LIEBHERR

Crawler crane with lattice mast

LR 1400/2

LR 1400-2-001

Operating instructions

BAL-No.: 12496-03-02

Pages: 1454

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!

Liebherr-Werk Ehingen GmbH
Postfach 1361
D-89582 Ehingen / Donau
✆: +49 (0) 7391 502–0
Fax: +49 (0) 7391 502–3399
✉: info.lwe@liebherr.com
www.liebherr.com

Foreword

General

This crane was built according to the state of technology and recognized safety technical regulations. Despite that, dangers to body and life for the user and/or third persons or damage to the crane and/or other material assets can occur.
This crane may only be used in flawless technical condition and according to its mission as well as with constant awareness of safety and dangers. Any problems, which could affect safety must be fixed immediately.
Modifications on the crane may only be made with written approval by Liebherr-Werk Ehingen GmbH.

Warning notes

The terms **DANGER**, **WARNING**, **CAUTION** and **NOTICE** used in these operating instructions are intended to point out certain rules of conduct to all persons working with the crane.

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

Additional notes

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

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

Operating instructions

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

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

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

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

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

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

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

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

Destined use

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

Non-destined use

Non -destined use is:

– Working outside the permissible crane configurations according to the load chart.
– Working outside the permissible projection radii and slewing ranges according to the load chart.
– Selecting load values, which do not correspond to the actual crane configuration.
– Selecting LMB-Codes, which do not match the actual crane configuration.
– Working with bypassed load moment limiter or bypassed hoist limit switch.
– Increasing the projection radius of the lifted load after a LMB shut off, for example by diagonally pulling the load.
– Using the support pressure display as a safety function against tipping over.
– Using equipment or attachment parts which are not approved for the crane.
– Using the crane at sports and recreational events, especially for 'Bungee' jumps.
– Driving on a public road in non-permissible driving condition (axle load, dimension).
– Driving with the equipment in place in a non-permissible driving condition.
– Pushing, pulling or lifting loads with the leveling regulation, the sliding beams or the support cylinders.
– Pushing, pulling or lifting loads by actuating the slewing gear, the luffing gear or the telescoping gear.
– Ripping stuck objects loose with the crane.
– Utilizing the crane for a longer period of time for material handling tasks.
– Releasing the crane suddenly (grapple or dumping operation).
– Utilizing the crane when the weight of the load, which its suspended load on the crane, is changed, for example by filling a container suspended on the load hook.

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

– attaching a stuck load for which the weight and center of gravity are not known and which is released first, for example with a cutting torch
– letting persons drive along outside the driver's cab
– transporting personnel in the crane cab while driving
– transporting personnel with the lifting equipment and on the load
– transporting personnel with containers (cherry pickers), if no written approval of the corresponding job safety board has been issued
– transporting loads on the chassis
– two hook operation without auxiliary equipment
– extended material handling operation

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

Safety systems

Special attention must be paid to the safety equipment built into the crane. The functionality of the safety equipment must be monitored at all times. The crane may not be operated if the safety equipment is not working or not working correctly.

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

The crane had been built in accordance with the applicable crane operating and driving regulations and have been approved by the relevant authorities.

Attachment and spare parts

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

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

Definition of directional data

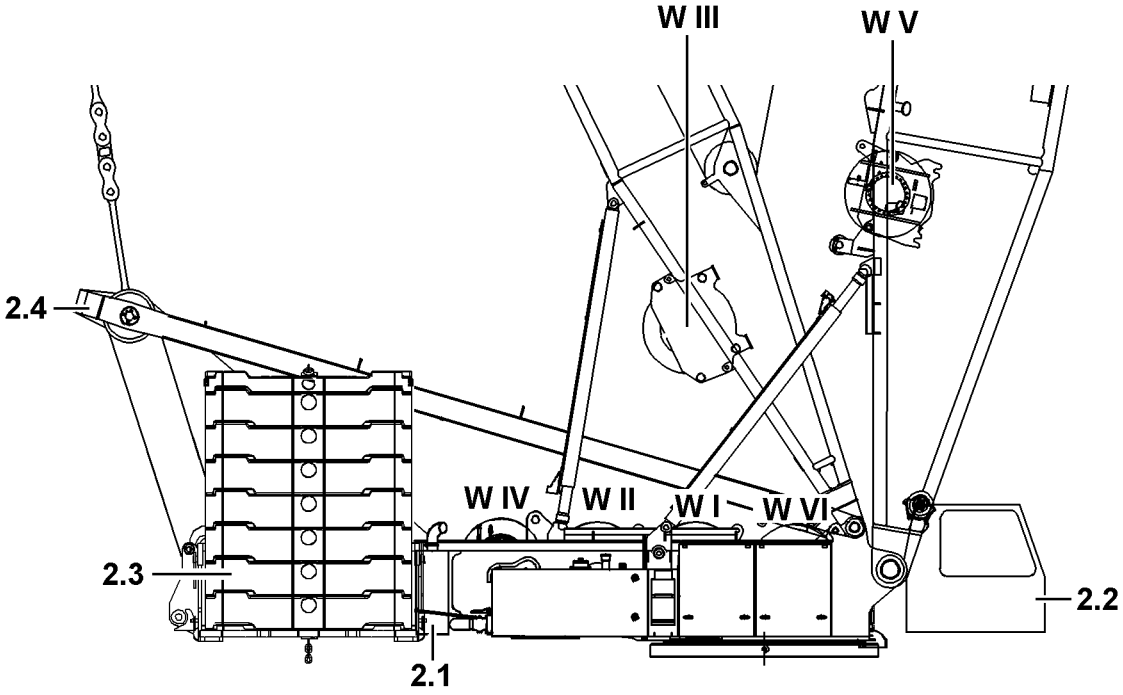
Forward driving means driving with the driver's cab on the front.
Reverse driving means driving with the tail lights of the chassis on the front.
Front, **rear**, **right**, **left** on the **crane** refer to the condition, that the driver's cab and the boom point in the same direction. Front is always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

Optional

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

Contents

1.00 Description of crane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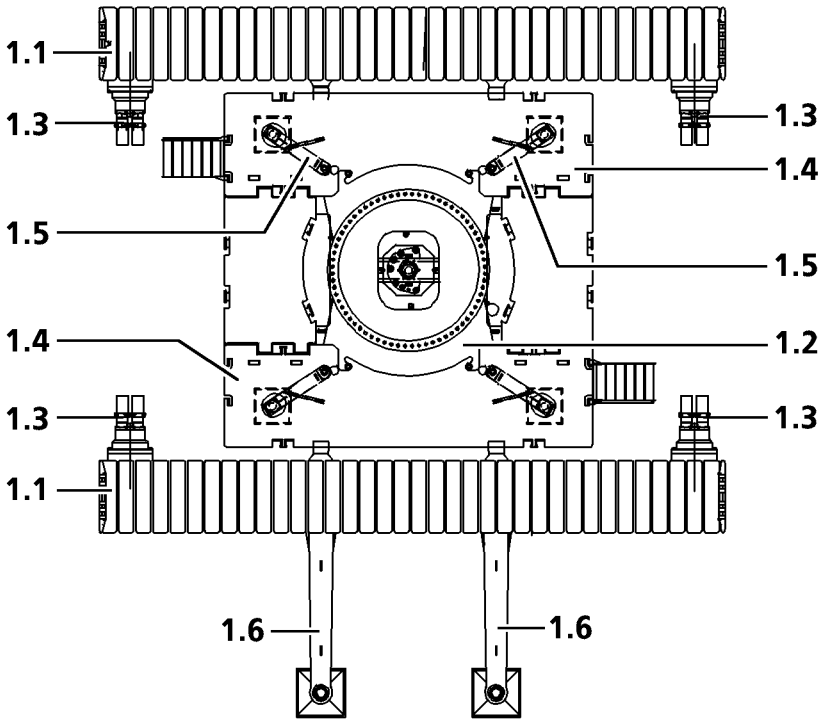
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1 Component overview

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1.3 Travel gear
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1.5 Hydraulic assembly supports
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2.1 Crane engine
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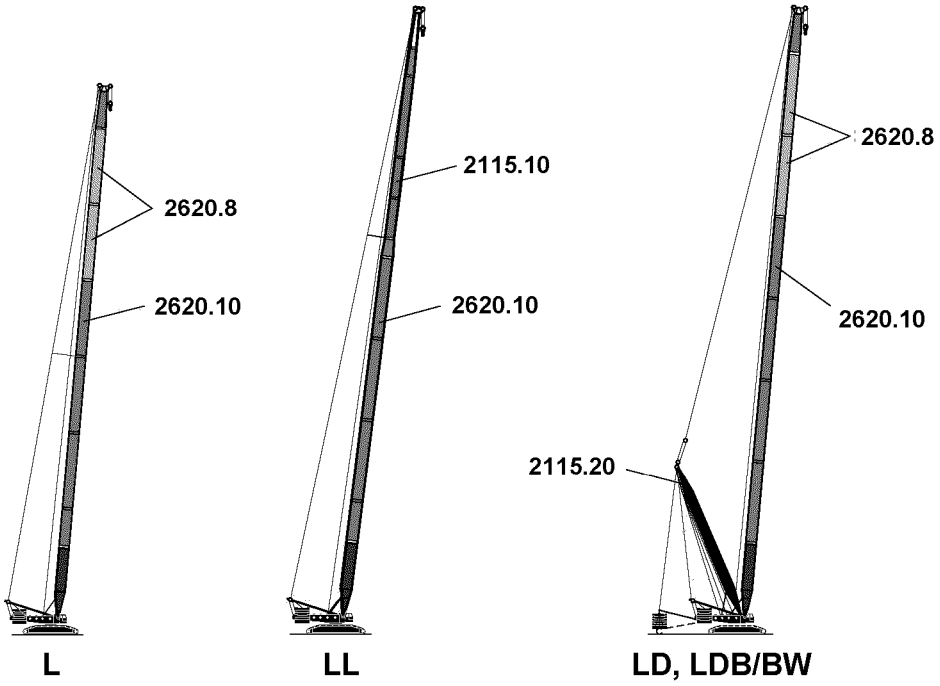
WI Winch 1
WII Winch 2
WIII Winch 3*
WIV Winch 4
WV Winch 5
WVI Winch 6*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LL
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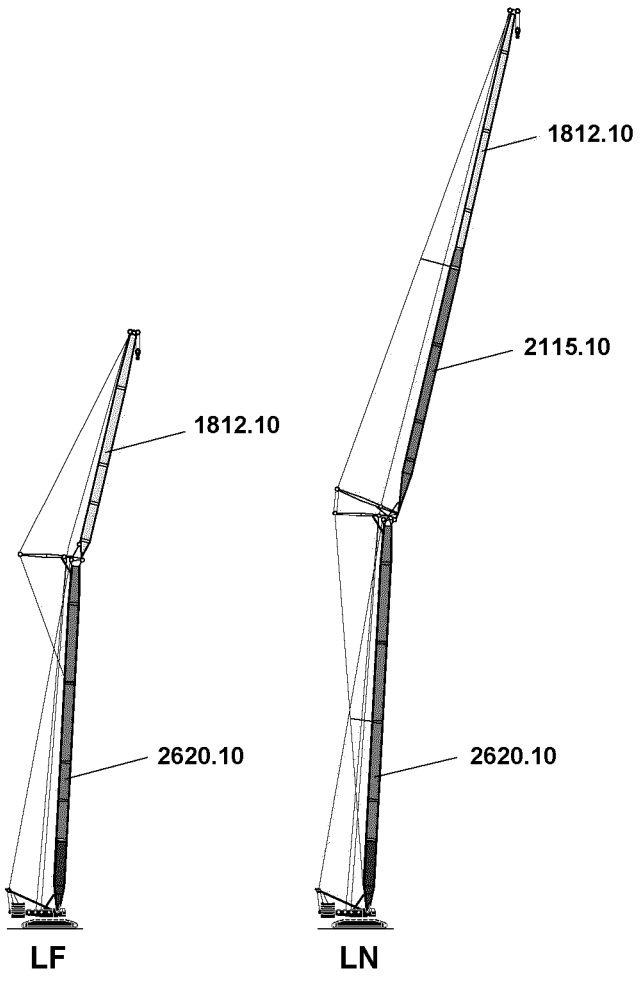
LD, LDB/BW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LN

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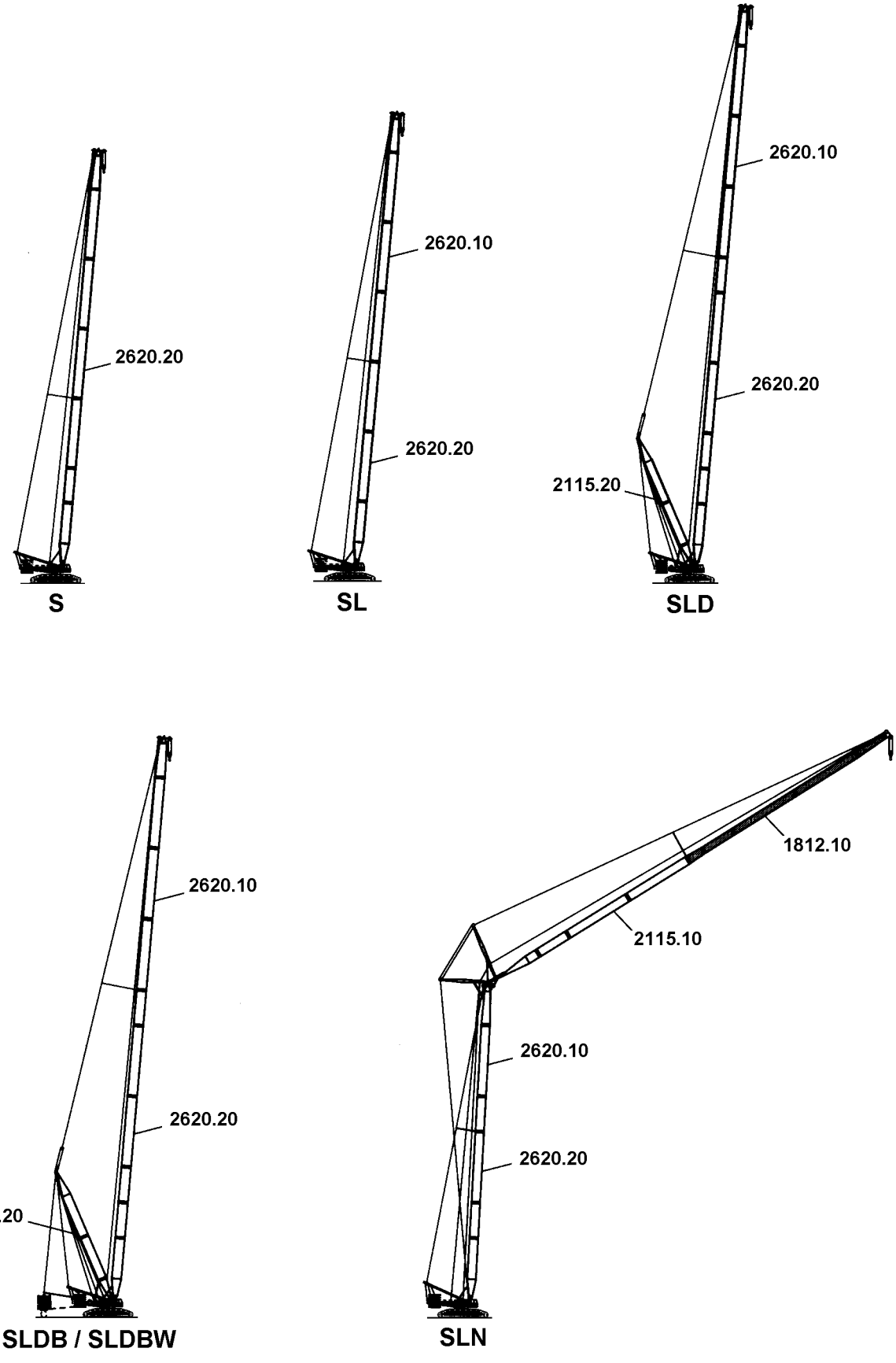
2 Boom systems

2.1 Abbreviations

L = Lattice boom, light
LL = Lattice boom, light L-version
N = Jib boom, light
F = Fixed jib
D = Derrick
B = Derrick ballast, suspended ballast
BW = Derrick ballast, ballast trailer

2.1.1 Boom combinations

Abbreviation	System lengths		
L	L	=	21.0 m - 98.0 m
LL	LL	=	49.0 m - 105.0 m
LD LDB LDBW	L D	= =	28.0 m - 105.0 m 21.0 m - 28.0 m
LN	L N	= =	21.0 m - 70.0 m 21.0 m - 91.0 m
LF	L F	= =	35.0 m - 70.0 m 10.5 m - 38.5 m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SLDB / SLDBW
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SLN

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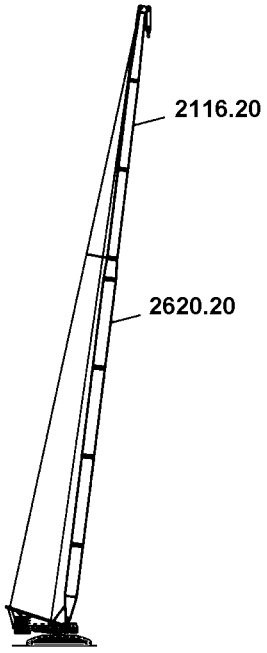
2.2 Abbreviations

S = Lattice boom, heavy
L = Lattice boom, light
N = Jib boom, light
D = Derrick
B = Derrick ballast, suspended ballast
BW = Derrick ballast, ballast trailer

2.2.1 Boom combinations

Abbreviation	System lengths		
S	S	=	21.0 m - 84.0 m
SL	SL	=	21.0 m - 91.0 m
SLD	SL	=	28.0 m - 112.0 m
	D	=	21.0 m - 28.0 m
SLN	SL	=	21.0 m - 70.0 m
	N	=	21.0 m - 91.0 m
SLDB SLDBW	SL	=	28.0 m - 112.0 m
	D	=	21.0 m - 28.0 m



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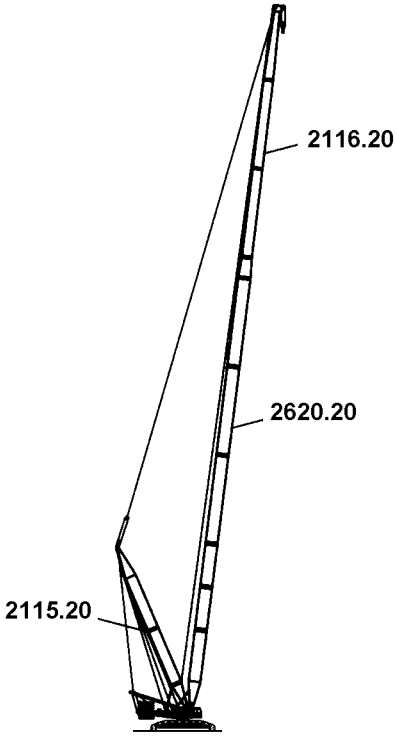

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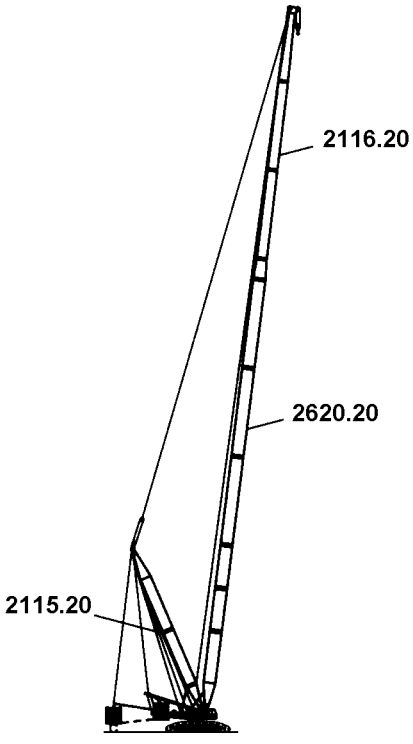
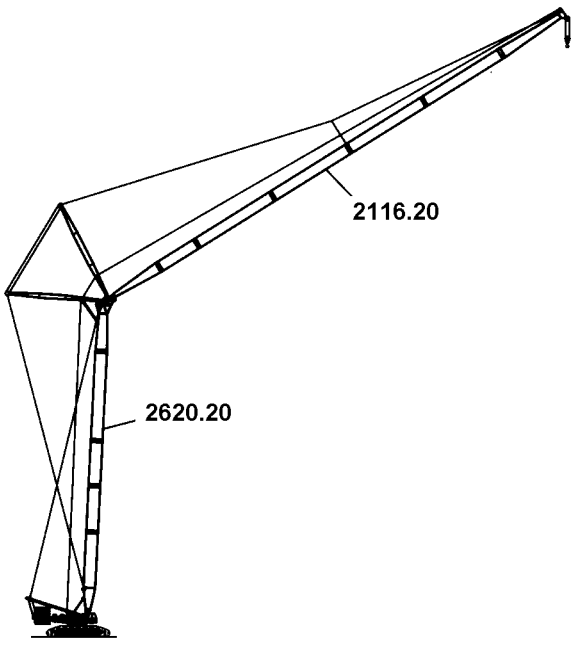


SwDB / SwDBW



SW

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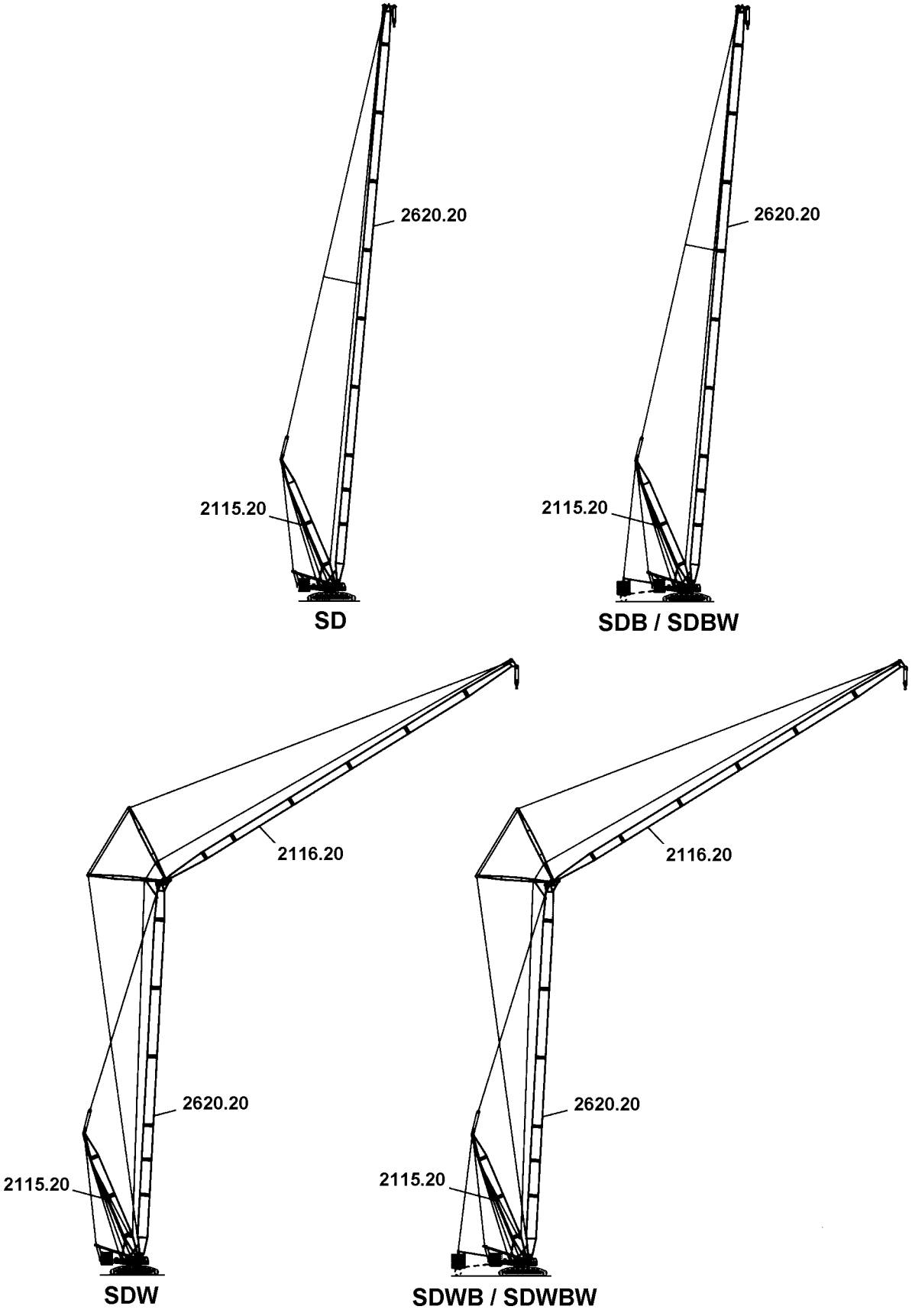
2.3 Abbreviations

S = Lattice boom, heavy
Sw = Lattice boom, mixed version
N = Jib boom, heavy
D = Derrick
B = Derrick ballast, suspended ballast
BW = Derrick ballast, ballast trailer

2.3.1 Boom combinations

Abbreviation	System lengths		
Sw	Sw	=	28.0 m - 98.0 m
SwD	Sw	=	35.0 m - 112.0 m
	D	=	21.0 m - 28.0 m
SwDB	Sw	=	35.0 m - 112.0 m
SwDBW	D	=	21.0 m - 28.0 m
SW	S	=	21.0 m - 56.0 m
	W	=	28.0 m - 91.0 m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SD
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2115.20
SDW
2116.20
2620.20
2115.20
SDWB / SDWBW

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2.4 Abbreviations

S = Lattice boom, heavy
W = Jib boom, heavy
D = Derrick
B = Derrick ballast, suspended ballast
BW = Derrick ballast, ballast trailer

2.4.1 Boom combinations

Abbreviation	System lengths		
SD	S	=	28.0 m - 119.0 m
	D	=	21.0 m - 28.0 m
SDB	S	=	28.0 m - 119.0 m
SDBW	D	=	21.0 m - 28.0 m
SDW	S	=	35.0 m - 84.0 m
	D	=	21.0 m - 28.0 m
	W		28.0 m - 91.0 m
SDWB	S	=	35.0 m - 84.0 m
SDWBW	D	=	21.0 m - 28.0 m
	W		28.0 m - 91.0 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 by the crane itself.

1.2 Tracks

Maintenance free, dirt protected crawler track with flat track pads.
Pad width: 1.2 m
Track width: 7.5 m

1.3 Drive

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

1.4 Travel power

Stepless speed from 0 km/h to 1.8 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, manufactured by Liebherr, model D 9406 TI-E A3, water-cooled.
Performance: 300 KW at 1900 rpm
Maximum torque: 1710 Nm at 1400 rpm

2.3 Crane drive

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

2.4 Crane control

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

2.5 Winches

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

2.6 Slewing gear

Hydraulically driven via axial piston pumps and planetary gears.
Disk brakes spring loaded and hydraulically vented.
Slewing speed steplessly regulated from 0 rpm to 1.2 rpm.

2.7 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.

2.8 Counterweight

155.0 t, consists of: One base plate and counterweight plates at 10.0 t.

2.9 Safety devices

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

2.10 Electrical system

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

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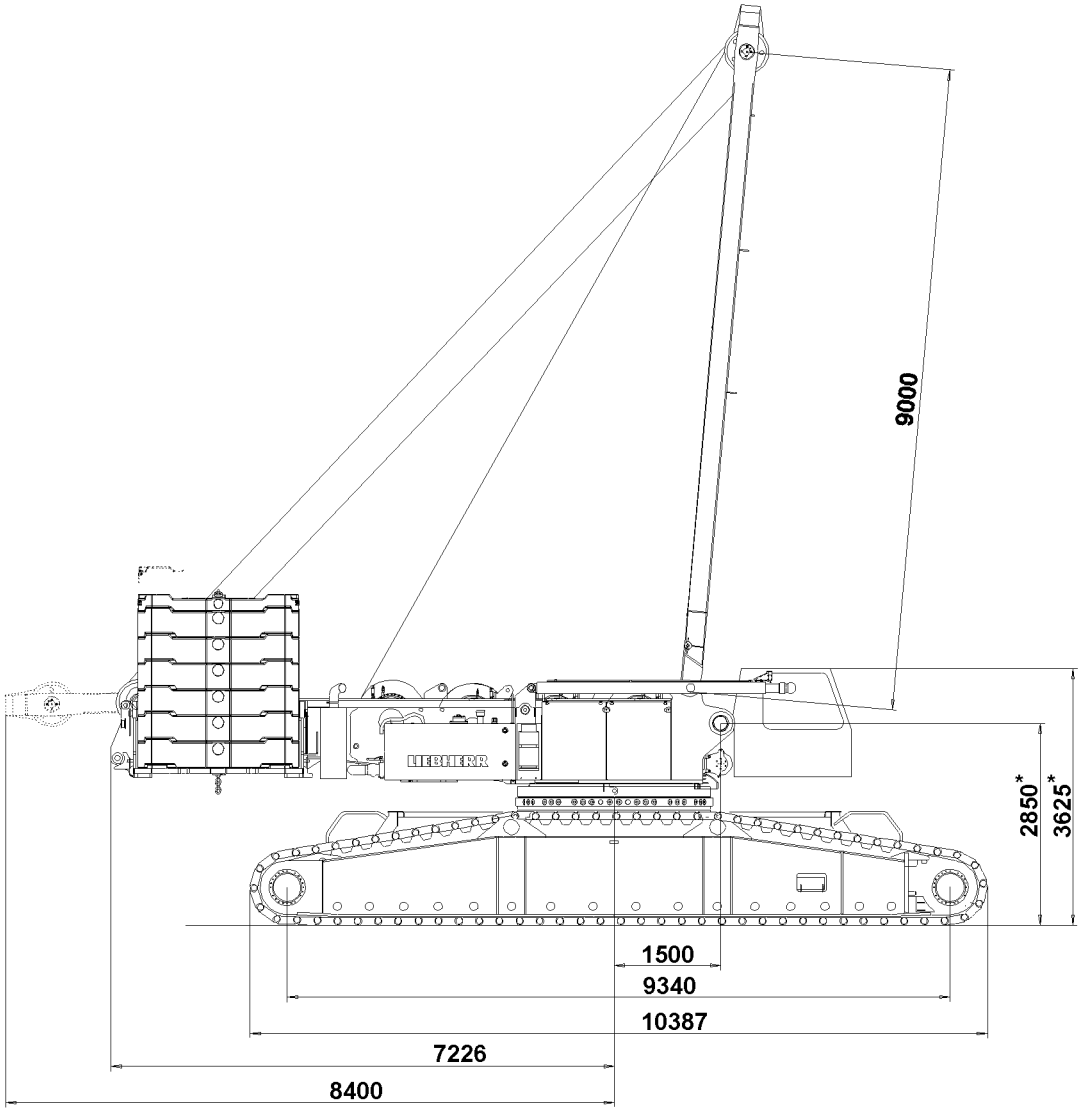
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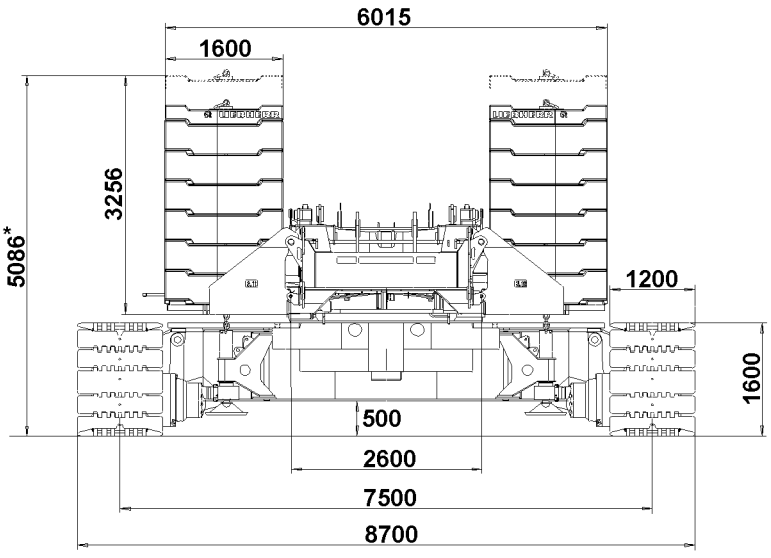
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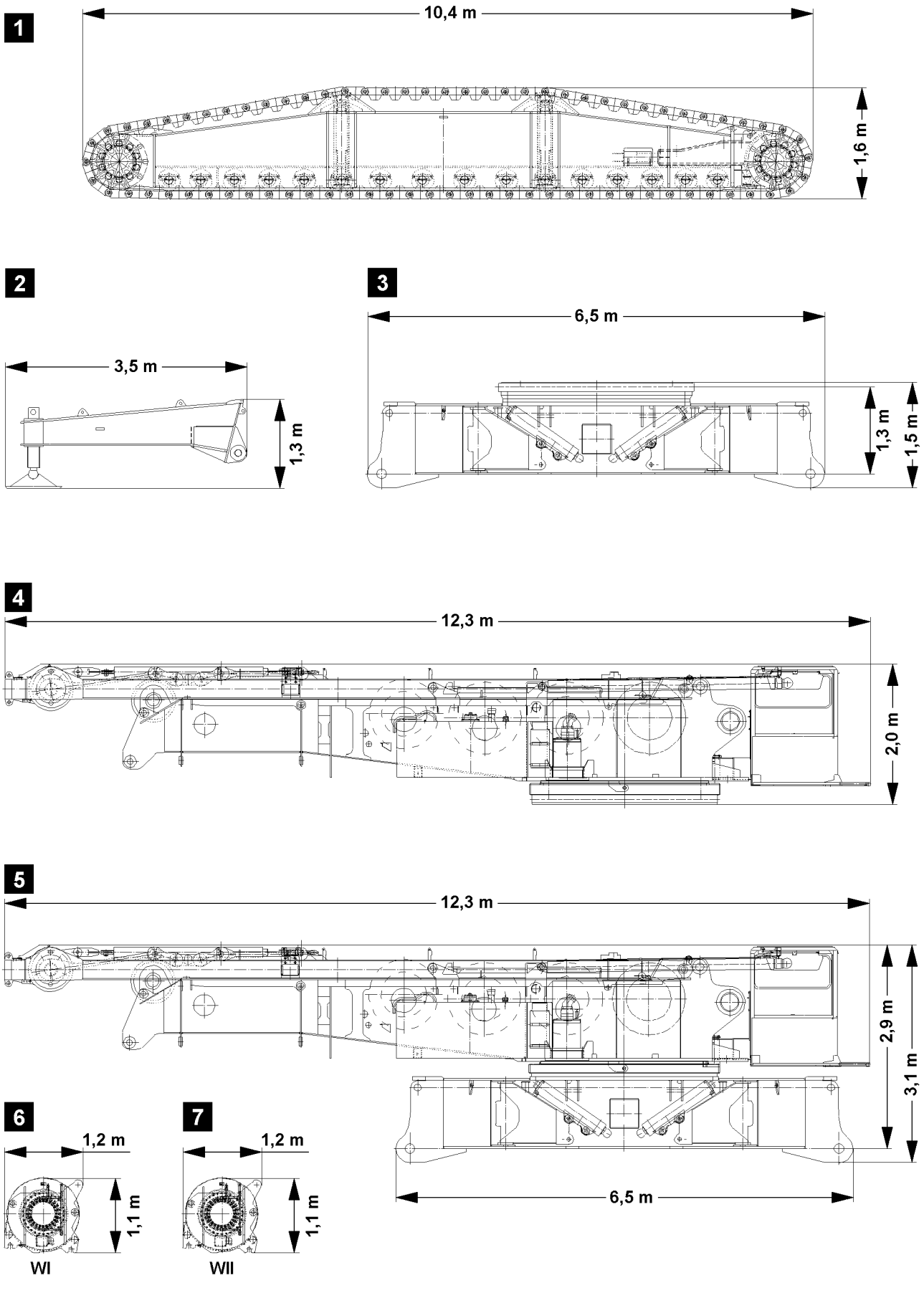
1 Dimensions and weights

1.1 Transport weights

Note
▶ Crawler travel gear with superstructure, see adjoining illustrations!

With Quick Connection*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12,3 m
2,9 m
3,1 m
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6
1,2 m
1,1 m
WI
7
1,2 m
1,1 m
WII

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1.2 Crawler carrier

See illustration **1**.

Crawler carrier	Weight	Width
1 Travel drive	25.2 t	1.6 m
2 Travel drives	27.7 t	1.6 m

1.3 Mechanical auxiliary support

See illustration **2**.

Weight	Width
1.3 t	0.8 m

1.4 Crawler center section

See illustration **3**.

Weight	Width
17.5 t	3.0 m

1.5 Turntable

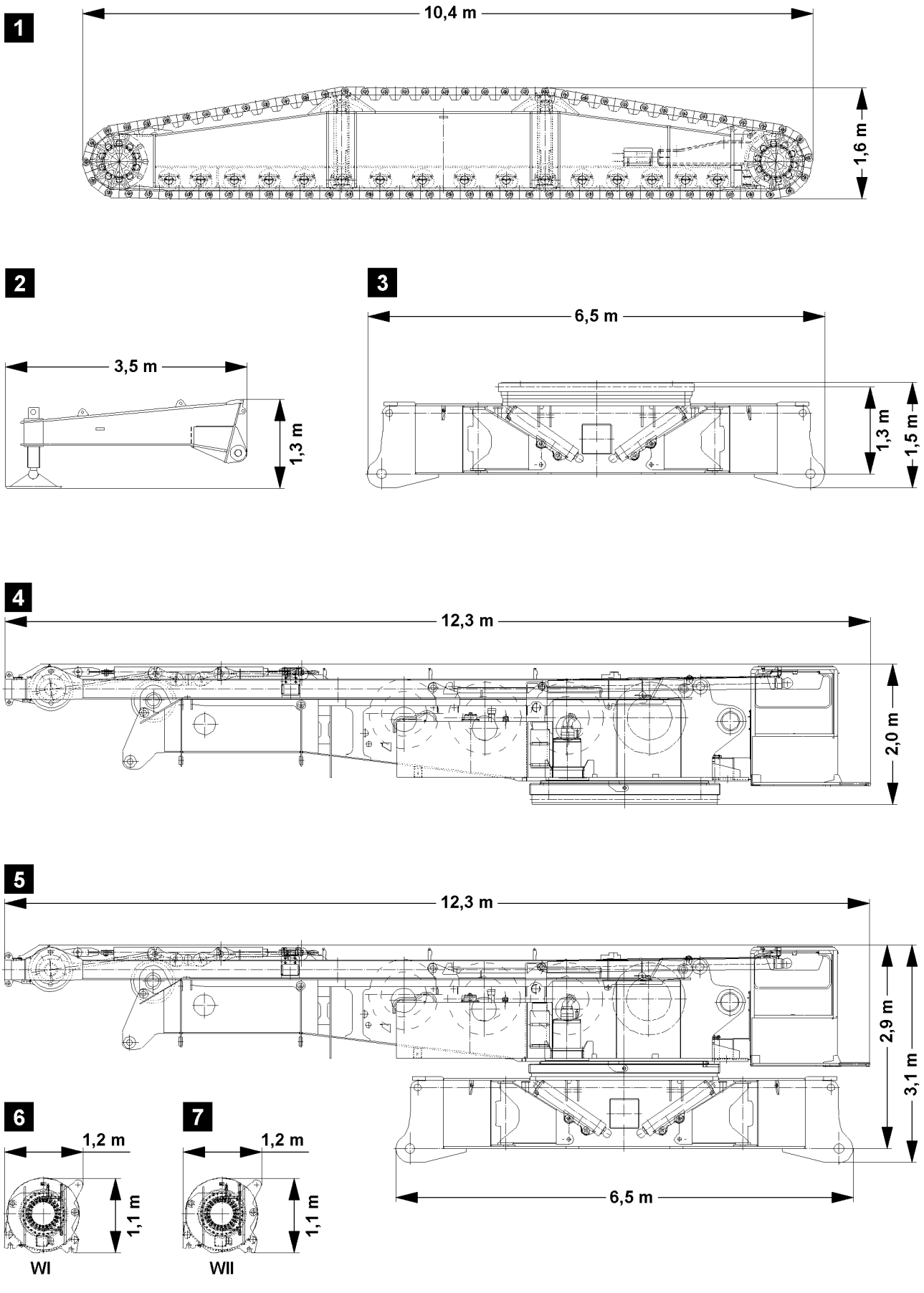
See illustration **4**.

Weight with winch 1 and winch 2	Weight without winch 1 and winch 2	Width
41.5 t	33.1 t	3.0 m

1.6 Turntable and crawler center section

See illustration **5**.

Weight with winch 1, winch 2 and winch 4	Weight without winch 1 and winch 2	Width
56.6 t	48.2 t	3.0 m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1.7 Winch 1

See illustration **6**.

Weight	Width
4.2 t	1.5 m

1.8 Winch 2

See illustration **7**.

Weight	Width
4.2 t	1.5 m

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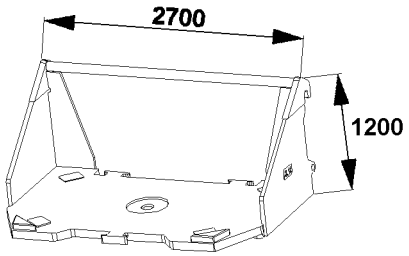

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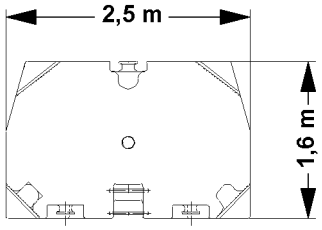

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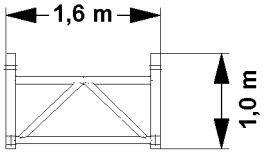

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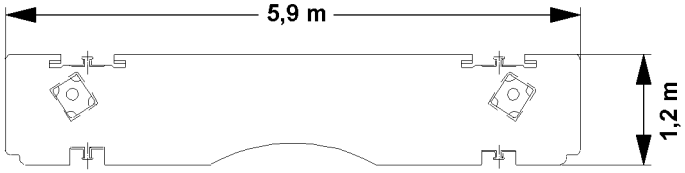

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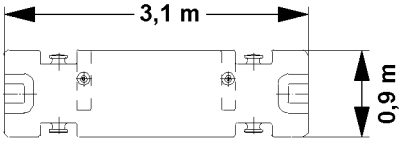

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1.9 Console

See illustration **8**.

Weight	Width
3.1 t	1.8 m

1.10 Counterweights for turntable / suspended ballast / ballast trailer

See illustration **9**.

Weight	Thickness
10.0 t	0.46 m
5.0 t	0.26 m

1.11 Ballast frame for central ballast

See illustration **10**.

Weight	Width
0.4 t	0.9 m

1.12 Central ballast 1

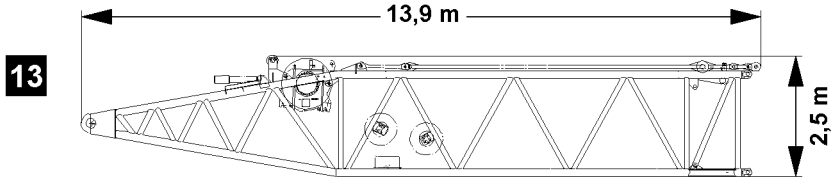
See illustration **11**.

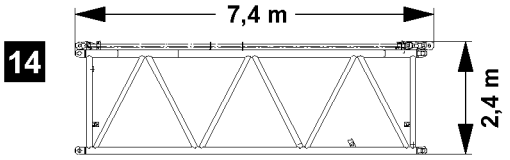
Weight	Thickness
5.7 t	0.16 m

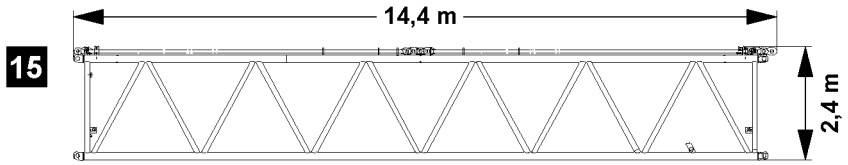
1.13 Central ballast 2

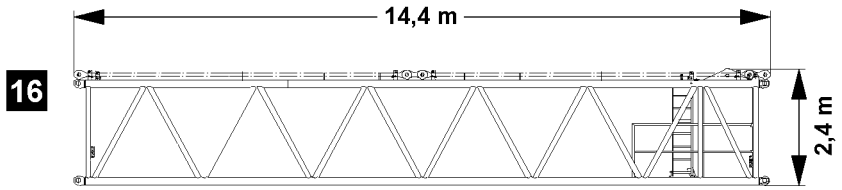
See illustration **12**.

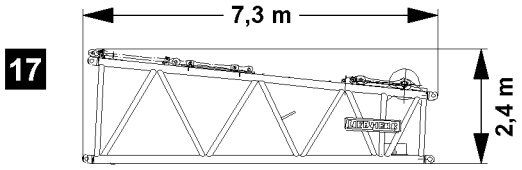
Weight	Thickness
8.0 t	0.5 m











B104499

1.14 S-pivot section 13.4 m

See illustration **13**.

Weight with winch 5	Weight without winch 5	Width
14.0 t	8.8 t	2.8 m

1.15 S-intermediate section 7.0 m, 2620.20

See illustration **14**.

Weight	Width
3.7 t	2.8 m

1.16 S-intermediate section 14.0 m, 2620.20

See illustration **15**.

Weight	Width
6.9 t	2.8 m

1.17 S-intermediate section 14.0 m for flying assembly, 2620.20

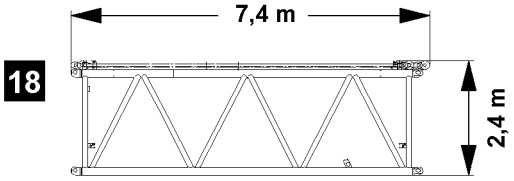
See illustration **16**.

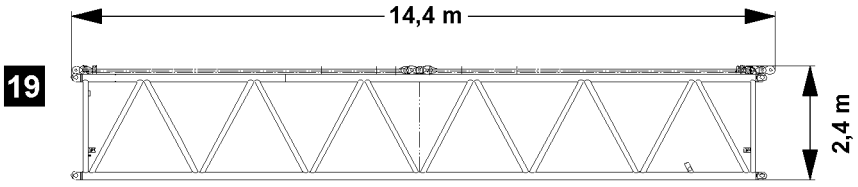
Weight	Width
7.9 t	2.8 m

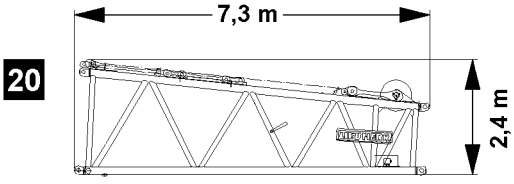
1.18 S-adapter 7.0 m

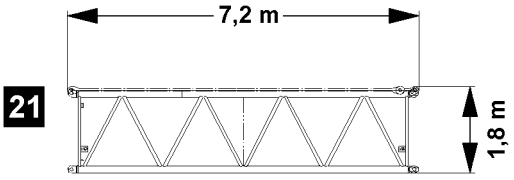
See illustration **17**.

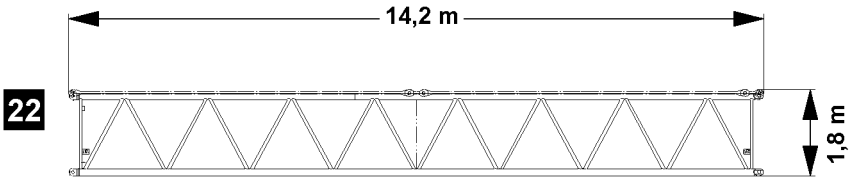
Weight	Width
3.6 t	2.8 m

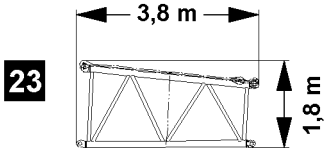

18
7,4 m
2,4 m


19
14,4 m
2,4 m


20
7,3 m
2,4 m


21
7,2 m
1,8 m


22
14,2 m
1,8 m


23
3,8 m
1,8 m

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1.19 L-intermediate section 7.0 m, 2620.10

See illustration **18**.

Weight	Width
2.9 t	2.8 m

1.20 L-intermediate section 14.0 m, 2620.10

See illustration **19**.

Weight	Width
5.4 t	2.8 m

1.21 L-adapter 7.0 m

See illustration **20**.

Weight	Width
3.1 t	2.8 m

1.22 NA-intermediate section 7.0 m

See illustration **21**.

Weight	Width
1.5 t	2.3 m

1.23 NA-intermediate section 14.0 m

See illustration **22**.

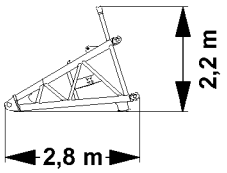
Weight	Width
2.8 t	2.3 m

1.24 NI-reducer section 3.5 m

See illustration **23**.

Weight	Width
0.8 t	2.3 m

24



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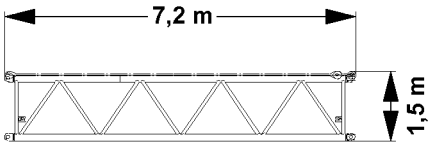

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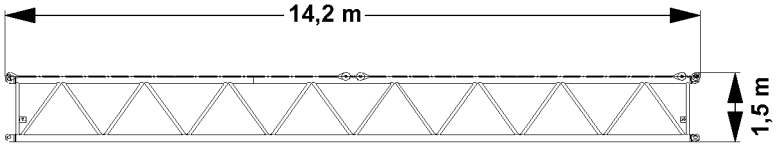

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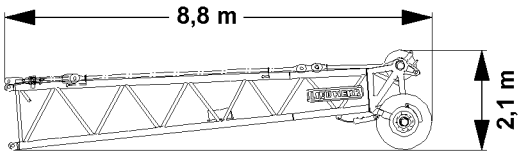

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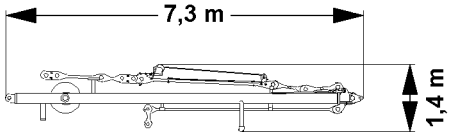

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1.25 F-pivot section 2.5 m

See illustration **24**.

Weight	Width
0.7 t	2.2 m

1.26 NI-intermediate section 7.0 m

See illustration **25**.

Weight	Width
1.4 t	2.0 m

1.27 NI-intermediate section 14.0 m

See illustration **26**.

Weight	Width
2.5 t	2.0 m

1.28 F-end section 8.0 m

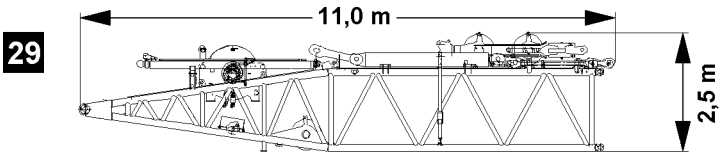
See illustration **27**.

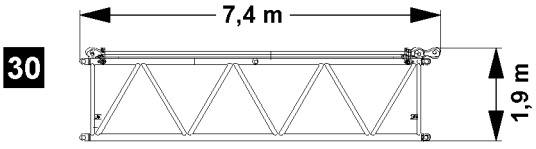
Weight	Width
3.3 t	2.0 m

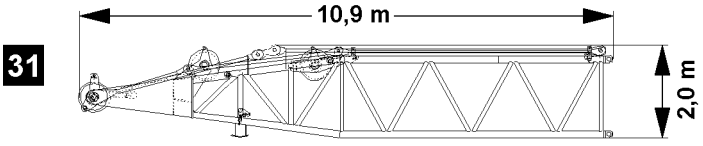
1.29 FA-frame 7.0 m

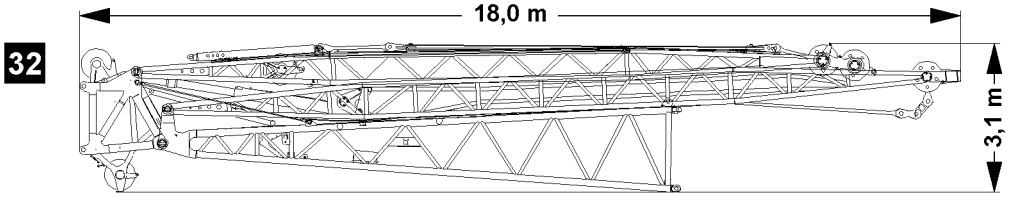
See illustration **28**.

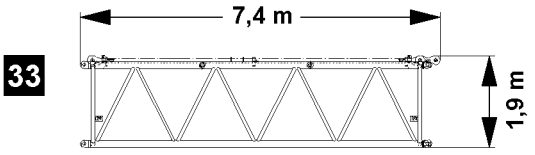
Weight	Width
2.4 t	2.4 m

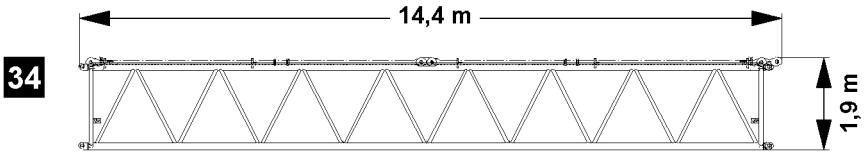

29
11,0 m
2,5 m

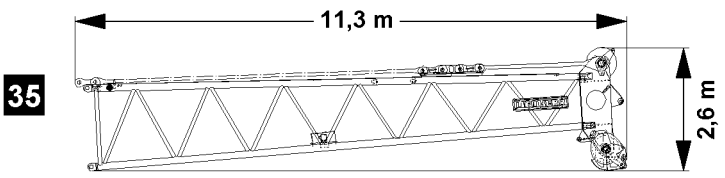

30
7,4 m
1,9 m


31
10,9 m
2,0 m


32
18,0 m
3,1 m


33
7,4 m
1,9 m


34
14,4 m
1,9 m


35
11,3 m
2,6 m

B104500

1.30 D-pivot section 10.5 m

See illustration **29**.

Weight	Width
14.5 t	2.7 m

1.31 D-intermediate section 7.0 m

See illustration **30**.

Weight	Width
2.7 t	2.5 m

1.32 D-end section 10.5 m

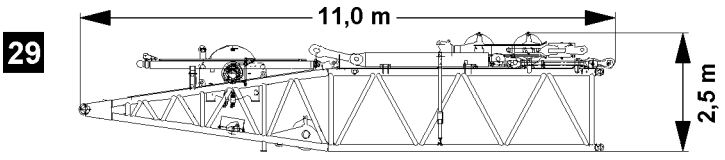
See illustration **31**.

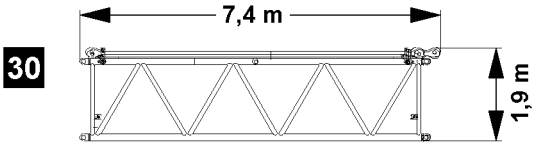
Weight	Width
5.4 t	2.5 m

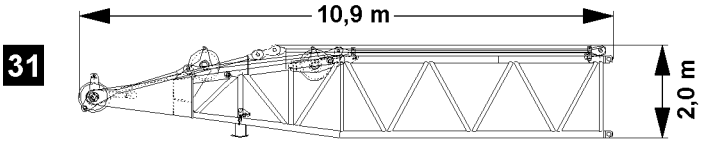
1.33 W-assembly unit

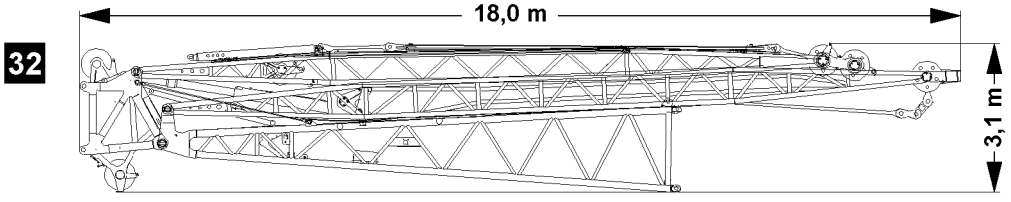
See illustration **32**.

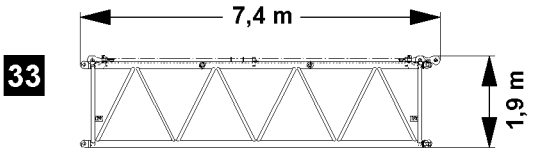
Weight	Width
14.1 t	2.4 m

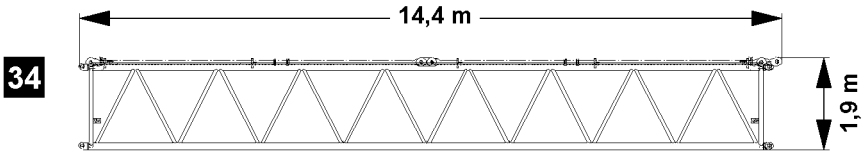

29
11,0 m
2,5 m

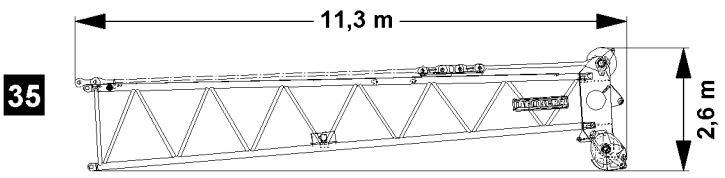

30
7,4 m
1,9 m


31
10,9 m
2,0 m


32
18,0 m
3,1 m


33
7,4 m
1,9 m


34
14,4 m
1,9 m


35
11,3 m
2,6 m

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1.34 W-intermediate section 7.0 m, 2116.20

See illustration **33**.

Weight	Width
1.7 t	2.4 m

1.35 W-intermediate section 14.0 m, 2116.20

See illustration **34**.

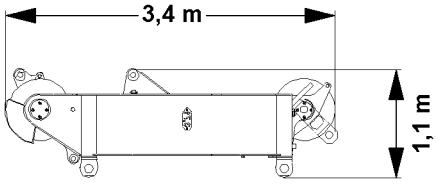
Weight	Width
3.0 t	2.4 m

1.36 W-end section 10.5 m

See illustration **35**.

Weight	Width
3.3 t	2.3 m

36



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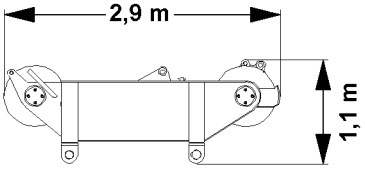

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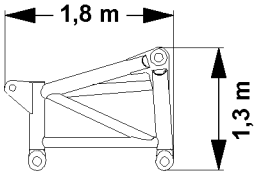

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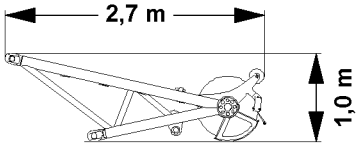

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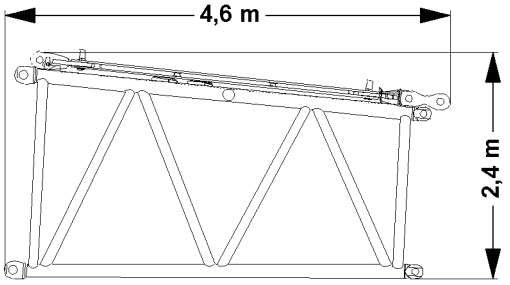

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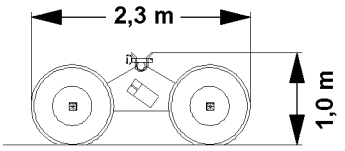

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1.37 S-end section 400 t

See illustration **36**.

Weight	Width
3.8 t	2.8 m

1.38 L-end section 350 t

See illustration **37**.

Weight	Width
2.2 t	2.3 m

1.39 L-end section

See illustration **38**.

Weight	Width
0.7 t	2.4 m

1.40 Boom nose

See illustration **39**.

Weight	Width
0.5 t	1.2 m

1.41 Sw-reducer section

See illustration **40**.

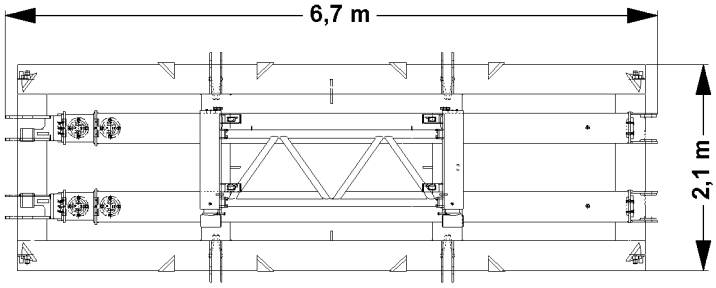
Weight	Width
1.8 t	2.8 m

1.42 Erection cart

See illustration **41**.

Weight	Width
0.5 t	1.7 m

42



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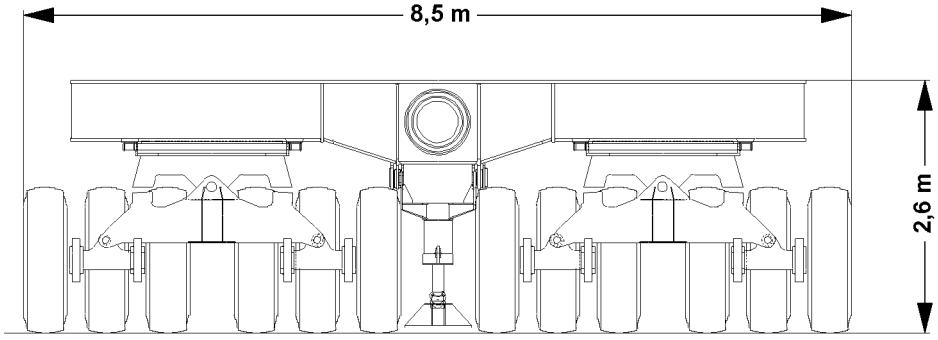

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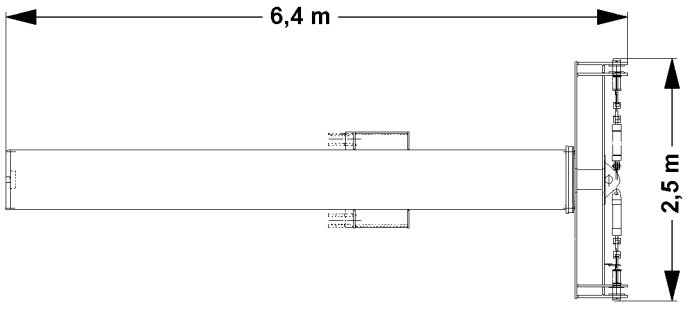

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1.43 Suspended ballast with guide

See illustration **42**.

Weight	Height
11.3 t	1.5 m

1.44 Ballast trailer

See illustration **43**.

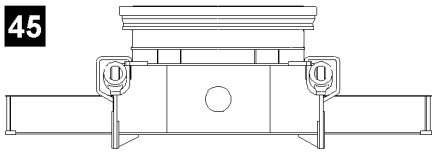
Weight	Width
26.8 t	2.5 m

1.45 Ballast trailer guide

See illustration **44**.

Weight	Width
9.6 t	1.0 m

45



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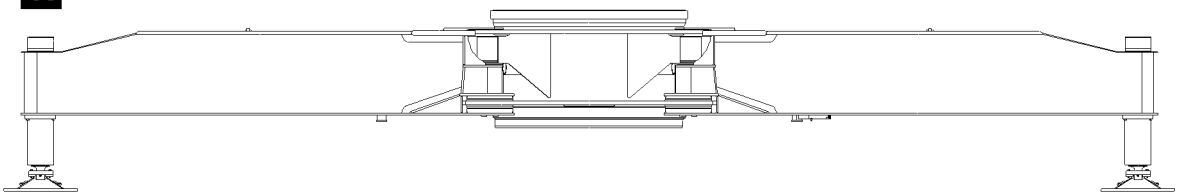

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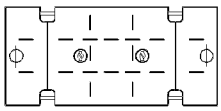

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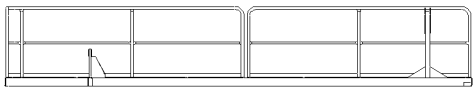

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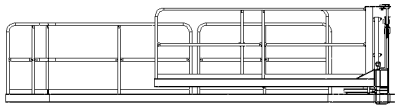

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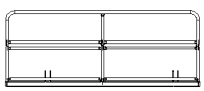

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1.46 “Narrow” crawler center section

See illustration **45**.

Weight	Width
12.8 t	2.8 m

1.47 Crane support

See illustration **46**.

Weight	Width
44.1 t	3.0 m

1.48 Support pad

See illustration **47**.

Weight	Thickness
1.3 t	0.3 m

1.49 Footbridge

See illustration **48**.

Weight	Width
0.7 t	1.6 m

1.50 Footbridge

See illustration **49**.

Weight	Width
1.2 t	2.2 m

1.51 Footbridge

See illustration **50**.

Weight	Width
0.2 t	1.2 m

1.52 Load tackle

Note
▶ For load tackle, see separate load chart manual!

2 Ground pressure

Maximum ground pressure at nominal load	2000 kN/m²

3 Workplace-related emission value

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

4 Crane speeds

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

Drives	**Infinitely variable**
Winch 1, 2	0 m/min to 150 m/min for single strand
Winch 3	0 m/min to 145 m/min for single strand
Winch 5	0 m/min to 130 m/min for single strand
Winch 6	0 m/min to 150 m/min for single strand
Winch 4	2 × 65 m/min for single strand

Drives	**Infinitely variable**
Slewing gear	0 rpm up to 1.2 rpm

5 Ropes

5.1 Hoist ropes

	Rope diameter
Winch 1	25 mm
Winch 2	25 mm
Winch 5	25 mm
Winch 6	25 mm

5.2 Control ropes

	Rope diameter
Winch 3	25 mm
Winch 4	25 mm
Winch 5	25 mm
Winch 6	25 mm

5.3 Guy ropes

	Rope diameter
Auxiliary guying	22 mm

5.4 Assembly ropes

	Rope diameter
Assembly winch	8 mm

2.00 Safety

B195219

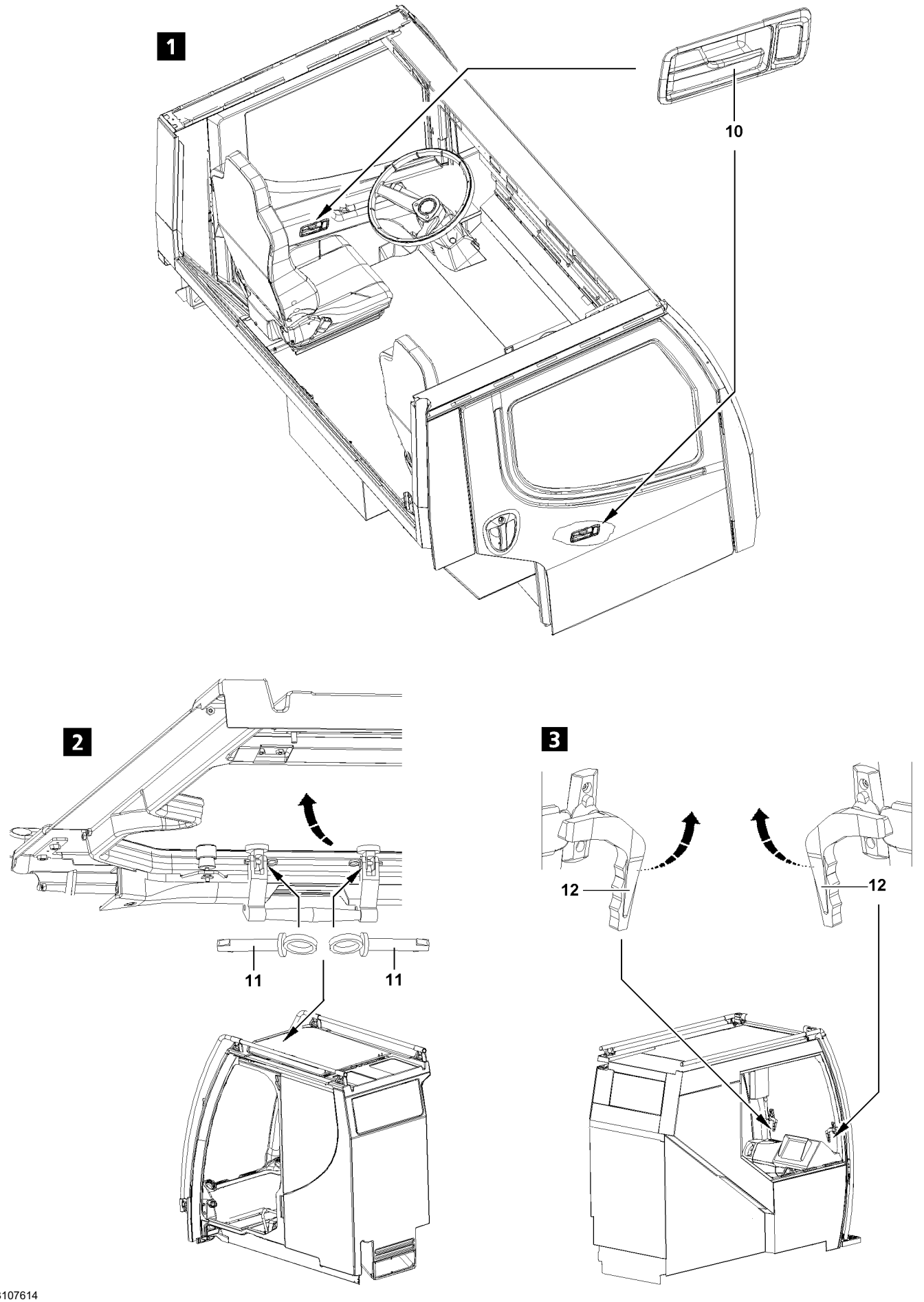
1 Crane operation planning

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

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

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

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


1
10
2
11
11
3
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1 General

Note

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

1.1 Exhaust systems and other hot components

WARNING

Danger of burns!

You can get severely injured 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!

▶ Be especially careful!

2 Emergency exit

2.1 Emergency exit - driver's cab

In an emergency, 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 driver's cab

In an emergency, when it is not possible to leave the crane driver's cab through the door, the crane driver's cab can be exited, depending on the version, through the roof window (illustration **2**), or through the front window (illustration **3**).

Note

▶ Leave the crane driver's cab through the roof window, see illustration **2**: Pull the pins **11** on the left and right and open the roof window upward.

▶ Leave the crane driver's cab through the front window, see illustration **3**: Unlock the left and right handles **12** and open the front window.

3 Requirements of the crane driver

3.1 General

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

The following important safety guidelines will help you achieve this.

Many crane accidents are caused by incorrect crane operation.

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

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

- Not paying careful attention while working, for example:
  - slewing too quickly,
  - quick braking of the load,
  - diagonal pulling,
  - loose cable formations.
- Overloading.
- Driving too fast with a load, or setting up and loading on an uneven surface.
- Attaching the load incorrectly.
- Unsuitable operation; especially diagonal pulling, breaking away stuck loads.
- Wind action on suspended loads.
- Problems when driving on a road without a load, for example overload of engine or transmission.
- 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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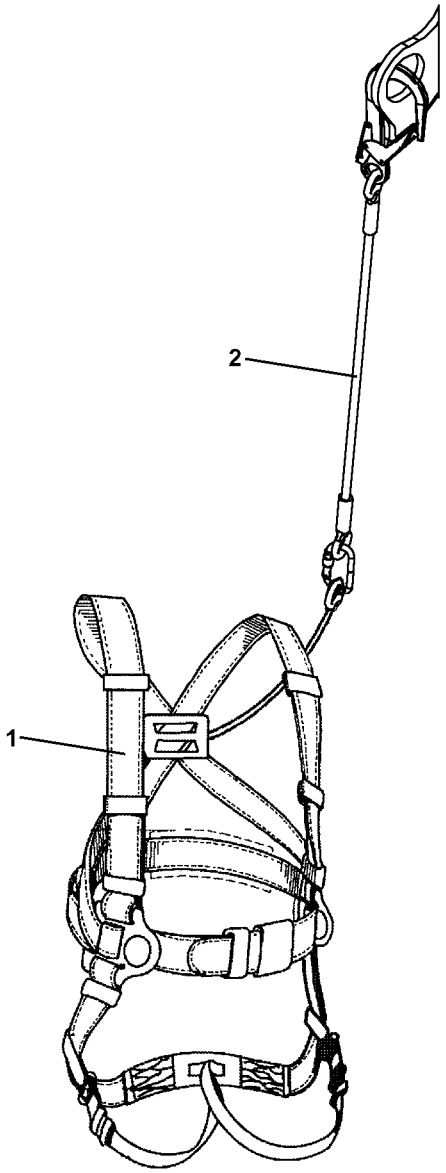

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3.2 Personal protection equipment

WARNING
Danger of accidents or falling!
If protective devices are not worn, the crane driver or the auxiliary personnel can be killed or severely injured!
- ▶ 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 using these aids or from the ground, the crane driver and the assembly personnel must be protected from falling using approved antifall guard systems!
- ▶ **Only approved antifall guard systems (catch belt, connectors) may be used! These antifall guard systems must meet the standards EN 354, EN 358, EN 360, EN 361, EN 362, EN 363 and EN 365 or national regulations.**
- ▶ The operating instructions of the manufacturer of the antifall guard systems must be observed and adhered to!
- ▶ Check regularly to make sure that the legibility of the product identification marking is ensured.
- ▶ The crane operating company must provide personal protection equipment to the crane driver and all auxiliary personnel!
- ▶ The crane operating company must ensure that the crane driver and auxiliary staff wear personal protection equipment!
- ▶ The crane driver 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.
- – Catch systems (catch belt **1**, connectors **2** for retaining systems and work place positioning) to protect against the danger of falling.
- – Safety shoes: Protection from falling parts at assembly and disassembly.
- – Warning apparel

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

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

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

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

3.2.1 Documentation

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

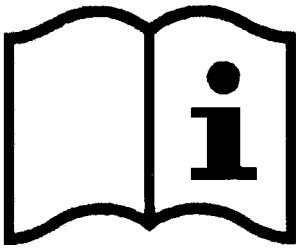
The following charts must be filled out after the respective inspections.

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

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

3.2.2 Identification

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

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

3.3 Work on the crane superstructure or boom

WARNING
Risk of falling!
During work, personnel must be secured with appropriate antifall guards to prevent them from falling!
If this is not observed, working personnel can fall and be killed or severely injured!

- ▶ The telescopic boom may not be accessed without suitable safety devices (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ Any work, where there is a danger of falling must be carried out with suitable aids!
- ▶ If work cannot be carried out using these aids or from the ground, then the maintenance personnel must be protected from falling using approved antifall guard systems!
- ▶ Only step on such aids with clean shoes!
- ▶ Keep aids clean and free of snow and ice!
- ▶ It is prohibited to step on the roof of the driver's cab or the cab!

3.4 Obligations of the crane driver

1.) Before starting to work, the crane driver 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 driver must cease crane operation in case of defects, which would endanger the safety.
3.) The crane driver must report all defects on the crane to the appropriate supervisor, also to his replacement in case of crane change. For mobile cranes, which are set up and taken down at their corresponding jobsite, he must enter any defects in the crane log book.
4.) The crane driver 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 driver 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 driver 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 driver may move the crane only with the aid of a guide.
7.) The crane driver must give warning signs when necessary.
8.) The crane driver may not move loads over personnel.
9.) Any loads attached by hand may only be moved by the crane driver 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 driver, then they must be agreed upon before use between the responsible party and the crane driver. If the crane driver 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 driver must keep the control devices within reach. This does not apply for towing of vehicles with towing cranes.
11.) The crane driver 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 driver may not take on an overload by pulling in / raising the boom.
13.) The crane driver may **not** bypass the overload protection to increase the hoisting power of the crane.

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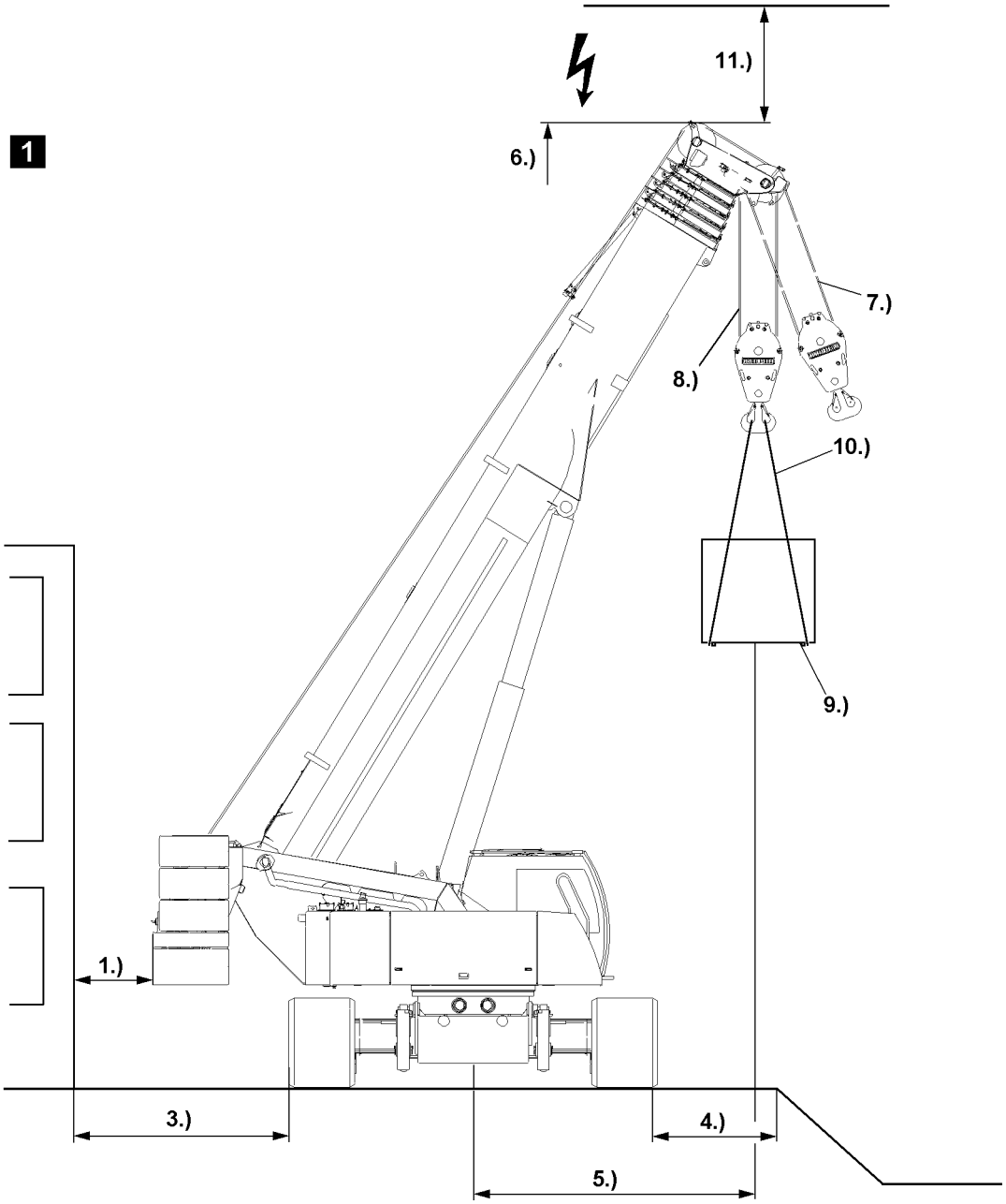
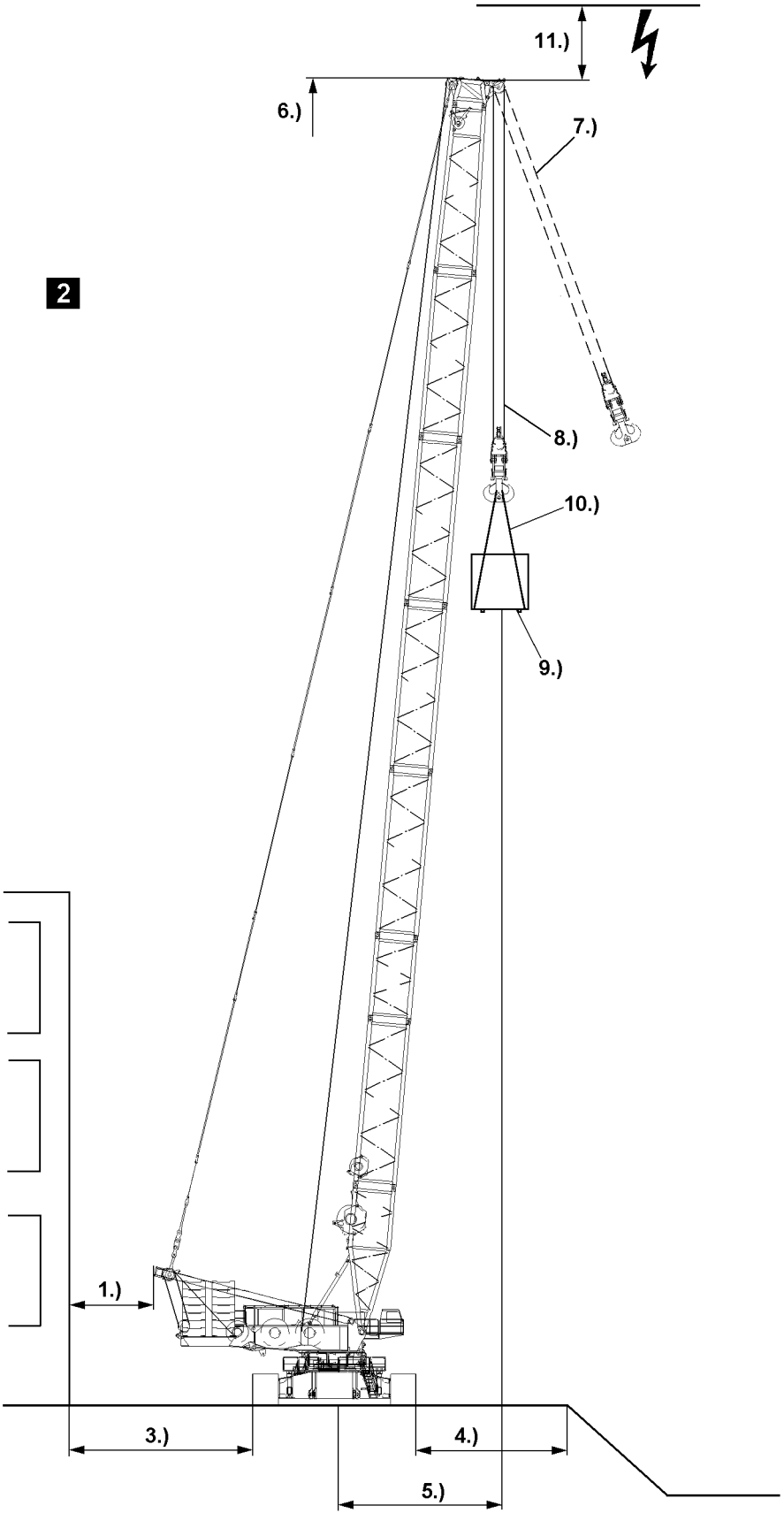
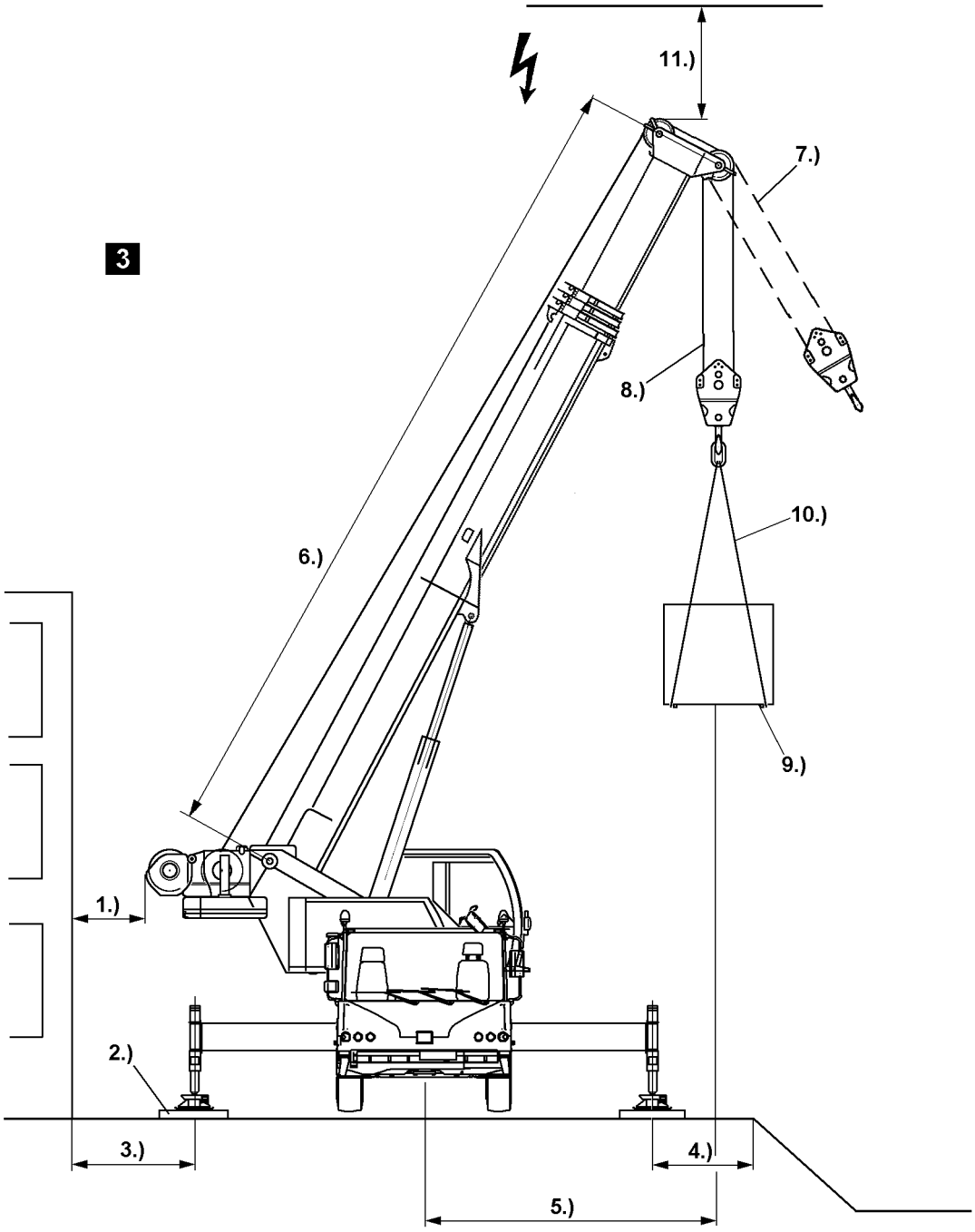


B104101 *Example for crawler crane with telescopic boom*



B104102 *Example for crawler crane with lattice mast boom*



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Example for mobile cranes

4 Selecting the location, illustrations 1 to 3

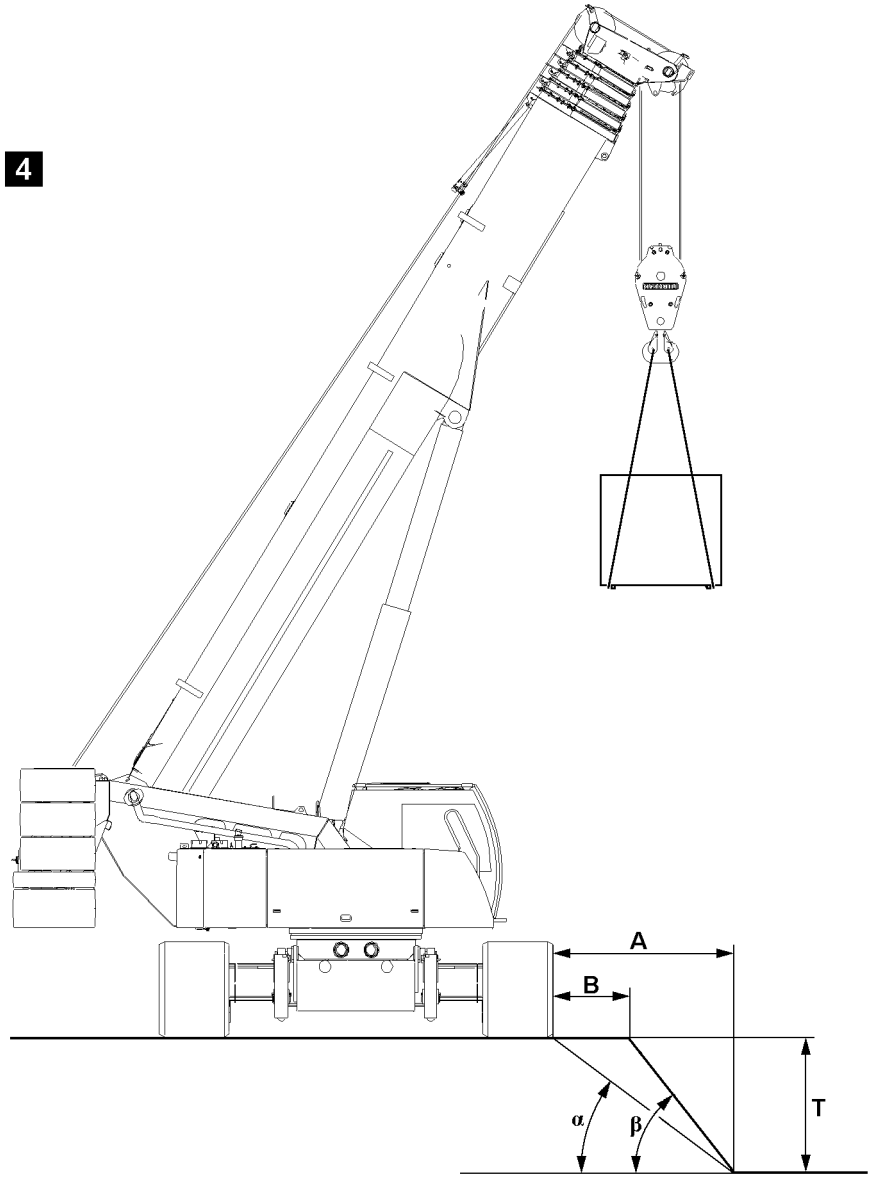
It is very important to choose an appropriate location for crane operation in order to minimize safety risks.

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

- ▶ Only support or drive the crane on ground with the required load-bearing capacity!
- ▶ Act responsibly when planning and selecting the crane location and route. If necessary, consult an expert.
- ▶ 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 embankments or similar.
5.) Keep the radius to a minimum. **Never** utilize the crane 100 %.
6.) Select the correct boom length to the load case.
7.) Diagonal pull is not permitted!
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.



B104104 *Example for crawler crane with telescopic boom*

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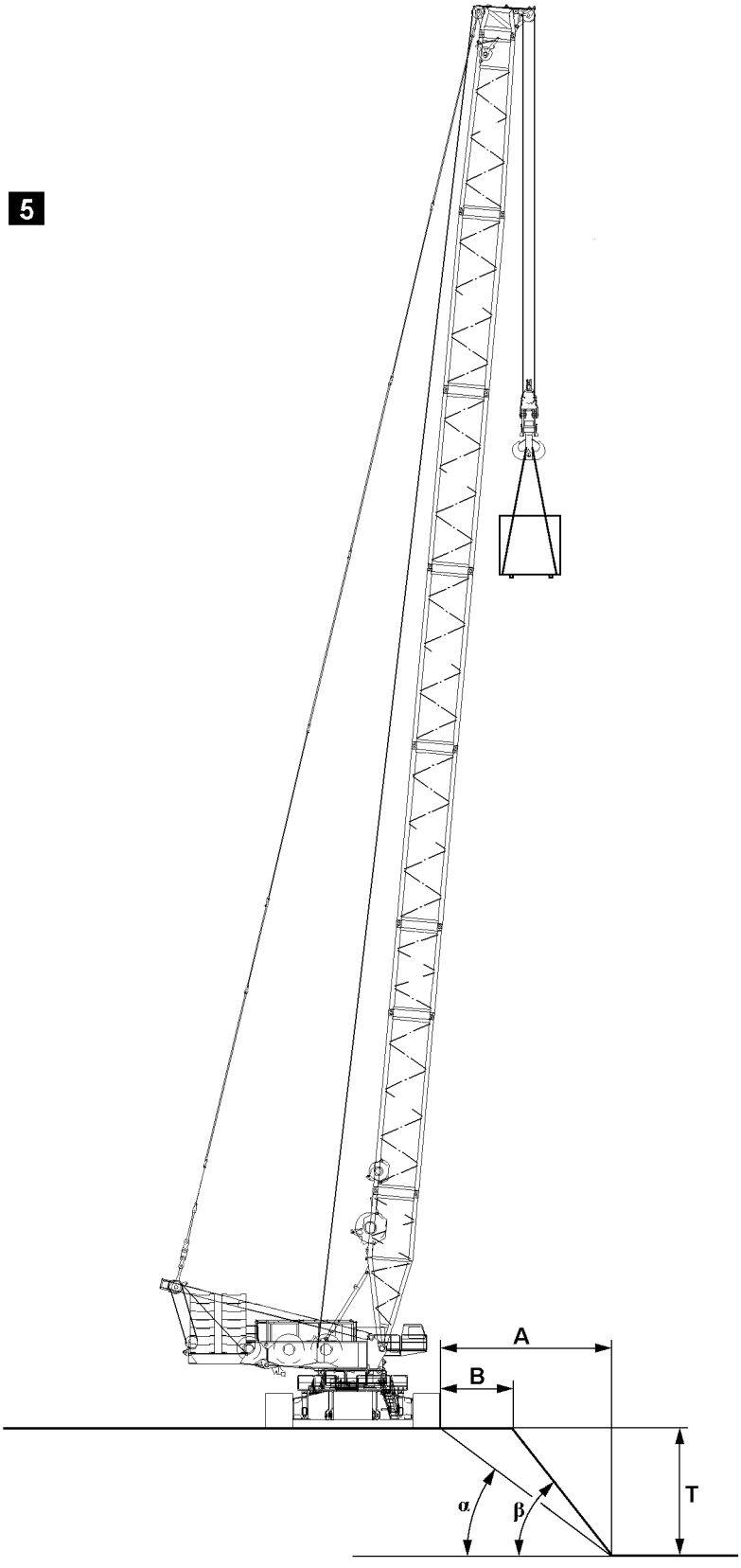

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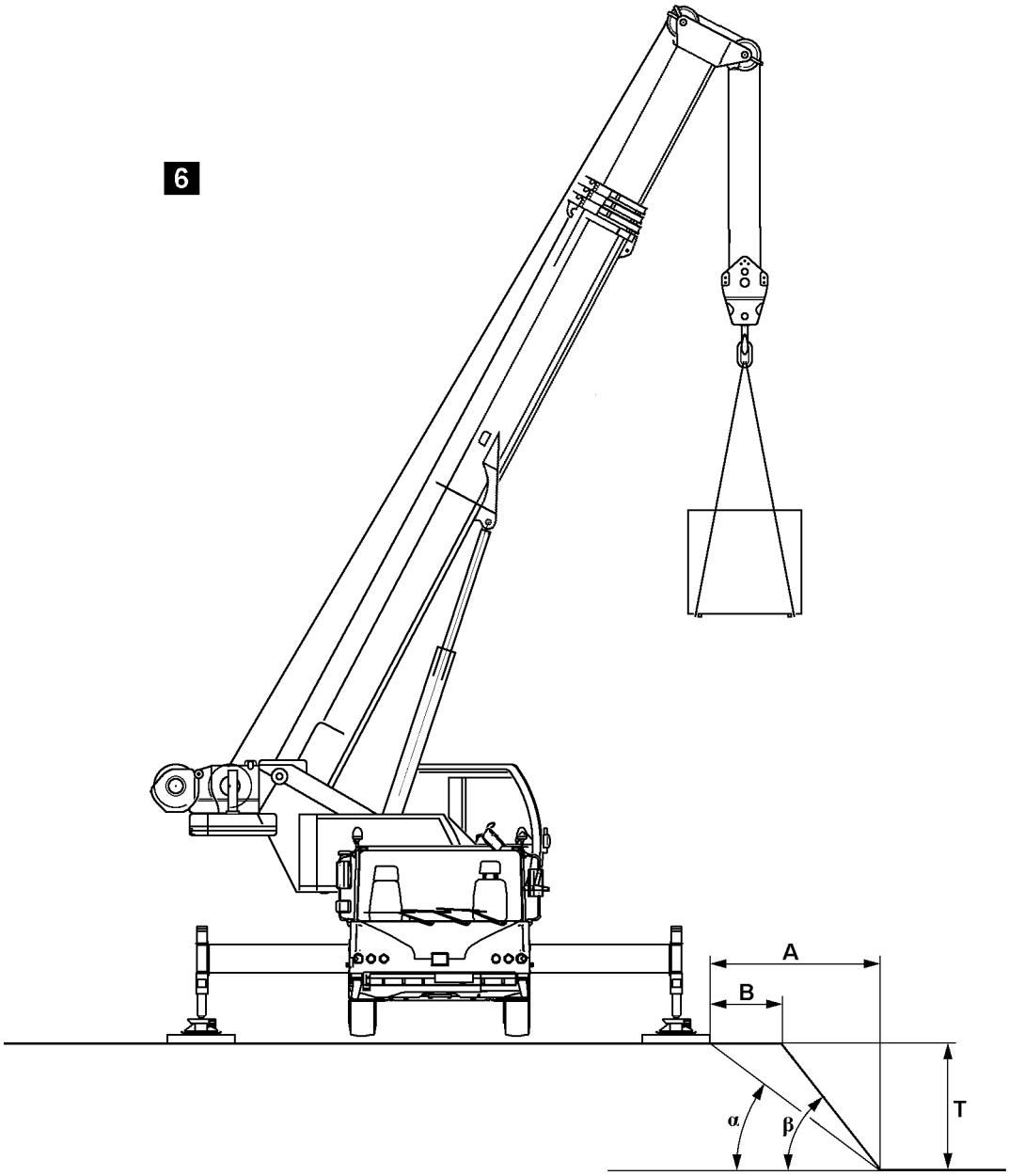
Example for crawler crane with lattice mast boom



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Example for mobile cranes

5 Slopes and excavations, illustrations 4 to 6

The crane may not be set up too close to slopes or ditches. Depending on the type of ground, ensure an adequate safety clearance **A** and safety clearance **B** as well as a corresponding load entry angle **α** and slope angle **β**.

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!

- ▶ An authorized and trained specialist should perform calculations to verify the load bearing capacity of the ground!
- ▶ Safety distance **A** and safety distance **B** should be calculated by an authorized and trained specialist!
- ▶ Always maintain the calculated safety distance **A** and safety distance **B**!
- ▶ Support the sides of the slope or ditch!

Abbreviation	Term
A	Distance to bottom of excavation
B	Distance to excavation
T	Depth of excavation
α	Load entry angle
β	Slope angle

6 Permissible ground pressures

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

Permissible ground pressures		
Soil type		[N/cm²]
	d) Mixed granular ground, clay to sand, gravel and rocky areas	
	Stiff	15
	Semi-solid	22
	Solid	33
5.	Rock in evenly solid condition:	
	a) Brittle, with traces of decomposition	150
	b) Not brittle	400

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

6.1 Permitted ground pressure for crawler cranes

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

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

6.2 Permitted ground pressure for mobile cranes

When the crane is supported, the support cylinders transmit significant forces to the ground. In certain cases, a single support cylinder is used to transfer almost the entire weight of the crane, plus the load weight, onto the ground.
The ground must be able to safely withstand this pressure. If the support pad area is inadequate, then it must be supported from below according to the load bearing capacity of the ground.
The required support area can be calculated from the load bearing capacity of the ground and the crane support force.

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

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

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

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

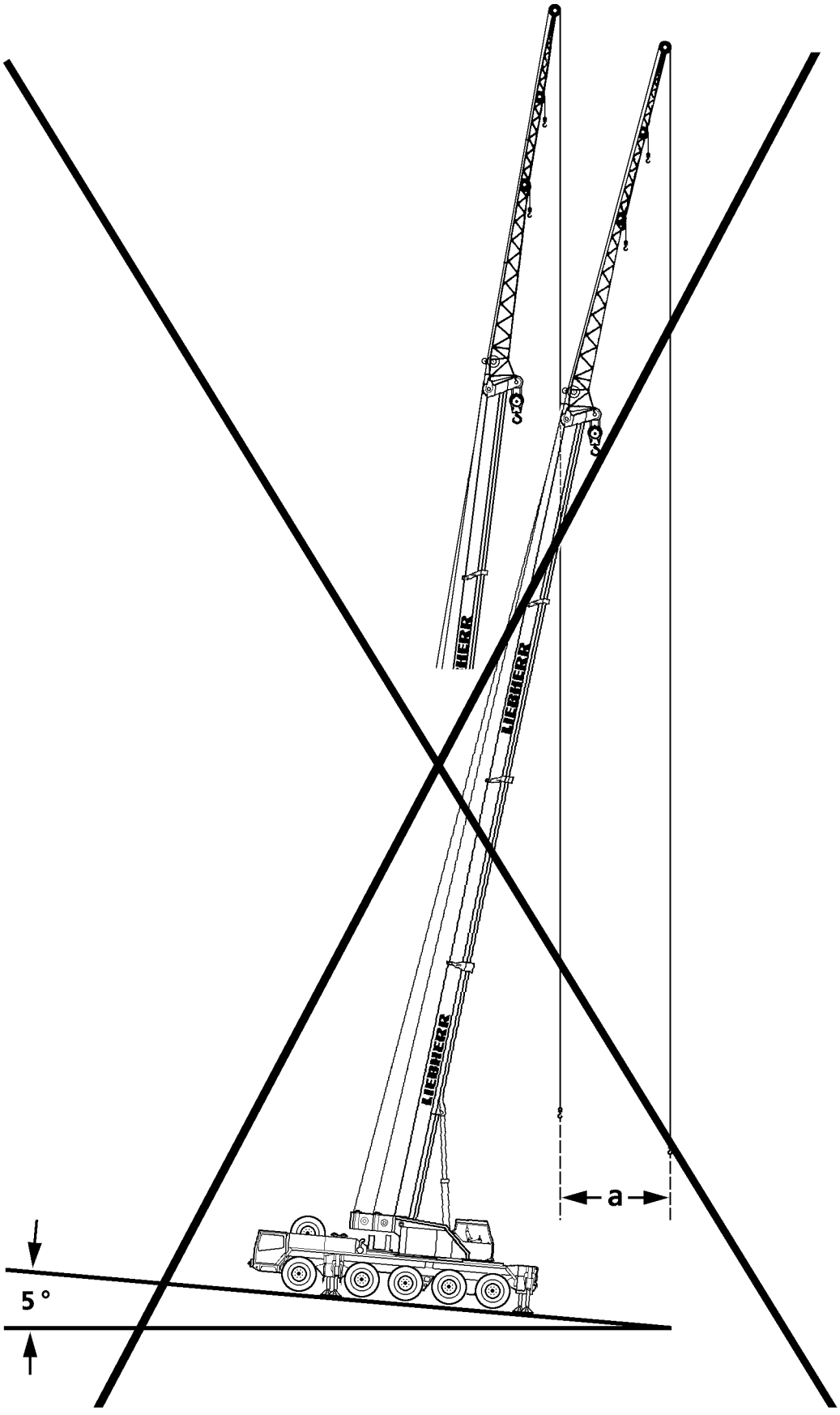
The value of the specific support pressure is far above the permissible ground pressure for all types of granular soil. If this crane is utilized on bedrock, type of ground gravel, permissible ground pressure 20 N/cm^2 , then the support surface must be increased.

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

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

Note

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



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General example

7 Supporting

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

DANGER
The crane can topple over!
Intermediate positions between the support bases may not be supported, because the force transfer is only possible via the side placement surfaces and in intermediate positions, due to the lack of placement surfaces, an incorrect force transmission can occur on the upper chord.
- ▶ Pin sliding beams to support base according to the load chart!
- ▶ Fully pin in and secure the pins!

All 4 sliding beams and support cylinders must be extended according to the data in the load chart, also those on the counterweight side.
If only the load side sliding beams are extended, the crane can tip over when turning or setting down the load.

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

7.1 Crane alignment

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

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

Example: At a boom length of 50 m, uneven adjustment of the crane by only 5° will cause an boom radius of 10 m to be increased by a = 4 m.

8 Checking the safety measures

– The placement location has been selected in such a way that the crane can be operated with the least possible radius.
– The load bearing capacity of the ground is adequate.
– There is sufficient distance to ditches 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.
– On mobile cranes:
  The axle suspension is blocked.
– On mobile cranes:
  All four sliding beams and support cylinders have been extended according to the support base given in the load chart.
– On mobile cranes:
  The sliding beams are secured with pins to prevent them from moving.
– On mobile cranes:
  The support pads are secured.
– The crane is horizontally aligned.
– On mobile cranes:
  The axles are relieved, which means the tires do not touch the ground.

9 Crane operation with a load

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

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

Note
- ▶ It must be observed, that the weight of the hook block and the weight of the tackle must be subtracted from the load given in the load chart, see the following chart!

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

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

9.1 Counterweight

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

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

9.2 Hoist gear, hoist rope

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

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

9.3 Crane operation

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

High accident risk if:

1.) The load torque limiter is not set to the actual configuration status of the crane, and as a result, cannot fulfill its function as a safety device.
2.) The load torque limiter is defective or put out of operation.
3.) The hoist limit switches are defective or turned off.
4.) On crawler cranes:
The angle sensor and the force test brackets are not functioning.
5.) On mobile cranes:
The sliding beams of the hydraulic supports are not extended to the points specified in the load chart.
6.) On crawler cranes:
The crawlers are not supported with stable base material sufficiently large for the soil conditions.
7.) On mobile cranes:
The support pads are not supported with stable base material sufficiently large for the soil conditions.
8.) If the load is pulled at an angle.
Angular pulling to the side is particularly dangerous, because the boom has only minimal lateral moment of resistance.
It is prohibited to pull a load at an angle.
9.) An excessive load is attached to the hook during dismantling 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 driver has not properly controlled the movements.
14.) The loads and radii contained in the load charts are exceeded.
15.) When working in the vicinity of power cables, these are not isolated by electricity engineers or if the hazardous area is not covered of fenced off.
If it is not possible to take such measures, a sufficient safety clearance must be maintained:

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

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

10 Lifting of personnel

10.1 Generally valid instructions:

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

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 driver 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 driver many not leave the crane driver's cab while lifting personnel with the crane!
- The lifting person must be in radio contact with the crane driver!
- 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!

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

10.2 In addition, the following applies for Germany:

Note

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

DANGER

Danger of accidents or falling!

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

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

- ▶ Observe the safety regulations and guidelines of the national occupational health and safety agencies!
- ▶ In Germany, moving personnel and personal lifting devices and working with these personnel lifting devices is permissible if the company carries out “suitable safety measures” and informs the trade association (Berufsgenossenschaft) of its intention **in writing**. For personnel movements, notification of at least two weeks before the intended movement is required. The company must carry out the stated safety-technical measures. “Suitable safety measures” are the safety regulations for “liftable personnel lifting devices” of the trade associations (Berufsgenossenschaften) BGR 159!

Additional obligations of the company:

- Report the use of personnel lifting devices to the applicable trade association (Berufsgenossenschaft) in writing, within 14 days.
- Determination of supervisor.
- The operator of the lifting device must be familiar with the tasks.
- The contractor may not assign other tasks to the lifting device operator and the guide while personnel is being lifted.
- The contractor must make lifting devices with sufficient load carrying capacity available.
- The contractor must provide personal protective equipment (such as safety harnesses).
- Liftable personnel lifting devices must be inspected before the initial use and after significant changes by an expert before putting them back into service:
  - Carry out trial runs in the present of the supervisor.
  - Regular inspections at least once a year.
  - Record and save proof of inspections.

11 Grounding

11.1 Grounding the crane

WARNING
Danger of fatal injury due to electric shock!
There is a risk of electrical shock, if the crane is not properly grounded.
▶ Properly ground the crane!

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

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

WARNING
Danger of fatal injury due to electric shock!
There is a risk of electrical shock, if the crane is not properly grounded.
▶ Prevent the crane from being electrostatically charged!

To prevent the crane from electrostatic charge, the following is required:
– An electrically conductive grounding rod, approx. 2 m long, which is inserted into the ground.
– An electrically conductive cable with a diameter of at least 16 mm^2 .
– Ground connection on the crane, or a screw clamp, as is used for welding work.

The following applies:
– Always use a cross grounding rod as grounding rod.
– The grounding resistance must be less than 0.5 Ohm.
– The connection between the crane and the ground must always be a proper electrically conductive connection.

Connect one end of the grounding cable with a diameter of at least 16 mm^2 with the grounding rod, which is inserted into the ground.
Insert the grounding rod at least 1.5 m into the ground.
Moisten the soil around the metal rod for better conductivity.

Note
▶ The grounding resistance depends on the make up of the ground material and on the active contact surfaces of the grounding rod.

Connect the other end of the grounding cable with a diameter of at least 16 mm^2 with the grounding connection on the crane, see Crane operating instructions, chapter 3.01.

Note
▶ The connection between the crane and the ground must always be a proper electrically conductive connection.

If there is a possibility to connect a foundation or band ground with correspondingly smaller grounding resistance, then this grounding method should always be preferred.

WARNING
Danger of fatal injury due to electric shock!
There is a risk of electrical shock, if the crane is not properly grounded!
▶ Make sure that the connection between the crane and the ground is a proper electrically conductive connection.

11.2 Grounding the load

WARNING
Danger of fatal injury due to electric shock!
There is a risk of electrical shock, if the load is not properly grounded!
▶ Properly ground the load!

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.

WARNING
Danger of fatal injury due to electric shock!
There is a risk of electrical shock, if the load is not properly grounded!
▶ Prevent the load from electrostatic charge!
▶ The connection between the load and the ground must always have a proper electrically conductive connection!

To prevent the load from becoming electrostatically charged, the following is required:
– An electrically conductive grounding rod, approx. 2 m long, which is inserted into the ground.
– An electrically conductive cable with a diameter of at least 16 mm^2 .
– An electrically conductive metal rod with insulated handle to touch the load.

Connect one end of the grounding cable with a diameter of at least 16 mm^2 with the grounding rod, which is inserted into the ground.
Insert the grounding rod at least 1.5 m into the ground.
Moisten the soil around the metal rod for better conductivity.

Note
▶ The grounding resistance depends on the make up of the ground material and on the active contact surfaces of the grounding rod.

Connect the other end of the grounding cable with a diameter of at least 16 mm^2 with the metal rod with insulated handle.

DANGER
Danger of fatal injury due to electric shock!
▶ The metal rod may only be held on the insulated handle!

Hold the metal rods on the insulated handle.
Touch the load with the metal rod before touching it with the hands.

12 Crane operation in case of thunderstorms

In weather conditions, which can include lightning:
– Stop work on the crane immediately.
– Always place down the load.
– If possible, telescope the boom in and bring it into a safe condition.
– Turn the crane engine off

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

13 Welding work on the load

Note

▶ The load must also be grounded.

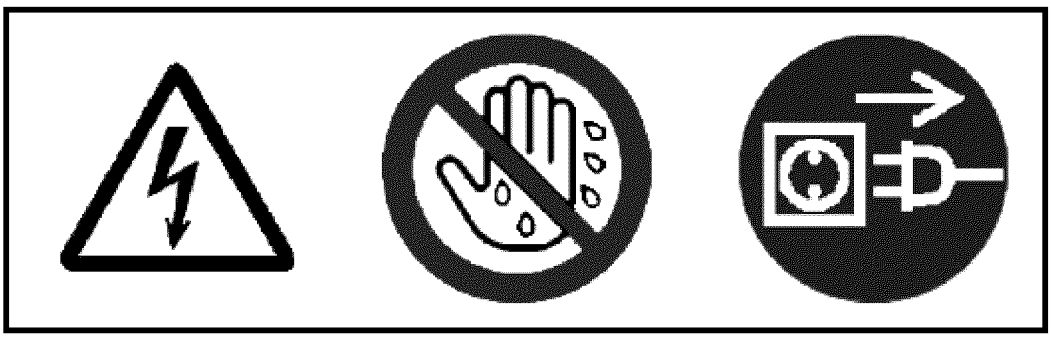
In case of welding work on the load, the screw clamp of the welding unit must be attached on the welding piece to avoid current flow via hoist rope, crane superstructure or crane chassis.

NOTICE

Damage to the heating control units!

▶ Disconnect the negative and positive cables from the batteries and connect the positive cables to the vehicle ground.

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



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

WARNING

Danger of fatal injury if the body conducts current!

Water and/or defective devices can cause hazardous stray voltages when touched. Subject to lethal currents.

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

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

WARNING
Risk of electric shock!
▶ To check the protective measures and to decide if the crane can be supplied with power form the general distribution network, always use a qualified electricians with the appropriate measuring equipment in accordance with VDE.

15 Endangering air traffic

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

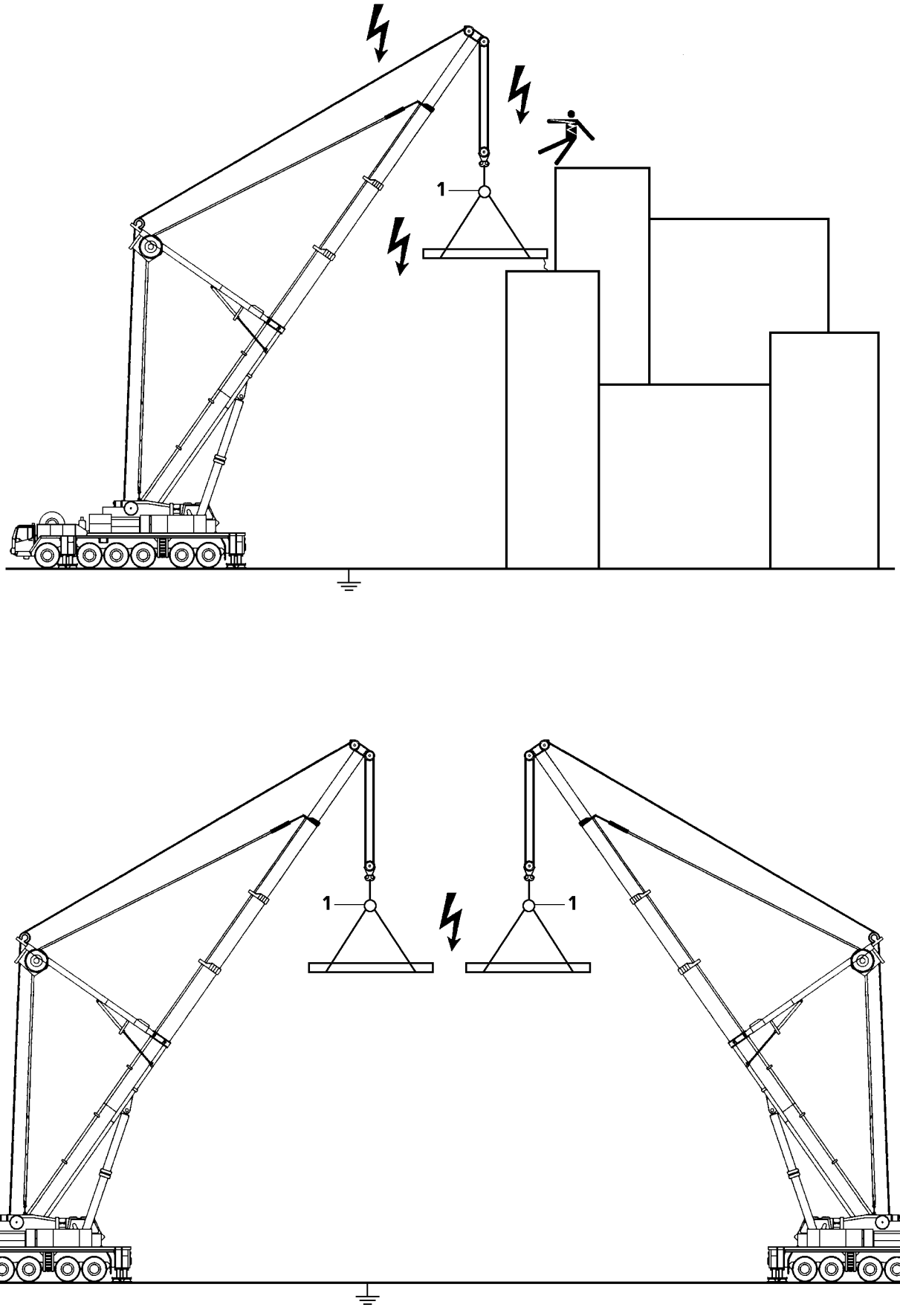
WARNING
Endangering air traffic!
If no protective measures are taken, this can result in endangerment to air traffic!
▶ Get the approval from agency responsible for air traffic!
▶ Install the airplane warning light on the boom head and turn it on!

16 Joint lifting of a load by numerous cranes

If a load is to be lifted by means of several cranes, the procedure must be previously determined by means of the contractor or his representatives, and must be carried out in the presence of a supervisor nominated by the contractor.
Proceed with particular care in the following cases:
– The part to be lifted has an uneven structure or the centre of gravity is unknown.
  Eventually, only use 75 % of the permissible load!
– Dynamic influences are to be taken into account when the load is freed.
– The cranes have differing load-bearing capacities

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!
▶ Diagonal pull is not permitted!



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General example

17 Working in the vicinity of transmitters

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

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

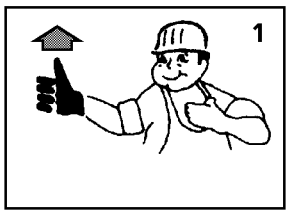
DANGER

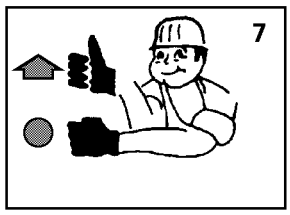
Risk due to electromagnetic fields!

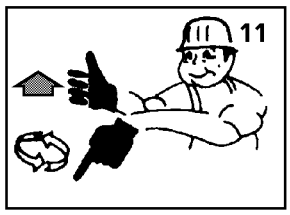
▶ Before operating a crane in the vicinity of transmitters, be sure to consult with LIEBHERR!
▶ Also consult a high frequency specialist!

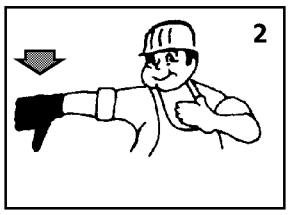
High frequency (HF) radiation from a transmitter requires supplementary work safety protection and special environmental specifications for crane drivers and personnel:

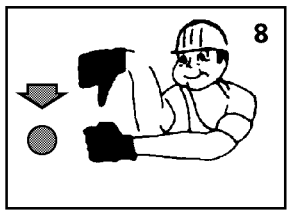
1.) Each crane must be “fully” grounded. Check visually or with a simple tester to ensure that ladder, cab and cable pulleys are grounded.
2.) All personnel working on the crane or with large metal objects must protect themselves from burns by wearing non-conductive synthetic gloves and suitable clothing while working.
3.) There is no need to panic if you feel your hand warm up. Always work under the assumption that the respective workpiece, structural steel member or support is “hot”.
4.) The temperature of objects affected by high frequency radiation depends on their “size”. Cranes, carriers and coverings, for example, are “hotter”.
5.) Contact with other crane loads is not permitted when operating the crane (arcing). Since defects caused by burns considerably reduce cable carrying capacity, any such occurrences must be reported immediately to the machinery supervisor so that the cables can be inspected.
6.) An insulator **1** is required at all times between the crane load hook and tackle. It is strictly prohibited to remove this insulator **1**.
7.) Do not touch the cables above the insulator **1**.
8.) Loads that are attached to the crane may not be touched by any unprotected parts of the body after the load has been lifted or set down.
9.) Do not work with a bare upper torso or in short pants, this is prohibited.
10.) To minimize absorption of high-frequency radiation, larger loads should be transported horizontally if possible.
11.) Loads must be grounded, or additional insulation used (rubber material between the object and gloves) when manual work is required.
12.) Use a suitable measuring instrument to check the “temperature” of the workpiece.
If, for example 500 V can be measured on a tool at a distance of 1 cm to - 2 cm, then the tool may not be touched with bare hands.
The greater the distance, the higher is the voltage on the object:
At a distance of 10 cm, the voltage is approx. 600 V, at a distance of 30 cm, the voltage is approx. 2000 V.
13.) To avoid secondary accidents, use a safety belt when working on structures that are high off the ground.
14.) Handling explosive matter (such as refuelling) may only be done at least 6 m away from the place where sparks could form due to handling of larger metal parts. Use only conductive rubber hoses to refuel.
15.) Any accidents and unexpected events must immediately be reported to the local construction supervisor and the safety engineer.

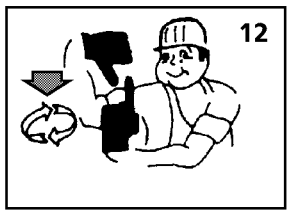


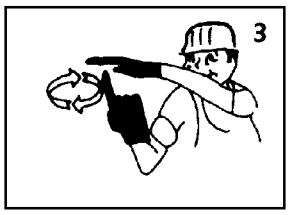


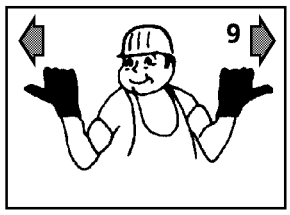


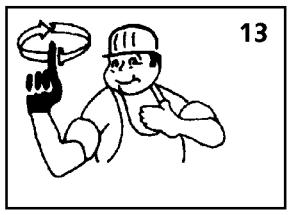


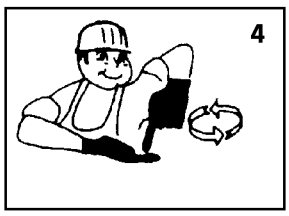


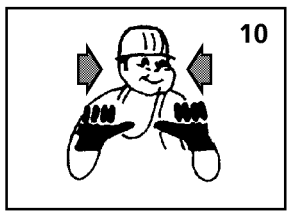


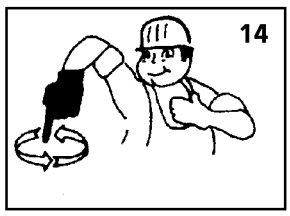


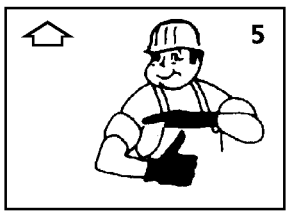


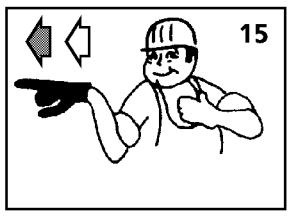


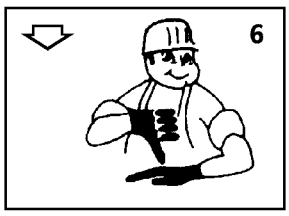


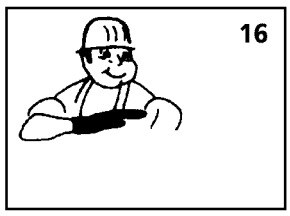


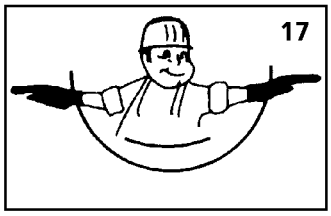












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18 Hand signals for guidance

For all crane movements, the crane driver 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 driver may only operate the crane if he is signed by an assigned guide.
The crane driver may be guided by hand signals or a two-way radio. It must be ensured that there are no misunderstandings.

WARNING
Danger of accident caused by misunderstood hand signals!
- ▶ Hand signals must be mutually agreed upon and clearly executed!

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

19 Consideration of wind conditions

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

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

The crane driver must check with appropriate information sources about the expected wind speeds, at:
1.) The start of crane operation.
2.) Interruption of crane operation.
3.) Taking up crane operation again.

WARNING
The crane can topple over!
If the crane is operated at wind speeds which are larger than the maximum permissible wind speeds according to the load charts, then it can topple over and kill personnel!
▶ If wind speeds are expected which are larger than the maximum permissible wind speeds for the equipped crane, then the attachments and the boom must be taken down!
▶ If wind speeds are expected which are larger than the maximum permissible winds speeds for the crane operation, then it is prohibited to lift a load!

Wind force		Wind speed		Effect of the wind
Beaufort	Description	[m/s]	[km/h]	in the inland
0	Calm	0 - 0,2	1	No wind, smoke rises straight up
1	Slight air (draft)	0,3 - 1,5	1 - 5	Wind direction is shown only by observing the trail of smoke, not by the wind sock
2	Light breeze	1,6 - 3,3	6 - 11	Wind can be felt on the face, the leaves rustle, wind sock moves slightly
3	Gentle breeze	3,4 - 5,4	12 - 19	Leaves and thin twigs move Wind extends a small breeze flag
4	Moderate breeze	5,5 - 7,9	20 - 28	Swirls up dust and loose paper, moves twigs and thin branches
5	Fresh breeze	8,0 - 10,7	29 - 38	Small deciduous trees begin to sway, foam forms at sea
6	Strong breeze	10,8 - 13,8	39 - 49	Thicker branches move; telephone lines begin to whistle, umbrellas are difficult to use
7	Stiff wind	13,9 - 17,1	50 - 61	Entire trees swaying; difficult to walk into wind
8	Gale force wind	17,2 - 20,7	62 - 74	Breaks twigs off trees, walking becomes difficult
9	Gale	20,8 - 24,4	75 - 88	Minor damage to property (chimney tops and roofing tile are blown off)

Wind force		Wind speed		Effect of the wind
Beaufort	Description	[m/s]	[km/h]	in the inland
10	Severe gale	24,5 - 28,4	89 - 102	Trees are uprooted, significant damage to property
11	Violent storm	28,5 - 32,6	103 - 117	Extensive, widespread storm damage
12	Hurricane	32.7 and more	118 and more	Major destruction

20 Interruption of crane operation

20.1 Interruption of crane operation

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

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

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

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

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

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

21 Taking up crane operation again

21.1 Taking up crane operation again

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

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

- ▶ Check operating mode settings and reset, if necessary.

22 Ending crane operation

22.1 Ending crane operation

Before the crane driver 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 dismantle if necessary.
- ▶ Bring the control lever (master switch) to 0-position.
- ▶ Switches off the heating.
- ▶ Apply the parking brake on the crane chassis.
- ▶ Turn the engine off and pull the ignition key.
- ▶ On mobile cranes:
  Secure the mobile crane to prevent unauthorized use. Ensure the crane driver's cab and driver cab are not occupied. Lock the crane driver's cab and driver cab.
- ▶ On mobile cranes:
  Secure the crane against uncontrolled rolling. See paragraph “Parking the vehicle”.

23 Turning / driving in reverse

WARNING
Danger of accidents when turning or driving in reverse!
When turning or driving in reverse, personnel can be overlooked or killed!
Objects can be severely damaged!
- ▶ When turning or driving in reverse, the vehicle operator must act in such a way that he does not endanger other traffic participants!
- ▶ The vehicle operator may only drive or move backward if it is ensured that no personnel or equipment is endangered. If this cannot be ensured, he must use a guide to signal!
- ▶ Under no circumstanances will an acoustical back-up warning device replace a guide!
- ▶ Make sure that there are no persons or objects behind the vehicle when driving in reverse!
- ▶ Make sure that no personnel is injured or killed!
- ▶ Make sure that no objects are damaged!
- ▶ Driving in reverse is only permissible a slow travel speed (manoeuvring speed)!
- ▶ Adhere to the national regulations!

24 Parking the vehicle

Note

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

WARNING

Danger of accidents if the vehicle rolls off!

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

▶ It is prohibited to park the vehicle at a slope or an incline of more than 18 %.

▶ The parking brake must always be applied when parking the vehicle.

▶ The ground where the vehicle is parked must be of sufficient load carrying capacity and level, so that the wedges will not slip away under load or be pushed into the soil.

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.

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 parked unsupervised,
– the vehicle is defective, particularly if the brake system is defective.

WARNING

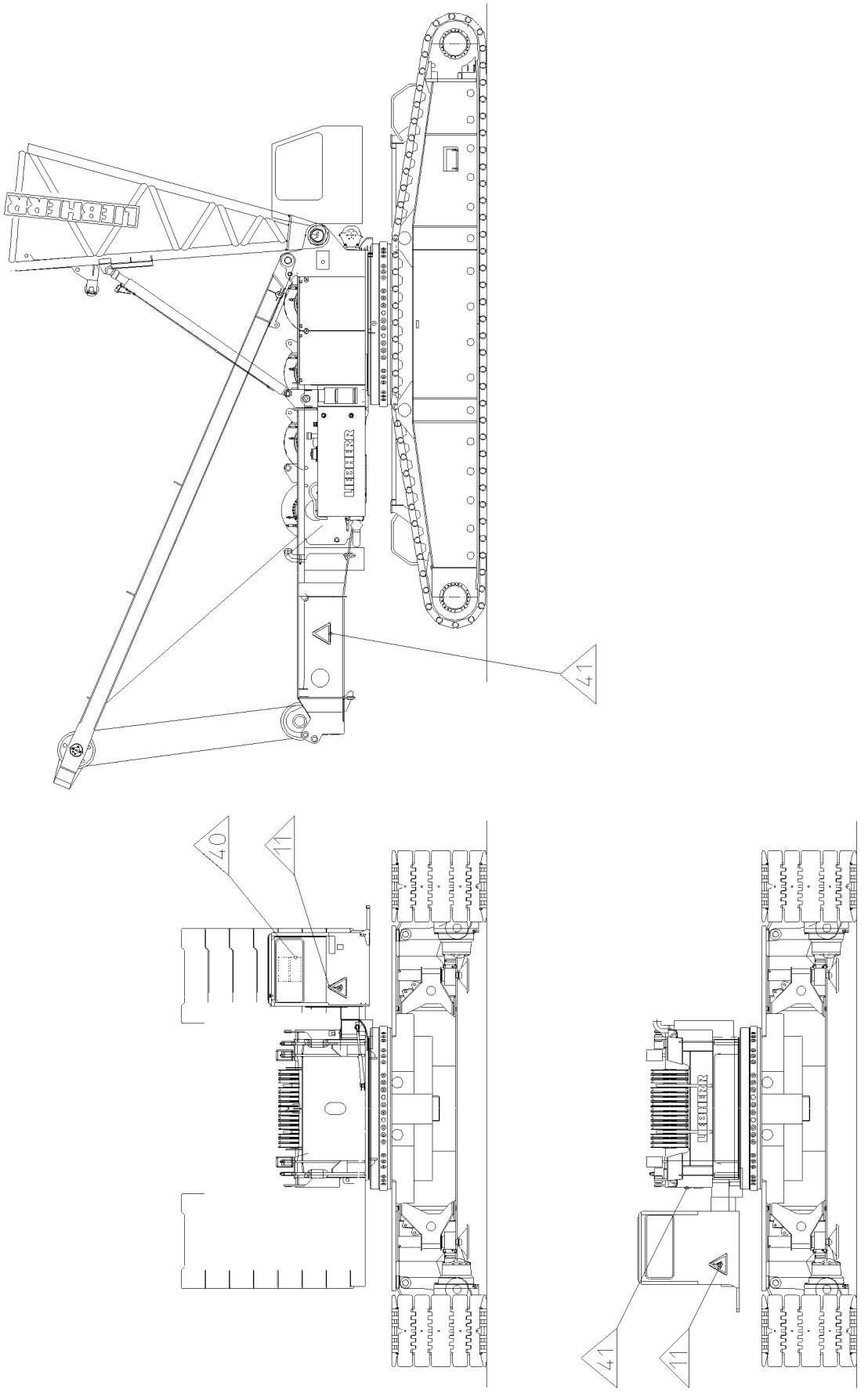
Vehicle can roll off uncontrollably!

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!



B108902

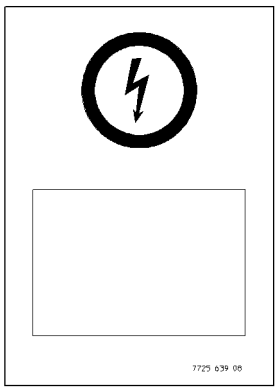
1 Warning signs

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!

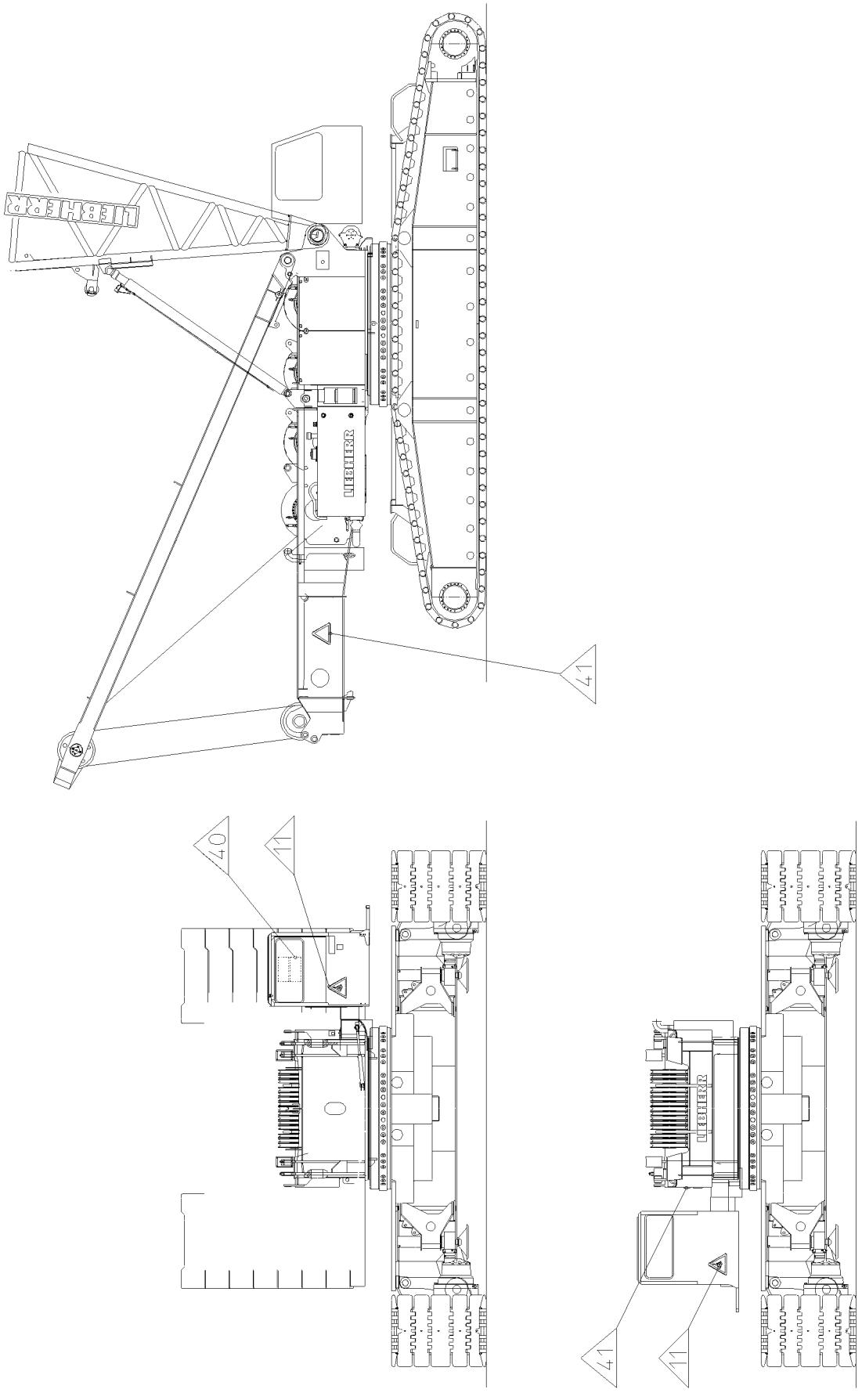
1.1 Warning of suspended load (position 11)

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)

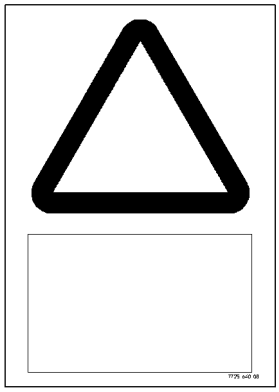


Note
- ▶ Only for certain countries!



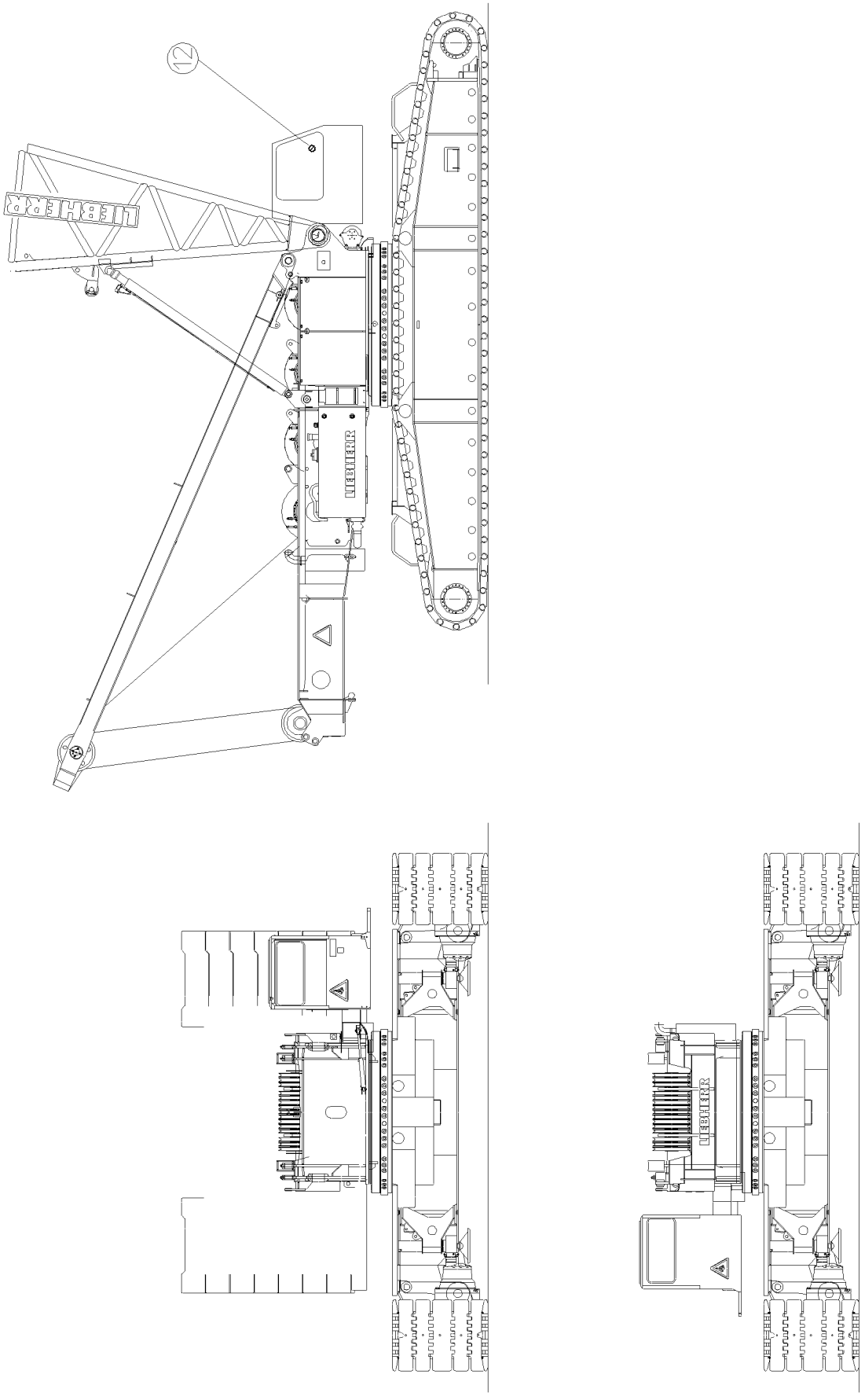
B108902

1.3 Slewing range (position 41)



Note

▶ Only for certain countries!



B108903

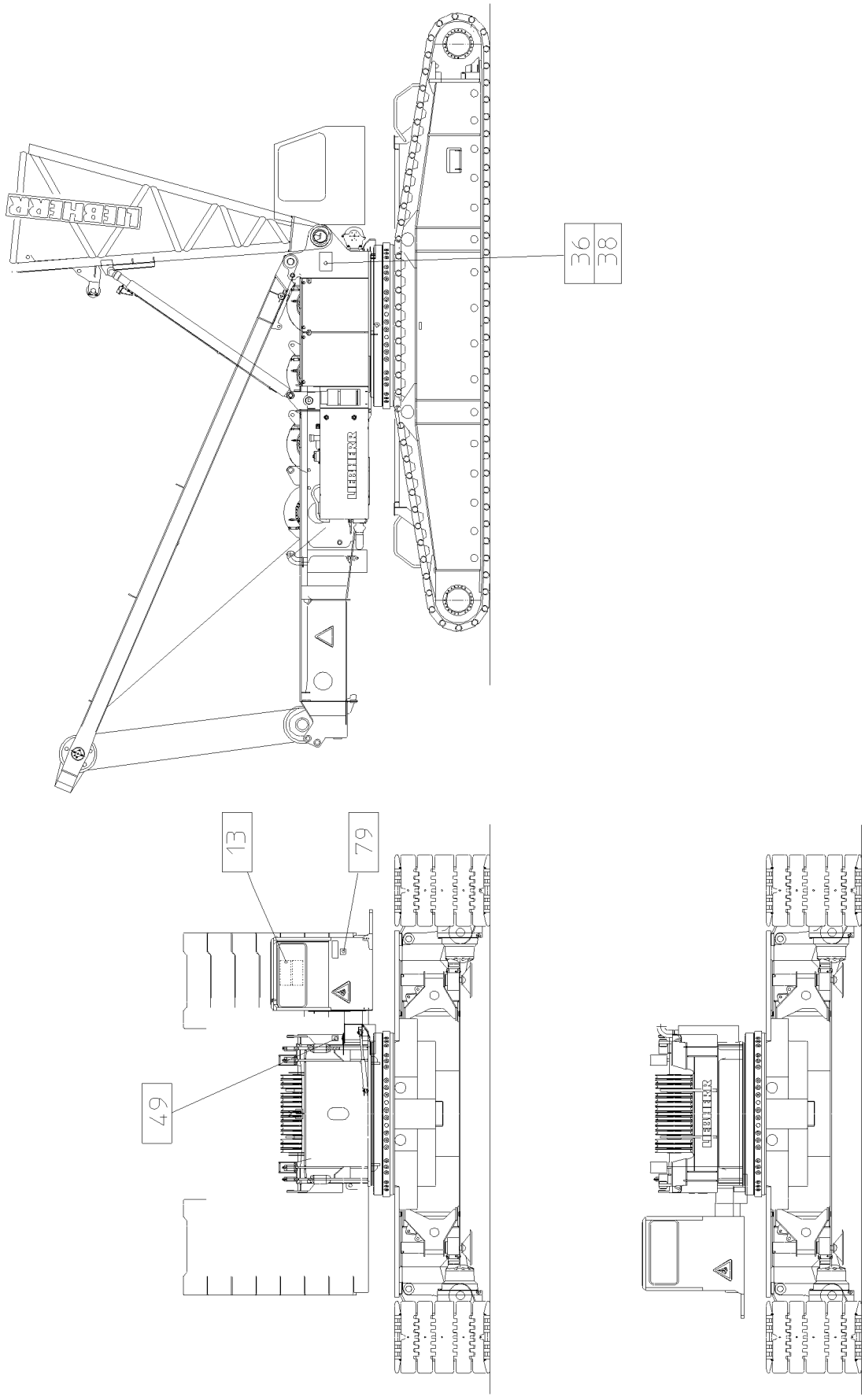
2 Command and prohibition signs

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!



B108904

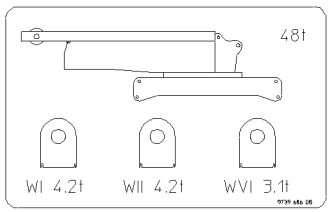
3 Notice signs

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!

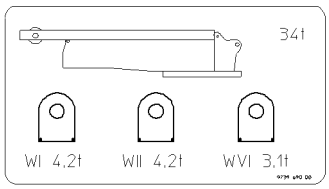
3.1 Operating instructions for cranes (position 13)

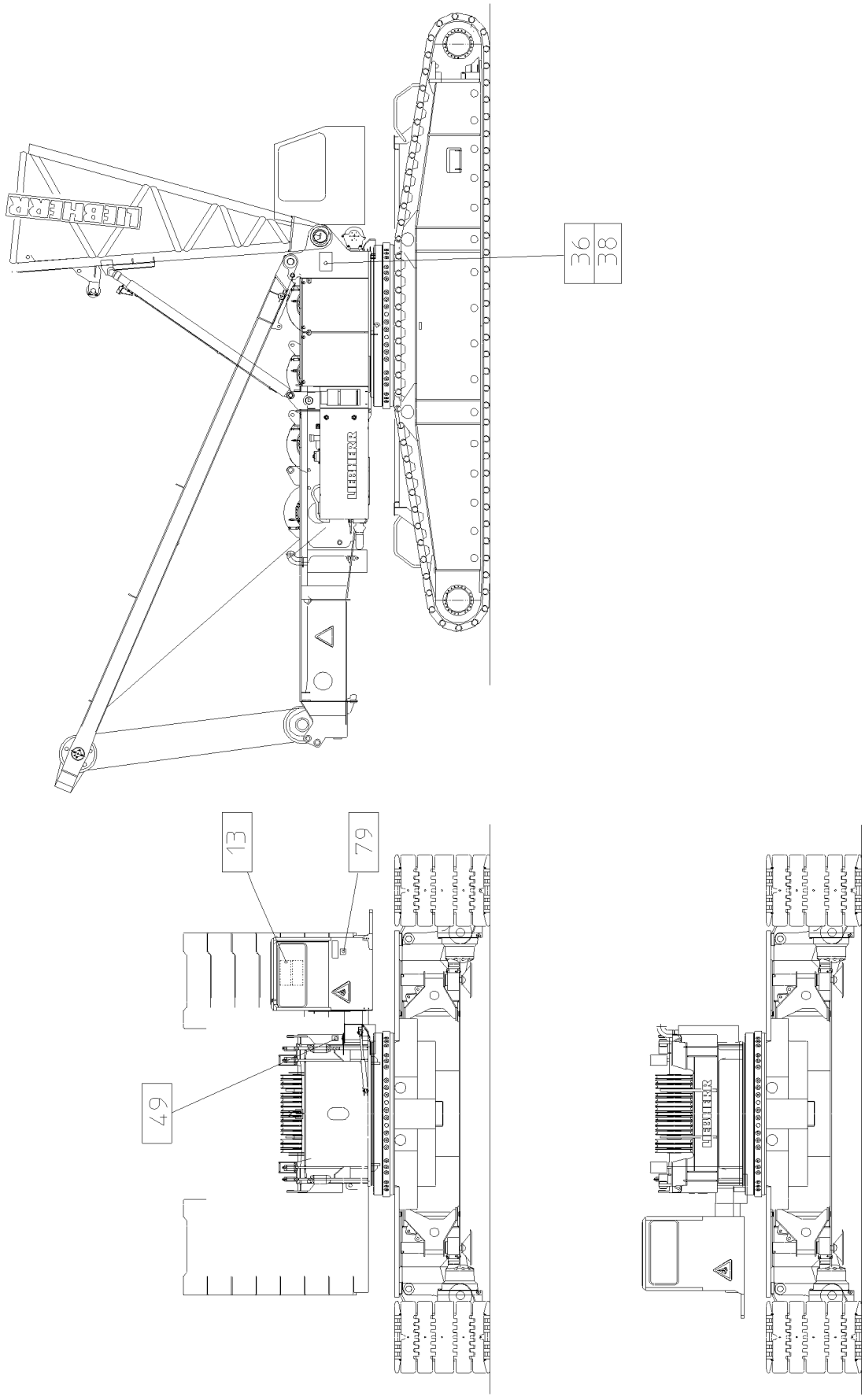
Note
- ▶ Only for certain countries!
- ▶ Read and observe the operating instructions before operating the crane!

3.2 Transport weights of components (Position 36)



3.3 Transport weights of components (Position 38)



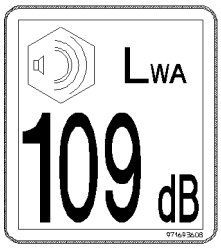


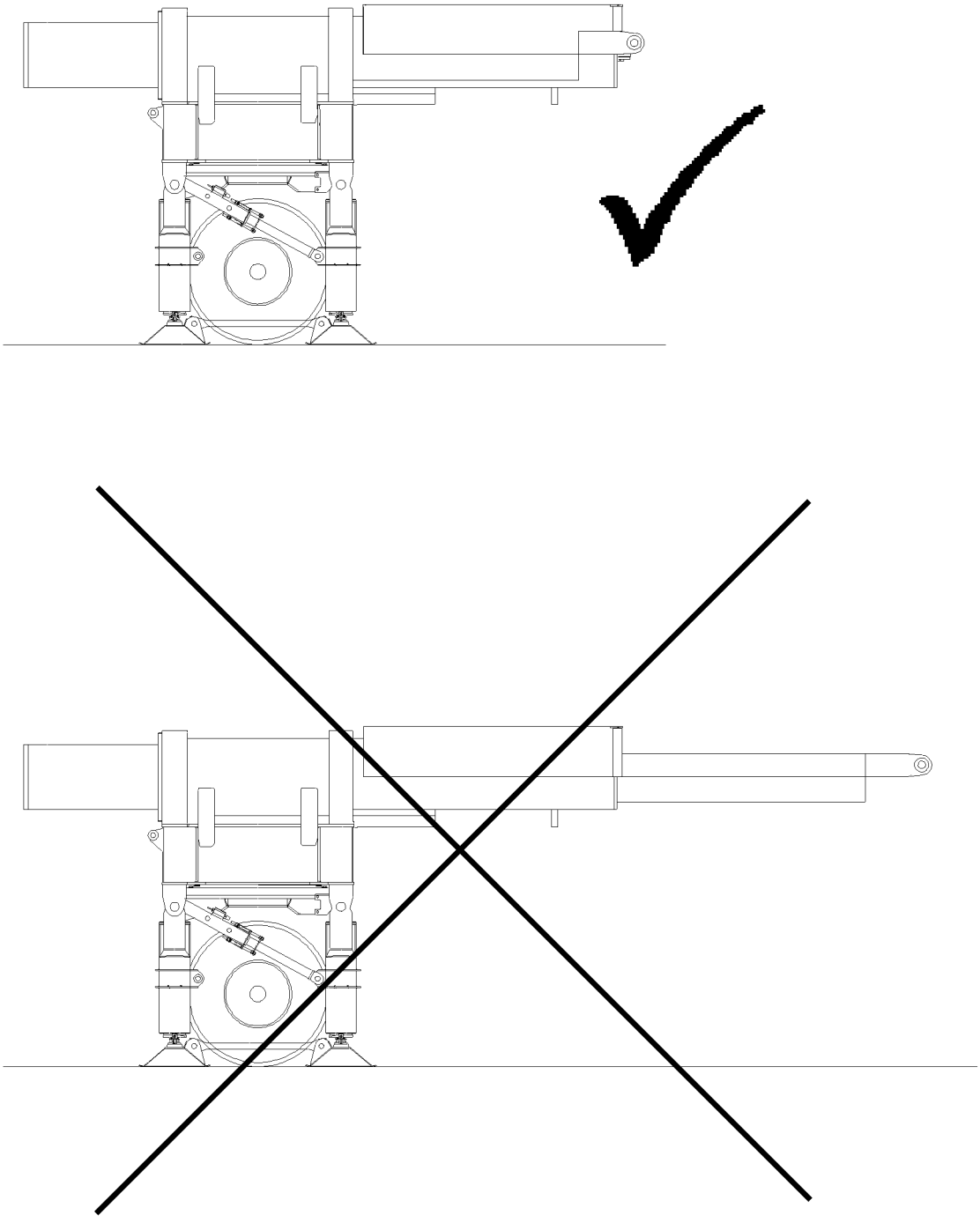
B108904

3.4 Notice sign for refueling (position 49)

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

3.5 Warranted maximum sound output level (position 79)





B107353

1 Safety guidelines

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

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

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

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

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

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

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

2 Inspection of tires and disk wheels

Note
- ▶ See Crane operating instructions, chapter 8.01!

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

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

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

2.1 Tires with air inflation

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

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

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

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

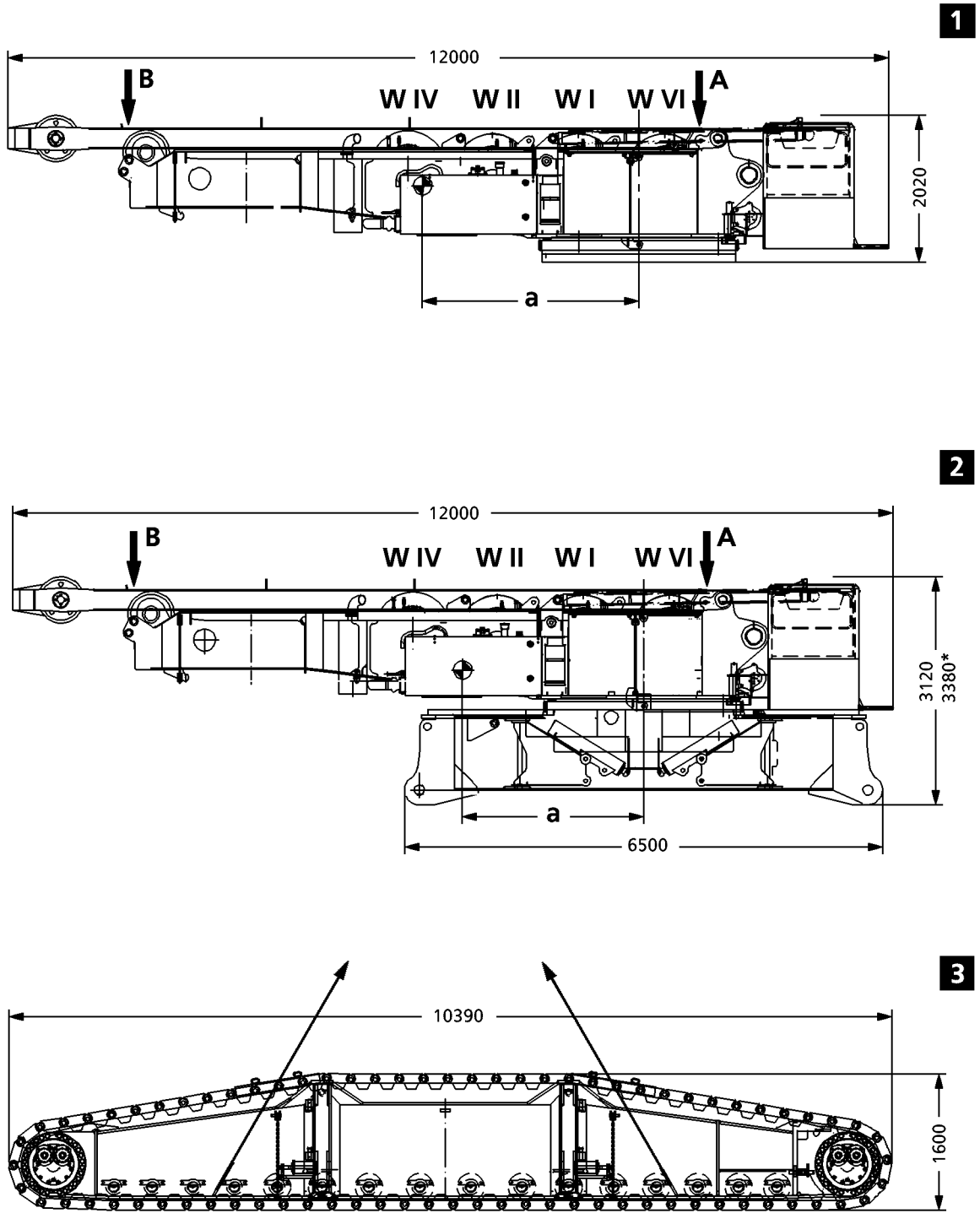
2.2 Tires foamed with special foam

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

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

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

3.00 Crane assembly


1
12000
B
W IV
W II
W I
W VI
A
2020
a
2
12000
B
W IV
W II
W I
W VI
A
3120
3380*
a
6500
3
10390
1600

B186765

1 Dimensions, weights and centers of gravity

1.1 Turntable

See illustration **1**.
Width: 6.08 m

Condition with Quick Connection*	Weight	Center of gravity a	A	B
with winch IV + rope	31.3 t	2672 mm	17.1 t	14.2 t
with winch I + IV + rope	35.5 t	2510 mm	20.1 t	15.4 t
with winch I, II + IV + rope	39.7 t	2456 mm	22.9 t	16.8 t
with winch VI, I, II + IV + rope	43.9 t	2180 mm	26.9 t	17.0 t

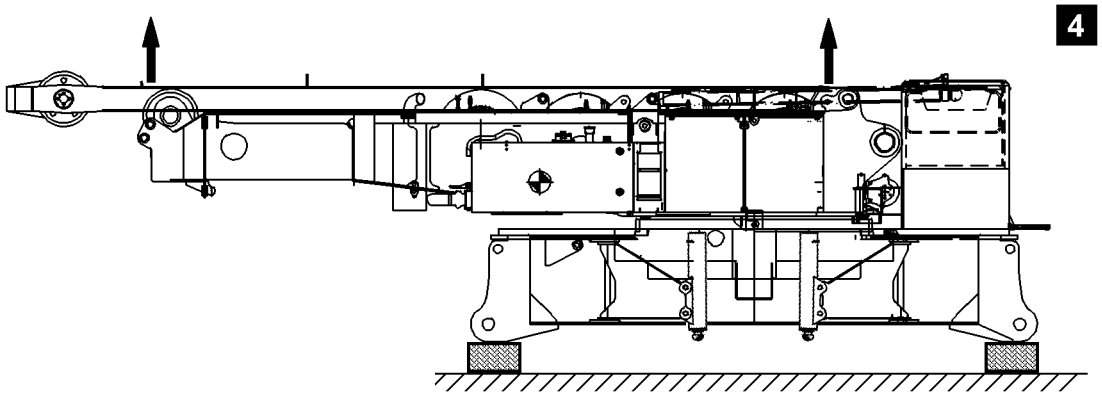
1.2 Turntable and crawler center section

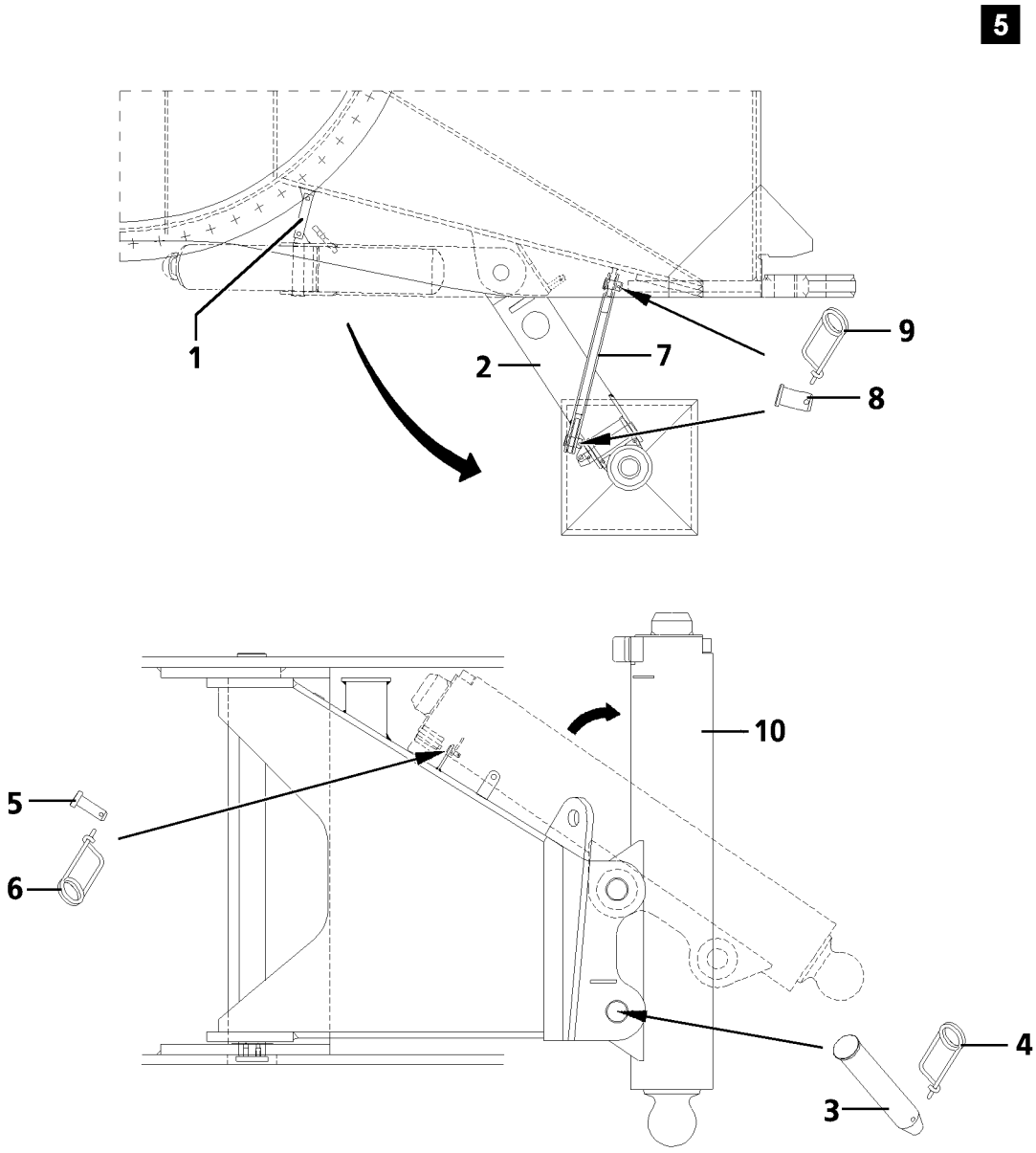
See illustration **2**.
Width: 6.08 m

Condition with Quick Connection*	Weight	Center of gravity a	A	B
with winch IV + rope	47.5 t	1761 mm	31.5 t	16.0 t
with winch I + IV + rope	51.7 t	1452 mm	36.4 t	15.3 t
with winch I, II + IV + rope	55.9 t	1745 mm	37.3 t	18.6 t
with winch VI, I, II + IV + rope	60.1 t	1598 mm	41.2 t	18.9 t

1.3 Crawler carrier

See illustration **3**.
Weight **with** track pads 1.2 m and two travel drives: 28 t
Width: 1.2 m





B104555

2 Assembling the crawler travel gear with SA-frame

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

- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect against falling!
- ▶ It is prohibited for anyone to remain within the complete danger zone during assembly and disassembly!

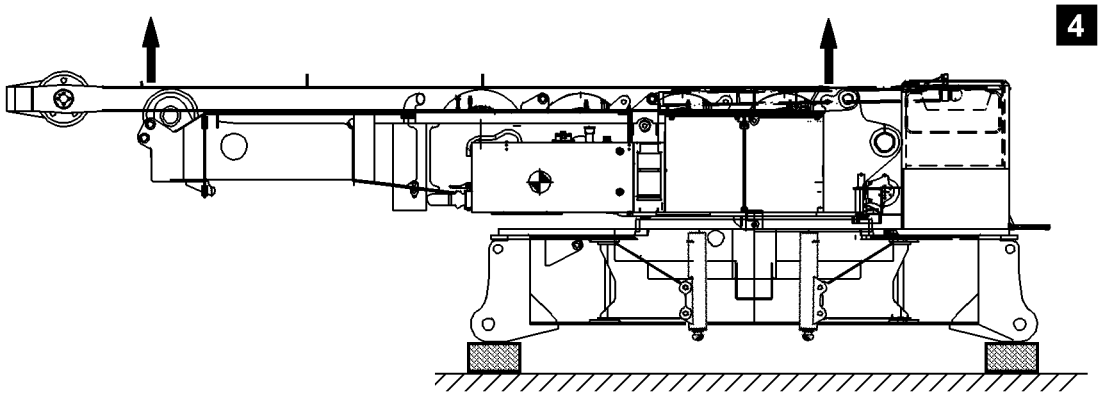
Make sure that the following prerequisites are met:
– an auxiliary crane is available,
– the placement location must be level and have adequate load bearing capacity,
– suitable material must be available for the support of the crawler center section.

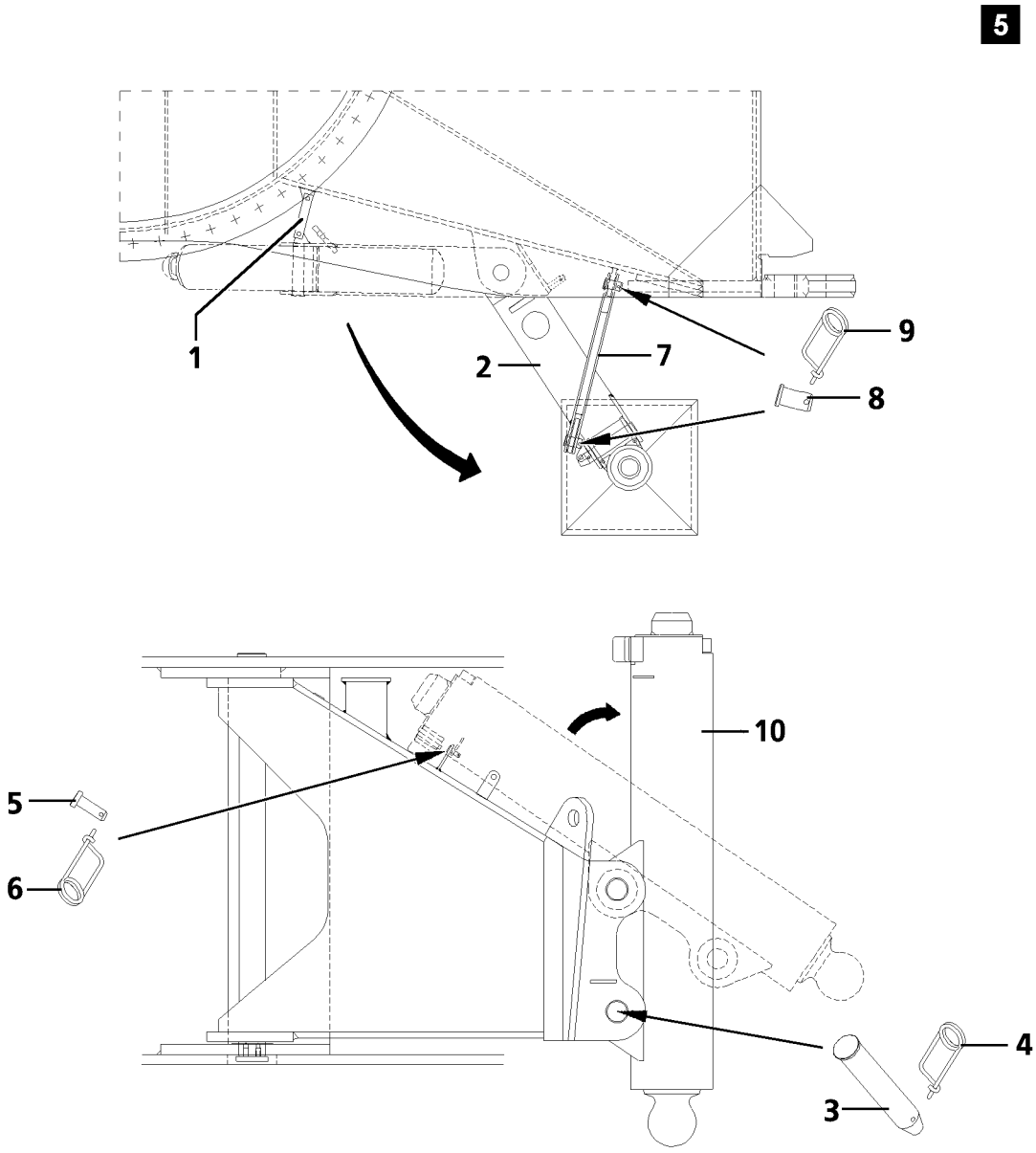
2.1 Short description of assembly procedure

Note

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

- ▶ Set the turntable and the crawler center section onto the support, see illustration **4**.
- ▶ Swing the supports out, see illustration **5**.
- ▶ Erecting the SA-frame, see illustration **6**.
- ▶ Lift the turntable and the crawler center section with the hydraulic support cylinders, see illustration **7**.
- ▶ For assembly of crawler carrier with SA-frame, see illustration **11**,**12**,**13**.





B104555

2.2 Set the turntable and the crawler center section onto the support

For the following work, the turntable and the crawler center section must be lifted with an auxiliary crane from the transport vehicle and supported from below (hardwood timbers or other similar material).
Ensure that the following prerequisite is met:
– the placement location must be level and have adequate load bearing capacity.

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

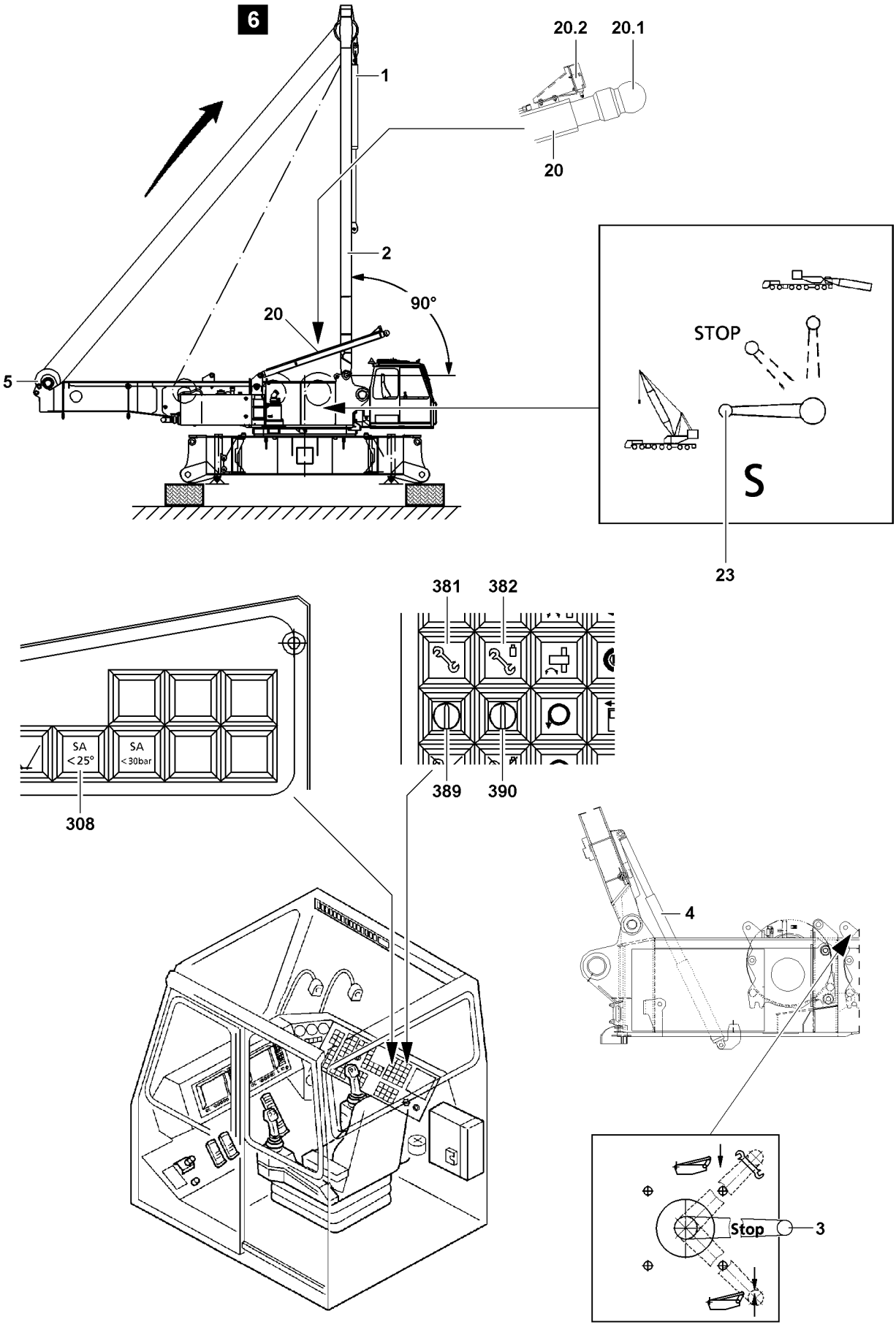
▶ Lift the turntable and the crawler center section with the auxiliary crane.
▶ Remove the transport vehicle.
▶ Set the turntable and the crawler center section onto the support, see illustration **4**.

2.3 Swinging the hydraulic support out

For the crawler assembly, the turntable with the crawler center section must be hydraulically supported. To do so, the hydraulic supports **2** on the crawler center section must be swung out, see illustration **5**.
▶ Loosen the transport retainer **1**.
▶ Swing the hydraulic supports **2** out.
▶ Remove pin **3** and spring retainer **4**.
▶ Loosen the pin **5** and spring retainer **6**.

DANGER
Danger of crushing!
The hydraulic support cylinder can fold down by itself due to its own weight when it is unlocked! This can crush fingers and hands, even cut off limbs!
▶ Before unlocking, hold the hydraulic support cylinder and fold it down slowly!

▶ Tilt the cylinder **10** into working position.
▶ To lock the cylinder, insert the pin **3** and secure with spring retainer **4**.
▶ Insert the pin **5** into the transport receptacle and secure with spring retainer **6**.
▶ Secure the bracket **7** by inserting the pin **8** with spring retainer **9**.


6
1
2
20
20.2
20.1
20
90°
5
STOP
S
23
381
382
389
390
SA
< 25°
SA
< 30bar
308
4
Stop
3
B108401

2.4 Erecting the SA-frame

Note

- ▶ The piston rods **20.1** of the S-relapse cylinder **20** must be extended approx. 10 cm to approx. 15 cm so that the limit switches **20.2** on the relapse cylinders **20** are “cleared” and winch 4 can be “moved” with master switch 1 (MS1)!
- ▶ If this is not observed, winch 4 cannot be actuated and moved!

Ensure that the following prerequisites are met:

– the rope of winch 4 “boom control” is reeved,
– the engine is running, see Crane operating instructions, chapter 4.03,
– the assembly key button **389** and key button **390** “crawler assembly” are actuated,
– the indicator lights “assembly **381** ” and “crawler assembly **382** ” light up,
– the piston rods **20.1** of the S-relapse cylinders **20** are extended approx. 10 cm to approx. 15 cm,
– the operating mode for the required configuration is set on the LICCON.

Note

- ▶ Pay attention to the master switch assignment for turned on key switches, see Crane operating instructions, chapter 4.05!

DANGER

Danger of toppling the crane!

- ▶ When the key button **390** “crawler assembly” is turned on, there is no overload shut off for the assembly cylinder **1** as well as for the crane!

2.4.1 Extend the S-relapse cylinder

NOTICE

Destruction of the S-relapse cylinders **20**!

If the ball cock **23** is in “STOP” position (the S-relapse cylinders are thus blocked), the S-relapse cylinders **20** can be destroyed due to large temperature differences on the jobsite (for example between day and night)!

Expensive and extensive repairs can result!

- ▶ After completion of the crawler assembly, the ball cock **23** must always be set in position “retract” **or** in position “extend”!
- ▶ Never leave the ball cock **23** in “STOP” position for a longer period of time!

- ▶ Move the ball cock **23** into horizontal position.

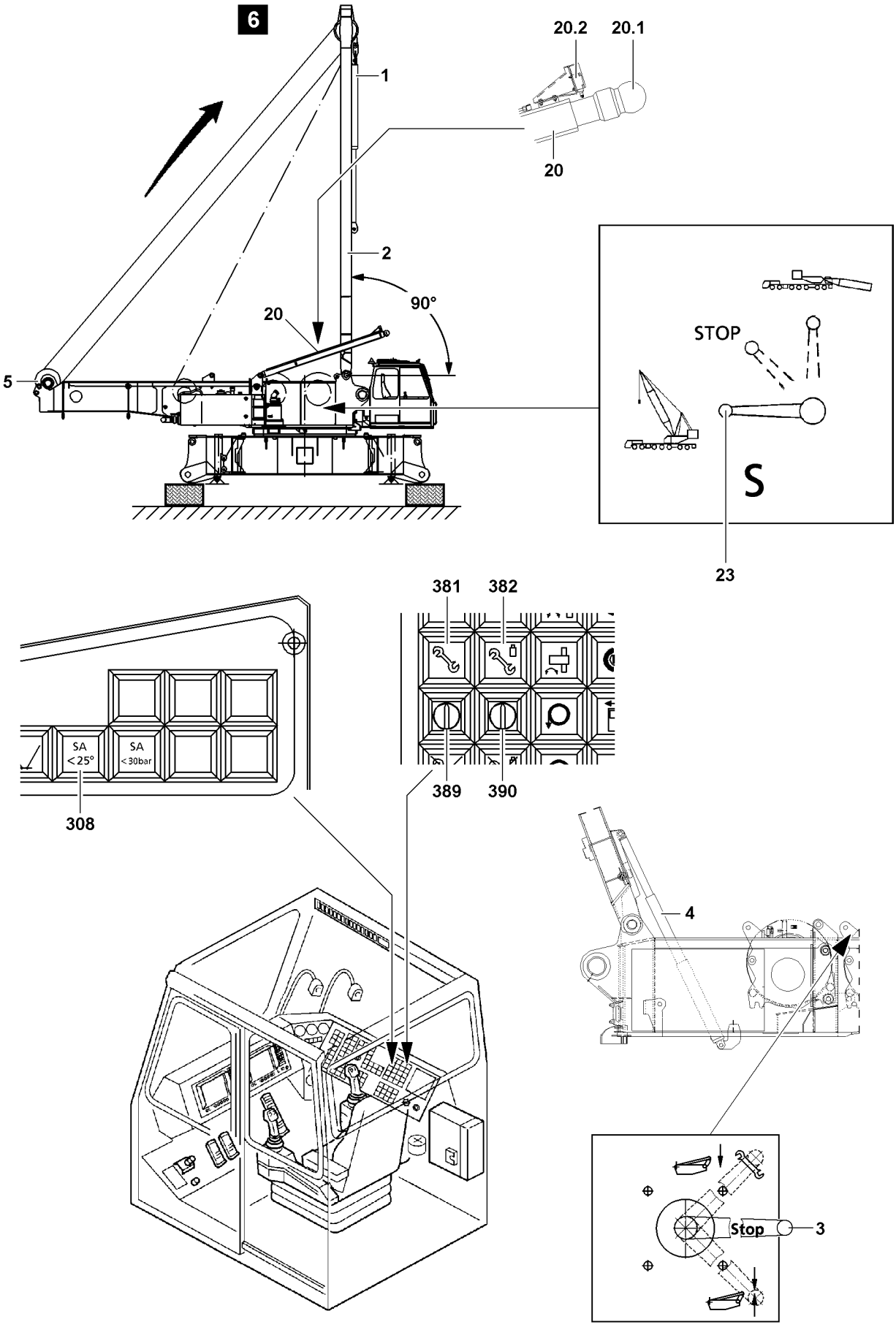
Result:

– The piston rod **20.1** of the S-relapse cylinder **20** extends.
– The limit switch **20.2** is no longer actuated.
– Winch 4 can be “moved”.

- ▶ When the piston rod **20.1** is extended approx. 10 cm to 15 cm: Move the ball cock **23** into STOP position.

Result:

– The S-relapse cylinder **20** is blocked in the current position.


6
1
2
20
90°
5
20.2
20.1
20
STOP
S
23
381
382
389
390
SA
< 25°
SA
< 30bar
308
4
Stop
3
B108401

2.4.2 Erection procedure

▶ Move the ball cock **3** downward into operating position.

Result:

– The SA-frame **2** is pushed upward by the erection cylinder **4** until the ropes are tensioned between the SA-frame and the turntable - pulley block.

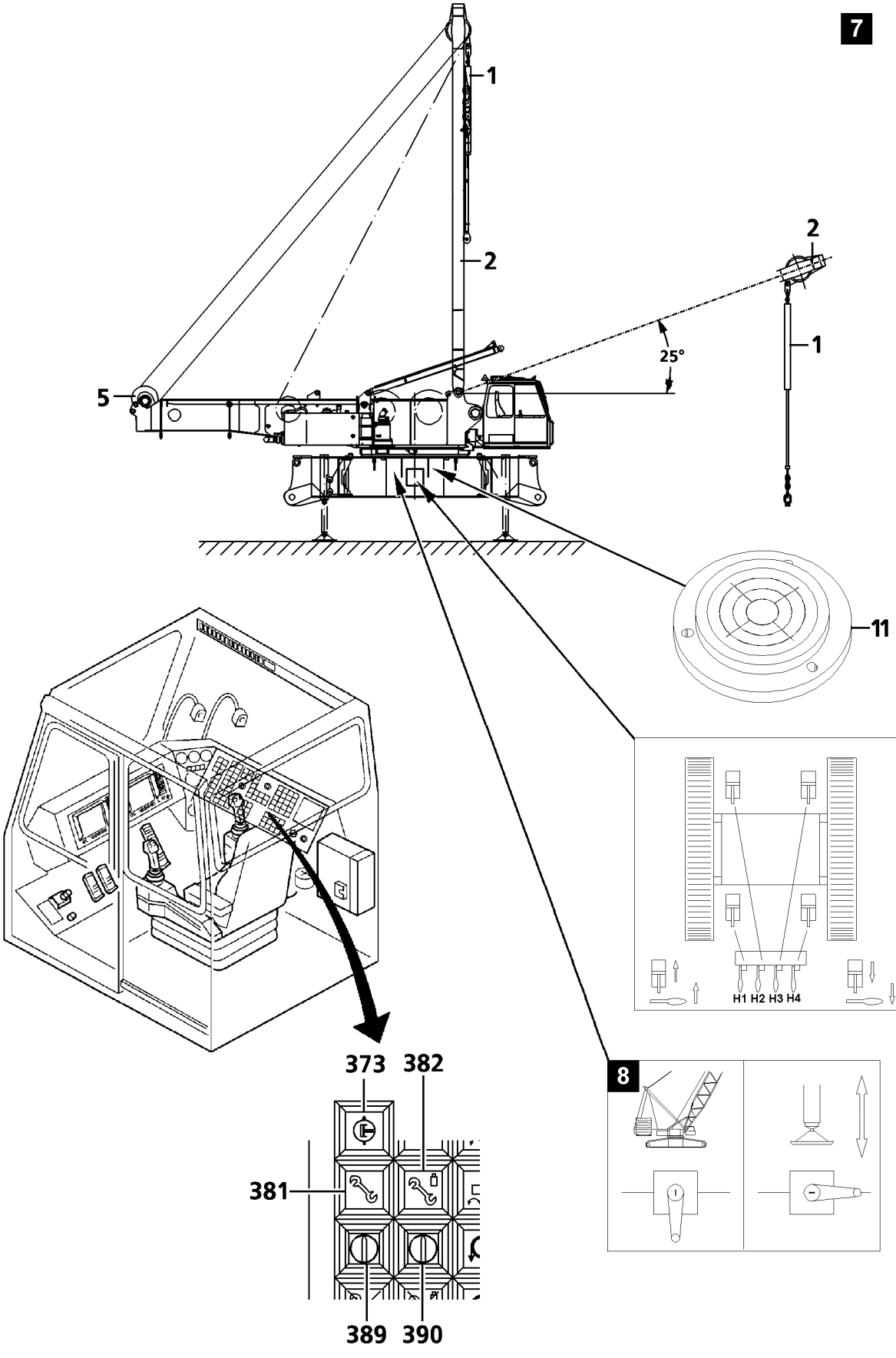
Positions of ball cock:	
Up	Lower the SA-frame onto the turntable (transport position)
Horizontal	STOP, extension and retraction of piston rod is blocked
Down	Operation, extend the piston rod

WARNING

Danger of damaging the rope pulleys or ropes!

▶ Check visually if the ropes are placed correctly in the respective rope pulley!

▶ Spool out winch 4 by actuating the master switch 1 until the SA-frame **2** is positioned at least at 90°!


7
1
2
2
1
25°
5
11
H1 H2 H3 H4
373
382
381
389
390
8
B104557

2.5 Lift the turntable and the crawler center section with the hydraulic support cylinders

Make sure that the following prerequisites are met:
– the SA-frame **2** is positioned at least at 90°,
– the assembly key button **389** and key button **390** “crawler assembly” are actuated,
– the indicator lights “assembly **381** ” and “crawler assembly **382** ” light up,
– the pressure change over switch **373** for the support cylinders in the cab is turned on,
– the ball cock is open (positioned vertically), see illustration **8**.

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

2.5.1 Supporting

The support pads must be supported with large enough stable materials, such as wood, steel or concrete slabs, depending on the ground conditions.

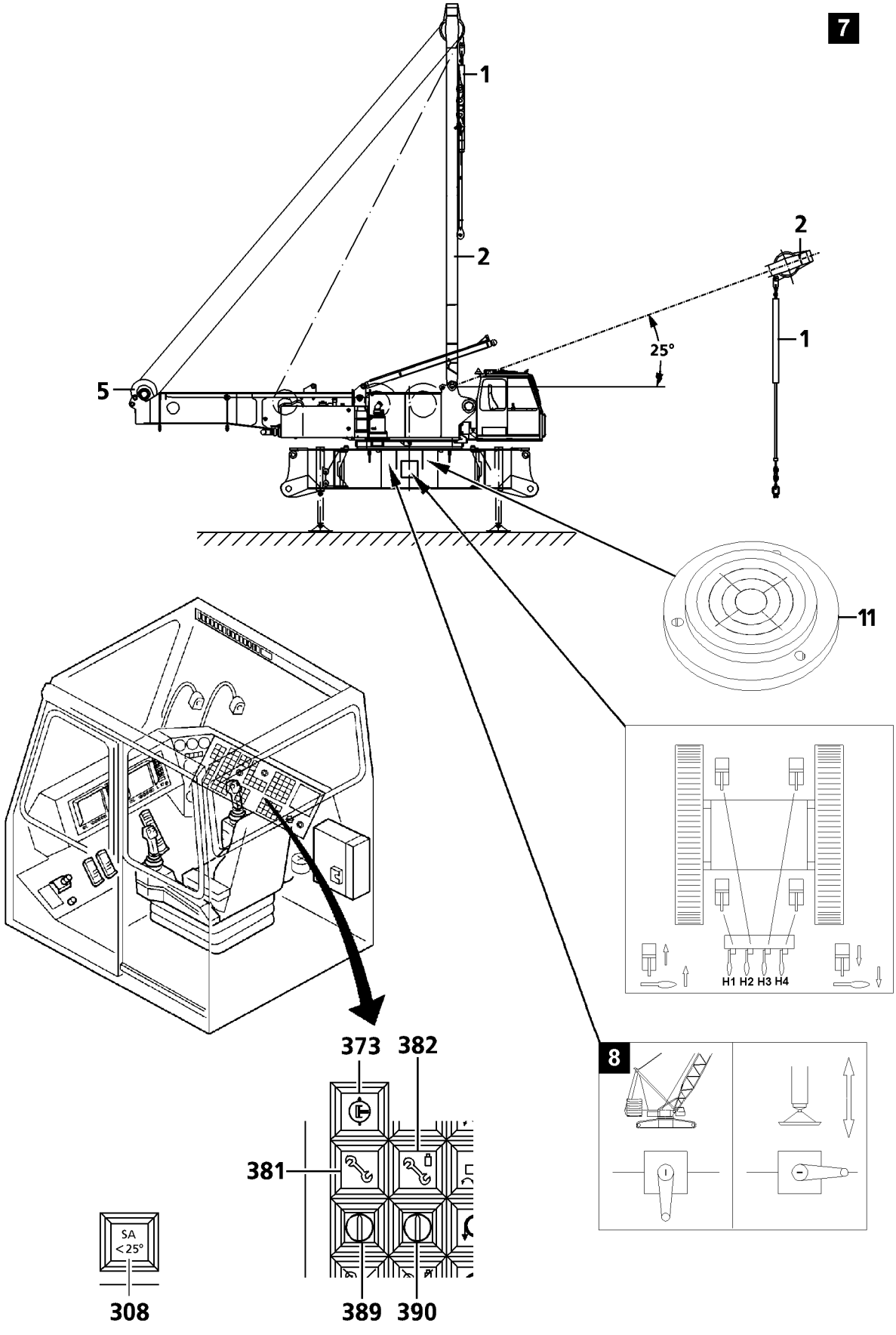
Note
▶ Observe the safety guidelines and permissible ground pressures, see Crane operating instructions, chapter 2.04!

DANGER
Danger of toppling the crane!
▶ Only suitable materials may be used for the support!
▶ The support must be placed in the center underneath the support pads!
▶ The SA-frame **2** must be erected at least to 90°!

▶ Support the support pads properly from underneath.
▶ Actuate the manual lever **H1**, **H2**, **H3**, **H4**.

Result:
– The support cylinders extend.

Note
▶ Lift the crane horizontally to approx. 1095 mm!



B108411

DANGER
Risk of accident!
- ▶ Pay attention to the horizontal position of the crane during the support procedure!
- ▶ After supporting and aligning, the ball cock must be closed, see illustration **8**!
- ▶ The ball cock **3** for the SA-frame must be in operating position “down” during assembly and crane operation, see illustration **6**!
- ▶ The ball cock position “STOP” and “up” are only permissible when lowering the SA-frame **2** to the turntable (transport position)!
- ▶ When spooling out winch 4, watch for slack rope formation!

- ▶ Align the crane with the spirit level **11** in horizontal direction.
- ▶ Close the ball cock, see illustration **8**.

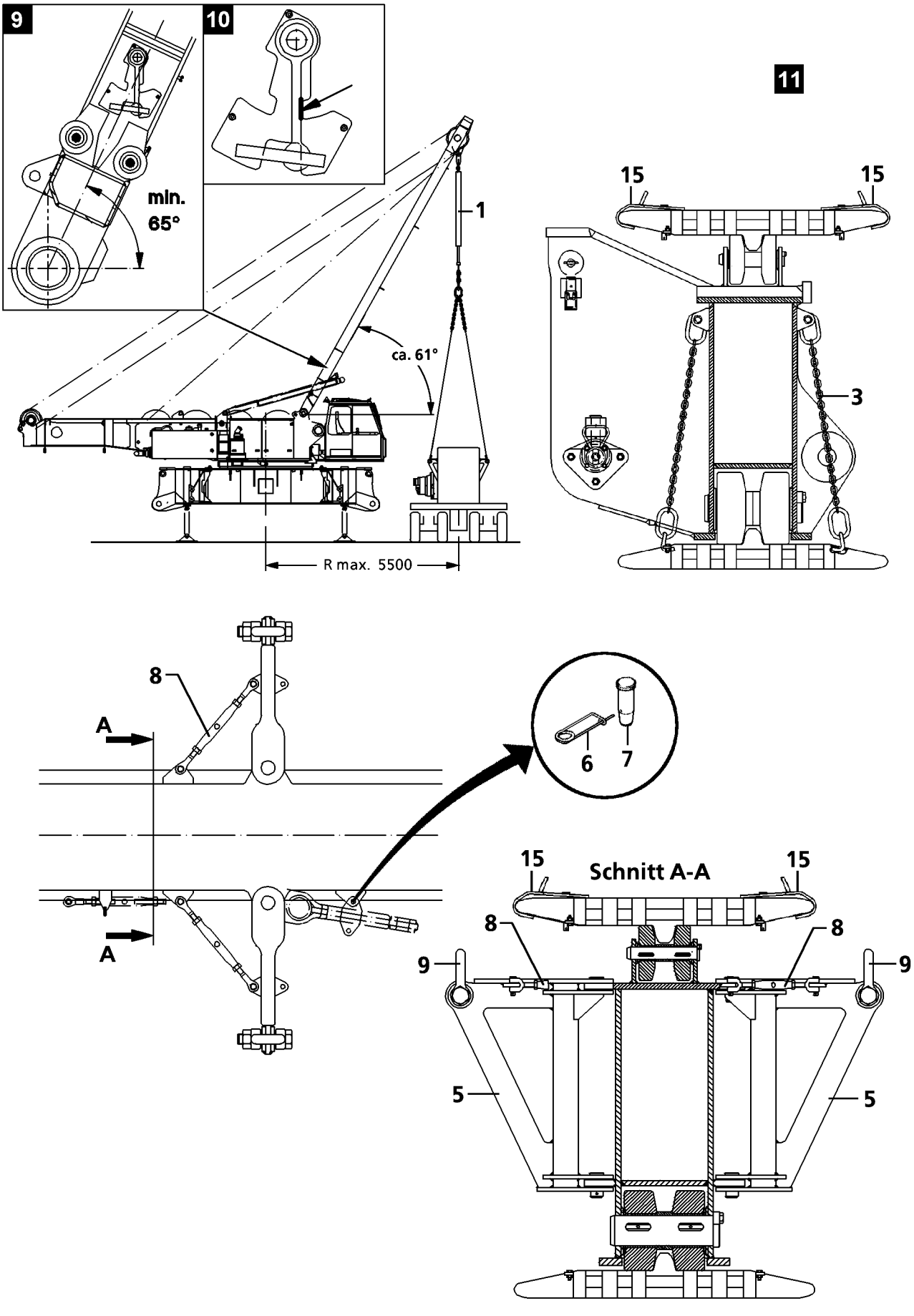
2.6 Lowering the SA-frame to the front

- ▶ Spool out winch 4.

Result:
– The SA-frame **2** is erected by the erection cylinder past the vertical position. Then it lowers to the front due to its own weight.

Note
- ▶ When the SA-frame **2** is inclined to the front and the angle to the horizontal is less than 25°, the winch 4 “spool out” movement is shut off. The indicator light **308** lights up!

- ▶ Hang the tackle chains on the assembly cylinder **1**.


9
10
11
min.
65°
1
ca. 61°
R max. 5500
15
15
3
8
A
A
6
7
15
Schnitt A-A
15
8
8
9
9
5
5

B104558

2.7 Assembly of crawler carrier with SA-frame

2.7.1 Assembly preparation

- ▶ Move the transport vehicle with the crawler carrier as close as possible to the crawler center section.
- ▶ Luff the SA-frame **2** up or down and turn the turntable if necessary until the assembly cylinder **1** is positioned over the crawler carrier.
- ▶ Remove the spring retainer **6**.
- ▶ Unpin the transport pin **7**.
- ▶ Swing the outer assembly console **5** out.
- ▶ Lock the turnbuckle **8** with the transport pin **7** and spring retainer **6** on the assembly console **5**.
- ▶ Extend the assembly cylinder **1**.
- ▶ Secure the crawler carrier plates with chains **3** on the respective two crawler plates on both sides to prevent them from sagging.

Note

- ▶ Attach 2 chains per crawler carrier side!

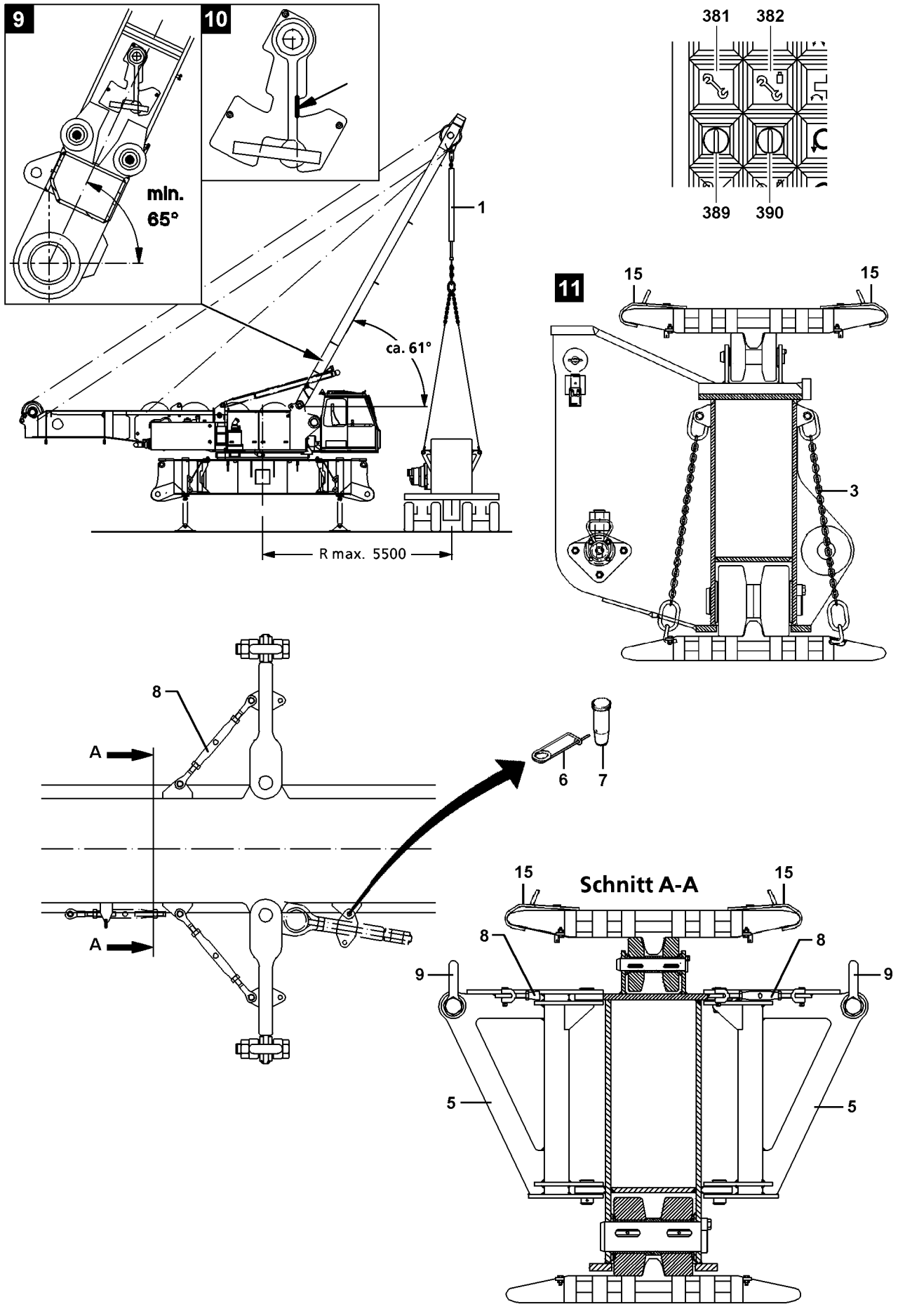
- ▶ Attach the rope guard **15** on the upper crawler plates.

DANGER

Risk of accident!

The rope guard must be used. If this is not observed, the attachment equipment can be damaged and rip!

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


9
10
min.
65°
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ca. 61°
R max. 5500
381
382
389
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11
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Schnitt A-A
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15
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5

B108412

- ▶ Attach the attachment equipment to the shackles **9** of the assembly console **5** and guide it over the rope guard **15**.
- ▶ Lift the crawler carrier with the assembly cylinder **1** from the transport vehicle.
- ▶ Remove the transport vehicle.

Note

- ▶ The assembly key button **389** and key button **390** “crawler assembly” are actuated!
- ▶ The indicator lights “assembly **381** ” and “crawler assembly **382** ” light up!
- ▶ Pay attention to the identification on the crawler carrier and the receptacle!

DANGER

Risk of accident!

- ▶ In this operating mode, when the key button “crawler assembly” is turned on, there is no overload shut off for the assembly cylinder as well as for the crane!

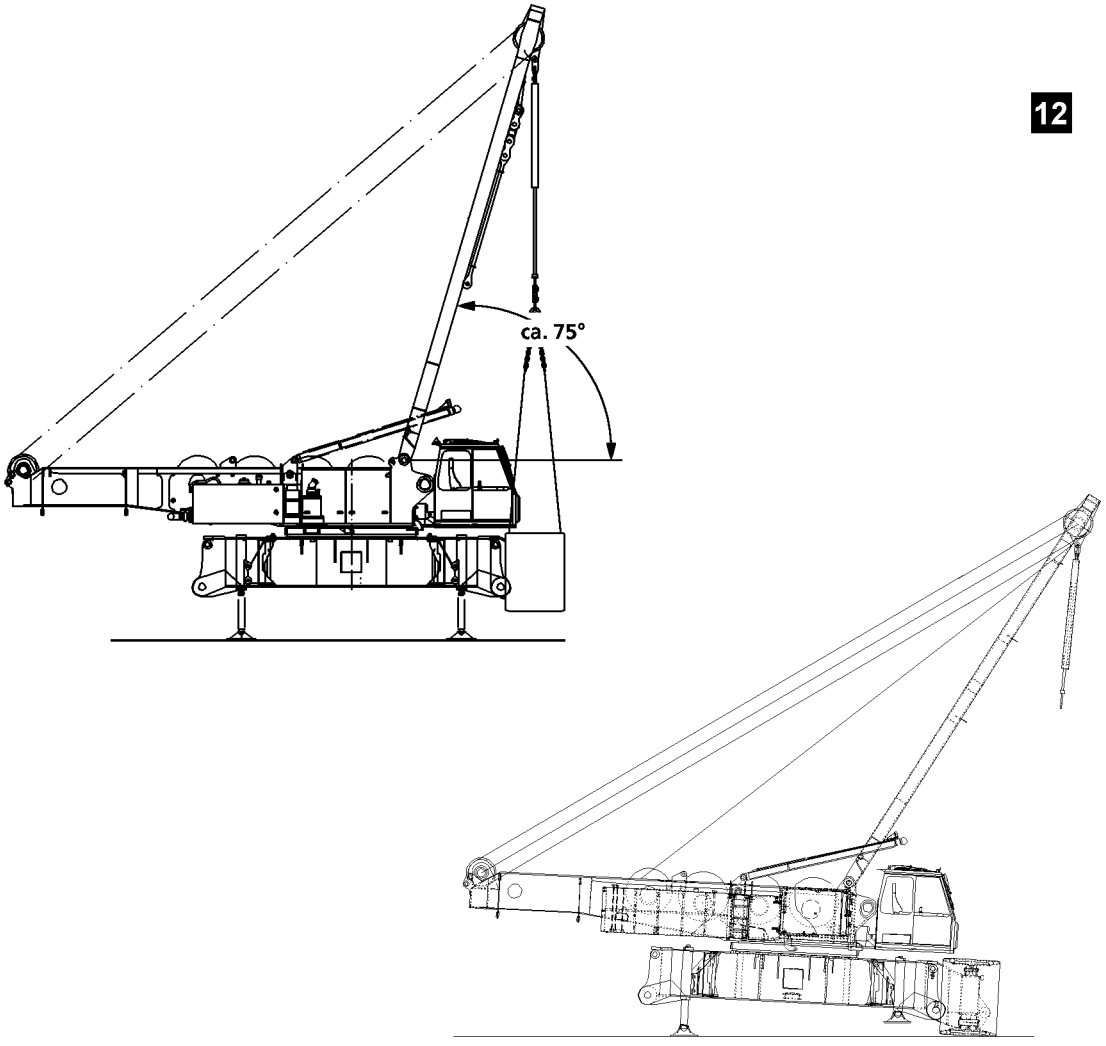
DANGER

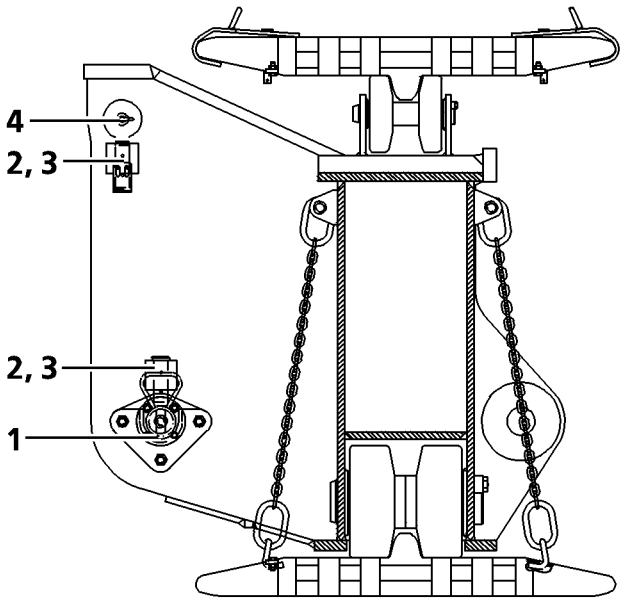
Risk of tipping the crane!

- ▶ The maximum radius of 5.5 m (approx. 61°) may not be exceeded when lifting the crawler carrier. The pendulum on the SA-frame must remain in the green range (approx. 61°-75°), see illustration **9**!

- ▶ Pay attention to the display of the pendulum on the SA-frame, see illustration **10**.

12





B104559

2.7.2 Assembling the first crawler carrier

Ensure that the following prerequisite is met:

– the preparations for crawler carrier assembly have been carried out, see section “Assembly preparation”.

▶ Swing the first crawler carrier to the receptacle on the crawler center section and insert it carefully to the stop and affix.

Note

▶ Note the identification on the crawler carrier and the crawler center section!

DANGER

Danger of crushing!

If the following point is not observed, life-threatening crushing injuries can occur!

▶ Do not stand between the crawler carrier and the crawler center section when the crawler carrier is placed!

▶ Pin and secure the crawler carrier on the crawler center section.

▶ Pin in the pins **1** with the hydraulic pin pulling device and secure with retaining pins **2**.

▶ Secure the retaining pins **2** with spring retainers **3**.

▶ Insert the pin **4** by hand and secure with spring retainer **2**.

▶ Secure the retaining pins **2** with spring retainers **3**.

▶ Remove the attachment equipment and rope guard **15**.

▶ Disengage the chains **3** on the crawler pads.

DANGER

Risk of tipping the crane!

▶ Before turning the turntable, the first assembled crawler carrier must be positioned on the ground!

▶ Open the ball cock (vertical position), see illustration **7**.

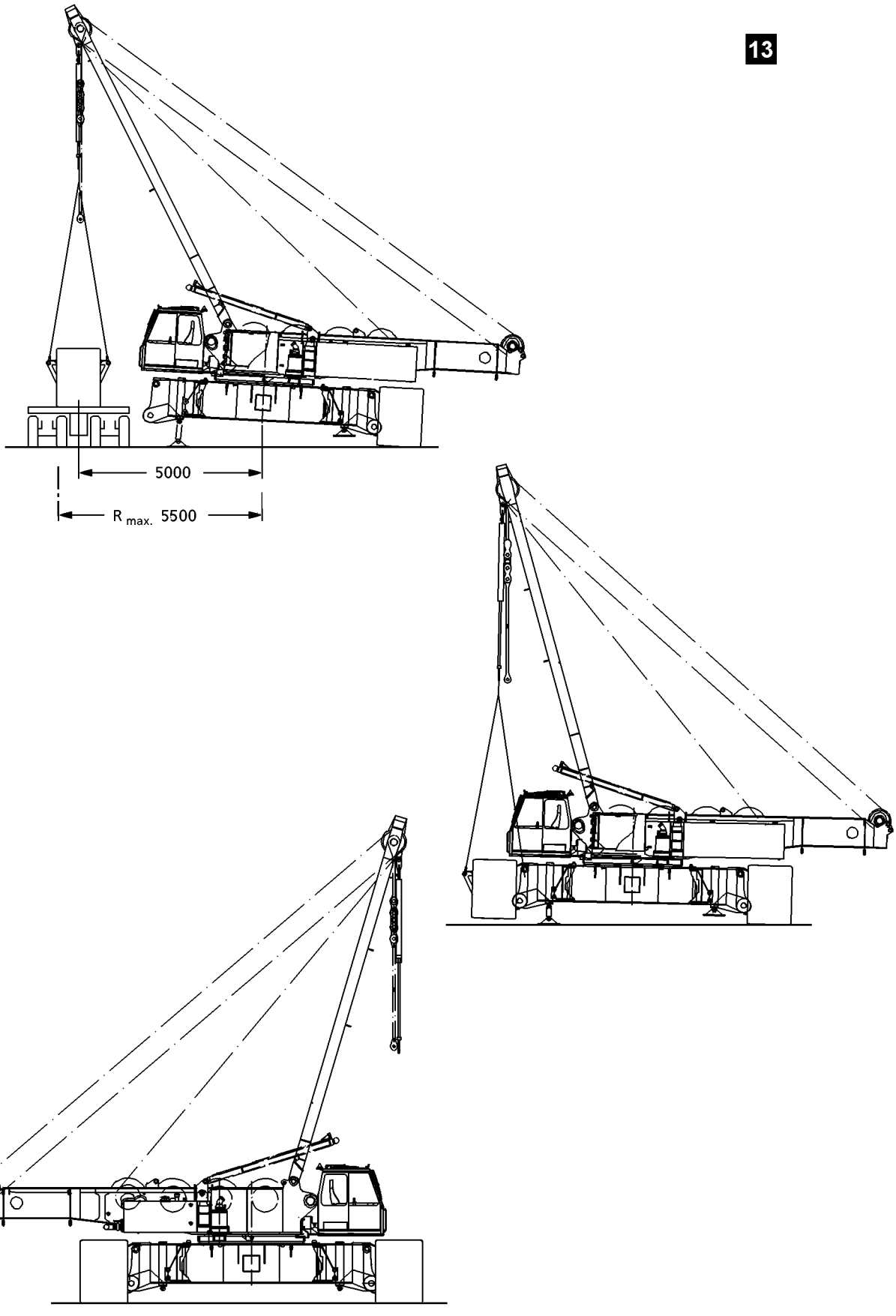
▶ Retract the two hydraulic support cylinders on the side of the first assembled crawler carrier until it is standing on the ground, see illustration **13**.

▶ Actuate the manual lever **H1**, **H2**, **H3**, **H4**.

Result:

– The support cylinders retract.

13



B104560

2.7.3 Assembling the second crawler carrier

Ensure that the following prerequisite is met:

– the preparations for crawler carrier assembly have been carried out, see section “Assembly preparation”.

DANGER

Risk of tipping the crane!

- ▶ Before turning the turntable, the first assembled crawler carrier must be positioned on the ground!
- ▶ The maximum radius of 5.5 m (approx. 61°) may not be exceeded when lifting the crawler carrier. The pendulum on the SA-frame must remain in the green range (approx. 61°-75°), see illustration **9**!

▶ Pay attention to the display of the pendulum on the SA-frame, see illustration **10**.

DANGER

Risk of accident!

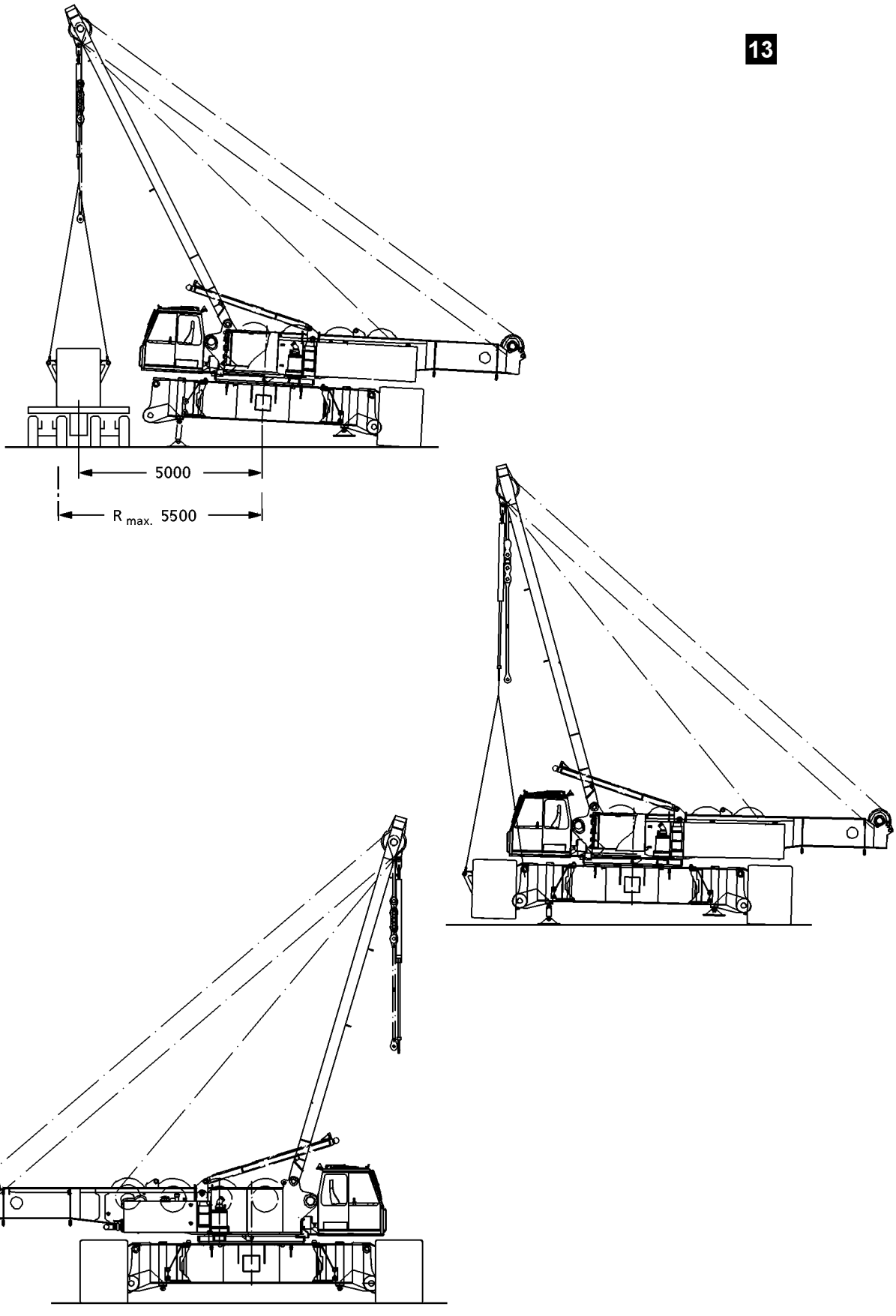
- ▶ In this operating mode, when the key button “crawler assembly” is turned on, there is no overload shut off for the assembly cylinder as well as for the crane!

▶ Swing the second crawler carrier to the receptacle on the crawler center section and insert it carefully to the stop and affix.

Note

- ▶ Note the identification on the crawler carrier and the crawler center section!

13



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DANGER
Danger of crushing!
If the following point is not observed, life-threatening crushing injuries can occur!
▶ Do not stand between the crawler carrier and the crawler center section when the crawler carrier is placed!

▶ Pin and secure the crawler carrier on the crawler center section.
▶ Pin in the pins **1** with the hydraulic pin pulling device and secure with retaining pins **2**.
▶ Secure the retaining pins **2** with spring retainers **3**.
▶ Insert the pin **4** by hand and secure with spring retainer **2**.
▶ Secure the retaining pins **2** with spring retainers **3**.
▶ Remove the attachment equipment and rope guard **15**.
▶ Disengage the chains **3** on the crawler pads.
▶ Retract the two hydraulic support cylinders on the side of the second assembled crawler carrier until it is standing on the ground, see illustration **13**.
▶ Retract the hydraulic support cylinders fully.
▶ Swing the assembly consoles **5** and the turnbuckles **8** in on the crawler carriers and secure.
▶ Close the ball cock (horizontal position), see illustration **8**.
▶ Turn the pressure change over switch **373** off in the cab.
▶ Retract the assembly cylinder **1** completely.
▶ Turn the key button **390** “crawler assembly” off.

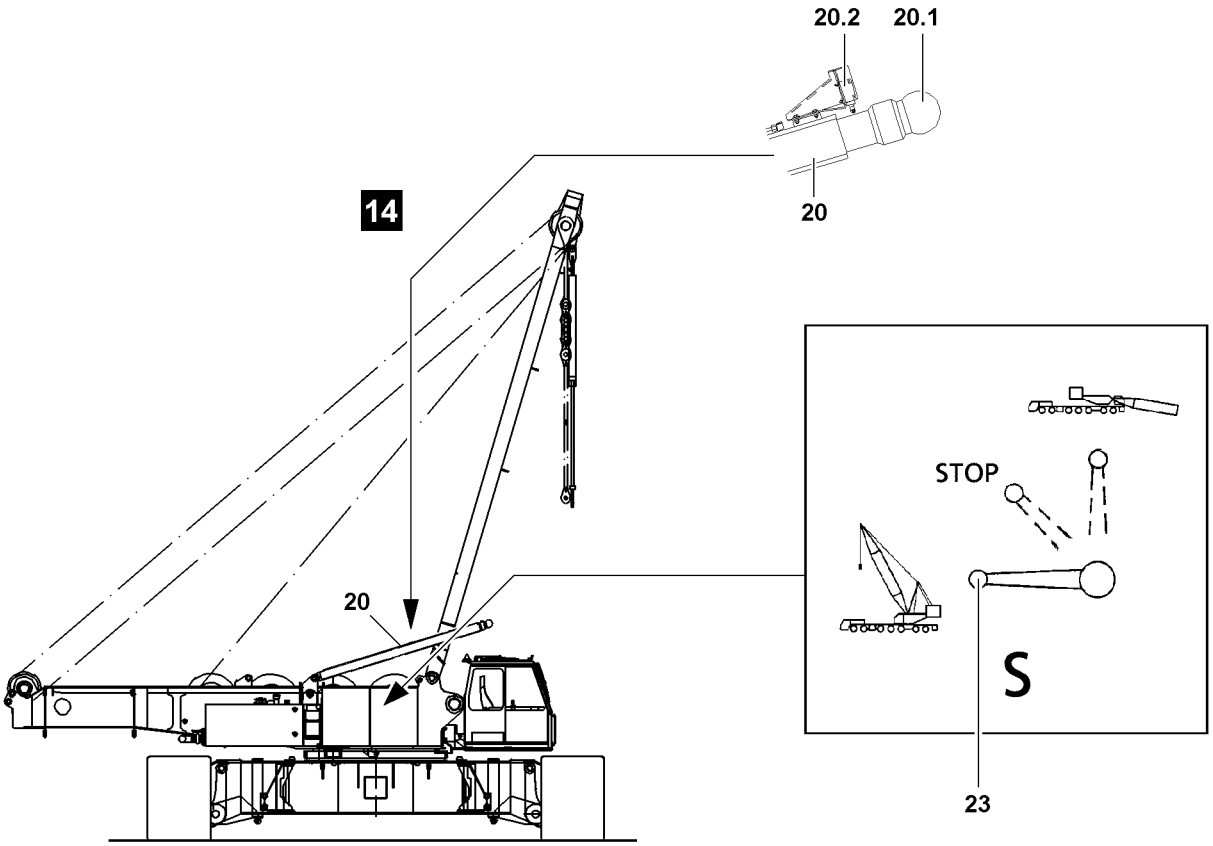
Result:
– The indicator light **382** “crawler assembly” turns off, see Crane operating instructions, chapter 4.01.

2.8 Establishing the hydraulic connection to the crawler travel gears

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

▶ Establish the hydraulic connections.

Note
▶ To connect the hydraulic lines with quick couplers, see Crane operating instructions, chapter 5.01!



B108402

2.9 The S-relapse cylinders retract or extend

NOTICE
Destruction of the S-relapse cylinders **20**!
If the ball cock **23** is in “STOP” position (the S-relapse cylinders are thus blocked), the S-relapse cylinders **20** can be destroyed due to large temperature differences on the jobsite (for example between day and night)!
Expensive and extensive repairs can result!
- ▶ After completion of the crawler assembly, the ball cock **23** must always be set in position “retract” **or** in position “extend”!
- ▶ Never leave the ball cock **23** in “STOP” position for a longer period of time!

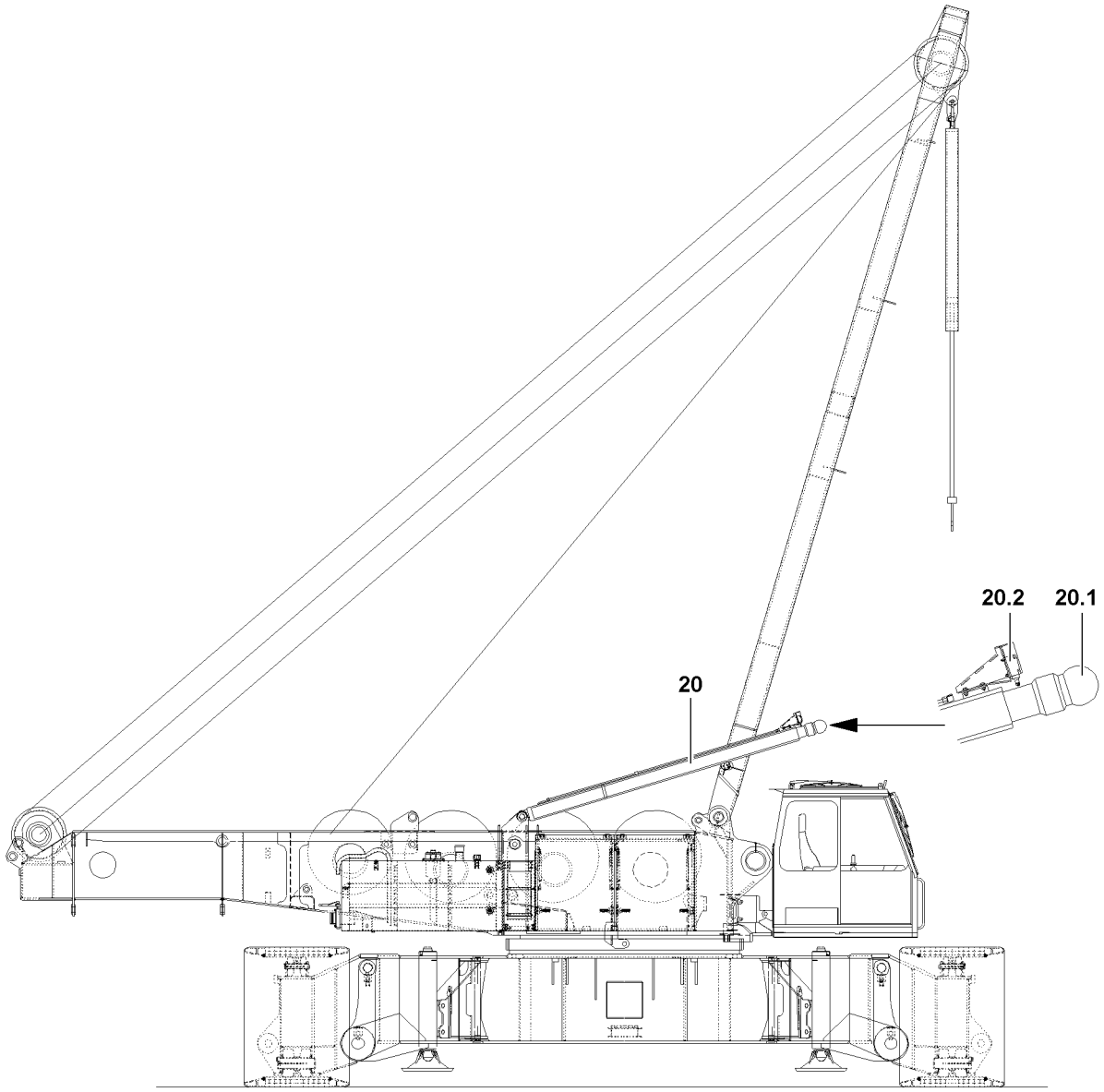
Extending S-relapse cylinders:
- ▶ The assembly of the crawler carrier is completed:
  Move the ball cock **23** into vertical position.

Result:
- – The piston rod **20.1** of the S-relapse cylinder **20** extends.
- – Winch 4 is blocked.

Note
- ▶ Alternatively, the S-relapse cylinders can also be extended after crawler assembly!

Extend the S-relapse cylinder:
- ▶ The assembly of the crawler carrier is completed:
  Move the ball cock **23** into horizontal position.

Result:
- – The piston rod **20.1** of the S-relapse cylinder **20** extends.



B108413

3 Disassembling the crawler travel gear with SA-frame

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

- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect against falling!
- ▶ It is prohibited for anyone to remain within the complete danger zone during assembly and disassembly!

Make sure that the following prerequisites are met:
– an auxiliary crane is available,
– the placement location must be level and have adequate load bearing capacity,
– the piston rods **20.1** of the S-relapse cylinders **20** are extended approx. 10 cm to approx. 15 cm,
– the limit master switches **20.2** are **not** actuated.

3.1 Short description of disassembly procedure

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

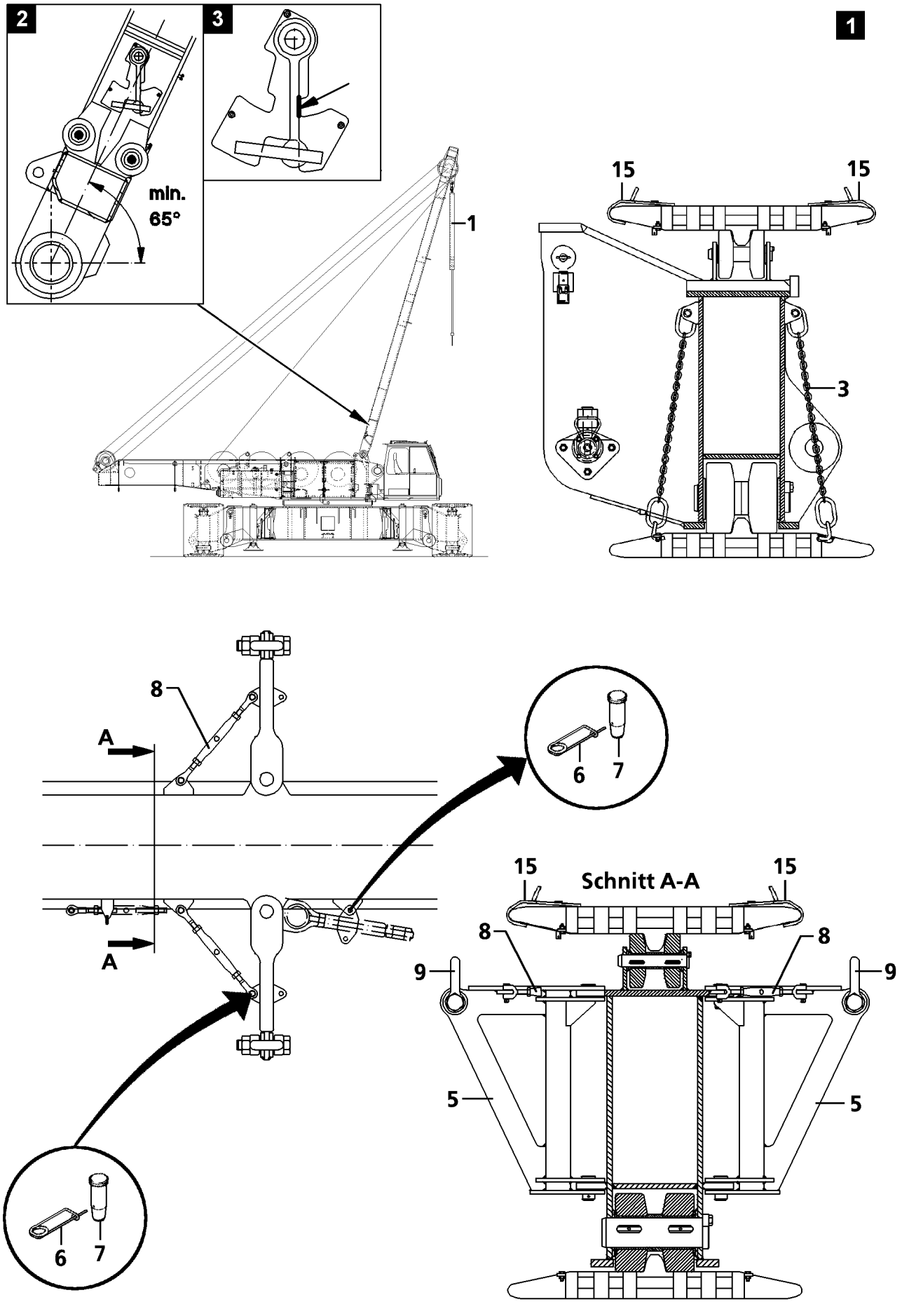
- ▶ For disassembly of crawler carrier with SA-frame, see illustration **1**, illustration **4**, illustration **6**.
- ▶ Lower the turntable and the crawler center section with the hydraulic support cylinders on the support, see illustration **7**.
- ▶ Place the SA-frame down, see illustration **8**.
- ▶ Swing the hydraulic supports in, see illustration **9**.
- ▶ Set the turntable and the crawler center section on the transport vehicle, see illustration **10**.

3.2 Disconnect the hydraulic connection to the crawler travel gears

Ensure that the following prerequisite is met:
– both crawler carriers are assembled on the crawler center section.

- ▶ Disconnect the hydraulic connections.

Note
- ▶ To release the hydraulic lines with quick couplers, see Crane operating instructions, chapter 5.01!



B104561

3.3 Disassembly of crawler carrier with SA-frame

3.3.1 Disassembly preparation

- ▶ Luff the SA-frame **2** up or down and turn the turntable if necessary until the assembly cylinder **1** is positioned over the crawler carrier.
- ▶ Remove the spring retainer **6**.
- ▶ Unpin the transport pin **7**.
- ▶ Swing the outer assembly console **5** out.
- ▶ Lock the turnbuckle **8** with the transport pin **7** and spring retainer **6** on the assembly console **5**.
- ▶ Extend the assembly cylinder **1** and hang in the tackle chains.
- ▶ Secure the crawler carrier plates with chains **3** on the respective two crawler plates on both sides to prevent them from sagging.

Note

- ▶ Attach 2 chains per crawler carrier side!

- ▶ Attach the rope guard **15** on the upper crawler plates.

DANGER

Risk of accident!

The rope guard must be used. If this is not observed, the attachment equipment can be damaged and rip!

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

- ▶ Attach the attachment equipment to the shackles **9** of the assembly console **5** and guide it over the rope guard **15**.

Note

- ▶ The assembly key button **389** and key button **390** “crawler assembly” are actuated!
- ▶ The indicator lights “assembly **381** ” and “crawler assembly **382** ” light up!
- ▶ Pay attention to the master switch assignment for turned on key switches, see Crane operating instructions, chapter 4.05!

DANGER

Risk of accident!

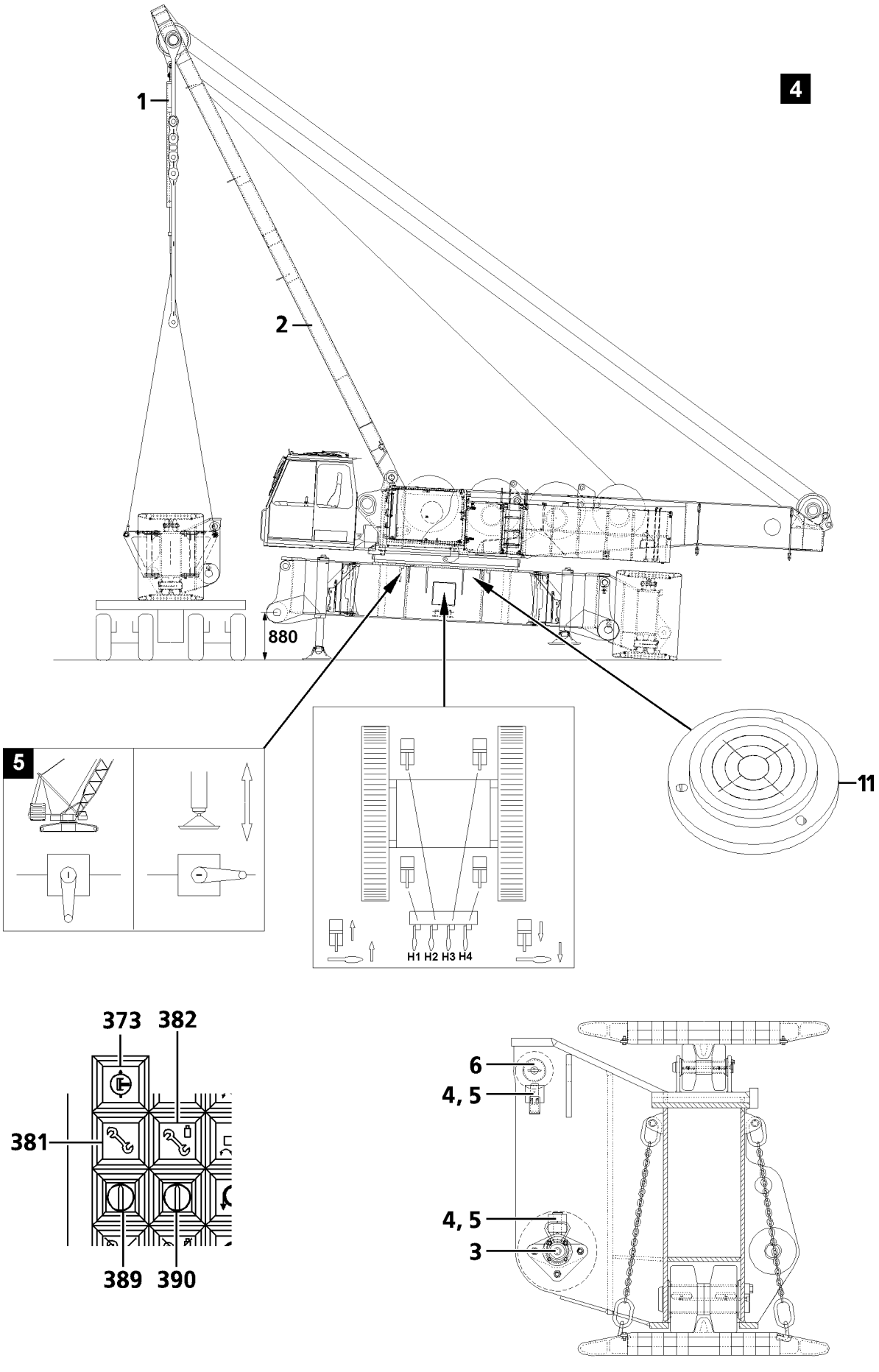
- ▶ In this operating mode, when the key button “crawler assembly” is turned on, there is no overload shut off for the assembly cylinder as well as for the crane!

DANGER

Risk of tipping the crane!

- ▶ The maximum radius of 5.5 m (approx. 61°) may not be exceeded when lifting the crawler carrier. The pendulum on the SA-frame must remain in the green range (approx. 61°-75°), see illustration **2**!

- ▶ Pay attention to the display of the pendulum on the SA-frame, see illustration **3**.



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3.3.2 Disassembling the first crawler carrier

Ensure that the following prerequisite is met:
- the preparations for crawler carrier disassembly have been carried out, see section “Disassembly preparation”,
- the pressure change over switch **373** for the support cylinders in the cab is turned on,
- the engine is running, see Crane operating instructions, chapter 4.03.

For disassembly of the first crawler carrier, the hydraulic support cylinders must be extended on one side, so that one crawler carrier is still on the ground, see illustration **4**.

▶ Open the ball cock (vertical position), see illustration **5**.

Before supporting, the support pads must be supported from below with solid materials, such as wood, steel or concrete slabs, large enough for the ground conditions.

DANGER
Danger of toppling the crane!
▶ Only suitable materials may be used for the support!
▶ The support must be placed in the center underneath the support pads!

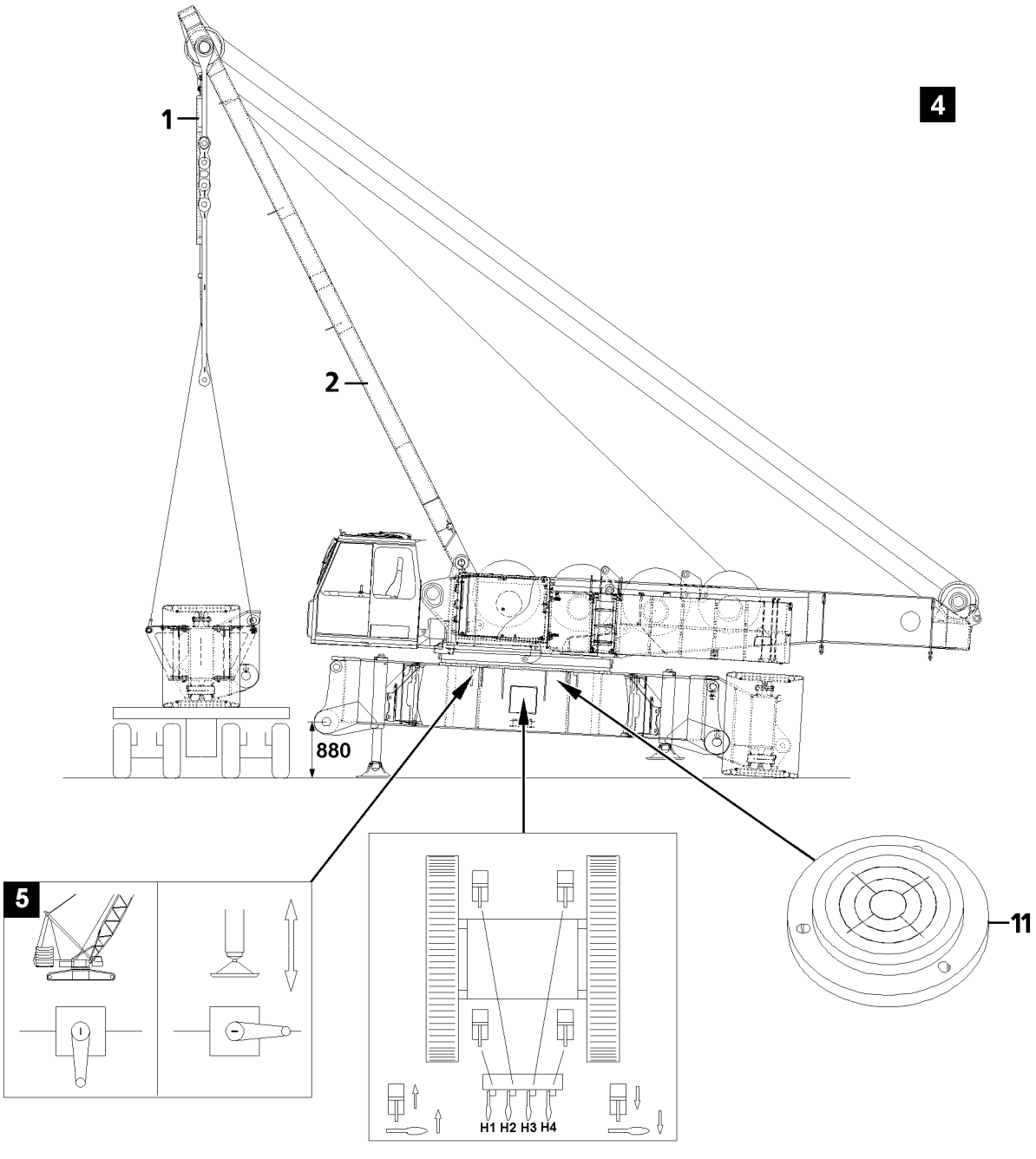
▶ Support the support pads properly from underneath.

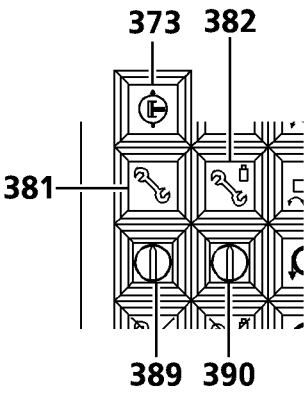
Note
▶ Observe the safety guidelines and permissible ground pressures, see Crane operating instructions, chapter 2.04!

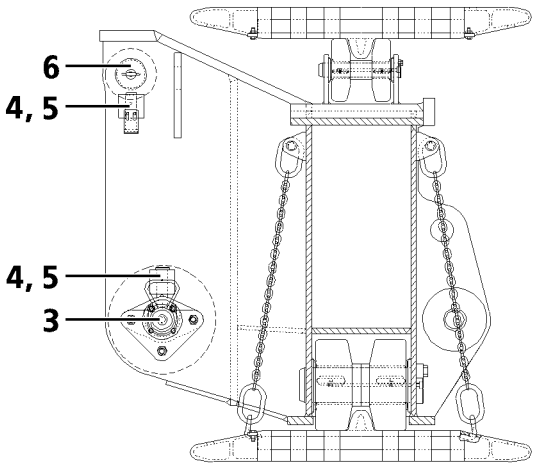
▶ Actuate the manual lever **H1**, **H2**, **H3**, **H4**.

Result:
- The support cylinders extend.

▶ Extend the hydraulic support cylinders on the side of the crawler center section to approx. **880 mm** , see illustration **4**.
▶ Close the ball cock (horizontal position), see illustration **5**.
▶ Retract the assembly cylinders **1** until the pins **3** and **6** are relieved.
▶ Loosen the retaining pin **4** and spring retainer **5**.
▶ Pull the pin **6** out by hand.
▶ Loosen the retaining pin **4** and spring retainer **5**.
▶ Unpin the pin **3** with the hydraulic pin pulling device.
▶ Move the transport vehicle as close as possible to the crawler carrier.
▶ Carefully move the crawler carrier out from the stop and swing it on receptacle on the transport vehicle.
▶ Remove the attachment equipment and rope guard **15**.







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DANGER
Risk of tipping the crane!
▶ Before turning the turntable, the still assembled crawler carrier must be standing on the ground!

▶ Turn the turntable.

DANGER
Risk of tipping the crane!
▶ After turning the turntable, bring the crane into horizontal position with the hydraulic support cylinders!

For disassembly of the second crawler carrier, the hydraulic support cylinders must be extended on the other side, so that the crawler center section is in horizontal position, see illustration **6**.
▶ Open the ball cock (vertical position), see illustration **5**.

Before supporting, the support pads must be supported from below with solid materials, such as wood, steel or concrete slabs, large enough for the ground conditions.

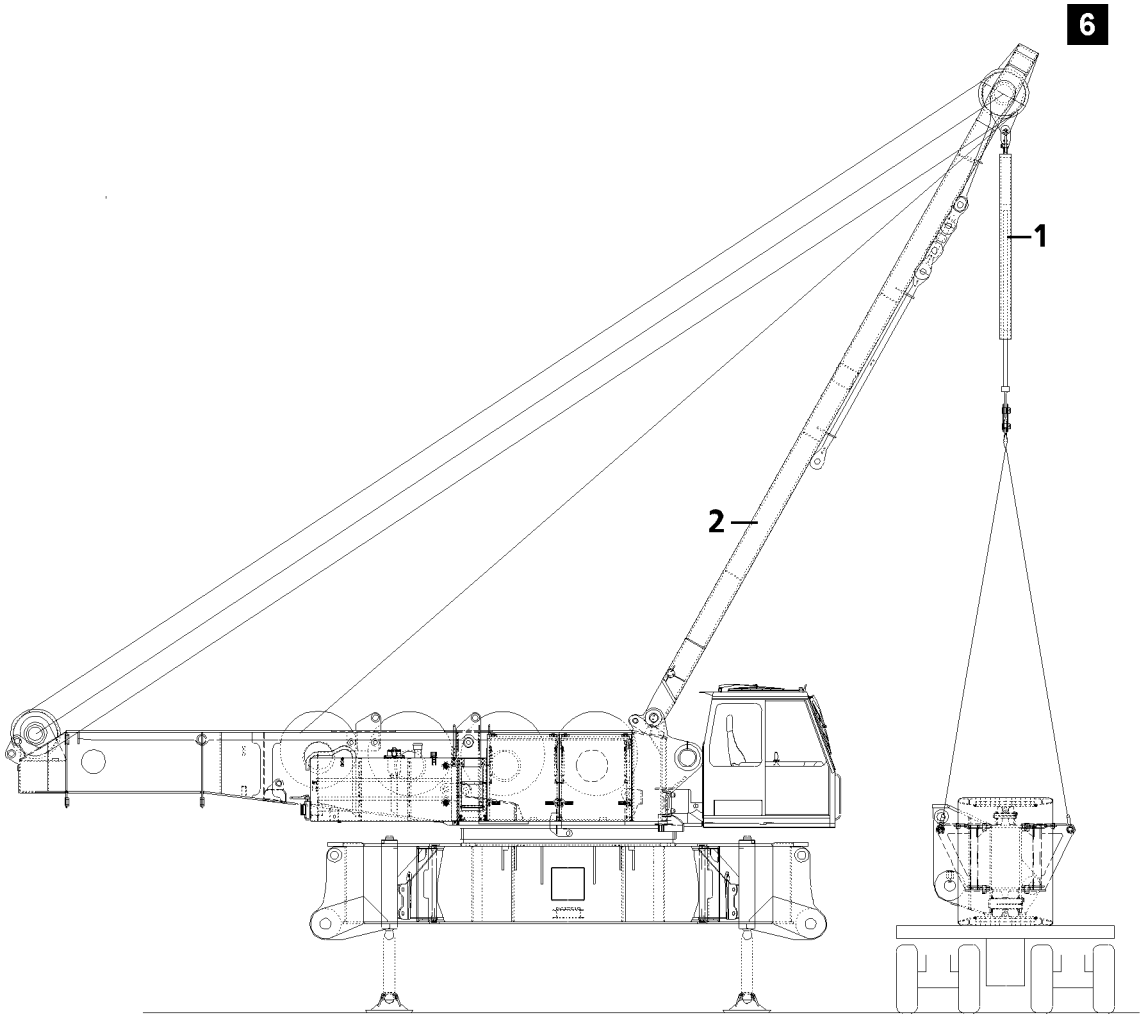
DANGER
Danger of toppling the crane!
▶ Only suitable materials may be used for the support!
▶ The support must be placed in the center underneath the support pads!

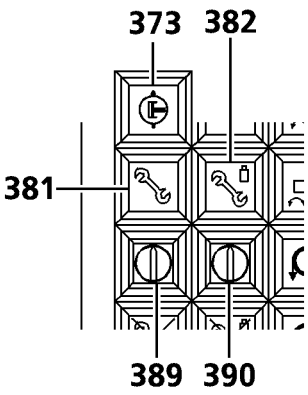
▶ Support the support pads properly from underneath.

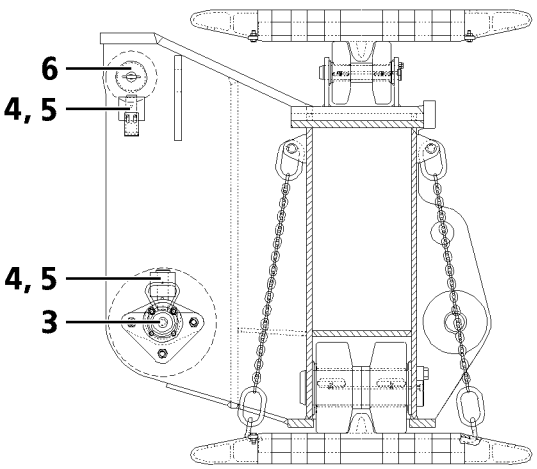
Note
▶ Observe the safety guidelines and permissible ground pressures, see Crane operating instructions, chapter 2.04!

▶ Actuate the manual lever **H1**, **H2**, **H3**, **H4**.
Result:
– The support cylinders extend.

▶ Extend the hydraulic support cylinders on the other side of the crawler center section until it is in horizontal position, see illustration **6**.
▶ Check the horizontal position of the crane with the spirit level **11**.
▶ Close the ball cock (horizontal position), see illustration **5**.
▶ Turn the pressure change over switch **373** off in the cab.







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3.3.3 Disassembling the second crawler carrier

Ensure that the following prerequisite is met:

– the preparations for crawler carrier disassembly have been carried out, see section “Disassembly preparation”,
– the crane is supported horizontally,
– the engine is running, see Crane operating instructions, chapter 4.03.

DANGER
Risk of tipping the crane!

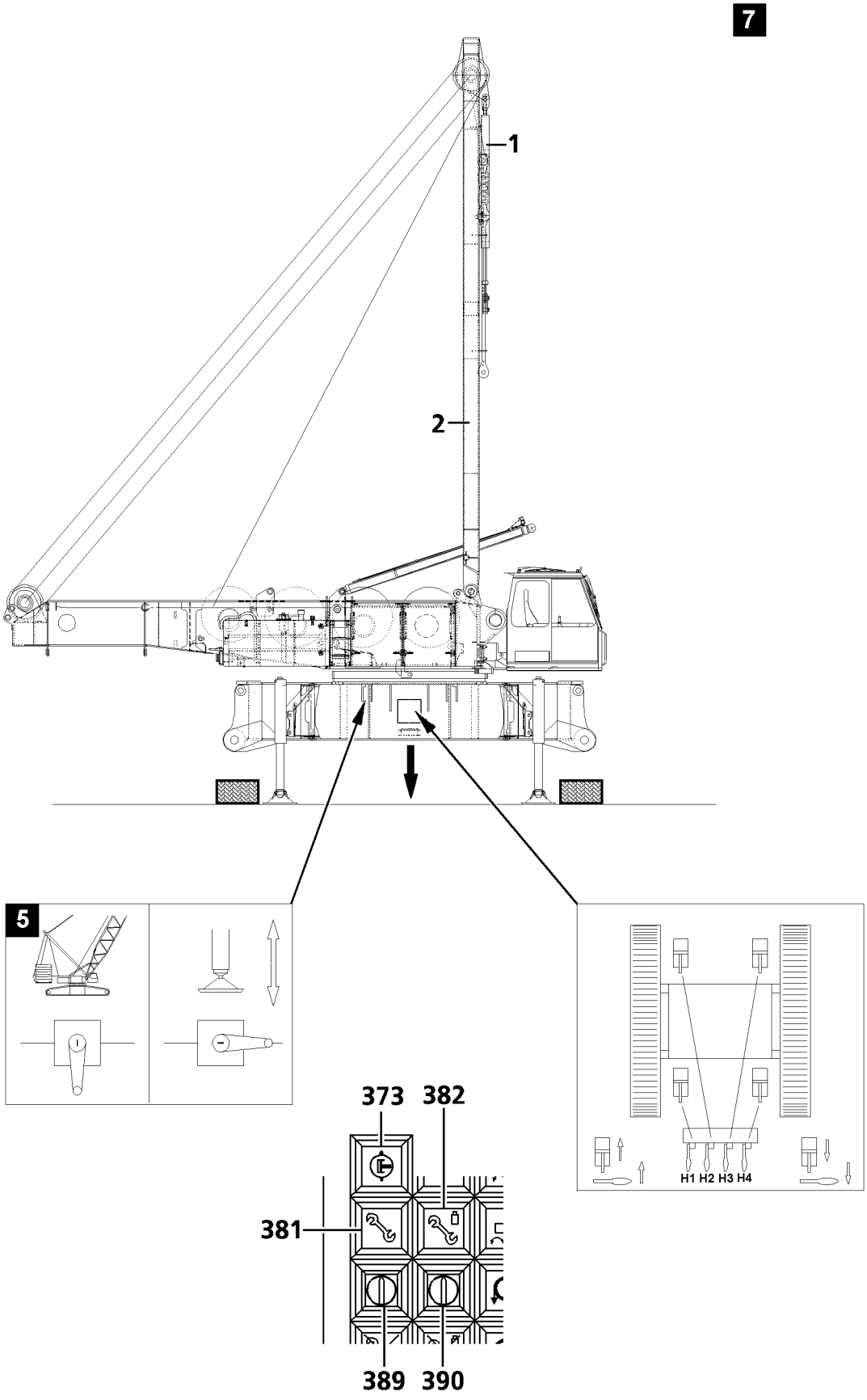
▶ The maximum radius of 5.5 m (approx. 61°) may not be exceeded when lifting the crawler carrier. The pendulum on the SA-frame must remain in the green range (approx. 61°-75°), see illustration **2**!

▶ Pay attention to the display of the pendulum on the SA-frame, see illustration **3**.

DANGER
Risk of accident!

▶ When the key button **390** “crawler assembly” is turned on, there is no overload shut off for the assembly cylinder **1** as well as for the crane!

▶ Retract the assembly cylinders **1** until the pins **3** and **6** are relieved.
▶ Loosen the retaining pin **4** and spring retainer **5**.
▶ Pull the pin **6** out by hand.
▶ Loosen the retaining pin **4** and spring retainer **5**.
▶ Unpin the pin **3** with the hydraulic pin pulling device.
▶ Move the transport vehicle as close as possible to the crawler carrier.
▶ Carefully move the crawler carrier out from the stop and swing it on receptacle on the transport vehicle.
▶ Remove the attachment equipment and rope guard.
▶ Retract the assembly cylinder **1** completely.
▶ Erect the SA-frame **2** to 90°.



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3.3.4 Lower the turntable and the crawler center section with the hydraulic support cylinders on the support

Make sure that the following prerequisites are met:
- the SA-frame **2** is positioned at least at 90°,
- the assembly key button **389** and key button **390** “crawler assembly” are actuated,
- the indicator lights “assembly **381** ” and “crawler assembly **382** ” light up,
- the pressure change over switch **373** for the support cylinders in the cab is turned on,
- the ball cock is open (positioned vertically), see illustration **5**,
- the engine is running, see Crane operating instructions, chapter 4.03.

Lowering

The support must be made with stable materials, large enough for the ground conditions.

Note
- ▶ Observe the safety guidelines and permissible ground pressures, see Crane operating instructions, chapter 2.04!

DANGER
Danger of toppling the crane!
- ▶ Only suitable materials may be used for the support!
- ▶ The SA-frame must be erected at least to 90°!

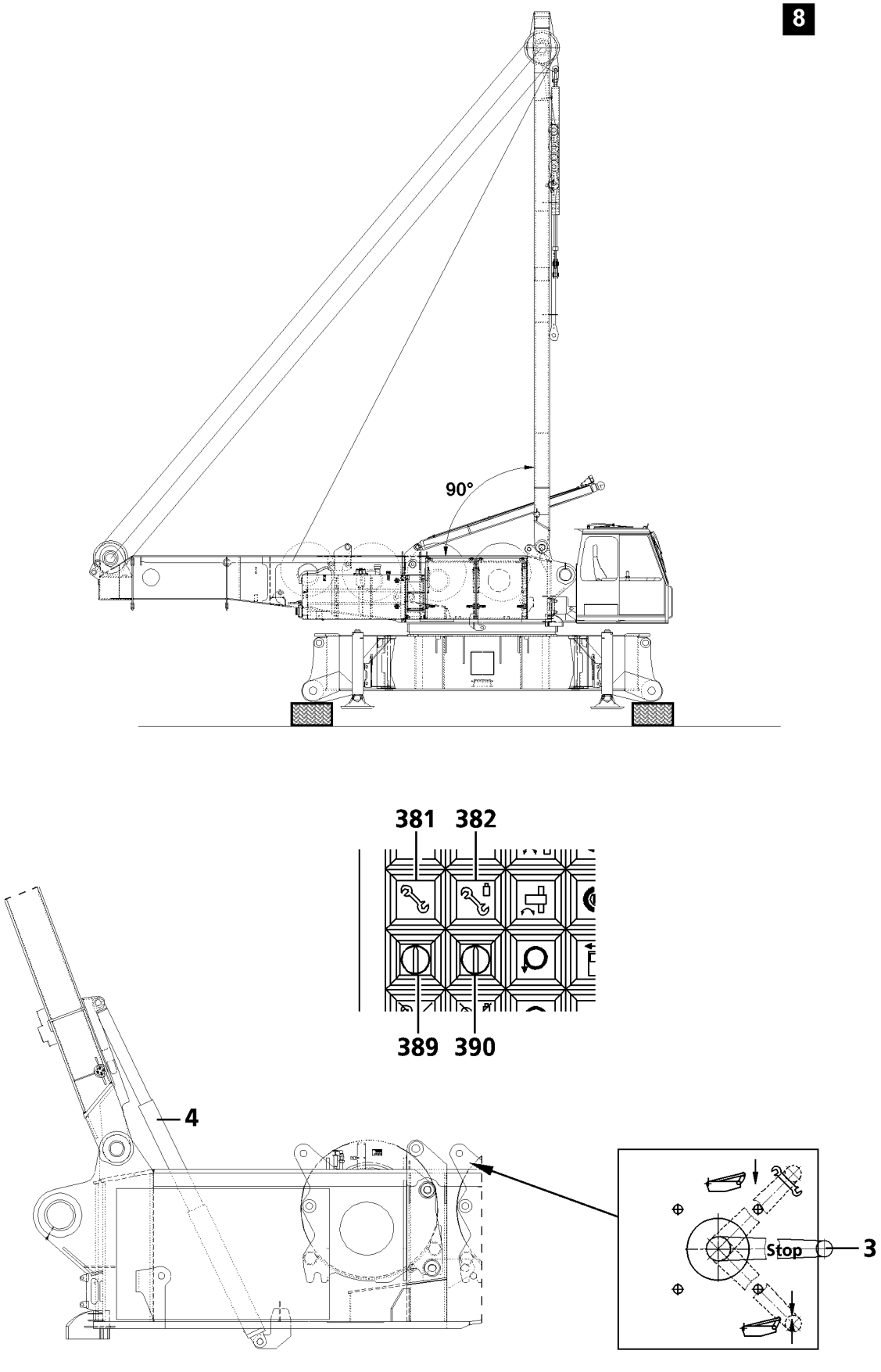
- ▶ Support the turntable and the crawler section properly.
- ▶ Actuate the manual lever **H1**, **H2**, **H3**, **H4**.

Result:
- The support cylinders move in.

Note
- ▶ Lower the crane horizontally to the support!

DANGER
Risk of accident!
- ▶ Pay attention to the horizontal position of the crane during the lowering procedure!
- ▶ After lowering, the ball cock must be closed, see illustration **5**!
- ▶ The ball cock **3** for the SA-frame must be in operating position “down” during assembly and crane operation, see illustration **8**!
- ▶ The ball cock position “STOP” and “up” are only permissible when lowering the SA-frame onto the turntable (transport position)!

- ▶ Close the ball cock (horizontal position), see illustration **5**.
- ▶ Turn the pressure change over switch **373** off in the cab.


8
90°
381
382
389
390
4
Stop
3
B104566

3.3.5 Placing the SA-frame down

Ensure that the following prerequisites are met:

– the engine is running, see Crane operating instructions, chapter 4.03,
– the assembly key button **389** and key button **390** “crawler assembly” are actuated,
– the indicator lights “assembly **381** ” and “crawler assembly **382** ” light up.

Note

▶ Pay attention to the master switch assignment for turned on key switches, see Crane operating instructions, chapter 4.05!

DANGER

Danger of toppling the crane!

▶ When the key button “crawler assembly” is turned on, there is no overload shut off for the assembly cylinder as well as for the crane!

Take down procedure

▶ Move the ball cock **3** into operating position **down**.

Result:

– The SA-frame is pulled back against the erection cylinder **4** by spooling up winch 4.

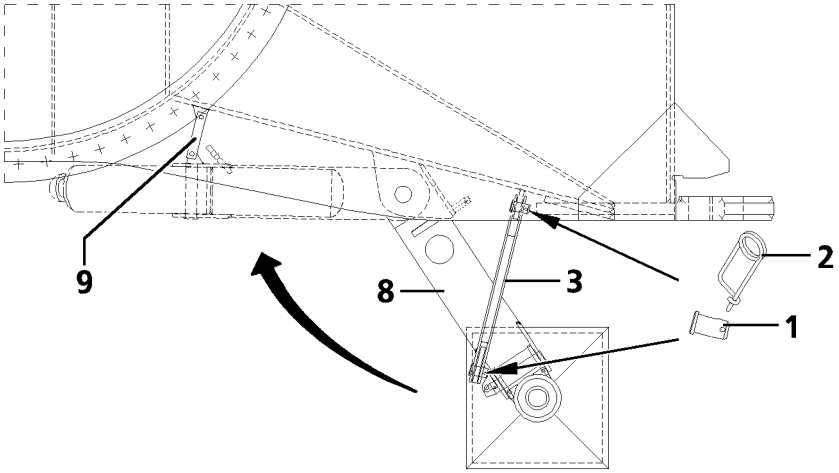
▶ Spool up winch 4 by actuating the master switch “1” until the SA-frame **2** is positioned approx. at 10°.

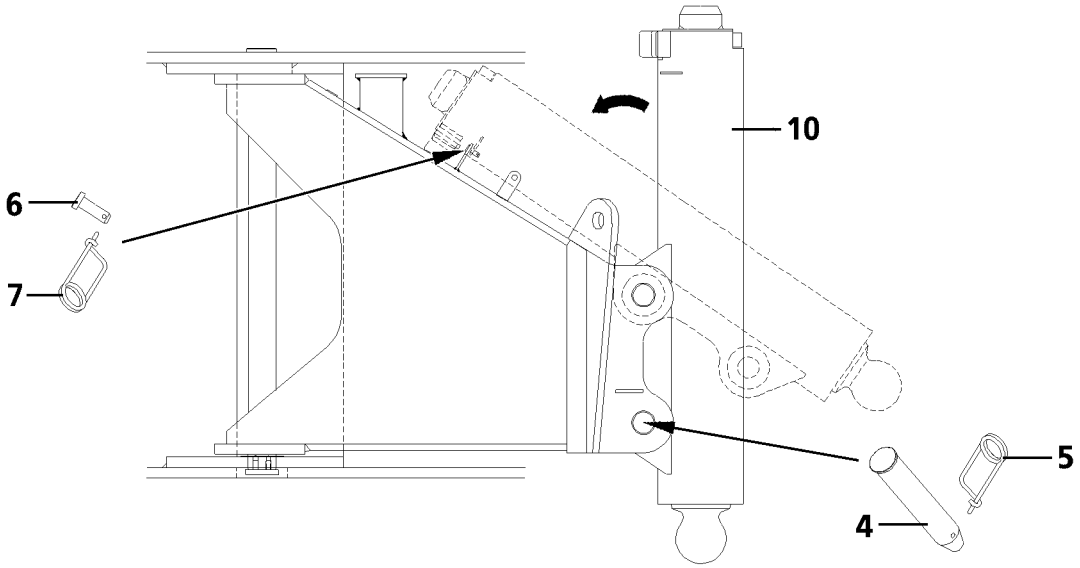
▶ Move the ball cock **3** into operating position **up**.

Result:

– The SA-frame **2** is place down completely.

9





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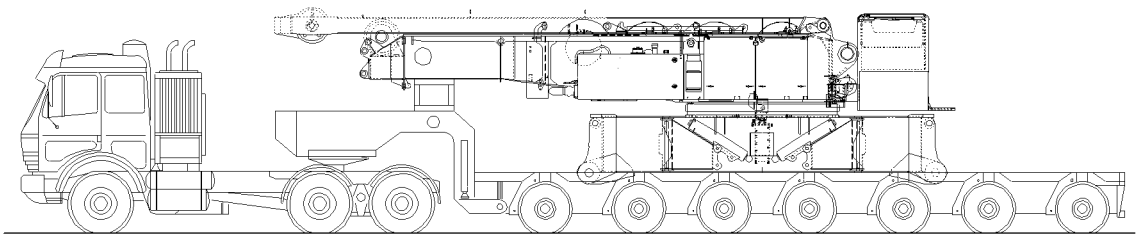


B104567

3.3.6 Swinging the hydraulic support in

After crawler disassembly, the hydraulic supports on the crawler center section must be swung in for transport, see illustration **9**.

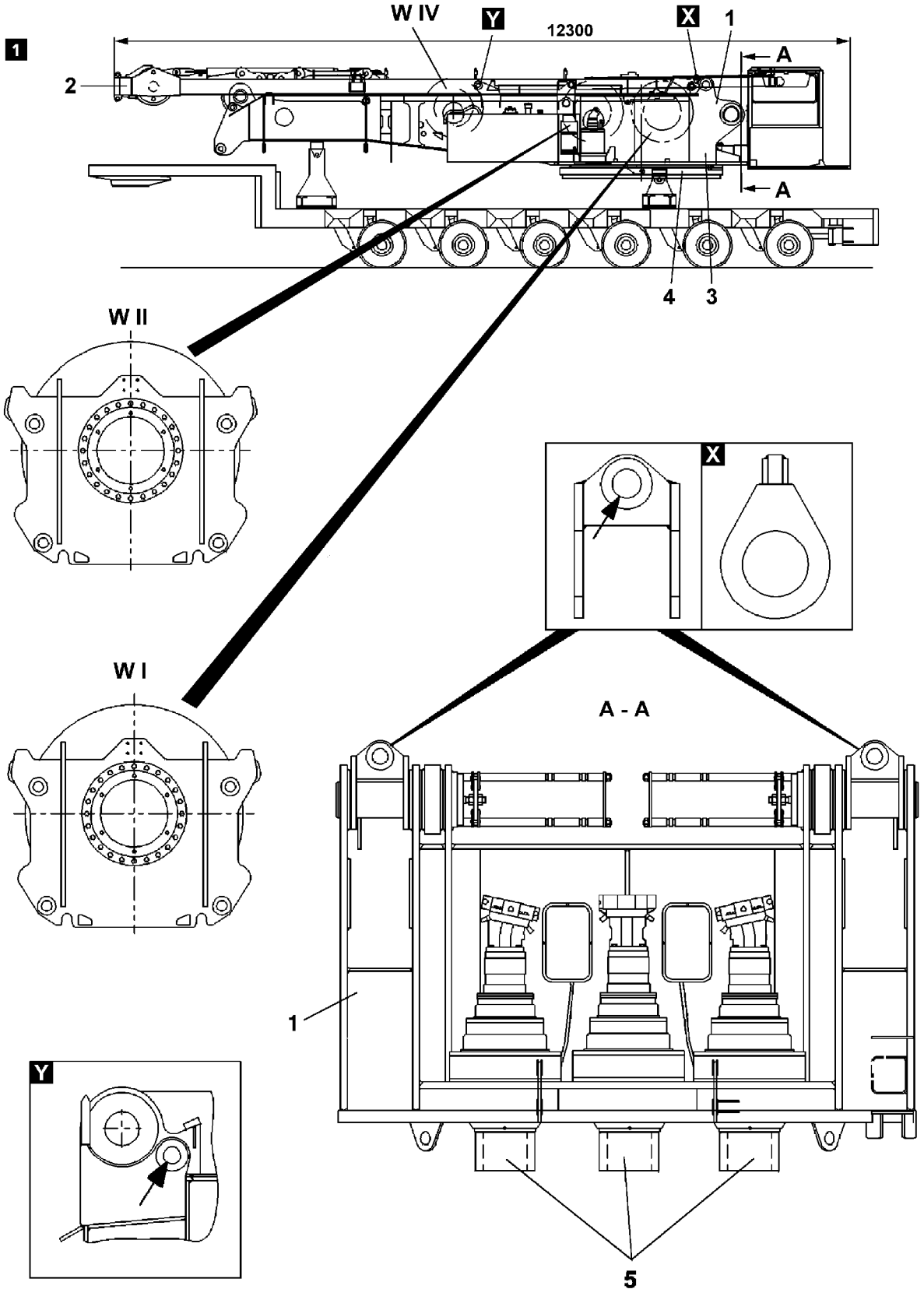
- ▶ Loosen the pin **1** and spring retainer **2**.
- ▶ Remove the bracket **3**.
- ▶ Remove pin **4** and spring retainer **5**.
- ▶ Loosen the pin **6** and spring retainer **7**.
- ▶ Tilt the cylinder **10** into transport position.
- ▶ Insert the pin **6** to secure the cylinder **10** and secure with spring retainer **7**.
- ▶ Insert the pin **4** and secure with spring retainer **5**.
- ▶ Swing the hydraulic supports **8** in.
- ▶ Secure the hydraulic supports with the transport retainer **9**.

3.3.7 Setting the turntable and the crawler center section onto the transport vehicle

For the following tasks, the turntable and the crawler center section must be lifted with an auxiliary crane from the support onto the transport vehicle.
Ensure that the following prerequisite is met:

– an auxiliary crane is available.

- ▶ Lift the turntable and the crawler center section with the auxiliary crane.
- ▶ Set the turntable and the crawler center section down on the transport vehicle, see illustration **10**.



B194503

1 Assembly of turntable with Quick Connection*

To bypass height limitations at transport, the turntable can be separated from the crawler center section with the Quick Connection* device. In that case, the turntable as well as the crawler center section are each transported on a separate transport vehicle.

1.1 Transport weights and centers of gravity of the turntable

For parts installed on the turntable, see fig. 1 :

– Winch IV including rope
– SA-bracket **2** including pulley set
– Assembly winch **3** including rope
– Upper section **4** of the rotary connection with Quick Connection
– One to three slewing gears **5**, depending on equipment

Weights turntable:

Turntable	Winch I including rope (4.2 t)	Winch II including rope (4.2 t)
Weight **33.1 t**	– – –	– – –
Weight **37.3 t**	– – –	**X**
Weight **41.5 t**	**X**	**X**

Centers of gravity turntable:
For centers of gravity, see chapter 3.01.

2 Installing the turntable

2.1 Lift the turntable from transport vehicle

Ensure that the following preconditions are met:

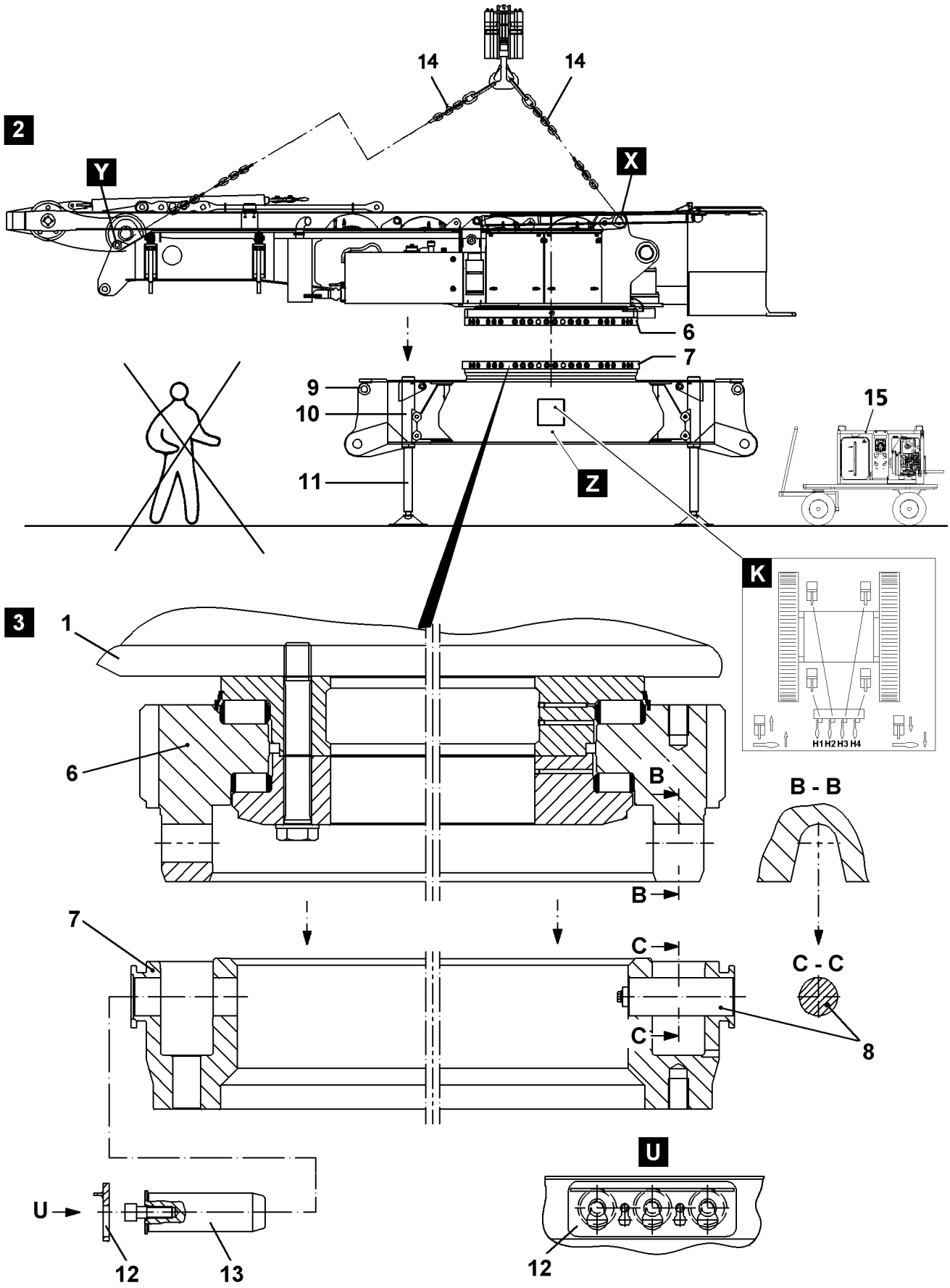
– The brackets **X** are pinned on the receptacle points for the pivot section, see sectional view **A-A**.

DANGER
Risk of accident!
▶ Make sure that the brackets **X** are pinned correctly.

▶ Attach the tackle **14** to the receptacle points **X** and **Y**.
▶ Bring the tackle **14** to “tension”.
▶ Release and remove the transport retainer on the turntable **1**.
▶ Lift the turntable **1** with the auxiliary crane from the transport vehicle.

DANGER
Risk of accident!
▶ Make sure that the tackle is attached correctly and sufficiently secured to prevent it from loosing up.

▶ Attach the tackle **14** to the intended receptacle points **X** and **Y**.



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2.2 Installing the turntable

2.2.1 Cleaning the rotary connection

Before setting the turntable onto the crawler center section, the placement surfaces or the contact surfaces as well as the pin bores on the upper section **6** and the lower section **7** on the rotary connection must be cleaned.

WARNING
Property damage!
▶ If dirt on the rotary connection cannot be removed, then severe damage can occur, which even might require a replacement of the rotary connection.

2.2.2 Setting the turntable on the crawler center section with the auxiliary crane

Ensure that the following prerequisites are met:
– The hydraulic support **10** on the crawler center section **9** is swung out, locked and pinned.
– The hydraulic support cylinders **11** are extended with the pin pulling device **15** connected on point **Z** on the hydraulic lines and with the manual levers, see fig. **K**.
– The crawler center section **9** is horizontally aligned.
– The upper **6** and lower sections **7** of the rotary connection have been cleaned.
– The two centering pins **8** are installed and secured on the lower section of the rotary connection.
– The centering pins **8** are greased with water repellent grease.
– The tackle **14** is attached on the receptacle points **X** and **Y** of the turntable, see fig. **2**.

DANGER
Risk of accident!
▶ It is prohibited for anyone to remain within the slewing range of the auxiliary crane and under the turntable when swinging the turntable in and lowering it.

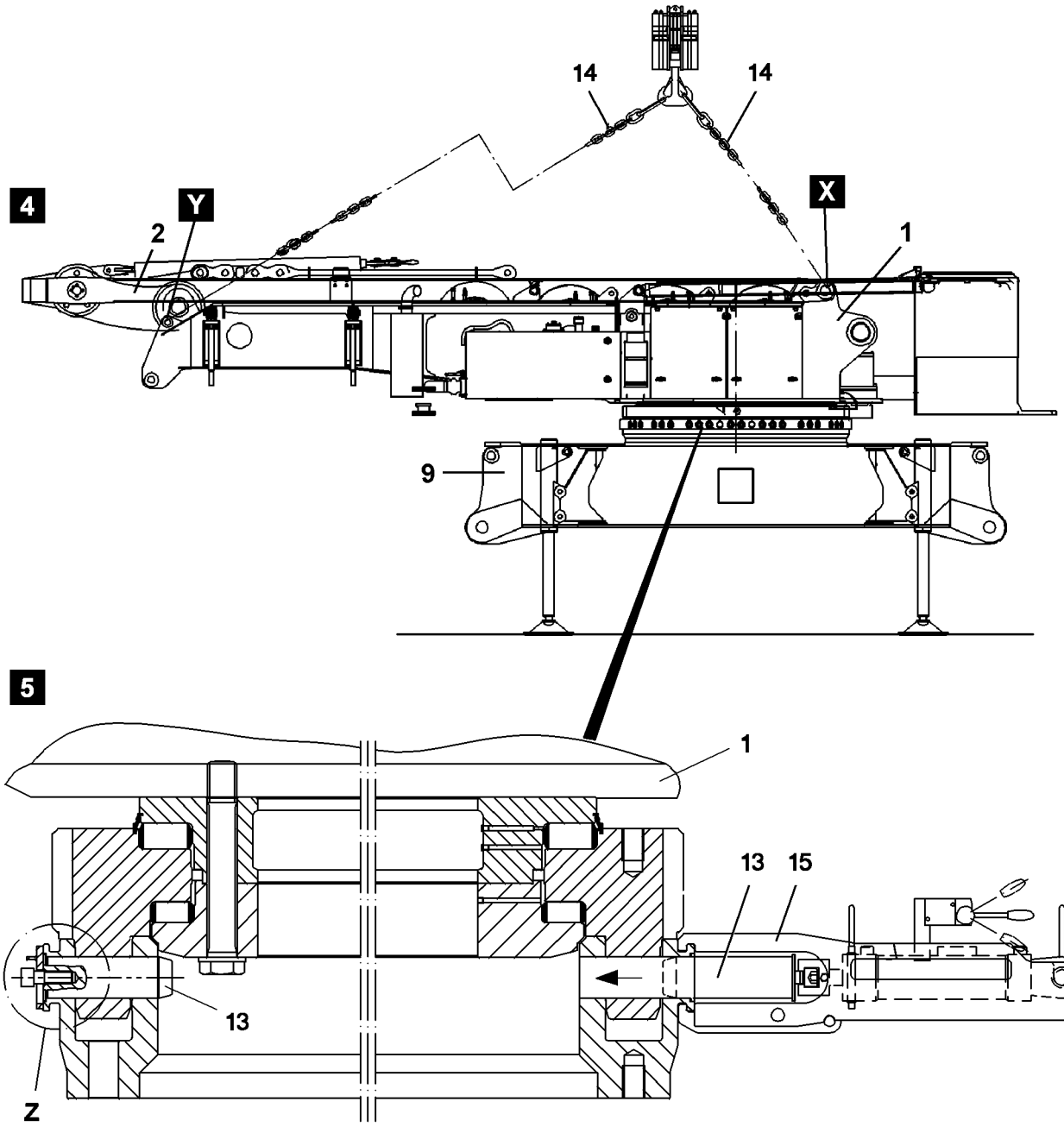
▶ Swing the turntable **1** with the auxiliary crane slowly over the supported and horizontally aligned crawler center section.

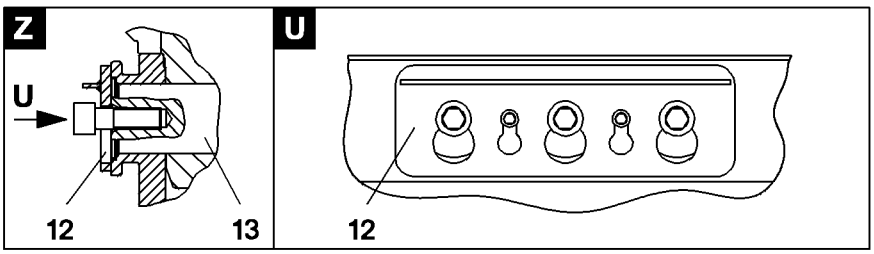
Note
▶ Pay attention to the precise alignment of the turntable or the receptacles to the centering pins **8**.
▶ Before lowering it, bring the turntable into position so that the centering pins **8** can be **“paired”** on the lower section **7** and the receptacles **B-B** on the upper section **6**. It is not possible to **“incorrectly”** set the turntable on the lower section **7** due to the arrangement design of the centering pins **8**.

▶ Lower the turntable **1** slowly.

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

▶ Carefully place the turntable **1** on the crawler center section.
▶ Lower the turntable **1** on the lower section to the point where the tackle **14** is still “tensioned”.





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2.2.3 Pin the turntable with the quick-connection

Ensure that the following prerequisites are met:
- The turntable **1** is seated on the crawler center section **9**.
- The tackle **14** between the turntable and the crawler center section is “tensioned”.
- The pin bores are clear on the circumference of the rotary connection.

▶ Grease all connector pins **13** with water repellent grease.

▶ Insert all connector pins **13** by hand to the stop, to pin the turntable with the crawler center section **9**, see fig. **5**.

▶ If they are hard to pin, use the pin pulling device **15** for pinning.

DANGER
Risk of accident!

▶ The connector pins **13** must be secured immediately after pinning the turntable to the crawler center section **9**.

▶ Attach the retaining bars **12** and secure the connector pins **13**, see fig. **U**.

▶ After pinning and securing the rotary connection, remove the tackle **14**.

2.2.4 Establishing the hydraulic connection to the turntable

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

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

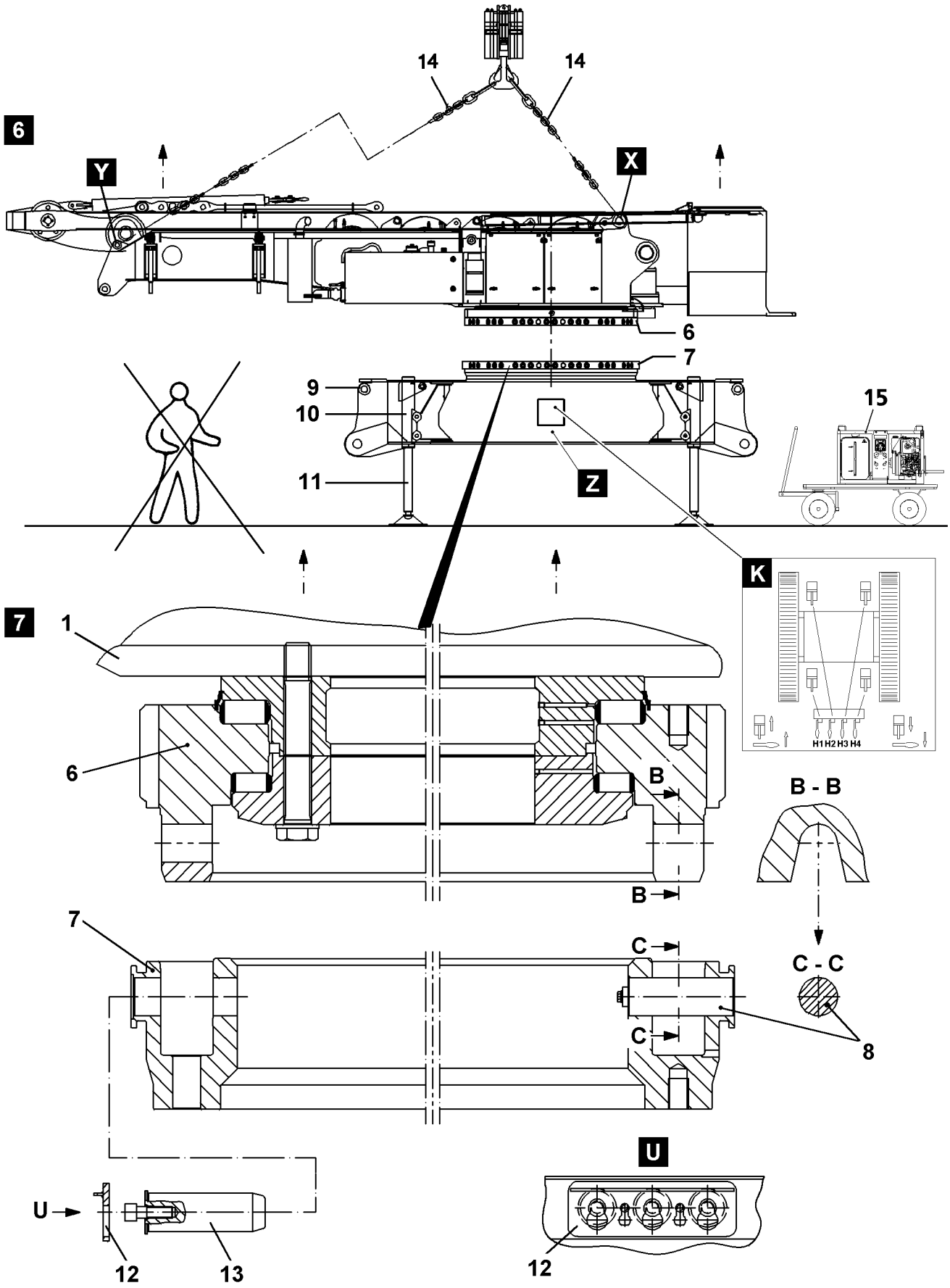
Note

▶ The matching quick couplers are marked.

▶ Establish the hydraulic connections.

Note

▶ For connection or release of hydraulic lines with quick couplers, see chapter 5.01.



B104574

3 Disassembly of the turntable with Quick Connection*

3.1 Removing the turntable

Ensure that the following prerequisites are met:

– An auxiliary crane is available.
– The turntable ballast and the boom system are removed.
– The crawler carriers are removed.
– The hydraulic support **10** on the crawler center section **9** is swung out, locked and pinned.
– The hydraulic support cylinders **11** are extended with the pin pulling device **15** connected on point **Z** on the hydraulic lines and with the manual levers, see fig. **K**.
– The crawler center section **9** is horizontally aligned.
– The SA-bracket **2** is placed on the turntable **1**.
– The hydraulic connections on the rotary connection to the turntable are separated.
– The brackets are installed and pinned on point **X**.
– The tackle **14** is attached on the receptacle points **X** and **Y** of the turntable, see fig. **6**.

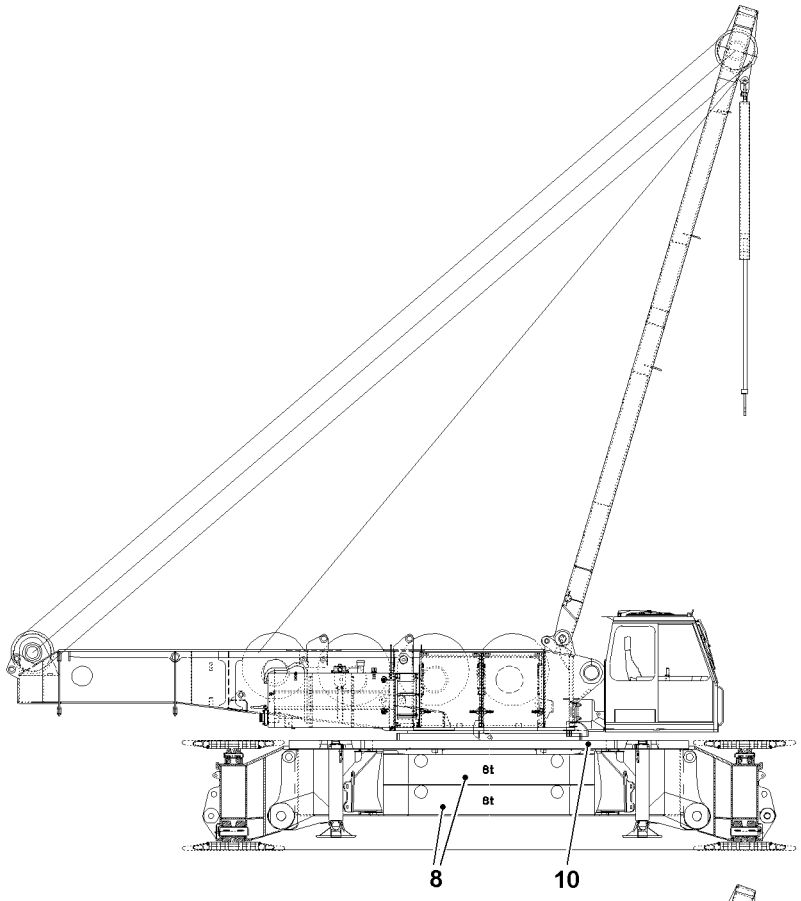
WARNING
Disconnect the hydraulic connection!
▶ Make sure that all hydraulic connections between the rotary connection and the turntable are separated.

▶ Bring the tackle **14** with the auxiliary crane to “tension”.
▶ Release and remove the retaining bars **12**, see fig. **U**.
▶ Unpin all connector pins **13**, using the pin pulling device **15**.

CAUTION
Remove the connector pins!
▶ Before lifting the turntable with the auxiliary crane, make sure that **all** connector pins **13** of the Quick connection have been removed.

▶ Carefully lift the turntable **1** with the auxiliary crane and set it on the transport vehicle.

1



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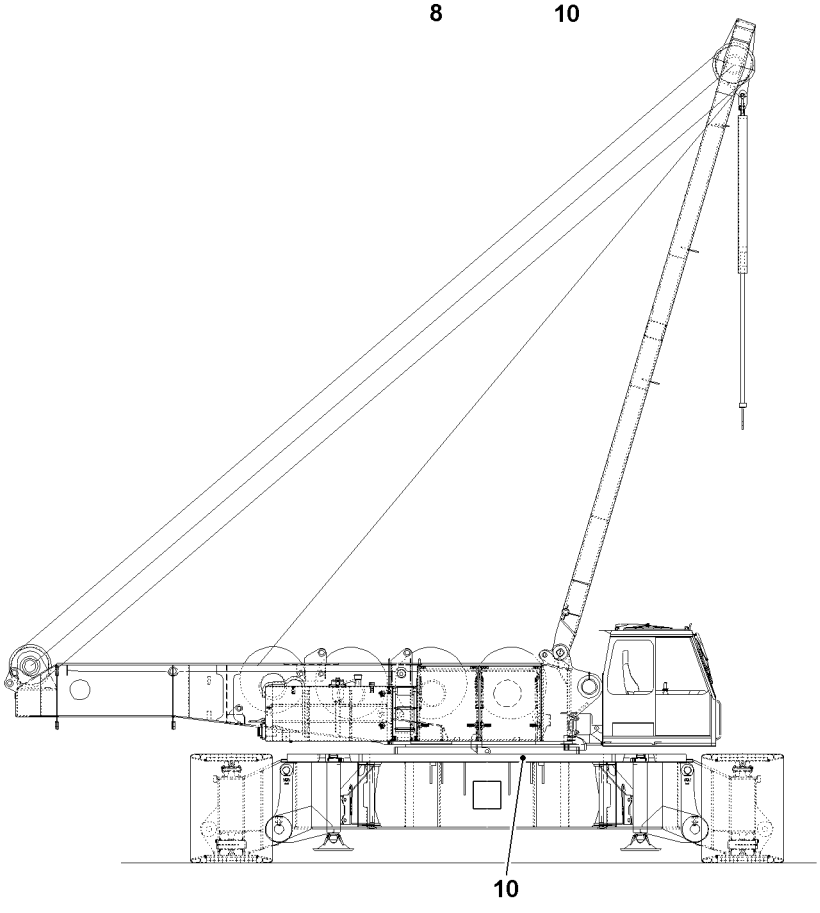


B104570

1 General

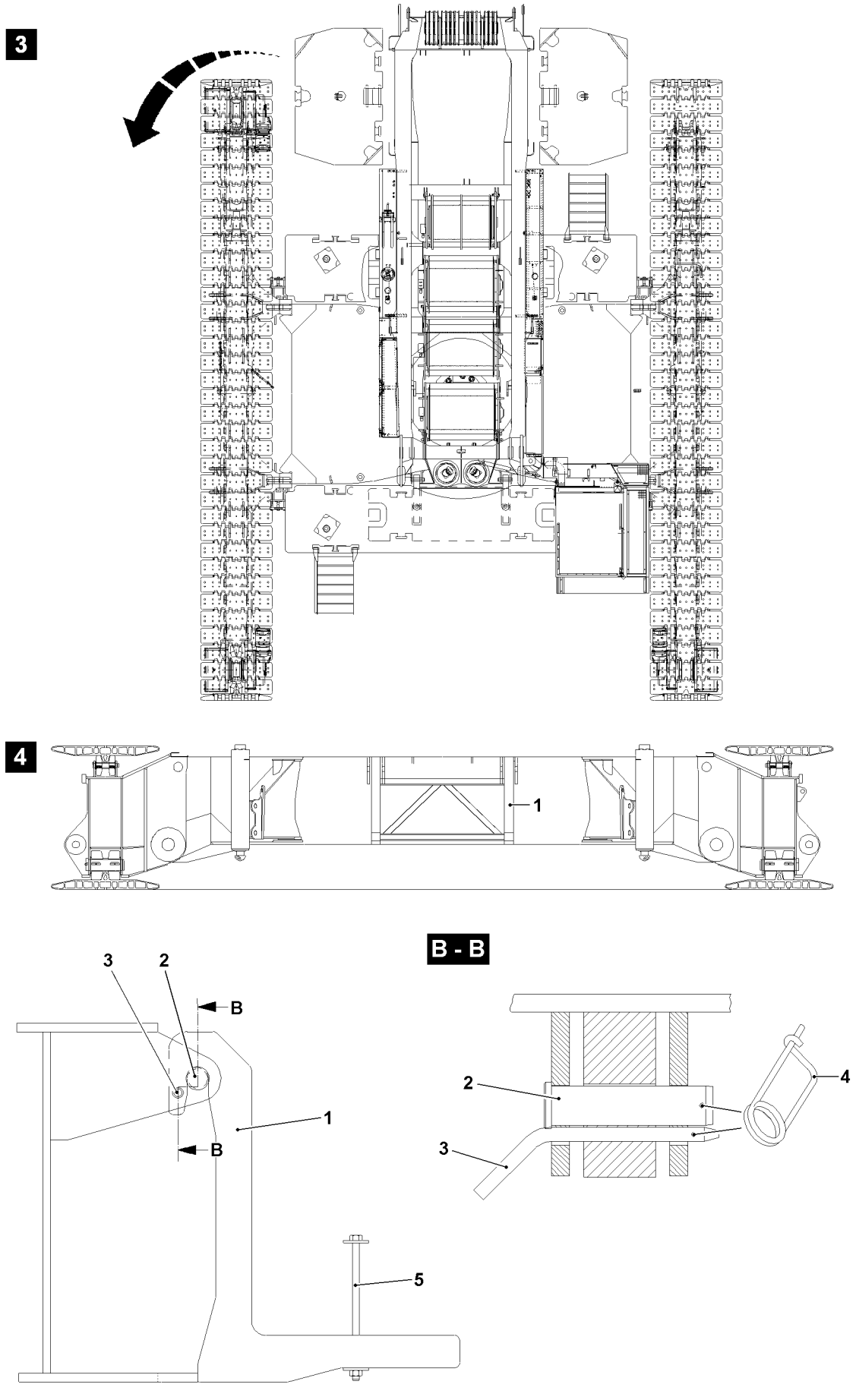
The crawler crane can be operated with two different central ballast versions:
1.) Central ballast 43 t, see fig. **1**
2.) Central ballast 11 t, see fig. **2**

2 Assembly of central ballast

Central ballast variation	Quantity	Description	Position	Illustration
43 t	2	Ballast frame		1
	4	Ballast plate 8.0 t	8	
	2	Counterweight plate 5.5 t	10	
11 t	2	Counterweight plate 5.5 t	10	2

The central ballast is installed with an auxiliary crane.

DANGER
Danger of impact and crushing!
Due to presence near the ballast assembly, there is an increased danger of impact and crushing when the ballast plates are “placed”.
- ▶ Exercise extreme caution when lifting the ballast.
- ▶ Never allow people to stand under a suspended ballast.
- ▶ Exercise extreme caution when lowering the ballast. Danger of crushing people in the immediate area of the ballast being lowered.



B104568

3 Installing the central ballast 43 t

Ensure that the following prerequisites are met:
– The installation of the crawler carrier is completed.
– All connections between the crawler center section and the crawler carrier are pinned and secured.
– The hydraulic support is swung out, locked and pinned.
– The hydraulic support cylinders are completely retracted.
– Both crawler carriers are standing on the ground.
– The turntable is turned by 90° in travel direction, see fig. **3**.
– The pin **2** is inserted in the receptacle of the ballast frame and is secured with the spring retainer **4**.
– An auxiliary crane is available.

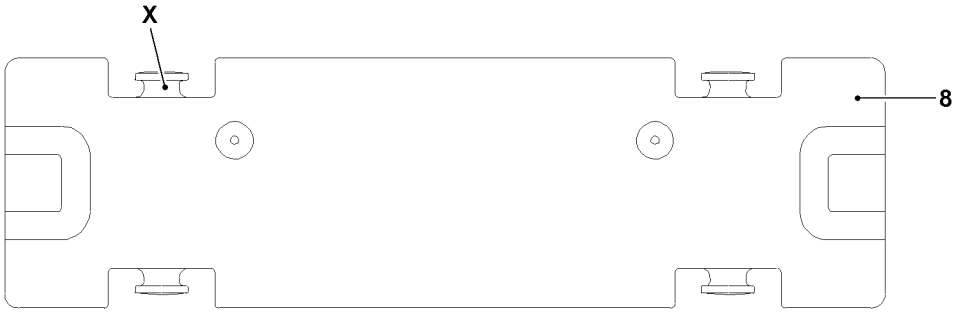
3.1 Installing the ballast frame

The ballast frame is used to retain the ballast plates. It must be installed first on the crawler center section.

▶ Release the spring retainer **4** on the pin **3**.
▶ Remove the pin **3**.
▶ Hang the ballast frame **1** with the auxiliary crane on the pin **3**.

WARNING
Risk of accident!
▶ Make sure that the ballast frame **1** is correctly hung on the crawler center section.

▶ Insert the pin **3** to secure the ballast frame **1** and secure with spring retainer **4**.



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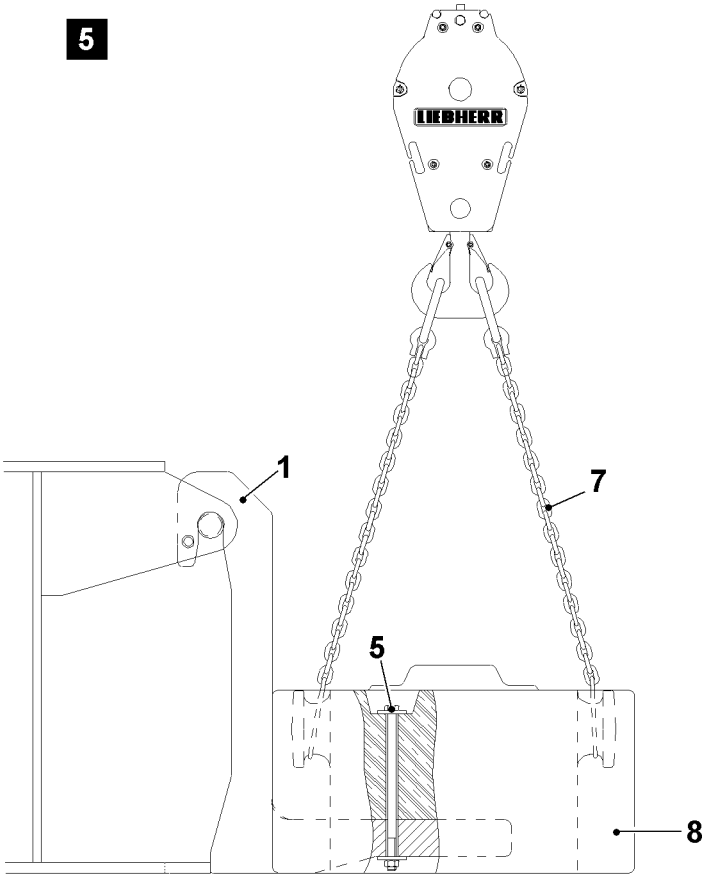

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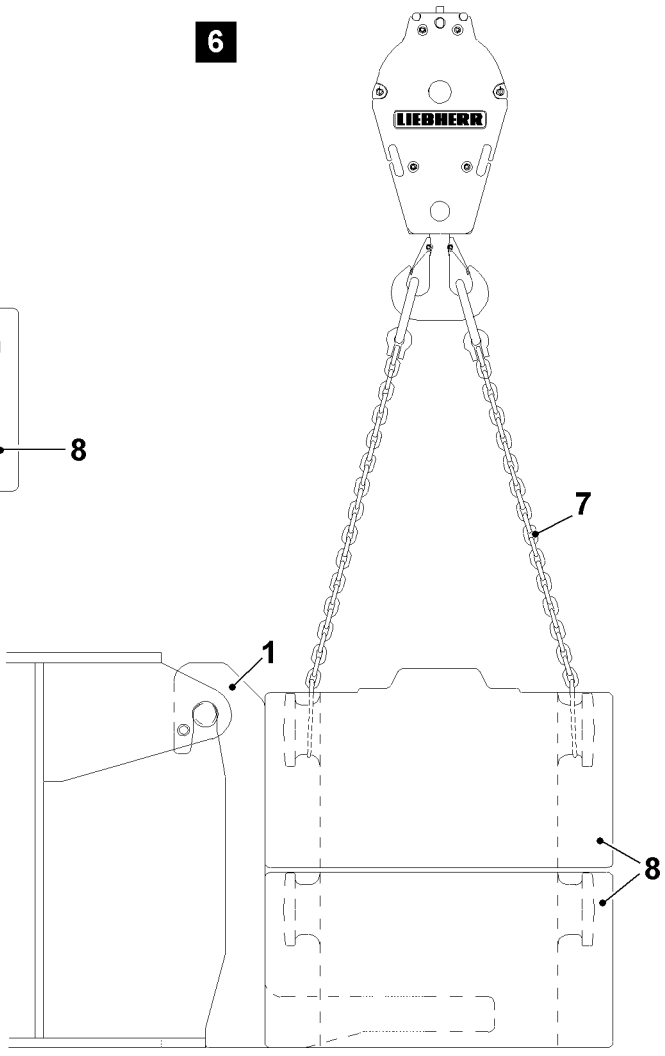


B104569

3.2 Place the ballast plates on the ballast frame

DANGER
Danger of crushing!
If the following note is not observed, severe injuries can occur.
▶ It is prohibited for anyone to remain between the ballast frame and the crawler carriers while the ballast plates are placed.

DANGER
Risk of accident!
If the following note is not observed, property damage on the crane can occur.
▶ Install the central ballast only according to the load chart.

3.2.1 Place the first ballast plate

Ensure that the following prerequisites are met:
– The ballast frame **1** is properly installed.

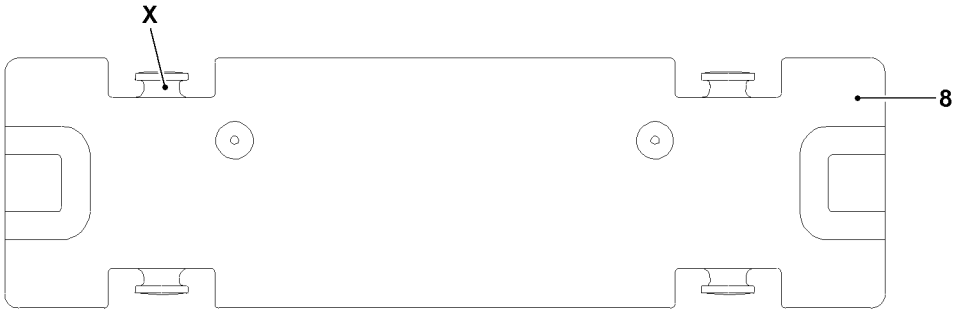
▶ Attach the tackle **7** to the bitts **X** of the ballast plate **8**.

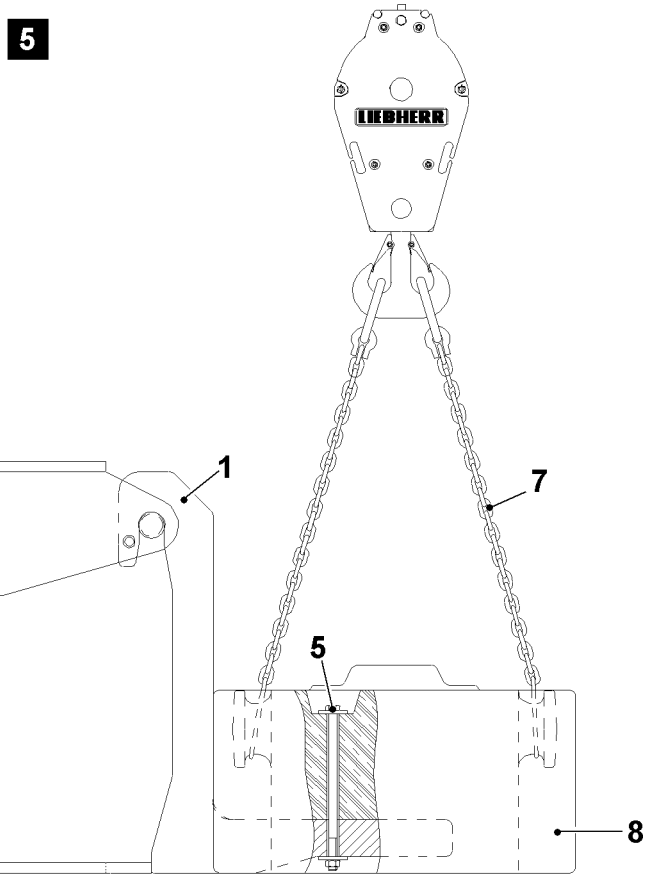
WARNING
Risk of accident!
▶ Make sure that the tackle **7** is correctly attached on the bitts **X** and that it is secured sufficiently to prevent it from loosening up.

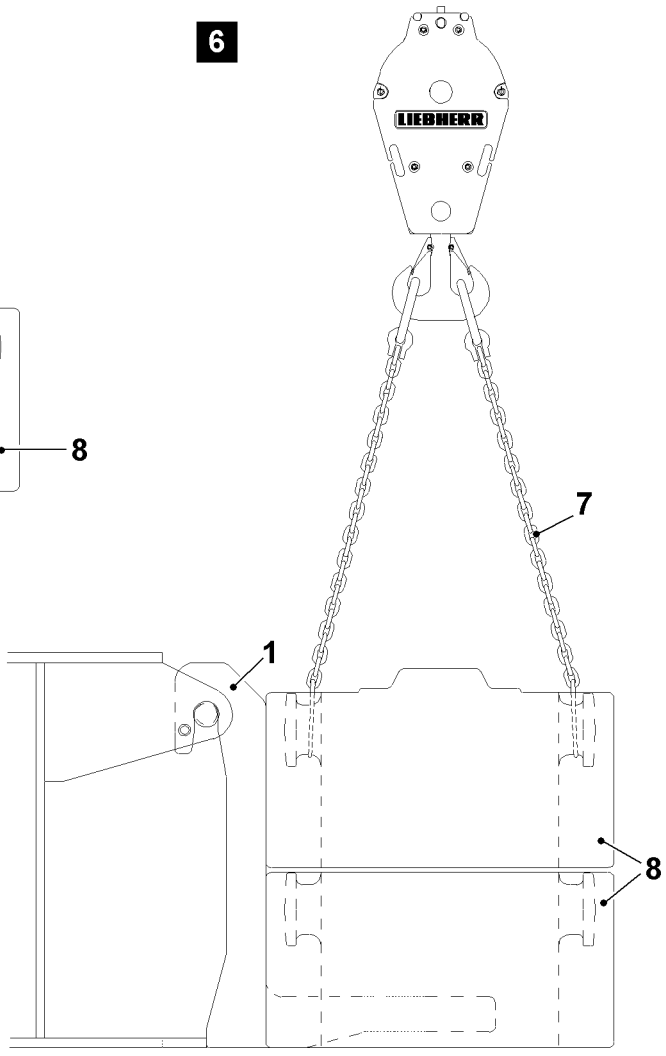
▶ Position the first ballast plate with the auxiliary crane and place it on the ballast frame **1**, see fig. **5**.
▶ Lower the ballast plate **8** all the way on the ballast frame **1** until the tackle **7** is relieved.

Note
▶ Do not loosen the tackle **7** on the ballast plate **8** until it is secured on the ballast frame **1** with the screw **5**.

▶ Secure the ballast plate **8** with the screw **5** on the ballast frame **1**.
▶ Loosen the tackle **7** on the ballast plate **8**.







B104569

3.2.2 Place the second ballast plate

Ensure that the following prerequisites are met:

– The first ballast plate is laying on the ballast frame **1** and is secured with the screw **5**.

▶ Attach the tackle **7** to the bitts **X** of the ballast plate **8**.

WARNING

Risk of accident!

▶ Make sure that the tackle **7** is correctly attached on the bitts **X** and that it is secured sufficiently to prevent it from loosening up.

▶ Place the second ballast plate with the auxiliary crane on the first ballast plate, see fig. **6**.

▶ Lower the ballast plate **8** all the way on the first ballast plate until the tackle **7** is relieved.

▶ Loosen the tackle **7** on the ballast plate **8**.

3.3 Installing the counterweight plate

Note

▶ For assembly of counterweight plate, see section “Installing the central ballast 11 t ”.

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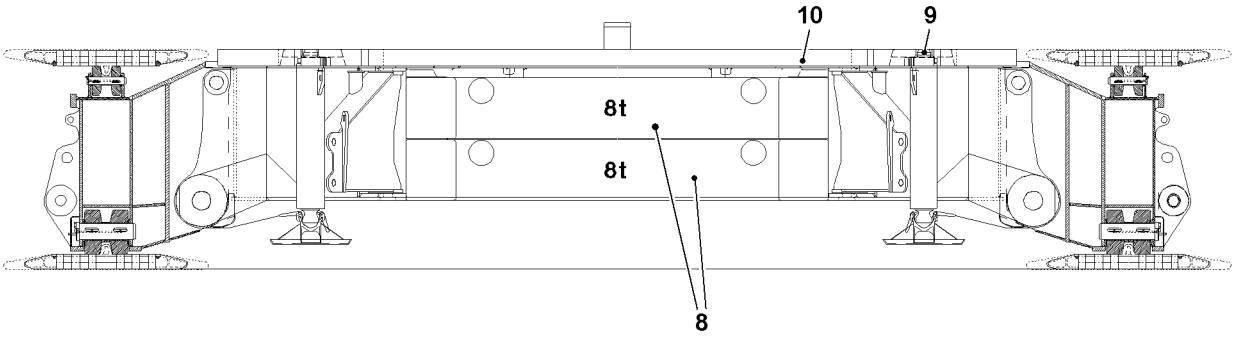

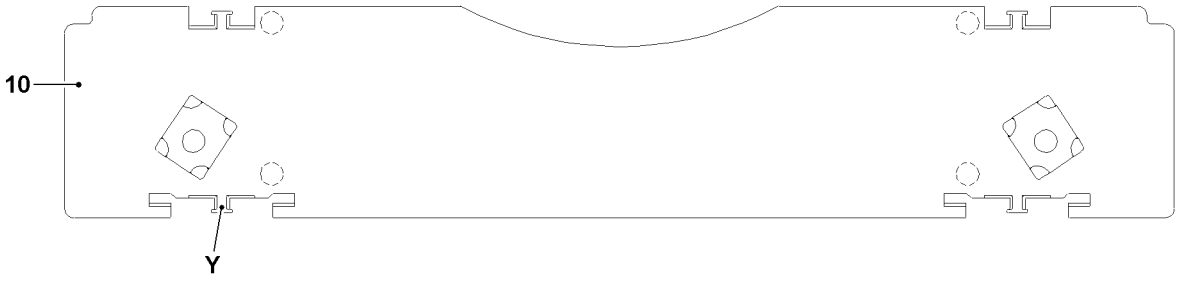

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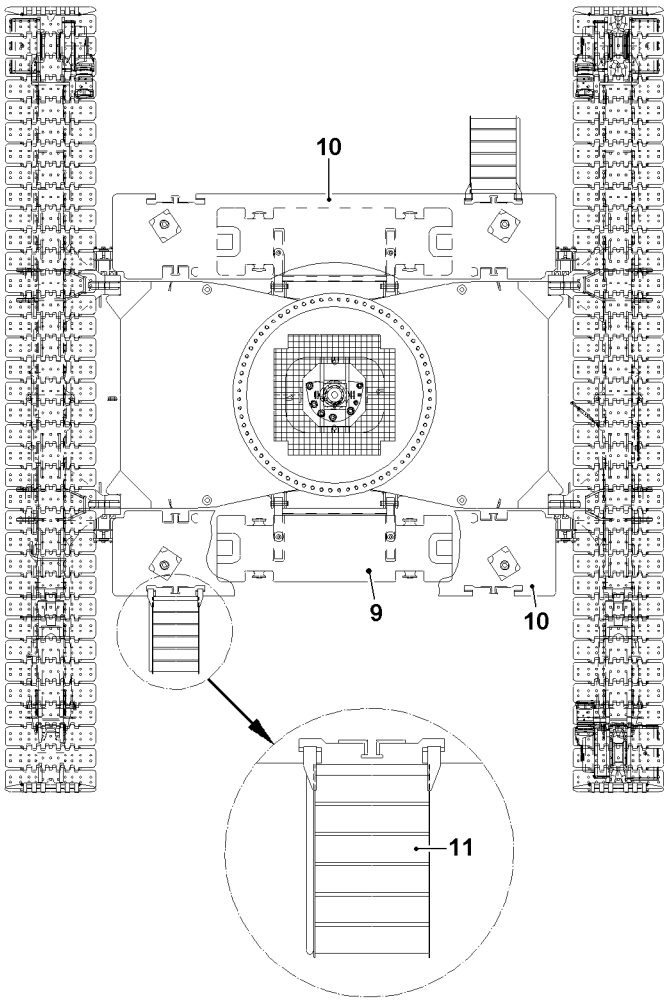


B104571

4 Installing the central ballast 11 t

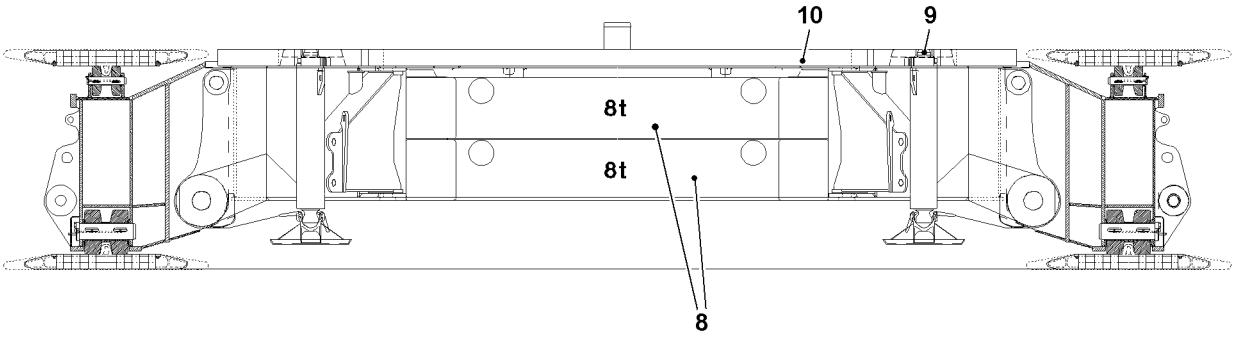
The counterweight plate serves as the central ballast and when installed, the platform insures access the crane operator's cab in any slewing angle of the turntable, see illustration.
Ensure that the following prerequisites are met:

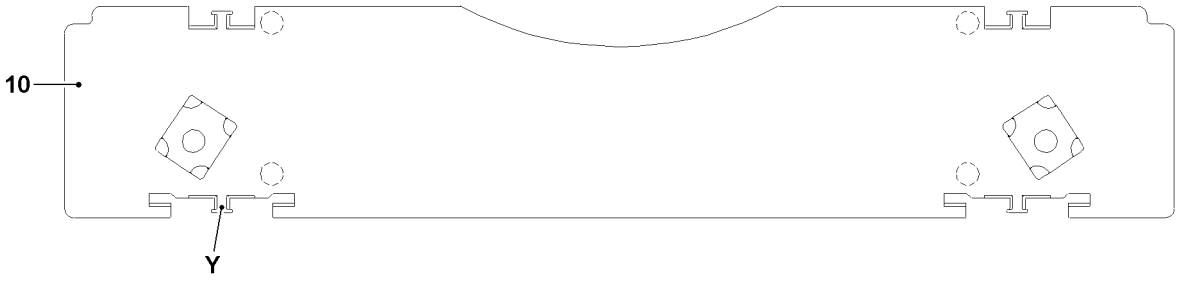
– The installation of the crawler carrier is completed.
– All connections between the crawler center section and the crawler carrier are pinned and secured.
– The hydraulic support is swung out, locked and pinned.
– The hydraulic support cylinders are completely retracted.
– Both crawler carriers are standing on the ground.
– The turntable is turned by 90° in travel direction, see fig. **3**.
– An auxiliary crane is available.
– For the central ballast version 43 t, the two ballast plates are installed on the ballast frame.

DANGER
Danger of crushing!
If the following note is not observed, severe injuries can occur.
▶ It is prohibited for anyone to remain between the crawler center section and the crawler carriers while the counterweight plate is placed.

DANGER
Risk of accident!
If the following note is not observed, property damage on the crane can occur.
▶ Install the central ballast only according to the load chart.

7





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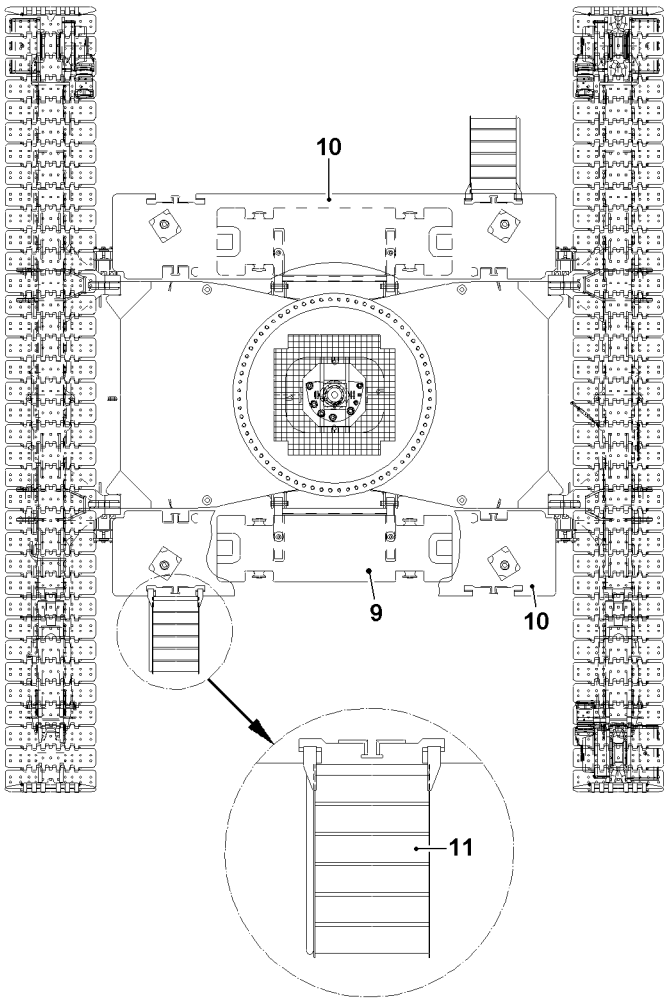

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4.1 Installing the counterweight plate

▶ Attach the tackle on the bitts **Y** of the counterweight plate **10**.

WARNING
Risk of accident!
▶ Make sure that the tackle is correctly attached on the bitts **Y** and that it is secured sufficiently to prevent it from loosening up.

▶ Place the counterweight plate **10** with the auxiliary crane on the receptacle studs **9** of the hydraulic support cylinder, see fig. **7**.
▶ Lower the counterweight plate **10** all the way on the hydraulic support cylinders until the tackle is relieved.

Note
▶ Do not loosen the tackle on the counterweight plate **10** until it is secured via the receptacle studs **9** of the hydraulic support cylinders.

▶ Loosen the tackle on the counterweight plate **10**.

4.2 Installing the access ladder

To ensure safe access for the crane operator and the assembly personnel, an access ladder is installed on each side.
▶ Hang the access ladder **11** on the notch of the counterweight plate **10**, see fig. **8**.

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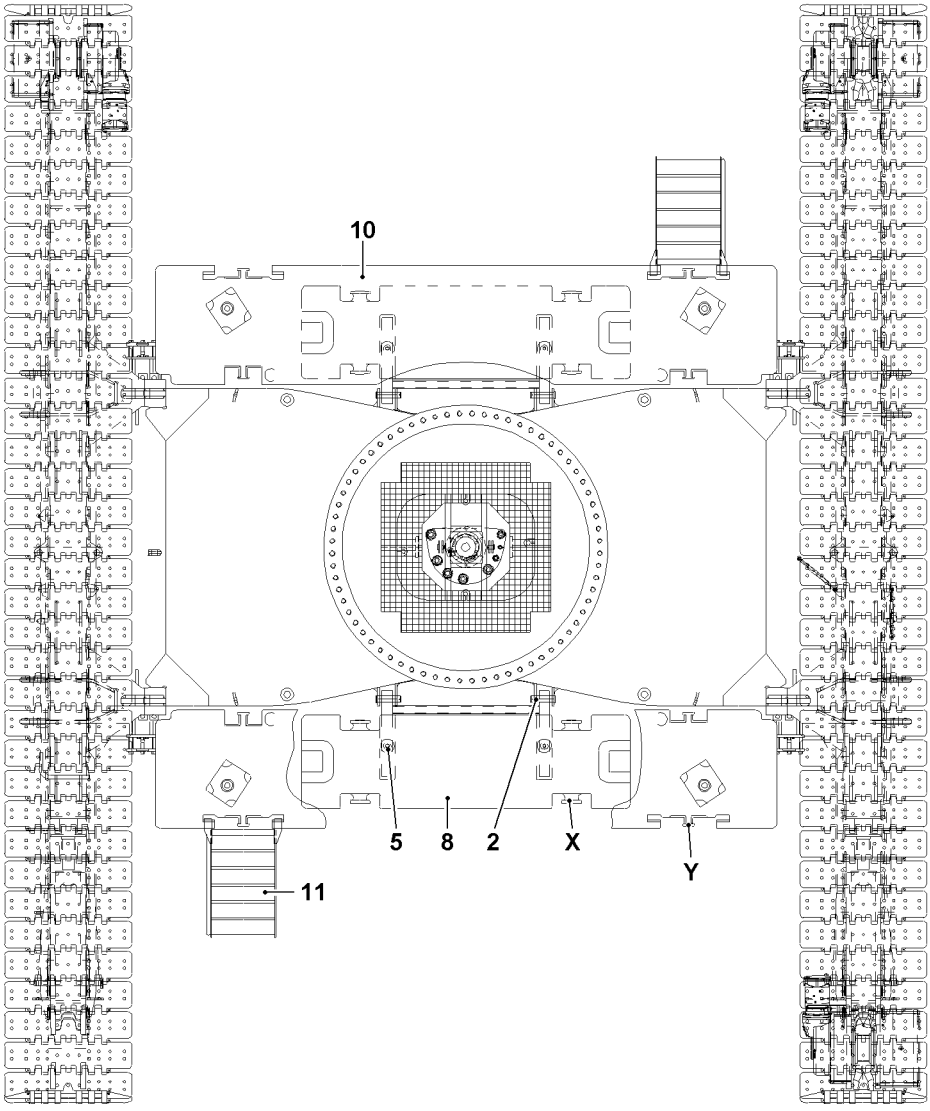

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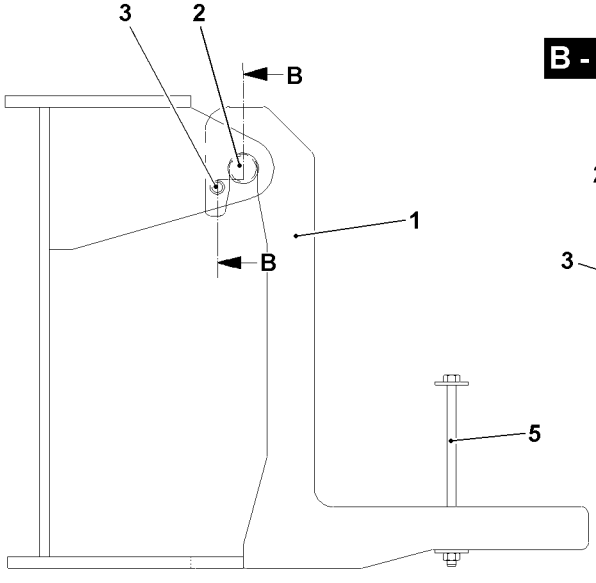

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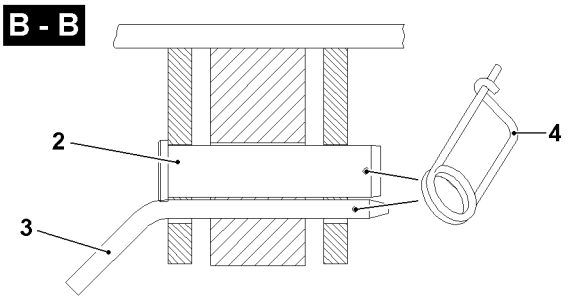


B104572

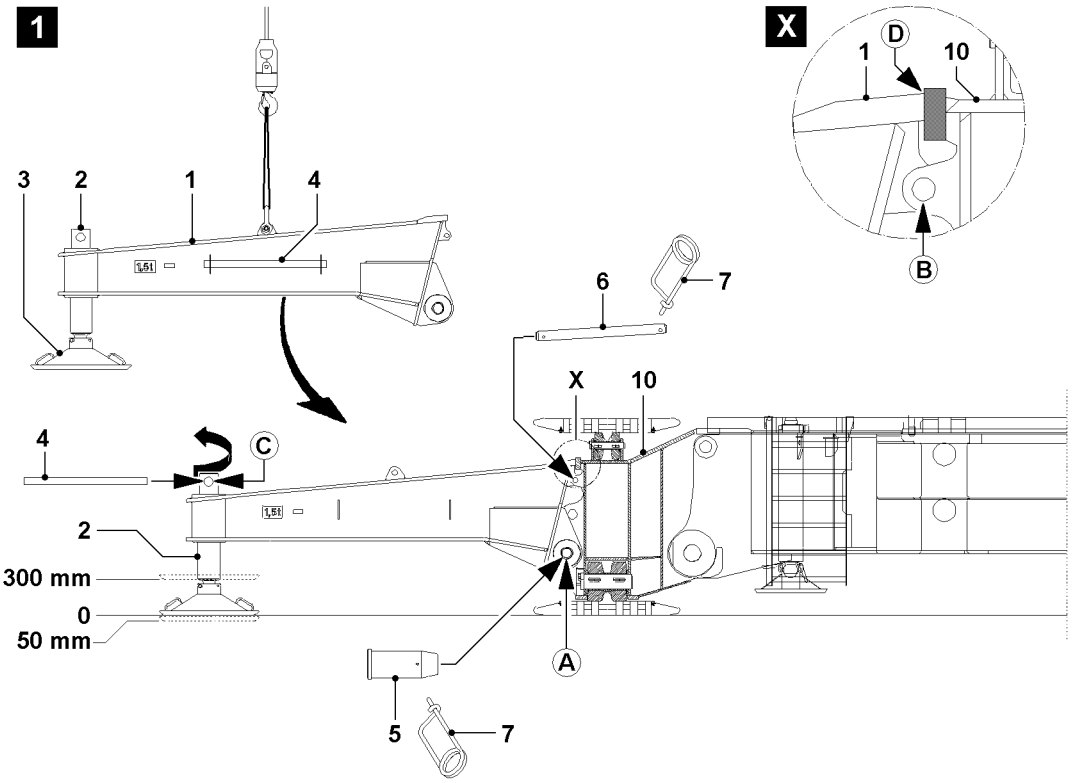
5 Removing the central ballast

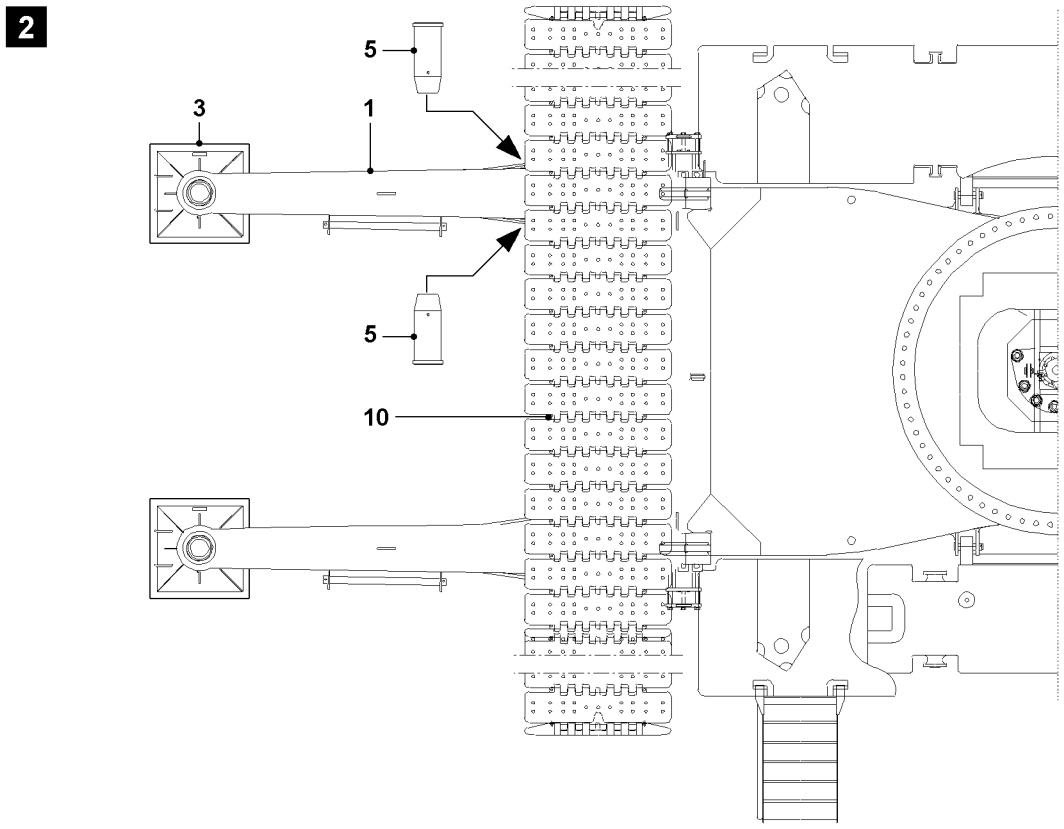
DANGER
Danger of impact and crushing!
Due to presence near the ballast assembly, there is an increased danger of impact and crushing when the ballast plates are “removed”.
- ▶ Exercise extreme caution when lifting the ballast.
- ▶ Never allow people to stand under a suspended ballast.
- ▶ Exercise extreme caution when lowering the ballast. Danger of crushing people in the immediate area of the ballast being lowered.

5.1 Removing the central ballast

Make sure that the following prerequisites are met:
- – An auxiliary crane is available.
- – The turntable is turned by 90° in travel direction, see fig. **3**.
- – Both crawler carriers are standing on the ground.

- ▶ Detach the access ladder **11** on the counterweight plate **10**.
- ▶ Attach the tackle on the bitts **Y** of the counterweight plate **10**.
- ▶ Lift the counterweight plate **10** with the auxiliary crane from the hydraulic support.
- ▶ Attach the tackle on the bitts **X** of the ballast plate **8**.
- ▶ Lift the first ballast plate **8** with the aid of the auxiliary crane from the ballast frame **1**.
- ▶ Attach the tackle on the bitts **X** of the ballast plate **8**.
- ▶ Loosen the retainer for the ballast plate **8** on the ballast frame **1** by removing the screw **5**.
- ▶ Lift the second ballast plate **8** with the aid of the auxiliary crane from the ballast frame **1**.
- ▶ Release the spring retainer **4** on the pin **3**, see fig. **10**.
- ▶ Remove the pin **3**.
- ▶ Detach the ballast frame **1** with the auxiliary crane from the crawler center section.
- ▶ Insert the pin **3** on the retainer of the ballast frame and secure with spring retainer **4**.





B104610

1 General

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.

Note

▶ The data in the erection and take down charts must be observed and adhered to!

2 Assembly

WARNING

Danger of fatal injury if crane topples over!

▶ If long boom combinations are erected or taken down without mechanical auxiliary support **1**, the crane can tip over and fatally injure personnel.

▶ Pin the mechanical auxiliary support **1** on the crawler carrier **10** and turn the spindle until the support pads lay on the ground.

Ensure 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.

2.1 Assembly procedure

Note

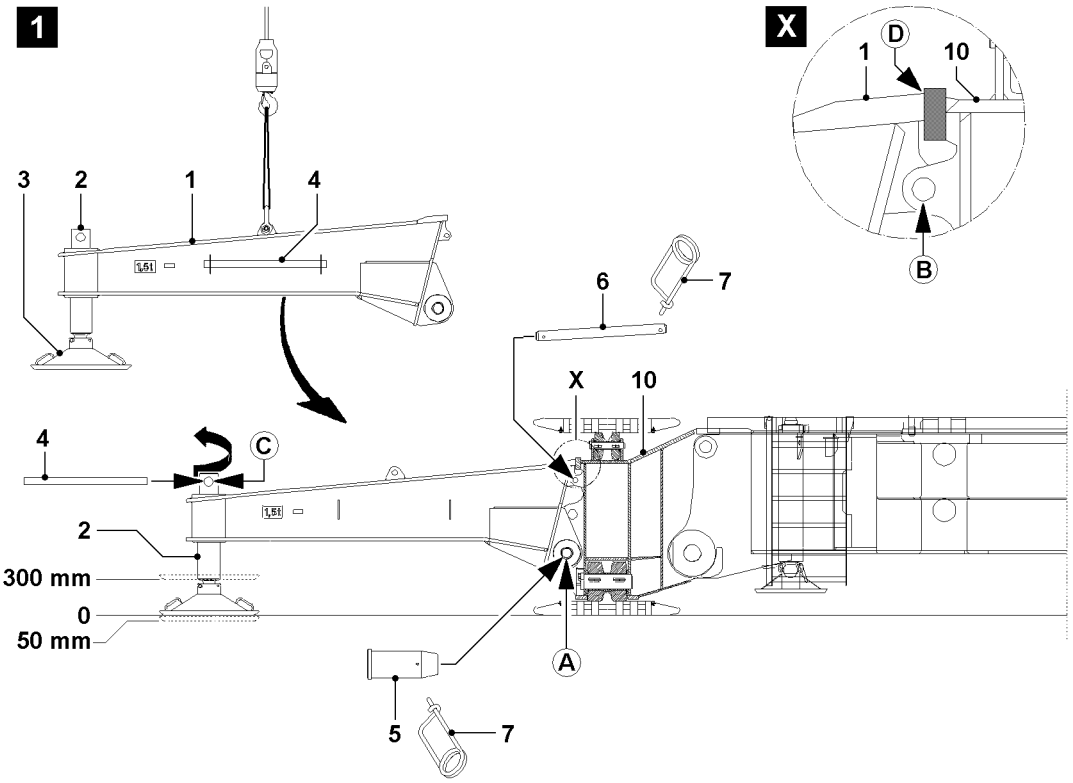
▶ The installation of the mechanical auxiliary support **1** is the same for both support beams on the left and right hand side!

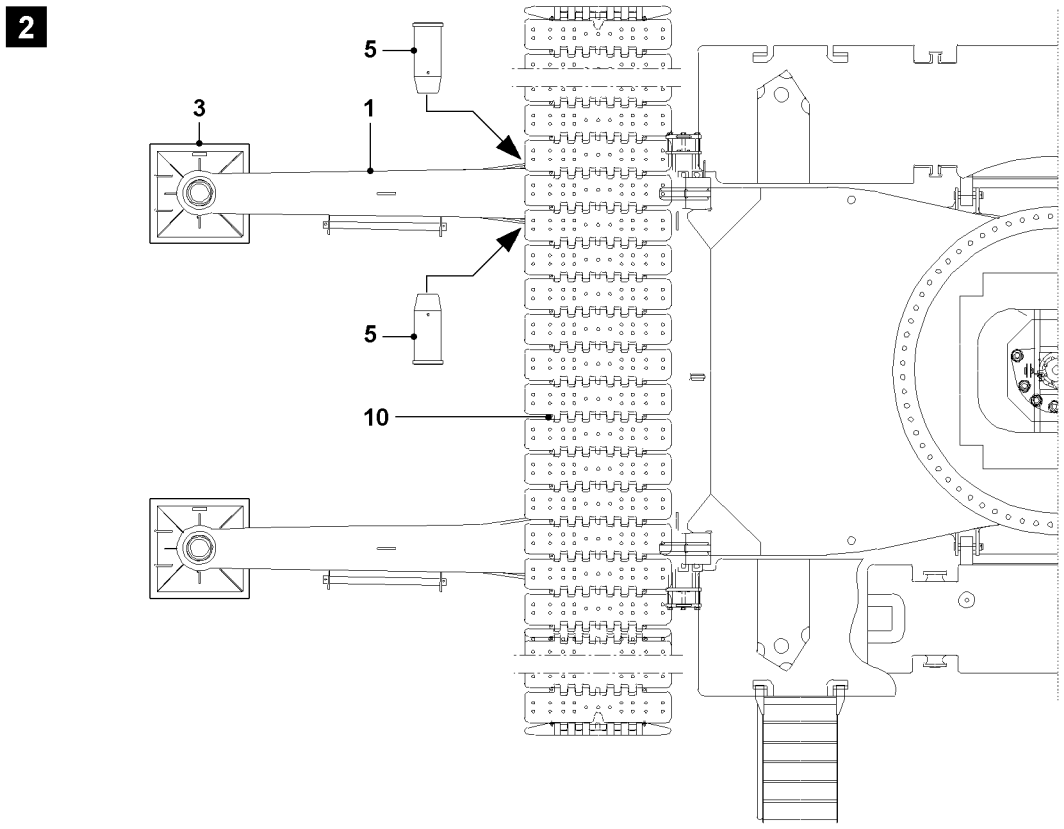
▶ Hang the mechanical auxiliary support **1** on the auxiliary crane and swing into pin position, fig. **1**.

▶ Align the mechanical auxiliary support **1** in such a way that the pin bores of the mechanical auxiliary support align with the pin bores on the crawler carrier **10**.

▶ Insert the pins **5** from the left and right at point **A** and secure each with spring retainer **7**, fig. **1** / fig. **2**.

▶ Insert the pin **6** at point **B** and secure with spring retainer **7** (fig. **X**).





B104610

DANGER
Danger of fatal injury if crane topples over!
Due to the mechanical auxiliary support, the stability of the crane is increased towards the side, over which the boom system is to be erected or taken down. This may not be used to increase the load momentum. If this is not observed, the crane can topple over fatally injure personnel.
- ▶ The mechanical auxiliary support is only an erection and take down device.
- ▶ 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.

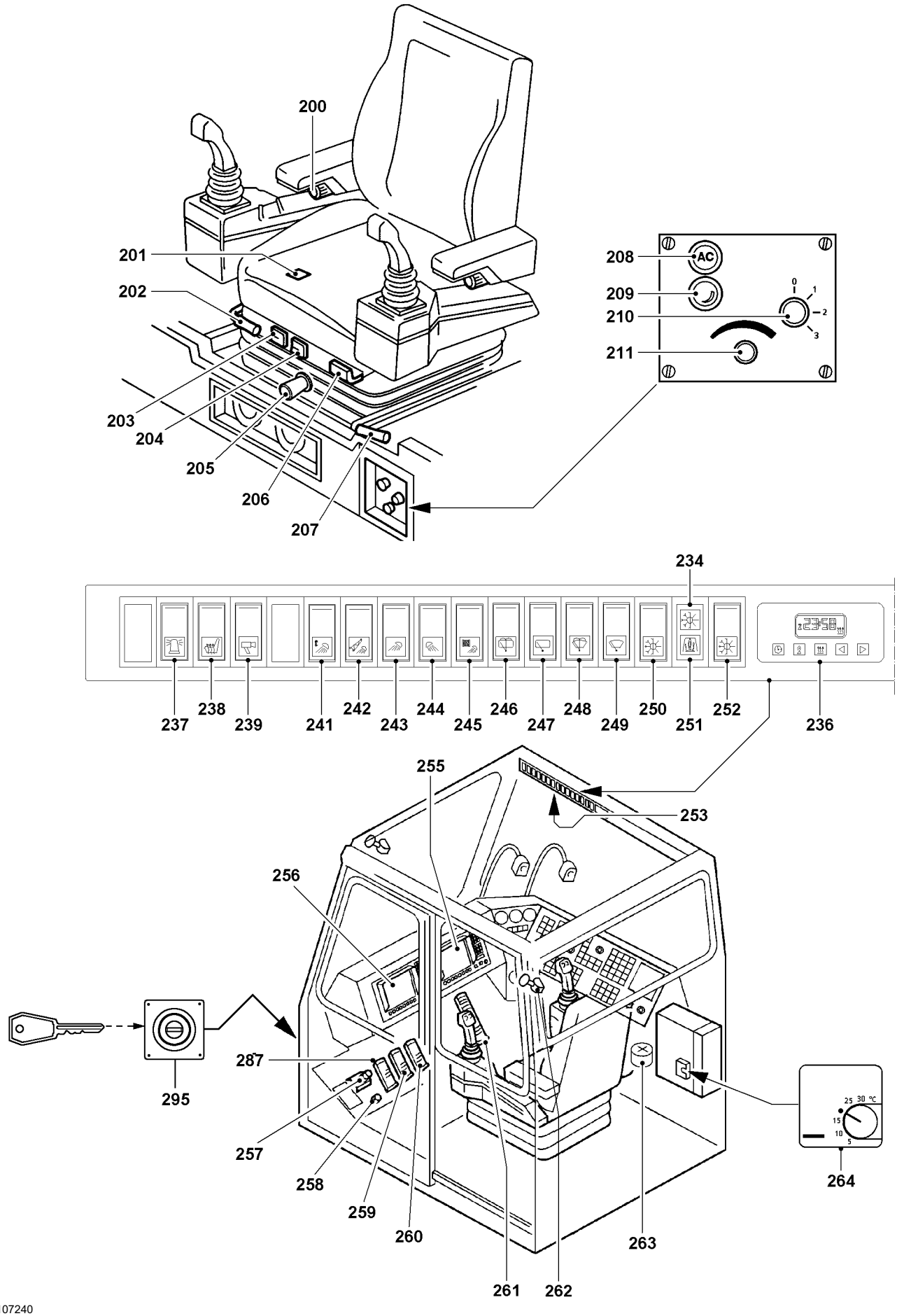
- ▶ Remove the pipe **4** from the transport retainer on the mechanical auxiliary support.
- ▶ Insert the pipe **4** at point **C** into the bore on the spindle **2**.
- ▶ Turn the support pad **3** by turning the spindle **2** with the pipe **4** downward until it is “tensioned” and placed horizontally on the base support.

DANGER
Danger of accidents during erection and take down!
The mechanical auxiliary support **1** must touch on the crawler carrier **10** at point **D**, see fig. **X**. If this is not observed, the boom can move jerkily during erection and take down.
- ▶ Turn the support pad **3** with the spindle **2** until the mechanical auxiliary support **1** touches at point **D**.

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

- ▶ If the mechanical auxiliary support **1** has no contact at point **D** to the placement surface on the crawler carrier:
  Turn the support pad **3** with the spindle **2**.

4.00 Operation of crane superstructure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B107240

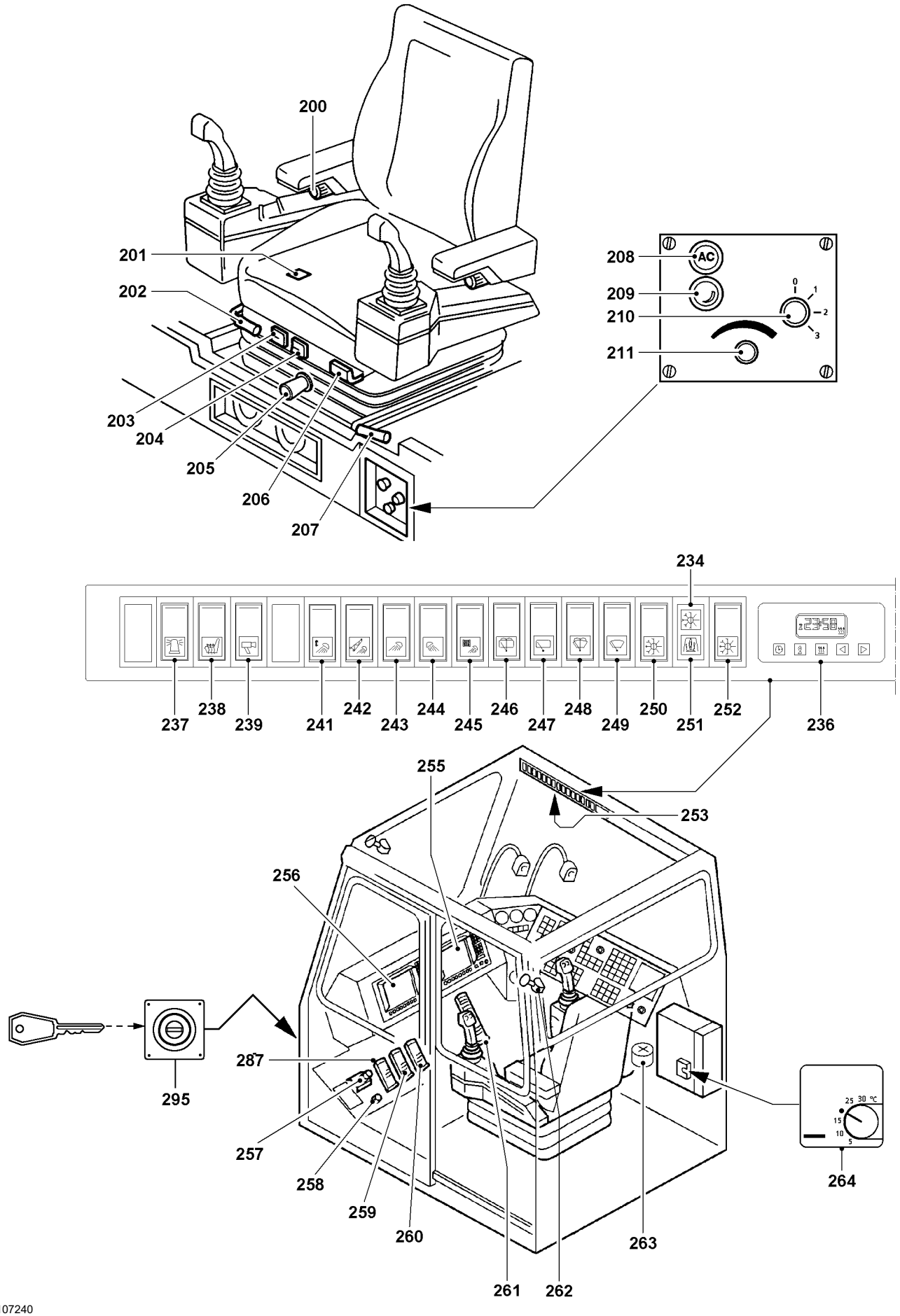
1 Operating and control instruments

1.1 Operating elements - Crane operator's seat / air conditioning system

200	Rotary knob	• Adjustment of armrest incline.
201	Seat contact button	
202	Manual lever	• Adjustment of seat cushion angle.
203	Button	• Lumbar support in lower part of backrest.
204	Button	• Lumbar support in upper part of backrest.
205	Rotary knob	• Adjustment of seat suspension for body weight.
206	Manual lever	• Backrest angle adjustment.
207	Manual lever	• Release for horizontal seat adjustment.
208	Regulator knob*	• Air conditioning system.
209	Switch	• Switching between fresh air / recirculated air. • Air volume.
210	Rotary switch	• Three stage blower.
211	Regulator knob	• Cab heating temperature.

1.2 Roof console controls

234	Indicator light*	• Air-conditioning system is turned on.
236	Timer for auxiliary heater*	• With the following displays: • Time and day of the week. • Fault in auxiliary heating. • Air temperature. • Preselection of heater operation.
237	Switch	• Airplane warning light.
238	Switch*	• Seat heating.
239	Switch	• Camera illumination. • **Switch position I:** Illumination winches 1 to 5. • **Switch position II:** Illumination winches 1 to 5. Illumination to the rear.
241	Button*	• Height adjustment work headlight, boom pivot section.
242	Switch*	• Work headlight on the boom pivot section.
243	Switch*	• Working floodlight, cab pedestal.
244	Switch*	• Working floodlight, cab roof, rear.
245	Switch*	• Working floodlight winch illumination.
246	Button	• Windshield wiper / washer, roof window.
247	Switch	• Window wiper roof window, 2-stage.
248	Button	• Windshield wiper / washer, front window.
249	Switch	• Window wiper front window, 2-stage.
250	Switch*	• Air conditioning system.
251	Indicator light	• Auxiliary heating turned on.
252	Switch*	• Auxiliary heater.
253	Domelight with switch	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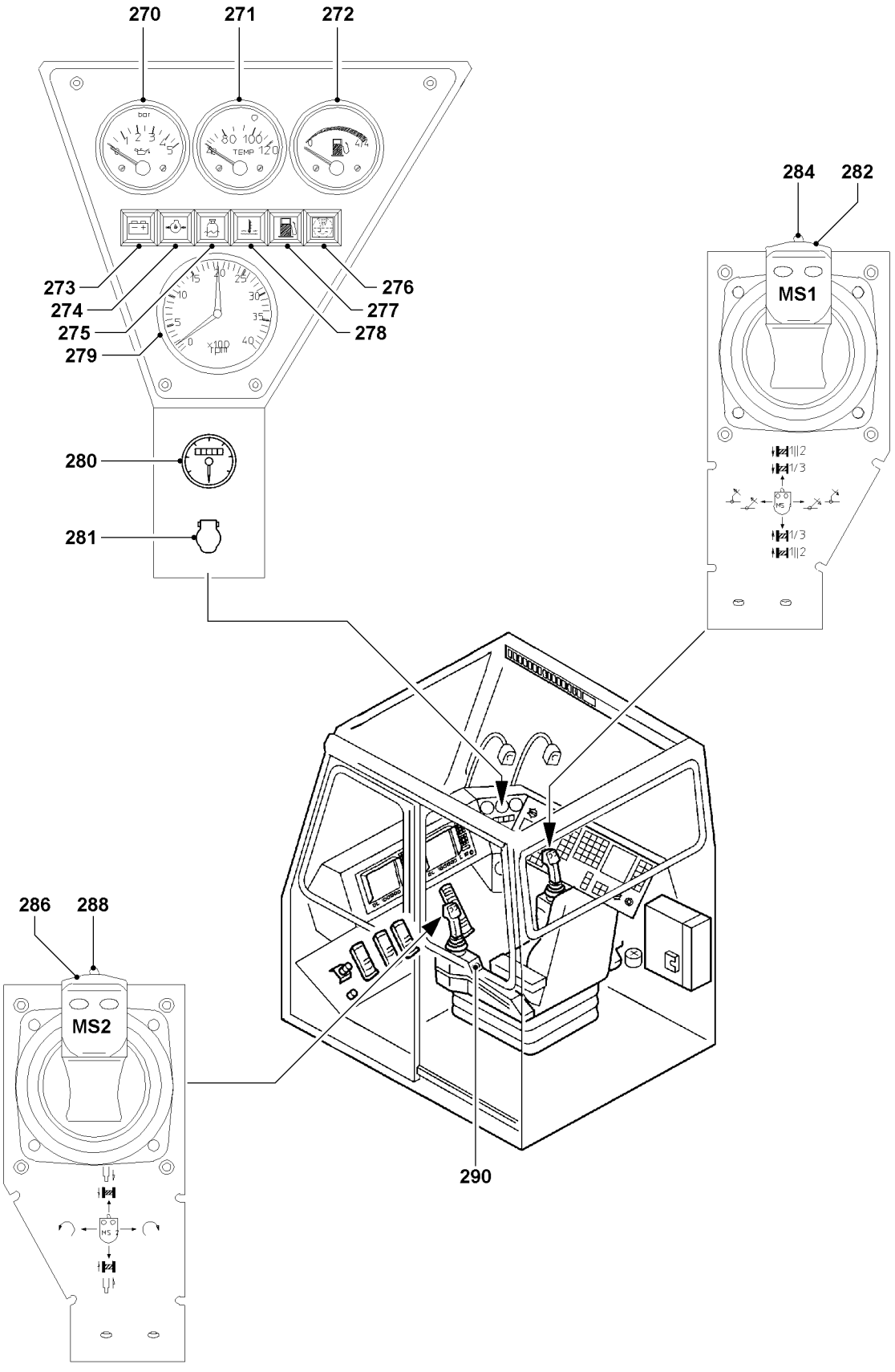
B107240

1.3 Operating elements, General

255	LICCON Monitor 0	
256	LICCON Monitor 1	
257	Foot button	• Coasting slewing gear.
258	Foot button	• Horn.
259	Foot pedal	• Crawler track left.
260	Foot pedal	• Crawler track right.
261	Pedal	• Engine regulation.
262	Lever	• Manual engine regulation.
264	Thermostat*	• Auxiliary heater.
287	Pedal*	• Slewing gear brake (block). **Note:** The slewing gear brake **287** (block) **may not be used** as operational slewing brake!
295	EMERGENCY OFF switch*	• Impact switch (outside of cab).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MS1
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MS2
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B107241

1.4 Indicator light instrument panel, right front

270	Oil pressure display	• Diesel engine.
271	Temperature display	• Coolant temperature diesel engine.
272	Fuel level display	• Diesel fuel tank.
273	Warning light	• Battery charge check.
274	Warning light	• Oil pressure diesel engine.
275	Warning light	• Coolant level too low.
276	Warning light	• Air filter is dirty.
277	Warning light	• Fuel level too low.
278	Warning light	• Coolant temperature too high.
279	RPM gauge	• Diesel engine.
280	Operating hour meter	
281	Socket 24 V	

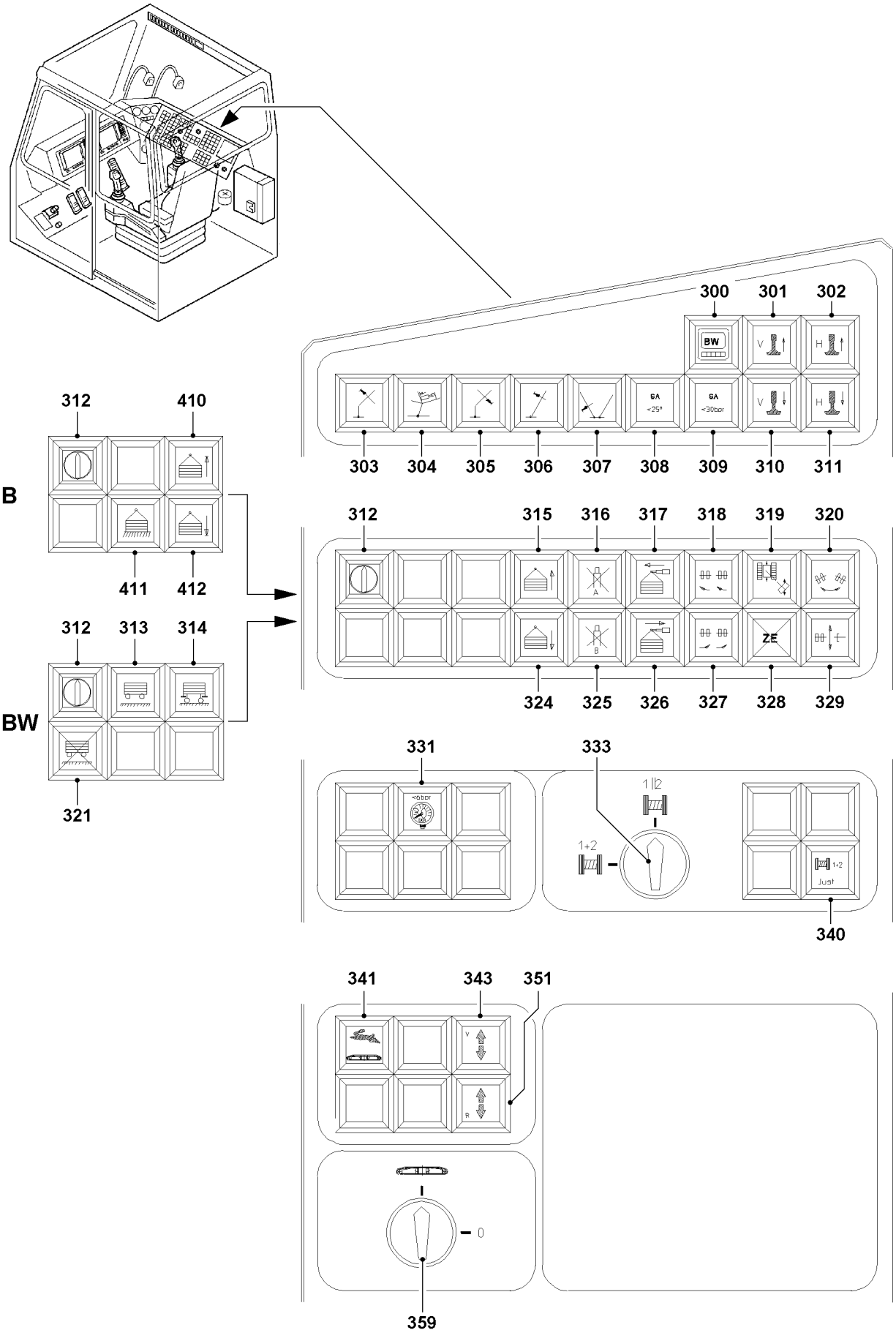
1.5 Operating elements on control panel

Control panel, right:

282	Master switch - right (MS 1).	• **Note:** For assignment of master switch to operating modes, see chart, chapter 4.05.
284	Button	• Bypass of seat contact button.

Control panel, left:

286	Master switch left (MS 2)	• **Note:** For assignment of master switch to operating modes, see chart, chapter 4.05.
288	Button	• Bypass of seat contact button.
290	Button	• Bypassing of overload protection, used to luff up at overload. **Danger:** **The bypass may only be done if the overload was caused by luffing down at freely suspended load and the crane operator is absolutely certain that luffing up the load will take it out of the overload range.**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B104613

1.6 Operating elements - Instrument panel right

300	Switch*	• Change monitor 1 over to test system ballast trailer. **Note:** The change over is only possible if the engine is turned off!
301	Button*	• Support cylinder ballast trailer front up.
302	Button*	• Support cylinder ballast trailer rear up.
303	Warning light	• Lattice jib “steepest” position, mechanical relapse retainer.
304	Warning light	• Lattice jib, “steepest” position, relapse cylinder.
305	Warning light	• Lattice jib “lowest” position.
306	Warning light	• Boom “steepest” position, relapse cylinder.
307	Indicator light*	• Derrick boom “bottom”.
308	Warning light	• SA-frame to the front, angle less than 25°.
309	Warning light	• Shut off winch 4 when falling below the required pressure (at least 30 bar) in the SA-frame relapse retainer.
310	Button*	• Support cylinder ballast trailer front down.
311	Button*	• Support cylinder ballast trailer rear down.

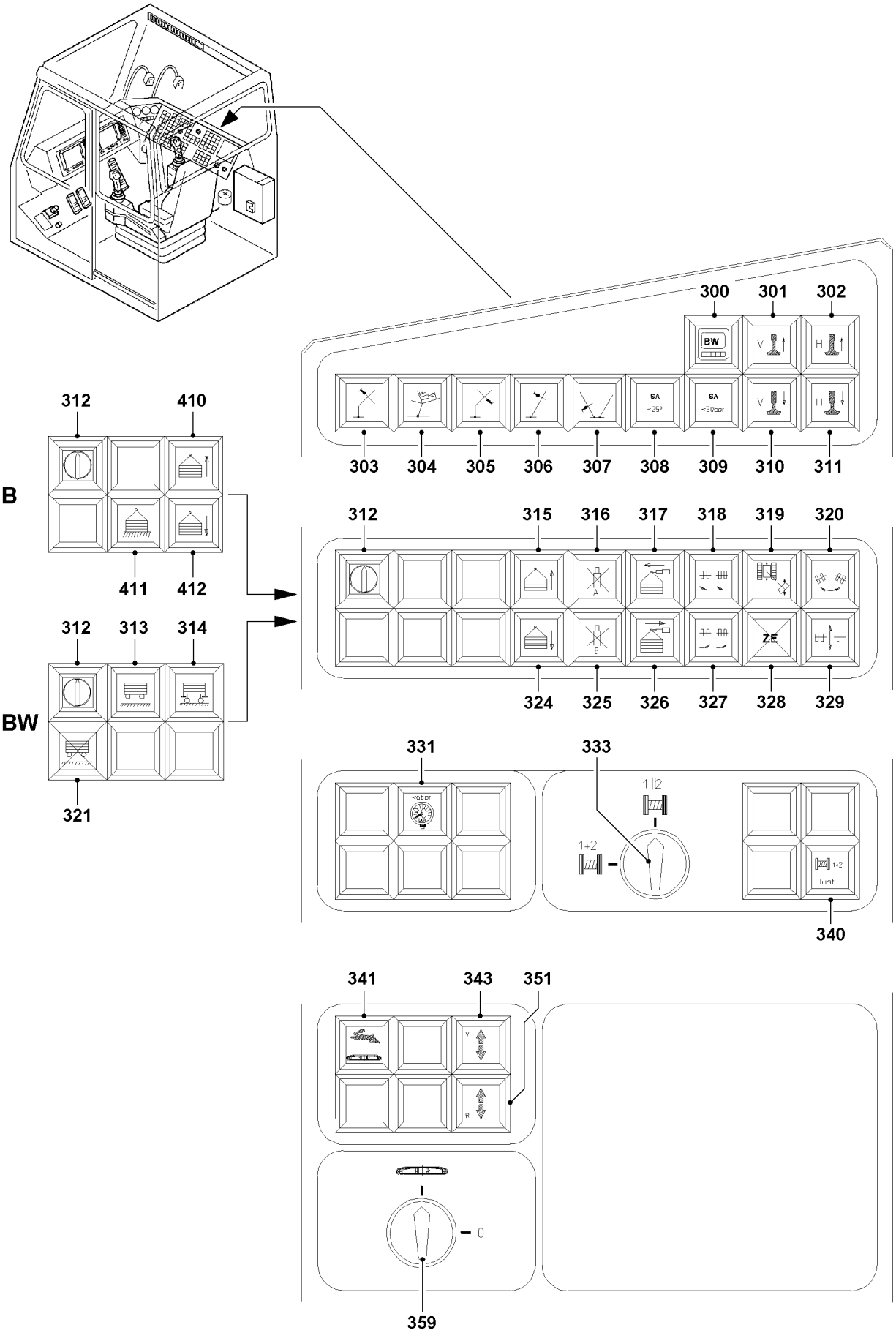
DANGER

Danger of toppling the crane if the key button **312** is **not** actuated!

Dangerous situations can arise if the ballast trailer lifts off completely when driving the crane. The crane can topple over in extreme cases.

- ▶ When driving the crane with the ballast trailer, the crane operator must ensure by constantly checking visually that the ballast trailer has constant ground contact!
- ▶ If the ballast trailer should lift off the ground completely, then the crane operator is obligated to turn on the key button **312** “Ballast trailer lifted off”, see also chapter 5.11.

312	Key button “Ballast trailer lifted off” *	• Briefly pressing the key button will turn on the operating mode “**Ballast trailer lifted off** ” (self retention). **Note:** **“Ballast trailer lifted off”** is shown by the blinking indicator light **313** as well as the red beacon assembled on the crane operator's cab. In addition, the ballast trailer icon on monitor 1 shows the suspended condition.
313	Warning light*	• Ballast trailer lifted off - blinks with turned on key button **312**.
314	Warning light*	• Support ballast trailer engaged.
315	Button*	• Derrick ballast “UP”.
316	Button*	• Block cylinder “A” on the derrick ballast.
317	Button*	• Telescope derrick ballast out.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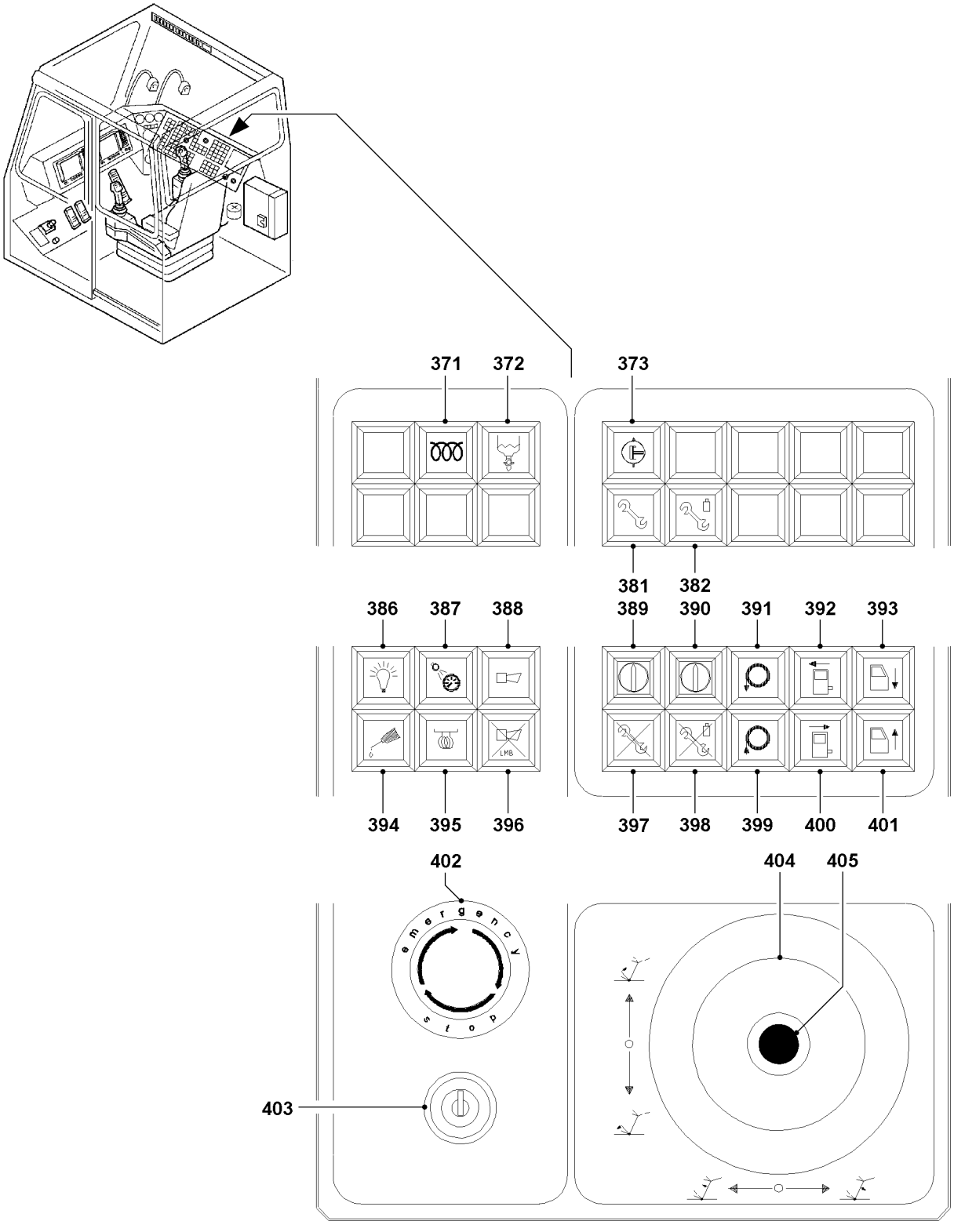
318 Button*	• Ballast trailer wheels turn to the right to drive on tight job sites - see also chapter 5.11.
319 Button*	• Turn ballast trailer wheels into parallel travel position (crab walk) - the indicator light **blinks**. • Ballast trailer wheels in parallel travel position - the indicator light **lights up** constantly - see also chapter 5.11.
320 Button*	• Turn ballast trailer wheels into turning position - the indicator light **blinks**. • Ballast trailer wheels in turning position - the indicator light **lights up** constantly - see also chapter 5.11.
321 Button*	• Turn off self-retention of key button **312**.
324 Button*	• Derrick ballast “DOWN”.
325 Button*	• Block cylinder “B” on the derrick ballast.
326 Button*	• Telescope in derrick ballast or ballast trailer.
327 Button*	• Ballast trailer wheels turn to the left to drive on tight job sites - see also chapter 5.11.
328 Warning light*	• CPU ballast trailer is not “booting up” - see also chapter 5.11.
329 Button*	• Set ballast trailer wheels into travel position - the indicator light **blinks**. • Ballast trailer wheels in travel position - the indicator light **lights up** - see also chapter 5.11.
331 Warning light	• Servo oil pressure in winches 1 to 4 < 10 bar. **Note:** It can be determined in the LICCON test system for which winch this is the case.

333 Preselection switch	• **Position 1 + 2:**
	  • Winch 1 and 2.
	  • Individual operation.
	  • Separate master switches.
	• **Position 1 II 2:**
	  • Winch 1 II 2.
	  • Parallel operation with a master switch.

340 Button	• Adjusting parallel control of winch 1/2. **Note:** Adjust only if the hook blocks of winch 1II2 are parallel.
341 Switch	• Rapid gear for crawler track.
343 Indicator light	• Position of turntable to crawler to the front (V).
351 Indicator light	• Position of turntable to crawler to the rear (R).

359 Preselection switch	• **Crawler operation:**
	  • 0 = crawler operation “OFF”
	  • 1 = crawler operation “ON”

410 Warning light	• Derrick ballast up.
411 Warning light	• Derrick ballast on ground.
412 Warning light	• Derrick ballast down.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371 Indicator light*	• Fuel pre-heating.
372 Indicator light	• Fuel condensation drainage.
373 Button	• Pressure change over switch, pump 9 is required for “erecting and lowering the SA-frame” if the button is not pressed. By pressing the button, the pressure from pump 9 is forwarded to the following auxiliary users: • Adjust the cab. • Boom pinning. • Assembly winch. • Assembly support.
381 Indicator light	• Lights up at assembly, Assembly key button **389** turned on.
382 Indicator light	• Lights up at crawler assembly, key button **390** turned on.
386 Button	• Bulb test.
387 Switch	• Instrument lighting.
388 Button	• Horn.

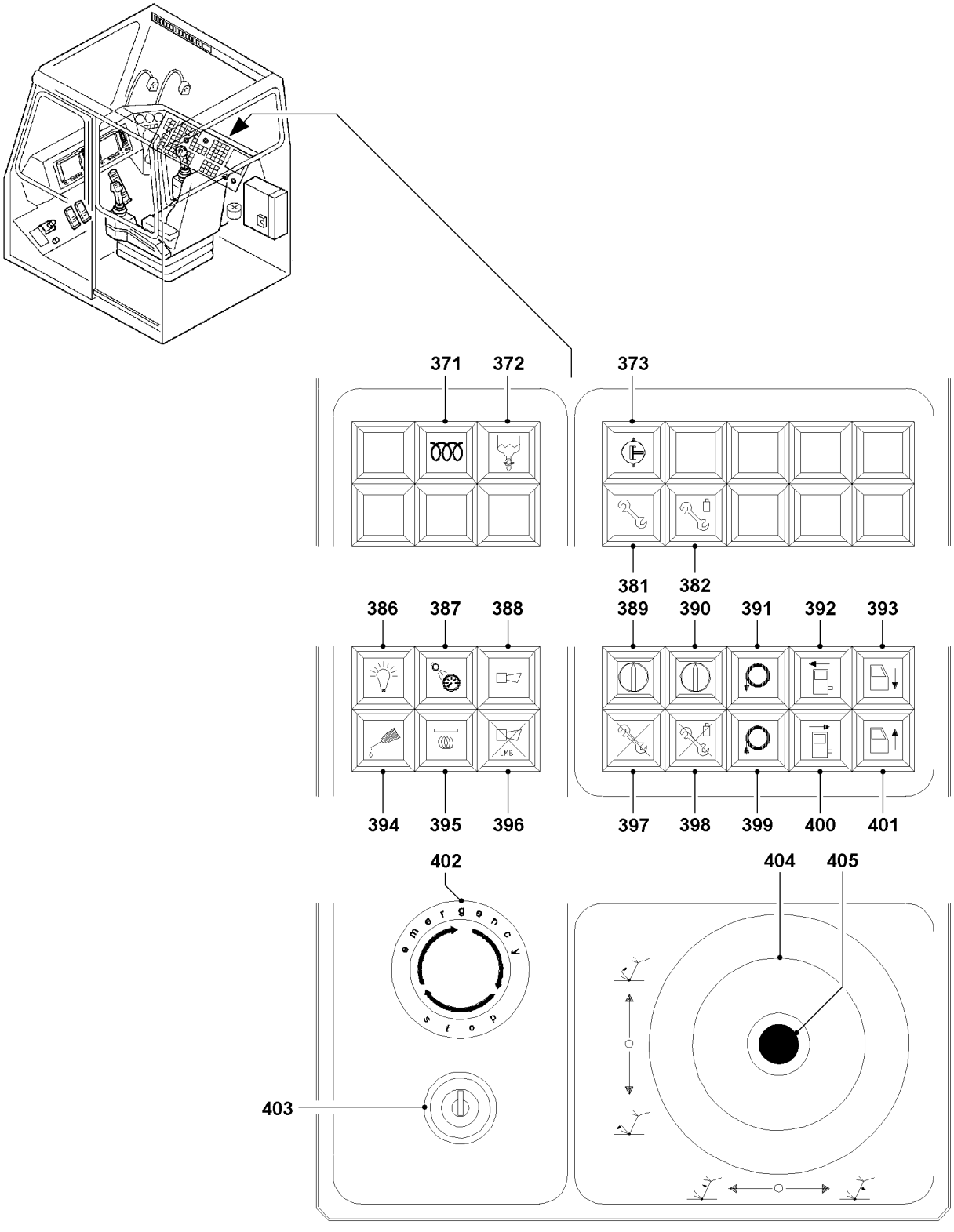
DANGER

Danger of toppling the crane if the assembly key button **389** is actuated!

If the following notes are not observed, an overload can occur causing the crane to topple over.

- ▶ The actuation of the assembly key button is only permitted for assembly tasks!
- ▶ Operational use of the assembly key button is **prohibited**!
- ▶ The LICCON overload protection is bypassed and therefore ineffective if the assembly key button is actuated, see also chapter 4.04!

389 Assembly key button	• Briefly pressing the key button will preselect the **“Assembly”** operating mode (self-retention). **Note:** Observe the safety notes in chapter 4.04! “**Assembly key button** ” turned on is shown by the indicator light **381** as well as the red beacon assembled on the crane operator's cab. In addition, the assembly icon is shown on the LICCON monitor.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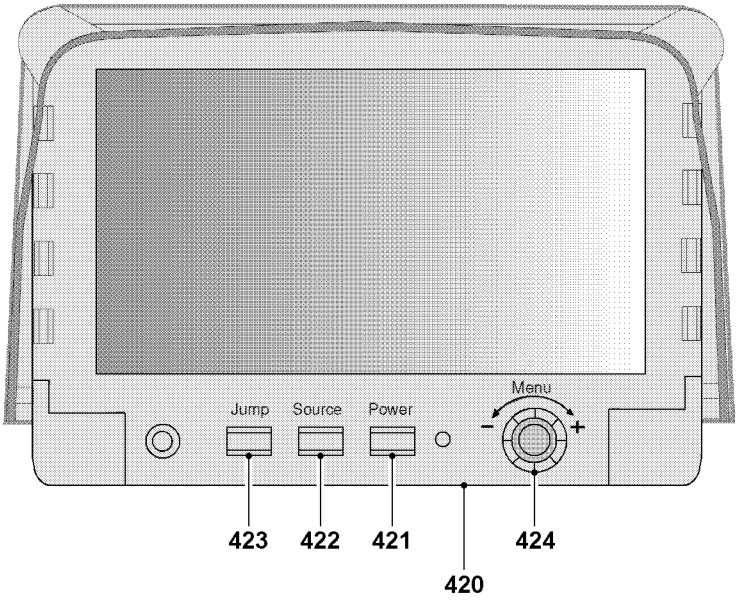
DANGER
Overload of crane in case of actuated crawler assembly key button **390**!
If the following notes are not observed, an overload of the assembly cylinder as well as the entire crane can occur.
- ▶ The actuation of the crawler assembly key button is only permitted for crawler assembly tasks!
- ▶ The LICCON overload safety is bypassed and therefore ineffective if the crawler assembly key button is actuated, see also chapter 4.04!

390	Crawler assembly key button	• Briefly pressing the crawler assembly key button will preselect the **"Crawler assembly with assembly cylinder"** operating mode (self-retention). **Note:** Observe the safety notes in chapter 4.04! "**Crawler assembly key button** " turned on is shown by the indicator light **382** as well as the red beacon assembled on the crane operator's cab. In addition, the assembly icon is shown on the LICCON monitor.
391	Button	• Spool assembly winch out.
392	Button	• Swing cab out.
393	Button	• Cab adjustment "down".
394	Indicator light	• Central lubrication crane superstructure.
395	Indicator light	• Engine preheating, heat flange.
396	Button*	• Acoustical warning LMB "OFF".
397	Button	• Turn off self-retention of key button **389**.
398	Button	• Turn off self-retention of key button **390**.
399	Button	• Spool assembly winch up.
400	Button	• Swing cab in.
401	Button	• Cab adjustment "up".
402	EMERGENCY OFF switch	• Impact switch.
403	Ignition starter switch	
404	Master switch 3 (MS 3)	• **Note:** For assignment of master switches to operating modes, see chapter 4.05.
405	Button	• Bypass of the seat contact button.



B107376

1.7 Camera monitoring

1.7.1 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.

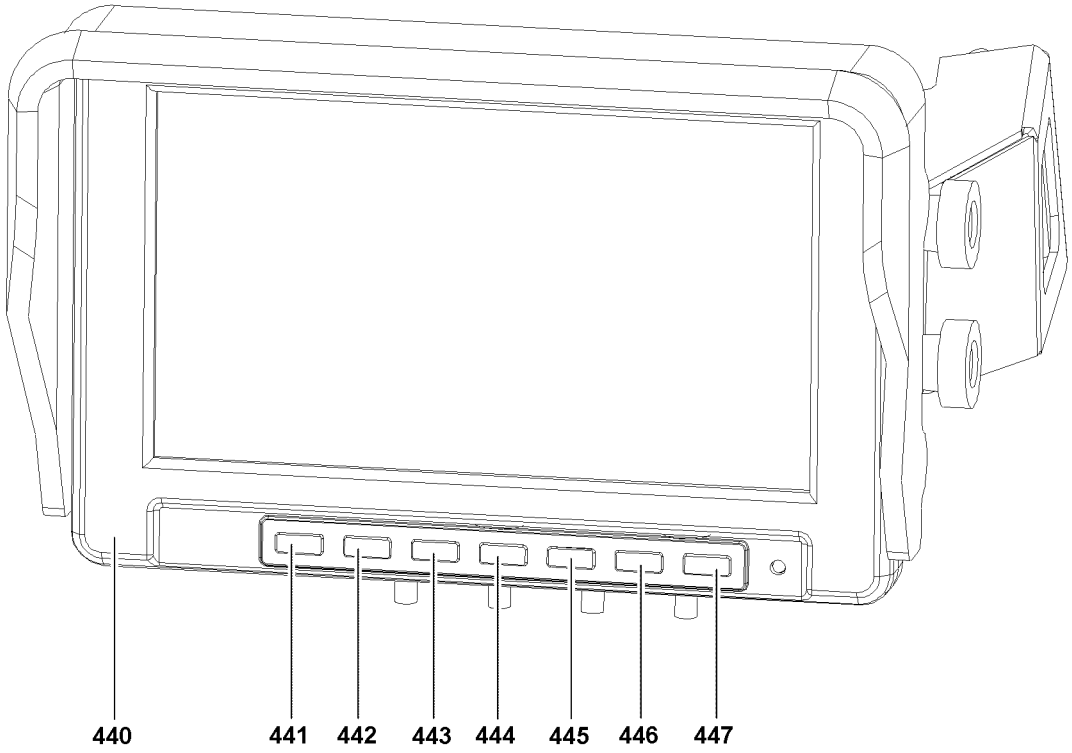
  Note:
  If no adjustments are made after activation of selection on the monitor, then the selection turns off by itself after several seconds.
- When the selection menu is activated, a menu point can be selected by turning the selection knob / pressure switch. The selected menu point is highlighted in “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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1.7.2 Monitor with keypad

440 TFT monitor

447 Key	• Monitor on / off.
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 Button “Minus”	• By pressing the “Minus” button, the value of a setting is reduced.
445 Button “Plus”	• 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.

B199898

1 General

Note

▶ The monitor illustrations in this chapter are only examples. The numerical values in the individual icons and charts do not have to necessarily match the crane exactly. In addition, many of the illustrations show the maximum configuration of the LICCON monitor with icons. In normal crane operation, an identical display will **not** appear on the LICCON monitor.

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

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

1.1 Overload protection (LMB)

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

1.1.1 Actual load

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

1.1.2 Maximum load according to load chart and reeving

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

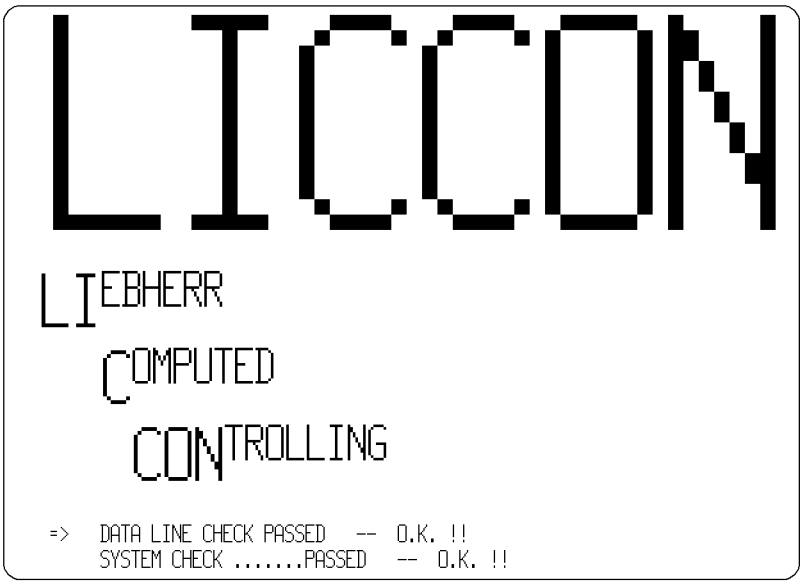
1.1.3 Comparison

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

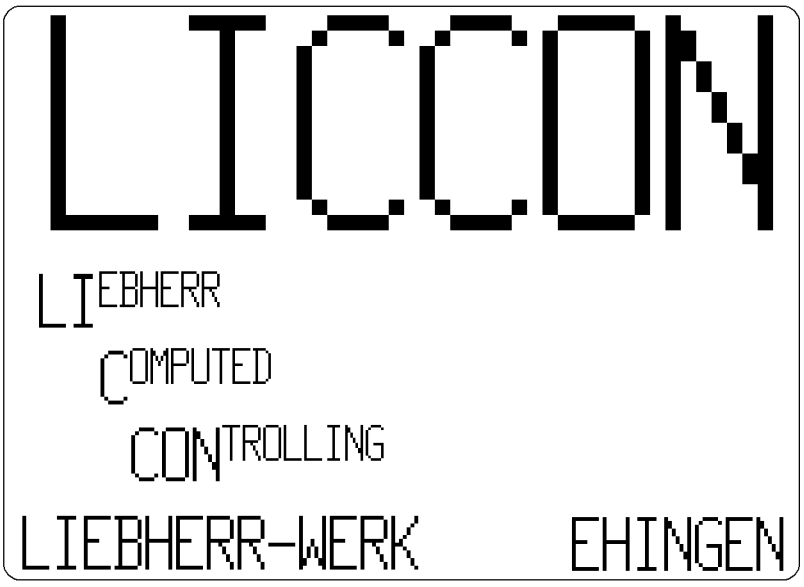
1


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

2


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

3


LICCON
LIEBHERR
COMPUTED
CONTROLLING
LIEBHERR-WERK EHINGEN

B199899

2 LICCON computer system boot up

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

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

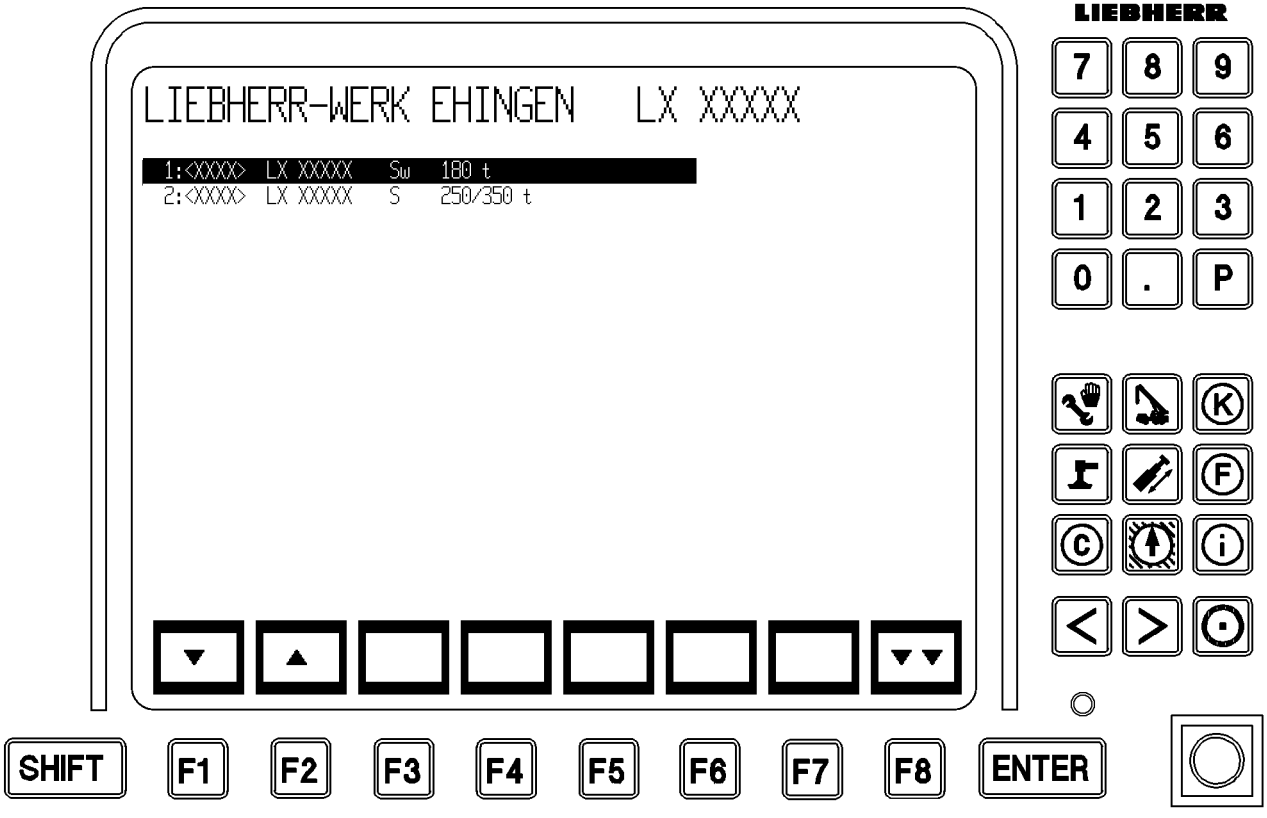
If the test finds no connection problems, there is a system test of all the microprocessor CPUs (ZE). The incremental sequence of the self test can be monitored on the 7 segment displays of the CPUs. If no errors are found during the system test, the monitor shows this image:

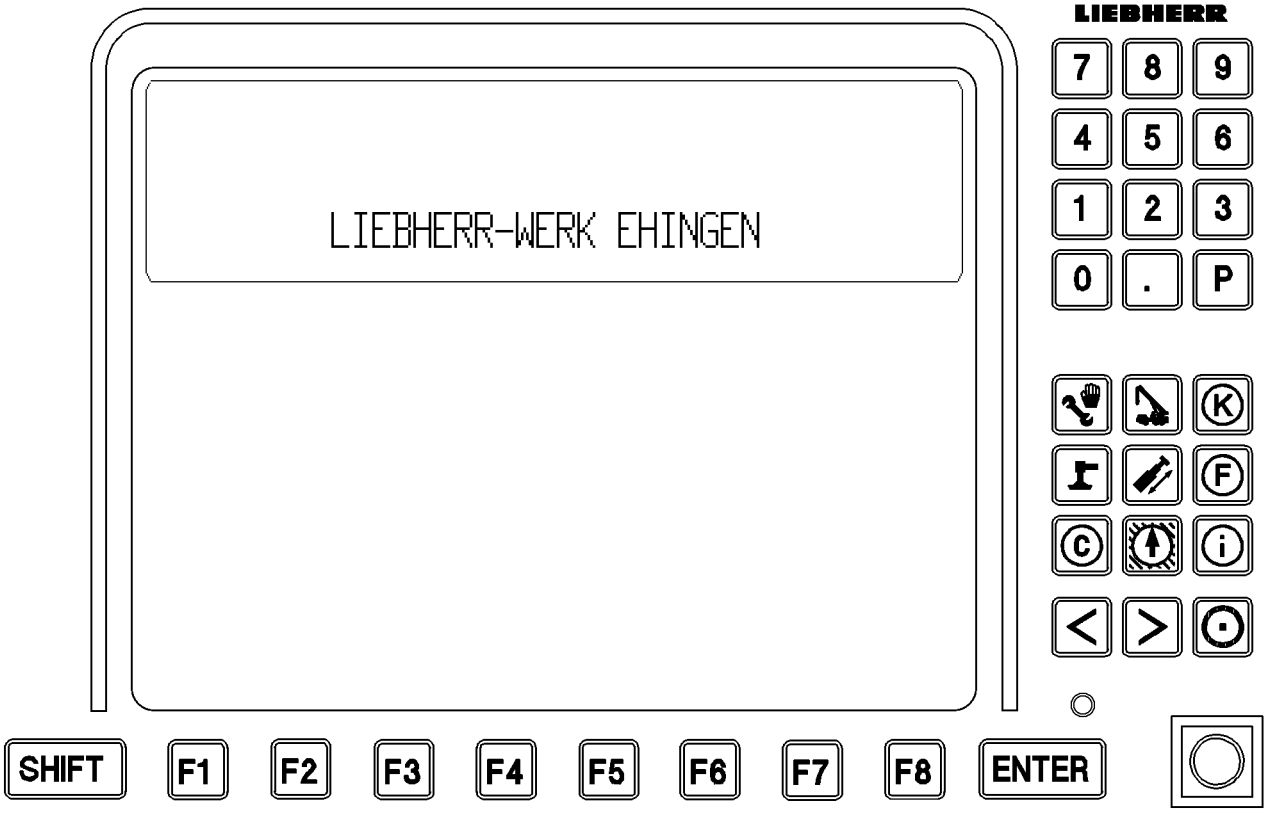
```
=>  DATA LINE CHECK PASSED   --  O.K. !!
    SYSTEM CHECK .......PASSED   --  O.K. !!
```

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

LIEBHERR-WERK EHINGEN

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


LIEBHERR
LIEBHERR-WERK EHINGEN LX XXXX
1:<XXXX> LX XXXXX Sw 180 t
2:<XXXX> LX XXXXX S 250/350 t
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR
LIEBHERR-WERK EHINGEN
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

B104509

2.1 Operating mode preselection on the LICCON computer system

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

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

2.1.1 Monitor 0

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

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

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

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

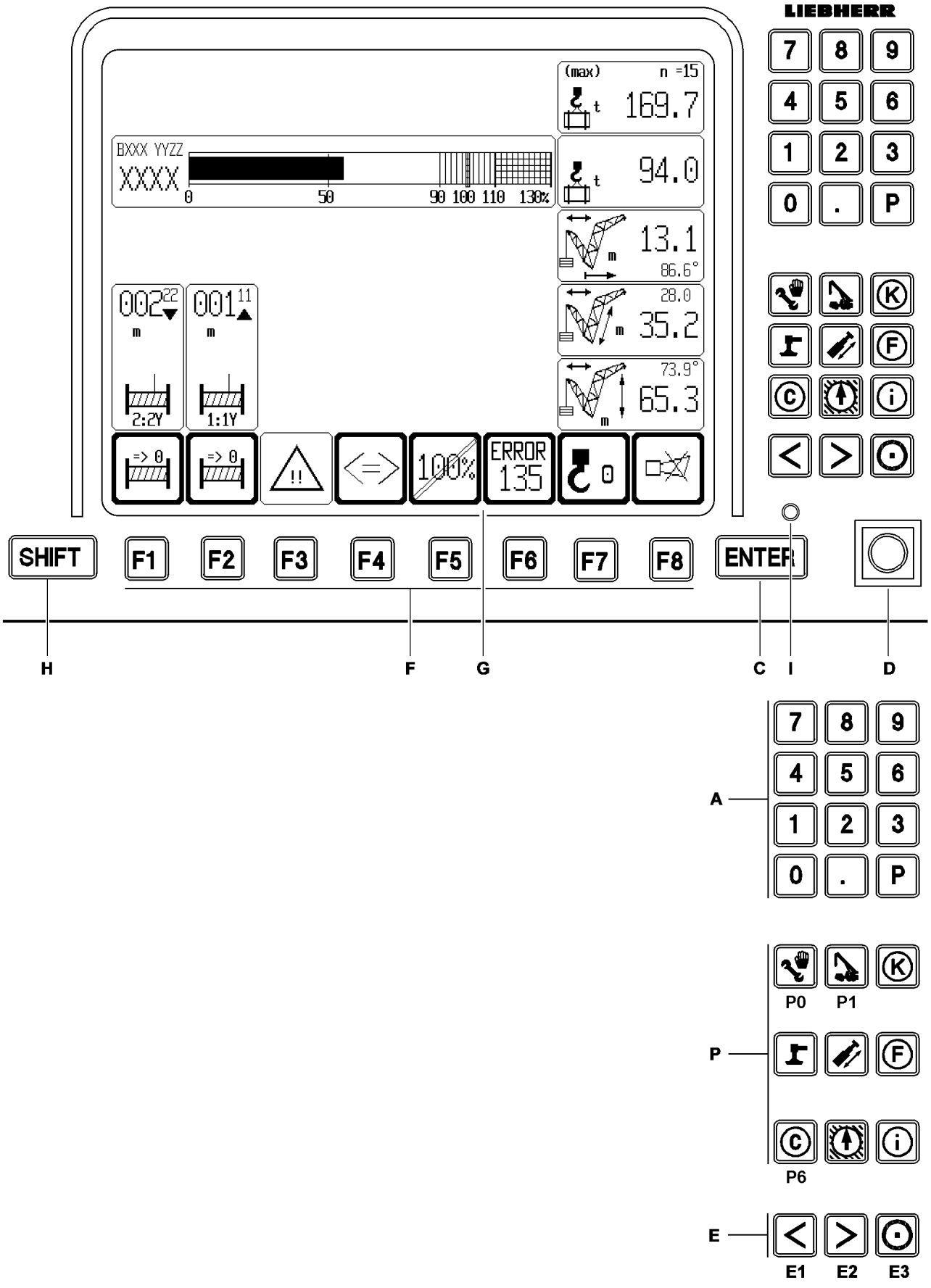
Press function key **“F1”** (cursor down) or **“F2”** (cursor up) and select the operating mode group required for the crane application.

