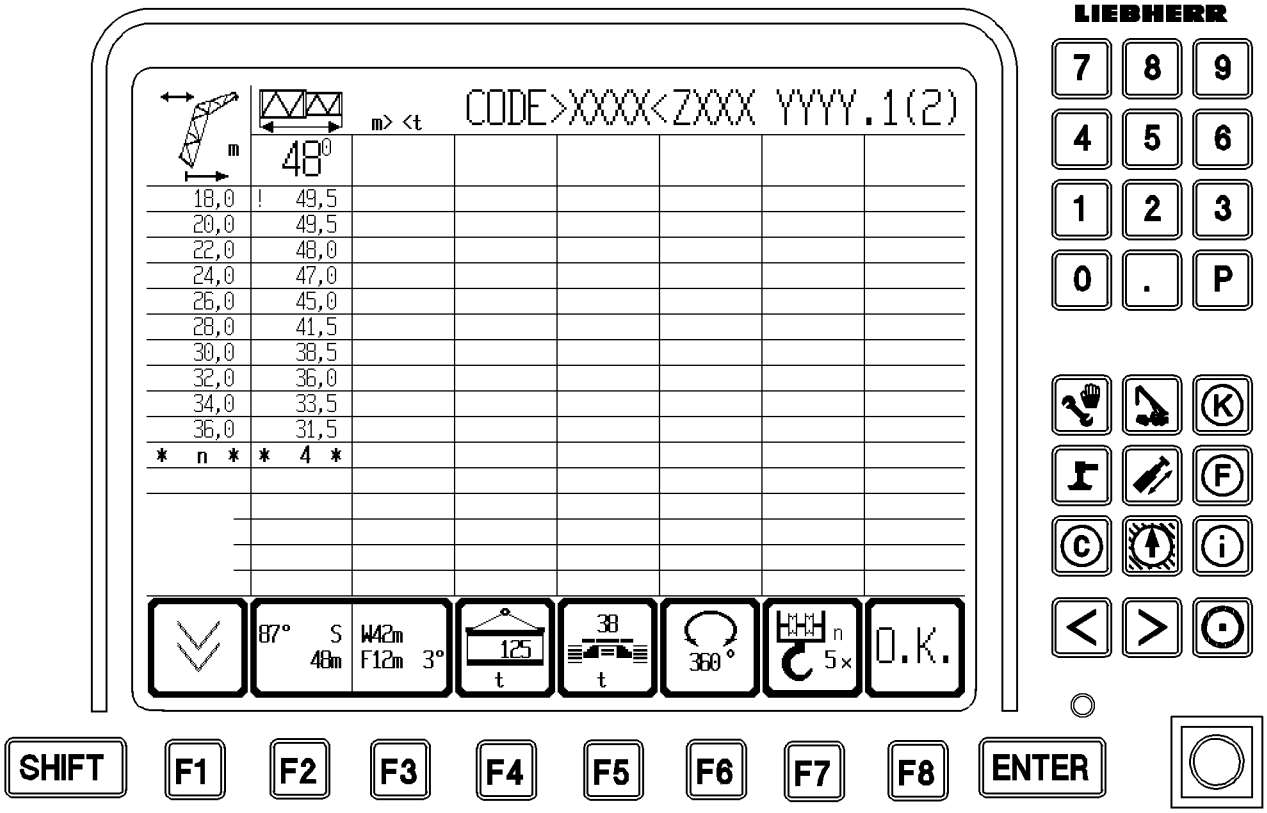
Description:
The SWF - boom combination **cannot** be erected in stretched condition. For that reason, the described procedure must be adhered to.

