LIEBHERR
LATTICE BOOM CRAWLER TRACK CRANE

LR 1400/2

crane no:015086, 015099, 015107, 015108,

015113 (047018), 074029, 074035,

074257, 074265, 074290

Operating instructions

BAL-No. **12494-01-02**

pages : 1 up to 1025

Crane number	
Date	

The operating instructions are part of the crane !

Always keep on hand !

Comply with road travel and crane operating regulations !

LIEBHERR-WERK EHINGEN GmbH, Postfach 1361, D-89582 Ehingen / Donau

Telefon (07391) 5 02-0, Telefax (07391) 5 02-33 99

www.lwe.liebherr.de, E-mail: info@lwe.liebherr.com

These operating instructions should enable you to operate the crane safely and utilize its capabilities to the fullest extent possible. They also provide notes on how important sub-assemblies and systems function.

Certain terms are used in these operating instructions, and in order to avoid misunderstandings while operating, these terms should be used consistently.

D A N G E R : **Only qualified and especially trained personnel may work on this crane! If this is not assured, the change of causing a serious accident is greatly increased!**

All regulations and guidelines applicable to the job site, such as accident prevention regulations and all guidelines and regulations stated in the Operation Manual must be strictly adhered to.
All accident prevention and operating guidelines and regulations, etc. assume that the crane is strictly used for lifting and transporting of loads, which are not stuck. Any other application or use does not constitute ”specified and proper use”.

C A U T I O N : **Pile driving and pulling tasks with vibration machinery, for example pulling pile plankings, may only be carried out in connection with attenuator pads and may only be performed after consultation with the crane manufacturer.**

Any risks associated with unspecified or improper use are the sole responsibility of the crane's owner, operator or user.

Using these instructions

- **makes it easier** to become familiar with the crane
- **avoids** malfunctions due to improper operation

Observing these instructions

- **increases** reliability in operations
- **increases** the operating life of the crane
- **reduces** repair costs and down-time

Always keep these operating instructions handy in the driver's and crane cab - they are an integral part of the crane!

Operate this crane only with a thorough knowledge of its capabilities and limitations and in strict observance of these instructions.

If you receive further information on the crane from us, e.g. in the form of technical information letters, this must be observed and filed with the operating instructions.

If there are parts of these instructions or individual chapters that you do not understand, please do not hesitate to ask us before you begin operation - we are glad to answer any inquiries you may have.

These operating instructions are to be read and the information in them is to be observed by all persons operating, maintaining, or otherwise working in any capacity on this crane.

Notes
Throughout these instructions, the terms **"Note", " C A U T I O N "** and **" D A N G E R "** occur - these refer any persons working with the crane to IMPORTANT OPERATING METHODS that must be observed.

Note: The term **"Note"** is used whenever the observance of certain instructions or notes is economically meaningful to the utilization of the crane.

C A U T I O N : **The term " C A U T I O N " is used whenever damage to the crane can occur if the operating instruction(s) is not observed and adhered to.**

D A N G E R : **The term " D A N G E R " is used whenever the nonobservance of the warning given may injure or lead to the death of persons and damage to the crane.**

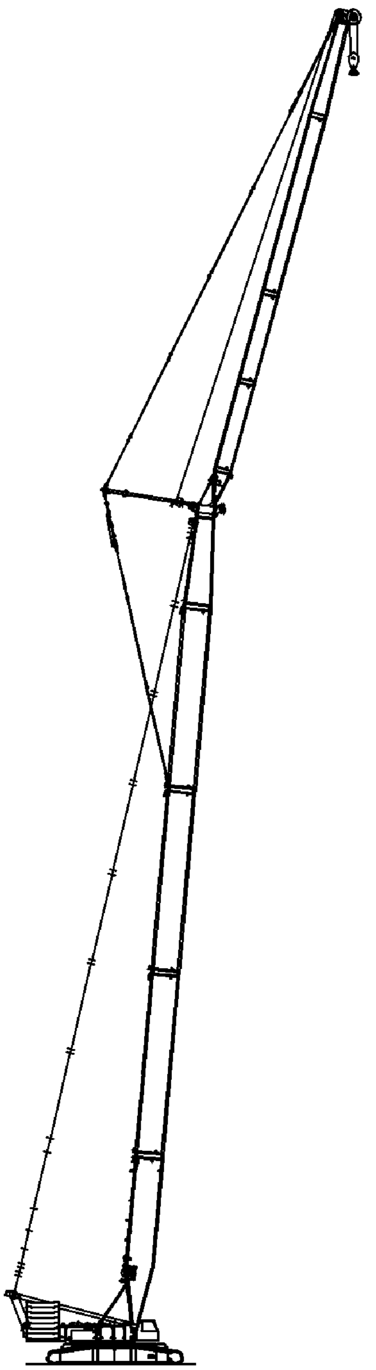
Safety devices
The safety devices integrated into the crane system deserve your special attention. They must always be checked to see that they are functioning properly. If they do not function or function incorrectly, the crane may not be operated. Your motto should always be:

" S A F E T Y F I R S T "

This crane has been designed for both crane operation and travel operation, in accordance with valid guidelines, and has been inspected and approved by the respective authorities

D A N G E R : **Should modifications, manipulations or replacement of originally installed components (e.g. dismantling of components, installation of components other than original parts) be carried out by unauthorised personnel, authorisation of crane operation, as well as manufacturer warranty are rendered immediatly invalid.**

CONTENTS



195116

CONTENTS

CONTENTS

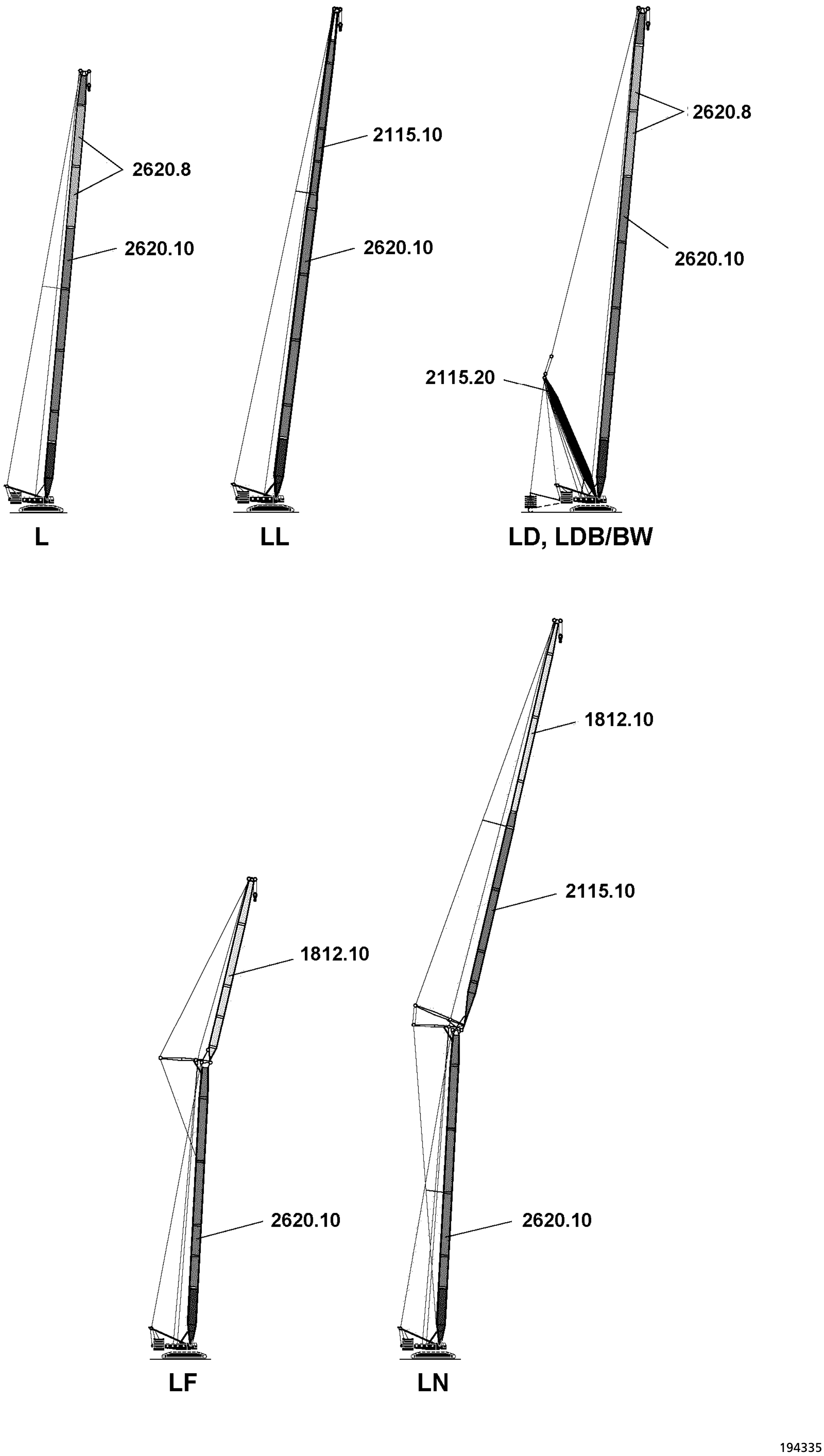
CONTENTS

CONTENTS

CONTENTS

Chapter 1

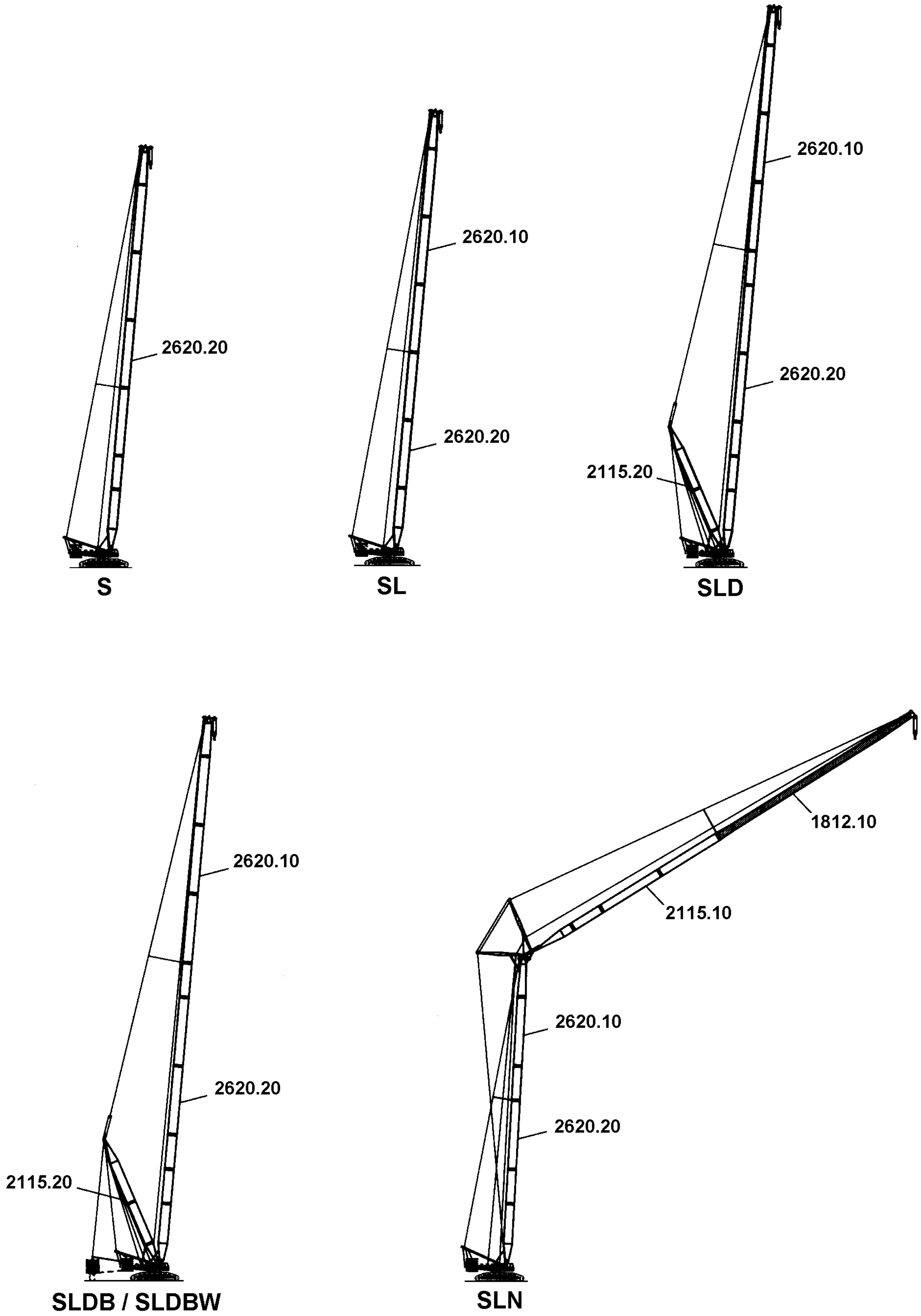
Description of the Crane


2620.8
2620.10
L
2115.10
2620.10
LL
2620.8
2620.10
2115.20
LD, LDB/BW
1812.10
2620.10
LF
1812.10
2115.10
2620.10
LN
194335

Short description of boom systems

L	-	Lattice boom
LL	-	Lattice boom, light version
N	-	Fly jib, light
F	-	Lattice fly jib
D	-	Derrick
B	-	Suspended ballast
BW	-	Ballast trailer

Boom combination							**System**
L	- Boom combination	L	=	21.0 m	-	98.0 m	2620.**10** / 2620.**8**
LL	- Boom combination	LL	=	49.0 m	-	105.0 m	2620.**10** / 2115.**10**
LD, LDB, LDBW	- Boom combination	L	=	28.0 m	-	105.0 m	2620.**10** / 2620.**8**
		D	=	21.0 m	-	28.0 m	2115.**20**
LN	- Boom combination	L	=	21.0 m	-	70.0 m	2620.**10**
		N	=	21.0 m	-	91.0 m	2115.**10** / 1812.**10**
LF	- Boom combination	L	=	35,0 m	-	70,0 m	2620.**10**
		F	=	10,5 m	-	38,5 m	1812.**10**

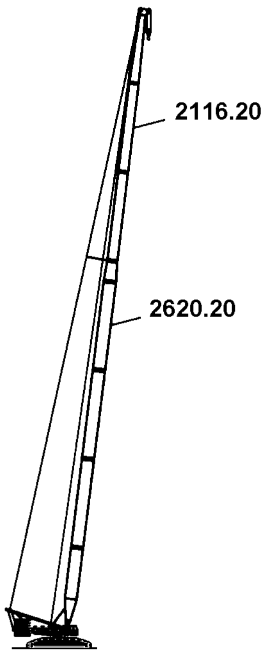

2620.20
S
2620.10
2620.20
SL
2620.10
2620.20
2115.20
SLD
2620.10
2620.20
2115.20
SLDB / SLDBW
1812.10
2115.10
2620.10
2620.20
SLN

189660

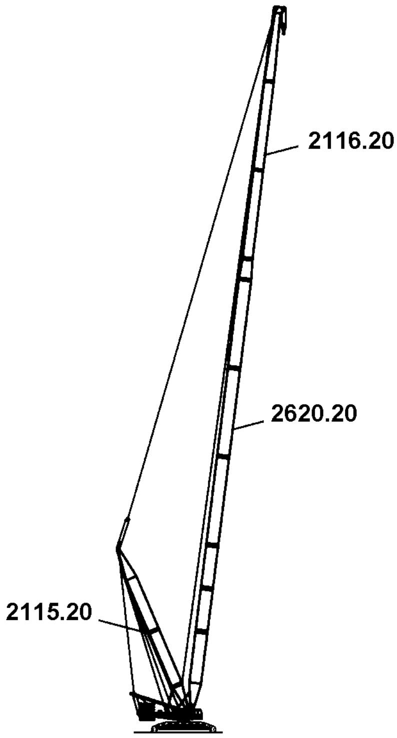
Short description of boom systems

S	-	Lattice boom, heavy
L	-	Lattice boom, light
N	-	Fly jib, light
D	-	Derrick
B	-	Suspended ballast
BW	-	Ballast trailer

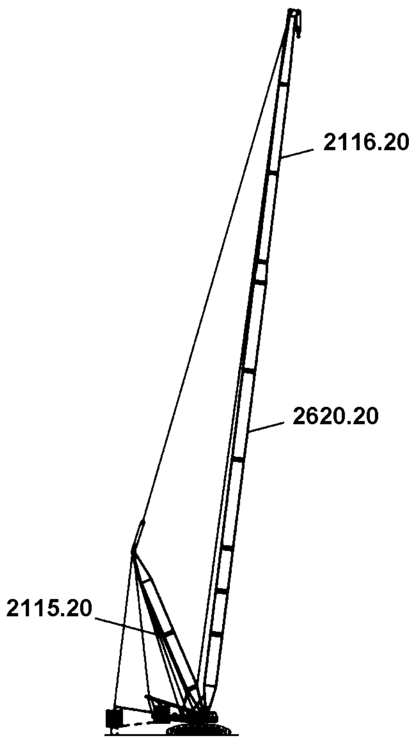
Boom combination							**System**
S	- Boom combination	S	=	21.0 m	-	84.0 m	2620.**20**
SL	- Boom combination	SL	=	21.0 m	-	91.0 m	2620.**20** / 2620.**10**
SLD	- Boom combination	SL	=	28.0 m	-	112.0 m	2620.**20** / 2620.**10**
		D	=	21.0 m	-	28.0 m	2115.**20**
SLN	- Boom combination	SL	=	21.0 m	-	70.0 m	2620.**20** / 2620.**10**
		N	=	21.0 m	-	91.0 m	2115.**10** / 1812.**10**
SLDB / SLDBW	- Boom combination	SL	=	28.0 m	-	112.0 m	2620.**20** / 2620.**10**
		D	=	21.0 m	-	28.0 m	2115.**20**