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

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

2.1.2 Monitor 1

The **monitor 1** Title screen > **“LIEBHERR-WERK EHINGEN”**

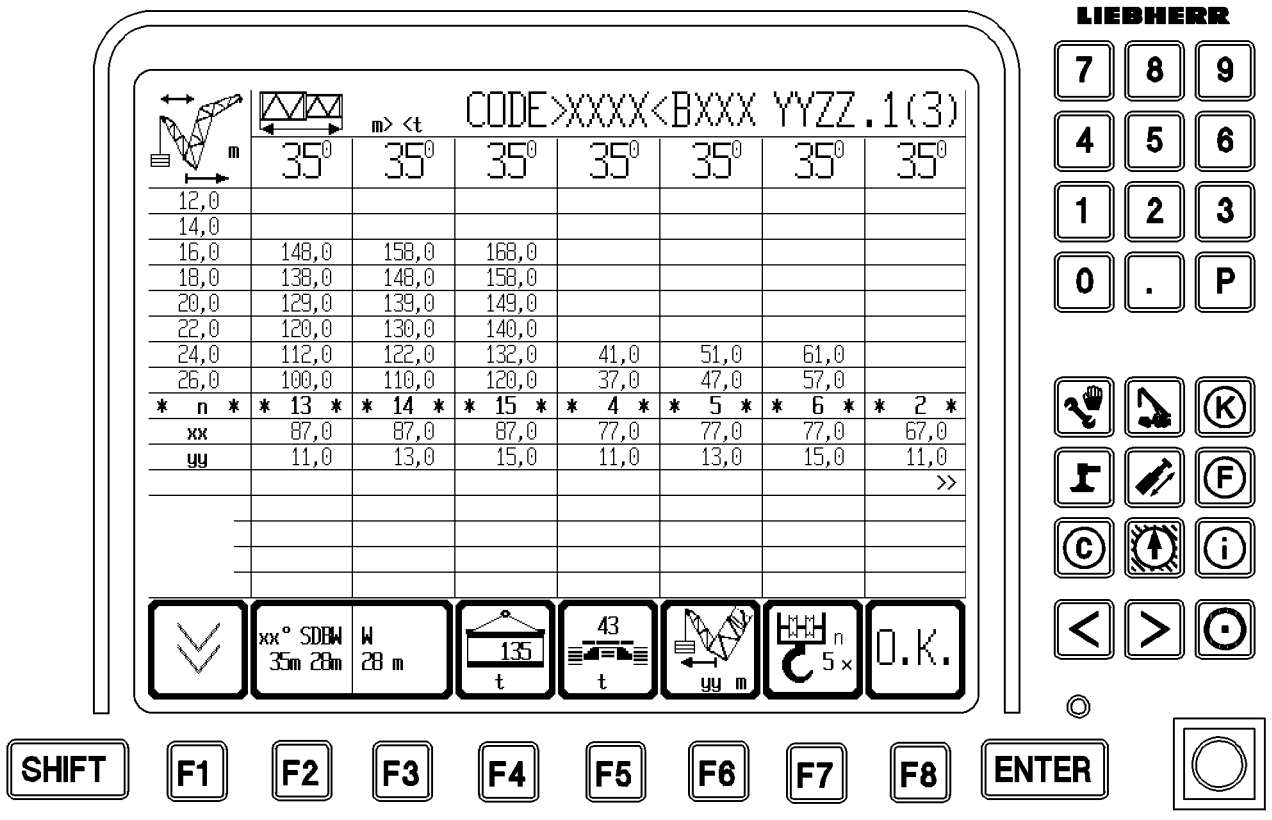

LIEBHERR
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
BXXX YYZZ
XXXX
0 50 90 100 110 130%
002 22
001 11
2:2Y
1:1Y
100%
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
F
G
C
I
D
A
P
P0
P1
P6
E
E1
E2
E3

B104510

3 Operating elements of the LICCON computer system on monitor 0

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

A	Keypad	
P	Program keys	• Selection of the individual LICCON programs
P0	Configuration	• **SHIFT** and **P0:** Engine monitoring
P1	Crane operation	
P2	Crane acceptance	• Correction coefficients (for LIEBHERR personnel only)
P3	Not assigned	
P4	Not assigned	
P5	Not assigned	
P6	Control parameter	
P7	Not assigned	
P8	Test system	
C	Input key “ENTER”	• Confirmation of changes
D	Bypass key button	• Position to right (touching) = The hoist limit switch and the LMB shut off are bypassed • Center position (self retaining) = Normal operation
E	Special function keys	• Monitor brightness adjustment • **E3** and **E1**: Turn background illumination on / off • **E3** and **E2**: Brightness adjustment in three stages • Additional functions of the special function keys are program-dependent and are further explained in the descriptions of the individual LICCON programs
F	Function keys	• The function keys should always be viewed in conjunction with the function key icon line displayed on the monitor
G	Monitor	• Display of the individual programs (example: “Crane operation” program)
H	SHIFT key	• Second-level key assignments, for example “Supervisory function”
I	LED display = Power supply for monitor available	


LIEBHERR
CODE>XXXX<BXXX YYZZ.1(3)
m> <t
m
35° 35° 35° 35° 35° 35° 35°
12,0
14,0
16,0 148,0 158,0 168,0
18,0 138,0 148,0 158,0
20,0 129,0 139,0 149,0
22,0 120,0 130,0 140,0
24,0 112,0 122,0 132,0 41,0 51,0 61,0
26,0 100,0 110,0 120,0 37,0 47,0 57,0
* n * * 13 * * 14 * * 15 * * 4 * * 5 * * 6 * * 2 *
xx 87,0 87,0 87,0 77,0 77,0 77,0 67,0
yy 11,0 13,0 15,0 11,0 13,0 15,0 11,0
>>
xx° SDBW
35m 28m
W
28 m
135
t
43
t
yy m
n
5x
O.K.
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B104511

4 “Configuration” program

Note

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

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

Note

Adjustment and display of equipment configuration and reeving.

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

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

4.1 Setting the operating mode and equipment configuration

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

Using the function keys:

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

▶ Select the respective function keys.

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

Result:

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

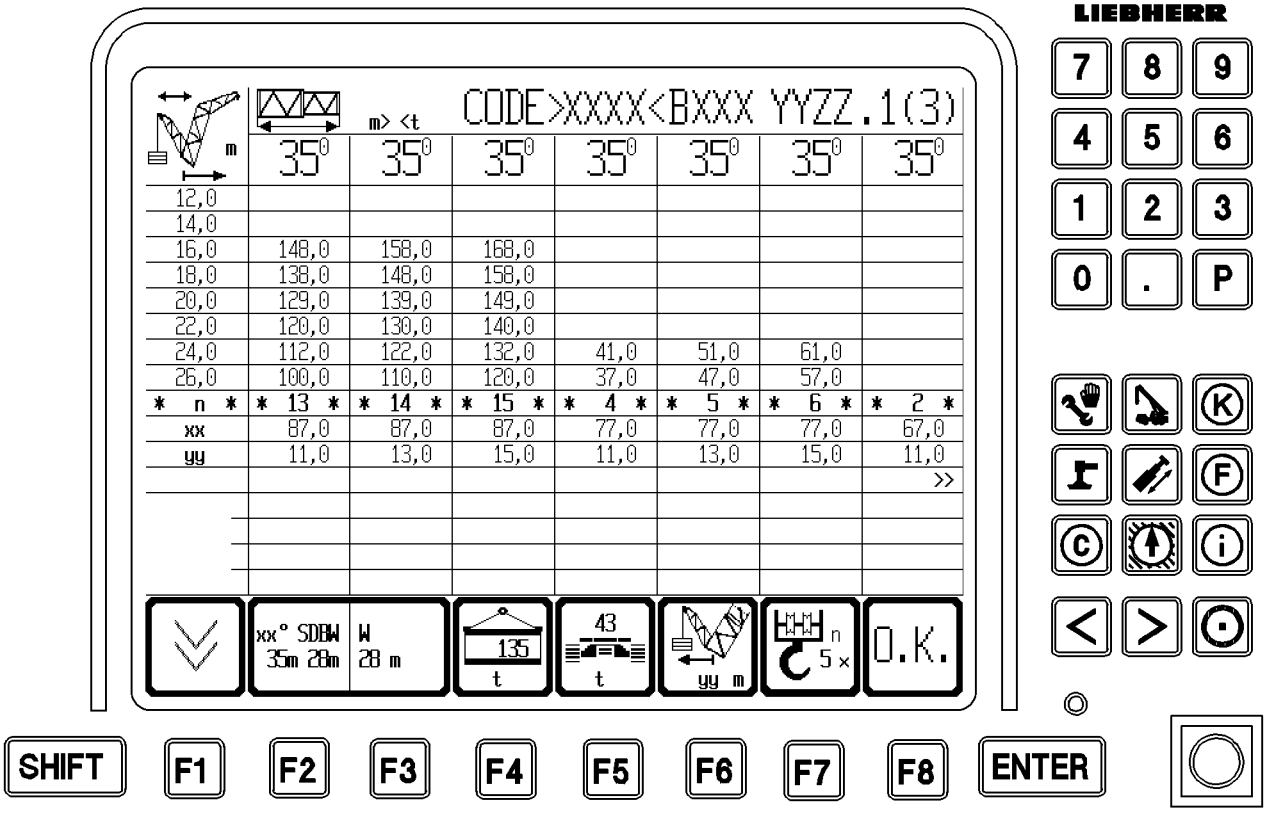
Using a 4-digit short code:

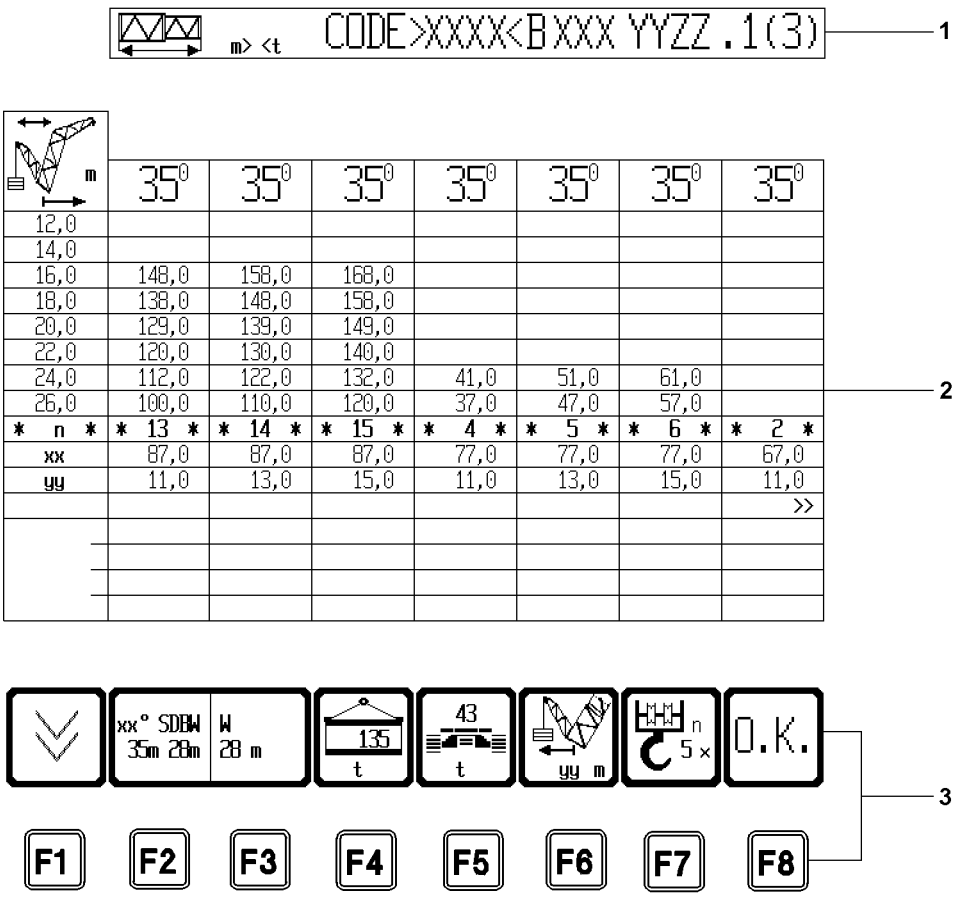
▶ Enter a 4-digit short code using the keypad on the LICCON monitor.

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

Result:

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


LIEBHERR
m> <t CODE>XXXX<BXXX YYZZ.1(3)
m
35° 35° 35° 35° 35° 35° 35°
12,0
14,0
16,0 148,0 158,0 168,0
18,0 138,0 148,0 158,0
20,0 129,0 139,0 149,0
22,0 120,0 130,0 140,0
24,0 112,0 122,0 132,0 41,0 51,0 61,0
26,0 100,0 110,0 120,0 37,0 47,0 57,0
* n * * 13 * * 14 * * 15 * * 4 * * 5 * * 6 * * 2 *
xx 87,0 87,0 87,0 77,0 77,0 77,0 67,0
yy 11,0 13,0 15,0 11,0 13,0 15,0 11,0
>>
xx° SDBW
35m 28m
W
28 m
135
t
43
t
yy m
n
5x
O.K.
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


m> <t CODE>XXXX<BXXX YYZZ.1(3)
1
m
35° 35° 35° 35° 35° 35° 35°
12,0
14,0
16,0 148,0 158,0 168,0
18,0 138,0 148,0 158,0
20,0 129,0 139,0 149,0
22,0 120,0 130,0 140,0
24,0 112,0 122,0 132,0 41,0 51,0 61,0
26,0 100,0 110,0 120,0 37,0 47,0 57,0
2
* n * * 13 * * 14 * * 15 * * 4 * * 5 * * 6 * * 2 *
xx 87,0 87,0 87,0 77,0 77,0 77,0 67,0
yy 11,0 13,0 15,0 11,0 13,0 15,0 11,0
>>
xx° SDBW
35m 28m
W
28 m
135
t
43
t
yy m
n
5x
O.K.
3
F1 F2 F3 F4 F5 F6 F7 F8

B104512

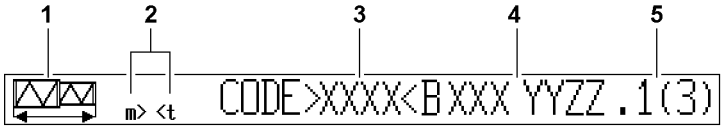
4.2 “Configuration” program areas

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

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

Note

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



B104513

4.2.1 General information line

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

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

5 Page number	• Relates to the currently displayed part of the load chart • Separated from the organization number with “.” • The total number of pages in this load chart is in parentheses

2

	35°	35°	35°	35°	35°	35°	35°	1
m								
12,0								
14,0								
16,0	148,0	158,0	168,0					
18,0	138,0	148,0	158,0					
20,0	129,0	139,0	149,0					
22,0	120,0	130,0	140,0					3
24,0	112,0	122,0	132,0	41,0	51,0	61,0		
26,0	100,0	110,0	120,0	37,0	47,0	57,0		
* n *	* 13 *	* 14 *	* 15 *	* 4 *	* 5 *	* 6 *	* 2 *	4
xx	87,0	87,0	87,0	77,0	77,0	77,0	67,0	6
yy	11,0	13,0	15,0	11,0	13,0	15,0	11,0	7

B104514

4.2.2 Display area of load chart values

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

2 “Boom radius” icon
- Operating mode-dependent
- In [m] or [ft]
- Maximum 10 lines of boom radius values
- Vertical axis of load value field

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

4 Reeving number of hoist rope
- * n *
  n = Reeving number of the hoist rope between the boom head and hook block, in order to be able to lift the maximum load in the corresponding load chart column in single winch operation.
- **Note:**
  - If a load value in the column exceeds that of a load that can be lifted with the maximum possible reeving, then there is an exclamation mark beside the reeving number (“!”). This exclamation mark indicates that special equipment is needed to lift this load.
- **Note:**
  - For parallel operation of winches **I** and **II**, always reeve in an even reeving.
  - If the minimum value of the reeving is uneven, then in parallel operation of the winches the next higher reeving must possibly be selected.
  - Enter and confirm the reeving on the LICCON monitor 0, according to the reeving on the boom head.

2

	35°	35°	35°	35°	35°	35°	35°	1
m								
12,0								
14,0								
16,0	148,0	158,0	168,0					
18,0	138,0	148,0	158,0					
20,0	129,0	139,0	149,0					
22,0	120,0	130,0	140,0					3
24,0	112,0	122,0	132,0	41,0	51,0	61,0		
26,0	100,0	110,0	120,0	37,0	47,0	57,0		
* n *	* 13 *	* 14 *	* 15 *	* 4 *	* 5 *	* 6 *	* 2 *	4
xx	87,0	87,0	87,0	77,0	77,0	77,0	67,0	6
yy	11,0	13,0	15,0	11,0	13,0	15,0	11,0	7

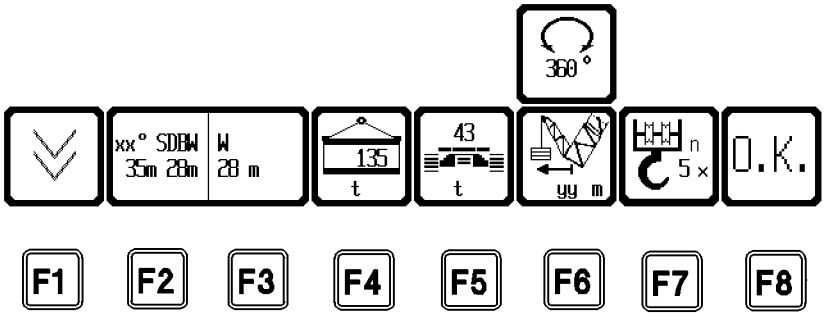
B104514

6 Main boom angle

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

7 Derrick ballast radius

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


360°
xx° SDBW
35m 28m
W
28 m
135
t
43
t
yy m
n
5 x
O.K.
F1
F2
F3
F4
F5
F6
F7
F8

B104515

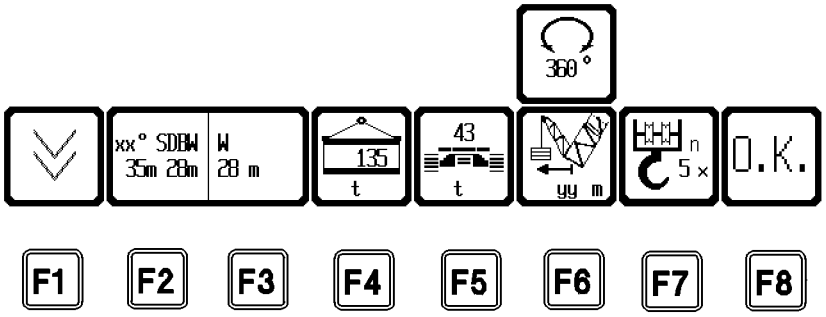
4.2.3 The function key line

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

– operating mode and
– equipment configuration

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

F1 Vertical paging	• Depending on the size of the monitor, up to 10 load chart lines can be displayed at once. If a chart consists of more than 10 lines, the display is spread over several pages. When pressing a key, the next page of the load chart will be displayed, and the number of the current page in the “General information line” will be counted up by 1. When the last page is reached, page 1 will appear again after pressing the function key **F1**.
F2 Main geometry status	• Adjustment possibility of different main boom operating modes and main boom lengths of the crane (if available). The types are described by abbreviations and length data in the icon. • Example: **xx° SDB W** 35 m
SHIFT and **F2**	• Previous main geometry status (if present)


360°
xx° SDBW
35m 28m
W
28 m
135
t
43
t
yy m
n
5 x
O.K.
F1
F2
F3
F4
F5
F6
F7
F8

B104515

F3 Accessories

- Options for selecting the different accessory types of the crane (if available). The types are described using abbreviations, angle and length data in the icon.
- Example:
  W 28 m
- **Note:**
  Pressing the function key **F2** and / or the function key **F3** deletes all data related to the operating mode and configuration data from the monitor and sets the short code in the general information line to “CODE >????<”.
- **Operating mode dependent data:**
  - Boom length icon in the general information line
  - Length units and weight units
  - Load chart organization number
  - Boom radius icon
  - Boom length data
- **Configuration dependent data:**
  - Numbering of current page number and total number of pages in load chart
  - Radius values in length units
  - Load values in weight units

SHIFT and **F3**

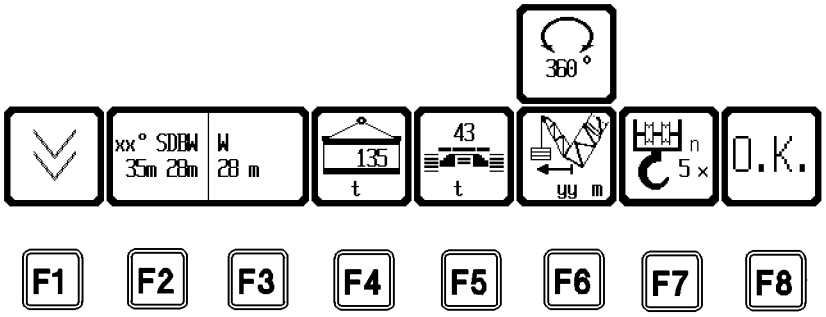
- Previous accessory geometry status (if present)

F4 Counterweight

- Adjustment possibility for current counterweight, which must be on the turntable in order to obtain the values in the current chart. When pressing a key, the following icon appears with additional text in the counterweight symbol.
- Example:
  “200.0 t ” = Total counterweight of 200.0 t

F5 Chassis

- In operating modes, where there are various chassis versions (for example: Ballast on chassis, variable support), this can be set with **“F5”** .


360°
xx° SDBW
35m 28m
W
28 m
135
t
43
t
yy m
n
5 x
O.K.
F1
F2
F3
F4
F5
F6
F7
F8

B104515

F6 Slewing range or derrick ballast radius

- In crane operating modes **without** derrick ballast, when pressing **F6**, the “slewing range icon 360°” appears
- For crane operating modes **with** derrick ballast, when pressing **F6**, the “derrick ballast radius icon **yy** ” appears in [m] or [ft]

F7 Hoist rope reeving

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

Note

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

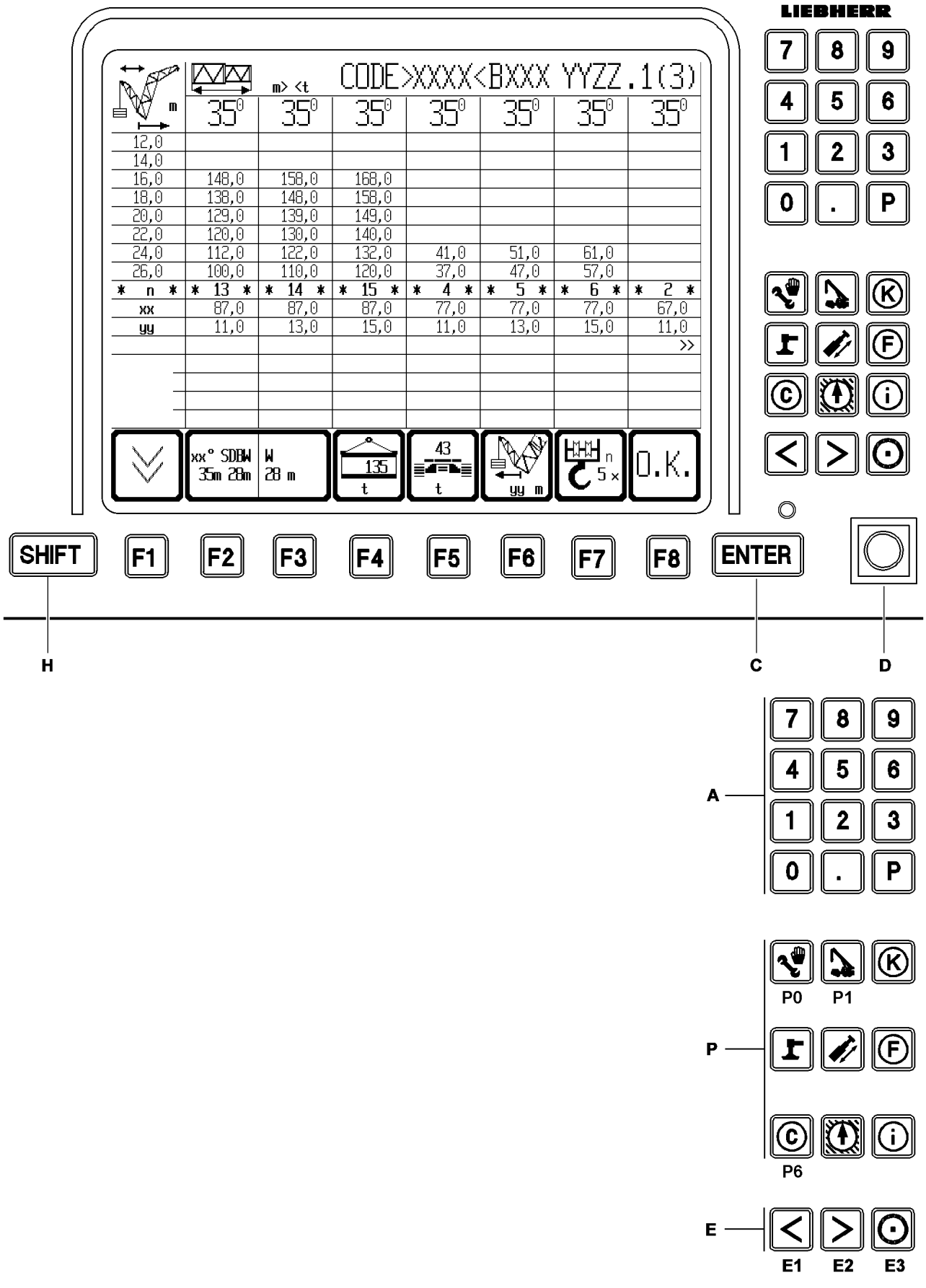
▶ The total reeving **must** always show an even number value in parallel operation!

SHIFT and **F7**

- Reeving number on boom is reduced by 1.

F8 Confirmation of selected equipment configuration

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


LIEBHERR
CODE>XXXX<BXXX YYZZ.1(3)
m> <t
m
35°
12,0
14,0
16,0 148,0 158,0 168,0
18,0 138,0 148,0 158,0
20,0 129,0 139,0 149,0
22,0 120,0 130,0 140,0
24,0 112,0 122,0 132,0 41,0 51,0 61,0
26,0 100,0 110,0 120,0 37,0 47,0 57,0
* n * * 13 * * 14 * * 15 * * 4 * * 5 * * 6 * * 2 *
xx 87,0 87,0 87,0 77,0 77,0 77,0 67,0
yy 11,0 13,0 15,0 11,0 13,0 15,0 11,0
>>
xx° SDBW
35m 28m
W
28 m
135
t
43
t
yy m
n
5 x
O.K.
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
C
D
A
P
P0 P1
P6
E
E1 E2 E3

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4.2.4 Other operating elements

A Keypad

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

P Program keys

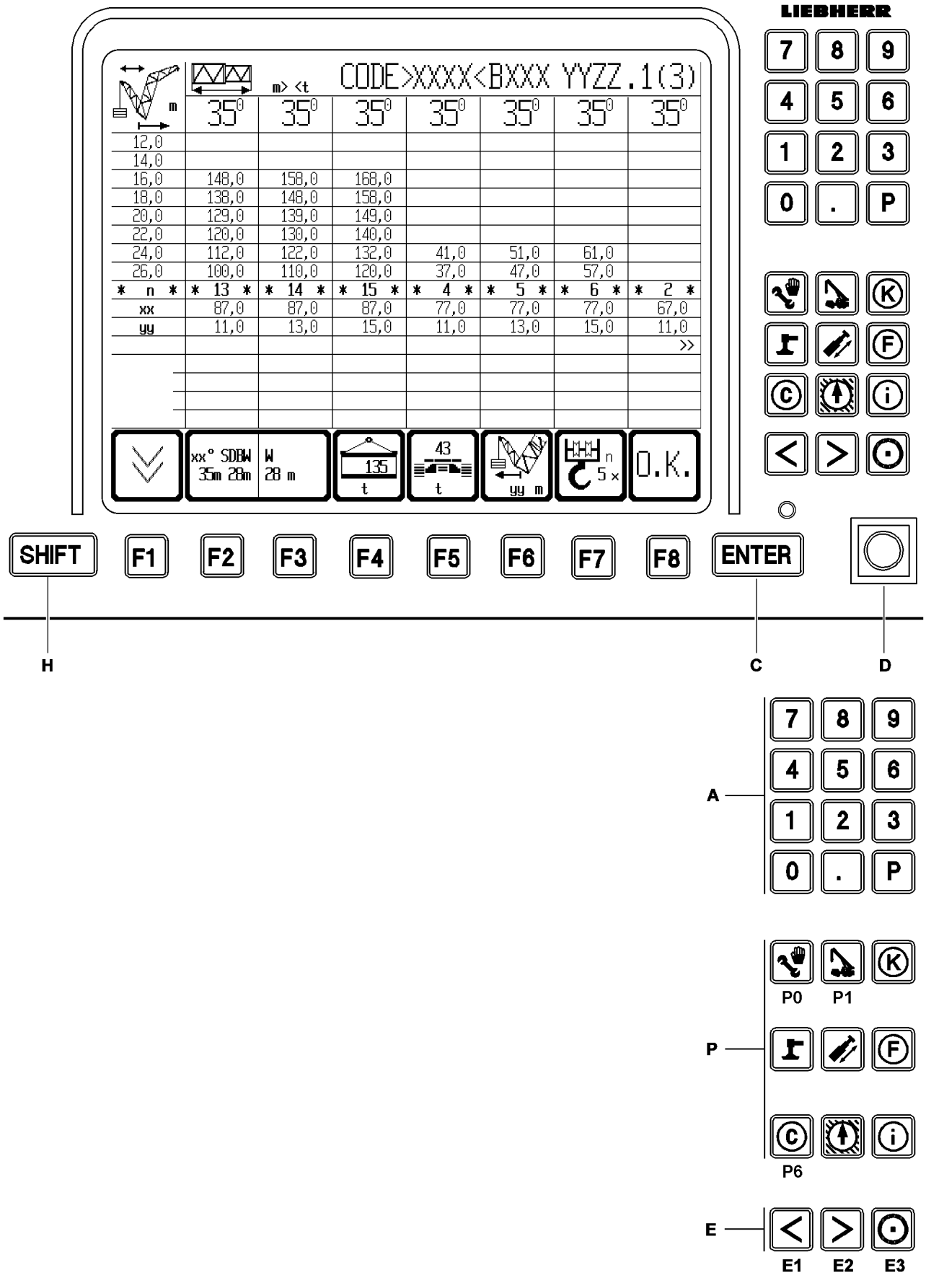
- Selecting from the individual programs. The settings in the Configuration program are discarded, and the equipment configuration and reeving most recently confirmed with the **O.K.** key will continue to be used.
  A program currently running **cannot** be called again using its program key.

C Input key “ENTER”

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

D Bypass key button

- Has no function in the “Configuration” program


LIEBHERR
CODE>XXXX<BXXX YYZZ.1(3)
m> <t
m
35°
12,0
14,0
16,0 148,0 158,0 168,0
18,0 138,0 148,0 158,0
20,0 129,0 139,0 149,0
22,0 120,0 130,0 140,0
24,0 112,0 122,0 132,0 41,0 51,0 61,0
26,0 100,0 110,0 120,0 37,0 47,0 57,0
* n * * 13 * * 14 * * 15 * * 4 * * 5 * * 6 * * 2 *
xx 87,0 87,0 87,0 77,0 77,0 77,0 67,0
yy 11,0 13,0 15,0 11,0 13,0 15,0 11,0
>>
xx° SDBW
35m 28m
W
28 m
135
t
43
t
yy m
n
5 x
O.K.
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
C
D
A
P
P0 P1
P6
E
E1 E2 E3

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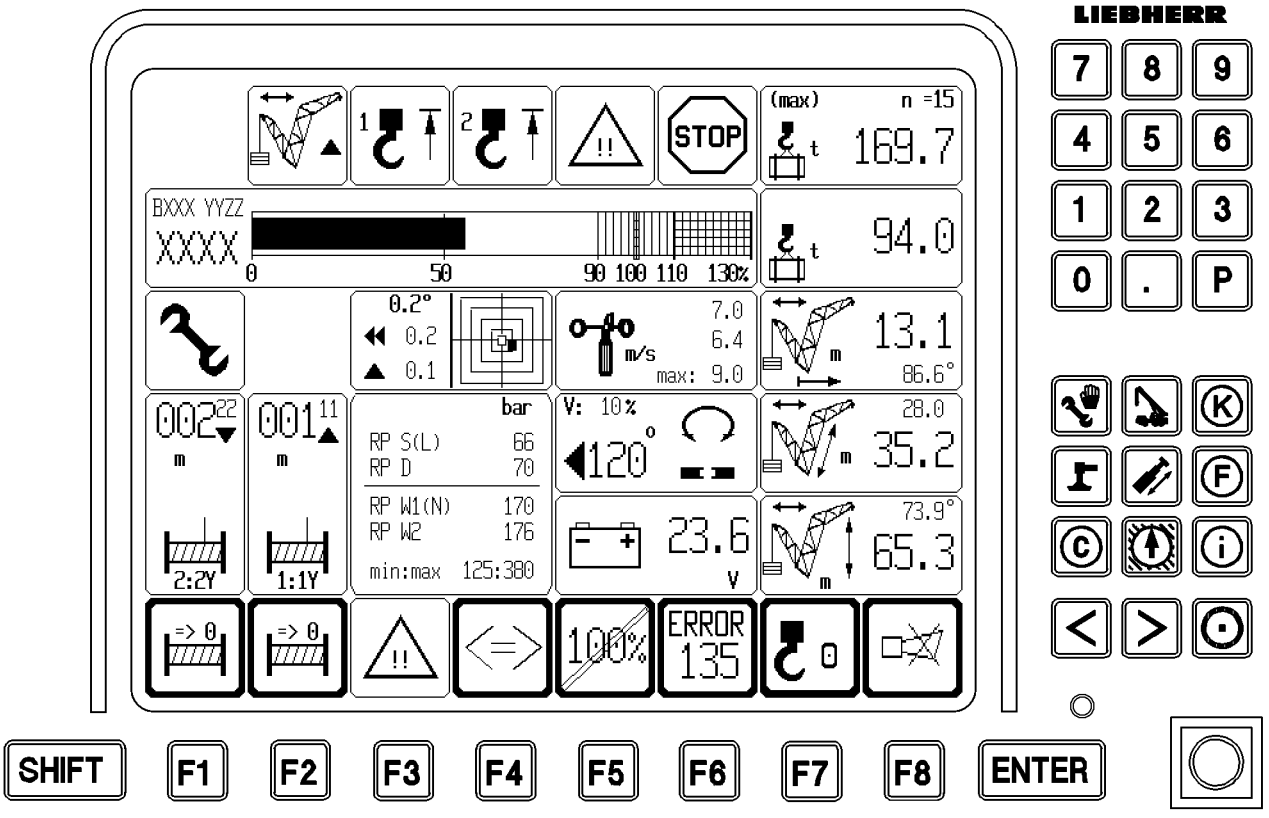
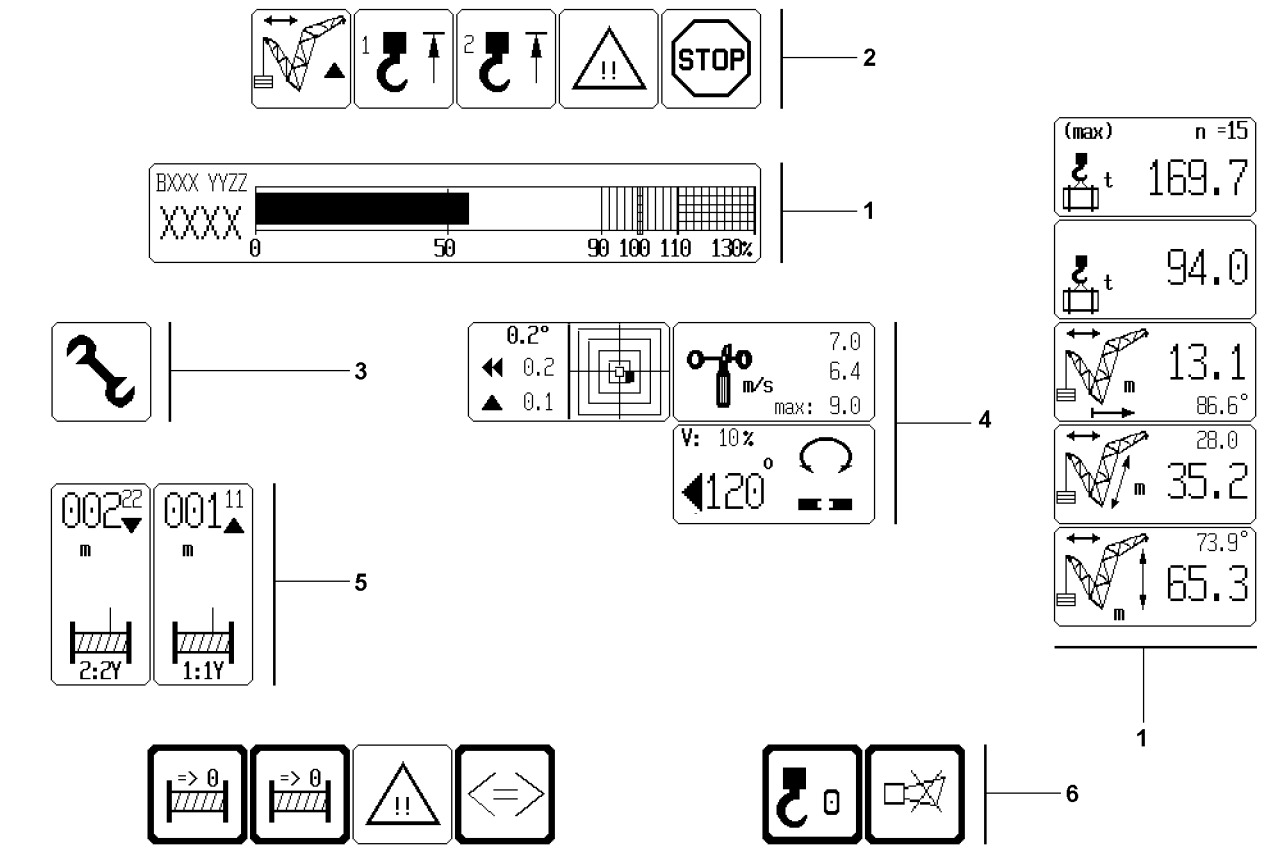
E Horizontal paging	• **Note:** The **E1** and **E2** keys only have a function if this is indicated in the “special displays line”. • If a load chart consists of more than seven columns, the first display of the configuration state only shows columns 1 to 7. • The double arrow at the right edge (>>) or at the left edge of the line (<<) points to additional columns in either direction. • Press **“E2”** to display the next right chart column. • Press **“E1”** to display the next left chart column. • **Note:** Using the key combination **SHIFT** and **E1** (<<) or **SHIFT** and **E2** (>>), you can, where possible, page to the left or right by 7 load chart columns (corresponds to 1 page).
H SHIFT key	• For example Supervisory function. • By pressing and holding down the **SHIFT** key and then pressing one of the function keys, which must correspond to the corresponding function, the previous main geometry status, the auxiliary geometry status and the previous reeving are reset.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
(max) n =15
169.7
94.0
BXXX YYZZ
XXXX
0 50 90 100 110 130%
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
86.6°
002 22
001 11
m
2:2Y
1:1Y
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
V: 10%
120°
28.0
35.2
23.6
V
73.9°
65.3
=> 0
100%
ERROR
135
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


STOP
2
BXXX YYZZ
XXXX
0 50 90 100 110 130%
1
3
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
V: 10%
120°
4
002 22
001 11
m
2:2Y
1:1Y
5
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
1
=> 0
6

B104586

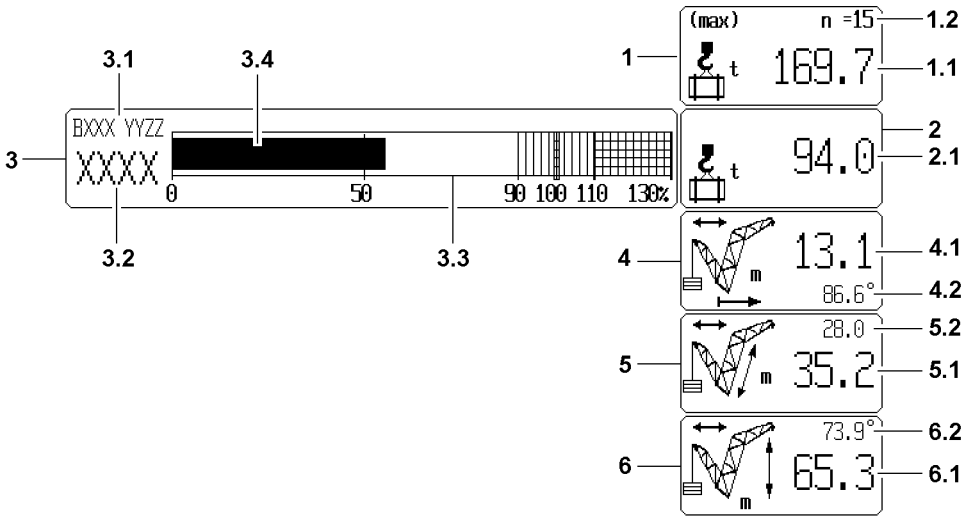
5 The “Crane operation” program on monitor 0

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

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

Note

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


(max)
n =15
1.2
1
t
169.7
1.1
3.1
3.4
2
BXXX YYZZ
3
XXXX
t
94.0
2.1
0
50
90 100 110 130%
3.2
3.3
4
m
13.1
4.1
86.6°
4.2
28.0
5.2
5
m
35.2
5.1
73.9°
6.2
6
m
65.3
6.1

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5.1 Crane geometry and load information

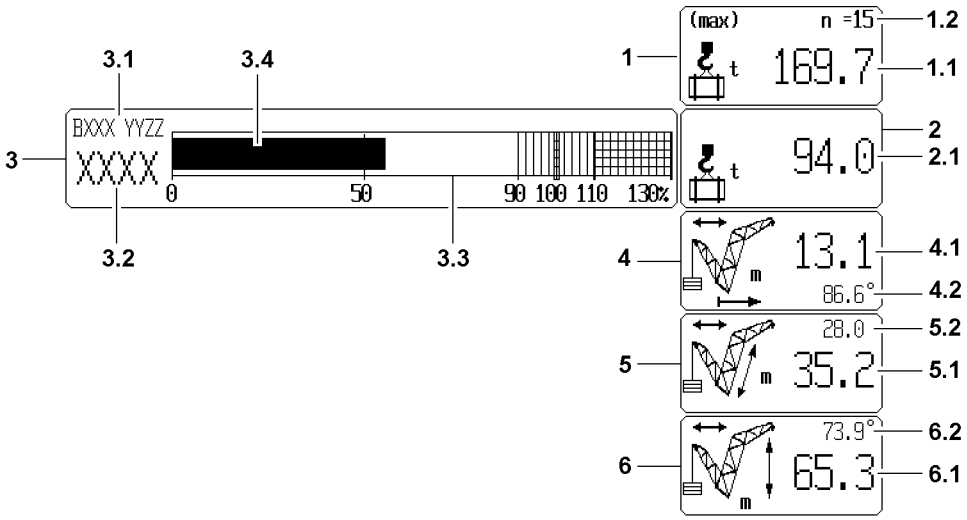
1 “Maximum load” icon
- In [t] or [lbs]

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

1.2 Reeving number of the hoist rope on the boom
- n = reeving number of hoist rope that is reeved at the pulley head on the boom, which has been selected via the load chart (previously selected in the “Configuration” program)

2 “Current load” icon
- In [t] or [lbs]

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


(max)
n =15
1.2
1
t
169.7
1.1
3.1
3.4
BXXX YYZZ
2
3
XXXX
t
94.0
2.1
0
50
90 100 110 130%
3.2
3.3
4
13.1
4.1
m
86.6°
4.2
28.0
5.2
5
m
35.2
5.1
73.9°
6.2
6
m
65.3
6.1

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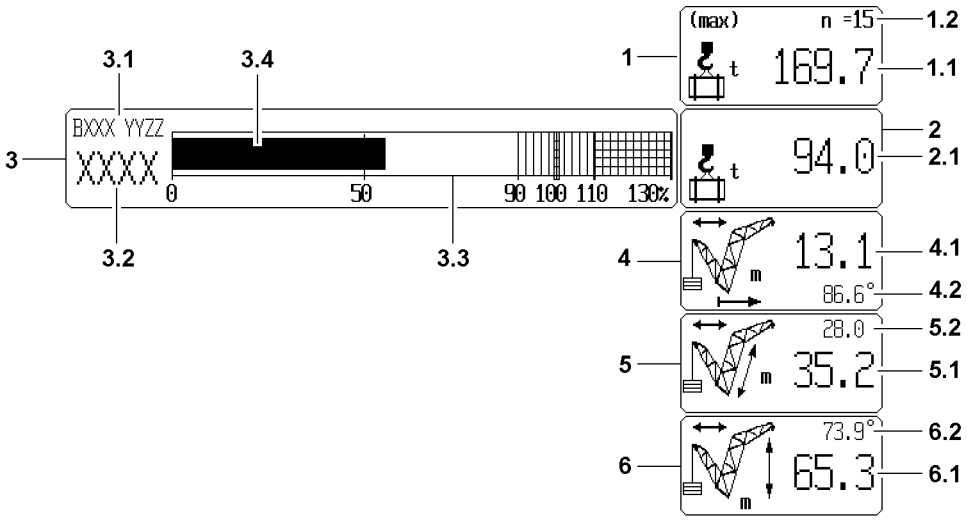
3	"Dynamic utilization bar display" icon	• In [%]
3.1	8-digit organization number	• Identifies the type of load chart that has been selected and the operating mode
3.2	Short code	• Identifies the selected equipment configuration
3.3	Utilization scale	• Marking from load of 90%: **Advanced warning** •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

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

4	"Boom radius" icon	
4.1	Radius	• In [m] or [ft] Identifies the horizontal center of gravity distance of the load (on the load hook selected by the operating mode) from the center of rotation of the superstructure, measured on the ground. This also takes into account the boom flexation due to its own weight and the suspended weight of the load. • **Note:** "? ? ? . ?" is displayed, if geometrical data or sensor values are missing, so that the radius cannot be calculated.
4.2	Main boom angle to the horizontal	• In [°] • Displayed is the medium value of the angle sensor in the main boom pivot section and the angle sensor in the main boom pulley head. If one of these angle sensor values is invalid, then the value of the other angle sensor is shown. • **Note:** "? ? ? . ?" is shown if both angle sensor values are invalid or if the difference between the two angle sensors is unbelievably high.


(max)
n =15
1.2
1
t
169.7
1.1
3.1
3.4
2
BXXX YYZZ
3
XXXX
t
94.0
2.1
0
50
90 100 110 130%
3.2
3.3
4
m
13.1
4.1
86.6°
4.2
28.0
5.2
5
m
35.2
5.1
73.9°
6.2
6
m
65.3
6.1

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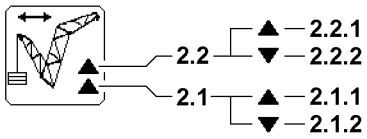
5	“Main boom length” icon	
5.1	Length of main boom	• In [m] or [ft]
5.2	Length of accessories	• In [m] or [ft]
6	“Pulley head height” icon	
6.1	Pulley head height	• In [m] or [ft] • Identifies the vertical distance from the crane base to the selected pulley head axle, to which the displayed maximum load applies. • **Note:** “? ? ? . ?” is displayed, when the geometric data or the sensor values are missing, so that the pulley head height cannot be calculated.
6.2	Angle of lattice jib to the horizontal*	• In [°] • **Note:** Display of the absolute angle always in operating modes with load chart for a fixed defined main boom angle (such as W). • Displayed is the medium value of the angle sensor in the lattice jib pivot section and the angle sensor in the lattice jib end section. If one of these angle sensor values is invalid, then the value of the other angle sensor is shown. • **Note:** “? ? ? . ?” is shown if both angle sensor values are invalid or if the difference between the two angle sensors is unbelievably high.



B104588

5.2 Alarm functions

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

2 “Boom limitation” icon

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

2.1 Limit signs main boom

2.1.1 Arrow pointing up

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

- Trigger the upper load chart limit (smallest radius is reached)

or

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

RISK OF ACCIDENT!

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

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

Note:

Luffing down the main boom is still possible.

2.1.2 Arrow pointing down

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

- Trigger the lower load chart limit (largest radius is reached)

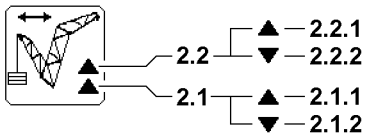
RISK OF ACCIDENT!

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

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

Note:

Luffing up the main boom is still possible.



B104588

2.2 Limit sign equipment

2.2.1 Arrow pointing up

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

- Trigger the upper load chart limit (smallest radius is reached)

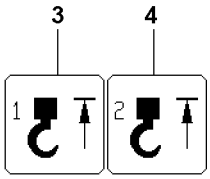
RISK OF ACCIDENT!
The shut off of the crane movement “Luffing up the equipment” is bypassed with actuated bypass key button. The crane operator is obligated to carry out all crane movements with foresight and extreme caution!
Note:
Luffing down the equipment is still possible.

2.2.2 Arrow pointing down

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

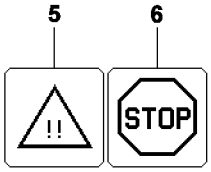
- Trigger the lower load chart limit (largest radius is reached)

RISK OF ACCIDENT!
The shut off of the crane movement “Luffing down the equipment” is bypassed with actuated bypass key button. The crane operator is obligated to carry out all crane movements with foresight and extreme caution!
Note:
Luffing up the equipment is still possible.



B104589

3 “Hoist top on main boom” icon	• Appears if the hook block runs against the hoist limit switch on the main boom or on the auxiliary jib of the main boom • **Note:** The crane movements “Spool up hoist winches” and “Luff down main boom” are shut off, see section “Other operating elements”.
4 “Hoist top on lattice jib” icon	• Appears if the hook block runs against the hoist limit switch on the lattice jib on the auxiliary jib of the lattice jib • **Note:** The crane movements “Spool up hoist winches” and “Luff down lattice jib” are shut off, see section “Other operating elements”.



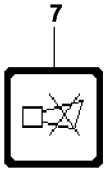
B104590

5 Load charts advanced warning

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

6 Load carrying capacity exceeded

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



B104591

7 “Horn” icon

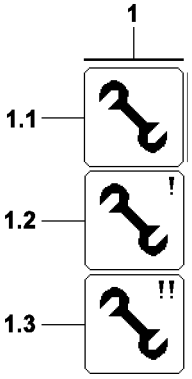
- Acoustical signal
- Sounds in addition to the optical display for operating errors on monitor 0, which lead to the shut off of a movement (for example: LMB-STOP) and application errors with error number (for example sensor errors, which occur due to insufficient sensor signals or a defective sensor).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

“Short horn”

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

Priority and “Horn off”

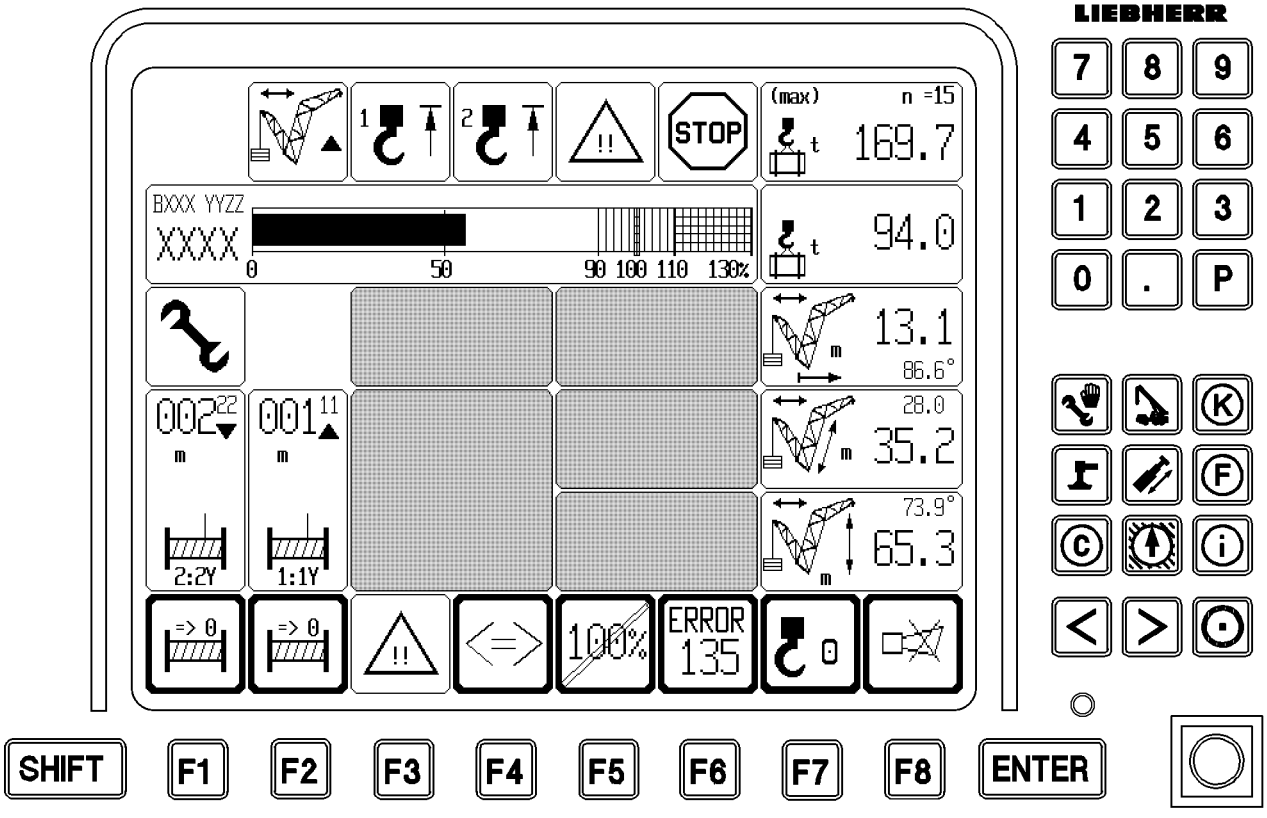
- The “Horn” alarm has higher priority than the “Short horn” alarm, i.e. “Horn” takes preference over “Short horn”
- The “Horn”, as well as the “Short horn” of the monitor may be turned off by function key **F8**
- **Note:**
  The “Horn”, as well as the “Short horn” immediately become active again if an error recurs.

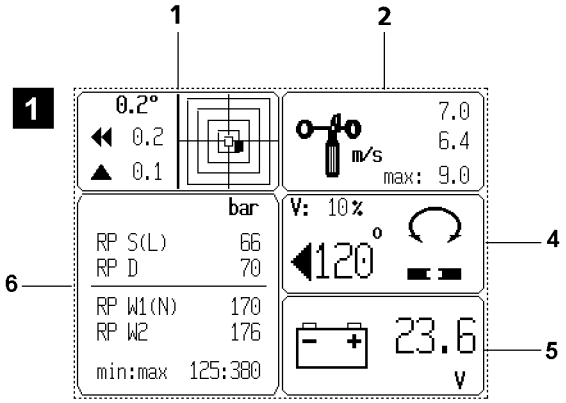


B104592

5.3 Special functions

1	“Assembly operation” icon	
1.1	Assembly	• The icon flashes if, the crane control has been switched using the bypass key button to the “Assembly” position. The “Crane operation” program is then is locked, meaning that no other program can be turned on via the program keys.
1.2	Emergency operation without assembly	• The icon flashes during emergency operation, if “Assembly” has **not** been enabled using the bypass key **Note:** The program “Crane operation” is **not** locked in this case.
1.3	Emergency operation and assembly	• The icon blinks during emergency operation, if “Assembly” has been enabled using the bypass key button


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
i
(max) n =15
169.7
STOP
BXXX YYZZ
XXXX
0 50 90 100 110 130%
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
002 22
001 11
m
2:2Y
1:1Y
=> 0
100%
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


1
2
1
0.2°
0.2
0.1
7.0
6.4
max: 9.0
m/s
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
V: 10%
120°
4
6
23.6
V
5

B104593

5.4 Monitored auxiliary functions for crane operation

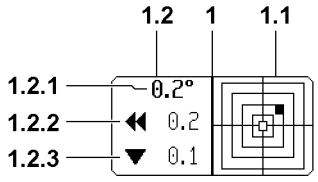
There are several monitored auxiliary functions, which can be displayed when needed or automatically.
The monitoring of all auxiliary functions is always active, only the icons may be hidden. The icons of the monitored auxiliary functions have their fixed place on the LICCON monitor.
Using the function key **F3**, you can show the icons for the monitored auxiliary functions. Since not all icons of the auxiliary functions fit on one page (at maximum assignment), they are split over two pages. The icons on page 2 (if available) can be shown with the function key **F4**.
Page 1 (figure **1**):
Crane incline **1**
Wind speed **2**
Slewing range **4**
Battery voltage **5**

Page 2 (figure **2**):
Relapse cylinder monitoring **6**

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

- Monitored auxiliary functions turned off **F3**:
- Only error in one function on page 1:
  Icon is displayed on page 1.
- Only error in one function on page 2:
  Icon is displayed on page 2.
- Error in a function on page 1 and 2:
  Icon is displayed on page 1 and icon for **F4** blinks (= indicates an error in a function on page 2).

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

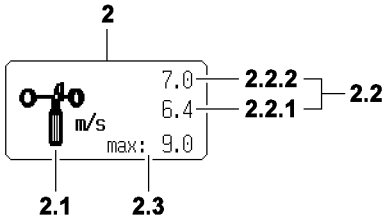


B104594

1	“Incline” icon	• Display of the incline of the superstructure to the horizontal in longitudinal and lateral direction. The display is graphic as well as numeric.
1.1	Graphic part	• The graphic display is in the form of a spirit level, with a moving dot (small square) representing the air bubble. The center of the dot shows the precise incline value.
1.2	Numeric part	
1.2.1	Incline range	• Value either 0.2° or 1° This value describes the resolution of the graphic illustration and can only assume the two values “0.2°” or “1°”. If the incline in lateral direction is **less than** 1.1° **and** in lengthwise direction **less than** 0.9°, the spirit level moves in the 0.2° range. If at least one value exceeds the above limit, it switches into the 1° range. **Note:** The range change is automatic.

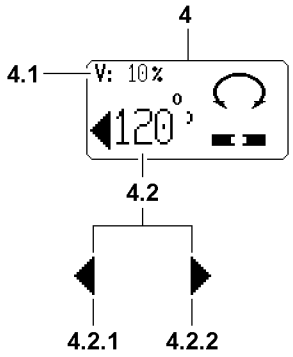
1.2.2	Incline of crane superstructure in crosswise (lateral) direction	• In [°]
		• The double arrow shows the direction of incline:
		  • Double arrow to left = crane superstructure slopes to the **left**
		  • Double arrow to right = crane superstructure slopes to the **right**

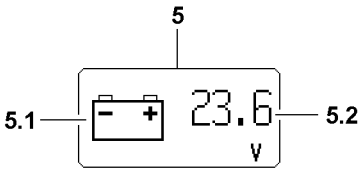
1.2.3	Incline of crane superstructure in lengthwise (longitudinal) direction	• In [°]
		• The arrow shows the direction of incline:
		  • Up arrow = crane superstructure slopes to the **front**
		  • Down arrow = crane superstructure slopes to the **rear**



B104595

2	“Wind speed” icon	• The wind speeds are displayed in [m/sec.] or [ft/sec.] depending on the units of measurement shown in the load chart
2.1	“Wind speed” icon	• In [m/sec.] or [ft/sec.]
2.2	Current wind speeds	
2.2.1	Current wind speed on the pulley head of the lattice jib	
2.2.2	Current wind speed on the pulley head of the main boom	
2.3	Maximum permissible wind speed	• With icon text “max:” • The value depends on the operating mode and the equipment configuration **Note:** If the current wind speed value exceeds the displayed maximum value, the maximum value starts to blink and the acoustic alarm “Short horn” sounds. **The crane movements will not be shut off!**





B104596

4 “Slewing range” icon

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

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

4.2 Current superstructure position
- In relation to the direction “to the front” (chain tension side)
- The value increased to a value of 180°

4.2.1 Arrow for the crane superstructure position left of 0°
- The arrow in front of the value indicates the deviation direction (for example: left of 0°)

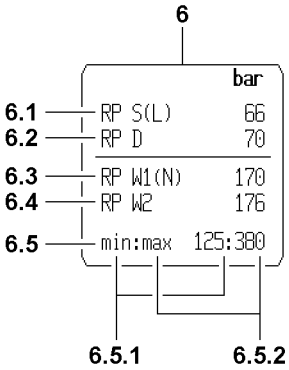
4.2.2 Arrow for the crane superstructure position right of 0°
- The arrow in front of the value indicates the deviation direction (for example: right of 0°)

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

5 Auxiliary function - Battery voltage

5.1 Battery voltage icon

5.2 Value for battery voltage
- Current value of battery voltage with the unit [V]
- The accuracy of the display is ±1/10 V


6
bar
6.1
RP S(L) 66
6.2
RP D 70
6.3
RP W1(N) 170
6.4
RP W2 176
6.5
min:max 125:380
6.5.1
6.5.2

B104598

6	"Relapse cylinder monitor" icon	
6.1	Pressure display	• In [bar] • In the S- or L-boom relapse cylinders
6.2	Pressure display	• In [bar] • In the derrick relapse cylinders
6.3	Pressure display	• In [bar] • Pressure in the W1-lattice jib relapse cylinder (=RPW1) at W-operation **or** Pressure in the N-lattice jib relapse cylinder (=RPN) at N-operation
6.4	Pressure display	• In [bar] • Pressure in the W-lattice jib relapse cylinder (=RPW2), if available
6.5	Pressure limits	• In [bar] • Monitored relapse cylinders (RP) - pressure limits in the jib relapse cylinders (W/N) Minimum / maximum pressure for RPW1 (RPN) and RPW2

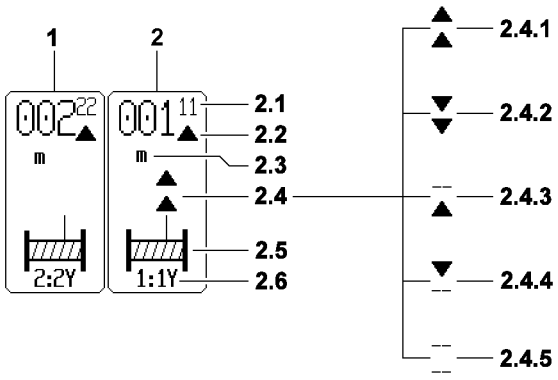
Note

- ▶ In the N-lattice jib, only one relapse cylinder (RP) is installed, = RPN.
- ▶ In the W-lattice jib, two relapse cylinders (RP) are installed, RPW1 on the right and RPW2 on the left side.

6.5.1	Pressure display - minimum pressure for RP (W/N)	• This monitored minimum pressure is calculated from the angle of the main boom and the jib. If one of the angles is invalid and is shown in the display with "???", then no monitoring of the minimum pressure can occur.
6.5.2	Pressure display - maximum pressure for RP (W/N)	• If a pressure limit value is being exceeded, then this is shown by a blinking pressure actual value and an additional error message.

Note

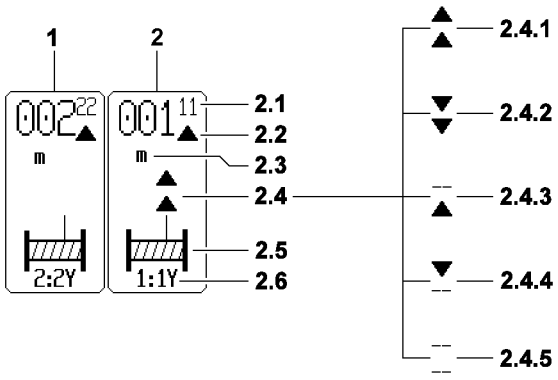
- ▶ Pressure display = "0", if these relapse cylinder(s) are not present for the set operating mode.
- ▶ Pressure display = "???", if the pressure sensor signal is erroneous (broken wire or short circuit). There is an error display with error number.



B104599

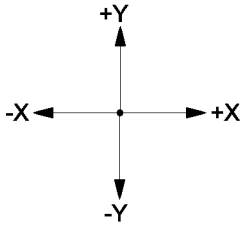
5.5 “Winch display” icon

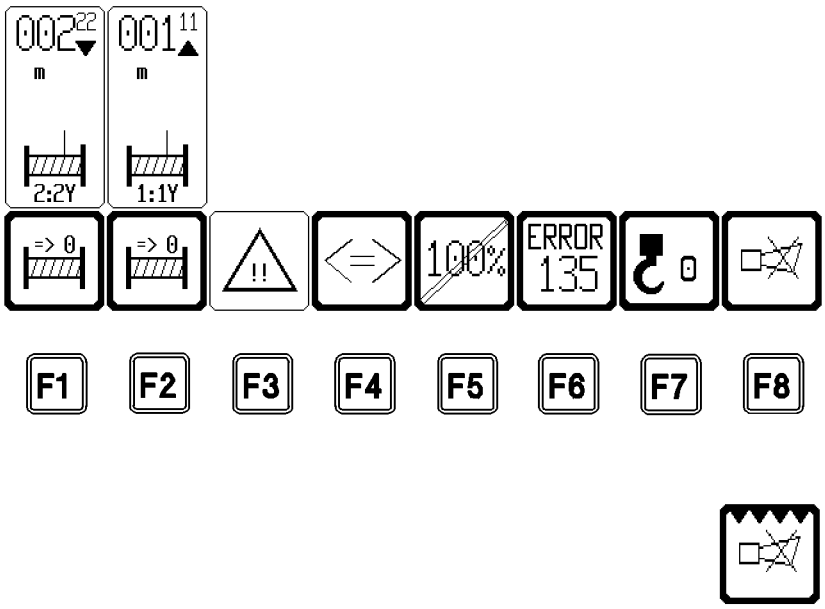
1 “Winch 2” icon	• The winch 1 and winch 2 icons have the same meaning, which are explained for the “Winch 1” icon **2**
2 “Winch 1” icon	• The icon “Winch 1” is only shown if winch 1 is installed, plugged in and if the winch turn sensor is active
2.1 Travelled distance	• In [m] or [ft] From a zero point which must be determined • For a single operation with the reeving setting made in the “Configuration” program: completed hook path For parallel operations: distance completed by hook block • The positions before the decimal point are displayed with up to 3 large digits. The digits after the decimal point are displayed with small digits. (Also refer to the description of the function key **F1** and function key **F2**). • A prerequisite for the correct display is that the entered value matches the actual number of rope strands between the boom head and the hook block. • The hook path calculation only works accurately if the load is suspended freely and is not luffed during the lifting procedure. Not taken into account are flexation and rope expansion. • The length display (hook path display) is only accurate and the layer sheer is only taken into account correctly if the winch has been calibrated and no interruptions of the CPU power supply have occurred (“Cold start”). **Note:** The crane operator may only rely on the hook path display if it has been checked before and found to be correct.
2.2 Direction of hook movement	The arrows on the length value show the direction of the hook movement in relation to the zero point: • Arrow pointing up: Hook has moved upward from the zero point • Arrow pointing down: Hook has moved down from the zero point
2.3 Length unit for hook path display	• In [m] or [ft]



B104599

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





B104600

5.6 The function key line

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

The function key icons may trigger a function or they change their appearance upon the push of a key (function keys) and thereby their definition.

Not all function keys must have assigned icons. This depends on the “active” program selection.

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

F1 Function key

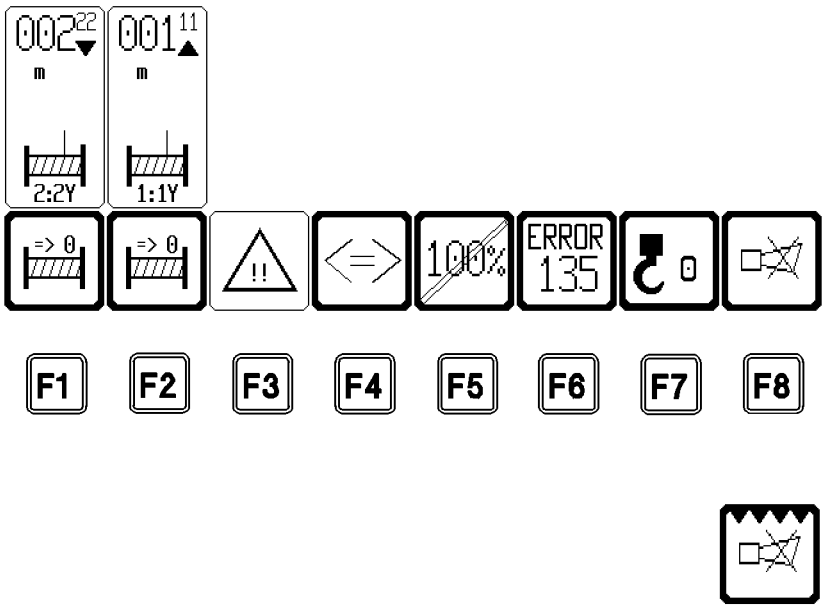
- Zero point for hook travel display, winch 2
- Pressing the function key **F1** causes the “Set winch display to zero” icon to appear, i.e. the winch 2 hook travel display in the winch icon above is set to “000.00” when the key is pressed. The path measurement begins here.

F2 Function key

- Zero point for hook travel display, winch 1
- Pressing the function key **F2** causes the “Set winch display to zero” icon to appear, i.e. the winch 1 hook travel display in the winch icon above is set to “000.00” when the key is pressed. The path measurement begins here.
- **Note:**
  When winch 1 and winch 2 work in parallel operation, then the lengths displays of winch 1 and winch 2 can only be set together with the function key **F1** to “000.00”. Then the function key **F2** has no function.

F3 Function key

- Turn monitoring icons on / off
- The function key **F3** can be used to turn all the monitored auxiliary functions in the crane on or off
- The appearance of the icon changes according to the condition:
  - “Thick border” = auxiliary function icons turned off
  - “Thin border” = auxiliary function icons turned on
- **Note:**
  The monitoring system of all auxiliary functions is always active; only the icons can be faded out. If a monitored limit has been exceeded, an acoustical signal (Horn) sounds and the corresponding icon is displayed, even if the monitoring symbols have been hidden.

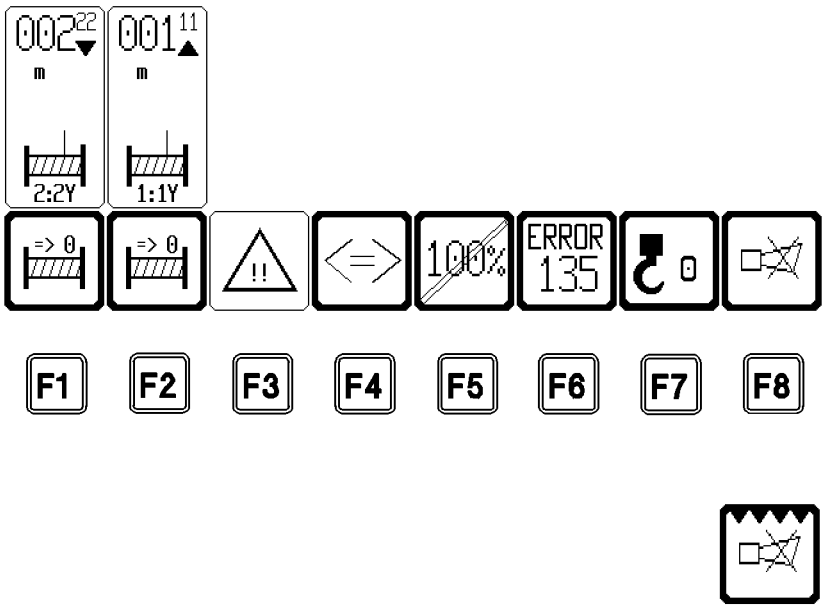


B104600

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

F5 Function key
- Selection of bypass
- **Note:**
  When the bypass key button **D** on the monitor is held in position “Right touching”, then movement limited shut off mechanisms of the LICCON overload protection can be bypassed, which were selected previously with the function key “F5”. **Two different types of bypasses can be preselected:**
  - Bypass of overload shut off (“utilization according to load chart and reeving” = 100%)
    The number “100%” is in the function key icon, diagonally crossed out. This corresponds to the basic setting.
  - Hoist-top shut off
    In the function key icon appears a diagonally crossed out load hook with arrow on stop “on top”.
  - **Note:**
    When the shut off is bypassed, the function key icon starts to blink.

F6 Function key
- Error
- When an application error occurs, then the text **“ERROR”** and a three digit error number describing the error appears in the function key icon. When the error is remedied, the error number disappears in the function key icon.
- **Note:**
  The function key “F6” affects only a reactivation of the possible shut off acoustical warning.



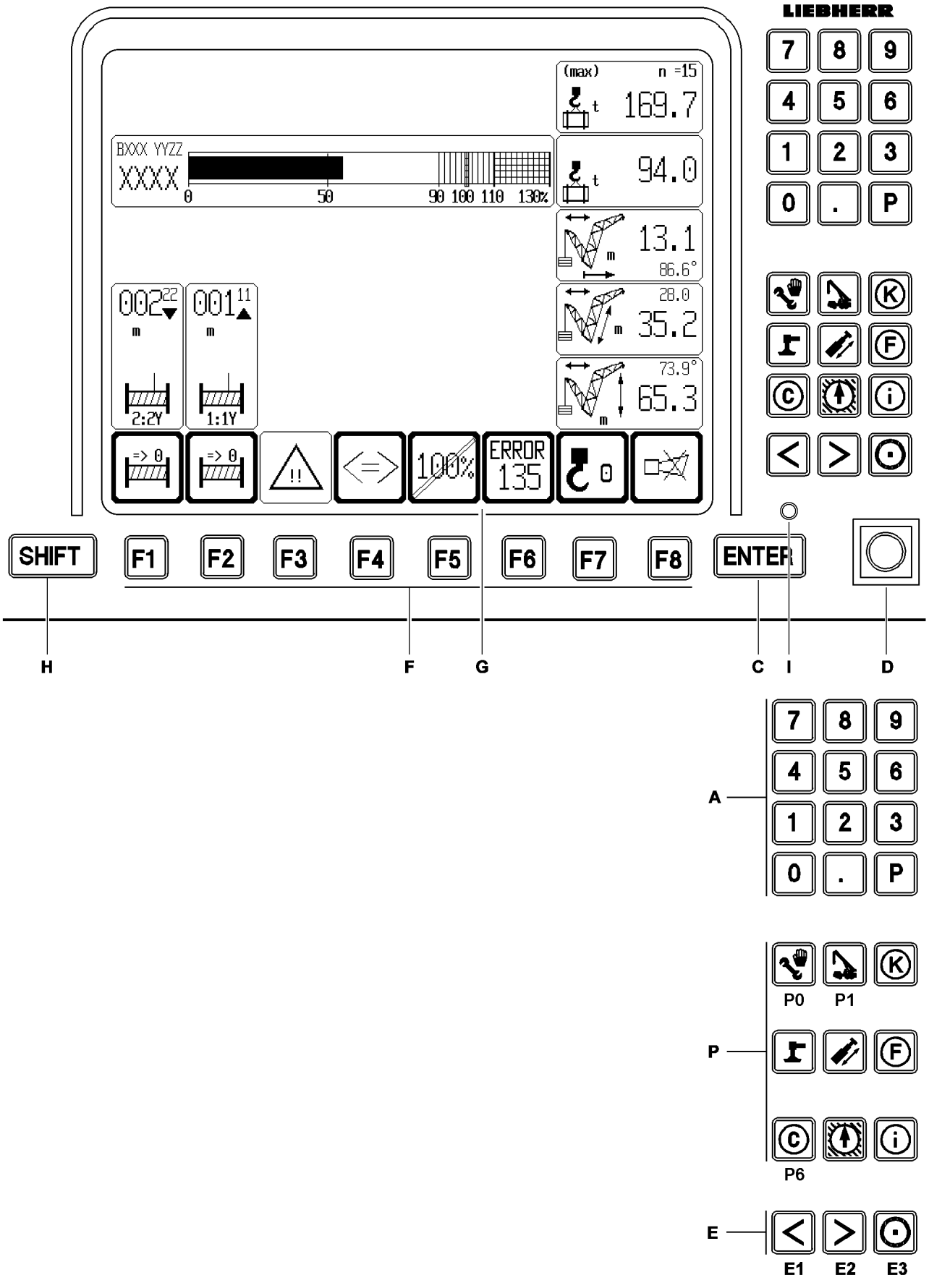
B104600

F7 Function key

- Taring
- When the function key **F7** is pressed, the actual load display is set to “zero”. At the same time, the word “net” appears in the icon of the actual load display. This function, for example, makes it possible to eliminate the weights of the hoist rope, load carriers, lifting and fastening equipment and only display the weight of the load that must be lifted (net load).
  If the taring is cancelled, the word “net” disappears from the icon “Actual load display” and the gross load value is displayed.
- Tare is cancelled by one of the following two actions:
  - Pressing the function key **F7** again
  - Luffing by more than ± 4°

F8 Function key

- Turn off the horn
- Turn off the acoustic warning
  The “Horn” and “Short horn” acoustic warnings can be turned off by pressing the function key **F8**.
  Note:
  A new error turns the acoustic warning on again.
- Special function “Horn” icon
  A special program is available for crane acceptance in the LICCON computer system. This program is blocked after completion of crane acceptance. If an additional mark is displayed in the “Horn” icon (talons along the upper margin, see illustration), this means that the acceptance program is not yet blocked. Contact LIEBHERR Service immediately.
  In order to prevent error functions, access to the special program is only permitted for trained LIEBHERR personnel.


LIEBHERR
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
BXXX YYZZ
XXXX
0 50 90 100 110 130%
002 22
001 11
2:2Y
1:1Y
100%
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
F
G
C
I
D
A
P
P0
P1
P6
E
E1
E2
E3
B104510

5.7 Other operating elements

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

A Keypad

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

P Program keys

- The program keys are used to select individual programs. However, the appropriate program-specific features (for example, switching from “Configuration” to “Crane operation” using the “O.K.”) must always be observed.
  Note:
  A program currently running **cannot** be called again using its program key.
  The programs may only be called up with their program key, if the bypass key switch “Assembly” is not in the “Assembly” position.

C Enter key

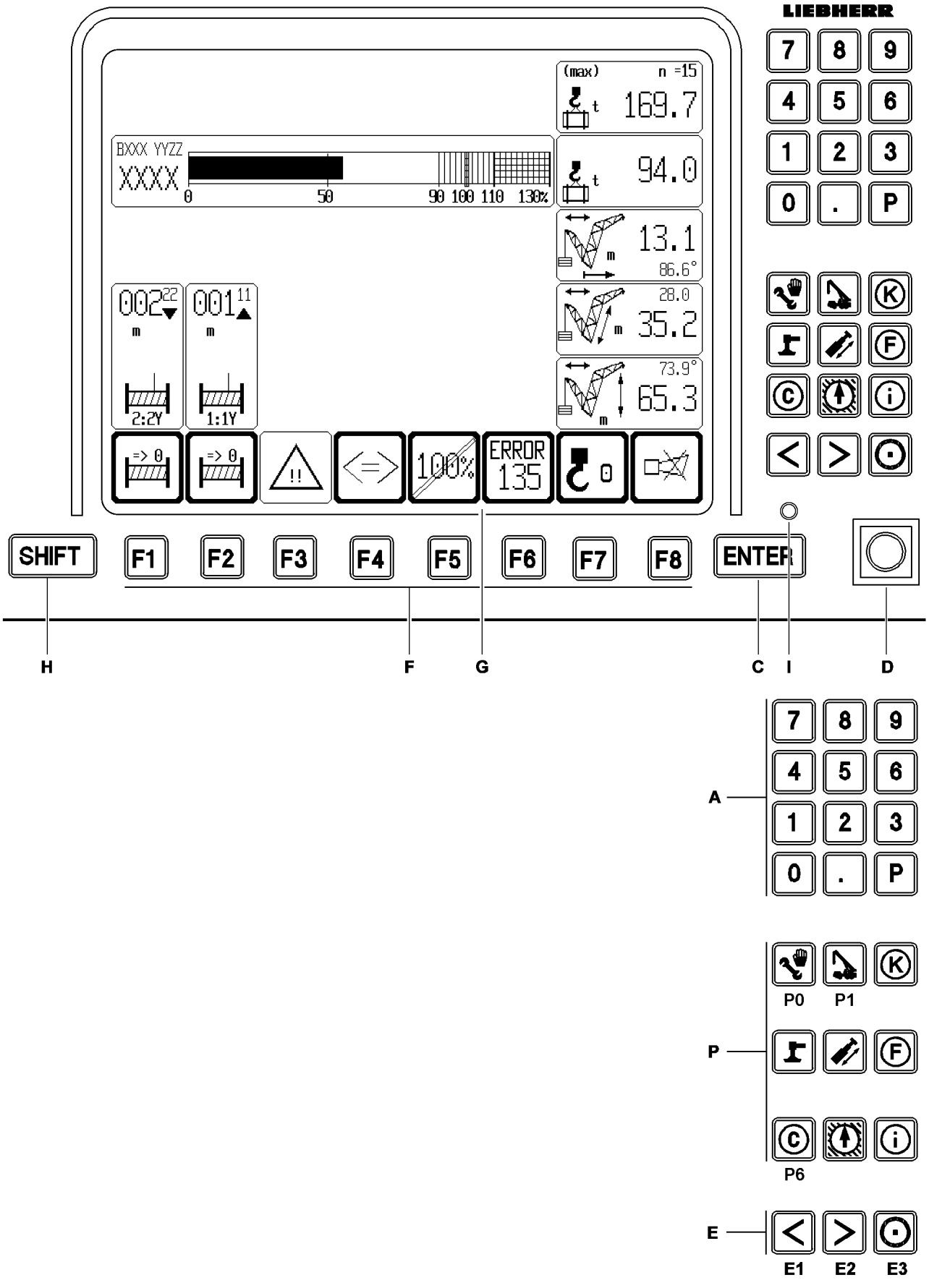
- No function in “Crane operation” program

D Bypass key button

The bypass key button has two positions:

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

DANGER
Increased danger of accidents!
After preselection with function key “F5”, the overload protection as well as the hoist limit switches can be bypassed with the aid of the bypass key button **D**.
In this event, continued protection against overloading the rope or the crane **no longer** exists!
▶ Please exercise extreme caution.


LIEBHERR
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
BXXX YYZZ
XXXX
0 50 90 100 110 130%
002 22
001 11
m
2:2Y
1:1Y
=> 0
100%
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
F
G
C
I
D
A
P
P0
P1
P6
E
E1
E2
E3

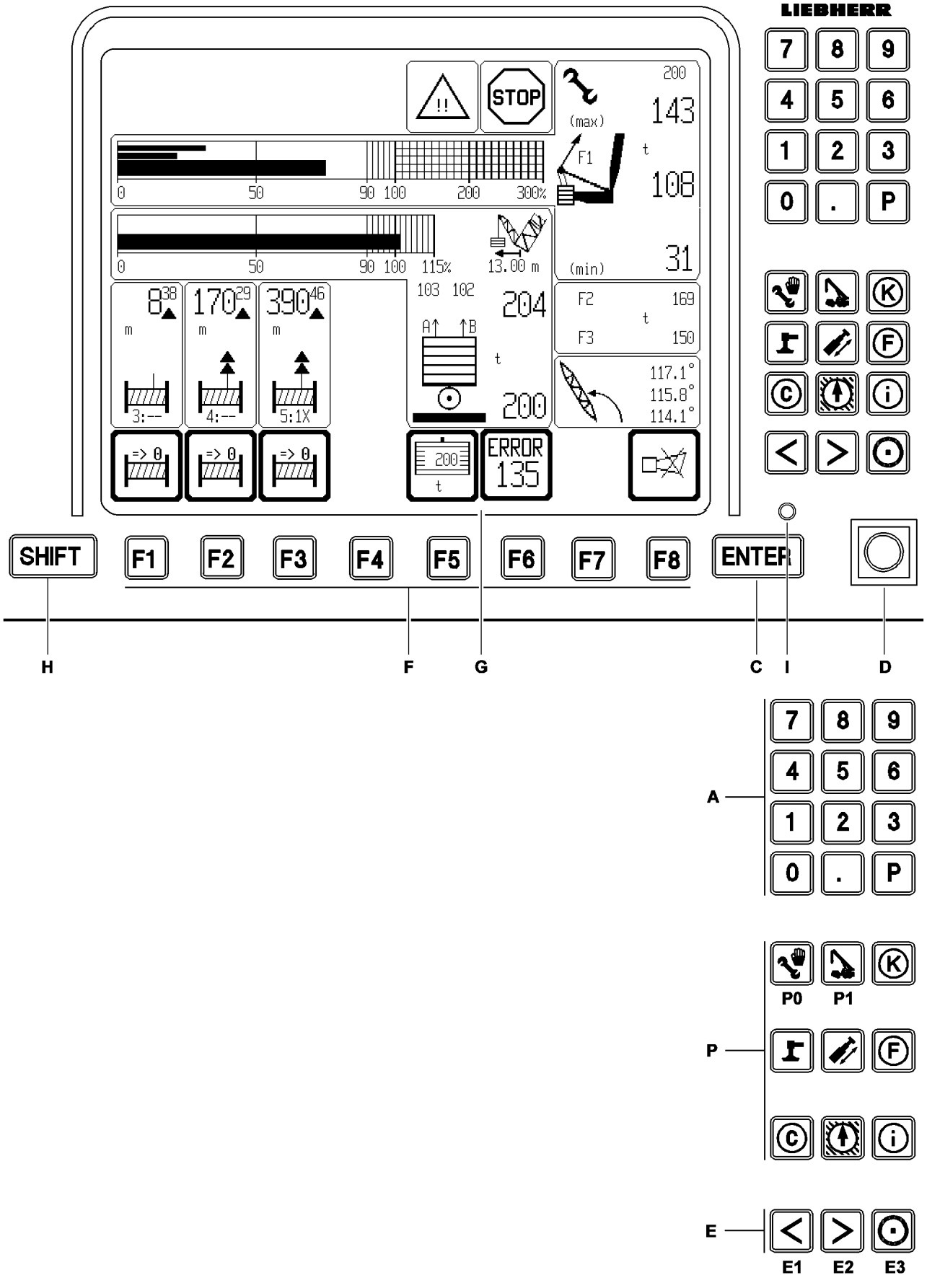
B104510

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

- Bypassing the overload protection:
  If the “maximum load according to the load chart and reeving” is exceeded, the LICCON overload protection turns off all crane movements that increase the load momentum.
  By pressing the function key “F5”, the bypass of the “maximum load according to the load chart and reeving” is selected (function key icon “100% crossed out” appears over F5), this shut off can be bypassed by holding the bypass key button **D** in position “Right touching”.
  Note:
  Bypassing overload protection may only be done if the crane supervisor is present and with utmost caution.
  All LICCON overload protection displays remain functional.
  A red beacon on the crane operator's cab shows that the crane operator has bypassed a shut off.
- Bypassing the hoist limit switch:
  If the hook block touches the hoist limit switch weight during the upward movement, the hoist limit switch reacts. The crane movements “Spool up winch” and “Luff down boom” are turned off. By pressing the function key “F5”, the bypass of the “hoist top shut off” is selected (function key icon “Diagonally crossed out load hook with arrow on stop on top” appears over F5), this shut off can be bypassed by holding the bypass key button **D** in position “Right touching”.
  Note:
  Bypassing the hoist limit switch may only be done if the crane supervisor is present, and with the help of a guide.
  The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block and the boom head.
  Carry out all crane movements with utmost care and at the least possible speed.
  A red beacon on the crane operator's cab shows that the crane operator has bypassed a shut off.

E Special function keys
- Monitor brightness adjustment (see section “Operating elements of the LICCON computer system”)

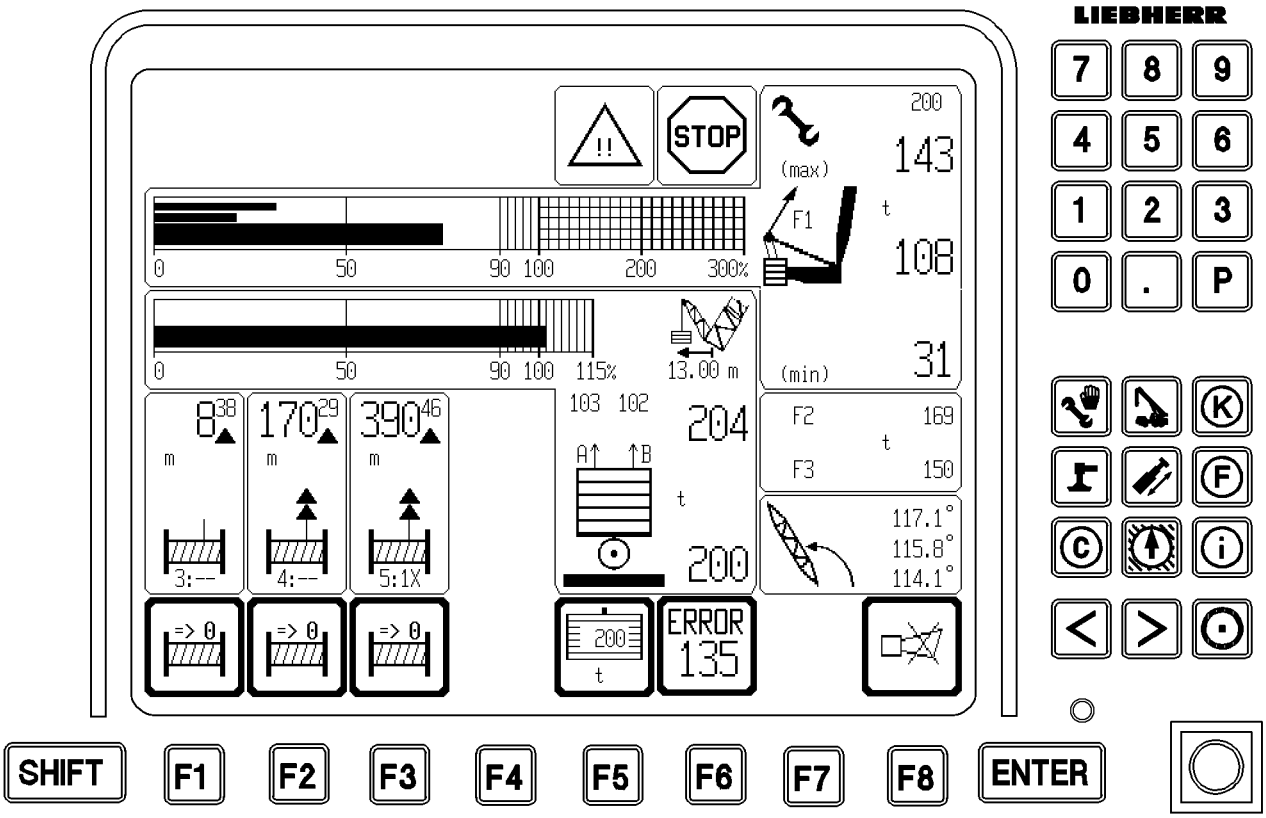
H “SHIFT” key
- No function in “Crane operation” program

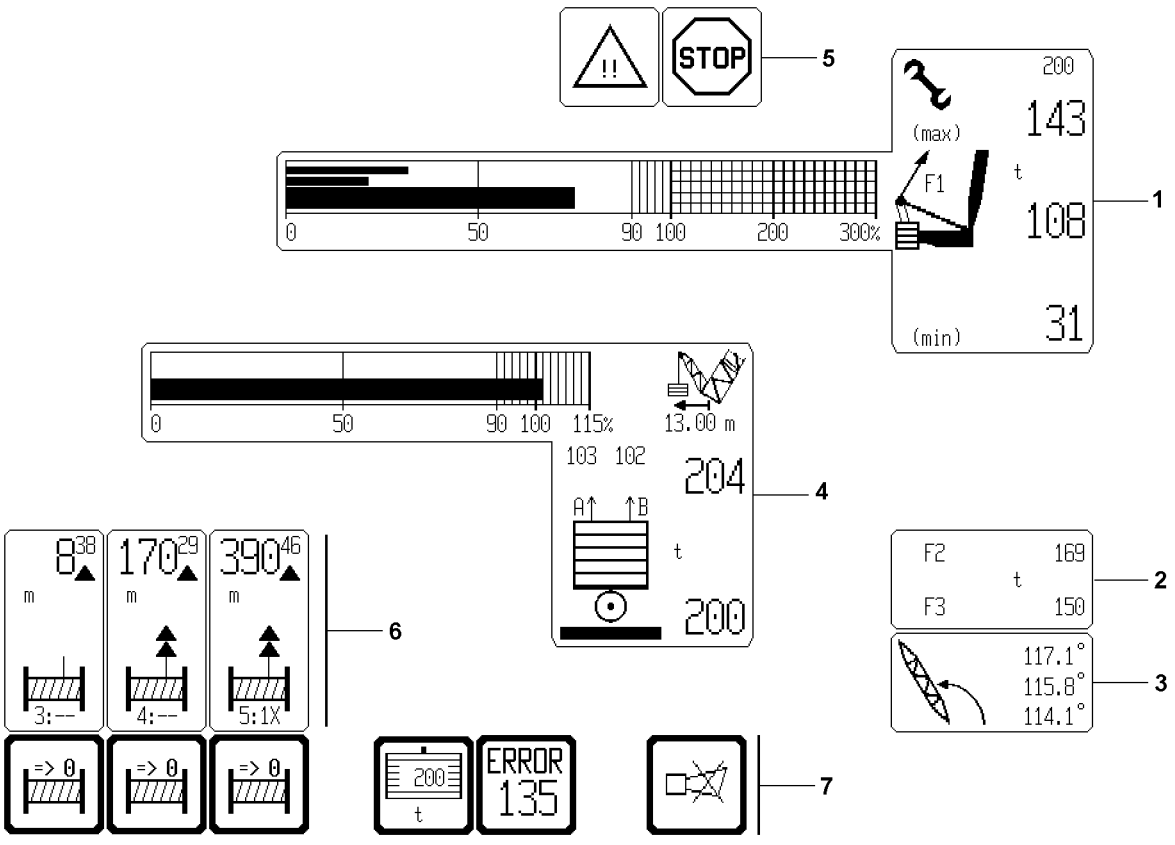

LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
200
143
(max)
F1
t
108
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
(min)
31
8 38
170 29
390 46
m
103 102
204
A B
t
200
F2 169
t
F3 150
117.1°
115.8°
114.1°
3:--
4:--
5:1X
=> 0
200
ERROR
135
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
H F G C I D
A
P0 P1
P
E
E1 E2 E3

B104601

6 Operating elements of the LICCON computer system on monitor 1

A	Keypad	• To edit the derrick ballast input values
P	Program keys	• No function
C	Input key “ENTER”	• Confirmation of changes
D	Key switch	• “Horn off”
E	Special function keys	• Monitor brightness adjustment (see section “Operating elements of the LICCON computer system on monitor 0”)
F	Function keys	• The function keys should always be viewed in conjunction with the function key icon line displayed on the monitor
G	Monitor	• Monitor 1 shows “normally” the crane operating screen of monitor 1
H	SHIFT key	• No function
I	LED display = Power supply for monitor available	


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
200
143
(max)
F1
t
108
(min)
31
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
103 102
204
A↑ ↑B
t
200
F2 169
t
F3 150
117.1°
115.8°
114.1°
8 38
170 29
390 46
m
3:--
4:--
5:1X
=> 0
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


5
1
2
3
4
6
7
STOP
200
143
(max)
F1
t
108
(min)
31
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
103 102
204
A↑ ↑B
t
200
F2 169
t
F3 150
117.1°
115.8°
114.1°
8 38
170 29
390 46
m
3:--
4:--
5:1X
=> 0
ERROR
135

B104602

7 The “Crane operation” program on monitor 1

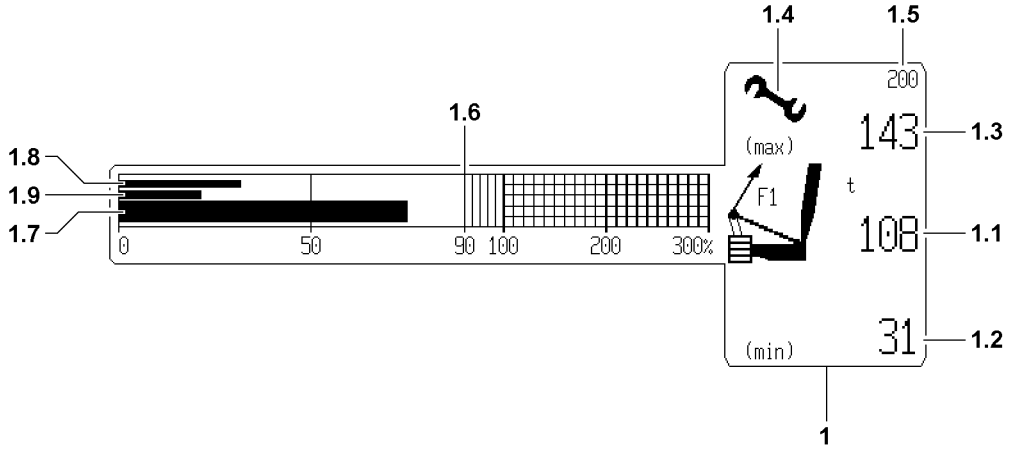
The maximum or minimum load required to balance the crane can be increased or decreased on cranes with a derrick ballast* during crane operation, even under load, by increasing or reducing the derrick ballast.

Note

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

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

1 Test point 1 = F1	• Pull test brackets on test points 1A and 1B in the SA bracket guying
2 Test points 2/3 = F2/F3	• Pull test brackets on test points 2A and 2B in the N/W guying • Pull test brackets on test points 3A and 3B in the S guying in derrick operation
3 Derrick boom angle	
4 Derrick ballast, weight and utilization	• Derrick ballast, placed and theoretically pulled • Derrick ballast radius • Derrick ballast utilization
5 Alarm functions	• “Advanced warning” and **“STOP”** icons
6 Winch displays	• Winch 3* • Winch 4 • Winch 5* • Winch 6*
7 Function key line	


1.4
1.5
200
1.6
(max)
143
1.3
1.8
1.9
1.7
F1
t
0
50
90
100
200
300%
108
1.1
31
1.2
(min)
1

B104603

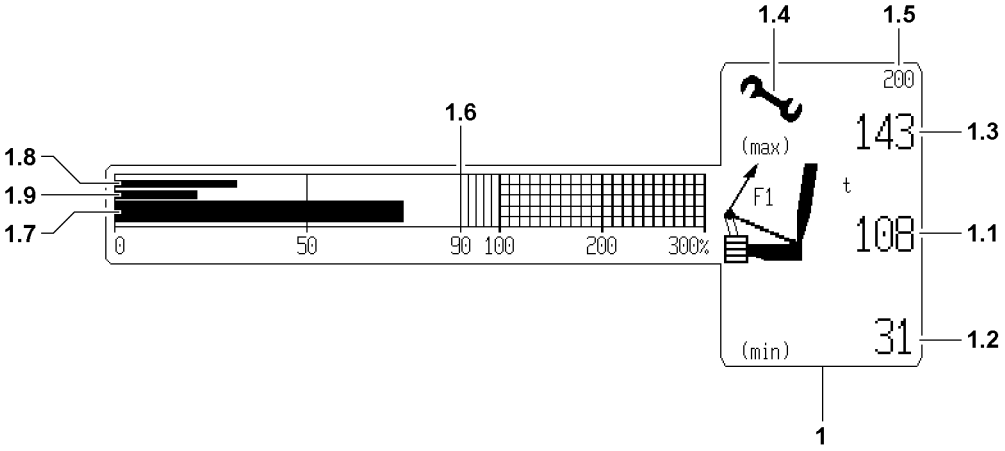
7.1 Test point 1 = F1

7.1.1 F1-Assembly maximum force

The monitoring by the LICCON for test point 1 - Assembly limit is an addition safety. Due to the complexity of the assembly procedure, it is not possible to always show generally valid and exact test point 1 - Assembly limits.

WARNING
Risk of accidents in assembly operation!

- ▶ In assembly operation, the crane operator must make sure that the crane is not subjected to loads to the assembly limit (F1-Assembly max. stop).
- ▶ The crane may always only be erected only **without loads**, according to the data in the operating instructions and the erection and take down charts.
- ▶ Before starting crane operation, observe the notes in the operating instructions and the shut off diagrams in the electrical wiring diagram.

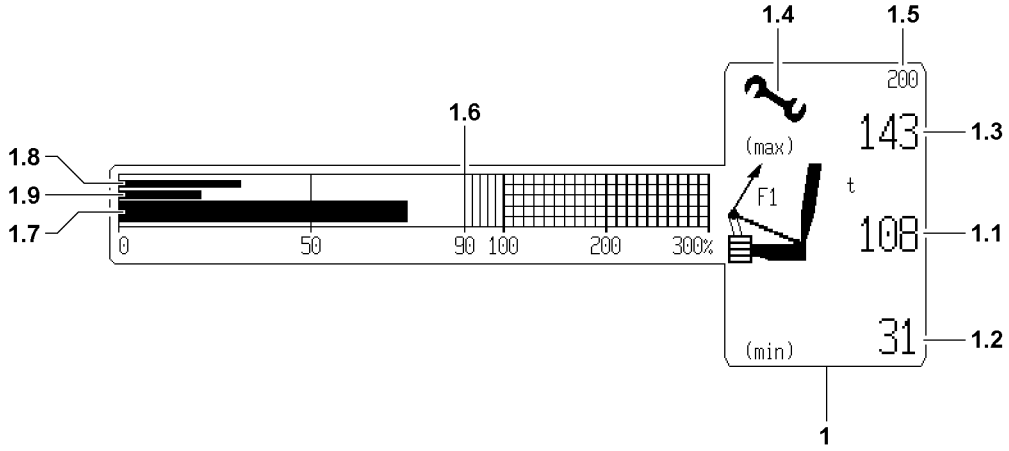

1.4
1.5
200
1.6
143
1.3
(max)
1.8
1.9
1.7
F1
t
0
50
90
100
200
300%
108
1.1
31
1.2
(min)
1

B104603

7.1.2 Test point 1 = F1 / icon description

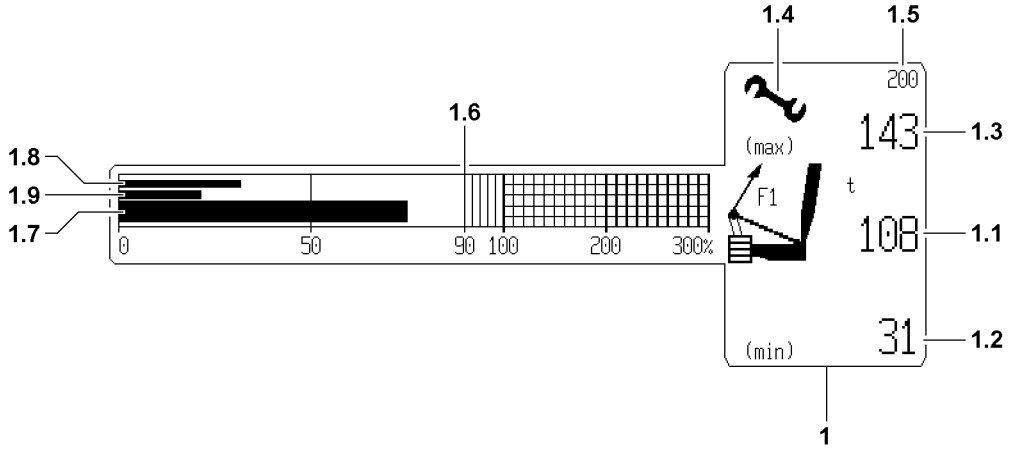
Pull test brackets on test point 1A and 1B in the SA bracket guying.

Position	Icons / display values	Type of display	Is shown
1	Icon “test point 1” = F1 in units of [t] or [kips]	Static	Always
1.1	Actual force: = F1 = $F1_{is}$ F1 = F1A + F1B F1A = Force test point 1A (SA-bracket left) F1B = Force test point 1B (SA-bracket right)	Static	For valid value
		“???” blinking	For invalid value
1.2	Minimum force = $F1_{min}$	Static	Always: **Note:** If the specified limit $F1_{min}$ is approached, an advance warning is issued. When this limit is reached or exceeded, the overload warning is triggered and the dangerous crane movements are shut off. By actuating the assembly key button, the test point 1 - minimum force ($F1_{min}$) is reduced by several tons, this allows one to reverse the maneuver and retreat from the situation in which the $F1_{min}$ shut off occurred. A shut off by $F1_{min}$ only occurs in operating modes with derrick ballast. In all other operating modes, $F1_{min}$ = 0. In these operating modes, the condition F1 = $F1_{min}$ **cannot** be reached in operation.


1.4
1.5
200
1.6
143
1.3
(max)
1.8
1.9
1.7
F1
t
0
50
90
100
200
300%
108
1.1
31
1.2
(min)
1

B104603

Position	Icons / display values	Type of display	Is shown
1.3	Maximum operating force = $F1_{max}$ operation	Static	In operating modes with derrick ballast (DB)
			Note: When the **F1-operation max stop** shut off is reached, all load moment increasing crane movements are shut off. This shut off can be bypassed with the assembly key button. The shut off “Luff up boom” can be bypassed also with the button 290 “Luff up at overload” . **DANGER:** If a shut off is bypassed with the assembly key button, then there is no new or subsequent shut off of crane movements! The crane operator alone is responsible completely for his actions.
1.4	Assembly icon	Static	At “assembly and boom not in operating range”


1.4
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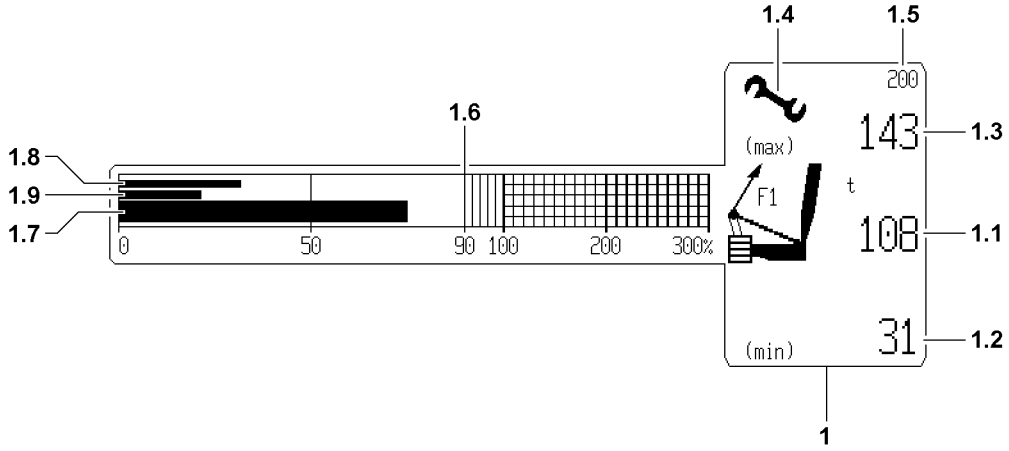
143
1.3
(max)
1.8
1.9
1.7
F1
t
0
50
90
100
200
300%
108
1.1
31
1.2
(min)
1

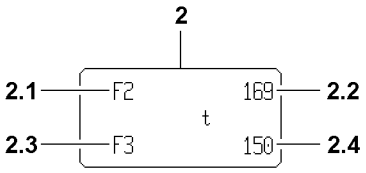
B104603

Position	Icons / display values	Type of display	Is shown
1.5	Max. assembly force = $F1_{max\text{-}assembly}$	Static	At “assembly and boom not in operating range” and F1 **smaller** than $F1_{max\text{-}assembly}$
		Blinking	At F1 **larger** or **the same as** $F1_{max\text{-}assembly}$
			Note: When the **F1-operation max stop** shut off is reached, all load moment increasing crane movements are **unbypassable** shut off. Exception: “Luff down boom” can be bypassed with the assembly key button. **DANGER:** If a shut off is bypassed with the assembly key button, then there is no new or subsequent shut off of crane movements! The crane operator alone is responsible completely for his actions.
1.6	F1-utilization scale in [%]	Static	Always
1.7	F1-utilization bar display = $F1/F1_{max\text{-}operation}$ 0% at: $F1_{max\text{-}operation} = 0$ **or** F1 = invalid	Dynamic	In operating modes with derrick ballast (DB)


1.4
1.5
200
1.6
143
1.3
(max)
1.8
1.9
1.7
F1
t
0
50
90
100
200
300%
108
1.1
31
1.2
(min)
1

B104603

Position	Icons / display values	Type of display	Is shown
1.8	F1-Min-Warning bar = $F1_{min\text{-}Warning\ value}$ / $F1_{max\text{-}operation}$ ($F1_{min\text{-}Warning\ value}$ = $F1_{min} + \Delta_{F1}$) 0% at: $F1_{max\text{-}operation} = 0$ **or** $F1_{max\text{-}operation}$ = invalid	Dynamic	In operating modes with derrick ballast (DB) Δ_{F1} = **for example:** 15 t for cranes with max- load **smaller than** 1,000 t 30 t for cranes with max- load **larger** or the **same** as 1,000 t
1.9	F1-Min-Stop bar = $F1_{min}$ / $F1_{max\text{-}operation}$ 0% at: $F1_{max\text{-}operation} = 0$ **or** $F1_{max\text{-}operation}$ = invalid	Dynamic	In operating modes with derrick ballast (DB)

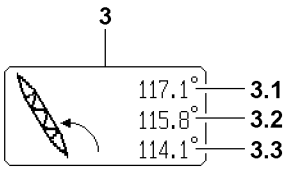


B104604

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

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

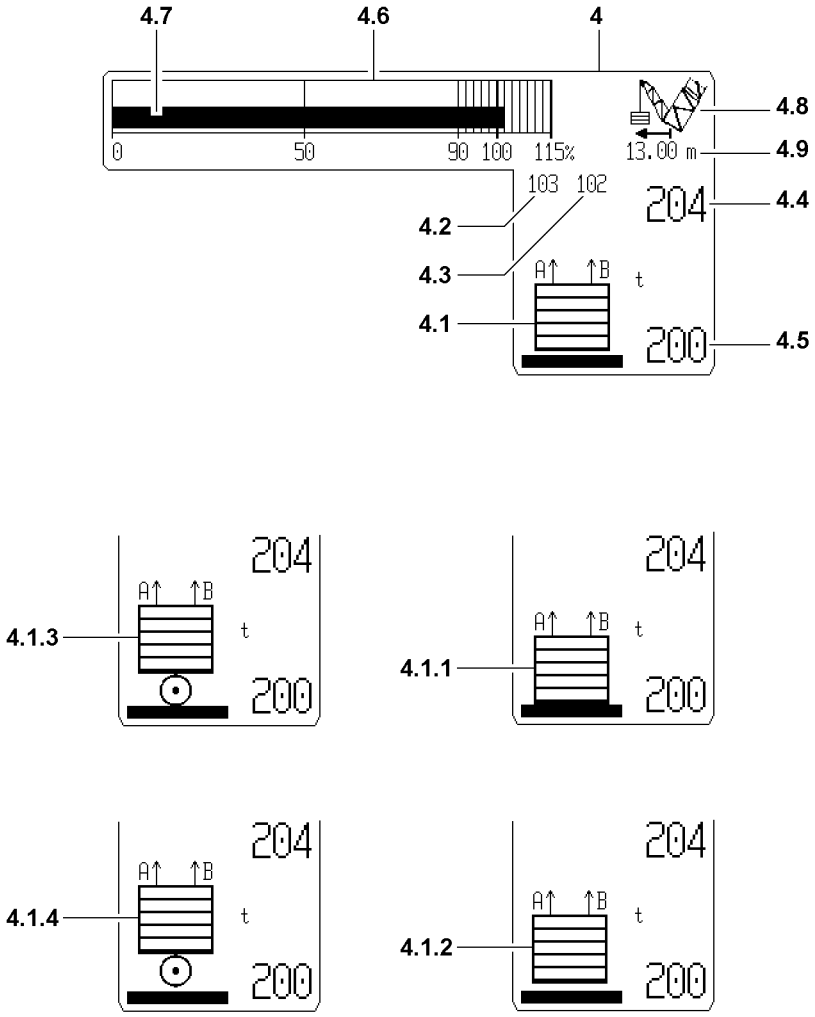
Position	Icons / display values	Type of display	Is shown
2	Icon for N/W-guy force and main boom S-guy force in derrick operation in units [t] or [kips]	Static	In operating modes with lattice jib or derrick
2.1	Icon F2 for N/W-guy force test point 2	Static	In operating modes with lattice jib
2.2	F2-actual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



B104605

7.3 Derrick boom angle

Position	Icons / display values	Type of display	Is shown
3	“Derrick boom angle” icon	Static	In operating modes with derrick
3.1	Maximum derrick angle angle-D_{max} during operation in [°]	Static	In operating modes with derrick and angle-$D_{current}$ **smaller** or the **same** as angle-D_{max}
		Blinking	In operating modes with derrick and angle-$D_{current}$ **larger** than angle-D_{max}
3.2	Current derrick angle angle-$D_{current}$ in [°]	Static	In operating modes with derrick and valid value
		“???” blinking	In operating modes with derrick and invalid value
3.3	Minimum derrick angle angle-D_{min} during operation in [°]	Static	In operating modes with derrick and angle-$D_{current}$ **larger** or the **same** as angle-D_{min}
		Blinking	In operating modes with derrick and angle-$D_{current}$ **smaller** than angle-D_{min}


4.7
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13.00 m
4.8
4.9
103 102
204
4.4
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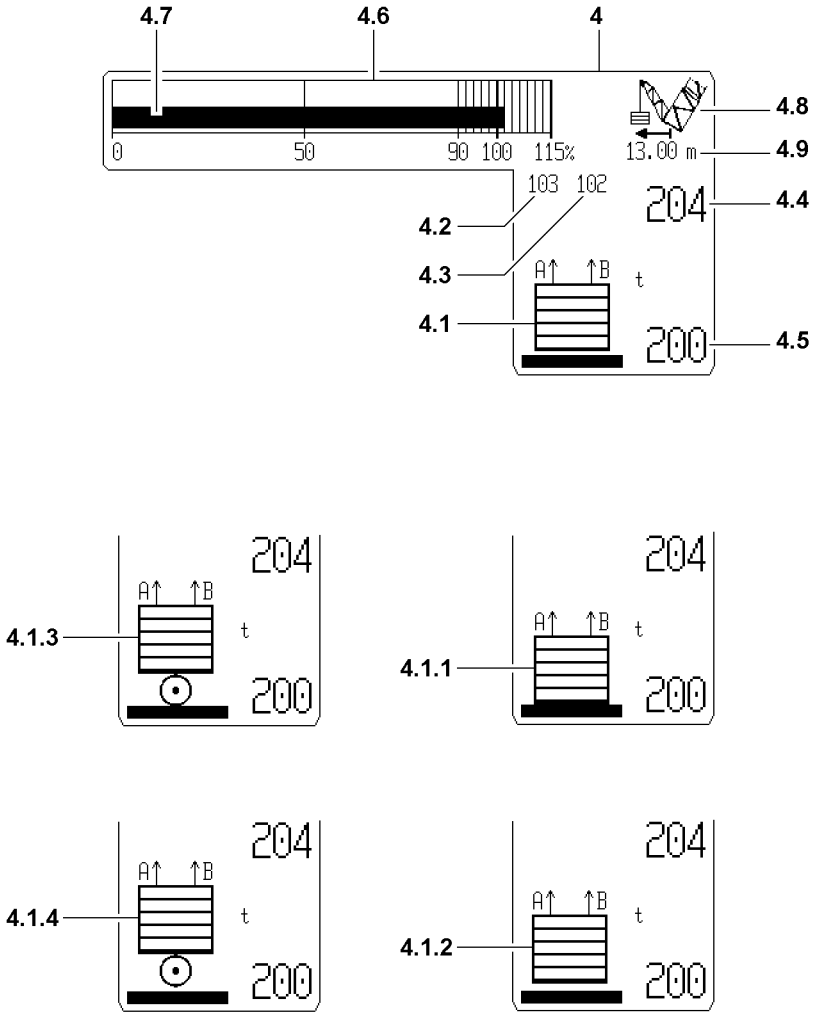
4.3
A↑ ↑B t
4.1
200
4.5
4.1.3
4.1.1
4.1.4
4.1.2

B104606

7.4 Derrick ballast, weight and utilization

Position	Icons / display values	Type of display	Is shown
4	“Derrick ballast, weight and utilization” icon	Static	In operating modes with derrick ballast
4.1	“Derrick ballast” in unit [t] or [kips] icon **Note:** This force unit applies to all force or weight values shown within the frame.	Static	In operating modes with derrick ballast, depending on the type and the condition of the derrick ballast (see 4.1.1 - 4.1.4)
4.1.1	“Suspended ballast on the ground” icon	Static	In operating modes with suspended ballast and suspended ballast **not suspended** , according to limit switch
4.1.2	“Suspended ballast suspended” icon	Static	In operating modes with suspended ballast and suspended ballast **suspended** , according to limit switch
4.1.3	“Ballast trailer on the ground” icon	Static	In operating modes with ballast trailer and ballast trailer **not suspended** , according to key switch **312** (see chapter 4.01)
4.1.4	“Ballast trailer suspended” icon	Static	In operating modes with ballast trailer and ballast trailer **suspended** , according to key switch **312** (see chapter 4.01)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90 100 115%
13.00 m
4.8
4.9
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204
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4.2
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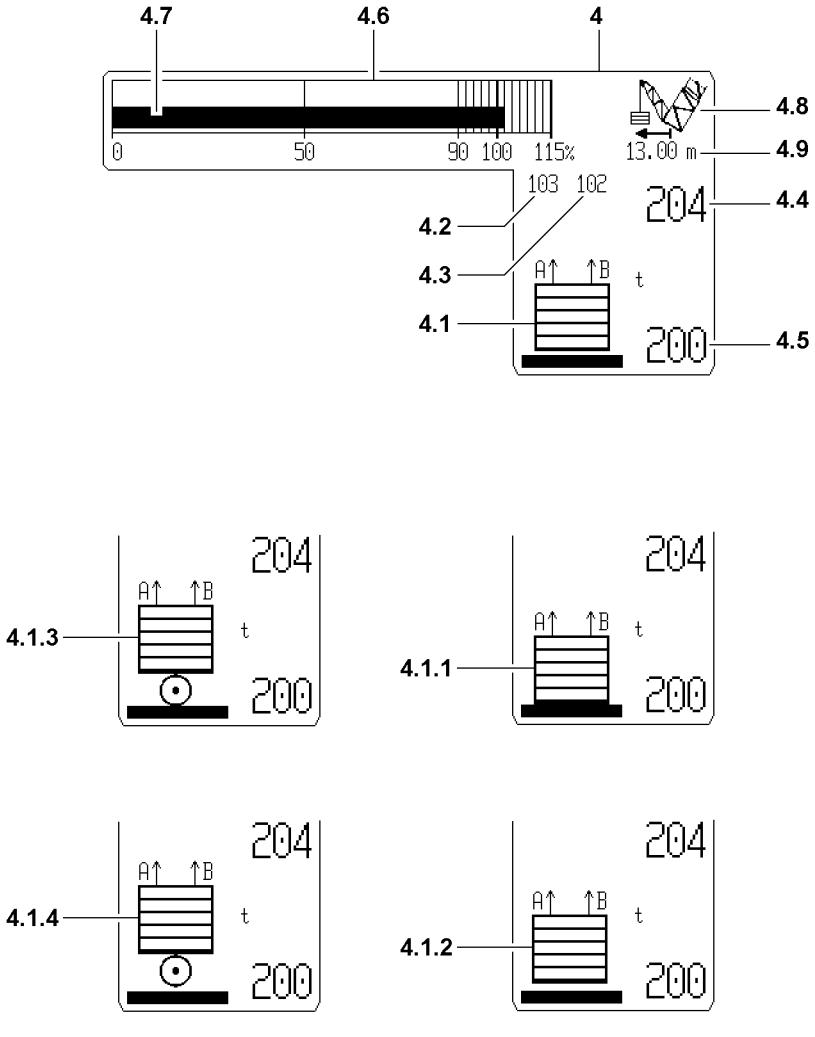
200
4.5
4.1.3
4.1.1
4.1.4
4.1.2

B104606

Position	Icons / display values	Type of display	Is shown
4.2 1)	Force in derrick ballast guying A (left) = F4A5 = F4A - F5/2	Static	Valid in operating modes with derrick ballast and **F4A**
		Blinking	Valid in operating modes with derrick ballast and **F4A** and **F4B** and the difference between the guy force A and B is larger than permitted
	Test point 4A = pressure sensor ring surface left Test point 5 = pressure sensor piston surface left and right When test point 5 is invalid, then F5 = 0 is taken into account	“???” blinking	Invalid in operating modes with derrick ballast and **F4A** and **F4B**
4.3 1)	Force in derrick ballast guying B (right) = F4B5 = F4B - F5/2	Static	Valid in operating modes with derrick ballast and **F4B**
		Blinking	Valid in operating modes with derrick ballast and **F4A** and **F4B** and the difference between the guy force A and B is larger than permitted
	Test point 4B = pressure sensor ring surface right Test point 5 = pressure sensor piston surface left and right When test point 5 is invalid, then F5 = 0 is taken into account	“???” blinking	Invalid in operating modes with derrick ballast and **F4A** and **F4B**

1) is not shown for “mechanical suspended ballast” (B4)


4.7
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4.9
103 102
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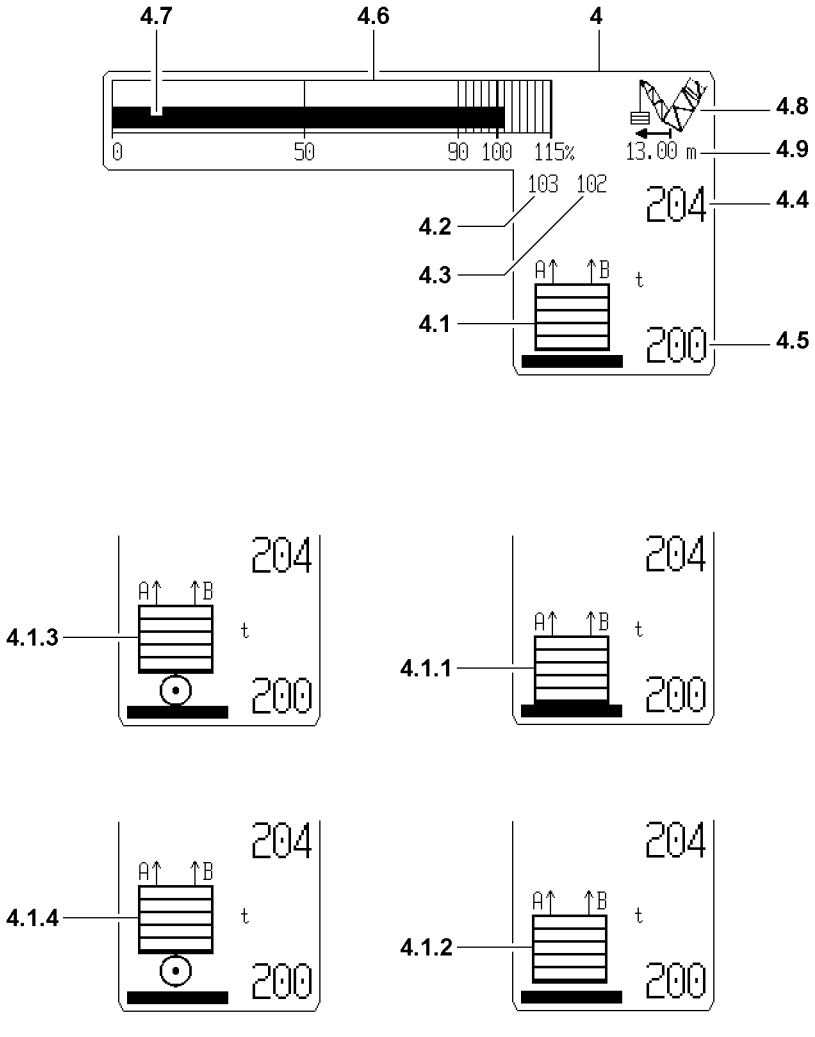
A↑ ↑B t
4.1
200
4.5
4.1.3
4.1.1
4.1.4
4.1.2

B104606

Position	Icons / display values	Type of display	Is shown
4.4	Pulled derrick ballast = BA_{pulled}	Static	For operating modes with derrick ballast, when valid and ballast utilization is **smaller** or the **same** as 90%, or **larger** than 90% if horn is turned off via F8
	= vertical force components of force in derrick ballast guying (= F4A5 + F4B5) calculated from test points 4A, 4B and 5	Blinking	In operating modes with derrick ballast, as warning with short horn at ballast utilization **larger** than 90% (display becomes static if horn is turned off by F8)
	Note: The sum of forces F4A5 and F4B5 is larger or the same as the pulled derrick ballast = BA_{pulled} .	"???" blinking	In operating modes with derrick ballast, if value invalid, **or** M4A or M4B defective (if M5 is defective, the pressure is calculated as M5 = 0. The display stays static).
4.4[2)]	Theoretical pulled derrick ballast = $BA_{pulled\ theoretical}$	Static	For "mechanical suspended ballast length sensor signal" **and** "test point 1 (F1)" **and** "test point 3 (F3)" ok
		"???" blinking	For "mechanical suspended ballast length sensor signal" , **or** "test point 1 (F1)" **or** "test point 3 (F3)" **erroneous**
			DANGER: The "theoretical pulled derrick ballast" ($BA_{pulled\ theoretical}$) can deviate from the actual pulled derrick ballast! The crane operator must monitor displays, "theoretical pulled derrick ballast" ($BA_{pulled\ theoretical}$) and the "derrick ballast utilization bar display" constantly and check them if they are plausible!

2) only valid for "mechanical suspended ballast" B4


4.7
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200
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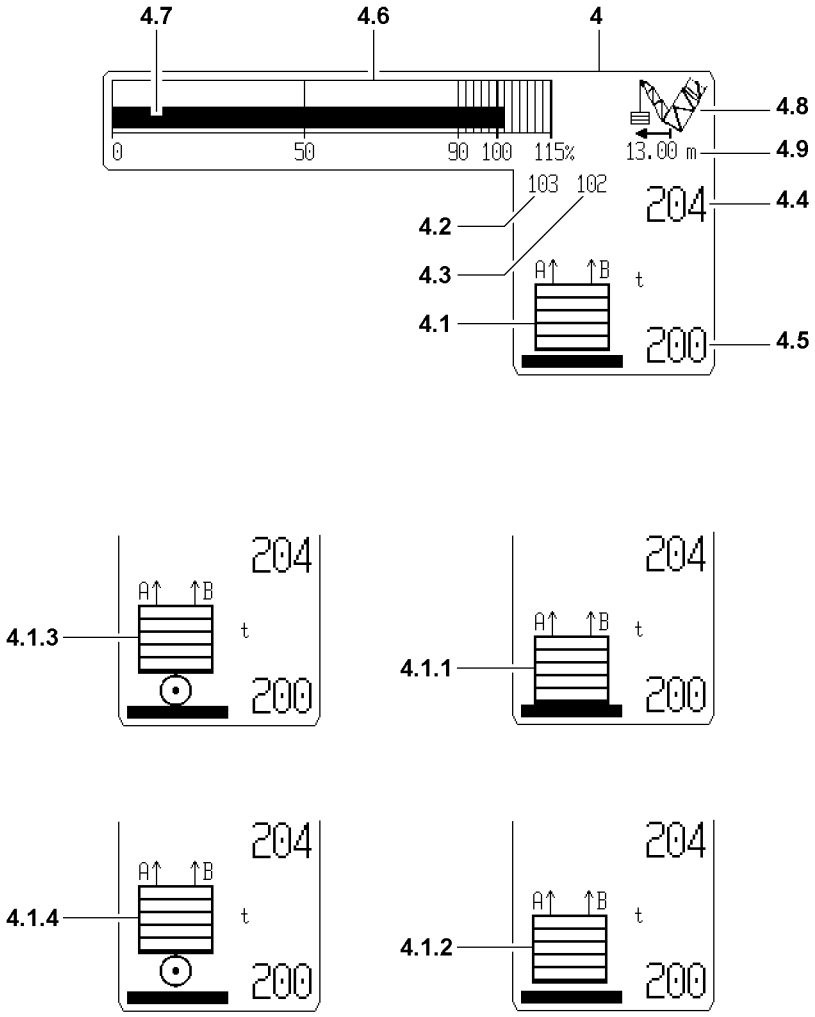
t
4.1.2
200

B104606

Position	Icons / display values	Type of display	Is shown
4.5	Placed derrick ballast = BA_{placed}	Static	In operating modes with derrick ballast, if value BA_{placed} is permissible
		Blinking	In operating modes with derrick ballast, if value BA_{placed} is questionable
	Note: This value has been entered by hand and confirmed with the **"ENTER"** key. The value is saved when turning off and is valid again after turning on until it is changed with the function key **"F5"** .	"???" blinking	In operating modes with derrick ballast, if value BA_{placed} is **smaller** than 0 or **larger** than 9999
4.5 [2)]	Placed derrick ballast = BA_{placed}		**Note** : The change over of $F1_{min\text{-}force\ threshold}$ is not made depending on the theoretical pulled derrick ballast, rather than depending on the placed derrick ballast BA_{placed} ! To reach the steepest boom position, it may be necessary to set the suspended ballast all the way down on the ground and to enter BA_{placed} = 0 t to maximum 4 t on the LICCON monitor 1. The $F1_{min\ threshold}$ is thereby lowered.
4.6	Ballast utilization scale	Static	In operating modes with derrick ballast

2) only valid for "mechanical suspended ballast" B4


4.7
4.6
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90 100 115%
13.00 m
4.8
4.9
103 102
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4.3
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t
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200
4.5
204
4.1.3
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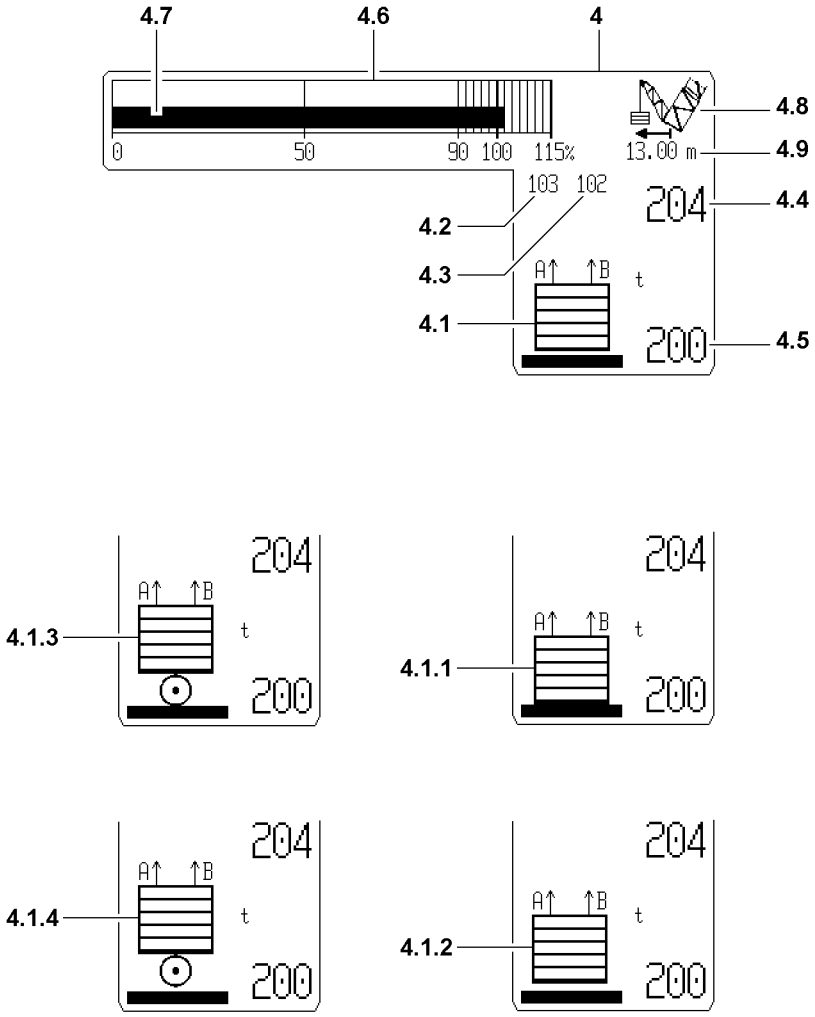
200
204
4.1.1
A↑ ↑B
t
200
204
4.1.4
A↑ ↑B
t
200
204
4.1.2
A↑ ↑B
t
200

B104606

Position	Icons / display values	Type of display	Is shown
4.7	Derrick ballast utilization bar display = BA_{pulled} / BA_{placed} in percentages [%] Derrick ballast utilization bar display is 0 at: BA_{placed} **smaller** BA_{placed_min} **or** BA_{pulled} = invalid **Note:** The bar can show max. 115%	Dynamic	In operating modes with derrick ballast **Note:** BA_{placed_min} 5 t on cranes with max. load carrying capacity **smaller** than 1000 t. BA_{placed_min} 10 t on cranes with max. load carrying capacity **larger** or the **same** as 1000 t.
4.7 [2)]	Derrick ballast utilization bar display = $BA_{pulled\ theoretical}$		**DANGER** : The ballast utilization may not be exact, since the calculation of the ballast utilization is based on the values of the “theoretical pulled derrick ballast” . The crane operator may not depend on the assumption that the derrick utilization bar display is exact. He must think for himself and initiate and slow down all movements with extreme caution and at the lowest speed.

2) only valid for “mechanical suspended ballast” B4


4.7
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13.00 m
4.8
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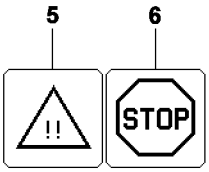
4.1.3
4.1.1
4.1.4
4.1.2

B104606

Position	Icons / display values	Type of display	Is shown
4.8	“Derrick ballast radius” icon	Static	In operating modes with derrick ballast
4.9	Display derrick ballast radius in [m] or [ft]	Static	Valid in operating modes with derrick ballast and derrick ballast radius value
		Blinking	Invalid in operating modes with derrick ballast and derrick ballast radius value
4.9 2)	Display derrick ballast radius in [m] or [ft]	Static	Suspended ballast length sensor signal ok
	Only the corresponding nominal value is shown, for example 11.0 m 13.0 m or 15.0 m	“???” blinking	Suspended length sensor signal not in permissible range

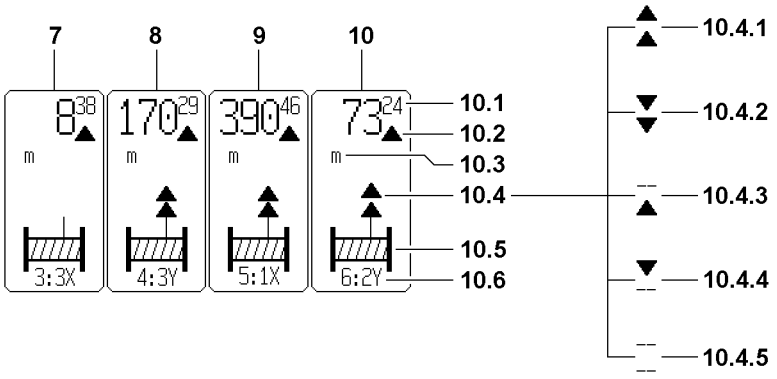
2) only valid for “mechanical suspended ballast” B4



B199940

7.5 Alarm functions

Position	Icons / display values	Type of display	Is shown
5	“Advanced warning” icon	Blinking	At $M1_{min\text{- advanced warning}}$ ($F1_{is}$ **smaller** than $F1_{min\text{-Warning value}}$) **or** for $F1_{max\text{-operating advanced warning}}$ (90%) ($F1$ **larger** than or the **same** as $F1_{max\text{-operating warning value}}$) **or** at $F1_{min\text{-Stop after-run}}$ **or** at $F1_{max\text{ - operation Stop after-run}}$
6	“STOP” icon	Blinking	At $F1_{min\text{-Stop}}$ ($F1_{is}$ **smaller** than $F1_{min}$) with after-run of 3 s **or** at $F1_{max\text{ - operation Stop}}$ ($F1$ **larger** or the **same** as $F1_{max\text{-operating shut off value}}$) with after-run of 3 s **or** $F1_{max\text{-assembly-Stop}}$ ($F1_{is}$ **larger** or the **same** as $F1_{max\text{-assembly}}$) with after-run of 3 s **or** Errors with error numbers, which lead to a shut off shown on monitor 1 with after-run of 3 s.


7
8
9
10
8 38
m
3:3X
170 29
m
4:3Y
390 46
m
5:1X
73 24
m
6:2Y
10.1
10.2
10.3
10.4
10.5
10.6
10.4.1
10.4.2
10.4.3
10.4.4
10.4.5

B104607

7.6 Winch displays

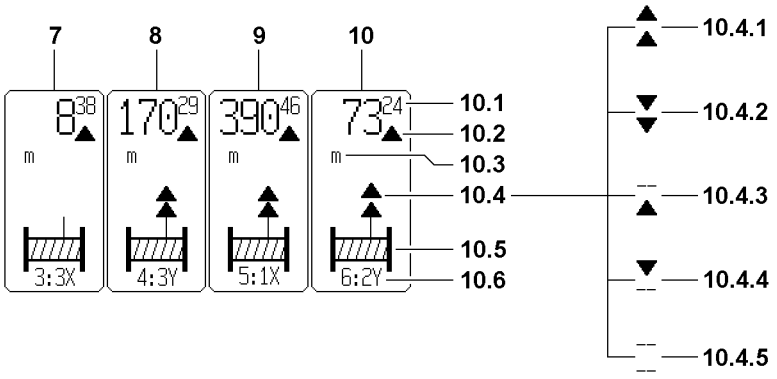
7.6.1 Winches

The icons for winches 3*, 4, 5* and 6* are only shown on monitor 1, if the crane is equipped with these winches.
The display of winches is the same as the display of winches 1 and 2 on monitor 0.
If one of these winches is used as hoist winch according to the set operating mode, then **the hook path** is shown in the winch icon. The value, which was tared by the corresponding function key is still shown unchanged, even after turning off and on or after an operating mode change.
However if one of the winches is used as a control winch, then **the current rope length on the winch drum** is shown, not the path of the (hook) block. Then taring is possible, but after turning on and off again or after an operating mode change, the original value “Rope length on the rope drum” is shown again.

Note

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

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


7
8
9
10
8 38
m
3:3X
170 29
m
4:3Y
390 46
m
5:1X
73 24
m
6:2Y
10.1
10.2
10.3
10.4
10.5
10.6
10.4.1
10.4.2
10.4.3
10.4.4
10.4.5

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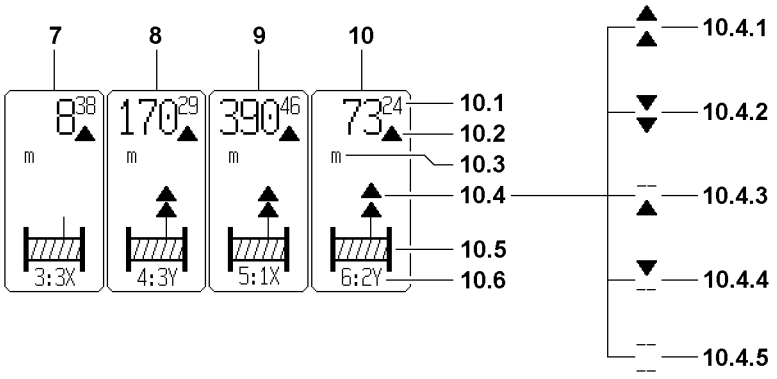
Position	Icons / display values	Type of display	Is shown
10.1	Hook path = rope length on winch / hoist rope reeving according to manual entry **or** = Rope length on winch drum (for the intake gear, the rope length is valid equally for the left and the right half of the rope drum)	Static	If winch is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

Note
- ▶ Winch 3, winch 4 and winch 5 are always calculated as control winches.
- ▶ Winch 6 is calculated as hoist winch, in operating system “Boom nose”.


7
8
9
10
8 38
m
3:3X
170 29
m
4:3Y
390 46
m
5:1X
73 24
m
6:2Y
10.1
10.2
10.3
10.4
10.5
10.6
10.4.1
10.4.2
10.4.3
10.4.4
10.4.5

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7.6.2 Winch display icon

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

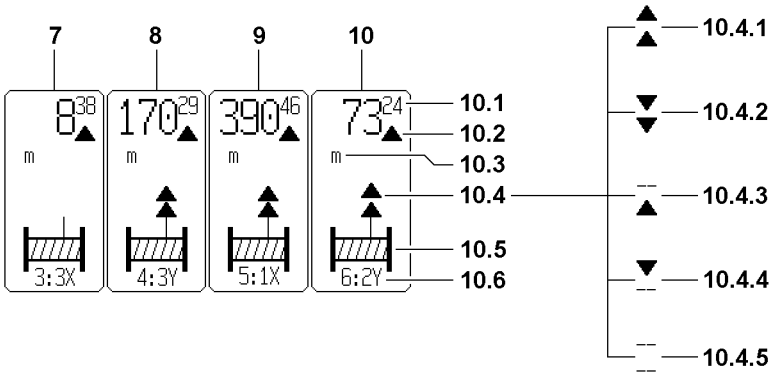
10 “Winch 6” icon

10.1 Travelled distance
- In [m] or [ft]
  From a zero point which must be determined
- For a single operation with the reeving setting made in the “Configuration” program: completed hook path
  For parallel operations: distance completed by hook block
- The positions before the decimal point are displayed with up to 3 large digits. The digits after the decimal point are displayed with small digits. (Also refer to description for function key **F1**, function key **F2**, function key **F3** and function key **F4**).
- A prerequisite for the correct display is that the entered value matches the actual number of rope strands between the boom head and the hook block
- The hook path calculation only works accurately if the load is suspended freely and is not luffed during the lifting procedure. Not taken into account are flexation and rope expansion.

10.2 Direction of hook movement

The arrows on the length value show the direction of the hook movement in relation to the zero point:
- Arrow pointing up: Hook has moved upward from the zero point
- Arrow pointing down: Hook has moved down from the zero point

10.3 Length unit for hook path display
- In [m] or [ft]


7
8
9
10
8 38
m
3:3X
170 29
m
4:3Y
390 46
m
5:1X
73 24
m
6:2Y
10.1
10.2
10.3
10.4
10.5
10.6
10.4.1
10.4.2
10.4.3
10.4.4
10.4.5

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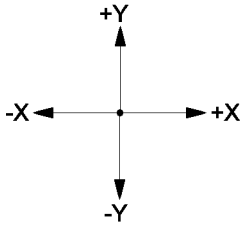
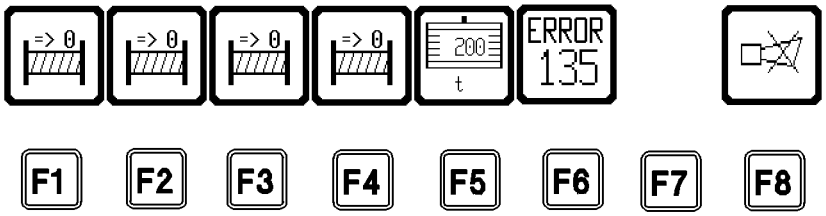
10.4 Winch status display	• There are five winch status icons (all flashing):
10.4.1 Spool out	
10.4.2 Spool up	
10.4.3 Spooled out	• Spooling out is blocked
10.4.4 Spooled up	• Spooling up is blocked
10.4.5 Winch is deactivated	• Spooling up and spooling out are blocked (via “Control parameter” program) • **Note:** If no winch status icon appears, the activated winch is inactive and is neither spooled up nor spooled out.
10.5 Winch icon	• (with rope end for winch status icon)
10.6 Winch number with master switch number and master switch operating direction	• Example: 6: 2Y First digit: Winch number Second digit: Master switch number Letter: Master switch operating direction

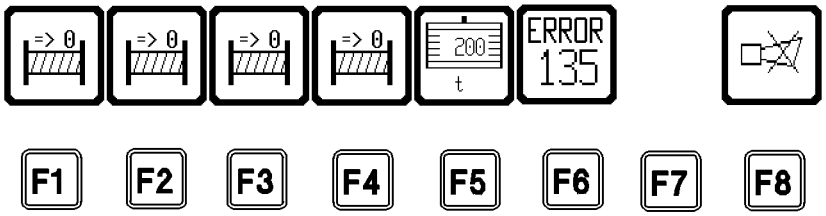




B104608

7.7 Function key line

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



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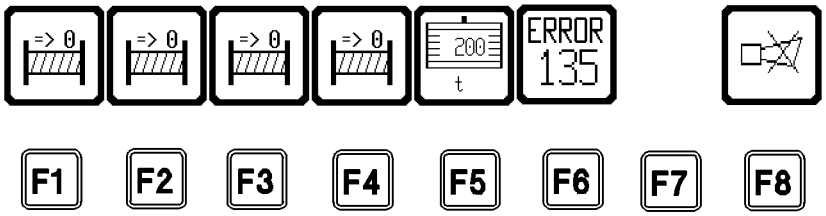
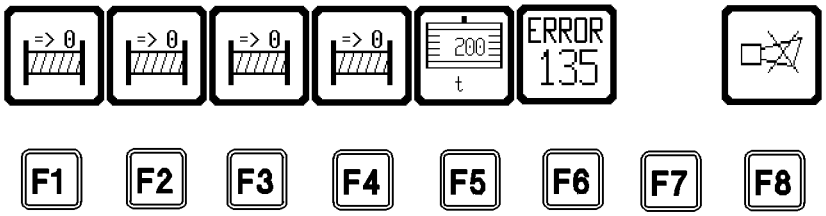
Position	Function / Function key line	Type of display	Is shown
F5	Ballast editing key* When pressing function key F5, the thick icon frame changes to a thin icon frame. A blinking cursor appears in the ballast editing field. The value for the placed ballast can only be entered in the displayed weight unit [t] or [kips] via the key field on monitor 1. **The ballast editing can be ended with:** - pressing the “ENTER” key = take over value. The entered value appears now as value for the placed ballast (BA_{placed}) in the ballast icon **or** - pressing “F5” key = End editing. The change is discarded. The old value of BA_{placed} remains in the ballast icon. **Note:** When editing the ballast, make sure to observe the instructions regarding the derrick ballast in chapter 4.03!	Static	In operating modes with derrick ballast
F5*	Ballast input value (BA_{edit})* = edited ballast value in function key icon of “F5”	Static	For **valid** ballast input value
		“???” blinking	For **invalid** ballast input value



B104608

Position	Function / Function key line	Type of display	Is shown
F6	Error icon with frame and text “ERROR” and error number of application error **Note:** The F6 key has no function.	Static Blinking	If an application error is found on CPU1
F7	Not assigned		
F8	“Horn” icon - Turn off the acoustical signal “Horn” on monitor 1 by pressing the “F8” key	Blinking	If the acoustical signal “Horn” sounds on monitor 1. See paragraph “Acoustical warning on monitor 1” .



B104608

7.8 Acoustical warning on monitor 1

7.8.1 “Horn”

7 “Horn” icon

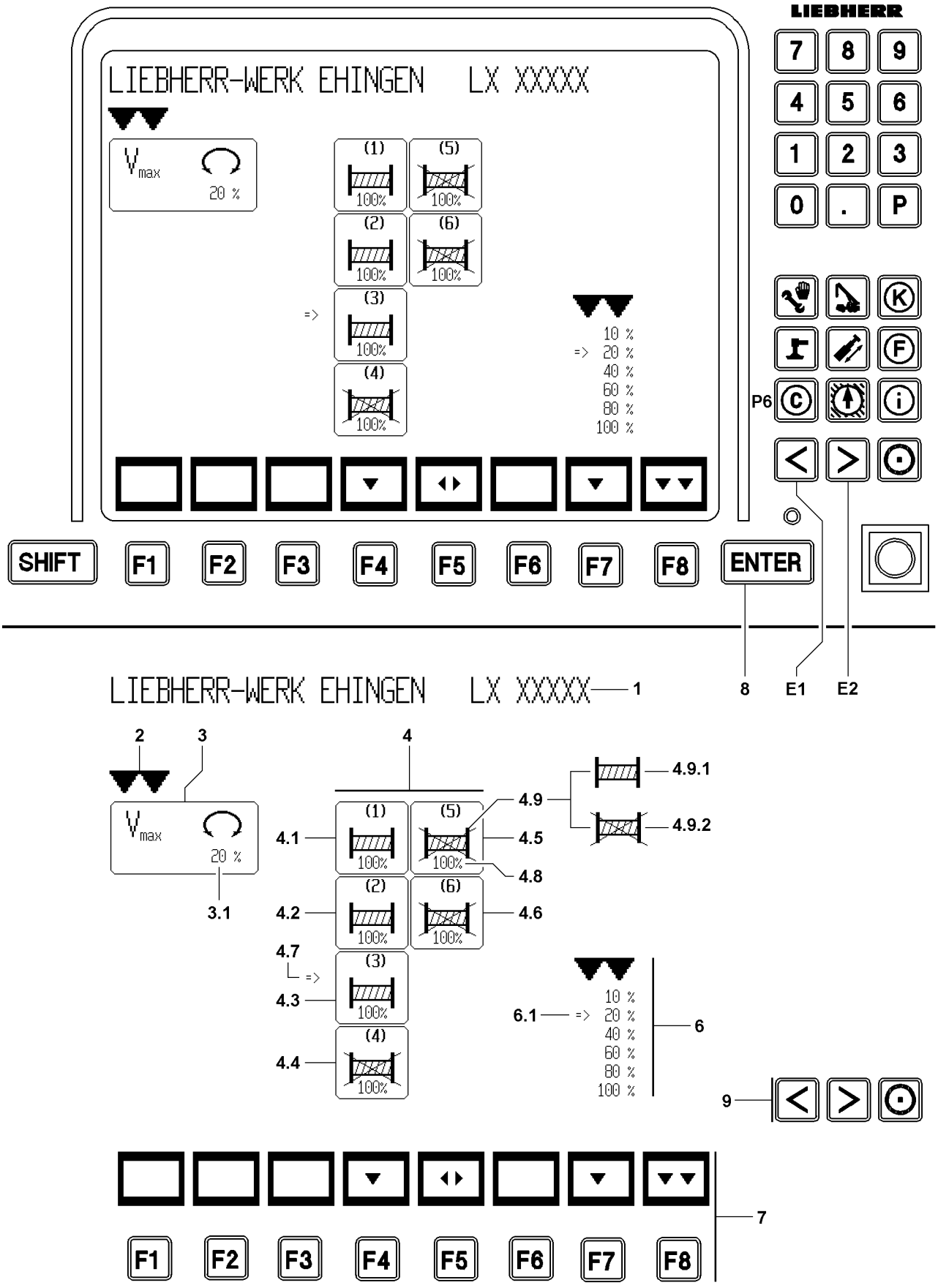
- Acoustical signal
- For some operational errors found on the CPU 1, which can lead to a shut off of a movement, it is important to check the operating screen on monitor 1. These errors are also reported by the acoustical signal “Horn”, in addition to the optical display.
  “Horn” is a beeping sound of a duration of approximately 0.5 seconds, which is repeated in one second rhythm.
- **Operational errors are:**
  - Exceeding of test point 1 - assembly maximum threshold
  - Exceeding of test point 1 - operation -Max- shut off threshold
  - Exceeding of test point 1 - minimum threshold
- **The following sensors are monitored:**
  - Pull test brackets
  - Pressure sensors
  - Angle sensors

“Short horn” on monitor 1

- Sounds in addition to the visual display of error messages without an error number and which do not lead directly to crane movement shut off by the LICCON overload protection.
  “Short horn” is a sound that lasts for approximately 0.1 seconds and is repeated in two second intervals.
- **The following errors are monitored:**
  - Advanced warning threshold of test point 1 - operating maximum force reached (= “NOTICE” at 90%)
  - Advanced warning threshold of test point 1 - Minimum force not reached (at approx. 15 t via $F1_{min}$)

Priority and “Horn off”

- The “Horn” alarm has higher priority than the “Short horn” alarm, i.e. “Horn” takes preference over “Short horn”
- The “Horn”, as well as the “Short horn” of the monitor 1 may be turned off by function key **F8**
- **Note:**
  The “Horn”, as well as the “Short horn” immediately become active again if an error recurs.


LIEBHERR-WERK EHINGEN LX XXXXX
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
P6
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
8 E1 E2
1
2 3 4
4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.9.1 4.9.2
3.1
6 6.1
7 9

B104609

8 “Control parameter” program

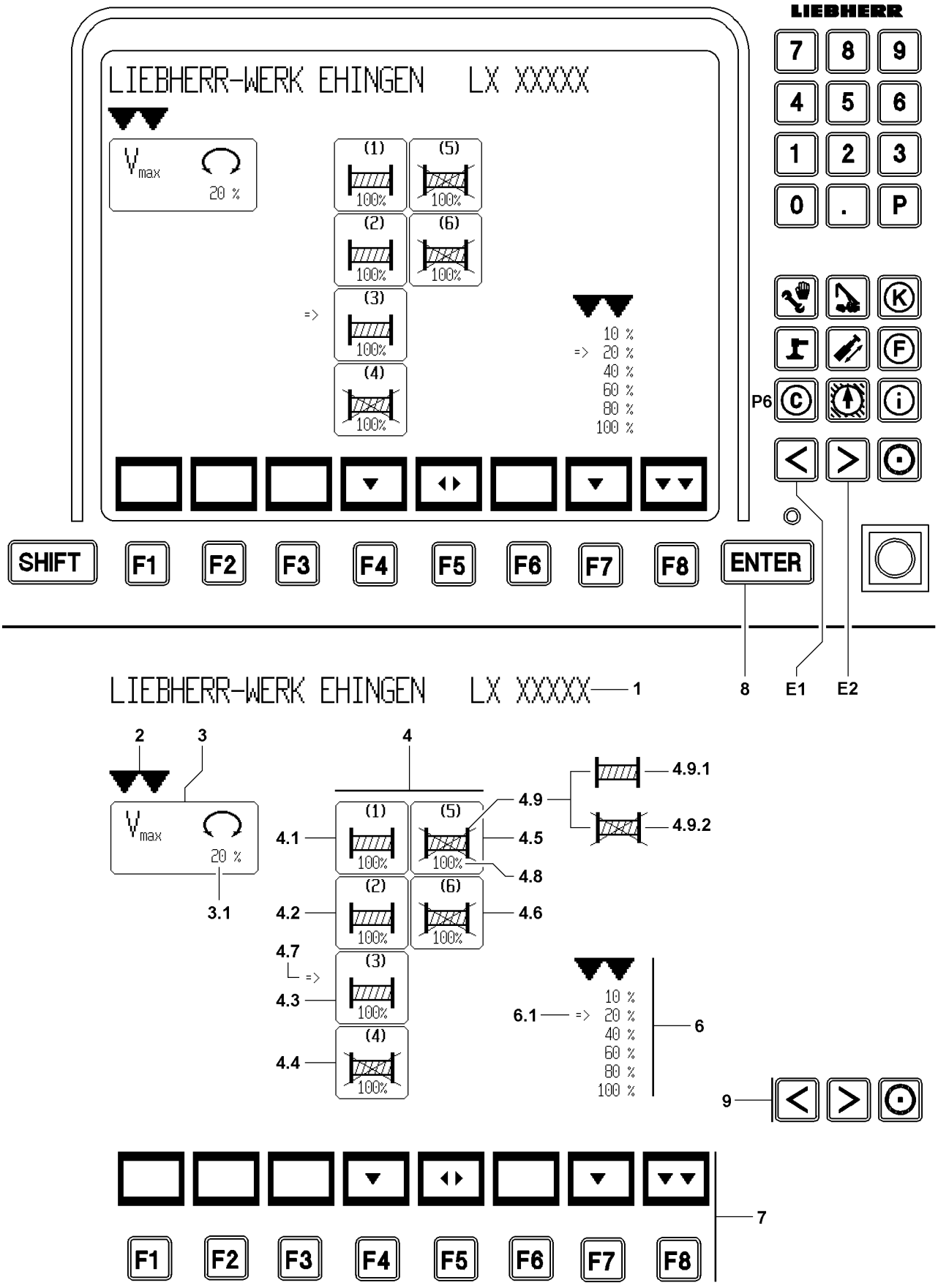
The “Control parameter” program offers the following possibilities:
– Preselection of maximum rotation speed of slewing gear
– Preselection of maximum rotation speed of individual winches
– Activation / deactivation of individual winches

The assembly and bypass switches are monitored during the “Control Parameter” program. If one of these switches is activated during the program, the system immediately switches back to the “Crane operation” program.

DANGER
Risk of accident!
▶ **Never** change the speeds or the activation / de-activation of the winches during a crane movement.

8.1 Starting the program

▶ Press program key **P6**.


LIEBHERR
LIEBHERR-WERK EHINGEN LX XXXXX
V max
20 %
(1) 100%
(2) 100%
(3) 100%
(4) 100%
(5) 100%
(6) 100%
=>
10 %
=> 20 %
40 %
60 %
80 %
100 %
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
P6
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
8 E1 E2
LIEBHERR-WERK EHINGEN LX XXXXX 1
2 3 4
4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.9.1 4.9.2
3.1
6.1 6
9
7
F1 F2 F3 F4 F5 F6 F7 F8

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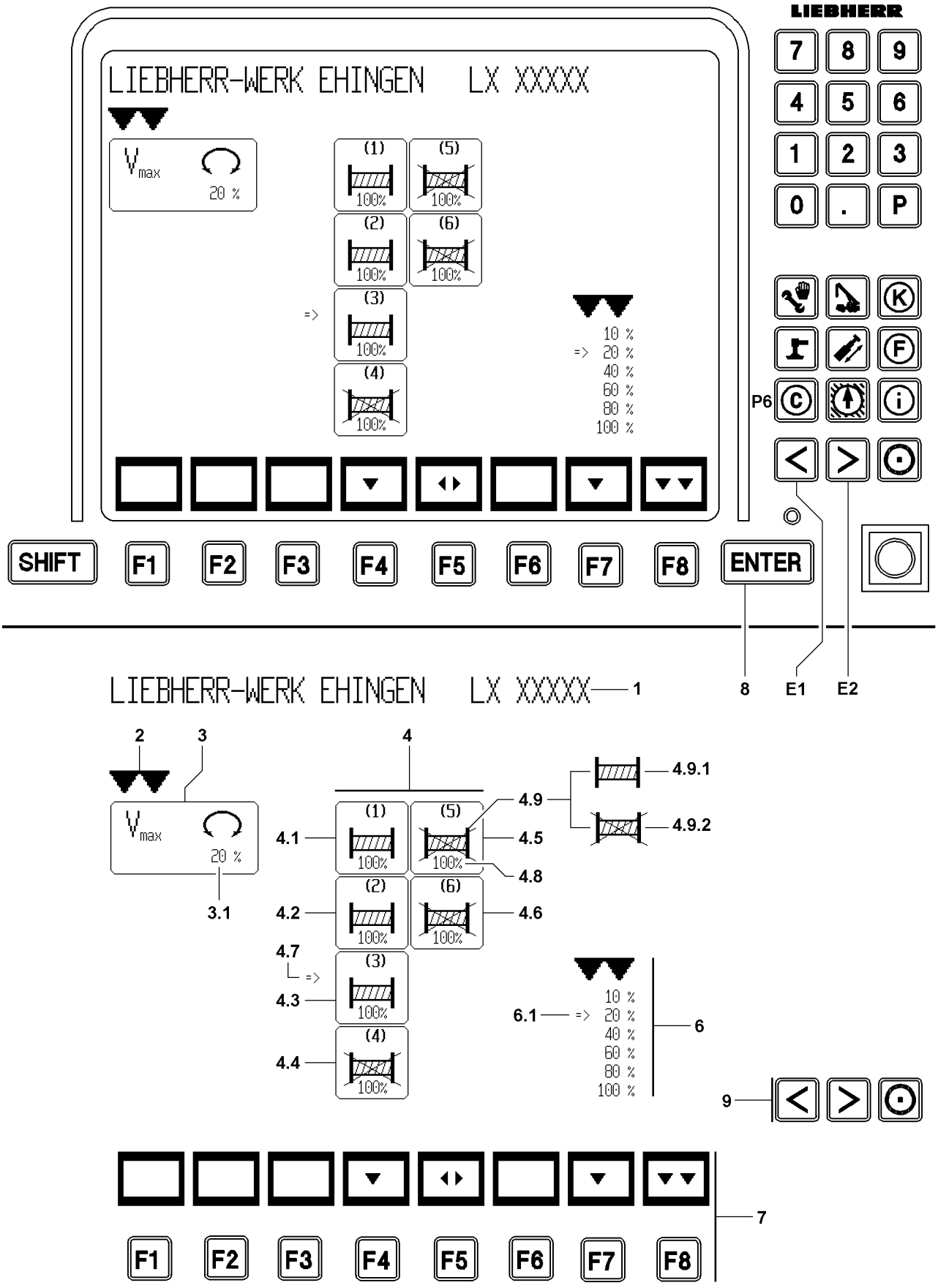
8.2 User interface

1	Crane type	
2	Selector “Icon selection”	• Double arrow pointing down • Select icon
3	“Slewing gear” icon	
3.1	“Maximum rotation speed”	• V_{max} in [%]
4	“Winches” symbol group	
4.1	Winch 1	
4.2	Winch 2	
4.3	Winch 3*	
4.4	Winch 4	
4.5	Winch 5*	
4.6	Winch 6*	
4.7	Winch selector	• Right arrow • Select winch, which “properties” are to be changed
4.8	Speed	• In [%] • See value field with selector
4.9	Winch icon	
4.9.1	Winch activated	
4.9.2	Winch deactivated	
6	Value field with selector	• The percentage values relate to the speed with maximum deflection of the manual control lever, always in relation to the maximum achievable speed of the drive, with 100% preselected speed. Six stages may be preselected.
6.1	Speed selector	• Right arrow • Select percentage value(s) for speed stages
7	Function key line	
F4	Function key	• Select winch
F5	Function key	• Activate / deactivate selected winch(es)
F7	Function key	• Select percentage value of corresponding speed in value field
F8	Function key	• Return to the “Crane operation” program and take over parameter
8	ENTER key	• Take over the selected speed setting for the preset functions
9	Special function keys	• Take over the selected speed setting for the preset functions
E1	Special function key	• Move the selector **2** for selecting icons to the left
E2	Special function key	• Move the selector **2** for selecting icons to the right


LIEBHERR
LIEBHERR-WERK EHINGEN LX XXXXX
V max
20 %
(1)
(2)
(3)
(4)
(5)
(6)
100%
=>
10 %
=> 20 %
40 %
60 %
80 %
100 %
7 8 9
4 5 6
1 2 3
0 . P
P6
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
8
E1
E2
1
2
3
4
3.1
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
4.9.1
4.9.2
6
6.1
9
7

B104609

8.3 Changing the maximum rotation speed of slewing gear

DANGER
Risk of accident!
- ▶ Always adhere to the maximum speeds relative to the boom length and the operating modes during crane operations with loads (according to load charts)!
- ▶ The greater the boom length, the heavier the equipment and the greater the load, the smaller the set “Maximum rotation speed”.
- ▶ **Never** deflect the master switch for the slewing gear to the stop at maximum load.

▶ Using the special function key **E1** or special function key **E2**, select the “Maximum rotation speed” icon **3.1**.

Result:
– Selector (double arrow down) **2** appears above the icon.

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

Result:
– Selector (arrow to right) **6.1** shows the selected percentage value.

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

Result:
– The value of the maximum rotation speed will be accepted.

8.4 Winches

8.4.1 Changing maximum rotation speed

▶ Using the special function key **E1** or special function key **E2**, select the Icon group winches **4**.

Result:
– Selector (double arrow down) **2** appears above the icon group.

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

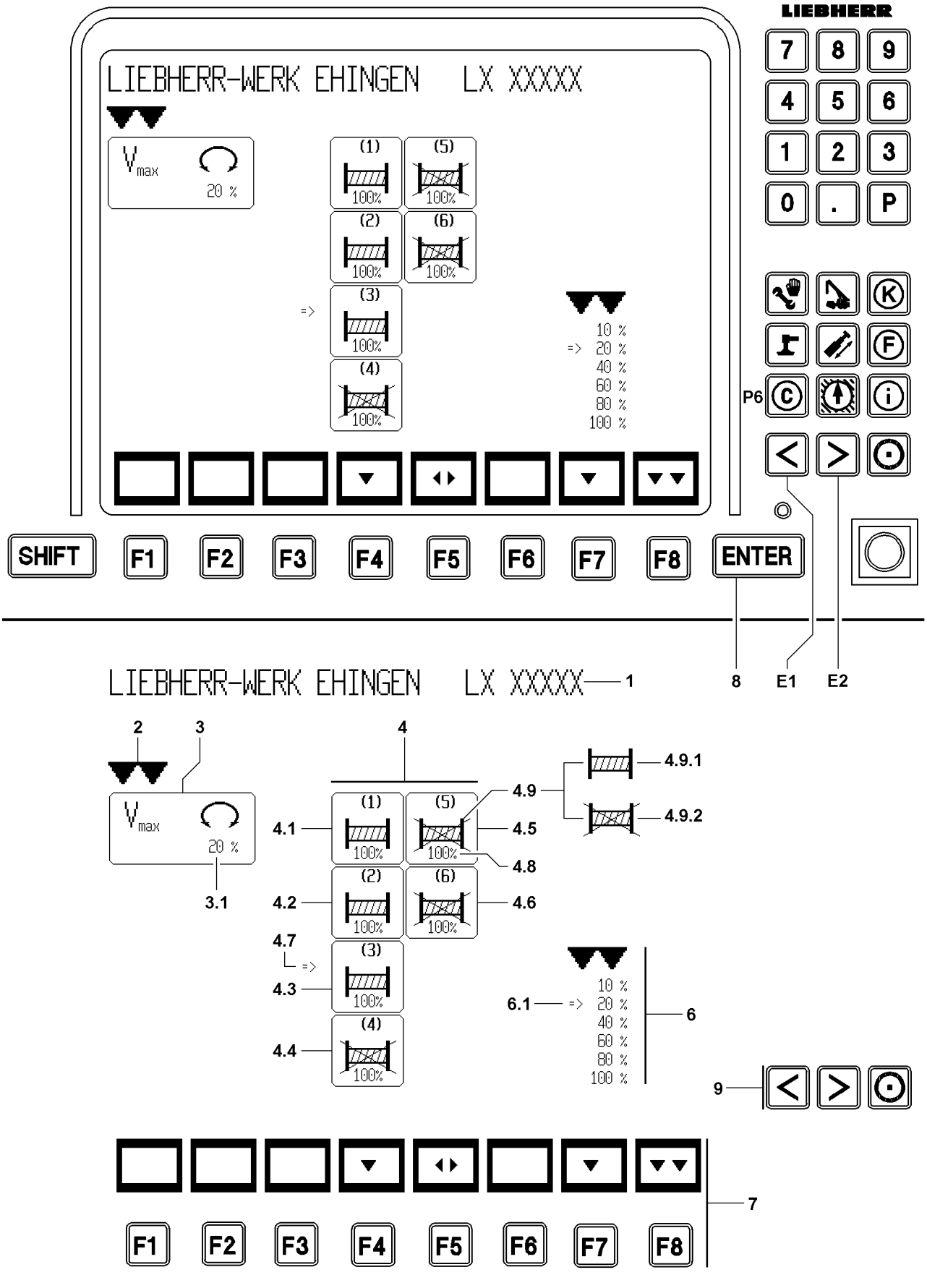
Result:
– Selector (arrow to right) **4.7** shows the selected winch.

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

Result:
– Selector (arrow to right) **6.1** shows the selected percentage value.

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

Result:
– The value of the maximum rotation speed will be accepted.


LIEBHERR
LIEBHERR-WERK EHINGEN LX XXXXX
V max
20 %
(1)
(2)
(3)
(4)
(5)
(6)
100%
=>
10 %
=> 20 %
40 %
60 %
80 %
100 %
7 8 9
4 5 6
1 2 3
0 . P
P6
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
8
E1
E2
1
2
3
4
3.1
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
4.9.1
4.9.2
6
6.1
9
7

B104609

8.4.2 Activating / deactivating individual winches

In order to prevent unintentional activation of a winch that is currently not required, de-activate individual winches.

▶ Using the special function key **E1** or special function key **E2**, select the Icon group winches **4**.

Result:

– Selector (double arrow down) **2** appears above the icon group.

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

Result:

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

▶ Using the function key **F5**, activate or deactivate the selected winch.

Result: The winch icon in the icon changes the appearance:

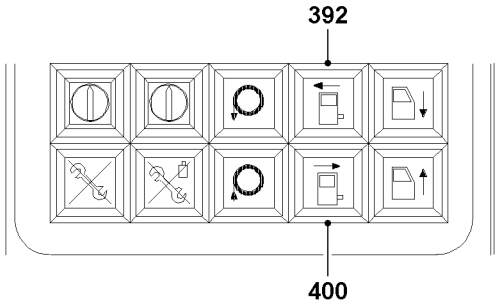
– Winch icon not crossed out = winch activated **4.9.1**.
– Winch icon crossed out = winch deactivated **4.9.2**.

8.5 Switching back to the “Crane operation” program

▶ Press function key **F8**.

Result:

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



B104615

1 Swinging the crane operator's cab into operating / transport position

The crane operator's cab is swung into transport position in front of the turntable.
Make sure that the following prerequisites are met:
– the crane is aligned in horizontal direction,
– the crane engine is running.

1.1 Swinging the crane operator's cab out into operating position

▶ Press the button **392** and “hold”.

Result:
– The crane operator's cab is swung out.

▶ When the end position “swung out” is reached:
Release the button **392**.

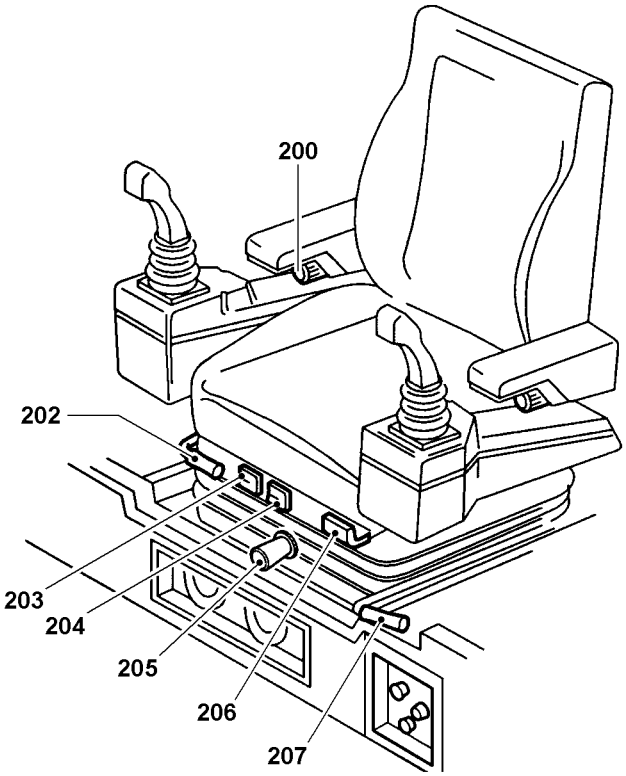
1.2 Swinging the crane operator's cab in into transport position

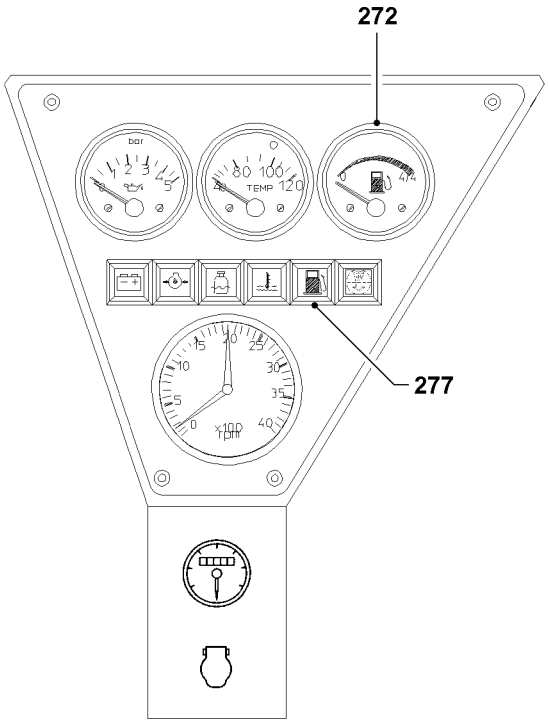
CAUTION
Damage to the crane operator's cab!
Remove the central ballast before swinging the crane operator's cab in into transport position, otherwise the crane operator's cab can be damaged.
▶ Remove the central ballast before swinging the crane operator's cab in.

▶ Press the button **400** and “hold”.

Result:
– The crane operator's cab is swung in.

▶ When the end position “swung in” is reached:
Release the button **400**.





B107262

2 Checks before start up

Various checks must be performed before operating the crane.

2.1 Checking the oil level and filters

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

2.2 Checking the fuel level

Note
Bleed the fuel system.
If the fuel tank has been run dry, then the fuel system must be bled.
- ▶ Do not run the fuel tank dry.

The tank contents is shown on the fuel gauge **272** in the “instrument panel, on the right front”.
- ▶ Check the tank contents on the fuel gauge **272** and add Diesel fuel, if necessary.
- ▶ If the warning light **277** lights up, then the fuel level in the tank is too low:
  Add Diesel fuel.

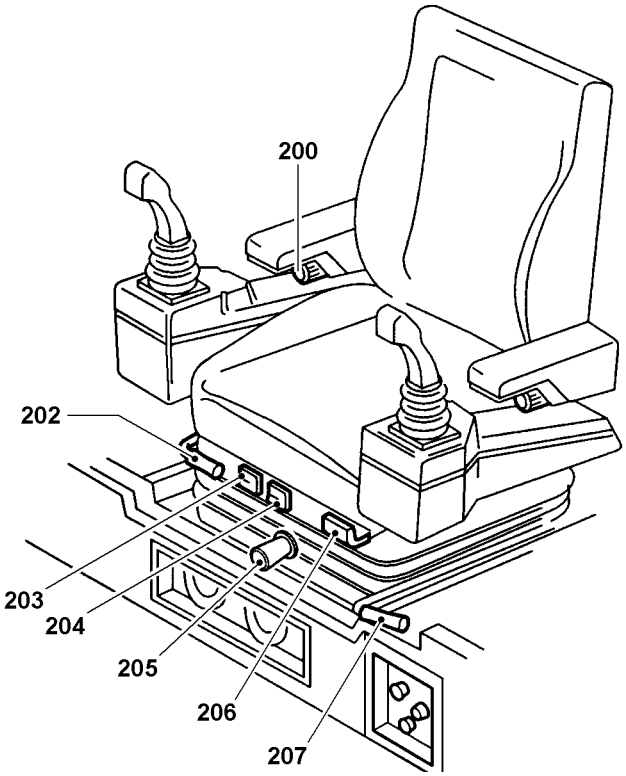
2.3 Checking the coolant level

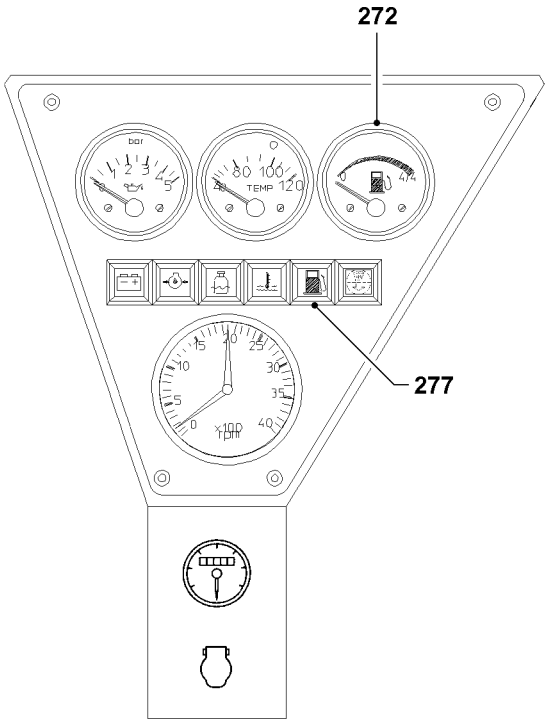
WARNING
Danger of injury due to scalding of the skin!
- ▶ Check the coolant level only when the engine is cold.

Fill coolant expansion tank up to overflow on filler neck.
- ▶ Check the coolant level.

2.4 Checking the central lubrication system

The grease container must be kept filled with grease as specified in the list of lubricants, see chapter 7.05.
- ▶ Check the grease container.





B107262

2.5 Checking general condition of crane

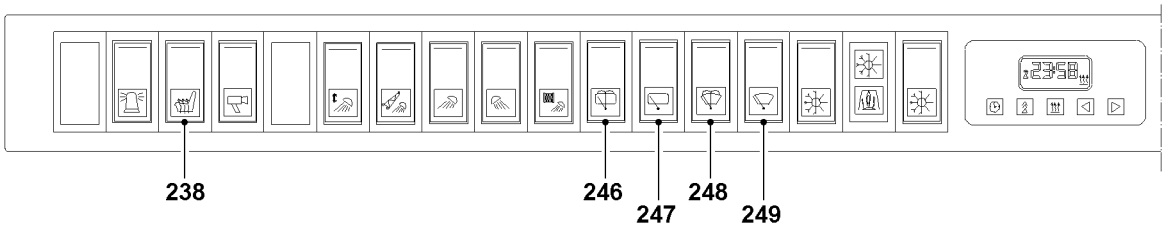
DANGER
Danger of fatal injuries due to falling parts!
Loose parts on the boom can fall when the boom system is erected and kill or severely injure personnel.
- ▶ Before erecting the boom system, check to ensure that there are no loose parts on the boom system - such as pins, spring retainers or ice.

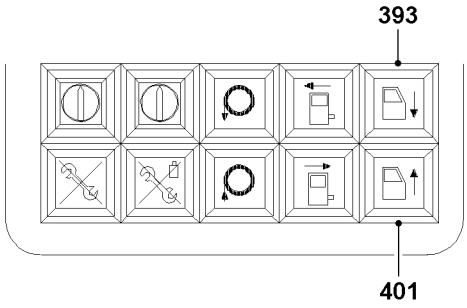
- ▶ Check if the crane is level.
- ▶ Check that the gear ring of the slewing ring connection is clean and greased.
- ▶ Check if the air supply to the oil and water cooler is clear.
- ▶ Check if the side covers are closed and locked.
- ▶ Ensure that there are no people or objects within the danger zone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

3 Work station - Crane operator's cab

3.1 Adjusting the crane operator's seat

The crane operator's seat can be adjusted to suit different body sizes.
- ▶ Adjust the incline of the armrests with the knob **200**.
- ▶ Adjust the incline of the seat surface with the hand lever **202**.
- ▶ Button **203** to adjust lumbar support in lower part of backrest.
- ▶ Button **204** to adjust lumbar support in upper part of backrest.
- ▶ Adjust the seat suspension to suit the body weight with the knob **205**.
- ▶ Adjust the backrest incline with the hand lever **206**.
- ▶ Adjust the horizontal seat adjustment with the hand lever **207**.





B104617

3.2 Turning the seat heater* on

▶ Actuate the switch **238** in the roof console.

Result:

– The crane operator's seat is heated.

3.3 Turning the heater / ventilation on

The cab can be heated or ventilated to the desired temperature. For a detailed description, see chapter 6.01.

3.4 Tilting the crane operator's cab

To provide a better field of vision for the crane operator during crane operation, the crane operator's cab can be tilted upward.

CAUTION

Danger of property damage!

When the crane operator's cab is tilted, the cab door moves back faster to the stop when it is opened and can be damaged.

▶ Hold the cab door by the handle and open slowly.

After completion of working with the crane, return the crane operator's cab to horizontal position.

3.4.1 Tilting the crane operator's cab “up”

▶ Press the button **401** on the instrument panel “on the right”.

Result:

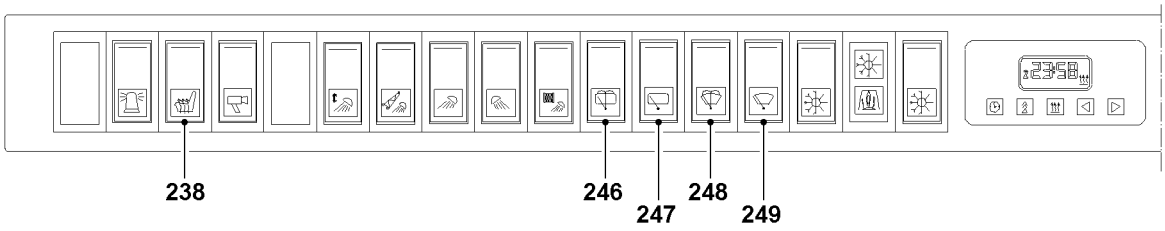
– Crane operator's cab moves upward.

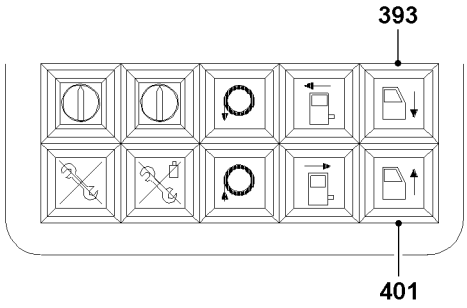
3.4.2 Tilt crane operator's cab “down”

▶ Press the button **393** on the instrument panel “on the right”.

Result:

– Crane operator's cab moves downward.





B104617

3.5 Operating the windshield wiper / washer system

3.5.1 Operating the windshield wiper

The windshield wipers on the front and roof window can be actuated with the 2-stage switch:
– Switch position I: Intermittent
– Switch position II: Wipe

▶ To activate the windshield wiper on the front window:
Actuate the switch **249**.

or

To activate the windshield wiper on the roof window:
■ Actuate the switch **247**.

3.5.2 Operating the windshield washer system

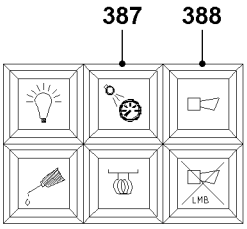
The windscreen wipers on the front and roof windows can be assisted by a windscreen washing system.

Note
▶ Before the start of the cold season, fill the container for the window washer fluid with standard antifreeze mix.

▶ To activate the windshield washer system for the front window:
Press the button **248**.

or

To activate the windshield washer system for the roof window:
■ Press the button **246**.



B104674

3.6 Opening front window

WARNING
Danger of hand injury from trapping!
▶ Be careful with your hands when closing the front window.

A pair of nitrogen gas cylinders provide help to lift the front window.
▶ To open from inside, just press on the front window.

or

If you only want to partly open the window:
■ Use the attached strap to set the desired opening angle.

3.7 Checking the horn

Note
Use of signal horn!
▶ Only use the horn only in dangerous situations to maintain its warning effect.

Before starting work, check that the signal horn is functioning.
▶ Press the button **388**.

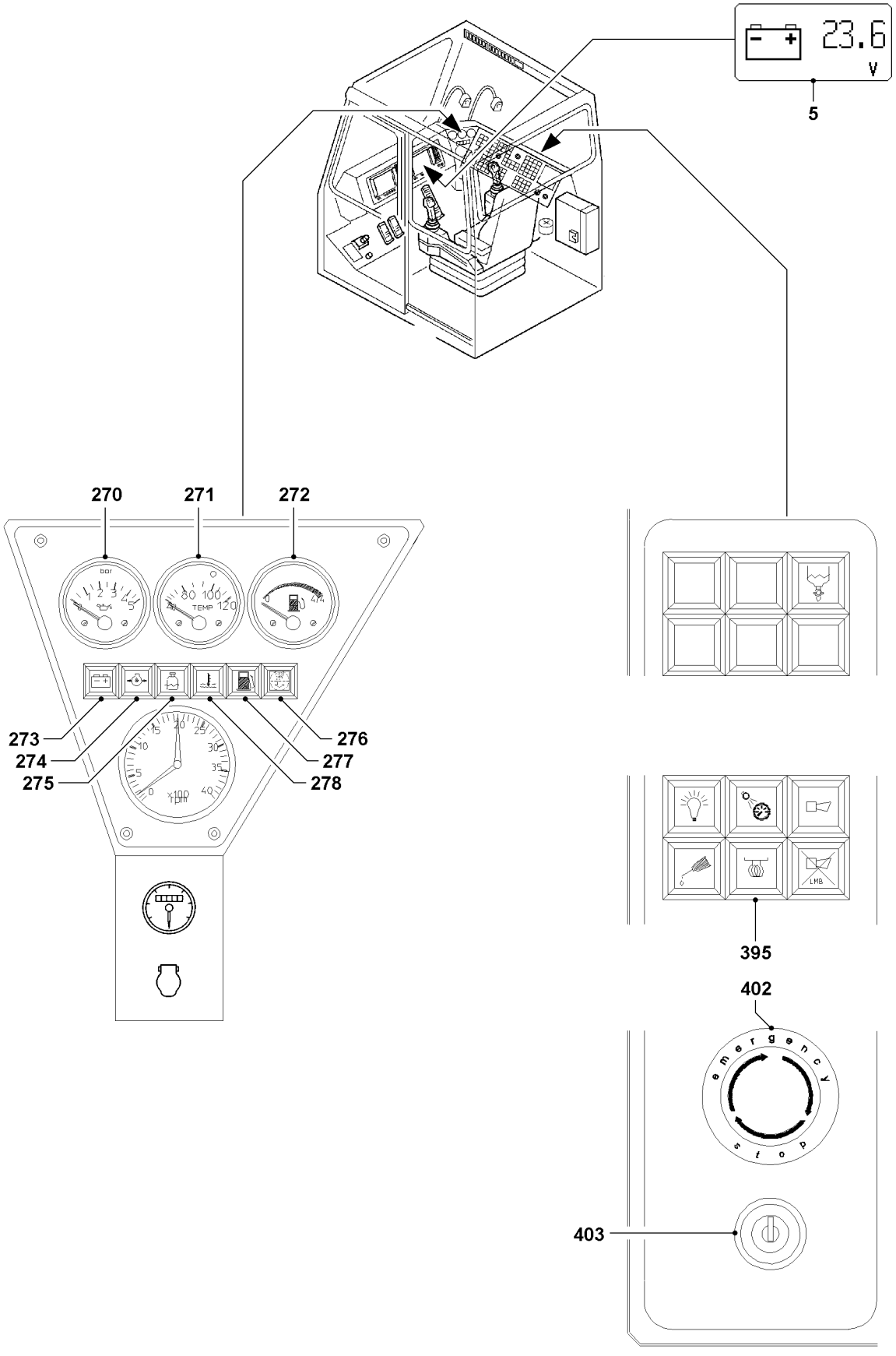
3.8 Turning the instrument panel illumination on / off

▶ Actuate the switch **387**.

Result:
– The instrument panel illumination is turned on.

▶ When the instrument panel illumination is turned on:
Actuate the switch **387**.

Result:
– The instrument panel illumination is turned off.


23.6
V
5
270
271
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273
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278
395
402
403
emergency
stop

B107263

4 Starting and stopping the engine

The engine must be operated according to the separately supplied Engine Operating instructions.
Ensure that the following prerequisite is met:
– the battery master switch is turned on.

4.1 Starting the engine

▶ Turn the ignition switch **403** to position “I”.

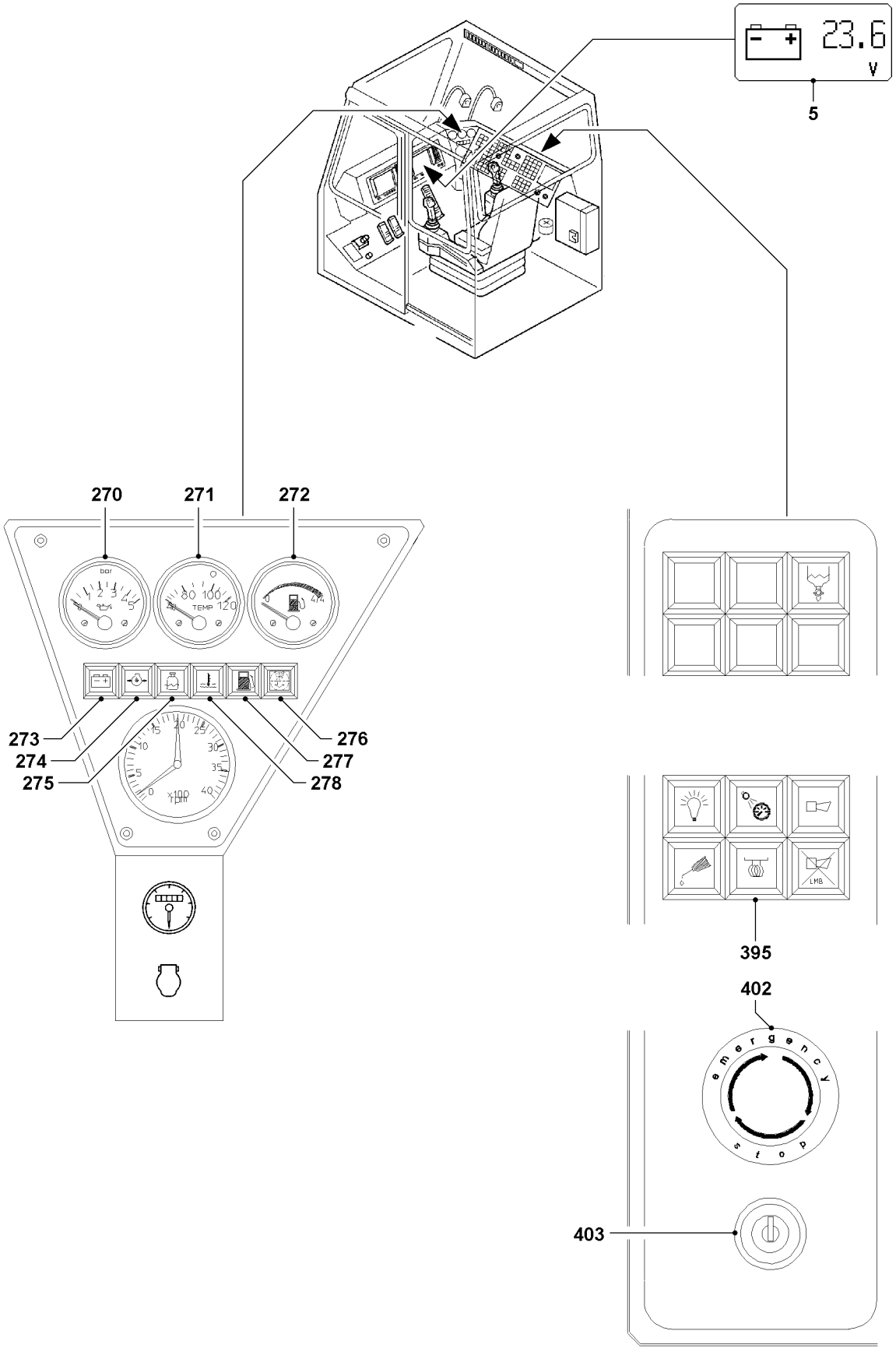
Result:
– The warning light **273** lights up.
– The indicator light **395** blinks
The engine is ready to start.

CAUTION
Danger of property damage!
▶ Start the engine only when the warning light **273** lights up and the indicator light **395** blinks.

▶ Turn the ignition switch **403** to position “II”.
▶ Start the engine.

Troubleshooting
The engine does not start after a maximum of 10 seconds.
▶ Wait for 1 minute. The starter can be operated three times for 10 seconds per attempt with a pause in between of one minute each time.

▶ Check the instruments after starting the engine.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276
277
278
395
402
403
emergency
stop

B107263

4.2 Starting the engine with heat flange control

To improve the cold start procedure, the engine is equipped with a heater flange. The heater flange control turns on at a coolant temperature below 10 °C. The heater flange control is also activated automatically at a coolant temperature above 25 °C and a charge air temperature of less than -10 °C. This turn on condition is required for a warm engine and very cold air.

When the engine is started with heater flange control, the low idle speed is automatically increased to assist the battery.

WARNING

Functionality of the battery in the cold season.

The starting capacity of the battery is considerably reduced in cold temperatures: For example, at a temperature of -10 °C, the battery is at only 66 % of its normal capacity.

▶ Once the engine has been turned off, store batteries in a heated room, if possible.

▶ Turn the ignition switch **403** to position “I”.

Result:

– The indicator light **395** lights up first and then starts to blink after a short time.
The engine is ready to start.

▶ Turn the ignition switch **403** to position “II”.

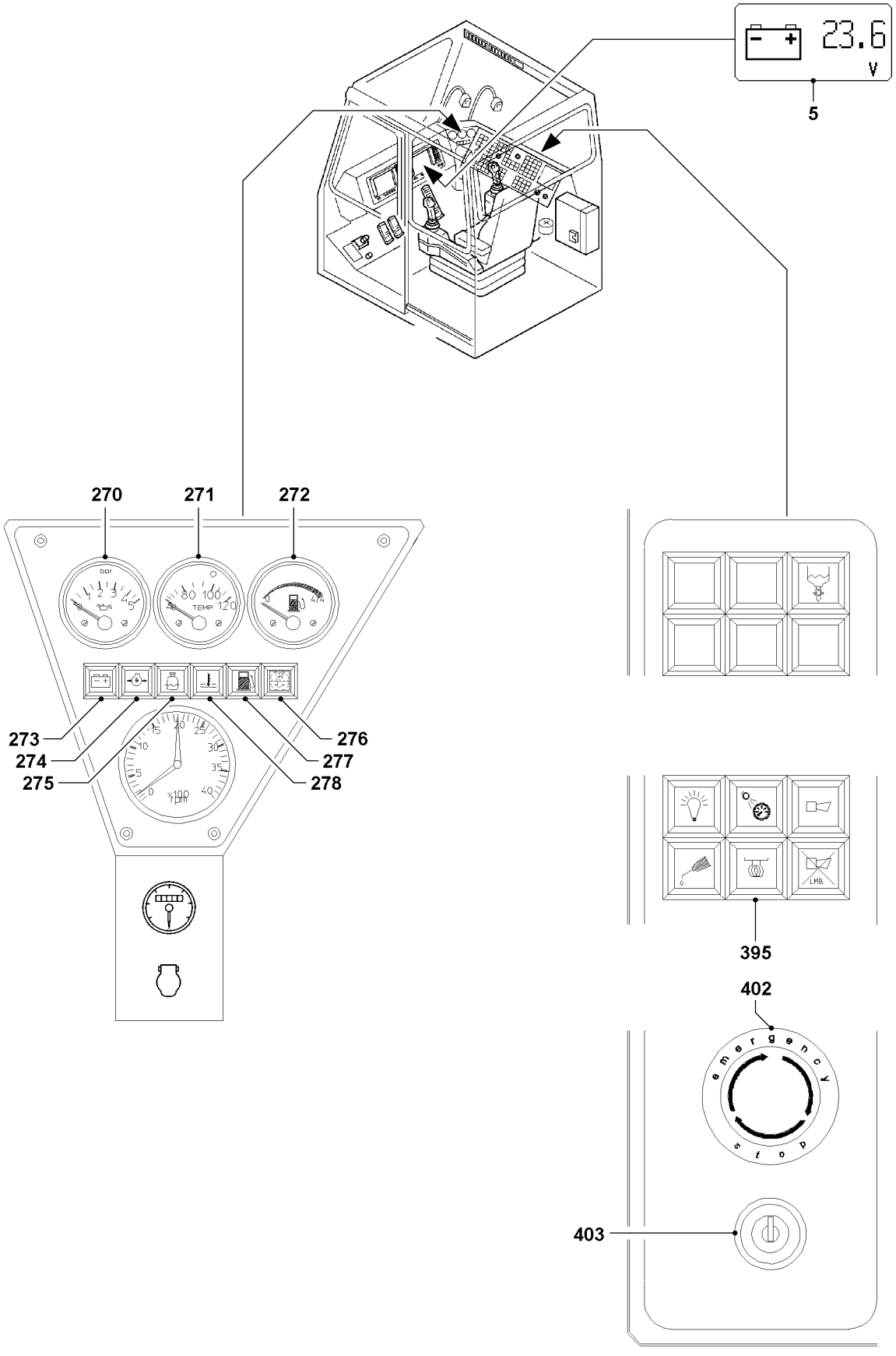
▶ Start the engine.

Troubleshooting

Is the indicator light **395** flashing rapidly?

The control unit has identified a defect on the heat flange system.

▶ Remedy the problem.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395
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403
emergency
stop

B107263

4.3 Checking the instruments after starting the engine

As soon as a stable voltage is present with the engine running, the electric crane control and the LICCON computer system are turned on automatically. A self-test of the microprocessor system follows, and after a few seconds the configuration screen appears on the monitor.
The following icons must turn off when the engine is running:

– Warning light **274** “Oil pressure diesel engine”
– Warning light **273** “Charge control”
– Indicator light **395** “Preheat engine / heat flange”

4.3.1 Checking the oil pressure - Diesel engine

▶ Check the oil pressure on the oil pressure display **270**.

Troubleshooting
The warning light **274** “Oil pressure diesel engine” does not turn off or lights up during crane operation?
The engine oil pressure is too low. The engine can be damaged as a result of insufficient oil pressure.
▶ Turn the engine off immediately and determine the cause.

4.3.2 Checking the coolant temperature

▶ Check the coolant temperature on the temperature display **271**.

Troubleshooting
The warning light **278** “Coolant temperature too high” lights up during crane operation?
The coolant temperature is too high. Excessive coolant temperature can lead to engine damage.
▶ Turn the engine off immediately.

4.3.3 Checking the tank contents

▶ Check the fuel gauge **272** “Tank contents”.

4.3.4 Checking the coolant level

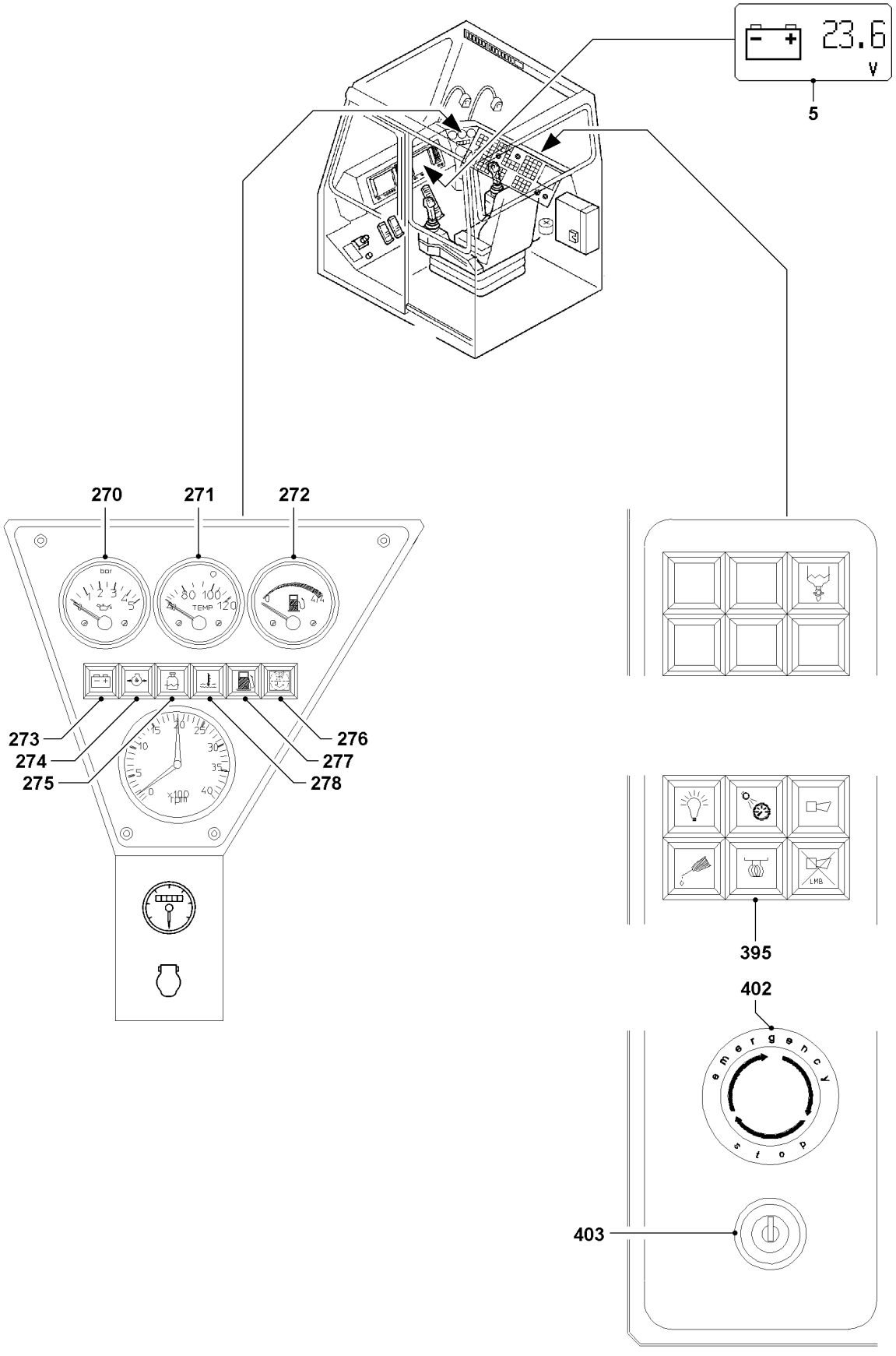
▶ Check the warning light **275** “Coolant level too low”.

4.3.5 Checking the air filter

▶ Check the warning light **276** “Air filter dirty”.

4.3.6 Checking the battery voltage

▶ Check the “Battery voltage” icon **5** in the operating screen (monitored auxiliary functions) of the LICCON monitor 0, see chapter 4.02.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395
402
403
emergency
stop

B107263

4.4 Turning the engine off

4.4.1 Turning the engine off

After operation at full engine output or with very high coolant temperature (above 95 °C), let the engine run without load for 1- 2 minutes at low idle speed.

▶ Turn the ignition switch **403** back to the stop.

▶ Pull the ignition key and store it in a safe place.

4.4.2 Turning off the engine in the event of danger

CAUTION

Operating the emergency off switch

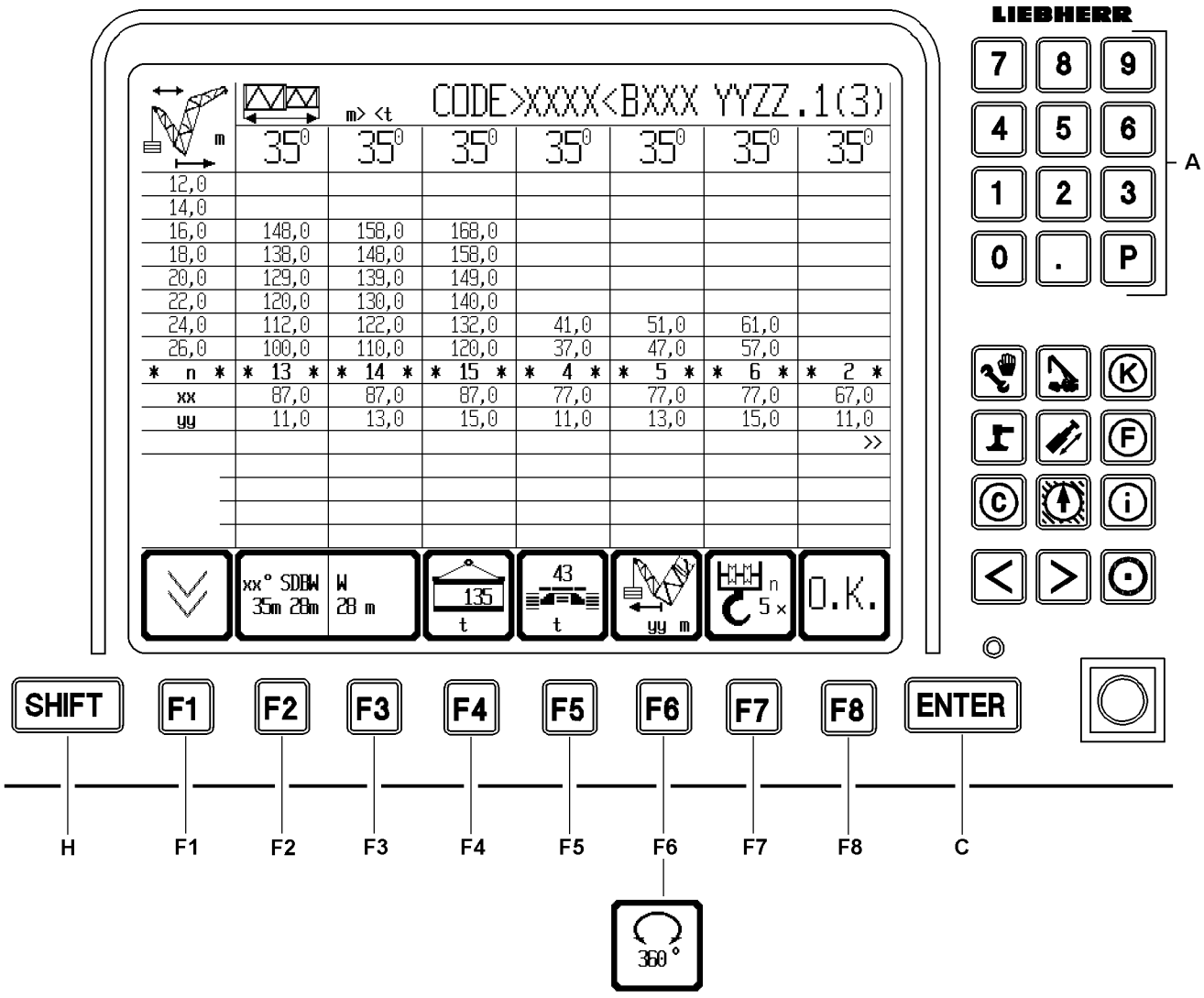
▶ Only use the emergency off switch **402** in the event of a clear emergency.

▶ Use of the emergency off switch **402** for normal operation is not permitted!

▶ Press the emergency off switch **402**.

Result:

– The crane will be turned off immediately.


LIEBHERR
CODE>XXXX<BXXX YYZZ.1(3)
m> <t
35° 35° 35° 35° 35° 35° 35°
12,0
14,0
16,0 148,0 158,0 168,0
18,0 138,0 148,0 158,0
20,0 129,0 139,0 149,0
22,0 120,0 130,0 140,0
24,0 112,0 122,0 132,0 41,0 51,0 61,0
26,0 100,0 110,0 120,0 37,0 47,0 57,0
* n * * 13 * * 14 * * 15 * * 4 * * 5 * * 6 * * 2 *
xx 87,0 87,0 87,0 77,0 77,0 77,0 67,0
yy 11,0 13,0 15,0 11,0 13,0 15,0 11,0
>>
xx° SDBW
35m 28m
W
28 m
135
t
43
t
yy m
n
5x
O.K.
7 8 9
4 5 6
1 2 3
0 . P
A
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
F1
F2
F3
F4
F5
F6
F7
F8
C
360°

B104619

5 LICCON computer system after engine start

The LICCON computer system is only operational with the engine running.

5.1 Waiting for the boot up phase

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

▶ Wait for the boot up phase.

Result:

– The operating mode preselection appears on the LICCON monitor, see chapter 4.02.
– The configuration screen appears on the LICCON monitor.

Normally, the most recently set configuration state and reeving number will be displayed.

If a master switch is moved away from the zero position during the boot up phase, the function circuit of the electrical safety chain is interrupted.

▶ In this case:
Turn the engine and the ignition off and restart.

Troubleshooting

An error message appears on the LICCON monitor?

▶ Turn the engine and the ignition off and restart.

▶ The LICCON computer system automatically displays the troubleshooting display.

Troubleshooting

The LICCON monitor does not show the most recently set configuration state and reeving number?

If there has been a data loss in the memory (cold start), then the first valid configuration appears in the configuration screen. The reeving number is set to “0”.

▶ Set the configuration state and reeving number again.

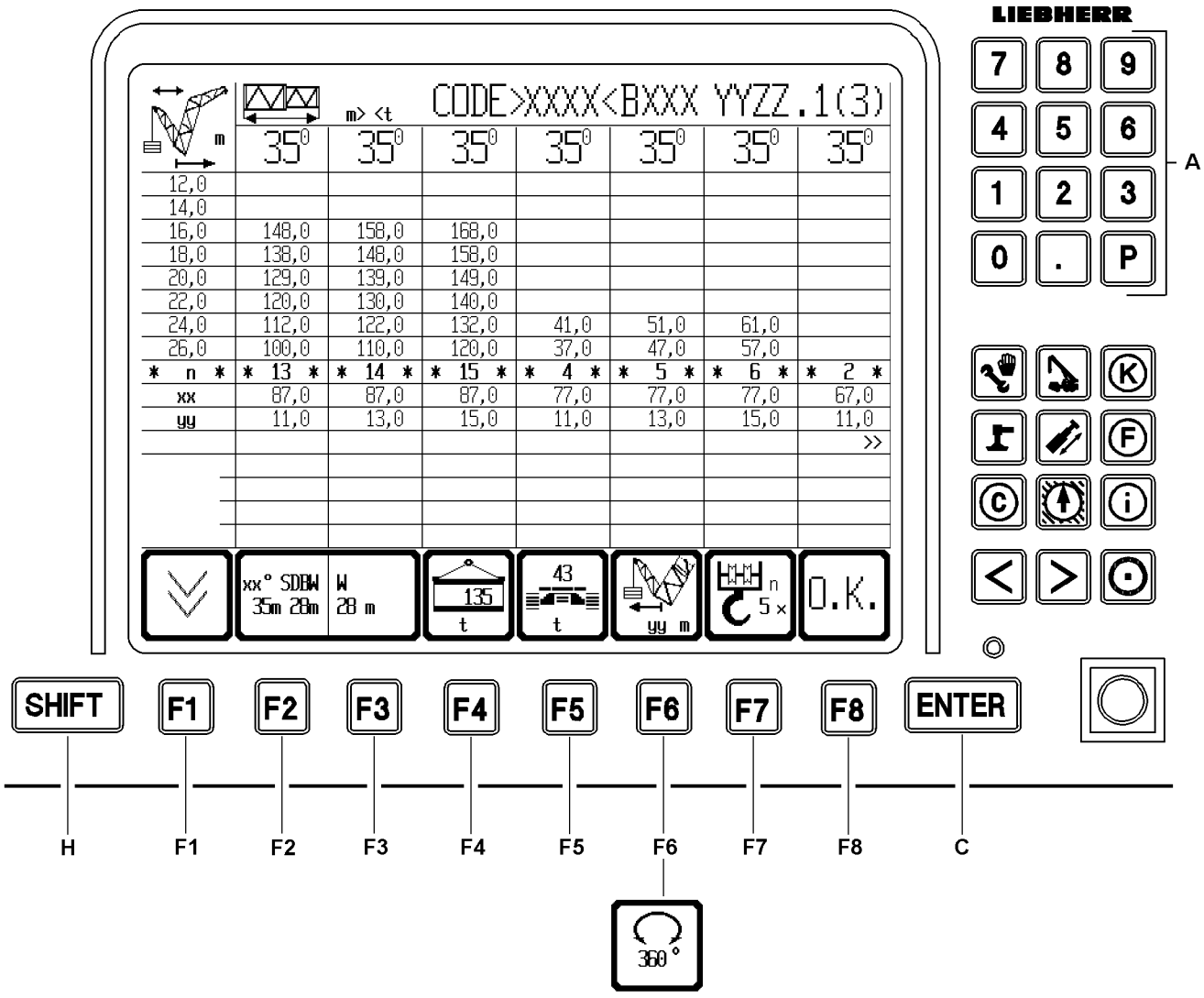
5.2 Taking over the previously selected configuration and hoist rope reeving

Check in the operating screen if the correct short code and the correct reeving number have been set, see chapter 4.02.

▶ If the settings on the operations screen are correct:
Press function key.

Result:

– The “Configuration” program is terminated and the adjusted parameters are accepted for the newly started “Crane operation” program.


LIEBHERR
CODE>XXXX<BXXX YYZZ.1(3)
m> <t
35° 35° 35° 35° 35° 35° 35°
12,0
14,0
16,0 148,0 158,0 168,0
18,0 138,0 148,0 158,0
20,0 129,0 139,0 149,0
22,0 120,0 130,0 140,0
24,0 112,0 122,0 132,0 41,0 51,0 61,0
26,0 100,0 110,0 120,0 37,0 47,0 57,0
* n * * 13 * * 14 * * 15 * * 4 * * 5 * * 6 * * 2 *
xx 87,0 87,0 87,0 77,0 77,0 77,0 67,0
yy 11,0 13,0 15,0 11,0 13,0 15,0 11,0
>>
xx° SDBW
35m 28m
W
28 m
135
t
43
t
yy m
n
5x
O.K.
7 8 9
4 5 6
1 2 3
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A
K
F
C
i
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F1
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F3
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F5
F6
F7
F8
ENTER
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F1
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F3
F4
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F6
F7
F8
C
360°

B104619

5.3 Selecting the new configuration and hoist rope reeving

The selected and displayed configuration can be changed with the function keys or by entering the short code.

5.3.1 Selecting the new configuration using function keys

- ▶ Press the function key **F2** until the desired main geometry status is selected.
- ▶ Press the function key **F3** until the desired accessory status is selected.
- ▶ Press the function key **F4** until the desired counterweight is selected.
- ▶ Press the function key **F5** until the desired central ballast is selected.
- ▶ Press the function key **F6** until the desired slewing range is selected for crane operation **without** derrick ballast.
- ▶ Press the function key **F6** until the desired derrick ballast range is selected for cranes **with** variable derrick ballast.
- ▶ Press the **ENTER C** key.
- ▶ Check the set load chart.

5.3.2 Selecting new configuration with short code

Take the short code from the load chart.

- ▶ Enter the 4-digit short code via the keyboard **A**.
- ▶ Confirm the entry with the **ENTER C** key.

Result:

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

For a more detailed description of the “Configuration” program, see chapter 4.02.

- ▶ Check the set load chart.

5.3.3 Selecting the new hoist rope reeving

- ▶ Press the function key **F7** until the desired reeving number is selected.

or

- ■ Press function keys **SHIFT** and **F7** until the desired reeving number is selected.

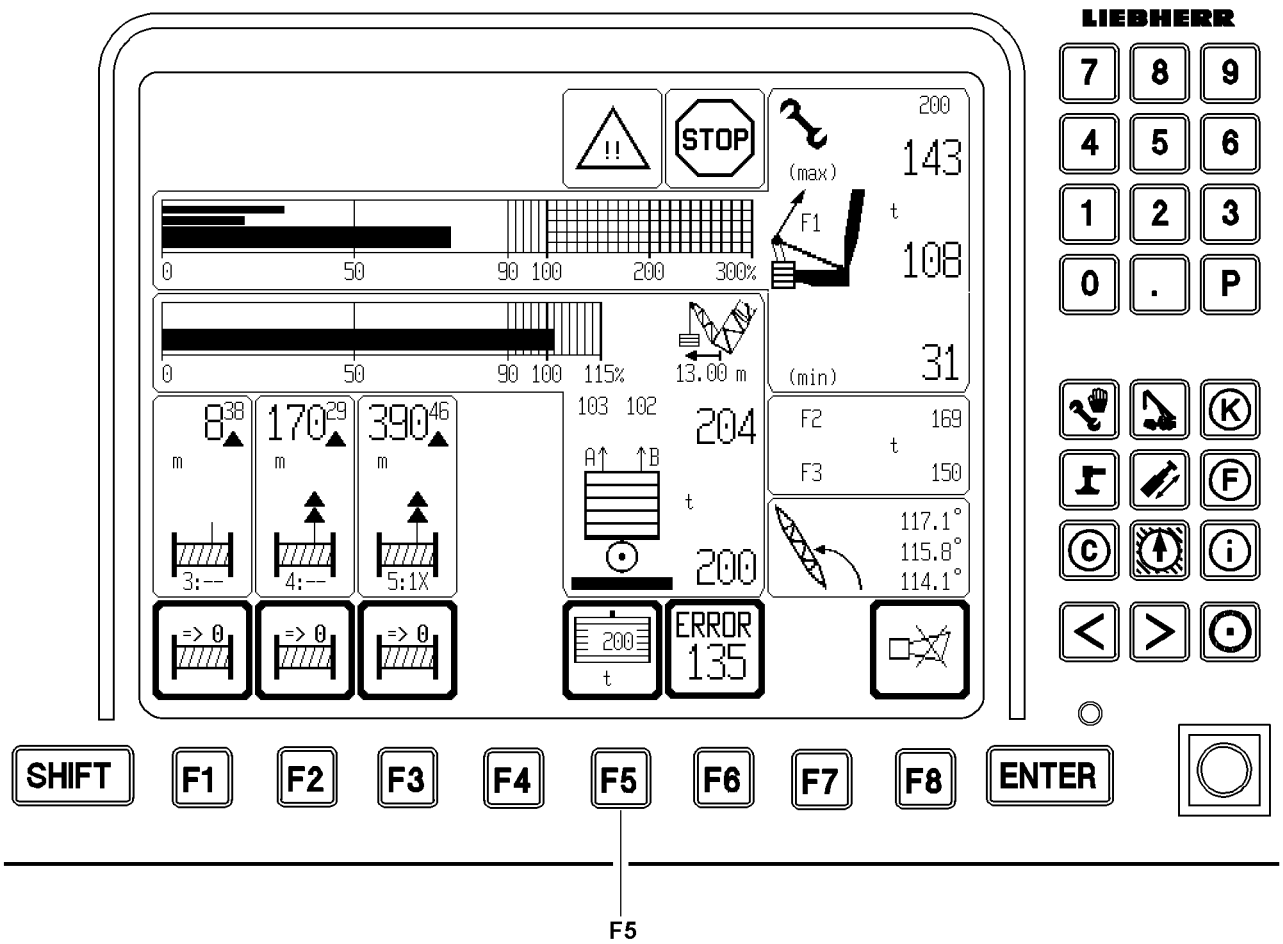
5.3.4 Check the new configuration and hoist rope reeving and accept

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

Result:

– The “Configuration” program is terminated.
– The set parameters are accepted into the restarted “Crane operation” program.

- ▶ Check in the crane operation screen if the correct short code and the correct reeving number have been set, see chapter 4.02.



B104620

5.4 Setting the Control Parameters

Note

▶ For a detailed description of the control parameters and their settings, refer to chapter 4.02.

5.5 Setting the derrick ballast

Note

▶ The entry of the derrick ballast is made on the LICCON monitor 1 with function key **F5**, see chapter 4.02.

CAUTION

Danger of accident due to incorrect derrick weight entry!

▶ For operation with derrick ballast, always set the current size of the derrick ballast. This includes the weight of the empty ballast pallet or the empty ballast trailer and the weight of the placed derrick ballast plates.

DANGER

Danger of accident due to incorrect derrick ballast value!

The crane can topple over and personnel can be fatally or seriously injured due to incorrectly edited derrick ballast value.

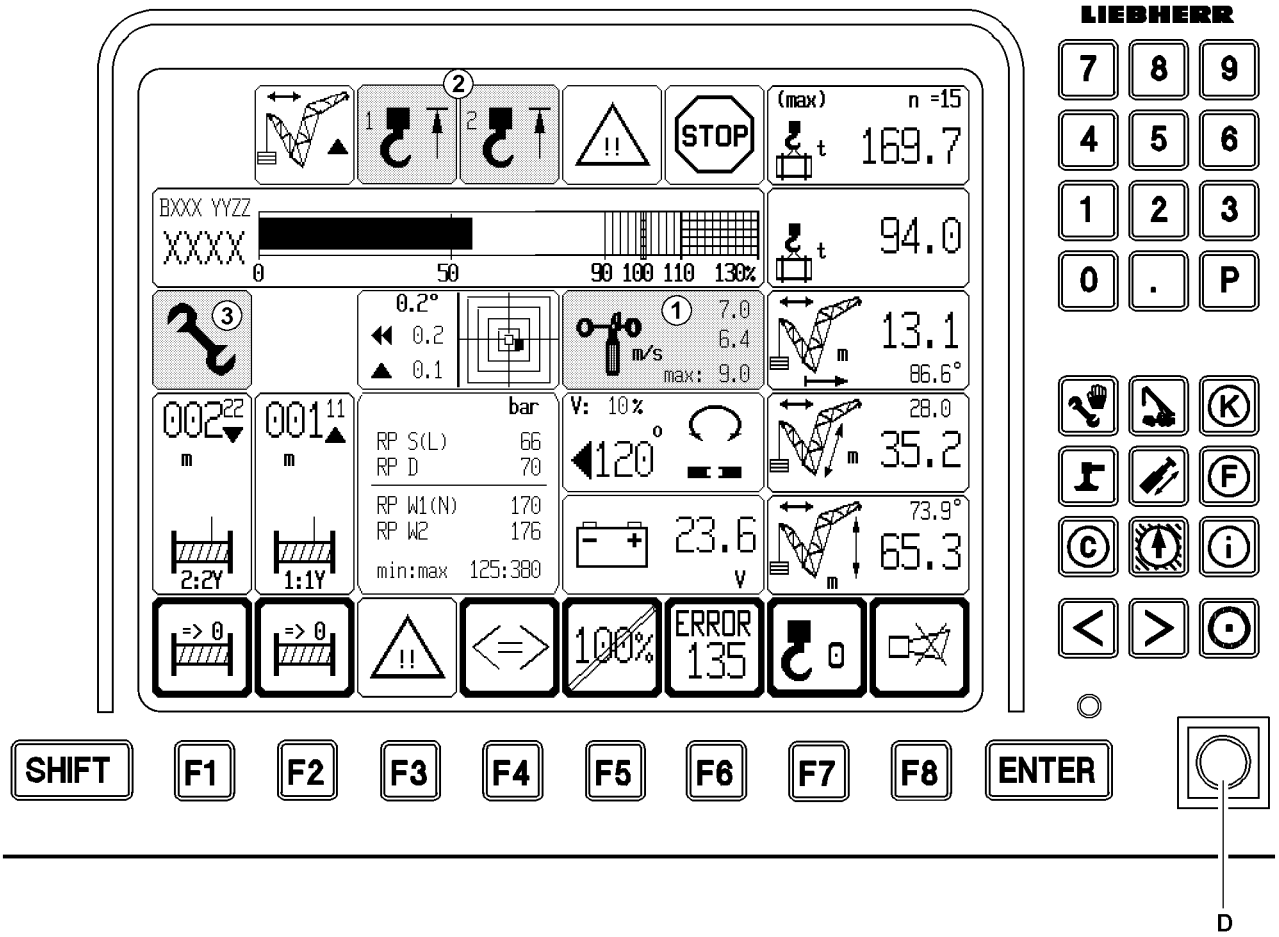
▶ The set derrick ballast value **must** match the actually installed derrick ballast weight.

▶ If a derrick ballast value is set, which is too low, then the derrick ballast utilization display is too large.

▶ If a derrick ballast value is set, which is too large, then the derrick ballast utilization display is too small and the ballast utilization dependent safety shut offs of test point 1 (F1min) are ineffective.

Note

▶ While the derrick ballast value is edited, the remaining monitor displays cannot be updated. The operating view on the monitor is frozen and can even show incorrect values. Therefore: Close off ballast editing quickly. If a master switch is actuated during ballast editing, then ballast editing is automatically aborted. The old value of the placed derrick ballast (BA_placed) remains in the derrick ballast icon.


LIEBHERR
7
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3
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P
STOP
(max)
n =15
169.7
94.0
BXXX YYZZ
XXXX
0
50
90 100 110 130%
0.2°
0.2
0.1
7.0
6.4
max: 9.0
m/s
13.1
86.6°
002 22
001 11
m
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
V: 10%
120°
28.0
35.2
23.6
V
73.9°
65.3
2:2Y
1:1Y
=> 0
100%
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D

B104962

1 General

1.1 Safety systems

Every time the crane is operated, the crane operator is required to satisfy himself about the functionality of the safety systems.

DANGER
Danger of accident from defective warning and safety systems!
Operating the crane with defective warning and safety systems can lead to life-threatening accidents!
- ▶ Make sure that all warning and safety systems are functioning.
- ▶ Make sure that the LICCON overload protection is functioning.

Note
- ▶ The crane operator must know and observe the shut off diagrams in the separately supplied electric wiring diagram.

1.2 Leveling instrument

To ensure the working safety of the crane, the crane must be aligned horizontally on level ground with sufficient load bearing capacity.

DANGER
Risk of accident due to toppling crane!
If the crane is not aligned horizontally, it can tip over. For the maximum approved deviation from the horizontal position of the crane, refer to load charts.
- ▶ Ensure that crane is level.

1.2.1 Spirit level on the superstructure

The horizontal alignment of the crane is displayed in the LICCON computer system both graphically and numerically.

2 LICCON computer system

The LICCON computer system is a system for 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 chapter 4.02.

2.1 Overload protection

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.

DANGER
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.

DANGER
Danger of accident due to incorrect operation of the crane!
Due to incorrect operation of the crane, the overload protection does not become effective or the shut off does not occur quickly enough. In these cases, accidents are possible despite an installed overload protection!
▶ Be especially vigilant!

The overload protection monitors, but does not shut off:
– Wind speed
  Note:
  If the current wind speed value exceeds the displayed maximum value, the maximum value starts to blink and the acoustic alarm “Short horn” sounds.
  The crane movements will not be shut off!

The overload protection registers, but does not monitor:
– Crane incline
– Rotation angle on 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
Danger of toppling or destroying the crane!
▶ The overload protection may not be used as an operational shut off device for crane movements of any kind.
▶ The overload protection must be adjusted to the current equipment configuration of the crane before crane operation to match the load chart. Only that way can it fulfill its protective task.
▶ After every set up condition change and/or boom configuration, the overload protection device must be reset to the corresponding set up condition and/or boom configuration.
▶ The crane operator must meet his duty of caution and attention, despite the overload protection.

2.1.1 Failure of the overload protection

It is technically possible to operate the crane without the LICCON.

DANGER
Serious risk of accidents!
If the LICCON system is no longer functioning properly because of a error in the LICCON monitor, the CPU or the power supply, then the crane can be operated in emergency mode with utmost caution, if absolutely necessary.
▶ In this case, the crane operator bears full responsibility.
▶ The crane operator may **not** use emergency mode if he is **not** fully aware of the extent of the monitoring tasks and dangers associated with that mode.

2.1.2 Procedure to follow in case of a problem

Basically, all conditions in the load charts must be strictly adhered to, even those not monitored by the LMB:

– The exact weight of the load, including load tackle, must be known.
– The current crane geometry, such as main boom angle, derrick angle, luffing jib angle as well as the derrick ballast radius and the pulled derrick ballast weight must be known and match the given values in the corresponding load chart. Radius, boom angle and derrick ballast radius must be measured manually.

In the event of a LICCON monitor failure:
Replace LICCON monitor with a functioning substitute monitor.

In the event of a CPU failure:
Replace CPU with a functioning substitute CPU.

In the event of power supply failure:
Replace the power supply unit with a functioning substitute power supply unit.

If one or more sensors fail, it is possible to continue work manually, if the “missing values” are monitored manually and agree with the values in the load chart that is used.

2.1.3 Ending a load lift

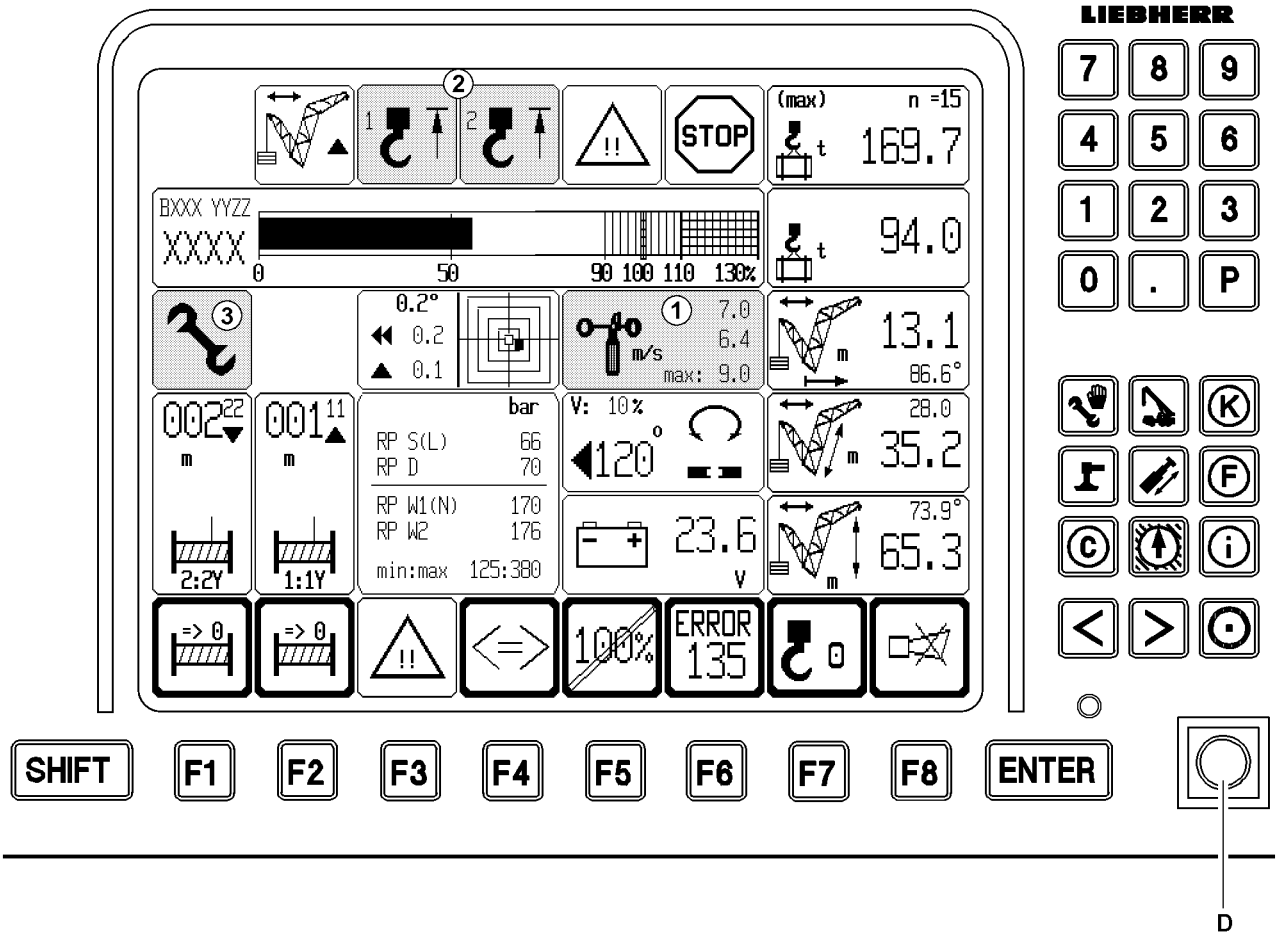
If the problem cannot be remedied using these measures, we recommend:

– Before continuing the load lift, contact the nearest Liebherr Service center or the Liebherr-Werk in Ehingen.

If this is not possible, then the load lift can be completed with utmost caution, as follows:

– All values, which are needed for determining the current set up condition and the associated load chart must be measured and/or manually determined.

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


LIEBHERR
7
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P
STOP
(max)
n =15
169.7
94.0
BXXX YYZZ
XXXX
0
50
90 100 110 130%
0.2°
0.2
0.1
7.0
6.4
max: 9.0
m/s
13.1
86.6°
002 22
001 11
m
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
V: 10%
120°
28.0
35.2
23.6
V
73.9°
65.3
2:2Y
1:1Y
=> 0
100%
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D

B104962

3 General safety equipment

3.1 Wind warning system

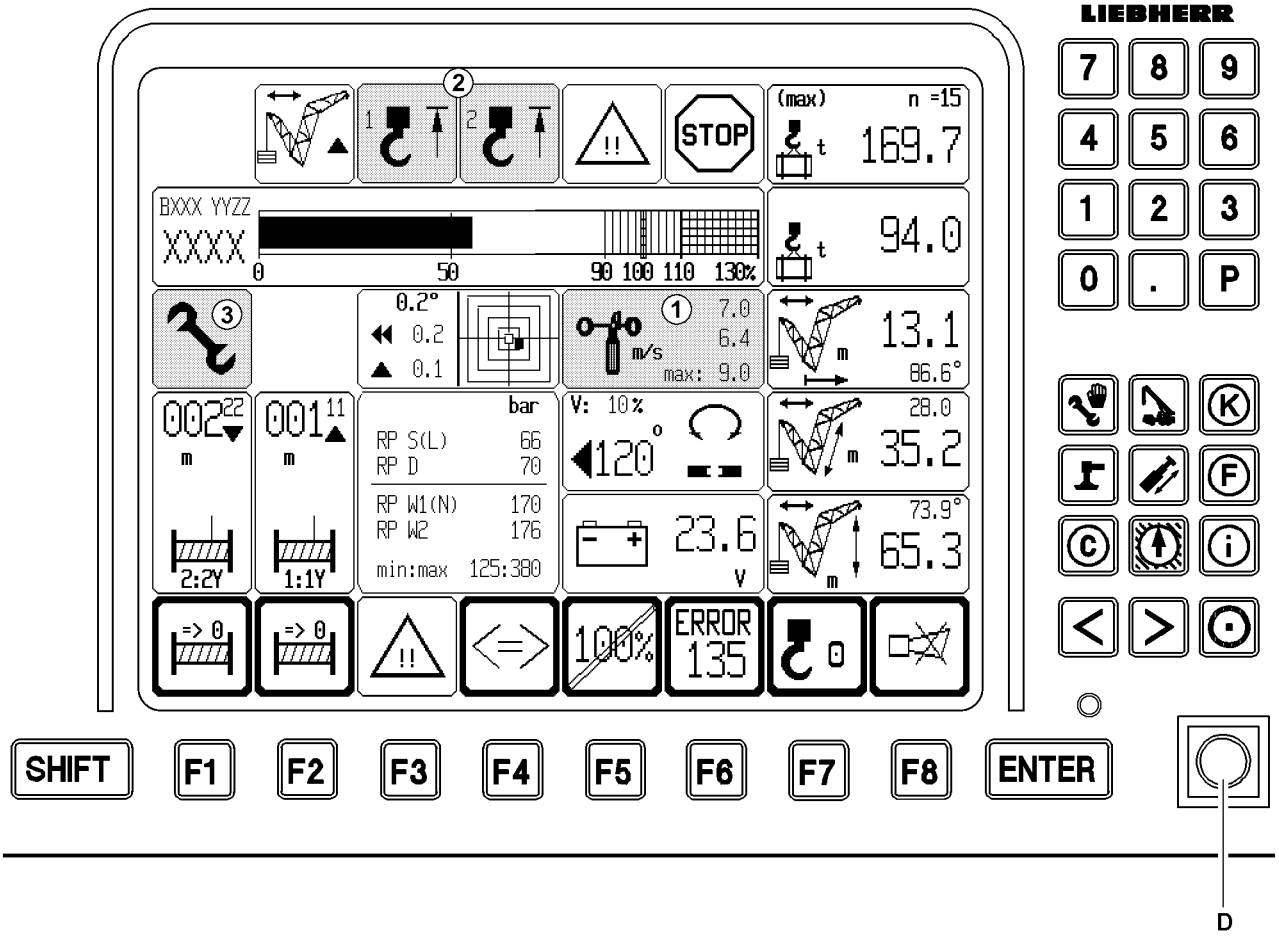
The wind warning appears in the operating view of the LICCON computer system.
If the current wind speed exceeds the displayed maximum value, the “Wind warning” icon **1** starts to blink and the acoustic alarm “Short horn” sounds. But there is **no shut off** of crane movements.

DANGER
Danger of accidents from exceeding the permitted wind speed!
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 switch weight with the hook block.
When the hoist limit switch is actuated, the icon **2** appears in the operations screen. The crane movements “Lift” and “Luffing down” are turned off.

DANGER
Risk of accident!
By bypassing the hoist limit switch, life threatening situations can occur for the operating / auxiliary personnel and severe property damage can occur on the crane.
▶ During crane operations, only bypass the hoist limit switch with the bypass key button **D** if an observer 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 movements 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.


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
STOP
(max)
n =15
169.7
94.0
BXXX YYZZ
XXXX
0
50
90 100 110 130%
0.2°
0.2
0.1
7.0
6.4
max: 9.0
m/s
13.1
86.6°
002 22
001 11
m
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
V: 10%
120°
28.0
35.2
23.6
V
73.9°
65.3
2:2Y
1:1Y
=> 0
100%
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D

B104962

3.3 Limit switch winch spooled out

The cam limit switches in winches 1, 2, 3, 5, and 6 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!

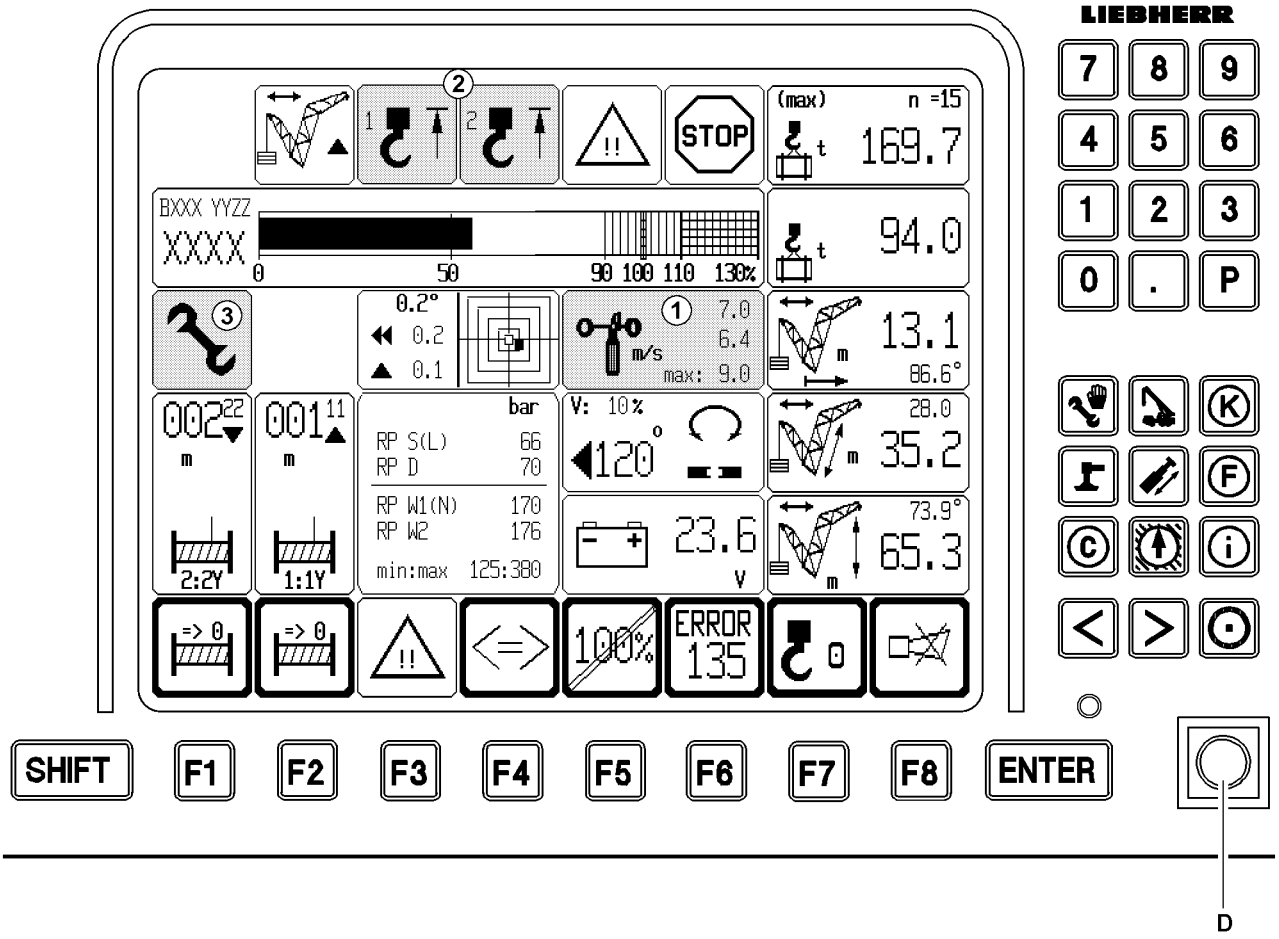
DANGER
Risk of accident due to falling load!
If the following conditions are not observed, the cam limit switch does not turn off when the last 3 minimum rope coils are reached and the load can fall down.
Personnel can be killed or severely injured.
The cam limit switch must be readjusted.
- ▶ **Do not** 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.

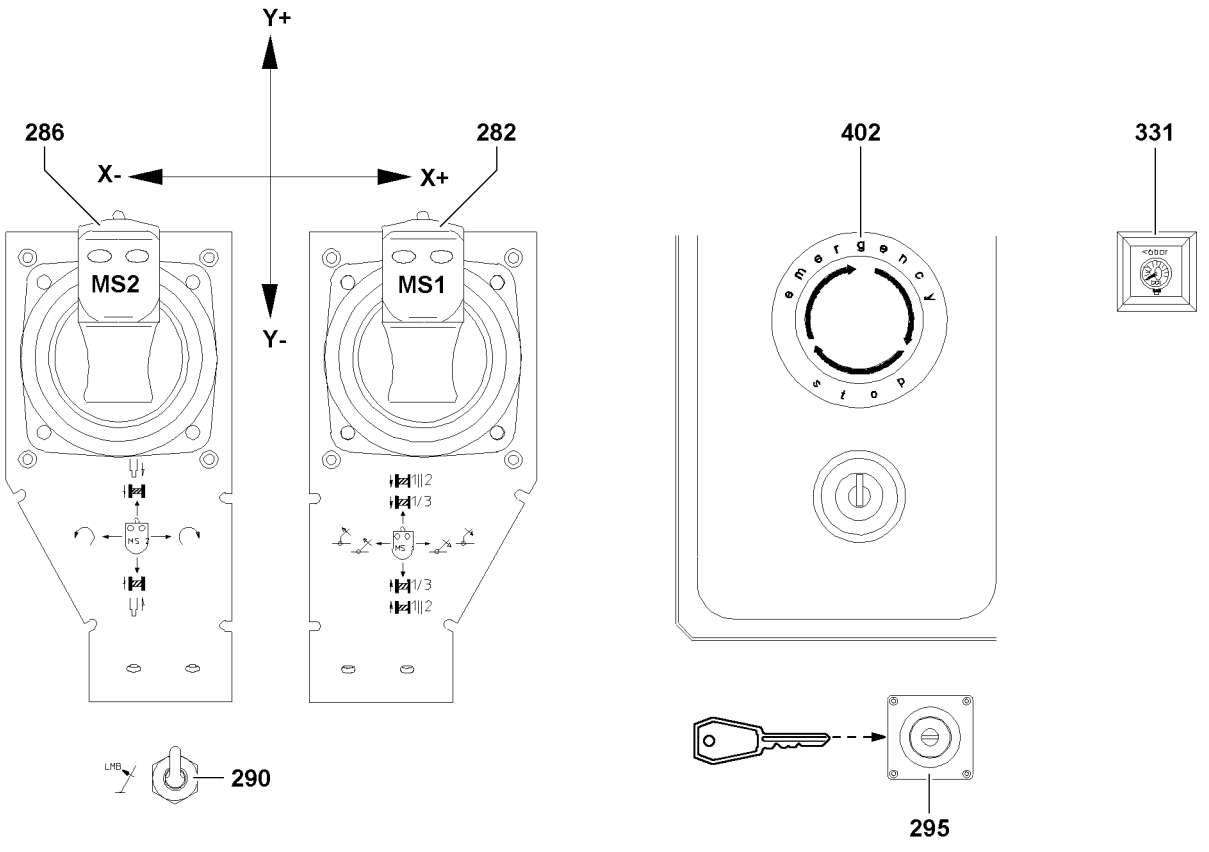
DANGER
Risk of accident if rope rips out of its mount or due to uncontrolled shut off of the winch!
- ▶ Make sure that the winches are properly adjusted. Check the shut off without a load on the hook.
- ▶ Crane operation with an incorrectly adjusted or non-adjusted winch is strictly prohibited!

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, 2, 3, 5 and 6 until the shut off a 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**.


LIEBHERR
STOP
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
23.6
V
ERROR
135
100%
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


Y+
Y-
X-
X+
286
282
MS2
MS1
290
402
331
295
emergency stop

B104947

3.4 EMERGENCY OFF switch

If the EMERGENCY OFF switch **402** (-S794) or the EMERGENCY OFF switch* **295** (-S84) are operated, the engine and the electrical crane control are turned off. Every carried out movement can be stopped immediately.
After the EMERGENCY OFF switch **402** (-S794) or the EMERGENCY OFF switch* **295** (-S84) are actuated, the system can only be released by an authorized person with a key.

DANGER
Danger of accidents due to actuation of the EMERGENCY OFF switch!
- ▶ Do not actuate the EMERGENCY OFF switch at maximum speed of a crane movement.
- ▶ Only use the EMERGENCY OFF switch in the event of a clear emergency!
- ▶ Use of the EMERGENCY OFF switch for normal operation is not permitted!

3.5 Control release

The seat contact button **201** 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 **284** and button **288** bypass the seat contact button **201** if it becomes necessary for the operator to work standing up.

3.6 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.

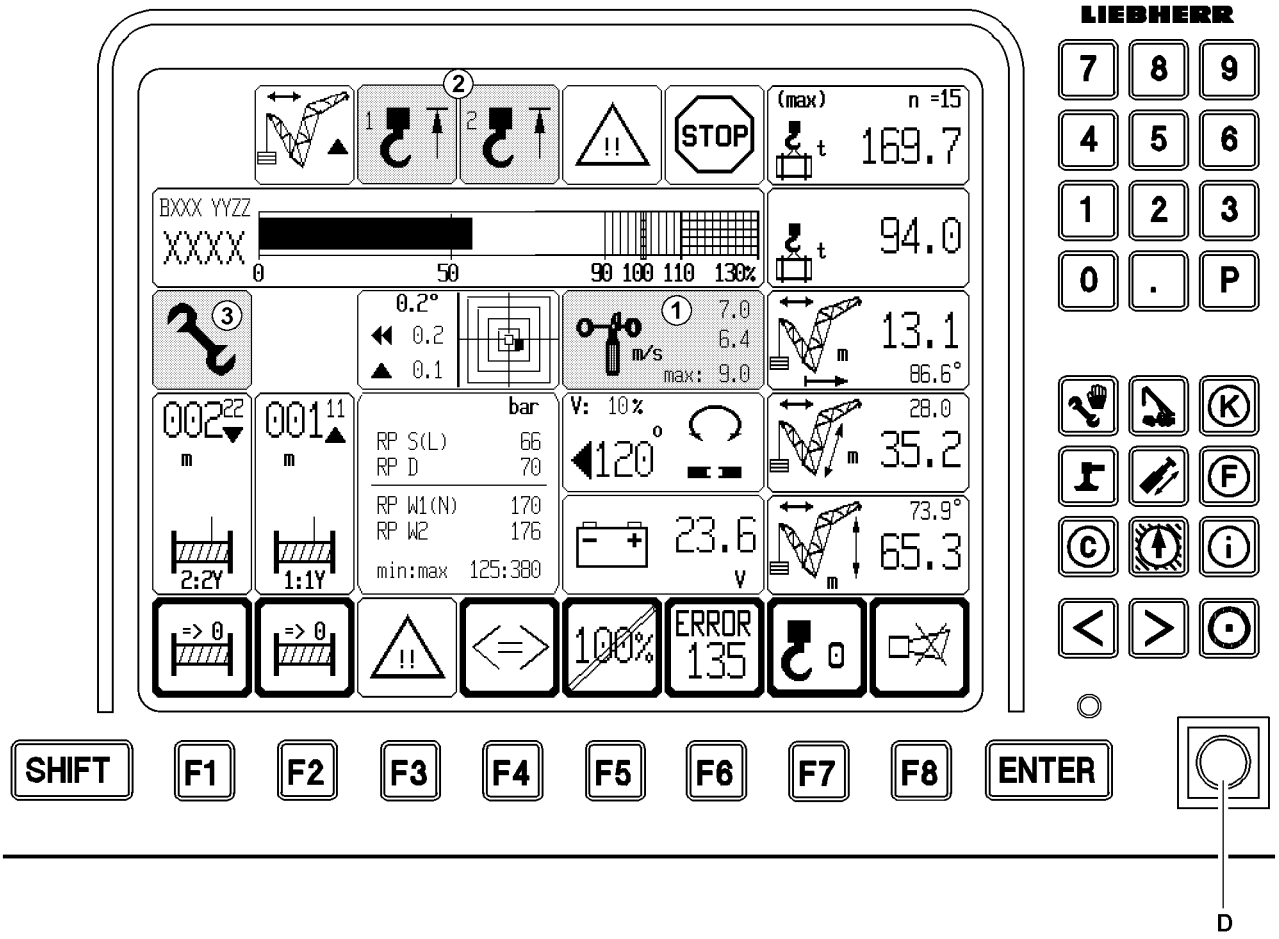
3.6.1 Pressure monitoring in the relapse cylinders

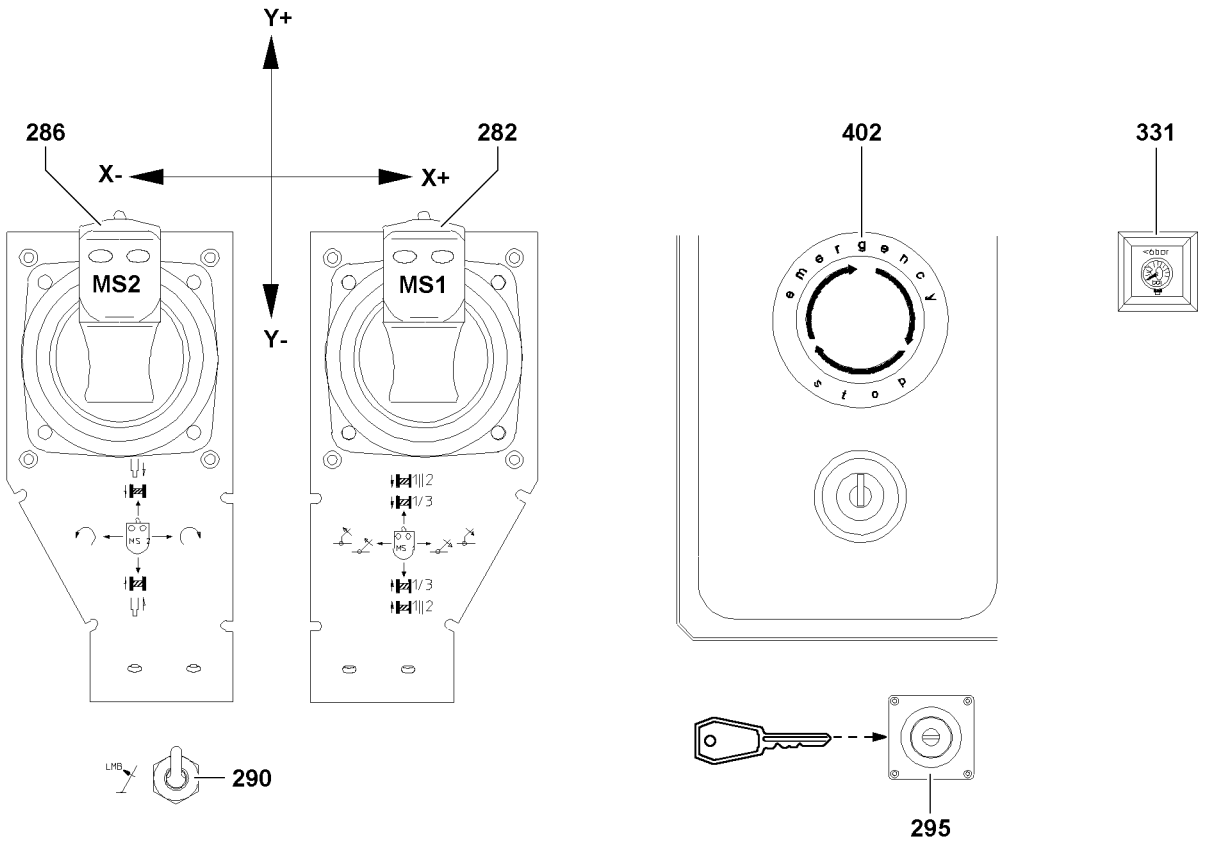
Pressure sensors are installed in the hydraulic relapse cylinders. The pressures measured with the pressure sensors are shown on the LICCON monitor, see chapter 4.02.

DANGER
Danger of toppling or destroying the crane!
Insufficient pressure in the relapse cylinders can cause the boom system to fall to “the rear”, toppling the crane.
- ▶ Continuously observe the pressure in the relapse cylinders during crane operation.

3.6.2 Servo oil pressure monitoring in the winches

If the servo oil pressure is less than 10 bar, the warning light **331** in the “right instrument panel” lights up.
It can be determined in the LICCON test system for which winch this is the case.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
23.6
V
ERROR
135
100%
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


Y+
Y-
X-
X+
286
282
MS2
MS1
290
402
331
295

B104947

3.7 Limit switch

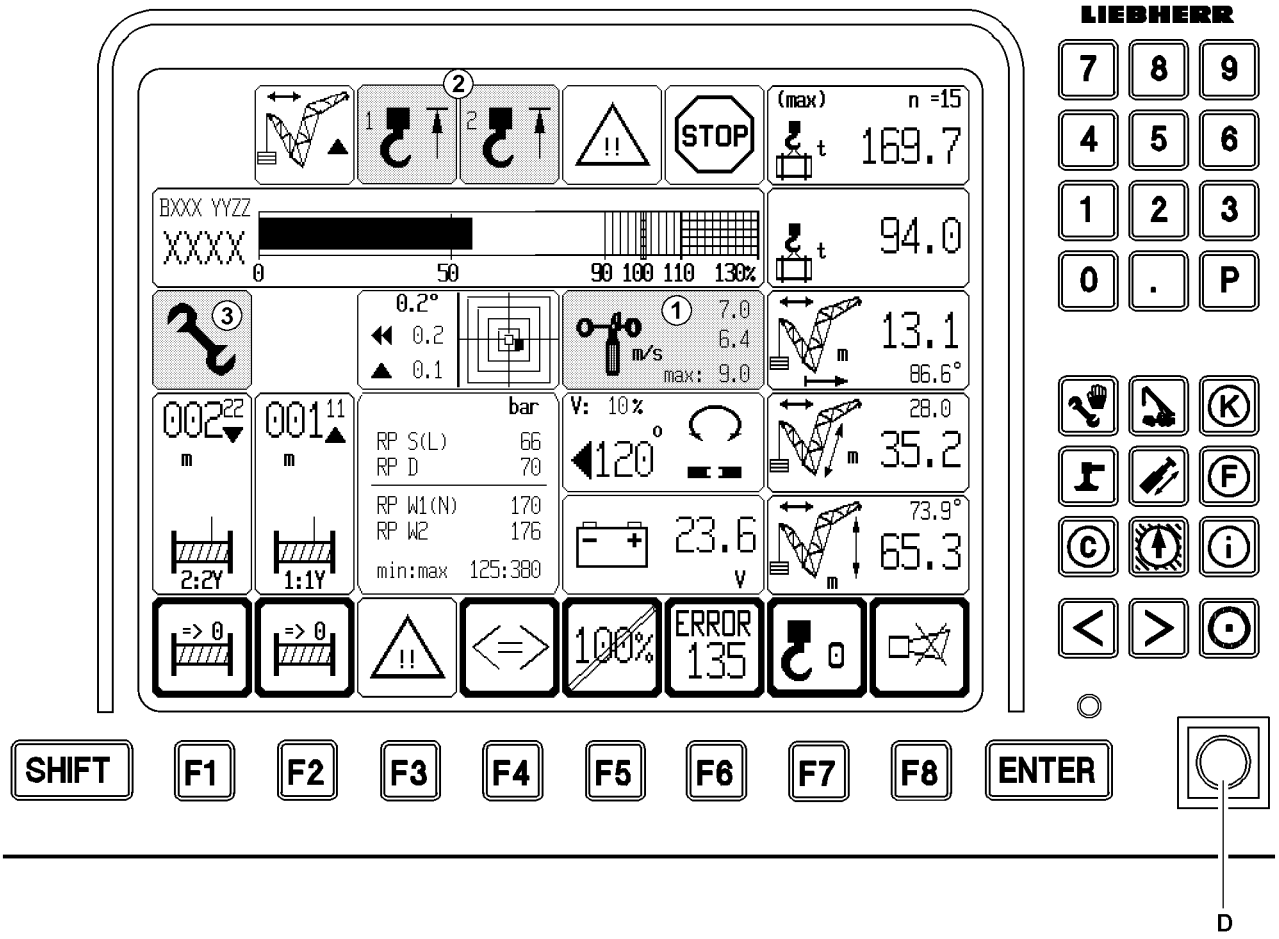
Limit switch for:	Position
Hoist “top”	on boom and lattice jib
Boom “top”	steepest position, relapse cylinder
Lattice jib “top”	steepest position, relapse cylinder
	steepest position, mechanical flap
Lattice jib “bottom”	lowest position
SA-bracket 25° to the front	

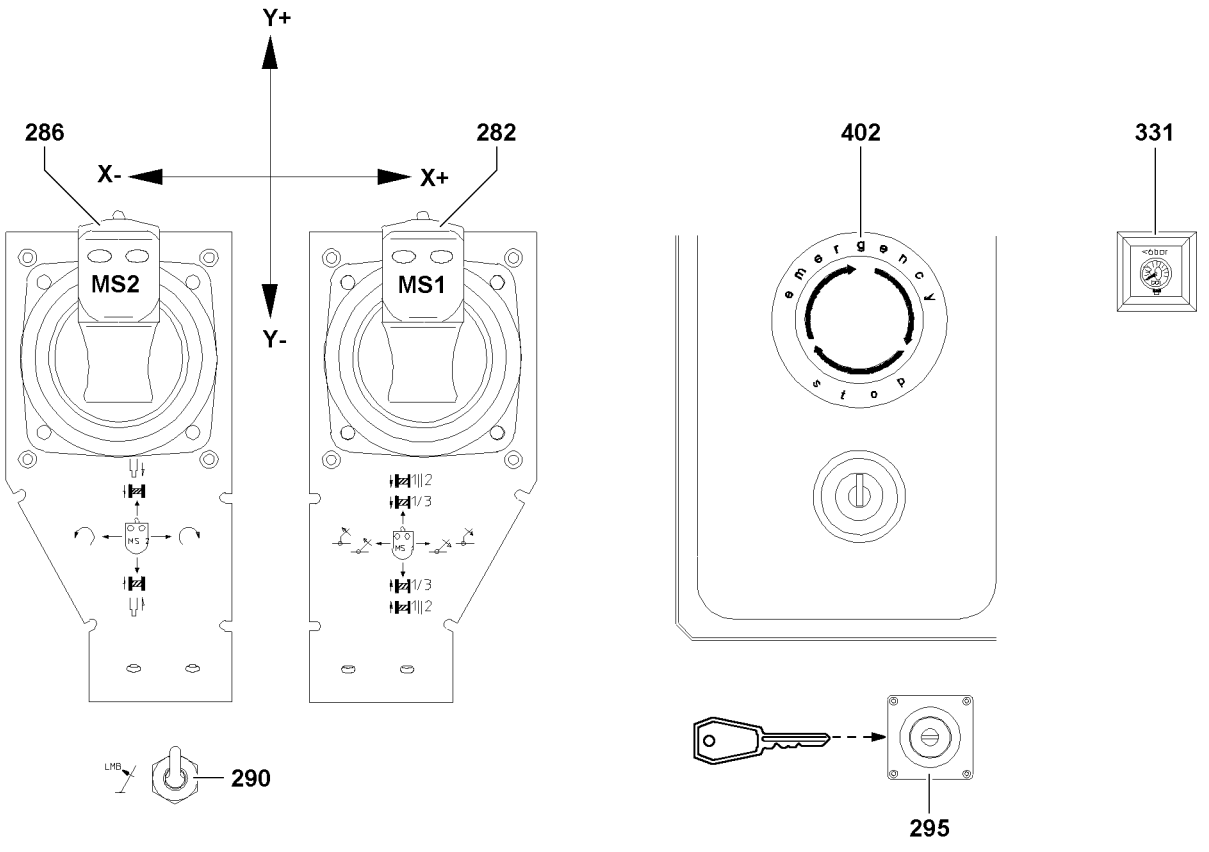
DANGER
Danger of toppling or destroying the crane!
▶ Do **not** use the hoist limit switch and limit switch for steepest boom position and luffing jib position as an operational shut off function.

3.8 Angle sensors

Two angle sensors are installed on the main boom.
Two angle sensors are installed on the lattice jib.
One angle sensor is installed on the derrick boom.

Note
▶ Refer to the electrical wiring diagram!


LIEBHERR
STOP
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
23.6
V
ERROR
135
100%
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


Y+
Y-
X-
X+
286
282
MS2
MS1
290
402
331
295

B104947

3.9 Pull test brackets (KMD = force test box)

The pull test brackets measure the force in the guying, which is results from the load and the boom momentum.
The pull test brackets are located:

- **KMD 1**, in the boom guying
  SA-bracket to main boom in all operating modes **without** derrick.
- **KMD 1**, in the derrick guying
  SA-bracket to derrick in all operating modes **with** derrick.
- **KMD 2**, in the lattice jib guying
  WA-bracket 1 to lattice jib end section.
- **KMD 3**, in the boom guying
  Derrick to boom in all operating modes **with** derrick.

Note

▶ See also electrical wiring diagram!

3.10 RPM monitoring for Diesel engine

If an impermissible high engine RPM is reached during crane operations, then the brake flaps and brake pumps are automatically added.
When the RPM drops, the brake flaps and brake pumps are turned off again.

Note

▶ At an engine RPM of more than 2400 RPM, the Diesel engine STOP and EMERGENCY OFF is triggered automatically.

Element	Status	Engine RPM
Brake flaps	On	more than 2200 RPM
	Off	less than 2100 RPM
Brake pump 9	On	more than 2200 RPM
	Off	less than 2100 RPM
Brake pump 10	On	more than 2250 RPM
	Off	less than 2150 RPM

4 Acoustic / visual warning overview

4.1 Crane operator

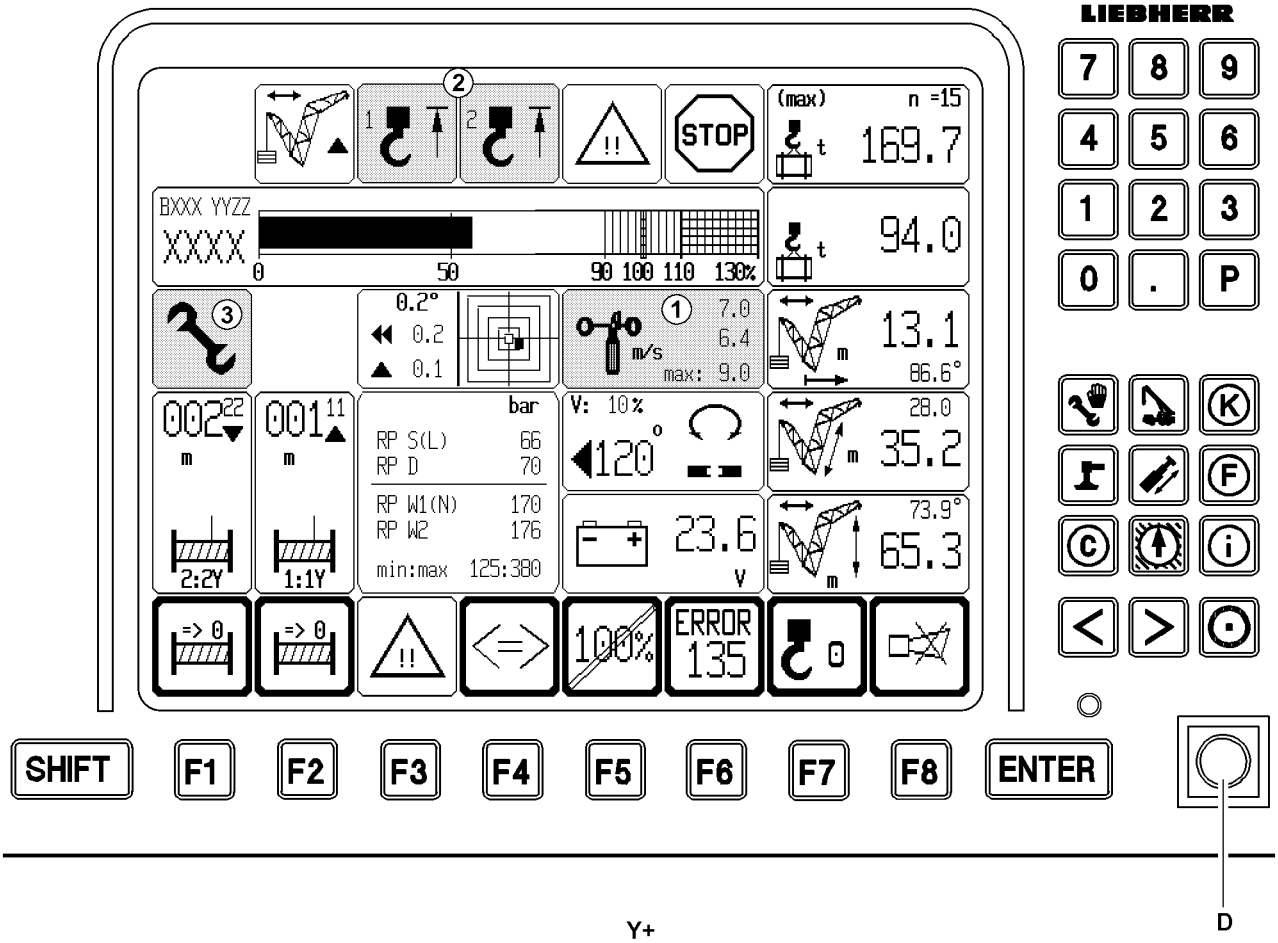
Signal	Crane operator							
	Acoustic warning		Visual warning - LICCON monitor icons					
	 *slow*	 *fast*	 *Advanced warning*	 *Shut off*				 *F1*
Utilization to 90 %								
LMB load greater than 90%	X[2]		X					
LMB load greater than 100%		X[2]	X	X				
Assembly (E1.6)					X		X	
Emergency operation (E1.7)						X	X	X
Bypass LMB (E1.5)					X			X
Crawler assembly					X			
$F1_{max}$ assembly								X

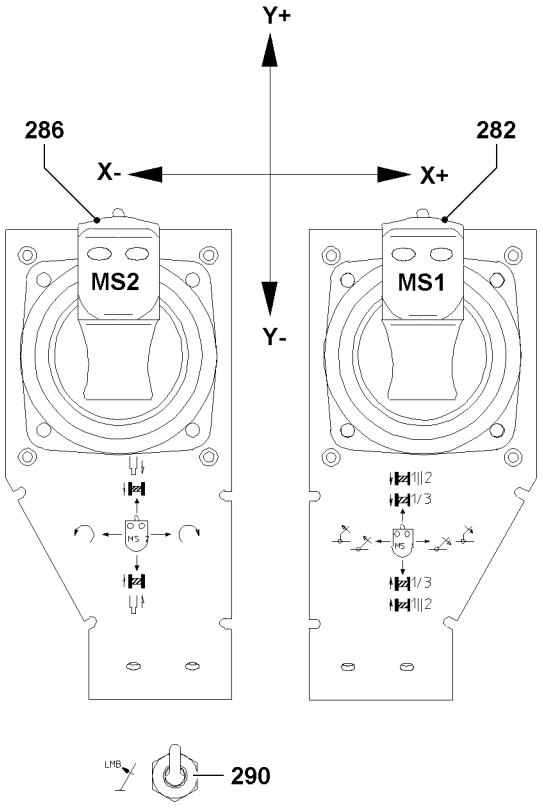
X = cannot be turned off
X^1 = can be turned off after 5 seconds
X^2 = can be turned off immediately

4.2 Personnel present in danger zone

Signal	Personnel present in danger zone				
	Bell	Flashing beacon	Warning light, cab		
			Green	Yellow	Red
Utilization to 90 %			X		
LMB load greater than 90%				X	
LMB load greater than 100%	X[1]				X
Assembly (E1.6)	X[2]	X			X
Emergency operation (E1.7)		X			X
Bypass LMB (E1.5)	X	X			X
Crawler assembly	X[2]	X			
$F1_{max}$ assembly	X				X
 + *Emergency operation*	*X*				
 + *Emergency operation*	*X*				
 + *Emergency operation*	*X*				

X = cannot be turned off
X[1] = can be turned off after 5 seconds
X[2] = can be turned off immediately


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
23.6
V
ERROR
135
100%
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


Y+
286
282
X-
X+
MS2
MS1
Y-
290

B104946

5 LICCON overload safety device

There are two ways of bypassing the LICCON overload protection:
– Bypassing the load moment limiter by pressing bypass key button **D** on the LICCON monitor.
– Bypassing the load moment limiter by pressing button **290** on the control panel.

5.1 Bypass with the bypass key button D on the LICCON monitor

The bypass key button **D** on the LICCON monitor is used to bypass the following shut off causes:
– Hoist-top shut off
– Load moment limiter

The shut off cause to be bypassed is selected with the function key **F5**. Another shut off cause appears in the icon whenever the function key **F5** is pressed. The selected shut off cause is bypassed by holding the bypass key button **D** in the right position.

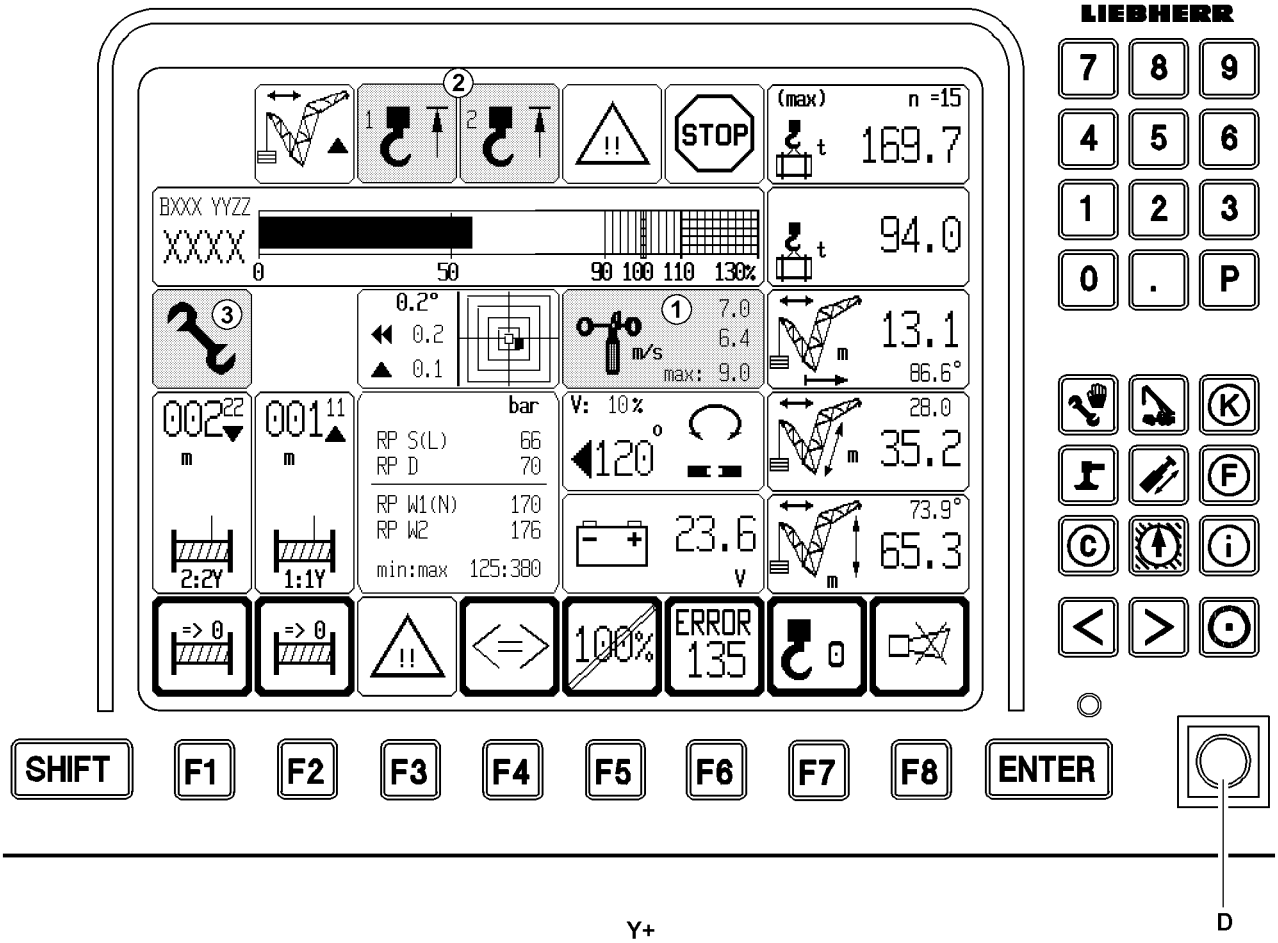
Note
▶ When the bypass is activated by the bypass key button D, the icon over the function key “F5” blinks!

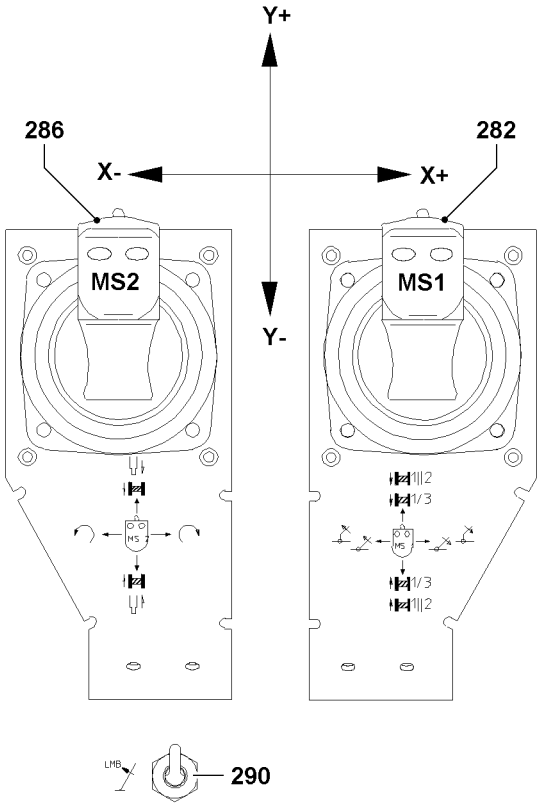
The bypass key switch **D** on the LICCON monitor has two positions:
– Operating position (not pressed): crane is in normal operation.
– Position to right (touching): the selected shut off cause is bypassed by the function key “F5”.

5.1.1 Bypassing the hoist top shut off

If the hook block touches the hoist limit switch weight during the upward movement, the hoist limit switch reacts. The hoist top icon **2** on the LICCON monitor blinks. The crane movements “Spool up winches” and “Luff boom down” are turned off. The hoist top shut off must be selected with the function key F5 and can be bypassed by the bypass key button **D** in position “right touching”.

DANGER
Increased accident risk when bypassing the overload protection!
When bypassing the hoist top shut-off, there is a risk that the hook block may be pulled against the pulley head when continuing to lift or luffing down the boom. This may damage the pulleys and cause the loads to fall!
▶ The hoist up shut off may only be bypassed if the crane supervisor is present, and with the help of a “guide”. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block and the boom head.
▶ Carry out all crane movements with utmost caution!


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
23.6
V
ERROR
135
100%
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


Y+
286
282
X-
X+
MS2
MS1
Y-
290

B104946

Operating the bypass key button D on the LICCON monitor

Note

▶ Shut offs which can be bypassed with the bypass key button **D** can be seen in the “shut off diagrams” of the electrical wiring diagram.

▶ Turn the bypass key button **D** to the right and hold.

Result:

– The LICCON overload protection is inactive.
– The Assembly icon **3** on the LICCON monitor blinks.
– An acoustic signal sounds.
– The red beacon on the crane cab blinks.

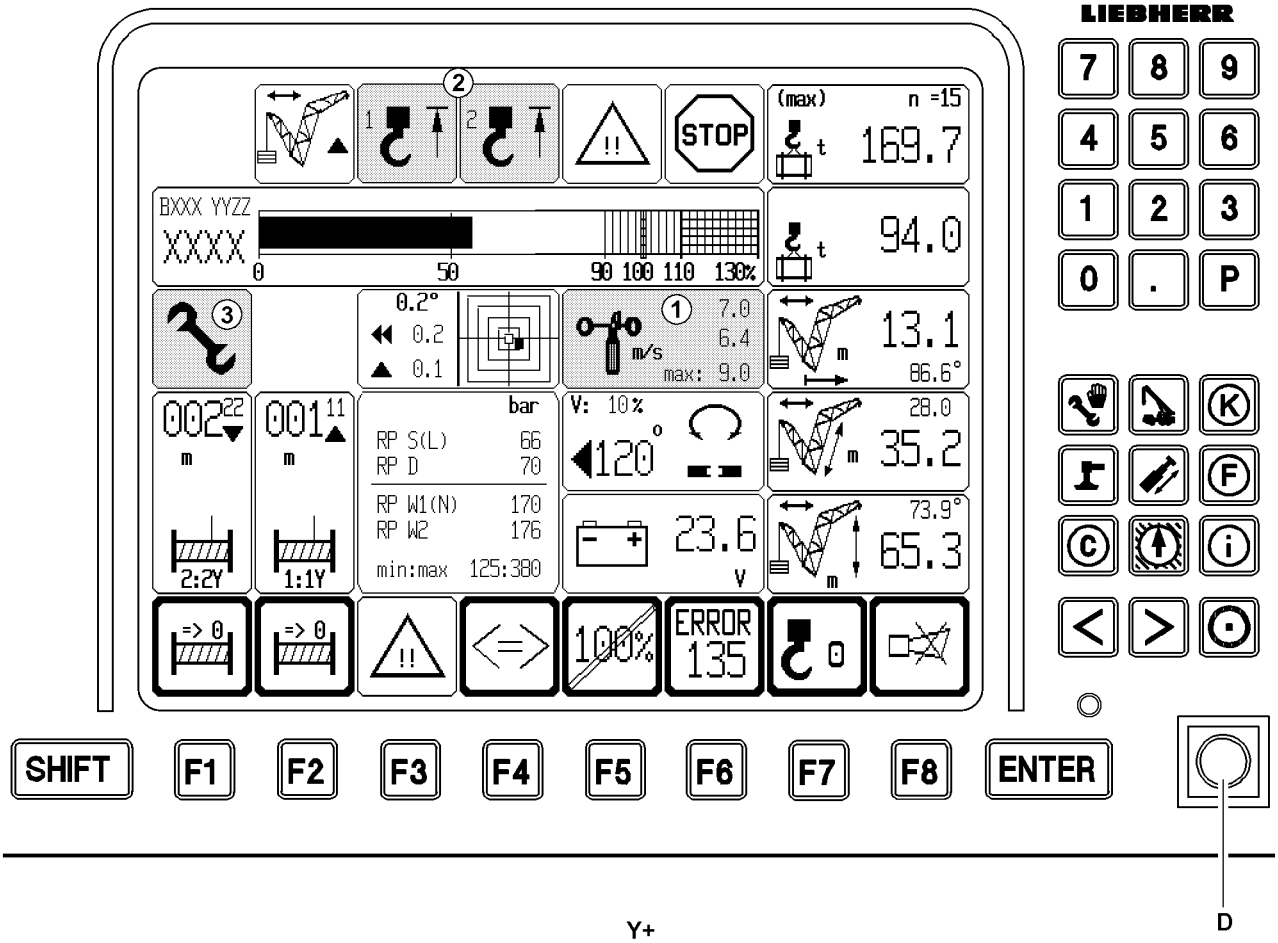
The bypass of the load moment limiter turns off when:

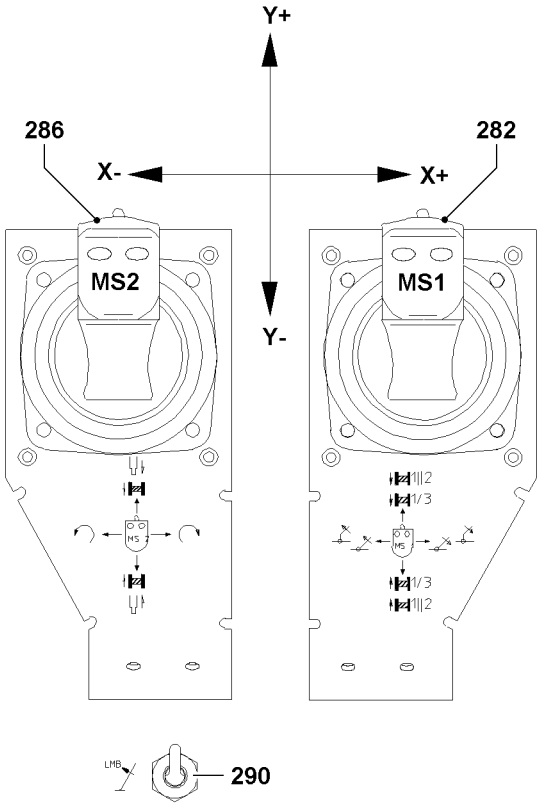
– The bypass key button D is no longer actuated.

▶ Do **no longer** actuate the bypass key button **D**.

Result:

– The LICCON overload protection is active.
– The Assembly icon **3** on the LICCON monitor turns off.
– The acoustic signal is turned off.
– The red beacon on the crane cab turns off.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
23.6
V
ERROR
135
100%
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
D


Y+
286
282
X-
X+
MS2
MS1
Y-
LMB
290

B104946

5.1.2 Bypassing the load moment limiter

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 bypassed by the bypass key button **D** in the “right touching position”.

DANGER
Increased accident risk when bypassing the overload protection!
If the overload protection is bypassed, there is no further protection against crane overload!
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!
Personnel can be killed!
This could result in high property damage!
All LICCON overload protection displays remain functional!

- ▶ It is only permitted to bypass the overload protection during assembly or in emergencies!
- ▶ The bypass key button **D** may only be actuated by persons who are aware of the effects of their acts regarding the bypass of the overload protection!
- ▶ Bypassing the overload protection requires the presence of the crane supervisor and must be performed with utmost caution!
- ▶ Crane operation with bypassed overload protection is prohibited!

Operating the bypass key button D on the LICCON monitor

Note

- ▶ Shut offs which can be bypassed with the bypass key button **D** can be seen in the “shut off diagrams” of the electrical wiring diagram.

- ▶ Turn the bypass key button **D** to the right and hold.

Result:

- – The LICCON overload protection is inactive.
- – The Assembly icon **3** on the LICCON monitor blinks.
- – An acoustic signal sounds.
- – The red beacon on the crane cab blinks.

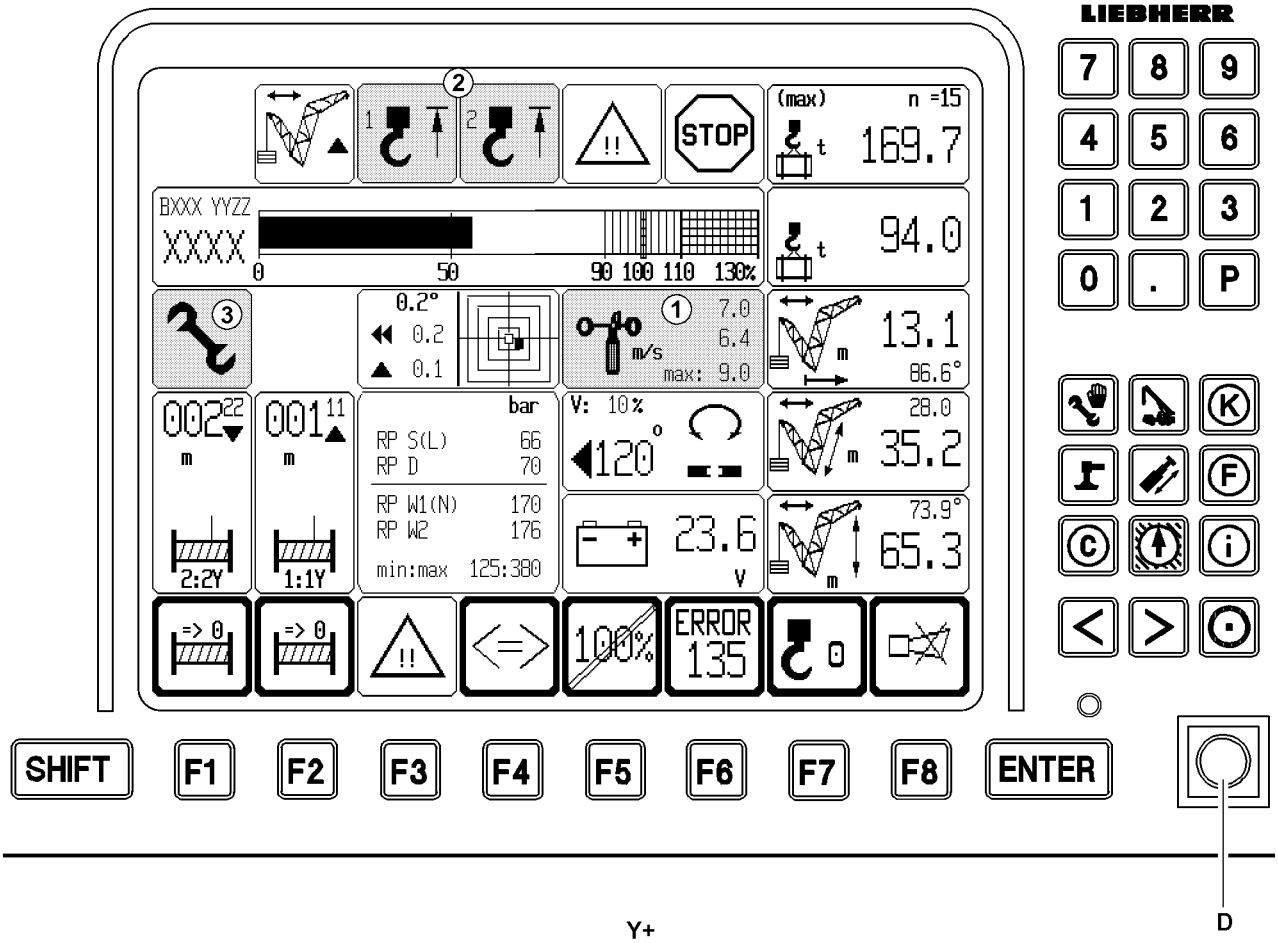
The bypass of the load moment limiter turns off when:

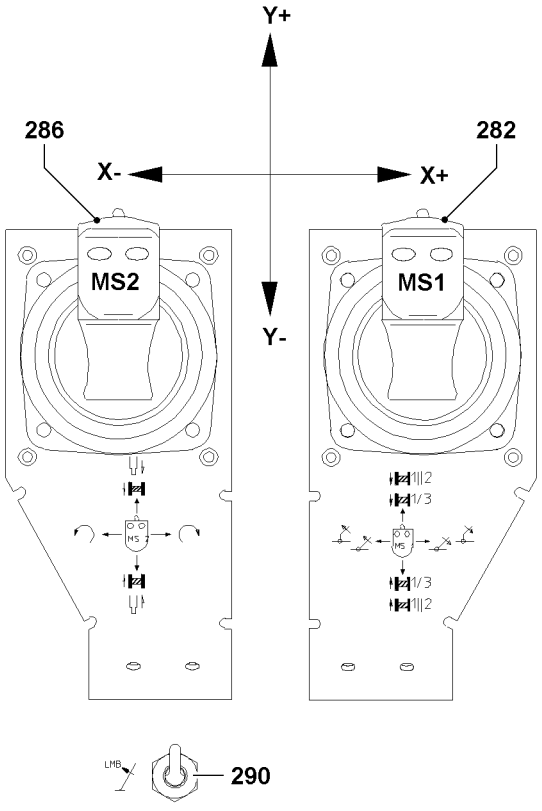
- – the bypass key button D is no longer actuated.

- ▶ Do **no longer** actuate the bypass key button **D**.

Result:

- – The LICCON overload protection is active.
- – The Assembly icon **3** on the LICCON monitor turns off.
- – The acoustic signal is turned off.
- – The red beacon on the crane cab turns off.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
(max) n =15
169.7
94.0
BXXX YYZZ
XXXX
0 50 90 100 110 130%
0.2°
0.2
0.1
7.0
6.4
max: 9.0
13.1
86.6°
002 22
001 11
m
2:2Y
1:1Y
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
V: 10%
120°
28.0
35.2
23.6
V
73.9°
65.3
100%
ERROR
135
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
D


Y+
286
282
X-
X+
MS2
MS1
Y-
LMB
290

B104946

5.2 Bypassing of the load moment limiter with button 290 in the left control panel

5.2.1 Bypassing “Luff up at overload”

The crane movement “Luff up” is turned off during overloads, although this almost always leads to an increase in the maximum load and is a load moment reducing crane movement for a freely suspended load.

DANGER

Risk of accident from overloading and toppling the crane!

Never lift a load by luffing up the boom if, when trying to lift the load, the hoist gear was turned off by the load moment limiter.

- Bypass with the button **290** is only permitted if the operator knows that the utilization is reduced by luffing up. This is the case, if the load is freely suspended and the load capacity simultaneously increases when luffing up.
- Bypass with the button **290**, “Luffing up at overload” is only permitted if the overload occurred before by luffing the boom or the luffing jib down. The crane operator must clearly prove according to the load chart, that the luffing up movement will lead to an increase of the maximum load capacity and the overload will be thereby removed.

- In order to still perform the luffing up movement:
  Press the button **290** “Luffing up at overload” and deflect the master switch “MS1 **282** ” in X-direction.

B195219

1 General

1.1 General notes

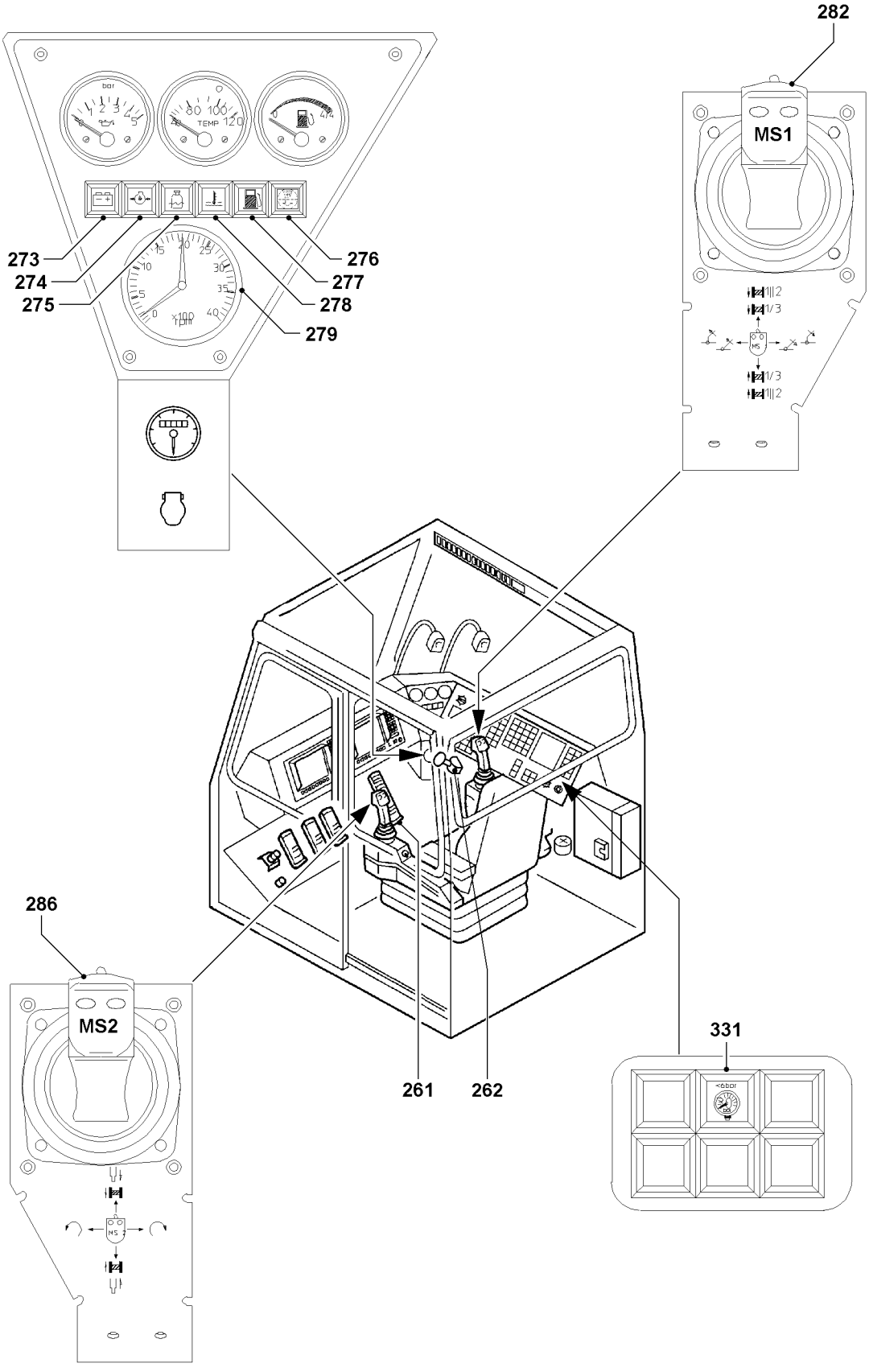
Make sure that the following prerequisites are met:

- the crane is aligned in horizontal direction,
- the counterweight is attached and secured according to the data in the load chart,
- the ground is able to carry the weight of the crane, including the load and the load tackle,
- the hook block is correctly reeved as shown in reeving plan,
- the crawler operation is turned off,
- the crane engine is running,
- all safety devices have been adjusted according to the data in the load chart,
- there are no persons or objects in the danger zone,
- the dummy plugs plugged in at assembly have been changed over to the corresponding connector sockets.

DANGER

Risk of accident!

- ▶ In order to protect the crane and reduce the danger of accidents always use the master switch slowly and sensitively.
- ▶ Ensure that there are no obstacles in the working range of the crane and that there are no persons within the danger zone.
- ▶ Give a warning signal before initiating a crane movement.
- ▶ Observe the danger notes for crane operation in chapter 2.04 and 5.01.



B107268

1.2 Observe the warning lights

CAUTION
Danger of damaging the engine!
If the warning light **274** and **278** are not observed, then severe engine damage can occur due to insufficient oil pressure or excessive coolant temperature.

- ▶ If the warning light **274** does not turn off after a short time after engine start, **turn the engine off immediately**!
- ▶ If the warning light **274** lights up during crane operation, **turn the engine off immediately**!
- ▶ If the warning light **278** lights up during crane operation, **turn the engine off immediately**!

During crane operation, the following warning lights must be regularly checked by the crane operator:

273 Warning light	• Battery charge check
274 Warning light	• Oil pressure Diesel engine
275 Warning light	• Coolant level too low
276 Warning light	• Air filter is dirty
277 Warning light	• Fuel level too low
278 Warning light	• Coolant temperature too high
331 Warning light	• Servo oil pressure in winches I to VI is less than 10 bar

1.3 Engine RPM

The current engine RPM is shown on the RPM gauge **279**.

1.3.1 Locking the engine RPM

Locking engine RPM relieves the crane operator if he needs to work for an extended period with constant RPM. The manual engine regulation **262** can be locked in any position.

- ▶ Actuate the lever **262** and set the desired engine RPM.

B195219

2 LICCON computer system

See chapter 4.02.

WARNING
Risk of accident from overloading the crane!
- ▶ Constantly monitor the displays on the LICCON monitor - especially the utilization bar display.
- ▶ Observe changing utilization conditions and forces.

Note
- ▶ The crane operator must evaluate constantly if the data shown in the operating view can even be correct. He may not rely blindly on the LICCON system but must think for himself and must recognize a possible error or overload conditions.

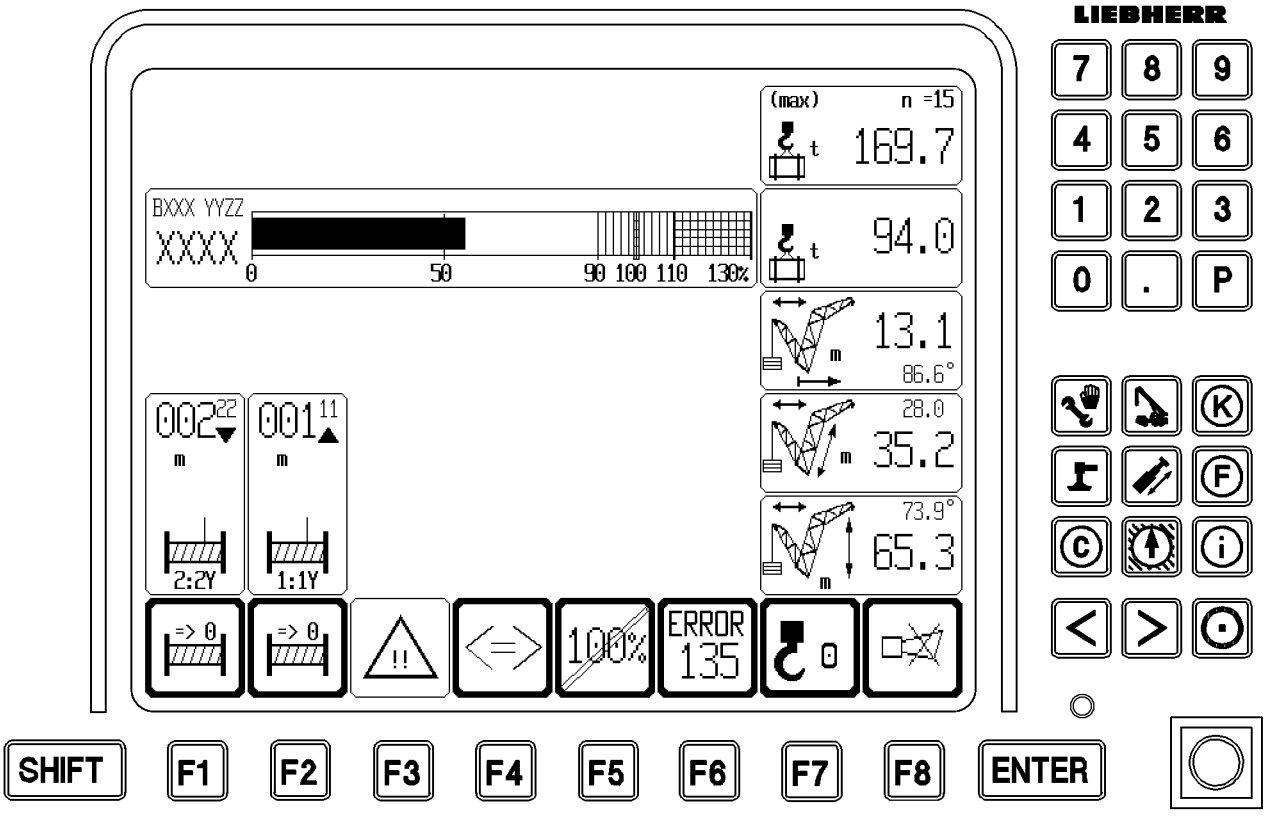
2.1 The crane engine is running

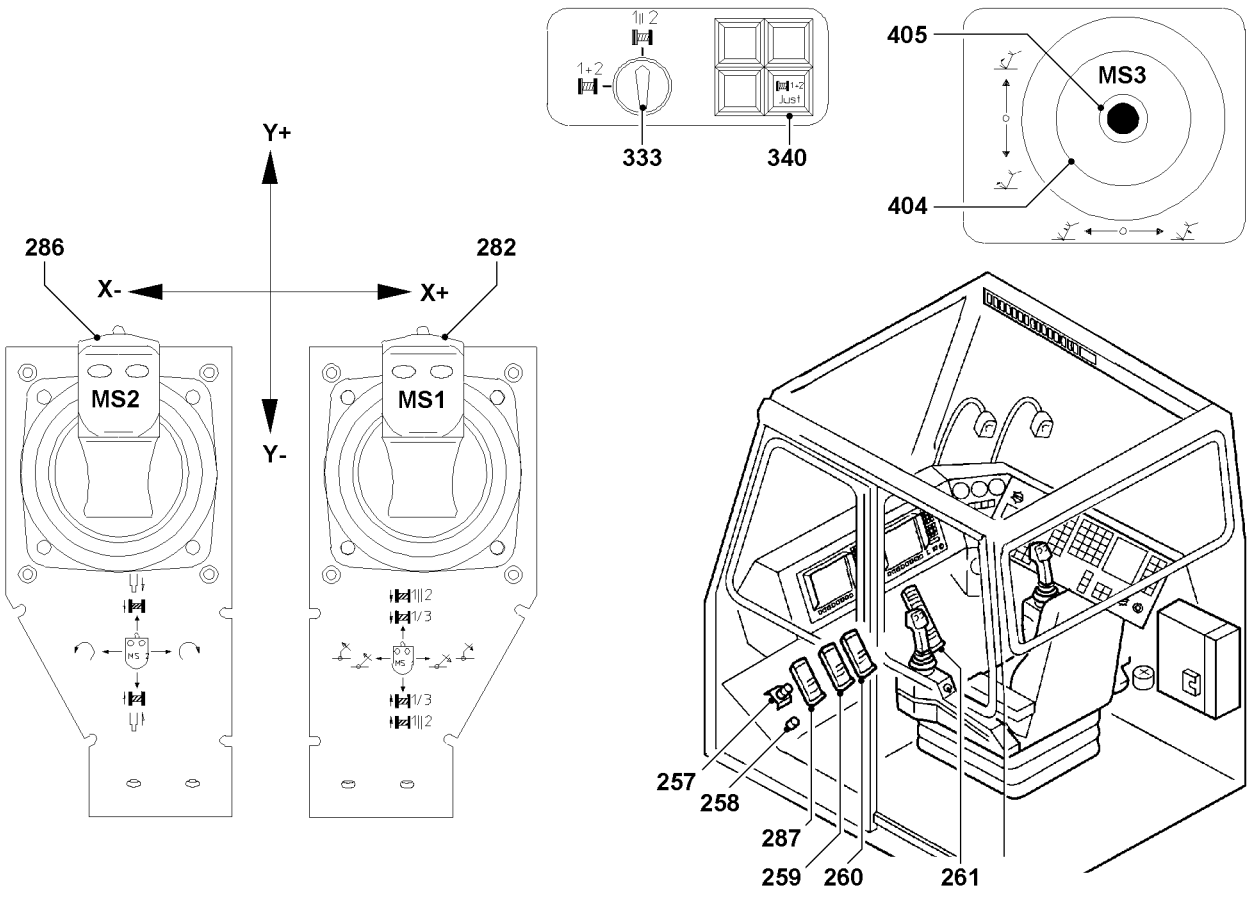
Make sure that the following prerequisites are met:
- – batteries are charged by the generator,
- – a stable voltage is present.

3 Winch and master switch assignment to operating modes

The assignment of the master switches to the winches is different, according to the operating modes. The assignments are shown and must be carried out as detailed in the separately supplied electric wiring diagram.

Note
- ▶ The crane operator must know and observe the assignments, in the separately supplied electric wiring diagram.


LIEBHERR
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
BXXX YYZZ
XXXX
0 50 90 100 110 130%
002 22
001 11
2:2Y
1:1Y
100%
ERROR
135
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


333
340
405
MS3
404
Y+
Y-
X-
X+
286
282
MS2
MS1
257
258
287
259
260
261

B104678

4 Lifting / lowering

CAUTION
Risk of rope damage!
- ▶ When spooling the winches up or out, make sure that no slack rope forms, especially for long booms and lattice jibs.
- ▶ Refer to the corresponding load charts for the required minimum hook block weights.

The speed of crane movement “lifting and lowering” is controlled via the deflection of the corresponding master switch and via the pedal **261** of the engine regulation.
In the “Control Parameter” program, the crane operator can assign a maximum winch speed to each individual winch. Individual winches can also be deactivated / activated by the crane operator.
See chapter 4.02, section “Control Parameter”.

4.1 Winch 1 - hoist winch

In the winch symbol is shown that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed.

▶ Deflect master switch 1 **282** in direction Y+.

Result:

– Winch 1 spools out and the load is lowered.

▶ Deflect master switch 1 **282** in direction Y-.

Result:

– Winch 1 spools up, the load is raised.

4.2 Winch 2 - hoist winch

In the winch symbol is shown that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed.

▶ Deflect master switch 2 **286** in direction Y+.

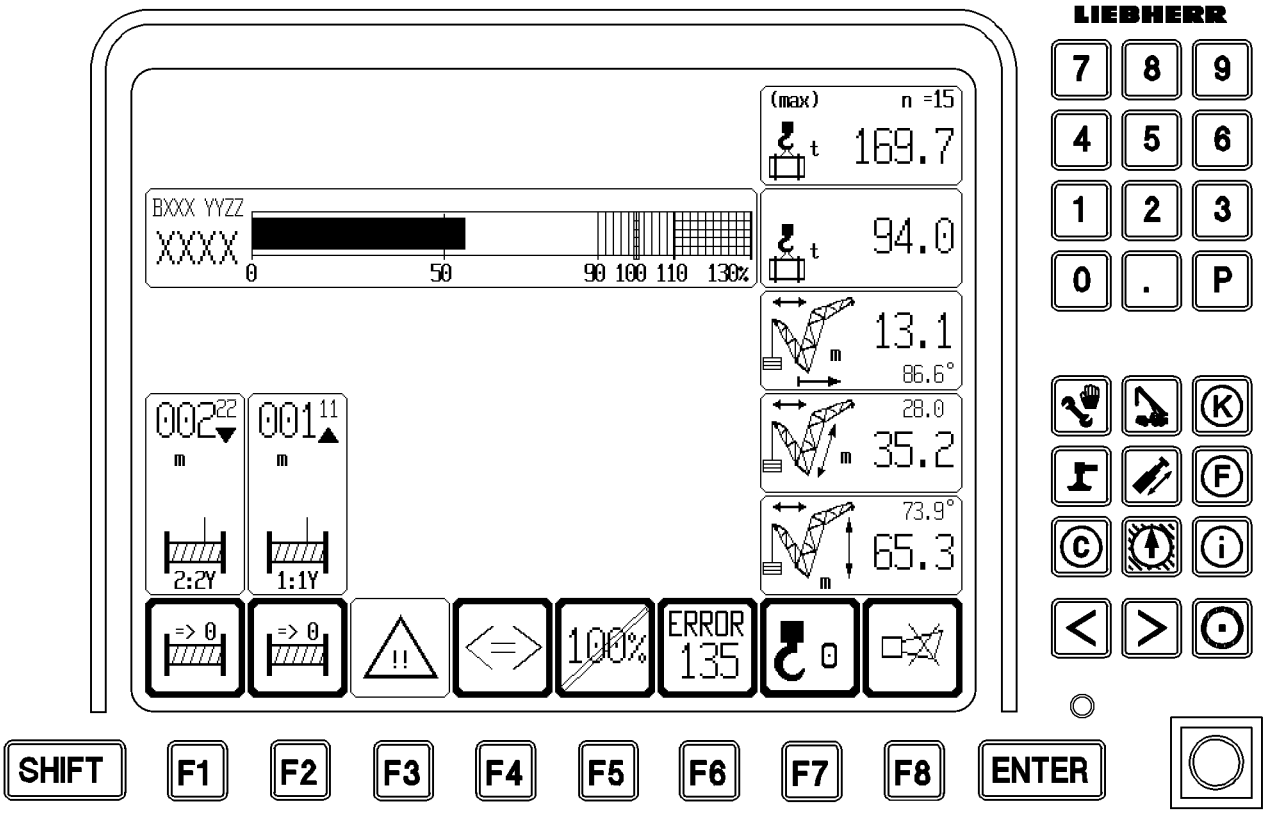
Result:

– Winch 2 spools out and the load is lowered.

▶ Deflect master switch 2 **286** in direction Y-.

Result:

– Winch 2 spools up and the load is lifted.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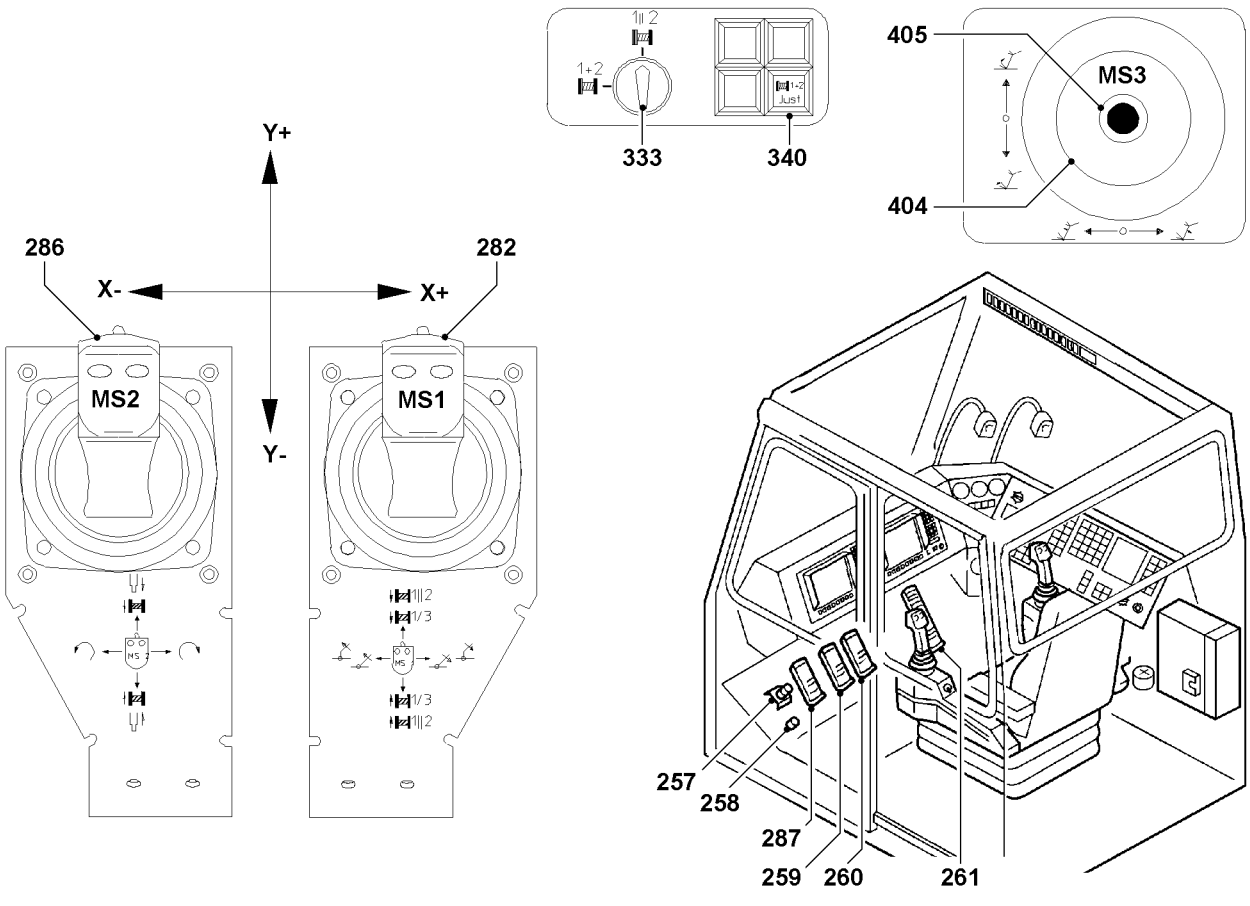
4 5 6
1 2 3
0 . P
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
BXXX YYZZ
XXXX
0 50 90 100 110 130%
002 22
001 11
2:2Y
1:1Y
ERROR 135
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


333
340
405
MS3
404
Y+
Y-
X-
X+
286
282
MS2
MS1
257
258
287
259
260
261

B104678

4.3 Winch 5

Winch 5 can be used for:
– The adjustment of the lattice jib.
– As hoist winch for the boom nose.

4.3.1 Winch 5 control winch

For adjustment movements of the lattice jib with winch 5 can be used:
– A torsion resistant hoist rope.
– A non-torsion resistant control rope.

WARNING
Damage of hoist rope!
If very frequent adjustment movements of the lattice jib are carried out with a torsion resistant hoist rope, then the rope will be damaged. Personnel can be severely injured or killed!
▶ For very frequent adjustment movements of the lattice jib, use a non-torsion resistant control rope!
▶ **Never** use non-rotation free ropes with a rotating rope end connections!

Note
▶ For a few adjustment movements of the lattice jib, a torsion resistant hoist rope may be used.

For operation, see section “Luffing the lattice jib in SW / SDW (B, BW) operation”.

4.3.2 Winch 5 hoist winch boom nose

WARNING
Rope breakage!
If a non-rotation free control rope is used as hoist rope for winch 5, then the rope will be overloaded and can break. Personnel can be severely injured or killed!
▶ A rotation-resistant rope must be used as hoist rope!
▶ Do not use a non-rotation free control rope as hoist rope!

In the winch symbol is shown that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed.

Note
▶ In individual operation of winch 1 and winch 2, no master switch is assigned to winch 5.
▶ In parallel operation - switch **333** is in switch position parallel operation - winch 1 and winch 2 are actuated with the MS1y. The master switch MS2y is assigned to winch 5.

Operation with winch 5 with turned on parallel operation of winch 1 II 2

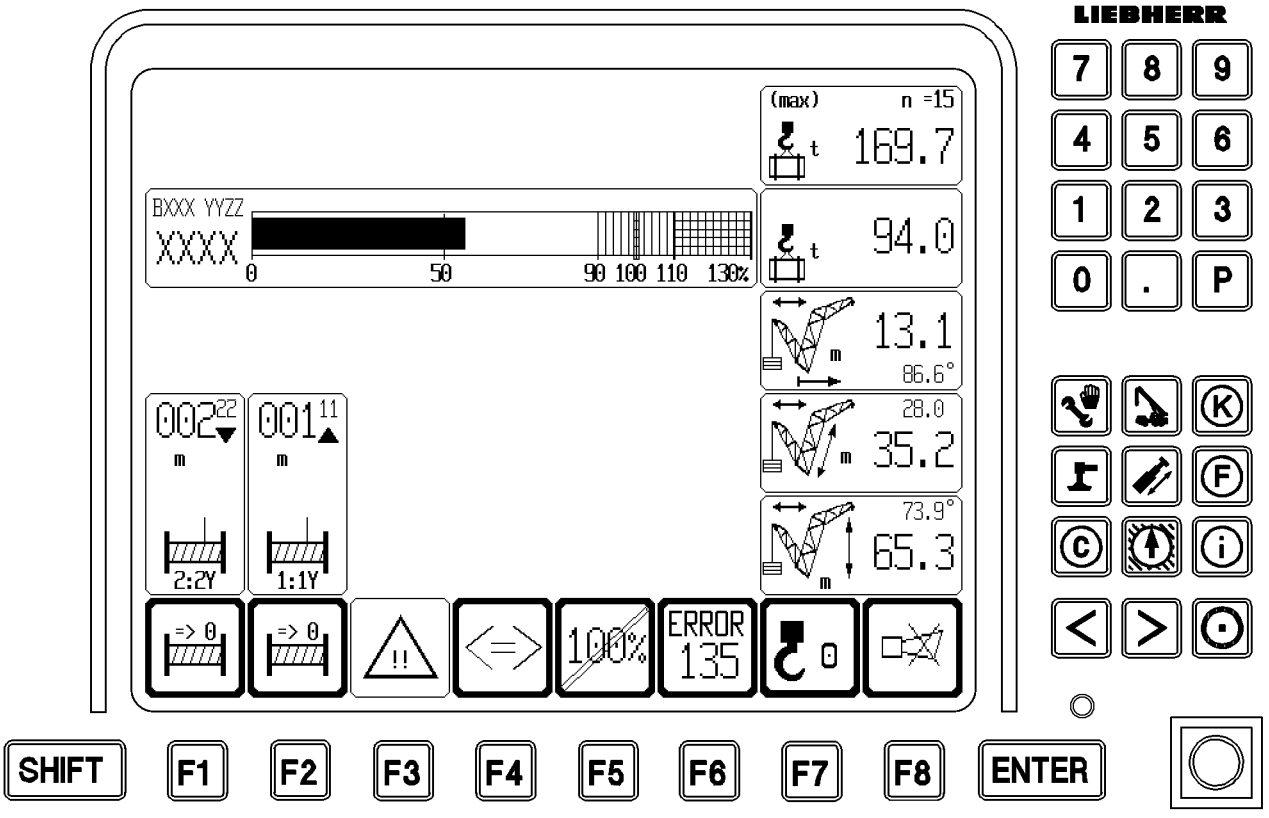
Ensure that the following prerequisite is met:
– switch **333** is in switch position “Parallel operation”.

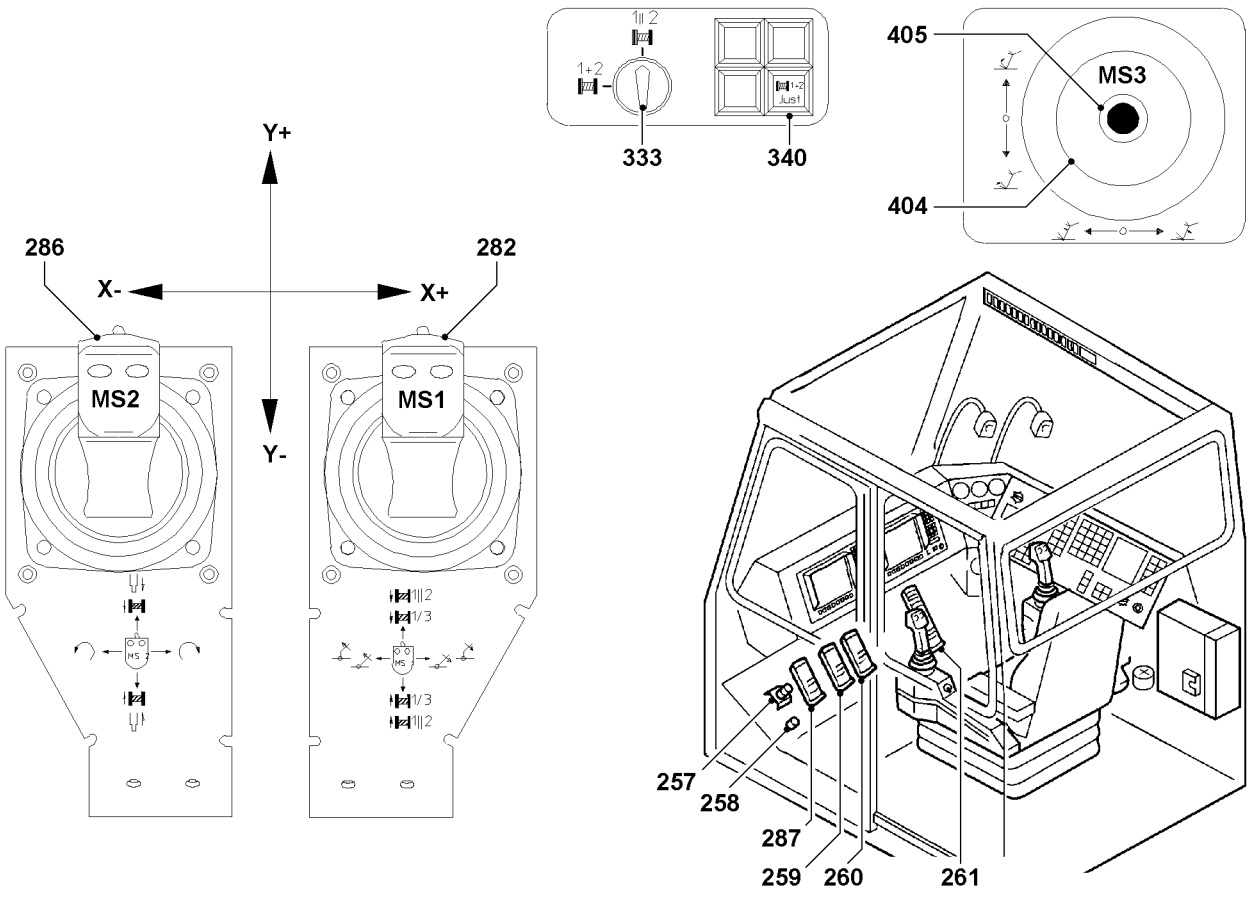
▶ Deflect master switch 2 **286** in direction Y+.

Result:
– Winch 5 spools out and the load is lowered.

▶ Deflect master switch 2 **286** in direction Y-.

Result:
– Winch 5 spools up and the load is raised.


LIEBHERR
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
ERROR
135
100%
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


Y+
Y-
X-
X+
286
282
MS2
MS1
333
340
405
404
MS3
257
258
287
259
260
261

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4.4 Winch 6 hoist winch boom nose

In the winch symbol is shown that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed.

Note

- ▶ In individual operation of winch 1 and winch 2, no master switch is assigned to winch 6.
- ▶ In parallel operation - switch **333** is in switch position parallel operation - winch 1 and winch 2 are actuated with the MS1y. The master switch MS2y is assigned to winch 6.

4.4.1 Operation with winch 6 with turned on parallel operation of winch 1 II 2

Ensure that the following prerequisite is met:

– Switch **333** is in switch position “Parallel operation”.

▶ Deflect master switch 2 **286** in direction Y+.

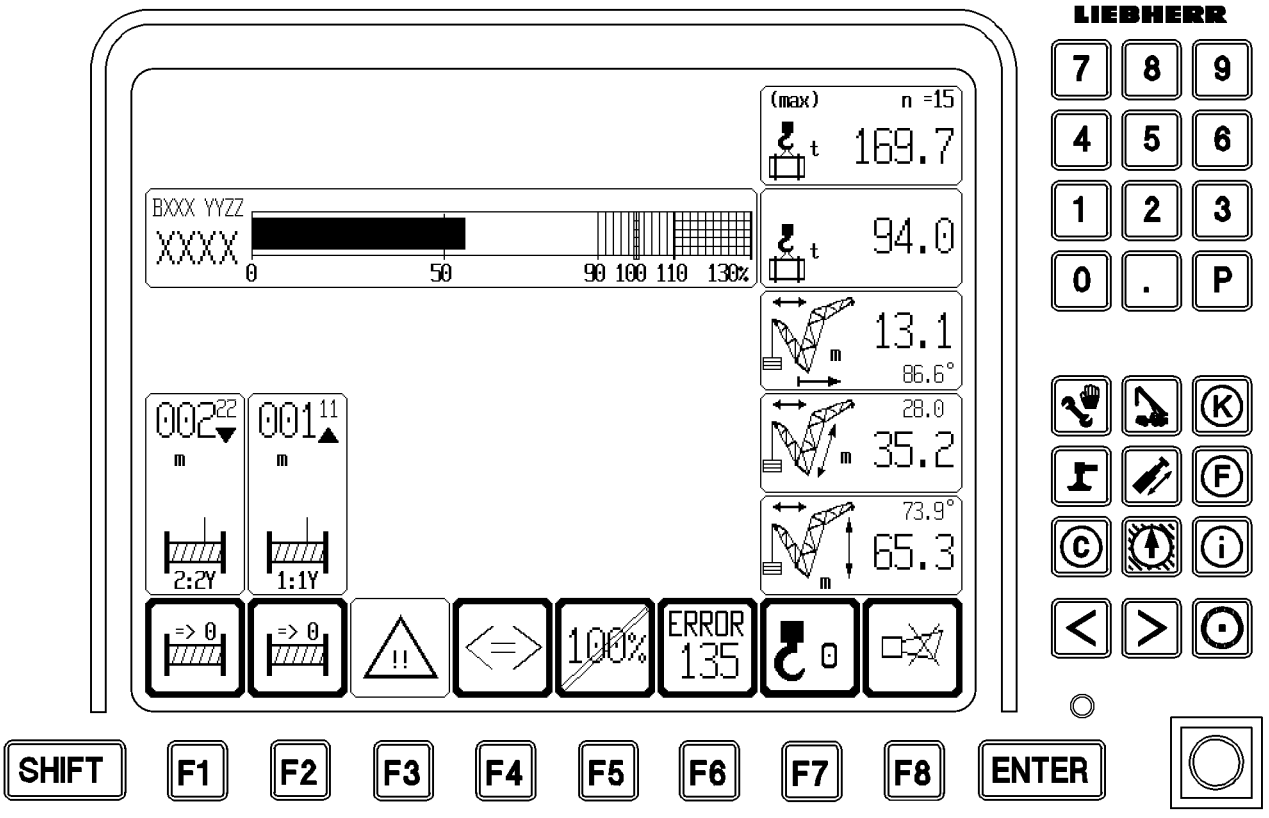
Result:

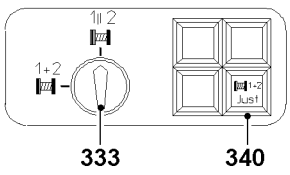
– Winch 6 spools out and the load is lowered.

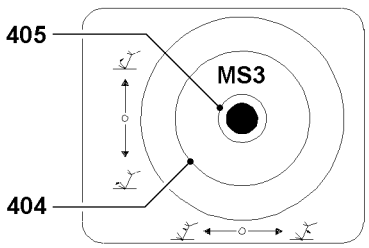
▶ Deflect master switch 2 **286** in direction Y-.

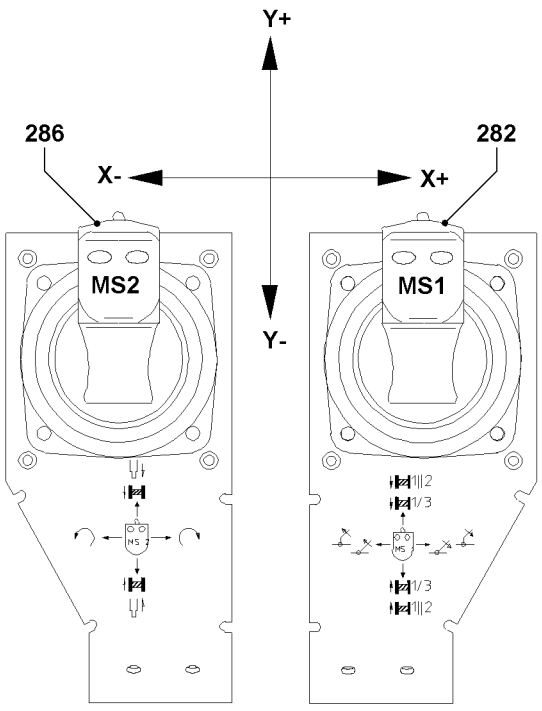
Result:

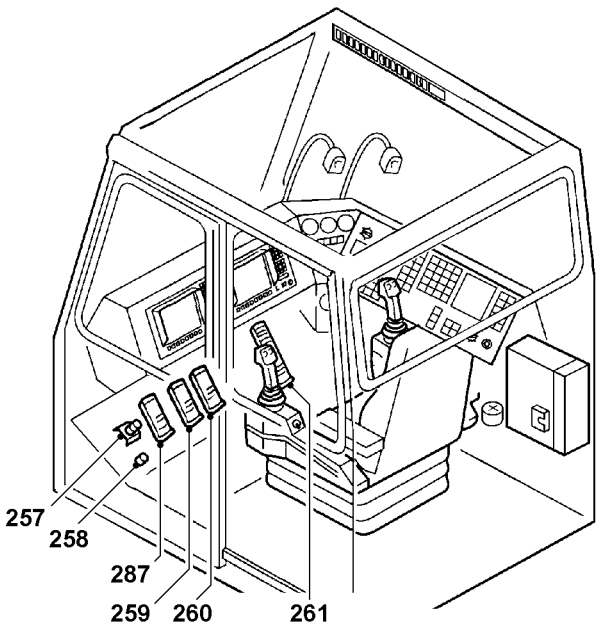
– Winch 6 spools up and the load is raised.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
BXXX YYZZ
XXXX
0 50 90 100 110 130%
002 22
001 11
2:2Y
1:1Y
ERROR 135
100%
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


333
340


405
MS3
404


Y+
286
X-
X+
282
MS2
MS1
Y-


257
258
287
259
260
261

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4.5 Parallel operation

For parallel operation, winch 1 and winch 2 are synchronized.
In parallel operation, winch 1 and 2 are actuated via the master switch MS1y.
Make sure that the following prerequisites are met:
– the double hook block is properly assembled,
– the double hook blocks are reeved according to the load charts,
– the double hook block is correctly reeved as shown in reeving plan,
– the total reeving has been entered and confirmed on the LICCON monitor,
– the number of total reeving on the double hook block must be the same and even.

DANGER
Risk of accident!
▶ The number of total reeving on the double hook block in parallel operation must be the same and even. If the minimum value of the reeving is uneven, then - in parallel operation - the next higher, even reeving must be selected.
▶ The transport pins must be removed before horizontal alignment and before crane operation.
▶ Make sure that the danger zone of the double hook block is free of any personnel.

4.5.1 Horizontally aligning the double hook blocks

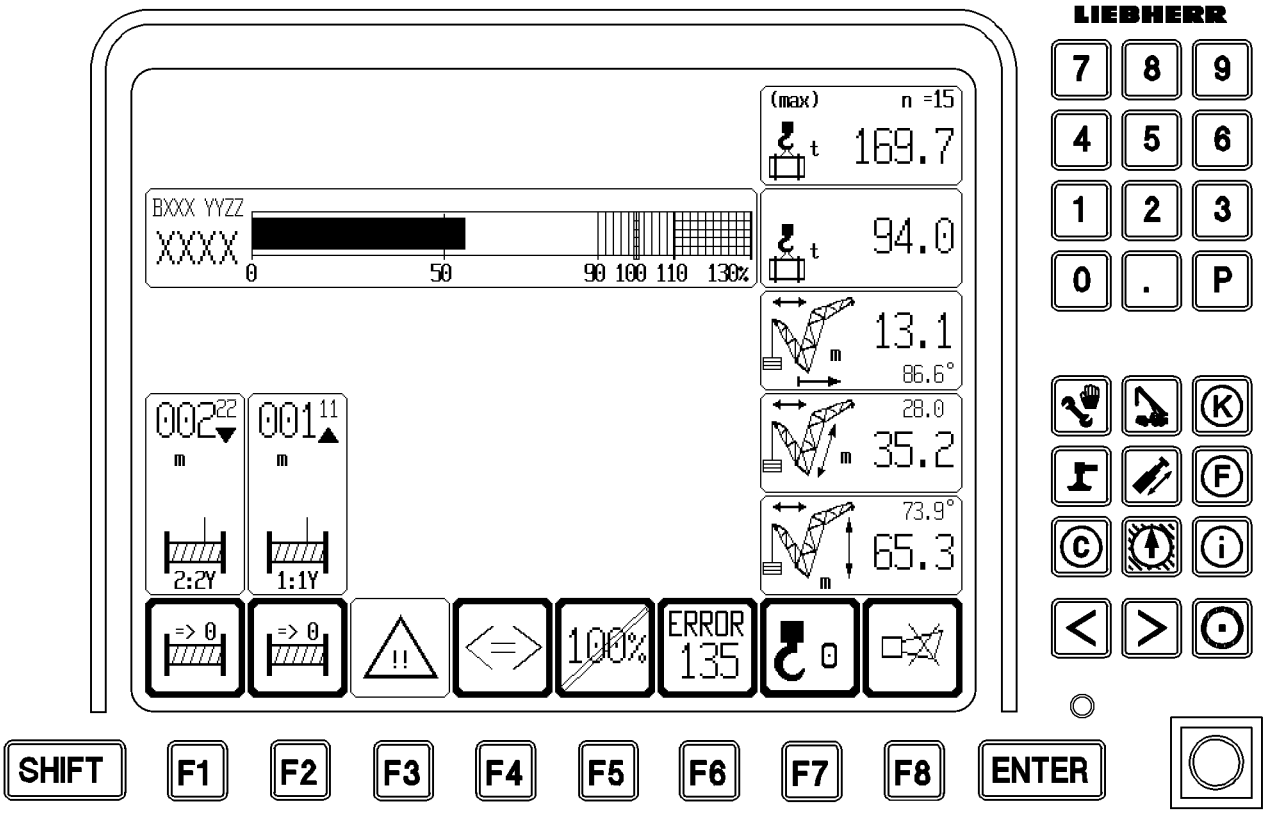
Ensure that the following prerequisite is met:
– the preselection switch **333** is in switch position individual operation for winch 1 and winch 2 (1+2).

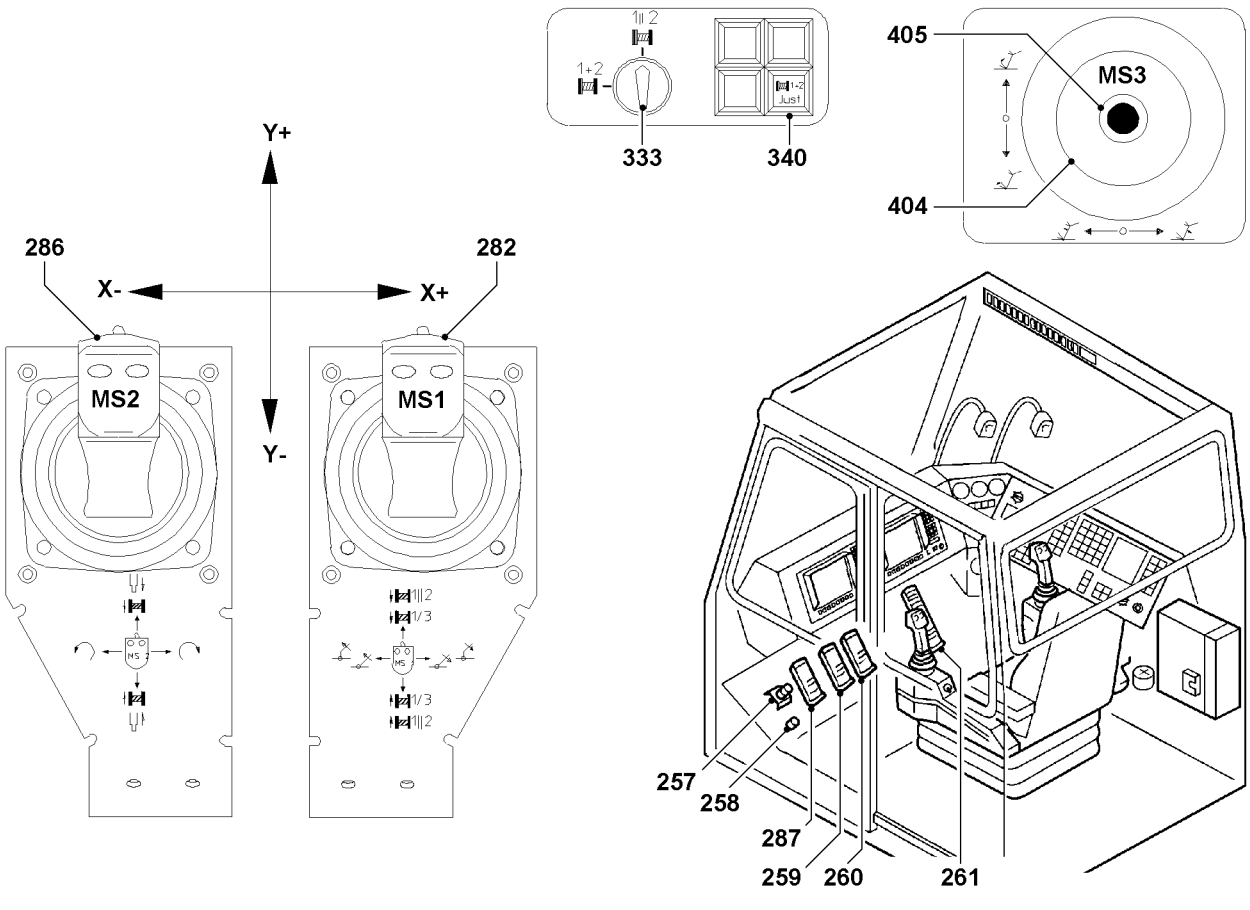
The double hook blocks must be manually aligned in horizontally direction, check visually.
▶ Deflect master switch 1 **282** in direction Y.

or

■ Deflect master switch 2 **286** in direction Y until the double hook blocks are horizontally aligned.
Result:
– Winch 1 or winch 2 spools up or out, check visually.

▶ When the double hook blocks are horizontally aligned, check visually:
Return master switch 1 **282** and / or master switch 1 **286** into zero position.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
BXXX YYZZ
XXXX
0 50 90 100 110 130%
002 22
001 11
2:2Y
1:1Y
ERROR 135
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


333
340
405
MS3
404
Y+
Y-
X-
X+
286
282
MS2
MS1
257
258
287
259
260
261

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4.5.2 Adjust parallel control of winch 1 and winch 2

Make sure that the following prerequisites are met:
- the double hook blocks are horizontally aligned, check visually,
- there is no load on the hook.

▶ Switch the preselection switch **333** to parallel operation (**1II2**).

▶ Press the button **340**.

Result:
- The parallel control of winch 1 and winch 2 is adjusted.

4.5.3 Adjusting zero point for hook path display

Note

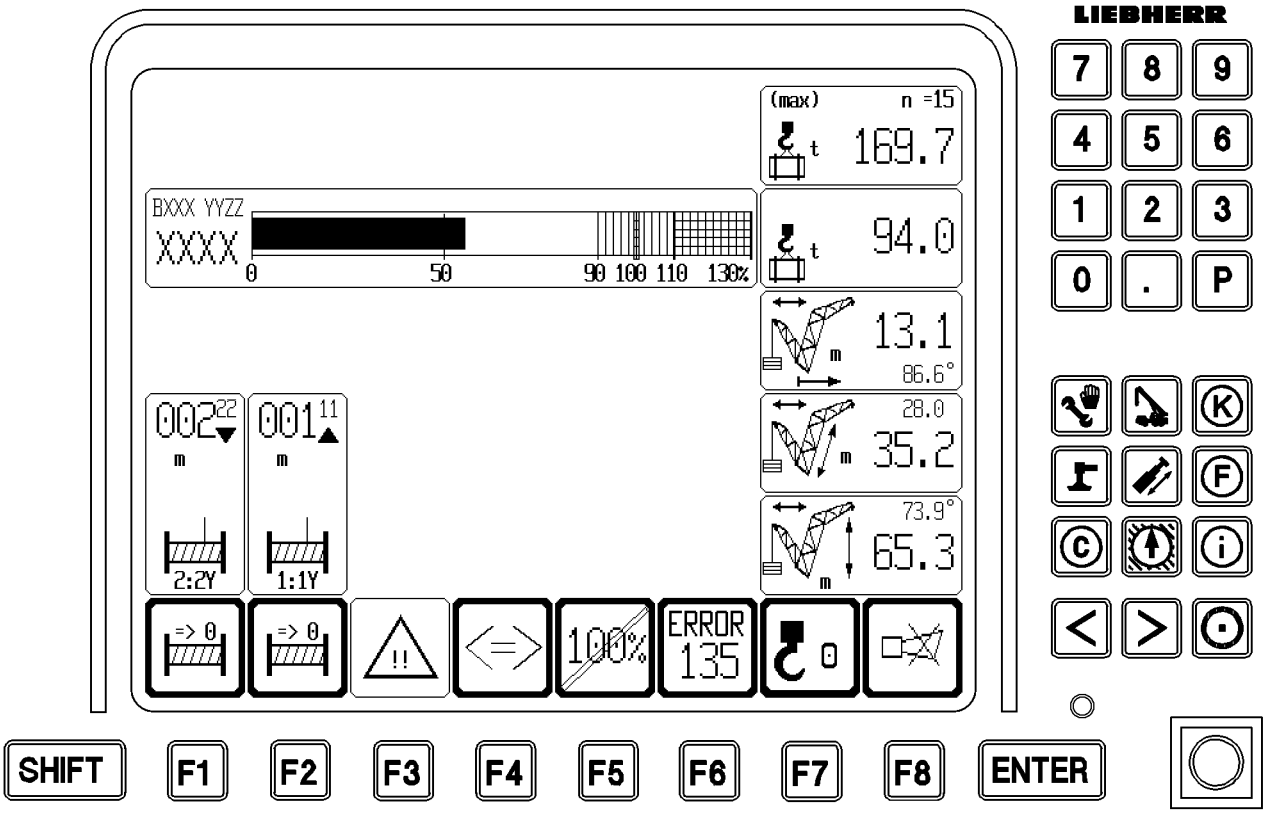
▶ When winch 1 and 2 are working in parallel operation, then the hook path can be reset to zero for both winches by pressing the function key **F1**.

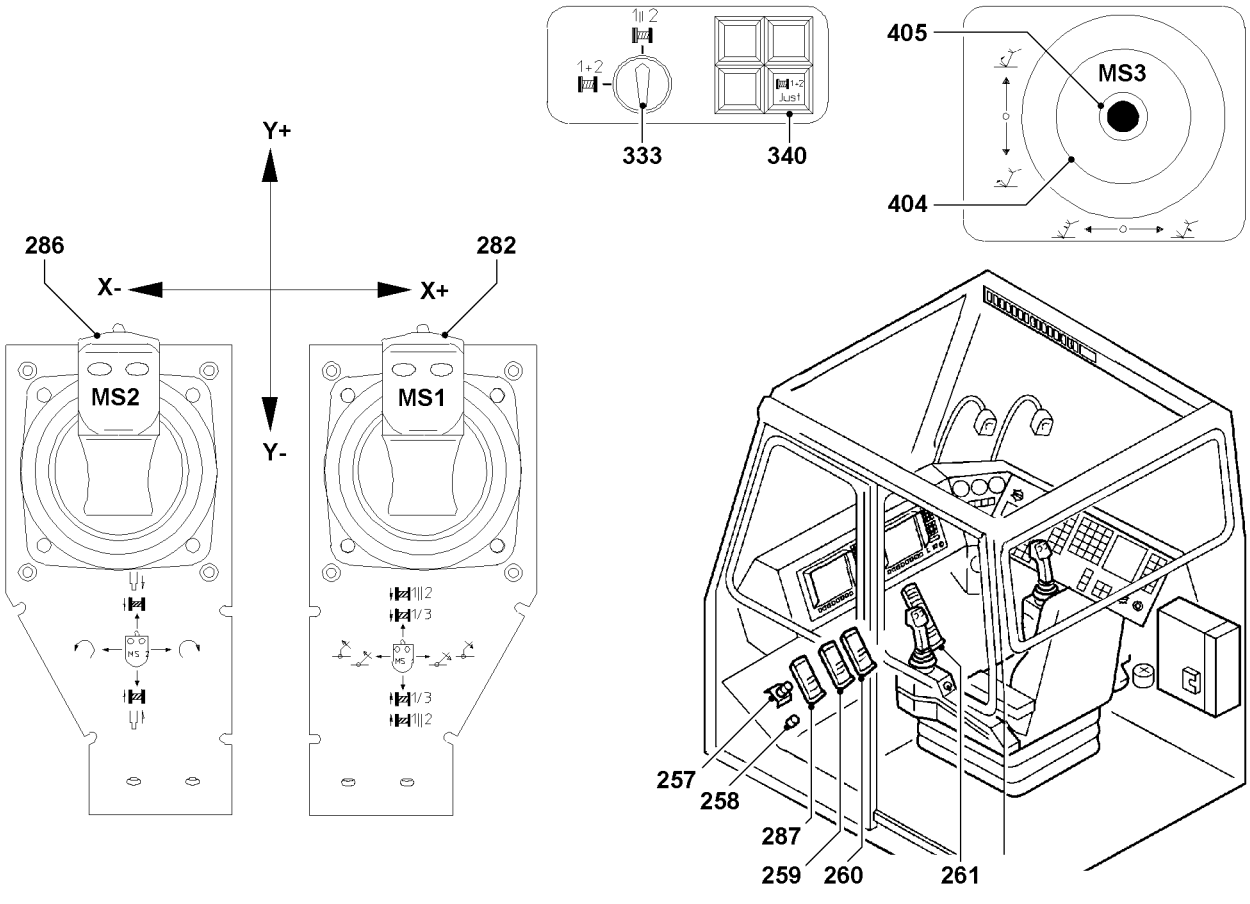
▶ Press the function key **F1**.

Result:
- The hook path display in the winch symbol of winch 1 is set to zero (000,00).
- The hook path display in the winch symbol of winch 2 is set to zero (000,00).

Note

▶ If the difference range for parallel control is exceeded in crane operation, then the winch movement is shut off. In that case, the winches must be again readjusted.


LIEBHERR
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
ERROR
135
100%
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


333
340
405
MS3
404
Y+
Y-
X-
X+
286
282
MS2
MS1
257
258
287
259
260
261

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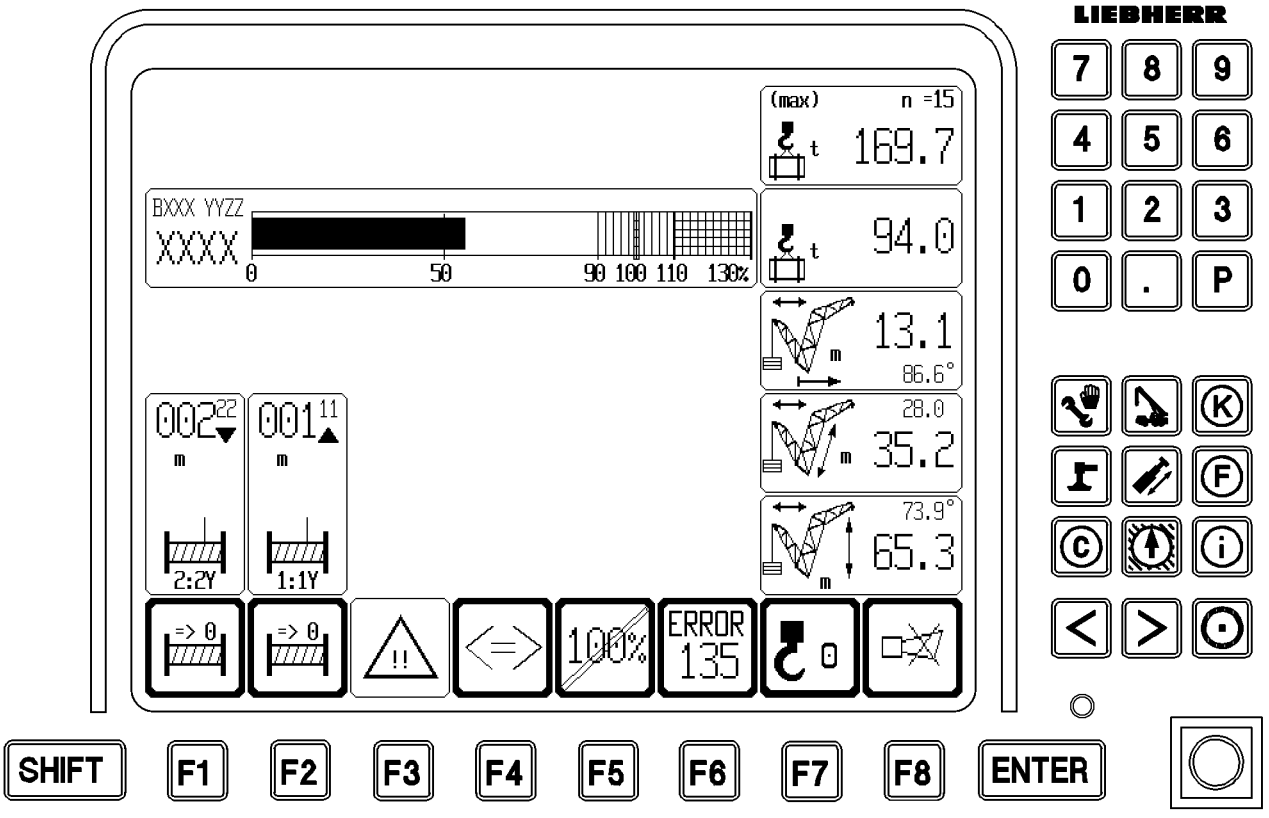
4.5.4 Parallel operation

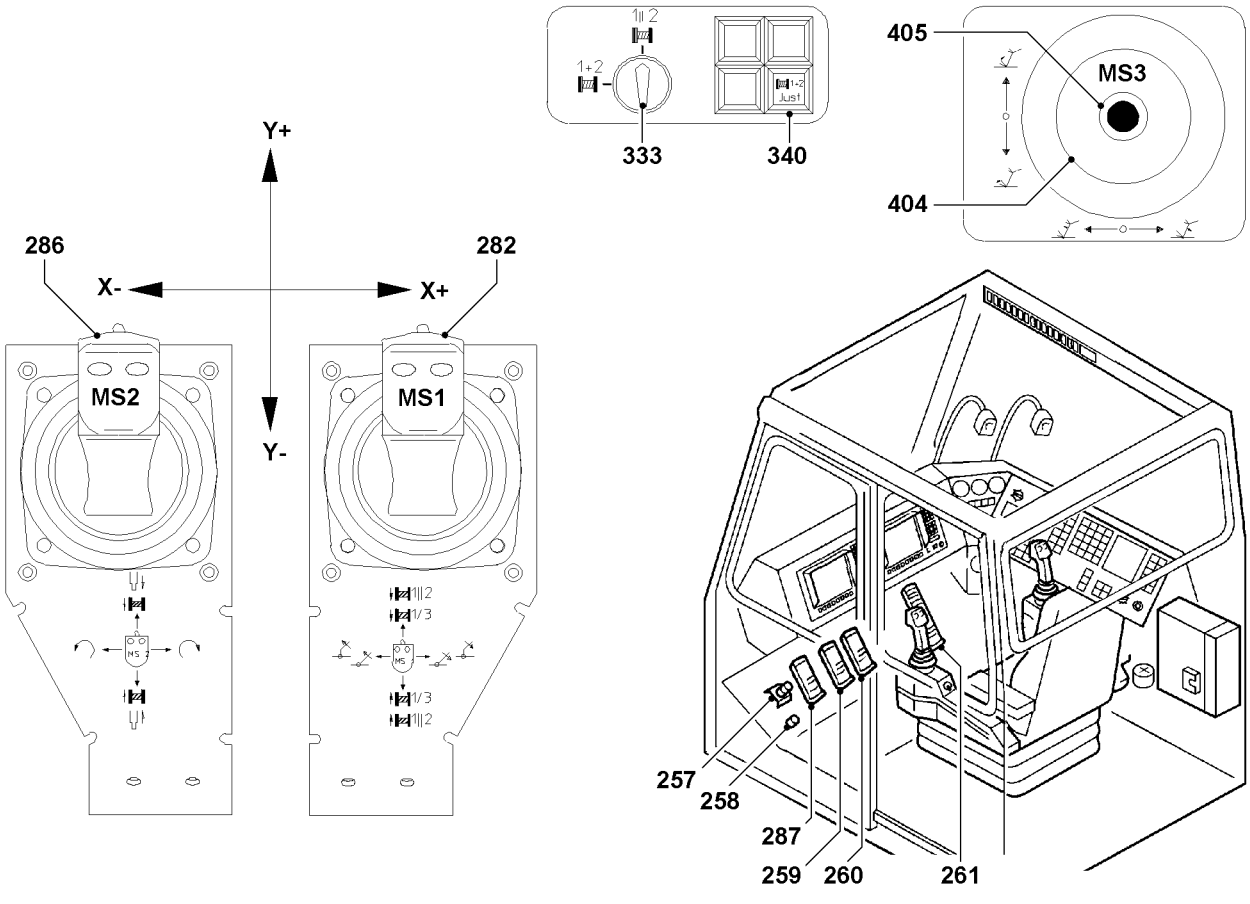
DANGER
Risk of accident!
Due to errors in the set up of parallel operation, severe accidents can occur - despite the monitoring of the rotational speed of both winches by the electronic parallel control.

- ▶ Uneven rope lengths of winches 1 and 2 are prohibited in parallel operation!
- ▶ Uneven reevings of winches 1 and 2 are prohibited!
- ▶ The crane operator is obligated to check winches 1 and 2 during crane operation for their winding behavior!
- ▶ The crane operator must ensure that the double hook blocks are always on the same level. If necessary, the winches must be readjusted!

DANGER
Risk of accident!
The compensating cross bar on the double hook blocks must always be horizontal.
If the compensation cross bar is inclined, then significant load increases will occur on the individual hook blocks.
If this is not observed, then the hook block, boom or ropes can be overloaded, resulting in property damage and personal injury.

- ▶ Make sure that the compensating cross bar is always horizontally aligned.


LIEBHERR
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
ERROR
135
100%
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


333
340
405
MS3
404
Y+
Y-
X-
X+
286
282
MS2
MS1
257
258
287
259
260
261

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5 Luffing

DANGER
Crane can be damaged or topple over!
If the LICCON overload protection turns off when attempting to lift the load with the winch, do not luff up the boom.
▶ Do not lift the load by luffing up the boom, see chapter 4.04.

The speed of crane movement “Luffing” is controlled by the deflection of the corresponding master switch and via the pedal **261** of the engine regulation.

5.1 Luffing the main boom at S / SL / SD / SLD / SDWV (B, BW) operation

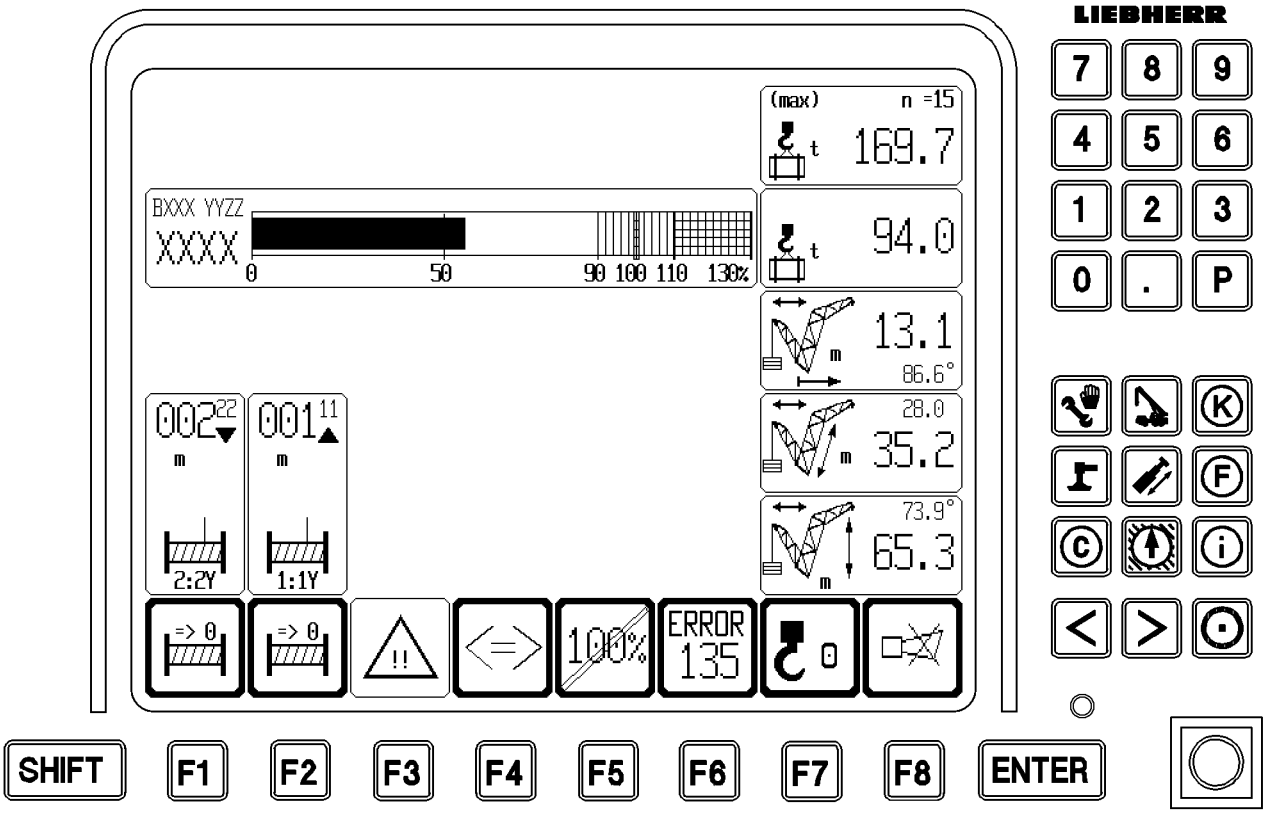
▶ Deflect the master switch 1 **282** in direction X-.
Result:
– The main boom is luffed up.

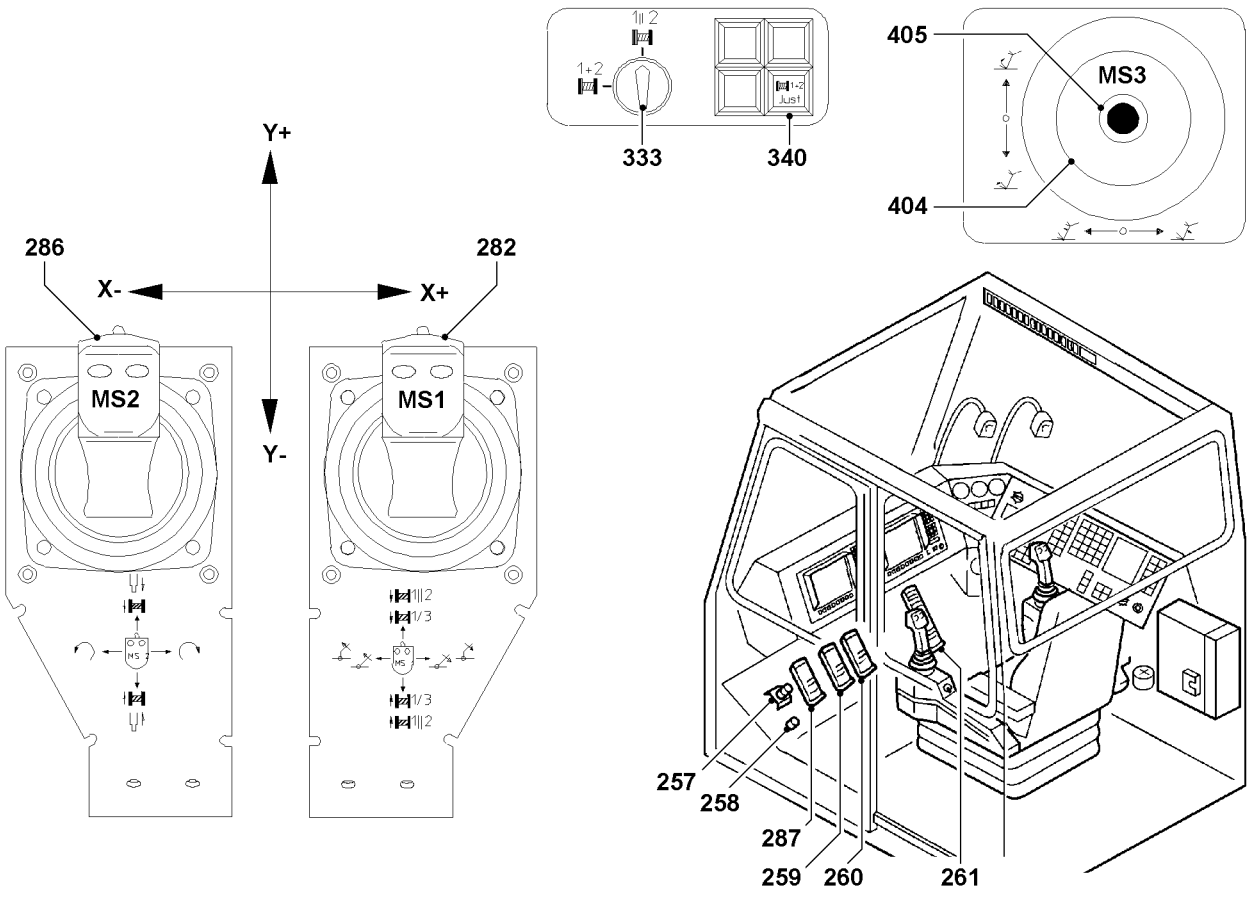
▶ Deflect the master switch 1 **282** in direction X+.
Result:
– The main boom is luffed down.

5.2 Luffing the main boom in SW / SDW (B, BW)-operation

▶ Deflect the master switch 3 **404** in direction X-.
Result:
– The main boom is luffed up.

▶ Deflect the master switch 3 **404** in direction X+.
Result:
– The main boom is luffed down.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
BXXX YYZZ
XXXX
0 50 90 100 110 130%
002 22
001 11
2:2Y
1:1Y
ERROR 135
100%
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


333
340
405
MS3
404
Y+
Y-
X-
X+
286
282
MS2
MS1
257
258
287
259
260
261

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5.3 Luffing the lattice jib in SW / SDW (B, BW) operation

▶ Deflect the master switch 1 **282** in direction X-.

Result:

– The lattice jib is luffed up.

▶ Deflect the master switch 1 **282** in direction X+.

Result:

– The lattice jib is luffed down.

5.4 Luffing the derrick, for all D operating modes

▶ Deflect master switch 3 **404** in direction Y-.

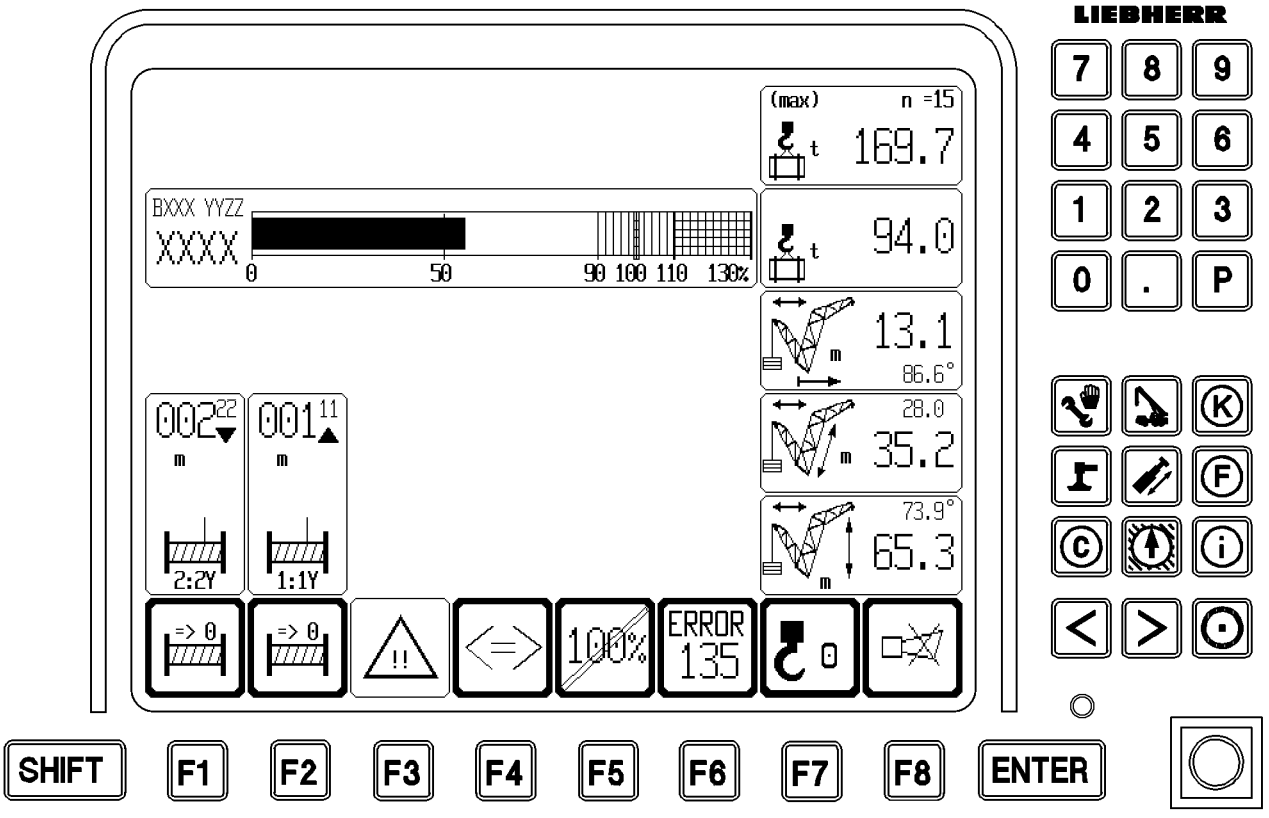
Result:

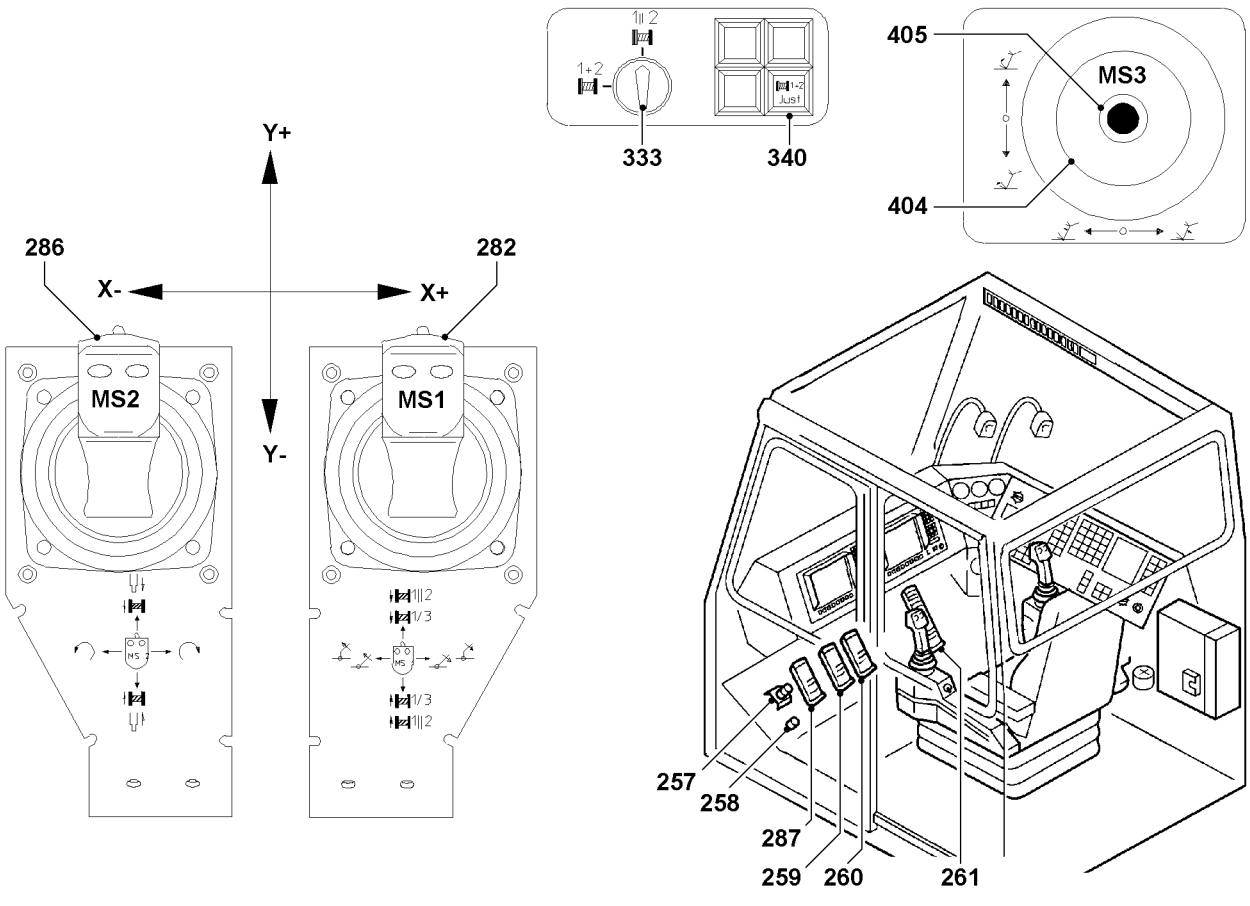
– The derrick is luffed up.

▶ Deflect master switch 3 **404** in direction Y+.

Result:

– The derrick is luffed down.


LIEBHERR
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
ERROR
135
100%
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


Y+
Y-
X-
X+
286
282
MS2
MS1
333
340
405
404
MS3
257
258
287
259
260
261

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6 Turning

The speed of the “Turning” crane movement is controlled via the deflection of master switch 2 **286** and via the pedal **261** of the engine regulation.

Note

▶ **The following applies:** The longer the boom and the larger the load, the lower is the rotational speed.

In the “Control Parameter” program, it is possible to preselect the maximum rotational speed.
See chapter 4.02, section “Control Parameter”.
The load chart manual gives the maximum slewing speeds in percentages. These values depend on the boom length and the operating mode, and may not be exceed under any circumstances.

6.1 Turning the crane superstructure

DANGER
Risk of fatal injury!
▶ Ensure that there are no obstacles in the crane working area and no persons in the danger zone.
▶ Give a short warning signal (horn) before starting a crane movement.

DANGER
Risk of fatal injury!
A swaying load can damage the crane and cause it to topple.
▶ The maximum permissible rotational speeds according to the load chart manual must be observed!
▶ When turning with a load, initiate and slow down the turning movement very sensitively.

▶ Deflect the master switch 2 **286** in direction X+.

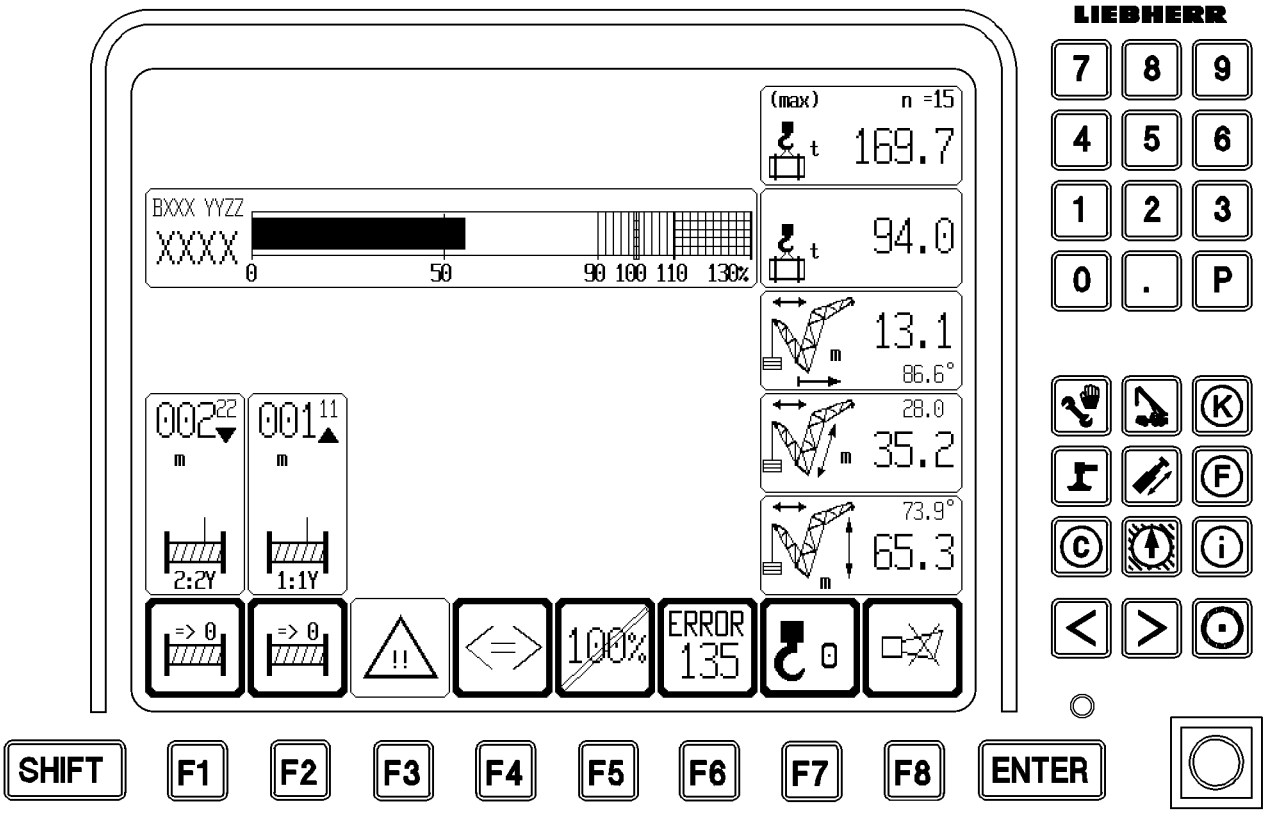
Result:
– The crane superstructure turns to the right.

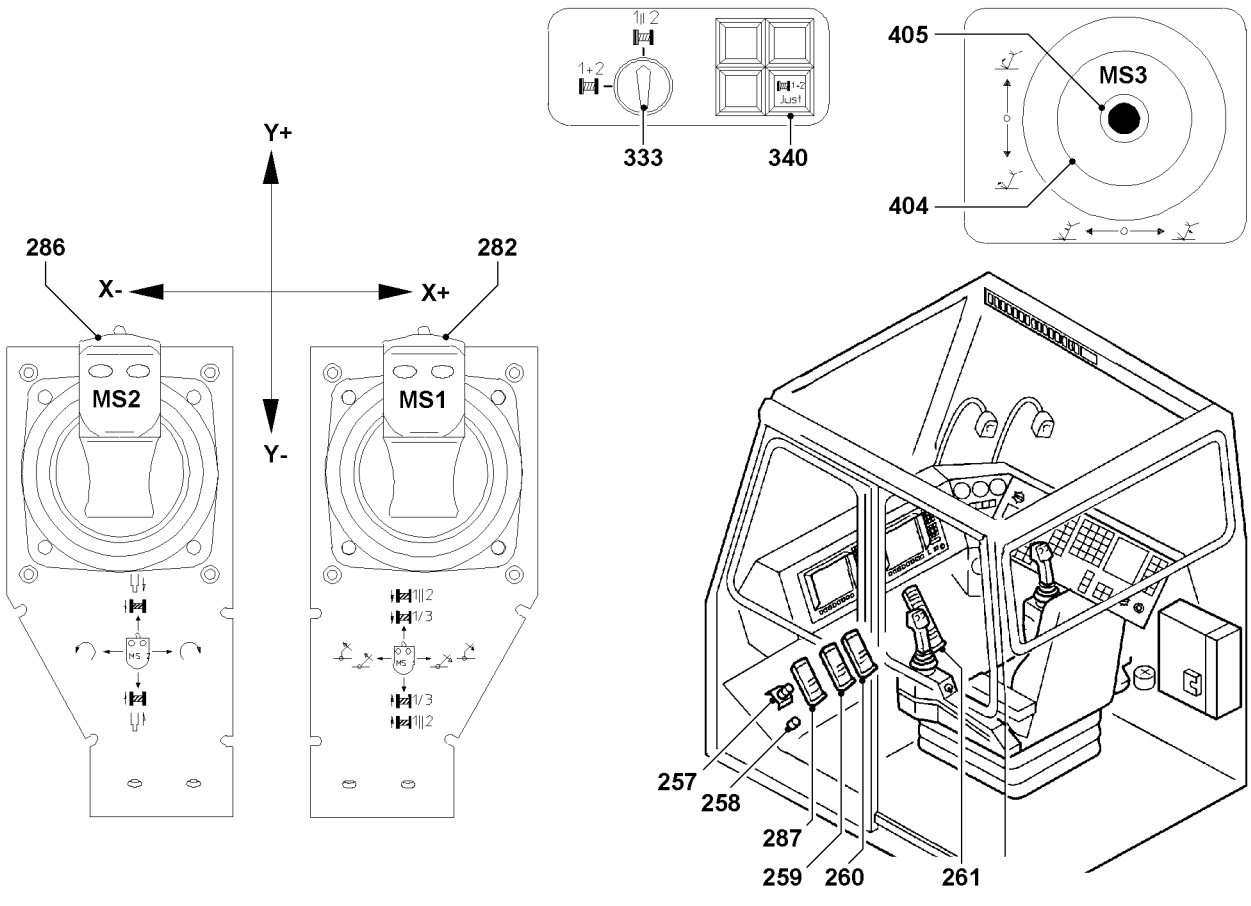
▶ Deflect the master switch 2 **286** in direction X-.

Result:
– The crane superstructure turns to the left.

6.2 Slewing gear, General

This crane is equipped with a “closed circuit slewing gear”.
With a “closed circuit slewing gear”, the braking effect starts as soon as master switch 2 **286** is moved towards the neutral position.
The parking brake is released as soon as master switch 2 **286** is moved away from the neutral position.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
ERROR
135
100%
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


333
340
405
MS3
404
Y+
Y-
X-
X+
286
282
MS2
MS1
257
258
287
259
260
261

B104678

6.3 Switching the slewing gear to coasting

The slewing gear can be switched to coasting to be able to simply position the boom over the load to be lifted. The master switch 2 **286** must be in neutral position.
The slewing gear **cannot** be switched to coasting in these situations:

– Slewing gear shut off by the LICCON overload protection.
– Activated working range limitation.

▶ Press the foot button **257**.

Result:

– The slewing gear is switched to coasting.

Troubleshooting

With the slewing gear released, the superstructure turns unintentionally to the side (for example due to wind).

▶ Do not release the foot button **287**.
▶ Deflect the master switch 2 **286** in slewing direction and then release the foot button **287**.
▶ Slow down the slewing movement by slowly resetting the master switch 2 **286**.

6.4 Adding the slewing gear brake (block)

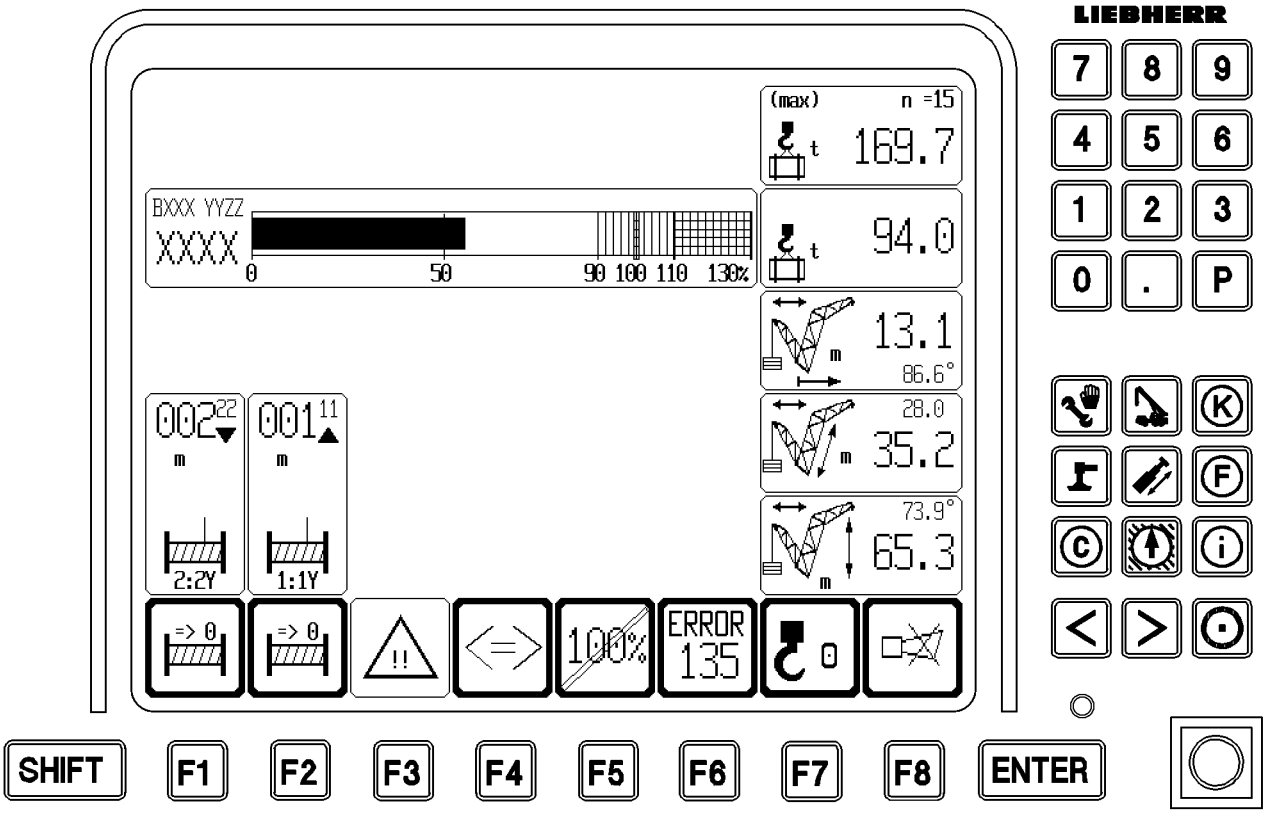
CAUTION

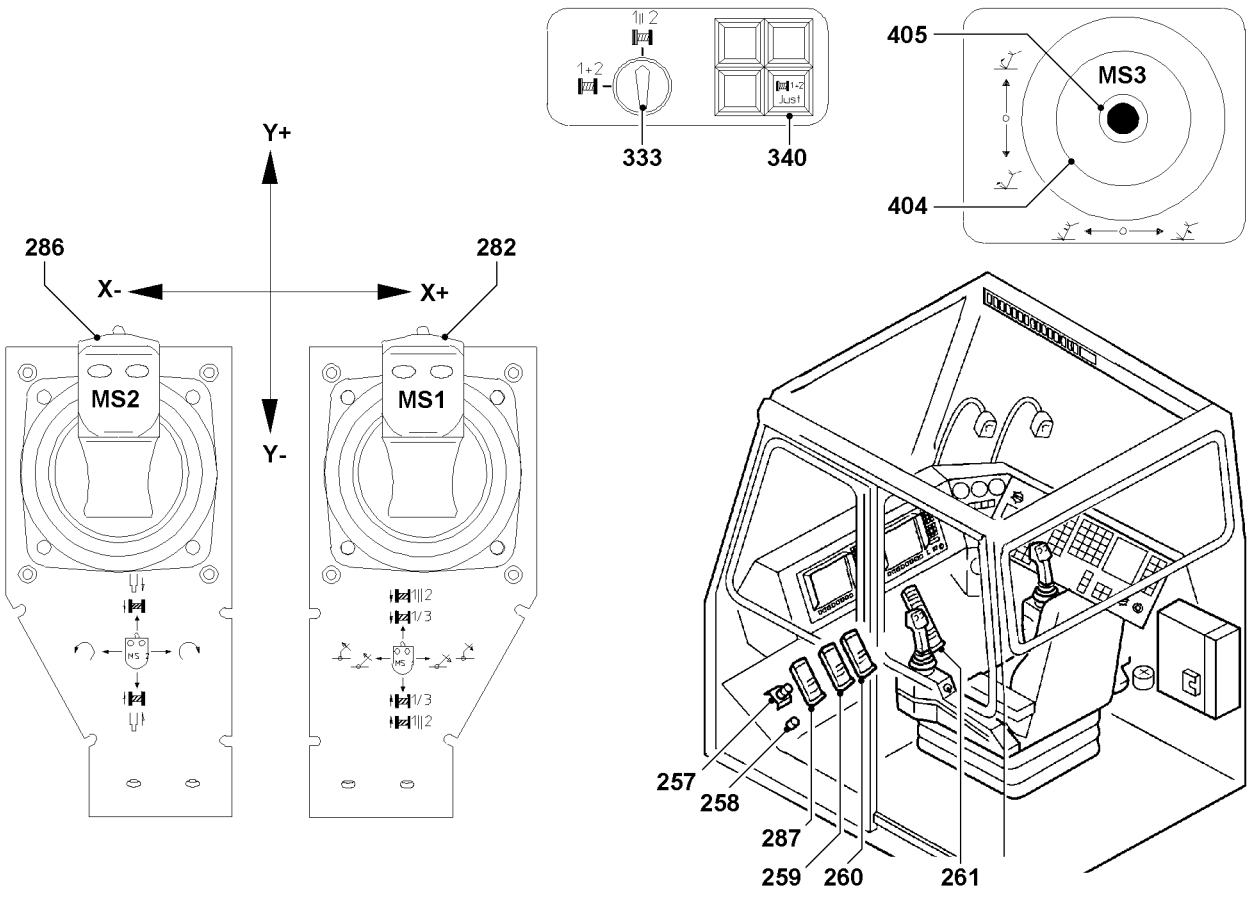
Destruction of the roller slewing ring connection or the slewing gear!
Due to improper use of the slewing gear brake **287**, the roller slewing ring and/or the slewing gear can be destroyed or heavily damaged!

▶ Do not use the slewing gear brake **287** as an operational slewing gear brake, since the slewing gear brake cannot slow down the full rotational momentum.
▶ The slewing gear brake **287** may only be used at **minimum** rotational speeds, in other words with master switch 2 **286** almost in the neutral position.
▶ Do not brake the turning movement of the crane by moving the master switch 2 **286** back to the neutral position and/or by abruptly applying the slewing gear brake **287**!

The slewing gear brake **287** is only to be used in the following situations:

1.) Starting out in strong side wind.
2.) Stopping the slewing movement in strong side wind.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
BXXX YYZZ
XXXX
0 50 90 100 110 130%
002 22
001 11
2:2Y
1:1Y
ERROR 135
100%
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


333
340
405
MS3
404
Y+
Y-
X-
X+
286
282
MS2
MS1
257
258
287
259
260
261

B104678

6.4.1 Starting out in strong side wind

When turning against the wind in strong side wind and with a long boom system, then the superstructure will turn into the opposite direction due to leakage in the hydraulic motor.
This can be avoided as follows:

- ▶ Actuate the slewing gear brake **287**.
- ▶ Deflect the master switch 2 **286** into the desired turning direction.
- ▶ Slowly release the slewing gear brake **287**.

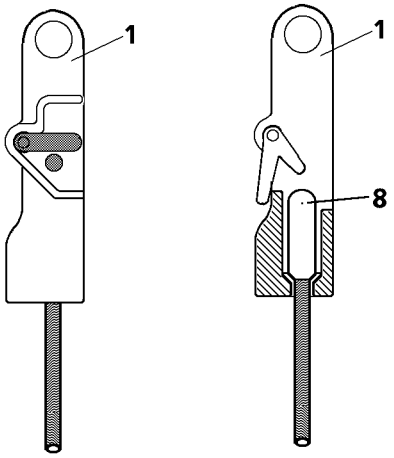
Result:

– The crane superstructure turns into the desired direction.

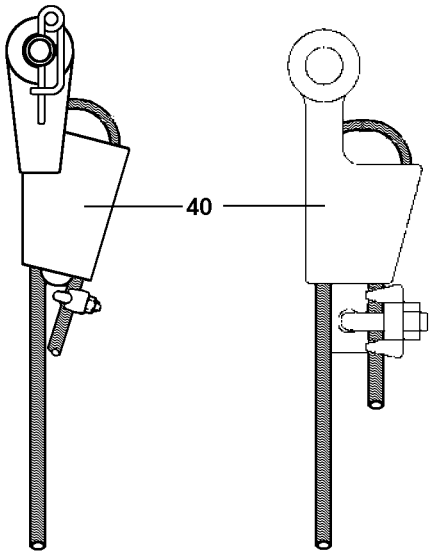
6.4.2 Stopping the slewing movement in strong side wind

- ▶ Slow down the crane with master switch 2 **286** to minimum turning speed.
- ▶ Apply the slewing gear brake **287** carefully, until the crane superstructure has come to a standstill at the desired position.

1



2



B108118

1 Wire ropes and rope end connections

1.1 Wire ropes

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

Note

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

DANGER

Danger of serious personnel injury and equipment damage!

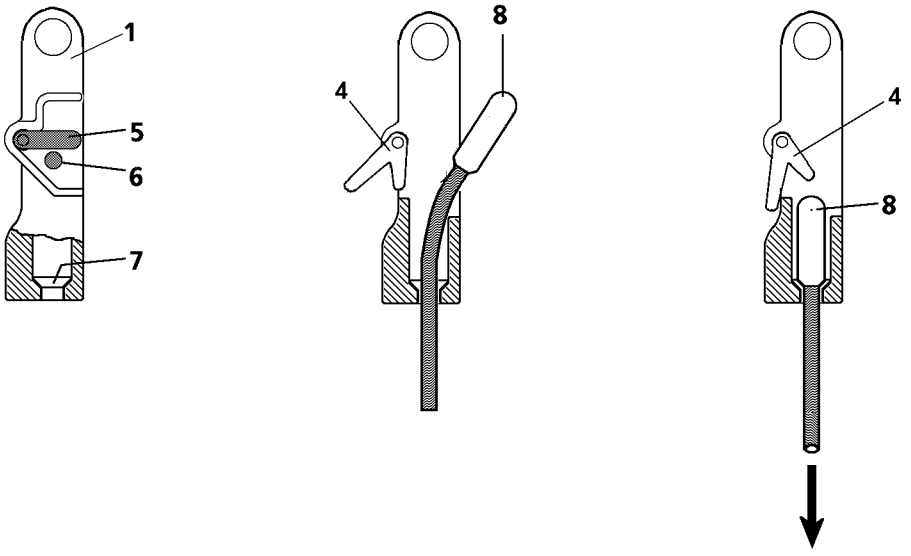
▶ **Never** use rotation-resistant ropes with a rotating rope end connection!

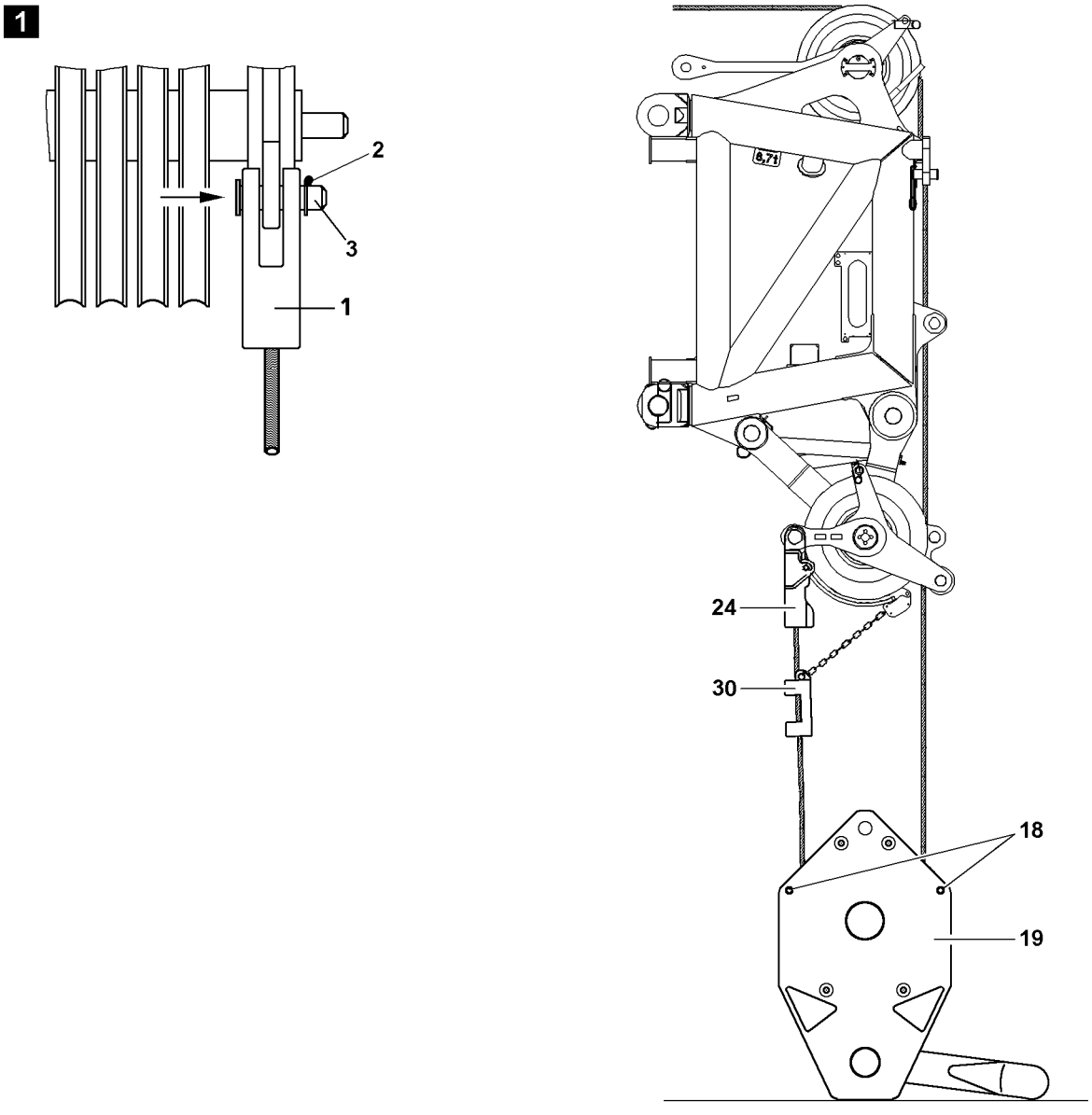
▶ **Never** install a twist compensator / swivel!

1.2 Rope end connections

Rope end connections are grouped into:

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





B108211

2 Reeving the hook block in and out

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

2.1 Reeving in the hook block

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

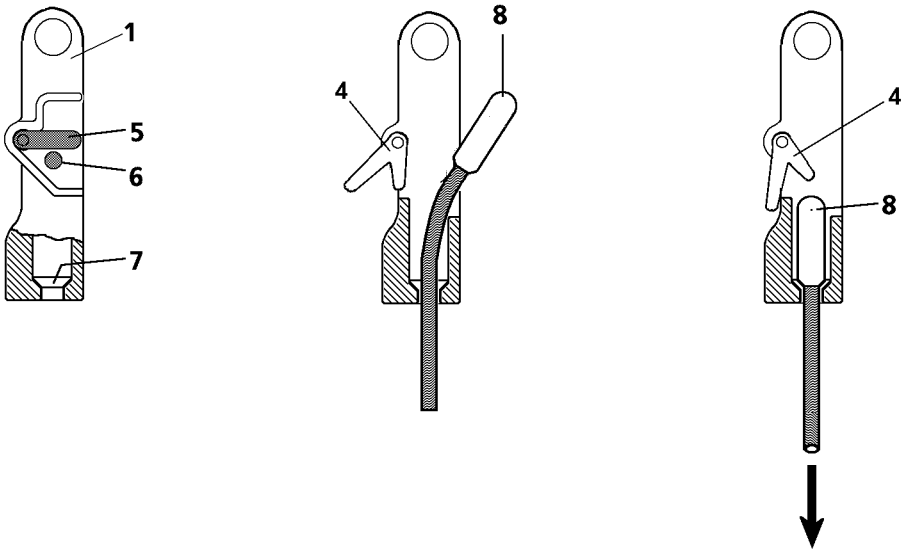
Note
- ▶ The reeving of the hoist rope can be carried out manually or with the aid of the assembly winch!
- ▶ Make sure that no slack rope forms during reeving!

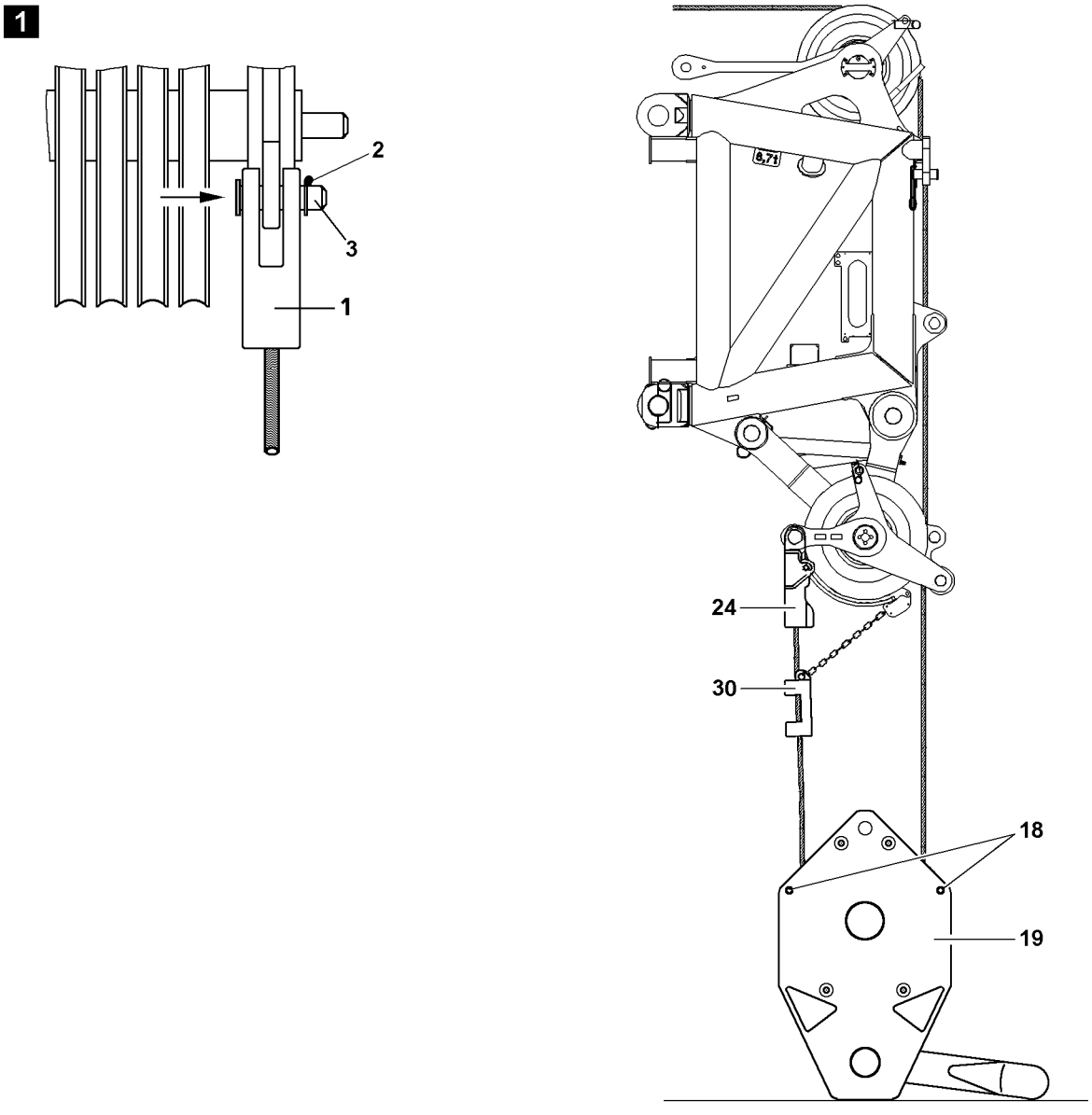
NOTICE
Damage to the hoist rope!
An incorrectly reeved hoist rope or the incorrect selection of the rope fixed point can cause the hook block not to hang vertically and thus cause damage to the hoist rope!
- ▶ Always carry out the reeving of the hoist rope according to the reeving plan!
- ▶ The rope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

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

2.1.1 Procedure

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





B108211

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!