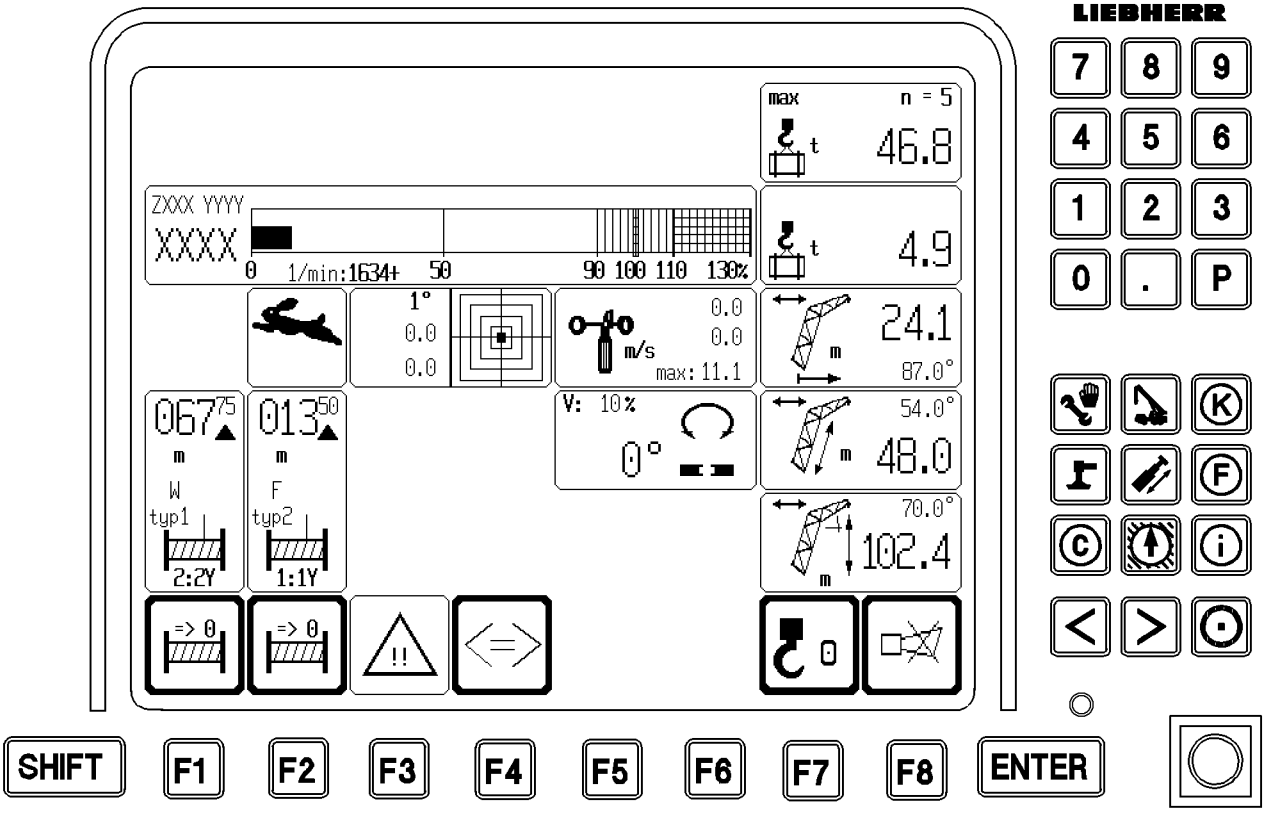
D A N G E R : The SWF - boom combinations may only be erected or taken down according to the erection and take down charts.
If this is not observed, the crane can be overloaded or tip over!

Prerequisite:
- The crane is aligned in horizontal direction.
- The SWF - boom combination is installed complete and placed on the ground via the auxiliary support (Fig. 26).
- The pulley cart is installed on the W (L) - end section (Fig. 26).
- The counterweight is installed on the slewing platform according to the load chart.
- The lattice jib - W is installed according to the load chart and the Operating manual.
- All limit switches are correctly installed and fully functioning.
- Before erection, the pendulum of the mechanical relapse safety must be checked for easy movement over the complete swing range of the pendulum.
- All pin connections are secured.
- The hoist cable is placed correctly into the cable pulleys and secured with the cable retaining pins to prevent it from jumping out (see Reeving plans)
- There are no persons within the danger zone.
- There are no loose parts on the boom and the lattice jib.
- In winter, the boom and the lattice jib and their components (limit switch, cable drum, airplane warning light, wind speed sensor, etc.) are free of ice and snow.

D AN G E R : Incorrectly or non-functioning limit switches as well as falling parts (pins, spring pins, ice, etc.) can cause accidents!
Before erection, the pendulum of the mechanical relapse safety must be checked within the complete swing range of the pendulum. If this is not observed, the mechanical relapse support will not engage in the steepest lattice jib position.
There is a danger of accidents, as the lattice jib can tip backward!