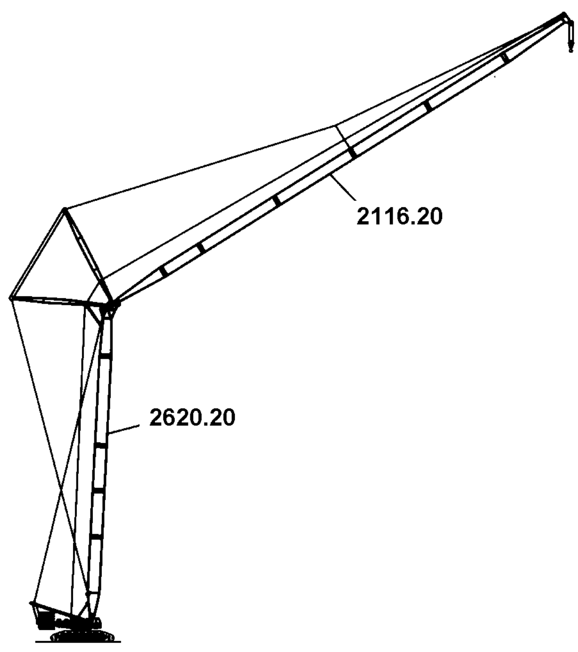
Sw



SwD



SwDB / SwDBW



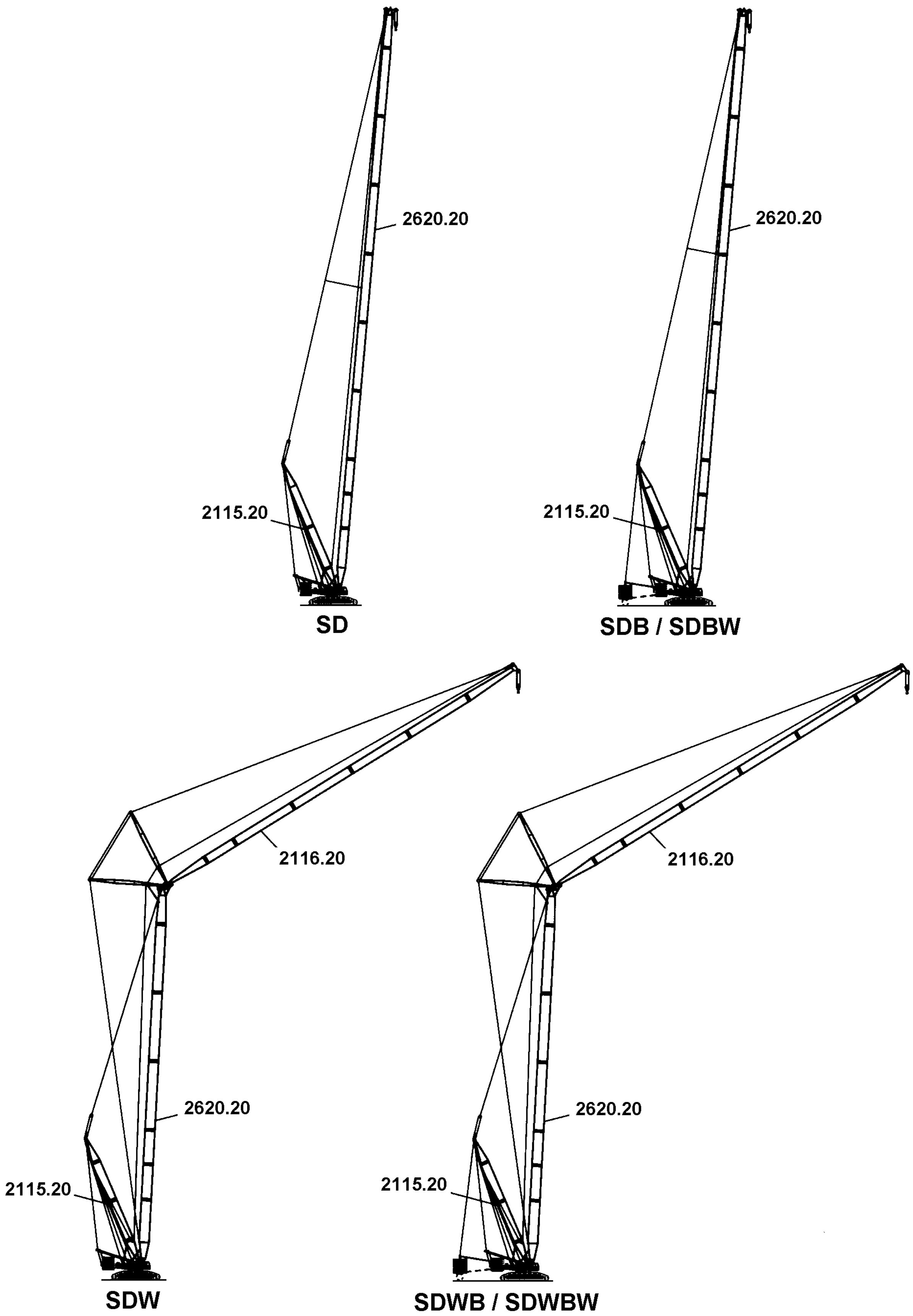
SW

189661

Short description of boom systems

S	-	Lattice boom, heavy
Sw	-	Lattice boom, mixed version
W	-	Fly jib, heavy
D	-	Derrick
B	-	Suspended ballast
BW	-	Ballast trailer

Boom combination								System
Sw	-	Boom combination	Sw	=	28.0 m	-	98.0 m	2620.**20** / 2116.**20**
SwD	-	Boom combination	Sw	=	35.0 m	-	112.0 m	2620.**20** / 2116.**20**
			D	=	21.0 m	-	28.0 m	2115.**20**
SwDB / SwDBW	-	Boom combination	Sw	=	35.0 m	-	112.0 m	2620.**20** / 2116.**20**
			D	=	21.0 m	-	28.0 m	2115.**20**
SW	-	Boom combination	S	=	21.0 m	-	56.0 m	2620.**20**
			W	=	28.0 m	-	91.0 m	2116.**20**

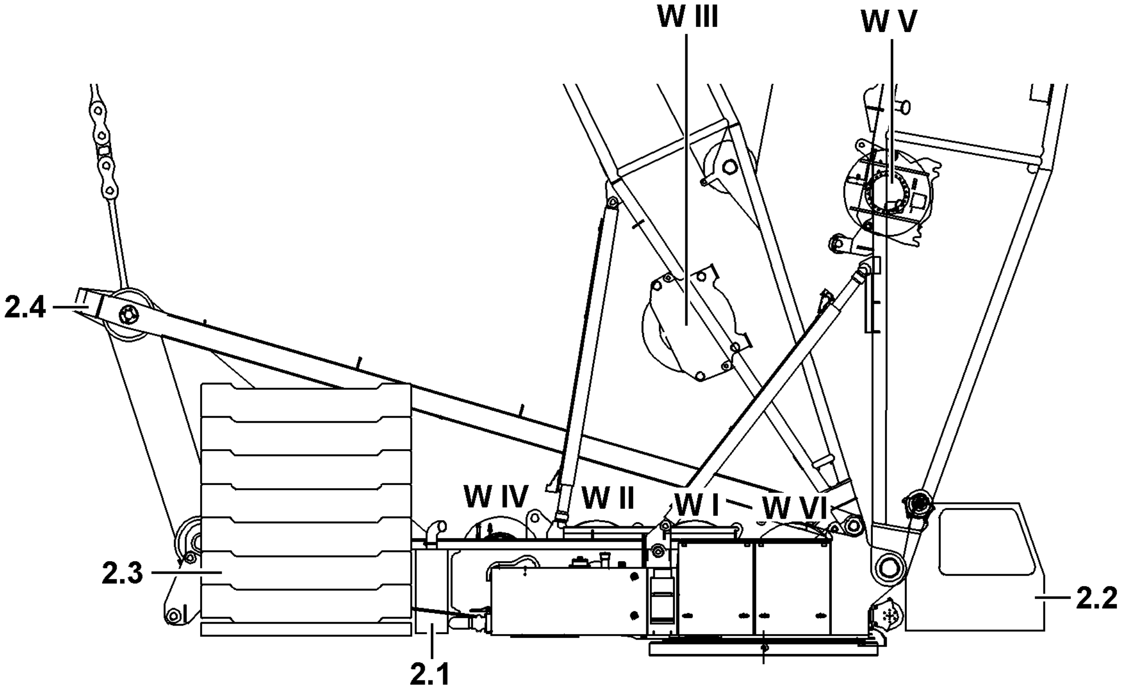

2620.20
2115.20
SD
2620.20
2115.20
SDB / SDBW
2116.20
2620.20
2115.20
SDW
2116.20
2620.20
2115.20
SDWB / SDWBW

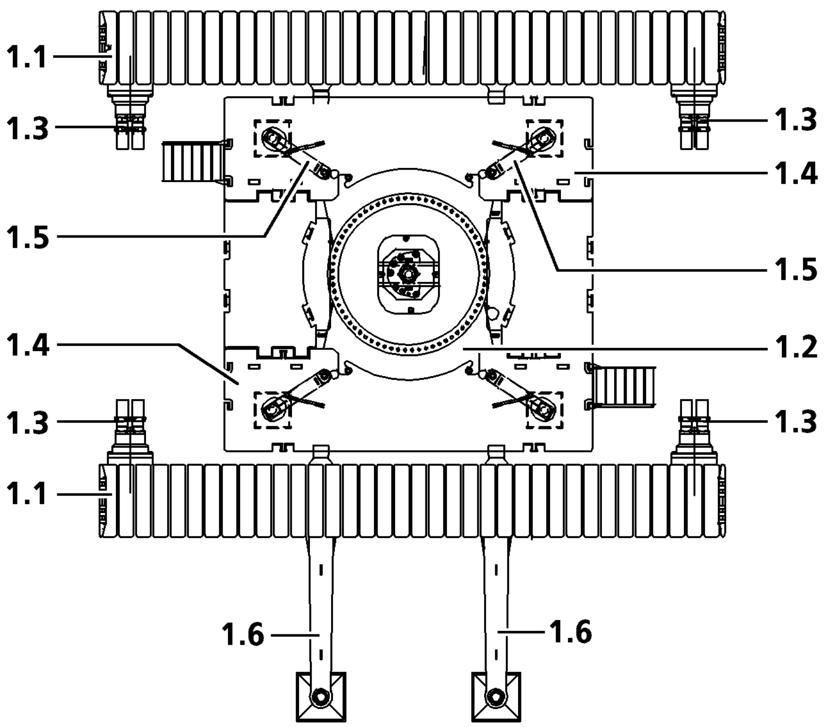
189662

Short description of boom systems

S	-	Lattice boom, heavy
W	-	Fly jib, heavy
D	-	Derrick
B	-	Suspended ballast
BW	-	Ballast trailer

Boom combination							System
SD	- Boom combination	S	=	28.0 m	- 119.0 m		2620.**20**
		D	=	21.0 m	- 28.0 m		2115.**20**
SDB / SDBW	- Boom combination	S	=	28.0 m	- 119.0 m		2620.**20**
		D	=	21.0 m	- 28.0 m		2115.**20**
SDW	- Boom combination	S	=	35.0 m	- 84.0 m		2620.**20**
		W	=	28.0 m	- 91.0 m		2116.**20**
		D	=	21.0 m	- 28.0 m		2115.**20**
SDWB / SDWBW	- Boom combination	S	=	35.0 m	- 84.0 m		2620.**20**
		W	=	28.0 m	- 91.0 m		2116.**20**
		D	=	21.0 m	- 28.0 m		2115.**20**


W III
W V
2.4
W IV
W II
W I
W VI
2.3
2.2
2.1


1.1
1.3
1.3
1.4
1.5
1.5
1.4
1.2
1.3
1.3
1.1
1.6
1.6

189128

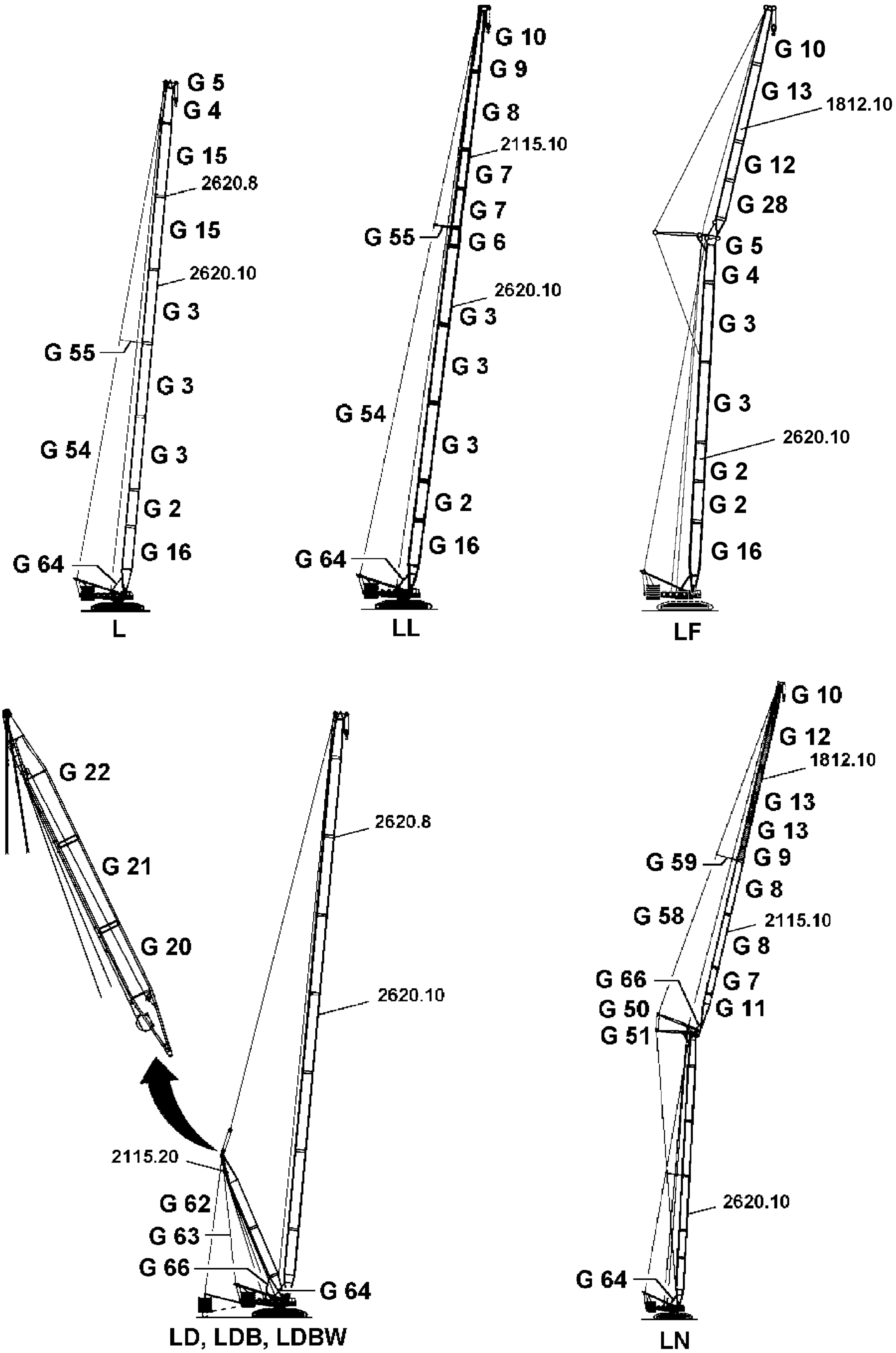
Component overview

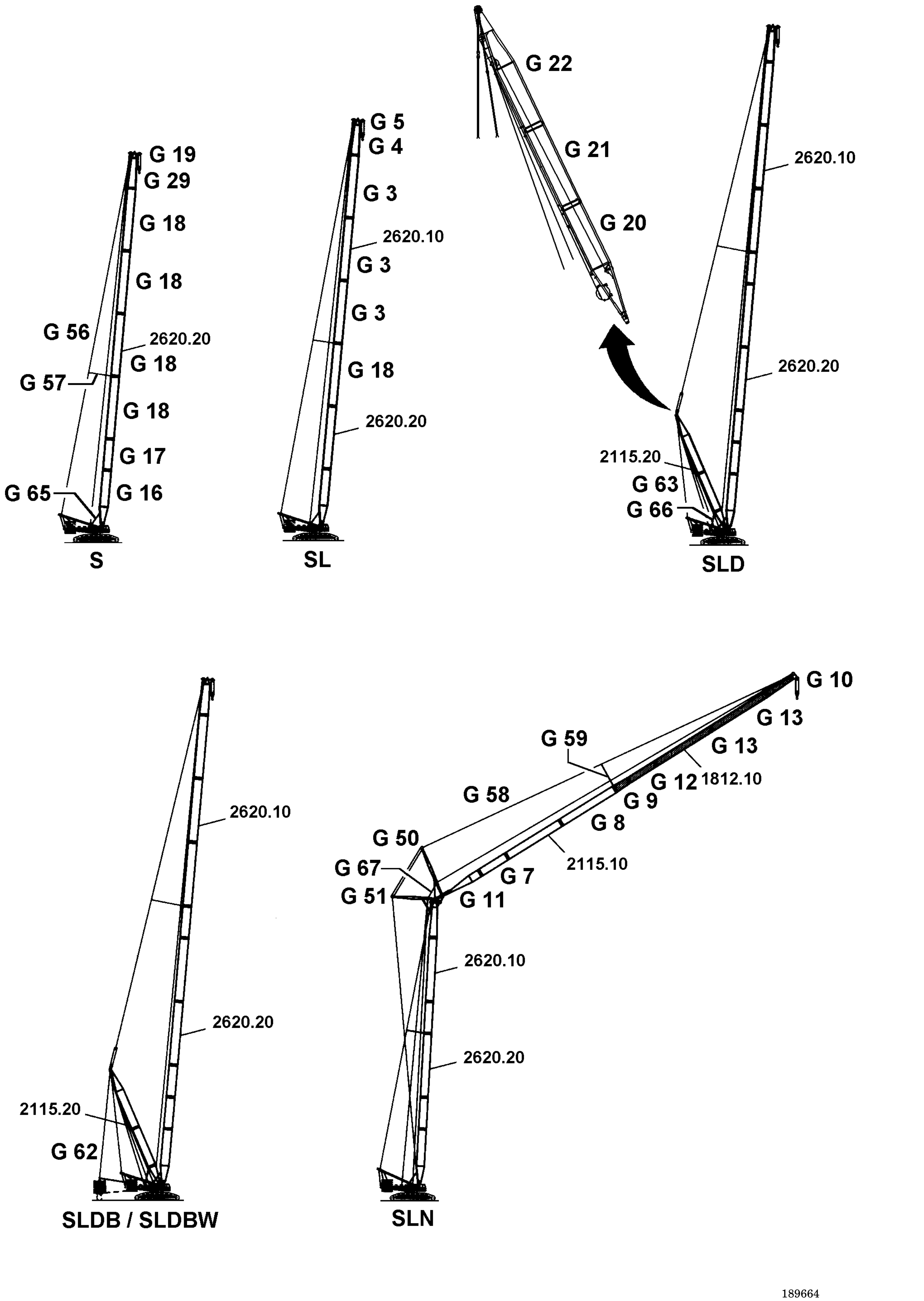
1	**Crane chassis**
1.1	Crawler carrier
1.2	Crawler center section
1.3	Travel gear
1.4	Central ballast
1.5	Hydraulic supports
1.6	Mechanical supports

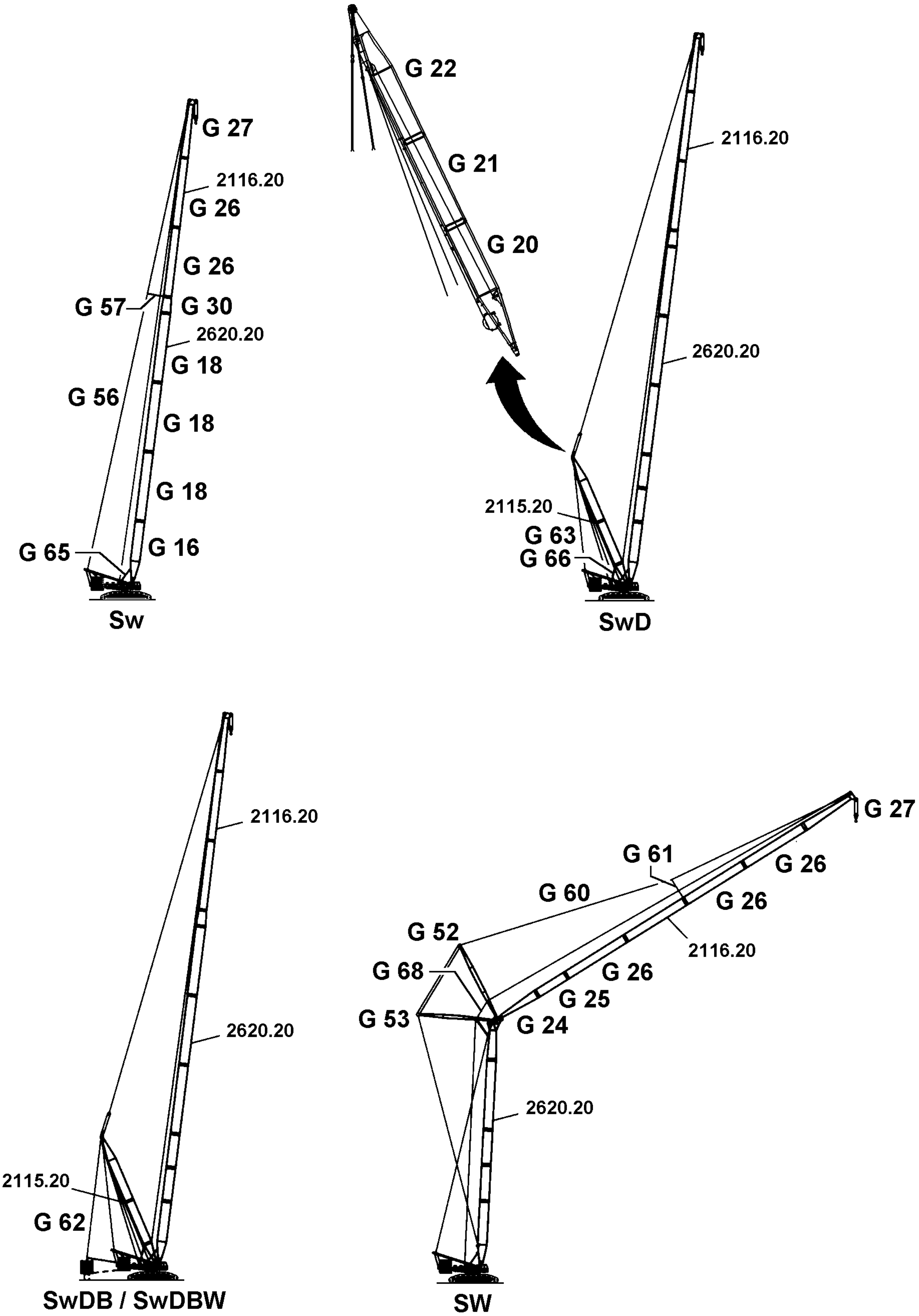
2	**Slewing platform**
I	Winch I
II	Winch II
III*	Winch III
IV	Winch IV
V	Winch V
VI*	Winch VI