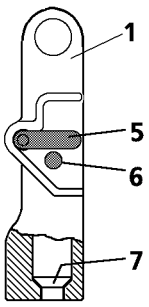
- ▶ Always insert pins **3** from “inside to outside” and secure them from the outside, see illustration **1**.

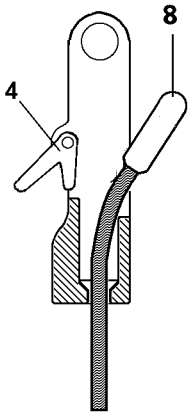
- ▶ The rope lock **1** must be pinned in either at the pulley head or on the hook block and secured with linch pins **2**, depending on reeving.
- ▶ On the rope lock **1**, push the retaining pin **6** in.
- ▶ Swing the lever **5** “down” and hold it in this position.

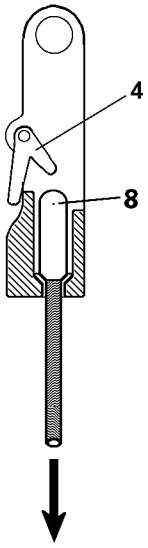
Result:

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

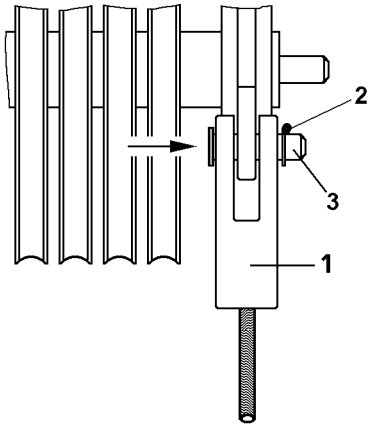
- ▶ Attach the rope end with the locking clamp **8** in the rope lock **1** and pull “down” firmly (in direction of arrow), until the locking clamp **8** is touching in the cone **7**.

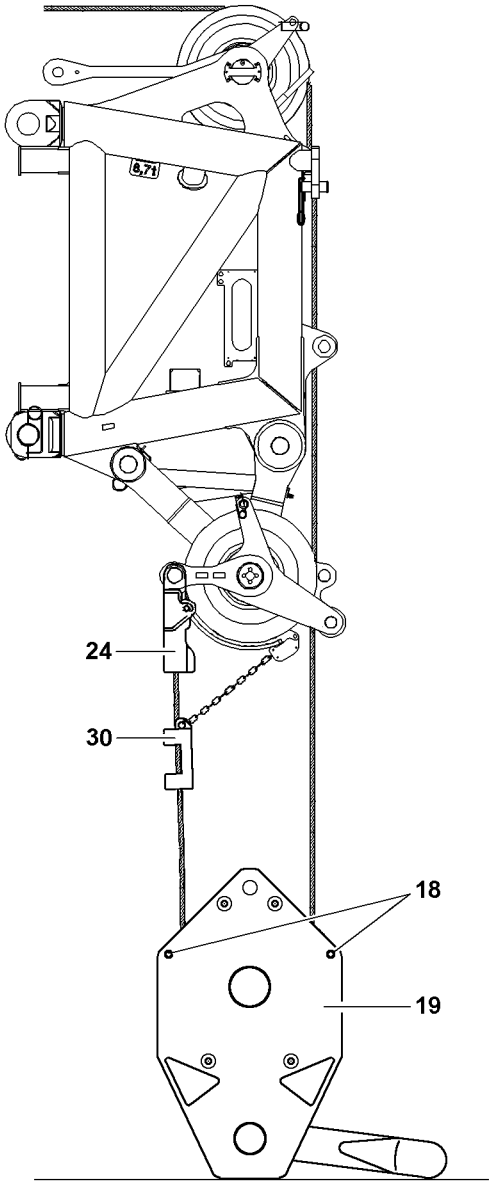






1





B108211

WARNING
Incorrectly secured locking clamp!
If the locking clamp **8** is hooked and secured incorrectly or insufficiently in the rope lock **1**, then the load and the hook block can fall down!
Personnel can be severely injured or killed!
▶ The locking clamp **8** must touch on the cone **7** after hanging it into the rope lock **1** and must be secured by the latch **4**!

▶ Release the lever **5**.

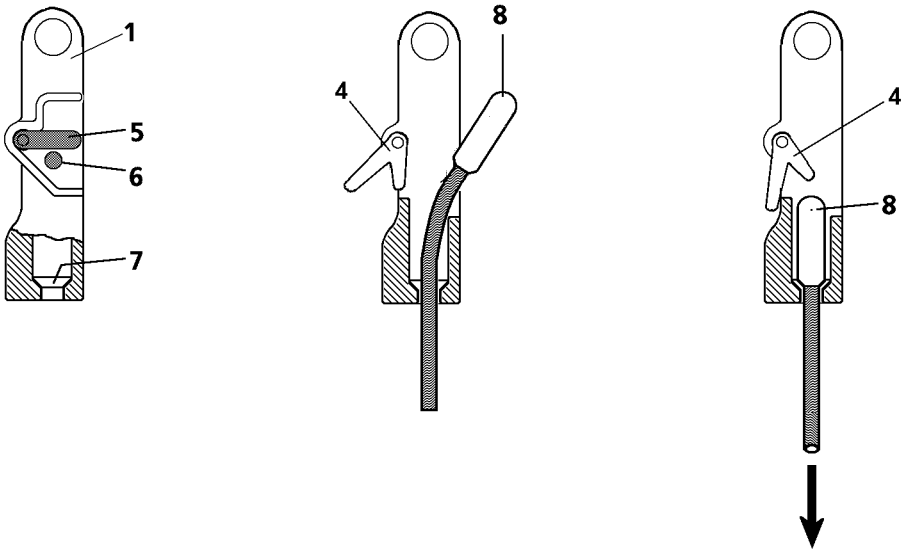
Result:
– The lever **5** returns to the initial position and is locked by the retaining pin **6**.

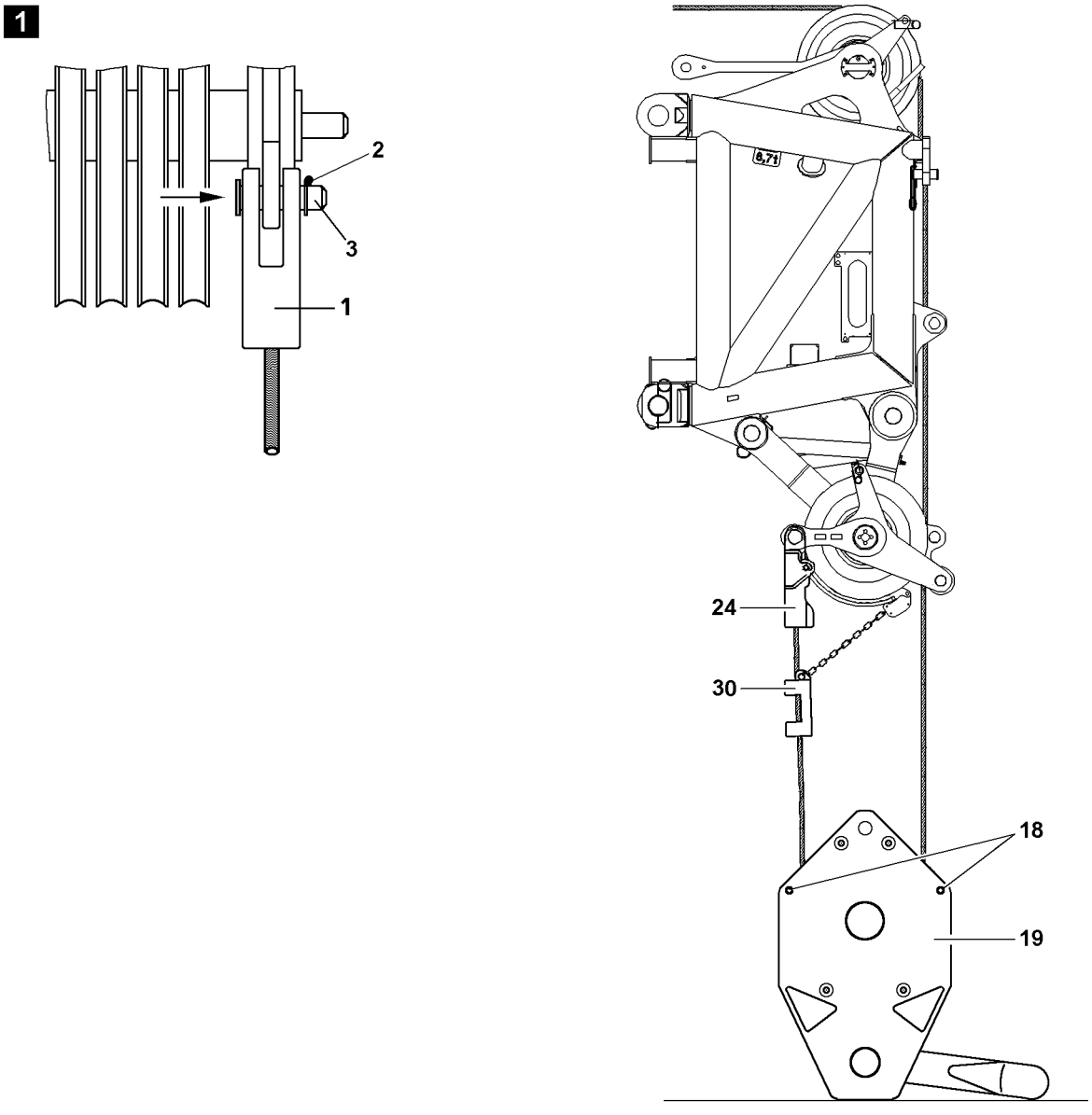
▶ Check the rope retainer. Check visually!

2.1.5 Preparing the hook block for crane operation

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

Note
▶ See chapter 5.19 of the crane operating instructions!





B108211

2.2 Unreeving the hook block

Make sure that the following prerequisites are met:
- the crane is aligned in horizontal direction,
- the ground is level and of sufficient load carrying capacity,
- the hook block is prepared for removal, see chapter 5.19 of the crane operating instructions,
- an assistant is present to guide the hoist rope.

2.2.1 Lowering the hook block

WARNING
Crushing of hands!
When guiding the hook block by hand, hands or fingers can be crushed!
When unreeving the hook block, it can topple over!
Personnel can be severely injured or killed!
- ▶ Use the handles in the safe area of the hook block!
- ▶ Make sure the hook block is safely positioned!

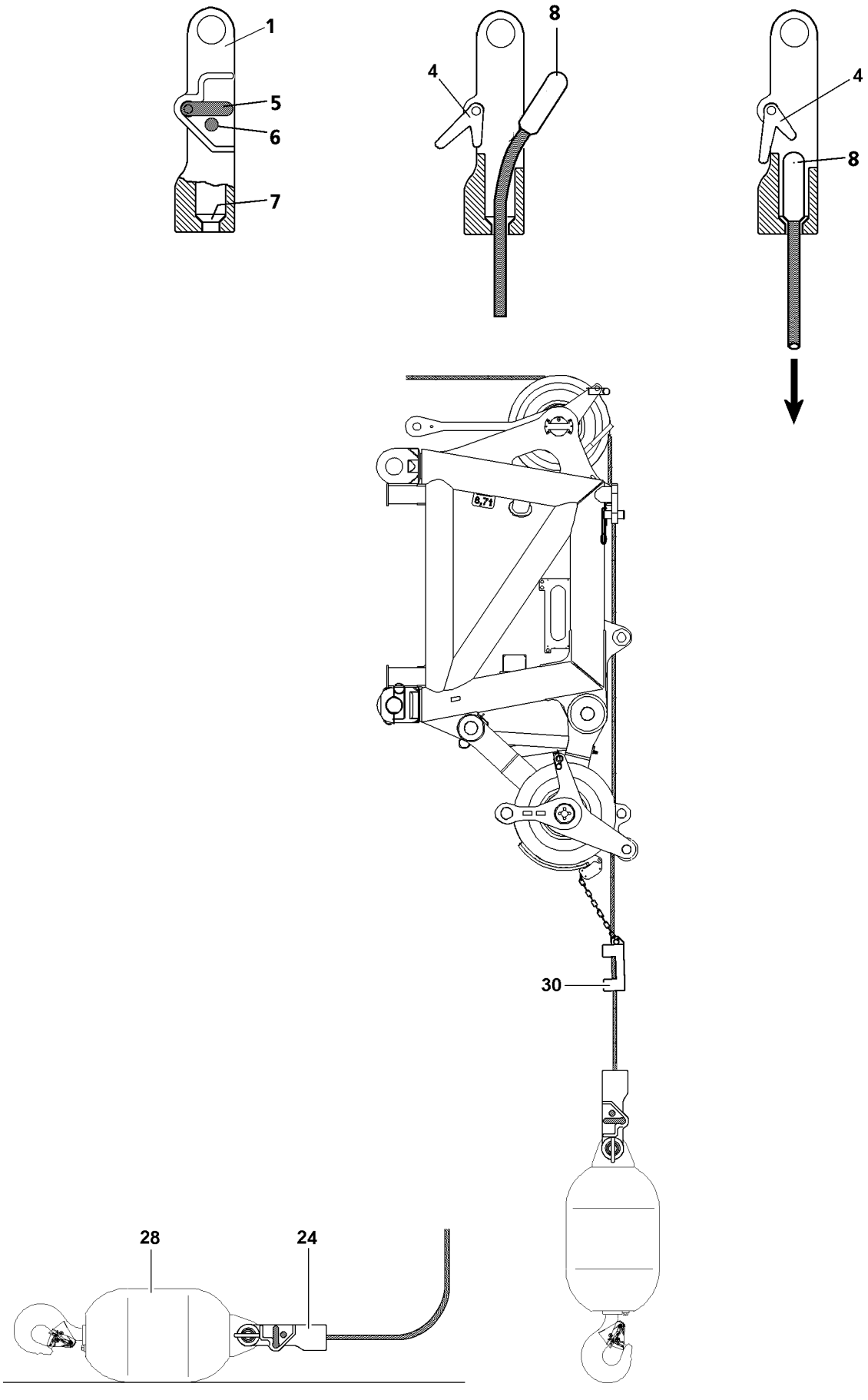
- ▶ Lower the hook block and set it on the ground.
- ▶ Remove the hoist limit switch weight, see section “Removing the hoist limit switch weight”.

2.2.2 Detaching the hoist rope

- ▶ Push in retaining pin **6** on the rope lock **1** move the lever **5** downward and hold it in this position.

Result:
- The latch **4** is moved to the side and the locking clamp **8** is released.

- ▶ Push the hoist rope up and detach the locking clamp **8**.
- ▶ Release and unpin the rope retaining pipe on the hook block.
- ▶ Unreeve the hoist rope from the hook block and the pulley head.
- ▶ Insert the rope retaining pipes again and secure with spring retainers.



B108212

3 Securing and removing the load hook*

3.1 Securing the load hook*

3.1.1 Assembling the load hook*

- ▶ Place the load hook under the pulley head of the boom.
- ▶ Release and unpin the rope retaining pipes on the back pulley and on the pulley head.

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

- ▶ An assistant guides the hoist rope over the boom to the pulley head and at the same time, the crane operator spools the hoist winch out.
- ▶ Place the hoist rope over the back pulley.
- ▶ Insert the rope retaining pipes again and secure with spring retainers.
- ▶ Pin the rope lock **1** in the load hook **26** and secure with spring retainers.

3.1.2 Fastening the hoist rope

- ▶ Push the retaining pin **6** in on the rope lock **1**, move the lever **5** to the side and hold it in this position.

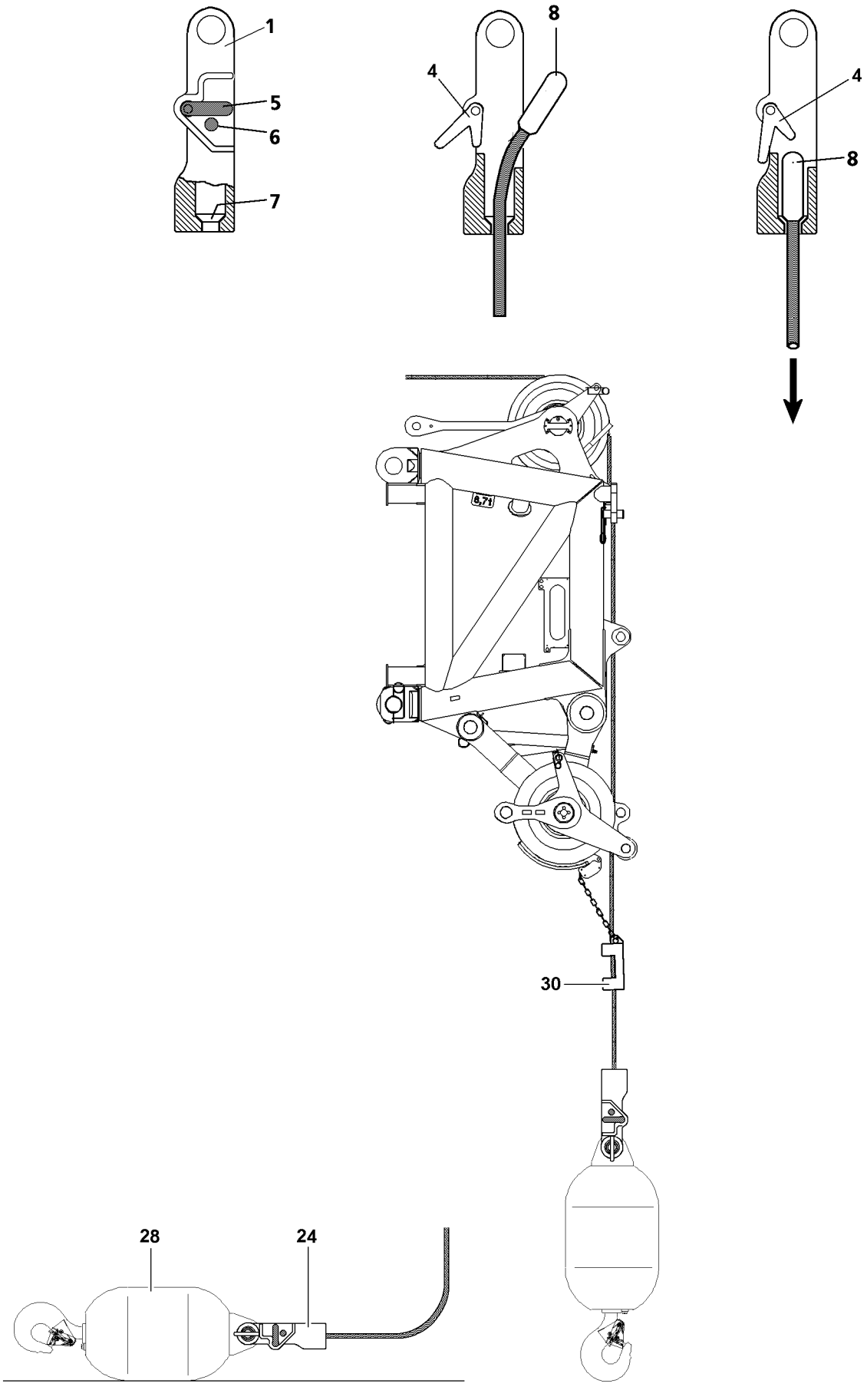
Result:
– The latch **4** is moved to the side.

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

WARNING
Incorrectly secured locking clamp!
If the locking clamp **8** is hooked and secured incorrectly or insufficiently in the rope lock **1**, then the load and the hook block can fall down!
Personnel can be severely injured or killed!
- ▶ The locking clamp **8** must touch on the cone **7** after hanging it into the rope lock **1** and must be secured by the latch **4**!

- ▶ Release the lever **5**.

Result:
– The lever **5** returns to the initial position and is locked by the retaining pin **6**.



B108212

3.2 Removing the load hook*

Make sure that the following prerequisites are met:
– the crane is aligned in horizontal direction,
– an assistant is present to guide the hoist rope,
– the ground is level and of sufficient load carrying capacity.

3.2.1 Lowering the load hook

WARNING
Crushing of hands!
When guiding the load hook by hand, hands or fingers can be crushed!
The load hook could roll away!
▶ Make sure the load hook is safely positioned!

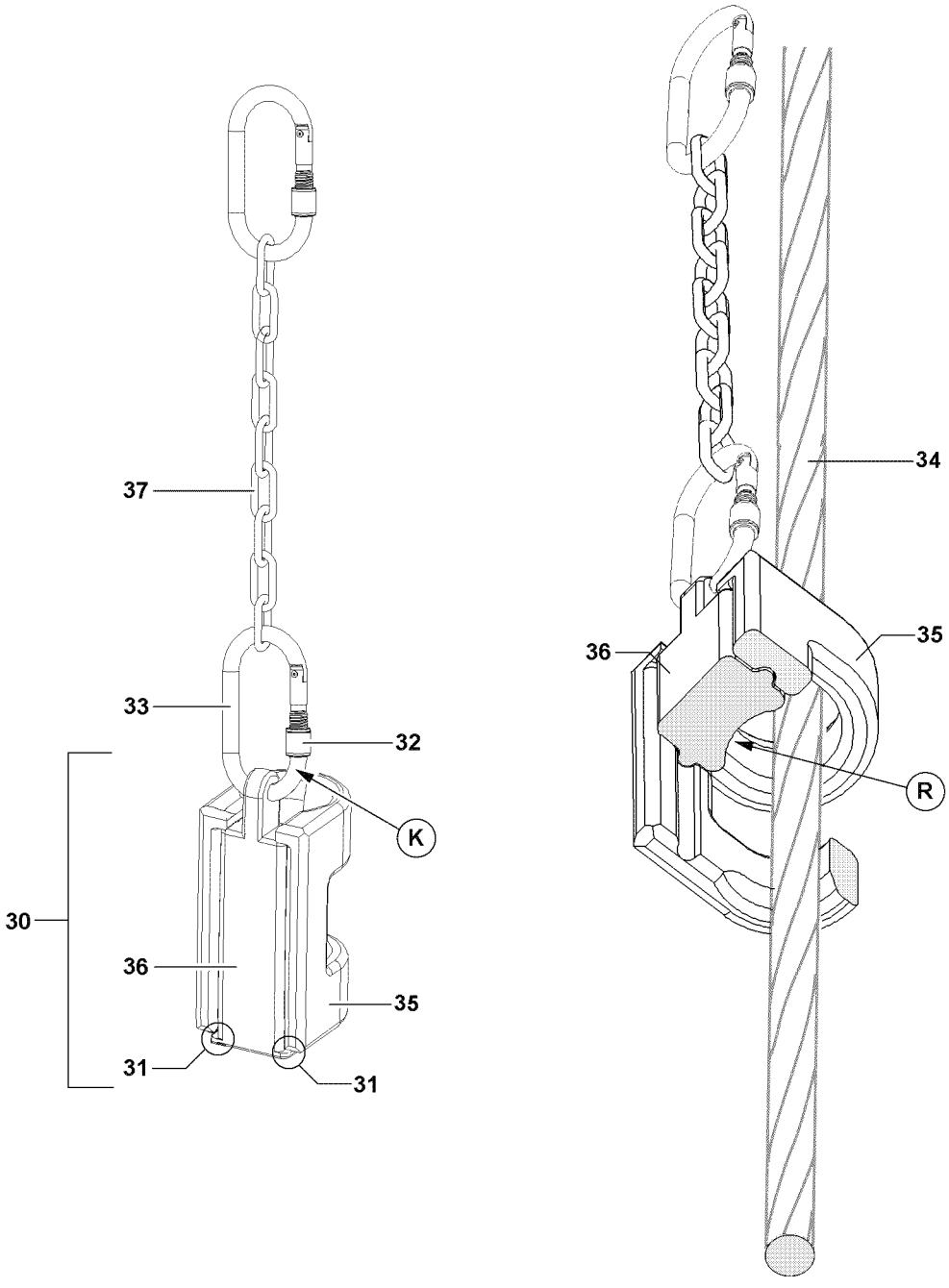
▶ Place the load hook **28** on the ground.
▶ Remove the hoist limit switch weight, see section “Removing the hoist limit switch weight”.

3.2.2 Detaching the hoist rope

▶ Push the retaining pin **6** in on the rope lock **1**, move the lever **5** to the side and hold it in this position.

Result:
– The latch **4** is moved to the side and the locking clamp **8** is released.

▶ Push the hoist rope in the direction of the load hook and detach the locking clamp **8**.
▶ Remove the rope retaining pipes on the pulley head and on the back pulley.
▶ Lift the hoist rope from the rope pulleys.
▶ Insert the rope retaining pipes again and secure with spring retainers.



B106127

4 Attaching / removing the hoist limit switch weight

4.1 Attaching the hoist limit switch weight

The hoist limit switch weight **30** consists of 2 parts, which are pushed into each other:
– The weight **35**
– The carrier section **36**

▶ Loosen and open the screw retainer **32**.

WARNING
The hoist limit switch can fall down!
If the hoist limit switch weight is incorrectly assembled, components can fall down!
Personnel can be severely injured or killed!
▶ Do not replace the snap hook **33** with other parts, such as a shackle or similar!
▶ When detaching or fastening the hoist limit switch weight **30** make sure that the weight **35** and the carrier section **36** do not fall down!
▶ Make sure that the curvature **R** of the carrier section **36** points to the hoist rope **34**!
▶ Make sure that the stubs **31** of the carrier section **36** touch on the weight **35**!
▶ Make sure that the screw retainer **32** can be turned to be closed from top to bottom, point **K**!

The attachment of the hoist limit switch weight **30** depends on the position of the rope fixed point.

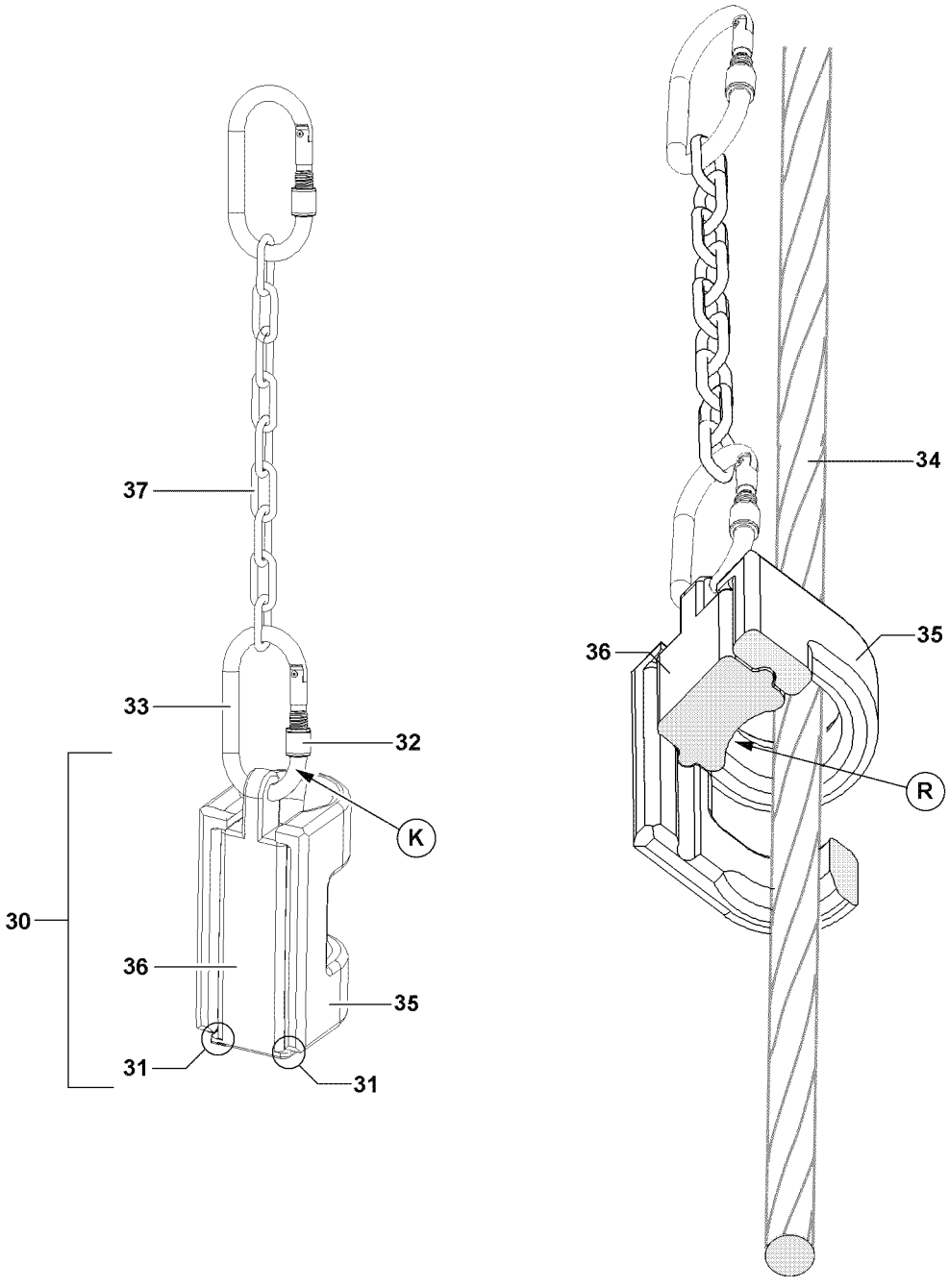
Rope fixed point on the pulley head:
– In the event of multiple hoist rope reeving, the hoist limit switch weight **30** must always be laid around the “stationary rope strand”, in other words around the rope strand that leads directly to the cable lock.

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

Note
▶ The chain **37** must be attached in full length during crane operation and may not be shortened.

▶ Push the weight **35** with one hand on the hoist rope **34** and hold.
▶ With the other hand, guide the carrier section **36** behind the hoist rope **34** and under the weight **35**. The curvature **R** of the carrier section **36** must point to the hoist rope **34**.
▶ Push the weight **35** on the carrier section **36**.
▶ Hang in the hoist limit switch weight **30** with the carrier section **36** in the snap hook **33**.

The snap hook **33** must be secured with the screw retainer **32**.
▶ Close the screw retainer **32** on the snap hook **33**.

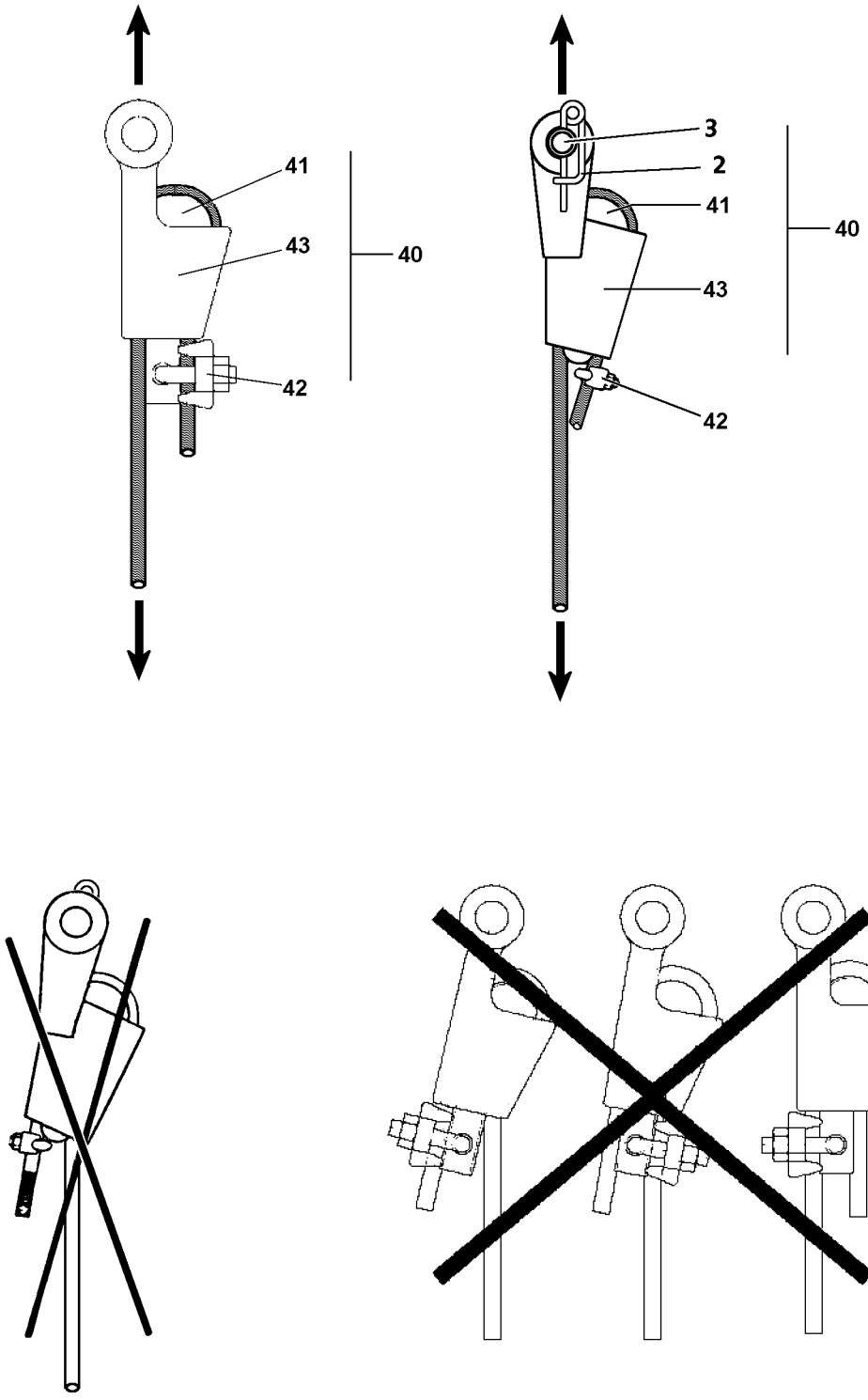


B106127

4.2 Removing the hoist limit switch weight

WARNING
The hoist limit switch can fall down!
If the hoist limit switch weight is incorrectly disassembled, components can fall down!
Personnel can be severely injured!
- When detaching or fastening the hoist limit switch weight **30** make sure that the weight **35** and the carrier section **36** do not fall down!
- It is prohibited for anyone to remain in the danger zone!

- Release and open the screw retainer **32** on the snap hook **33**.
- Detach the hoist limit switch weight **30** from the snap hook **33**.
- Hold the weight **35** with one hand and with the other hand, push the carrier section **36** from the weight **35**.
- Store the weight **35** and carrier section **36** safely.



B108119

5 Assembling / disassembling the wedge lock

Make sure that the following prerequisites are met:
– the locking clamp is cut off on the hoist rope,
– the hook block or the load hook are ready for assembly.

5.1 Assembling the wedge lock

WARNING
Danger of fatal accidents due falling load!
If an incorrect wedge lock **40** is used or if the wedge lock **40** is incorrectly assembled, the hoist rope can rip off or the hoist rope can be pulled through the wedge lock **40**!
The hook block and the load can fall down and kill personnel!
- ▶ Use only a wedge lock **40** approved by **LIEBHERR-Werk Ehingen GmbH**!
- ▶ Assembling the wedge lock **40** correctly!
- ▶ Place the hoist rope with the wedge **41** into the housing **43** in such a way that the rope strand runs in the pull axle of the wedge lock **40**!
- ▶ The dead end of the rope must be secured by the clamp **42** to prevent it from being pulled through!
- ▶ It is prohibited for personnel to remain in the danger zone!

- ▶ Take a matching wedge lock **40** from the tool box.
- ▶ Place the hoist rope with the wedge **41** into the housing **43**.
- ▶ If possible, assemble the clamp **42** through the wedge **41** on the dead end of the rope.

NOTICE
Damage to the hoist rope!
If the pin **3** has been assembled incorrectly, the hoist rope may rub against the pin **3** or on the linch pin **2**.
- ▶ Always insert the pins **3** from “inside to outside” and secure from the outside.

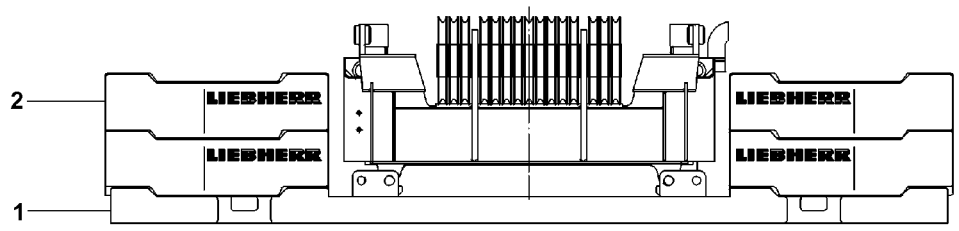
- ▶ Pin and secure the wedge lock **40** on the fixed point of the pulley head or that of the hook block or on the load hook, depending on the reeving plan.

5.2 Disassembling the wedge lock

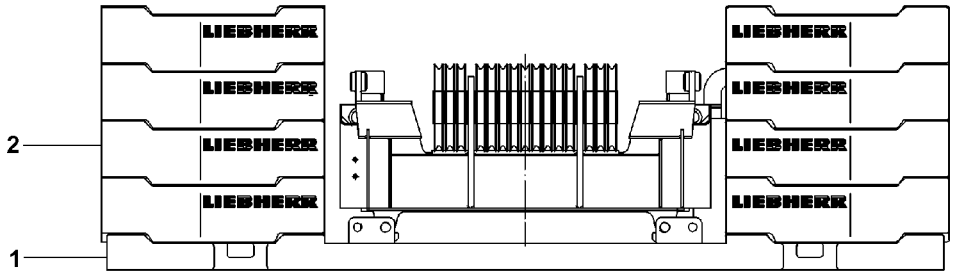
- ▶ Unpin the wedge lock **40** on the fixed point.
- ▶ Remove the clamp **42** and pull the hoist rope with the wedge from the housing.
- ▶ Store the wedge lock **40**.

6 Rope reeving

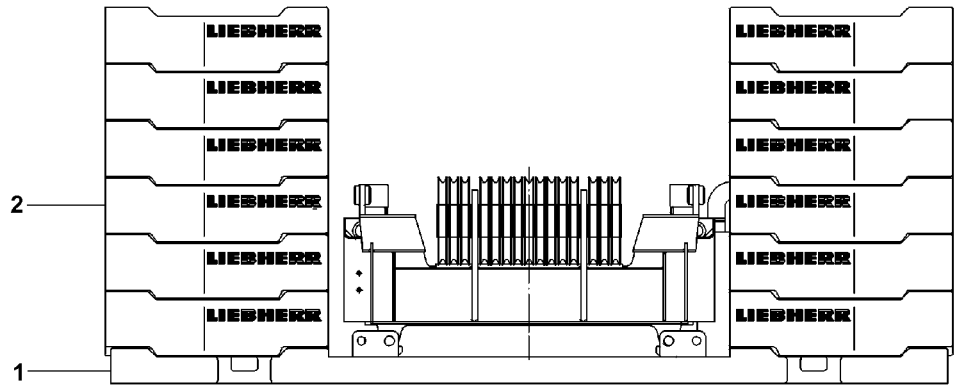
Note
- ▶ For reeving plans, see crane operating instructions, chapter 4.15!



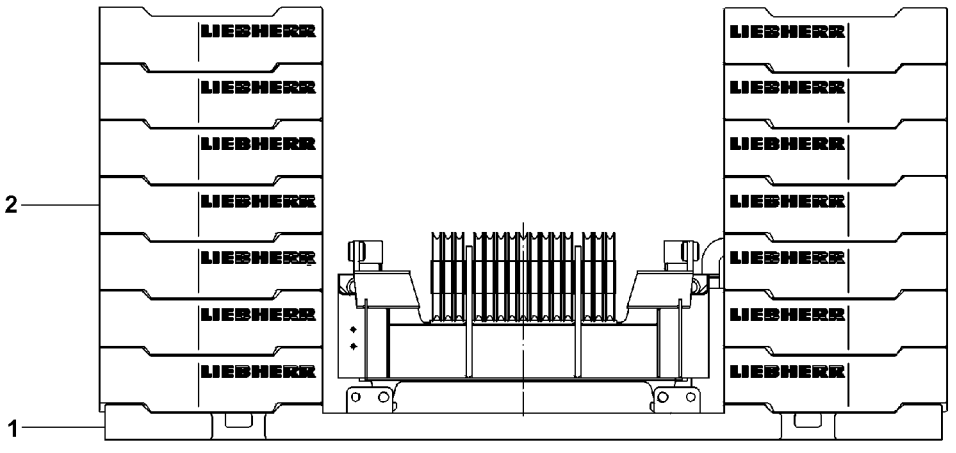
55 t



95 t



135 t



155 t

B109193

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!
- ▶ Attach counterweight in accordance with the information in the load chart!
- ▶ Replace damaged counterweight plates!

1.1 Counterweight combinations

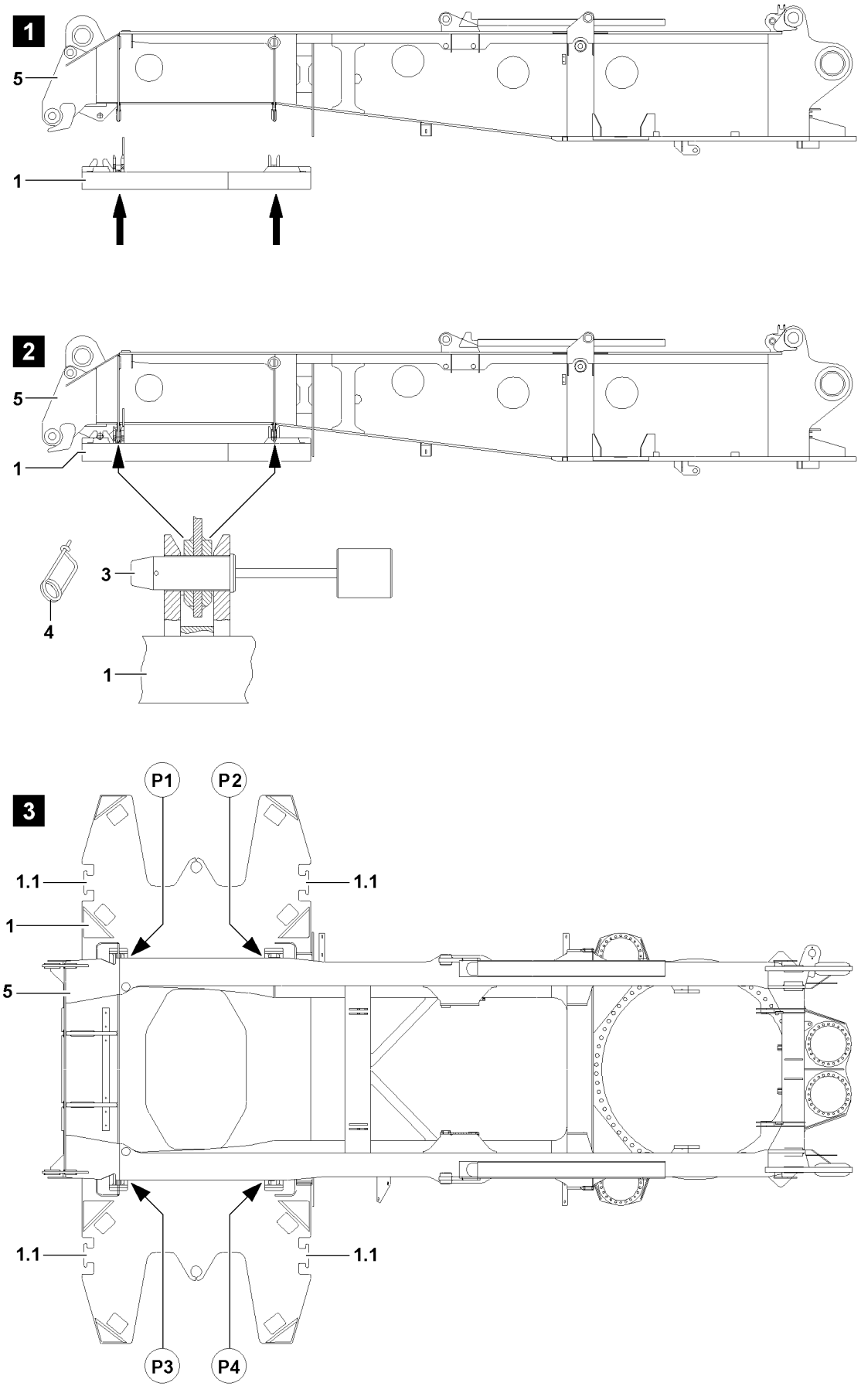
NOTICE
Incorrect placement of counterweight on the turntable!
An unsymmetrical counterweight condition of more than 20 t between the left and right counterweight stack can cause significant property damage!
- ▶ When ballasting the counterweight up or down, an unsymmetrical counterweight condition of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

Counterweight	Combination	Individual weight
55 t	1 x base plate 1	15 t
	4 x counterweight plate 2	10 t

Counterweight	Combination	Individual weight
95 t	1 x base plate 1	15 t
	8 x counterweight plate 2	10 t

Counterweight	Combination	Individual weight
135 t	1 x base plate 1	15 t
	12 x counterweight plate 2	10 t

Counterweight	Combination	Individual weight
155 t	1 x base plate 1	15 t
	14 x counterweight plate 2	10 t



B109191

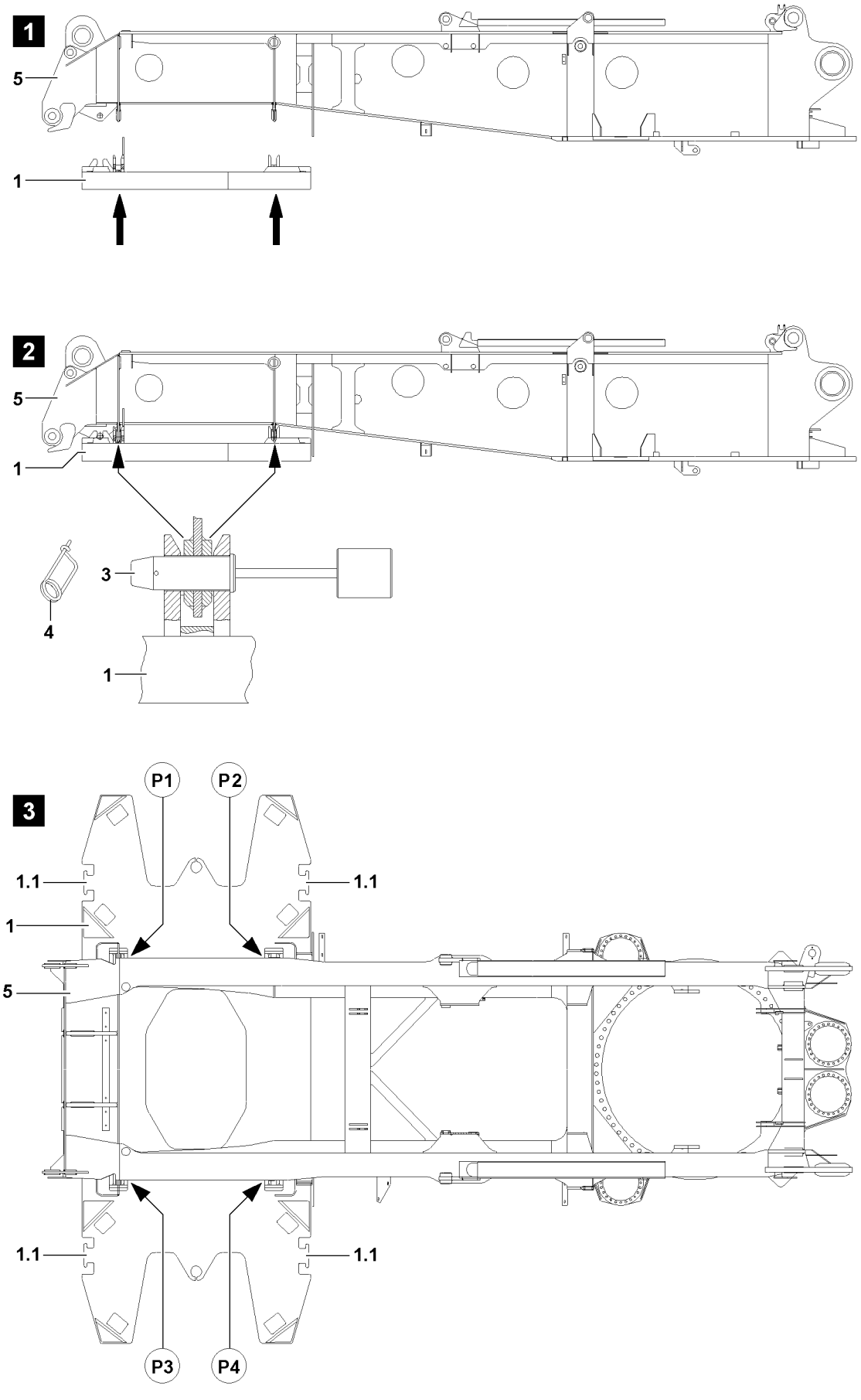
2 Installing the counterweight

WARNING
The crane can topple over!
If the crane superstructure is turned when the boom is **not installed**, the crane can topple to the rear during the ballasting procedure!
Personnel can be severely injured or killed!
▶ Erect the SA-bracket to 90° before the ballasting procedure!
No more than the following counterweights may then be used:
▶ For 155 t required counterweight, install first the central ballast (CB) of 43 t!
▶ For 135 t required counterweight, install first the central ballast (CB) of 43 t!
▶ For 95 t required counterweight, install first the central ballast (CB) of 11 t!
▶ For 55 t required counterweight, install first the central ballast (CB) of 11 t!

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

WARNING
Falling components and counterweight plates!
At assembly, the components and counterweight plates can fall down!
Personnel can be severely injured or killed!
▶ Make sure that no persons or objects are within the danger zone!

WARNING
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!



B109191

2.1 Installing the base plate

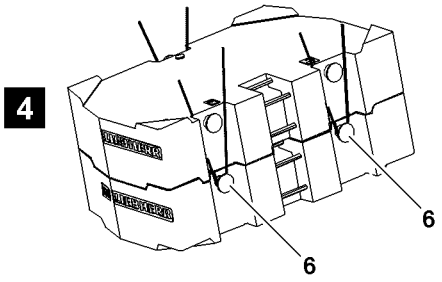
Ensure that the following prerequisite is met:
– the pins **3** are unpinned, fig. **2**

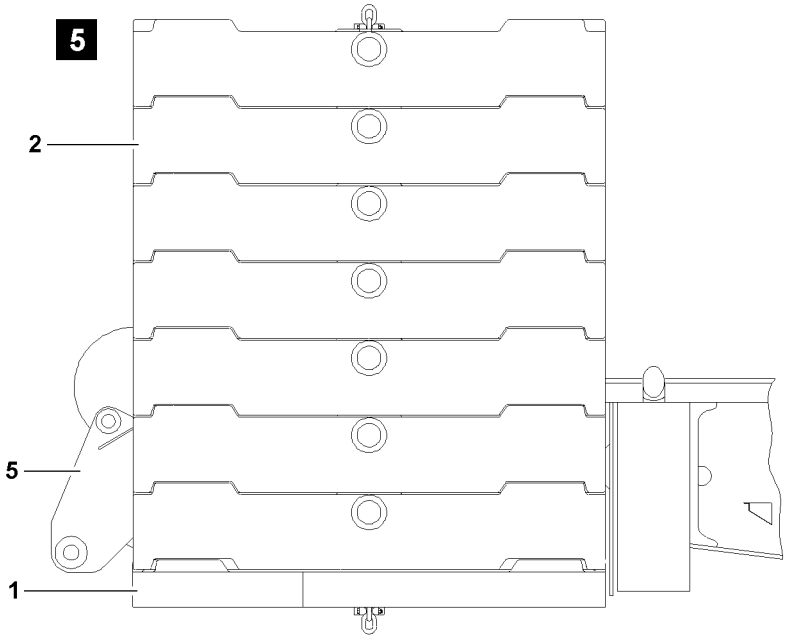
Note
▶ The weight of the base plate **1** is approx. 15 t!

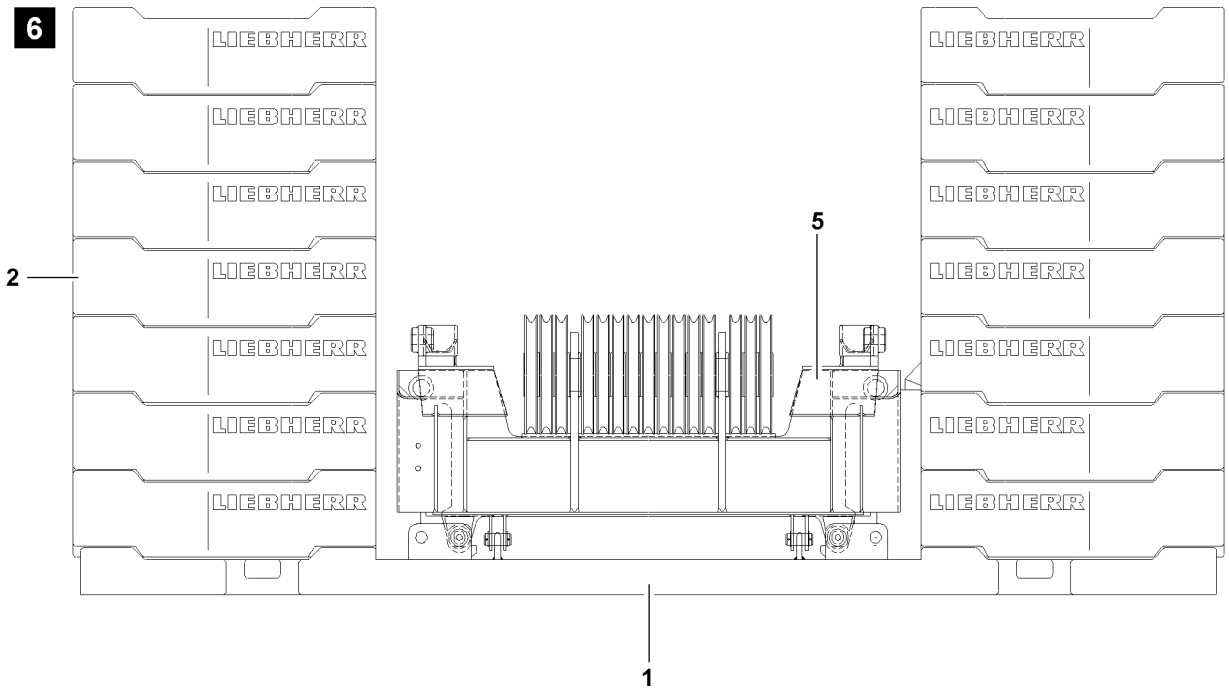
▶ Attach the base plate **1** on the bitts **1.1** to the auxiliary crane.
▶ Swing the base plate **1** with the auxiliary crane under the turntable **5**.
▶ Lift the base plate **1** with the auxiliary crane to the centerings.
▶ When the base plate **1** is centered on the turntable **5**:
Pin the base plate **1** on the pin points of the turn table **5**.
▶ Insert the pin **3** on the base plate **1** at point **P1**.
▶ Insert the pin **3** on the base plate **1** at point **P2**.
▶ Insert the pin **3** on the base plate **1** at point **P3**.
▶ Insert the pin **3** on the base plate **1** at point **P4**.
▶ Secure the pins **3** with spring retainers **4**, see fig. **3**.

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 **5**!

▶ Remove the tackle.







B109190

2.2 Placing the counterweight

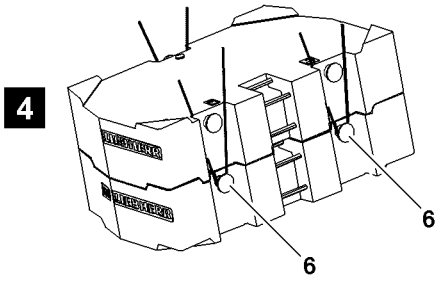
DANGER
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** installed boom, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Observe the data in the erection and take down charts!
- ▶ If no boom is installed on the turntable, max. 135 t counterweight may be installed and when turning the turntable by 360°, it must be ensured that the SA-bracket is erected to **more than 90°**!
- ▶ If the counterweight is increased to 155 t, then the boom must be installed and raised off the ground!

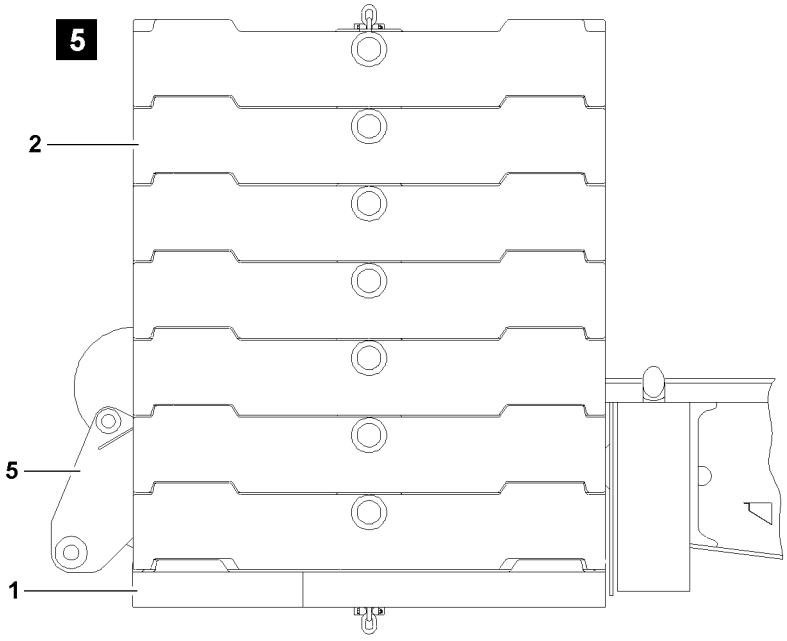
Maximum counterweight	Minimum central ballast	Equipment
55 t	11 t	Without equipment
95 t	11 t	
135 t	43 t	
155 t	43 t	Boom installed and raised off the ground

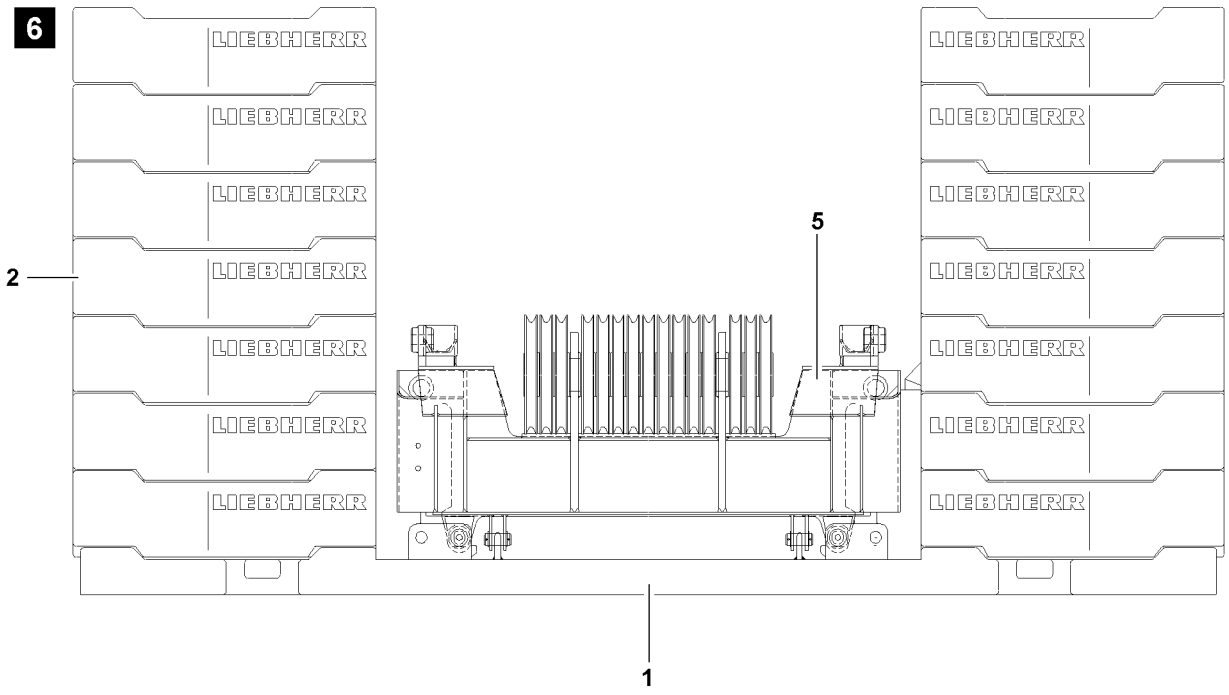
Ensure that the following prerequisite is met:
– the base plate **1** is pinned and secured on the turntable.

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 **3** or if the counterweight is placed asymmetrically, then the crane can topple over!
Personnel can be severely injured or killed!
- ▶ A weight difference between the right and left counterweight stack of more than 20 t is prohibited!
- ▶ Alternately place no more than maximum 20 t counterweight assemblies on the counterweight stack, alternately symmetrically on the left and right!







B109190

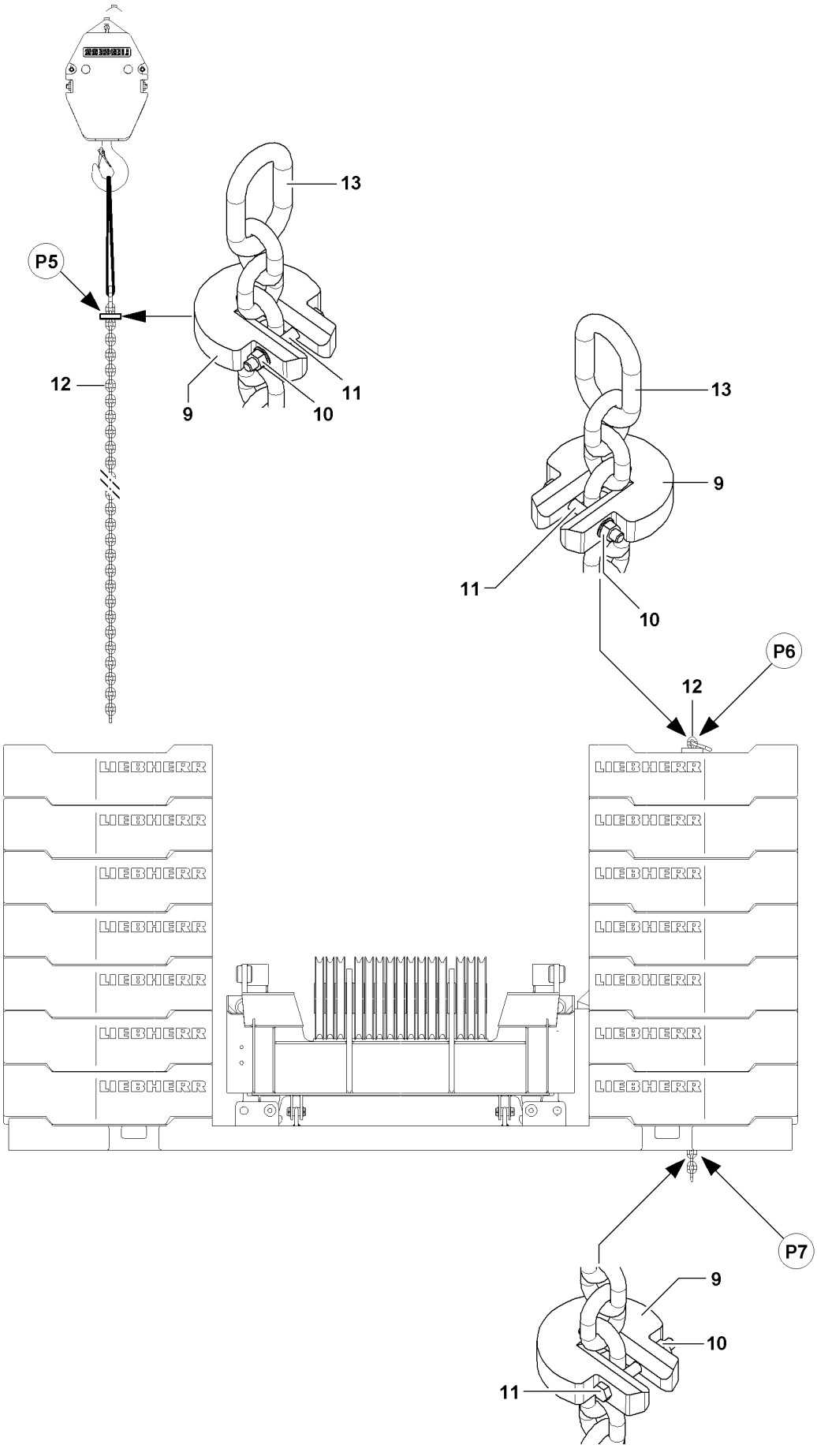
WARNING
Falling counterweight plates!
If more than the permissible loads are lifted, then the bitts **6** are overloaded and the counterweight plates can fall down!
Personnel can be severely injured or killed!
- ▶ Lift no more than maximum 20 t with the ropes, 3 tackle points!
- ▶ Replace damaged counterweight plates!

WARNING
Incorrect handling of tackle!
If tackle cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the tackle is correctly attached on the bitts **6** and that it is secured sufficiently to prevent it from loosening up!

2.2.1 Placing the counterweight

Note
- ▶ Place the counterweight plates individually or as a counterweight assembly, maximum 20 t!
- ▶ The permissible weight difference between the counterweight stacks on the left and right is maximum 20 t!
- ▶ 20 t counterweight assembly, see fig. **4**!

- ▶ Hang counterweight plate **2** or counterweight assembly, see fig. **4**, onto the auxiliary crane and place it on both sides on the base plates **1**!



B109192

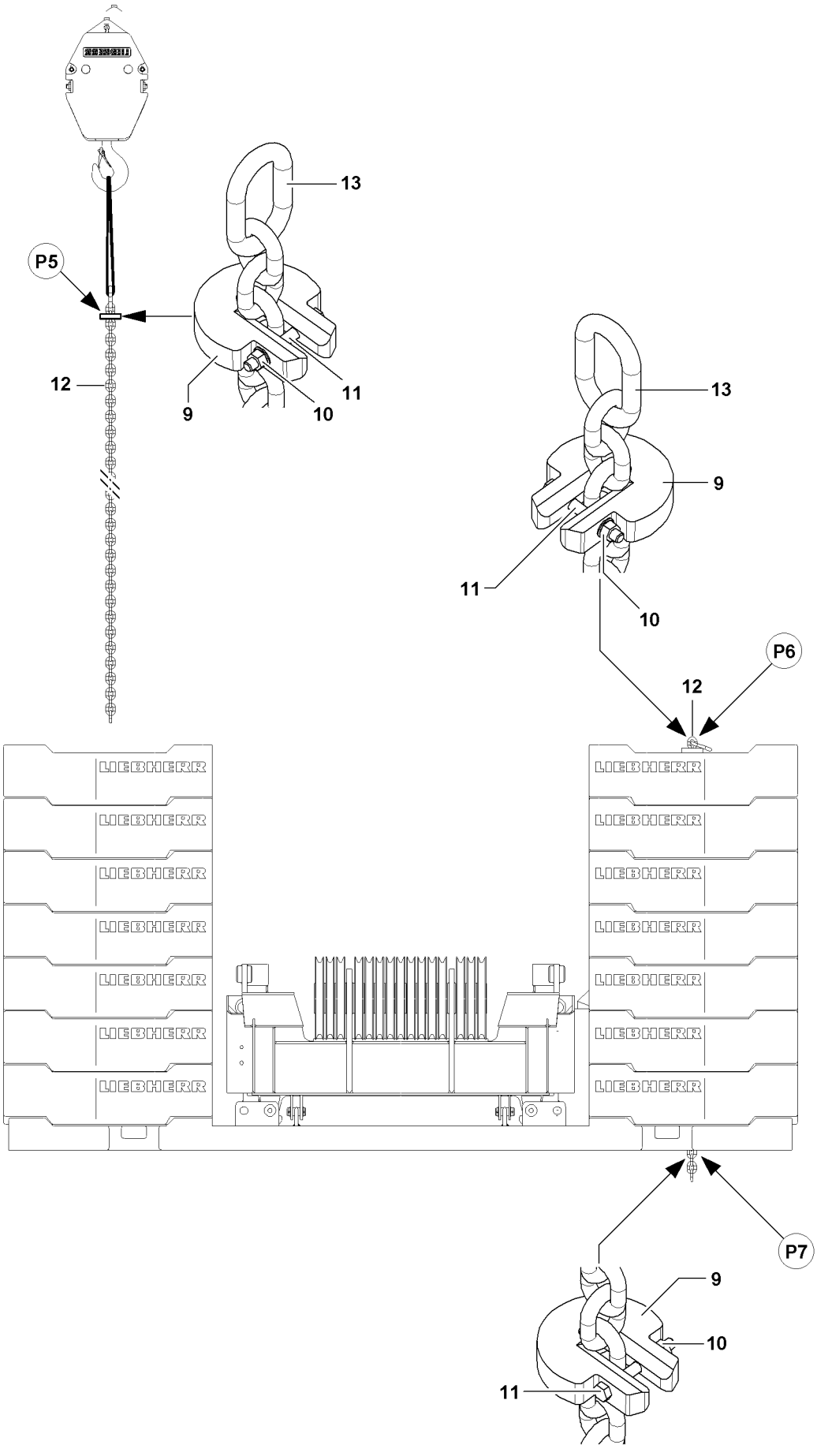
2.3 Securing the counterweight

WARNING
The counterweight can topple over!
Unsecured counterweights can slip from the counterweight stacks due to shocks during crane operation!
Personnel can be severely injured or killed!
▶ Before starting crane operation, secure the counterweights on both sides!

Repeat the following tasks for each other counterweight stack.
The retaining plate **9** is to be preassembled on the ground.
▶ Push the retaining plate **9** onto the retaining chain **12**, point **P5**.
▶ Attach the retaining plate **9**: Pin the screw **11** and secure with the nut **10**.
▶ Attach the retaining chain **12** on the chain link **13** with tackle onto the auxiliary crane.
▶ Guide the retaining chain **12** from top with the auxiliary crane into the counterweight stack until the retaining plate **9** is placed on the upper counterweight plate at point **P6**.
▶ Release the retaining chain **12** from the auxiliary crane.
▶ Remove the auxiliary crane.

Note
▶ Attach the retaining plate **9** as close as possible on the underside of the console (point **P7**)!

▶ Push the retaining plate **9** at point **P7** onto the retaining chain **12**.
▶ Attach the retaining plate **9**: Pin the screw **11** and secure with the nut **10**.



B109192

3 Removing the counterweight

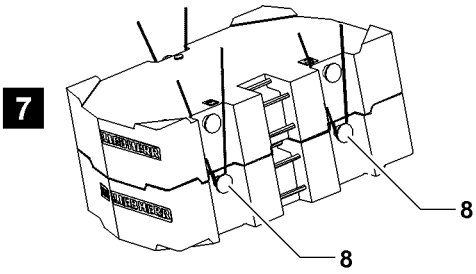
Ensure that the following prerequisite is met:
– the crane is aligned in horizontal direction

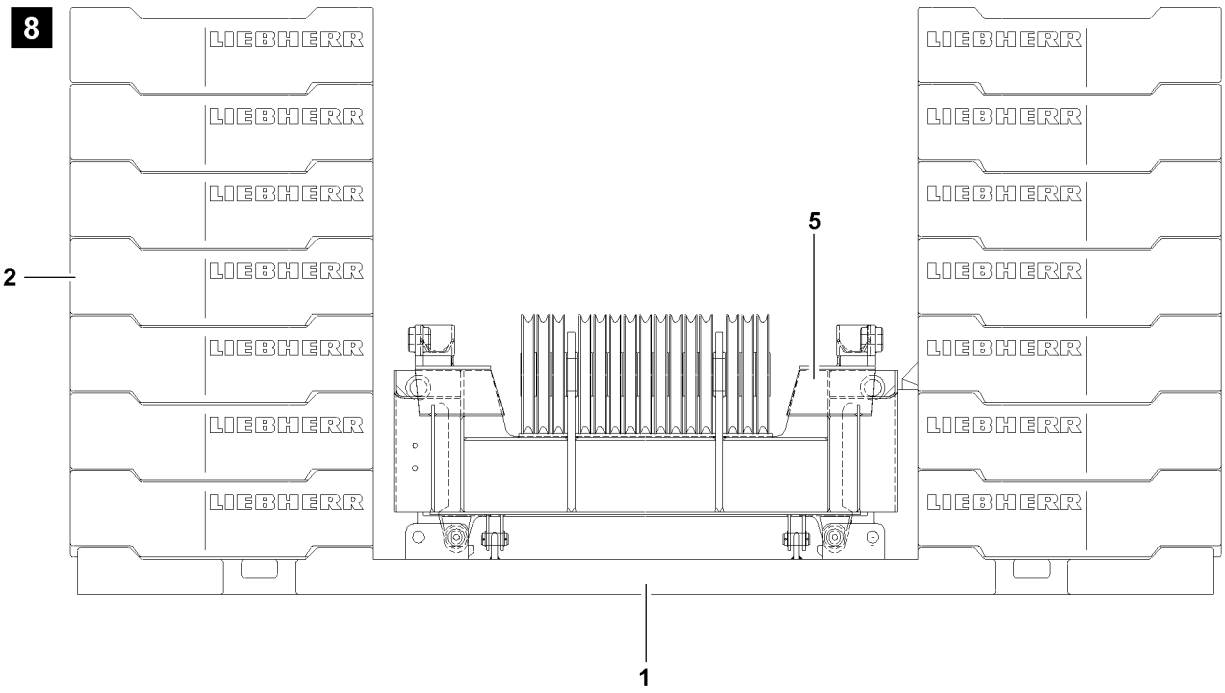
WARNING
Falling components and counterweight plates!
At disassembly, the components and counterweight plates can fall down!
Personnel can be severely injured or killed!
▶ Make sure that no persons or objects are within the danger zone!

WARNING
Incorrect or missing fall guard!
Using inappropriate aids to secure the assembly personnel at disassembly can result in a fall!
Personnel can be severely injured or killed!
▶ Secure yourself and others during all disassembly 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 disassembly work with personal protective equipment (for example safety belts) to prevent a fall!

3.1 Releasing the counterweight

Repeat the following tasks for each other counterweight stack:
▶ Remove the retaining plate **9** on point **P7**: Loosen the nut **10** and unpin the screw **11**.
▶ Remove the retaining plate **9**.
▶ Attach the retaining chain **12** on the chain link **13** with tackle onto the auxiliary crane.
▶ Pull the retaining chain **12** with the auxiliary crane upward from the counterweight stack and place on the ground.
▶ Release the retaining chain **12** from the auxiliary crane.
▶ Remove the auxiliary crane.
▶ Remove the retaining plate **9** on point **P5**: Loosen the nut **10** and unpin the screw **11**.
▶ Remove the retaining plate **9**.





B109195

3.2 Removing the counterweight plates

Ensure that the following prerequisite is met:
– the retaining chains **12** are removed

WARNING
The crane can topple over!
If more than 20 t are removed with one lift from a counterweight stack or if the counterweight is removed asymmetrically, then the crane can topple over!
Personnel can be severely injured or killed!
▶ A weight difference between the right and left counterweight stack of more than 20 t is prohibited!
▶ Alternately remove no more than maximum 20 t counterweight assemblies from the counterweight stack, symmetrically on the left and right!

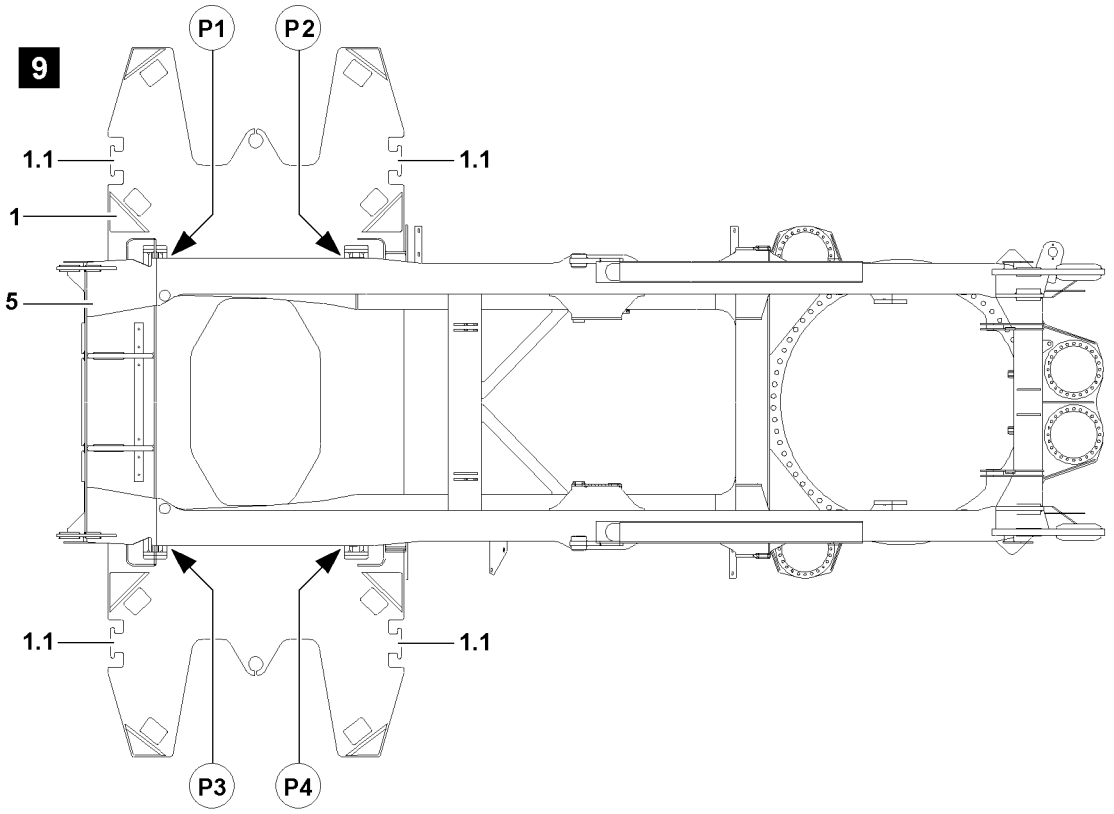
WARNING
Falling counterweight plates!
If more than the permissible loads are lifted, then the fastening points **6** are overloaded and the counterweight plates can fall down!
Personnel can be severely injured or killed!
▶ Lift no more than maximum 20 t with the ropes, 3 tackle points!
▶ Replace damaged counterweight plates!

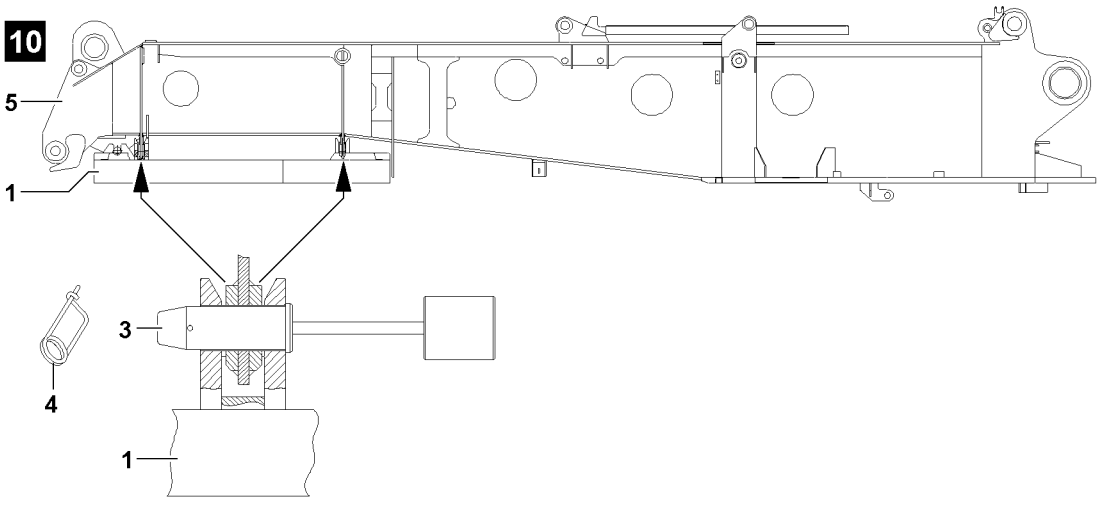
WARNING
Incorrect handling of tackle!
If tackle cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down!
Personnel can be severely injured or killed!
▶ Make sure that the tackle is correctly attached on the fastening points **6** and that it is secured sufficiently to prevent it from loosening up!

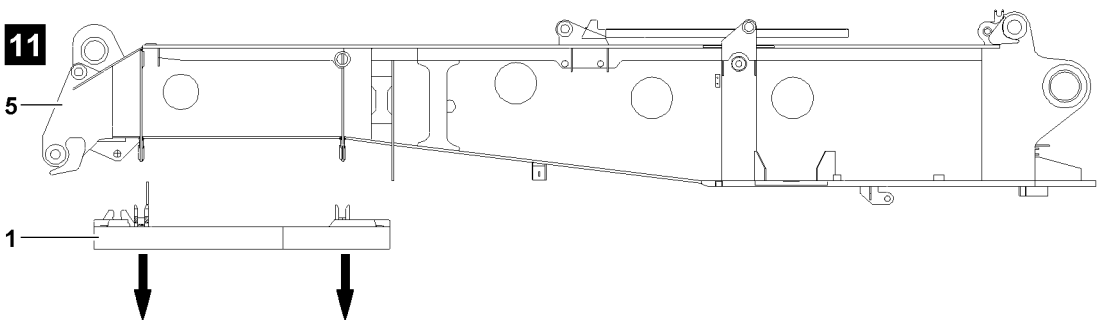
3.2.1 Removing the counterweight plates

Note
▶ Remove the counterweight plates individually or as a counterweight assembly, maximum 20 t!
▶ Weight difference between the counterweight stacks, no more than maximum 20 t!
▶ 20 t counterweight assembly, see fig. **7**!

▶ Hang the counterweight plates on the auxiliary crane and take them off alternately on both sides!







B109196

3.3 Removing the base plate

Note

▶ The weight of the console is approx. 15 t!

▶ Attach the base plate **1** on the bitts **1.1** to the auxiliary crane, fig. **9**.

▶ Unpin the base plate **1** on the turntable **1**:
Remove the spring retainers **4** and unpin the pins **3** on the left and right on the base plate **1**, fig. **9**, fig. **10**.

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

▶ When the base plate **1** on the turntable is removed:
Insert the pins **3** again and secure with spring retainer **4**.

B195219

1 Technical safety instructions for working with 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 boom projection radii specified in the load chart must be observed!

WARNING
Risk of accident from cracks in the cable!
If the reeving number on the pulley head is less than the reeving number set on the LICCON computer system, it can result in an overload of the hoist rope, 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 minimum coils (three) 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!
▶ Call in an additional observer if the lowest windings position of a winch drum has been reached.
▶ The job of the additional observer is to ensure that there are always at least three windings on the winch drum!

Always comply with the maximum load specified in 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.
Reeve the hook block to the maximum extent required to lift the load. Bigger hook blocks must not be reeved.

2 Checking 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 crane 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 operations 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 control and warning lights.
- – Damage to the hoist ropes.
- – Functional failures in the safety devices.
- – Leakage in the crane hydraulics.

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 in cranes with telescopic booms. This causes telescopic boom side distortion, which can reduce the load-bearing capacity of the telescopic boom. For example, a temperature difference between the two boom sides of 30 °C and a boom length of 60 m results in a length difference caused by the temperature difference between the two sides of the telescopic boom of approximately 22 mm. 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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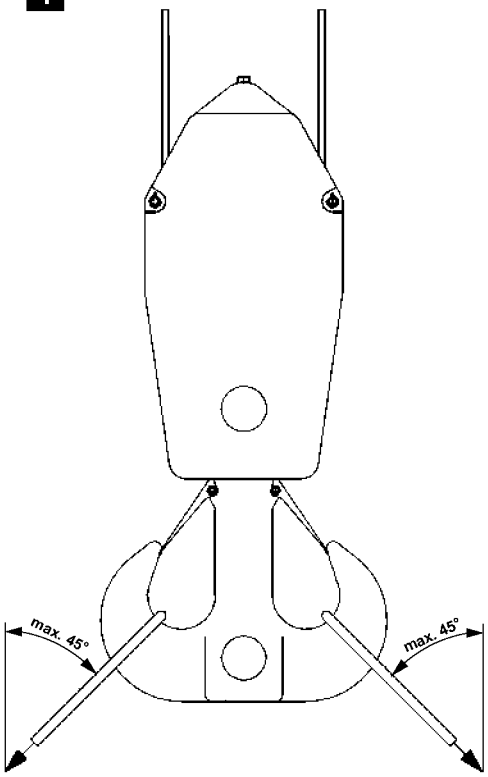

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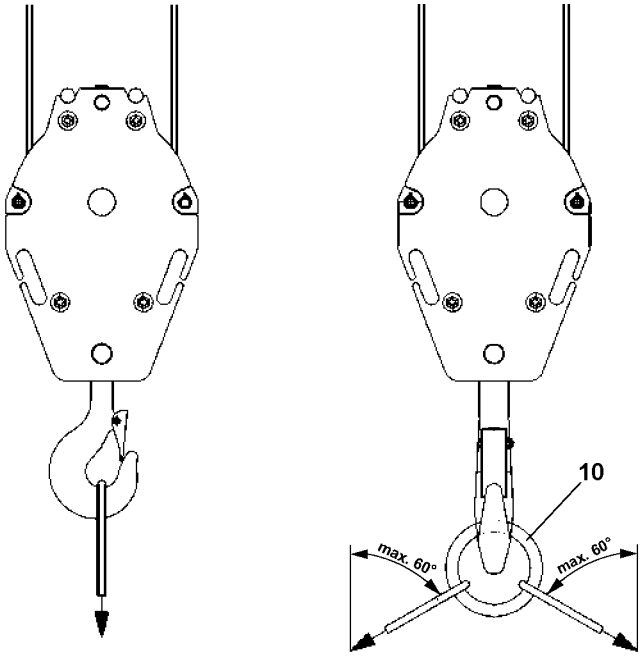


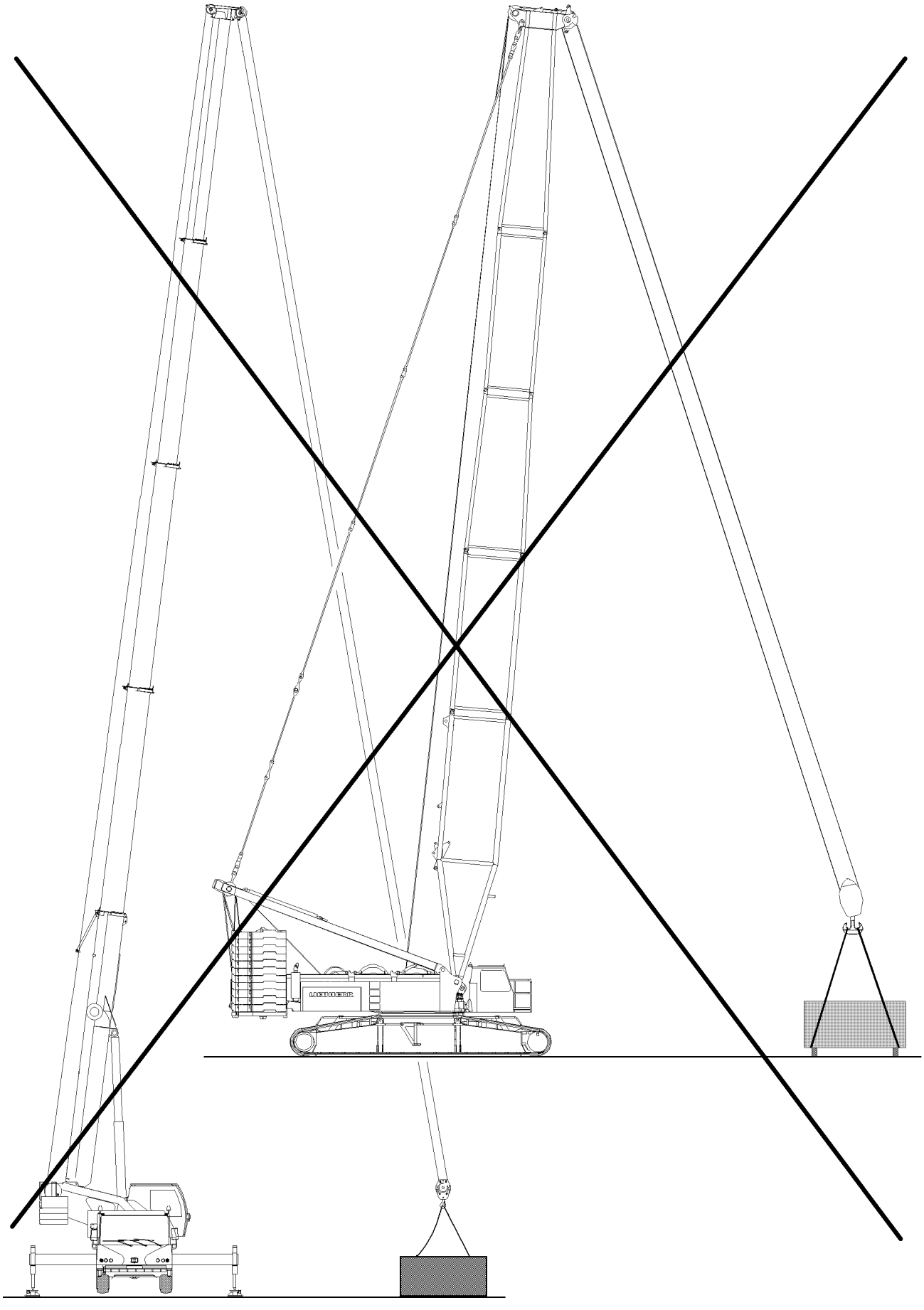
B108127

3 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.

3.1 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 suspended member **10**! The maximum permissible inclination amounts to 60°. See illustration **2**.



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3.2 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!
- ▶ The crane operator must ensure, before lifting the load, 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!

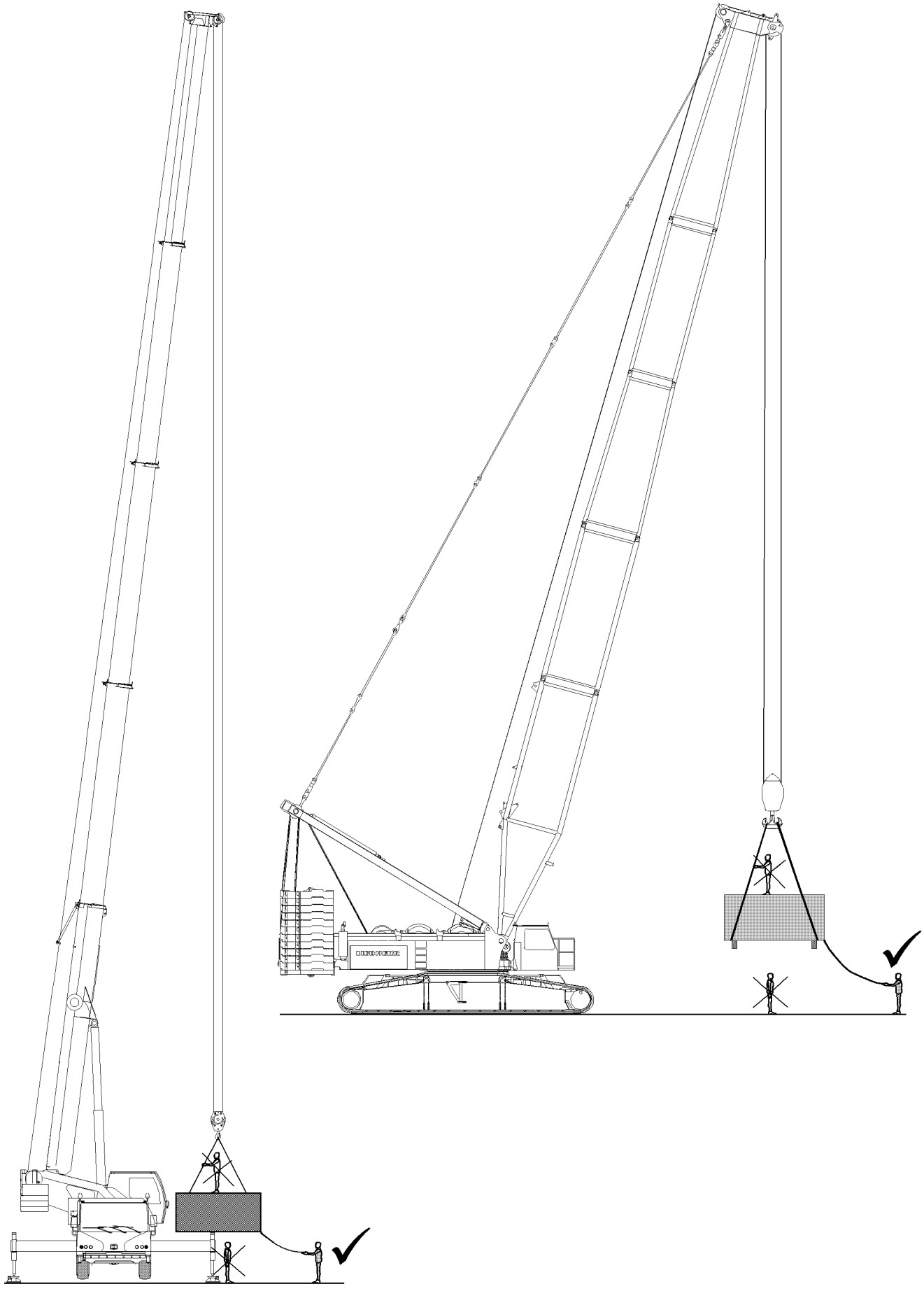
Note
When using the assembly winch* observe the following:
- ▶ The assembly winch* should only be used for assembly, and not for lifting loads!
- ▶ Lifting of loads with the auxiliary winch is prohibited!

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.

3.3 Angular pull

WARNING
The crane can topple over!
Diagonal 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 centre of gravity of the load to be lifted!
- ▶ Diagonal pull is not permitted!

The crane is designed only to lift loads vertically. During diagonal pulling, regardless of whether this is done in the same direction as the boom or diagonally, horizontal forces are generated in addition to the vertical ones, for which the boom is not designed.



B102717

3.4 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!

4 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.

4.1 General

A swaying 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!

4.2 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.

4.3 Carrying people

The crane is not designed to carry people.

WARNING
Mortal danger due to impermissible personnel transport!
▶ Transporting personnel with the load tackle and on the load is prohibited!

4.4 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 swaying loads is strictly prohibited!

4.5 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 operator'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!

4.6 Ram work or pulling sheet piles

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

DANGER
Important instructions for “ram work” or “pulling sheet piles”!
If the crane is used for ram work or pulling sheet piles, then the following instructions must be followed. Failure to follow the instructions can result in damage to the crane.
▶ The ramming equipment 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 lifting force restriction can be achieved by suspending a crane scale between the load hook and the pulling equipment.

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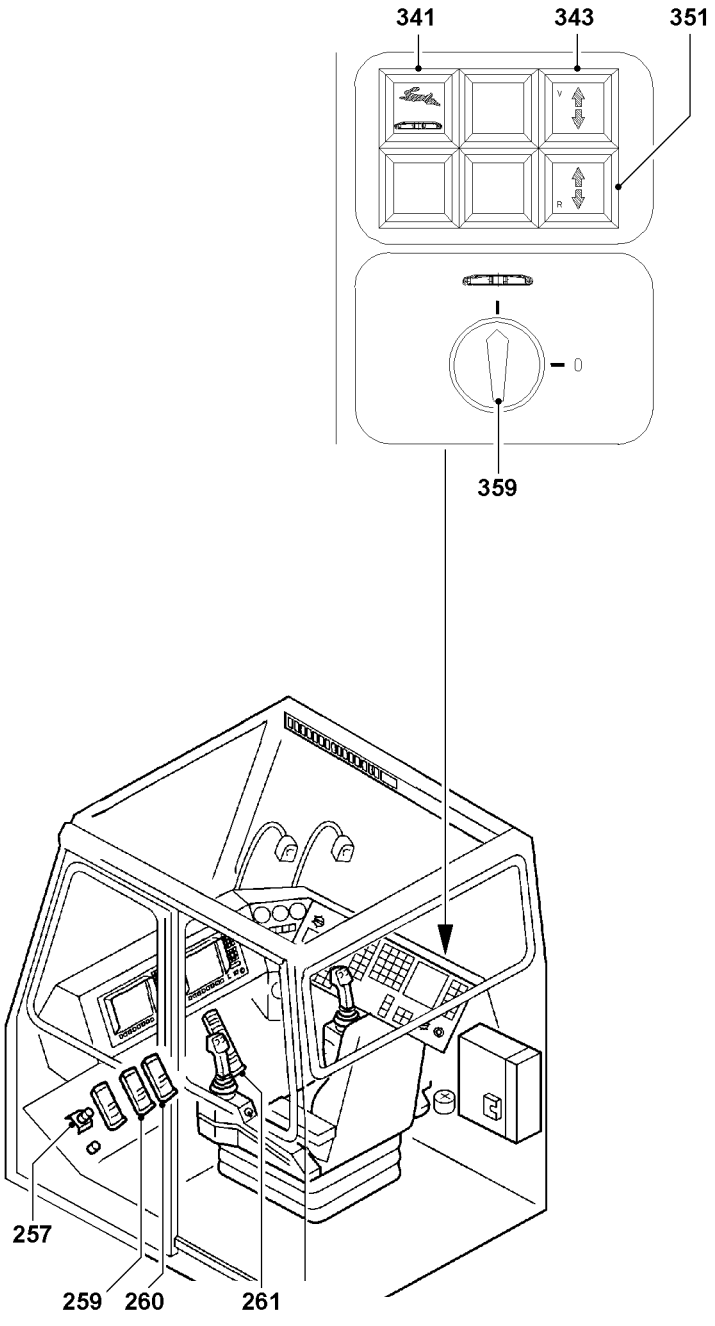


B104691

1 Crawler operation

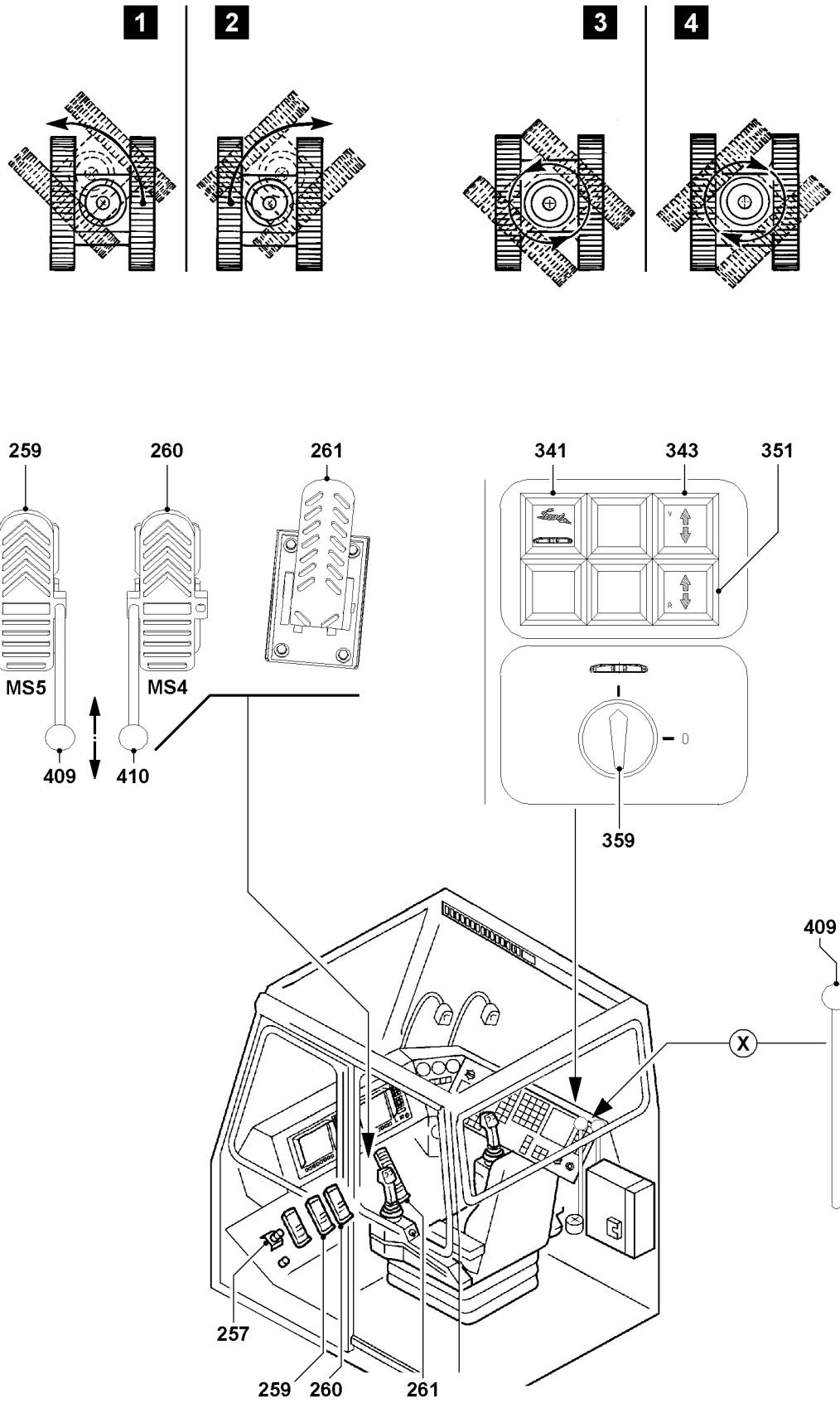
Make sure that the following prerequisites are met:
– The ground is sufficiently load bearing to safely take on the weight of the crane - including load and tackle.
– The crane engine is running.
– There are no persons or objects in the danger zone.

DANGER
Risk of fatal injury!
If personnel remains within the movement or working range (danger zone) of the crawler crane, they can be severely injured or killed.
▶ The danger zone of the crawler crane must be monitored by cameras or by a supervisor familiar with the dangers.

1.1 Activating crawler operation

For “normal” crane operation, the preselector switch **359** “Crawler operation OFF / ON” is in zero position. To activate crawler operation, the preselector switch **359** must be switch to position I, “Crawler operation ON”.
▶ Turn the preselector switch **359** to position I, to the left.
Result:
– Crawler operation is activated.
– The indicator light **343** or indicator light **351** lights up (depending on the turntable position).

▶ If the crawler operation is to be turned off:
Turn the preselector switch **359** to position 0, to the right.
Result:
– Crawler operation is turned off.
– Indicator light **343** or indicator light **351** turns off.


1
2
3
4
259
260
261
341
343
351
MS5
MS4
409
410
359
409
410
X
257
259
260
261

B104692

1.2 Driving the crawler

Note

- ▶ Remove the manual levers **409** and **410** before using them from the transport retainer (point **X**) - on the right of the crane operator's seat.
- ▶ The technical design of the manual lever **409** and the manual lever **410** is completely identical. The differentiation of the two manual levers is only in their assignment to the corresponding foot pedals in installed (pushed on) condition!

Make sure that the following prerequisites are met:

– The preselector switch **359** is switched to crawler operation (switch position I).

1.2.1 Function / operation

The crawler tracks on the left and right can be operated with the foot pedals **259** and **260**.
Alternatively, the manual levers **409** and **410** can be installed (pushed in) on the foot pedal **259** and the foot pedal **260** for especially sensitive control of the travel movements of the crawler.
The travel direction of the crane refers to the position of the crane superstructure and is shown via the indicator lights **343** and **351**.
If the crane superstructure is turned by 90°, the forward / reverse travel direction changes. If the crane superstructure with actuated foot pedal **259** or **260** is turned past 90°, then the travel direction remains until the corresponding foot pedal / manual control lever is “returned” to neutral position.
This means the new travel direction becomes active only if the corresponding foot pedal / manual control lever is no longer actuated.

▶ Push the right foot pedal MS4 **260** forward.

or

■ Move the right manual lever MS4 **410** forward.

Result:

– The right crawler moves forwards.

▶ Push the right foot pedal MS4 **260** back.

or

■ Move the right manual lever MS4 **410** back.

Result:

– The right crawler moves backwards.

▶ Push the left foot pedal MS5 **259** forward.

or

■ Move the left manual lever MS5 **409** forward.

Result:

– The left crawler moves forwards.

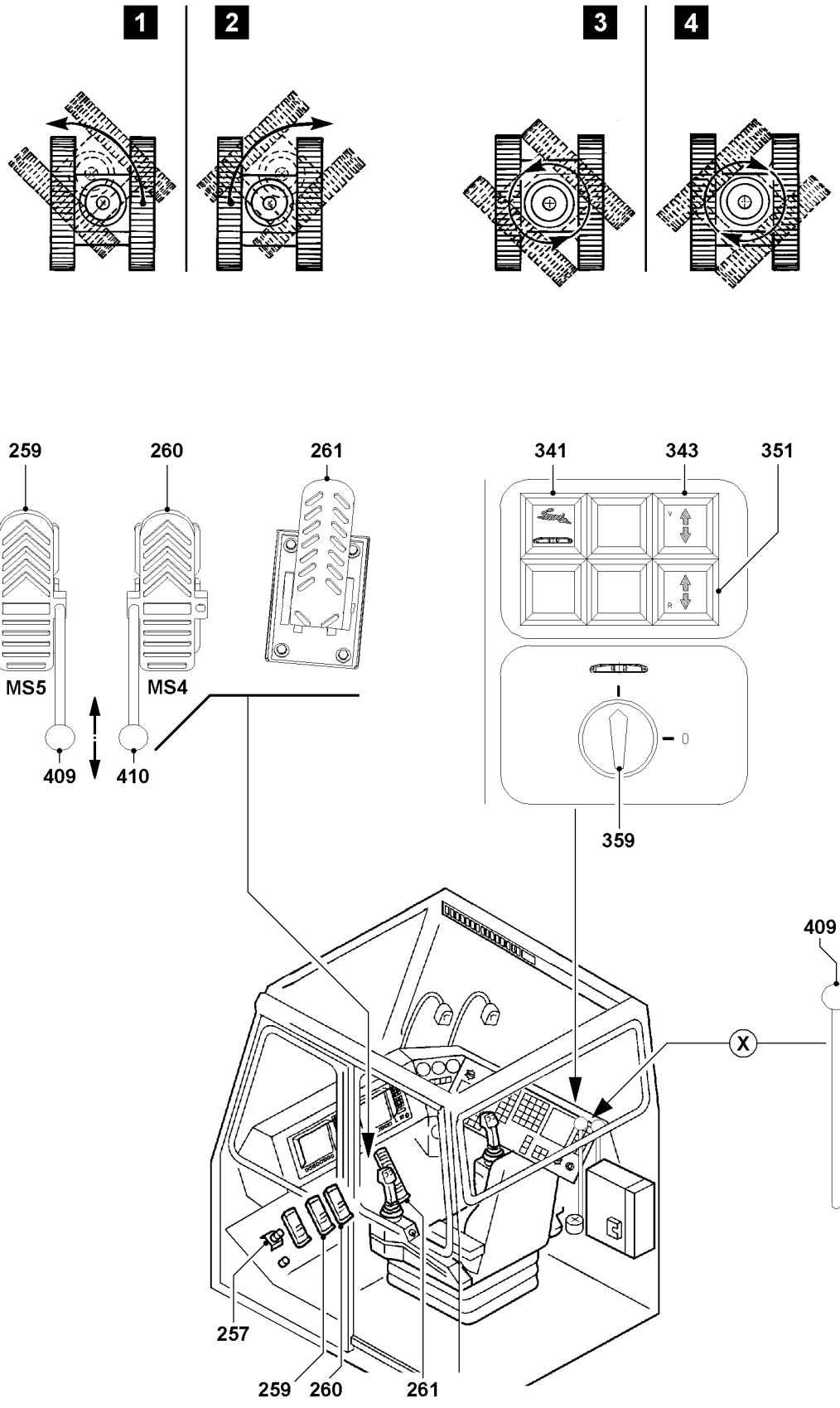
▶ Push the left foot pedal MS5 **259** back.

or

■ Move the left manual lever MS5 **409** back.

Result:

– The left crawler moves backwards.


1
2
3
4
259
260
261
341
343
351
MS5
MS4
409
410
359
409
410
X
257
259
260
261

B104692

1.2.2 Steering the crane

Note

- ▶ Protect the crawler tracks by always turning with the maximum possible turning radius avoiding to turning in reverse!
- ▶ Protect the tracks by avoiding counterrotation turns!

▶ To drive the crawler crane towards the left, fig.1:
Push the right foot pedal MS4 **260** forward.

or

- ■ Move the right manual lever MS4 **410** forward.

▶ To drive the crawler crane towards the right, fig.2:
Push the left foot pedal MS5 **259** forward.

or

- ■ Move the left manual lever MS5 **409** forward.

▶ To counterrotate the crawler crane to the left, fig. 3:
Push the right foot pedal MS4 **260** forward and the left foot pedal MS5 **259** backward.

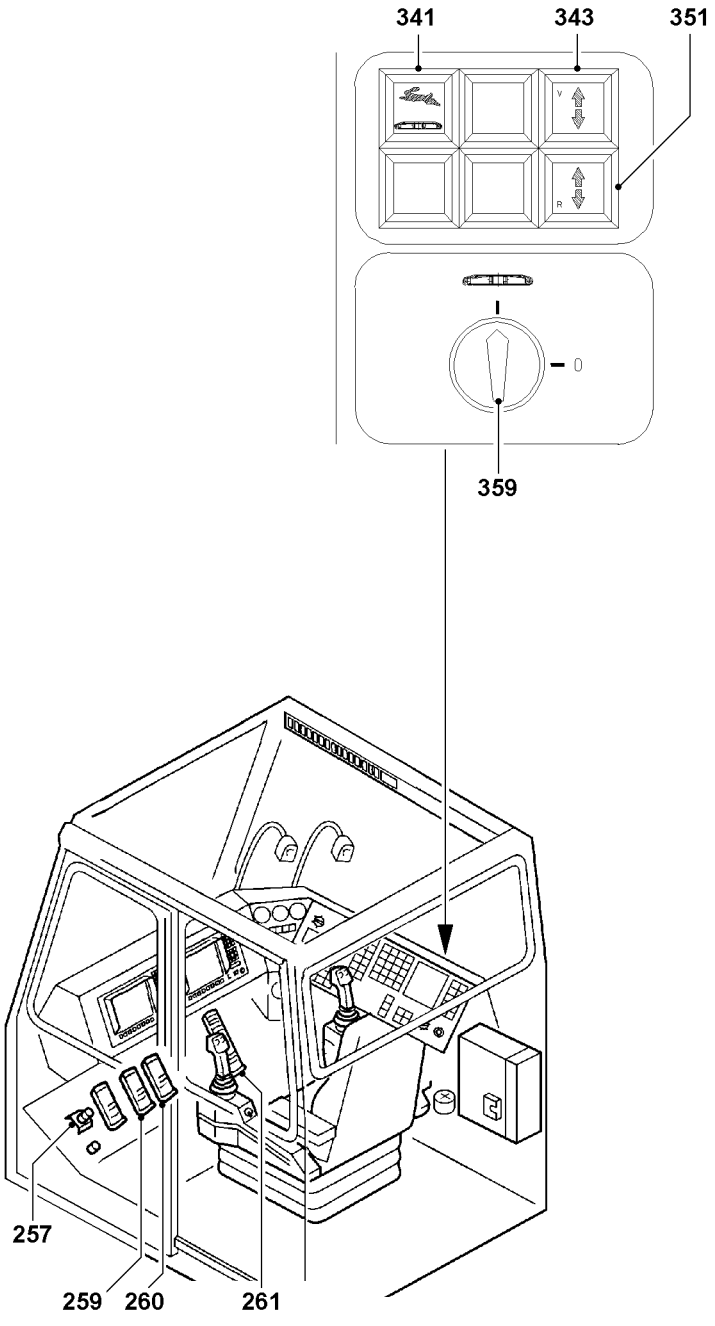
or

- ■ Move the right manual lever MS4 **410** forward and the left manual lever MS5 **409** backward.

▶ To counterrotate the crawler crane to the right, fig. 4:
Push the left foot pedal MS5 **259** forward and the right foot pedal MS4 **260** backward.

or

- ■ Move the left manual lever MS5 **409** forward and the right manual lever MS4 **410** backward.



B104691

1.3 Selecting the travel speed

This crawler crane has 2 possible speeds:

1.) Speed stage 1
Creeper gear is activated.

2.) Speed stage 2
Rapid gear for “Crawler operation” is activated.

▶ To select speed stage 1:
Do **not** actuate the switch **341**.

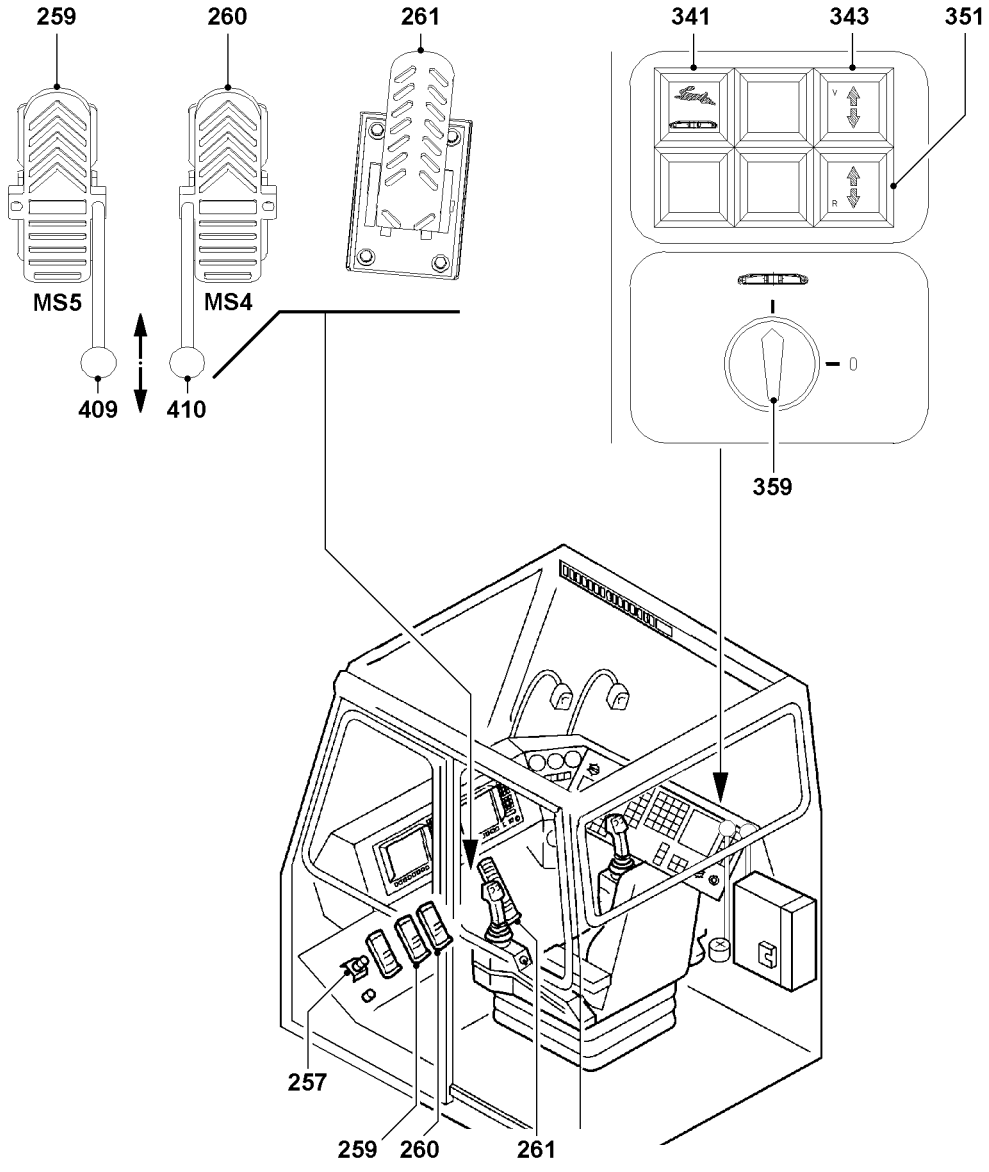
Result:

– The indicator light in the icon **341** does **not** light up.
– The creeper gear is active.

▶ To select speed stage 2:
Actuate the switch **341**.

Result:

– The rapid gear for “Crawler operation” is activated.
– The indicator light in the switch **341** lights up.



B104693

1.4 Steerability of the crawler

The steerability of the crawler is dependent on the following conditions:

– The friction conditions under the chains.
  Panels underneath, sand or gravel improve the steerability of the crane.
– Flatness of the ground.
  Steering is not possible if the crawler track is only making contact with the ground at the front and rear!
– Load-bearing capability of the ground.
  Steerability is significantly restricted if the crawler track sinks into the ground!
– Position of the combined center of gravity.
  If the combined center of gravity of the crane and load is at the center of the crane, then steering is hard or not possible at all!

1.5 Driving with an attached load

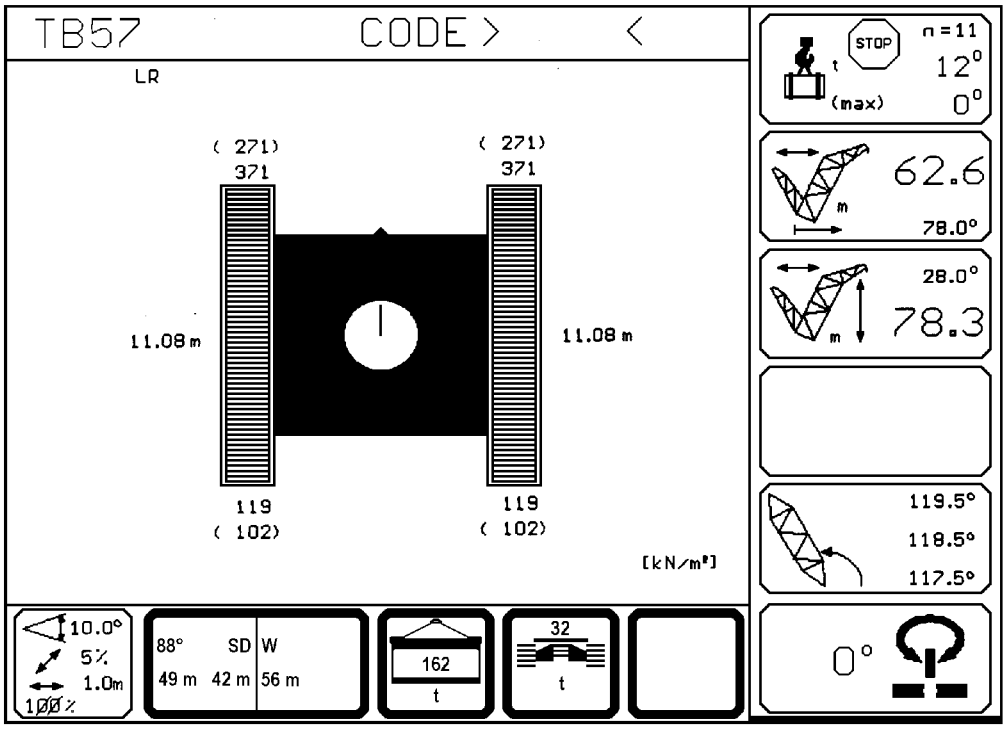
DANGER
The crane can topple over!
The crane can be driven with the loads given in the load charts, providing the following conditions are met.

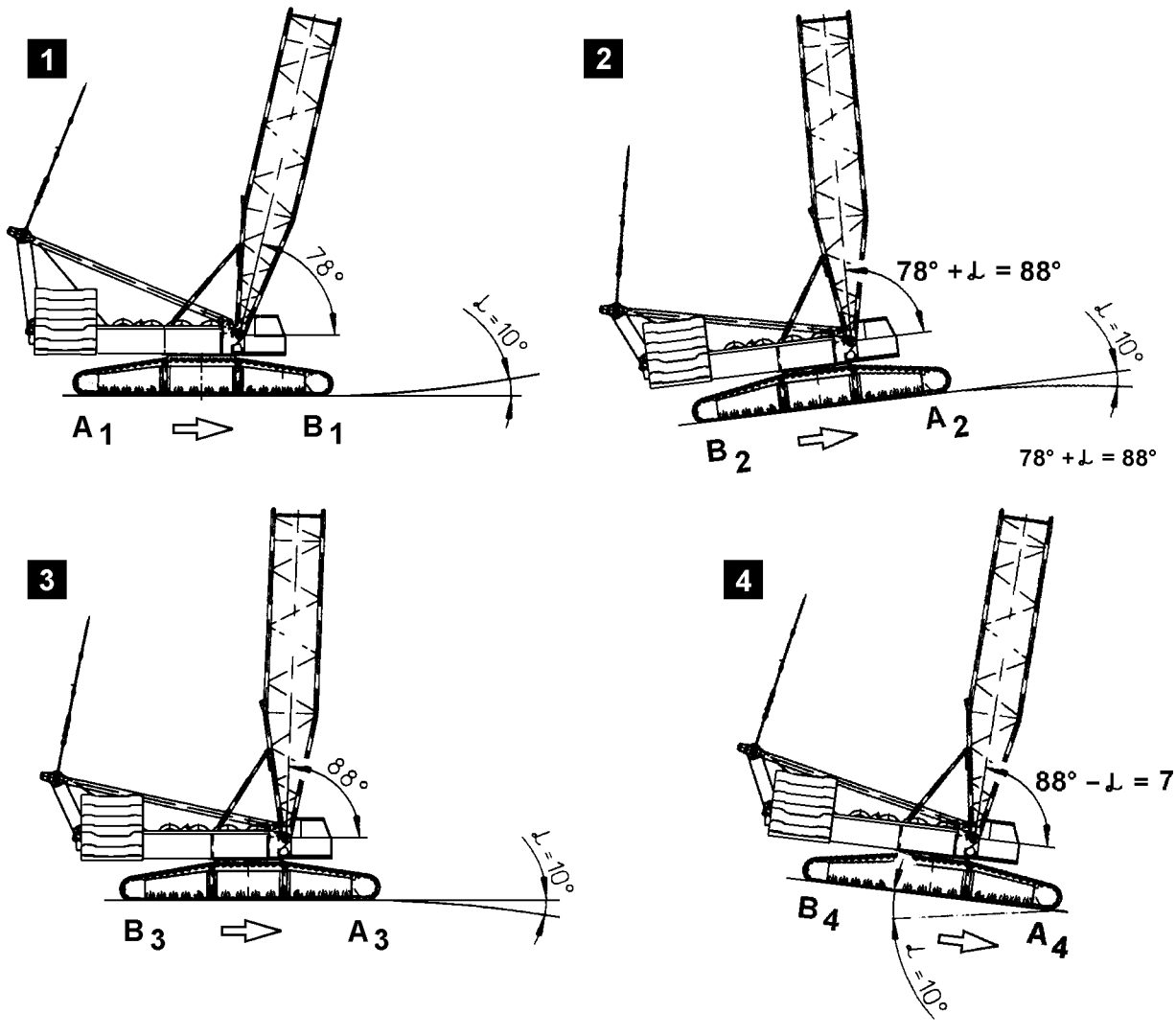
- ▶ The placement location must be level (+/- 0.2°) and have adequate load bearing capacity!
- ▶ The ground must be able to safely take on the ground pressures, which were calculated with the job planner!
- ▶ Only drive at the lowest possible speed!
- ▶ Avoid jerky driving movements!
- ▶ The attached load must be secured to prevent it from swinging!
- ▶ Carry out any steering movements with utmost caution!

Note
For all driving conditions, the ratio between the front and rear or the rear and the front ground pressures must be greater than 0.3.

- ▶ A : B must be greater than 0.3.

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


TB57
CODE >
LR
(271)
371
(271)
371
11.08 m
11.08 m
119
(102)
119
(102)
[kN/m²]
STOP
n = 11
12°
(max)
0°
62.6
78.0°
28.0°
78.3
119.5°
118.5°
117.5°
0°
10.0°
5%
1.0m
100%
88° SD W
49 m 42 m 56 m
162
t
32
t


1
78°
⊿ = 10°
A 1
B 1
2
78° + ⊿ = 88°
⊿ = 10°
B 2
A 2
78° + ⊿ = 88°
3
88°
⊿ = 10°
B 3
A 3
4
88° − ⊿ = 78°
B 4
A 4
⊿ = 10°

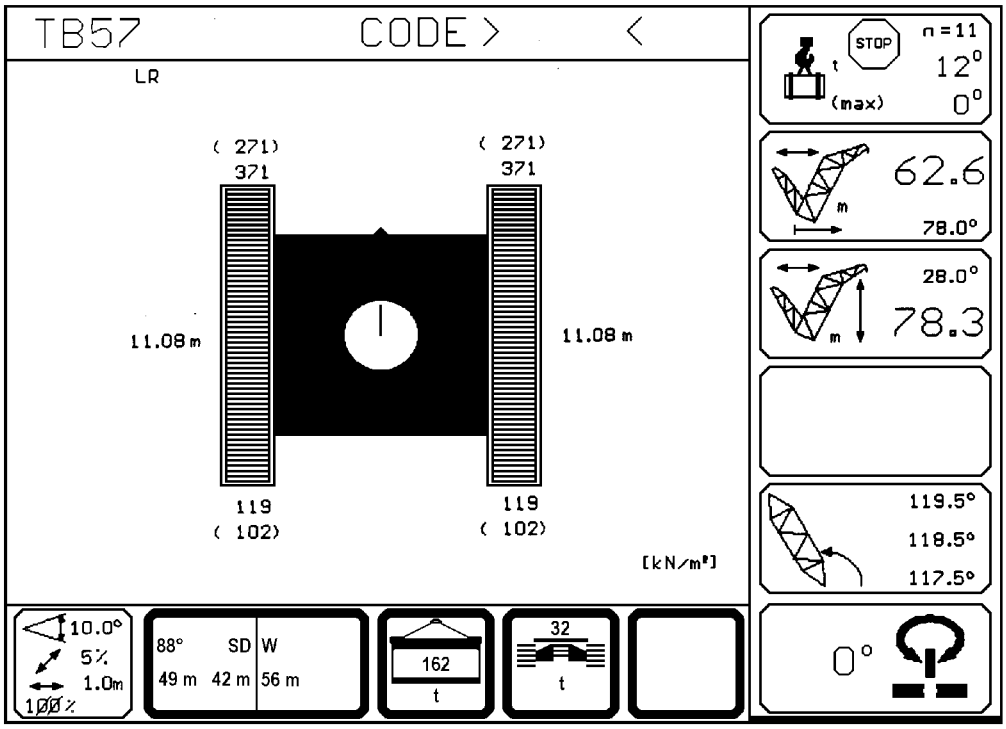
B192820

2 Driving the crawler crane without an attached load with equipment in place on an uphill / downhill slope

The maximum climbing ability of the crawler crane is limited by the following criteria:
– The location of the center of gravity for the complete crawler crane.
– The friction coefficient between roadway and track pads.
– The transit between the horizontal and the incline.
– The maximum uphill / downhill slope of 10° to a boom length of 150 m.
– The maximum uphill / downhill slope of 5° with derrick ballast.

Make sure that the following prerequisites are met:
– The ground must be sufficiently load bearing and have sufficient traction to prevent the crane from slipping.
– The turntable counterweight is secured with a chain,
see chapter 4.07.
– The boom is set with the aid of the job planner in such a way that the center of gravity is in the center of the crawler track.
– The maximum oil level in the engine is available.

DANGER
The crane can topple over!
If the following conditions for driving the crawler crane on an incline are not met, the crane can topple over and fatally injure personnel!
▶ The ground must be able to take on the occurring ground pressures.
▶ The friction coefficient between the roadway and the ground must be large enough to take on the occurring drive forces. Slippery ground conditions can result in the crane slipping sideways and could cause it to lean in an inadmissible position.
▶ The turntable must be parallel to the crawler carriers and secured to prevent it from turning.
▶ Side slope is not permissible!
▶ Use slow driving speeds; carefully perform any acceleration and delayed manoeuvres.
▶ 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. Any changes in gradient should be steady.
▶ The ground pressures which will occur should be calculated prior to driving with the job planner.


TB57
CODE >
LR
(271)
371
(271)
371
11.08 m
11.08 m
119
(102)
119
(102)
[kN/m²]
STOP
n = 11
12°
(max)
0°
62.6
78.0°
28.0°
78.3
119.5°
118.5°
117.5°
0°
10.0°
5%
1.0m
100%
88° SD W
49 m 42 m 56 m
162
t
32
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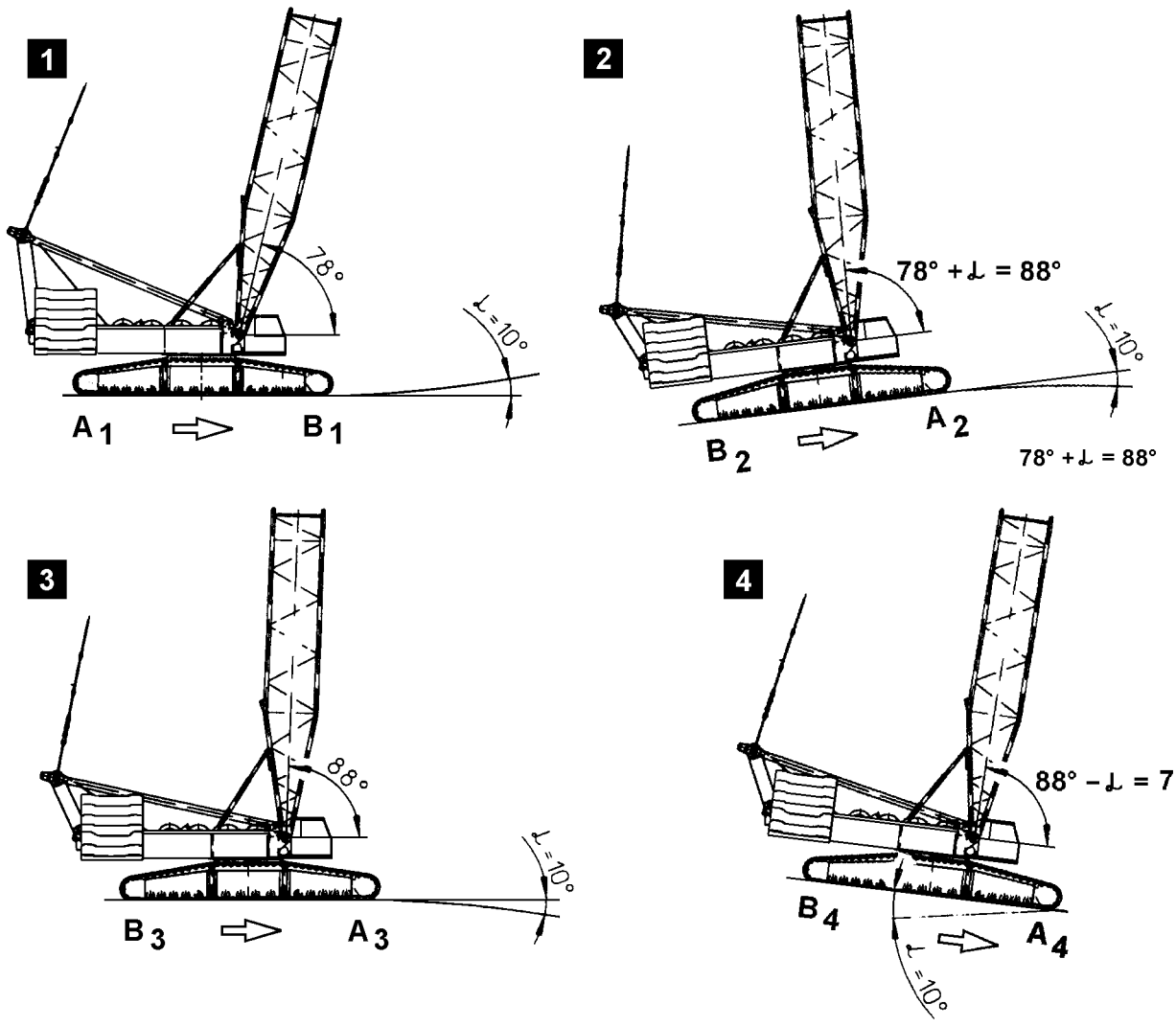

1
78°
⊿ = 10°
A 1
B 1
2
78° + ⊿ = 88°
⊿ = 10°
B 2
A 2
78° + ⊿ = 88°
3
88°
⊿ = 10°
B 3
A 3
4
88° − ⊿ = 78°
B 4
A 4
⊿ = 10°

B192820

2.1 Distribution of the ground pressure

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

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

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.

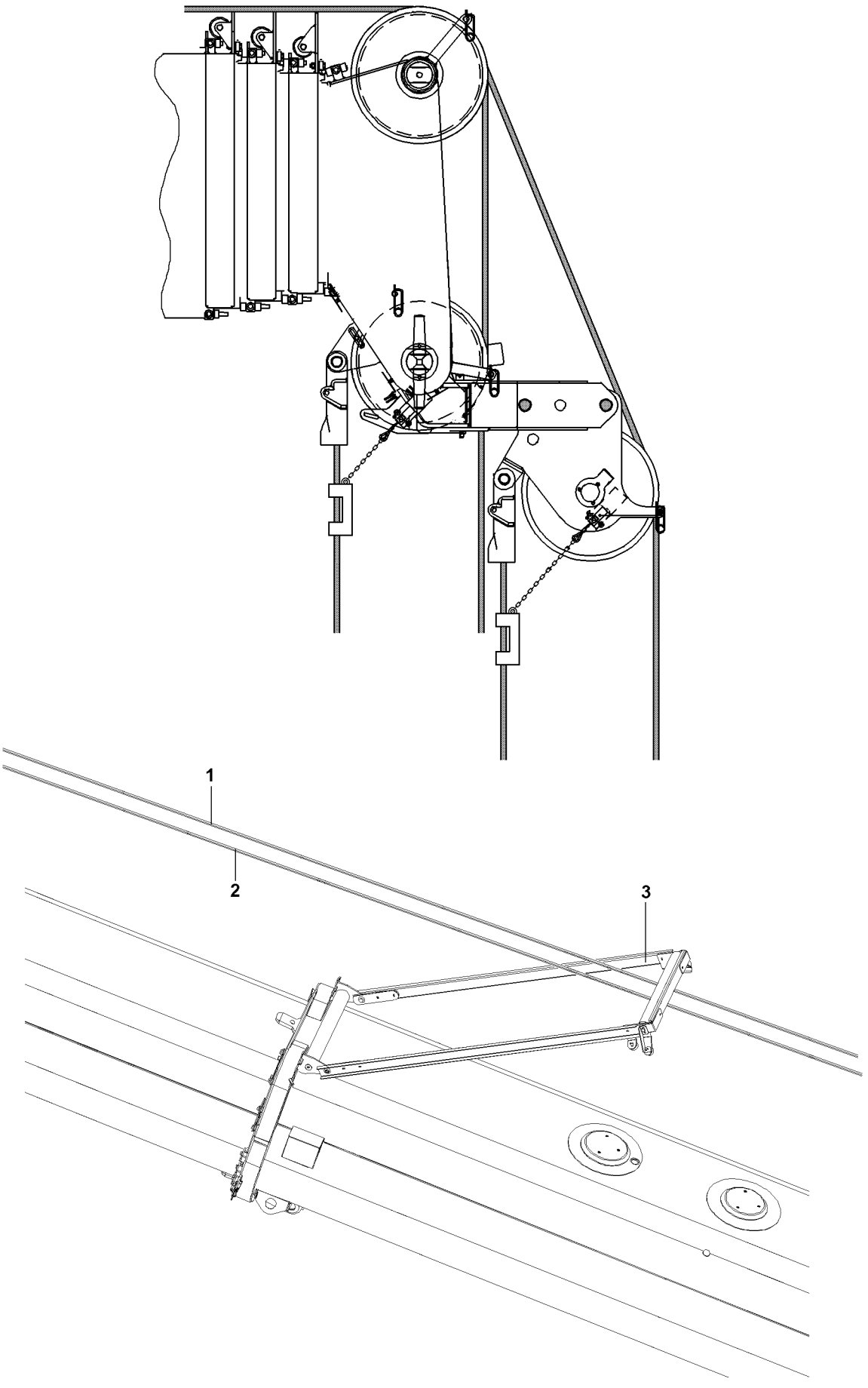
2.2 Calculation of required length for transfers

Illustration	Direction of travel	
	from	to
1	Horizontal	Uphill slope
2	Uphill slope	Horizontal
3	Horizontal	Incline
4	Incline	Horizontal

The required length **L** for transfers results from the existing uphill angle **α** and the length of the crawlers **LC**.
– L = Required length of transfers
– α= Angle of uphill slope in degrees
– LC = Length of crawlers between drive wheels and change over wheels

2.2.1 Calculation example

Given:
α= 10°
LC = 12.6 m
Wanted:
L = ?
Formula:
L = 0.5 * α* LC
Result:
L = 0.5 * 10 * 12.6 m = 63 m



B108770

1 General

In 2-hook operations there is a difference between:

1.) Operations with a boom nose* on the telescopic boom
2.) Operations with a boom nose* on the lattice jib
3.) Operations with a boom extension (folding jib, auxiliary boom, luffing jib)

1.1 Operations with a boom nose* on the telescopic boom

NOTICE
Danger of damage on the hoist ropes!
When reeving in, the hoist rope **1** and hoist rope **2** must be guided through the bracket **3** on the telescopic boom!
▶ Guide the hoist rope **1** and hoist rope **2** through the bracket **3** on the telescopic boom.

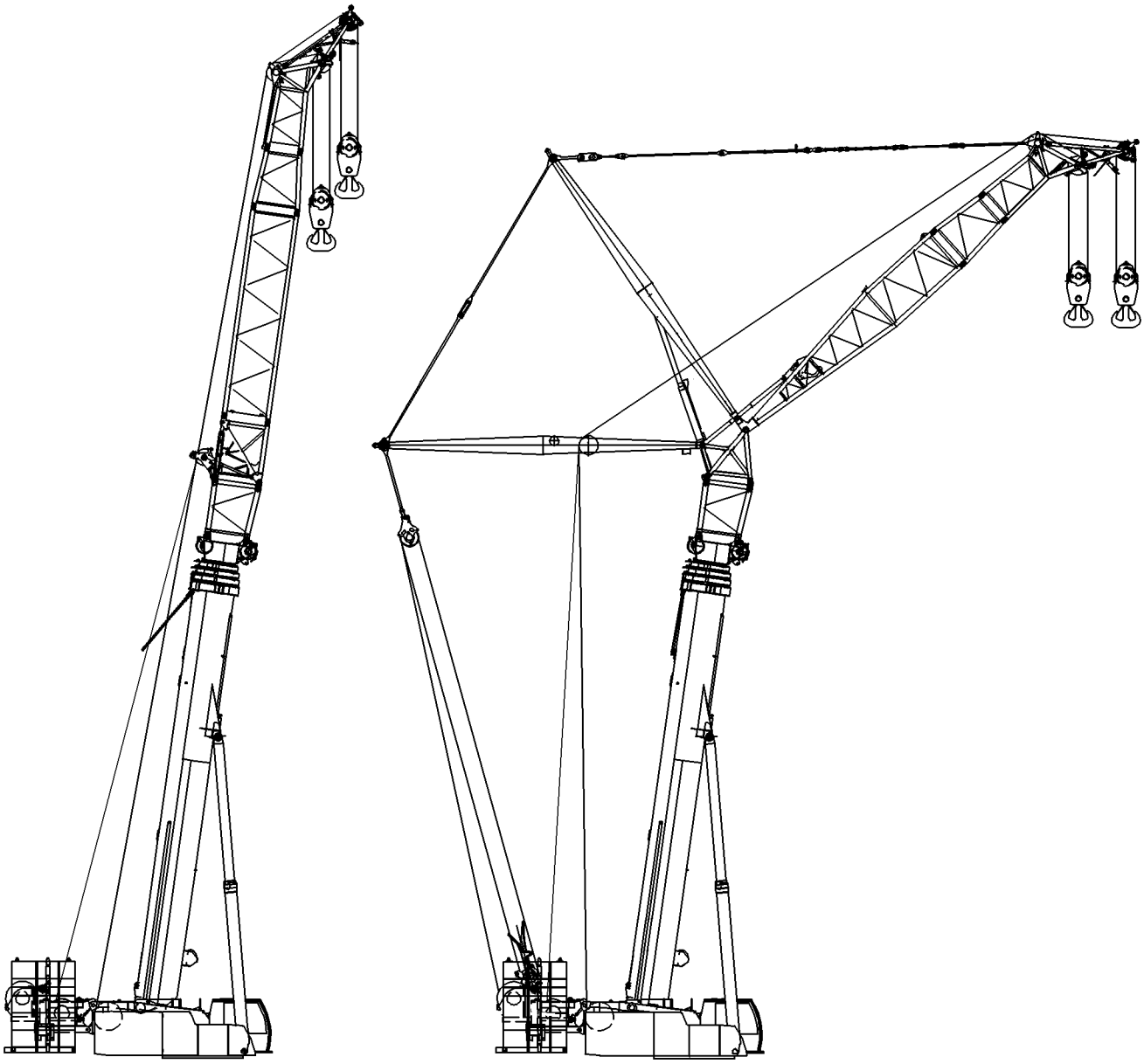
This option is set up for rapid hoists over the boom nose, whereby the hook block reeved on the telescopic boom can remain reeved.
No special loading tables are available for boom nose operations. The boom nose is generally run in the telescopic boom operating mode.

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

▶ Set the operating mode of the telescopic boom to overload protection.

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

The weight of the hook blocks (load hook), the boom nose and the lifting accessories must be added to the load to be lifted.
Setting this to the smaller reeving of the two hooks ensures that the crane cannot be overloaded.
▶ Enter the cable reeving that corresponds to the actual reeving on the mast nose.



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1.2 Operations with a boom nose* on the lattice jib

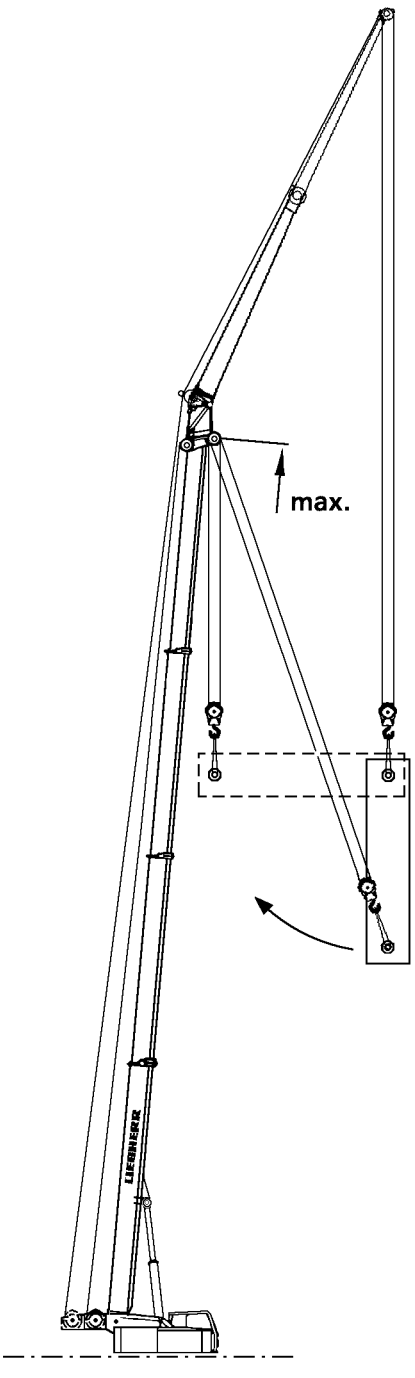
This option is set up for rapid hoists over the boom nose, whereby the hook block reeved on the lattice jib can remain reeved.
No special loading tables are available for boom nose operations. The boom nose is generally extended in the lattice jib operating mode.

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

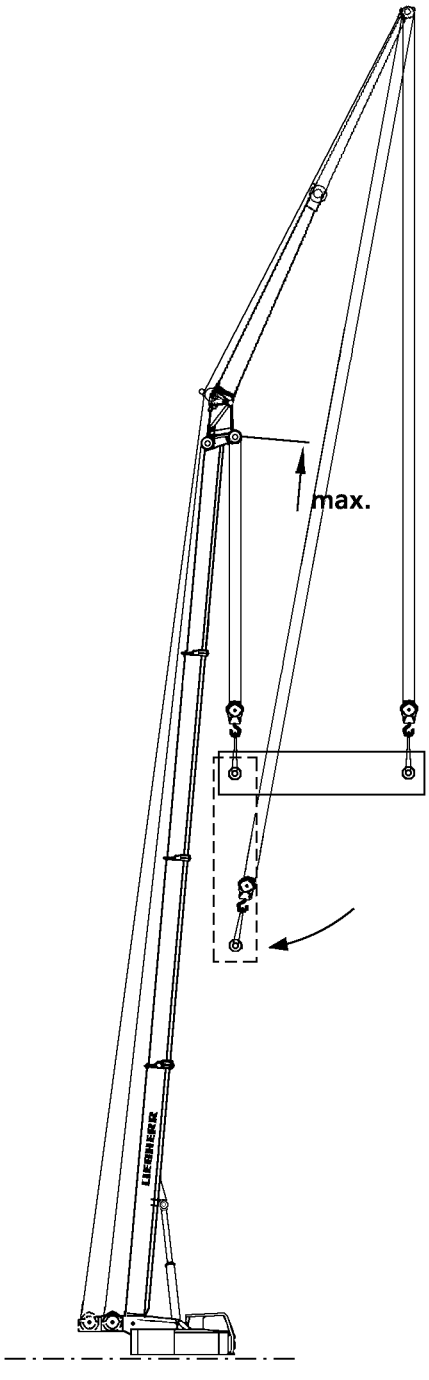
▶ Set the operating mode of the lattice jib to overload protection.

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

The weight of the hook blocks (load hook) and the lifting accessories must be added to the load to be lifted.
Setting this to the smaller reeving of the two hooks ensures that the crane cannot be overloaded.
▶ Enter the cable reeving that corresponds to the actual reeving on the mast nose.



Va. 1



Va. 2

B180647

1.3 Operations with a boom extension (folding jib, auxiliary boom, luffing jib)

This option is set up for turning loads during the simultaneous operation of both sets of hoisting gear.

Note
Raising the load
- ▶ The load must always be raised or lowered using the weakest component (folding jib, auxiliary boom, luffing jib) initially at 100%

- ▶ In “2-hook operations” with a boom extension (folding jib, auxiliary boom, luffing jib), the overload protection must be set to the operating mode boom extension (folding jib, auxiliary boom, luffing jib).

DANGER
Risk of accident by overloading the hoisting gear or hoisting cable!
- ▶ The reeving on the boom must be equal to or greater than the reeving on the boom extension (folding jib, auxiliary boom, luffing jib).

- ▶ Enter the reeving that corresponds to the existing reeving on the boom extension (folding jib, auxiliary boom, luffing jib) into the overload protection.

In this case, the maximum permissible total load corresponds to the maximum permissible load in the corresponding loading table for operating with the boom extension (folding jib, auxiliary boom, luffing jib).
The weight of the hook blocks (load hook) and the lifting accessories must be added to the load to be lifted.

Note
Radius display
- ▶ The radius is displayed, depending on the boom extension (folding jib, auxiliary boom, luffing jib) entered.
- ▶ The load-bearing capacity for each hook in “2-hook operations” is the permissible load in the corresponding loading table for operating with a boom extension (folding jib, auxiliary boom, luffing jib).
- ▶ In 2-hook operations, the total load is the permissible load in the corresponding loading table for operating with a boom extension (folding jib, auxiliary boom, luffing jib).

DANGER
Risk of accident from overloading individual components on the crane!
- ▶ Lifting a load with two hooks is only permissible if done as shown in the illustrations Va. 1 and Va 2.

DANGER
Danger of accidents
- ▶ If both hooks are loaded, it is forbidden to lower the boom!
- ▶ In those circumstances, safety cover from the overload protection is not available.
- ▶ This is why the load must always be picked up at the maximum radius.

As soon as the inner hook is pulled, the overload protection load display is wrong!
- ▶ If a load is raised as shown in Va. 1, the load must first be fully lifted to 100% with the hook furthest away.

B195219

1 Reeving plans

Note

▶ See separate reeving plans!

5.00 Equipment

B195219

1 Checking the retaining elements

Retaining elements are used to secure the pins in the folding jibs and lattice sections. The spring force of the retaining elements may significantly reduce if they are mechanically damaged or distorted. Do not re-use retaining elements if there is insufficient spring force. The pins must be secured with correctly **functioning** retaining elements.

DANGER
Risk of accident if retaining element does not provide enough spring force!
It cannot be guaranteed that the pin is correctly secured if the retaining element does not provide sufficient spring force.
▶ Use retaining elements with sufficient spring force!

2 Checking the ropes

The ropes must be checked by an expert before assembly and checks must be performed at regular intervals in order to detect possible damage or wear and tear at an early stage. See Crane operating instructions, chapter 8.04.
The ropes must be removed immediately if any of the following damage is detected:
– Breakage of a strand.
– Wire breaks.
– Broken wire nests.
– Reduction in the rope diameter by 10 % or more of the nominal size.
– Rope deformation.

2.1 Attaching a new hoist rope

In order to guarantee safety and operating characteristics only use original Liebherr replacement parts.
Worn rope pulleys must be removed and replaced **before** fitting a new hoist rope. If this is not done the new hoist rope will be damaged.

2.1.1 Cranes with cam limit switch

The cam limit switch is calibrated in the factory to switch off when only 3 hoist rope coils are left on the winch.

WARNING
Risk of accident due to falling load!
If the following instructions are not observed, the hoist rope end attachment may be torn out causing the load to topple.
▶ If a new hoist rope is used, the cam limit switch must be reset!
▶ The cam limit switch must be adjusted so that it turns off when only 3 hoist rope coils remain on the winch!
▶ If the hoist rope is wound up during the assembly, the hoist rope end must remain in front of the winch and may not be pulled over the winch, otherwise the cam limit switch must be reset!

2.1.2 Cranes with winch turn sensor

The winch turn sensor is adjusted in the factory. If used properly, the winch turn sensor will not need to be readjusted.

DANGER

Avoid the following situations otherwise the winch 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.

3 Inspection procedures

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!

Perform the following checks before operating the crane:

– **On mobile cranes:**
  • Check if the axle suspension is blocked.
  • Check if the support pads are secured in the operating position.
– Check if the ground has adequate load-bearing capacity.
– 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.
– **On mobile cranes:**
  • Check if the sliding beams are prevented from sliding by pins.
  • Check if the crane is supported.
– Check if the crane is level.
– **On mobile cranes:**
  • Check that the tires are not in contact with the ground.
– Check that the overload protection has been adjusted as per the information in the load chart.
– Check if the bypass key button and the assembly key button are turned off.
– **On certain crawler cranes:**
  • Check that the crawler assembly key button is turned off.
– Check the shut-off of the overload protection by running against the operating position on “top” and “bottom”.
– 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.
– **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.
– Check the easy movement of the pendulum for the mechanical relapse retainer over the total swing range of the pendulum.

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!

4 Dangerous conditions without shut-off

4.1 Block position of relapse cylinders when setting down a load

NOTICE
Damage to boom or relapse cylinder!
If the block position of the relapse cylinders is triggered by the boom or the derrick with attached, freely suspended load, then there is a danger of damaging the boom or the relapse cylinders when setting down the load onto the ground! By setting down the load, the crane is relieved, which causes the boom system to move to the rear.
There is no shut-off of the hoist gear down function!
- ▶ Actuate the opposite direction of movement which caused the block position and eliminate the block position!

5 Transporting components

If any components are transported on an auxiliary vehicle, then they must be properly secured. If necessary, transport these components on supports or using a special transport device.

5.1 Transporting lattice sections

If the lattice sections are pushed inside each other for transportation purposes, they must each be secured with 2 chains.

6 Pneumatic springs for assembly support of components

Pneumatic springs are installed on various components to simplify the assembly of these components.

WARNING
Danger of crushing!
Defective pneumatic springs no longer provide the supporting properties on the movable components!
Due to falling components, personnel can be killed or severely injured!
High risk of accident!
- ▶ Do not use components with defective pneumatic springs! Replace defective pneumatic springs!
- ▶ Always check pneumatic springs for external damage before actuating the corresponding components!
- ▶ It is strictly prohibited for personnel or objects to remain within the movement range of the components, which are supported by the pneumatic spring!
- ▶ It is prohibited for personnel or objects to remain within the danger zone of the moveable components!

7 Weights

Note
Please note:
- The weight of each component is specified in the corresponding chapter of the Crane operating instructions or stated on the tag attached to the corresponding component!
- Contact the Service department at **LIEBHERR-Werk Ehingen GmbH.** if the weight of the respective component is not stated on the tag or in the Crane operating instructions.
- If components are pushed into one another (for example intermediate pieces) or folded together (for example the folding jib), then the total weight is given by the sum of the individual components!
- Use an auxiliary crane with sufficient load carrying capacity!

8 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.

B197716 *Example for cranes with LICCON overload protection*

9 Bypassing the overload protection

DANGER

Increased accident risk when bypassing the overload protection!

As section 4.2.6.3.2 of EN 13000 does not put the requirements of appendix 1 of the EC machinery directive 89/37/EC into concrete terms, the overload protection has not been designed according to this definition.

Proper and destined use of the crane is ensured due to the construction of the overload protection system and observance of the information in the Crane operating instructions. All **sensibly foreseeable erroneous operations** of the crane have been taken into consideration.

Impermissible crane operation with bypassed overload protection – with the aim of increasing the maximum load-bearing capacity of the crane above the rated value in the load chart, or to extend the designated working range of the crane – does not constitute a **sensibly foreseeable erroneous operation**, rather **a deliberate improper use with high risk of accident**!

The possible risks and consequences of such deliberate improper use are detailed in the operating instructions.

Such deliberate improper use can neither be prevented by means of the constructive design, nor by means of information in the operating instructions!

- ▶ Only operate the bypass key button in accordance with the operating instructions!
- ▶ All other usage of the bypass key button other than as described in the operating instructions is prohibited!

9.1 Bypassing the overload protection

If the maximum permissible load moment is exceeded, the overload protection turns all load moment increasing crane movements off. This shut off can be bypassed with the bypass key button. The LICCON overload overload safety device displays remain functional.

WARNING

Increased accident risk when bypassing the overload protection!

If the overload protection is bypassed, there is no further protection against crane overload!

In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be killed!

This could result in high property damage!

- ▶ It is only permitted to bypass the overload protection during assembly or in emergencies!
- ▶ The bypass key button may only be actuated by persons who are aware of the effects of their acts regarding the bypass of the overload safety!
- ▶ Bypassing the overload protection requires the presence of the crane supervisor and must be performed with utmost caution!
- ▶ Crane operation with bypassed overload protection is strictly prohibited!

B197716 *Example for cranes with LICCON overload protection*

9.2 Bypassing the hoist-top shut off

If the hook block touches the hoist limit switch weight during the upward movement, the hoist limit switch reacts. The crane movements “Spool up winches”, “Luff boom down” and “Telescope telescopic boom out” are turned off. The shut off can be bypassed by the bypass key button.

WARNING
Increased accident risk when bypassing the overload protection!
When bypassing the hoist top shut off, there is a risk that the hook block may be pulled against the pulley head when continuing to lift or luffing down the boom. This may damage the pulleys and cause the loads to fall!

- ▶ The hoist up shut-off must only be bypassed if the crane supervisor is present, and with the help of a “guide”. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block and the boom head.
- ▶ Carry out all crane movements with maximum care and minimum speed.

9.3 Actuating the overload protection

9.3.1 Actuating the LICCON overload protection

▶ Turn the bypass key button to the right and hold.

Result:

– The LICCON overload protection is inactive.
– The assembly icon on the LICCON monitor blinks.
– An acoustic signal sounds.
– The red flashing beacon on the crane cab blinks.

▶ If the bypass key button is to be turned off:
Do not actuate the bypass key button any more.

Result:

– The LICCON overload protection is active.
– The assembly icon on the LICCON monitor turns off.
– The acoustic signal is turned off.
– The red flashing beacon on the crane cab extinguishes.

9.3.2 Actuating the PAT overload protection

▶ Actuate the bypass key button and turn the PAT overload protection off.

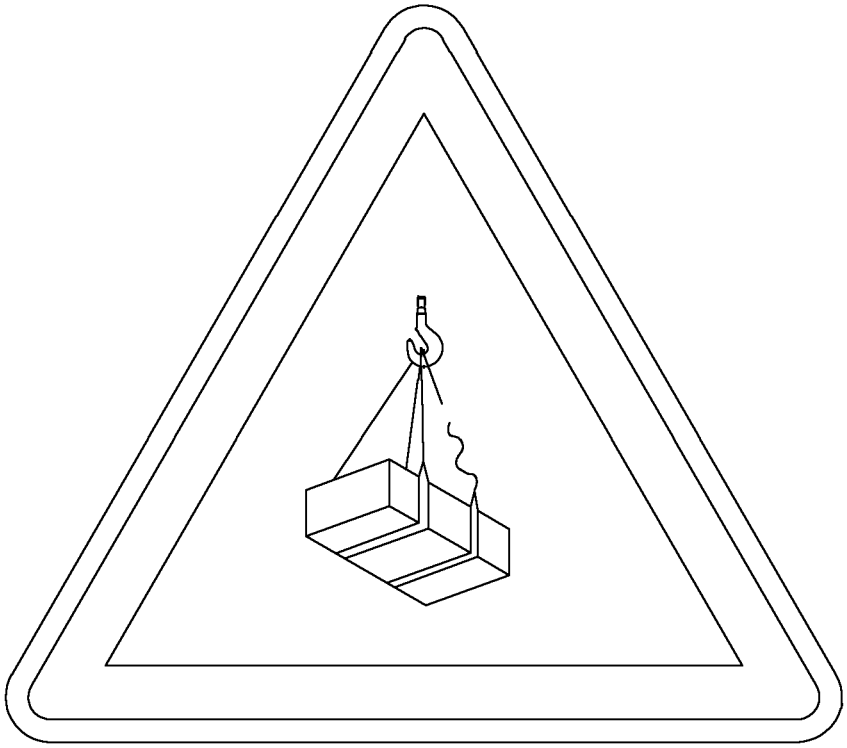
Result:

– The PAT overload protection is inactive.

▶ Actuate the bypass key button and turn the PAT overload protection on.

Result:

– The PAT overload protection is active.




DANGER
IMPACT HAZARD!
Moving attachments can crush and impale.
Keep clear of machine working area.

B108048

10 Assembly / disassembly

WARNING
Risk of fatal injury due to incorrect assembly or disassembly!
The assembly / disassembly of components may never be performed by untrained personnel. Incorrect assembly / disassembly can result in death or severe injury!
- ▶ Assembly and disassembly may only be carried out by authorized trained experts!

Note
- ▶ For assembly / disassembly of individual components, also refer to the chapters relating to those components!
- ▶ Only use the auxiliary winch (assembly or reeving winch) for assembly and not to lift loads!
- ▶ Lifting of loads with the auxiliary winch is prohibited!

Normal assembly / disassembly procedures require all separately transported components to be transported close to the ground using appropriate auxiliary cranes and tackle. They must be safely (correctly) connected to the crane.
Suspended loads such as counterweights, lattice sections or auxiliary booms etc. must be placed on the ground or on a frame or other suitable load bearing device before being approached by assembly personnel.

WARNING
Danger of impact and crushing!
There is a risk of impact and crushing when standing in the vicinity of suspended loads moving sideways.
- ▶ During assembly / disassembly no one may be in the dangerous area around or even underneath the suspended load before the load has been secured!

WARNING
Risk of falling!
During assembly and disassembly, inspection and maintenance work, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.
- ▶ All assembly work must be carried out using suitable aids (ladders, lifting platforms, scaffolding, auxiliary crane, etc.)!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with the personal antifall guard system (see Crane operating instructions, chapter 2.04) to protect against falling! The personal antifall guard system must be attached in the corresponding attachment points on the crane (see Crane operating instructions, chapter 2.06).
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly, inspection and maintenance work.
- ▶ Only step on aids and antifall guards with clean shoes!
- ▶ Keep aids and antifall guards clean and free from snow and ice!
- ▶ It is prohibited to walk on the telescopic or auxiliary booms!

B197715

10.1 Assembly / disassembly of the booms

If lattice sections are not in contact with the ground during assembly / disassembly they must be supported with suitable, stable materials. Adjust the height of the support so that the lattice sections are not in contact with the ground. Pay particular attention if the lattice sections are equipped with rope pulleys. Otherwise the rope pulleys could be damaged.

During disassembly it must be ensured that the auxiliary crane lifts the load vertically. The crane operator must ensure that the load bearing capacity of the auxiliary crane is sufficient to safely raise the dismantled component at the given radius. When attaching the auxiliary crane it must be ensured that the hook of the auxiliary crane is above the center of gravity of the disassembled component and the fastening ropes are attached to the load.

WARNING

The crane can topple over!

Angular pulling can destroy the crane or cause it to topple over.

- The hook block must always be attached vertically over the center of gravity of the load to be lifted!
- Diagonal pull is not permitted!

WARNING

Danger of accident at assembly / disassembly of booms!

The disassembling of unsecured or unsupported booms may result in fatal injury or mutilation.

- Never unpin the pins under unsecured or unsupported booms!
- Never unpin the connecting pins under unsecured or unsupported booms!
- Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- Safely secure the pins in the bearing points as well as receptacles!
- Do not lean the ladder against the component being disassembled!

WARNING

Risk of accident from distorted pins!

Angular pulling or excessive / low hoisting force of the auxiliary crane may result in distortion of the pins.

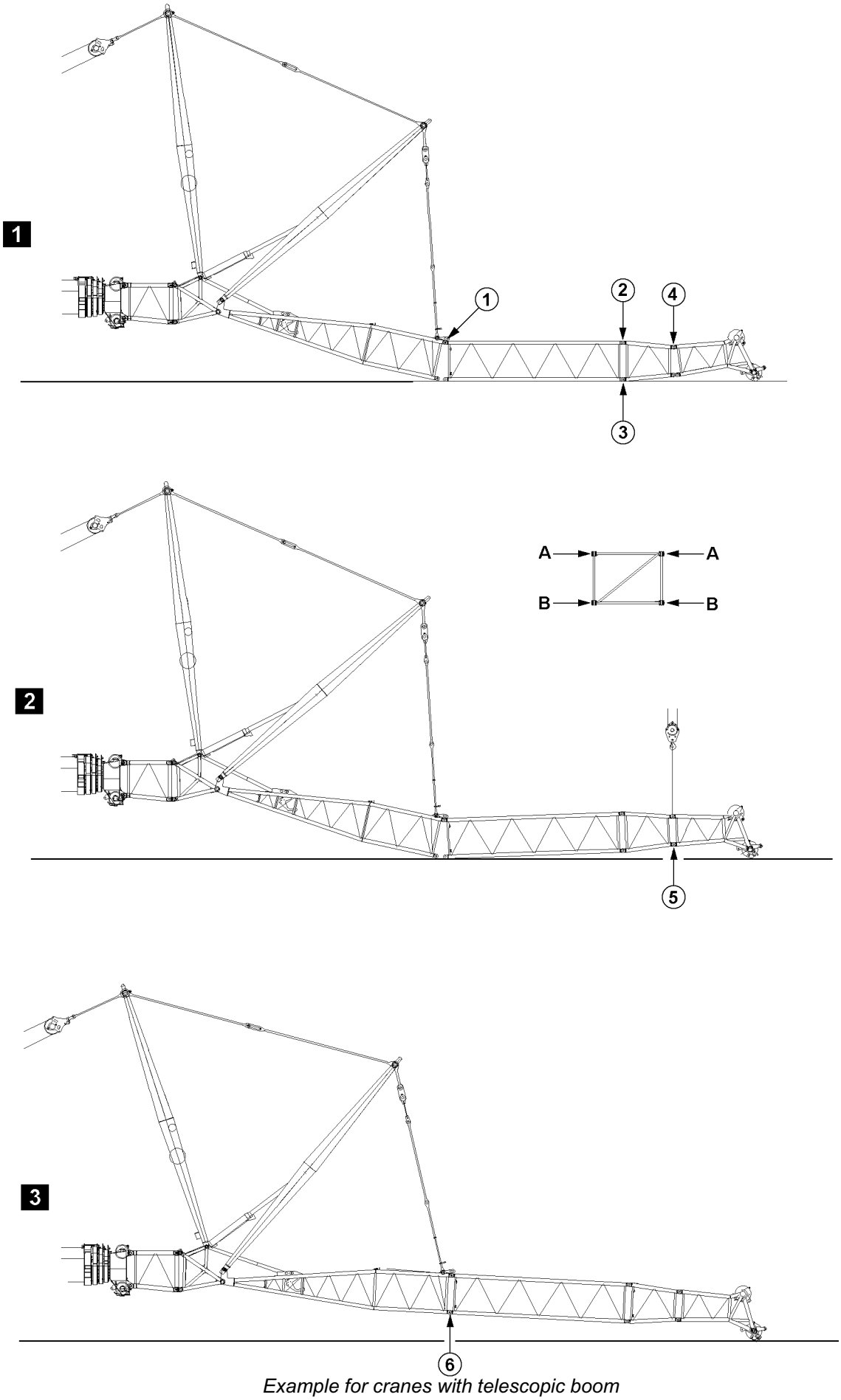
Distorted parts can suddenly detach themselves when the pins are unpinned. This represents a fatal injury risk to assembly personnel.

- When the pins are unpinned, the “lifting force” of the crane must be adapted to the “weight” of the parts being lifted!
- Do **not** remove difficult to remove pins by force!
- Remove the reason for the distortion!

Note

Instructions for pinning and unpinning:

- Unpin or pin both pins at the same horizontal level, i.e. **left and right**!
- Pin the lower pins **from inside to outside** and unpin from **outside to inside**!
- Pin in and unpin horizontally-assembled double cone pins from **outside to inside**!
- Pin and unpin vertically assembled double cone pins from **top to bottom**!



B197718

Example for cranes with telescopic boom

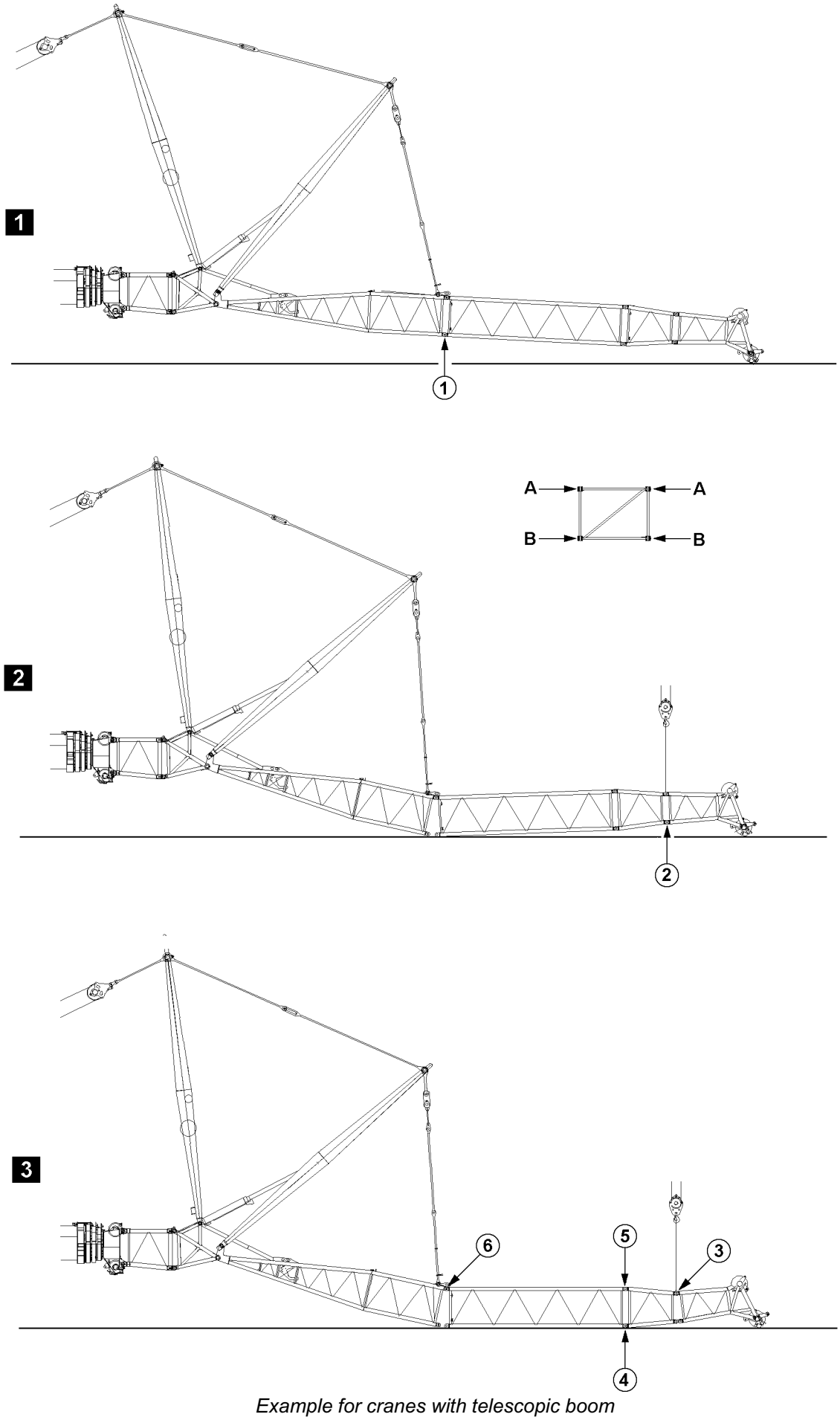
10.2 Assembly of lattice sections for telescopic cranes

10.2.1 Assembly of lattice sections for guyed auxiliary boom with an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when assembling auxiliary booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
- ▶ Pins must be pinned in the order specified!

- ▶ Pin in and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **A**) at point **2**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **B**) at point **3**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **A**) at point **4**, illustration 1.
- ▶ Lift the end section with the auxiliary crane, illustration 2.
- ▶ Pin in and secure pins at both sides (level **B**) at point **5**, illustration 2.
- ▶ Lift the lattice sections, illustration 3.
- ▶ Pin in and secure pins at both sides (level **B**) at point **6**, illustration 3.



B197719

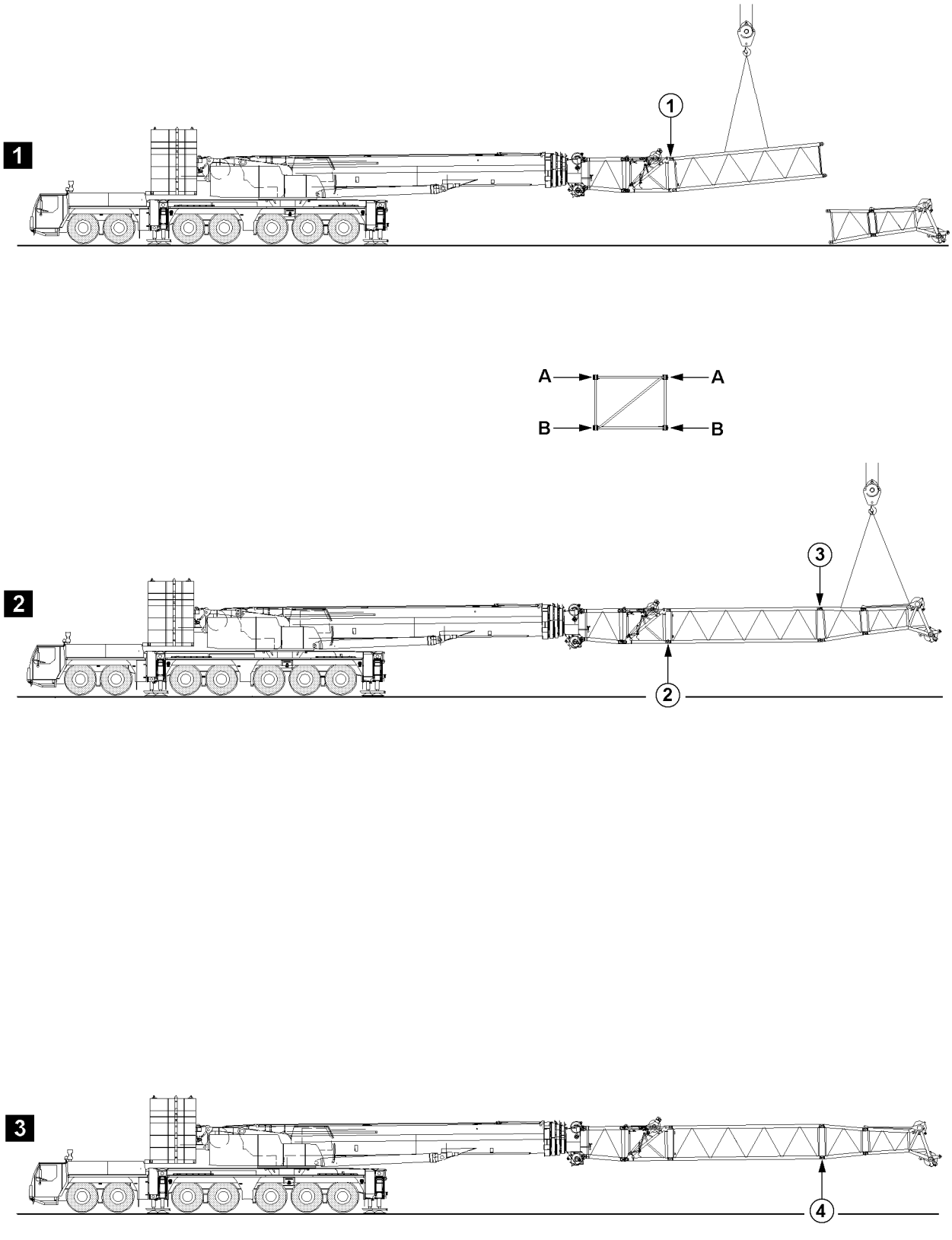
Example for cranes with telescopic boom

10.2.2 Disassembly of lattice sections for guyed auxiliary boom with an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

- ▶ Luff the auxiliary boom down until the end section is lightly touching the ground, illustration 1.
- ▶ Release and unpin pins at both sides (level **B**) at point **1**, illustration 1.
- ▶ Completely remove the lattice sections, illustration 2.
- ▶ Lift the end section with the auxiliary crane, illustration 2.
- ▶ Release and unpin pins at both sides (level **B**) at point **2**, illustration 2.
- ▶ Release and unpin pins at both sides (level **A**) at point **3**, illustration 3.
- ▶ Release and unpin pins at both sides (level **B**) at point **4**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **5**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **6**, illustration 3.



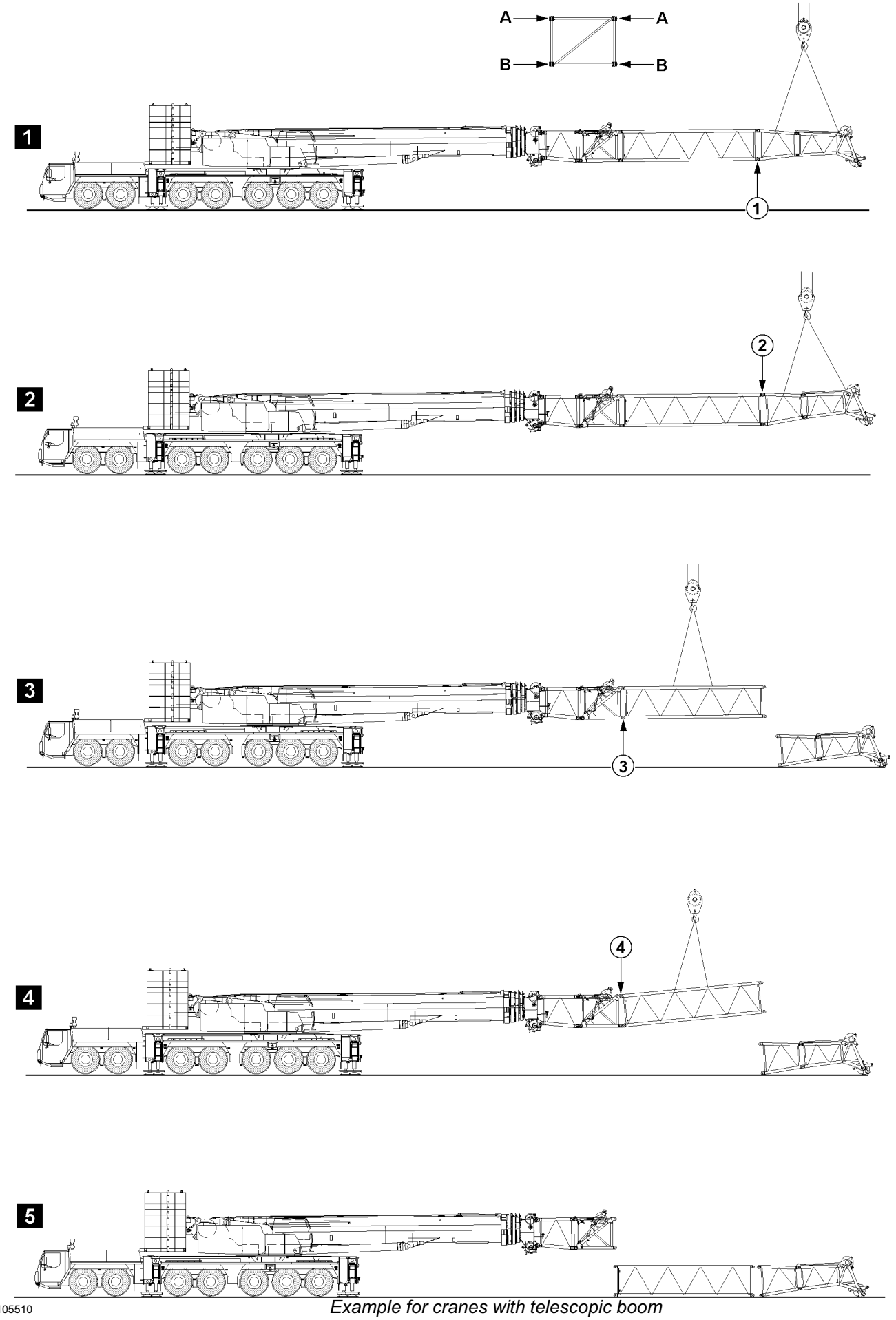
B197705 *Example for cranes with telescopic boom*

10.2.3 Assembly of lattice sections on self-supporting auxiliary booms using an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when assembling auxiliary booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

- ▶ Pin in and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **B**) at point **2**, illustration 2.
- ▶ Pin in and secure pins at both sides (level **A**) at point **3**, illustration 2.
- ▶ Pin in and secure pins at both sides (level **B**) at point **4**, illustration 3.



B105510

Example for cranes with telescopic boom

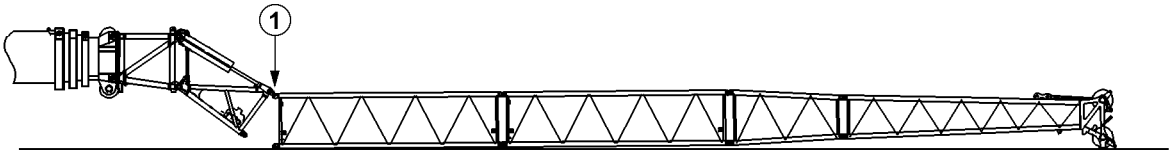
10.2.4 Disassembly of lattice sections on self-supporting auxiliary booms using an auxiliary crane

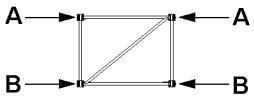
The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

- ▶ Release and unpin pins at both sides (level **B**) at point **1**, illustration 1.
- ▶ Release and unpin pins at both sides (level **A**) at point **2**, illustration 2.
- ▶ Release and unpin pins at both sides (level **B**) at point **3**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **4**, illustration 4.

1





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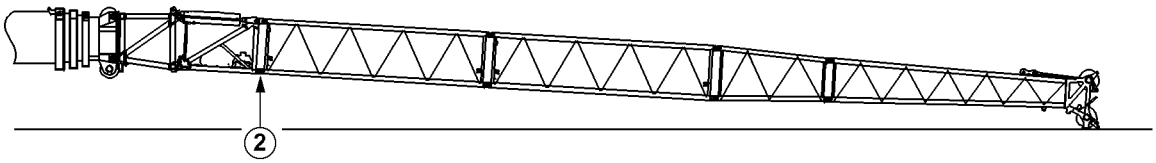

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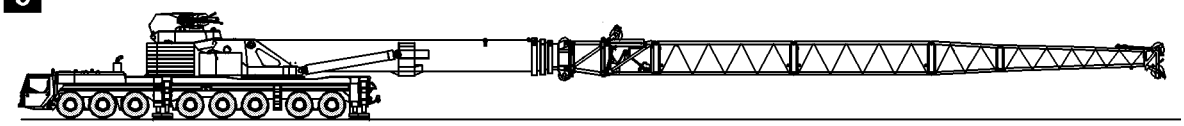


B197712

Example for cranes with telescopic boom

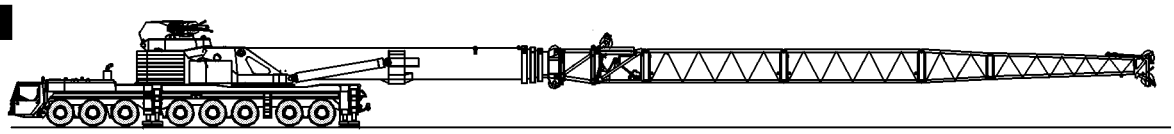
10.2.5 Assembly of lattice sections on self-supporting auxiliary booms without using an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when assembling auxiliary booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

For cranes with hydraulic angle adjustment and self-supporting auxiliary boom, the assembly / disassembly of additional lattice sections may be performed using the crane itself.
In order to do so, proceed as follows.
▶ Assemble the lattice sections to the required length.
▶ Pin in and secure pins at both sides (level **A**) at point **1**, illustration 1.
▶ Luff the auxiliary boom up until the pins can be pinned at point **2**, illustration 2.
▶ Pin in and secure pins at both sides (level **B**) at point **2**, illustration 2.

1



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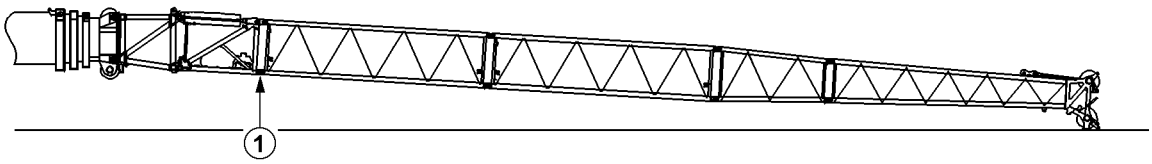

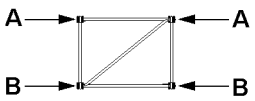

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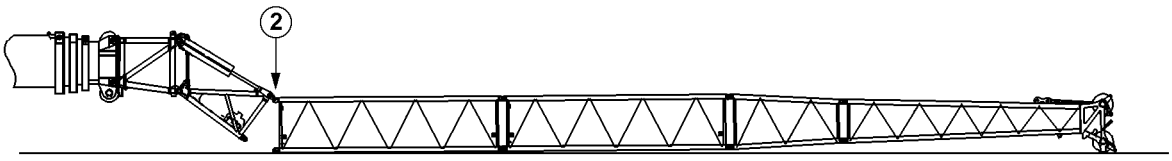


B197713 *Example for cranes with telescopic boom*

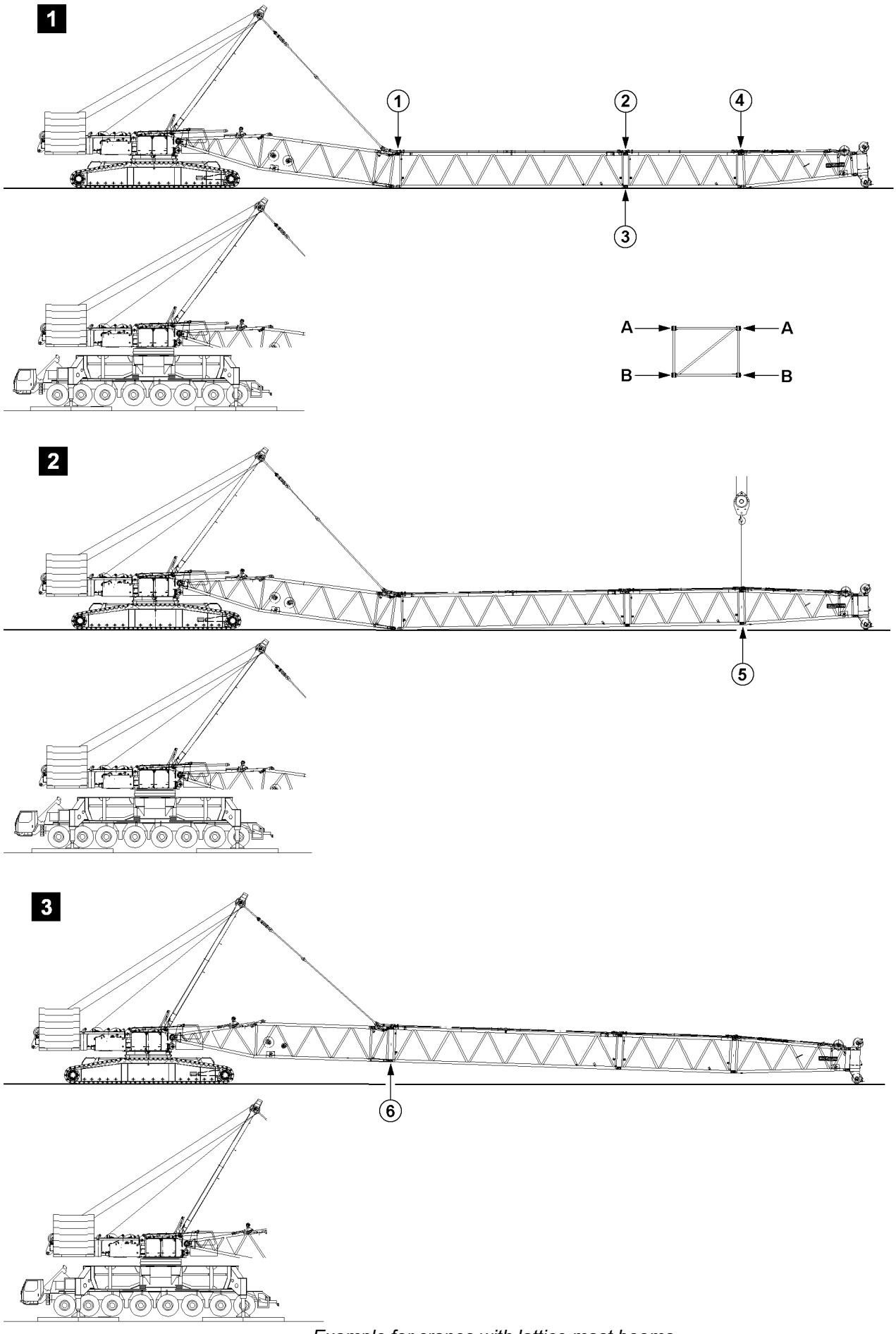
10.2.6 Disassembly of lattice sections on self-supporting auxiliary booms without using an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

For cranes with hydraulic angle adjustment and self-supporting auxiliary boom, the assembly / disassembly of additional lattice sections may be performed using the crane itself.
In order to do so, proceed as follows.

- ▶ Luff the auxiliary boom down until the end section is lightly touching the ground, illustration 2.
- ▶ Release and unpin pins at both sides (level **B**) at point **1**, illustration 2.
- ▶ Luff the auxiliary boom down until the lattice section to be disassembled are completely laying on the ground, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **2**, illustration 3.
- ▶ Completely remove the auxiliary boom.



B197710 *Example for cranes with lattice mast booms*

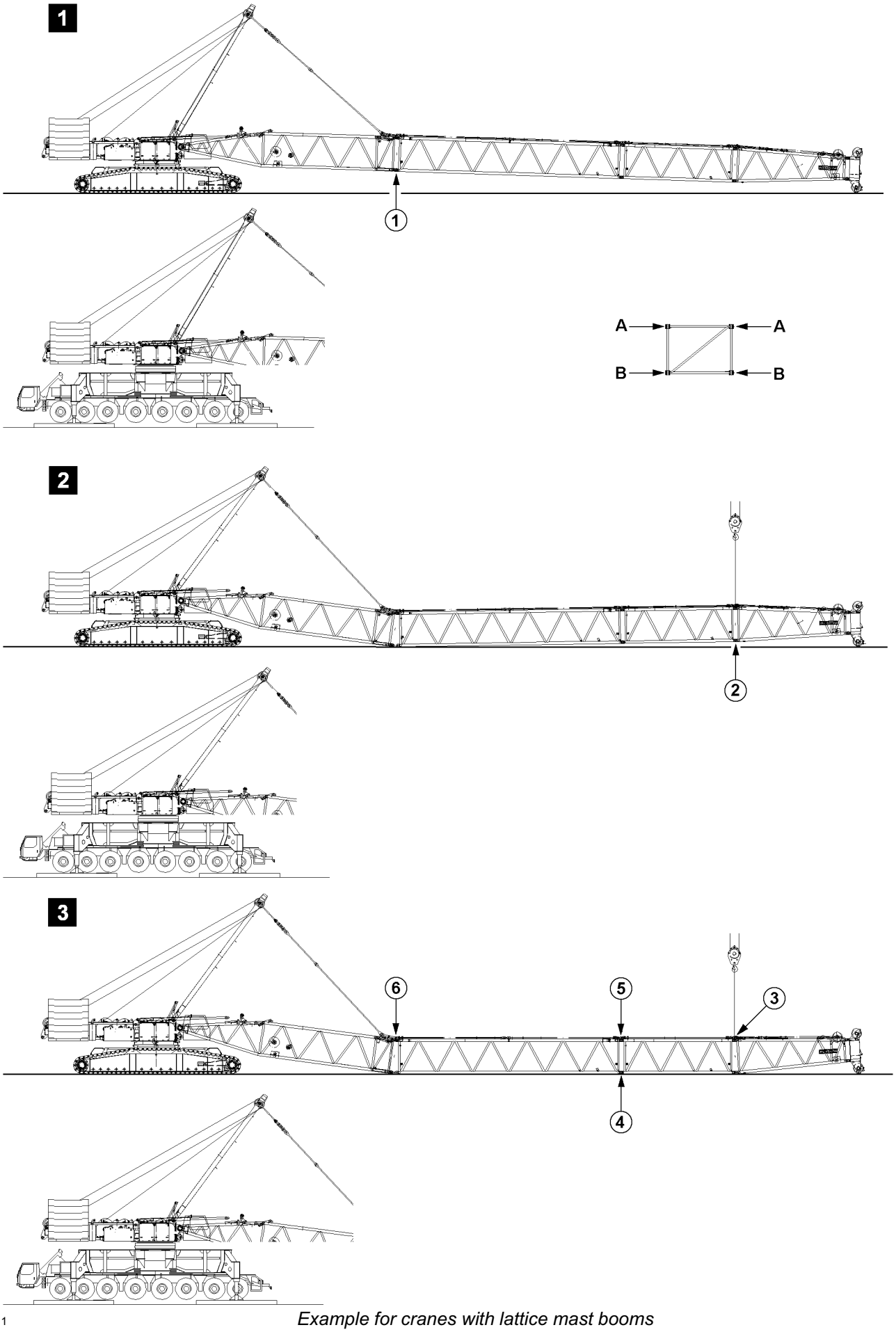
10.3 Assembly of lattice sections for lattice mast cranes

10.3.1 Assembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when assembling booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

- ▶ Pin in and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **A**) at point **2**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **B**) at point **3**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **A**) at point **4**, illustration 1.
- ▶ Lift the end section with the auxiliary crane, illustration 2.
- ▶ Pin in and secure pins at both sides (level **B**) at point **5**, illustration 2.
- ▶ Lift the lattice sections, illustration 3.
- ▶ Pin in and secure pins at both sides (level **B**) at point **6**, illustration 3.



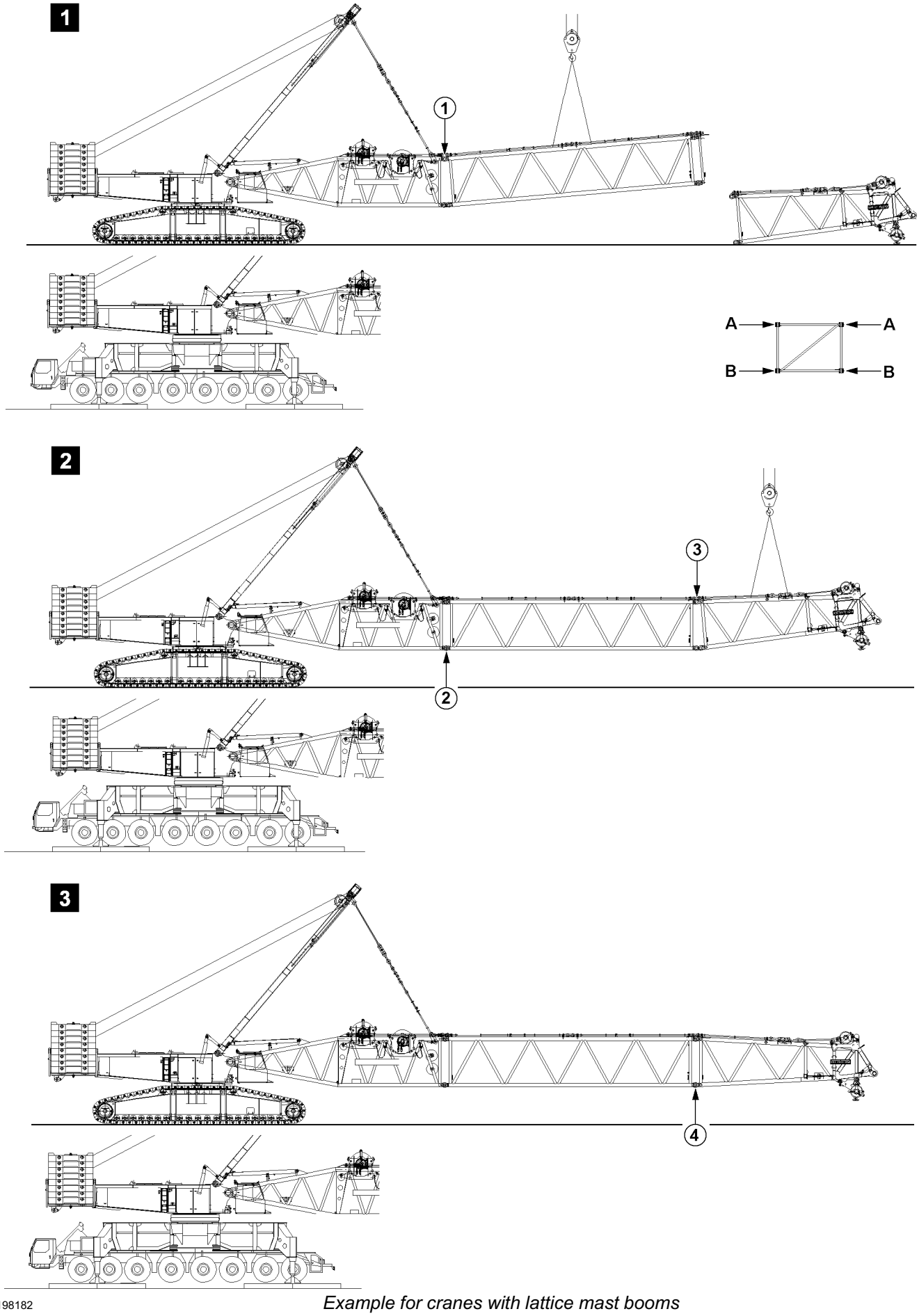
B197711 *Example for cranes with lattice mast booms*

10.3.2 Disassembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling booms!
If the pins are not unpinned in the given sequence, lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
- ▶ Pins must be unpinned in the order specified!

- ▶ Luff the boom down until the end section is lightly touching the ground, illustration 1.
- ▶ Release and unpin pins at both sides (level **B**) at point **1**, illustration 1.
- ▶ Completely remove the lattice sections, illustration 2.
- ▶ Lift the end section with the auxiliary crane, illustration 2.
- ▶ Release and unpin pins at both sides (level **B**) at point **2**, illustration 2.
- ▶ Release and unpin pins at both sides (level **A**) at point **3**, illustration 3.
- ▶ Release and unpin pins at both sides (level **B**) at point **4**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **5**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **6**, illustration 3.



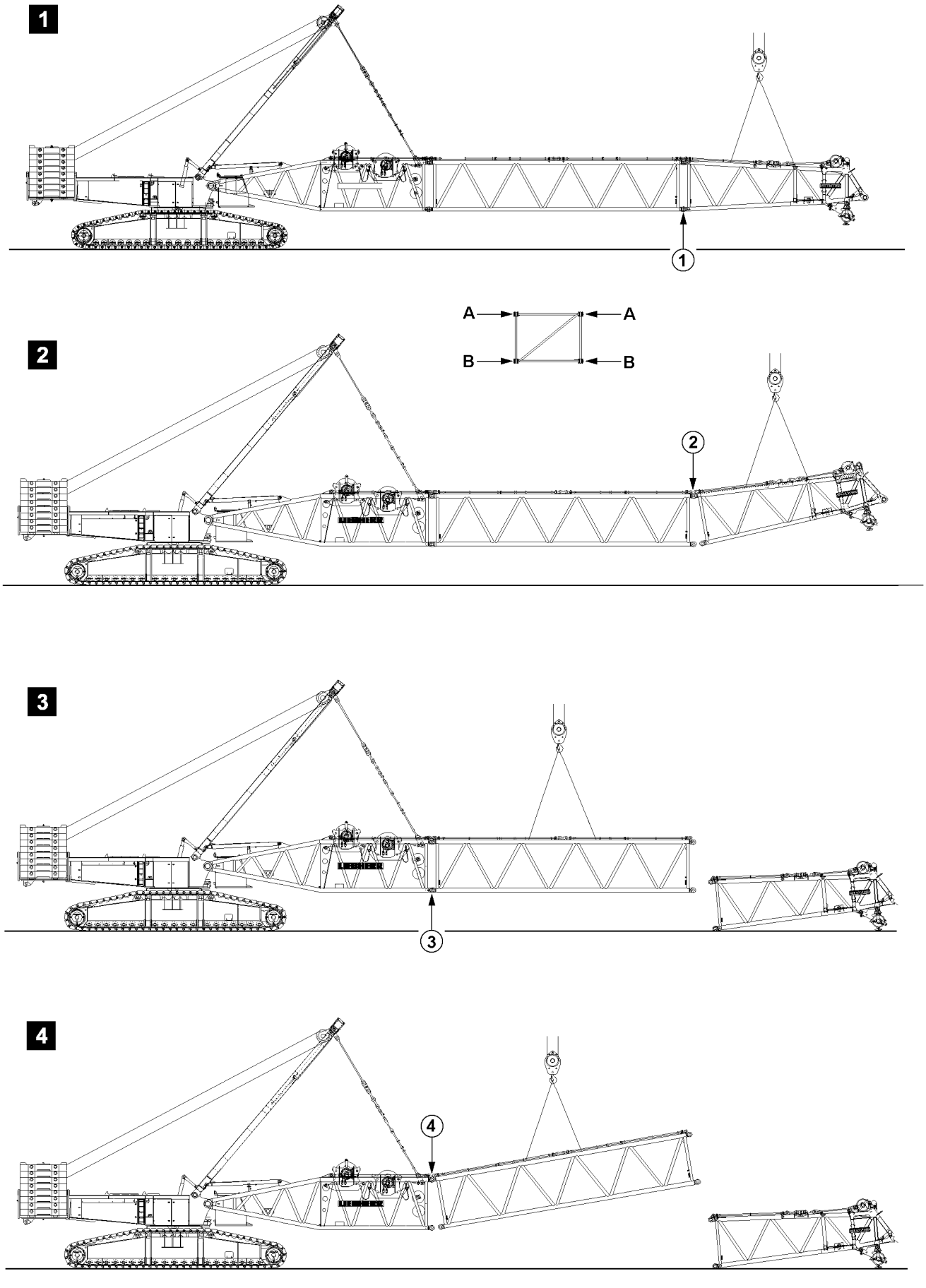
B198182 *Example for cranes with lattice mast booms*

10.3.3 Flying assembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when assembling booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be pinned in the order specified!

- ▶ Pin in and secure pins at both sides (level **A**) at point **1**, illustration 1.
- ▶ Pin in and secure pins at both sides (level **B**) at point **2**, illustration 2.
- ▶ Pin in and secure pins at both sides (level **A**) at point **3**, illustration 2.
- ▶ Pin in and secure pins at both sides (level **B**) at point **4**, illustration 3.



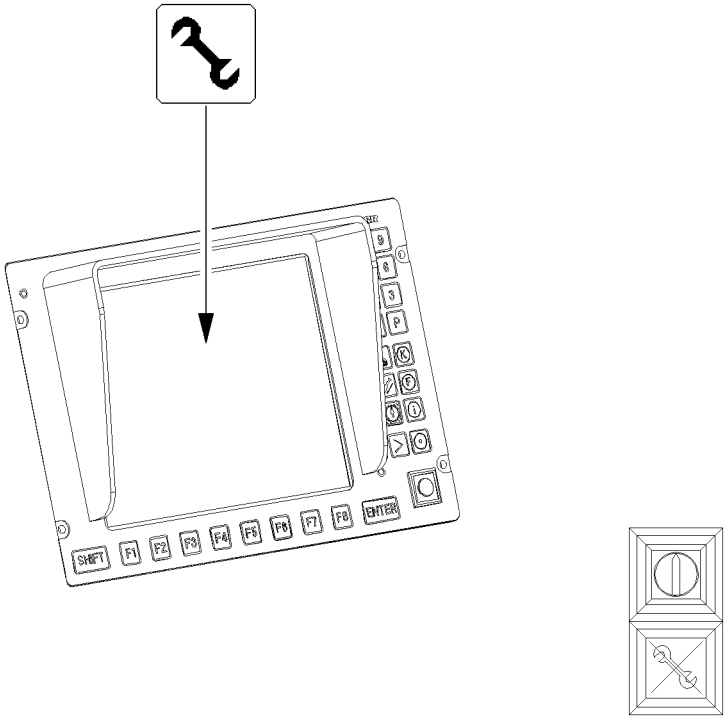
B105511 *Example for cranes with lattice mast booms*

10.3.4 Flying disassembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling booms!
If the pins are not unpinned in the given sequence, lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
- ▶ Pins must be unpinned in the order specified!

- ▶ Release and unpin pins at both sides (level **B**) at point **1**, illustration 1.
- ▶ Release and unpin pins at both sides (level **A**) at point **2**, illustration 2.
- ▶ Release and unpin pins at both sides (level **B**) at point **3**, illustration 3.
- ▶ Release and unpin pins at both sides (level **A**) at point **4**, illustration 4.



B108049 *Example for cranes with LICCON overload protection*

10.4 Bypass for assembly and disassembly

Note

▶ The assembly key button is only installed on certain cranes.

WARNING

High risk of injury when operating crane with assembly key button enabled!

Operating the assembly key button bypasses the hoist limit switch and the overload protection!

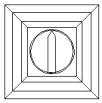
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be killed!

This could result in high property damage!

- ▶ Only operate the assembly key button when performing assembly and disassembly tasks!
- ▶ All other usage of the assembly key button other than as described in the operating instructions is prohibited!
- ▶ The assembly key button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ Operating the crane with the assembly key button enabled is strictly prohibited!
- ▶ The assembly key button must be removed immediately and handed to an authorized person after carrying out any assembly and disassembly work!

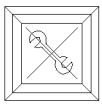
10.4.1 Crane with LICCON overload protection



▶ Actuate assembly key button.

Result:

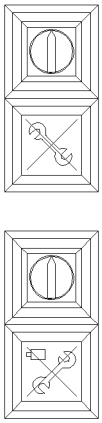
– The LICCON overload protection is inactive.
– The indicator light in the button lights up.
– The assembly icon on the LICCON monitor blinks.
– An acoustic signal sounds.
– The red flashing beacon on the crane cab blinks.



▶ To turn the assembly key button off:
Turn off the assembly key button by pressing the button.

Result:

– The LICCON overload protection is active.
– The indicator light in the button turns off.
– The assembly icon on the LICCON monitor turns off.
– The acoustical signal turns off.
– The red flashing beacon on the crane cab turns off.

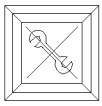


B108050 *Example for cranes with LICCON overload protection*

10.5 Bypassing during crawler assembly

Note

▶ The crawler assembly key button is only installed on certain cranes.



Make sure that the following prerequisites are met:

– the assembly key button is actuated,
– the indicator light in the button lights up.

WARNING

High risk of injury in case of actuated crawler assembly key button!

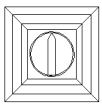
Operating the crawler assembly key button bypasses the overload protection! No shut off at overload will occur in assembly mode or in crane operations!

In the event of deliberate misuse, the crane can topple over!

Personnel can be killed!

This could result in high property damage!

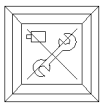
▶ The crawler assembly key button may only be actuated for assembly tasks!
▶ All other usage of the crawler assembly key button other than as described in the operating instructions is prohibited!
▶ Operating the crane with the crawler assembly key button enabled is strictly prohibited!



▶ Actuate the crawler assembly key button.

Result:

– The LICCON overload protection is inactive.
– The indicator light in the button lights up.



▶ To turn the crawler assembly key button off:
Turn off the crawler assembly key button by pressing the button.

Result:

– The indicator light in the button turns off.

10.6 Assembling / disassembly of hydraulic lines

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

WARNING

Risk of accident due to loss of pressure or leakage!

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

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

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

11 Erection / take down

WARNING
The crane can topple over!
Due to an unforeseen occurrence, for example: sudden strong wind or storm, dangers operating situations can occur, up to toppling the crane!
Personnel can be severely injured or killed!
- ▶ The boom must be able to be placed down at any time with its current equipment!
- ▶ The required counterweight must always be in direct vicinity of the crane!
- ▶ The crane operator must ensure that the required counterweight is carried along when dirving the crane with the equipment in place and that the boom can be placed down at any time!

Make sure that the following prerequisites are met:
- – **On mobile cranes:**
  - • The crane is properly supported.
- – The crane is aligned in horizontal direction.
- – The counterweight has been attached to the turntable according to the load chart.
- – **On crawler cranes:**
  - • 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.
- – **On mobile cranes:**
  - • The telescopic boom is fully telescoped in.
- – The boom has been attached 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 telescopic boom or the auxiliary boom.
- – In winter, the telescopic boom, boom and associated components (limit switches, cable drums, flashing beacon, wind speed sensor etc.) must be kept free of ice and snow.

WARNING
Risk of fatal injury!
- ▶ Incorrectly assembled or non-operational limit switches and falling parts (pins, spring retainers, ice etc.) can cause accidents!

11.1 Checking the prerequisites

- ▶ Check if all prerequisites have been met.

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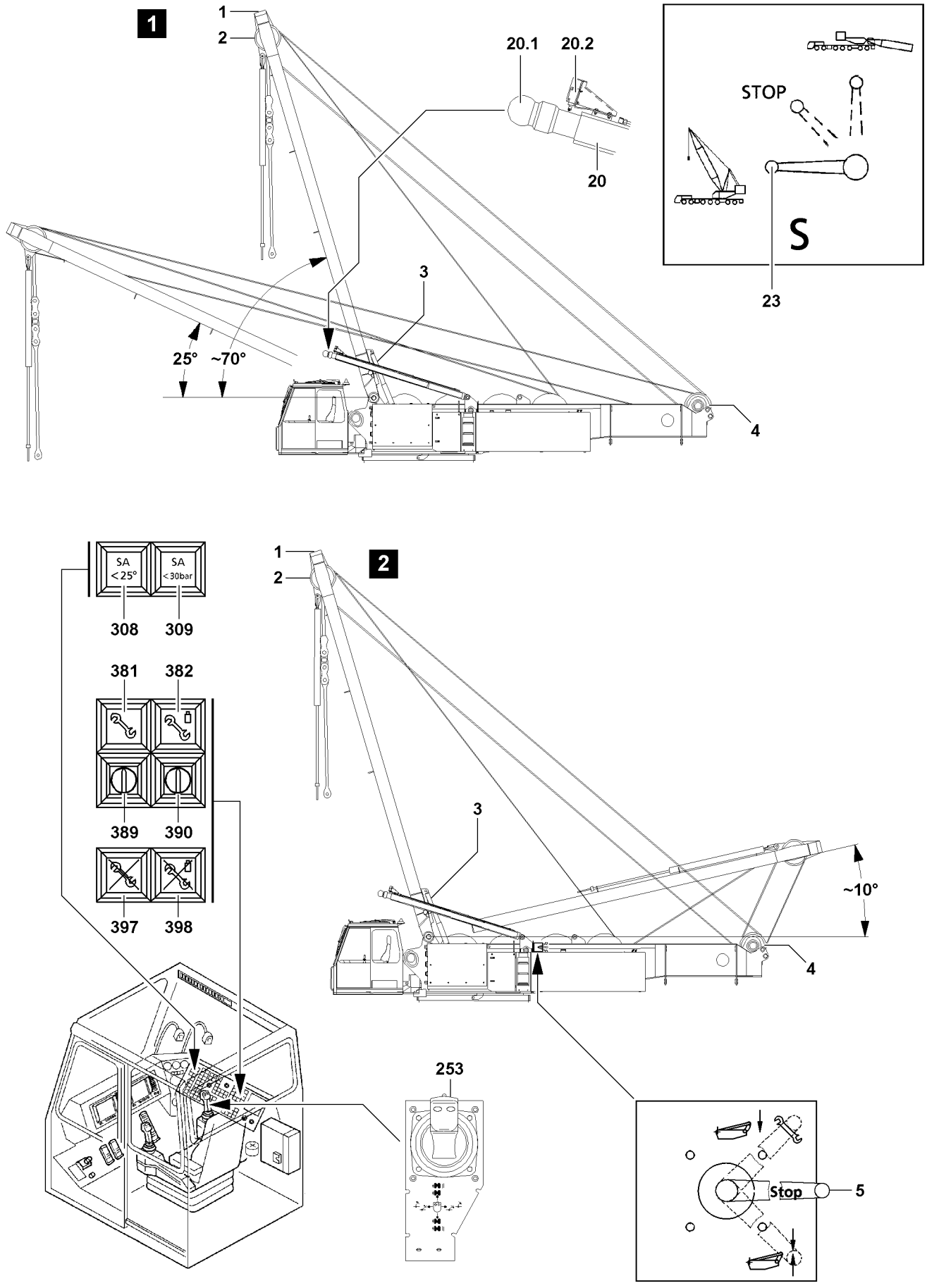
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B108462

1 SA-frame

Note

▶ The SA-frame is used in assembly operation to install the crawler track, see Crane operating instructions, chapter 3.01!

Make sure that the following prerequisites are met:
– the SA-frame has been placed on the turntable (transport position),
– the engine is running, see Crane operating instructions, chapter 4.03,
– **no** counterweight is installed on the turntable,
– the rope of winch 4 “boom control” is reeved,
– the assembly key button **389** and key button **390** “crawler and boom assembly” are actuated,
– the indicator lights assembly **381** and crawler assembly **382** light up,
– the piston rods **20.1** of the S-relapse cylinders **20** are extended approx. 10 cm to approx. 15 cm.

Note

▶ For master switch assignment with turned on assembly key buttons, see Crane operating instructions, chapter 4.05!

DANGER

The crane can topple over!

In active assembly operation, the LICCON overload protection is bypassed and there is no monitoring and shut off of crane movements at overload. The crane can be overloaded unnoticed and topple over!

Personnel can be severely injured or killed!

▶ In active assembly operation, carry out all crane movements with maximum caution and minimum speed!

1.1 Erecting the SA-frame

Note

▶ The piston rods **20.1** of the S-relapse cylinder **20** must be extended approx. 10 cm to approx. 15 cm so that the limit switches **20.2** on the relapse cylinders **20** are “cleared” and winch 4 can be “moved” with master switch 1 (MS1)!

▶ If this is not observed, winch 4 cannot be actuated and moved!

WARNING

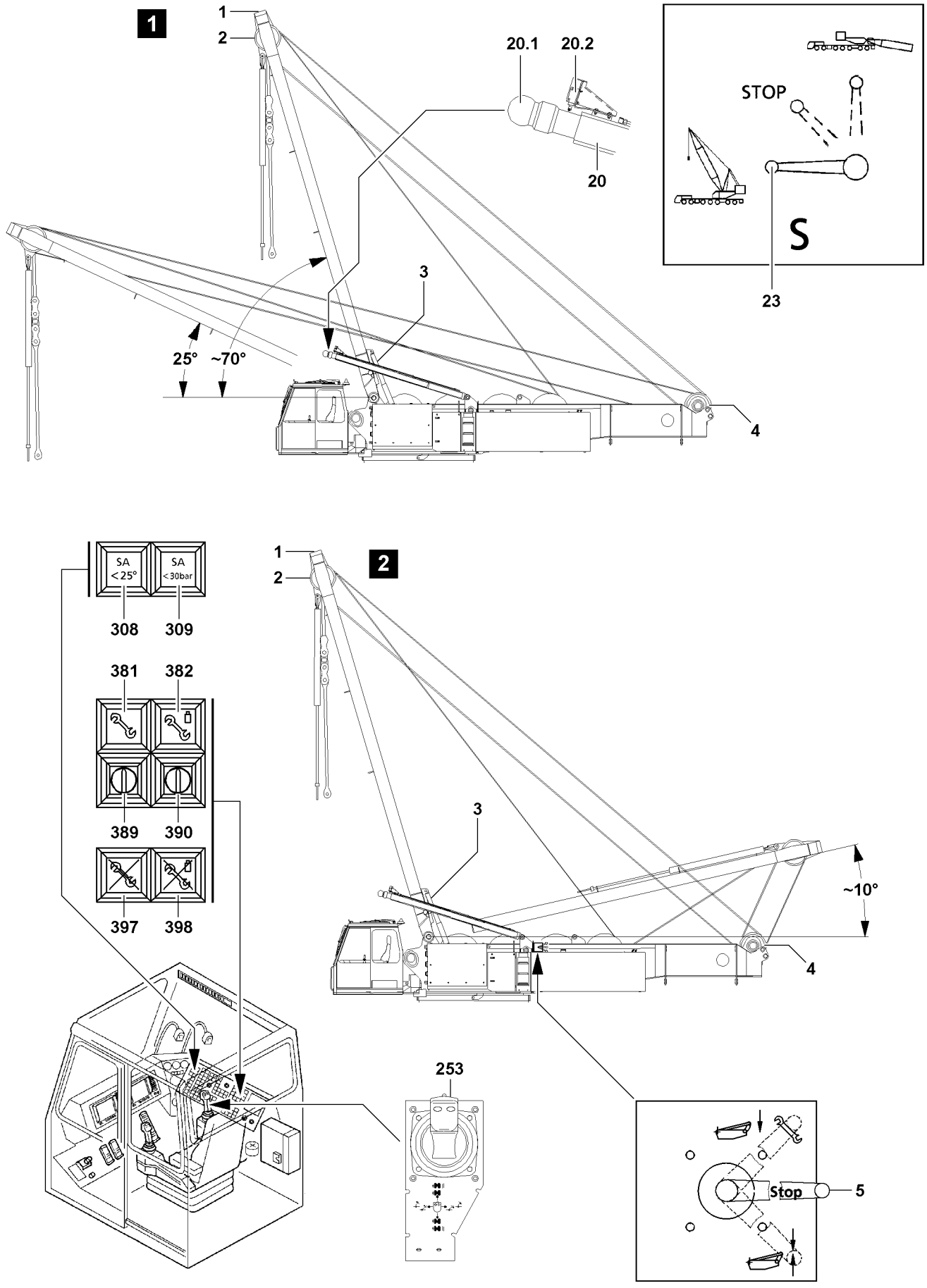
Mortal danger due to unsecured ball cock **5**!

Due to an unsecured ball cock **5** in “down” position, the SA-frame can “fall to the rear” uncontrolled in assembly operation, due to unauthorized change of the ball cock position!

Personnel can be severely injured or killed!

▶ If the SA-frame is erected to operating range (approx. 70° to the front, illustration **1**), secure the ball cock in “down” position with a safety lock to prevent unauthorized access!

▶ The ball cock position “STOP” and “up” are only permissible when lowering the SA-frame onto the turntable!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B108462

1.1.1 Extend the S-relapse cylinder

NOTICE
Destruction of the S-relapse cylinders **20**!
If the ball cock **23** is in “STOP” position (the S-relapse cylinders are thus blocked), the S-relapse cylinders **20** can be destroyed due to large temperature differences on the jobsite (for example between day and night)!
Expensive and extensive repairs can result!

- ▶ After erection of the SA-frame, the ball cock **23** must always be set in position “retract” **or** in position “extend”!
- ▶ Never leave the ball cock **23** in “STOP” position for a longer period of time!

▶ Move the ball cock **23** into horizontal position.

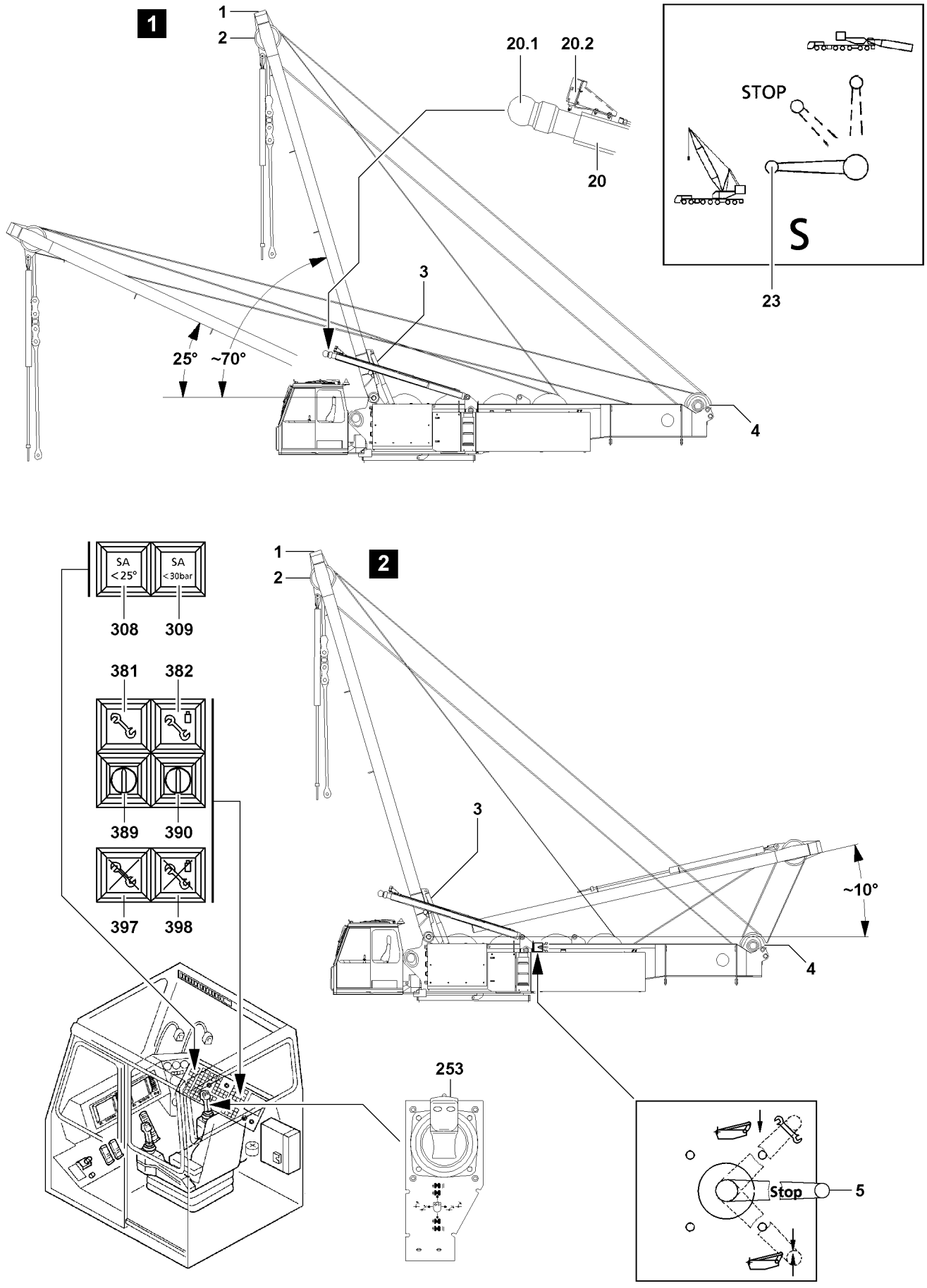
Result:

– The piston rod **20.1** of the S-relapse cylinder **20** extends.
– The limit switch **20.2** is no longer actuated.
– Winch 4 can be “moved”.

▶ When the piston rod **20.1** is extended approx. 10 cm to 15 cm:
Move the ball cock **23** into STOP position.

Result:

– The S-relapse cylinder **20** is blocked in the current position.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B108462

1.1.2 Erection procedure

NOTICE
Damage to the intake ropes!
By actuating winch 4 significant property damage can occur if the intake ropes are not placed correctly in the rope pulleys!
- ▶ Inspect the intake ropes visually!
- ▶ The intake ropes must be laying correctly in the corresponding rope pulleys!
- ▶ If the intake ropes are not in the rope pulleys, winch 4 may not be actuated!

▶ Move the ball cock **5** “down” to the stop.

Result:
– The SA-frame **1** is pushed upward by the erection cylinders **3** until the intake ropes are tensioned between the rope pulleys **2** of the SA-frame and the rope pulleys **4** of the turntable pulley block.

Positions of ball cock:	
Up	Lower the SA-frame onto the turntable (transport position)
Horizontal	**STOP** , piston rods of the erection cylinder are blocked
Down	Erecting the SA-frame to operating position

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!

▶ Deflect the master switch MS1 **253** in direction X Plus.

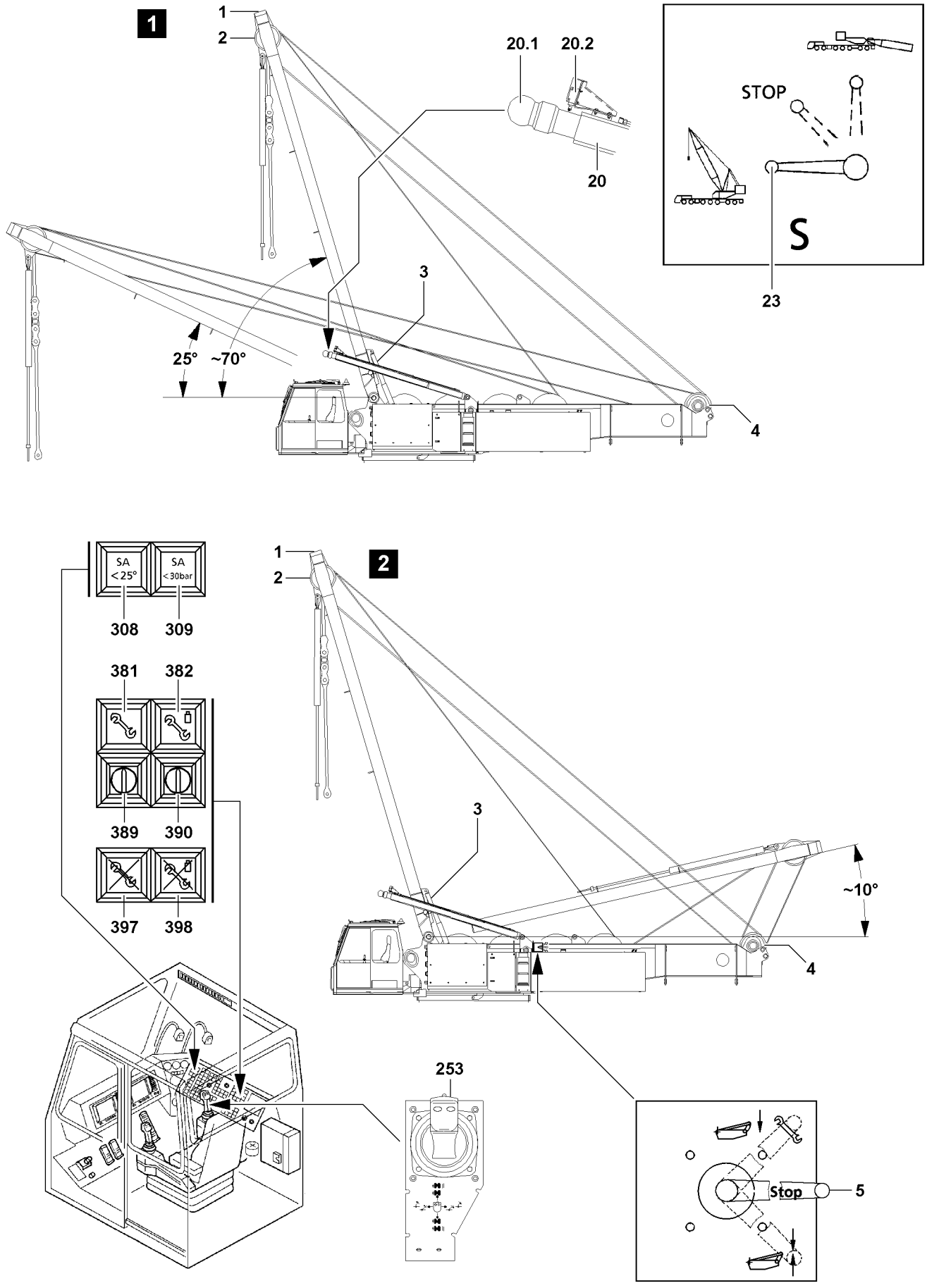
Result:
– Winch 4 is spooled out.
– The SA-frame **1** is erected by the erection cylinders **3** to approx. 70° (block position of the erection cylinders) to the horizontal - to the front, see illustration **1**.

Note
- ▶ When the SA-assembly range is reached, the SA-frame lowers itself to the front, due to its own weight - when spooling out winch 4!

▶ When the SA-frame is erected to approx. 70°:
Set the master switch MS1 **253** to zero position.

Result:
– Winch 4 is turned off.
– The SA-frame is in the SA-assembly range.

▶ Secure the ball cock **5** with a safety lock to prevent unauthorized access.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B108462

1.2 SA-frame in assembly operation

DANGER
Risk of accident!
The ball cock **5** must be in “down” position during assembly operation and must be secured with a safety lock to prevent unauthorized access!
▶ After erecting the SA-frame, secure the ball cock immediately with a safety lock!

Note
▶ The luffing up and down of the SA-frame is realized by spooling winch 4 up or out. The SA-frame lowers itself to the front due to its own weight when spooling out winch 4!

1.2.1 Luffing the SA-frame up

▶ Deflect the master switch (MS1) **253** in direction X Minus.
Result:
– Winch 4 spools up.
– The SA-frame is luffed up.

1.2.2 Luffing the SA-frame down

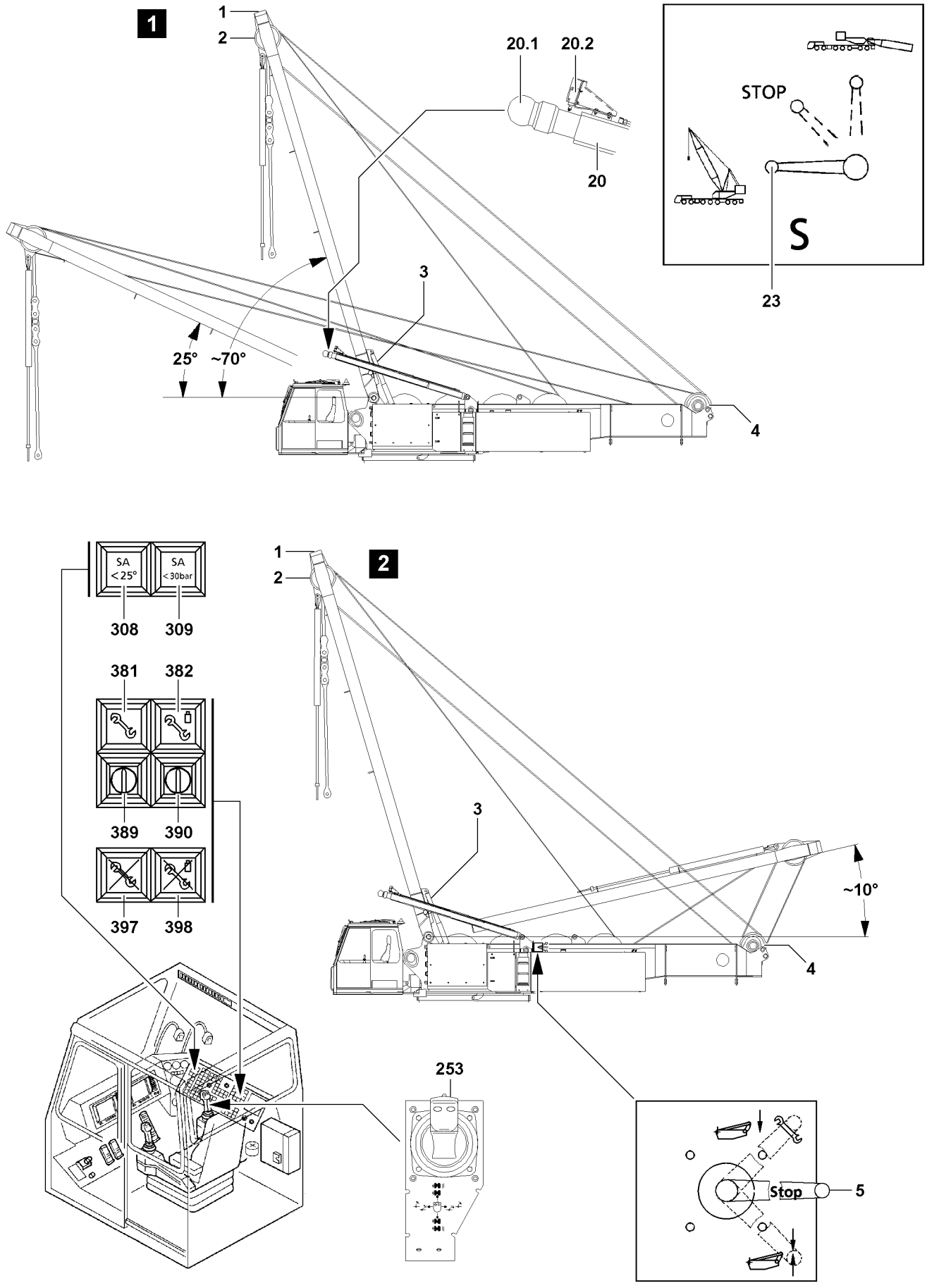
▶ Deflect the master switch (MS1) **253** in direction X Plus.
Result:
– Winch 4 spools out.
– The SA-frame is lowered to the front.

1.3 Shut offs in SA-assembly operation

Condition SA-frame	Shut off / reaction
SA-frame angle to the horizontal is smaller than 25°	Shut off Winch 4
	The indicator light 308 lights up.
Pressure in erection cylinders smaller than 30 bar	Shut off Winch 4
	The indicator light 309 lights up.

1.4 Placing the SA-frame onto the turntable

Make sure that the following prerequisites are met:
– the assembly key button **389** is actuated, indicator light “Assembly” **381** lights up,
– the key button **390** “crawler and boom assembly” is actuated; the indicator light “crawler and boom assembly” **382** lights up,
– the erection cylinders **3** are completely extended,
– the SA-frame is in the assembly range.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B108462

1.4.1 Take down procedure

▶ Deflect the master switch MS1 **253** in direction X Minus.

Result:

– Winch 4 spools up.
– The SA-frame **1** is pulled back against the pressure in the erection cylinders **3**.

▶ When the SA-frame **1** has reached the 10° position “to the rear”, see illustration **2**:
Set the master switch MS1 **253** to zero position.

Result:

– Winch 4 is turned off.

WARNING
Risk of accident!
When lowering the SA-frame, personnel within the danger zone can be severely injured or killed!
▶ The crane operator must ensure, before lowering the SA-frame, that there are no persons or objects within the danger zone!

▶ Remove the safety lock on the ball cock **5**.

NOTICE
Danger of slack rope formation!
▶ When lowering the SA-frame on the turntable, winch 4 must be spooled up simultaneously to avoid slack rope formation!

▶ Move the ball cock **5** “up”.

Result:

– The SA-frame **1** lowers itself slowly on the turntable.

▶ Deflect the master switch MS1 **253** carefully in direction X Minus.

Result:

– Winch 4 spools up.

▶ When the SA-frame **1** is laying completely on the turntable:
Set the master switch MS1 **253** to zero position.

Result:

– Winch 4 is turned off.

▶ Press the button **397**.

Result:

– The self-retention of the key button **389** is turned off.
– The indicator light **381** turns off.

▶ Press the button **398**.

Result:

– The self-retention of the key button **390** is turned off.
– The indicator light **382** turns off.

1 Equipment for boom combinations

Note

- The boom combinations must be assembled according to the separately supplied erection drawings!

WARNING

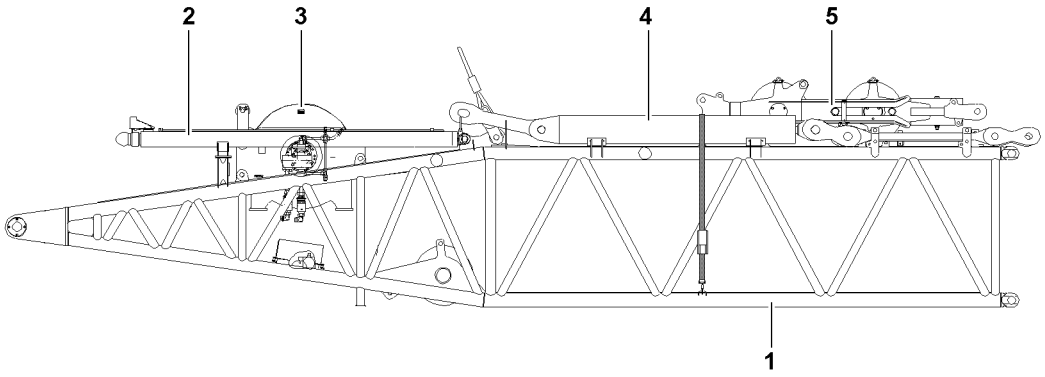
Danger of accidents due to incorrectly assembled intermediate sections!

- Any other arrangement of the intermediate sections and guy rods than specified in the operating manual or the erection drawings is prohibited!
- There is the danger that intermediate sections are mixed up, they are differently sized and do not differ externally!
- They only differ externally by the welded on plates (.8, .10, .20, .30)!
- When assembling the boom, it must be ensured that the intermediate sections are installed according to their description.

1.1 Components

Description	System	Length	Weight
L-pivot section	2620. **10**	13.4 m	7.5 t
L-pivot section with winch 5	2620. **10**	13.4 m	11.0 t
L-intermediate section	2620. **8**	14.0 m	4.4 t
L-intermediate section	2620. **10**	3.5 m	1.5 t
L-intermediate section	2620. **10**	7.0 m	3.1 t
L-intermediate section	2620. **10**	14.0 m	5.7 t
L-adapter	2620. **10**	7.0 m	3.2 t
L-end section 250 t		0.6 m	2.0 t
L-end section 350 t		1.0 m	2.2 t
L-end section without pulleys for S2		1.1 m	0.9 t
LL-reducer section		3.1 m	1.3 t
NA-intermediate section	2115. **10**	7.0 m	1.5 t
NA-intermediate section	2115. **10**	14.0 m	2.6 t
NI-reducer section		3.5 m	0.8 t
N-end section 130 t		8.0 m	2.7 t
NI-intermediate section	1812. **10**	7.0 m	1.4 t
NI-intermediate section	1812. **10**	14.0 m	2.5 t
S-pivot section	2620. **20**	13.4 m	9.0 t
S-pivot section with winch 5	2620. **20**	13.4 m	12.5 t
S-pivot section	2620. **25**	13.4 m	9.4 t
S-pivot section with winch 5	2620. **25**	13.4 m	12.5 t
S-intermediate section	2620. **20**	3.5 m	1.7 t
S-intermediate section	2620. **20**	7.0 m	3.6 t
S-intermediate section	2620. **20**	14.0 m	6.5 t

Description	System	Length	Weight
S-intermediate section	2620. **25**	14.0 m	7.7 t
S-intermediate section for “flying assembly”	2620. **20**	14.0 m	6.4 t
S-intermediate section for fixed jib	2620. **20**	14.0 m	7.1 t
S-adapter	2620. **20**	7.0 m	3.6 t
S-end section 400 t		0.6 m	4.1 t
Sw-reducer section	2620. **20**	4.1 m	1.5 t
SL-end section 100 t		3.5 m	2.4 t
D-pivot section	2115. **20**	10.5 m	11.0 t
D-pivot section with winch 3	2115. **20**	10.5 m	14.5 t
D-intermediate section	2115. **20**	7.0 m	2.7 t
D-end section	2115. **20**	10.5 m	6.3 t
W-assembly unit with fold in head		10.5 m	14.1 t
W(w)-intermediate section	2116.**20**	3.5 m	1.1 t
W(w)-intermediate section	2116.**20**	7.0 m	1.7 t
W(w)-intermediate section	2116.**20**	14.0 m	3.0 t
W-end section 180 t		10.5 m	3.3 t
F-pivot section		2.5 m	0.6 t
F-adapter		2.9 m	4.2 t
F-end section with assembly winch		8.0 m	3.5 t



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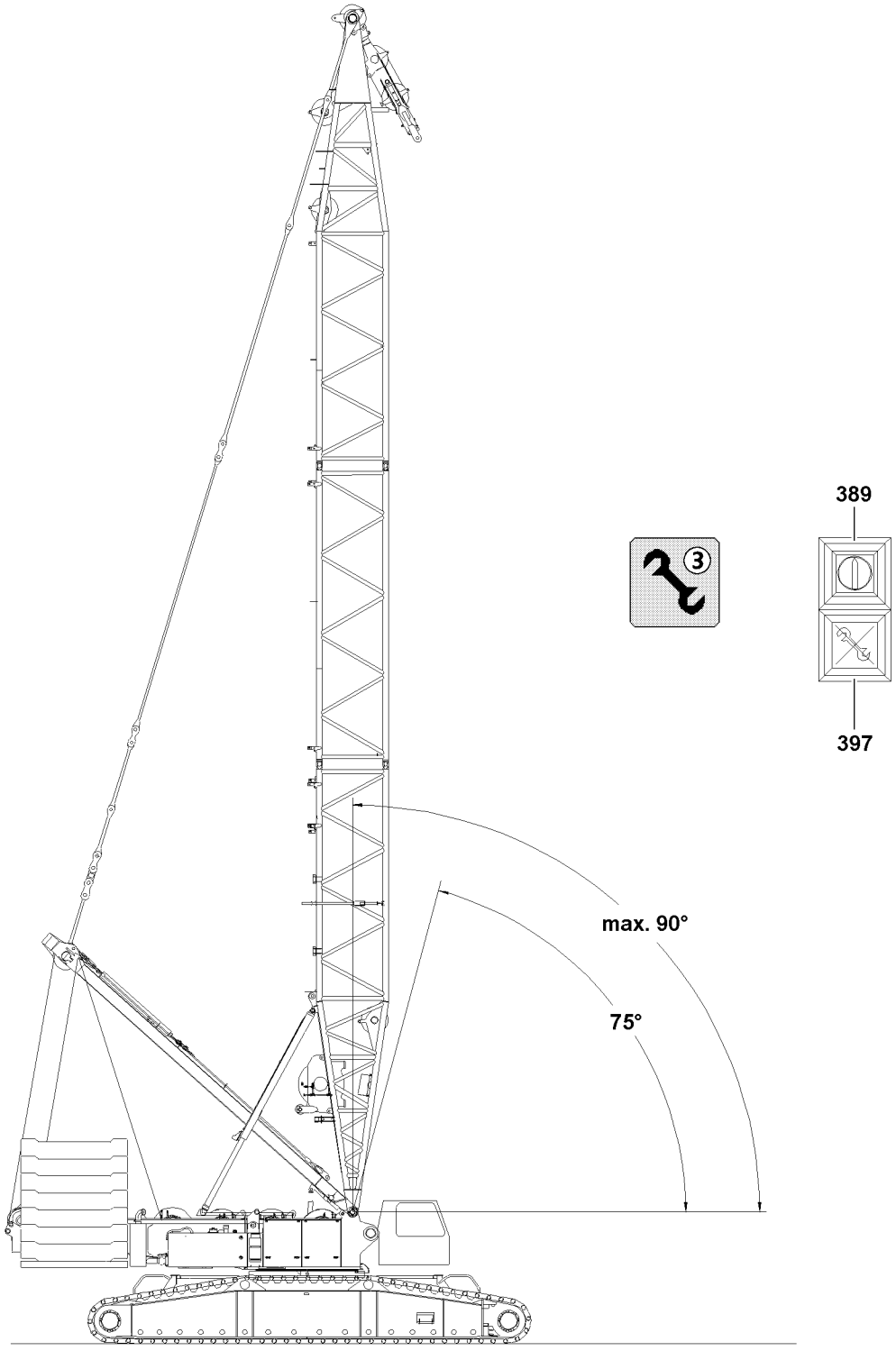
1 General

1.1 Component overview on D-pivot section

The D-pivot section consists of:

D-pivot section without winch 3		
Position	**Component**	**Weight**
1	D-pivot section	
2	D-relapse cylinder	
4	Pull cylinder for B/BW	
5	Pulley block	
Total weight:		11.50 t

D-pivot section incl. winch 3 and rope		
Position	**Component**	**Weight**
1	D-pivot section	
2	D-relapse cylinder	
3	Winch 3 with cable	
4	Pull cylinder for B/BW	
5	Pulley block	
Total weight:		14.50 t



B104942

2 Assembly

DANGER
Risk of falling!
During assembly work, the assembly 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 injuries.

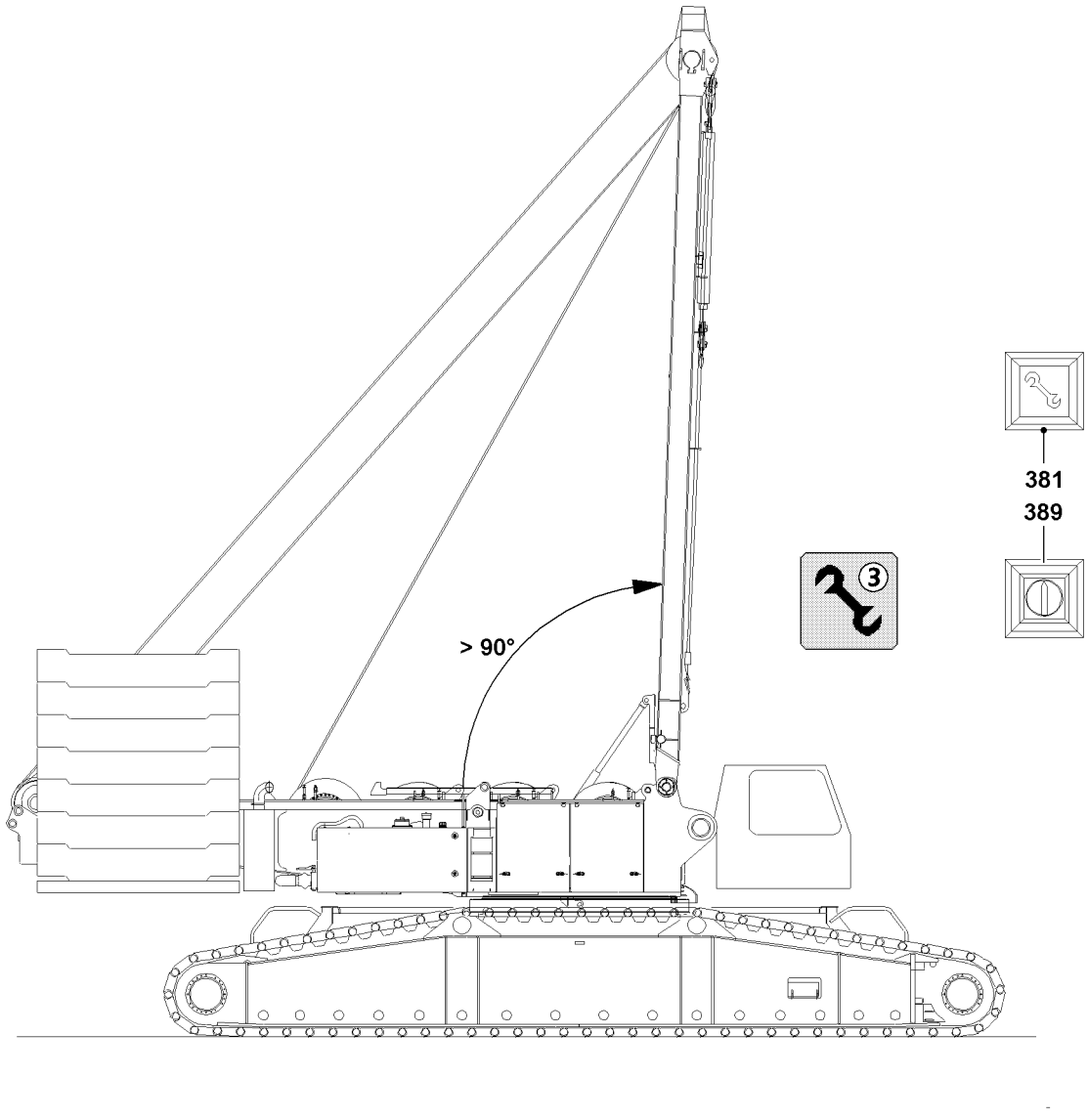
- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The working height, from which assembly work must be carried out with aids depends on the national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect against falling!

DANGER
Risk of injury when disassembling booms!
When you disassemble unsecured or unsupported booms, the booms can fall down.
Personnel can be severely injured or killed!

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- An auxiliary crane is available.
- An assembly scaffolding / work platform is available.
- The counterweight has been attached to the turntable in accordance with the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The assembly icon **3** on the LICCON monitor blinks.
- No main boom is installed on the turntable.



B105269

2.1 Installing the D-boom

2.1.1 Turning the turntable into assembly position

DANGER
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** installed D-boom, the crane can topple over.
Personnel can be severely injured or killed!
- ▶ Observe the data in the erection and take down charts!
- ▶ If no D-boom is installed on the turntable, max. 135 t counterweight may be installed and when turning the turntable by 360°, it must be ensured that the SA-bracket is erected to **more than 90°**.
- ▶ If the counterweight is increased to 155 t, then the D-boom must be installed and raised off the ground!

Maximum counterweight	Minimum central ballast	Equipment
55 t	11 t	without equipment
95 t	11 t	
135 t	43 t	
155 t	43 t	D-boom installed and raised off the ground

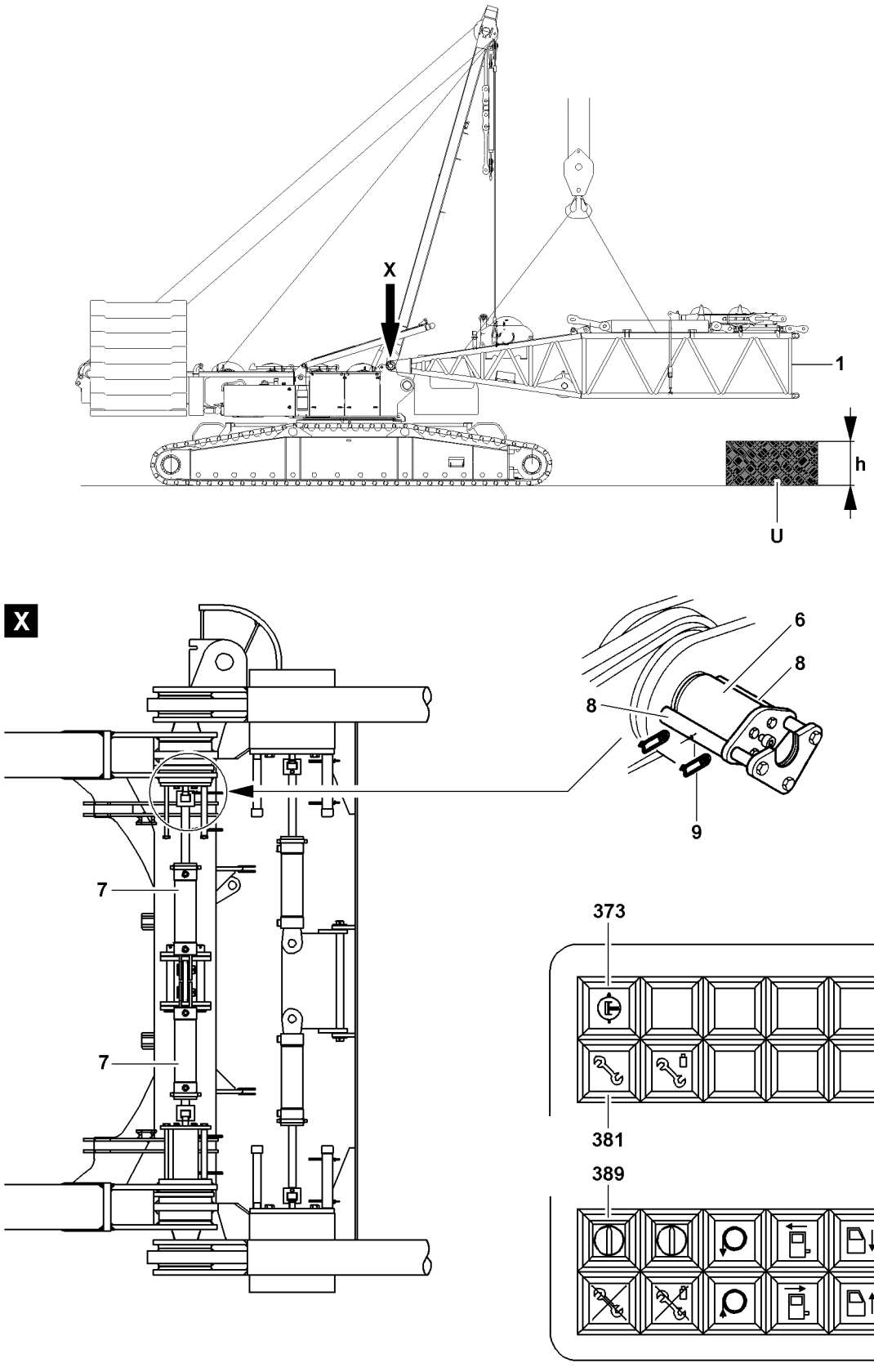
- ▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side.

2.1.2 Adding the operating mode “Assembly”

DANGER
Danger of fatal injury at crane operation with turned on assembly key button.
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly keyed button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ When the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection are bypassed!
- ▶ Crane operation with turned on assembly key button **389** is strictly prohibited!
- ▶ After assembly work is completed, the assembly key button **389** must be pulled immediately and turned over to an authorized person!

- ▶ Actuate the assembly key switch **389**.

Result:
- – The LICCON overload protection is inactive.
- – The indicator light in the button **381** lights up.
- – The Assembly icon **3** on the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red beacon on the crane cab blinks.



B104943

2.2 Installing the D-boom

WARNING
General danger notes!
- ▶ Support the D-boom during assembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy rods must be checked regularly! See chapter 8.15.

2.2.1 Pin the D-pivot section on the turntable

- ▶ Hang the D-pivot section **1** onto the auxiliary crane and swing in to the pin points on the turntable.

Establish the hydraulic connection to the pin pulling device via two quick couplers.
Pin the D-pivot section **1** on the turntable and secure.
- ▶ Establish the hydraulic connection to the pin pulling device.
- ▶ Turn the pressure change over switch **373** on.

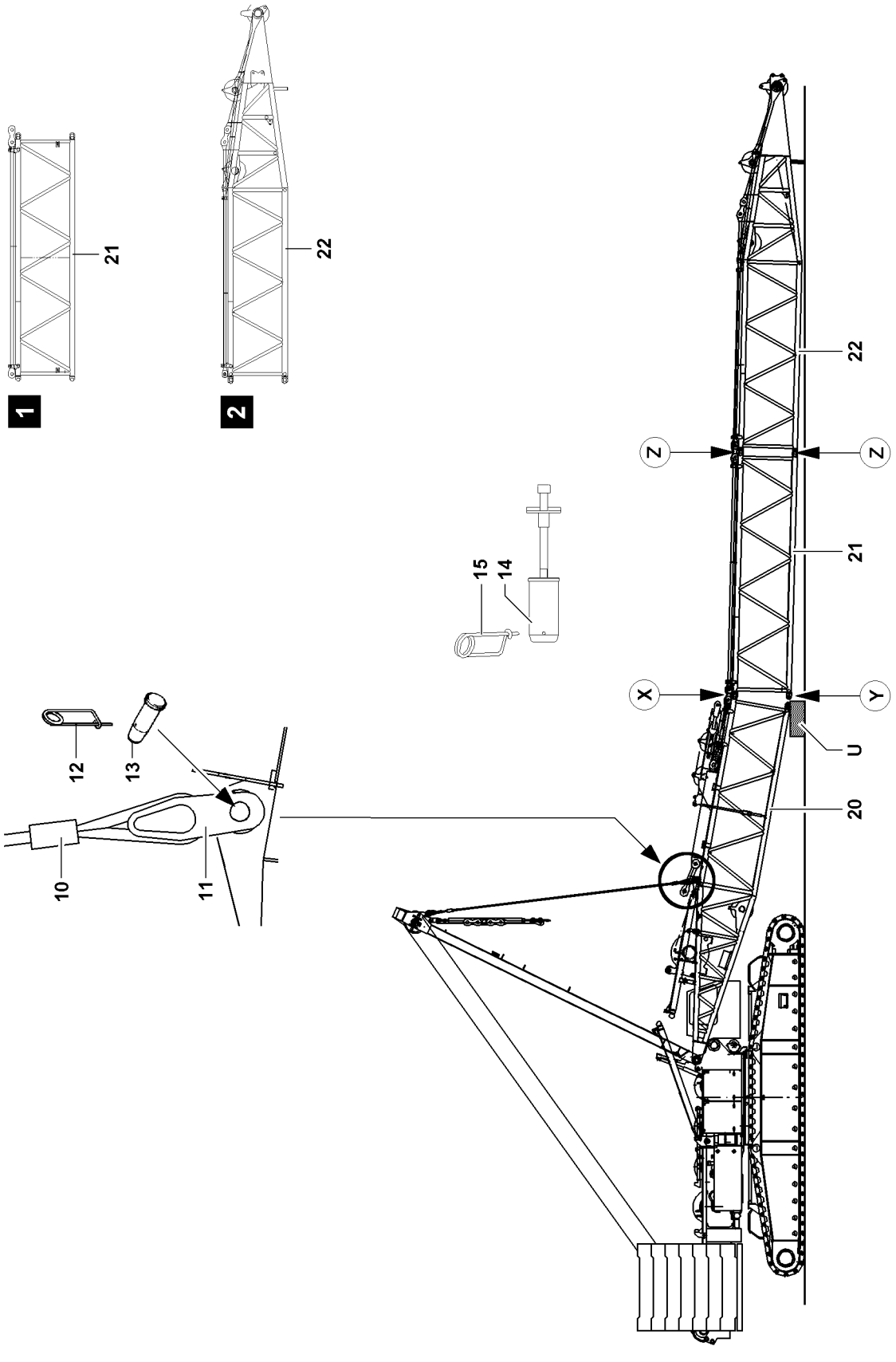
DANGER
Risk of fatal injury!
Due to unsecured or insufficiently secured connector pins, the D-boom can fall down and fatally injure personnel.
- ▶ Secure the connector pins **6** between the D-pivot section **1** and the turntable after the pin procedure with the retaining plates **8**.

- ▶ Insert the connector pins **6** with the hydraulic pin pulling device **7**.
- ▶ Insert the connector pin **6** on the left and right and secure with the retaining plate **8** and spring retainer **9**.
- ▶ Turn the pressure change over switch **373** off.

NOTICE
Damage of the D-pivot section and the turntable!
By placing the installed D-pivot section on the ground, significant property damage can occur on the pivot section and on the turntable.
- ▶ The D-pivot section may not be placed directly on the ground.
- ▶ When placing the D-pivot section down, always use a sufficiently load bearing and large enough support.
- ▶ The support **U** may not fall below the specified minimum height **h**.

Minimum height of support U on D-pivot section	
without Quick connection	400 mm
with Quick Connection	760 mm

- ▶ Place the D-pivot section carefully with the auxiliary crane on the support **U**.
- ▶ Remove the auxiliary crane.



B104939

2.2.2 Installing the D-lattice sections on the D-pivot section

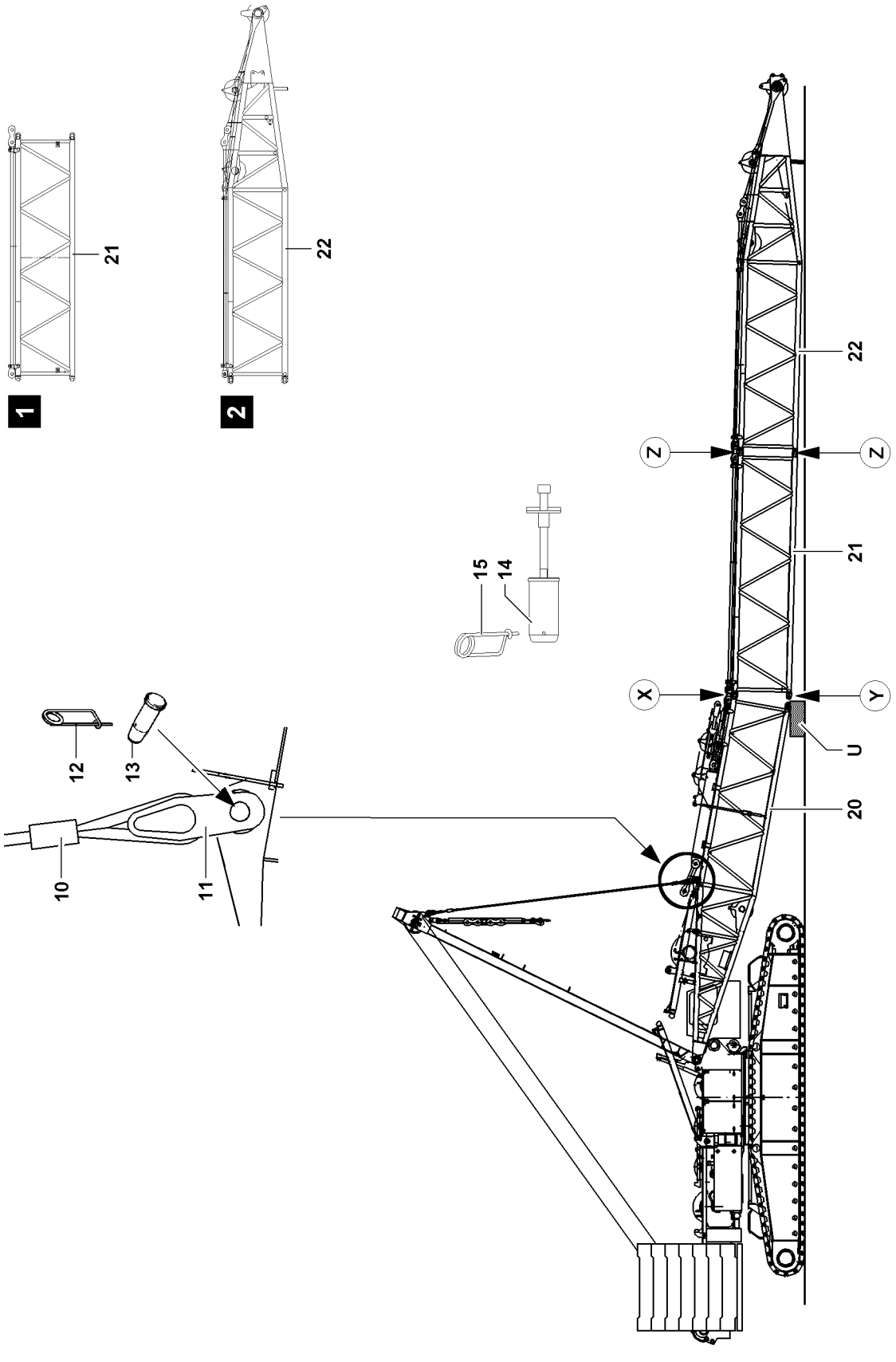
Make sure that the following prerequisites are met:
– The D-pivot section is pinned and secured on the turntable.
– The D-pivot section is placed on the support **U**.

WARNING
General danger notes!
▶ Support the D-boom during assembly with suitable materials!
▶ All pins must be secured after assembly!
▶ The guy rods must be checked regularly! See chapter 8.15.

To be able to install the D-lattice sections on the D-pivot section, the SA-bracket and the assembly rope **10** must be used.
▶ Lower the SA-bracket to the front, see chapter 5.02.

Pin the assembly rope on the assembly bracket on the D-pivot section.
▶ Loosen the assembly rope **10** on the transport receptacle on the SA-bracket.
▶ Pull the assembly rope **10** to the assembly bracket **11** on the D-pivot section **20**.
▶ Pin the assembly rope **10** on the assembly bracket **11** with pins **12** and secure with spring retainer **13**.

Pin the D-intermediate section **21** on the D-pivot section **20** on top:
▶ Attach the D-intermediate section **21** on the auxiliary crane and align on the D-pivot section **20**.
▶ When the pin bores on the D-pivot section **20** and on the D-intermediate section **21** “on top” (point **X**) align:
Insert the pin **14** from the inside to the outside and secure with spring retainer **15**.
▶ Lift the D-pivot section **20** with the SA-bracket until the pin bores on the “bottom” align at point **Y**.
▶ When the pin bores on the D-pivot section **20** and on the D-intermediate section **21** “on the bottom” (point **Y**) align:
Insert the pin **14** from the inside to the outside and secure with spring retainer **15**.
▶ Attach the D-end section **22** on the auxiliary crane and align on the D-intermediate section **21**.
▶ When the pin bores on the D-intermediate section **21** and on the D-end section **22** “on top” (point **Z**) align:
Insert the pin **14** from the inside to the outside and secure with spring retainer **15**.
▶ Erect the SA-bracket until the pin bores on the D-intermediate section **21** and on the D-end section **22** “on the bottom” (point **Z**) align:
▶ When the pin bores on the D-intermediate section **21** and on the D-end section **22** “on the bottom” (point **Z**) align:
Insert the pin **14** from the inside to the outside and secure with spring retainer **15**.
▶ When the pins are properly pinned and secured on all D-lattice sections:
Luff the SA-bracket down until the assembly rope **10** is relieved.



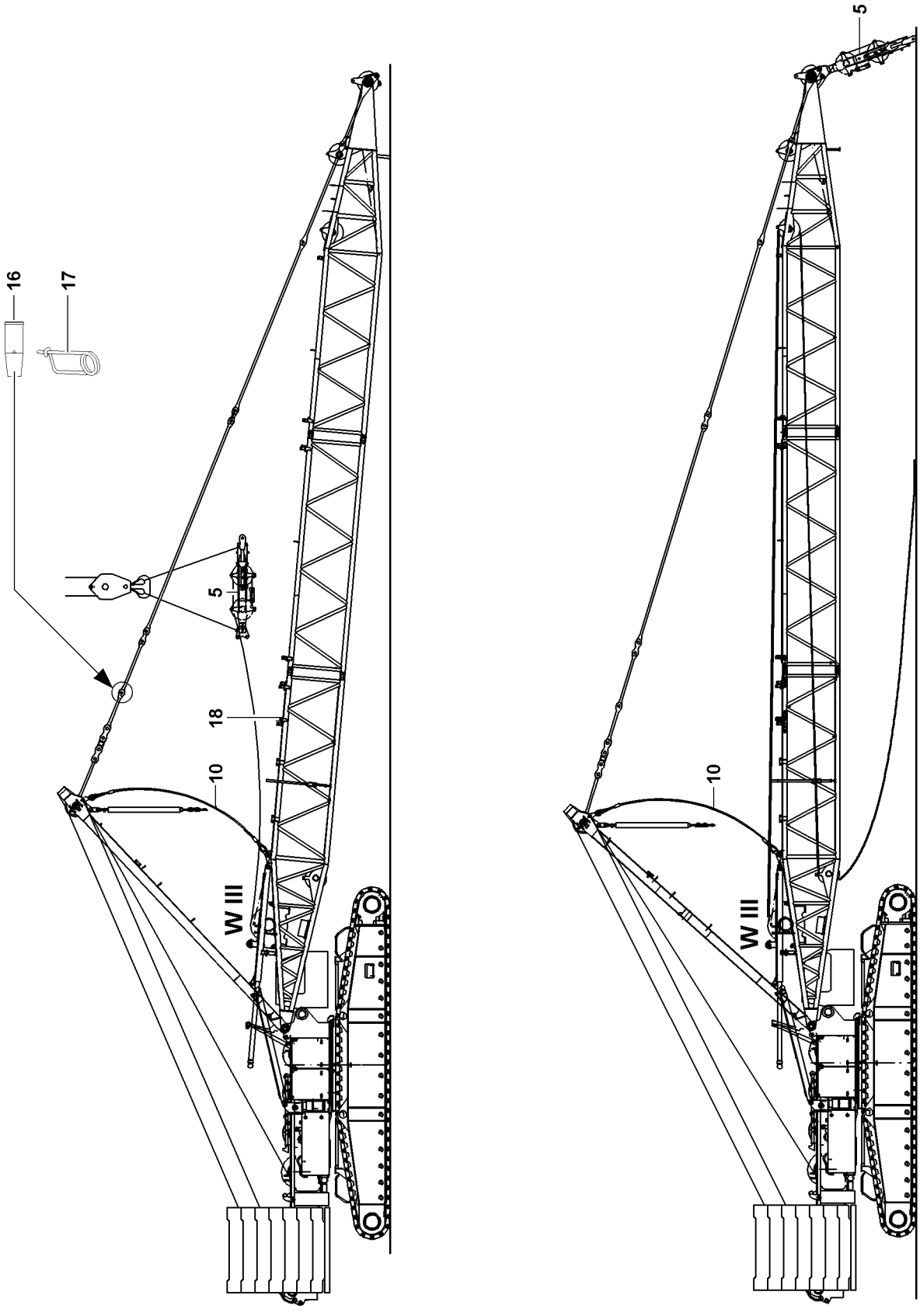
B104939

DANGER
Risk of fatal injury!
If the following danger notes are not observed, the Derrick boom can suddenly fold down.
Personnel can be severely injured or killed!

- The assembly rope may only be unpinned on the assembly bracket **11** on the D-pivot section **20** when it is ensured that the D-lattice sections are properly pinned and secured on all pin points.
- It is prohibited for anyone to remain under the installed D-lattice sections during the unpinning procedure on the assembly bracket.

Remove the assembly rope on the D-pivot section.

- Release and unpin the pins **12** on the assembly bracket **11** on the D-pivot section **20**.
- Secure the assembly rope **10** in the transport receptacle on the SA-bracket.



B104940

2.2.3 Installing the D-guy rods

WARNING
Inspection and maintenance on guy rods not carried out!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also chapter 8.15.

Note
▶ The D-guy rods must be installed and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

The D-guy rods are placed and secured for transport on the D-lattice components. Before assembly, the transport retainers must be released.
▶ Release the transport retainers on the guy rods.
▶ Lower the SA-bracket to the front.

DANGER
Risk of accident!
▶ The pins **16** of the Derrick guy rods may only be pinned from the outside to the inside!

Pin the guy rods of the SA-bracket with the guy rods on the D-pivot section.
▶ Insert the pin **16** and secure with spring retainer **17**.

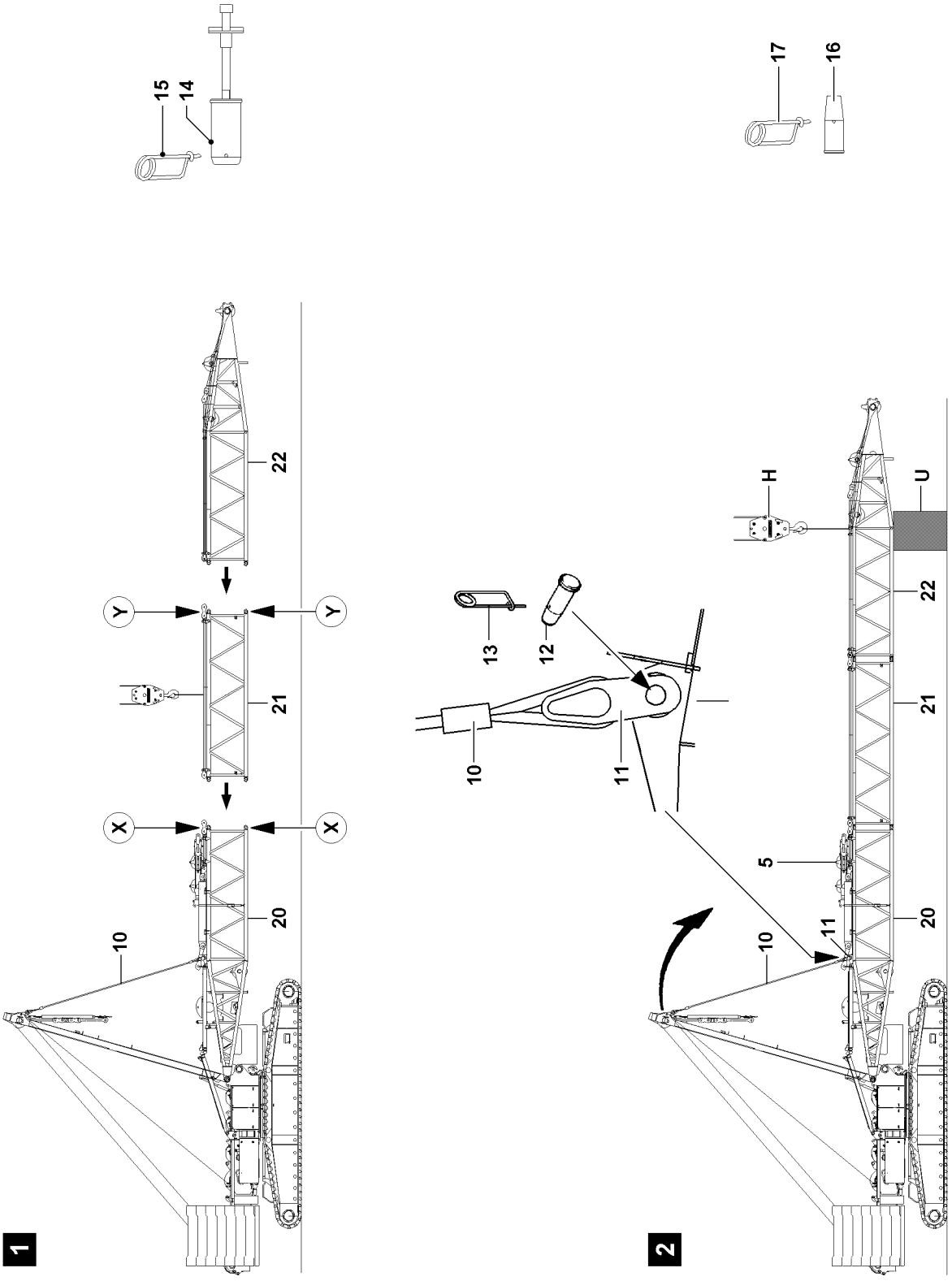
Pin the guy rods of the D-intermediate section with the guy rods on the D-pivot section.
▶ Insert the pin **16** and secure with spring retainer **17**.

Pin the guy rods of the D-intermediate section with the guy rods on the D-end section.
▶ Insert the pin **16** and secure with spring retainer **17**.
▶ Actuate winch IV until the guy rods are tensioned between the SA-bracket and the D-end section.
▶ Hang the pulley block **5** onto the auxiliary crane.
▶ Release and unpin the retaining pins on the transport receptacle **18** of the D-pivot section.
▶ Pull the pulley block **5** with the auxiliary crane to the D-end section while spooling out winch 3 at the same time.
▶ Pin and secure the pulley block **5** on the D-end section.
▶ Remove the auxiliary crane.

Note
▶ The hoist rope reeving is shown in chapter 4.06!

DANGER
General danger notes!
If the following conditions are not met before erecting the derrick boom, the hoist rope can fall down and fatally injury personnel!
▶ Enough hoist rope must be guided over the rope pulleys to prevent the hoist rope from being pulled back and fall down due to its own weight when erecting the D-boom!

▶ Pull the hoist rope over the rope pulleys on the D-end section and the D-pivot section.
▶ Luff up the derrick boom until the pulley block **5** hangs freely.



B104941

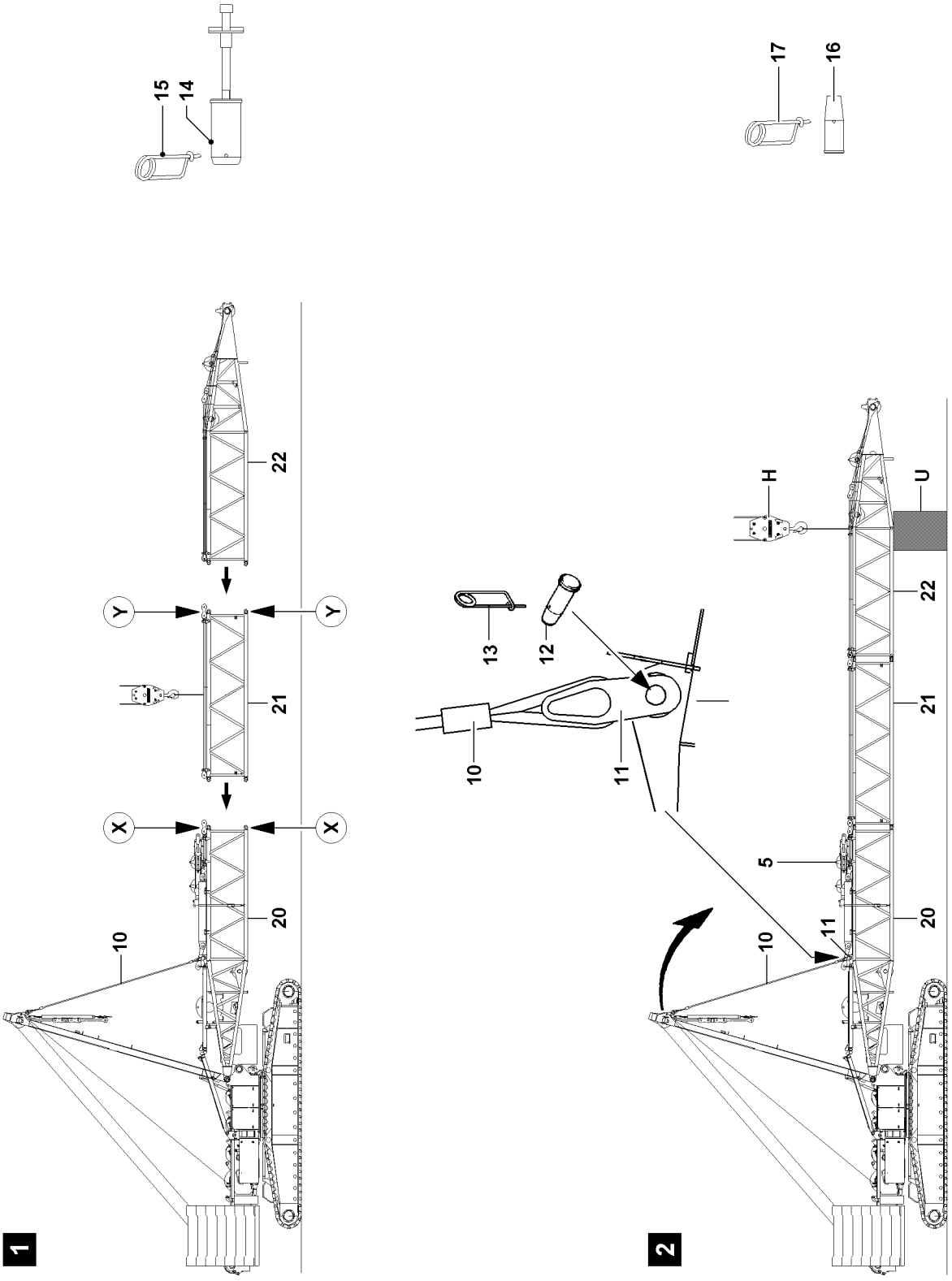
2.3 Flying assembly of the D-boom

If spatial prerequisites on the job site are limited for the assembly of the derrick boom, or if they are limited by buildings or similar, then the Derrick boom can be installed in flying mode.
Make sure that the following prerequisites are met:

– The D-pivot section is pinned and secured on the turntable.
– The D-pivot section hangs horizontally on the assembly rope **10**, see fig. **1**.

2.3.1 Installing the D-lattice sections on the D-pivot section

▶ Attach the D-intermediate section **21** on the auxiliary crane.
▶ Lift the D-intermediate section **21** with the auxiliary crane and swing in to the pin points on the D-pivot section **20**.
▶ When the pin bores on the D-pivot section **20** and on the D-intermediate section **21** “on top” and “bottom” align:
Insert the pins **14** “on top” and “bottom” at point **X** from the inside to the outside and secure with spring retainer **15**, see fig. **1**.
▶ When the pins are properly inserted “on top” and “bottom” between the D-pivot section **20** and the D-intermediate section **21**:
Remove the auxiliary crane.
▶ Attach the D-end section **22** on the auxiliary crane.
▶ Lift the D-end section **22** with the auxiliary crane and swing in to the pin points on the D-intermediate section **21**.
▶ When the pin bores on the D-intermediate section **21** and on the D-end section **22** “on top” and “bottom” align:
Insert the pins **14** “on top” and “bottom” at point **Y** from the inside to the outside and secure with spring retainers **15**, see fig. **1**.
▶ When the pins are properly inserted “on top” and “bottom” between the D-intermediate section **21** and the D-end section **22**:
Remove the auxiliary crane.



B104941

2.3.2 Installing the D-guy rods

WARNING
Inspection and maintenance on guy rods not carried out!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also chapter 8.15.

Note
▶ The D-guy rods must be installed and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

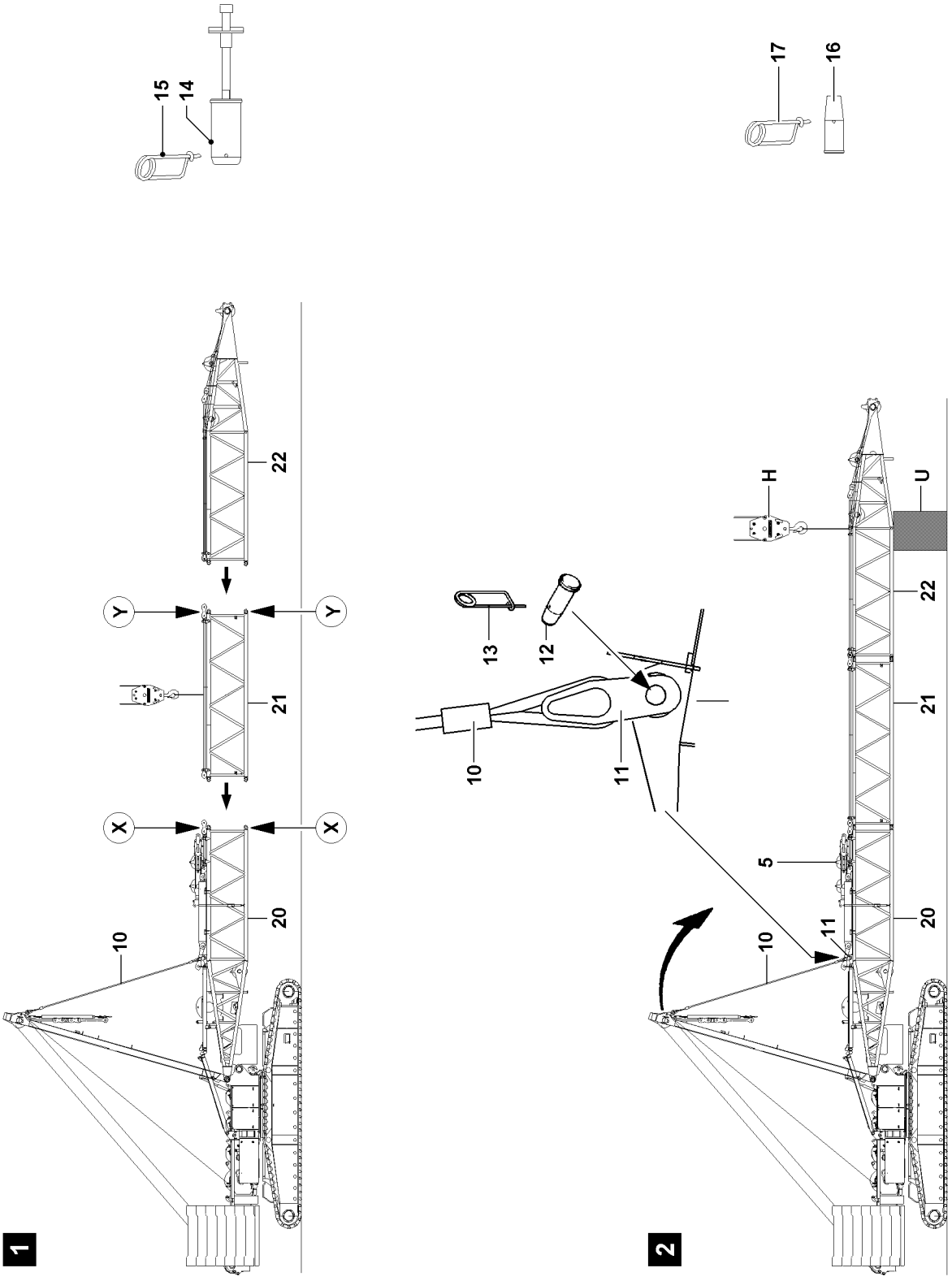
Make sure that the following prerequisites are met:
– The derrick boom is properly installed and all pin connections are secured.
– The installed derrick boom is horizontally aligned and placed on a support **U** or it is held by an auxiliary crane **H**, see fig. **2**.

The D-guy rods are placed and secured for transport on the D-lattice components. Before assembly, the transport retainers must be released.
▶ Release the transport retainers on the guy rods.

WARNING
Mortal danger due to folding down of derrick boom!
If the derrick boom is not properly supported with stable materials or held by an auxiliary crane before unpinning the assembly rope, then the derrick boom can fold down suddenly and fatally or severely injure personnel.
In addition, the derrick boom can be severely damaged!
▶ The crane operator must ensure that the derrick boom is supported properly with stable materials or that it is held by an auxiliary crane!
▶ During the disassembly of the assembly rope, it is prohibited for anyone to remain under the derrick boom!

▶ Carefully lower the SA-bracket until the assembly rope **10** is relieved.

Unpin the assembly rope **10** on the assembly bracket **11**, see fig. **2**.
▶ Remove the spring retainer **13** and unpin the pin **12**.
▶ Secure the assembly rope **10** in the transport receptacle on the SA-bracket.
▶ Continue to lower the SA-bracket to the front, see chapter 5.02.



B104941

WARNING
Risk of accident!
▶ The pins **16** of the derrick guy rods may only be pinned from the outside to the inside.

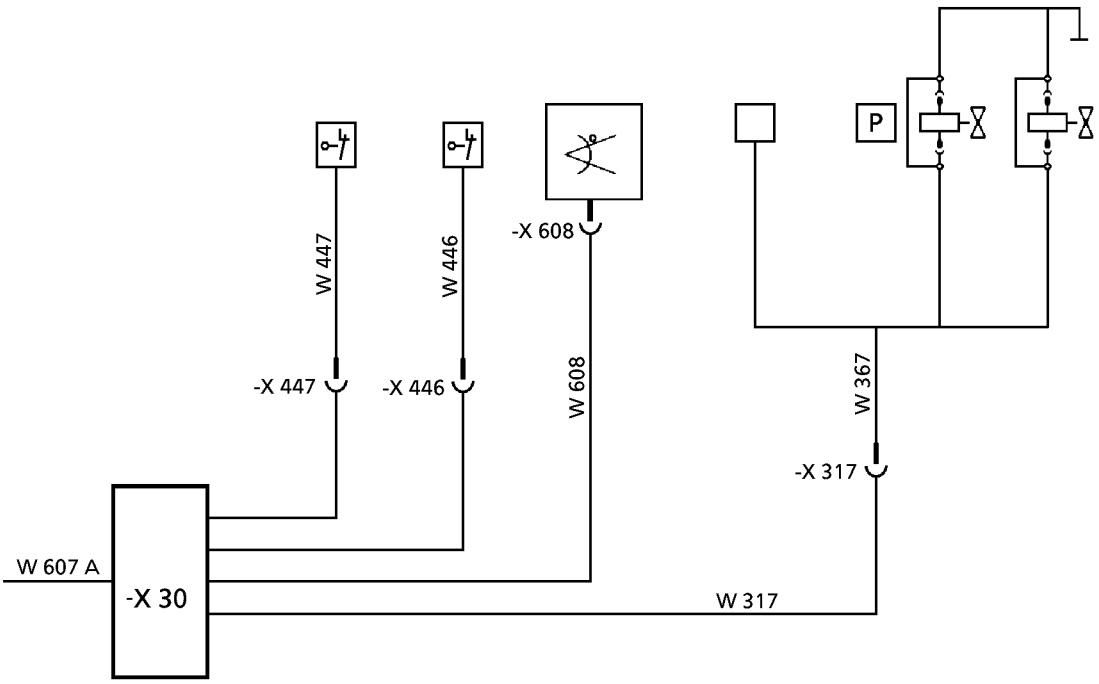
Pin the guy rods of the SA-bracket with the guy rods on the D-pivot section.
▶ Insert the pin **16** and secure with spring retainer **17**.

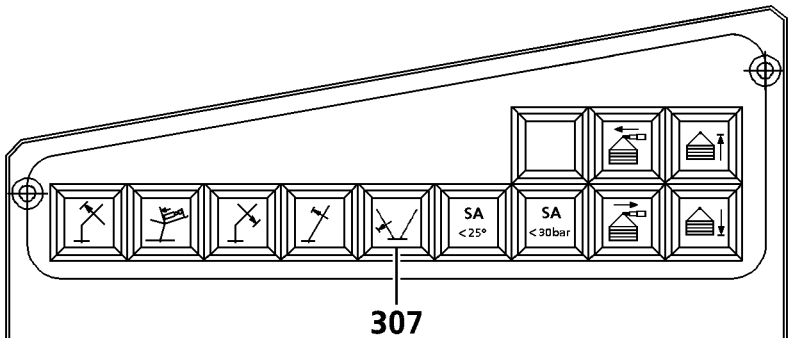
Pin the guy rods of the D-intermediate section with the guy rods on the D-pivot section.
▶ Insert the pin **16** and secure with spring retainer **17**.

Pin the guy rods of the D-intermediate section with the guy rods on the D-end section.
▶ Insert the pin **16** and secure with spring retainer **17**.
▶ Actuate winch IV until the guy rods are tensioned between the SA-bracket and the D-end section.

DANGER
Mortal danger due to folding down of derrick boom!
▶ Before removing the auxiliary crane, the crane operator must ensure that the derrick boom is safely held by the guy rods.

▶ When the guy rods are tensioned between the SA-bracket and the D-end section:
Remove the auxiliary crane.


W 447
W 446
-X 608
P
-X 447
-X 446
W 608
W 367
-X 317
W 607 A
-X 30
W 317


SA
< 25°
SA
< 30bar
307

B187146

2.4 Establishing the electrical connections

Ensure that the following prerequisite is met:
– The D-boom is completely assembled.

▶ Establish the electrical connection (W607A) from the turntable to the connector box (-X30).
▶ Establish the electrical connection to the D-relapse cylinder limit switches. Plug in cable plug (W447/W446).
▶ Plug in cable plug (W317) in (-X317) for the replenishing pressure switch winch 3.
▶ Establish the electrical connection to the angle sensor. Plug cable plug (W608) into (-X608).

2.5 Function check

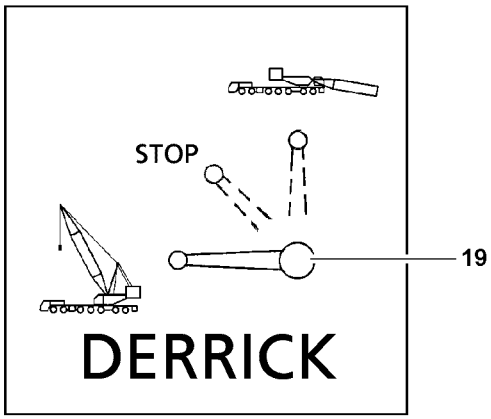
Make sure that the following prerequisites are met:
– All electrical connections have been made.
– The crane engine is running.
– The appropriate operating mode is set.
– The actuator levers of the limit switches have been checked for easy movement and are lubricated.

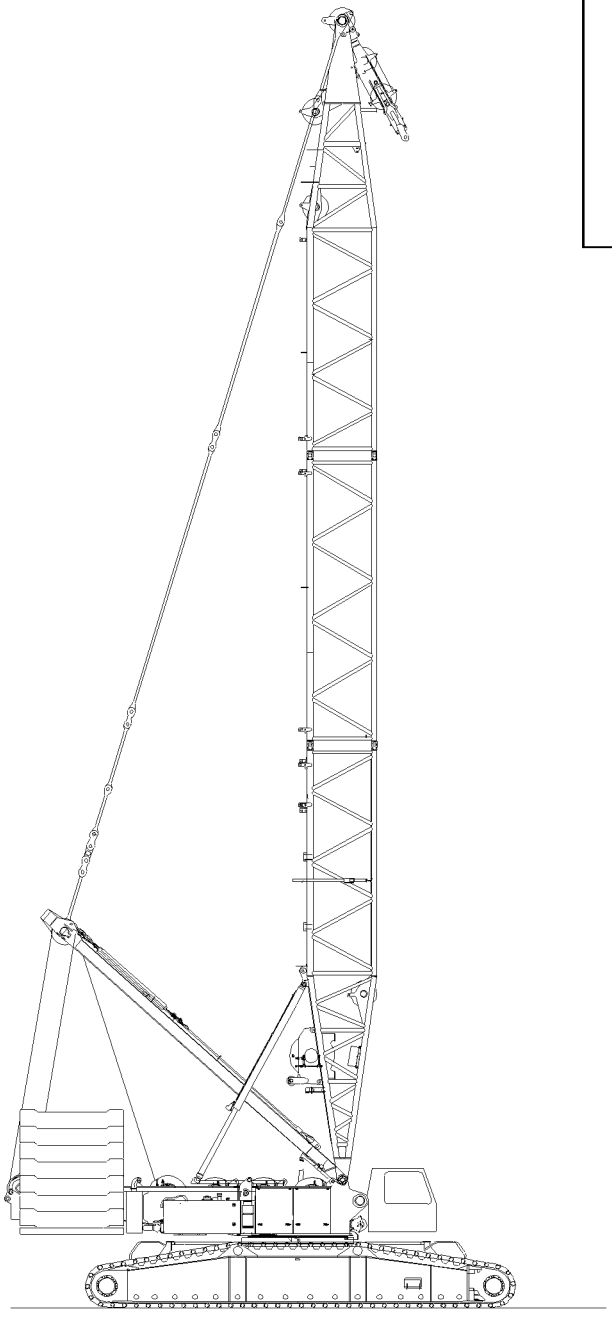
2.5.1 Limit switch - General

Note
▶ The limit switch functions have to be checked individually before erection!

▶ Manually actuate the individual limit switches on the D-relapse cylinders.

Result:
– Winch IV (D-control winch) turns off in upward movement.
– The indicator light **307** lights up.





B104945

2.6 Extending the D-relapse cylinder

WARNING
Mortal danger due to derrick boom!
If the D-relapse cylinders are not extended before erecting the derrick boom, then the derrick boom can fall backward.
Personnel can be severely injured or killed!
- ▶ The D-relapse cylinders must be extended before erection of the derrick boom.
- ▶ The ball cock must be secured during crane operation to prevent unintended actuation.

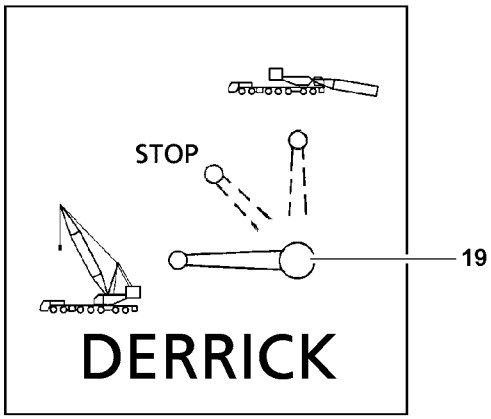
The piston rod on the D-relapse cylinder must be extended by actuating the ball cock **19**.

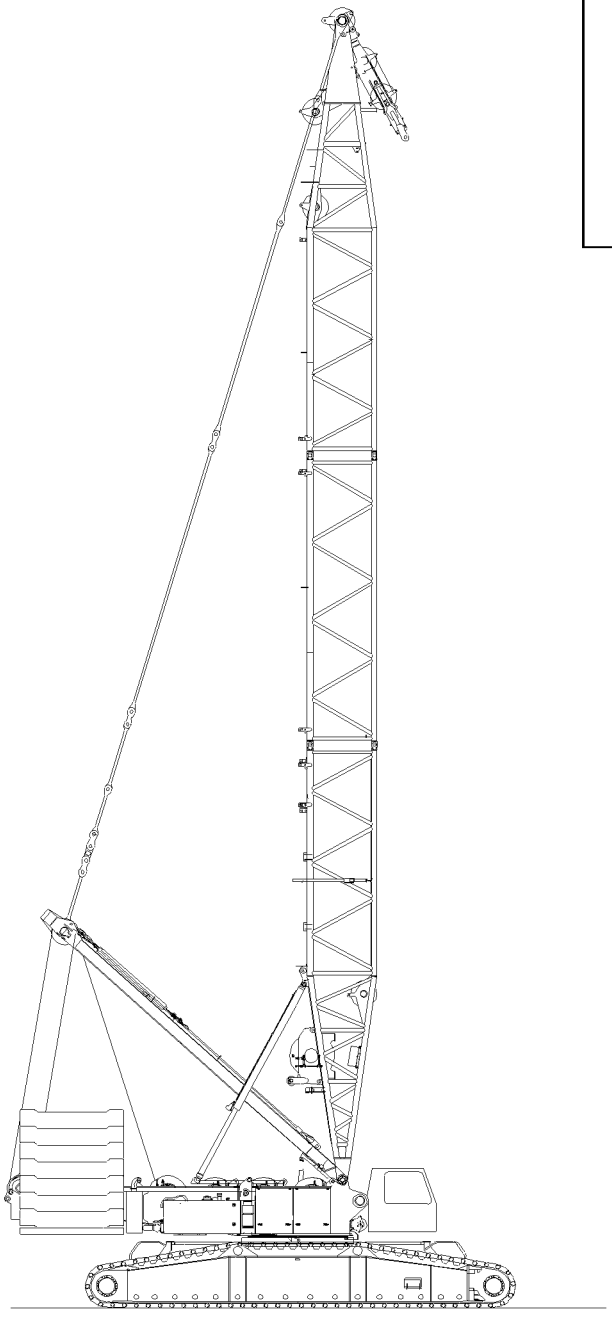
Ball cock positions	
horizontal	Crane operation, extend the piston rod
vertical	Assembly, retract the piston rod
45°	STOP (The piston rod cannot be retracted / extended)

2.7 Erecting the D-boom

DANGER
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over.
Personnel can be severely injured or killed!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

Make sure that the following prerequisites are met:
- – The crane is aligned in horizontal direction.
- – All electrical connections have been made.
- – All limit switches are functioning.
- – The counterweight has been attached to the turntable in accordance with the load chart.
- – All pin connections have been secured.
- – The relapse cylinders on the D-pivot section are extended.
- – The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The LICCON overload protection settings have been compared with the actual crane configuration.
- – The assembly key button **389** is actuated.



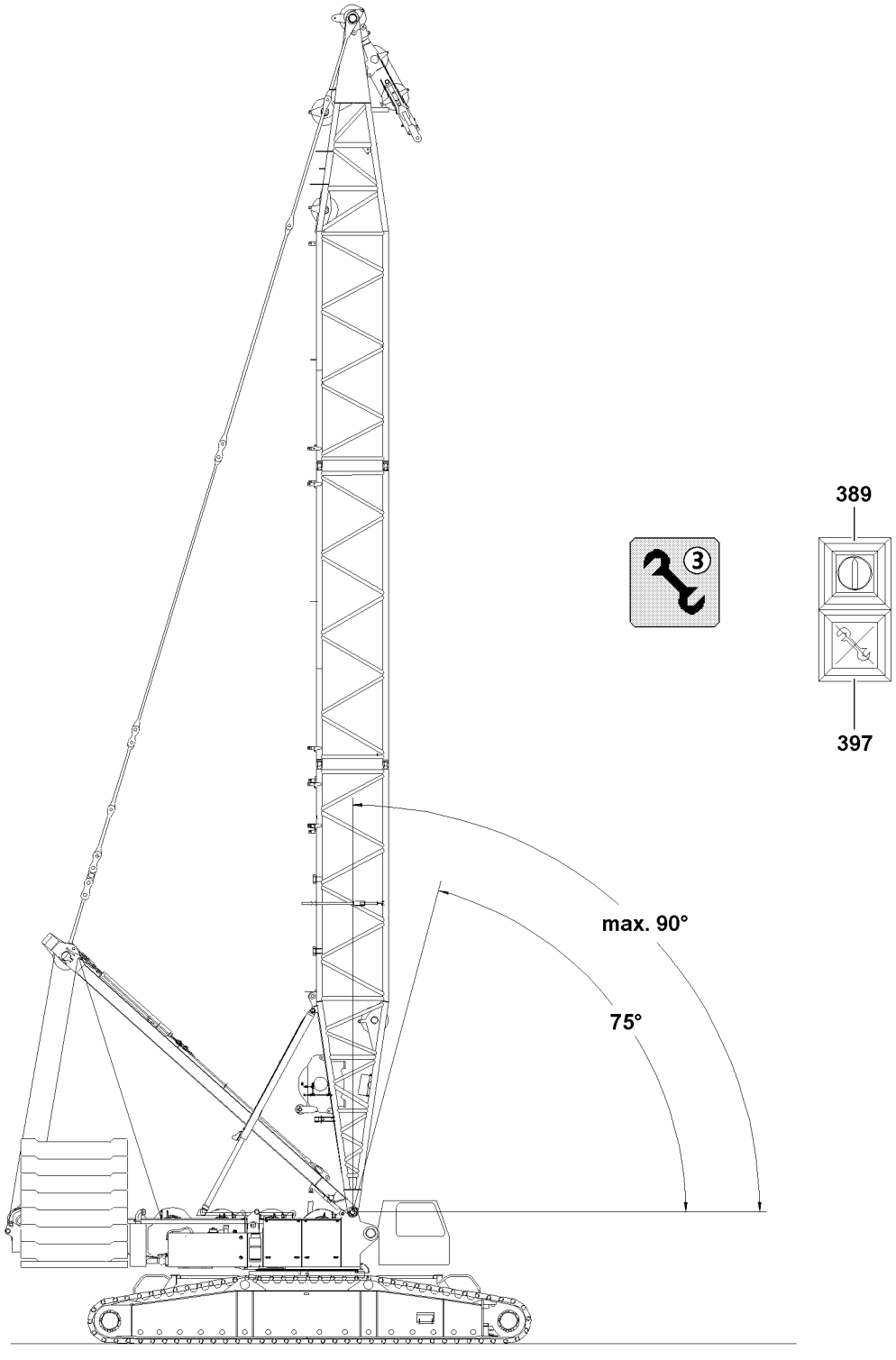


B104945

2.7.1 Erection procedure

DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane superstructure during erection procedure!
- ▶ Do not allow slack cable to build up on the control winch (winch 3)!
- ▶ The derrick boom may not be erected further than maximum 90° to the horizontal!

- ▶ Actuate winch IV and erect the derrick boom to an angle range of 80° to 85°.



B104942

3 Disassembly

DANGER
Risk of falling!
During disassembly of the D-boom, assembly 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 injuries.

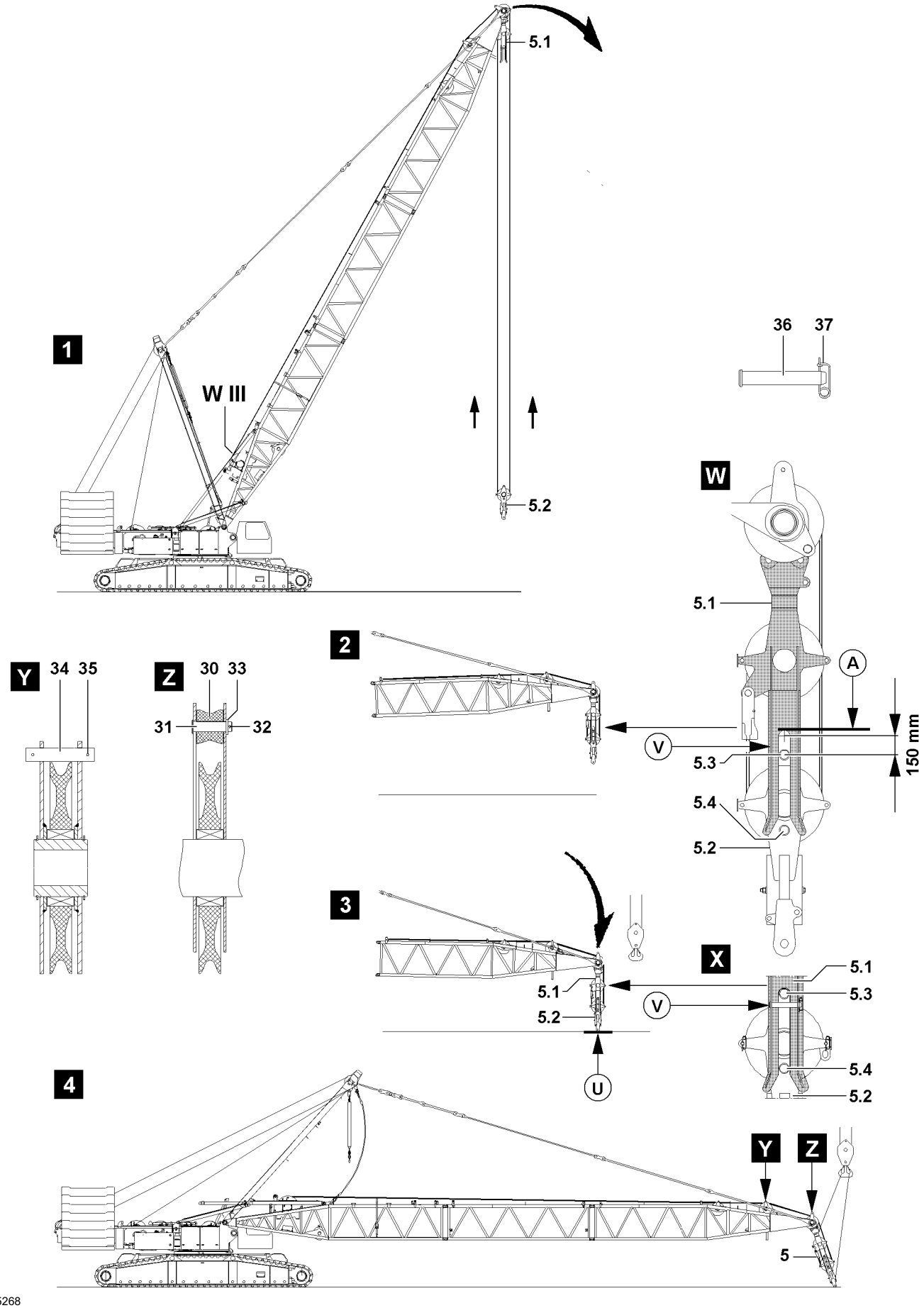
- ▶ All disassembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which disassembly must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect against falling!

DANGER
Risk of injury when disassembling booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being disassembled!

DANGER
Falling components!
If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!

- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!


1
W III
5.1
5.2
36 37
W
5.1
A
150 mm
V
5.3
5.4
5.2
2
Y
34 35
Z
30 33
31
32
3
5.1
5.2
U
X
5.1
V
5.3
5.4
5.2
4
Y
Z
5

B105268

3.1 Removing the D-boom

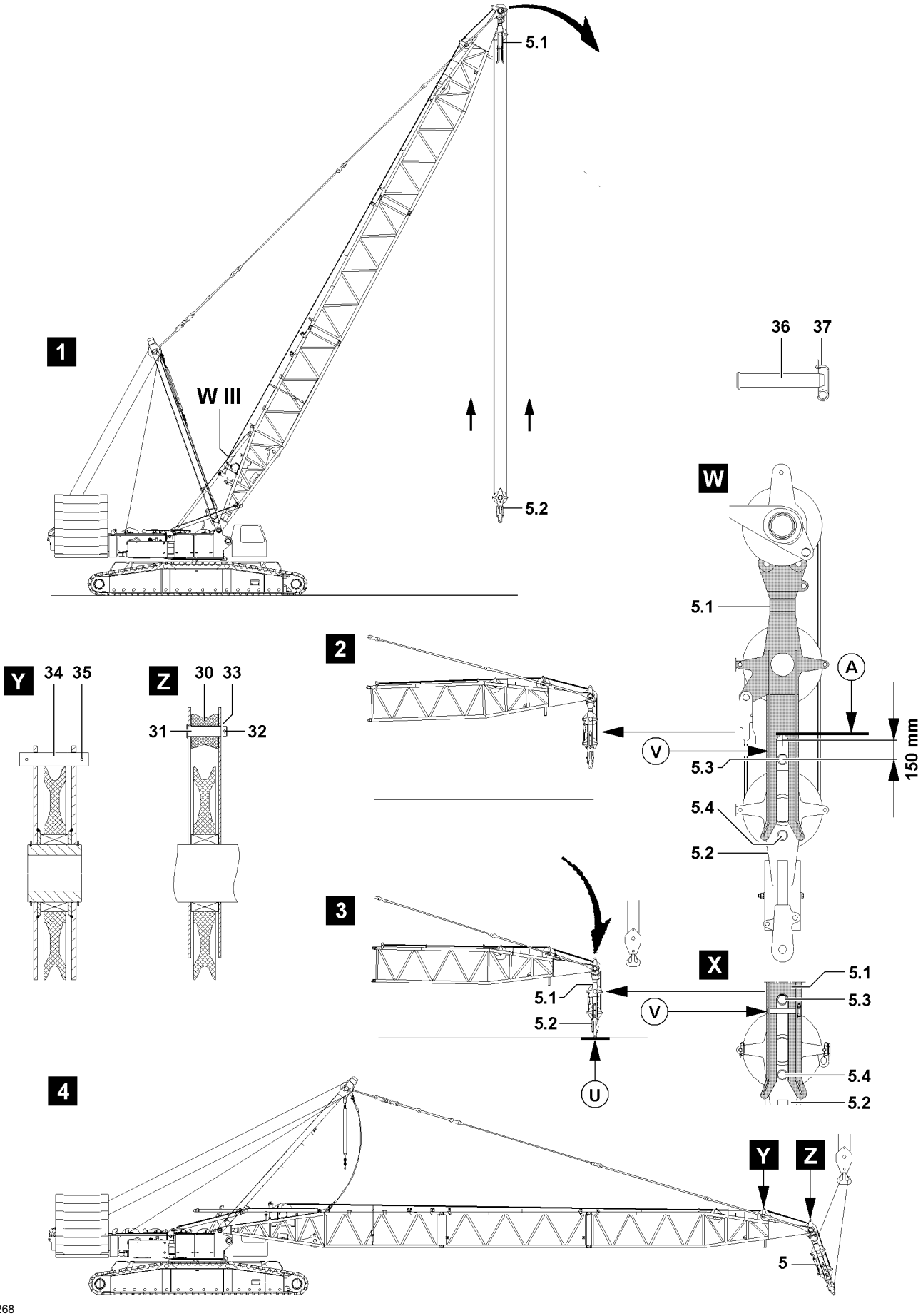
WARNING
Falling boom!
If the D-boom is not properly supported before disassembly or held with an auxiliary crane, then the D-boom can fall down when it is unpinned!
Personnel can be severely injured or killed!
- ▶ Before supporting the D-boom, the ground condition must be checked regarding load bearing capability and level.

If the ground condition is not classified as sufficient:
- ▶ Support the D-boom properly and safely with suitable material!

3.1.1 Luffing the D-boom down

NOTICE
Damage to the pulley block!
If the derrick boom is lowered too quickly “to the front”, significant damage can occur on the pulley block and on the D-end section.
- ▶ Lower the derrick boom carefully to the front.

- ▶ Lower the derrick boom to the front until the pulley block is approx. 1 m above the ground.


1
5.1
W III
5.2
36 37
W
5.1
A
150 mm
V
5.3
5.4
5.2
2
Y
34 35
Z
30 33
31
32
3
5.1
5.2
U
X
5.1
V
5.3
5.4
5.2
4
Y
Z
5

B105268

3.1.2 Pinning the upper pulley block with the lower pulley block

Make sure that the following prerequisites are met:
- The main boom is completely disassembled.
- The upper pulley block **5.2** hangs in reeved condition above the ground level, see fig. **1**.
- The retaining pin **36** on the bracket of the lower pulley block **5.1** is unpinned on point **V**, see fig. **W**.

The upper pulley block **5.2** must be pinned with the lower pulley block **5.1** before the complete pulley block **5** can be placed in the transport receptacle on the D-pivot section.

▶ Slowly luff the D-boom down and spool up winch 3 at the same time until the upper pulley block **5.2** is connected with the guide pin **5.3** in the bracket to approx. 150 mm on the stop, point **A** of the lower pulley block **5.1**, see fig. **2** and fig. **W**.

▶ When the upper pulley block is approx. 150 mm before the stop of the lower pulley block **5.1**, point **A**:
Slowly and carefully luff the D-boom down until the upper pulley block **5.2** is in contact with the ground (point **U**), see fig. **3**.

NOTICE
Danger of property damage on the pulley block!
If the D-boom is luffed down too quickly, then significant property damage can occur on the upper as well as the lower pulley block.
▶ Always use a guide when connecting the upper and lower pulley block.
▶ Carry out all crane movements slowly and with utmost caution.
▶ When the guide pin **5.3** reaches the stop at point **A**, stop the luff down movement of the D-boom immediately.

▶ When the upper pulley block **5.2** is in contact with the ground at point **U**, fig. **3**:
Luff the D-boom down slowly and carefully until the guide pin **5.3** is entered to the stop at point **A**.

▶ When the guide pin **5.3** touches on stop point **A** of the lower pulley block **5.1**, fig. **X**:
stop the luff down movement immediately.

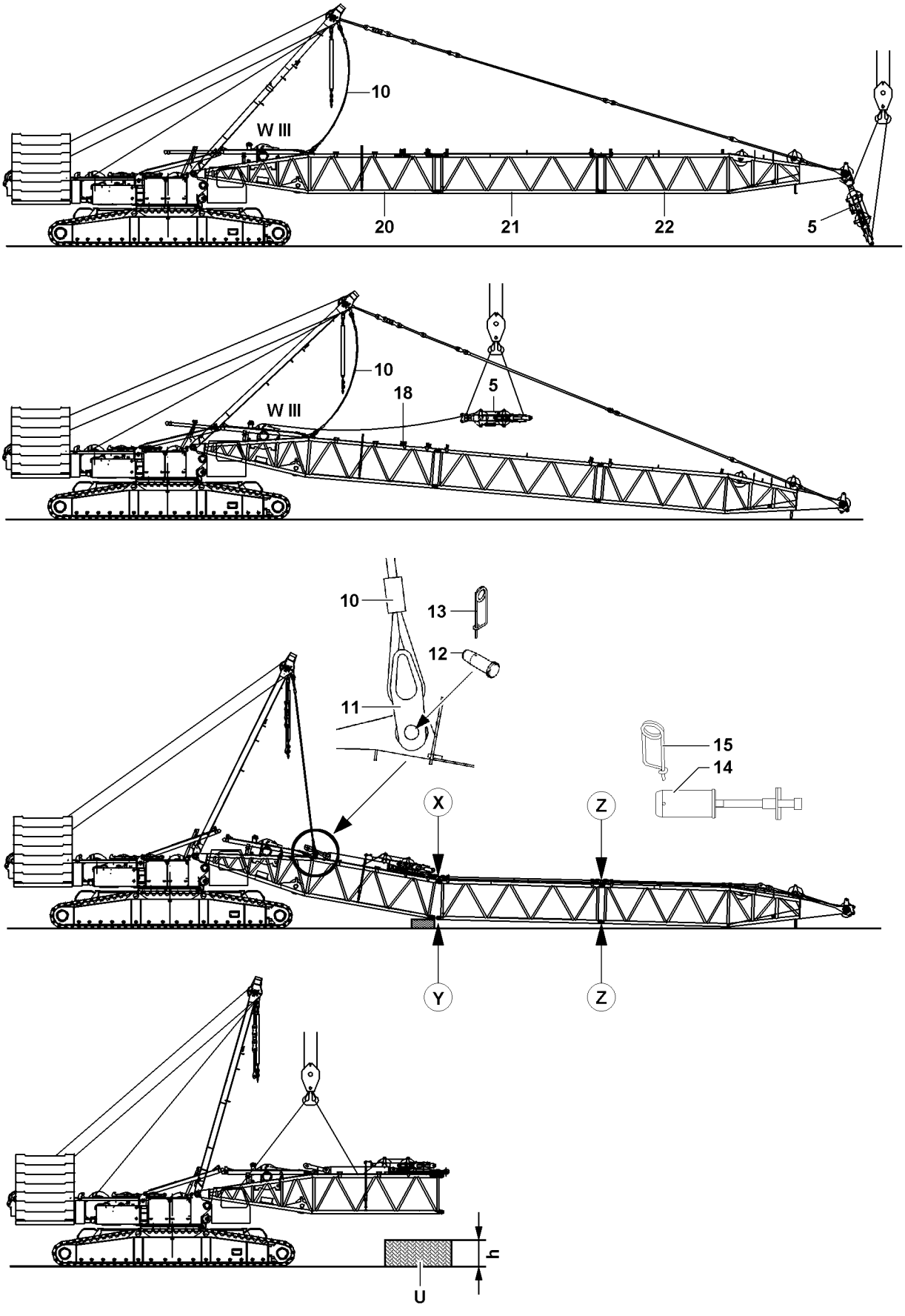
▶ Insert the retaining pins **36** on both sides on the bracket of the lower pulley block **5.1** at point **V** and secure with spring retainer **37**.

Result:
- The upper pulley block **5.2** is connected with the lower pulley block **5.1** and now forms the “transport unit” pulley block **5**, fig. **4**.

Before the pulley block **5** can be placed in the transport receptacle on the D-pivot section, the rope retaining pin **34**, see fig. **Y** and the rope retaining pin **31**, see fig. **Z** must be removed, fig. **4**.

Note
Loss of rope retaining elements
▶ After disassembly, store the rope retaining pipes and pins, spring retainers and linch pins in a safe location.

▶ Remove the spring retainer **35** on the rope retaining pipe **34**.
▶ Unpin the rope retaining pipe **34**, fig. **Y**.
▶ Remove the linch pin **32** on the rope retaining pin **31**.
▶ Remove the washer **33**.
▶ Hold the roller **30** and unpin the rope retaining pin **31**.



B104944

3.1.3 Placing the pulley block in the transport receptacle

Make sure that the following prerequisites are met:

– The lower and the upper pulley block are pinned together as a “transport unit” pulley block **5**.
– The rope retaining pipes and pins are released and unpinned.

▶ Attach the pulley block **5** onto the auxiliary crane.
▶ Tension the tackle between the pulley block and the hook block of the auxiliary crane.

WARNING
Swinging pulley block!
If the pulley block is not properly attached on the auxiliary crane for disassembly, then the pulley block can start to swing back and forth during the unpinning procedure!
Personnel can be severely injured or killed!

▶ Before the unpinning procedure of the pulley block, the crane operator must ensure that it is held safely.
▶ It is prohibited to remain in the danger zone.

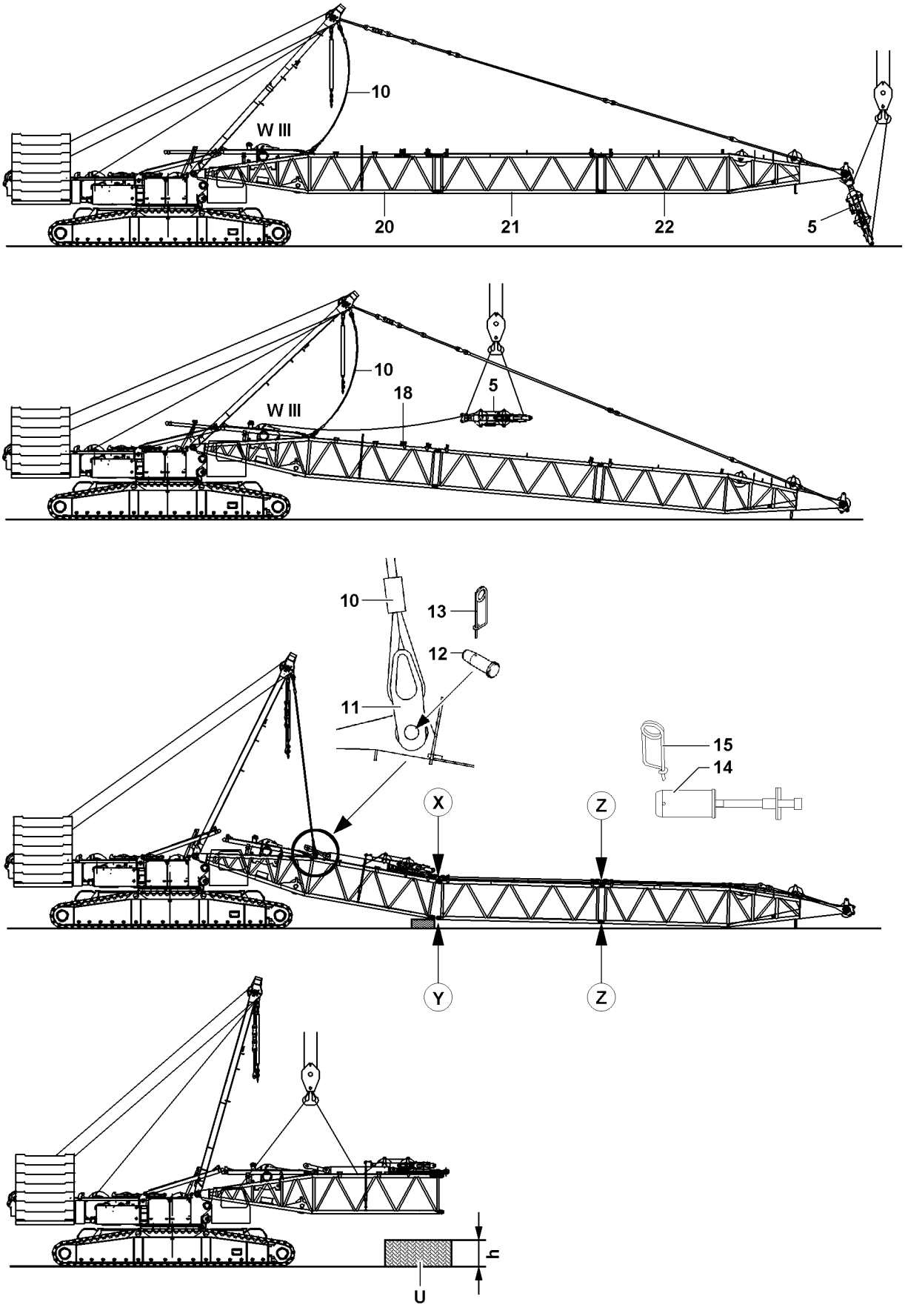
▶ Unpin the pulley block on the D-end section.
▶ Pull the pulley block **5** with the auxiliary crane to the D-pivot section while spooling out winch 3 at the same time.
▶ Placing the pulley block **5** in the transport receptacle **18**.
▶ Pin and secure the pulley block **5** in the transport receptacle **18**.

3.1.4 Disassembling the D-guy rods

Ensure that the following prerequisite is met:

– The pulley block **5** is placed in the transport receptacle **18** on the D-pivot section **20**, pinned and secured.

▶ Carefully luff the derrick boom down until the D-end section is laying on the ground or on the support.
▶ Lower the SA-bracket to the front.
▶ Remove the guy rods and place them in the corresponding transport retainers on the D-lattice sections.
▶ Secure the guy rods in the transport retainers.



B104944

3.1.5 Removing the D-lattice sections on the D-pivot section

Pin the assembly rope on the assembly bracket on the D-pivot section.

- ▶ Loosen the assembly rope **10** on the transport receptacle on the SA-bracket.
- ▶ Pull the assembly rope **10** to the assembly bracket **11** on the D-pivot section.
- ▶ Pin the assembly rope **10** on the assembly bracket **11** with pins **12** and secure with spring retainer **13**.
- ▶ Luff the SA-bracket up until the assembly rope **10** is tensioned on the D-pivot section.

DANGER
Risk of fatal injury!

- ▶ Before unpinning the D-end section “on the bottom” at point **Z**, the assembly rope **10** must be pinned and tensioned on the assembly bracket **11**.
- ▶ It is prohibited for anyone to remain under the derrick boom during the entire disassembly procedure.

Release and unpin the pin **14** “at the bottom” at point **Z**.

- ▶ Remove the spring retainer **15** “on the bottom” at point **Z** on pin **14**.
- ▶ Unpin the pin **14** “at the bottom” at point **Z**.
- ▶ Hang the D-end section on the auxiliary crane.

DANGER
Risk of fatal injury!
The D-end section can fall down during the unpinning procedure and severely injure or kill personnel.

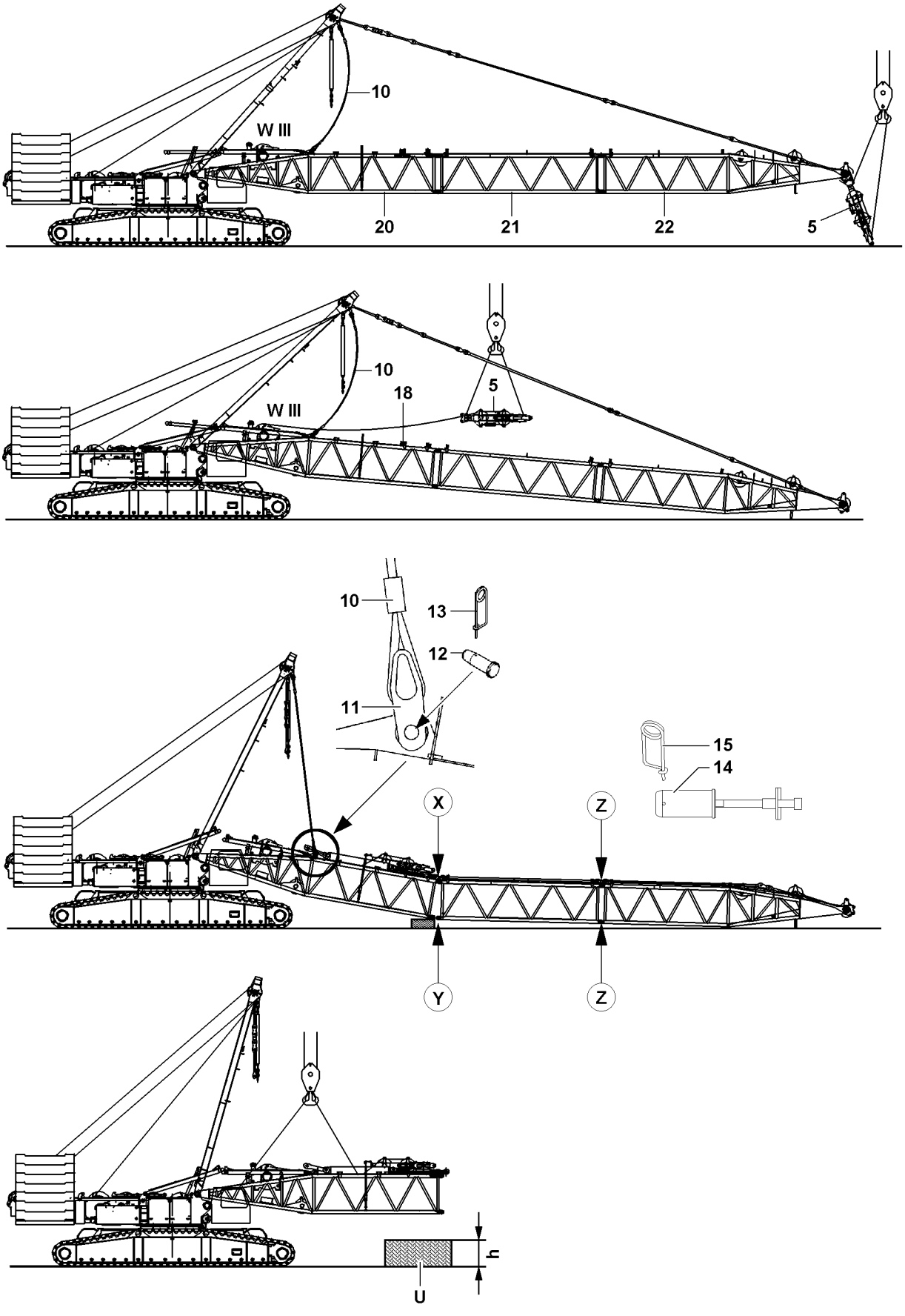
- ▶ The crane operator must make sure before the unpinning procedure, that the D-end section is being held completely by the auxiliary crane.

- ▶ When the D-end section is being held by the auxiliary crane:
  Release and unpin the pin **14** “on top” at point **Z**.
- ▶ Remove the D-end section with the auxiliary crane.
- ▶ Carefully luff the derrick boom down until the D-intermediate section is laying on the ground or on the support.
- ▶ Release and unpin the D-intermediate section at the “bottom” at point **Y**.
- ▶ Hang the D-intermediate section on the auxiliary crane.

DANGER
Risk of fatal injury!
The D-intermediate section can fall down during the unpinning procedure and severely injure or kill personnel.

- ▶ The crane operator must make sure before the unpinning procedure, that the D-intermediate section is being held completely by the auxiliary crane.

- ▶ When the D-intermediate section is being held by the auxiliary crane:
  Release and unpin the pin **14** “on top” at point **X**.
- ▶ Remove the D-intermediate section with the auxiliary crane.



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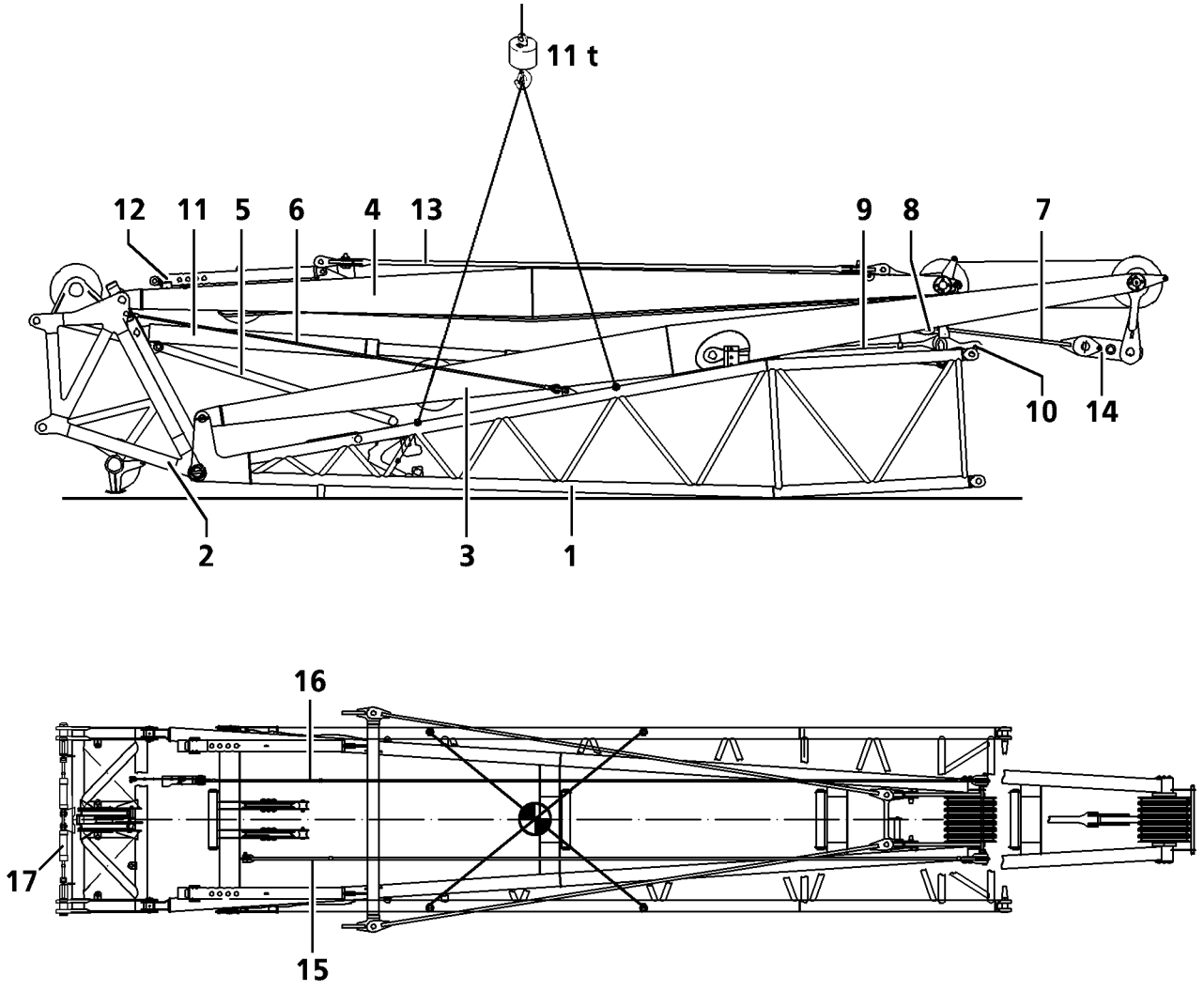
CAUTION
Damage of the D-pivot section and the turntable!
By placing the installed D-pivot section on the ground, significant property damage can occur on the D-pivot section and on the turntable.
- ▶ The D-pivot section may not be placed directly on the ground.
- ▶ When placing the D-pivot section down, always use a sufficiently load bearing and large enough support.
- ▶ The support **U** may not fall below the specified minimum height **h**.

Minimum height of support U on D-pivot section	
without Quick connection	400 mm
with Quick Connection	760 mm

- ▶ Place the D-pivot section on the support **U**.
- ▶ Hang the D-pivot section on the auxiliary crane.

Remove the assembly rope **10** on the D-pivot section.
- ▶ Release and unpin the pin **12** on the assembly bracket **11** on the D-pivot section.
- ▶ Secure the assembly rope **10** on the transport retainers on the SA-bracket.
- ▶ Turn the pressure change over switch **373** on.

Establish the hydraulic connection to the pin pulling device via two quick couplers.
Unpin the D-pivot section on the turntable.
- ▶ Release and remove the retaining plates of the connector pins.
- ▶ Unpin the connector pins with the hydraulic pin pulling device.
- ▶ When the connector pins are unpinned:
  Release the electrical and hydraulic connections from the turntable to the D-pivot section.
- ▶ Remove the D-pivot section with the auxiliary crane.
- ▶ Turn the pressure change over switch **373** off.



B108954

1 General

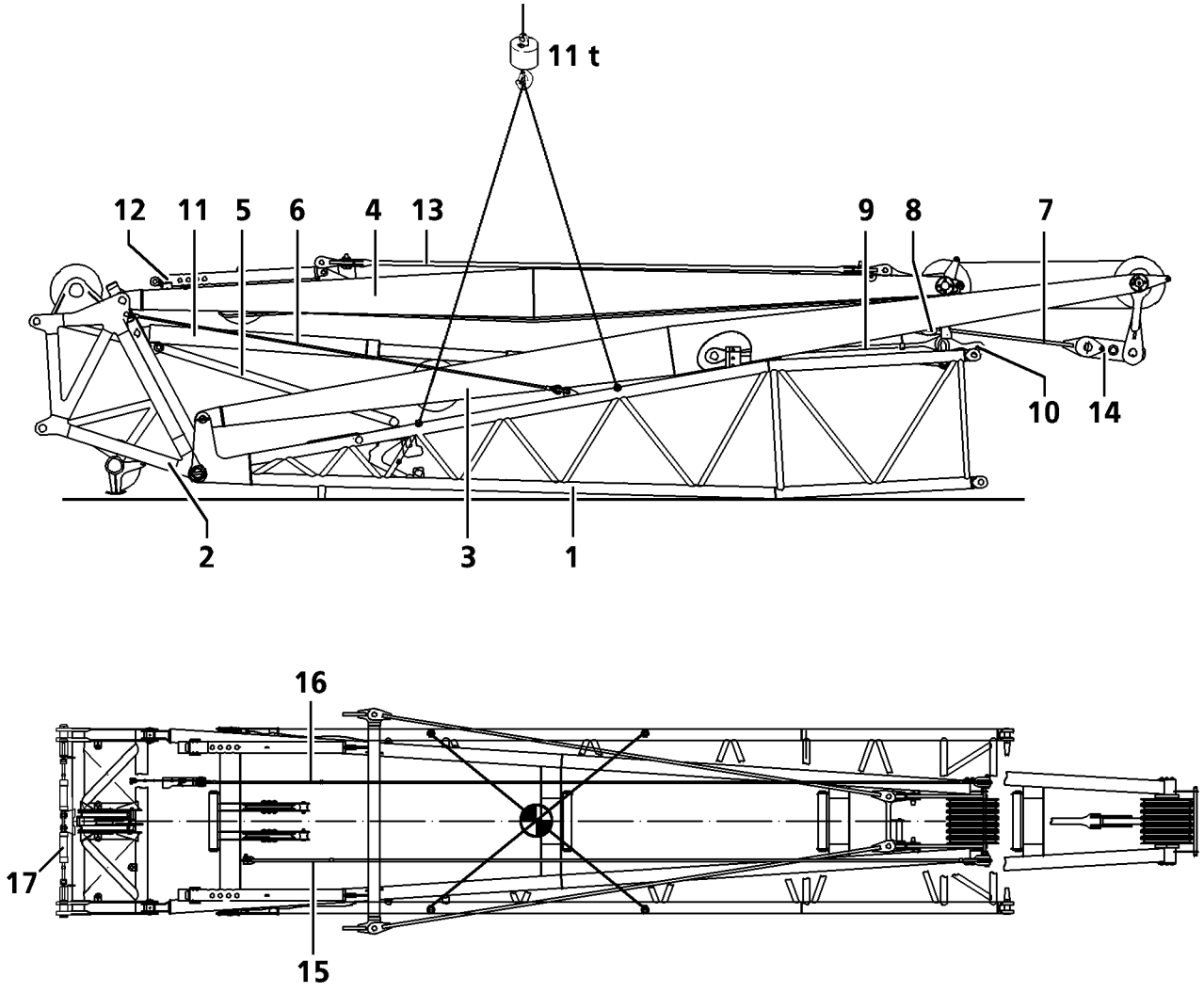
WARNING
When working aloft, there is a danger of falling!
If the following notes are not observed, the assembly personnel could fall and suffer life-threatening injuries!
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!
- ▶ Before any assembly / disassembly work and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also crane operating instructions, chapter 2.04!

DANGER
Danger of accident at assembly / disassembly of booms!
When you disassemble unsecured or unsupported booms, they can fall down!
Personnel can be severely injured or killed!
- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being assembled / disassembled!

1.1 Component overview of assembly unit

Note
- ▶ The total weight of the N-assembly unit is approx. 11 t!

Component overview	
Position	**Description**
1	N-pivot section
2	Fold in head
3	NA-frame I
4	NA-frame II
5	Mechanical relapse support
6	Retaining rope
7	Guy rod 2010 mm
8	Guy rod 2630 mm
9	Guy rod 2790 mm
10	Connector bracket 420 mm
11	Relapse accumulator cylinder



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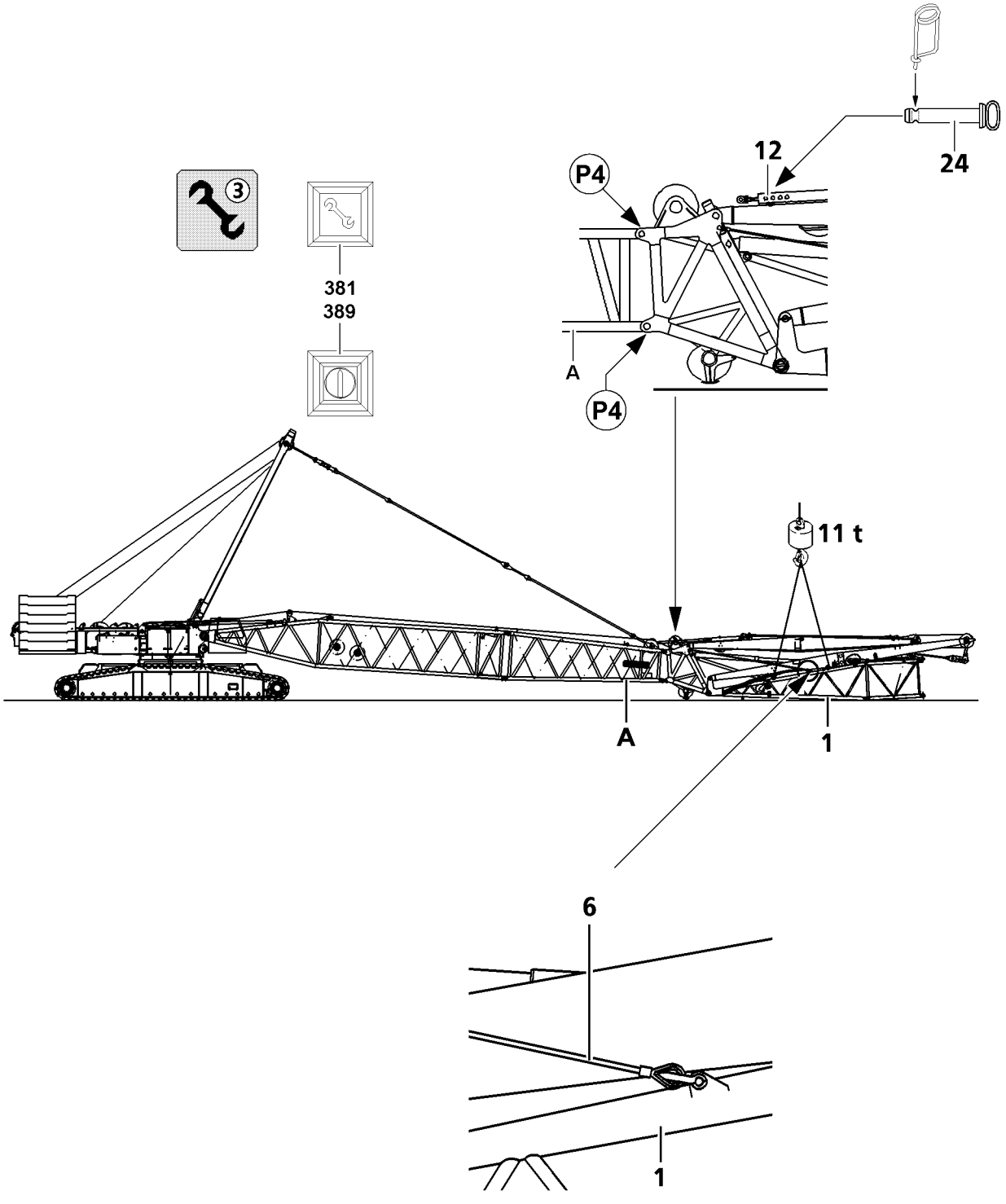
Component overview	
Position	**Description**
12	NA-bracket II, relapse support
13	Guy rods
14	Test bracket
15	Installation rope for NA-bracket II
16	Assembly rope
17	Pin pulling device



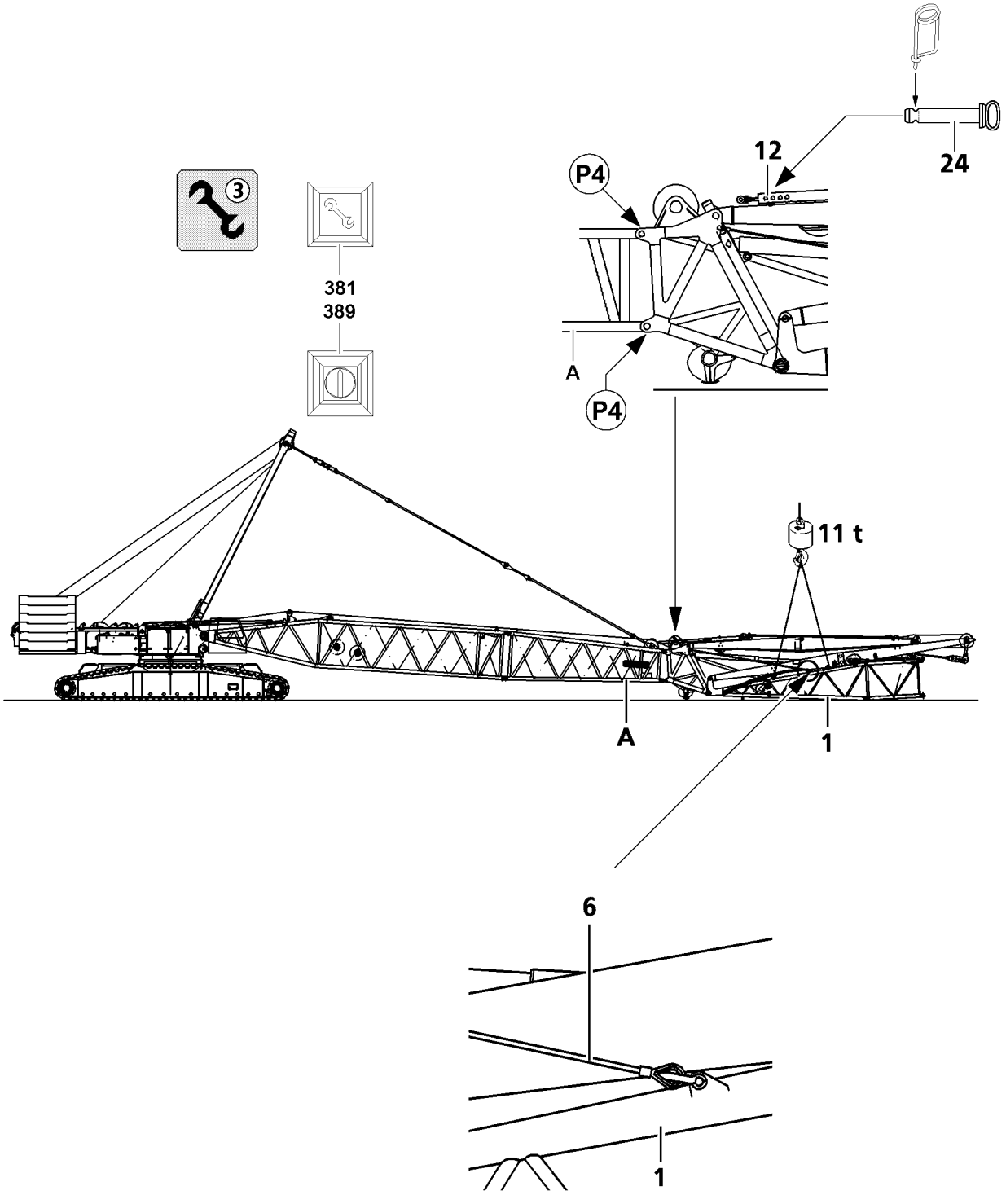
B108955

2 Assembly

DANGER
Risk of falling!
During assembly and disassembly, the assembly 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 injuries!

- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations! The national regulations must be adhered to!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must wear **approved anti-fall guards and protective equipment**, see crane operating instructions, chapter 2.04!

Make sure that the following prerequisites are met:
- the crane is aligned in horizontal direction,
- the S/SL-boom is assembled,
- the counterweight is attached to the turntable according to the load chart and placed on the suspended ballast pallet / ballast trailer,
- the LICCON overload protection has been set according to the data in the load chart,
- the assembly key button **389** is pressed and the indicator light **381** lights up,
- the assembly icon **3** on the LICCON monitor blinks,
- an auxiliary crane is available.



B108955

2.1 Installing the N-assembly unit on the L-/SL-boom

2.1.1 Adding the operating mode “Assembly”

DANGER
Risk of fatal injury at crane operation with turned on assembly key button!
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button **389** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is inactive.
- – The indicator light **381** lights up.
- – The Assembly icon **3** on the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red flashing beacon on the crane cab blinks.

2.1.2 Pinning the N-assembly unit on the L-/SL-boom

Take on the N-assembly unit with the auxiliary crane on the attachment points on the N-pivot section **1**.

▶ Pin the N-assembly unit on the L-adapter **A** with the pin pulling device on top and bottom on points **P4** and secure with spring retainer, see crane operating instructions, chapter 5.30.

DANGER
Mortal danger due to folding down pivot section!
The pivot section folds down by itself when the retaining rope **6** is removed!
Personnel can be severely injured!
- ▶ The N-assembly unit must be secured with the auxiliary crane before removing the retaining rope **6**!

▶ Remove the retaining rope **6**.

▶ Lower the N-assembly unit with the auxiliary crane until it is laying on the ground.

▶ Support the N pivot section **1**.

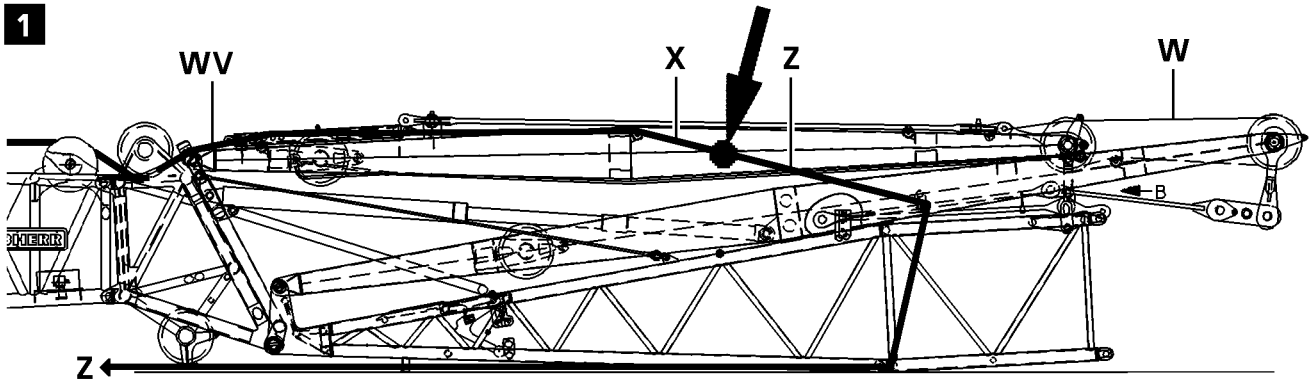
▶ Release the socket pin **24** on the NA-bracket II relapse support **12**.

▶ Unpin the socket pin **24** on the NA-bracket II relapse support **12**.

▶ Pull the NA-bracket II relapse support **12** apart to the last hole.

▶ Insert socket pin **24** and secure with spring retainer.

1



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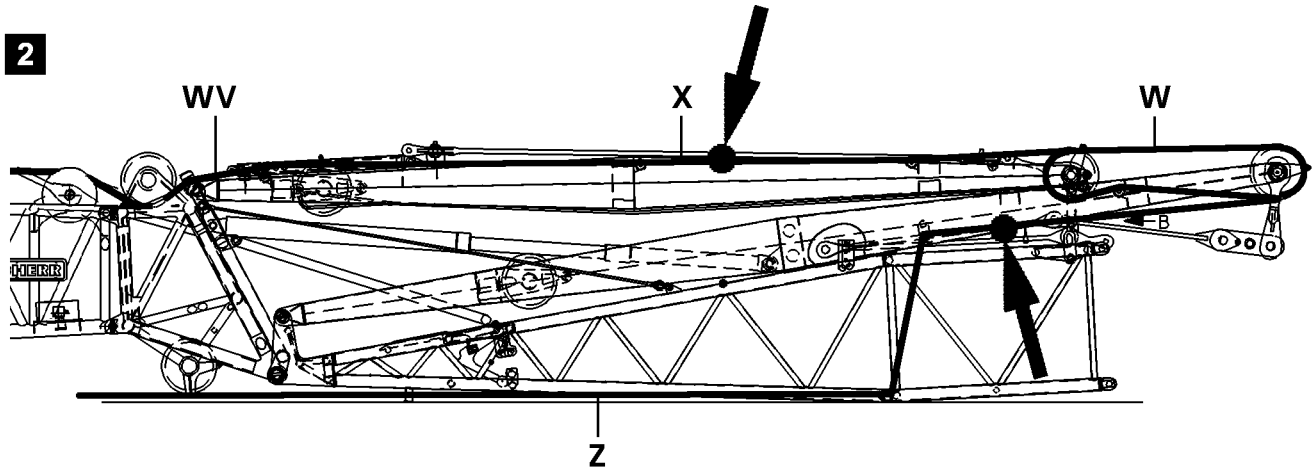

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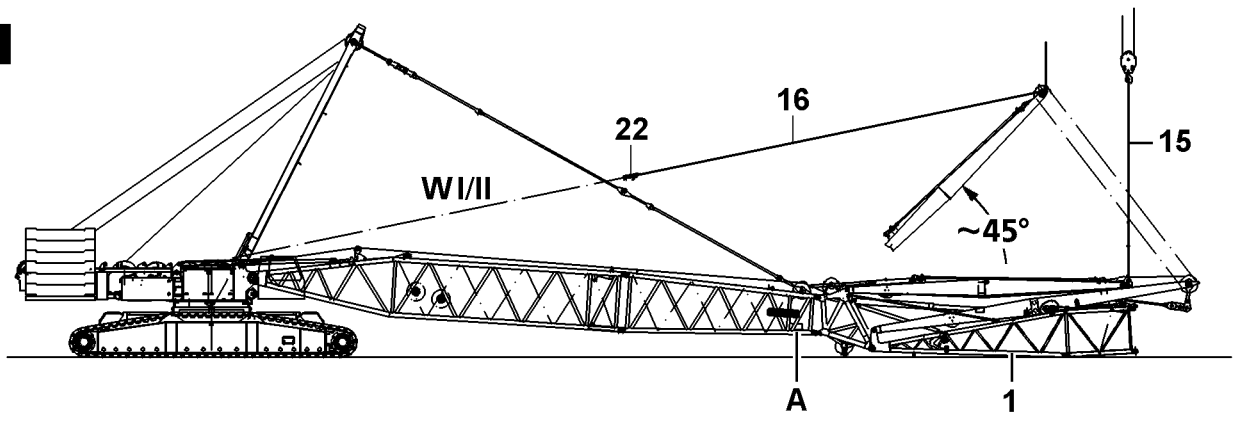


B108956

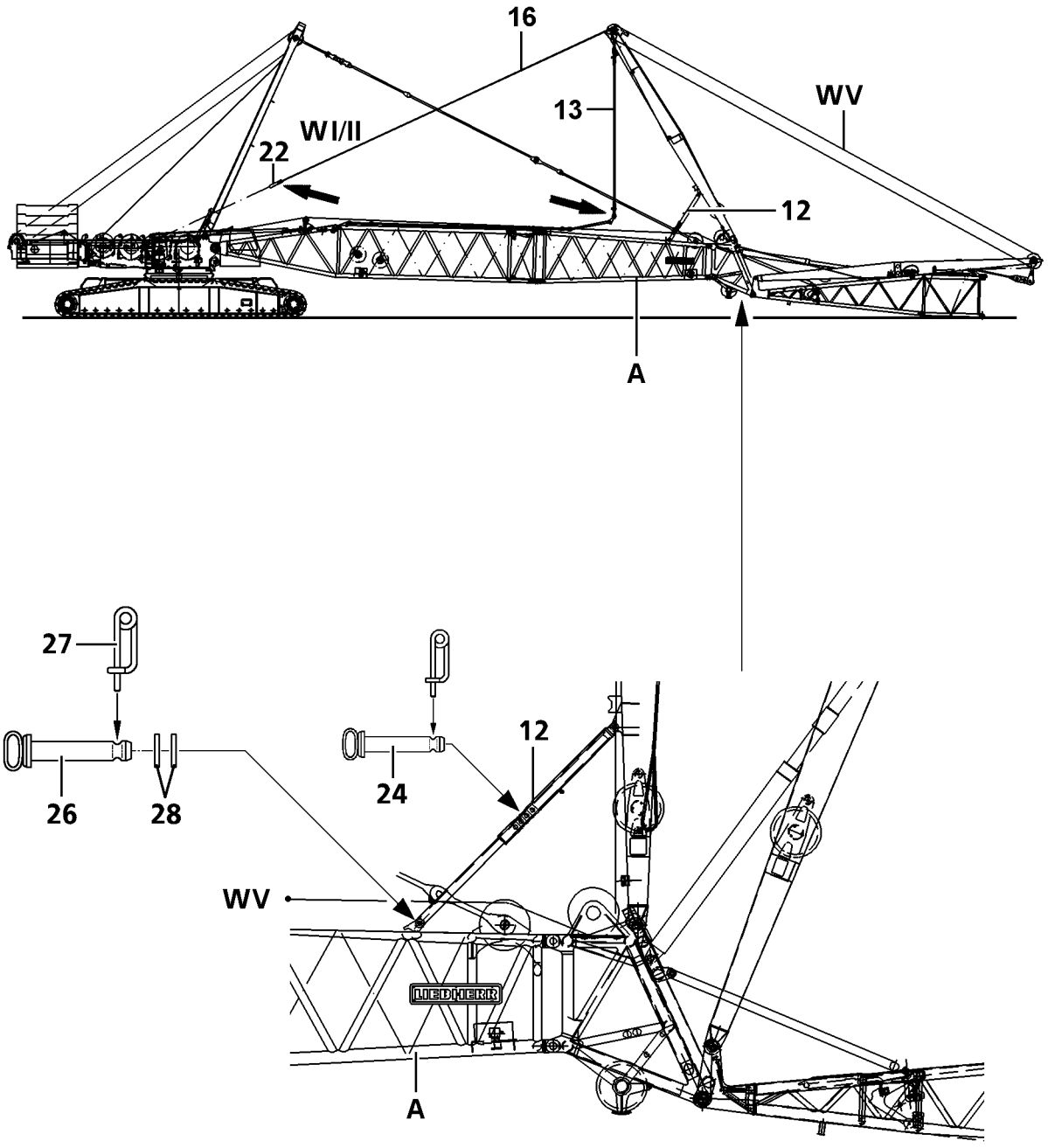
2.2 Reeving in the N-control rope between the NA-bracket I and the NA-bracket II

- ▶ Pull the auxiliary rope **Z** of the auxiliary winch over the change over pulleys to the turntable.
- ▶ Connect the auxiliary rope **Z** with the N-control rope **X** of winch 5 **WV**.
- ▶ Spool the auxiliary winch up and spool winch 5 **WV** out simultaneously and pull the N-control rope **X** to the NA-bracket II - watch the rope run, see fig. **1**.
- ▶ Connect the N-control rope **X** and the auxiliary rope **Z** with the reeving rope **W** which is already reeved in between the NA-bracket I and the NA-bracket II - watch the rope run, see fig. **2**.
- ▶ Spool the auxiliary winch up and simultaneously spool winch 5 **WV** out.
- ▶ Reeve in the N-control rope between the NA-bracket I and the NA-bracket II, for reeving, see crane operating instructions, chapter 4.06.

Note

- ▶ To prevent the NA-bracket II from pulling up, the N-control winch winch 5 **WV** must be spooled out at the same time at erection!

- ▶ Attach the NA-bracket II on the assembly rope **15** to the auxiliary crane, see fig. **3**.
- ▶ Erect the NA-bracket II with the auxiliary crane to approx. 45°.
- ▶ Hang the hoist rope of winch 1 / winch 2 **WI/II** on the lock **22** of the assembly rope **16**.



B108957

2.3 Assembling the guy rods between the NA-bracket II and the L-/SL-pivot section

▶ Establish the electrical connections.

Note

▶ To establish the electrical connections, use the separate electrical wiring diagram!

▶ Continue to erect the NA-bracket II from approx. 45° with the hoist rope and the assembly rope **16** until the mechanical relapse support **12** can be pinned and secured on the L-adapter **A** with pin **26**, spring retainer **27** and two washers **28**.

NOTICE

Danger of property damage on NA-bracket II!

If the socket pin **24** is not unpinned after pinning the relapse support **12** on the L-adapter, the NA-bracket II can be significantly damaged when “pulling it to the rear”!

▶ Make sure to unpin the socket pin **24**!

▶ Make sure that the socket pin **24** is unpinned!

▶ Unpin the socket pin **24** on the mechanical relapse support **12**.

▶ **Spool up** the hoist winch and simultaneously **spool out** the N-control winch **WV**.

Result:

– The NA-bracket II is pulled to the rear.

Pull the NA-bracket II to the rear until the guy rods **13** of the NA-bracket II with the guy rods of the L/SL-pivot section can be pinned and secured.

WARNING

Danger of accidents due to incorrect pin connection(s)!

Due to incorrect pin connections, the pins can loosen up by themselves and dangerous situations can arise!

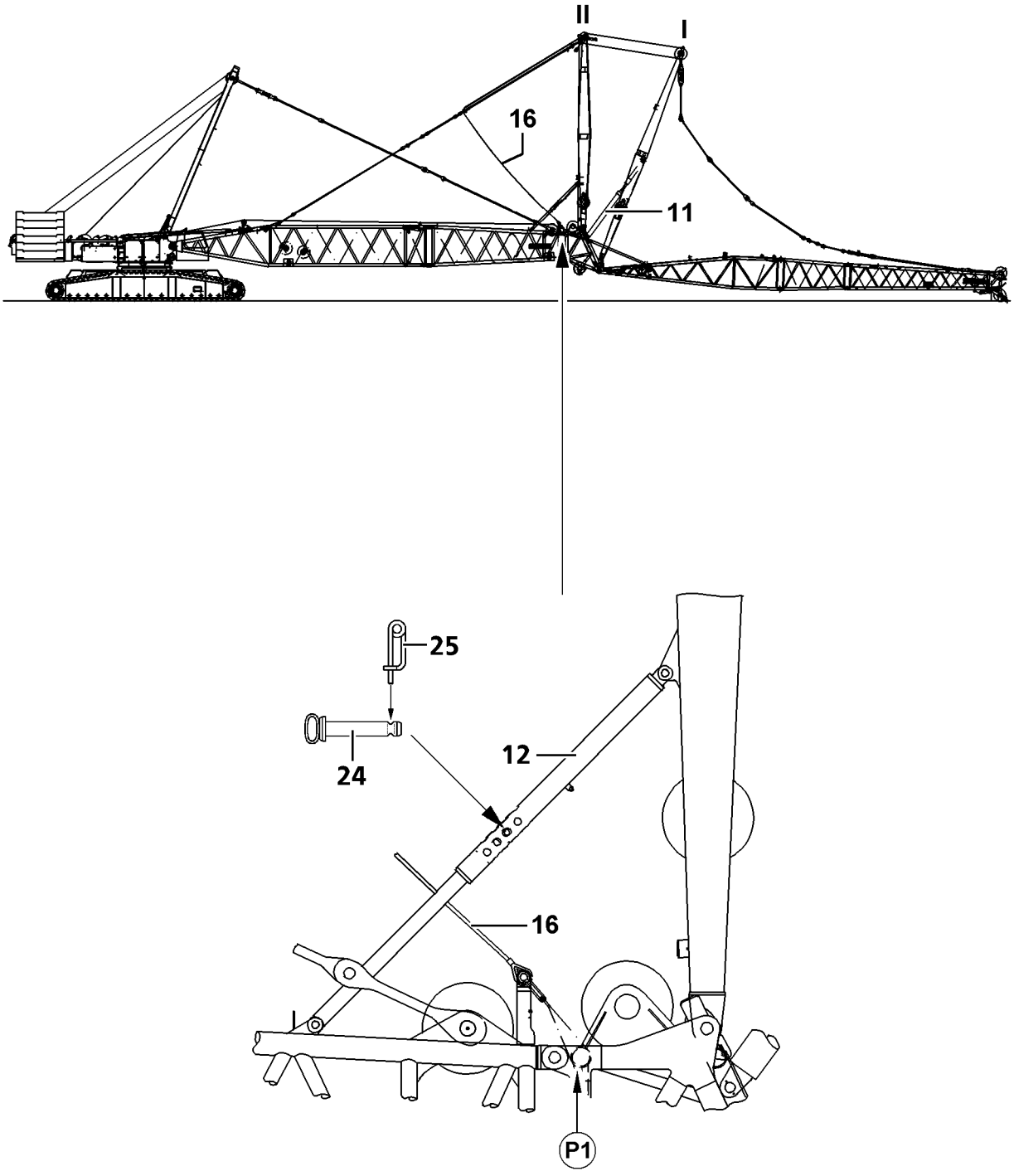
Personnel can be severely injured or killed!

▶ The pins on the guy rods must be pinned from the inside to the outside!

▶ Secure the pins from the outside!

▶ When the NA-bracket II has been pulled back far enough:
Pin the guy rods of the NA-bracket II with the guy rods on the L/SL-pivot section.

▶ Secure the pin connection.



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2.4 Erect the NA-bracket II

Make sure that the following prerequisites are met:
- the limit switches on the relapse accumulator cylinder **11** have been checked manually for function,
- the NA-bracket II guy rods are pinned.

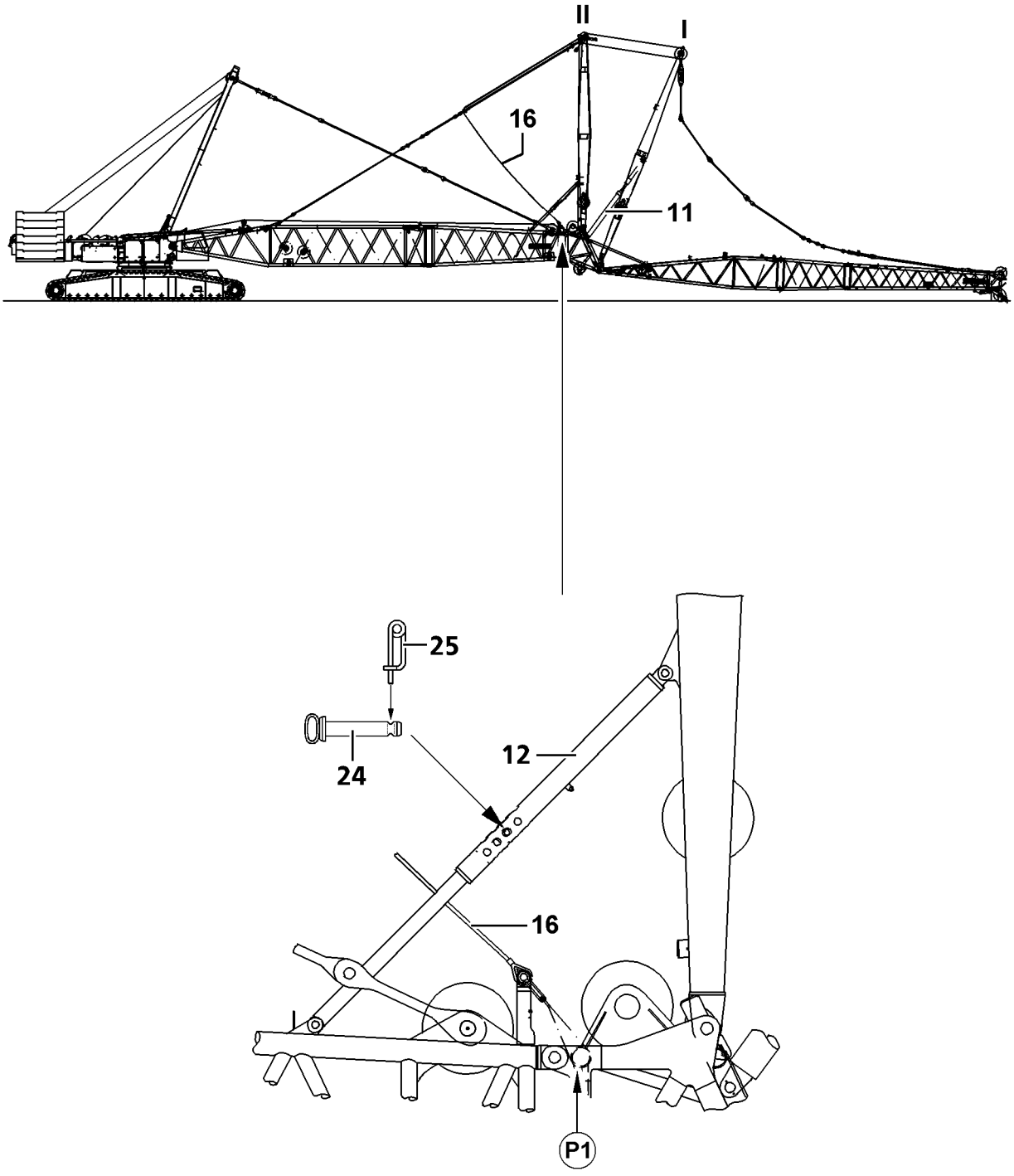
NOTICE
Damage to the N-relapse accumulator cylinder!
Before erecting the NA-bracket I, the electrical connections for the limit switches of the relapse accumulator cylinder **11** must have be established and manually actuated! If this is not the case, the NA-bracket I can be pulled back to the mechanical stop of the relapse accumulator cylinder **11** and be significantly damaged!
▶ Check the shut off with the limit switches of the relapse accumulator cylinder **11**!

▶ Establish the electrical connections to the limit switches of the relapse accumulator cylinder **11**.
▶ Manually actuate the limit switches individually.

Result:
- The icon appears on the LICCON monitor.
- The spool up function of the N-control winch (winch 5) turns off.

Note
▶ The guying between the NA-bracket II and the L-/SL-pivot section is tensioned by spooling out the hoist winch and simultaneously spooling up the N-control winch, due to the pressure in the relapse accumulator cylinder **11**!

▶ Spool out the hoist winch and at the same time, spool up the N-control winch (winch 5) until the guying between the NA-bracket II and the L-/SL-pivot section is tensioned.
▶ Insert the socket pin **24** in maximum possible length on the next bore of the NA-bracket II relapse support **12** and secure with spring retainer **25**.
▶ Continue to spool out the hoist winch.
▶ Disengage the hoist rope on the lock.
▶ Attach the assembly rope **16** on the NA-bracket II on point **P1**.
▶ Loosen the tackle on the guy rods.
▶ Erect the NA-bracket I by spooling up the N-control winch (winch 5) until the limit switch is actuated on the relapse accumulator cylinder **11**.



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2.5 Assembling the N-lattice jib

2.5.1 Assembly of the N-lattice jib on the N-pivot section

Note

▶ Adhere to the pin sequence described in chapter 5.01 during the assembly of the N-lattice jib!

Ensure that the following prerequisite is met:

– the N-end section has been placed in the pulley cart at assembly of the N-lattice jib, see crane operating instructions, chapter 5.15.

WARNING

General danger notes!

If the following notes are not observed, severe accidents can occur due to tipping or falling components!

Personnel can be severely injured or killed!

▶ Support the lattice sections at lattice jib assembly / disassembly with suitable materials!

▶ All pins are to be secured after assembly of the lattice sections with spring retainers!

▶ Check the guy rods in regular intervals!

▶ It is prohibited for anyone to remain under the lattice sections during the pinning / unpinning procedure!

▶ Assemble the N-lattice jib to the required length.

▶ Spool the hoist rope out and pull it to the N-end section and attach it there.

The guy rods are placed and secured for transport on the lattice sections. The transport retainers must be release prior to the assembly of the guy rods.

▶ Release the transport retainers on the guy rods.

Note

▶ Always pin the pins from the “inside” to the “outside”!

▶ The numbering on the assembly drawings must be identical to the numbering on the guy rods!

▶ Pin the guy rods of the N-end section to the guy rods of the NA-bracket I and secure.

▶ Tension the guy rods.

B195219

2.6 Establishing the electrical connections

NOTICE
Damage to the electrical connection on the cable drum!
If the electrical connection from the cable drum to the terminal box on the L-pivot section is established first before the connection to the terminal box on the L-end section, the electrical connection can be damaged when spooling out the cable drum!

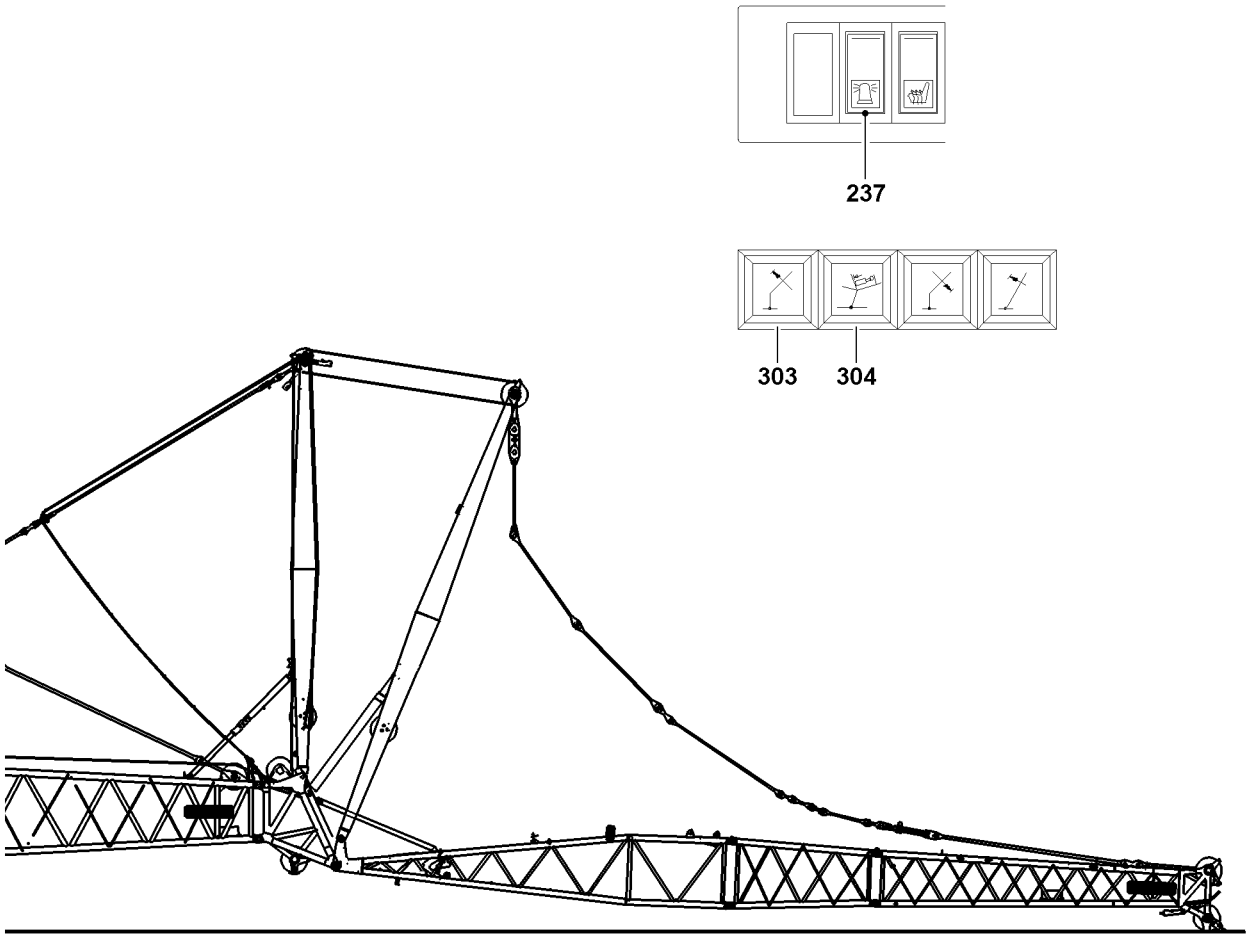
▶ Make the electrical connection from the cable drum in the L-pivot section to the terminal box on the L-end section first and then the electrical connection from the terminal box in the L-pivot section to the cable drum!

Note

▶ To establish the electrical connections on the boom, use the separate electrical wiring diagram!

Make sure that the following prerequisites are met:
– the N-boom is completely assembled,
– the airplane warning light and the wind speed sensor are installed.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.



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2.7 Function check

Make sure that the following prerequisites are met:
- all electrical connections have been established,
- the engine is running,
- the appropriate operating mode is set,
- the actuator levers of the limit switches have been checked for easy movement and are lubricated.

2.7.1 Airplane warning light*

▶ Turn the airplane warning light on with switch **237** and visually check the function.

2.7.2 Wind speed sensor*

▶ Test the movement and the function of the wind speed sensor.

2.7.3 Hoist limit switch

▶ Actuate the hoist limit switch manually on the pulley head.

Result:
- The “Hoist top” icon on the LICCON monitor blinks.
- The **spool up function** of the hoist winch turns off.

2.7.4 Limit switch lattice jib, “steepest” position, relapse cylinder

Note

▶ The switch point of the limit switches on the relapse cylinder must be checked before erection, see crane operating instructions, chapter 8.12!

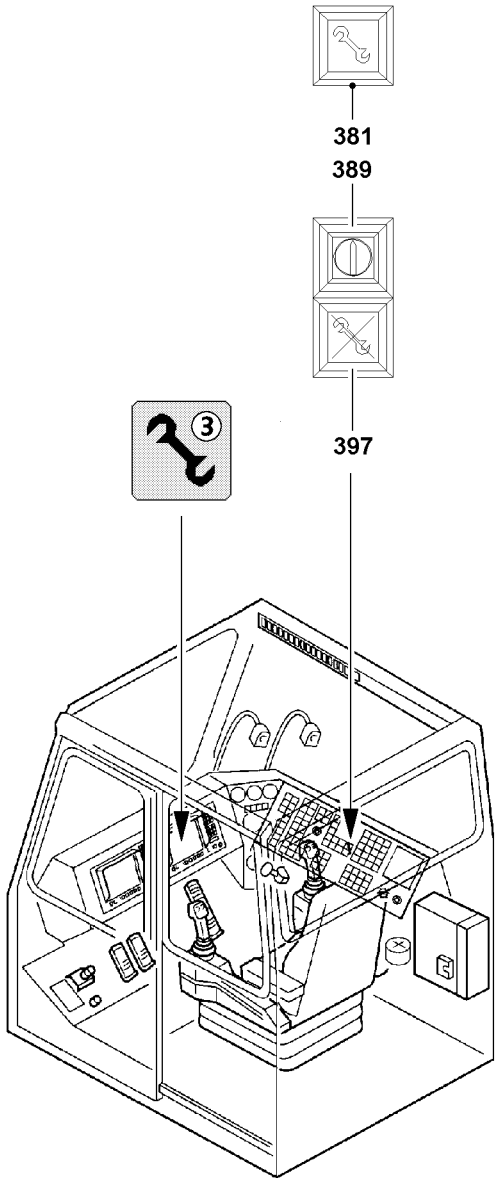
▶ Manually actuate the limit switches on the relapse cylinder individually.

Result:
- The N-control winch movement “spooling up” turns off.
- The indicator light **304** lights up.

2.7.5 Limit switch lattice jib, “steepest” position, mechanical relapse support

▶ Manually actuate the limit switches on the pendulum individually.

Result:
- The N-control winch movement “spooling up” turns off.
- The indicator light **303** lights up.



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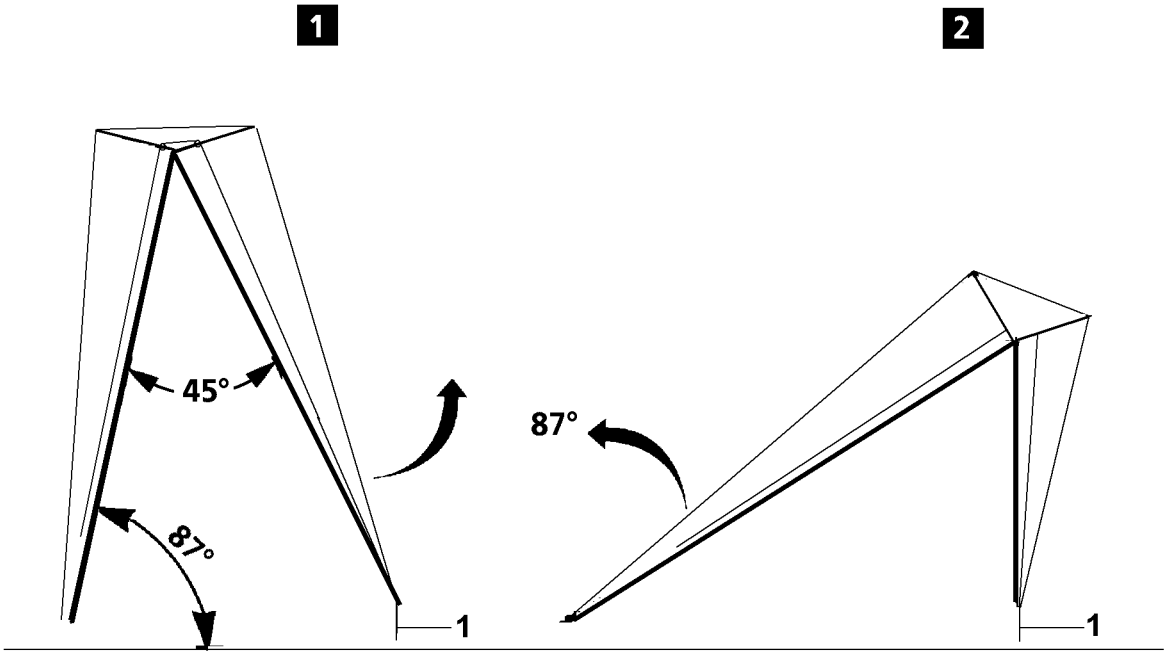
2.8 Erecting boom

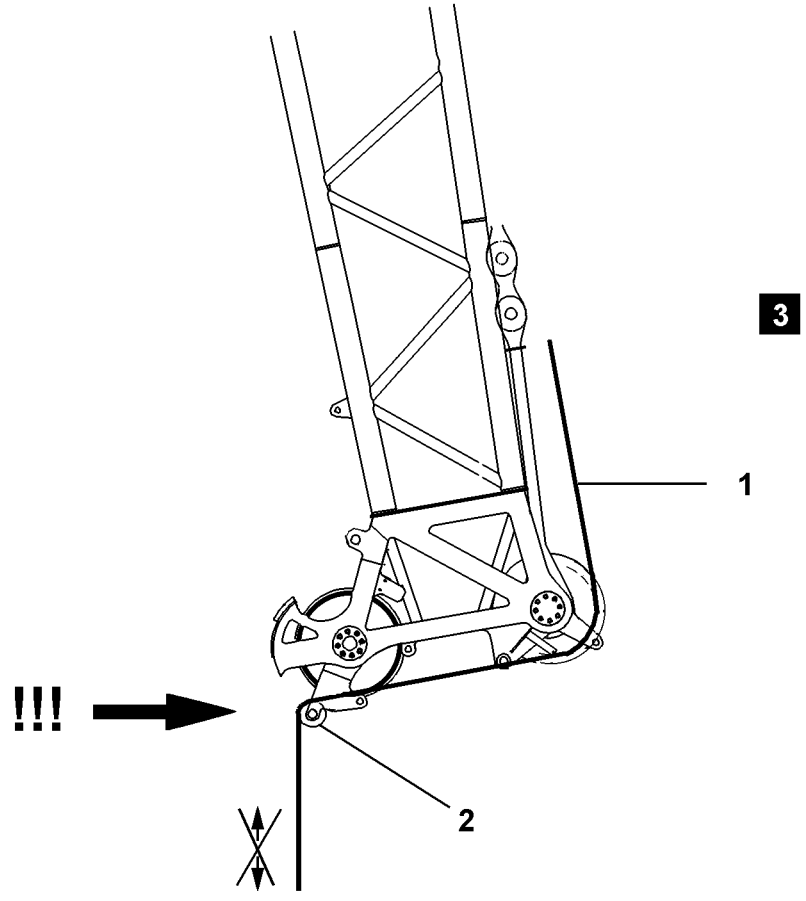
DANGER
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Move the relapse cylinder out before erection!

Make sure that the following prerequisites are met:
- – the crane is aligned in horizontal direction,
- – all electrical connections have been established,
- – all limit switches have been correctly installed and are fully functional,
- – the counterweight is installed on the turntable and on the derrick according to the load chart and the erection chart,
- – the lattice jib has been assembled according to the load chart and the Operating instructions,
- – the easy movement of the pendulum on the mechanical relapse support must be checked over the entire swing range,
- – all pin connections have been secured,
- – no personnel is within the danger zone,
- – there are no loose parts on the boom or the lattice jib,
- – the hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the corresponding rope retaining pins,
- – the LICCON overload protection has been adjusted according to the data in the load chart,
- – the LICCON overload protection settings have been compared with the current crane configuration,
- – in winter, the boom, the lattice jib and their components (limit switches, cable drum, airplane warning light, wind speed sensor) must be kept free of ice and snow,
- – the assembly key button **389** is actuated,
- – the indicator light **381** lights up,
- – the assembly icon **3** on the LICCON monitor blinks,
- – the hoist rope is attached to the end section.

WARNING
Falling components!
When erecting the N-boom combination, loose or incorrectly installed components can fall down!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!

DANGER
Tipping lattice jib!
If the easy movement on the pendulum of the mechanical relapse support is **not** checked before erection or **not** reestablished, if necessary, then the mechanical relapse support will not engage in steep lattice jib position! As a result, the lattice jib can tip to the rear!
Personnel can be severely injured or killed!
- ▶ Check the easy movement on the pendulum of the mechanical relapse support before erection!
- ▶ If the pendulum does not move easily: Make the pendulum easy to move!





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2.8.1 Erection procedure

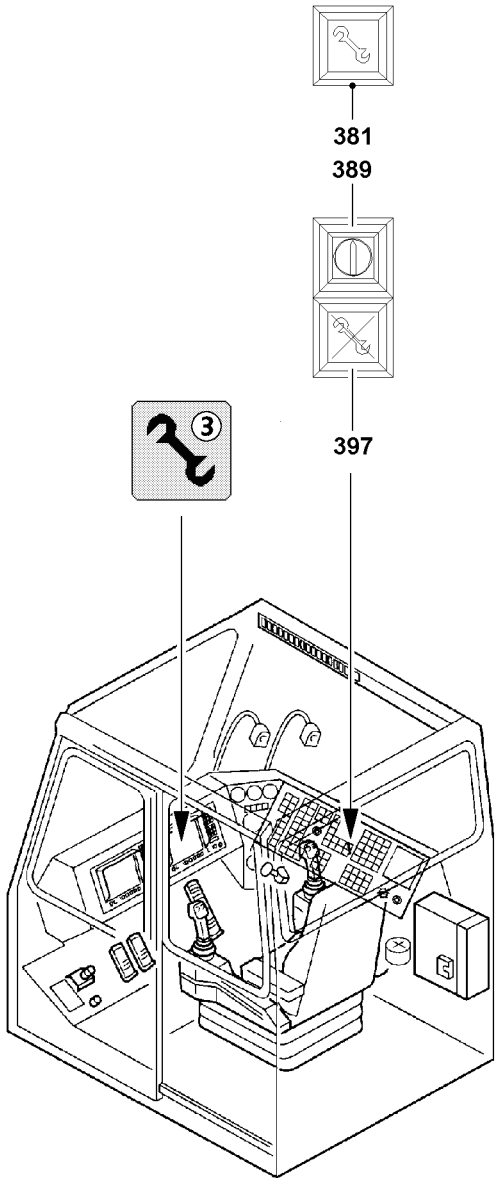
WARNING
The crane can topple over!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!
- ▶ The lattice jib must roll on the ground with its entire weight!
- ▶ Spool the lattice jib control out so that the guy rods sag slightly!
- ▶ Do not allow slack cable to build up on the control winch!

WARNING
Falling hoist rope!
If the hoist rope is not properly attached on the end section before the erection procedure, then it can fall down backward due to its own weight!
Personnel can be severely injured or killed!
- ▶ Attach the hoist rope properly on the end section before the erection procedure!

- ▶ Luff up the L-/SL-boom and simultaneously spool out the N-control winch to keep the lattice jib with the N-end section placed on the roller cart on the ground. Carry out this procedure until the boom and the N-lattice jib form an angle of more / equal to 45° or until the lattice jib has lifted off the ground first, fig. **1**, fig. **2**.
- ▶ Remove the roller cart on the N-end section, see crane operating instructions, chapter 5.15 Roller cart.
- ▶ Luff up the N-lattice jib to the **lowest** operating position.
- ▶ Luff up the L-/SL-boom until the N-end section lifts off the roller cart.

NOTICE
Damage to the hoist rope!
If the hoist rope is reeved on the hook block and changed over the “small guard rollers **2** ”, then the hoist gear may be moved any longer, since the hoist rope can be damaged by spooling up or out, see fig. **3**!
- ▶ Do not spool the hoist rope up or out!

- ▶ Loosen the hoist rope on the N-end section and reeve it in properly 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.



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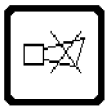
Note

▶ During the erection procedure - outside the operating area - the alarm functions listed in the chart are displayed as blinking on the crane operating screen!

Displays on the LICCON monitor during the erection procedure	
 *Icon: "STOP" blinks*	
 *Icon: "ERROR 150" blinks*	***Note:*** *For error description, see Diagnostics manual, chapter 20.05.*
 *Icon: "Horn" blinks*	***Note:*** *In addition to the "Horn" icon, an acoustic warning sounds.*

▶ Luff the L-/SL-boom up to the lowest operating position.

▶ When the operating range of the boom is reached:
Luff up the L-/SL-boom to the steepest boom position (87°).

▶ Luff up the N-lattice jib to the lowest operating position.

DANGER

The crane can topple over!

▶ When the lowest operating position is reached, the assembly key button **389** must be turned off immediately!

▶ The assembly key button **389** bypasses the safety devices!

▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!

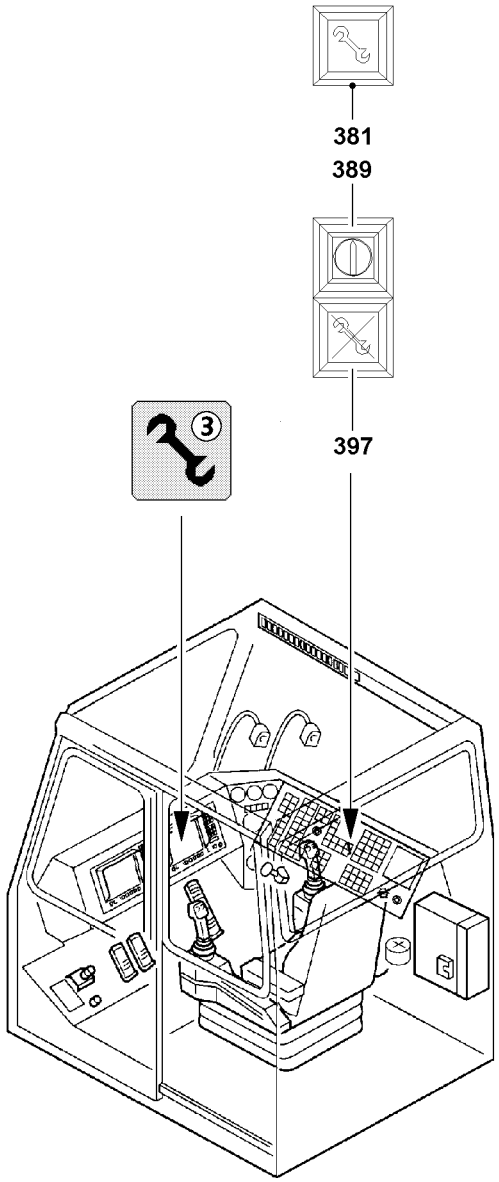
Note

▶ The operating position is reached if the blinking displays turn off and a load display appears in the "maximum load" symbol instead of question marks (???)!

▶ Turn the assembly key button **389** off by pressing the button **397**.

Result:

– The LICCON overload protection is active.
– The assembly icon **3** on the LICCON monitor turns off.
– The acoustical signal turns off.
– The red beacon on the crane operator's cab is off.



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3 Crane operation

Observe the notes in the crane operating instructions, chapter 4.05, 4.08 and 5.01.
Make sure that the following prerequisites are met:

– the LICCON overload protection has been set according to the data in the load chart,
– the assembly key button **389** has been turned off by pressing the button **397**,
– the assembly icon **3** on the LICCON monitor is off,
– the indicator light **381** is off.

DANGER
The crane can topple over!

▶ Check the horizontal position of the crane before and during operation!
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation!

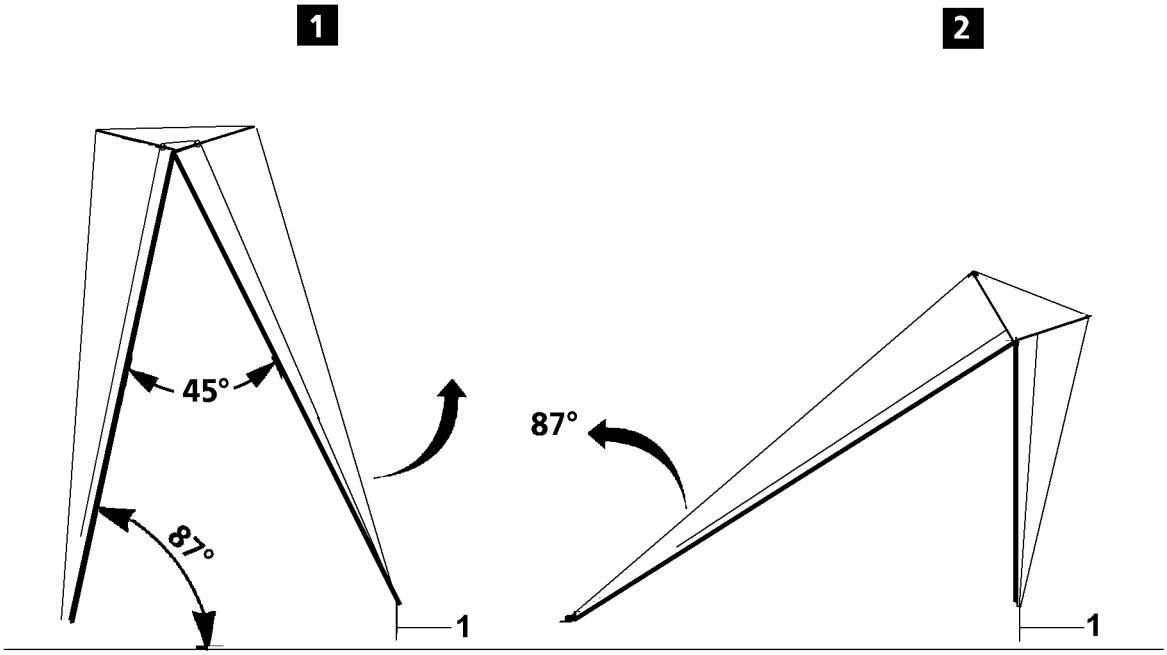
3.1 Checking the settings

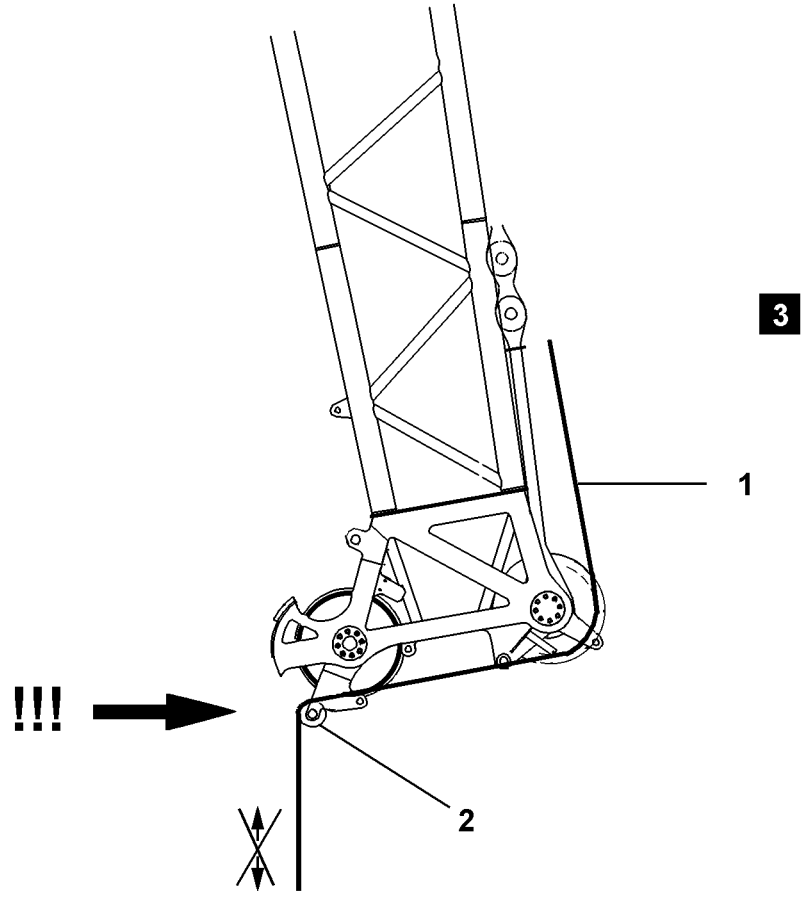
▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the limit switches “lattice jib steep” on the relapse cylinders.

3.2 Setting the boom to 67°/77°

Note

▶ **Before adjusting the boom to 67° or 77°**, the boom must be erected to the steepest boom position (87°) and the lattice jib to the steepest operation position!