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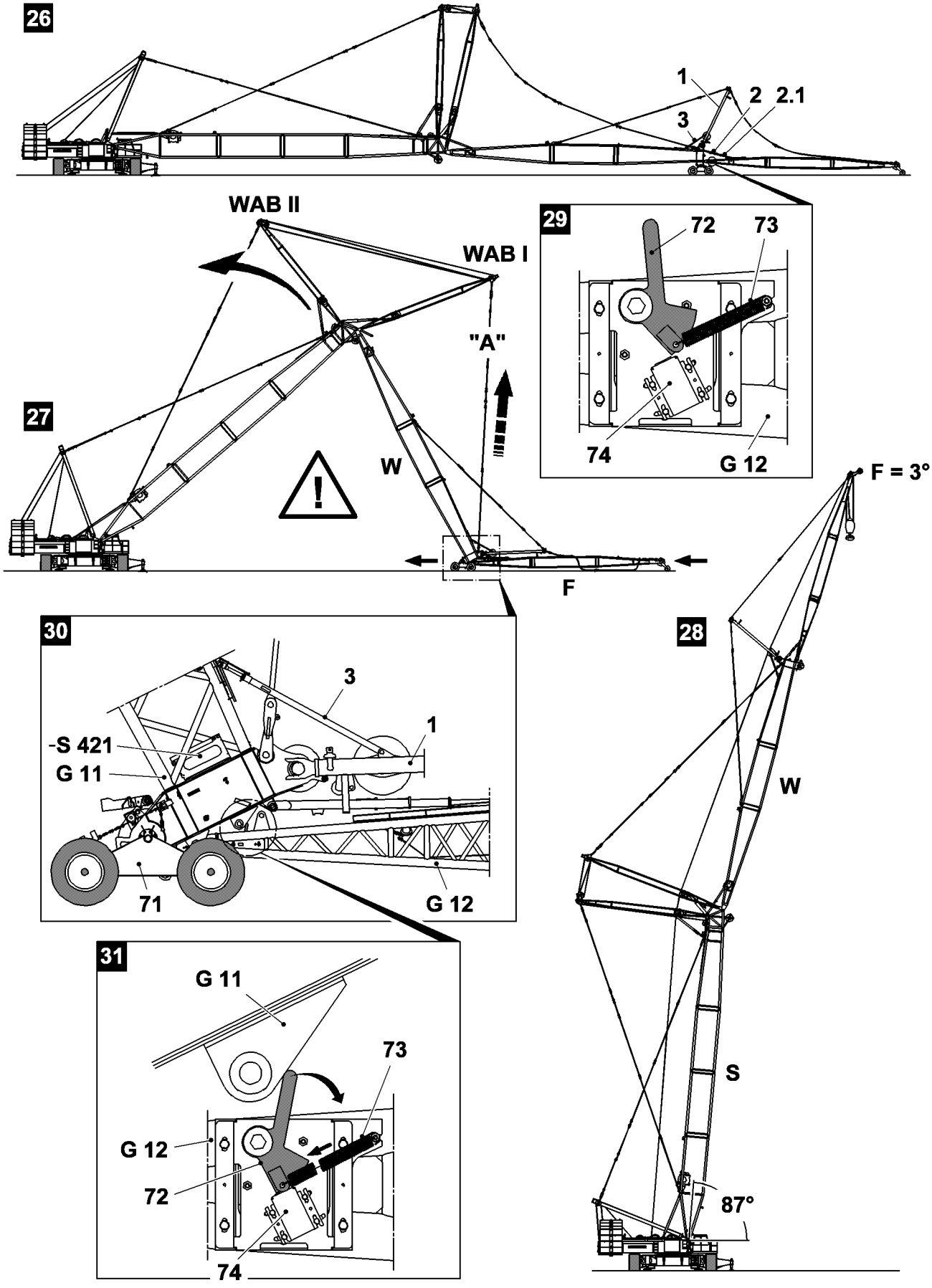
2.5.1.1 Erection procedure

Note: Carry out the erection procedure according to the erection and take down charts.

- The LICCON overload protection has been set according to the data in the load chart.
- Set the selector switch "Winch use" (73) according to the operating mode or the reeving (see chapter 4.05).
- The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
- The configuration status has been entered into the LICCON computer system.
- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.
- Attach the hoist rope on the F-end section.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

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2.5.1.2 Erection

Actuate the master switch 3 (MS3) and slowly luff up the main boom (Fig. 27).
At the same time, spool out the lattice jib control winch (winch V) with (MS1) to hold the lattice jib - W, with the W-end section, which is laying on the pulley cart, on the ground.

D A N G E R : **The lattice jib - W must roll with its complete weight with the pulley cart on the ground.**
When erecting the main boom, the lattice jib control winch must be lowered is such a way that the guy rods of guying "A" (Fig. 27) always hang through slightly.
Watch for slack cable formation on the control winch!
If this is not observed, the crane can be overloaded (F1max) or tip over!

Procedure:
- Luff up the main boom until the limit switch in the F - pivot section (G12) is actuated by the W (L) - end section (G11) (Fig. 31) and the warning signal can be heard (see chapter **4.04**)

D A N G E R : **When the acoustical warning signal (continuous bell sound) can be heard, then the smallest possible angle between the W (L) - end section and the F - pivot section is reached (Fig. 27 // Fig. 30)**

There is NO shut off of the luffing up movement!

The crane operator must stop the lufing up movement of the main boom immediately to prevent a collision between the W (L) - end section and the F - pivot section.

If this is not observed, the crane can be damaged!