2.1	Diesel engine
2.2	Crane operator's cab
2.3	Counterweight
2.4	LA - bracket

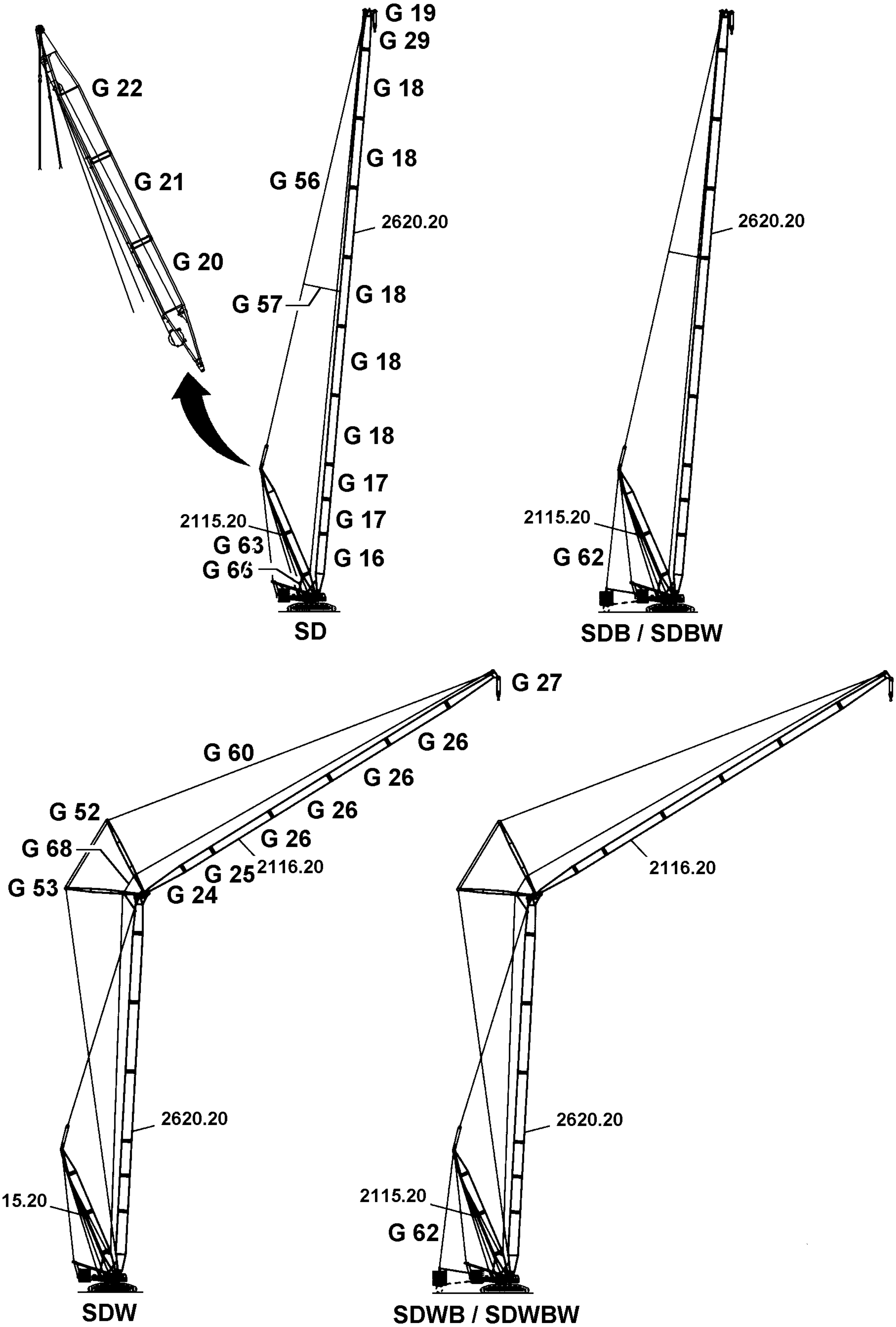
* = if installed


G 5
G 4
G 15
2620.8
G 15
2620.10
G 3
G 55
G 3
G 54
G 3
G 2
G 64
G 16
L
G 10
G 9
G 8
2115.10
G 7
G 7
G 55
G 6
2620.10
G 3
G 3
G 54
G 3
G 2
G 64
G 16
LL
G 10
G 13
1812.10
G 12
G 28
G 5
G 4
G 3
G 3
2620.10
G 2
G 2
G 16
LF
G 22
G 21
G 20
2620.8
2620.10
2115.20
G 62
G 63
G 66
G 64
LD, LDB, LDBW
G 10
G 12
1812.10
G 13
G 13
G 59
G 9
G 8
G 58
2115.10
G 8
G 66
G 7
G 50
G 11
G 51
2620.10
G 64
LN
194336


G 19
G 29
G 18
G 18
G 56
2620.20
G 18
G 57
G 18
G 17
G 65
G 16
S
G 5
G 4
G 3
2620.10
G 3
G 3
G 18
2620.20
SL
G 22
G 21
G 20
2620.10
2620.20
2115.20
G 63
G 66
SLD
2620.10
2620.20
2115.20
G 62
SLDB / SLDBW
G 10
G 13
G 59
G 13
G 12
1812.10
G 58
G 9
G 8
G 50
2115.10
G 67
G 7
G 51
G 11
2620.10
2620.20
SLN
189664


G 27
2116.20
G 26
G 26
G 57
G 30
2620.20
G 18
G 56
G 18
G 18
G 65
G 16
Sw
G 22
G 21
G 20
2116.20
2620.20
2115.20
G 63
G 66
SwD
2116.20
2620.20
2115.20
G 62
SwDB / SwDBW
G 27
G 61
G 26
G 60
G 26
G 52
2116.20
G 68
G 26
G 25
G 53
G 24
2620.20
SW

189665


G 19
G 29
G 22
G 18
G 18
G 21
G 56
2620.20
G 20
G 57
G 18
G 18
G 18
G 17
2115.20
G 17
G 63
G 16
G 66
SD
2620.20
2115.20
G 62
SDB / SDBW
G 27
G 60
G 26
G 26
G 52
G 26
G 68
G 26
G 25
2116.20
G 53
G 24
2116.20
2620.20
2620.20
2115.20
2115.20
G 62
SDW
SDWB / SDWBW

189666

	Description	System	Length (m)	Weight (t)
G 1	L - Pivot section	2620.**10**	13.4	7.5 (11.0*)
G 2	L - Intermediate section	2620.**10**	7.0	3.1
G 3	L - Intermediate section	2620.**10**	14.0	5.7
G 4	L - Adapter	2620.**10**	7.0	3.2
G 5	L - End section 250 t		0.6	2.0
G 6	LL - Reducer section		3.1	1.3
G 7	NA - Intermediate section	2115.**10**	7.0	1.5
G 8	NA - Intermediate section	2115.**10**	14.0	2.6
G 9	NI - Reducer		3.5	0.8
G 10	F - End section		8.0	3,0
G 11	N - Installation unit			11.0
G 12	NI - Intermediate section	1812.**10**	7.0	1.4
G 13	NI - Intermediate section	1812.**10**	14.0	2.5
G 14	L - Intermediate section	2620.**8**	7.0	
G 15	L - Intermediate section	2620.**8**	14.0	4.4
G 16	S - Pivot section	2620.**20**	13.4	9.0 (12.5*)
G 17	S - Intermediate section	2620.**20**	7.0	3.6
G 18	S - Intermediate section	2620.**20**	14.0	6.5
G 19	S - End section 400 t		0.6	4.1
G 20	D - Pivot section	2115.**20**	10.5	11.0 (14.5**
G 21	D - Intermediate section	2115.**20**	7.0	2.7
G 22	D - End section	2115.**20**	10.5	6.3
G 23	L - Intermediate section	2620.**10**	3.5	1.5
G 24	W - Installation with fold - in head		10.5	14.1
G 25	W (w) - Intermediate section	2116.**20**	7.0	1.7
G 26	W (w) - Intermediate section	2116.**20**	14.0	3.0
G 27	W - End section 180 t		10.5	3.3
G 28	F - Pivot section		2.5	0.8

Note: For example: 2620.**10** = **.10** (welded-on tag on intermediate section)
* = with winch V
** = with winch III
For two 7 m long intermediate sections, one 14 m long intermediate section may be installed.

D A N G E R: **It is strictly prohibited to assemble the lattice sections and guy rods other than noted in the Operation Manual or the installation drawings!**
There is the danger that the intermediate sections, which are various sizes and DO NOT differentiate externally, will be interchanged / mixed up!
They differ externally only by the welded-on tags (.8, .10, .20)
When installing the boom, it must be ensured that the intermediate sections are installed according to their description . If this is not observed, there is a danger of accidents!

Overview of the maximum possible attachments

	Description	System	Length (m)	Weight (t)
G 29	S - Adapter	2620.**20**	7.0	3.6
G 30	Sw - Reducer	2620.**20**	4.1	1.5
G 31	W (w) - Intermediate section	2116.**20**	3.5	1.015
G 32	SL - head piece 100 t		3,5	2,4
G 33	S - Intermediate section	2620.**20**	3.5	1,710
G 34	S - Intermediate section for flying installation	2620.**20**	14,0	6,4
G 35	L - head piece (without pulleys, for S2)		1,06	0,87
G 36	S - Intermediate section	2620.**25**	14,0	7,62
G 37	L - head piece 350 t		0,95	2,2
G 38	S - Pivot section	2620.**25**	13.4	9.4 (12.5*)
G 39	S - intermediate section for fixed jib	2620.**20**	**14,0**	7,05

G 50	NA- bracket I
G 51	NA- bracket II
G 52	WA- bracket I
G 53	WA- bracket II
G 54	L- guying
G 55	L- added guying
G 56	S- guying
G 57	S- added guying
G 58	N- guying
G 59	N- added guying
G 60	W- guying
G 61	W- added guying
G 62	B or BW- guying
G 63	D- guying

Note: For example: 2620**.10** = **.10** (welded-on tag on intermediate section)
* = with winch V
** = with winch III
For two 7 m long intermediate sections, one 14 m long intermediate section may be installed.

D A N G E R: **It is strictly prohibited to assemble the lattice sections and guy rods other than noted in the Operation Manual or the installation drawings!**
There is the danger that the intermediate sections, which are various sizes and DO NOT differentiate externally, will be interchanged / mixed up!
They differ externally only by the welded-on tags (.8, .10, .20)
When installing the boom, it must be ensured that the intermediate sections are installed according to their description . If this is not observed, there is a danger of accidents!

Overview of the maximum possible attachments

	Description	System	Length (m)	Weight (t)
G 64	L- relapse retainer			
G 65	S- relapse retainer			
G 66	D- relapse retainer			
G 67	N- relapse retainer			
G 68	W- relapse retainer			
G 69	F- Adapter		2.9	4.2
G 70	Boom nose		0.6	1.2
G 71	Auxiliary jib (fixed guyed)			
G 72	HA- bracket			
G 73	H- guy rods			

Note: for example : 2620**.10** = **.10** (welded tag on intermediate section)
* = with winch V
** = with winch III
Instead of two 7 m sections, one 14 m section can be used.

DANGER: **It is forbidden to use any other set up of the latticecomponents and the tensioning rods than found in the Operation Manual and/or the constructionplans !**
There is the risk of confusing intermediate sections which are of diverse dimensions but do not look different on the outside!
The only difference on the outside are the tags welded on (.8, .10, .20)
When installing the boom make absolutely sure, that the intermediate sections are installed in accordance with their designations. If not observed, there is risk of accident!

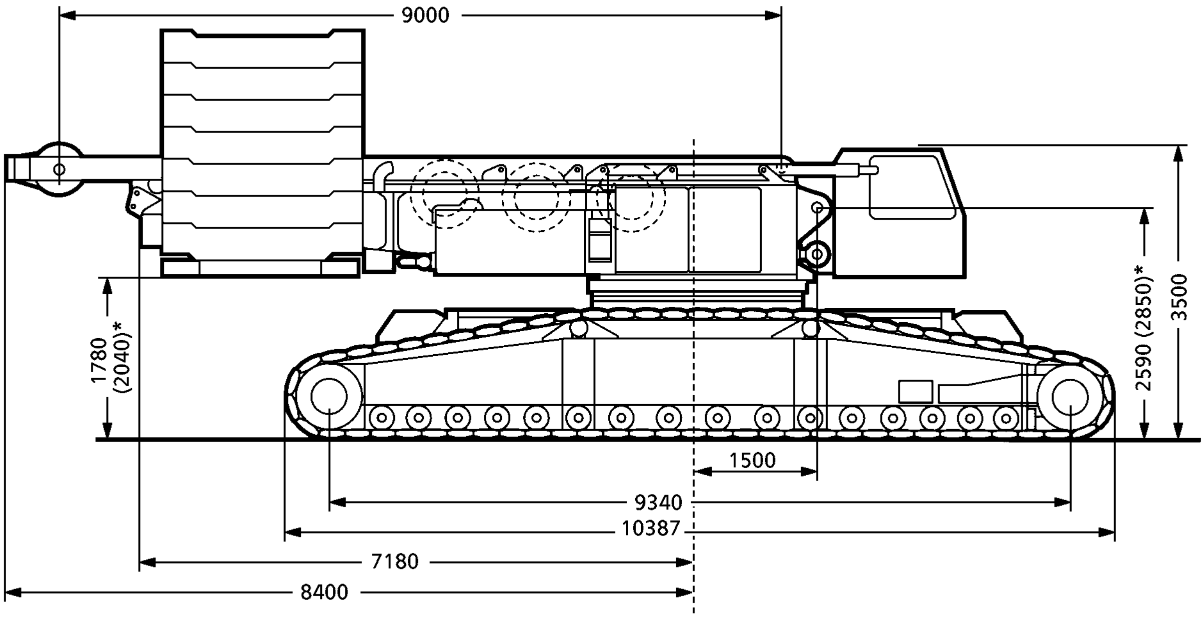
Crawler track chassis

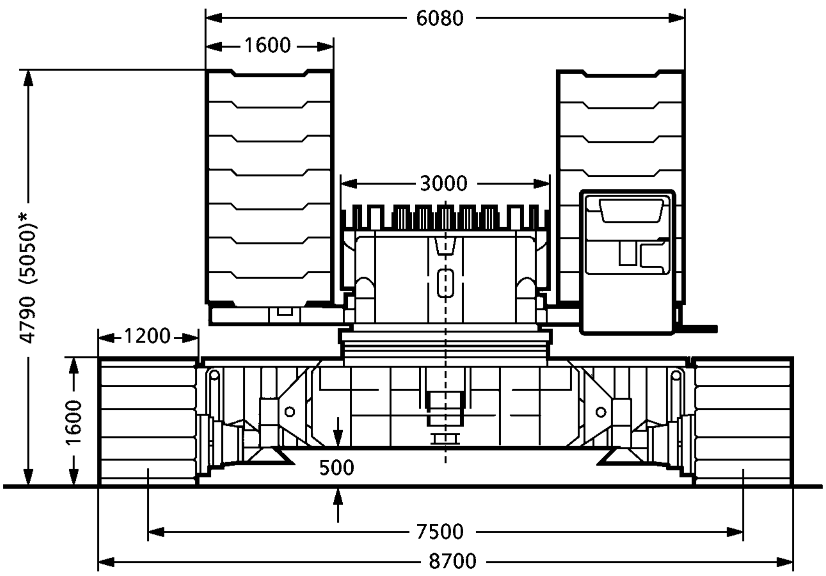
Frame	Self - manufactured, torsion resistant, welded construction of high - tensile steel. The crawler carriers are removable and can be re - installed by the crane itself.
Travelling gear:	Maintenance - free, tracklaying gear with flat track pads. Pad width: 1,2 m, track gauge: 7,5 m.
Drive:	Hydraulic travelling drives with planetary gears. The crawler chains can be controlled independently and opposed, i. e. there is no preferential travelling direction.
Driving performance:	Infinittely variable speed from 0 to 1,8 km/h

Crane superstructure

Frame	Self - manufactured, torsion resistant, welded construction of high - tensile steel. Connected to chassisby by a 3-row roller slewing ring, 360° slewing range.
Crane engine	6 cylinder diesel, Liebherr type D 9406 TI - E, water cooled, output according to DIN 70020 = 300 kW (408 HP) at 1900 rpm, maximum torque 1710 Nm at 1400 rpm.
Crane drive	Hydraulically by pump transfer case and 4 axial - piston variable displacement pumps with capacity control; closed hydraulic circuits.
Crane control	Servo control with electronic synchronizing device on hoisting winches. Energy recycling during lowering of load. All motions controlled independently by joystick selectors.
Winches	2 winches as hoist gear and luffing gear, hydraulically controlled by axial piston variable displacement pumps and planetary gears. Spring loaded multi - disc brakes with hydraulic release.
Slewing gears	hydraulically controlled by axial piston pump andplanetary gear, spring loaded multi - disc - brake with hydraulic release. Infinitely variable slewing speed 0 -1,2 min^{-1}.
Counterweight:	155 t, consisting of: 1 base slab of 15 t and 14 slabs of 10 t each.
Operator's cab	Sheet steel design with safety glazing, movable sideward and inclinable to the rear; including operating equipment and check instruments.
Safety devices	LICCON safe load indicator, hoist limit switch, electronic display of inclination, safety valves to protect hydraulic system against pipe and hose fracture.
Electrical system	24 Volt DC, 2 batteries, 143 Ah each.