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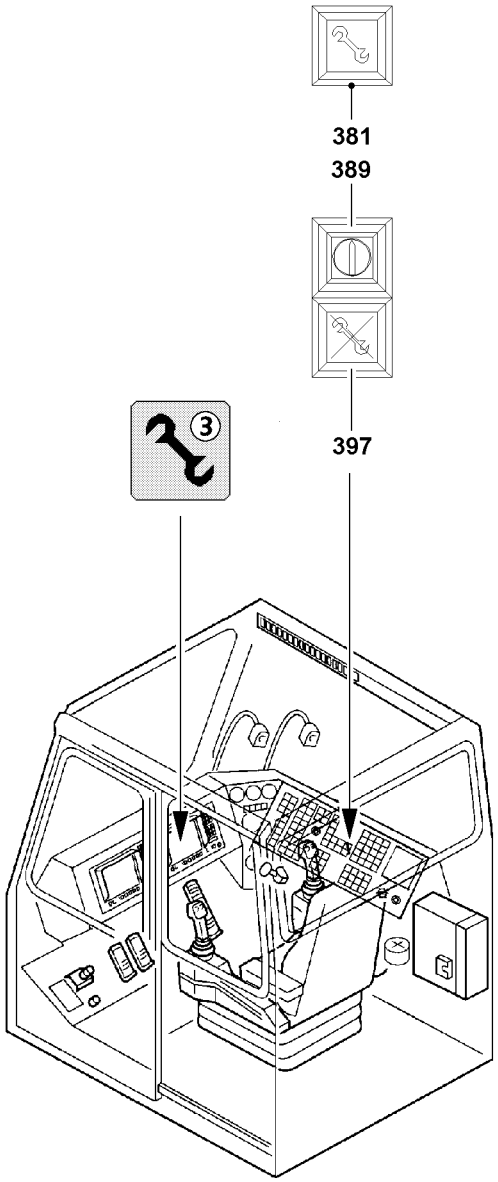
4 Disassembly

WARNING
When working aloft, there is a danger of falling!
If the following notes are not observed, the assembly personnel could fall and suffer life-threatening injuries!
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!
- ▶ Before any assembly / disassembly work and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also crane operating instructions, chapter 2.04!

DANGER
Danger of accident at assembly / disassembly of booms!
When you disassemble unsecured or unsupported booms, they can fall down!
Personnel can be severely injured or killed!
- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being assembled / disassembled!

DANGER
Falling components!
If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!
- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!



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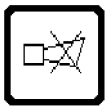
4.1 Setting down the boom

DANGER
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical notes, see the crane operating instructions, chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

Make sure that the following prerequisites are met:
– the L-/SL-boom is in the steepest position, 87°,
– the hook block is approx. 5 m below the pulley head of the lattice jib.

▶ Luff down the N-lattice jib to the **lowest** operating position. When the lowest operating position is reached the luff down movement is shut off.

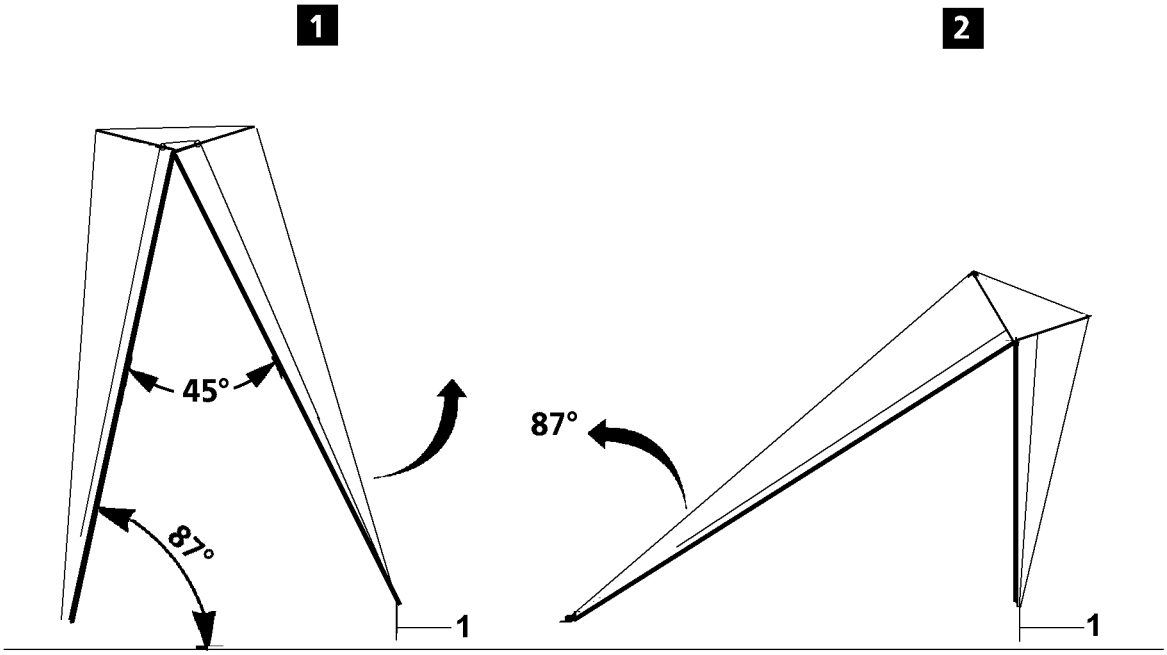
The load value in the “maximum load” icon disappears and question marks appear (????).
The following alarm functions become active:

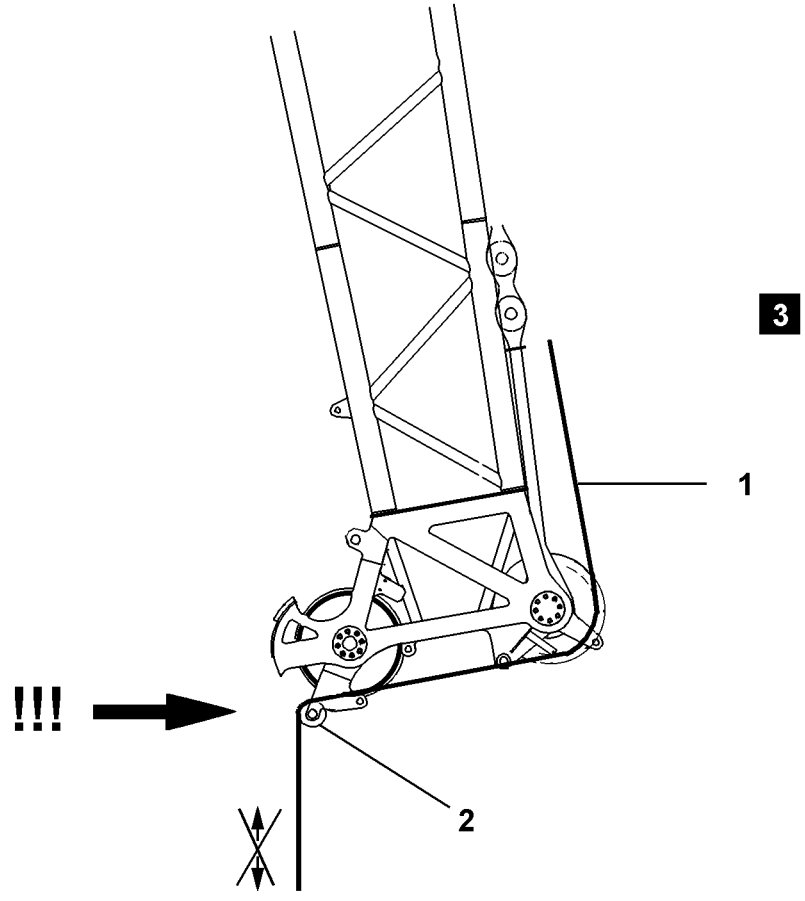
Display on the LICCON-Monitor after reaching the “lowest” operating position	
 *Icon: “STOP” blinks*	
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

DANGER
Risk of fatal injury at crane operation with turned on assembly key button!
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button **389** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
– The LICCON overload protection is inactive.
– The indicator light in the button **397** lights up.
– The Assembly icon **3** on the LICCON monitor blinks.
– An acoustical signal sounds.
– The red beacon on the crane operator's cab blinks.
– The horn sounds.





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▶ Continue to luff the N-lattice jib down until an angle of approximately 45° is reached between the boom and the N-lattice jib.

When the angle is reached, “lattice jib bottom” is shut off, the indicator light lights up.

▶ Luff down the boom.

CAUTION
Damage to crane!

▶ Luff the L-/SL-boom down and simultaneously spool the hoist winch out to prevent a collision between the hook block and the N-end section!

▶ Luff the L-/SL-boom down until the hook block touches the ground.

▶ Remove the hoist limit switch weight and unreeve the hook block.

▶ Luff the L-/SL-boom down until the N-end section is laying with the receptacle studs in the receptacles on the pulley cart.

NOTICE
Damage to the hoist rope!
If the hoist rope is reeved on the hook block and changed over the “small guard rollers **2** ”, then the hoist gear may be moved any longer, since the hoist rope can be damaged by spooling up or out, see fig. **3**!

▶ Do not spool the hoist rope up or out!

▶ Remove the roller cart on the N-end section, see crane operating instructions, chapter 5.15.

DANGER
The crane can topple over!

▶ Do not pull the hook block along on the ground!

▶ The lattice jib must roll on the ground with its entire weight!

▶ Do not allow slack cable to build up on the control winch!

▶ Continue to luff down the L-/SL-boom and simultaneously spool the N-lattice jib control out so that the guy rods sag slightly.

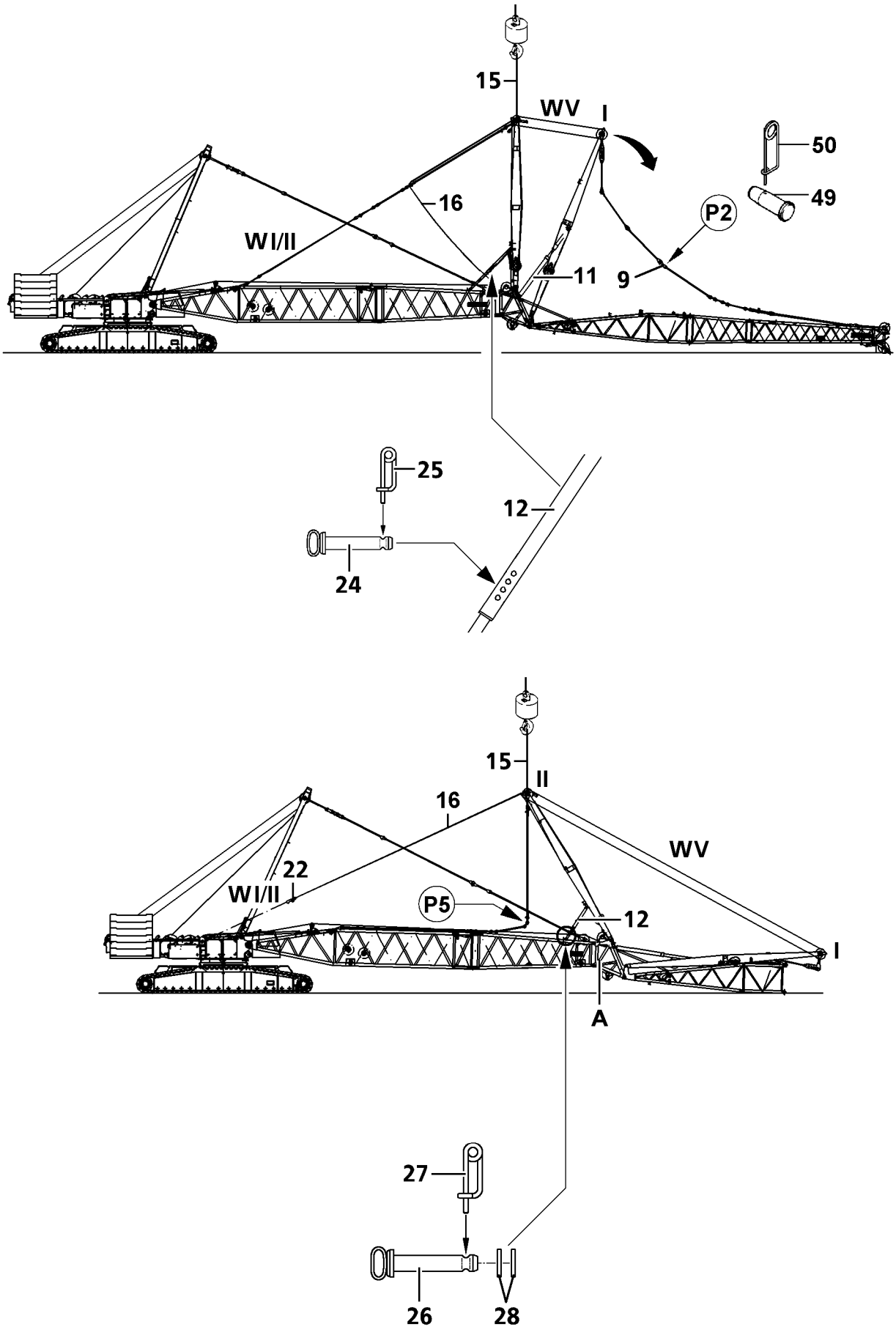
▶ Luff down the L-/SL-boom until the boom head is resting on the base support on the ground.

DANGER
Risk of accident!

▶ Make sure that no personnel may be found within the danger zone!

▶ Secure the hoist rope with the auxiliary rope and pull it back slowly over the rope pulleys in the NA-brackets and lower it toward the end section!

▶ Remove the hoist rope.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16
P2
WI/II
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WI/II
P5
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28

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4.2 Disassembling the guy rods

- ▶ Lower the NA-bracket I to the front: Spool the N-control winch **WV** out.
- ▶ Unpin the guy rods at the connector brackets **9** on point **P2**: Remove the spring retainer **50** and unpin the pin **49**.
- ▶ Place the guy rods from the NA-bracket I down and secure.
- ▶ Place the remaining guy rods on the lattice sections and secure.

WARNING
The lattice jib can fold down!
If the following notes are not observed, the lattice jib can suddenly fold down during unpinning!
Personnel can be severely injured or killed!
- ▶ The pivot section must be held by an auxiliary crane before unpinning the connector pins or it must be supported with suitable and stable materials!
- ▶ It is prohibited for anyone to remain under the lattice jib which is to be disassembled!

- ▶ Disassemble the N-lattice jib.
- ▶ Unpin the pin between the pivot section and the intermediate section.

NOTICE
Damage of the relapse accumulator cylinder!
By pulling the NA-bracket II up, significant damage can occur due on the relapse accumulator cylinder **11** to a defective or not connected limit switch- due to the block position!
- ▶ The electrical connections to the limit switches on the relapse accumulator cylinders have been established!
- ▶ “Spool up winch 5” must turn off when the limit switches on the relapse accumulator cylinders are actuated!

- ▶ Disengage the assembly rope **16** on the NA-bracket and hang the hoist rope of winch 1 / winch 2 **WI/II** into the lock **22**.
- ▶ Spool the N-control winch **WV** up and pull the NA-bracket I up until the guying from the NA-bracket II to the pivot section is tensioned due to the counterpressure of the relapse accumulator cylinder **11**.

Result:
– The relapse support **12** can be unpinned.

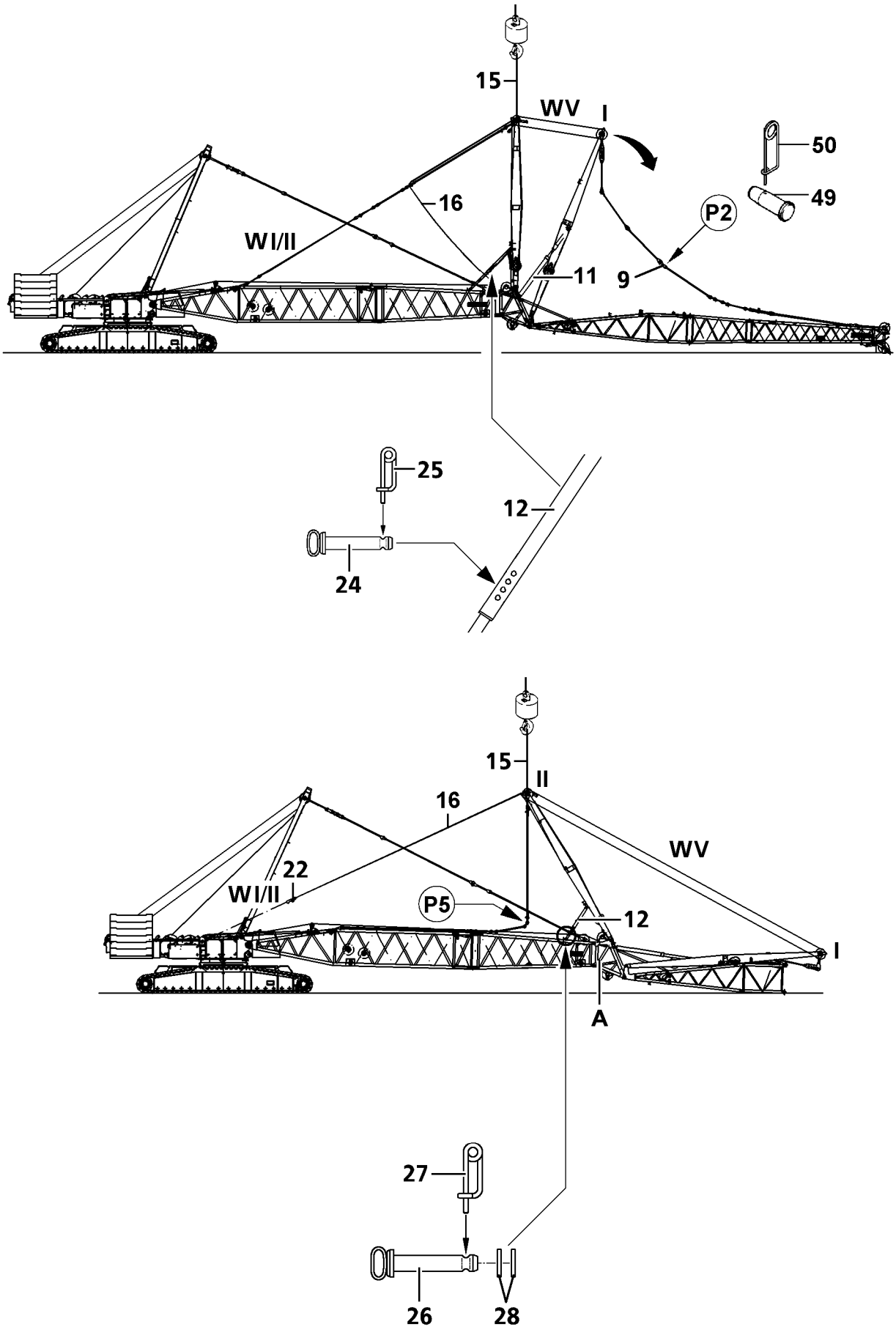
- ▶ Remove spring retainer **25** and socket pin **24**.
- ▶ Lower the NA-bracket I until it rests on the N-pivot section.
- ▶ Pull the NA-bracket II back by spooling up the hoist winch and spooling the N-control winch **WV** out simultaneously and unpin the guy rods from the NA-bracket II to the pivot section on point **P5**.
- ▶ Place the guy rods on the lattice sections and secure.

NOTICE
Damage of socket pins **24** and the NA-bracket II!
If the NA-bracket II is “pulled to the rear”, the socket pin **24** can be cut off and components of the NA-bracket II can be damaged!
- ▶ Make sure to unpin socket pins **24** before the NA-bracket II is “pulled to the rear”!

- ▶ Spool out the hoist winch and simultaneously spool up the N-control winch **WV**.

Result:
– The NA-bracket II is pulled up.

- ▶ Attach the assembly rope **15** on the NA-bracket II.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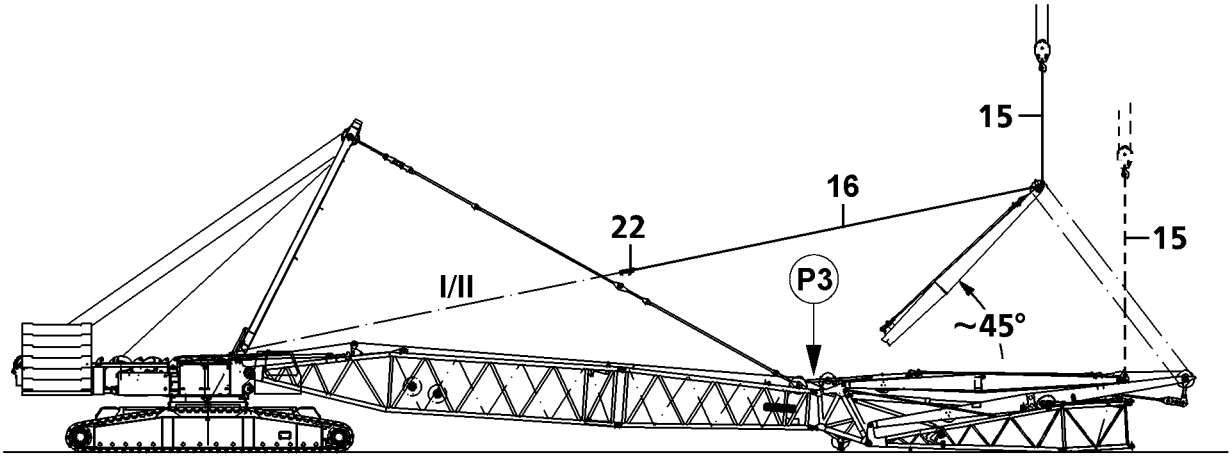
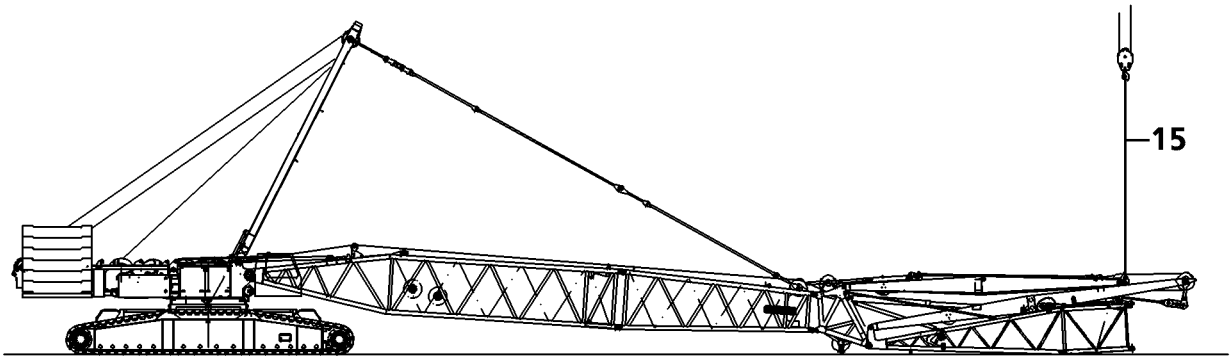
- ▶ Spool out the hoist winch and spool up the N-control winch **WV** until the NA-bracket II is in vertical position.
- ▶ Unpin the relapse support **12** on the L-adapter **A**.
- ▶ Remove the pin **26**, spring retainer **27** and washers **28**.





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4.3 Place the NA-bracket II down

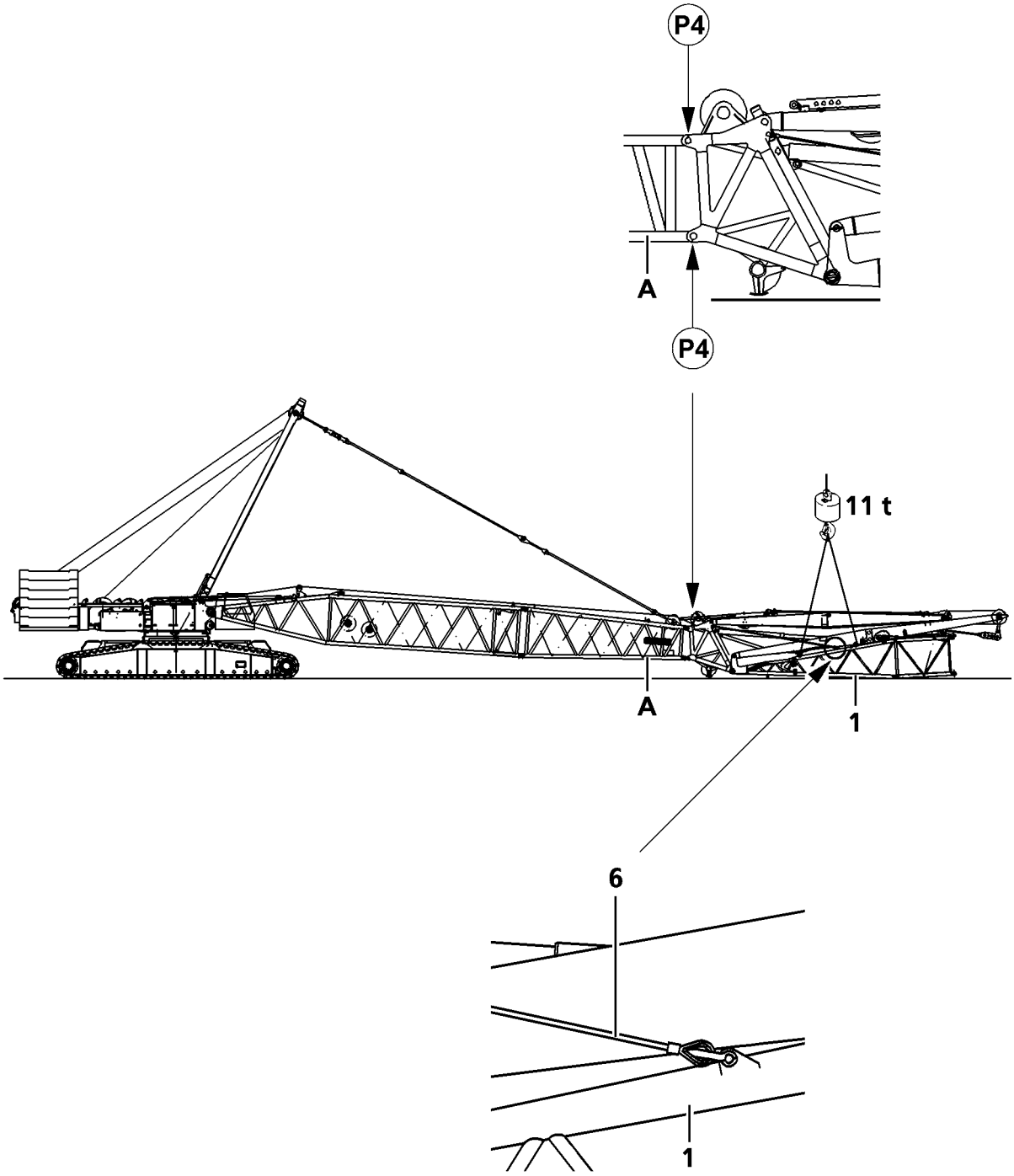
▶ Attach the assembly rope **15** on the NA-bracket II.

WARNING
The NA-bracket can fold down!
If the NA-bracket II is not held with the auxiliary crane during take down, from approx. 45° to the horizontal, then the NA-bracket can fold forward by itself!
Personnel can be severely injured or killed!
▶ Attach the NA-bracket II on the auxiliary crane (assembly rope **15**)!
▶ Lower the NA-bracket II slowly!

▶ Pull the NA-bracket II forward by spooling up winch 5 and simultaneously spooling out the hoist winch until approx. 45° to the horizontal.

NOTICE
Danger of slack rope formation!
▶ Slowly spool up the control rope when placing the NA-bracket II down!
▶ Hold the control rope tight when spooling up!

▶ Lower the NA-bracket II until it is placed on the NA-bracket I.
▶ Disengage the hoist rope on the lock **22** of the assembly rope **16** and engage the assembly rope **16** on the L-adapter at point **P3**.
▶ Remove the assembly rope **16** on the auxiliary crane and attach on the NA-bracket II.
▶ Unreeve the control rope and reeve in the auxiliary rope for the reeving at the same time.



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4.4 Unpinning the assembly unit on the L-/SL-boom

- ▶ Pin and secure the retaining rope **6** on the N-pivot section.
- ▶ Take on the N-assembly unit with the auxiliary crane on the attachment points on the N-pivot section.

Note

- ▶ The total weight of the assembly unit is approx. 11.0 t!

WARNING

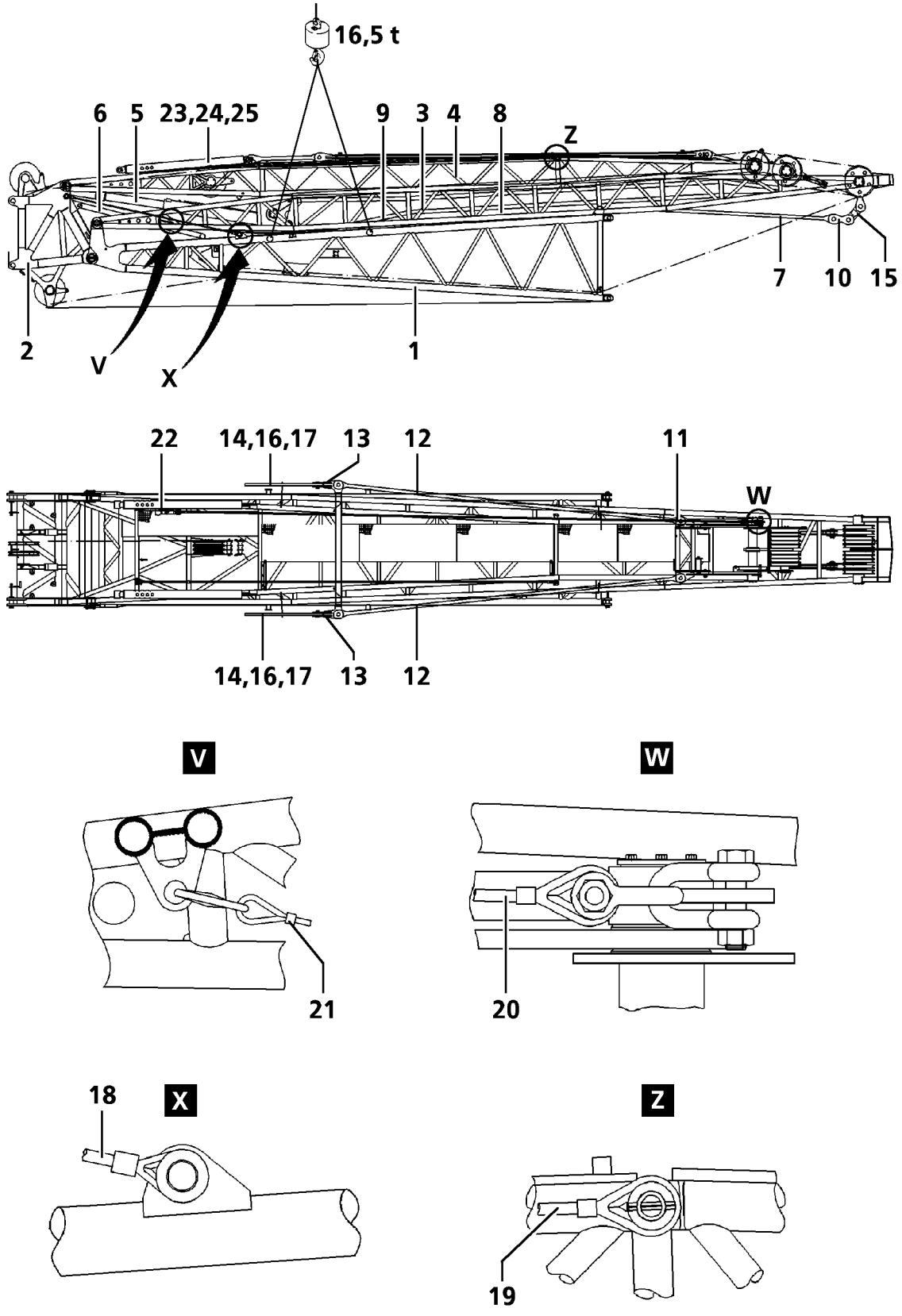
Mortal danger if the fold in head folds away!

If the following notes are not observed, the fold in head can fold away with the NA-bracket I and the NA-bracket II!

Personnel can be severely injured or killed!

- ▶ Before unpinning the assembly unit, it must be held with the auxiliary crane!
- ▶ The retaining rope **6** must be pinned and secured on the N-pivot section **1**!
- ▶ It is prohibited for anyone to remain under the assembly unit!

- ▶ Unpin the N-assembly unit on the L-adapter **A** with the pin pulling device on top and bottom on points **P4**, see crane operating instructions, chapter 5.30.
- ▶ Remove the N-assembly unit with the auxiliary crane and place it down.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1 General

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

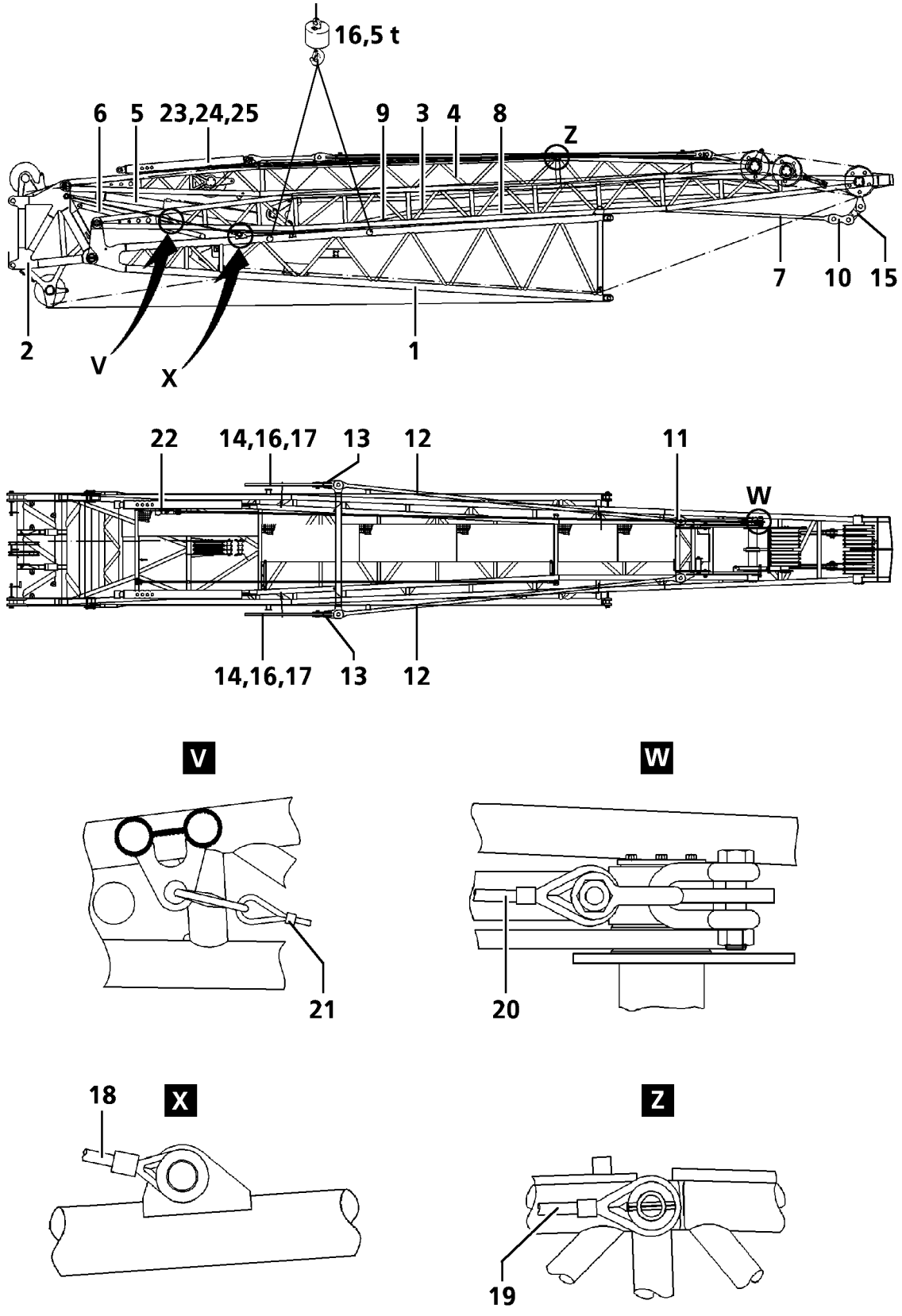
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!
- ▶ Before any assembly / disassembly work and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also chapter 2.04!

DANGER
Danger of accident at assembly / disassembly of booms!
When you disassemble unsecured or unsupported booms, they can fall down!
Personnel can be severely injured or killed!

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being assembled / disassembled!

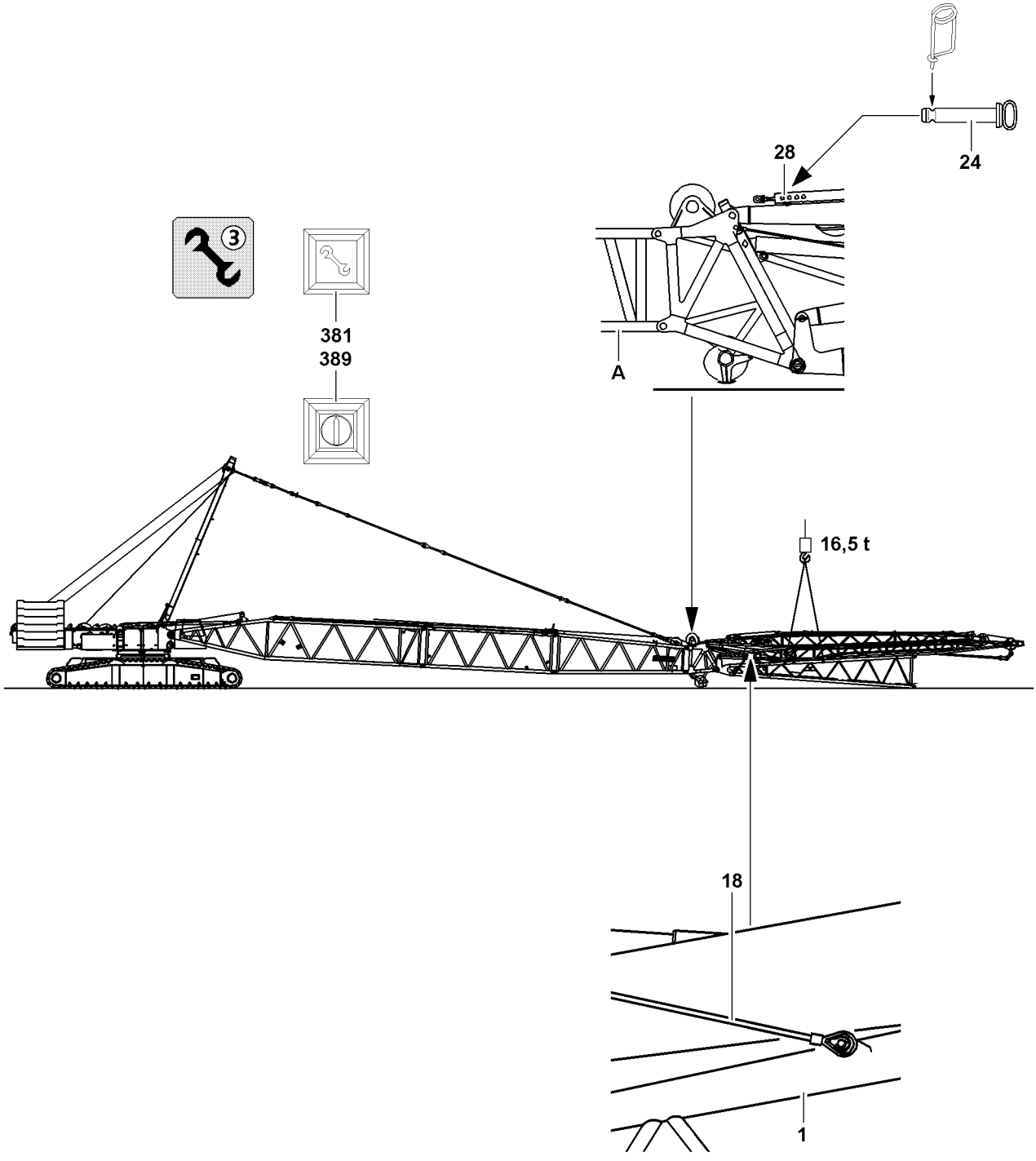
1.1 Component overview of assembly unit

Component overview	
Position	**Item**
1	W-pivot section
2	S-end section 100 t
3	WA-bracket I
4	WA-bracket II
5	W-relapse cylinder
6	Mechanical relapse support
7	Guy rod 4200 mm
8	Guy rod 4730 mm
9	Connector bracket 320 mm
10	Connector bracket 300 mm
11	Cross beam
12	Guy rod 6990 mm
13	Cross beam
14	Guy rod 1380 mm


16,5 t
6
5
23,24,25
9
3
4
8
Z
7
10
15
2
V
X
1
22
14,16,17
13
12
11
W
14,16,17
13
12
V
21
W
20
18
X
Z
19

B188559

Component overview	
Position	**Item**
15	Test bracket
16	Spring retainer
17	Pin
18	Retaining rope
19	Assembly rope
20	Assembly rope
21	Tackle
22	Lock
23	WA-bracket II -Relapse support
24	Socket pin
25	Spring retainer



B105615

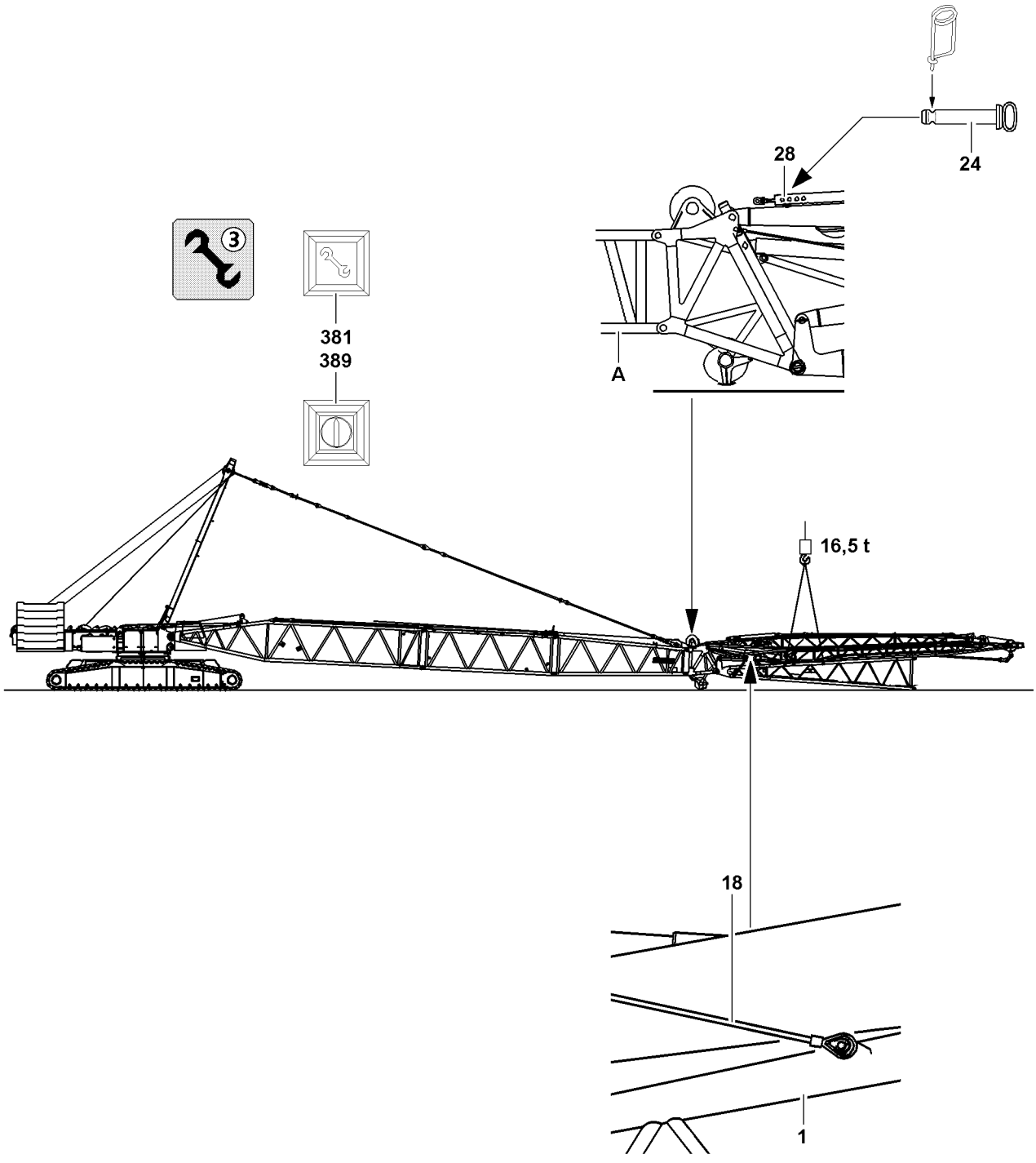
2 Assembly

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

- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must wear **approved anti-fall guards and protective equipment**, see chapter 2.04!

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The S-boom is installed.
- The counterweight is attached to the turntable according to the load chart and placed on the suspended ballast pallet / ballast trailer.
- The LICCON overload protection has been set according to the data in the load chart.
- The assembly key button **389** is pressed and the indicator light **381** lights up.
- The assembly icon **3** on the LICCON monitor blinks.
- An auxiliary crane is available.



B105615

2.1 Attaching the W-assembly unit to the S-boom

2.1.1 Adding the operating mode “Assembly”

DANGER
Risk of fatal injury at crane operation with turned on assembly key button!
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button **389** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is inactive.
- – The indicator light **381** lights up.
- – The Assembly icon **3** on the LICCON monitor blinks.
- – An acoustic signal sounds.
- – The red flashing beacon on the crane cab blinks.

2.1.2 Pinning the W-assembly unit to the S-boom

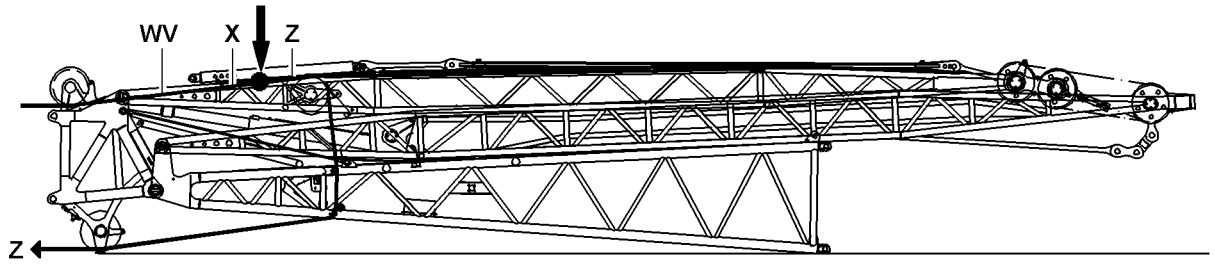
Take on the W-assembly unit with the auxiliary crane on the attachment points on the W-pivot section **1**.

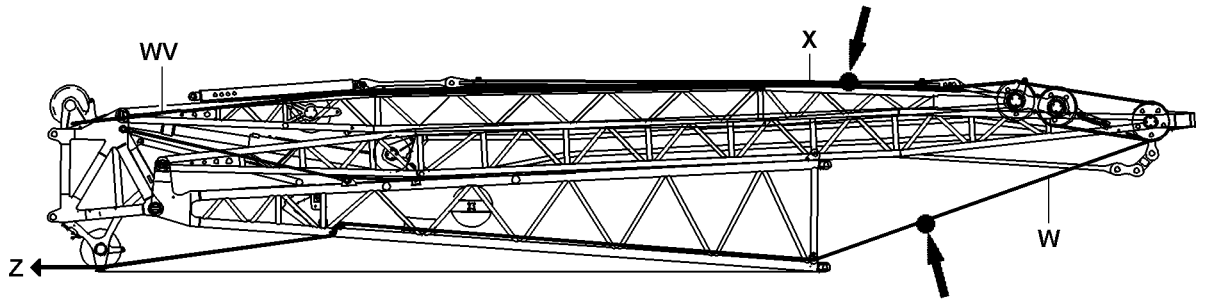
Note
▶ The total weight of the W-assembly unit is 16.5 t.

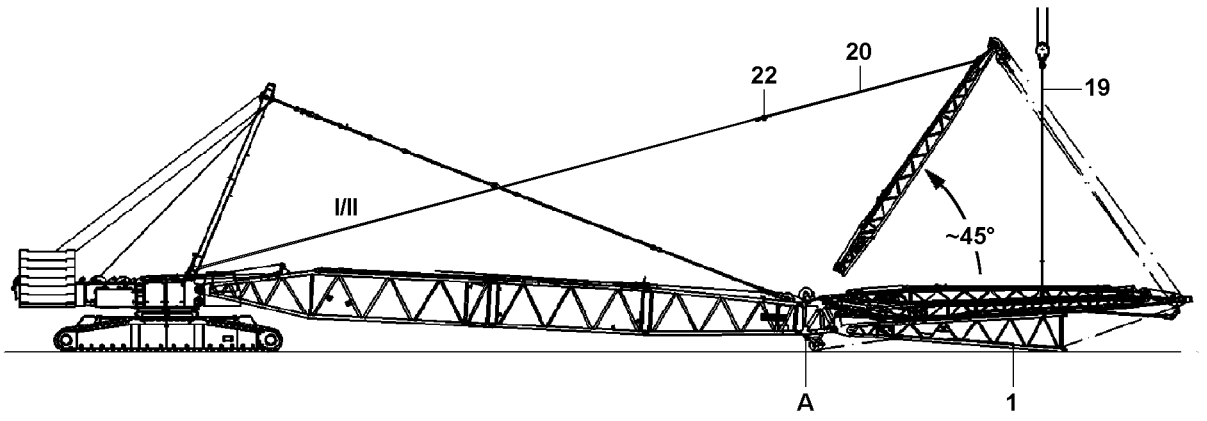
▶ Pin the W-assembly unit on the S-adapter **A** with the pin pulling device on top and bottom and secure with spring retainer.

DANGER
Mortal danger due to folding down pivot section!
The pivot section folds down by itself when the retaining rope is removed!
Personnel can be severely injured!
▶ The W-assembly unit must be secured with the auxiliary crane before removing the retaining rope.

▶ Remove the retaining rope **18**.
▶ Lower the W-assembly unit with the auxiliary crane until it is laying on the ground.
▶ Support the W-pivot section **1**.
▶ Release the socket pin **24** on the WA-bracket II relapse support.
▶ Unpin the socket pin **24** on the WA-bracket II relapse support.
▶ Pull the relapse support apart to the last bore.
▶ Pin and secure the socket pin **24**.







B105616

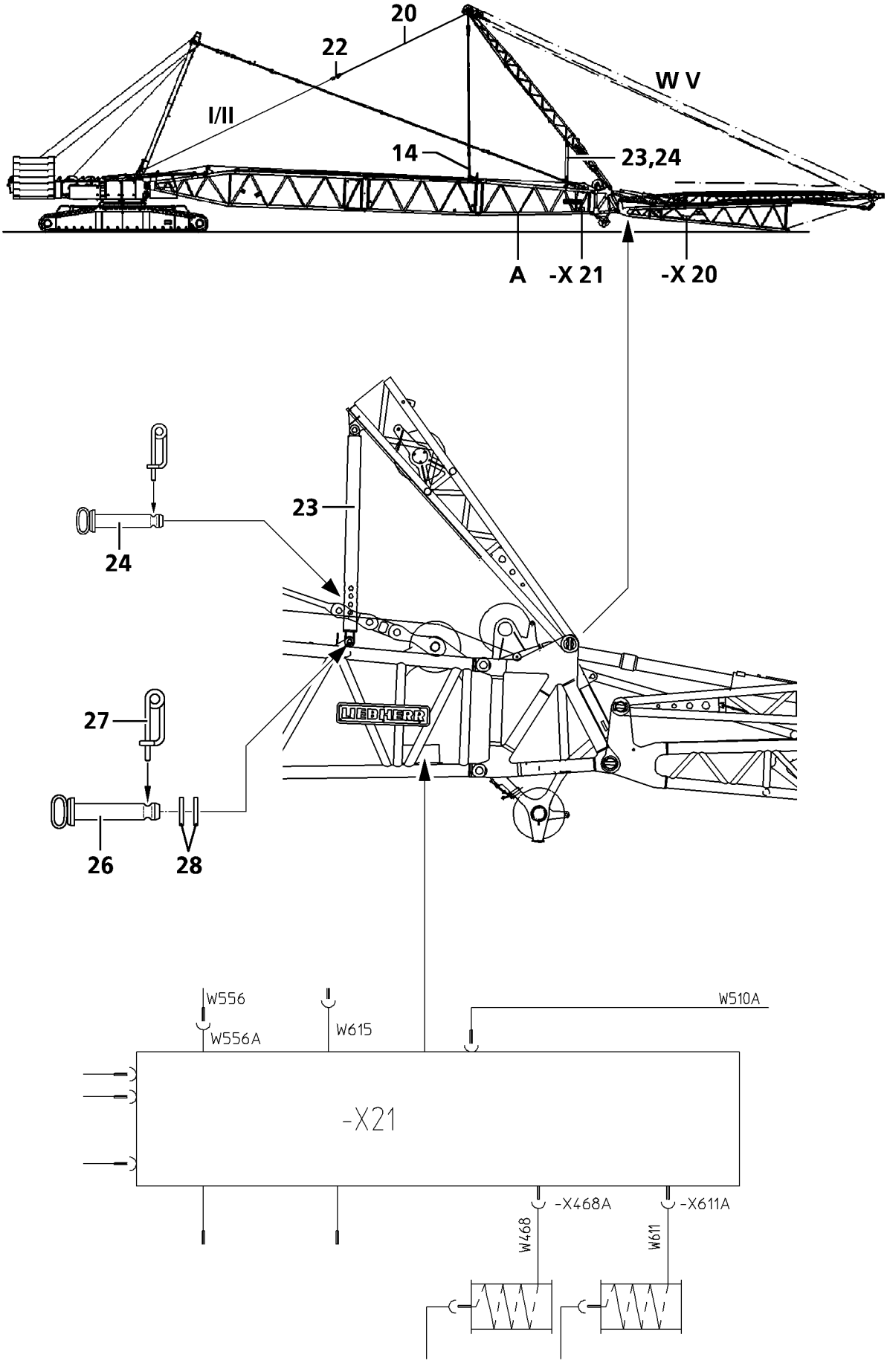
2.2 Reeve in the W-control rope between the WA-bracket I and the WA-bracket II

- ▶ Pull the auxiliary rope **Z** of the auxiliary winch over the change over pulleys to the turntable.
- ▶ Connect the auxiliary rope **Z** with the W-control rope **X** of winch 5 (WV).
- ▶ Spool the auxiliary winch up and spool winch 5 out simultaneously and pull the W-control rope to the WA-bracket II - watch the rope run, see fig. .
- ▶ Connect the W-control rope **X** and the auxiliary rope **Z** with the reeving rope **W** which is already reeved in between the WA-bracket I and the WA-bracket II - watch the rope run, see fig. .
- ▶ Spool the auxiliary winch up and simultaneously spool winch 5 out.
- ▶ Reeve in the W-control rope between the WA-bracket I and the WA-bracket II, for reeving, see chapter 4.06.

Note

- ▶ To prevent the WA-bracket II from pulling up, the control winch (winch 5) must be spooled out at the same time at erection.

- ▶ Attach the WA-bracket II on the assembly rope **19** to the auxiliary crane.
- ▶ Erect the WA-bracket II with the auxiliary crane to approx. 45°.
- ▶ Hang the hoist rope of winch 1 / winch 2 on the lock **22** of the assembly rope **20**.


20
22
W V
I/II
14
23,24
A
-X 21
-X 20
23
24
27
26
28
LIEBHERR
W556
W556A
W615
W510A
-X21
-X468A
-X611A
W468
W611

B105617

2.3 Assemble the guy rods between the WA-bracket II and the S-pivot section

Establish the electrical connections from the cable drums in the S-pivot section to the connector box **-X21** in the S-adapter.

- ▶ Plug in the cable **W468** on the cable plug **-X468A** of the connector box **-X21**.
- ▶ Plug in the cable **W611** on the cable plug **-X611A** of the connector box **-X21**.
- ▶ Continue to erect the WA-bracket II from approx. 45° with the hoist rope and the assembly rope **20** until the mechanical relapse support **23** can be pinned and secured on the S-adapter **A** with pin **26**, spring retainer **27** and two washers **28**.

NOTICE

Danger of property damage on WA-bracket II!

If the socket pin **24** is not unpinned after pinning the relapse support on the S-adapter, the WA-bracket II can be significantly damaged when “pulling it to the rear”!

- ▶ Make sure to unpin the socket pin **24**!
- ▶ Make sure that the socket pin **24** is unpinned!

- ▶ Unpin the socket pin **24** on the mechanical relapse support **23**.
- ▶ **Spool up** the hoist winch and simultaneously **spool out** the W-control winch.

Result:

– The WA-bracket II is pulled to the rear.

Pull the WA-bracket II to the rear until the guy rods of the WA-bracket II with the guy rods of the S-pivot section can be pinned and secured.

WARNING

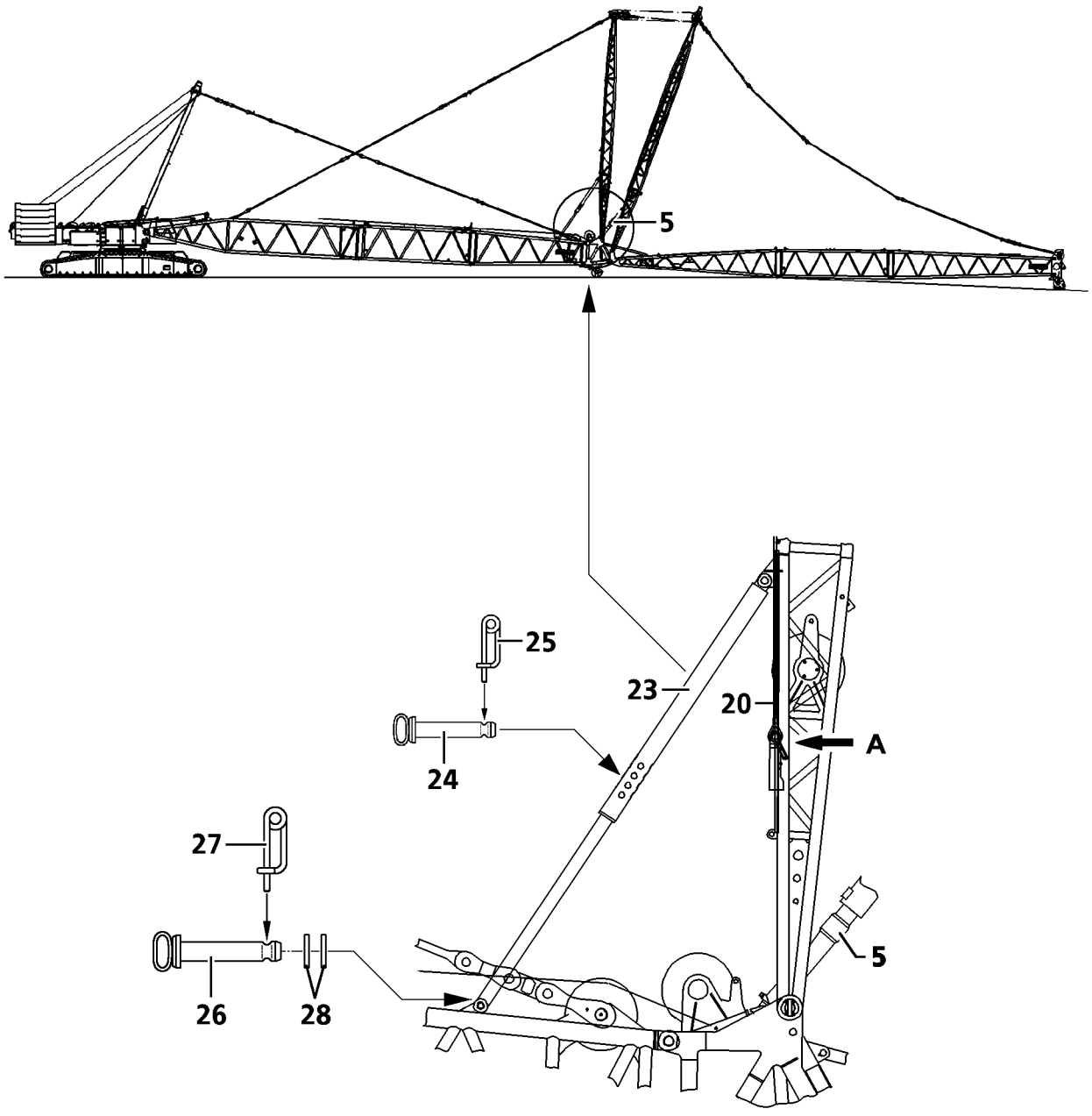
Danger of accidents due to incorrect pin connection(s)!

Due to incorrect pin connections, the pins can loosen up by themselves and dangerous situations can arise!

Personnel can be severely injured or killed!

- ▶ The pins on the guy rods must be pinned from the inside to the outside.
- ▶ Secure the pins from the outside.

- ▶ When the WA-bracket II has been pulled back far enough:
  Pin the guy rods of the WA-bracket II with the guy rods on the S-pivot section.
- ▶ Secure the pin connection.



B188564

2.4 Erect the WA-bracket II

Make sure that the following prerequisites are met:

– The limit switches on the W-relapse accumulator cylinder **5** have been checked manually for function.
– The WA-bracket II guy rods are pinned.

NOTICE

Damage to the W-relapse accumulator cylinder!

Before erecting the WA-bracket I, the electrical connections for the limit switches of the W-relapse accumulator cylinder **5** must have be established and manually actuated. If this is not the case, the WA-bracket I can be pulled back to the mechanical stop of the W-relapse accumulator cylinder **5** and be significantly damaged!

▶ Check the shut off with the limit switches of the W-relapse accumulator cylinder **5**.

▶ Establish the electrical connections to the limit switches of the W-relapse accumulator cylinder **5**.
▶ Manually actuate the limit switches individually.

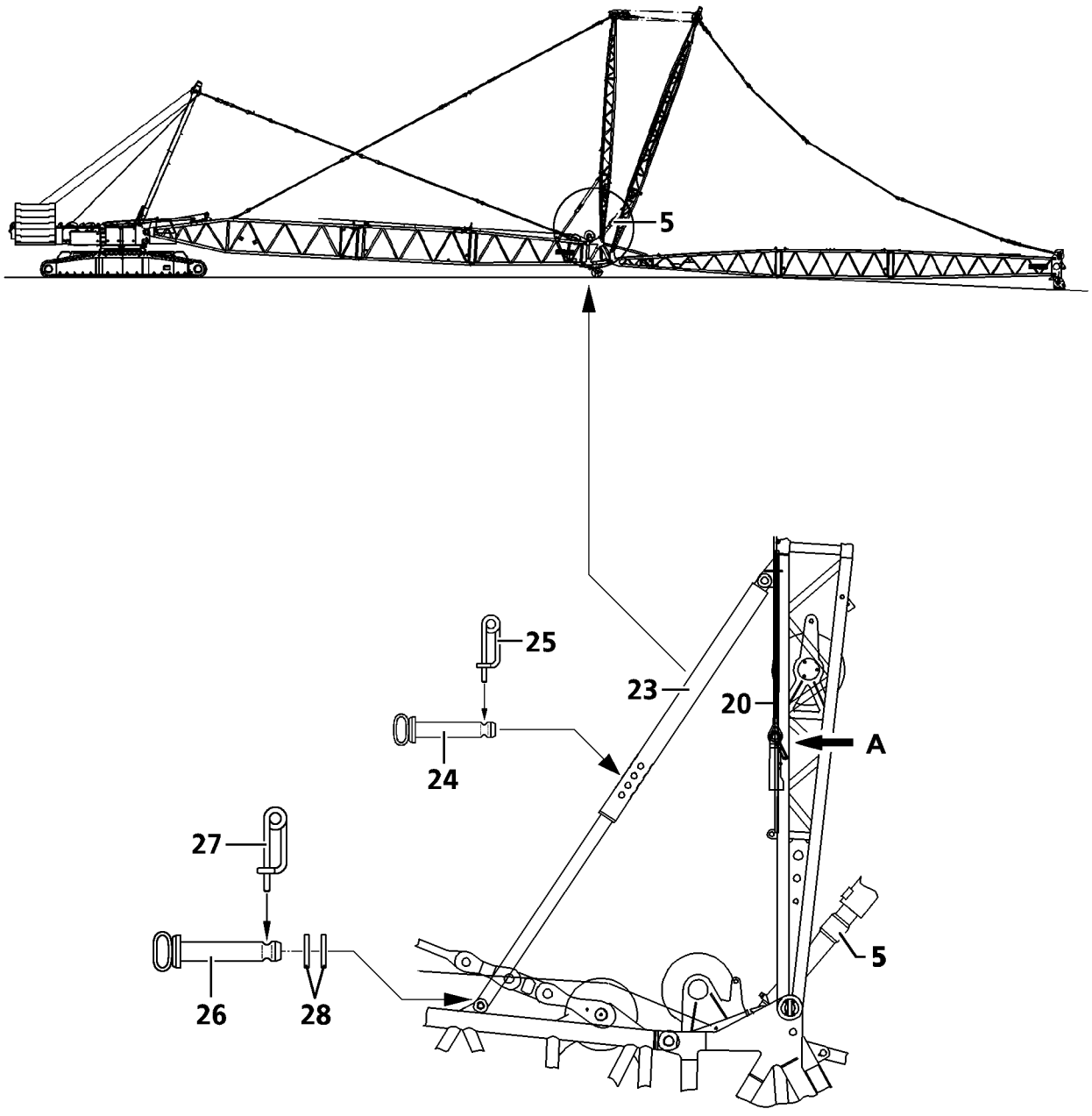
Result:

– The icon appears on the LICCON monitor.
– The spool up function of the W-control winch (winch 5) turns off.

Note

▶ The guying between the WA-bracket II and the S-pivot section is tensioned by spooling out the hoist winch and simultaneously spooling up the W-control winch, due to the pressure in the W-relapse accumulator cylinder **5**.

▶ Spool out the hoist winch and at the same time, spool up the W-control winch (winch 5) until the guying between the WA-bracket II and the S-pivot section is tensioned.
▶ Insert the socket pin **24** in maximum possible length on the next bore of the WA-bracket II relapse support **23** and secure with spring retainer **25**.
▶ Continue to spool out the hoist winch.
▶ Disengage the hoist rope on the lock.
▶ Attach the assembly rope **20** on A of the WA-bracket II.
▶ Loosen the tackle on the guy rods.
▶ Erect the WA-bracket I by spooling up the W-control winch (winch 5) until the limit switch is actuated on the W-relapse cylinder **5**.



B188564

2.5 Assembling the W-lattice jib

2.5.1 Assembly of the W-lattice jib on the W-pivot section

Note
▶ Adhere to the pin sequence described in chapter 5.01 during the assembly of the W-lattice jib!

Ensure that the following prerequisite is met:
– The W-end section has been placed in the pulley cart at assembly of the W-lattice jib, see chapter 5.15.

Note
▶ The air pressure in the tires of the pulley cart must be 9 bar.

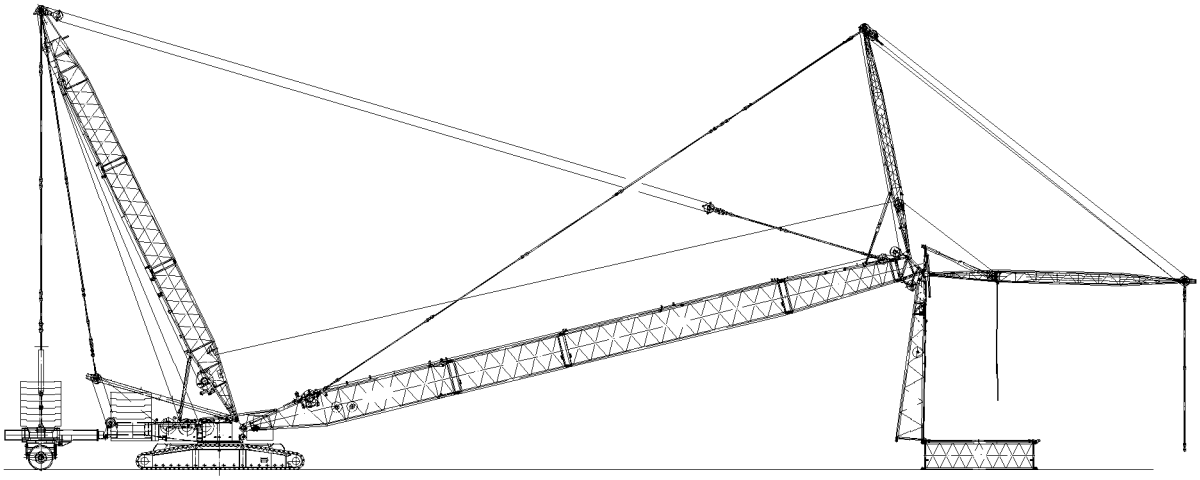
WARNING
General danger notes!
If the following notes are not observed, severe accidents can occur due to tipping or falling components.
Personnel can be severely injured or killed!
▶ Support the lattice sections at lattice jib assembly / disassembly with suitable materials!
▶ All pins are to be secured after assembly of the lattice sections with spring retainers!
▶ Check the guy rods in regular intervals!
▶ It is prohibited for anyone to remain under the lattice sections during the pinning / unpinning procedure!

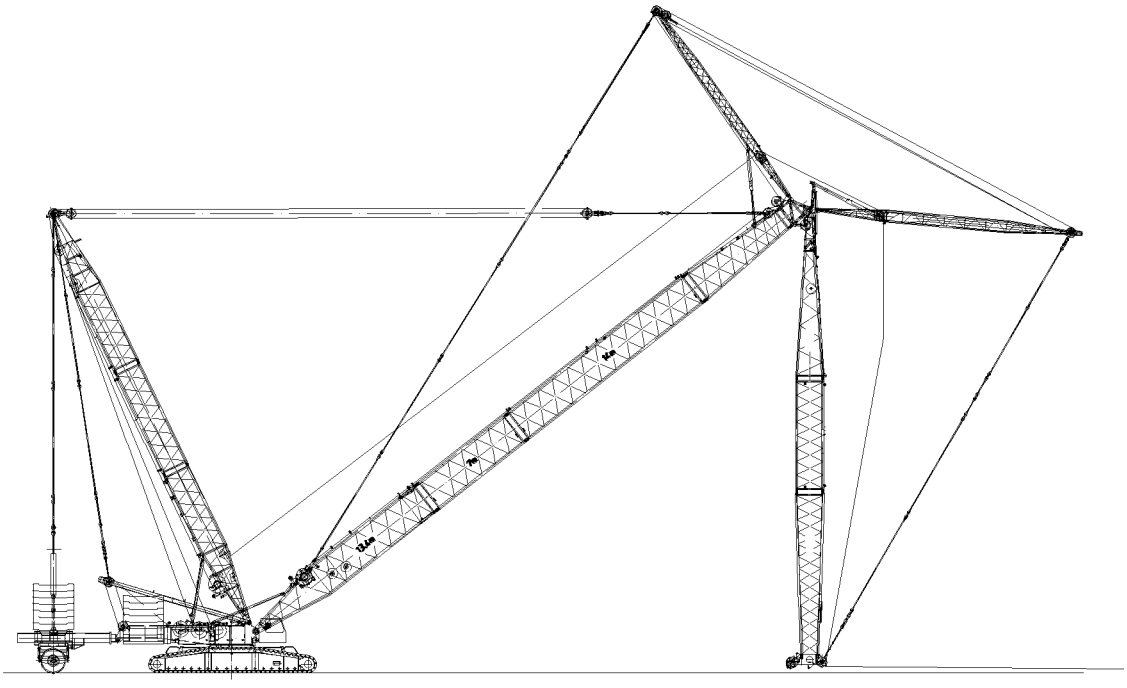
▶ Assemble the W-lattice jib to the required length.
▶ Spool the hoist rope out and pull it to the W-end section and attach it there.

The W-guy rods are placed and secured for transport on the W-lattice sections. Before assembly of the W-guy rods, the transport retainers must be released.
▶ Release the transport retainers of the W-guy rods.

Note
▶ Always insert the pins of the guy rods from the “inside” to the “outside”.
▶ The numbering on the assembly drawings must be identical to the numbering on the W-guy rods.

▶ Pin the W-guy rods of the W-end section to the W-guy rods of the WA-bracket I and secure.
▶ Tension the W-guy rods.





B195939

2.5.2 Flying assembly of the W-lattice jib on the W-pivot section

If spatial prerequisites on the job site are limited for the assembly of the W-lattice jib or if they are limited by buildings or similar, then the W-lattice jib can be installed in flying mode up to the following maximum lengths.

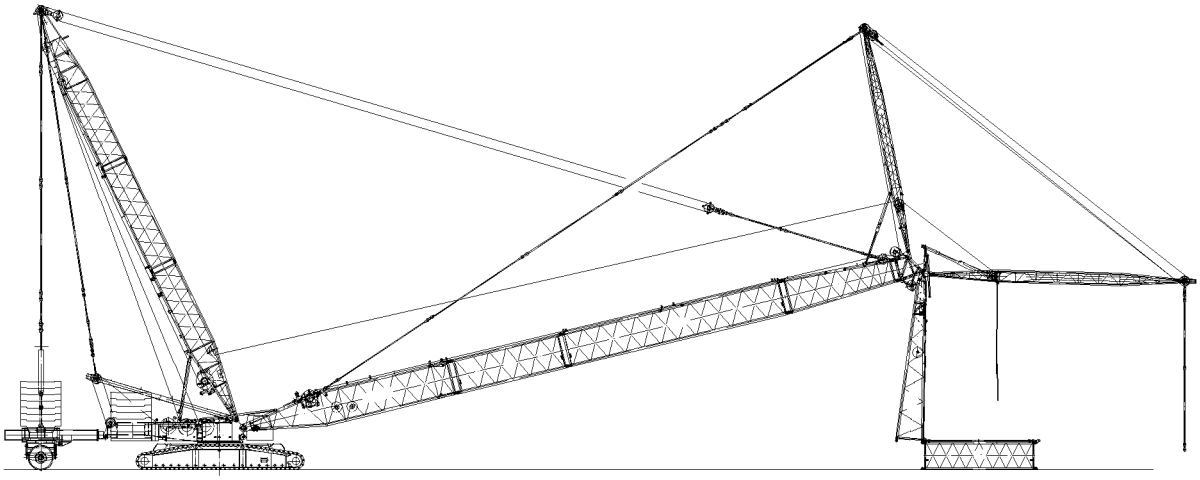
Flying assembly: hanging	
S-boom	**W-lattice jib**
S 42 m	W 28 m
S 49 m	W 35 m
S 56 m	W 42 m
S 63 m	W 42 m
S 70 m	W 49 m
S 77 m	W 56 m
S 84 m	W 56 m

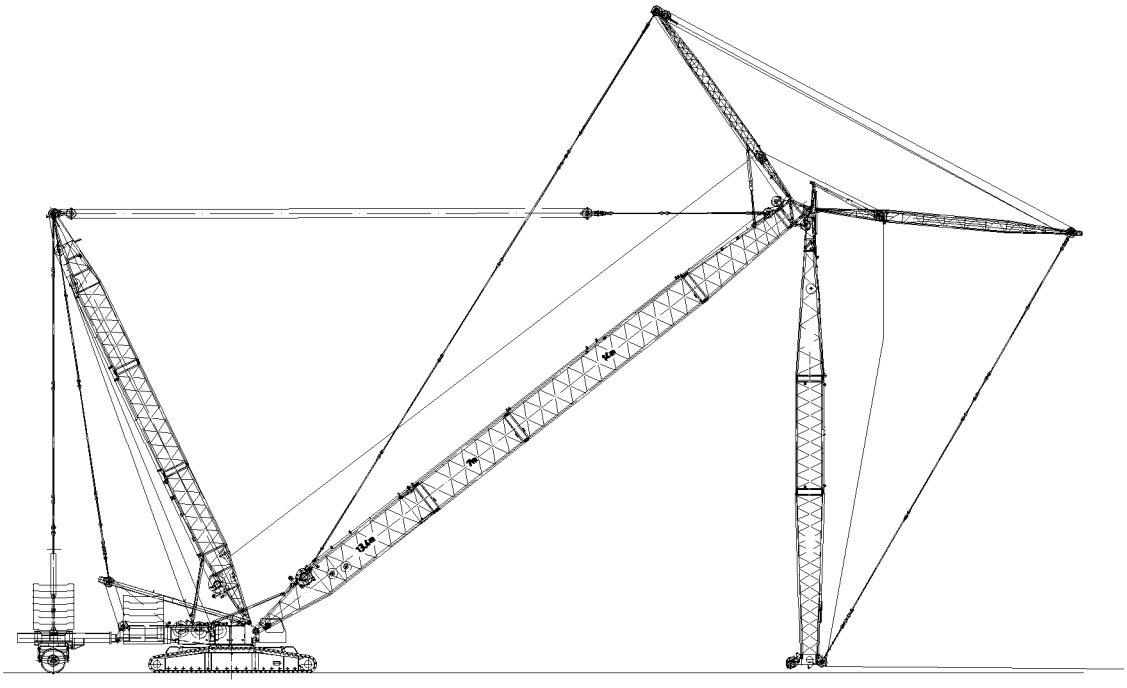
WARNING
Danger of toppling the crane!
If the data on the LICCON monitor does not match the actual crane condition, then the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Counterweight, central ballast and derrick ballast are installed according to the data in the load charts!
- ▶ Counterweight, central ballast and derrick ballast match with the settings on the LICCON monitor!

Note
- ▶ For the individual weights of the individual lattice sections, refer to chapter 5.03!

Make sure that the following prerequisites are met:
- The S-boom is assembled to the required length.
- The W-assembly unit is installed.
- The WA-bracket I and WA-bracket II are erected.
- The hoist rope is placed and pulled off over the rope pulleys of the WA-brackets.
- The cable from the cable drum to the end section is pulled off.

NOTICE
Danger of damage of the W-pivot section!
- ▶ The W-pivot section must be guided along with the auxiliary crane to prevent it from sliding on the ground and being damaged!





B195939

WARNING
Risk of fatal injury!
Severe accidents can occur if the following notes are not observed.
Personnel can be severely injured or killed!
- ▶ The maximum permissible W-lattice jib lengths may not be exceeded!
- ▶ The specifications in the load charts must be observed!
- ▶ It is prohibited for anyone to remain under the lattice sections during the unpinning / pinning procedure!

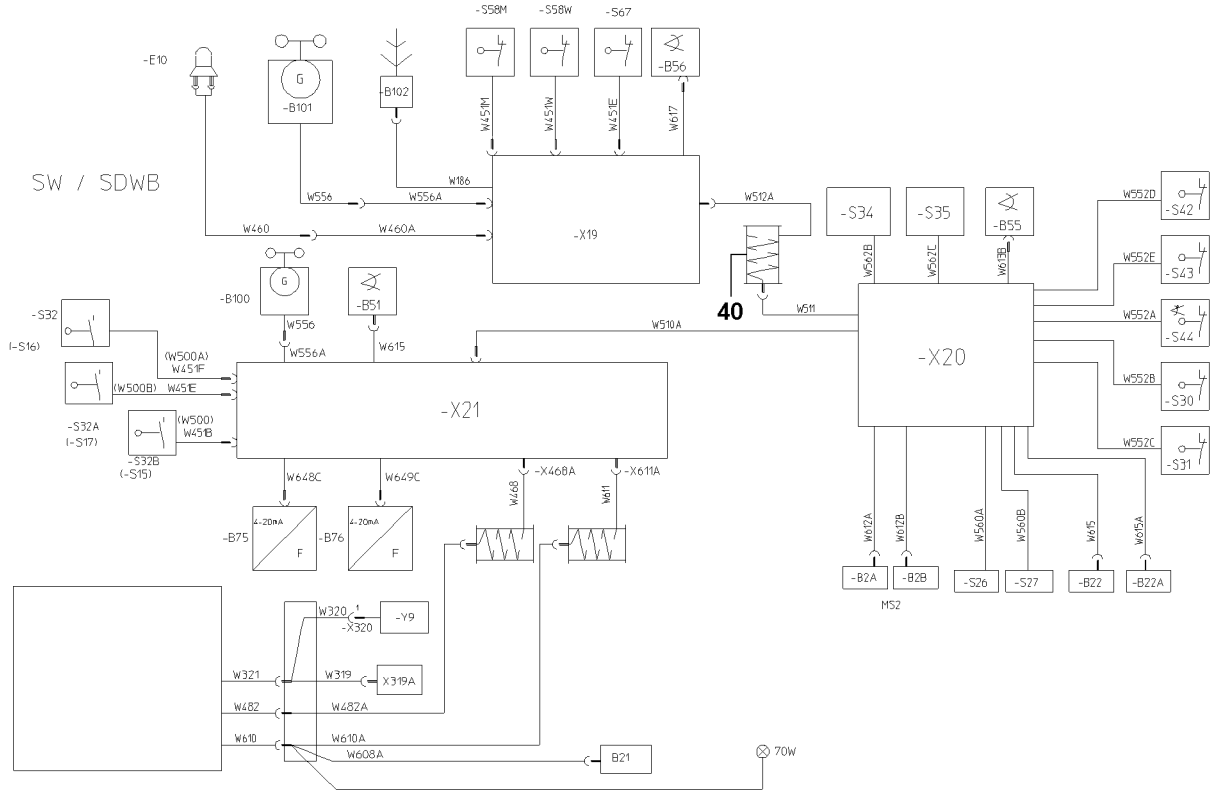
▶ Pull the S-boom up until the W-pivot section hangs vertically.

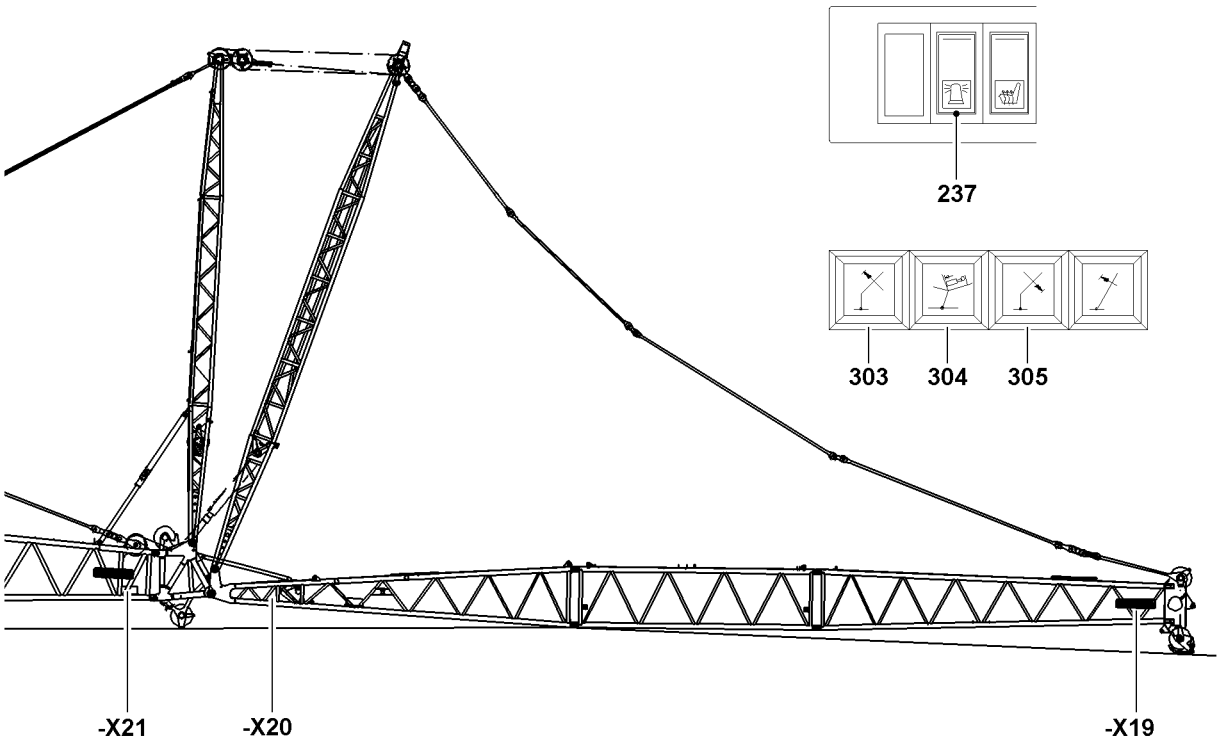
or

■ Pull the S-boom up until the angle between the S-boom and the W-pivot section is at least 45°.
▶ Lower the WA-bracket I to the front.
▶ Pin and secure the guy rods of the intermediate section to be installed first on the guy rods of the WA-bracket I.
▶ Pin and secure the first intermediate section on the pin bores on the W-pivot section “on top”.
▶ Continue to luff the S-boom up until the W-intermediate section hangs freely on the W-pivot section.
▶ Carefully luff the S-boom down until the W-intermediate section is standing upright on the ground.
▶ When the “lower” pin bores of the W-intermediate section align with the pin bores on the W-pivot section:
Pin and secure the W-intermediate section with the W-pivot section “on the bottom”.
▶ Assemble additional W-intermediate sections and the W-end section the same way individually and one after the other to the required length.
▶ Disassemble the guy rods of the additional W-intermediate sections on the intermediate section and pin and secure continuously on the guy rods on the WA-bracket I.

Note
▶ For the W-lattice jib lengths to 49 m, corresponding, additional guy rods must be installed, see separate rod diagram.

▶ Plug the cable of the cable drum in on the W-end section.


SW / SDWB
-E10
-B101
-B102
-S58M
-S58W
-S67
-B56
W451M
W451W
W451E
W617
W186
W556
W556A
W460
W460A
-X19
W512A
-S34
-S35
-B55
W562B
W562C
W561B
W552D
W552E
W552A
W552B
W552C
-S42
-S43
-S44
-S30
-S31
-B100
-B51
-S32
(-S16)
W556
W556A
W615
W510A
40
W511
-X20
(W500A)
W451F
(W500B)
W451E
-X21
-S32A
(-S17)
(W500)
W451B
-S32B
(-S15)
W648C
W649C
-X468A
-X611A
W468
W611
-B75
-B76
4-20mA
F
W672A
W672B
W560A
W560B
W615
W615A
-B2A
-B2B
-S26
-S27
-B22
-B22A
MS2
W320
-X320
-Y9
W321
W319
X319A
W482
W482A
W610
W610A
W608A
B21
70W


237
303
304
305
-X21
-X20
-X19

B105618

2.6 Establishing the electrical connections

Ensure that the following prerequisite is met:

– The W-boom is fully assembled.

▶ Establish the electrical connection from the terminal box W-pivot section **-X20** to the terminal box **-X21** on the adapter. Plug the cable plug **W510A** in on the terminal box **-X21**.

CAUTION

Damage to the electrical connection on the cable drum!

If the electrical connection from the cable drum to the terminal box **-X19** on the W-end section is made first and then the connection to the terminal box **-X20** on the W-pivot section, the electrical connection may be damaged when spooling out the cable drum **40**.

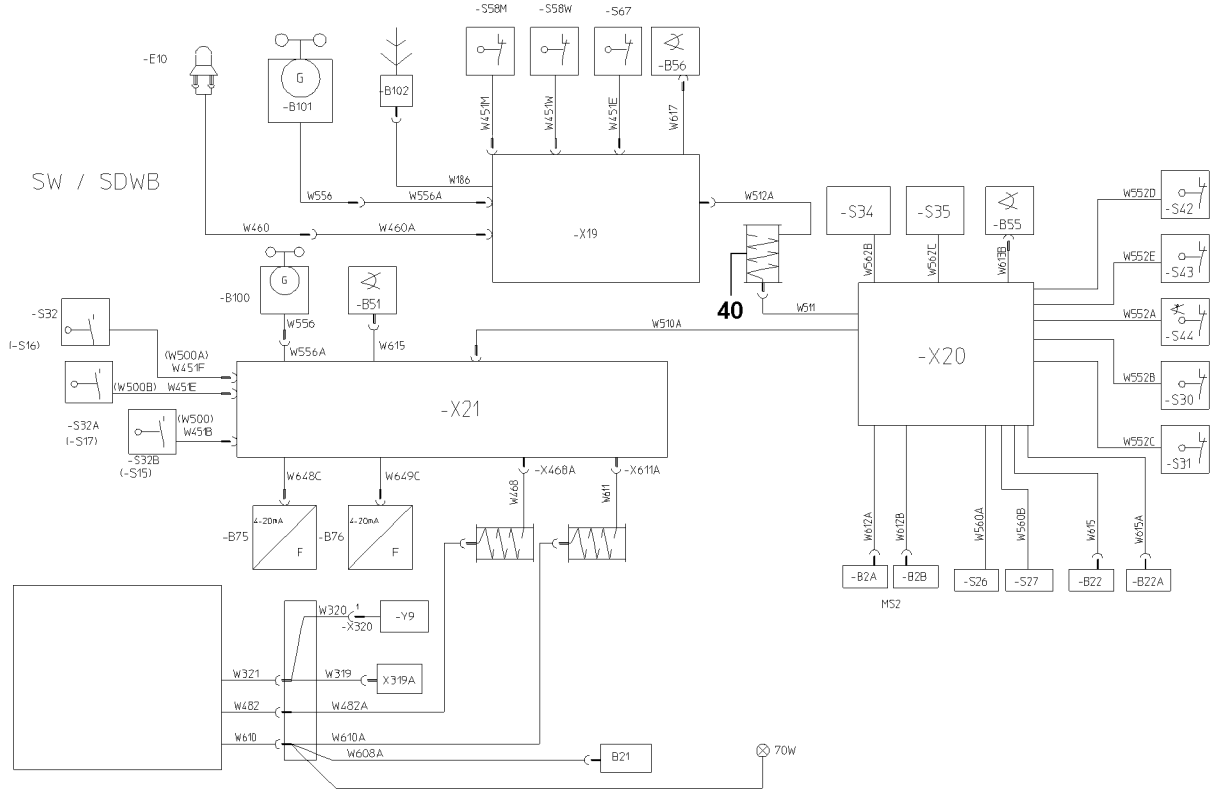
▶ Make the electrical connection from the cable drum **40** to the terminal box **-X19** on the W-end section first and then the electrical connection from the terminal box **-X20** on the W-pivot section to the cable drum **40**!

▶ Establish the electrical connection from the cable drum **40** on the W-pivot section to the terminal box **-X19** on the W-end section. Plug in the cable plug **W512A** from the cable drum **40** on the terminal box **-X19**.

▶ Establish the electrical connection from the terminal box **-X20** to the cable drum **40**. Plug in the cable plug of the cable **W511** on the cable drum **40**.

▶ Establish the electrical connection for the airplane warning light on the W-end section*.

▶ Establish the electrical connection for the wind speed sensor on the W-end section*.


SW / SDWB
-E10
-B101
-B102
-S58M
-S58W
-S67
-B56
W451M
W451W
W451E
W617
W186
W556
W556A
W460
W460A
-X19
W512A
-S34
-S35
-B55
W562B
W562C
W561B
W552D
W552E
W552A
W552B
W552C
-S42
-S43
-S44
-S30
-S31
40
W511
W510A
-X20
-B100
-B51
-S32
(-S16)
W556
W556A
W615
(W500A)
W451F
(W500B)
W451E
-S32A
(-S17)
(W500)
W451B
-S32B
(-S15)
-X21
W648C
W649C
-X468A
-X611A
W468
W611
-B75
-B76
4-20mA
F
W672A
W672B
W560A
W560B
W615
W615A
-B2A
-B2B
-S26
-S27
-B22
-B22A
M52
W320
-X320
-Y9
W321
W319
X319A
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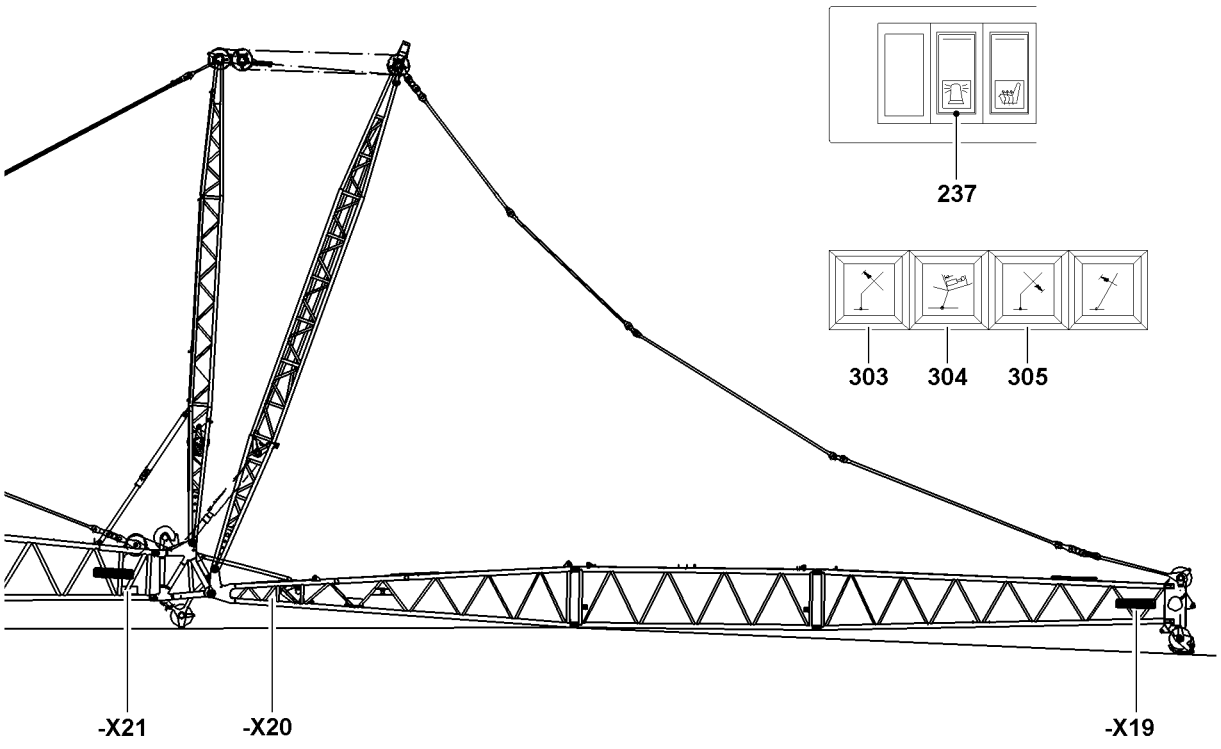
W610A
W608A
B21
70W


237
303
304
305
-X21
-X20
-X19

B105618

2.7 Function check

Make sure that the following prerequisites are met:
- All electrical connections have been established.
- The engine is running.
- The appropriate operating mode is set.
- The actuator levers of the limit switches have been checked for easy movement and are lubricated.

2.7.1 Airplane warning light*

▶ Turn the airplane warning light on and visually check the function.

2.7.2 Winding speed sensor*

▶ Test the movement and the function of the wind speed sensor.

2.7.3 Hoist limit switch

▶ Actuate the hoist limit switch manually on the pulley head.

Result:
- The “Hoist top” icon on the LICCON monitor blinks.
- The **spool up function** of the hoist winch turns off.

2.7.4 Limit switch lattice jib, “steepest” position, relapse cylinder

Note

▶ The switch point of the limit switches on the relapse cylinder must be checked before erection, see chapter 8.13.

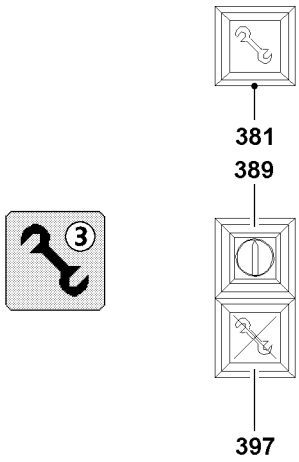
▶ Manually actuate the limit switches on the relapse cylinder individually.

Result:
- The W-control winch movement “Spool up” turns off.
- The indicator light **304** lights up.

2.7.5 Limit switch lattice jib, “steepest” position, mechanical relapse support

▶ Manually actuate the limit switches on the pendulum individually.

Result:
- The W-control winch movement “Spool up” turns off.
- The indicator light **303** lights up.



B105619

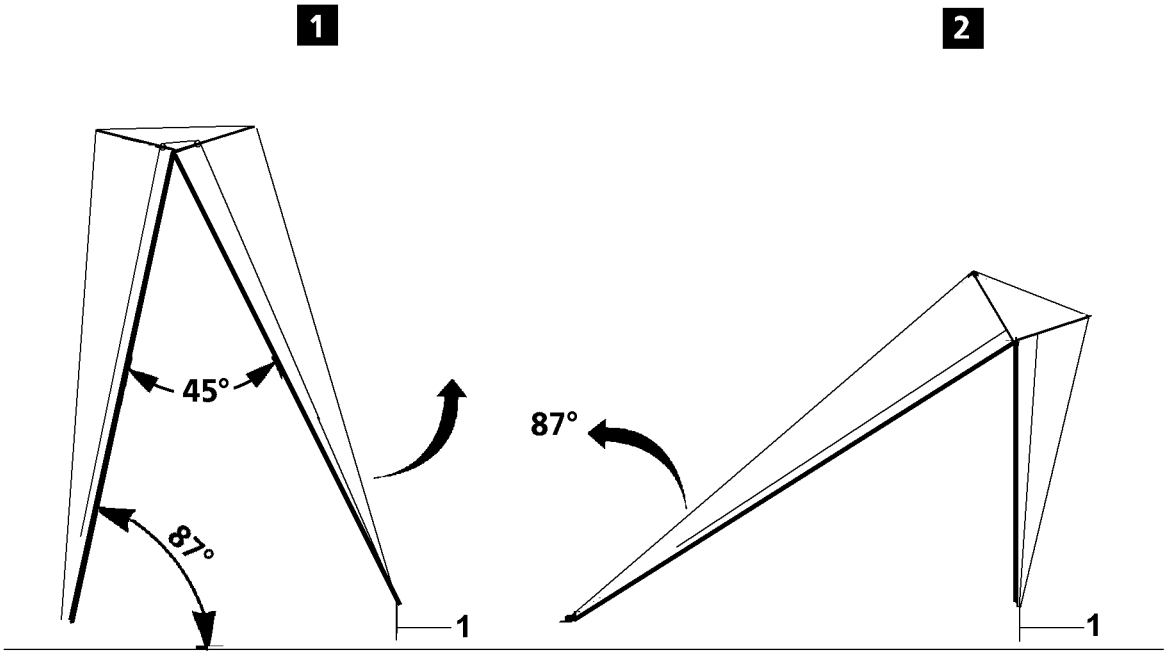
2.8 Erecting the boom

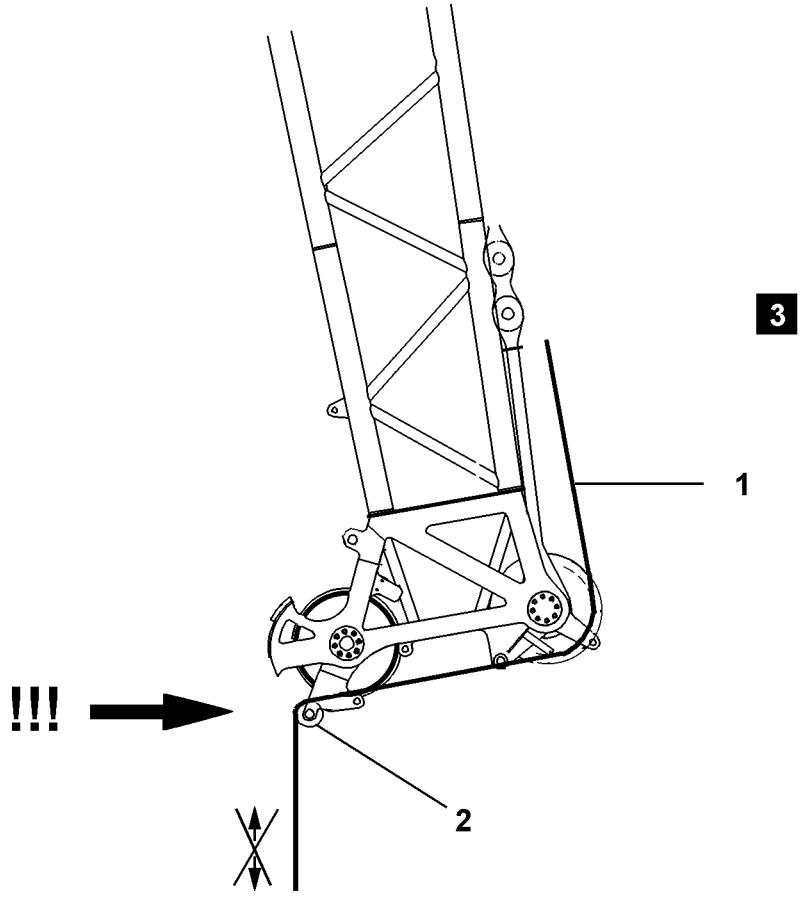
DANGER
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

Make sure that the following prerequisites are met:
- – The crane is aligned in horizontal direction.
- – All electrical connections have been established.
- – All limit switches have been correctly installed and are fully functional.
- – The counterweight is installed on the turntable and on the derrick according to the load chart and the erection chart.
- – The lattice jib has been assembled according to the load chart and the Operating instructions.
- – The easy movement of the pendulum on the mechanical relapse support must be checked over the entire swing range.
- – All pin connections have been secured.
- – No personnel is within the danger zone.
- – There are no loose parts on the boom or the lattice jib.
- – The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the corresponding rope retaining pins.
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The LICCON overload protection settings have been compared with the current crane configuration.
- – In winter, the boom, the lattice jib and their components (limit switches, cable drum, airplane warning light, wind speed sensor, ...) must be kept free of snow a ice.
- – The assembly key button **389** is actuated.
- – The indicator light **381** lights up.
- – The assembly icon **3** on the LICCON monitor blinks.
- – The hoist rope is attached to the end section.

WARNING
Falling components!
When erecting the W-boom combination, loose or incorrectly installed components can fall down!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!

DANGER
Tipping lattice jib!
If the easy movement on the pendulum of the mechanical relapse support is **not** checked before erection or **not** reestablished, if necessary, then the mechanical relapse support will not engage in steep lattice jib position. As a result, the lattice jib can tip to the rear!
Personnel can be severely injured or killed!
- ▶ Check the easy movement on the pendulum of the mechanical relapse support before erection!
- ▶ If the pendulum does not move easily: Make the pendulum easy to move!





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2.8.1 Erection procedure

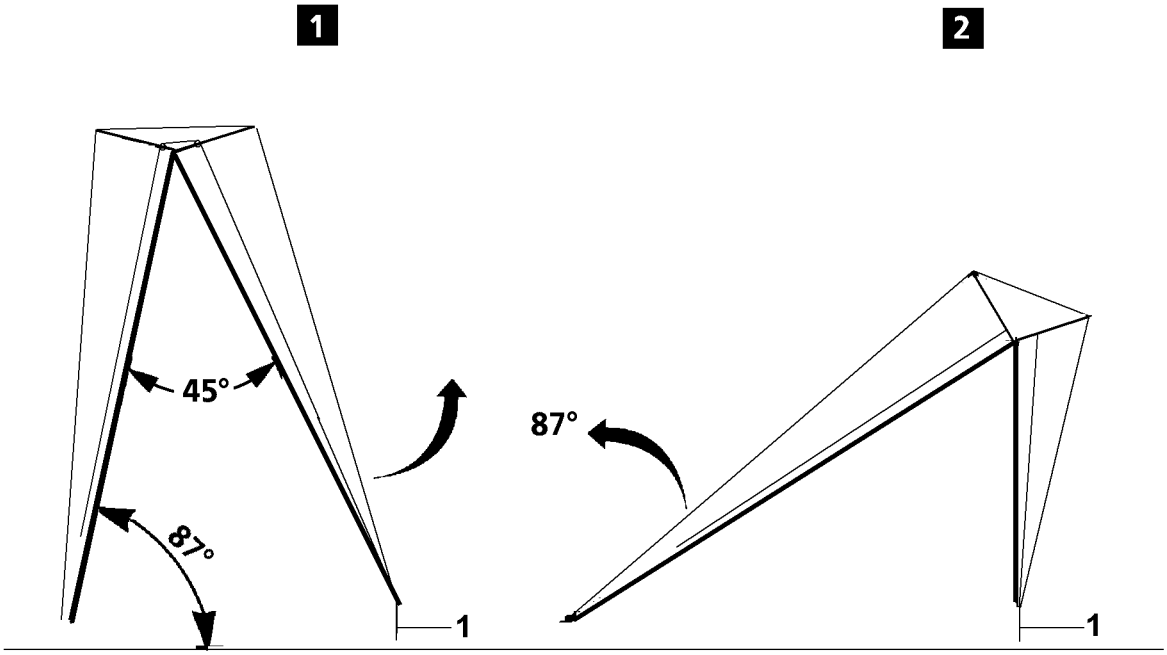
WARNING
The crane can topple over!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!
- ▶ The lattice jib must roll on the ground with its entire weight!
- ▶ Spool the lattice jib control out so that the guy rods sag slightly!
- ▶ Do not allow slack cable to build up on the control winch!

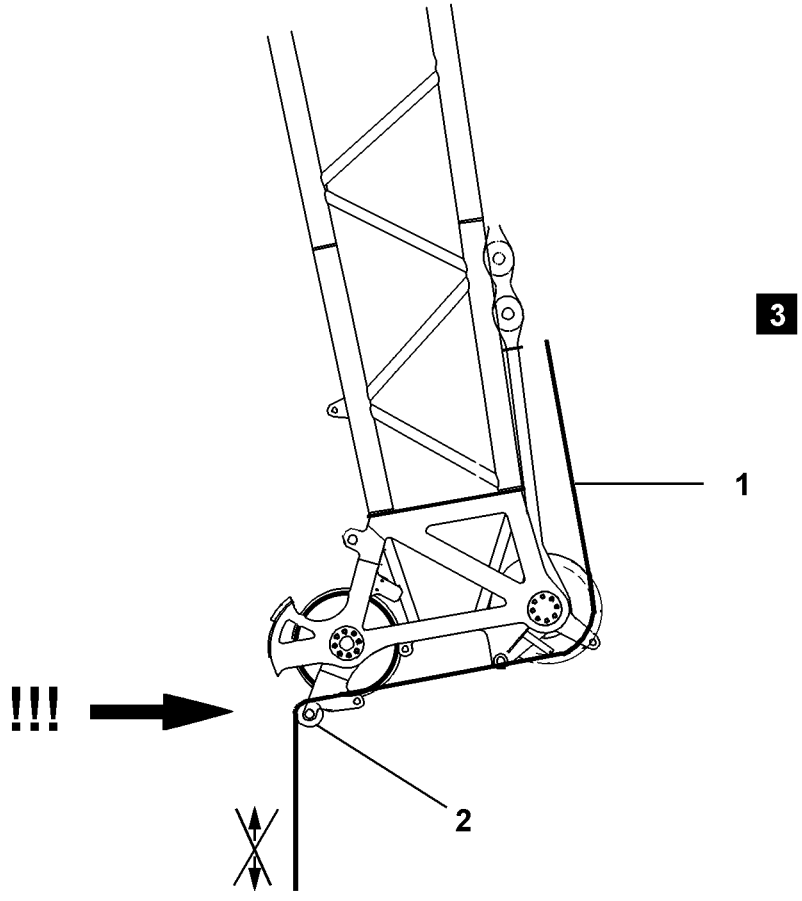
WARNING
Falling hoist rope!
If the hoist rope is not properly attached on the end section before the erection procedure, then it can fall down backward due to its own weight!
Personnel can be severely injured or killed!
- ▶ Attach the hoist rope properly on the end section before the erection procedure!

- ▶ Luff up the S-boom and simultaneously spool out the W-control winch to keep the lattice jib with the W-end section placed on the roller cart on the ground. Carry out this procedure until the S-boom and the W-lattice jib form an angle of more / equal to 45° or until the lattice jib has lifted off the ground first, fig. **1**, fig. **2**.
- ▶ Remove the roller cart on the W-end section, see chapter 5.15 Roller cart.
- ▶ Luff W-lattice jib to the **lowest** operating position.
- ▶ Luff up the S-boom until the W-end section lifts off the roller cart.

NOTICE
Damage to hoist rope!
If the hoist rope is reeved on the hook block and changed over the “small guard rollers **2** ”, then the hoist gear may be moved any longer, since the hoist rope can be damaged by spooling up or out, see fig. **3**!
- ▶ Do not spool the hoist rope up or out!

- ▶ Loosen the hoist rope on the W-end section and reeve it in properly 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.





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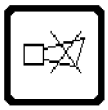
Note

▶ During the erection procedure - outside the operating area - the alarm functions listed in the chart are displayed as blinking on the crane operating screen.

Displays on the LICCON monitor during the erection procedure	
 *Icon: "STOP" blinks*	
 *Icon: "ERROR 150" blinks*	***Note:*** *For error description, see chapter 20.05.*
 *Icon: "Horn" blinks*	***Note:*** *In addition to the "Horn" icon, an acoustic warning sounds.*

▶ Luff the S-boom up to the lowest operating position.

▶ When the operating range of the S-boom is reached:
Luff up the S-boom to the steepest boom position (87°).

▶ Luff up the W-lattice jib to the lowest operating position.

DANGER

The crane can topple over!

▶ When the lowest operating position is reached, the assembly key button **389** must be turned off immediately.

▶ The assembly key button **389** bypasses the safety devices!

▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!

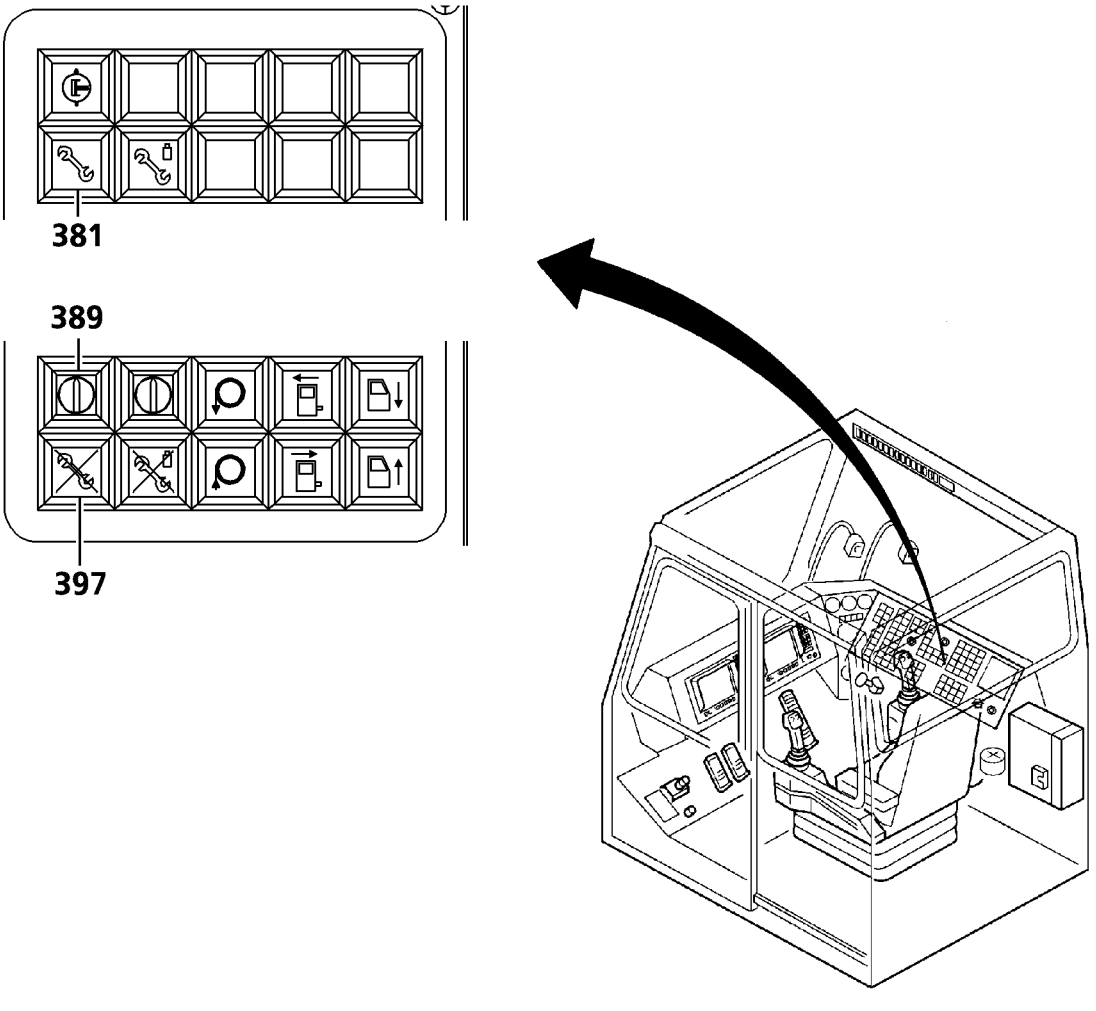
Note

▶ The operating position is reached if the blinking displays turn off and a load display appears in the "maximum load" symbol instead of question marks (???).

▶ Turn the assembly key button **389** off by pressing the button **397**.

Result:

– The LICCON overload protection is active.
– The assembly icon **3** on the LICCON monitor turns off.
– The acoustical signal turns off.
– The red beacon on the crane operator's cab is off.



B186927

3 Crane operation

Observe the notes in chapter 4.05, 4.08 and 5.01.
Make sure that the following prerequisites are met:
– The LICCON overload protection has been set according to the data in the load chart.
– The assembly key button **389** has been turned off by pressing the button **397**.
– The assembly icon **3** on the LICCON monitor is off.
– The indicator light **381** is off.

DANGER
The crane can topple over!
▶ Check the horizontal position of the crane before and during operation.
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation.

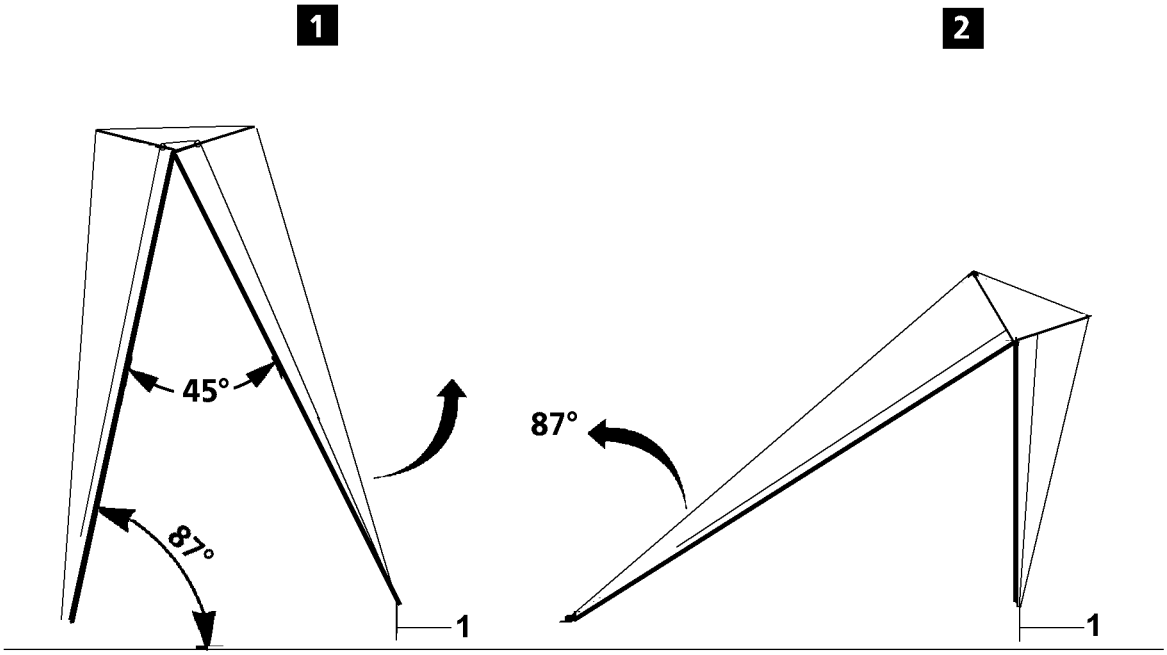
3.1 Checking the settings

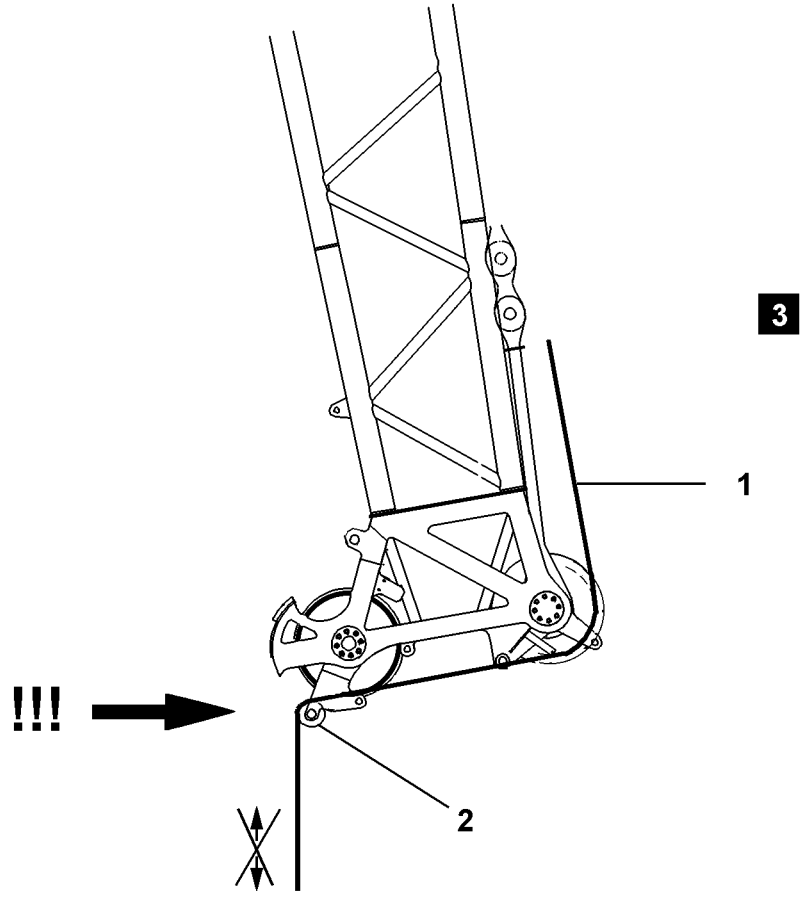
▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the limit switches “lattice jib steep” on the relapse cylinders.

3.2 Setting the boom to 67° / 77°

Note
▶ **Before adjusting the boom to 67° or 77°**, the boom must be erected to the steepest boom position (87°) and the lattice jib to the steepest operation position!

WARNING
Configuration of the crane!
▶ When adjusting the boom to 67° and in SDWB operation, it may be required that the derrick ballast is installed, even without a load on the hook.





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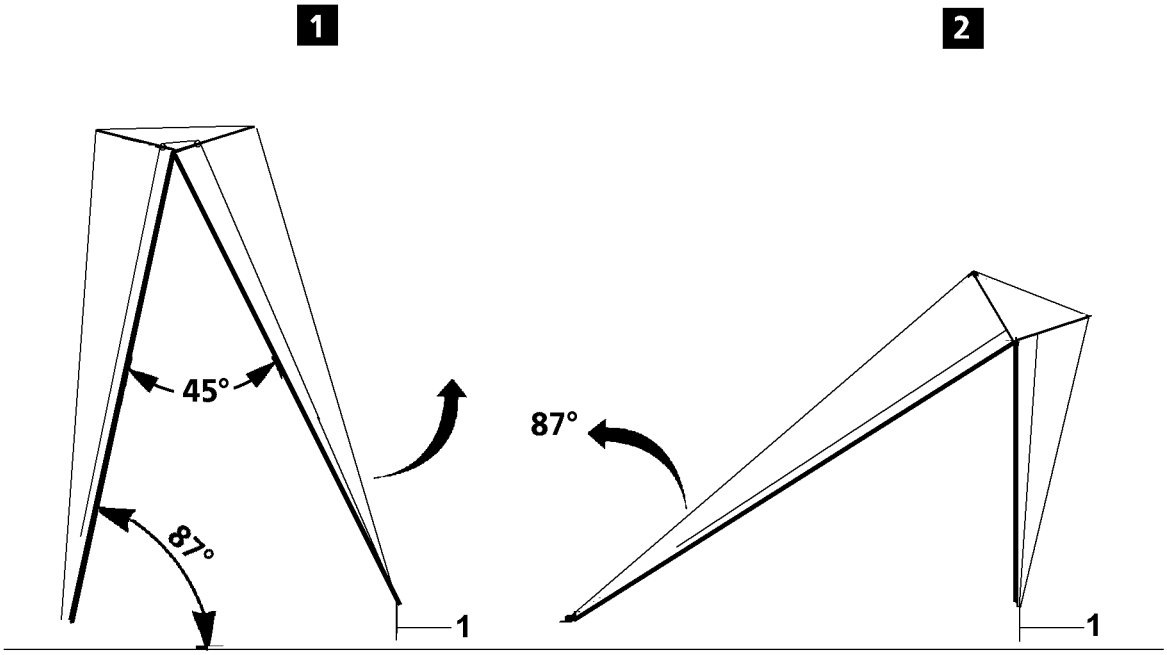
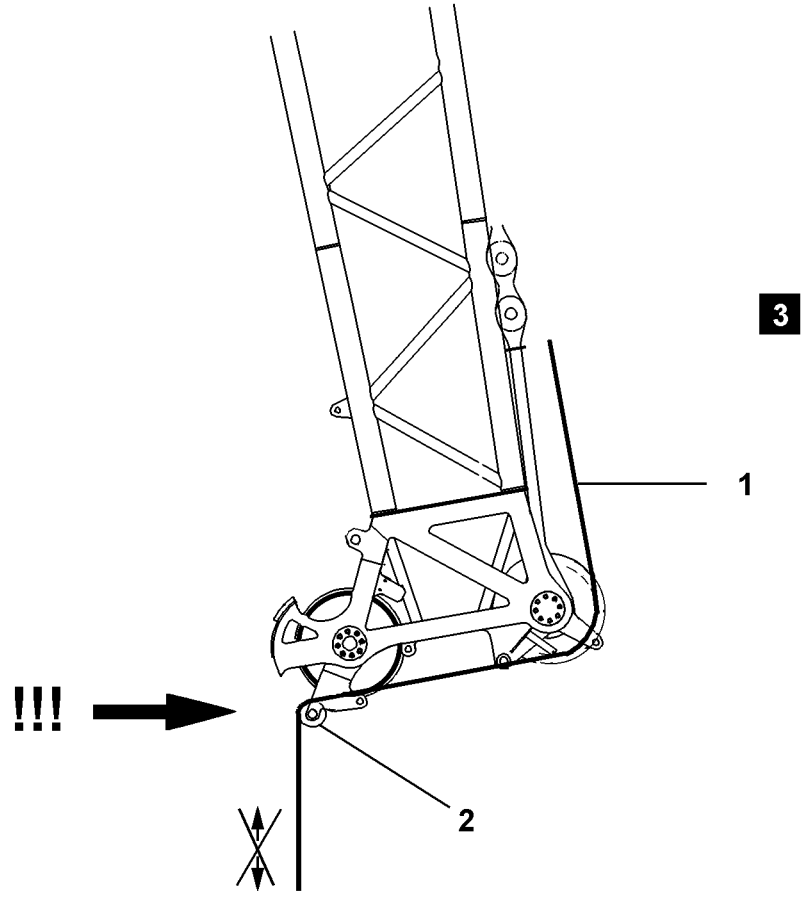
4 Disassembly

WARNING
When working aloft, there is a danger of falling!
If the following notes are not observed, the assembly personnel could fall and suffer life-threatening injuries!
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!
- ▶ Before any assembly / disassembly work and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also chapter 2.04!

DANGER
Danger of accident at assembly / disassembly of booms!
When you disassemble unsecured or unsupported booms, they can fall down!
Personnel can be severely injured or killed!
- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ It is prohibited to lean the ladder against the component being assembled / disassembled!

DANGER
Falling components!
If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!
- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!





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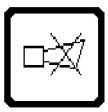
4.1 Setting down the boom

DANGER
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

Make sure that the following prerequisites are met:
- – The S-boom is in the steepest position, 87°.
- – The hook block is approx. 5 m below the pulley head of the lattice jib.

▶ Luff the W-lattice jib down to the **lowest** operating position. When the lowest operating position is reached the luff down movement is shut off.

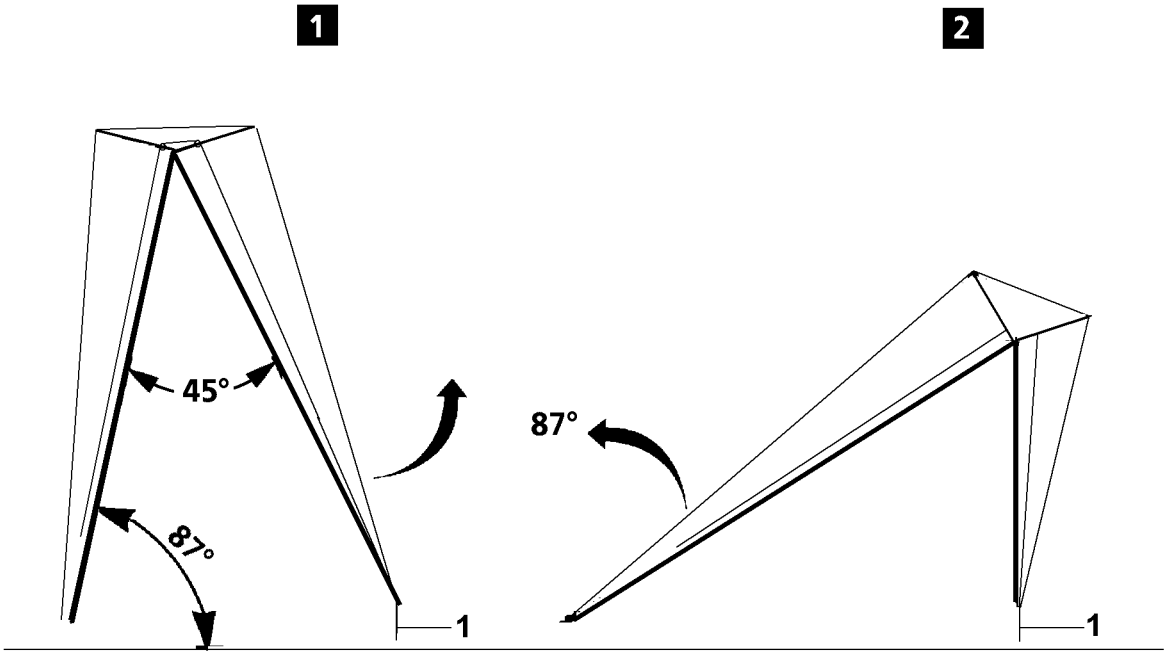
The load value in the “maximum load” icon disappears and question marks appear (????).
The following alarm functions become active:

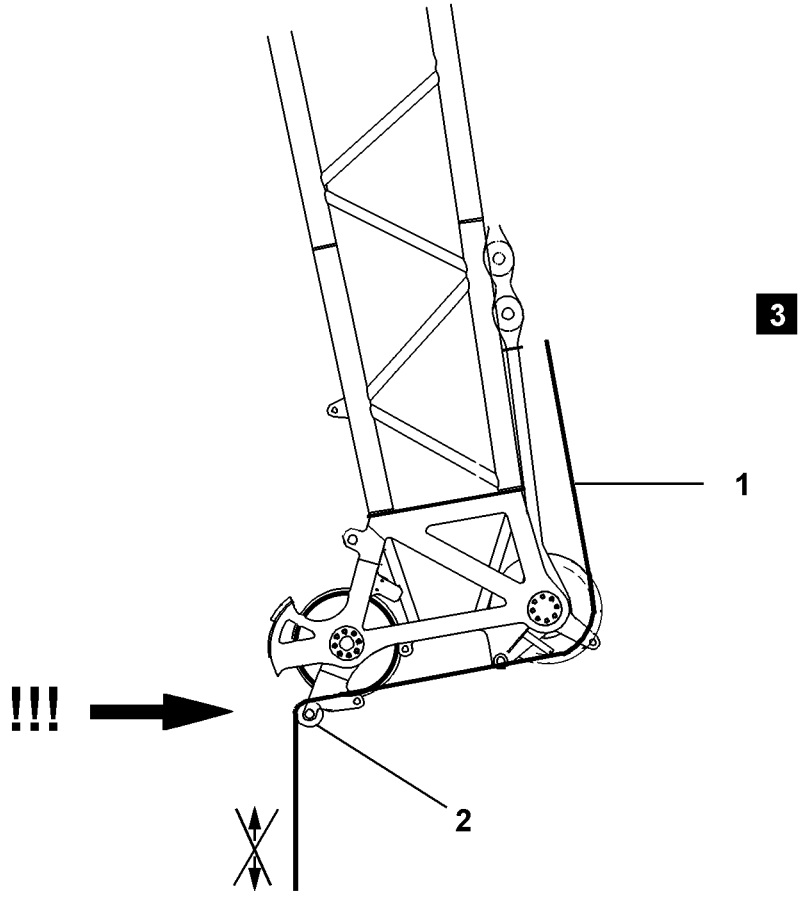
Display on the LICCON-Monitor after reaching the “lowest” operating position	
 *Icon: “STOP” blinks*	
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

DANGER
Risk of fatal injury at crane operation with turned on assembly key button!
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button **389** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is inactive.
- – The indicator light in the button **397** lights up.
- – The Assembly icon **3** on the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red beacon on the crane operator's cab blinks.
- – The horn sounds.





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▶ Continue to luff the W-lattice jib down until an angle of approximately 45° is reached between the S-boom and the W-lattice jib.

When the angle is reached, “lattice jib bottom” is shut off, the indicator light lights up.

▶ Luff the S-boom down.

CAUTION

Damage to crane!

▶ Luff the S-boom down and simultaneously spool the hoist winch out to prevent a collision between the hook block and the W-end section.

▶ Luff the S-boom down until the hook block touches the ground.

▶ Remove the hoist limit switch weight and unreeve the hook block.

▶ Luff the S-boom down until the W-end section is laying with the receptacle studs in the receptacles on the pulley cart.

NOTICE

Damage to hoist rope!

If the hoist rope is reeved on the hook block and changed over the “small guard rollers **2** ”, then the hoist gear may be moved any longer, since the hoist rope can be damaged by spooling up or out, see fig. **3**!

▶ Do not spool the hoist rope up or out!

▶ Remove the roller cart on the W-end section, see chapter 5.15.

DANGER

The crane can topple over!

▶ Do not pull the hook block along on the ground!

▶ The lattice jib must roll on the ground with its entire weight!

▶ Do not allow slack cable to build up on the control winch!

▶ Continue to luff down the S-boom and simultaneously spool the W-lattice jib control out so that the guy rods sag slightly.

▶ Luff the S-boom down until the S-boom head is laying on the support on the ground.

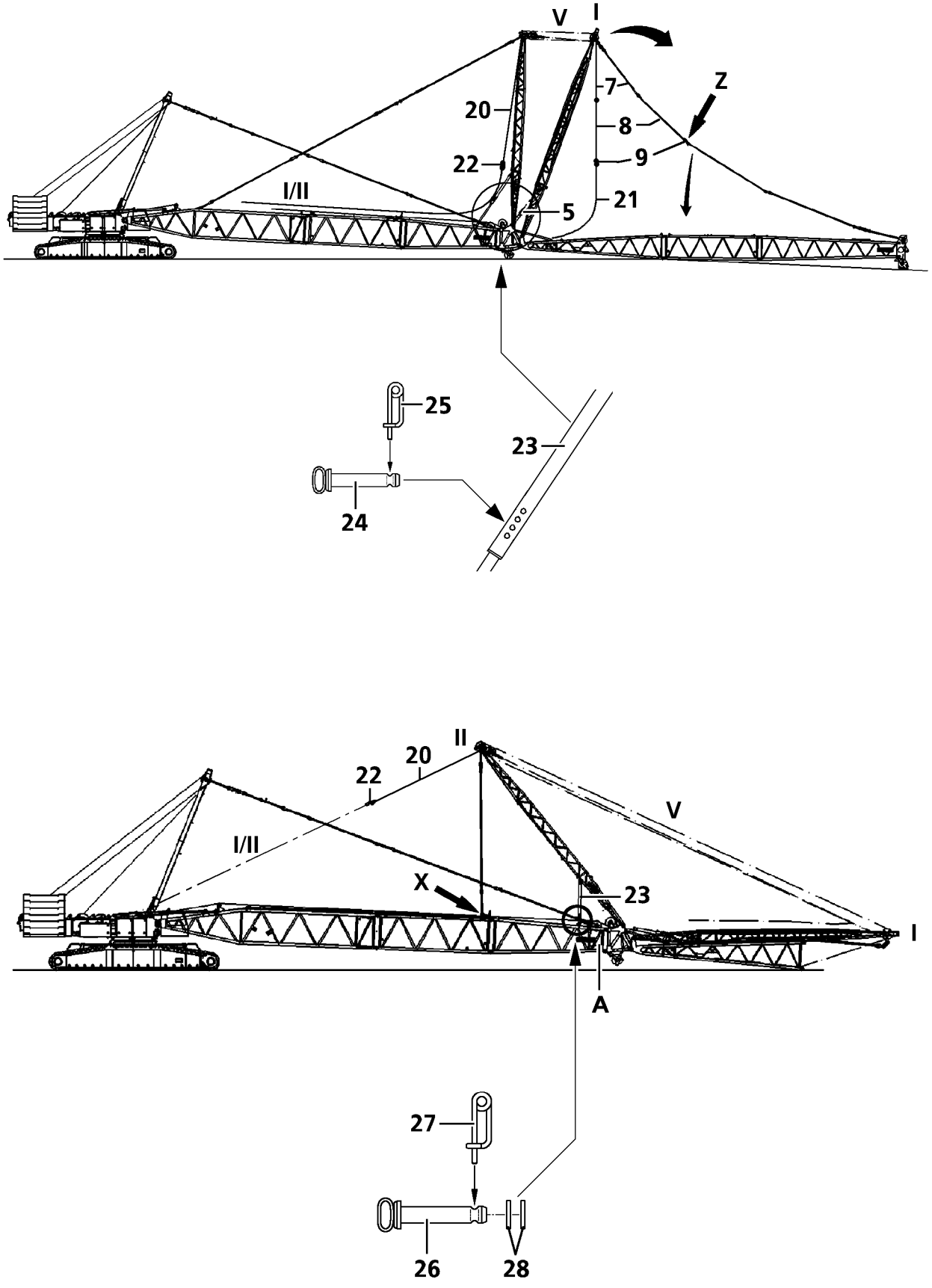
DANGER

Risk of accident!

▶ Make sure that no personnel is within the danger zone.

▶ Secure the hoist rope with the auxiliary rope and pull it back slowly over the rope pulleys in the WA-brackets and lower it toward the S-end section.

▶ Remove the hoist rope.



B188566

4.2 Disassembling the guy rods

- ▶ Lower the WA-bracket I to the front: Spool the W-control winch **V** out.
- ▶ Unpin the guy rods at the connector brackets **9**: Remove the spring retainer **50** and unpin the pin **49**, point **Z**.
- ▶ Attach the guy rods from the WA-bracket I on the tackle ropes **21** and place the remaining guy rods on the lattice sections and secure.

WARNING
Lattice jib can fold down!
If the following notes are not observed, the lattice jib can suddenly fold down during unpinning!
Personnel can be severely injured or killed!
- ▶ The pivot section must be held by an auxiliary crane before unpinning the connector pins or it must be supported with suitable and stable materials!
- ▶ It is prohibited for anyone to remain under the lattice jib which is to be disassembled!

- ▶ Disassembling the W-lattice jib.
- ▶ Unpin the pin between the pivot section and the intermediate section.

NOTICE
Damage of relapse supports!
By pulling the WA-bracket II up, significant damage can occur due on the W-relapse support **5** to a defective or not connected limit switch- due to the block position!
- ▶ The electrical connections to the limit switches on the W-relapse supports have been established!
- ▶ “Spool up winch 5” must turn off when the limit switches on the W-relapse supports are actuated!

- ▶ Disengage the assembly rope **20** on the WA-bracket and hang the hoist rope of winch I/II into the lock **22**.
- ▶ Spool the W-control winch **V** up and pull the WA-bracket I up until the guying from the WA-bracket II to the S-pivot section is tensioned due to the counterpressure of the relapse cylinder **5**.

Result:
– The relapse support **23** can be unpinned.

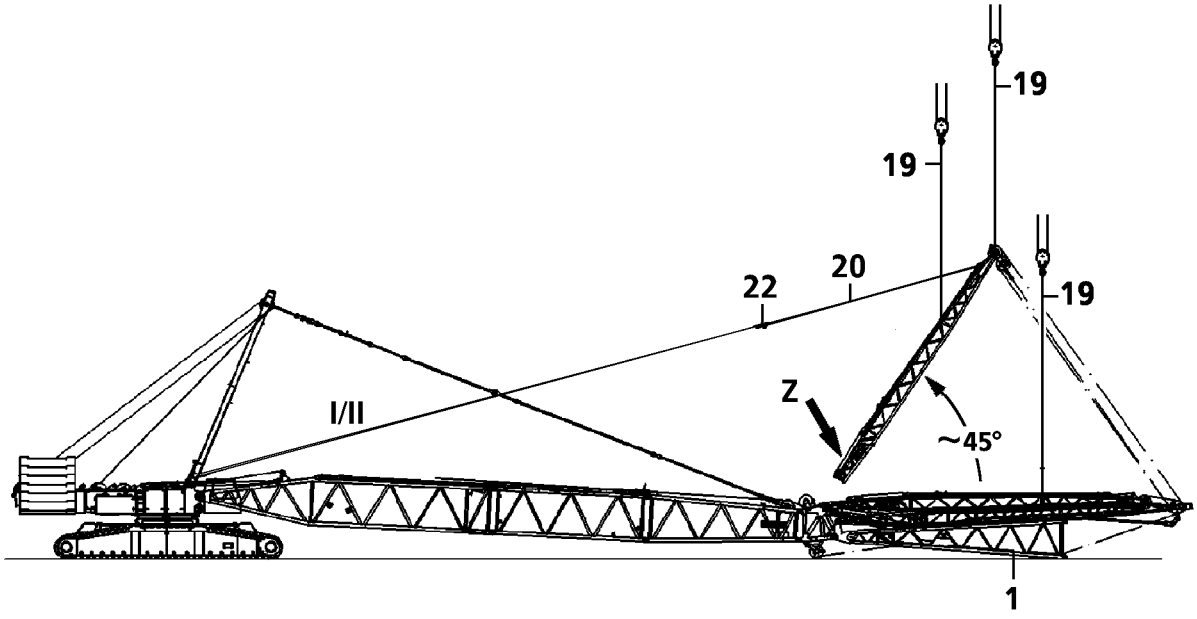
- ▶ Remove spring retainer **25** and socket pin **24**.
- ▶ Lower the WA-bracket I until it rests on the W-pivot section.
- ▶ Pull the WA-bracket II back by spooling up the hoist winch and spooling the W-control winch (winch 5) out simultaneously and unpin the guy rods from the WA-bracket II to the S-pivot section on point **X**.
- ▶ Place the guy rods on the lattice sections and secure.

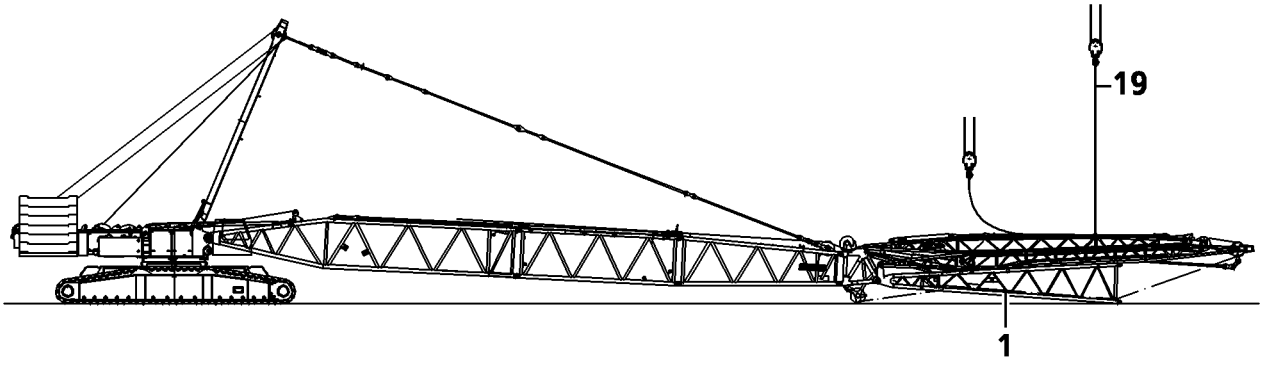
NOTICE
Damage of socket pins **24** and the WA-bracket II!
By “pulling the WA bracket II to the rear”, the socket pin **24** can be sheared off and the components of the WA-bracket II can be damaged!
- ▶ Unpin the socket pin **24** before “pulling the WA-bracket II back”!

- ▶ Spool out the hoist winch and spool the W-control winch (winch 5A) up at the same time.

Result:
– The WA-bracket II is pulled up.

- ▶ Actuate the spool out hoist winch and spool up the W-control winch (winch 5) until the WA-bracket II is in vertical position.
- ▶ Unpin the WA-relapse support **23** on the S-adapter **A**.
- ▶ Remove the pin **26**, spring retainer **27** and washers **28**.





B188567

4.3 Place the WA-bracket II down

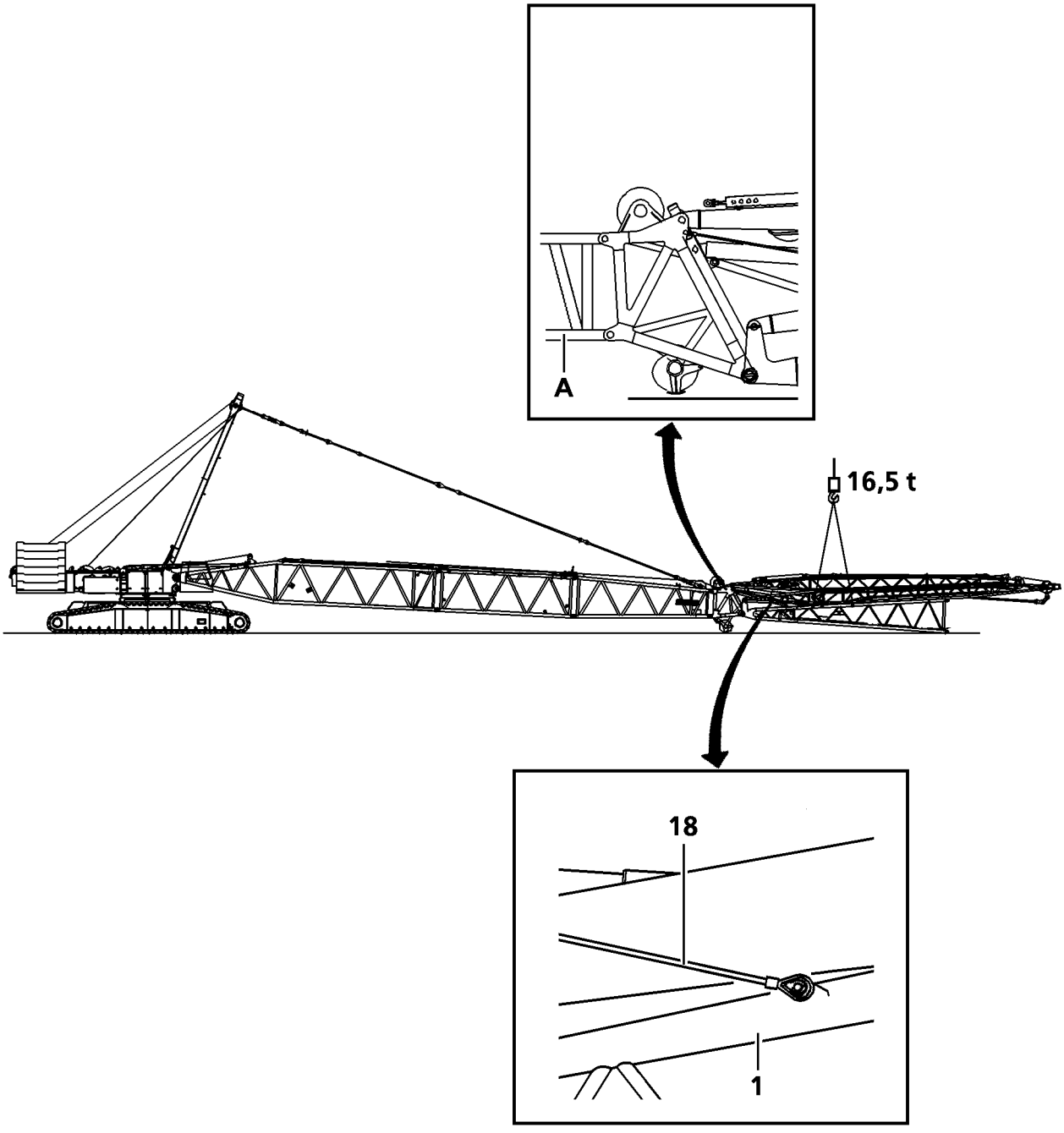
- ▶ Attach the assembly rope **19** on the WA-bracket II.

WARNING
Danger due to folding down of the WA-bracket!
If the WA-bracket II is not held with the auxiliary crane during take down, from approx. 45° to the horizontal, then the WA-bracket can fold forward by itself!
Personnel can be severely injured or killed!
- ▶ Attach the WA-bracket II on the auxiliary crane (assembly rope **19**)!
- ▶ Lower the WA-bracket II slowly!

- ▶ Pull the WA-bracket II forward by spooling up winch 5 and simultaneously spooling out the hoist winch until approx. 45° to the horizontal.

NOTICE
Danger of slack rope formation!
- ▶ Slowly spool up the control rope when placing the WA-bracket II down.
- ▶ Hold the control rope tight when spooling up!

- ▶ Lower the WA-bracket II until it is placed on the WA-bracket I.
- ▶ Disengage the hoist rope on the lock **22** of the assembly rope **20** and engage the assembly rope **20** on the WA-bracket Ii at point **Z**.
- ▶ Remove the assembly rope **19** on the auxiliary crane and attach on the WA-bracket II.
- ▶ Unreeve the control rope and reeve in the auxiliary rope for the reeving at the same time.



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4.4 Unpinning the assembly unit on the S-boom

- ▶ Pin and secure the retaining rope **18** on the W-pivot section.
- ▶ Take on the W-assembly unit with the auxiliary crane on the attachment points on the W-pivot section.

Note

- ▶ The total weight of the assembly unit is approx. 16.5 t.

WARNING

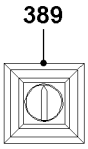
Mortal danger if the fold in head folds away!

If the following notes are not observed, the fold in head can fold away with the WA-bracket I and the WA-bracket II!

Personnel can be severely injured or killed!

- ▶ Before unpinning the assembly unit, it must be held with the auxiliary crane!
- ▶ The retaining rope **18** must be pinned and secured on the pivot section!
- ▶ It is prohibited for anyone to remain under the assembly unit!

- ▶ Unpin the W-assembly unit on the S-adapter **A** with the pin pulling device on top and bottom.



B104933

1 General

DANGER
Danger of falling!
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening injuries.
- ▶ All assembly work from a height of 2 m must generally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane, etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect them against falling!

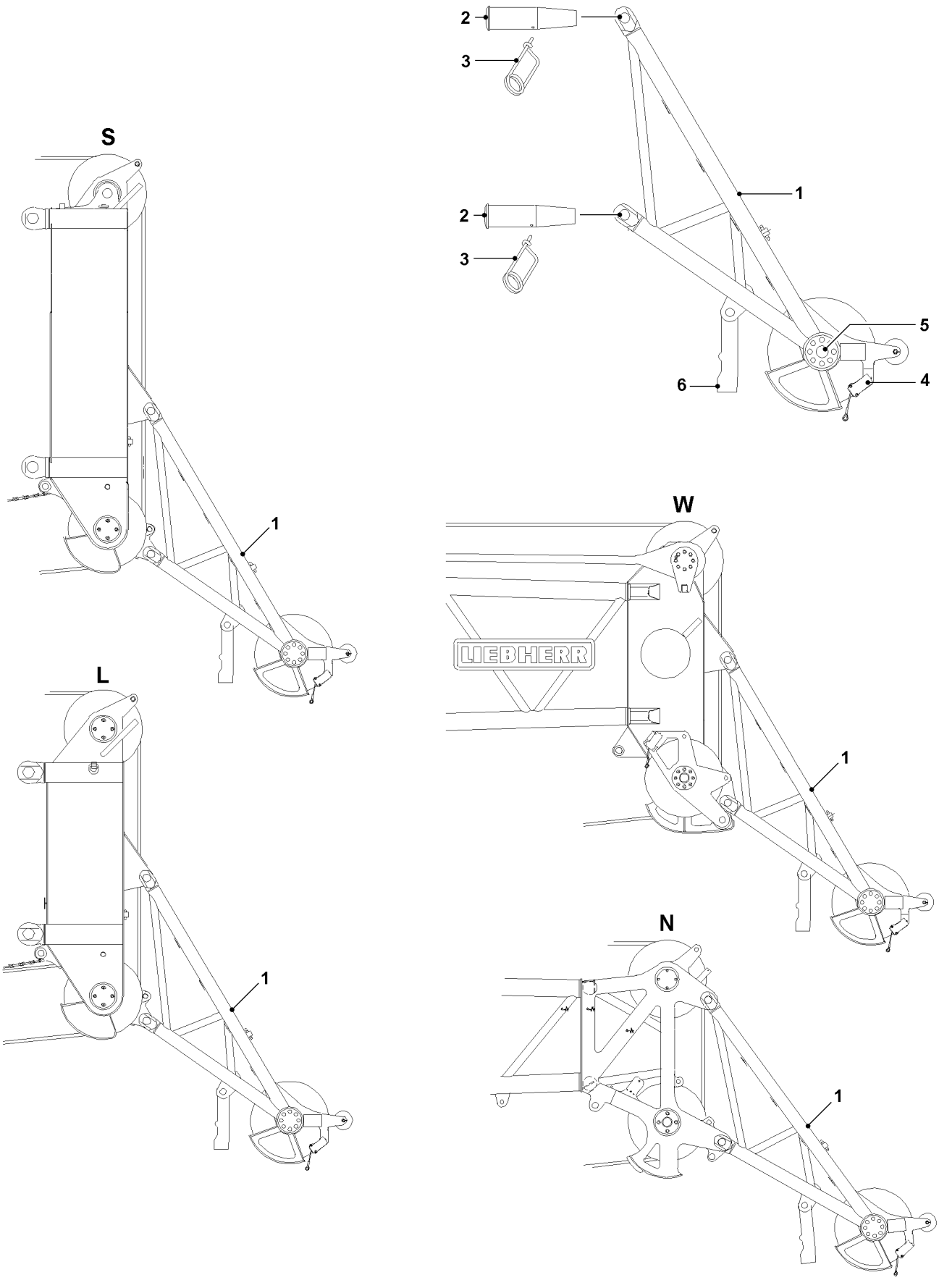
DANGER
Danger of accident at assembly / disassembly of booms!
The disassembly of unsecured or unsupported booms can cause them to fall and kill or severely injure personnel.
- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins on unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

DANGER
Danger of fatal injury at crane operation with turned on assembly key button.
- ▶ The actuation of the assembly key switch **389** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ When the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection are bypassed!
- ▶ Crane operation with turned on assembly key switch **389** is strictly prohibited!
- ▶ After assembly work is completed, the assembly key button **389** must be pulled immediately and turned over to an authorized person!

Observe the safety guidelines for assembly in chapter 5.01.

1.1 Assembly prerequisites

Ensure that the following prerequisites are met:
- – The crane is aligned in horizontal direction.
- – The counterweight has been attached to the turntable according to the load chart.
- – The derrick ballast is placed on the suspended ballast or the ballast trailer, according to the load chart.
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The mechanical auxiliary support is installed on the crane.
- – An auxiliary crane is available.



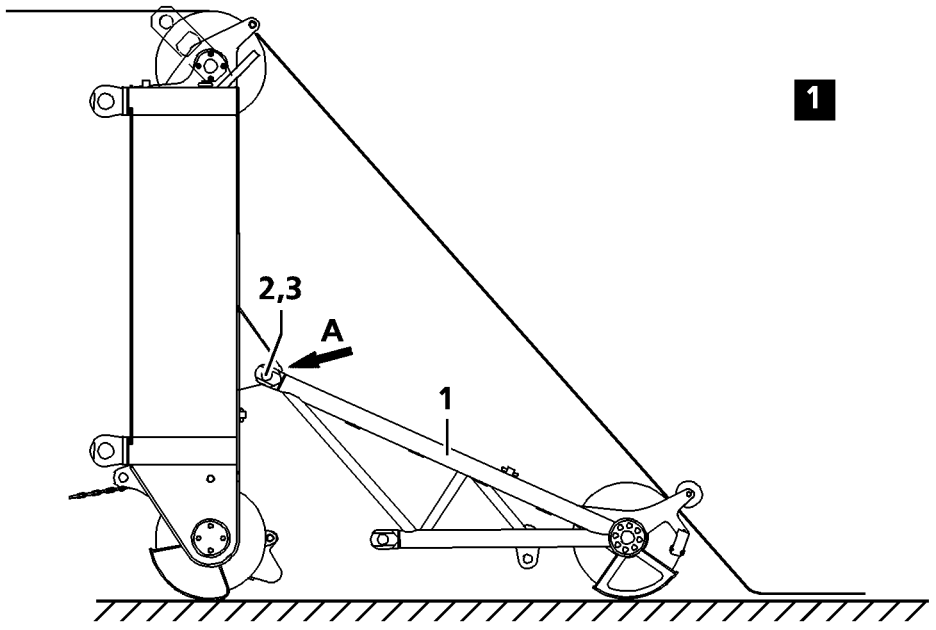
B104694

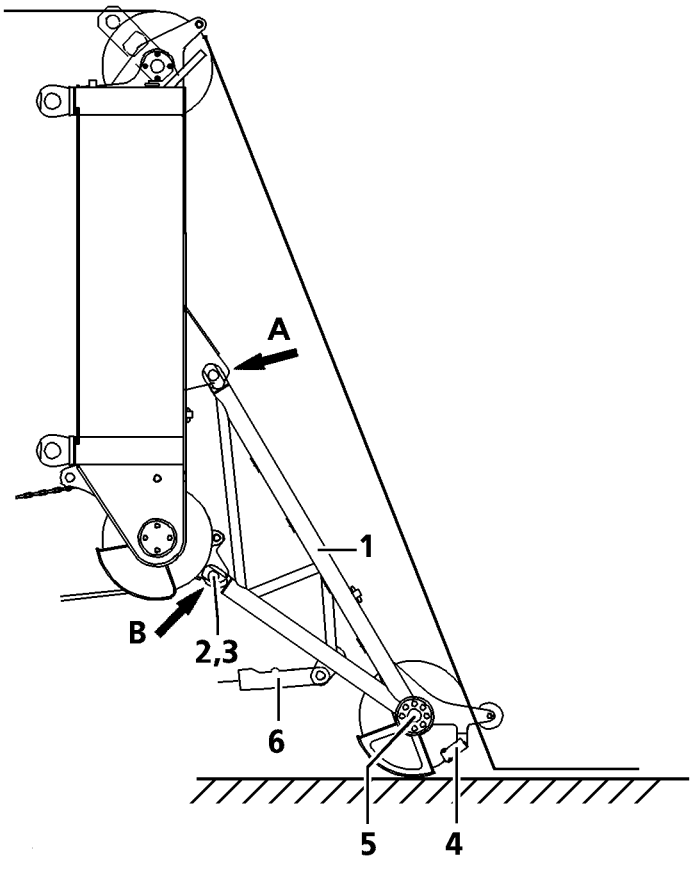
2 Boom nose 36 t (H)

2.1 Assembly

The 36 t boom nose (H) **1** can be installed and operated on various boom end sections (S-, L-, W- and N-), see fig.

Position	Description	Weight
1	Boom nose 36 t (H)	0.45 t
2	Pin	
3	Spring retainer	
4	Hoist limit switch	
5	Axle for erection roller cart	
6	Rope fixed point (rope lock)	





B187874

2.1.1 Assembly procedure on S-/L-boom head

Note

▶ The assembly procedure is described on the example of the S-boom head.

Ensure that the following prerequisite is met:

– The S-end section is laying on the ground.

▶ Hang the boom nose **1** onto the auxiliary crane.

▶ Position the boom nose **1** with the auxiliary crane on the S-end section in such a way that the pin bores align “on top” (point **A**), see fig. **1**.

▶ When the pin bores align “on top”:
Insert the pin **2** on the end section “on top” and secure with spring retainer **3**.

▶ Lower the boom nose **1** to the ground with the auxiliary crane.

▶ Remove the auxiliary crane.

▶ Luff the boom up until the boom nose **1** touches the S-end section “on the bottom”, see fig. **2**.

▶ When the pin bores align “on the bottom”:
Insert the pin **2** on the S-end section “on the bottom” (point **B**) and secure with spring retainer **3**.

CAUTION

Damage of boom nose!

By placing the boom system down with fully installed boom nose, significant damage can occur on the boom nose due to the weight of the boom.

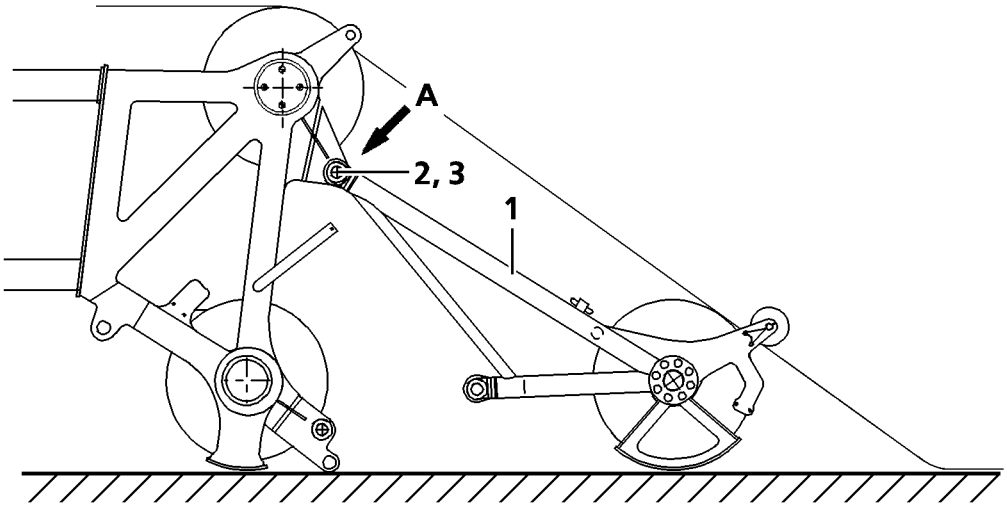
▶ Luff the boom with installed boom nose down only to the point where the boom nose **1** does not touch the ground.

Note

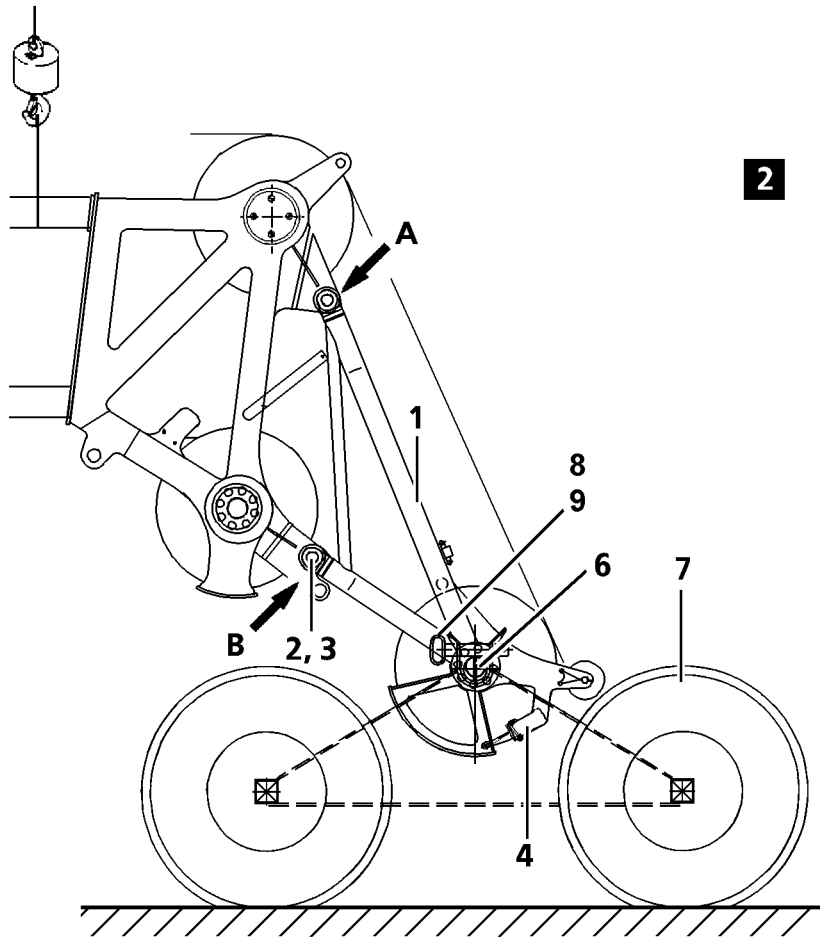
▶ Pull the hoist rope over the rope pulleys and reeve it in according to the separately supplied reeving plans.

▶ Reeve the hook block properly and attach the hoist limit switch weight.

1



2



B104699

2.1.2 Assembly procedure on W-/N-boom head

Note

▶ The assembly procedure is described on the example of the W-boom head.

Ensure that the following prerequisite is met:

– The W-end section is laying on the ground.

▶ Hang the boom nose **1** onto the auxiliary crane.

▶ Position the boom nose **1** with the auxiliary crane on the W-end section in such a way that the pin bores align “on top” (point **A**), see fig. **1**.

▶ When the pin bores align “on top”:
Insert the pin **2** on the W-end section “on top” and secure with spring retainer **3**.

▶ Lower the boom nose **1** to the ground with the auxiliary crane.

▶ Remove the auxiliary crane.

▶ Lift the W-end section with the auxiliary crane until the boom nose lays on the end section “on the bottom”, see fig. **2**.

▶ When the pin bores align “on the bottom”:
Insert the pin **2** on the W-end section “on the bottom” (point **B**) and secure with spring retainer **3**.

▶ Continue to lift the W-end section until the erection roller cart can be pushed under the boom nose.

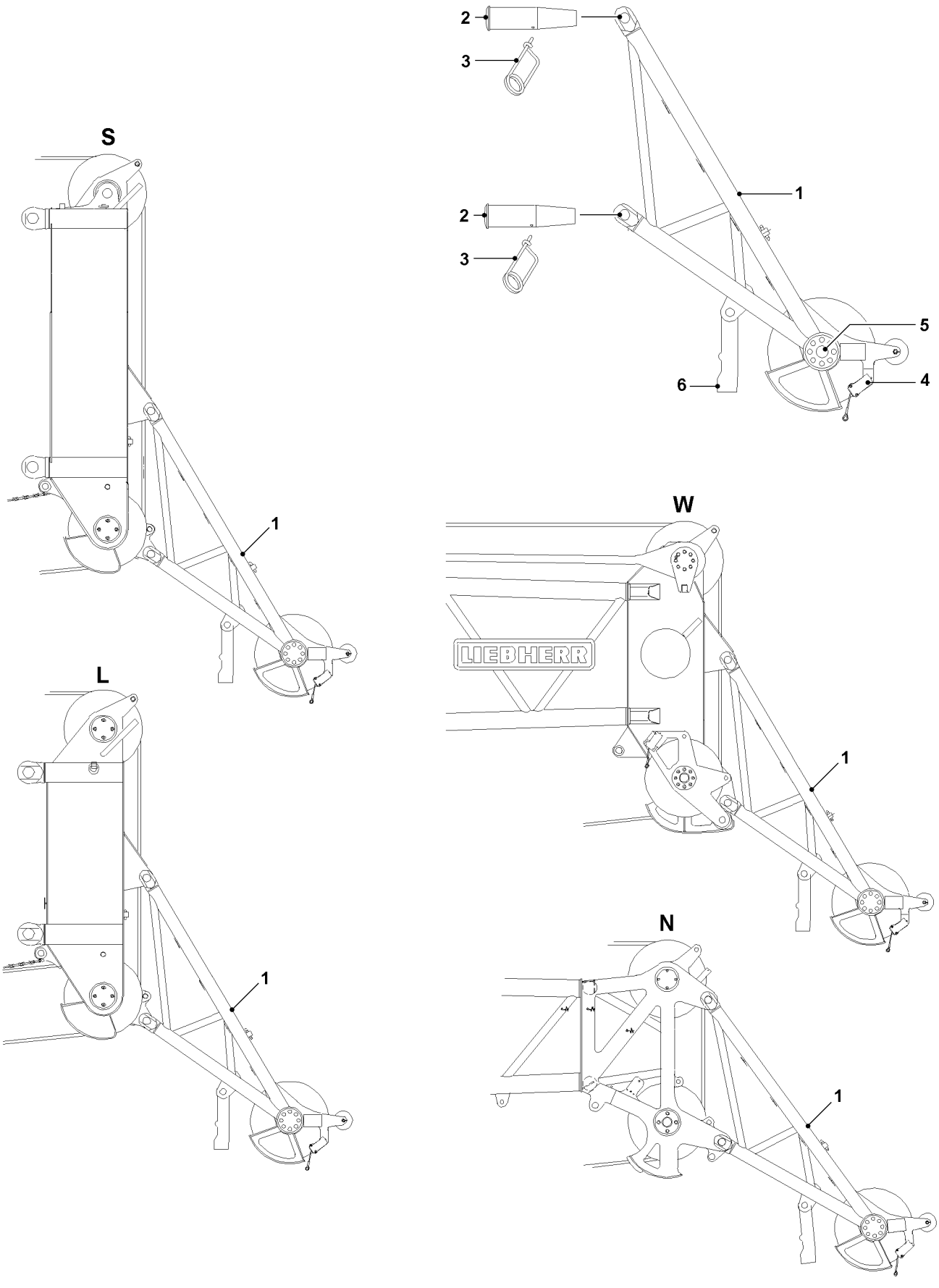
▶ When the erection roller cart is positioned under the boom nose:
Slowly lower the W-end section with the auxiliary crane and place the boom nose with the studs **8** into the receptacles on the erection roller cart.

▶ Insert the pins **9** into the retainers on the erection roller cart and secure.

Note

▶ Pull the hoist rope over the rope pulleys and reeve it in according to the separately supplied reeving plans.

▶ Reeve the hook block properly and attach the hoist limit switch weight.



B104694

2.1.3 Establish the electrical connections

Ensure that the following prerequisite is met:
– The boom nose is completely installed.

▶ Establish the electrical connection from the terminal box of the “S-end section” or the “L-end section”, or the “W-end section” or the “N-end section” to the terminal box “boom nose”.

▶ Establish the electrical connection from the terminal box of the “boom nose” to the hoist limit switch.

2.1.4 Function check

Ensure that the following prerequisites are met:
– All electrical connections have been established.
– The corresponding operating mode is set on the LICCON monitor.

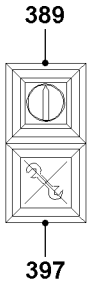
Limit switch, general

Note
▶ The limit switch functions have to be checked individually before erection!

Hoist limit switch

▶ Actuate the hoist limit switches manually.

Result:
– The icon appears on the LICCON monitor.
– The **spool up function** of the hoist winch turns off.



B104932

2.2 Erecting the boom

DANGER
Crane can topple over!
If the following conditions are not met before erecting the crane, the crane can topple over and fatally injury personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

CAUTION
Danger of property damage on the boom nose!
- ▶ When erecting the boom systems, it must be ensured that the hoist rope does not get stuck in the boom nose.
- ▶ Reeve the hoist rope according to the reeving plans on the hook block.

Ensure that the following prerequisites are met:
– The assembly key switch **389** has been actuated.

DANGER
Crane can topple over!
- ▶ The assembly key switch **389** bypasses the safety devices!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection procedure!

2.2.1 Erection

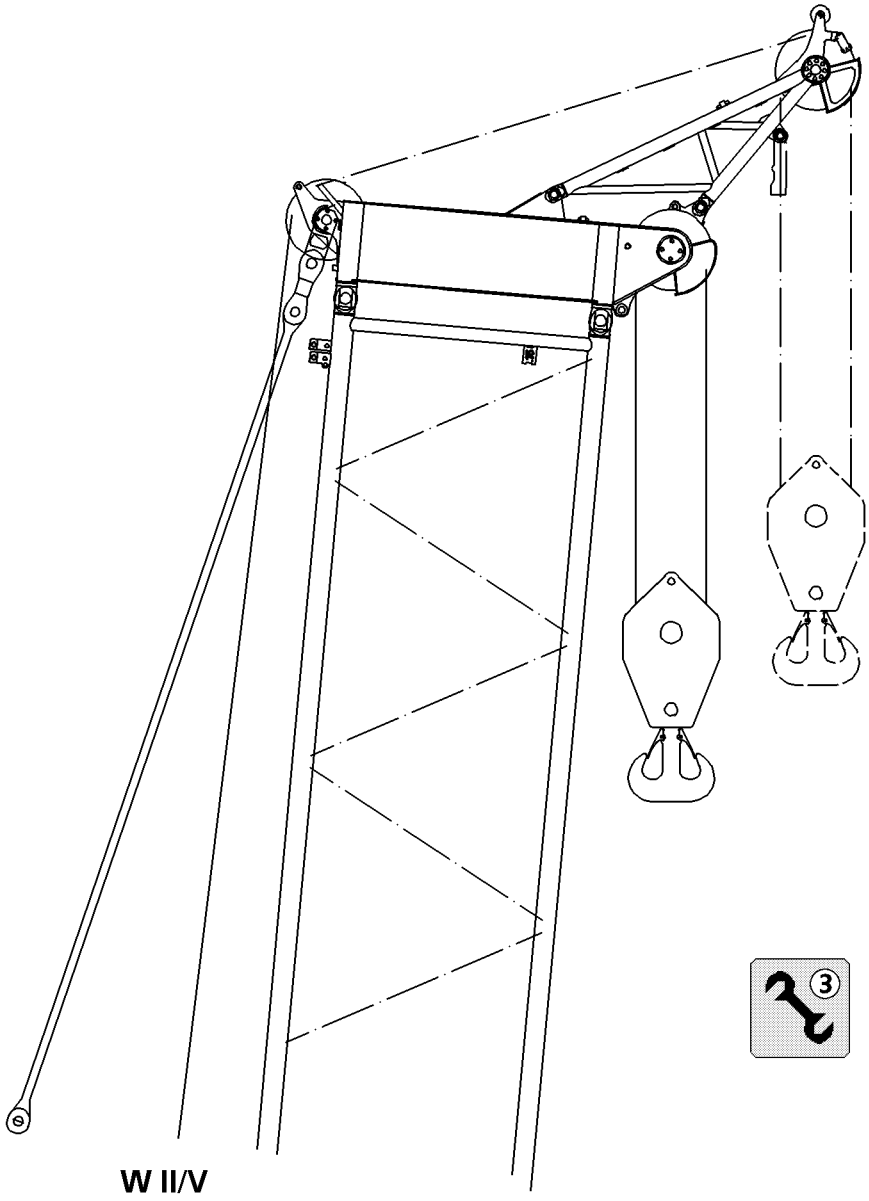
▶ Luff the boom up to the lowest operating position.

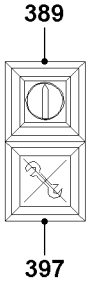
DANGER
Crane can topple over!
- ▶ When the lowest operating position is reached, the assembly key switch **389** must be turned off immediately.
- ▶ The assembly key switch **389** bypasses the safety devices!
- ▶ The radii specified in the load chart may not be exceeded nor fallen below!

Note
- ▶ The operating position is reached if the blinking displays turn off and a load display appears in the “maximum load” icon instead of question marks (???).

▶ Turn the assembly key switch **389** off by pressing the button **397**.

Result:
– The LICCON overload protection is active.
– The Assembly icon **3** on the LICCON monitor turns off.
– The acoustical signal turns off.
– The red beacon on the crane cab turns off.





B104936

2.3 Crane operation

The possibility to operate the crane with the boom nose is intended for quick lifts with winch V in S/L-operation and winch II in W/N-operation.
The hook block can remain reeved on the boom head.

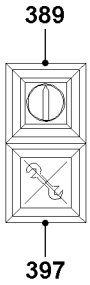
DANGER
Risk of accident!
- ▶ Two hook operation is prohibited for the 36 t boom nose!
- ▶ Maximum 3-way reeving is permissible, otherwise the boom nose will be overloaded.

Observe the instructions in chapter 4.05, 4.08 and 5.01.
Ensure that the following prerequisites are met:
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The assembly key button **389** has been turned off by pressing the button **397**.
- – The assembly icon **3** on the LICCON monitor is off.

DANGER
Crane can topple over!
- ▶ Check the horizontal position of the crane before and during operation.
- ▶ If the crane operator leaves the cab, even if only for a short time, then he is obligated to check and reset the operating mode setting, if necessary, before resuming crane operation.

2.3.1 Check the settings

- ▶ Check the function of the LICCON overload protection by running against the operating positions on top and bottom.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches on the jib stop cylinders.



B104932

2.4 Disassembly

Observe the safety guidelines for disassembly in chapter 5.01.

2.4.1 Luffing down the boom, general

DANGER
Crane can topple over!
If the following conditions are not met before taking down the crane, the crane can topple over and fatally injury personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

▶ Luff down the boom.

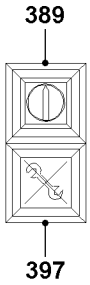
CAUTION
Damage to crane!
- ▶ Luff the boom down and spool the hoist winch out simultaneously to prevent a collision between the hook block and the boom nose.

▶ Luff the boom down to the **lowest** operating position.

When the lowest operating position is reached, the luff down movement is shut off.
The load value in the “maximum load” symbol disappears and question marks appear (????).
The following alarm functions become active:
– “STOP”
– “Horn” and acoustical signal

▶ Actuate the assembly key switch **389**.

Result:
– The LICCON overload protection is inactive.
– The Assembly icon **3** on the LICCON monitor blinks.
– An acoustical signal sounds.
– The red beacon on the crane cab blinks.



B104932

- ▶ Luff the boom down until hook block touches the ground.
- ▶ Remove the hoist limit switch weight and unreeve the hook block.

Note

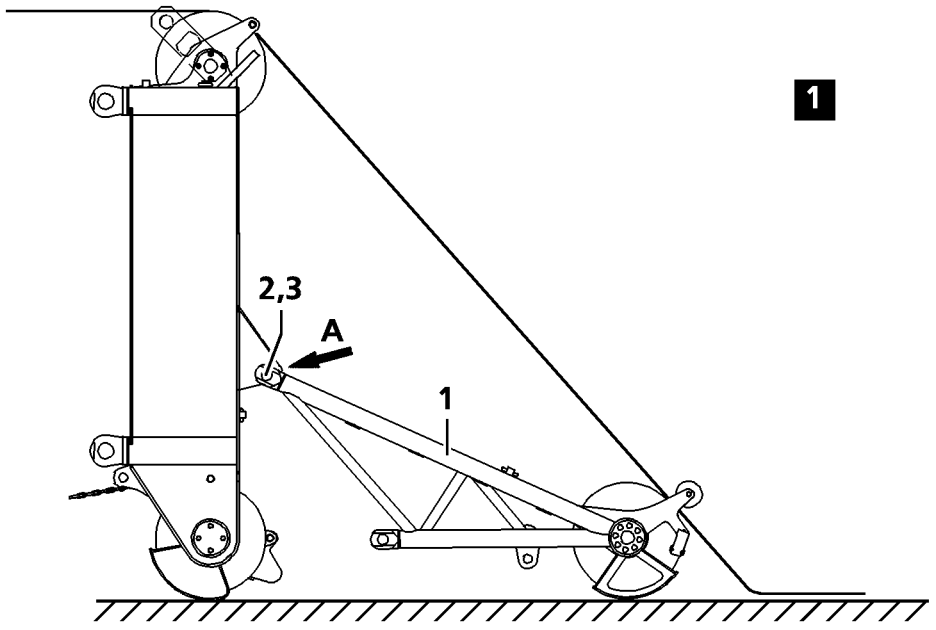
- ▶ Placing the various booms down is only possible to certain boom lengths.
- ▶ In any case, the data in the erection and take down charts must be observed and adhered to.
- ▶ For longer booms, the lower pins of the boom nose must be unpinned before take-down.

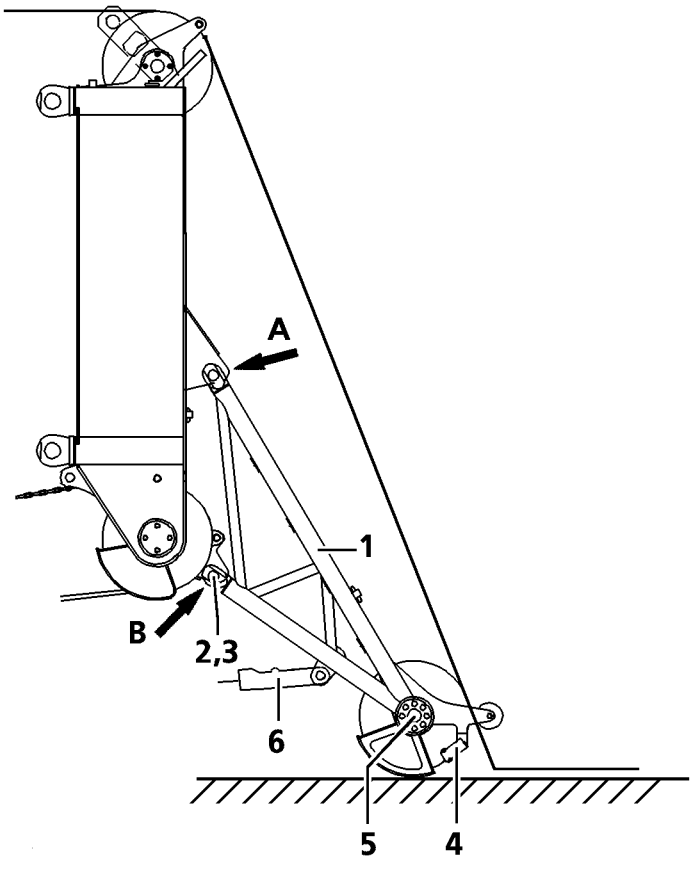
CAUTION

Damage of boom nose!

- ▶ If the boom nose is pinned on top and bottom on the end section, then the boom may be luffed down only to the point where the boom nose is not touching the ground.

- ▶ Luff the boom down until the boom nose is just above the ground.
- ▶ Remove the hoist rope.
- ▶ Unplug the hoist limit switch.
- ▶ Disconnect the electrical connections to the terminal boxes.





B187874

2.4.2 Removing the boom nose 36 t (H)

Disassembly procedure on S-/L-boom head

Note

▶ The disassembly procedure is described on the example of the S-boom head.

Ensure that the following prerequisite is met:

– The boom nose is just above the ground.

▶ Disengage the hoist limit switch weight with chain and shackle on the boom nose.

▶ Unreeve the hoist rope.

▶ Disconnect the electrical connections to the boom nose.

▶ Release and unpin the pin **2** on the end section “on the bottom” (point **B**).

▶ Hang the boom nose **1** onto the auxiliary crane.

▶ Lift the boom nose **1** with the auxiliary crane.

Note

▶ Make sure that the boom nose does not hit the ground when placing the S-boom down.

▶ Luff down the S-boom until the S-boom head is placed on the ground.

▶ When the S-boom head is laying on the ground:
Carefully lower the boom nose to the ground with the auxiliary crane.

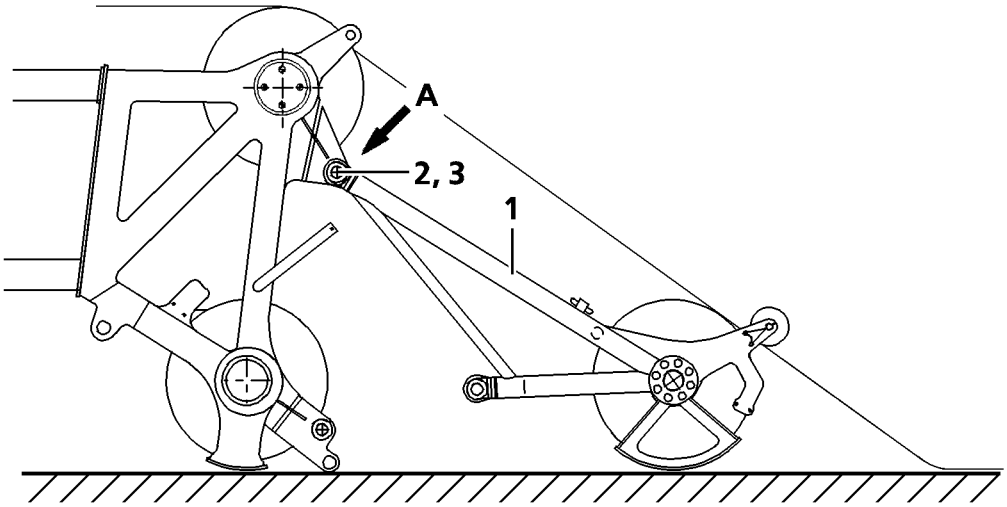
▶ Disconnect the electrical connections to the boom nose.

▶ Release and unpin the pin **2** on the end section “on top” (point **A**).

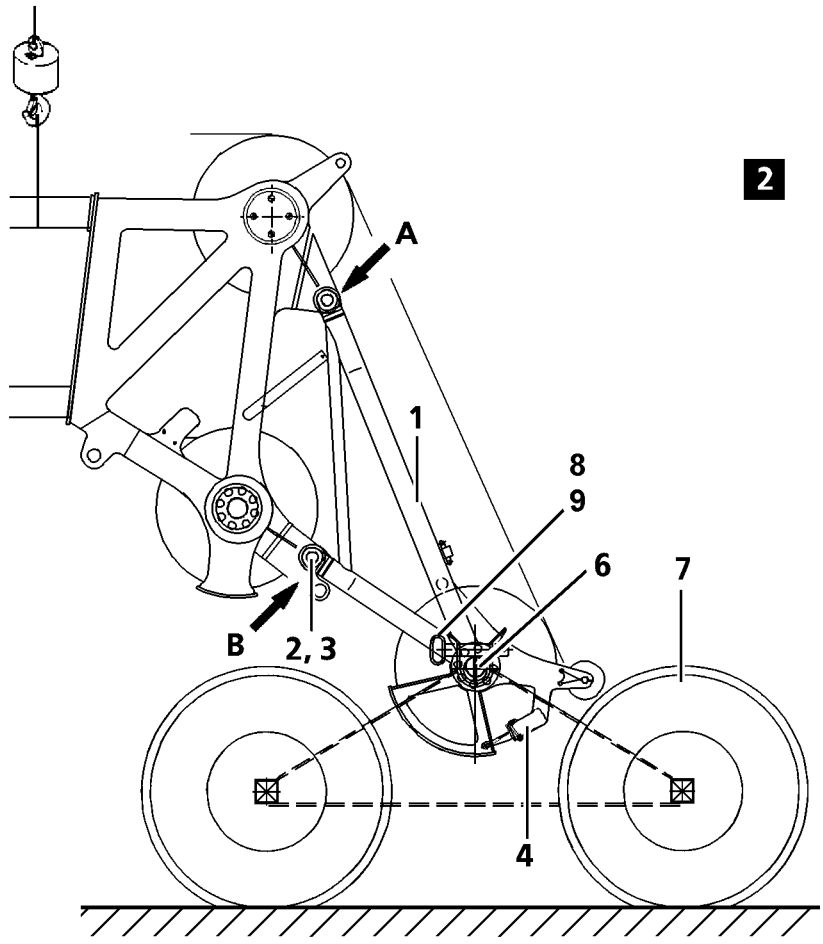
▶ Remove the boom nose with the auxiliary crane and place it down outside the working range.

▶ Remove the auxiliary crane from the boom nose.

1



2



B104699

Disassembly procedure on W-/N-boom head

Note

▶ The disassembly procedure is described on the example of the W-boom head.

Ensure that the following prerequisite is met:

– The boom nose is just above the ground.

▶ Disengage the hoist limit switch weight with chain and shackle on the boom nose.

▶ Unreeve the hoist rope.

▶ Disconnect the electrical connections to the boom nose.

For disassembly of the boom nose on the W-boom head, use the erection roller cart.

▶ Position the erection roller cart under the boom nose.

▶ When the erection roller cart is positioned under the boom nose:
Luff down the boom and place the boom nose with the studs **8** into the receptacles on the erection roller cart.

▶ When the boom nose is placed properly in the receptacles of the erection roller cart:
Insert and secure pins **9** in the receptacles.

▶ Slowly luff down the boom.

Result:

– The boom moves on the erection roller cart toward the “outside” (away from the crane).

When the boom is taken down fully, lift the W-end section with the auxiliary crane, remove the erection roller cart and unpin the boom nose “on the bottom”.

▶ When the boom is completely taken down:
Hang the W-end section on the auxiliary crane and bring the tackle to “tension”.

▶ Release and unpin the pin **9** on the erection roller cart.

▶ Lift the W-end section until the erection roller cart can be removed on the boom nose.

▶ Release and unpin the pin **2** on the end section “on the bottom” (point **B**).

▶ Disconnect the electrical connections to the boom nose.

Note

▶ When taking the W-end section down, it must be ensured that the boom nose is not being damaged.

▶ Place the W-end section slowly to the ground with the auxiliary crane.

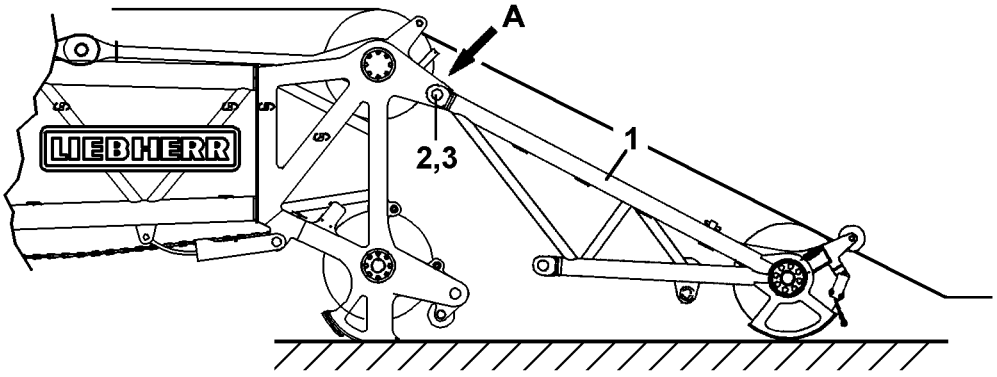
▶ Release and unpin the pin **2** on the end section “on top” (point **A**).

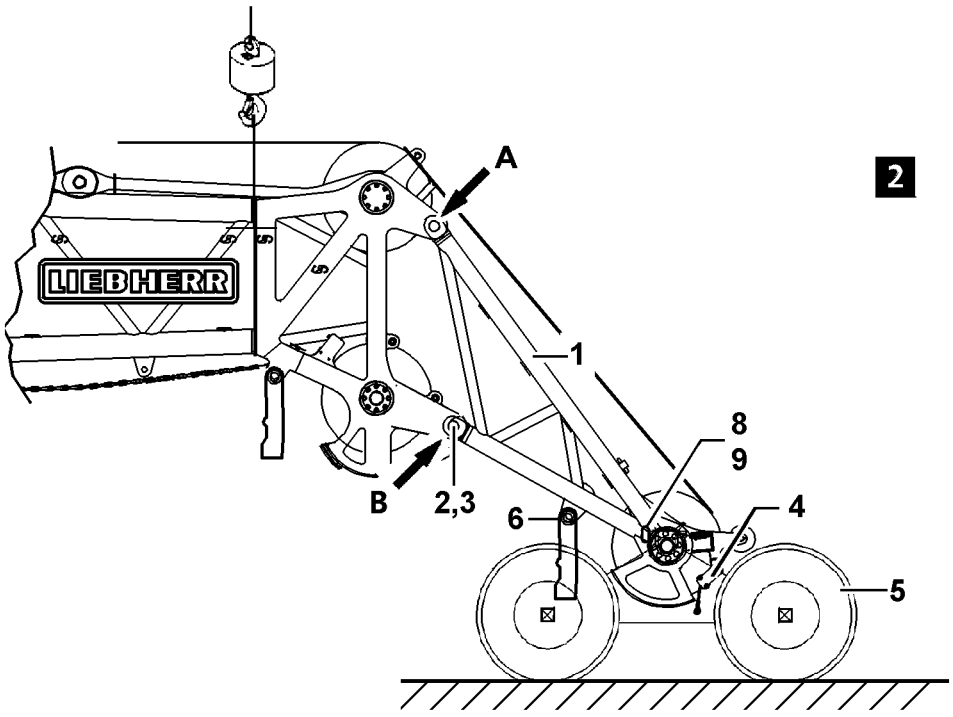
▶ Attach the boom nose on the intended attachment points with the auxiliary crane.

▶ Place the boom nose with the auxiliary crane down outside the working range.

▶ Remove the auxiliary crane from the boom nose.

1





2

B104700

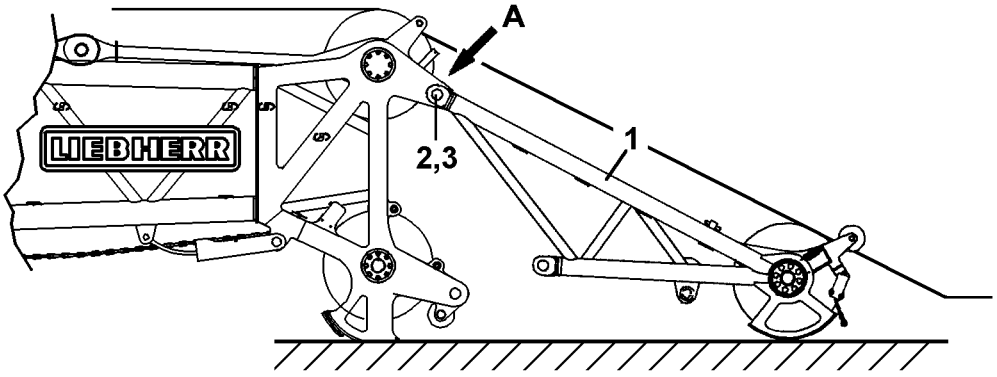
3 Boom nose 48 t (H2)

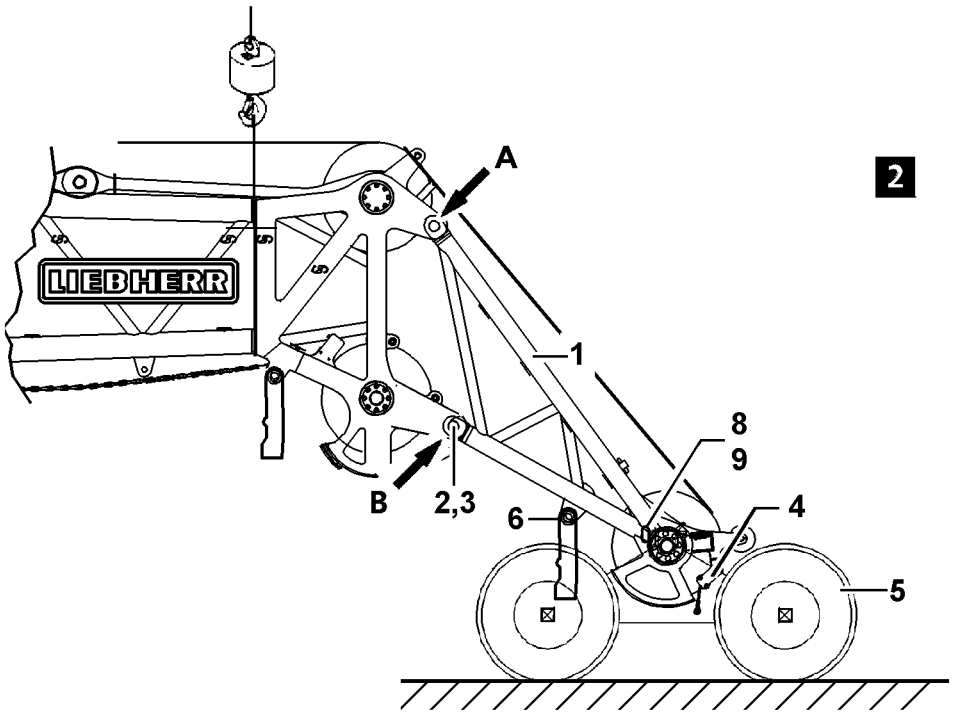
3.1 Assembly

The 48 t boom nose (H2) **1** can be installed and operated on various boom end sections (S-, L-, W- and N-), see fig.

Position	Description	Weight
1	Boom nose 48 t (H2)	0.61 t
2	Pin	
3	Spring retainer	
4	Hoist limit switch	
5	Axle for erection roller cart	
6	Rope fixed point (rope lock)	

1





2

B104700

3.1.1 Assembly procedure on N-boom head

Ensure that the following prerequisite is met:

– The N-end section is laying on the ground.

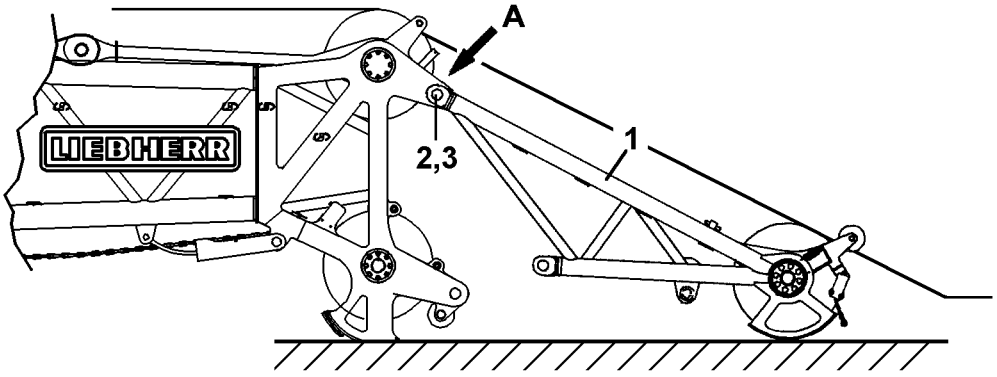
- ▶ Hang the boom nose **1** onto the auxiliary crane.
- ▶ Position the boom nose **1** with the auxiliary crane on the N-end section in such a way that the pin bores align “on top” (point **A**), see fig. **1**.
- ▶ When the pin bores align “on top”:
  Insert the pin **2** on the N-end section “on top” and secure with spring retainer **3**.
- ▶ Lower the boom nose **1** to the ground with the auxiliary crane.
- ▶ Remove the auxiliary crane.
- ▶ Lift the N-end section with the auxiliary crane until the boom nose lays on the end section “on the bottom”, see fig. **2**.
- ▶ When the pin bores align “on the bottom”:
  Insert the pin **2** on the N-end section “on the bottom” (point **B**) and secure with spring retainer **3**.
- ▶ Continue to lift the N-end section until the erection roller cart can be pushed under the boom nose.
- ▶ When the erection roller cart is positioned under the boom nose:
  Swing the folding roller to the rear and hold.
- ▶ Slowly lower the N-end section with the auxiliary crane and place the boom nose with the studs **8** into the receptacles on the erection roller cart.
- ▶ Insert the pins **9** into the retainers on the erection roller cart and secure.

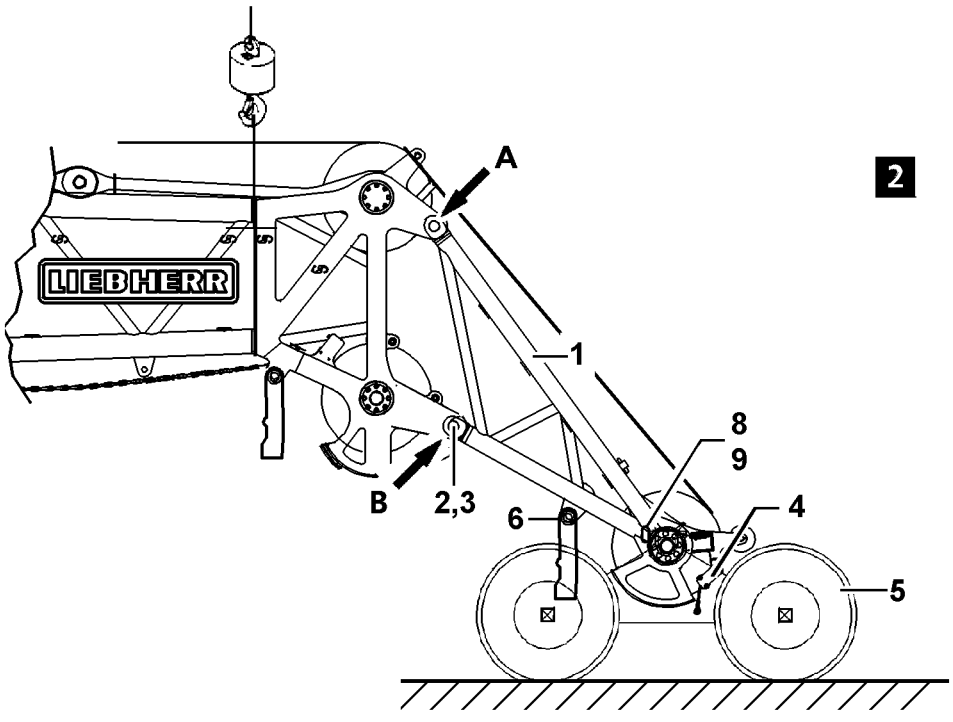
Note

- ▶ Pull the hoist rope over the rope pulleys and reeve it in according to the separately supplied reeving plans.

- ▶ Reeve the hook block properly and attach the hoist limit switch weight.

1





2

B104700

3.1.2 Establish the electrical connections

Ensure that the following prerequisite is met:
– The boom nose is completely installed.

▶ Establish the electrical connection from the terminal box of the “N-end section” to the terminal box “boom nose”.
▶ Establish the electrical connection from the terminal box of the “boom nose” to the hoist limit switch.

3.1.3 Function check

Ensure that the following prerequisites are met:
– All electrical connections have been established.
– The corresponding operating mode is set on the LICCON monitor.

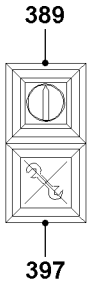
Limit switch, general

Note
▶ The limit switch functions have to be checked individually before erection!

Hoist limit switch

▶ Actuate the hoist limit switches manually.

Result:
– The icon appears on the LICCON monitor.
– The **spool up function** of the hoist winch turns off.



B104932

3.2 Erecting the boom

DANGER
Crane can topple over!
If the following conditions are not met before erecting the crane, the crane can topple over and fatally injury personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

CAUTION
Danger of property damage on the boom nose!
- ▶ When erecting the boom systems, it must be ensured that the hoist rope does not get stuck in the boom nose.
- ▶ Reeve the hoist rope according to the reeving plans on the hook block.

Ensure that the following prerequisites are met:
– The assembly key switch **389** has been actuated.

DANGER
Crane can topple over!
- ▶ The assembly key switch **389** bypasses the safety devices!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection procedure!

3.2.1 Erection

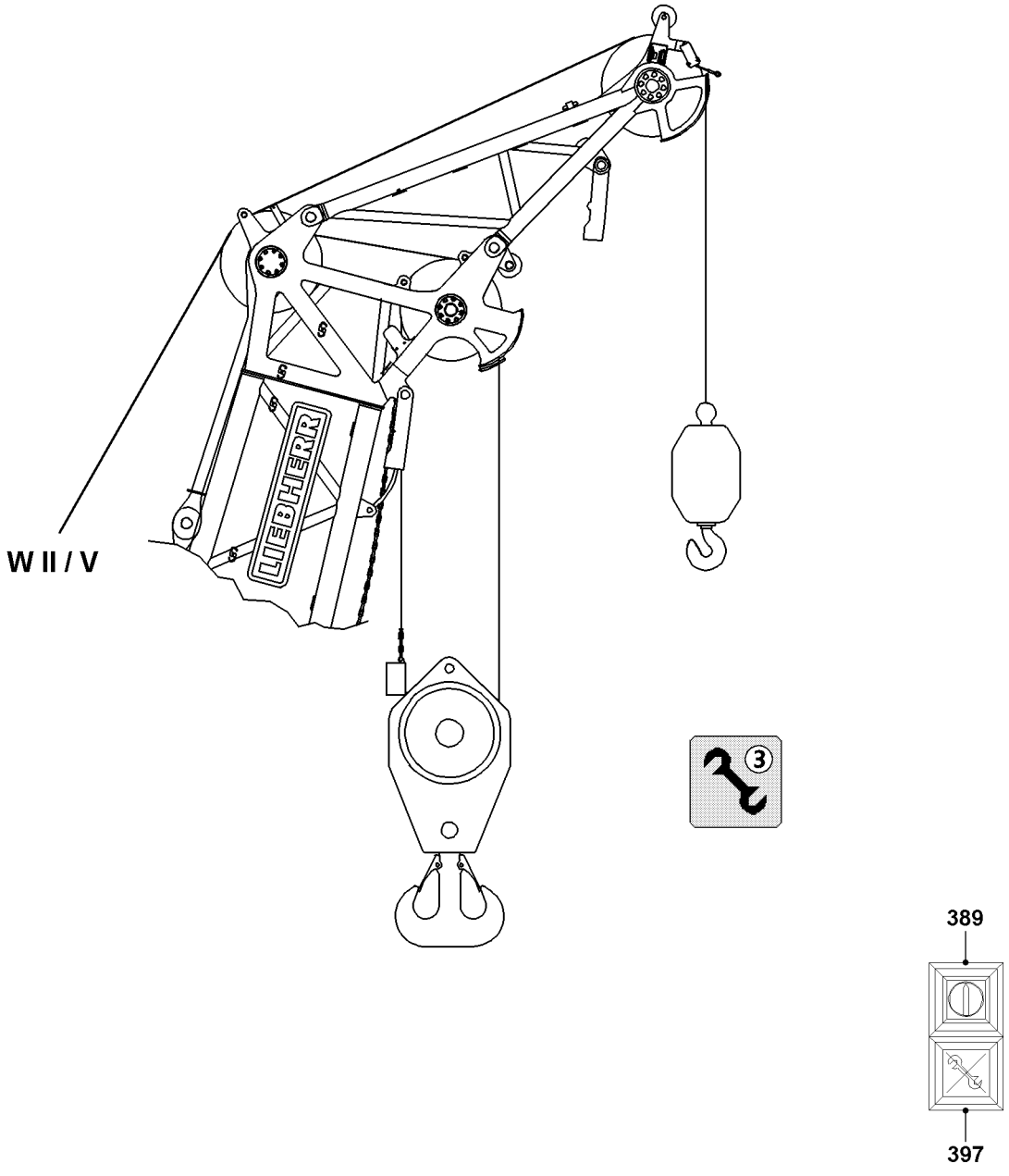
▶ Luff the boom up to the lowest operating position.

DANGER
Crane can topple over!
- ▶ When the lowest operating position is reached, the assembly key switch **389** must be turned off immediately.
- ▶ The assembly key switch **389** bypasses the safety devices!
- ▶ The radii specified in the load chart may not be exceeded nor fallen below!

Note
- ▶ The operating position is reached if the blinking displays turn off and a load display appears in the “maximum load” icon instead of question marks (???).

▶ Turn the assembly key switch **389** off by pressing the button **397**.

Result:
– The LICCON overload protection is active.
– The Assembly icon **3** on the LICCON monitor turns off.
– The acoustical signal turns off.
– The red beacon on the crane cab turns off.



B104937

3.3 Crane operation

The possibility to operate the crane with the boom nose is intended for quick lifts with winch V in S/L-operation and winch II in N/W-operation.
The hook block can remain reeved on the boom head.

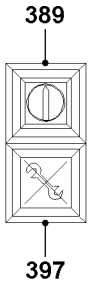
DANGER
Risk of accident!
- ▶ Two hook operation is prohibited for the 48 t boom nose!
- ▶ Maximum 4-way reeving is permissible, otherwise the boom nose will be overloaded.

Observe the instructions in chapter 4.05, 4.08 and 5.01.
Ensure that the following prerequisites are met:
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The assembly key button **389** has been turned off by pressing the button **397**.
- – The assembly icon **3** on the LICCON monitor is off.

DANGER
Crane can topple over!
- ▶ Check the horizontal position of the crane before and during operation.
- ▶ If the crane operator leaves the cab, even if only for a short time, then he is obligated to check and reset the operating mode setting, if necessary, before resuming crane operation.

3.3.1 Check the settings

- ▶ Check the function of the LICCON overload protection by running against the operating positions on top and bottom.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches on the jib stop cylinders.



B104932

3.4 Disassembly

Observe the safety guidelines for disassembly in chapter 5.01.

3.4.1 Luffing down the boom, general

DANGER
Crane can topple over!
If the following conditions are not met before taking down the crane, the crane can topple over and fatally injury personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

▶ Luff down the boom.

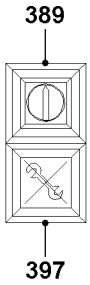
CAUTION
Damage to crane!
- ▶ Luff the boom down and spool the hoist winch out simultaneously to prevent a collision between the hook block and the boom nose.

▶ Luff the boom down to the **lowest** operating position.

When the lowest operating position is reached, the luff down movement is shut off.
The load value in the “maximum load” symbol disappears and question marks appear (????).
The following alarm functions become active:
– “STOP”
– “Horn” and acoustical signal

▶ Actuate the assembly key switch **389**.

Result:
– The LICCON overload protection is inactive.
– The Assembly icon **3** on the LICCON monitor blinks.
– An acoustical signal sounds.
– The red beacon on the crane cab blinks.



B104932

- ▶ Luff the boom down until hook block touches the ground.
- ▶ Remove the hoist limit switch weight and unreeve the hook block.

Note

- ▶ Placing the various booms down is only possible to certain boom lengths.
- ▶ In any case, the data in the erection and take down charts must be observed and adhered to.
- ▶ For longer booms, the lower pins of the boom nose must be unpinned before take-down.

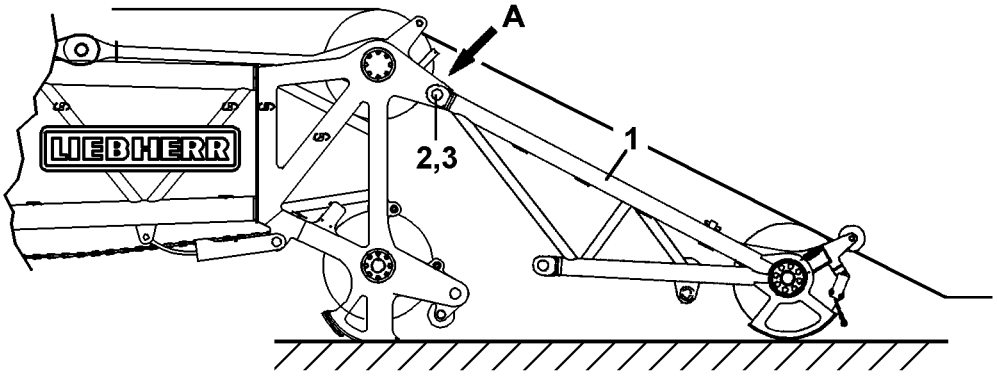
CAUTION

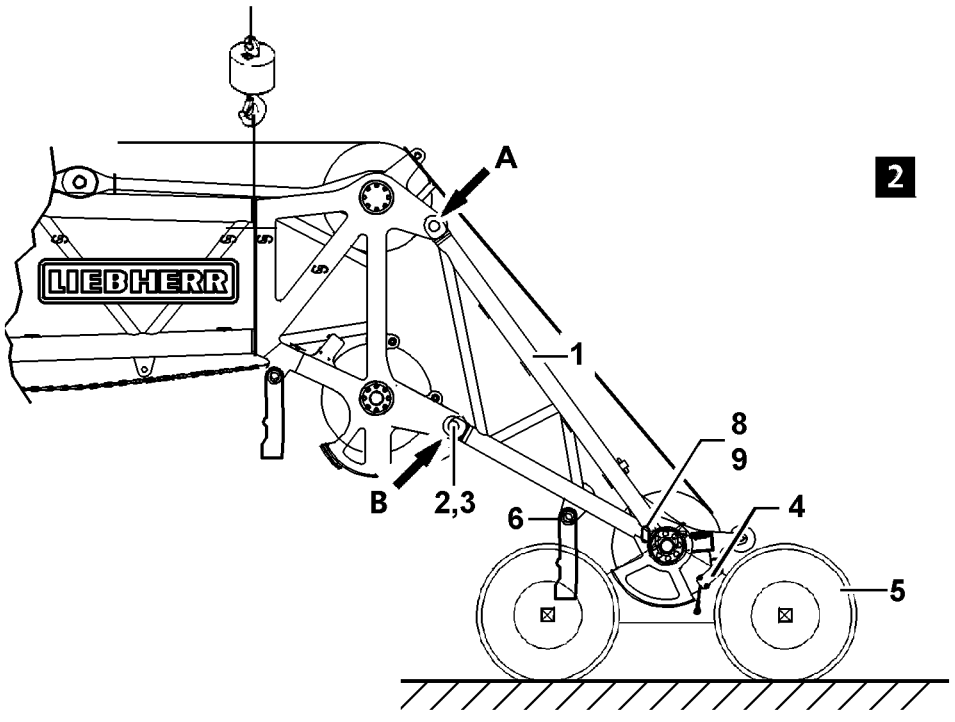
Damage of boom nose!

- ▶ If the boom nose is pinned on top and bottom on the end section, then the boom may be luffed down only to the point where the boom nose is not touching the ground.

- ▶ Luff the boom down until the boom nose is just above the ground.
- ▶ Remove the hoist rope.
- ▶ Unplug the hoist limit switch.
- ▶ Disconnect the electrical connections to the terminal boxes.

1





2

B104700

3.4.2 Disassembly of the 48 t (H2) boom nose

Disassembly procedure on N-boom head

Ensure that the following prerequisite is met:

– The boom nose is just above the ground.

▶ Disengage the hoist limit switch weight with chain and shackle on the boom nose.

▶ Unreeve the hoist rope.

▶ Disconnect the electrical connections to the boom nose.

For disassembly of the boom nose on the N-boom head, use the erection roller cart.

▶ Position the erection roller cart under the boom nose.

▶ When the erection roller cart is positioned under the boom nose:
Luff down the boom and place the boom nose with the studs **8** into the receptacles on the erection roller cart.

▶ When the boom nose is placed properly in the receptacles of the erection roller cart:
Insert and secure pins **9** in the receptacles.

▶ Slowly luff down the boom.

Result:

– The boom moves on the erection roller cart toward the “outside” (away from the crane).

When the boom is taken down fully, lift the N-end section with the auxiliary crane, remove the erection roller cart and unpin the boom nose “on the bottom”.

▶ When the boom is completely taken down:
Hang the N-end section on the auxiliary crane and bring the tackle to “tension”.

▶ Disconnect the electrical connections to the boom nose.

▶ Release and unpin the pin **9** on the erection roller cart.

▶ Lift the N-end section until the erection roller cart can be removed on the boom nose.

▶ Release and unpin the pin **2** on the end section “on the bottom” (point **B**).

Note

▶ When taking the N-end section down, it must be ensured that the boom nose is not being damaged.

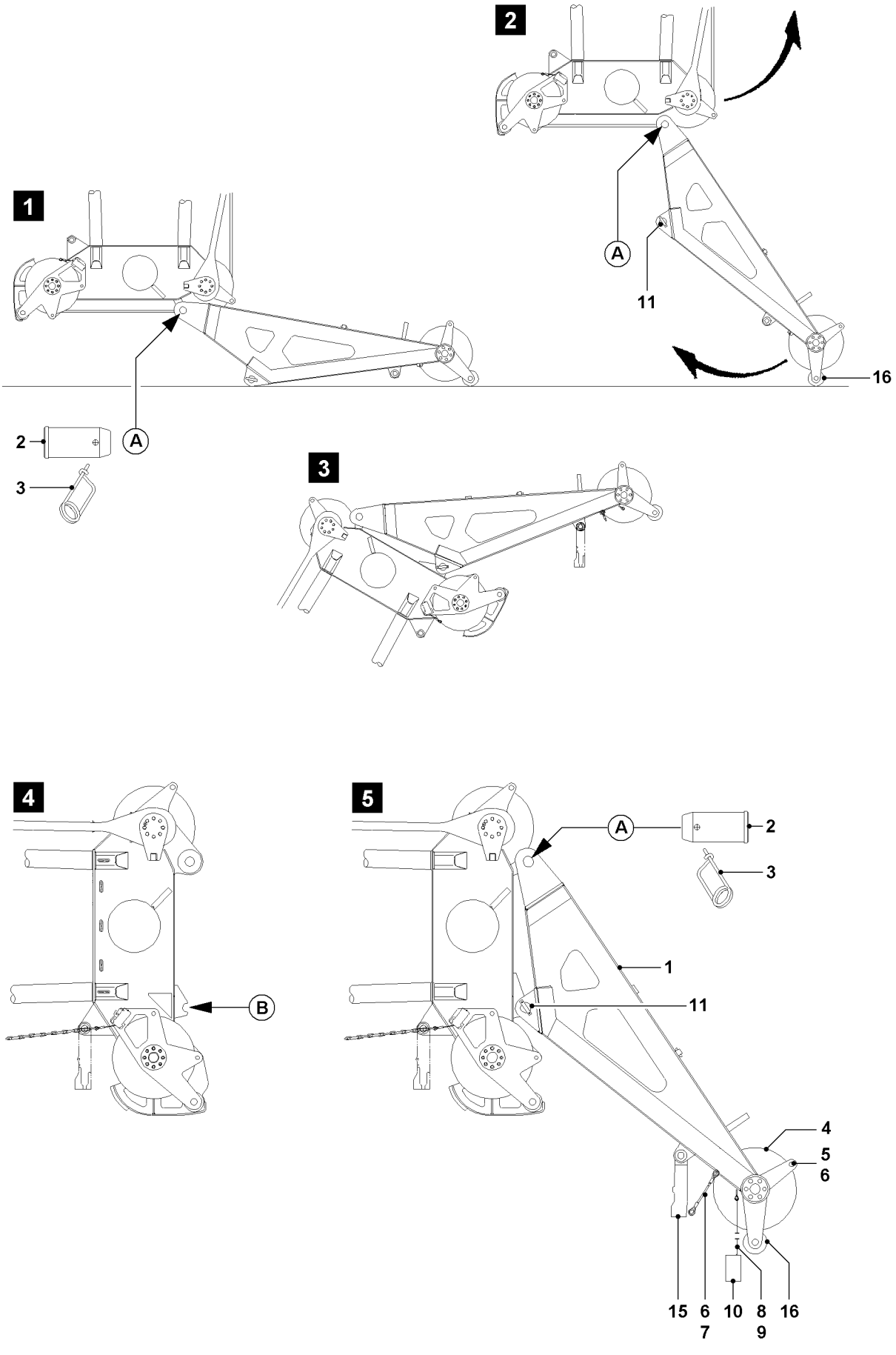
▶ Place the N-end section slowly to the ground with the auxiliary crane.

▶ Release and unpin the pin **2** on the end section “on top” (point **A**).

▶ Attach the boom nose on the intended attachment points with the auxiliary crane.

▶ Place the boom nose with the auxiliary crane down outside the working range.

▶ Remove the auxiliary crane from the boom nose.



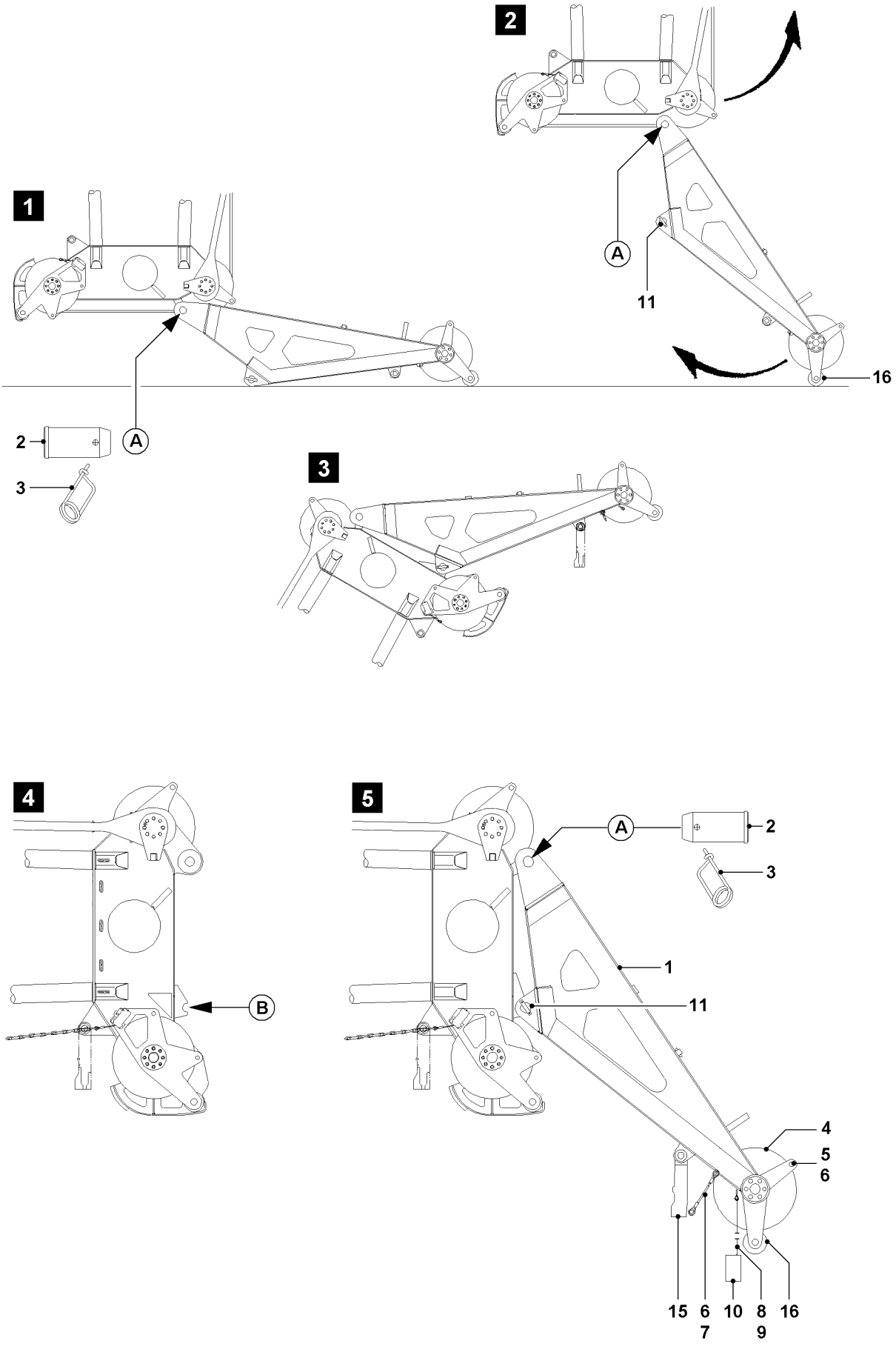
B104697

4 Boom nose 60 t (H)

4.1 Assembly

The 60 t boom nose (H) **1** can be installed and operated on the W-end section.

Position	Description	Weight
1	Boom nose 60 t (H)	0.78 t
2	Pin	
3	Spring retainer	
4	Cable pulley	
5	Rope retaining pipe	
6	Spring retainer	
7	Rope	
8	Shackle	
9	Chain	
10	Hoist limit switch weight	
11	Pin	
12	Flat steel bar	
13	Spring ring A8	
14	Screw	
15	Twist compensator	
16	Roller	



B104697

4.1.1 Assembly procedure on W-boom head

Ensure that the following prerequisite is met:

– The W-boom is in folded down position, see fig. **1**.

▶ The boom nose **1** is laying on the ground, see fig. **1**.

▶ Position the boom nose **1** in such a way that the pin bores align at point **A**.

▶ When the pin bores align on point **A**:
Insert the pin **2** on the W-end section at point **A**) and secure with spring retainer **3**.

▶ Release and unpin the rope retaining pipe **5**.

▶ Pull the hoist rope over the rope pulley **4**.

▶ Insert the rope retaining pipe **5** and secure with spring retainer **6**.

Result:

– The hoist rope is secured to prevent it from jumping out of the rope pulley **4**.

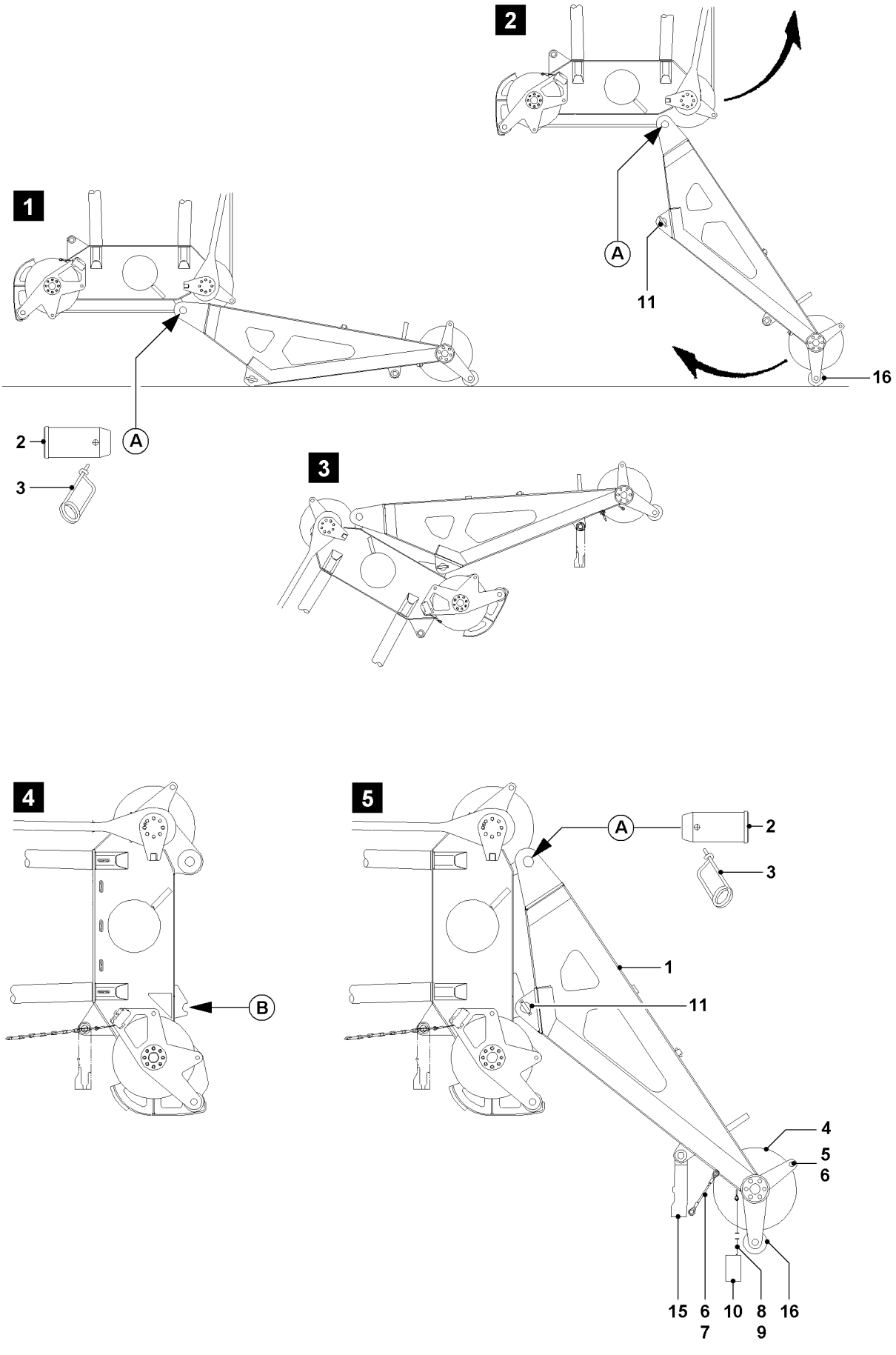
▶ Release the twist compensator by releasing it from the rope **7**.

▶ Luff the W-boom up until the stop pins **11** touch the W-end section “on the bottom” (point **B**), see fig. **4**.

Note

▶ Pull the hoist rope over the rope pulleys and reeve it in according to the separately supplied reeving plans.

▶ Reeve the hook block properly and attach the hoist limit switch weight **10**.



B104697

4.1.2 Establish the electrical connections

Ensure that the following prerequisite is met:
– The boom nose is completely installed.

▶ Establish the electrical connection from the terminal box of the “W-end section” to the terminal box “boom nose”.

▶ Establish the electrical connection from the terminal box of the “boom nose” to the hoist limit switch.

4.1.3 Function check

Ensure that the following prerequisites are met:
– All electrical connections have been established.
– The corresponding operating mode is set on the LICCON monitor.

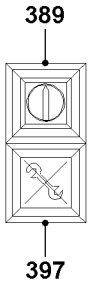
Limit switch, general

Note
▶ The limit switch functions have to be checked individually before erection!

Hoist limit switch

▶ Actuate the hoist limit switches manually.

Result:
– The icon appears on the LICCON monitor.
– The **spool up function** of the hoist winch turns off.



B104932

4.2 Erecting the boom

DANGER
Crane can topple over!
If the following conditions are not met before erecting the crane, the crane can topple over and fatally injury personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

CAUTION
Danger of property damage on the boom nose!
- ▶ When erecting the boom systems, it must be ensured that the hoist rope does not get stuck in the boom nose.
- ▶ Reeve the hoist rope according to the reeving plans on the hook block.

Ensure that the following prerequisites are met:
– The assembly key switch **389** has been actuated.

DANGER
Crane can topple over!
- ▶ The assembly key switch **389** bypasses the safety devices!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection procedure!

4.2.1 Erection

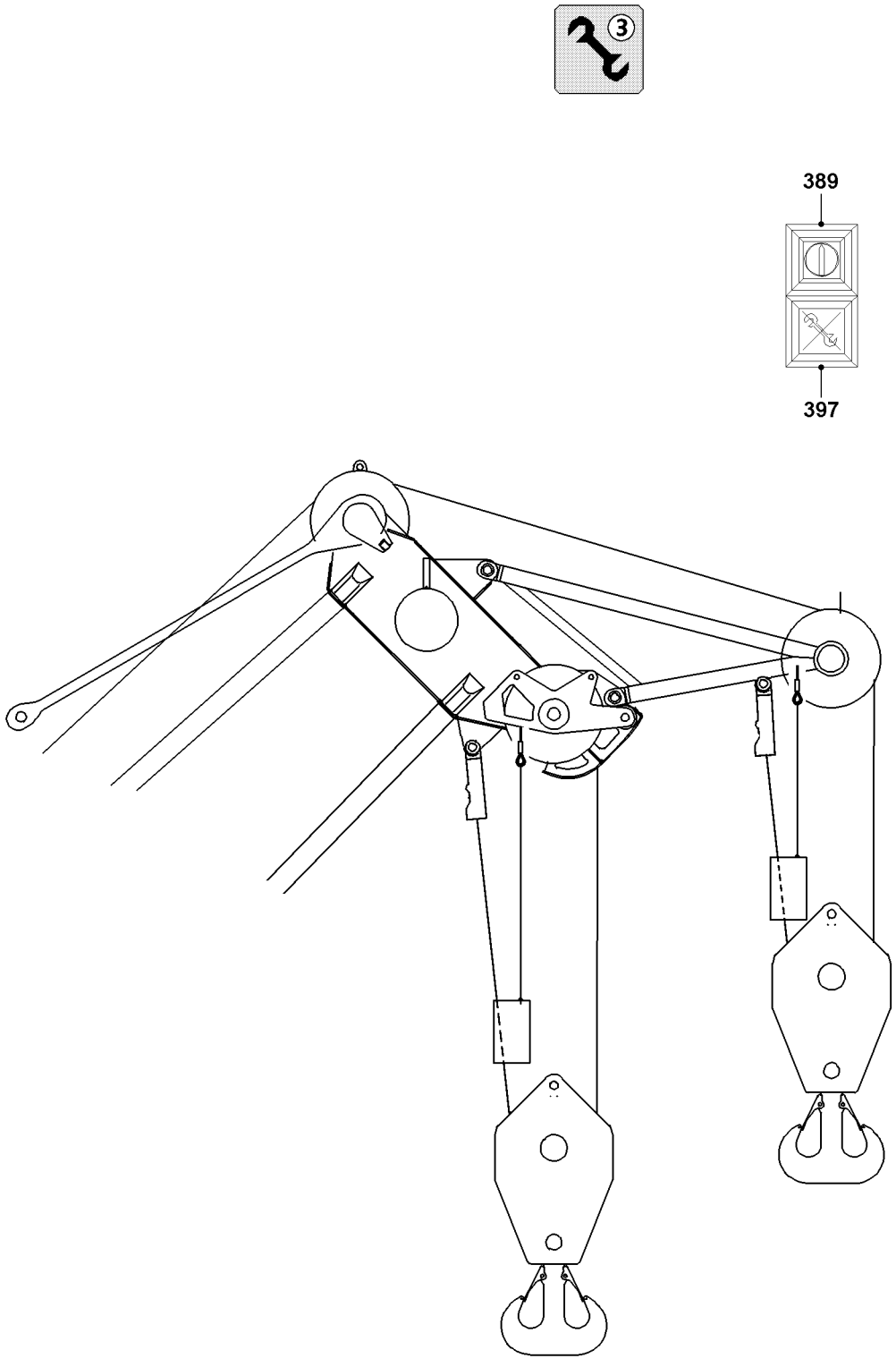
▶ Luff the boom up to the lowest operating position.

DANGER
Crane can topple over!
- ▶ When the lowest operating position is reached, the assembly key switch **389** must be turned off immediately.
- ▶ The assembly key switch **389** bypasses the safety devices!
- ▶ The radii specified in the load chart may not be exceeded nor fallen below!

Note
- ▶ The operating position is reached if the blinking displays turn off and a load display appears in the “maximum load” icon instead of question marks (???).

▶ Turn the assembly key switch **389** off by pressing the button **397**.

Result:
– The LICCON overload protection is active.
– The Assembly icon **3** on the LICCON monitor turns off.
– The acoustical signal turns off.
– The red beacon on the crane cab turns off.



B104934

4.3 Crane operation

The possibility to operate the crane with this boom nose is intended for turning loads at simultaneous operation of both hoist gears over the 400 t end section and the boom nose.

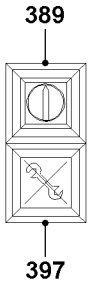
DANGER
Crane can topple over!
- ▶ It is only permitted to turn a load in two hook operation towards the main hook!
- ▶ The setting if the LICCON overload protection to the smaller reeving of the two hook blocks ensures that the crane is not overloaded.
- ▶ Loads up to a maximum of 60 t are permissible on the boom nose!

Observe the instructions in chapter 4.05, 4.08 and 5.01.
Ensure that the following prerequisites are met:
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The assembly key button **389** has been turned off by pressing the button **397**.
- – The assembly icon **3** on the LICCON monitor is off.

DANGER
Crane can topple over!
- ▶ Check the horizontal position of the crane before and during operation.
- ▶ If the crane operator leaves the cab, even if only for a short time, then he is obligated to check and reset the operating mode setting, if necessary, before resuming crane operation.

4.3.1 Check the settings

- ▶ Check the function of the LICCON overload protection by running against the operating positions on top and bottom.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches on the jib stop cylinders.



B104932

4.4 Disassembly

Observe the safety guidelines for disassembly in chapter 5.01.

4.4.1 Luffing down the boom, general

DANGER
Crane can topple over!
If the following conditions are not met before taking down the crane, the crane can topple over and fatally injury personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

▶ Luff down the boom.

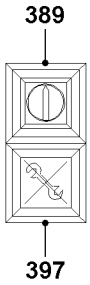
CAUTION
Damage to crane!
- ▶ Luff the boom down and spool the hoist winch out simultaneously to prevent a collision between the hook block and the boom nose.

▶ Luff the boom down to the **lowest** operating position.

When the lowest operating position is reached, the luff down movement is shut off.
The load value in the “maximum load” symbol disappears and question marks appear (????).
The following alarm functions become active:
– “STOP”
– “Horn” and acoustical signal

▶ Actuate the assembly key switch **389**.

Result:
– The LICCON overload protection is inactive.
– The Assembly icon **3** on the LICCON monitor blinks.
– An acoustical signal sounds.
– The red beacon on the crane cab blinks.



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- ▶ Luff the boom down until hook block touches the ground.
- ▶ Remove the hoist limit switch weight and unreeve the hook block.

Note

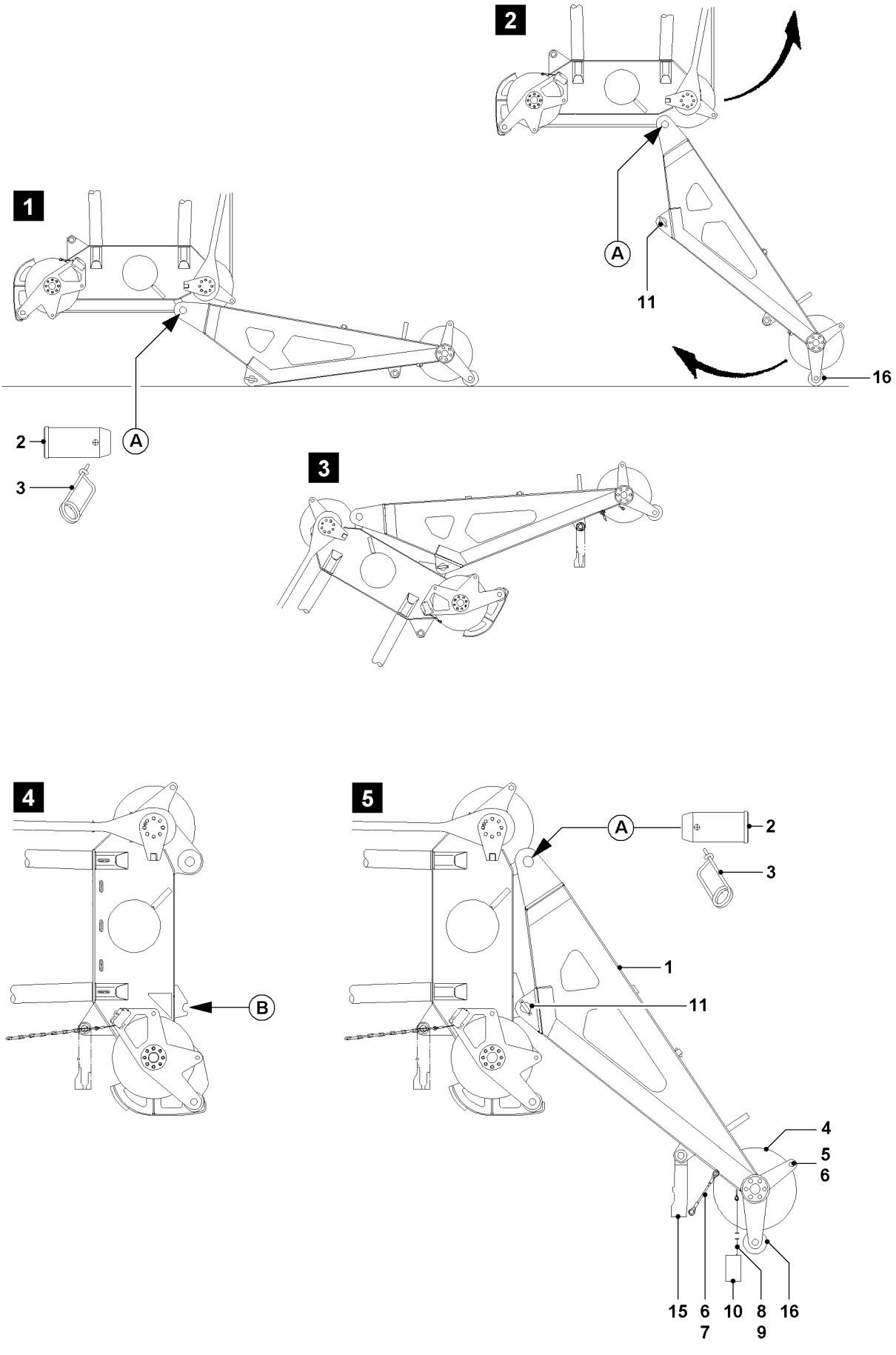
- ▶ Placing the various booms down is only possible to certain boom lengths.
- ▶ In any case, the data in the erection and take down charts must be observed and adhered to.
- ▶ For longer booms, the lower pins of the boom nose must be unpinned before take-down.

CAUTION

Damage of boom nose!

- ▶ If the boom nose is pinned on top and bottom on the end section, then the boom may be luffed down only to the point where the boom nose is not touching the ground.

- ▶ Luff the boom down until the boom nose is just above the ground.
- ▶ Remove the hoist rope.
- ▶ Unplug the hoist limit switch.
- ▶ Disconnect the electrical connections to the terminal boxes.



B104697

4.4.2 Removing the boom nose 60 t (H)

Disassembly procedure on W-boom head

Ensure that the following prerequisite is met:

– The boom nose is just above the ground.

- ▶ Disengage the hoist limit switch weight with chain and shackle on the boom nose.
- ▶ Release and unpin the rope retaining pipe **5**.
- ▶ Unreeve the hoist rope.
- ▶ Pin the rope retaining pipe **5** in again and secure.
- ▶ Disconnect the electrical connections to the boom nose.

CAUTION

Danger of property damage on twist compensator!

If the twist compensator **15** is not secured on the boom nose in transport position before placing the boom all the way down, then it can be destroyed when it hits the ground.

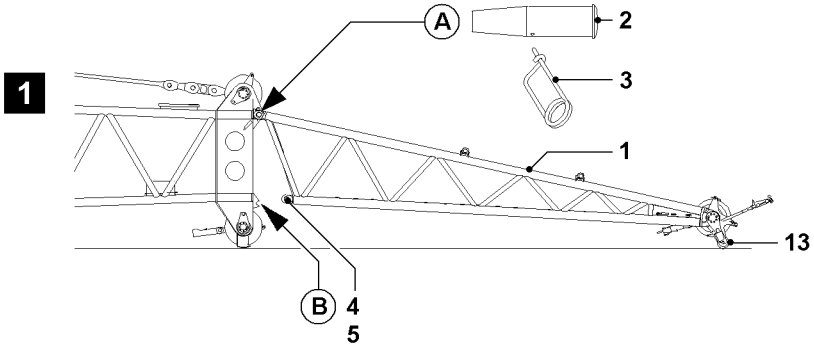
- ▶ Secure the twist compensator **15** on the boom nose with the rope **7** and spring retainer **6** before placing the boom down.

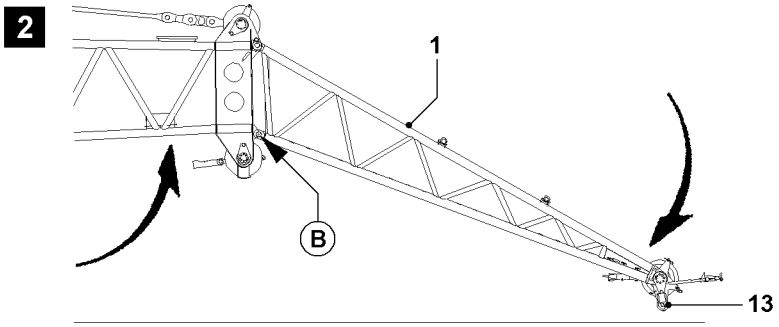
- ▶ Carefully luff down the W-boom until the boom nose touches the ground with the “roller”.
- ▶ Continue to luff down the W-boom carefully until the boom nose folds automatically outward.
- ▶ Place the W-boom all the way down.

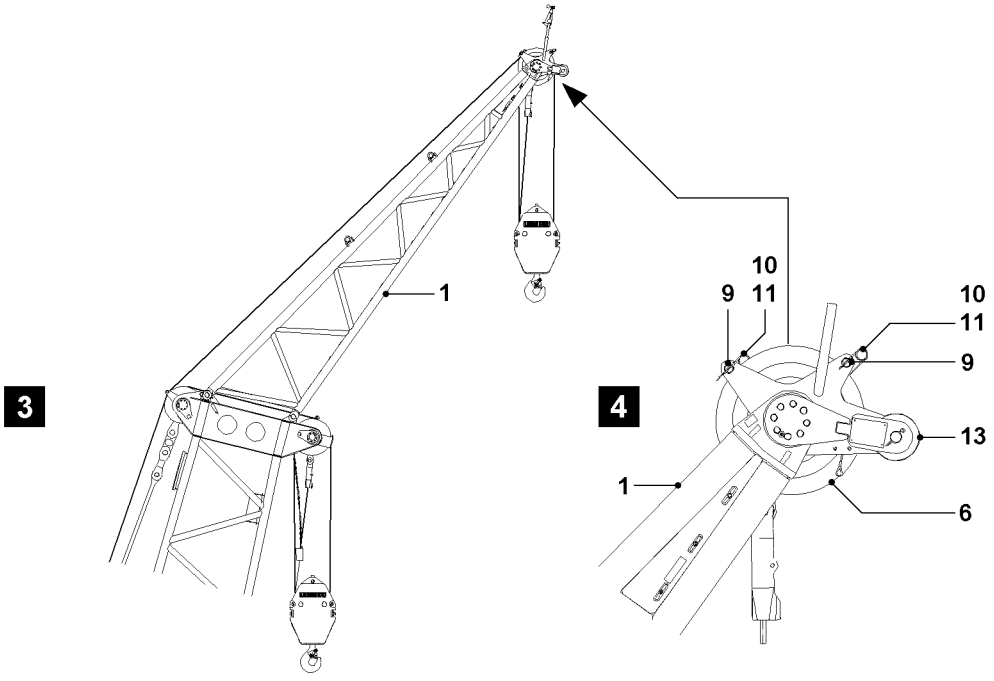
Result:

– The boom nose runs on the roller by itself toward the “outside” (away from the crane).

- ▶ When the boom and the boom nose are laying completely on the ground:
  Attach the boom nose on the auxiliary crane.
- ▶ Release and unpin the pin **2** on the end section “on top” point **A**.
- ▶ Remove the boom nose with the auxiliary crane and place it down outside the working range.
- ▶ Remove the auxiliary crane from the boom nose.







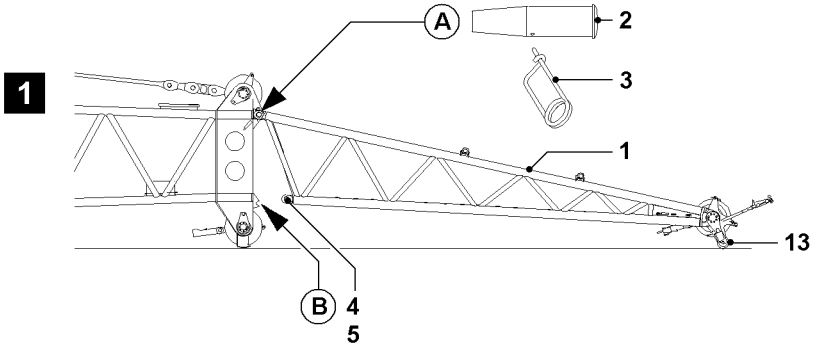
B104698

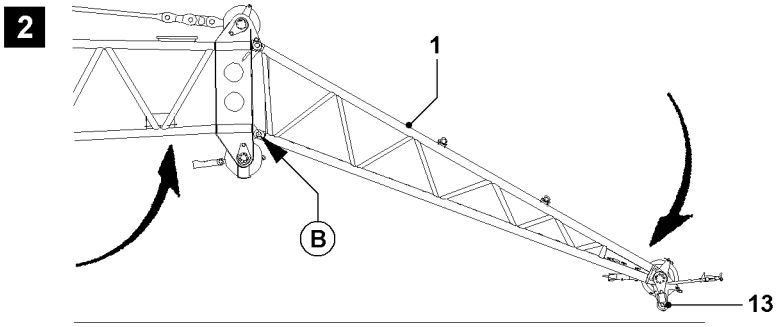
5 Boom nose 72 t (H)

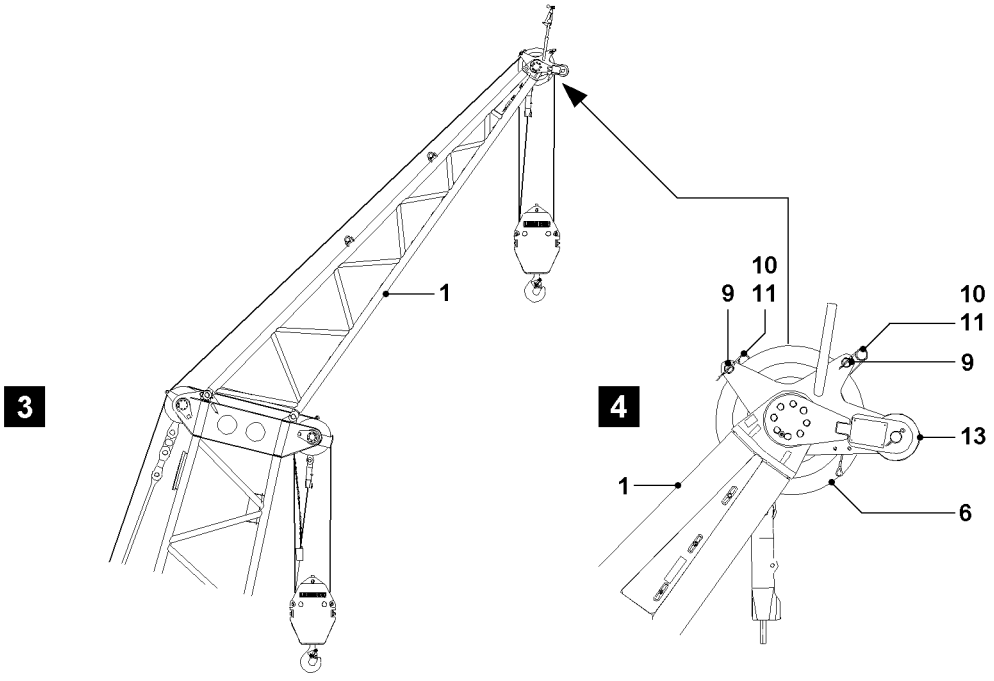
5.1 Assembly

The 72 t boom nose **1** can be installed and operated on the SL-end section, see figure.

Position	Description	Weight
1	Boom nose 72 t (H)	1.75 t
2	Pin	
3	Spring retainer	
4	Pin	
5	Cotter pin	
6	Cable pulley	
9	Rope retaining pipe	
10	Cotter pin (on rope retaining pipe)	
11	Spring retainer	
13	Roller	







B104698

5.1.1 Assembly procedure on SL-boom head

Ensure that the following prerequisite is met:

– The SL-end section is laying on the ground.

▶ Hang the boom nose **1** onto the auxiliary crane.

▶ Position the boom nose **1** with the auxiliary crane on the SL-end section in such a way that the pin bores align “on top” (point **A**), see fig. **1**.

▶ When the pin bores align “on top”:
Insert the pin **2** on the SL-end section “on top” from the outside to the inside and secure with spring retainer **3**.

▶ Lower the boom nose **1** to the ground with the auxiliary crane.

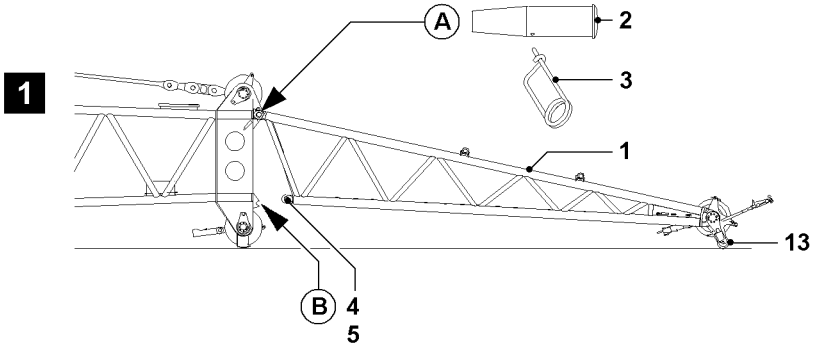
▶ Remove the auxiliary crane.

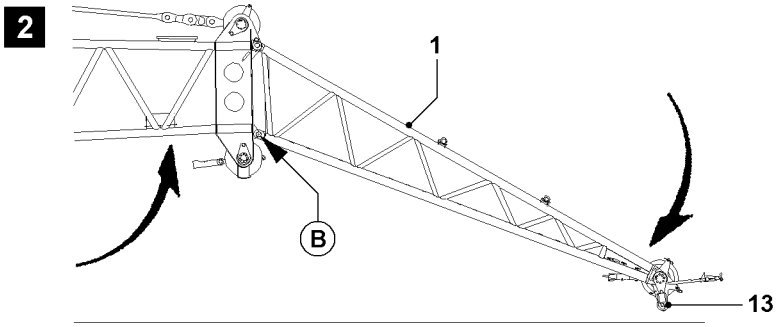
▶ Luff the SL-boom up until the stop pins **4** touch the SL-end section “on the bottom” (point **B**), see fig. **2**.

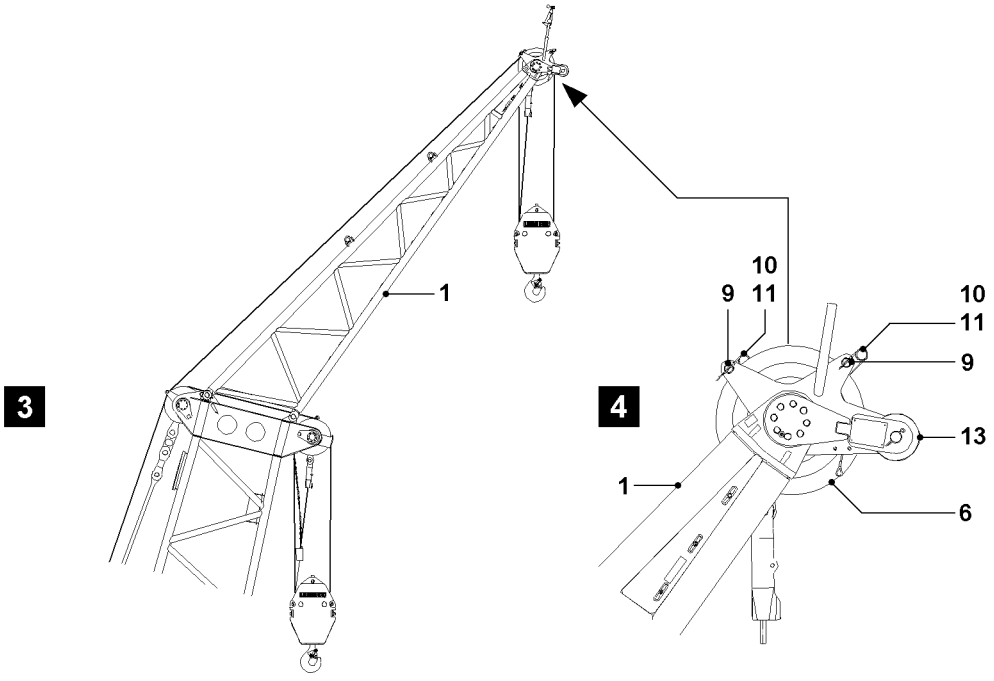
Note

▶ Pull the hoist rope over the rope pulleys and reeve it in according to the separately supplied reeving plans.

▶ Reeve the hook block properly and attach the hoist limit switch weight.







B104698

5.1.2 Establish the electrical connections

Ensure that the following prerequisite is met:
– The boom nose is completely installed.

▶ Establish the electrical connection from the terminal box of the “SL-end section” to the terminal box “boom nose”.
▶ Establish the electrical connection from the terminal box of the “boom nose” to the hoist limit switch.

5.1.3 Function check

Ensure that the following prerequisites are met:
– All electrical connections have been established.
– The corresponding operating mode is set on the LICCON monitor.

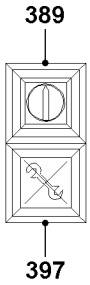
Limit switch, general

Note
▶ The limit switch functions have to be checked individually before erection!

Hoist limit switch

▶ Actuate the hoist limit switches manually.

Result:
– The icon appears on the LICCON monitor.
– The **spool up function** of the hoist winch turns off.



B104932

5.2 Erecting the boom

DANGER
Crane can topple over!
If the following conditions are not met before erecting the crane, the crane can topple over and fatally injury personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

CAUTION
Danger of property damage on the boom nose!
- ▶ When erecting the boom systems, it must be ensured that the hoist rope does not get stuck in the boom nose.
- ▶ Reeve the hoist rope according to the reeving plans on the hook block.

Ensure that the following prerequisites are met:
– The assembly key switch **389** has been actuated.

DANGER
Crane can topple over!
- ▶ The assembly key switch **389** bypasses the safety devices!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection procedure!

5.2.1 Erection

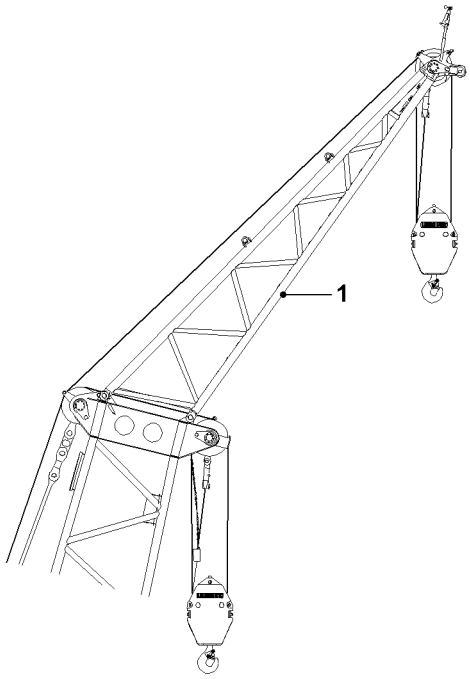
▶ Luff the boom up to the lowest operating position.

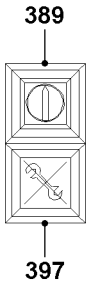
DANGER
Crane can topple over!
- ▶ When the lowest operating position is reached, the assembly key switch **389** must be turned off immediately.
- ▶ The assembly key switch **389** bypasses the safety devices!
- ▶ The radii specified in the load chart may not be exceeded nor fallen below!

Note
- ▶ The operating position is reached if the blinking displays turn off and a load display appears in the “maximum load” icon instead of question marks (???).

▶ Turn the assembly key switch **389** off by pressing the button **397**.

Result:
– The LICCON overload protection is active.
– The Assembly icon **3** on the LICCON monitor turns off.
– The acoustical signal turns off.
– The red beacon on the crane cab turns off.





B104935

5.3 Crane operation

The possibility to operate the crane with this boom nose is intended for turning loads at simultaneous operation of both hoist gears over the 100 t end section (SL-end section) and the boom nose.

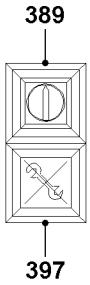
DANGER
Crane can topple over!
- ▶ It is only permitted to turn a load in two hook operation towards the main hook!
- ▶ The setting if the LICCON overload protection to the smaller reeving of the two hook blocks ensures that the crane is not overloaded.
- ▶ Loads up to a maximum of 72 t are permissible on the boom nose!

Observe the instructions in chapter 4.05, 4.08 and 5.01.
Ensure that the following prerequisites are met:
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The assembly key button **389** has been turned off by pressing the button **397**.
- – The assembly icon **3** on the LICCON monitor is off.

DANGER
Crane can topple over!
- ▶ Check the horizontal position of the crane before and during operation.
- ▶ If the crane operator leaves the cab, even if only for a short time, then he is obligated to check and reset the operating mode setting, if necessary, before resuming crane operation.

5.3.1 Check the settings

- ▶ Check the function of the LICCON overload protection by running against the operating positions on top and bottom.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches on the jib stop cylinders.



B104932

5.4 Disassembly

Observe the safety guidelines for disassembly in chapter 5.01.

5.4.1 Luffing down the boom, general

DANGER
Crane can topple over!
If the following conditions are not met before taking down the crane, the crane can topple over and fatally injury personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

▶ Luff down the boom.

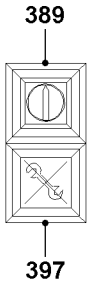
CAUTION
Damage to crane!
- ▶ Luff the boom down and spool the hoist winch out simultaneously to prevent a collision between the hook block and the boom nose.

▶ Luff the boom down to the **lowest** operating position.

When the lowest operating position is reached, the luff down movement is shut off.
The load value in the “maximum load” symbol disappears and question marks appear (????).
The following alarm functions become active:
– “STOP”
– “Horn” and acoustical signal

▶ Actuate the assembly key switch **389**.

Result:
– The LICCON overload protection is inactive.
– The Assembly icon **3** on the LICCON monitor blinks.
– An acoustical signal sounds.
– The red beacon on the crane cab blinks.



B104932

- ▶ Luff the boom down until hook block touches the ground.
- ▶ Remove the hoist limit switch weight and unreeve the hook block.

Note

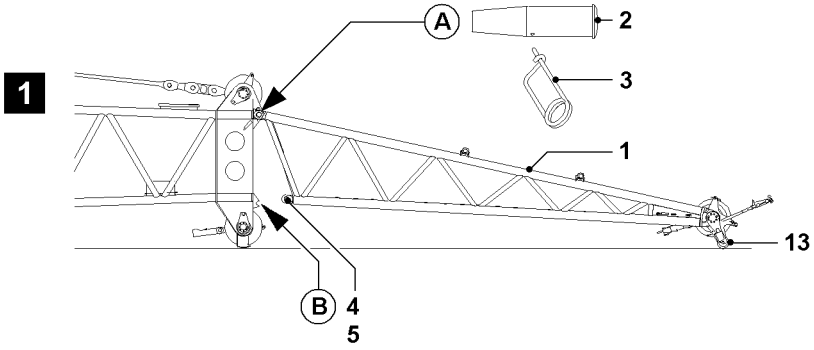
- ▶ Placing the various booms down is only possible to certain boom lengths.
- ▶ In any case, the data in the erection and take down charts must be observed and adhered to.
- ▶ For longer booms, the lower pins of the boom nose must be unpinned before take-down.

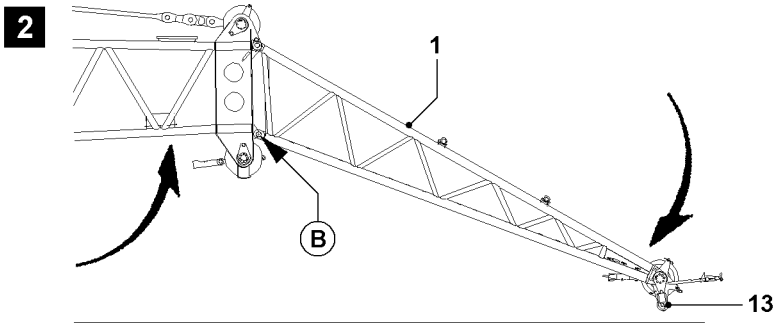
CAUTION

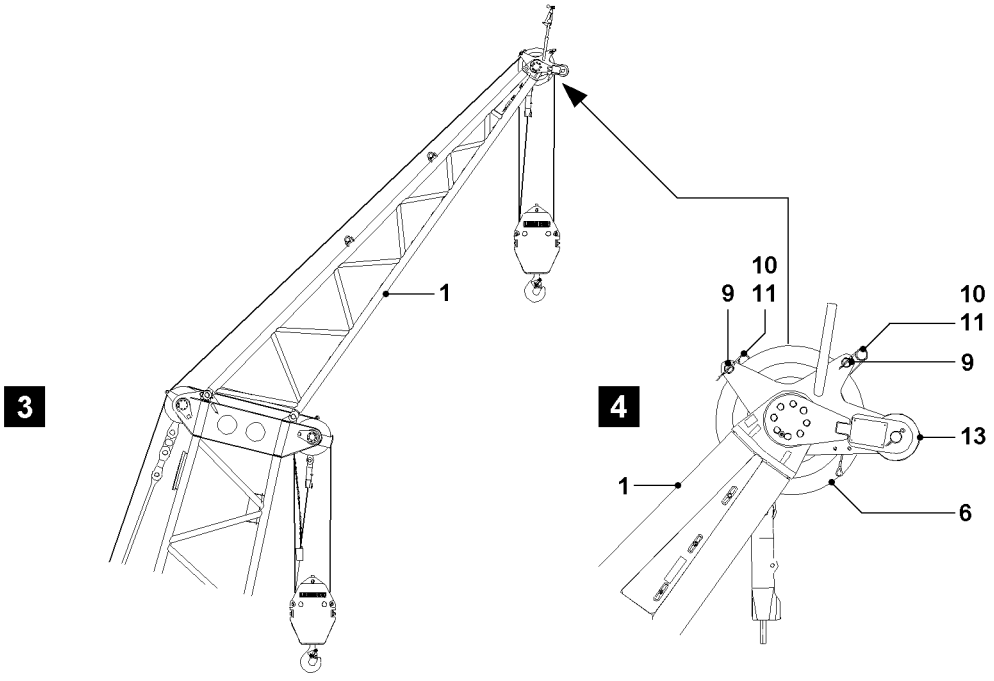
Damage of boom nose!

- ▶ If the boom nose is pinned on top and bottom on the end section, then the boom may be luffed down only to the point where the boom nose is not touching the ground.

- ▶ Luff the boom down until the boom nose is just above the ground.
- ▶ Remove the hoist rope.
- ▶ Unplug the hoist limit switch.
- ▶ Disconnect the electrical connections to the terminal boxes.







B104698

5.4.2 Removing the boom nose 72 t (H)

Disassembly procedure on SL-boom head

Ensure that the following prerequisite is met:

– The boom nose is just above the ground.

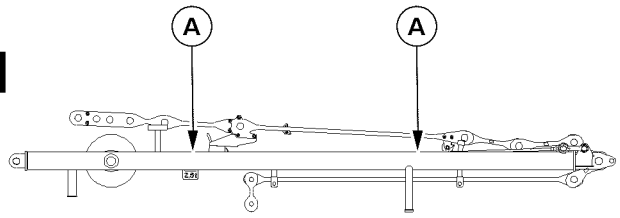
▶ Disengage the hoist limit switch weight with chain and shackle on the boom nose.
▶ Release and unpin the rope retaining pipe **9**.
▶ Unreeve the hoist rope.
▶ Pin the rope retaining pipe **9** in again and secure.
▶ Disconnect the electrical connections to the boom nose.
▶ Carefully lower the SL-boom until the boom nose **1** touches the ground with the “roller **13** ”.
▶ Continue to luff down the SL-boom carefully until the boom nose folds automatically outward.
▶ Place the SL-boom all the way down.

Result:

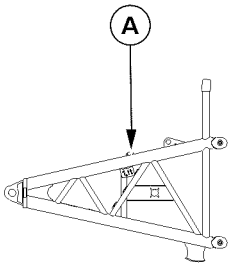
– The boom nose runs on the roller **13** by itself toward the “outside” (away from the crane).

▶ When the boom and the boom nose are laying completely on the ground:
Attach the boom nose on the auxiliary crane.
▶ Release and unpin the pin **2** on the end section “on top” point **A**.
▶ Remove the boom nose with the auxiliary crane and place it down outside the working range.
▶ Remove the auxiliary crane from the boom nose.

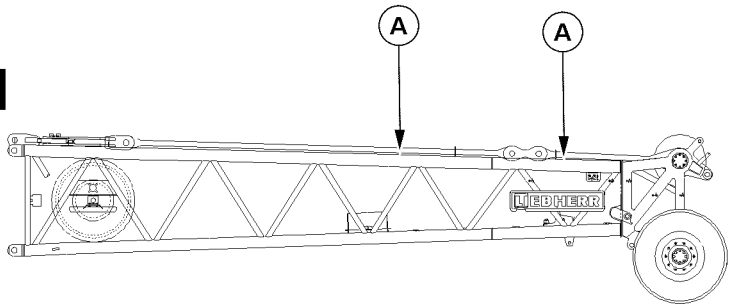
1



2



3



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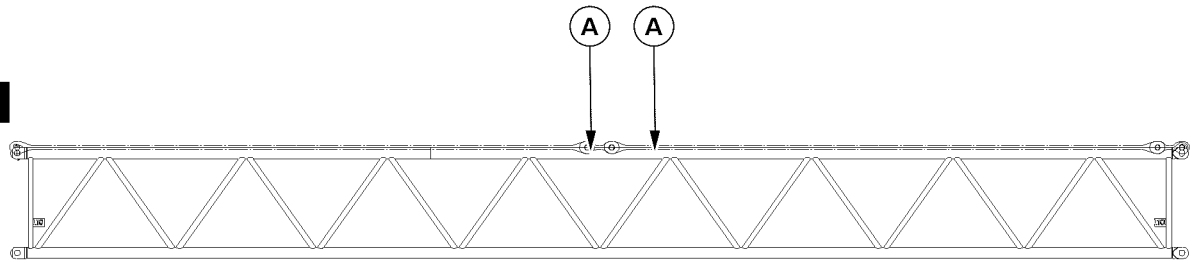

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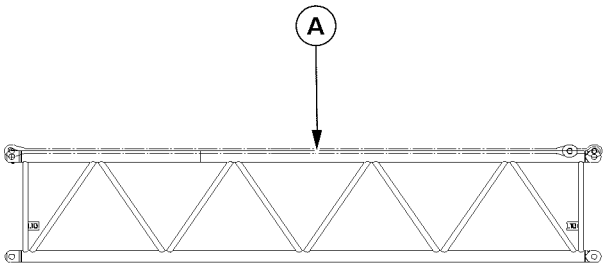


B105939

1 Component overview

1.1 Fastening points

WARNING
Falling components!
Components can fall due to incorrect or improper attachment. Personnel can be severely injured or killed!
▶ The corresponding components must be attached on the intended points **A**!

Note
▶ For assembly or disassembly, tackle with a strand length of at least **4 m** must be used.

1.2 FA-bracket

See figure **1**

Component	Abbreviation	Weight
FA-bracket	—	2.4 t

1.3 F-articulated piece

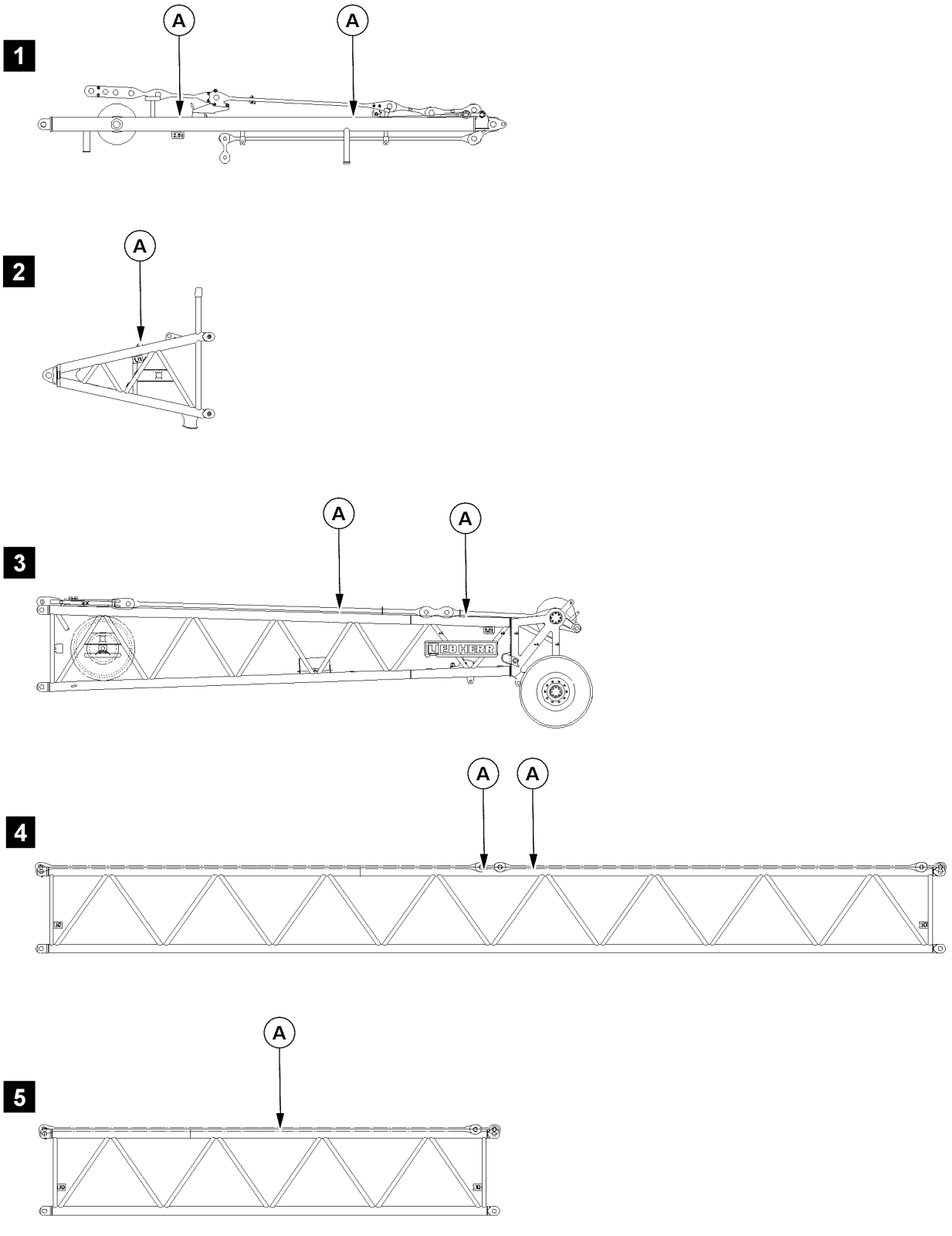
See figure **2**

Component	Abbreviation	Weight
F-articulated piece	—	0.7 t

1.4 F-head piece

See figure **3**

Component	Abbreviation	Weight
F-head piece	—	3.3 t



B105939

1.5 NI-intermediate section 14 m

See figure **4**
For the combination of the lattice sections with the same system number and the same grade, the following rules apply:
– Two 7 m intermediate pieces can be replaced with a 14 m intermediate piece.

Component	Abbreviation	Weight
NI-intermediate section (14 m) with guy rods	NI 1812.10	2.5 t

1.6 NI-intermediate section 7 m

See figure **5**
For the combination of the lattice sections with the same system number and the same grade, the following rules apply:
– Two 7 m intermediate pieces can be replaced with a 14 m intermediate piece.

Component	Abbreviation	Weight
NI-intermediate section (7 m) with guy rods	NI 1812.10	1.4 t

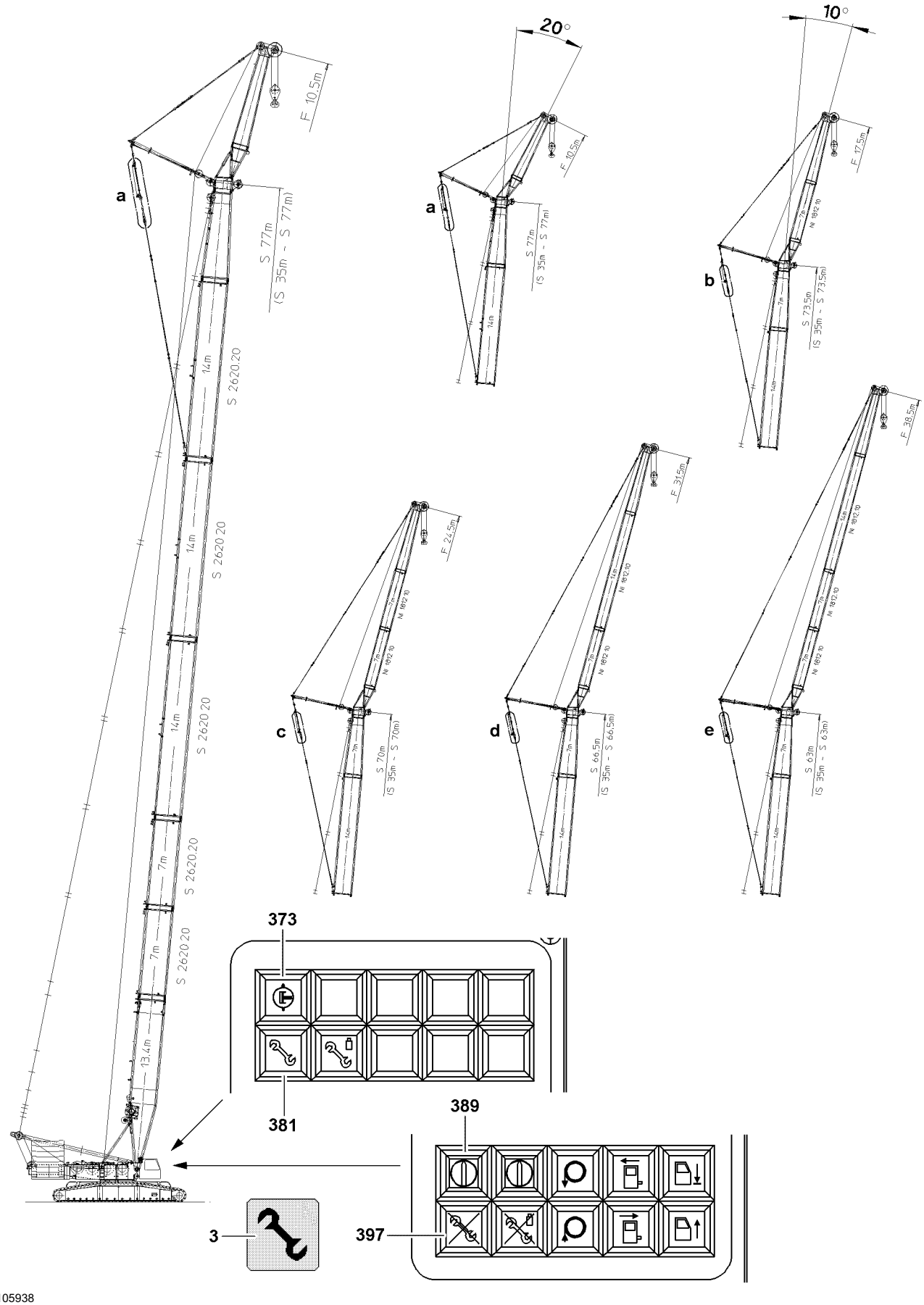
B195219

2 Assembling F-lattice jib

DANGER
Crane can topple over!
The boom combinations must be assembled according to the “separately supplied set up drawings”!
Any other arrangement of the lattice sections and the guy rods than specified in the set up drawings is prohibited!
At assembly of the intermediate sections, it must be observed that they are assembled according to their identification!
- ▶ Install the lattice sections and guy rods as noted in the set up drawings.

WARNING
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening injuries.
- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly/disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out using these aids or from the ground, the assembly personnel must be protected from falling with suitable means (such as safety belts, working platform)!

WARNING
Falling down booms or components!
If unsecured or non-supported booms or components are assembled or removed, they can fall down. Personnel can be severely injured or killed!
- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!
- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!


a
F 10.5m
S 77m
(S 35m - S 77m)
S 2620.20
14m
7m
13.4m
20°
10°
F 17.5m
S 73.5m
(S 35m - S 73.5m)
b
F 24.5m
S 70m
(S 35m - S 70m)
c
F 31.5m
S 66.5m
(S 35m - S 66.5m)
d
F 38.5m
S 63m
(S 35m - S 63m)
e
373
381
389
397
3

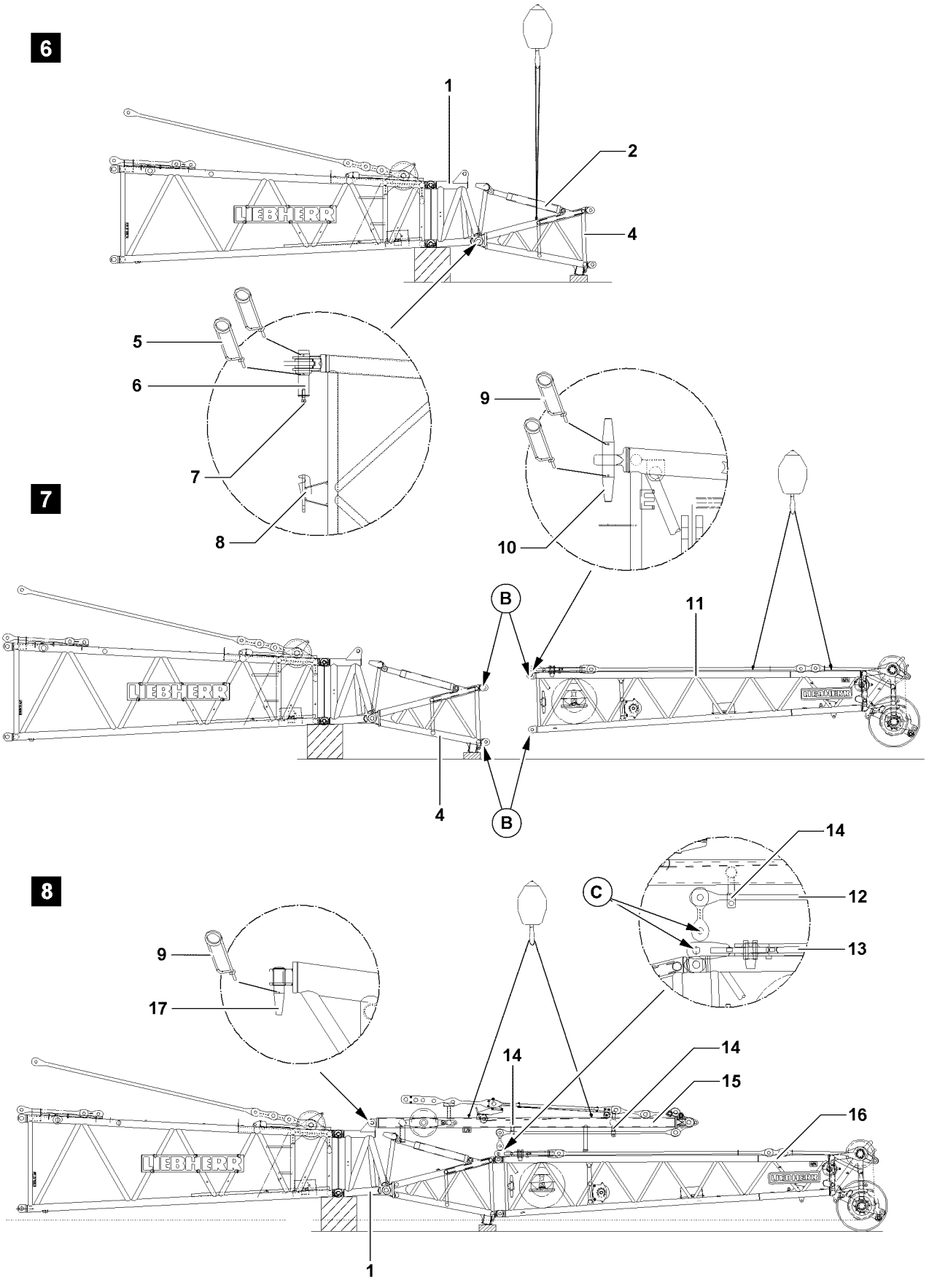
B105938

This crane can be equipped with an F-lattice jib.
The F-lattice jib can be assembled in the following angles for the S-boom, see figure:
– 10 °
– 20 °

Note
▶ The F-lattice jib is **not** adjustable in crane operation.

Note
▶ In the S2F2 operation, no pulley block is assembled on the L-head piece.

Make sure that the following prerequisites are met:
– On the crane, “mechanical auxiliary supports” are assembled properly, see **erection and take down charts**.
– The SL-boom is installed and luffed down “to the side” over the “mechanical auxiliary supports”.
– The S-intermediate section with “guy brackets for the F-guying” is assembled on the S-boom, pinned and secured.
– The guy rods are placed on the S-intermediate section and are pinned and secured with the guy brackets.
– The L-head piece is pinned and secured on the S-adapter.
– The F-assembly unit is properly hung and secured on the auxiliary crane.
– The F-assembly unit is pinned on top and bottom of the L-head piece and secured with spring retainers.
– The LICCON overload protection has been set according to the data in the load chart.
– The Assembly-Key Button **389** is pressed and the indicator lamp **381** illuminates, see figure.
– The Assembly symbol **3** blinks on the LICCON display.
– The button **373** is actuated for the manual pressure supply.



B105941

2.1 Assembling F-articulated piece

See figure **6**
Make sure that the following prerequisites are met:
– Hydraulic relapse cylinder is retracted.
– The boom lays on the ground with the pulley set or is supported.

Note
▶ Pin pulling device, see chapter 5.30.

▶ Release pins **6** and unpin F-articulated piece **4**.
▶ Lift up the F-articulated piece **4** with the auxiliary crane.
▶ Hang the hydraulic pin-pulling cylinder on the bolt **7** and retainer **8**.
▶ Pin and secure F-articulated piece **4** with pins **6** and with spring retainers **5** on the L-head piece **1** with pin-pulling device.
▶ Hoist and remove hydraulic pin-pulling cylinder on the F-articulated piece **4**.
▶ Support F-articulated piece **4** and set aside.
▶ Remove the auxiliary crane.

2.2 Assembling F-lattice jib

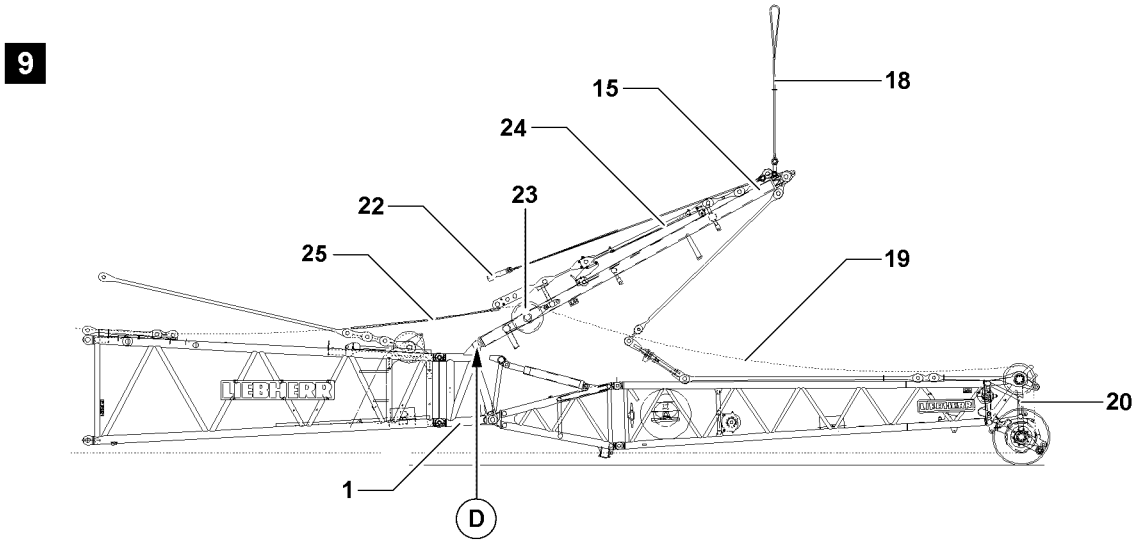
See figure **7**

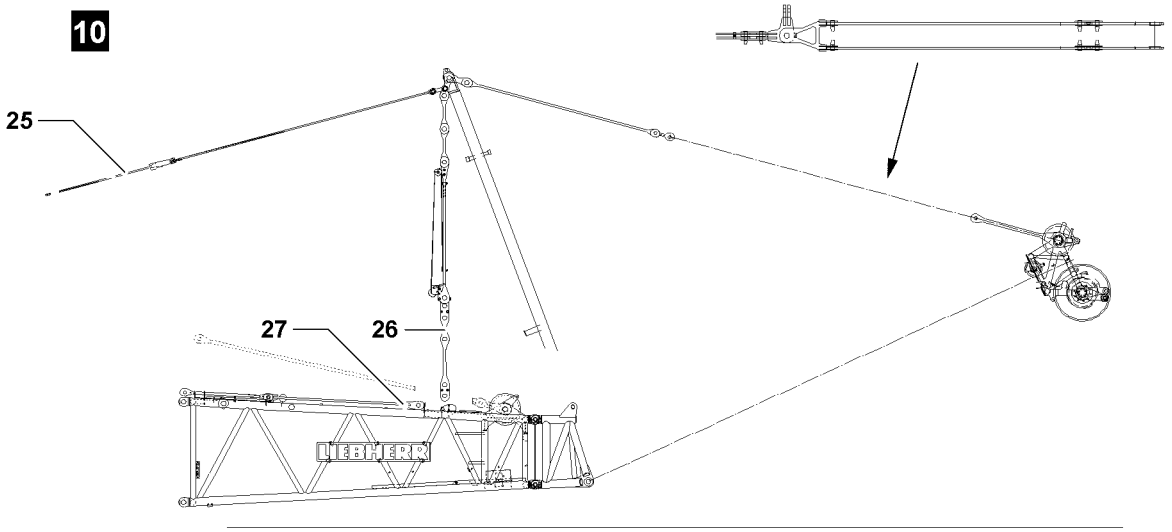
Build the F-lattice jib together with the NI-lattice sections and the F-articulated piece **4** at the necessary length.
Lift up the components with the auxiliary crane.
▶ Support NI-lattice sections and F-head piece **11** and pin with bolts **10** and secure with spring retainers **9**.
▶ Bolt F-lattice jib on the F-articulated piece **4** in the points **B** with bolts **10** and secure with spring retainers **9**.

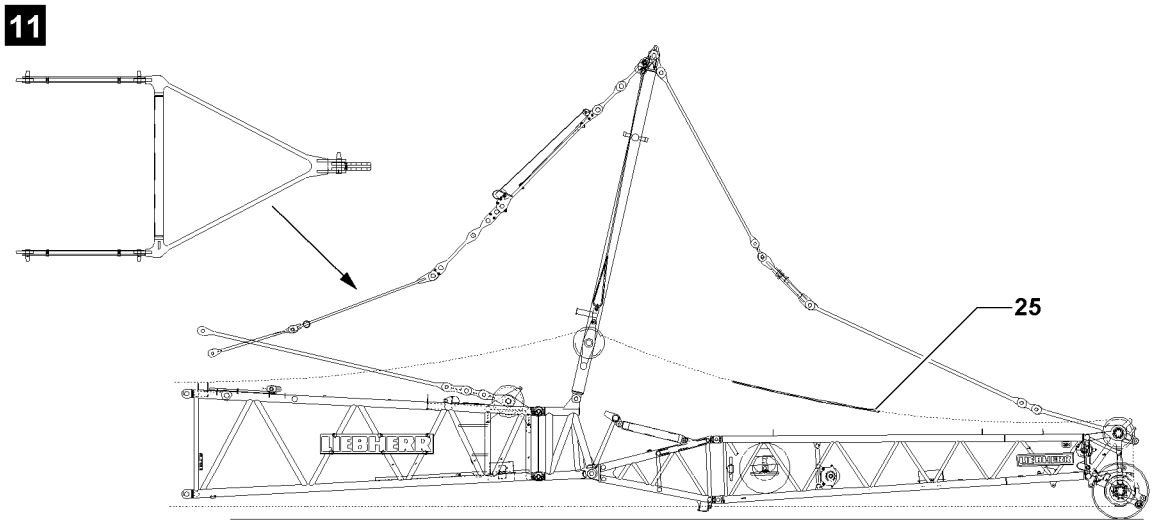
2.3 Assembling FA-bracket

See figure **8**
Ensure that the following prerequisites are met:
– Main boom is raised up or head piece is supported.

▶ Raise FA-bracket **15** with the auxiliary crane on the L-head piece **1** and pin with bolts **17** and secure with spring retainer **9**.
▶ Set aside FA-bracket **15** on lattice jib **16**.
▶ Release and unpin the transport retainers **14**.
▶ Pin guy rods FA-bracket **12** with guy rods F-lattice jib **16** in the point **C**.







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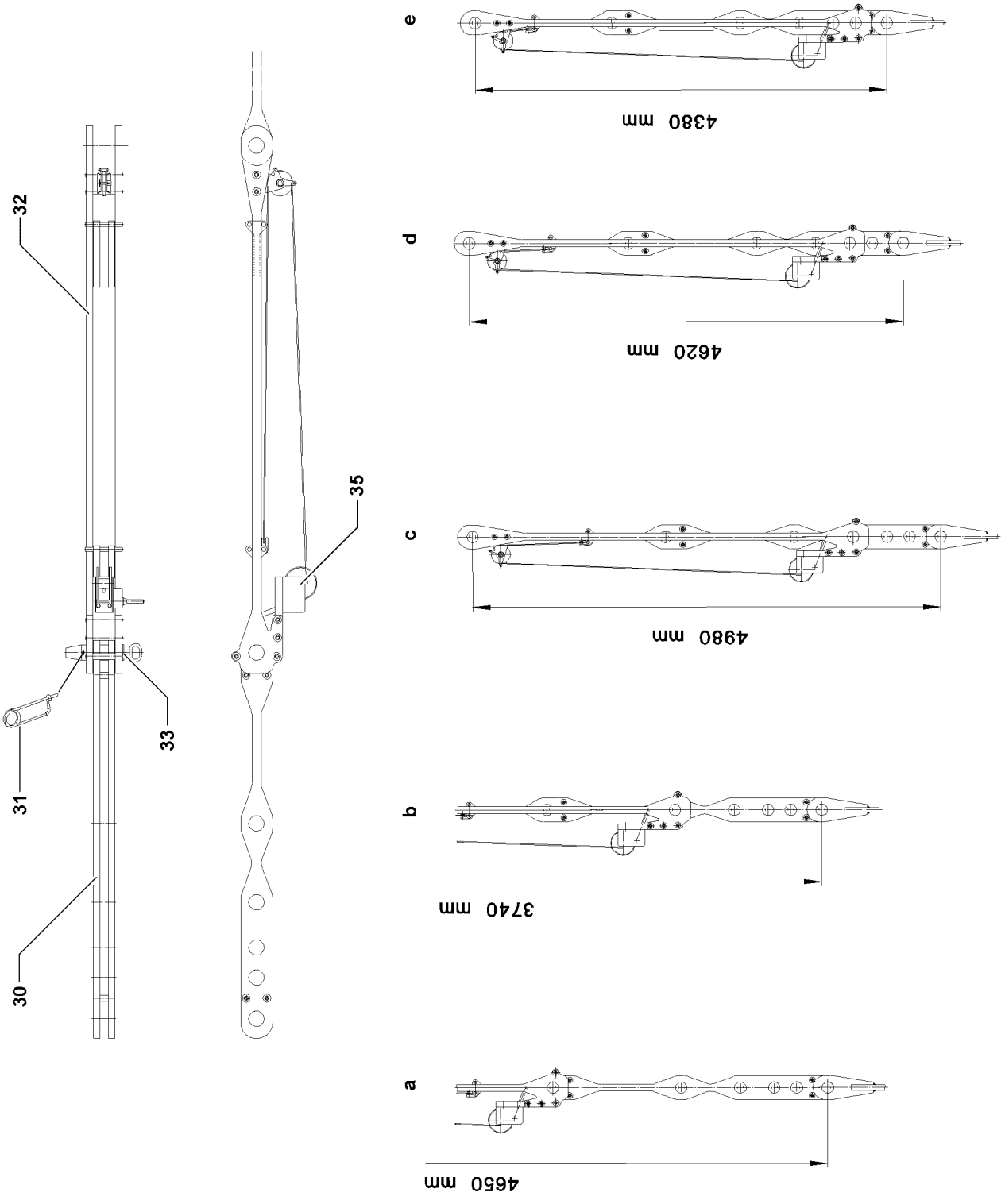
2.4 Assembling guy rods

2.4.1 Erecting FA-bracket

- Pull assembly rope **19** over pulley set **20** on the F-head piece and over rollers **23** on the FA bracket.
- Hang the FA-bracket tackle **18** on the auxiliary crane.
- Raise **15** FA-bracket.
- Pull in hoist rope **25** with spool assembly up to the L-head piece **1** and insert in rope lock **22** on the FA-bracket **15**.
- Raise FA-bracket **15** with the auxiliary crane, up to the FA-bracket **15** found over the pivot point **D** see figure **9**.
- Tension hoist rope **25** and remove the auxiliary crane.
- Pull up FA-bracket **15** with hoist rope up to the guy rod FA-bracket **26** hanging vertically downward.



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2.4.2 Install length guy rods

The FA-bracket guy rods are correspondingly installed to the lattice jib lengths.

Lattice jib lengths F	Illustration
10.5 m	**a**
17.5 m	**b**
24.5 m	**c**
31.5 m	**d**
38.5 m	**e**

▶ Determine the necessary lengths for the guy rods.

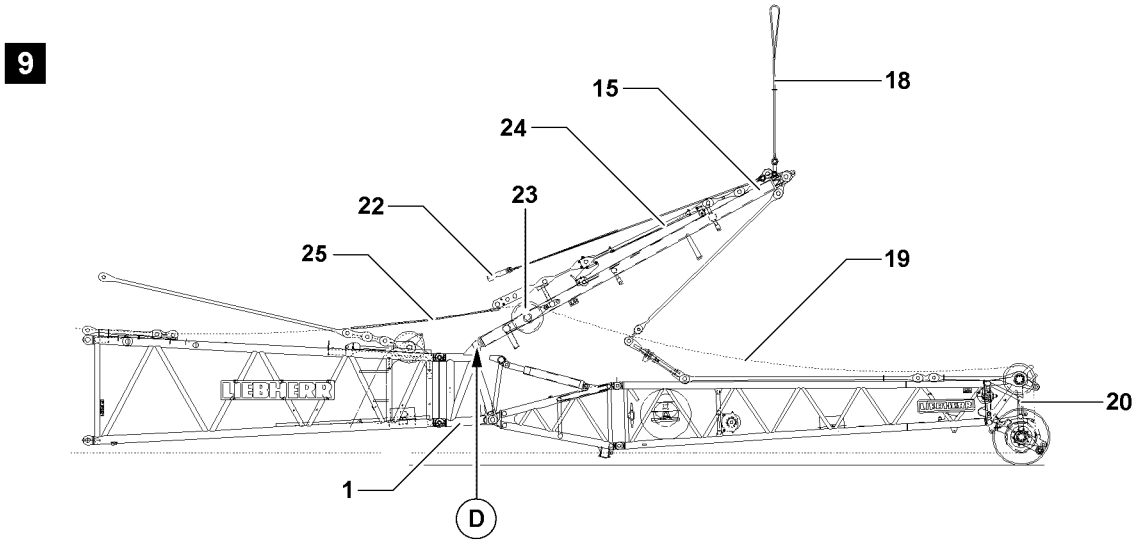
Note

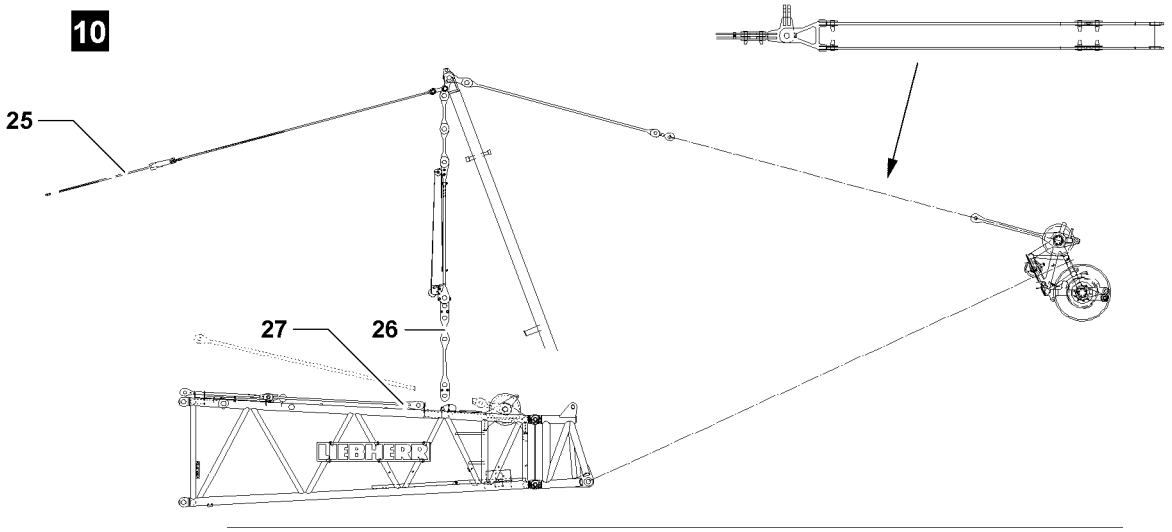
▶ If the bolts **33** are unpinned, self-retention of the rope winch **35**, prevents the guy rods **30** from falling downward.

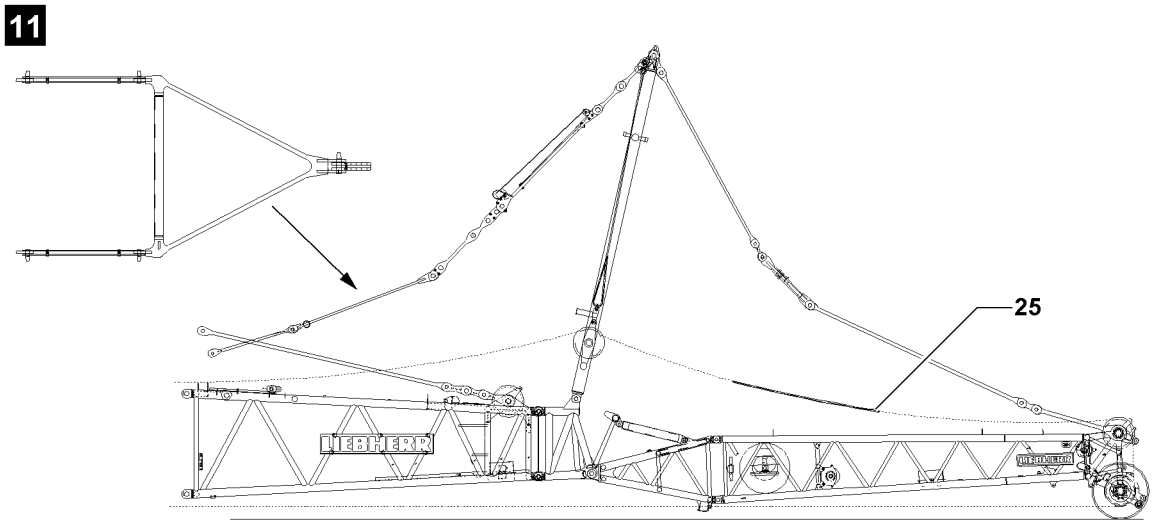
▶ Remove the spring retainer **31** and unpin the bolts **33**.

▶ Install guy rods **26** with the rope winch **35** on the necessary lengths.

▶ Secure guy rods **32** and guy rods **33** with bolts **33** and spring retainer **31**.



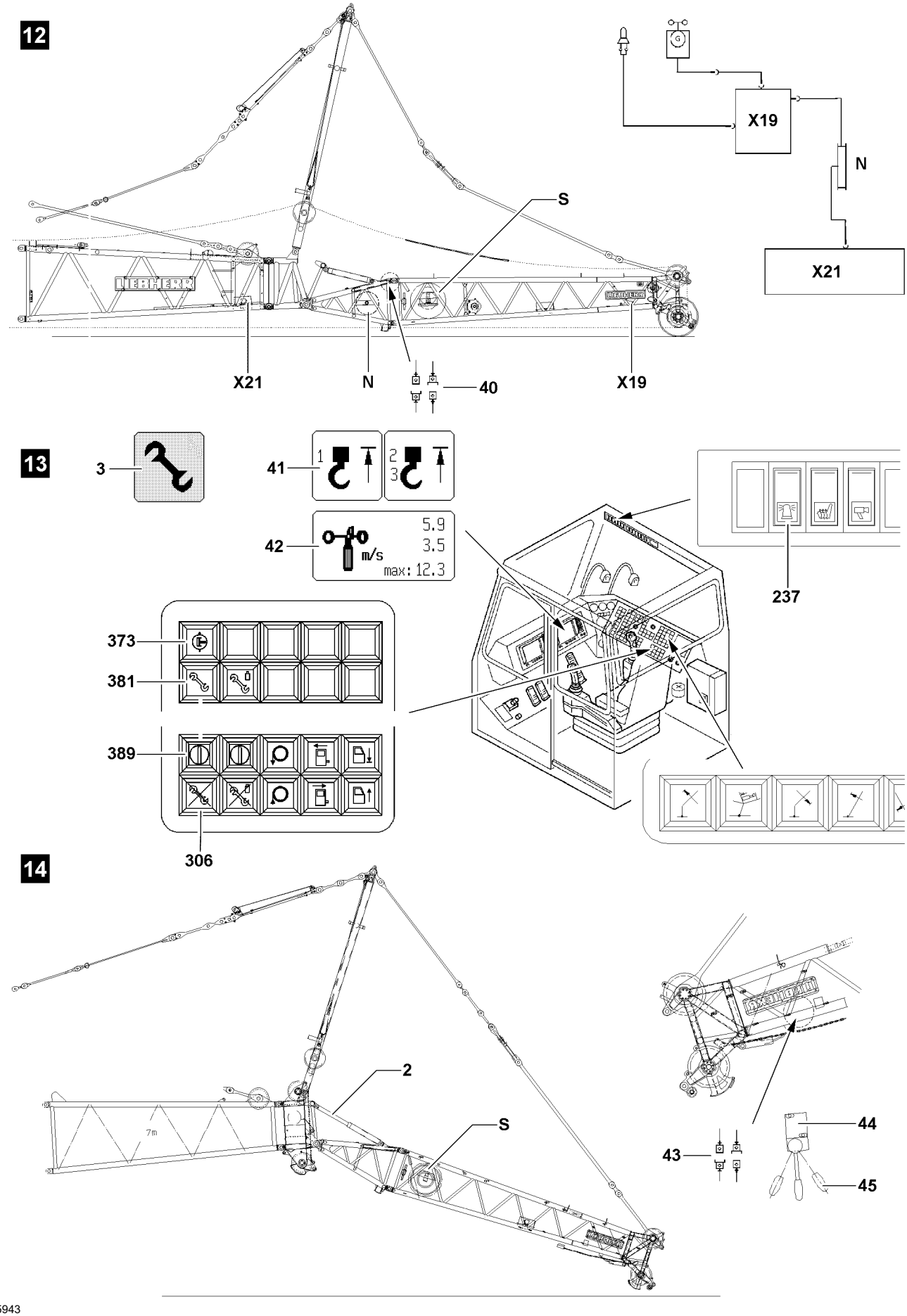




B105942

2.4.3 Pinning the guy rods

- ▶ Pin and secure guy rods **26** FA-bracket with guy rods **27** for the main boom.
- ▶ Loosen hoist rope **25** and remove rope lock **22**.
- ▶ Secure hoist rope **25** on the assembly rope **19** and pull over the pulley set **20** so that sufficient rope is present for the erection procedure.
- ▶ Remove assembly rope and spool on the spool assembly.


12
X19
N
X21
S
X21
N
40
X19
13
3
41
1
2
3
42
5.9
3.5
m/s
max: 12.3
237
373
381
389
306
14
2
S
7m
44
43
45

B105943

2.5 Establishing the electrical connections

See figure **12**
Ensure that the following prerequisites are met:
– The F-lattice jib is completely assembled.

CAUTION
Damage to the electrical connection on the cable drum!
If the electrical connection from the cable drum **N** to the terminal box **X21** on the S-boom is established first before the connection to the terminal box **X19** on the F-head piece, the electrical connection can be damaged when spooling out the cable drum.
▶ Establish the electrical connection from the cable drum **N** to the terminal box **X19** first and then the electrical connection from the terminal box **X21** to the cable drum **N**!

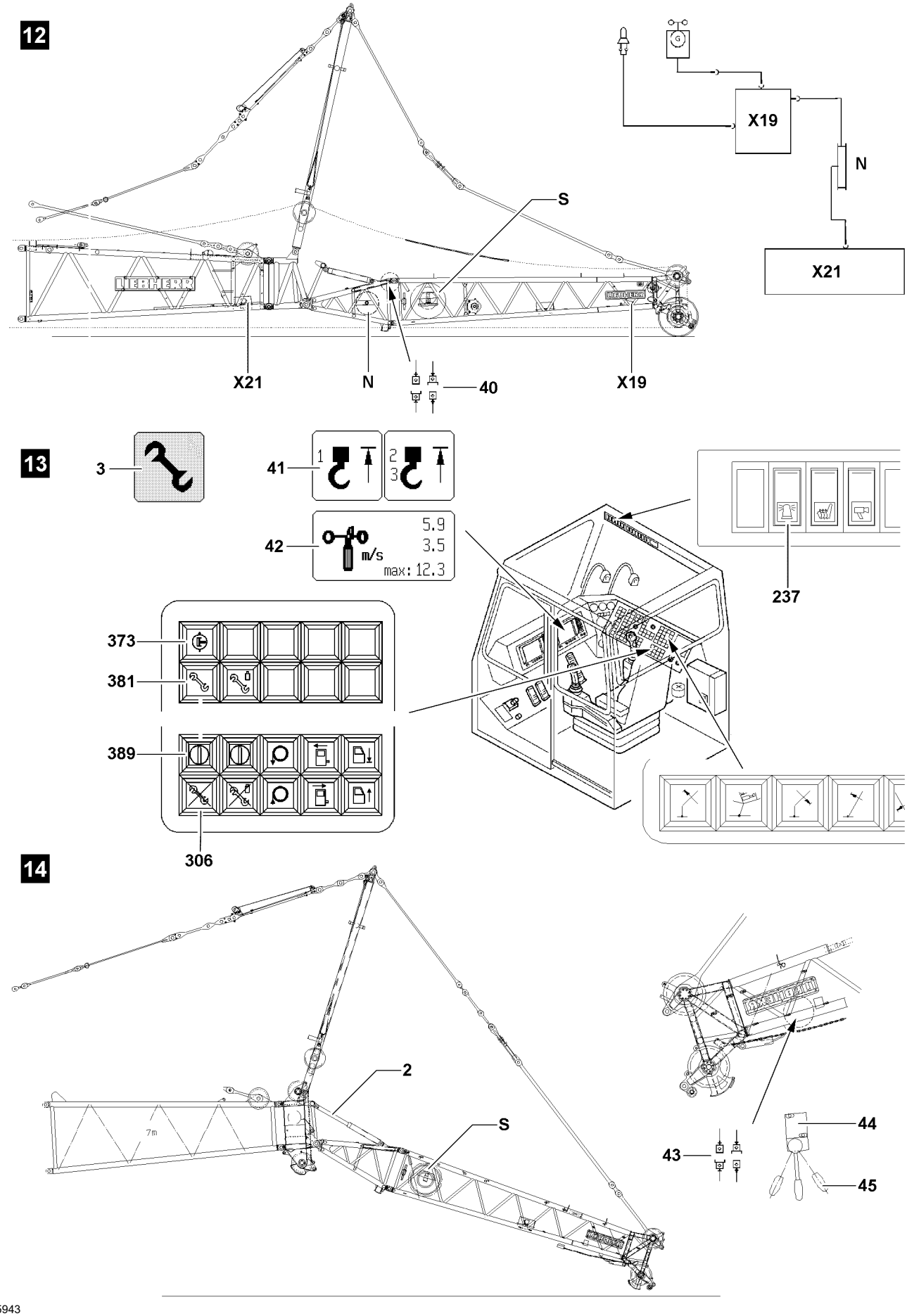
▶ Spool electrical cable from the cable drum **N**.
▶ Establish the electrical connection from the cable drum **N** on the F-head piece to the terminal box **X19**.
▶ Establish the electrical connection from the terminal box **X21** on the S-boom to the cable drum **N**.
▶ Make sure that all electrical connections on the boom are established.

2.6 Checking the function of the safety devices

WARNING
Non-functioning safety devices!
If the function of the safety devices is defective, personnel can be severely injured or killed.
▶ Crane operation with non-functioning safety devices is **prohibited**!

Note
▶ The function of the individual limit switches must be checked before erection!
▶ The function of the limit switch initiators must be checked in the test system, see separate “Diagnostics” manual.

Note
▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact **LIEBHERR** customer service.


12
X19
N
X21
S
X21
N
40
X19
13
3
41
1
2
3
42
5.9
3.5
m/s
max: 12.3
237
373
381
389
306
14
2
S
7m
44
43
45

B105943

Make sure that the following prerequisites are met:
– All electrical connections have been made.
– The crane engine is running.
– The corresponding operating mode is set on the LICCON monitor.
– The limit switch activation level are inspected and greased for movement.

2.6.1 Checking the wind speed sensor

▶ Test the movement and the function of the wind speed sensor.

Result:
– The symbol **42** “wind speed” appears on the LICCON-Monitor 0.

2.6.2 Checking the airplane warning light

▶ Turn on the airplane warning light on with the switch **237**.

▶ Check the function visually.

2.6.3 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 **41** “Hoist top” appears on the LICCON-Monitor 0.
– Limit switch is functioning.

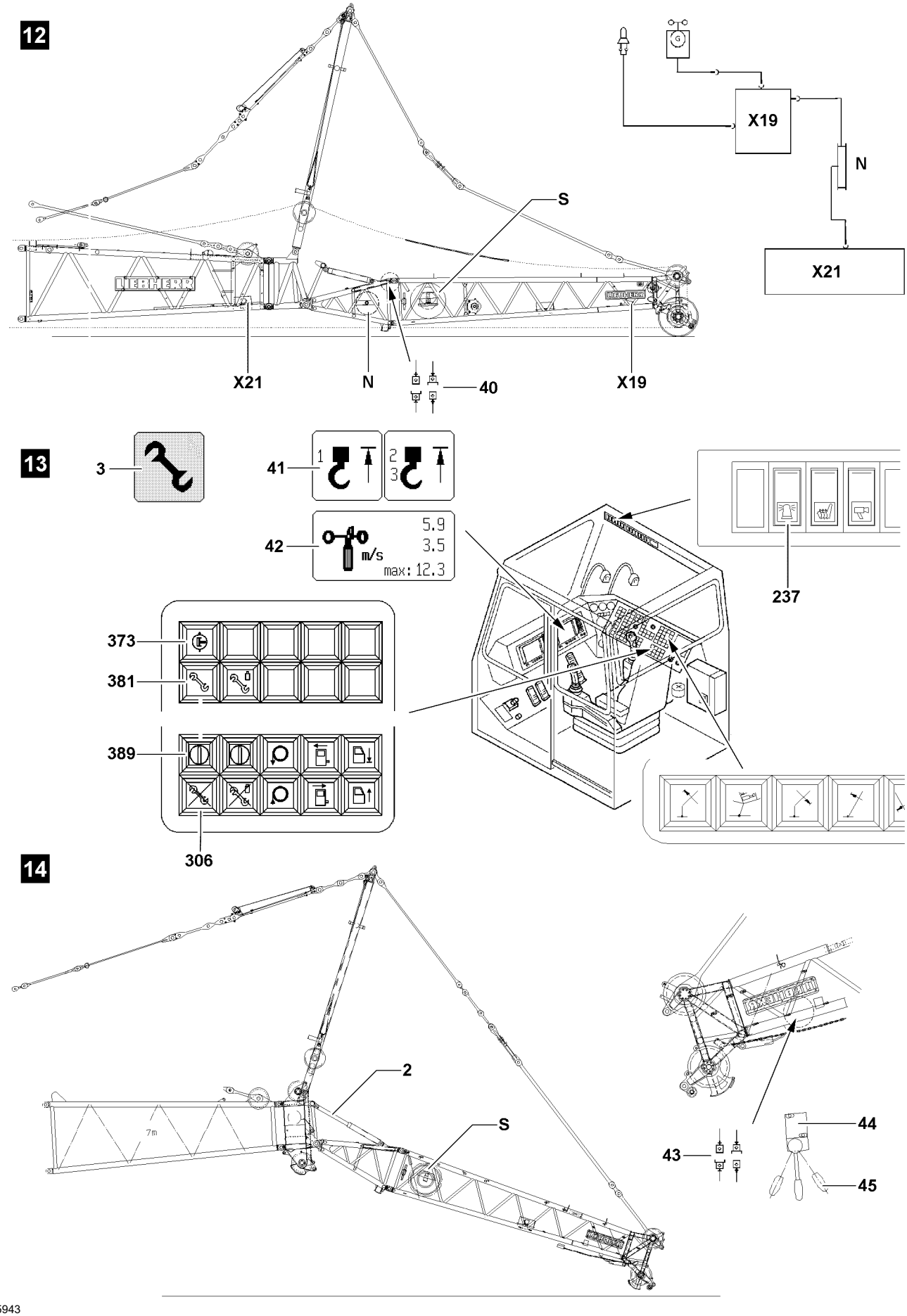
2.6.4 Check the limit switch S-boom “steepest position”

Note

▶ The limit switch functions have to be checked individually before erection!

▶ Cover the limit switch initiators on the S-relapse cylinder individually with a metal plate.

Result:
– The hoist limit switch is actuated manually.
– The spool up function of winch IV (control winch) turns off.
– Control light **306** illuminates.
– Limit switch is functioning.


12
X19
N
X21
S
X21
N
40
X19
13
3
41
1
2
3
42
5.9
3.5
m/s
max: 12.3
237
373
381
389
306
14
2
S
7m
44
43
45

B105943

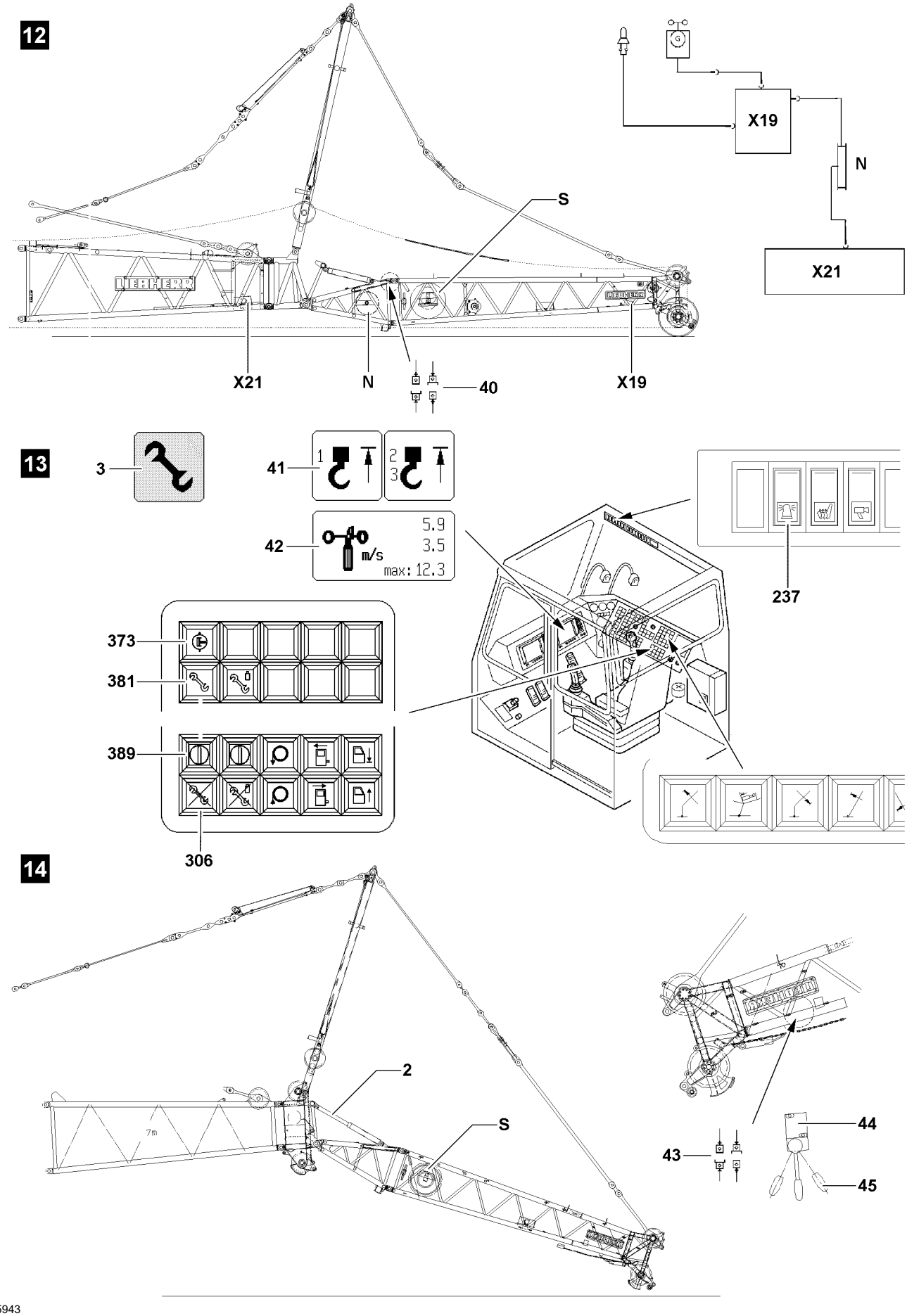
2.7 Raising the SF-booms

DANGER
Crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Make sure that no slack rope forms on the control winch!

WARNING
Crane can topple over!
For certain boom lengths, the mechanical auxiliary supports must be installed, see Erection and take down charts!
- ▶ The boom must be erected or taken down “to the side” “in the direction” of the mechanical auxiliary supports.
- ▶ Always erect or take down according to the data in the **Erection and take down charts**!

WARNING
Falling hoist rope!
If the hoist rope before the erection procedure is not properly secured onto the head piece, it can fall down backward on the basis of its own weight. Personnel can be severely injured or killed!
- ▶ Secure the hoist rope properly on the head piece before the erection procedure.

Make sure that the following prerequisites are met:
- – The crane is aligned in horizontal direction.
- – All electrical connections have been made.
- – All limit switches are functioning.
- – The counterweight has been attached to the turntable in accordance with the load chart.
- – All pin connections have been secured.
- – The hoist rope has been correctly placed in the cable pulleys and 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 current crane configuration.
- – The assembly keyed switch **389** is actuated.
- – The indicator light **381** “Assembly” lights up.
- – The assembly icon **3** on the LICCON monitor 0 lights up.


12
X19
N
X21
S
X21
N
40
X19
13
3
41
1
2
3
42
5.9
3.5
m/s
max: 12.3
237
373
381
389
306
14
2
S
7m
44
43
45

B105943

2.7.1 Pretension relapse cylinder

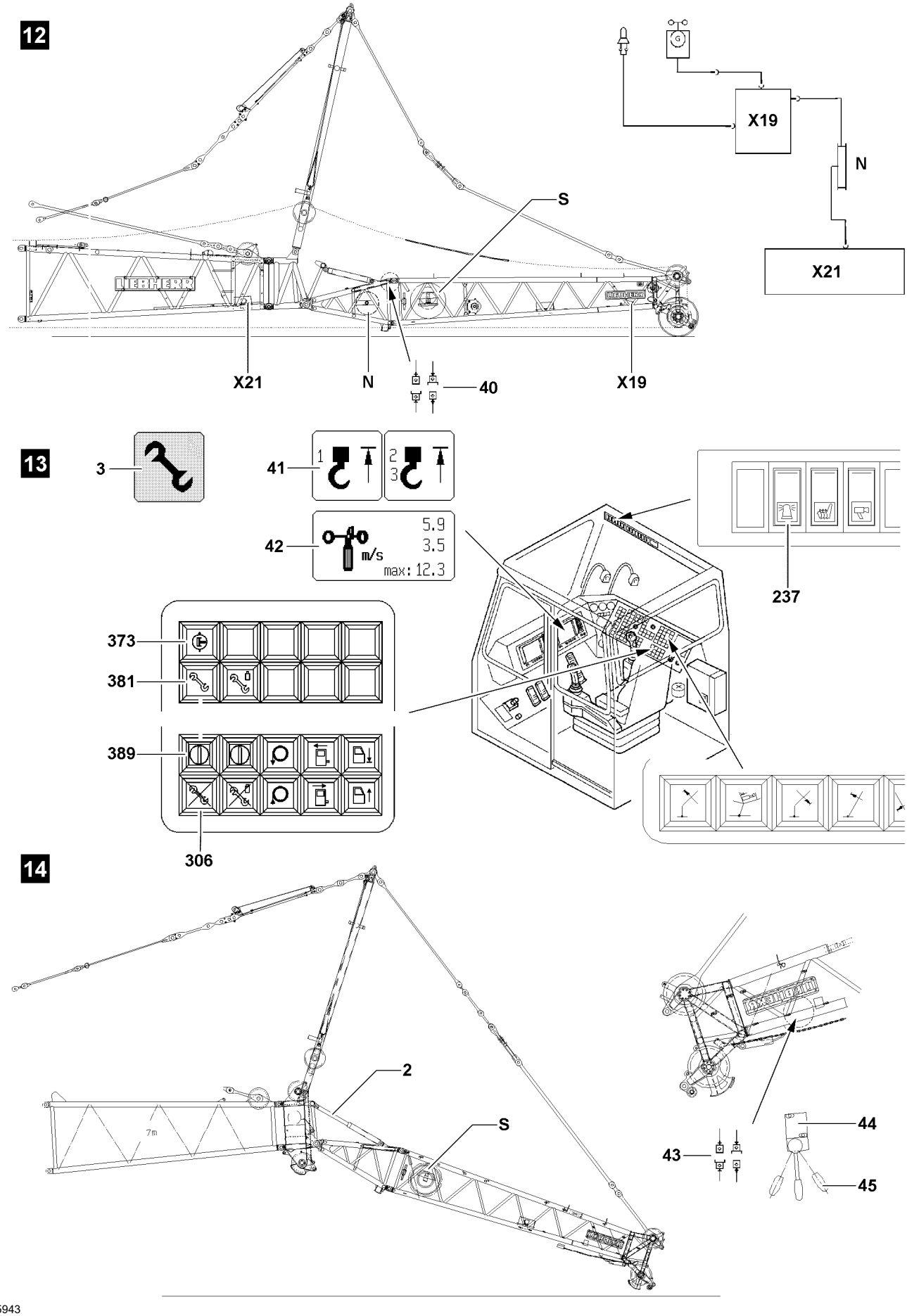
See figure **14**

NOTICE
Damage to the boom system!
If the relapse cylinder is pretensioned when the F-head piece is lying on the base, the boom system is damaged.
- ▶ Raise the F-head piece from the base before pretensioning the relapse cylinders **2**.

- ▶ Spool the hydraulic hose from the hose drum **S** and close the quick-release couplings **40** for the relapse cylinder on the F-articulated piece.
- ▶ Luff up the SF-boom until the F-lattice jib (10° or 20°) hangs in the guy rods and the F-head piece lifts off the ground.
- ▶ Connect the hydraulic unit for the pin-pulling device to the quick-release couplings **43** on the F-head piece.

Note
- ▶ In order to pretension the relapse cylinder, the operating pressure on the pin-pulling device must amount to at least 180 bar.
- ▶ Pin pulling device, see chapter 5.30.

- ▶ Pretension hydraulic relapse cylinder **2**: Activate lever **45** on the valve **44** until the piston rod is extended.
- ▶ Disconnect the hydraulic aggregate from the quick-release couplings **43**.


12
X19
N
X21
S
X21
N
40
X19
13
3
41
1
2
3
42
5.9
3.5
m/s
max: 12.3
237
373
381
389
306
14
2
S
7m
44
43
45

B105943

2.7.2 Erection procedure

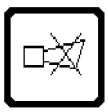
DANGER
Crane can topple over!
- ▶ It is not permitted to turn the crane superstructure during erection procedure!
- ▶ Observe the data in the erection and take down charts!

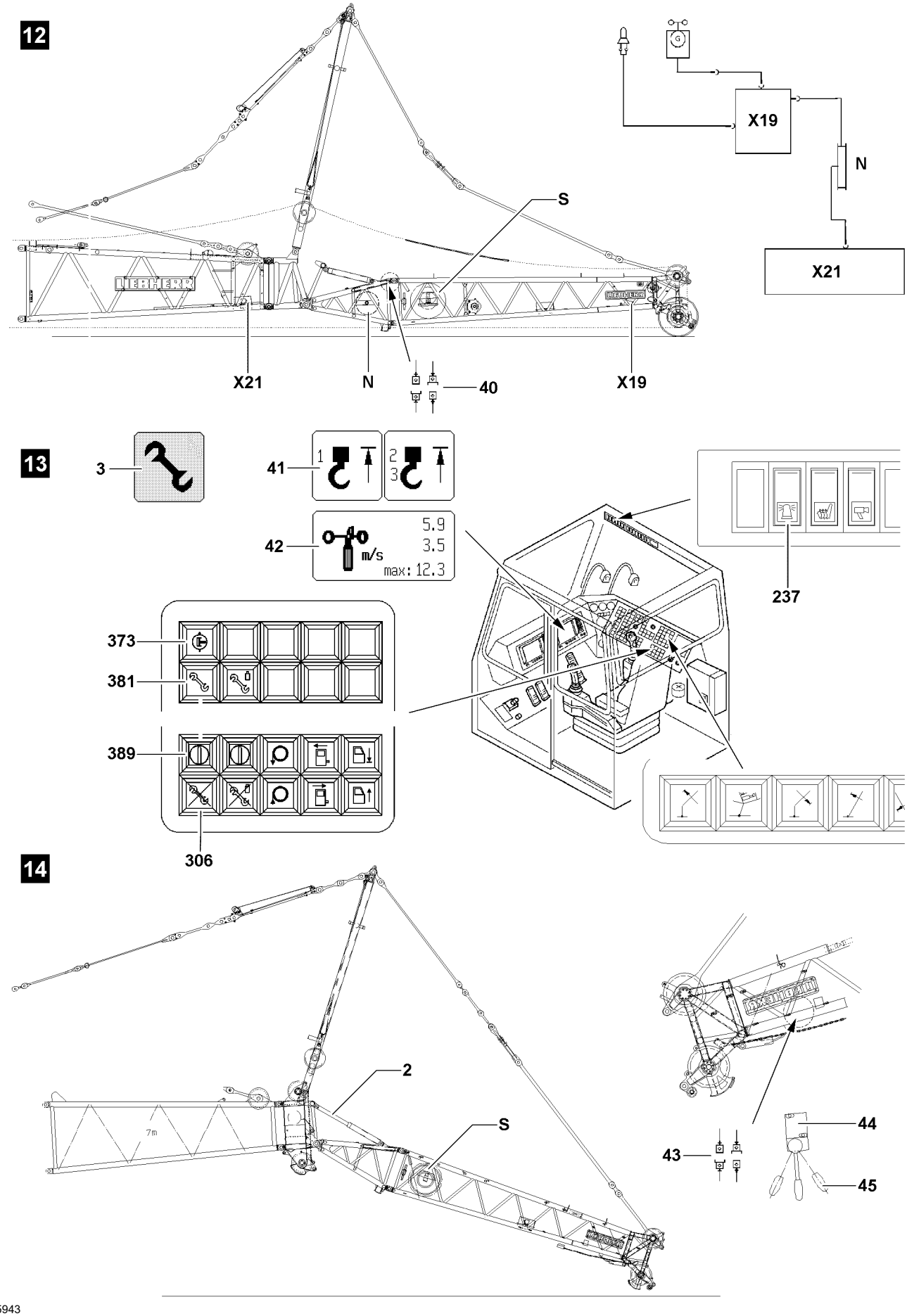
- ▶ Reeve in the hoist rope properly and secure on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.

WARNING
Crane can topple over!
- ▶ When the lowest operating position is reached, the assembly key button **389** must be turned off immediately.
- ▶ The assembly key button **389** bypasses the safety devices!
- ▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!

- ▶ Luff the boom up to the lowest operating position.

Note
- ▶ During the erection procedure - outside the operating area - the alarm functions listed in the table are displayed as blinking on the crane operating screen.

Display on the LICCON-Monitor 0 upon achieving the “lowest” operating setting	
 *Symbol: “STOP” blinks*	
 *Symbol: “ERROR 150” blinks*	***Note:*** *For fault description see chapter 20.05.*
 *Symbol: “Horn” blinks*	***Note:*** *In addition to the symbol “Horn” an acoustic warning sounds.*


12
X19
N
X21
S
X21
N
40
X19
13
3
41
1
2
3
42
5.9
3.5
m/s
max: 12.3
237
373
381
389
306
14
2
S
7m
44
43
45

B105943

Note

▶ If the lowest operating setting for the boom is achieved, the display turns off (see table above), and on the symbol “Maximum load” instead of the display “???” a load value appears on “t”!

WARNING

Crane can topple over!

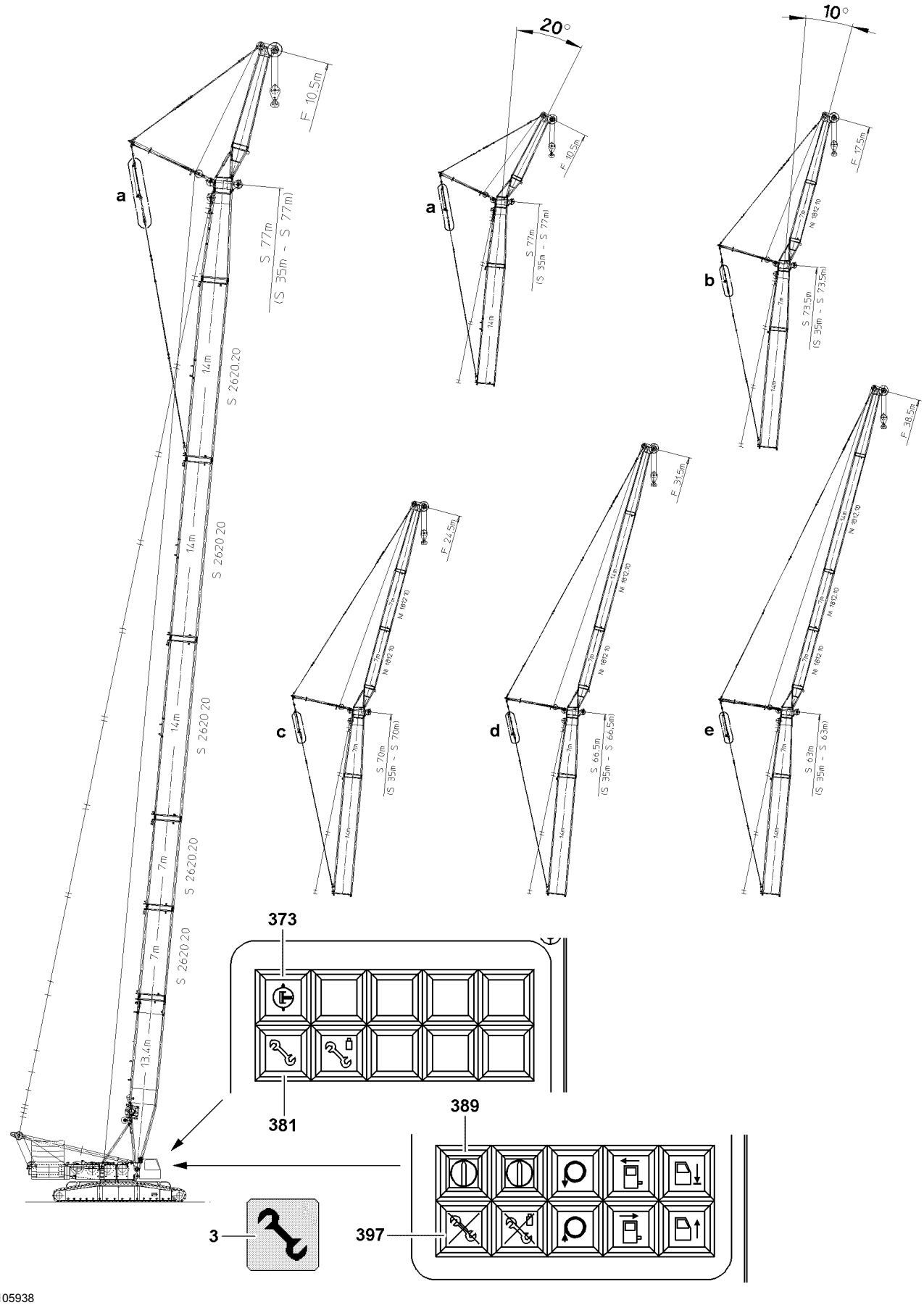
▶ When the lowest operating position of the boom is reached, turn off the assembly key button **389** immediately.

▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

▶ Turn the assembly keyed button **389** off: Press button **397**.

Result:

– Self retention of the assembly key button **389** is switched off.
– The LICCON overload protection is active.
– The indicator light **381** turns off.
– The assembly symbol **3** on the LICCON monitor turns off.
– The acoustical signal turns off.


a
F 10.5m
S 77m
(S 35m - S 77m)
S 2620.20
14m
14m
14m
14m
7m
7m
13.4m
a
20°
F 10.5m
S 77m
(S 35m - S 77m)
14m
b
10°
F 17.5m
S 73.5m
(S 35m - S 73.5m)
c
F 24.5m
S 70m
(S 35m - S 70m)
d
F 31.5m
S 66.5m
(S 35m - S 66.5m)
e
F 38.5m
S 63m
(S 35m - S 63m)
373
381
389
397
3

B105938

3 Operating the crane

3.1 Preparing for crane operation

Note

▶ Observe the notes in chapter 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

– The LICCON overload protection has been set according to the data in the load chart.
– The assembly key button **389** has been turned off by pressing the button **397**.
– The assembly icon **3** on the LICCON monitor is off.

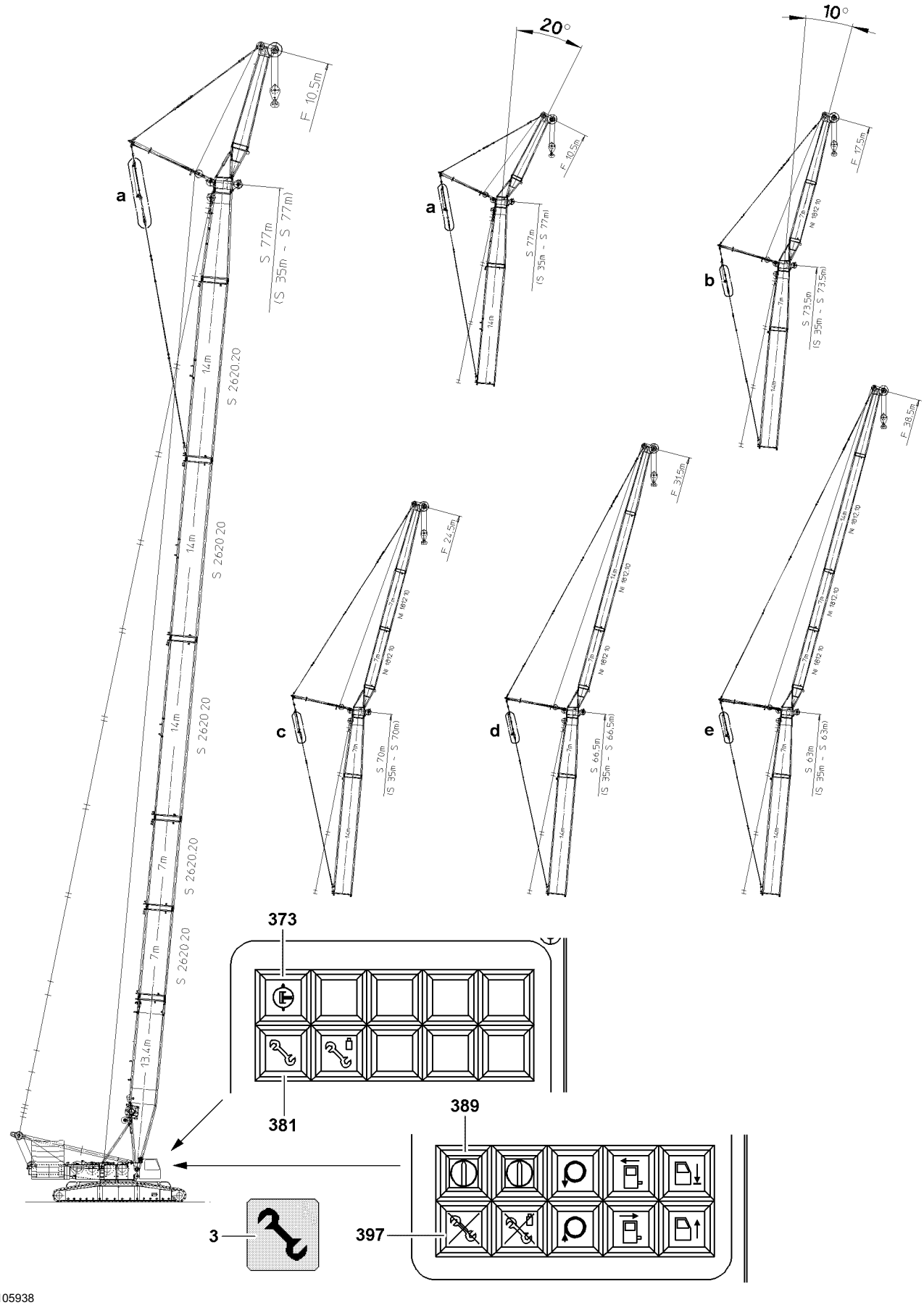
WARNING

Crane can topple over!

▶ Check the horizontal position of the crane before and during operation.
▶ If the crane operator leaves the cab, even for a short time, then he is obligated to check the operating mode setting before resuming crane operation and reset it, if necessary.

3.2 Checking the settings

▶ Check the function of the LICCON overload protection by running against the operating positions “on top” and “bottom”.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the limit switches on the relapse cylinders.


a
F 10.5m
S 77m
(S 35m - S 77m)
S 2620.20
14m
7m
13.4m
20°
10°
b
F 17.5m
S 73.5m
(S 35m - S 73.5m)
c
F 24.5m
S 70m
(S 35m - S 70m)
d
F 31.5m
S 66.5m
(S 35m - S 66.5m)
e
F 38.5m
S 63m
(S 35m - S 63m)
373
381
389
397
3

B105938

4 Disassembling F-lattice jib

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

- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly/disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out using these aids or from the ground, the assembly personnel must be protected from falling with suitable means (such as safety belts, working platform)!

WARNING
Falling down booms or components!
If unsecured or non-supported booms or components are assembled or removed, they can fall down. Personnel can be severely injured or killed!

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!
- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!

Make sure that the following prerequisites are met:

- – “Mechanical auxiliary supports” are properly installed on the crane see also **Erection and take down charts**.
- – The SF-boom is luffed up “to the side” over the “mechanical auxiliary supports” and is luffed down to the “lowest” operating position.
- – The LICCON overload protection has been set according to the data in the load chart.
- – The assembly key button **389** is pressed and the indicator light **381** lights up.
- – The assembly icon on the LICCON display blinks.
- – The button **373** is actuated for the manual pressure supply.
- – The auxiliary crane is available.

B195219

4.1 Taking the SF-boom down

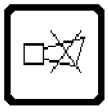
DANGER
Crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

WARNING
Crane can topple over!
For certain boom lengths, the mechanical auxiliary supports must be installed, see Erection and take down charts!
- ▶ The boom must be erected or taken down “to the side” “in the direction” of the mechanical auxiliary supports.
- ▶ Always erect or take down according to the data in the **Erection and take down charts**!

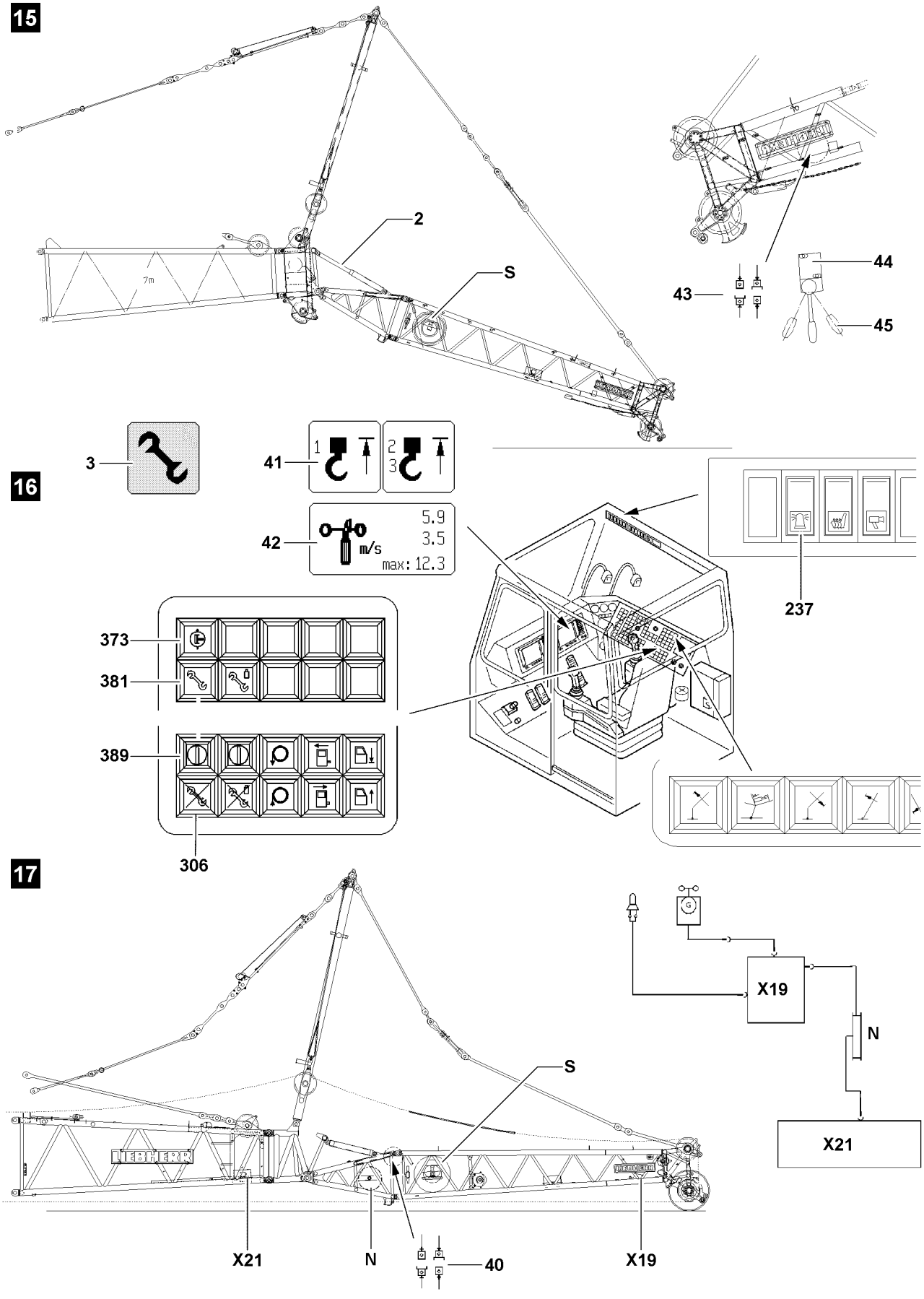
NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head. There is the danger that boom components may be significantly damaged!
- ▶ Upon taking down the boom system, always spool out the hoist winch at the same time!

4.1.1 Luffing the SF-boom down

When the lowest operating position is reached, the luff down movement is switched off.
On the symbol “Maximum load”, the load value disappears and the display “???” appears.
The following alarm functions become active:

Display on the LICCON-Monitor 0 upon achieving the “lowest” operating setting	
 *Symbol: “STOP” blinks*	
 *Symbol: “ERROR 150” blinks*	***Note:*** *For fault description see chapter 20.05.*
 *Symbol: “Horn” blinks*	***Note:*** *In addition to the symbol “Horn” an acoustic warning sounds.*

- ▶ Luff the S-boom down to the **lowest** operating position.

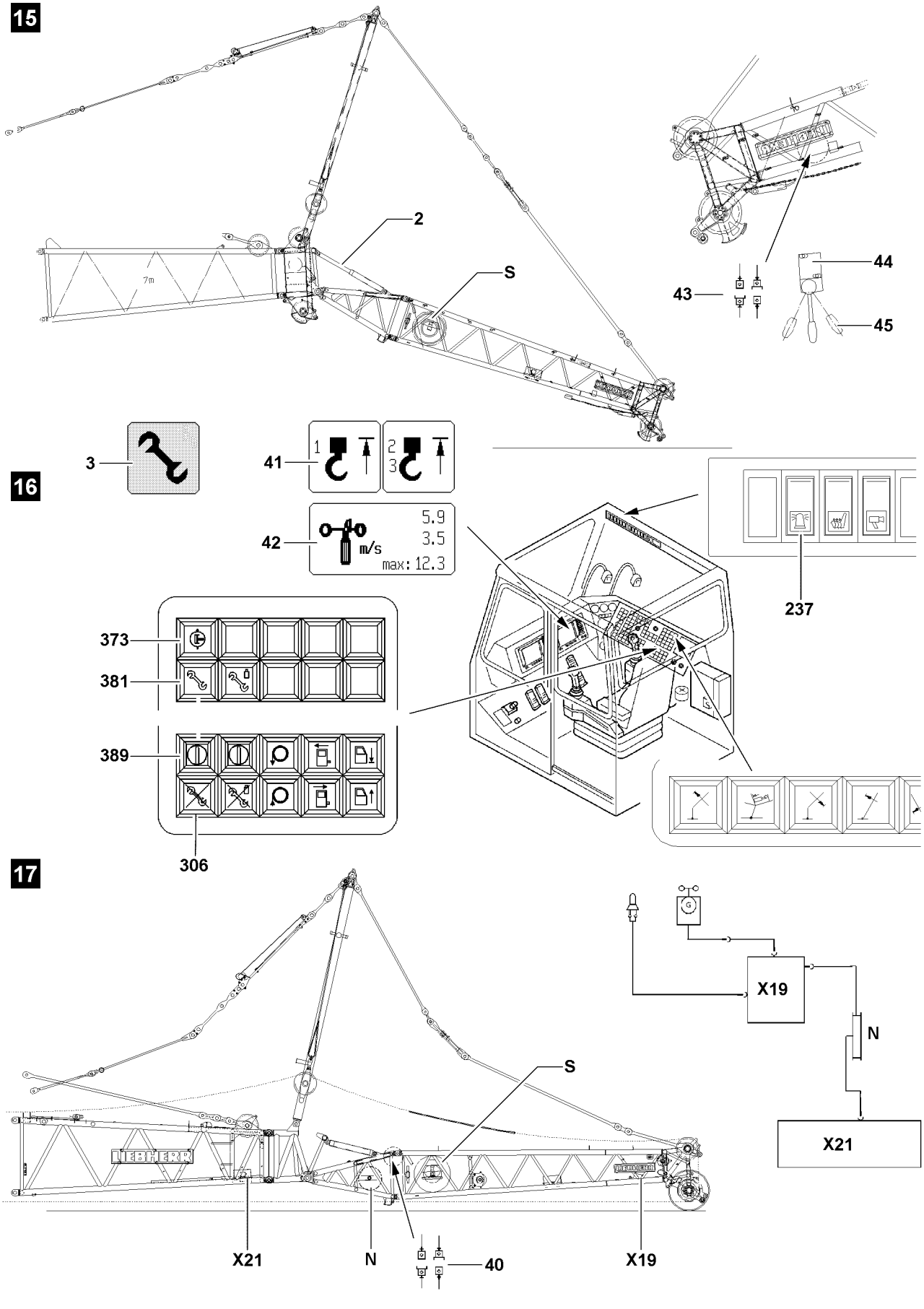

15
2
S
7m
44
43
45
16
3
41
1
2
3
42
5.9
3.5
m/s
max: 12.3
237
373
381
389
306
17
X19
N
S
X21
N
40
X19
X21

B106124

WARNING
Risk of fatal injury in crane operation with enabled assembly keyed button.
- ▶ The actuation of the assembly keyed button **389** is only permitted for assembly tasks!
- ▶ The assembly key switch **389** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly keyed button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly keyed button **389** turned on is strictly prohibited!
- ▶ The assembly keyed button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly keyed button **389**.

Result:
- – The LICCON overload protection is inactive.
- – The indicator light in the button **381** lights up.
- – The Assembly symbol **3** in the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red flashing beacon on the crane cab blinks.
- – The STOP icon on the LICCON monitor blinks.


15
2
S
7m
44
43
45
16
3
41
1
2
3
42
5.9
3.5
m/s
max: 12.3
237
373
381
389
306
17
S
X19
N
X21
X21
N
40
X19

B106124

4.1.2 Slacken the relapse cylinder

See figure **15**

NOTICE
Damage to the boom system!
If the SF-boom is set aside on the ground when the relapse cylinder is tensioned, boom system is damaged.
▶ Slacken the relapse cylinder **2** before the SF-boom is set aside on the ground.

▶ Luft the SF-boom down until the F-head piece is located just above the ground.
▶ Connect the hydraulic unit for the pin-pulling device to the quick-release couplings **43** on the F-head piece.

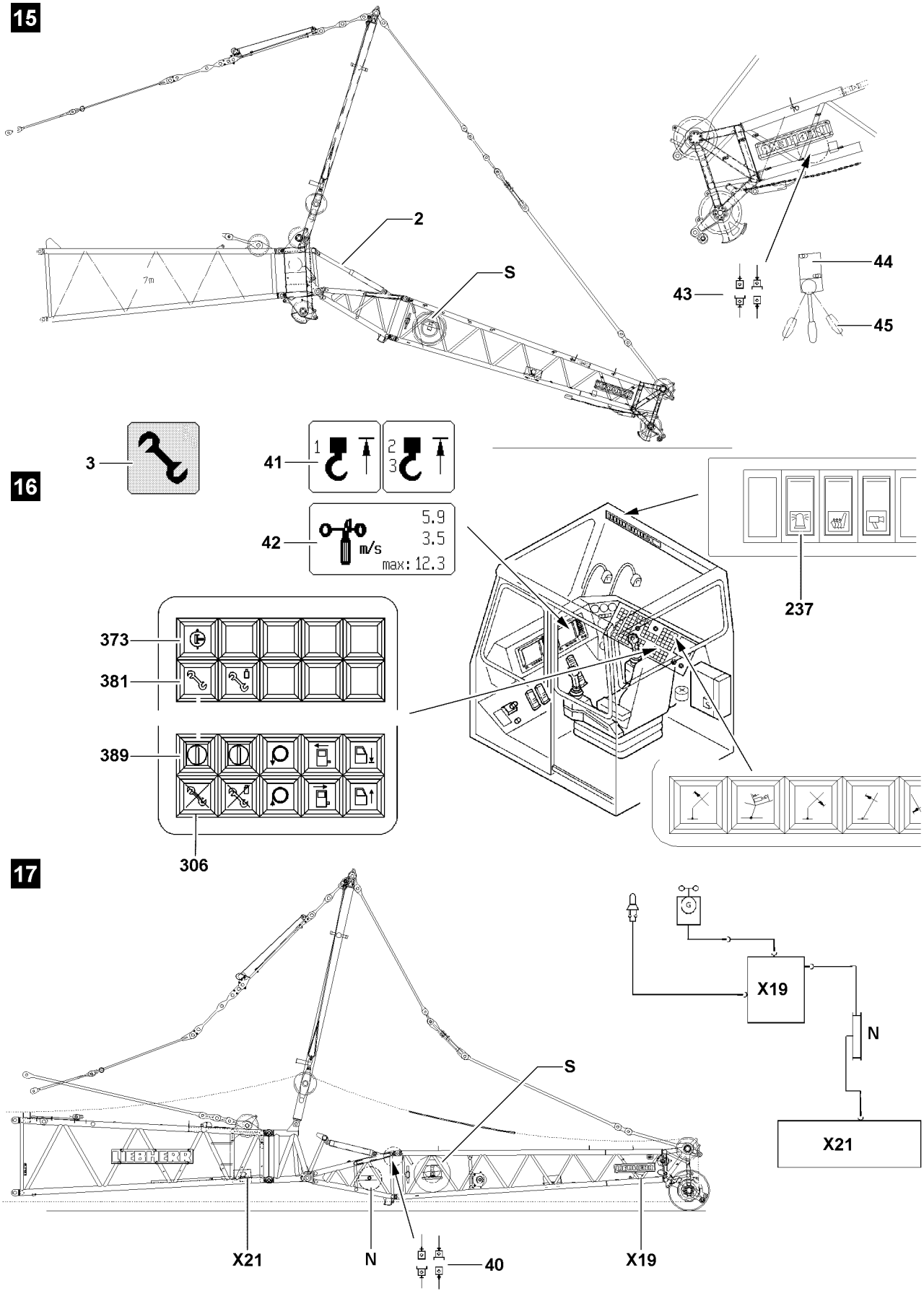
Note
▶ In order to slacken the relapse cylinder, the operating pressure on the pin-pulling device must amount to at least 180 bar.
▶ Pin pulling device, see chapter 5.30.

▶ Pretension hydraulic relapse cylinder: Activate lever **45** on the valve **44** until the cylinder is extended.
▶ Disconnect the hydraulic unit from the quick-release couplings **43**.

4.1.3 Taking the SF-boom down

See figure **17**
Ensure that the following prerequisites are met:
– Relapse cylinder is slackened.

▶ Spool the hoist winch out and luff the S-boom down further until the hook block touches the ground.
▶ Remove the hoist limit switch weight and unreeve the hook block.
▶ Luff the SF-boom down until the F-lattice jib is horizontally set aside on the support.
▶ Disconnect the hydraulic hose from the quick-release couplings **40** for the F-articulated piece and spool on the hose drum **S**.


15
2
S
7m
44
43
45
16
3
41
1
2
3
42
5.9
3.5
m/s
max: 12.3
237
373
381
389
306
17
X19
N
S
X21
N
40
X19
X21

B106124

4.2 Disconnecting the electrical connections

See figure **17**

Ensure that the following prerequisites are met:

– The F-lattice jib is set aside.

CAUTION

Damage to the electrical connection on the cable drum!

If the electrical connection from the cable drum **N** to the terminal box **X19** on the S-boom is first separated from the terminal box **X21** on the F-head piece, the electrical connection is damaged when spooling out the cable drum.

▶ First, disconnect the electrical connection from the cable drum **N** to the terminal box **X21** and then disconnect the electrical connection from the terminal box **X19** to the cable drum **N**!

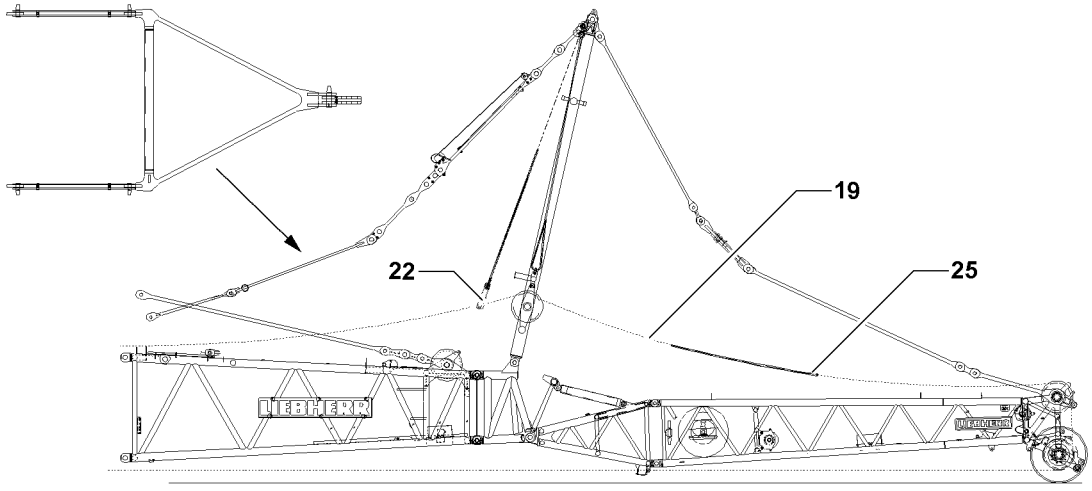
▶ Disconnect the electrical connection from the terminal box **X21** on the S-boom to the cable drum **N**.

▶ Disconnect the electrical connection on the F-head piece from the cable drum **N** to the terminal box **X19**.

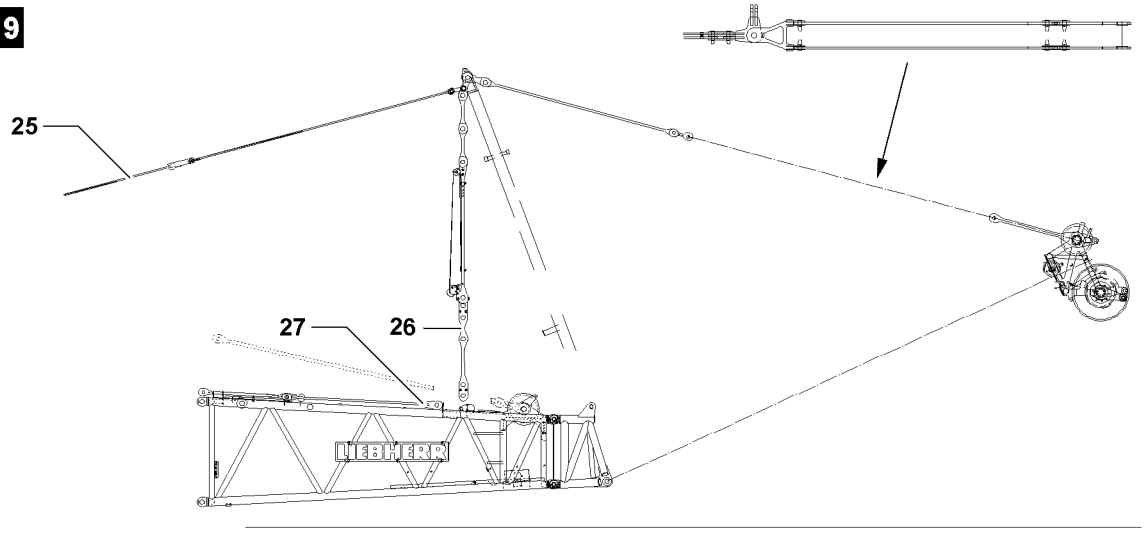
▶ Spool electrical cable on the cable drum **N**.

▶ Make sure that all electrical connections on the SF-lattice jib have been disconnected.

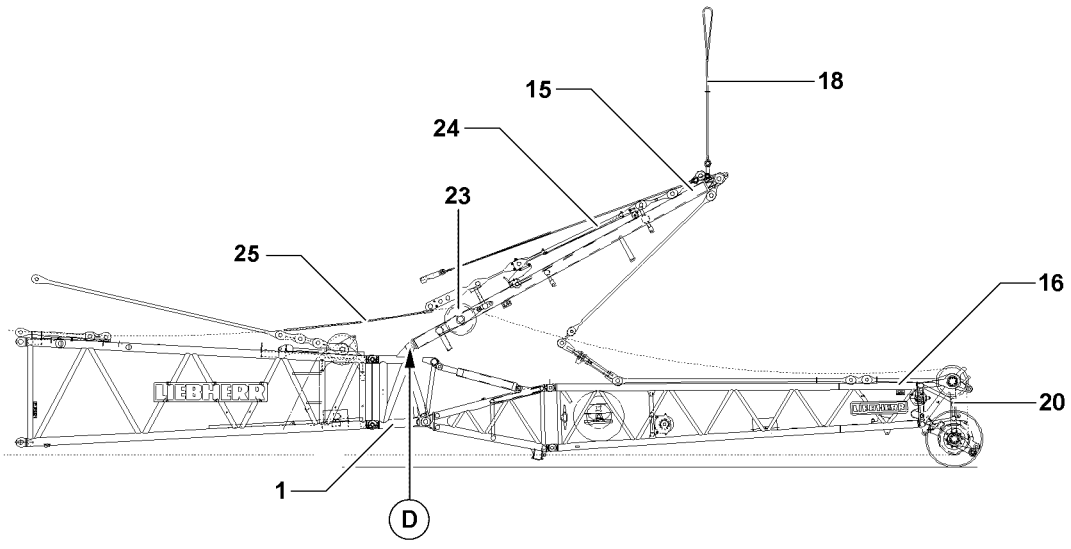
18



19



20



B106125

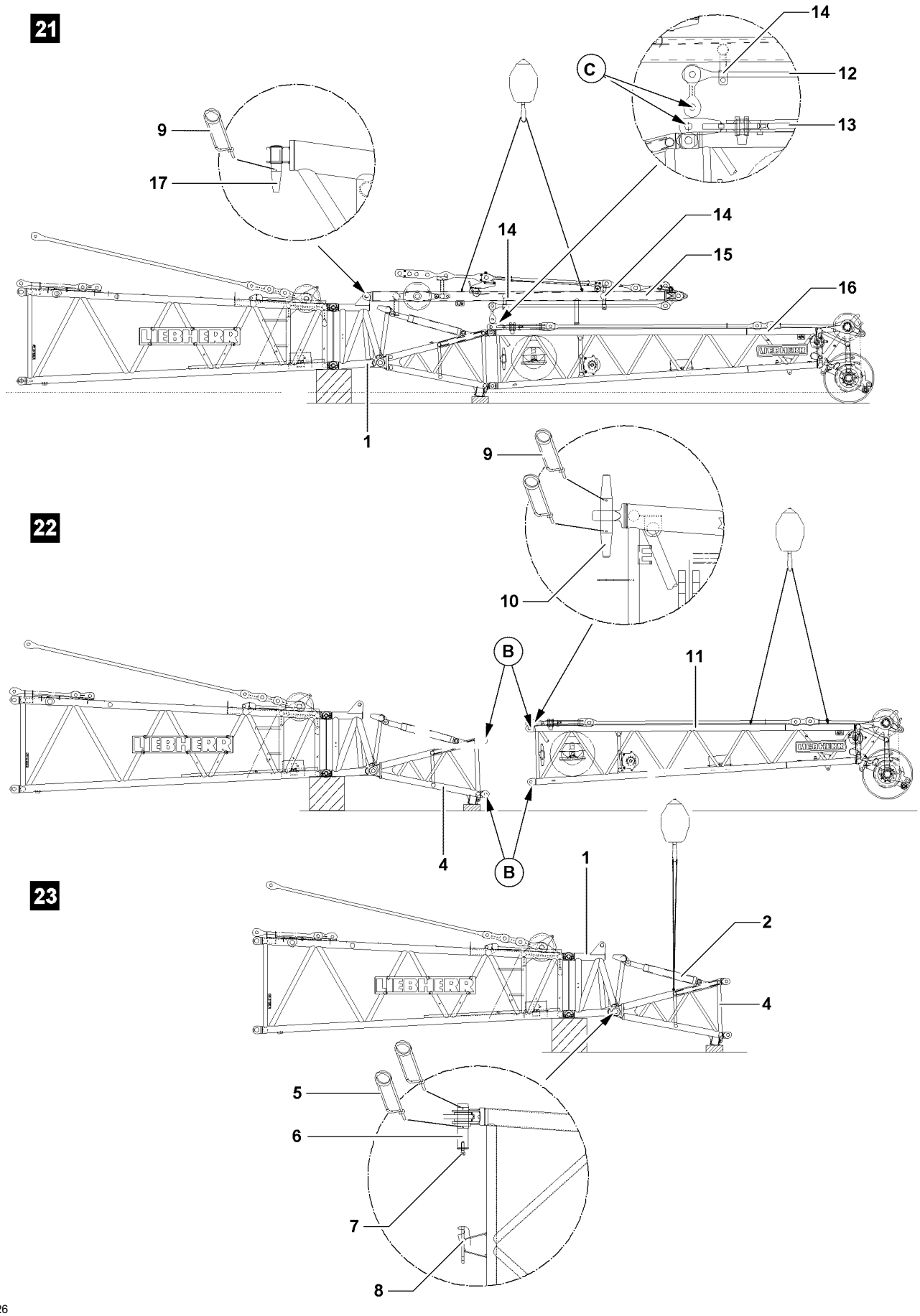
4.3 Disassembling the guy rods

4.3.1 Unbolt guy rods

- Secure hoist rope **25** on the assembly rope **19** and pull up to the FA-bracket.
- Insert hoist rope **25** into the rope lock **22**.
- Erect FA-bracket with hoist rope **25** until guy rods FA-bracket **27** hangs vertically downward, see figure **19**.
- Disconnect guy rods **26** FA-bracket from guy rods **27** main boom: Release and unpin the bolts.

4.3.2 Set aside FA-bracket

- Release hoist rope **25** until FA-bracket **27** is located over the pivot point to the right, see figure **20**.
- Hang the FA-bracket tackle **18** on the auxiliary crane.
- Loosen hoist rope **25** and remove rope lock **22**.
- Set aside FA-bracket **14** on F-lattice jib **16**.
- Remove the auxiliary crane.


21
14
C
12
13
9
17
14
14
15
16
1
9
22
10
B
11
4
B
1
23
2
4
5
6
7
8
B106126

4.4 Disassembling FA-bracket

See figure **21**

- ▶ Disconnect guy rods FA-bracket **12** from guy rods F-lattice jib **16** in the point **C**: Release and unpin the bolts.
- ▶ Pin and secure guy rods FA-bracket **12** in transport retainer **14**.
- ▶ Secure FA-bracket **15** with the auxiliary crane.
- ▶ Disconnect FA-bracket **15** from the L-head piece **1**: Remove the spring retainer **9** and unpin the bolts **17**.
- ▶ Raise and remove the FA-bracket **15** with auxiliary crane.

4.5 Disassembling F-lattice jib

See figure **22**

- ▶ Support the F-articulated piece **4**.
- ▶ Disconnect F-lattice jib **16** from F-articulated piece **4** in points **B**: Remove the spring retainers **9** and unpin the bolts **10**.
- ▶ Raise and remove the F-lattice jib **16** with auxiliary crane.
- ▶ Support and disconnect NI-lattice sections and F-head piece **11**: Remove the spring retainers **9** and unpin the bolts **10**.

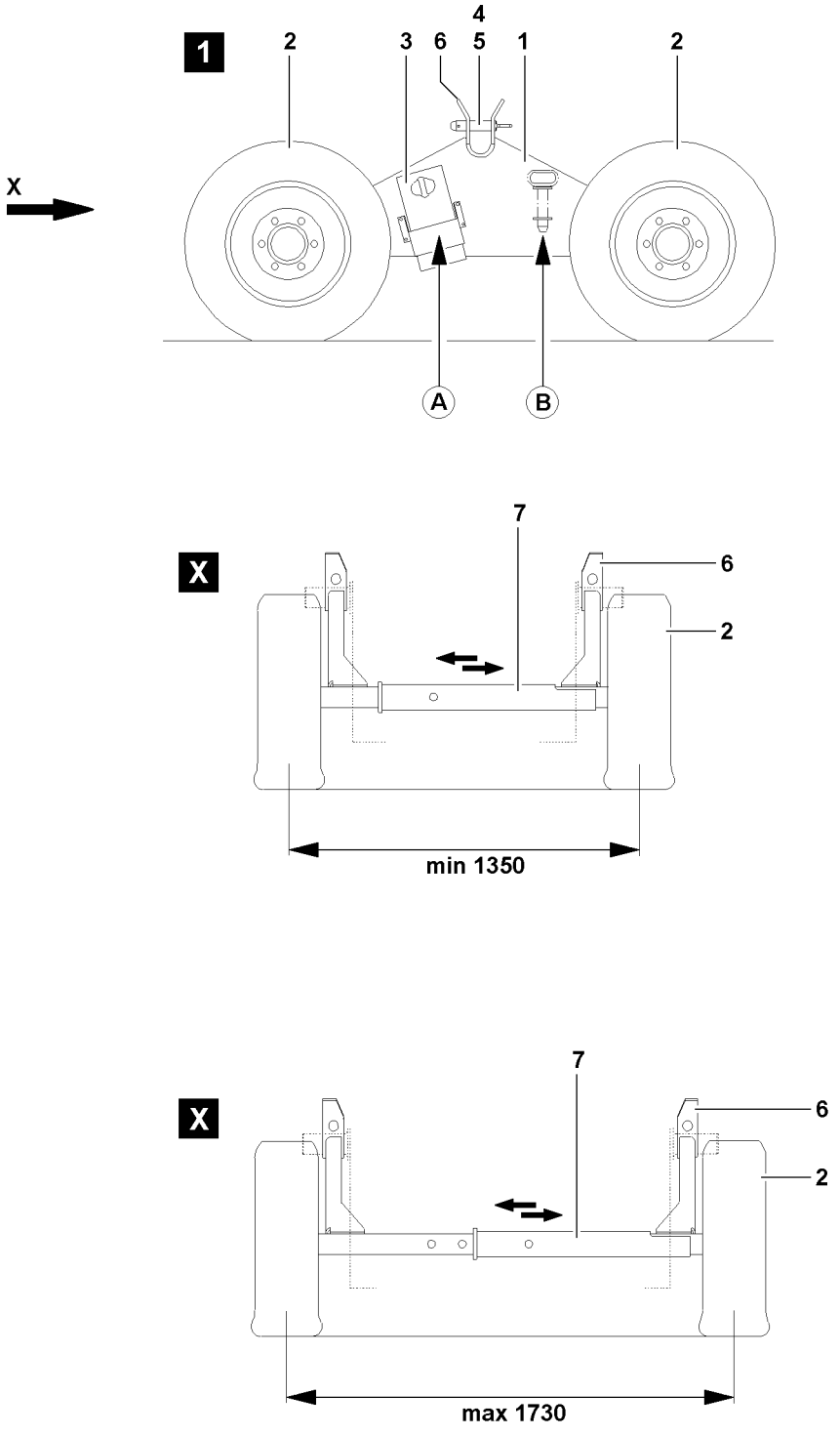
4.6 Disassembling F-articulated piece

See figure **23**

Note

- ▶ Pin pulling device, see chapter 5.30.

- ▶ Secure F-articulated piece **4** with the auxiliary crane.
- ▶ Hang hydraulic pin-pulling cylinder on screw **7** and the retainer **8** on F-articulated piece **4**.
- ▶ Disconnect F-articulated piece **4** from the L-head piece **1**: Remove the spring retainers **5** and unpin the bolts **6** with pin-pulling cylinder.
- ▶ Hoist and remove hydraulic pin-pulling cylinder on the F-articulated piece **4**.
- ▶ Raise F-articulated piece **4** and remove.



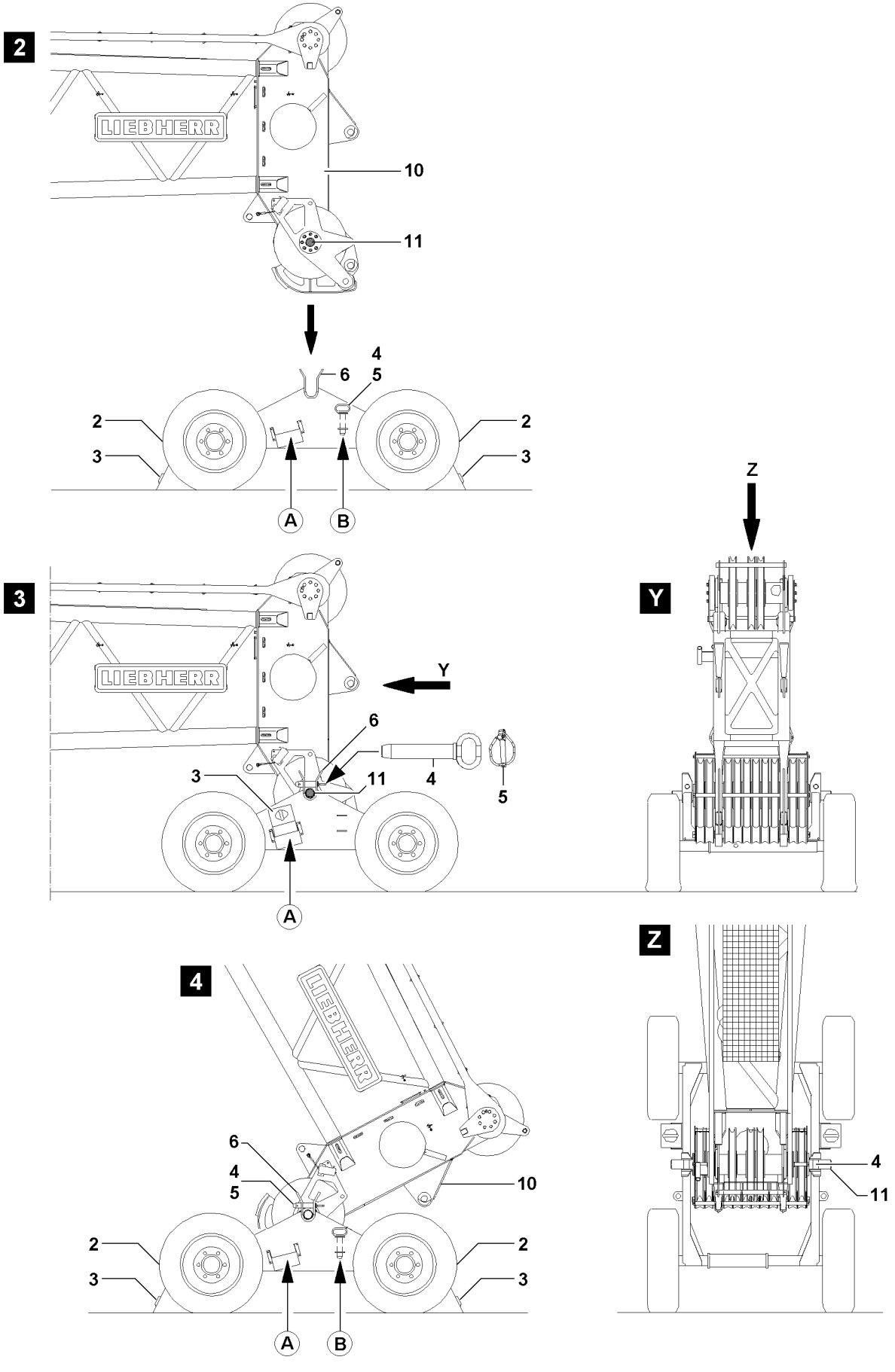
B105433

1 Components of pulley cart

Position	Item
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.


2
LIEBHERR
10
11
4
6
5
2
3
2
3
A
B
3
LIEBHERR
Y
6
3
11
4
5
A
Y
Z
Z
4
LIEBHERR
6
4
5
10
2
3
2
3
A
B
4
11

B105434

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**, fig. **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**, fig. **3**.
- ▶ Remove the wedges **3** on the wheels.
- ▶ Remove the wedges **3** on the transport receptacle (point **A**) on the pulley cart.

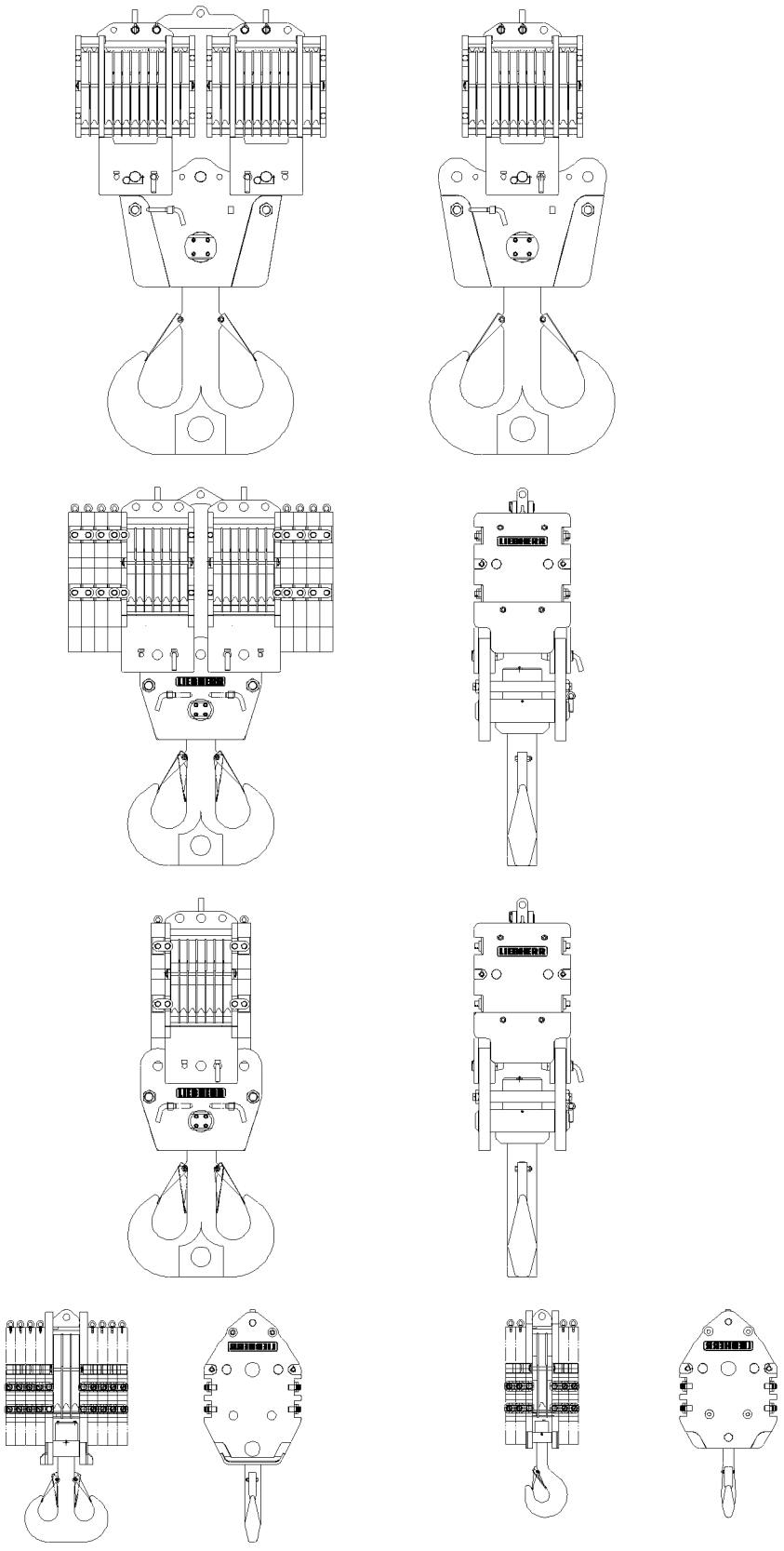
1.3 Removing the pulley cart

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**, fig. **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.



B108122

1 Hook block overview

Note

- For this crane type, the permissible load hooks and hook blocks may be found in a separate load chart!
- The hook blocks described in this chapter only serve as examples and can depart their design type and the number of rope pulleys from your hook block. The various assembly and disassembly procedures therefore serve only as exemplary description for a large number of different hook blocks!

DANGER

Hook block weights!

If the information in the erection and take down charts or those in the load charts are not observed, dangerous situations can result, up to toppling of the crane!

Personnel can be severely injured or killed; additionally, high property damages can result!

- Observe the data in the erection and take down charts!
- The specifications in the load charts must be adhered to!
- The crane operator alone is responsible for his actions for maintaining the specifications in the erection and take down charts and in the load charts!

For different sized loads, various large hook blocks can be used.

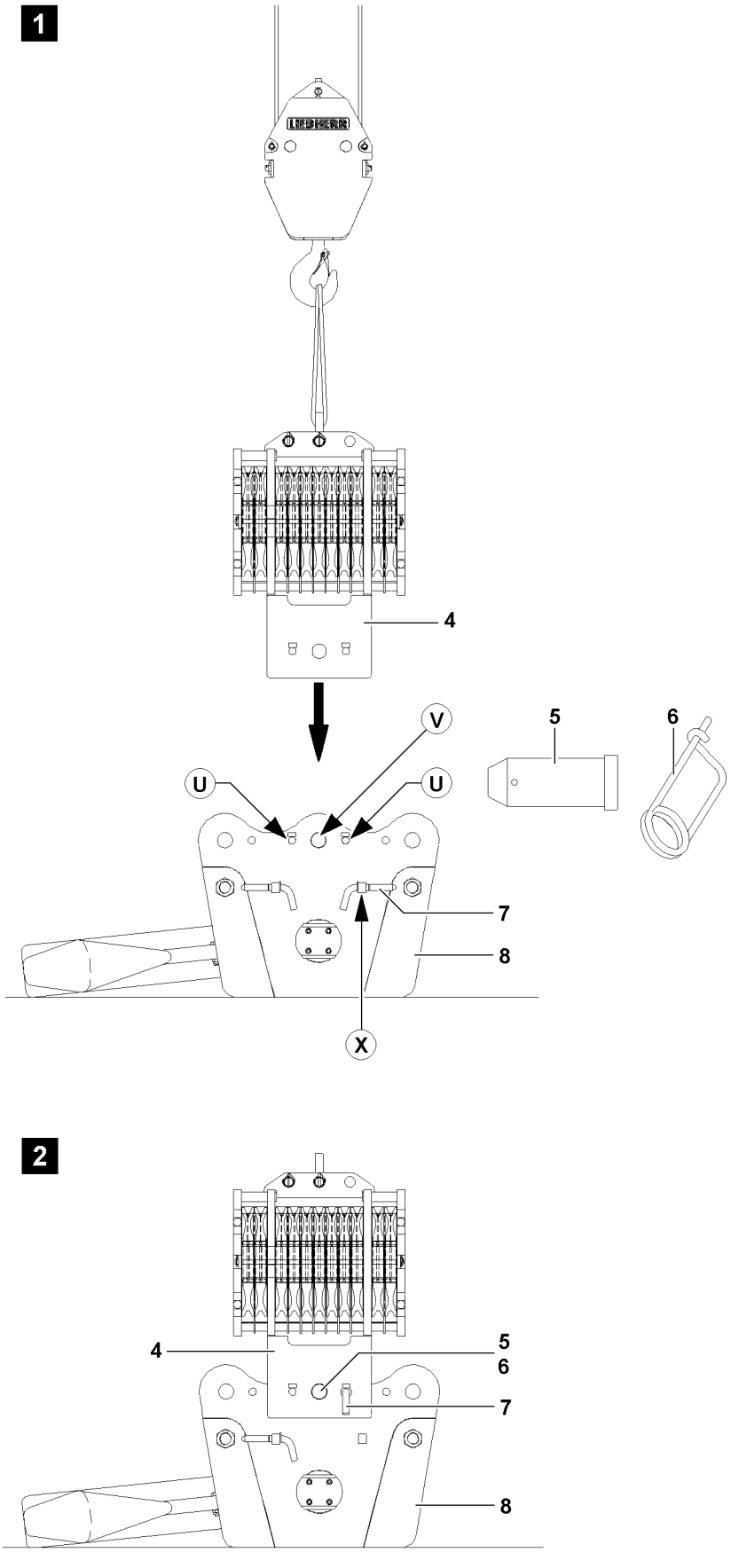
NOTICE

Rope damage due to insufficient hook block weight!

If the hook block weight is too low to tighten the hoist rope sufficiently, spooling problems may occur on the winches when lowering and lifting the hook block due to slack rope formation!

The hoist rope can be damaged!

- In order to prevent spooling problems on the winches, the hook block weight may be increased with auxiliary weights, if necessary!
- If problems develop in the assembly and set up conditions due to the weight increase of the hook block, auxiliary weights must be removed again!



B108123

2 Assembling a double hook block for individual operation

2.1 Assembling the hook blocks

If the hook blocks are to be brought into individual operation, then the pulley block **4** is attached centrally on the cross brace **8**.

2.1.1 Assembling the pulley block on cross brace

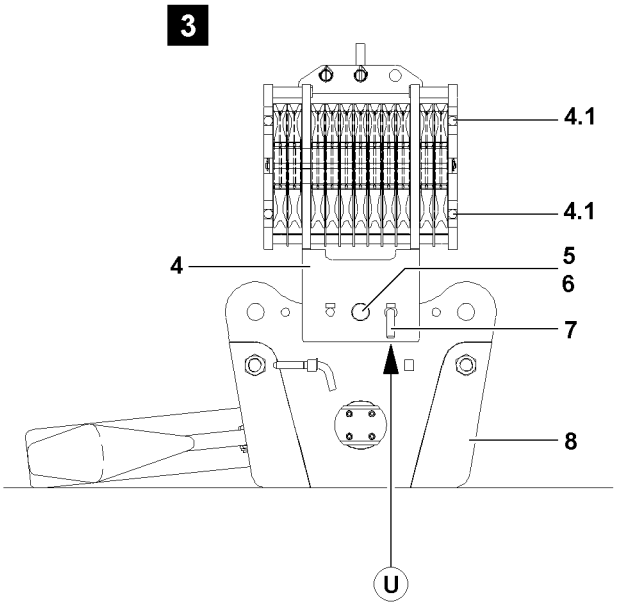
Make sure that the following prerequisites are met:

– the ground is sufficiently load bearing to take on the weight of the hook block safely,
– the subsoil is level and horizontal,
– the cross brace **8** is placed on the floor, see illustration **1**.

DANGER
Risk of tipping the pulley block!
If the retaining pins **7**, during assembly of the pulley block **4**, is not pinned to the cross brace, then the pulley block tips to the side upon removal of the auxiliary crane!
Personnel remaining in the danger zone can be severely injured or killed!

▶ Pin in the retaining pins **7** into the bores **U** on the hook block!
▶ Make sure before removing the auxiliary crane that the pulley block is properly pinned and secured!

▶ Attach the pulley block **4** onto the auxiliary crane, illustration **1**.
▶ Position pulley block **4** on the cross brace **8** and align the pin bore **V**.
▶ Pin in the pin **5** on point **V** and secure with spring retainer **6**.
▶ Unpin the retaining pin **7** from the transport receptacle (point **X**).
▶ Pin in the retaining pins **7** into the bores (point **U**) on the cross brace **8**, illustration **1**.
▶ If the pulley block **4** is secured through the retaining pins **7** at point **U**:
Remove the auxiliary crane.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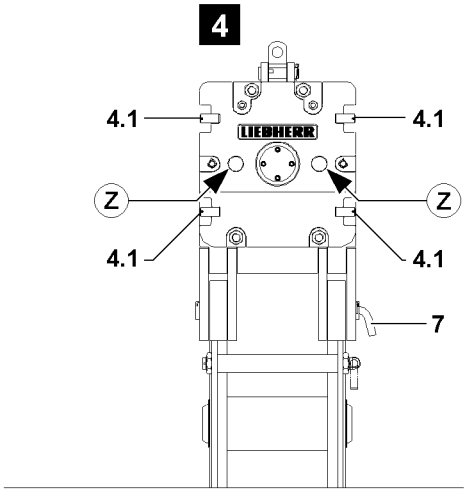
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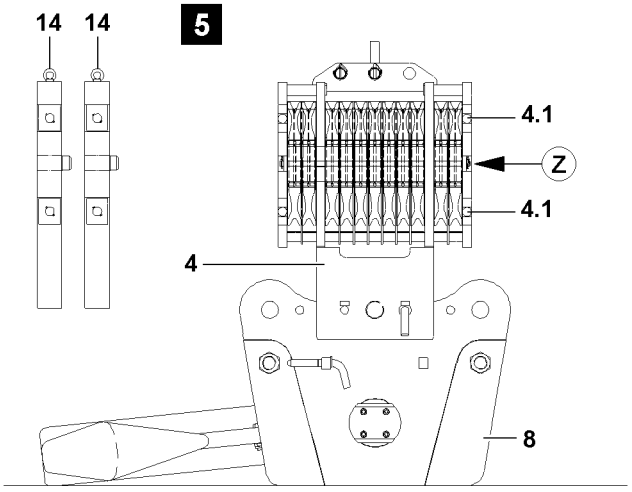
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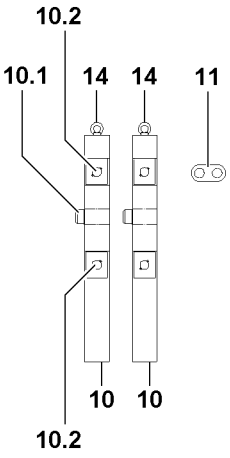
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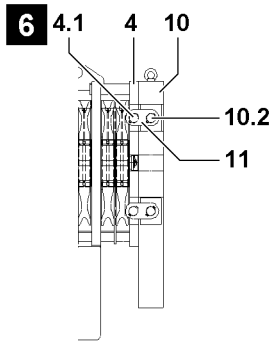
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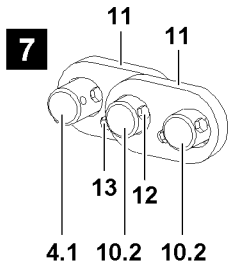
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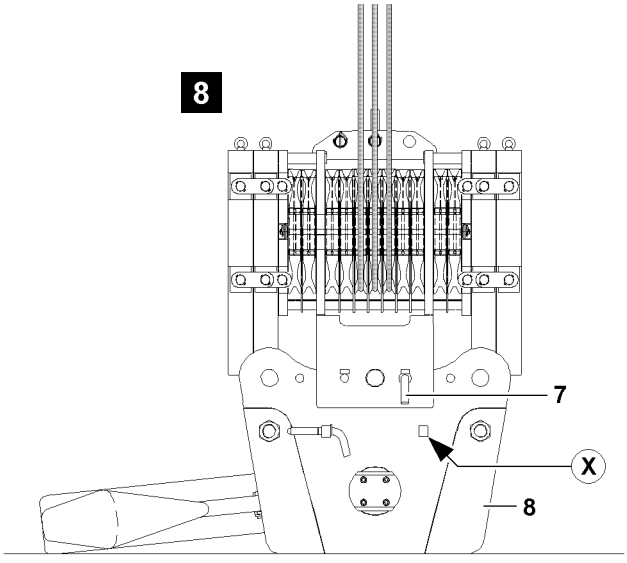
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B108141

2.1.2 Assembling the auxiliary weights

Note

▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING

Toppling of hook block!

One-sided placement of auxiliary weights can topple the hook block!

Personnel can be severely injured or killed!

▶ The auxiliary weights may only be installed **individually** and alternating left and right on the pulley block!

▶ If the required auxiliary weight is assembled on the pulley block, then the difference between left and right side may never be more than one auxiliary weight!

▶ Asymmetrical installation of auxiliary weights is prohibited!

Make sure that the following prerequisites are met:

– the hook block is placed on the ground,

– the pulley block **4** is properly assembled and secured,

– the retaining pin **7** is pinned and secured at point **U**.

WARNING

Falling auxiliary weights!

If the auxiliary weights on the pulley block are not properly assembled, they can fall down during assembly or during crane operation!

Personnel can be severely injured or killed!

▶ Standing under suspended auxiliary weight is prohibited!

▶ Ensure that the auxiliary weights are assembled properly and securely!

▶ Operating the crane without insufficiently secured auxiliary weights is forbidden!

▶ Attach the auxiliary weight **10** onto the eyebolt **14** on the auxiliary crane, see illustration **5**.

WARNING

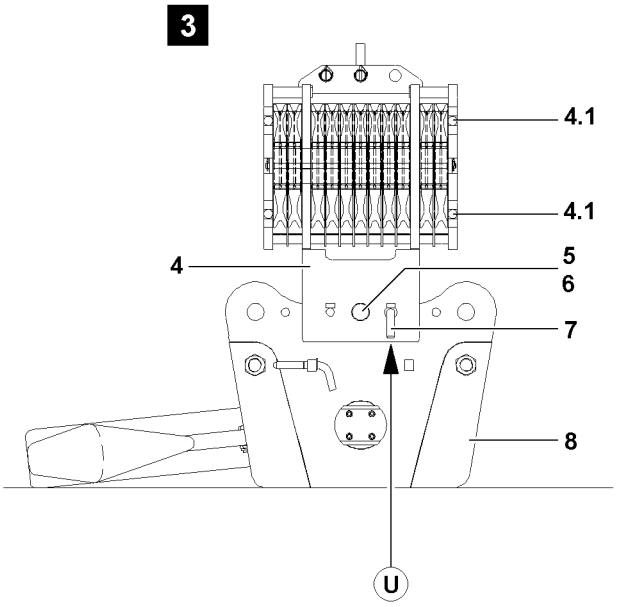
Danger of crushing!

While swinging in the auxiliary weights for the pulley block, personnel can be severely injured or killed!

Fingers, hands or arms can be crushed or severed!

▶ Standing between pulley block and auxiliary weight is prohibited!

▶ Swing in auxiliary weights with extreme caution and at low speed for the pulley block!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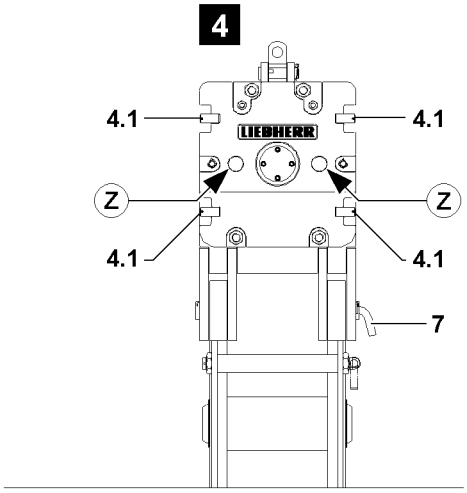
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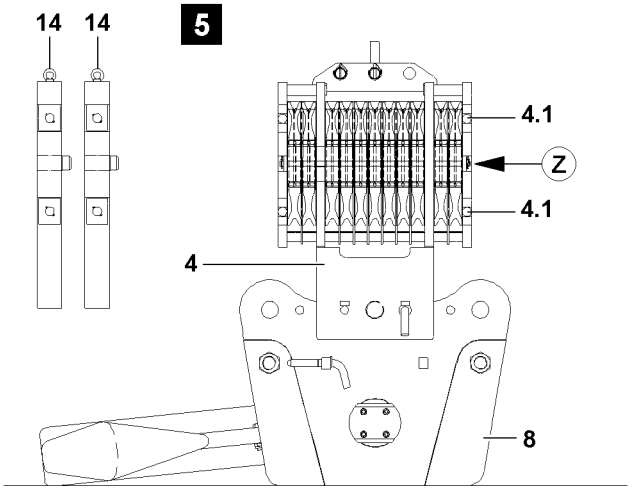
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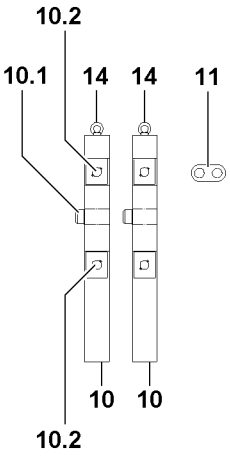
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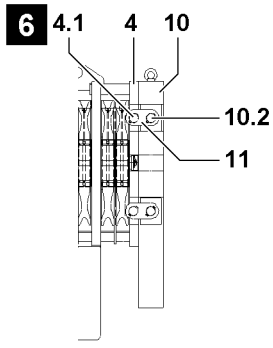
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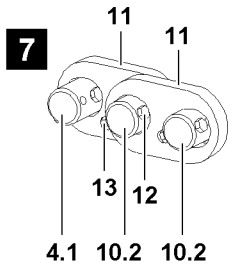
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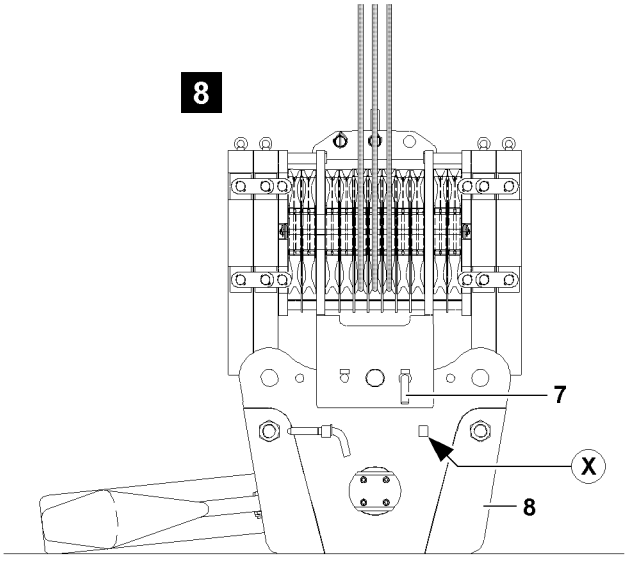
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B108141

- ▶ Align auxiliary weight **10** on the pulley block **4**.
- ▶ Retract auxiliary weight centring pin **10.1** into the centring bores **Z** on them pulley block **4**, illustration **6**.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Install mounting brackets **11** laterally and connect the pulley block **4** with the auxiliary weight **10**, illustration **7**.
- ▶ Secure mounting brackets **11** with screws **12** and safety nut **13**, illustration **7**.