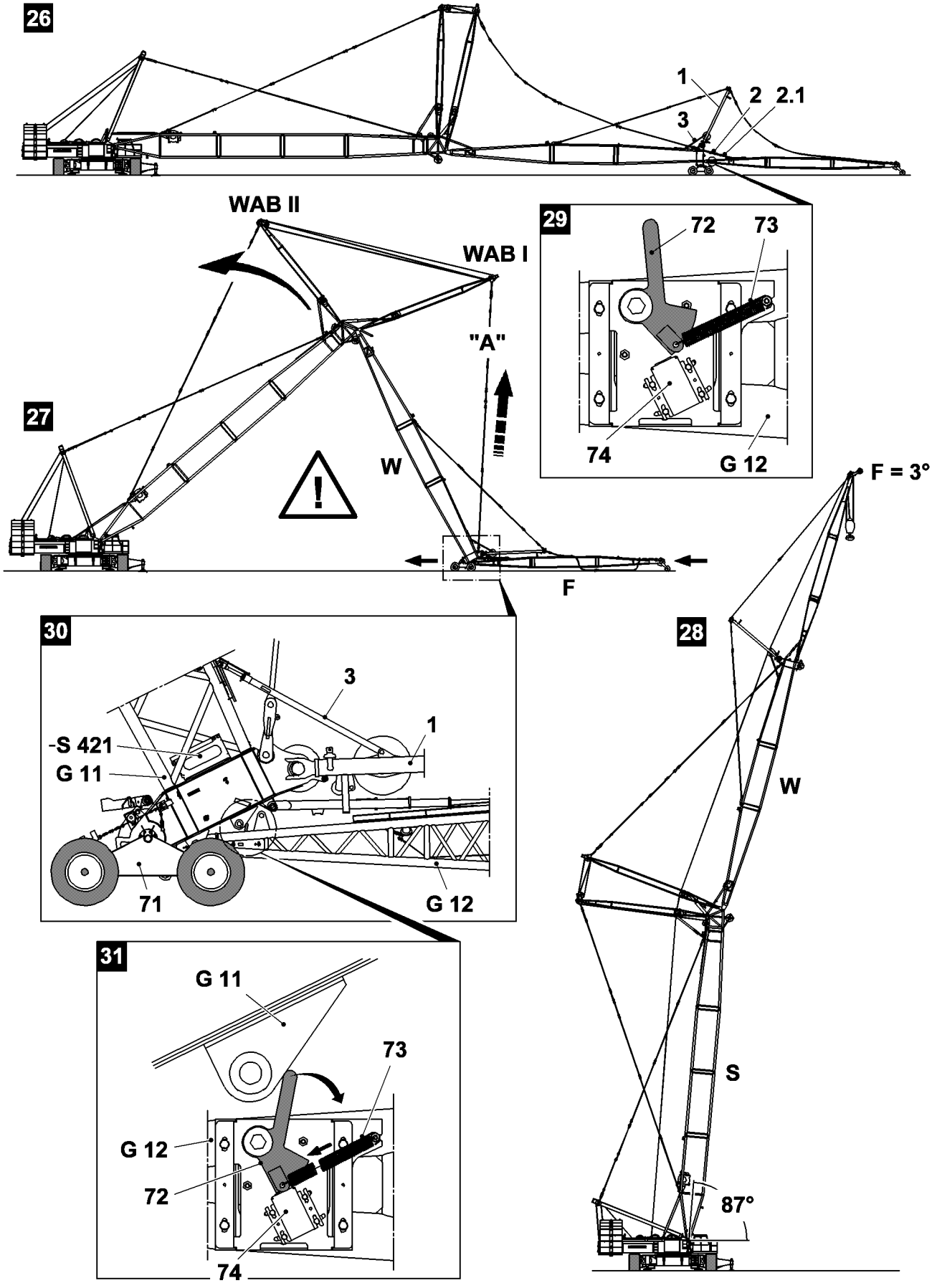
Note: **As soon as the acoustical warning signal sounds, the** LICCON monitor issues an error message - **"Block position W / F reached - Caution, no shut off, danger of accidents"**.

- Tension the guying from the WAB I to the W (L) - end section "A" with winch V (MS1) (Fig. 27).
- Remove the pulley cart (71) on the W-end section.
- Loosen the hoist cable on the F - end section and reeve between the pulley head on the end section and the hook block and secure on the fixed point (**see Reeving plans**).
- Attach the hoist limit switch weight.
- Luff up the main boom slowly to the steepest boom position of 87°.

D A NG E R : **Before luffing up the main boom, it must be ensured that:**
- the lattice jib W does not move further in direction of the crane during the luffing up movement.
- the luffing up procedure is monitored by a guide to prevent a collision between the W (L) - end section and the F - pivot section.
- the flap (41) in the F - pivot section is released as soon as the F- end section is lifted off the ground.

Note: Only after leaving the danger zone (Fig. 27 // Fig. 30) by luffing up the main boom or when no signal is applied on the limit switch (74) in the F - pivot section (G12) (Fig. 31), will the error message on the LICCON monitor and the acoustical warning signal (continuous bell sound) turn automatically off.

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2.5.1.3 Erection (continuation)

- When the main boom has reached the steepest operating position of 87°, then the lattice jib - W can also be luffed up to operating position.
- The auxiliary jib F is automatically tensioned, depending on the assembly of the guying and the assembly of the auxiliary jib F, at an angle of 3° or 25° to the lattice jib - W.

C A U T I O N : During the erection procedure, the hoist winch must be spooled out as soon as the lattice jib - W has reached an angle of approx. 0° to prevent a collision of the hook block with the F - end section.
If this is not observed, the crane can be damaged!