1. **The dimensions**
   * = with Quick connection





186575

2. The weights

Basic machine without boom

Crane superstructure	39,5 t
Counterweight	max. 135 t
Centre section	15,5 t
Crawler track chassis	2 × 27 t
Central ballast	43 t

The lifting tackle

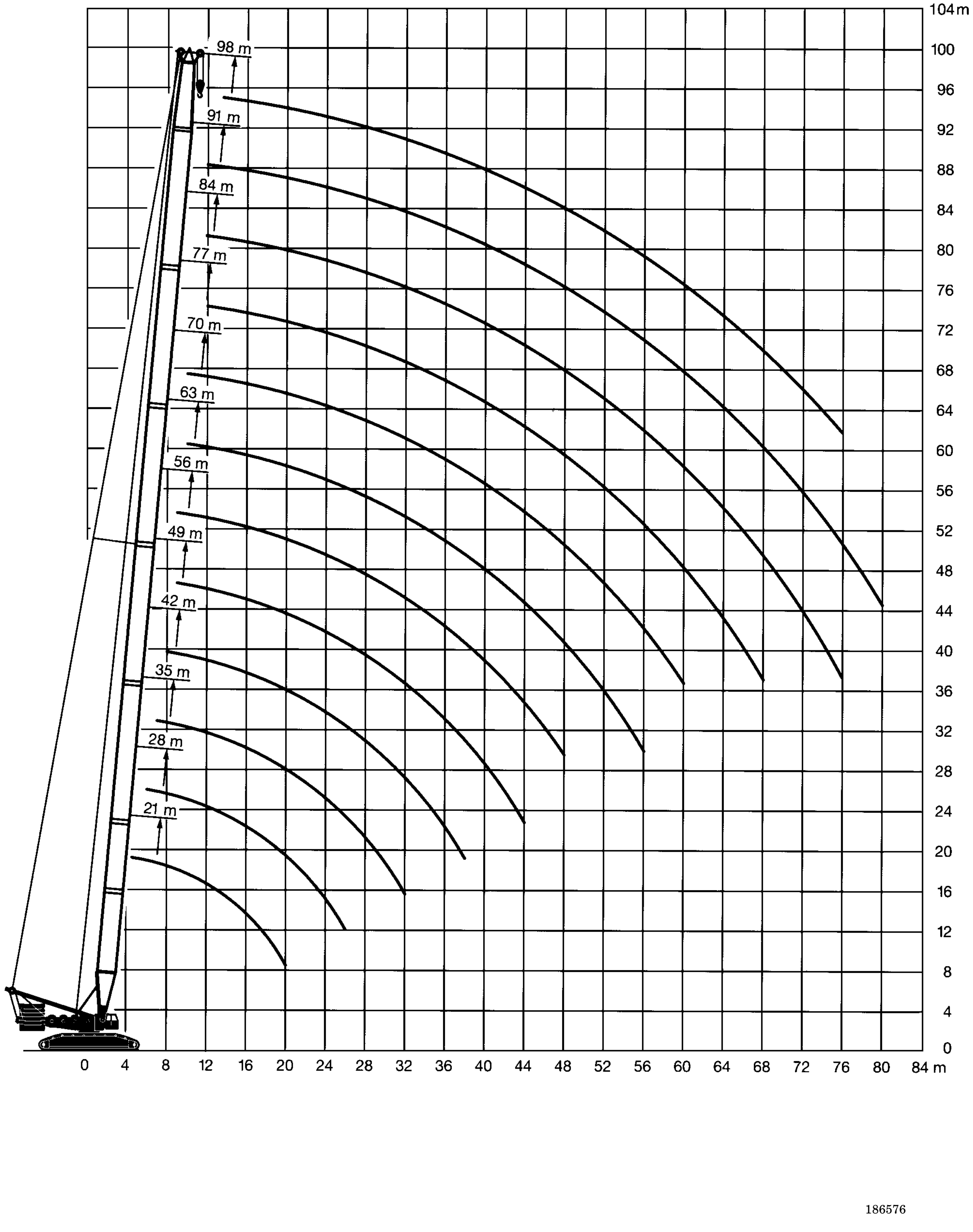
Load capacity	Rollers	Lines	Weight t
400	2 × 9	2 × 19	8,0
250	2 × 5	2 × 11	6,0
200	9	19	5,4
160	7	15	3,5
125	5	11	3,8
80	3	7	2,6
36	1	3	1,5
12	-	1	0,6

3. The speeds

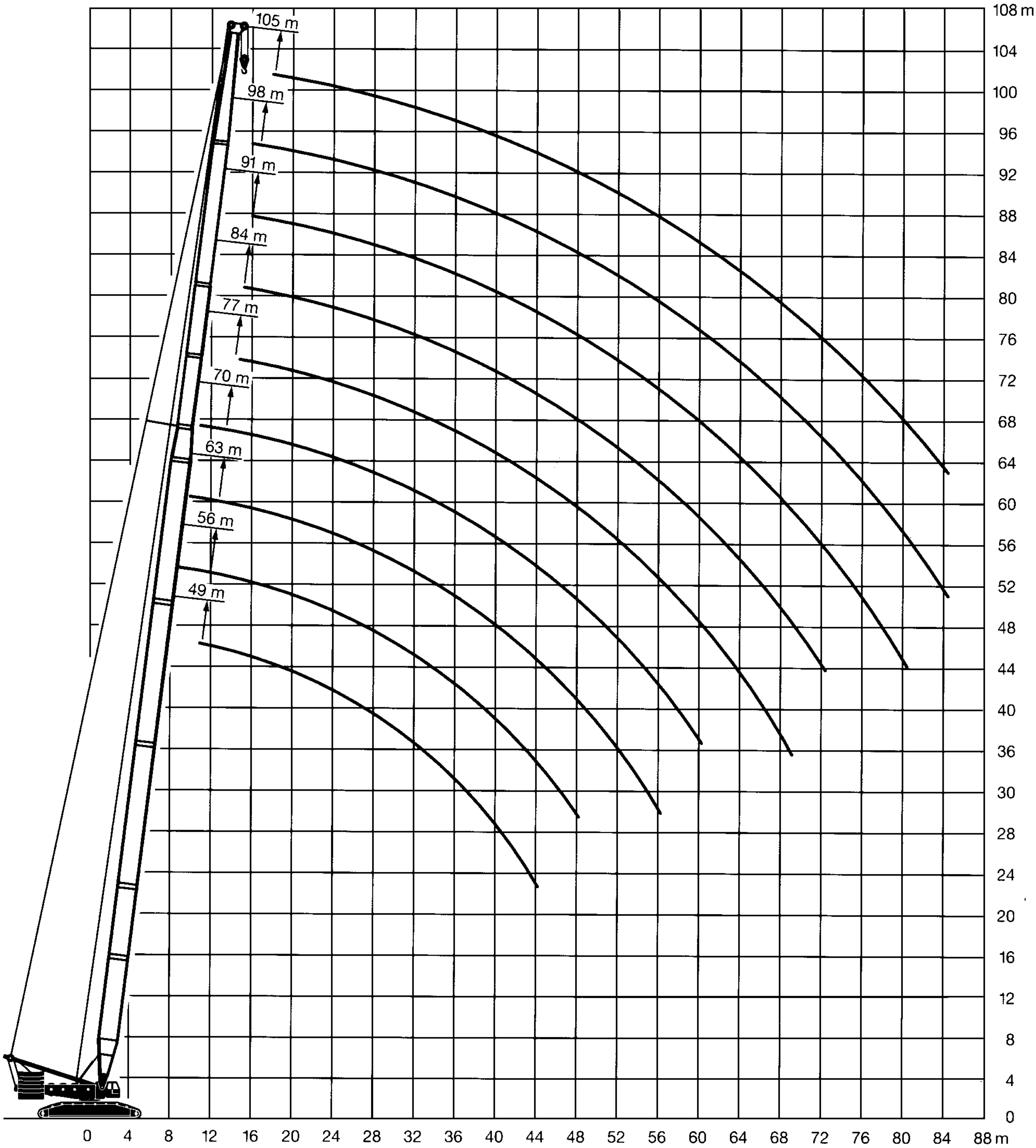
The crane speeds at an engine speed of 1900 rpm

Slewing gear	0 - 1,2 min^{-1}	
Drive	**Continuous**	**Cable ∅**
Winch I, II,	0 - 150 m/min for single line	25 mm
Winch, III	0 - 145 m/min for single line	25 mm
Winch, V	0 - 130 m/min for single line	25 mm
Winch, VI	0 - 150 m/min for single line	25 mm
Winch IV	2 × 65 m/min for single line	25 mm