Note
- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

WARNING
Falling auxiliary weights!
By removing the auxiliary crane, the auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Only remove the auxiliary crane when it is ensured that the auxiliary weight **10** is secured properly with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly assembled and secured:
  Remove the auxiliary crane.

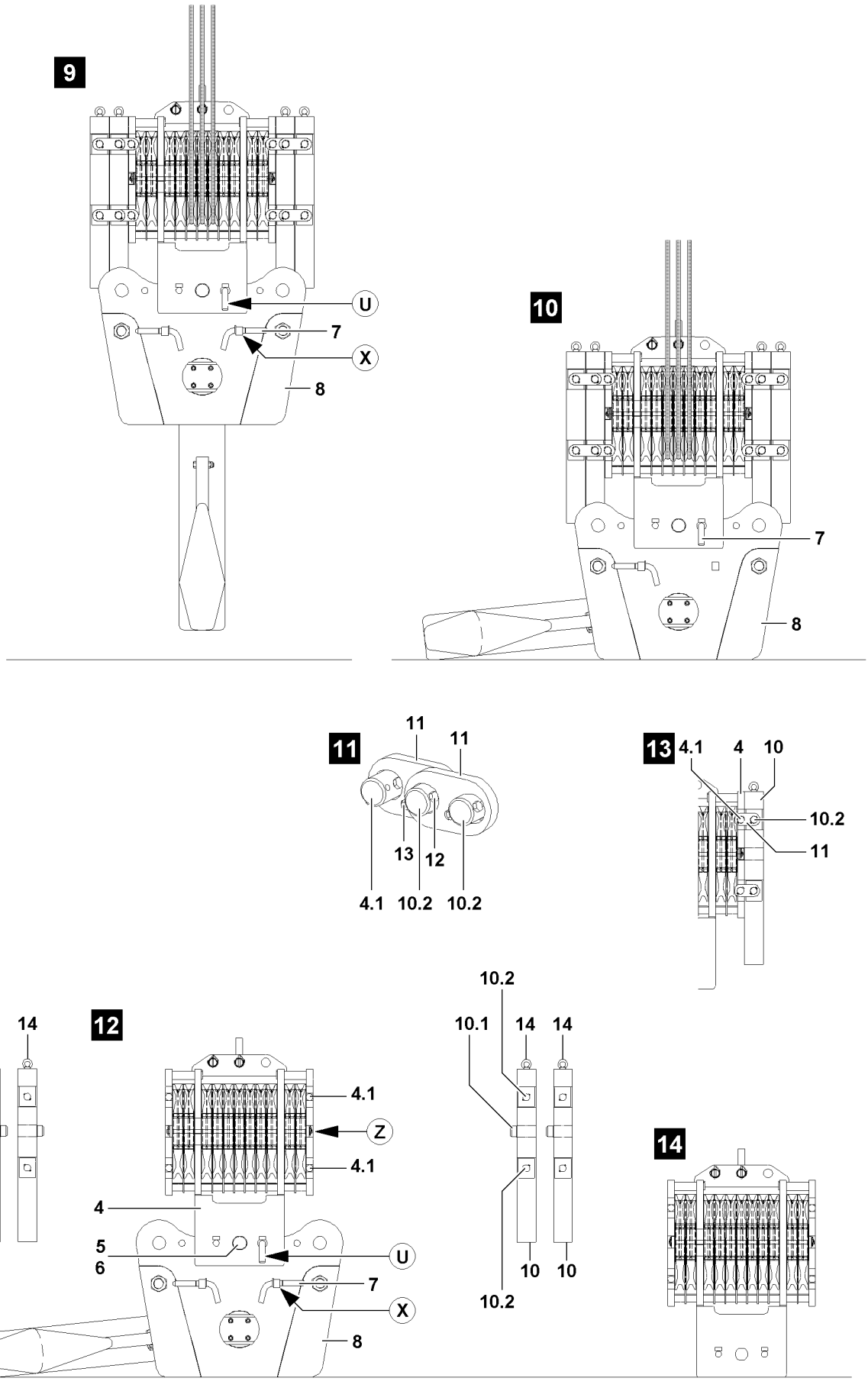
2.1.3 Preparing the hook block for crane operation

Note
- ▶ Reeving in of the hook blocks is described in chapter 4.06 of the crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

- ▶ Reeve in hoist rope according to chapter 4.06 of the crane operating instructions and on the basis of the separate reeving plans!

NOTICE
Pin in retaining pins **7** when lifting the load!
If the retaining pin **7** is not unpinned prior to the crane operation, the retaining pin **7** may be sheered off when raising the load!
- ▶ Unpin the retaining pin **7** from the hook block before crane operation!

- ▶ When the hook block is properly reeved and has been lifted from the ground:
  Unpin retaining pin **7** and pin and secure into the transport receptacle (point **X**), illustration **8**.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2.2 Disassembling the hook block

2.2.1 Preparing the hook block for disassembly

Note

- ▶ Reeving out of the hook blocks is described in chapter 4.06 of the crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

NOTICE

Retaining pin **7** unpinned upon lowering the hook block!

If the retaining pin **7** - before setting the hook block on the ground - is not pinned, the pulley block tips away laterally upon being set down!

Personnel can be severely injured or killed!

- ▶ Pin in and secure retaining pin **7**, before setting down hook block onto the ground, at point **U**!

Make sure that the following prerequisites are met:

– the subsoil is sufficiently load bearing to take on the weight of the hook block safely, including the auxiliary weights,

– the subsoil is level and horizontal.

- ▶ Lower the hook block completely onto the ground.
- ▶ If the hook block has been placed properly onto the ground:
  Reeve out hoist rope according to chapter 4.06 of the crane operating instructions!

2.2.2 Disassembling auxiliary weights

Note

- ▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING

Toppling of hook block!

One-sided disassembly of auxiliary weights can topple the hook block!

Personnel can be severely injured or killed!

- ▶ The auxiliary weights may only be placed **individually** and are disassembled alternating left and right on the pulley block!
- ▶ The difference between left and right side may never be more than one auxiliary weight upon disassembly of the auxiliary weight!
- ▶ Asymmetrical disassembly of auxiliary weights is prohibited!

Ensure that the following prerequisite is met:

– the retaining pin **7** is pinned in and secured at point **U**.

WARNING

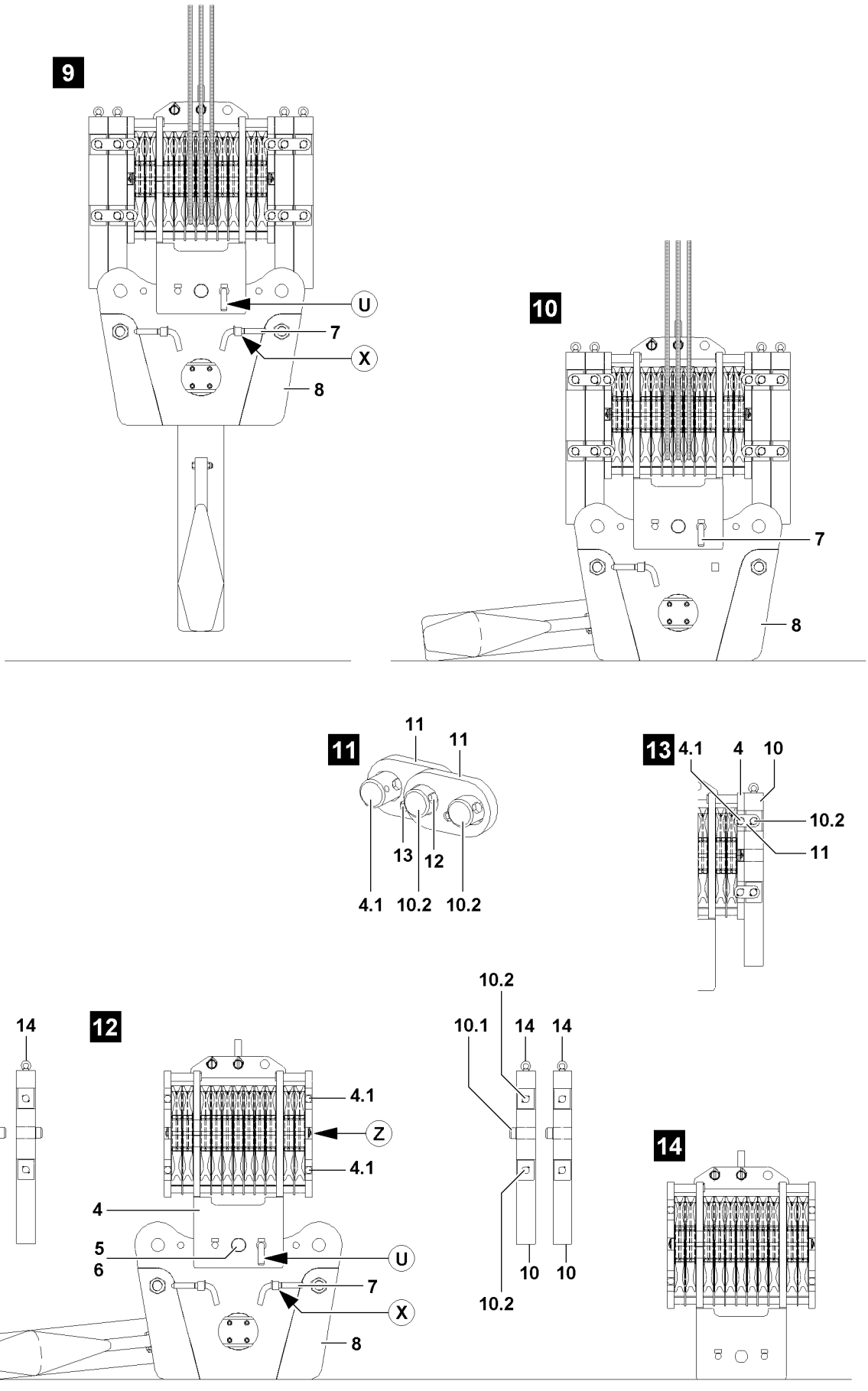
Falling auxiliary weights!

If the auxiliary weights on the pulley block are not properly disassembled, they can fall down during disassembly!

Personnel can be severely injured or killed!

- ▶ Standing under suspended auxiliary weight is prohibited!

- ▶ Attach auxiliary weight **10** on the eyebolt **14** on the auxiliary crane.
- ▶ Carefully tension the tackle.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WARNING
Swinging auxiliary weights!
During disassembly of the auxiliary weights, the auxiliary weights can lead to swinging!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Take heed that the auxiliary weight to be disassembled is properly attached on the auxiliary crane before loosening the mounting brackets!
- ▶ Diagonal pull is not permitted!

- ▶ When the tackle on the auxiliary weight is tensioned:
  Loosen bolt connection on the mounting brackets of the outermost auxiliary weights and remove bolts.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Disconnect mounting brackets **11** laterally.

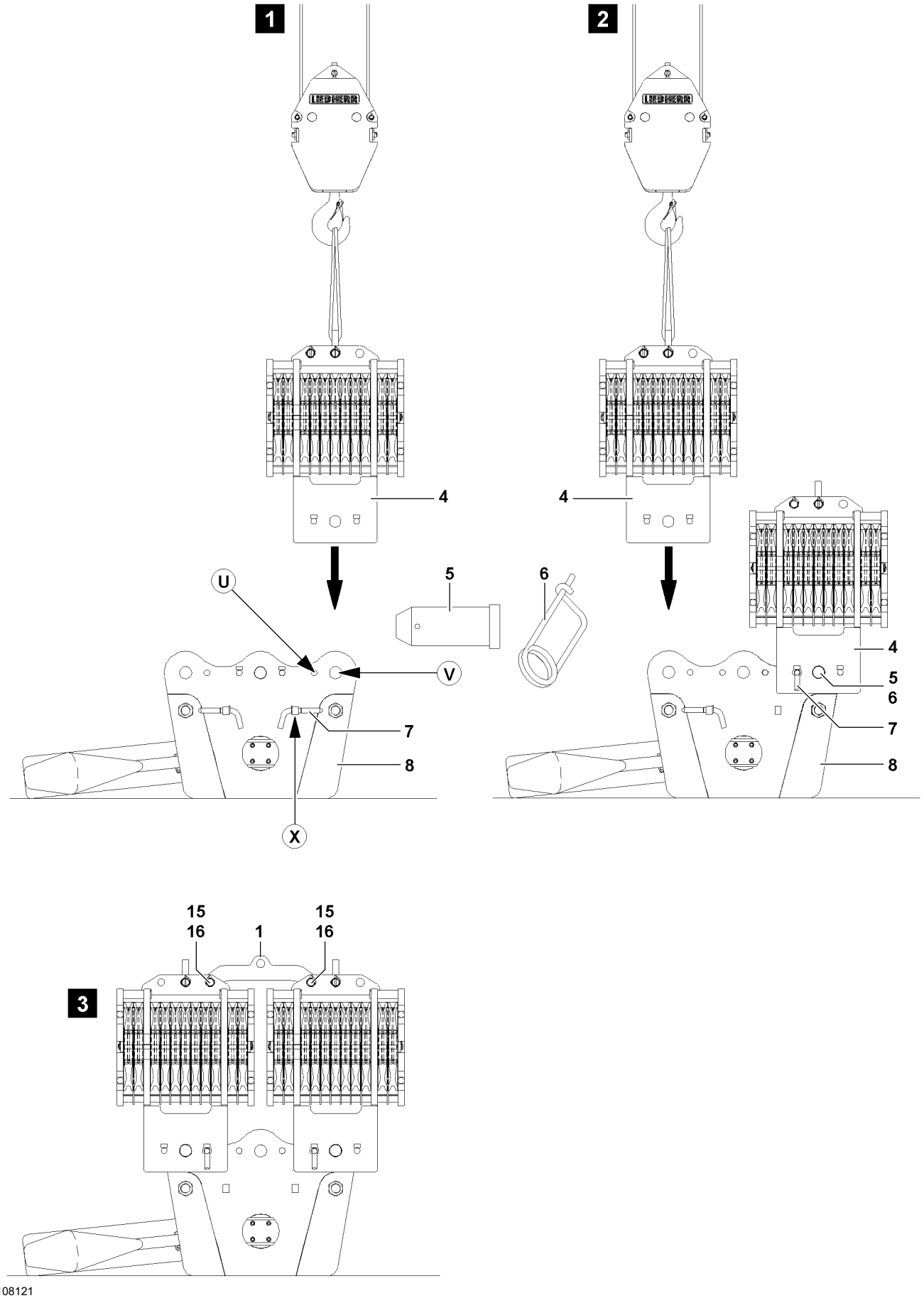
WARNING
Falling auxiliary weights!
If more than the auxiliary weights to be disassembled are released, these auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the other auxiliary weights are secured with the mounting brackets before removing the outermost auxiliary weights!

- ▶ If additional mounting brackets must be removed for releasing the outermost auxiliary weights: Immediately reinstall mounting brackets so that only the relevant auxiliary weight to be disassembled is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the pulley block.
- ▶ Place the auxiliary weight onto the ground.
- ▶ Remove the auxiliary crane.
- ▶ Disassemble additional auxiliary weights as described above.

2.2.3 Disassembling the pulley block on cross brace

Ensure that the following prerequisite is met:
– the auxiliary weights are disassembled.

- ▶ Attach the pin pulling device **4** on the auxiliary crane.
- ▶ Carefully tension the tackle.
- ▶ Unpin retaining pin **7** at point **U** and pin into transport receptacle on the cross brace, point **X**, illustration **12**.
- ▶ Release and unpin the pin **5**.
- ▶ Swing out pulley block **4** with auxiliary crane.
- ▶ Place the pulley block **4** on the ground, illustration **14**.
- ▶ Remove the auxiliary crane.



B108121

3 Assembling a double hook block for parallel operation

3.1 Assembling the hook blocks

If the hook blocks are to be brought into parallel operation, then attach the pulley blocks **4** left and right on the cross brace **8**.

3.1.1 Assembling the pulley blocks on cross brace

Make sure that the following prerequisites are met:
- the ground is sufficiently load bearing to take on the weight of the hook block safely,
- the subsoil is level and horizontal,
- the cross brace **8** is placed on the floor, see illustration **1**.

DANGER
Tipping over the pulley blocks!
If the retaining pins **7**, are not pinned during assembly of the pulley blocks **4** on the cross brace, then the pulley block tips to the side upon removal of the auxiliary crane!
Personnel remaining in the danger zone can be severely injured or killed!
- ▶ Pin in the retaining pins **7** into the bores **U** on the hook block!
- ▶ Make sure before removing the auxiliary crane that the pulley blocks are properly pinned and secured!

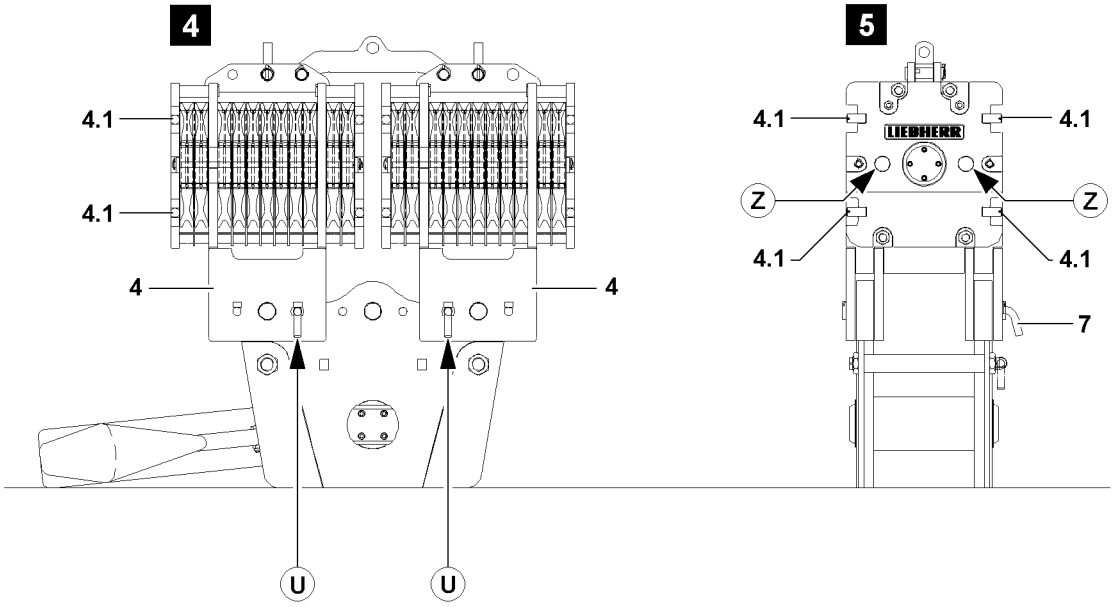
Note
- ▶ The assembly of two pulley blocks **4** is identical and is described on the example of a pulley block!

- ▶ Attach the pulley block **4** onto the auxiliary crane, illustration **1**.
- ▶ Position pulley block **4** on the cross brace **8** and align the pin bore **V**.
- ▶ Pin in the pin **5** on point **V** and secure with spring retainer **6**.
- ▶ Unpin the retaining pin **7** from the transport receptacle (point **X**).
- ▶ Pin in the retaining pins **7** into the bore (point **U**) on the cross brace **8**, illustration **1**.
- ▶ If the pulley block **4** is secured through the retaining pins **7** at point **U**:
  Remove the auxiliary crane, illustration **2**.
- ▶ Assemble second pulley block.

3.1.2 Assembling the block connector

Ensure that the following prerequisite is met:
- assemble and secure the two pulley blocks **4** on the cross brace **8**.

Both pulley blocks **4** are pinned with the block connector **1**.
- ▶ Attach the block connector **1** on the auxiliary crane.
- ▶ Position block connector **1** with auxiliary crane in pinning position, illustration **3**.
- ▶ Pin in the pins **15** on both sides to the pulley blocks **4** and pin with linchpin **16**, illustration **3**.
- ▶ When the block connection **1** is pinned and secured properly:
  Remove the auxiliary crane.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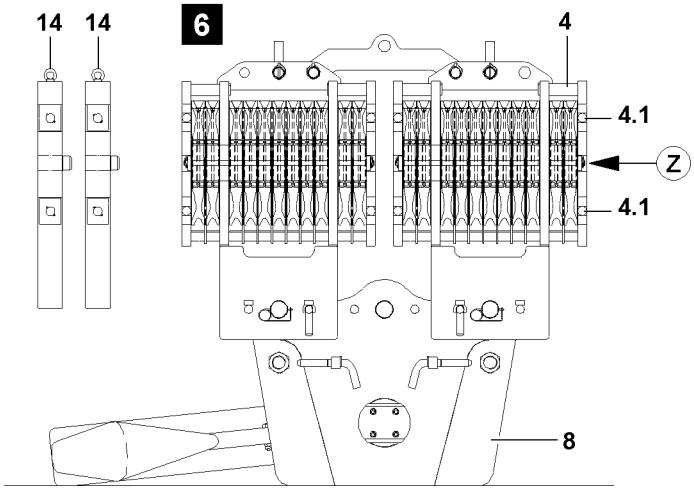
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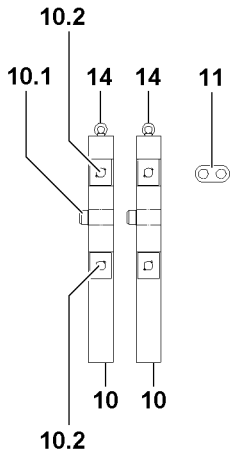
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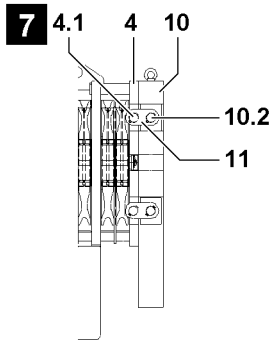
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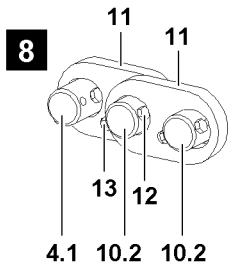
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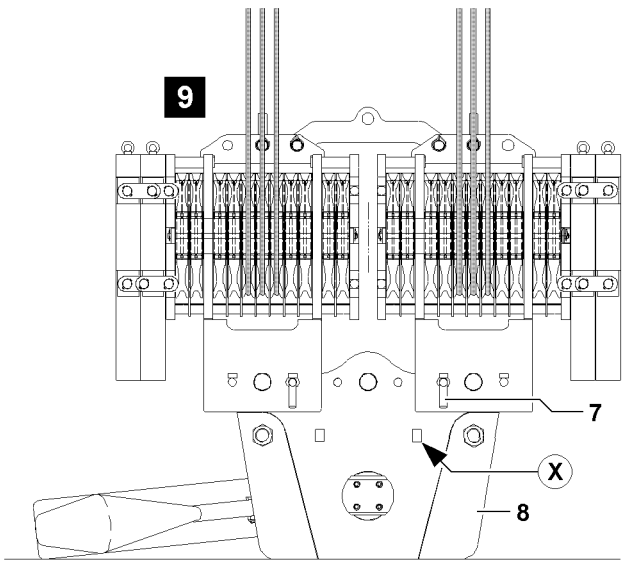
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3.1.3 Assembling the auxiliary weights

Note

▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING

Toppling of hook block!

One-sided placement of auxiliary weights can topple the hook block!

Personnel can be severely injured or killed!

▶ The auxiliary weights may only be placed **individually** and alternating left and right on the pulley blocks of the hook block!

▶ If the required auxiliary weight is assembled on the pulley blocks, then the difference between left and right side may never be more than one auxiliary weight!

▶ Asymmetrical installation of auxiliary weights is prohibited!

Make sure that the following prerequisites are met:

– the hook block is placed on the ground,
– the pulley blocks **4** are properly assembled and secured,
– the retaining pins **7** are pinned in and secured at point **U**,
– the block connector **1** is properly assembled and secured.

WARNING

Falling auxiliary weights!

If the auxiliary weights on the pulley blocks are not properly assembled, they can fall down during assembly or during crane operation!

Personnel can be severely injured or killed!

▶ Standing under suspended auxiliary weight is prohibited!

▶ Ensure that the auxiliary weights are assembled properly and securely!

▶ Operating the crane without insufficiently secured auxiliary weights is forbidden!

▶ Attach auxiliary weight **10** on the eyebolt **14** on the auxiliary crane.

WARNING

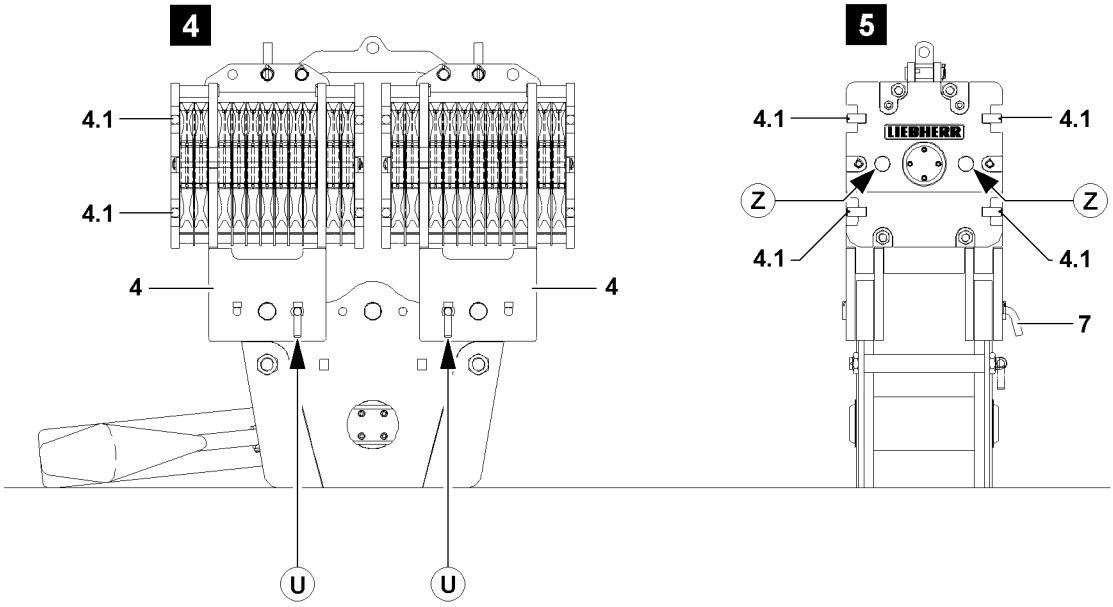
Danger of crushing!

While swinging in the auxiliary weights for the pulley block, personnel can be severely injured or killed!

Fingers, hands or arms can be crushed or severed!

▶ Standing between pulley blocks and auxiliary weight is prohibited!

▶ Swing in auxiliary weights with extreme caution and at low speed for the pulley block!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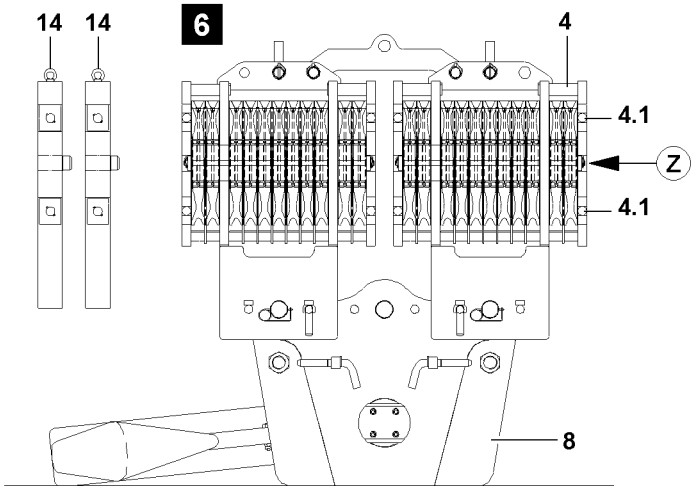
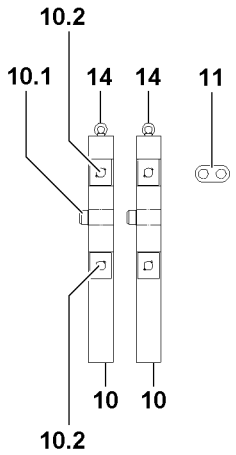
4.1
4.1
4
4
U
U

5
4.1
4.1
LIEBHERR
Z
Z
4.1
4.1
7


14
14
6
4
4.1
Z
4.1
8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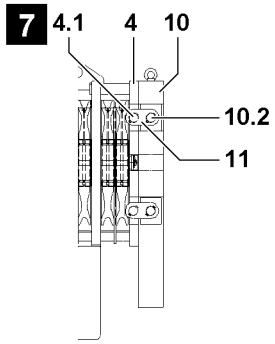
10.1
14
14
11
10
10
10.2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4
10
10.2
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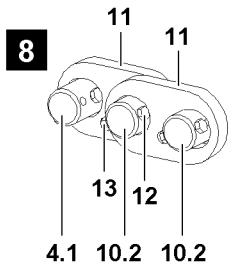
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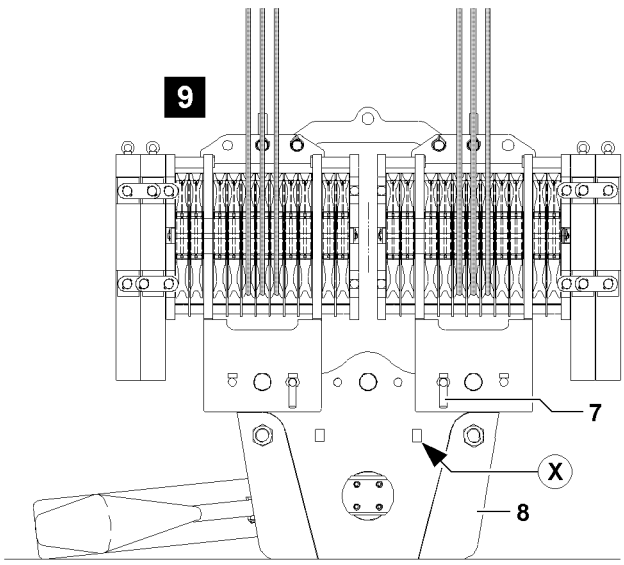
11
13
12
4.1
10.2
10.2


9
7
X
8

B108120

- ▶ Align auxiliary weight **10** on the pulley block **4**.
- ▶ Retract auxiliary weight centring pin **10.1** into the centring bores **Z** on them pulley block **4**, illustration **7**.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Install mounting brackets **11** laterally and connect the pulley block **4** with the auxiliary weight **10**, illustration **8**.
- ▶ Secure mounting brackets **11** with screws **12** and safety nut **13**, illustration **8**.

Note
- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

WARNING
Falling auxiliary weights!
By removing the auxiliary crane, the auxiliary weights can fall down laterally!
Personnel can be severely injured or killed!
- ▶ Only remove the auxiliary crane when it is ensured that the auxiliary weight **10** is secured properly with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly assembled and secured:
  Remove the auxiliary crane.

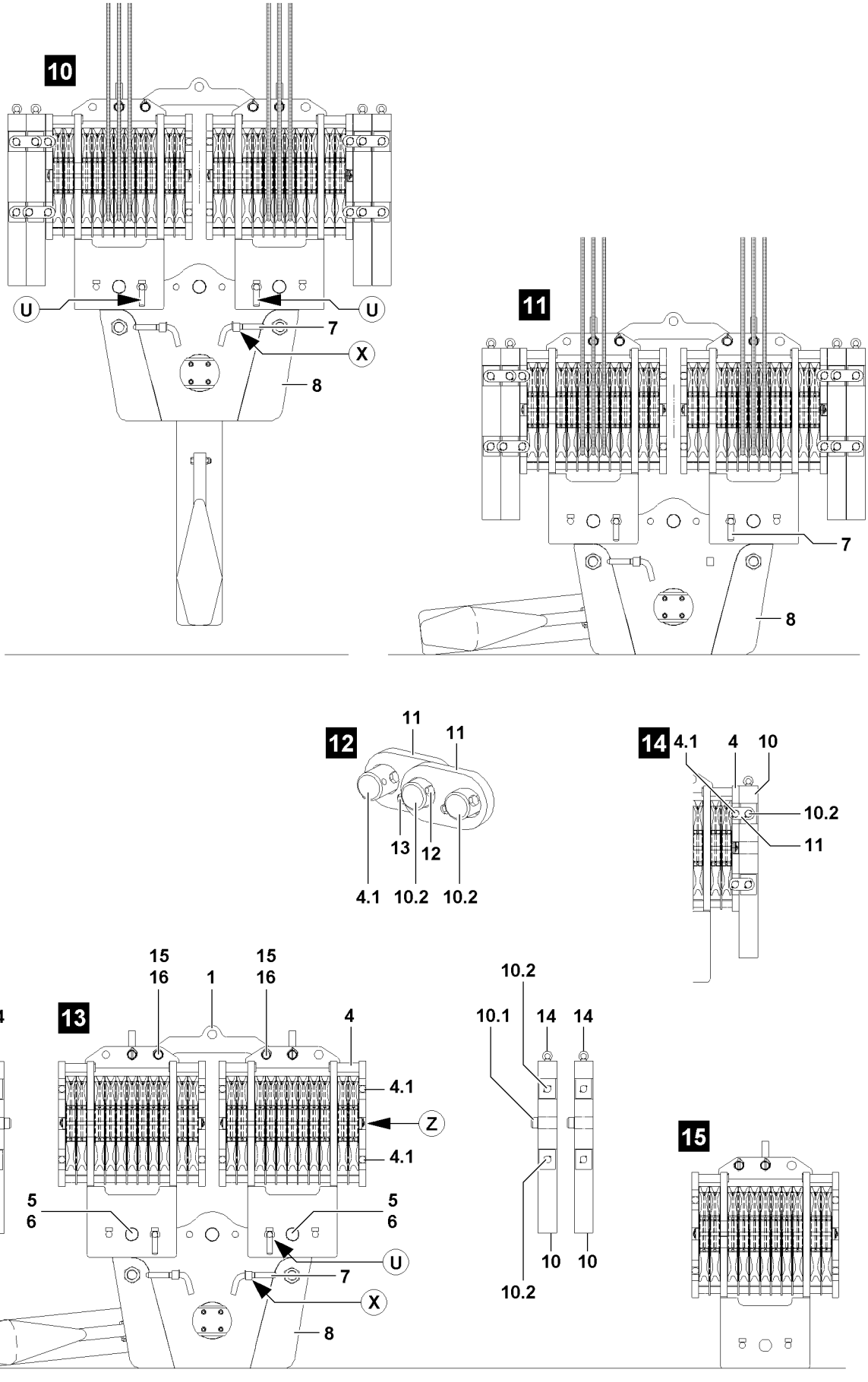
3.1.4 Preparing the hook block for crane operation

Note
- ▶ Reeving in of the hook blocks is described in chapter 4.06 of the crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

- ▶ Reeve in hoist rope according to chapter 4.06 of the crane operating instructions and on the basis of the separate reeving plans!

NOTICE
Pin in the retaining pins **7** when lifting the load!
If the retaining pins **7** are not unpinned prior to the crane operation, the pins **7** may be sheered off when raising the load!
- ▶ Unpin the retaining pin **7** from the hook block before crane operation!

- ▶ When the hook block is properly reeved and has been lifted from the ground:
  Unpin retaining pin **7** and pin and secure into the transport receptacle (point **X**), illustration **9**.


10
U
U
7
X
8
11
7
8
12
11
11
13
12
4.1
10.2
10.2
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4
10
10.2
11
15
16
1
15
16
14
14
13
4
4.1
Z
4.1
5
6
5
6
U
7
X
8
10.2
10.1
14
14
10
10
10.2
15

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3.2 Disassembling the hook block

3.2.1 Preparing the hook block for disassembly

Note

- ▶ Reeving out of the hook blocks is described in chapter 4.06 of the crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

NOTICE

Retaining pin **7** unpinned upon lowering the hook block!

If the retaining pins **7** - before setting the hook block on the ground - is not pinned in, the pulley blocks tip away laterally upon reeving out the hoist rope!

Personnel can be severely injured or killed!

- ▶ Pin in and secure retaining pin **7**, before setting down hook block onto the ground, at both pulley blocks at point **U**!

Make sure that the following prerequisites are met:

- – the subsoil is sufficiently load bearing to take on the weight of the hook block safely, including the auxiliary weights,
- – the subsoil is level and horizontal.

- ▶ Lower the hook block completely onto the ground.
- ▶ If the hook block has been placed properly onto the ground:
  Reeve out hoist rope(s) according to chapter 4.06 of the crane operating instructions!

3.2.2 Disassembling the auxiliary weights

Note

- ▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING

Toppling of hook block!

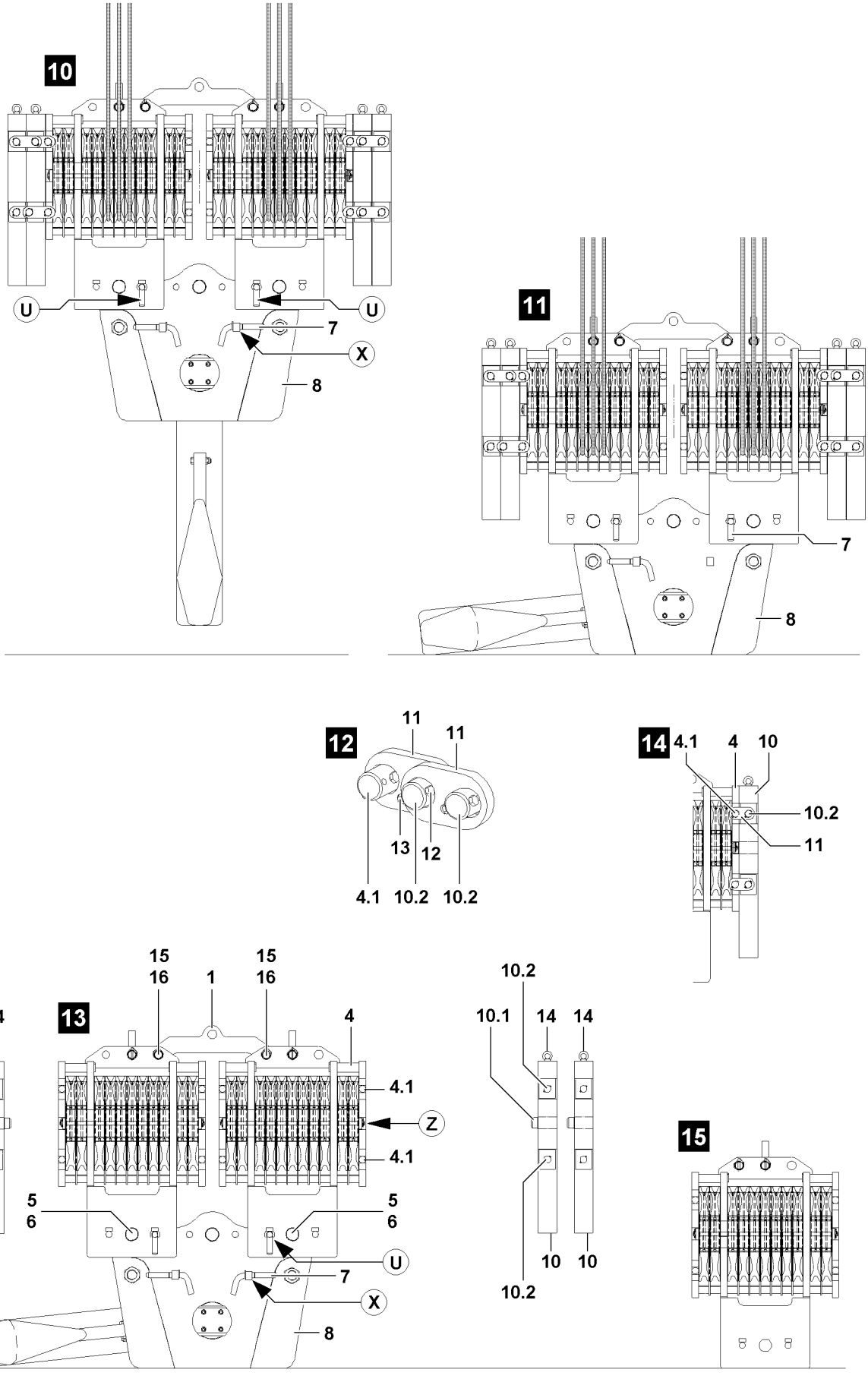
One-sided disassembly of auxiliary weights can topple the hook block!

Personnel can be severely injured or killed!

- ▶ The auxiliary weights may only be disassembled **individually** and alternating left and right on the pulley blocks of the hook block!
- ▶ The difference between left and right side may never be more than one auxiliary weight upon disassembly of the auxiliary weight!
- ▶ Asymmetrical disassembly of auxiliary weights is prohibited!

Make sure that the following prerequisites are met:

- – the retaining pins **7** are pinned and secured on both sides at point **U**,
- – the block connector **1** is disassembled.


10
U
U
7
X
8
11
7
8
12
11
11
13
12
4.1
10.2
10.2
14
4.1
4
10
10.2
11
15
16
1
15
16
14
14
13
4
4.1
Z
4.1
5
6
5
6
U
7
X
8
10.2
10.1
14
14
10
10
10.2
15

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WARNING
Falling auxiliary weights!
If the auxiliary weights on the pulley blocks are not properly disassembled, they can fall down during disassembly!
Personnel can be severely injured or killed!
- ▶ Standing under suspended auxiliary weight is prohibited!

- ▶ Attach auxiliary weight **10** on the eyebolt **14** on the auxiliary crane.
- ▶ Carefully tension the tackle.

WARNING
Swinging auxiliary weights!
During disassembly of the auxiliary weights, the auxiliary weights can lead to swinging!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Take heed that the auxiliary weight to be disassembled is properly attached on the auxiliary crane before loosening the mounting brackets!
- ▶ Diagonal pull is not permitted!

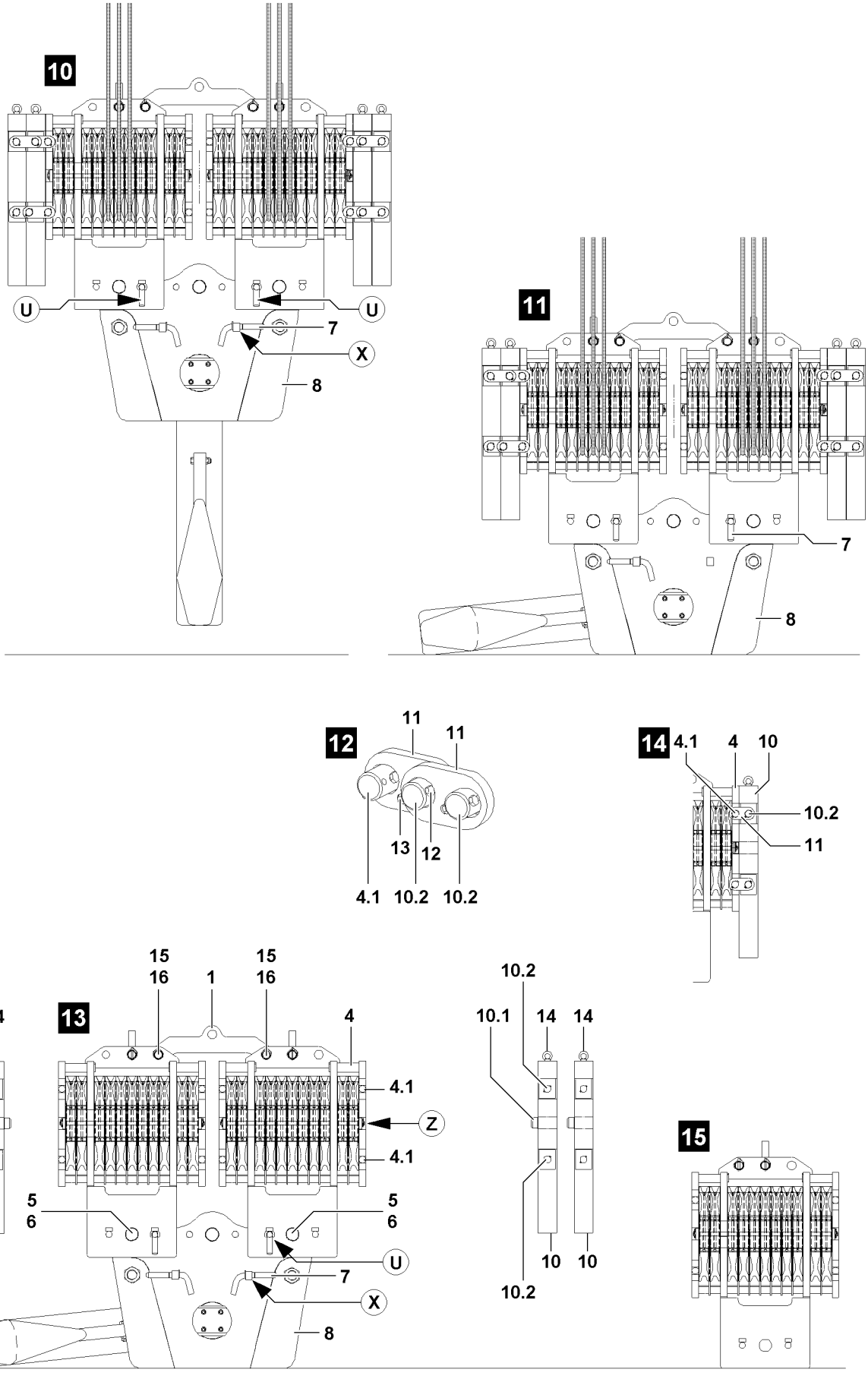
- ▶ When the tackle on the auxiliary weight is tensioned:
  Loosen bolt connection on the mounting brackets of the outermost auxiliary weights and remove bolts.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Disconnect mounting brackets **11** laterally.

WARNING
Falling auxiliary weights!
If more than the auxiliary weights to be disassembled are released, these auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the other auxiliary weights are secured with the mounting brackets before removing the outermost auxiliary weights!

- ▶ If additional mounting brackets must be removed for releasing the outermost auxiliary weights: Immediately reinstall mounting brackets so that only the relevant auxiliary weight to be disassembled is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the pulley block.
- ▶ Place the auxiliary weight onto the ground.
- ▶ Remove the auxiliary crane.
- ▶ Disassemble additional auxiliary weights as described above.


10
U
U
7
X
8
11
7
8
12
11
11
13
12
4.1
10.2
10.2
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4.1
4
10
10.2
11
15
16
1
15
16
14
14
13
4
4.1
Z
4.1
5
6
5
6
U
7
X
8
10.2
10.1
14
14
10
10
10.2
15

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3.2.3 Disassembling the block connector

▶ Attach the block connector **1** on the auxiliary crane.

DANGER
Tipping over the pulley blocks!
If the retaining pins **7**, are not pinned during disassembly of the block connector **1** on the pulley blocks, then the pulley block tips to the side upon removal of the block connector!
Personnel remaining in the danger zone can be severely injured or killed!
▶ Pin in the retaining pins **7** into the bores **U** on the hook block!
▶ Make sure before removing the block connector that the pulley blocks are properly pinned and secured!

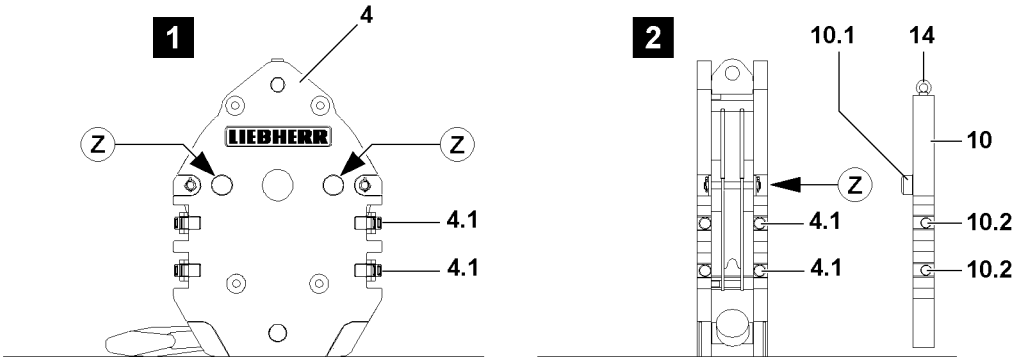
▶ Release and unpin the pins **15** on both sides at the pulley blocks **4**.
▶ Remove the block connector **1** with the auxiliary crane.
▶ Place the block connector **1** onto the ground.
▶ Remove the auxiliary crane.

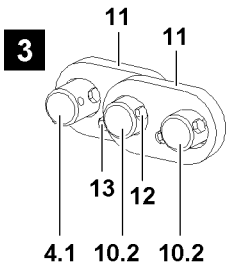
3.2.4 Disassembling the pulley blocks on cross brace

Note
▶ The disassembly of two pulley blocks is identical and is described on the example of a pulley block!

Make sure that the following prerequisites are met:
– the auxiliary weights are disassembled,
– the block connector is disassembled.

▶ Attach the pin pulling device **4** on the auxiliary crane.
▶ Carefully tension the tackle.
▶ Unpin retaining pin **7** at point **U** and pin into transport receptacle on the cross brace, point **X**, illustration **13**.
▶ Release and unpin the pin **5**.
▶ Swing out pulley block **4** with auxiliary crane.
▶ Place the pulley block **4** onto the ground.
▶ Remove the auxiliary crane.
▶ Disassemble second pulley block.


1
4
LIEBHERR
Z
Z
4.1
4.1
2
10.1
14
10
Z
4.1
4.1
10.2
10.2


3
11
11
13
12
4.1
10.2
10.2

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4 Single hook block

4.1 Assembling the single hook block

4.1.1 Assembling the auxiliary weights

Note

▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING

Toppling of hook block!

One-sided placement of auxiliary weights can topple the hook block!

Personnel can be severely injured or killed!

▶ The auxiliary weights may only be placed **individually** and alternating left and right on the hook block!

▶ If the required auxiliary weight is assembled on the hook block, then the difference between left and right side may never be more than one auxiliary weight!

▶ Asymmetrical attachment of auxiliary weights is prohibited!

Ensure that the following prerequisite is met:

– the hook block is placed on the ground.

WARNING

Falling auxiliary weights!

If the auxiliary weights on the pulley blocks are not properly assembled, they can fall down during assembly or during crane operation!

Personnel can be severely injured or killed!

▶ Standing under suspended auxiliary weight is prohibited!

▶ Ensure that the auxiliary weights are assembled properly and securely!

▶ Operating the crane without insufficiently secured auxiliary weights is forbidden!

▶ Attach auxiliary weight **10** on the eyebolt **14** on the auxiliary crane.

WARNING

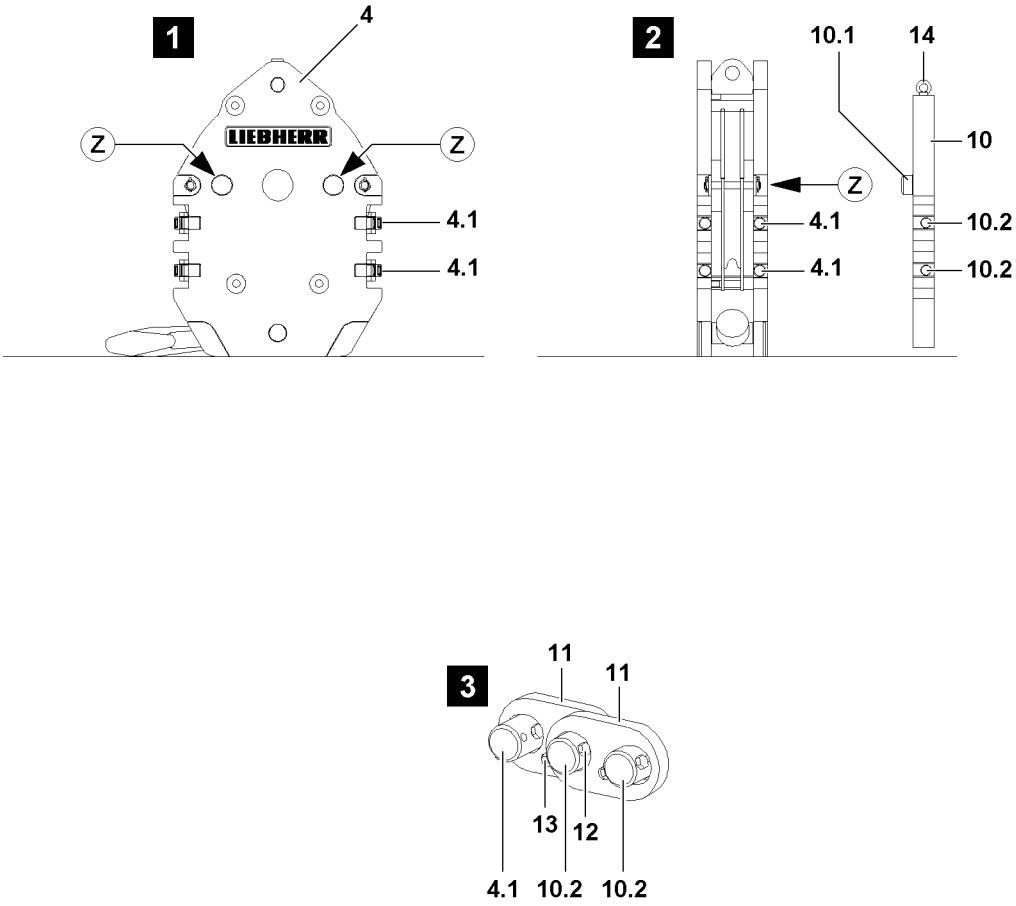
Danger of crushing!

While swinging in the auxiliary weights for the hook block, personnel can be severely injured or killed!

Fingers, hands or arms can be crushed or severed!

▶ Standing between hook block and auxiliary weight is prohibited!

▶ Swing in auxiliary weights with the most extreme caution and at low speed for the hook block!


1
4
LIEBHERR
Z
Z
4.1
4.1
2
10.1
14
10
Z
4.1
4.1
10.2
10.2
3
11
11
13
12
4.1
10.2
10.2

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- ▶ Align auxiliary weight **10** at the hook block.
- ▶ Retract auxiliary weight centring pins **10.1** into the centring bores **Z** at the hook block.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Install mounting brackets **11** laterally and connect the hook block with the auxiliary weight **10**, illustration **3**.
- ▶ Secure mounting brackets **11** with screws **12** and safety nut **13**, illustration **3**.

Note
- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

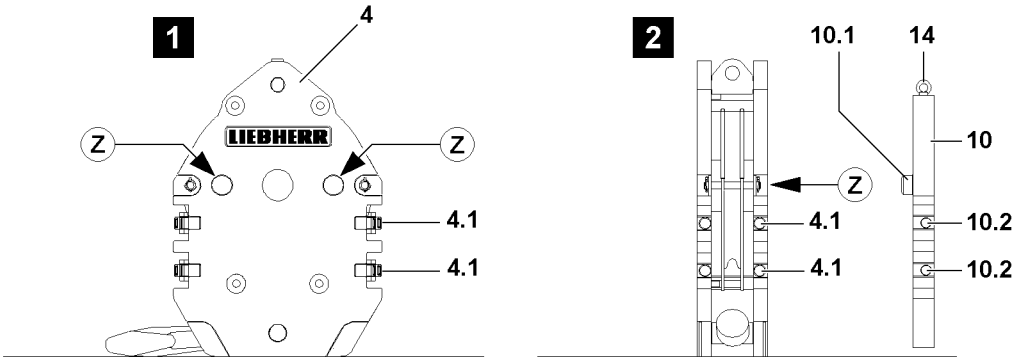
WARNING
Falling auxiliary weights!
By removing the auxiliary crane, the auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Only remove the auxiliary crane when it is ensured that the auxiliary weight **10** is secured properly with the mounting brackets **11**!

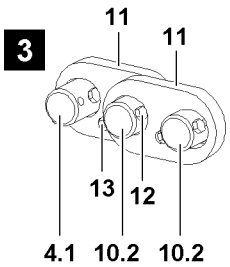
- ▶ When the respective auxiliary weight is properly assembled and secured:
  Remove the auxiliary crane.

4.1.2 Preparing the hook block for crane operation

Note
- ▶ Reeving in of the hook blocks is described in chapter 4.06 of the crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

- ▶ Reeve in hoist rope according to chapter 4.06 of the crane operating instructions and on the basis of the separate reeving plans!


1
4
LIEBHERR
Z
Z
4.1
4.1
2
10.1
14
10
Z
4.1
4.1
10.2
10.2


3
11
11
13
12
4.1
10.2
10.2

B108146

4.2 Disassembling the single hook block

4.2.1 Preparing the hook block for disassembly

Note
- ▶ Reeving out of the hook blocks is described in chapter 4.06 of the crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

Make sure that the following prerequisites are met:
- – the subsoil is sufficiently load bearing to take on the weight of the hook block safely, including the auxiliary weights,
- – the subsoil is level and horizontal.

- ▶ Lower the hook block completely onto the ground.
- ▶ If the hook block has been placed properly onto the ground:
  Reeve out hoist rope according to chapter 4.06 of the crane operating instructions!

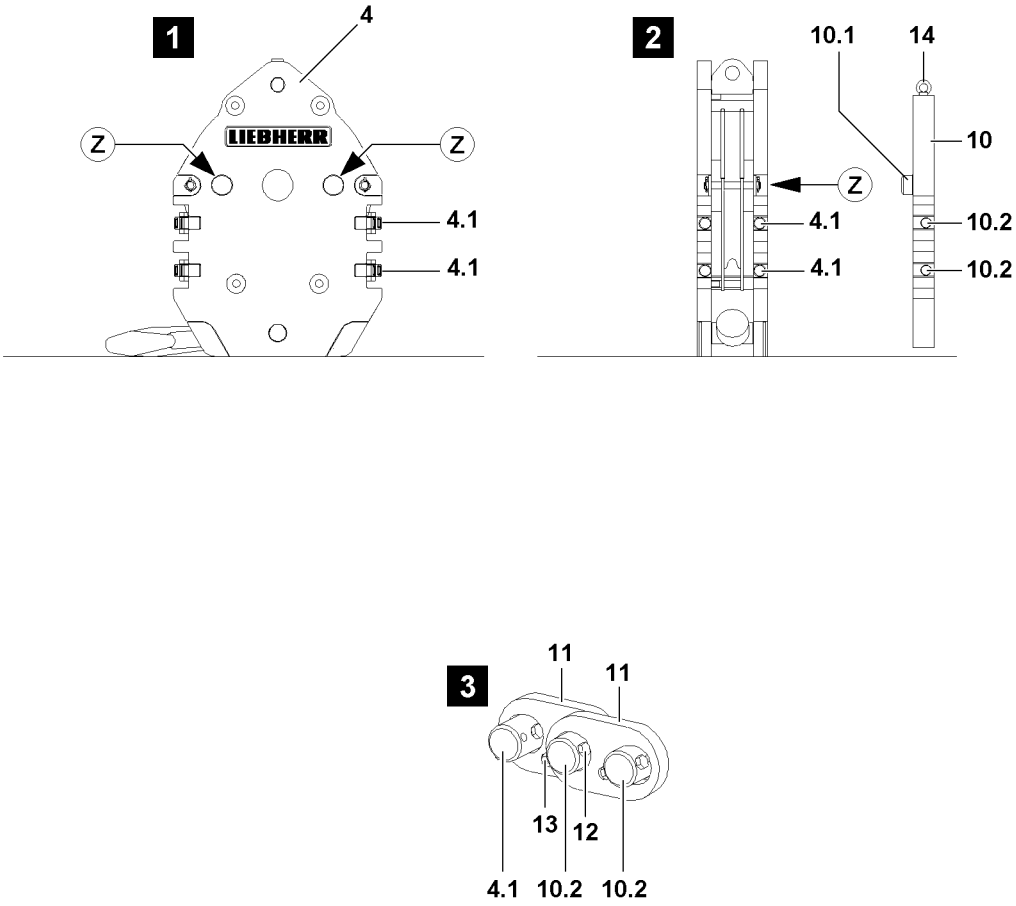
4.2.2 Disassembling the auxiliary weights

Note
- ▶ Each auxiliary weight's own weight is accepted on the auxiliary weight!

WARNING
Toppling of hook block!
One-sided disassembly of auxiliary weights can topple the hook block!
Personnel can be severely injured or killed!
- ▶ The auxiliary weights may only be disassembled **individually** and alternating left and right on the hook block!
- ▶ The difference between left and right side may never be more than one auxiliary weight upon disassembly of the auxiliary weight!
- ▶ Asymmetrical disassembly of auxiliary weights is prohibited!

WARNING
Falling auxiliary weights!
If the auxiliary weights on the pulley block are not properly disassembled, they can fall down during disassembly!
Personnel can be severely injured or killed!
- ▶ Standing under suspended auxiliary weight is prohibited!

- ▶ Attach auxiliary weight **10** on the eyebolt **14** on the auxiliary crane.
- ▶ Carefully tension the tackle.


1
4
LIEBHERR
Z
Z
4.1
4.1
2
10.1
14
10
Z
4.1
4.1
10.2
10.2
3
11
11
13
12
4.1
10.2
10.2

B108146

WARNING
Swinging auxiliary weights!
During disassembly of the auxiliary weights, the auxiliary weights can lead to swinging!
Personnel can be severely injured or killed!
- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Take heed that the auxiliary weight to be disassembled is properly attached on the auxiliary crane before loosening the mounting brackets!
- ▶ Diagonal pull is not permitted!

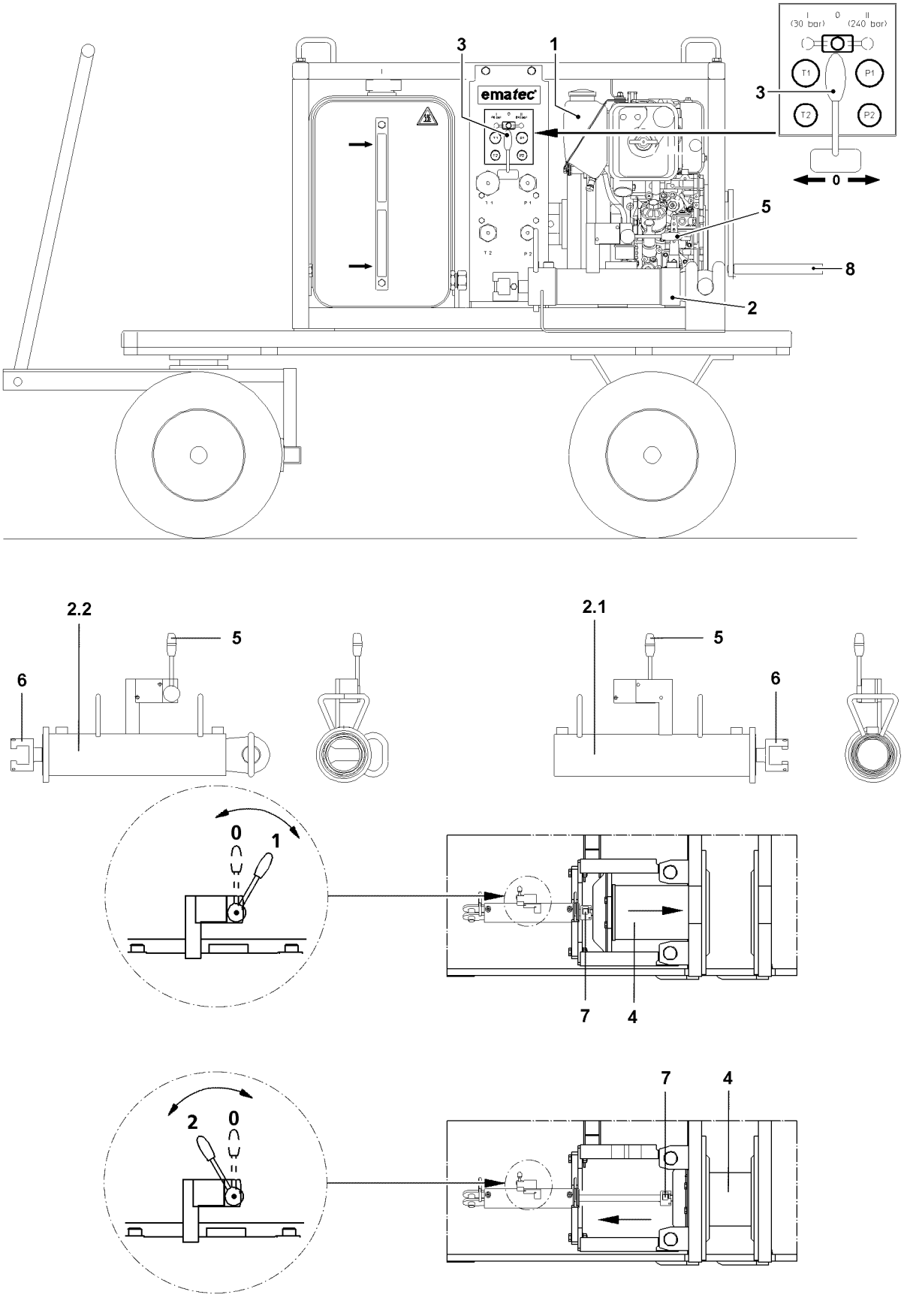
- ▶ When the tackle on the auxiliary weight is tensioned:
  Loosen bolt connection on the mounting brackets of the outermost auxiliary weights and remove bolts.

WARNING
Falling auxiliary weights!
If all mounting brackets are simultaneously removed on an unsecured auxiliary weight, the auxiliary weight can fall down!
Personnel can be severely injured or killed!
- ▶ All mounting brackets for an unsecured auxiliary load must never be simultaneously removed!
- ▶ Always change sides when installing or removing mounting brackets!

- ▶ Disconnect mounting brackets **11** laterally.

WARNING
Falling auxiliary weights!
If more than the auxiliary weights to be disassembled are released, these auxiliary weights can fall down!
Personnel can be severely injured or killed!
- ▶ Make sure that the other auxiliary weights are secured with the mounting brackets before removing the outermost auxiliary weights!

- ▶ If additional mounting brackets must be removed for releasing the outermost auxiliary weights: Immediately reinstall mounting brackets so that only the relevant auxiliary weight to be disassembled is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the hook block.
- ▶ Place the auxiliary weight onto the ground.
- ▶ Remove the auxiliary crane.
- ▶ Disassemble additional auxiliary weights as described above.


3
1
ematec
I 0 II
(30 bar) (240 bar)
T1
P1
T2
P2
3
0
5
8
2
2.2
5
6
2.1
5
6
0
1
7
4
7
4
2
0

B104575

1 Pinning and unpinning with pin pulling device

The pin pulling device consists of the aggregate **1** and the pin pulling cylinders **2.1 und 2.2**. The connector pins on the crawler crane and on the lattice sections are pinned and unpinned with these cylinders.
The cylinder **2.1** is used to pin and unpin the connector pins on the crawler.
The cylinder **2.2** is used to pin and unpin the connector pins on the boom lattice sections and on the ballast trailer.

Note
▶ Before pinning and unpinning the lattice sections, engage the lever **5** in position **1** or **2**. For safety reasons, the cylinder **2.2** is actuated on the aggregate.

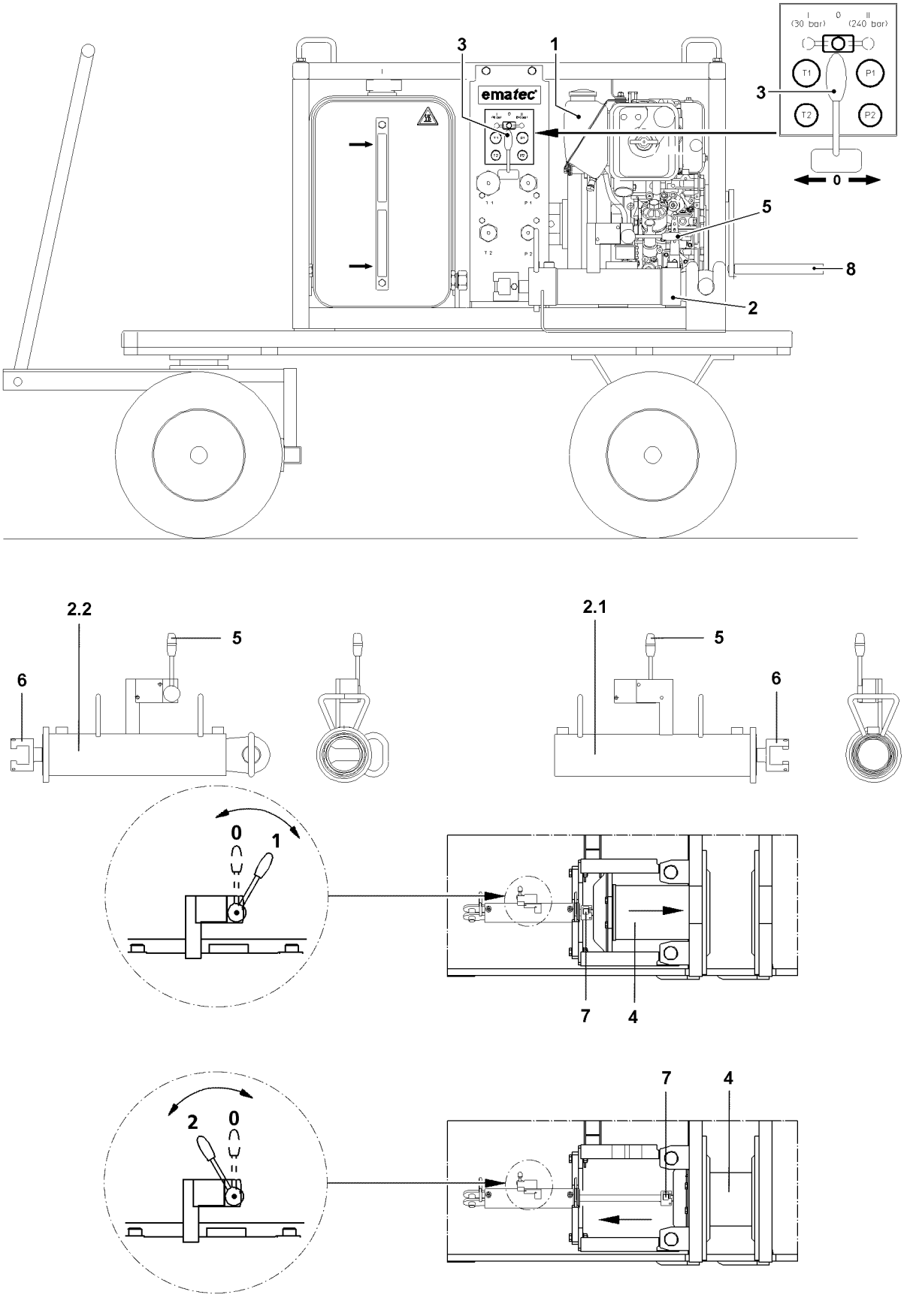
The cylinder **2.1** is actuated directly with the lever on the cylinder.
Make sure that the following prerequisites are met:
– The aggregate **1** is not yet started.
– The change over lever **3** is in **0-position**.

DANGER
Risk of accident!
When you disassemble unsecured or unsupported crane parts, they can fall down and kill or severely injure personnel.
▶ Never stand **under** unsecured or unsupported crane parts and unpin the pins!
▶ Never unpin the connecting pins under unsecured or unsupported booms!
▶ Do not stand under the crane parts or within the complete danger zone during the pinning and unpinning procedure!
▶ Do not lean the ladder against the crane part being disassembled!

1.1 Preparatory work

▶ Connect hydraulic hoses of the required cylinder on the pin pulling device **1**.
▶ Hang or pin the cylinder into the retainer on the crawler or lattice section.
▶ Connect the piston rod head **8** with the screw **7** on the pin **4**.

Note
▶ Pin the cylinder **2.2** additionally on the lattice section.


3
1
ematec
I
0
II
(30 bar)
(240 bar)
T1
P1
T2
P2
3
0
5
8
2
2.2
5
6
2.1
5
6
0
1
7
4
7
4
2
0

B104575

1.2 Pinning and unpinning the pins on the boom lattice sections or on the ballast trailer

▶ Engage the lever **5** on the cylinder **2.2**.

Note
▶ Position 1, insert pin **4**.
▶ Position 2, unpin pin **4**.

▶ Set the change over lever **3** in 0-position.
▶ Start the aggregate **1** with the hand crank **8**.
▶ Move the change over lever **3** to the **left** (30 bar) and unpin or pin the pin **4**.

Note
▶ The change over lever **3** to the **right** (240 bar) is only needed if the pin **4** is tight or hard to move.

▶ Set the engine RPM on the aggregate **1**.

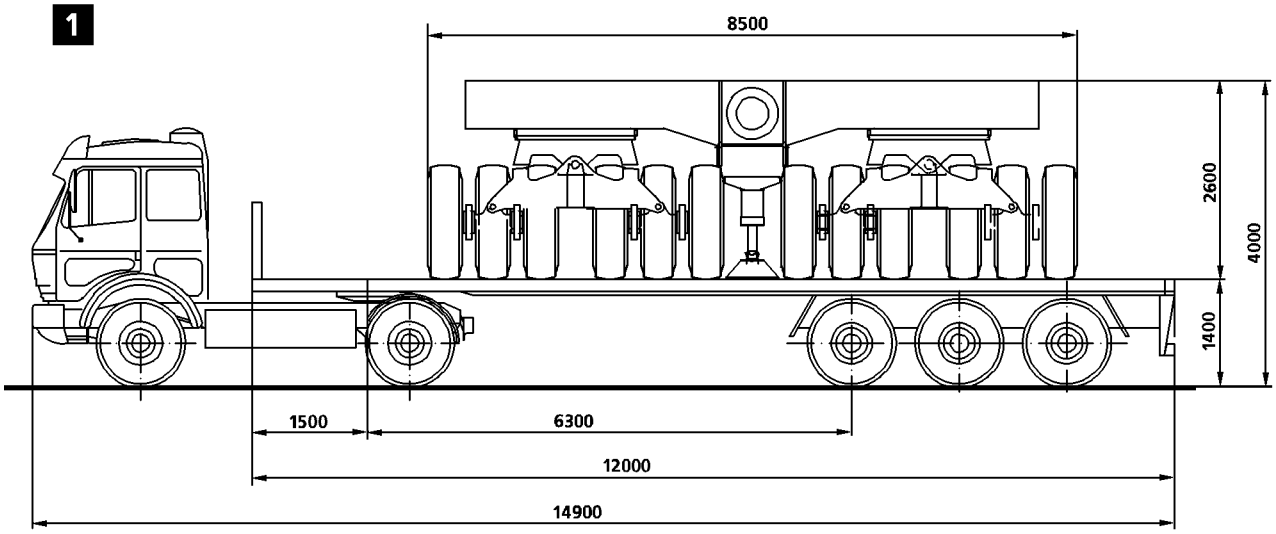
1.3 Pinning and unpinning pins on the cross carriers or the crawler carriers

▶ Set the change over lever **3** to the **left** (30 bar).

Note
▶ The change over lever **3** to the **right** (240 bar) is only needed if the pin **4** is tight or hard to move.

▶ Start the aggregate **1** with the hand crank **8**.
▶ Set the engine RPM on the aggregate **1**.
▶ Actuate the lever **6** on the cylinder **2.1**.
▶ Pin or unpin the pin **4**.

1



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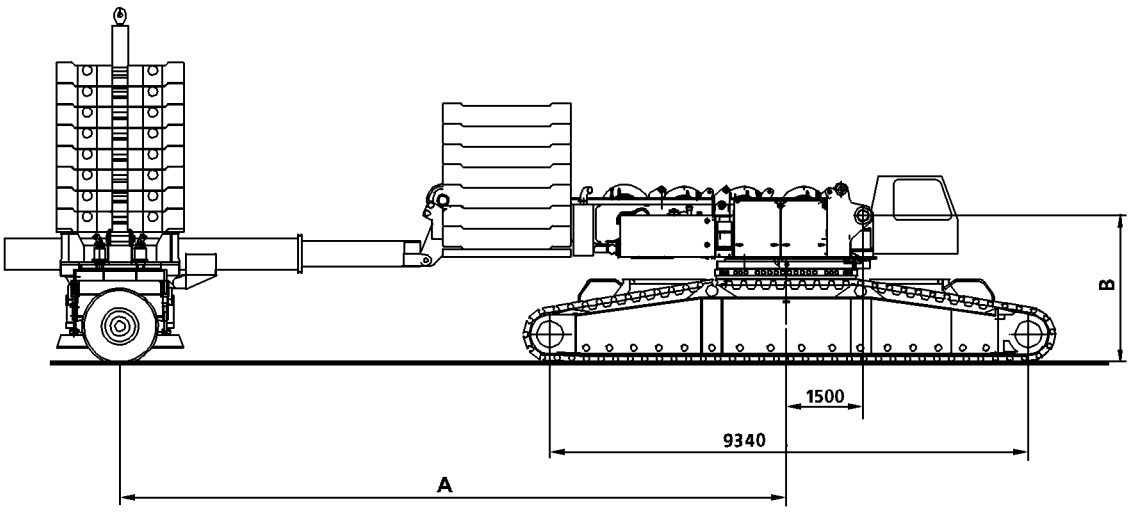
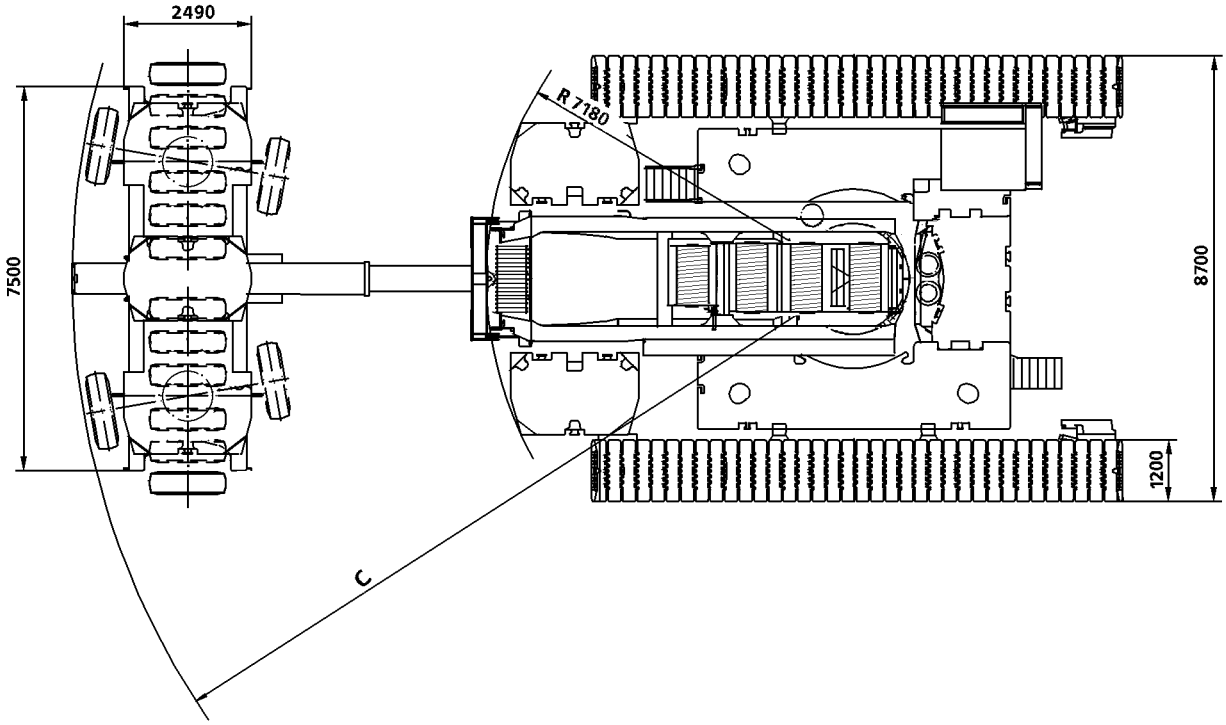


B188652

3



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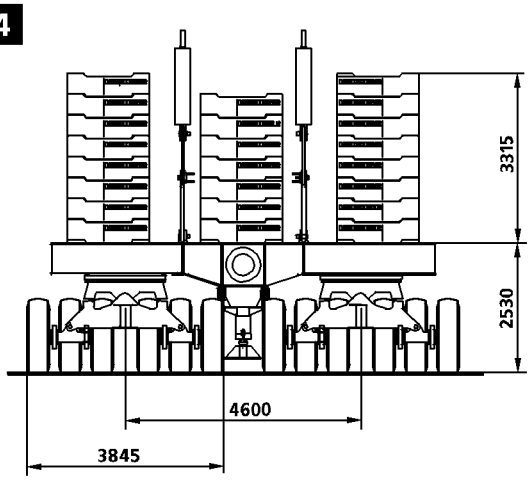

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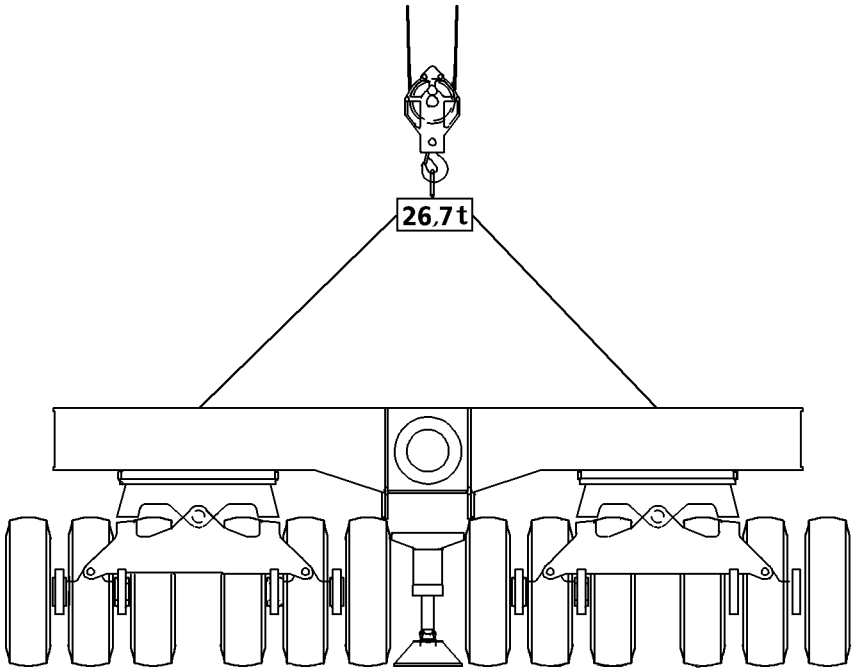

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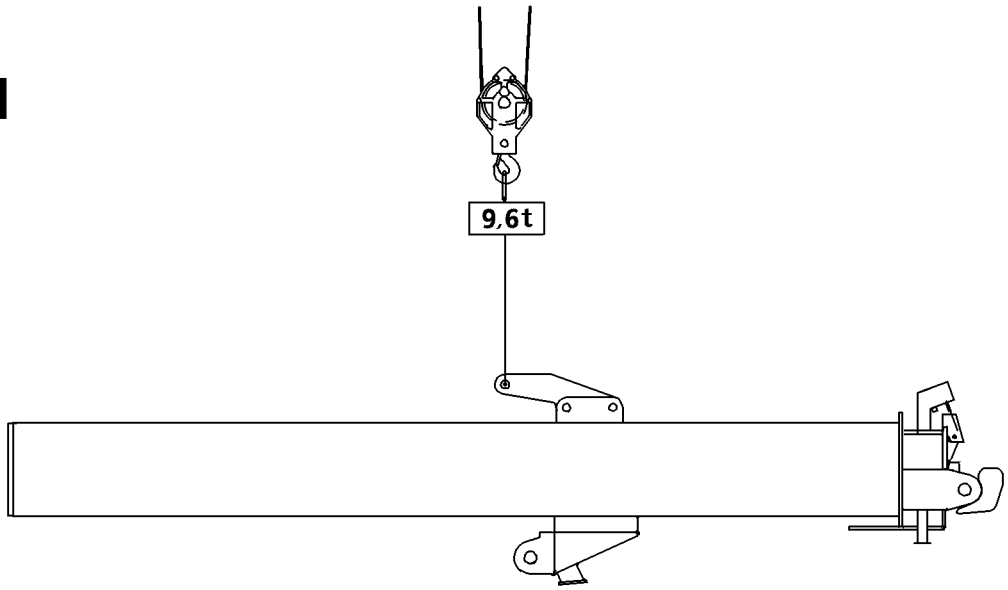


B188657

1 Ballast trailer

1.1 General

The ballast trailer consists of:
– 2 wheel sets, oscillating mounted
– Ballast frame
– Guide tube

Hydraulic, telescopic guide for ballast trailer radii of R13.26 m - R17.26 m. The pull cylinders for the ballast trailer are fitted directly and can be actuated under load.
Hydraulic, mechanical steering, electronically adjustable for:
– Towing
– Circular travel
– Parallel travel
– Manual resteering

1.1.1 Dimensions

See illustration **1**, **2**, **3**, **4**

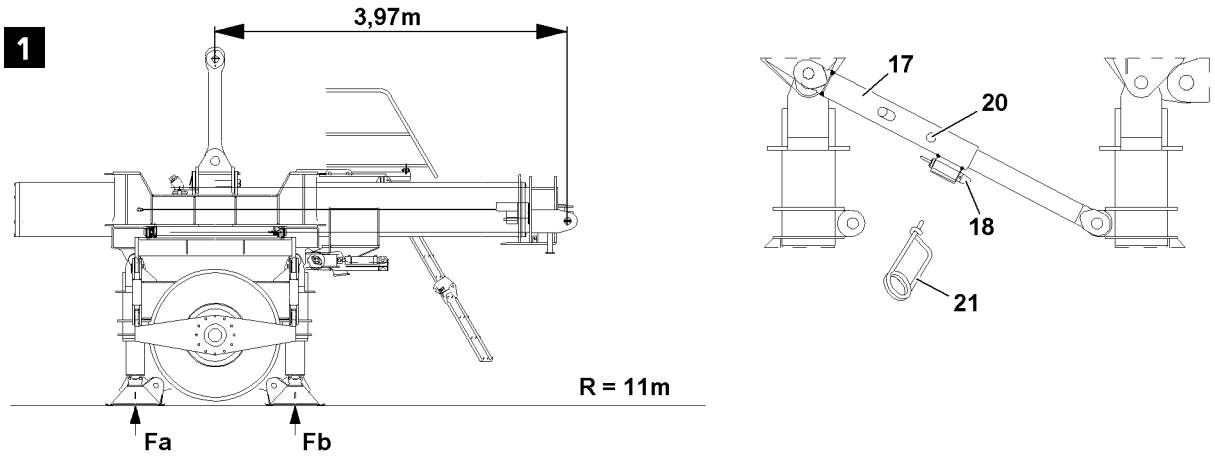
Length A	Turning radius C
11.00 m	13.40 m
13.00 m	15.35 m
15.00 m	17.30 m

	With Quick Connection	Without Quick Connection
Length **B**	2.85 m	2.59 m

1.1.2 Components, weights

See illustration **5** and **6**

Component	Weight
Ballast trailer	26.7 t
Guide	9.6 t



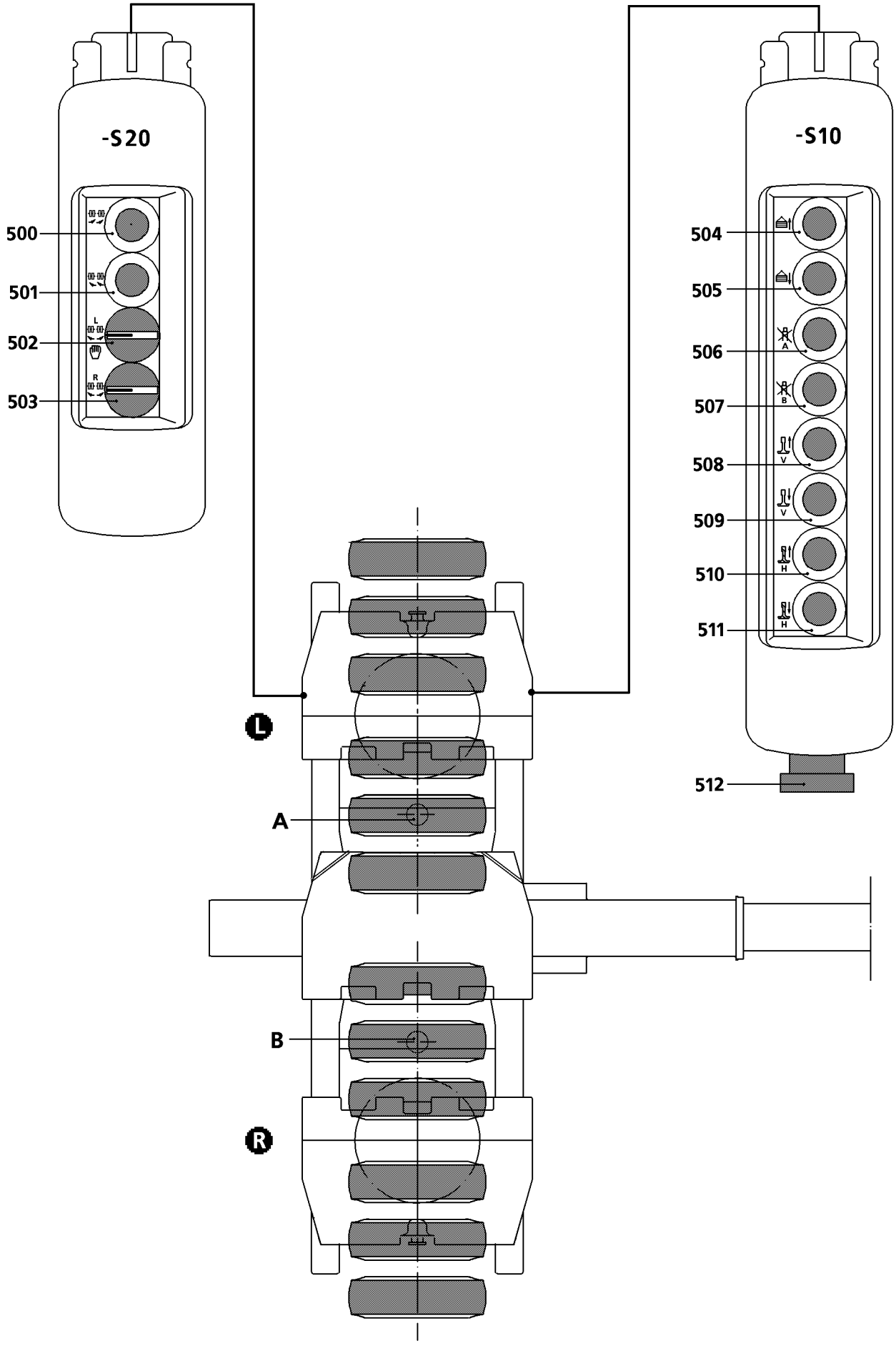
B107350

1.1.3 Stability and tipping safety in case of non-installed ballast trailer on the turntable

Make sure that the following prerequisites are met:
– the ballast trailer guide is hydraulically fully retracted,
– the ballast trailer is supported and aligned in horizontal direction.

WARNING
Danger of tipping the ballast trailer!
If the ballast trailer is not assembled on the turntable and the ballast trailer guide is not completely retracted, then the ballast trailer can tip!
Personnel can be severely injured or killed!
▶ Before removal of the ballast trailer on the turntable, the locking pin **18** must be pinned on the strut of the ballast trailer and secured with the spring retainer **21**!
▶ The ballast trailer guide must be fully retracted before removal of the ballast trailer on the turntable!

Illustration	Ballast trailer radius	Ballast	Fa	Fb
1	R = 11 m	0 t	12.6 t	23.0 t

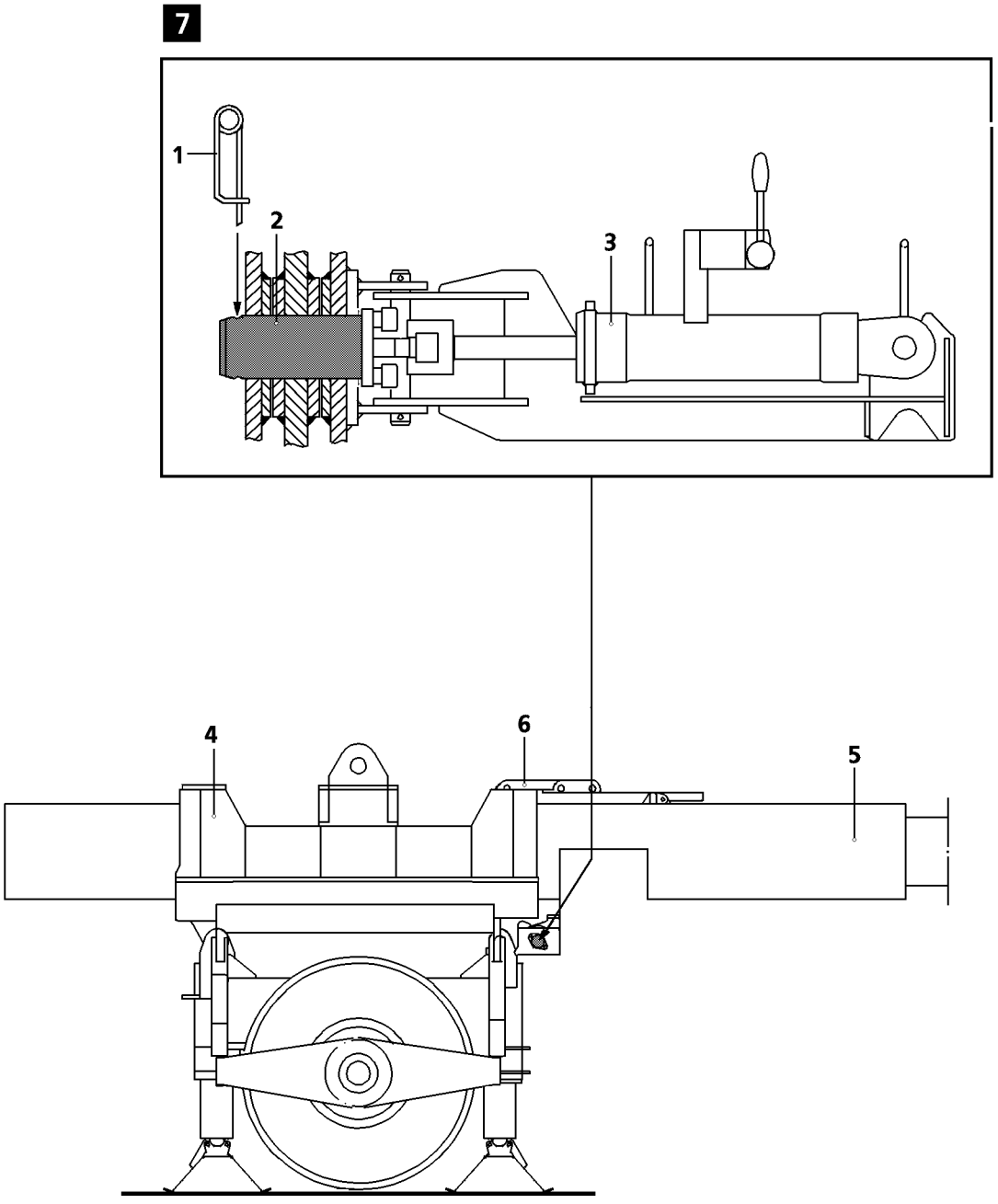


B104576

1.1.4 Control elements on the control panels

Control panel - S20		
500	Button	• Manual resteering, turn the wheel sets to the left
501	Button	• Manual resteering, turn the wheel sets to the right
502	Rotary switch	• Turn wheel set on left side L to right or left, manual operation during assembly or emergency operation
503	Rotary switch	• Turn wheel set on right side R to right or left, manual operation during assembly or emergency operation

Control panel - S10		
504	Button	• Derrick ballast “UP” - retract both cylinders
505	Button	• Derrick ballast “DOWN” - extend both cylinders
506	Button	• Block cylinder “A” on the derrick ballast
507	Button	• Block cylinder “B” on the derrick ballast
508	Button	• Retract front support cylinder
509	Button	• Extend front support cylinder
510	Button	• Retract front support cylinder
511	Button	• Extend rear support cylinder
512	Switch	• **EMERGENCY-OFF**



B188655

1.2 Ballast trailer assembly

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

- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect against falling!

DANGER
Risk of accident
The assembly of the ballast trailer may only be carried out on level and load bearing ground and only by authorized personnel.

- ▶ The ballast trailer is not equipped with a brake system. It is therefore essential that it rests on the support cylinders when it is not pinned to the turntable.

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

1.2.1 Assembly of guide on ballast frame

See illustration **7**
Ensure that the following prerequisites are met:
– the wheel sets are relieved,
– the ballast trailer **4** is supported on the support cylinders and horizontally aligned.

DANGER
Danger of tipping over!
See section “Observe the stability and tipping resistance when ballast trailer is not fitted to the turntable”.

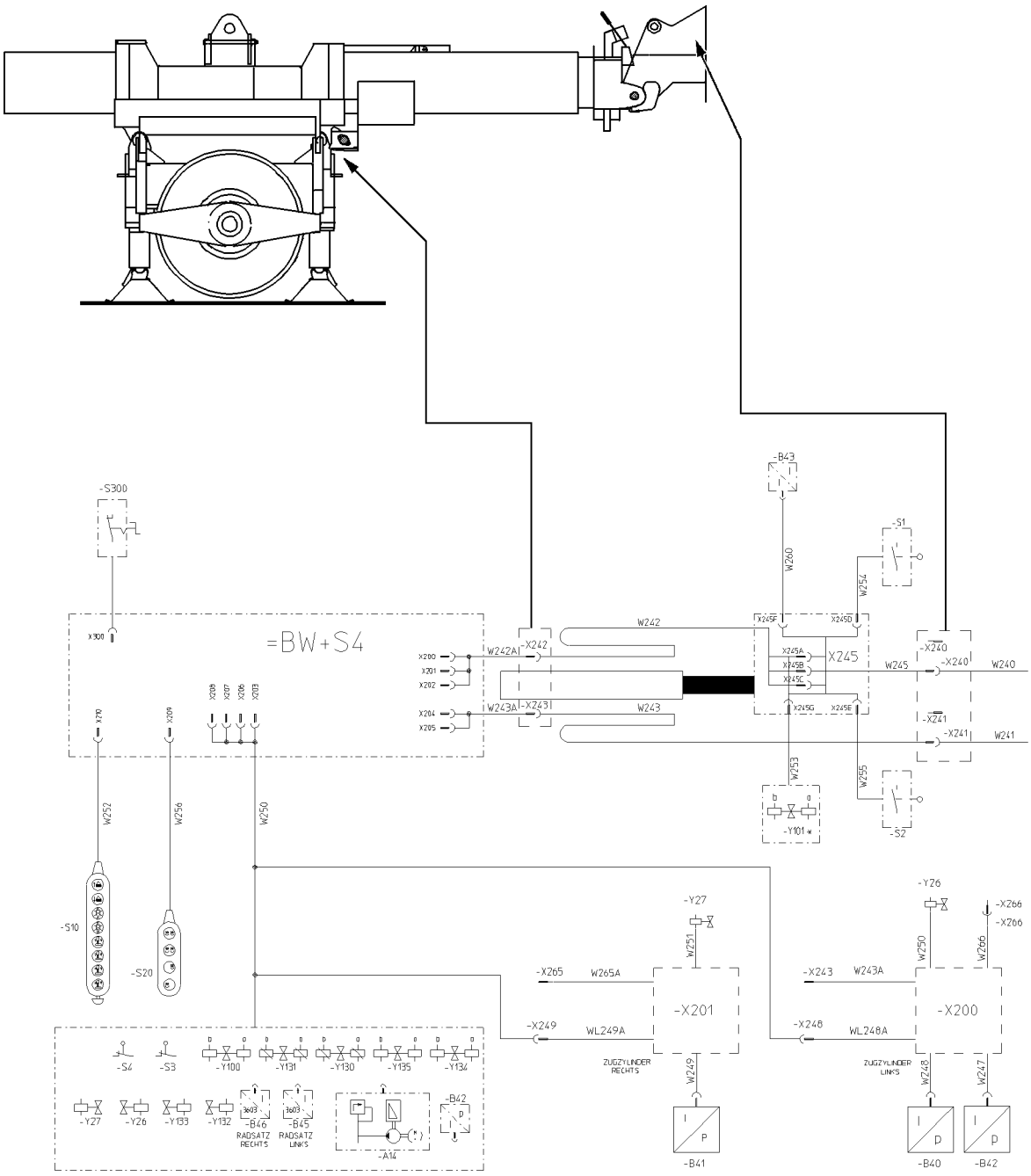
- ▶ If the stability and tipping safety guidelines are not observed, there is a danger of tipping over.

- ▶ Lift the ballast trailer **4** with the auxiliary crane from the transport vehicle.
- ▶ Use the auxiliary crane to lift the guide **5** towards the lifting strap **6** of the transport vehicle and swing in as far as the pin points on the ballast frame **4**. Fix in position.

Note

- ▶ The guide **5** must remain suspended from the auxiliary crane until it is pinned and secured.

- ▶ Connect the pin pulling device **3** to the hydraulic aggregate.
- ▶ Pin the pins **2** on both sides using the pin pulling device **3**.
- ▶ Secure the pin **2** with spring retainer **1**.
- ▶ Unpin the lifting strap **6** and tilt forward.


-S300
X300
=BW+S4
X200
X201
X202
X204
X205
W242A
-X242
W242
-X243
W243A
W243
-B43
W260
-S1
W254
X245F
X245D
X245A
X245B
X245C
X245G
X245E
X245
-X240
W240
W245
-X241
W241
W253
W255
-Y101
-S2
X208
X207
X206
X203
X70
X204
W252
W256
W250
-S10
-S20
-S4
-S3
-Y100
-Y131
-Y130
-Y135
-Y134
-Y27
-Y26
-Y133
-Y132
-B46
RADSATZ RECHTS
-B45
RADSATZ LINKS
-A14
-B42
-Y27
W251
-X265
W265A
-X249
WL249A
-X201
ZUGZYLINDER RECHTS
W249
-B41
-Y26
-X266
-X266
W250
W266
-X243
W243A
-X248
WL248A
-X200
ZUGZYLINDER LINKS
W248
W247
-B40
-B42

B104662

1.2.2 Pinning the guide on the turntable

Ensure that the following prerequisites are met:
- move the crane as close as possible to the ballast trailer,
- the engine is turned off,
- the ballast trailer is supported.

Establishing the electrical connection

Note

▶ For assembly, the electrical connection can be established to be able to move the support cylinders as well as the pull cylinders, if necessary. The “ballast UP / DOWN” release is independent of whether the ballast trailer is attached, providing the conditions in the shut off diagram are fulfilled. The “ballast UP” release allows the retraction of the pull and support cylinders. The “ballast DOWN” release allows the extension of the pull and support cylinders. This means the support cylinders and the pull cylinders can be moved, even if the “Ballast trailer assembled” signal is not yet present.

▶ Remove the dummy plug from socket **-X 240** and socket **-X 241**.
▶ Plug the cable **W 245** into the socket **-X 240**.
▶ Plug the cable **W 243** into the socket **-X 241**.
▶ Plug the cable **W 242A** into the socket **-X 242**.
▶ Plug the cable **W 243A** into the socket **-X 243**.
▶ Plug the cable **WL 248A** into the socket **-X 248**.
▶ Plug the cable **WL 249A** into the socket **-X 249**.

Establishing the hydraulic connection

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

Note

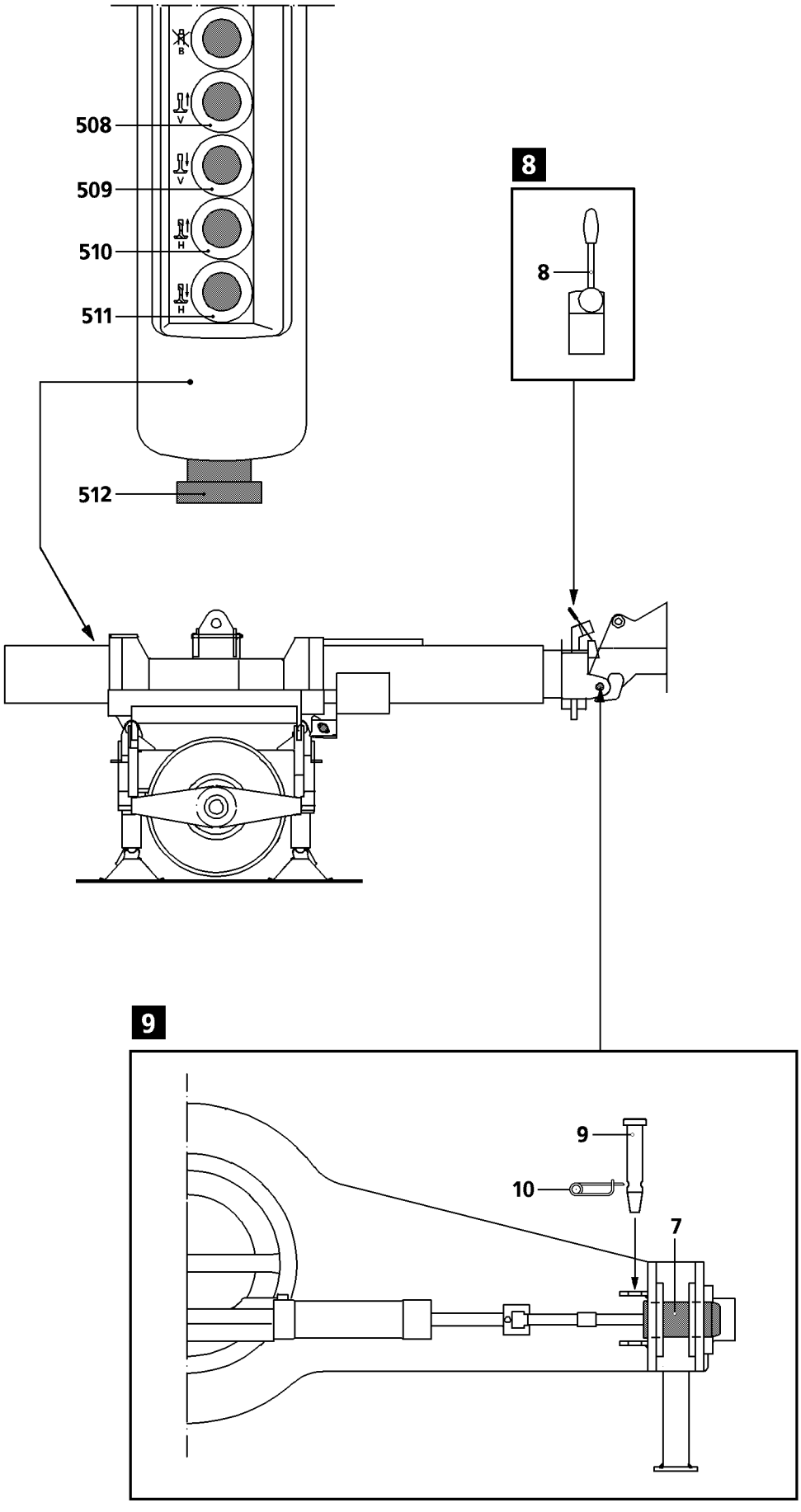
▶ The matching quick-release hydraulic couplings are marked.

DANGER

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

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

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



B188656

Aligning the ballast trailer

Make sure that the following prerequisites are met:
– the electrical and hydraulic connections have been established,
– the crane has been moved to the pin points on the guide of the ballast trailer.

▶ Align the ballast trailer by raising or lowering the two support cylinders until the pins **7** can be inserted on both sides.

Control panel -

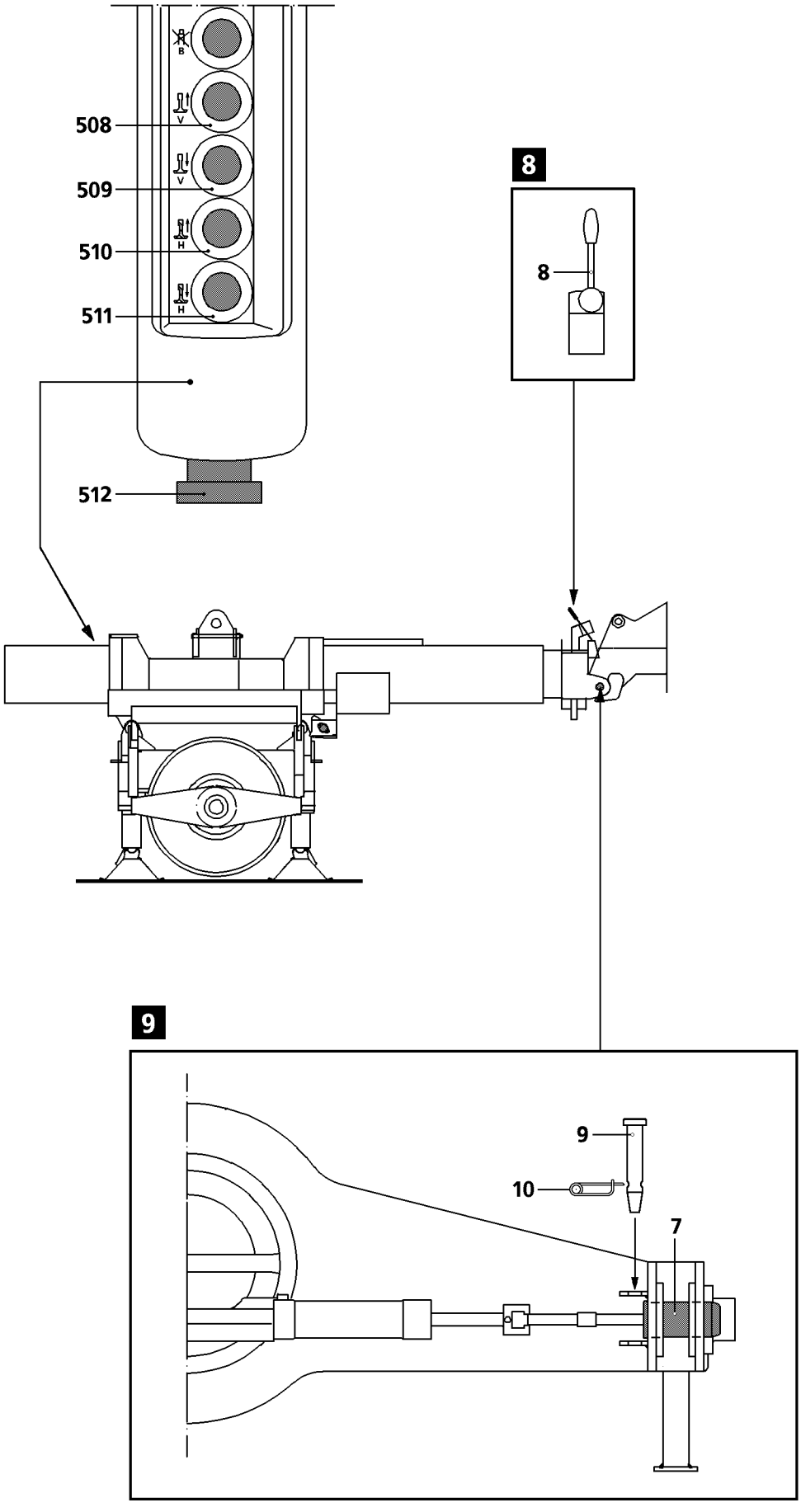
S10

508	Button	• Retract front support cylinder
509	Button	• Extend front support cylinder
510	Button	• Retract front support cylinder
511	Button	• Extend rear support cylinder
512	Switch	• **EMERGENCY-OFF**

Note
▶ To align the pin bores on top of each other, the turntable might have to be turned a little. Check visually!

DANGER
Danger due to operating error!
▶ All movements must be carried out with extreme caution!
▶ If this is not observed, the crane or the ballast trailer can be damaged!

▶ If necessary, carefully swivel the turntable.



B188656

Pinning procedure

See illustration **8** and **9**

▶ Operate lever **8**.

Result:

– The guide is pinned to the turntable by pins **7**.

▶ Retaining pins **10** should be pinned on both sides and secured with spring retainers **9**.

Note

▶ The crane control recognized with the limit switch initiators on the left and right on the pin points if the pins are fully inserted on the turntable.

▶ After pinning, it must be rechecked if both pins are properly pinned and secured and if the connector lines are correctly and completely connected.

▶ If the two pins are pinned completely and correctly, the crane control receives the message “Ballast trailer pinned”, which means the turntable cannot be turned and the crawler cannot be driven.

▶ Release is issued only when the ballast trailer wheels are in the required position for circular, towing or parallel travel.

DANGER

Danger due to operating error!

As long as only one pin is pinned, the crane control does not receive the message “Ballast trailer pinned”, which means that the turntable can be turned and the crawler can be driven to be able to pin the second pin.

▶ All movements must be carried out with extreme caution!

▶ If this is not observed, the crane or the ballast trailer can be damaged!

▶ Retract front / rear support cylinders.

Control panel -

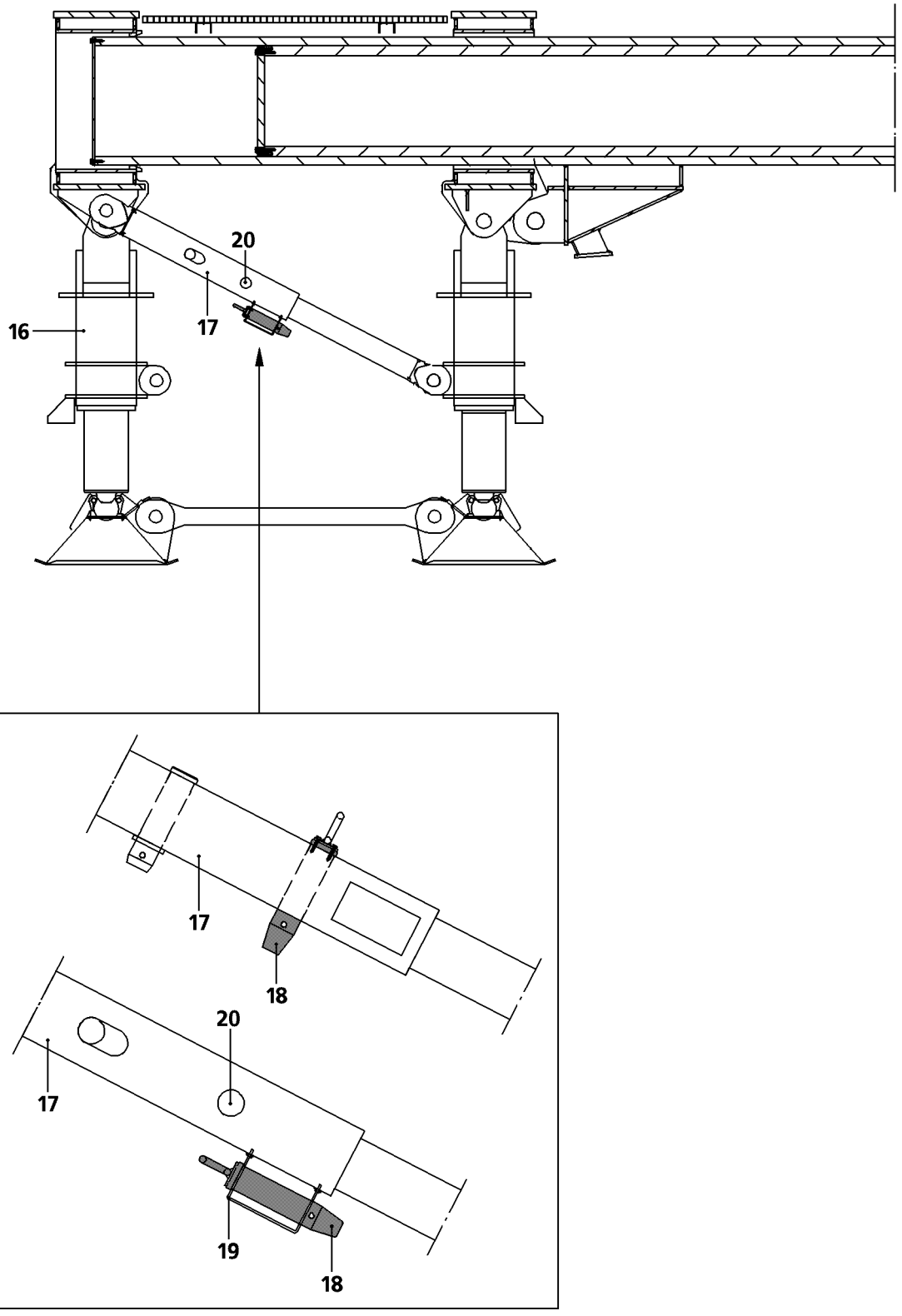
S10

508	Button	• Retract front support cylinder
510	Button	• Retract rear support cylinder
512	Switch	• **EMERGENCY-OFF**

Note

▶ The support cylinders can also be retracted via the corresponding buttons on the instrument panel in the crane operator's cab.

▶ Retract the support cylinders completely.



B190332

1.2.3 Retract the support cylinders

When the pin procedure between the ballast trailer and the turntable is completed, retract the support cylinders **16**.
Make sure that the following prerequisites are met:
– the ballast trailer is pinned and secured to the turntable,
– the electrical and hydraulic connections are connected.

Retract front / rear support cylinders 16:

508	Button	• Retract front support cylinder
510	Button	• Retract rear support cylinder
512	Switch	• **EMERGENCY-OFF**

▶ Remove spring retainer on the locking pin **18**.
▶ Unpin the locking pin **18** on the strut **17**.
▶ Insert the locking pins **18** into the transport receptacle **19** and secure with spring retainers.

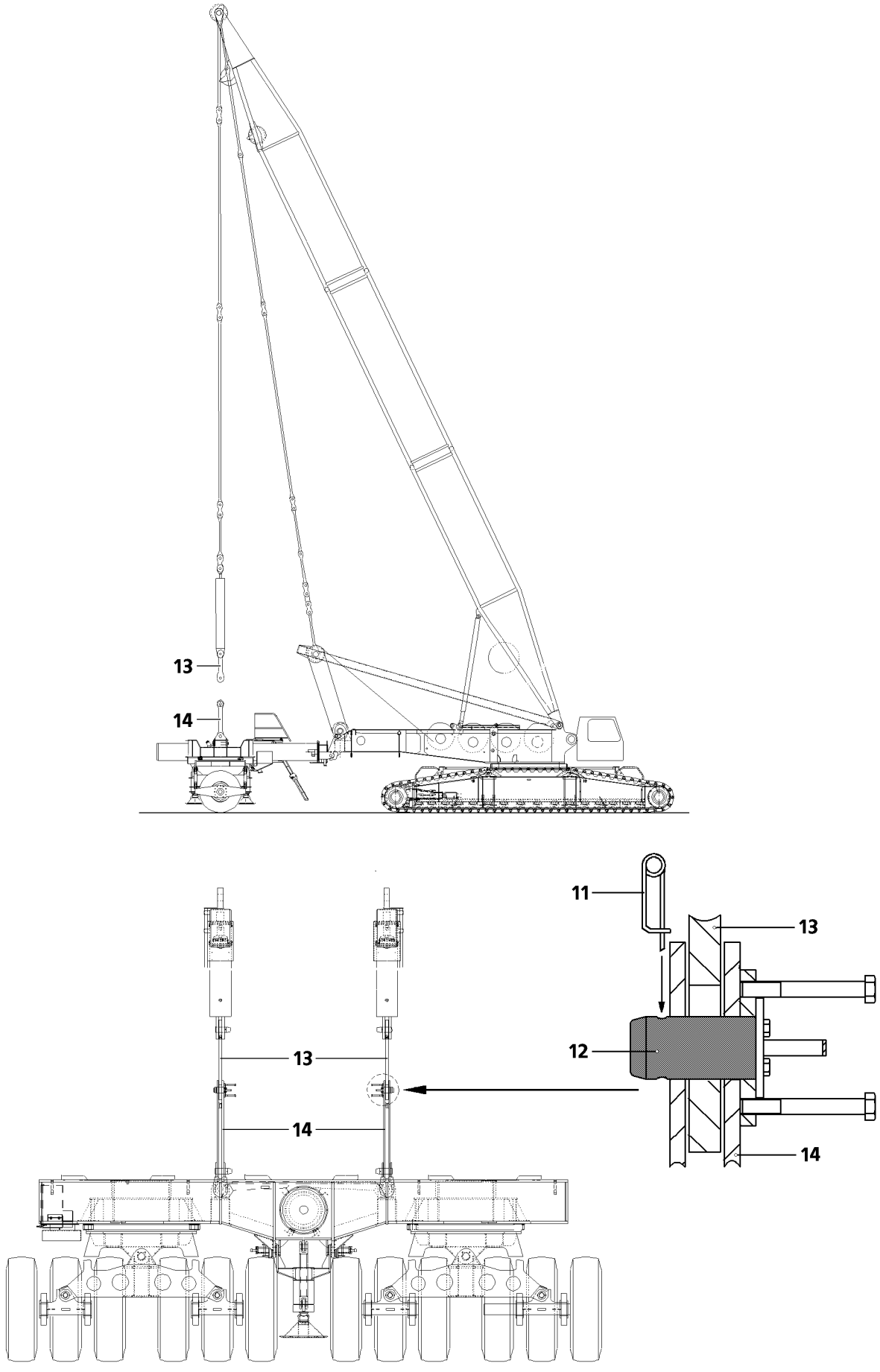
Note
▶ The locking pin **18** can only be unpinned if the support cylinders **16** are relieved.

CAUTION
Danger of property damage!
▶ Before placing ballast plates on the ballast trailer attached to the crane, ensure that the support cylinders **16** are retracted and the locking pins **18** on the strut **17** unpinned.
▶ The locking pin **18** must be unpinned before supporting the mounted ballast trailer, for example when changing the wheel position.
▶ This is necessary to allow a level adjustment between the strut **17** and the support cylinders **16** with supported and ballasted ballast trailer.
▶ If this is not observed, the ballast trailer may be damaged!

▶ Retract the support cylinders completely.

WARNING
Risk of accident!
▶ It is forbidden to operate the supports on crawler cranes when a load is suspended or the stay ropes to the ballast trailer or the suspended ballast are under tension. Changing the support will alter the slope of the boom system, resulting in a significant shift of the relative forces. Under these conditions, the relapse cylinders could also go to the block position. An LMB shut-off will not occur.

▶ Do not operate the crane supports when performing a lift.



B104577

1.2.4 Assembling the ballast guy rods

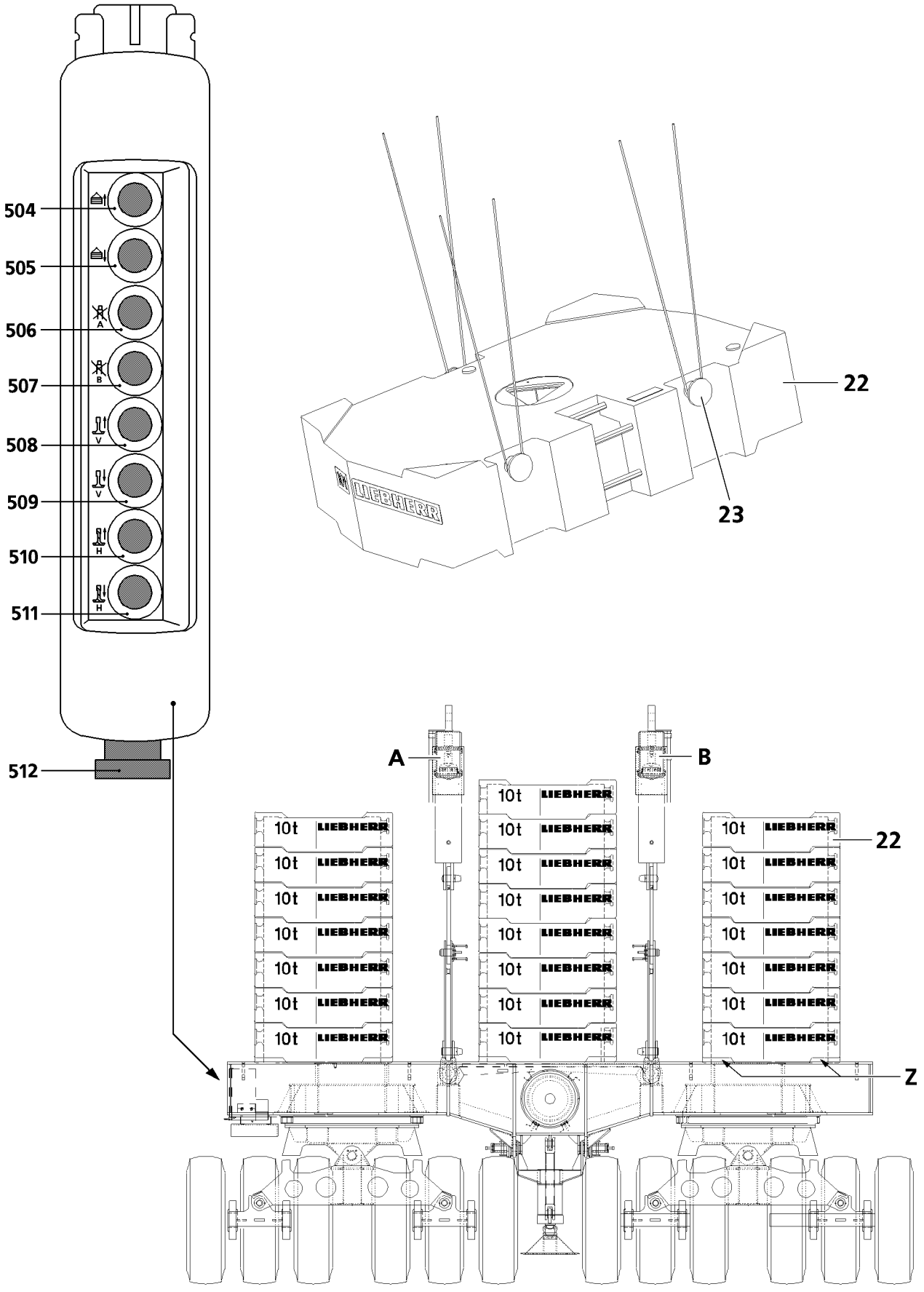
Make sure that the following prerequisites are met:

– the turntable is turned in the lengthwise direction of the ballast trailer,
– the transport retainers for the ballast guy rods on the derrick boom have been released,
– the ballast trailer radius is R 11.00 m,
– the derrick is erected.

DANGER
Risk of accident!

▶ The ballast guy rods and pull cylinders swivel out automatically as soon as the derrick boom is lowered to the rear beyond the vertical.
▶ It is prohibited for anyone to remain under the ballast trailer when lowering the derrick boom.

▶ Fold up the con-rods **14**.
▶ Use auxiliary ropes to secure the pull cylinders and ballast guy rods **13** on the derrick boom.
▶ Use the auxiliary rope to pull the ballast guy rods **13** to the con-rods **14**.
▶ Pin the ballast guy rods **13** using pins **12**.
▶ Secure pins **12** with spring retainers **11**.
▶ Connect the supply line from the ballast trailer to the turntable.



B104578

1.2.5 Ballast the ballast trailer

The ballast plates are marked with their own weights.

– Ballast plate 10 t.

Ensure that the following prerequisites are met:

– the ballast trailer is pinned and secured to the turntable,
– the ballast guy rods are pinned and secured on both sides,
– the support cylinders must be retracted and the locking pins on the strut unpinned.

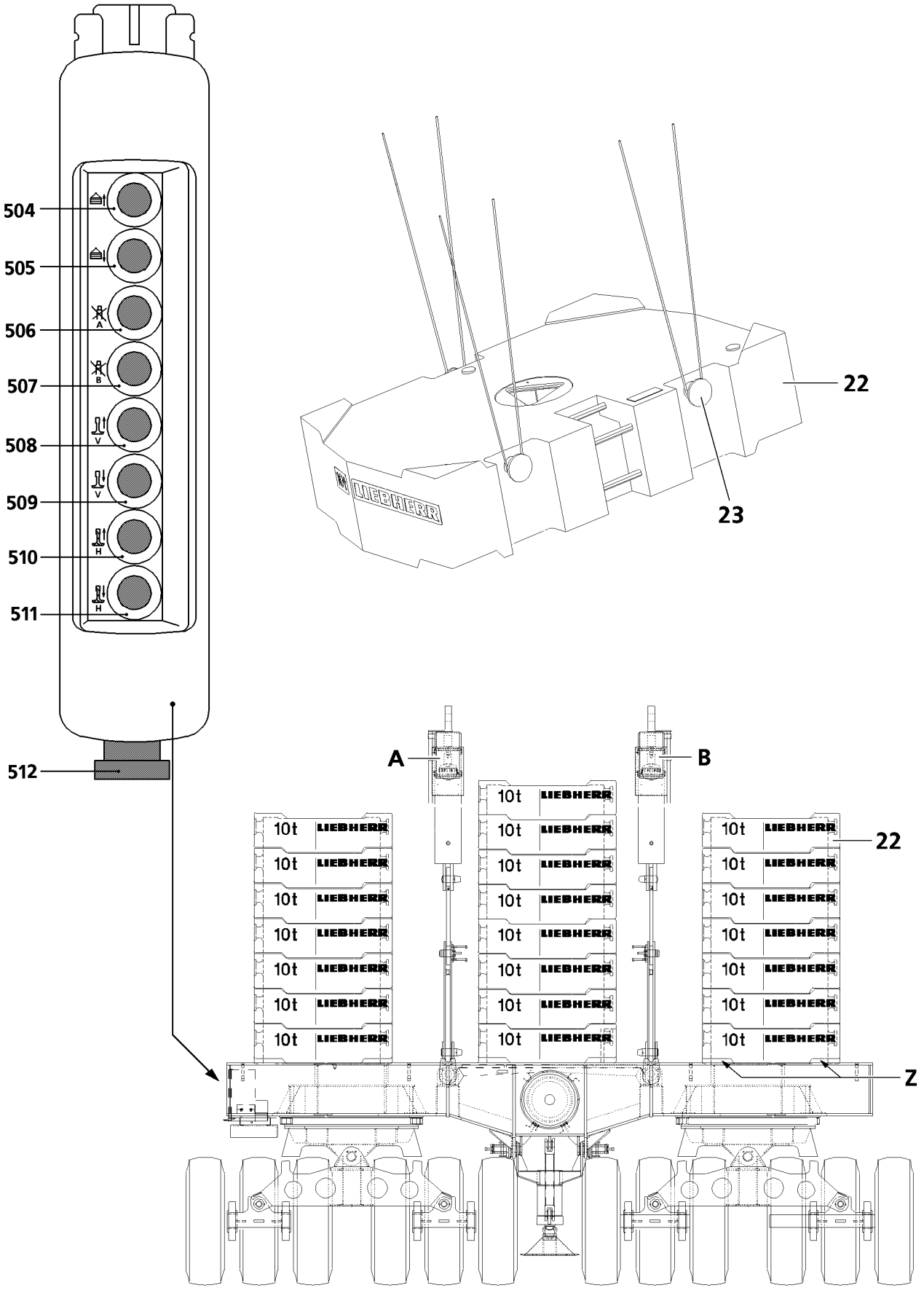
DANGER

Risk of accident!

If more than the specified loads are lifted with the ropes, then they or the studs will be overloaded and the ballast plates can fall down and fatally injure personnel.

▶ Lift a maximum of 10 t.
▶ Ensure that the ballast plates are correctly placed on the ballast trailer centering points.
▶ Replace damaged ballast plates.

▶ Use the auxiliary crane to evenly distribute the ballast plates **22** on the ballast trailer and center them on the centering plates **Z**.
▶ Lift each ballast plate **22** individually. Lift no more than maximum 10 t with the ropes attached at 3 attachment points.



B104578

1.2.6 Lifting and lowering the ballast trailer with the pull cylinders during assembly

From the control panel:

– Press the button **504**, the ballast trailer is lifted using the pull cylinders.
– Press the button **505**, the ballast trailer is lowered with the pull cylinders.

DANGER
Risk of accident!

- ▶ When the ballast trailer is lifted or lowered, pay attention to the horizontal position of the ballast trailer.
- ▶ If the ballast trailer is at an angle, block the appropriate pull cylinder until the ballast trailer reaches a level position.
- ▶ The control panel on the ballast trailer should only be used during assembly.
- ▶ During crane operation, the crane operator may **not** lift or lower the ballast trailer with the control panel on the ballast trailer, because the monitors cannot be seen from there.
- ▶ Raising or lowering during crane operation should **only** be controlled from the cab.
- ▶ When lifting and lowering the ballast trailer, it must be ensured that the difference of the forces in the ballast guying is not too large.
- ▶ The LICCON shows both forces and issues a warning if the difference of the forces is too large.
- ▶ Also refer to paragraph “Differential force monitoring for ballast guying”.
- ▶ If this is not observed, there is an increased danger of accidents!

– Press button **506**, ballast cylinder **A** left is locked.
– Press button **507**, ballast cylinder **B** right is locked.

1.2.7 Lifting and lowering the ballast trailer with the pull cylinders during crane operation

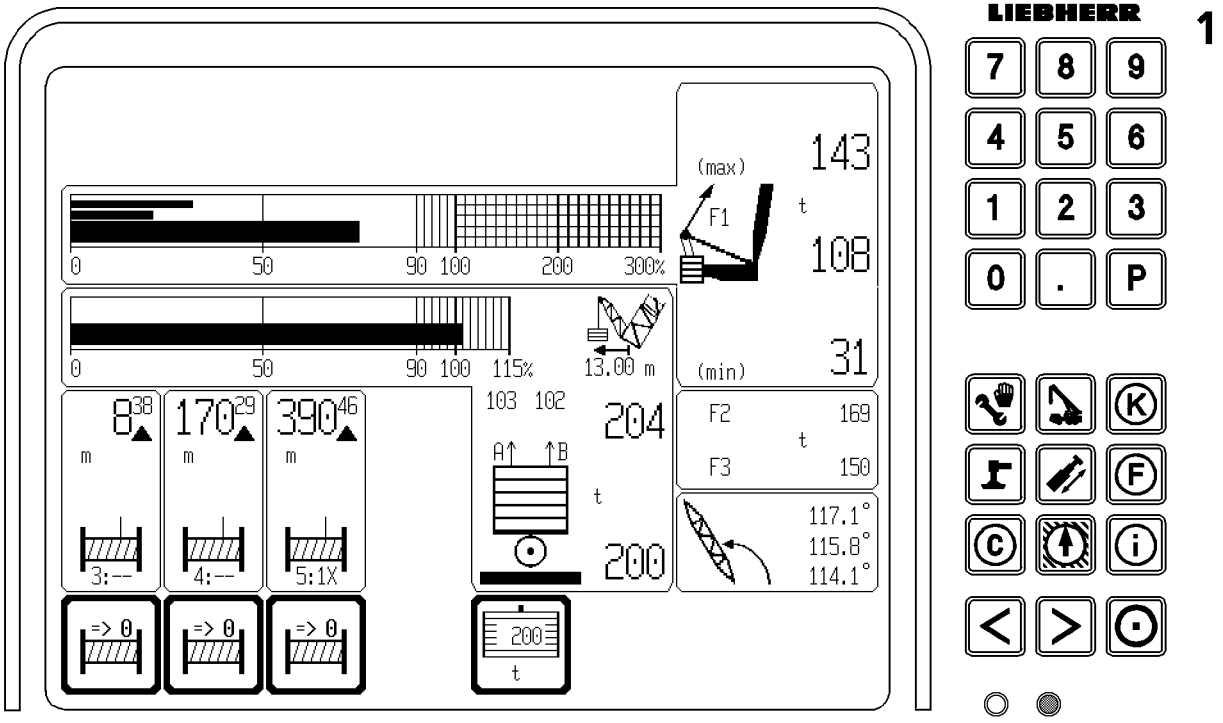
From the crane cab:

– Press button **315** in the cab, the ballast trailer is lifted with the pull cylinders.
– Press button **324** in the cab, the ballast trailer is lowered with the pull cylinders.

DANGER
Risk of accident!

- ▶ When the ballast trailer is lifted or lowered, pay attention to the horizontal position of the ballast trailer.
- ▶ If the ballast trailer is at an angle, block the appropriate pull cylinder until the ballast trailer reaches a level position.
- ▶ The control panel on the ballast trailer should only be used during assembly.
- ▶ During crane operation, the crane operator may **not** lift or lower the ballast trailer with the control panel on the ballast trailer, because the monitors cannot be seen from there.
- ▶ Raising or lowering during crane operation should **only** be controlled from the cab.
- ▶ When lifting and lowering the ballast trailer, it must be ensured that the difference of the forces in the ballast guying is not too large.
- ▶ The LICCON shows both forces and issues a warning if the difference of the forces is too large.
- ▶ Also refer to paragraph “Differential force monitoring for ballast guying”.
- ▶ If this is not observed, there is an increased danger of accidents!

– Press button **316**, ballast cylinder **A** left is locked.
– Press button **325**, ballast cylinder **B** right is locked.


LIEBHERR
1
7 8 9
4 5 6
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0 . P
(max)
143
t
F1
108
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31
0 50 90 100 200 300%
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13.00 m
103 102
204
A B
t
200
F2 169
t
F3 150
117.1°
115.8°
114.1°
8.38 m
170.29 m
390.46 m
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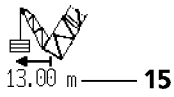
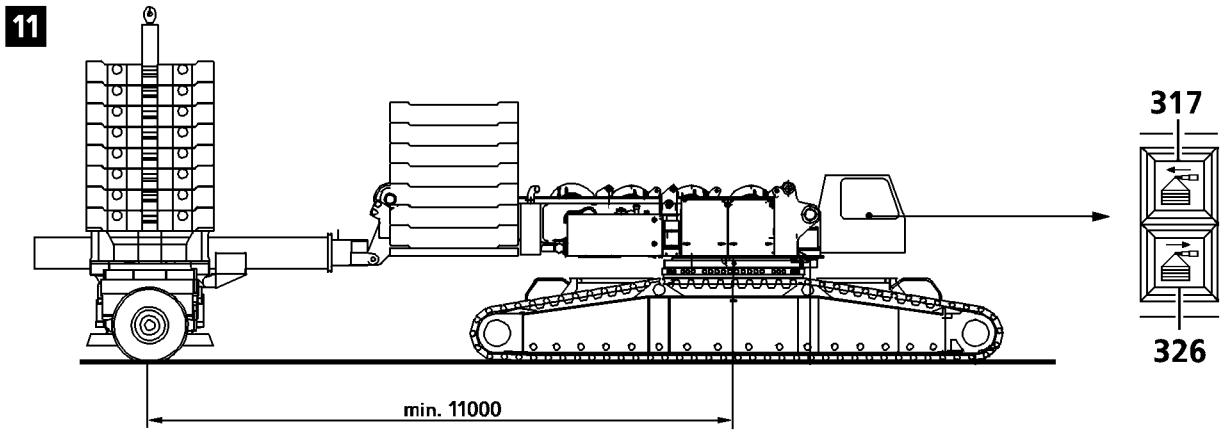
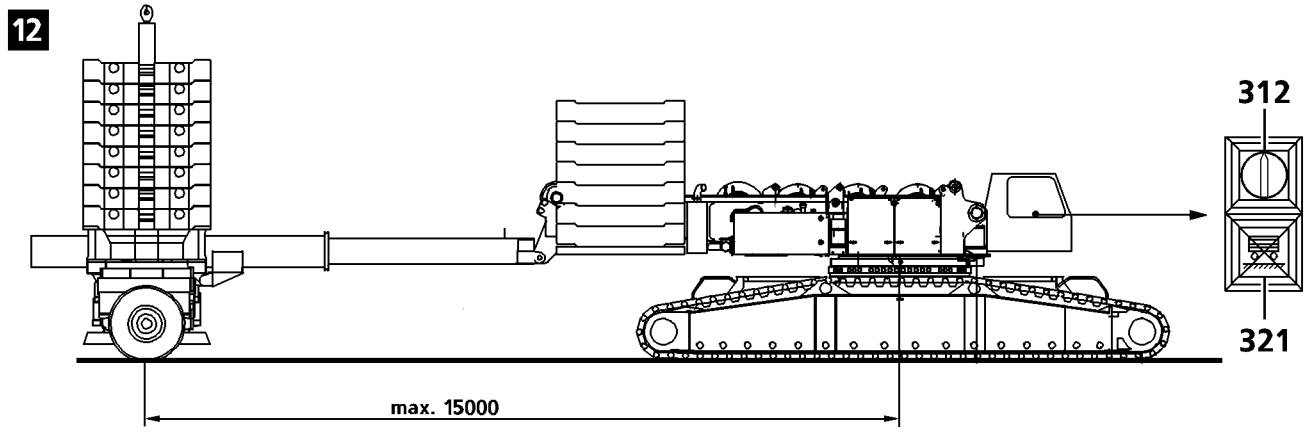

13.00 m
15


11
317
326
min. 11000


12
312
321
max. 15000

B188659

1.3 Setting the ballast trailer radii

The ballast trailer is equipped with a telescopic guide. This allows the ballast trailer length to be adjusted to suit the environment and type of lifting work. The maximum length of the telescopic guide is 15 m and the minimum length is 11 m see illustration **11** and **12**.

1.3.1 Telescoping the guide out and in

Note

- The release for telescoping the ballast trailer guide in/out is issued when the wheel sets are set to towing mode, or the ballast trailer is suspended and assembly condition **"Ballast trailer lifted off"** is turned on by operating key button **312**. Warning light **313** flashes when key button **312** is turned on, see section Key button "Ballast trailer lifted off".

DANGER

Risk of accident!

The wheel sets must be set to towing mode when telescoping the ballast trailer guide in or out.

- If this is not observed, the crane or ballast trailer may be damaged!

Note

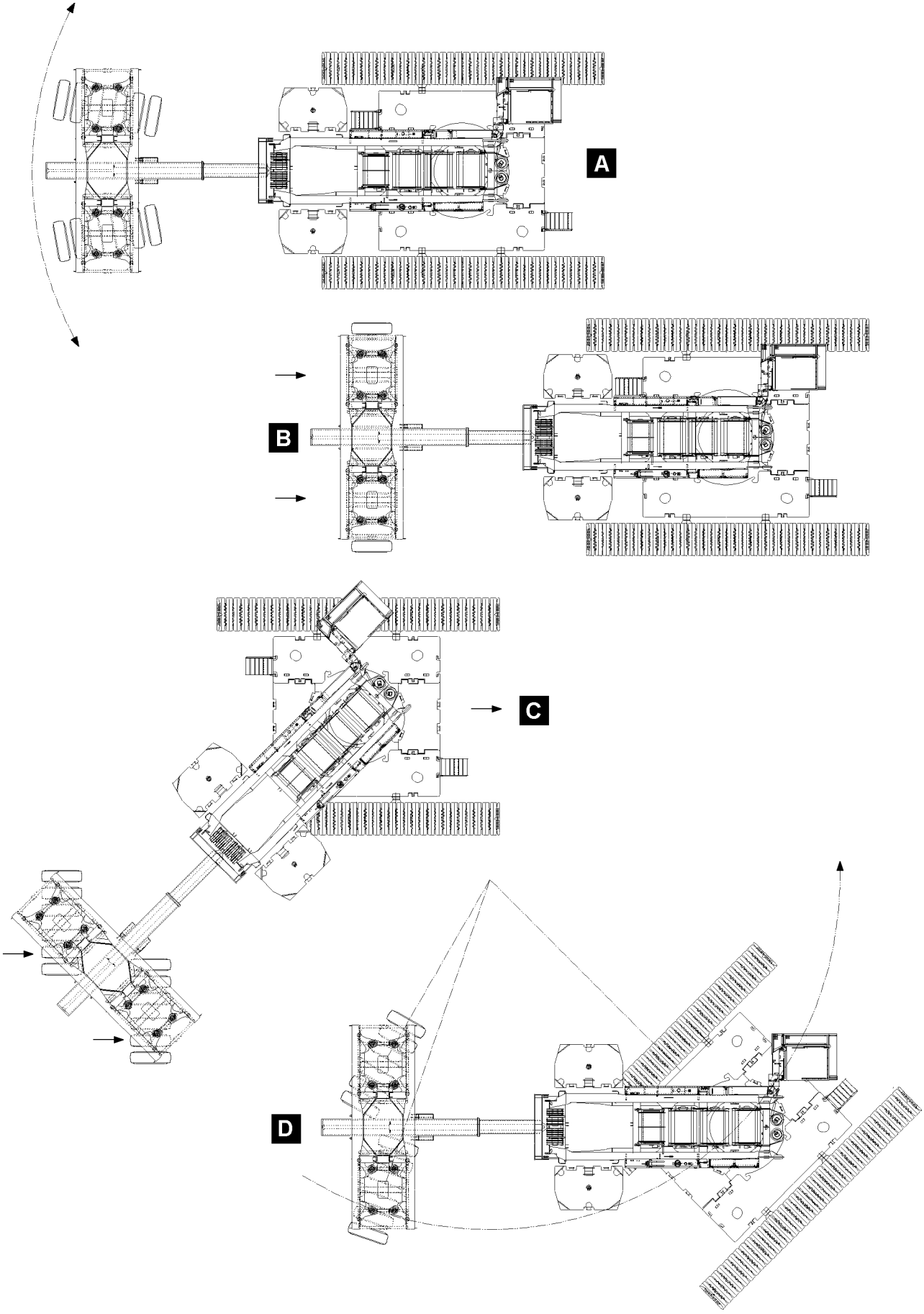
- When telescoping out, monitor the displayed actual length **R** on the LICCON monitor.
- The crane operator should not simply rely on the radius measurement, instead he should also be pro-active and check whether the length sensor measurement is functioning correctly, see section "Checking the length sensor value on the ballast trailer".

Telescoping from R 11 m to R 15 m

- Release the guy rods between the derrick head and the ballast trailer.
- Press the button **317** and telescope the ballast trailer out to the required radius R 13 m or R 15 m.

Telescoping from R 15 m to R 11 m

- Release the guy rods between the derrick head and the ballast trailer.
- Press the button **326** and telescope the ballast trailer in to the required radius R 13 m or R 11 m.



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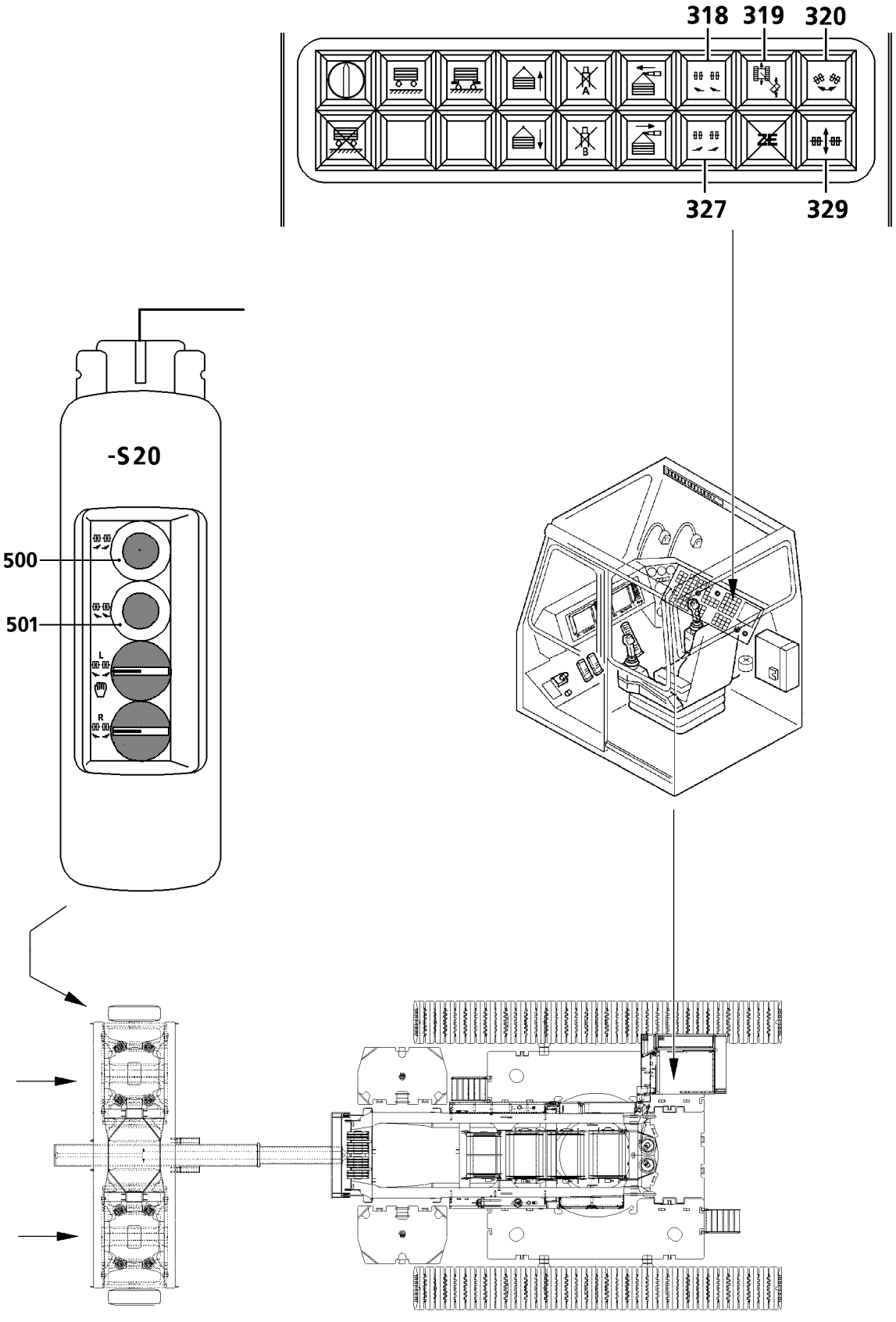
1.4 Changing the wheel sets

1.4.1 Steering programs

The ballast trailer is equipped with computer controlled steering programs.

- **Circular travel**, see illustration **A**.
- **Towing**, see illustration **B**.
- **Parallel travel**, see illustration **C**.
- **Manual resteering** , see illustration **D**.

The computer controlled steering programs circular travel, towing and parallel travel can only be actuated from the cab.



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1.4.2 Notes to change the wheel sets

The change of the wheel sets for circular travel **320**, towing **329** and parallel travel **319** is only possible with buttons **320**, **329** and **319** in the cab.
Manual resteering can be performed using buttons **318** and **327** in the cab or buttons **500** and **501** on the ballast trailer control panel **-S20**.
The manual change of the wheel sets for assembly purposes is only possible with the buttons on the control panel **-S20** on the ballast trailer.

Note

- During crane operation, the wheel sets must be set to the circular travel steering program. If the ballast trailer is operated on the ground, the wheel sets must be in the circular travel position. If the ballast trailer is suspended, the wheel sets can be positioned in any mode, if the key button **312** “Ballast trailer lifted off” was turned on. In this case, the crane driver must monitor that the wheels do not touch the ground.

DANGER
Risk of accident!

- If the ballast trailer is resting on the ground during crane operation, the wheel sets must be set to the circular travel otherwise the ballast trailer and crane will be damaged.

1.4.3 Changing the wheel sets

The change procedure is the same for all steering programs.

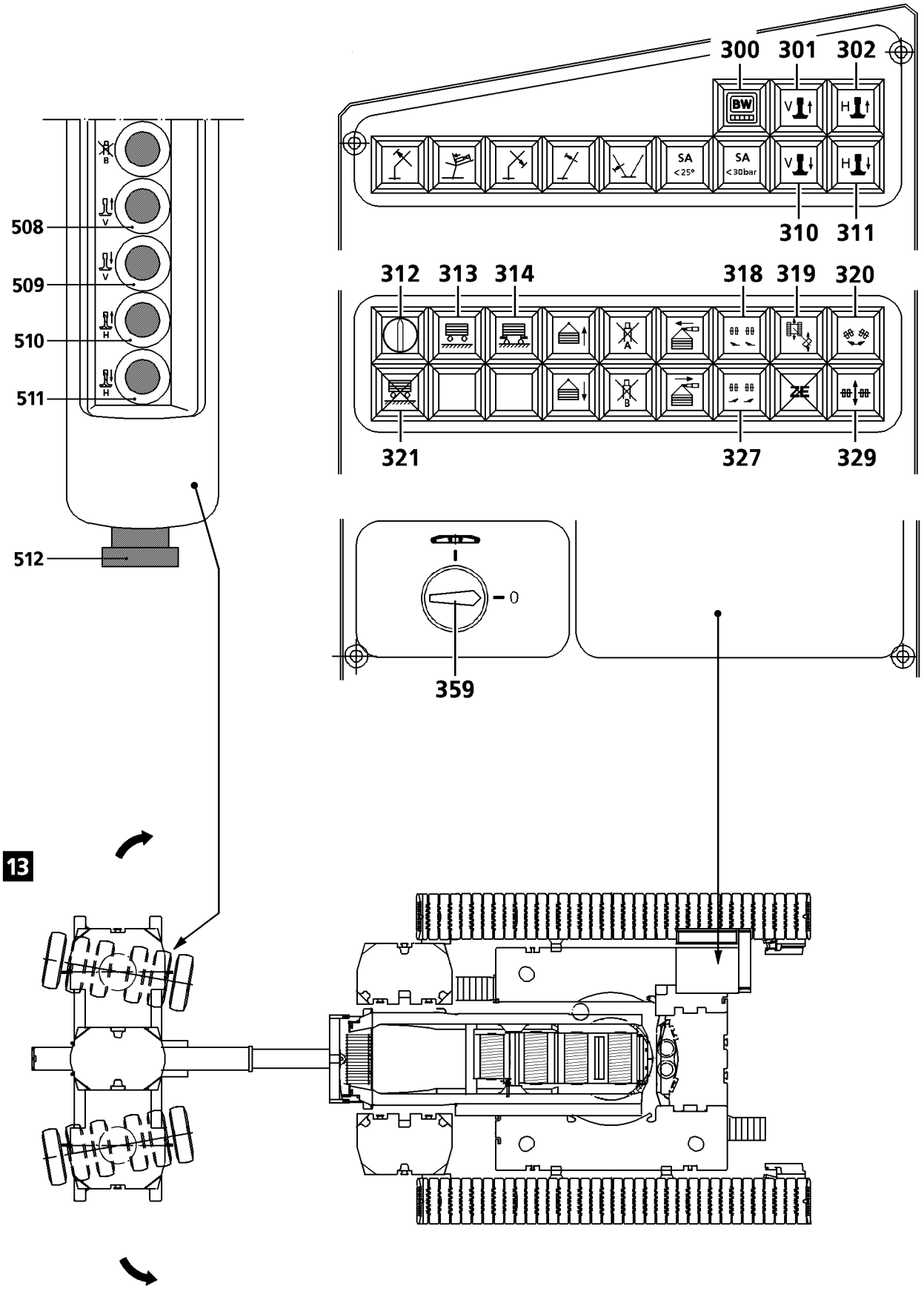
Note

- If the ballast trailer is not loaded, the wheel sets can be changed without relieving the tires.
- If the ballast trailer is loaded, first raise the ballast trailer with the support cylinders until the load on the tires is relieved.

DANGER
Risk of accident!

- By raising the ballast trailer with the support cylinders, the force at test point 1 = F 1 can increase to its maximum value. The extension of the support cylinders is then turned off. However it should not reach the shut-off position; instead it should stop first.

- Actuate the support cylinders in the cab and watch the monitor display at the same time.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B188660

1.4.4 Circular travel

See illustration **13**
Make sure that the following prerequisites are met:
– the ballast trailer guide is telescoped out to the required radius.

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 wheel sets can be set to any position providing key button **312** “Ballast trailer lifted off” has been turned on. In this case, the crane driver must monitor that the wheels do not catch.

WARNING
Damage to tires
▶ If the ballast trailer is resting on the ground in an incorrect wheel position and key button **312** “Ballast trailer lifted off” is turned on, the ballast trailer wheels may become damaged as they turn.

Raising the ballast trailer with the support cylinders

▶ Press button **310** and **311** or button **509** and **511** and extend the front / rear support cylinders.
▶ Raise the ballast trailer until the tires are relieved.

Setting the axles to circular travel position

▶ Press button **320**, the wheel sets are turned to the circular travel position.

Result:
– The indicator light in the button will blink until the circular driving position is reached. The indicator light in the button remains permanently lit when the circular driving position is reached.

Note
▶ If one of the wheel sets deviates from the specified angle, the indicator light in button **320** blinks and the axles must be reset as described above.

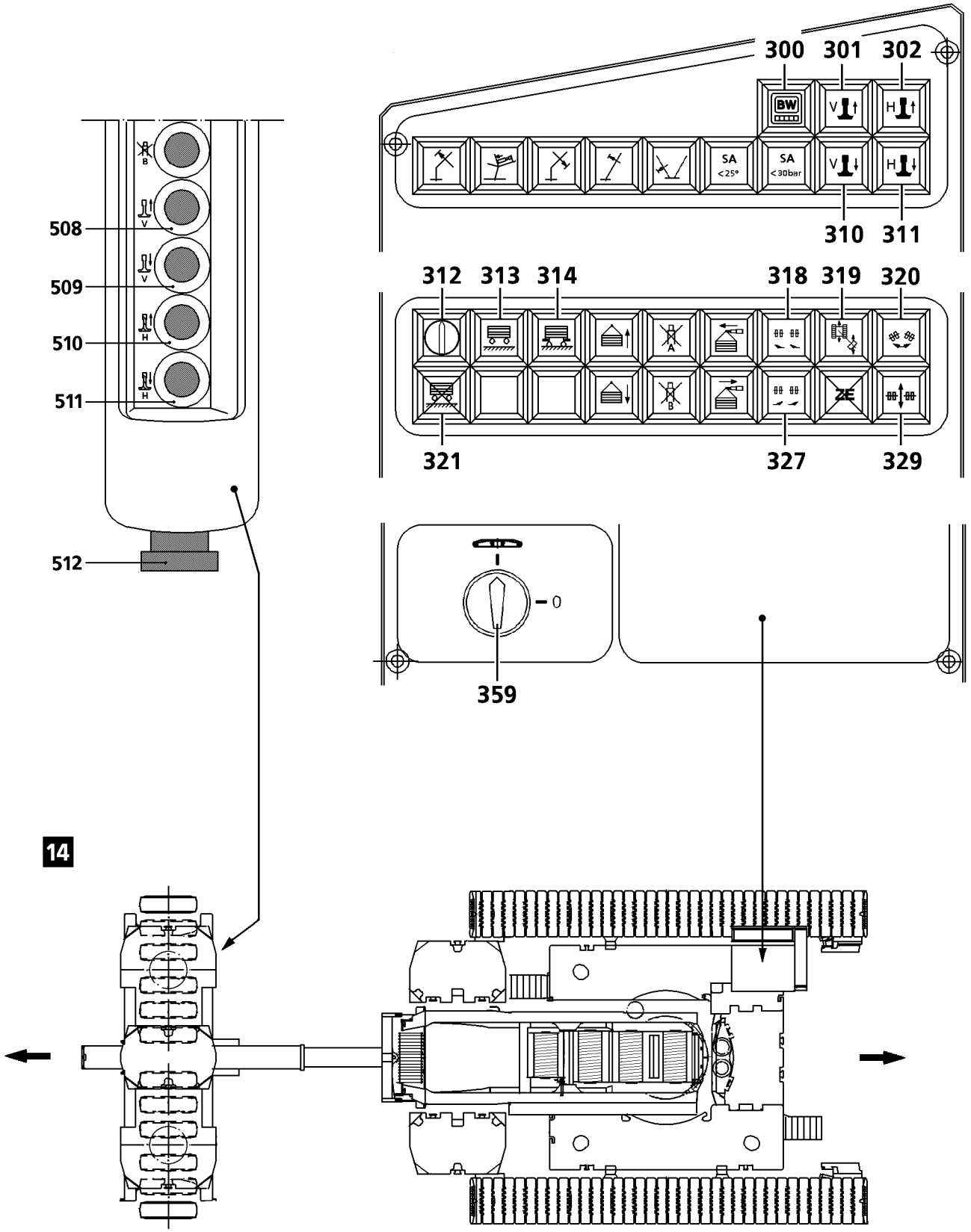
▶ Press button **320** again.

Lowering the ballast trailer with the support cylinders

▶ Press button **301** and **302** or button **508** and **510** and fully retract the front / rear support cylinders.

Result:
– Indicator light **314** lights up, the support cylinders are retracted.

Note
▶ The release for “turning the turntable” is only given when both axles are in the turning position and the support cylinders are retracted.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1.4.5 Towing

See illustration **14**
Ensure that the following prerequisite is met:
– the rotary switch **359** is set to crawler operation (vertical 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 wheel sets can be set to any position providing key button **312** “Ballast trailer lifted off” has been turned on. In this case, the crane driver must monitor that the wheels do not catch.

WARNING
Damage to tires
▶ If the ballast trailer is resting on the ground in an incorrect wheel position and key button **312** “Ballast trailer lifted off” is turned on, the ballast trailer wheels may become damaged as they turn.

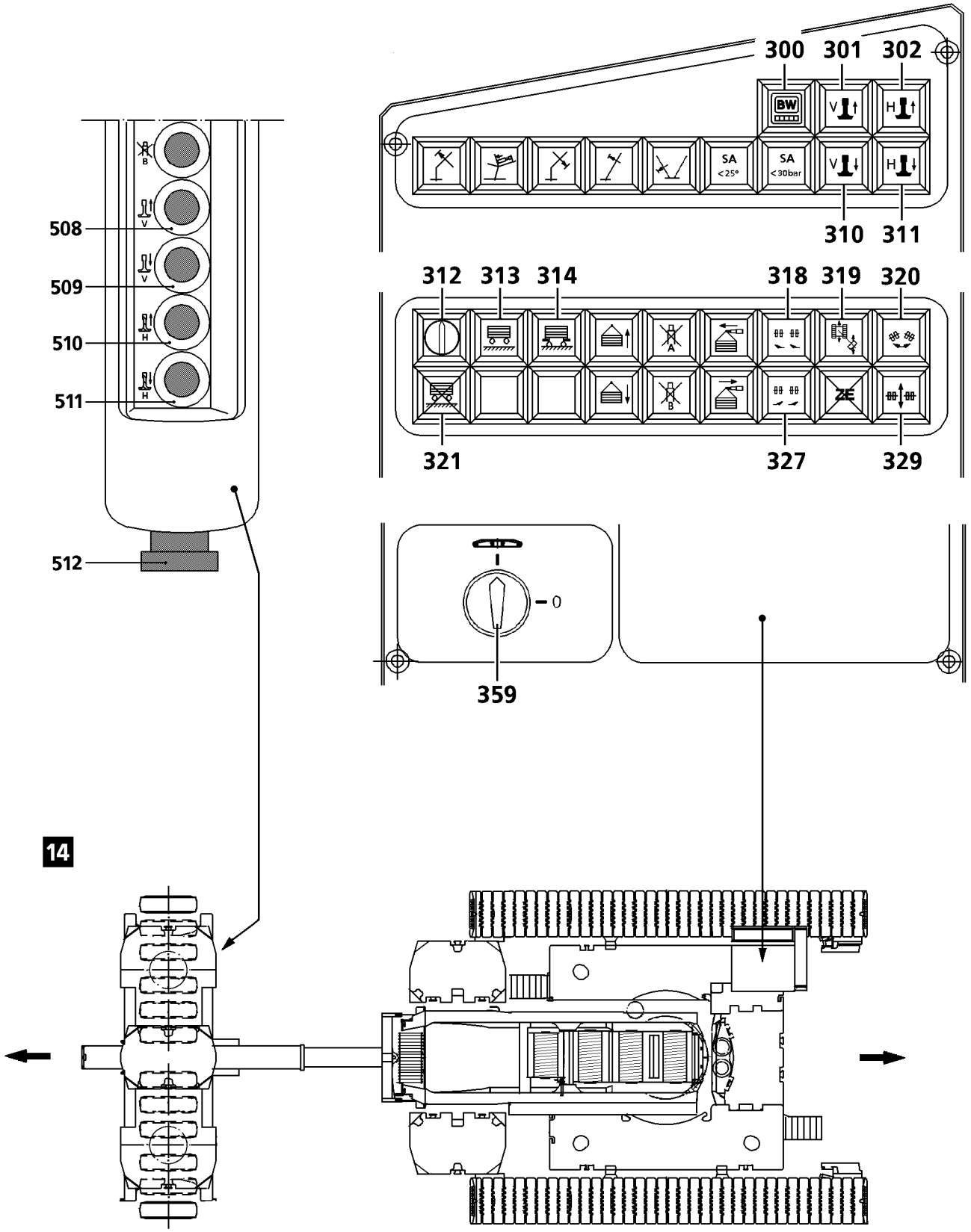
Raising the ballast trailer with the support cylinders

▶ Press button **310** and **311** or button **509** and **511** and extend the front / rear support cylinders.
▶ Raise the ballast trailer until the tires are relieved.

Setting the axles to towing position

▶ Press button **329**, the axles are turned to the towing position.

Result:
– The indicator light in the button will blink until the towing position is reached. The indicator light in the button remains permanently lit when the towing position is reached.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Lowering the ballast trailer with the support cylinders

▶ Press button **301** and **302** or button **508** and **510** and fully retract the front / rear support cylinders.

Result:

– Indicator light **314** is lit, the support cylinders are retracted.

Note

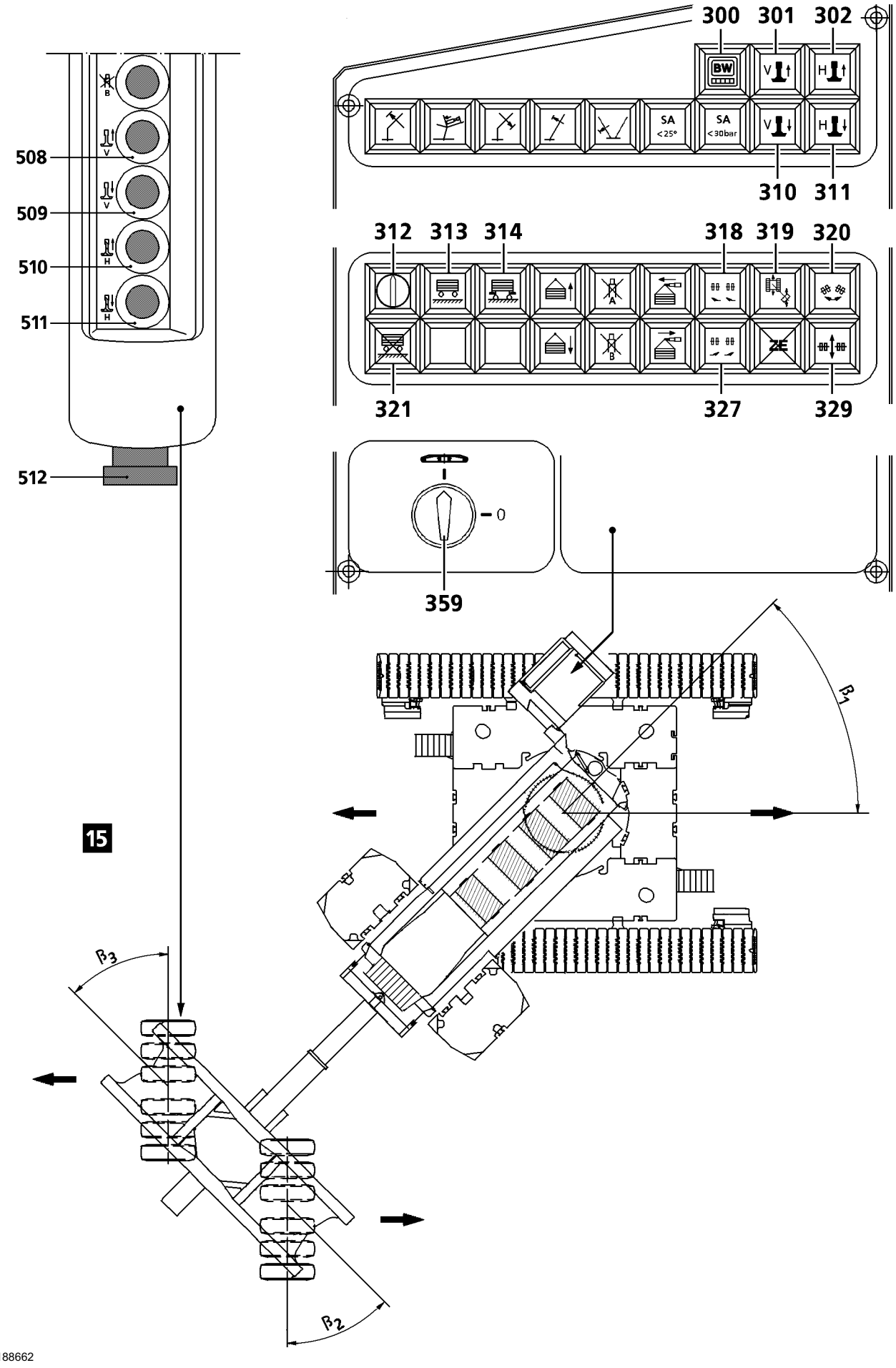
▶ The release for “towing” is only made when both wheel sets are in travel position (neutral position) and the support cylinders are completely retracted.

▶ Check the setting of the wheel sets and the support cylinders.

Changing from manual resteering to the towing position and vice-versa

Note

▶ Changing from operating mode towing to manual resteering (and back) is possible while moving the crawler. If one of the wheel sets deviates from the specified angle, the indicator light in button **329** blinks and the axles must be reset as described above. If towing is selected when currently in manual resteering mode, the indicator light in button **329** blinks until the towing position is reached. The general rule is that the wheel sets can only move if button **318** or **327** or **329** are pressed when in a particular operating mode or the crawler is being driven.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B188662

1.4.6 Parallel travel

See illustration **15**
Ensure that the following prerequisite is met:
– the rotary switch **359** is set to crawler operation (vertical position).

Note
▶ The wheel sets must be in parallel travel position, regardless if the “ballast trailer is on the ground” or if the “ballast trailer is suspended”. For other wheel set positions, the control system reverts to the same shut off functions as for towing.

WARNING
Damage to tires
▶ If the ballast trailer is resting on the ground in an incorrect wheel position and key button **312** “Ballast trailer lifted off” is turned on, the ballast trailer wheels may become damaged as they turn.

Raising the ballast trailer with the support cylinders

▶ Press button **310** and **311** or button **509** and **511** and extend the front / rear support cylinders.

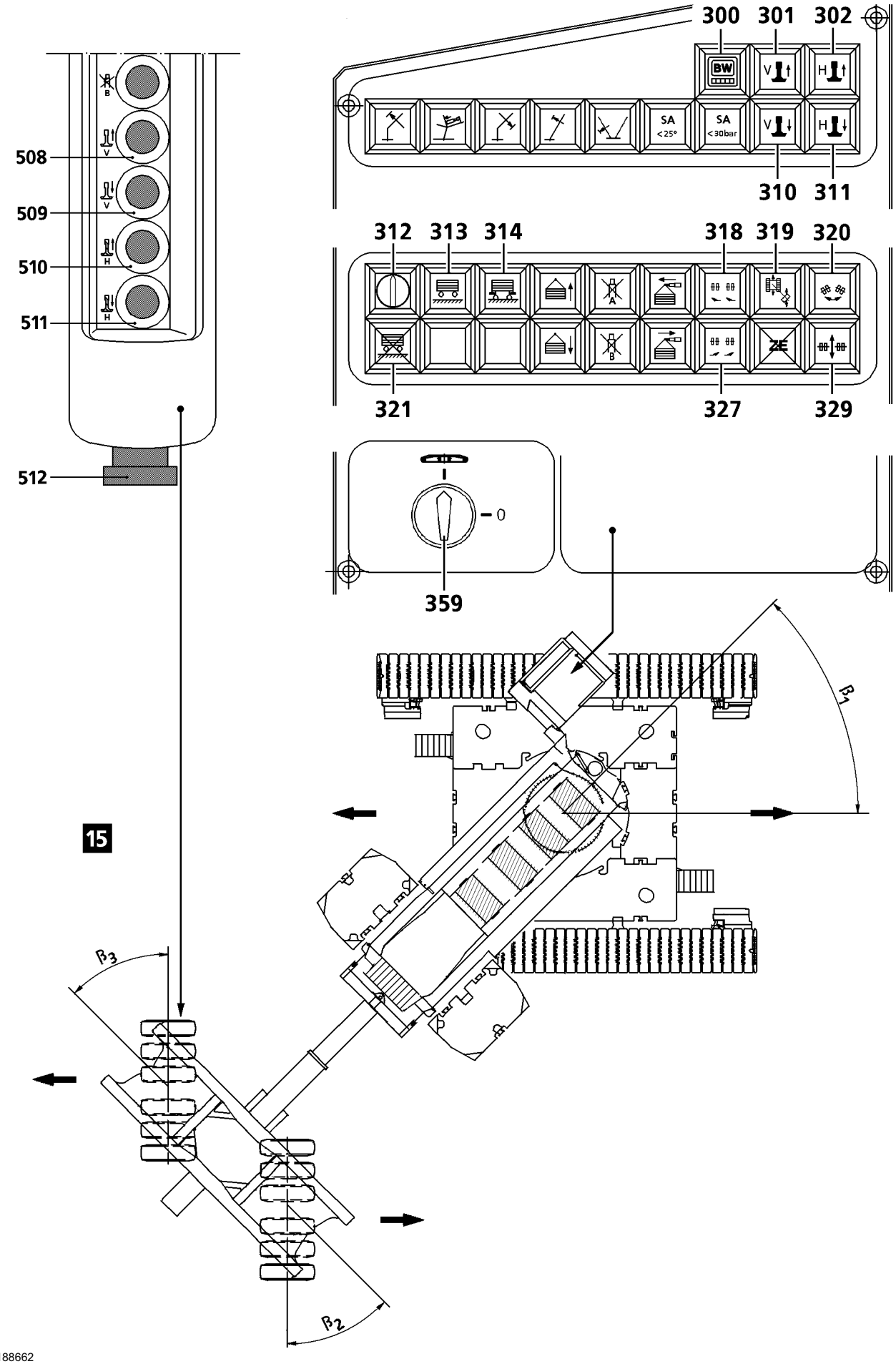
Setting the axles to parallel position

▶ Press the button **319**, the axles are turned to the parallel position.

Result:
– The control light in the button will blink until the parallel position is reached. The indicator light in the button is lit when the parallel position is reached.

Note
▶ If one of the wheel sets deviates from the specified angle, the indicator light in button **319** blinks and the wheel sets must be reset as described above.

▶ Check the parallel position.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Lowering the ballast trailer with the support cylinders

▶ Press button **301** and **302** or button **508** and **510** and fully retract the front / rear support cylinders.

Result:

– Indicator light **314** lights up, the support cylinders are retracted.

Note

▶ The travel drive of the crawler is locked until the axles are in parallel position. During "drive crawler", the slewing gear brake on the crane is engaged and the hydraulic concentric run is opened.

▶ If the angles ß2, ß3 in relation to ß1 deviate by more than the permissible limit value, then the crawler track is stopped. The indicator light **319** blinks.

▶ The crawler track is only released again by turning the axles to the specified angle, as described above.

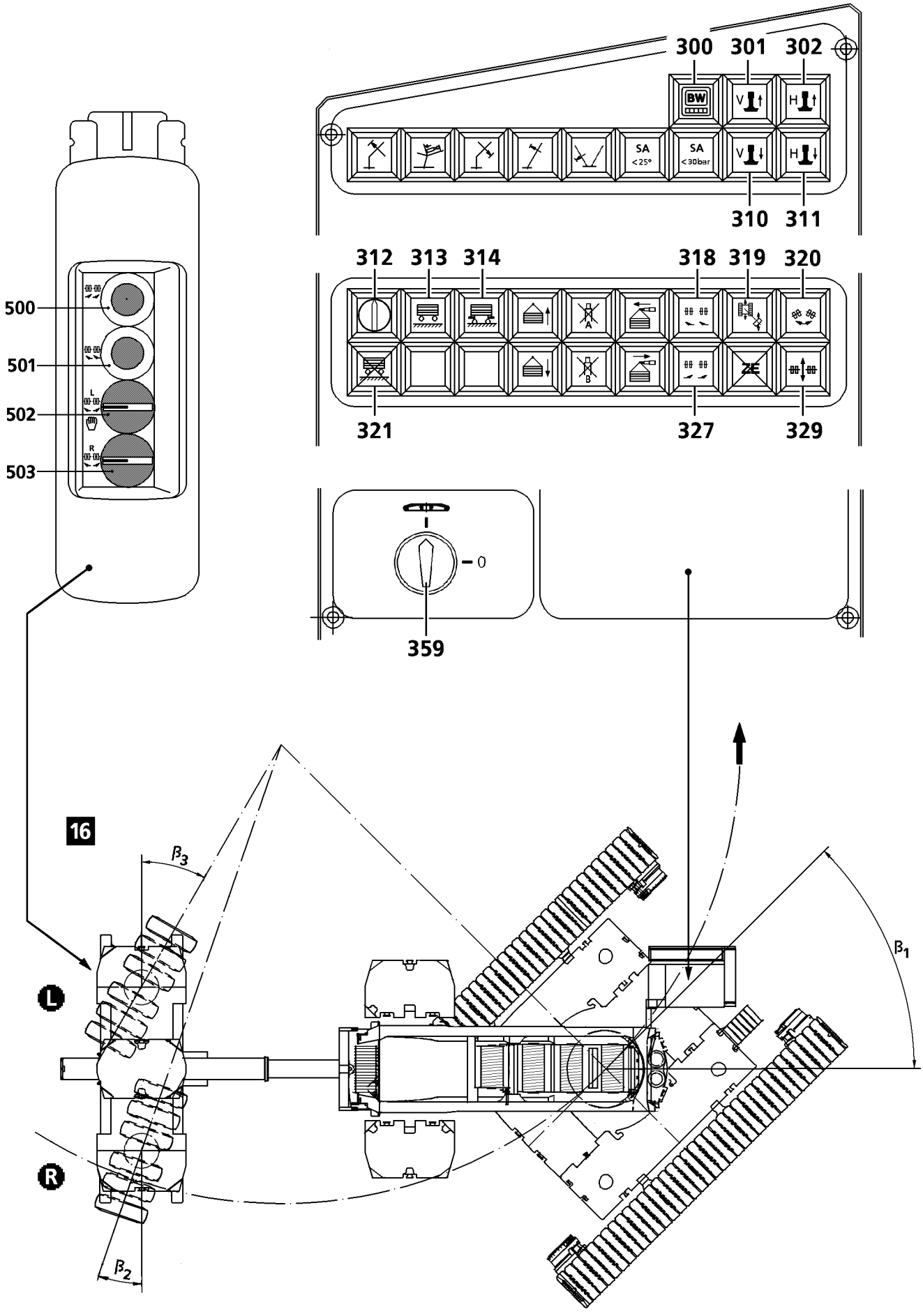
CAUTION

Property damage!

▶ In parallel travel, steering the crawlers is prohibited, but not shut off. If they are steered anyway, the mechanical slewing brake can slip until the crawler track is stopped, due to the angle deviation.

▶ In parallel travel, a person must monitor the side tire distortion. In case of a distortion of more than 100 mm, the position of the axles must be corrected.

▶ Check the settings.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1.4.7 Manual resteering

Ensure that the following prerequisite is met:

– the rotary switch **359** is set to crawler operation (vertical position).

Steering and resteering the axles

Make sure that the following prerequisites are met:

– operating mode towing was selected **and** the ballast trailer axles have reached the towing position.

▶ Press button **318** or **501**, the ballast trailer wheels turn to the right.

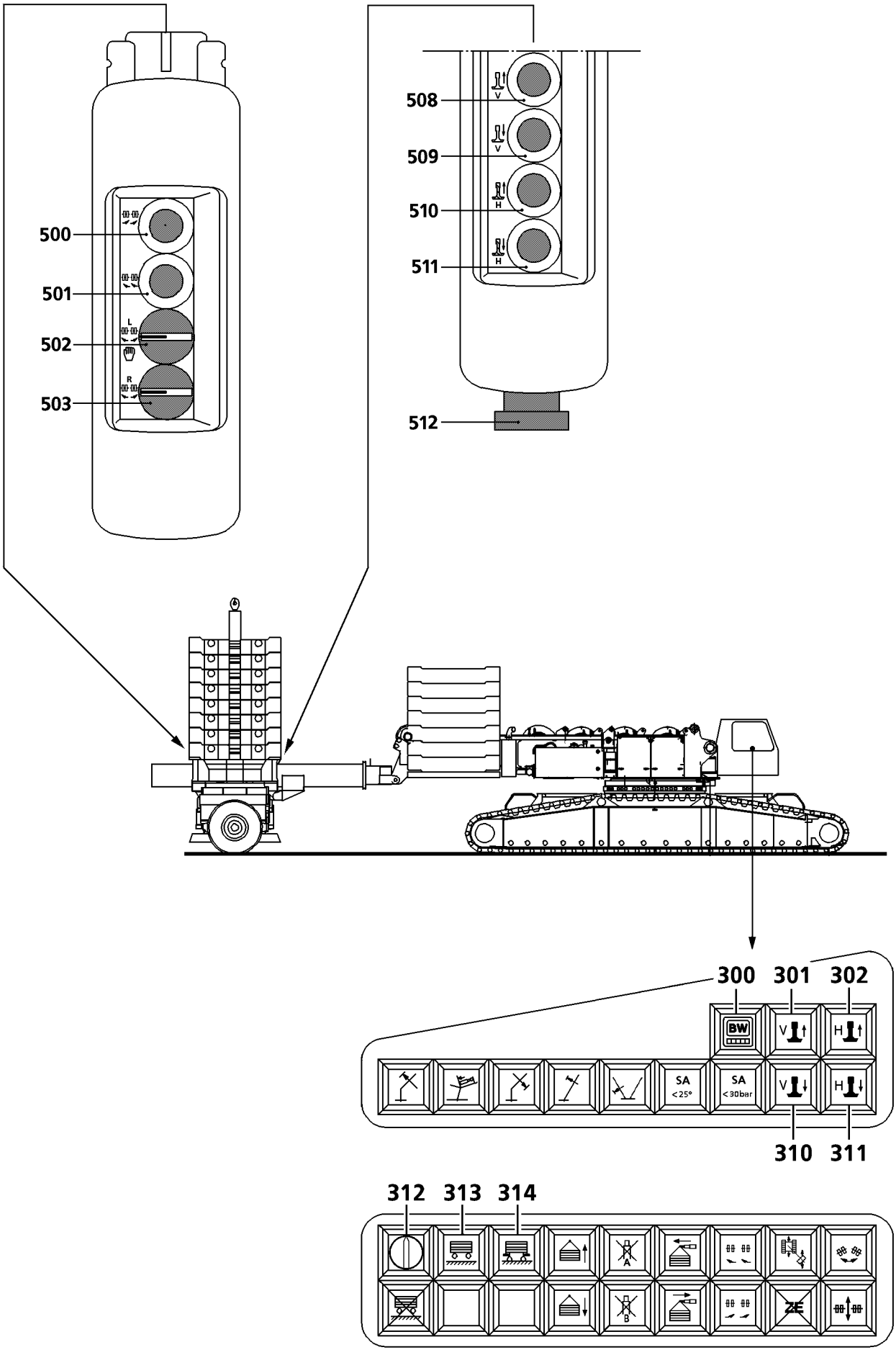
▶ Press button **327** or **500**, the ballast trailer wheels turn to the left.

The right wheels set is regulated by the computer controlled steering program in such a way that a steering centre is always present. Angles ß1 is determined by the travel of the crawler and angle ß3 by the operator steering, whereby angle ß2 is continually corrected. It is possible to switch between manual corrective steering and towing modes when driving the crawler once the towing position has been reached. If manual corrective steering is selected when currently in towing mode, the indicator lights in buttons **318** and **327** are lit.

Note

▶ The left wheel set can be steered up to a specified angle ß3. It is not possible to steer beyond this limit. The right wheel set is reregulated according to the steering center. If the right wheel set (corrective steering) cannot follow the left wheel set, the left wheel set is halted until the right wheel set (corrective steering) has caught up. If the right wheel set still deviates from the specified angle, the indicator lights in buttons **318** and **327** blink and towing has to be re-started. If angle ß1 of the turntable exceeds the specified value, an automatic switch is made to towing mode. The indicator lights in buttons **318** and **327** and **329** flash. When the towing position is reached, manual resteering can continue. Indicator lights in buttons **318** and **327** are lit. The general rule is that the wheel sets only move during manual resteering if button **318** or **327** or **329** or **500** or **501** on the control panel are pressed in a given operating mode or whilst the crawler is being driven.

▶ Check the settings.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1.4.8 Manual operation for assembly

The ballast trailer is equipped with a program which allows for each wheel set to be turned individually at assembly.

Raising the ballast trailer with the support cylinders

▶ Press button **310** and **311** or button **509** and **511** and extend the front / rear support cylinders.

Setting the axles

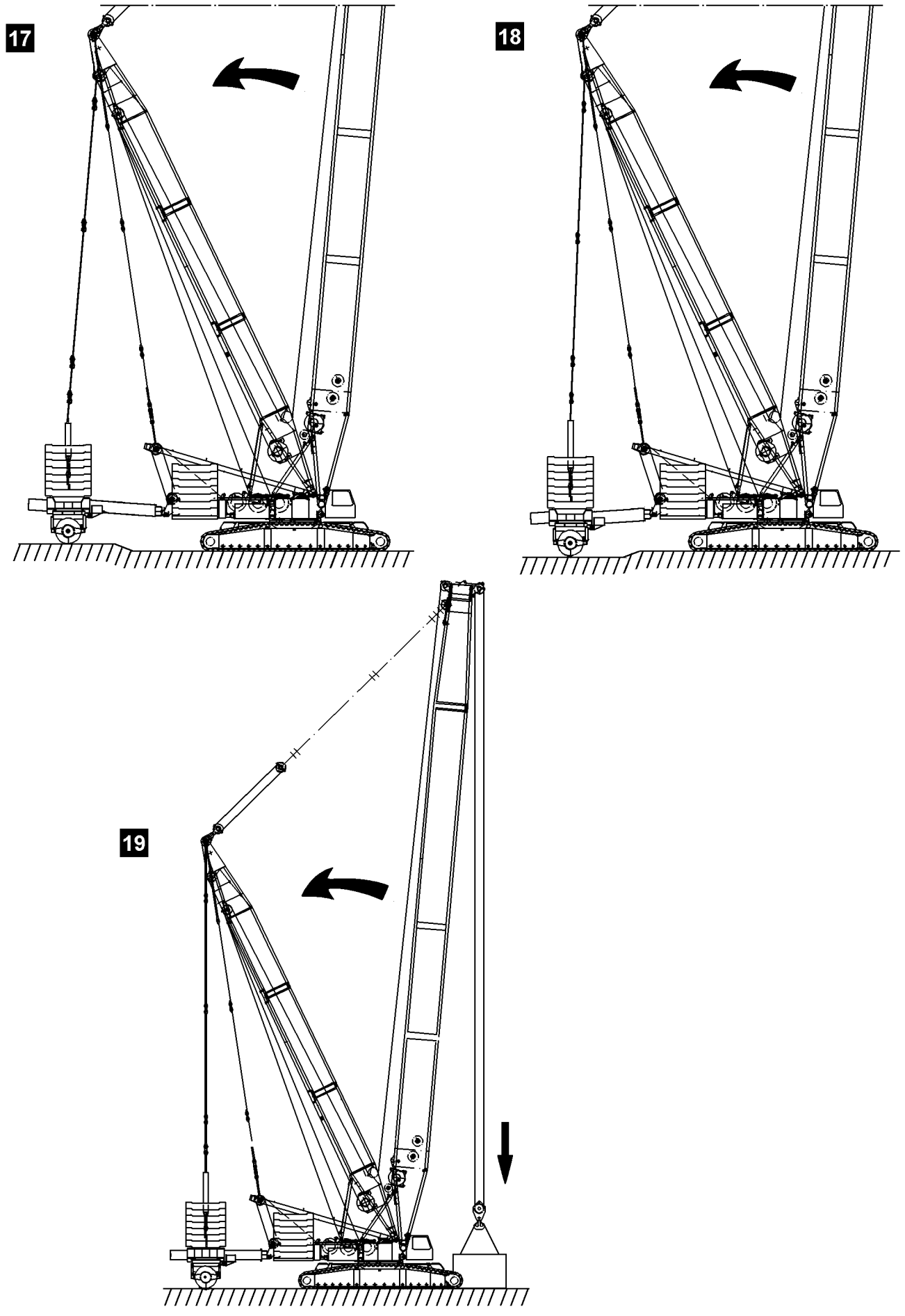
▶ Turn the rotary switch **502** to the right, the left axle turns to the right.
▶ Turn the rotary switch **502** to the left, the left axle turns to the left.
▶ Turn the rotary switch **503** to the right, the right axle turns to the right.
▶ Turn the rotary switch **503** to the left, the right axle turns to the left.

Lowering the ballast trailer with the support cylinders

▶ Press button **301** and **302** or button **508** and **510** and fully retract the front / rear support cylinders.

Result:

– Indicator light **314** lights up, the support cylinders are retracted.



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1.5 Driving with the ballast trailer

WARNING
Ground not suitable for driving with ballast trailer!
The guide on the ballast trailer could be overloaded or damaged when driving forwards / reversing the trailer on unsuitable ground. Personnel can be severely injured or killed!
- ▶ It is only permitted to drive the ballast trailer on level ground capable of supporting the load!
- ▶ It is prohibited to drive over obstacles!

If the ballast trailer sinks into soft ground or when driving up/down slopes:
- ▶ Unload the ballast trailer.

1.5.1 Safety guidelines for travel operation

Relapse cylinder

When the steepest operating position of the main boom is reached, luffing up is turned off by the overload protection in all operating modes.

Note
- ▶ However, there are cases when the relapse cylinders move mechanically to stop position, due to a movement of the entire crane system to the rear.

Block position relapse cylinders

In normal crane operation without bypass of the overload protection, a block position is not possible. Should a block position occur anyway, the movement is shut off and a indicator light on the instrument panel is lit.
This cab indicator light is used to determine which limit switch on which relapse cylinder has been actuated. The most recent action should be revoked until the relevant limit switch is released again.

Case 1, illustration 17

When driving or turning the crane with steeply positioned boom, the ballast trailer can be lowered, due to the level differences. This causes the whole boom system to be pulled backward. There is a risk of reaching a block position in the relapse cylinders. The same risk applies when turning if the ballast trailer sinks due to level differences.

Note
- ▶ Due to the signals “Main boom relapse cylinder on block” or “Derrick relapse cylinder on block”, the drive and turn movements of the crawler are automatically turned off during crane operation with the ballast trailer.

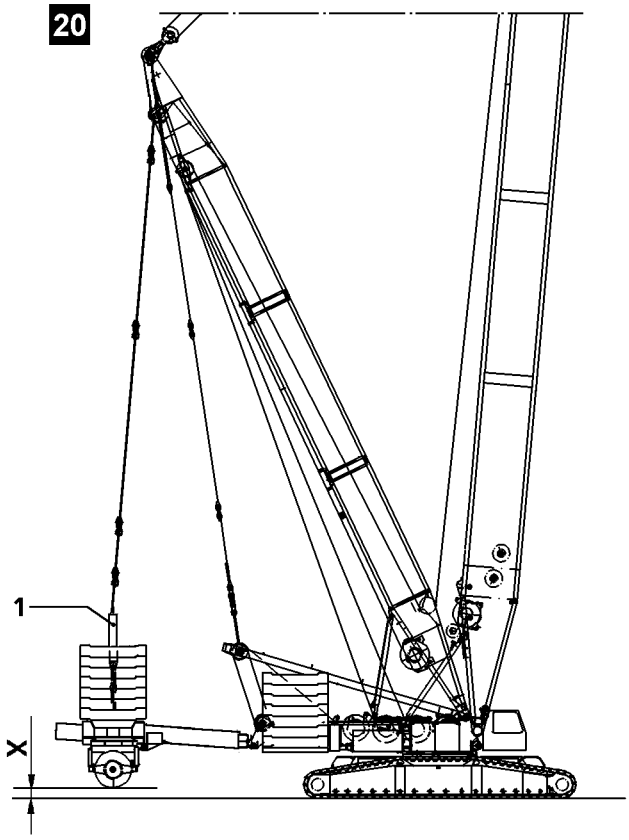
Case 2, illustration 18

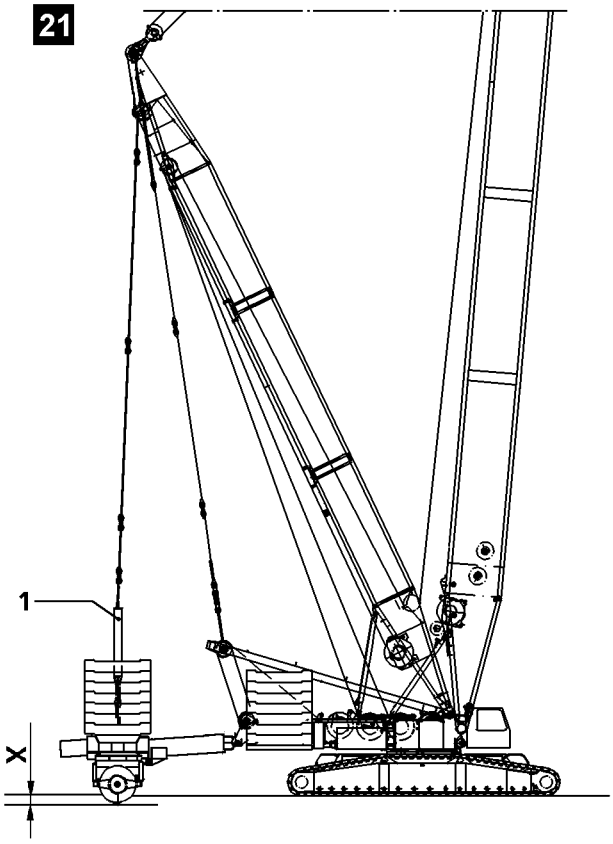
If the level under the crane increases, the boom system is also pulled back. There is a risk that the relapse cylinders reach the block position.

Note
- ▶ Due to the signals “Main boom relapse cylinder on block” or “Derrick relapse cylinder on block”, the drive and turn movements of the crawler are automatically turned off during crane operation with the ballast trailer.

Case 3, illustration 19

When the load is set down with the hoist gear, the crane is relieved. This causes the booms to move to the rear. The hoist gear is not shut off.





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1.5.2 Maximum permitted level difference

Level changes between the crane footprint and ballast trailer while driving or turning.

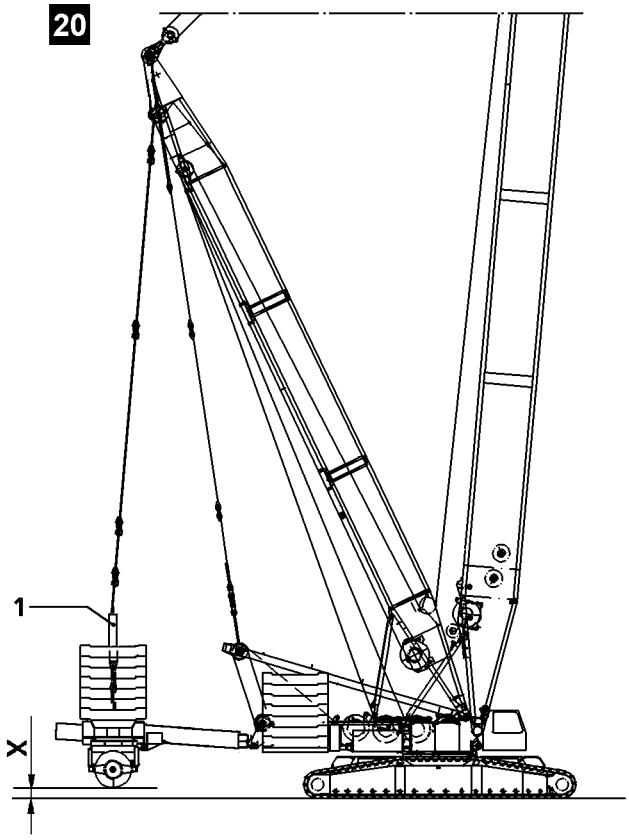
DANGER
Risk of accident!

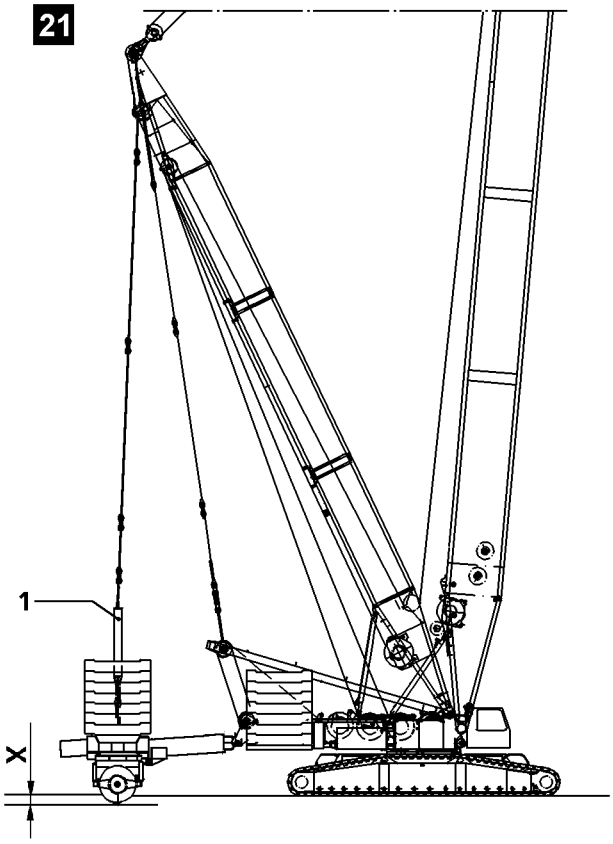
- The level difference of the ballast trailer route in relation to the crane route must be a maximum of ± 250 mm for towing and parallel travel. The level difference between the ballast trailer route and the base of the crane should be maximum ± 250 mm for circular travel (constant uphill or downhill slope).

Compensation of the maximum permitted level difference by the pull cylinders, illustrations 20 and 21

The permitted ground unevenness can be compensated by raising or lowering the pull cylinders.

Ballast trailer radius R 11 m				
	With Quick Connection		**Without Quick Connection**	
Cylinder stroke	**Dimension X**	**Cylinder stroke**	**Dimension X**	
Maximum permitted level difference		± 250 mm		± 250 mm
Pull cylinder retracted	0	+ 1440 mm	0	+ 1140 mm
Nominal position of pull cylinder	1320 mm	0	1060 mm	0
Pull cylinder extended	2180 mm	- 810 mm	2180 mm	- 1040 mm





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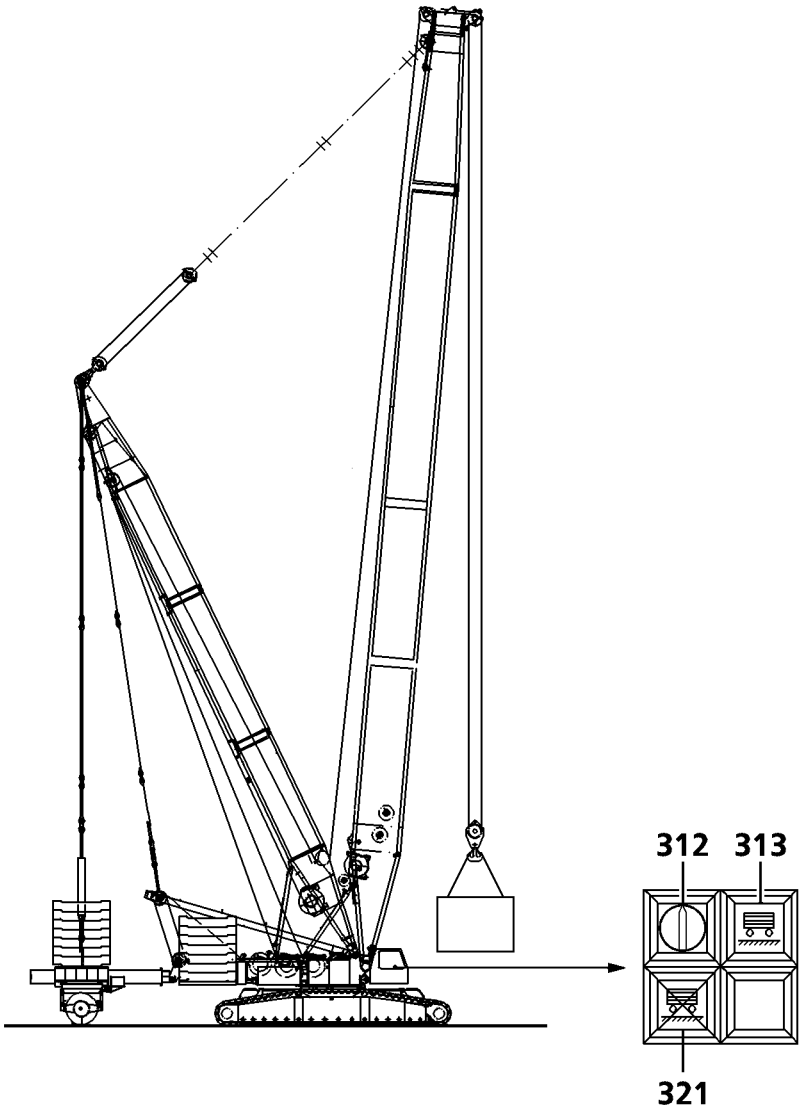
Ballast trailer radius R 13 m				
	With Quick Connection		Without Quick Connection	
Cylinder stroke	Dimension X	Cylinder stroke	Dimension X	
Maximum permitted level difference		± 250 mm		± 250 mm
Pull cylinder retracted	0	+ 1440 mm	0	+ 1160 mm
Nominal position of pull cylinder	1400 mm	0	1140 mm	0
Pull cylinder extended	2180 mm	- 760 mm	2180 mm	- 1010 mm

Ballast trailer radius R 15 m				
	With Quick Connection		Without Quick Connection	
Cylinder stroke	Dimension X	Cylinder stroke	Dimension X	
Maximum permitted level difference		± 250 mm		± 250 mm
Pull cylinder retracted	0	+ 1660 mm	0	+ 1390 mm
Nominal position of pull cylinder	1630 mm	0	1370 mm	0
Pull cylinder extended	2180 mm	- 550 mm	2180 mm	- 810 mm



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1.5.3 Key button “Ballast trailer lifted off”

When “crawler driving” and key switch **312** is not operated, i.e. “Ballast trailer not lifted off”, the slewing gear brake and hydraulic concentric running of the slewing gear are opened. When driving the “drive crawler” with lifted off ballast trailer (constant visual check), the key button **312** “Ballast trailer lifted off” must be turned on.

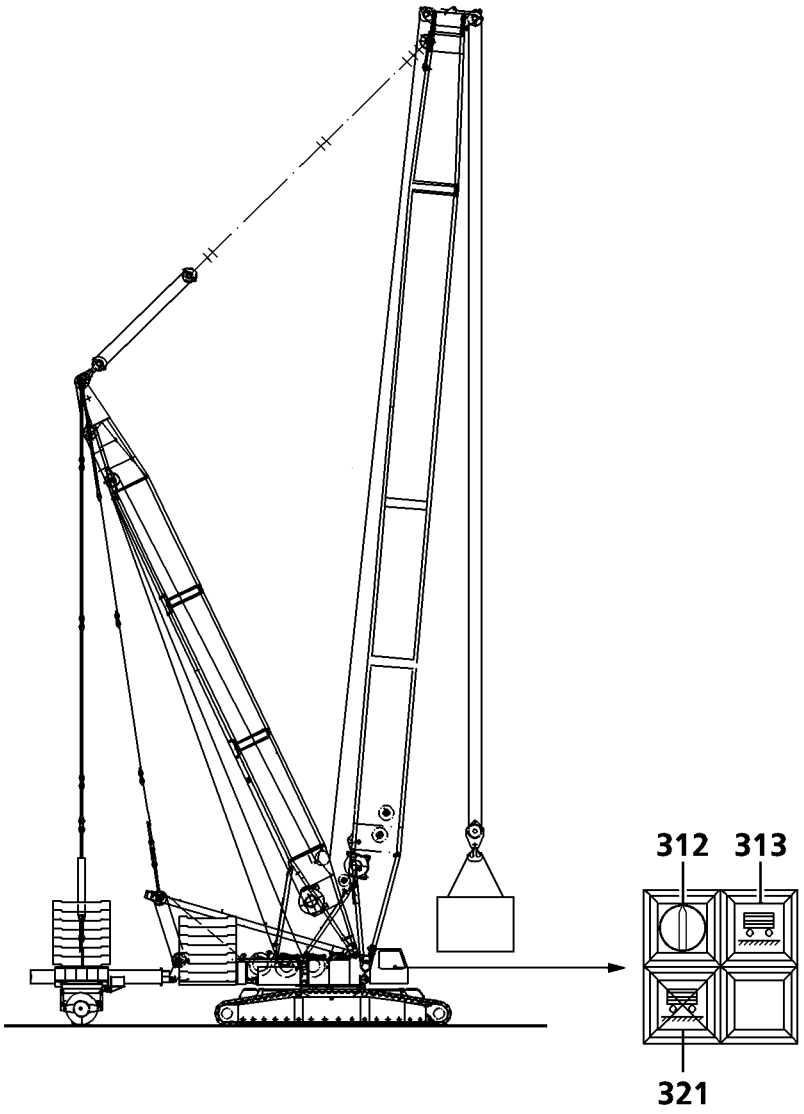
DANGER
Risk of accident
If the ballast trailer is lifted off the ground (constant visual check), there is the danger that the wind turns the turntable when “driving the crawler”; the key button **312** “Ballast trailer lifted off” must be therefore be turned on.

- ▶ Therefore, when “driving the crawler”, the slewing brake remains applied, but the hydraulic slewing gear coasting remains open. If, when “driving the crawler”, the ballast trailer scrapes on the ground or gets stuck on the ground, so that the turntable twists with the ballast trailer against the crawler track, the slewing brake can slip. The slewing gear will not be damaged. However, if the wheels of the ballast trailer are not in towing position, the ballast trailer or the crane will be damaged.

Note

- ▶ When the function “Ballast trailer lifted off” is turned on, the indicator light **313** blinks, it is possible to turn the crane superstructure or to move the crane even though the wheels of the ballast trailer are not on circular travel, towing or parallel travel.

If the key button **312** is turned to “Ballast trailer lifted off”, this is indicated by the blinking indicator light **313**, as well as the red flashing beacon on the crane cab. The ballast trailer symbol on monitor 1 indicates a suspended state.
To turn “Ballast trailer lifted off” off, the button **321** must be pressed. The indicator light **313** turns off. The LICCON monitor shows the derrick ballast symbol on the ground.



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1.5.4 Defined ballast trailer operation

The ballast trailer may not lifted off or set down during travel, it must be lifted off or set down before starting to travel.

1. The ballast trailer should be either

defined as set on the ground, key button **312** not actuated **“Ballast trailer not lifted off”** . This means that the ballast trailer and its residual load are resting on the ballast trailer tires. This residual load is large enough to prevent the wind from turning the crane superstructure even though the slewing gear brake opens when the crawler is actuated.

or

2. Defined as lifted off the ground, key button **312** actuated **“Ballast trailer lifted off”** . This means that the slewing gear brake does not open when crawler is being driven. The wind can therefore not turn the superstructure when the crawler is driven.

DANGER

Risk of accident!

▶ The ballast trailer must always be operated, as defined, either freely suspended or solidly on the ground. Operation of the ballast trailer in an undefined state is prohibited. There is an increased accident risk if the ballast trailer is not in a defined set down or raised state.

1.5.5 Non-defined ballast trailer operation

DANGER

Risk of accident!

▶ The ballast trailer must always be operated in a defined mode.

Ballasted ballast trailer is still standing on the ground with 1 t.

1. If key button **312** is not actuated **“Ballast trailer not lifted off”** . The slewing gear brake opens when driving the crawler. The wind can turn the superstructure and cause the load to swing.

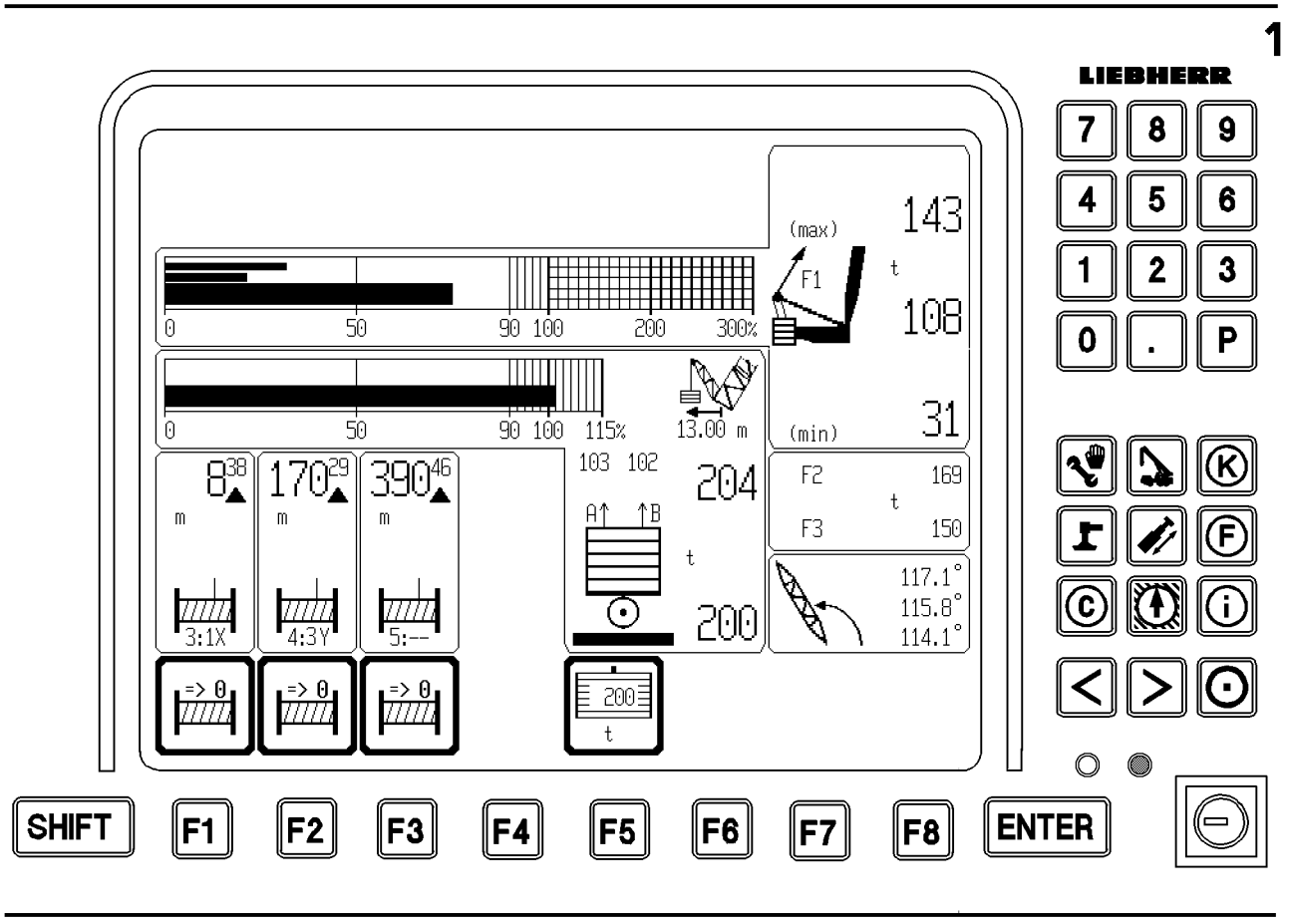
DANGER

Risk of accident!

▶ There is an increased danger of accidents due to collision.

or

2. If key button **312** is actuated “**Ballast trailer lifted off** ”. The slewing gear brake remains closed when driving the crawler. When cornering with the crawler, the ballast trailer tires or slewing gear brake will slip.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3:1X
4:3Y
5:--
103 102
204
A B
t
200
F2 169
t
F3 150
117.1°
115.8°
114.1°
=> 0
200
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B188681

1.6 LICCON overload protection

1.6.1 General

Make sure that the following prerequisites are met:

– the required derrick ballast according the load chart is placed and exactly entered and confirmed in the LICCON,
– the derrick is in operating position.

Pre-adjustments

▶ Set and confirm the load chart for the upcoming crane operation on the LICCON monitor.

Note

▶ Set the weight of the actual derrick ballast on the LICCON monitor.
▶ Set the amount of actual reeving on the LICCON monitor.

To set the derrick ballast - see chapter 4.03.

DANGER

Risk of accident!

The set derrick ballast must match the actually installed derrick ballast weight.

▶ Incorrect ballast weight entry can lead to dangerous operating situations.

▶ Check the set derrick ballast against the actual derrick ballast!

Crane operation

For crane operation with derrick ballast, the data in chapter 4.02 must be observed.

DANGER

Risk of accident!

There may be no persons or obstacles within the turning range of the derrick ballast.

During the turn, a guide must monitor the boom, derrick boom and derrick ballast for any danger of collision.

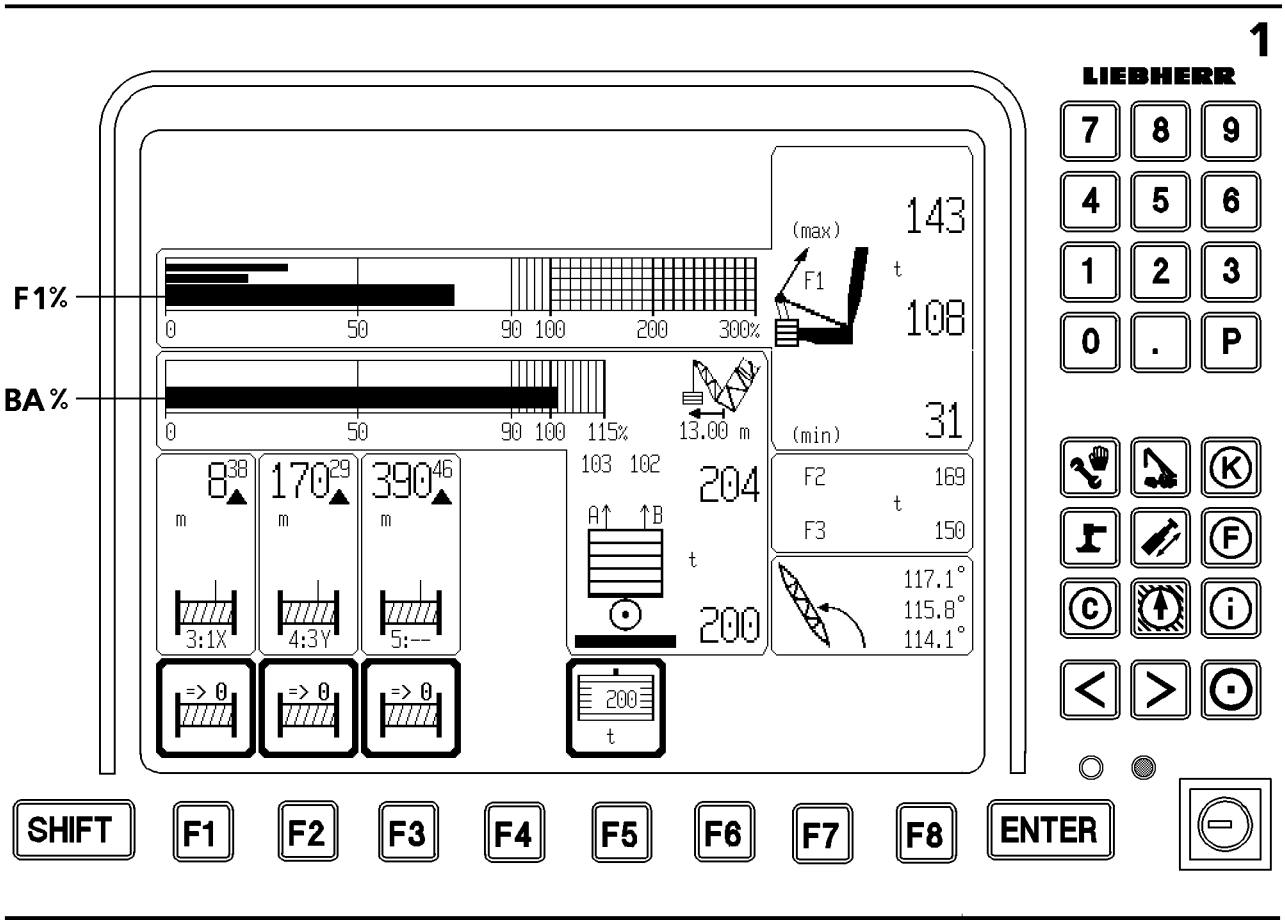
When turning with a load and suspended derrick ballast, the turning movement must be initiated or slowed down extremely sensitively.

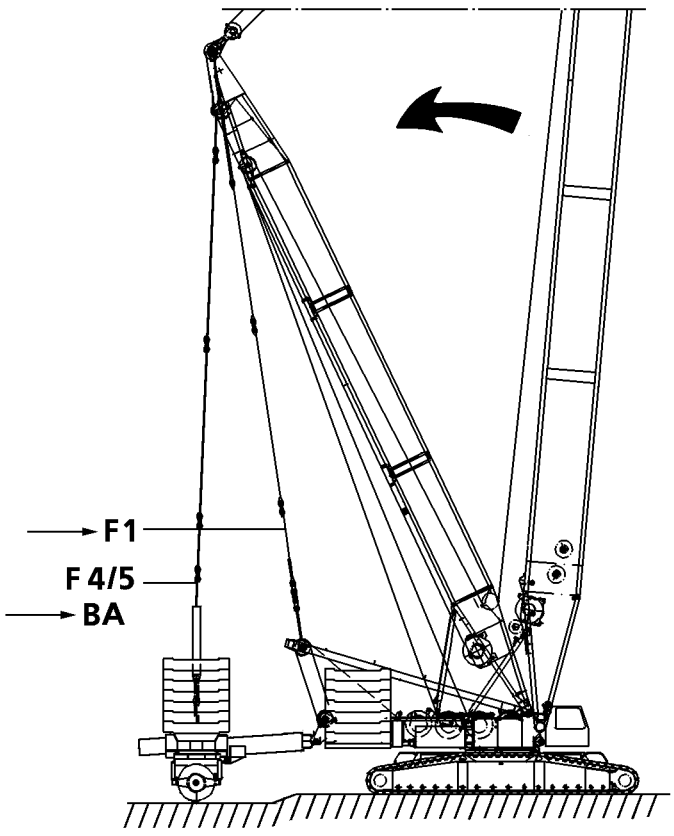
▶ If the turning movement is initiated or slowed down jerkily, it can cause the load or the suspended derrick ballast to swing.
▶ This can cause the boom to break or the crane to topple over.

Note

▶ See section “Lifting and lowering with pull cylinders” and “Differential force monitoring for ballast guying”.

▶ Monitor the extension condition of the pull cylinders and the incline of the ballast trailer.


1
LIEBHERR
F1%
BA%
7
8
9
4
5
6
1
2
3
0
.
P
(max)
143
t
F1
108
(min)
31
F2
169
t
F3
150
117.1°
115.8°
114.1°
204
200
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


F1
F 4/5
BA

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1.6.2 Safety guidelines

Note

- The test points must be checked for function before crane operation. The crane must be horizontally aligned on the set up location. The weight of the load to be lifted must be known. The contact area of the derrick ballast trailer should not be no more than maximum 0.25 m above or 0.25 m below the level of the crane base. The placement surface on which the suspended derrick ballast is placed after completion of the load lift must be level, horizontal and able to safely support the weight.

CAUTION

Risk of accident!

- Before setting down the load and the suspended derrick ballast, the crane operator must make sure that a safe placement is ensured.

Note

- There may be no obstacles within the slewing range of the crane, the derrick ballast and the load. When the derrick ballast is raised, it must be observed by a guide or the crane operator. When taking on the load, diagonal pull must be avoided, which means the derrick ballast, the centre of rotation of the turntable and the load must be on one line! To ensure this, operate the pull cylinder to lift and set down the derrick ballast before adding any ballast plates.

DANGER

Risk of accident!

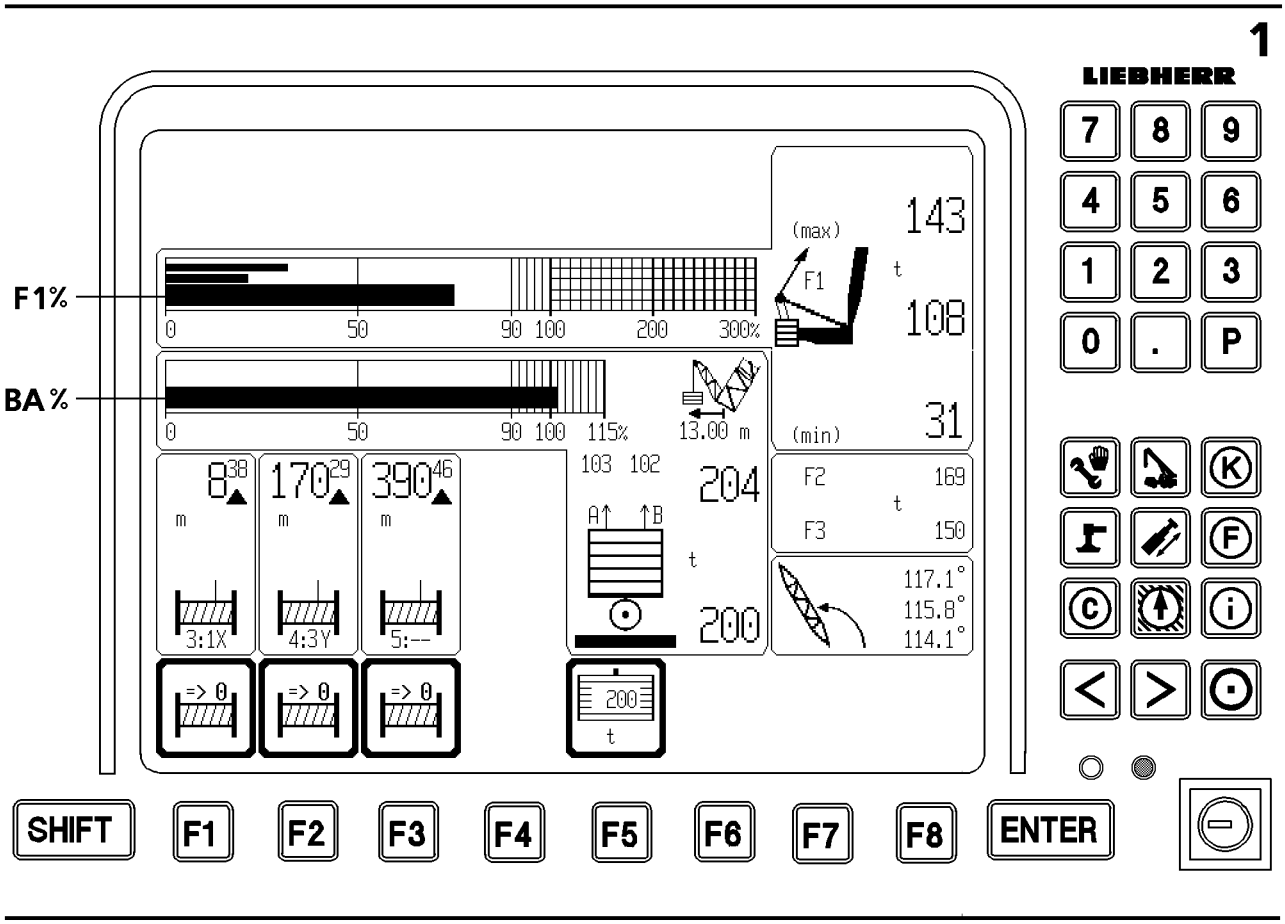
- If this is not observed, there is a danger of tipping over when lifting with placed ballast plates and it can cause the crane to topple over.

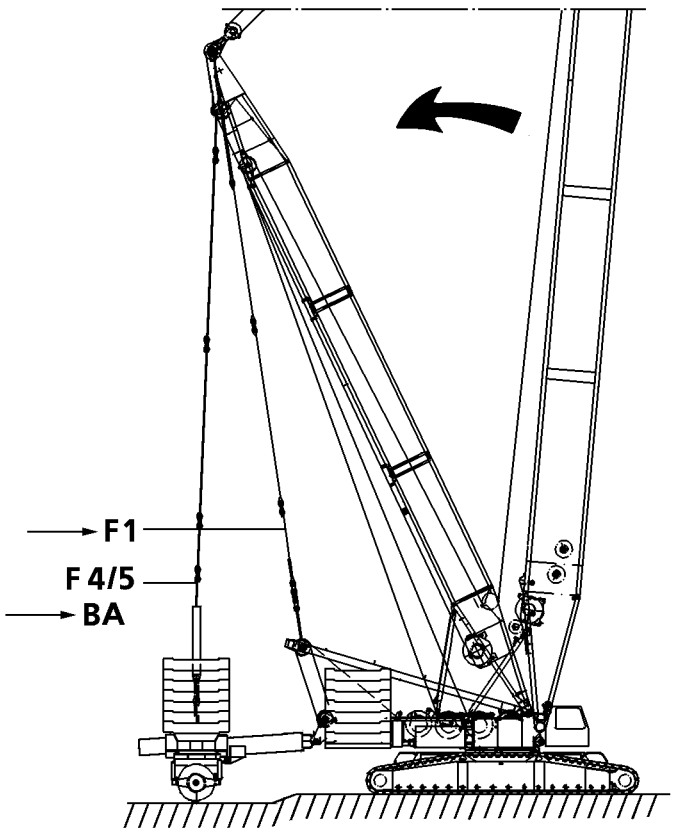
When lifting the load, the guying between the derrick ballast and derrick head must be relieved to the point where the actual force at test point 1 - actual force is higher than the F1-minimum force (F1-min).

DANGER

Risk of accident!

- The guying between the SA frame and the derrick head, test point 1, may never be without tension.
- This could lead to uncontrolled movements of the boom system and therefore cause an accident.


1
LIEBHERR
F1%
BA%
0
50
90 100
200
300%
115%
(max)
F1
143
t
108
(min)
31
13.00 m
103 102
204
A
B
t
200
F2
169
F3
150
117.1°
115.8°
114.1°
8 38
170 29
390 46
m
3:1X
4:3Y
5:--
=> 0
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


F1
F 4/5
BA

B188680

1.6.3 Determination of forces in operating mode with derrick ballast

In all operating modes with derrick ballast, the load is divided between the guy rods from the derrick head to the SA-frame (F1) and the derrick ballast (F4/5).

Note

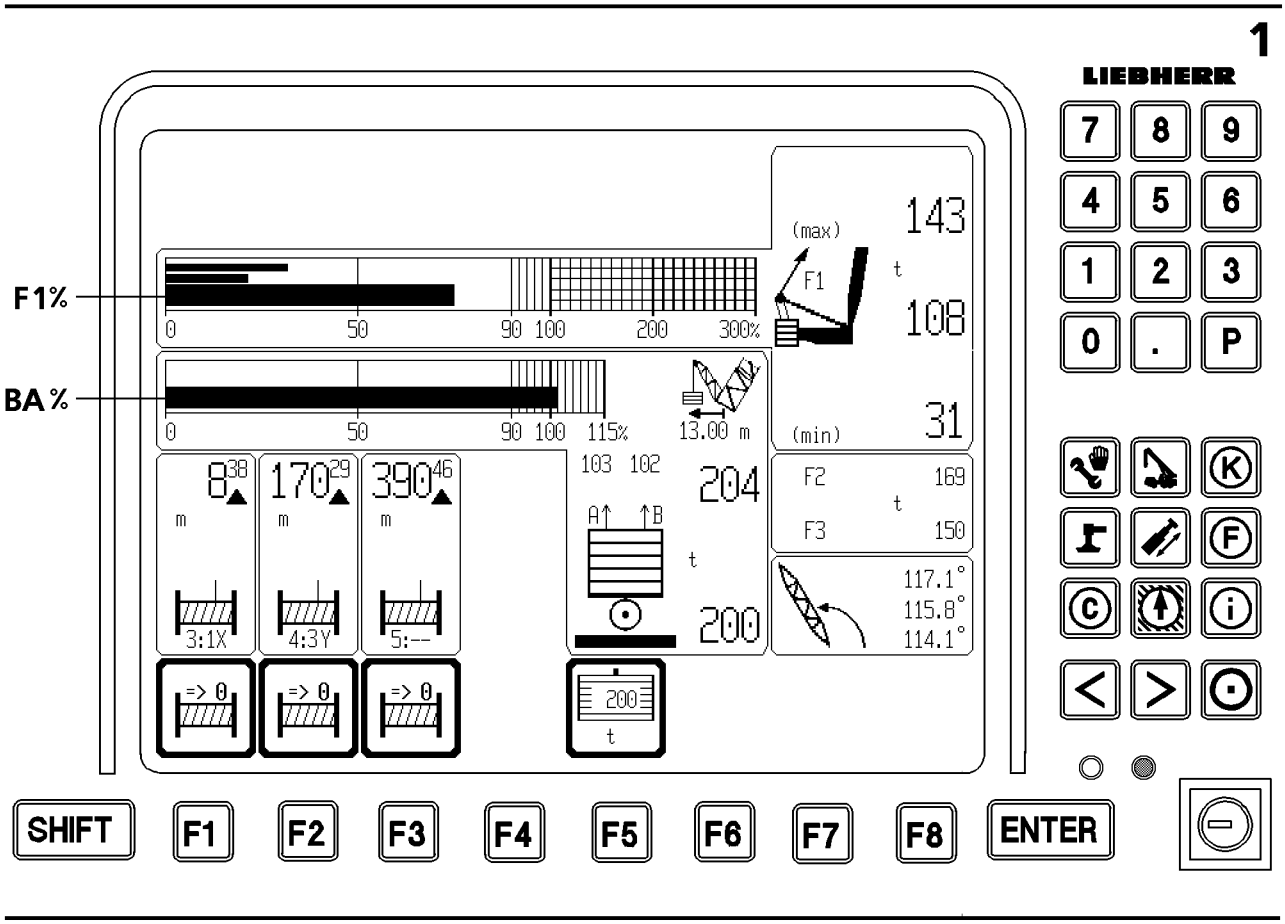
▶ For a detailed description, see also chapter 4.02.

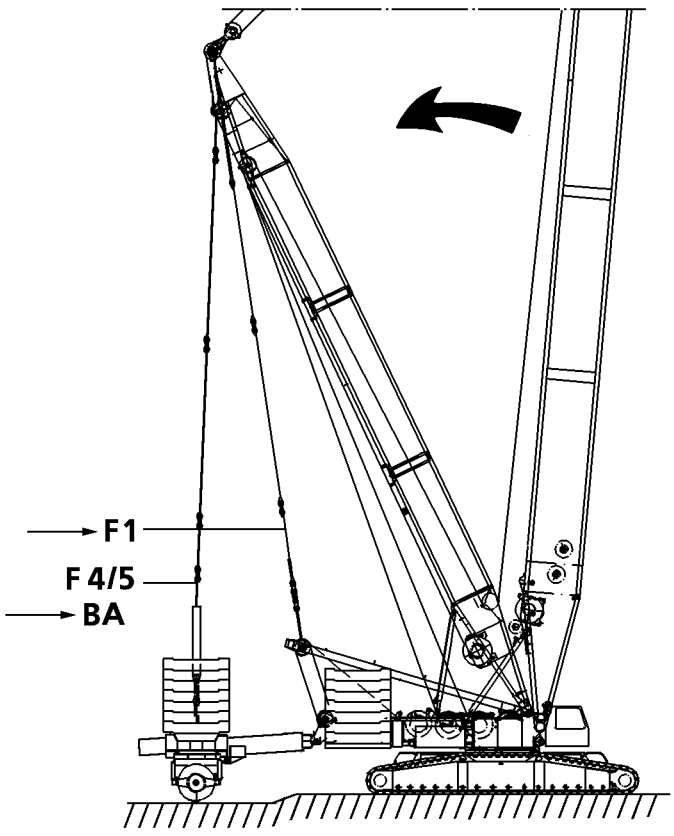
Force F1 (test point 1) between guying SA-frame - Derrick end section

The force F1 (test point 1) is determined in the guy rods from the SA-frame to the derrick head by 2 force test boxes and is shown on the LICCON as total force of the guying.
From the operating force F1 and the force F1-operational maximum force results the F1 utilization. This is indicated by a bar display (F1 %) on the LICCON.

Force F4/5 (test point 4/5) guying derrick ballast - derrick head

The forces F4/5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.
The actual forces in the guy rods (A = left and B = right) are calculated from three pressure sensors installed on the pull cylinders and displayed on the LICCON as individual forces.
The pulled ballast is calculated from the forces of the individual guyings, which means the part of the ballast pulled up by the guying. The remaining part is on the ground. The derrick ballast utilization results from the pulled ballast and the placed ballast. This is indicated on the LICCON by means of a utilization bar (BA %).


1
LIEBHERR
F1%
BA%
7 8 9
4 5 6
1 2 3
0 . P
(max)
143
t
F1
108
(min)
31
F2 169
t
F3 150
117.1°
115.8°
114.1°
204
200
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


F1
F 4/5
BA

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Monitoring of minimum force F1

Note

▶ Also refer to the graphic illustration and description of the shut-off functions in paragraph “Shutting off during crane operation with derrick ballast”.

If more than 50 % of the entered derrick ballast is pulled (ballast utilization bar > 50 %), and the force falls below the minimum force F1 min (test point 1), all load moment increasing crane movements are turned off.

DANGER

Risk of accident!

▶ It is prohibited to let the minimum force 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, in case of loose tension from test point 1 (F1) and derrick ballast on the ground, the derrick ballast can suddenly lift off the ground due to the increased load moment and the boom system suddenly moves forward! This will cause the load to swing strongly, which in turn can damage the boom and crane.

If more than 90 % of the entered derrick ballast is pulled (ballast utilization bar > 90 %), and the force falls below the minimum force F1 min (test point 1), all load moment increasing / decreasing crane movements are turned off. All hoist gear movements are also turned “off”.

DANGER

Risk of accident!

It is prohibited to let the minimum force 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 and the load torque is increased when the guying is slack at test point 1 (F1) and the derrick ballast is suspended, the derrick ballast can suddenly drop to the ground, causing the boom system to suddenly lurch backwards! Thereby the relapse cylinders can be pressed on block and be overloaded. The relapse cylinders on the boom and derrick may become damaged.

▶ This also causes significant oscillation of the load, which can damage the boom and the crane.

Note

▶ By actuating the assembly key switch, the test point 1 - minimum force F1 min. is reduced by a few tons, so that one can back out again by reverse movement, if F1 min- shut off was previously triggered.

▶ This is the only exception on the crane, where, after a shut off, a load moment increasing movement can be continued with the assembly key switch.

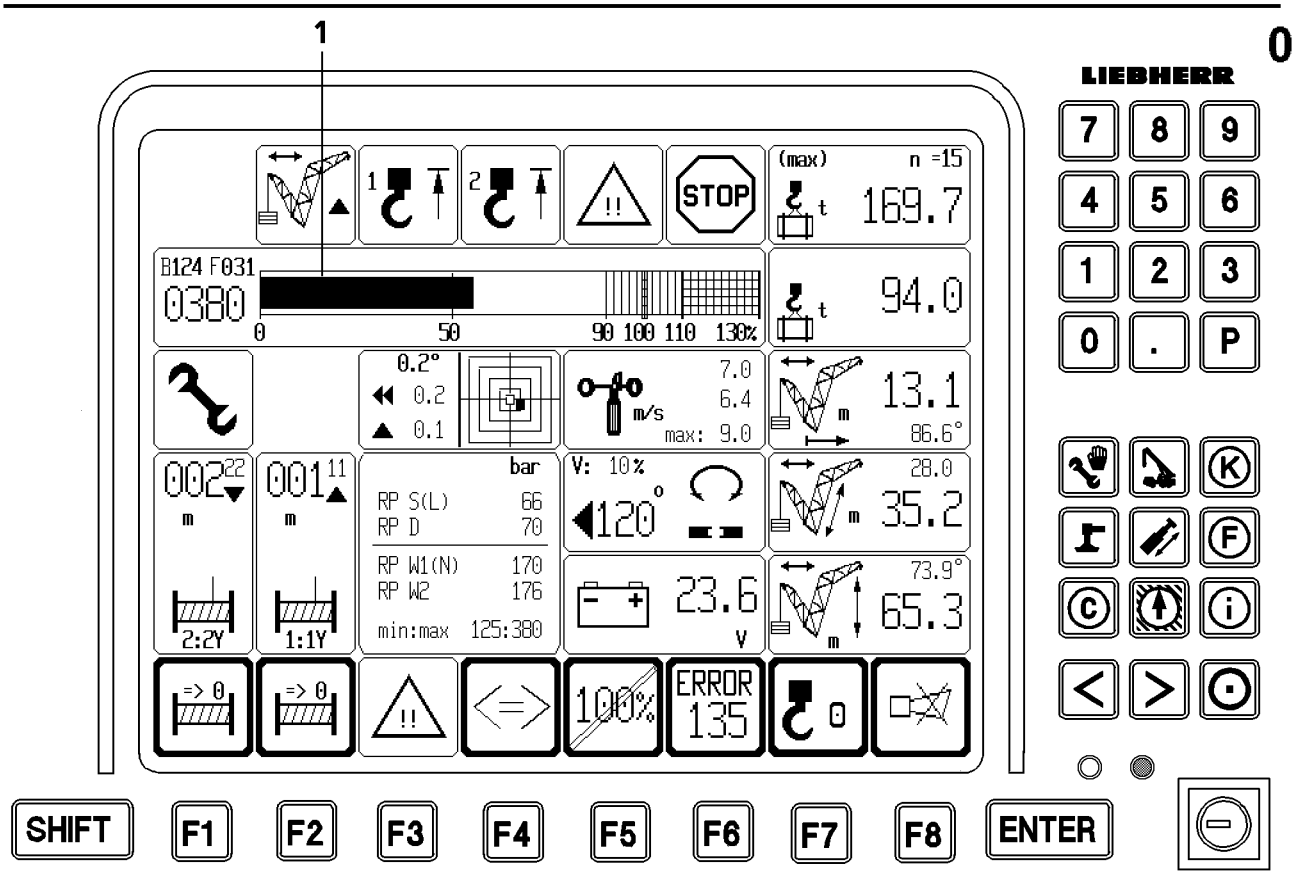
DANGER

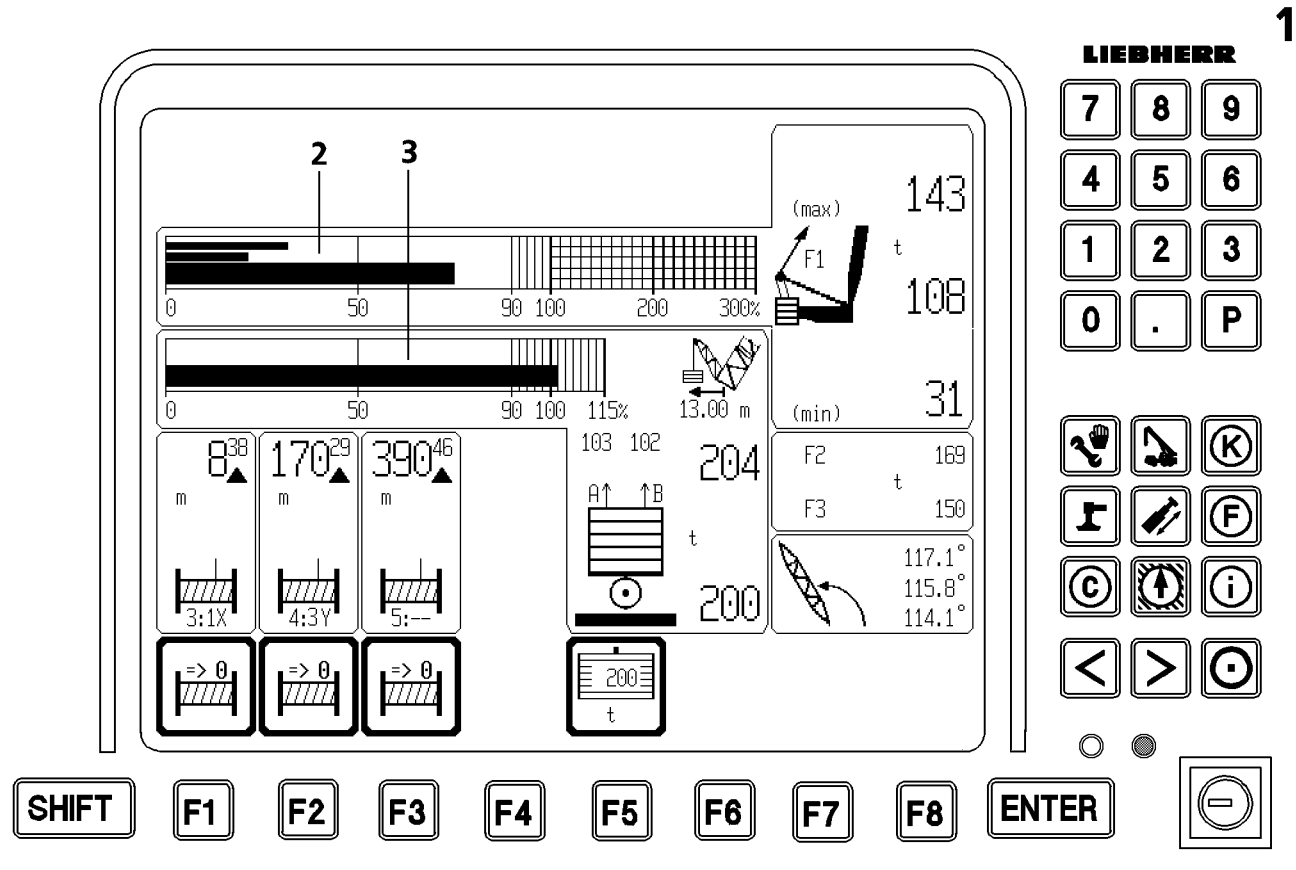
Risk of accident!

If overload protection is bypassed, there is no further protection against overloading the crane.

▶ There is an increased danger of accidents!

After a shut off by F1 min, the force F1 must be increased by a movement. If the derrick ballast is suspended, perform a luff down movement; if the derrick ballast is already on the ground, remove some of the ballast.


0
1
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
(max) n =15
169.7
94.0
13.1
86.6°
35.2
65.3
23.6
V
ERROR
135
100%
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


1
LIEBHERR
2
3
7 8 9
4 5 6
1 2 3
0 . P
(max)
143
F1
108
(min)
31
13.00 m
204
200
F2 169
F3 150
117.1°
115.8°
114.1°
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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1.6.4 Overload monitoring in operating mode with derrick ballast

Note

- ▶ All terms in inverted commas (" ") are explained in chapter 4.02.
- ▶ See also the graphic illustration in section “Shut offs during crane operation 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 by the LMB overload protection.
2.) Monitoring of test point 1 - operational maximum force by derrick ballast overload protection.

The LMB overload protection

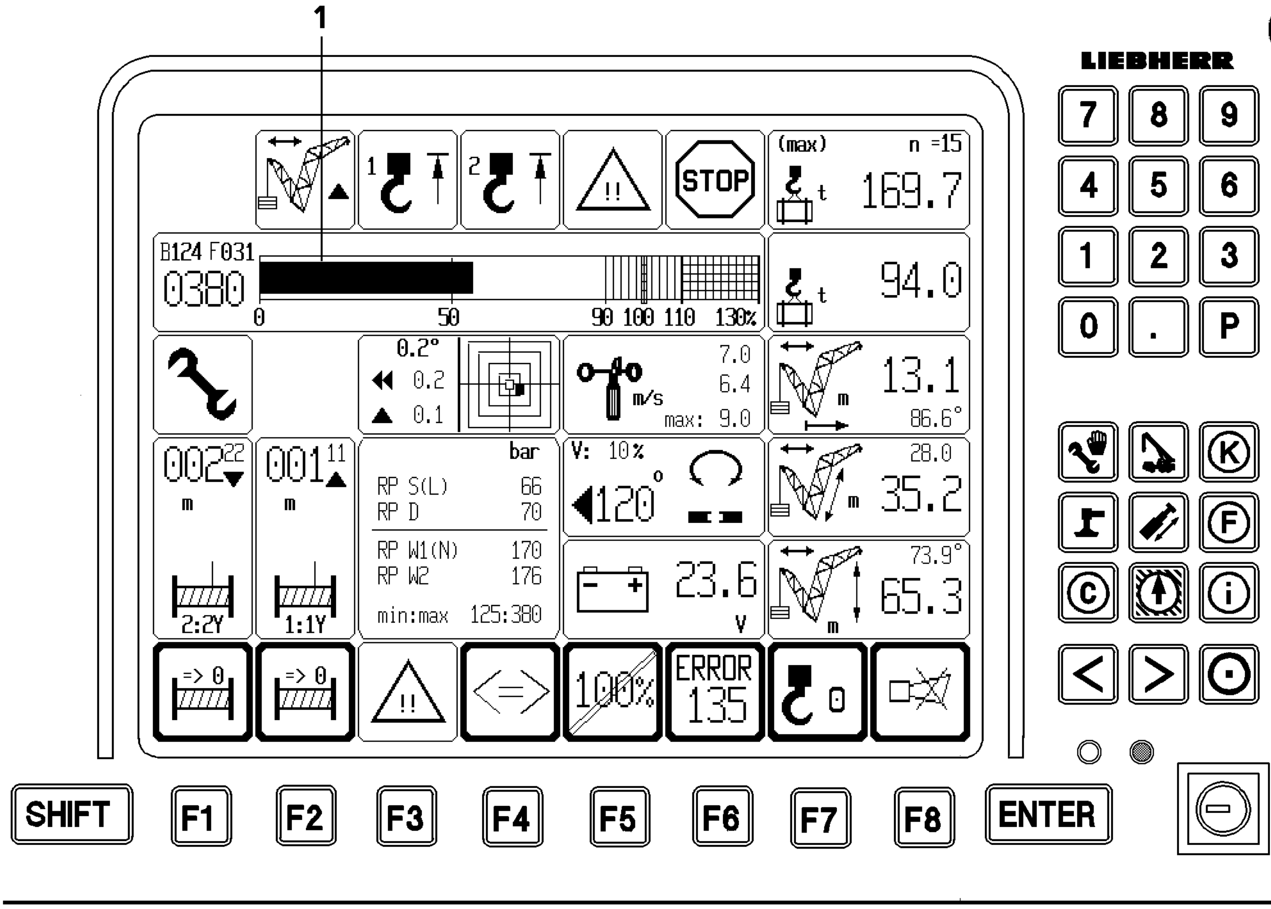
It monitors the “maximum load according to load chart and reeving”.
In operating modes with derrick ballast, this is the maximum load of the current crane condition with optimum derrick ballast. It is shown on monitor 0. The current utilization of the crane with optimum derrick ballast results from the load utilization bar **1** on monitor 0.
At 90 % on the load utilization bar, a advance warning with caution symbol and “SHORT HORN” is issued on monitor 0.
At 100 % on the load utilization bar, the shut off of all load moment increasing movements with the stop symbol and the acoustical warning “HORN” occurs on monitor 0.
It may then be possible to further increase the “maximum load for the current crane condition”.

Monitoring of test point 1-operational maximum force (= F1 max)

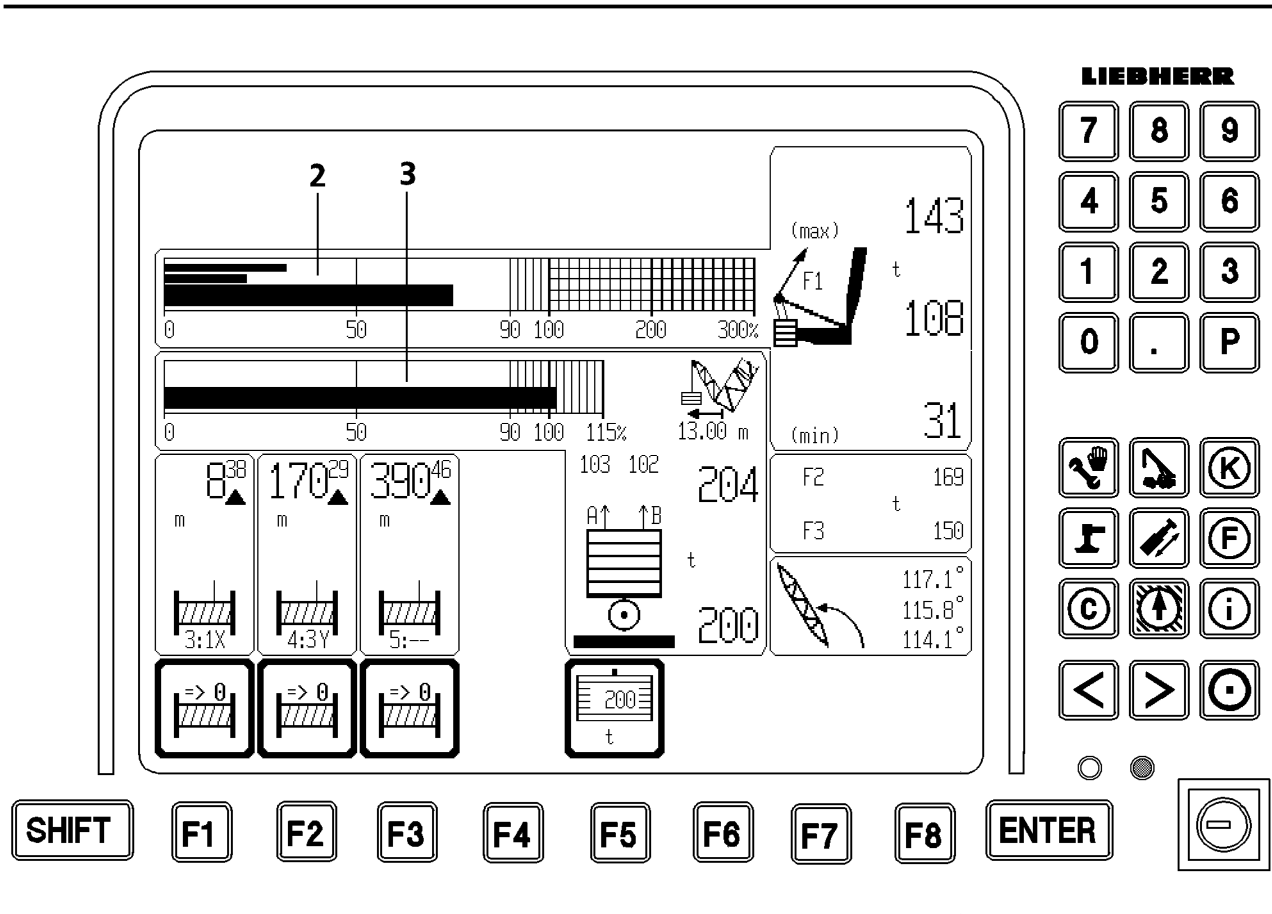
It is shown on monitor 1.
If the F1 max- utilization **2** reaches 90 %, an advance warning is given in the form of a caution icon and a “SHORT HORN” on monitor 1.
At 100 % F1max utilization, all load moment increasing movements are shut off. A stop icon and acoustic warning “HORN” are signalled on monitor 1.
When 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:

- Lifting the derrick ballast if it is not already suspended.
- Telescoping out the derrick ballast if the added ballast is still lower than the optimum ballast.
- Increasing the derrick ballast by adding additional ballast plates if the placed ballast is still smaller than the optimum ballast.

0


1
LIEBHERR
(max)
n =15
169.7
94.0
B124 F031
0380
0
50
90 100 110 130%
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
86.6°
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
V: 10%
120°
28.0
35.2
23.6
V
73.9°
65.3
2:2Y
1:1Y
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

1


2
3
LIEBHERR
(max)
143
F1
t
108
(min)
31
0
50
90 100
200
300%
115%
13.00 m
8
170
390
m
103 102
204
A
B
t
200
F2 169
F3 150
117.1°
115.8°
114.1°
3:1X
4:3Y
5:--
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B188682

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** 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).

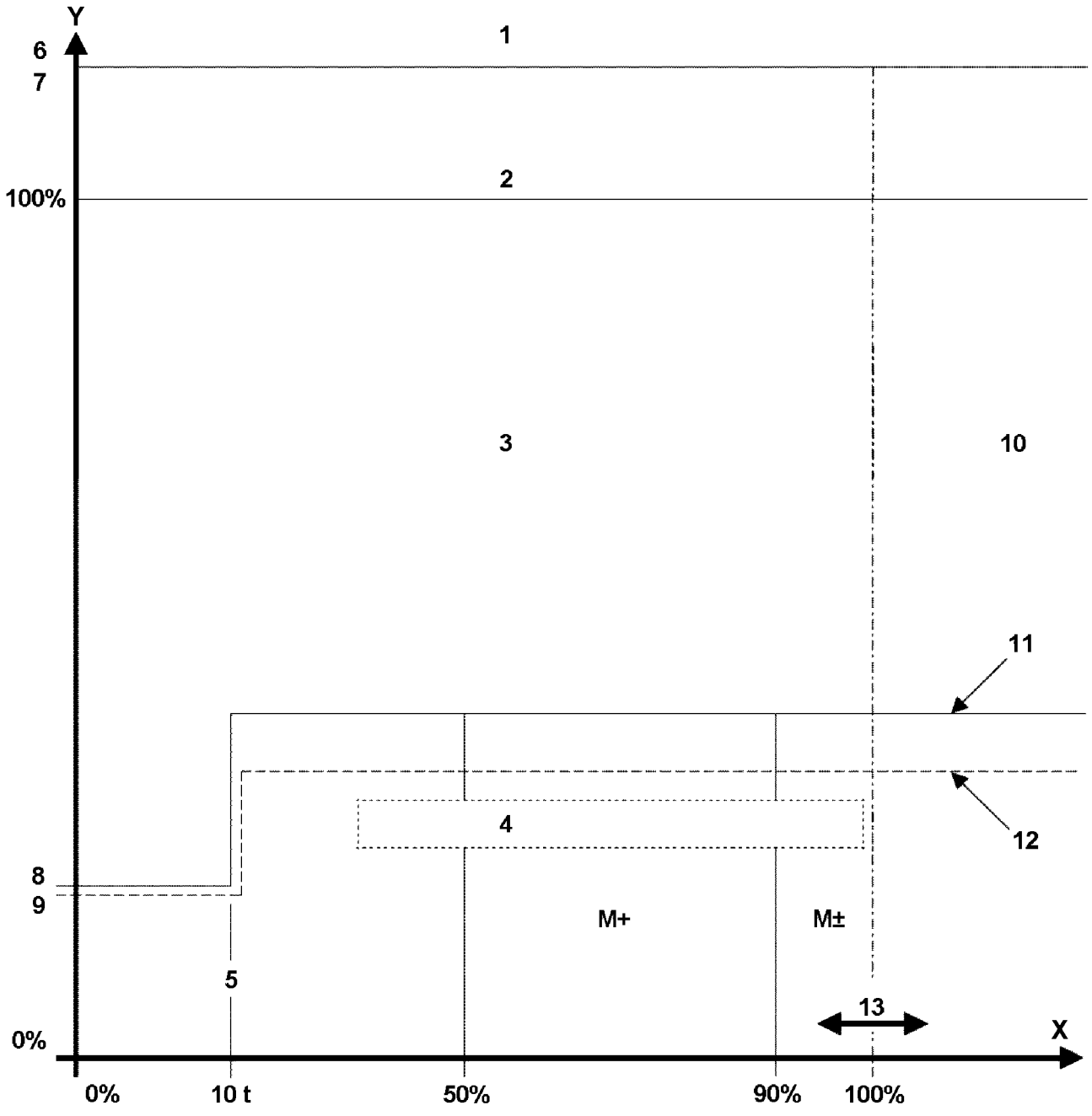
The “maximum load according to the load chart and the reeving” (100 % limit of load utilization bar) and the maximum load according to F1 max-operation (100 % limit of the F1 utilization bar) can be bypassed by the following measures:

1.) Holding the key button D_0 on monitor 0 in position “right touching ” (after corresponding preselection with function key $F5_0$) bypasses only the maximum load according to the load chart and reeving (see chapter 4.02).

2.) Assembly key button on instrument panel.
This bypasses the maximum load according to the load chart and reeving, the test point 1-operation - maximum force (= F1max-operation) and a number of other limit values and limit switches.
Test point 1-assembly-maximum force (= F1max-assembly) cannot be bypassed (see chapter 4.04).

DANGER
Risk of accident!
When the assembly key button is turned on, only load moment decreasing crane movements up to a permissible operating and load range can be carried out.
When the permissible load range is reached, the assembly key button must be turned off again immediately.
When the assembly key button is turned on, the load moment limiter is no longer effective.
▶ Danger of accidents!

The movement “Ballast up” or “Ballast down” requires utmost attention. When 90 % of the placed ballast is pulled, the warning “upcoming lift off of derrick ballast” is issued. The warning is indicated by a “Short horn” and blinking “Pulled ballast” value. The warning is turned off when the operator confirms that he has recognized the warning by pressing the function key $F8_1$ (=horn off on monitor 1).

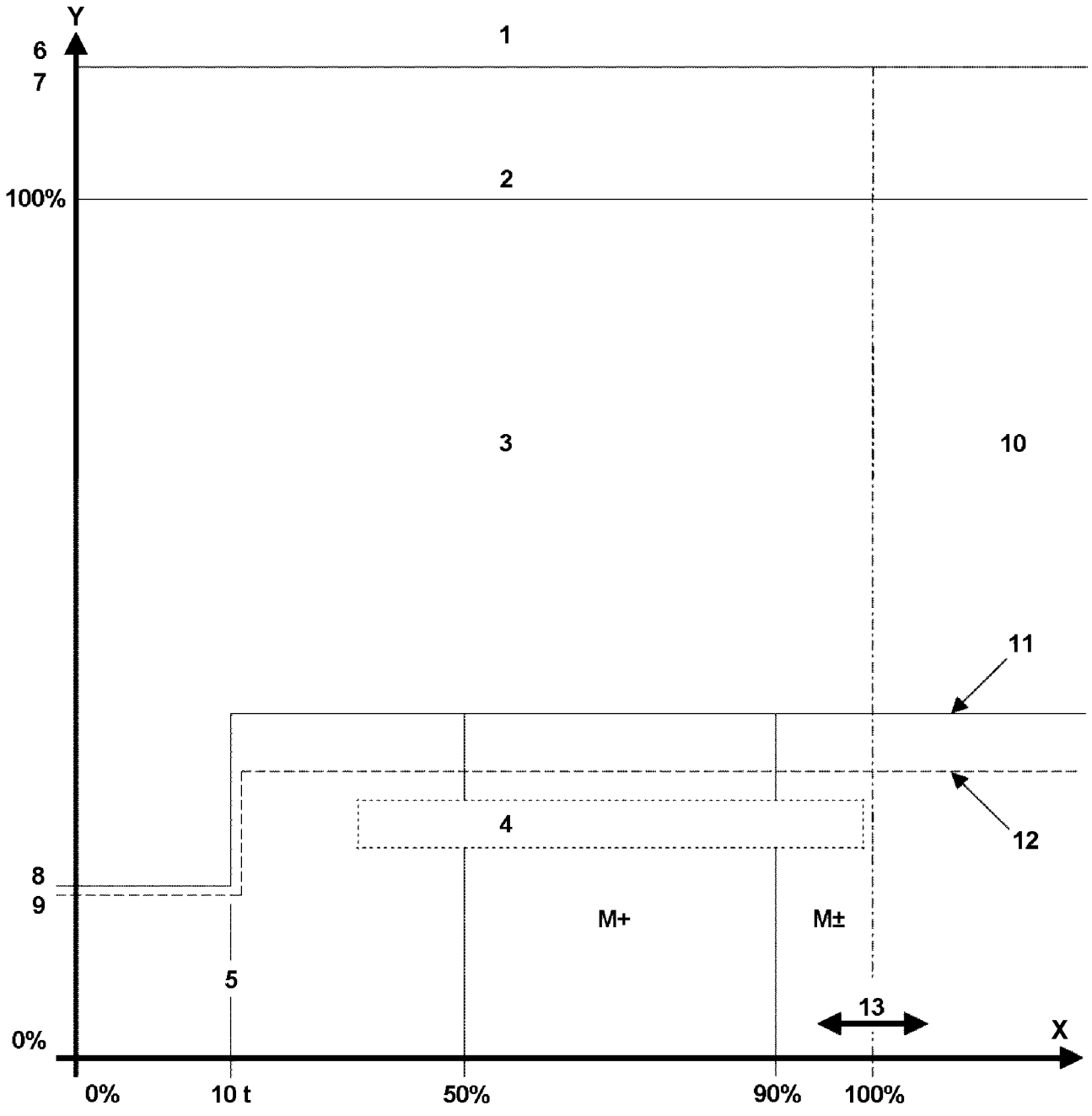


B104652

1.6.5 Shut offs during crane operation with derrick ballast

Graphic illustration of various ranges of utilization on test point 1 (F1 % utilization bar) and utilization of derrick ballast (Ballast utilization bar, BA %).

Position	Detail
X	Derrick ballast utilization (BA %) = Ballast bar on crane operating screen 1
Y	F1-utilization (%) = F1-bar on crane operating screen 1 (F1 %)
1	F1-assembly-max-STOP = shut-offs as for F1-operational-max-STOP, cannot be bypassed
2	F1-operation-max-STOP = All crane movements that increase load torque (“Lift load” , “Luff down boom” , “Luff up boom” , “Lower ballast” , “Telescope in ballast”) are turned off. These shut offs can be bypassed using the assembly key button. The shut off “Luff up boom” can also be bypassed with the button “Luff up at overload” .
3	Operating range
4	F1 min-STOP
5	Intake gear (EZW) down = The crane movement “Spool out intake gear (winch 4)” is shut off, at the same time, “Telescope ballast out” is shut off.
6	F1 max-assembly
7	F1 max-operation
8	F1 min = The derrick ballast overload protection protects the crane against sudden lift off of the derrick ballast (crane rocks forward) and against sudden set down of the derrick ballast (crane rocks backwards). This is ensured by the monitoring function for measuring point 1 - Minimum force. If the specified limit F1 min is approached, an advance warning is issued. When this limit is reached or exceeded, an overload warning is triggered and the dangerous crane movements are shut off, see M + and M ±.
9	F1 min-operation
10	Derrick ballast suspended
11	Can be bypassed with assembly key button
12	Cannot be bypassed



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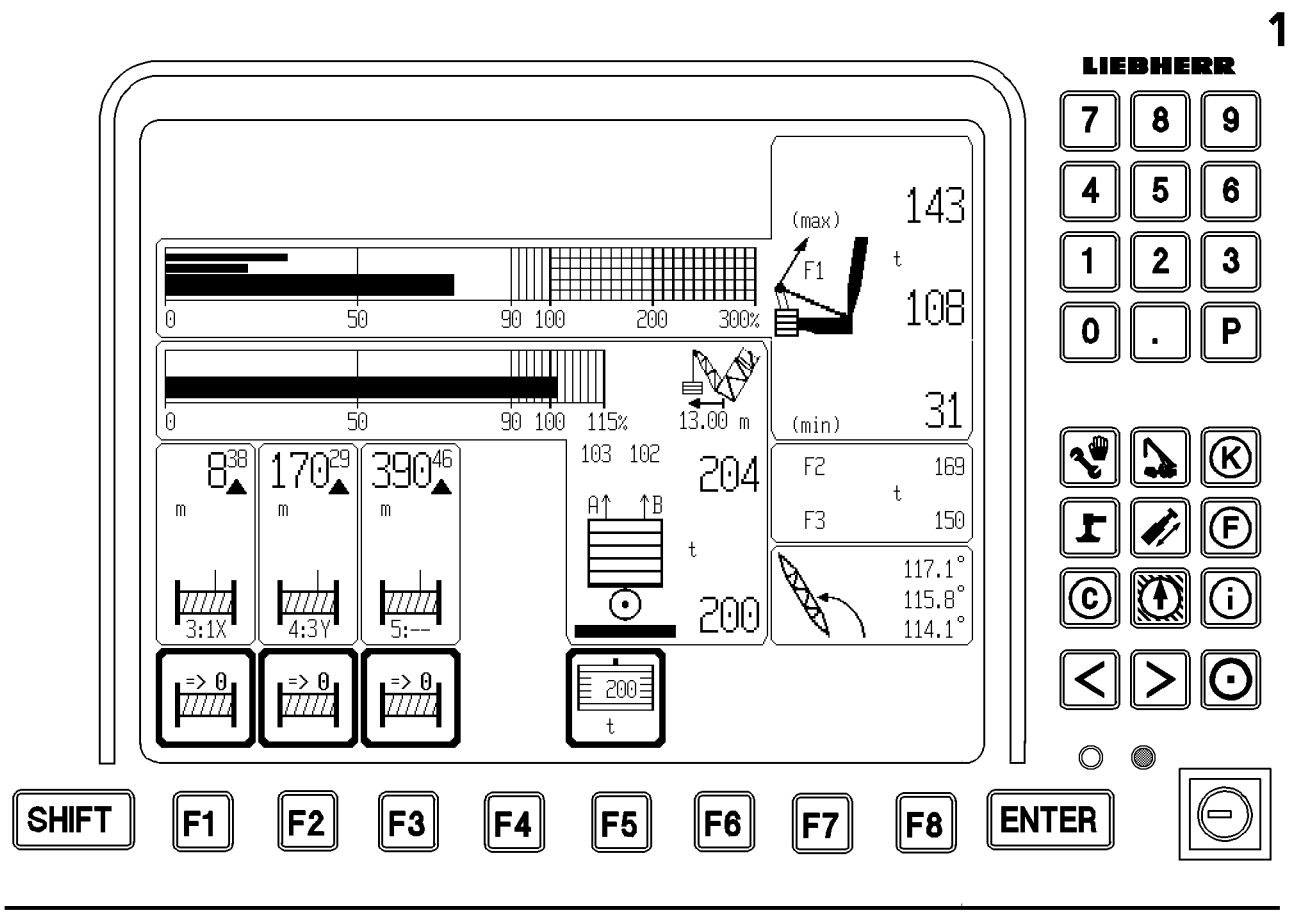
Position	Detail
13	Dangerous transition
M +	= The following load moment increasing crane movements are shut off: “Lift load” , “Luff down main boom / jib” , “Luff up main boom / jib” , “Spool out intake gear” and “Telescope ballast in and out” . The shut offs cannot be bypassed.
M ±	= The following load moment increasing movements are shut off: “Lift load” , “Lower load” , “Luff up boom” , “Luff down boom” , “Spool out intake gear” , “Spool up intake gear” , “Telescope ballast in and out” . Only “Lower ballast” or “Unload ballast” are still possible.

Note

▶ During crane operation, observe the guidelines in the crane operating manual and the shut offs on the shut off diagram in the circuit diagram.


1
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
143
(max)
F1
t
108
0 50 90 100 200 300%
31
(min)
0 50 90 100 115%
13.00 m
8 38
170 29
390 46
m
3:1X
4:3Y
5:--
103 102
204
A B
t
200
F2 169
t
F3 150
117.1°
115.8°
114.1°
=> 0
200
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B188681

1.6.6 Accessing the load charts

For the:

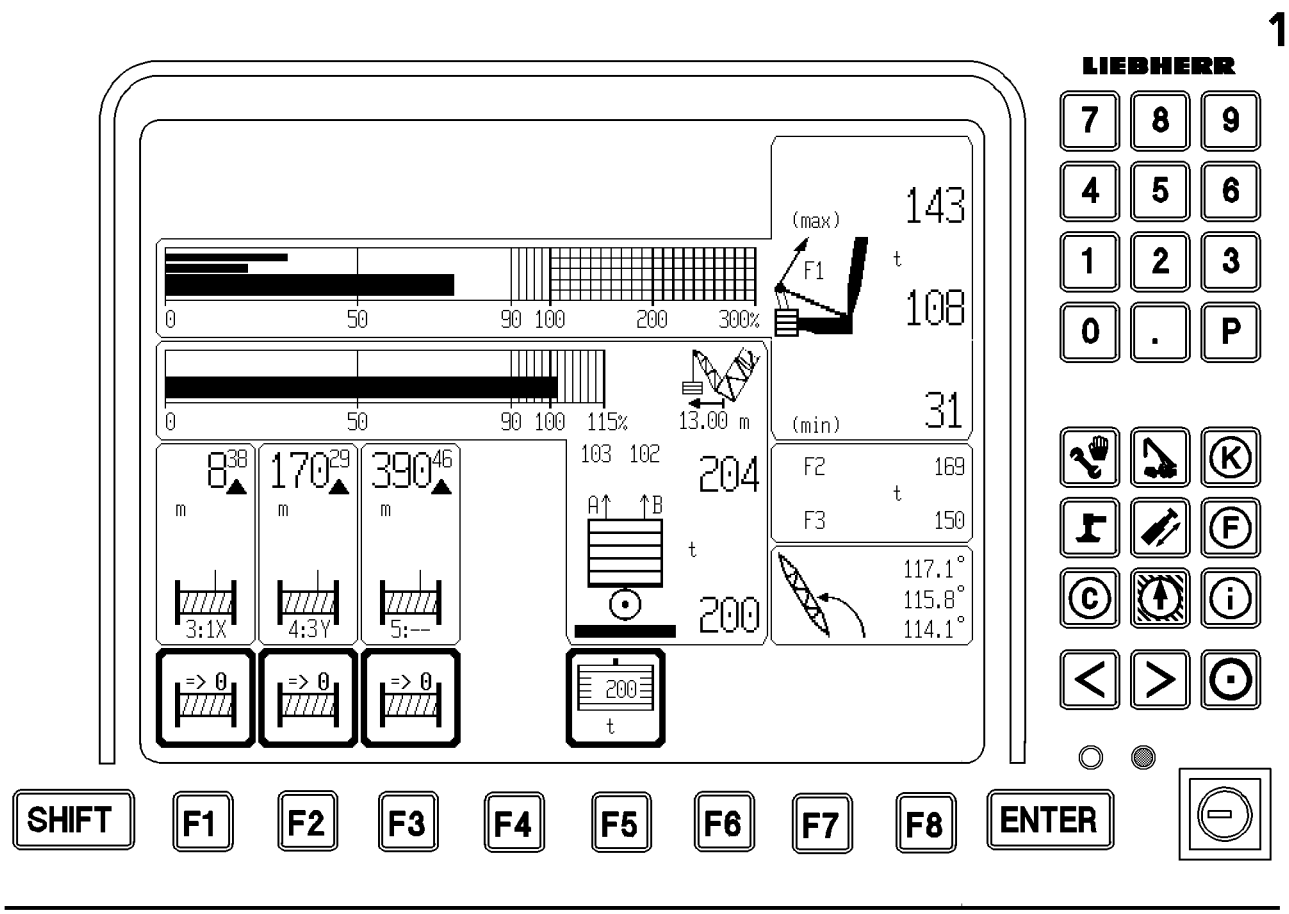
– main boom angle interpolation;
– derrick ballast radius interpolation;
– combination of main boom angle interpolation and derrick ballast radius interpolation.

See chapter 4.02.

1.6.7 Checking the length sensor value on the ballast trailer

When telescoping the derrick ballast in and out, the derrick ballast radius display must be monitored carefully.
When telescoping the derrick ballast, the display must change according to the movement. This allows the crane operator to immediately notice if the length sensor rope drum jams when spooling in or out.
When the derrick ballast is extended or retracted all the way, the derrick ballast display must show almost the exact end position, for example Radius = 11 m or 15 m.
The crane operator may not rely blindly on the derrick ballast radius measurement, but he must think for himself and check, if the measurement is still working correctly.

DANGER
Risk of accident!
If the derrick ballast radius is measured incorrectly, the false radius value will result in the calculated maximum lifted load and Test point 1-Operation-max-force being too high.
▶ The crane will be overloaded although this is not apparent.


1
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
143
(max)
F1
t
108
0 50 90 100 200 300%
31
(min)
0 50 90 100 115%
13.00 m
8 38
170 29
390 46
m
3:1X
4:3Y
5:--
103 102
204
A B
t
200
F2 169
t
F3 150
117.1°
115.8°
114.1°
=> 0
200
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B188681

1.6.8 Difference force monitoring of ballast guying

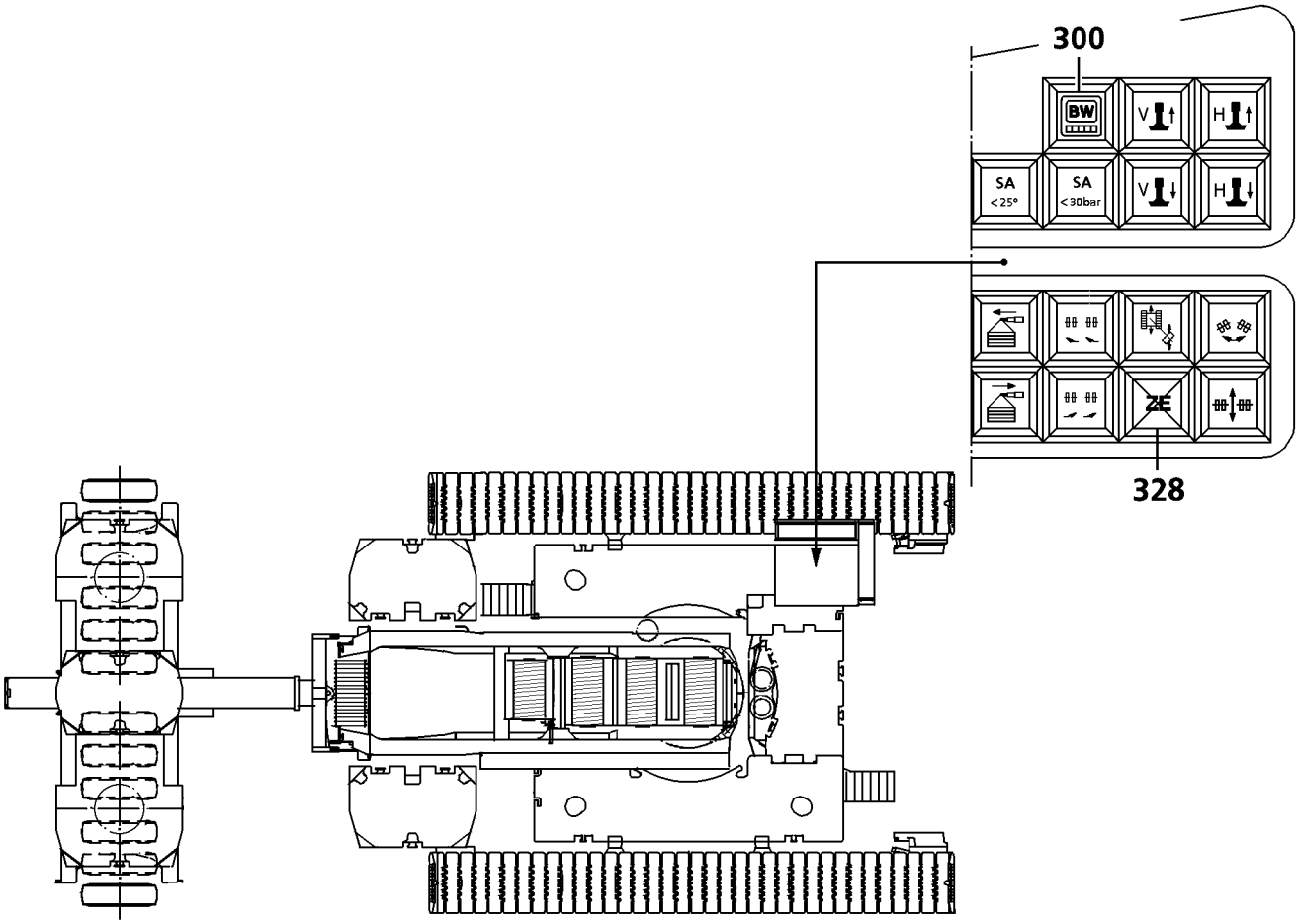
In operating modes with derrick ballast, the difference of the forces of derrick ballast guyings A and B, monitor 1, are monitored.

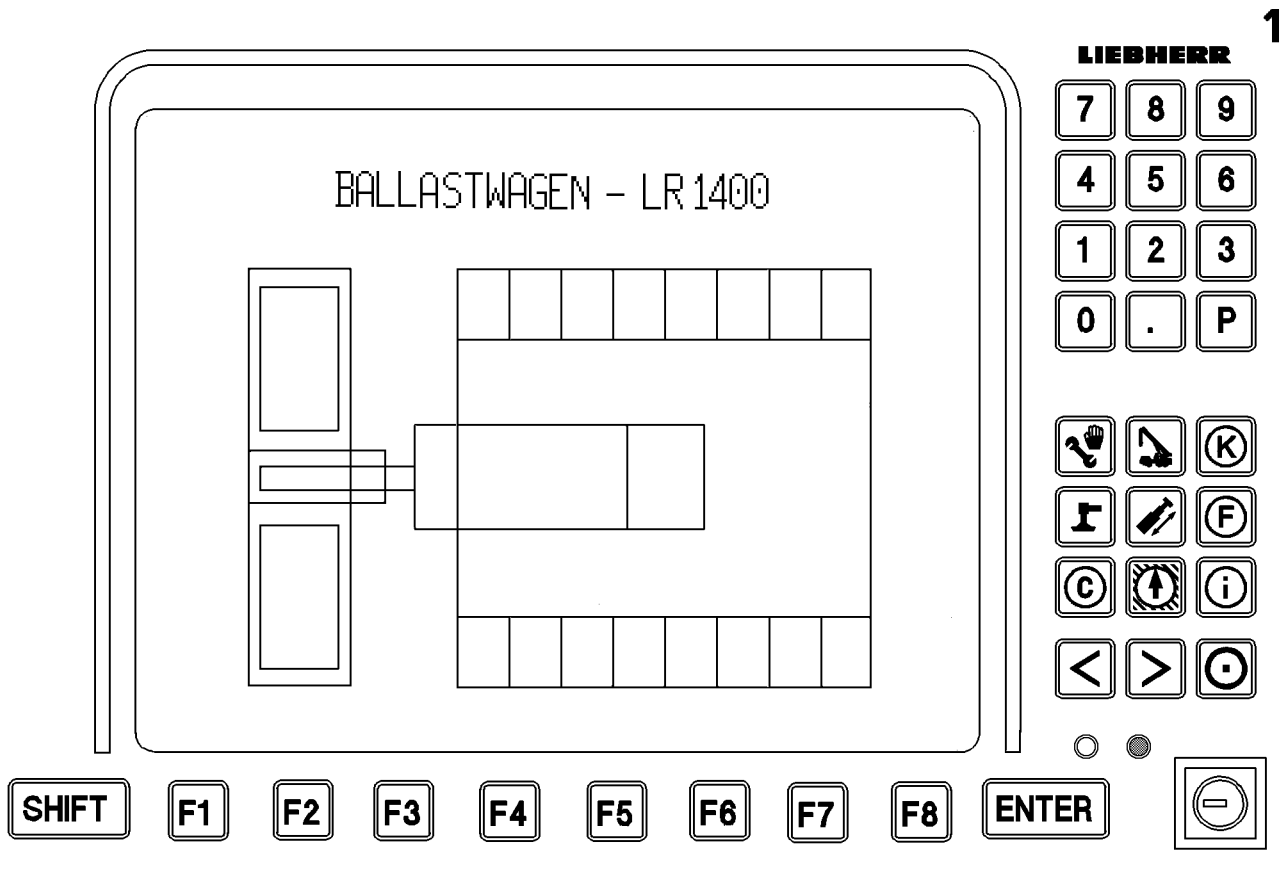
DANGER
Risk of accident!
If the difference of these forces is too high, it will damage the derrick head or other crane components.
▶ Danger of accidents!

The forces in the derrick ballast guyings A and B are shown and compared on monitor 1. If the difference exceeds a permissible value, an acoustical warning is issued and the two force values blink. However **none** of the movements are turned off.
If the difference of the forces of the derrick ballast guyings A and B exceeds the specified limit value, then this can have various causes:
– Taking up the load by relieving the load on the ballast trailer tires or flexing the turntable.
– The ground under the derrick ballast is uneven.
– The crane is leaning to one side.
– The derrick ballast has been loaded on one side.
– By raising or lowering the derrick ballast using the pull cylinders.
– Incorrect force measurement in one of the guying.

The crane operator must recognize the correct cause and take countermeasures:
1.) The error, which caused the one-sided force, must be remedied.
2.) In case of small ground unevenness only, the following measure is permissible:
Lock one ballasting cylinder and use the other ballasting cylinder to “Raise the ballast” or “Lower the ballast” until the difference between the forces reduces. Ensure that the derrick ballast is not tilted at an inadmissible angle with respect to the crane, otherwise the derrick ballast guide and attachments will be damaged.
3.) In case of implausible sensor values: Check whether the ballast weighing pressure sensors or inputs are faulty. If necessary, detach the sensor or replace the CPU.

DANGER
Risk of accident!
▶ Derrick ballast cylinder A should be extended by a maximum of approx. 40 mm more or less than cylinder B!


300
BW
V
H
SA
< 25°
SA
< 30bar
V
H
ZE
328


1
LIEBHERR
BALLASTWAGEN - LR 1400
7
8
9
4
5
6
1
2
3
0
.
P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B188952

1.6.9 “Test system” program

The ballast trailer is equipped with a test system. The test system is a service and diagnostic tool used to quickly locate and remedy malfunctions on the ballast trailer without the need for any additional measurement equipment.

Note

- Certain safety-relevant test system functions can only be used by competent specialist personnel; they are protected from being accessed by unauthorized operators.

LICCON in standard operation

Note

- The programs and program flow of the LICCON computer system are not influenced; this means that the ballast trailer will remain fully functional and the control system can be analysed using the comprehensive tools included in the test system.
- The LICCON monitor is solely used to perform test system functions during LICCON ballast trailer control.

1.6.10 Starting the test system

If the rotation or length sensors are faulty or missing, appropriate additional system error messages are output.
The indicator light blinks when the ballast trailer control safety test is being executed (after ignition on or engine start).

If a malfunction occurs, for example indicator light **328** is lit, use switch **300** to assign monitor 1 to ballast trailer control for diagnostic purposes:

- Turn off the crane engine and ignition.
- Actuate the switch **300**.

Note

- The switch **300** should only be operated when the crane engine and ignition are both off.

- Turn on the crane engine and wait until monitor 1 displays the “Ballast trailer > LR” screen.
- Start up the test system by pressing the “i” >key—> MULTI>ZE>TESTYSTEM > VERSION XX.XX

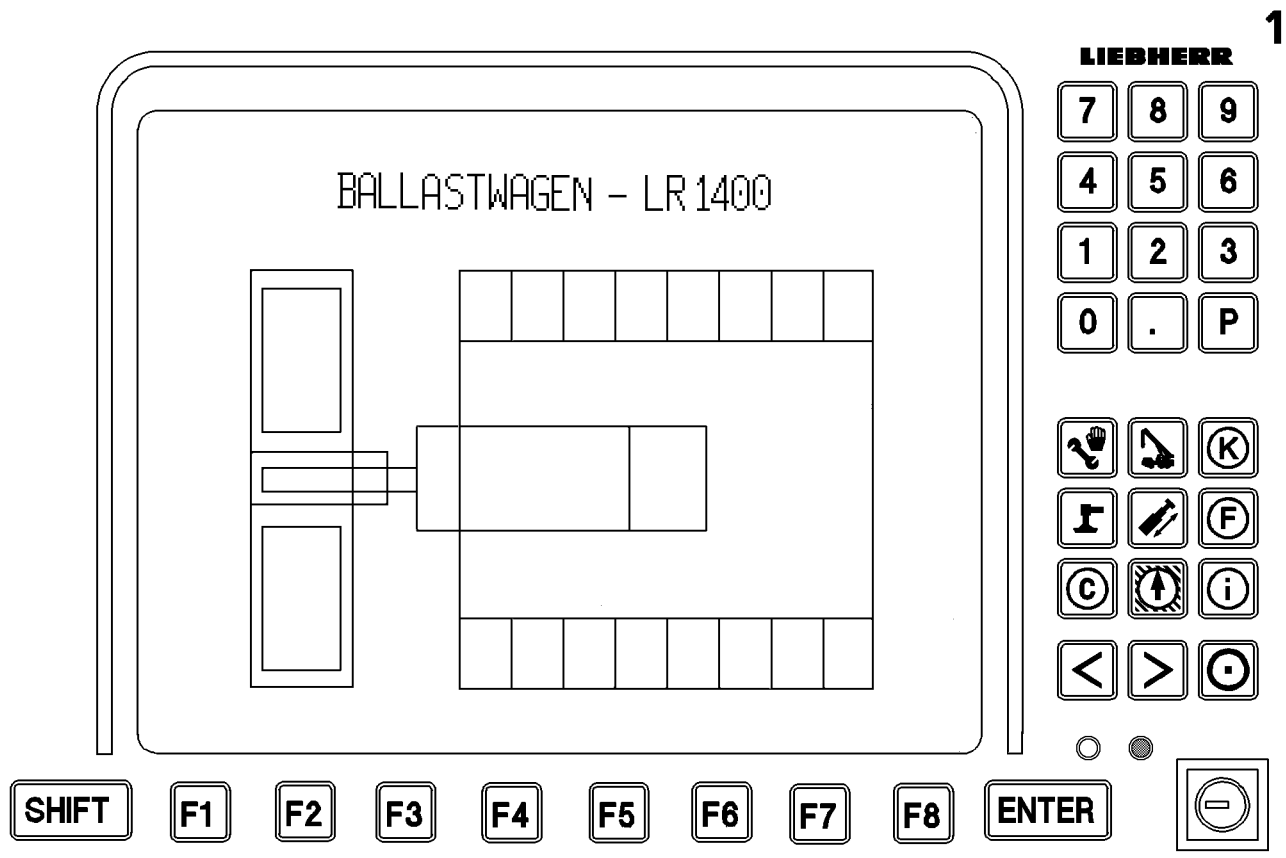
The indicator light **328** lights up when:

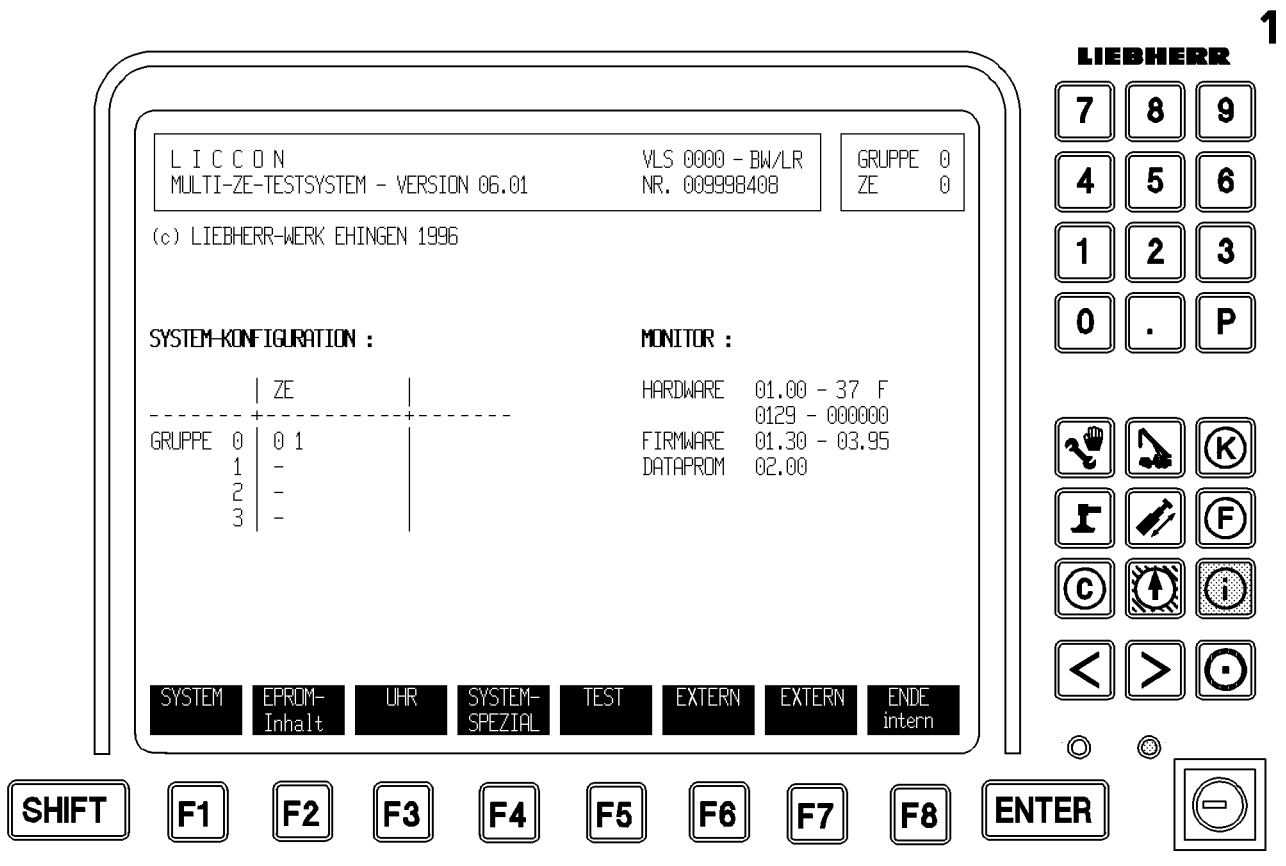
– a LICCON failure occurs;
– a turn sensor fault occurs on the left wheel set;
– a turn sensor fault occurs on the right wheel set;
– a turn sensor fault occurs on the turntable (boom direction);
– a sliding cylinder length sensor fault occurs.

- Locate the fault.

Note

- If the rotation or length sensors are faulty or missing, appropriate additional system error messages are output.
- The indicator light blinks when the ballast trailer control safety test is being executed (after ignition on or engine start).


1
LIEBHERR
BALLASTWAGEN - LR 1400
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


1
LIEBHERR
L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 06.01
VLS 0000 - BW/LR
NR. 009998408
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 1996
SYSTEM-KONFIGURATION :
MONITOR :
ZE
GRUPPE 0 0 1
1 -
2 -
3 -
HARDWARE 01.00 - 37 F
0129 - 000000
FIRMWARE 01.30 - 03.95
DATAPROM 02.00
SYSTEM
EPROM-Inhalt
UHR
SYSTEM-SPEZIAL
TEST
EXTERN
EXTERN
ENDE intern
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B188683

1.6.11 Main menu

After starting the LICCON test systems, the program is started and the main menu is displayed. This contains the basic system data, function keys “F1” to “F8” are used to access all sub-functions.

1.6.12 Selecting the central processing unit or group

In the right-hand, upper selection window the cursor flashes to indicate the selection of the desired CPU.

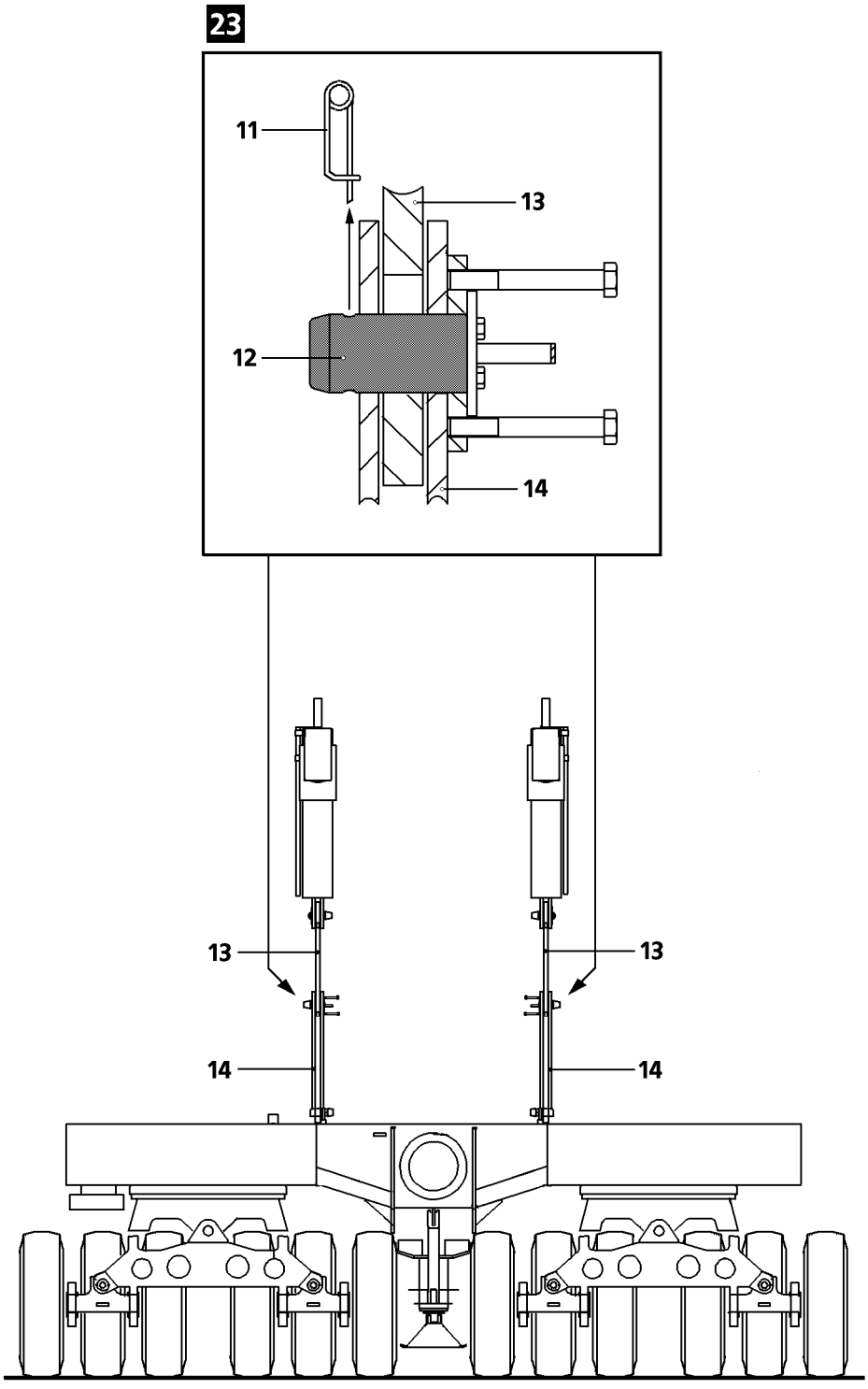
– Press the “ENTER” key to switch the cursor from “CPU” to “Group” and back.
– Enter the desired group or CPU from the installed units using the numeric keys on the alphanumeric keypad.

Note

▶ The test system can only access installed units (group, CPU).

1.6.13 Function key line main menu

“F1”	**SYSTEM**	Access inputs and outputs, AWL operands, “specific” system-internal
“F2”	**EPROM - content**	Software of the LICCON-CPUs
“F3”	**CLOCK**	Access-protected function for setting and stopping / starting the battery-buffered real time clock
“F4”	**SYSTEM-SPECIAL**	Used to check complete function units on the ballast trailer
“F5”	**TEST**	
“F6”	**EXTERNAL**	Start remote diagnostics
“F7”	**EXTERNAL**	
“F8”	**END internal**	End of program



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1.7 Disassembling the ballast trailer

DANGER
Risk of accident!
- ▶ The ballast trailer should only be disassembled on level and load bearing ground and only by authorized personnel.
- ▶ The ballast trailer is not equipped with a brake system. It is therefore essential that it rests on the support cylinders when it is not pinned to the turntable.

Make sure that the following prerequisites are met:
- – the crane is aligned in horizontal direction,
- – the boom and the derrick are assembled on the turntable,
- – the derrick is erected,
- – the placement location must be level and have adequate load bearing capacity,
- – an auxiliary crane is available.

1.7.1 Removing ballast

The ballast plates are marked with their own weights.
- – Ballast plate 10 t.

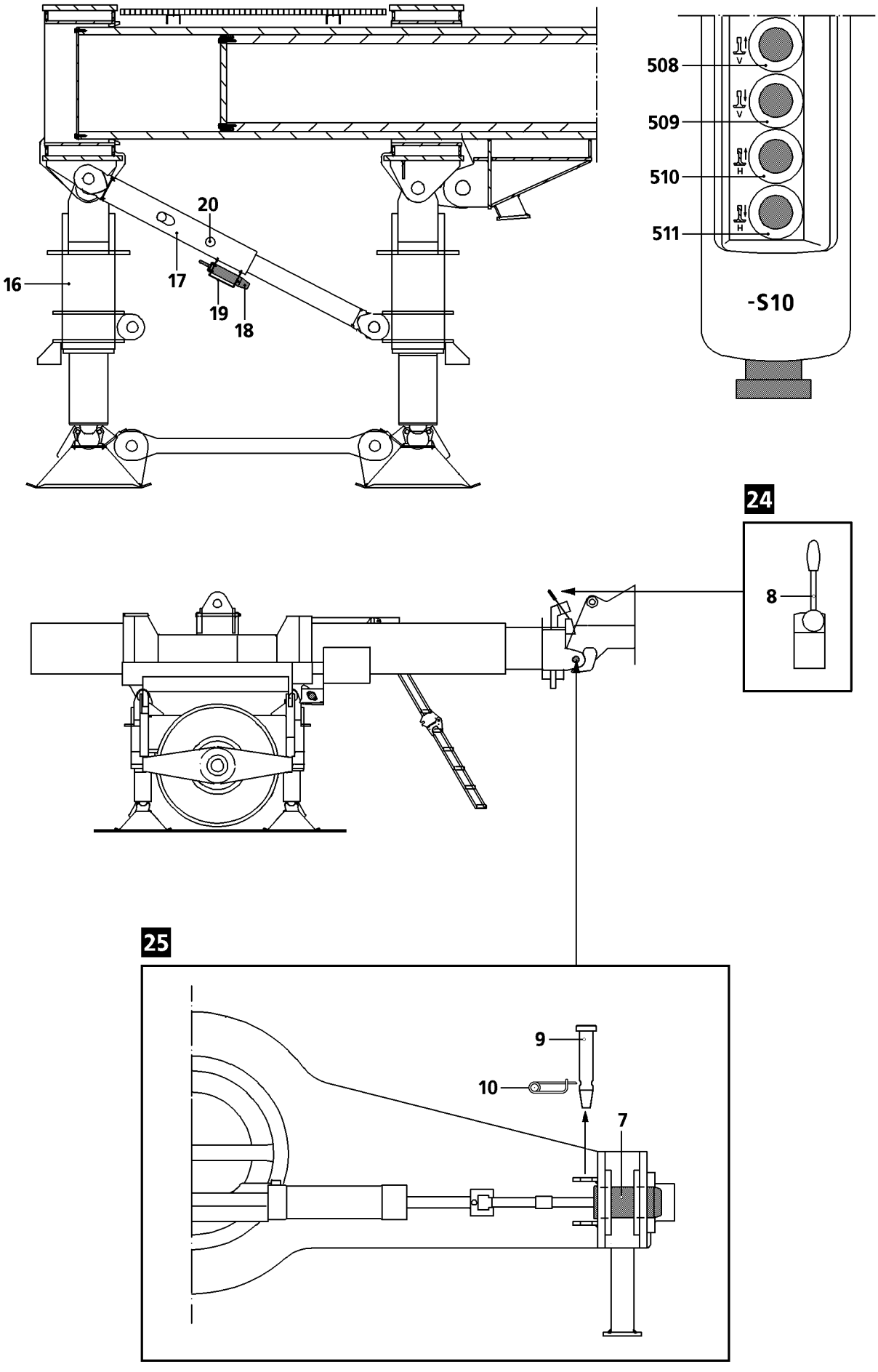
Ensure that the following prerequisites are met:
- – the ballast trailer is pinned and secured to the turntable,
- – the ballast guy rods are pinned and secured on both sides,
- – the support cylinders must be retracted and the locking pins on the strut unpinned.

DANGER
Risk of accident!
If more than the specified loads are lifted with the ropes, then they or the studs will be overloaded and the ballast plates can fall down and fatally injure personnel.
- ▶ Lift a maximum of 10 t.

- ▶ Evenly remove the ballast plates from the ballast trailer with the auxiliary crane.
- ▶ Lift each ballast plate individually. Lift no more than maximum 10 t with the ropes attached at 3 attachment points.

1.7.2 Disassembling the ballast guy rods

See illustration **23**
- ▶ Detach the supply lines from the turntable to the ballast trailer.
- ▶ Remove the spring retainer **11** on pin **12**.
- ▶ Unpin the pins **12** on both sides.
- ▶ Fold down the con-rods **14**.



B104653

1.7.3 Extend the support cylinders

If the ballast trailer and guy rods have been disassembled, extend the support cylinders.
Make sure that the following prerequisite is met:
– the crane is aligned in horizontal direction.

Note
▶ The locking pin **18** can only be pinned if the support cylinders **16** are relieved.

▶ Remove spring retainer on the locking pin **18**.
▶ Unpin the locking pin **18** from the transport receptacle **19**.
▶ Insert the locking pin **18** into hole **20** on the strut **17** and secure with a spring retainer.

Extend the support cylinders **16**:
– Press button **509**, front support cylinder extends.
– Press button **511**, rear support cylinder extends.

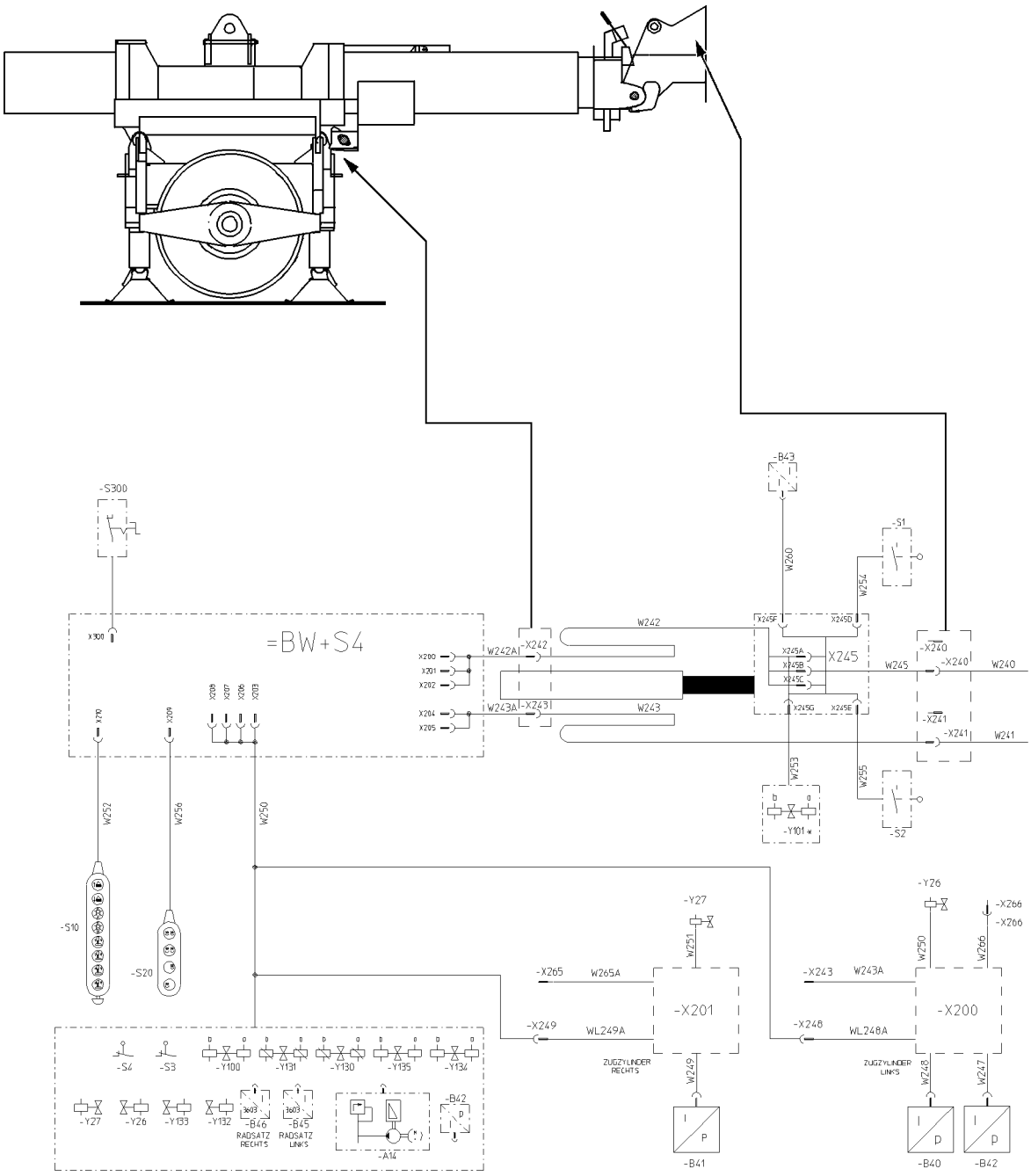
▶ Check visually on the extended support cylinder.

1.7.4 Unpinning the guide from the turntable

Unpinning procedure

See illustration **24** and **25**
▶ Remove spring retainer **10** on the retaining pin **9**.
▶ Operate lever **8**.

Result:
– The pins **7** are unpinned on both sides of the pinning point between the guide and the turntable.


-S300
X300
=BW+S4
X70
X204
X208
X207
X206
X203
W252
W256
W250
-S10
-S20
-S4
-S3
-Y100
-Y131
-Y130
-Y135
-Y134
-Y27
-Y26
-Y133
-Y132
-B46
RADSATZ RECHTS
-B45
RADSATZ LINKS
-A14
-B42
-B43
W260
-S1
W254
W242
X245F
X245D
X245A
X245B
X245C
X245G
X245E
X245
-X242
W242A
X200
X201
X202
X204
X205
W243A
-X243
W243
-X240
W240
W245
-X241
W241
W253
W255
-Y101
-S2
-Y27
W251
-X265
W265A
-X249
WL249A
-X201
ZUGZYLINDER RECHTS
W249
-B41
-Y26
-X266
-X266
W250
W266
-X243
W243A
-X248
WL248A
-X200
ZUGZYLINDER LINKS
W248
W247
-B40
-B42

B104662

Disconnecting the hydraulic connections

Ensure that the following prerequisite is met:

– the engine is not running.

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

DANGER

Risk of accident due to loss of pressure or leakage!

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

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

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

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

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

▶ Fit dummy plugs to the couplings after they are opened.

Releasing the electrical connection

DANGER

Damage to crane!

▶ Only detach the electrical connections and insert them in the dummy plug when the ballast trailer guide on the crane is completely unpinned. As soon as one of the two pins is unpinned from the guide frame, the crane control recognizes that the ballast trailer is not longer assembled. The crane can be still turned and driven, despite the attached ballast trailer (ballast trailer is connected to the turntable using one pin). There is a danger of damage to the ballast trailer or crane, if the crawler is driven or the turntable is turned.

▶ Unplug the cable **W 243** from the socket **-X 243** and insert in the dummy plug on the ballast trailer guide.

▶ Unplug the cable **W 242** from the socket **-X 242** and insert in the dummy plug on the ballast trailer guide.

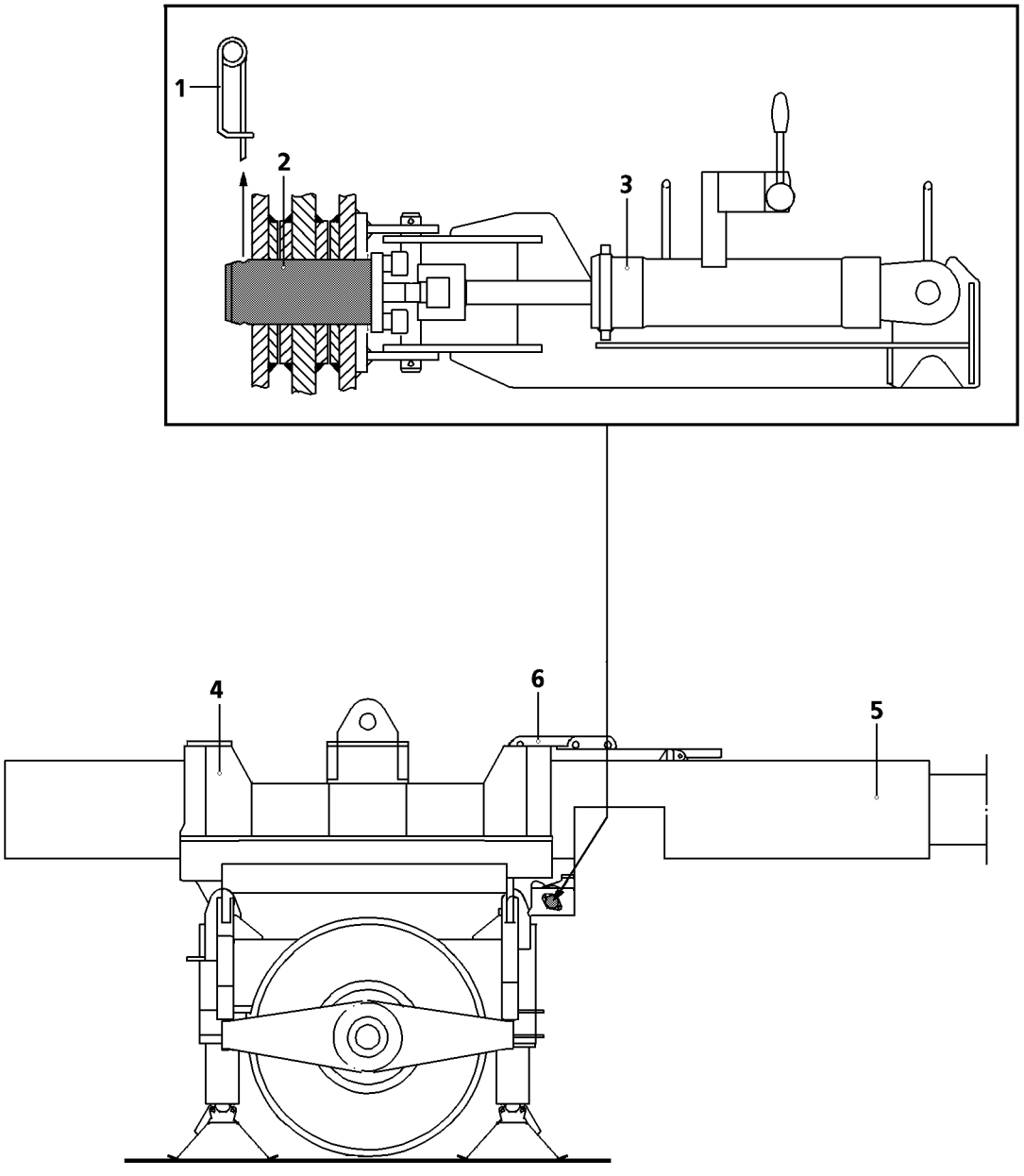
▶ Unplug the cable **W 243** from the socket **-X 241** and insert in the dummy plug on the ballast trailer guide.

▶ Unplug the cable **W 245** from the socket **-X 240** and insert in the dummy plug on the ballast trailer guide.

▶ Insert the dummy plug **W 240** into the socket **-X 240**.

▶ Insert the dummy plug **W 241** into the socket **-X 241**.

26



B188671

1.7.5 Disassembling the guide from the ballast frame

See illustration **26**

Make sure that the following prerequisites are met:

– the ballast trailer **4** is supported on the support cylinders and horizontally aligned,
– the wheel sets are relieved,
– the locking pin is pinned in the strut,
– an auxiliary crane is ready,
– the crane has been driven away from the ballast trailer.

DANGER

Danger of tipping over!

See section “Observe the stability and tipping resistance when ballast trailer is not fitted to the turntable”.

▶ If the safety guidelines for the stability and tipping safety are not observed and the strut is not pinned with the locking pin, there is a danger of tipping over.
▶ The strut must be pinned with the locking pin.

Disassembling the guide

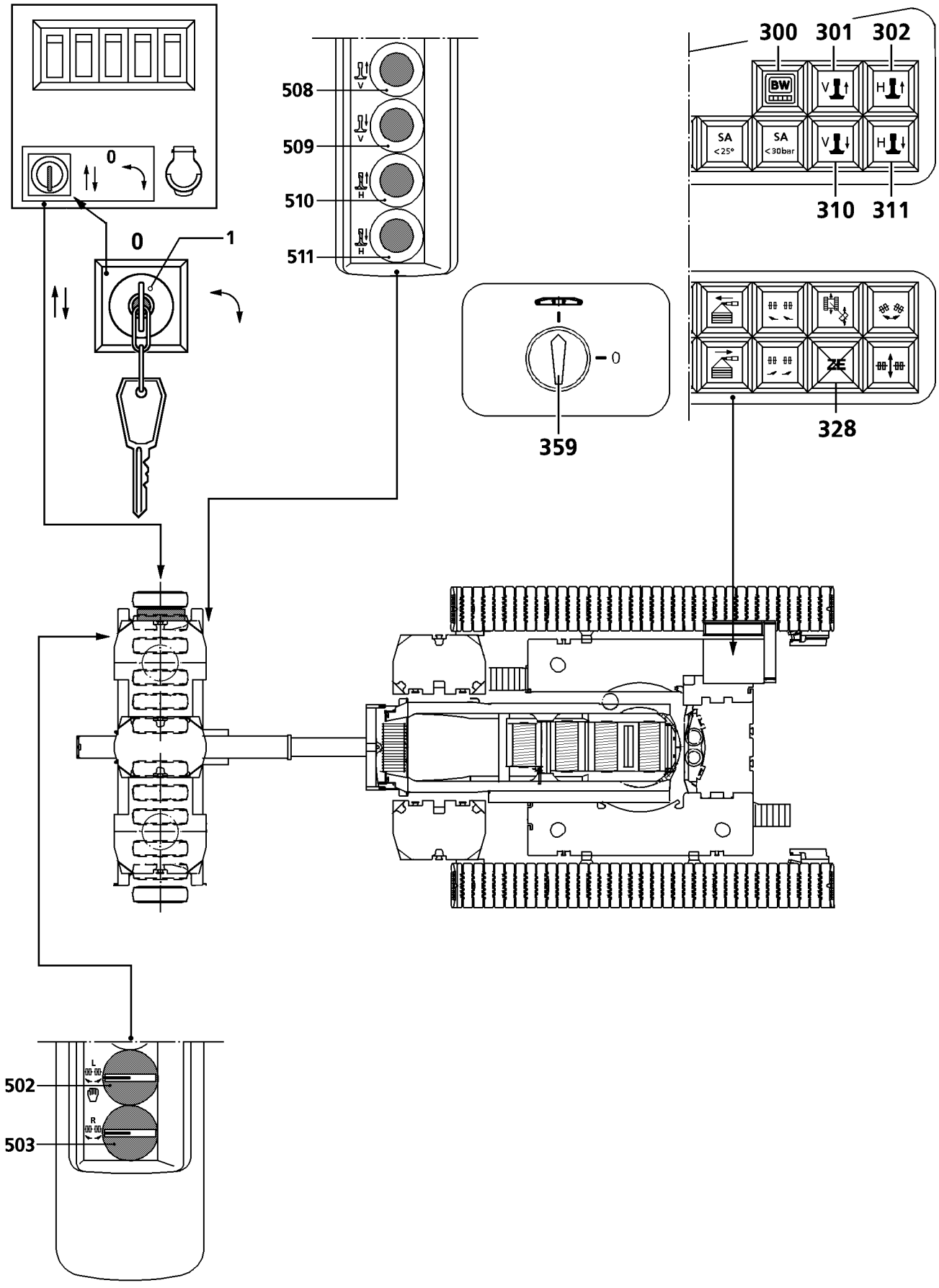
▶ Unpin the lifting strap **6**, tilt backwards and pin.
▶ Secure the ballast trailer guide **5** using the auxiliary crane.
▶ Connect the pin pulling device **3** to the hydraulic aggregate.
▶ Release the pins **2** and unpin on both sides with the pin pulling device **3**.
▶ Use the auxiliary crane to place the ballast trailer guide **5** onto the transport vehicle.
▶ Use the auxiliary crane to set the ballast trailer **4** down on the transport vehicle.

DANGER

Risk of accident!

▶ The ballast trailer **4** and ballast trailer guide **5** must be properly secured for transportation. The ballast trailer must be supported so that the tires are slightly pushed in.
▶ The ballast trailer is not equipped with its own brake system. It must therefore be supported after it has been disassembled.

▶ Secure the ballast trailer for transport on the transportation vehicle.


0
0
1
508
509
510
511
300
301
302
BW
V
H
SA
<25°
SA
<30bar
V
H
310
311
0
359
ZE
328
L
R
502
503

B188674

1.8 Emergency operation and maintenance

1.8.1 Emergency operation of the ballast trailer - General

In case of a failure or defect of the central unit on the ballast trailer (warning light **328** lit), the electronic steering of the ballast trailer can no longer be actuated.
The signals towing and circular travel can no longer be sent from the ballast trailer control to the crane control.
By actuating the key switch **1** in the switch box on the ballast trailer, the central unit can be bypassed.
Key switch positions

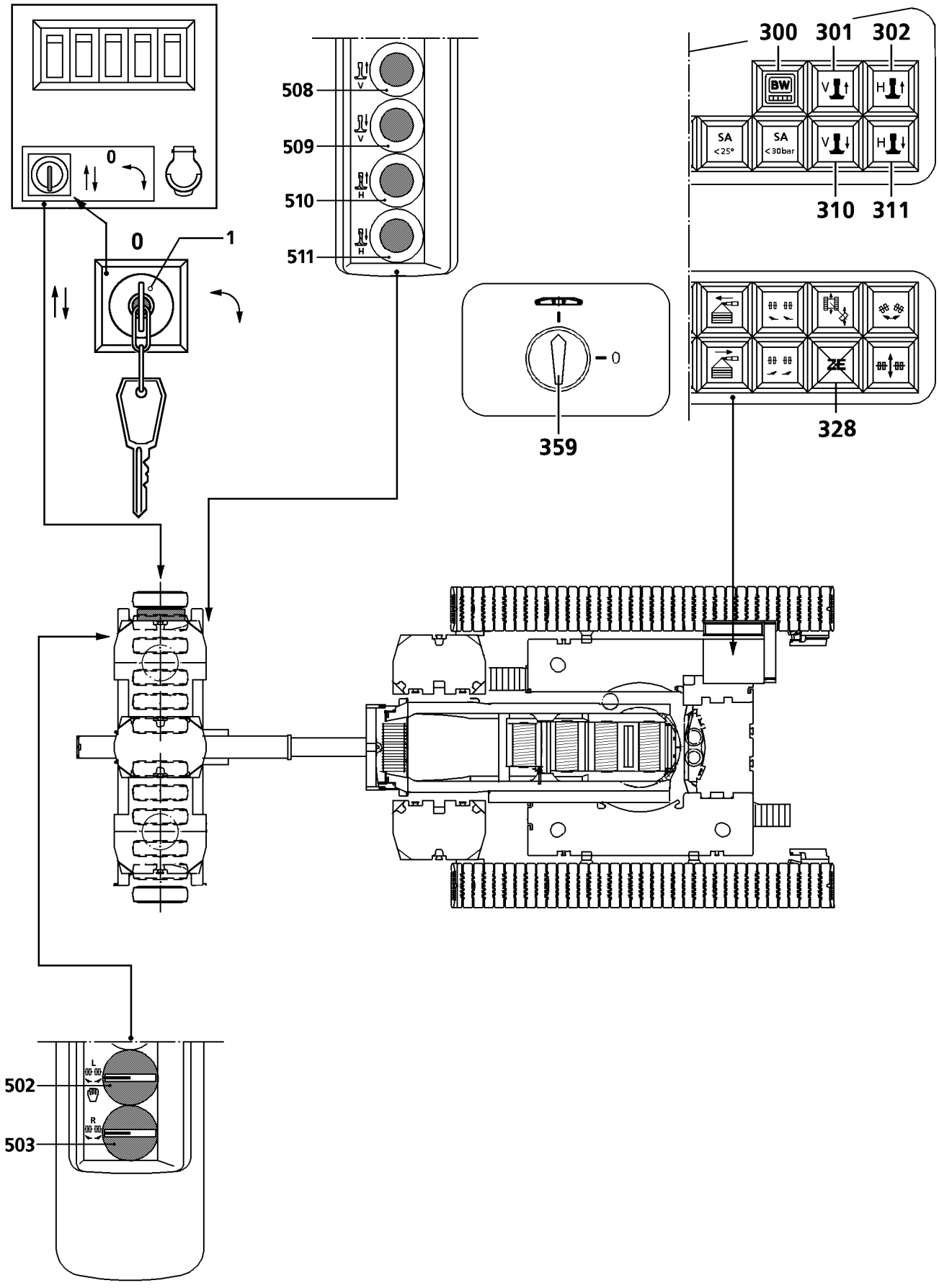
– 0 (center) = no emergency operation
– I (left) = emergency operation towing
– II (right) = emergency operation circular travel

DANGER
Risk of accident!

- ▶ Emergency operation should only be carried out by authorized personnel.
- ▶ Make sure that no personnel are within the danger zone of the ballast trailer.
- ▶ Perform each driving manoeuvre with utmost caution, minimum acceleration and careful braking.
- ▶ Only actuate the key switch **1** if the electronics have failed.
- ▶ The signal “Towing” and “Circular travel” is released on the crane, even though the wheels might be positioned incorrectly.
- ▶ The wheel position must be manually monitored. Observe the angle scale on the ballast trailer.

Note

- ▶ During crane operation (no emergency operation), the key switch **1** must be set to position 0 (centre position).


0
1
508
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510
511
300
301
302
BW
V
H
SA
<25°
SA
<30bar
V
H
310
311
ZE
328
0
359
502
503
L
R

B188674

1.8.2 Emergency operation of the ballast trailer - Towing

Make sure that the following prerequisites are met:

– the crane is upright,
– the ballast trailer is properly assembled,
– the rotary switch **359** is set to crawler operation (vertical position).

1.8.3 Raising the ballast trailer with the support cylinders

▶ Switch the key switch **1** on the ballast trailer to position I (left).

Note

▶ By turning the key switch **1** to position I, the “towing” command is forwarded to the crane and emergency operation is turned on.

▶ Press button **310** and **311** or button **509** and **511**; extend the front / rear support cylinders.

▶ In emergency operation, the support can only be moved using the control panel on the ballast trailer.

1.8.4 Setting the axles to towing position

▶ Switch the key switch **1** on the ballast trailer to position I (left).

▶ Actuate the rotary switch **502**, move the left wheel pair to the towing position.

▶ Actuate the rotary switch **503**, move the right wheel pair to the towing position.

DANGER

Risk of accident!

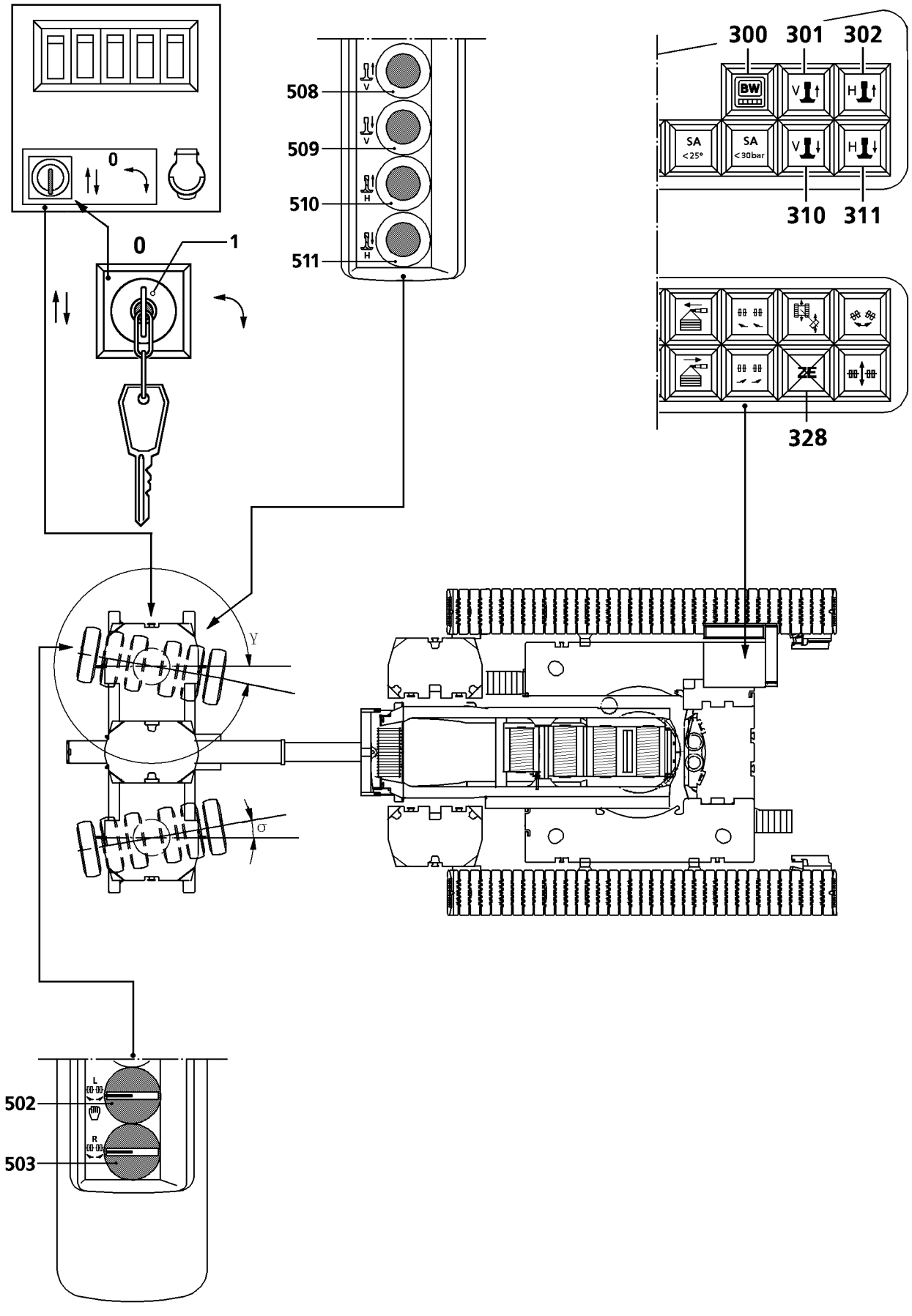
▶ Constantly monitor the wheel position of the wheel pairs when driving. Observe the angle scale on the ballast trailer. If the tires become excessively deformed, readjust the wheel position.

▶ If necessary, correct the wheel position.

1.8.5 Lowering the ballast trailer with the support cylinders

▶ Press button **301** and **302** or button **508** and **510**; retract the front / rear support cylinders.

▶ The indicator light **314**, indicating that the ballast trailer supports are retracted, is lit.


0
1
508
509
510
511
300
301
302
BW
V
H
SA
<25°
SA
<30bar
310
311
328
Y
σ
502
503
L
R

B188951

1.8.6 Emergency operation of the ballast trailer - Circular driving

Different turning radii are possible by telescoping the ballast trailer.
Make sure that the following prerequisites are met:
– the crane is upright,
– the ballast trailer is properly assembled.

1.8.7 Raising the ballast trailer with the support cylinders

▶ Switch the key switch **1** on the ballast trailer to position II (right).

Note
▶ By turning the key switch **1** to position II, the command for “circular travel” is forwarded to the crane and emergency operation is turned on.

▶ Press button **310** and button **311 or** button **509** and button **511**, the support cylinders on the front and the rear extend.

1.8.8 Setting the axles to circular travel position

Ballast trailer radius [m]	Angle scale [°]	
	Left [γ]	Right [σ]
11 m	348,19	11,8
13 m	349,96	10,3
15 m	351,28	8,71

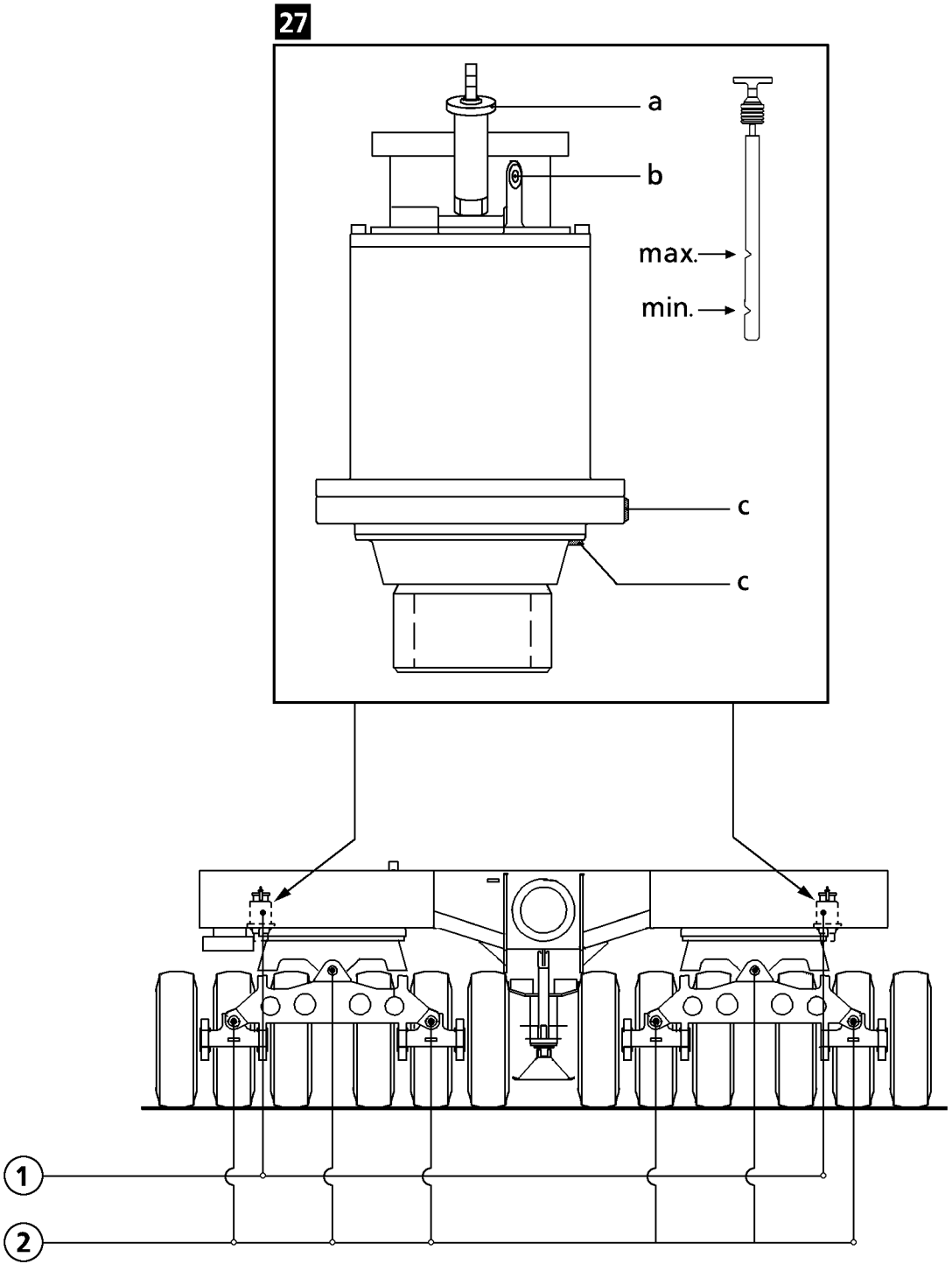
▶ Operate the knob **502** and turn the left wheel pair in the circular driving position until the marking pointer matches the ballast trailer radius.
▶ Operate the knob **503** and turn the right wheel pair in the circular driving position until the marking pointer matches the ballast trailer radius.

DANGER
Risk of accident!
▶ Constantly monitor the wheel position of the wheel pairs when driving. Observe the marking pointer on the ballast trailer. If the tires become excessively deformed, readjust the wheel position.

▶ If necessary, correct the wheel position.

1.8.9 Lowering the ballast trailer with the support cylinders

▶ Press button **301** and **302** or button **508** and **510**; retract the front / rear support cylinders.
▶ The indicator light **314**, indicating that the ballast trailer supports are retracted, is lit.



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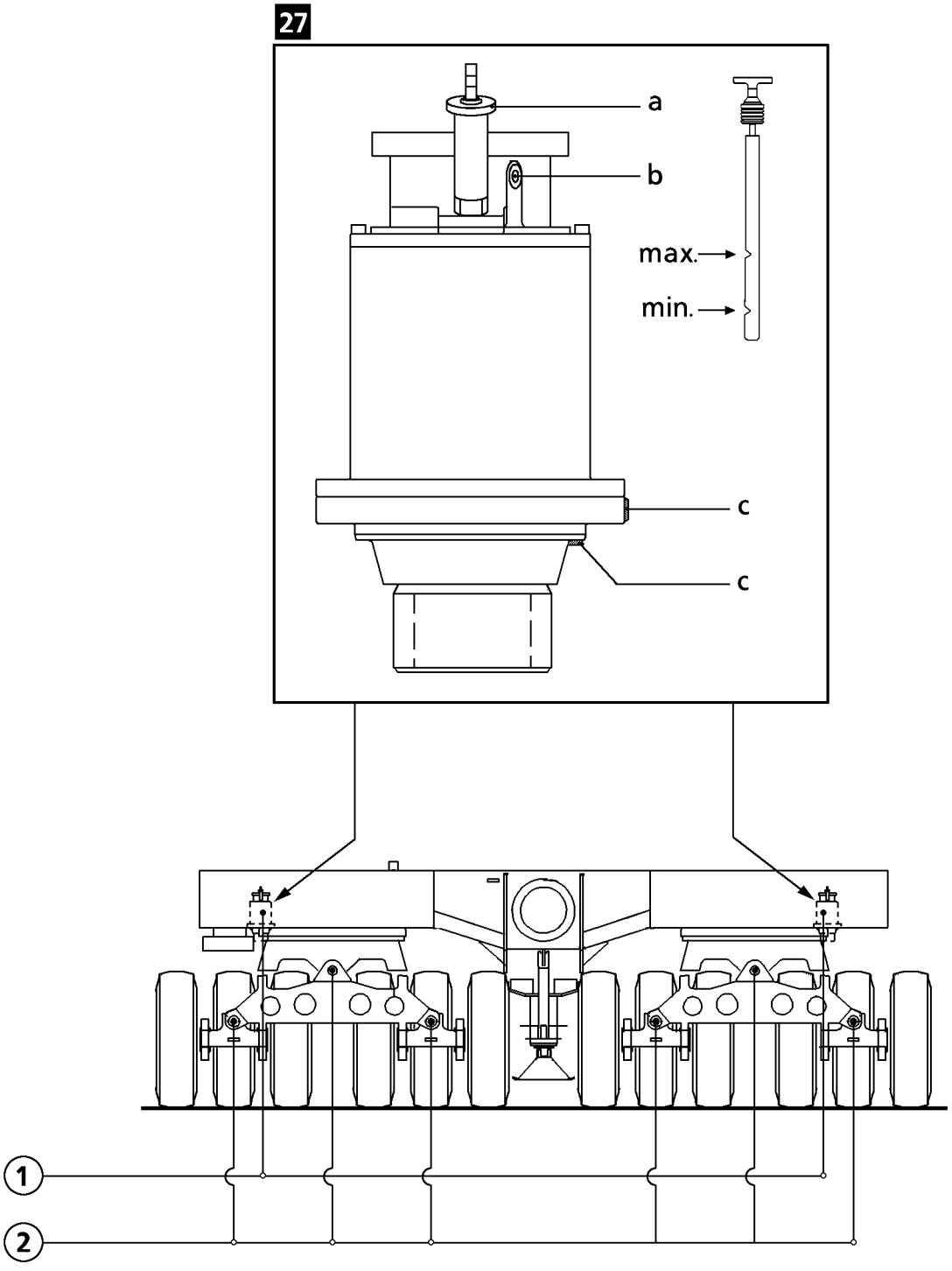
1.8.10 Maintenance

1.8.11 Maintenance intervals

	First maintenance after	Regular maintenance, every				Minimum maintenance annual	Checks	
		100 h	200 h	400 h	1200 h		Daily	Weekly
• **Slewing gear**								
- Check for any leakage							**X**	
- Check oil level								**X**
- Make sure that fixing bolts are tight	**200 h**			**X**		**X**		
- Oil change					**4000 h**	**Every 4 years**		
• **Axle link**								
- Lubricate			**X**			**X**		

1.8.12 Slewing gear

See illustration **27**



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1.8.13 Oil level check

The oil level must be between the MIN and MAX marks on the oil dipstick.
Make sure that the following prerequisites are met:

– the crane is in horizontal position.

- ▶ Remove the dipstick, wipe clean, re-insert and pull out again.
- ▶ After the check has been completed, re-insert the oil dipstick in the measuring point.
- ▶ If necessary, refill with oil as specified on the lubrication chart.

Note

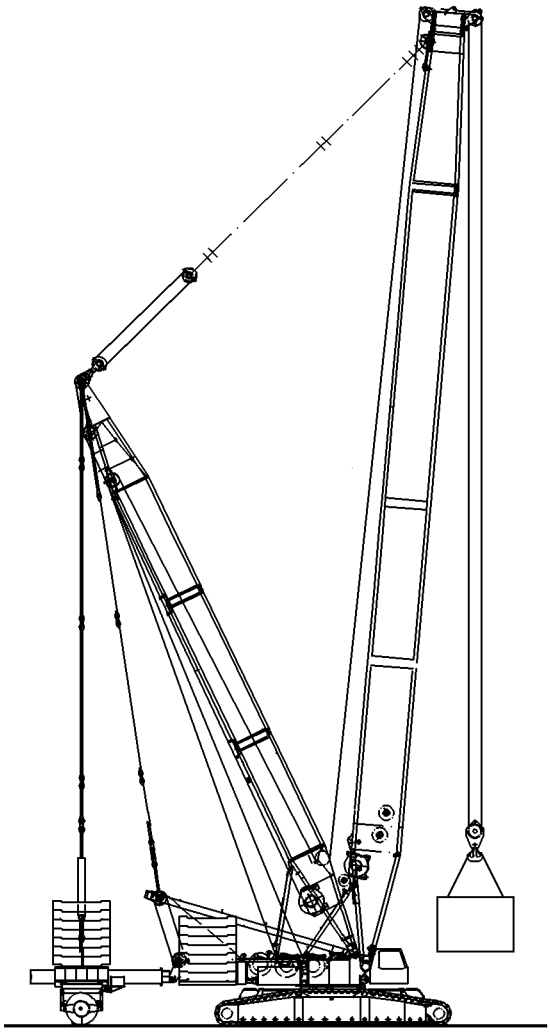
- ▶ If the oil level has dropped below the MIN mark, top up oil as shown in the lubricant chart until the oil level is between the MIN and MAX marks.
- ▶ Risk of gear damage if oil is not topped up.

1.8.14 Oil change

- ▶ Pull the oil dipstick **a** out of the oil filler nozzle **a**.
- ▶ Unscrew the oil drain plug **c** and seal ring. Clean the sealing surface.
- ▶ Drain off the old oil.
- ▶ Install the oil drain plug **c** with new seal ring and tighten.
- ▶ Top up with oil as specified on the lubrication chart through the oil filler opening **b**.
- ▶ Wipe clean the dipstick, re-insert and pull out again.
- ▶ After the check has been completed, re-insert the oil dipstick in the measuring point.
- ▶ If necessary, repeat this step.

1.8.15 Central lubrication system

For the maintenance of the central lubrication system, see chapter 7.05.



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1.8.16 Tires

Check the tires for damage.
The tread depth may not fall below the legally specified minimum value.
The tire inflation pressure must be 10 bar.
Check the tire inflation pressure when the tires are cold.
Before pumping up the tires, check the proper seating of the tire on the rim as well as the proper seating of the locking ring.

DANGER
Risk of accident!
When checking the tire inflation pressure on the vehicle or after fitting tires, please ensure that the clamp collar is correctly fitted to the rim. Otherwise there is a risk of accident! If the clamp collar is not correctly seated, ask a specialist for assistance. The disk wheels must be checked for operational safety prior to every use of the ballast trailer.

▶ When pumping up the tires on the vehicle, ensure no persons are in danger of being hit by flying parts. There is an increased accident risk if the tires are damaged, the tread is too low or there are differences in the tire pressures.

▶ Check tire pressure and correct if necessary.

1.8.17 Safety and maintenance guidelines for disk wheels (rims)

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.
The wheel is one of the most important safety components on the vehicle, for that reason, the following points must be strictly observed. Check the wheels at the rim and the wheel disk for the following when changing the tires:

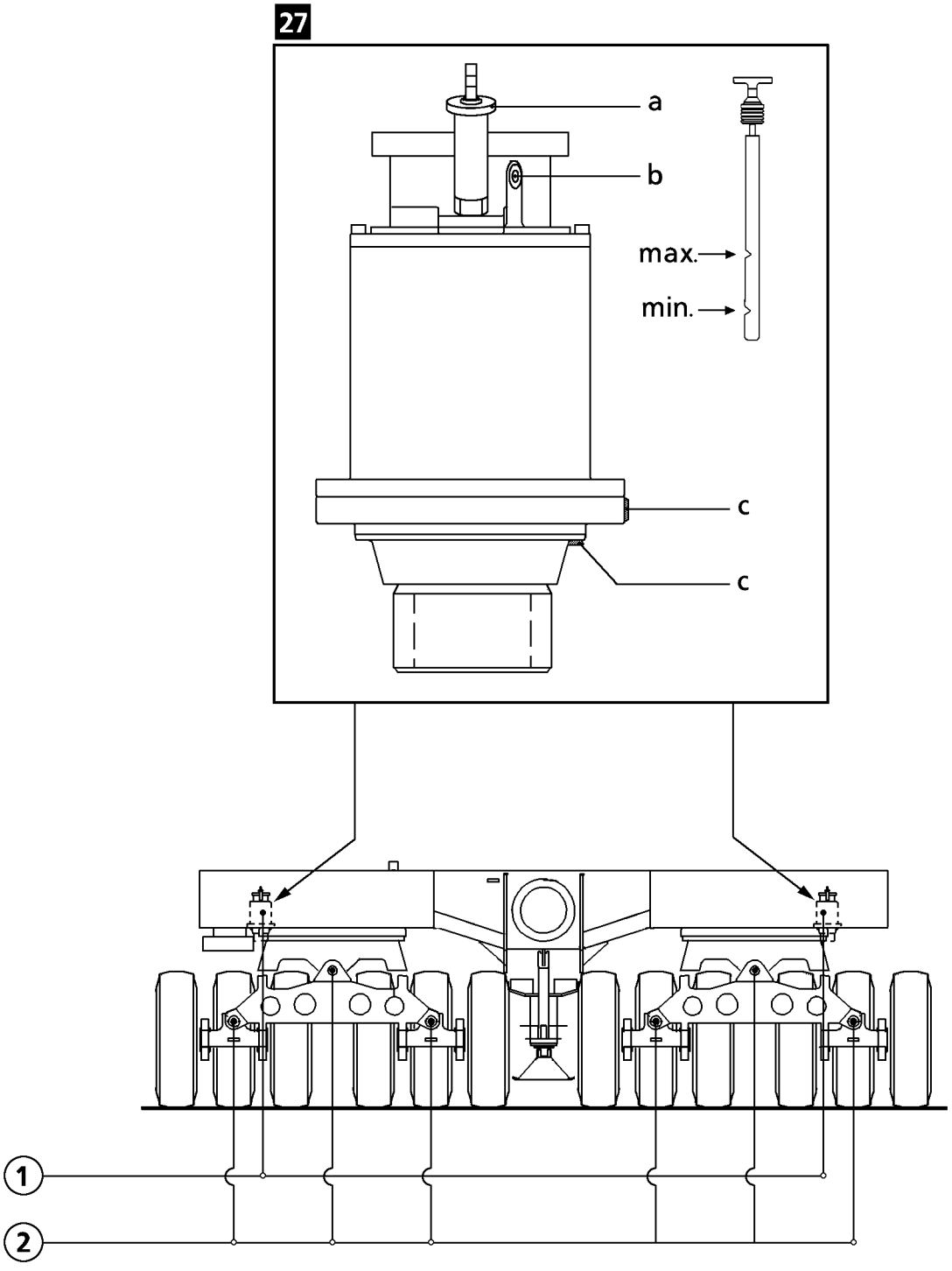
– Excessive rust or corrosion.
– Bent rim edges.
– Cracks in the rim.
– Cracks in the wheel dish.
– Damage to side and locking rings.
– Damaged wheel lugs or nuts.
– Worn out pin holes.
– Matching rim parts.

If any damaged rim parts are found during the inspection, then they must be removed and replaced with new parts.
If paint damage or slight rust formation is found, the wheels can be repaired with commercially available paint after removal of the rust, however, special attention must be paid to a flawless surface on the tire seating surfaces.

DANGER
Risk of accident!

▶ Any welding work on rims and wheel dishes, particularly repairs to worn pin holes or replacement of the entire wheel reflector is prohibited. Disk wheels with exhibiting such faults must be scrapped immediately. Repairing these highly-stressed disk wheel components causes structural changes in the material, which can lead to premature overload breakage.

▶ Replace rims and wheel disks in case of severe damage.



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1.8.18 Lubrication chart and fill levels

Ballast trailer	
Slewing gear synthetic gear oil	3.0 L
Central lubrication system special grease	2.0 kg
Protective screen special grease	0.1 kg

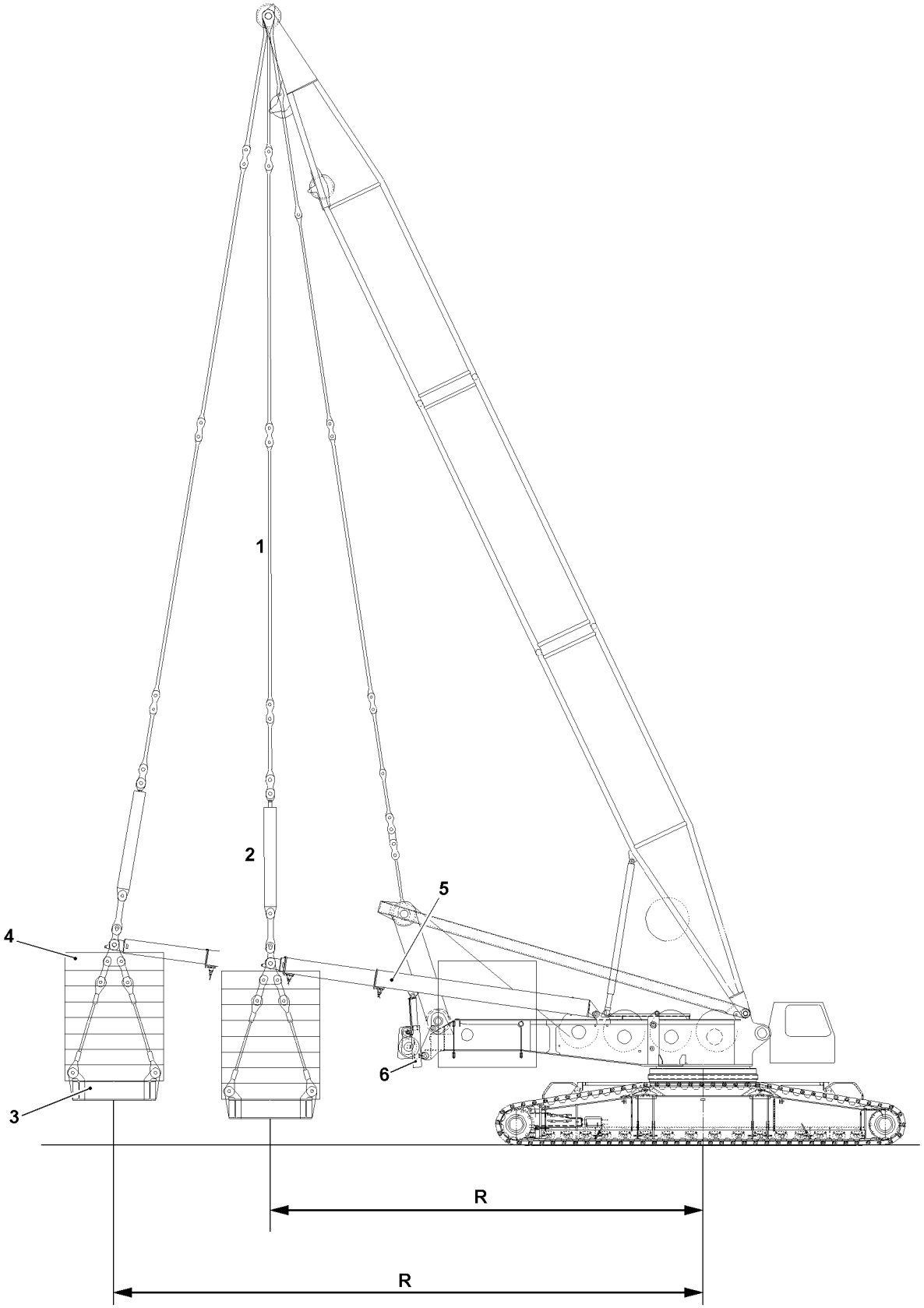
Note

▶ The specified fill quantities are orientation values. The markings on the dipsticks, inspection openings and viewing glasses are decisive when filling.

Legend for adjacent lubrication chart:

1 Synthetic gear oil

2 Grease



B104656

1 Suspended ballast

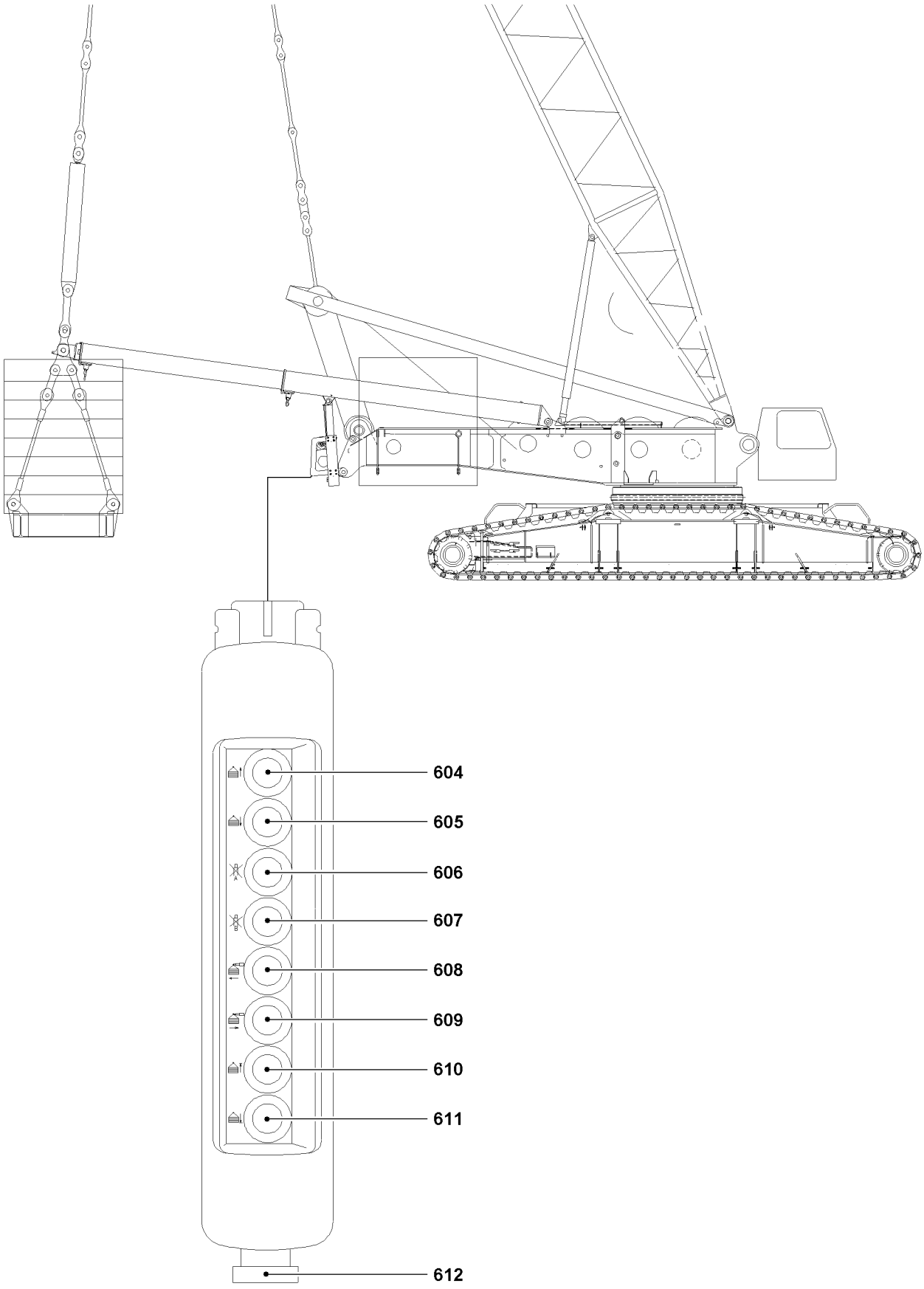
1.1 Description

The derrick ballast can be telescoped out steplessly via the hydraulically telescopeable ballast guides **5**, which are pinned on both sides of the turntable. The derrick boom angle, the derrick ballast, weight and utilization are shown on LICCON monitor 1.
After assembly on the ground, the derrick ballast is raised for crane operation using the pull cylinders **2** assembled on the ballast guides **5**.
For crane operation with derrick ballast, also see Crane operating instructions, chapter 4.02.

1.2 Component overview - Derrick ballast

The components for crane operation with derrick ballast are:

Components	
1	Guying
2	Pull cylinder
3	Ballast pallet
4	Ballast plates
5	Complete guide
6	Ballast guide



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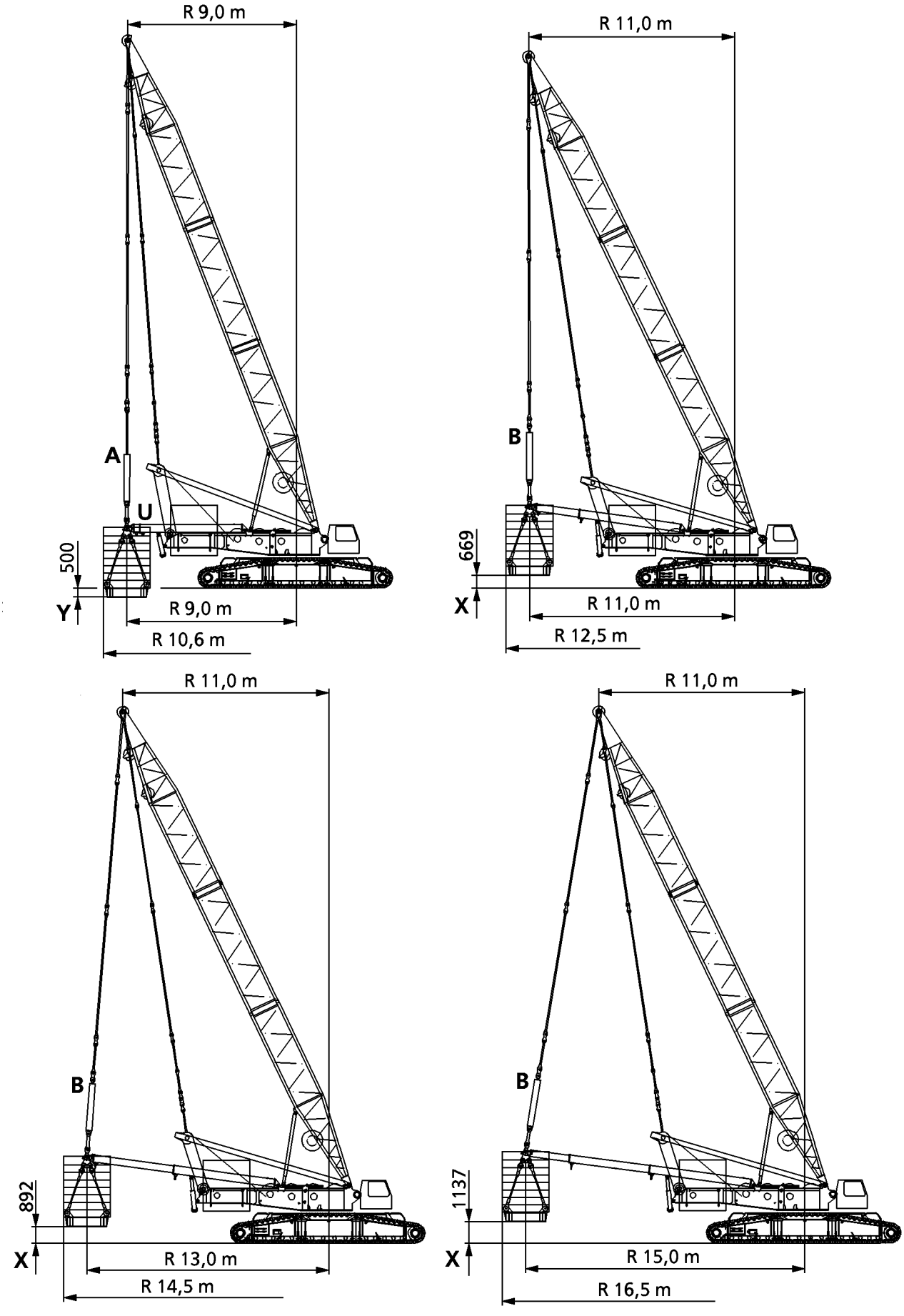
1.3 Control elements on the control panels

Control panel suspended ballast

604	Button	• Derrick ballast “UP” - retract both cylinders
605	Button	• Derrick ballast “DOWN” - extend both cylinders
606	Button	• Block cylinder “A” on the derrick ballast
607	Button	• Block cylinder “B” on the derrick ballast
608	Button	• Telescope derrick ballast out
609	Button	• Telescope derrick ballast in
610	Indicator light	• Indicator “Derrick ballast above ground level”
611	Illuminated button	• Indicator and bypass “Derrick ballast below ground level”
612	Switch	• **EMERGENCY-OFF**


R 9,0 m
A
U
500
Y
R 9,0 m
R 10,6 m
R 11,0 m
B
669
X
R 11,0 m
R 12,5 m
R 11,0 m
B
892
X
R 13,0 m
R 14,5 m
R 11,0 m
B
1137
X
R 15,0 m
R 16,5 m

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1.4 Derrick boom radii

1.4.1 Derrick boom radii for derrick 28 m

Configuration states, see illustrations	
A	= cylinder extended
B	= cylinder retracted
U	= lower shut-off
X	= maximum above level of base [mm]
Y	= maximum below level of base [mm]

Note
- ▶ The lower shut-off **U** applies to all radii!
- ▶ The dimension of 500 mm for “maximum below level of base” applies to all radii!

1.4.2 Derrick boom radii for derrick 21 m

Configuration states, see illustrations	
A	= cylinder extended
B	= cylinder retracted
U	= lower shut-off
X	= maximum above level of base [mm]
Y	= maximum below level of base [mm]

Note
- ▶ The lower shut-off **U** applies to all radii!
- ▶ The dimension of 500 mm for “maximum below level of base” applies to all radii!

1.5 Assembly

DANGER
Risk of falling!
During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening injuries!
- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect against falling!

DANGER

Danger of accident during assembly / disassembly of derrick ballast!

When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel!

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within any part of the danger zone when pinning / unpinning the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

Make sure that the following prerequisites are met:

- the crane is aligned in horizontal direction,
- the boom and the derrick are assembled on the turntable,
- the derrick is erected,
- the counterweight has been attached to the turntable according to the load chart,
- an auxiliary crane is available.

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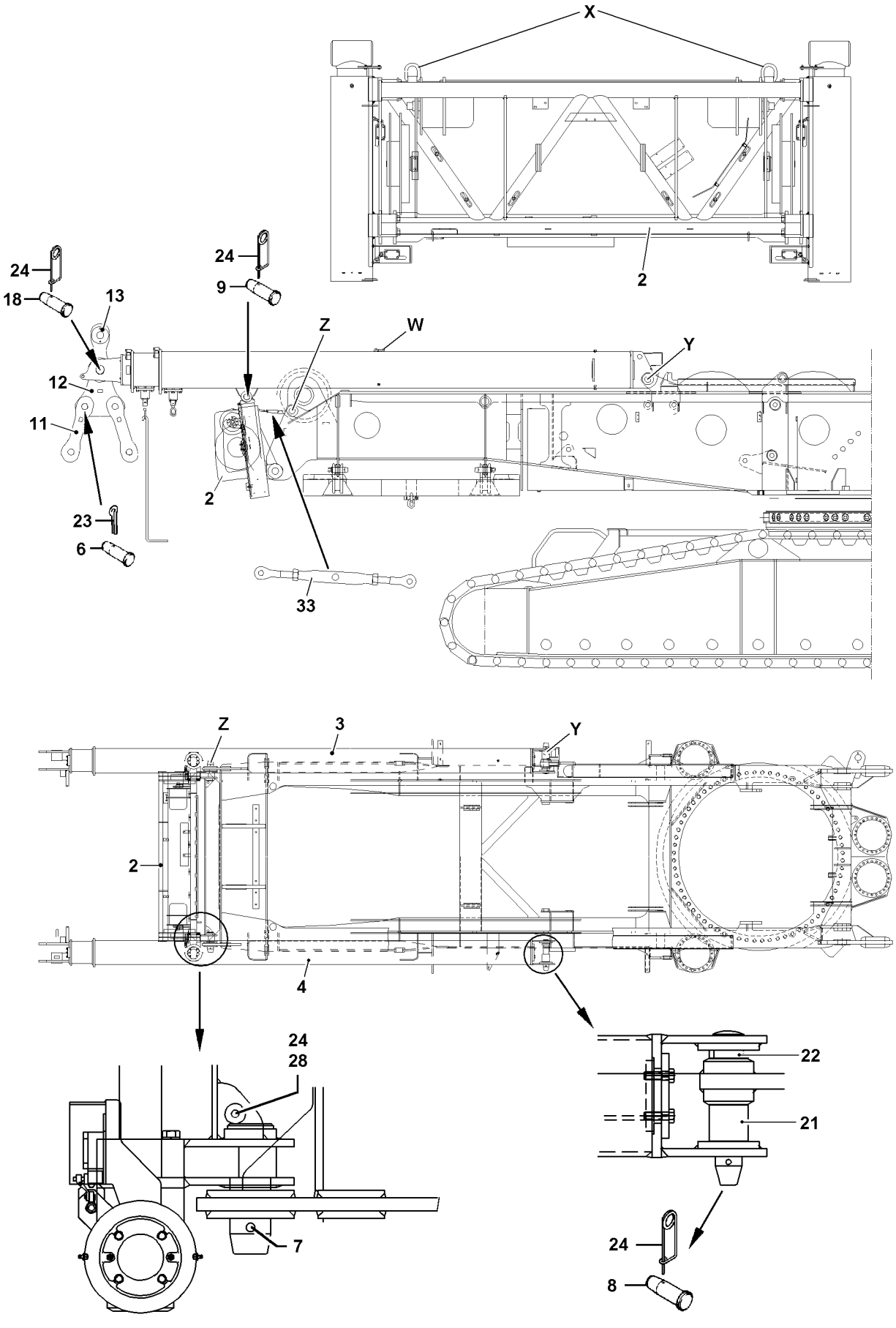


B104659

1.5.1 Installing the guide frame

- ▶ Secure the guide frame **2** to the lifting brackets **X** on the auxiliary crane.
- ▶ Use the auxiliary crane to swivel and fix the guide frame **2** to the pinning point **Z** on the turntable.
- ▶ Pin in the pins **7** at the pinning point **Z** and secure with spring retainers **28**.
- ▶ Secure the retaining pins **28** with spring retainers **24**.

Note

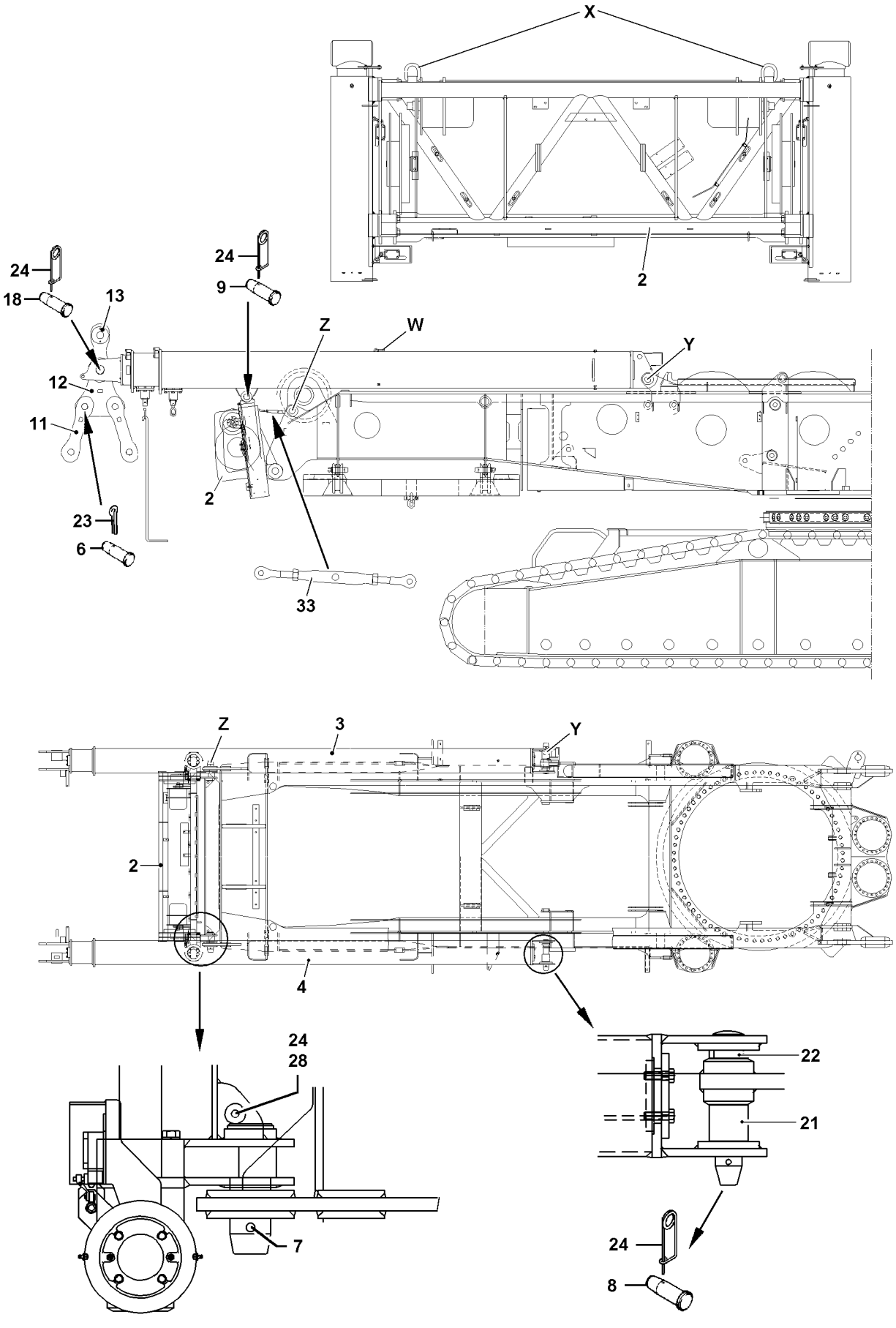
- ▶ The turnbuckle **33** only serves as an assembly support and **must** be disassembled after the ballast guide has been fitted!

- ▶ Attach the turnbuckle **33** between the guide frame **2** and the turntable.

1.5.2 Assembling the ballast guide

Before assembling the ballast guides, pin and secure the triangular brackets **12**, brackets **11** and ballast guy rods **13** to the end section on the ballast guide **3** and **4**.

- ▶ Pin triangular brackets **12** and ballast guy rods **13** to the end section using pins **18**.
- ▶ Secure the pin **18** with spring retainer **24**.
- ▶ Pin the brackets **11** to the triangular brackets **12** using pins **6**.
- ▶ Secure pins **6** with split pins **23**.
- ▶ Secure ballast guide right **3** and ballast guide left **4** to the auxiliary crane lifting brackets **W**.
- ▶ Use the auxiliary crane to swivel and fix the ballast guide **3** and **4** to the pinning point **Y** on the turntable.
- ▶ Pin in the pins **8**.
- ▶ Fit spacer pipes **21** and **22**.
- ▶ Secure pins **8** and spacer pipes **21** and **22** with spring retainers **24**.



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Once the ballast guides are pinned to the pinning point **Y**, also pin the ballast guides to the guide pipe on the guide frame **2**.

- ▶ Completely lower ballast guide right **3** and ballast guide left **4** onto the turntable using the auxiliary crane.
- ▶ Pin ballast guides **3** and **4** using pins **9** to the guide pipe on the guide frame **2**.
- ▶ Secure the pin **9** with spring retainer **24**.
- ▶ Remove the turnbuckle **33** between the guide frame **2** and the turntable.

Note

- ▶ The turnbuckle **33** only serves as an assembly support and **must** be disassembled after the ballast guide has been fitted!

DANGER

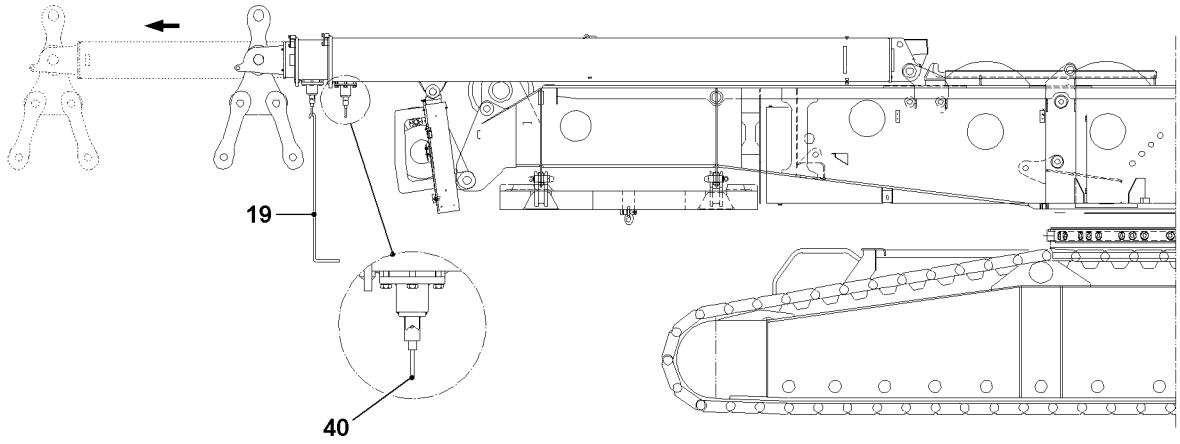
Risk of accident due to loss of pressure or leakage!

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

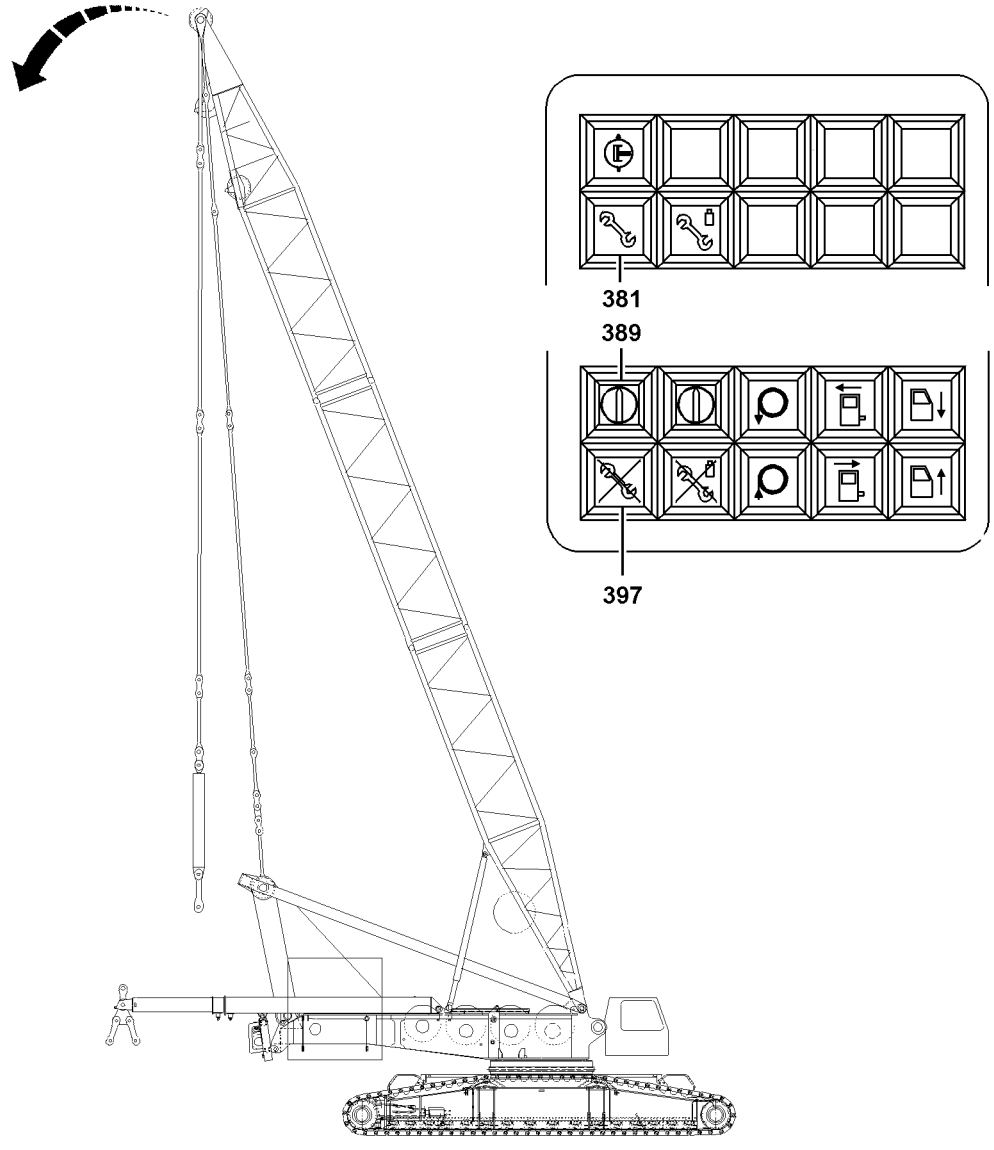
- ▶ Check that the quick-release couplings have been properly connected before using the crane!

- ▶ Connect the supply lines for the ballast guide to the turntable.

A



B



B104663

1.5.3 Mechanically telescoping the ballast guide

Ensure that the following prerequisites are met:
– the guide frame is assembled to the turntable,
– both ballast guides are assembled to the turntable.

The ballast guide is equipped with a telescopic end section having a length of 2 m, this must be mechanically pulled using suitable equipment, see illustration **A**.

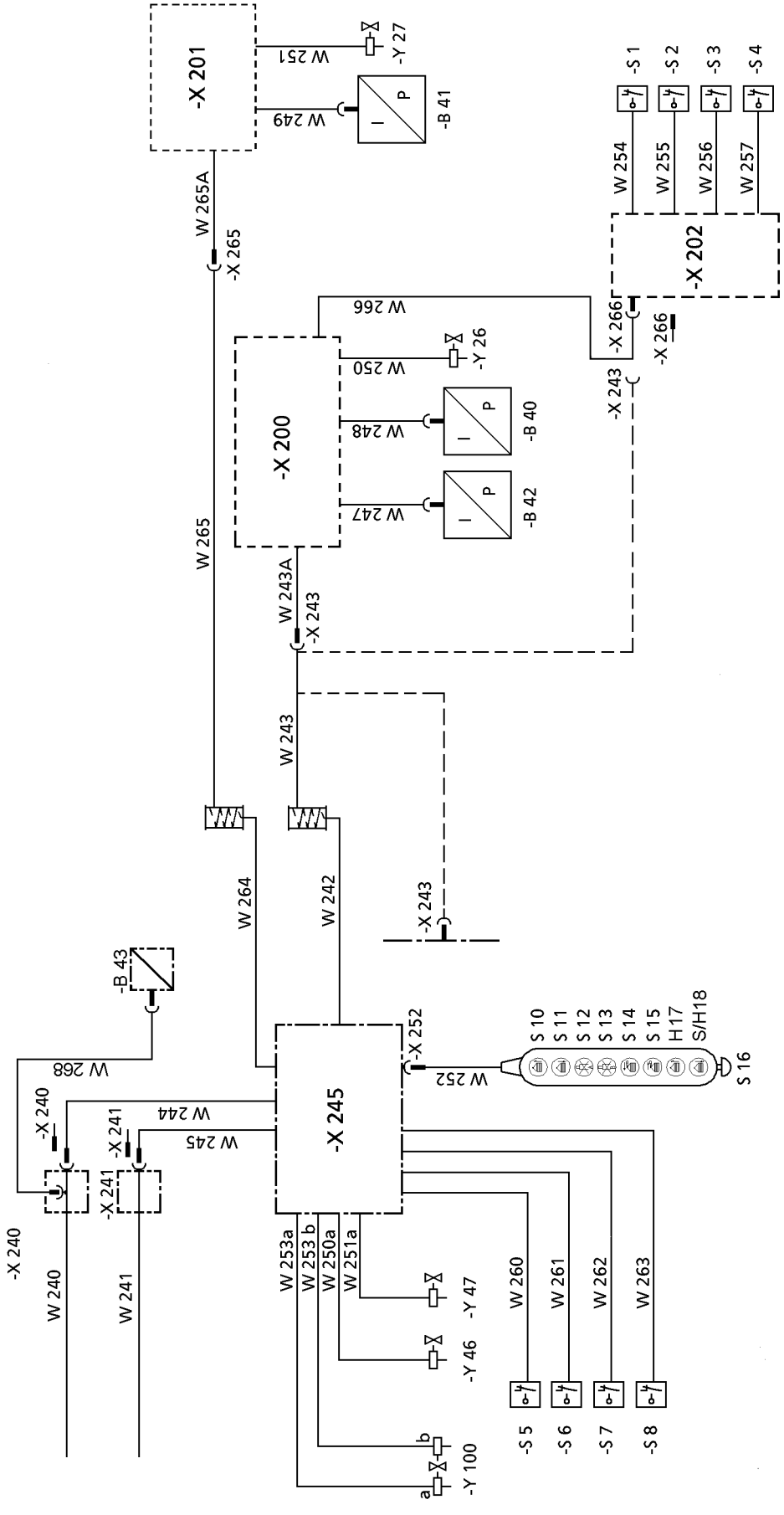
Note
▶ In order to mechanically pull the telescopic end section, **both** locking pins **40** must be released from the assembly rod **19**!
▶ After telescoping has been completed, **both** locking pins **40** must be pinned and secured to the assembly rod **19**!

1.5.4 Erecting the derrick boom

The derrick boom and ballast guide must be erected or telescoped to a radius of 11 m to allow the pull cylinders to be connected to the ballast guide, see illustration **B**.
▶ Operate assembly key button **389**.

Result:
– The indicator light **381** lights up.

▶ Erect derrick boom to radius of 11 m using master switch 1.


-X 201
W 251
-Y 27
W 249
-B 41
-S 1
-S 2
-S 3
-S 4
W 254
W 255
W 256
W 257
-X 202
W 265A
-X 265
W 266
-X 266
-X 266
-X 243
W 250
-Y 26
-X 200
W 248
-B 40
W 247
-B 42
W 265
W 243A
-X 243
W 243
W 264
W 242
-X 243
-B 43
W 268
-X 252
S 10
S 11
S 12
S 13
S 14
S 15
H17
S/H18
S 16
W 252
-X 240
W 244
-X 241
W 245
-X 245
-X 241
-X 240
W 253a
W 253 b
W 250a
W 251a
W 260
W 261
W 262
W 263
W 240
W 241
-Y 47
-Y 46
b
a
-Y 100
-S 5
-S 6
-S 7
-S 8

B104661

1.5.5 Establishing the electrical connection

- ▶ Remove the dummy plugs from socket **-X 240**, socket **-X 241** and socket **-X 266**.
- ▶ Plug the cable **W 244** into the socket **-X 240**.
- ▶ Plug the cable **W 245** into the socket **-X 241**.

Note

- ▶ The cables **W 243A** and **W 265A** must be pulled as far as the end section on the ballast guide and then secured using the attached tension spring!

- ▶ Plug the cable **W 243A** into the socket **-X 243**.
- ▶ Plug the cable **W 265A** into the socket **-X 265**.
- ▶ Plug the cable **W 266** into the socket **-X 266**.

1.5.6 Establishing the hydraulic connection

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

Note

- ▶ The matching quick-release hydraulic couplings are marked!

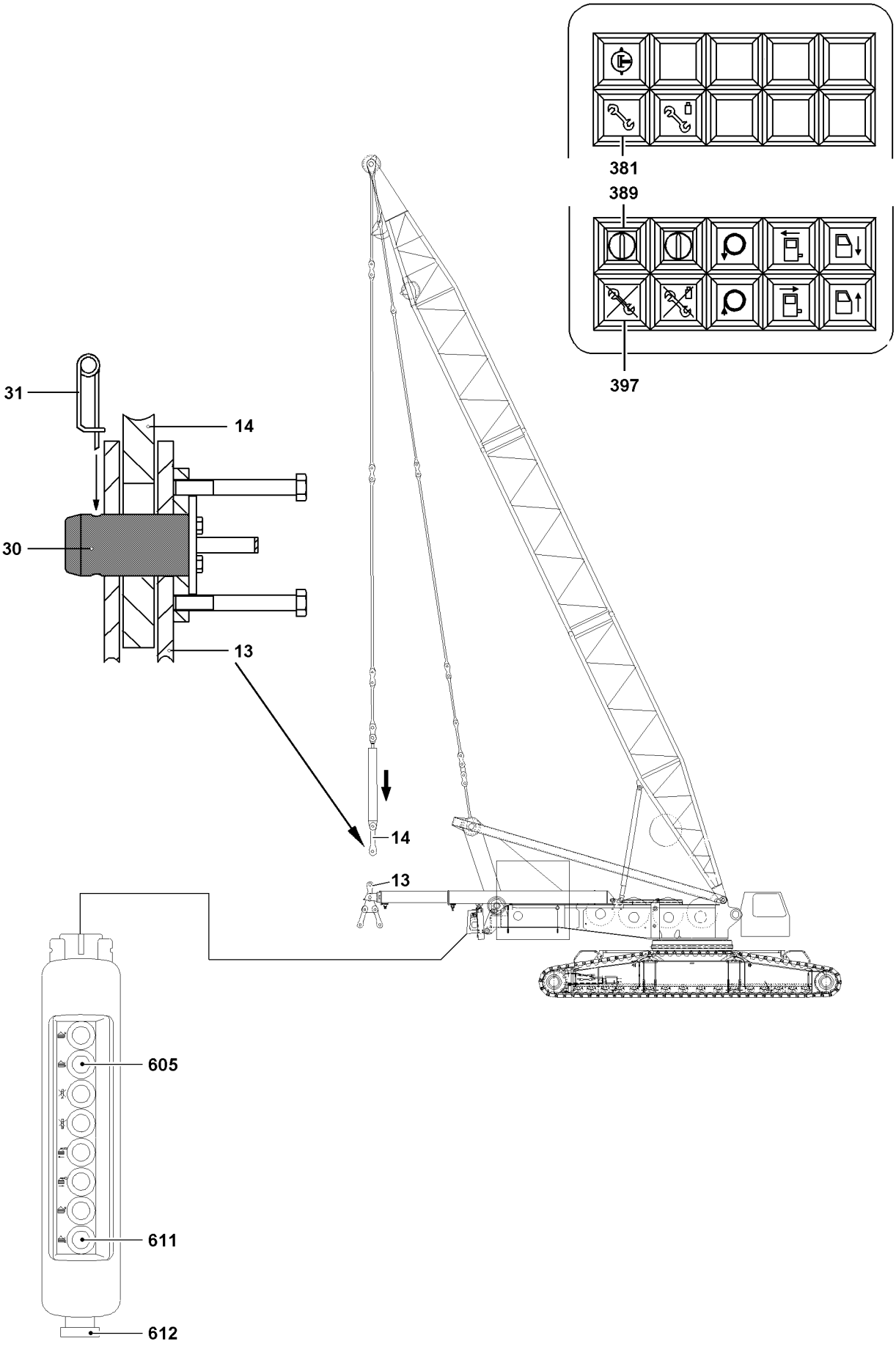
DANGER

Risk of accident due to loss of pressure or leakage!

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

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

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



B104664

1.5.7 Pinning the pull cylinder to the end section on the guide

Ensure that the following prerequisites are met:
- the engine is running,
- the key button **389** for assembly is switched on and the indicator light **381** is lit,
- the turnbuckle between the guide frame and turntable has been disassembled,
- the derrick boom is set to 11 m,
- the ballast guide is mechanically telescoped to 11 m, pinned and secured.

▶ Remove the control panel from the storage compartment in the guide frame.

▶ Press button **605** “Extend pull cylinders”.

Troubleshooting

Pull cylinders do not extend when operating button **605**?

When assembling both ballast guides, these rest on the turntable frame. Consequently the limit switches for “Derrick ballast below ground level” are actuated and the pull cylinders cannot be extended. The illuminated button **611** lights up.

▶ The limit switches can be bypassed by operating the illuminated button **611**.

▶ Press button **605** and illuminated button **611** at the same time.

Result:
- Both pull cylinders extend.

▶ Extend the pull cylinders until the brackets **14** align with the ballast guy rods **13** on the end section.

WARNING

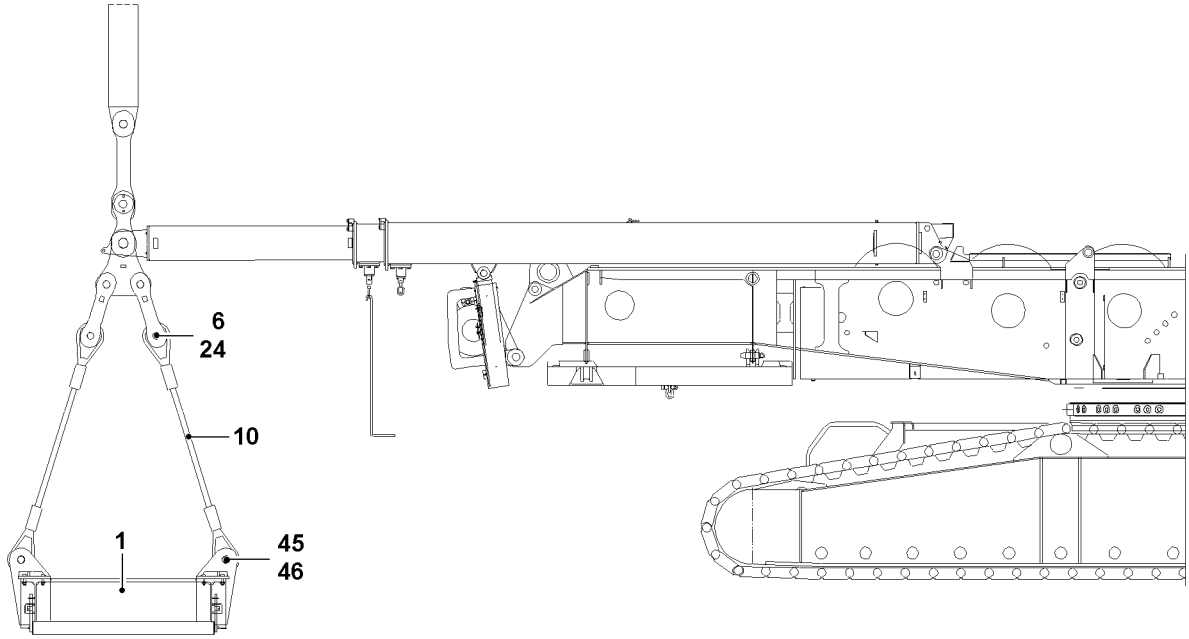
Risk of accident!

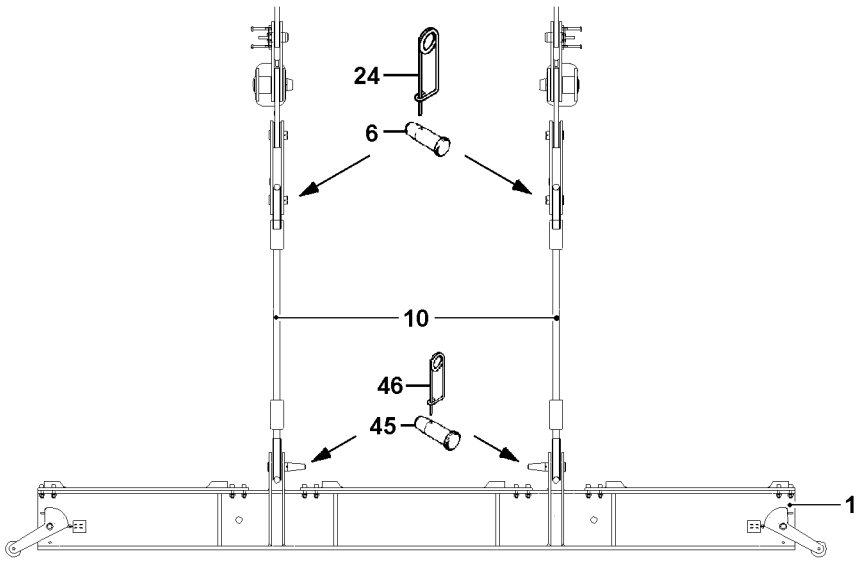
▶ The manual control panel should only be used to install or remove the derrick ballast. Once the pins have been inserted, the derrick ballast functions may only be driven from the crane operator's cab as derrick ballast operation requires the use of the LICCON monitor!

▶ It is prohibited to raise the derrick ballast off the ground using the control panel!

▶ Pin the ballast guy rods **13** and brackets **14** using pins **30**.

▶ Secure the pin **30** with spring retainer **31**.





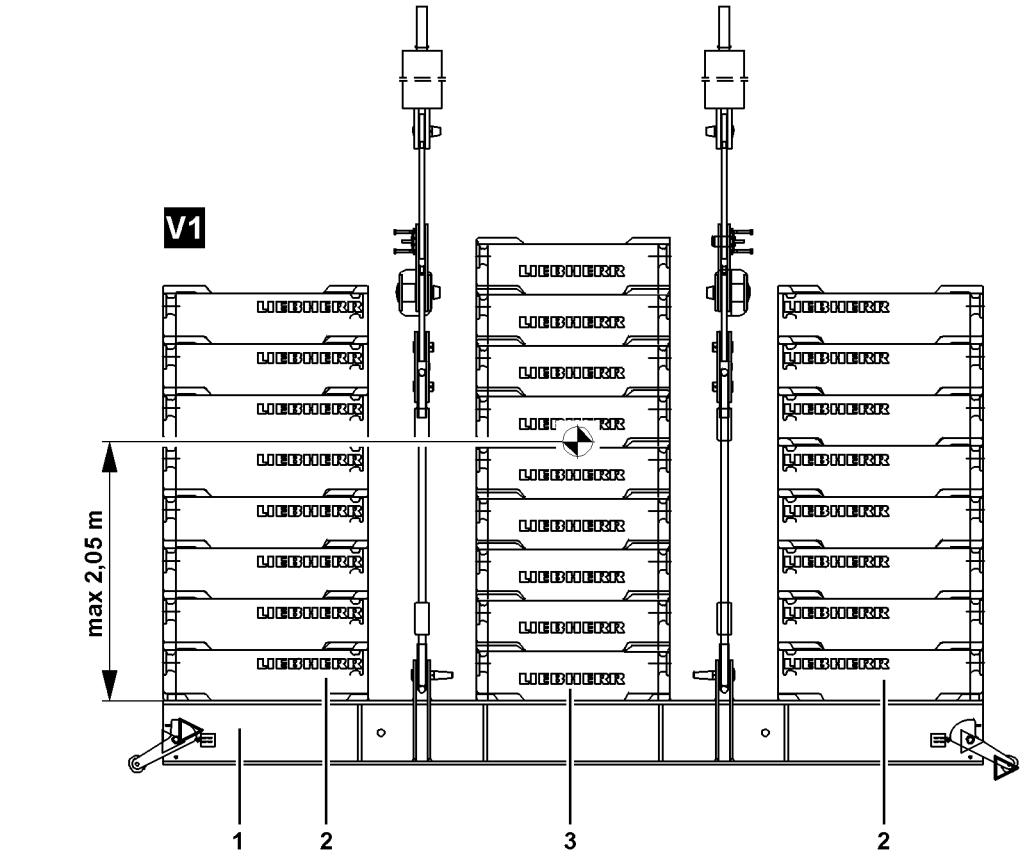
B104660

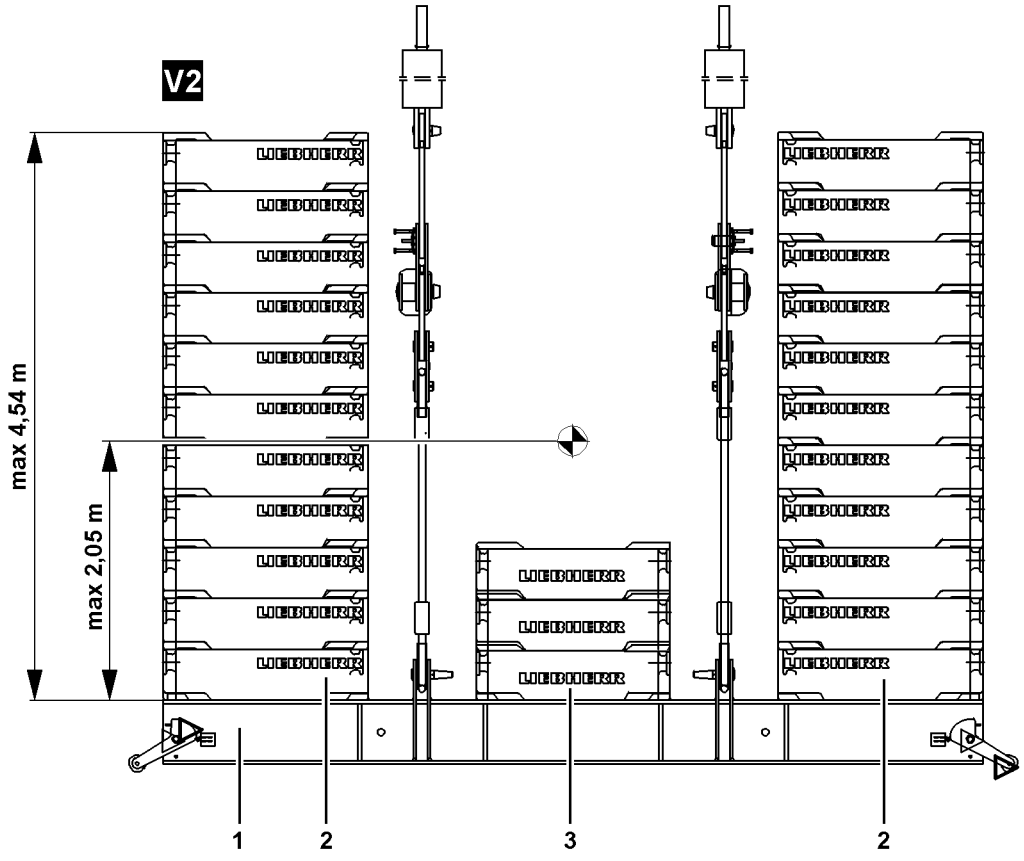
1.5.8 Installing the ballast pallet

Make sure that the following prerequisites are met:

– the ballast guides are pinned to the pull cylinders,
– an auxiliary crane is available.