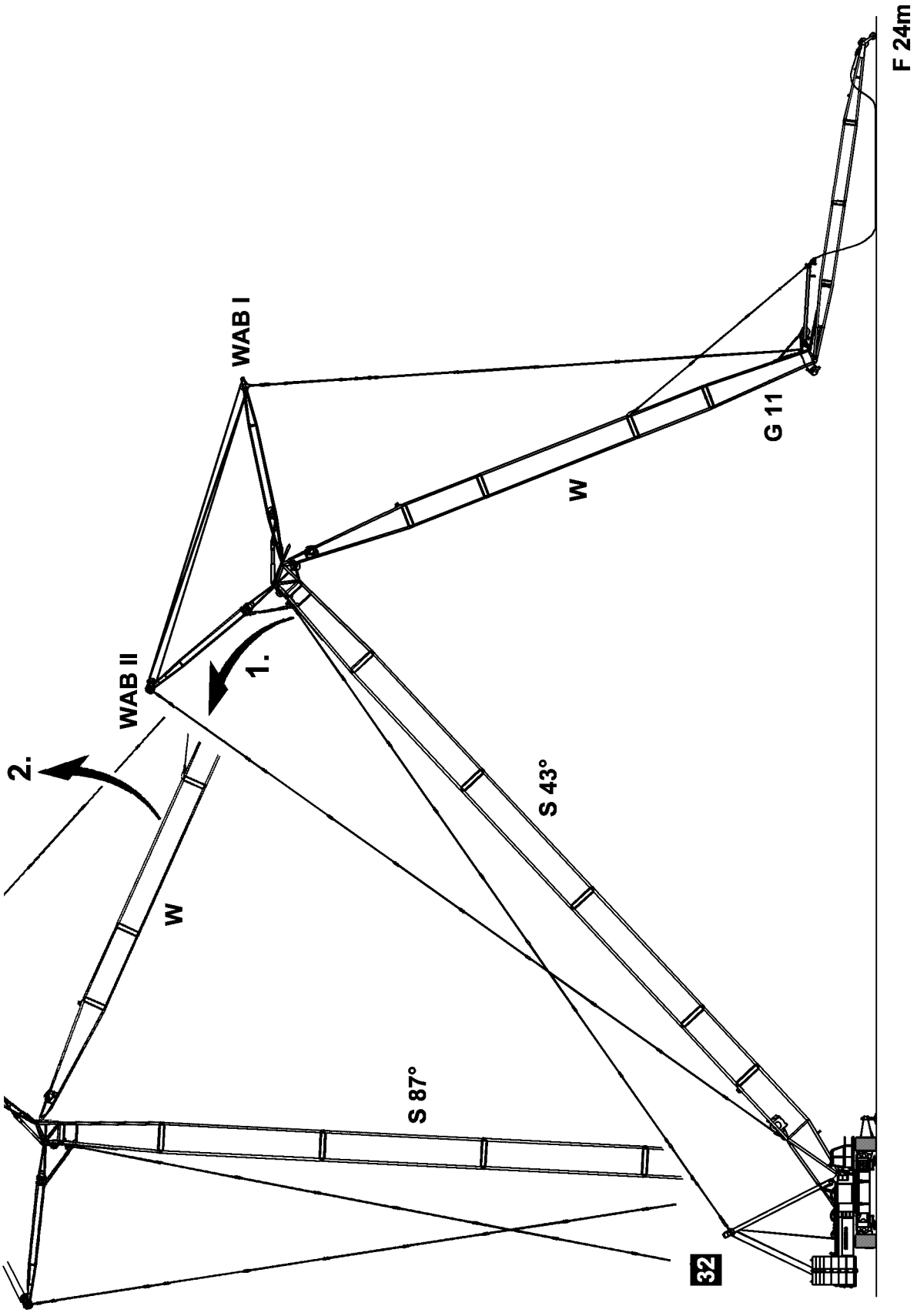
- Luff up the boom combination to the required operating position (Fig. 28).

Note: If a range is reached during erection which is monitored by the load chart, then the LICCON overload protection is activated.
The lowest operating position has been reached if the displays turn off and a load display – t – appears in the “MAX LOAD” icon instead of question marks (“? ? ? ?”).

D A NG E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
The set up key (D) bypasses the safety devices!
The radii given in the load capacity chart may not be exceeded nor fallen below, even without a load on the hook!
If this is not observed, the crane can tip over!

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2.5.2 Erection of boom combination - S60 W42 F12 - F24

G E F A H R : **The SWF - boom combinations may only be erected or taken down according to the erection and take down charts.**
If this is not observed, the crane can be overloaded or tip over!