4. **The hoisting heights**
L- boom system, 85°

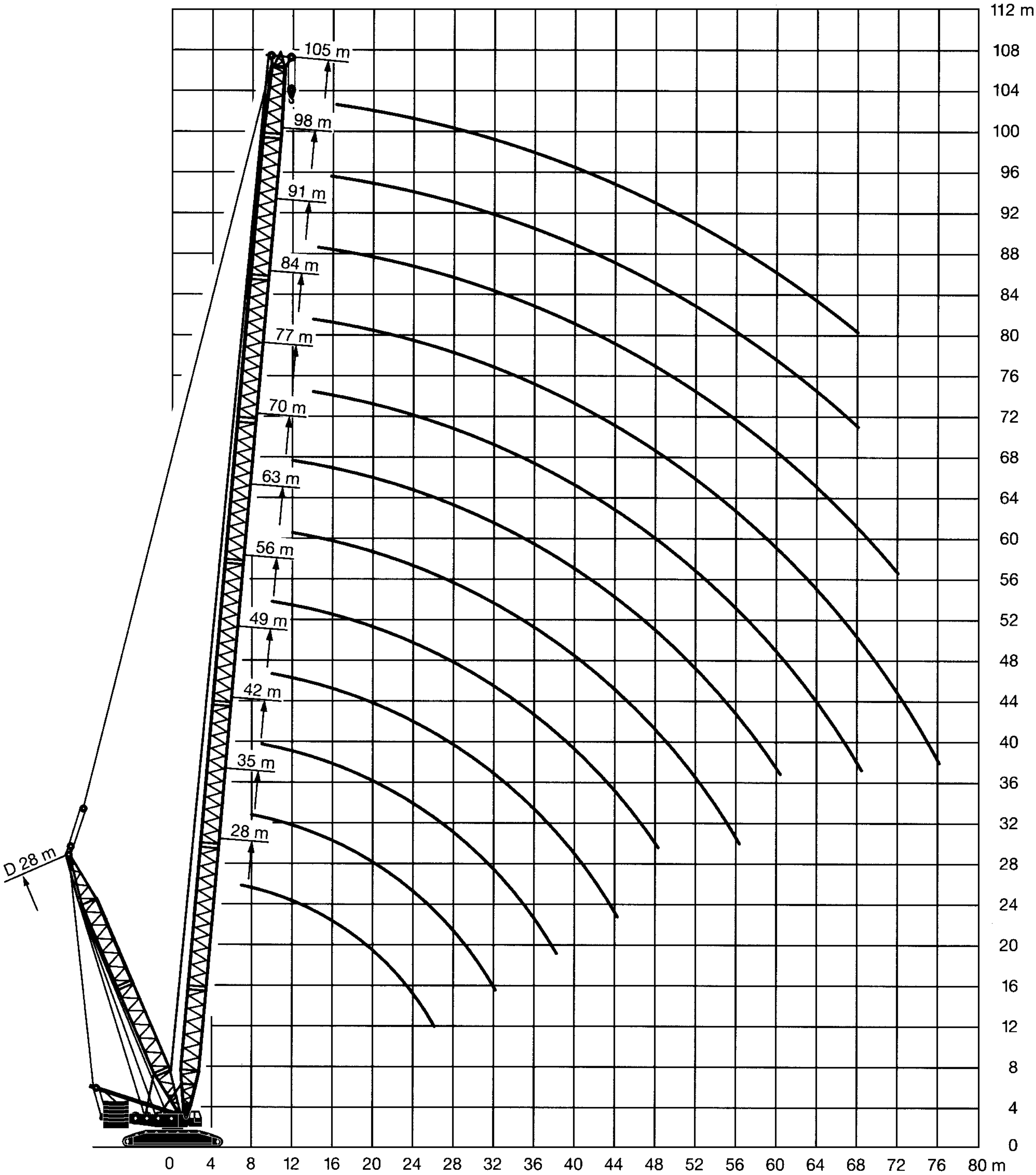


The hoisting heights
LL - boom system, 83°



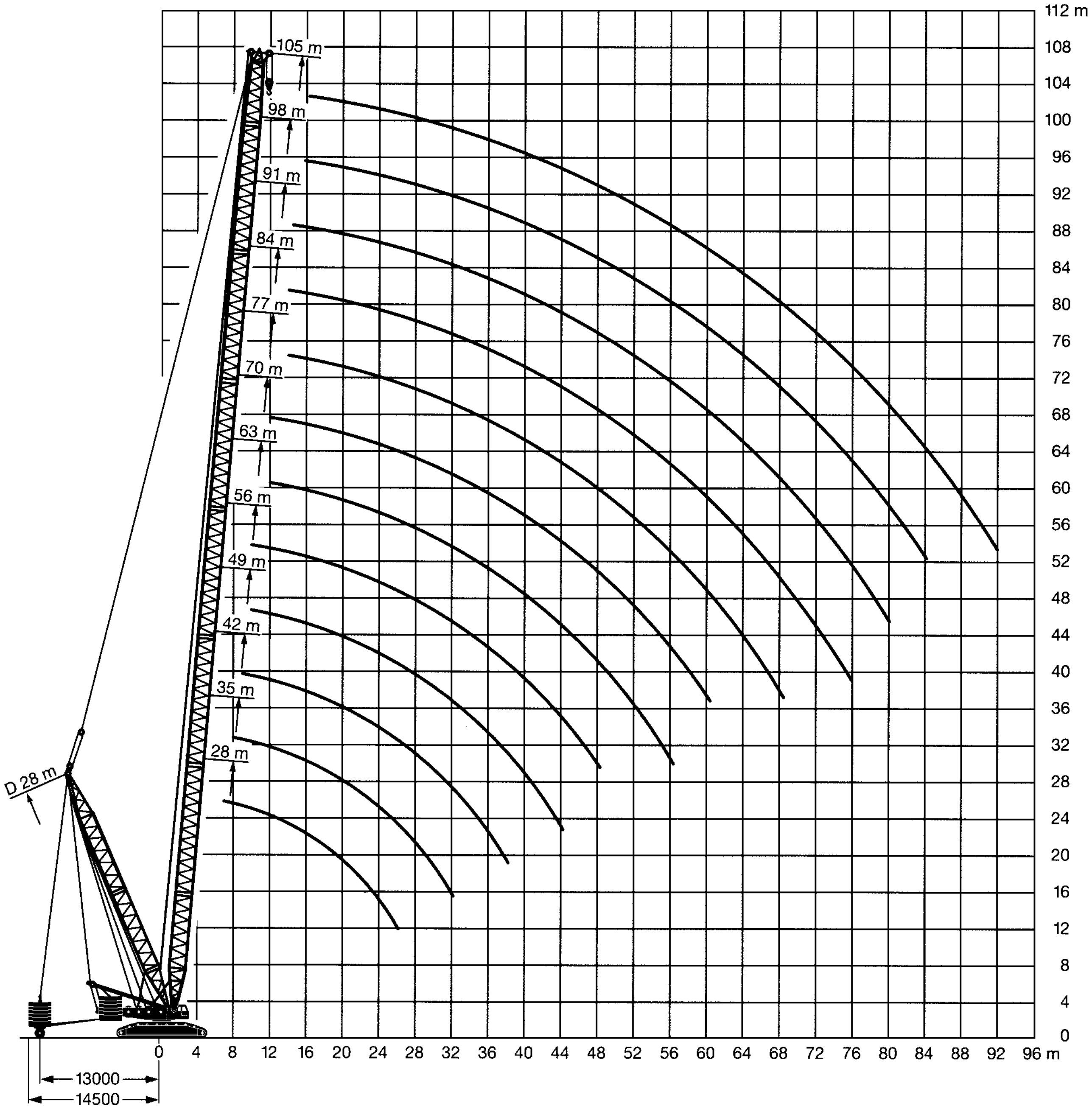
186577

The hoisting heights
LD- boom system



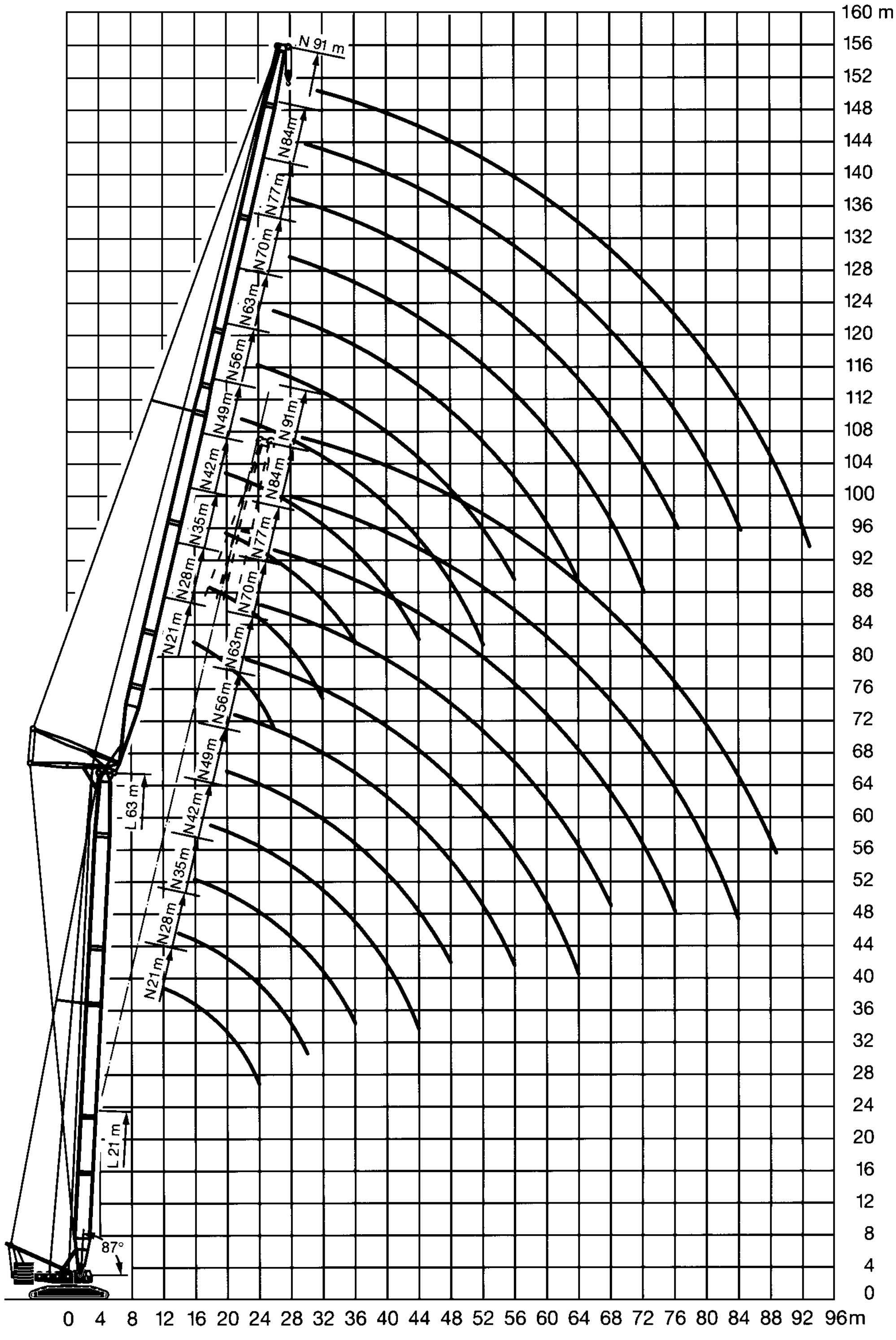
188547

The hoisting heights
LDB / LDBW- boom system



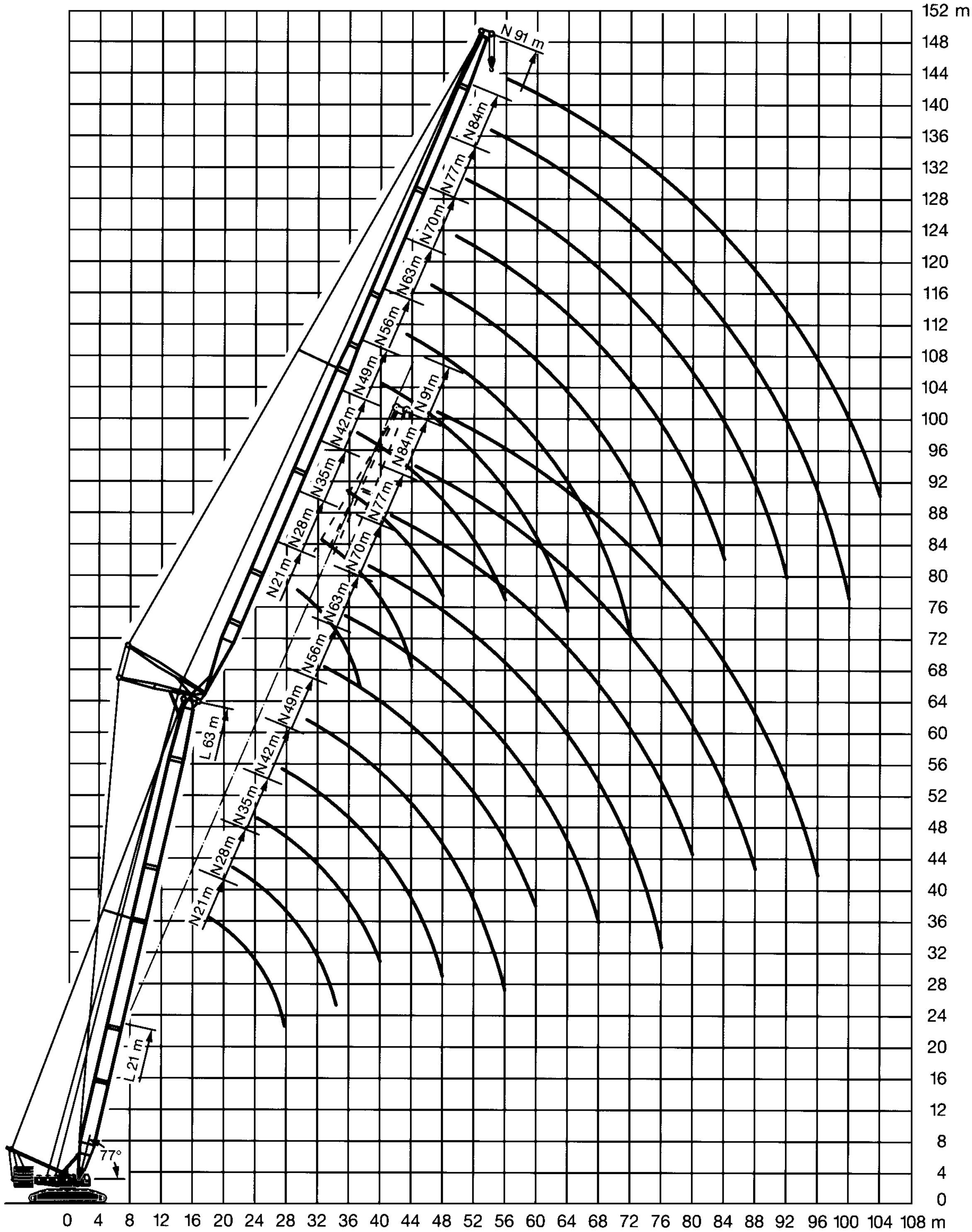
188548

The hoisting heights
LN- boom system, L = 87°



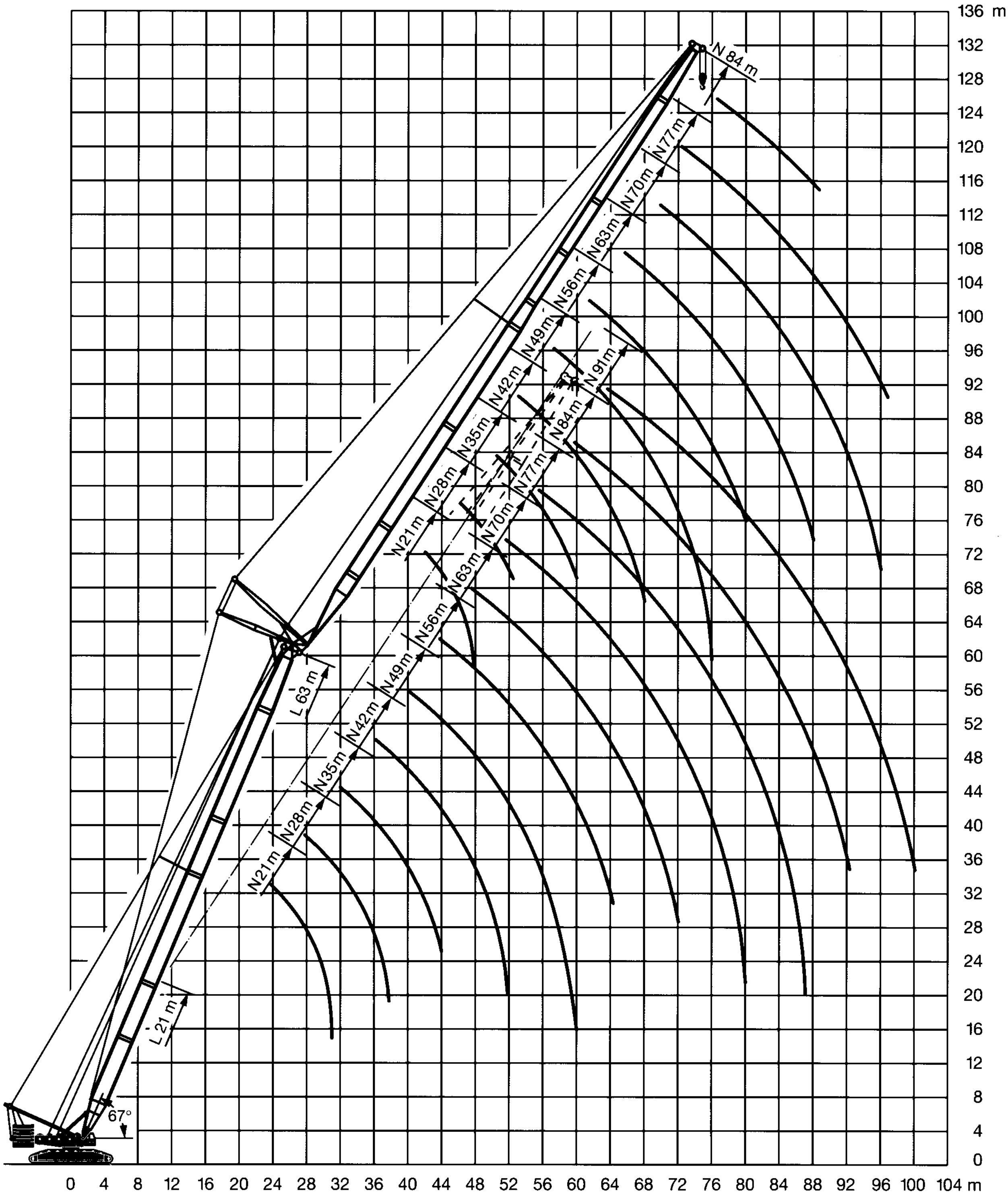
186578

The hoisting heights
LN- boom system. L = 77°



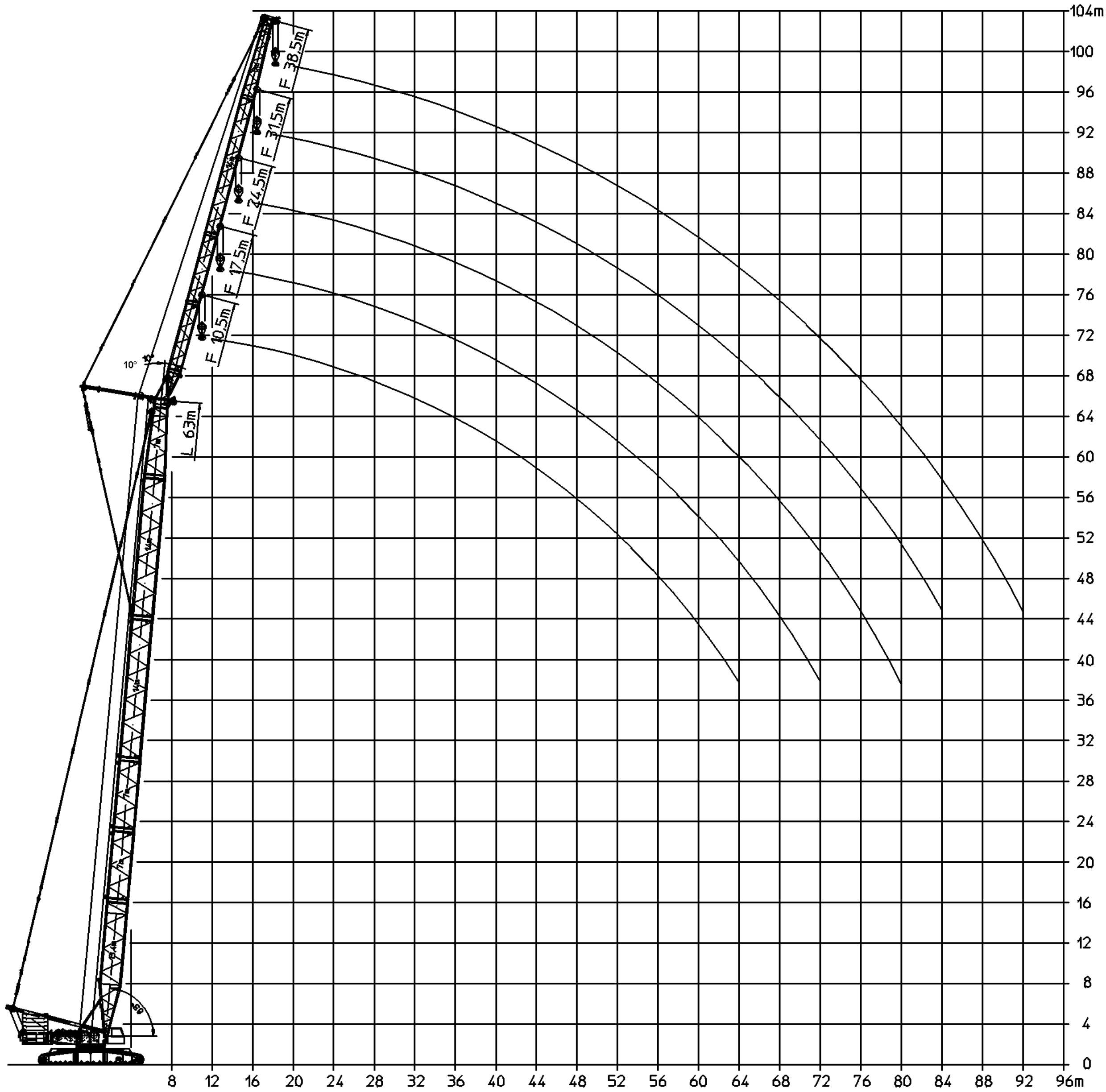
186579

The hoisting heights
LN- boom system, L = 67°



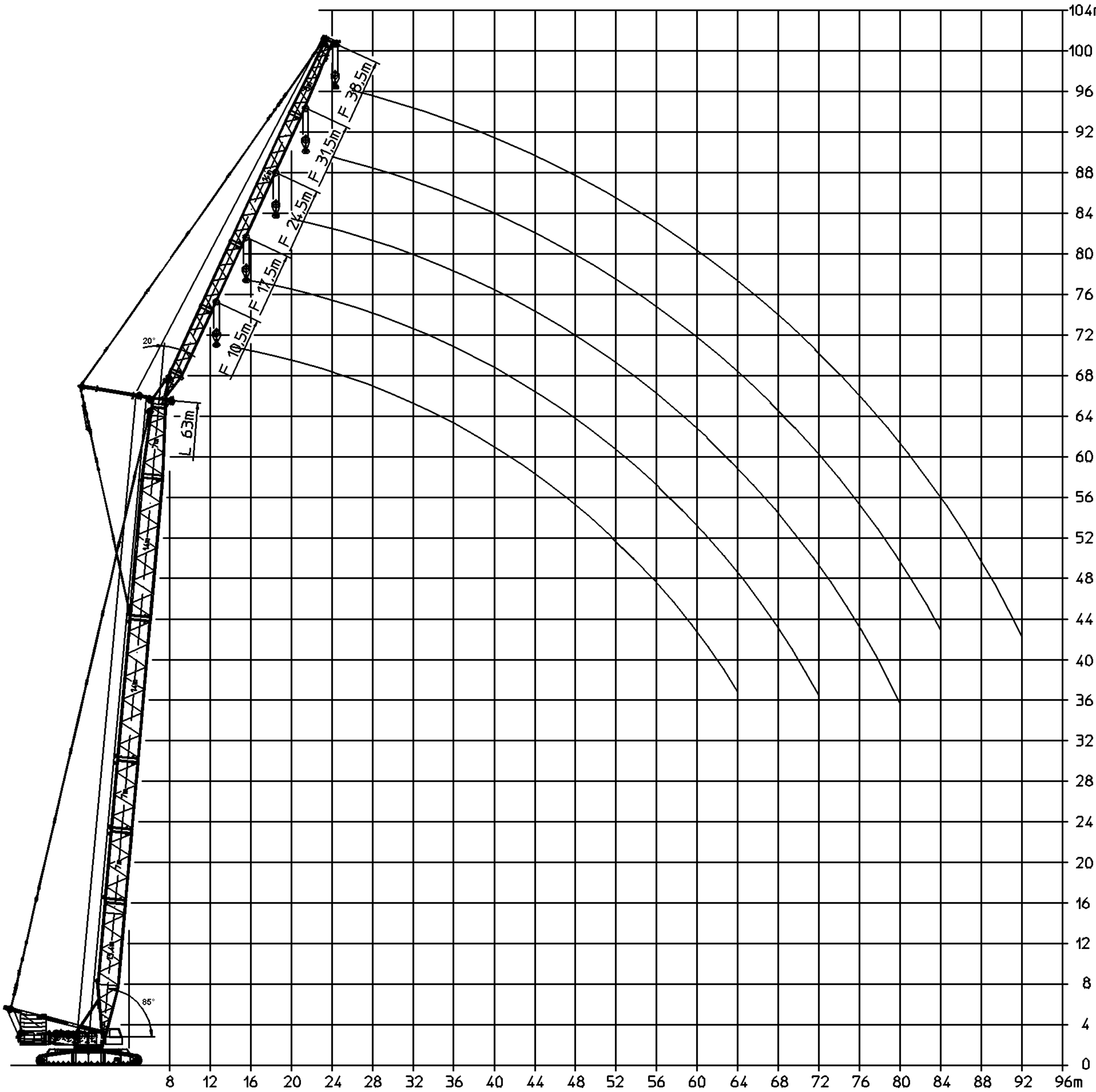
186580

The hoisting heights
LF - boom system; F = 10°



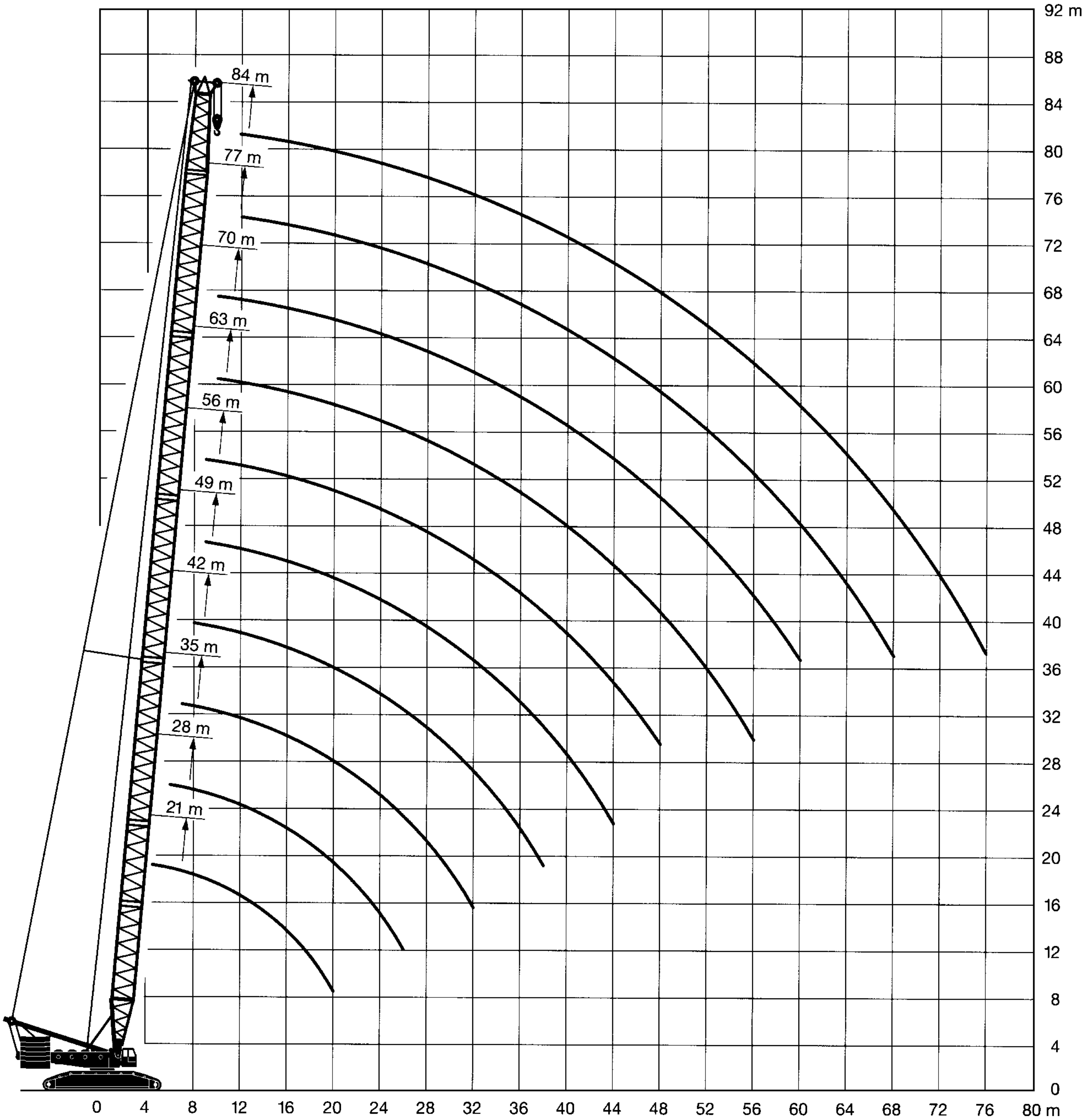
194337

The hoisting heights
LF - boom system; F = 20°



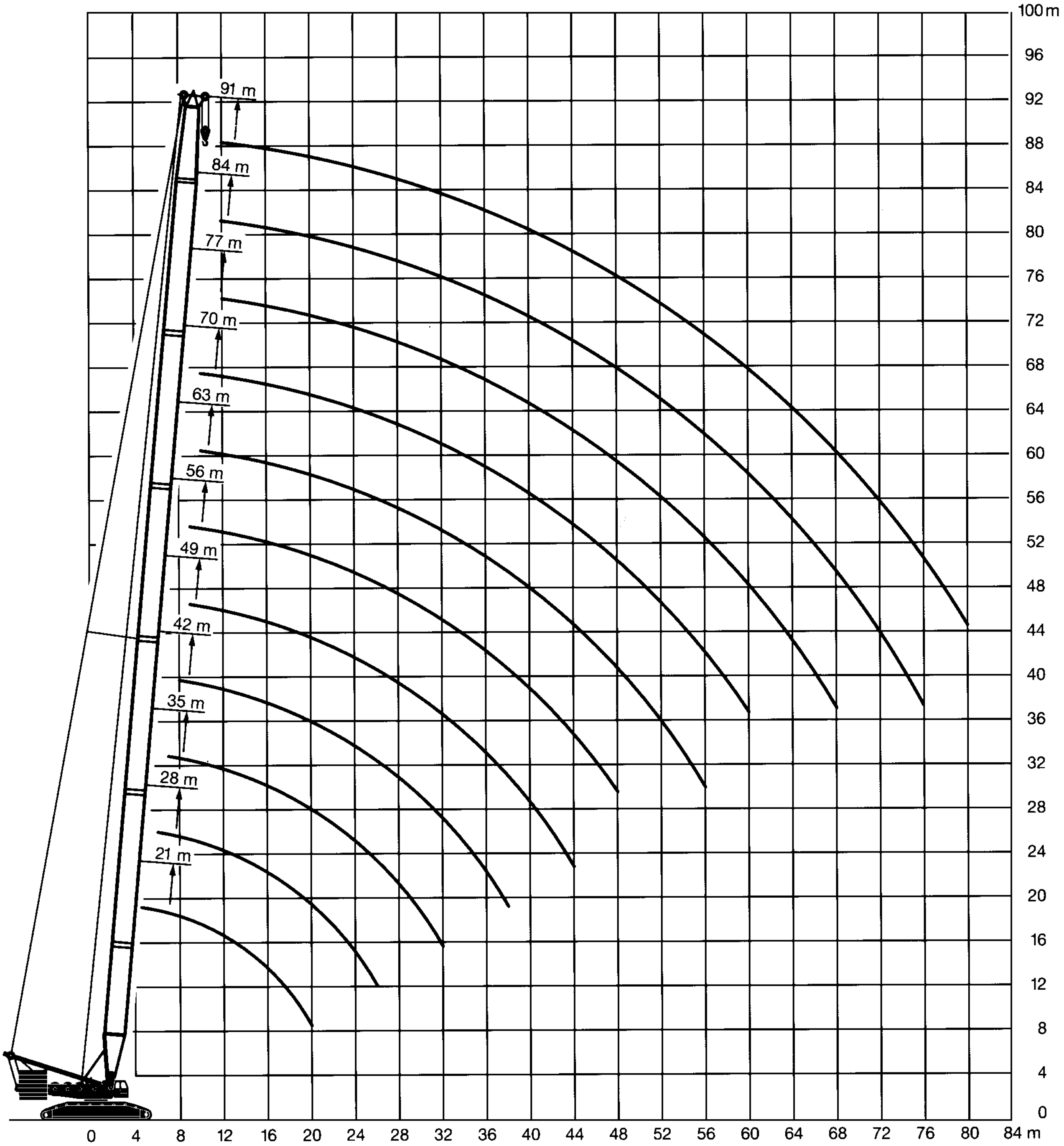
194338

The hoisting heights
S - boom system



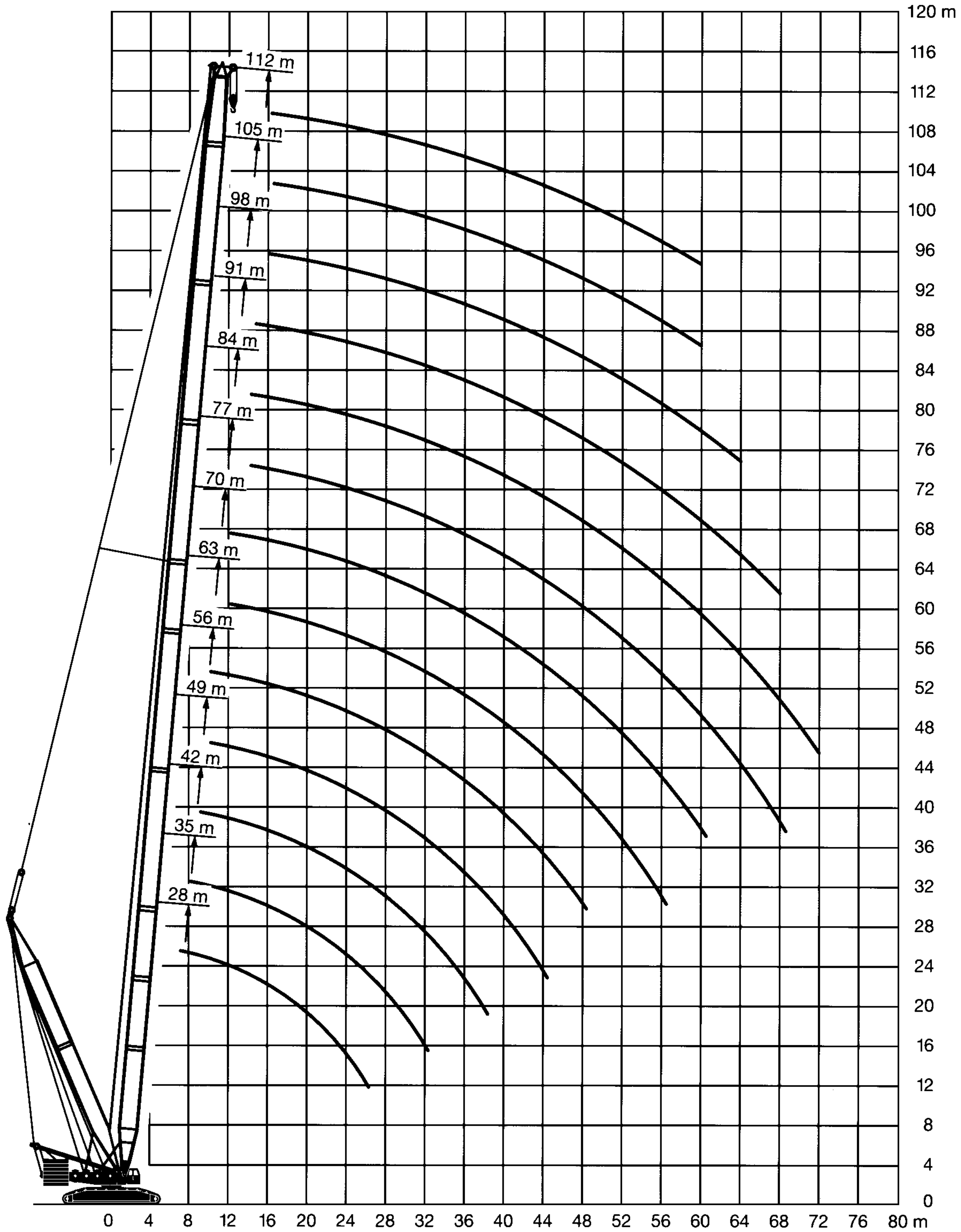
188579

The hoisting heights
SL- boom system, 85°



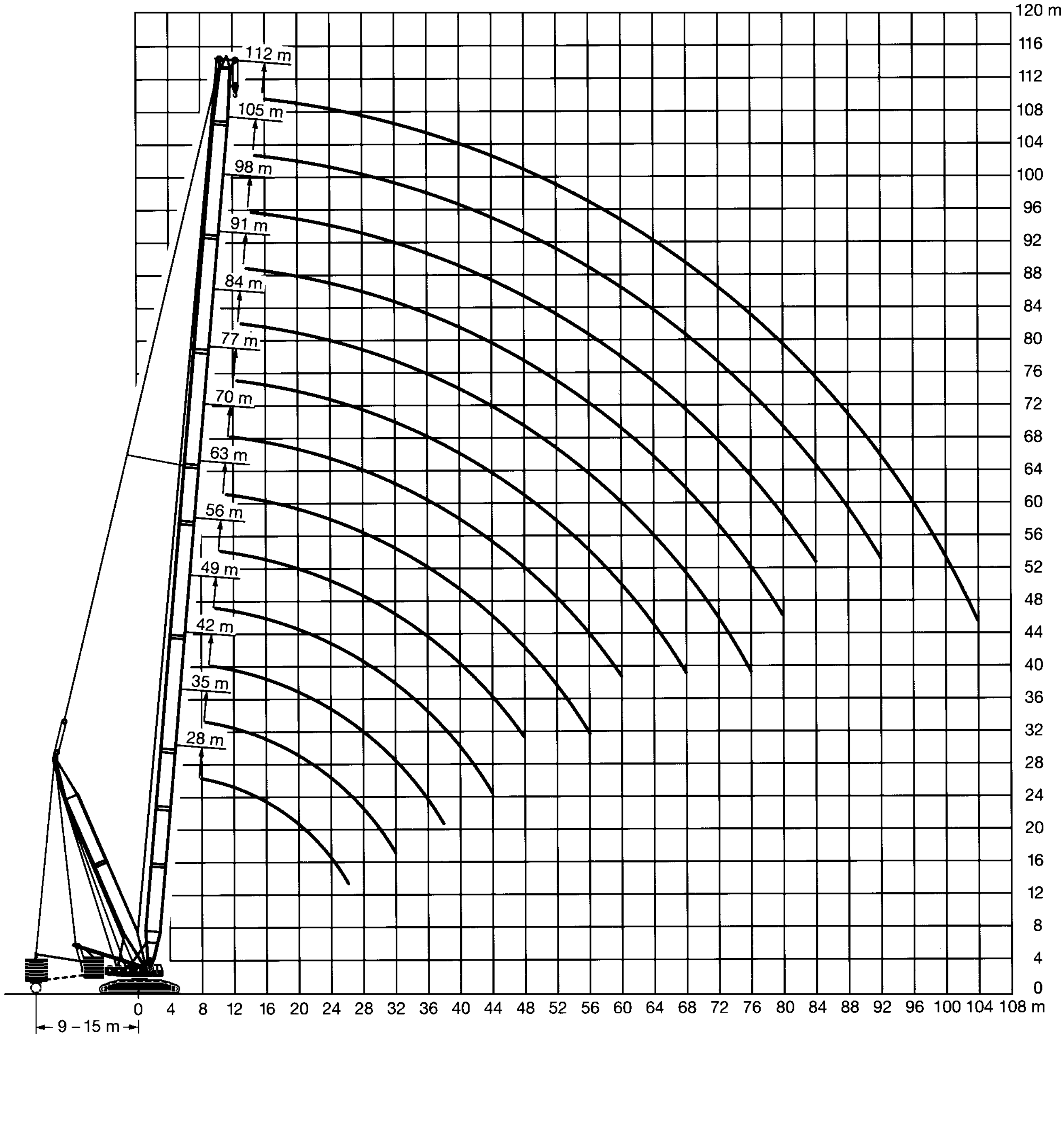
187236

The hoisting heights
SLD- boom system

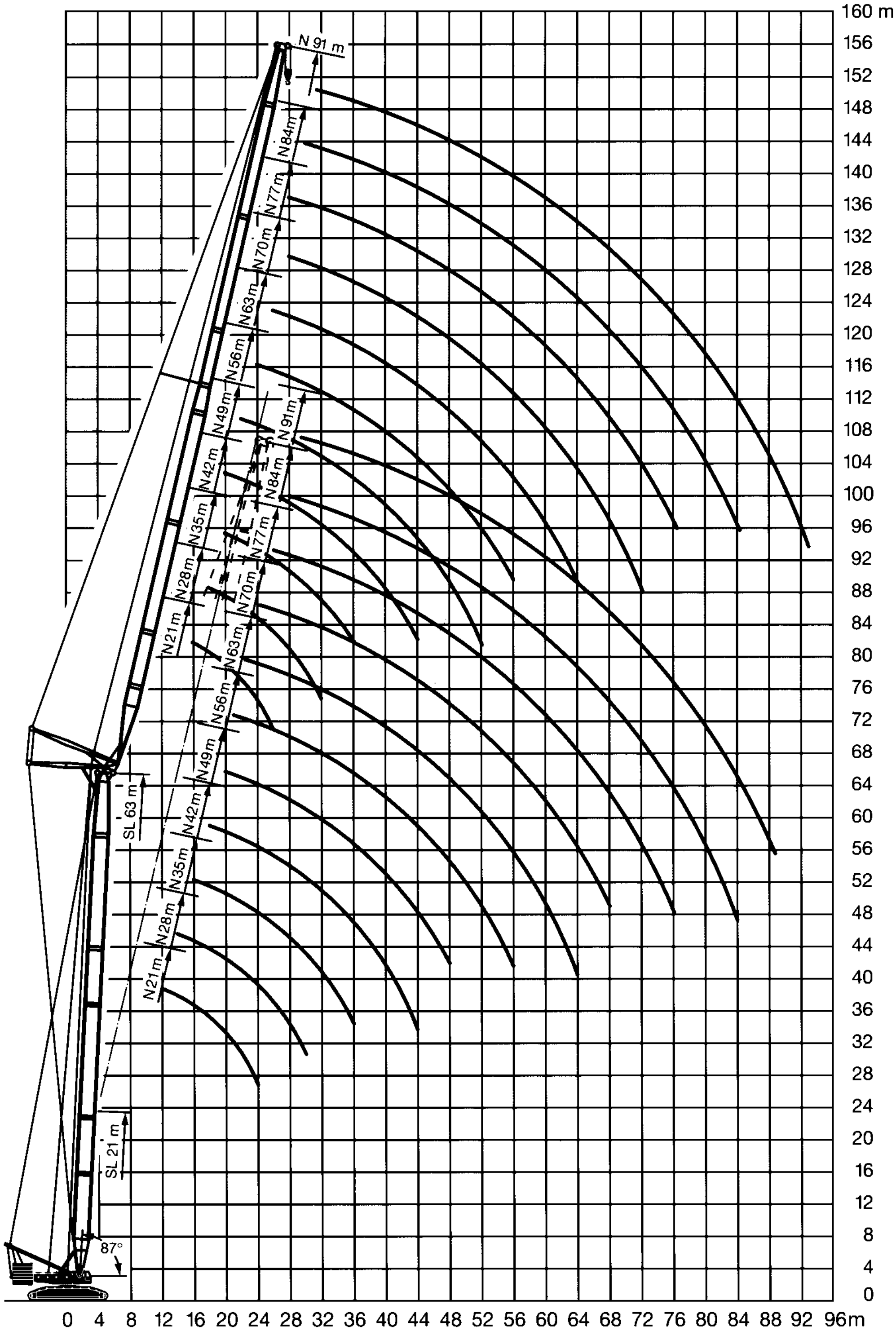


187237

The hoisting heights
SLDB / SLDBW- boom system, SL = 85°

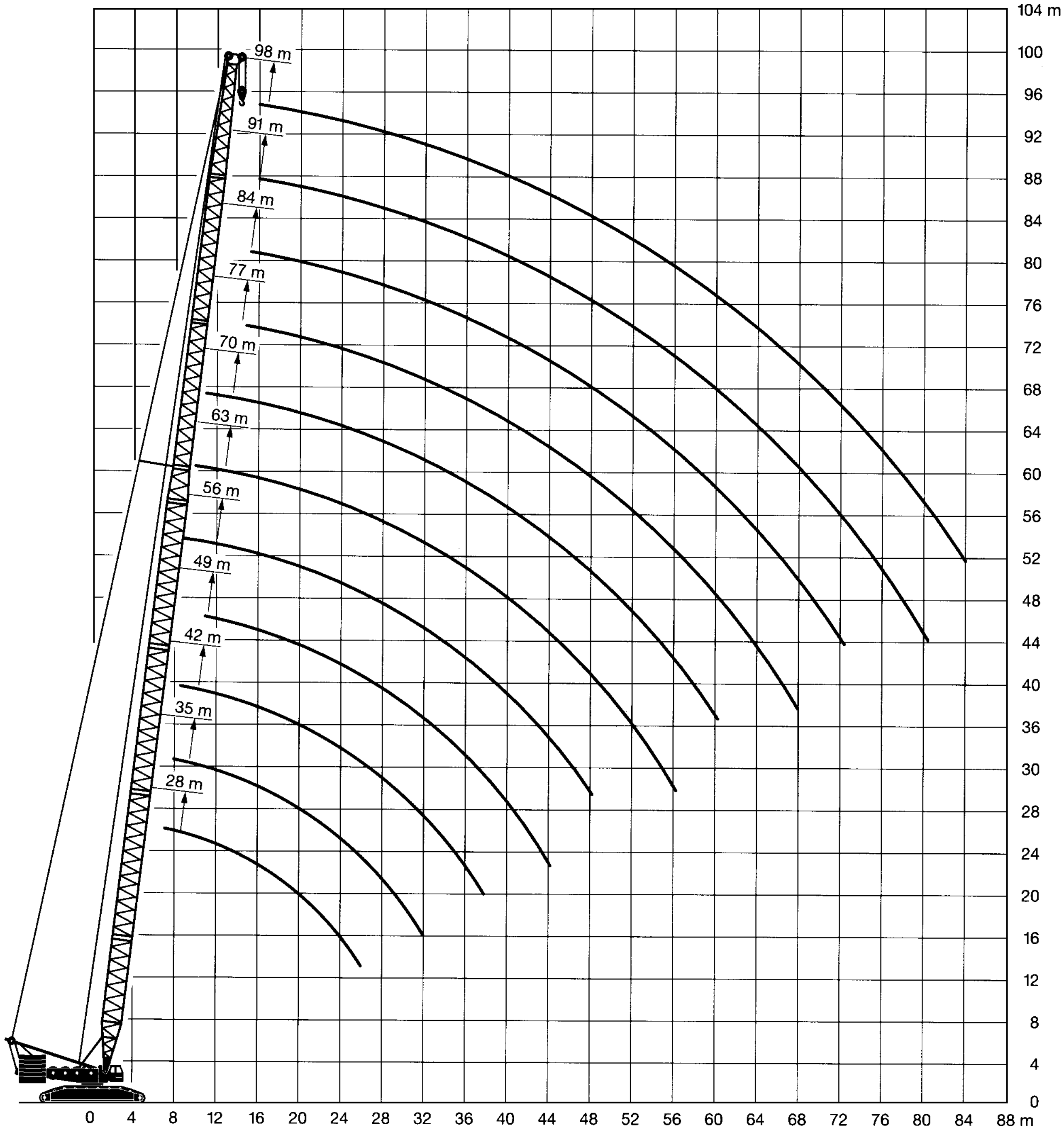


The hoisting heights
SLN- boom system, SL = 87°