▶ Set down and align the ballast pallet **1** to a radius of approx. 11 m relative to the point of crane rotation.
▶ Pin the rope **10** to the brackets of the end section with the pins **6**.
▶ Secure the pin **6** with spring retainer **24**.
▶ Pin the rope **10** to the ballast pallet **1** using pins **45**.
▶ Secure the pin **45** with spring retainer **46**.





B105614

1.5.9 Ballasting the ballast pallet

The ballast plates are marked with their own weights.

– Ballast plate 10 t.

Ensure that the following prerequisites are met:

– the ballast pallet is assembled on the ballast guide,
– the pull cylinders are pinned and secured on both sides,
– an auxiliary crane is available,
– the key button **389** for assembly is switched on and the indicator light **381** is lit.

Note

▶ Raise the empty ballast pallet **1** off the ground by luffing down the derrick boom to the front and using master switch 1. Subsequently place it back on the ground by erecting the derrick boom. This ensures that the ballast pallet **1** is aligned exactly vertically before the ballast plates are added!

WARNING

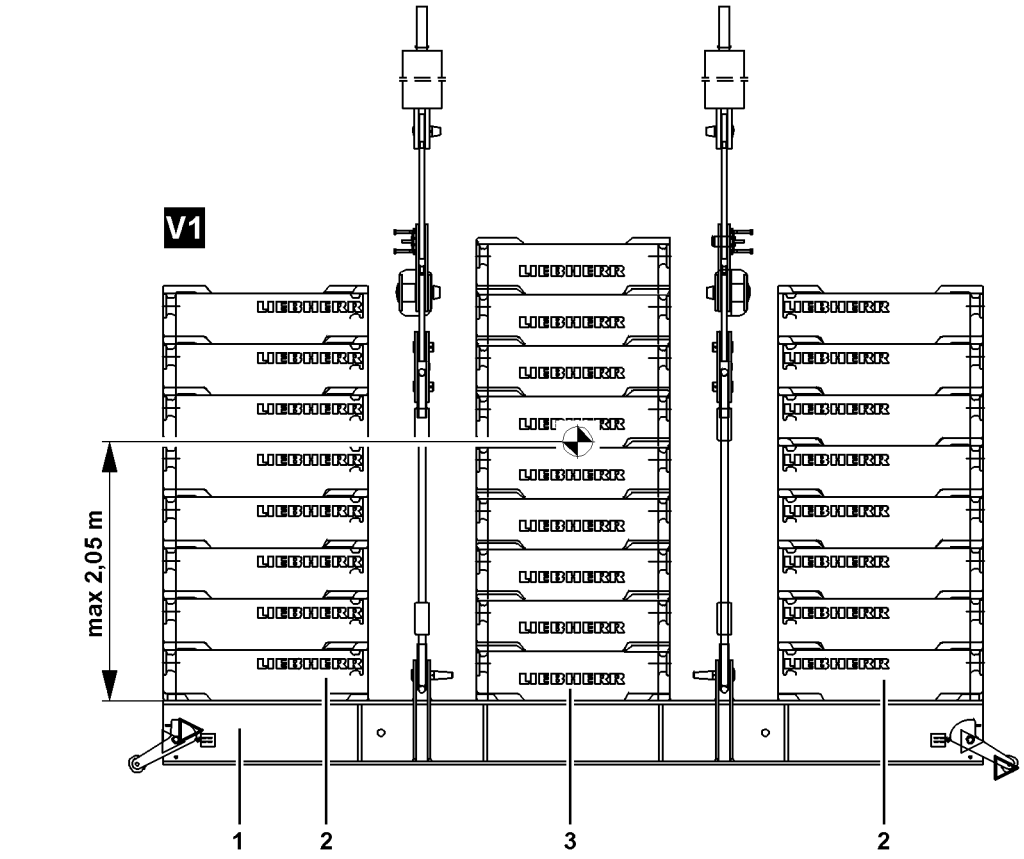
Danger of toppling the ballast stack!

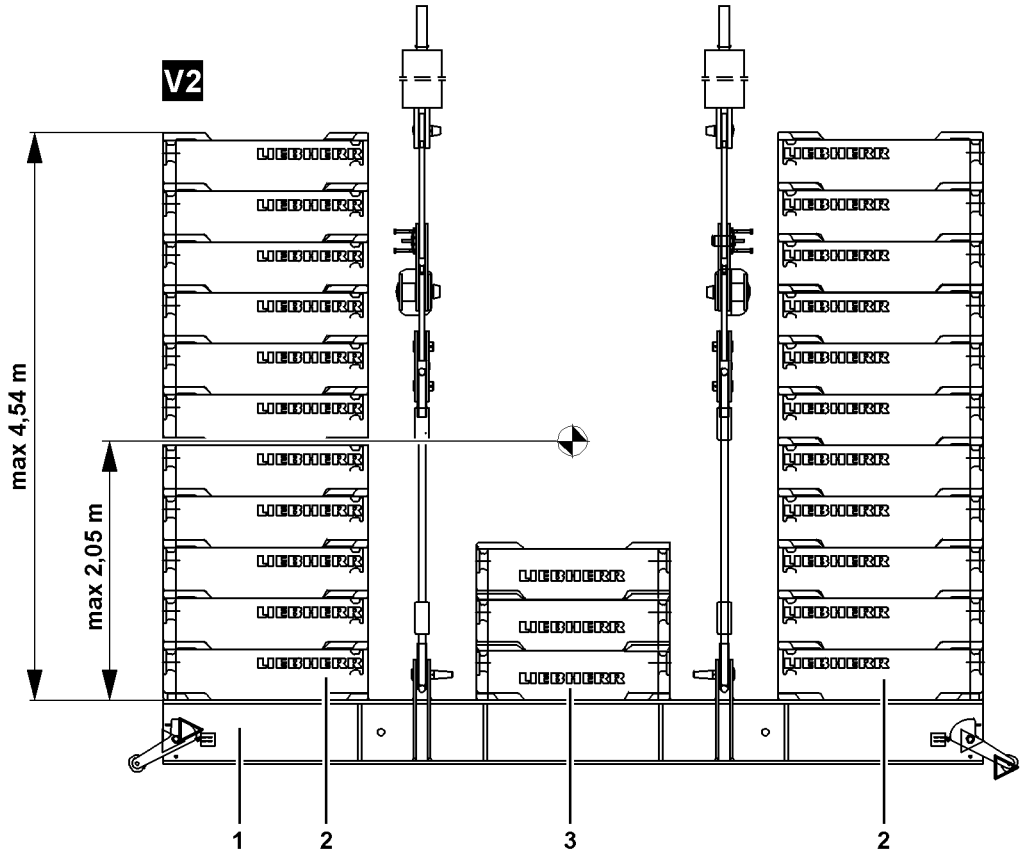
Incorrect up or down ballasting of the ballast plates on the ballast pallet can cause the ballast stack to topple over!

Personnel can be severely injured or killed!

▶ The maximum permissible total weight of the suspended ballast is 260 t!
▶ The ballast stacks on the left and right hand side must weigh the same and be the same height after ballasting or during crane operation!
▶ The permissible weight difference between the left and right ballast stack may not exceed 10 t for ballasting up or down!
▶ The maximum permissible height of the ballast center of gravity of **2.05 m** may **not** be exceeded!
▶ The maximum permissible stack height of the ballast plates of 4.54 m - measured from the upper edge of the ballast pallet - may **not** be exceeded!
▶ The installed derrick ballast must correspond to the data in the load chart!
▶ The ballasts must be placed in such a way that the ballast pallet is always balanced!

Possible permissible distribution of the ballast plates, Variation V1			
Description	Number of ballast plates		Total weight
Ballast stack left	8 x 10 t	=	80 t
Ballast stack center	9 x 10 t	=	90 t
Ballast stack right	8 x 10 t	=	80 t
Maximum total weight of the ballast plates			250 t
Maximum total weight of the suspended ballast			260 t





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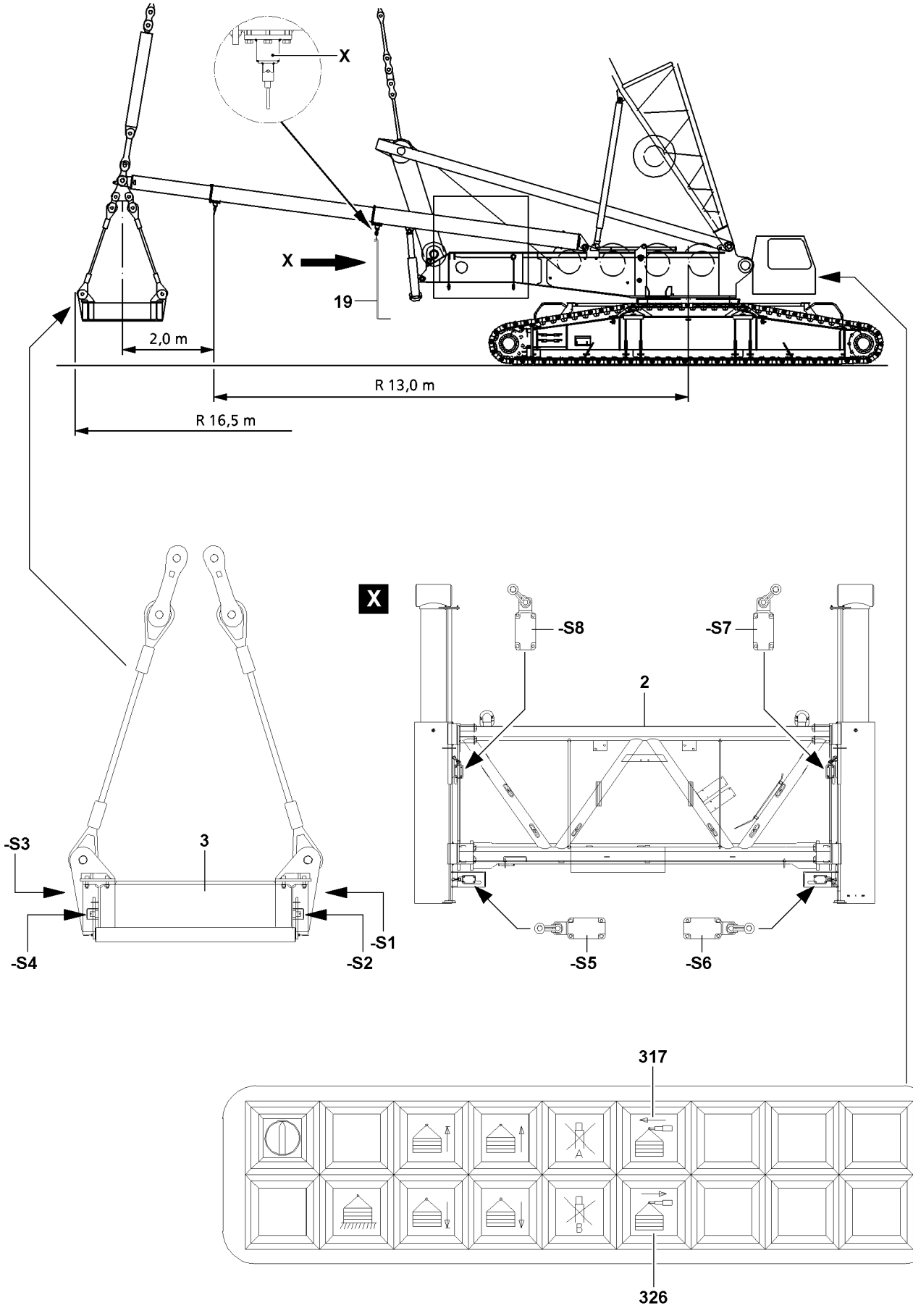
Possible permissible distribution of the ballast plates, Variation V2			
Description	Number of ballast plates		Total weight
Ballast stack left	11 x 10 t	=	110 t
Ballast stack center	3 x 10 t	=	30 t
Ballast stack right	11 x 10 t	=	110 t
Maximum total weight of the ballast plates			250 t
Maximum total weight of the suspended ballast			260 t

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the studs on the ballast plates are overloaded and the ballast plates can fall down. Personnel can be severely injured or killed!
- ▶ Lift no more than maximum 10 t with the ropes, 3 attachment points!
- ▶ Replace damaged ballast plates!

▶ Place ballast plates according to the two variations described above on the ballast pallet.

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

▶ Hang the ballast plate or ballast assembly on the auxiliary crane and evenly ballast the ballast pallet.



B104668

1.5.10 Function check

Make sure that the following prerequisites are met:

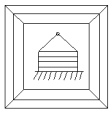
– all electrical connections have been made,
– the actuator levers of the limit switches on the guide and ballast pallet have been checked for ease of movement and have been lubricated,
– the actuator rollers on the ballast pallet have been checked for easy movement and are lubricated.

Limit switch “Derrick ballast on ground”

▶ Manually actuate limit switch **-S1**, limit switch **-S2**, limit switch **-S3** and limit switch **-S4** on the ballast pallet **3** individually.

Result:

– The slewing gear must turn off.
– The warning light **411** lights up.



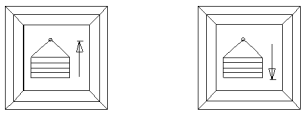
Warning light 411 “Derrick ballast on ground”

Limit switch “Derrick ballast up and down”

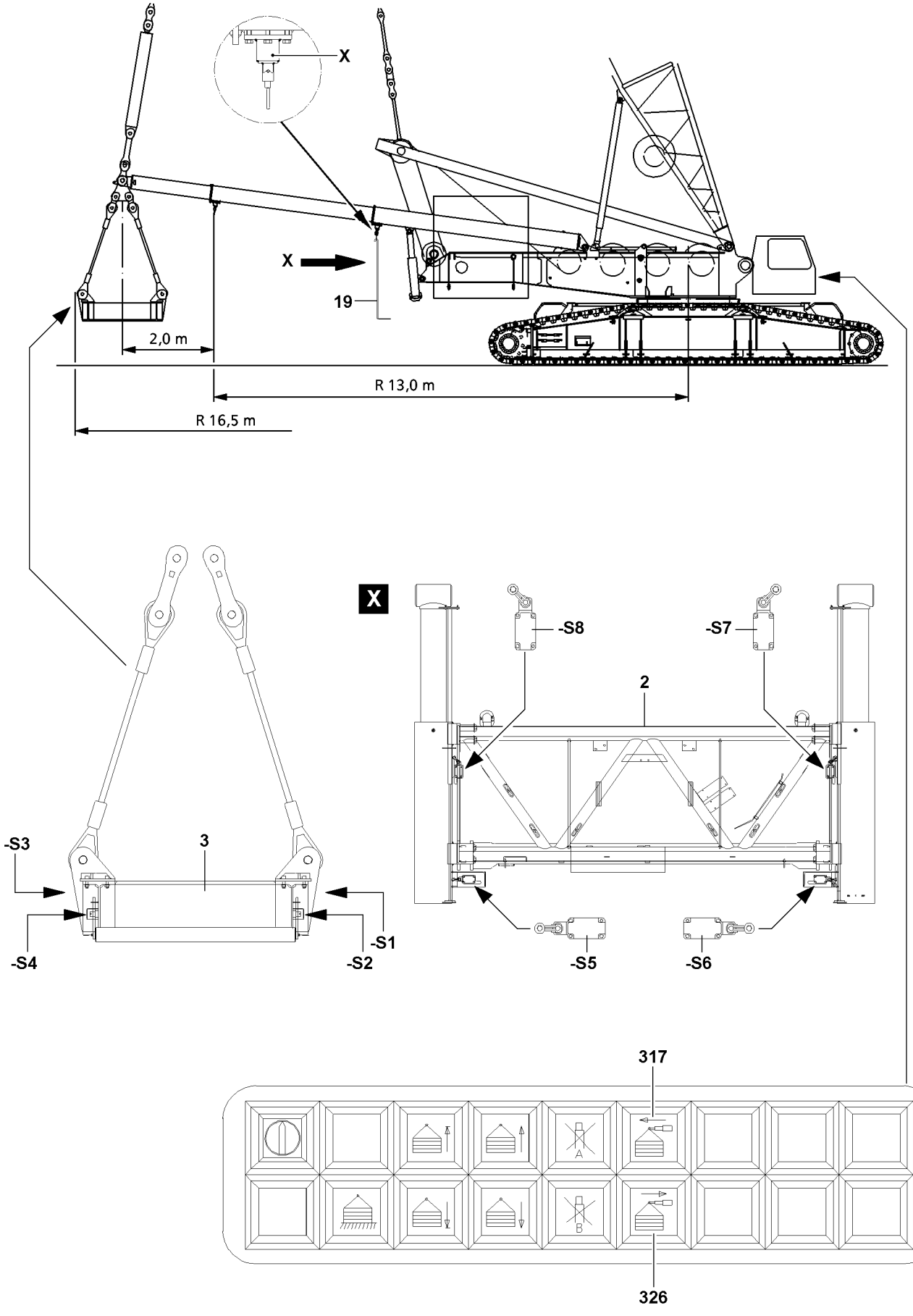
▶ Manually actuate limit switch **-S5**, limit switch **-S6**, limit switch **-S7** and limit switch **-S8** on the guide frame **2** individually, see view **X**.

Result:

– Extension and retraction of the pull cylinders is switched off.
– Warning light **410** or warning light **412** is lit.



Warning light 410 “Derrick ballast up” and warning light 412 “Derrick ballast down”



B104668

1.5.11 Telescoping the derrick ballast to the required radius

The ballast guide can be steplessly hydraulically telescoped. To achieve a radius of 15 m, the 2 m long end section must be mechanically pulled, see section “Mechanically telescoping the ballast guide”.

WARNING
Risk of accident!
- ▶ The crane driver must ensure that both telescopic cylinders extend by the same amount, because only one side is equipped with a length sensor. If both telescopic cylinders diverge, briefly drive the extension mechanism against a stop until both telescopic cylinder are extended or retracted by the same amount!

Hydraulically telescoping out the ballast guide

▶ Press button **317** in the crane operator's cab.

Result:

– The ballast guide extends.

▶ When the required derrick ballast radius is reached:
Do **not** press the button **317** in the crane operator's cab any longer.

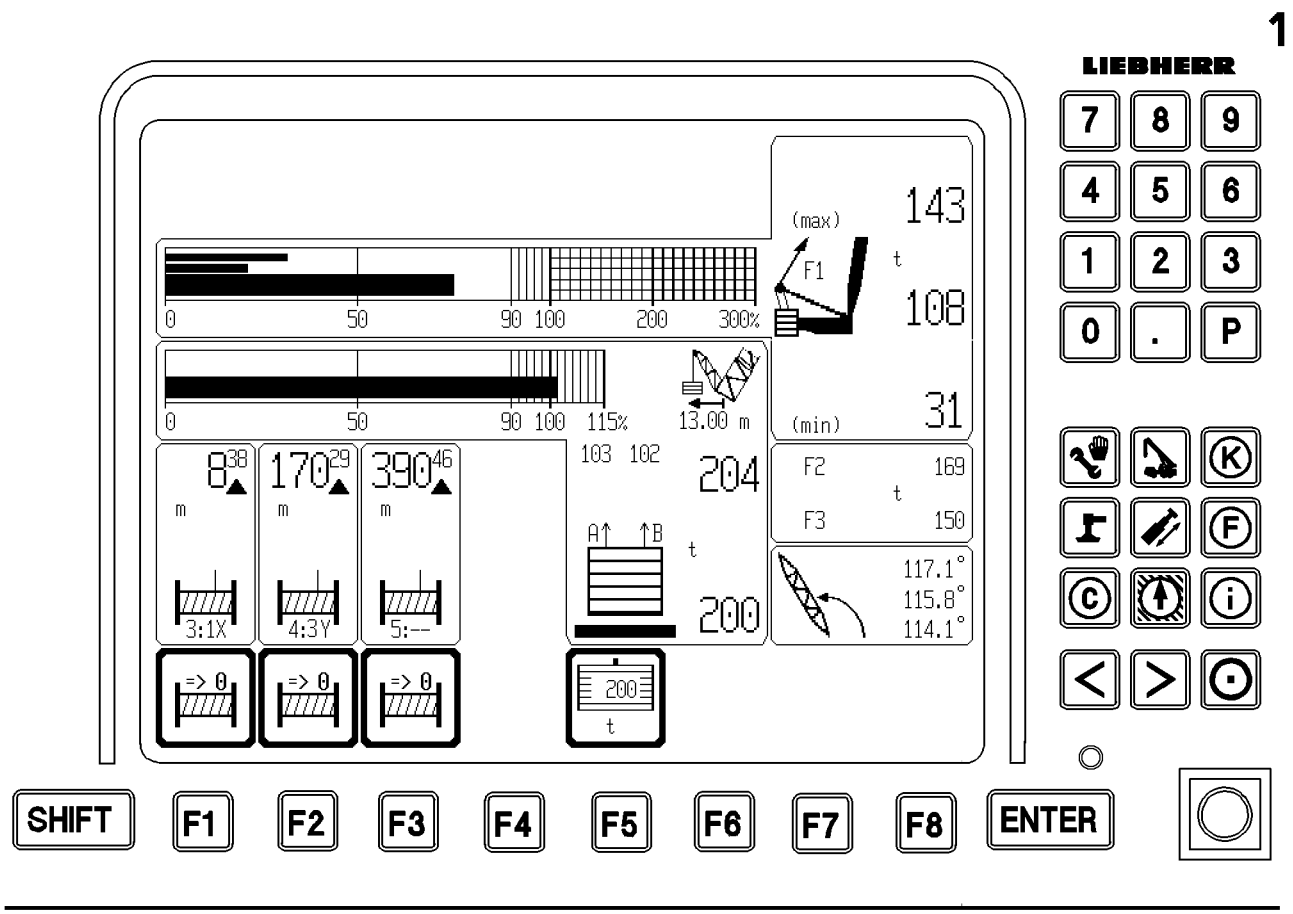
Hydraulically telescoping in the ballast guide

▶ Press button **326** in the crane operator's cab.

Result:

– The ballast guide retracts.

▶ When the required derrick ballast radius is reached:
Do **not** press the button **326** in the crane operator's cab any longer.


1
LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
(max)
143
t
F1
108
0
50
90 100
200
300%
0
50
90 100
115%
13.00 m
(min)
31
8 38
170 29
390 46
m
m
m
3:1X
4:3Y
5:--
103 102
204
A
B
t
200
F2
169
t
F3
150
117.1°
115.8°
114.1°
=> 0
=> 0
=> 0
200
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B104669

1.5.12 Crane operation with derrick ballast

Note

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

Make sure that the following prerequisites are met:

– the required derrick ballast is placed according to the load chart,
– the derrick boom is in the required operating position, radius **9 m or 11 m** .

Settings

- ▶ Set and confirm the load chart for the upcoming crane operation on the LICCON monitor.
- ▶ Set the weight of the actual derrick ballast on the LICCON monitor.

Note

- ▶ To set the derrick ballast, see chapter 4.03 of the Crane operating instructions!
- ▶ The required derrick ballast must be determined according to the data in the load chart!

DANGER

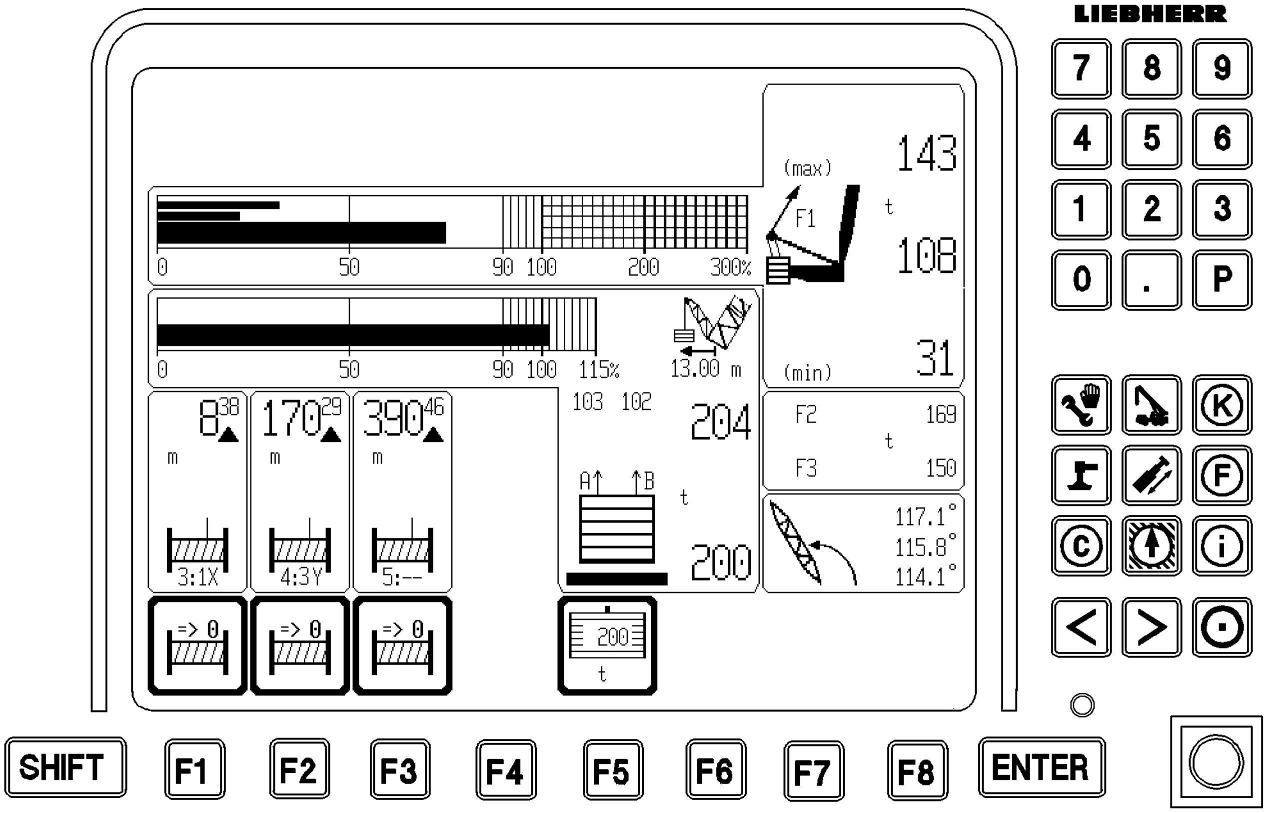
Risk of accident!

The set derrick ballast must match the actually placed derrick ballast!

- ▶ Incorrect ballast weight entry can lead to dangerous operating situations!

- ▶ Check the set derrick ballast against the actual derrick ballast!

1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ENTER

B104669

Crane operation

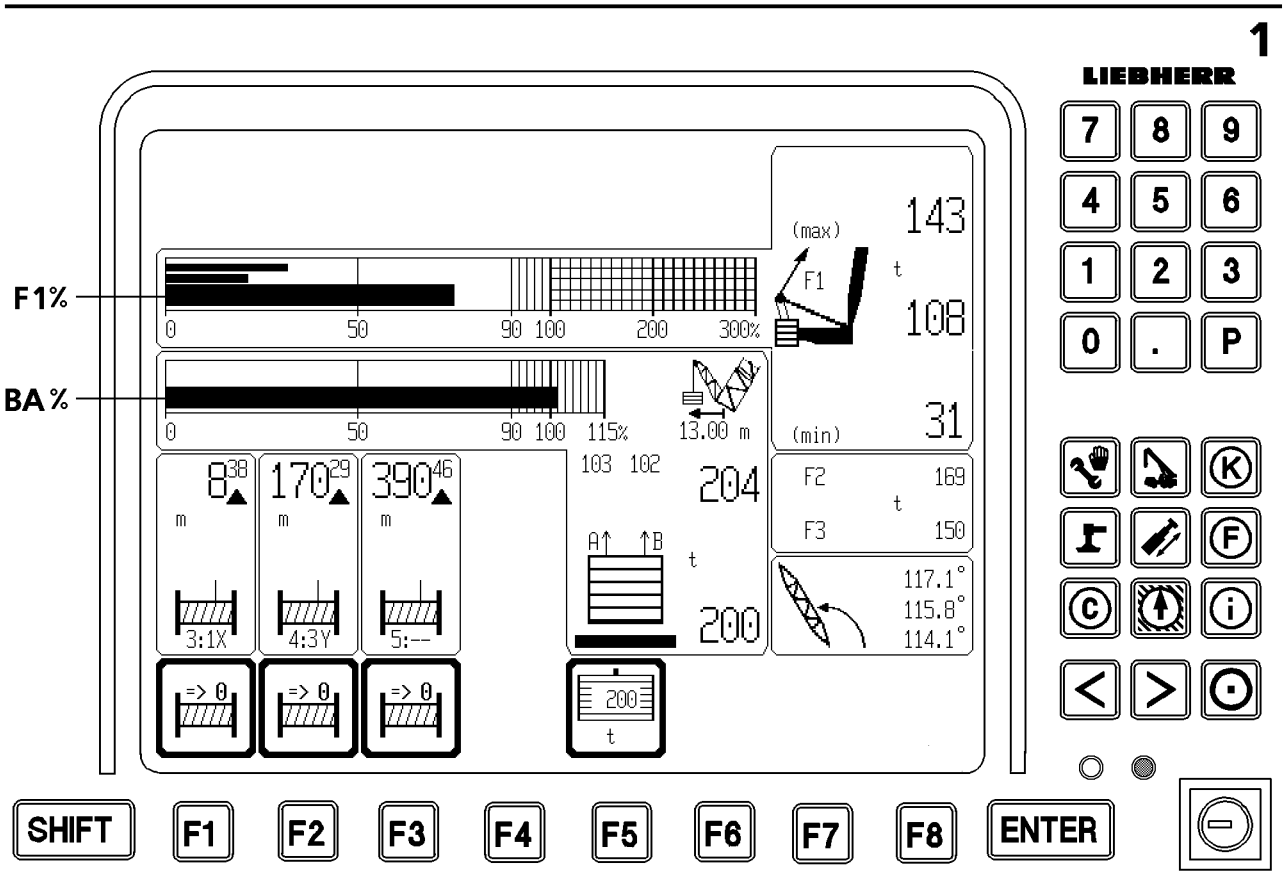
For crane operation with derrick ballast, the data in chapter 4.02 of the Crane operating instructions must be observed.

DANGER
Risk of accident!
There may be no persons or obstacles within the turning range of the derrick ballast.
During the turn, a guide must 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!
- ▶ The jerky execution / braking of turning movement can cause the load or suspended derrick ballast to swing!
- ▶ This can cause the boom to break off or the crane to topple over!

Note
- ▶ If the suspended derrick ballast must be swung over 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. The pull cylinders are operated from the crane operator's cab!

DANGER
Danger of tipping over!
The derrick ballast functions may only be carried out from the crane operator's cab because the monitor display is required for derrick ballast operation!
- ▶ It is prohibited to raise the derrick ballast off the ground using the control panel!
- ▶ The derrick ballast must always be in horizontal position when it is raised or lowered with the pull cylinders!

- ▶ Monitor the extended state of the cylinder piston rod.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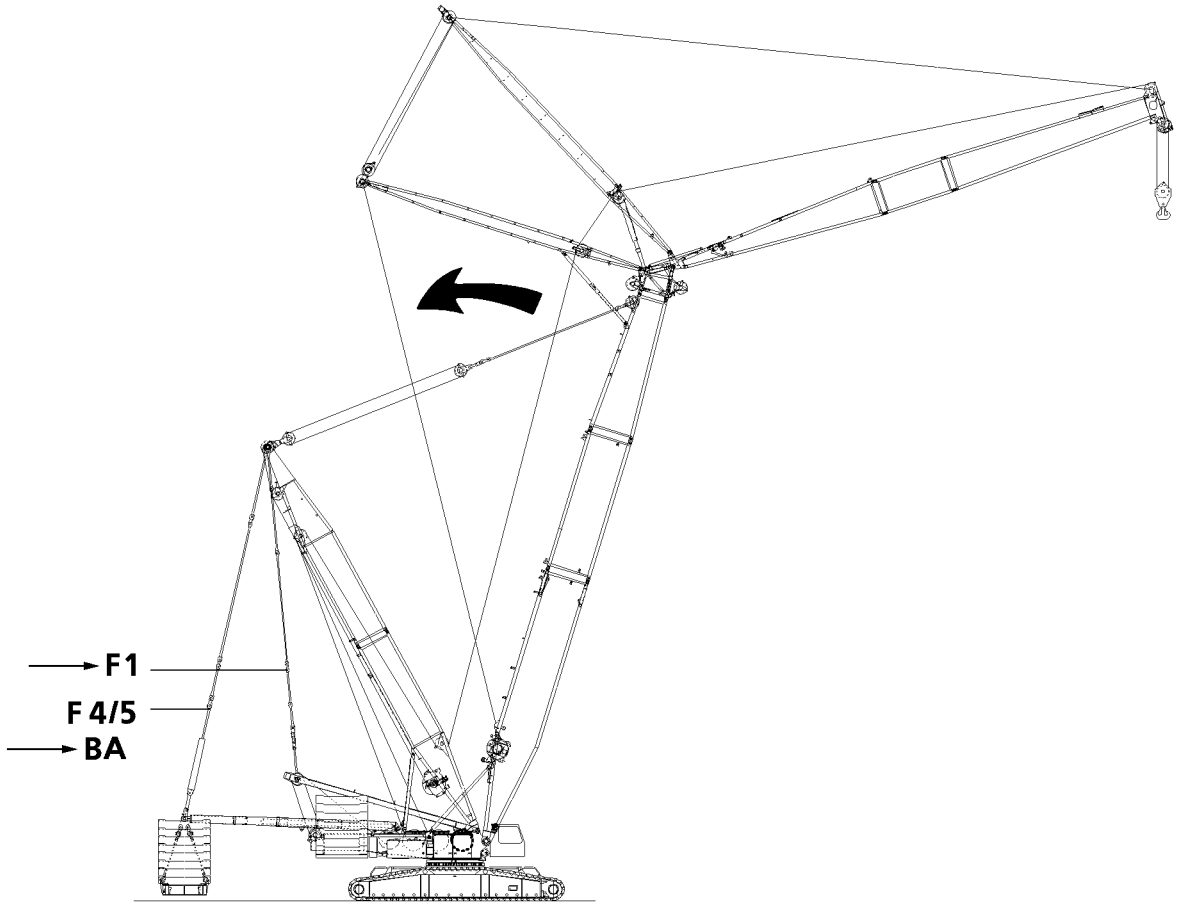
ENTER


F1
F 4/5
BA

B104670

Crane operation with derrick ballast

In all operating modes with derrick ballast, the load on the guy rods from the derrick head to the SA-frame (F1) and to the derrick ballast (F4/5) is distributed.
The load of the crane is monitored by test point 1 (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 be changed by the following procedures:

– Taking on the load: By flexing of the turntable.
– By raising or lowering the derrick ballast using the pull cylinders.
– By ballasting derrick ballast plates on or off.

Safety guidelines

– The test points must be checked for function before crane operation.
– The crane must be horizontally aligned on the set up location.
– The weight of the load to be lifted must be known.
– Place the ballast plates according to the data in the load charts or the job planner.
– According to the information on the following illustrations, the contact surface of the derrick ballast may be above or below the level of the crane base.
– The placement surface on which the suspended derrick ballast is placed after completion of the load lift must be level, horizontal and able to safely support the weight.

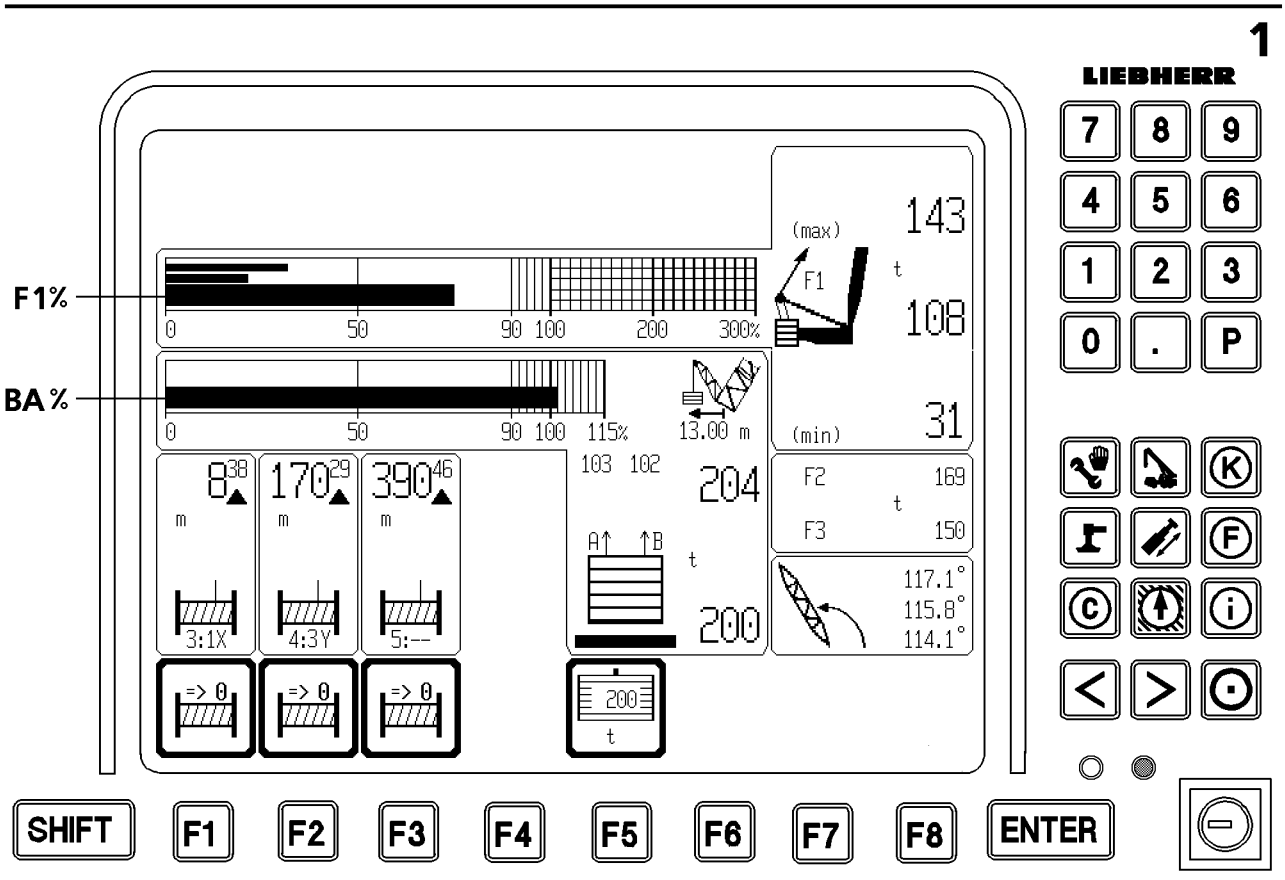
WARNING
Risk of accident!
▶ Before setting down the load and suspended derrick ballast, the crane operator must make sure that it can be safely set down!

– There should not be any obstacles within the slewing range of the crane, ballast trailer, suspended derrick ballast and load.
– The suspended derrick ballast should be lifted off the ground by approx. 0.25 m. Lift off must be monitored by the crane operator or guide.
– 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.

DANGER
Danger of tipping over!
▶ If this is not observed, there is a risk of tipping when lifting with ballast plates. This could cause the crane to topple over!

– When 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 (F1)** is being exceeded.
– The guying between the SA-frame and derrick head **test point 1 (F1)** should **never be untensioned**!

DANGER
Risk of accident!
▶ If the guying between the SA-frame and the derrick head is not under tension, this may lead to uncontrolled movements of the boom system and cause an accident!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300%
115%
(max)
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(min)
31
13.00 m
103 102
204
200
F2
169
F3
150
117.1°
115.8°
114.1°
3:1X
4:3Y
5:--
=> 0
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
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F5
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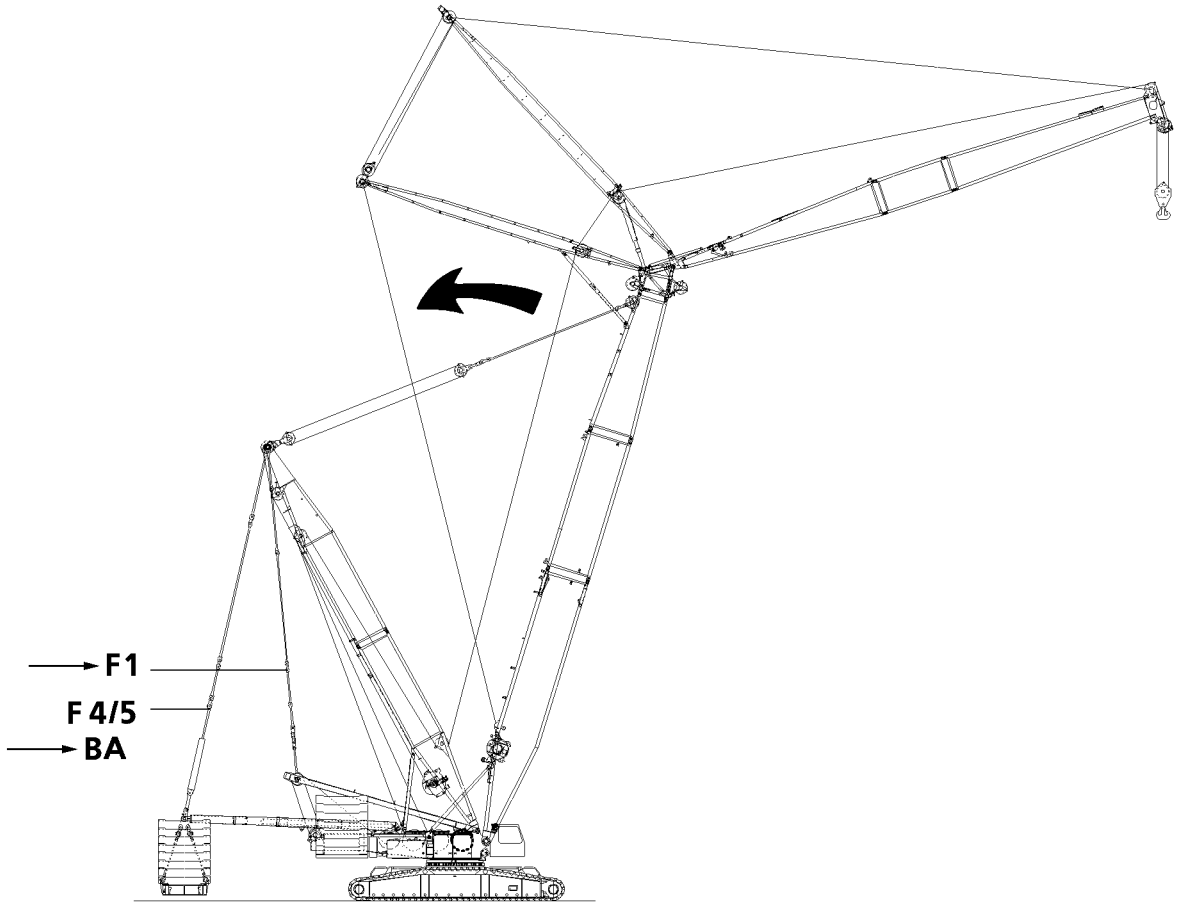
ENTER


F1
F 4/5
BA

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Force F4/5 (test point 4/5) guying derrick ballast - derrick head

The forces F4/5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.
The actual forces in the guy rods (A = left and B = right) are calculated from three pressure sensors installed on the pull cylinders and displayed on the LICCON as individual forces.
The pulled ballast is calculated from the forces of the individual guyings, which means the part of the ballast pulled up by the guying. The remaining part is on the ground. The derrick ballast utilization results from the pulled ballast and the placed ballast. This is shown on the LICCON in a utilization bar (BA in %).

Force F1 (Test point 1) between guying SA-frame - Derrick end section

The force F1 (test point 1) is determined in the guy rods from the SA-frame to the derrick head by 2 force test boxes and is shown on the LICCON as total force of the guying.
From the operating force F1 and the force F1-operational maximum force results the F1 utilization. This is shown on the LICCON in a utilization bar (F1 in %).

Monitoring of minimum force F1

Note

▶ Also refer to the graphic illustration and description of the shut off functions in paragraph “Shutting off during crane operation with derrick ballast”!

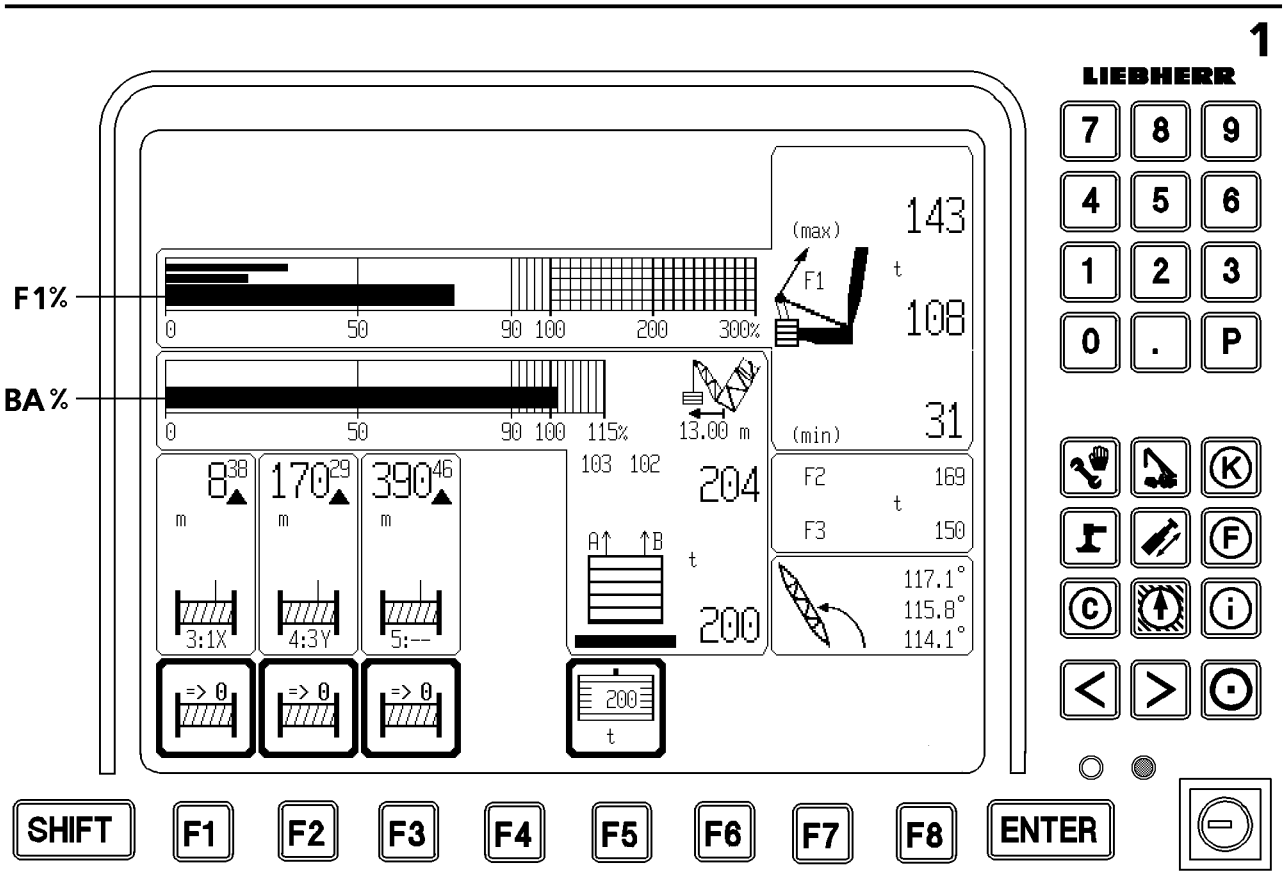
If more than 50 % of the entered derrick ballast is pulled (ballast utilization bar more than 50 %), and the force falls below the minimum force F1 min (test point 1), all load moment increasing crane movements are turned off.

DANGER

Risk of accident!

▶ It is prohibited to fall below the minimum force F1 min (test point 1) if more than 50 % of the derrick ballast is pulled. If this is not observed, in case of loose tension from test point 1 (F1) and derrick ballast on the ground, the derrick ballast can suddenly lift off the ground due to the increased load moment and the boom system suddenly moves forward! This will result in the load swinging violently and could damage the boom and cab!

If more than 90 % of the entered derrick ballast is pulled (ballast utilization bar at more than 90 %), and the force falls below the minimum force F1 min (test point 1), all load moment increasing and all load moment reducing crane movements are turned off. The hoist gear “down” movement is also turned off.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F1%
BA%
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90 100
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300%
115%
(max)
F1
143
t
108
(min)
31
13.00 m
103 102
204
F2
169
F3
150
117.1°
115.8°
114.1°
8.38
170.29
390.46
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4:3Y
5:--
=> 0
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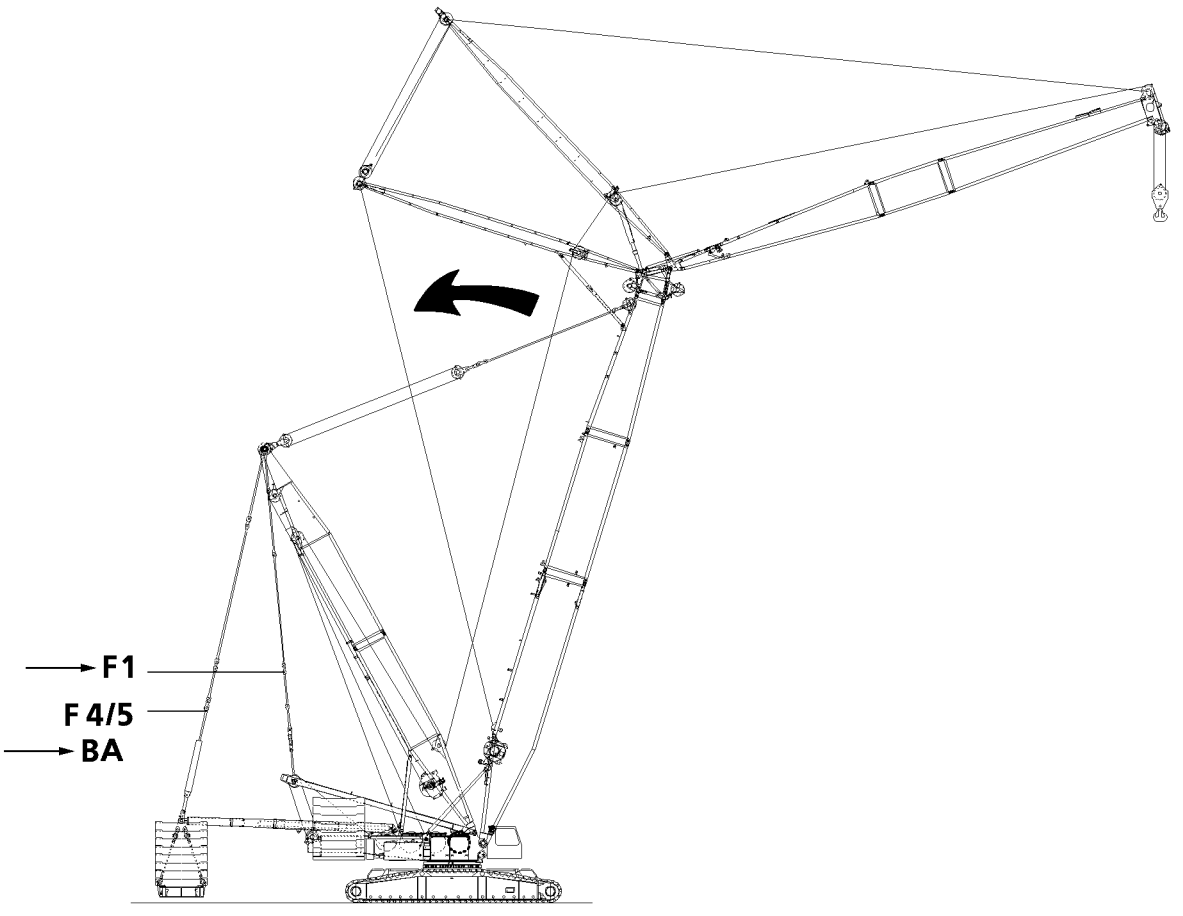
F8
ENTER


F1
F 4/5
BA

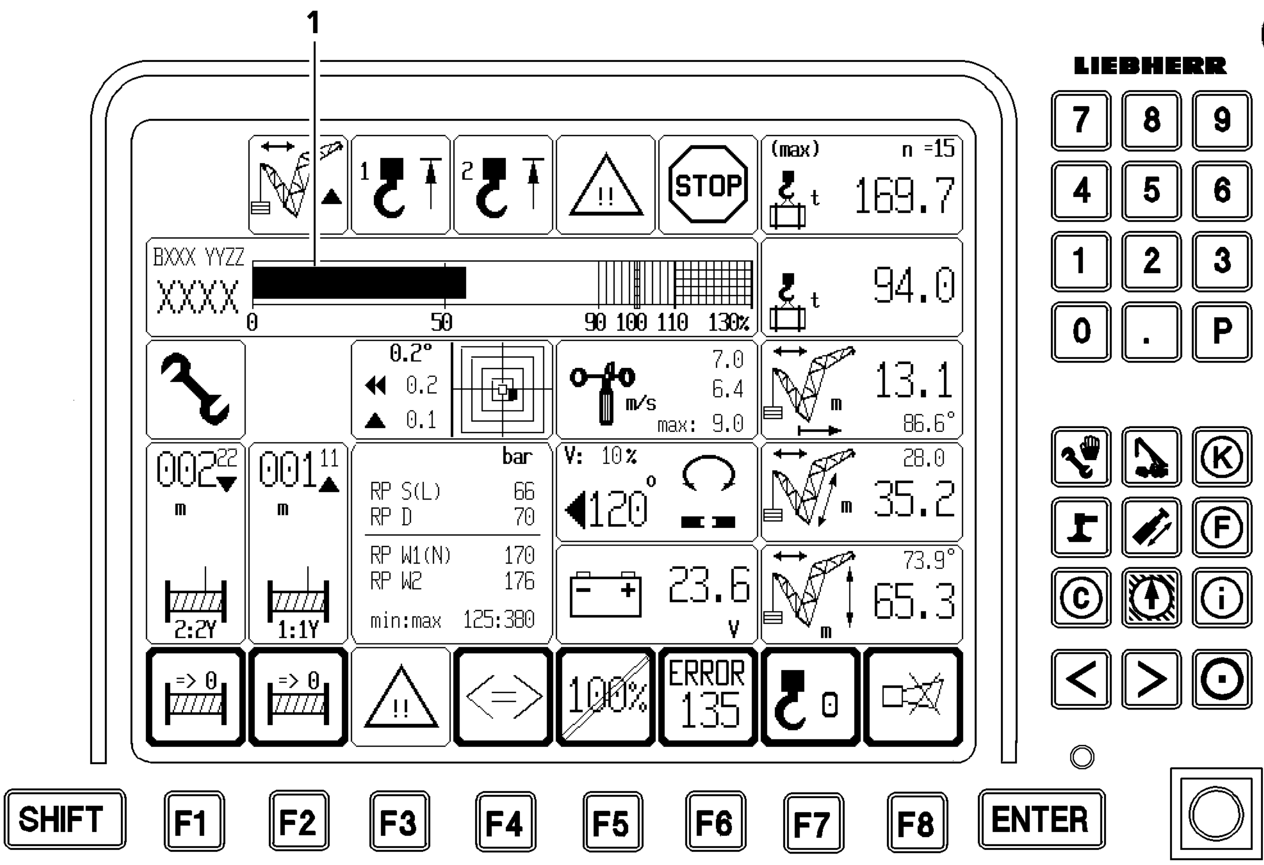
B104670

DANGER
Risk of accident!
It is prohibited to fall below the minimum force F1 min (test point 1) if more than 90 % of the derrick ballast is pulled. If this is not observed and the load torque is increased when the guying is slack at test point 1 (F1) and the derrick ballast is suspended, the derrick ballast can suddenly drop to the ground, causing the boom system to suddenly lurch backwards! Thereby the relapse cylinders can be pressed on block and be overloaded. There is a danger of damage to the relapse cylinders for boom and derrick!
▶ This also causes significant oscillation of the load, which can damage the boom and the crane!

This danger condition can only be overcome :
– by lowering the suspended derrick ballast to the ground using the pull cylinders;
– **or** ballast pallets are unloaded to reduced the derrick ballast utilisation and increase the load at test point 1 (F1).

DANGER
Risk of accident!
▶ When the assembly key button is turned on, only load moment decreasing crane movements up to a permissible load range can be carried out. When the permissible load range is reached, the assembly key button must be turned off again immediately!
▶ When the assembly key button is turned on, the load moment limiter is no longer effective!

0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LIEBHERR
(max)
n =15
169.7
94.0
BXXX YYZZ
XXXX
0
50
90 100 110 130%
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
86.6°
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
V: 10%
120
28.0
35.2
23.6
73.9°
65.3
2:2Y
1:1Y
STOP
ERROR
135
100%
SHIFT
F1
F2
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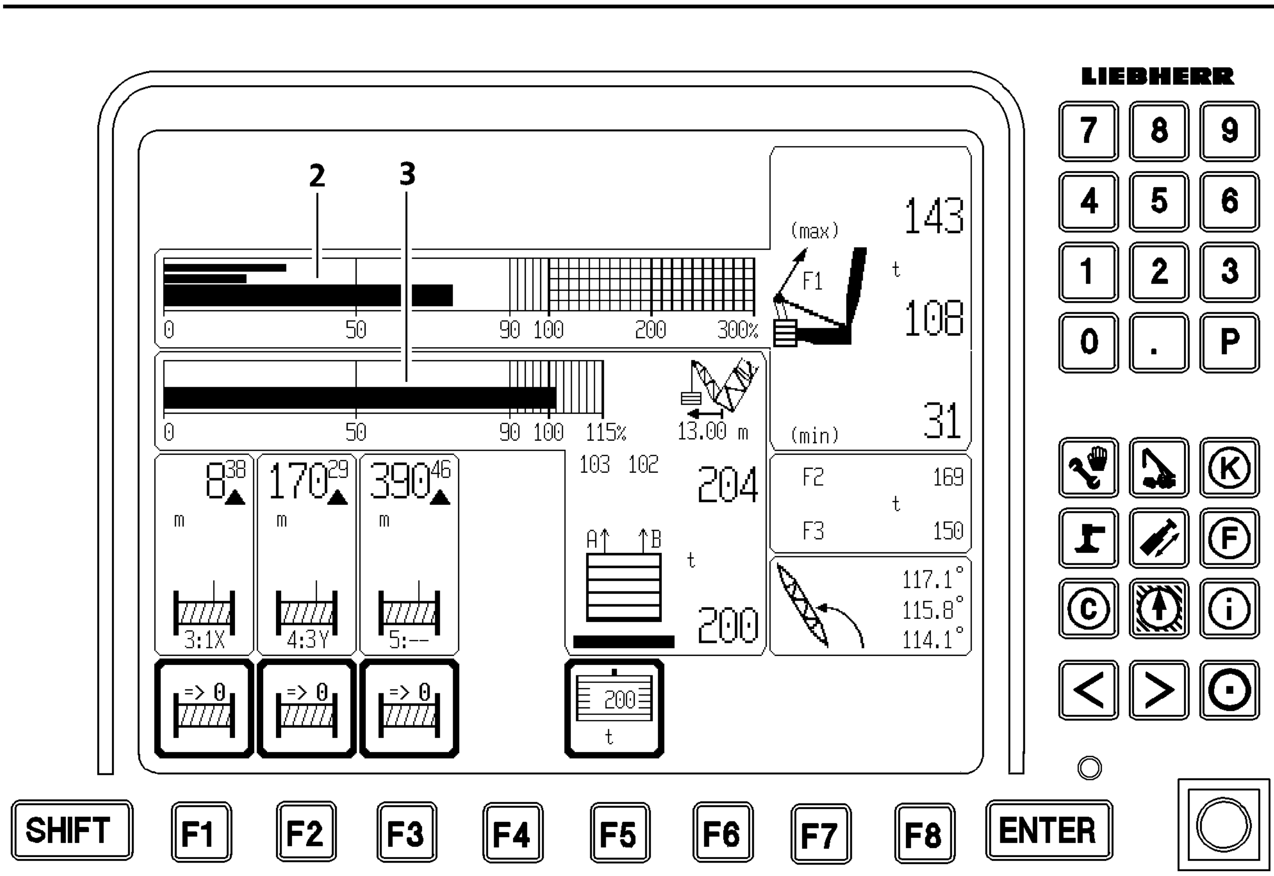
ENTER

1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F1
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90 100 115%
13.00 m
103 102
204
200
F2 169
F3 150
117.1°
115.8°
114.1°
3:1X
4:3Y
5:--
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

B104671

1.5.13 Overload monitoring in operating mode with derrick ballast

Note

- ▶ All terms in inverted commas (" ") are explained in chapter 4.02 of the crane operating instructions!
- ▶ See also the graphic illustration in section “Shut offs during crane operation 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 by the LMB overload protection.
2.) Monitoring of test point 1 - operational maximum force by derrick ballast overload protection.

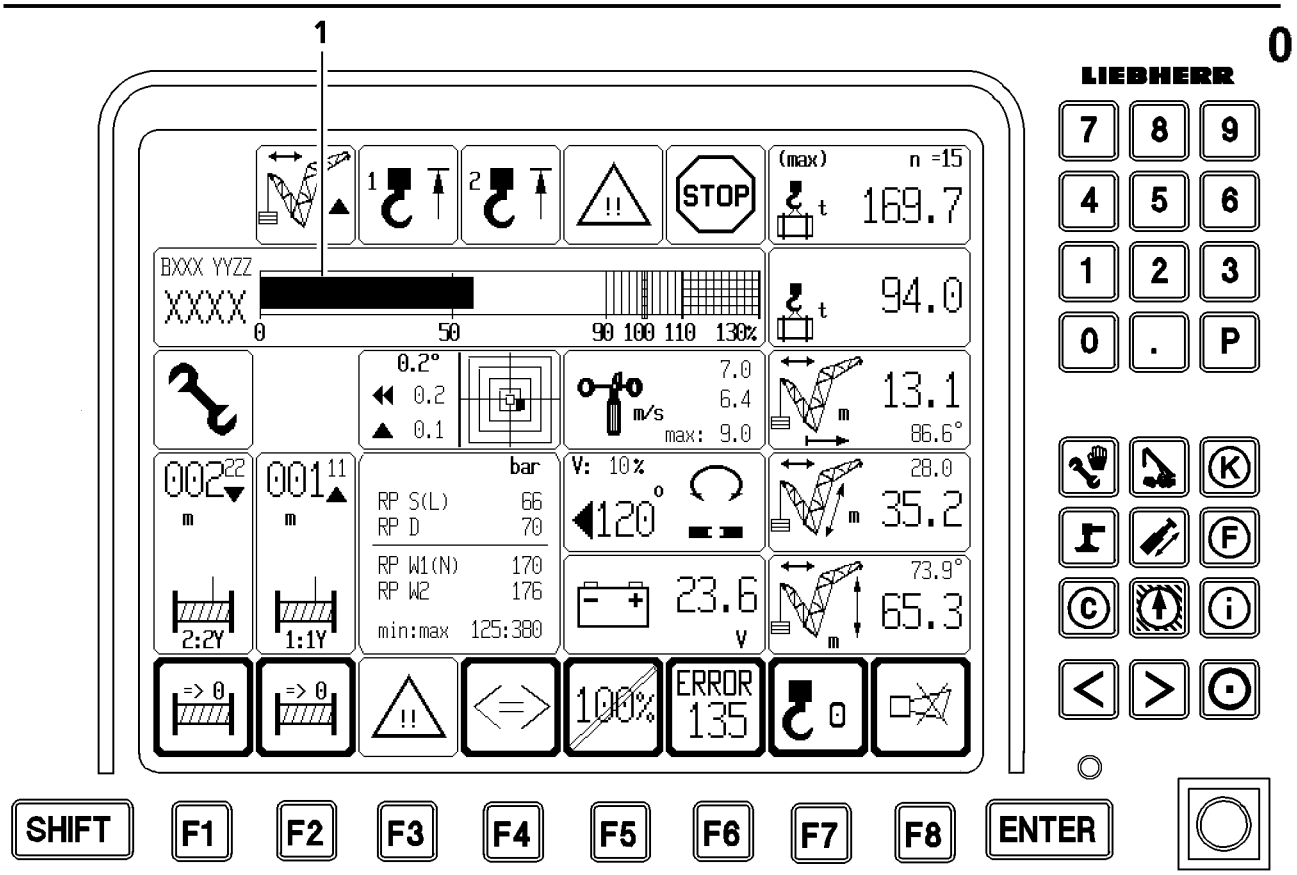
The LMB overload protection

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 with optimum derrick ballast. It is shown on LICCON monitor 0. The current utilization of the crane with optimum derrick ballast results from the load utilization bar **1** on the 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 the LICCON monitor 0.
At 100 % on the load utilization bar, the shut off of all load moment increasing movements with the stop icon and the acoustical warning “HORN” occurs on the LICCON monitor 0.
The “maximum load” can possibly be increased further by pulling the derrick ballast up or by placing additional ballast plates - within the specifications of the load charts.

Monitoring of test point 1-operational maximum force (= F1 max)

It is shown on LICCON monitor 1.
If the F1 max- utilization **2** reaches 90 %, an advance warning is given in the form of a caution icon and a “SHORT HORN” on the LICCON monitor 1.
At 100 % F1max utilization, the shut off of all load moment increasing movements with the stop icon and the acoustical warning “HORN” occurs on the LICCON monitor 1.
When 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:

- Lifting the derrick ballast if it is not already suspended.
- Telescoping out the derrick ballast if the added ballast is still lower than the optimum ballast.
- Increasing the derrick ballast by adding additional ballast plates if the placed ballast is still smaller than the optimum ballast.


0
1
LIEBHERR
STOP
(max) n =15
169.7
94.0
BXXX YYZZ
XXXX
0 50 90 100 110 130%
0.2°
0.2
0.1
7.0
6.4
max: 9.0
m/s
13.1
86.6°
002 22
001 11
m
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
V: 10%
120°
28.0
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23.6
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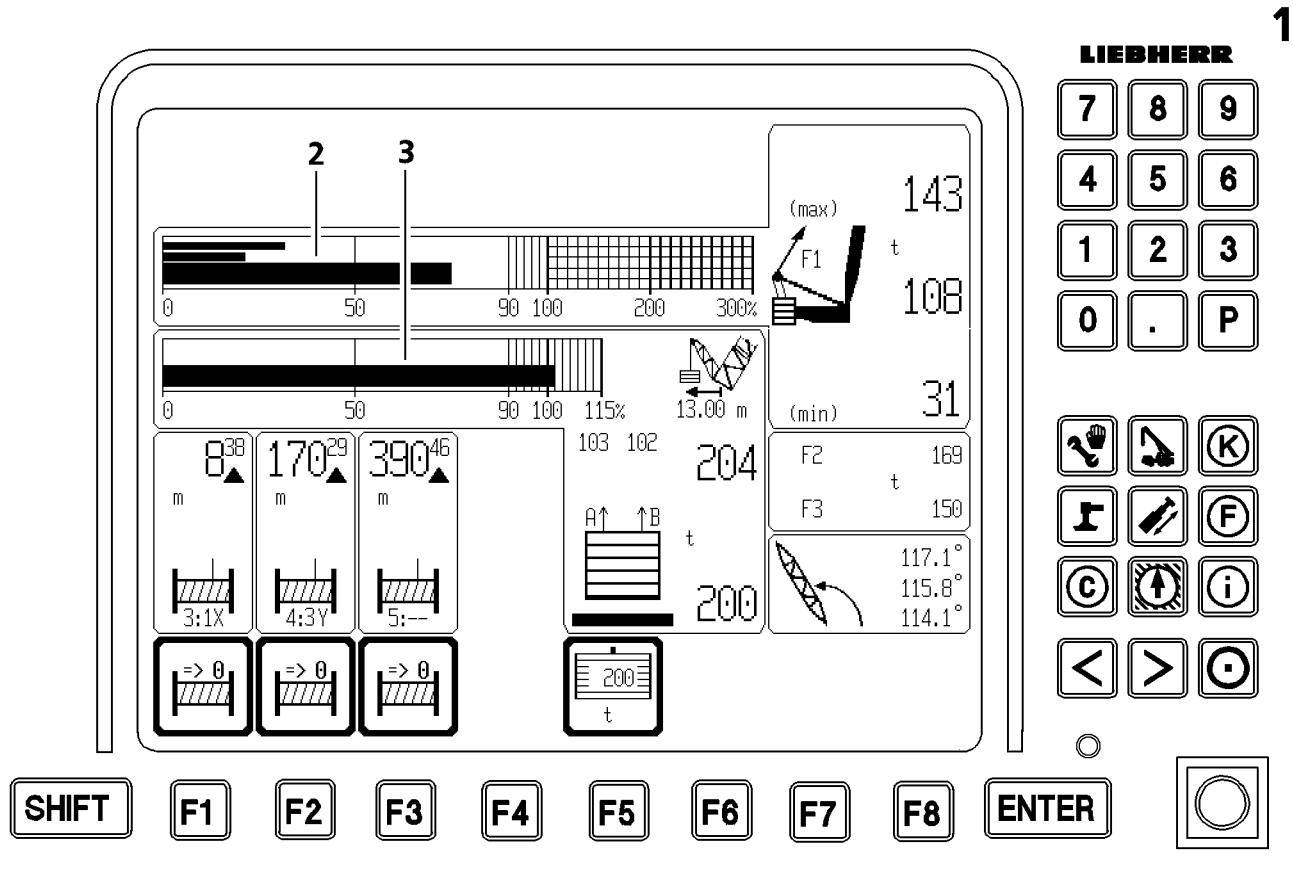
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SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

B104671

1.5.14 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 the 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).

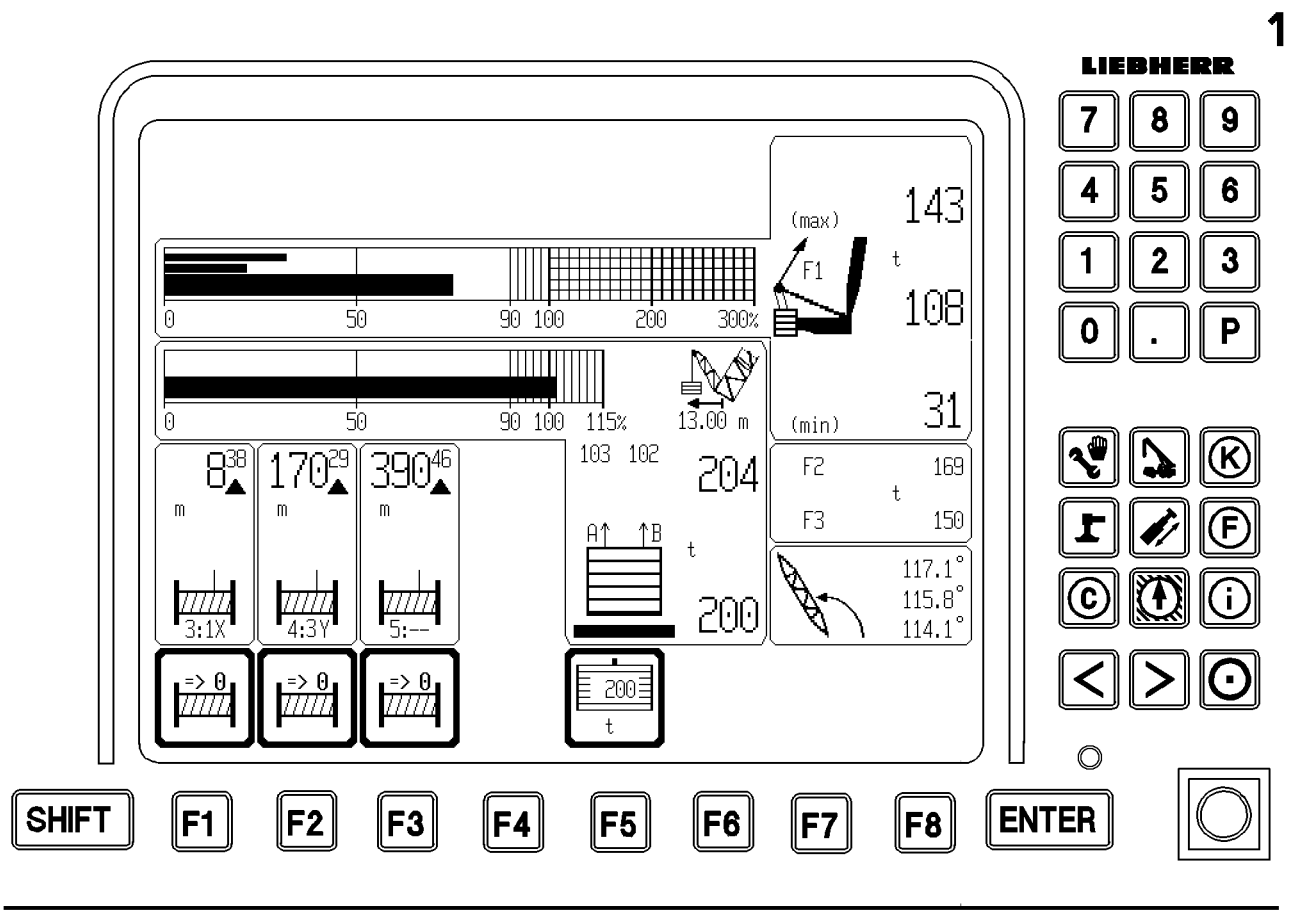
The “maximum load according to the load chart and the reeving” (100 % limit of load utilization bar) and the maximum load according to F1 max-operation (100 % limit of the F1 utilization bar) can be bypassed by the following measures:

1.) Holding the key button D_0 on LICCON monitor 0 in position “right touching ” (after corresponding preselection with function key $F5_0$) bypasses only the maximum load according to the load chart and reeving, see chapter 4.02 of the Crane operating instructions.

2.) Assembly key button on instrument panel.
This bypasses the maximum load according to the load chart and reeving, the test point 1-operation - maximum force (= F1max-operation) and a number of other limit values and limit switches.
Test point 1-assembly-maximum force (= F1max-assembly) cannot be bypassed, see chapter 4.04 of the Crane operating instructions.

DANGER
Risk of accident!
When the assembly key switch is turned on, it is only permitted to execute crane movements that reduce the load torque within certain operating and load ranges!
When the permissible load range is reached, the assembly key button must be turned off again immediately!
When the assembly key button is turned on, the load moment limiter is no longer effective!
▶ Danger of accidents!

The movement “Ballast up” or “Ballast down” requires utmost attention. When 90 % of the placed ballast is pulled, the warning “upcoming lift off of derrick ballast” is issued. The warning is indicated by a “Short horn” and blinking “Pulled ballast” value. The warning is turned off when the operator confirms that he has recognized the warning by pressing the function key $F8_1$ (=horn off on LICCON monitor 1).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170 29
390 46
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117.1°
115.8°
114.1°
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SHIFT
F1
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F6
F7
F8
ENTER

B104669

1.5.15 Accessing the load charts

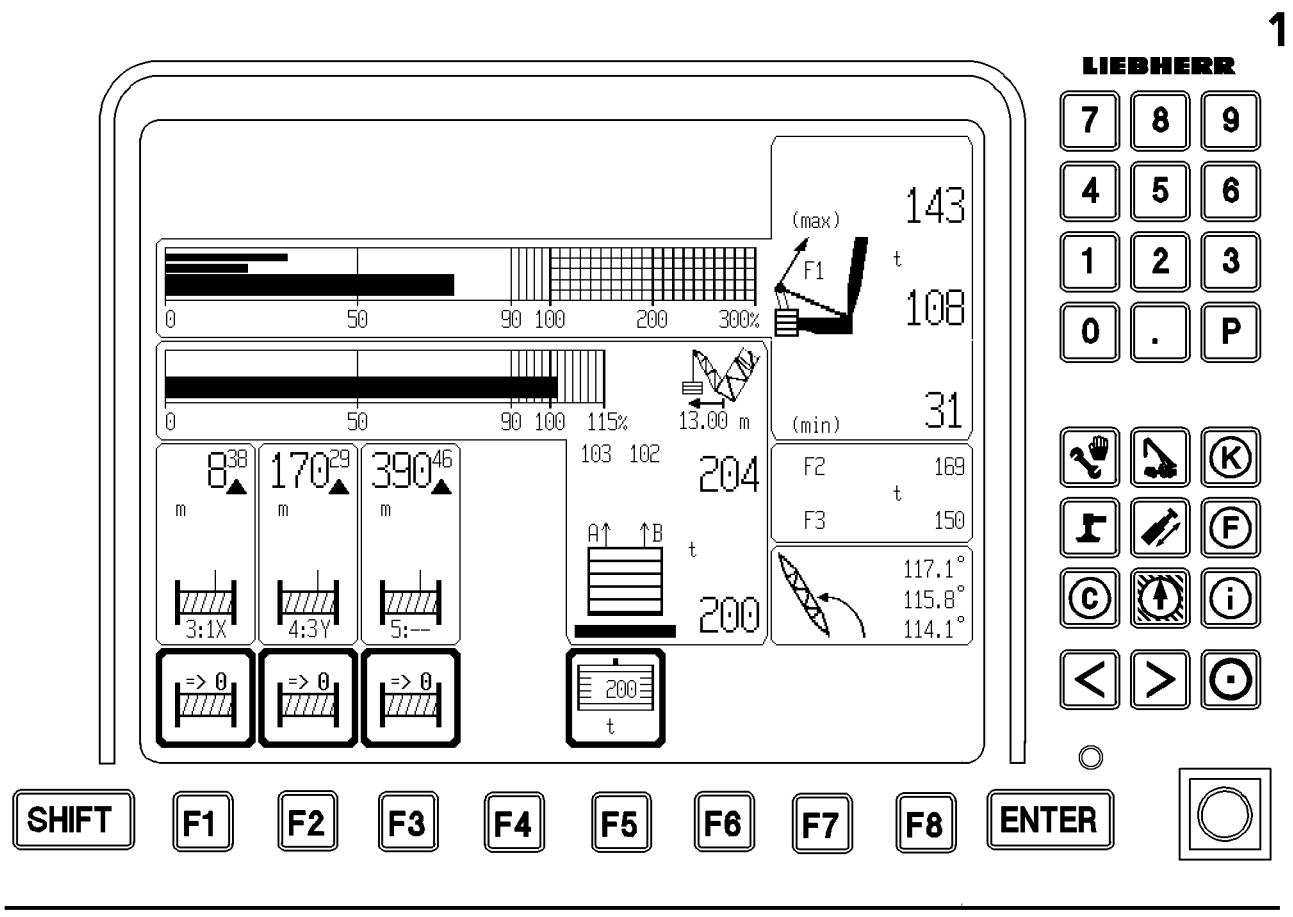
Checking the length sensor value on the derrick ballast

When telescoping the derrick ballast in and out, the derrick ballast radius display must be monitored carefully.
When telescoping the derrick ballast, the display must change according to the movement. This allows the crane operator to immediately notice if the length sensor rope drum jams when spooling in or out.
When the derrick ballast is extended or retracted all the way, the derrick ballast display must show almost the exact end position, for example Radius = 11 m or 15 m.
The crane operator may not rely blindly on the derrick ballast radius measurement, but he must think for himself and check, if the measurement is still working correctly.

DANGER
Risk of accident!
If the derrick ballast radius is measured incorrectly, the false radius value will result in the calculated maximum lifted load and Test point 1-operation-max-force being too high!
▶ The crane will be overloaded although this is not apparent!

Check with length sensor for derrick ballast radius

It must be ensured that both telescopic cylinders extend by the same amount, because only one side is equipped with a length sensor.
If both telescopic cylinders diverge, briefly drive the extension mechanism against a stop until both telescopic cylinder are extended or retracted by the same amount.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90 100
115%
13.00 m
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F8
ENTER

B104669

1.5.16 Difference force monitoring of ballast guying

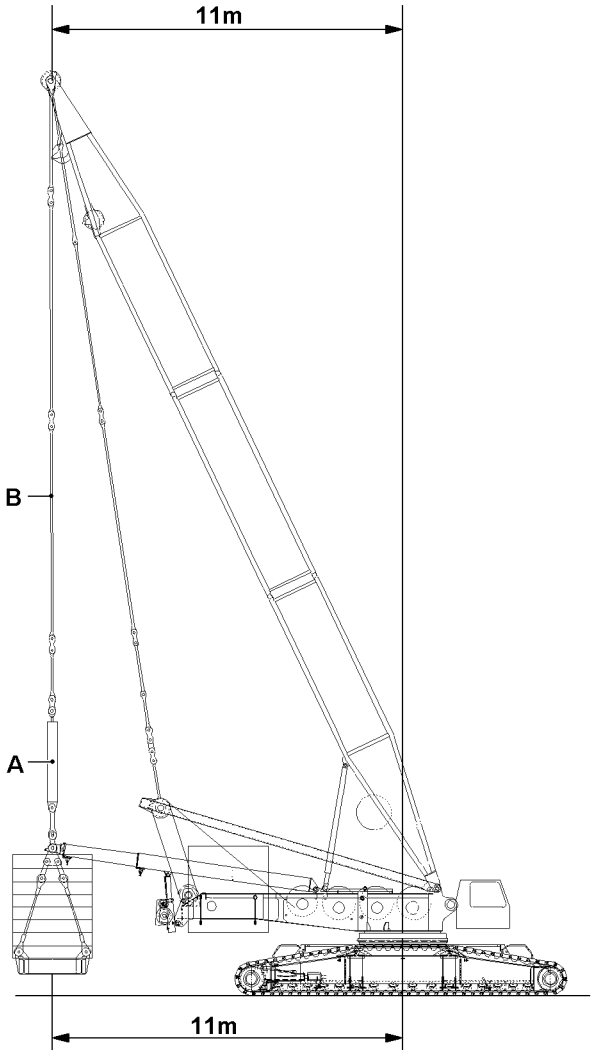
In operating modes with derrick ballast, the difference of the forces of derrick ballast guyings A and B, LICCON monitor 1, are monitored.

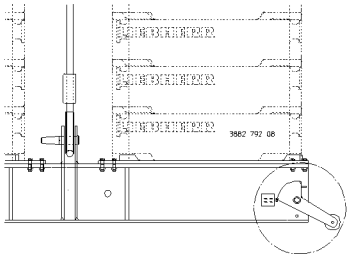
DANGER
Risk of accident!
If the difference of these forces is too high, it will damage the derrick head or other crane components!
▶ Danger of accidents!

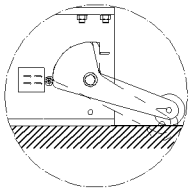
The forces in the derrick ballast guyings A and B are shown and compared on LICCON monitor 1. If the difference exceeds a permissible value, an acoustical warning is issued and the two force values blink. However **none** of the movements are turned off.
If the difference of the forces of the derrick ballast guyings A and B exceeds the specified limit value, then this can have various causes:
– Taking up the load by relieving the load on the ballast trailer tires or flexing 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.
– By raising or lowering the derrick ballast using the pull cylinders.
– Incorrect force measurement in one guying.

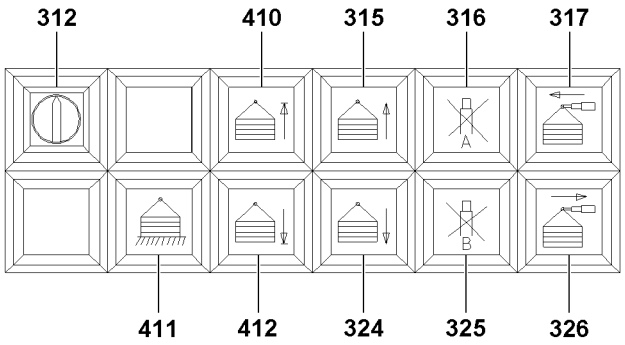
The crane operator must recognize the correct cause and take countermeasures:
1.) The error, which caused the one-sided force, must be remedied.
2.) In case of small ground unevenness only, the following measure is permissible:
Lock one ballasting cylinder and use the other ballasting cylinder to “Raise the ballast” or “Lower the ballast” until the difference between the forces reduces. Ensure that the derrick ballast is not tilted at an inadmissible angle with respect to the crane, otherwise the derrick ballast guide and attachments will be damaged.
3.) In case of implausible sensor values: Check whether the ballast weighing pressure sensors or inputs are faulty. If necessary, detach the sensor or replace the CPU.

DANGER
Risk of accident!
▶ Derrick ballast cylinder A should be extended by a maximum of approx. 40 mm more or less than cylinder B!









B104672

1.6 Disassembly

Make sure that the following prerequisites are met:
- the placement surface for the derrick ballast must be level, horizontal and of sufficient load carrying capacity,
- the boom and the derrick boom are assembled on the turntable,
- an auxiliary crane is available.

DANGER
Risk of accident!
The surface on which the derrick ballast is set down must be level, horizontal and of sufficient load bearing capacity, otherwise the derrick ballast can tip over and cause fatal injury!
- ▶ 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 the LICCON monitor!
- ▶ It is strictly prohibited for anyone to stand under the derrick ballast or in any part of the danger zone during the set down procedure!

1.6.1 Setting the ballast pallet down

Make sure that the following prerequisites are met:
- the derrick boom is set to a radius of 11 m,
- the ballast guide is telescoped to a radius of 11 m,
- a guide or crane operator must monitor the setting down of the derrick ballast and the load.

▶ Press the button **324**.

Result:
- The piston rods of the pull cylinders **A** extend.
- The derrick ballast is lowered.

Note
- ▶ If the ballast pallet is at an angle and if there is a difference in the forces in the guying **B**, re-align the ballast pallet until it is horizontal!

▶ Block the left or right pull cylinder **A** by pressing button **316** or button **325**.

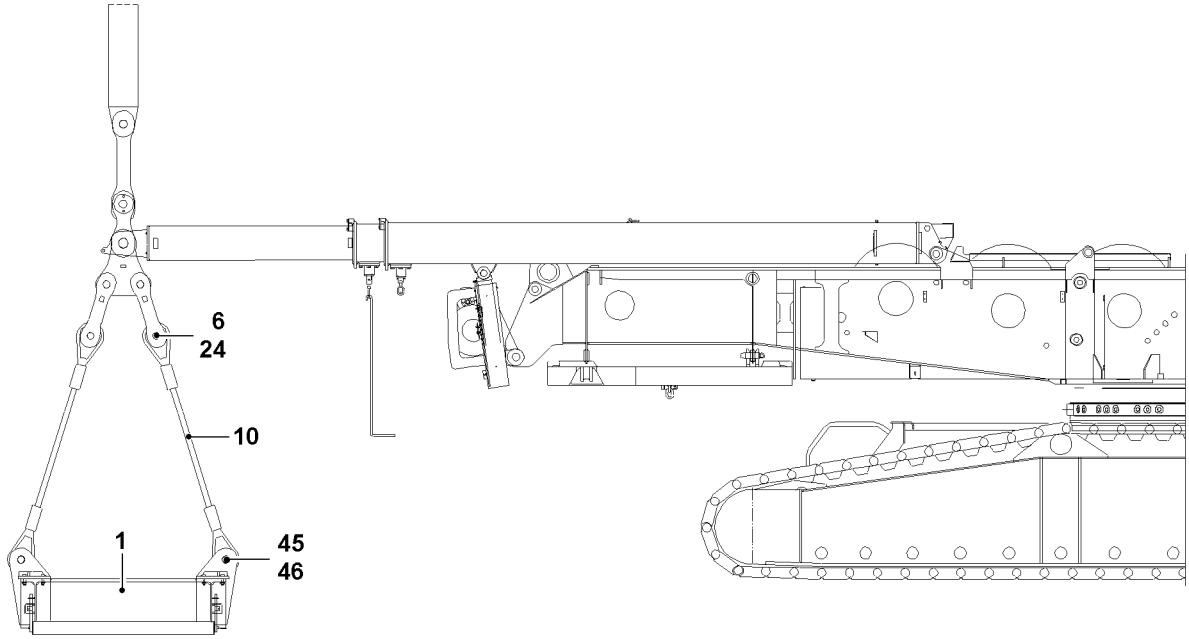
▶ Extend or retract the non-blocked pull cylinder **A** by pressing button **315** or button **324** until the ballast pallet is horizontal.

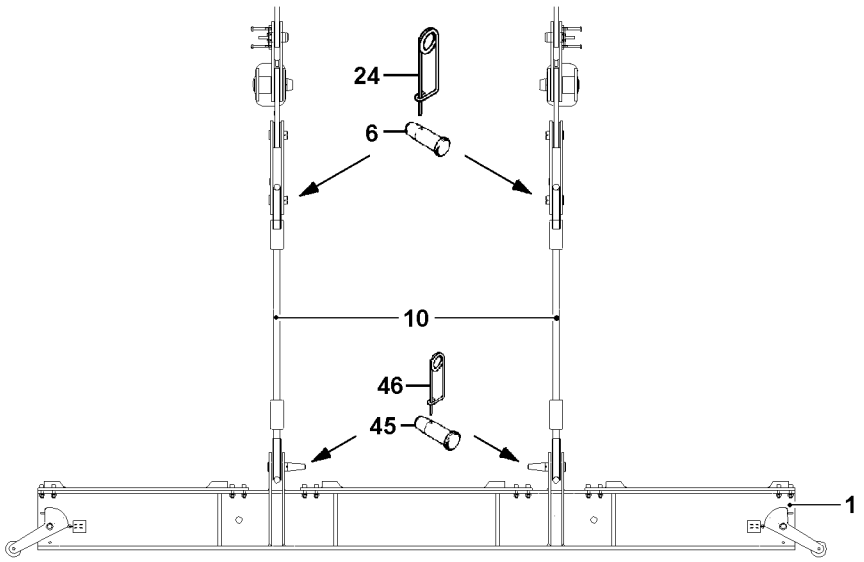
▶ When the ballast pallet touches the ground, the ground contact switches are actuated.

Result:
- The crane movements **“Turning the turntable”** and **“Driving the crawler”** turn off.

▶ Press button **324** until indicator light **412** is lit.

Result:
- The ballast guide is now fully resting on the turntable frame.
- The crane movement **Derrick ballast down** is switched off.





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1.6.2 Removing ballast

The ballast plates are marked with their own weights.

– Ballast plate 10 t.

Ensure that the following prerequisites are met:

– the suspended ballast is pinned and secured on the ballast guide,
– the ballast guy rods are pinned and secured on both sides.

DANGER

Risk of accident!

If more than the specified loads are lifted with the ropes, then they or the studs will be overloaded and the ballast plates can fall down and fatally injure personnel!

▶ Lift no more than a maximum of 10 t!

▶ Evenly remove the ballast plates from the ballast trailer with the auxiliary crane.

▶ Lift each ballast plate individually. Lift no more than maximum 10 t with the ropes attached at 3 attachment points.

1.6.3 Removing the ballast pallet

Make sure that the following prerequisites are met:

– the ballast pallet is ballasted down,
– the ballast pallet is placed on the ground,
– the ballast guide is resting on the turntable frame,
– an auxiliary crane is available.

▶ Remove the spring retainer **46** on pin **45**.

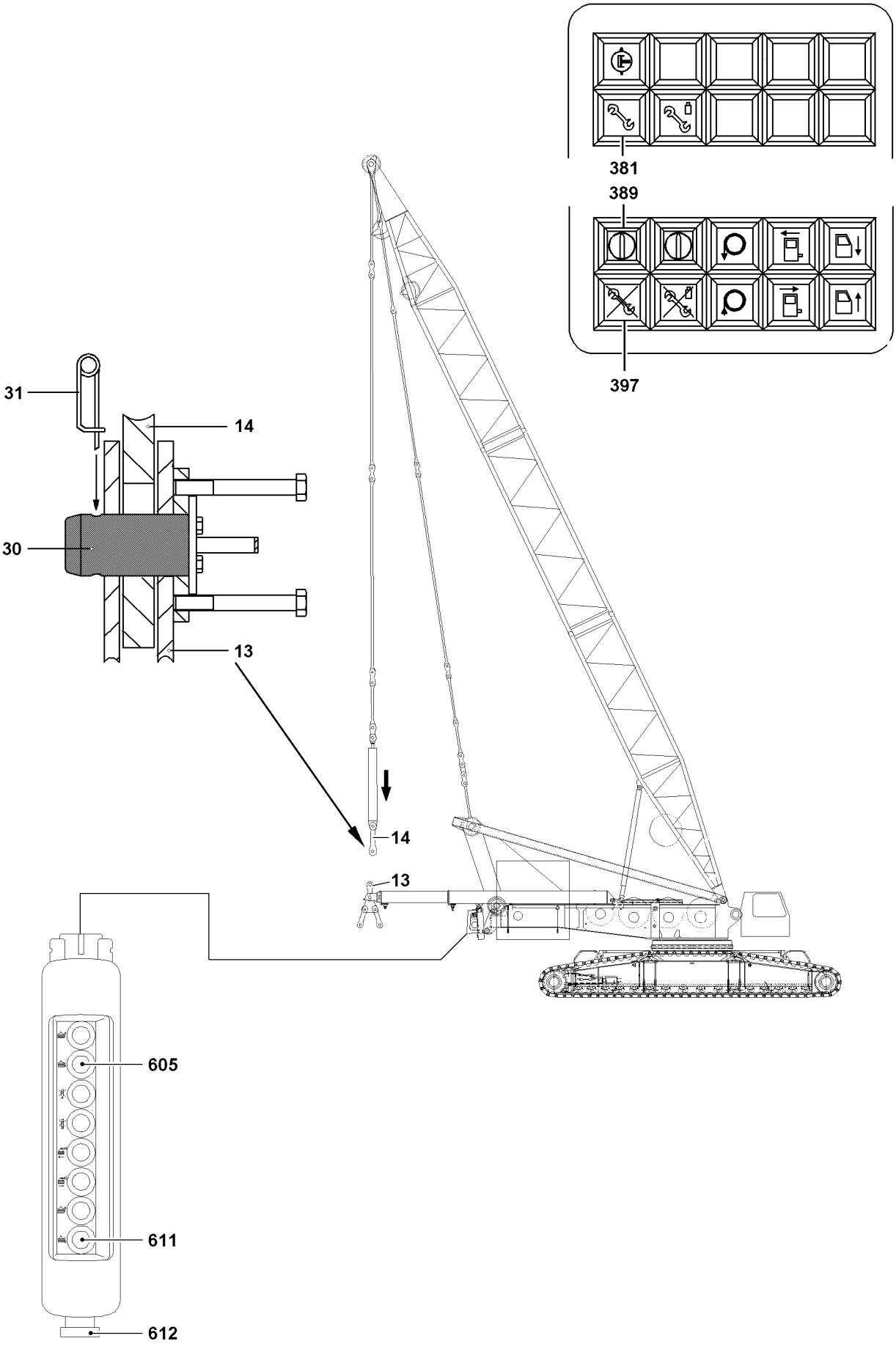
▶ Unpin the pins **45** on the ropes **10** of the ballast pallet **1**.

▶ Remove the spring retainer **24** on pin **6**.

▶ Unpin the rope **10** from the ballast guide end section brackets using pins **6**.

▶ Unplug cable **W 266** from socket **-X 266** and insert dummy plug **-X 266**.

▶ Use the auxiliary crane to set the ballast pallet **1** down on the transport vehicle.



B104664

1.6.4 Unpin the pull cylinder from the end section on the guide

Ensure that the following prerequisites are met:
- the engine is running,
- the key button **389** for assembly is switched on and the indicator light **381** is lit,
- the derrick boom is set to 11 m,
- the ballast guide is mechanically telescoped to 11 m, pinned and secured.

WARNING
Risk of accident!
- ▶ The manual control panel should only be used to install or remove the derrick ballast. Once the pins have been inserted, the derrick ballast functions may only be driven from the crane operator's cab as derrick ballast operation requires the use of the LICCON monitor!
- ▶ It is prohibited to raise the derrick ballast off the ground using the control panel!

▶ Remove the control panel from the storage compartment in the guide frame.

▶ Press button **605** “Extend pull cylinders”.

Troubleshooting
Pull cylinders do not extend when operating button **605**?
When assembling both ballast guides, these rest on the turntable frame. Consequently the limit switches for “Derrick ballast below ground level” are actuated and the pull cylinders cannot be extended. The illuminated button **611** lights up.
- ▶ The limit switches can be bypassed by operating the illuminated button **611**.

▶ Press button **605** and illuminated button **611** at the same time.

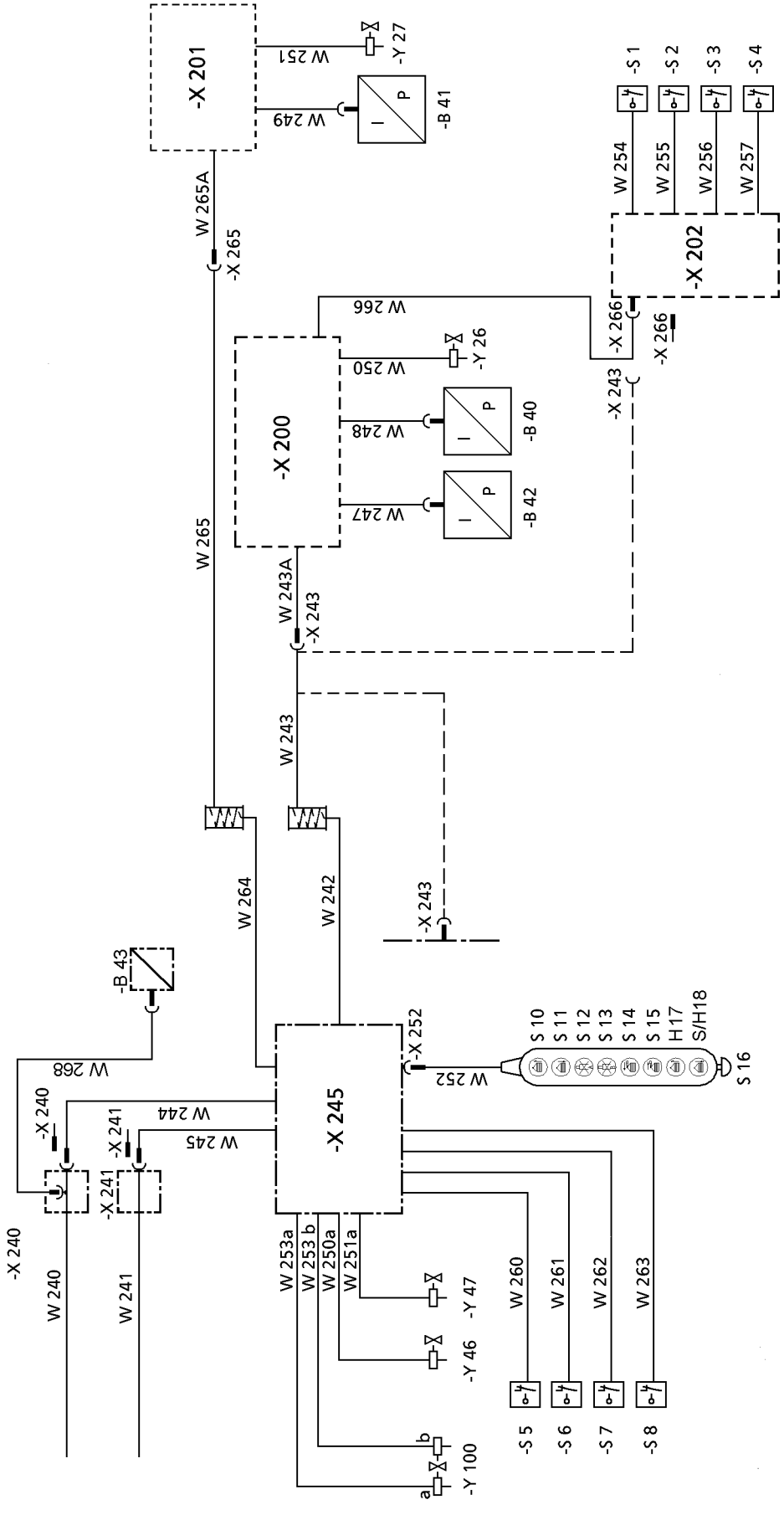
Result:
- Both pull cylinders extend.

▶ Extend the pull cylinder until pins **30** on the end section are no longer under tension.

▶ Remove spring retainer **31** on the pins **30**.

▶ Unpin the pins **30** on both sides.

▶ After completing this procedure, fully retract the pull cylinder.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W 249
-B 41
-S 1
-S 2
-S 3
-S 4
W 254
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W 265A
-X 265
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-X 266
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-Y 26
W 250
-X 243
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-S 6
-S 7
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B104661

1.6.5 Disconnecting the hydraulic connections

Ensure that the following prerequisite is met:

– the engine is not running.

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

DANGER

Risk of accident due to loss of pressure or leakage!

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

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

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

▶ 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.

▶ Fit dummy plugs to the couplings after they are opened.

1.6.6 Releasing the electrical connection

▶ Unplug the cable **W 265A** from the socket **-X 265**.

▶ Unplug the cable **W 243A** from the socket **-X 243**.

Note

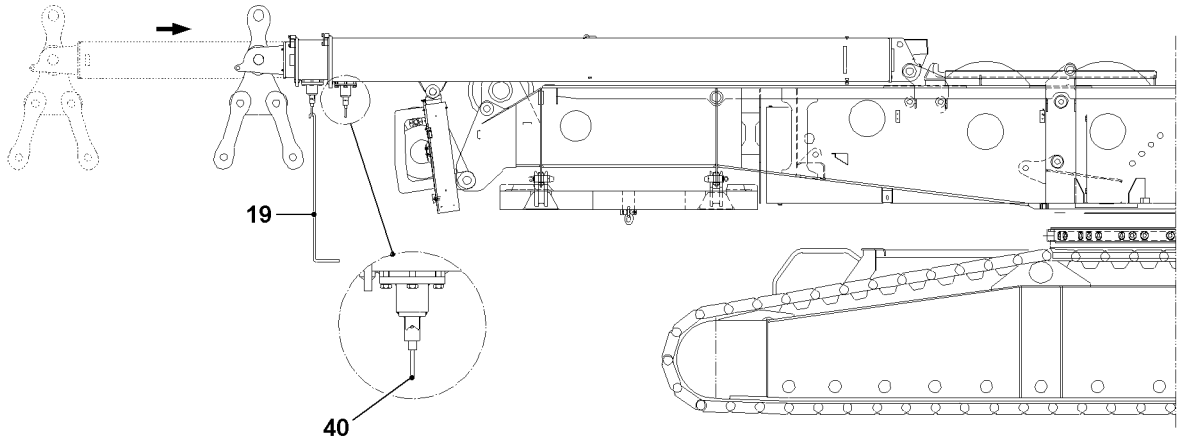
▶ Cable **W 243** and cable **W 265** must be detached from the ballast guide end section and then wound onto their respective cable drums inside the guide frame!

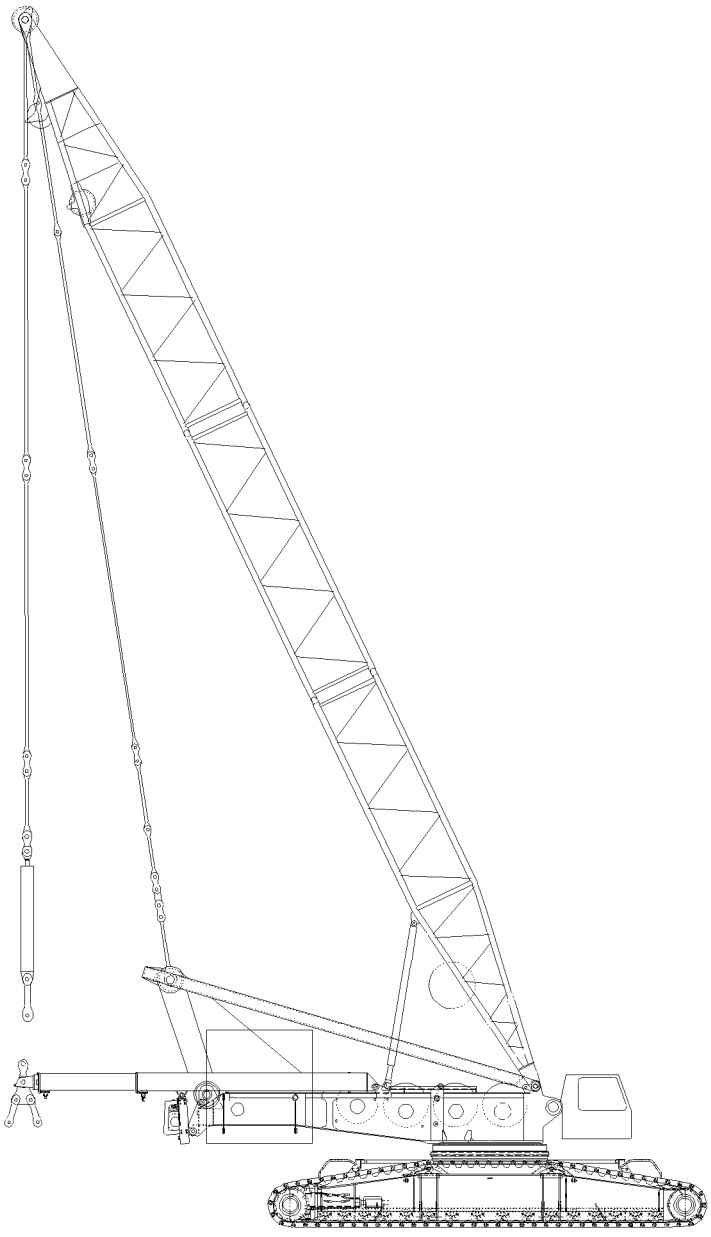
▶ Unplug the cable **W 245** from the socket **-X 241** and insert in the dummy plug on the ballast trailer guide.

▶ Unplug the cable **W 244** from the socket **-X 240** and insert in the dummy plug on the ballast trailer guide.

▶ Insert the dummy plug **-X 240** into the socket **-X 240**.

▶ Insert the dummy plug **-X 241** into the socket **-X 241**.





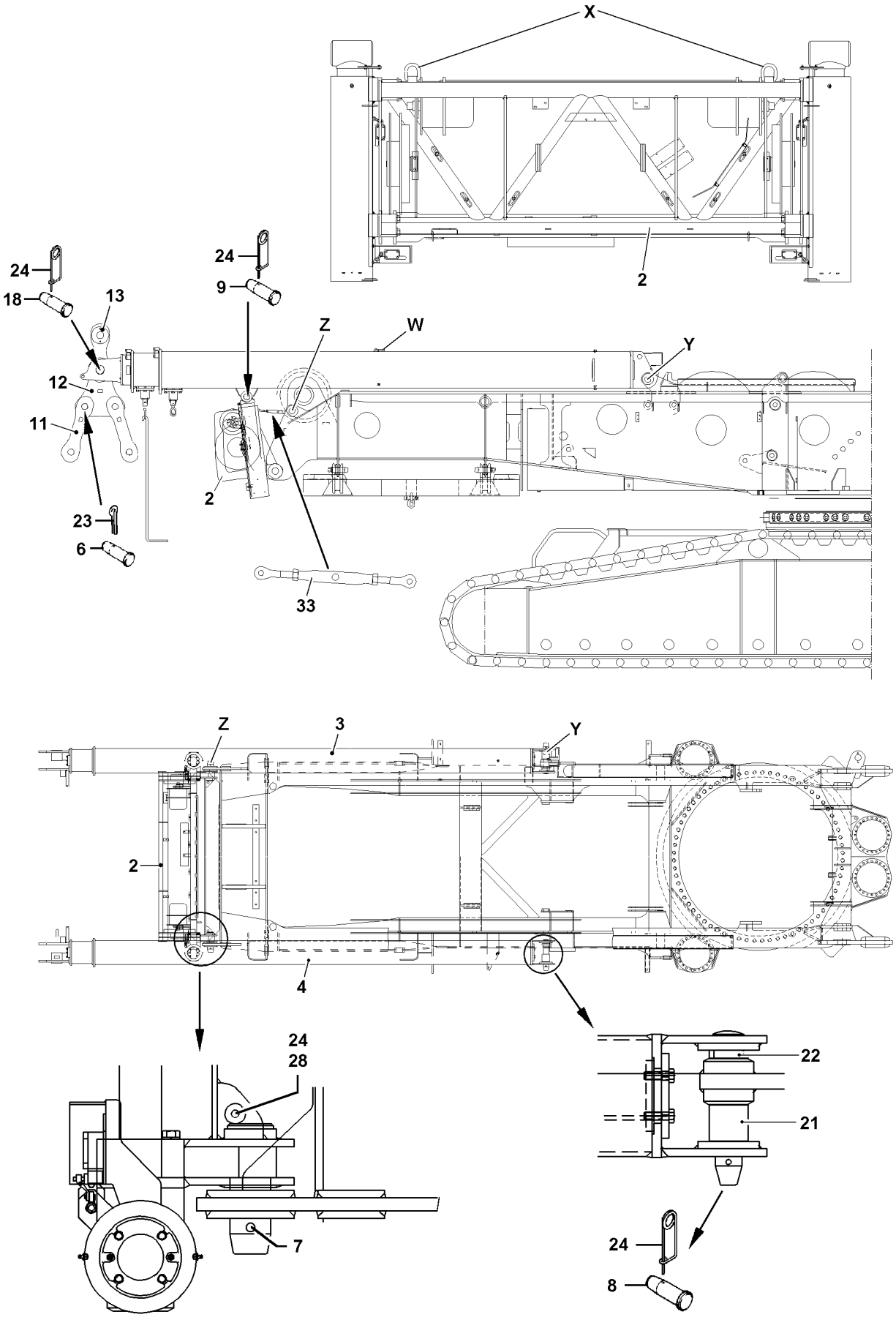
B104673

1.6.7 Mechanically telescoping in the ballast guide

Ensure that the following prerequisites are met:
– both ballast guides are assembled to the turntable,
– the pull cylinder is detached from the ballast guide.

The 2 m long telescopic end section on the ballast guide must be mechanically telescoped in using suitable equipment.

Note
- In order to mechanically telescope in the telescopic end section, **both** locking pins **40** must be released from the assembly rod **19**!
- After telescoping has been completed, **both** locking pins **40** must be pinned and secured with the assembly rod **19**!



B104659

1.6.8 Removing the ballast guide

Before removing the ballast guide, fit the turnbuckle **33** between the guide frame **2** and turntable.

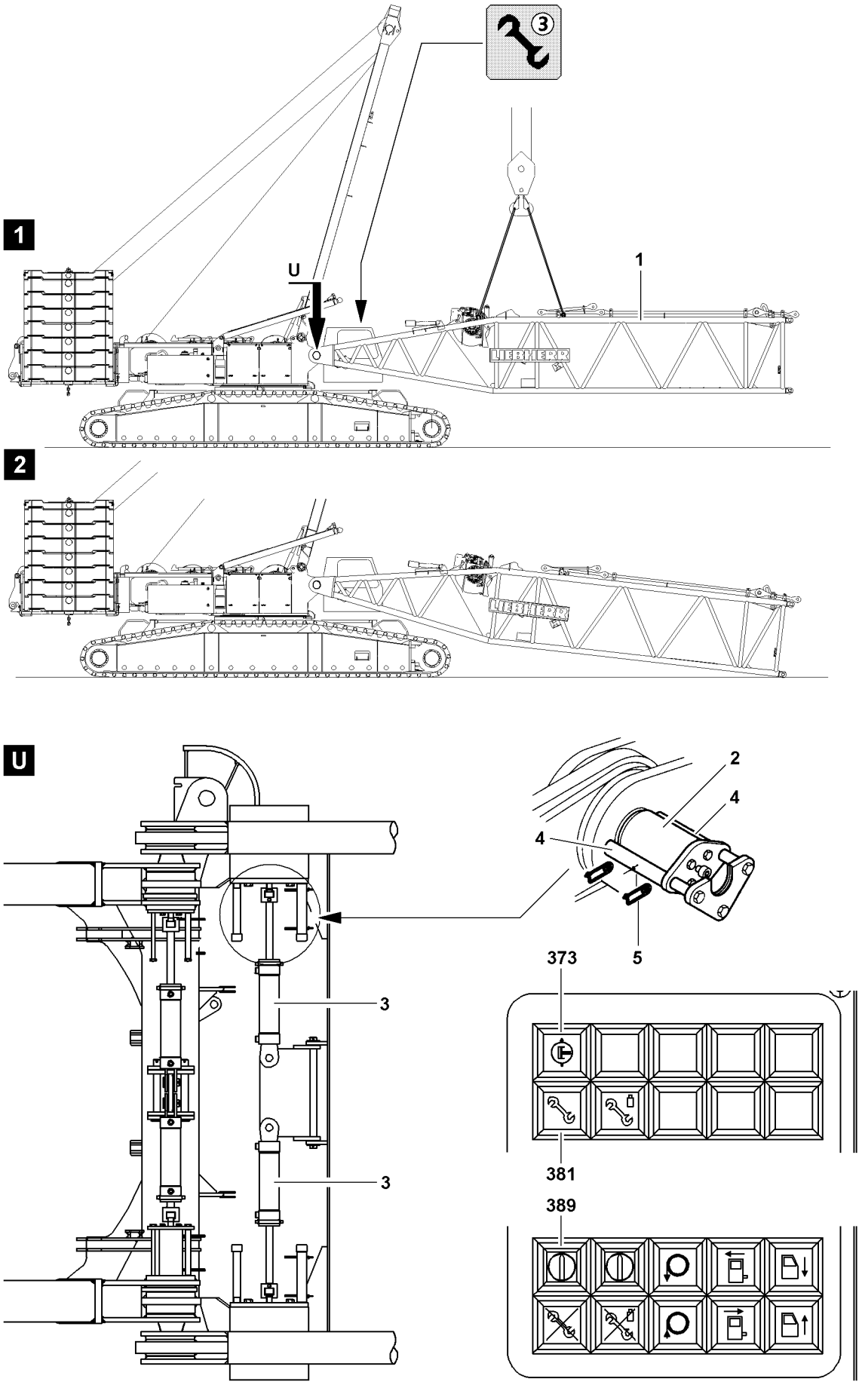
- ▶ Remove the spring retainer **24** on pin **9**.
- ▶ Unpin the pins **9** at the pinning point between the ballast guides **3** and **4** and the guide pipe on the guide frame **2**.
- ▶ Before releasing the pin **8**, hook an auxiliary crane into the lifting bracket **W** on the ballast guide.
- ▶ Remove the spring retainer **24** on pin **8**.
- ▶ Remove spacer pipes **21** and **22**.
- ▶ Unpin the pin **8**.
- ▶ Use the auxiliary crane to lift the ballast guides from the turntable onto the transportation vehicle.

Before removing the ballast guides, remove the triangular brackets **12**, brackets **11** and ballast guy rods **13** to the end section on the ballast guide **3** and **4**.

- ▶ Remove the split pin **23** from pin **6**.
- ▶ Unpin the pins **6** from the triangular brackets **12** and brackets **11**.
- ▶ Remove the spring retainer **24** on pin **18**.
- ▶ Unpin the pins **18** from the end section.

1.6.9 Disassembling the guide frame

- ▶ Secure the guide frame **2** to the lifting brackets **X** on the auxiliary crane.
- ▶ Release the turnbuckle **33** between the guide frame **2** and turntable.
- ▶ Release the spring retainer **24** on retaining pin **28**.
- ▶ Unpin retaining pins **28**.
- ▶ Unpin the pin **7** on the pin point **Z**.
- ▶ Lift the guide frame **2** using the auxiliary crane onto the transport vehicle.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1 Component overview L-pivot section

Component	Weight
L-pivot section with winch 5	12.5 t

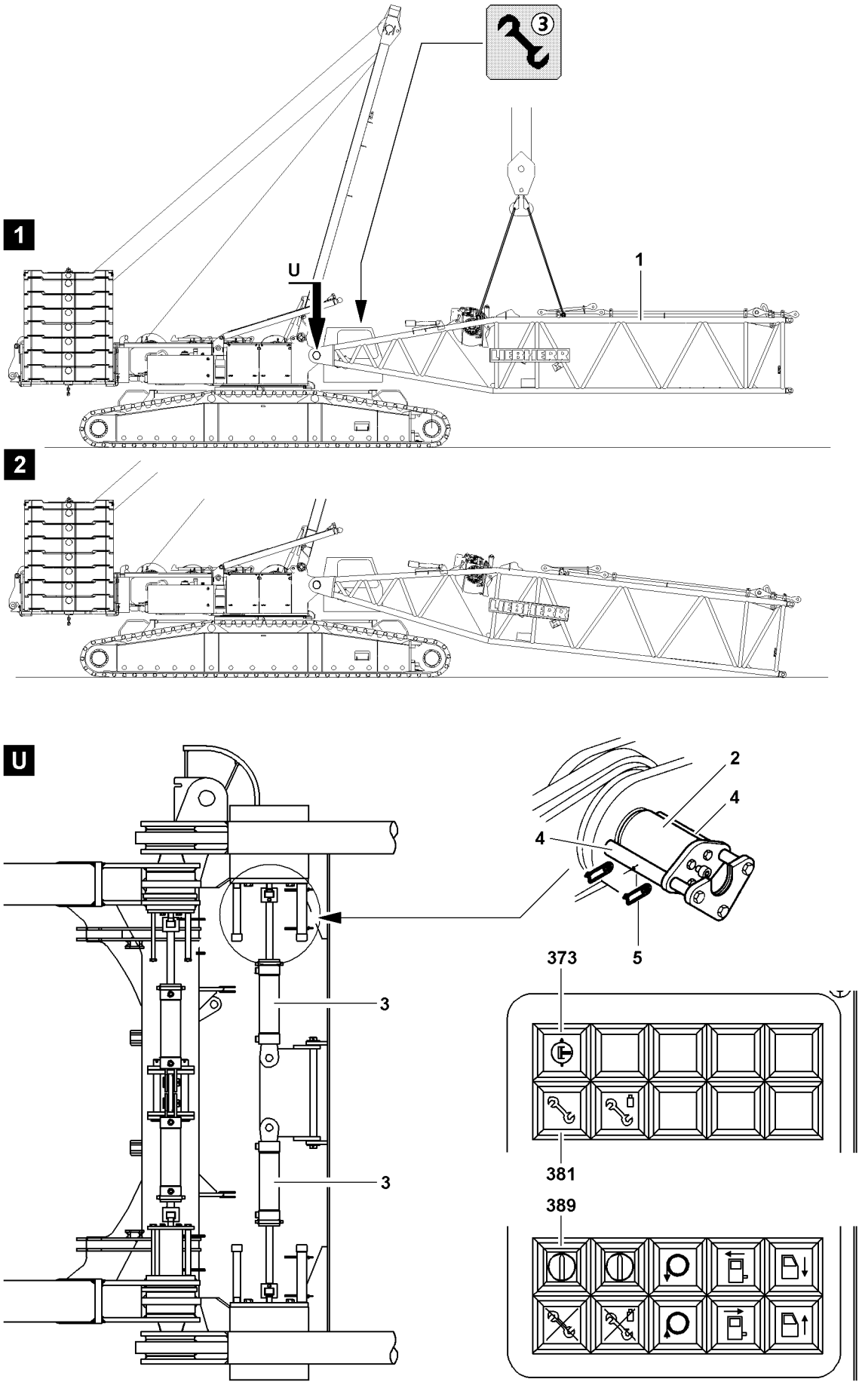
2 L/LL-assembly

DANGER
When working aloft, there is a danger of falling!
During assembly / disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling!
If the following notes are not observed, assembly personnel can fall down!
Personnel can be severely injured or killed!

- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations! The national regulations must be adhered to!
- ▶ Before any assembly / disassembly work and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also crane operating instructions, chapter 2.04!
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

DANGER
Danger of accident at assembly / disassembly of booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel!

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!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2.1 Assembling the boom

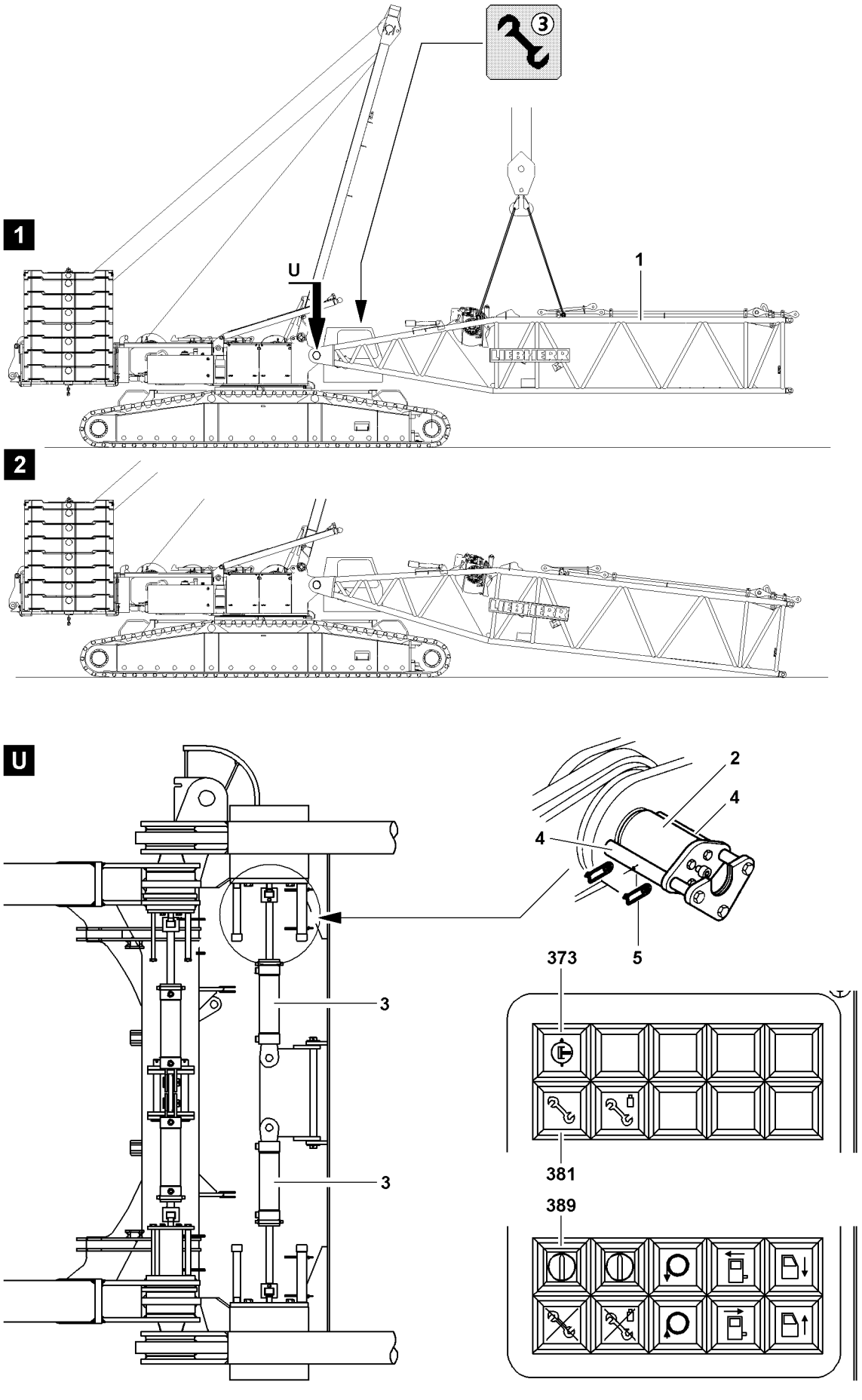
Make sure that the following prerequisites are met:
- the crane is aligned in horizontal direction,
- an auxiliary crane is available,
- an assembly scaffolding / work platform is available,
- the counterweight has been installed to the turntable according to the load chart,
- the LICCON overload protection has been set according to the data in the load chart,
- the assembly icon **3** on the LICCON monitor blinks.

2.1.1 Turn the turntable into assembly position

DANGER
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** installed L-boom, the crane can topple over!
Personnel can be severely injured or killed!
- ▶ Observe the data in the erection and take down charts!
- ▶ If no L-boom is assembled on the turntable, max. 135 t counterweight may be installed and when turning the turntable by 360°, it must be ensured that the SA-frame is erected to **more than 90°**!
- ▶ If the counterweight is increased to 155 t, then the L-boom must be installed and raised off the ground!

Maximum counterweight	Minimum central ballast	Equipment
55 t	11 t	Without equipment
95 t	11 t	
135 t	43 t	
155 t	43 t	L-boom installed and raised off the ground

- ▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side.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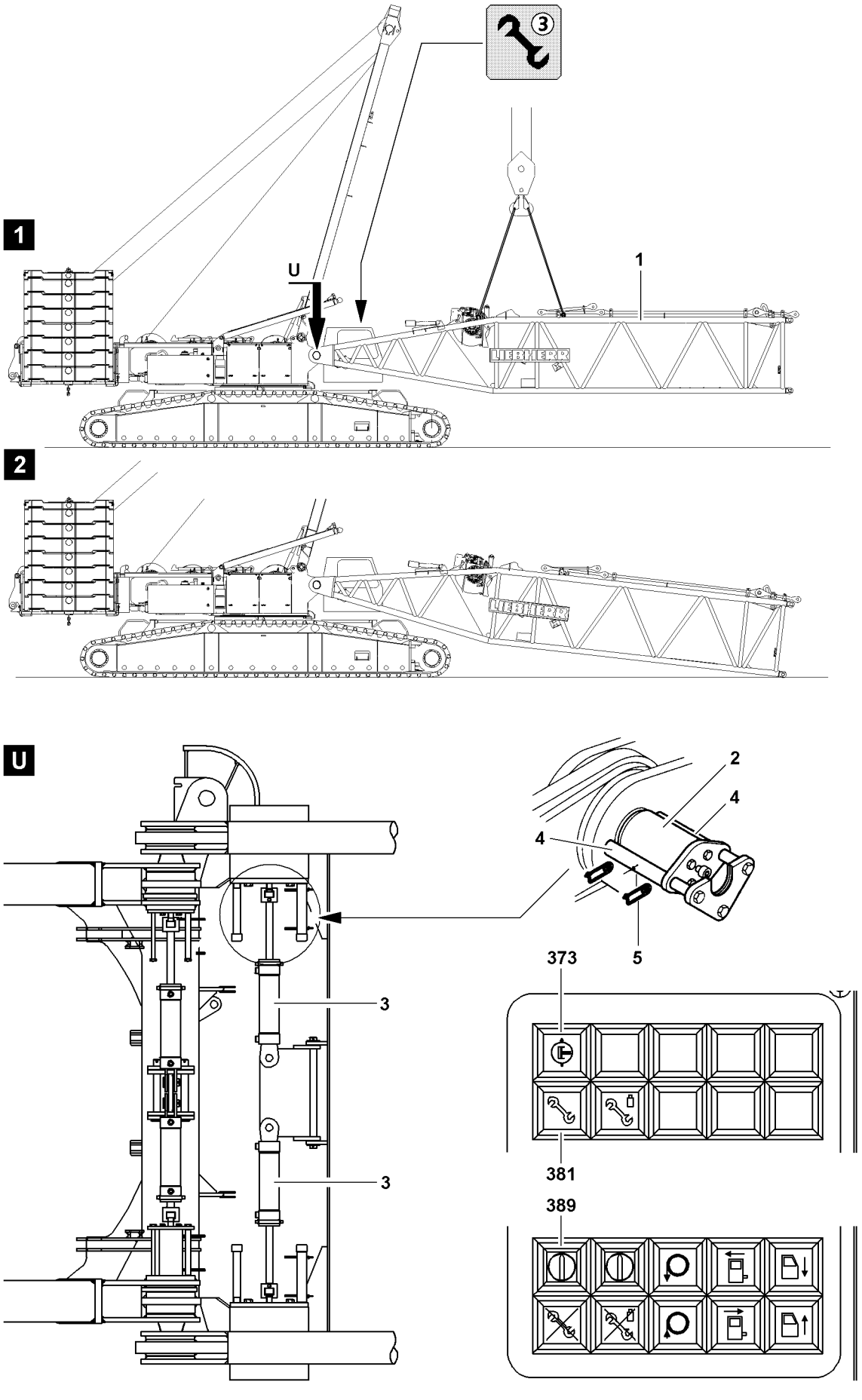
2.1.2 Adding the operating mode “assembly”

DANGER
Risk of fatal injury at crane operation with turned on assembly key button!
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is bypassed.
- – The indicator light in the button **381** lights up.
- – The assembly icon **3** on the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red flashing beacon on the crane cab blinks.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2.2 Pin the L-pivot section on the turntable

WARNING
General danger notes!
- ▶ Support the L-boom during assembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly! See crane operating instructions, chapter 8.15!

▶ Hang the L-pivot section **1** onto the auxiliary crane and swing in to the pin points on the turntable, illustration **1**.

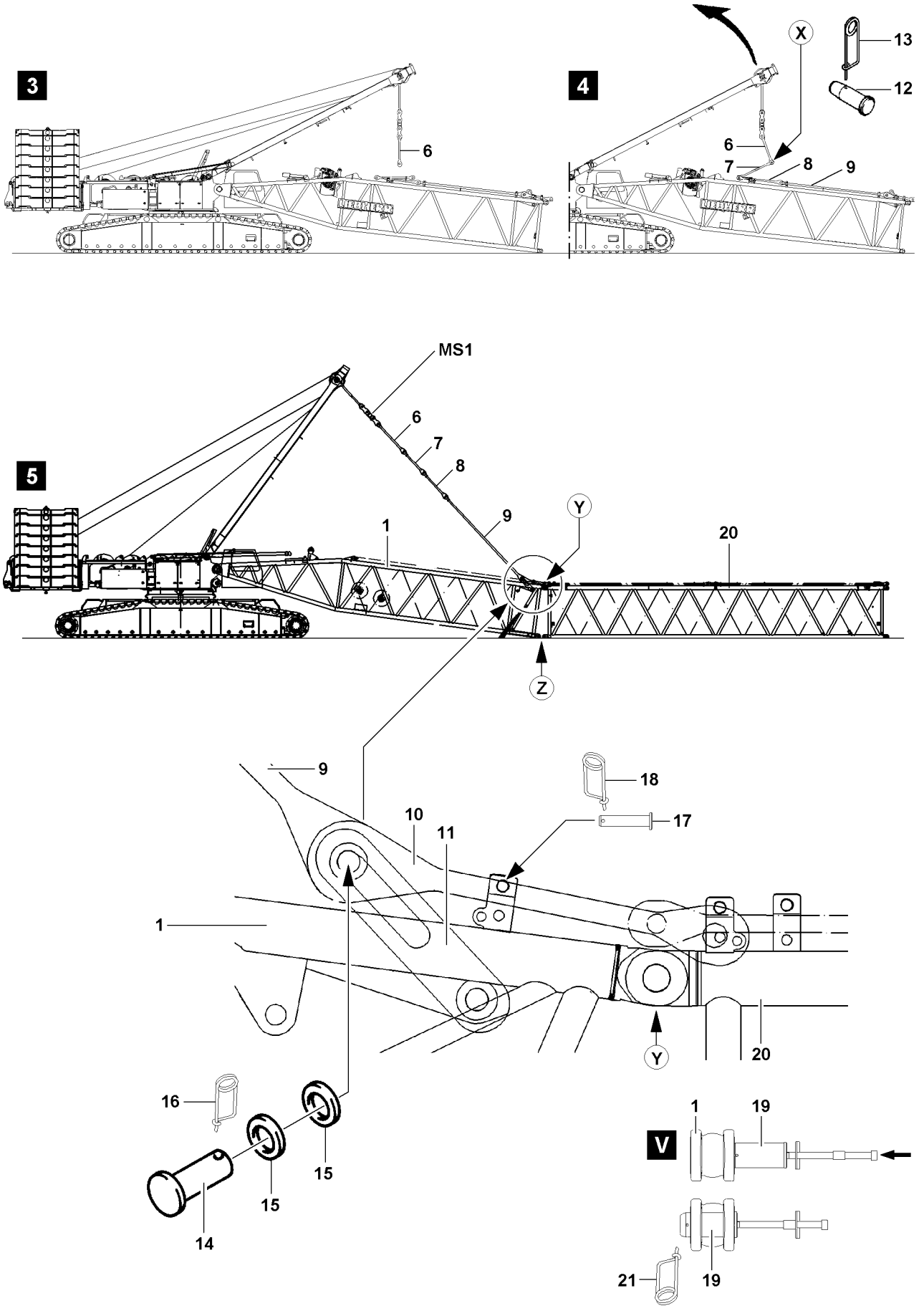
Establish the hydraulic connection to the pin pulling device via two quick couplers.
Pin the L-pivot section **1** on the turntable and secure.
- ▶ Establish the hydraulic connection to the pin pulling device.
- ▶ Turn the pressure change over switch **373** on.

DANGER
Risk of fatal injury!
Due to unsecured or insufficiently secured connector pins, the L-boom can fall down and fatally injure personnel.
- ▶ Secure the connector pins **2** between the L-pivot section **1** and the turntable after the pin procedure with the retaining plates **4**!

- ▶ Pin in the connector pins **2** with the hydraulic pin pulling device **3**.
- ▶ When the connector pins **2** are completely pinned on the left and right on the L-pivot section: Secure the connector pin **2** on the left and right with the retaining plate **4** and the spring retainer **5**.
- ▶ Turn the pressure change over switch **373** off.

NOTICE
Damage to the L-pivot section!
Property damage can occur on the L-pivot section by placing the assembled L-pivot section on the ground!
- ▶ Slowly place the L-pivot section with the auxiliary crane and at low speed on the ground!
- ▶ Before placing it on the ground, support the L-pivot section!

- ▶ Carefully place the L-pivot section down.
- ▶ Remove the auxiliary crane.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B104973

2.3 Assembling the L-intermediate sections

2.3.1 Installing the L-intermediate section on the L-pivot section

Make sure that the following prerequisites are met:
- the L-pivot section is pinned and secured on the turntable,
- the L-pivot section is placed on the ground,
- the auxiliary crane is removed.

Note
▶ To pin the L-intermediate sections, the pin pulling device can be used, see crane operating instructions, chapter 5.30!

WARNING
General danger notes!
▶ All pins are to be secured after assembly with the intended safety elements!
▶ The guy rods must be checked regularly! See the crane operating instructions, chapter 8.15!

To be able to assemble the L-intermediate sections on the L-pivot section, the SA-frame guy rods must be used.
▶ Remove the transport retainers for the guy rods on the SA-frame.
▶ Remove the transport retainers for the guy rods on the L-pivot section.
▶ Lower the SA-frame to the front until the guy rods **6** hang freely over the guy rods **7** of the L-intermediate section **20**, see illustration **3**.

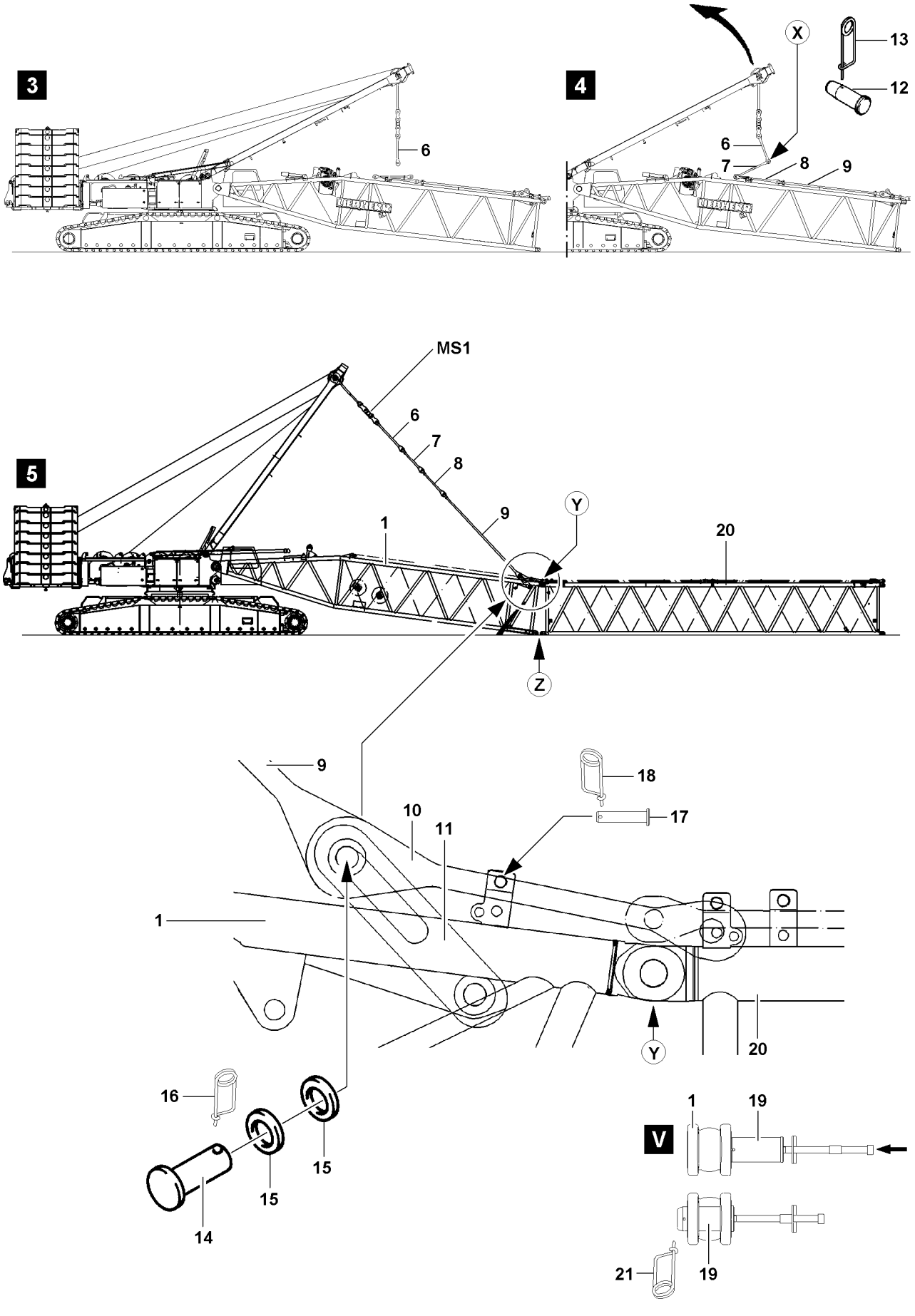
Pin the guy rods **6** of the SA-frame with the guy rods **7** on the L-pivot section.
▶ Pin in the pins **12** at point **X** from the “inside” to the “outside” and secure with spring retainers **13**, see illustration **4**.

Pin and secure the assembly brackets **11** on the connector point of the guy rods **9** and guy rods **10**, use washers **15**.
▶ Pin in the pins **14** into the hollow axle and secure with spring retainers **16**.
▶ Erect the SA-frame until the guy rods are completely tensioned, see illustration **5**.

Note
▶ Assemble the L-guy rods according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

The guy rods are placed and secured for transport on the L-intermediate sections. The transport retainers must be removed before assembly of the guy rods.
▶ Release the transport retainers of the guy rods on the L-intermediate sections: Remove the spring retainer **18** and unpin the pin **17**.

Pin the L-intermediate section **20** on the L-pivot section **1** “on top”:
▶ Attach the L-intermediate section **20** on the auxiliary crane and align on the L-pivot section **1**, see illustration **5**.
▶ When the pin bores on the L-pivot section **1** and on the L-intermediate section **20** “on top” (point **Y**) align, see illustration **5**:
Pin in the pin **19** from the inside to the outside and secure with spring retainer **21**, see illustration **V**.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B104973

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!

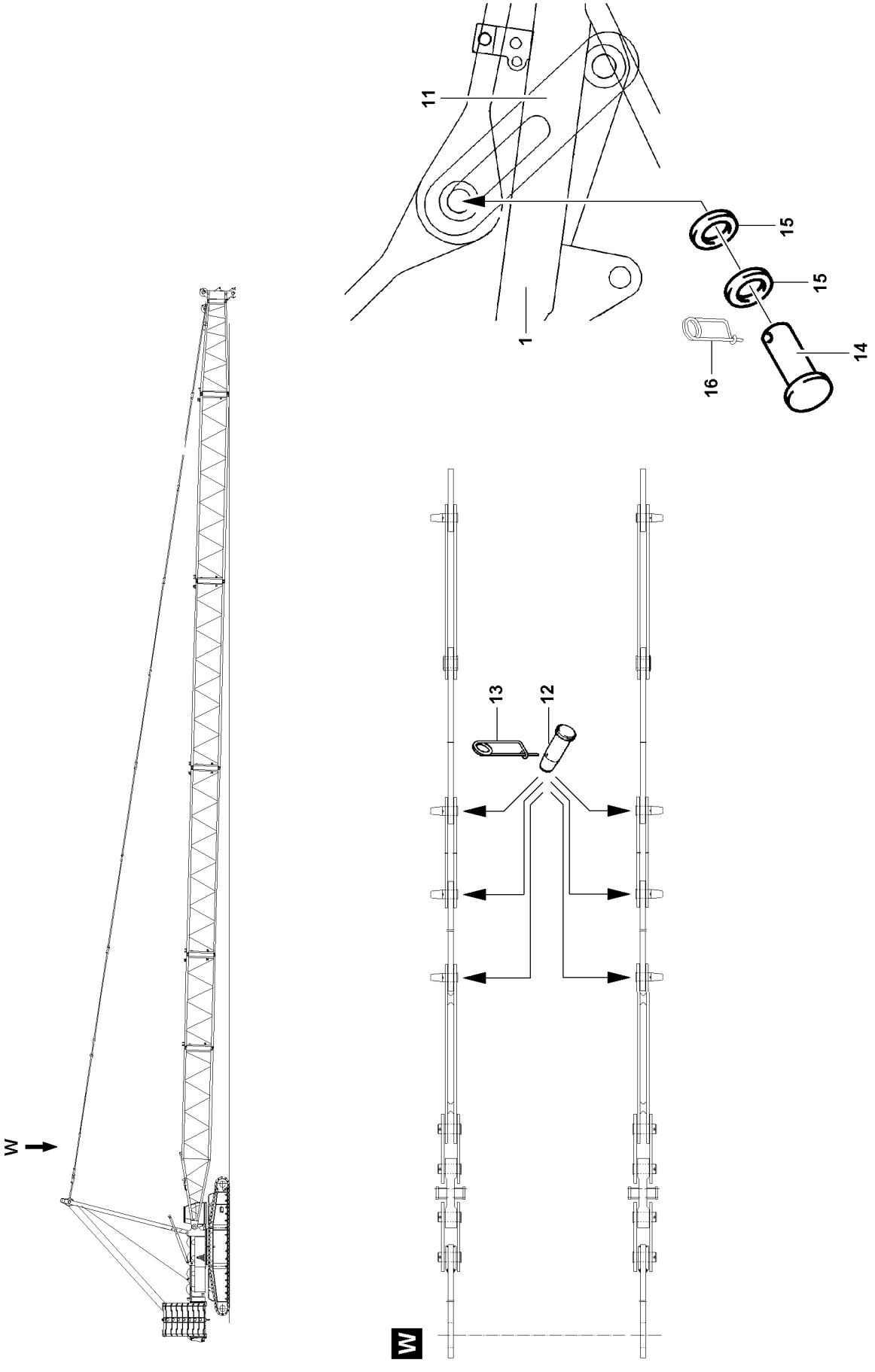
- During the “closing procedure” of the L-intermediate sections, the maximum total force on test point **MS1** of 110 t, may **not** be exceeded!
- The end section of the corresponding L/LL-boom combination during the “closing procedure” may **not** lift off the ground!
- With the SA-frame, L-boom combinations may be lifted / closed to maximum **L 105 m** !

Note

- The actual force on the test point MS1 - which is exerted during the closing procedure of the boom system - is shown on the LICCON monitor 1!
- Record the actual force and keep it ready for the disassembly of the boom system!
- During the boom disassembly, the guying is tensioned with the noted actual force (assembly) so that the connector pins of the intermediate sections can be unpinned!

Assemble the L-boom to the required length and pin and secure on the L-intermediate section **20** “on top” and “bottom”.

- Pin in the pin **19** from the inside to the outside and secure with spring retainer **21**.
- When the L/LL-boom combination is assembled to the desired length:
  Lift the L-pivot section **1** with the SA-frame until the pin bores on the “bottom” align at point **Z**, see illustration **5**.
- Read the actual force of the test point 1 (MS1) on the LICCON monitor and record it.
- Insert the pin **19** on point **Z** from the inside to the outside and secure with spring retainer **21**.



B104977

2.3.2 Assembling the L-guy rods

WARNING
Neglectful inspection and maintenance on guy rods!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and unrecognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also crane operating instructions, chapter 8.15!

Note
▶ The L-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods!

Ensure that the following prerequisite is met:
– the boom is pinned and secured on the L-pivot section.

▶ Relieve the guy rods between the SA-frame and the L-pivot section: Lower the SA-frame somewhat to the front.

Result:
– The guy rods between the SA-frame and the L-pivot section are relieved.

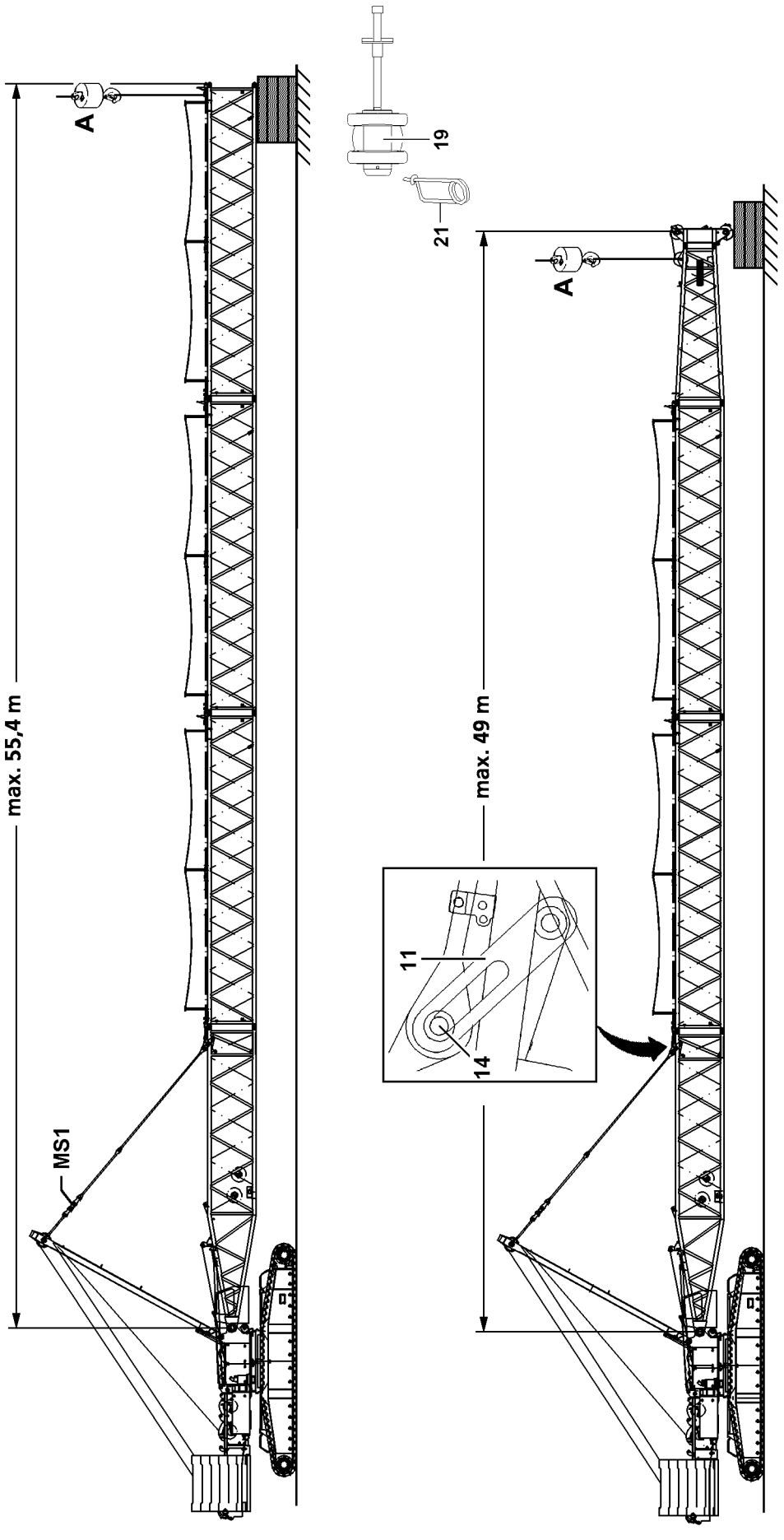
The L-guy rods are placed and secured for transport on the corresponding intermediate sections. Before assembly, the transport retainers must be released.
▶ Loosen the transport retainers on the guy rods.

NOTICE
Danger of property damage!
▶ Always pin in the pins of the guy rods from the inside to the outside!

▶ Pin and secure the guy rods for all intermediate sections.
▶ Pin the guy rods: Pin in the pins **12** from the “inside” to the “outside”.
▶ Secure the pin **12** with spring retainer **13**.

WARNING
The boom can suddenly fold downward!
If the pins **14** on the assembly bracket **11** are unpinned, then the boom can fold down!
Personnel can be severely injured or killed!
▶ Unpin the pins **14** on the assembly brackets **11** only when it is ensured that the intermediate sections are supported with suitable materials or if they are held by an auxiliary crane!

▶ When all guy rods on the boom system are pinned:
Release and unpin the pin **14** on the hollow axle of the assembly bracket **11**.
▶ Actuate winch IV until the guy rods are tensioned between the SA-frame and the L-end section.



B108953

2.4 Assembling the L-intermediate sections in flying mode

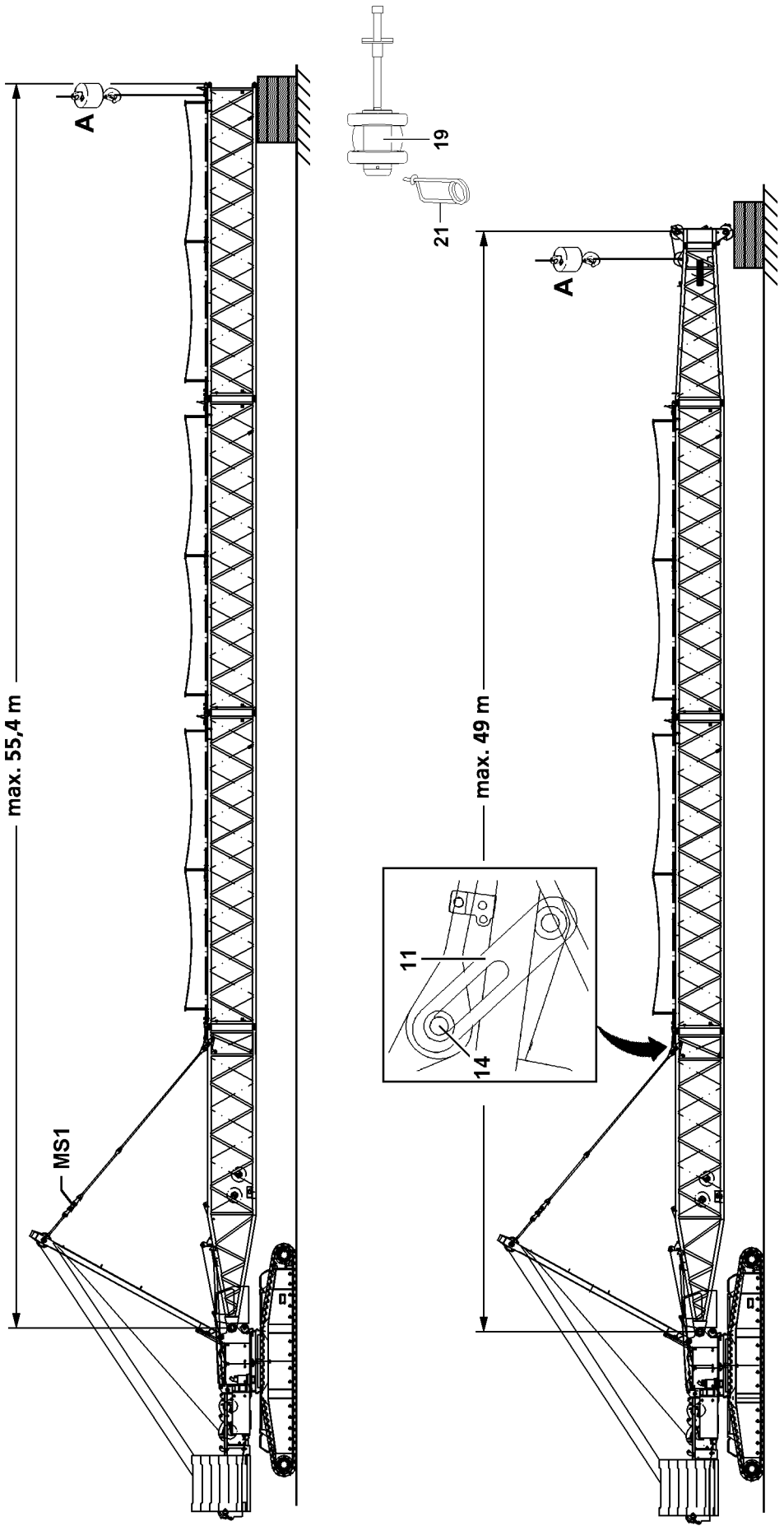
If spatial prerequisites on the job site are limited for the assembly of the L-boom, or if they are limited by buildings or similar, then the L-boom can be assembled in flying mode.

WARNING
General danger notes!
- ▶ Support the L-boom during assembly / disassembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly! See the crane operating instructions, chapter 8.15!

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ For the “flying” boom assembly, the maximum permissible total force on the test point **MS1** may **not** be exceeded. The “actual force” is shown on LICCON monitor 1!
- ▶ The “flying” boom assembly is only permissible up to a certain system length, observe the following charts!

Maximum permissible total force MS1 110 t				
Boom system	**Maximum system length**	**Equipment**	**DB_{min}** 1)	**ZB_{min}** 2)
L	49.0 m	- with end section - without hook block	55 t	43 t
L	55.4 m	- without end section - without hook block	55 t	43 t

1) This counterweight must be at least installed on the turntable for “flying assembly”.
2) This central ballast must be at least installed on the crawler center section for “flying assembly”.



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2.4.1 “Flying” assembly of the intermediate section to the L-pivot section

For “flying” assembly of the intermediate sections, they can be installed individually or as preassembled boom unit on the L-pivot section.

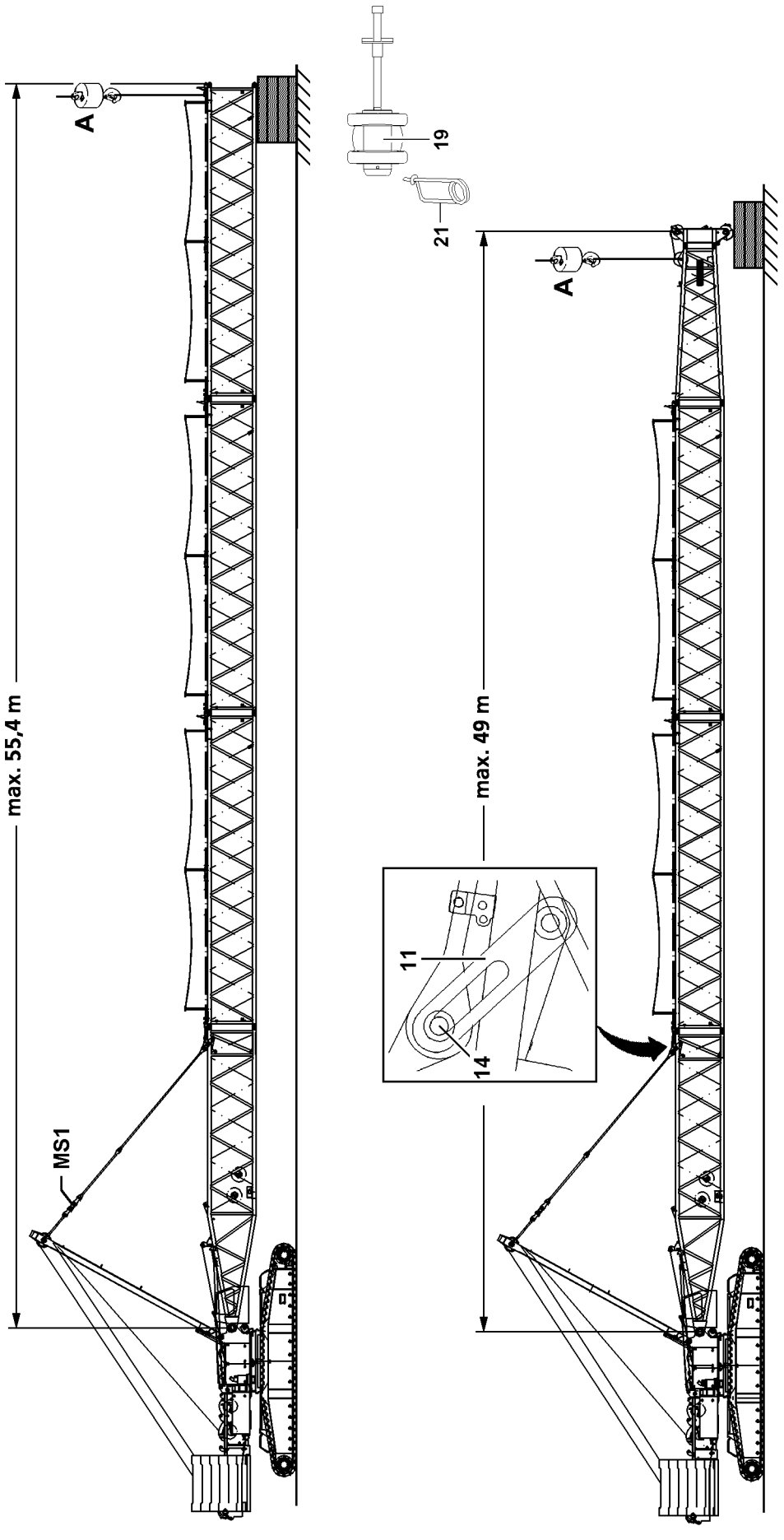
WARNING
Impermissible boom lengths!
If impermissible boom lengths are assembled on the crane, significant property damage can occur on the crane!
Personnel can be severely injured or killed!
- ▶ The maximum permissible boom lengths for the “flying assembly” may not be exceeded!
- ▶ The data in the erection and take down charts as well as the load charts must be observed!

Note
- ▶ For weights of intermediate sections with placed guy rods, see crane operating instructions, chapter 5.03!

Make sure that the following prerequisites are met:
- – the L-pivot section is pinned and secured on the turntable,
- – the L-pivot section is horizontally tensioned,
- – a minimum of 55 t counterweight is placed on the turntable,
- – a minimum of 43 t central ballast is installed on the crawler center section,
- – an auxiliary crane is available.

WARNING
Falling components!
Due to assembly / disassembly of unsecured or unsupported booms, components can fall down!
Personnel can be severely injured or killed!
- ▶ Never work under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure!
- ▶ All pins must be secured in the bearing points as well as in the receptacles!

- ▶ Attach intermediate sections or preassembled boom unit on the auxiliary crane.
- ▶ Lift the intermediate sections or preassembled boom unit with the auxiliary crane and position on the L-pivot section.
- ▶ When the pin points between the L-pivot section and the intermediate section or the preassembled boom unit align “on top” and “bottom”:
  Pin in the pin **19** on “top” and “bottom” from the inside to the outside and secure with spring retainer **21**.
- ▶ When the pins are properly pinned and secured on “top” and “bottom” between the L-pivot section and the L-intermediate section or the preassembled boom unit:
  Remove the auxiliary crane.



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2.4.2 Assembling the S-guy rods

WARNING
Neglectful inspection and maintenance on guy rods!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and unrecognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also crane operating instructions, chapter 8.15!

Note
▶ The L-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!

Make sure that the following prerequisites are met:
– the intermediate sections or preassembled boom unit are pinned and secured on the L-pivot section,
– the intermediate sections or the preassembled unit are supported with suitable materials or secured with the auxiliary crane.

▶ Relieve the guy rods: Lower the SA-frame somewhat to the front.

Result:
– The guy rods between the SA-frame and the L-pivot section are relieved.

The L-guy rods are placed and secured for transport on the corresponding intermediate sections. Before assembly, the transport retainers must be released.
▶ Loosen the transport retainers on the guy rods.

NOTICE
Danger of property damage!
▶ Always pin in the pins of the guy rods from the inside to the outside!

▶ Pin and secure the guy rods for all intermediate sections.

WARNING
The boom can suddenly fold downward!
If the pins **14** on the assembly bracket **11** are unpinned, then the boom can fold down!
Personnel can be severely injured or killed!
▶ Unpin the pins **14** on the assembly brackets **11** only when it is ensured that the intermediate sections are supported with suitable materials or if they are held by an auxiliary crane!

▶ When all guy rods on the boom system are pinned:
Release and unpin the pin **14** on the hollow axle of the assembly bracket **11**.
▶ Actuate winch IV until the guy rods are tensioned between the SA-frame and the L-end section.

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2.5 Establishing the electrical connections

NOTICE
Damage to the electrical connection on the cable drum!
If the electrical connection from the cable drum to the terminal box on the L-pivot section is established first before the connection to the terminal box on the L-end section, the electrical connection can be damaged when spooling out the cable drum!

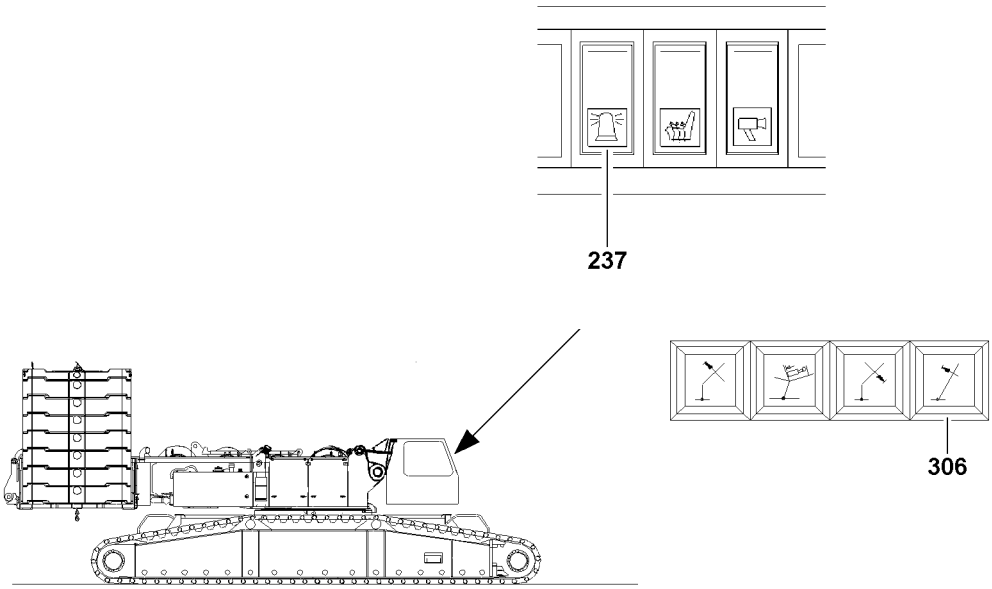
▶ Make the electrical connection from the cable drum in the L-pivot section to the terminal box on the L-end section first and then the electrical connection from the terminal box in the L-pivot section to the cable drum!

Note

▶ To establish the electrical connections on the L-boom, use the separate electrical wiring diagram!

Make sure that the following prerequisites are met:
– the L-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.



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2.6 Function check

Note

▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked! If no visible connection errors or component defects can be found, contact LIEBHERR Service!

WARNING

Risk of fatal injury if safety devices are not functioning!

▶ Crane operation with non-functioning safety devices is **prohibited**!

Make sure that the following prerequisites are met:

– all electrical connections have been made,
– the crane engine is running,
– the appropriate operating mode is set,
– the actuator levers of the limit switches have been checked for easy movement and are lubricated.

2.6.1 Wind speed sensor*

▶ Test the movement and the function of the wind speed sensor.

2.6.2 Airplane warning light *

▶ Turn on the airplane warning light on with the switch **237**.

▶ Visually check functionality.

2.6.3 Hoist limit switch

▶ Actuate the limit switch on the pulley head manually.

Result:

– The hoist winch turns off in upward movement.
– The hoist top icon on the LICCON monitor 0 blinks.

2.6.4 Limit switch boom “steepest position”

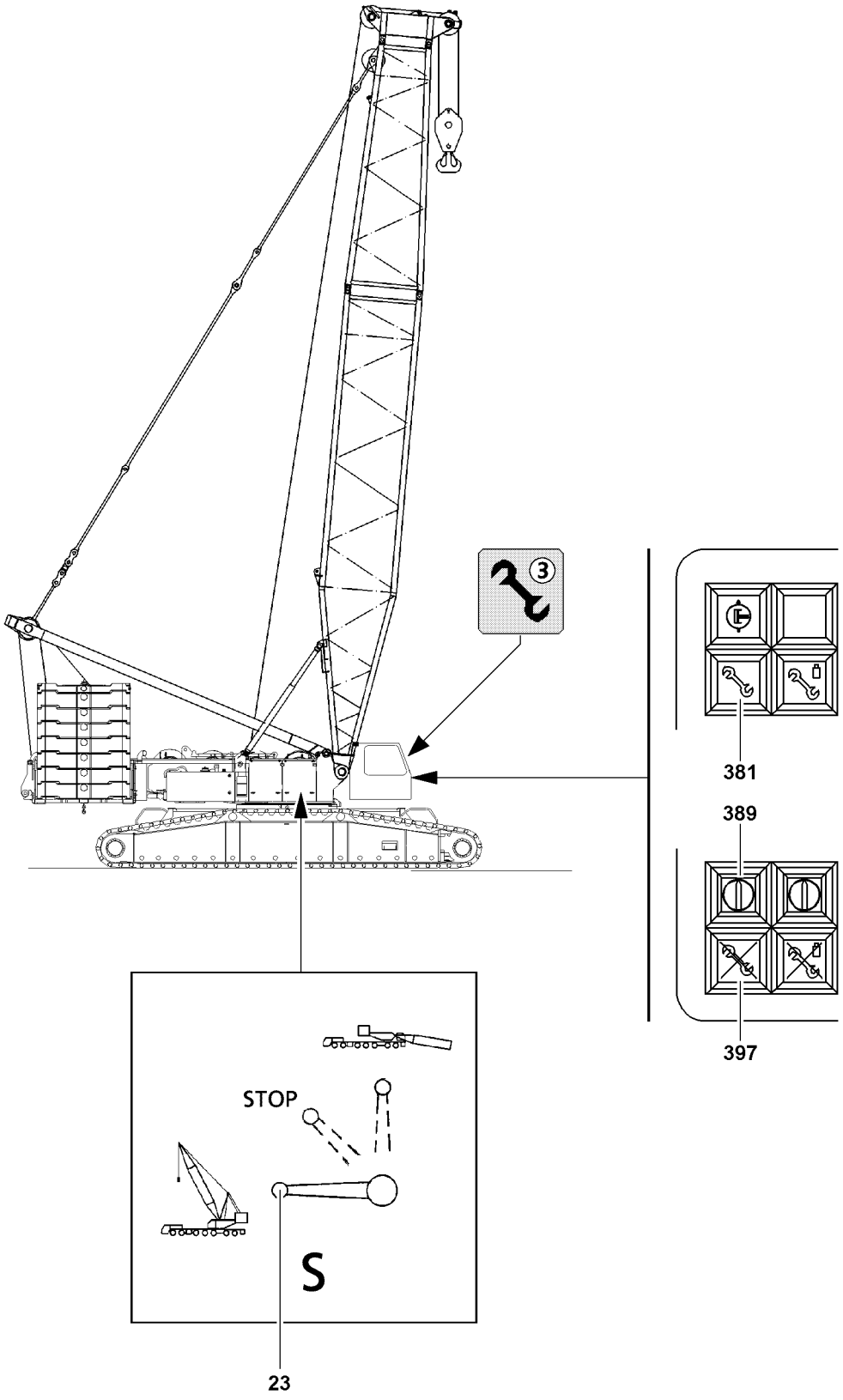
Note

▶ The limit switch functions have to be checked individually before erection!

▶ Manually actuate the individual limit switches on the relapse cylinders.

Result:

– Winch IV (control winch) turns off in upward movement.
– The indicator light **306** lights up.
– An acoustic signal sounds.



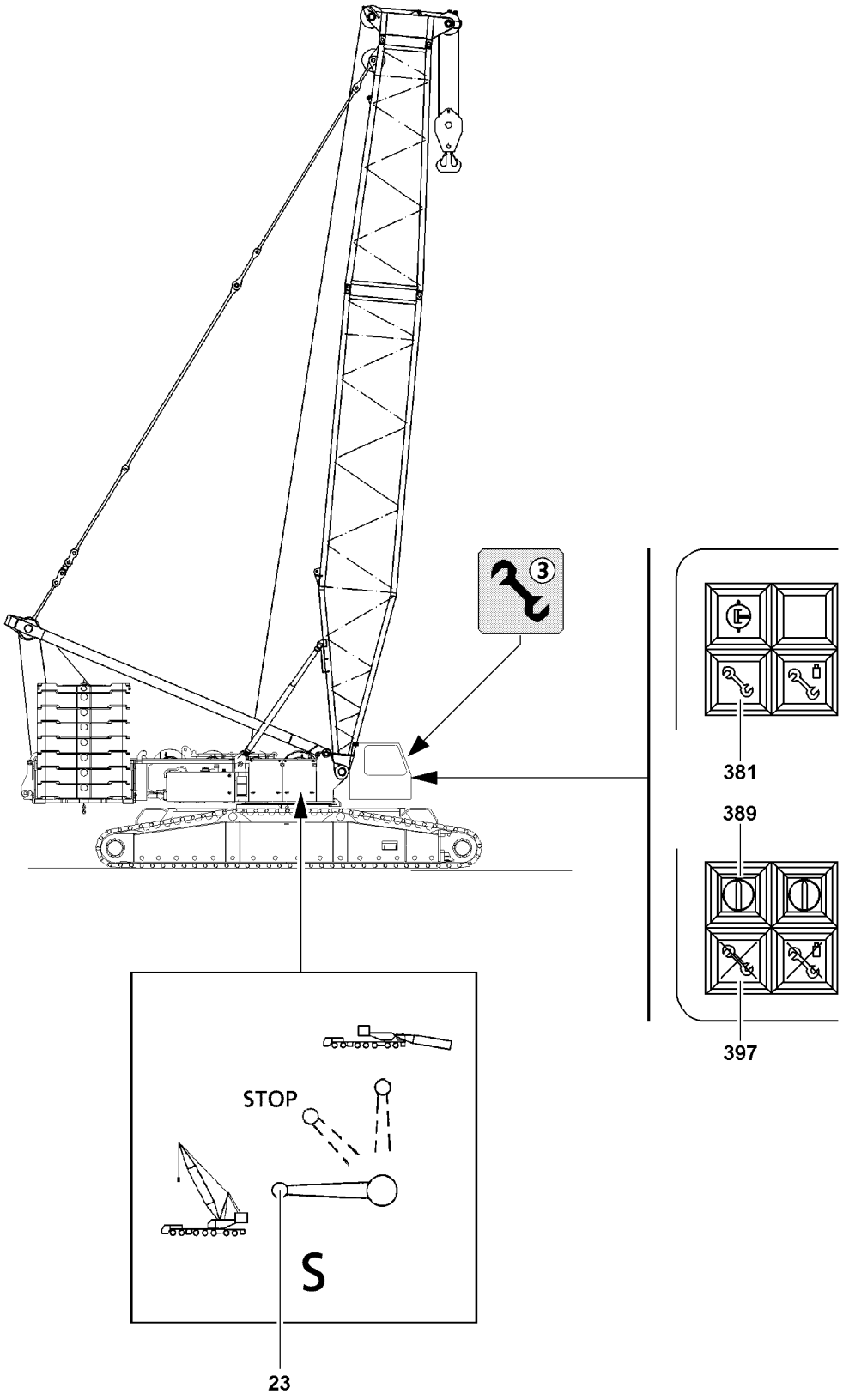
B105428

2.7 Erecting the L - boom

DANGER
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical notes, see crane operating instructions, chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Move the relapse cylinder out before erection!

Make sure that the following prerequisites are met:
- – the crane is aligned in horizontal direction,
- – all electrical connections have been made,
- – all limit switches are functioning,
- – the counterweight has been installed to the turntable according to the load chart,
- – all pin connections have been secured,
- – the hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins,
- – there are no loose parts on the boom,
- – the LICCON overload protection has been adjusted according to the data in the load chart,
- – the LICCON overload protection settings have been compared with the actual crane configuration,
- – no personnel is within the danger zone,
- – the assembly key button **389** is actuated,
- – the indicator light **381** “assembly” lights up,
- – the assembly icon **3** on the LICCON monitor 0 lights up.

DANGER
The crane can topple over!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Do not allow slack cable to build up on the control winch!
- ▶ The ball cock cabinet must be locked! Always pull the key and hand it to an authorized person!



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2.7.1 Moving the relapse cylinder out

WARNING
Risk of fatal injury!
If the relapse cylinders are not moved out before erecting the L-boom, then the L-boom can fall backward during crane operation!
Personnel can be severely injured or killed!
▶ The L-relapse cylinders must be moved out before erection of the L-boom!
▶ The ball cock must be secured during crane operation to prevent unintended actuation!

The piston rod on the L-relapse cylinder must be moved out by actuating the ball cock **23**.

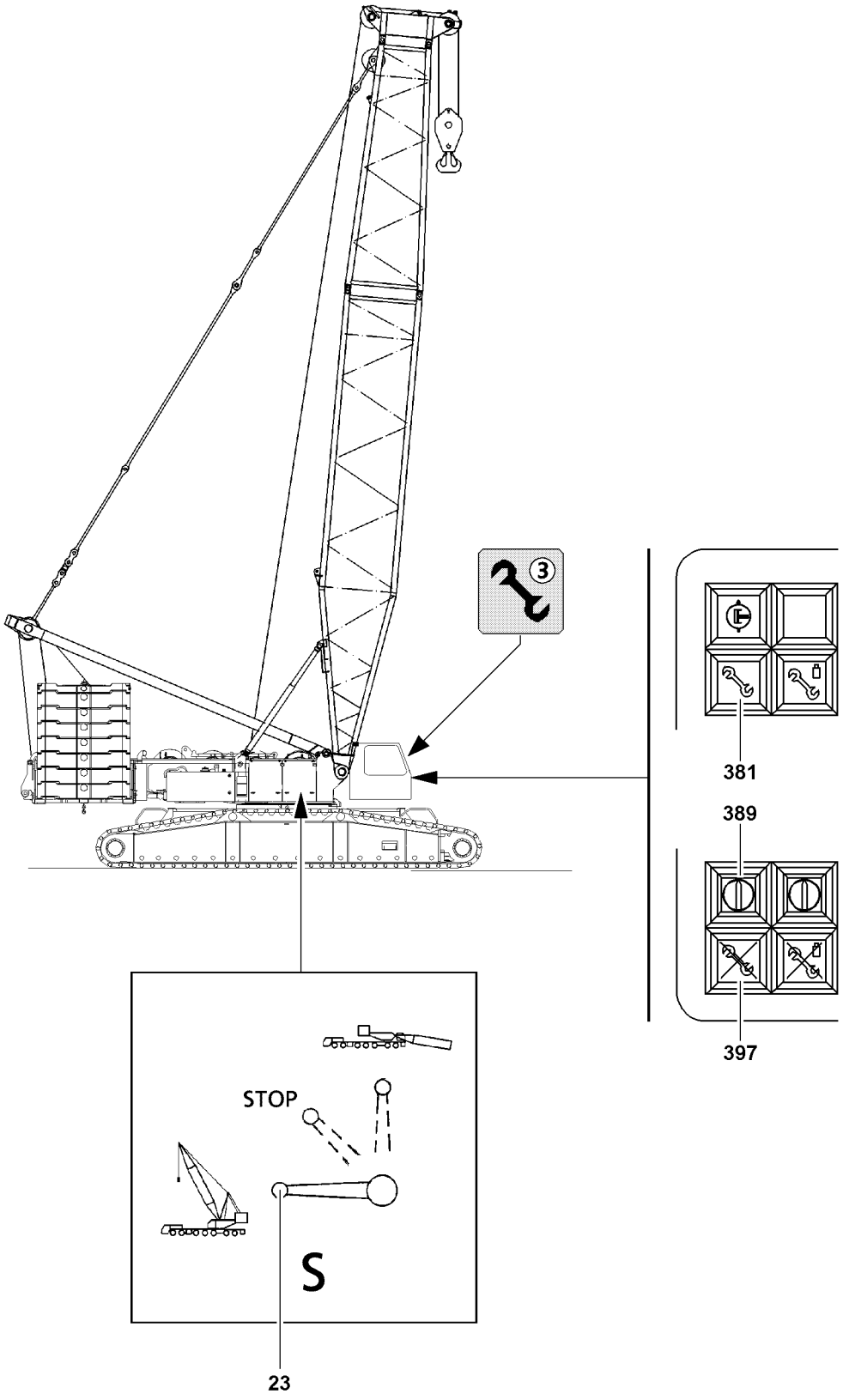
Ball cock positions	
Horizontal	Crane operation, move the piston rod out
Vertical	Assembly, move the piston rod in
45°	STOP (The piston rod cannot be moved in / moved out)

Ensure that the following prerequisite is met:
– all hydraulic connections have been made.

▶ Move the ball cock **23** into horizontal position.

Result:
– The piston rod of the L-relapse cylinders moves out.

Secure the ball cock **23** by closing and locking the cabinet doors to prevent unauthorized access.
▶ Close the cabinet door and pull the key.
▶ Hand the key to an authorized person.



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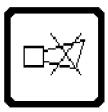
2.7.2 Erection procedure

DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane superstructure during erection procedure!
- ▶ Observe the data in the erection and take down charts!

- ▶ Erect the boom until the end section lifts off the ground.
- ▶ Reeve in the hoist rope properly and secure on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.

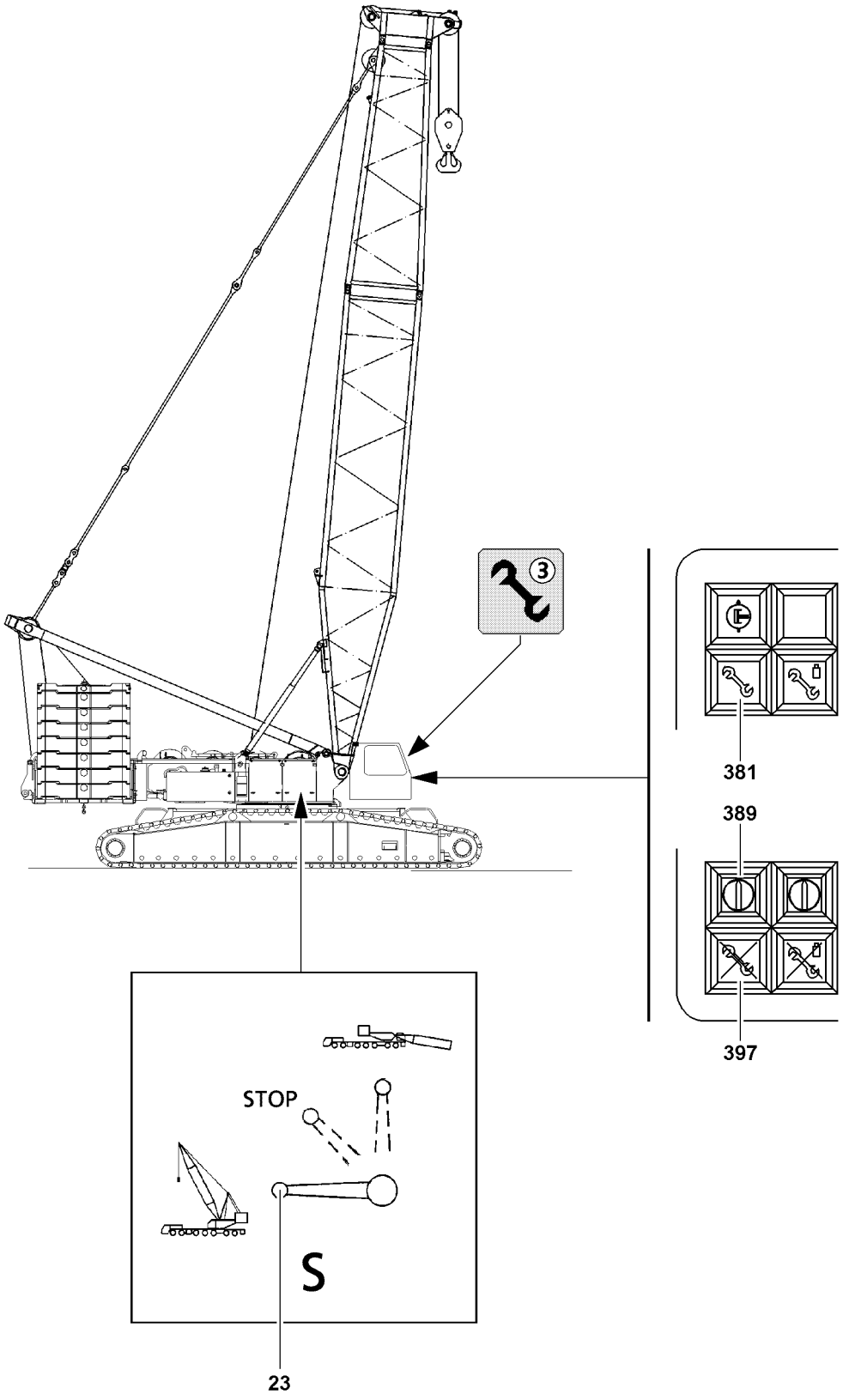
WARNING
The crane can topple over!
- ▶ When the lowest operating position is reached, the assembly key button **389** must be turned off immediately!
- ▶ The assembly key button **389** bypasses the safety devices!
- ▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!

Note
- ▶ During the erection procedure - outside the operating area - the alarm functions listed in the chart are displayed as blinking on the crane operating screen!

Displays on the LICCON monitor during the erection procedure	
 *Icon: “STOP” blinks*	
 *Icon: “ERROR 150” blinks*	***Note:*** *For error description, see Diagnostics manual, chapter 20.05.*
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

- ▶ Luff the boom up to the lowest operating position.

Note
- ▶ If the lowest operating setting for the boom is achieved, the display turns off (see table above), and on the icon “Maximum load” instead of the display “???” a load value appears on “t”!



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WARNING
The crane can topple over!
- ▶ When the lowest operating position of the boom is reached, turn off the assembly key button **389** immediately!
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

▶ Turn the assembly key button **389** off: Press the button **397**.

Result:
- – Self retention of the assembly key button **389** is turned off.
- – The LICCON overload protection is active.
- – The indicator light **381** turns off.
- – The assembly icon **3** on the LICCON monitor turns off.
- – The acoustical signal turns off.

3 Crane operation

3.1 Preparing for crane operation

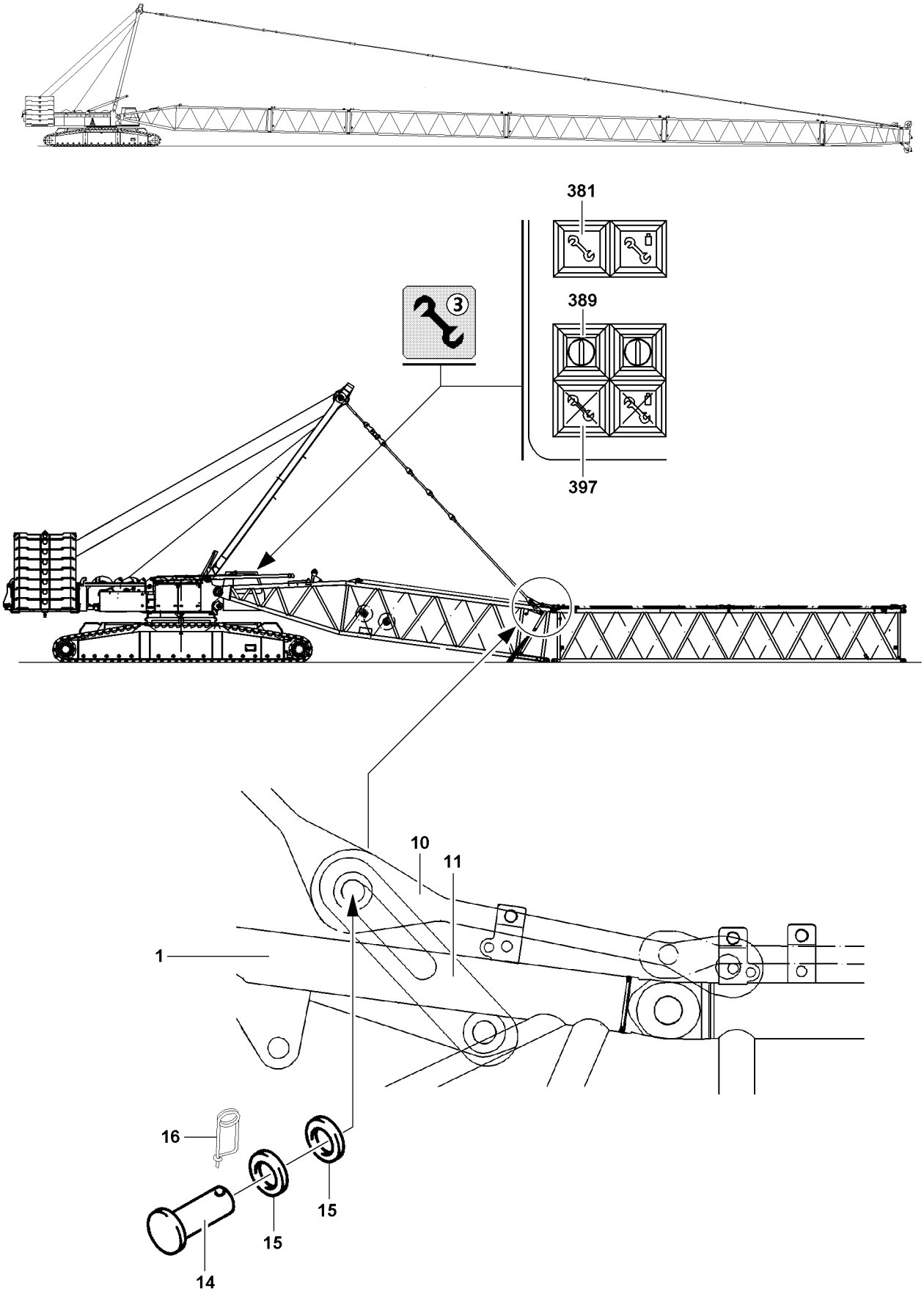
Note
- ▶ Observe the notes in the crane operating instructions, chapter 4.05, 4.08 and 5.01!

Make sure that the following prerequisites are met:
- – the LICCON overload protection has been set according to the data in the load chart,
- – the assembly key button **389** has been turned off by pressing the button **397**.

WARNING
The crane can topple over!
- ▶ Check the horizontal position of the crane before and during operation!
- ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation!

3.1.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches “boom steep” on the relapse cylinders.



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4 L/LL-disassembly

DANGER
Risk of falling!
During 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 injuries!

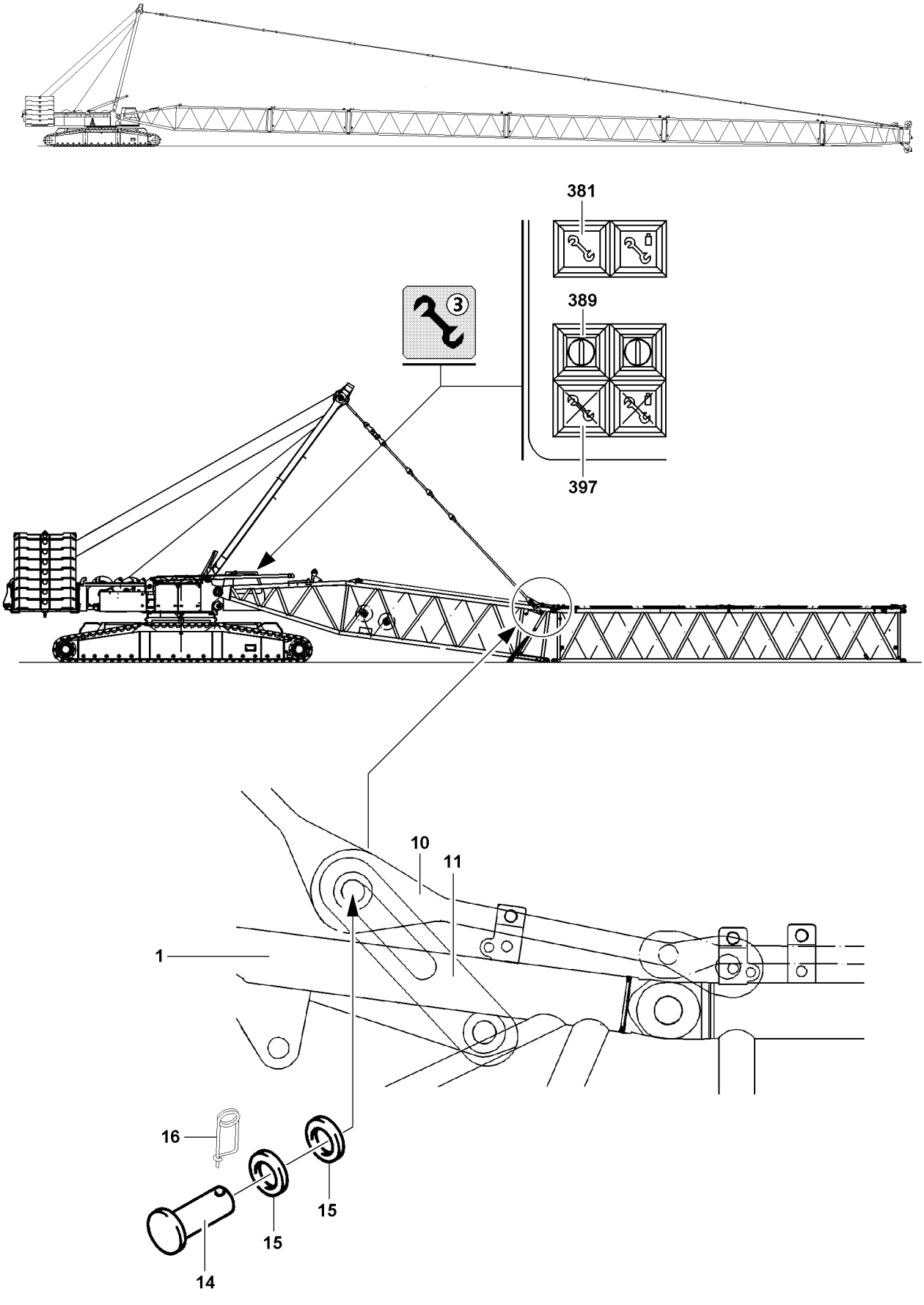
- ▶ All disassembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which disassembly must be carried out with aids depends on national regulations! The national regulations must be adhered to!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect against falling!

DANGER
Risk of injury when disassembling booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel!

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

DANGER
Falling components!
If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!

- ▶ Secure components before disassembly with the auxiliary crane to prevent them from falling!



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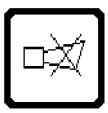
4.1 Placing the L - boom down

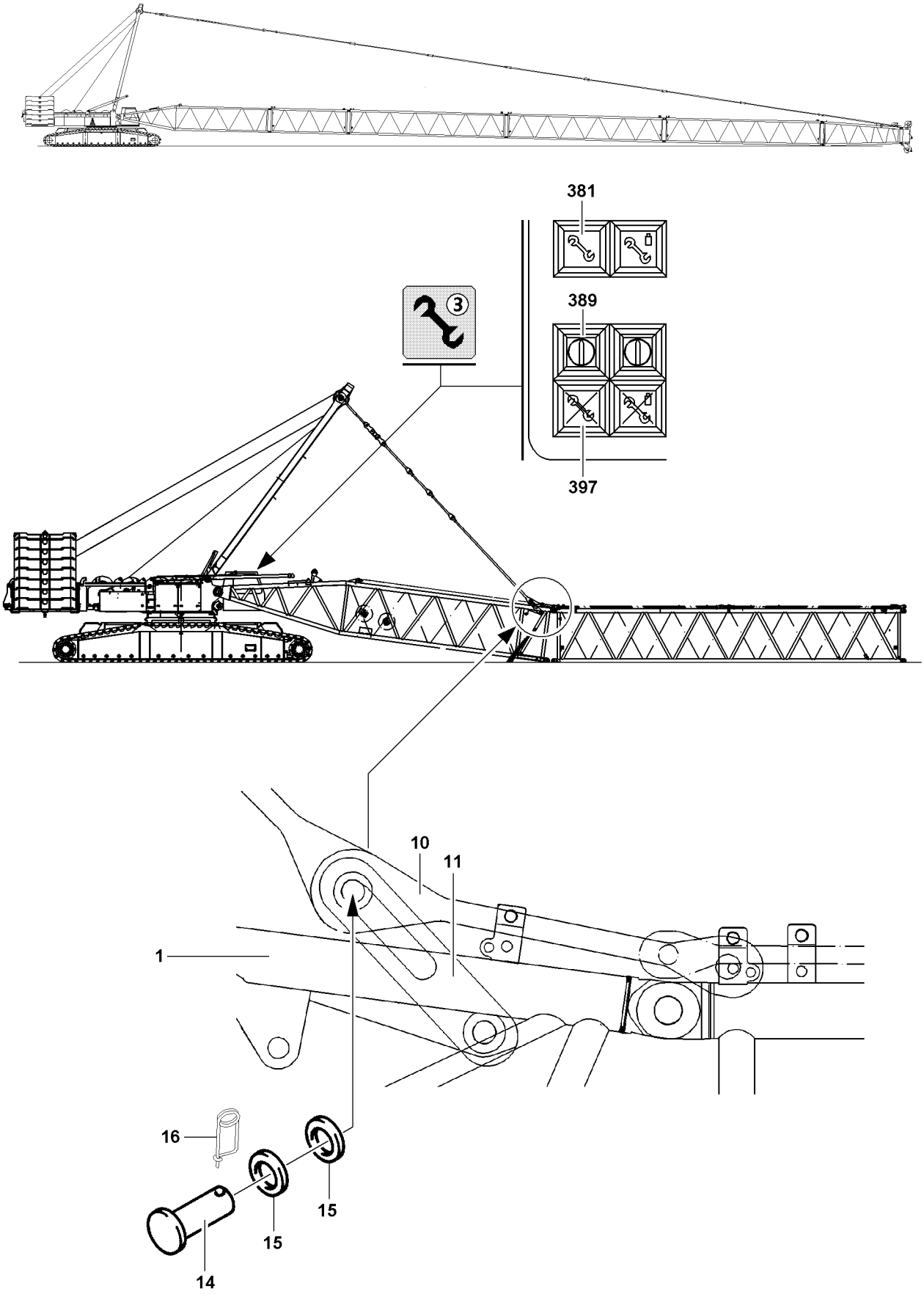
DANGER
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical notes, see crane operating instructions, chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head!
There is the danger that boom components may be significantly damaged!
- ▶ Upon taking down the boom system, always spool out the hoist winch at the same time!

When the lowest operating position is reached, the Luff down movement is turned off.
On the “Maximum load” icon, the load value disappears and the display “???” appears.
The following alarm functions become active:

Display on the LICCON-Monitor 0 after reaching the “lowest” operating position	
 *Icon: “STOP” blinks*	
 *Icon: “ERROR 150” blinks*	***Note:*** *For error description, see Diagnostics manual, chapter 20.05.*
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

- ▶ Luff the L-boom down to the **lowest** operating position.



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WARNING
Risk of fatal injury at crane operation with turned on assembly key button!
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button **389** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is inactive.
- – The indicator light in the button **381** lights up.
- – The assembly icon **3** in the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red flashing beacon on the crane cab blinks.
- – The STOP icon on the LICCON monitor blinks.

▶ Spool the hoist winch out and luff the S-boom down further until the hook block touches the ground.

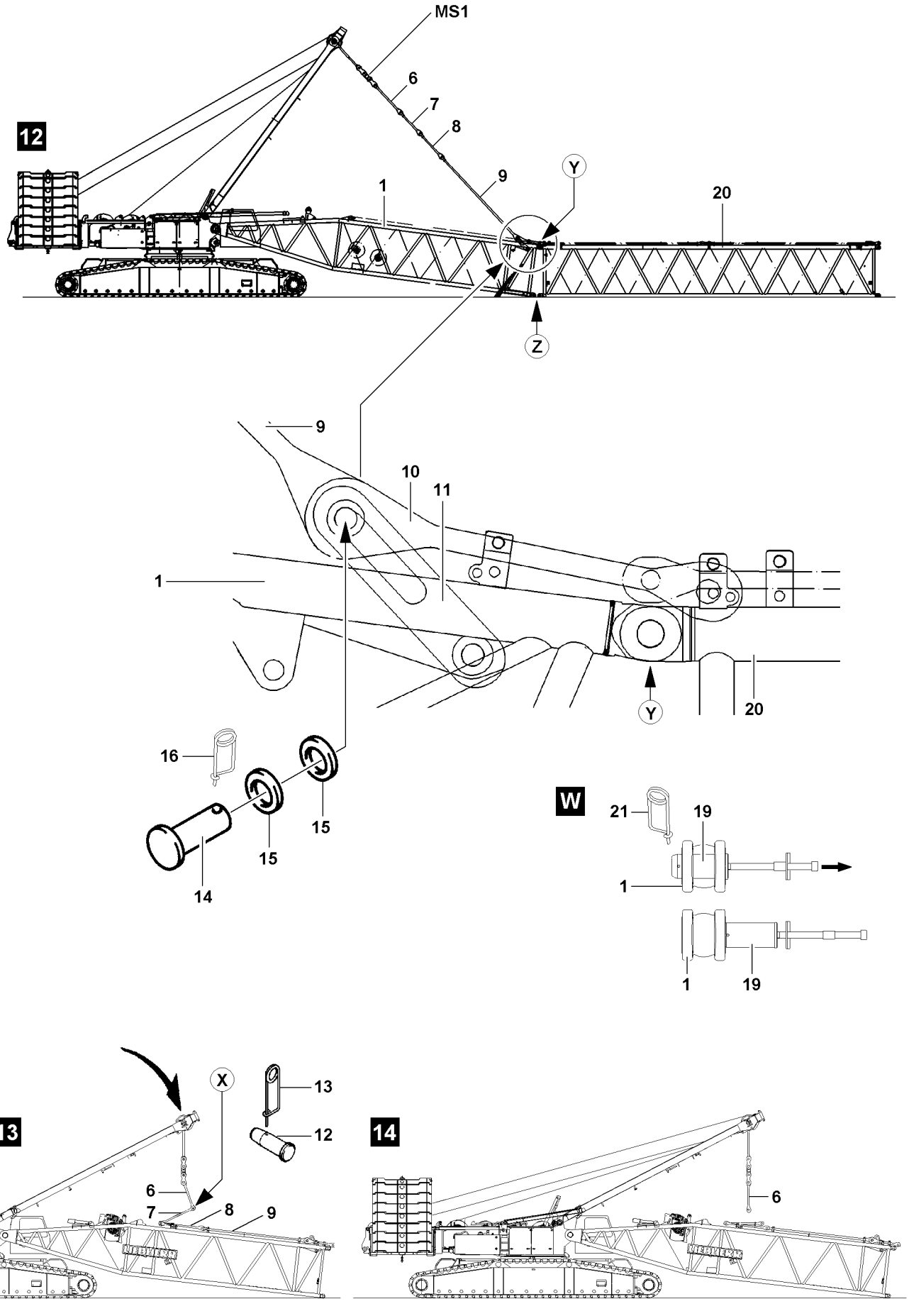
▶ Remove the hoist limit switch weight and unreeve the hook block.

▶ Luff the boom down until the boom head is lying on the support on the ground.

WARNING
Risk of accident!
- ▶ 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, the settings of the cam limit switch are not longer correct and there is an increased danger of accidents!
As a result, extensive adjustment work on the cam limit switch is required!
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch!
- ▶ Stop the winch in time, with sufficient rope reserve!
- ▶ Do not over spool the winch!

▶ Remove the hoist rope.


12
MS1
6
7
8
9
1
Y
20
Z
9
10
11
1
Y
20
16
15
15
14
W
21
19
1
1
19
13
X
13
12
6
7
8
9
14
6

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4.2 Disassembling the L - boom

WARNING
The boom can suddenly fold downward!
If the following conditions are not met prior to dismantling the boom, the boom can fold down and fatally injure people!
- ▶ Support the L-boom during disassembly with suitable materials!
- ▶ Before unpinning the L-intermediate section **20**, the guy rods **9** on the assembly brackets **11** must be pinned and secured!
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!

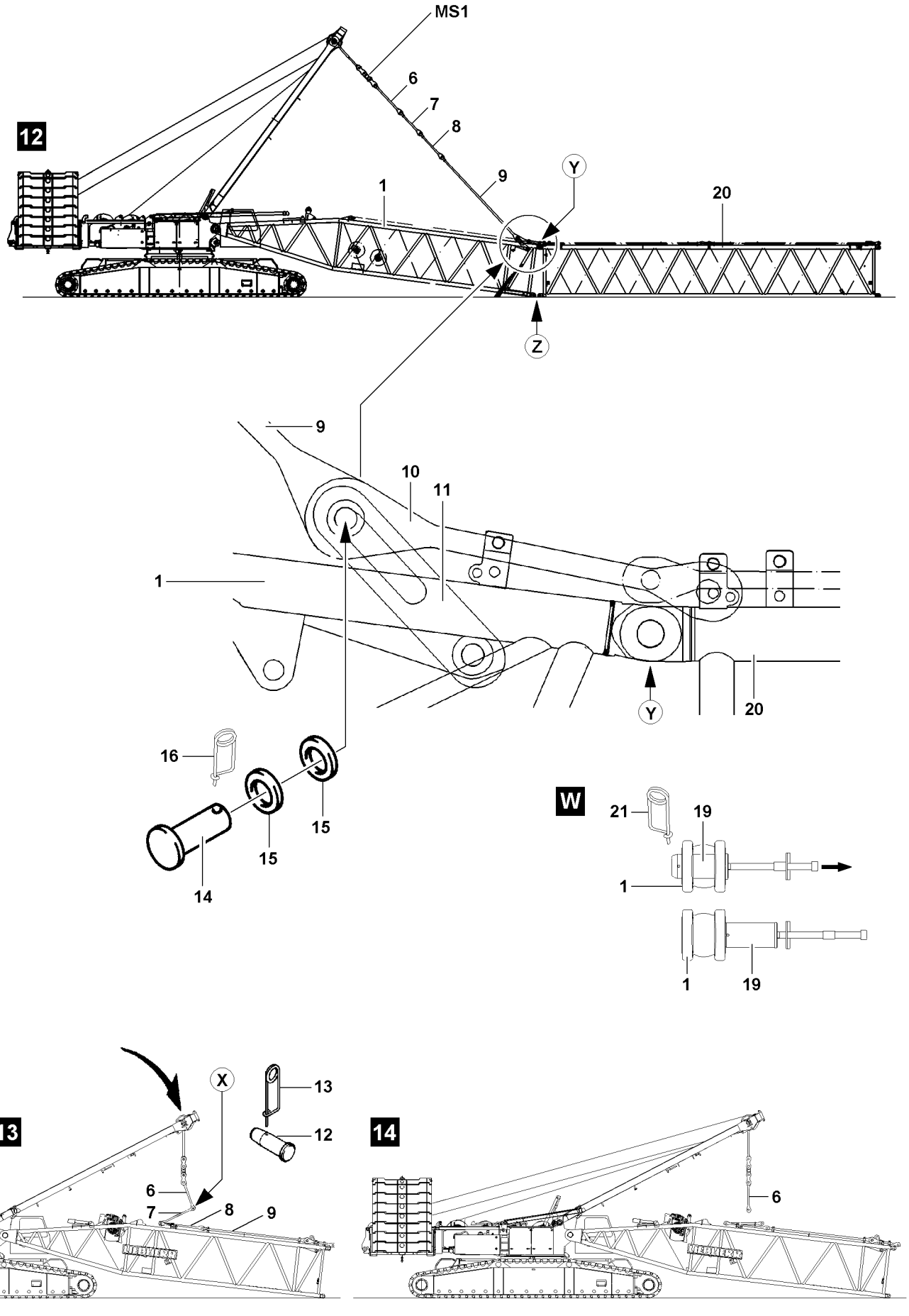
- ▶ Relieve the guy rods by lowering the SA-frame: Spool out winch 4.
- ▶ Unpin the guy rods on the L-intermediate sections: Remove the spring retainer **13** and unpin the pin **12**.
- ▶ Place the guy rods on the L-intermediate sections and secure with transport retainers.
- ▶ Pin the guy rods **9** on the assembly brackets **11**: Pin in the pin **14** and secure with spring retainer **16**, see illustration **12**, point **Y**.

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ The maximum permissible total force on test point **MS1** may **not** be exceeded!
- ▶ Lifting the following boom length is permissible if the maximum permissible total force on test point 1 (MS1) is noted, observe the following charts!

Note
- ▶ The ACTUAL force on test point **MS1** is shown on monitor 1!
- ▶ Tension the guy rods on the SA-frame with the same force as during the assembly!
- ▶ For this, refer the ACTUAL force at the measuring point measured and recorded during the assembly (MS1)!
- ▶ The pins can be pulled easier and the pins and lugs are therefore not damaged!

Maximum permissible total force MS1 110 t				
Boom system	**Maximum system length**	**Equipment**	**DB_{min}** [1]	**ZB_{min}** [2]
L	49.0 m	- with end section - without hook block	55 t	43 t
L	55.4 m	- without end section - without hook block	55 t	43 t

1) This counterweight must be at least installed on the turntable when taking down the boom systems.
2) This central ballast must be at least installed on the crawler center section when taking down the boom systems.


12
MS1
6
7
8
9
1
Y
20
Z
9
10
11
1
Y
20
16
15
15
14
W
21
19
1
1
19
13
X
13
12
6
7
8
9
14
6

B105431

Note

- Unpin the intermediate sections with the pin pulling device, see crane operating instructions, chapter 5.30!

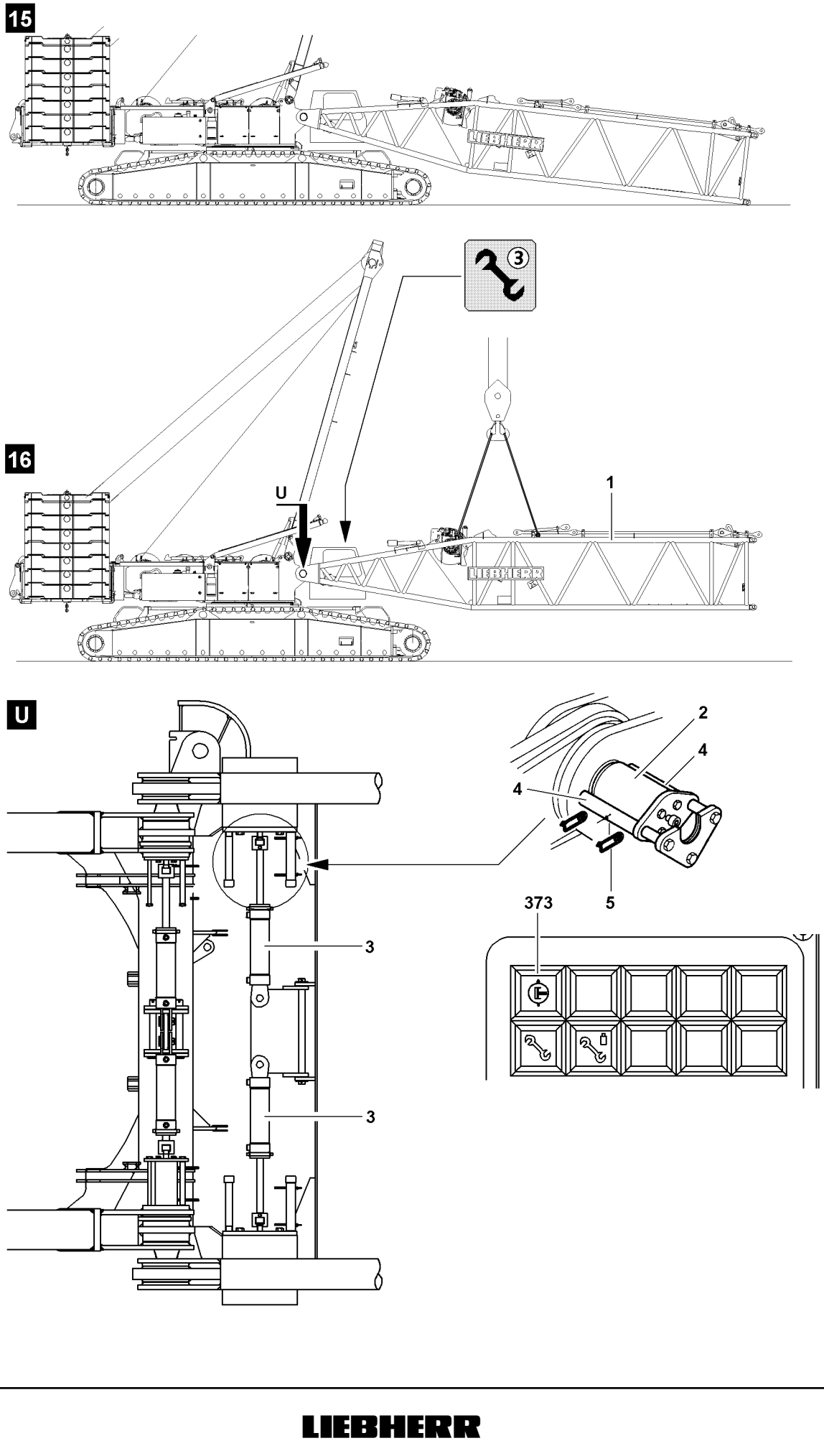
NOTICE

Danger of property damage!

If the maximum permissible total force is not observed when lifting the boom system for disassembly, then the crane components can be severely damaged!

- Do not exceed the maximum permissible total force!

- Disconnect the electrical connections and store the cables carefully.
- Spool the cable drum up and secure it to prevent inadvertent spooling out.
- Lift the L-pivot section **1** up with the SA-frame and unpin on both sides at point **Z**: Remove the spring retainer **21** and unpin the pin **19**.
- Lower the L-pivot section on the support.
- Relieve the guy rods by lowering the SA-frame.
- Unpin the guy rods at the assembly brackets **11**: Remove the spring retainer **16** and unpin the pin **14**.
- Unpin and disassemble the intermediate sections.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4.3 Unpinning the L-pivot section

WARNING
General danger notes!
- ▶ Support the L-pivot section during disassembly with suitable materials!
- ▶ Pin in and secure all pins after disassembly in the intended transport receptacles!

Ensure that the following prerequisite is met:
– the SA-frame is erected to the point where the L-pivot section can be disassembled without obstructions.

- ▶ Attach the L-pivot section **1** on the auxiliary crane.
- ▶ Lift the L-pivot section **1** with the auxiliary crane to the horizontal.

Establish the hydraulic connection to the pin pulling device via two quick couplers.
Release and unpin the L-pivot section **1** on the turntable.
- ▶ Establish the hydraulic connection to the pin pulling device.
- ▶ Turn the pressure change over switch **373** on.

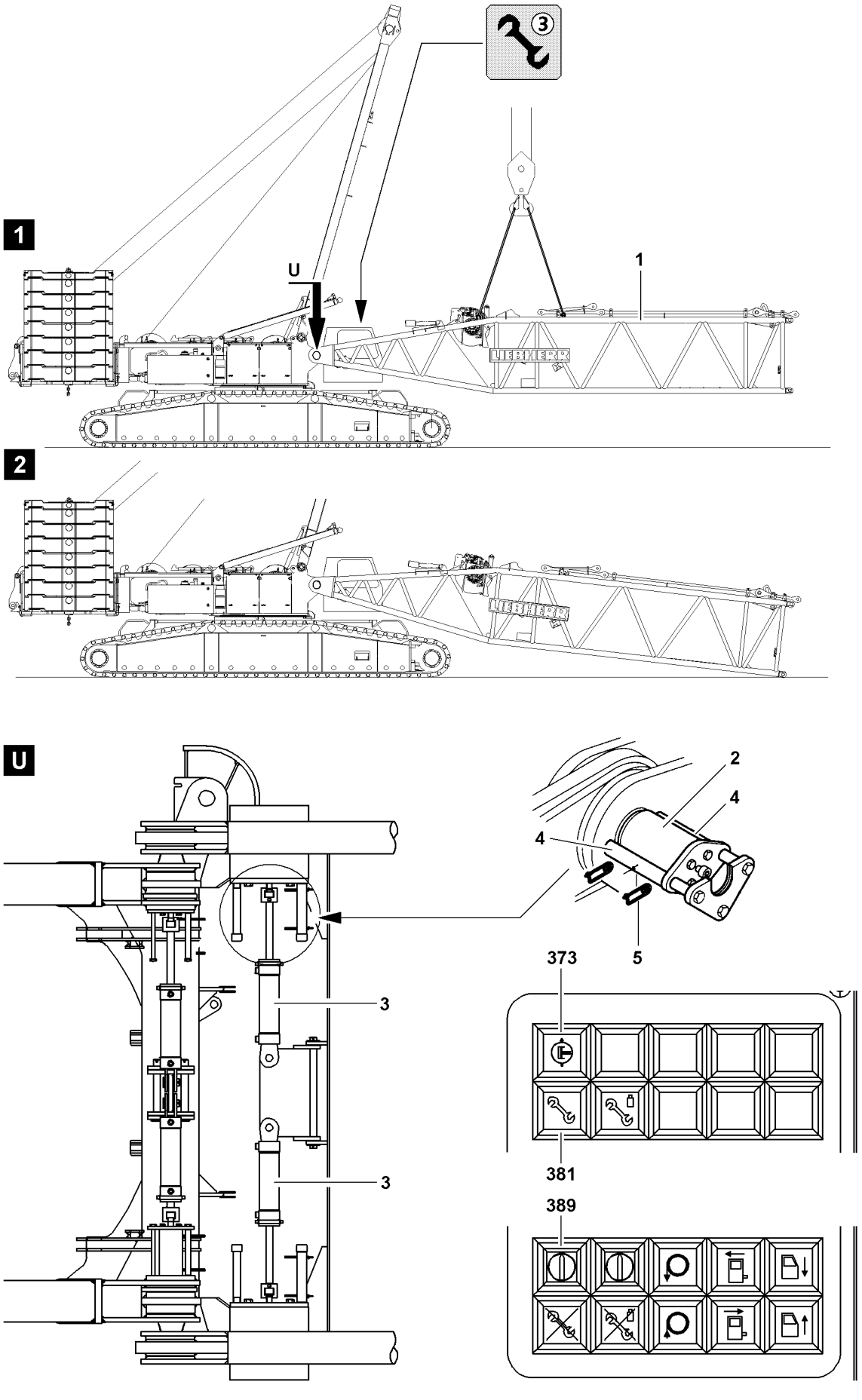
WARNING
Falling L-pivot section!
- ▶ Make sure that the L-pivot section is safely held by the auxiliary crane before unpinning the pins **2**!

- ▶ Remove the spring retainer **5** on the retaining plate **4** on the left and right.
- ▶ Remove the retaining plate **4** left and right.
- ▶ Unpin the connector pins **2** with the hydraulic pin pulling device **3**.
- ▶ Turn the pressure change over switch **373** off.

NOTICE
Danger of property damage on the turntable and on the L-pivot section!
- ▶ Slowly swing the L-pivot section out with the auxiliary crane and at low speed on the turntable!

- ▶ Place the L-pivot section with the auxiliary crane on the support on the ground.
- ▶ Remove the pin pulling device.
- ▶ Remove the auxiliary crane.

Note
- ▶ Place the SA-frame on the turntable, see crane operating instructions, chapter 5.02!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1 Component overview S-pivot section

Component	Weight
S-pivot section incl. guy rods	7.7 t
Winch 5 including rope	6.3 t
Total weight	14.0 t

2 S / SL-assembly

Note

▶ The assembly is described on the example of the S-boom!

DANGER

When working aloft, there is a danger of falling!

During assembly / disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.

If the following notes are not observed, assembly personnel can fall down!

Personnel can be severely injured or killed!

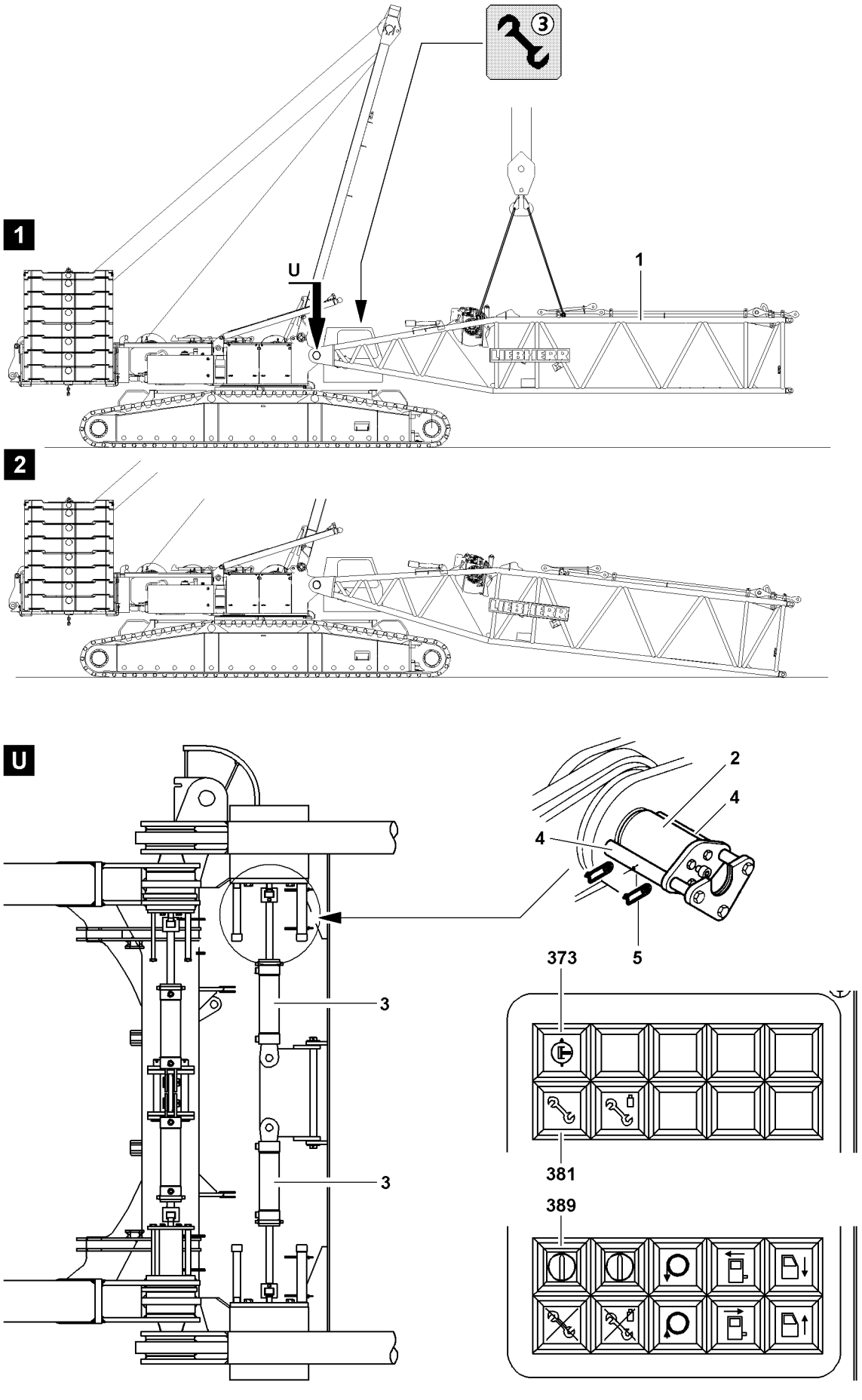
- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ Before any assembly / disassembly work and maintenance work on the crane and lattice mast boom, superstructure and the telescopic boom, assembly personnel must wear the **approved catch systems and protective equipment**, see chapter 2.04.
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

DANGER

Danger of accident at assembly / disassembly of booms!

When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!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2.1 Installing the boom

Make sure that the following prerequisites are met:

– The crane is aligned in horizontal direction.
– An auxiliary crane is available.
– An assembly scaffolding / work platform is available.
– The counterweight has been attached to the turntable in accordance with the load chart.
– The LICCON overload protection has been set according to the data in the load chart.
– The assembly icon **3** on the LICCON monitor blinks.

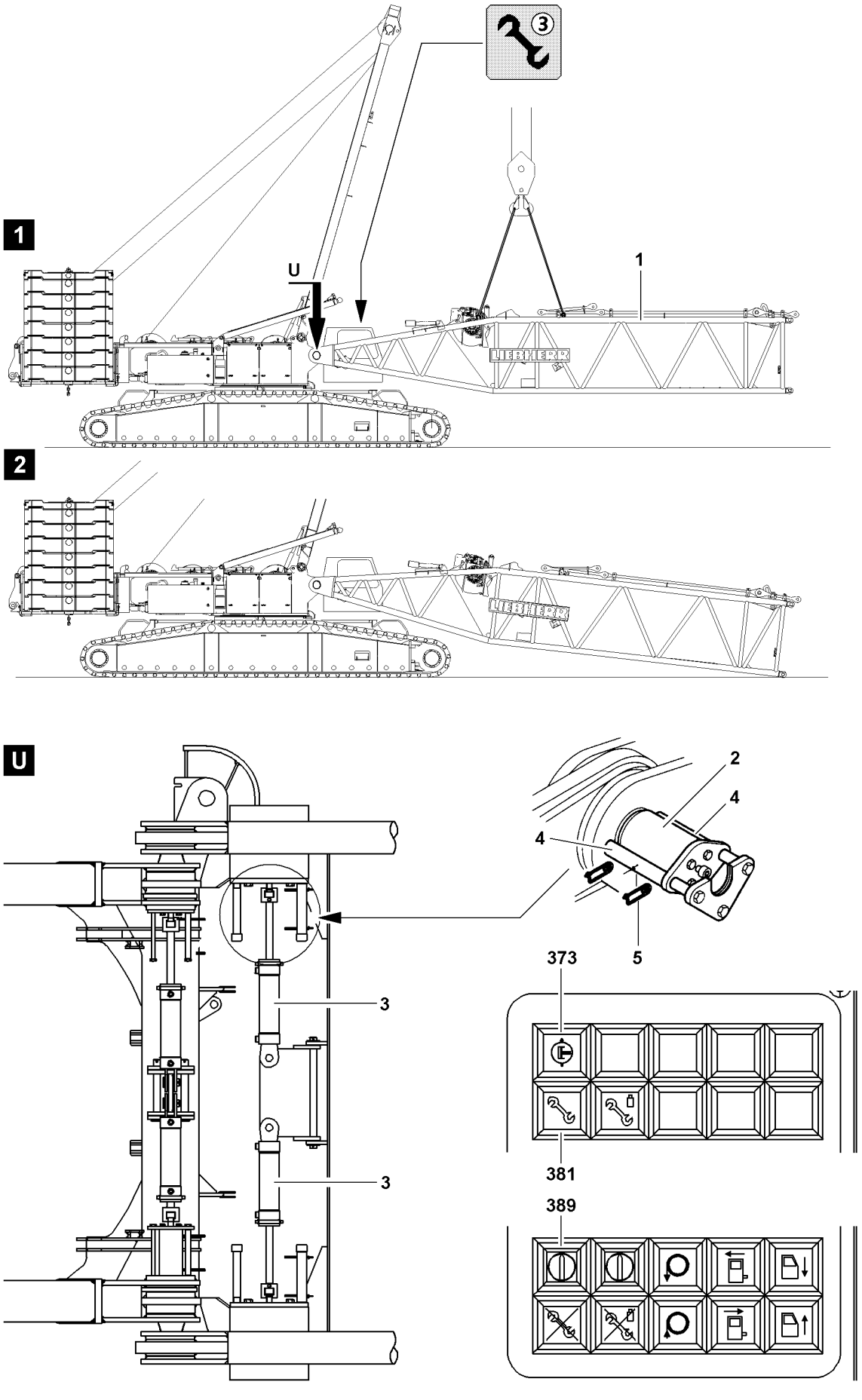
2.1.1 Turning the turntable into assembly position

DANGER
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** installed S-boom, the crane can topple over.
Personnel can be severely injured or killed!

▶ Observe the data in the erection and take down charts!
▶ If no S-boom is installed on the turntable, max. 135 t counterweight may be installed and when turning the turntable by 360°, it must be ensured that the SA-bracket is erected to **more than 90°**.
▶ If the counterweight is increased to 155 t, then the S-boom must be installed and raised off the ground!

Maximum counterweight	Minimum central ballast	Equipment
55 t	11 t	without equipment
95 t	11 t	
135 t	43 t	
155 t	43 t	S-boom installed and raised off the ground

▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side.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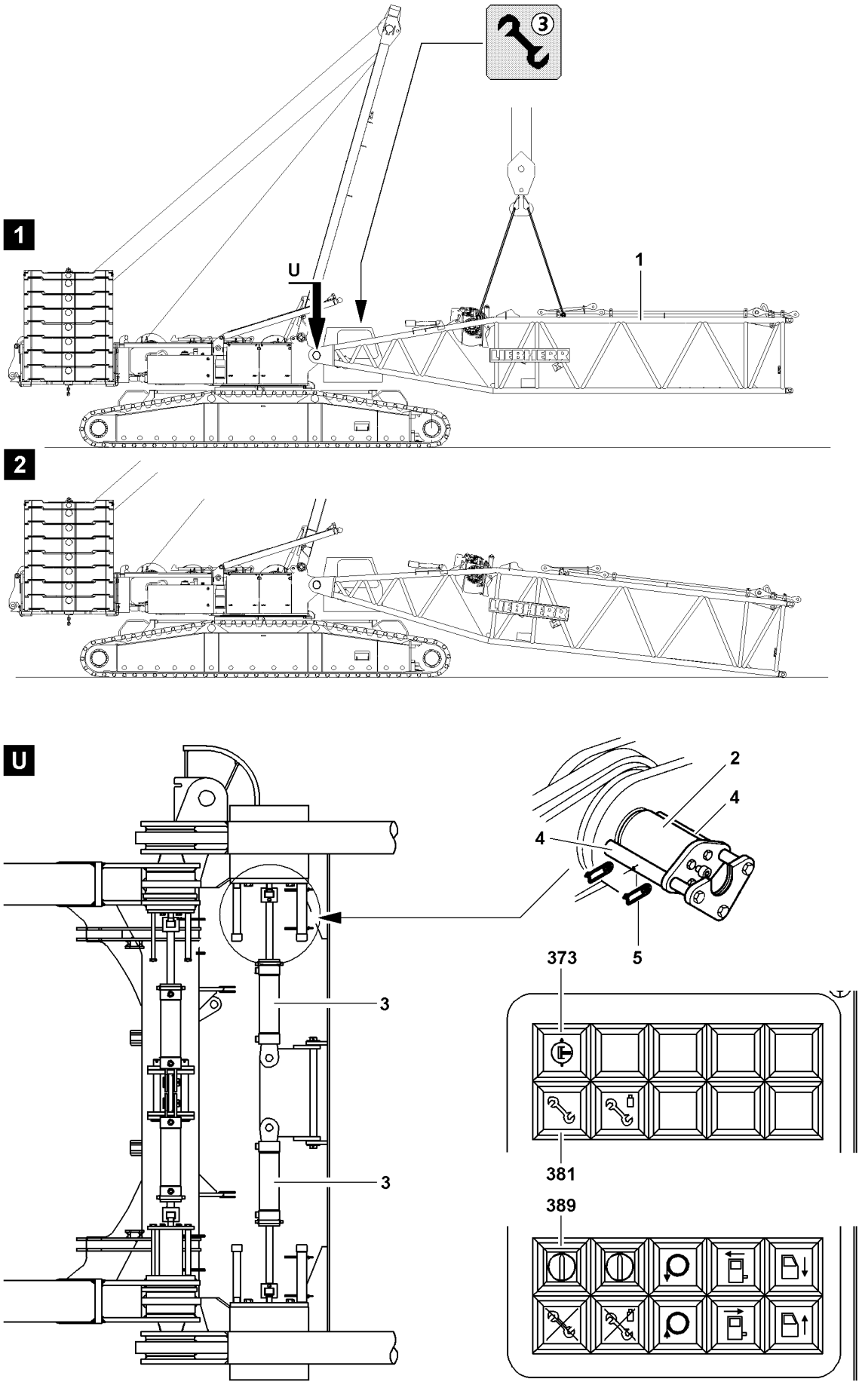
2.1.2 Adding the operating mode “Assembly”

DANGER
Risk of fatal injury in crane operation with enabled assembly key button.
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key switch may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is bypassed.
- – The indicator light in the button **381** lights up.
- – The Assembly icon **3** on the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red flashing beacon on the crane cab blinks.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2.2 Pinning the S-pivot section on the turntable

WARNING
General danger notes!
- ▶ Support the S-boom during assembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly! See also Chapter 8.15.

▶ Hang the S-pivot section **1** onto the auxiliary crane and swing in to the pin points on the turntable, fig. **1**.

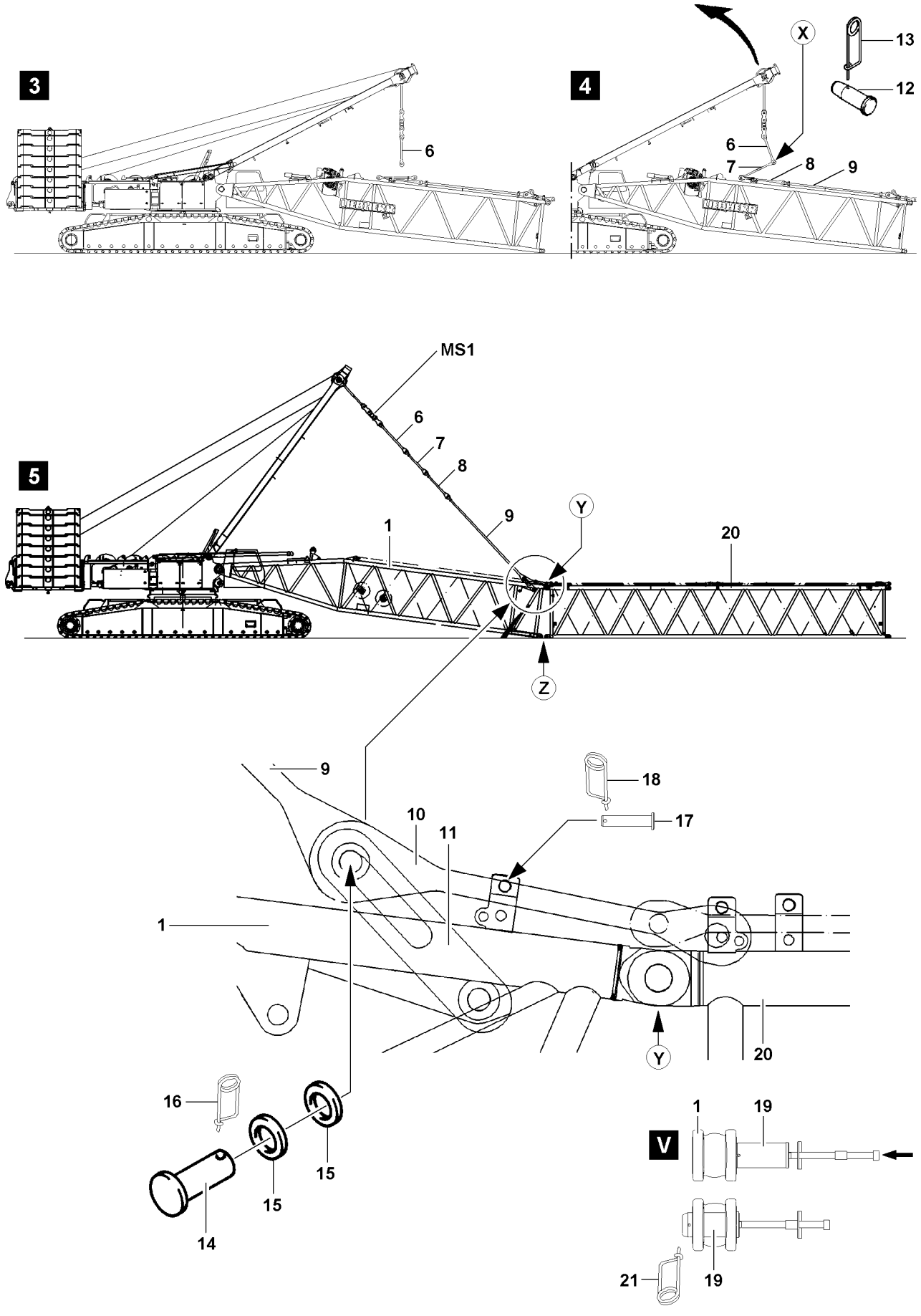
Establish the hydraulic connection to the pin pulling device via two quick couplers.
Pin the S-pivot section **1** on the turntable and secure.
- ▶ Establish the hydraulic connection to the pin pulling device.
- ▶ Turn the pressure change over switch **373** on.

DANGER
Risk of fatal injury!
Due to unsecured or insufficiently secured connector pins, the S-boom can fall down and fatally injure personnel.
- ▶ Secure the connector pins **2** between the S-pivot section **1** and the turntable after the pin procedure with the retaining plates **4**.

- ▶ Insert the connector pins **2** with the hydraulic pin pulling device **3**.
- ▶ When the connector pins **2** are completely pinned on the left and right on the S-pivot section: Insert the connector pin **2** on the left and right and secure with the retaining plate **4** and spring retainer **5**.
- ▶ Turn the pressure change over switch **373** off.

NOTICE
Damage to the S-pivot section!
Property damage can occur on the S-pivot section by placing the installed S-pivot section on the ground.
- ▶ Slowly place the S-pivot section with the auxiliary crane and at low speed on the ground.
- ▶ Before placing it on the ground, support the S-pivot section.

- ▶ Carefully place the S-pivot section down.
- ▶ Remove the auxiliary crane.


3
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B104973

2.3 Assembling the S-intermediate sections

2.3.1 Installing the S-intermediate section on the S-pivot section

Make sure that the following prerequisites are met:
- The S-pivot section is pinned and secured on the turntable.
- The S-pivot section is placed on the ground.
- The auxiliary crane is removed.

Note
▶ To pin the S-intermediate sections, the pin pulling device can be used, see chapter 5.30.

WARNING
General danger notes!
▶ All pins are to be secured after assembly with the intended safety elements!
▶ The guy rods must be checked regularly! See also Chapter 8.15.

To be able to assemble the S-intermediate sections on the S-pivot section, the SA-bracket guy rods must be used.
▶ Remove the transport retainers for the guy rods on the SA-bracket.
▶ Remove the transport retainers for the guy rods on the S-pivot section.
▶ Lower the SA-bracket to the front until the guy rods **6** hang freely over the guy rods **7** of the S-intermediate section **20**, fig. **3**.

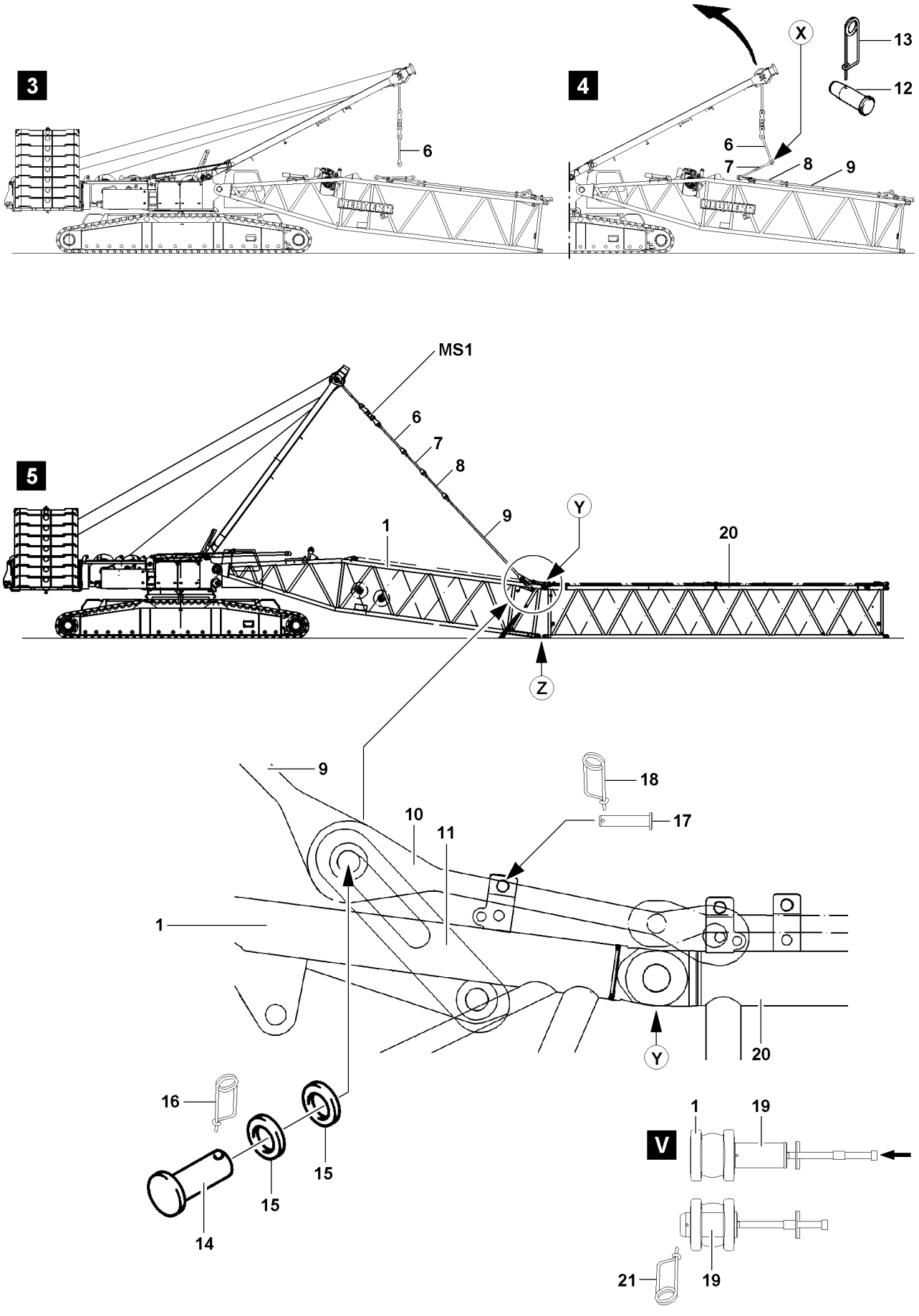
Pin the guy rods **6** of the SA-bracket with the guy rods **7** on the S-pivot section.
▶ Insert the pin **12** at point **X** from the “inside” to the “outside” and secure with spring retainer **13**, fig. **4**.

Pin and secure the assembly brackets **11** on the connector point of the guy rods **9** and guy rods **10**, use washers **15**.
▶ Insert the pins **14** into the hollow axle and secure with spring retainers **16**.
▶ Erect the SA-bracket until the guy rods are completely tensioned, fig. **5**.

Note
▶ Assemble the S-guy rods according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

The guy rods are placed and secured for transport on the S-intermediate sections. The transport retainers must be removed before assembly of the guy rods.
▶ Release the transport retainers of the guy rods on the S-intermediate sections: Remove the spring retainer **18** and unpin the pin **17**.

Pin the S-intermediate section **20** on the S-pivot section **1** “on top”:
▶ Attach the S-intermediate section **20** on the auxiliary crane and align on the S-pivot section **1**, fig. **5**.
▶ When the pin bores on the S-pivot section **1** and on the S-intermediate section **20** “on top” (point **Y**) align, fig. **5**:
Insert the pin **19** from the inside to the outside and secure with spring retainer **21**, fig. **V**.


3
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X
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MS1
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B104973

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!

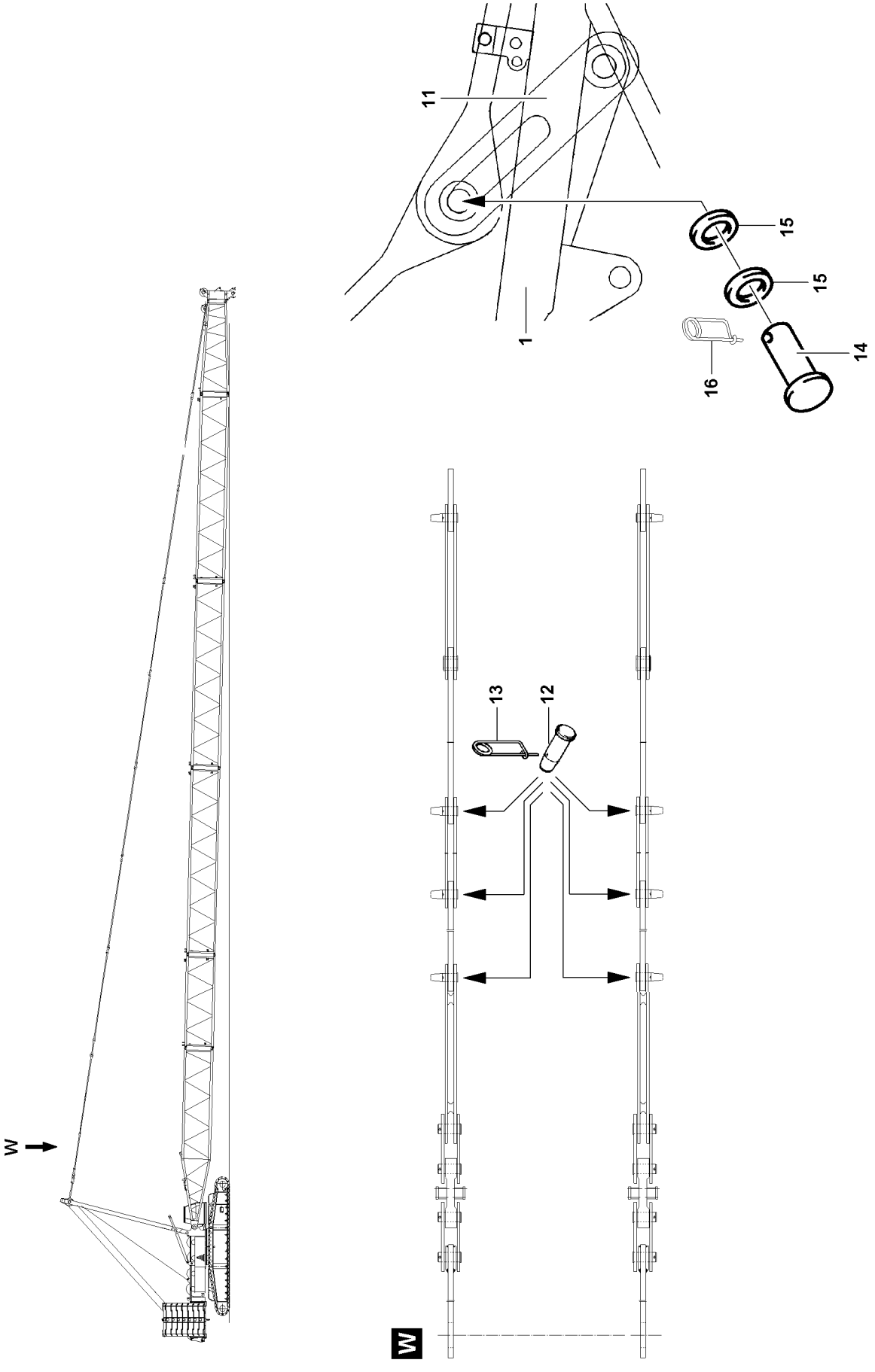
- During the “closing procedure” of the S-intermediate sections, the maximum total force on test point **MS1** of 110 t, may **not** be exceeded.
- The end section of the corresponding S/SL-boom combination may **not** lift off the ground during the “closing procedure”!
- With the SA-bracket, S-boom combinations to maximum **S 119 m** may be lifted / closed.
- With the SA-bracket, SL-boom combinations to maximum **SL 112 m** may be lifted / closed.

Note

- The actual force on the test point MS1 - which is exerted during the closing procedure of the boom system - is shown on the LICCON monitor 1.
- Record the actual force and keep it ready for the disassembly of the boom system.
- During the boom disassembly, the guying is tensioned with the noted actual force (assembly) so that the connector pins of the intermediate sections can be unpinned.

Assemble the S-boom to the required length and pin and secure on the S-intermediate section **20** “on top” and “bottom”.

- Insert the pin **19** from the inside to the outside and secure with spring retainer **21**.
- When the S/SL-boom combination is assembled to the desired length:
  Lift the S-pivot section **1** with the SA-bracket until the pin bores on the “bottom” align at point **Z**, fig. **5**.
- Read the actual force of the test point 1 (MS1) on the LICCON monitor and record it.
- Insert the pin **19** on point **Z** from the inside to the outside and secure with spring retainer **21**.



B104977

2.3.2 Installing the S-guy rods

WARNING
Inspection and maintenance on guy rods not carried out!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also chapter 8.15.

Note
▶ The S-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

Ensure that the following prerequisite is met:
– The boom is pinned and secured on the S-pivot section.

▶ Relieve the guy rods between the SA-bracket and the S-pivot section: lower the SA-bracket somewhat to the front.

Result:
– The guy rods between the SA-bracket and the S-pivot section are relieved.

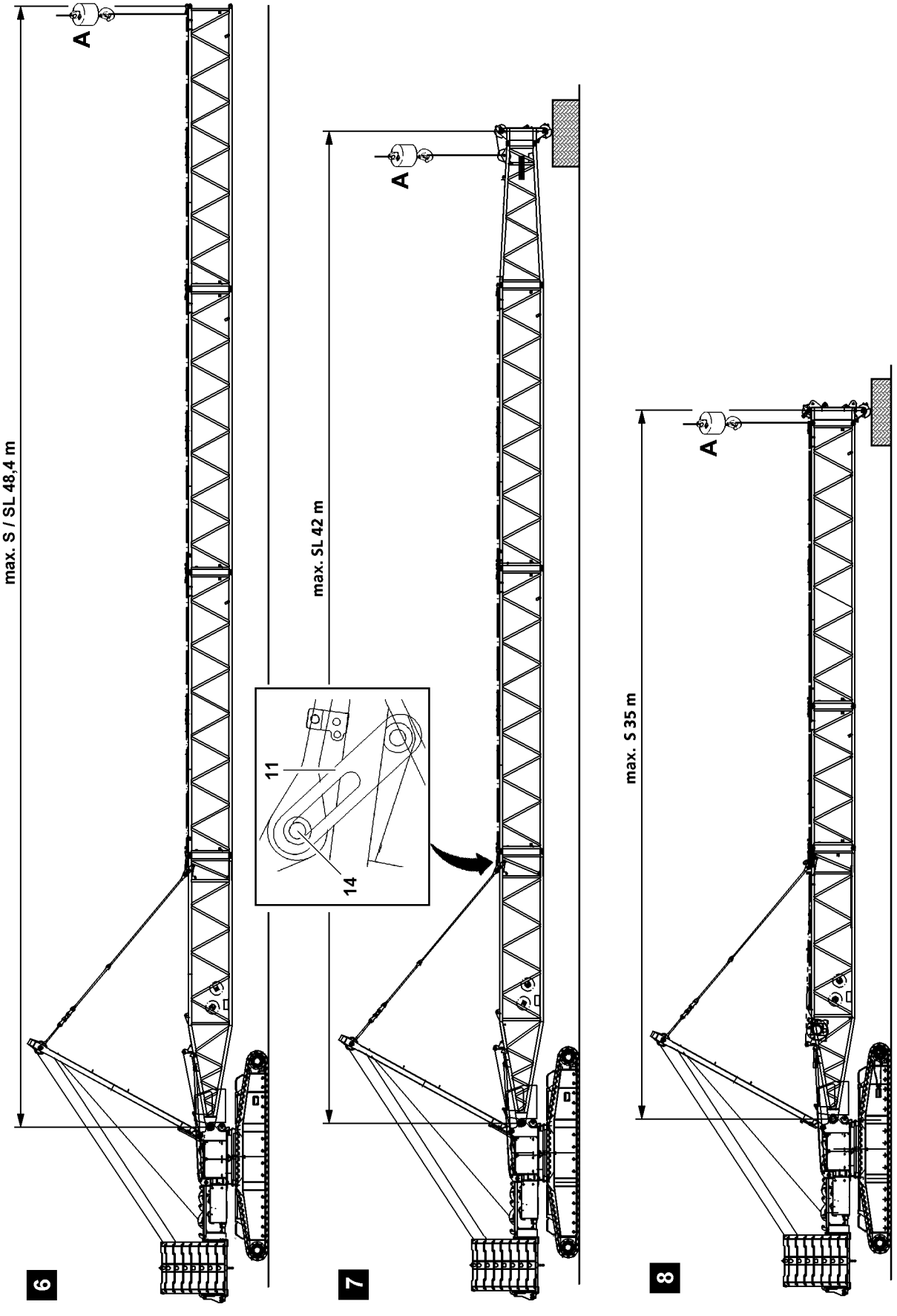
The S-guy rods are placed and secured for transport on the corresponding intermediate sections. Before assembly, the transport retainers must be released.
▶ Release the transport retainers on the guy rods.

NOTICE
Danger of property damage!
▶ Always insert the pins of the guy rods from the inside to the outside.

▶ Pin and secure the guy rods for all intermediate sections.
▶ Pin the guy rods: Insert the pins **12** from the “inside” to the “outside”.
▶ Secure the pin **12** with spring retainer **13**.

WARNING
The boom can suddenly fold down!
If the pins **14** on the assembly bracket **11** are unpinned, then the boom can fold down!
Personnel can be severely injured or killed!
▶ Unpin the pins **14** on the assembly brackets **11** only when it is ensured that the intermediate sections are supported with suitable materials or if they are held by an auxiliary crane.

▶ When all guy rods on the boom system are pinned:
Release and unpin the pin **14** on the hollow axle of the assembly bracket **11**.
▶ Actuate winch IV until the guy rods are tensioned between the SA-bracket and the S-end section.



B105425

2.4 Flying assembly of the S-intermediate sections

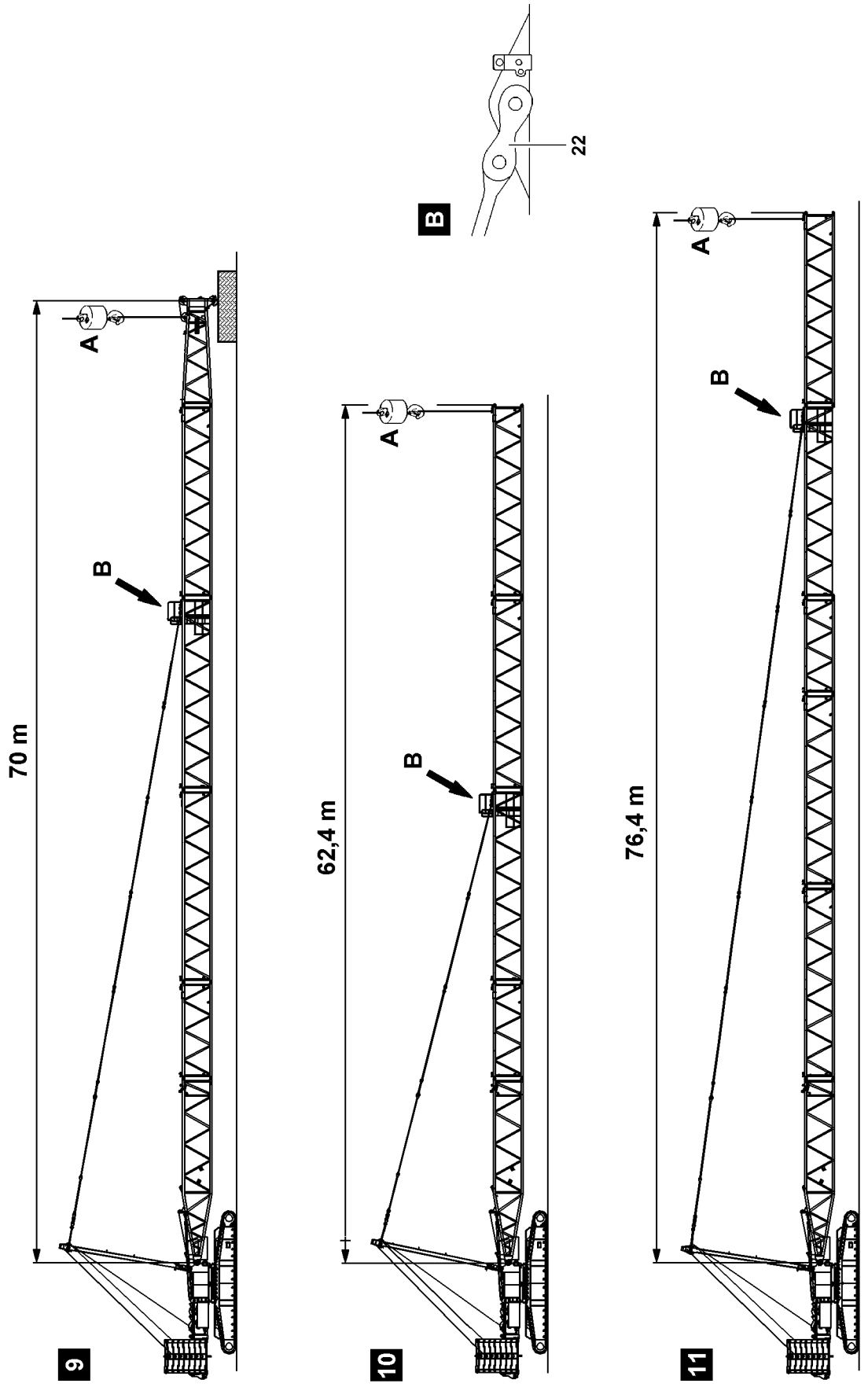
If spatial prerequisites on the job site are limited for the assembly of the S-boom, or if they are limited by buildings or similar, then the S-boom can be installed in flying mode.

WARNING
General danger notes!
- ▶ Support the S-boom during assembly / disassembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly! See also Chapter 8.15.

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ For the “flying” boom assembly, the maximum permissible total force on the test point **MS1** may **not** be exceeded. The “actual force” is shown on LICCON monitor 1.
- ▶ The “flying” boom assembly is only permissible up to a certain system length, observe the following charts!

Maximum permissible total force MS1 110 t				
Boom system	**Maximum system length**	**Equipment**	**DB_{min}** 1)	**ZB_{min}** 2)
S	35.0 m	- with 400 t end section - without hook block	55 t	43 t
SL	42.0 m	- with 250 t end section - without hook block	55 t	43 t
S/SL	48.4 m	- without end section - without hook block	55 t	43 t

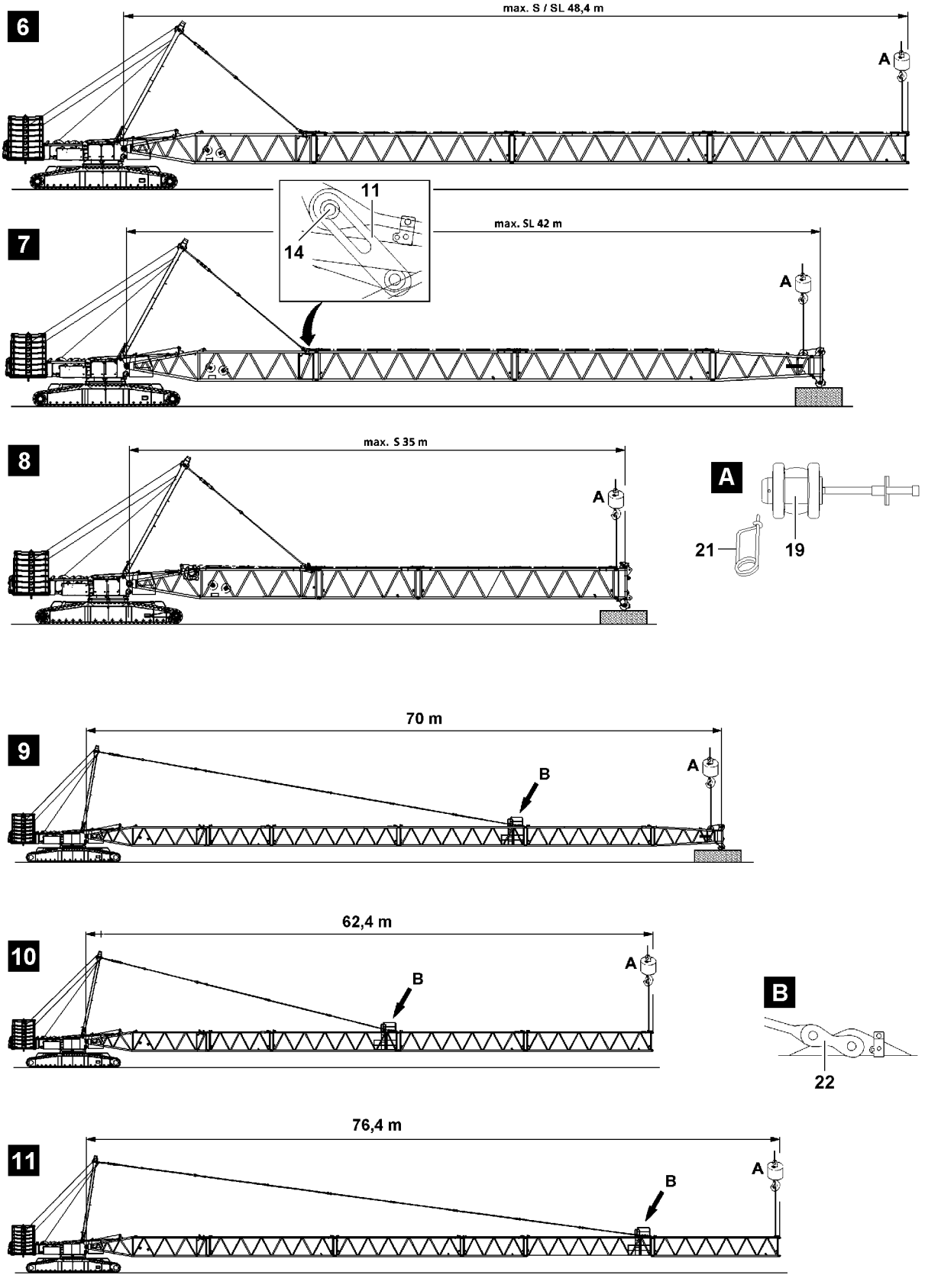
1) This counterweight must be at least installed on the turntable for “flying assembly”.
2) This central ballast must be at least installed on the crawler center section for “flying assembly”.



B105426

Maximum permissible total force MS1 150 t				
Boom system	**Maximum system length**	**Equipment**	**DB_{min} 1)**	**ZB_{min} 2)**
SL	62.4 m	- without L-end section - without adapter	55 t	43 t
SL	70.0 m	- without hook block	55 t	43 t
S/SL	76.4 m	- without L-end section - without adapter	55 t	43 t

1) This counterweight must be at least installed on the turntable for “flying assembly”.
2) This central ballast must be at least installed on the crawler center section for “flying assembly”.


6
max. S / SL 48,4 m
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14
7
max. SL 42 m
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8
max. S 35 m
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A
21
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9
70 m
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62,4 m
A
B
B
22
11
76,4 m
A
B

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2.4.1 Installing the intermediate section “flying” on the S-pivot section

For “flying” assembly of the intermediate sections, they can be installed individually or as preassembled boom unit on the S-pivot section.

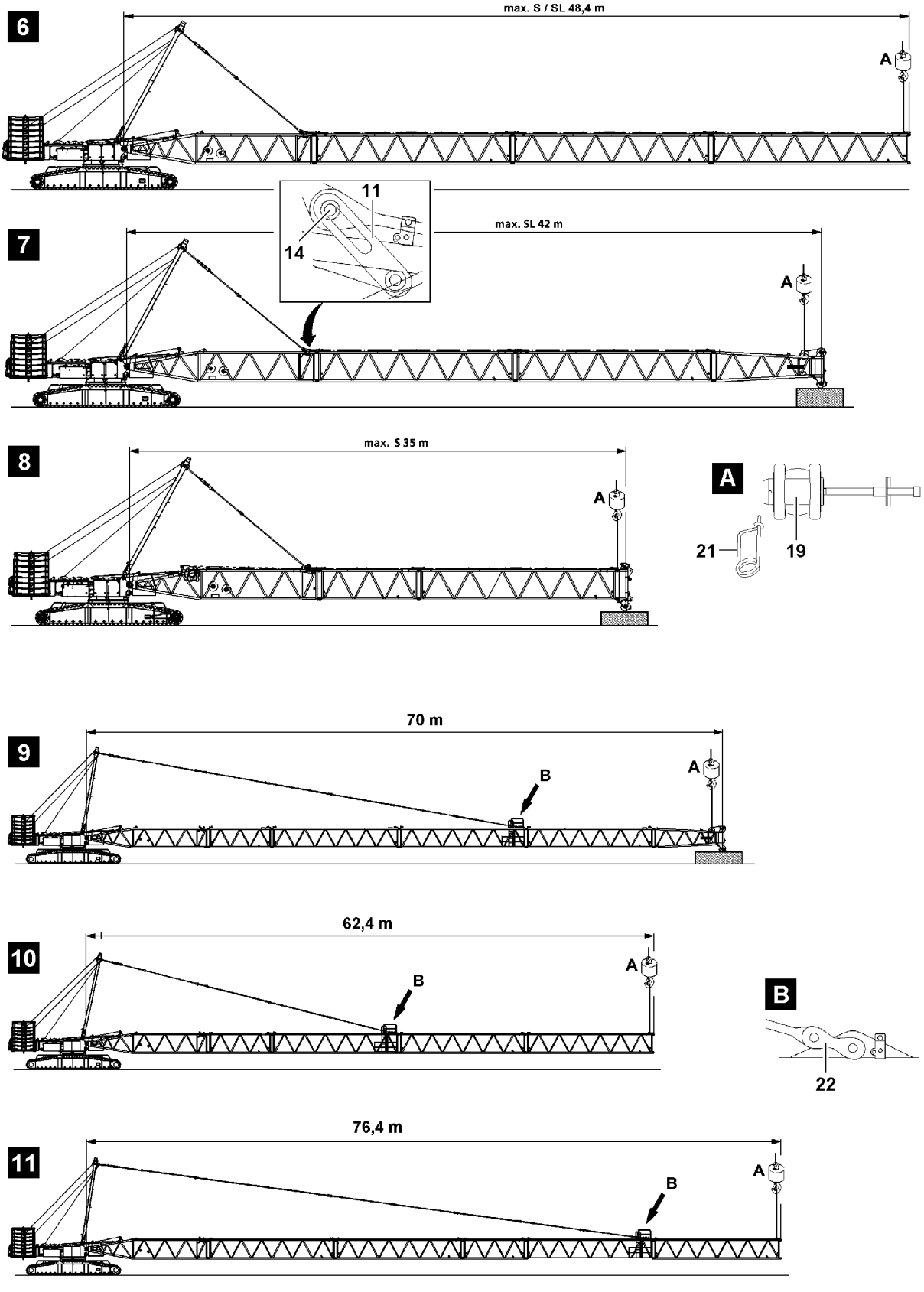
WARNING
Impermissible boom lengths!
If impermissible boom lengths are installed on the crane, significant property damage can occur on the crane!
Personnel can be severely injured or killed!
- ▶ The maximum permissible boom lengths for the “flying assembly” may not be exceeded!
- ▶ The data in the erection and take down charts as well as the load charts must be observed!

Note
- ▶ For weights of intermediate sections with placed guy rods, see chapter 5.03!

Make sure that the following prerequisites are met:
- – The S-pivot section is pinned and secured on the turntable.
- – The S-pivot section is horizontally tensioned, fig. **1**.
- – A minimum of 55 t counterweight is placed on the turntable.
- – A minimum of 43 t central ballast is installed on the crawler center section.
- – An auxiliary crane is available.

WARNING
Falling components!
Due to assembly / disassembly of unsecured or unsupported booms, components can fall down!
Personnel can be severely injured or killed!
- ▶ Never work under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure!
- ▶ All pins must be secured in the bearing points as well as in the receptacles!

- ▶ Attach intermediate sections or preassembled boom unit on the auxiliary crane.
- ▶ Lift the intermediate sections or preassembled boom unit with the auxiliary crane and position on the S-pivot section.
- ▶ When the pin points between the S-pivot section **1** and on the intermediate section or the preassembled boom unit align “on top” and “bottom”:
  Insert the pin **19** on “top” and “bottom” from the inside to the outside and secure with spring retainer **21**.
- ▶ When the pins are properly pinned and secured on “top” and “bottom” between the S-pivot section **20** and the S-intermediate section **20** or the preassembled boom unit:
  Remove the auxiliary crane.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B
B
22
11
76,4 m
A
B

B104978

2.4.2 Installing the S-guy rods

WARNING
Inspection and maintenance on guy rods not carried out!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also chapter 8.15.

Note
▶ The S-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

Make sure that the following prerequisites are met:
– The intermediate sections or preassembled boom unit are pinned and secured on the S-pivot section.
– The intermediate sections or the preassembled unit are supported with suitable materials or secured with the auxiliary crane.

▶ Relieve the guy rods: lower the SA-bracket somewhat to the front.

Result:
– The guy rods between the SA-bracket and the S-pivot section are relieved.

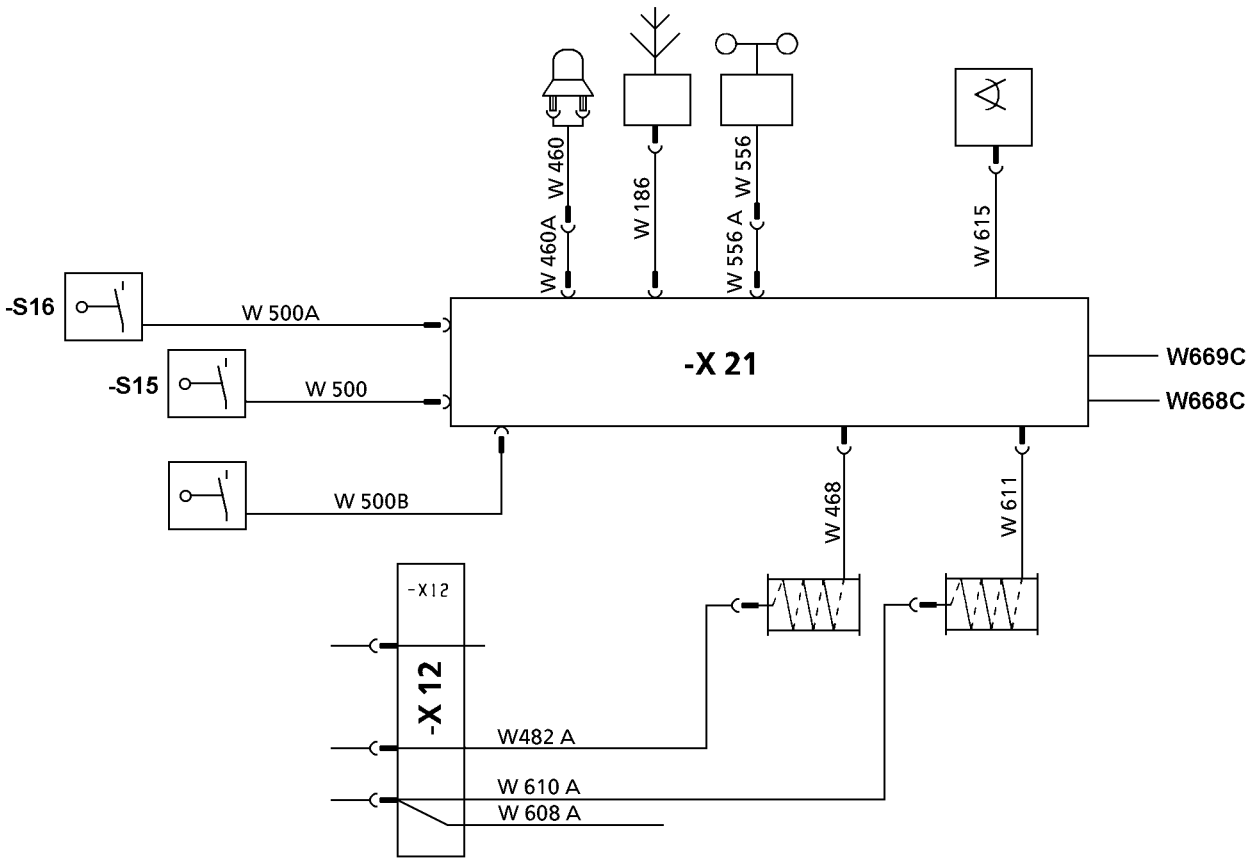
The S-guy rods are placed and secured for transport on the corresponding intermediate sections. Before assembly, the transport retainers must be released.
▶ Release the transport retainers on the guy rods.

NOTICE
Danger of property damage!
▶ Always insert the pins of the guy rods from the inside to the outside.

▶ Pin and secure the guy rods for all intermediate sections.

WARNING
The boom can suddenly fold down!
If the pins **14** on the assembly bracket **11** are unpinned, then the boom can fold down!
Personnel can be severely injured or killed!
▶ Unpin the pins **14** on the assembly brackets **11** only when it is ensured that the intermediate sections are supported with suitable materials or if they are held by an auxiliary crane.

▶ When all guy rods on the boom system are pinned:
Release and unpin the pin **14** on the hollow axle of the assembly bracket **11**.
▶ Actuate winch IV until the guy rods are tensioned between the SA-bracket and the S-end section.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W 615
-S16
W 500A
-S15
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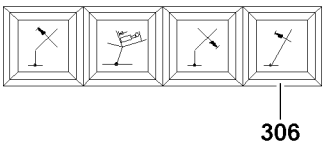
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A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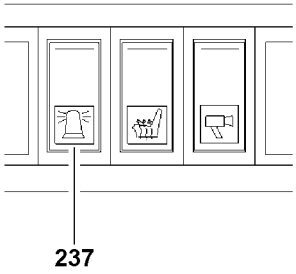
237

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2.5 Establishing the electrical connections

Ensure that the following prerequisite is met:
– The boom is fully assembled.

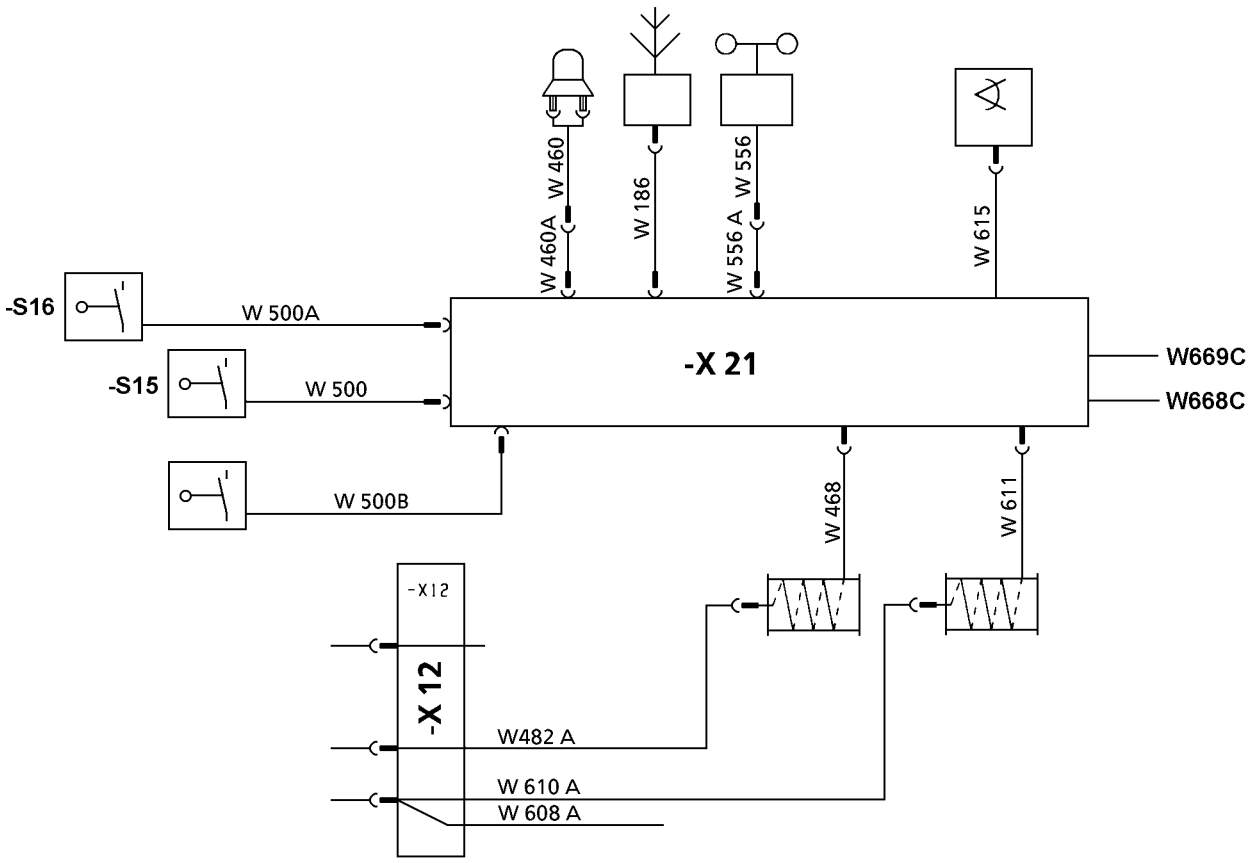
Establish the electrical connection from the cable drums to the connector box **-X21**.
▶ Insert the cable plug **W468** into the connector box **-X21**.
▶ Insert the cable plug **W611** into the connector box **-X21**.

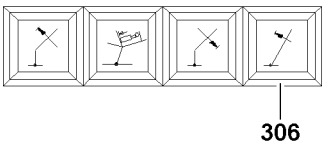
Establish the electrical connection from the connector box **-X12** on the turntable to the cable drums in the S-pivot section.
▶ Insert the cable plug **W482A** into the connector box **-X12**.
▶ Insert the cable plug **W610A** into the connector box **-X12**.

Establish the electrical connection from the connector box **-X21** to the airplane warning light*.
▶ Insert the cable plug **W460** into the socket **W460A** on the wiring harness **W460A**.
▶ Insert the cable plug **W460A** into the connector box **-X21**.

Establish the electrical connection from the connector box **-X21** to the wind speed sensor*.
▶ Insert the cable plug **W556** into the socket **W556A** on the wiring harness **W556A**.
▶ Insert the cable plug **W556A** into the connector box **-X21**.

Establish the electrical connection from the connector box **-X21** to the hoist top limit switches.
▶ Insert the cable plug **W500** into the connector box **-X21**.
▶ Insert the cable plug **W500A** into the connector box **-X21**.
▶ Insert the cable plug **W500B** (boom nose) into the connector box **-X21**.


W 460A
W 460
W 186
W 556 A
W 556
W 615
-S16
W 500A
-S15
W 500
W 500B
-X 21
W669C
W668C
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A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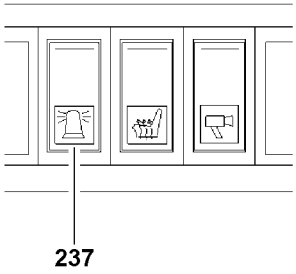
237

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2.6 Function check

Note

▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact LIEBHERR Service.

WARNING

Risk of fatal injury if safety devices are not functioning!

▶ Crane operation with non-functioning safety devices is **prohibited**!

Make sure that the following prerequisites are met:

– All electrical connections have been made.
– The crane engine is running.
– The appropriate operating mode is set.
– The actuator levers of the limit switches have been checked for easy movement and are lubricated.

2.6.1 Winding speed sensor*

▶ Test the movement and the function of the wind speed sensor.

2.6.2 Airplane warning light*

▶ Turn on the airplane warning light on with the switch **237**.

▶ Check the function visually.

2.6.3 Hoist limit switch

▶ Actuate the limit switch on the pulley head manually.

Result:

– The hoist winch turns off in upward movement.
– The hoist top icon on the LICCON monitor 0 blinks.

2.6.4 Limit switch boom “steepest position”

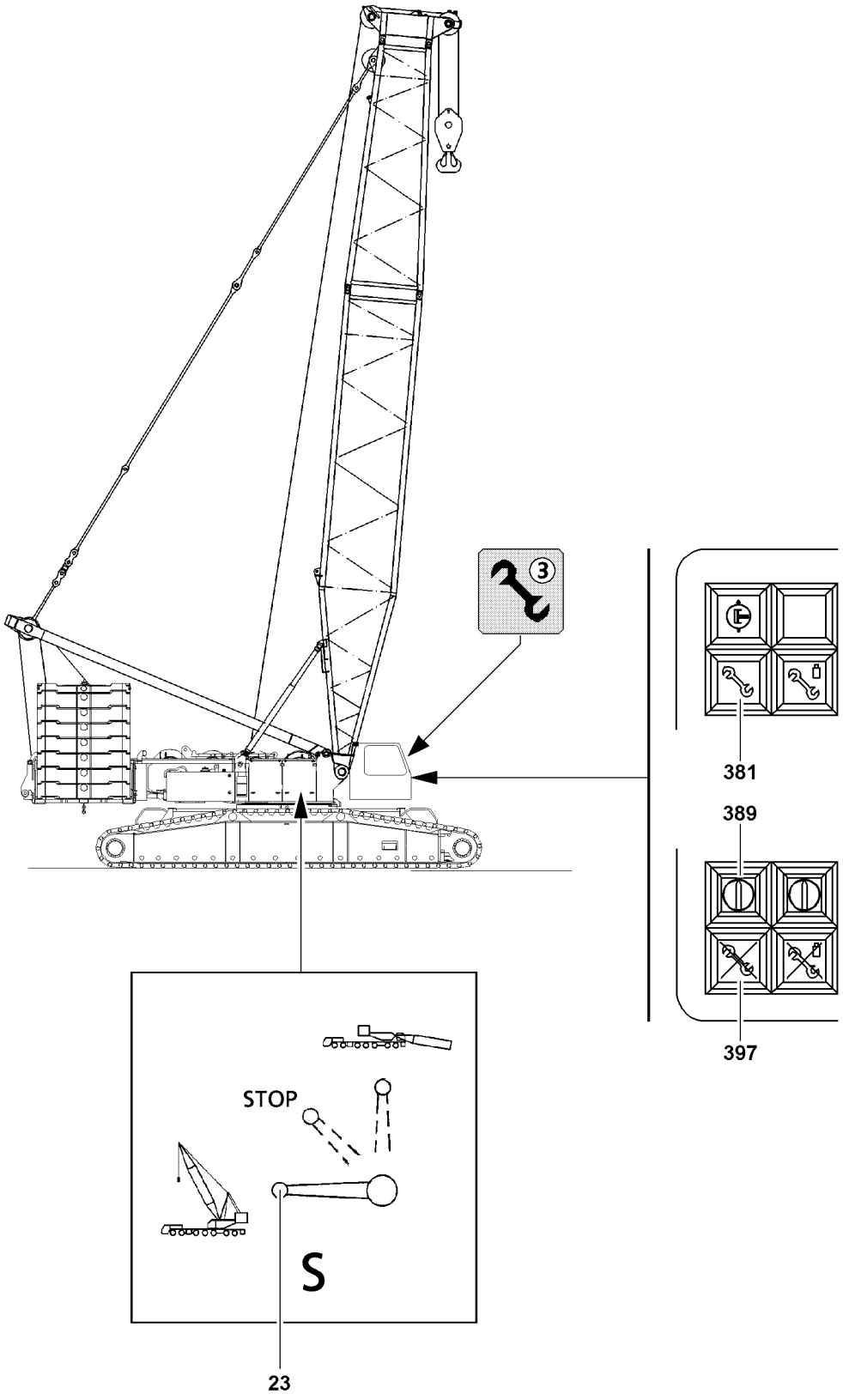
Note

▶ The limit switch functions have to be checked individually before erection!

▶ Manually actuate the individual limit switches on the S-relapse cylinders.

Result:

– Winch IV (control winch) turns off in upward movement.
– The indicator light **306** lights up.
– An acoustic signal sounds.



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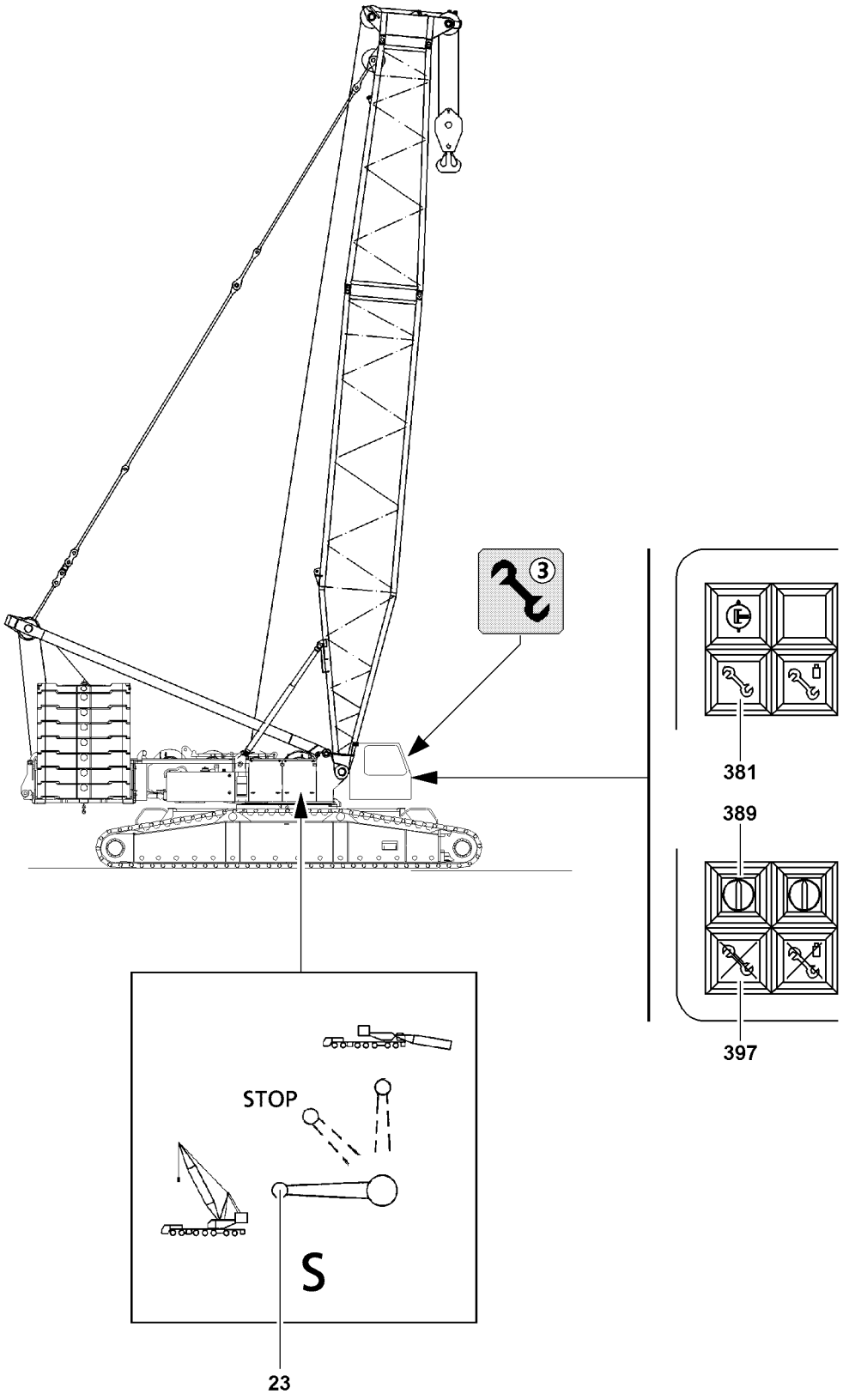
2.7 Erecting the S-boom

DANGER
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

Make sure that the following prerequisites are met:
- – The crane is aligned in horizontal direction.
- – All electrical connections have been made.
- – All limit switches are functioning.
- – The counterweight has been attached to the turntable in accordance with the load chart.
- – All pin connections have been secured.
- – The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- – There are no loose parts on the boom.
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The LICCON overload protection settings have been compared with the actual crane configuration.
- – No personnel is within the danger zone.
- – The assembly key button **389** is actuated.
- – The indicator light **381** “Assembly” lights up.
- – The assembly icon **3** on the LICCON monitor 0 lights up.

DANGER
The crane can topple over!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Do not allow slack cable to build up on the control winch!
- ▶ The ball cock cabinet must be locked! Always pull the key and hand it to an authorized person!



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2.7.1 Extending the S-relapse cylinder

WARNING
Risk of fatal injury!
If the S-relapse cylinders are not extended before erecting the S-boom, then the S-boom can fall backward during crane operation.
Personnel can be severely injured or killed!
- ▶ The S-relapse cylinders must be extended before erection of the S-boom.
- ▶ The ball cock must be secured during crane operation to prevent unintended actuation.

The piston rod on the S-relapse cylinder must be extended by actuating the ball cock **23**.

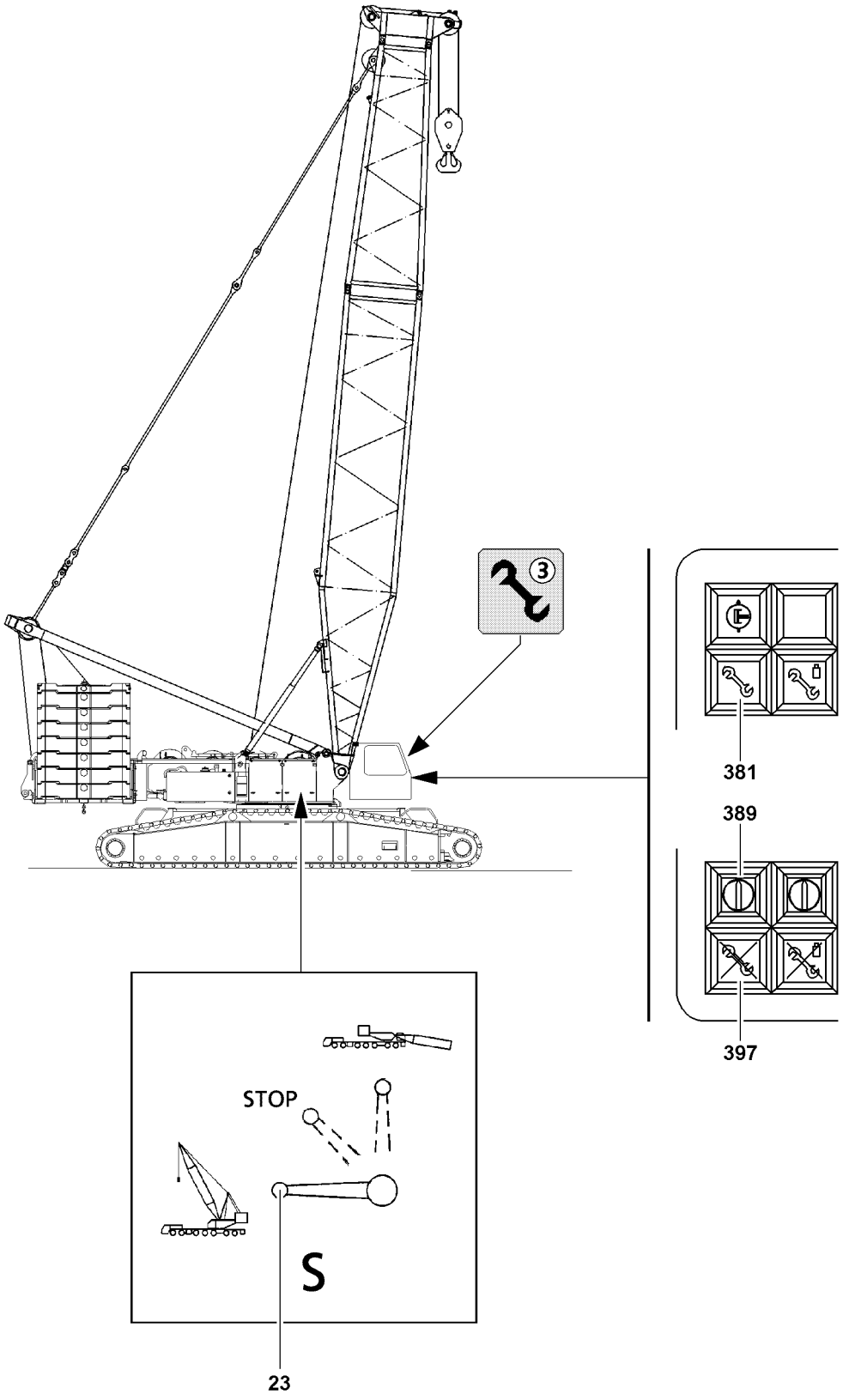
Ball cock positions	
horizontal	Crane operation, extend the piston rod
vertical	Assembly, retract the piston rod
45°	STOP (The piston rod cannot be retracted / extended)

Ensure that the following prerequisite is met:
– All hydraulic connections have been made.

▶ Move the ball valve **23** into horizontal position.

Result:
– The piston rod of the S-relapse cylinders extends.

Secure the ball cock **23** by closing and locking the cabinet doors to prevent unauthorized access.
- ▶ Close the cabinet doors and pull the key.
- ▶ Hand the key to an authorized person.



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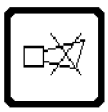
2.7.2 Erection procedure

DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane superstructure during erection procedure!
- ▶ Observe the data in the erection and take down charts!

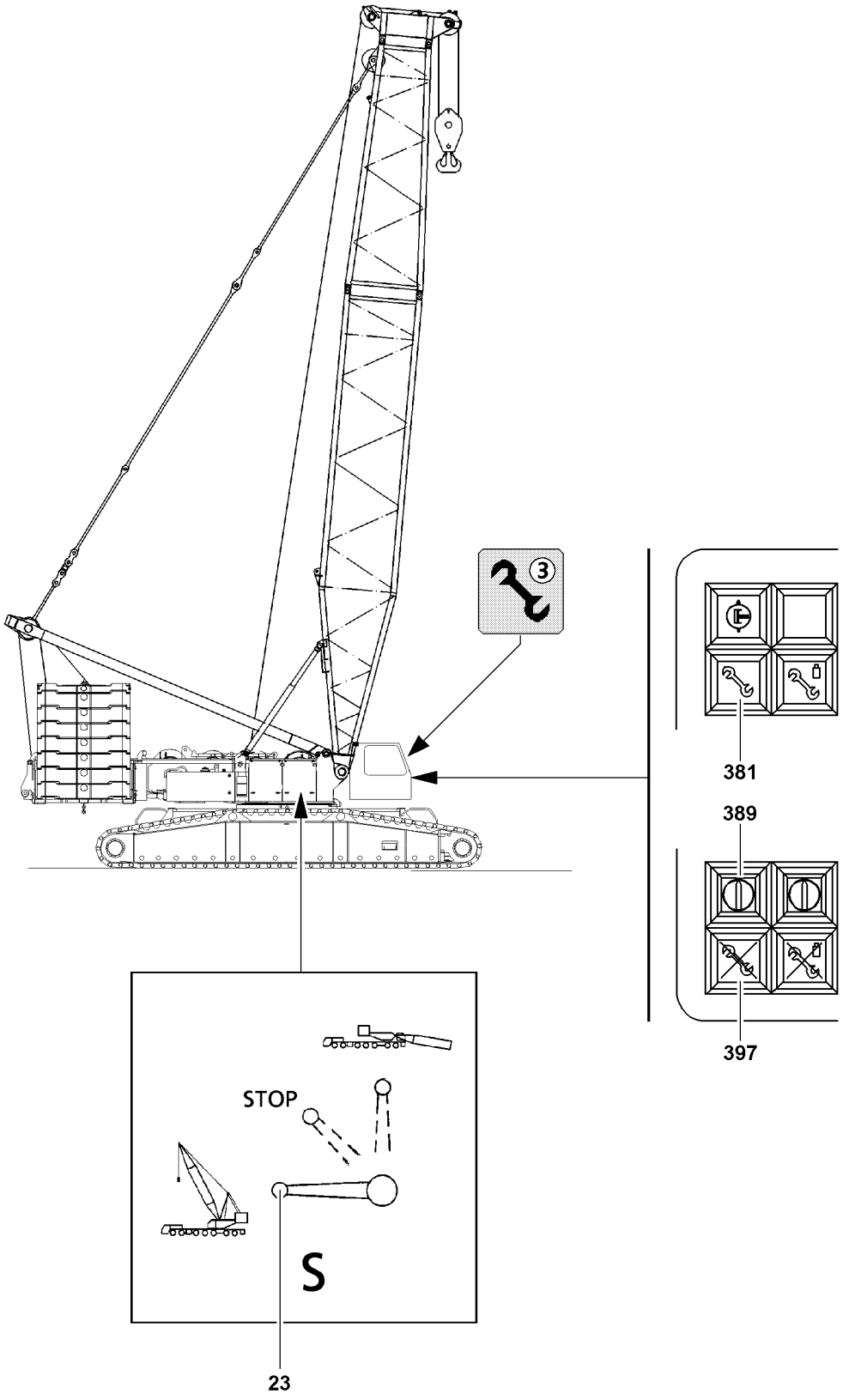
- ▶ Erect the boom until the end section lifts off the ground.
- ▶ Reeve in the hoist rope properly and secure on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.

WARNING
The crane can topple over!
- ▶ When the lowest operating position is reached, the assembly key button **389** must be turned off immediately.
- ▶ The assembly key button **389** bypasses the safety devices!
- ▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!

Note
- ▶ During the erection procedure - outside the operating area - the alarm functions listed in the chart are displayed as blinking on the crane operating screen.

Displays on the LICCON monitor during the erection procedure	
 *Icon: “STOP” blinks*	
 *Icon: “ERROR 150” blinks*	***Note:*** *For error description, see chapter 20.05.*
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

- ▶ Luff the boom up to the lowest operating position.



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Note

▶ If the lowest operating setting for the boom is achieved, the display turns off (see table above), and on the symbol “Maximum load” instead of the display “???” a load value appears on “t”!

WARNING

The crane can topple over!

▶ When the lowest operating position of the boom is reached, turn off the assembly key button **389** immediately.

▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

▶ Turn the assembly keyed button **389** off: Press button **397**.

Result:

– Self retention of the assembly key button **389** is turned off.
– The LICCON overload protection is active.
– The indicator light **381** turns off.
– The assembly symbol **3** on the LICCON monitor turns off.
– The acoustical signal turns off.

3 Crane operation

3.1 Preparing for crane operation

Note

▶ Observe the notes in chapters 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

– The LICCON overload protection has been set according to the data in the load chart.
– The assembly key button **389** has been turned off by pressing the button **397**.

WARNING

The crane can topple over!

▶ Check the horizontal position of the crane before and during operation.

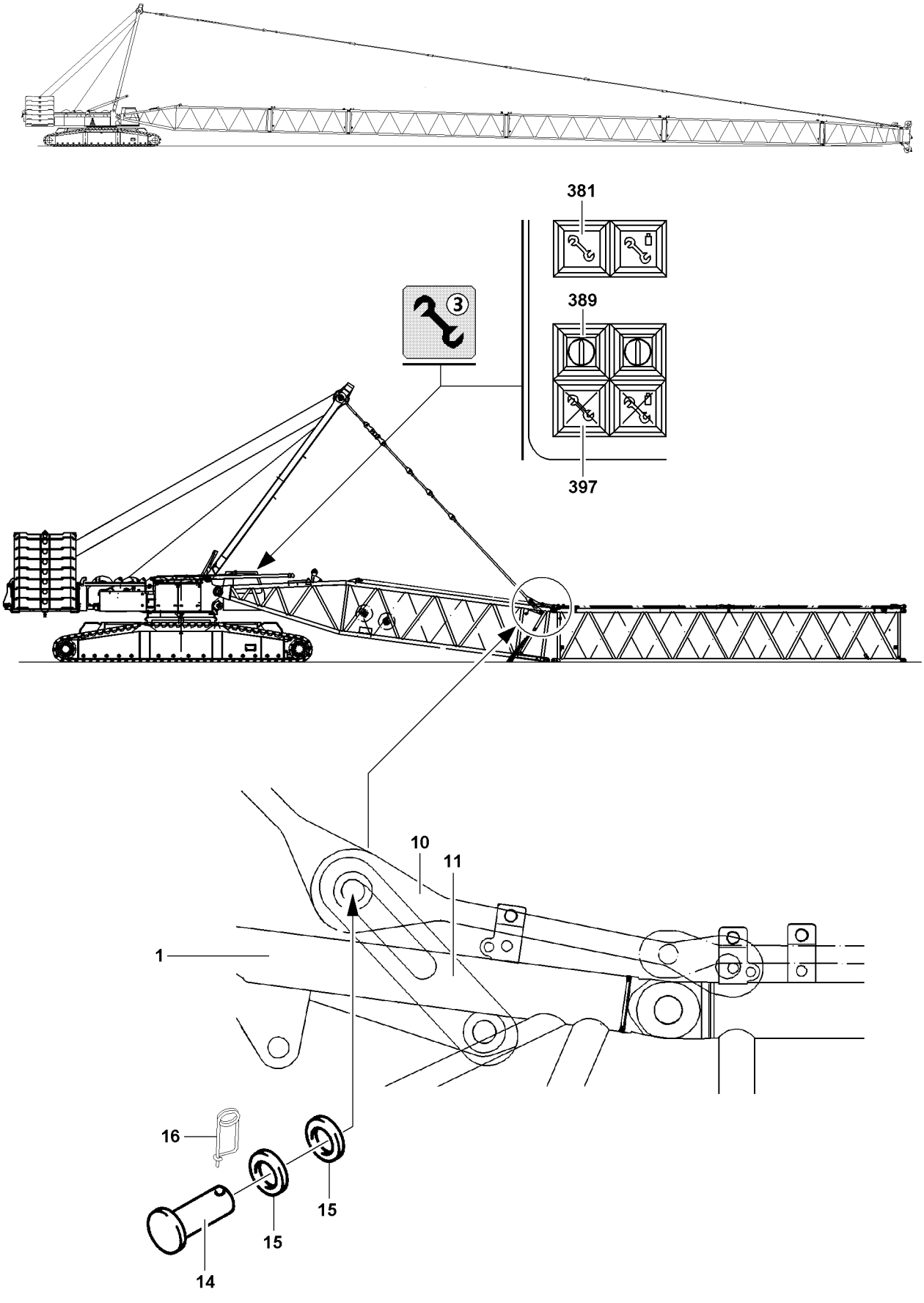
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation.

3.1.1 Checking the settings

▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.

▶ Check the hoist limit switch by running against the hoist limit switch weight.

▶ Check the function of the limit switches “boom steep” on the relapse cylinders.



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4 S/SL-disassembly

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

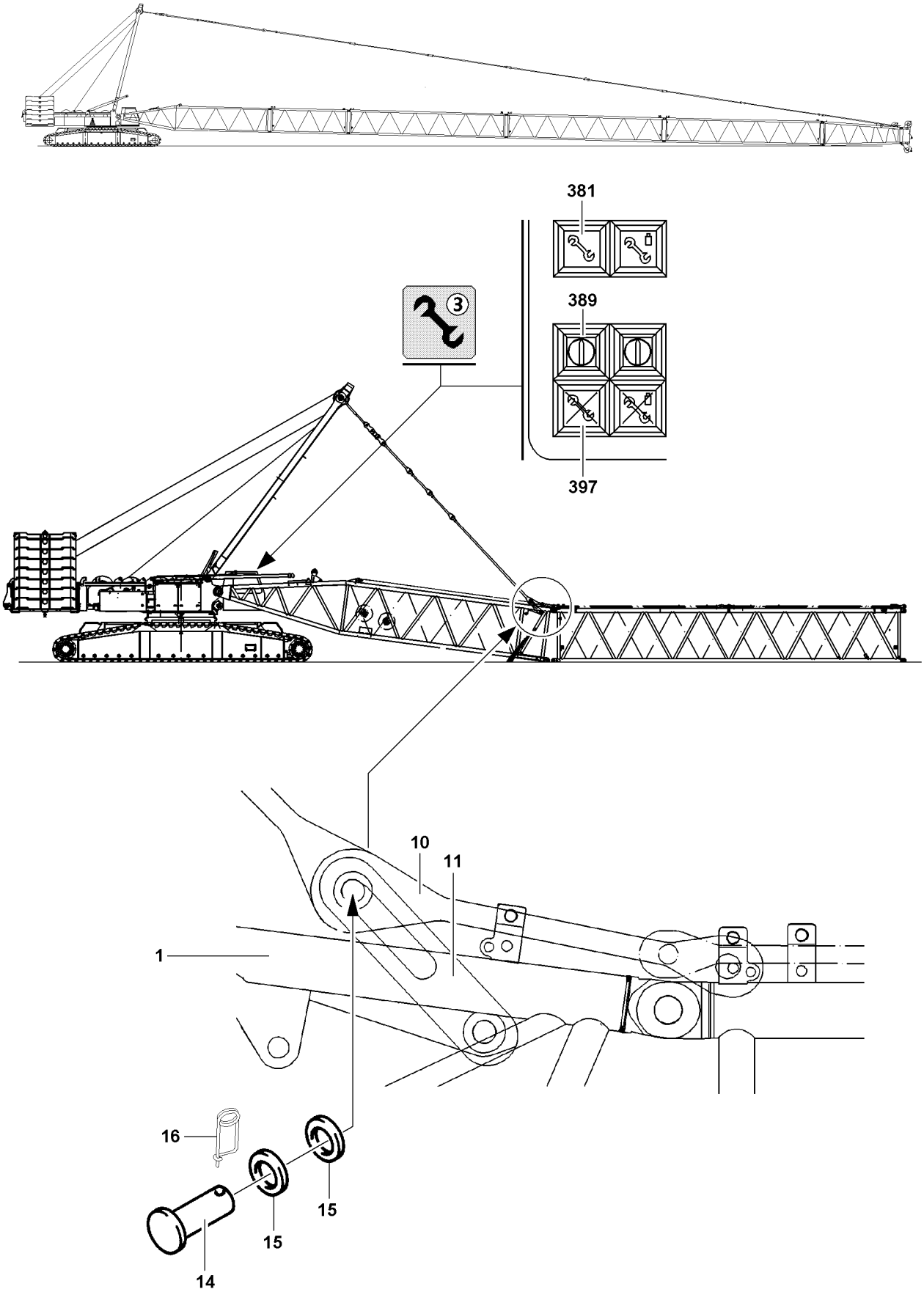
- ▶ All disassembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which disassembly must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect against falling!

DANGER
Risk of injury when disassembling booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

DANGER
Falling components!
If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!

- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!



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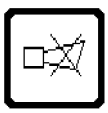
4.1 Taking the S-booms down

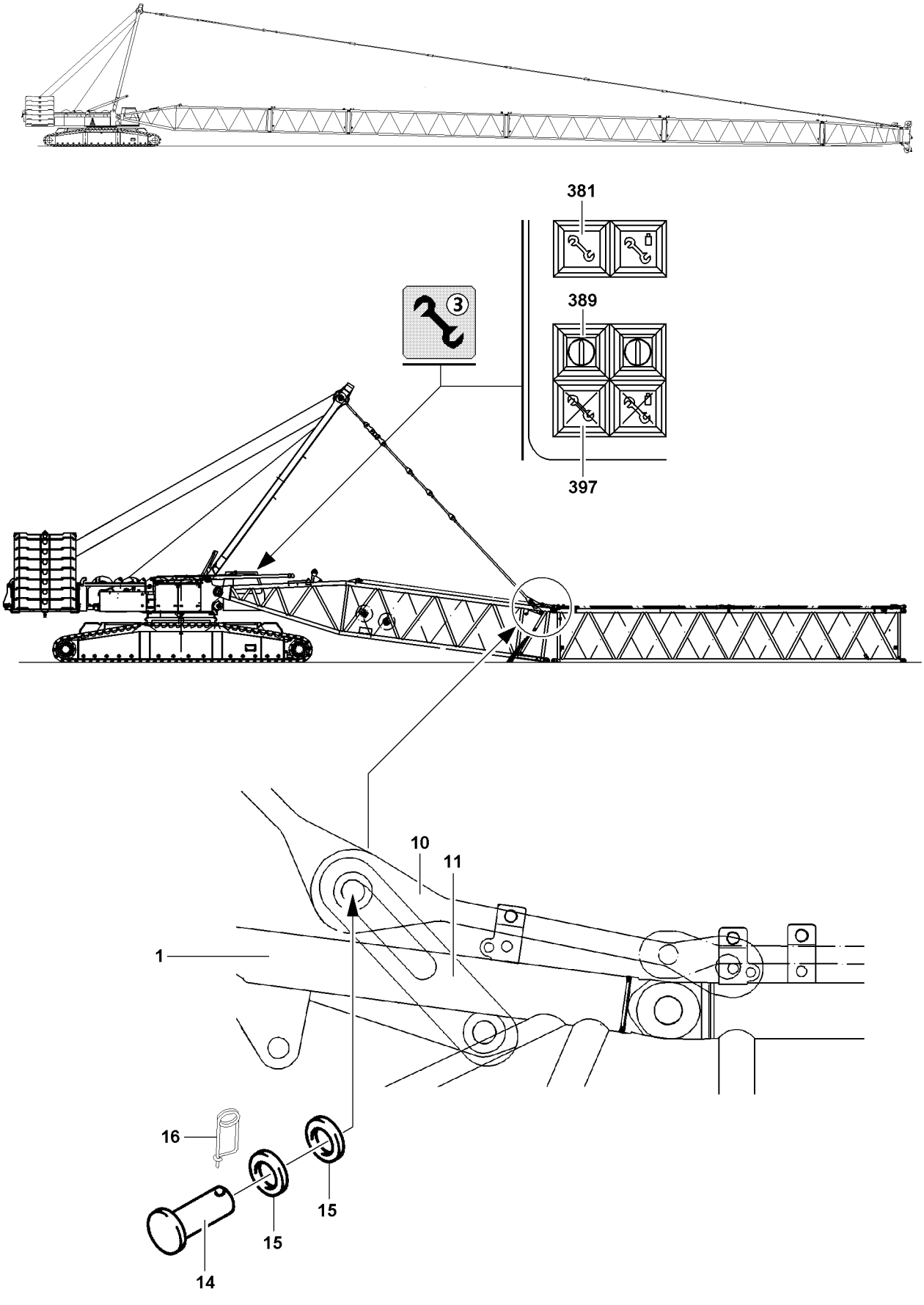
DANGER
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head. There is the danger that boom components may be significantly damaged!
- ▶ Upon taking down the boom system, always spool out the hoist winch at the same time!

When the lowest operating position is reached, the luff down movement is switched off.
On the “Maximum load” icon, the load value disappears and the display “???” appears.
The following alarm functions become active:

Display on the LICCON-Monitor 0 after reaching the “lowest” operating position	
 *Icon: “STOP” blinks*	
 *Icon: “ERROR 150” blinks*	***Note:*** *For error description, see chapter 20.05.*
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

- ▶ Luff the S-boom down to the **lowest** operating position.



B105429

WARNING
Risk of fatal injury in crane operation with enabled assembly key button.
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button **389** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is inactive.
- – The indicator light in the button **381** lights up.
- – The Assembly symbol **3** in the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red flashing beacon on the crane cab blinks.
- – The STOP icon on the LICCON monitor blinks.

▶ Spool the hoist winch out and luff the S-boom down further until the hook block touches the ground.

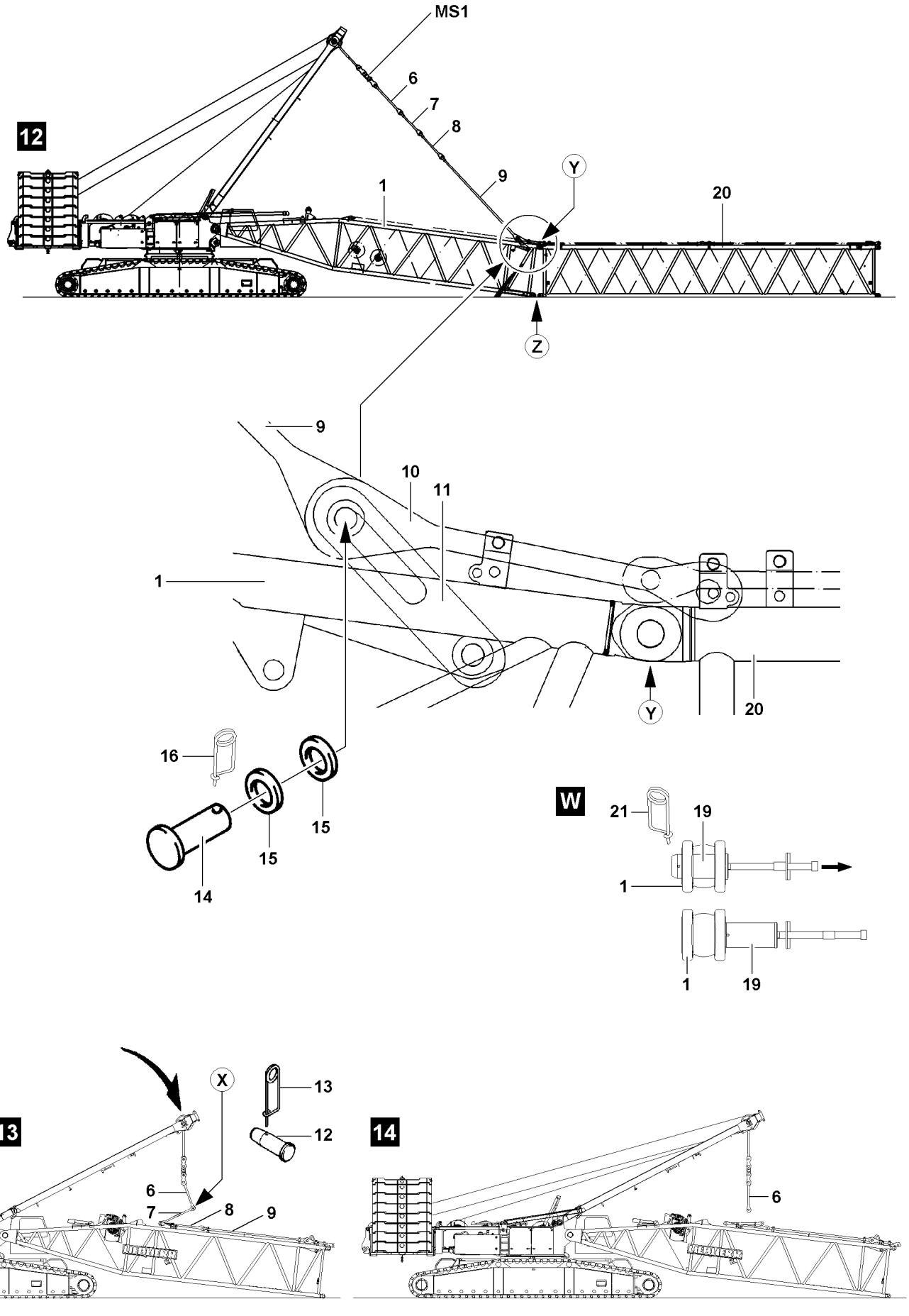
▶ Remove the hoist limit switch weight and unreeve the hook block.

▶ Luff the boom down until the boom head is laying on the support on the ground.

WARNING
Risk of accident!
- ▶ Make sure that no personnel is within the danger zone.

NOTICE
Overspooled winch!
If the rope is pulled under the winch when spooling up, the settings of the cam limit switch are not longer correct and there is an increased danger of accidents!
As a result, extensive adjustment work on the cam limit switch is required!
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch.
- ▶ Stop the winch in time, with sufficient rope reserve!
- ▶ Do not overspool the winch!

▶ Remove the hoist rope.


12
MS1
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7
8
9
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20
Z
9
10
11
1
Y
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16
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W
21
19
1
1
19
13
X
13
12
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8
9
14
6

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4.2 Disassembling the S-booms

WARNING
The boom can suddenly fold down!
If the following conditions are not met prior to dismantling the boom, the boom can fold down and fatally injure people!
- ▶ Support the S-boom during disassembly with suitable materials!
- ▶ Before unpinning the S-intermediate section **20**, the guy rods **9** on the assembly brackets **11** must be pinned and secured!
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!

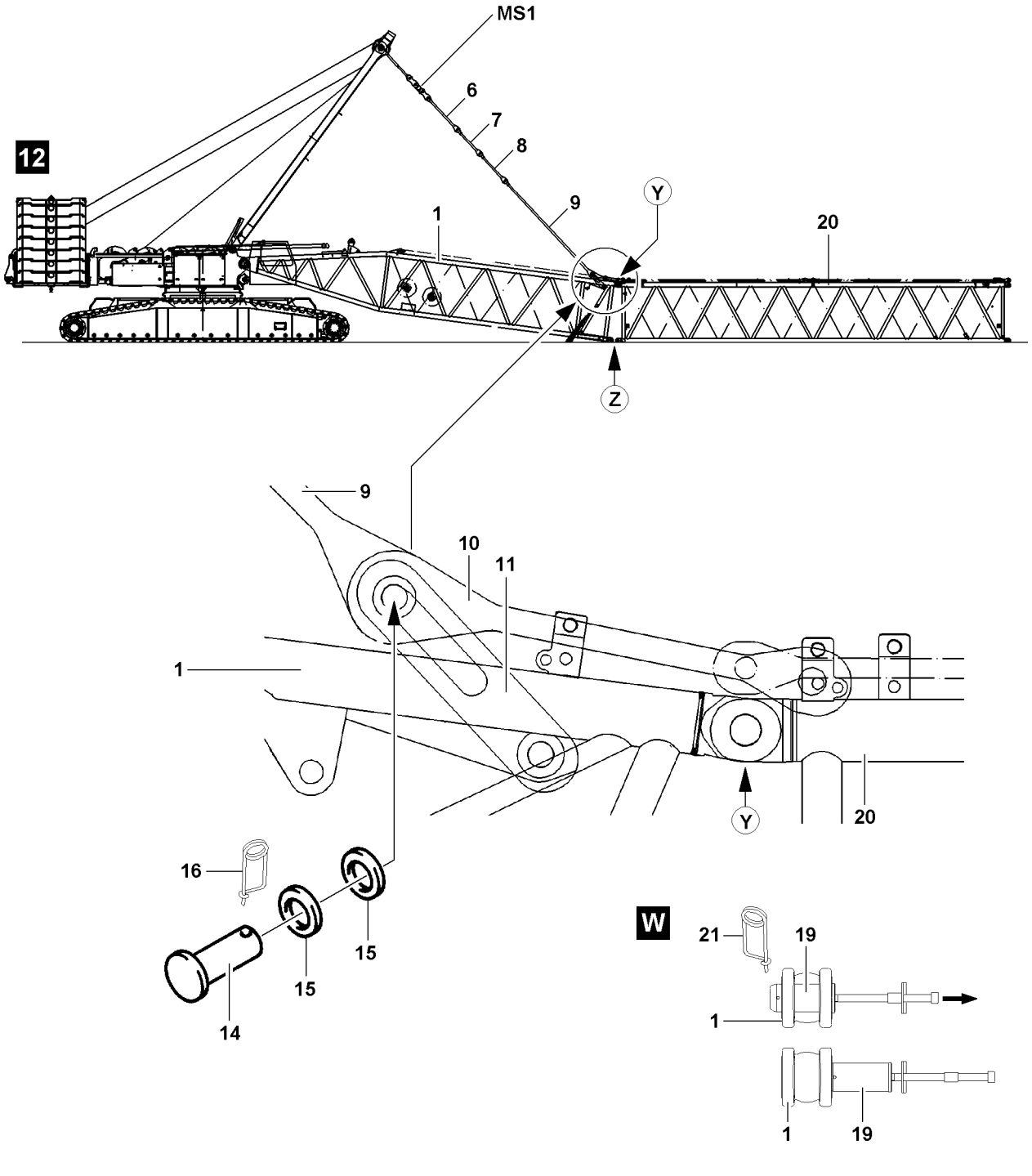
- ▶ Relieve the guy rods by lowering the SA-bracket. Spool out winch 4.
- ▶ Unpin the guy rods on the S-intermediate sections: Remove the spring retainer **13** and unpin the pin **12**.
- ▶ Place the guy rods on the S-intermediate sections and secure with transport retainers.
- ▶ Pin the guy rods **9** on the assembly brackets **11**: Insert the pin **14** and secure with spring retainer **16**, see figure **12**, point **Y**.

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ The maximum permissible total force on test point **MS1** may **not** be exceeded.
- ▶ Lifting the following boom length is permissible if the maximum permissible total force on test point 1 (MS1) is noted, observe the following charts!

Note
- ▶ The ACTUAL force on test point **MS1** is shown on monitor 1.
- ▶ Tension the guy rods on the SA-bracket with the same force as during the assembly.
- ▶ For this, refer the ACTUAL force at the measuring point measured and recorded during the assembly (MS1).
- ▶ The pins can be pulled easier and the pins and lugs are therefore not damaged.

Maximum permissible total force MS1 110 t				
Boom system	**Maximum system length**	**Equipment**	**DB_{min}** [1]	**ZB_{min}** [2]
S	35.0 m	- with 400 t end section - without hook block	55 t	43 t
SL	42.0 m	- with 250 t end section - without hook block	55 t	43 t
S/SL	48.4 m	- without end section - without hook block	55 t	43 t

1) This counterweight must be at least installed on the turntable when taking down the boom systems.
2) This central ballast must be at least installed on the crawler center section when taking down the boom systems.


12
MS1
6
7
8
9
1
Y
20
Z
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10
11
1
Y
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16
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15
14
W
21
19
1
1
19
13
X
13
12
6
7
8
9
14
6

B105431

Maximum permissible total force MS1 150 t				
Boom system	**Maximum system length**	**Equipment**	**DB_{min} 1)**	**ZB_{min} 2)**
SL	62.4 m	- without L-end section - without adapter	55 t	43 t
SL	70.0 m	- without hook block	55 t	43 t
S/SL	76.4 m	- without L-end section - without adapter	55 t	43 t

1) This counterweight must be at least installed on the turntable when taking down the boom systems.
2) This central ballast must be at least installed on the crawler center section when taking down the boom systems.

Note

▶ Unpin the intermediate sections with the pin pulling device, see chapter 5.30.

NOTICE

Danger of property damage!

If the maximum permissible total force is not observed when lifting the boom system for disassembly, then the crane components can be severely damaged.

▶ Do not exceed the maximum permissible total force!

▶ Disconnect the electrical connections and store the cables carefully.

▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.

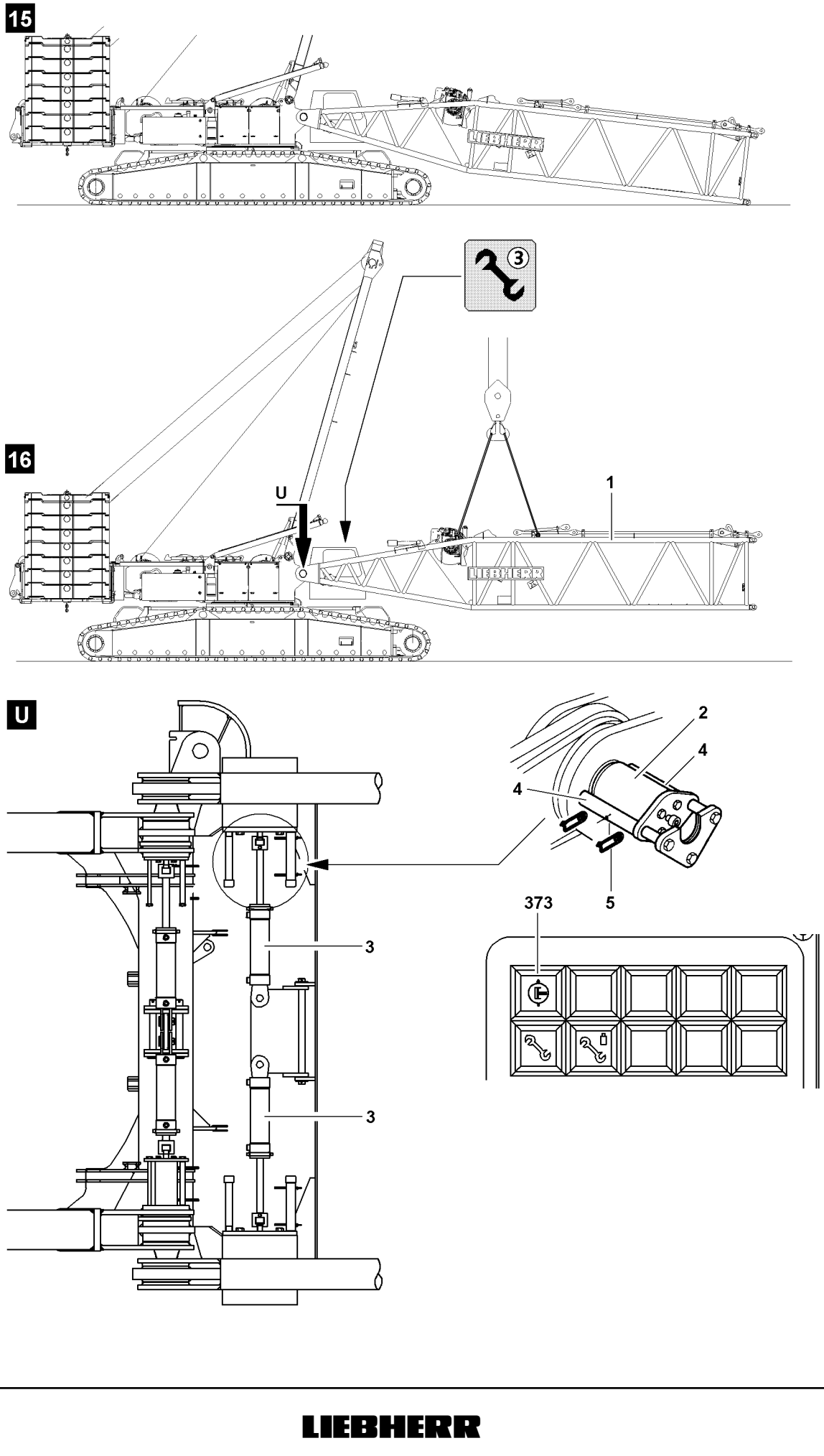
▶ Lift the S-pivot section **1** up with the SA-bracket and unpin on both sides at point **Z**: Remove the spring retainer **21** and unpin the pin **19**.

▶ Lower the S-pivot section on the support.

▶ Relieve the guy rods by lowering the SA-bracket.

▶ Unpin the guy rods at the assembly brackets **11**: Remove the spring retainer **16** and unpin the pin **14**.

▶ Unpin and disassemble the intermediate sections.


15
16
U
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373
3
3
B105432

4.3 Unpinning the S-pivot section

WARNING
General danger notes!
- ▶ Support S-pivot section during disassembly with suitable materials!
- ▶ Insert and secure all pins after disassembly in the intended transport receptacles!

Ensure that the following prerequisite is met:
– The SA-bracket is erected to the point where the S-pivot section can be disassembled without obstructions.

- ▶ Attach the S-pivot section **1** on the auxiliary crane.
- ▶ Lift the S-pivot section **1** with the auxiliary crane to the horizontal.

Establish the hydraulic connection to the pin pulling device via two quick couplers.
Release and unpin the S-pivot section **1** on the turntable.
- ▶ Establish the hydraulic connection to the pin pulling device.
- ▶ Turn the pressure change over switch **373** on.

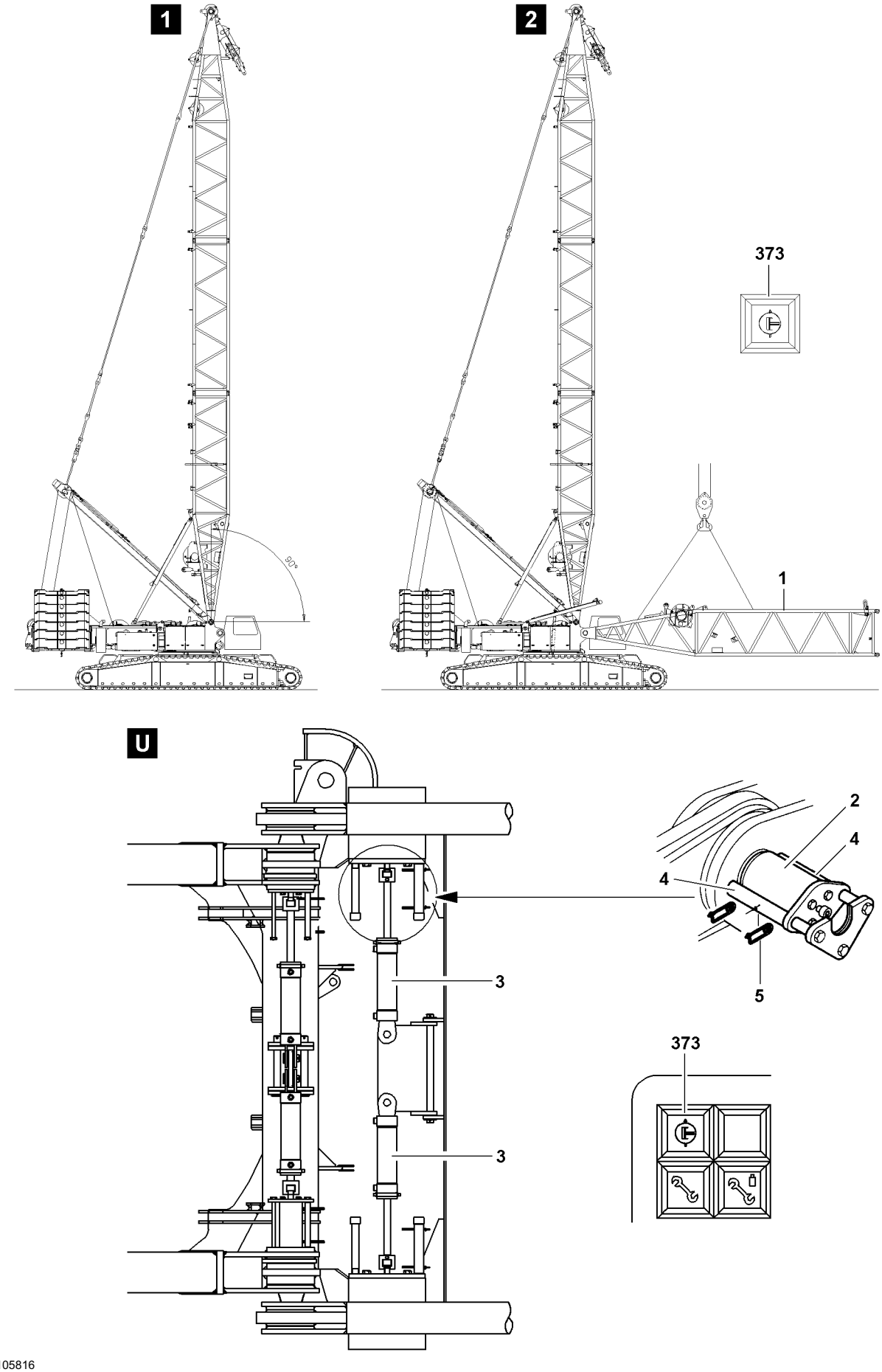
WARNING
Falling S-pivot section!
- ▶ Make sure that the S-pivot section is safely held by the auxiliary crane before unpinning the pins **2**.

- ▶ Remove the spring retainer **5** on the retaining plate **4** on the left and right.
- ▶ Remove the retaining plate **4** left and right.
- ▶ Unpin the connector pins **2** with the hydraulic pin pulling device **3**.
- ▶ Turn the pressure change over switch **373** off.

NOTICE
Danger of property damage on the turntable and on the S-pivot section!
- ▶ Slowly swing the S-pivot section out with the auxiliary crane and at low speed on the turntable.

- ▶ Place the S-pivot section with the auxiliary crane on the support on the ground.
- ▶ Remove the pin pulling device.
- ▶ Remove the auxiliary crane.

Note
- ▶ Place the SA-bracket on the turntable, see chapter 5.02!



B105816

1 LD/SLD/SD assembly

Note

▶ The assembly is described on the example of the boom!

DANGER

When working aloft, there is a danger of falling!

During assembly / disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.

If the following notes are not observed, assembly personnel can fall down!

Personnel can be severely injured or killed!

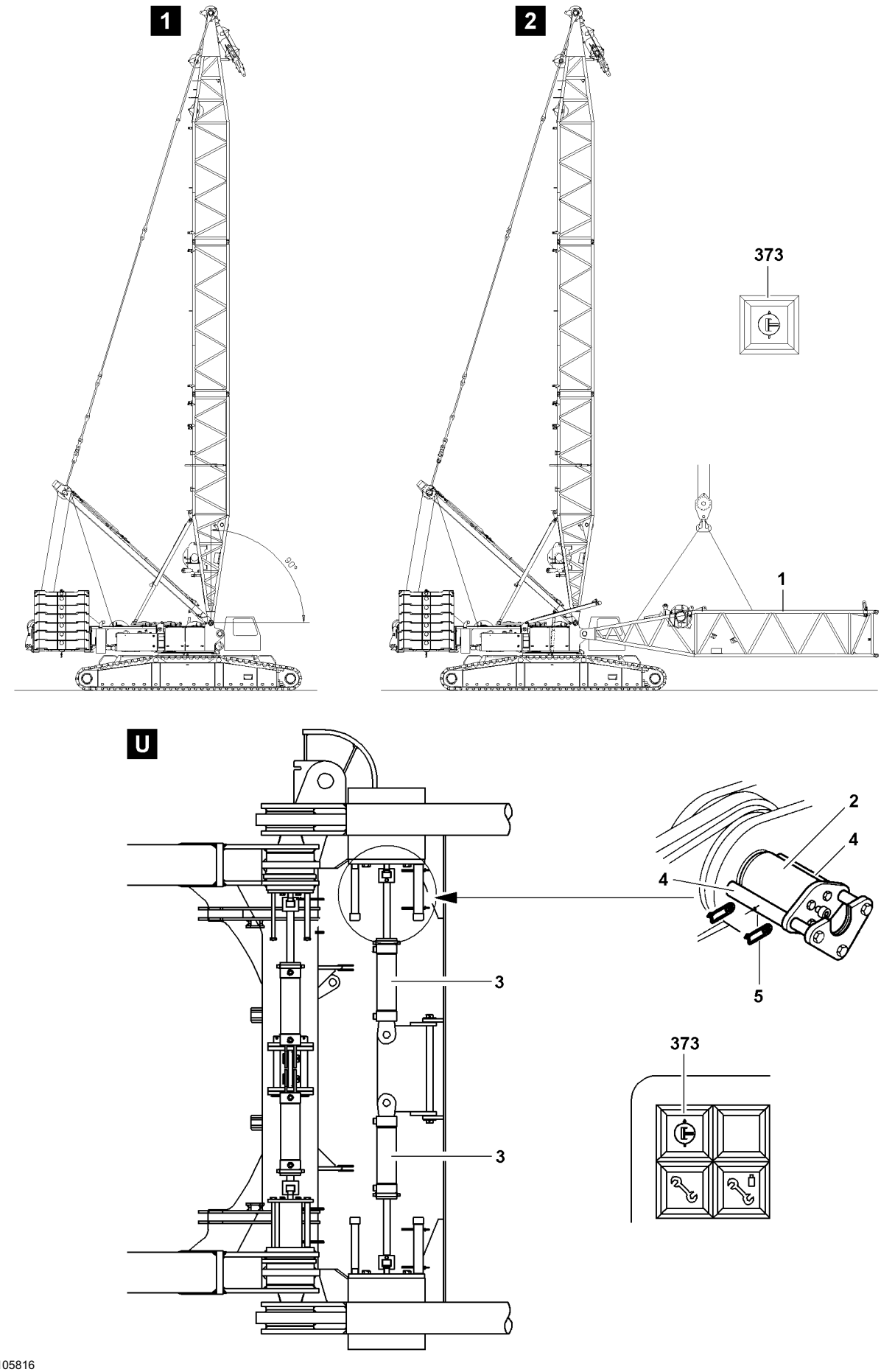
- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ Before any assembly / disassembly work and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also chapter 2.04.
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

DANGER

Danger of accident at assembly / disassembly of booms!

When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!



B105816

1.1 Installing the boom

1.1.1 Pinning the pivot section on the turntable

WARNING
General danger notes!
- ▶ Support the boom during assembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly! Refer to Chapter 8.15.

Make sure that the following prerequisites are met:
- – The crane is in assembly position.
- – The crane is aligned in horizontal direction.
- – An auxiliary crane is available.
- – An assembly scaffolding / work platform is available.
- – The counterweight has been attached to the turntable according to the load chart.
- – The derrick boom is completely assembled and erected on the turntable, see chapter 5.05.
- – The LICCON overload protection has been set according to the data in the load chart.

▶ Hang the pivot section **1** onto the auxiliary crane and swing in to the pin points on the turntable, fig. **1**, fig. **2**.

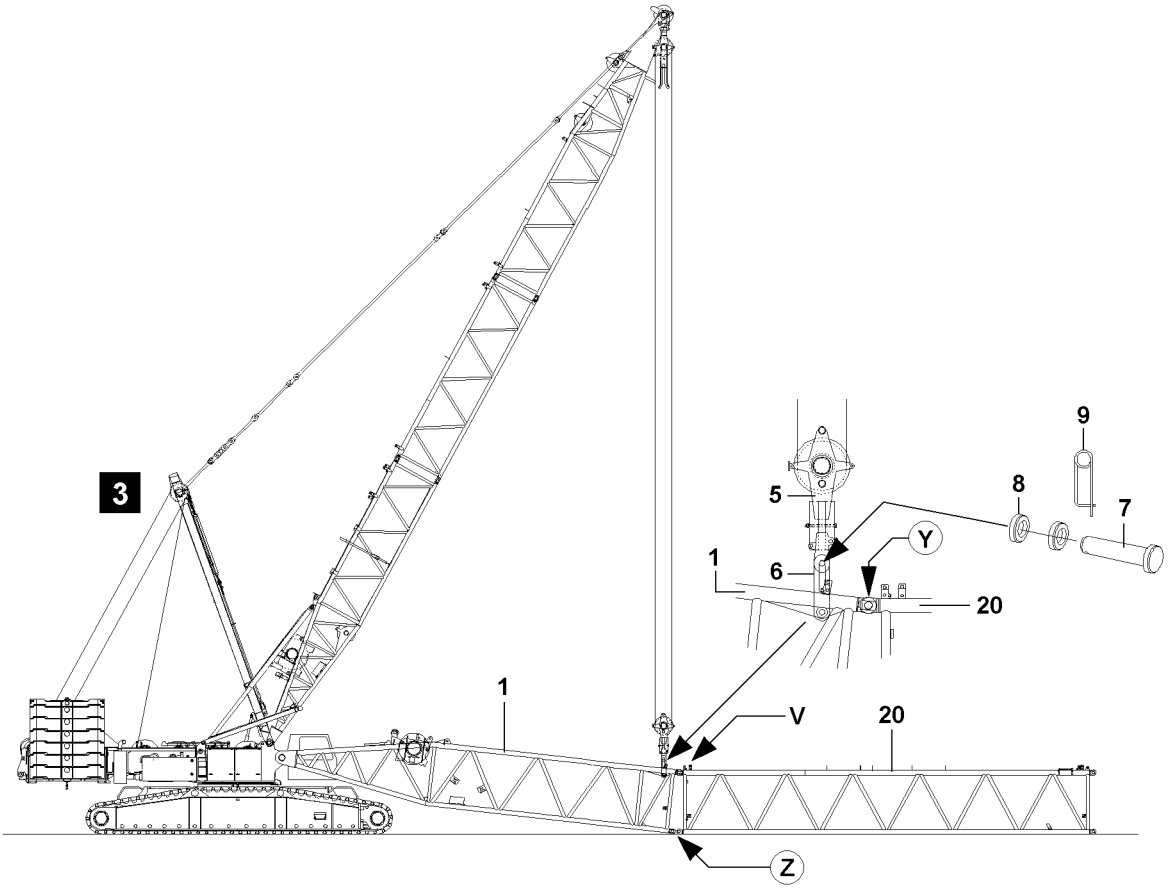
Establish the hydraulic connection to the pin pulling device via two quick couplers.
Pin the pivot section **1** on the turntable and secure.
- ▶ Establish the hydraulic connection to the pin pulling device.
- ▶ Turn the pressure change over switch **373** on.

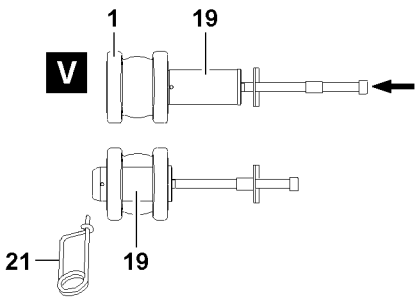
DANGER
Risk of fatal injury!
Due to unsecured or insufficiently secured connector pins, the boom can fall down and fatally injure personnel.
- ▶ Secure the connector pins **2** between the pivot section **1** and the turntable after the pin procedure with the retaining plates **4**.

- ▶ Insert the connector pins **2** with the hydraulic pin pulling device **3**.
- ▶ When the connector pins **2** are completely pinned on the left and right on the pivot section: Insert the connector pin **2** on the left and right and secure with the retaining plate **4** and spring retainer **5**.
- ▶ Turn the pressure change over switch **373** off.

NOTICE
Damage to the pivot section!
Property damage can occur on the pivot section by placing the installed pivot section on the ground.
- ▶ Slowly place the pivot section with the auxiliary crane and at low speed on the ground.

- ▶ Carefully place the pivot section down.
- ▶ Remove the auxiliary crane.





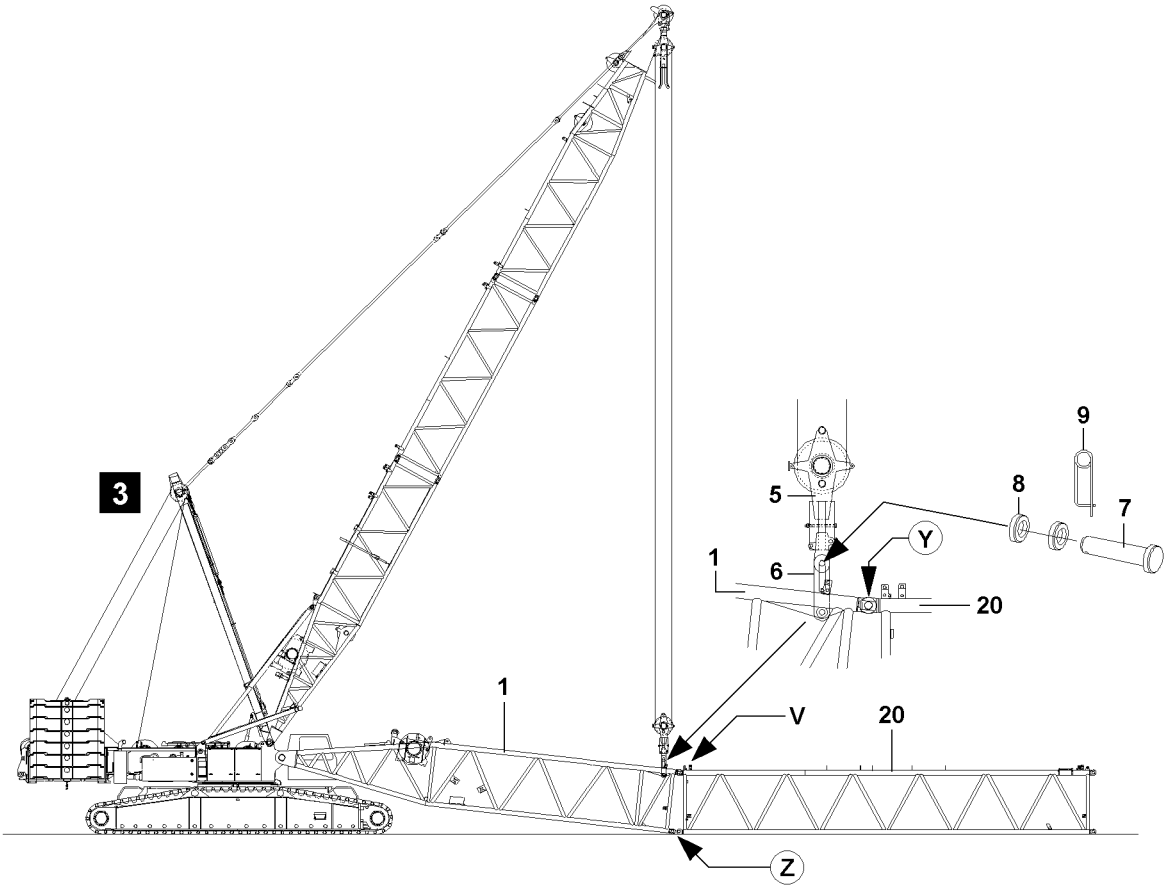
B105817

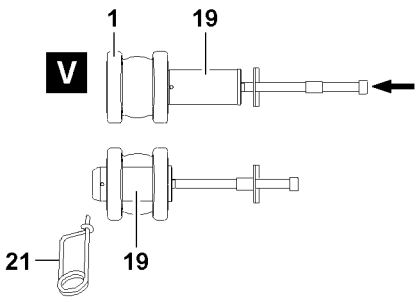
1.1.2 Pin the upper pulley block on the pivot section

To be able to “close” the boom combination after assembly, it is necessary to luff the derrick boom down to the front and to lower the upper pulley block to the pivot section. Then pin and secure the upper pulley block with the pivot section.
Ensure that the following prerequisites are met:

– The pivot section is pinned and secured on the turntable.
– The pivot section is placed on the ground.
– The auxiliary crane is removed.

▶ Luff the derrick down to the front until the upper pulley block **5** is positioned freely over the assembly bracket **6** of the pivot section **1**.
▶ Lower the upper pulley block **5** to the pivot section.
▶ Pin and secure the upper pulley block **5** with the assembly brackets **6**.
▶ Use pin **7**, washer **8** and spring retainer **9**.





B105817

1.1.3 Installing the intermediate sections on the pivot section

Make sure that the following prerequisites are met:

– The pivot section is pinned and secured on the turntable.
– The pivot section is placed on the ground.
– The auxiliary crane is removed.
– The upper pulley block **5** is pinned and secured with the assembly brackets **6**.

Note

▶ To pin the intermediate sections, the pin pulling device can be used, see chapter 5.30.

WARNING

General danger notes!

▶ All pins are to be secured after assembly with the intended safety elements!

Pin the intermediate section **20** on the pivot section **1** “on top”:

▶ Attach the intermediate section **20** to the auxiliary crane and align on the pivot section **1**.
▶ When the pin bores on the pivot section **1** and on the intermediate section **20** “on top” (point **Y**) align, fig. **3**:
Insert the pin **19** from the inside to the outside and secure with spring retainer **21**, fig. **V**.

Assemble the boom to the required length and pin and secure on the intermediate section **20** “on top” and “bottom”.

▶ Insert the pin **19** from the inside to the outside and secure with spring retainer **21**.

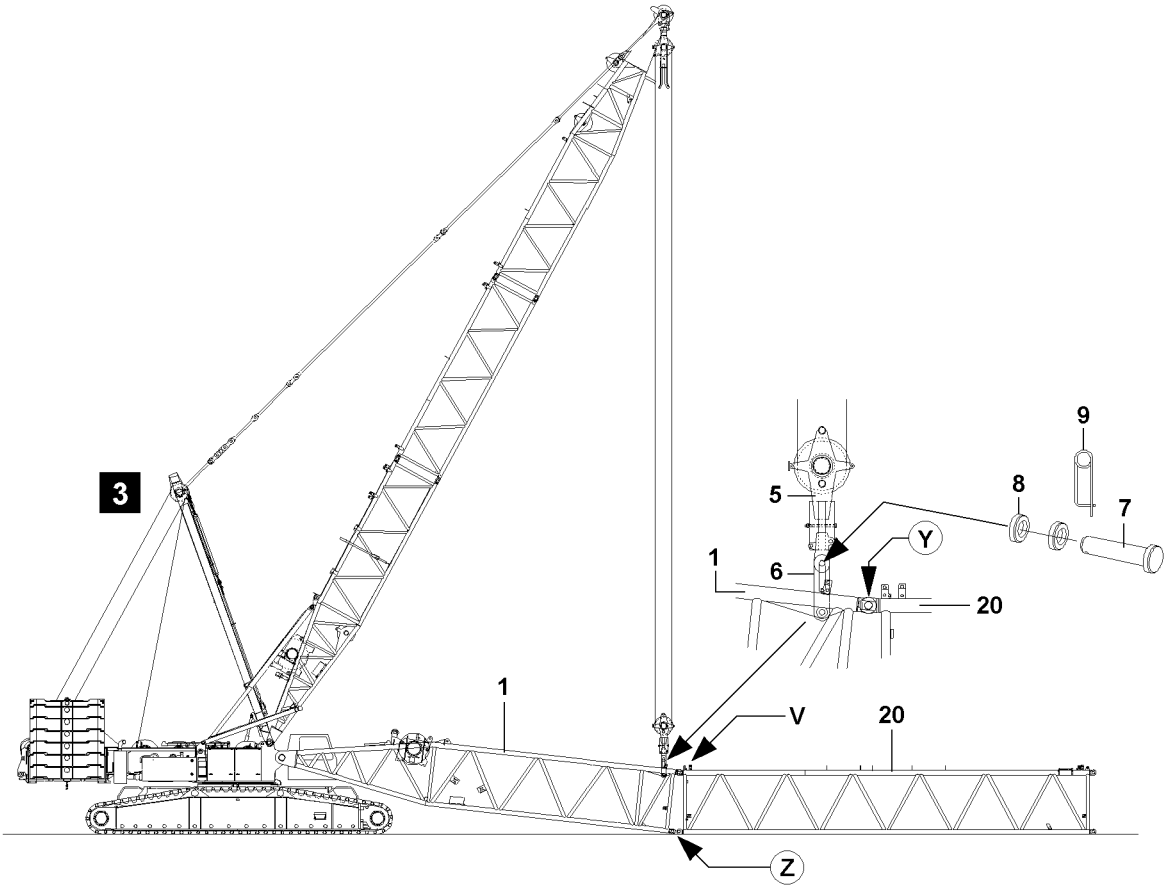
WARNING

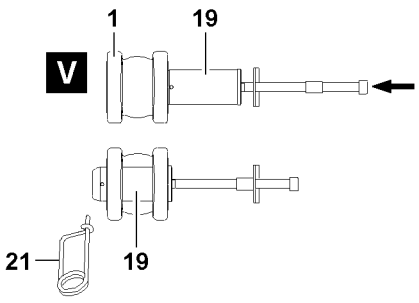
The crane can topple over!

If the following conditions are not met, the crane can topple over or be significantly damaged!

Personnel can be severely injured or killed!

▶ During the “closing procedure” of the intermediate sections, the maximum permissible total force on the test point **MS1 must** be **smaller** than **70 t** .
▶ The end section of the corresponding boom combination may **not** lift off the ground during the “closing procedure”!
▶ With the upper pulley block, boom combinations to maximum **L 105 m** may be lifted / closed.
▶ With the upper pulley block, boom combinations to maximum **SL 112 m** may be lifted / closed.
▶ With the upper pulley block, boom combinations to maximum **S 119 m** may be lifted / closed.





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Note

- The actual force on the test point MS1 - which is exerted during the closing procedure of the boom system - is shown on the LICCON monitor 1.
- Record the actual force and keep it ready for the disassembly of the boom system.
- During the boom disassembly, the guying is tensioned with the noted actual force (assembly) so that the connector pins of the intermediate sections can be unpinned.

- When the L/SL/S-boom combination is assembled to the desired length:
  Lift the pivot section **1** with the upper pulley block until the pin bores on the “bottom” align at point **Z**, fig. **3**.
- Insert the pin **19** from the inside to the outside and secure with spring retainer, fig. **V**.

WARNING

The crane can topple over!

If the following conditions are not met, the crane can topple over or be significantly damaged!

Personnel can be severely injured or killed!

- The end section of the corresponding L/SL/S-boom combination may **not** lift off the ground during the “closing procedure”!
- With the upper pulley block, boom combinations to maximum L 98 m, SL91 m and S 56 m can be lifted / closed.

- Insert the pin **19** on point **Z** from the inside to the outside and secure with spring retainer **21**.

WARNING

Mortal danger due to folding down of boom!

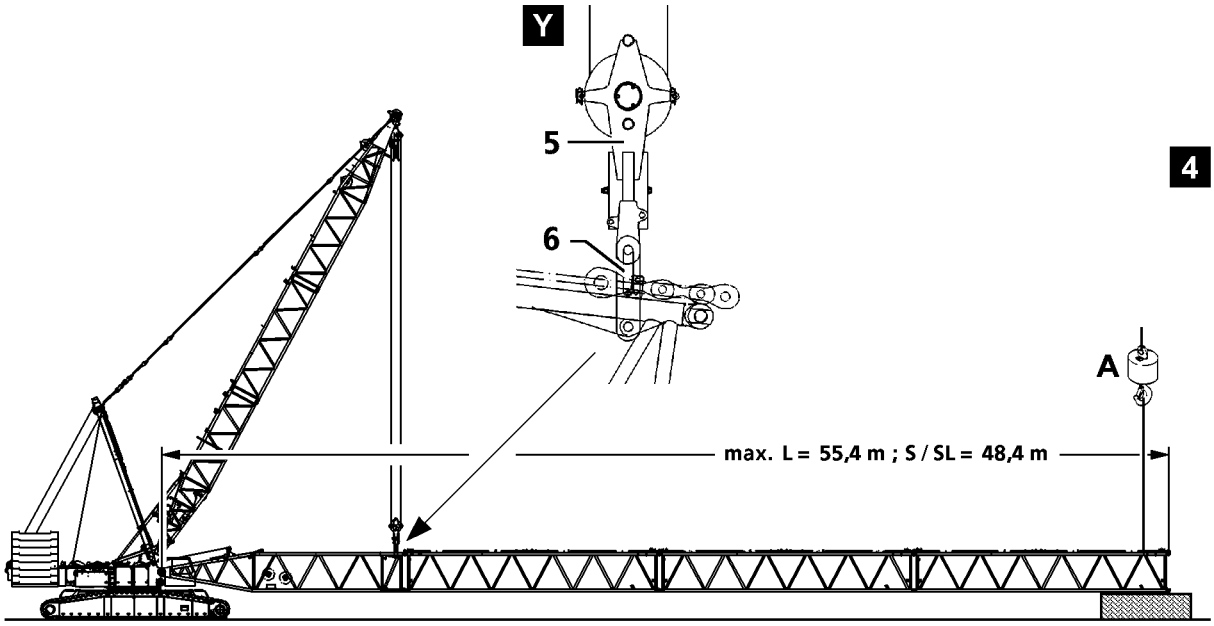
By unpinning the upper pulley block **5** on the assembly brackets **6**, the boom can suddenly fold down if the boom is not pinned at point **Z** “on the bottom”.

Personnel can be severely injured or killed!

- It is prohibited for anyone to remain under the raised lattice jib during the pinning / unpinning procedure!
- Unpin the upper pulley block **5** only when it is ensured that the pivot section **1** is pinned and secured “on top” and “bottom” with the intermediate section **20**.

Unpin the upper pulley block **5** on the assembly brackets **6**.

- Relieve the upper pulley block **5** by spooling out the control rope.
- Unpin the upper pulley block **5** on the assembly brackets **6**.



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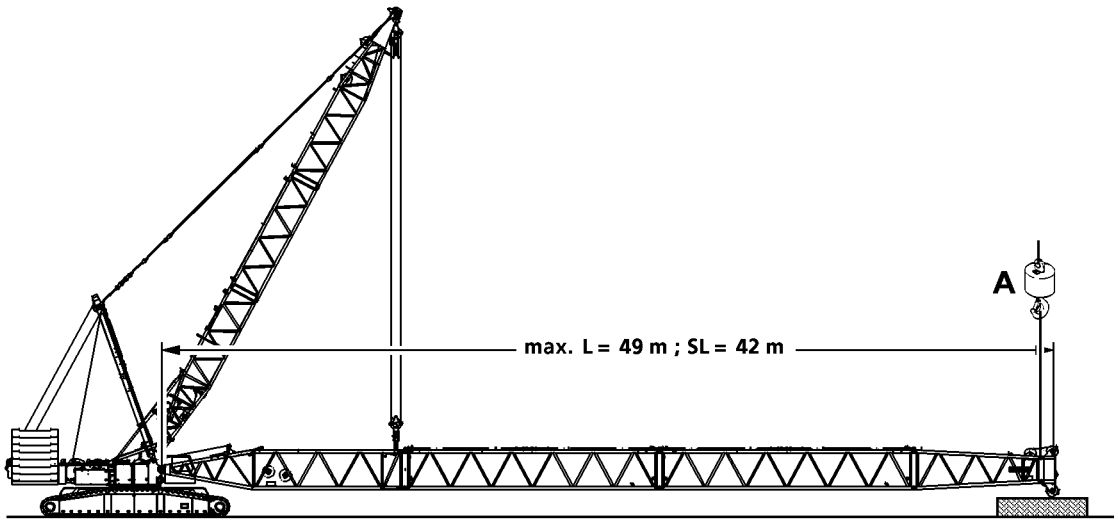

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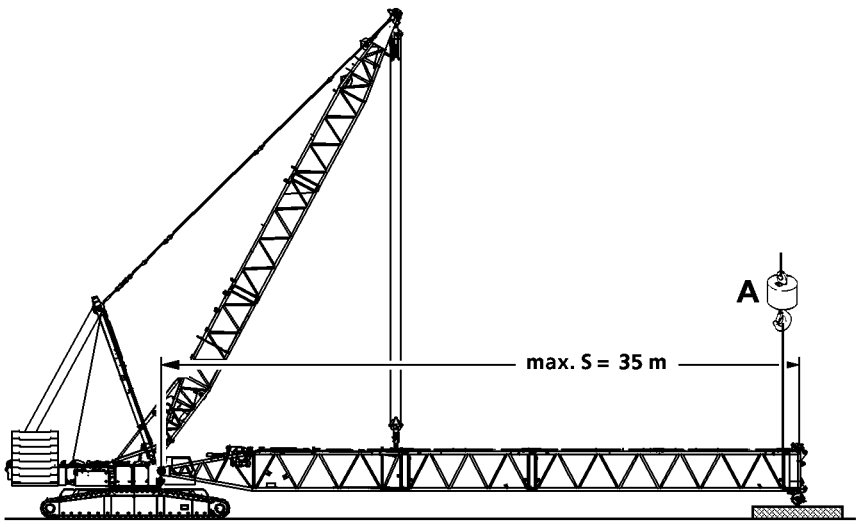

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B105809

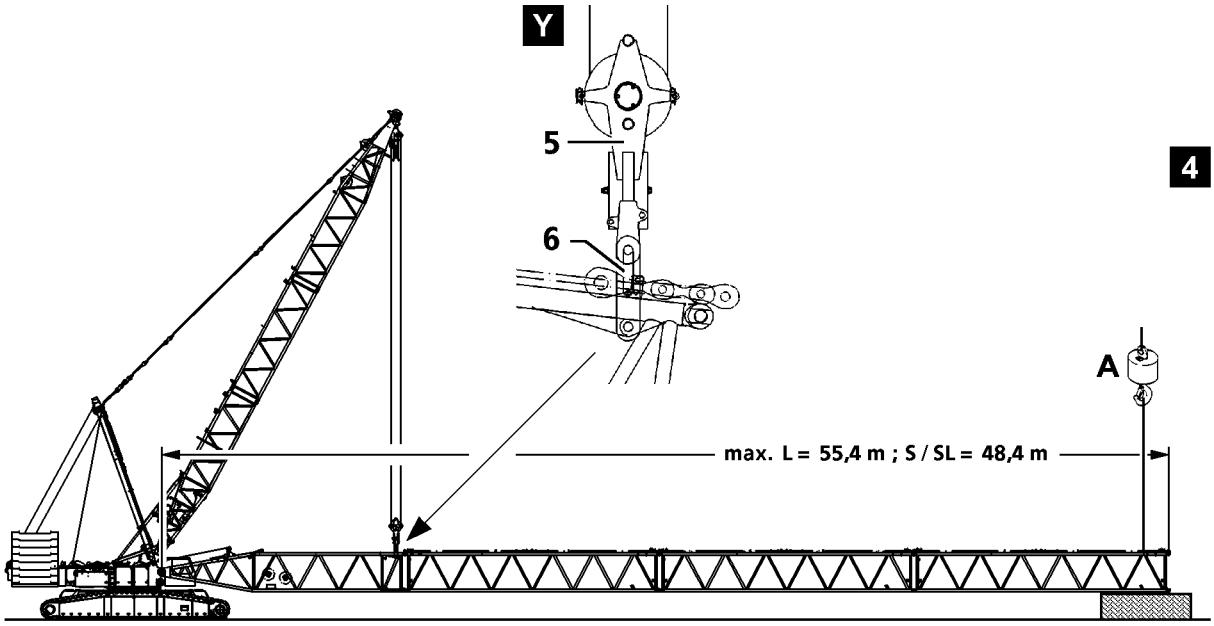
1.2 “Flying” installation of the LD/SLD/SD-boom

If spatial prerequisites on the job site are limited for the assembly of the boom, or if they are limited by buildings or similar, then the boom can be installed in “flying” mode.

WARNING
General danger notes!
- ▶ Support the boom during assembly / disassembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ For the “flying” boom assembly, the maximum permissible total force on the test point 1 (MS1) may **not** be exceeded. The “actual force” is shown on LICCON monitor 1.
- ▶ The “flying” boom assembly is only permissible to certain system lengths!
- ▶ The maximum permissible system lengths may not be exceeded!

Note
- ▶ The total weights of the individual lattice sections including the corresponding guy rods are shown in chapter 5.03.



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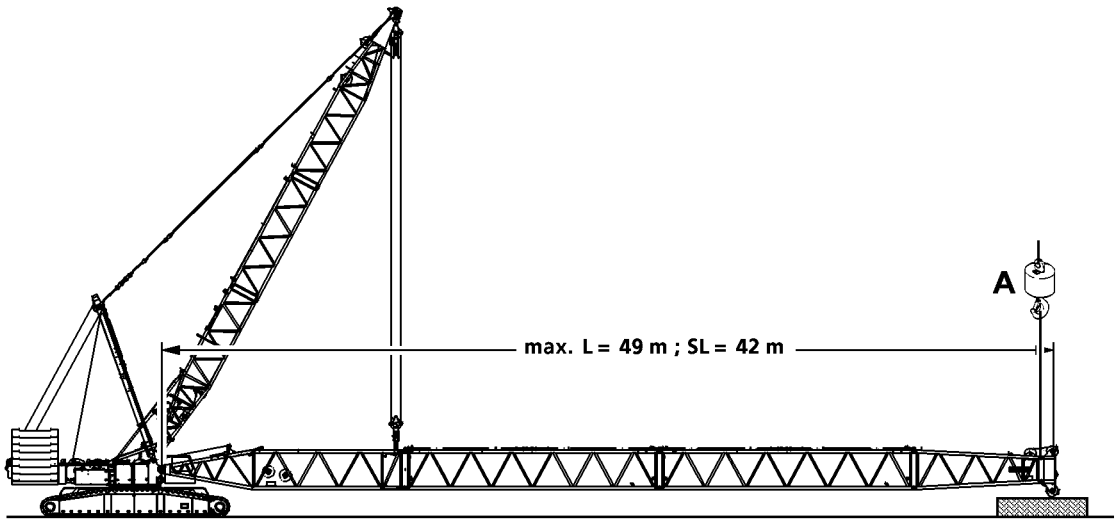

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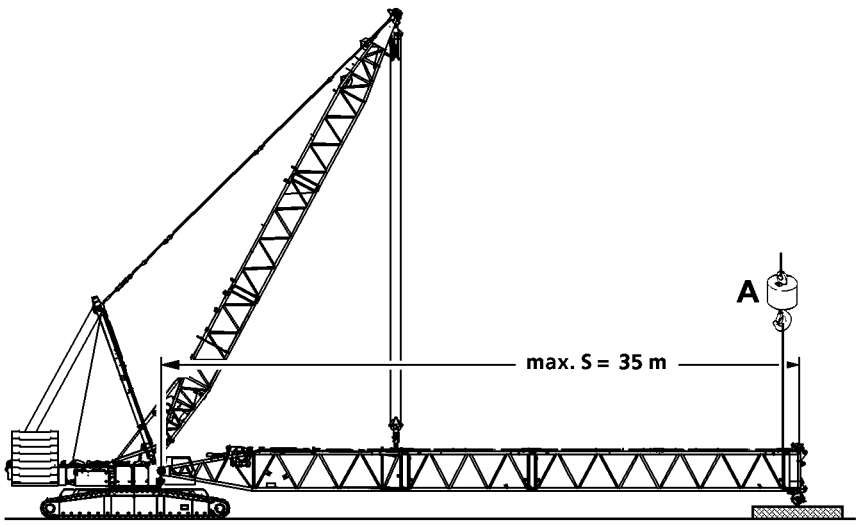

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B105809

1.2.1 “Flying” installation of the LD/SLD/SD-boom, guying on pivot section

Maximum permissible system length for a maximum total force MS1 110 t					
Boom system	**Maximum system length**	**Equipment**	**DB_{min} 1)**	**ZB_{min} 2)**	**Illustration**
L(D)	55.4 m	- without end section - without hook block	95 t	43 t	4
	49.0 m	- with 250 t end section - without hook block	95 t	43 t	5
SL(D)	48.4 m	- without end section - without hook block	95 t	43 t	4
	42.0 m	- with 250 t end section - without hook block	95 t	43 t	5
S(D)	48.4 m	- without end section - without hook block	95 t	43 t	4
	35.0 m	with 400 t end section - without hook block	95 t	43 t	6

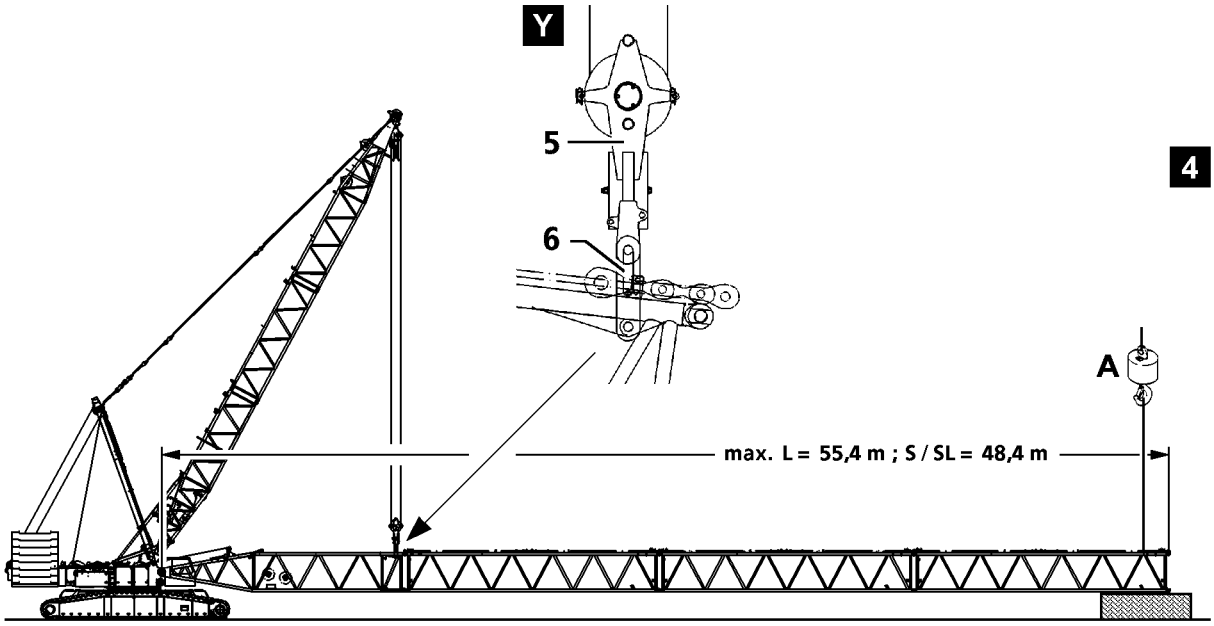
1) This counterweight must be at least installed on the turntable for “flying assembly”.
2) This central ballast must be at least installed on the crawler center section for “flying assembly”.

Make sure that the following prerequisites are met:

– The pivot section **1** is pinned and secured with the assembly bracket **6** on the upper pulley block **5**.
– The pivot section **1** is lifted via the upper pulley block **5** and is in horizontal position.

Note

▶ The weights of the individual lattice sections are shown in chapter 5.03!



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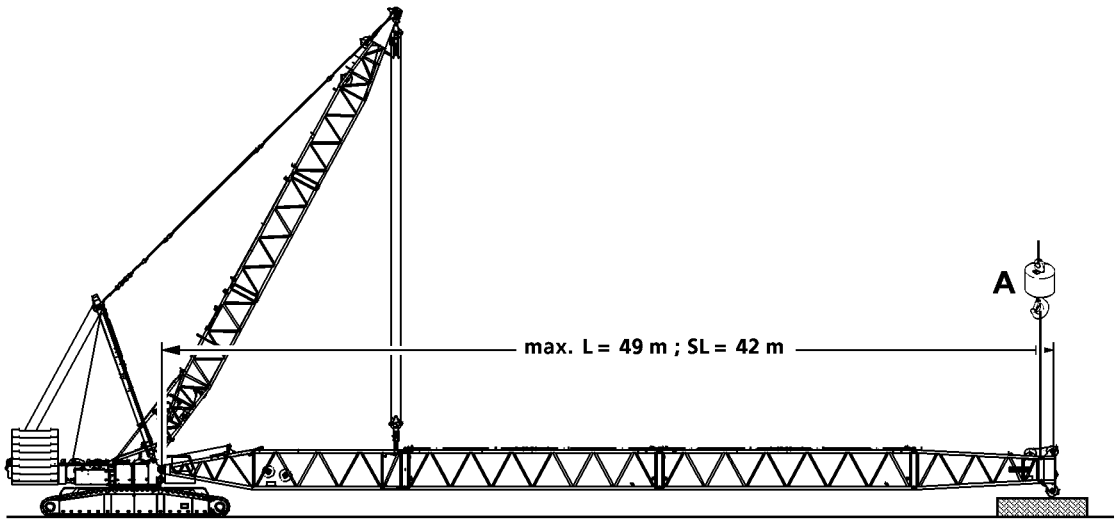

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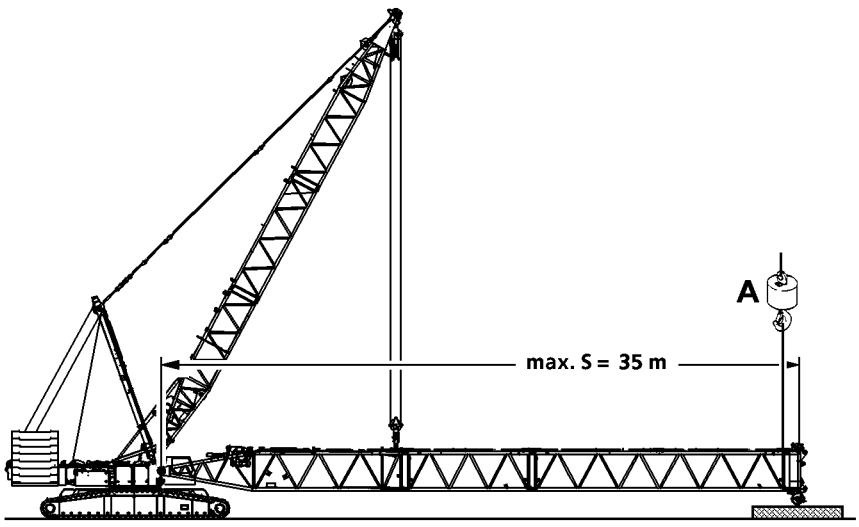

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B105809

In “flying” assembly, the intermediate sections can be pinned and secured with the auxiliary crane individually or as a preassembled unit on the pivot section.

▶ Insert and secure the pin “on top” and “on the bottom”.

▶ When the intermediate sections on the pivot section are pinned and secured:
Attach the boom on the front on the auxiliary crane.

or

■ Support the boom with stable materials.

▶ When the boom is attached on the auxiliary crane or properly supported:
Lower the upper pulley block **5**.

Result:

– The control rope is relieved.

WARNING

Mortal danger due to folding down of lattice jib!

When unpinning the upper pulley block from the assembly bracket, the derrick boom can suddenly fold down!

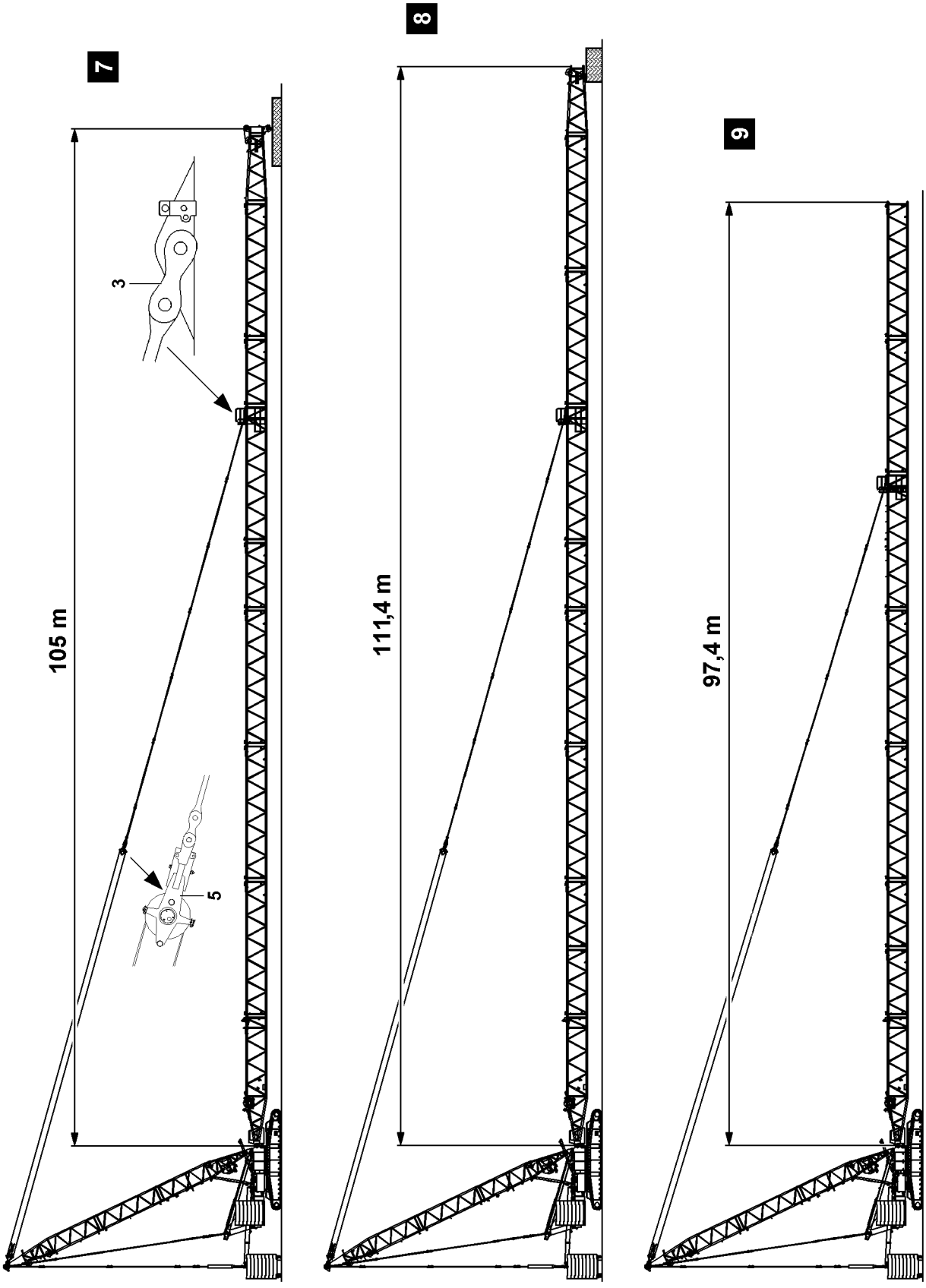
Personnel can be severely injured or killed!

▶ Before unpinning the upper pulley block **5**, the boom must be safely held by an auxiliary crane **A** or it must be supported accordingly!

▶ It is prohibited for anyone to remain under the lattice jib during the unpinning procedure!

▶ Unpin the upper pulley block **5** on the assembly bracket **6**.

▶ Pin and secure the upper pulley **5** with the guy rods of the end section.



B105810

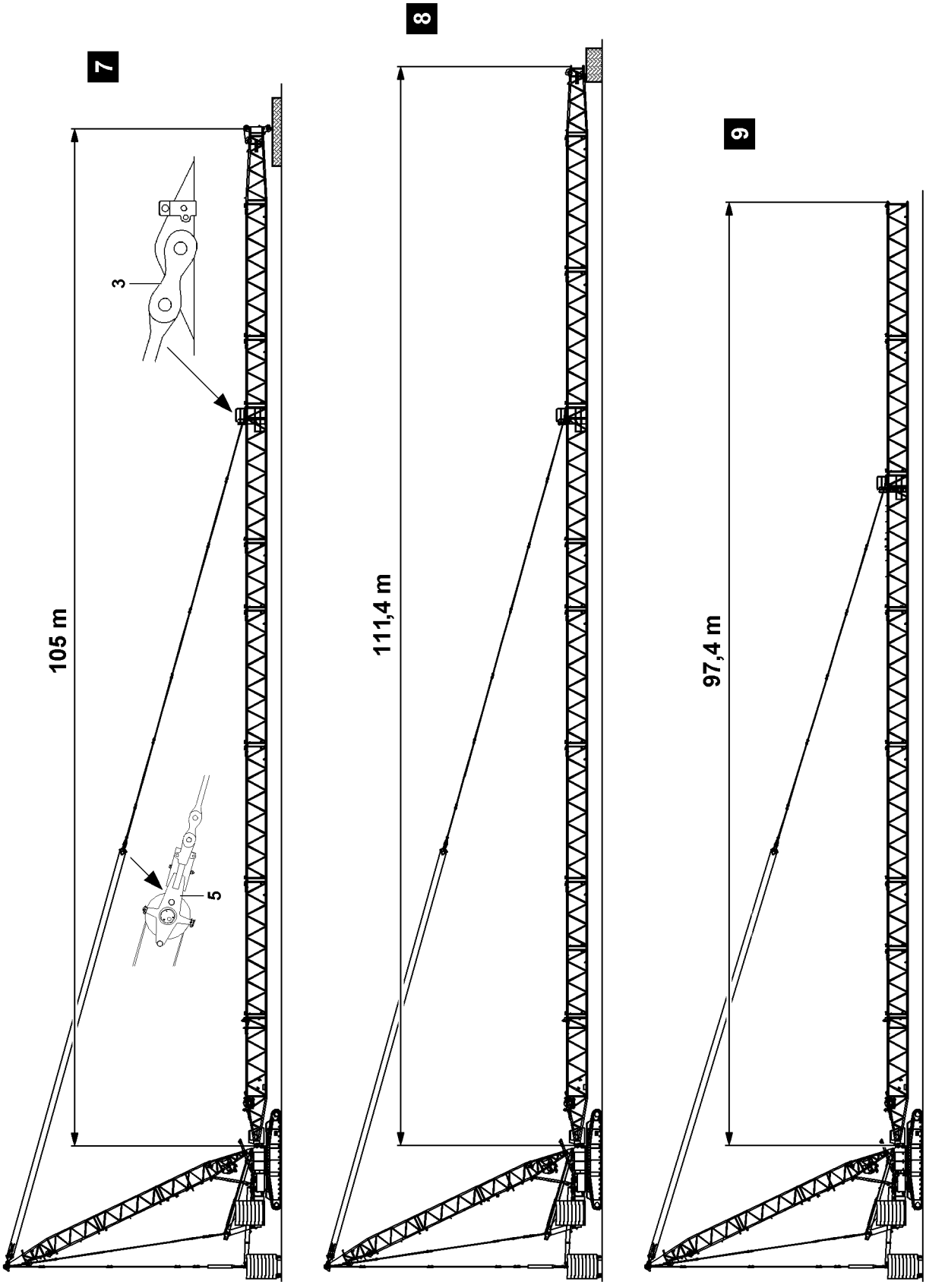
1.2.2 “Flying” installation of the LD/SLD/SD-boom, guying on reinforced intermediate section

WARNING
The crane can topple over!
When erecting the below listed boom systems with the WA-bracket II, the crane can be overloaded or the crane can topple over!
The following notes must be observed and adhered to, otherwise personnel can be severely injured or killed!

▶ When erecting the boom systems with the WA-bracket II, the maximum permissible system lengths must be reduced by a minimum of 7 m!

Maximum permissible system length for a maximum total force MS1 180 t					
Boom system	**Maximum system length**	**Equipment**	**DB_{min} 1)**	**ZB_{min} 2)**	**Illustration**
SL(D)	105.0 m	- without WA-bracket II - without rods for WA-bracket II - without hook block	95 t	43 t	7
	111.4 m	- without L-end section - without WA-bracket II - without rods for WA-bracket II	95 t	43 t	8
S(D)	105.0 m	- without WA-bracket II - without rods for WA-bracket II - without hook block	95 t	43 t	7
	97.4 m	- without adapter and L-end section - without WA-bracket II - without rods for WA-bracket II	95 t	43 t	9

1) This counterweight must be at least installed on the turntable for “flying assembly”.
2) This central ballast must be at least installed on the crawler center section for “flying assembly”.



B105810

Note

▶ The pivot section and the intermediate sections must be preassembled at a suitable location. The reinforced intermediate section must be the end of the preassembled boom combination!

Make sure that the following prerequisites are met:
– The boom combination is preassembled to the “reinforced intermediate section”.
– The derrick boom is erected (between 75° and 90°).

▶ Swing the preassembled boom combination with the auxiliary crane to the turntable.
▶ Pin and secure the boom combination on the pivot section on the turntable.

The boom combination must be attached after assembly on the turntable **or** it must be placed on a stable and solid support.

▶ When the boom combination is installed on the pivot section:
Attach the boom combination on the auxiliary crane.

or

■ Place the boom combination on the support.
▶ Lower the upper pulley block **5** to the pivot section **1** or the boom.
▶ Pin the guy rods on the upper pulley block **5** and on the brackets **3**.

NOTICE
Overload of crane!
By luffing the derrick boom into operating position, the crane can be overloaded!
The crane can be thereby damaged!

▶ If the derrick boom is luffed into operating position, it must be ensured that the guy rods and the control rope are **not** tensioned during the luffing procedure!
▶ Spool the control rope out somewhat, if necessary!

Note

▶ The boom combination must be in horizontal position for “flying assembly”.

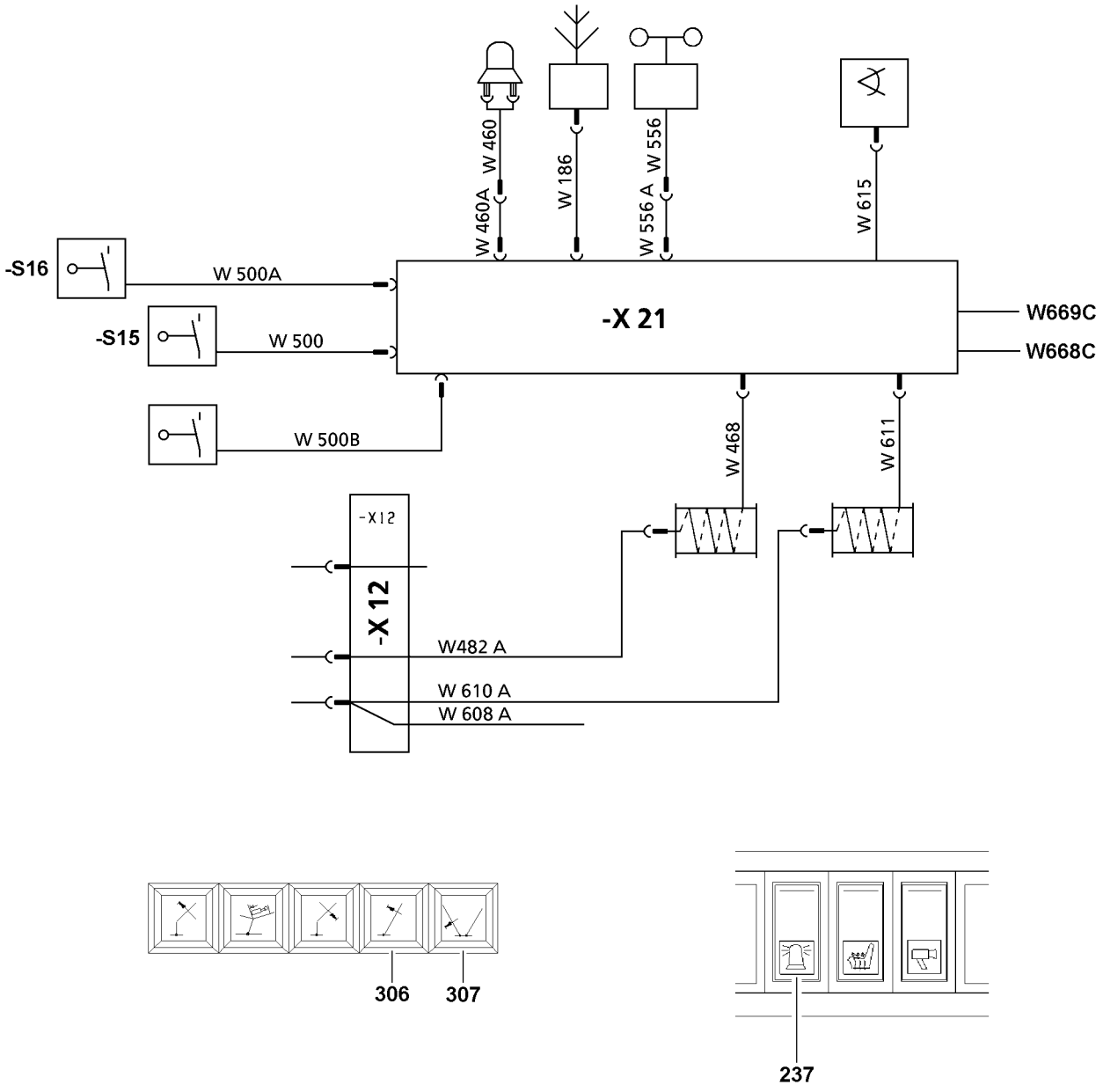
▶ Luff the derrick boom up to operating position.
▶ When the derrick boom is in operating position:
Spool the control winch up until the guying of the boom combination is tensioned.
▶ When the boom combination is tensioned:
Remove the auxiliary boom.

or

■ Remove the support.

The other intermediate sections are to be installed individually or preassembled with the auxiliary crane on the reinforced intermediate section.

▶ Swing the intermediate sections with the auxiliary crane in on the reinforced intermediate section.
▶ Pin and secure the intermediate sections.
▶ Pin and secure the guy rods of the lattice sections with each other.
▶ Hang the boom combination on the front on the auxiliary crane or support it with stable materials.
▶ Spool the control winch out until the guying between the upper pulley block and the “reinforced intermediate section” is relieved.
▶ When the guying is relieved and the boom combination is safely placed on the support or is held by the auxiliary crane:
Release and unpin the pins on the bracket **3**.


W 460
W 460A
W 186
W 556
W 556 A
W 615
-S16
W 500A
-S15
W 500
W 500B
-X 21
W669C
W668C
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A
306
307
237

B105808

1.3 Establishing the electrical connections

Ensure that the following prerequisite is met:

– The boom is fully assembled.

Establish the electrical connection from the cable drums to the connector box **-X21**.

▶ Insert the cable plug **W468** into the connector box **-X21**.

▶ Insert the cable plug **W611** into the connector box **-X21**.

Establish the electrical connection from the connector box **-X12** on the turntable to the cable drums in the pivot section.

▶ Insert the cable plug **W482A** into the connector box **-X12**.

▶ Insert the cable plug **W610A** into the connector box **-X12**.

Establish the electrical connection from the connector box **-X21** to the airplane warning light*.

▶ Insert the cable plug **W460** into the socket **W460A** on the wiring harness **W460A**.

▶ Insert the cable plug **W460A** into the connector box **-X21**.

Establish the electrical connection from the connector box **-X21** to the wind speed sensor*.

▶ Insert the cable plug **W556** into the socket **W556A** on the wiring harness **W556A**.

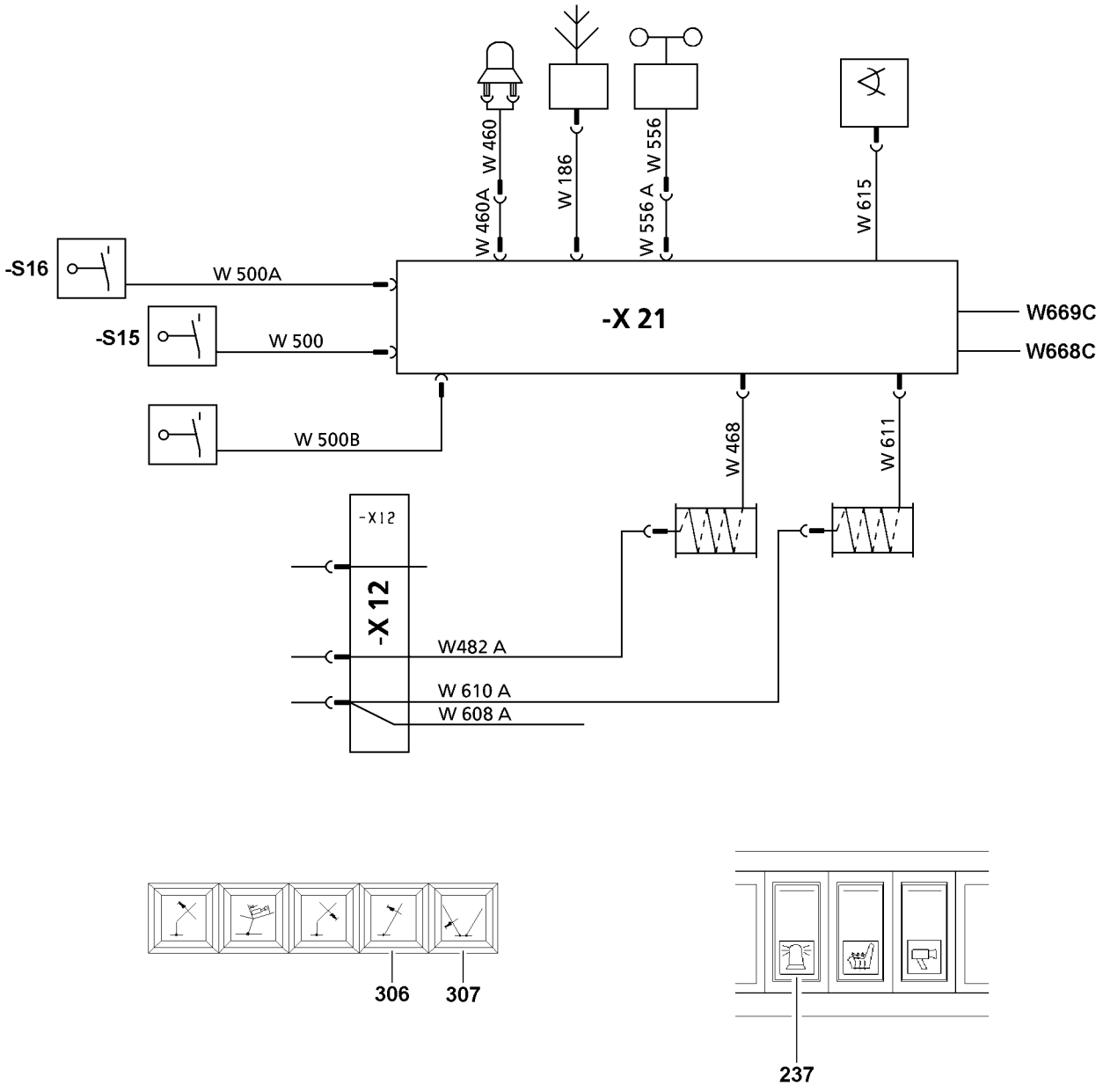
▶ Insert the cable plug **W556A** into the connector box **-X21**.

Establish the electrical connection from the connector box **-X21** to the hoist top limit switches.

▶ Insert the cable plug **W500** into the connector box **-X21**.

▶ Insert the cable plug **W500A** into the connector box **-X21**.

▶ Insert the cable plug **W500B** (boom nose) into the connector box **-X21**.


W 460
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-S15
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-X 21
W669C
W668C
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A
306
307
237

B105808

1.4 Function check

Note

▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact LIEBHERR Service.

WARNING

Risk of fatal injury if safety devices are not functioning!

▶ Crane operation with non-functioning safety devices is **prohibited**!

Make sure that the following prerequisites are met:

– All electrical connections have been made.
– The crane engine is running.
– The appropriate operating mode is set.
– The actuator levers of the limit switches have been checked for easy movement and are lubricated.

1.4.1 Winding speed sensor*

▶ Test the movement and the function of the wind speed sensor.

1.4.2 Airplane warning light*

▶ Turn on the airplane warning light on with the switch **237**.

▶ Check the function visually.

1.4.3 Hoist limit switch

▶ Actuate the limit switch on the pulley head manually.

Result:

– The hoist winch turns off in upward movement.
– The hoist top icon on the LICCON monitor 0 blinks.

1.4.4 Limit switch boom “steepest position”

Note

▶ The limit switch functions have to be checked individually before erection!

▶ Manually actuate the individual limit switches on the S-relapse cylinders.

Result:

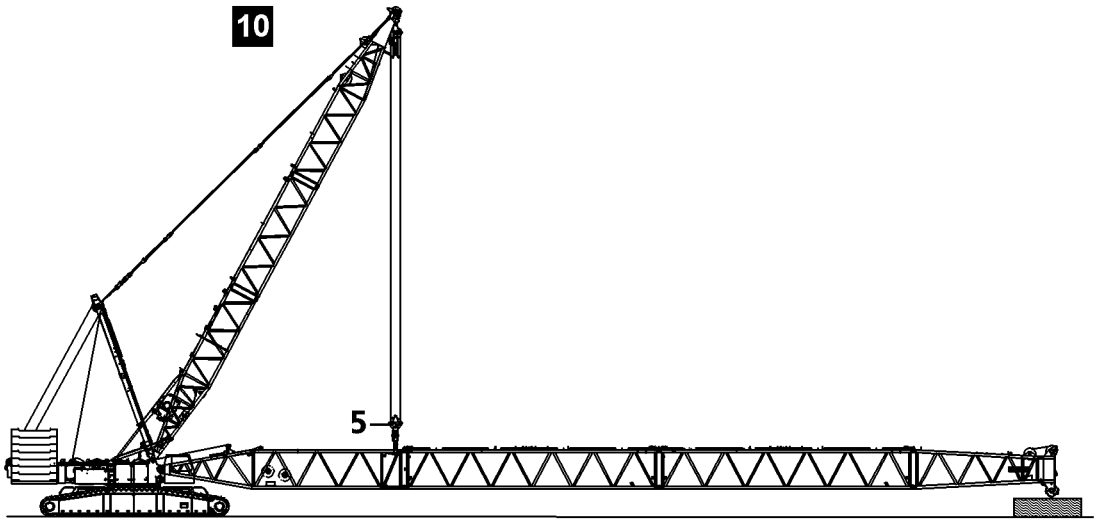
– Winch 3 (control winch) turns off in upward movement.
– The indicator light **306** lights up.
– An acoustic signal sounds.

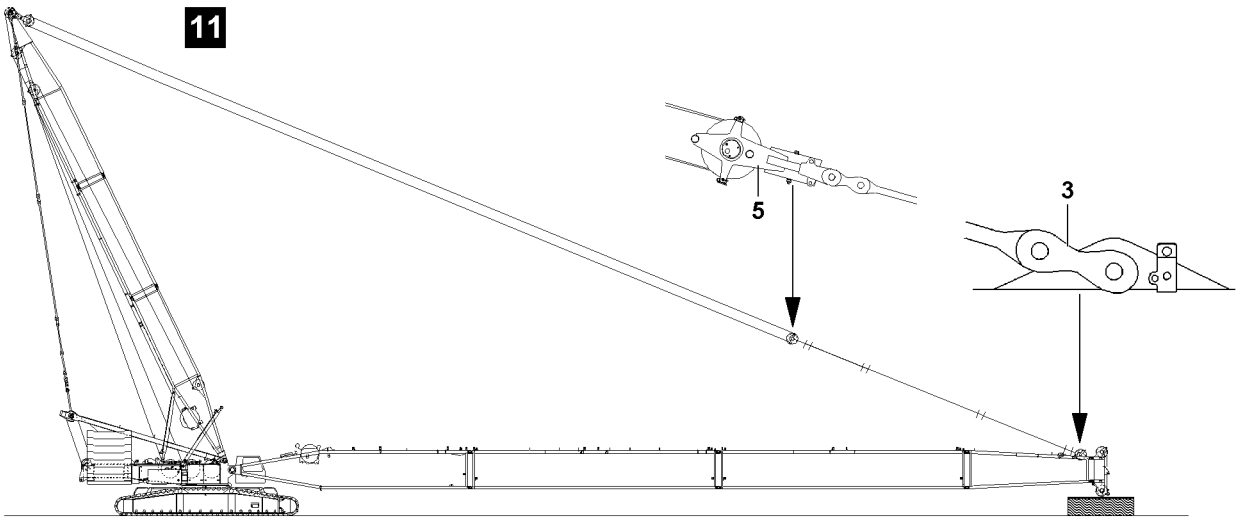
1.4.5 D-relapse cylinder

▶ Manually actuate the individual limit switches on the D-relapse cylinders.

Result:

– Winch IV (control winch) turns off in upward movement.
– The indicator light **307** lights up.
– An acoustic signal sounds.





B105811

1.5 Assembling guy rods

WARNING
Inspection and maintenance on guy rods not carried out!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also chapter 8.15.

Note
▶ The guy rods must be installed and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

Make sure that the following prerequisites are met:
– The boom is fully assembled.
– All lattice sections are properly pinned with each other.
– All pin connections have been secured.

▶ Luff the derrick boom down to the front.
▶ Lower the upper pulley to the boom: spool out winch 3.

The guy rods are placed and secured for transport on the corresponding intermediate sections. Before assembly, the transport retainers must be released.
▶ Release the transport retainers on the guy rods.

NOTICE
Danger of property damage!
If the pins of the guy rods are not pinned from the “inside” to the “outside”, the hoist rope can scrape on the ground and be damaged!
▶ Always insert the pins of the guy rods from the “inside” to the “outside”.
▶ Pay attention to the special rod plan!