Prerequisite:
- The crane is aligned in horizontal direction.
- The counterweight is installed on the slewing platform according to the load chart.
- The lattice jib - F is installed according to the load chart and the Operating manual.
- The FA bracket / F guying is installed properly and secured (fig. 32).
- All limit switches are correctly installed and fully functioning.
- Before erection, the pendulum of the mechanical relapse safety must be checked for easy movement over the complete swing range of the pendulum.
- All pin connections are secured.
- The hoist cable is placed correctly into the cable pulleys and secured with the cable retaining pins to prevent it from jumping out (see Reeving plans)
- There are no persons within the danger zone.
- There are no loose parts on the boom and the lattice jib.
- In winter, the boom and the lattice jib and their components (limit switch, cable drum, airplane warning light, wind speed sensor, etc.) are free of ice and snow.

D AN G E R : **Incorrectly or non-functioning limit switches as well as falling parts (pins, spring pins, ice, etc.) can cause accidents!**
Before erection, the pendulum of the mechanical relapse safety must be checked within the complete swing range of the pendulum. If this is not observed, the mechanical relapse support will not engage in the steepest lattice jib position.
There is a danger of accidents, as the lattice jib can tip backward!

2.5.2.1 Erection procedure

see 2.5.1.1

2.5.2.2 Erection

- Erect the main boom S into the steepest operating position (87°) (1. - Fig. 32).
- Erect the lattice jib W to the max. permissible operating position (2. - Fig. 32).
- The auxiliary jib F is automatically tensioned, depending on the assembly of the guying and the assembly of the auxiliary jib F, at an angle of 3° or 25° to the lattice jib - W.

C A U T I O N : **During the erection procedure, the hoist winch must be spooled out as soon as the lattice jib - W has reached an angle of approx. 0°, to prevent a collision between the hook block and the F - end section.**
If this is not observed, the crane can be damaged!

D A NG E R : **Danger of toppling or destroying the crane!**
If the overload protection is deactivated, there is no additional protection against crane overload!
The set up key (D) bypasses the safety devices!
The radii given in the load capacity chart may not be exceeded nor fallen below, even without a load on the hook!
If this is not observed, the crane can tip over!

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2.6 Crane operation

C A U T IO N : Observe the notes in

chapter 4.02, chapter 4.04, chapter 4.05 and chapter 4.08.

Prerequisite:
- The LICCON overload safety system is set according to the data in the load chart.

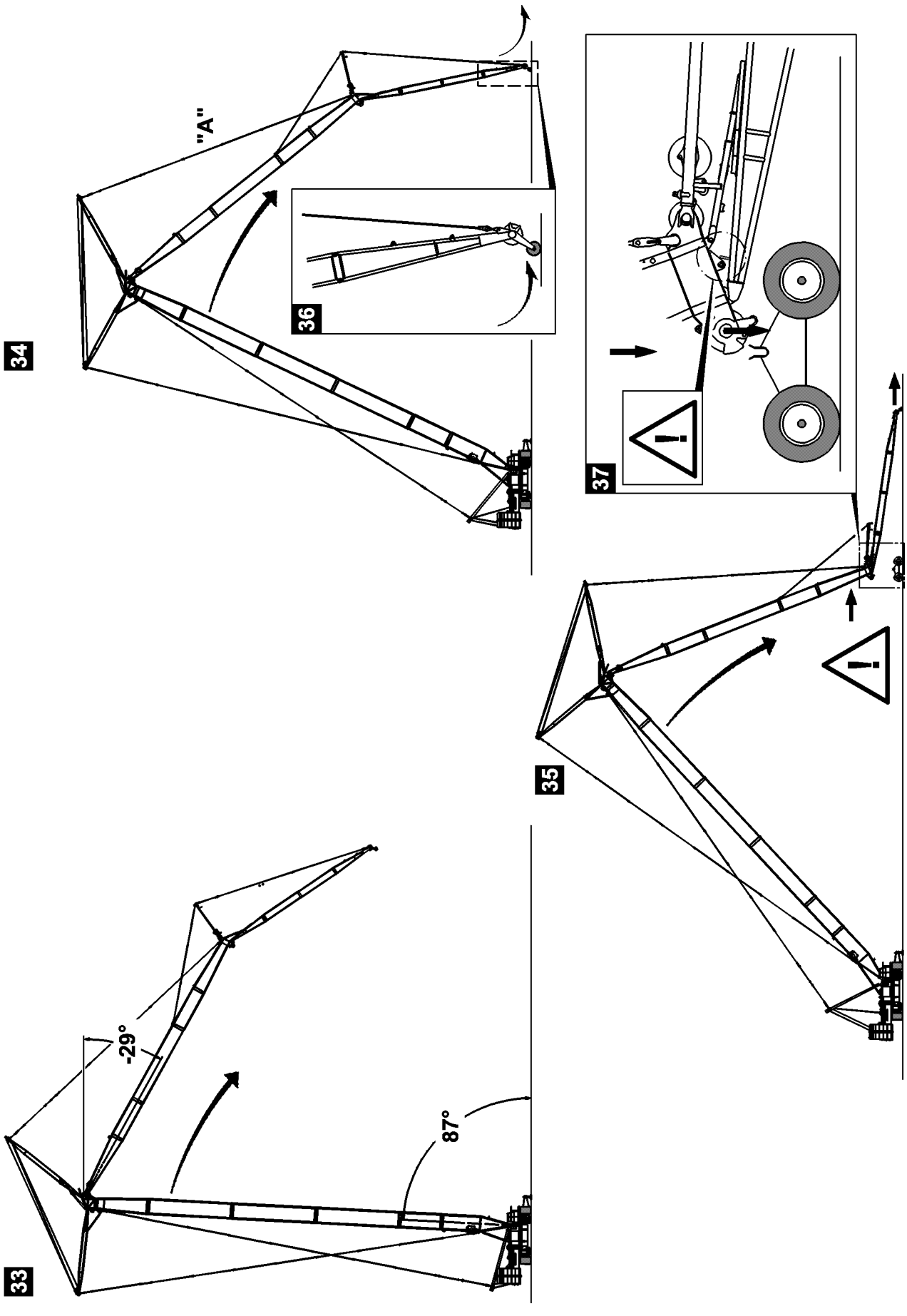
D A N G E R : Check the horizontal position of the crane before and during operation.
If the crane operator leaves the crane cab, even for only a short time, then before continuing to work he is obligated to check the operating mode setting and to reset it, if necessary.