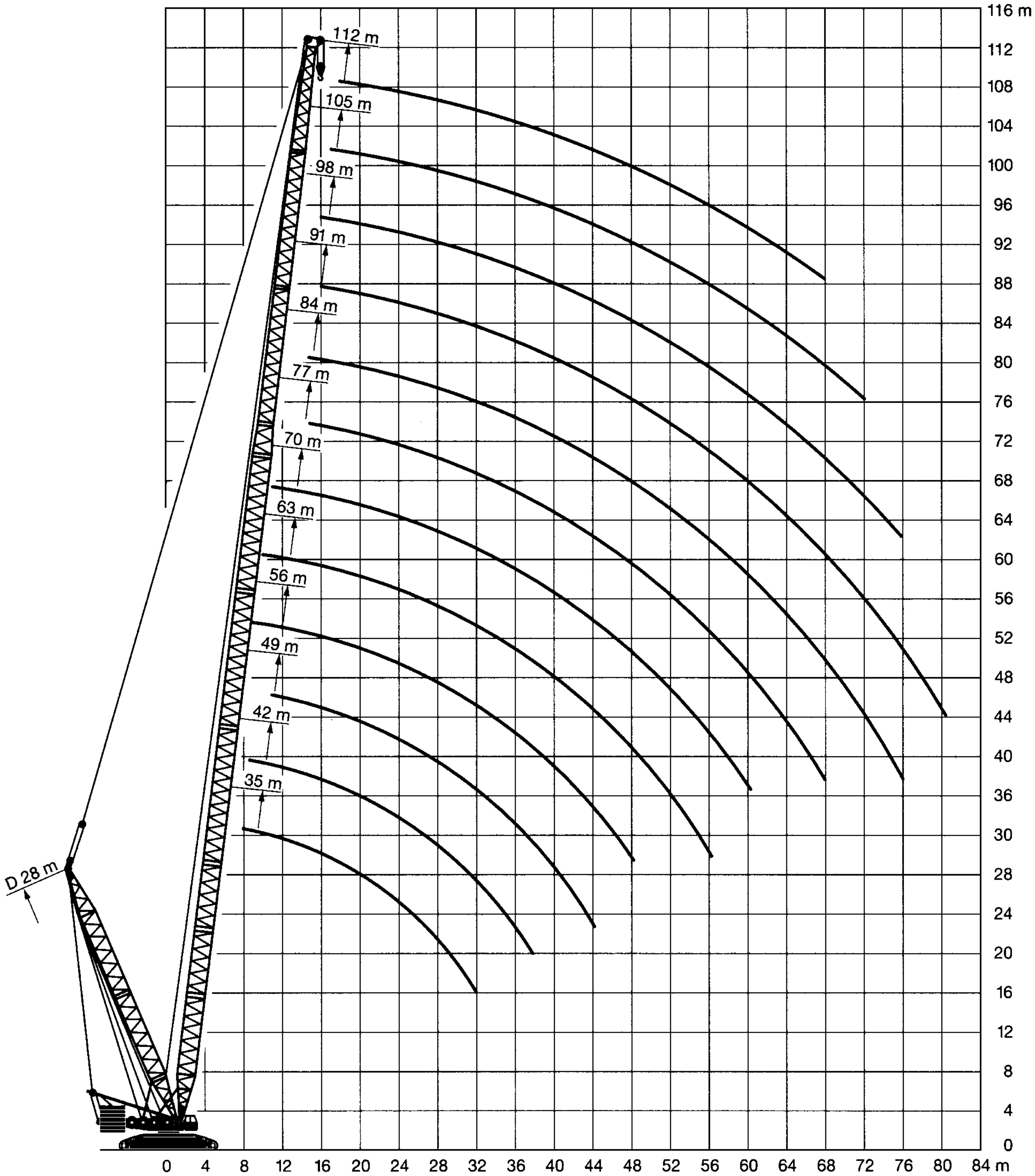
187239

The hoisting heights
Sw- boom system



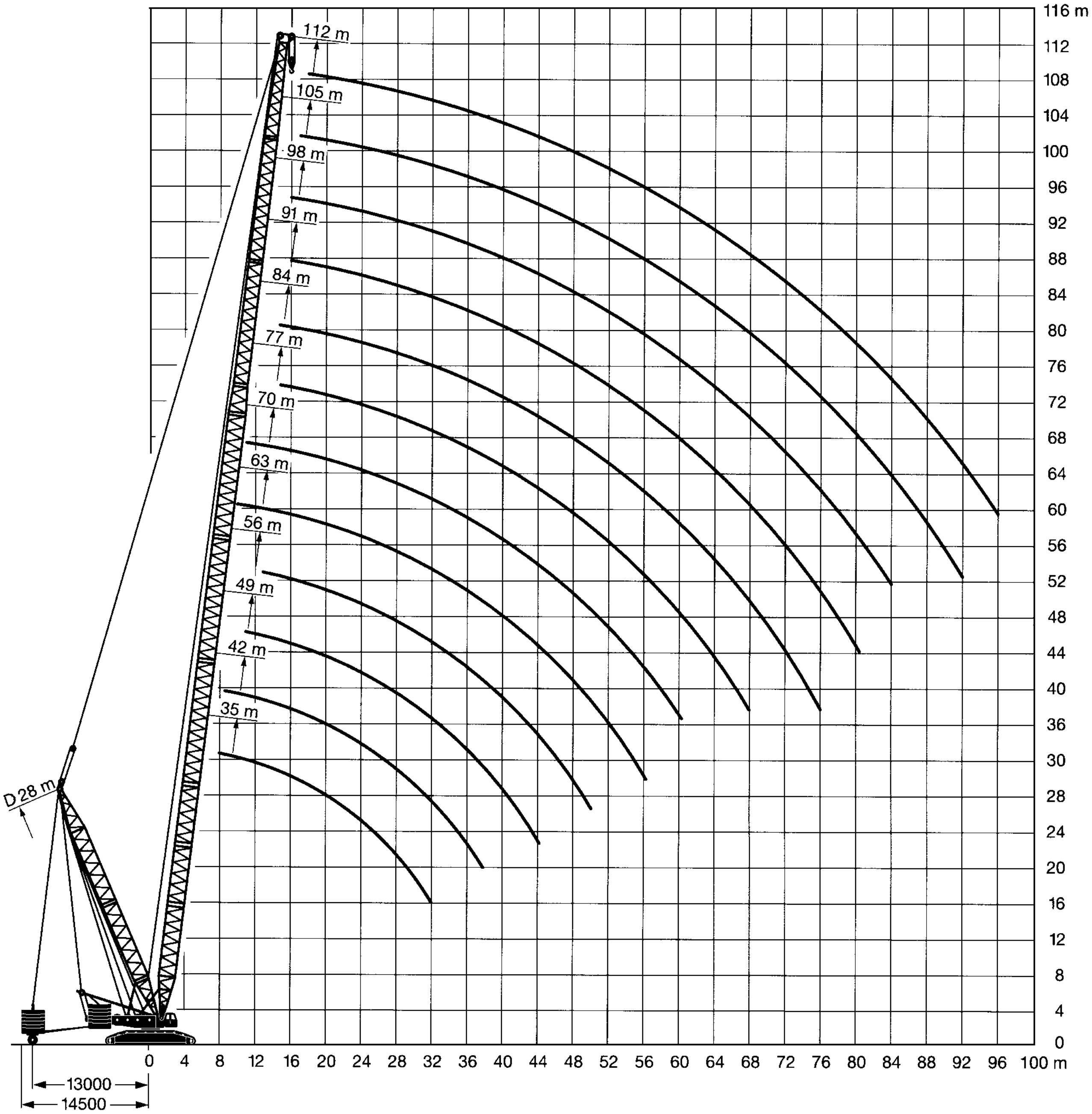
188580

The hoisting heights
SwD- boom system



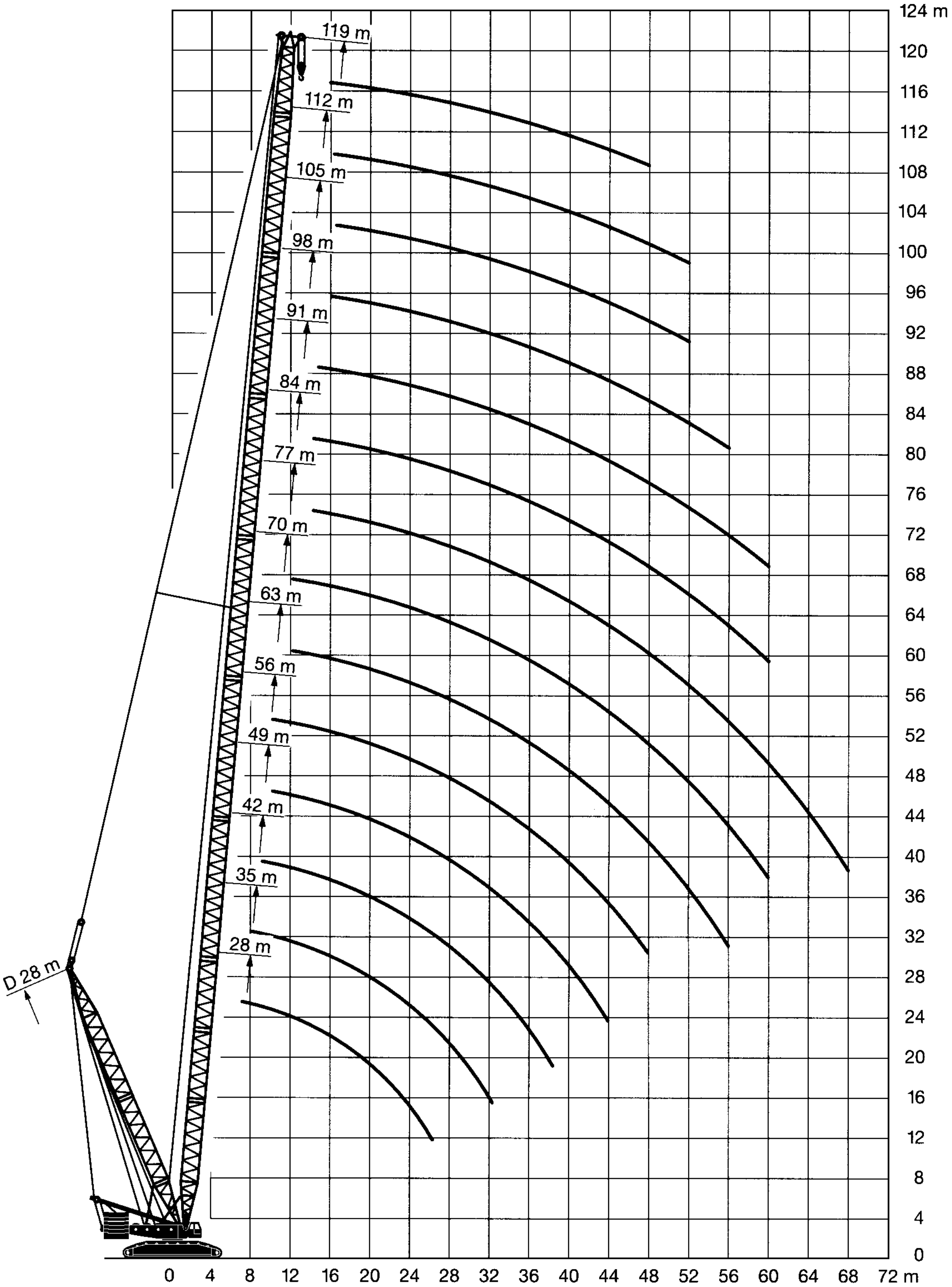
188581

The hoisting heights
SwDB / BW- boom system



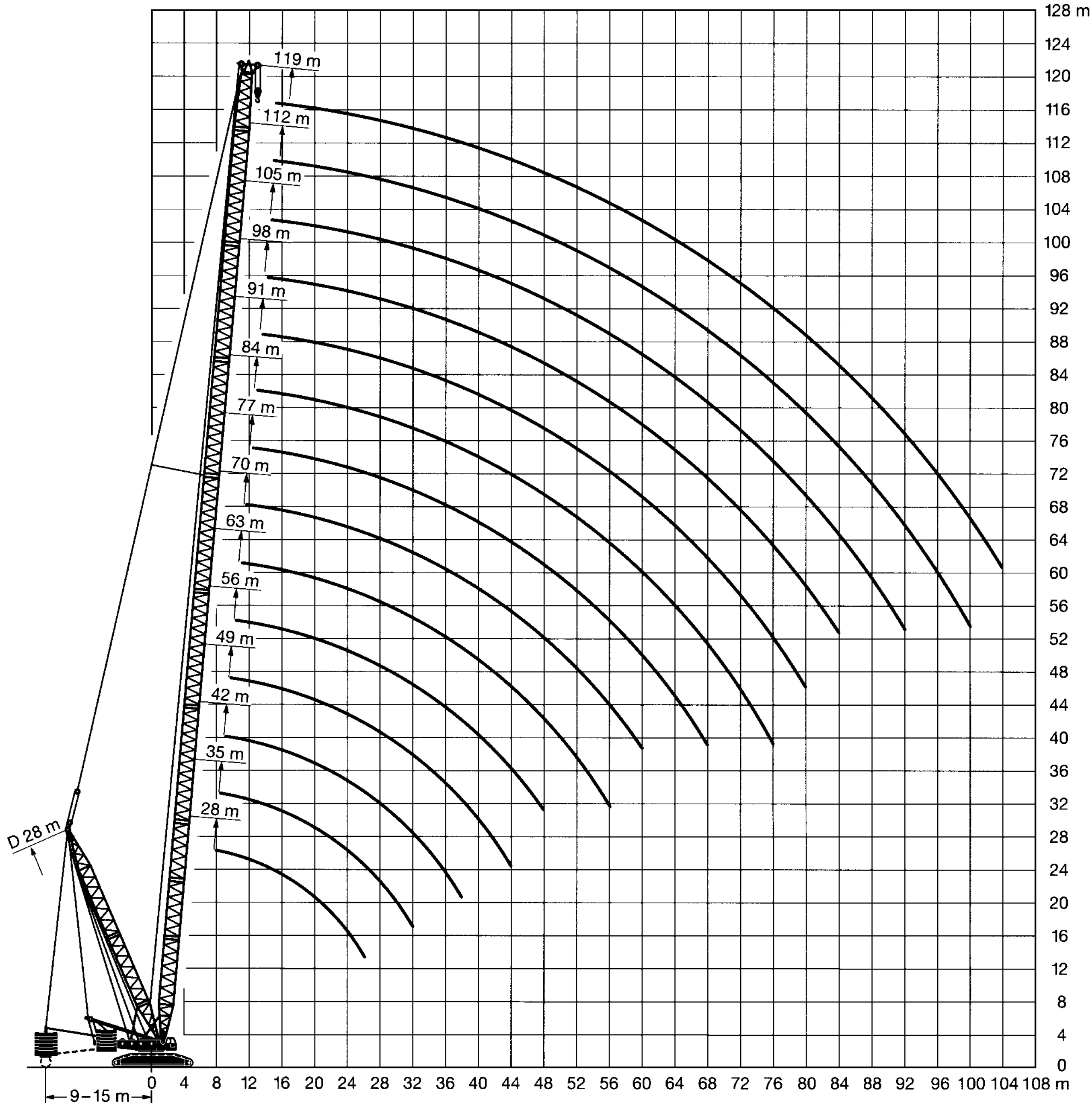
188582

The hoisting heights
SD- boom system



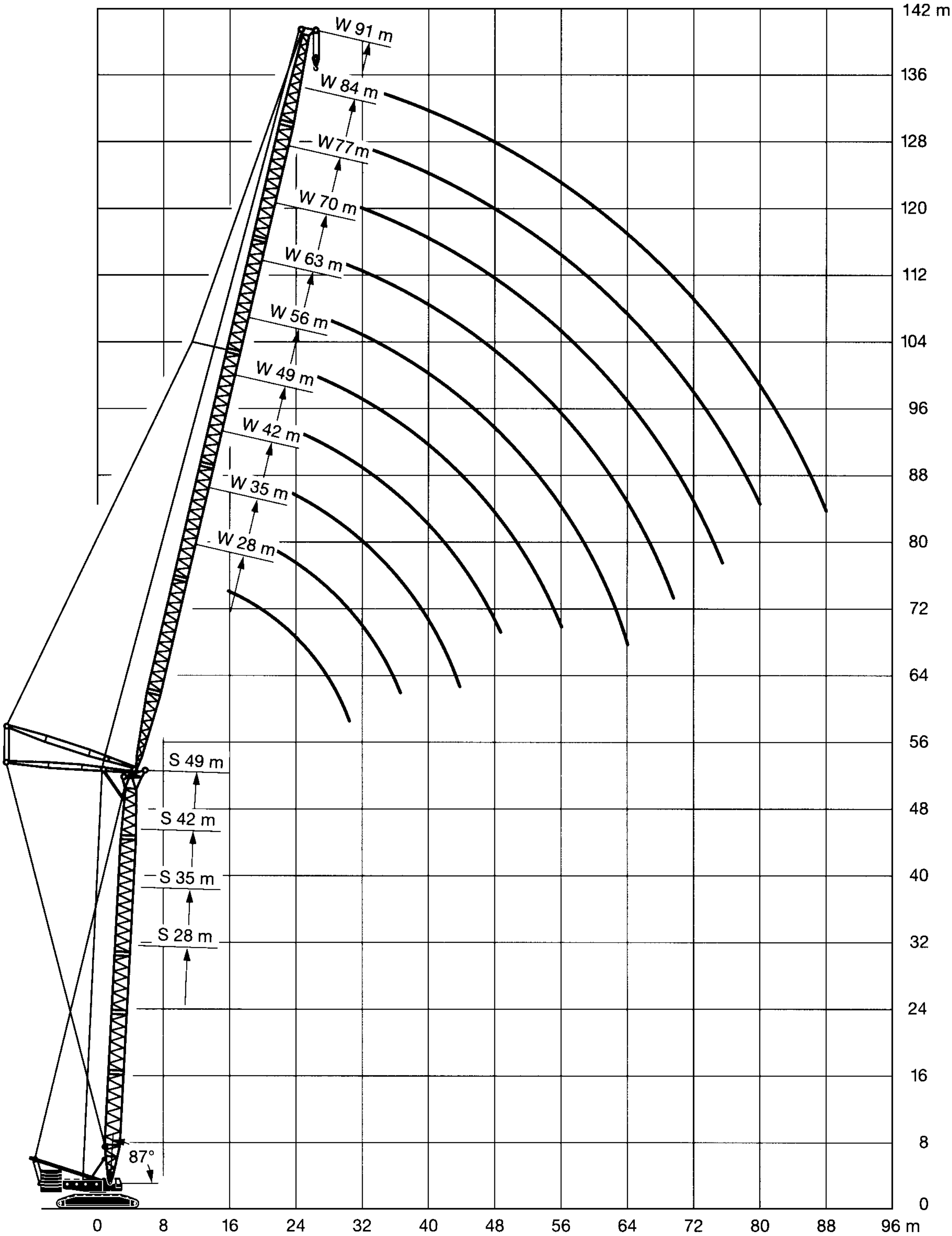
188583

The hoisting heights
SDB / BW- boom system



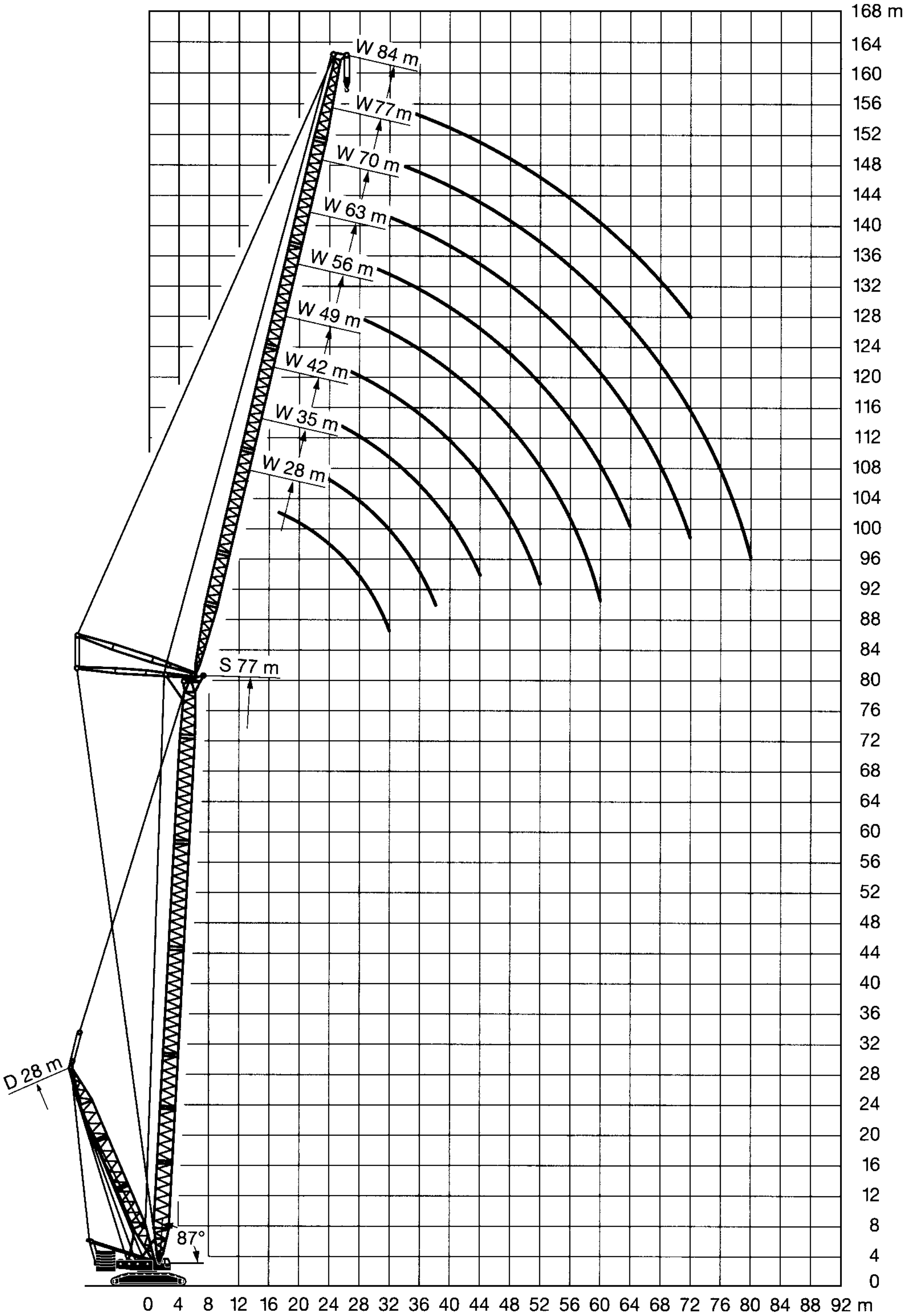
188584

The hoisting heights
SW- boom system



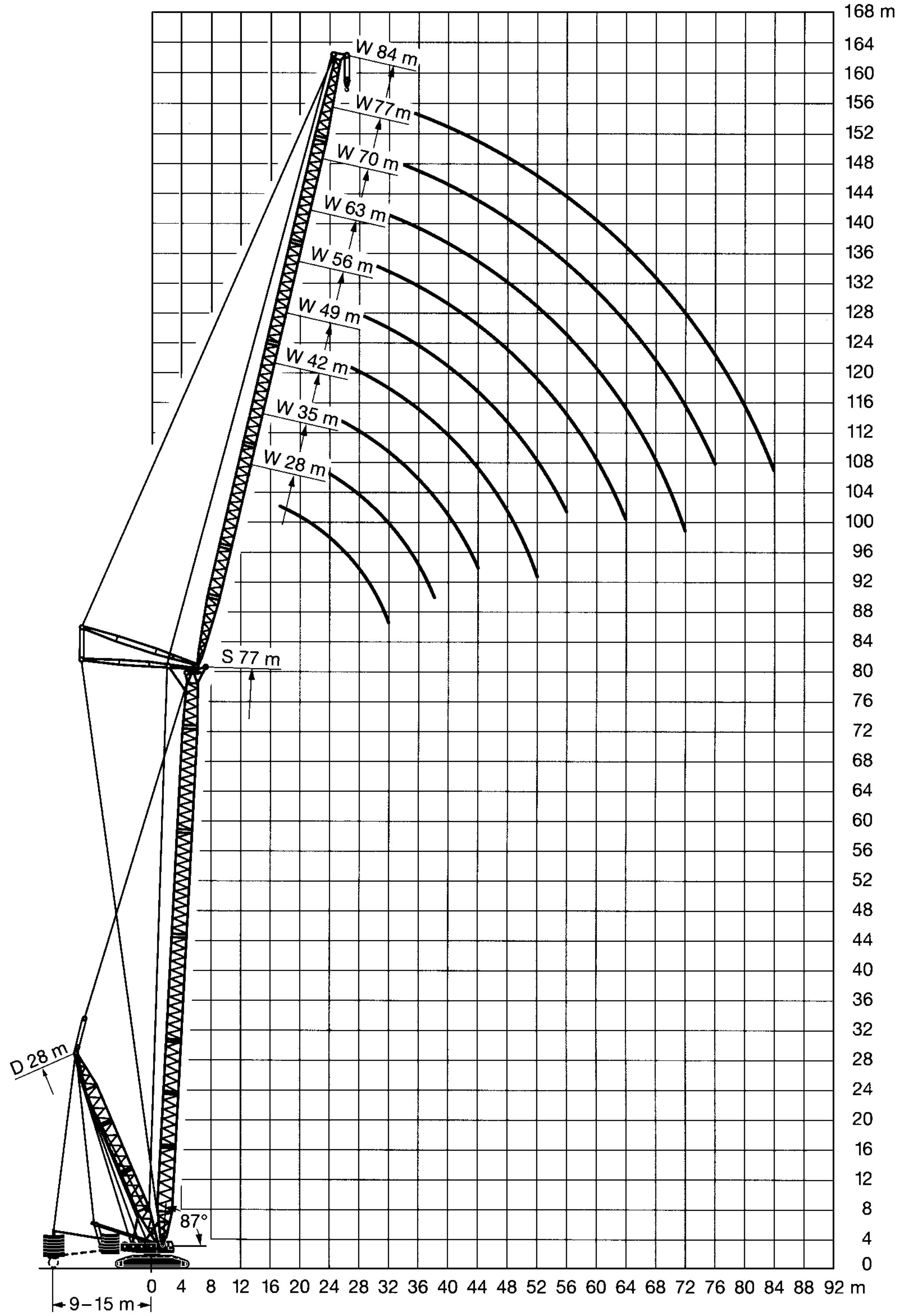
189348

The hoisting heights
SDW- boom system



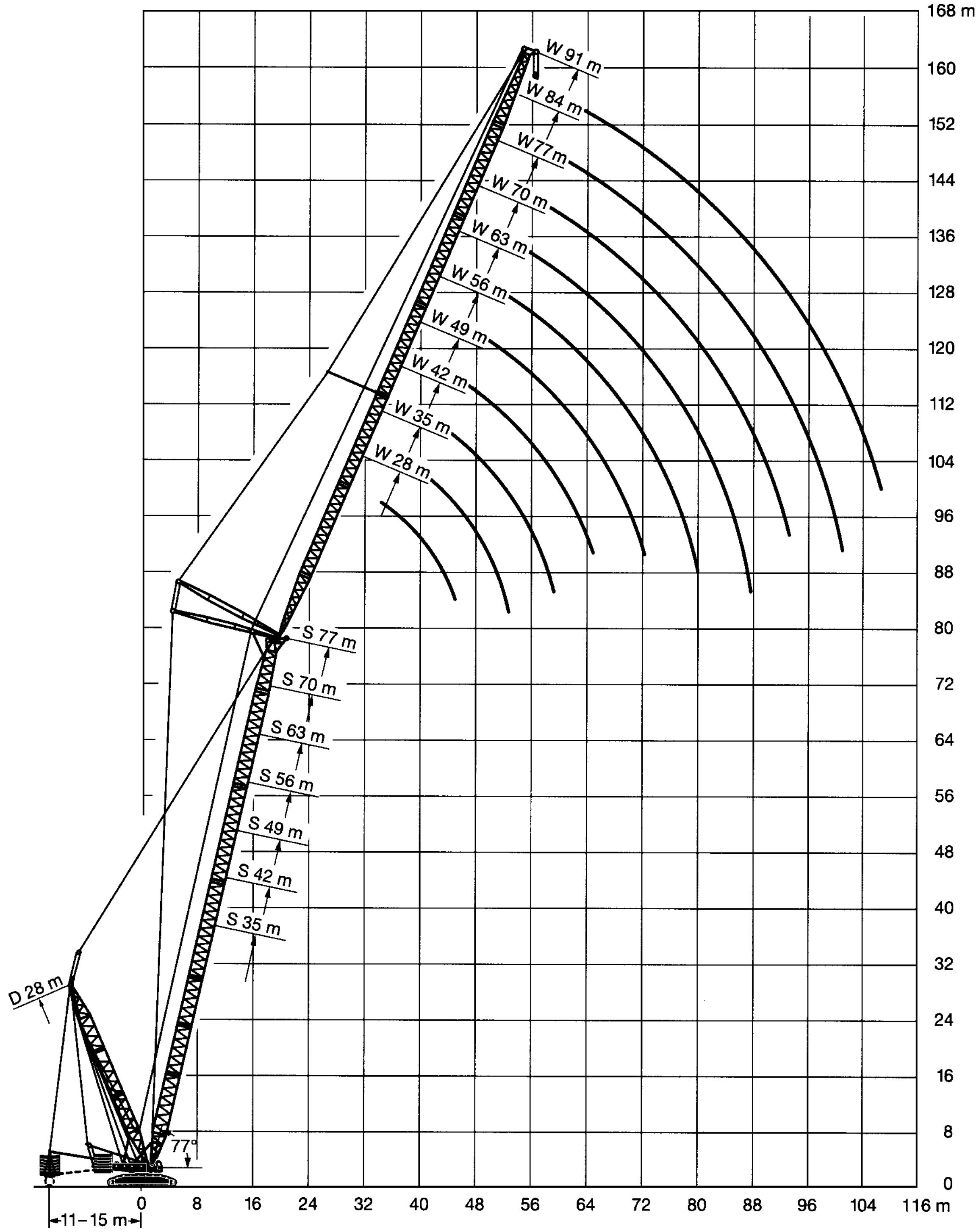
188585

The hoisting heights
SDWB / BW- boom system, S=87°



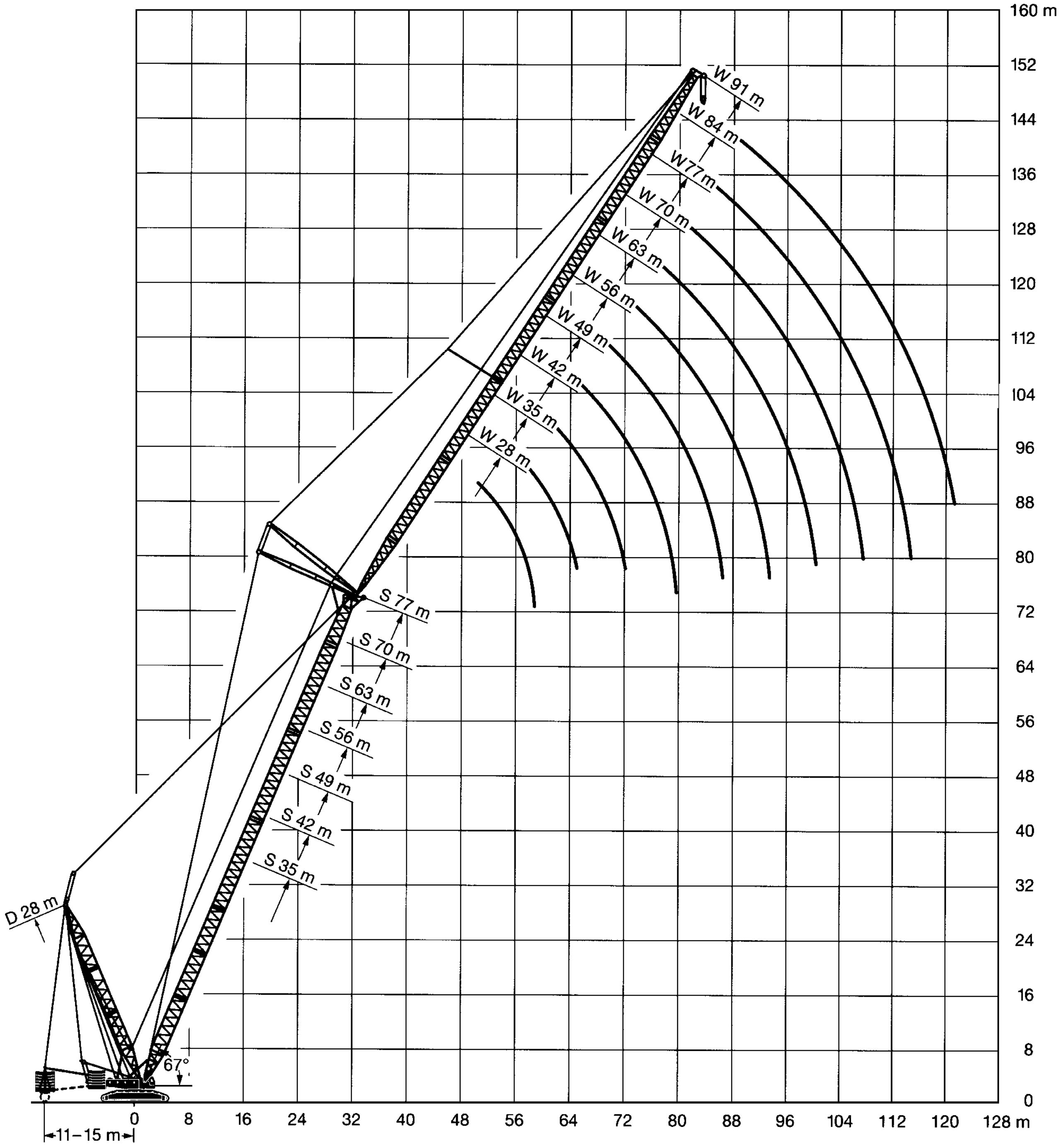
188586

The hoisting heights
SDWB / BW- boom system, S = 77°



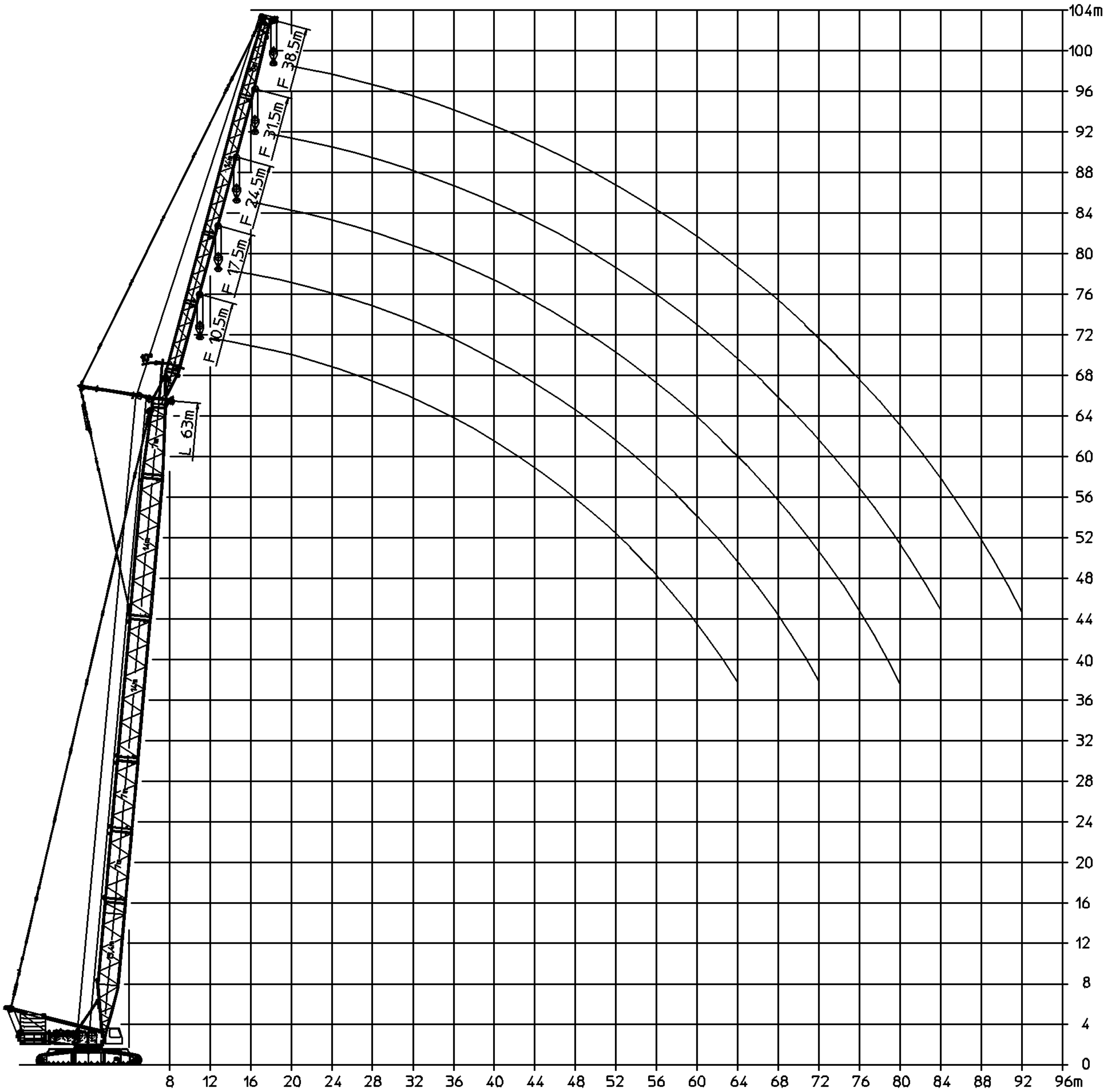
189331

The hoisting heights
SDWB / BW- boom system, S=67°



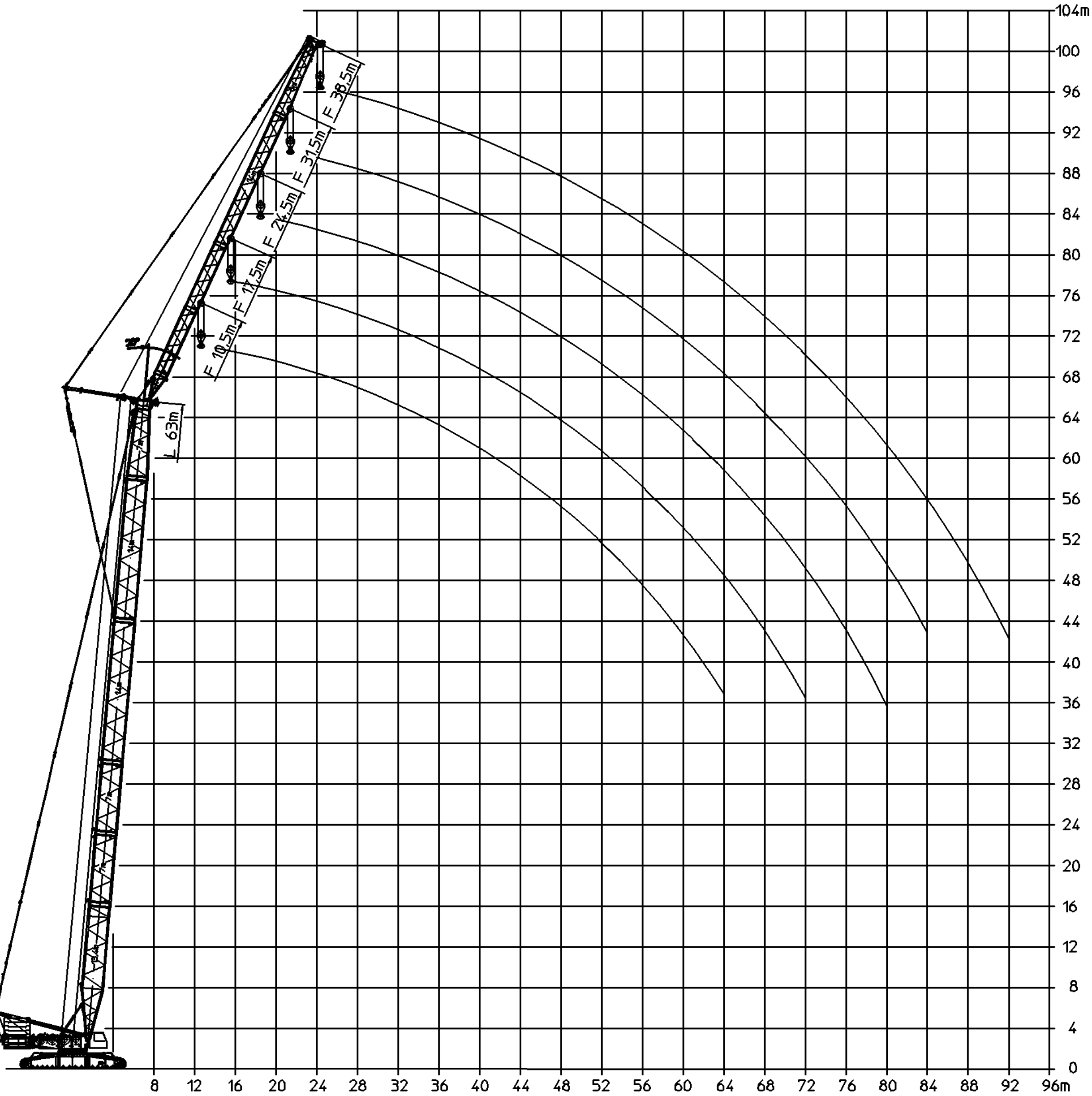
189332

The hoisting heights
SLF- boom system, F=10°



194315

The hoisting heights
SLF- boom system, F=20°



194316

Chapter 2

Safety

Operational planning

As well as a fully functioning crane and well-qualified personnel, **operational planning** is an important precondition for safe and reliable crane operation.