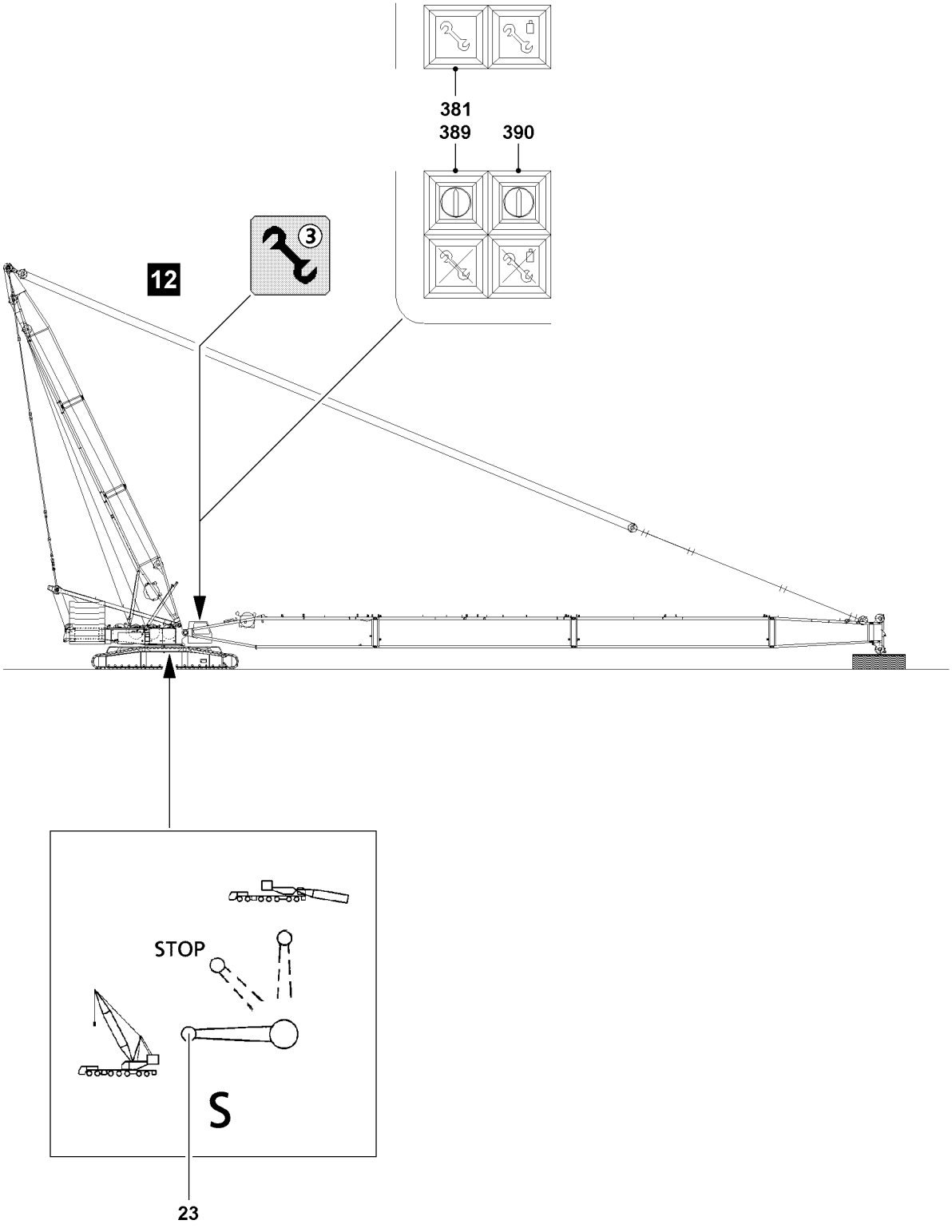
▶ Pin and secure the guy rods for the intermediate sections.
▶ Pin and secure the guy rods with the upper pulley block **5**.
▶ When the guy rods are pinned and secured:
Erect the derrick to the operating position (X = 111.1° to 115.6°) and spool out winch 3 at the same time so that the boom is not pulled up.
▶ When the derrick boom has reached the operating position:
Tension the guying between the derrick and the boom head.

WARNING
The boom can suddenly fold down!
If the following notes are not observed, the boom can suddenly fold down when the auxiliary boom or the support is removed!
Personnel can be severely injured or killed!
▶ Remove the auxiliary boom only when the derrick boom is in operating position and the guying between the derrick and the boom is tensioned.

▶ Remove the auxiliary crane on the boom head.

or

■ Remove the support.
▶ Guide the hoist rope over the rope pulley on the end section.



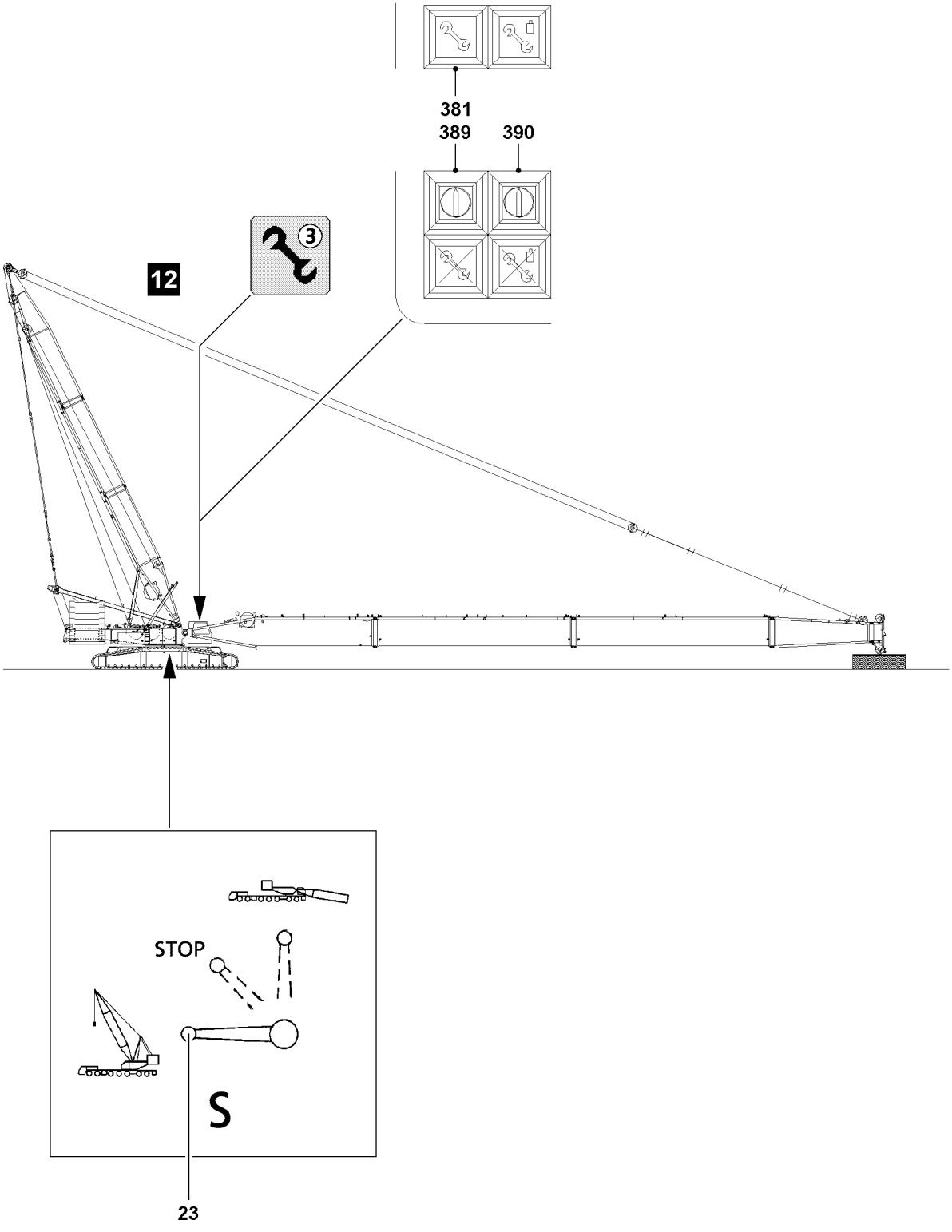
B105812

1.6 Erecting the boom

DANGER
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

Make sure that the following prerequisites are met:
- – The crane is aligned in horizontal direction.
- – All electrical connections have been made.
- – All limit switches are functioning.
- – The counterweight has been attached to the turntable according to the load chart.
- – All pin connections have been secured.
- – The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- – There are no loose parts on the boom.
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The LICCON overload protection settings have been compared with the actual crane configuration.
- – No personnel is within the danger zone.
- – The assembly key button **389** is actuated.
- – The indicator light **381** “Assembly” lights up.
- – The assembly icon **3** on the LICCON monitor 0 lights up.

DANGER
The crane can topple over!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Do not allow slack cable to build up on the control winch!
- ▶ The ball cock cabinet must be locked! Always pull the key and hand it to an authorized person!



B105812

1.6.1 Extending the relapse cylinder

NOTICE
Damage of the relapse cylinder!
When extending the relapse cylinder on the L-/SL- or S-boom, it must be ensured that the derrick boom is already in operating position. Otherwise the relapse cylinders on the L-/SL- or S-boom will collide with the D-relapse cylinders!
This can result in severe property damage on the relapse cylinders!
▶ The relapse cylinders on the L-/SL- or S-boom may only be extended when the derrick boom is in operating position!

WARNING
Risk of fatal injury!
If the relapse cylinders are not extended before erecting the boom, then the boom can fall backward during crane operation.
Personnel can be severely injured or killed!
▶ The relapse cylinders must be extended before erection of the boom.
▶ The ball cock must be secured during crane operation to prevent unintended actuation.

The piston rod on the relapse cylinder must be extended by actuating the ball cock **23**.

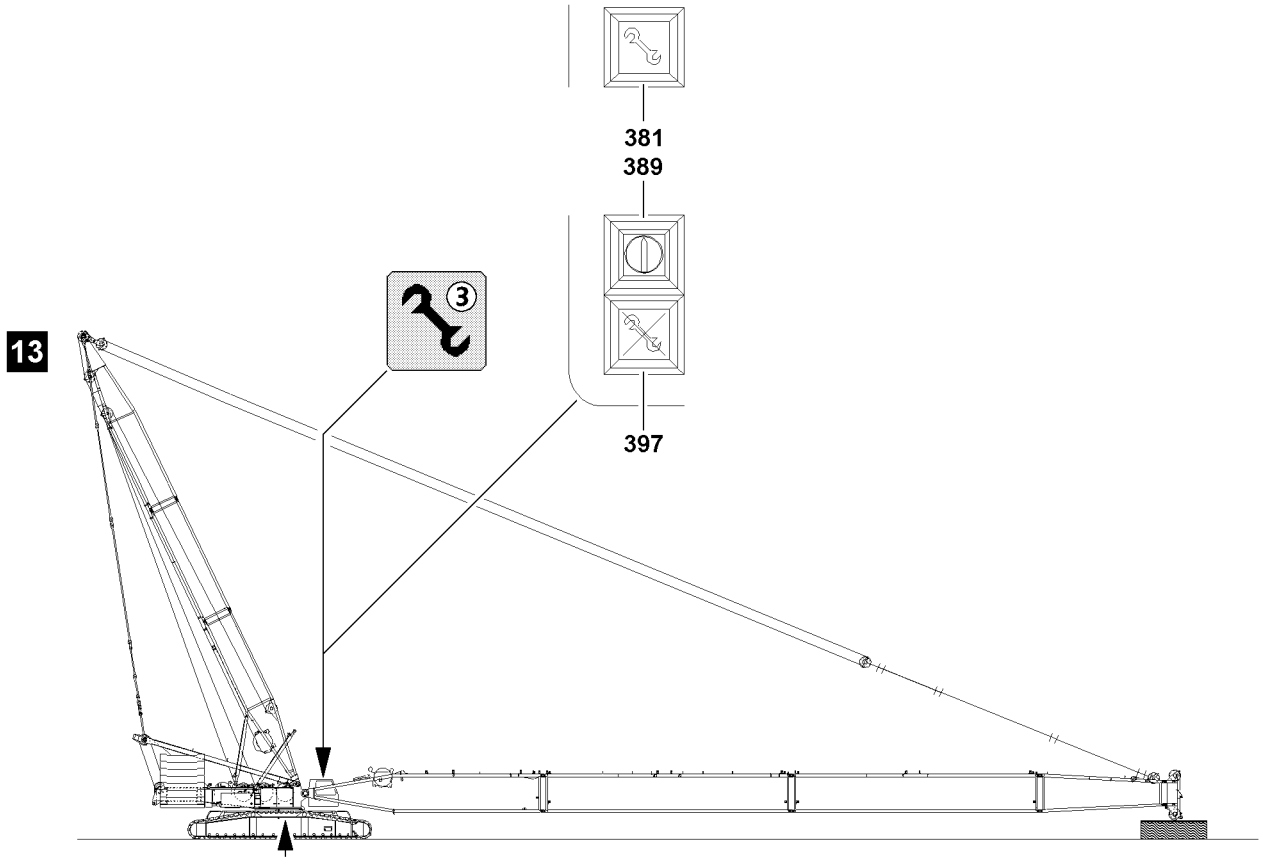
Ball cock positions	
horizontal	Crane operation, extend the piston rod
vertical	Assembly, retract the piston rod
45°	STOP (The piston rod cannot be retracted / extended)

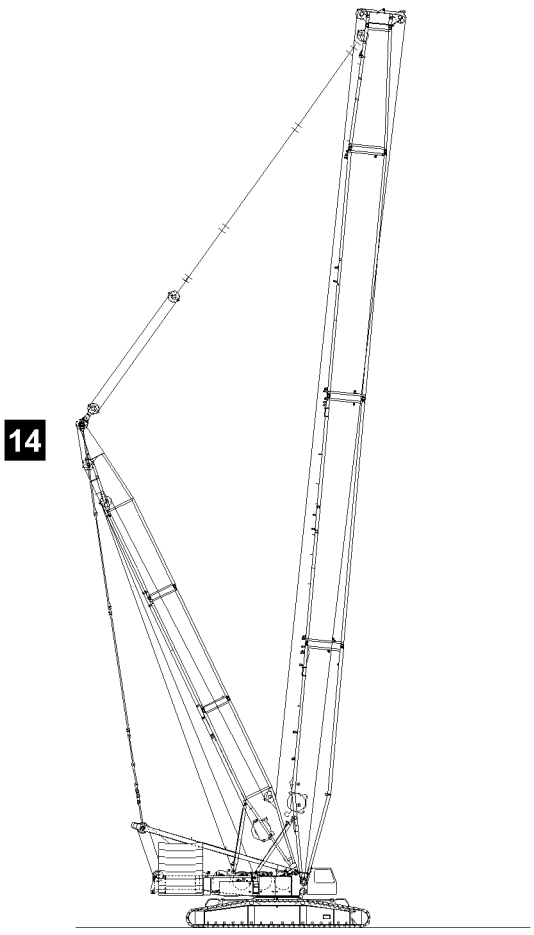
Ensure that the following prerequisite is met:
– All hydraulic connections have been made.

▶ Move the ball cock **23** into horizontal position.

Result:
– The piston rod of the relapse cylinders extends.

Secure the ball cock **23** by closing and locking the cabinet doors to prevent unauthorized access.
▶ Close the cabinet door and pull the key.
▶ Hand the key to an authorized person.





B105818

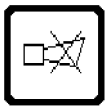
1.6.2 Erection procedure

DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane superstructure during erection procedure!
- ▶ Observe the data in the erection and take down charts!

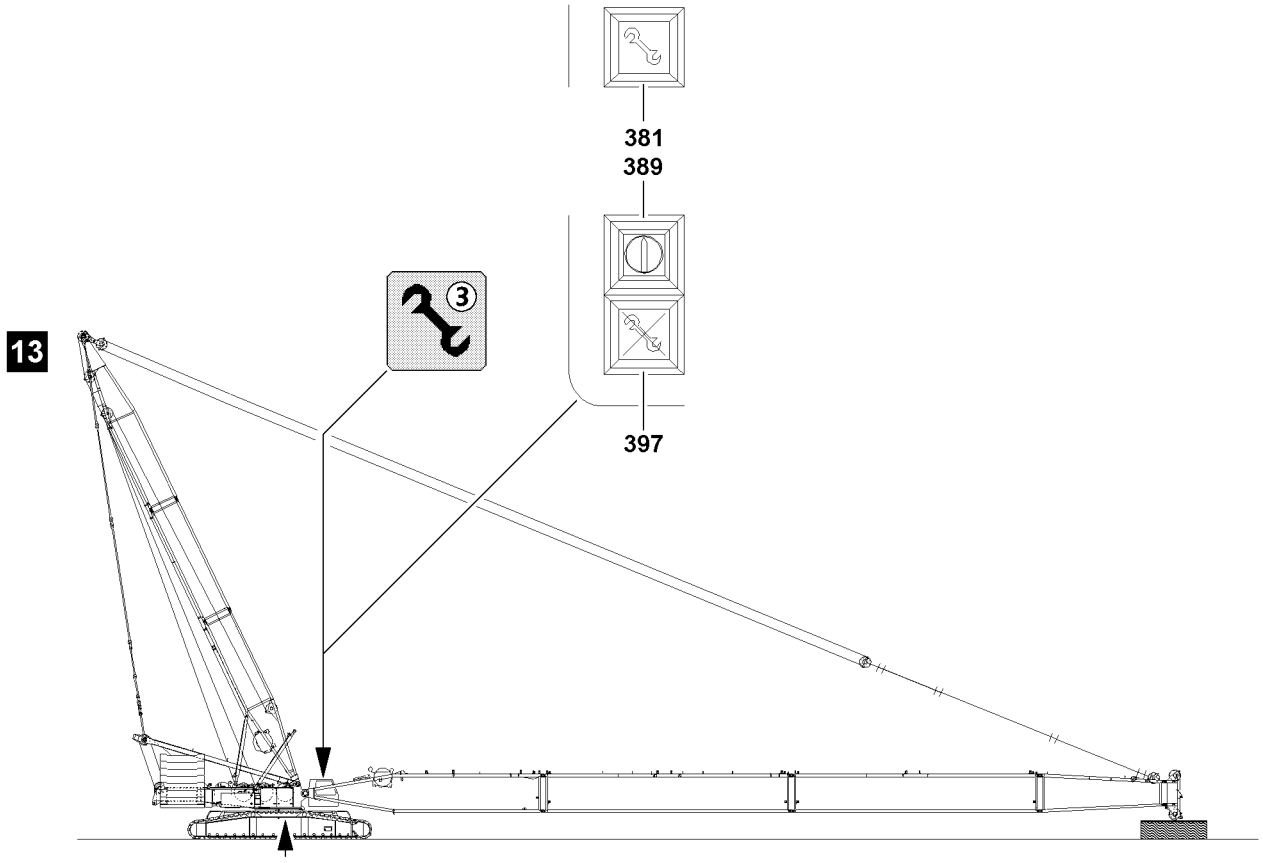
- ▶ Erect the boom until the end section lifts off the ground.
- ▶ Reeve in the hoist rope properly and secure on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.

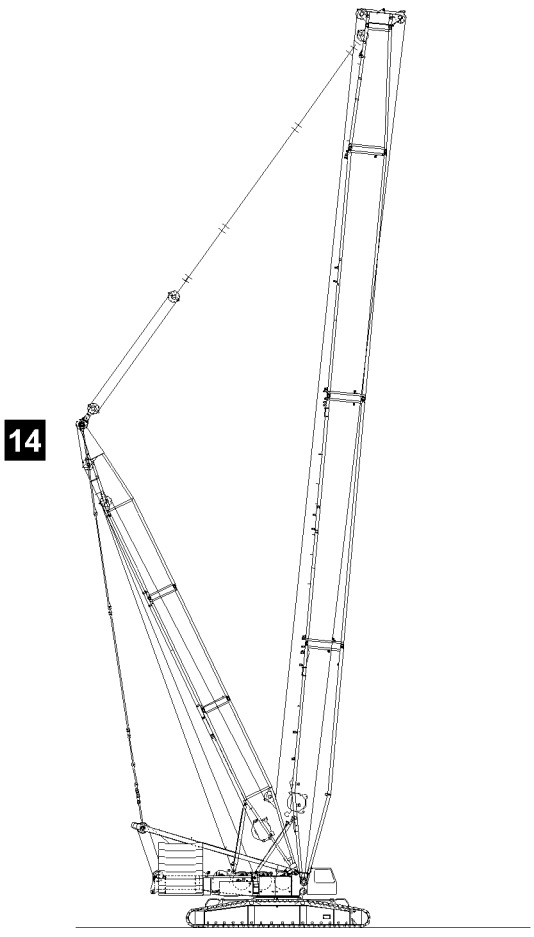
WARNING
The crane can topple over!
- ▶ When the lowest operating position is reached, the assembly key button **389** must be turned off immediately.
- ▶ The assembly key button **389** bypasses the safety devices!
- ▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!

Note
- ▶ During the erection procedure - outside the operating area - the alarm functions listed in the chart are displayed as blinking on the crane operating screen.

Displays on the LICCON monitor during the erection procedure	
 *Icon: “STOP” blinks*	
 *Icon: “ERROR 150” blinks*	***Note:*** *For error description, see chapter 20.05.*
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

- ▶ Luff the boom up to the lowest operating position.





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Note

▶ If the lowest operating setting for the boom is achieved, the display turns off (see table above), and on the symbol “Maximum load” instead of the display “???” a load value appears on “t”!

WARNING

The crane can topple over!

▶ When the lowest operating position of the boom is reached, turn off the assembly key button **389** immediately.

▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

▶ Turn the assembly keyed button **389** off: Press button **397**.

Result:

– Self retention of the assembly key button **389** is turned off.
– The LICCON overload protection is active.
– The indicator light **381** turns off.
– The assembly symbol **3** on the LICCON monitor turns off.
– The acoustical signal turns off.

2 Crane operation with derrick boom combination

2.1 Preparing for crane operation

Note

▶ Observe the notes in chapters 4.02, 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

– The LICCON overload protection has been set according to the data in the load chart.
– The assembly key button **389** has been turned off by pressing the button **397**.

WARNING

The crane can topple over!

▶ Check the horizontal position of the crane before and during operation.

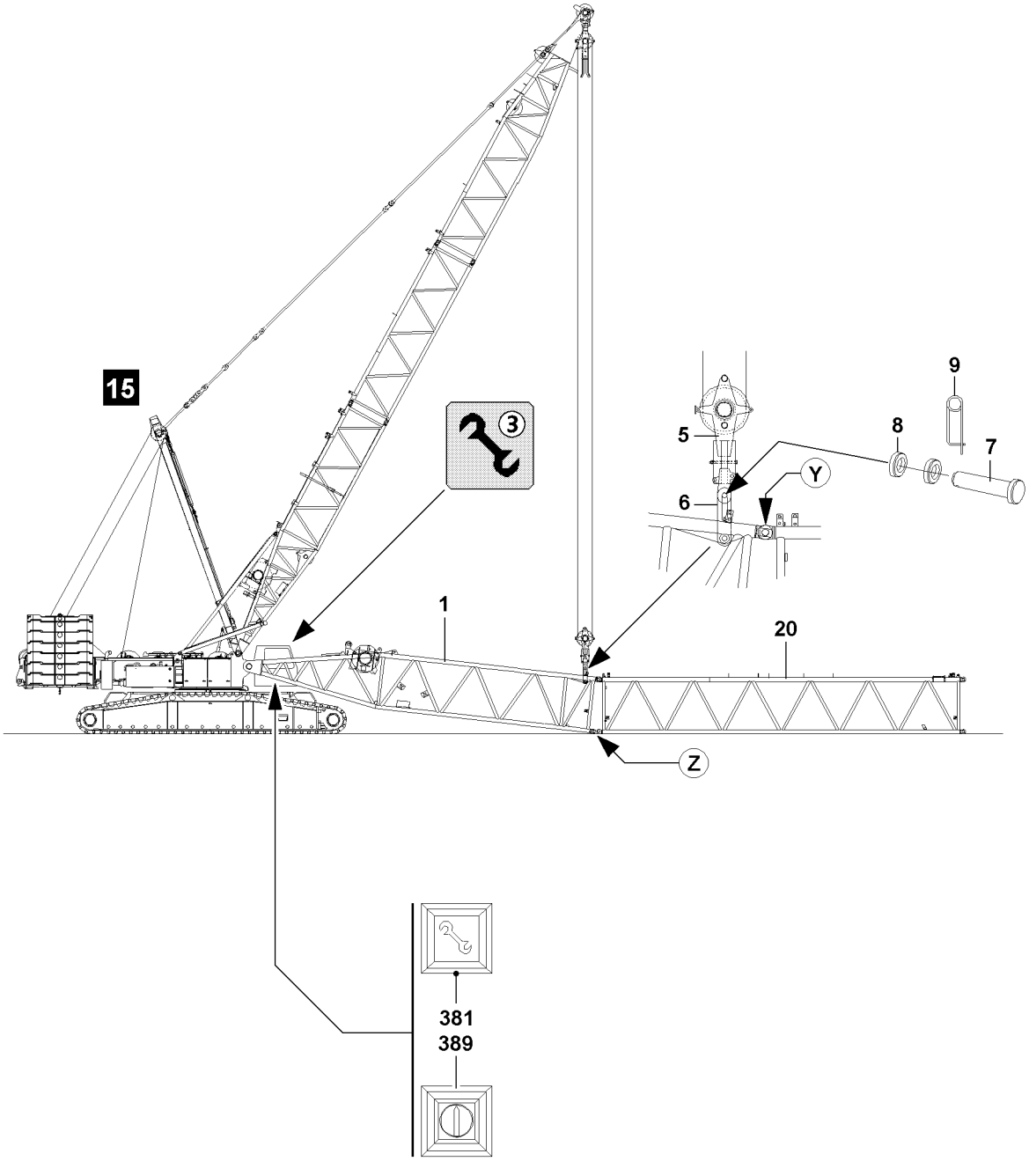
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation.

2.1.1 Checking the settings

▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.

▶ Check the hoist limit switch by running against the hoist limit switch weight.

▶ Check the function of the limit switches “boom steep” on the relapse cylinders.



B105814

3 LD/SLD/SD disassembly

DANGER
When working aloft, there is a danger of falling!
During assembly / disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.
If the following notes are not observed, assembly personnel can fall down!
Personnel can be severely injured or killed!

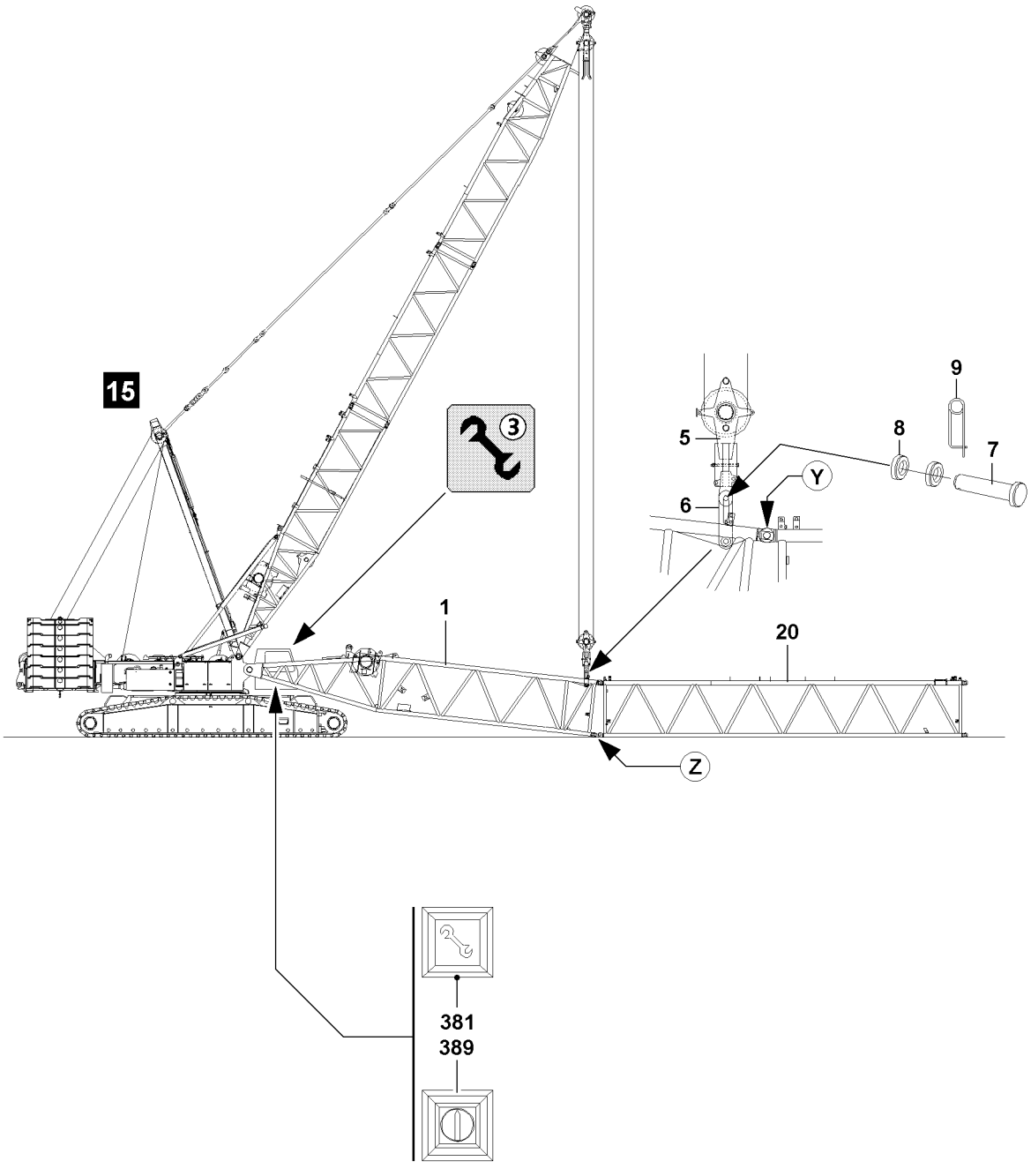
- All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- Before any assembly / disassembly work and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also chapter 2.04.
- During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

DANGER
Risk of injury when disassembling booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- Never unpin the pins under unsecured or unsupported booms!
- Never unpin the connecting pins under unsecured or unsupported booms!
- Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- Safely secure the pins in the bearing points as well as receptacles!
- Do not lean the ladder against the component being disassembled!

DANGER
Falling components!
If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!

- Secure components before removal with the auxiliary crane to prevent them from falling!



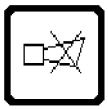
B105814

3.1 Setting down the boom

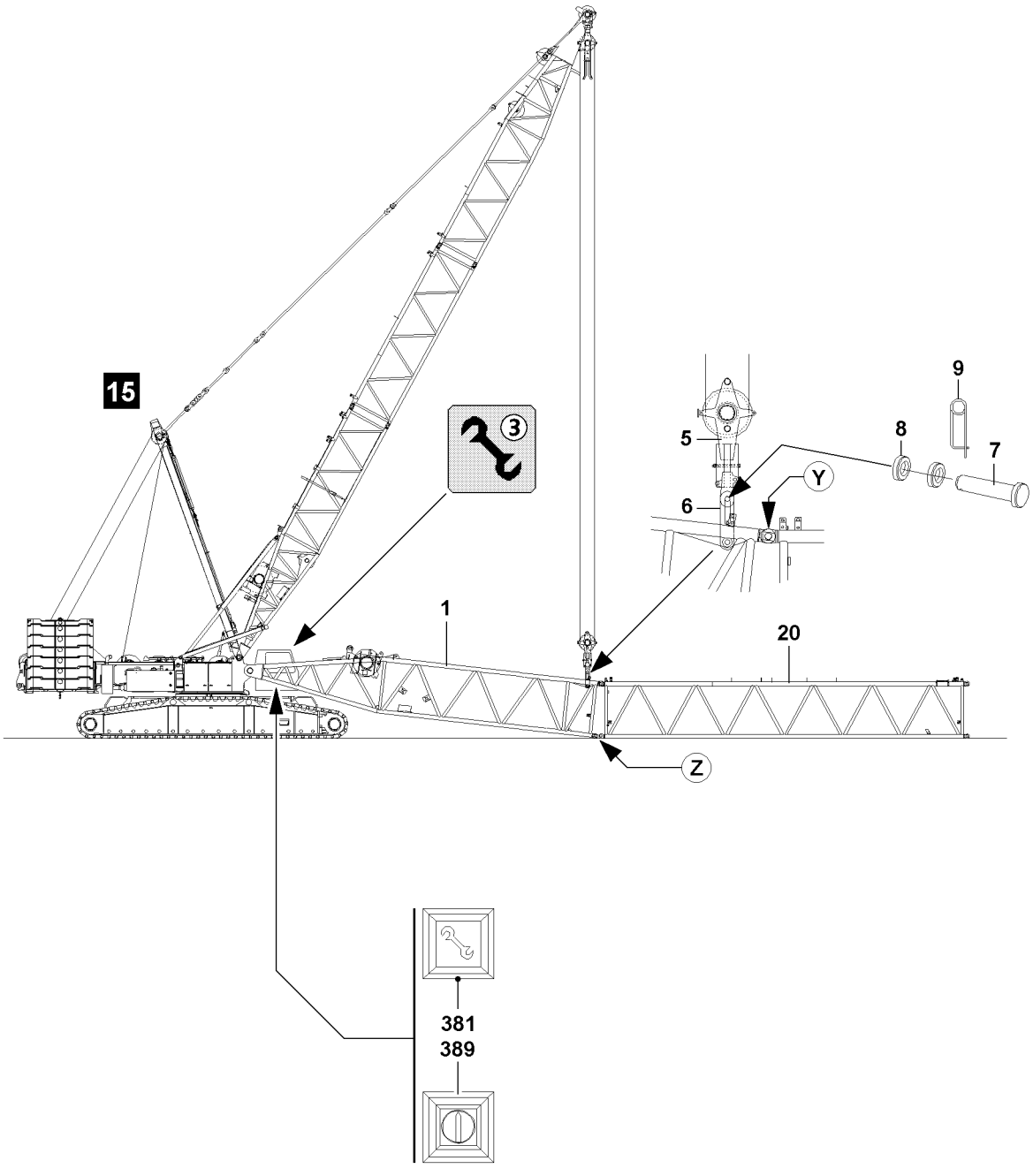
DANGER
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head. There is the danger that boom components may be significantly damaged!
- ▶ Upon taking down the boom system, always spool out the hoist winch at the same time!
- ▶ When luffing the boom system down, the derrick boom must remain in operating position until the end section is laying on the ground.

When the lowest operating position is reached, the luff down movement is turned off.
On the “Maximum load” icon, the load value disappears and the display “???” appears.
The following alarm functions become active:

Display on the LICCON-Monitor 0 after reaching the “lowest” operating position	
 *Icon: “STOP” blinks*	
 *Icon: “ERROR 150” blinks*	***Note:*** *For error description, see chapter 20.05.*
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

- ▶ Luff the boom down to the **lowest** operating position.



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WARNING
Risk of fatal injury in crane operation with enabled assembly key button.
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button **389** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is inactive.
- – The indicator light in the button **381** lights up.
- – The Assembly symbol **3** in the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red flashing beacon on the crane cab blinks.
- – The STOP icon on the LICCON monitor blinks.

▶ Spool the hoist winch out and luff the boom down further until the hook block touches the ground.

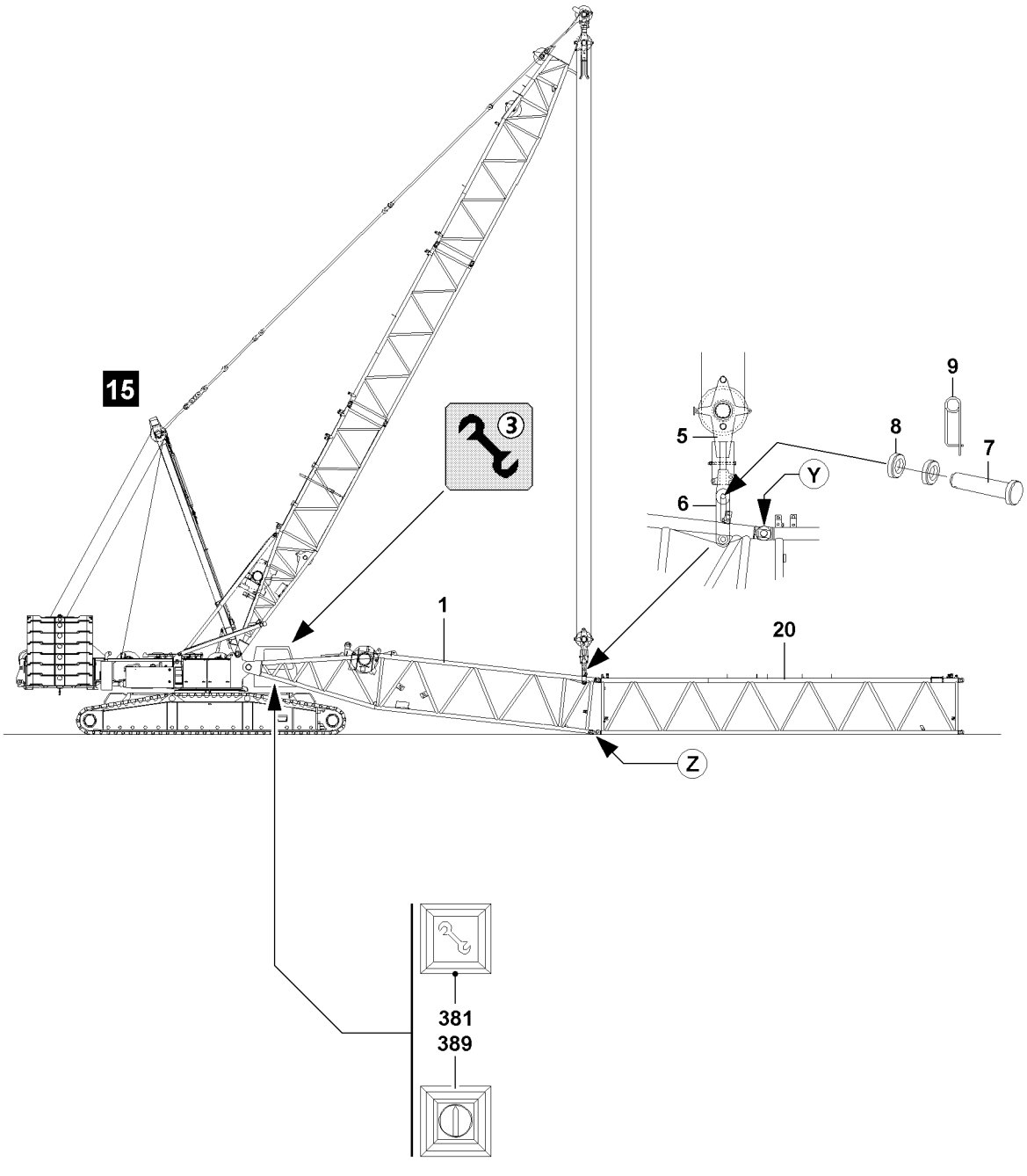
▶ Remove the hoist limit switch weight and unreeve the hook block.

▶ Luff the boom down until the boom head is laying on the support on the ground.

WARNING
Risk of accident!
- ▶ Make sure that no personnel is within the danger zone.

NOTICE
Overspooled winch!
If the rope is pulled under the winch when spooling up, the settings of the cam limit switch are not longer correct and there is an increased danger of accidents!
As a result, extensive adjustment work on the cam limit switch is required!
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch.
- ▶ Stop the winch in time, with sufficient rope reserve!
- ▶ Do not overspool the winch!

▶ Remove the hoist rope.



B105814

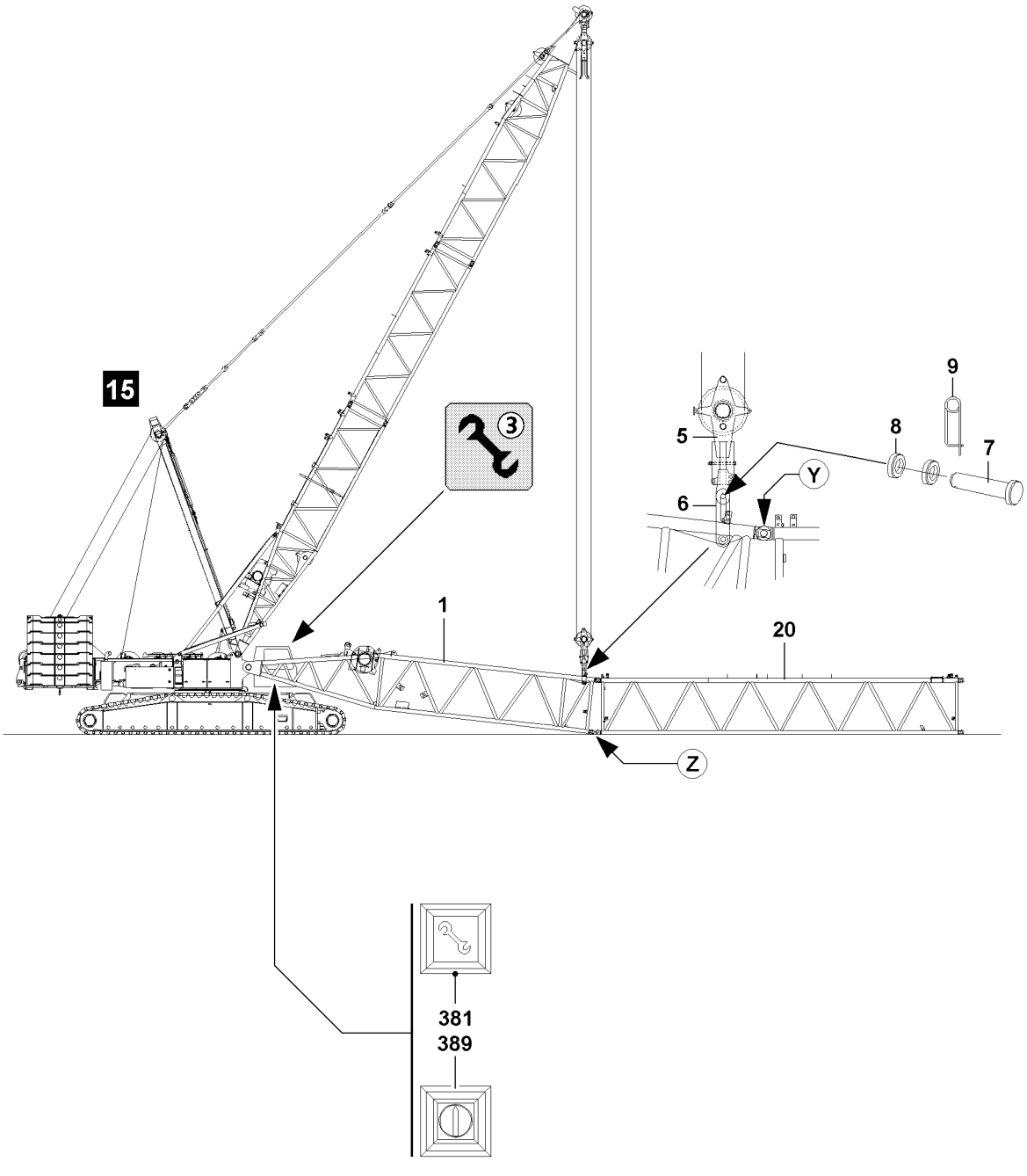
3.2 Disassemble the boom

WARNING
The boom can suddenly fold down!
If the following conditions are not met prior to dismantling the boom, the boom can fold down and fatally injure people!
- ▶ Support the boom for disassembly with suitable materials or place it on the ground!
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!

- ▶ Relieve the guying: Luff the derrick boom down to the front.
- ▶ When the guying is relieved:
  Unpin the upper pulley block on the guy rods.
- ▶ Place the guy rods on the intermediate sections and secure with transport retainers.
- ▶ Erect the derrick boom.
- ▶ Lower the upper pulley block **5** until it is over the assembly brackets.
- ▶ Pin and secure the upper pulley block **5** with the assembly brackets **6**.
- ▶ Use pin **7**, washer **8** and spring retainer **9**.

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ The maximum permissible total force on test point **MS1** may **not** be exceeded.
- ▶ Lifting the following boom length is permissible if the maximum permissible total force on test point 1 (MS1) is noted, observe the following charts!

Note
- ▶ The ACTUAL force on test point **MS1** is shown on monitor 1.
- ▶ Tension the guy rods on the SA-bracket with the same force as during the assembly.
- ▶ For this, refer the ACTUAL force at the measuring point measured and recorded during the assembly (MS1).
- ▶ The pins can be pulled easier and the pins and lugs are therefore not damaged.



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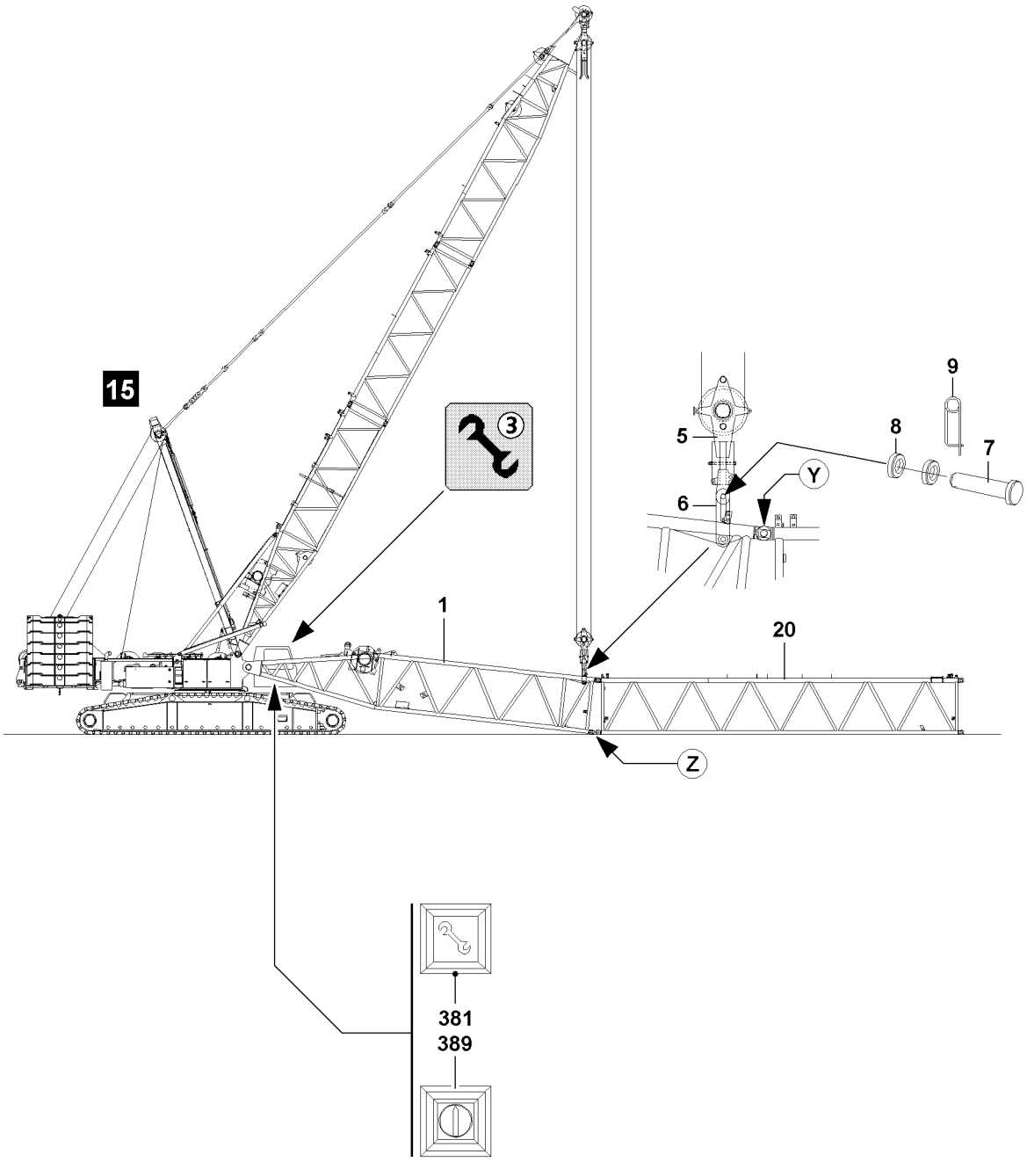
Maximum permissible system length for a maximum total force MS1 110 t				
Boom system	**Maximum system length**	**Equipment**	**DB_{min} 1)**	**ZB_{min} 2)**
L(D)	55.4 m	- without end section - without hook block	95 t	43 t
	49.0 m	- with 250 t end section - without hook block	95 t	43 t
SL(D)	48.4 m	- without end section - without hook block	95 t	43 t
	42.0 m	- with 250 t end section - without hook block	95 t	43 t
S(D)	48.4 m	- without end section - without hook block	95 t	43 t
	35.0 m	with 400 t end section - without hook block	95 t	43 t

1) This counterweight must be at least installed on the turntable for “disassembly”.
2) This central ballast must be at least installed on the crawler center section for “disassembly”.



B105814

Maximum permissible system length for a maximum total force MS1 180 t				
Boom system	**Maximum system length**	**Equipment**	**DB_{min} 1)**	**ZB_{min} 2)**
SL(D)	105.0 m	- without WA-bracket II - without rods for WA-bracket II - without hook block	95 t	43 t
	111.4 m	- without L-end section - without WA-bracket II - without rods for WA-bracket II	95 t	43 t
S(D)	105.0 m	- without WA-bracket II - without rods for WA-bracket II - without hook block	95 t	43 t
	97.4 m	- without adapter and L-end section - without WA-bracket II - without rods for WA-bracket II	95 t	43 t

1) This counterweight must be at least installed on the turntable for “disassembly”.
2) This central ballast must be at least installed on the crawler center section for “disassembly”.

Note

▶ Unpin the intermediate sections with the pin pulling device, see chapter 5.30.

NOTICE

Danger of property damage!

If the maximum permissible total force is not observed when lifting the boom system for disassembly, then the crane components can be severely damaged.

▶ Do not exceed the maximum permissible total force!

▶ Disconnect the electrical connections and store the cables carefully.

▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.

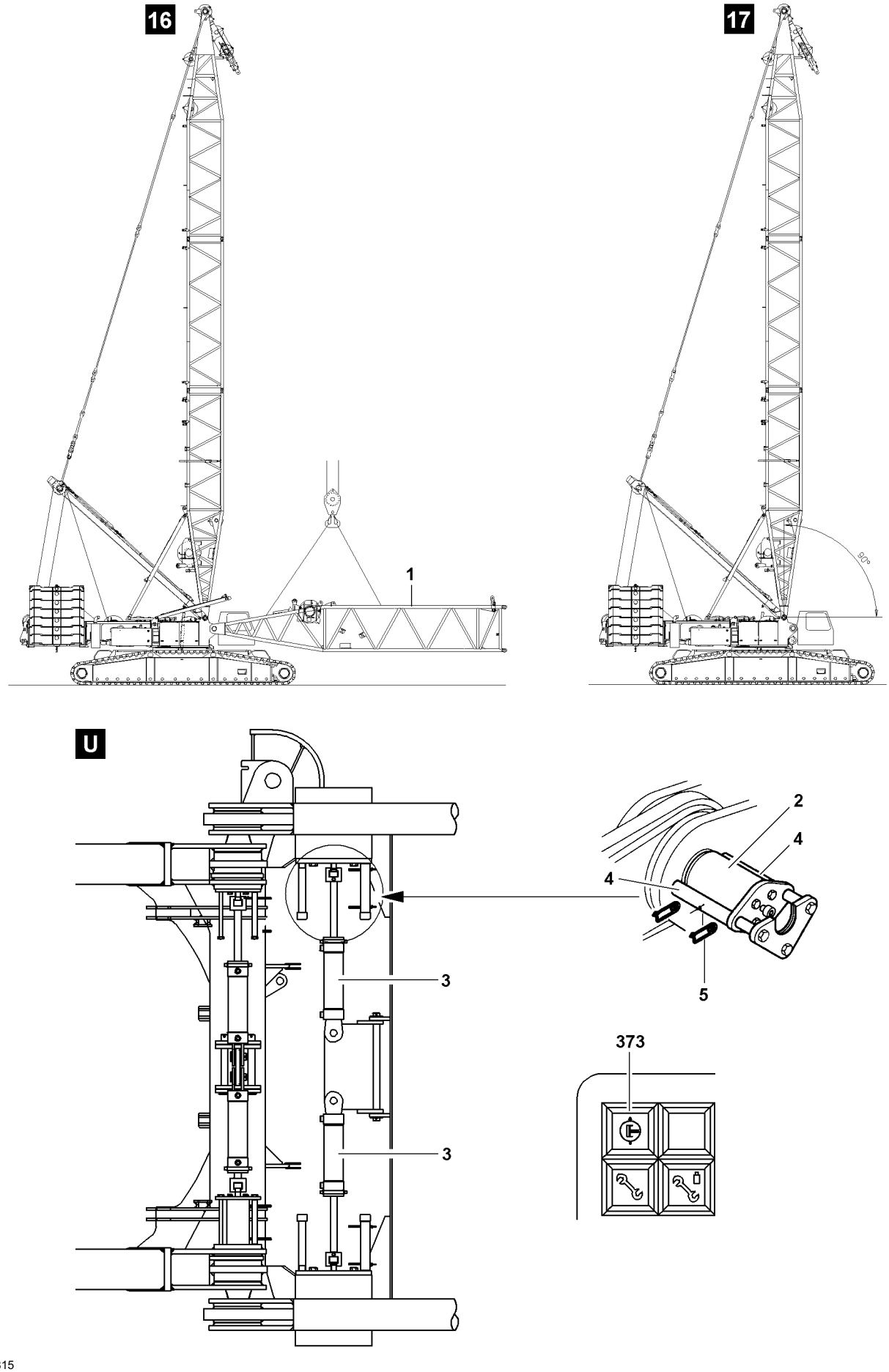
▶ Lift the pivot section **1** with the upper pulley block **1** and unpin on both sides at point **Z**: Remove the spring retainer **9** and unpin the pin **7**.

▶ Lower the pivot section **1** to the ground.

▶ Relieve the guying by lowering the upper pulley block **5**.

▶ Unpin the upper pulley block **5** on the assembly brackets **6**: Remove the spring retainer **9** and unpin the pin **7**.

▶ Unpin and disassemble the intermediate sections.



B105815

3.3 Unpin the pivot section

WARNING
General danger notes!
▶ Insert and secure all pins after disassembly in the intended transport receptacles!

Ensure that the following prerequisite is met:
– The derrick boom is erected to the point where the boom - pivot section can be disassembled without obstructions.

▶ Attach the pivot section **1** onto the auxiliary crane.
▶ Lift the pivot section **1** with the auxiliary crane to the horizontal.

Establish the hydraulic connection to the pin pulling device via two quick couplers.
Release and unpin the pivot section **1** on the turntable.
▶ Establish the hydraulic connection to the pin pulling device.
▶ Turn the pressure change over switch **373** on.

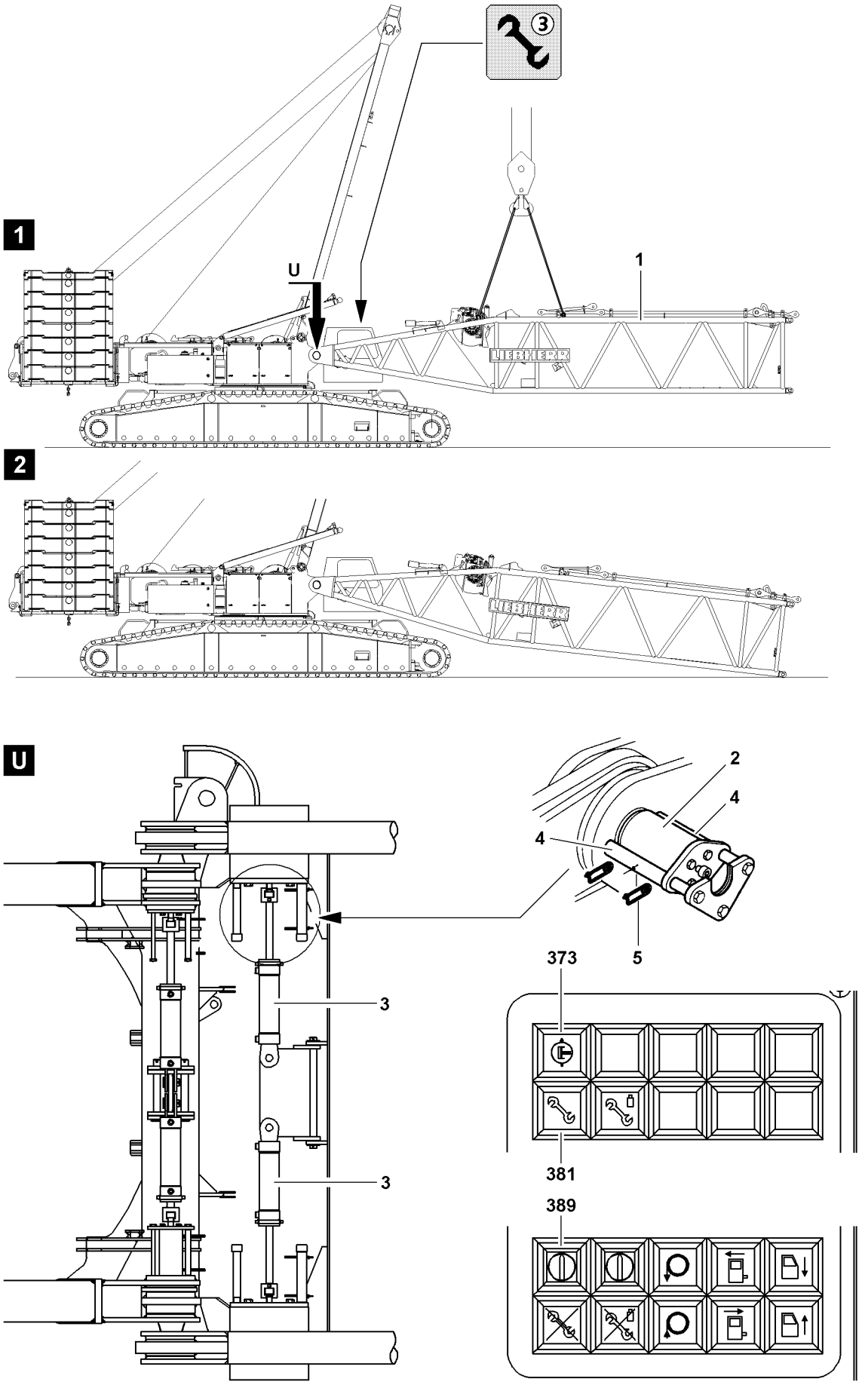
WARNING
Falling pivot section!
▶ Make sure that the pivot section is safely held by the auxiliary crane before unpinning the pins **2**.

▶ Remove the spring retainer **5** on the retaining plate **4** on the left and right.
▶ Remove the retaining plate **4** left and right.
▶ Unpin the connector pins **2** with the hydraulic pin pulling device **3**.
▶ Turn the pressure change over switch **373** off.
▶ Disconnect the hydraulic connections to the pin pulling device.

NOTICE
Danger of property damage on the turntable and on the pivot section!
▶ Slowly swing the pivot section out with the auxiliary crane and at low speed on the turntable.

▶ Place the pivot section with the auxiliary crane on the support on the ground.
▶ Remove the pin pulling device.
▶ Remove the auxiliary crane.

Note
▶ Disassemble the derrick boom, see chapter 5.05!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389
B104972

1 Component overview S-pivot section

Component	Weight
S-pivot section incl. guy rods	7.7 t
Winch 5 including rope	6.3 t
Total weight	14.0 t

2 Sw-assembly

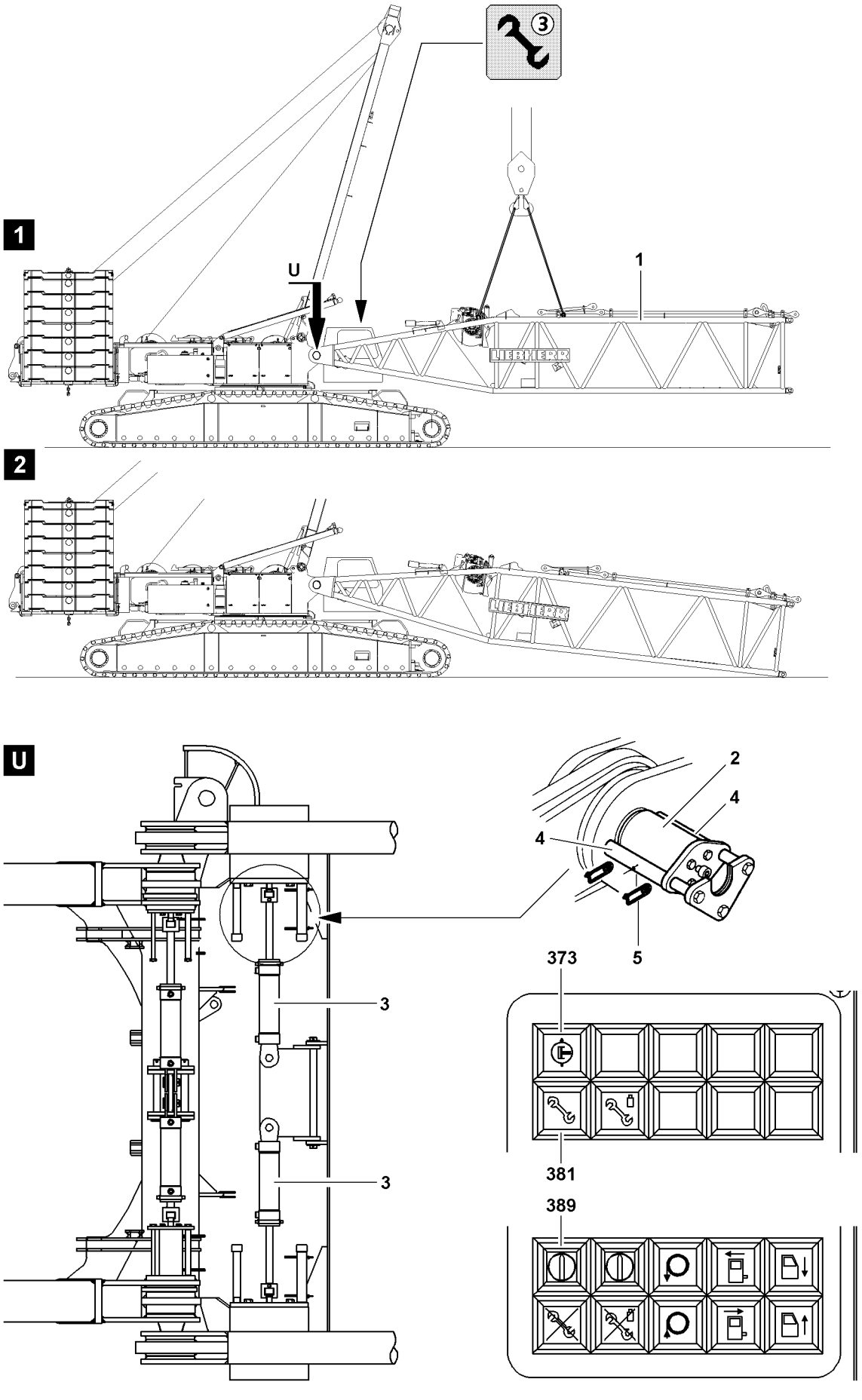
The **Sw** -boom comprises lattice sections from the S- and W-systems, as well as a SW-reducer section and W-end section.

DANGER
When working aloft, there is a danger of falling!
During assembly, personnel must be secured with appropriate antifall guards to prevent them from falling.
If the following notes are not observed, assembly personnel can fall down!
Personnel can be severely injured or killed!

- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height limit above which assembly must be carried out using equipment depends on national regulations. The national regulations must be adhered to!
- ▶ Before any assembly and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also chapter 2.04.
- ▶ Travel or crane operation is prohibited during all assembly, maintenance and inspection work!

DANGER
Risk of injury when assembling booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!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2.1 Installing the boom

Make sure that the following prerequisites are met:

– The crane is aligned in horizontal direction.
– An auxiliary crane is available.
– An assembly scaffolding / work platform is available.
– The counterweight has been attached to the turntable according to the load chart.
– The LICCON overload protection has been set according to the data in the load chart.
– The assembly icon **3** on the LICCON monitor blinks.

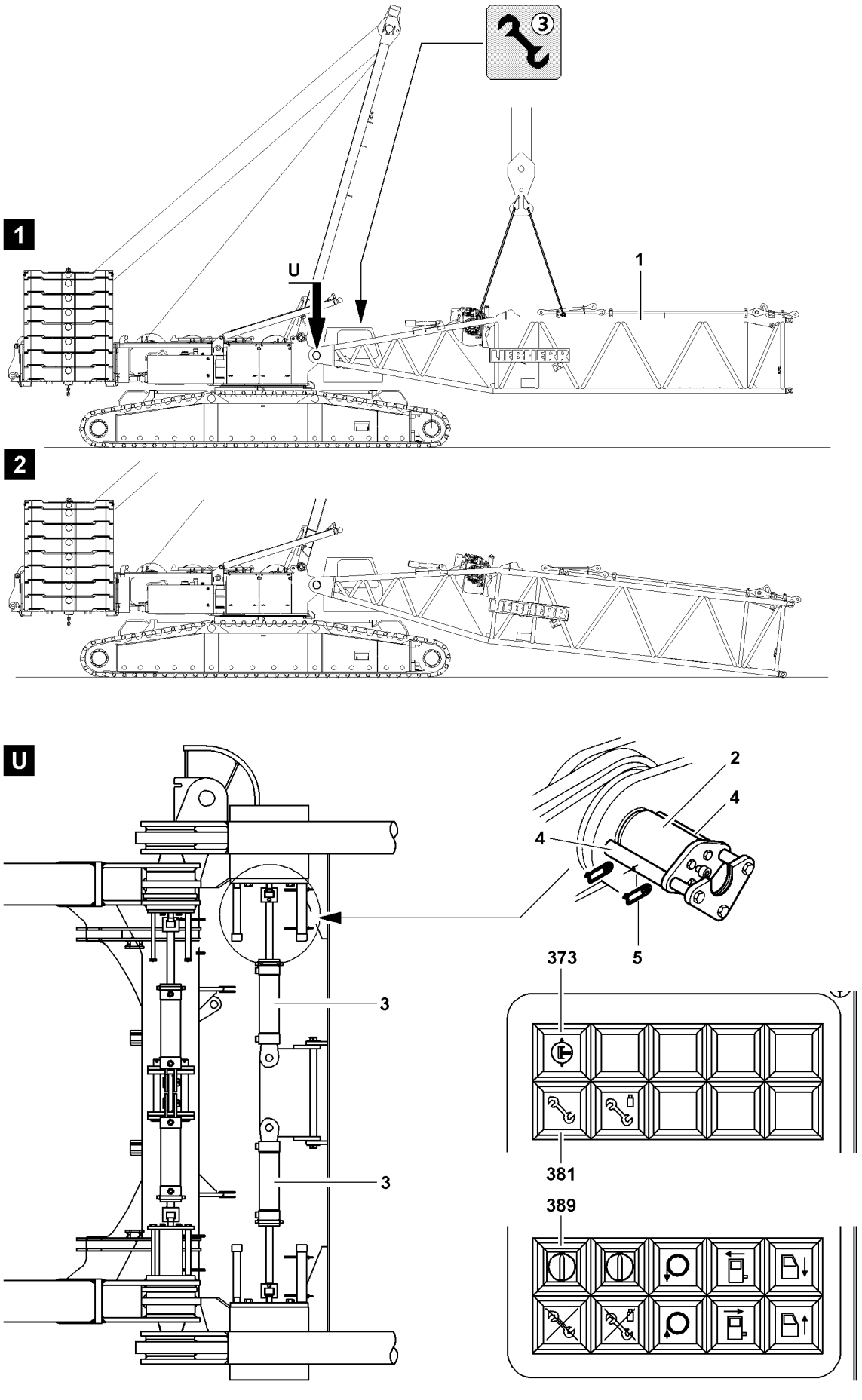
2.1.1 Turning the turntable into assembly position

DANGER
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** installed boom, the crane can topple over.
Personnel can be severely injured or killed!

▶ Observe the data in the erection and take down charts!
▶ If no boom is installed on the turntable, max. 135 t counterweight may be installed and when turning the turntable by 360°, it must be ensured that the SA-bracket is erected to **more than 90°**.
▶ If the counterweight is increased to 155 t, then the boom must be installed and raised off the ground!

Maximum counterweight	Minimum central ballast	Equipment
55 t	11 t	without equipment
95 t	11 t	
135 t	43 t	
155 t	43 t	Boom installed and raised off the ground

▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side.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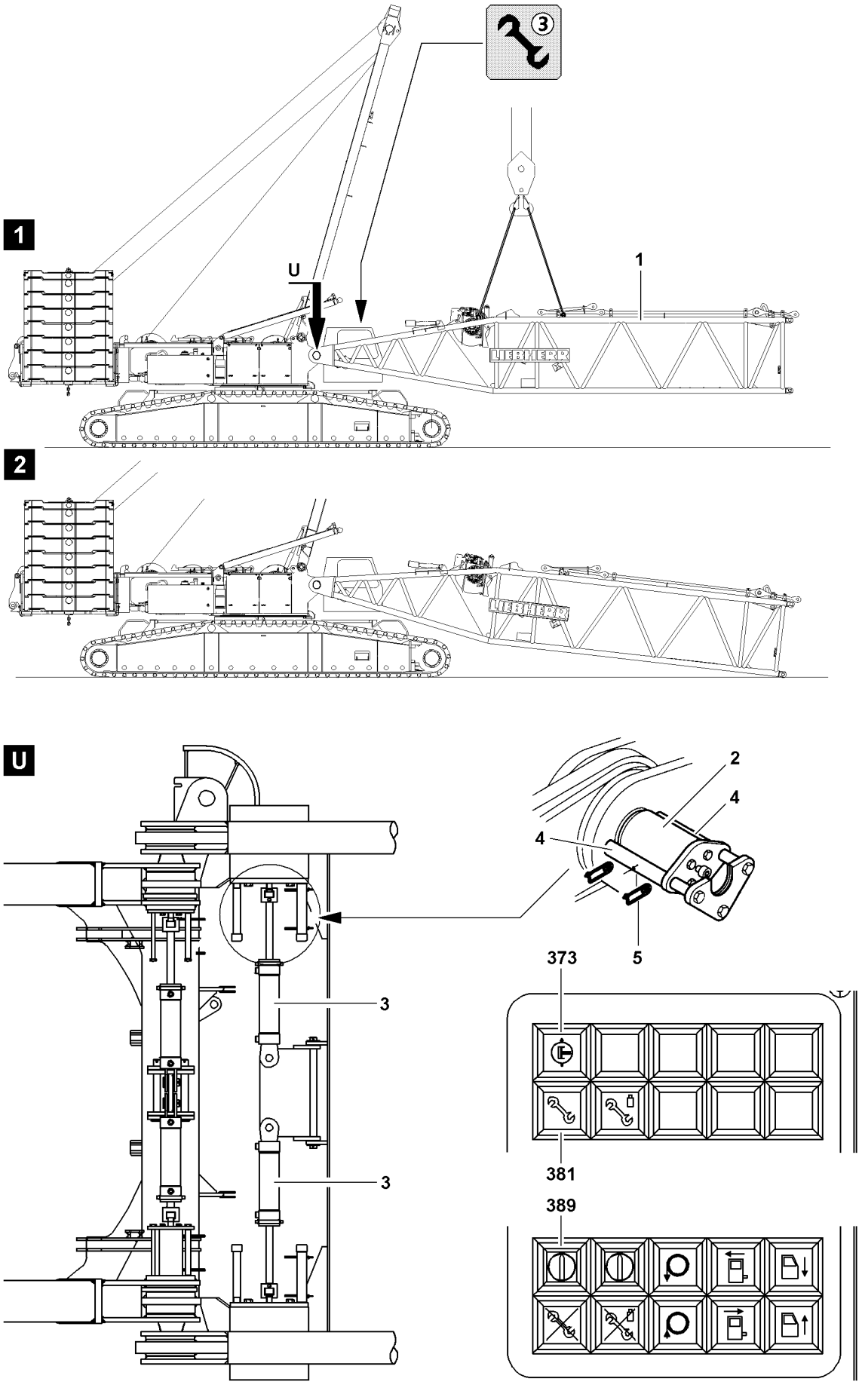
2
4
4
5
373
3
3
381
389
B104972

2.1.2 Adding the operating mode “Assembly”

DANGER
Risk of fatal injury in crane operation with enabled assembly key button.
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is bypassed.
- – The indicator light in the button **381** lights up.
- – The Assembly icon **3** on the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red flashing beacon on the crane cab blinks.


1
3
U
1
2
U
2
4
4
5
373
3
3
381
389
B104972

2.2 Pinning the S-pivot section on the turntable

WARNING
General danger notes!
- ▶ Support the Sw-boom during assembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly! Please refer to chapter 8.15.

- ▶ Hang the S-pivot section **1** onto the auxiliary crane and swing in to the pin points on the turntable, fig. **1**.

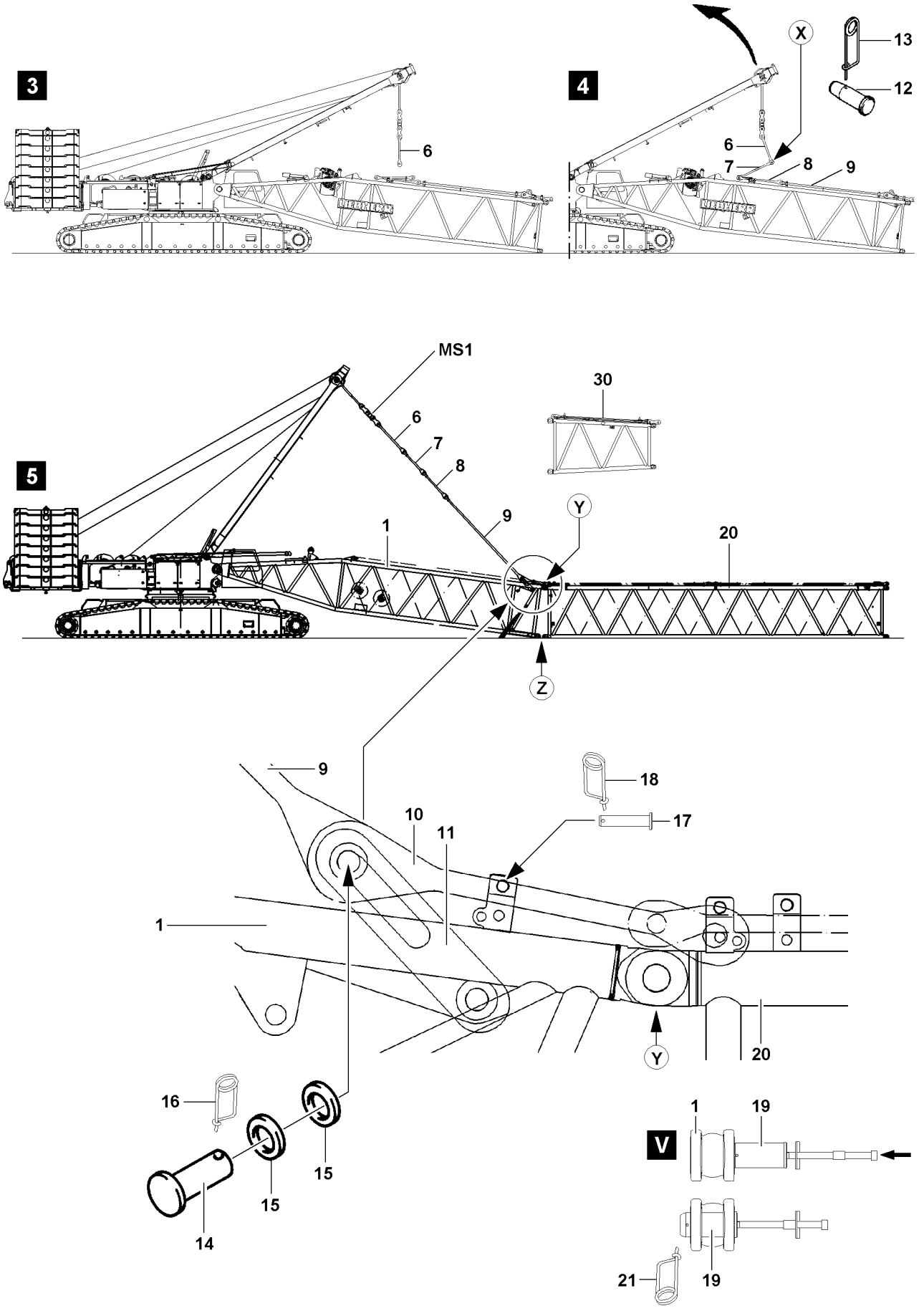
Establish the hydraulic connection to the pin pulling device via two quick couplers.
Pin the S-pivot section **1** on the turntable and secure.
- ▶ Establish the hydraulic connection to the pin pulling device.
- ▶ Turn the pressure change over switch **373** on.

DANGER
Risk of fatal injury!
Due to unsecured or insufficiently secured connector pins, the S-boom can fall down and fatally injure personnel.
- ▶ Secure the connector pins **2** between the S-pivot section **1** and the turntable after the pin procedure with the retaining plates **4**.

- ▶ Insert the connector pins **2** with the hydraulic pin pulling device **3**.
- ▶ When the connector pins **2** are completely pinned on the left and right on the S-pivot section: Insert the connector pin **2** on the left and right and secure with the retaining plate **4** and spring retainer **5**.
- ▶ Turn the pressure change over switch **373** off.

NOTICE
Damage to the S-pivot section!
Property damage can occur on the S-pivot section by placing the installed S-pivot section on the ground.
- ▶ Slowly place the S-pivot section with the auxiliary crane and at low speed on the ground.
- ▶ Before placing it on the ground, support the S-pivot section.

- ▶ Carefully place the S-pivot section down.
- ▶ Remove the auxiliary crane.


3
6
4
X
13
12
6
7
8
9
5
MS1
30
6
7
8
9
1
Y
20
Z
9
18
10
11
17
1
Y
20
16
15
15
14
V
1
19
21
19

B105908

2.3 Fitting the S-intermediate sections, SW-reducer section and W-intermediate sections

The number of boom components is dependent on the required boom length for a particular application. Depending on the required boom length, it may be necessary to fit the SW-reducer section **directly** to the S-pivot section.

Note
▶ The component quantities are given on the assembly drawings and rod diagrams!

2.3.1 Fitting the S-intermediate section(s) or SW-reducer section onto the S-pivot section

Make sure that the following prerequisites are met:
– The S-pivot section is pinned and secured on the turntable.
– The S-pivot section is placed on the ground.
– The auxiliary crane is removed.

Note
▶ To pin the S- and W-intermediate sections, the pin pulling device can be used, see chapter 5.30.

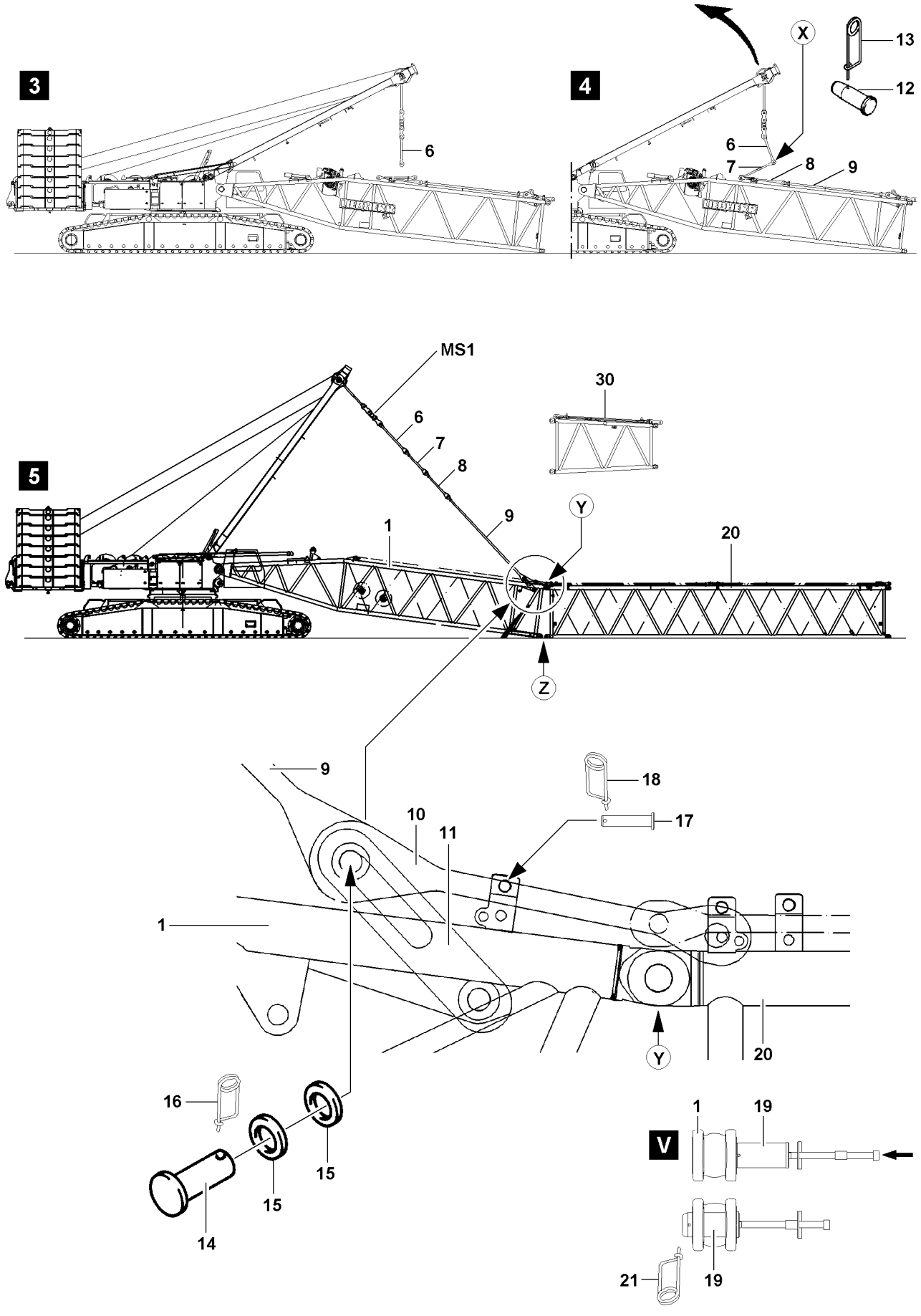
WARNING
General danger notes!
▶ All pins are to be secured after assembly with the intended safety elements!
▶ The guy rods must be checked regularly! Please refer to chapter 8.15.

In order to fit the S-intermediate section or SW-reducer section onto the S-pivot section, use the SA-bracket guy rods.
▶ Remove the transport retainers for the guy rods on the SA-bracket.
▶ Remove the transport retainers for the guy rods on the S-pivot section.
▶ Lower the SA-bracket to the front until the guy rods **6** hang freely over the guy rods **7** of the S-intermediate section **20**, fig. **3**.

Pin the guy rods **6** of the SA-bracket with the guy rods **7** on the S-pivot section.
▶ Insert the pin **12** at point **X** from the “inside” to the “outside” and secure with spring retainer **13**, fig. **4**.

Pin and secure the assembly brackets **11** on the connector point of the guy rods **9** and guy rods **10**, use washers **15**.
▶ Insert the pins **14** into the hollow axle and secure with spring retainers **16**.
▶ Erect the SA-bracket until the guy rods are completely tensioned, fig. **5**.

Note
▶ Assemble the S-guy rods according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.


3
6
4
X
13
12
6
7
8
9
5
MS1
6
7
8
9
30
1
Y
20
Z
9
10
11
18
17
1
Y
20
16
15
15
14
V
1
19
21
19

B105908

The guy rods are placed and secured for transport on the intermediate sections. The transport retainers must be removed before assembly of the guy rods.

▶ Release the transport retainers of the guy rods on the S-intermediate sections: Remove the spring retainer **18** and unpin the pin **17**.

Pin the S-intermediate section **20 or** SW-reducer section **30** on the S-pivot section **1** “on top”.

▶ Attach the S-intermediate section **20** on the auxiliary crane and align on the S-pivot section **1**, fig. **5**.

▶ When the pin bores on the S-pivot section **1** and on the S-intermediate section **20** “on top” (point **Y**) align, fig. **5**:
Insert the pin **19** from the inside to the outside and secure with spring retainer **21**, fig. **V**.

or

■ Attach the SW-reducer section **30** onto the auxiliary crane and align to the S-pivot section **1**.

▶ When the pinning holes on the S-pivot section **1** and SW-reducer section **30** “on top” (point **Y**) align, fig. **5**:
Insert the pin **19** from the inside to the outside and secure with spring retainer **21**, fig. **V**.

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!

▶ During “closure” of the Sw-boom, the maximum permitted total force at test point **MS1** of 100 t, may **not** be exceeded!

▶ The end section of the Sw-boom should **not** lift off the ground during “closure”!

▶ With the SA-bracket, Sw-booms up to maximum **Sw 98 m** may be lifted / closed!

Note

▶ The actual force on the test point MS1 - which is exerted during the closing procedure of the boom system - is shown on the LICCON monitor 1.

▶ Record the actual force and keep it ready for the disassembly of the boom system.

▶ During the boom disassembly, the guying is tensioned with the noted actual force (assembly) so that the connector pins of the intermediate sections can be unpinned.

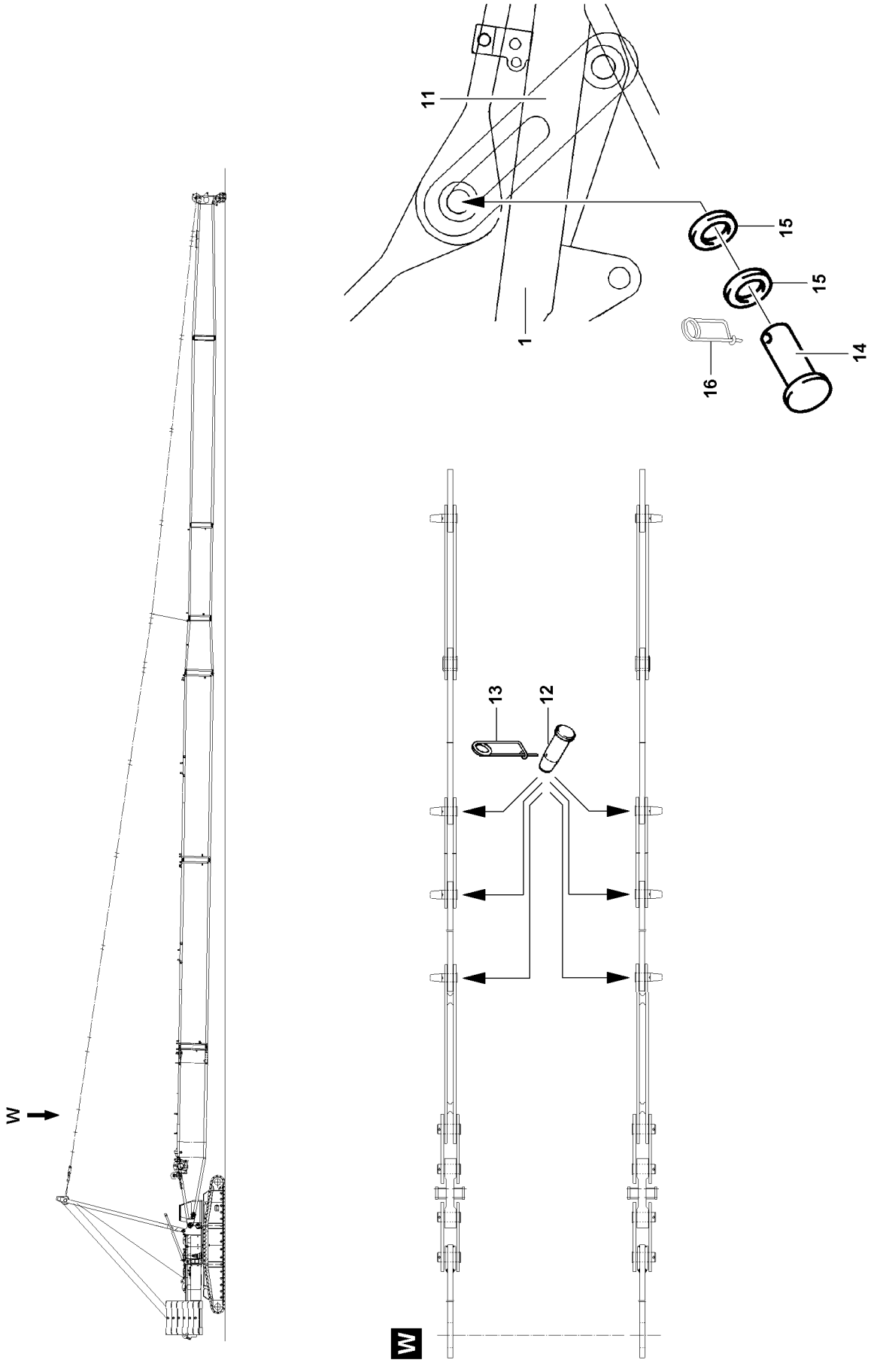
Assemble the Sw-boom to the required length and either pin and secure to the S-intermediate section **20** or the SW-reducer section **30** “top” and “bottom”.

▶ Insert the pin **19** from the inside to the outside and secure with spring retainer **21**.

▶ When the Sw-boom is assembled to the desired length:
Lift the S-pivot section **1** with the SA-bracket until the pin bores on the “bottom” align at point **Z**, fig. **5**.

▶ Read the actual force of the test point 1 (MS1) on the LICCON monitor and record it.

▶ Insert the pin **19** on point **Z** from the inside to the outside and secure with spring retainer **21**.



B105904

2.3.2 Assembling guy rods

WARNING
Inspection and maintenance on guy rods not carried out!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also chapter 8.15.

Note
▶ The guy rods must be installed and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

Ensure that the following prerequisite is met:
– The Sw-boom is pinned and secured to the S-pivot section.

▶ Relieve the guy rods between the SA-bracket and the S-pivot section: lower the SA-bracket somewhat to the front.

Result:
– The guy rods between the SA-bracket and the S-pivot section are relieved.

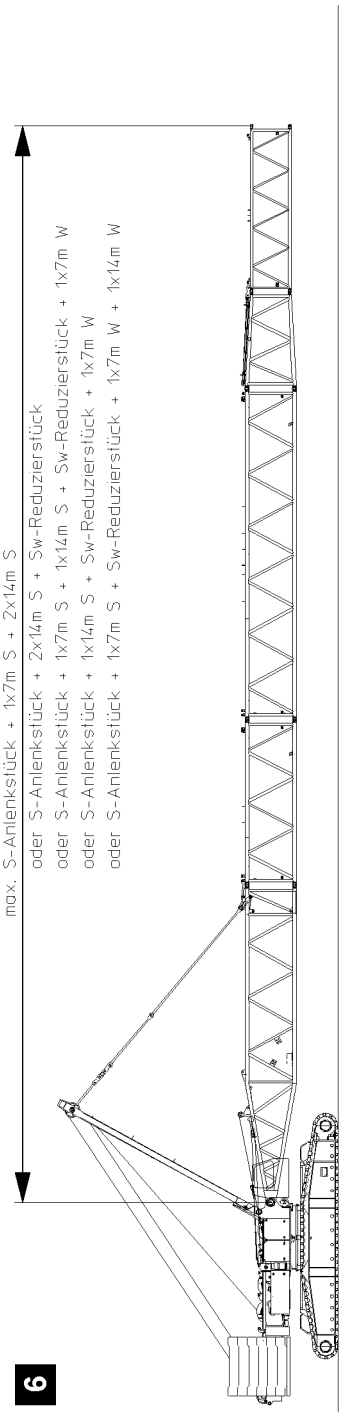
The guy rods are placed and secured for transport on the corresponding intermediate sections. Before assembly, the transport retainers must be released.
▶ Release the transport retainers on the guy rods.

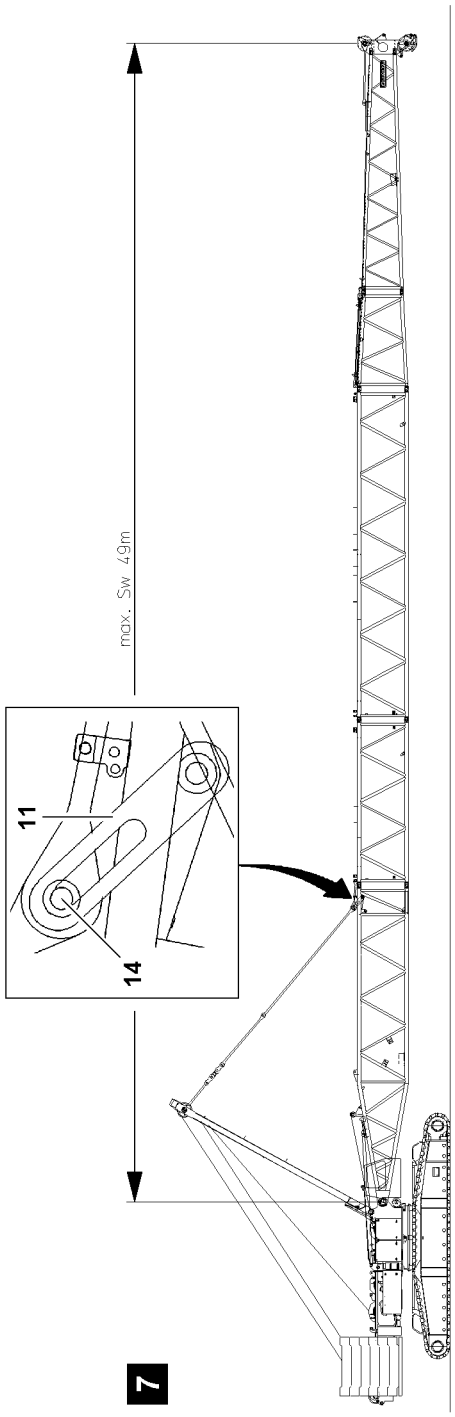
NOTICE
Danger of property damage!
▶ Always insert the pins of the guy rods from the “inside” to the “outside”.

▶ Pin and secure the guy rods for all intermediate sections.
▶ Pin the guy rods: Insert the pins **12** from the “inside” to the “outside”.
▶ Secure the pin **12** with spring retainer **13**.

WARNING
The boom can suddenly fold down!
If the pins **14** on the assembly bracket **11** are unpinned, then the boom can fold down!
Personnel can be severely injured or killed!
▶ Unpin the pins **14** on the assembly brackets **11** only when it is ensured that the intermediate sections are supported with suitable materials or if they are held by an auxiliary crane.

▶ When all guy rods on the boom system are pinned:
Release and unpin the pin **14** on the hollow axle of the assembly bracket **11**.
▶ Actuate winch IV until the guy rods are tensioned between the SA-bracket and the W-end section.


max. S-Anlenkstück + 1x7m S + 2x14m S
oder S-Anlenkstück + 2x14m S + Sw-Reduzierstück
oder S-Anlenkstück + 1x7m S + 1x14m S + Sw-Reduzierstück + 1x7m W
oder S-Anlenkstück + 1x14m S + Sw-Reduzierstück + 1x7m W
oder S-Anlenkstück + 1x7m S + Sw-Reduzierstück + 1x7m W + 1x14m W
6


max. Sw 49m
11
14
7

B105905

2.4 Flying assembly of the intermediate sections

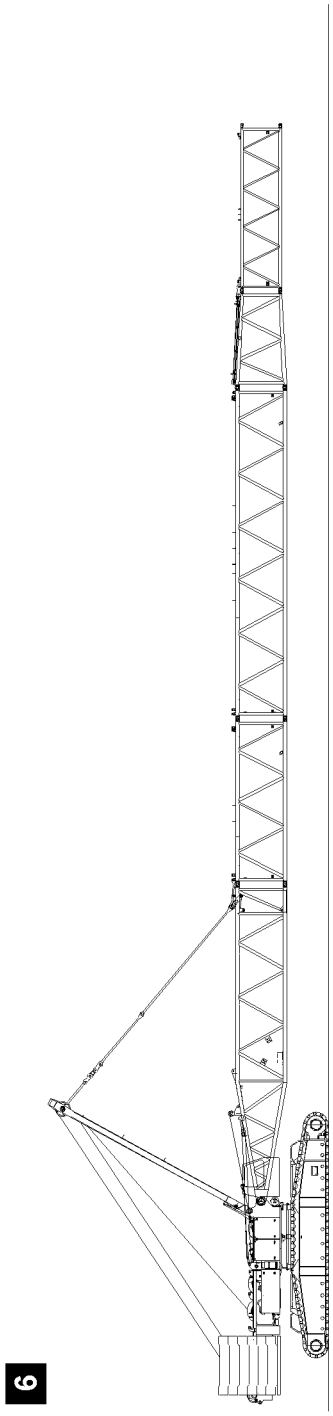
If spatial prerequisites on the job site are limited for the assembly of the boom, or if they are limited by buildings or similar, then the boom can be installed in “flying” mode.

WARNING
General danger notes!
- ▶ Support the boom during assembly / disassembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly! Please refer to chapter 8.15.

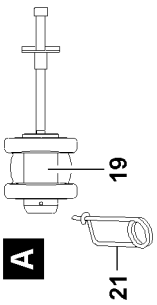
WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ For the “flying” boom assembly, the maximum permissible total force on the test point **MS1** may **not** be exceeded. The “actual force” is shown on LICCON monitor 1.
- ▶ The following system lengths should only be mounted “flying”, if it has been ensured that the turntable is fitted with a counterweight of at least 55 t and the crawler center section is fitted with a central ballast of 43 t!
- ▶ The maximum permissible system lengths may not be exceeded, refer to the following table!

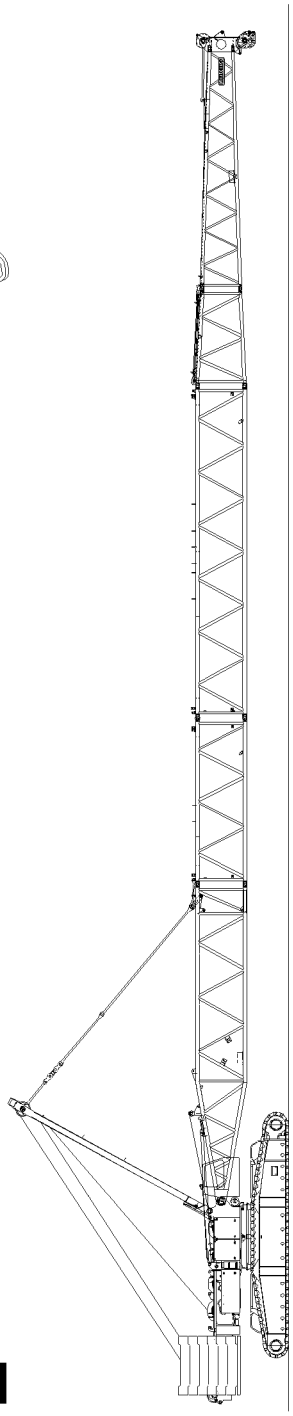
	Maximum permissible system lengths for a maximum total force MS1 100 t					
	49.0 m	48.4 m	45.5 m	45.5 m	38.5 m	**45.5 m**
	DB_{min} 1) 55 t / ZB_{min} 2) 43 t					
S-pivot section 13.4 m	1x	1x	1x	1x	1x	1x
S-intermediate section 7.0 m	1x	1x	—	1x	—	1x
S-intermediate section 14.0 m	—	2x	2x	1x	1x	—
SW-reducer section 4.1 m	1x	—	1x	1x	1x	1x
W-intermediate section 7.0 m	—	—	—	1x	1x	1x
W-intermediate section 14.0 m	1x	—	—	—	—	1x
W-end section 10.5 m	1x	—	—	—	—	—

1) This counterweight **must** be at least installed on the turntable for “flying assembly”.
2) This central ballast **must** be at least installed on the crawler center section for “flying assembly”.



6





7

B105906

2.4.1 “Flying” installation of the intermediate section to the S-pivot section

For “flying” assembly of the intermediate sections, they can be installed individually or as preassembled boom unit on the S-pivot section.

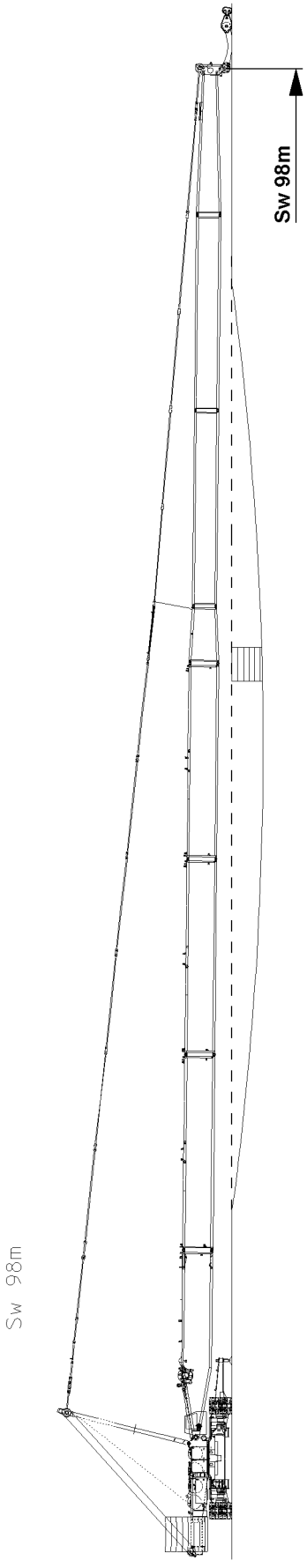
WARNING
Impermissible boom lengths!
If impermissible boom lengths are installed on the crane, significant property damage can occur on the crane!
Personnel can be severely injured or killed!
- ▶ The maximum permissible boom lengths for the “flying assembly” may not be exceeded!
- ▶ The data in the erection and take down charts as well as the load charts must be observed!

Note
- ▶ For weights of intermediate sections with placed guy rods, see chapter 5.03!

Make sure that the following prerequisites are met:
- – The S-pivot section is pinned and secured on the turntable.
- – The S-pivot section is horizontally tensioned, fig. **1**.
- – A minimum of 55 t counterweight is placed on the turntable.
- – A minimum of 43 t central ballast is installed on the crawler center section.
- – An auxiliary crane is available.

WARNING
Falling components!
Due to assembly / disassembly of unsecured or unsupported booms, components can fall down!
Personnel can be severely injured or killed!
- ▶ Never work under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure!
- ▶ All pins must be secured in the bearing points as well as in the receptacles!

- ▶ Attach intermediate sections or preassembled boom unit on the auxiliary crane.
- ▶ Lift the intermediate sections or preassembled boom unit with the auxiliary crane and position on the S-pivot section.
- ▶ When the pin points between the S-pivot section **1** and S-intermediate section **20 or** the SW-reducer section **30 or** pre-assembled boom unit align “top” and “bottom”:
  Insert the pin **19** on “top” and “bottom” from the inside to the outside and secure with spring retainer **21**.
- ▶ When the pins are properly pinned and secured at the “top” and “bottom” between the S-pivot section **20** and the S-intermediate section **20 or** SW-reducer section **30 or** the preassembled boom unit:
  Remove the auxiliary crane.



B106311

2.4.2 Mounting the SwD-boom combination with supporting base

In order to mount the Sw-boom combination to the crane when on **uneven ground** without damaging the crane, the Sw-boom combination must be supported on suitable materials capable of bearing the load.

Note

▶ Use a supporting base for boom lengths greater than 98 m!

Make sure that the following prerequisites are met:

– The crane is in assembly position.

The S-boom combination - comprising an S-pivot section and S-intermediate sections - should be preassembled in a suitable location. The pre-assembled S-boom combination must be swung towards the turntable using an auxiliary crane and pinned / secured in position.

▶ Pre-assembled S-boom combination.

▶ Swing the preassembled S-boom combination with the auxiliary crane to the turntable.

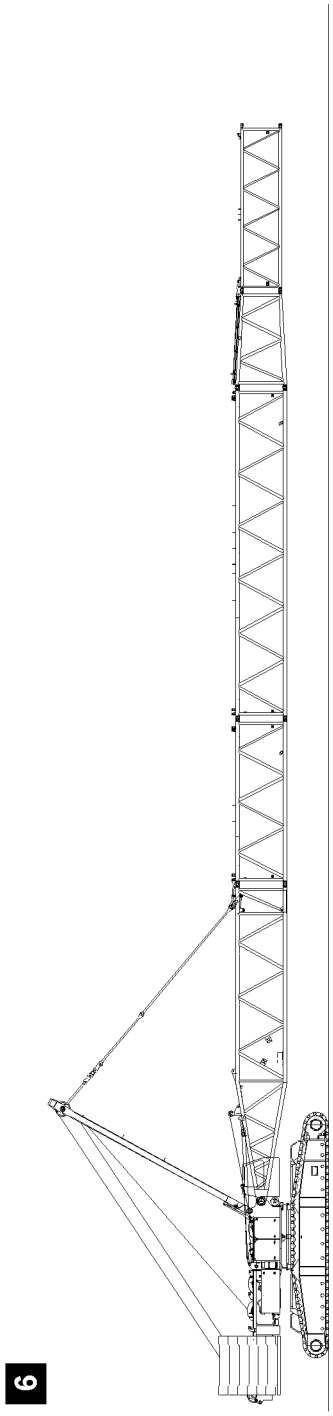
▶ Pin and secure the S-boom combination to the S-pivot section on the turntable.

Note

▶ The boom combination must be supported underneath near the reducer section until it is raised to the height of the alignment level **A**!

▶ Place the S-boom combination on the support base **U** or hang from the auxiliary crane.

▶ Fully pre-assemble the W-boom combination including the W-end section and attach it to the S-boom combination using an auxiliary crane, or individually attach, pin and secure each W-intermediate section and W-end section using the auxiliary crane.



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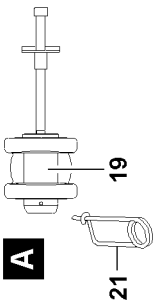
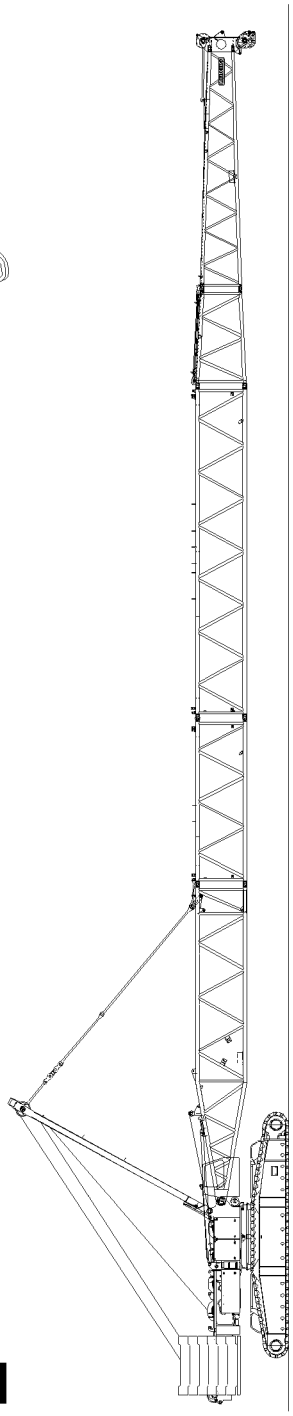




7

B105906

2.4.3 Assembling guy rods

WARNING
Inspection and maintenance on guy rods not carried out!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also chapter 8.15.

Note
▶ The guy rods must be installed and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

Make sure that the following prerequisites are met:
– The S-intermediate sections **or** the SW-reducer section **or** the preassembled unit are pinned and secured to the S-pivot section.
– The S-intermediate sections **or** the SW-reducer section **or** the preassembled unit are supported by suitable materials or secured by the auxiliary crane.

▶ Relieve the guy rods: lower the SA-bracket somewhat to the front.

Result:
– The guy rods between the SA-bracket and the S-pivot section are relieved.

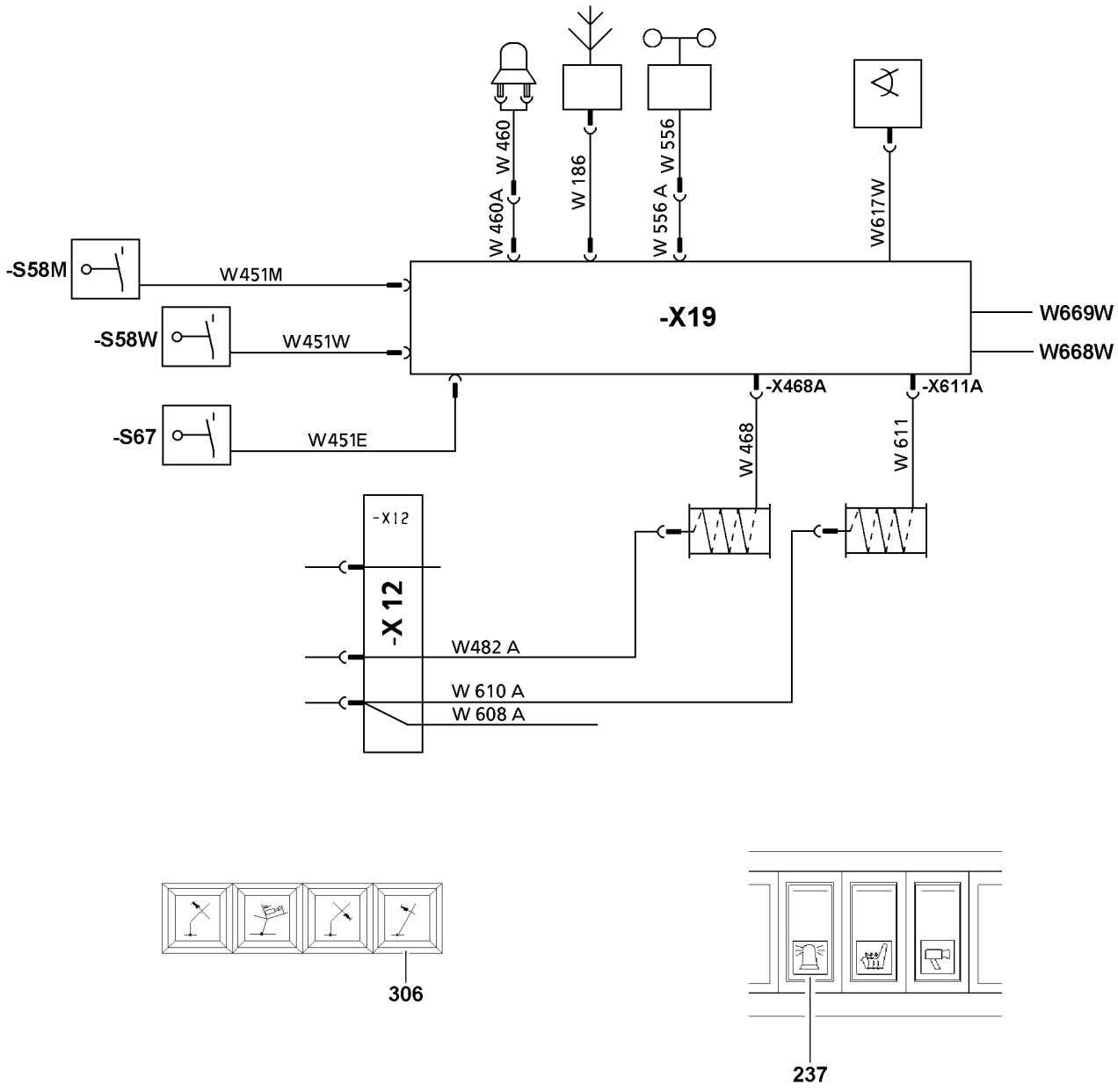
The guy rods are placed and secured for transport on the corresponding intermediate sections. Before assembly, the transport retainers must be released.
▶ Release the transport retainers on the guy rods.

NOTICE
Danger of property damage!
▶ Always insert the pins of the guy rods from the “inside” to the “outside”.

▶ Pin and secure the guy rods for all lattice sections.

WARNING
The boom can suddenly fold down!
If the pins **14** on the assembly bracket **11** are unpinned, then the boom can fold down!
Personnel can be severely injured or killed!
▶ Unpin the pins **14** on the assembly brackets **11** only when it is ensured that the intermediate sections are supported with suitable materials or if they are held by an auxiliary crane.

▶ When all guy rods on the boom system are pinned:
Release and unpin the pin **14** on the hollow axle of the assembly bracket **11**.
▶ Actuate winch IV until the guy rods are tensioned between the SA-bracket and the W-end section.


W 460
W 460A
W 186
W 556
W 556 A
W617W
-S58M
W451M
-S58W
W451W
-S67
W451E
-X19
W669W
W668W
-X468A
-X611A
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A
306
237

B105902

2.5 Establishing the electrical connections

Ensure that the following prerequisite is met:

– The Sw-boom is fully assembled.

Establish the electrical connection from the cable drums to the connector box **-X19**.

▶ Insert the cable plug **W468** into the connector box **-X19**.

▶ Insert the cable plug **W611** into the connector box **-X19**.

Establish the electrical connection from the connector box **-X12** on the turntable to the cable drums in the S-pivot section.

▶ Insert the cable plug **W482A** into the connector box **-X12**.

▶ Insert the cable plug **W610A** into the connector box **-X12**.

Establish the electrical connection from the connector box **-X19** to the airplane warning light*.

▶ Insert the cable plug **W460** into the socket **W460A** on the wiring harness **W460A**.

▶ Insert the cable plug **W460A** into the connector box **-X19**.

Establish the electrical connection from the connector box **-X19** to the wind speed sensor*.

▶ Insert the cable plug **W556** into the socket **W556A** on the wiring harness **W556A**.

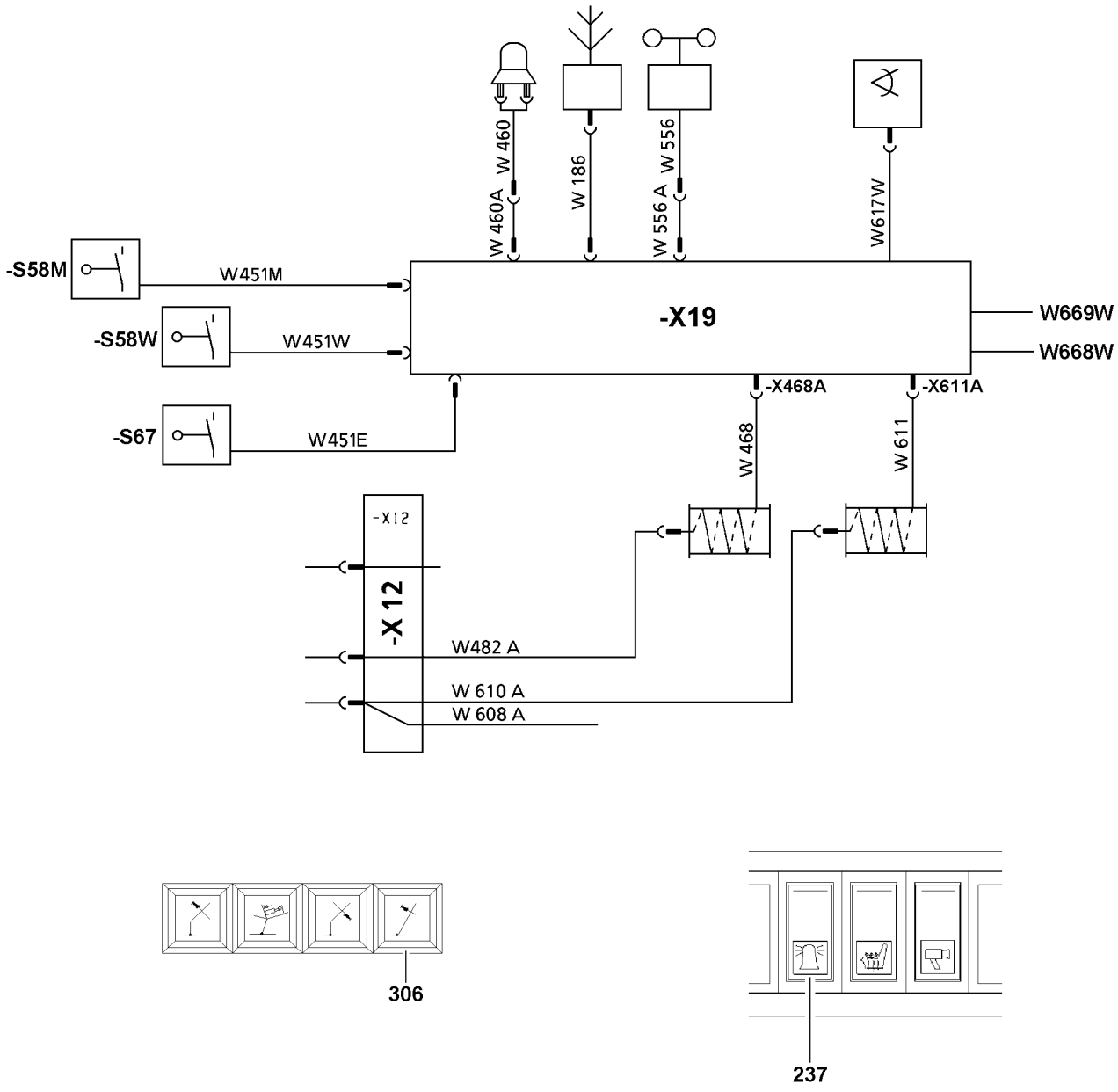
▶ Insert the cable plug **W556A** into the connector box **-X19**.

Establish the electrical connection from the connector box **-X19** to the hoist top limit switches.

▶ Insert the cable plug **W451M** into the connector box **-X19**.

▶ Insert the cable plug **W451W** into the connector box **-X19**.

▶ Insert the cable plug **W451E** (boom nose) into the connector box **-X19**.


W 460
W 460A
W 186
W 556
W 556 A
W617W
-S58M
W451M
-S58W
W451W
-S67
W451E
-X19
W669W
W668W
-X468A
-X611A
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A
306
237

B105902

2.6 Function check

Note

▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact LIEBHERR Service.

WARNING

Risk of fatal injury if safety devices are not functioning!

▶ Crane operation with non-functioning safety devices is **prohibited**!

Make sure that the following prerequisites are met:

– All electrical connections have been made.
– The crane engine is running.
– The appropriate operating mode is set.
– The actuator levers of the limit switches have been checked for easy movement and are lubricated.

2.6.1 Winding speed sensor*

▶ Test the movement and the function of the wind speed sensor.

2.6.2 Airplane warning light*

▶ Turn on the airplane warning light on with the switch **237**.

▶ Check the function visually.

2.6.3 Hoist limit switch

▶ Actuate the limit switch on the pulley head manually.

Result:

– The hoist winch turns off in upward movement.
– The hoist top icon on the LICCON monitor 0 blinks.

2.6.4 Limit switch boom “steepest position”

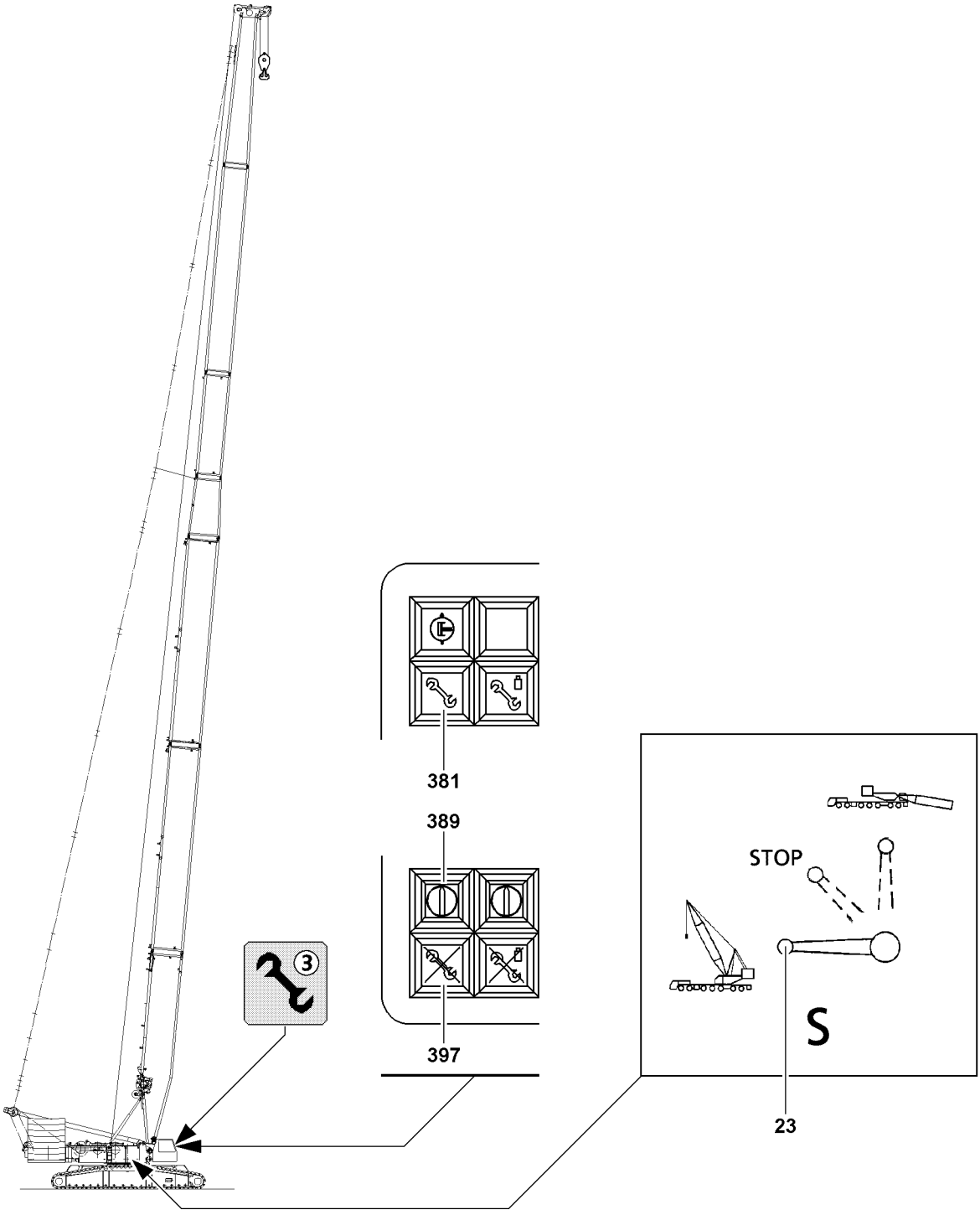
Note

▶ The limit switch functions have to be checked individually before erection!

▶ Manually actuate the individual limit switches on the S-relapse cylinders.

Result:

– Winch IV (control winch) turns off in upward movement.
– The indicator light **306** lights up.
– An acoustic signal sounds.



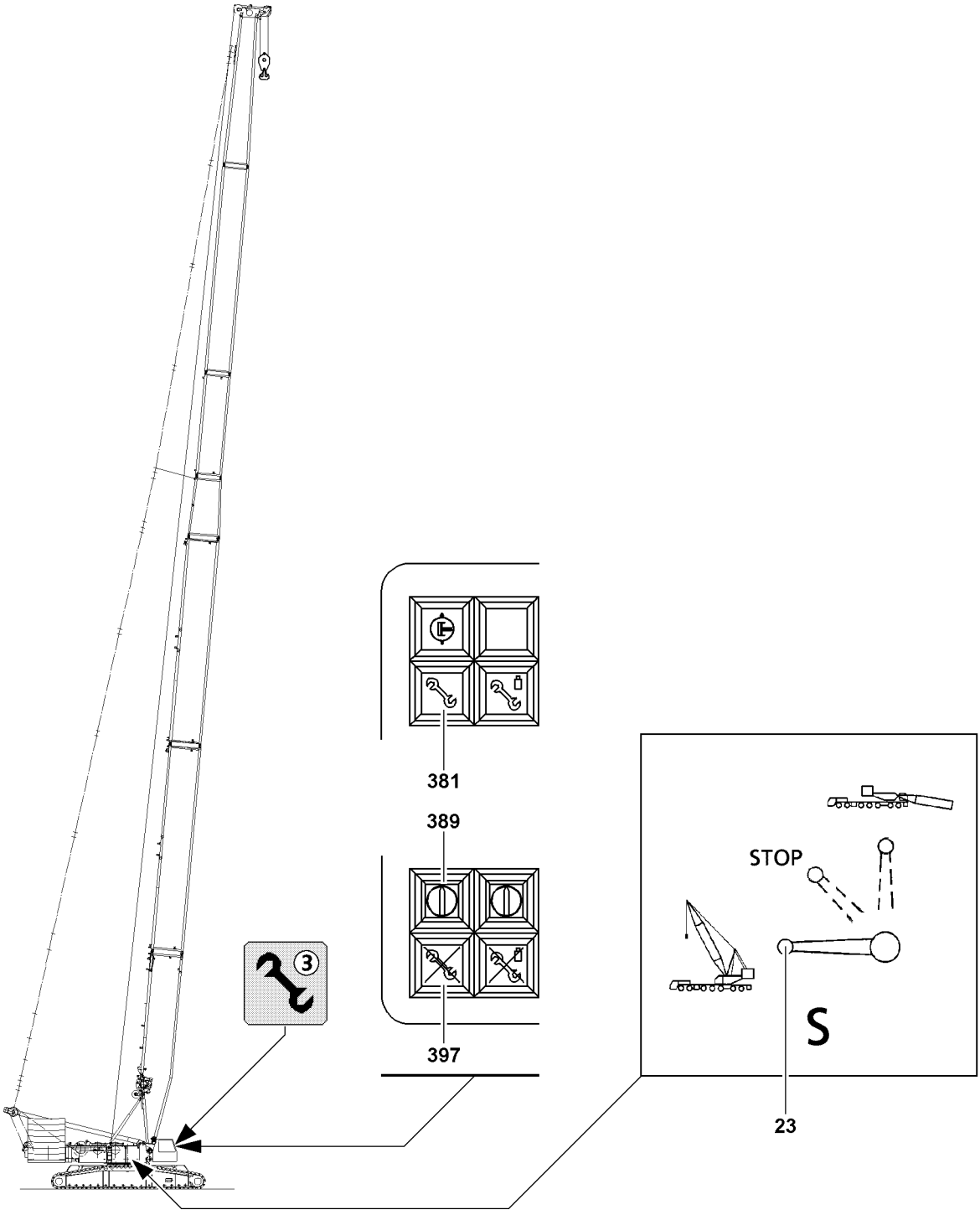
B105903

2.7 Erecting the boom

DANGER
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

Make sure that the following prerequisites are met:
- – The crane is aligned in horizontal direction.
- – All electrical connections have been made.
- – All limit switches are functioning.
- – The counterweight has been attached to the turntable according to the load chart.
- – All pin connections have been secured.
- – The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- – There are no loose parts on the boom.
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The LICCON overload protection settings have been compared with the actual crane configuration.
- – No personnel is within the danger zone.
- – The assembly key button **389** is actuated.
- – The indicator light **381** “Assembly” lights up.
- – The Assembly icon **3** on the LICCON monitor 0 lights up.

DANGER
The crane can topple over!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Do not allow slack cable to build up on the control winch!
- ▶ The ball cock cabinet must be locked! Always pull the key and hand it to an authorized person!



B105903

2.7.1 Extending the S-relapse cylinder

WARNING
Risk of fatal injury!
If the S-relapse cylinders are not extended before erecting the Sw-boom, then the Sw-boom can fall backward during crane operation.
Personnel can be severely injured or killed!
- ▶ The S-relapse cylinders must be extended before erection of the Sw-boom.
- ▶ The ball cock must be secured during crane operation to prevent unintended actuation.

The piston rod on the S-relapse cylinder must be extended by actuating the ball cock **23**.

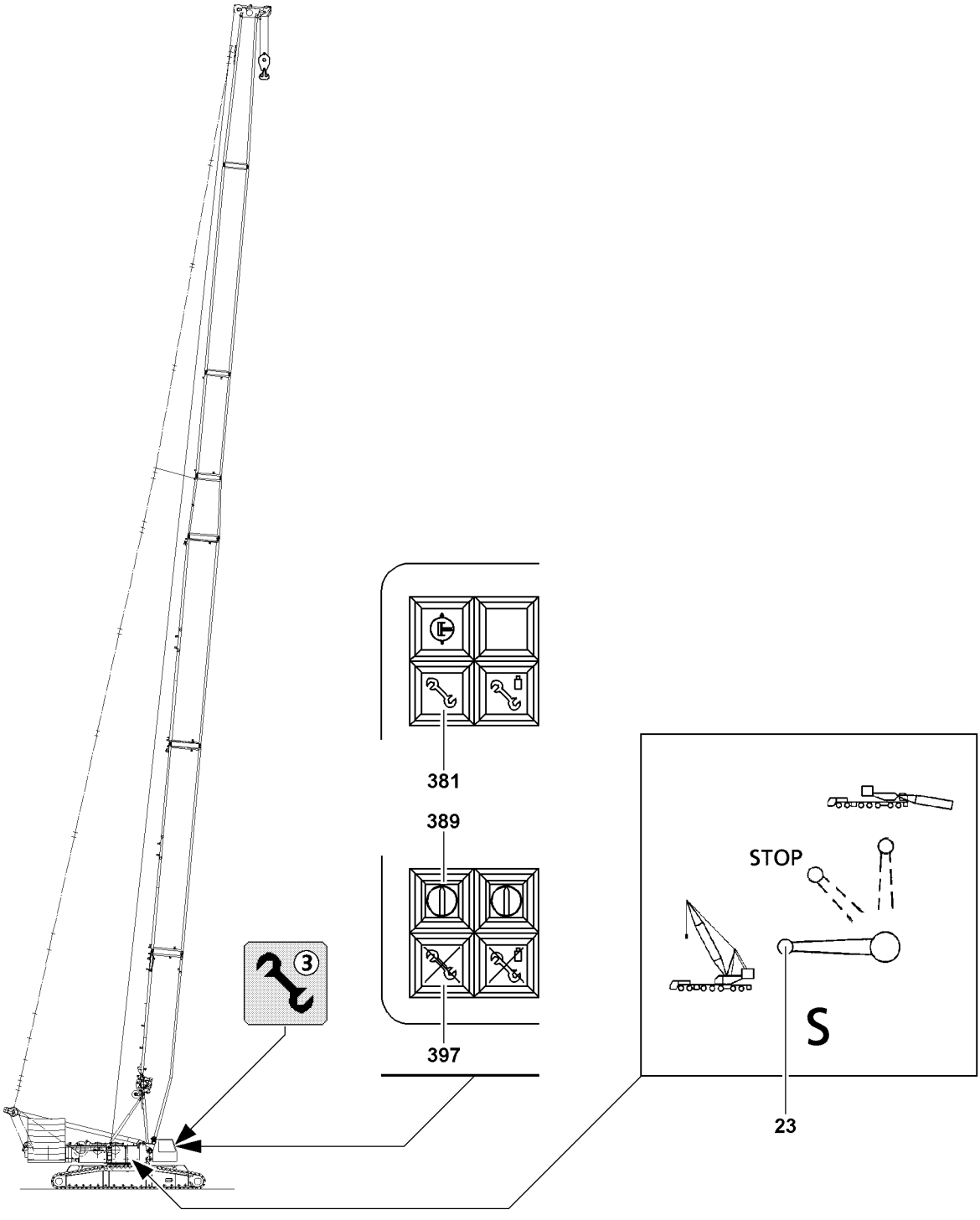
Ball cock positions	
horizontal	Crane operation, extend the piston rod
vertical	Assembly, retract the piston rod
45°	STOP (The piston rod cannot be retracted / extended)

Ensure that the following prerequisite is met:
– All hydraulic connections have been made.

▶ Move the ball cock **23** into horizontal position.

Result:
– The piston rod of the S-relapse cylinders extends.

Secure the ball cock **23** by closing and locking the cabinet doors to prevent unauthorized access.
- ▶ Close the cabinet door and pull the key.
- ▶ Hand the key to an authorized person.



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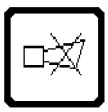
2.7.2 Erection procedure

DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane superstructure during erection procedure!
- ▶ Observe the data in the erection and take down charts!

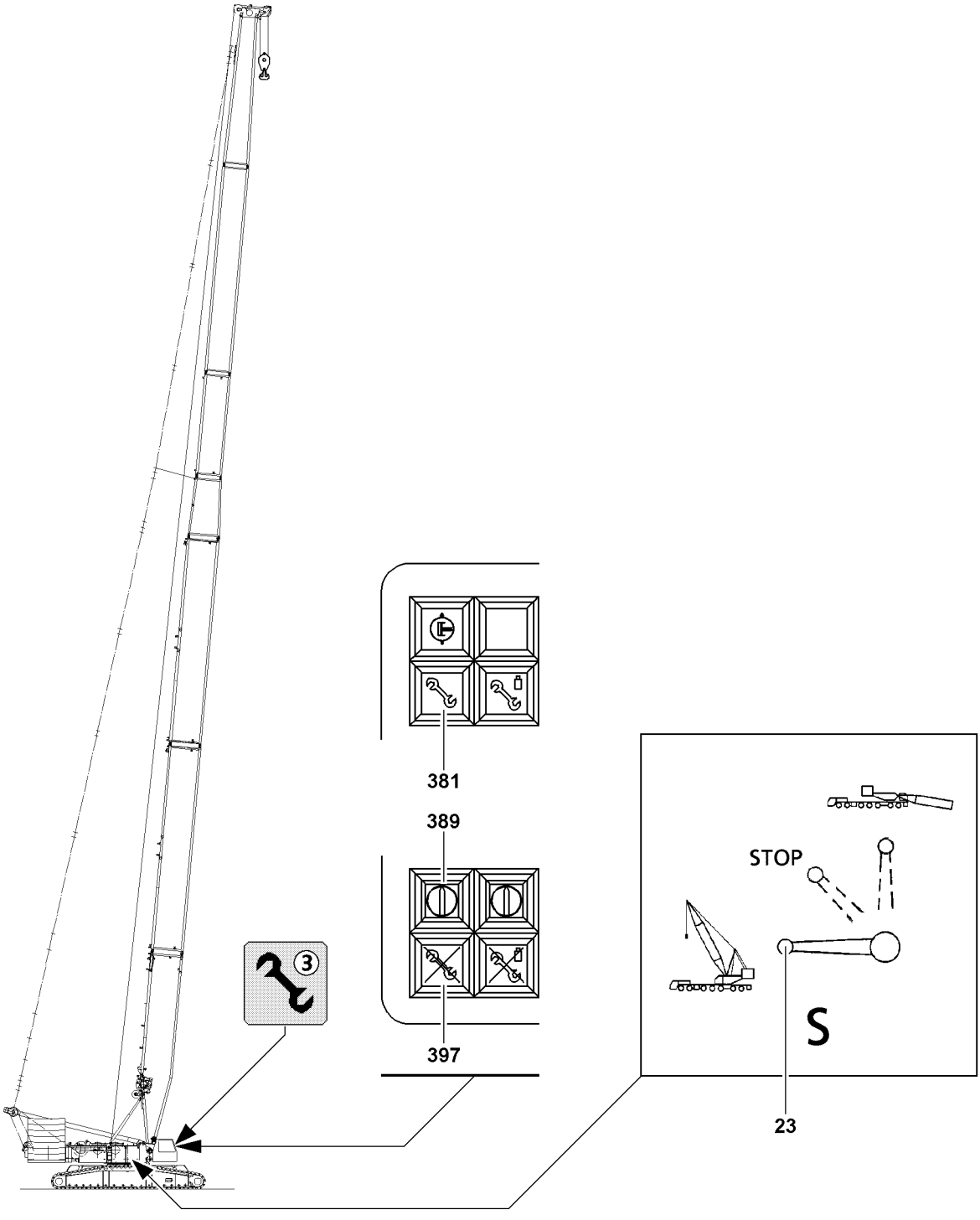
- ▶ Erect the boom until the end section lifts off the ground.
- ▶ Reeve in the hoist rope properly and secure on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.

WARNING
The crane can topple over!
- ▶ When the lowest operating position is reached, the assembly key button **389** must be turned off immediately.
- ▶ The assembly key button **389** bypasses the safety devices!
- ▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!

Note
- ▶ During the erection procedure - outside the operating area - the alarm functions listed in the chart are displayed as blinking on the crane operating screen.

Displays on the LICCON monitor during the erection procedure	
 *Icon: “STOP” blinks*	
 *Icon: “ERROR 150” blinks*	***Note:*** *For error description, see chapter 20.05.*
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

- ▶ Luff the boom up to the lowest operating position.



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Note

▶ If the lowest operating setting for the boom is achieved, the display turns off (see previous table), and on the symbol “Maximum load” instead of the display “???” a load value appears on “t”!

WARNING

The crane can topple over!

▶ When the lowest operating position of the boom is reached, turn off the assembly key button **389** immediately!

▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

▶ Turn the assembly keyed button **389** off: Press button **397**.

Result:

– Self retention of the assembly key button **389** is turned off.
– The LICCON overload protection is active.
– The indicator light **381** turns off.
– The assembly symbol **3** on the LICCON monitor turns off.
– The acoustical signal turns off.

3 Crane operation

3.1 Preparing for crane operation

Note

▶ Observe the notes in chapters 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

– The LICCON overload protection has been set according to the data in the load chart.
– The assembly key button **389** has been turned off by pressing the button **397**.

WARNING

The crane can topple over!

▶ Check the horizontal position of the crane before and during operation.

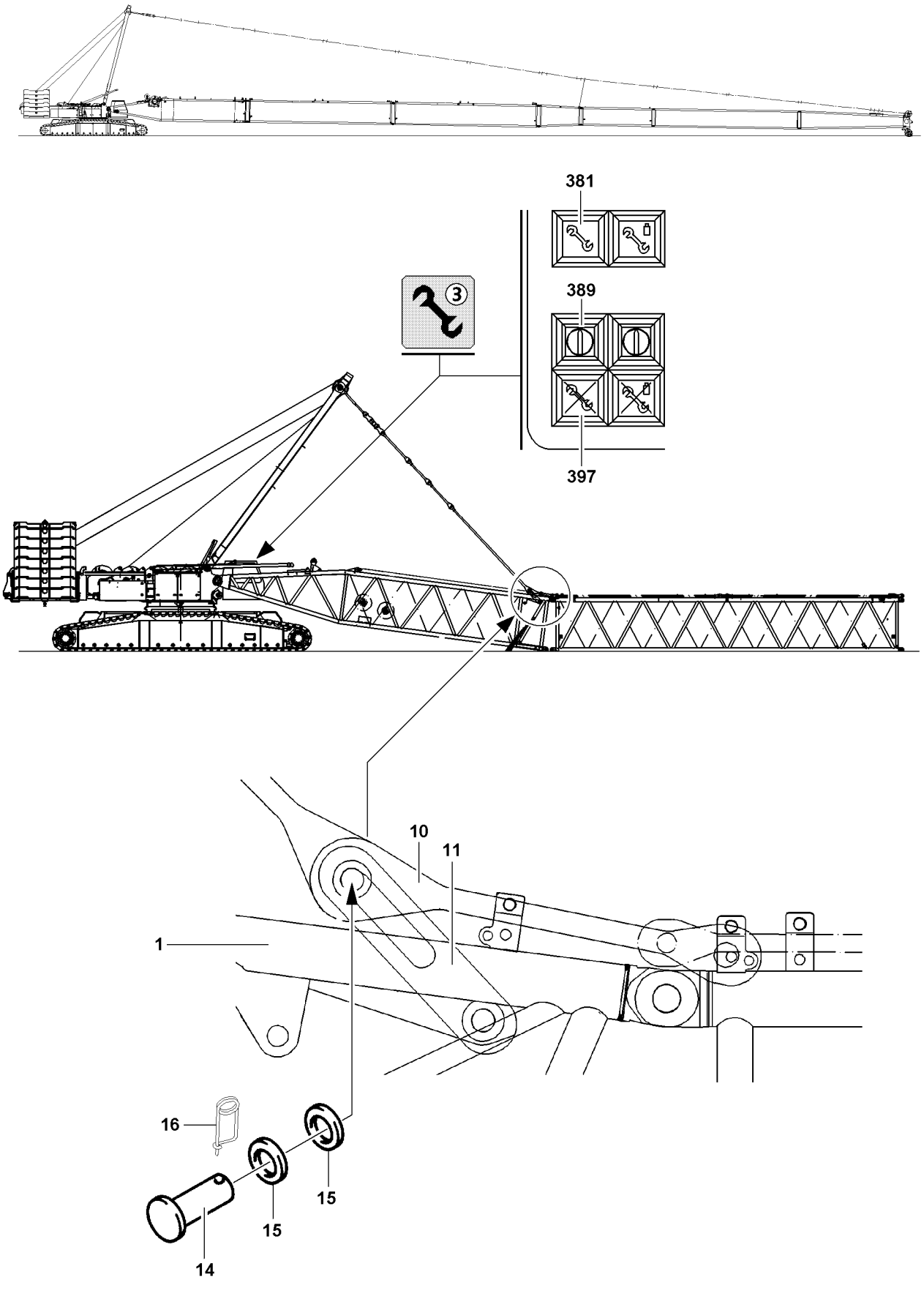
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation.

3.1.1 Checking the settings

▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.

▶ Check the hoist limit switch by running against the hoist limit switch weight.

▶ Check the function of the limit switches “boom steep” on the relapse cylinders.



B105907

4 Sw-disassembly

DANGER
When working aloft, there is a danger of falling!
During disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.
If the following notes are not observed, assembly personnel can fall down!
Personnel can be severely injured or killed!

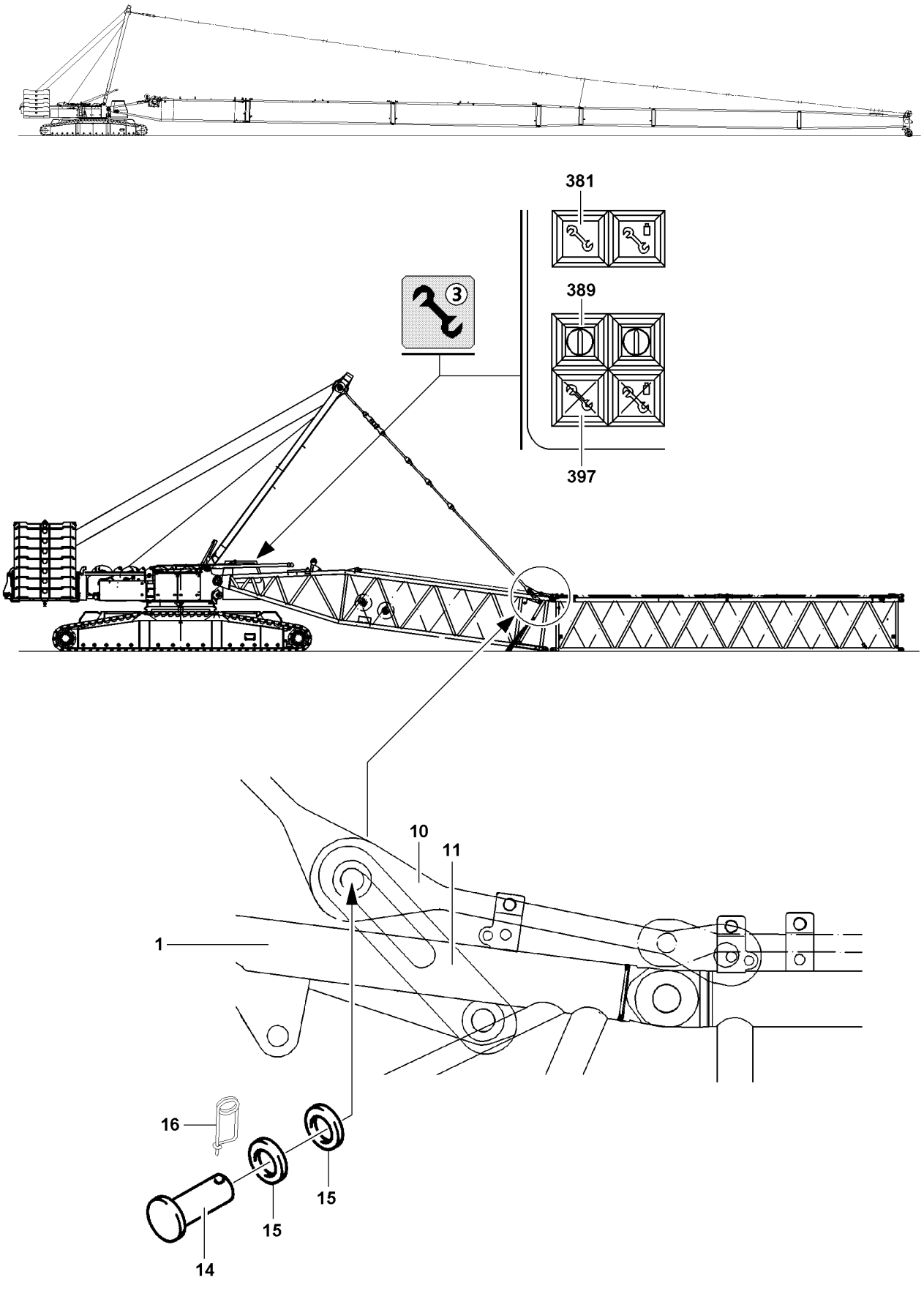
- All disassembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which disassembly must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- Before any disassembly and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also chapter 2.04.
- Travel or crane operation is prohibited during all disassembly, maintenance and inspection work!

DANGER
Risk of injury when disassembling booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- Never unpin the pins under unsecured or unsupported booms!
- Never unpin the connecting pins under unsecured or unsupported booms!
- Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- Safely secure the pins in the bearing points as well as receptacles!
- Do not lean the ladder against the component being disassembled!

DANGER
Falling components!
If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!

- Secure components before removal with the auxiliary crane to prevent them from falling!



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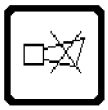
4.1 Taking the Sw-booms down

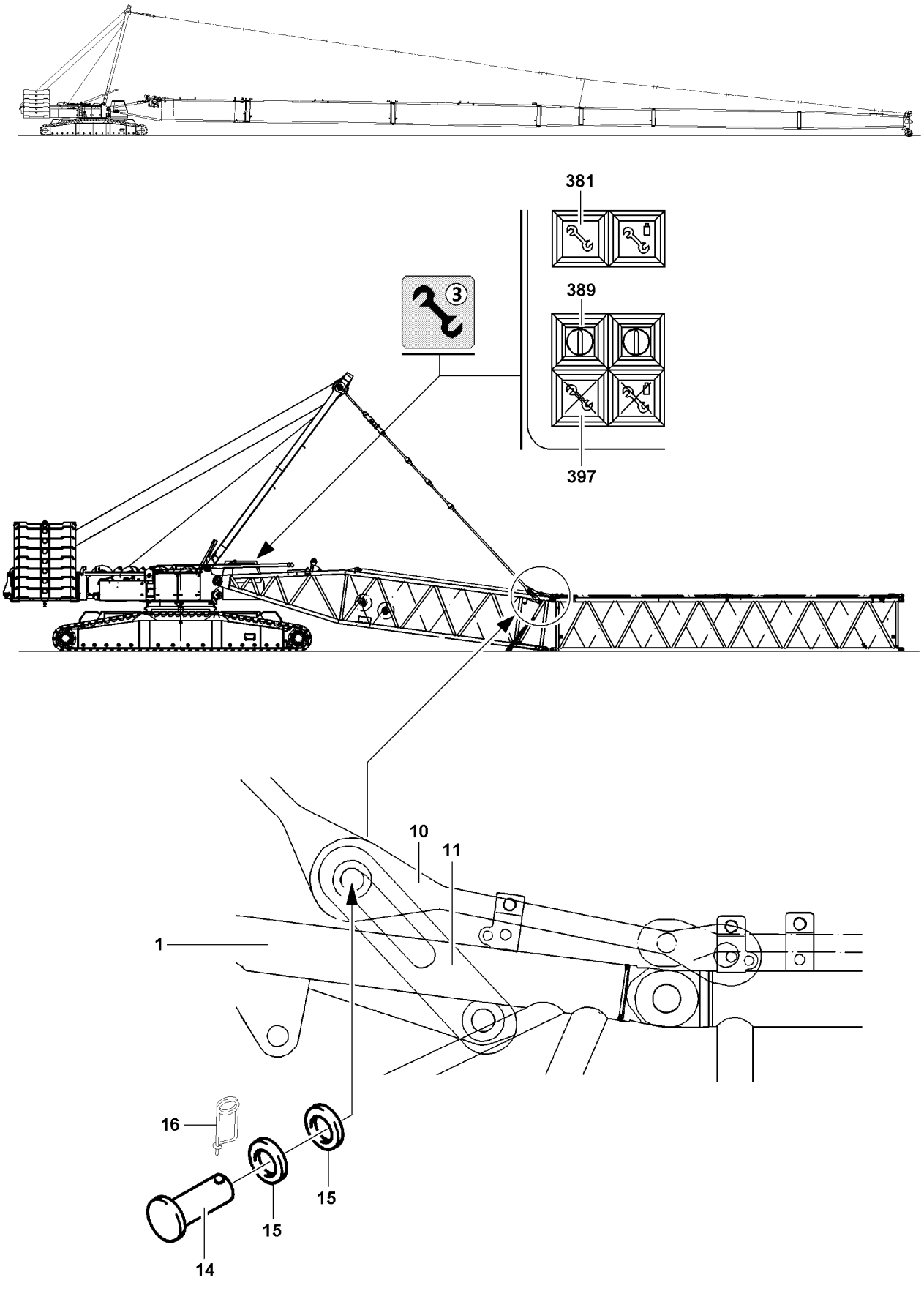
DANGER
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head. There is the danger that boom components may be significantly damaged!
- ▶ Upon taking down the boom system, always spool out the hoist winch at the same time!

When the lowest operating position is reached, the Luff down movement is turned off.
On the “Maximum load” icon, the load value disappears and the display “???” appears.
The following alarm functions become active:

Display on the LICCON-Monitor 0 after reaching the “lowest” operating position	
 *Icon: “STOP” blinks*	
 *Icon: “ERROR 150” blinks*	***Note:*** *For error description, see chapter 20.05.*
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

- ▶ Luff the Sw-boom down to the **lowest** operating position.



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WARNING
Risk of fatal injury in crane operation with enabled assembly key button.
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button **389** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is inactive.
- – The indicator light in the button **381** lights up.
- – The Assembly symbol **3** in the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red flashing beacon on the crane cab blinks.
- – The STOP icon on the LICCON monitor blinks.

▶ Spool the hoist winch out and luff the Sw-boom down further until the hook block touches the ground.

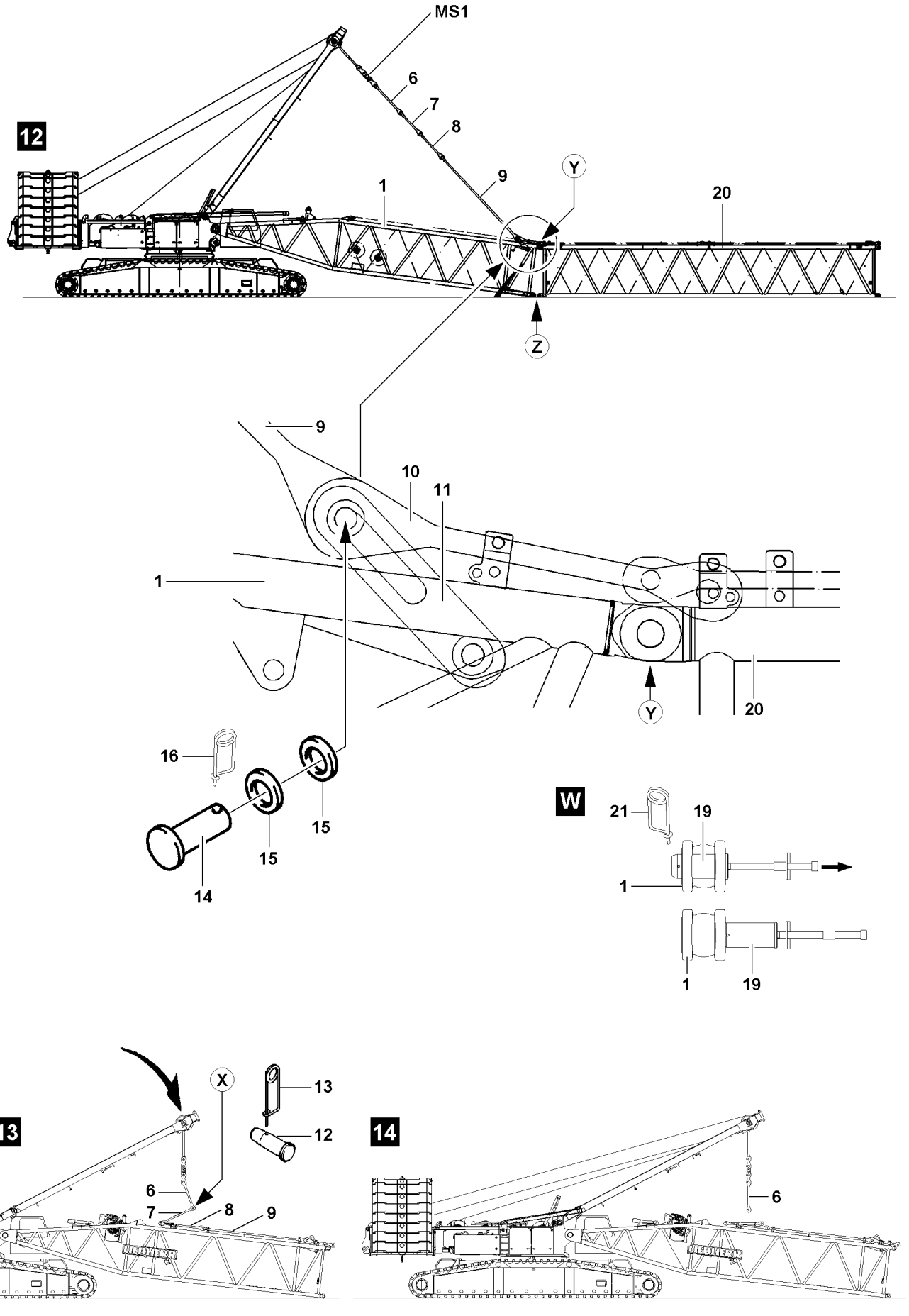
▶ Remove the hoist limit switch weight and unreeve the hook block.

▶ Luff the boom down until the boom head is laying on the support on the ground.

WARNING
Risk of accident!
- ▶ Make sure that no personnel is within the danger zone.

NOTICE
Overspooled winch!
If the rope is pulled under the winch when spooling up, the settings of the cam limit switch are not longer correct and there is an increased danger of accidents!
As a result, extensive adjustment work on the cam limit switch is required!
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch.
- ▶ Stop the winch in time, with sufficient rope reserve!
- ▶ Do not overspool the winch!

▶ Remove the hoist rope.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B105431

4.2 Dismantling the Sw-booms

WARNING
The boom can suddenly fold down!
If the following conditions are not met prior to dismantling the boom, the boom can fold down and fatally injure people!
- ▶ Support the Sw-boom during disassembly with suitable materials!
- ▶ Before unpinning the S-intermediate section **20 or** the SW-reducer section, the guy rods **9** on the assembly brackets **11** must be pinned and secured!
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!

- ▶ Relieve the guy rods by lowering the SA-bracket: spool out winch 4.
- ▶ Unpin the guy rods at the intermediate sections: Remove the spring retainer **13** and unpin the pin **12**.
- ▶ Place the guy rods on the intermediate sections and secure with transport retainers.
- ▶ Pin the guy rods **9** on the assembly brackets **11**: Insert the pin **14** and secure with spring retainer **16**, see figure **12**, point **Y**.

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ The maximum permissible total force on test point **MS1** may **not** be exceeded.
- ▶ Lifting the following boom length is permissible if the maximum permissible total force on test point 1 (MS1) is noted, observe the following charts!
- ▶ When disassembling the boom, ensure that the turntable is fitted with a counterweight of at least 55 t and the crawler center section is fitted with a central ballast of 43 t!

Note
- ▶ The ACTUAL force on test point **MS1** is shown on monitor 1.
- ▶ Tension the guy rods on the SA-bracket with the same force as during the assembly.
- ▶ For this, refer the ACTUAL force at the measuring point measured and recorded during the assembly (MS1).
- ▶ The pins can be pulled easier and the pins and lugs are therefore not damaged.

	Maximum permissible system lengths for a maximum total force MS1 100 t					
	49.0 m	48.4 m	45.5 m	45.5 m	38.5 m	**45.5 m**
	DB_{min} [1] 55 t / ZB_{min} [2] 43 t					
S-pivot section 13.4 m	1x	1x	1x	1x	1x	1x
S-intermediate section 7.0 m	1x	1x	—	1x	—	1x
S-intermediate section 14.0 m	—	2x	2x	1x	1x	—
SW-reducer section 4.1 m	1x	—	1x	1x	1x	1x

	Maximum permissible system lengths for a maximum total force MS1 100 t					
W-intermediate section 7.0 m	—	—	—	1x	1x	1x
W-intermediate section 14.0 m	1x	—	—	—	—	1x
W-end section 10.5 m	1x	—	—	—	—	—

1) This counterweight **must** be at least installed on the turntable for “flying assembly”.
2) This central ballast **must** be at least installed on the crawler center section for “flying assembly”.

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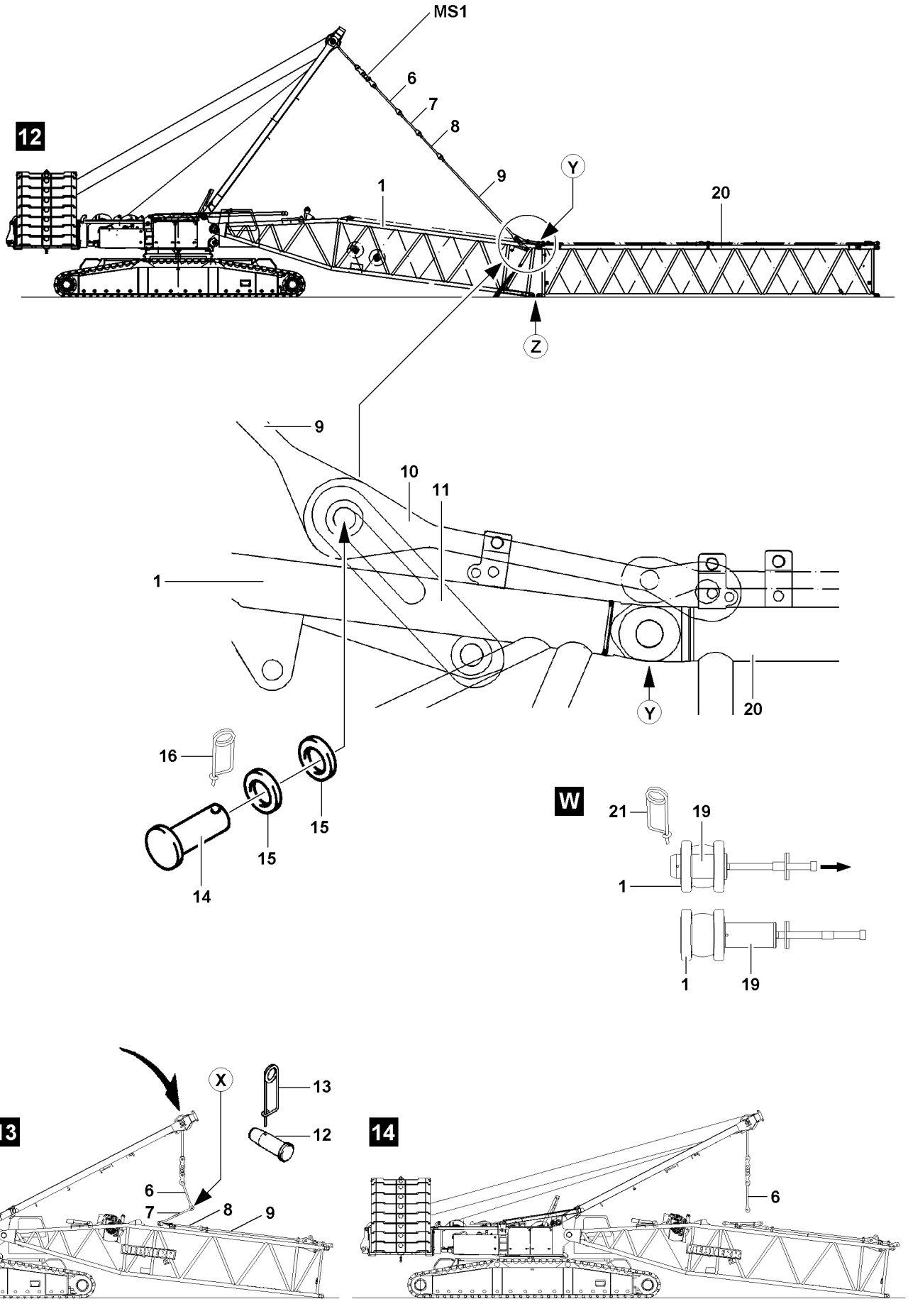
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B105431

Note

▶ Unpin the intermediate sections with the pin pulling device, see chapter 5.30.

NOTICE

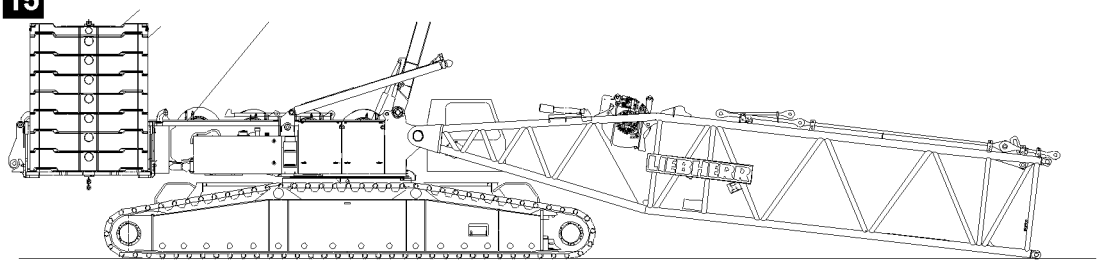
Danger of property damage!

If the maximum permissible total force is not observed when lifting the boom for disassembly, then the crane components can be severely damaged.

▶ Do not exceed the maximum permissible total force!

- ▶ Disconnect the electrical connections and store the cables carefully.
- ▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
- ▶ Lift the S-pivot section **1** up with the SA-bracket and unpin on both sides at point **Z**: Remove the spring retainer **21** and unpin the pin **19**.
- ▶ Lower the S-pivot section on the support.
- ▶ Relieve the guy rods by lowering the SA-bracket.
- ▶ Unpin the guy rods at the assembly brackets **11**: Remove the spring retainer **16** and unpin the pin **14**.
- ▶ Unpin and disassemble the intermediate sections.

15



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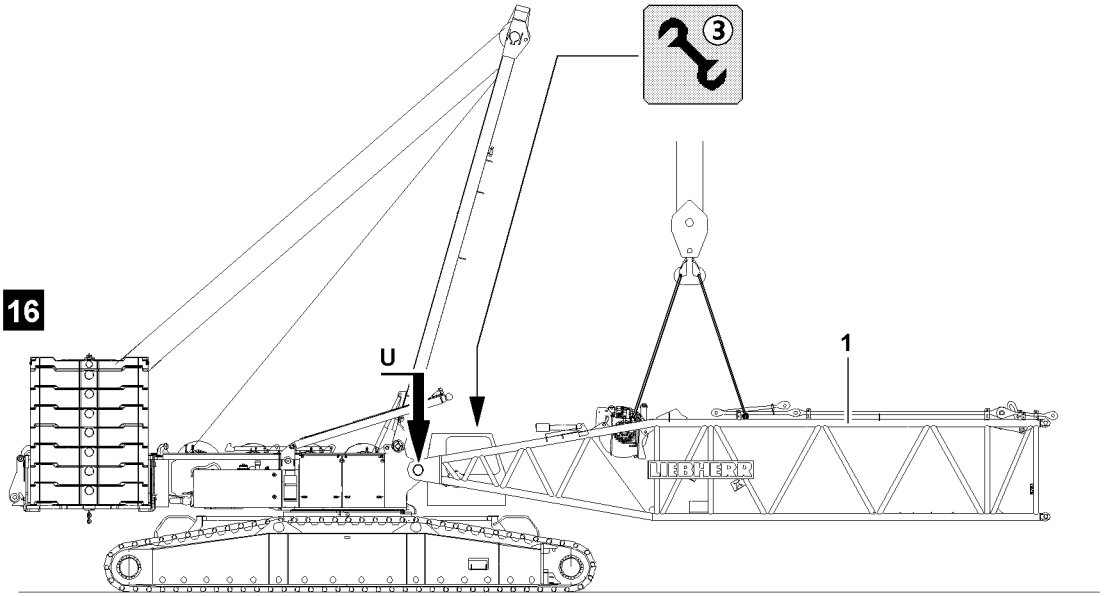

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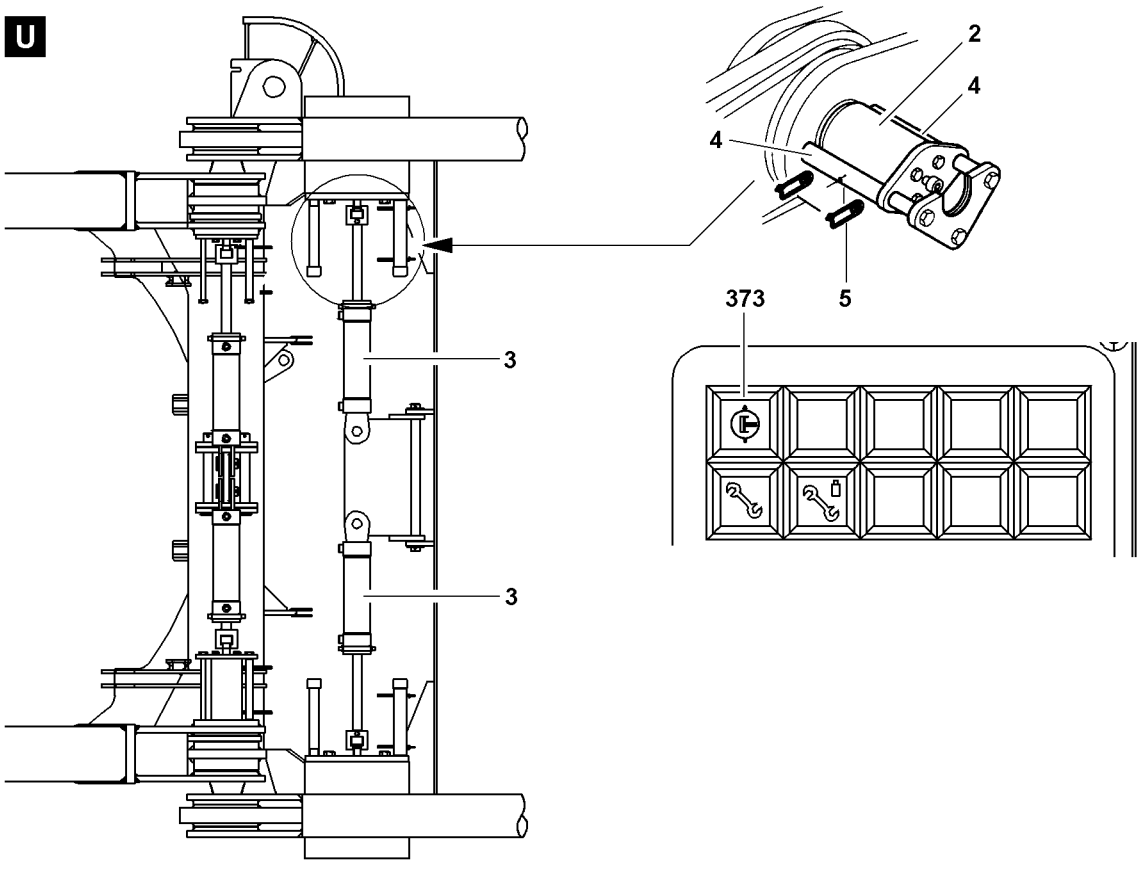


B105432

4.3 Unpinning the S-pivot section

WARNING
General danger notes!
- ▶ Support S-pivot section during disassembly with suitable materials!
- ▶ Insert and secure all pins after disassembly in the intended transport receptacles!

Ensure that the following prerequisite is met:
– The SA-bracket is erected to the point where the S-pivot section can be disassembled without obstructions.

- ▶ Attach the S-pivot section **1** on the auxiliary crane.
- ▶ Lift the S-pivot section **1** with the auxiliary crane to the horizontal.

Establish the hydraulic connection to the pin pulling device via two quick couplers.
Release and unpin the S-pivot section **1** on the turntable.
- ▶ Establish the hydraulic connection to the pin pulling device.
- ▶ Turn the pressure change over switch **373** on.

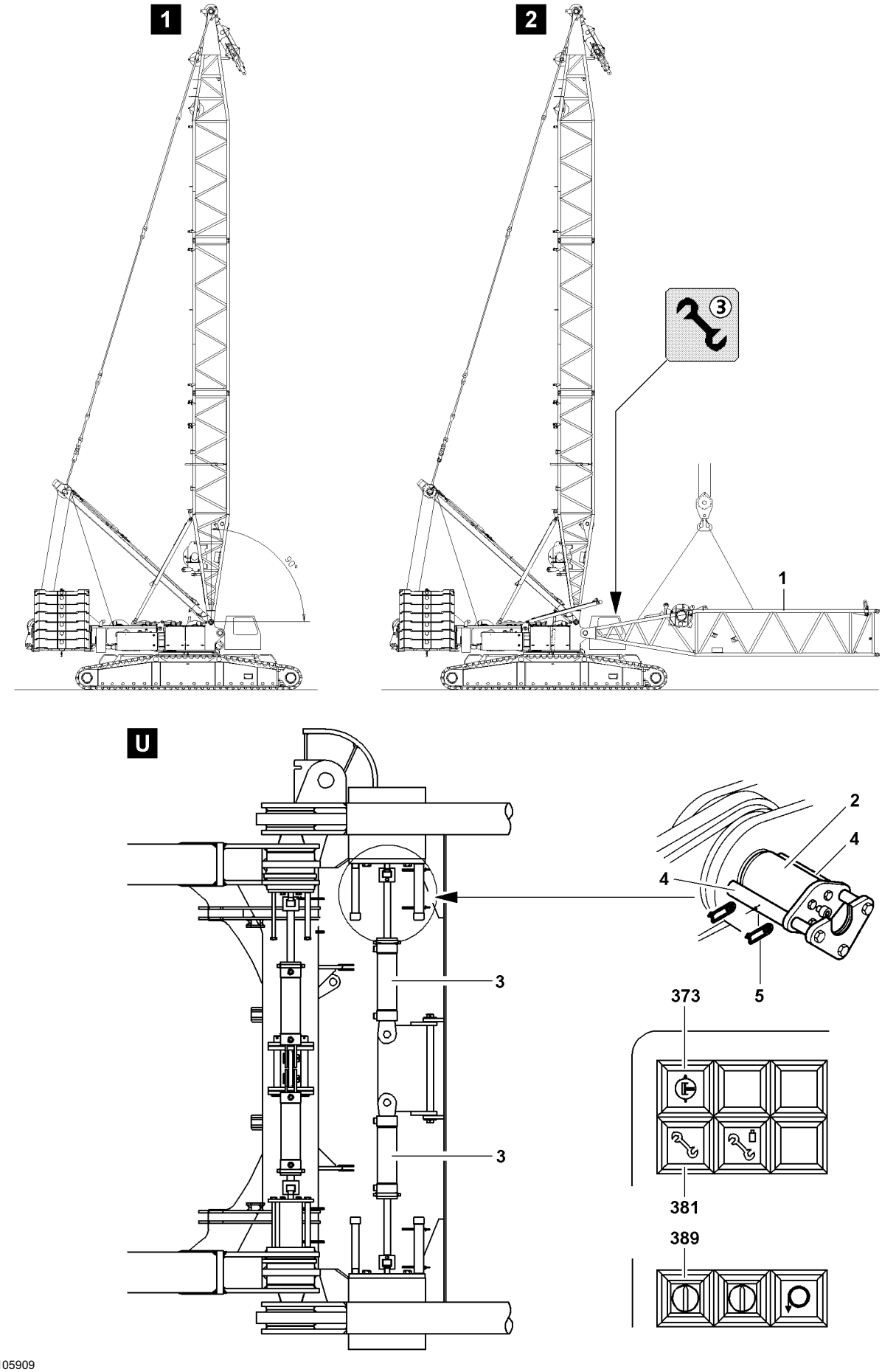
WARNING
Falling S-pivot section!
- ▶ Make sure that the S-pivot section is safely held by the auxiliary crane before unpinning the pins **2**.

- ▶ Remove the spring retainer **5** on the retaining plate **4** on the left and right.
- ▶ Remove the retaining plate **4** left and right.
- ▶ Unpin the connector pins **2** with the hydraulic pin pulling device **3**.
- ▶ Turn the pressure change over switch **373** off.

NOTICE
Danger of property damage on the turntable and on the S-pivot section!
- ▶ Slowly swing the S-pivot section out with the auxiliary crane and at low speed on the turntable.

- ▶ Place the S-pivot section with the auxiliary crane on the support on the ground.
- ▶ Remove the pin pulling device.
- ▶ Remove the auxiliary crane.

Note
- ▶ Place the SA-bracket on the turntable, see chapter 5.02!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B105909

1 SwD-boom combination

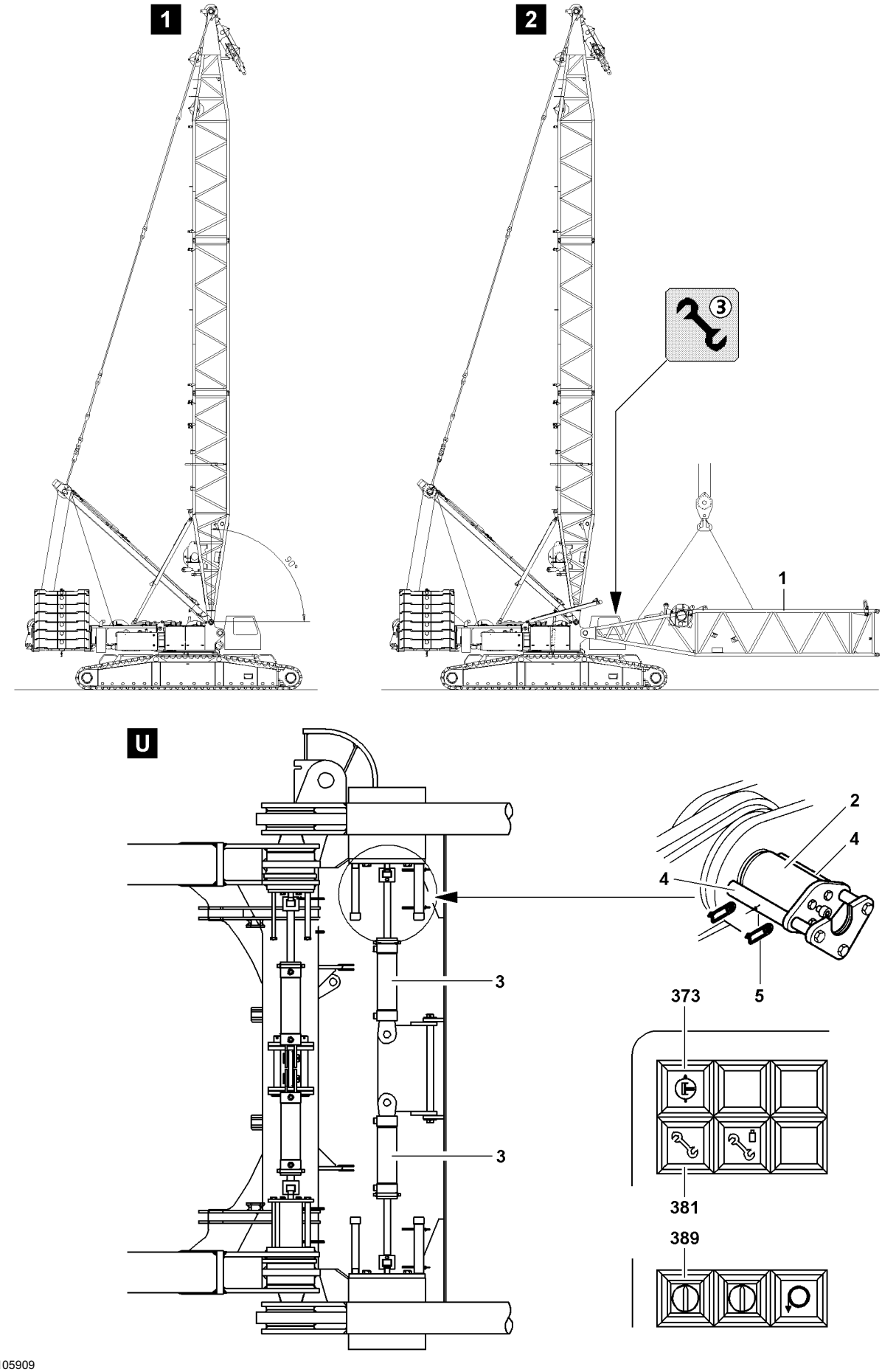
The **SwD** -boom combination comprises lattice sections from the S- and W-systems, as well as a SW-reducer section and W-end section. The boom system is supplemented with the derrick boom D, refer to chapter 5.05.

DANGER
When working aloft, there is a danger of falling!
During assembly / disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.
If the following notes are not observed, assembly personnel can fall down!
Personnel can be severely injured or killed!

- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ Before any assembly / disassembly work and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also chapter 2.04.
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

DANGER
Danger of accident at assembly / disassembly of booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!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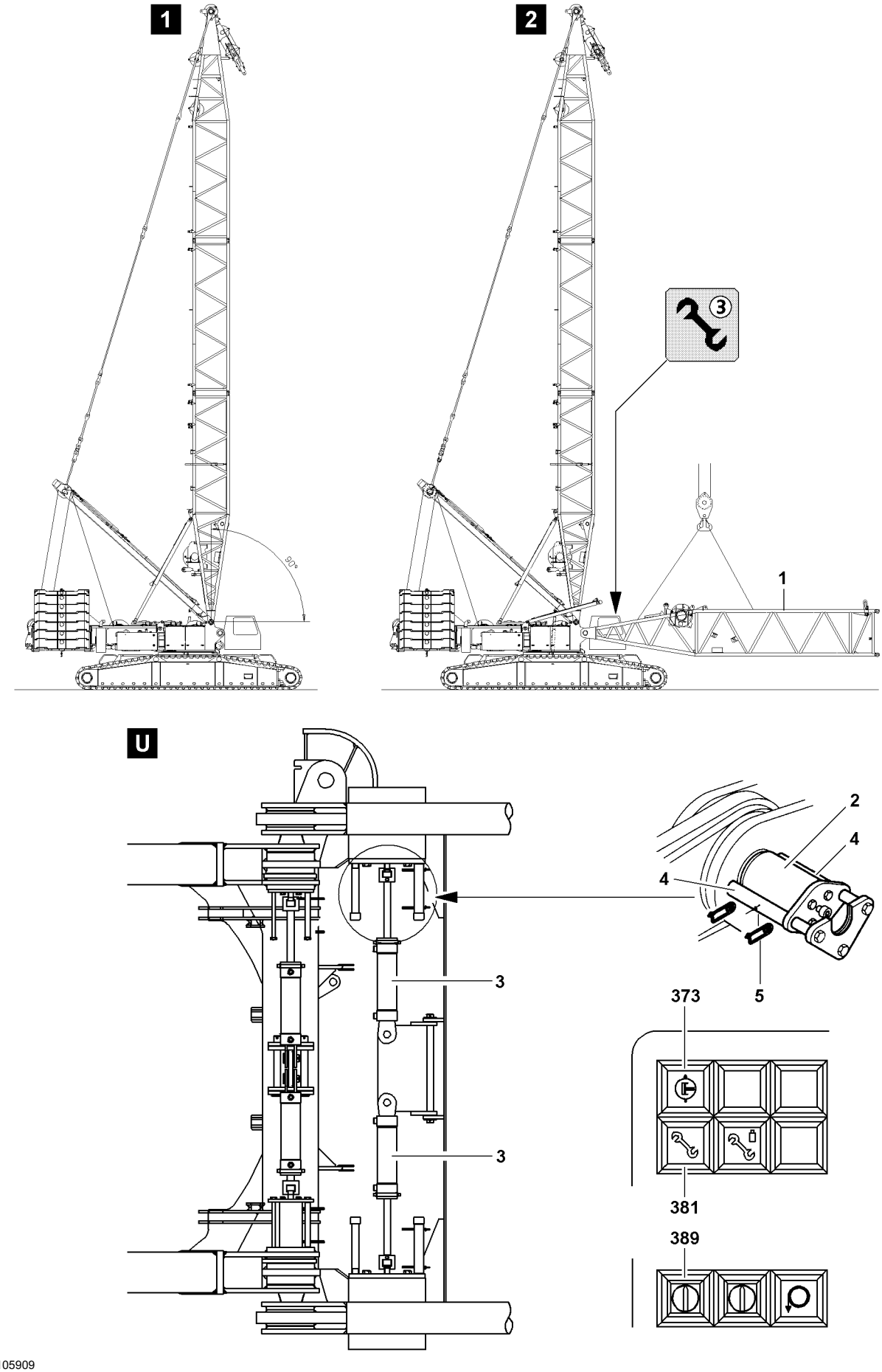
1.1 Adding the operating mode “Assembly”

DANGER
Risk of fatal injury in crane operation with enabled assembly key button.
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
– The LICCON overload protection is bypassed.
– The indicator light in the button **381** lights up.
– The Assembly icon **3** on the LICCON monitor blinks.
– An acoustical signal sounds.
– The red flashing beacon on the crane cab blinks.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1.2 Assembling the SwD-boom combination

1.2.1 Pinning the S-pivot section on the turntable

WARNING
General danger notes!
- ▶ Support the boom during assembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly! Please refer to chapter 8.15.

Make sure that the following prerequisites are met:
- – The crane is in assembly position.
- – The crane is aligned in horizontal direction.
- – An auxiliary crane is available.
- – An assembly scaffolding / work platform is available.
- – The counterweight has been attached to the turntable according to the load chart.
- – The derrick boom is completely assembled and erected on the turntable, see chapter 5.05.
- – The LICCON overload protection has been set according to the data in the load chart.

- ▶ Hang the S-pivot section **1** onto the auxiliary crane and swing in to the pin points on the turntable, illustration **1**, illustration **2**.

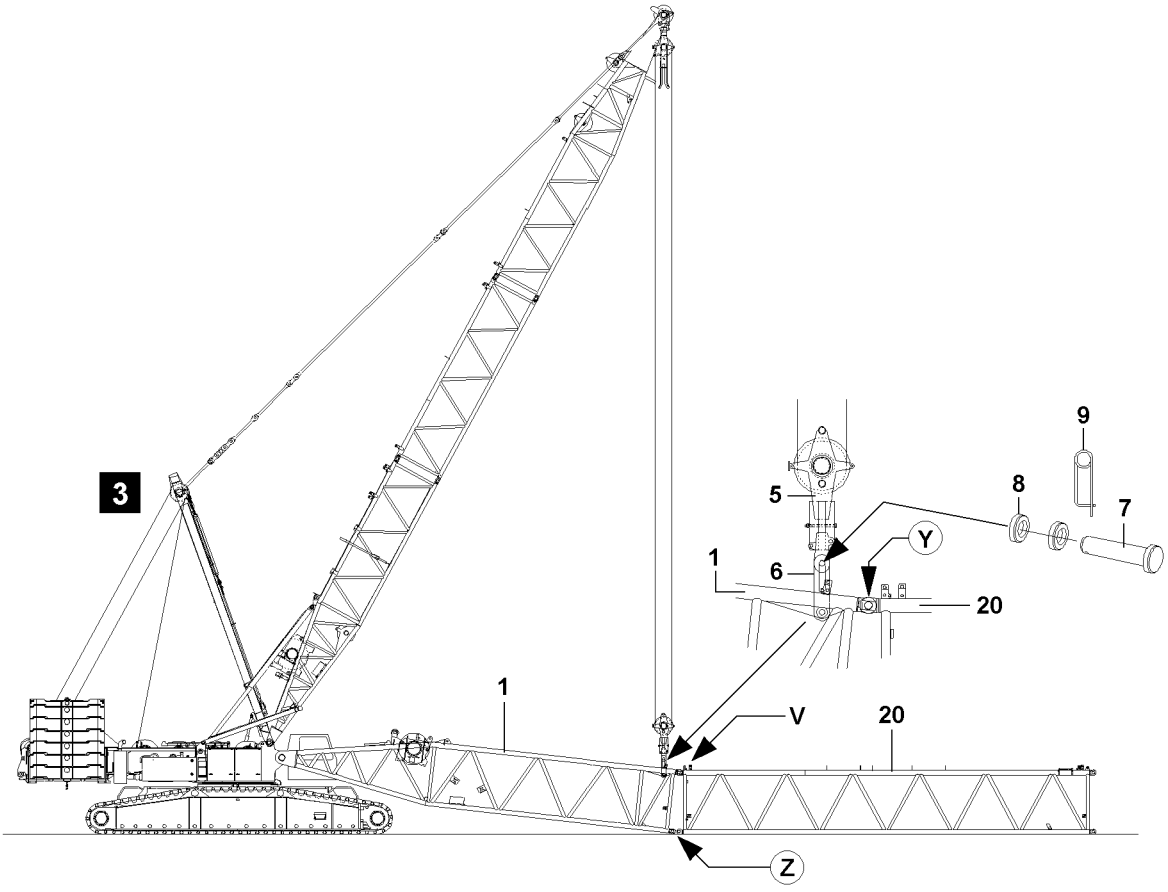
Establish the hydraulic connection to the pin pulling device via two quick couplers.
Pin the S-pivot section **1** on the turntable and secure.
- ▶ Establish the hydraulic connection to the pin pulling device.
- ▶ Turn the pressure change over switch **373** on.

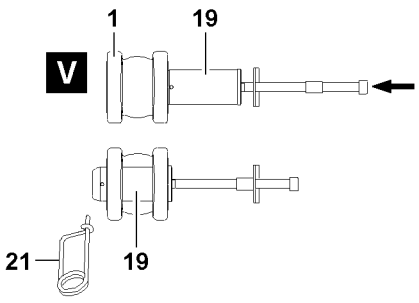
DANGER
Risk of fatal injury!
Due to unsecured or insufficiently secured connector pins, the boom can fall down and fatally injure personnel.
- ▶ Secure the connector pins **2** between the S-pivot section **1** and the turntable after the pin procedure with the retaining plates **4**.

- ▶ Insert the connector pins **2** with the hydraulic pin pulling device **3**.
- ▶ When the connector pins **2** are completely pinned on the left and right on the S-pivot section: Insert the connector pin **2** on the left and right and secure with the retaining plate **4** and spring retainer **5**.
- ▶ Turn the pressure change over switch **373** off.

NOTICE
Damage to the S-pivot section!
Property damage can occur on the S-pivot section by placing the installed S-pivot section on the ground.
- ▶ Slowly place the S-pivot section with the auxiliary crane and at low speed on the ground.

- ▶ Carefully place the S-pivot section down.
- ▶ Remove the auxiliary crane.





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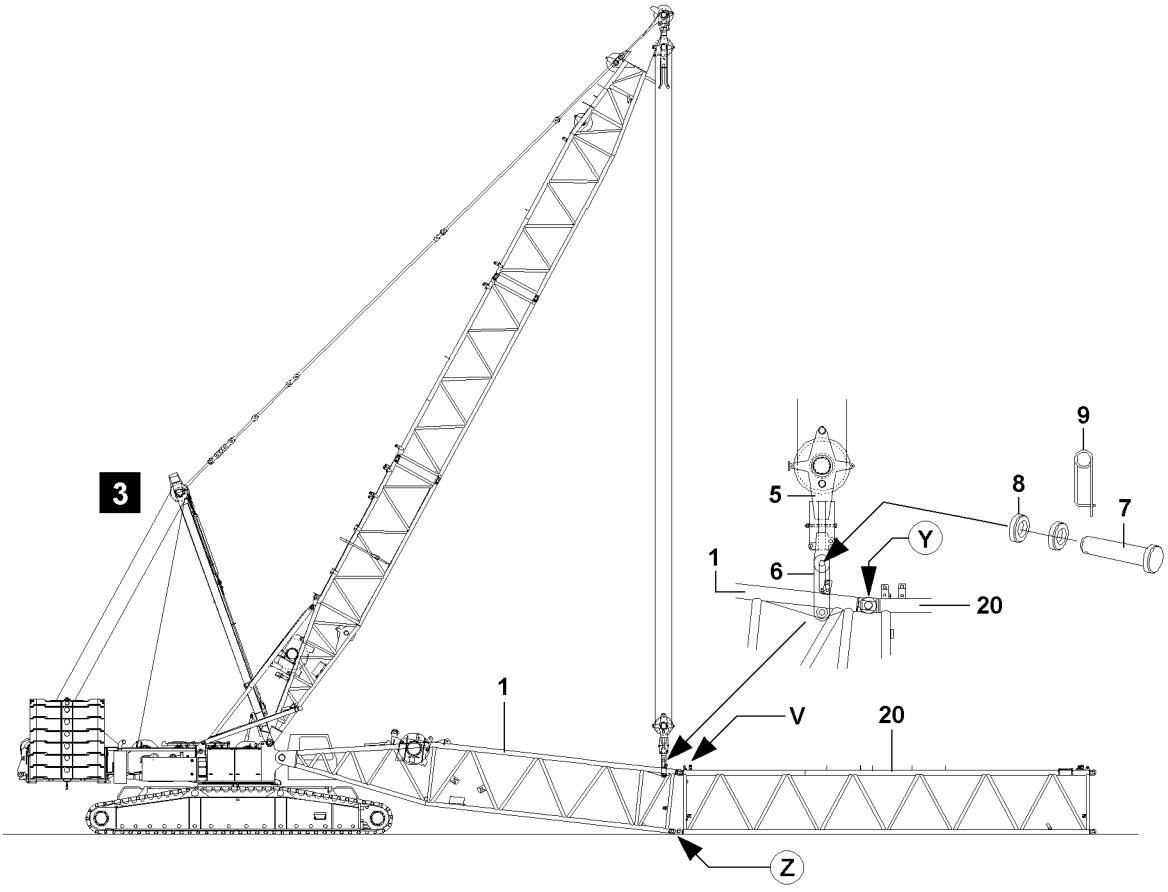
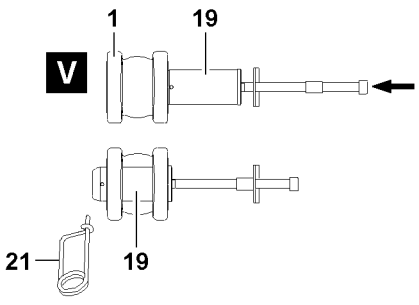
1.2.2 Pin the upper pulley block to the S-pivot section

To be able to “close” the boom combination after assembly, it is necessary to luff the derrick boom down to the front and to lower the upper pulley block to the S-pivot section. Then pin and secure the upper pulley block with the S-pivot section.
Ensure that the following prerequisites are met:

– The S-pivot section is pinned and secured on the turntable.
– The S-pivot section is placed on the ground.
– The auxiliary crane is removed.

▶ Luff the derrick down to the front until the upper pulley block **5** is positioned freely over the assembly bracket **6** of the S-pivot section **1**.
▶ Lower the upper pulley block **5** to the S-pivot section.
▶ Pin and secure the upper pulley block **5** with the assembly brackets **6**.
▶ Use pin **7**, washer **8** and spring retainer **9**.





B105817

1.2.3 Fitting the S-intermediate sections, SW-reducer section and W-intermediate sections

The number of boom components is dependent on the required boom length for a particular application.

Note

▶ The component quantities are given on the assembly drawings and rod diagrams!

Installing the S-intermediate section(s) on the S-pivot section

Make sure that the following prerequisites are met:

– The S-pivot section is pinned and secured on the turntable.
– The S-pivot section is placed on the ground.
– The auxiliary crane is removed.
– The upper pulley block **5** is pinned and secured with the assembly brackets **6**.

Note

▶ To pin the S- and W-intermediate sections, the pin pulling device can be used, see chapter 5.30.
▶ The guy rods must be checked regularly! Please refer to chapter 8.15.

WARNING

General danger notes!

▶ All pins are to be secured after assembly with the intended safety elements!
▶ The guy rods must be checked regularly! Please refer to chapter 8.15.

To be able to assemble the S-intermediate sections on the S-pivot section, the derrick guy rods must be used.

▶ Attach the S-intermediate section **20** to the auxiliary crane and align on the S-pivot section **1**.
▶ When the pin bores on the S-pivot section **1** and on the S-intermediate section **20** “on top” (point **Y**) align, fig. **3**:
Insert the pin **19** from the “inside” to the “outside” and secure with spring retainer **21**, fig. **V**.

Assemble the Sw-boom to the required length and pin and secure on the S-intermediate section **20** “on top” and “bottom”.

▶ Insert the pin **19** from the “inside” to the “outside” and secure with spring retainer **21**.

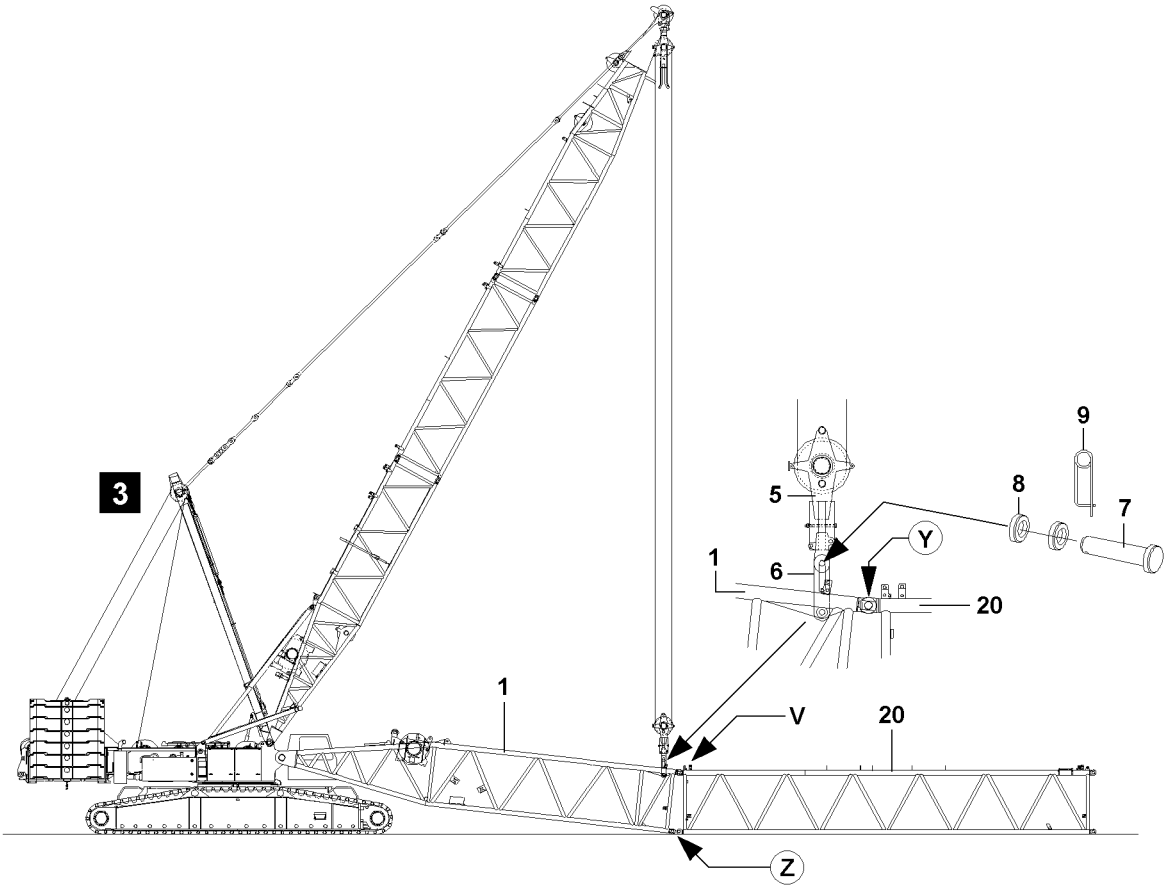
WARNING

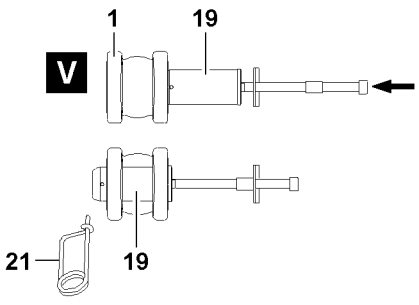
The crane can topple over!

If the following conditions are not met, the crane can topple over or be significantly damaged!

Personnel can be severely injured or killed!

▶ During the “closing procedure” of the intermediate sections, the maximum permissible total force on the test point **MS1 must** be **smaller** than **70 t** .
▶ The end section of the corresponding boom combination may **not** lift off the ground during the “closing procedure”!
▶ With the upper pulley block, boom combinations to maximum **Sw 112 m** may be lifted / closed.





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Note

- The actual force on the test point MS1 - which is exerted during the closing procedure of the boom system - is shown on the LICCON monitor 1.
- Record the actual force and keep it ready for the disassembly of the boom system.
- During the boom disassembly, the guying is tensioned with the noted actual force (assembly) so that the connector pins of the intermediate sections can be unpinned.

- When the Sw-boom combination is assembled to the desired length:
  Lift the S-pivot section **1** with the upper pulley block until the pin bores on the “bottom” align at point **Z**, fig. **3**.
- Insert the pin **19** at point **Z** from the “inside” to the “outside” and secure with spring retainer **21**, fig. **V**.

WARNING

Mortal danger due to folding down of boom!

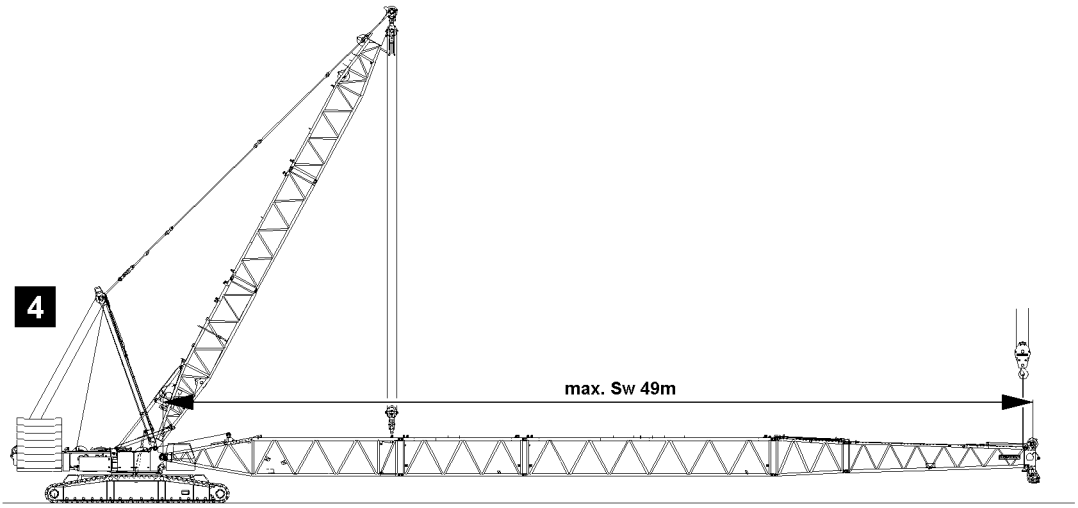
By unpinning the upper pulley block **5** on the assembly brackets **6**, the boom can suddenly fold down if the boom is not pinned at point **Z** “on the bottom”.

Personnel can be severely injured or killed!

- It is prohibited for anyone to remain under the raised lattice jib during the pinning / unpinning procedure!
- Unpin the upper pulley block **5** only when it is ensured that the S-pivot section **1** is pinned and secured “on top” and “bottom” with the intermediate section **20**.

Unpin the upper pulley block **5** on the assembly brackets **6**.

- Relieve the upper pulley block **5** by spooling out the control rope.
- Unpin the upper pulley block **5** on the assembly brackets **6**.



B105910

1.3 “Flying” assembly of the SwD-boom

If spatial prerequisites on the job site are limited for the assembly of the boom, or if they are limited by buildings or similar, then the boom can be installed in “flying” mode.

WARNING
General danger notes!
- ▶ Support the boom during assembly / disassembly with suitable materials!
- ▶ All pins are to be secured after assembly with the intended safety elements!

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ For the “flying” boom assembly, the maximum permissible total force at test point **MS1** should **not** be exceeded. The “actual force” is shown on LICCON monitor 1.
- ▶ The “flying” boom assembly is only permissible to certain system lengths!
- ▶ The maximum permissible system lengths may not be exceeded!

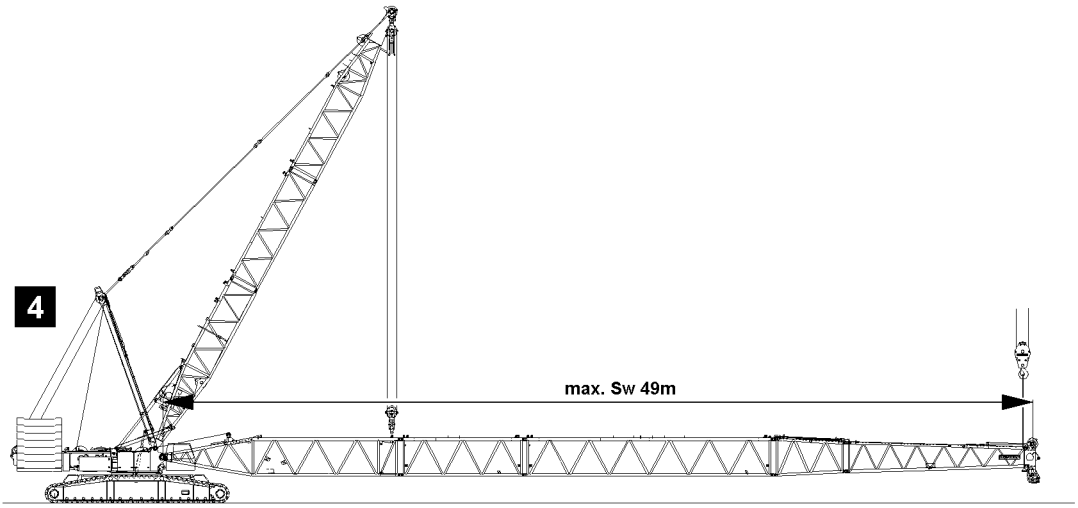
Note
- ▶ The total weights of the individual lattice sections including the corresponding guy rods are shown in chapter 5.03.

1.3.1 “Flying” installation of the SwD-boom, guying on S-pivot section

WARNING
The crane can topple over!
- ▶ The following system lengths should only be mounted “flying”, if it has been ensured that the turntable is fitted with a counterweight of at least 95 t and the crawler center section is fitted with a central ballast of 43 t!

	Maximum permissible system lengths for a maximum total force MS1 110 t					
	49.0 m	48.4 m	45.5 m	45.5 m	38.5 m	**45.5 m**
	DB_{min} [1] 95 t / ZB_{min} [2] 43 t					
S-pivot section 13.4 m	1x	1x	1x	1x	1x	1x
S-intermediate section 7.0 m	1x	1x	—	1x	—	1x
S-intermediate section 14.0 m	1x	2x	2x	1x	1x	—
SW-reducer section 4.1 m	1x	—	1x	1x	1x	1x
W-intermediate section 7.0 m	—	—	—	1x	1x	1x
W-intermediate section 14.0 m	—	—	—	—	—	1x
W-end section 10.5 m	1x	—	—	—	—	—

1) This counterweight **must** be at least installed on the turntable for “flying assembly”.
2) This central ballast **must** be at least installed on the crawler center section for “flying assembly”.



B105910

Make sure that the following prerequisites are met:
– The S-pivot section **1** is pinned and secured with the assembly bracket **6** on the upper pulley block **5**.
– The S-pivot section **1** is lifted using the upper pulley block **5** and is in a horizontal position.
– A minimum counterweight of 95 t is placed on the turntable.
– A minimum central ballast of 43 t is added.

Note
▶ The weights of the individual lattice sections are shown in chapter 5.03!

In “flying” assembly, the intermediate sections can be pinned and secured with the auxiliary crane individually or as a preassembled unit on the S-pivot section.
▶ Insert and secure the pin “on top” and “on the bottom”.
▶ When the intermediate sections on the S-pivot section are pinned and secured:
Attach the boom on the front on the auxiliary crane.

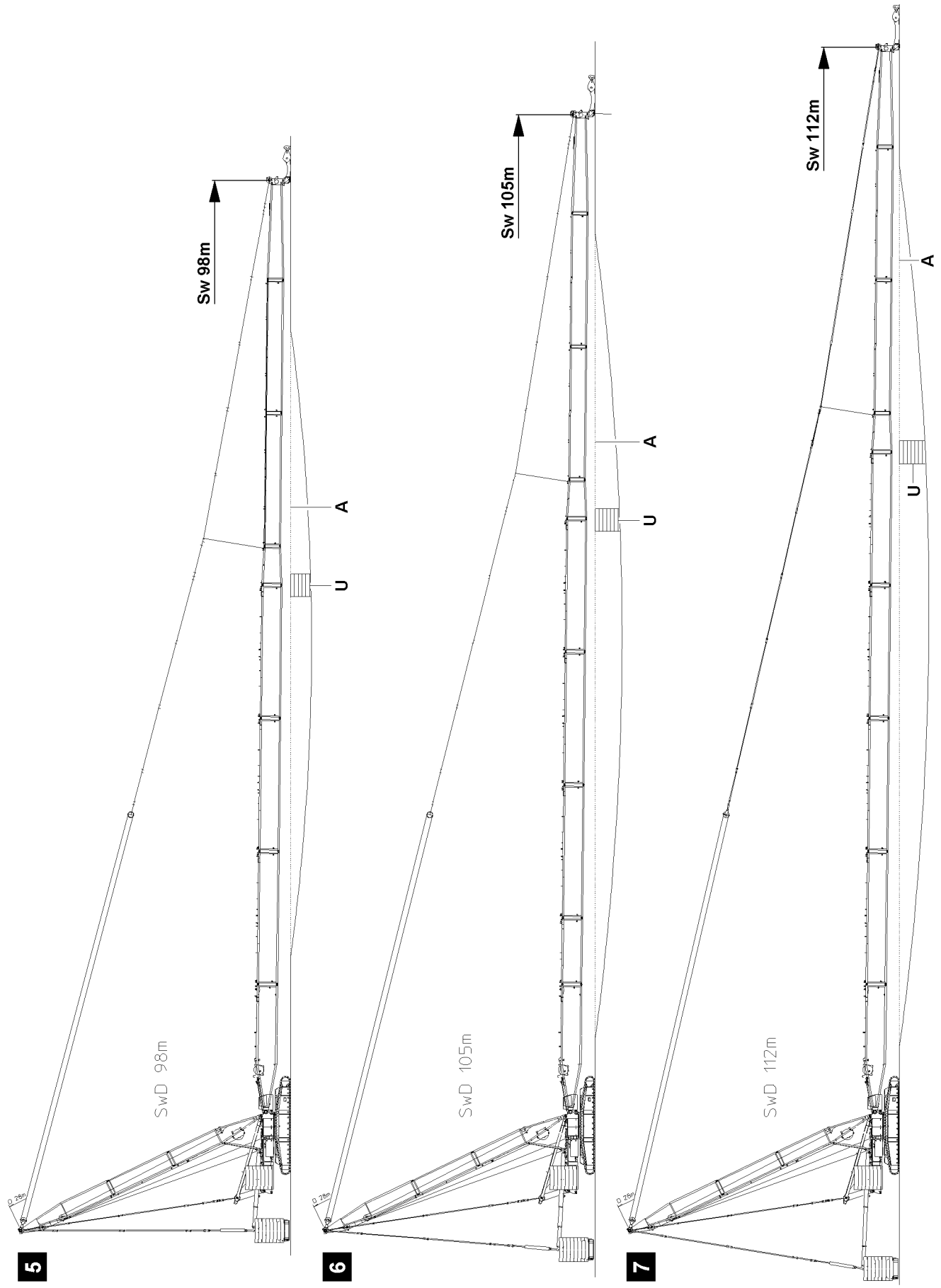
or

■ Support the boom with stable materials.
▶ When the boom is attached on the auxiliary crane or properly supported:
Lower the upper pulley block **5**.

Result:
– The control rope is relieved.

WARNING
Mortal danger due to folding down of lattice jib!
When unpinning the upper pulley block from the assembly bracket, the derrick boom can suddenly fold down!
Personnel can be severely injured or killed!
▶ Before unpinning the upper pulley block **5**, the boom must be safely held by an auxiliary crane **A** or it must be supported accordingly!
▶ It is prohibited for anyone to remain under the lattice jib during the unpinning procedure!

▶ Unpin the upper pulley block **5** on the assembly bracket **6**.


Sw 98m
A
U
SwD 98m
D 28m
5
Sw 105m
A
U
SwD 105m
D 28m
6
Sw 112m
A
U
SwD 112m
D 28m
7

B106193

1.4 Mounting the SwD-boom combination with supporting base

In order to mount the SwD-boom combination to the crane when on **uneven ground** without damaging the crane, the SwD-boom combination must be supported on suitable materials capable of bearing the load.

Note

▶ Use a supporting base for boom lengths greater than 98 m!

Make sure that the following prerequisites are met:

– The derrick boom is assembled and erected at an angle of 75° to 85°.
– The crane is in assembly position.

WARNING

Danger of toppling the crane!

There is a risk of the crane toppling if the derrick boom is erected at an angle greater than 85°!

Personnel could be severely injured or killed!

▶ The derrick boom must not be erected further than a maximum of 85°!

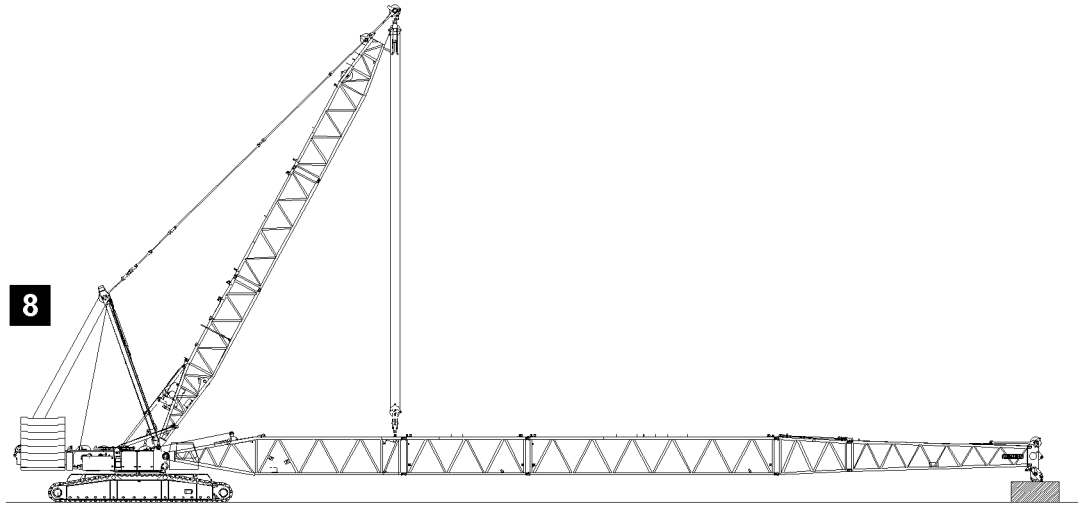
The S-boom combination - comprising an S-pivot section and S-intermediate sections - should be preassembled in a suitable location. The pre-assembled S-boom combination must be swung towards the turntable using an auxiliary crane and pinned / secured in position.

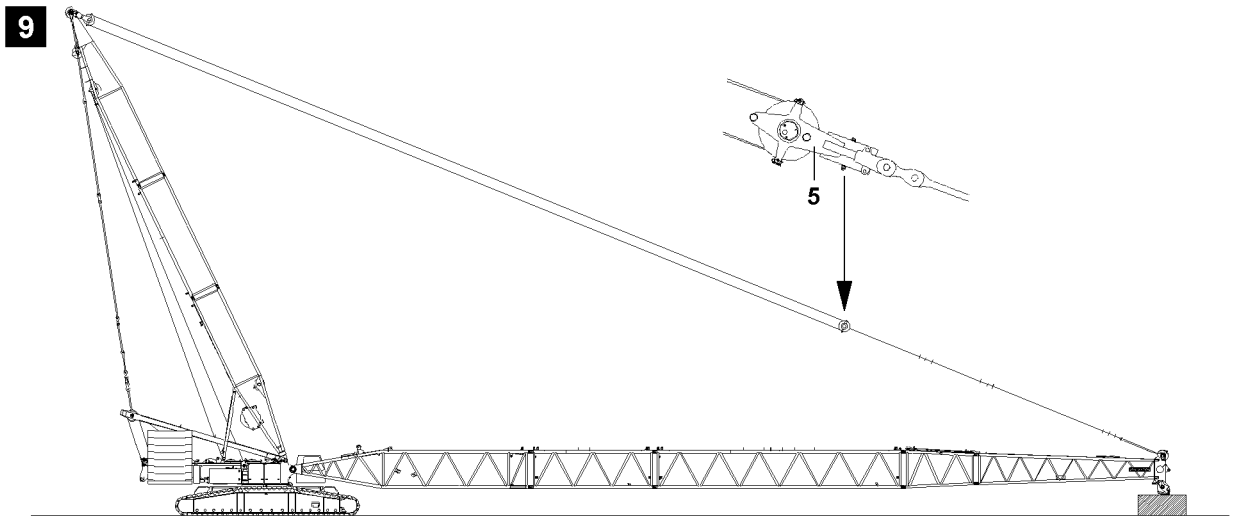
▶ Pre-assembled S-boom combination.
▶ Swing the preassembled S-boom combination with the auxiliary crane to the turntable.
▶ Pin and secure the S-boom combination to the S-pivot section on the turntable.

Note

▶ The boom combination must be supported underneath near the reducer section until it is raised to the height of the alignment level **A**!

▶ Place the S-boom combination on the support base **U** or hang from the auxiliary crane.
▶ Fully pre-assemble the W-boom combination including the W-end section and attach it to the S-boom combination using an auxiliary crane, or individually attach, pin and secure each W-intermediate section and W-end section using the auxiliary crane.





B106188

1.5 Assembling guy rods

WARNING
Inspection and maintenance on guy rods not carried out!
If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!
Personnel can be severely injured or killed!
▶ The guy rods must be checked before every assembly, see also chapter 8.15.

Note
▶ The guy rods must be installed and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

Make sure that the following prerequisites are met:
– The boom is fully assembled.
– All lattice sections are properly pinned with each other.
– All pin connections have been secured.

▶ Luff the derrick boom down to the front.
▶ Lower the upper pulley to the boom: spool out winch 3.

The guy rods are placed and secured for transport on the corresponding intermediate sections. Before assembly, the transport retainers must be released.
▶ Release the transport retainers on the guy rods.

NOTICE
Danger of property damage!
If the pins of the guy rods are not pinned from the “inside” to the “outside”, the hoist rope can scrape on the ground and be damaged!
▶ Always insert the pins of the guy rods from the “inside” to the “outside”.
▶ Pay attention to the special rod plan!

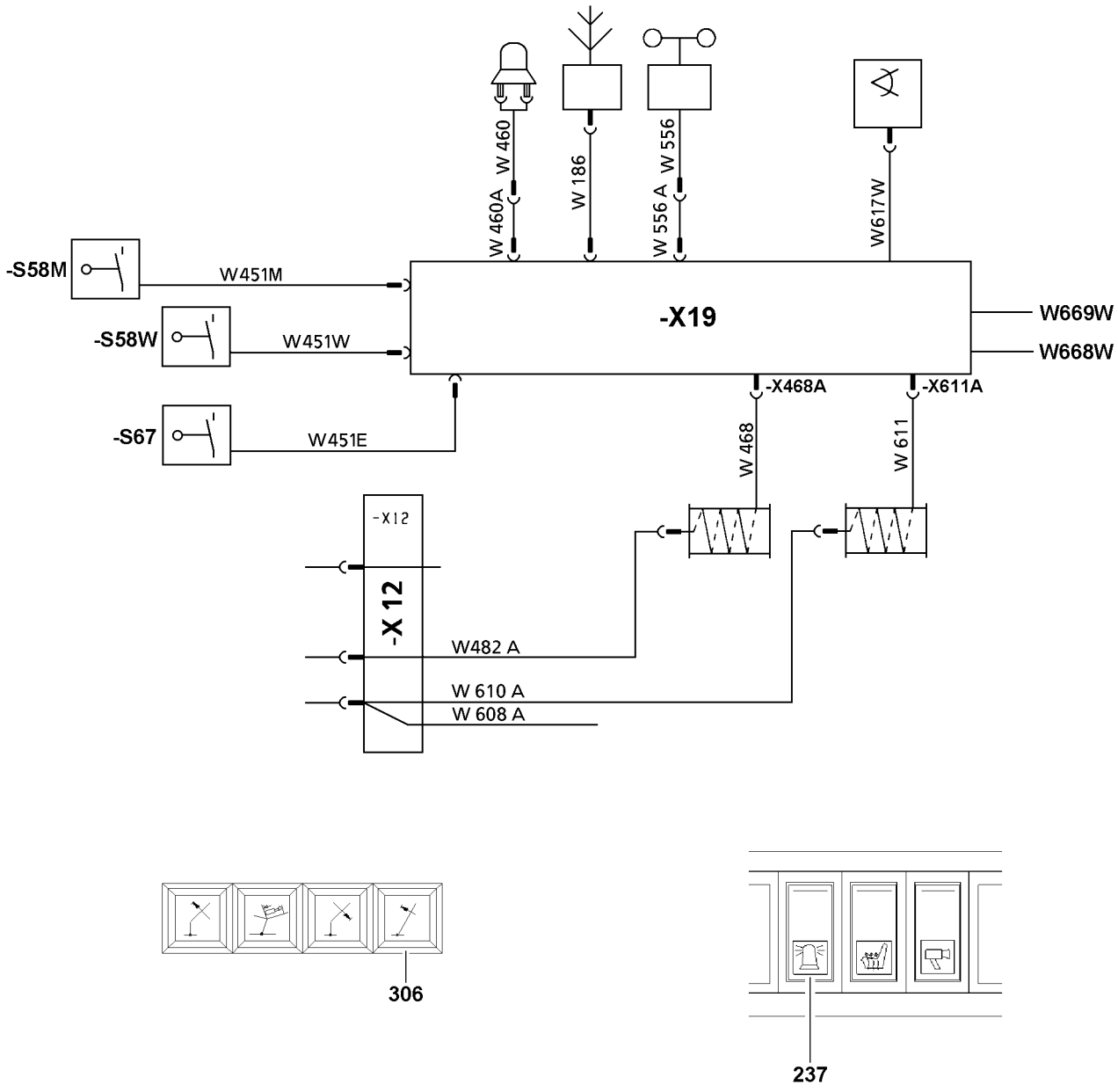
▶ Pin and secure the guy rods for the intermediate sections.
▶ Pin and secure the guy rods with the upper pulley block **5**.
▶ When the guy rods are pinned and secured:
Erect the derrick to the operating position (X = 111.1° to 115.6°) and spool out winch 3 at the same time so that the boom is not pulled up.
▶ When the derrick boom has reached the operating position:
Tension the guying between the derrick and the boom head.

WARNING
The boom can suddenly fold down!
If the following notes are not observed, the boom can suddenly fold down when the auxiliary boom or the support is removed!
Personnel can be severely injured or killed!
▶ Remove the auxiliary boom only when the derrick boom is in operating position and the guying between the derrick and the boom is tensioned.

▶ Remove the auxiliary crane on the boom head.

or

■ Remove the support.
▶ Guide the hoist rope over the rope pulley on the end section.


W 460
W 460A
W 186
W 556
W 556 A
W617W
-S58M
W451M
-S58W
W451W
-S67
W451E
-X19
W669W
W668W
-X468A
-X611A
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A
306
237

B105902

1.6 Establishing the electrical connections

Ensure that the following prerequisite is met:
– The boom is fully assembled.

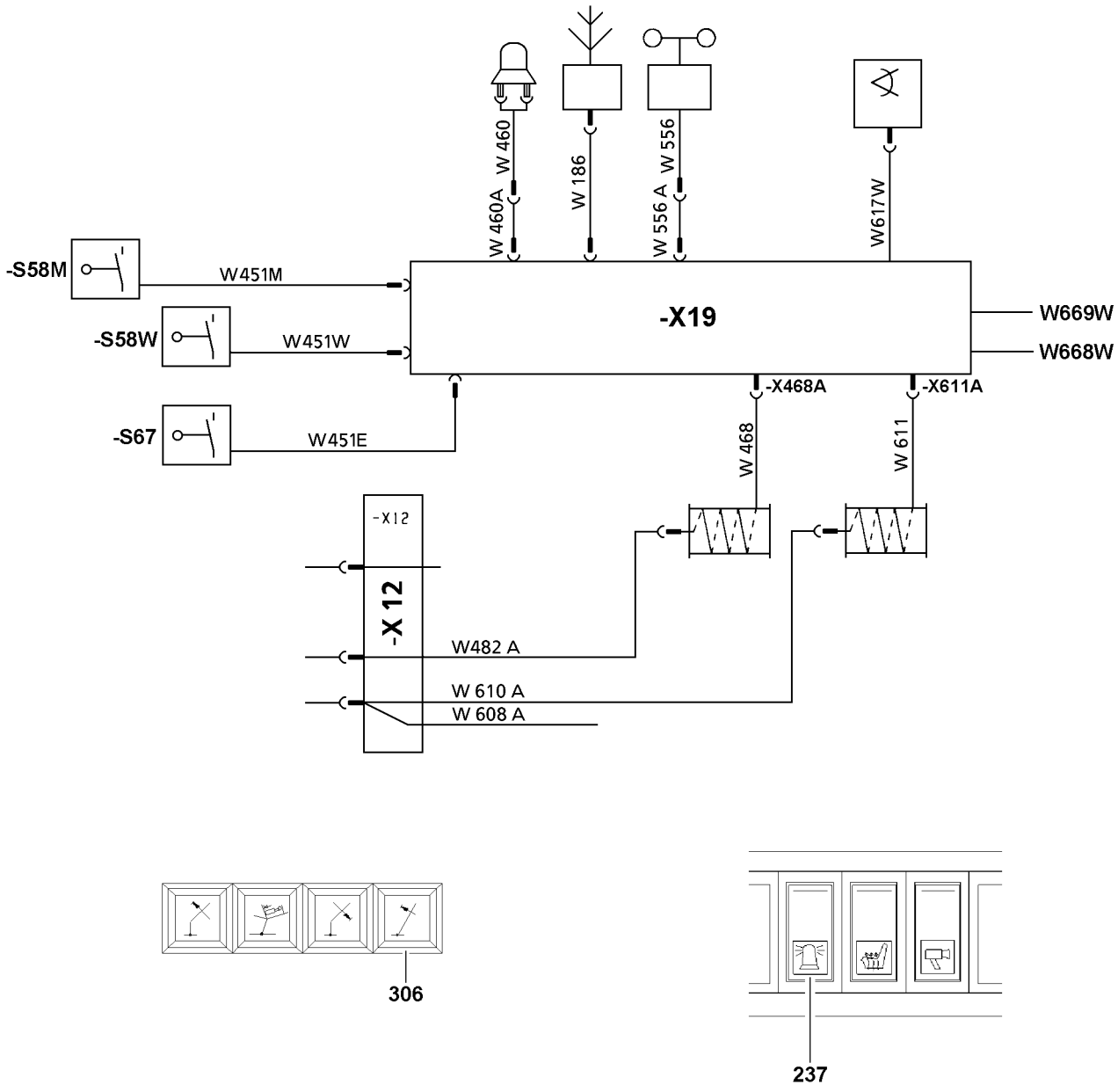
Establish the electrical connection from the cable drums to the connector box **-X19**.
▶ Insert the cable plug **W468** into the connector box **-X19**.
▶ Insert the cable plug **W611** into the connector box **-X19**.

Establish the electrical connection from the connector box **-X12** on the turntable to the cable drums in the S-pivot section.
▶ Insert the cable plug **W482A** into the connector box **-X12**.
▶ Insert the cable plug **W610A** into the connector box **-X12**.

Establish the electrical connection from the connector box **-X19** to the airplane warning light*.
▶ Insert the cable plug **W460** into the socket **W460A** on the wiring harness **W460A**.
▶ Insert the cable plug **W460A** into the connector box **-X19**.

Establish the electrical connection from the connector box **-X19** to the wind speed sensor*.
▶ Insert the cable plug **W556** into the socket **W556A** on the wiring harness **W556A**.
▶ Insert the cable plug **W556A** into the connector box **-X19**.

Establish the electrical connection from the connector box **-X19** to the hoist top limit switches.
▶ Insert the cable plug **W451M** into the connector box **-X19**.
▶ Insert the cable plug **W451W** into the connector box **-X19**.
▶ Insert the cable plug **W451E** (boom nose) into the connector box **-X19**.


W 460
W 460A
W 186
W 556
W 556 A
W617W
-S58M
W451M
-S58W
W451W
-S67
W451E
-X19
W669W
W668W
-X468A
-X611A
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A
306
237

B105902

1.7 Function check

Note

▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact LIEBHERR Service.

WARNING

Risk of fatal injury if safety devices are not functioning!

▶ Crane operation with non-functioning safety devices is **prohibited**!

Make sure that the following prerequisites are met:

– All electrical connections have been made.
– The crane engine is running.
– The appropriate operating mode is set.
– The actuator levers of the limit switches have been checked for easy movement and are lubricated.

1.7.1 Winding speed sensor*

▶ Test the movement and the function of the wind speed sensor.

1.7.2 Airplane warning light*

▶ Turn on the airplane warning light on with the switch **237**.

▶ Check the function visually.

1.7.3 Hoist limit switch

▶ Actuate the limit switch on the pulley head manually.

Result:

– The hoist winch turns off in upward movement.
– The hoist top icon on the LICCON monitor 0 blinks.

1.7.4 Limit switch boom “steepest position”

Note

▶ The limit switch functions have to be checked individually before erection!

▶ Manually actuate the individual limit switches on the S-relapse cylinders.

Result:

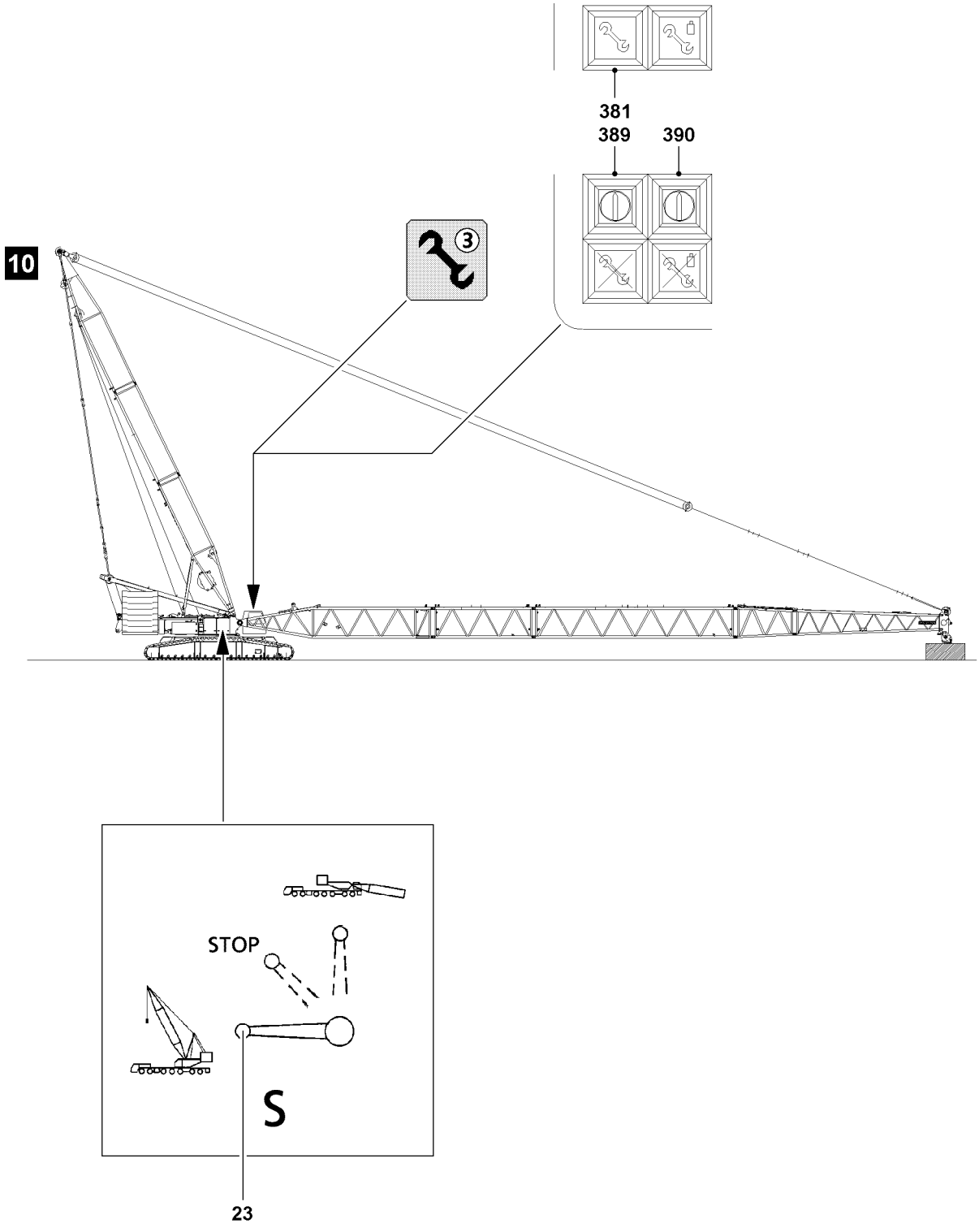
– Winch 3 (control winch) turns off in upward movement.
– The indicator light **306** lights up.
– An acoustic signal sounds.

1.7.5 D-relapse cylinder

▶ Manually actuate the individual limit switches on the D-relapse cylinders.

Result:

– Winch IV (control winch) turns off in upward movement.
– The indicator light **307** lights up.
– An acoustic signal sounds.



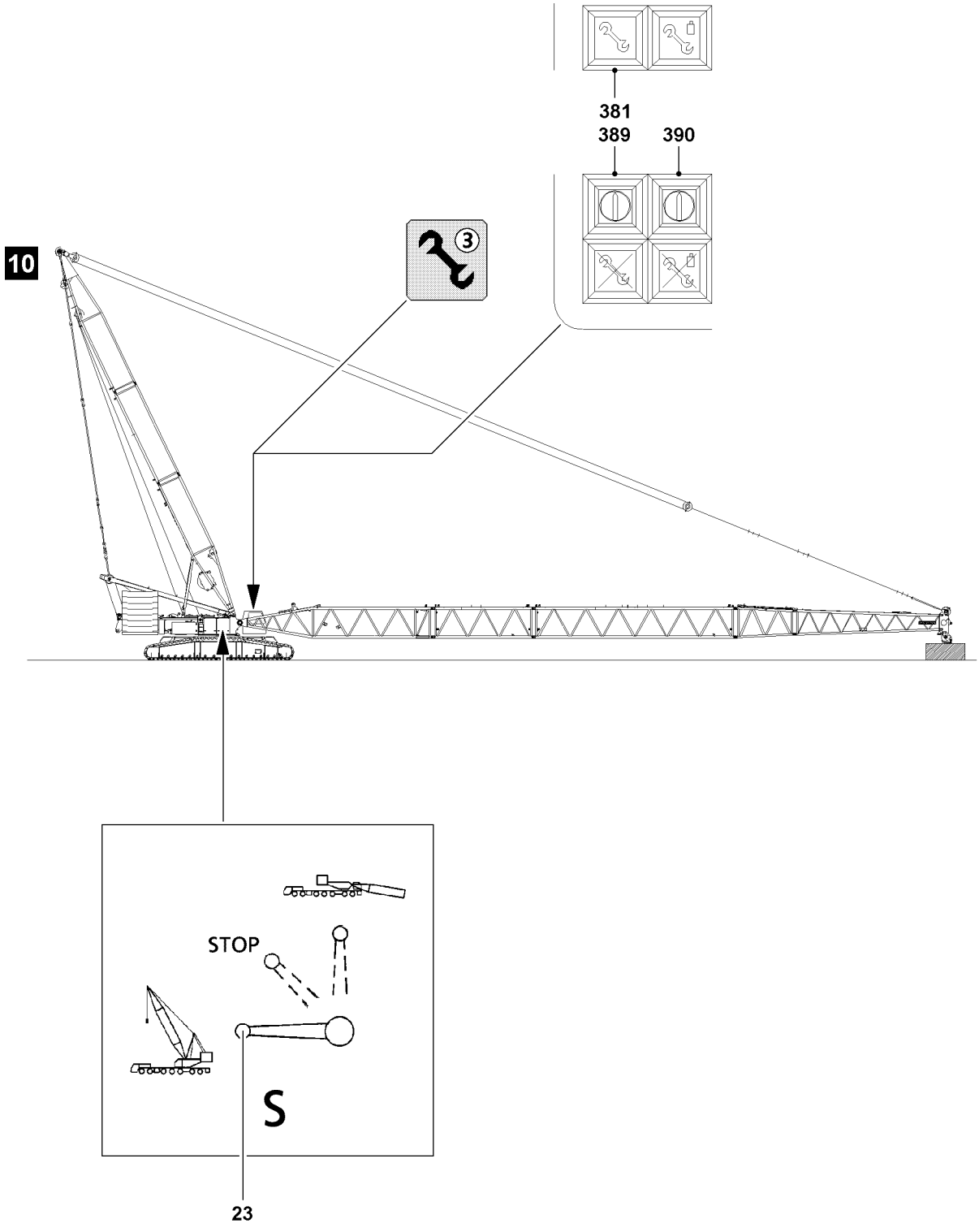
B106189

1.8 Erecting the boom

DANGER
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

Make sure that the following prerequisites are met:
- – The crane is aligned in horizontal direction.
- – All electrical connections have been made.
- – All limit switches are functioning.
- – The counterweight has been attached to the turntable according to the load chart.
- – All pin connections have been secured.
- – The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- – There are no loose parts on the boom.
- – The LICCON overload protection has been adjusted according to the data in the load chart.
- – The LICCON overload protection settings have been compared with the actual crane configuration.
- – No personnel is within the danger zone.
- – The assembly key button **389** is actuated.
- – The indicator light **381** “Assembly” lights up.
- – The Assembly icon **3** on the LICCON monitor 0 lights up.

DANGER
The crane can topple over!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Do not allow slack cable to build up on the control winch!
- ▶ The ball cock cabinet must be locked! Always pull the key and hand it to an authorized person!



B106189

1.8.1 Extending the relapse cylinder

NOTICE
Damage of the relapse cylinder!
When extending the S-relapse cylinder on the Sw-boom, it must be ensured that the derrick boom is already in its operating position. Otherwise the S-relapse cylinders on the Sw-boom will collide with the D-relapse cylinders!
This can result in severe damage to the S-relapse cylinders!
▶ The relapse cylinders on the Sw-boom may only be extended when the derrick boom is in its operating position!

WARNING
Risk of fatal injury!
If the S-relapse cylinders are not extended before erecting the Sw-boom, then the Sw-boom can fall backward during crane operation.
Personnel can be severely injured or killed!
▶ The S-relapse cylinders must be extended before erection of the Sw-boom.
▶ The ball cock must be secured during crane operation to prevent unintended actuation.

The piston rod on the S-relapse cylinder must be extended by actuating the ball cock **23**.

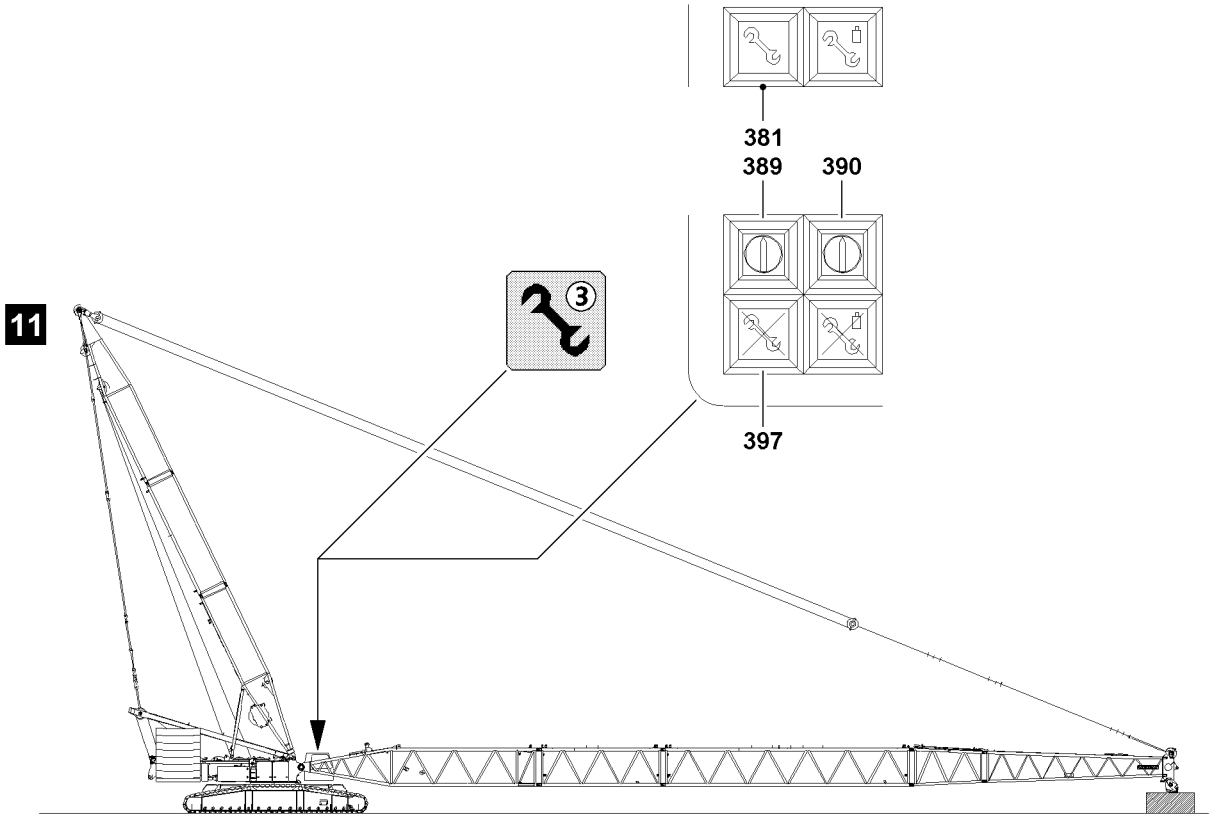
Ball cock positions	
horizontal	Crane operation, extend the piston rod
vertical	Assembly, retract the piston rod
45°	STOP (The piston rod cannot be retracted / extended)

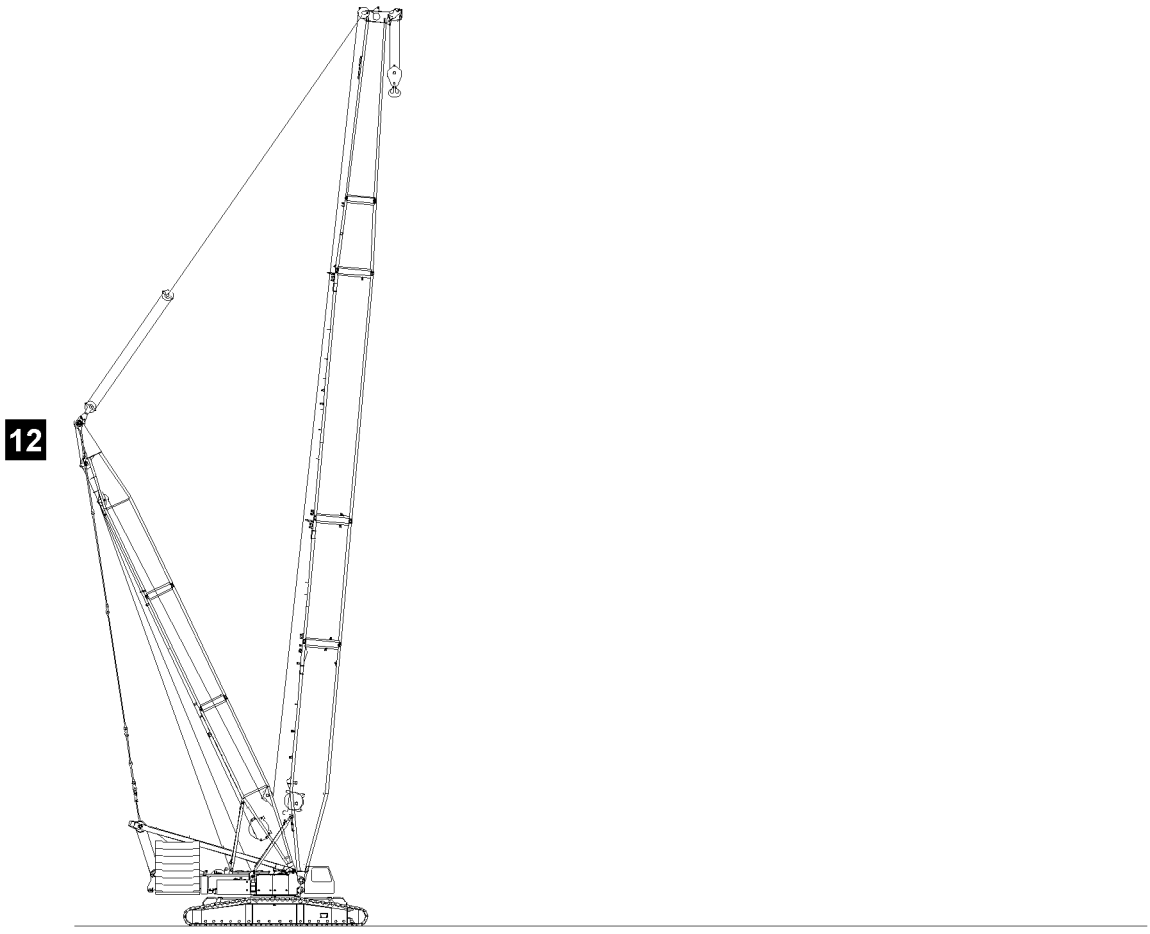
Ensure that the following prerequisite is met:
– All hydraulic connections have been made.

▶ Move the ball cock **23** into horizontal position.

Result:
– The piston rod of the relapse cylinders extends.

Secure the ball cock **23** by closing and locking the cabinet doors to prevent unauthorized access.
▶ Close the cabinet door and pull the key.
▶ Hand the key to an authorized person.





B106190

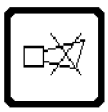
1.8.2 Erection procedure

DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane superstructure during erection procedure!
- ▶ Observe the data in the erection and take down charts!

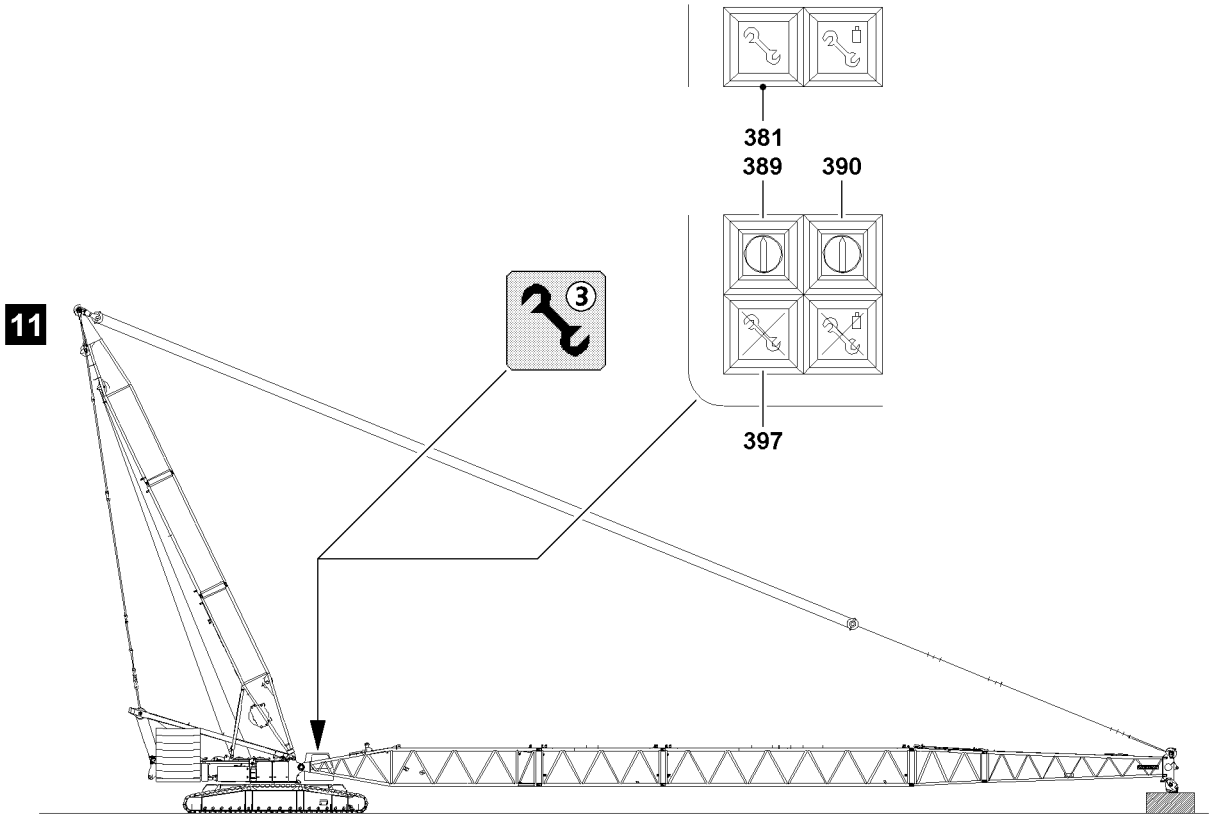
- ▶ Erect the Sw-boom until the end section lifts off the ground.
- ▶ Reeve in the hoist rope properly and secure on the rope fixed point, for reeving, see separate reeving plans.
- ▶ Attach the hoist limit switch weight.

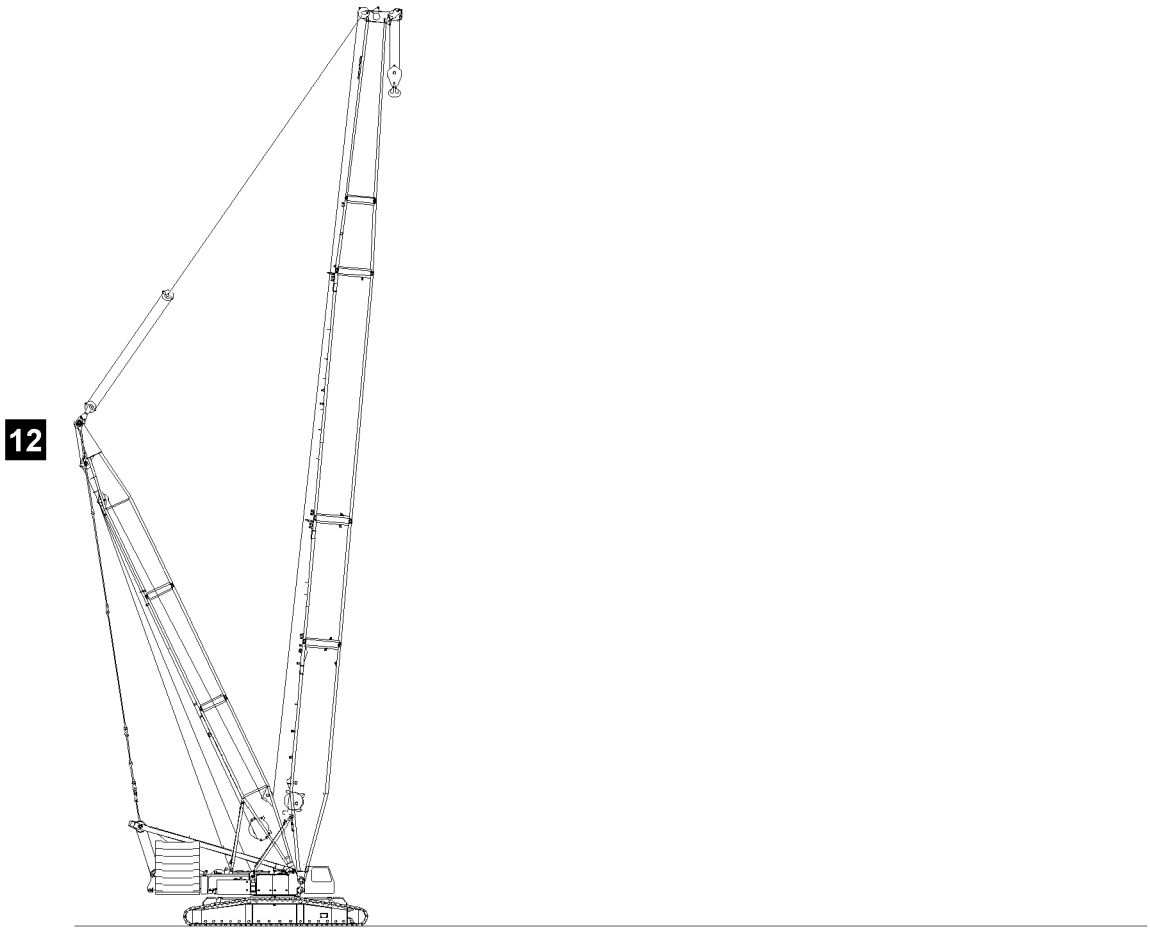
WARNING
The crane can topple over!
- ▶ When the lowest operating position is reached, the assembly key button **389** must be turned off immediately.
- ▶ The assembly key button **389** bypasses the safety devices!
- ▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!

Note
- ▶ During the erection procedure - outside the operating area - the alarm functions listed in the chart are displayed as blinking on the crane operating screen.

Displays on the LICCON monitor during the erection procedure	
 *Icon: “STOP” blinks*	
 *Icon: “ERROR 150” blinks*	***Note:*** *For error description, see chapter 20.05.*
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

- ▶ Luff up the Sw-boom to the lowest operating position.





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Note

▶ Once the lowest operating position of the Sw-boom is reached, the display turns off (see table above); instead of the display “???” a load value in “t” appears on the “Maximum load” symbol!

WARNING

The crane can topple over!

▶ When the lowest operating position of the Sw-boom is reached, immediately turn off the assembly key button **389**.

▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

▶ Turn the assembly keyed button **389** off: Press button **397**.

Result:

– Self retention of the assembly key button **389** is turned off.
– The LICCON overload protection is active.
– The indicator light **381** turns off.
– The assembly symbol **3** on the LICCON monitor turns off.
– The acoustical signal turns off.

2 Crane operation with derrick boom combination

2.1 Preparing for crane operation

Note

▶ Observe the notes in chapters 4.02, 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

– The LICCON overload protection has been set according to the data in the load chart.
– The assembly key button **389** has been turned off by pressing the button **397**.

WARNING

The crane can topple over!

▶ Check the horizontal position of the crane before and during operation.

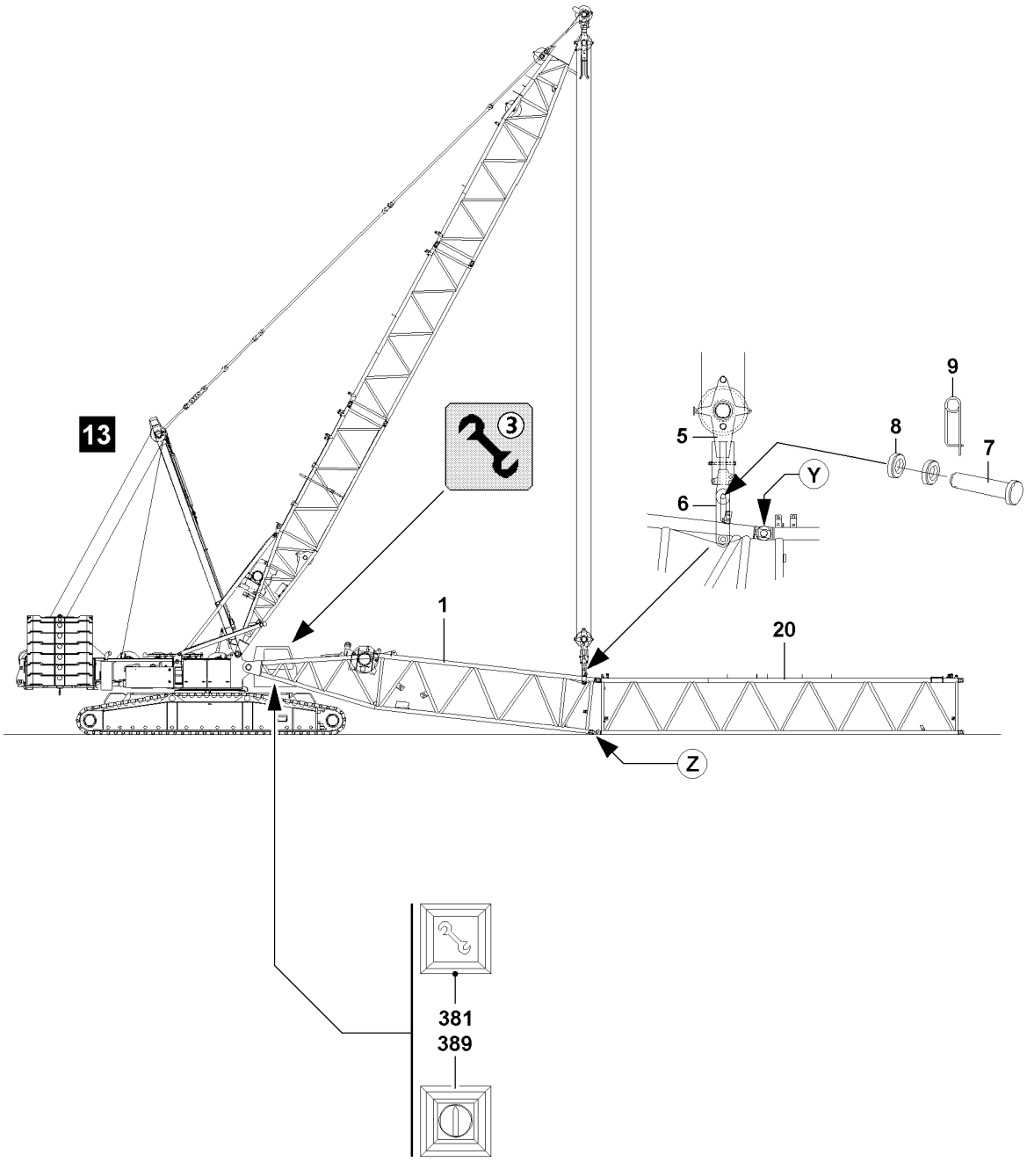
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation.

2.1.1 Checking the settings

▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.

▶ Check the hoist limit switch by running against the hoist limit switch weight.

▶ Check the function of the limit switches “boom steep” on the relapse cylinders.



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3 Disassembling the SwD-boom combination

DANGER
When working aloft, there is a danger of falling!
During assembly / disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling.
If the following notes are not observed, assembly personnel can fall down!
Personnel can be severely injured or killed!

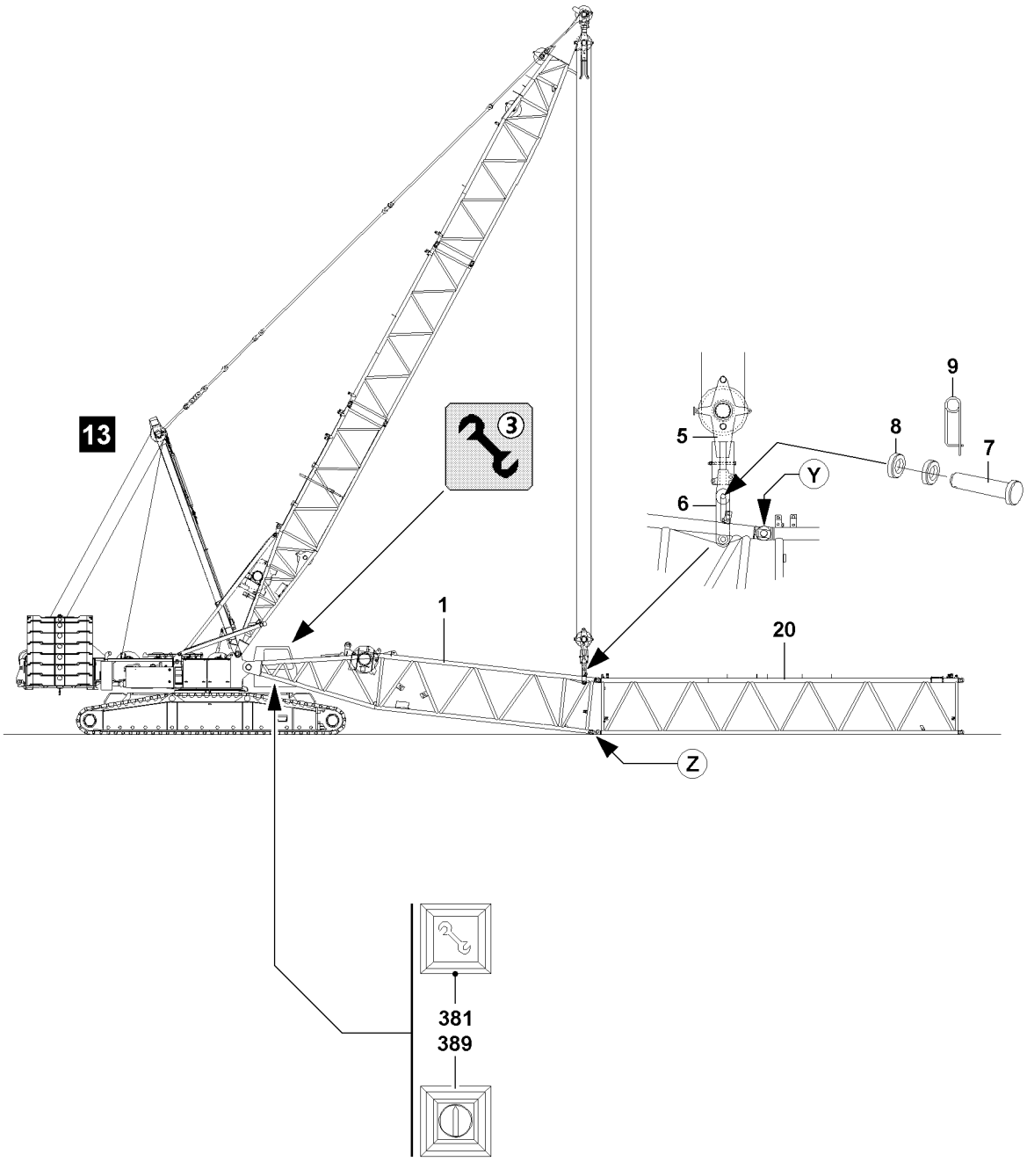
- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ Before any assembly / disassembly work and maintenance work on the crane and lattice mast boom, assembly personnel must wear the **approved anti-fall systems and protective equipment**, see also chapter 2.04.
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited!

DANGER
Risk of injury when disassembling booms!
When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

DANGER
Falling components!
If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!

- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!



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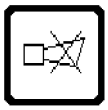
3.1 Taking the Sw-booms down

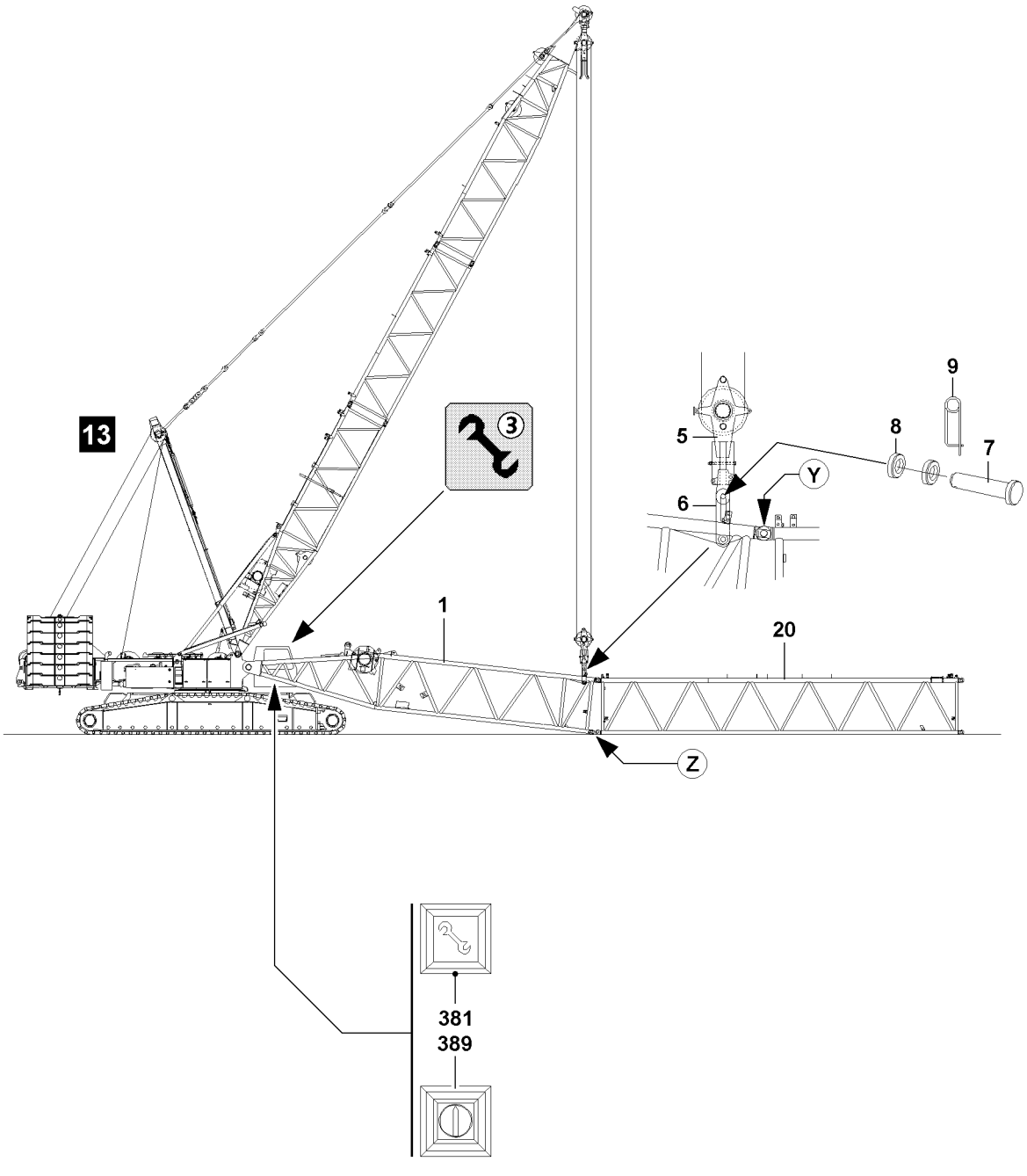
DANGER
The crane can topple over!
If the following conditions are not met before taking down the Sw-boom, the crane can topple over and fatally injure personnel!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head. There is the danger that boom components may be significantly damaged!
- ▶ Upon taking down the boom system, always spool out the hoist winch at the same time!
- ▶ When luffing the boom system down, the derrick boom must remain in operating position until the end section is laying on the ground.

When the lowest operating position is reached, the Luff down movement is turned off.
On the “Maximum load” icon, the load value disappears and the display “???” appears.
The following alarm functions become active:

Display on the LICCON-Monitor 0 after reaching the “lowest” operating position	
 *Icon: “STOP” blinks*	
 *Icon: “ERROR 150” blinks*	***Note:*** *For error description, see chapter 20.05.*
 *Icon: “Horn” blinks*	***Note:*** *In addition to the “Horn” icon, an acoustic warning sounds.*

- ▶ Luff the boom down to the **lowest** operating position.



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WARNING
Risk of fatal injury in crane operation with enabled assembly key button.
- ▶ The actuation of the assembly key button **389** is only permitted for assembly tasks!
- ▶ The assembly key button **389** may only be operated by persons who are aware of the consequences of a bypass!
- ▶ If the assembly key button **389** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **389** turned on is strictly prohibited!
- ▶ The assembly key button **389** must be removed immediately after carrying out the assembly work and handed to an authorized person!

▶ Actuate the assembly key button **389**.

Result:
- – The LICCON overload protection is inactive.
- – The indicator light in the button **381** lights up.
- – The Assembly symbol **3** in the LICCON monitor blinks.
- – An acoustical signal sounds.
- – The red flashing beacon on the crane cab blinks.
- – The STOP icon on the LICCON monitor blinks.

▶ Spool the hoist winch out and luff the Sw-boom down further until the hook block touches the ground.

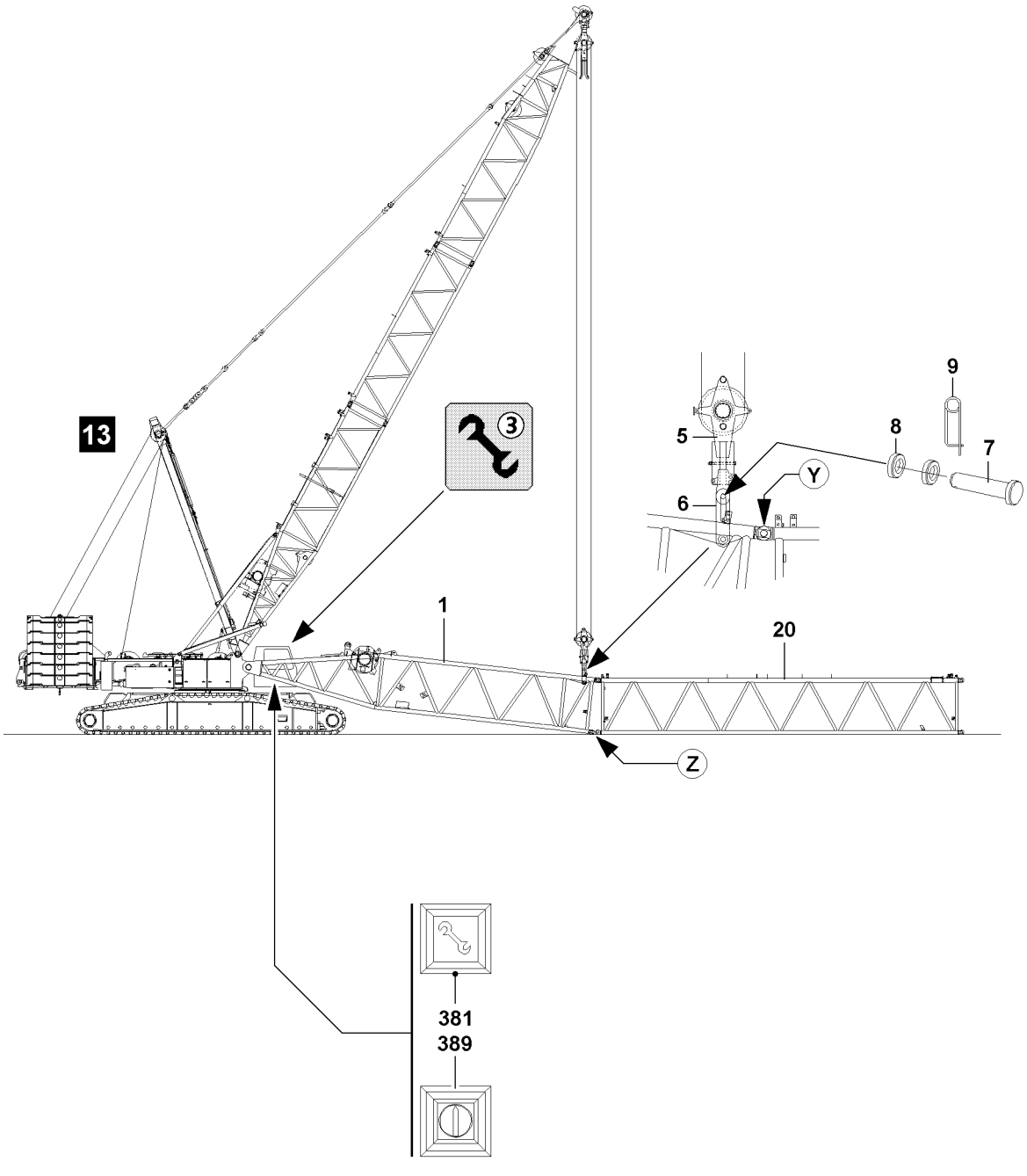
▶ Remove the hoist limit switch weight and unreeve the hook block.

▶ Luff down the Sw-boom until the boom head is resting on the base support on the ground.

WARNING
Risk of accident!
- ▶ Make sure that no personnel is within the danger zone.

NOTICE
Overspooled winch!
If the rope is pulled under the winch when spooling up, the settings of the cam limit switch are not longer correct and there is an increased danger of accidents!
As a result, extensive adjustment work on the cam limit switch is required!
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch.
- ▶ Stop the winch in time, with sufficient rope reserve!
- ▶ Do not overspool the winch!

▶ Remove the hoist rope.



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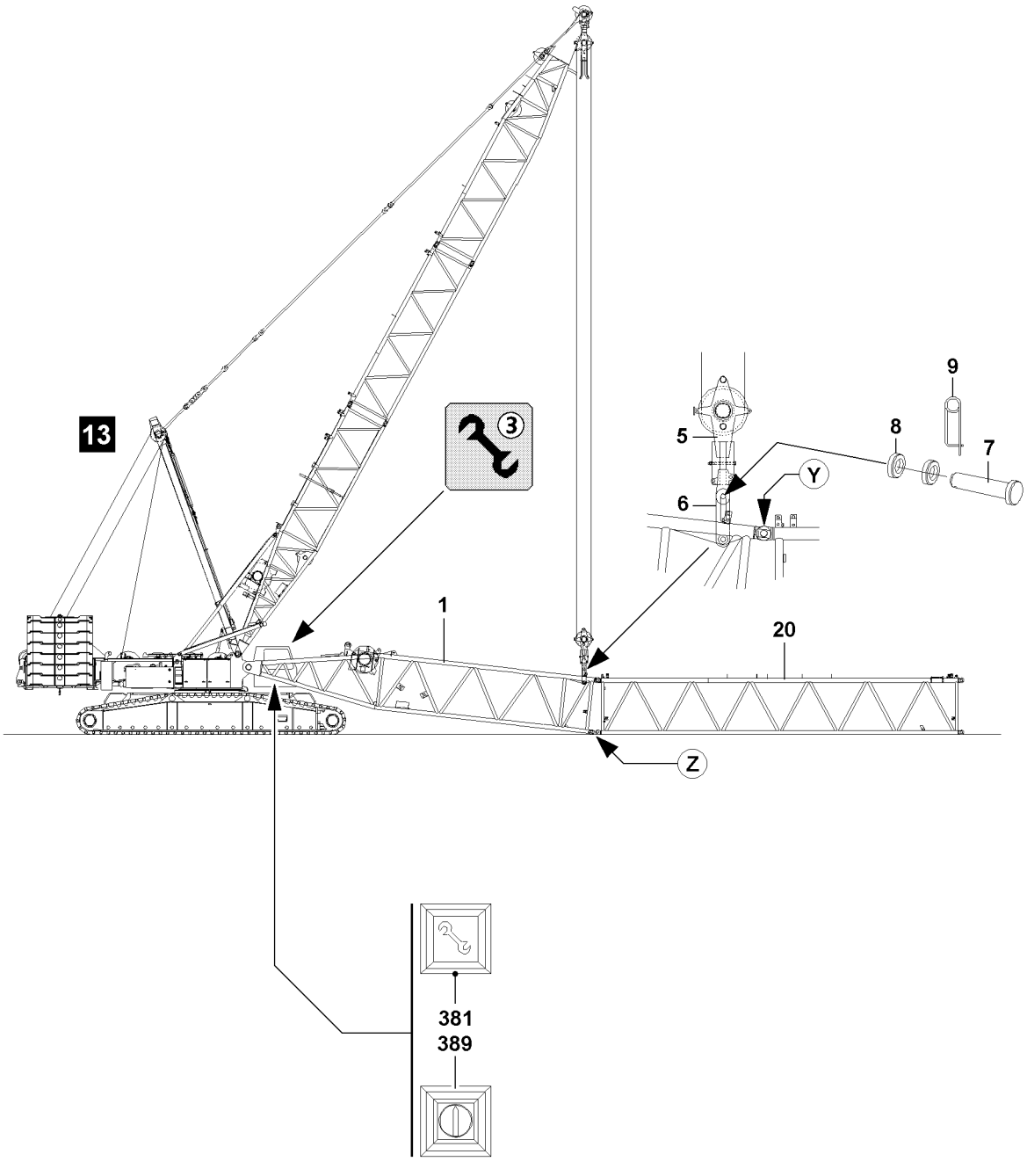
3.2 Disassemble the boom

WARNING
The Sw-boom can suddenly fold down!
If the following conditions are not met prior to dismantling the Sw-boom, the Sw-boom can fold down and fatally injure people!
- ▶ Support the Sw-boom during disassembly with suitable materials or place it on the ground!
- ▶ It is prohibited for anyone to remain under the Sw-boom or in any part of the danger zone during the boom pinning and unpinning procedure!

- ▶ Relieve the guying: Luff the derrick boom down to the front.
- ▶ When the guying is relieved:
  Unpin the upper pulley block on the guy rods.
- ▶ Place the guy rods on the intermediate sections and secure with transport retainers.
- ▶ Erect the derrick boom.
- ▶ Lower the upper pulley block **5** until it is over the assembly brackets.
- ▶ Pin and secure the upper pulley block **5** with the assembly brackets **6**.
- ▶ Use pin **7**, washer **8** and spring retainer **9**.

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged!
Personnel can be severely injured or killed!
- ▶ The maximum permissible total force on test point **MS1** may **not** be exceeded.
- ▶ Lifting the following boom lengths is permissible providing the maximum permissible total force at test point **MS1** is observed. Refer to the following charts!

Note
- ▶ The ACTUAL force on test point **MS1** is shown on monitor 1.
- ▶ Tension the guy rods on the SA-bracket with the same force as during the assembly.
- ▶ For this, refer the ACTUAL force at the measuring point measured and recorded during the assembly (MS1).
- ▶ The pins can be pulled easier and the pins and lugs are therefore not damaged.



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WARNING
The crane can topple over!
▶ When disassembling the boom, ensure that the turntable is fitted with a counterweight of at least 95 t and the crawler center section is fitted with a central ballast of 43 t!

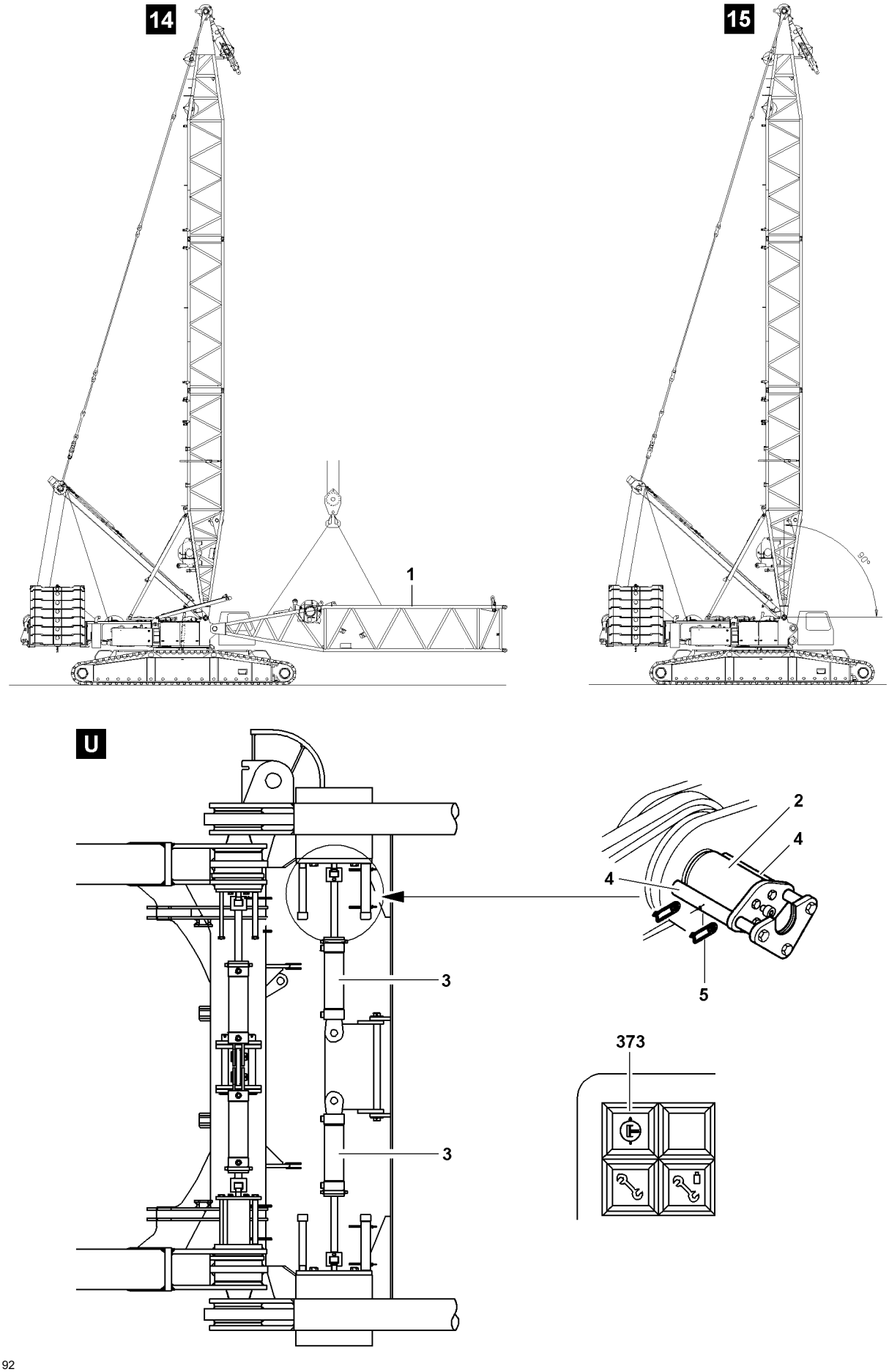
	Maximum permissible system lengths for a maximum total force MS1 110 t					
	49.0 m	48.4 m	45.5 m	45.5 m	38.5 m	45.5 m
	DB_{min} 1) 95 t / ZB_{min} 2) 43 t					
S-pivot section 13.4 m	1x	1x	1x	1x	1x	1x
S-intermediate section 7.0 m	1x	1x	—	1x	—	1x
S-intermediate section 14.0 m	1x	2x	2x	1x	1x	—
SW-reducer section 4.1 m	1x	—	1x	1x	1x	1x
W-intermediate section 7.0 m	—	—	—	1x	1x	1x
W-intermediate section 14.0 m	—	—	—	—	—	1x
W-end section 10.5 m	1x	—	—	—	—	—

1) This counterweight **must** at least be installed on the turntable during “disassembly”.
2) This central ballast **must** at least be installed on the crawler center section during “disassembly”.

Note
▶ Unpin the intermediate sections with the pin pulling device, see chapter 5.30.

NOTICE
Danger of property damage!
If the maximum permissible total force is not observed when lifting the boom system for disassembly, then the crane components can be severely damaged.
▶ Do not exceed the maximum permissible total force!

▶ Disconnect the electrical connections and store the cables carefully.
▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
▶ Lift the S-pivot section **1** with the upper pulley block **1** and unpin on both sides at point **Z**: Remove the spring retainer **9** and unpin the pin **7**.
▶ Lower the S-pivot section **1** to the ground.
▶ Relieve the guying by lowering the upper pulley block **5**.
▶ Unpin the upper pulley block **5** on the assembly brackets **6**: Remove the spring retainer **9** and unpin the pin **7**.
▶ Unpin and disassemble the intermediate sections.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3.3 Unpinning the S-pivot section

WARNING
General danger notes!
▶ Insert and secure all pins after disassembly in the intended transport receptacles!

Ensure that the following prerequisite is met:
– The derrick boom is erected to the point where the S-pivot section can be disassembled without obstructions.

▶ Attach the S-pivot section **1** on the auxiliary crane.
▶ Lift the S-pivot section **1** with the auxiliary crane to the horizontal.

Establish the hydraulic connection to the pin pulling device via two quick couplers.
Release and unpin the S-pivot section **1** on the turntable.
▶ Establish the hydraulic connection to the pin pulling device.
▶ Turn the pressure change over switch **373** on.

WARNING
Falling S-pivot section!
▶ Make sure that the S-pivot section is safely held by the auxiliary crane before unpinning the pins **2**.

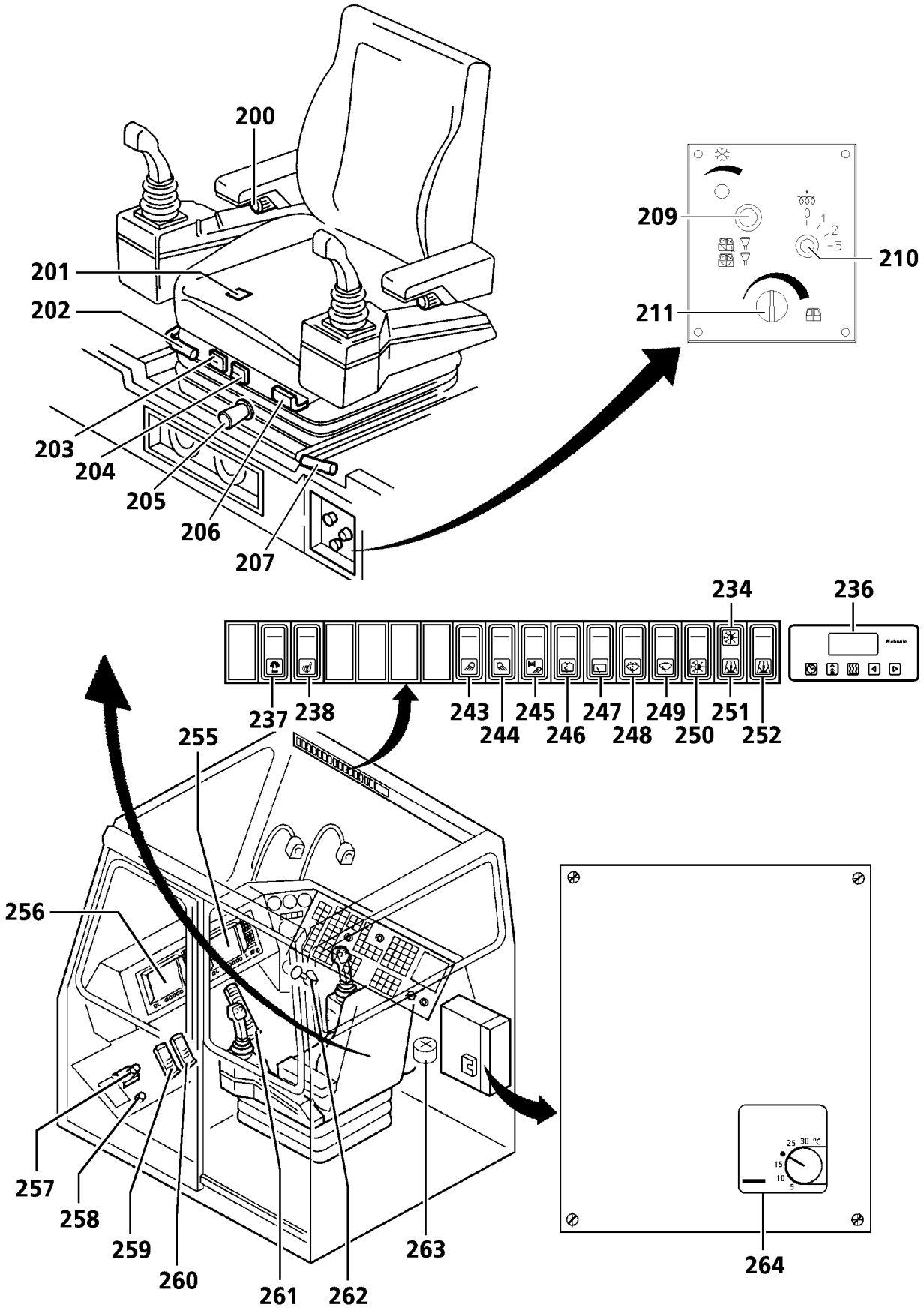
▶ Remove the spring retainer **5** on the retaining plate **4** on the left and right.
▶ Remove the retaining plate **4** left and right.
▶ Unpin the connector pins **2** with the hydraulic pin pulling device **3**.
▶ Turn the pressure change over switch **373** off.
▶ Disconnect the hydraulic connections to the pin pulling device.

NOTICE
Danger of property damage on the turntable and on the S-pivot section!
▶ Slowly swing the S-pivot section out with the auxiliary crane and at low speed on the turntable.

▶ Place the S-pivot section with the auxiliary crane on the support on the ground.
▶ Remove the pin pulling device.
▶ Remove the auxiliary crane.

Note
▶ Disassemble the derrick boom, see chapter 5.05!

6.00 Additional equipment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B105249

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 **211**.

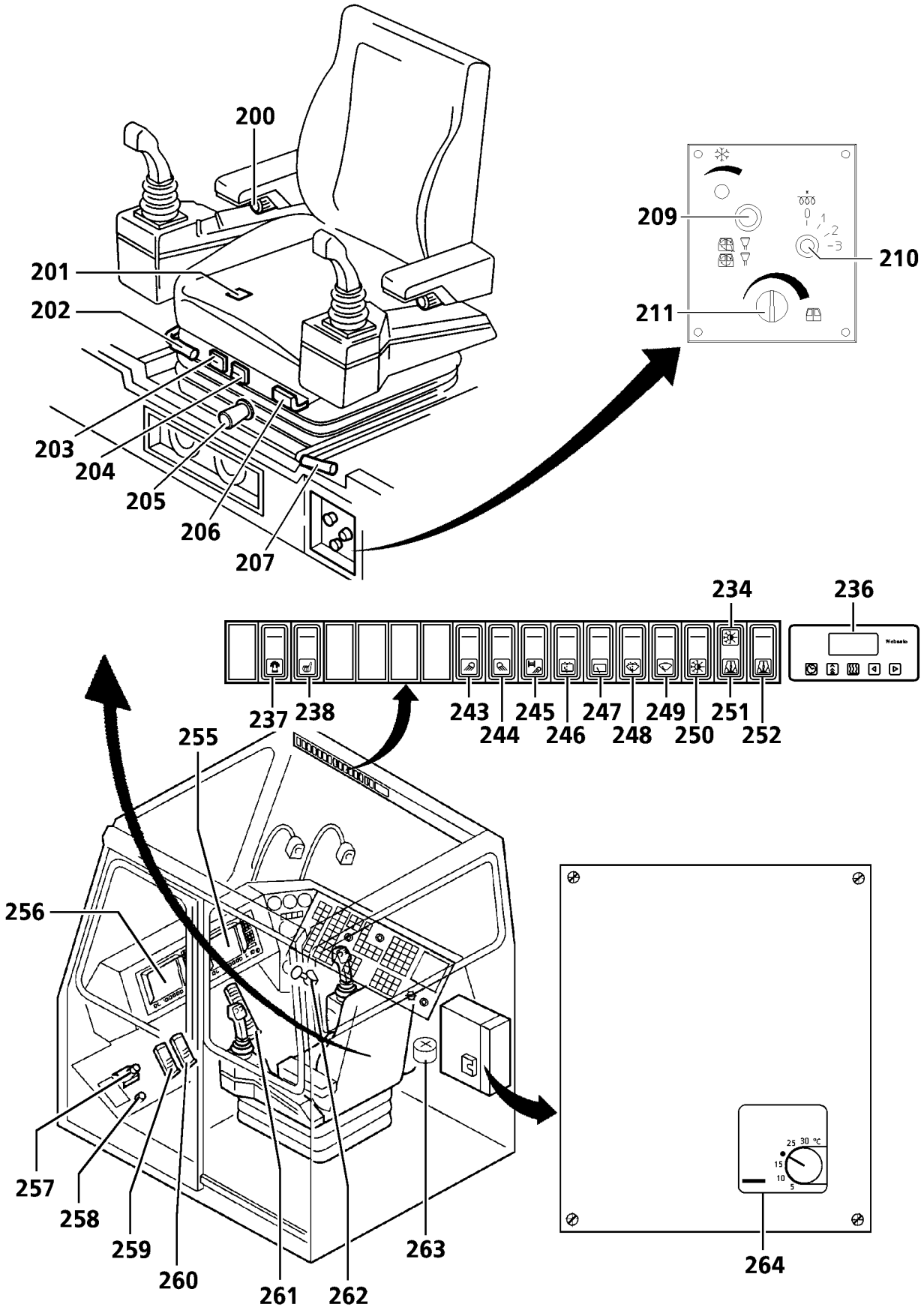
1.1.2 Adjusting the ventilation

▶ Set the blower with the 3-stage rotary switch **210**.

Result:
– The air volume will be regulated.

1.1.3 Adjusting the recirculated air / fresh air

▶ Actuate the changeover switch **209**.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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.

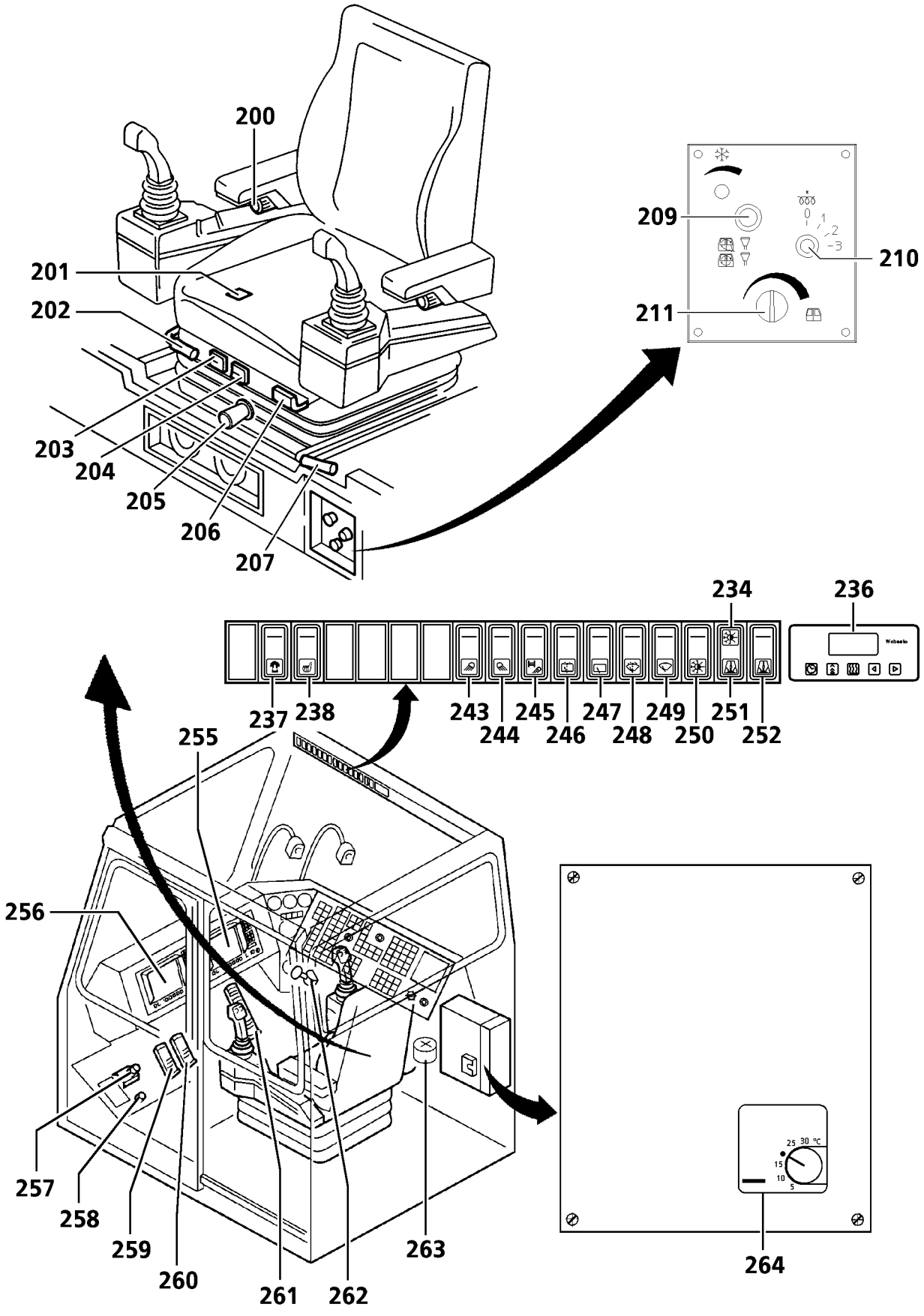
▶ Set the knob **211** to “warm”.
▶ Actuate the switch **252**.
Result:
– The function control on the switch **252** lights up.
– The indicator light **251** lights up.

1.2.2 Turning off

▶ Actuate the switch **252**.
Result:
– The function control on the switch **252** turns off.
– Each time the auxiliary heater is turned off, it continues to run up to 150 seconds longer.

NOTICE
Danger of property damage!
▶ Only turn off the battery master switch once the heater after run is over.

– When the after run is over:
The indicator light **251** turns off.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1.2.3 Operation with timer*

For a detailed description of the timer **236** refer to the enclosed manufacturer's operating instructions.

▶ Set the required turn-on time, temperature and duration of heater operation on the timer **236**.

▶ Open or close the air vents as desired.

Result:

– Upwards or downwards air distribution will be selected.

▶ Set the knob **211** to “warm”.

1.2.4 Operating the thermostat*

Ensure that the following prerequisites are met:

– The knob **211** is set to “warm”.

▶ Turn the thermostat **264** to the desired temperature.

1.2.5 Venting the system

When refilling, the system 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 **211** to “warm”.

▶ Check the expansion tank for air bubbles.

Result:

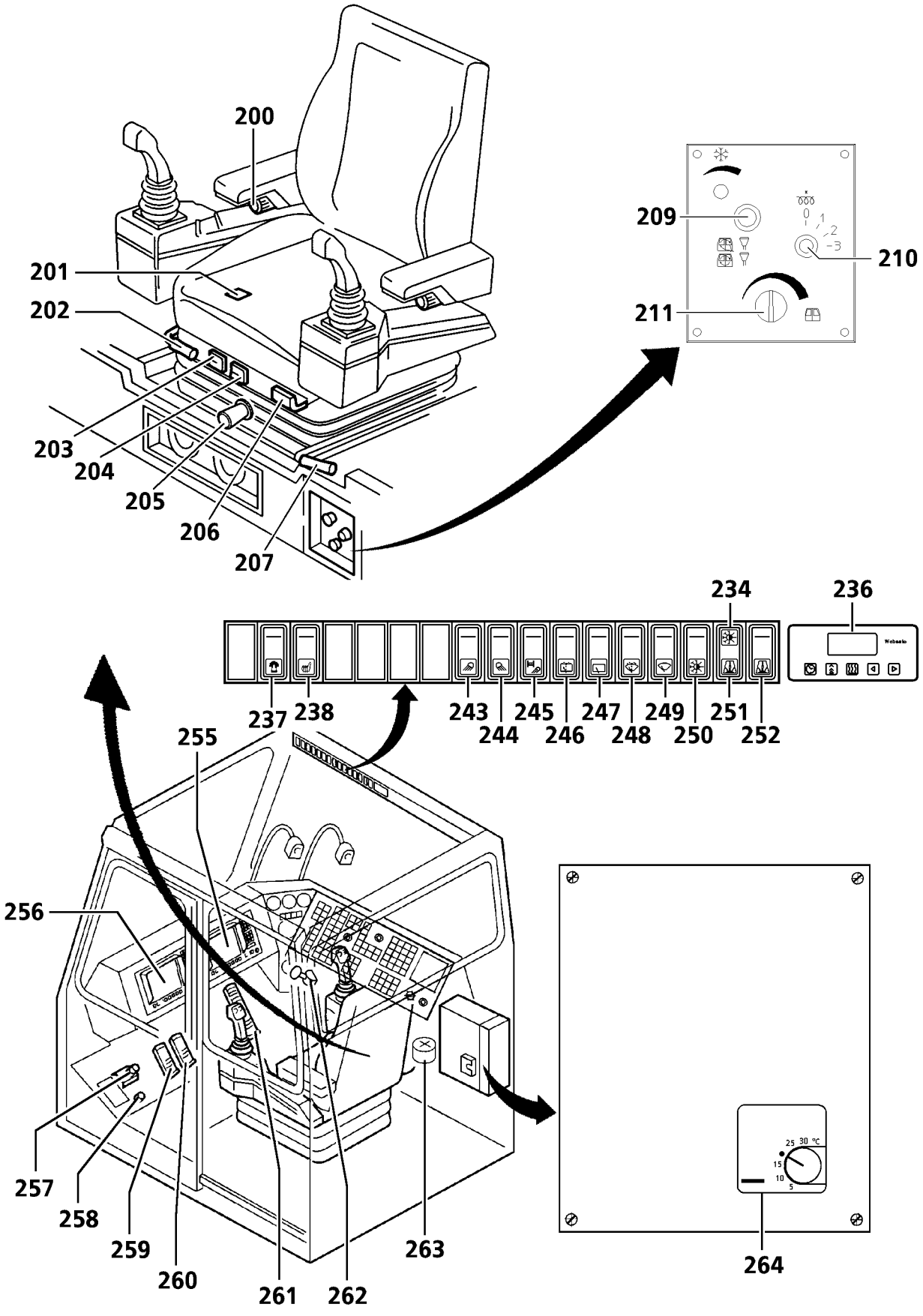
– The heating system is vented as soon as no more air bubbles rise up.

▶ Set the knob **211** 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.

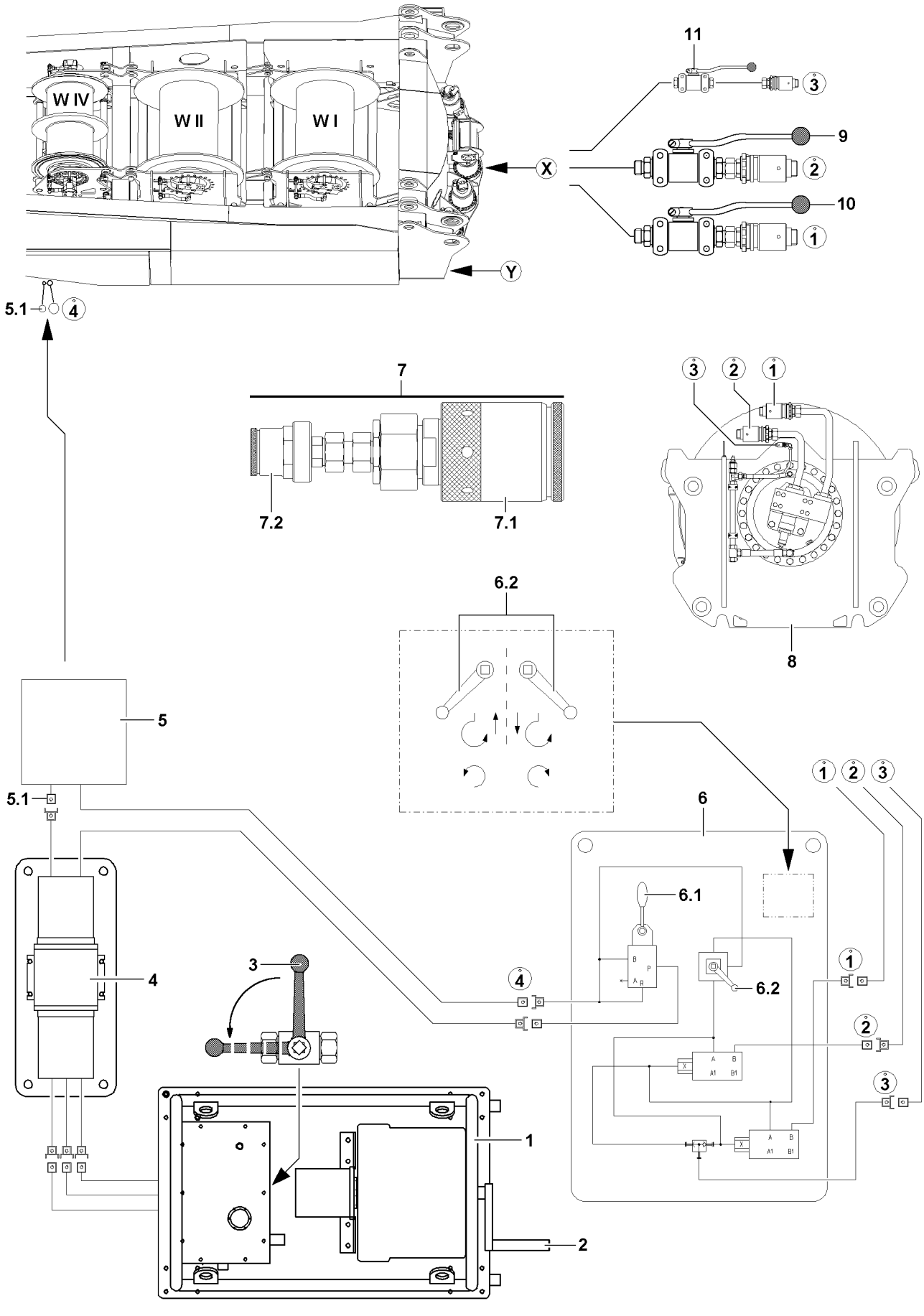
▶ Open or close the air vents as desired.

Result:
– Upwards or downwards air distribution will be selected.

▶ Close both windows and the cab door.
▶ Set the changeover switch **209** for fresh air / recirculated air to recirculated air operation.
▶ Actuate the switch **250**.

Result:
– The indicator light **234** 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 **210**.
▶ Regulate the temperature with the knob **211**.



B108301

1 Emergency control

Note
▶ The illustrations in this chapter are examples and may not apply exactly to your crane!

1.1 General danger notes

DANGER
Significant accident risk during emergency operation!
During an emergency operation, crane movements are no longer monitored by the LICCON computer system!
In the event of improper operation or deliberate misuse, the crane can topple over!
There is an increased risk of accident if the following danger notes are not observed!
Personnel can be severely injured or killed!
This could result in high property damage!
▶ All hazard warnings are to be observed and maintained!

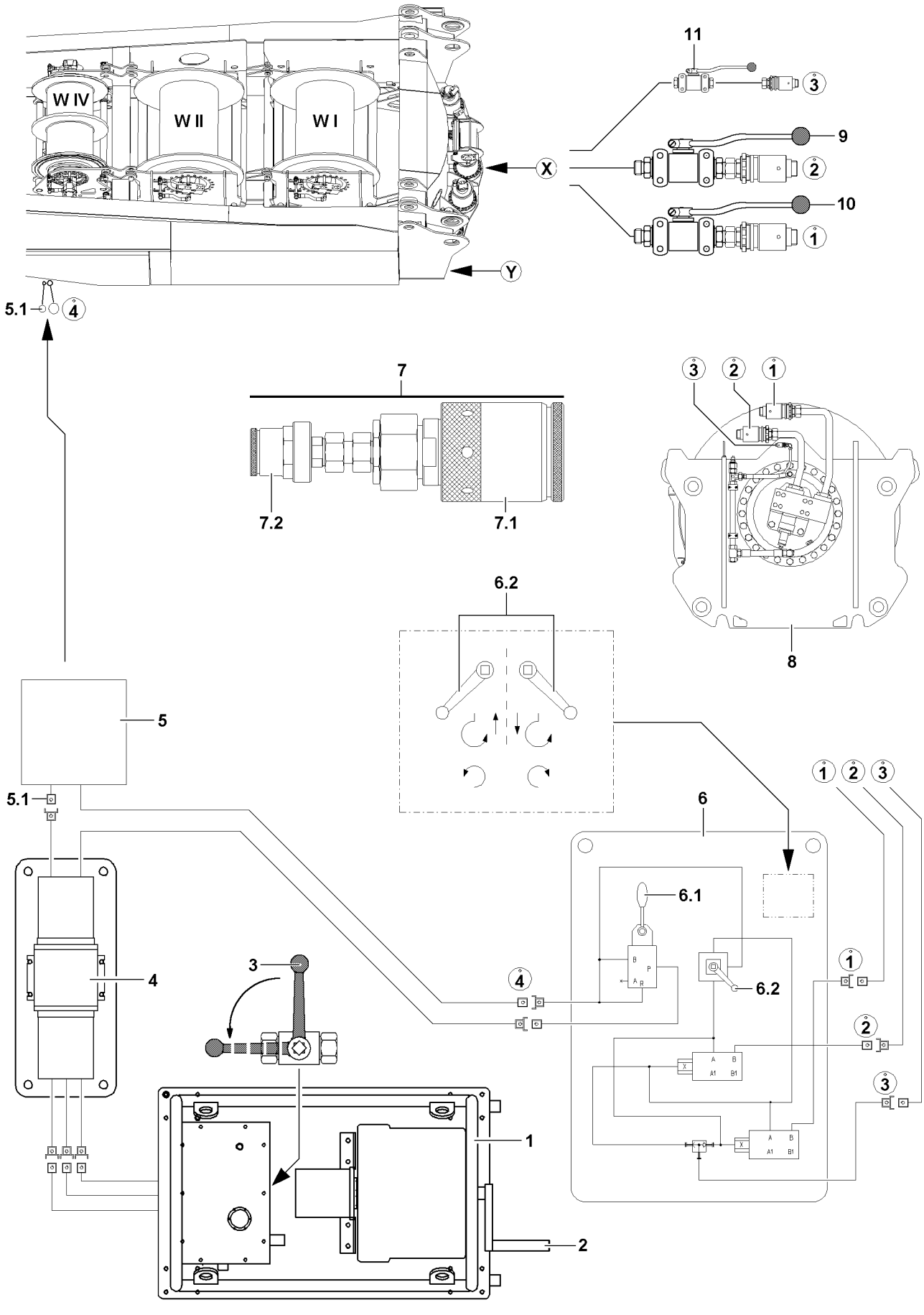
General danger notes!

1.) **Emergency operation of the crane superstructure may only be carried out:**
- **To remove a dangerous situation.**
- **After consultation with customer service at LIEBHERR-Werk Ehingen GmbH.**
- **By authorized personnel who are knowledgeable of the hydraulic circuit diagram, the connection diagram and carrying out emergency operation.**
- **By authorized personnel who are aware of the risks of emergency operation.**
- **To carry out load reducing movements.**

2.) **The danger zone must be blocked off!**
3.) **No persons or objects are to be situated in the danger zone!**
4.) **If a load is on the hook, then it must first be set down to relieve the boom!**
5.) **During emergency operation, all safety devices, with the exception of “winch spool 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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B108301

2 Preparing the crane for emergency operation

With this crane, emergency operation is to be carried out with the help of an emergency operation unit **1**, a hydraulic Transformer **4** and the assembly plate **6**.

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 unit **1** is available,
– a “hydraulic transformer” **4** is available,
– the emergency plate **6** is available,
– reducer sections **7** (adapter) are available,
– the dust plugs for the hydraulic connections are removed.

2.1 Establish the hydraulic connections

WARNING
Danger from hydraulic pressure!
If the hydraulic lines stand under pressure upon loosening the connections, it can lead to severe injuries to assembly personnel!

▶ Remove pressure from hydraulic lines before loosening!

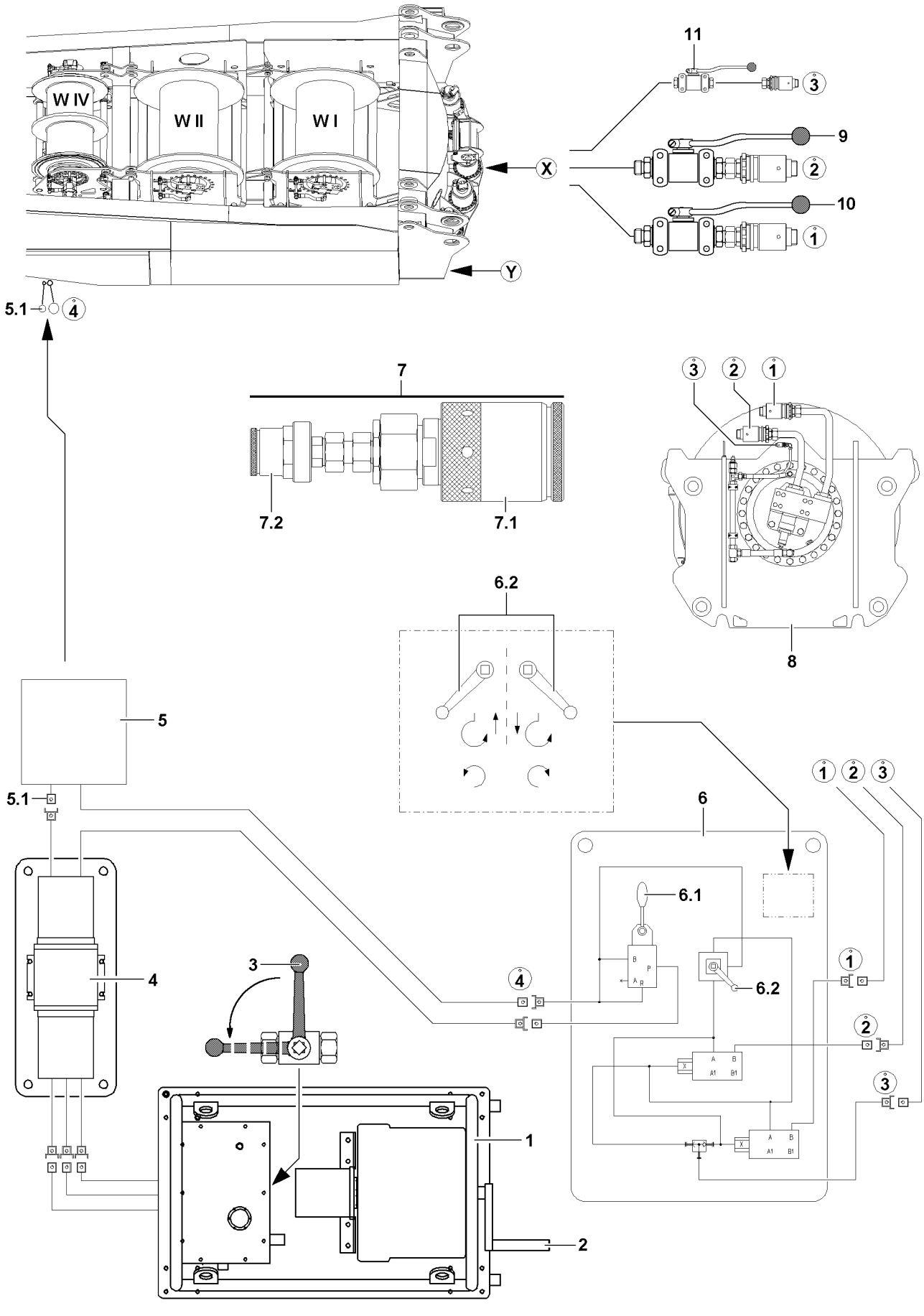
▶ Establish the hydraulic connections from the emergency operation unit* **1** to the transformer **4**.
▶ Hydraulic connection of transformer **4** for (suction line) production to the crane turntable, connection **5.1**.
▶ Hydraulic connection (return line, number **4**) of the crane turntable for the assembly plate **6**.
▶ Create hydraulic connection (pressure line) from the transformer **4** to the assembly plate **6**.

2.2 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.



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3 Start the emergency operation unit

3.1 Starting procedure

- ▶ Turn crank **2** on the emergency operation unit* **1**.
- ▶ Ball valve **3** switched over “horizontally”.

Note

- ▶ The motor rotational speed on emergency operation unit the can be set via a separate speed regulator!

4 Emergency operation winches

Note

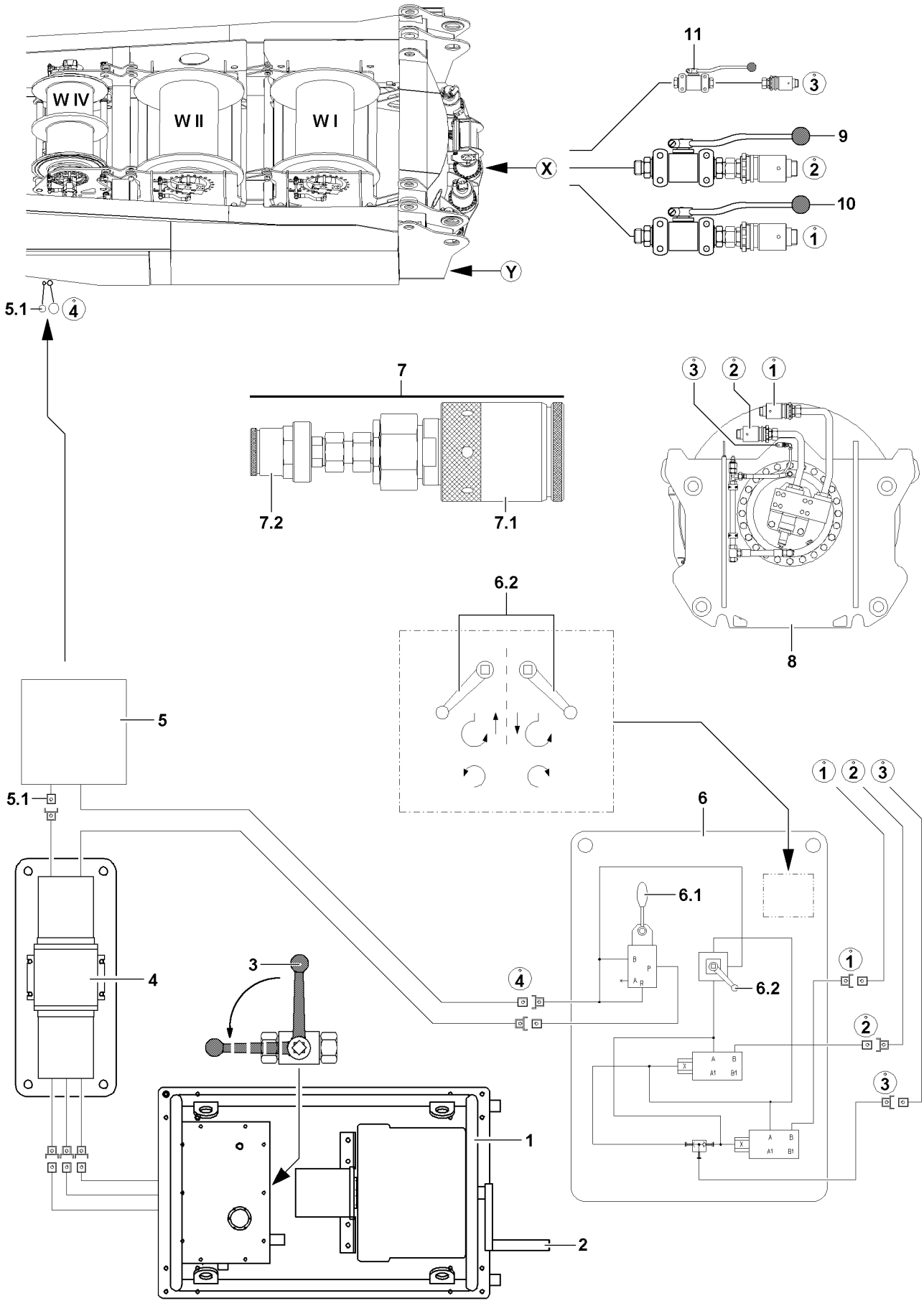
- ▶ Carrying out emergency operation is identical for all winches and is described on the example of a winch!

WARNING

Danger from hydraulic pressure!

If the hydraulic lines stand under pressure upon loosening the connections, it can lead to severe injuries to assembly personnel!

- ▶ Remove pressure from hydraulic lines before loosening!



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4.1 Establishing the hydraulic connection to the winch

Ensure that the following prerequisite is met:
– the hydraulic system is pressureless.

▶ Loosen hydraulic connections on the corresponding winch.
▶ Assemble Reducer sections **7** (adapter) with coupling sleeve **7.1** on the connection **1** and on the connection **2** of the winch **8**.

Note
▶ Observe numbering of the hydraulic lines!

▶ Create hydraulic connections for the assembly plate **6** (connection **1**, connection **2** and brake **3**) for the winch **8**.

4.2 Unspool winch

▶ Set ball cock **6.2** for the assembly plate **6** on “lower”.
▶ Move the manual lever **6.1** carefully.

Result:
– Spool winch out.

4.3 Spool up winch

▶ Set ball cock **6.2** for the assembly plate **6** on “lift”.
▶ Move the manual lever **6.1** carefully.

Result:
– Winch spools up.

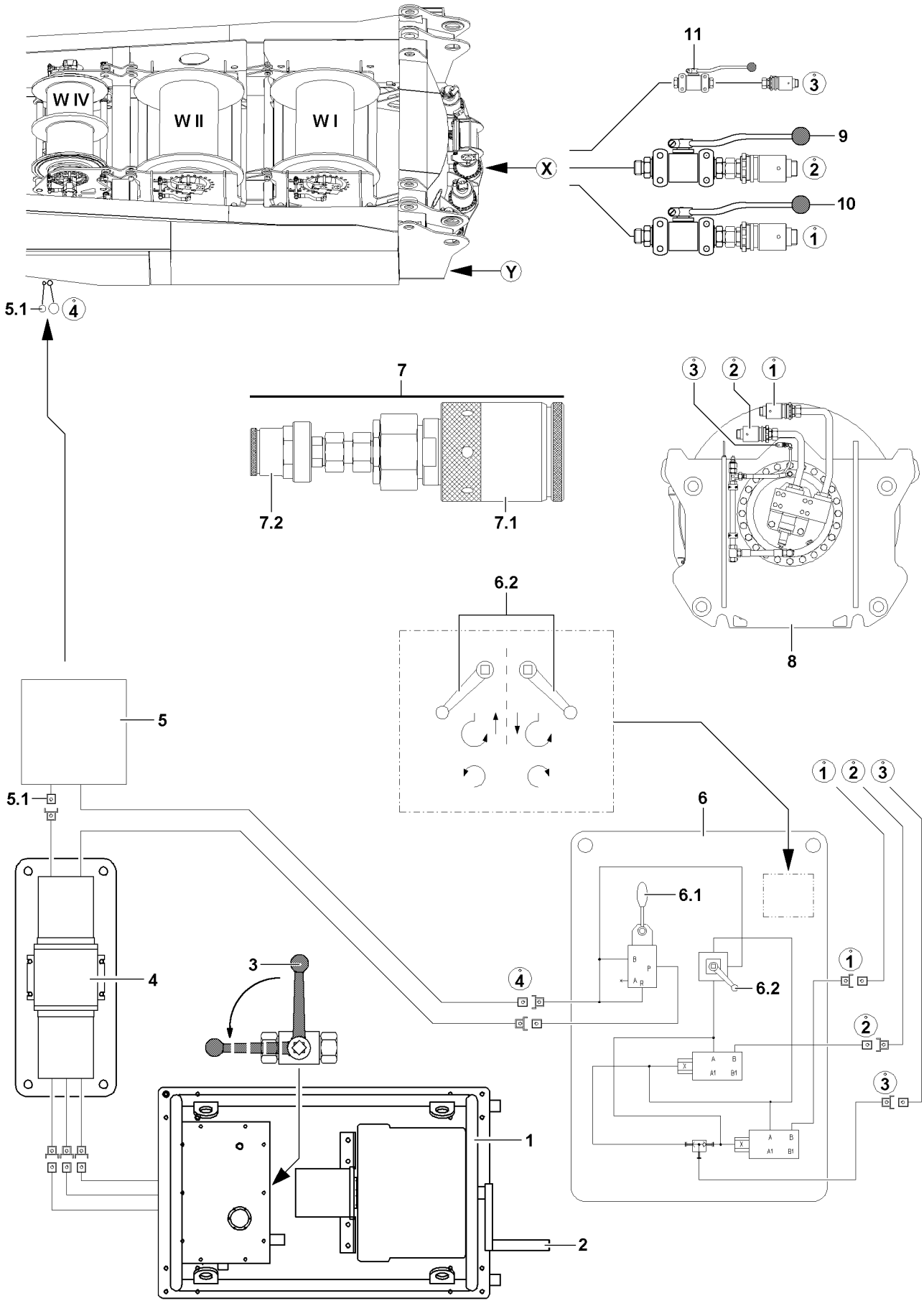
4.4 Disconnect the hydraulic connections.

Make sure that the following prerequisites are met:
– emergency operation is completed,
– the hydraulic system is pressureless.

▶ Separate hydraulic connections from winch **8** to the assembly plate **6**.
▶ Disassemble reducer sections **7** (adapter).
▶ Close hydraulic connections of the winch **8** with dust plugs.

or

■ Reconnect winch **8** onto the crane hydraulic system.



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5 Emergency operation slewing gear(s)

WARNING
Danger from hydraulic pressure!
If the hydraulic lines stand under pressure upon loosening the connections, it can lead to severe injuries to assembly personnel!
▶ Remove pressure from hydraulic lines before loosening!

Note
▶ For each crane type, the installation position of the ball valves for emergency operation of the slewing gear on the turntable varies!
▶ Possible installation positions of the ball valve: Point **X** or point **Y**!

5.1 Establishing the hydraulic connection to the slewing gears

Ensure that the following prerequisite is met:
– the hydraulic system is pressureless.

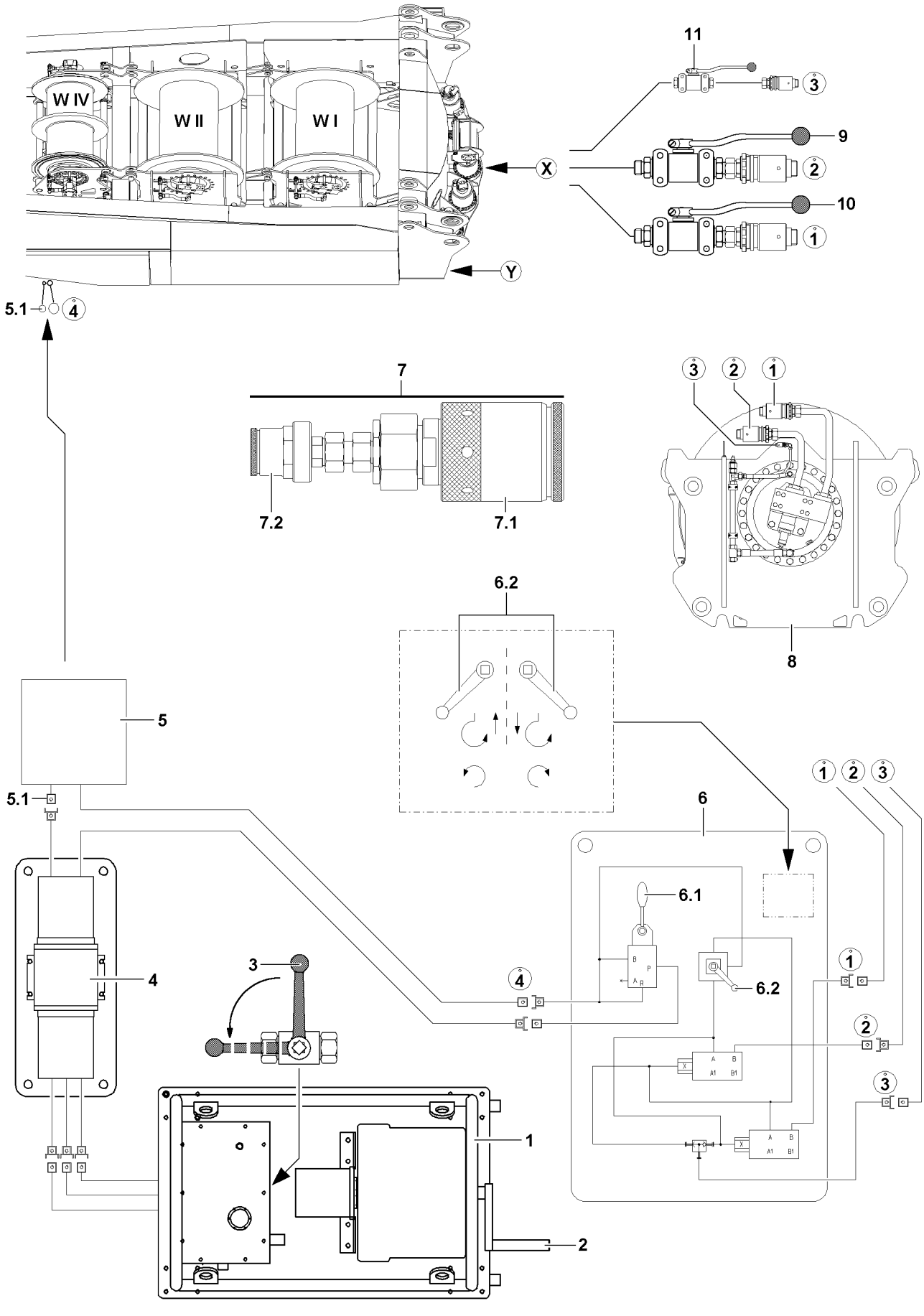
Note
▶ Observe numbering of the hydraulic lines!

▶ Create hydraulic connections to the assembly plate **6** (connection **1**, connection **2** and brake **3**) to the “ball valves” on the turntable.

5.2 Turning the turntable to the left

▶ Setting ball valve **9** into emergency operation position.
▶ Setting ball valve **10** into emergency operation position.
▶ Setting ball valve **11** into emergency operation position.
▶ Set ball valve **6.2** for the assembly plate **6** on “turn left”.
▶ Move the manual lever **6.1** carefully.

Result:
– Turntable turns to the left.



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5.3 Turning the turntable to the right.

- ▶ Setting ball valve **9** into emergency operation position.
- ▶ Setting ball valve **10** into emergency operation position.
- ▶ Setting ball valve **11** into emergency operation position.
- ▶ Set ball valve **6.2** for the assembly plate **6** on “turn right”.
- ▶ Move the manual lever **6.1** carefully.

Result:

– Turntable turns to the right.

5.4 Disconnect the hydraulic connections.

Make sure that the following prerequisites are met:

– emergency operation is completed,
– the hydraulic system is pressureless.

Disconnect the hydraulic connections to the assembly plate **6**.

- ▶ Reposition the ball valve **9** in position for crane operation.
- ▶ Reposition the ball valve **10** in position for crane operation.
- ▶ Reposition the ball valve **11** in position for crane operation.
- ▶ When ball valve **9**, ball valve **10** and ball valve **11** are repositioned into crane operation position. Disconnect the hydraulic connections to the assembly plate **6**.
- ▶ Close hydraulic connections with dust plugs.

6 Completing emergency operation

6.1 Procedure

- ▶ Shut off emergency operation unit* **1**.
- ▶ Close the ball valve **3**.
- ▶ Loosen the hydraulic connections and close with dust plugs.

7.00 Service and maintenance

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1 General

WARNING
Danger of fatal injury due to damaged crane components!
If crane components, which were damaged, for example due to maintenance errors, are not replaced immediately, personnel can be fatally injured!
- ▶ Maintain crane components according to the data in the maintenance intervals, the maintenance notes and the lubrication chart!
- ▶ Replace damaged crane components immediately!

NOTICE
Damage of crane components!
If crane components are not maintained according to the maintenance intervals and maintenance guidelines in the individual chapter, or if other lubricants are used than specified in the lubrication chart, the respective crane components can be damaged and/or fail!
The warranty for the respective crane components will be voided!
- ▶ Maintain crane components according to the data in the maintenance intervals, the maintenance notes and the lubrication chart!

1.1 LIEBHERR Service for you

LIEBHERR cranes - whether truck-mounted, mobile or crawler cranes - are technically advanced products, which prove their worth daily even under tough conditions.
The high technical standards, which these cranes provide today, offer functional security, resistance to failure and easy maintenance.
LIEBHERR is continuously developing the drive and control components. The combination of well proven units and modern manufacturing methods produces cranes that are safe to operate and easy to maintain.
Several hundred cranes are built every year for the international market, supported by international service.
LIEBHERR's “After Sales Service” plays an important role in ensuring the operational readiness and high availability of the cranes.
With LIEBHERR, service begins when the crane is handed over. Your crane operators will be professionally trained in line with their level of knowledge, and we devote much time to this.
We also train your workshop staff in all crane-specific matters, because we know that they can deal with more than just minor repairs themselves. Often there are specialists who can quickly and reliably carry out crane repairs.
We also have specialist service advisers who can help you to fix your on-site problems creatively. This contact by telephone saves time and money. In the event of problems, get in touch as soon as possible.
Our service technicians are also specialists with years of experience, and can be deployed from local support points. Naturally these experts have specialized knowledge and special tools.
But before you call on these people, it is worth making full use of the facilities for getting advice mentioned above.

Note
Customers claims for warranties and refunds!
The buyer only has a claim to warranties and possible credit if only Original LIEBHERR replacement parts, LIEBHERR service items and LIEBHERR lubricants are used for LIEBHERR cranes!
- ▶ Only original LIEBHERR replacement parts have been tested for operational use in cranes, and they can be installed without risking safety.

Note
Exclusion of liability!
In the event that replacement parts are used that are **not** original LIEBHERR replacement parts and **not** original LIEBHERR service items and lubricants, LIEBHERR-Werk Ehingen GmbH disclaims all liability, for system functionality as well as for the parts!
▶ Use only original LIEBHERR replacement parts!

2 Cleaning and care of the crane

2.1 Instructions for sound damping (soundproofing)

Sound proofing in the area of engines and other noise sources is an integral part of the entire construction. It is your task to limit the noise generation of vehicles and the sound level in the workplace to the legally specified values in connection with sound absorption and the design of the equipment. They are therefore an integral part for the construction permits for the machines. They may not be removed, and if damaged, they must be replaced by original LIEBHERR replacement parts.
They have been designed to be maintenance free. They have been equipped with surfaces that repel dirt, oil and water. They are fire-resistant and some of them are fireproof, depending on the location. For these reasons, these parts need minimal care. Any small dirt deposits can be disregarded, as the acoustic effectiveness of the parts is not reduced.

NOTICE
Damage of insulation (sound proofing)!
If unsuitable tools or cleaning methods are used, the insulation can be destroyed or damaged during cleaning!
▶ Remove coarse dirt with suitable tools, such as soft plastic scrapers!
▶ Do not use tools with sharp edges!
▶ Use steam cleaners only with utmost caution, sufficient distance to the insulation and low water pressure!
▶ **Solvents** may **not** be used for cleaning!

WARNING
Contamination due to solvents and foreign matter!
If the insulation is contaminated with solvents, engine oils, gear oils, hydraulic oils or fuel, then these substances can ignite and significantly change the fire proofing of the insulation!
▶ If the respective insulation was contaminated, remove the insulation **immediately** and replace with **original parts**!

2.2 Care instructions for the driver's cab and the crane operator's cab

Note
▶ The steering wheel, center console, dashboard cover, floor cover, and dirty upholstery in the driver's cab and the crane operator's cab should only be cleaned with warm water mixed with a little dish washing detergent!
▶ Do not use any scouring agents!

3 Measures to take during work stoppage or transport

3.1 Hydraulic cylinder

NOTICE
Risk of corrosion of hydraulic cylinders!
During crane application under aggressive environmental conditions, such as on locations with sea climate and especially salt containing air, the hydraulic cylinders can corrode, resulting in destruction or severe damage!
As a result, extensive and expensive repairs may be needed!

- If the crane is out of service for a longer period of time: Dismantle the crane!
- Fully retract all hydraulic cylinders on the crane! If the hydraulic cylinders cannot be retracted all the way, then protect exposed areas of the piston rod from corrosion, for example by applying a layer of grease!
- Carefully grease exposed areas of the piston rods, such as on luffing cylinders and ballasting cylinders!

4 Maintenance work on the crane superstructure or boom

WARNING
Risk of falling!
During maintenance work on the crane superstructure of boom, personnel must be secured with appropriate antifall guards to prevent them from falling! If this is not observed, working personnel can fall and be killed or severely injured!

- For all work on the crane where there is a danger of falling, suitable safety measures must be taken!
- The crane superstructure or boom may not be accessed without suitable aids!
- Suitable aids are, for example: Lifting platforms, scaffoldings, ladders, assembly platforms, auxiliary crane.
- If railing are present on the crane superstructure, then they must be swung into operating position and secured for all work, see crane operating instructions, chapter 2.06!
- Only step on such aids with clean shoes!
- Keep aids clean and free of snow and ice!
- If the work cannot be carried out with such aids nor from the ground, then the maintenance personnel must secure themselves with approved antifall guards to avoid falling, see crane operating instructions, chapter 2.04!
- It is prohibited to step on the operator's cab or cab roof and specially marked surfaces, see crane operating instructions, chapter 2.05!

5 Maintenance and inspection guidelines

Note

- ▶ The maintenance and inspection work on the crane chassis is carried out based on operating hours or by kilometers travelled!
- ▶ The maintenance and inspection work on the crane superstructure is carried out based entirely on operating hours!

Observe the following chapters when performing maintenance and inspection of the crane:

- Chapter 7.02: Maintenance intervals - Crane chassis [1]
- Chapter 7.03: Maintenance intervals - Crane superstructure [1]
- Chapter 7.04: Maintenance guidelines - Crane chassis [2]
- Chapter 7.05: Maintenance guidelines - Crane superstructure [2]
- Chapter 7.06: Fill quantities, lubrication chart
- Chapter 7.07: Service items and lubricants

[1] These chapters contain a list of maintenance intervals for all maintenance work. Only the relevant work is to be carried out.
[2] For individual components, the manufacturer's specifications must be observed.

WARNING

Danger of accidents during maintenance and inspection of crane components!

During maintenance and inspection work on crane components, there is an increased danger of accidents if the maintenance and inspection guidelines are not observed!

Personnel can be severely injured or killed!

- ▶ Observer and adhere to the following listed warning notes and the generally valid safety regulations!

5.1 Warning notes

- Maintenance and inspection work may only be carried out by authorized and especially trained personnel.
- Unauthorized personnel may not remain within the danger zone.
- Turn the engine in the crane superstructure and the crane chassis off.
- Apply the parking brake for the crane chassis.
- Pull the ignition key on the crane superstructure and the crane chassis and hand it to an authorized person.
- It is strictly prohibited to carry out maintenance or inspection work during travel or crane operation.

5.1.1 Warning notes regarding danger of burns

WARNING

Danger of burns during maintenance or inspection work!

When carrying out maintenance or inspection work, you can be burnt severely on hot surfaces of crane components! This applies especially for the exhaust system or the travel gear!

- ▶ Let any components to be maintained or inspected cool off!
- ▶ Do not spill any service fluids over hot components!
- ▶ Avoid short circuits in the electrical system, especially on the battery!

5.1.2 Warning notes regarding rotating parts

WARNING
Danger due to rotating parts!
If inspection work must be carried out while the engine is running, there is a significant danger from turning parts and from the ignition system!
Personnel can be severely injured!
- ▶ Be especially careful and do not reach into rotating parts!
- ▶ Never reach into the cooler fan when the engine is warm! The cooler fan could turn on suddenly!

5.1.3 Warning notes regarding scalding danger

WARNING
Danger of scalding during maintenance or inspection work!
When opening the coolant reservoir, hot coolant can emerge explosively!
Severe scalding over the whole body can result!
- ▶ Never open the cap on the coolant reservoir as long as the engine is warm!
- ▶ The cooling system is under pressure!
- ▶ To protect face, hands and arms from steam of hot coolant, cover the cap with a large rag when opening!

5.1.4 Warning notes regarding danger of fire

DANGER
Danger of fire!
When working on the fuel system or on electrical systems, there is an increased danger of fires if the general safety regulations are not observed!
Personnel can be severely injured or killed!
This could result in high property damage!
- ▶ Disconnect the battery from the power supply!
- ▶ Do not smoke!
- ▶ Do not work near open flames!
- ▶ Keep a functioning fire extinguisher ready!

5.1.5 Maintenance errors

NOTICE
Damage of components!
In case of incorrect maintenance, severe functional defects and damage on the components can occur!
- ▶ Add correct and sufficient service fluids during maintenance!
- ▶ For all maintenance work, observe utmost cleanliness to prevent dirt from entering the inside of the components!
- ▶ Check components in regular intervals for leaks!
- ▶ Have leaking components sealed immediately and properly!

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1 Crane chassis maintenance and inspection plan

Note

- The operating hour meter of the crawler travel gear is the deciding factor for the maintenance intervals in this chart!
- The operating hour meter “crawler travel gear” * is located in the control cabinet!

	First maintenance	Regular maintenance, every			Minimum maintenance	Checks	
	After	10 h	100 h	1000 h	Annually	Daily	Weekly
Travel gear							
Oil change	200 h			4000 h	Every 4 years		
Check for leaks		X					
Grease the sprocket bearing		X					
Check the mounting screws for tight seating		X			X		
Crawler carrier							
Check track rollers, carrier rollers (with oil lubrication) for leaks			X				
Grease track rollers, carrier rollers (with grease lubrication)		X					
Grease guide rails at sliding piece					X		
Lubricate the consoles					X		
Crawler chain							
Check correct mounting			X				
Check for damage			X				
Check the chain tension, retension if necessary			X				X
Check the wear on the bores of the track pads, replace track pads if necessary			X				

	First maintenance	Regular maintenance, every			Minimum maintenance	Checks	
	After	10 h	100 h	1000 h	Annually	Daily	Weekly
Check the wear on the connector pins of the track pads, replace pins if necessary			X				
Assembly support							
Check the hydraulic cylinder for leaks							X
Check ease of movement / grease the support beam					X		
Lubricate the bearing points of the support beams					X		
Check sight gauge, readjust if necessary					X		
Crane support							
Check the hydraulic cylinder for leaks							X
Check ease of movement / grease the support beams					X		
Lubricate the struts					X		
Lubricate the mounting pins on the struts					X		
Lubricate the support pad bearing					X		
Rotary connection							
Lubricate				X			
Hydraulic cylinder							
Check for leaks							X
Hydraulic hose lines							
Check for leaks and damage						X	
A safety check should be performed by experts					X		

	First maintenance	Regular maintenance, every			Minimum maintenance	Checks	
	After	10 h	100 h	1000 h	Annually	Daily	Weekly
Central lubrication system							
Check grease supply of central lubrication system		X					
Check for correct function			X				

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2 Ballast trailer maintenance and inspection schedule

	First maintenance	Regular maintenance, every			Minimum maintenance	Checks	
	After	10 h	100 h	1000 h	Annually	Daily	Weekly
Tires							
Check for external damage							X
Check the tire pressure							X
Ensure that lug nuts are tight, retighten if necessary		X					
Axle link							
Lubricate			250 h		X		
Hydraulic cylinder							
Check for leaks							X
Hydraulic hose lines							
Check for leaks and damage						X	
A safety check should be performed by experts					X		
Slewing gear							
Check for leaks						X	
Check the oil level							X
Check the mounting screws for tight seating	250 h		500 h		X		
Oil change				4000 h	Every 4 years		
Central lubrication system							
Check grease supply of central lubrication system		X					
Check for correct function			X				
Emergency control							
Check for correct function					X		

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1 Crane superstructure maintenance and inspection schedule

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Diesel engine								
Check the oil level For all other maintenance tasks, follow the instructions of the engine manufacturer							X	
Check the coolant level in the equalising reservoir							X	
Replace coolant						Every 2 years		
Air filter								
Check monitoring device							X	
Clean or change (follow the instructions of the engine manufacturer)								
Rotary connection								
Lubricate gearing			X					
Lubricate the rotary connection						X[1]		
Check screws for tight seating	250 h				X	X		
Check tilt play					X	X		
Check the grease container fill level		X				X		
Rope winches								
Check for leaks							X	
Check the oil level								X
Check the mounting screws for tight seating	250 h			X		X		

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
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 authorized inspector						Every 4 years		
Relapse supports								
Lubricate bearings				X		X		
Relapse cylinder								
Check for leaks	X[2, 6]							

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Check pretension pressure (nitrogen)	X[2, 6]			X		X		
Check oil level	X[2, 6]			X		X		
Pneumatic springs								
Check the function	X[2, 5, 6]			X		X		
A-frame bearing								
Lubricate				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 and damage					X	X		
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 technical expert						Every 4 years		
Hook blocks								
Grease hook				X		X		
Check distance gap (y)				X		X		
Crane operator's cab								
Check the fittings are functioning correctly							X	

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
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	
Electrical system								
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		
Pump distributor gear								
Check for leaks							X	
Check the oil level								X

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Oil change	500 h				X	X		
Hydraulic hose lines								
Check for leaks and damage							X	
Check for safe condition by a technical expert						X		
Hydraulic system								
Check the oil level							X	
Check for leaks								X
Replace servo pressure and replenishing pressure filter inserts	250 h			X		X		
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		

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Clean air drier preliminary filter						X		
Central lubrication system								
Check for correct function				X				
Emergency control								
Check for correct function						X		
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 for distortions and cracks						X		
Check hydraulic system components for leaks						X		

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Check telescoping cylinder for proper condition				X		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 the oil level on the guy winch								Every 6 months
Change the oil on the guy winch						Every 4 years		
Derrick ballast								
Check frame, suspension and guide section for distortion and cracks						X		

	First maintenance	Regular maintenance, every				Minimum maintenance	Checks	
	After	125 h	250 h	500 h	1500 h	Annually	Daily	Weekly
Check wheels for condition and tight seating						X		

[1] every 3 months if the crane is not moved.
[2] carry out a visual inspection before every startup in service.
[3] in hot climates twice a year.
[4] note chapter 7.05, Crane superstructure maintenance instructions.
[5] when necessary.
[6] during assembly.

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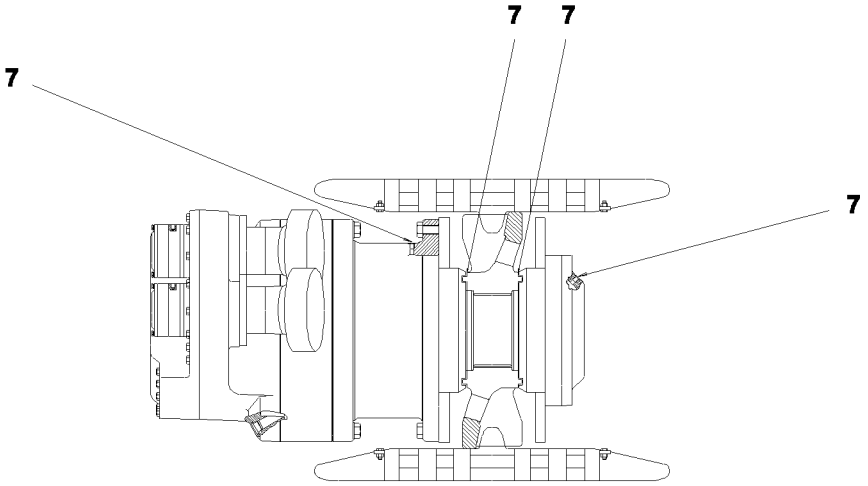

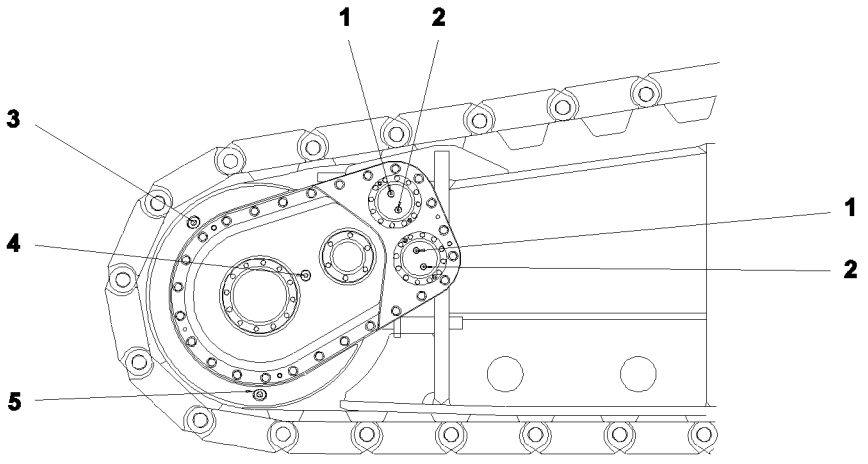

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1 Travel gear

NOTICE
Danger of gear damage!
▶ For all work on the travel gear, observe utmost cleanliness to avoid dirt infiltration into the inside of the travel gear!

1.1 Check the oil level

Travel gear, see illustration 1
1 Oil filler port, brake
2 Oil level, brake
3 Oil filler port, gear
4 Oil level, gear
5 Oil drain, gear
7 Grease lubrication

Make sure that the following prerequisites are met:
– the crane is in horizontal position,
– the travel gear must be at a standstill.

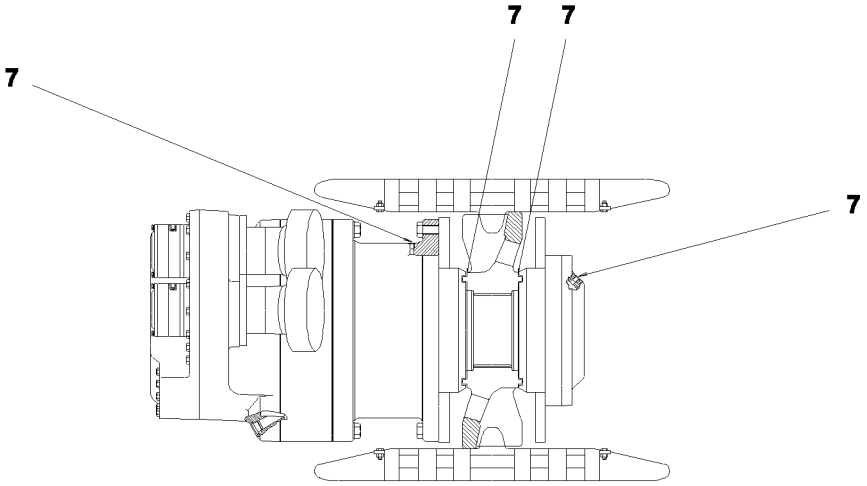
Note
▶ To ensure proper oil level check, make sure that the travel gears are at a standstill for at least two minutes before checking the oil level. This ensures that the oil has returned to the oil chamber completely!

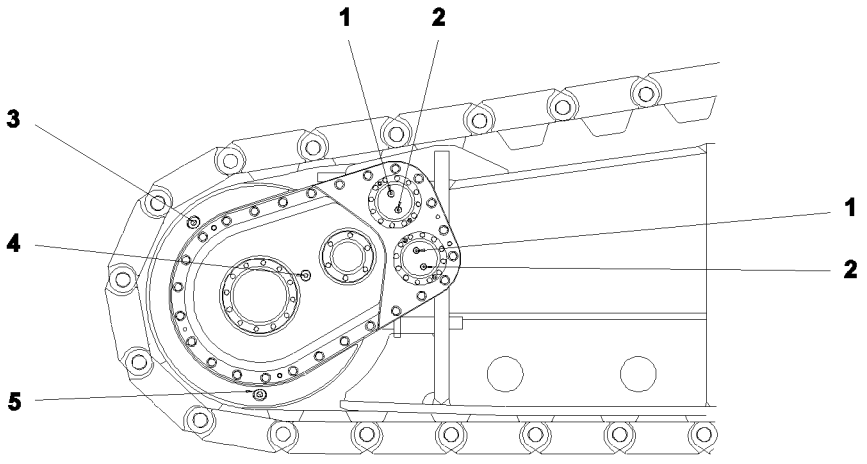
▶ Carefully back out the oil level plug.
▶ If the oil runs out of the control port or if the oil level is at the height of the lower edge of the control port, then the oil level on the travel gear is ok.

NOTICE
Danger of gear damage!
▶ If the oil level has dropped below the control port edge, make sure to add gear oil according to the lubrication chart until the oil level is again at the height of the lower control port!

▶ Add oil on the oil filler port.
▶ Reinstall the oil level plug and tighten.

1





B107280

1.2 Oil change

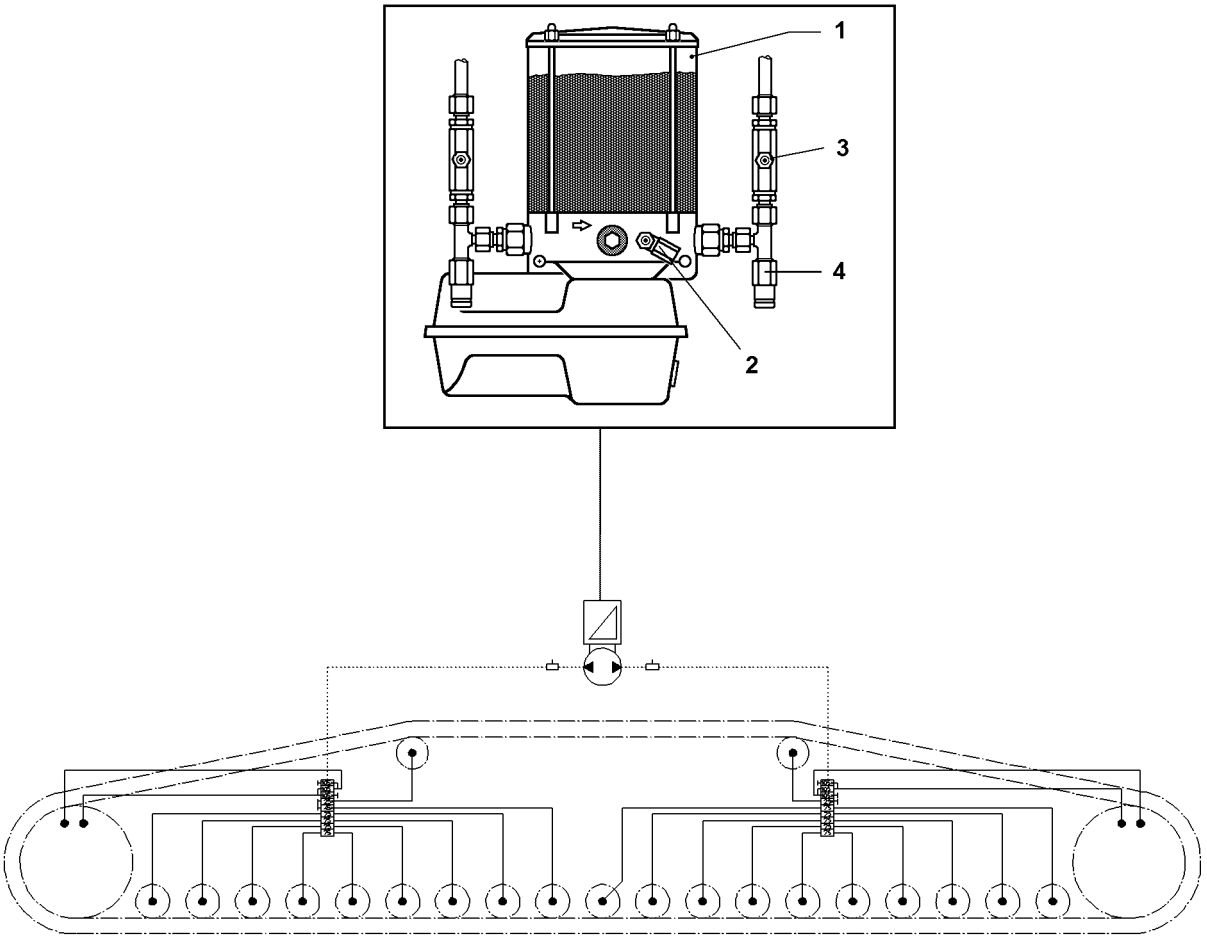
Make sure that the following prerequisites are met:
- the crane is in horizontal position,
- the travel gear must be at a standstill,
- travel gear at operating temperature,
- a container to catch the “used oil” is available.

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 travel gear, see chapter 7.06!

- ▶ Remove the oil filler plug **3**.
- ▶ Remove the oil drain plug **5** and drain oil into a suitable container.
- ▶ Remove the oil level plug **4**.

Note
- ▶ Allow the gear to empty completely!

- ▶ Clean the oil drain plug **5** and the sealing surface.
- ▶ Install the oil drain plug **5** with new seal and tighten.
- ▶ Add oil according to the lubrication chart on the oil filler plug **3** until “it is” at the height of the oil level port **4** or until it starts to run over.
- ▶ Install the oil level plug **4** with new seal and tighten.
- ▶ Install the oil filler plug **3** with new seal and tighten.



B102498

2 Central lubrication system

The crawler carriers are equipped with a central lubrication system. All grease points (see overview on the left) are automatically supplied with the correct amount of grease. If the crane has not been moved for more than 3 months, then it must be lubricated every 3 months with an external grease pump until grease emerges from all grease points. Then repeat the corresponding crawler movement several times and repeat the lubrication procedure.

Note

▶ Cleaning is permitted in washing bays or with steam cleaners!

2.1 Components of the system

– Grease container **1**
– Grease fitting **2**: Filling the grease container
– Grease fitting **3**: Filling the lube lines
– Pump outlet **4**

2.2 Filling the grease container

NOTICE

Inadequate lubrication will damage the travel gear!

▶ There must always be sufficient grease in the grease container **1**!
▶ Observe utmost cleanliness when filling the grease container **1**!

▶ Fill the grease container **1** with a grease pump via the grease fitting **2** on the central lubrication pump.

2.3 Bleeding the central lubrication system

If the grease container **1** has been emptied, then it may be necessary to bleed the central lubrication system.

▶ Fill the grease container **1**.
▶ Unscrew the main line from the pump outlet **4**.
▶ Trigger additional lubricating pulses until there are no more air bubbles in the emerging grease at the pump outlet **4**.
▶ Reconnect the main line.
▶ Trigger an additional lubricating process.

2.4 Filling the lubrication lines

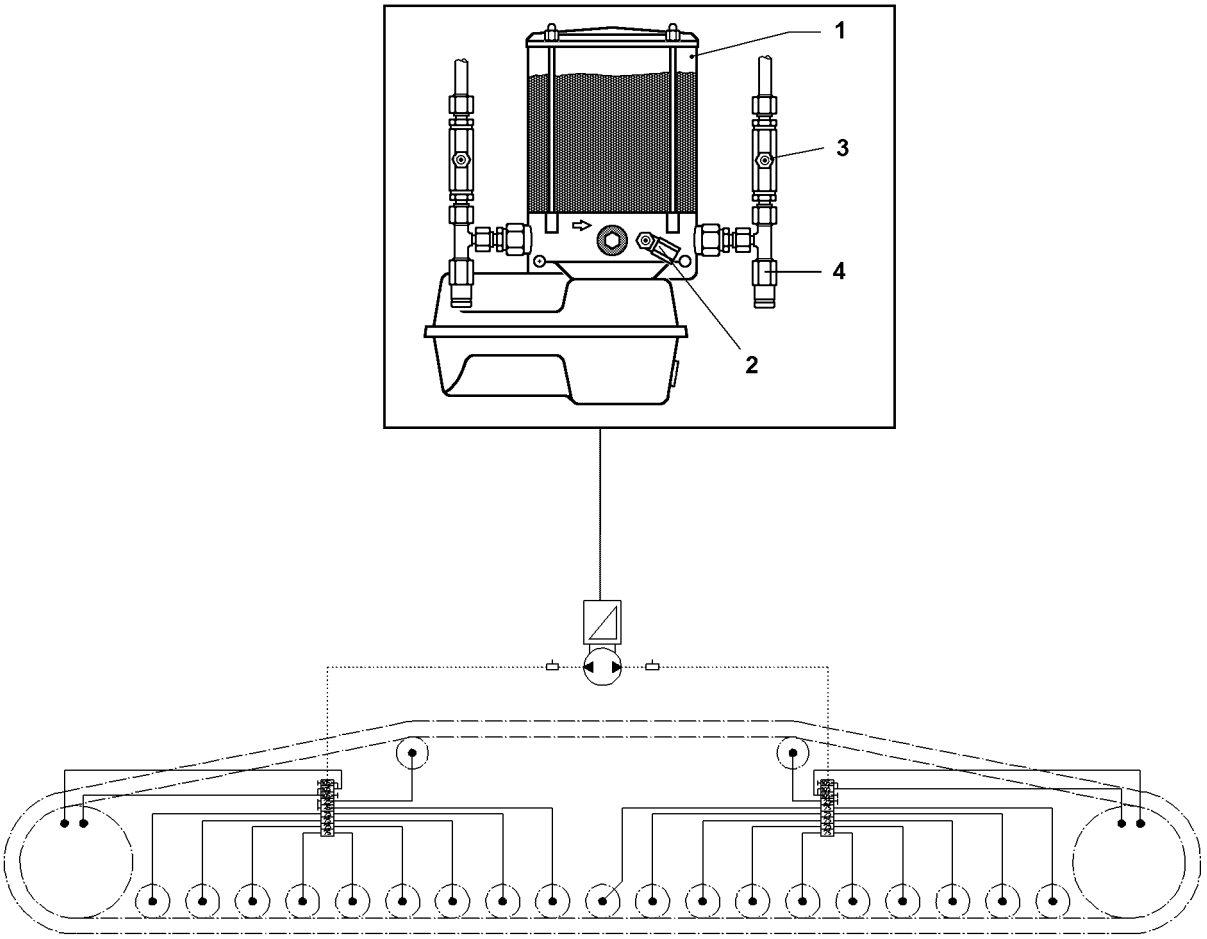
NOTICE

Inadequate lubrication will damage the travel gear!

The lubrication lines must be refilled after any repair on components, which are lubricated with grease. If this is not observed, the component may run dry!

▶ Sufficient grease must be available in the grease lines after every repair on greased components!
▶ Observe utmost cleanliness when filling the grease lines!

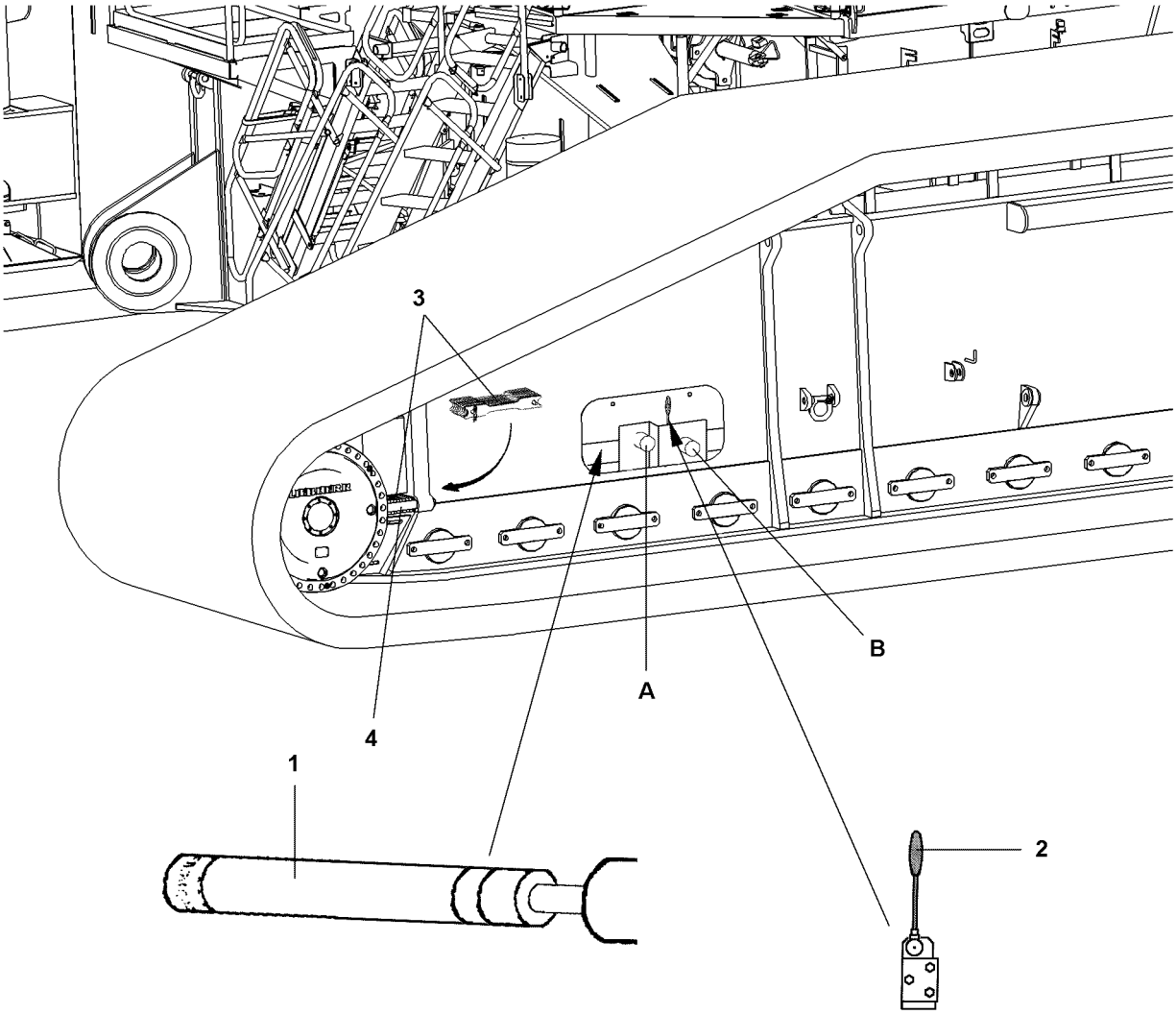
▶ Add grease with an external grease pump via the grease fitting **3**.



B102498

2.5 Troubleshooting on the central lubrication system

Problem	Cause	Remedy
Pump is not working	Integrated electronic control defective, electrical line interrupted, pump defective	Replace lower part of motor protection housing, replace electrical line, replace pump
Pump operates, but does not deliver	Air cushion in delivery piston has dropped below minimum fill level, pump element defective	Bleed pump, fill reservoir, replace pump element
No grease collar on all lube points	Pump not operating, interval time too high or cycle time too short, system blocked	See “Pump not operating” , reduce interval time or increase number of cycles, refer to “Grease emerges on pressure relief valve”
No grease collar on several lube points	Supply lines to secondary distributors broken or leaking, screw connections leaking	Replace lines, tighten or replace screw connections
No grease collar on one lube point	Associated lube line broken or leaking, screw connection leaking	Replace line, tighten or replace screw fitting
Pump speed reduced	Higher system pressure, lower ambient temperature	Check system / bearing points, no damage: Try 1 or 2 intermediate greasing operations
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
Indicator light lights up constantly	Engine is overloaded	Consult LIEBHERR or BekaMax customer service
Control light blinks in 0.5 second cycle	Error in the monitoring period from cycle start	Proximity switch is defective, possibly consult Liebherr or BekaMax customer service



B102497

3 Tensioning the crawler chain

The crawler chains are tensioned with tension cylinders **1**.

3.1 Tensioning

Make sure that the following prerequisites are met:
– the crane is in horizontal position,
– the hydraulic hoses from the hydraulic components are connected on connections **A** and connections **B**.

3.1.1 Tensioning procedure

NOTICE
Damage to crawler chain or travel drive!
▶ Before tensioning the crawler chains, check the crawler chains and the travel drives for foreign particles, such as rocks!

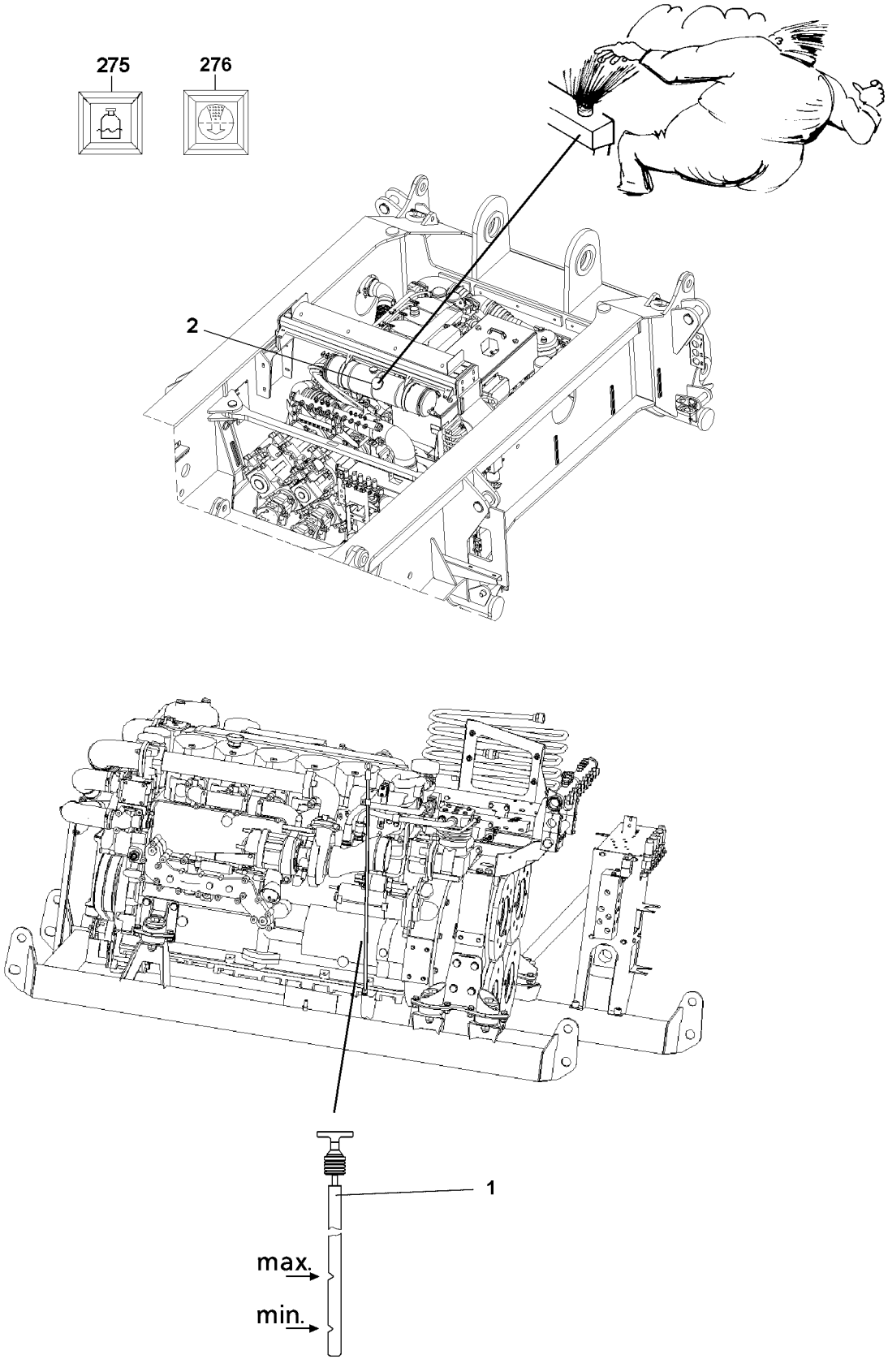
▶ Actuate the manual lever **2** and extend the tension cylinder **1** until the tension resistance in the crawler chain is larger than the force on the tension cylinder.

Result:
– Crawler chain is tensioned.

▶ Push the spacer plates **3** between the sliding section and the crawler carrier. Secure the spacer plates **3** with pins **4**.
▶ Relieve the tension cylinder **1** again.
▶ After the tension procedure, move the crawler about one crawler length straight back and forth.

Result:
– The tension in the lower chain area is relieved.

Note
▶ If necessary, repeat the tension procedure of the crawler chain and insert additional spacer plates!



B107261

1 Diesel engine

Never step on fuel lines during maintenance or repair work in the engine area!

DANGER
Danger of fire!
- ▶ Make sure that the engine area is kept free of diesel fuel.
- ▶ Extreme cleanliness is vital, particularly during filter changes and bleeding. Wipe up any spilled fuel!
- ▶ When replacing the filter, it is recommended to put down cleaning rags before removing the filter in order to absorb fuel.

1.1 Engine oil

1.1.1 Check the oil level

Make sure that the following prerequisites are met:
– the crane is in horizontal position,
– the engine is turned off and the oil is collected in the oil pan.

- ▶ Remove and wipe off the oil dipstick **1**.
- ▶ Reinsert the oil dipstick **1** and pull it out again.

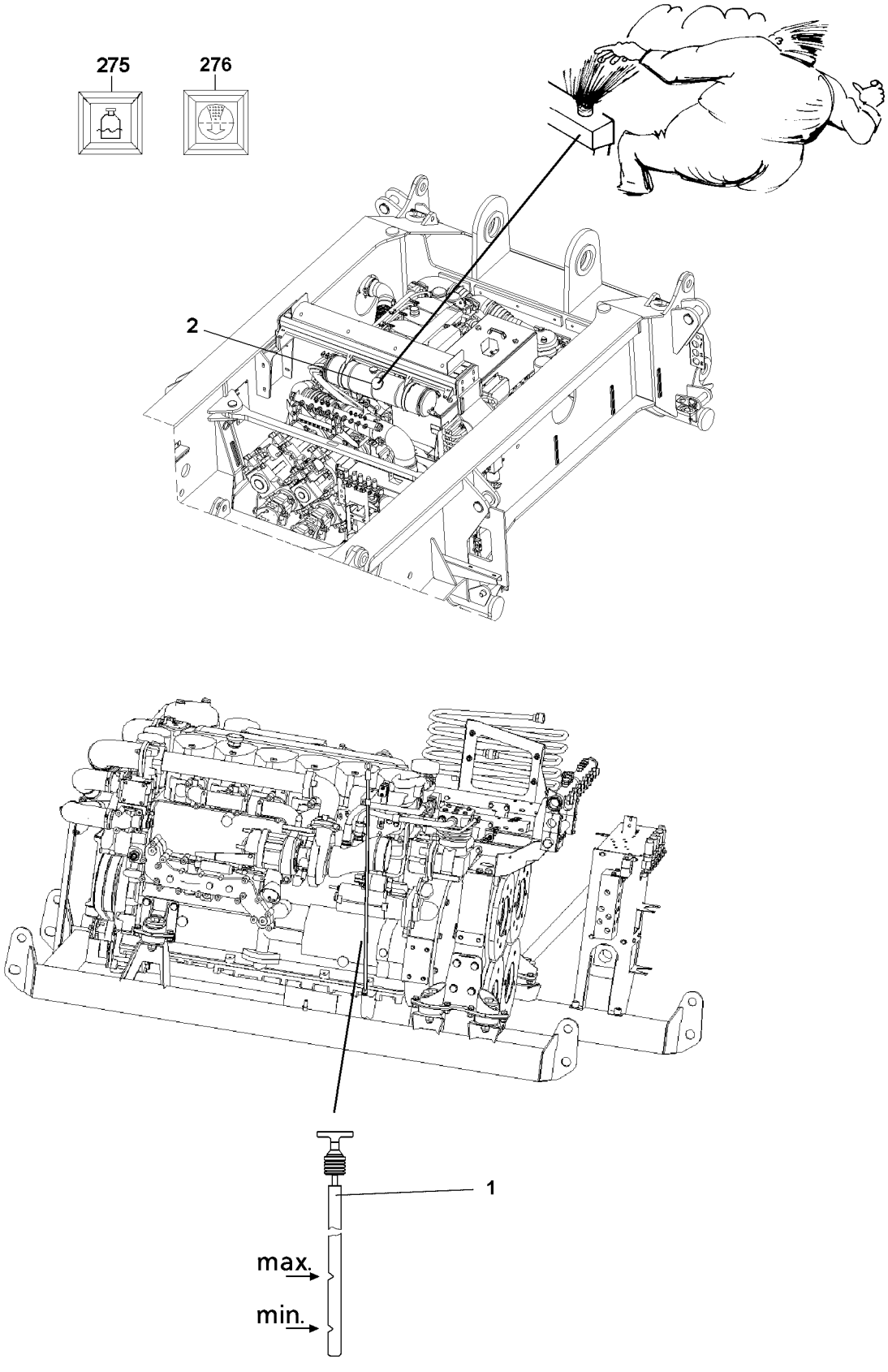
The oil level must be between the min. and max. marks on the oil dipstick **1**.
- ▶ Check the oil level.

CAUTION
Danger of damaging the engine!
If the oil level has dropped below the minimum mark, add engine oil according to the lubrication chart until the oil level is between the minimum and maximum marks.
- ▶ Add engine oil and check again.

- ▶ Reinsert the oil dipstick **1**.

1.1.2 Changing the oil

Refer to separate operating instructions for “Liebherr Diesel engines”.



B107261

1.2 Engine coolant

The coolant level is monitored electrically. If the coolant level is too low the “Coolant level too low” **275** icon appears on the right instrument panel.

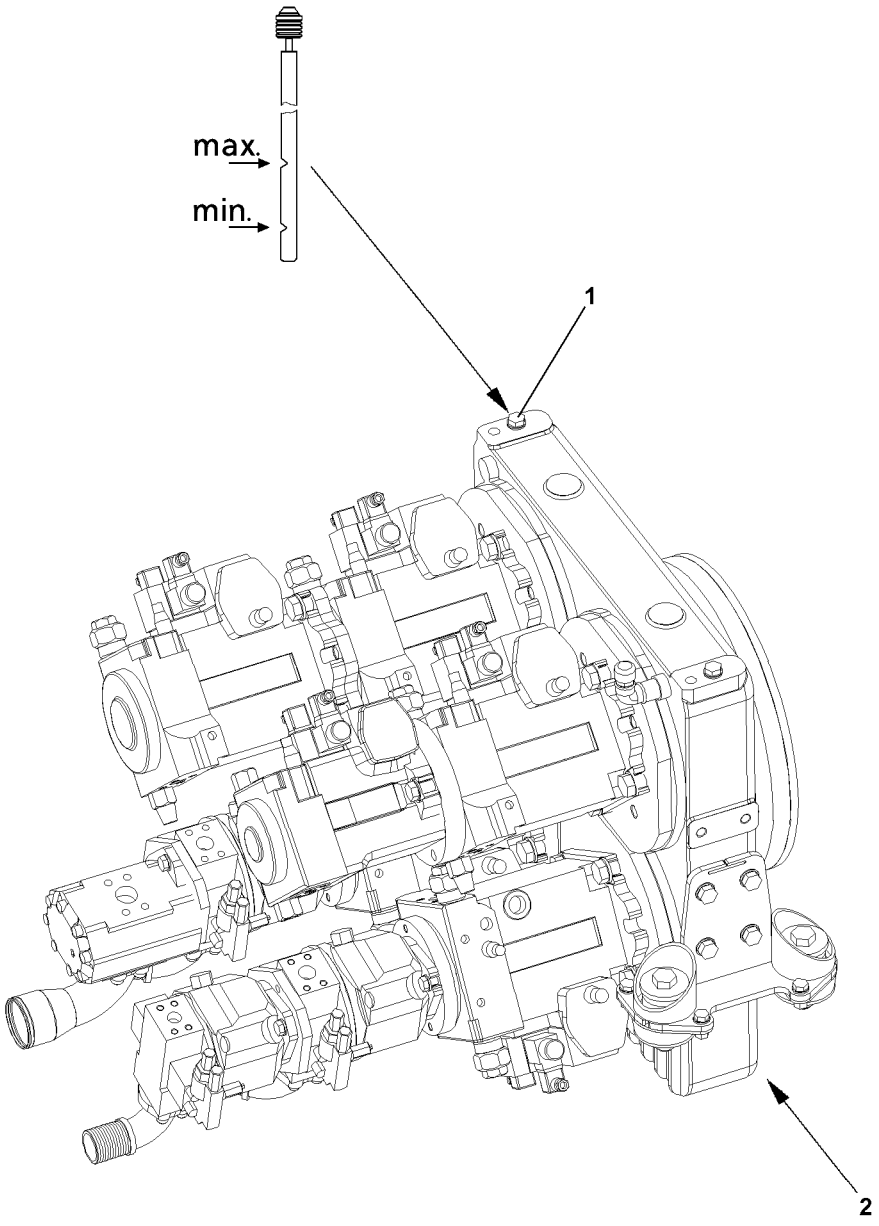
DANGER
Danger of skin burns!
▶ Engine must be cold when performing coolant check.

▶ Turn the cap **2** on the filler neck of the water cooler expansion tank to the 1st notch.
▶ Release excess pressure.
▶ Remove the cap **2**.
▶ Check the coolant level.

Only add coolant according to the lubrication chart on the filler neck on the water cooler expansion tank.
▶ Add coolant to overflow level if necessary.
▶ Close the cover **2** tightly.

1.3 Air filter

The air filter is monitored electrically. If the vacuum increases in the intake line due to dirty filter units, the “Air filter contaminated” **276** icon lights up on the instrument panel.
▶ If the “Air filter contaminated” **276** icon appears:
Clean or replace the filter insert.



B105291

2 Splitterbox

Please maintain utmost cleanliness during all work to prevent dirt from entering the gear system.

2.1 Check the oil level

Ensure that the crane is horizontal.

- ▶ Remove and wipe off the oil dipstick **1**.
- ▶ Re-insert the oil dipstick **1** and pull it out again.

The oil level must be between the min. and max. marks on the oil dipstick **1**.

- ▶ Check the oil level.

CAUTION
Danger of gear damage!
If the oil level has dropped below the minimum mark, add oil according to the lubrication chart until the oil level is between the minimum and maximum mark.

- ▶ Add oil and check again.

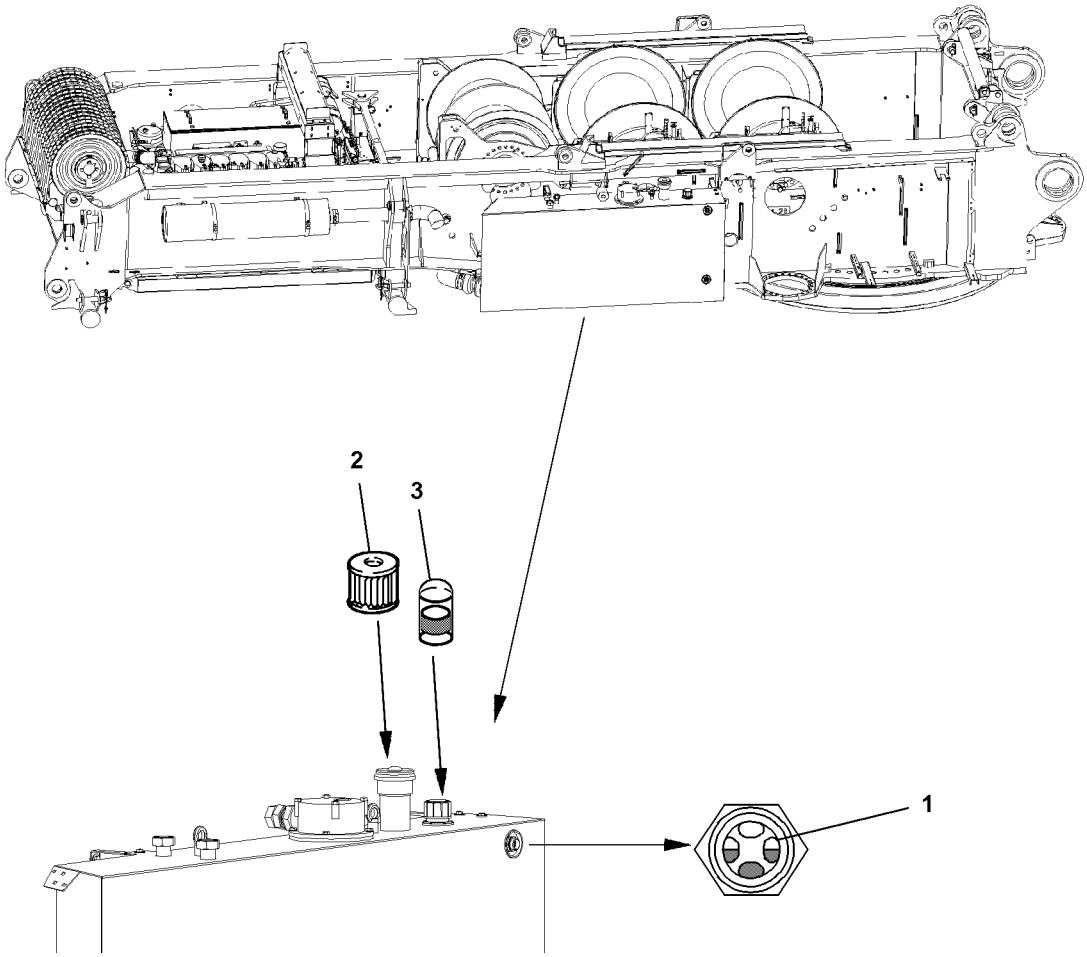
- ▶ Reinsert the oil dipstick **1**.

2.2 Changing the oil

Make sure that the following prerequisites are met:

– the crane is horizontal,
– the gear is warm.

- ▶ Remove the oil dipstick **1**.
- ▶ Remove the oil drain plug **2** and drain the oil.
- ▶ Install the oil drain plug **2** with new seal and tighten.
- ▶ Add oil as specified in the lubrication chart on the oil dipstick **1** until the oil level is between the min. and max. mark on the dipstick **1**.
- ▶ Install the oil dipstick **1** with new seal.
- ▶ Check the oil level.



B105292

3 Hydraulic system

CAUTION
Damage to the hydraulic system!
If the hydraulic system is contaminated when working on the hydraulic system, then the hydraulic system can be damaged and fail.
- ▶ Always keep up most cleanliness when working on the hydraulic system!
- ▶ This applies especially for filter changes, refilling of hydraulic oil or changing of components!

3.1 Hydraulic tank

3.1.1 Check the oil level

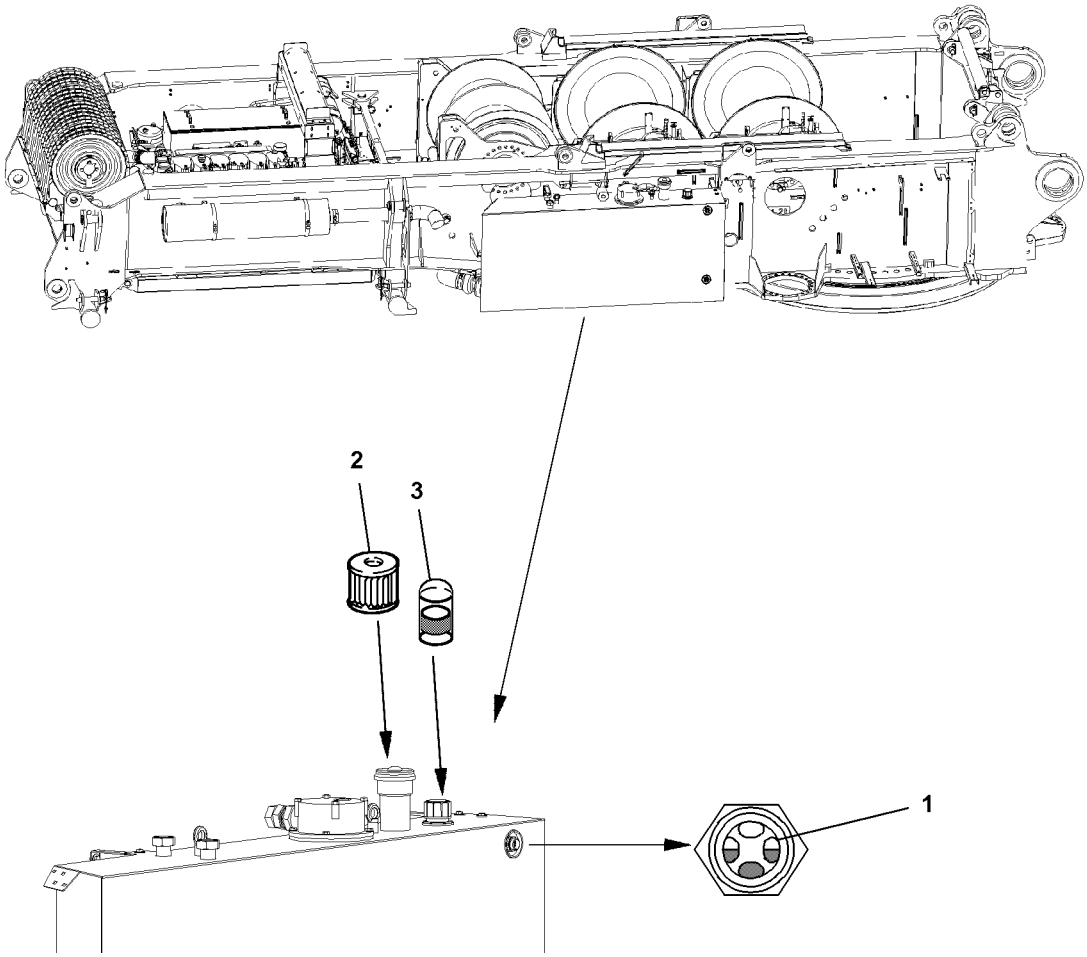
Make sure that the following prerequisites are met:
– the crane is in horizontal position,
– all hydraulic cylinders are fully retracted.

The oil level must be in the center of the oil level sight gauge **1**.
- ▶ Check the oil level in the oil level sight gauge **1** of hydraulic oil tank.

Troubleshooting
No oil visible in the oil level sight gauge **1**?
- ▶ Add oil as specified in the lubrication chart using a fine-mesh strainer until oil level is in center of the oil level sight gauge **1**.

3.1.2 Checking the vent / breather filter

- ▶ Open the cover with the turn lock.
- ▶ Check filters **2** for impurities (visual inspection).
- ▶ In the event of heavy contamination:
  Replace the filters **2**.
- ▶ Close the cover with the turn lock again.
- ▶ Start the engine.
- ▶ Slowly run through all crane movements.
- ▶ Check the oil level again and add oil if necessary.

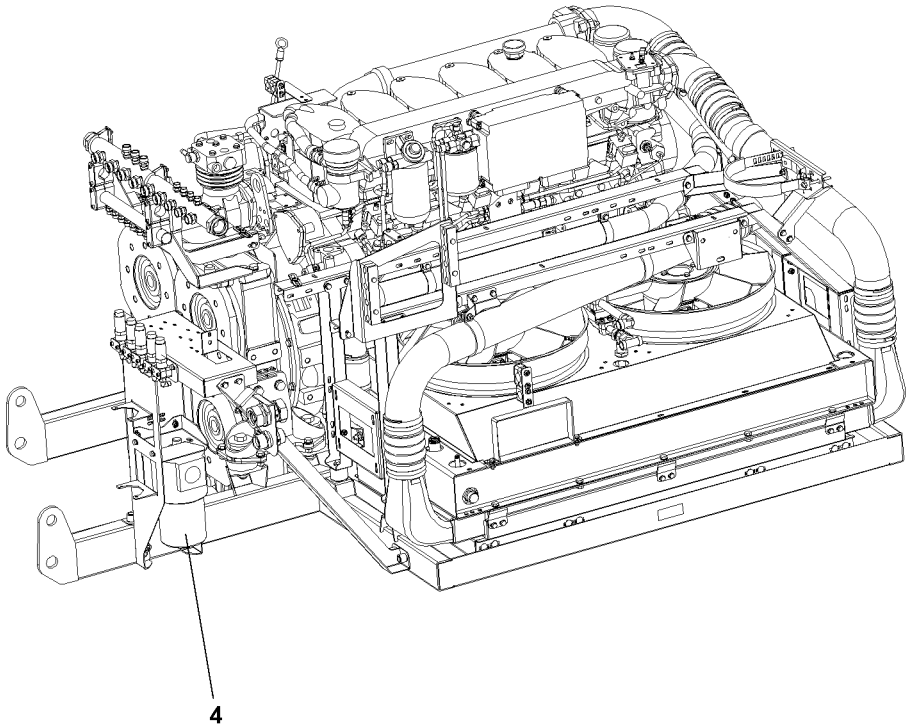


B105292

3.1.3 Return filter

The return filters **3** are equipped with a maintenance indicator. If the red mark is visible when the oil is at operating temperature, then the filter insert must be replaced.

- ▶ Unscrew and remove both filter covers.
- ▶ Remove the filter units.
- ▶ Rinse out the filter housing.
- ▶ Clean the sealing surfaces on the covers and filter housings.
- ▶ Insert new filter units.
- ▶ Lubricate the rubber seal rings in the covers with oil.
- ▶ Replace both filter covers and screw tight.
- ▶ Start the engine and check the filter for leaks.
- ▶ Check the oil level and add oil if necessary.



B105293

3.2 Pressure filter in crane hydraulic

The pressure filter **4** is equipped with a maintenance indicator. If the red bar indicator is visible when the oil is at operating temperature, then the filter cartridge must be replaced.

- ▶ Turn the engine off.
- ▶ Release the filter cartridge and collect any escaping oil in a suitable container.
- ▶ Remove and dispose of the filter cartridge.
- ▶ Clean the sealing surface on the filter bracket.
- ▶ Lubricate the rubber seal ring on the new oil filter cartridge with oil.
- ▶ 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.

CAUTION

Risk of damaging the hydraulic system!

If the outside temperature fluctuates considerably, e.g. after transport to extremely hot or cold countries or in countries with considerable differences between the summer and winter temperatures, the gas accumulator pressures may change.

- ▶ Check the gas accumulator pressures and correct if necessary.

Ensure that the following prerequisite is met:

– the crane engine is turned off.
  This relieves the diaphragm reservoir at the fluid side.

DANGER

Risk of explosion!

The pressure in the nitrogen cylinder must be less than the maximum permissible operating pressure of the accumulator or the pressure gauge. Otherwise install a pressure reducer between the cylinder and the filling device.

- ▶ Do not use air or oxygen to fill the diaphragm reservoir.

The pretension pressure in the hydraulic reservoirs may only be checked by an expert with appropriate training and equipment. In addition, the national regulations for pressurized container inspections must also be observed.

- ▶ Check the pretension pressure with a testing and filling device and correct if necessary.

3.4 Hydraulic hose lines

The hydraulic hoses must be checked according to ISO 9927-1 by an **experienced technician** or **expert mechanic**, as required, depending on the duration of use and the operating conditions, but at least once a year.

Experienced technicians are persons who:

– possess sufficient knowledge about cranes due to their professional background and experience,
– are familiar with the relevant settings to detect any abnormal operating situations,
– have undergone special training.

Expert mechanics are mechanics, who:

– are experienced in the design, construction or maintenance of cranes,
– possess sufficient knowledge about the relevant settings and standards,
– are fully equipped to perform inspections,
– are able to assess the safety of the crane,
– can decide which action needs to be taken to ensure the crane can continue to be operated safely.

Note

▶ The applicable national regulations must also be complied with!

3.4.1 Checking the hydraulic hoses within area of responsibility of the German employer's liability insurance associations

At least once a year, an **expert** must inspect the hydraulic hoses to ensure they are in operationally safe condition. The crane must be inspected by an **authorized inspector** every four years from the day it was first licensed. After the 12th year of operation, the crane must be inspected by the authorized inspector annually.

The **expert** or **authorized inspector** must document the fact that the hydraulic hoses can continue to be used in the crane!

An expert is someone:

– whose technical training and experience means that he has adequate knowledge in the field of hydraulic hoses and hose systems,
– who is familiar with the relevant occupational health and safety regulations,
– who is familiar with the relevant accident prevention guidelines,
– who is familiar with the directives and generally accepted technical regulations (e.g. DIN standards, VDE regulations, technical regulations of other EU member states or other countries that have signed the European Economic Community agreement),
– who can properly assess whether hydraulic hoses and hose systems are deemed safe in accordance with the guidelines and regulations stated above.

Authorized inspector(s) is / are :

– an authorized expert employed by the technical supervisory authorities,
– in Hamburg this is the Amt für Arbeitsschutz (office for occupational health and safety),
– in Hessen these are the technical supervisory offices,
– an authorized expert appointed by the professional associations.

3.4.2 Examples of possible defects in hose lines

WARNING
Risk of fire or accident!
If problems are discovered during inspections, then they must be remedied immediately or suitable measures are to be taken. Failure to do this can result in serious injury to persons, death or damage to property.
▶ Remedy problems or take suitable measures!

- Damage to the outer layer as far as the intermediate later (e.g. chafing, cuts and cracks).
- Outer layer brittleness (hose material cracking).
- Deformation that differs from the natural shape of the hose or hose system when depressurised or pressurised or when the hose is bent (e.g. layer separation, bubbling, crushing or kinking).
- Leaks.
- Failure to follow installation instructions.
- Damage or deformation of hose fittings that inhibit the operation and strength of the fitting or the hose / fitting connection.
- Hose slipping out of fitting.
- Fitting corrosion that inhibits operation and strength.
- Storage time or usage period exceeded.

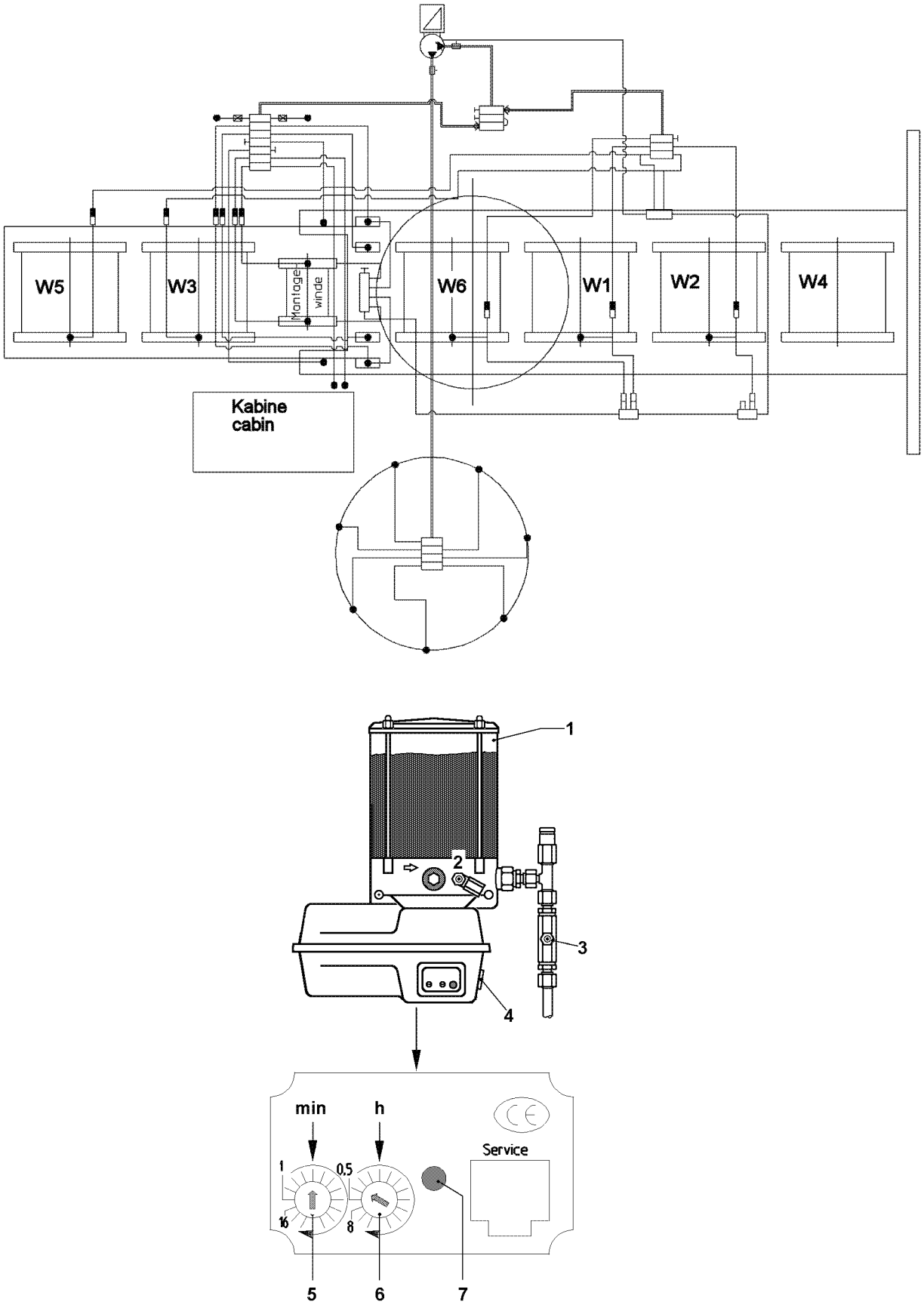
3.4.3 Maintaining hose lines

- We recommend to check all hoses, hose lines and screw fittings daily, but at least every two weeks for leaks and externally recognizable signs of damage.
- Damaged parts must be replaced immediately! Oil spray can lead to injuries and fires.
- Hydraulic lines and hoses may not be repaired.
- Hoses that have already been used in a hose system may not be reinstalled in hose systems.
- Always use original LIEBHERR spare parts when replacing hoses and hose systems.
- Always ensure that the hoses are routed free of torsion. If high pressure hoses are being used, attach screw of clamps or full flange at both ends of hose and then tighten.
- When using high pressure hoses with a bent fitting, tighten the end with the bent fitting first when tightening the flanges, then the end with the straight fitting.
- Any mounting clamps in the hose center may be attached and tightened only thereafter.
- Route the hoses in such a way that chafing with other hoses or other structures is prevented. Maintain minimum clearance of approximately ½ the outer diameter of the hose from other parts. The clearance must never be less than 10 mm - 15 mm.