Settings / Checks
- Check the function of the overload system by triggering the operating positions **”top”** and **”bottom”**.
- Check the function of the hoist limit switch **”top”** by running against the hoist limit switch weight.
- Check the function of the limit switch ”lattice jib steep”, by running on the relapse safety.

D A N G E R : The data in the load charts and in the erection and take down charts must be observed.
If this is not observed, there is a danger of accidents!

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2.7 Take down procedure / general

- The main boom S is in the steepest position, (87°).
- Actuate the master switch and luff down the W - lattice jib to -29° (Fig. 33).

C A U T I O N : When luffing down the lattice jib - W it must be ensured that the hook block does not collide with the end section!
The hook block may not be pulled along on the ground.

- Luff down the S- boom until the hook block touches the ground.
- Remove the hoist limit switch weight.
- Unreeve the hook block.

D A N G E R : When unreeving the hoist cable, make sure that there are no persons within the danger zone.

- Slowly continue to luff down the main boom S until the auxiliary jib F is just above the ground and the manual winch can be reached in the F - end section.

C A U T I O N : The flap (41) in the F - pivot section m u s t be brought with the manual winch in the F - end section into "bottom" position.
If this is not observed, the crane can be damaged!

- Continue to luff down the main boom S until the pulley of the F - end section is laying on the ground (Fig.34 // Fig. 36). Tension the W - guying to the W (L) - end section a little so that the auxiliary jib F can roll forward with the pulley on the F - end section - away from the crane (Fig.34 // Fig. 35). Continue to luff down the main boom S slowly and carefully until the limit switch (74) is actuated in the F - pivot section (Fig. 35 // Fig. 37). The warning signal (continuous bell sound) can be heard.

C A U T I O N : When the warning signal sounds, an error message appears on the LICCON monitor, but there is NO shut off of the luffing down movement.
The luffing down movement must be stopped immediately.
If this is not observed, the crane can be damaged!

Note: After reaching the lowest operating position on the main boom S, the luffing down movement is shut off.

C AU T I O N : When luffing down, the hoist winch must be spooled out at the same time to prevent a collision of the hook block with the pulley head on the F - end section.

- Actuate the keyed button "Installation" (133). The installation symbol on the LICCON indicator blinks.

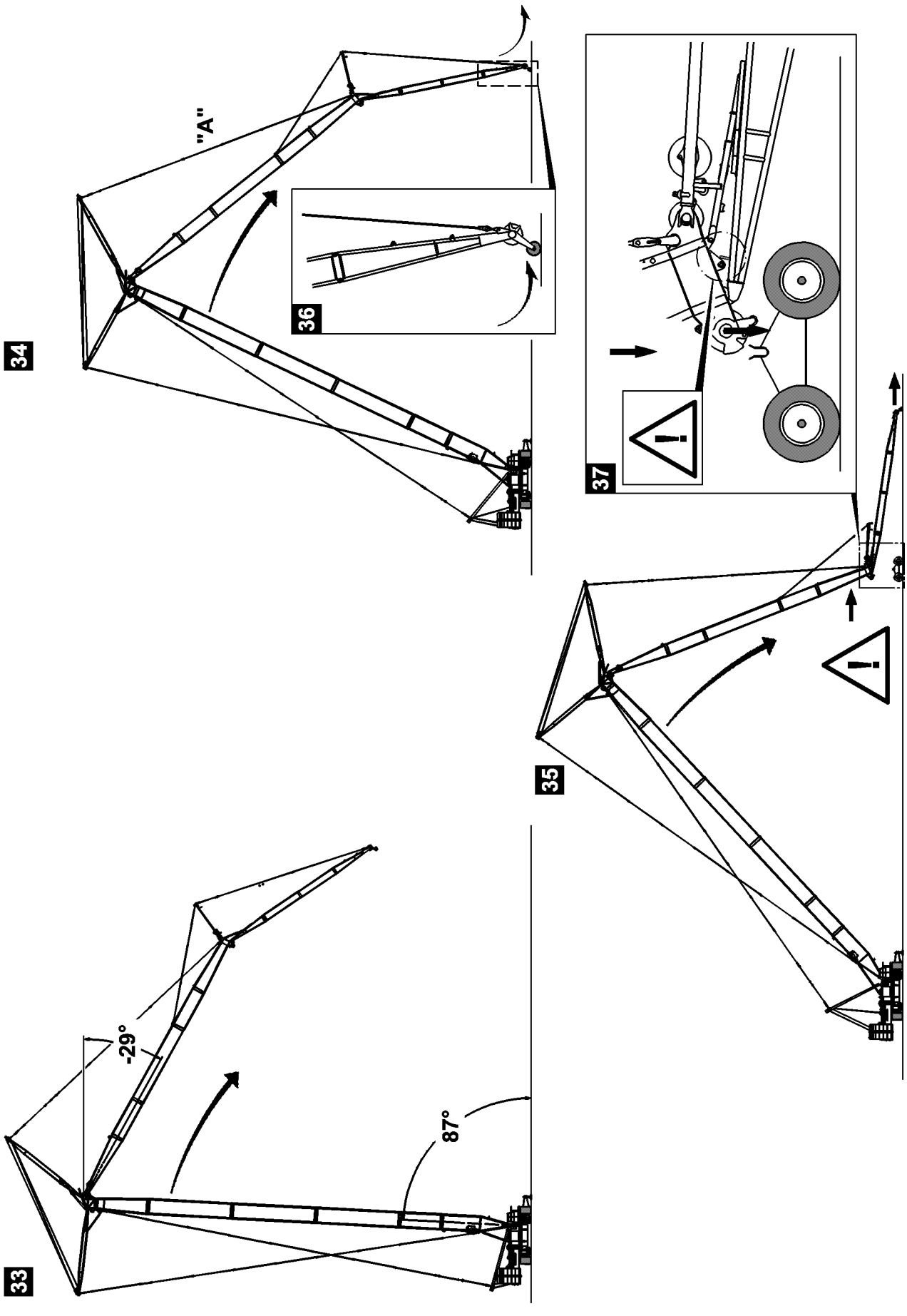
D A N G E R : The overload safety system is no longer effective.
The limit switch hoist ”top” is bypassed.

- The current configuration status corresponds to the data in the erection and take down charts and the respective load chart.
- The configuration status has been entered into the LICCON computer system.
- Press the set up key (D):
  The Assembly icon appears in the LICCON monitor.
  The LICCON overload protection is deactivated.

D A N G E R : Danger of toppling or destroying the crane!
If the overload protection is deactivated, there is no additional protection against crane overload!
Crane operation with deactivated overload protection is prohibited!

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2.7.1 Boom combination S60 W42 F12 - F24

Note: For boom combination **S60 W42 F12 - F24**, remove the auxiliary jib F in this position. Removal is in reverse order as installation.

D A N G E R : **The luffing down movement of the main boom S must be made slowly and with extreme care and caution and must be stopped immediately if the acoustical warning signal sounds.**
If this is not observed, there is a danger of accidents and the crane can be damaged!

2.7.2 Boom combination S48 W42 F12 to S54 W66 F36

Note: For boom combination **S48 W42 F12** to **S54 W66 F36**, the main boom S is luffed down until the end section of the lattice jib - W can be installed on the pulley cart (71).

C A U T I O N : **Observe the acoustical and optical warning signals.**
If this is not observed, the crane can be damaged.

When the W - lattice jib is laying on the pulley cart, the W-guying must be tensioned a little so that the pulley cart rolls to the front.

D A N G E R : **It must be ensured,as the main boom S is continued to be luffed down, that the lattice jib - W moves away from the crane, towards the front.**
If this is not observed, there is a danger of accidents and the crane can be damaged.

- Continue to luff down the main boom S all the way until the F - boom combination is stretched out on the ground.

D A N G E R : **The lattice jib must roll with its complete weight on the ground.**
Lower the lattice jib control in such a way that the guy rods always hang through slightly.
Watch for slack cable formation on the control winch!
If this is not observed, the crane will be overloaded or tip over!

- Remove the hoist cable.

D A N G E R : **When removing the hoist cable, make sure that there are no persons within the danger zone!**

Note: When the SWF - boom combination - **S48 W42 F12** to **S54 W66 F36 -** is laying completely on the ground, then the auxiliary jib F can be removed. Remove the auxiliary jib F in reverse order as the installation.