3.4.4 Replacing the hose lines

WARNING
Risk of fire or accident!
Failure to replace hose systems at appropriate intervals can cause serious injury to persons, death or damage to property.
▶ Replace hose lines in appropriate intervals!

This must be documented in the crane's log book by the **expert** or the **authorized inspector**.
The service life of a hose system may not exceed six years, including a storage period of a maximum of two years (observe the manufacturing date on the hoses). The duration of use can also be defined by the **expert** or **authorized inspector** in accordance with existing test and empirical data in the individual application areas, taking the usage conditions into consideration.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B105351

4 Central lubrication system

The turntable, the rotary connection and the winches are equipped with a central lubrication system. All grease points (see illustration on the left) are automatically provided with the correct amount of grease.
If the crane has not been moved for more than 3 months, then it must be lubricated every 3 months with an external grease pump until grease emerges from all grease points. Then the relevant crane movement must be repeated several times and the lubrication procedure must be carried out again.

4.1 Central lubricating system - turntable

Lubricating time: 5 min
Break period: 1 h

4.1.1 Components of the system

Grease container **1**
Grease fitting **2**: - Filling the central lubricating system
Grease fitting **3**: - Filling the lubrication lines
Push button **4**: - Intermediate lubrication
Latched switch **5**: - Lubricating time min
Latched switch **6**: - Break period h
LED **7** yellow

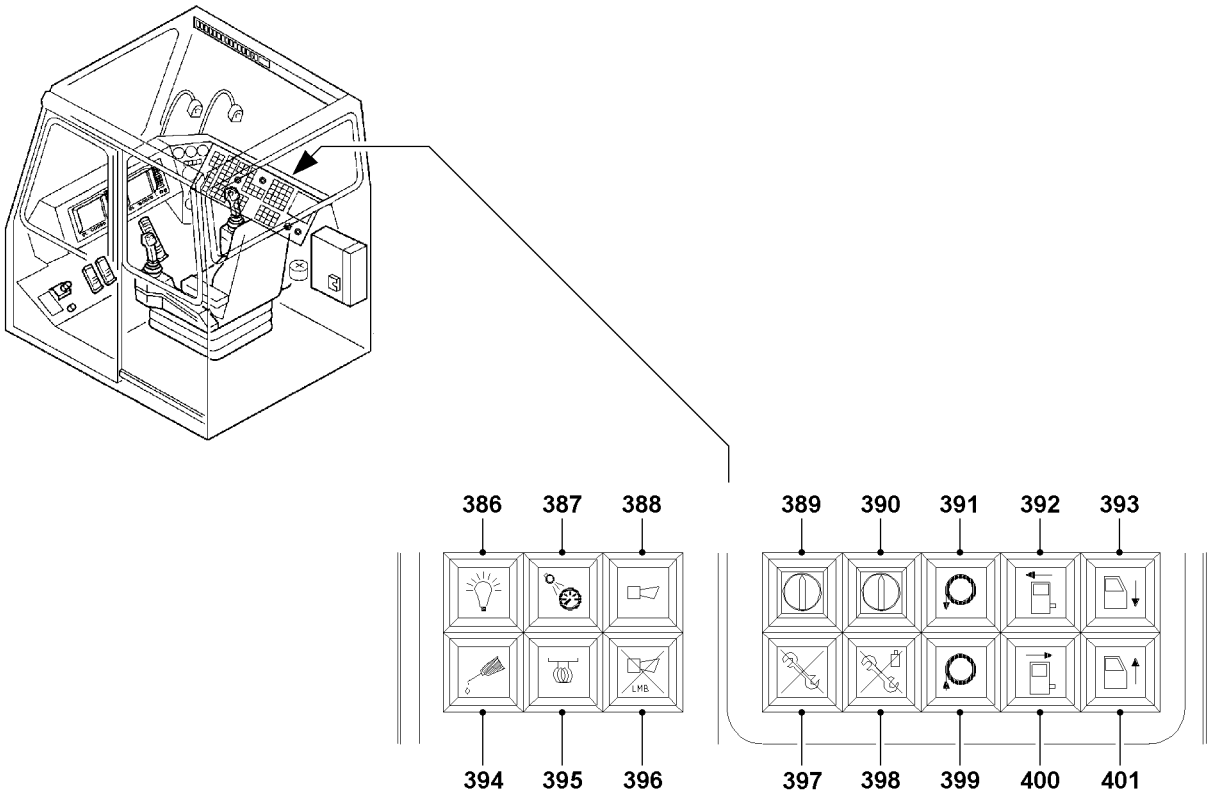
4.1.2 Setting the lubrication and break periods

The LED **7** on the engine protection housing blinks in a 0.5 second cycle during the lubrication process. The lubrication and pause time is set at the factory. The times can possibly be changed by using the latched switch **5** and latched switch **6**.

▶ Turn on the engine ignition.

Result:

– When turning on the ignition, the LED **7** lights up for approximately 1.5 seconds and displays the operational readiness.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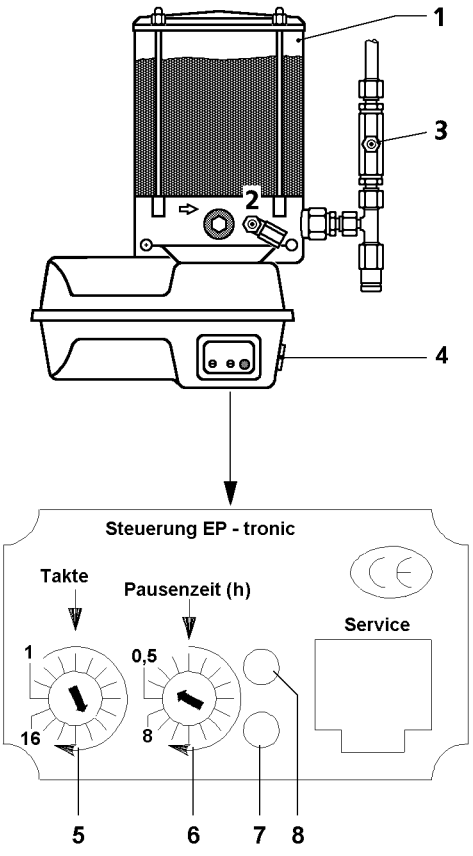
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B105352

4.2 Central lubricating system - slewing ring connection

Pump operation period: 12 cycles
Cycle time: 1 h

4.2.1 Components of the system

Grease container **1**
Grease fitting **2**: - Filling the central lubricating system
Grease fitting **3**: - Filling the lubrication lines
Push button **4**: - Intermediate lubrication
Latched switch **5**: - Cycles
Latched switch **6**: - Break period h
LED **7** green
LED **8** red

4.2.2 Adjusting the lubrication and break period

The lubrication and break period is set in the factory.

- ▶ Adjust running time of the pump with the latched switch **5**.
- ▶ Adjust the break period with the latched switch **6**.

4.2.3 Cycle control

The central lubrication system is progressively monitored. This means that a proximity switch converts the piston strokes of the central lubricating system distributor into electric control signals and relays them to the control unit. If the control signals are not present or incomplete, the indicator light **394** shows a malfunction.

Blinker code - cycle control

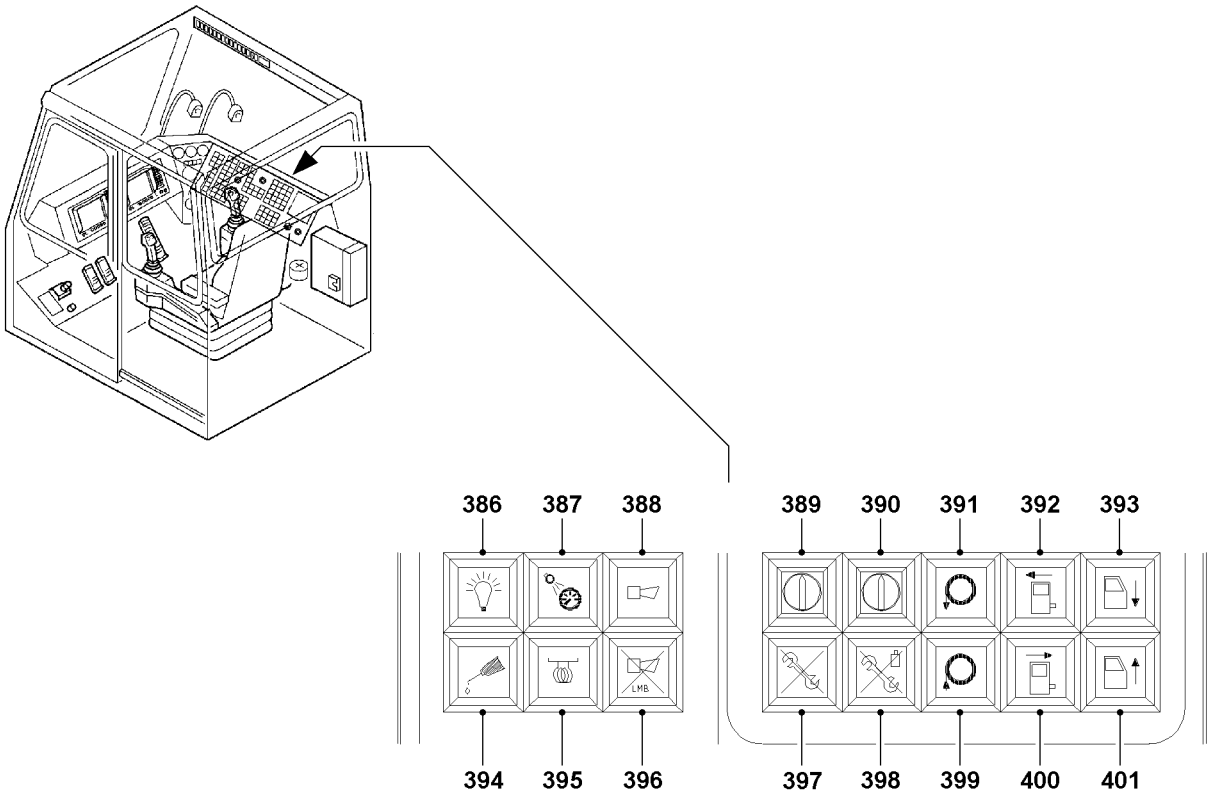
The LED **7** performs the equivalent function of the indicator light **394**.

During operation

Ignition on, ready for operation:
Indicator light **394** lights up for 1.5 s and turns off.
Lubrication:
Indicator light **394** lights up during the lubricating period.

In case of a problem

Error in monitoring time cycle input:
Indicator light **394** lights up for 1 s and is off for 1 s etc.
Memory error, battery error:
Indicator light **394** does not light up.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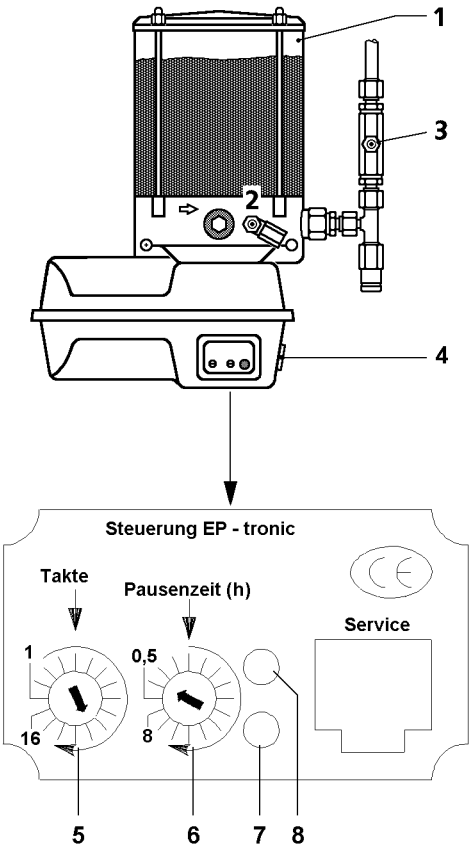

1
3
2
4
Steuerung EP - tronic
Takte
Pausenzeit (h)
Service
1
16
0,5
8
5
6
7
8

B105352

4.3 Central lubricating system in general

4.3.1 Intermediate lubrication

Intermediate lubrication can be carried out manually after washing the crane, for example.

▶ Press the push button **4**.

Result:

– Components are greased.

4.3.2 Function check

Ensure that the ignition is turned on.

▶ Trigger 2 or 3 grease pulses using the push button **4**.

Result:

– Grease exits from the pressure relief valve.

4.3.3 Filling the grease container

CAUTION

Risk of damage due to insufficient lubrication!

▶ There must be sufficient grease in the grease container **1** at all times.

▶ Observe utmost cleanliness when filling the grease container **1**.

▶ Fill grease container **1** using grease pump via the grease fitting **2**.

4.3.4 Filling the lubrication lines

CAUTION

Risk of damage due to insufficient lubrication!

The lubrication lines must be refilled after any repair on components, which are lubricated with grease. If this is not observed, the component may run dry.

▶ Sufficient grease must be available in the grease lines after every repair on greased components.

▶ Observe utmost cleanliness when filling the grease lines!

▶ Add grease with an external grease pump via the grease fitting **3**.

or

■ Push the red button on the engine protection housing of the pump while the ignition is on.

4.3.5 Bleeding the central lubricating system

If the grease container **1** has been emptied, then it may be necessary to bleed the central lubrication system.

▶ Fill the grease container **1**.

▶ Unscrew the main line from the pump outlet.

▶ Activate intermediate greasing until bubble-free grease exits from the pump outlet.

▶ Reconnect the main line.

▶ Trigger intermediate lubrication.

4.4 Troubleshooting on the central lubrication system

Problem	Cause	Remedy
Pump is not working	Integrated electronic control is defective, electrical line interrupted, pump defective	Replace lower part of motor protection housing, replace electrical cable to pump
Pump operates, but does not deliver	Insulating air cushion in delivery pump has dropped below minimum filling level, pump element defective	Bleed pump, fill reservoir, replace pump element
No grease collar on all lube points	Pump not operating, interval time too high or cycle time too short, system blocked	See “pump not operating” , reduce interval time or increase number of cycles
No grease collar on several lube points	Supply lines to secondary distributors broken or leaking, screw connections leaking	Replace lines, tighten or replace screw connections
No grease collar on one lube point	Associated lube line broken or leaking, screw connection leaking	Replace line, tighten or replace screw fitting
Pump speed reduced	Higher system pressure, lower ambient temperature	Check system / bearing points. No damage: try 1 or 2 intermediate lubrications)
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

5 Rotary connection

5.1 Greasing the slewing ring

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. Then the relevant crane movement must be repeated several times and the lubrication procedure must be carried out again.

▶ Grease exterior of slewing ring.

5.2 Tilt play of roller ring connection

The wear of the roller ring connection is determined by measuring the “tilt play” with the ring installed.

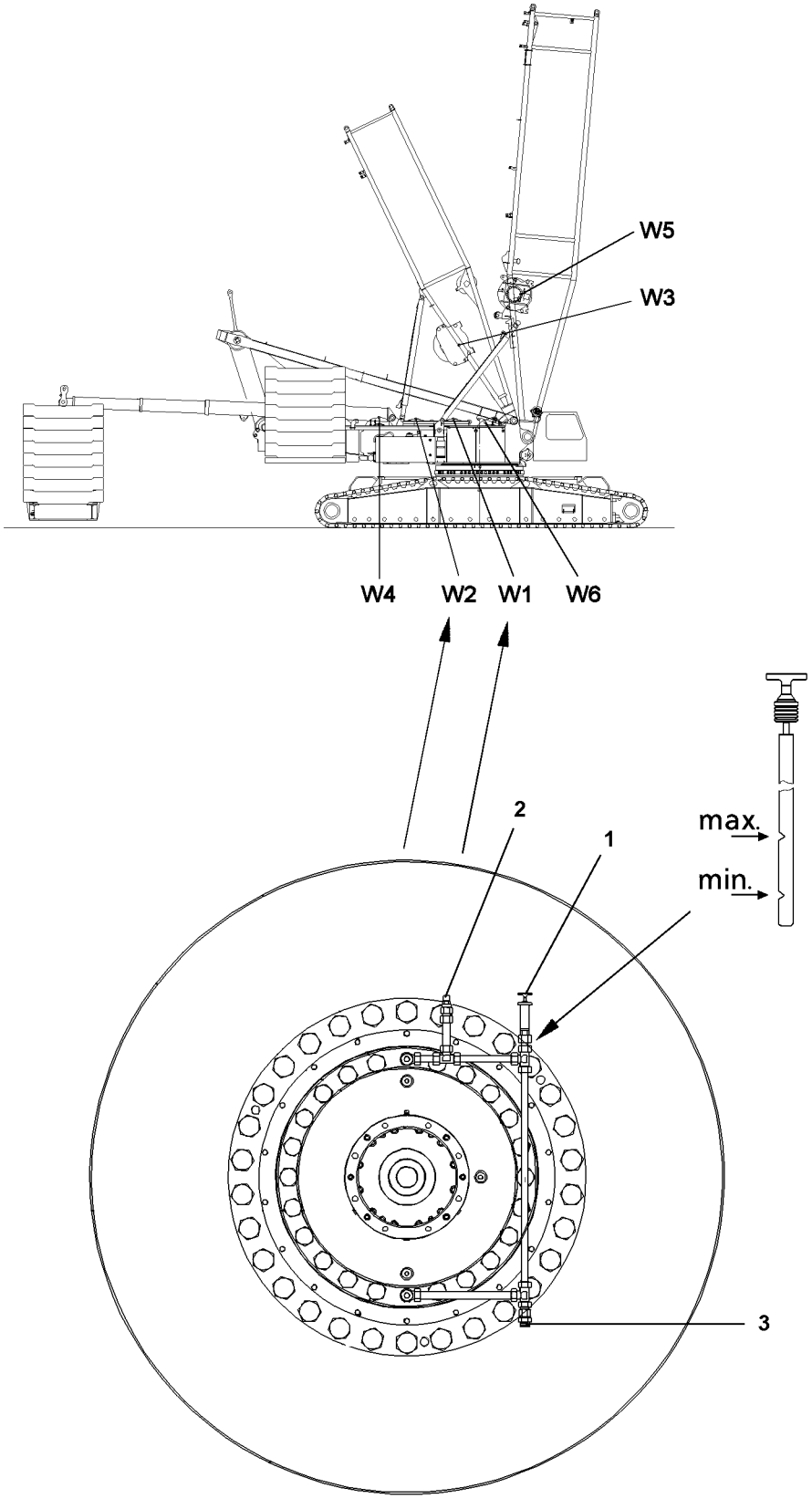
Note

▶ The determination of the “tilt play” must be carried out according to the **test instructions** of **Liebherr-Werk Ehingen GmbH**.

▶ Contact the Service Dept. at **Liebherr-Werk Ehingen GmbH** for **test instructions**.

DANGER
Danger of accident if tilt play of roller ring connection is too large!
If the permissible tilt play of 2.0 mm is exceeded, then safe crane operation is no longer possible.
▶ Replace the roller ring connection if the tilt play is larger than 2.0 mm!

1



B105370

6 Winches

Please maintain utmost cleanliness during all work to prevent dirt from entering the gear system.

6.1 Illustration overview - winches

Winch 1 + 2, illustration 1
Winch 3, illustration 2
Winch 4, illustration 3
Winch 5, illustration 4
Winch 6, illustration 5

6.1.1 Overflow container

When the oil heats up in the hydraulic motor of winch, the oil can enter the overflow container via a check valve, but cannot flow back into the hydraulic system after cooling off. For this reason the oil that has collected in the overflow container must be disposed of at regular intervals.

6.2 Hoist gear

Make sure that the following prerequisites are met:
– the hoist gear is inactive,
– the crane is in horizontal position.

6.2.1 Check the oil level

▶ Remove and wipe the oil dipstick **1** off.
▶ Re-insert oil dipstick **1** and pull out again.

The oil level must be between the Min. and Max. marks on the oil dipstick **1**.
▶ Check the oil level.

CAUTION
Danger of gear damage!
If the oil level has dropped below the Minimum mark, top up engine oil as shown in the lubrication chart.
▶ Refill oil, recheck and reinsert the dipstick **1**.

▶

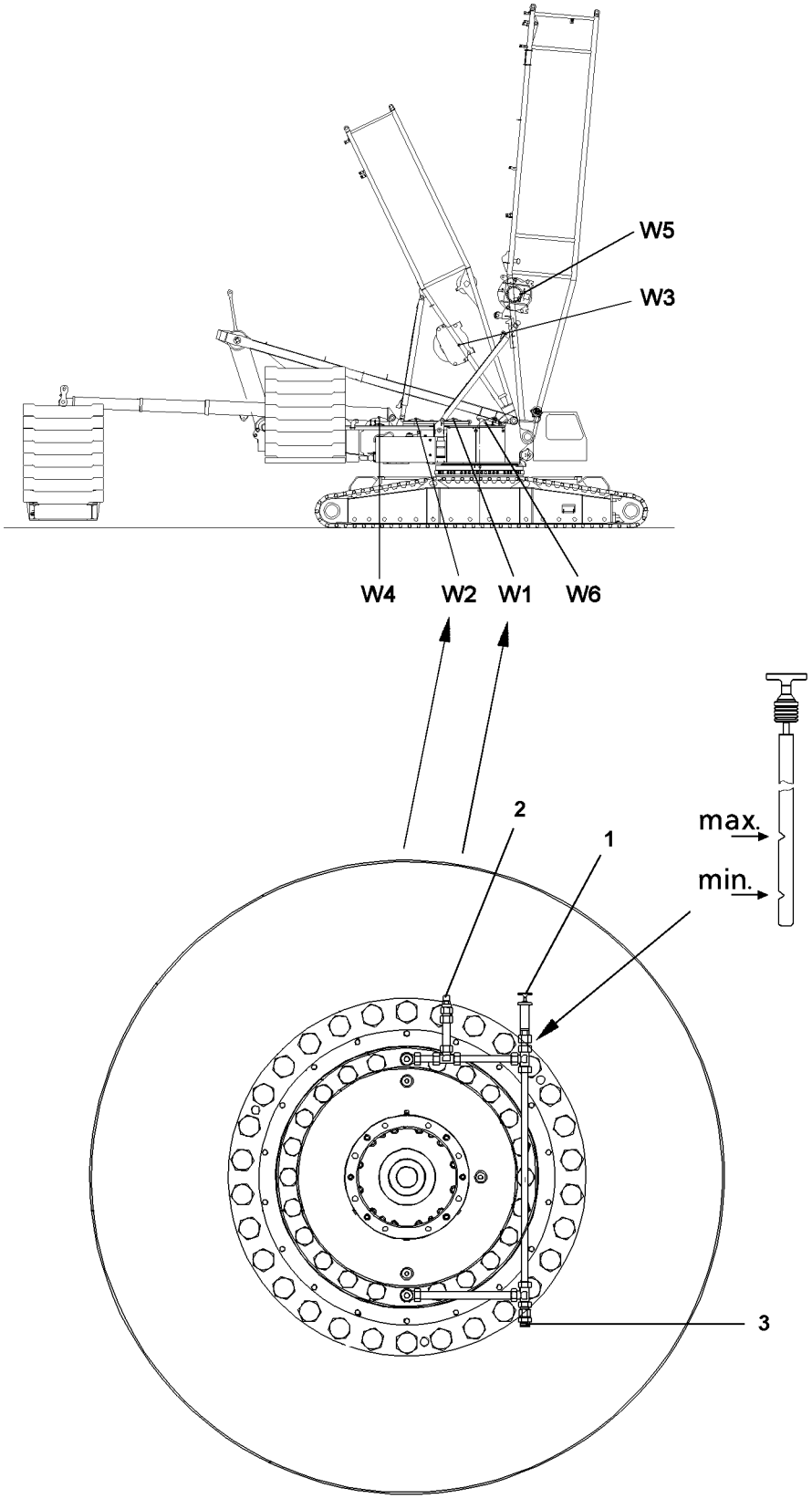
6.2.2 Changing the oil

▶ Unscrew the breather screw **2**.
▶ Remove the oil drain plug **3** with seal ring and drain the oil into a suitable container.
▶ Reinstall the oil drain plug **3** with new seal ring and tighten.

Note
▶ Remove the dipstick **1** to open the oil filler port.

▶ Add oil at oil filler port according to the lubrication chart.
▶ Reinstall the breather screw **2** and tighten.
▶ Check the oil level as described above.

1



B105370

6.3 Hoist gear brake

Make sure that the following prerequisites are met:
– the hoist gear is inactive,
– the crane is in horizontal position.

6.3.1 Check the oil level

▶ Remove screw **4**.

The oil level must reach the edge of the bore.
▶ Perform a visual inspection.

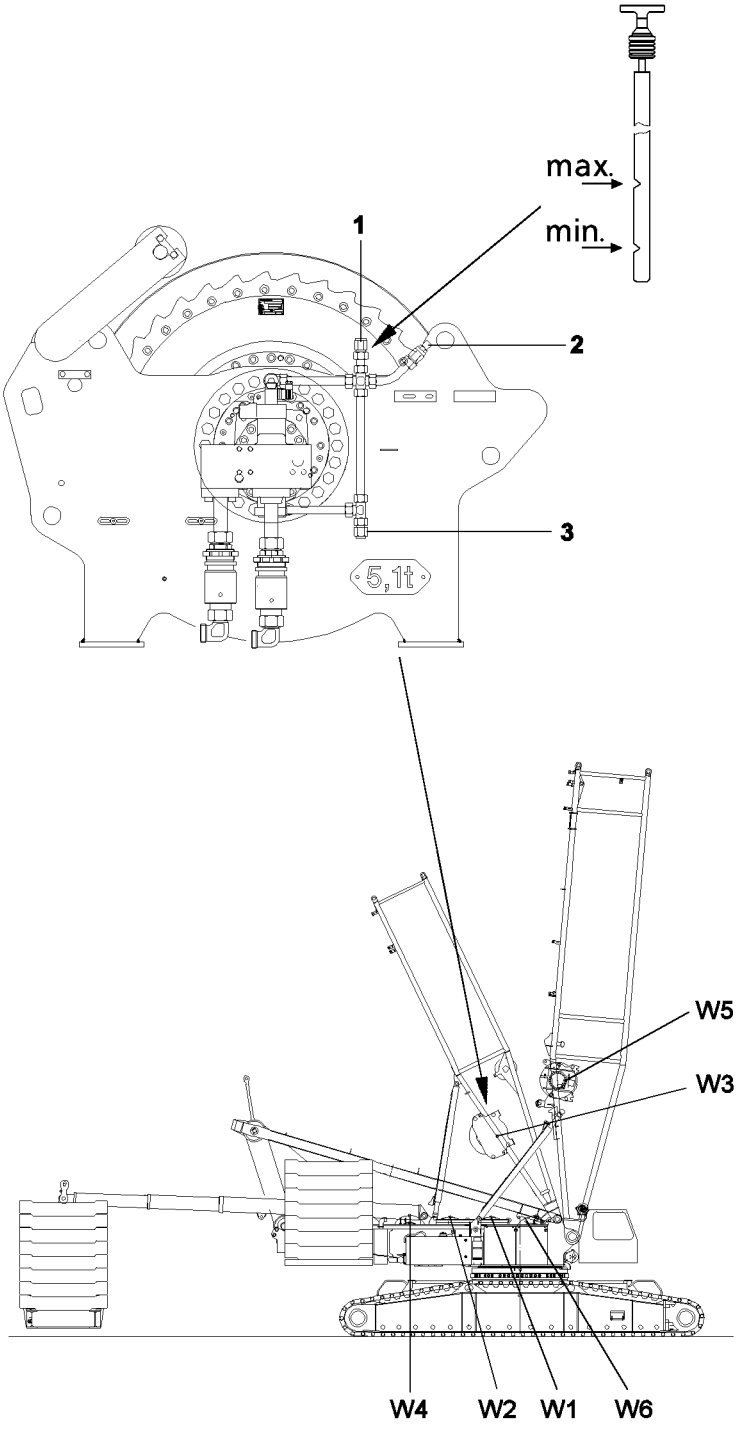
CAUTION
Danger of gear damage!
▶ If the oil level has dropped, add the oil as specified in the lubrication chart until it overflows on the filler port.

▶ Clean the sealing surfaces on the housing and on the plug.
▶ Reinstall the screw 4 and tighten.

6.3.2 Changing the oil

▶ Remove the oil filler plug **5** and clean the sealing surface.
▶ Remove the oil drain plug **6** with seal ring and drain the oil into a suitable container.
▶ Clean the oil drain plug **6** and sealing surface on the housing.
▶ Reinstall the oil drain plug **6** with new seal ring and tighten.
▶ Add oil at the oil filler port as specified in the lubrication chart until the oil begins to overflow at the port **4**.
▶ Clean the oil filler plug **5** and reinstall it with a new seal ring and tighten.
▶ Check the oil level as described above.

2



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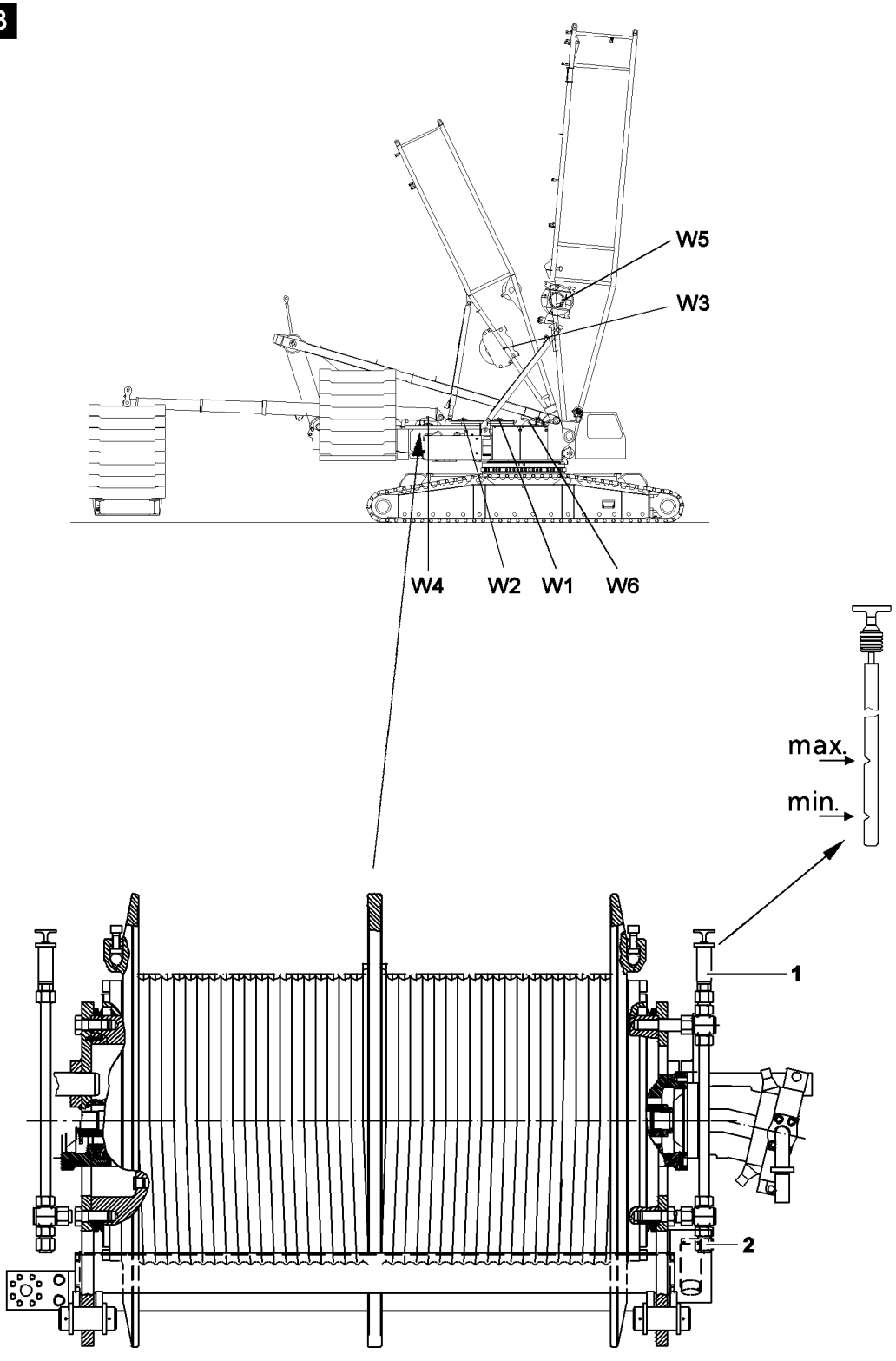
3



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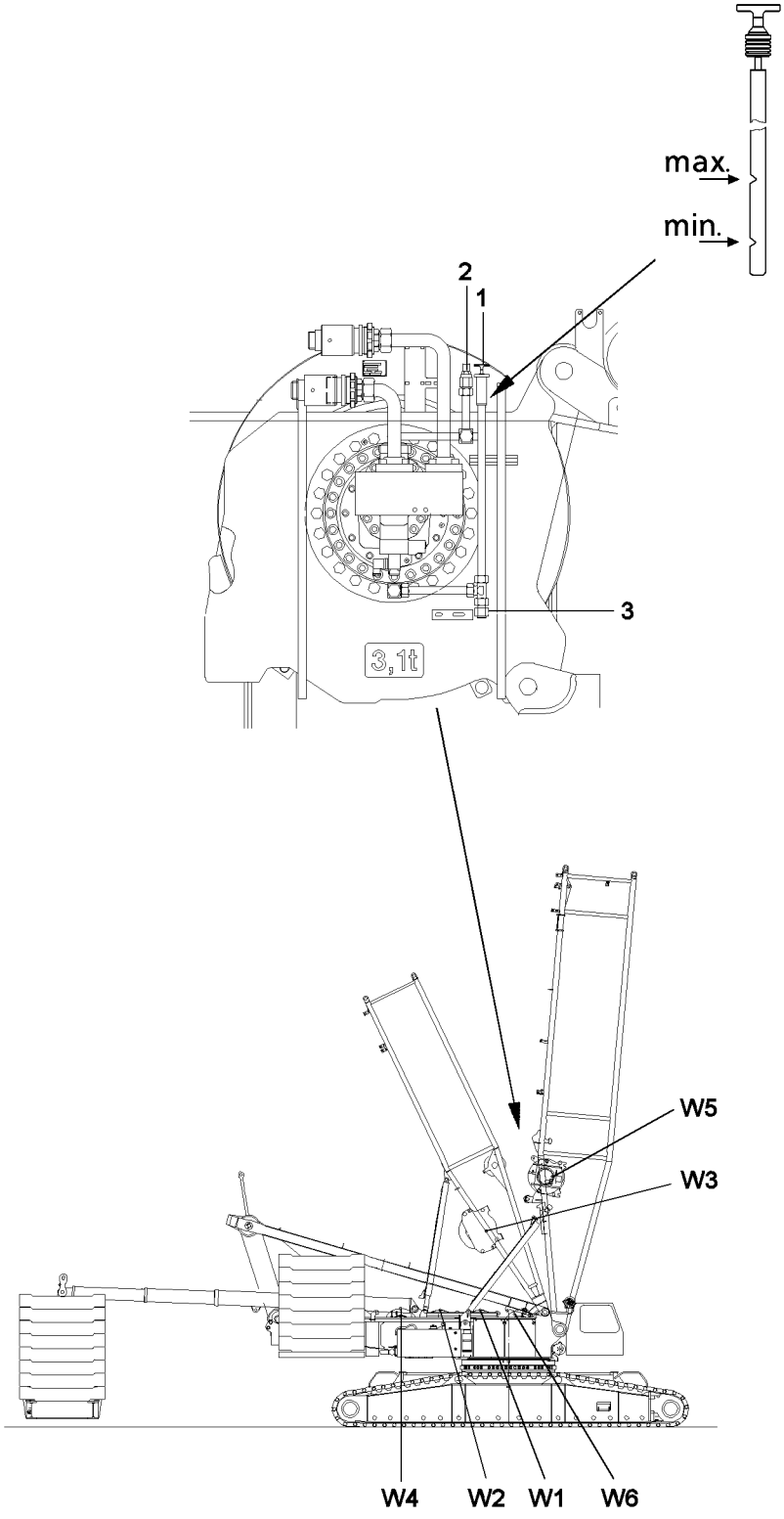

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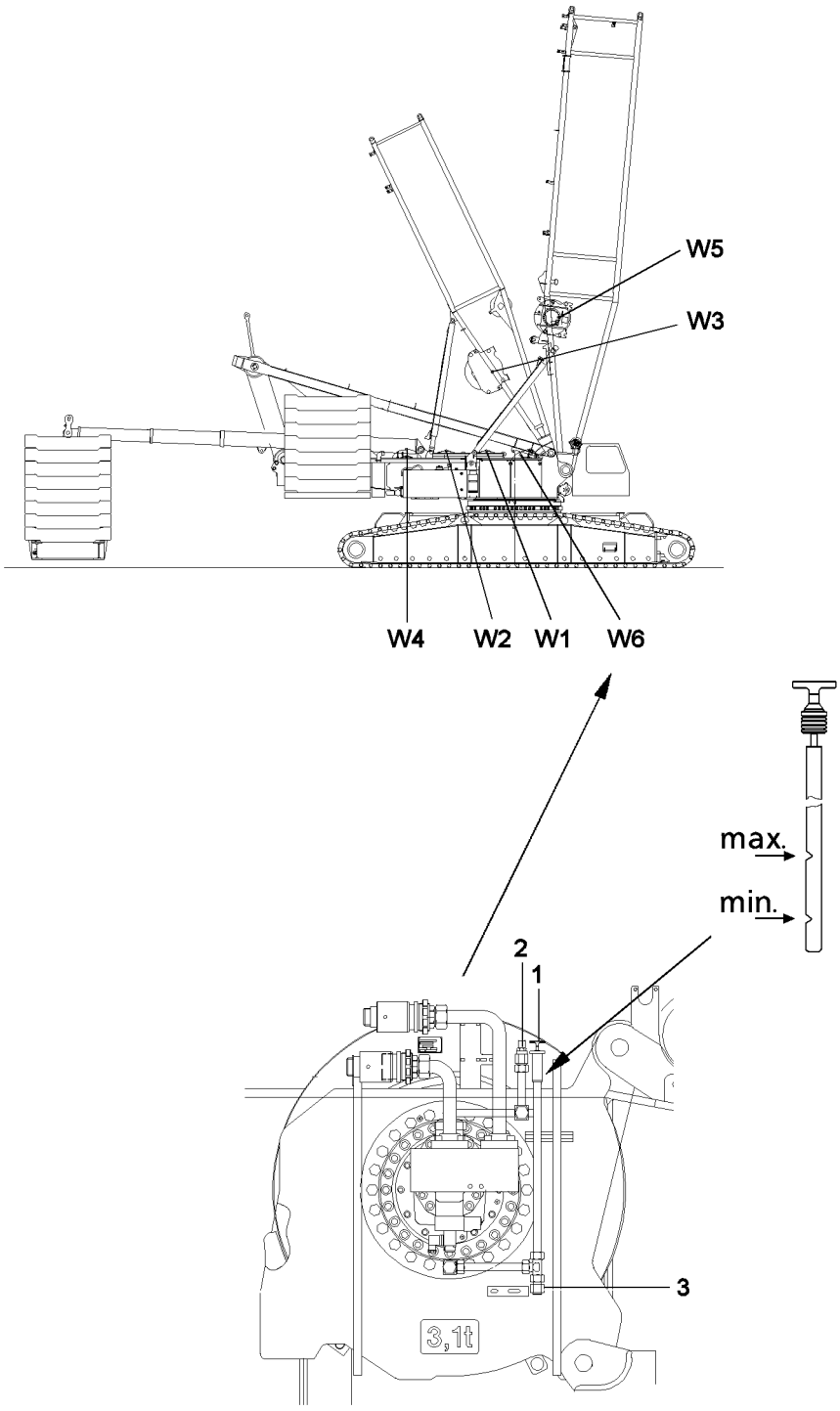

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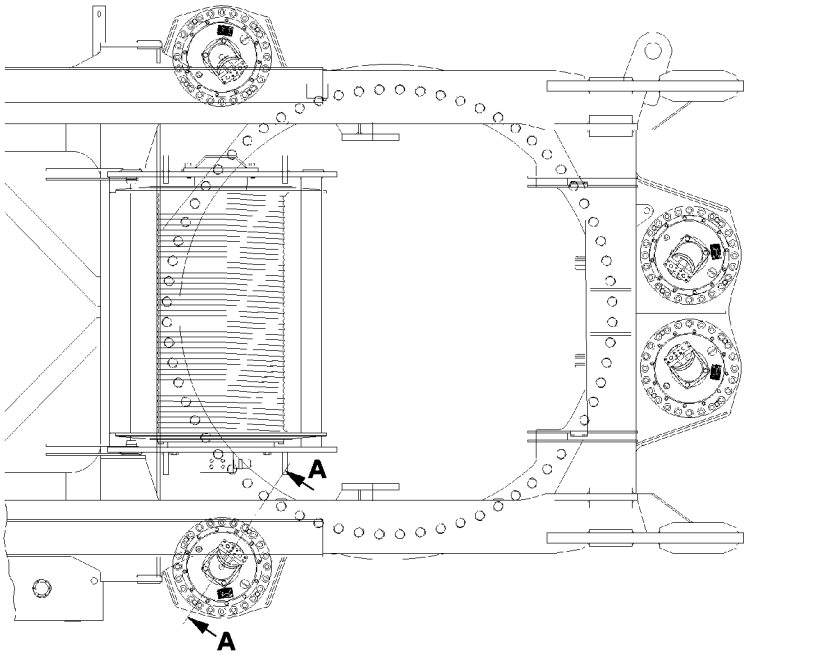
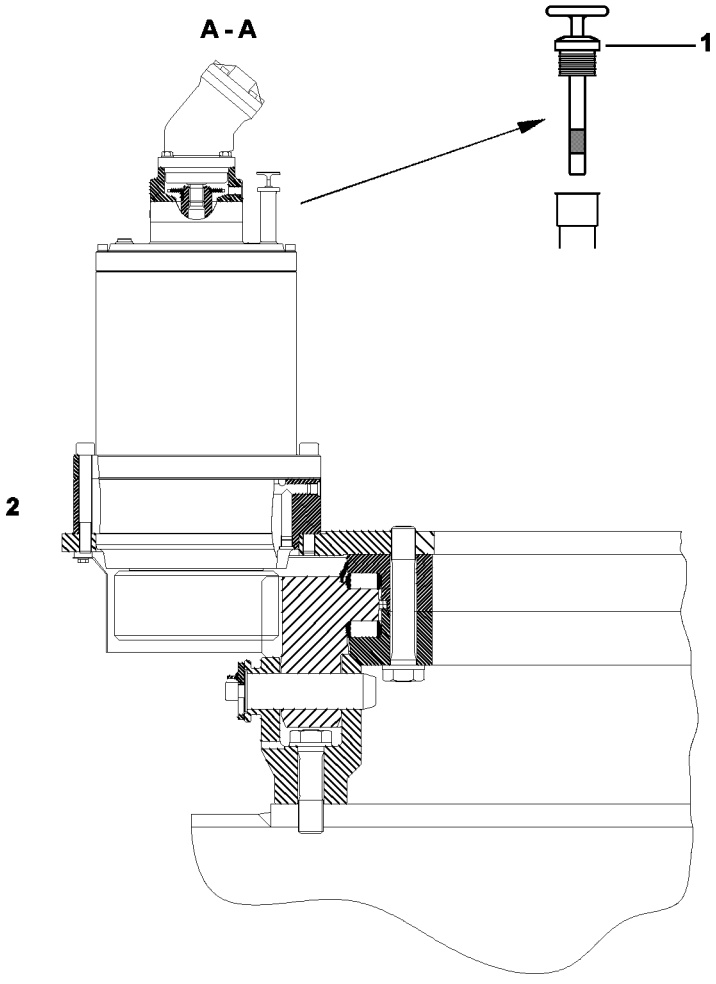




B105437

7 Slewing gear

Please maintain utmost cleanliness during all work to prevent dirt from entering the gear system.

7.1 Check the oil level

Make sure that the following prerequisites are met:
– the crane is in horizontal position.

▶ Remove and wipe off the oil dipstick **1**.
▶ Reinsert the oil dipstick **1** and pull it out again.

The oil level must be between the two notches on the oil dipstick **1**.
▶ Check the oil level.

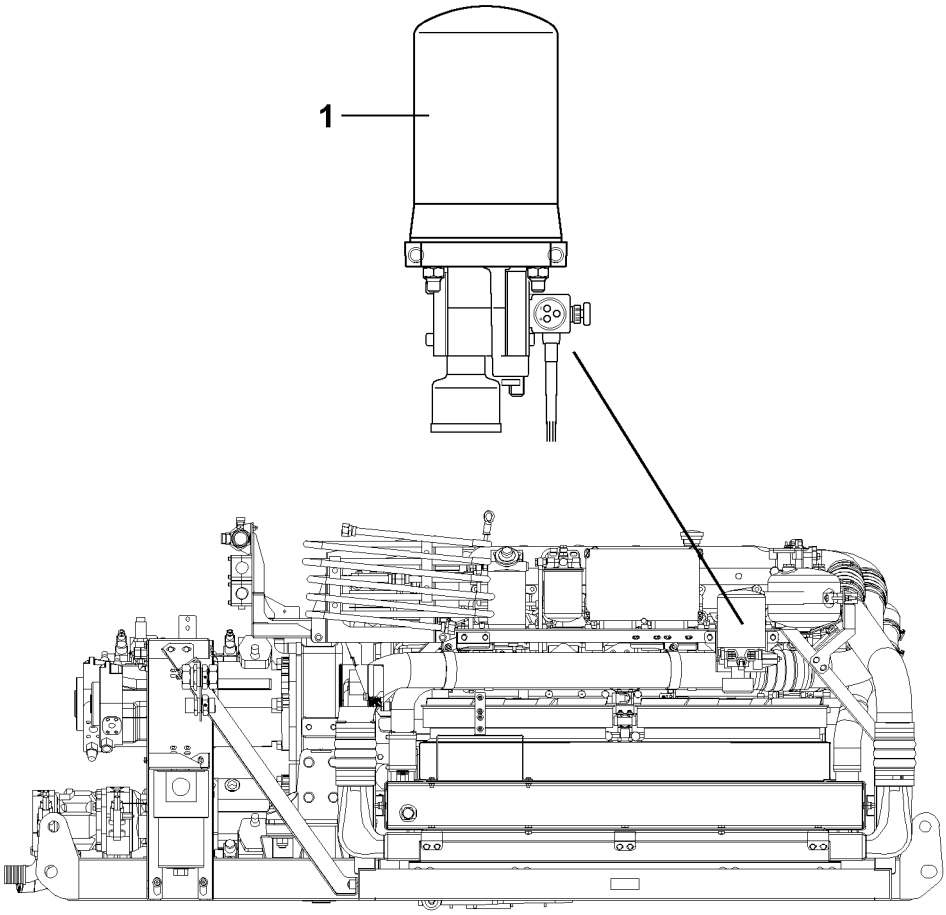
CAUTION
Danger of gear damage!
If the oil level has dropped below the lower notch, add oil according to the lubrication chart until the oil level is between the two notches.
▶ Add oil and check again.

▶ Reinsert the oil dipstick **1**.

7.2 Changing the oil

Make sure that the following prerequisites are met:
– the crane is in horizontal position,
– the gear has warmed up.

▶ Open the oil filler port by unscrewing the oil dipstick **1**.
▶ Remove the oil drain plug **2** with the seal ring and drain the oil.
▶ Clean the oil drain plug **2** and sealing surface on the housing.
▶ Install the oil drain plug **2** with new seal ring and tighten.
▶ Add oil according to the lubrication chart at the oil filler port until the oil level is between the two notches on the oil dipstick **1**.
▶ Close the oil filler port by screwing in the oil dipstick **1**.
▶ Check the oil level as described above.



B105798

8 Air dryer of the compressed air system of the crane superstructure

8.1 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.

9 Electrical system - lighting

The maintenance of the electrical system is essentially limited to replacing defective fuses and bulbs and maintaining the batteries.

NOTICE
Damage of electrical system!
Never short circuit defective fuses with wire or similar items!
▶ Always replace defective fuses with fuses of the same amperage!

9.1 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.
▶ Loosen dirty terminals, clean and grease them with an acid-free and acid-resistant grease.
▶ Check the acid levels in batteries at least once a year. In summer and in hot climate zones, check it at least twice a year.
▶ With conventional batteries, check electrolyte level at regular intervals and add distilled water to the specified “Max mark”, if necessary.
▶ When adding distilled water:
Measure the acid concentration only after 30 minutes. The best acid temperature for measuring is +20 °C.

Proceed as follows when checking the battery charge:

Spec. gravity	Charge condition
1,28/1,23*	Well charged
1,20/1,16*	Semi-charged, recharge
1,12/1,08*	Discharged, recharge immediately

* in tropical countries

Reduced battery performance requires greater power requirements.

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

9.2 Mixing battery acid

▶ Ensure that work area is well ventilated.

DANGER

Risk of explosion!

▶ When mixing battery acid, always pour distilled water into the container first, then the concentrated sulphuric acid.

▶ Observe this order, otherwise explosions and spattering can occur.

▶ Stir mixture with acid-proof stick (glass or plastic).

Desired acid concentration kg/l	1,23	1,24	1,25	1,26	1,27	1,28
Volume ratio of concentrated sulphuric acid (96 %) to distilled water	1:3,8	1:3,6	1:3,4	1:3,2	1:3,0	1:2,8

When pouring in the battery acid, the acid level should be 15 mm above the top edge of the battery plates and the temperature of the acid should be approximately 15 °C.

▶ Pouring acid into battery.

Wait approximately 20 minutes before connecting the battery. By that time, it will be balanced out.

▶ Connect the battery after approximately 20 minutes.

9.3 Removal and recharging

WARNING

Danger of body injuries!

▶ Do not place tools on batteries and keep open flames away!

9.3.1 Removal

Make sure that the following prerequisites are met:

– the engine is turned off,

– all electrical users have been 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 spark formation.

▶ Disconnect negative terminal first (ground line), then the positive terminal.

- ▶ Remove the battery.
- ▶ Avoid spark formation caused by electrostatic charge. Do this by touching the ground point in the cab.
- ▶ Do not tilt or shake the battery.

9.3.2 Recharging

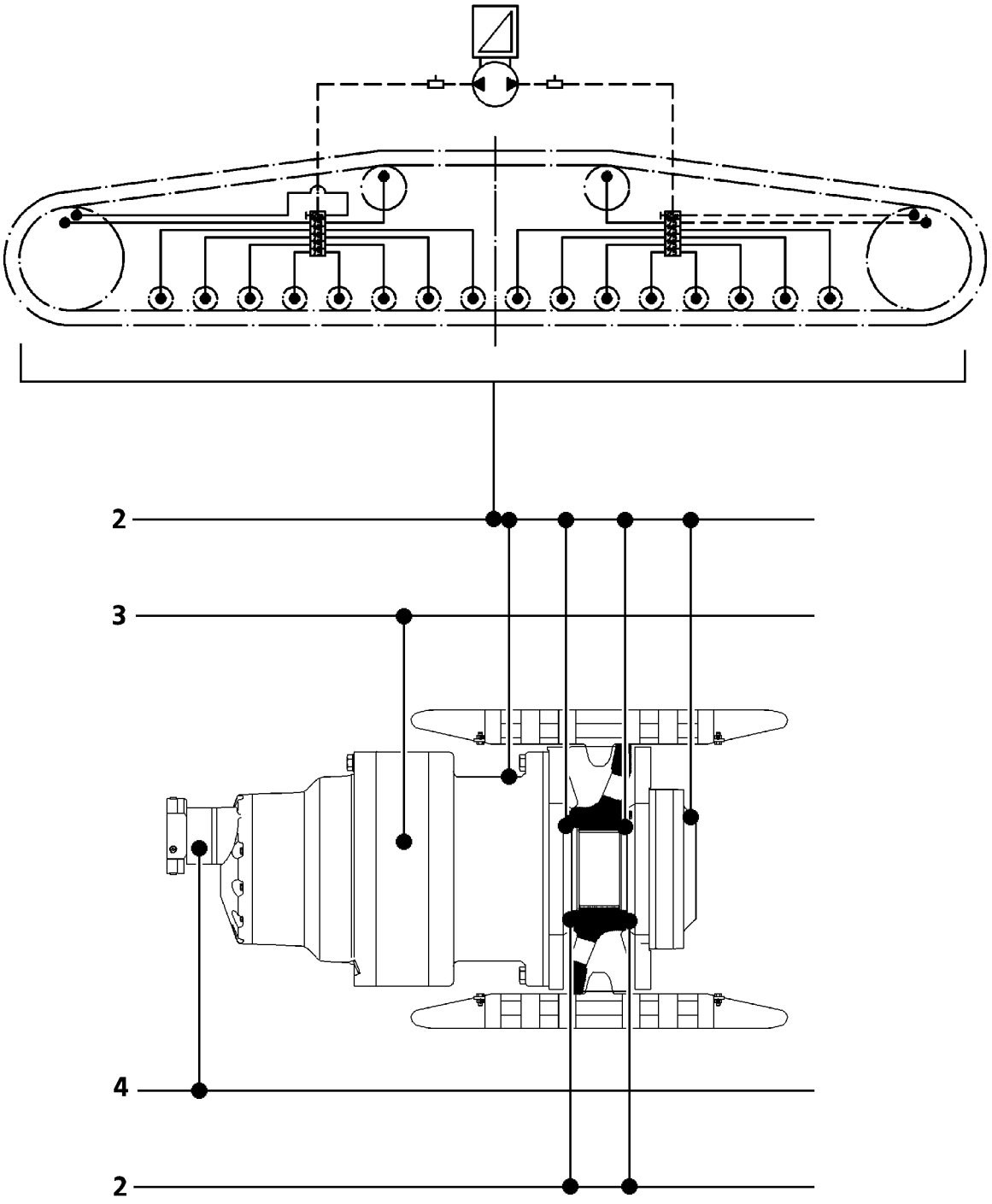
NOTICE
Damage to battery!
- ▶ Recharge only with direct current, the strength of which does not exceed 1/10 of the battery capacity!

Recharging example: A battery with 170 Ah should be charged with a maximum charge current of 17.0 A.
- ▶ Frozen batteries must be thawed out before charging.
- ▶ Remove all plugs before charging.
- ▶ Provide ventilation during charging (risk of oxyhydrogen gas explosion!).
- ▶ Connect the battery to a battery charger (positive to positive and negative to negative).
- ▶ Turn on the battery charger after connecting the battery.

Stop charging immediately if:
- The acid temperature exceeds 55 °C (housing is more than warm to the touch).
- Battery starts to give off gas.
- The acid concentration or the charging voltage has not changed for 2 hours.

- ▶ Turn the battery charger off after charging, then remove the connector cables individually from battery and battery charger.

9.3.3 Installation
- ▶ Reinstall the battery tightly in the vehicle.
- ▶ Avoid spark formation caused by electrostatic charge. Do this by touching the ground point in the cab.
- ▶ First connect the positive terminal to the battery, then the negative terminal (ground line).
- ▶ Check that the terminals are tightly seated (low contact resistance).
- ▶ Grease the terminals and end poles with acid-free and acid-resistant grease (also corrosion protection for modern maintenance-free batteries).



B107279

1 Crane chassis

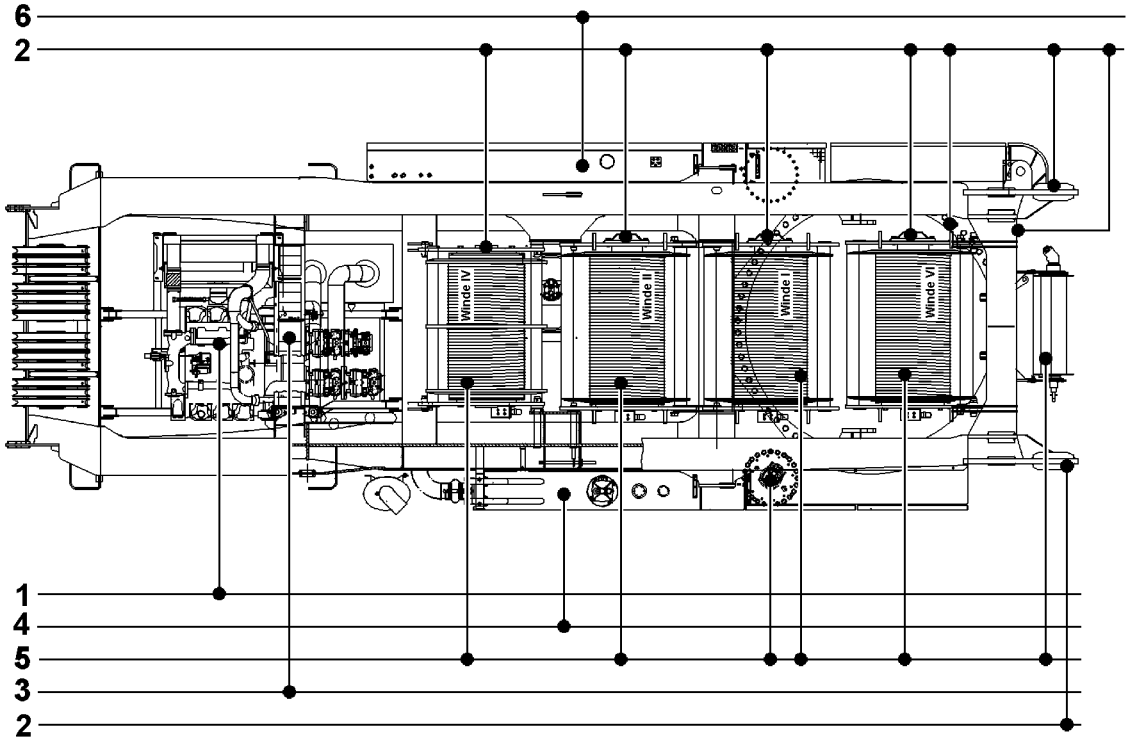
Explanations for lubrication chart:

2 Special grease
3 Gear oil
4 ATF

Fill chart
The specified fill quantities (change quantities) are orientation values. The markings on the dipsticks, inspection ports or sight gauges are decisive for filling.

NOTICE
Danger of property damage!
▶ Do not mix synthetic oils with mineral oils.

Assembly	Medium	Dosage
Travel gear	Gear oil	49.0 l
Travel gear brake	ATF	0.02 l
Central lubrication system	Special grease	4.0 kg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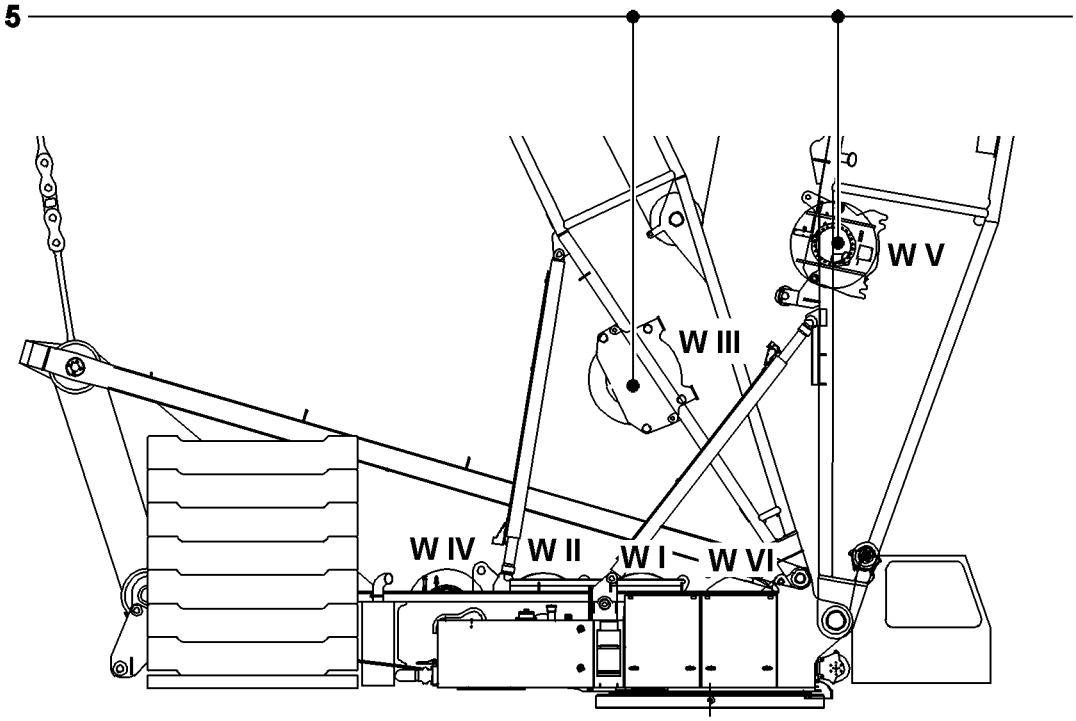
2
Winde IV
Winde II
Winde I
Winde VI
1
4
5
3
2


5
W V
W III
W IV
W II
W I
W VI

B107276

2 Crane superstructure

Explanations for lubrication chart:

1 Engine oil
2 Special grease
3 Gear oil
4 ATF
5 Synthetic gear oil
6 Diesel fuel

Fill chart
The specified fill quantities (change quantities) are orientation values. The markings on the dipsticks, inspection ports or sight gauges are decisive for filling.

NOTICE
Danger of property damage!
▶ Do not mix synthetic oils with mineral oils.

Assembly	Medium	Dosage
Diesel engine	Engine oil	26.0 l
Cooling system	Coolant	40.0 l
Fuel tank	Diesel fuel	700.0 l
Pump distributor gear	Gear oil	7.7 l
Winch 1 **W I**, Winch 2 **W II**, Winch 3 **W III**, Winch 5 **W V**, Winch 6 **W VI**	Synthetic gear oil	6.4 l
Winch brake Winch 1 **W I**, Winch 2 **W II**, Winch 3 **W III**, Winch 5 **W V**, Winch 6 **W VI**	ATF	0.75 l
Winch 4 **W IV** (per side)	Synthetic gear oil	12.0 l
Winch brake Winch 4 **W IV**	ATF	0.4 l
Assembly winch	Synthetic gear oil	0.4 l
Slewing gear	Synthetic gear oil	23.0 l
Hydraulic oil tank [1], (without support)	ATF	450.0 l
Hydraulic oil tank [1], (with support)	ATF	720.0 l
Central lubrication system	Special grease	4.0 kg

[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.

B195219

1 Service items and lubricants required for LIEBHERR cranes

1.1 Service items and lubricants

Note

- To improve the cold start ability of the diesel engine at an ambient temperature below -10 °C, we recommend the use of the following engine oil:
- Viscosity grade SAE 5W-30 according to specification ACEA E4.
- **LWE Id. No.: 10425711**!

	Usage	**Ambient temperature for driving and crane operation**	
		-25 °C to +50 °C	**-40 °C to +30 °C**
1	Diesel engine	**LWE Id. No.: 8610240** SAE 10W-40 API CF ACEA E4-96 **Below -20 °C** with pre-heating	**LWE Id. No.: 8610240** SAE 10W-40 API CF ACEA E4-96 **Below -20 °C** with pre-heating
2	Drive axle With differential locks, Planetary gear and Installed distributor gear	**LWE Id. No.: 861901008** SAE 90 API GL 5 ZF TE-ML 05	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5 ZF TE-ML 05
3	Axle drive ZF DK-7	**LWE Id. No.: 861901008** SAE 90 API GL 5 ZF TE-ML 05	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5 ZF TE-ML 05
4	Vehicle distributor gear KESSLER VG 1800 / 2400 /2550 / 2600 / 3750 W 3750 ZF Passau, STEYR PUCH VG 1200 / 1600 / 2000 / 3800	**LWE Id. No.: 861901008** SAE 90 API GL 5 ZF TE-ML 19	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5 ZF TE-ML 19

1.2 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
5	Drop box ZF Passau, STEYR PUCH	**LWE Id. No.: 861901008** SAE 90 API GL 5 ZF TE-ML 19	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5 ZF TE-ML 19
6.1	Pump distributor gear Filled with mineral gear oil	**LWE Id. No.: 861901008** SAE 90 API GL 5	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5
6.2	Pump distributor gear Filled with synthetic gear oil	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!	**LWE Id. No.: 10664125** ISO VG 150, DIN 51 519 CLP PG 150, DIN 51 502 Do not mix with mineral oils!
6.3	Pump distributor gear LTC 1055-3.1	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5
7.1	Load powershift gear box ZF torque converter WG 120, WG 150 WG 180, WG 181, WG 200, WG 201	**LWE Id. No.: 8610240** SAE 10W-40 API CF ACEA E2-96, E4-96 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ALLISON C4 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions

1.3 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
7.2	Load powershift gear box ZF torque converter WG 251* ZF ERGOPOWER WG 210, WG 260, WG 310 * also for ambient temperatures above -10 °C	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions
8	Load powershift gear box CLARK	**LWE Id. No.: 8610240** SAE 10W-40 API CF ACEA E2-96, E4-96 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ALLISON C4 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions
9	Drop box ALLISON	**LWE Id. No.: 8610240** SAE 10W-40 API CF ACEA E2-96, E4-96 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ALLISON C4 ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions

1.4 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
10.1	Automatic transmission ALLISON CLBT 740, CLBT 750, CLBT 754, CLBT 755, HT 755, HD 4560	ATF Dexron III ALLISON C4 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861903708** CASTROL Transynd **Below -20 °C** run warm as described in the operating instructions
10.2	Automatic transmission ZF	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 03 **Below -20 °C** run warm as described in the operating instructions
11	Automatic gear box ZF AS-Tronic ZF TC-Tronic ZF TC-Tronic HD	**LWE Id. No.: 10218305** ZF-Ecofluid M ZF TE-ML 02	**LWE Id. No.: 10218305** ZF-Ecofluid M ZF TE-ML 02 **below -20 °C** pre-heat gearbox as described in the operating instructions
12.1	Torque converter transmission ZF TC HD	**LWE Id. No.: 10218305** ZF-Ecofluid M ZF TE-ML 02	**LWE Id. No.: 10218305** ZF-Ecofluid M ZF TE-ML 02 **below -20 °C** pre-heat gearbox as described in the operating instructions
12.2	Torque converter transmission ZF TC 2	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 14	**LWE Id. No.: 861900608** ATF Dexron II D ZF TE-ML 14

1.5 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
13	Gear box ZF ECO-Split	**LWE Id. No.: 861004208** Engine oil or gear oil ZF TE-ML 02	**LWE Id. No.: 10425142** SAE 75W-90 ZF TE-ML 02
14	Rope winch	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!
15	Slewing gear	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!
16	Winch Telescopic boom guying	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!	**LWE Id. No.: 861901208** ISO VG 220, DIN 51 519 CLP PG 220, DIN 51 502 Do not mix with mineral oils!

1.6 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
17.1	Crane hydraulics Crane chassis and crane superstructure	**LWE Id. No.: 861903508** Liebherr Hydraulic 37	**LWE Id. No.: 10467552** Liebherr Hydraulic FFE 30 or **LWE Id. No.: 10293807**
17.2	Crane hydraulics LTC 1055–3.1	**LWE Id. No.: 10467552** Liebherr Hydraulic FFE 30 or **LWE-Identnr.: 10293807** Liebherr Hydraulic Plus Arctic	**LWE Id. No.: 10467552** Liebherr Hydraulic FFE 30 or **LWE-Identnr.: 10293807** Liebherr Hydraulic Plus Arctic
17.3	Crane hydraulics LTM 11200–9.1 Crane chassis and crane superstructure LTR 11200 Crane superstructure	**LWE Id. No.: 10467552** Liebherr Hydraulic FFE 30 or **LWE-Identnr.: 10293807** Liebherr Hydraulic Plus Arctic	**LWE Id. No.: 10467552** Liebherr Hydraulic FFE 30 or **LWE-Identnr.: 10293807** Liebherr Hydraulic Plus Arctic
18	Brake system if hydraulically actuated	**LWE Id. No.: 861000108** DOT 4 SAE J 1703e	**LWE Id. No.: 861000108** DOT 4 SAE J 1703e
19	Clutch actuator	**LWE Id. No.: 861000108** DOT 4 SAE J 1703e	**LWE Id. No.: 861000108** DOT 4 SAE J 1703e

1.7 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
20	King pin bearing Gear shaft if not maintenance-free	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS
21	Slide and roller bearing roller bearing joint	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS
22	Central lubrication system Crane superstructure	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS
23	Boom lock	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS
24	Rotary connection Roller bearing	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS	Special regulations: LIEBHERR **LWE Id. No.: 861301308** Special grease 9610 PLUS
25	Support pad with equalization	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus

1.8 Service items and lubricants (continuation)

	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
26	Plastic slide bearing Sliding beam	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus
27	Plastic slide bearing Telescopic boom	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus	Special regulations: LIEBHERR **LWE Id. No.: 861303608** Special grease 9613 Plus
28	Outer slide bearing Telescopic boom Guide rail on Telescoping cylinder	Special regulations: LIEBHERR **LWE Id. No.: 861303308** Special grease 1336 with Solvent LM (spray grease)	Special regulations: LIEBHERR **LWE Id. No.: 861303308** Special grease 1336 with Solvent LM (spray grease)
29	Inner slide bearing Telescopic boom (only during assembly)	Special regulations: LIEBHERR **LWE Id. No.: 861303308** Special grease 1336 with Solvent LM (spray grease)	Special regulations: LIEBHERR **LWE Id. No.: 861303308** Special grease 1336 with Solvent LM (spray grease)
30	Gear ring rotary connection Slewing gear pinion	**LWE Id. No.: 861301508** Adhesive grease OGPF 2 S-30, DIN 51 502 (water-resistant)	**LWE Id. No.: 861301508** Adhesive grease OGPF 2 S-30, DIN 51 502 (water-resistant)

1.9 Service items and lubricants (continuation)

	Usage	**Ambient temperature for driving and crane operation**	
		-25 °C to +50 °C	**-40 °C to +30 °C**
31	Running rope	**LWE Id. No.: 861301508** Adhesive grease OGPF 2 S-30, DIN 51 502 (water-resistant)	**LWE Id. No.: 861301508** Adhesive grease OGPF 2 S-30, DIN 51 502 (water-resistant)
32	Radiator fluid Diesel engine and heating system	Special regulations: LIEBHERR **LWE Id. No.: 861600508** 50 % antifreeze fluid with corrosion inhibitor 50 % water	Special regulations: LIEBHERR **LWE Id. No.: 861600508** 50 % antifreeze fluid with corrosion inhibitor 50 % water
33.1	Drive transmission crawler crane	see nameplate	see nameplate
33.2	Drive transmission crawler crane LTR 1100	**LWE Id. No.: 861901008** SAE 90 API GL 5	**LWE Id. No.: 10425142** SAE 75W-90 API GL 5
34	Towing winch	see nameplate	see nameplate
35	Towing winch rope	Special regulations: **LWE Id. No.: 861008608** Motorex TW-Fluid	Special regulations: **LWE Id. No.: 861008608** Motorex TW-Fluid

8.00 Inspections of cranes

B195219

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 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 a competent expert before putting it back into service!

Respective local regulations also apply.
Expert: Is a person whose technical training and experience means that he has adequate knowledge in the field of inspecting technical equipment. He is adequately familiar with the relevant national work safety regulations, accident prevention regulations, and standards that he is able to evaluate the operational safety of the equipment (for example cranes). Responsible employees from specialist workshops and customer service engineers may be considered as experts.

Note
▶ Experts are not authorized inspectors!

Authorized inspector: Is a person whose technical training and experience means that he has explicit knowledge in the field of inspecting technical equipment. He is adequately familiar with the relevant national work safety regulations, accident prevention regulations, and standards that he is able to evaluate the operational safety of the equipment (for example cranes). He is to test the technical equipment and is able to certify the equipment as safe. Authorized inspectors can be active engineers.

Note
▶ Authorized inspectors are legally recognized experts who have received special training!

Periodic inspection are principally a visual inspection, wherein the inspector (either type) appraises the condition of the crane and its components.
The purpose of the inspections is to avoid accidents by detecting deficiencies in a timely fashion. Any deficiencies determined by the inspectors must be documented, remedied, and subsequently reinspected.
A number of important examples of items that are particularly important during the periodic crane inspections are listed in the following: We wish to advise that the authorized inspectors / experts take sole responsibility for the crane inspections that they carry out.

Note

- The inspection may not be solely limited to the following positions shown in the sample construction illustrations. Rather the **entire** crane structure must be subjected to a careful inspection!

A checklist for periodic inspections recommended for LIEBHERR vehicles and crawler cranes is included in the appendix to assist the inspectors.
If the inspector has any questions they should be directed to Liebherr-Werk Ehingen GmbH's technical department.

WARNING
Risk of accident!

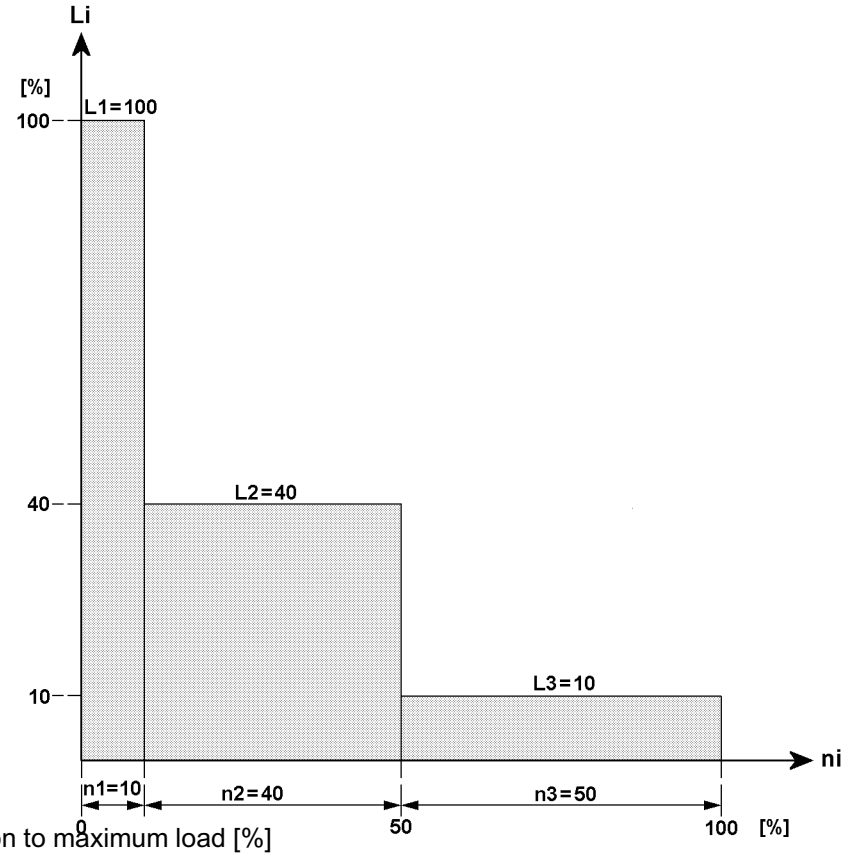
- Adhere to the following inspection guidelines and intervals.

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. Even though welding joints are not normally situated at maximum load locations, it is nevertheless important that they be inspected with particular care during the periodic inspections.
If paint damage with corrosion (rust) is found on load carrying parts of the crane structure, especially on telescopic booms, lattice booms, lattice jibs, pull rods etc., then the rust must be removed, primered and painted.
During an electrolyte process, such as corrosion in combination with water, an atomic hydrogen is created, which causes to hydrogen induced corrosion with resulting cracks on high tensile fine grain construction steel.
If disassembly and assembly work on the crane is required to carry out the inspections, then they must be carried out by taking the manufacturer's data into account or in coordination with the crane manufacturer.
We would like to point out that the framework of mobile cranes is designed for a limited number of stress work cycles. This also determines the utilization or service life of the framework. The service life is not determined solely by the number of stress cycles. It also depends on the loads (load spectrum) applied during the time in operation.
Liebherr mobile and crawler cranes are designed for assembly operation and can only perform a limited number of stress cycles. They are designed for special movement characteristics. For example: Continuous deployment of drive forces, occasional operation and load conditions according to DIN 15018:1984 Part 3 or EN 13000:2004.
Example of a duty cycle according to the grouping for Liebherr mobile and crawler cranes:



Li: Load proportion in relation to maximum load [%]
ni: Load cycles in relation to maximum number [%]

Note

- The life of Liebherr mobile and crawler cranes can drastically reduce, for example when used in magnet, grab or material handling applications.

For that reason, the steel structures and the welding joints must be subjected to an intensive inspection by the authorized inspector during the specified periodic inspections.
If any damage (such as cracks or suspicion of cracks) are apparent on any part of the steel structure, the total extent of the damage must be determined by qualified specialists using appropriate material testing methods, such as magnetic crack detection, ultrasound or x-rays. Thereafter, the qualified personnel must determine whether or not the damaged area can be repaired by welding or by other means.
The following diagrams are samples of the load-bearing weld designs. The welding joints or seams or steel structural zones that require inspection may be present more than once and in various forms. The joints or zones must be inspected all around at the locations identified by arrows.

Note

- The scope and extent of all inspections remain the sole responsibility of the inspectors.
- The scope and results of tests should be documented to permit reproducibility. This documentation forms part of the crane records and should be safely stored during the entire service life of the crane.
- The following diagrams are provided to assist the inspector. The sketches are only examples and are not necessarily 100% complete!

2.1 Repair welds

If defects such as cracks or permanent deformation are detected on load-bearing steel components, they should be immediately reported to **Liebherr-Werk Ehingen GmbH** (hereinafter called LWE), **Customer Service Department**.
Furthermore, the defect must immediately be appraised by an authorized inspector in accordance with standard welding practice rules. The inspector must immediately ascertain whether or not the crane can continue to be safely operated until the time of the repair.
The following items apply to the repair weld:

– Repair welds may only be carried out by the following persons or companies:
  - **LWE** personnel, or third-party personnel contracted by **LWE**, with appropriate qualifications according to EN 287-1 for the subject material (3.2) and welding method.
  - Companies whose suitability is verified according to DIN18800, Part 7, DIN 15018, and DIN 4132 with an endorsement for cranes, crane runways and the following high and ultra-high-tensile fine-grained construction steel:
    Metal sheeting S690QL1 W.No.1.8988
    Metal sheeting S690QL W.No.1.8928
    Metal sheeting S700MC W.No.1.8974
    Metal sheeting S960QL W.No.1.8933
    Metal sheeting S960MC W.No.–
    Metal sheeting S1100QL W.No.1.8942
    S770QL W.No.1.8938 pipe
    S890QL1 W.No.1.8925 pipe
    Experience in repairing mobile and crawler cranes using the appropriate materials and application of welding methods in accordance with MAGM (135), especially manual arc welding E (111), are absolutely essential.
– Repair instructions that identify the basic material, along with the required welding accessories and supplementary materials, must be requested from **LWE** before starting the repair. The required non-destructive tests must be carried out and documented.
– The repair weld must be carried out in accordance with the latest revision of **LWE's** internal welding guideline ISR B 010!
– The repaired structural component must subsequently be subjected to a load test.
  The required test loads and boom configurations shall be obtained from **LWE**, Customer Service!
  Successful test results shall be documented in the crane inspection log!
– We also refer to observing the accident prevention regulations “Principles for testing cranes by authorized inspectors or experts in accordance with UVV **Cranes** BGV D6 and BGG 905”!

WARNING
Danger of serious personnel injury and equipment damage!
▶ Comply absolutely with all recommendations, particularly welding specifications!

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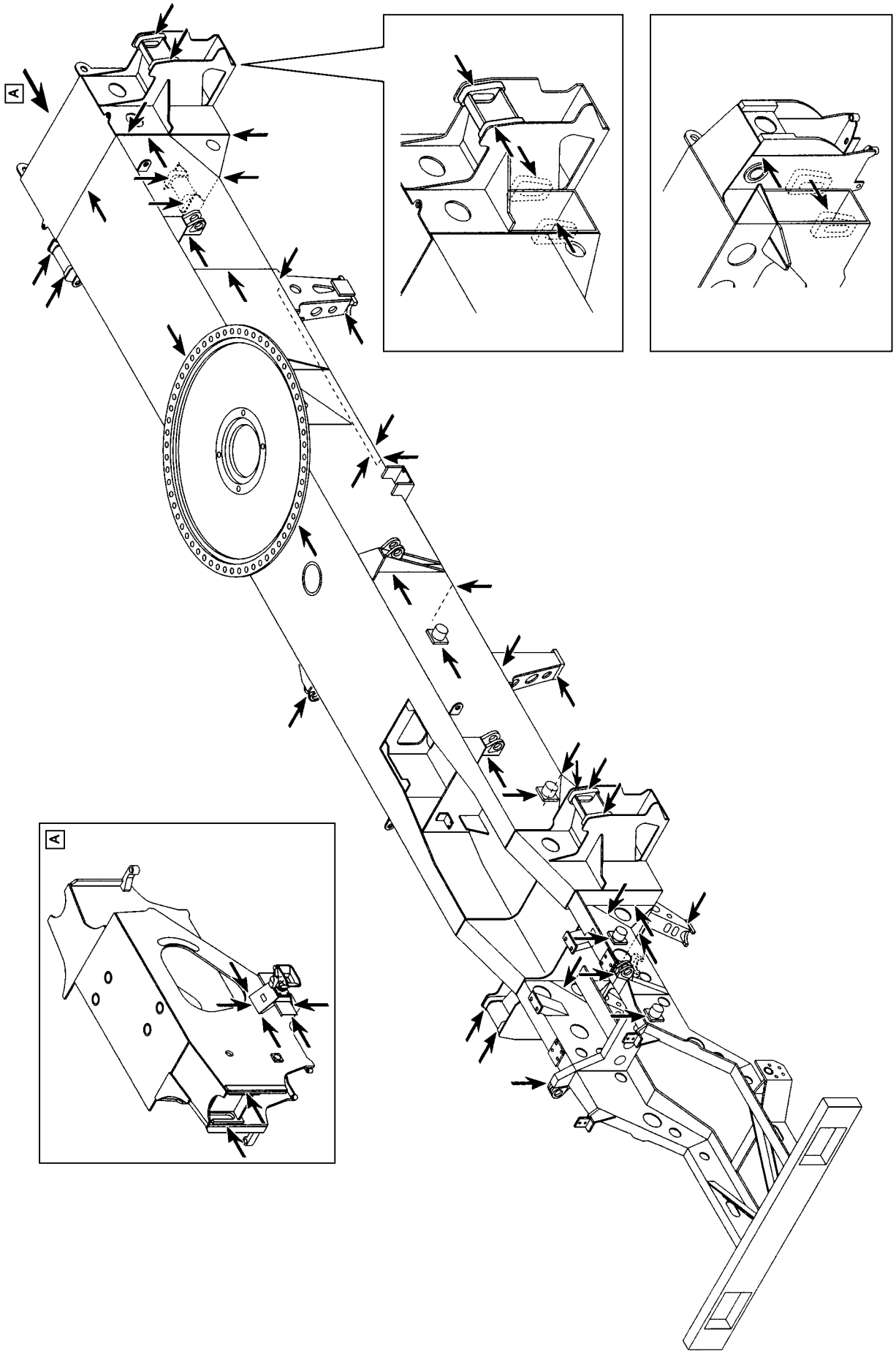
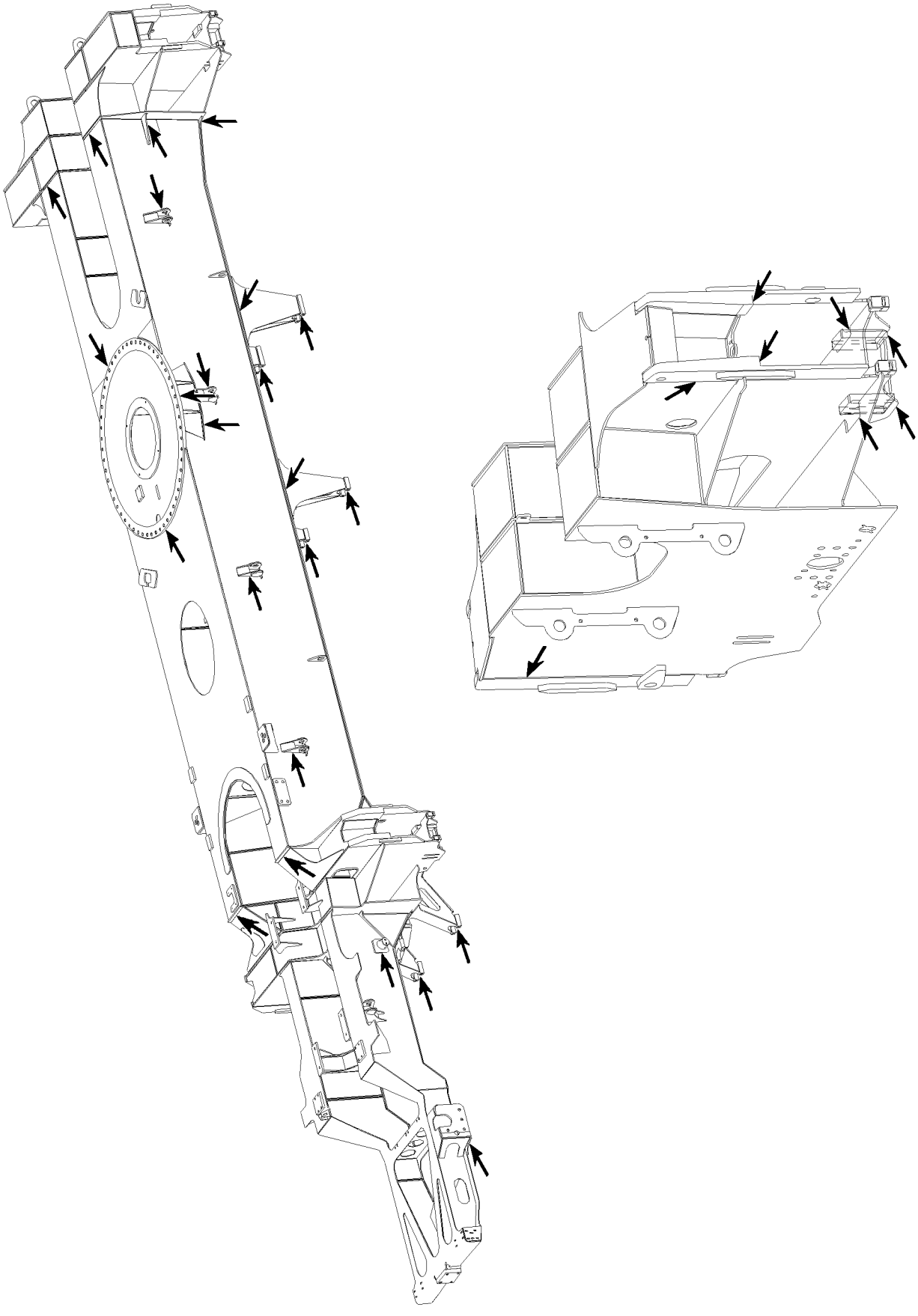


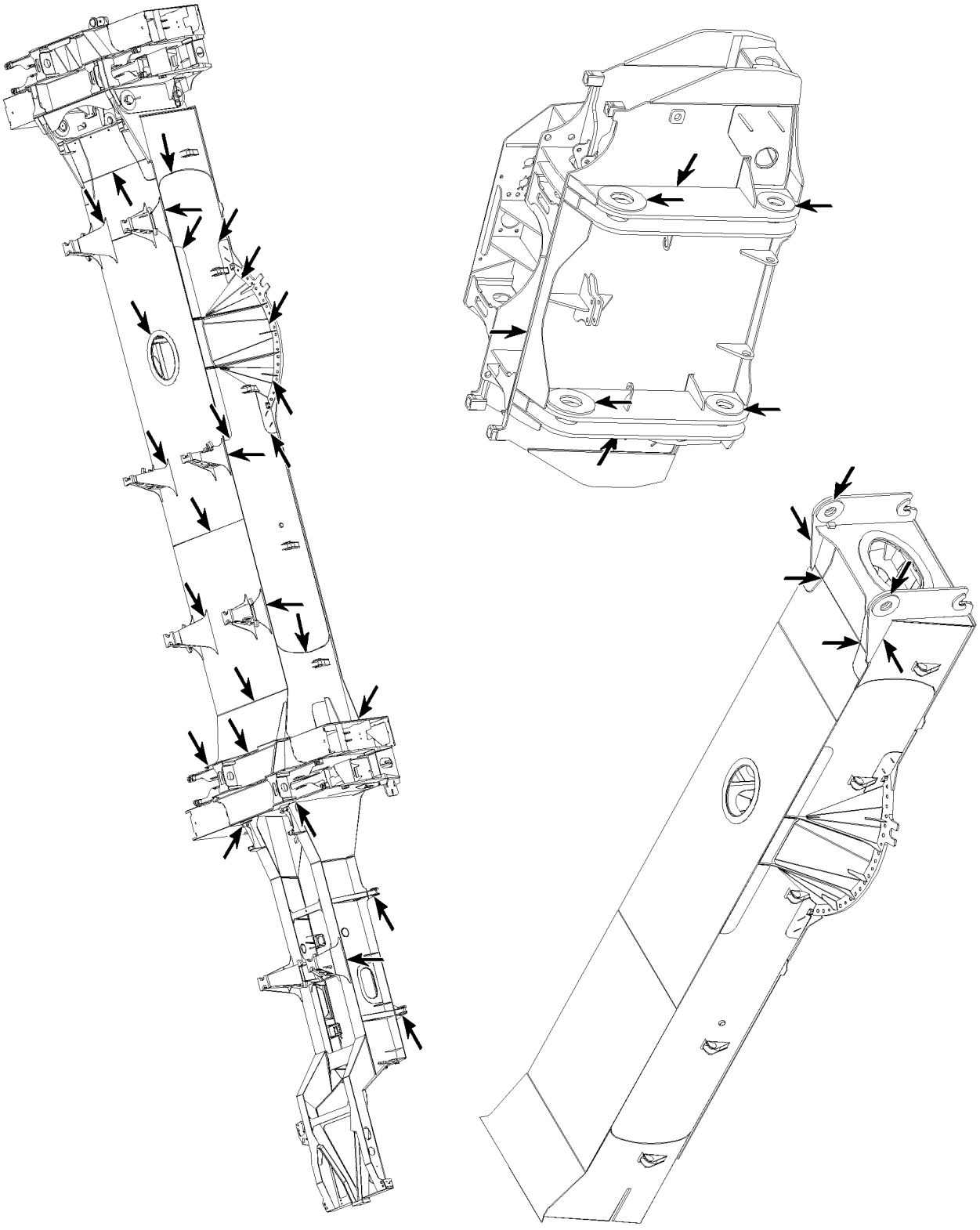
B185046

Example for vehicle frame

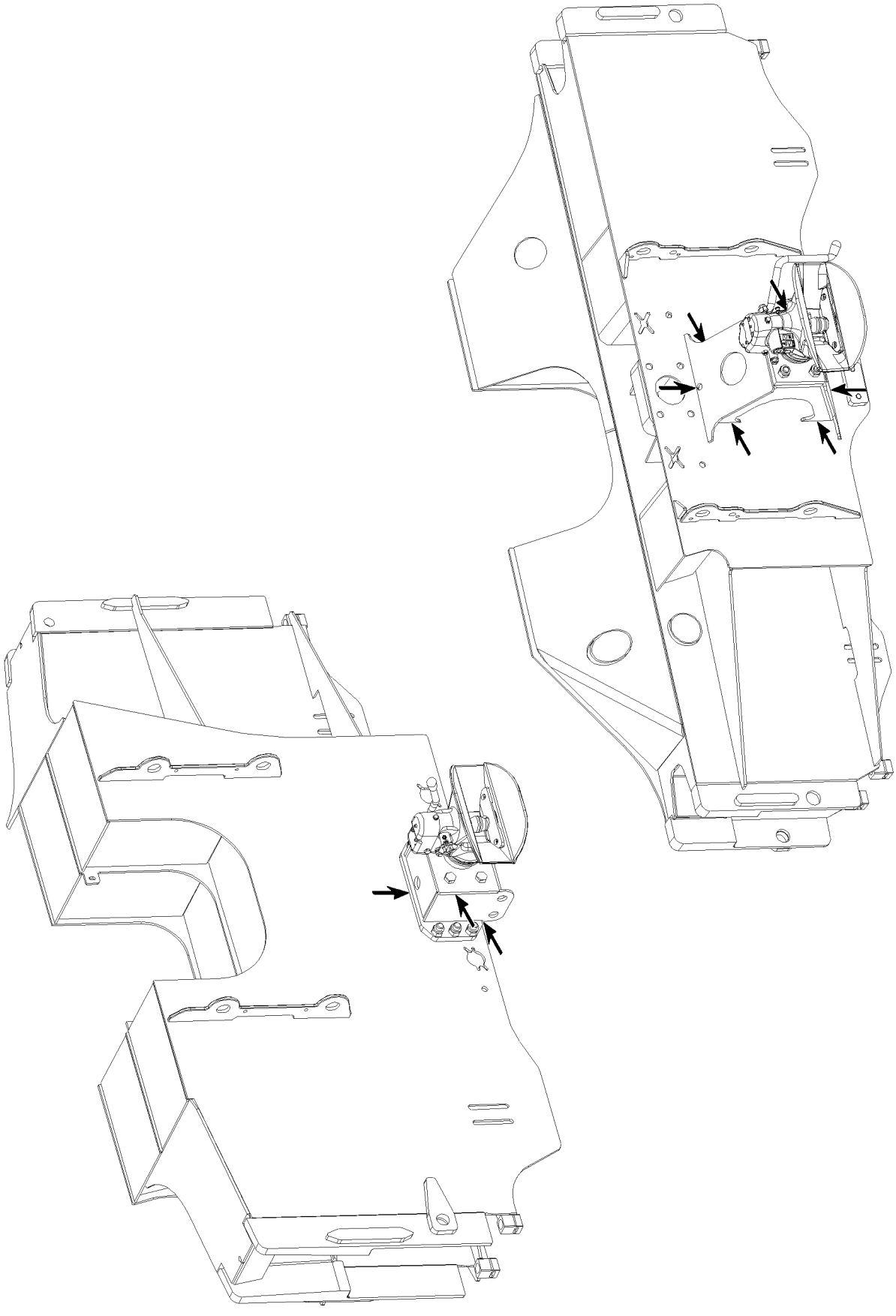


B105702

Example for vehicle frame

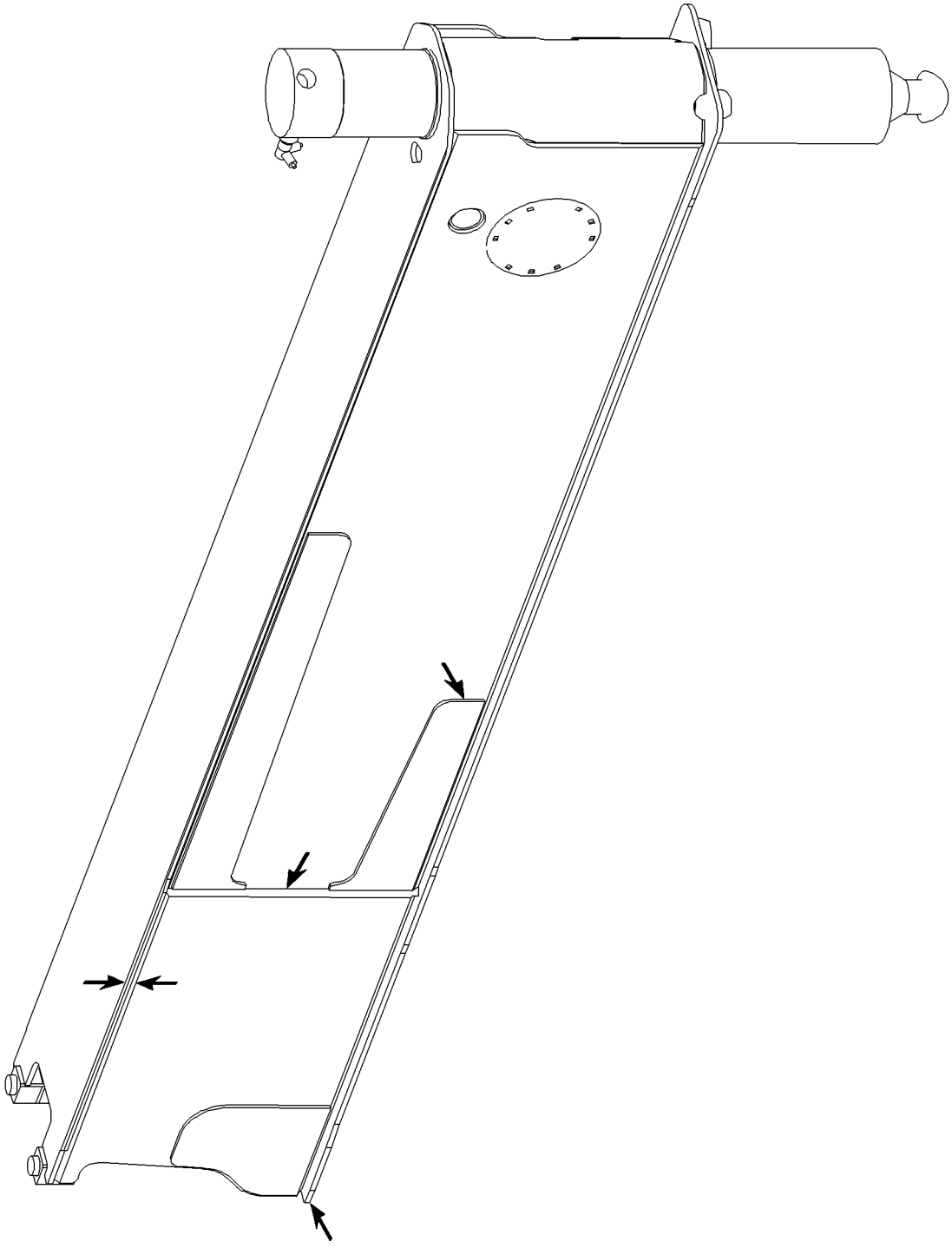


B105719 *Example for vehicle frame*



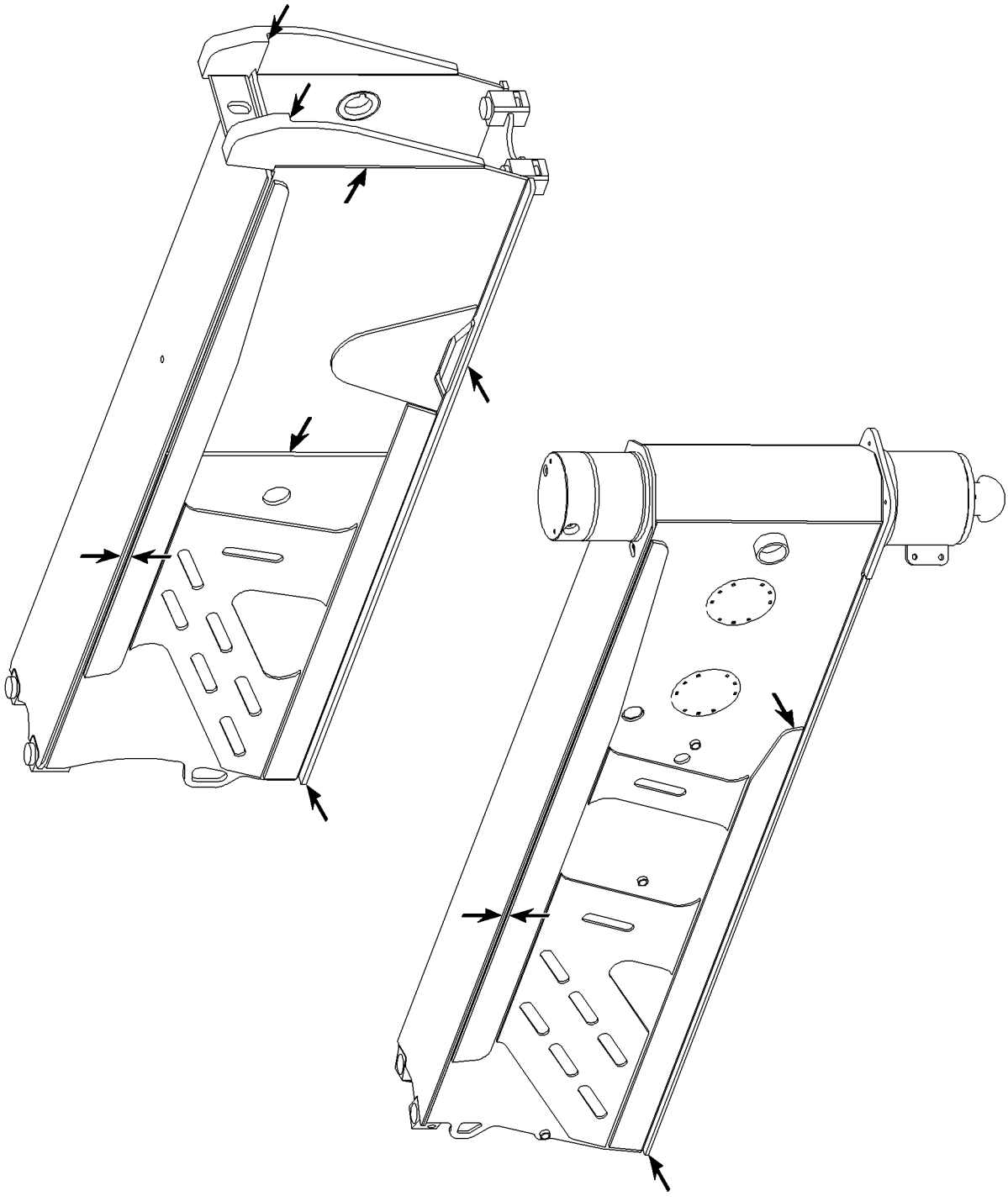
B105687

Example for tow coupling

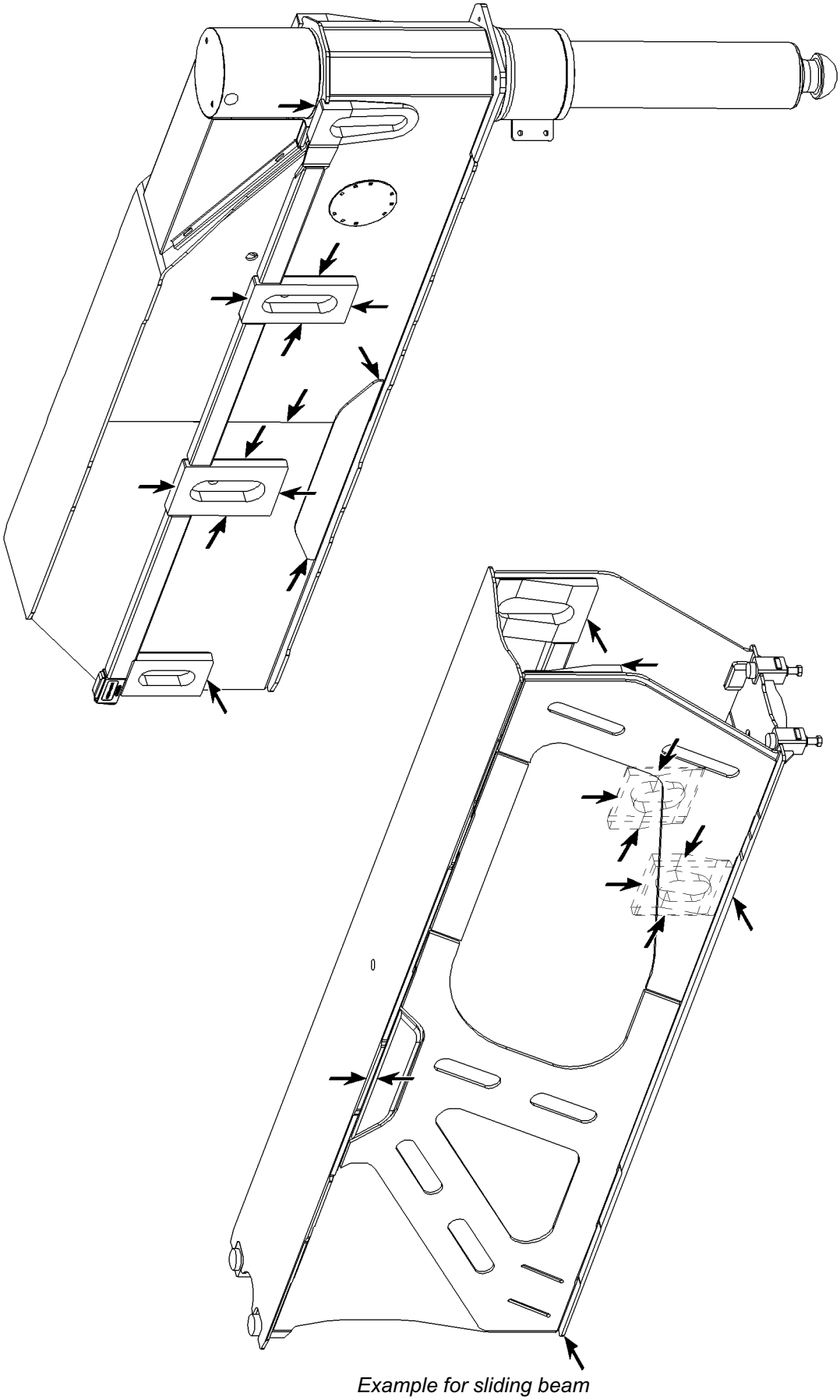


B105698

Example for sliding beam

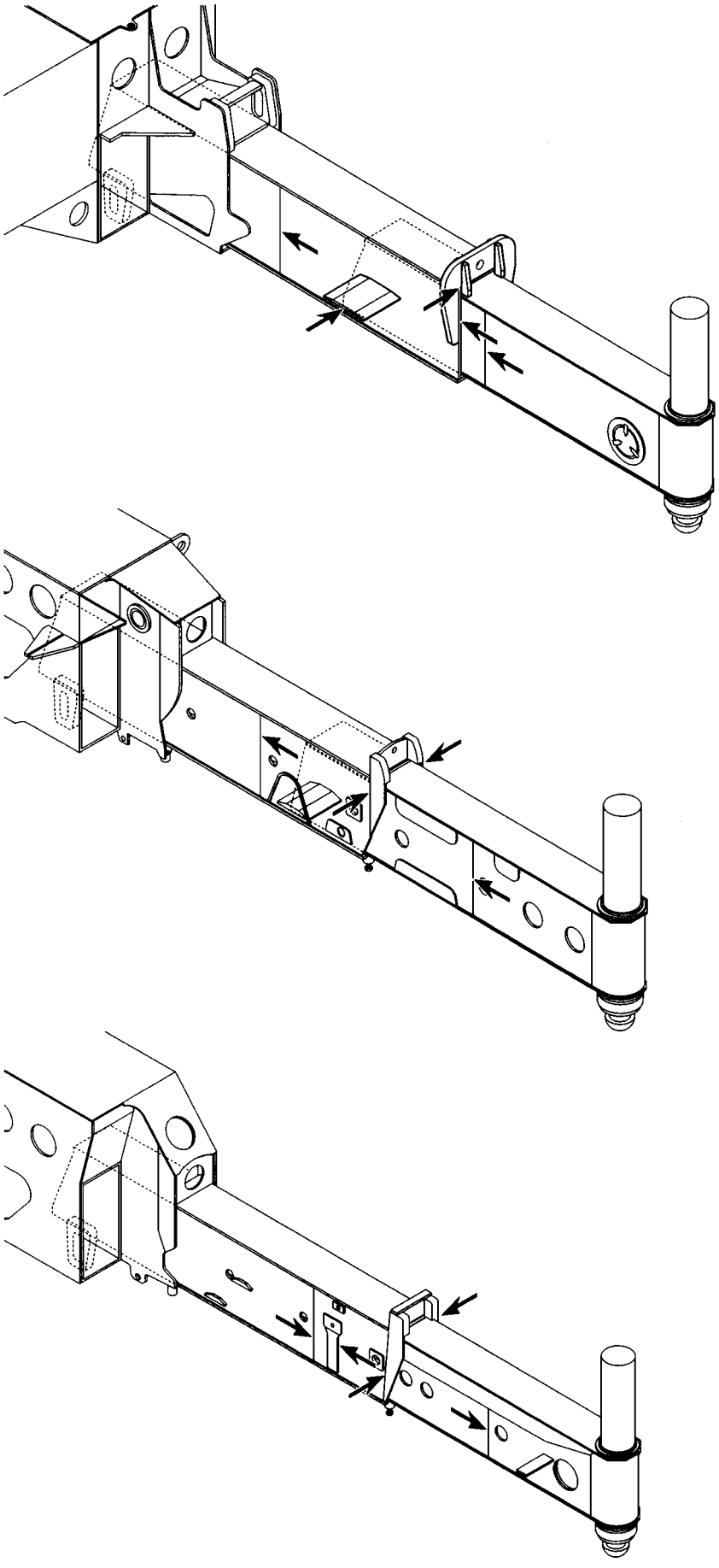


B105717 *Example for sliding beam*



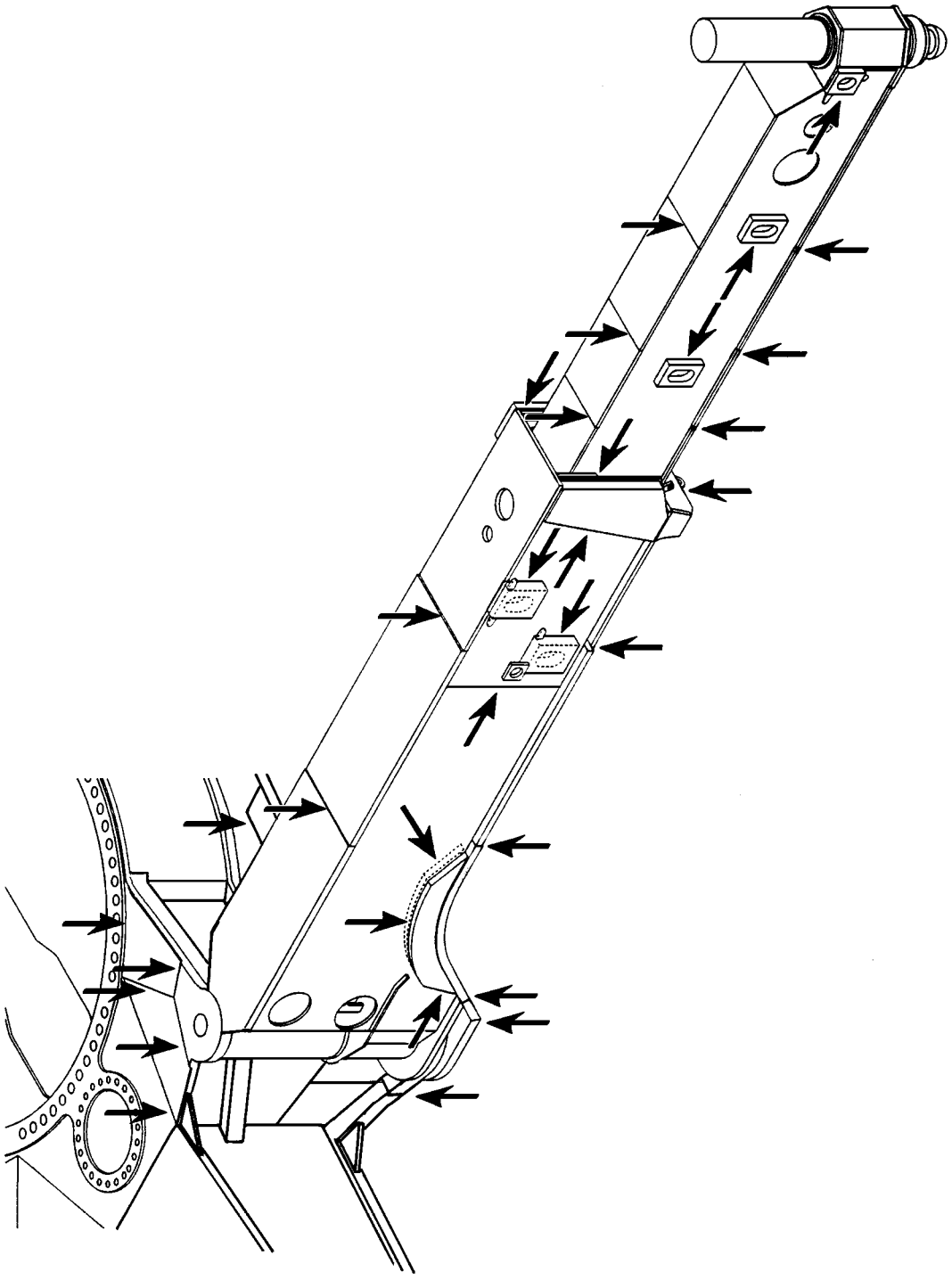
B105718

Example for sliding beam

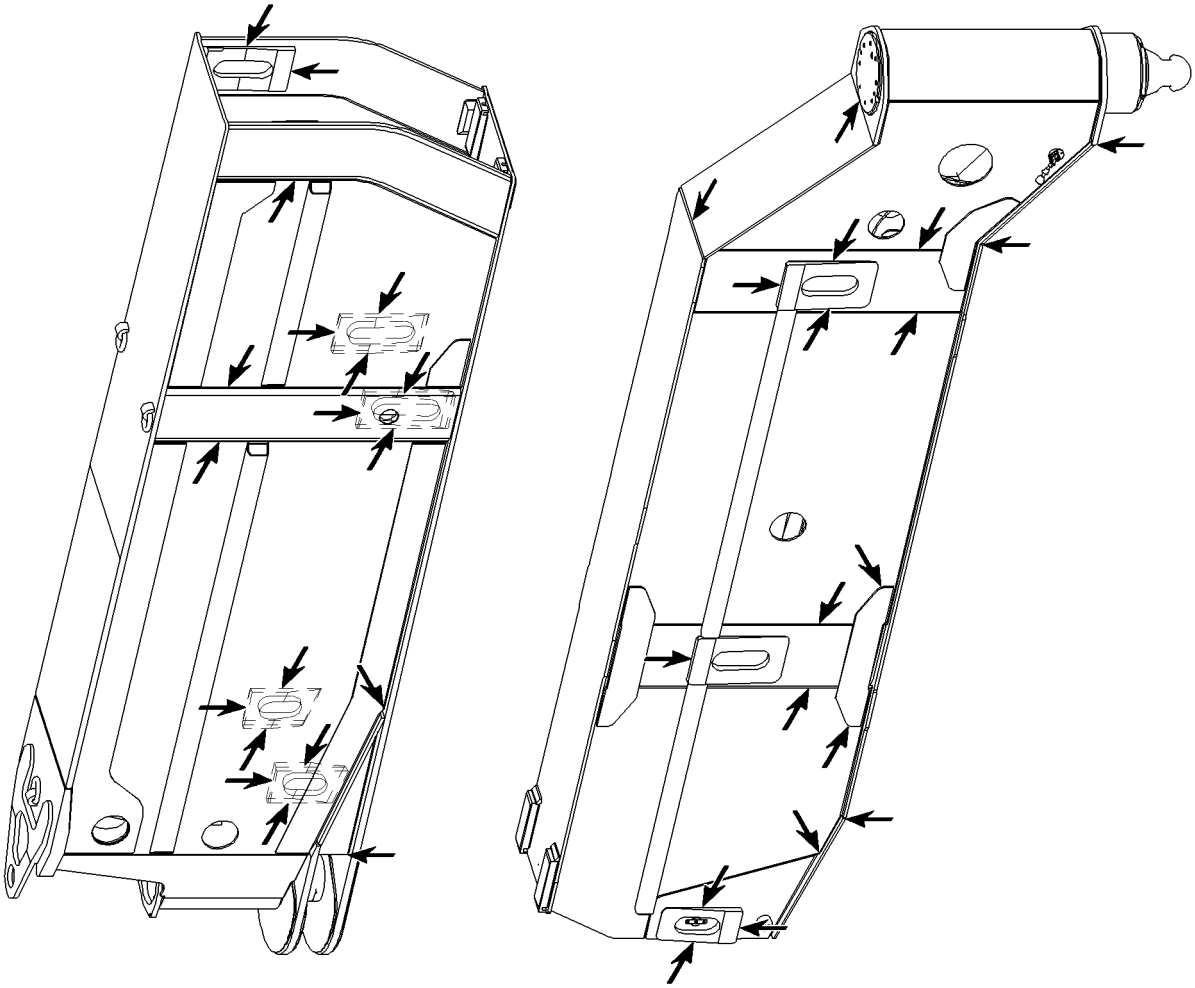


B185047

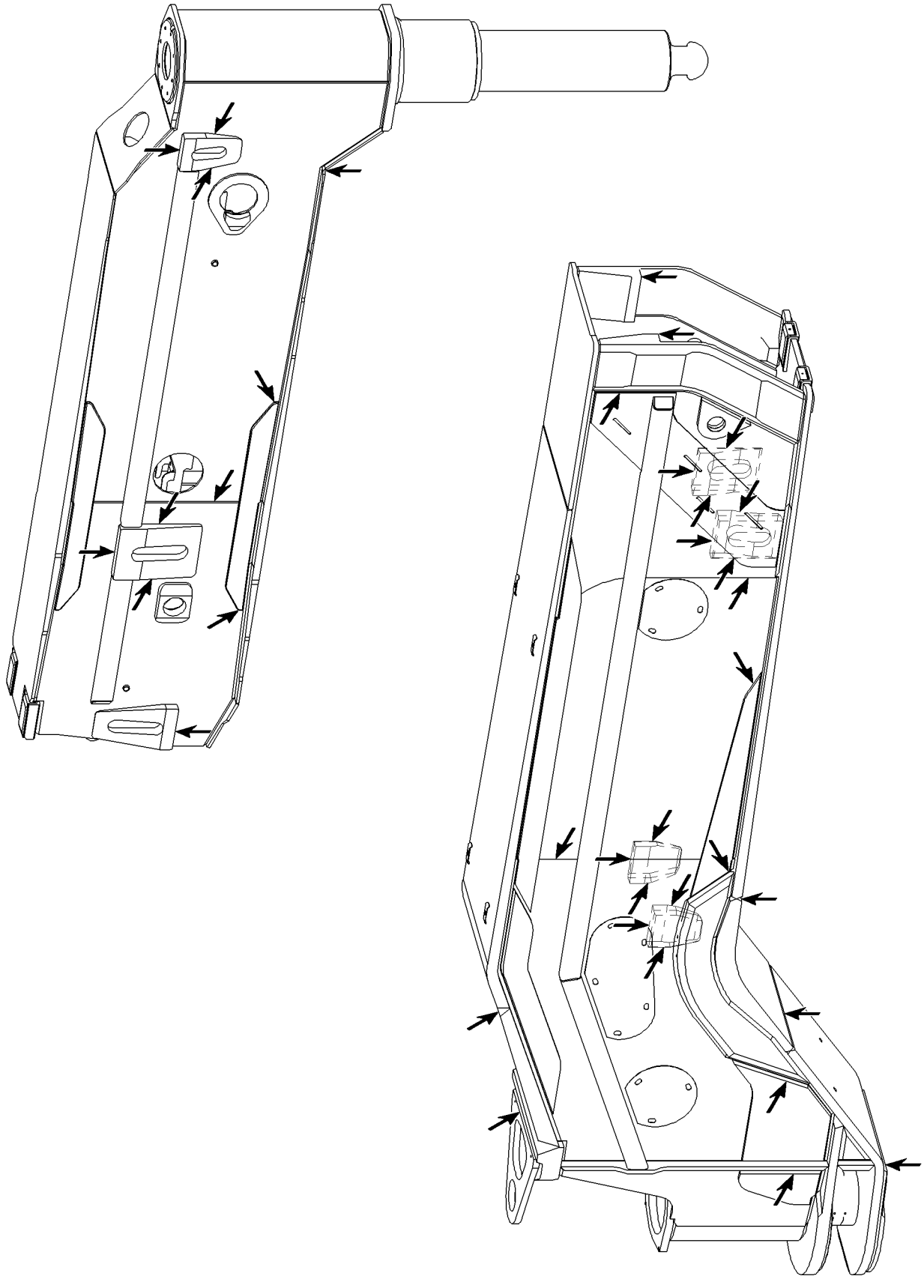
Example for sliding beam



B185060 *Example for slewing sliding beam*

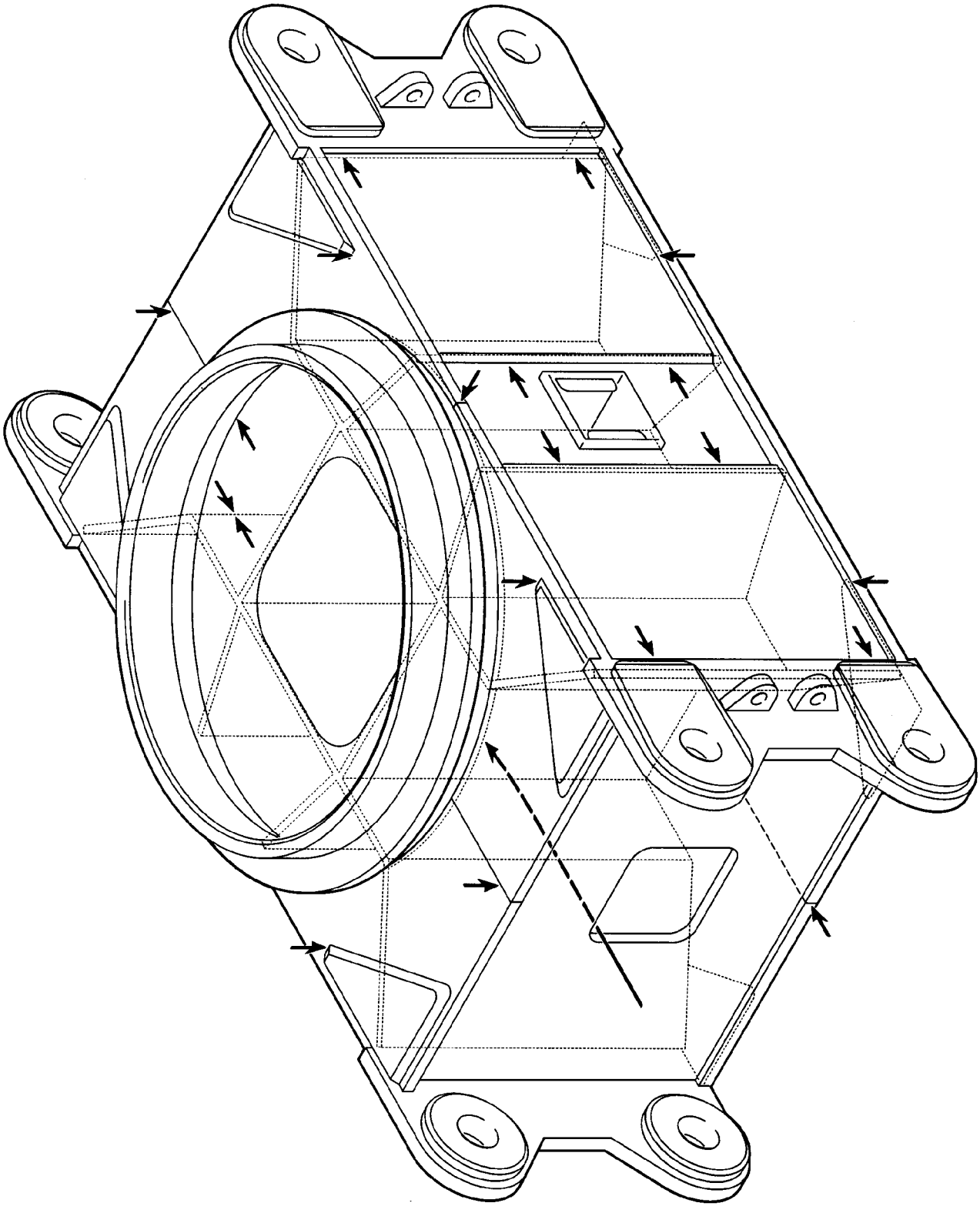


B105690 *Example for slewing sliding beam*

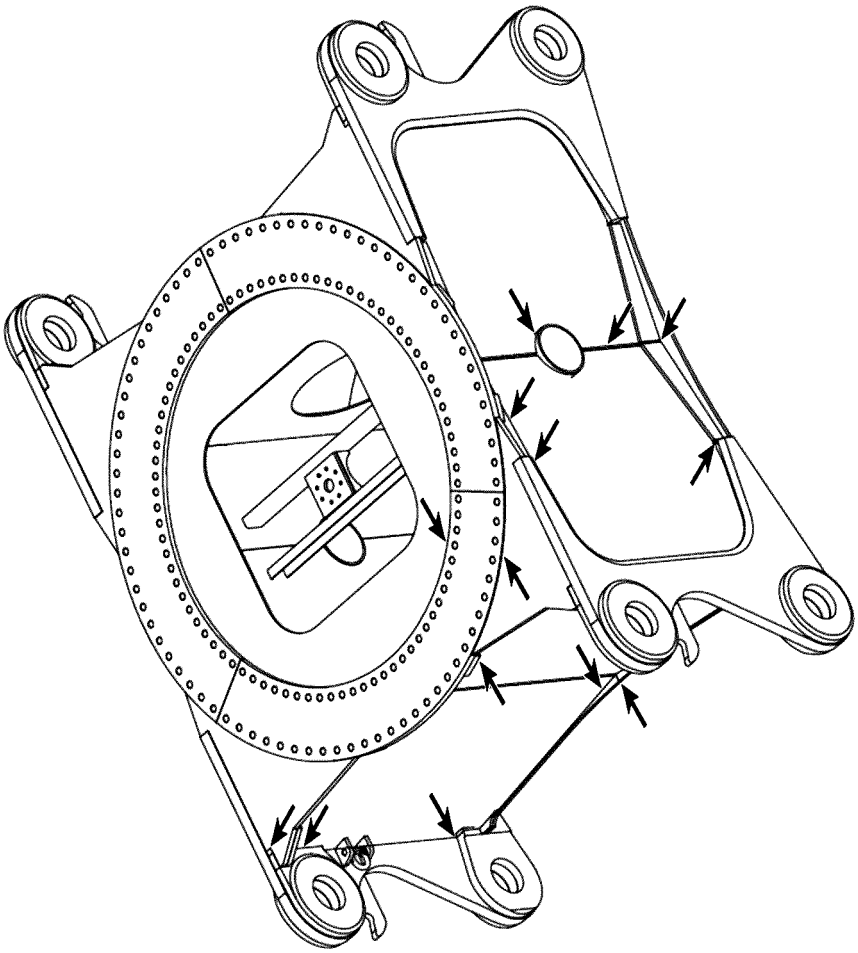


B105704

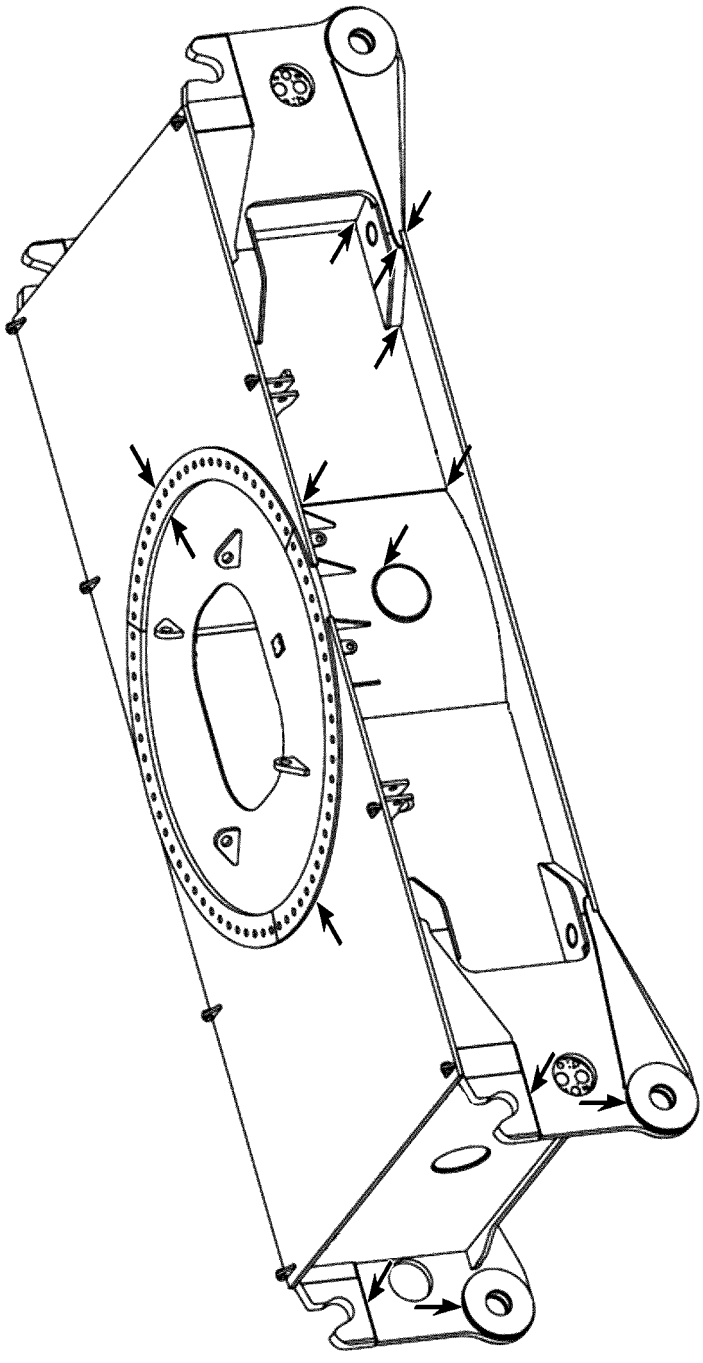
Example for slewing sliding beam



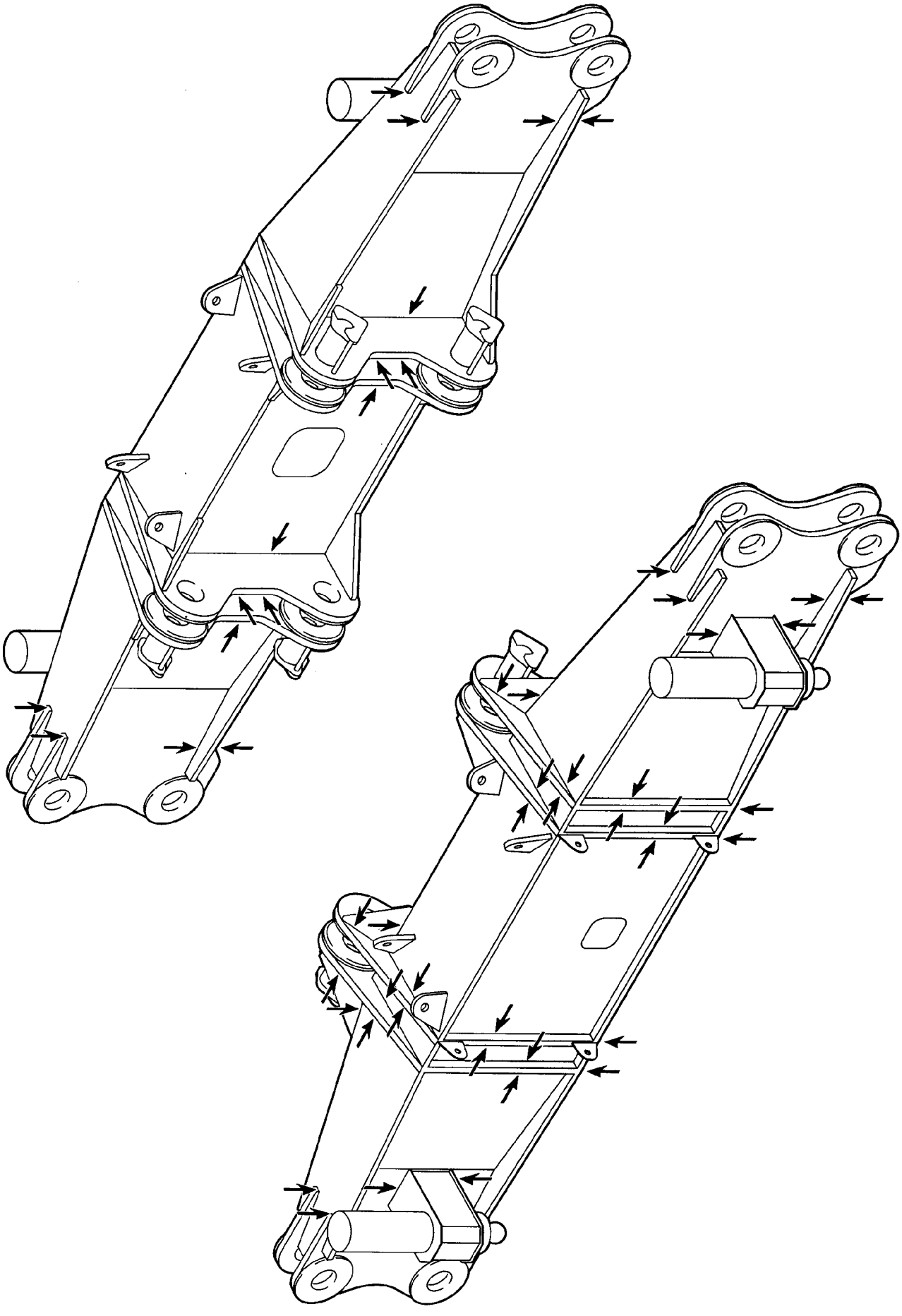
B187347 *Example for crawler center section*



B105725 *Example for crawler center section*

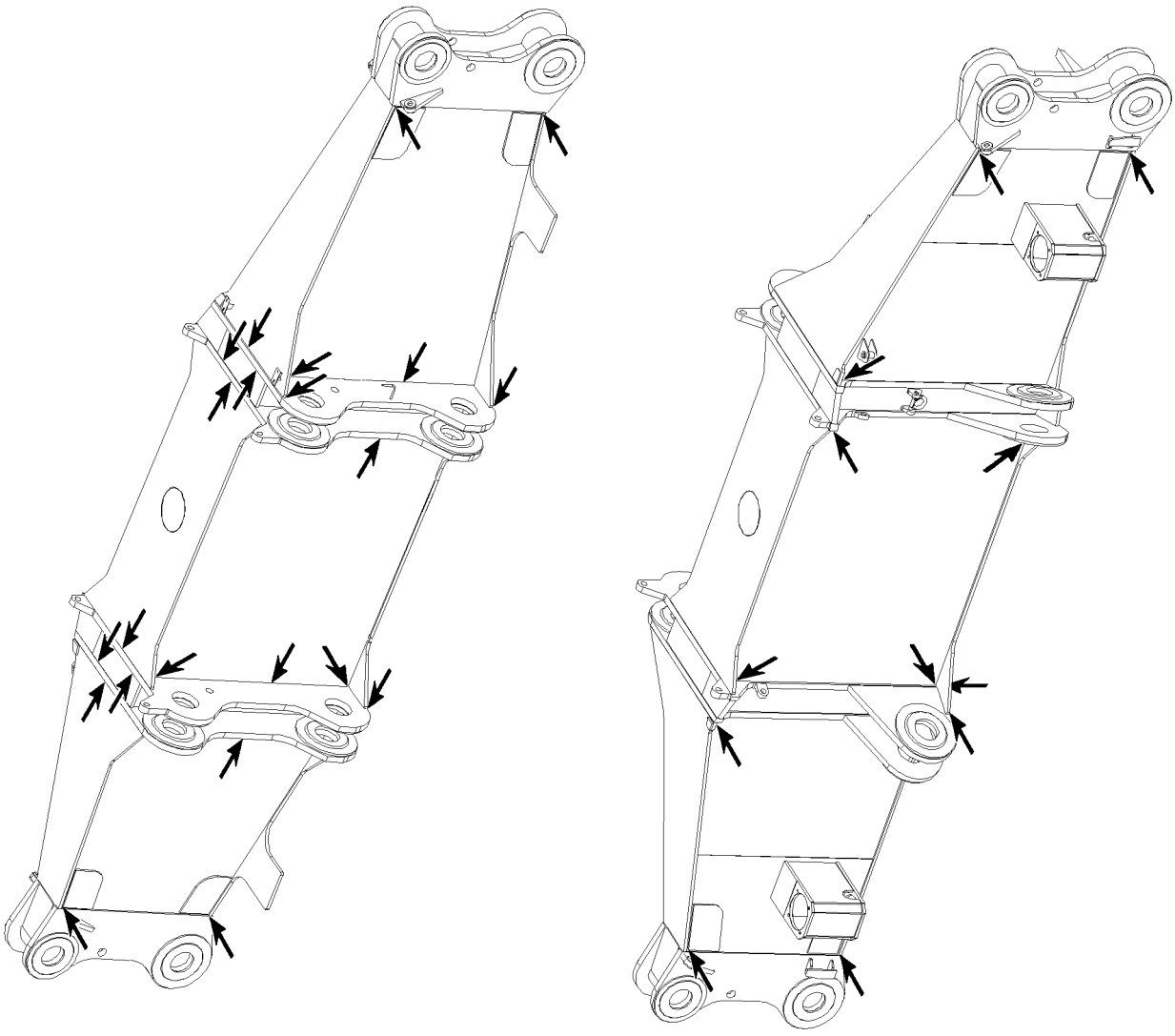


B105726 *Example for crawler center section*



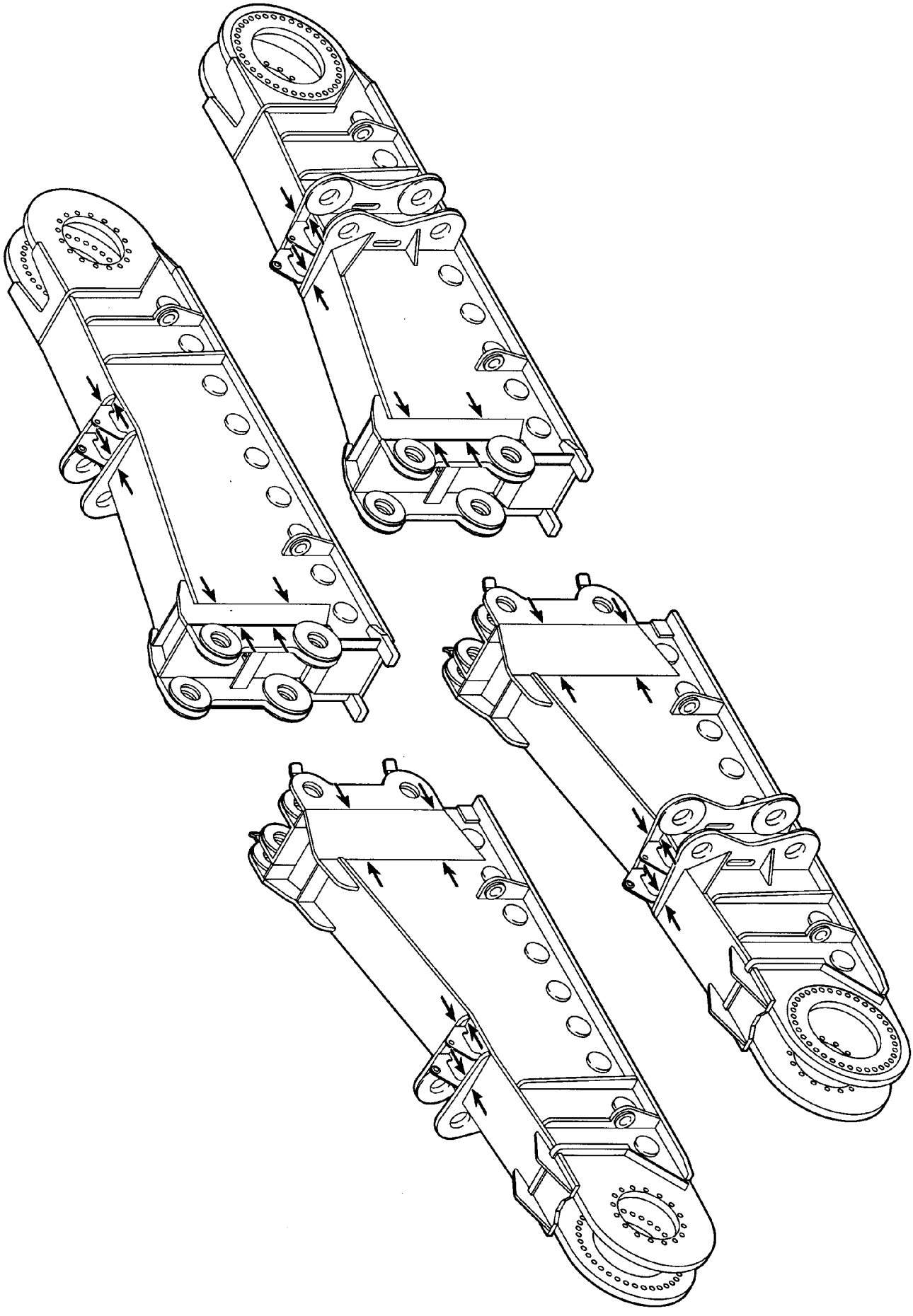
B187348

Example for cross carrier



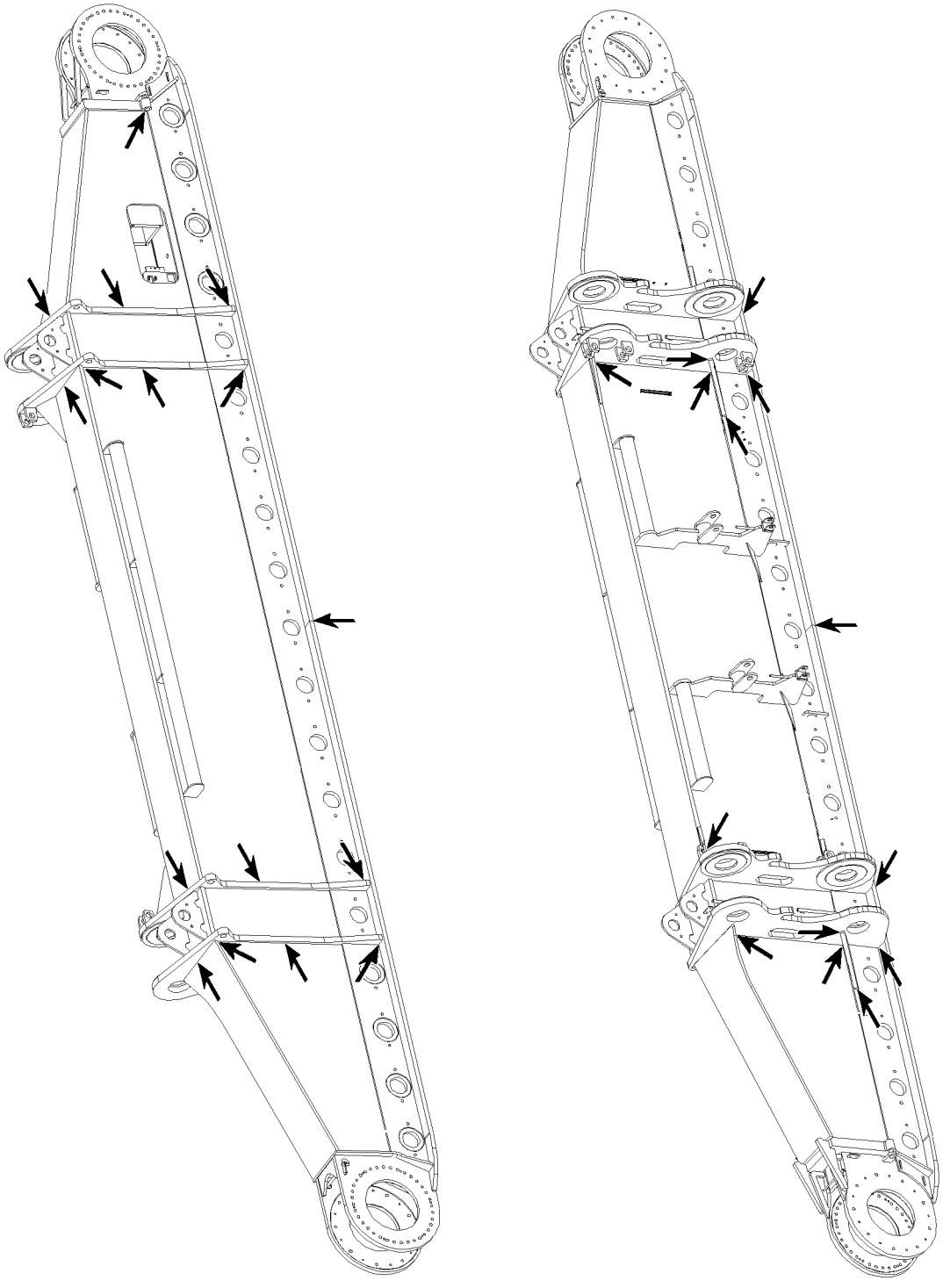
B105727

Example for cross carrier



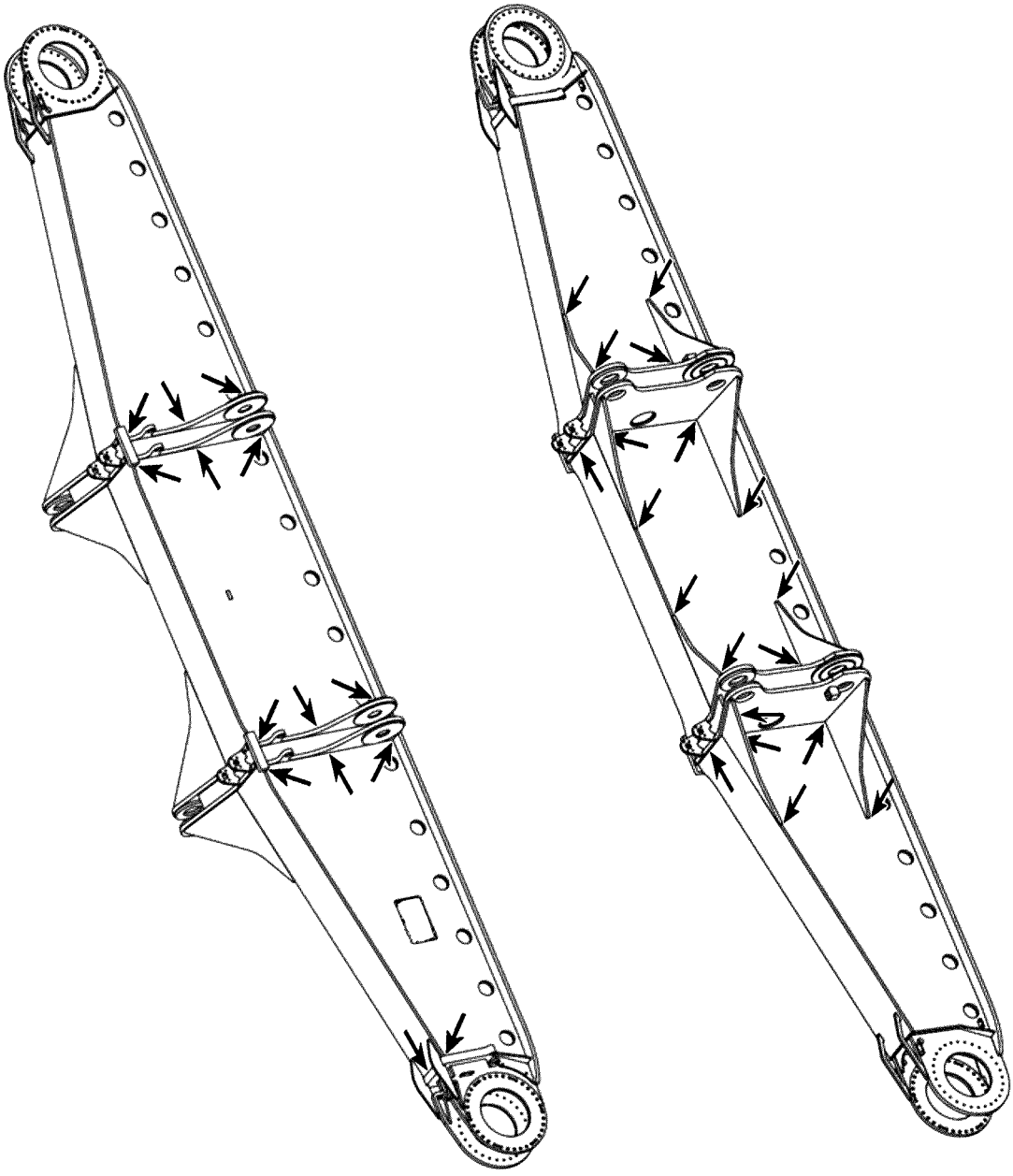
B187349

Example for crawler carrier

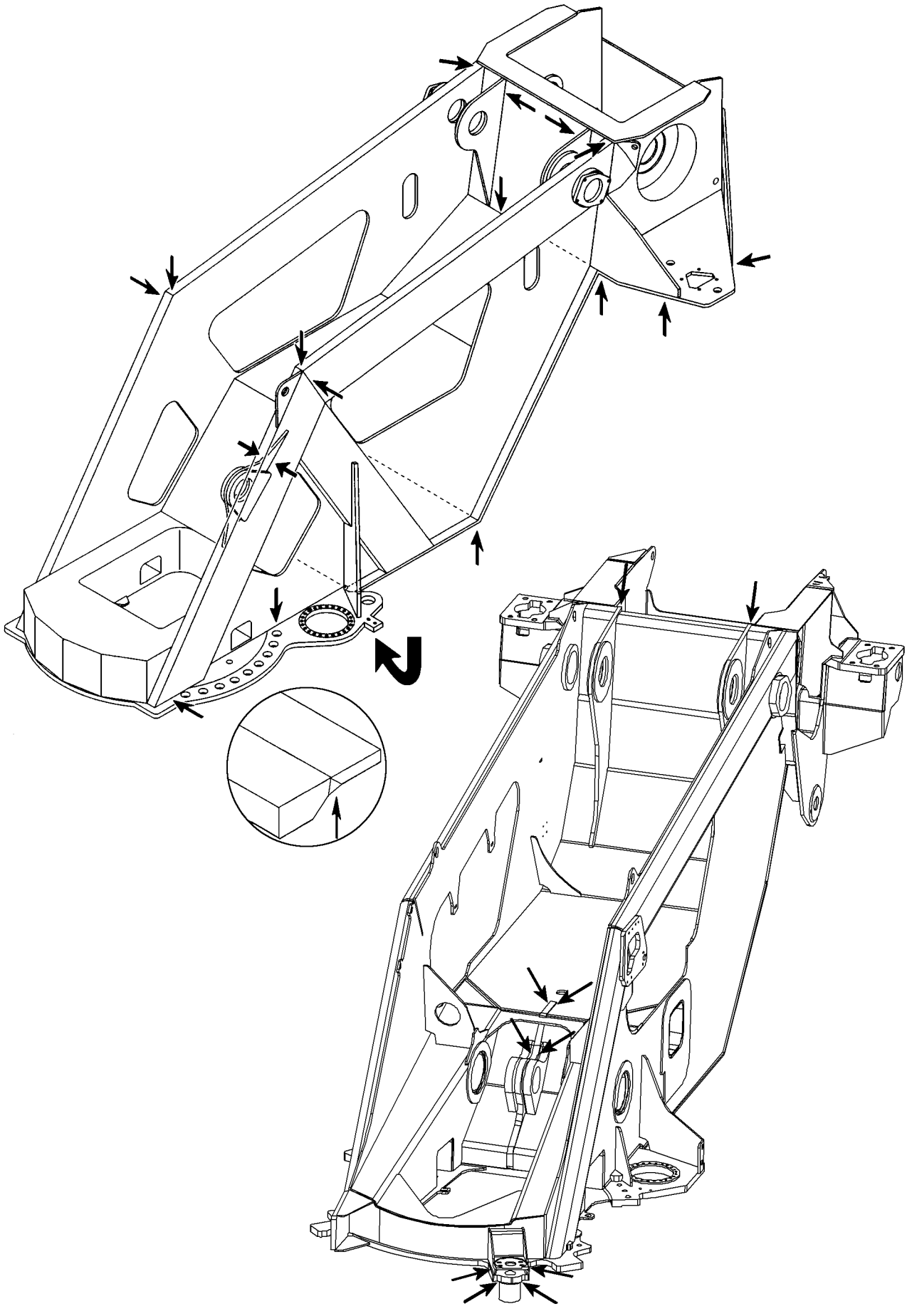


B105728

Example for crawler carrier

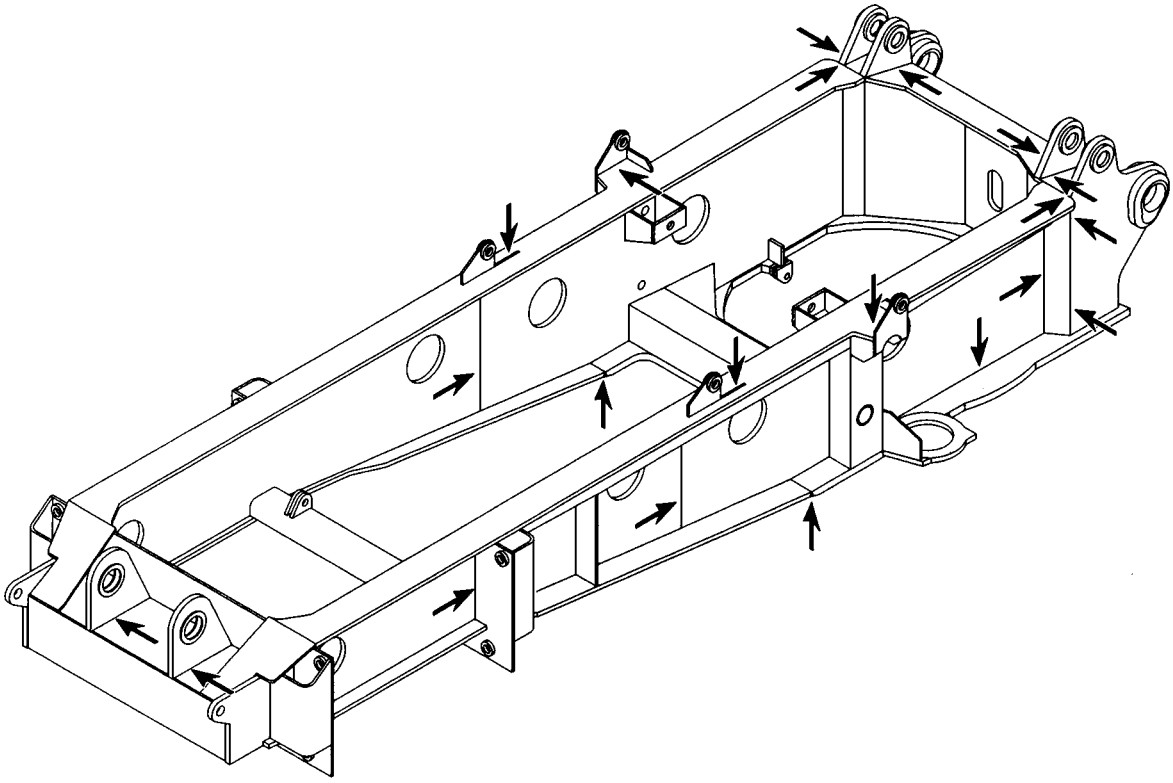


B105729 *Example for crawler carrier*

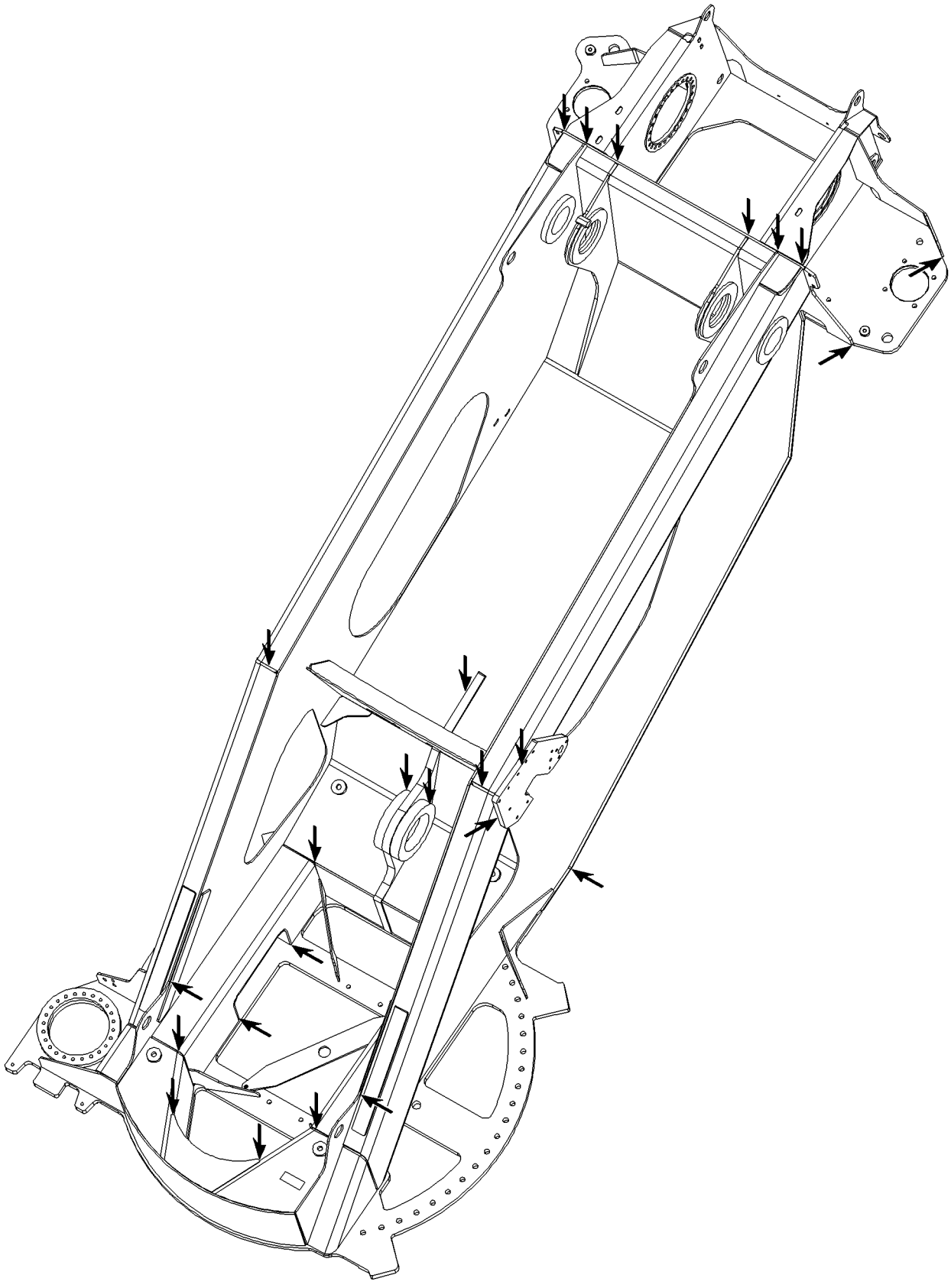


B185048

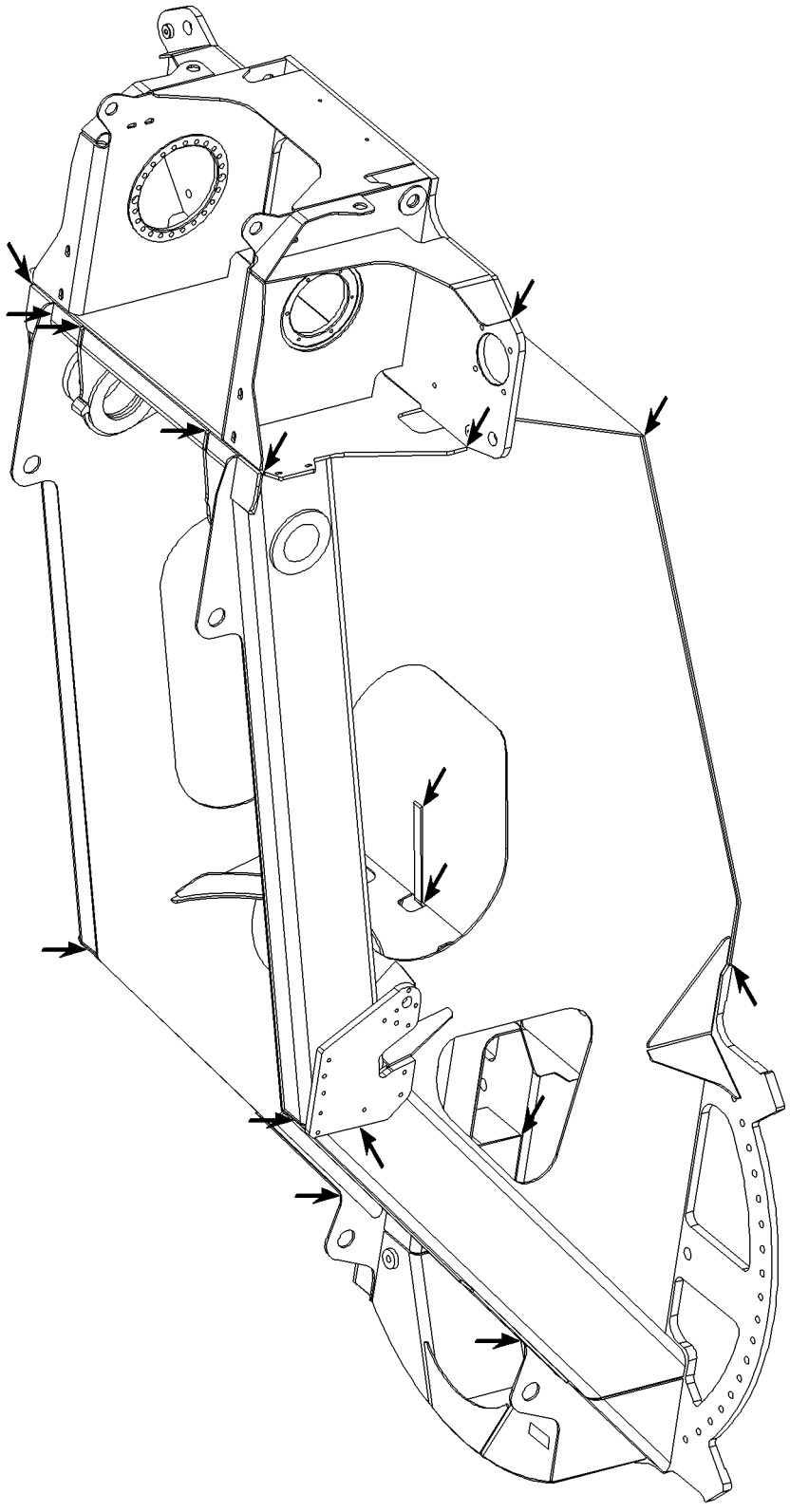
Example for turntable frame



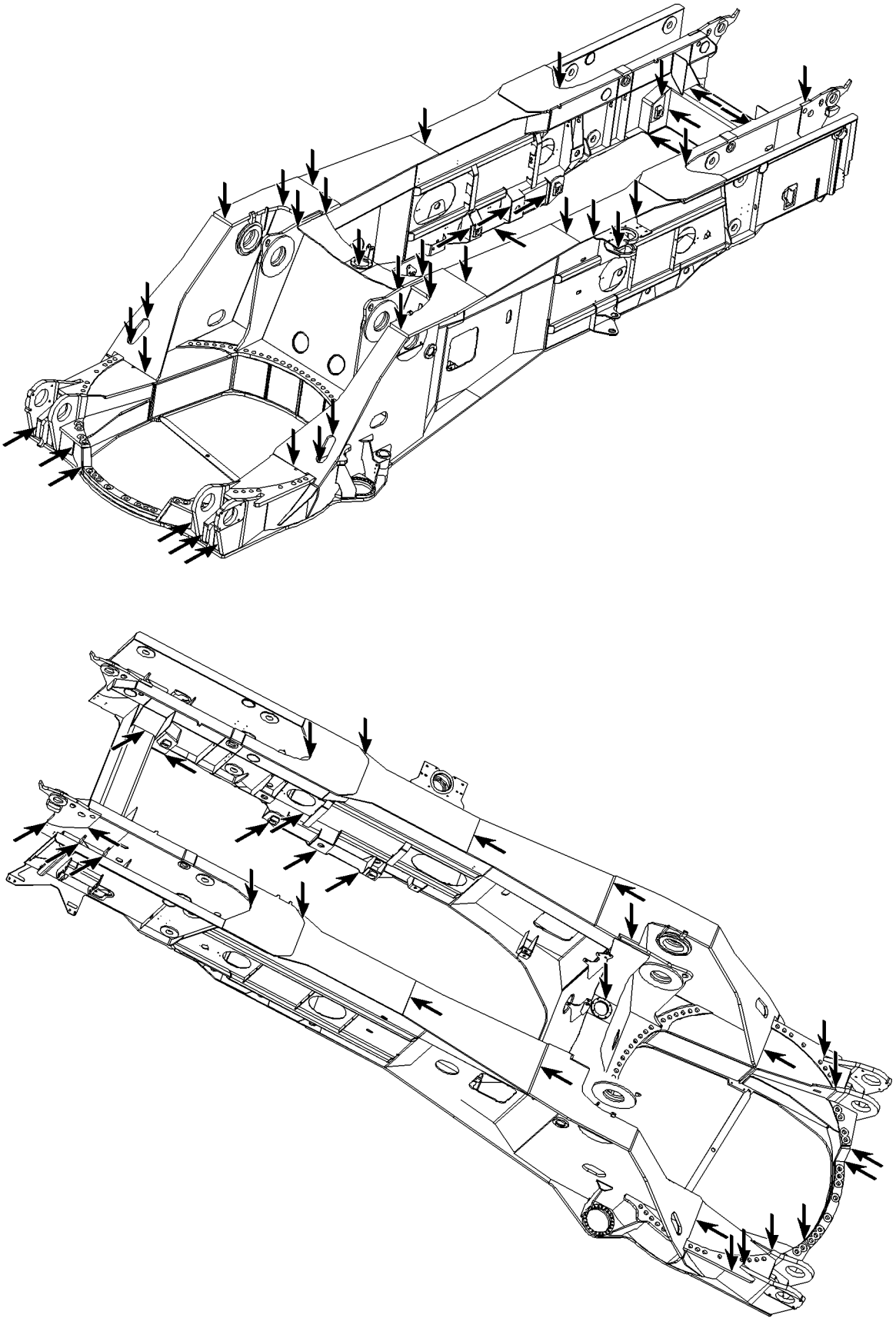
B185049 *Example for turntable frame*



B105700 *Example for turntable frame*

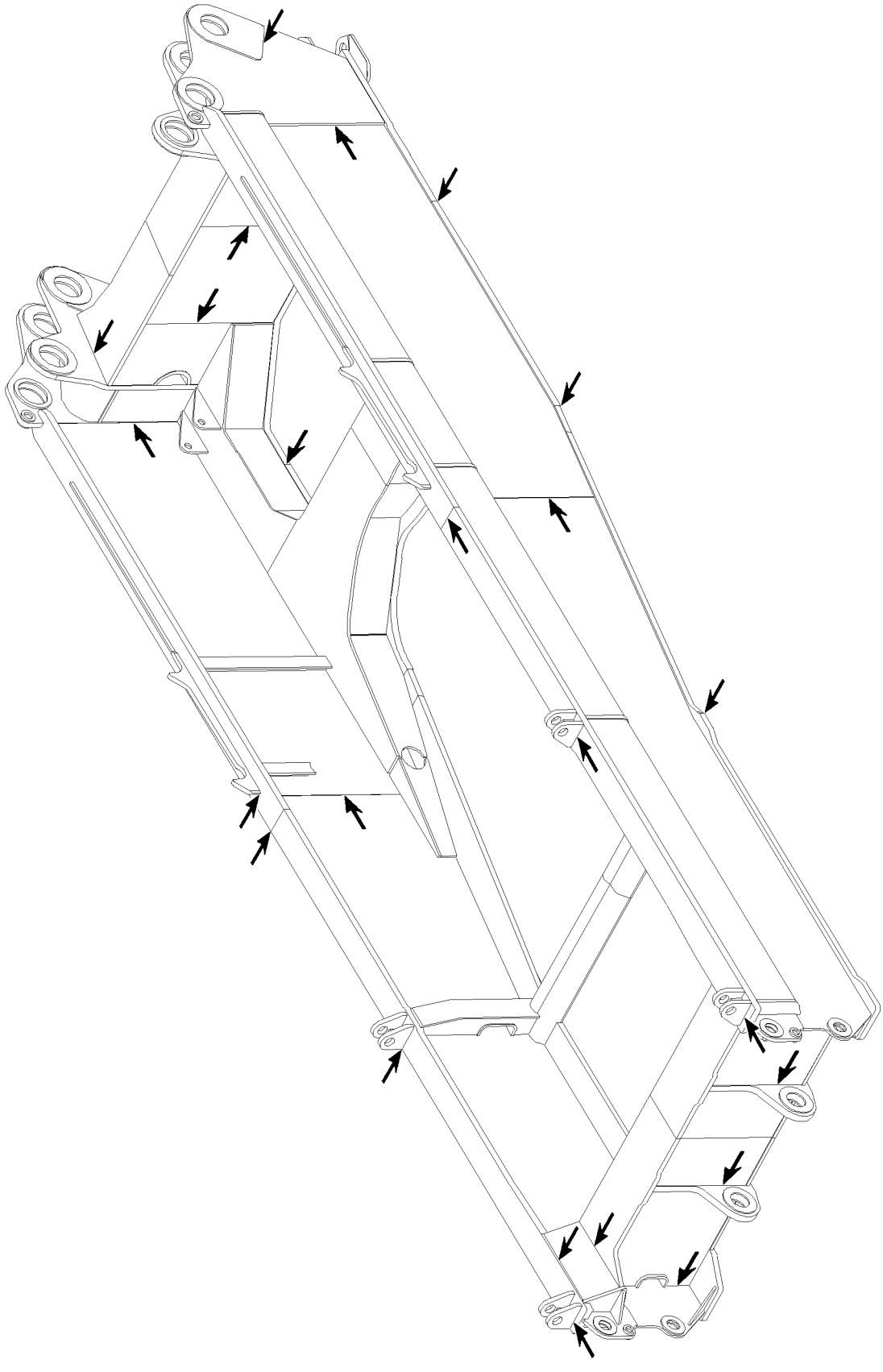


B105701 *Example for turntable frame*



B105706

Example for turntable frame



B105694

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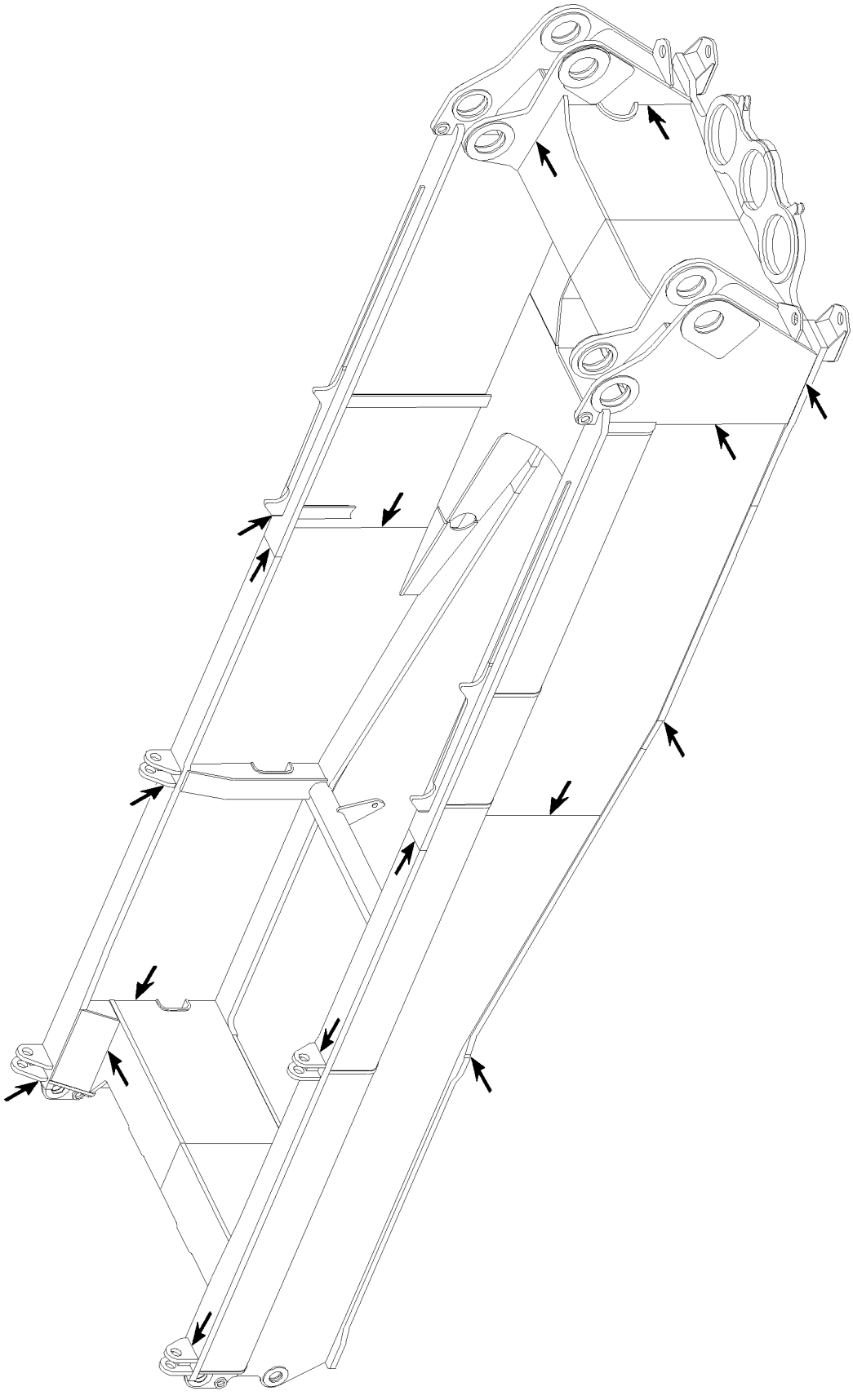

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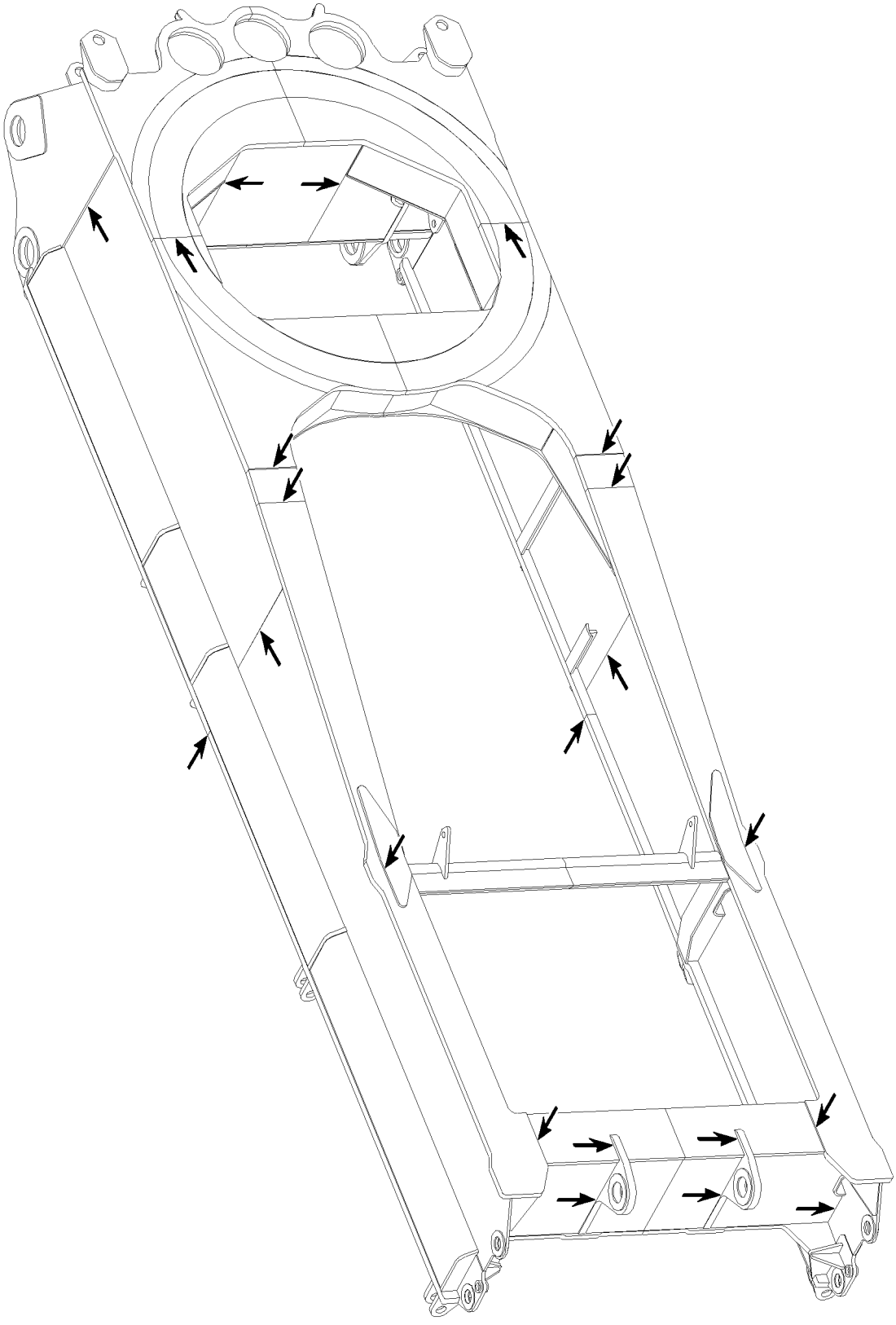

B105696

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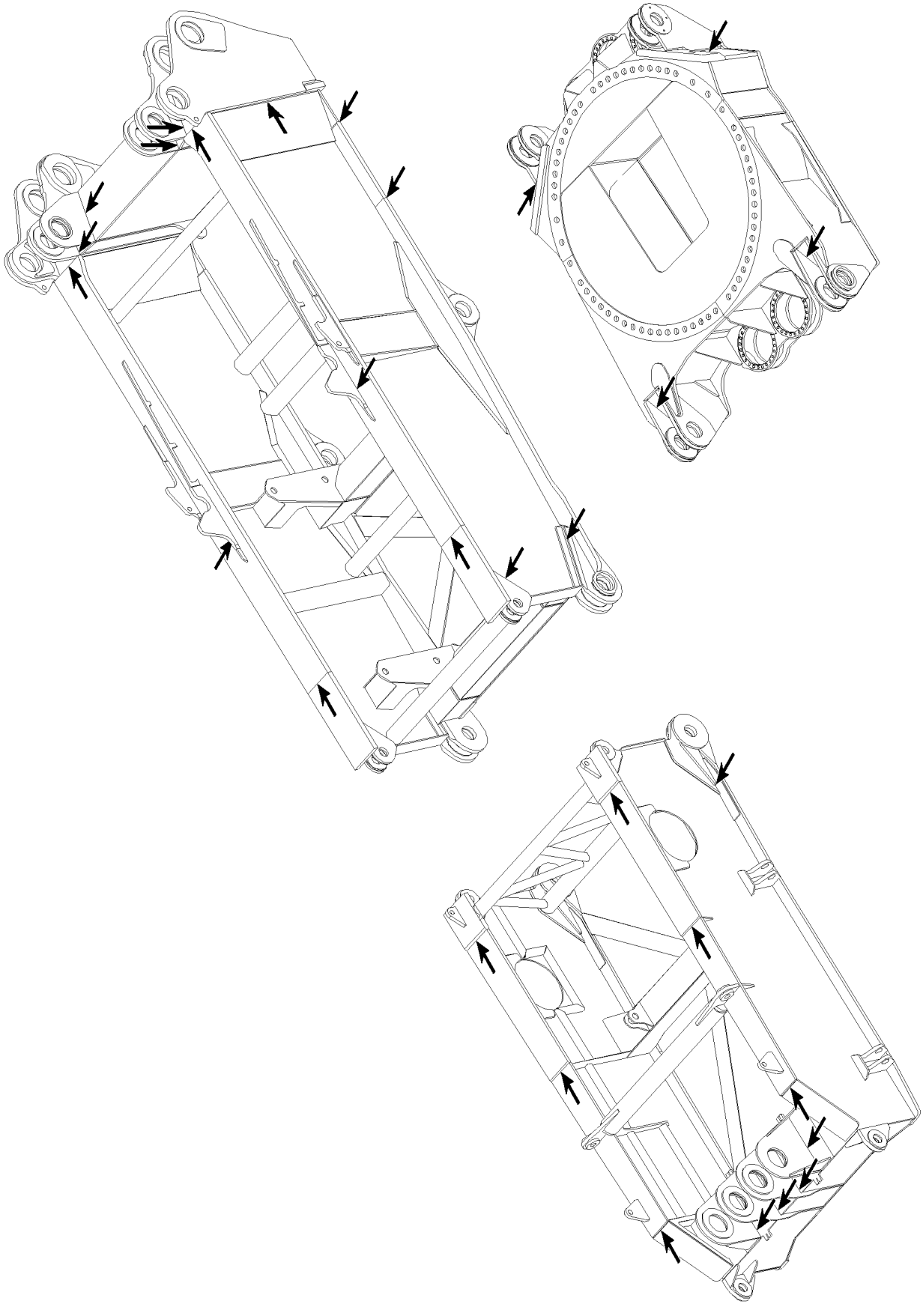
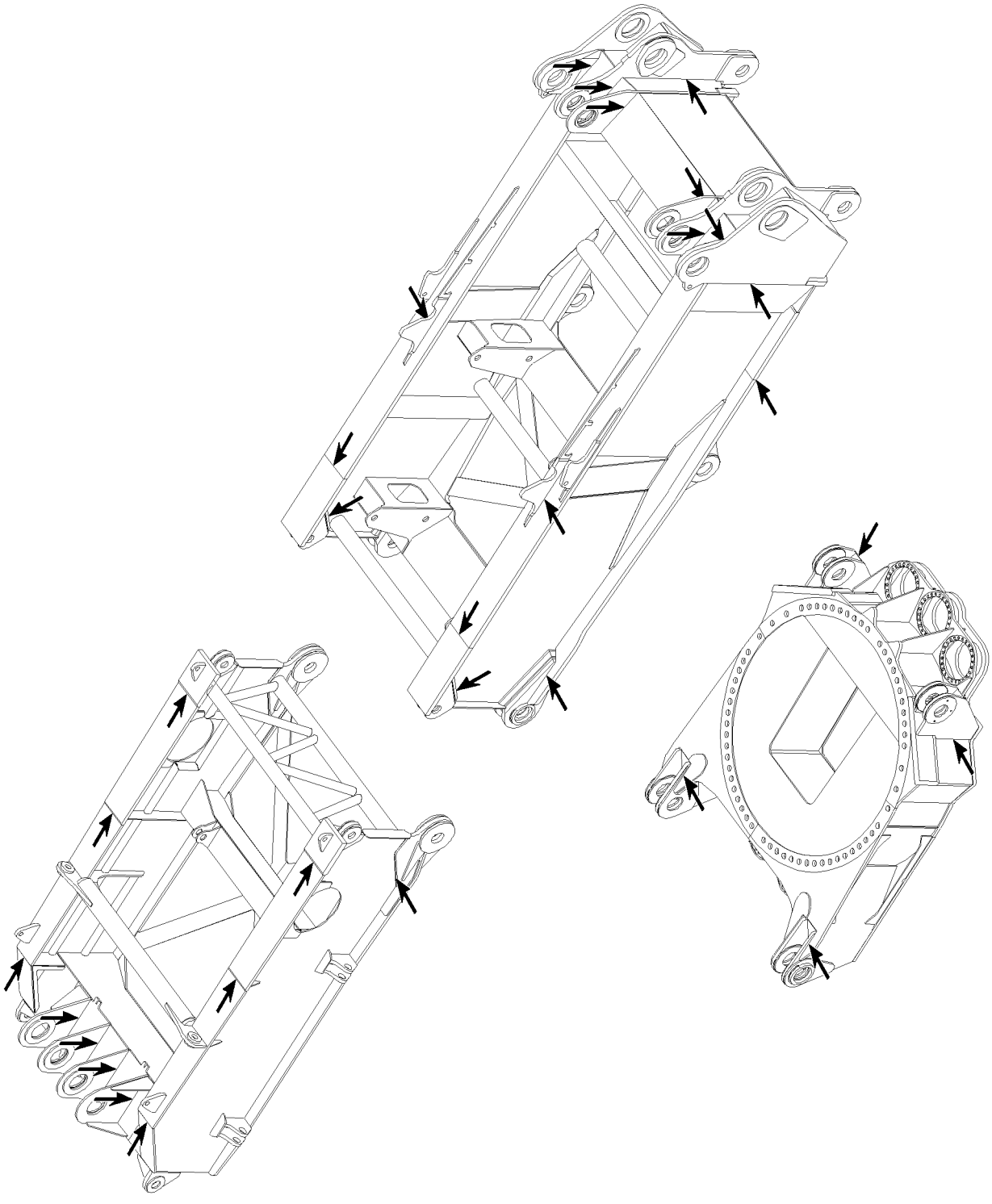
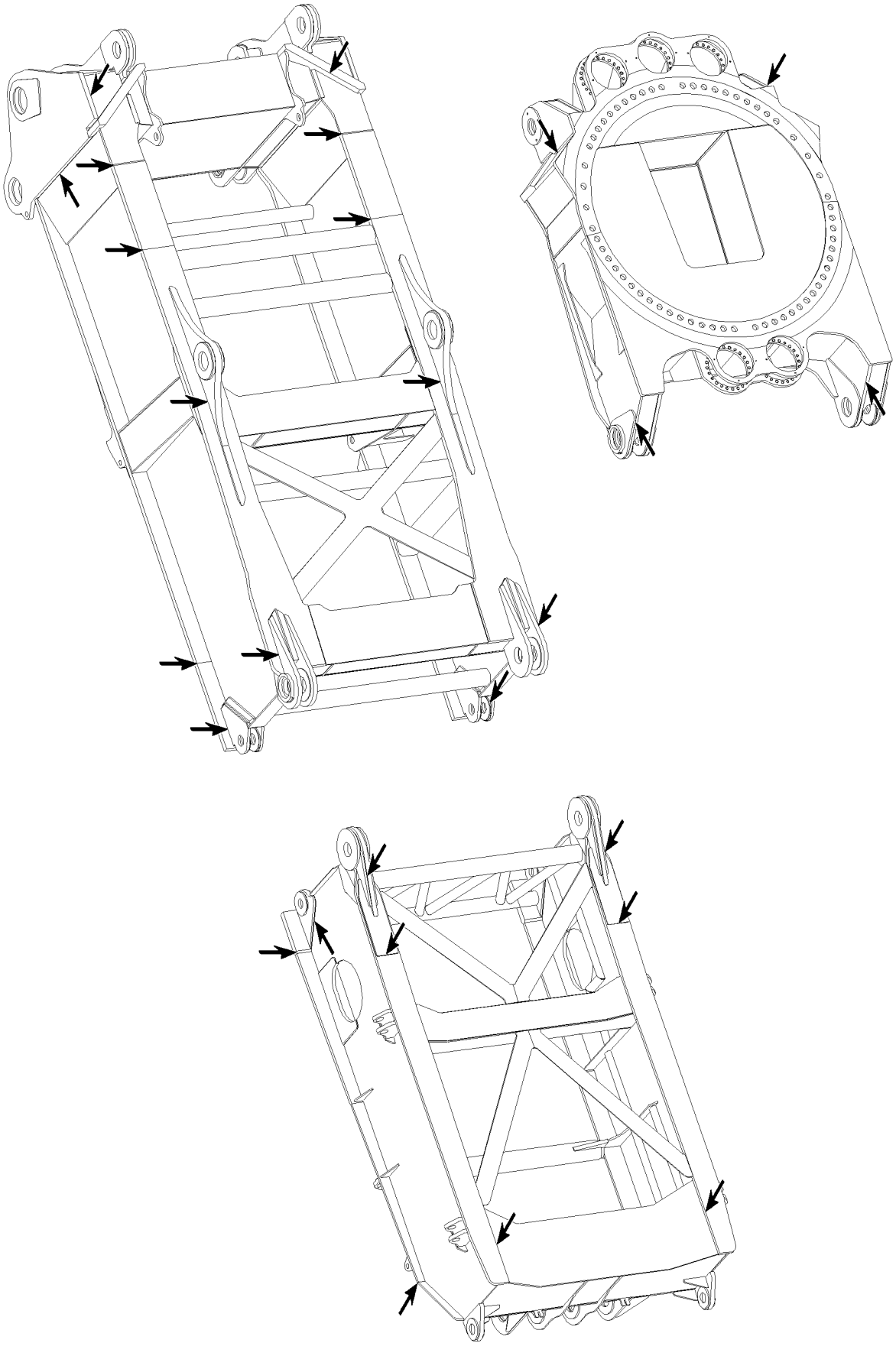


B105691

Example for turntable frame

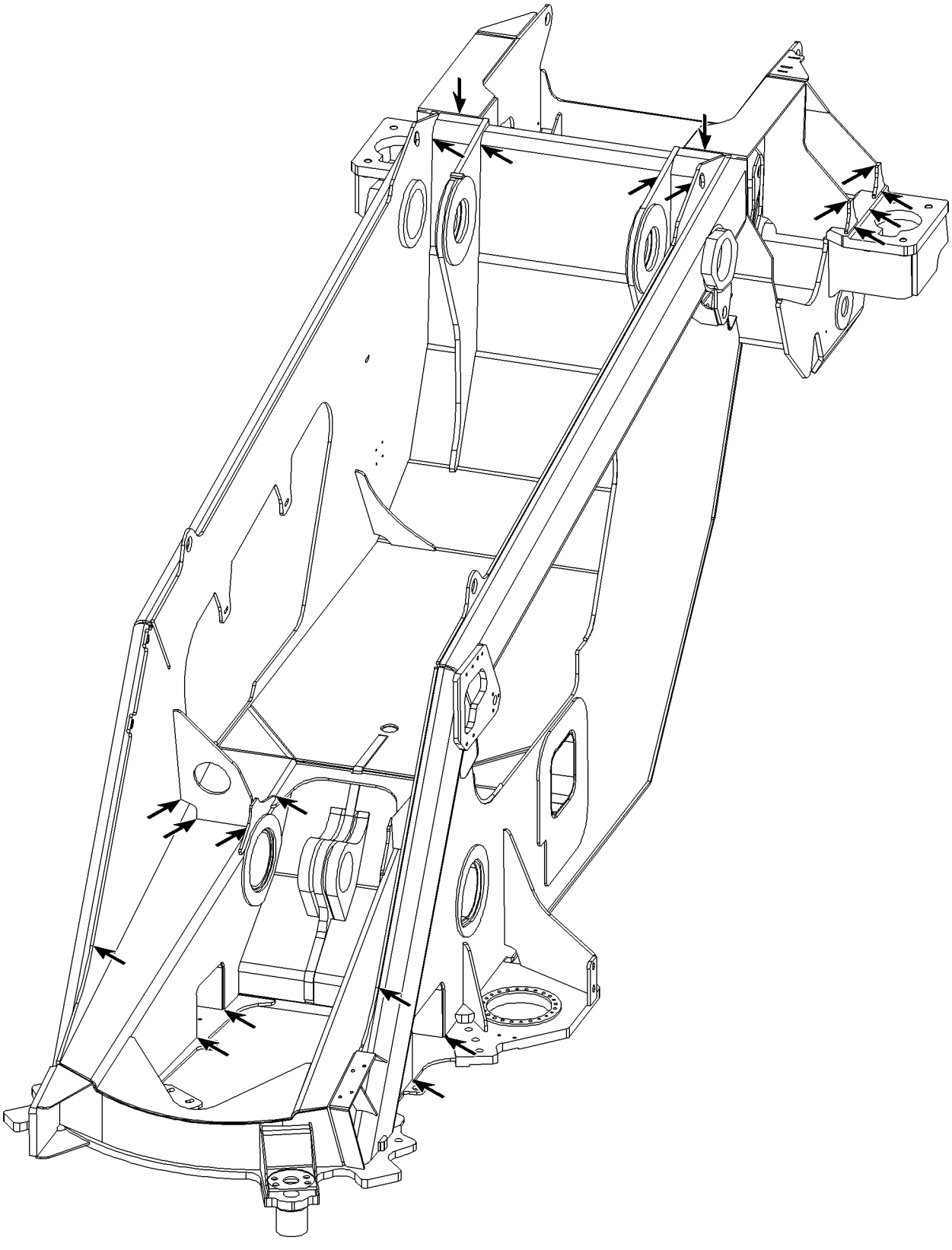


B105692 *Example for turntable frame*

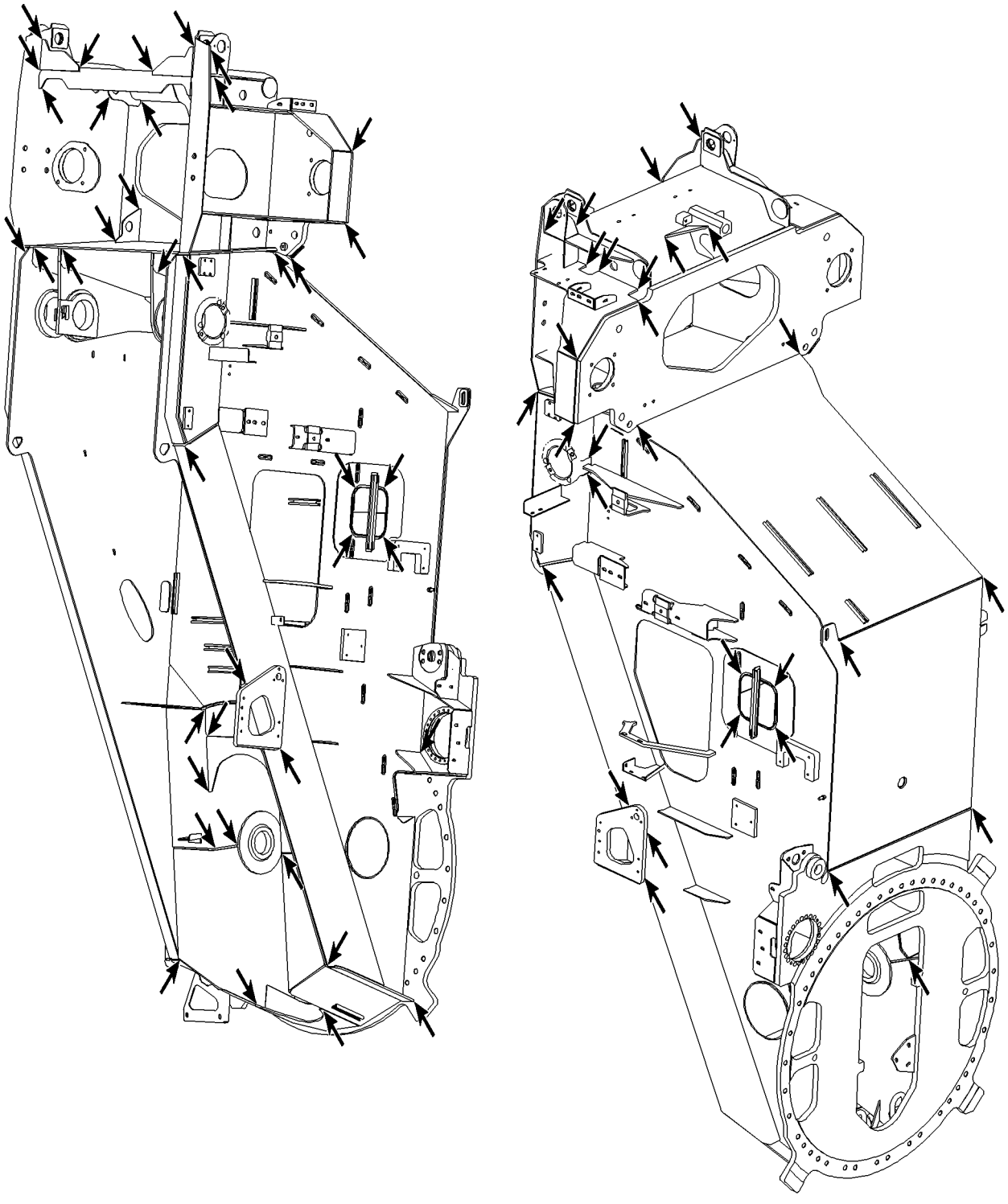


B105693

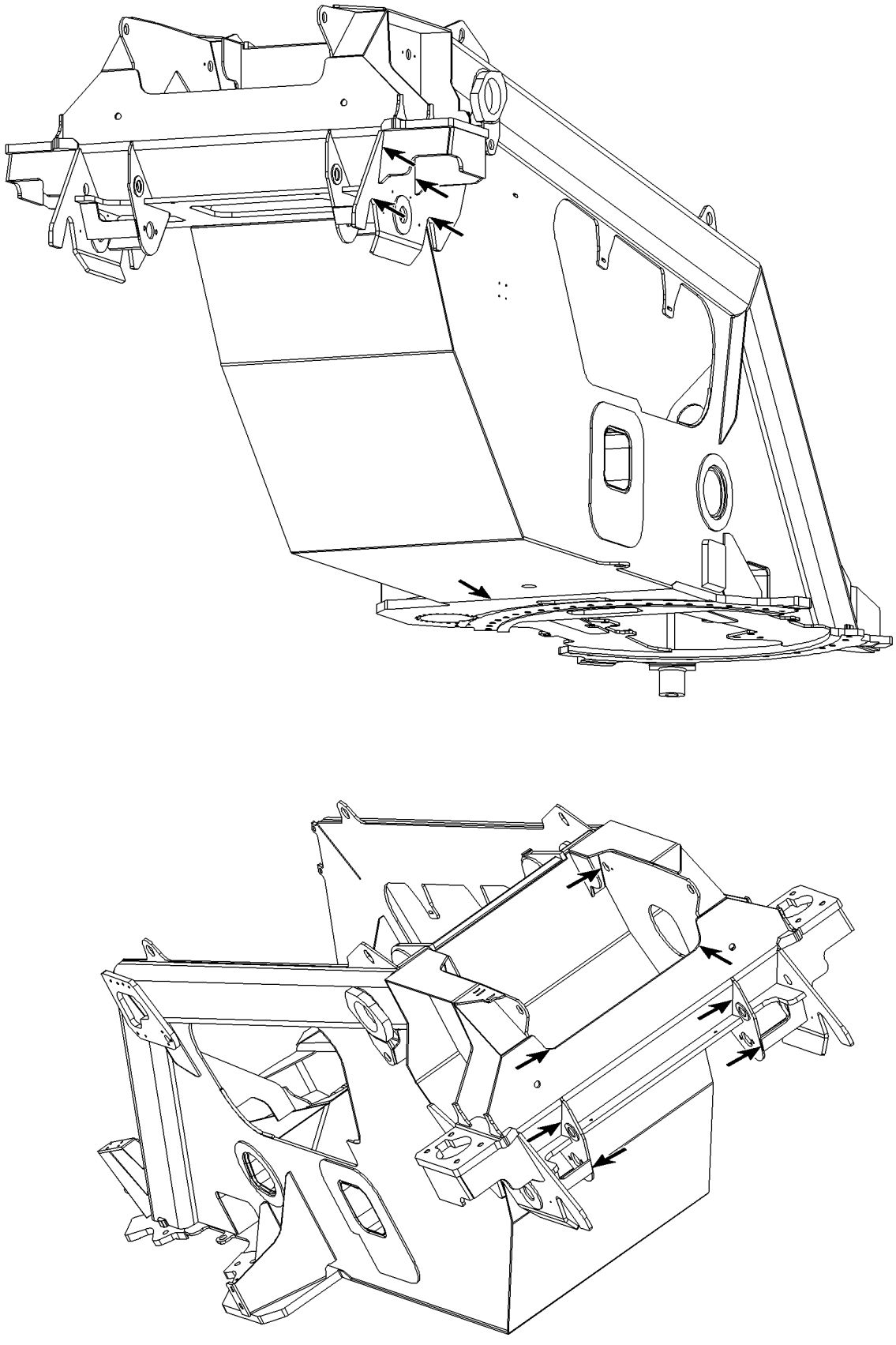
Example for turntable frame



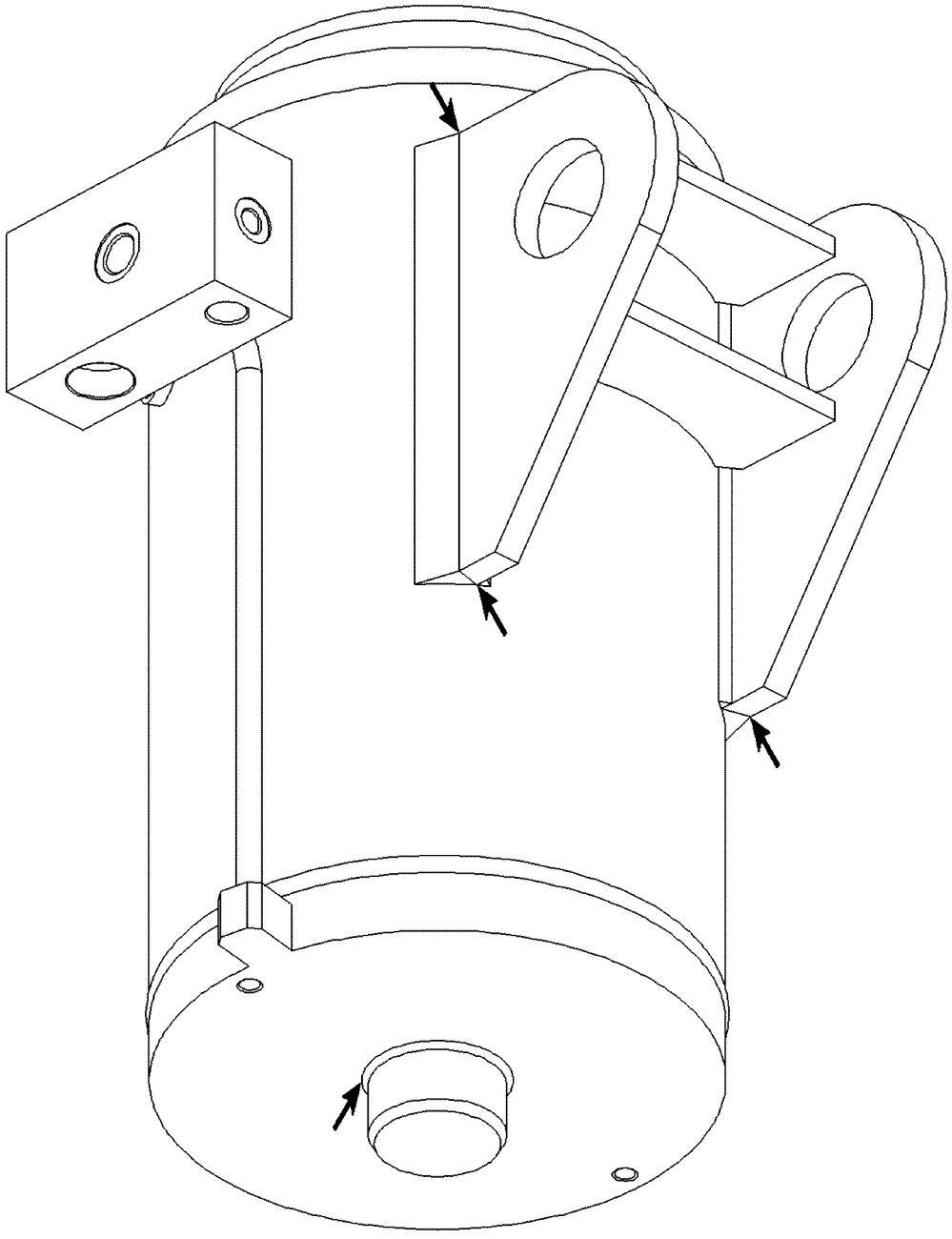
B105722 *Example for turntable frame*



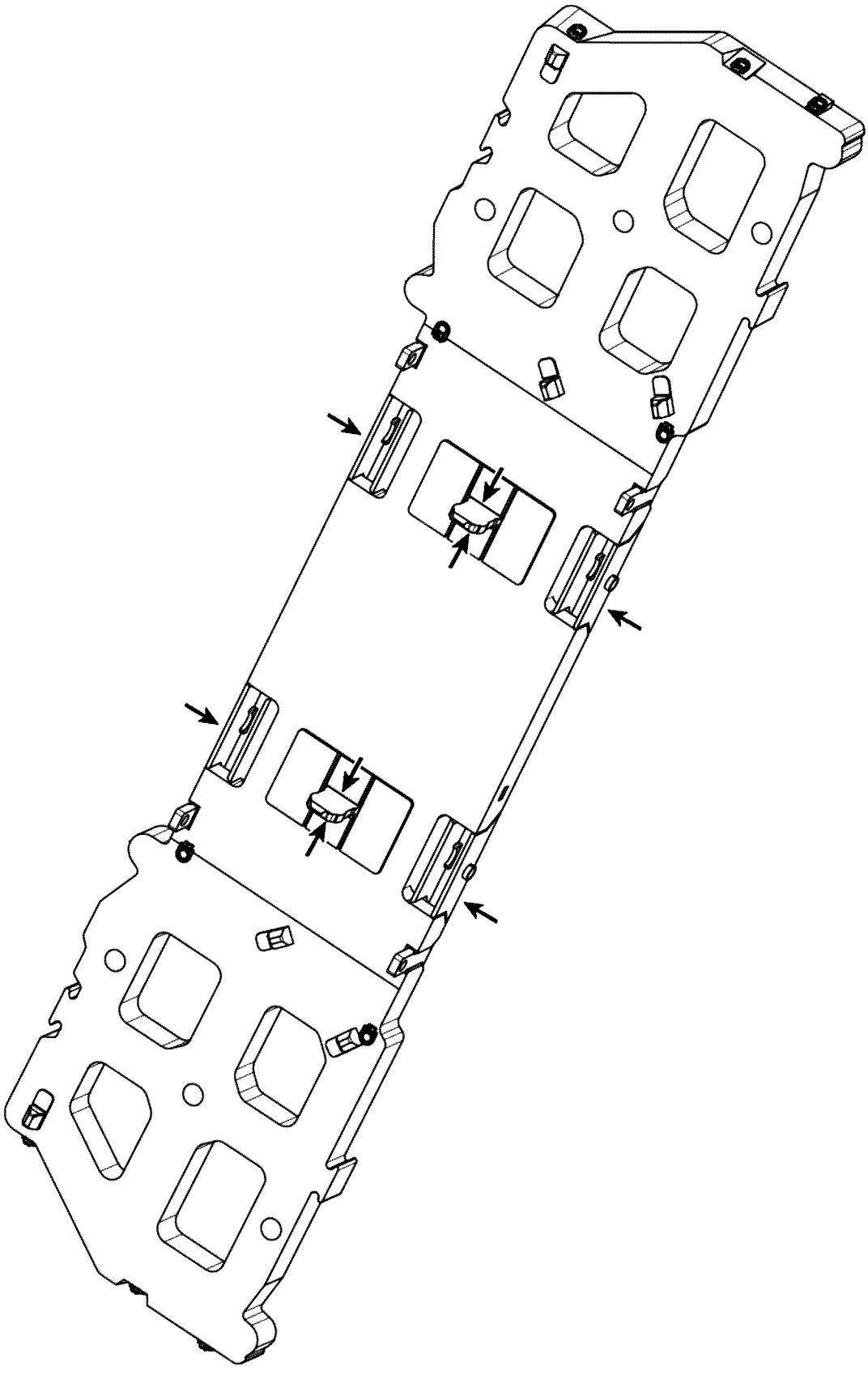
B105932 *Example for turntable frame*



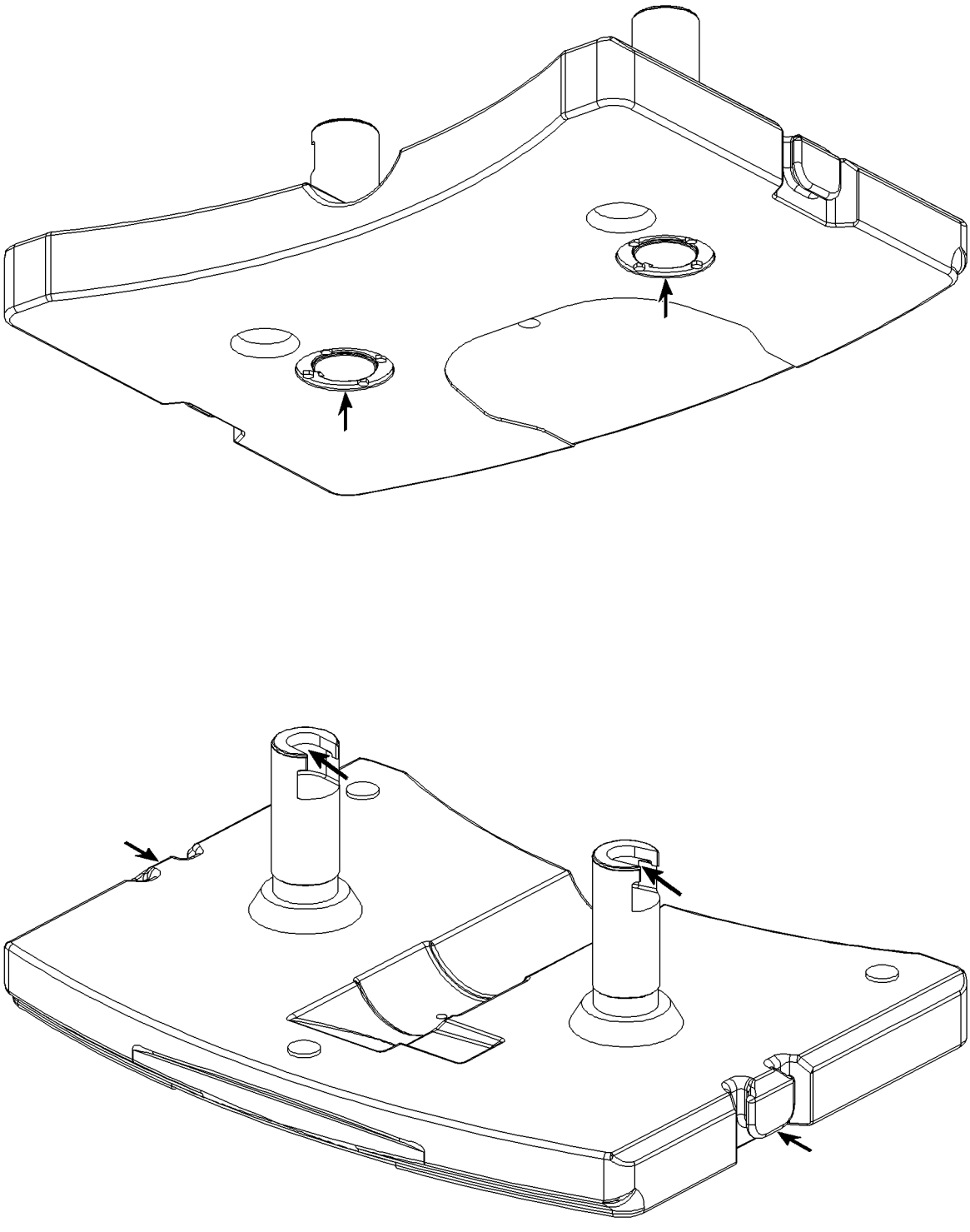
B105723 *Example for turntable frame*



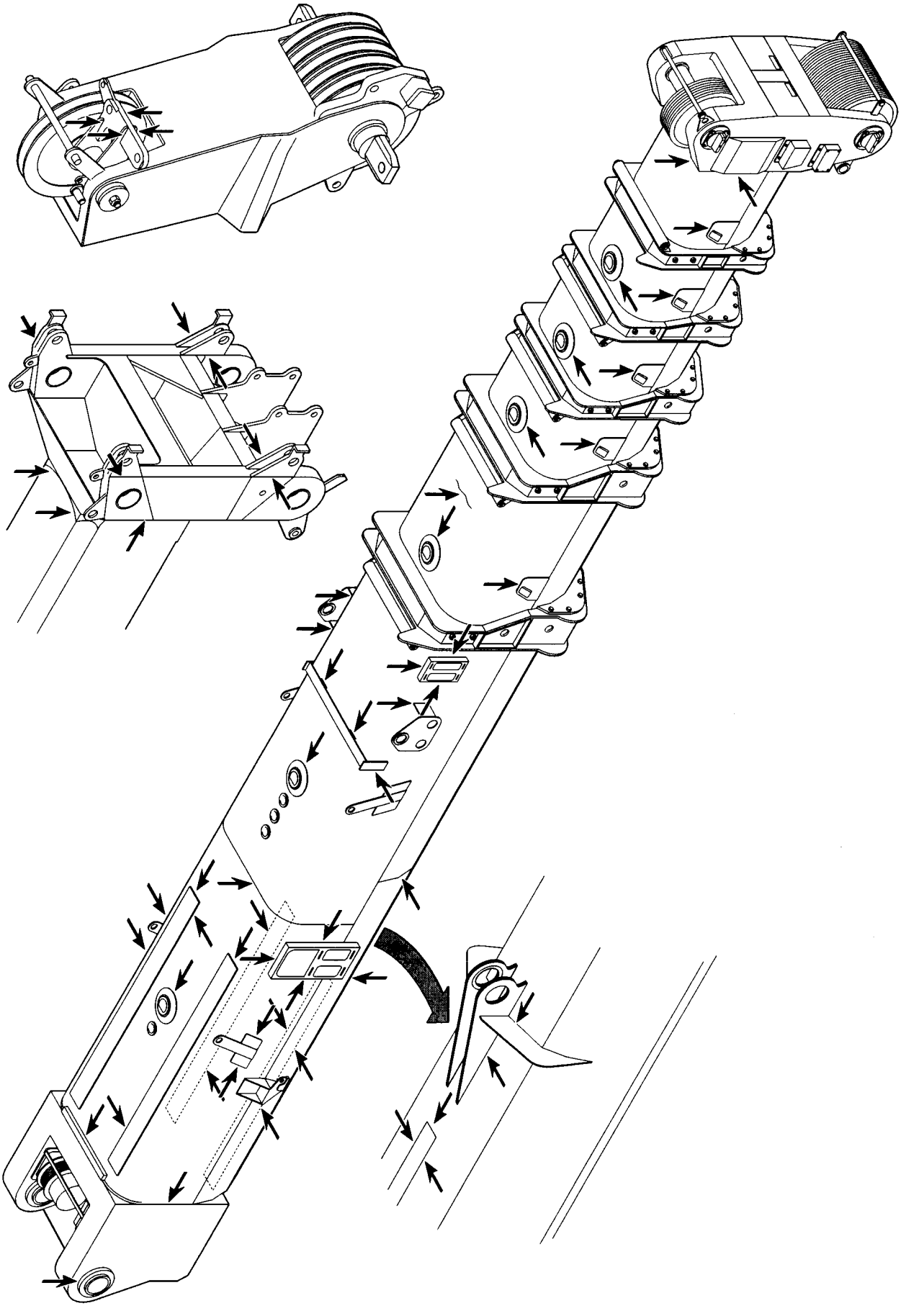
B105801 *Example for ballasting cylinder*



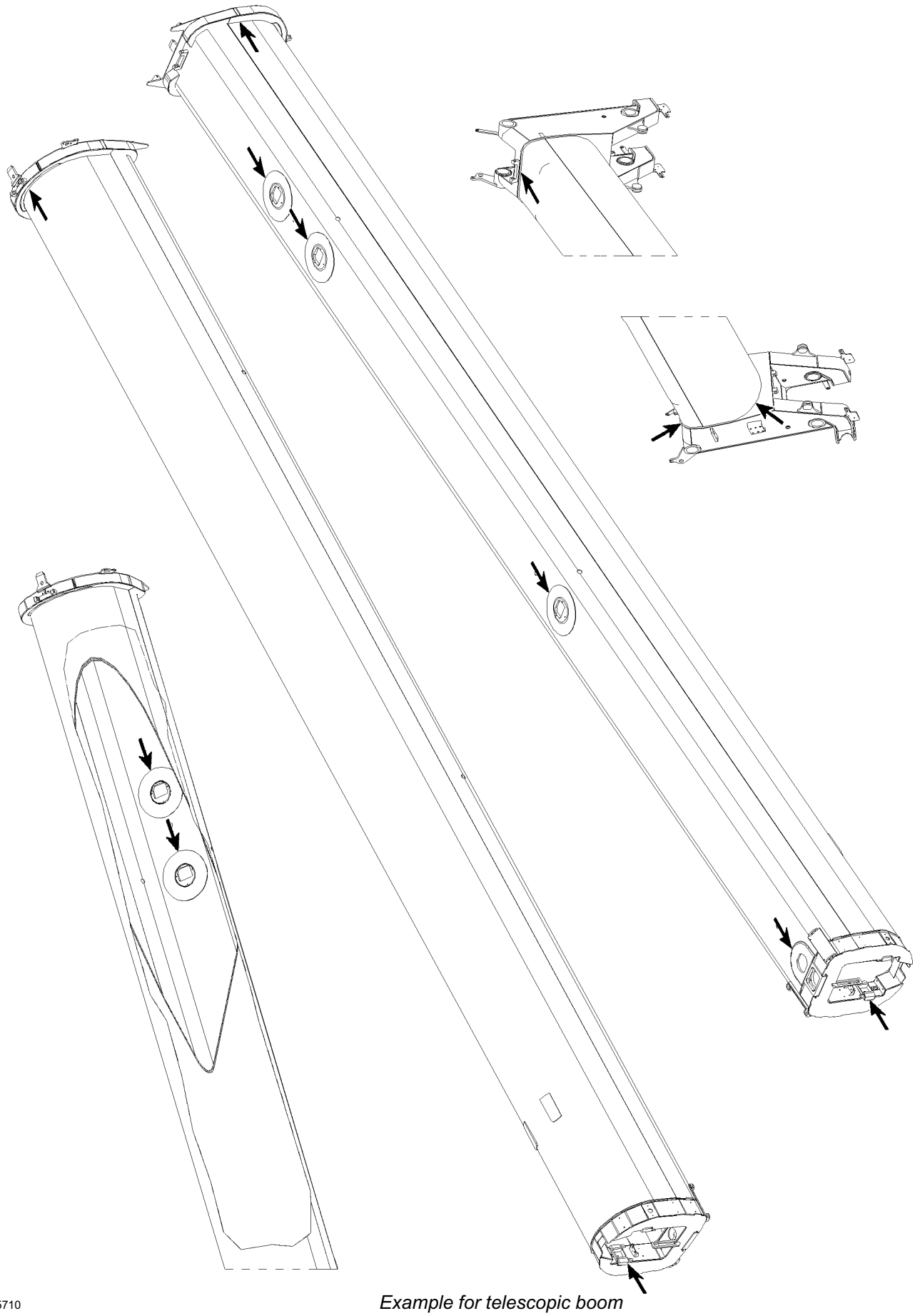
B105705 *Example for mounting plate*



B105807 *Example for base plate*

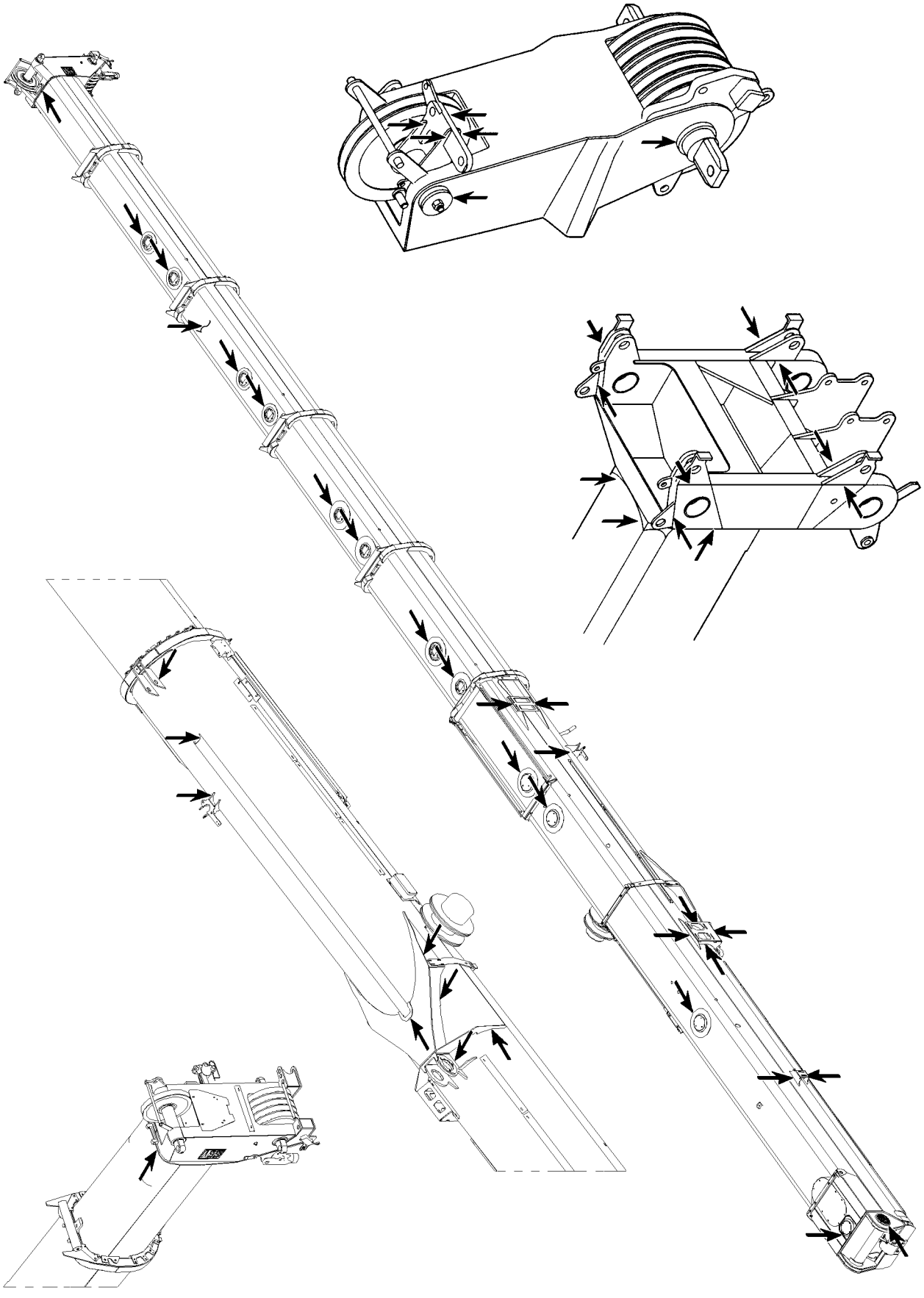


B185050 *Example for telescopic boom*



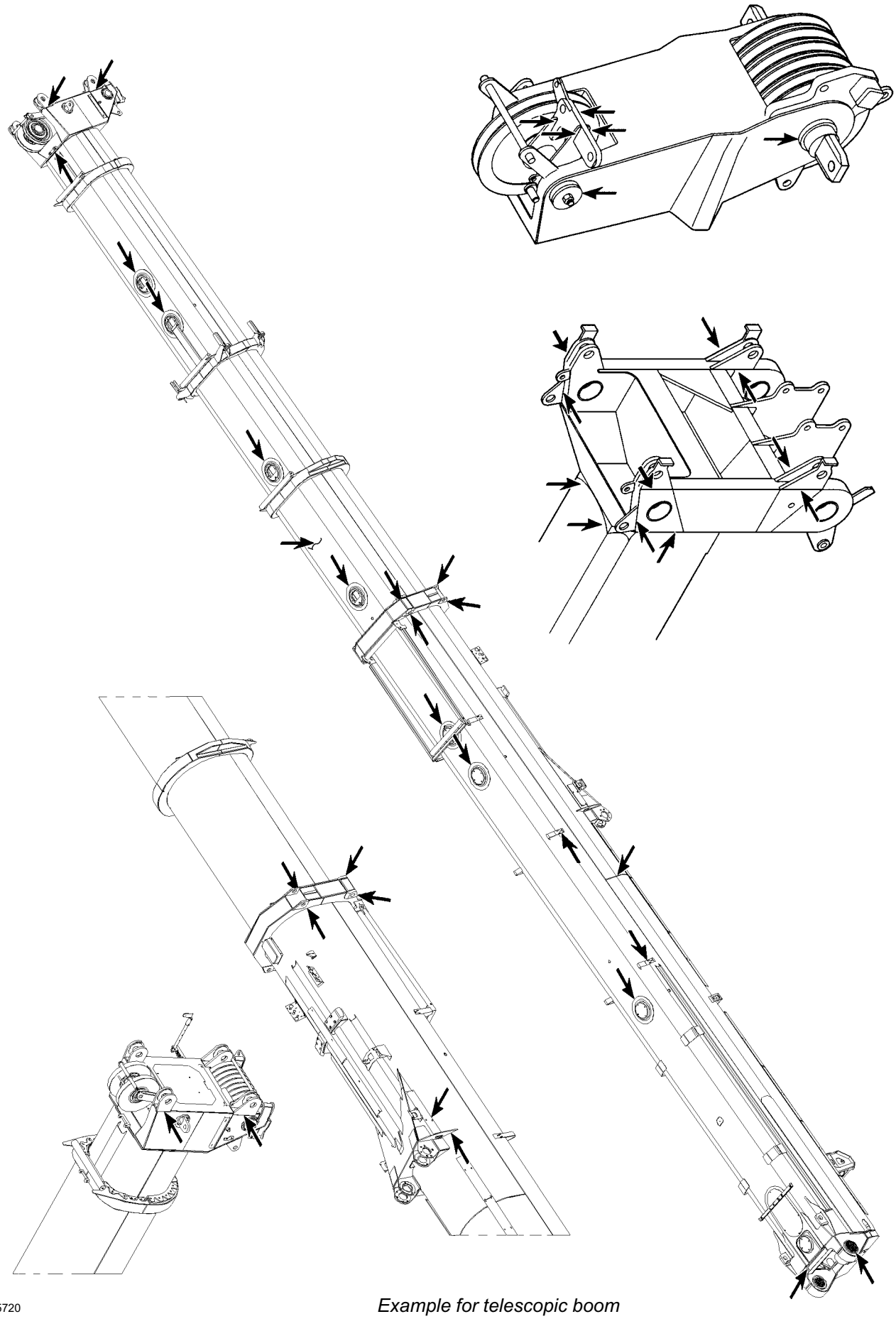
B105710

Example for telescopic boom



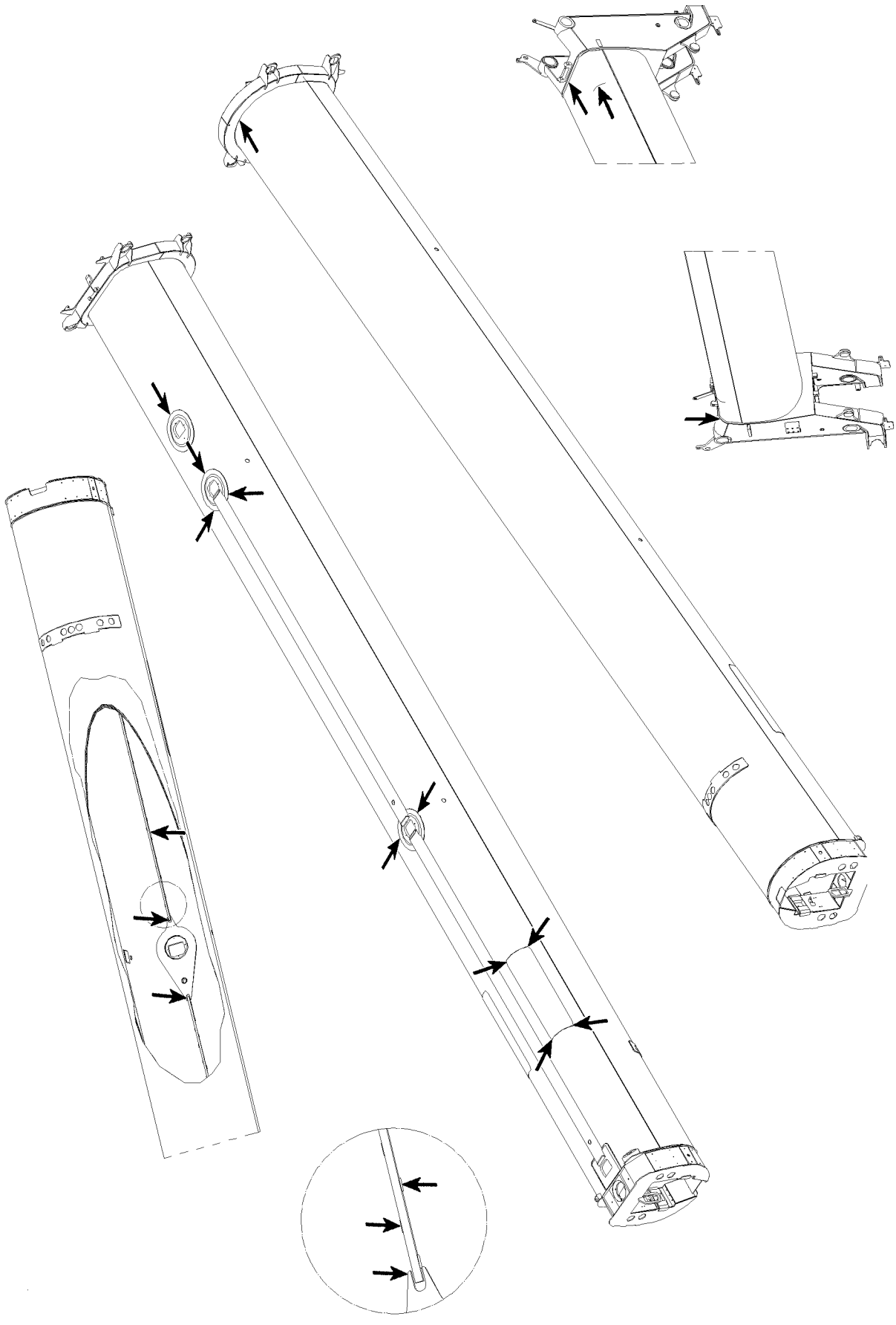
B105711

Example for telescopic boom



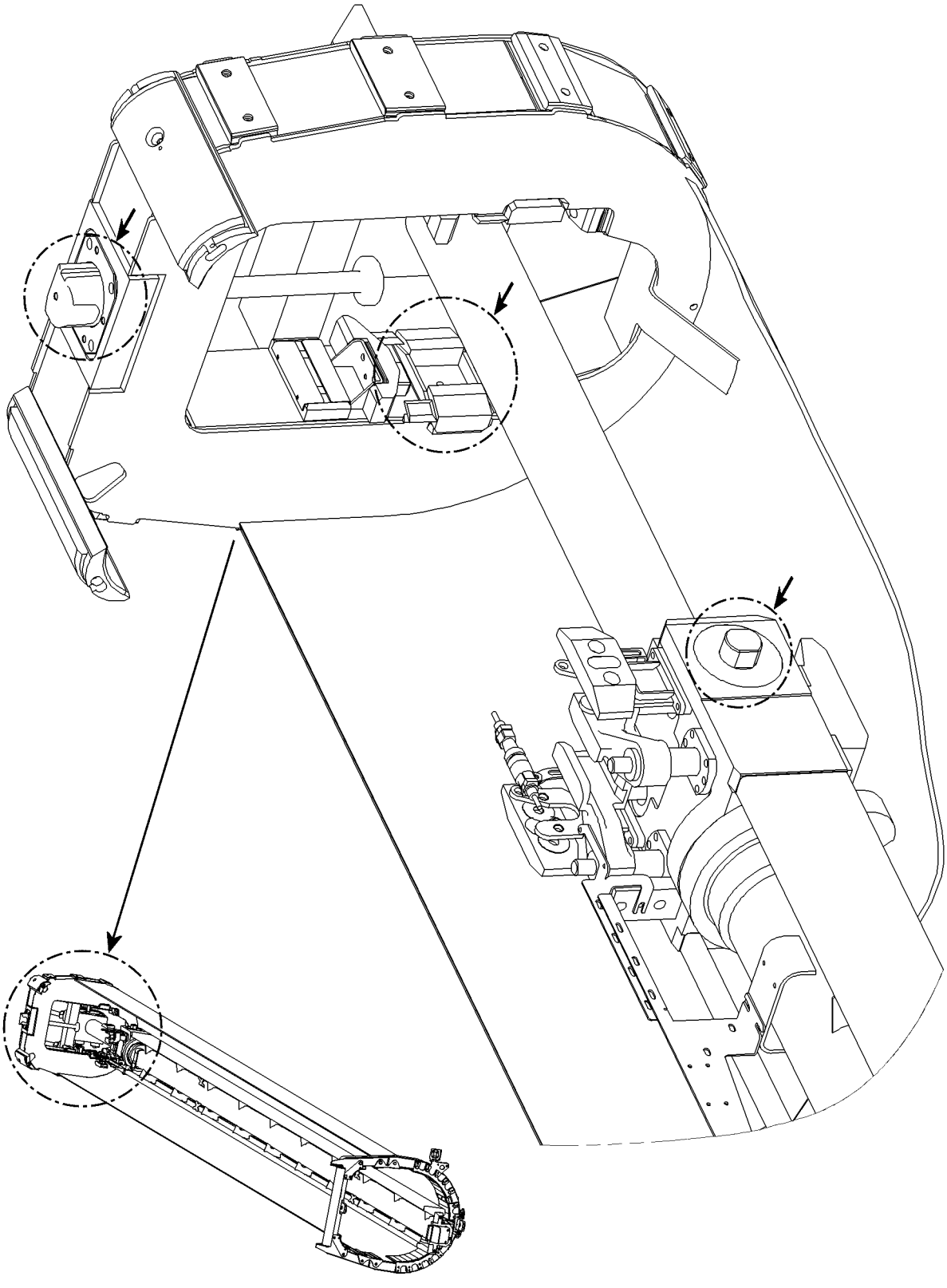
B105720

Example for telescopic boom

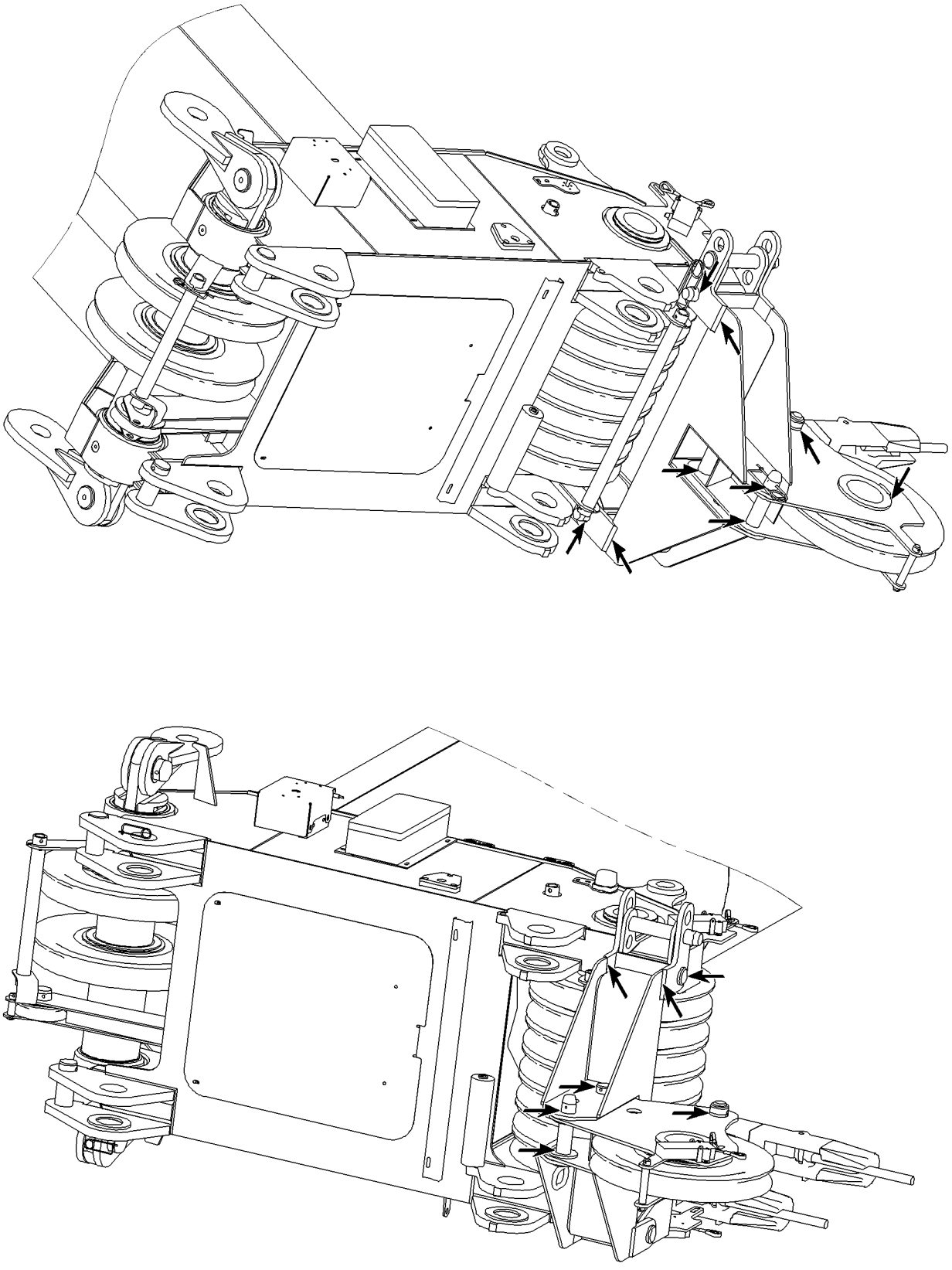


B105721

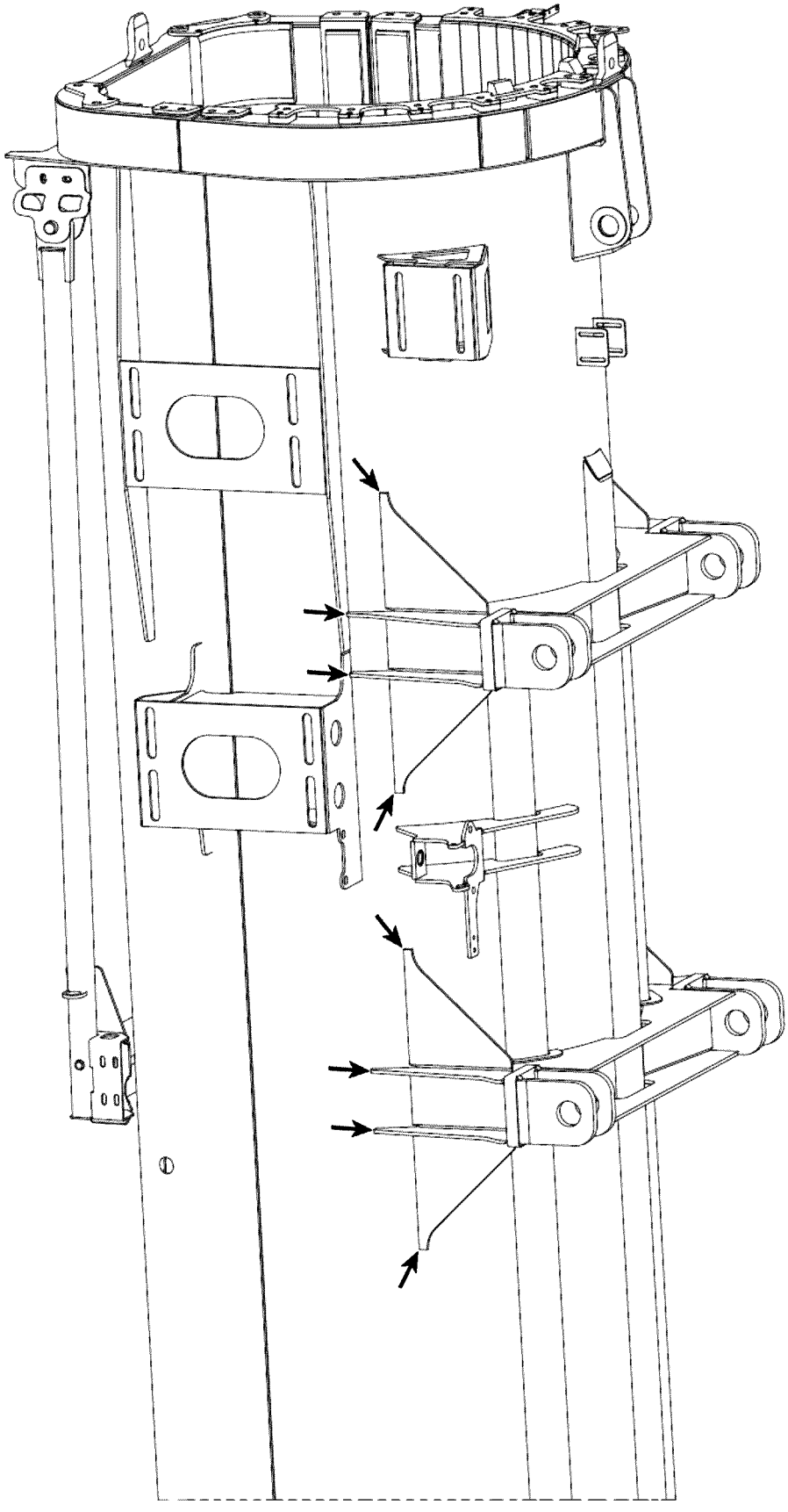
Example for telescopic boom



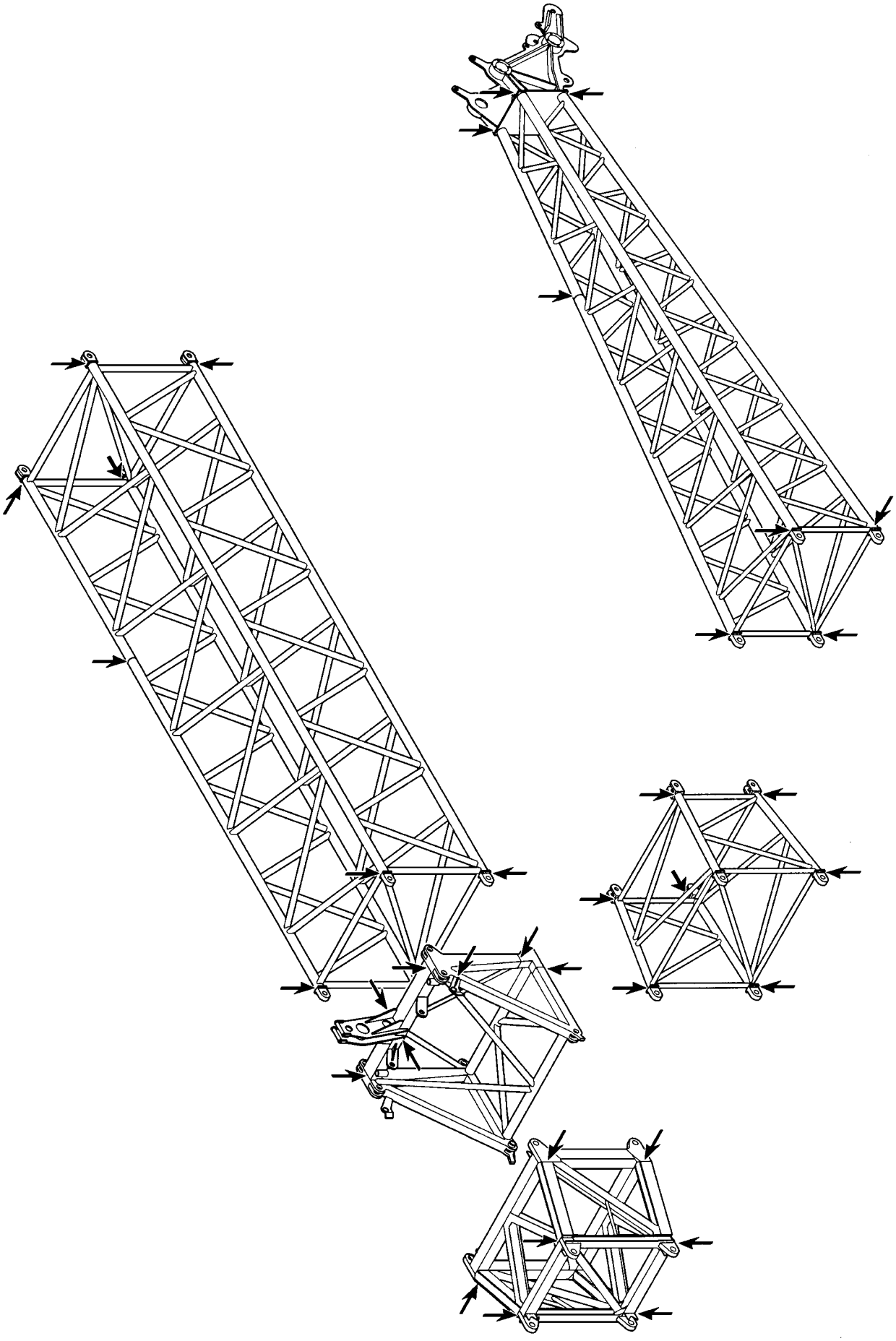
B105891 *Example for push out mechanics telescopic boom*



B105892 *Example for boom nose*

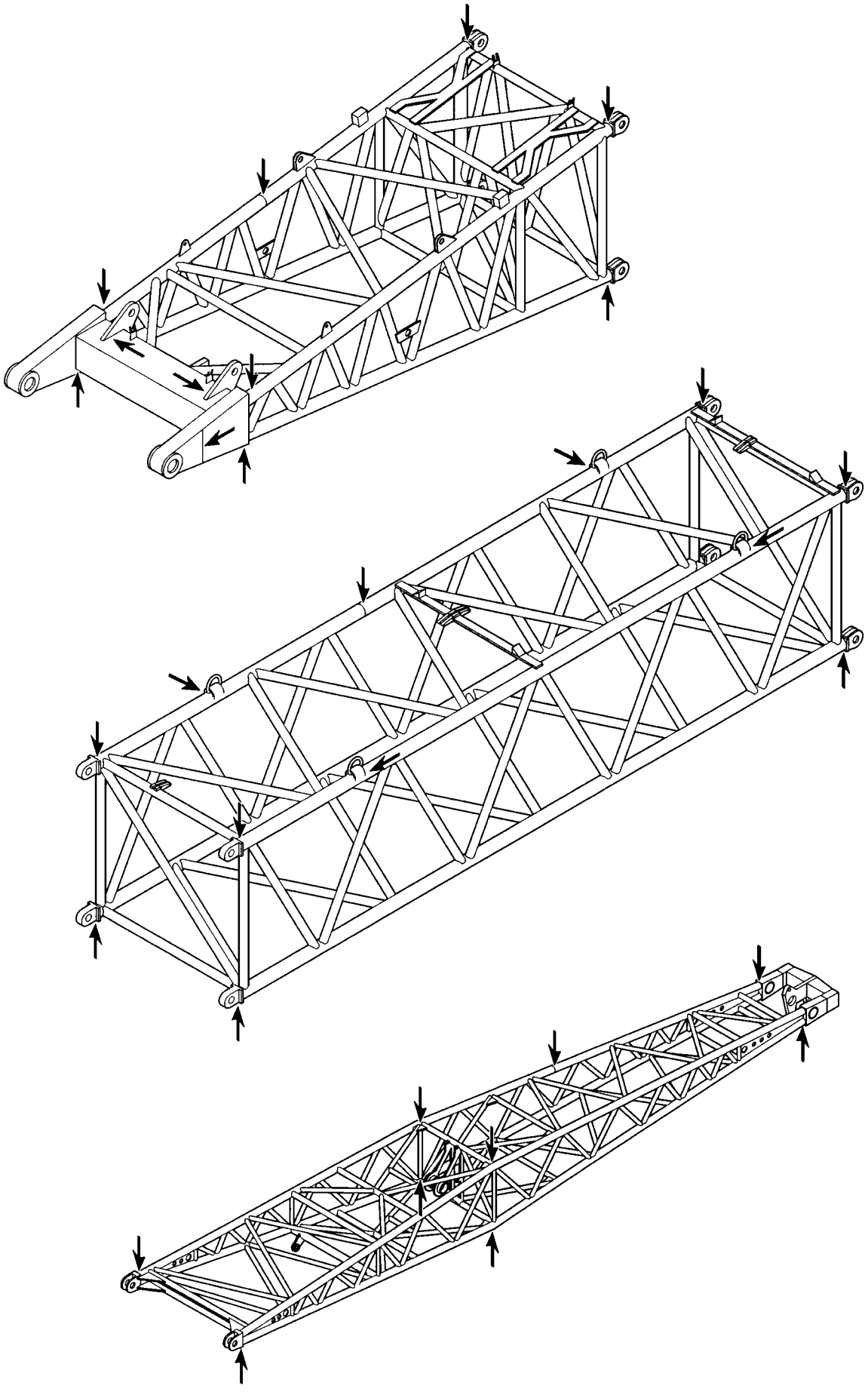


B105689 *Example for dolly console*



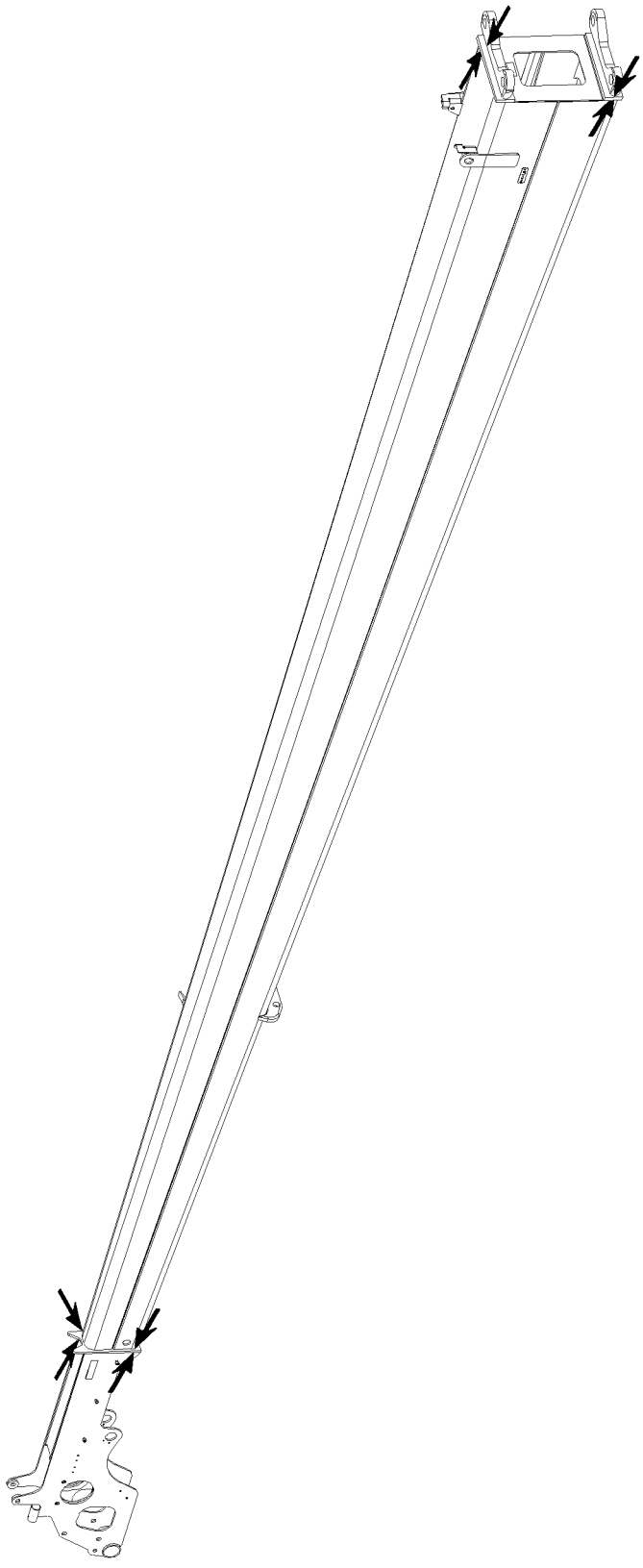
B185051

Example for lattice jib



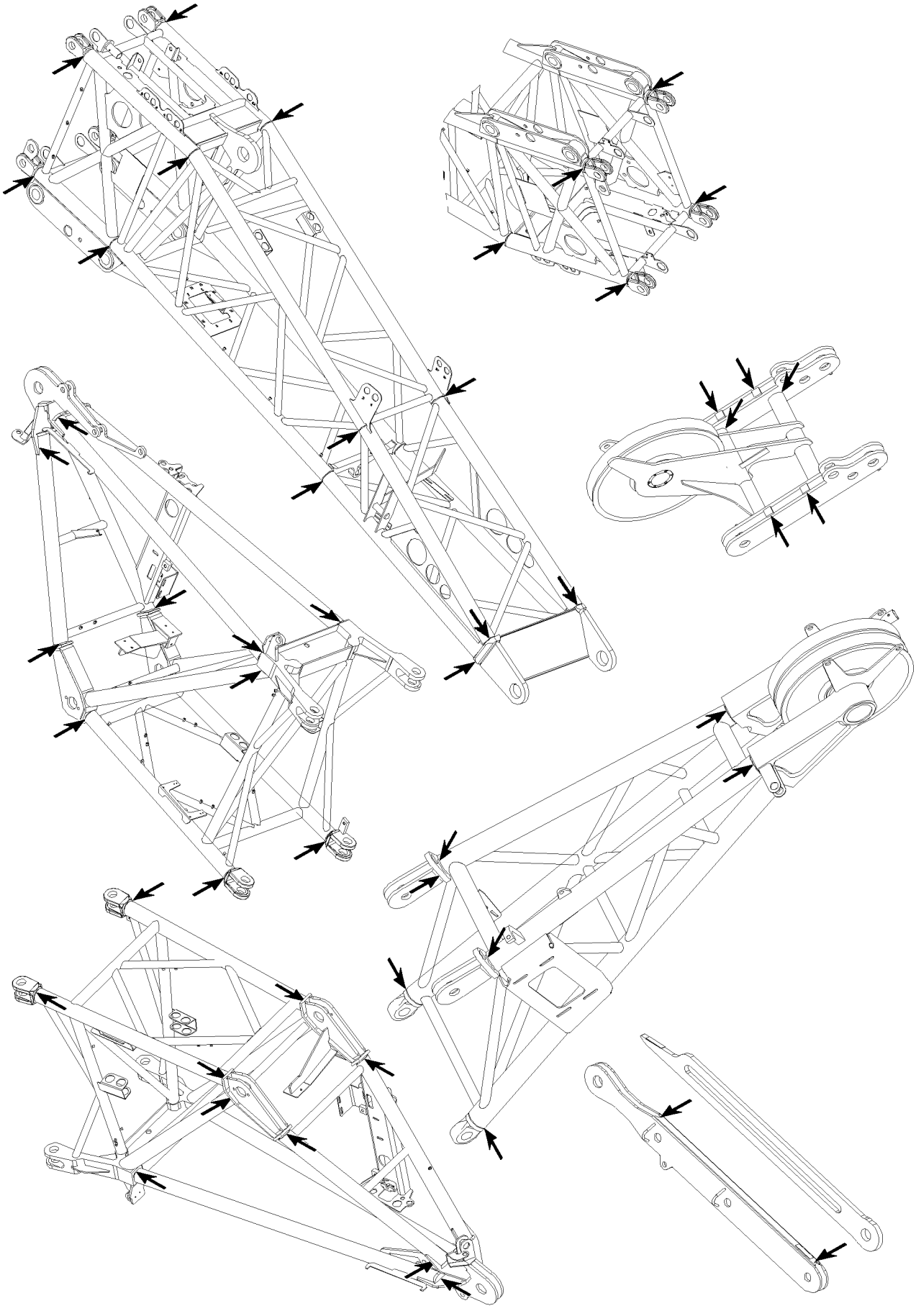
B185052

Example for NA / WA frame



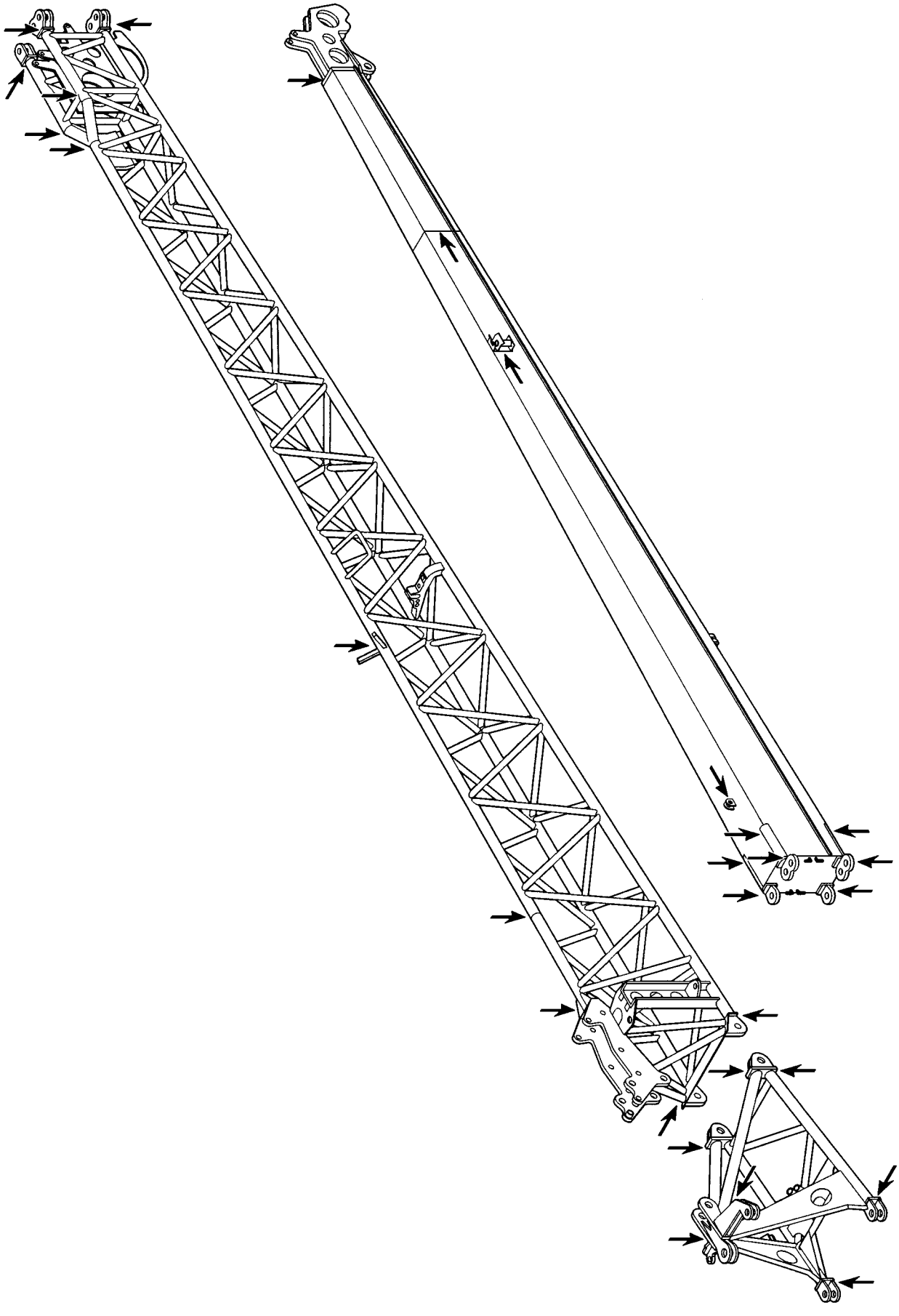
B105713

Example for end section



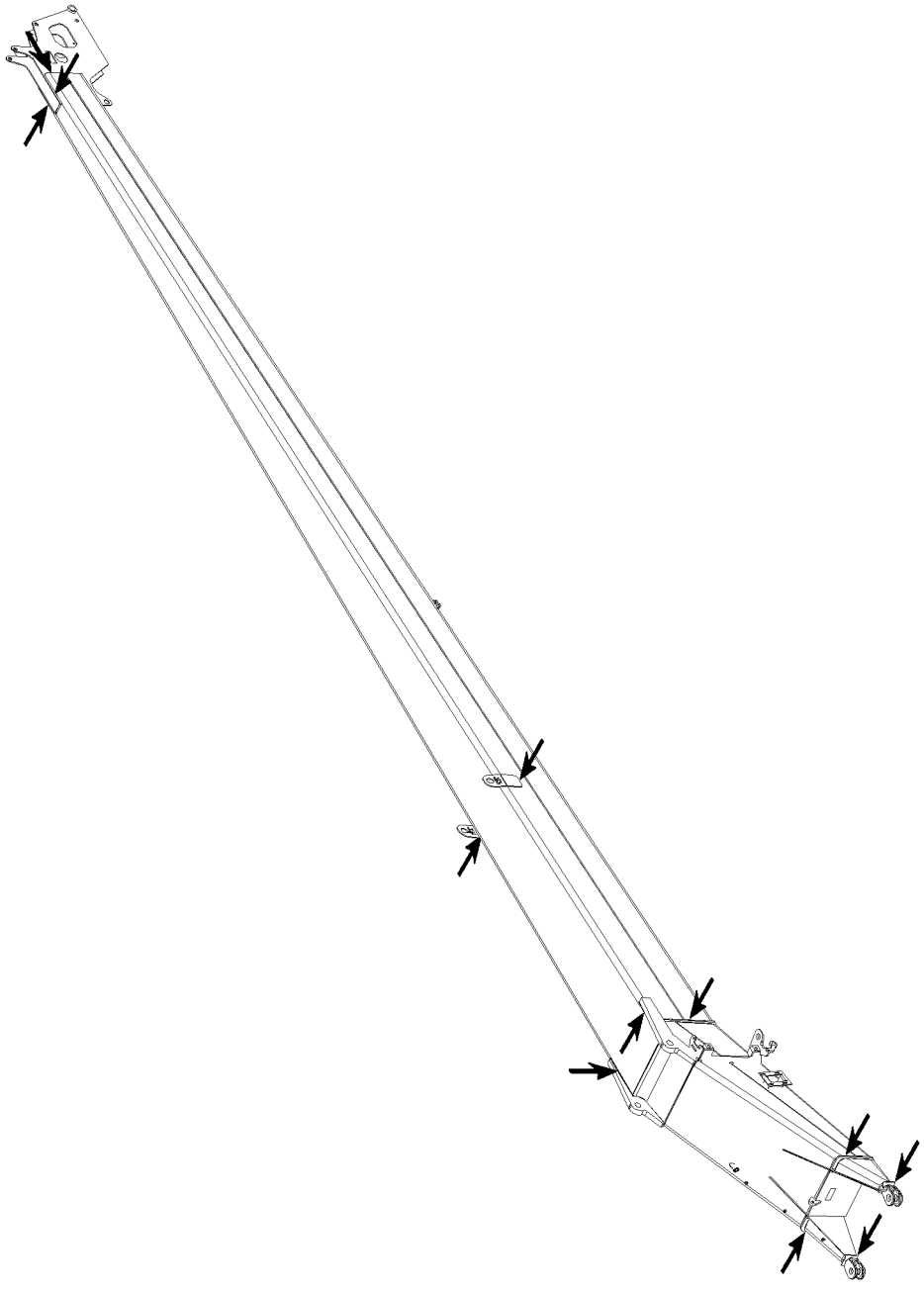
B105836

Example for pivot section, adapter and boom nose

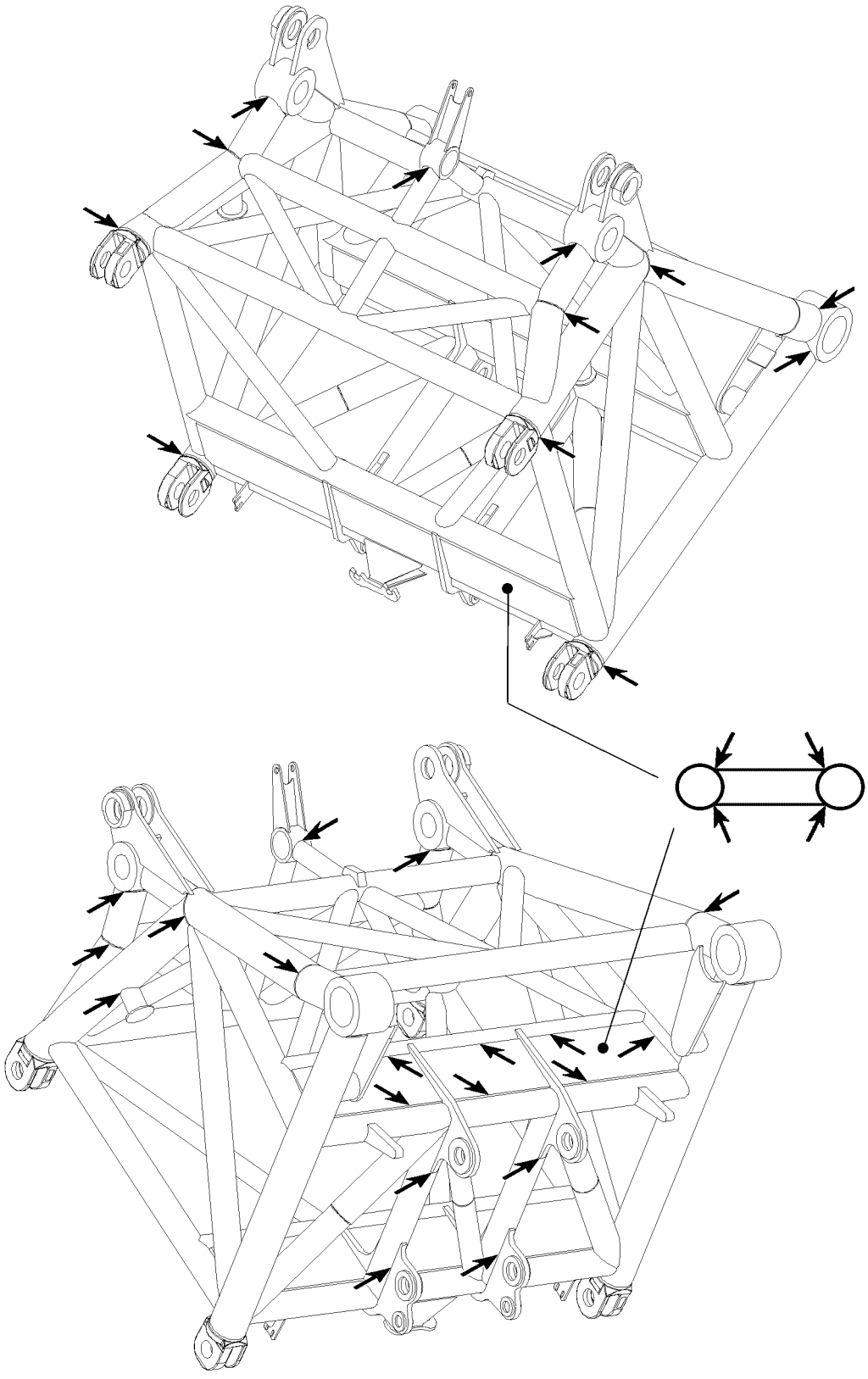


B185058

Example for folding jib

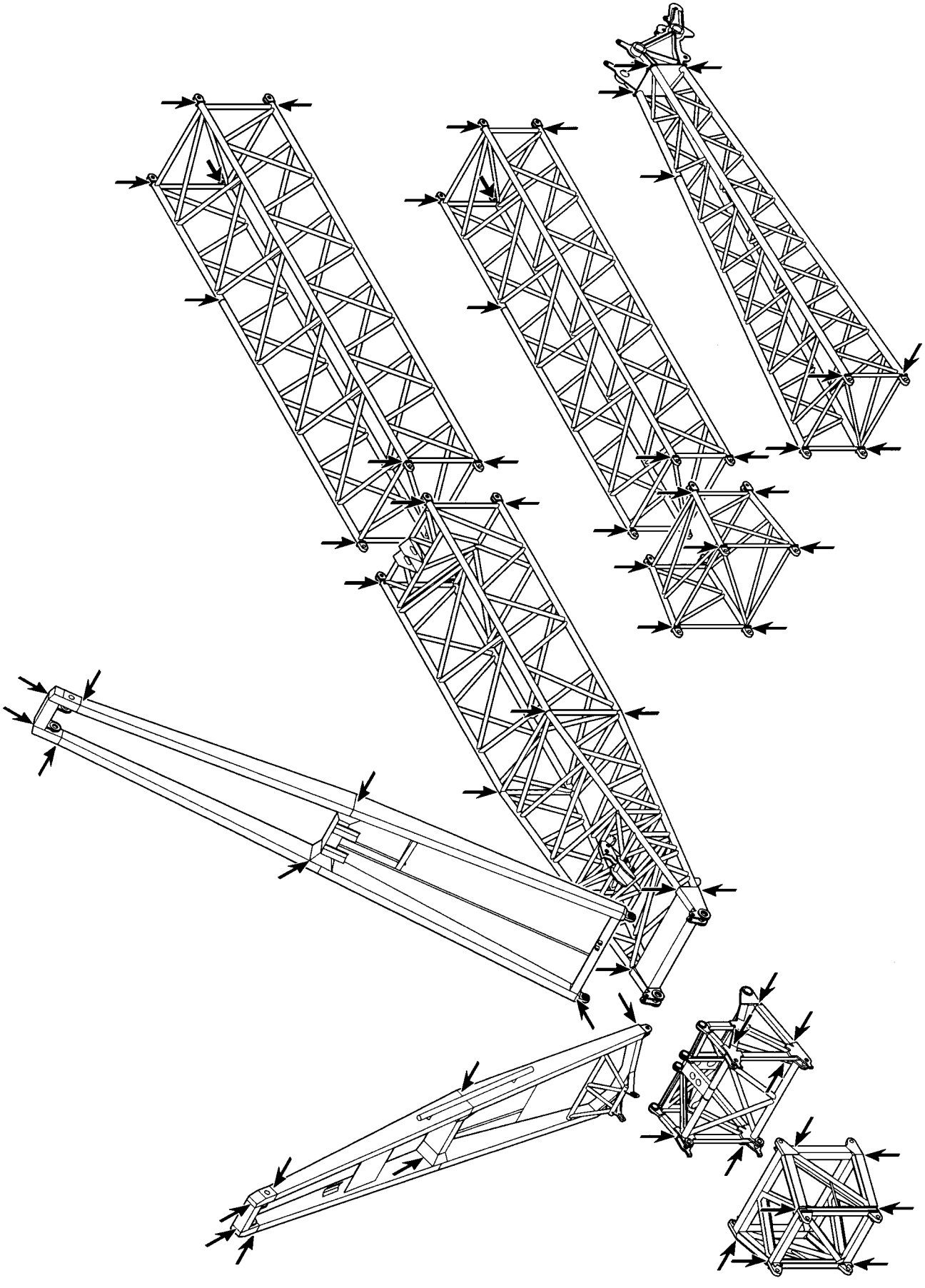


B105697 *Example for folding jib*



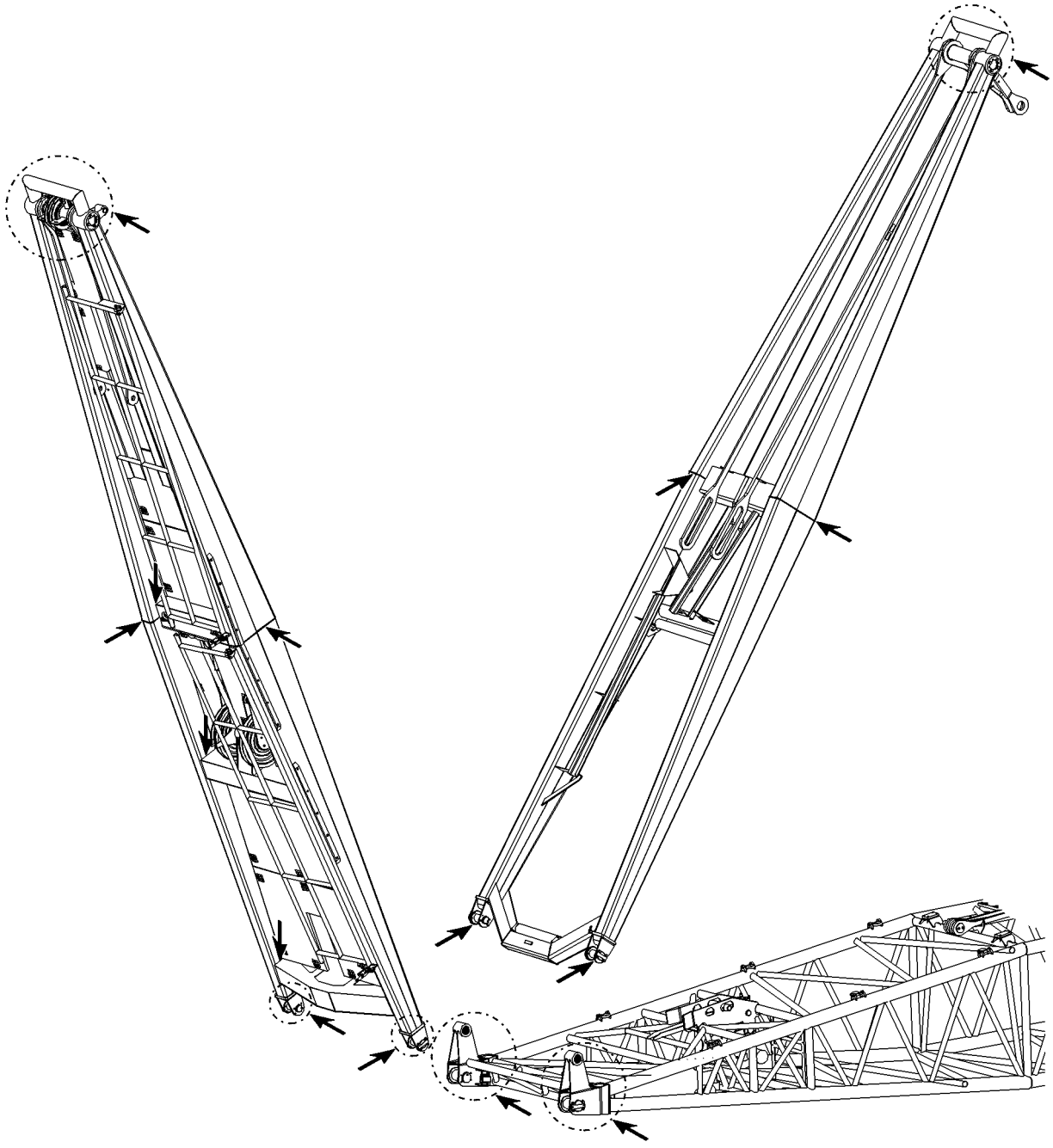
B105732

Example for W-connector head



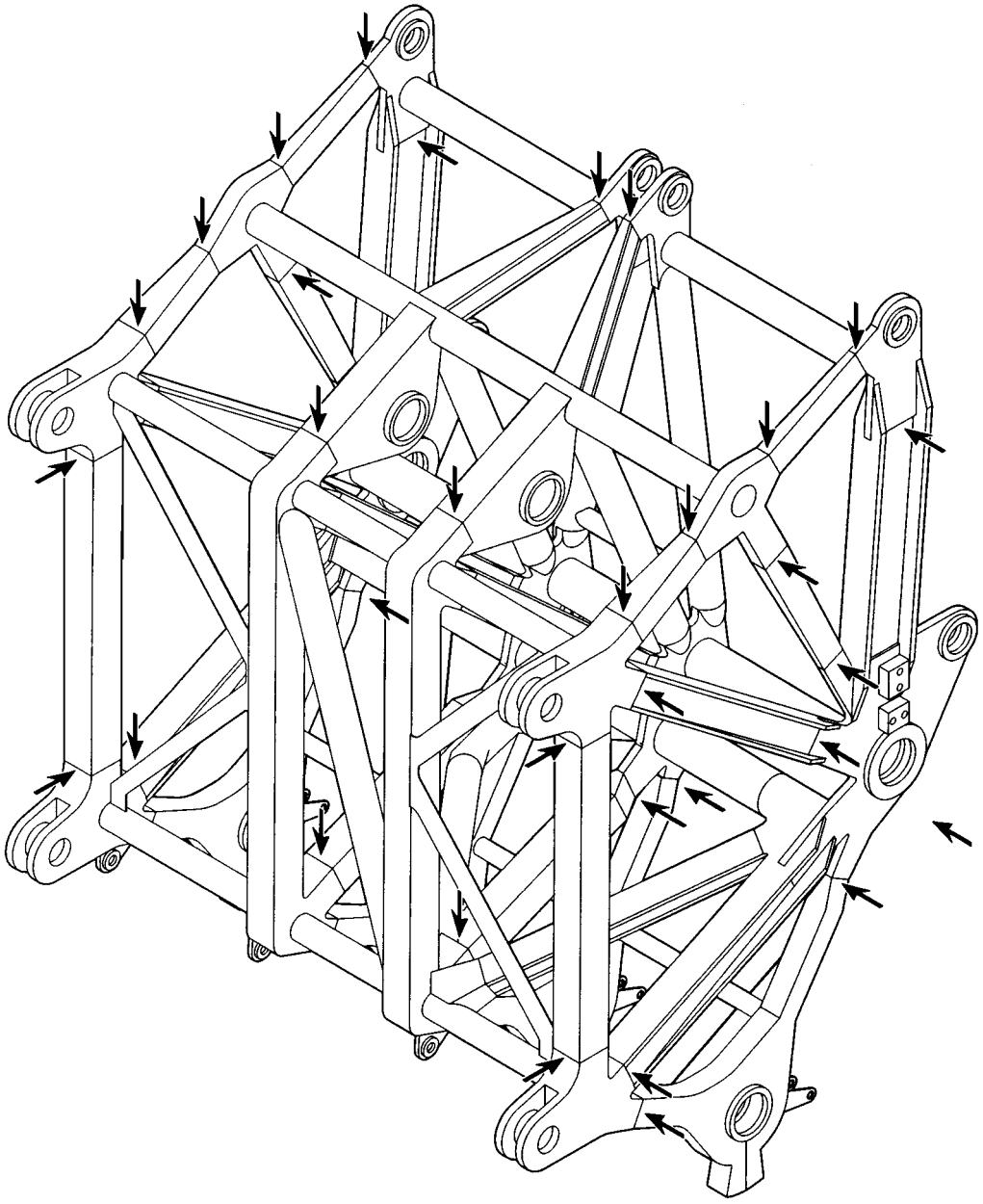
B185053

Example for assembly unit with lattice jib

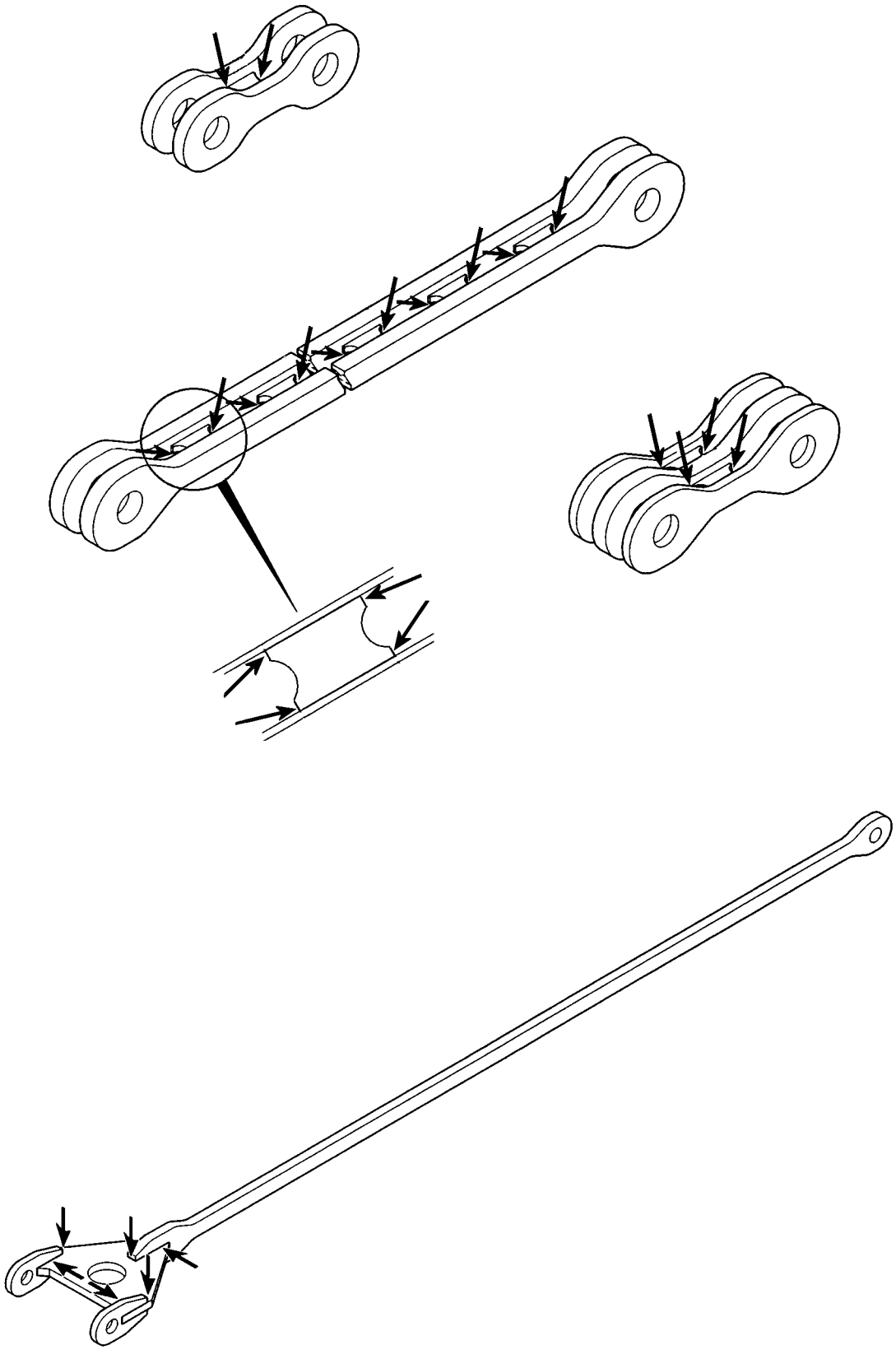


B105838

Example for NA frames

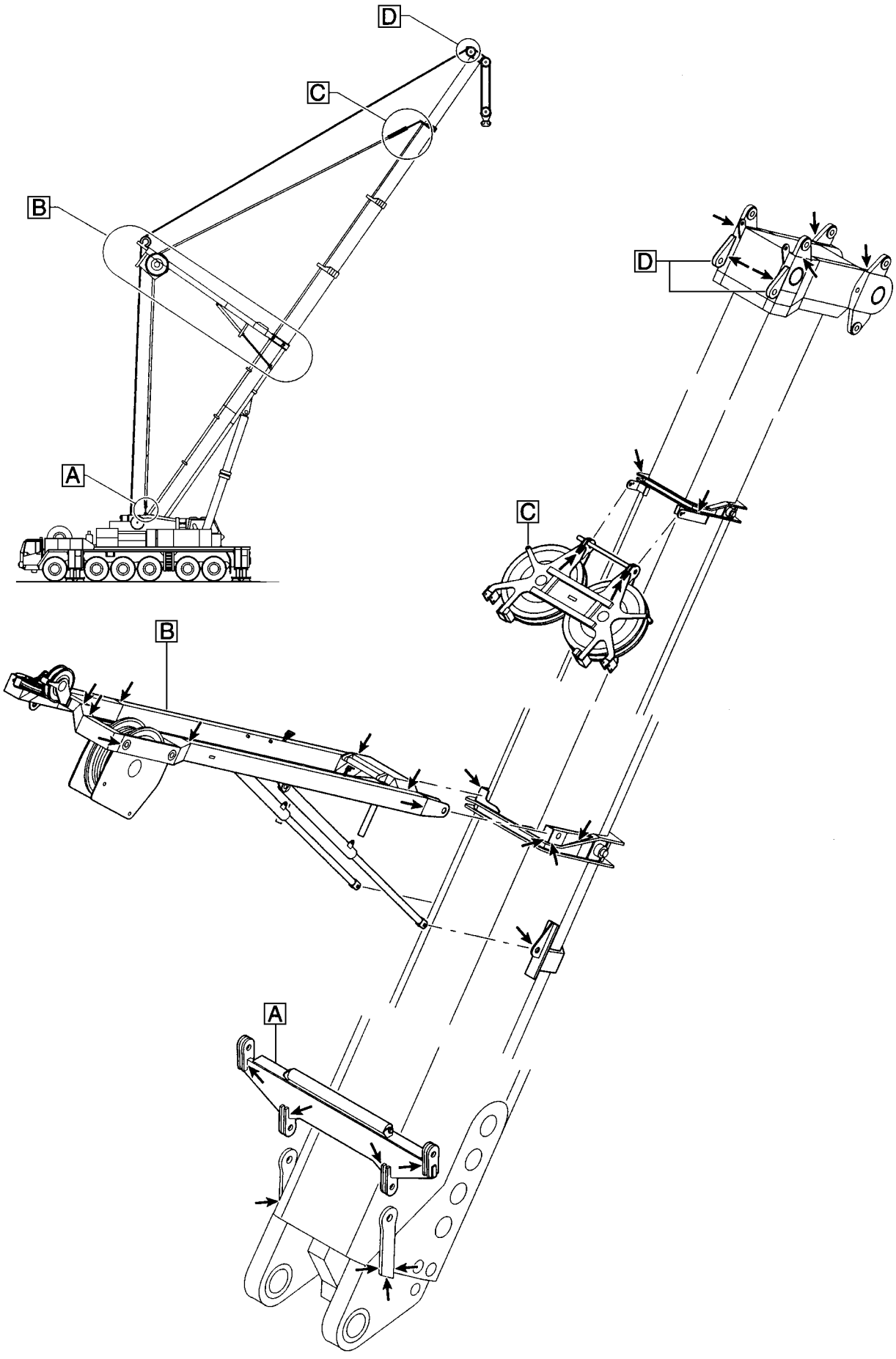


B185054 *Example for pulley head*



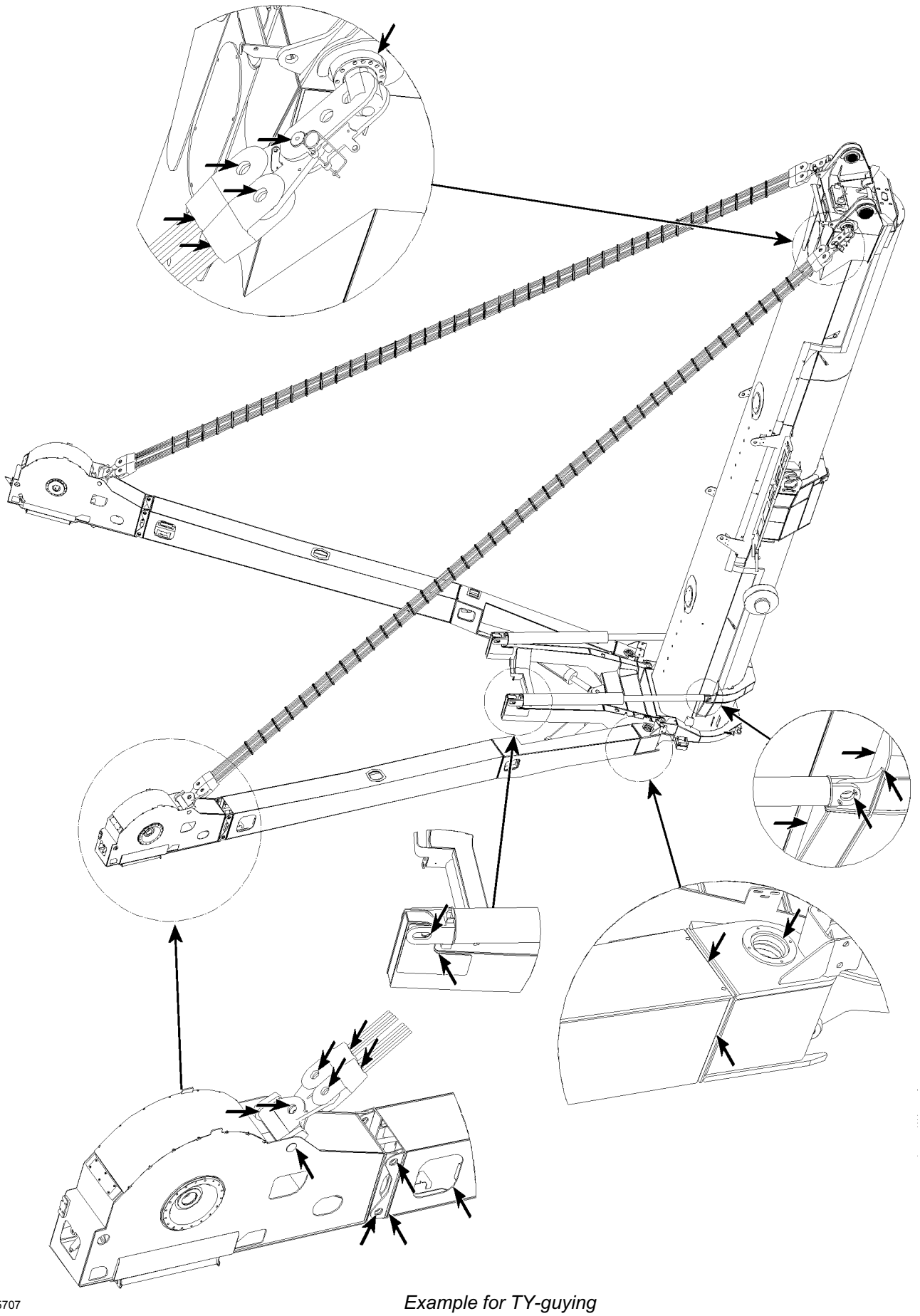
B185055

Example for guy rod



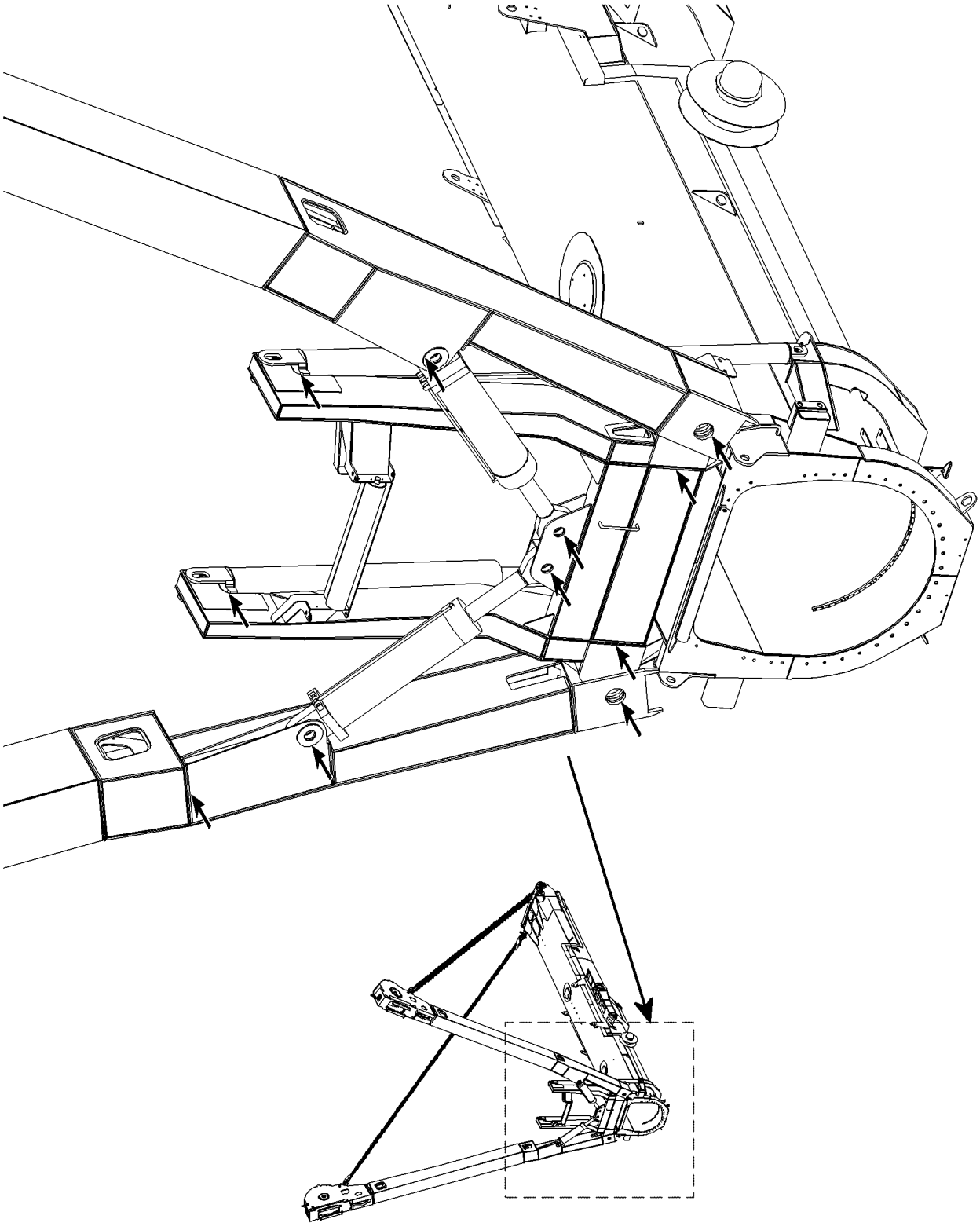
B185059

Example for TA-guying



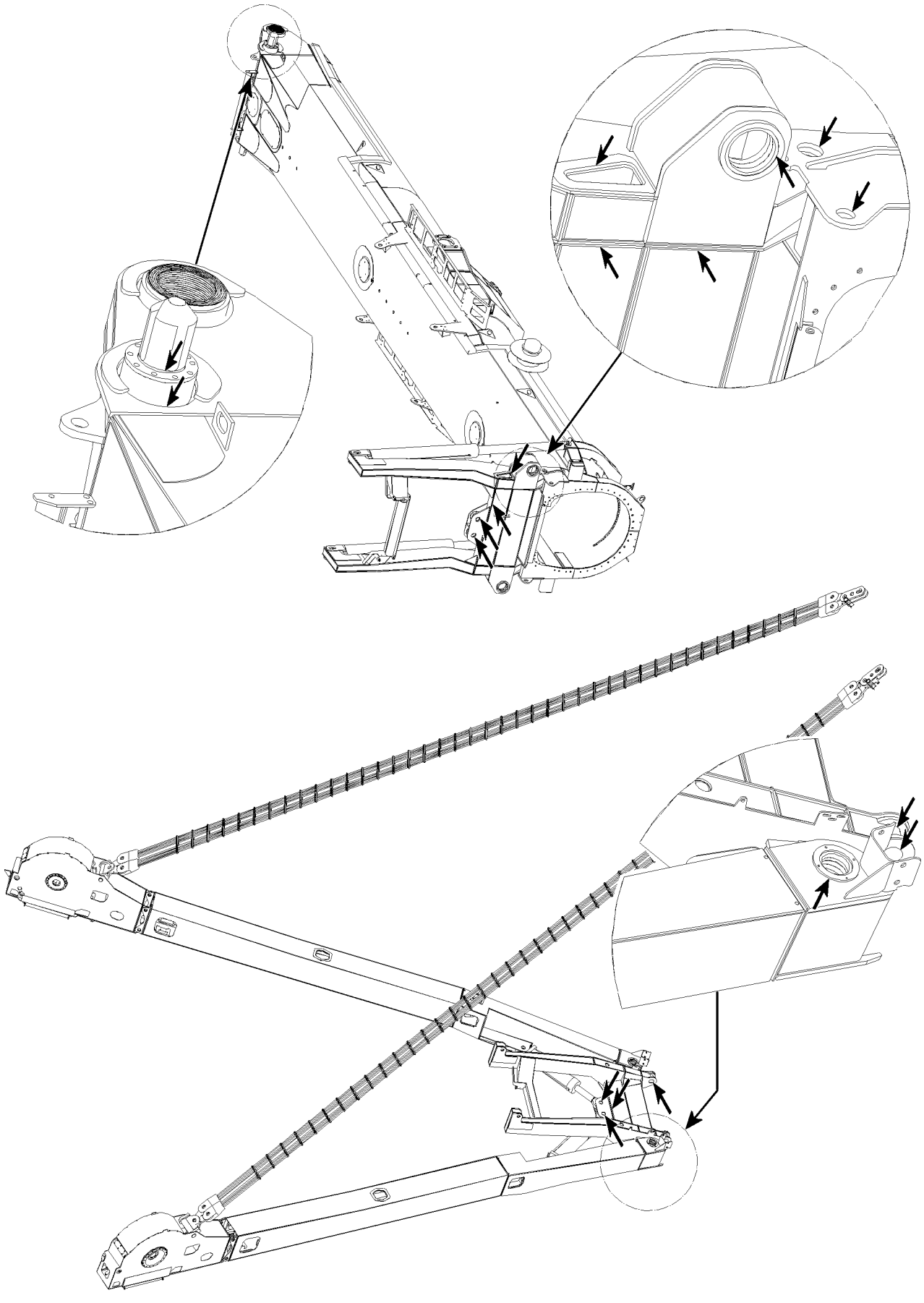
B105707

Example for TY-guying



B105708

Example for TY-guying



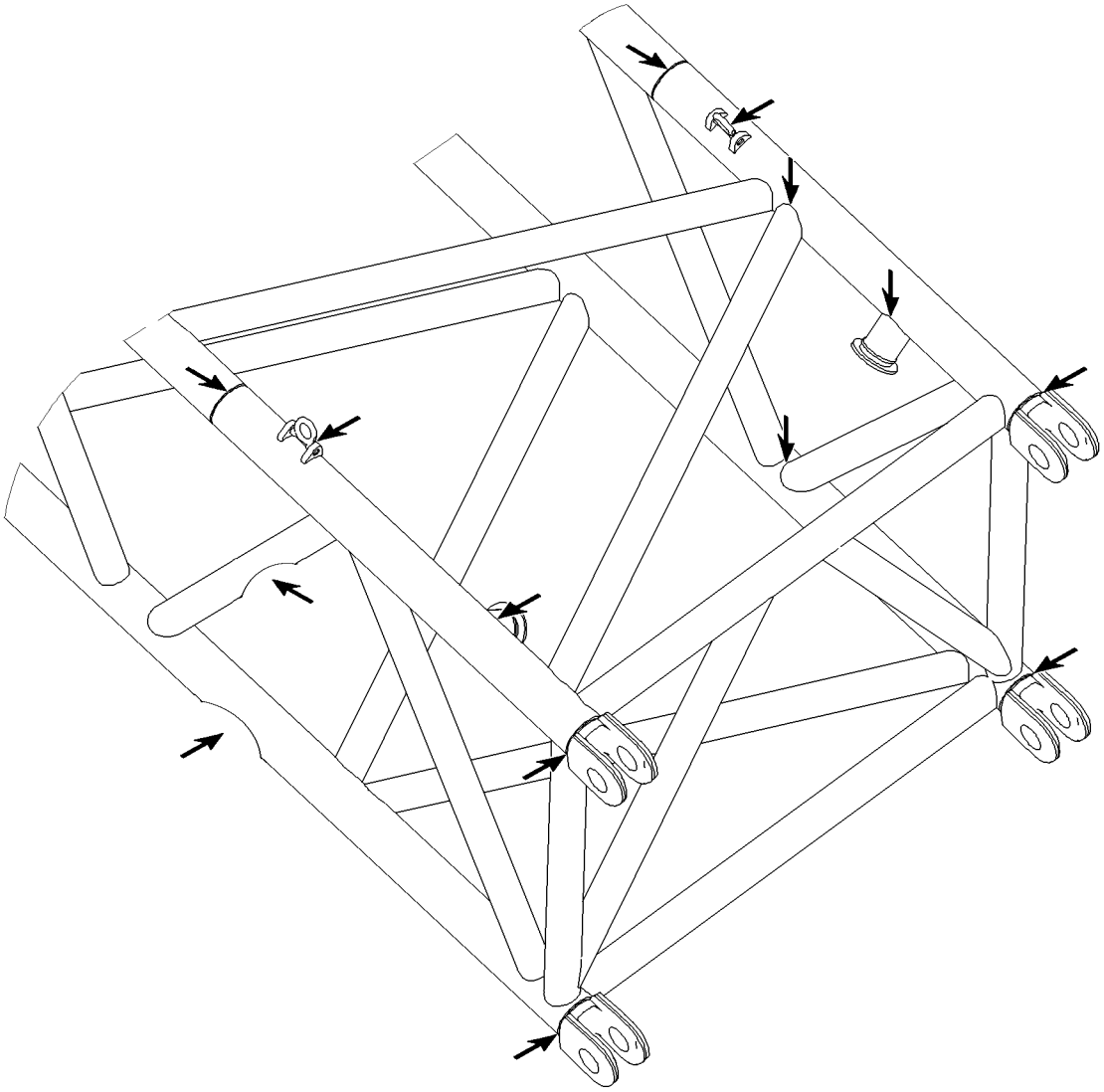
B105709

Example for TY-guying

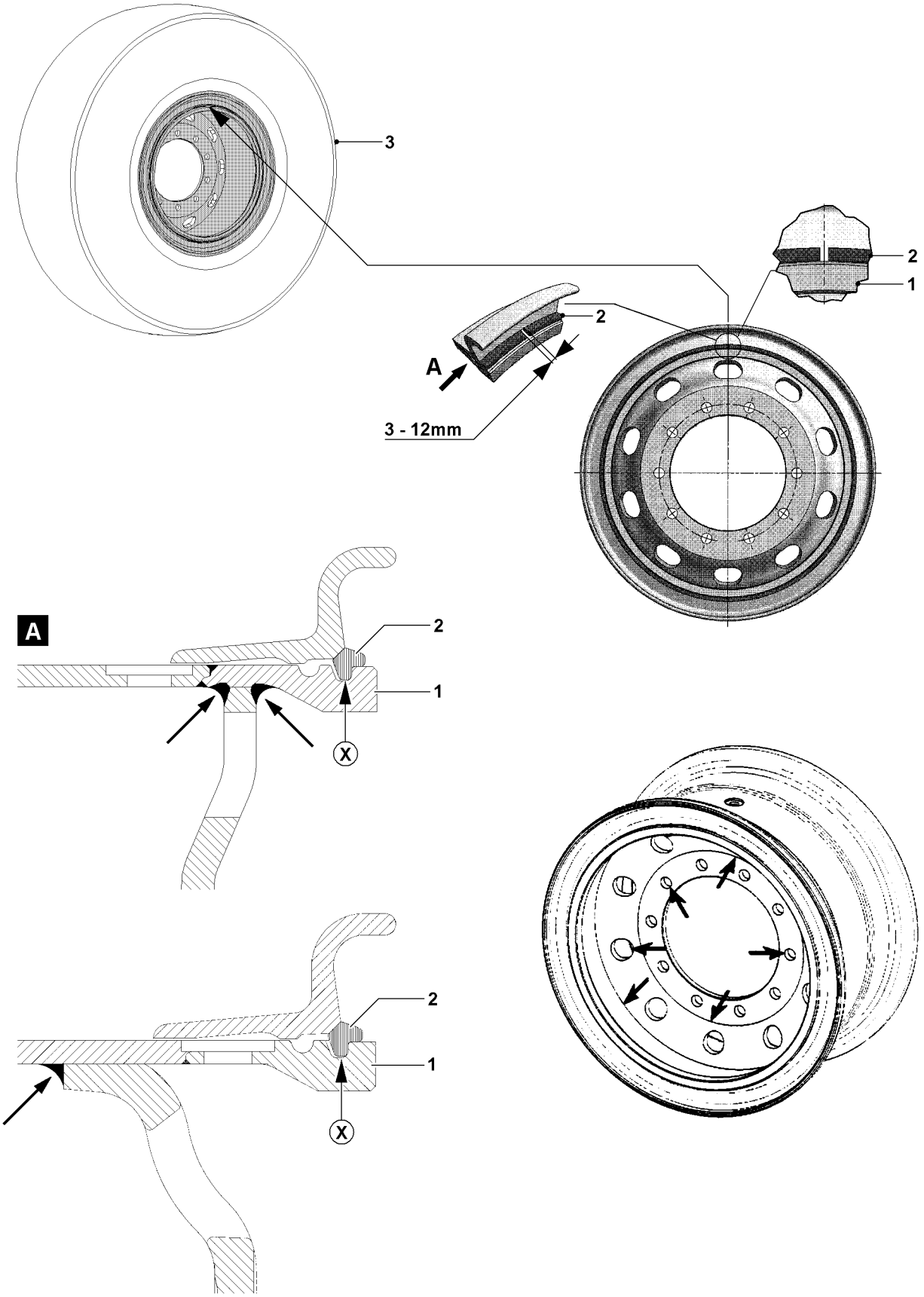
2.2 Inspection of lattice sections

Note

- The illustration is only an example and is valid for all lattice sections.
- Check all diagonal and frame pipe connections!



Example for lattice sections



B107378

3 Inspection of tires and disk wheels

3.1 Inspection of tires

WARNING
Risk of accident if incorrect tires are used!
The use of improper tires and tires which do **not** meet the license permits may result in serious accidents with fatal injuries!
- ▶ Only tire types and sizes approved for this crane may be assembled on the crane.
- ▶ Regularly check the tires for damage, tread depth, foreign particles and tire pressures!
- ▶ Carefully remove any foreign particles stuck or wedged in the tire tread before starting to travel (for example: rocks or gravel)!

The tread depth of the tire may not fall below the legally specified minimum value.
- – Check the tread depth.
- – Check the tires for damage.
- – Make sure that the tire **3** is correctly seated on the disk wheel **1**. The tire bead must touch the inside and outside of the disk wheel evenly.

WARNING
Risk of fatal injury if the lock ring **2** is not properly seated!
Personnel can be severely injured or killed due to an incorrectly assembled lock ring **2**!
- ▶ Check to ensure that the lock ring is correctly seated!
- ▶ Consult with authorized and trained specialists if there is any doubt whether a lock ring **2** has been correctly assembled!

Indications of an incorrectly installed lock ring are present if:
- – The lock ring **2** is not completely seated with its entire circumference in the groove (point **X**) of the disk wheel, see figure **A**.
- – The gap of the assembled lock ring **2** is outside the permitted tolerance range of 3 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 figure **A**,
- – the gap at the lock ring **2** is between 3 and 12 mm.

WARNING
Risk of fatal injury!
When checking the tire inflation pressure on the vehicle or after fitting tires, please ensure beforehand that the clamp collar **2** is correctly assembled on the disk wheel.
If the tire pressure has dropped below 3 bar and the tires are improperly inflated, there is a risk of fatal injury if the lock ring **2** jumps off explosively.
- ▶ If the tire pressure is below 3 bar, the tire may only be inflated by authorized and trained specialists!
- ▶ If the lock ring **2** is not correctly seated on the disk wheel, it is essential that authorized and trained personnel are called in. Do **not** attempt to change the tire pressure yourself!
- ▶ Adhere to the specified tire pressure!

The tire pressure may not exceed or fall below the permitted range, otherwise the body of the tire could be damaged and tire failure may occur.

Note
- ▶ Always check the tire pressure when the tires are cold.
- ▶ The specified tire pressure must be within the tolerance range of ±0.2 bar.

Observe the tire pressure, which is approved for the tire assembled on the crane. See Crane operating instructions, chapter 1.03.
– Check the tire pressure.

3.3 Inspection of disk wheels

The disk wheel is one of the most important safety relevant components on the vehicle.
The disk wheel is a welded steel structure and must be inspected according to section 2.
In addition, at least during the annual specified inspection of cranes, the outside and the inside of the disk wheel must be inspected for cracks and condition, taken the below listed points into account. The color penetration procedure is recommended for the crack inspection.
In particular, the disk wheels must be inspected for cracks that are developing in the base material, as well as at the locations indicated by the arrows.
Any disk wheels that show evidence of cracks or crack formation must be replaced immediately.
After a mileage of maximum 40,000 km, the operator must routinely inspect the disk wheel regardless of the actual duty cycle.
The following safety and maintenance guidelines are the manufacturer's recommendations for avoiding safety risks caused by damaged disk wheels. In addition, the manufacturer can only provide a warranty in case of a claim if these guidelines have been observed.

Note
- ▶ Tires may only be changed by authorized and trained specialists!
- ▶ This applies both to dismounting and mounting of the tire on the disk wheel **1**!

Workshop personnel or authorized and trained specialists should check the wheels at the rim and the disk wheel for the following when changing the tires:
– Excessive rust or corrosion.
– Bent rim flanges.
– Cracks in the disk wheel.
– Cracks in the brake drum fastening on the inside or outside of the disk wheel.
– Weld seam connection on inside or outside of disk wheel.
– Damage to side and locking rings.
– Damaged wheel bolts or nuts.
– Worn out pin holes.
– Matching disk wheel parts.

WARNING
Risk of overload breakage!
Disk wheels with worn bolt holes must be scrapped immediately. Repairing these highly-stressed disk wheel components causes structural changes in the material, which can lead to premature overload breakage!
- ▶ No welding work is permitted on rims and disk wheels, particularly repairs to worn bolt bores!

– If damaged disk wheel parts are discovered during the inspection:
  Remove and replace any damaged disk wheel components.
– If paint damage or minor rust formation is found:
  Make good the wheels by removing the rust using commercially available paint. Pay special attention to having a perfect surface in the tire seating areas.

4 Inspecting the hoist and luffing winches

The hoist and luffing winches are designed using integrated planetary gears. These gears are sized for long service life and the drive shafts and gears are rated for endurance.
Even though the hoist and luffing winches are designed for long life, an external visual inspection is not adequate, since their life can be significantly affected by bad maintenance (insufficient oil), using oil that does not meet specification requirements, defective seals, improper operation or overloading. The inspection must therefore be carried out by an expert according to the following requirements.

4.1 Inspections

4.1.1 Inspection intervals

1000 hours of operation, minimum once per year

4.1.2 Inspecting oil level

Re-check oil level using the dipstick. For hoist and retraction 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

This inspection should be carried out by a qualified laboratory. 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.

4.1.5 Evaluation of foreign substances found in the oil

A qualified laboratory shall be used to assess the oil.
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 above values are exceeded, the gearbox must be dismantled to determine the root cause of the excessive abrasion. Damaged components must be replaced and the gear refilled with fresh oil.

NOTICE
Risk of equipment damage!
▶ Repairs may only be carried out by specialists with appropriate equipment knowledge.

4.1.6 Visual inspection

The gearboxes shall be checked for leakage, since loss of oil, in addition to polluting the environment, can lead to gearbox failure.

4.1.7 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 upper 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 Liebherrwerk Ehingen.
- Only operate the crane after it has been checked and approved for use by the customer service department at Liebherr Werk Ehingen!

NOTICE

Risk of equipment damage!

- Only qualified personnel with specialized knowledge shall be used to assess gearboxes and brakes.

4.1.8 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.
Your crane winches 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 hrs.

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 crane’s duty cycle is split 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).

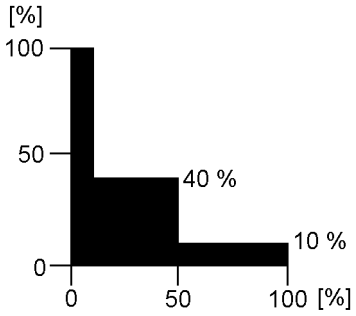
40% of the time with dead load and 1/3 working load.

50% of the time only with dead load.

Factor of load spectrum:

Km = 0.125

Graphic view:



Note

- Duty cycle L1 with duty cycle factor Km = 0.125 is normally applied to cranes used for assembly operations.

Duty cycle class: Medium L2

Definition:

Power train or parts thereof are subjected to maximum loading relatively often, but normally only operate at light load.

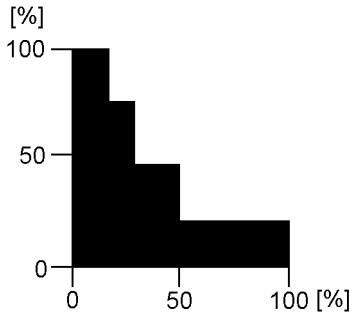
Operating time rates:

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 time only with dead load.

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.

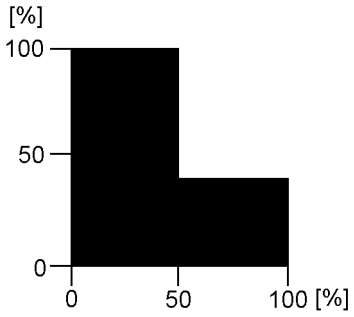
Operating time rates:

50% of the time at maximum load (dead load and 1/1 working load).
50% of the time only with dead load.

Factor of load spectrum:

Km = 0.5

Graphic view:



Duty cycle class: Very heavy L4

Definition:

Power train or parts thereof are regularly subjected to near maximum load.

Operating time rates:

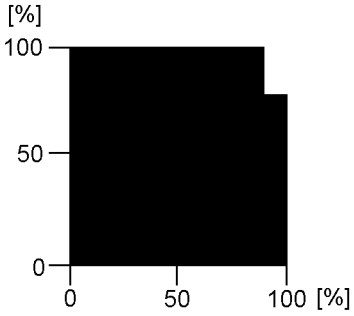
90% of the time at maximum load (dead load and 1/1 working load).

10% of the time only with dead load.

Factor of load spectrum:

Km = 1

Graphic view:



Determining the effective operating hours T_i

The effective operating hours calculated 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% of the total operating hours of the superstructure.

3.) One operating hour meter is used for both the crane engine and the crane drive.
The winch proportion of the total crane operating hours must be estimated.
For cranes used in assembly operations, the operating time for the superstructure can be estimated at 60% of the total operating hours of the crane. If the hoist winch proportion is estimated at 20% of the superstructure operating hours (see previous item), then the result in relation to the **total** operating hours of the crane is: 12%.

4.) No operating hour meter installed.
In this case the operator must estimate and document the actual operating hours of the winch.
The approximate percentages stated above normally apply to main hoist winches. For auxiliary hoist winches or boom control winches, the proportion of the total operating hours can be significantly less and should therefore be estimated by the operator.

Determining the actual usage proportion of the design life

For an inspection interval i (max. 1 year), the actually used proportion S_i of the theoretical design life is derived from the formula:

$$S_i = \frac{Km_i}{Km} \times T_i$$

Abbreviation	Explanation
S_i	Used proportion of the theoretical service life.
Km	Load spectrum factor that was used to calculate the winch rates. This factor is provided in the Operating instructions.
Km_i	Load spectrum factor for inspection interval i according to section “Determining the operating conditions” .
T_i	Effective operating hours for inspection interval i according to section “Determining the effective operating hours T_i” .

The actually used hours proportion is subtracted from the remaining design life D_i after each inspection interval (see example).
If the remaining design life is not long enough to cover the next projected operating period, a general overhaul of the winch is required.

If the design life D has been reached (see chapter on “Design life”), the winch may only be operated after conducting a general overhaul.
A general overhaul of the winch is required not later than 10 years after commissioning.
The general overhaul shall be arranged by the operator and carried out by the manufacturer or the manufacturer's authorized representatives and must be documented in the inspection log. After the general overhaul, the manufacturer or the manufacturer's authorized representative will define a new theoretical service life D.
If the design life has not been reached after 10 years, continued operation of the winch without a general overhaul is acceptable, provided that the crane's authorized inspector has confirmed the accuracy of the actual usage calculation by signing the crane inspection log at each authorized inspection interval.
In such a case, the crane authorized inspector must thoroughly inspect the winch. This comprises at least:

– Outer visual inspection (leakage, damage, deformation, etc.).
– Oil inspection, particularly looking for metal residues.
– Load test at minimum and maximum cable tension, at maximum speed in both cases. At least one layer must be spooled up. Pay particular attention to any unusual noises during this load test.

The crane's authorized inspector must confirm this inspection in the crane inspection log and must make a statement regarding suitability of the winch for continued operation. The next inspection must take place at the end of the 12th operating year and annually thereafter.

4.2.3 Example

According to the manufacturer's operating manual, a mobile crane with a separate operating hour meter for the crane engine and the crane drives classified as follows:

– Power train group: M3
– Load spectrum: Light L1
– Factor of load spectrum: Km = 0.125
– Design life: D = 3200 h

Actual usage proportion S of the design life is calculated using the individual inspection intervals as follows:

First inspection (first year)

The crane was used for assembly work during the elapsed year:
Duty cycle L1, in other words $Km_1 = 0{,}125$.
The superstructure operating hour meter indicates 800 hours. 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 operating hour meter indicates 2000 hours; i.e., during this period:
2000 h - 800 h = 1200 h (800 h were used during the first year of operation).
The winch was operated about 40% of the time; i.e. $T_2 = 480$ h.
The actual usage proportion S_2 of the design life at the time of the second inspection is therefore:

$$S_2 = \frac{0{,}5}{0{,}125} \times 480\ \text{h} = 1920\ \text{h}$$

Remaining design life:
$D_2 = 3040\ \text{h} - 1920\ \text{h} = 1120\ \text{h}$.

Third inspection (third year)

The crane was used for assembly work and occasionally at a harbor for unloading work:
Duty cycle L2, in other words $Km_3 = 0.25$.
The superstructure operating hour meter indicates 3000 hours; i.e., during this period:
3000 h - 2000 h = 1000 h (2000 h were used during the first two years of operation).
The winch was operated about 30% of the time; i.e. $T_3 = 300$ h.
The actual usage proportion S_3 of the 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: .....

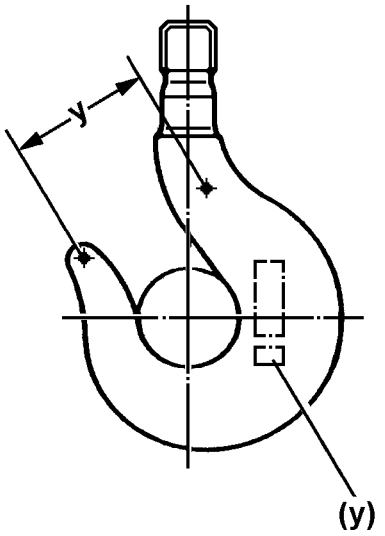
S_i = Used part of theoretical service life since last inspection
D_i = Remaining theoretical service life
D_{i-1} = Remaining theoretical service life after previous inspection
Km = Factor of load collective, which was taken for calculation of winch. This factor is to be taken from the Operating Manual
Km_i = Factor of load collective in inspection interval i
T_i = Effective operating hours in inspection interval i

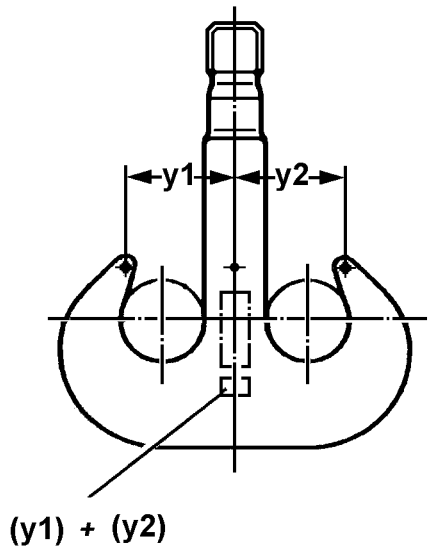
*) In the following pages, carry over the last line from the previous page.

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 inspected annually by a competent inspector.
The purpose of the inspections is to avoid accidents by detecting deficiencies in a timely fashion.
Any deficiencies determined by the inspector must be documented, corrected, and subsequently reinspected.

5.1 Inspection and monitoring procedure

5.1.1 Deformation

The hook should be inspected for distortion as required, but at least once a year; e.g., at the hook jaw.
The original dimensions, (y) or (y1) and (y2), are given on the load hook itself.
Measure between the punch marks.

DANGER
Risk of accident!
Hook jaw distortion may not exceed 10% of the original dimensions (y) or (y1) and (y2).
- ▶ Do not use a load hook that exhibits greater distortion.
- ▶ Advise the Liebherr-Werk Ehingen GmbH Customer Service Department.

5.1.2 Corrosion

DANGER
Risk of accidents caused by thread corrosion / wear and tear!
- ▶ Stop using the load hook.
- ▶ Advise the Liebherr-Werk Ehingen GmbH Customer Service Department.

Unscrew the nut from the hook shank so that the threads can be inspected for corrosion and wear and tear.

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.

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 piston rod for grooves.
- Inspection of wear pattern on cylinder pinning and tele pinning.
- Inspection of guide rails for distortion of contour.
- Inspection of plastic guide on cylinder bottom for damage.
- Inspection of screws on push out cylinder for tight seating.

8 Inspecting the safety controls on the relapse supports

Inspection of the safety control or limit switches on the relapse supports and the boom A-frames, see Crane operating instructions, chapter 8.12.

9 Inspection of the nitrogen reservoir

Inspect the nitrogen storage tank for specified gas pressure, particularly for relapse supports and suspension storage tanks (comply with specifications), see Crane operating instructions, chapters 7.04, 7.05, 8.13, 8.14.

10 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.

11 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 shall not deviate more than 10% off the measured projection.

12 Inspecting the roller slewing ring

For tilt play dimension, see Crane operating instructions, chapter 7.05.

13 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 a fixed 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.

14 Inspecting the oil and fuel reservoirs

Oil and fuel reservoirs shall be inspected at least once a year and checked all around for leakage during the periodic inspections every four years.

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 Customer Service Department at Liebherr-Werk Ehingen GmbH has not been consulted!

15 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.

16 Appendix

The following is a checklist to assist the inspector during the periodic inspections of Liebherr mobile and crawler cranes.

16.1 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 20:	

1. Inspection category: Crane document						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Crane inspection log						
Operating and installation instructions						
Crane control log						
Load chart manual						
Job planner						

2. Inspection category: Signs / labeling						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Factory tag						
Load data						
Operating specifications label						
Prohibition and command signs						
Other safety signs						

3. Inspection category: Travel gear[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Frame[2]						
Supports[3]						
Axles						
Wheels						

3. Inspection category: Travel gear[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Tires						
Bearings						
Gear						
Universal drive shaft						
Leaf springs / springs						
Shock absorbers						
Steering						
Brakes						
Hydraulic axle suspension						

4. Inspection category: Chassis[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Coverings						
Treads						
Counterweight holders[2]						
Suspension equipment						
Ladders						
Hook block mounting[2]						
Boom support[2]						

5. Inspection category: Chassis - driver's cab[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Doors						
Windows / windshields						
Windshields wiper						
Mirrors						
Seat						
Heater						
Ventilation						
Sound-proofing						
Trip recorder						
First aid kit						

5. Inspection category: Chassis - driver's cab[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Spare bulbs						
Hazard warning triangle						
Safety vest						

6. Inspection category: Chassis - drive[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Combustion engine						
Exhaust system						
Fuel tank						
Filter						
Sound-proofing						
Engine mount						
Oil levels						
Fuel lines						

7. Inspection category: Chassis - hydraulics[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Oil reservoir						
Filter						
Pumps						
Motors						
Valves						
Lines						
Hoses						
Cylinder						
Pressure limiting valves						

8. Inspection category: Chassis - pressurized air system[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Compressor						
Filter						
Air tanks						
Valves						

8. Inspection category: Chassis - pressurized air system[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Lines						
Hoses						
Cylinder						

9. Inspection category: Chassis - electrical system[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Motors						
Generators						
Battery						
Switch						
Lines						
Fuses						
Resistors						
Illumination						
Brake lights						
Indicator lights						
Tail lights						
Working lights						
Signaling systems						
Indicator lights						
Battery switch						
Limit switches: Transmission, steering, drivetrain						
Support pressure indicator[2]						

10. Inspection category: Chassis - control devices[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Engine regulation						
Gear						
Couplings						
Circuits						
Brakes						
Steering						
Indicator displays						
Engine shut off line						

10. Inspection category: Chassis - control devices[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Control of supports[2]						
Axle suspension						
Crane leveling						
Rear axle steering						

11. Inspection category: Superstructure						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Frame						
Coverings						
Treads						
Bearings						
Counterweights						
Relapse retainer						
Rotary connection: Tilt play						
Rotary connection: Mounting screws						
Rotary connection: Gearing						
Slewing gear: Mounting screws						
Slewing gear: Gearing						

12. Inspection category: Superstructure - crane operator's cab						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Doors						
Windows / windshields						
Windshields wiper						
Mirrors						
Seat						
Heater						
Ventilation						
Sound absorber						
Joystick for working functions						
Gear shifts						
Safety: Crushing / shear locations						

13. Inspection category: Superstructure - Retaining and protection devices						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Grab handles and accesses						To the cab and to the power train
Coverings						
Covers						
Hatches						

14. Inspection category: Superstructure - engine						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Combustion engine						
Exhaust system						
Fuel tank						
Filter						
Sound-proofing						
Engine mount						
Fuel lines						

15. Inspection category: Superstructure - hydraulic system						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Oil reservoir						
Filter						
Pumps						
Motors						
Valves						
Lines						
Hoses						
Cylinder						
Pressure limiting valves						
Lowering brake valves						
Brake control: Hoist gear						
Brake control: Slewing gear						

16. Inspection category: Superstructure - electrical system						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Motors						
Generators						
Batteries						
Switch						
Lines						
Fuses						
Resistors						
Illumination						

17. Inspection category: Superstructure - control systems						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Engine regulation						
Gear						
Flexible couplings						
Circuits						
Engine shut off line						
Monitoring indicators						

18. Inspection category: Superstructure - rope drives						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Winch 1[3]						
Winch 2[3]						
Winch 3[3]						
Winch 4[3]						
Rope pulleys						
Rope end connection						
Rope for winch 1						
Rope for winch 2						
Rope for winch 3						
Rope for winch 4						
Guy ropes						

19. Inspection category: Superstructure - load hook						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Pulleys						
Rope guards on pulleys						
Axle support						
Load hook						
Load hook mounting						
Hook retention						

20. Inspection category: Superstructure - safety and switching systems						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Hoist emergency limit switch I						
Hoist emergency limit switch II						
Lowering emergency limit switch I						
Lowering emergency limit switch II						
Boom emergency limit switch I						
Boom emergency limit switch II						
Luffing jib: Boom limit switch I						
Luffing jib: Boom limit switch II						
Load moment limiter						
Angle display: Boom						
Angle display: Luffing jib						
Angle display: Slewing gear						
Safety devices: Control						
Operating range limiter						
Pressure sensors						
Speed sensor						
Wind sensor						
Sliding beam monitoring						
Support pressure indicator						
Incline display						
Length indicator: Radius, boom length						
Emergency off system						
Engine stop						

21. Inspection category: Boom						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Weld structure						
Rope pulleys						
Luffing cylinder						
Telescoping cylinder						
Boom extension ropes						
Boom retraction ropes						
Boom bearings						
Boom pinning						
Guy rods						
Relapse cylinders						

Inspection criteria:
A = Present / complete
B = Condition / maintenance
C = Function
D = Repair / replace
E = Reinspection required

Evaluation:
Satisfactory = x
Unsatisfactory = -
Not required = 0

Comments:
[1] Inspection of the crane carrier vehicle road worthiness is also fulfilled if it has already been certified by the road traffic department certification authority. For cranes that are not certified for use on public roads, an expert or authorized inspector must conduct the required tests to validate the vehicle's road worthiness.
[2] These inspections must be carried out by an authorized inspector even if it has passed the road traffic department test and is certified.
[3] Inspection of the winches regarding the used portion of the theoretical service life.

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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.
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 they can accommodate the spare rope correctly (see section entitled “Inspection”).

2.2 Installation

When the rope is removed from the spool or unwound from a reel, it must be ensured that the rope is not twisted, otherwise loops, reverse bends or kinks could originate in the rope.
If the rope is looped over any part of the system when it is not under strain, these areas must be protected accordingly.
Before starting to use the rope on the system, the user must ensure that all components that are functionally associated with the wire rope in connection with the standing components have been set up in such a way that they will operate correctly.
To stabilize the wire rope, a few lifting procedures should be carried out at approximately 10% of the normal load.

2.3 Maintenance

The maintenance of the wire ropes depends on the type of lifting device, its application, the environment as well as the type of rope that is used. Unless other instructions from the crane or rope manufacturer are provided, the wire rope should be cleaned, if possible, and lubricated with grease or oil, particularly in areas in which the rope is subjected to bending when it runs over pulleys.
The kind of grease that is used must be suitable for steel ropes.
Lack of maintenance will reduce the service life of the rope, particularly if the crane is used in a corrosive environment and if re-lubricating is not possible because of the nature of the respective crane application.

2.4 Inspection

2.4.1 Frequency

Daily inspection

If possible, all visible parts of the ropes must be checked for general wear and distortion every working day. Special attention must be paid to the rope end connections. Any suspected changes in the condition of the rope must be reported and the rope must be inspected by a trained expert inspector in accordance with the section “Points to check on the rope”.
In the event that the lower rope layers on the drum are used infrequently or not at all, periodically unwind and rewind the entire drum under pretension. A rope is most cost-effective if it is used over its entire length. For that reason, it is recommended to use an appropriate rope length when operating the crane over longer periods.

Note

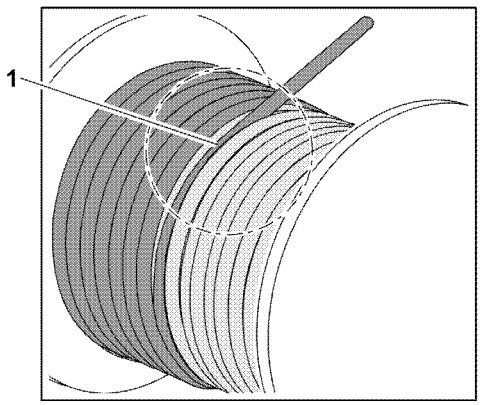
▶ If a rope is newly placed, then it must be pretensioned and placed with a pretension of at least 10% of the maximum rope pull.

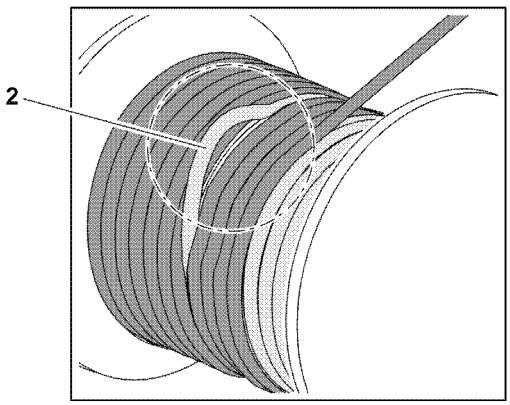
Special inspection as described in section “Points to check on the rope”

The rope must be checked after any events that may have led to damage to the rope and / or the rope ends and whenever the rope is taken back into service after being taken down and then re-installed.

2.4.2 Checking the spooling behavior of the rope on the cable drum

To avoid spooling errors and associated rope damage, it is necessary to check the spooling behavior daily. If spooling errors are determined, the rope must be reeled off until there are only 3 rope coils on the winch. Thereafter, the rope is to be tensioned with a pretension of at least 10% of the maximal rope pull and then placed again.





Possible spooling errors:
– Cutting into the lower rope layers **1**
– Loop formation in the lower rope layers **2**

2.4.3 Points to check on the rope

General

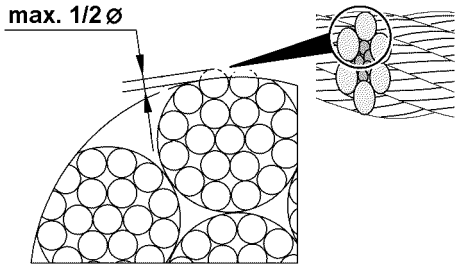
Although the entire length of the rope must be checked, particular attention must be paid to checking the following areas:

– At the rope end points on both sides, for movable as well as fixed ropes.
– The part of the rope that runs through the block or over rope pulleys; particular attention must be paid to parts of the rope that are on rope pulleys when under load (see appendix 1) in systems that carry out repeated movements.
– Parts of the rope that run over a compensation pulley.
– All parts of the rope that can be subjected to wear caused by external elements (e.g. protruding hatch surrounds).
– All parts of the rope that are subjected to the effects of heat.
– On the contact positions of the ropes when spooling up.
– Check the inside of the rope for corrosion and material fatigue.

The results of the inspection must be entered in the inspection log for the system (for typical example see section entitled “Rope inspection log” and appendix 2).

Checking the rope in the uphill pitch zones of the rope coil for flat sections

In the cross area of the coiled up rope layers, the rope is under more strain and can therefore be flattened. To void flat sections, the rope can be shortened on the rope drum fixed point.



If the wires in the outer braids are flattened to no more than maximum half the wire diameter:

– Shorten the rope by a length of 1/3 of the rope drum circumference and reset.

DANGER

Rope breakage!

If the following measures are not observed, the rope can break, the load can fall down and fatally injure personnel!

▶ Take the rope down when the take down criteria is reached, as described in section “Take down criteria”!
▶ Take the rope down when the wires in the outer braids are flattened by more than half the wire diameter!

Rope suspension and connection systems - except loops

The rope must be examined at the exits of the rope suspension and connection system, since this area is particularly susceptible to initial signs of material fatigue (wire breaks) and corrosion. The rope suspension and connection systems must also be examined for signs of deformation or wear.
Rope suspension and connection systems with pressure sleeves must undergo the same checking, and the sleeve must be checked for cracks in the sleeve material and possible slippage of the rope in the sleeve.
Detachable rope suspension systems (cotters, rope clamps) must be checked for wire breaks inside and beneath the mount or fastening; it must also be examined whether the cotters and screwed-on rope clamps are firmly connected to the rope. This check should also ensure that the requirements of the rope suspension and connection systems standards and procedural guidelines are complied with.

2.5 Take-down criteria

The safe use of the rope is assessed in accordance with the following criteria:

1.) Number of wire breaks
2.) Broken wire nests
3.) Wire break increase rate
4.) Strand breaks
5.) Rope diameter reduction, including the reduction caused by damage to the rope core
6.) External and internal wear
7.) External and internal corrosion
8.) Deformation
9.) Damage caused by the effects of heat or arc welders

These individual factors must be taken into consideration in accordance with the relevant criteria during all examinations. However, rope quality deterioration frequently results from a combination of the individual factors, meaning that a worsening effect occurs that can be detected by an expert and that influences the decision as to whether the rope has reached its rope removal limit and whether it can continue to be used.
The checker must investigate whether the deterioration has been caused by a fault in the system; if this is the case remedial action should be recommended before fitting a new rope.

2.5.1 Number of wire breaks

The number of wire breaks must be determined by visually inspecting the entire length of the rope. If a wire break is found, sections that are 30 × d (d = nominal rope diameter) in length are marked at both sides of this point. These sections must be examined extremely carefully. All wire breaks are now carefully counted in each section. Please compare the number of visible wire breaks with appendix 4. If the number of visible wire breaks is less than the number specified in the table, the area in which the most broken wires are found is marked to a length of 6 × d. Count the number of visible wire breaks again and compare the result with appendix 4. If the number of visible wire breaks is less than the number specified in the table, the rope does not have to be taken down yet.

Note
Defining the interval until the next inspection
▶ The interval until the next inspection is set depending on the number of visible wire breaks.

2.5.2 Broken wire nests

If the wire breaks are extremely close together and form wire nests, the rope must be taken down. If the frequency of such wire breaks occurs over a rope length of less than **6d** or is concentrated on one strand, taking the rope down is recommended, even if the number of wire breaks is less than the maximum number specified in the tables.

2.5.3 Wire break increase rate

For applications in which the main reason for damage to the rope is material fatigue, the first wire breaks will not occur until a certain time has elapsed, but the number of wire breaks will increase rapidly at ever-decreasing intervals.
Careful checking and logging of the increased number of wire breaks over time is recommended in these cases.

2.5.4 Strand breaks

If an entire strand breaks, the rope must be taken down.

2.5.5 Reduction in rope diameter caused by damage to core rope

The rope diameter can be reduced as a result to damage to the core because of:

1.) Internal wear and notching
2.) Internal wear due to friction between individual strands and wires in the rope, particularly if it is subjected to bending
3.) Steel core breakage
4.) Break in internal layers of multi-strand ropes

If the rope diameter (average of two diameter measurements) is reduced by 3% of the nominal diameter (rotation resistant ropes) or 10% of the nominal diameter of other ropes due to these factors, the ropes must be taken down, even if no wire breaks are visible.

Note
Diameter of new ropes
▶ New ropes can have an actual diameter that is greater than the nominal diameter, meaning that proportionally greater wear is possible.

2.5.6 External wear

Abrasion of outer wires of outer rope strands as a result of rubbing contact under pressure with the grooves in the rope reels and drums. This condition is particularly evident in moving ropes in the areas in which they come into contact with rope pulleys when the load is being moved and braked, and manifest themselves as flattened surfaces on the outer wires. Abrasion is exacerbated by a lack of or incorrect lubrication as well as the effects of dust.
Wear reduces the breaking strain of steel ropes because the cross section of the steel is reduced. The rope must be taken down if the actual rope diameter has reduced by 7% or more because of outer wear, even if no wire breaks are visible.

2.5.7 External and internal corrosion

Corrosion is a particular problem in maritime climates and atmospheres that are polluted by industrial emissions, reducing breaking strain and accelerating material fatigue because of the reduction in the rope material cross section, leading to irregular surfaces that are the starting point for stress cracks. Extreme corrosion can reduce the elasticity of the rope.

1.) External corrosion
Corrosion of the outer rope wires can be determined by visual inspection.
2.) Internal corrosion
This condition is more difficult to detect than external corrosion.

Note
Internal corrosion
▶ If there are any signs of internal corrosion the rope must be checked by a competent expert.

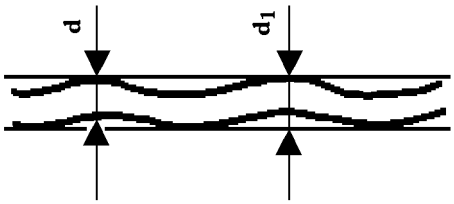
DANGER
Occurrence of internal corrosion!
▶ If the suspicion of extreme internal corrosion is confirmed, the rope must be taken down immediately.

2.5.8 Rope deformation

A visible change to the rope structure is referred to as “rope deformation” and can cause a change at the deformation point that results in irregular rope tension.
A distinction is made between the following important types of rope deformation on the basis of the rope appearance (see following sections):

1.) Corkscrew-like deformation
2.) Basket formation
3.) Strands protruding from the rope
4.) Wire loop formation
5.) Flattening
6.) Reverse bends or knots
7.) Kinks

Corkscrew-like deformation (see appendix 3, table 1)



Corkscrew-like deformation

If there is any corkscrew-like deformation the rope must be taken down if the following condition is net:

$$d_1 > \frac{4\,d}{3}$$

d = nominal diameter of rope
$\mathbf{d_1}$ = rope sheath diameter of the distorted rope

Basket formation (see appendix 3, table 2)

If there are kinks in the rope, it must be replaced immediately.

Strands protruding from the rope (see appendix 3, table 3)

The rope must be replaced immediately if this kind of deformation occurs.

Wire loop formation (see appendix 3, tables 4 and 5)

In this case, certain wires or groups of wires protrude from the rope at the side facing the rope pulley in the form of loops - this is normally the result of sudden strain. If serious deformation occurs, the rope must be taken down.

Flattening (see appendix 3, tables 8 and 9)

Flattening is the result of mechanical damage; if it is pronounced the rope must be replaced.

Reverse bends or knots (see appendix 3, tables 6 and 7)

If the rope has any reverse loops or knots it must be taken down immediately.

Kinks (see appendix 3, table 10)

Kinks are angled deformations in the rope caused by external influences. If there are kinks in the rope, it must be replaced immediately.

2.5.9 Damage caused by the effects of heat or arc welders

Steel ropes that have been subjected to extremely high temperatures, which can be detected externally because of the colouring that it causes, must be taken down.

3 Operating behavior of steel ropes

Exact logging of information by the checker can be useful for predicting the behaviour of a certain type of steel rope on a crane. This information is useful for planning and adapting maintenance instructions and controlling the stocking of spare ropes. The use of such a prediction system should not cause the examinations to be less strict or the rope usage time to be extended beyond the criteria that are specified in the previous sections of this guideline for monitoring and taking down of crane ropes.

4 Condition of equipment that is functionally associated with the rope

Note
Groove radius
▶ The radius must not be smaller than the actual diameter of the rope.

Rope drums and pulleys must be checked at regular intervals in order to ensure that all these components rotate correctly in their bearings. Stiff or blocked rope pulleys wear rapidly and unevenly and cause serious rope abrasion. Ineffective compensation pulleys can lead to irregular rope tension. The radius at the bottom of the rope grooves of all rope pulleys and the drum must be suitable for the nominal diameter of the rope. If the radius has become too big or too small the rope groove must be reworked or the rope pulley replaced.

5 Rope inspection log

The user must provide a log for each of the regular inspections in which all rope inspection information is recorded. Typical example of a log - see appendix 2.

6 Rope storage and marking

Clean, dry rope storage facilities must be provided in order to prevent damage to ropes that are not in use; it must also be ensured that the ropes can be clearly and unambiguously assigned to their checking logs.

7 Wire ropes and rope end connections

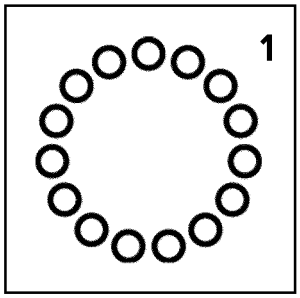
DANGER
Risk of accident!
▶ Correct choice and use of the wire rope and the rope end connections are a decisive precondition for proper and accident-free crane operation.

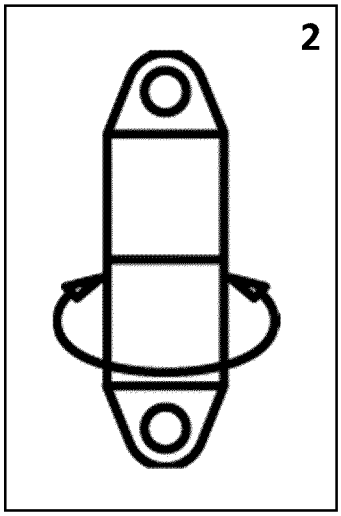
The wire ropes and rope end connections selected in accordance with their usage. It must be determined whether a rotation-resistant or non-rotation free rope is required. The type of rope that is selected then determines the type of rope end connections that are used.

7.1 Rotation-resistant ropes and their rope end connections

Rotation-resistant ropes are special ropes that produce extremely little torque and twisting at the rope end connection when they are under strain.

Note
▶ Rotation-resistant ropes are used as **hoist ropes**.





Typical rotation-resistant wire rope structures are ropes with 15 to 18 outer strands. Rotation-resistant ropes are symbolically depicted with 15 outer strands (circles) (see table **1**).
Rotation-resistant ropes can be optionally used with the following rope end connections:

– Rope end connection **rotating** in the form of a PFEIFER link **with** swivel or spin stabiliser / swivel.
– Rope end connection **non-rotating** in the form of a PFEIFER link **without** swivel or gib and cotter.

If possible, preference should be given to the use of a twisting rope end connection to reduce torsional stress with **rotation-resistant ropes** (see table **2**).

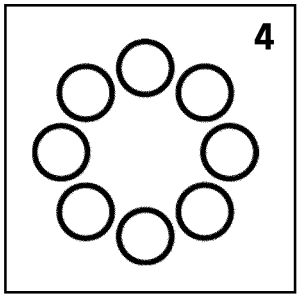
DANGER
Danger of serious personnel injury and equipment damage!
▶ **Never** use rotating rope end connections with non-rotation free ropes!

Note
Usage warning notes
▶ The usage warning notes on the rotating PFEIFER link with pulley indicates that this rope end connection may **not** be used for non-rotation free ropes (see table **3**)!

7.2 Non-rotation free ropes and their rope end connections

Non-rotation free ropes generate high torque levels at the rope end connection when they are under load. For this reason, the rope ends must be protected from twisting using an appropriate rope end connection to prevent the rope from unscrewing under strain!

Note
▶ Non-rotation free ropes are used as **guy ropes** or **control ropes**.

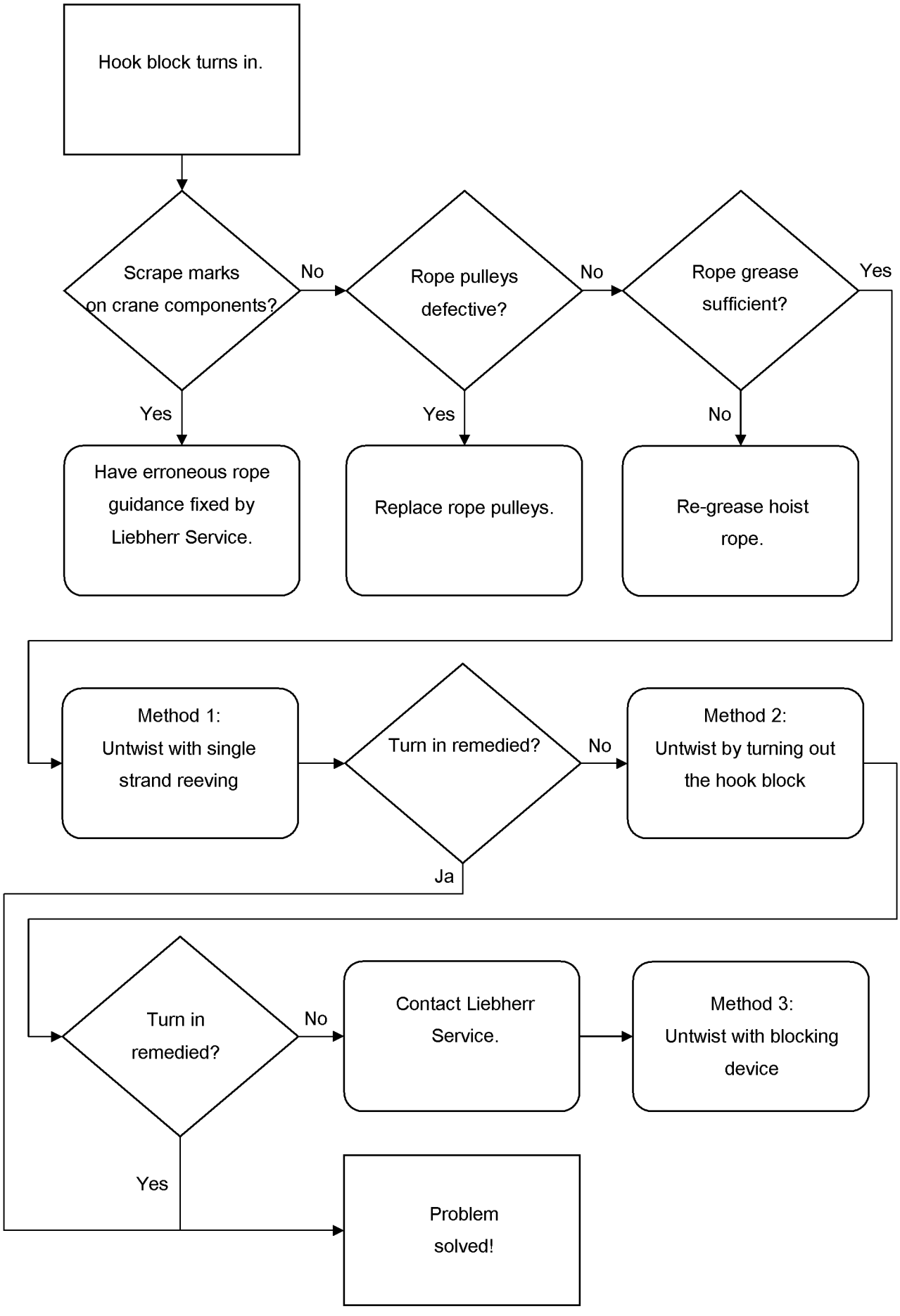


Typical non-rotation free wire rope structures are ropes with 8 to 10 outer strands. Twisting ropes are symbolically depicted with 8 outer strands (circles) (see table **4**).
Non-rotation free ropes can only be used with the following rope end connections:

– Rope end connection **non-rotating** in the form of a PFEIFER link **without** swivel or gib and cotter. A non-rotating rope end connection is also the mount of the rope on the fixed point of the winch drum.

DANGER
Danger of serious personnel injury and equipment damage!
▶ **Never** use rotating rope end connections with non-rotation free ropes!
▶ Never install a twist compensator / swivel!

Note
Usage warning notes
▶ The usage warning note on PFEIFER links without swivel and cotter indicates that this rope end connection may **not** be used for non-twist free ropes **in combination** with a twist compensator / swivel (see table **5**)!


Hook block turns in.
Scrape marks on crane components?
No
Rope pulleys defective?
No
Rope grease sufficient?
Yes
Yes
Yes
No
Have erroneous rope guidance fixed by Liebherr Service.
Replace rope pulleys.
Re-grease hoist rope.
Method 1: Untwist with single strand reeving
Turn in remedied?
No
Method 2: Untwist by turning out the hook block
Ja
Turn in remedied?
No
Contact Liebherr Service.
Method 3: Untwist with blocking device
Yes
Problem solved!

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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.

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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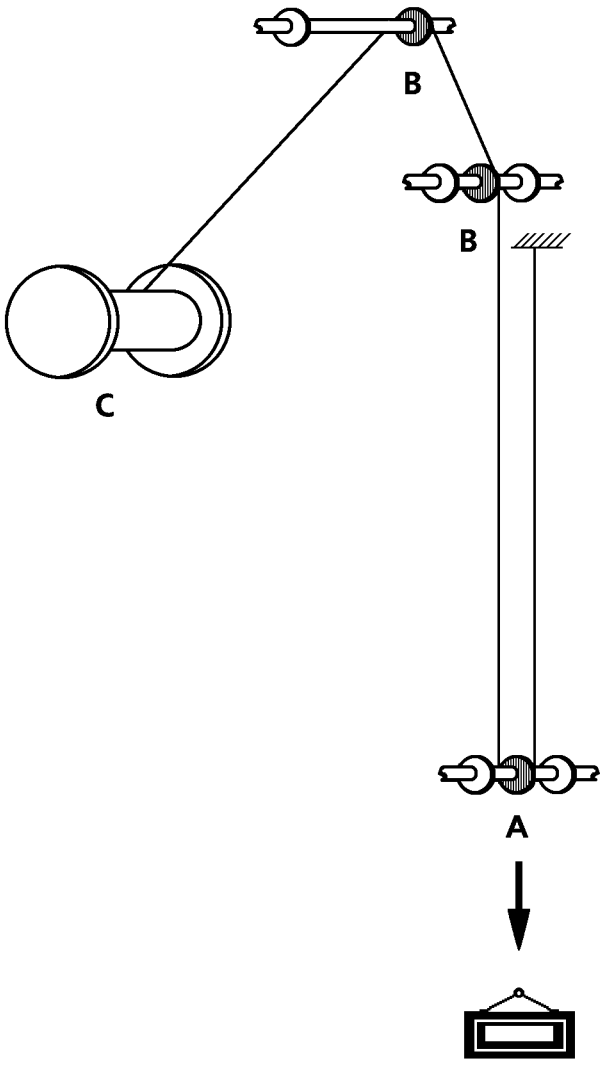

Fig. 1

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A Hook block **B** Rope pulley **C** Rope drum

9 Appendix 1

Diagram of possible defects, with reference to different areas that must be considered during inspection:

1.) Check rope end connection at rope drum
2.) Examine for incorrect spooling up, which causes deformation (crushing) and wear, which can have serious consequences at rope crossing points
3.) Examine for wire breaks
4.) Examine for corrosion
5.) Look for deformation as a result of hook block loading
6.) Inspect parts of rope that run over rope pulleys for wire breaks and wear
    - Rope suspension and rope mountings:
    - Check for wire breaks and corrosion
    - Also inspect parts of rope that run on or next to compensating pulleys
7.) Look for deformation
8.) Check rope diameter
9.) Carefully check length of rope that runs through the hook block, particularly the part that rests on the rope pulley under load
10.) Check for wire breaks and surface wear
11.) Check for corrosion

Datasheet for ropes	Machine: ..... Application: .....
Construction:	Date fitted: .....
Direction of rope lay: RH / LH [1]	Date discarded: .....
Type of lay: Ordinary / Langs [1]	
Nominal diameter:	Minimum breaking load: .....
Tensile grade:	Working load: .....
Quality: ungalvanized / galvanized [1]	
Type of core:	Diameter measured: .....
steel / natural or synthetic textile / mixed [1]	under a load of: .....
Preformation:	
Length of rope:	
Type of termination:	

Visible broken wires		**Abrasion of outer wires**	**Corrosion**	**Reduction of rope diameter**	**Positions measured**	**Overall assessment**	**Damage and deformations**
Number in length of **6 d**	Number in length of **30 d**	Degree of deterioration [2]	Degree of deterioration [2]	%		Degree of deterioration [2]	Nature

	Date: ..... Signature: .....
Rope supplier:	Number of working hours: .....
Other observations:	Reasons for discard: .....

[1] Delete as applirope
[2] In these columns, describe the latter as: slight, medium, high, very high, discard.

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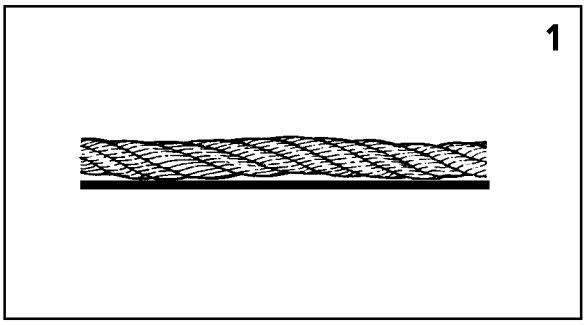
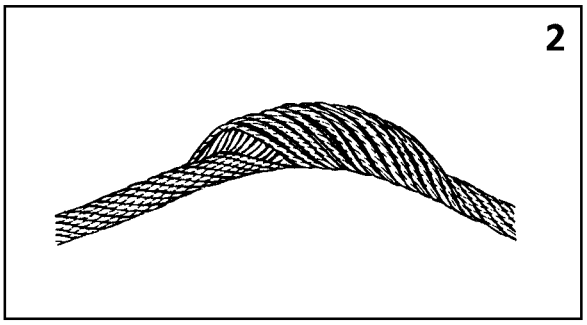
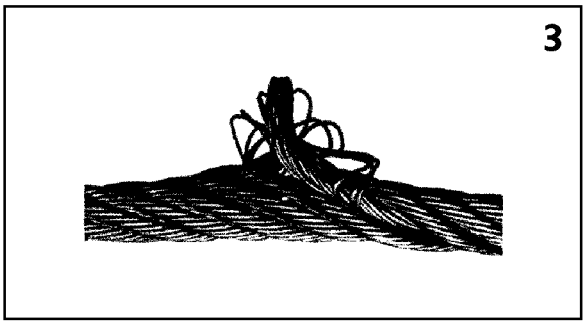
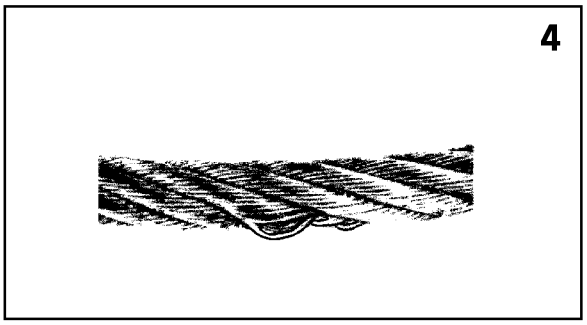
10 Appendix 2

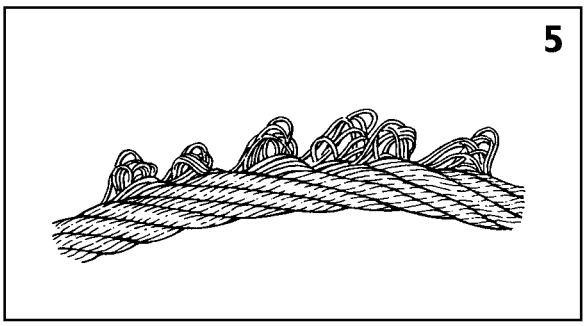
Typical example for an inspection log

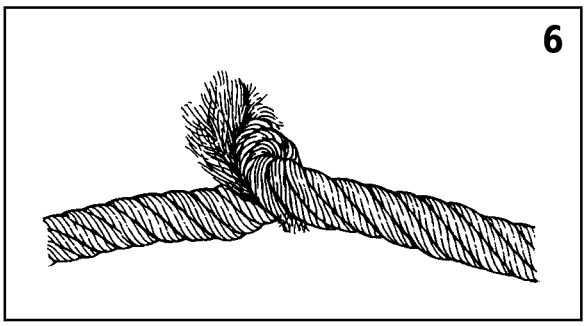


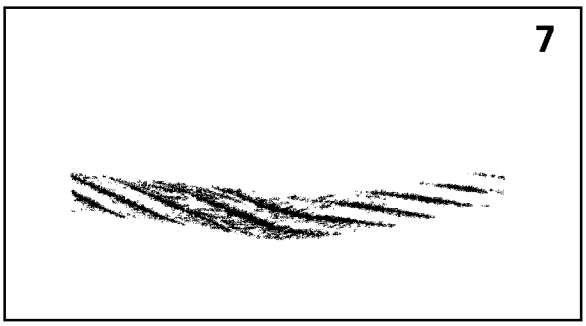


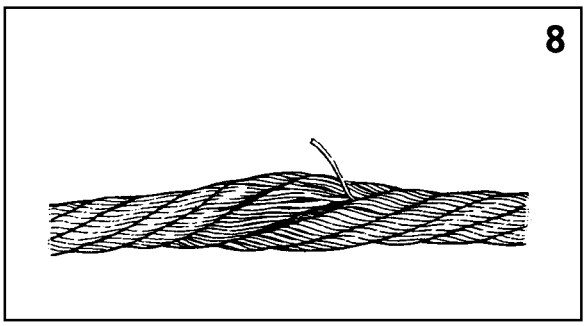


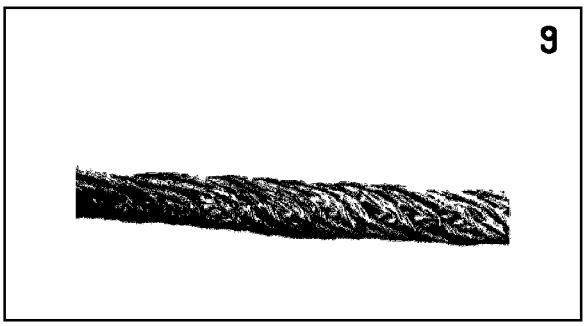


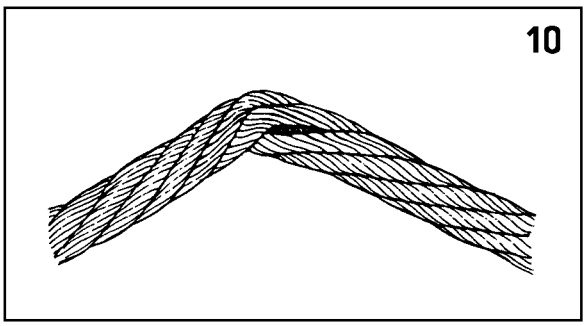












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11 Appendix 3

Note
Depiction of deformation
The deformation that is depicted on many pictures is exaggerated in order to show it more clearly.
▶ The ropes that are shown would have had to be taken down long before they reached this stage.

Typical examples of damage that can occur to wire ropes:

– Picture **1**:
  Corkscrew-like deformation: deformation where rope is in the form of a spiral along its longitudinal axis.
  The rope must be taken down if the deformation exceeds the value that is mentioned in chapter “Take-down criteria”, section entitled “Corkscrew-like deformation”.
– Picture **2**:
  Basket formation on a multi-strand rope.
  Reason for immediate rope take-down.
– Picture **3**:
  Steel core rope exit, generally in combination with basket formation in the immediate vicinity.
  Reason for immediate rope take-down.
– Picture **4**:
  Only one strand is affected by loop formation, although the examination of a longer section of rope shows that the deformation is visible at regular intervals; normally deformation along the length of a lay.
  Reason for immediate rope take-down.
– Picture **5**:
  Serious worsening of the previous problem (see picture **4**) (typical of hoist rope in a ram system).
  Reason for immediate rope take-down.
– Picture **6**:
  A serious reverse bend or knot.
  Note the destroyed lay that leads to the exit of the fibre layer.
  Reason for immediate rope take-down.
– Picture **7**:
  A wire rope that has been kinked during installation but still taken into operation, and now suffers from localised wear and substandard rope tension.
  Reason for rope take-down.
– Picture **8**:
  Crushing as a result of local mechanical damage causing imbalance beneath the strands, resulting in wire breaks.
  Reason for rope take-down.
– Picture **9**:
  Crushing of a multi-strand rope caused by incorrect spooling up on the rope drum.
  Note increase in length of outer strands of lay. Here too, imbalance would occur under load.
  Reason for rope take-down.
– Picture **10**:
  Example of serious kinking.
  Reason for rope take-down.

12 Appendix 4

Guideline for number of wire breaks in accordance with ISO 4309
for power train classification groups M1, M2, M3 and M4

12.1 Wire ropes

12.1.1 Hoist ropes

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
see chapter 1.03	2	4

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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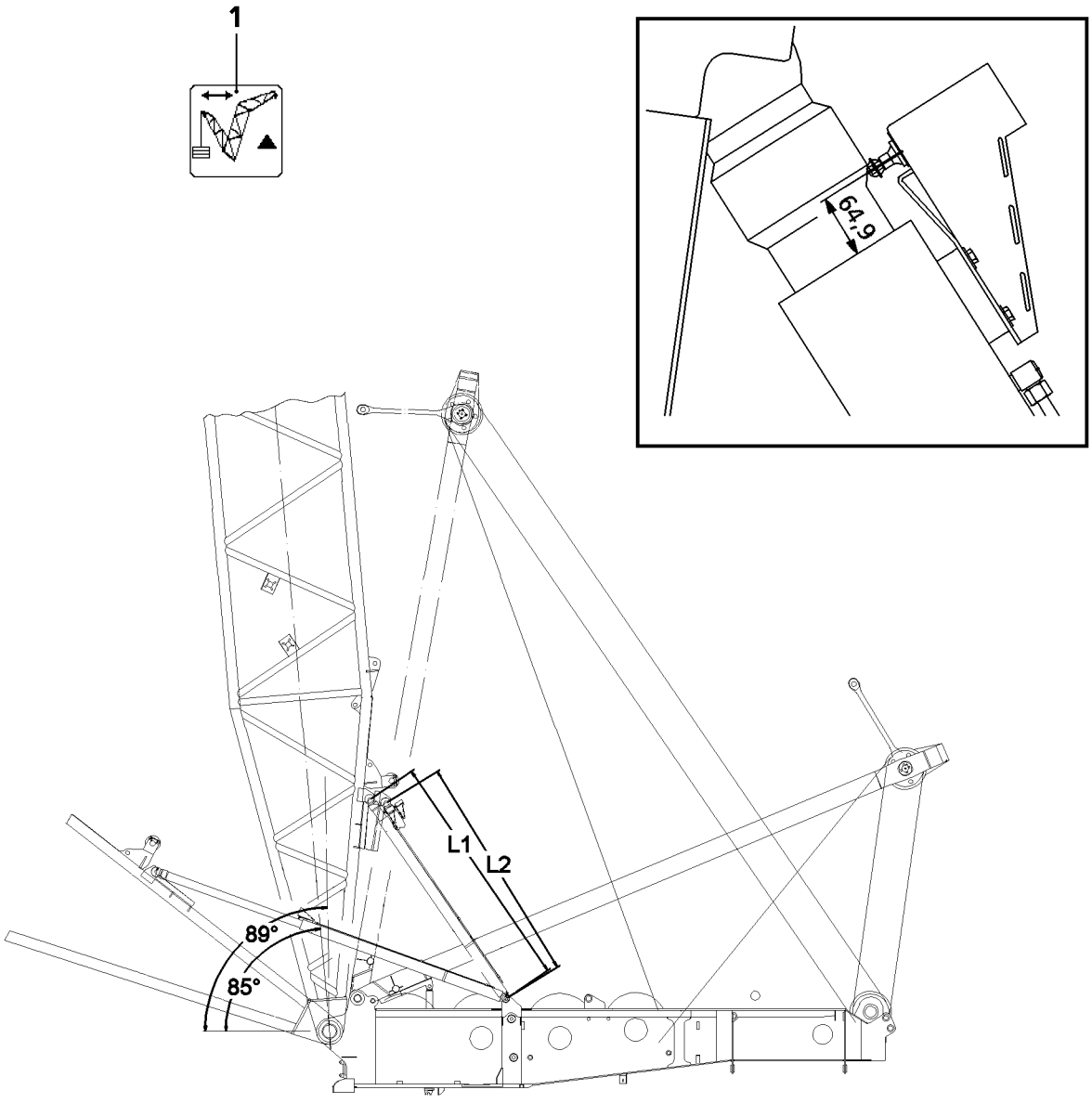


B105795

1 Boom relapse retainer

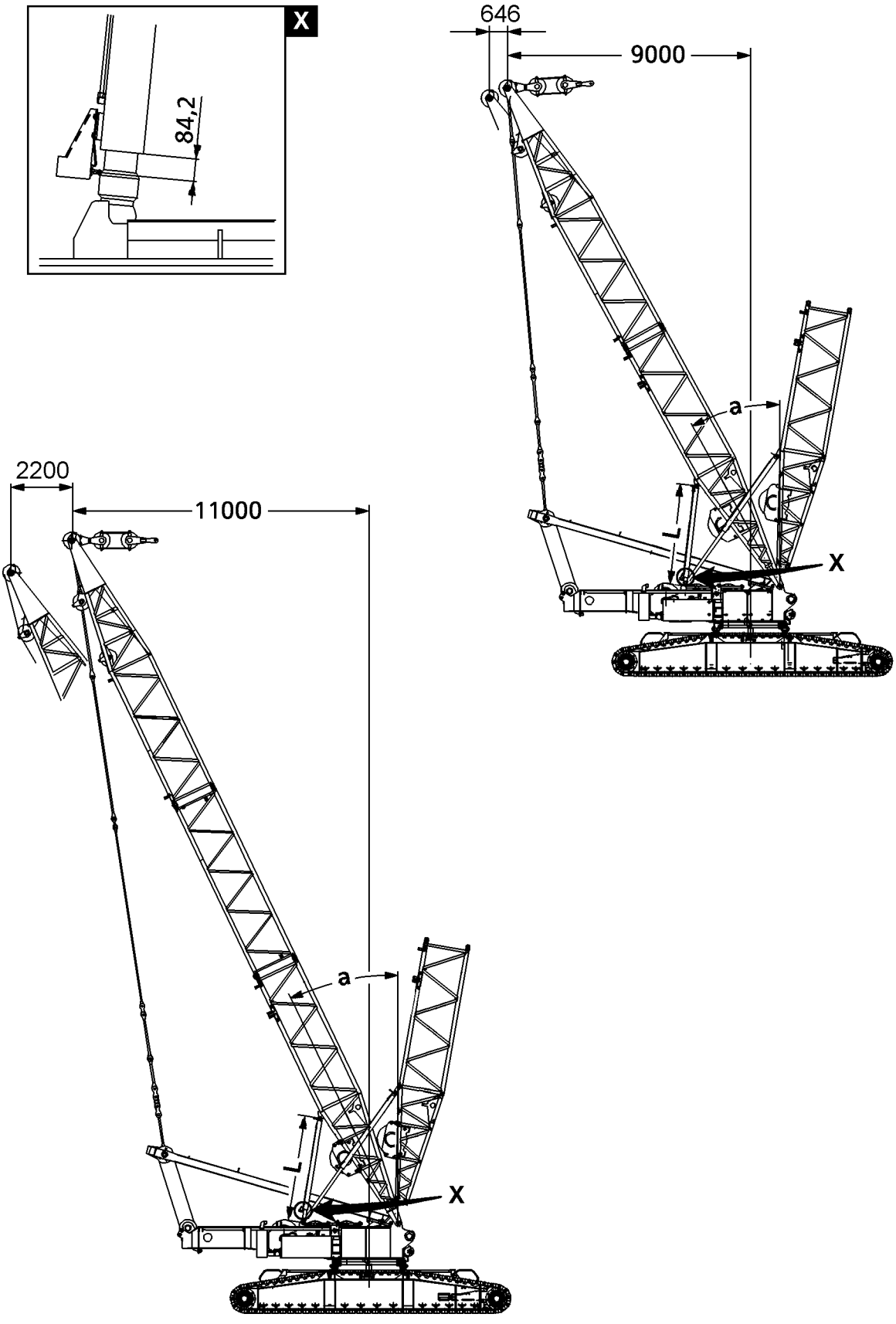
Two hydraulic cylinders prevent the boom from falling backward.
They are controlled on high or low pressure, depending on the operating mode or boom length.
In steepest boom position, the luffing up movement is turned off by the actuated limit switches in the cylinders.

1.1 Checking limit switch initiators for function

Cover limit switch initiators on the relapse cylinder individually with a metal plate.

– The boom “luffing up” movement must turn off.
– The icon **1** must appear on the LICCON monitor.

	L-operation **S-operation** **SL-operation**	**LL-operation**	**LN-operation** **SW-operation** **SLN-operation**	**LD-operation** **SD-operation** **SLD-operation**	**SDW-operation**
Operating position	85°	83°	87°	85°	87°
Cylinder length **L1**	3655 mm	3741 mm	3568 mm	3655 mm	3568 mm
Electric switch position	88°	88°	88°	88°	88°
Cylinder length	3524 mm	3524 mm	3524 mm	3524 mm	3524 mm
Block position	89°	89°	89°	89°	89°
Cylinder length **L2**	3480 mm	3480 mm	3480 mm	3480 mm	3480 mm



B198562

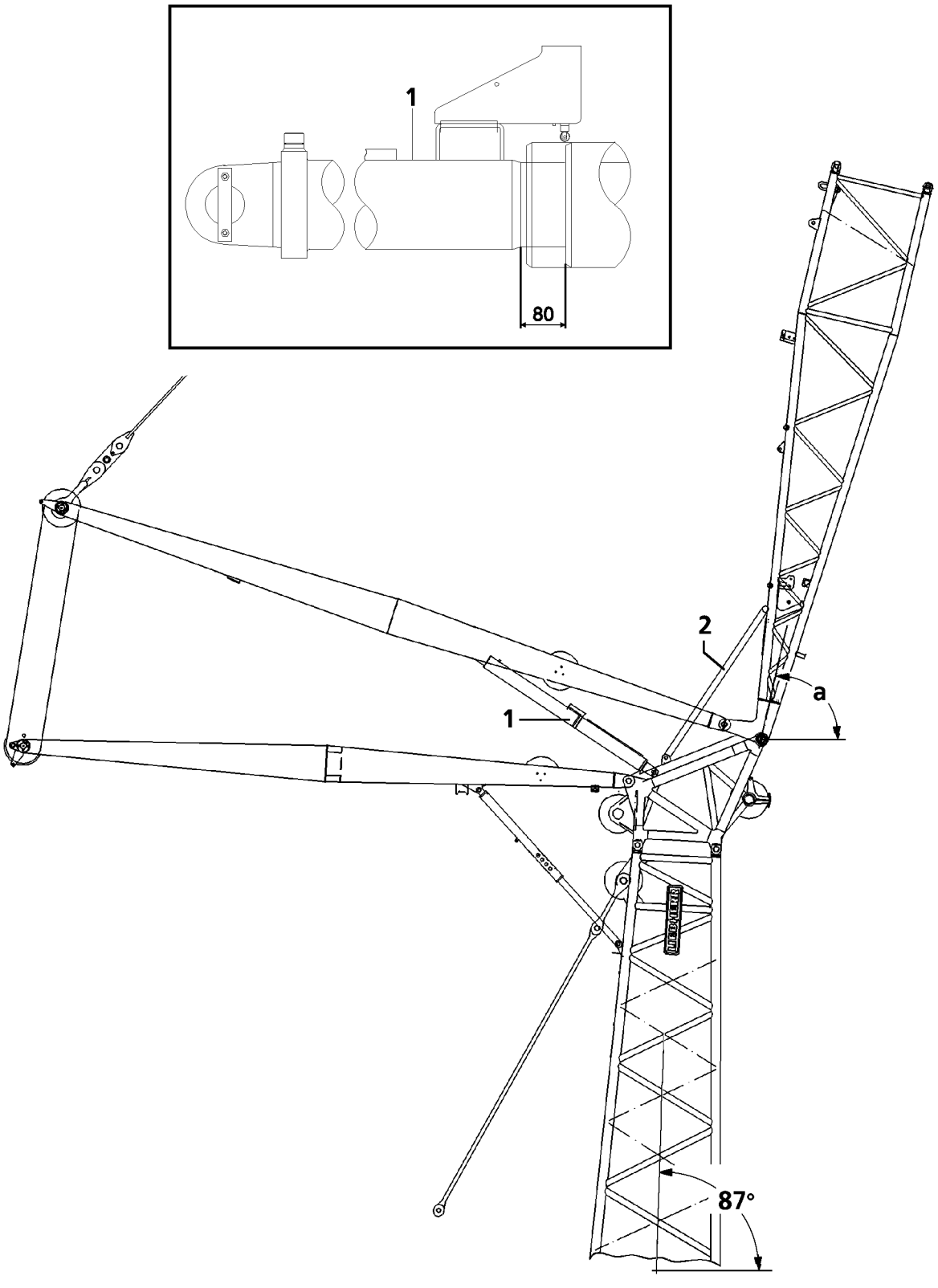
2 Derrick relapse retainer

Two hydraulic cylinders prevent the derrick from falling backward.
– If the limit switches on the cylinders are actuated, the winch 4 “spool up” movement is turned off.

2.1 Checking limit switch initiators for function

Cover limit switch initiators on the D-relapse cylinder individually with a metal plate.
– The D-boom “luffing up” movement must turn off.

	D-21/9m	**D-28/9m**	**D-28/11m**
Distance center of rotation - derrick head	9000 mm	9000 mm	11000 mm
Theoretical operating position (a)	28,7°	21,1°	25,5°
Cylinder length	3726 mm	4182 mm	3915 mm
Distance center of rotation - derrick head	9330 mm	12798 mm	12798 mm
Electric switch position	29,7°	29,7°	29,7°
Cylinder length	3665 mm	3665 mm	3665 mm
Distance center of rotation - derrick head	9646 mm	13220 mm	13220 mm
Block position	30,7°	30,7°	30,7°
Cylinder length	3600 mm	3600 mm	3600 mm



B105796

3 N-lattice jib

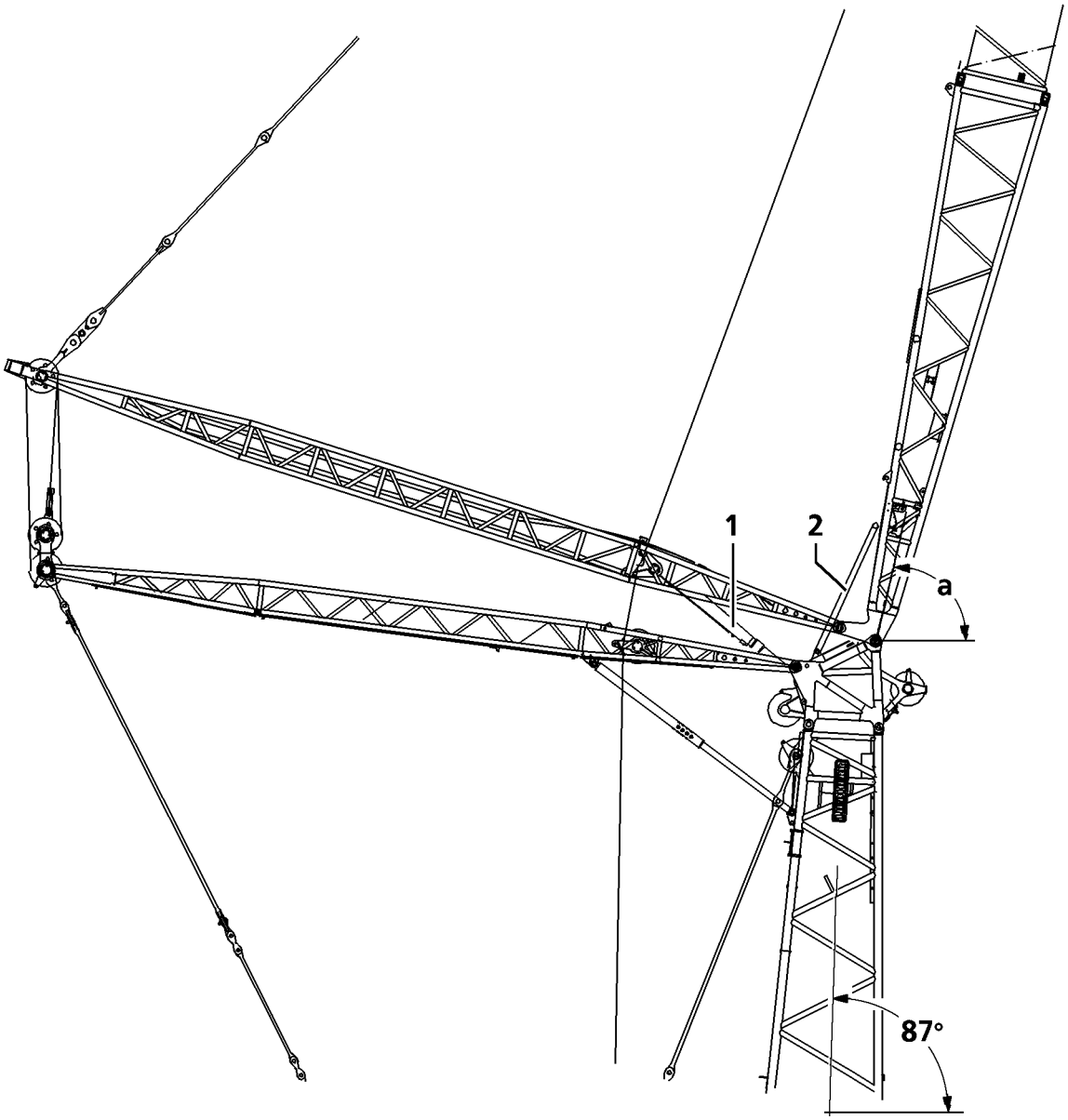
3.1 Checking limit switch initiators for function

Cover limit switch initiators on the N-relapse cylinder **1** individually with a metal plate.

– The N-control winch movement “spooling up” must turn off.

After successful test, reset the A-brackets to set up condition.

	Lattice jib angle a	**Cylinder length**	**Stroke**	**Pressure at**			
				- 20 °C	**0 °C**	**+20 °C**	**+40 °C**
Flattest operating position	25°	–	–	–	–	–	–
Steepest operating position	80°	4920 mm	1380 mm	273.0 bar	294.0 bar	315.5 bar	336.5 bar
Mechanical block position through relapse support	83°	–	–	–	–	–	–
Test position accumulator cylinder	38°+2°	6100 mm	200 mm	64.5 bar	69.5 bar	74.5 bar	79.5 bar
Accumulator cylinder extended all the way	32°	6300 mm	0 mm	57.5 bar	62.0 bar	66.5 bar	71.0 bar



B188549

4 W-lattice jib

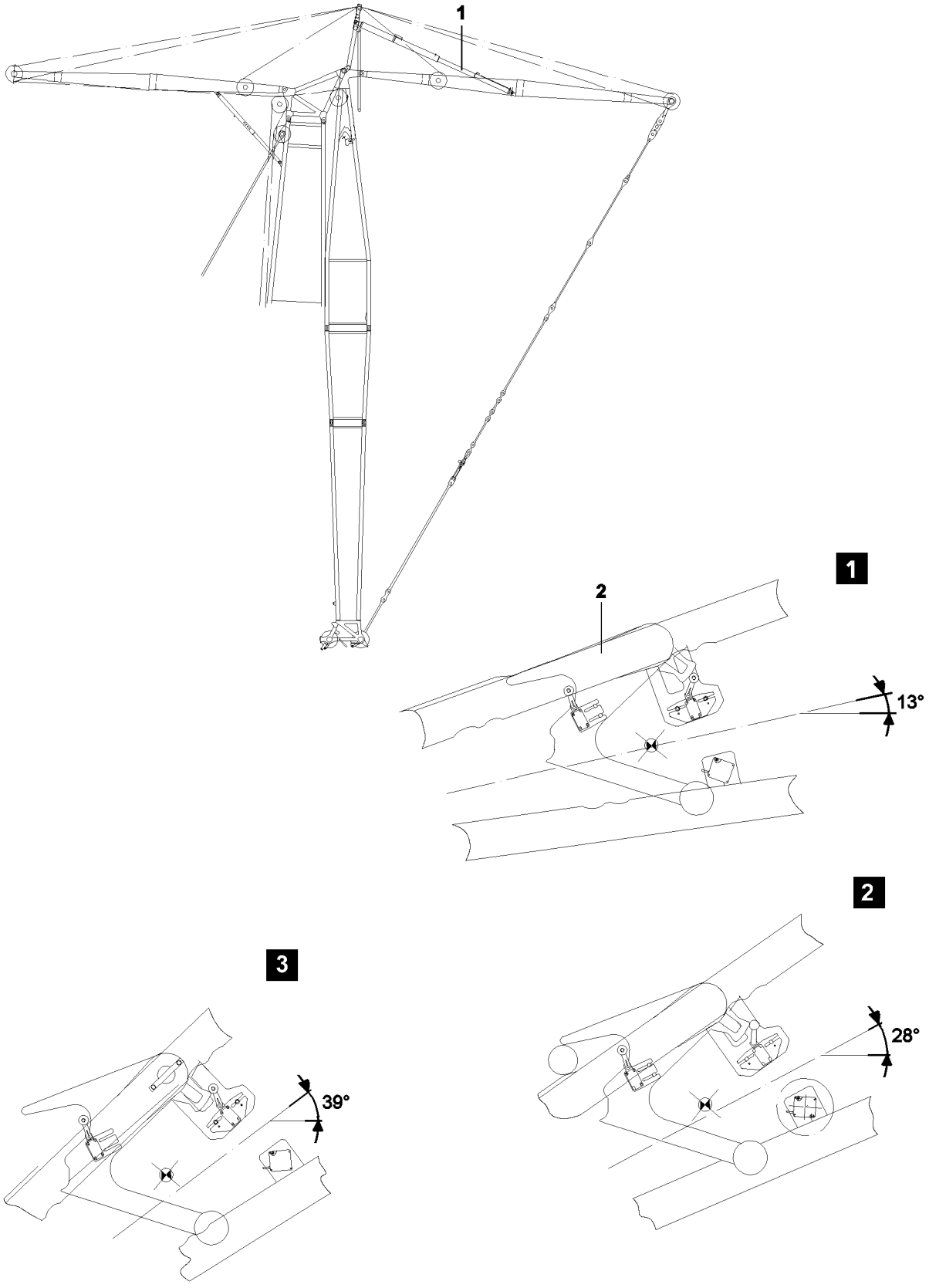
4.1 Checking limit switch initiators for function

Cover the limit switch initiators individually with a metal plate.

– The W-control winch “spool out” movement must turn off.

– Limit switch initiators, see fig.

	Lattice jib angle a	**Cylinder length**	**Stroke**	**Pressure at**			
				-20 °C	**0 °C**	**+20 °C**	**+40 °C**
Flattest operating position	25°	maximum	–	–	–	–	–
Steepest operating position	80°	3735 mm	85 mm	280.0 bar	303.0 bar	326.0 bar	336.5 bar
Mechanical block position through retention support	83°	3659 mm	–	–	–	–	–
Test position accumulator cylinder	38°+2°	4801 mm	1151 mm	95.5 bar	103.6 bar	111.3 bar	118.5 bar
Accumulator cylinder extended all the way	36,2°	4850 mm	1200 mm	93.0 bar	100.5 bar	108.0 bar	115.0 bar



B105797

4.2 Function check of limit switch initiators on the mechanical relapse retainer

Mechanical relapse support **1**
Oscillating safety **2** for mechanical relapse support

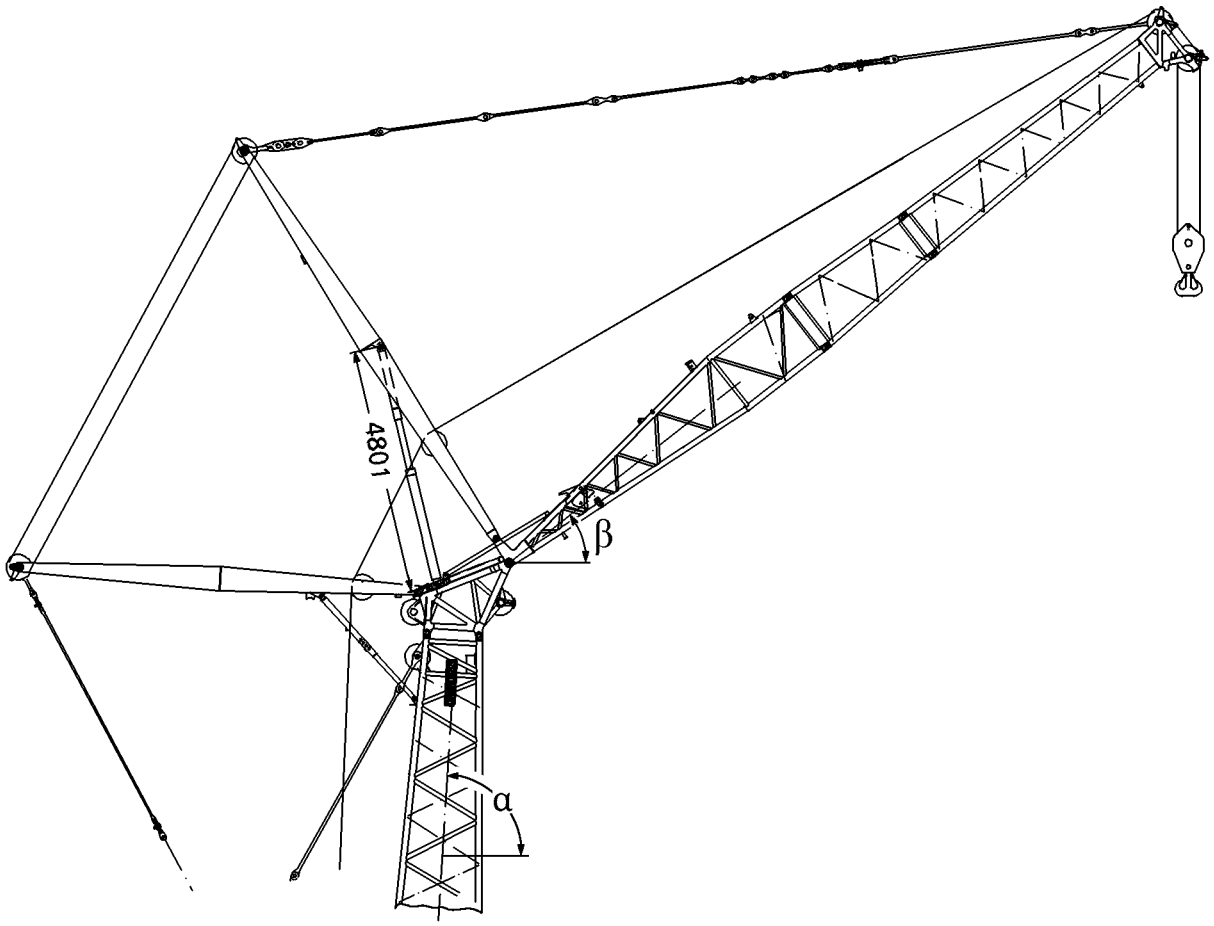
In addition to the relapse cylinders, the lattice jib is also secured by a mechanical relapse support **1**, which engages in steepest lattice jib position into the flap of the oscillating safety **2**. The luffing up movement is turned off by the actuated limit switches on the oscillating safety.

WARNING
Danger of tipping over if the oscillating safety is hard to move!
If the oscillating safety **2** is hard to move, the mechanical relapse retainer will no longer function. The W-lattice jib can tip backwards uncontrolled and cause the crane to topple over!

- ▶ Crane operation with hard to move oscillation safety **2** is prohibited!
- ▶ Before erection, the pendulum of the mechanical relapse retainer must be checked for easy movement over the complete swing range of the pendulum.

Depending on the lattice jib position (boom position = 87 °), the flap on the oscillation safety is swung out by the weight of the pendulum:

- 13 ° the flap is swung in, see fig. **1**.
- 28 ° the flap can be pushed up, see fig. **2**.
- 38 ° the flap is swung out, see fig. **3**.



B105466

1 Inspection of accumulator pressure in relapse cylinder

The accumulator pressure in the relapse cylinder must be checked before and during crane operation via the LICCON operating screen, see “Diagnostics”.
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:
– To check the accumulator pressure “fully extend the relapse cylinder”.
– Check the accumulator pressure with the “relapse cylinder in test position”.

1.1 To check the accumulator pressure, “fully extend the relapse cylinder”

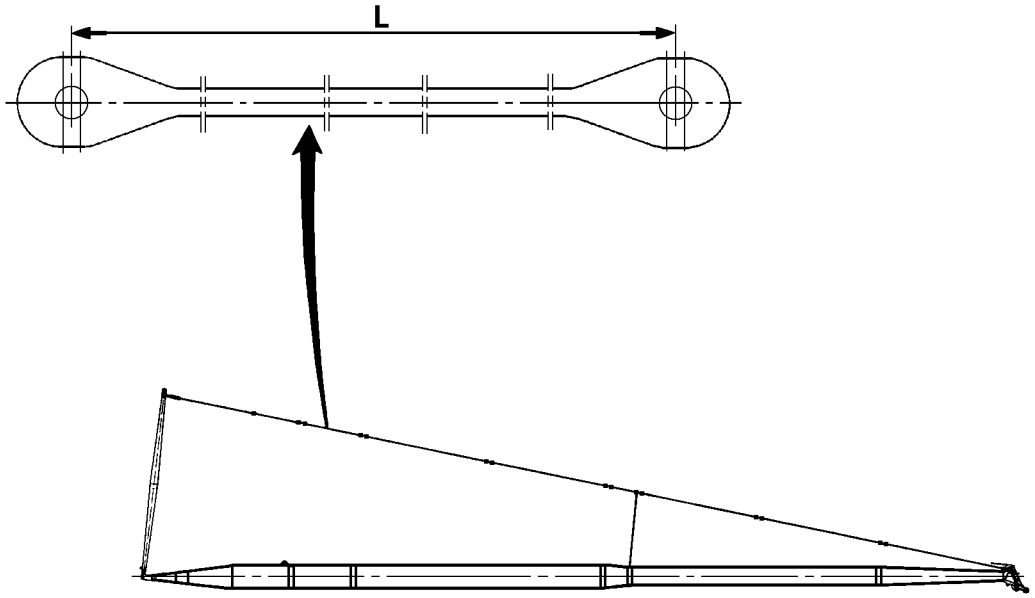
– Set the main boom and the lattice jib to the angle specified in the chart.
– Compare the nominal pressure in the chart with the actual pressure in the LICCON operating screen.

“Extend the relapse cylinder fully”							
Boom angle α	**Lattice jib angle β**	**Cylinder length**	**Stroke**	**Nominal pressure at**			
				-20 °C	0 °C	20 °C	40 °C
87 °	36,2 °	4850 mm	1200 mm	83 bar	100.5 bar	108 bar	115 bar

1.2 Checking 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 at**			
				-20 °C	0 °C	20 °C	40 °C
87 °	38 + 2 °	4801 mm	1151 mm	95.9 bar	103.6 bar	111.3 bar	118.5 bar



B180875

1 General

Always check the entire length of the guy rods before every assembly.
Also check the concealed bearing surfaces and bores.

2 Repeat inspection of guy rods

The guy rods must be checked at least once a year by an expert according to VGB D6.
The inspection must be carried out by an authorized expert every 4 years.
If a load was dropped or if the crane was overloaded, an additional inspection by an expert is required.
The inspections must be documented.

DANGER
Risk of accident in case of guy rod failure!
▶ If the following damage is found, the guy rods may no longer be used and must be replaced immediately!

2.1 Cracks and dents

The guy rods must be thoroughly inspected visually for cracks and dents.
If cracks are present, the guy rods must be replaced. Repairs are not permitted.

Note
▶ In case of doubt, the relevant areas must be carefully examined, for example with magnetic crack detection!

2.2 Stretching

Check for guy rod stretching by measuring the guy rods.
The stretch may be no more than max. 0.2 %, for example 14 mm, for an initial dimension (L) of 7000 mm.

Note
▶ The initial dimension (L) of the guy rods is noted in the separate rod diagram!

2.3 Wear

Check the bores, pins and pin retainers for signs of wear.

2.4 Damaged paint

Check the paint on the guy rods at regular intervals (signs of corrosion).
Repair damaged paint.

Note
▶ The guy rods may not be stored in aggressive media, such as salt water!

2.5 Ductile distortion

After a ductile distortion, such as bending, the guy rods must be replaced.

9.00 General notes

B195219

1 Daily checking

The following checks are to be carried out daily and before each start-up:

– Check that all oil and fuel lines are leak-free and dry.
– Check that the injection pump, fuel and oil filters are leak-free.
– Check that the hydraulic units, fan drive hydraulic motors and their supply lines are leak-free.
– Check that the exhaust system and exhaust flange are leak-free.
– Check whether the exhaust flap retention flap is free.
  The return springs that open the exhaust flaps must function properly, because seized, and therefore closed exhaust flaps during engine operation will result in considerable overheating.
– Inspect electrical wiring and ensure that there is sufficient clearance to hot exhaust system piping and that it is properly fastened and that there is no insulation damage.
– Inspect the soundproofing mats for soiling from solutions and large quantities of oil or fuel, as well as other damage.
  Immediately remove any soundproofing mats that are excessively damaged or soiled and replace them with new ones.
  Observe the care instructions in the maintenance chapter regarding sound damping when cleaning the engine or gearbox room.

2 Repair and maintenance tasks

Note

▶ Repair and maintenance tasks are to be carried out carefully!

Take particular precautions regarding cleanliness when replacing diesel and oil filters. Remove any diesel fuel or oil that has leaked. Perform a test run on the systems to ensure that there are no leaks.
The diesel engine V-room must be inspected regularly, and any oil or diesel fuel must be cleaned up, particularly after repairs and servicing. Any fuel that has collected in V-room can spread throughout the engine room while the crane is travelling on the road and can ignite if it comes into contact with hot surfaces.
We stress that all electrical wiring must be installed according to the regulations and must be properly fastened. Immediately repair any wiring insulation that exhibits signs of chafing or brittleness as a result of operational activities. Any wiring that is not in perfect condition is to be immediately and professionally replaced.
We would like to particularly emphasise that over time fuel and oil lines can become brittle or porous as they age. Any hoses that appear to be excessively porous should be replaced immediately, see crane maintenance chapter.

3 Important servicing

The following service tasks are to be carried out regularly:

– Check gearbox and engine oil levels regularly.
  Add oil as required during normal operation. If oil consumption or loss is unusually high, determine the cause and correct.

4 Maintenance notes for replacement parts

The following is to be considered when replacing drive components such as engine, gearbox or axles:

– Before re-starting, be sure to refill with the correct type of oil to the centre of the min. - max. markings.
  Refer to the nameplate and operating materials and lubricants to determine the oil type.
– Conduct initial maintenance according to chapter “Maintenance intervals”; thereafter, maintain in accordance with the specified maintenance intervals.
– Maintain break-in instructions, see chapter 2.02.

5 Instructions for travel operation

NOTICE
Engine damage!
If the permissible engine speed in exceeded, the engine can be seriously damaged!
▶ Do not exceed the permissible engine rpm!

6 Disposal of fuels and greases

Note
Engine, gearbox and hydraulic oils, brake fluids, grease and fuels are dangerous waste materials!
▶ These materials must be disposed of separately!
▶ These materials may not be disposed of in the ground or in any bodies of waters: wastewater systems, sewers or groundwater!
▶ Comply with the regulations specified by local authorities before disposing of any of these items or substances!

Note
Radiator fluid for diesel motors and heating systems are dangerous waste materials!
▶ Undiluted antifreeze / anti-corrosion agents must be handled as dangerous waste materials!
▶ Follow the regulations of the local authorities when disposing of used cooling fluids (mixture of antifreeze / anti-corrosion agents solution and tap water).

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