The crane operator must be in possession of or procure all the necessary information before starting the crane operation, especially:

- Nature of work
- Height and side clearances
- Electrical overhead wires (complete with voltage data)
- Space requirements at the operating sites
- Movement restrictions due to surrounding structures
- Weight and dimensions of load(s) to be lifted
- Required lifting height and radius
- Load-bearing capacity of soil or surface to be operated upon

The crane operator can then use this information to decide on the correct crane operating equipment:

- Hook blocks/load blocks
- Auxiliary telescopic boom
- Lifting / slinging tackle
- Counterweight

D A N G E R : **If the crane operator does not possess all necessary and required information, it may prove impossible to carry out the intended work, or he may be tempted to improvise - and accidents may be the result!**

1. Requirements of the crane operator

1.1 General

The most important requirement of the crane operator is to control, operate and adjust the crane so that there is no danger to the crane crew and/or third parties.

In order to fulfill this requirement, we would like to give you the following important safety notes.

Many problems and damages with mobile cranes are caused by improper crane operation.

Improper operating procedures most often carried out are:

Not paying careful attention while working in the case of, for example:
- slewing too quickly,
- quick braking of the load,
- cross pulling,
- loose cable formations

Overloading

Driving too fast with a load, or setting up and loading on an uneven surface.

Improperly slinging a load.

Operating in unsuitable conditions, especially pulling at an angle or fixed loads coming loose.

Wind on suspended load.

Collision with bridges, ceilings, high-voltage wires due to insufficient vertical clearance.

Improper assembly / disassembly of telescopic booms.

Many of accidents involving cranes are due to improper maintenance:

- Lack of oil, grease or antifreeze
- Accumulation of too much dirt
- Broken cable wires, defective crawler plates, worn parts
- Emergency limit switch or load moment limiter not operational
- Brake and / or transmission failure
- Defects in the hydraulic systems; for example, tears in hoses
- Loose screws

D A N G E R : **In your interest and in the interest of others, please learn to command your crane thoroughly and familiarize yourself with all the dangers associated with the work to be carried out.**

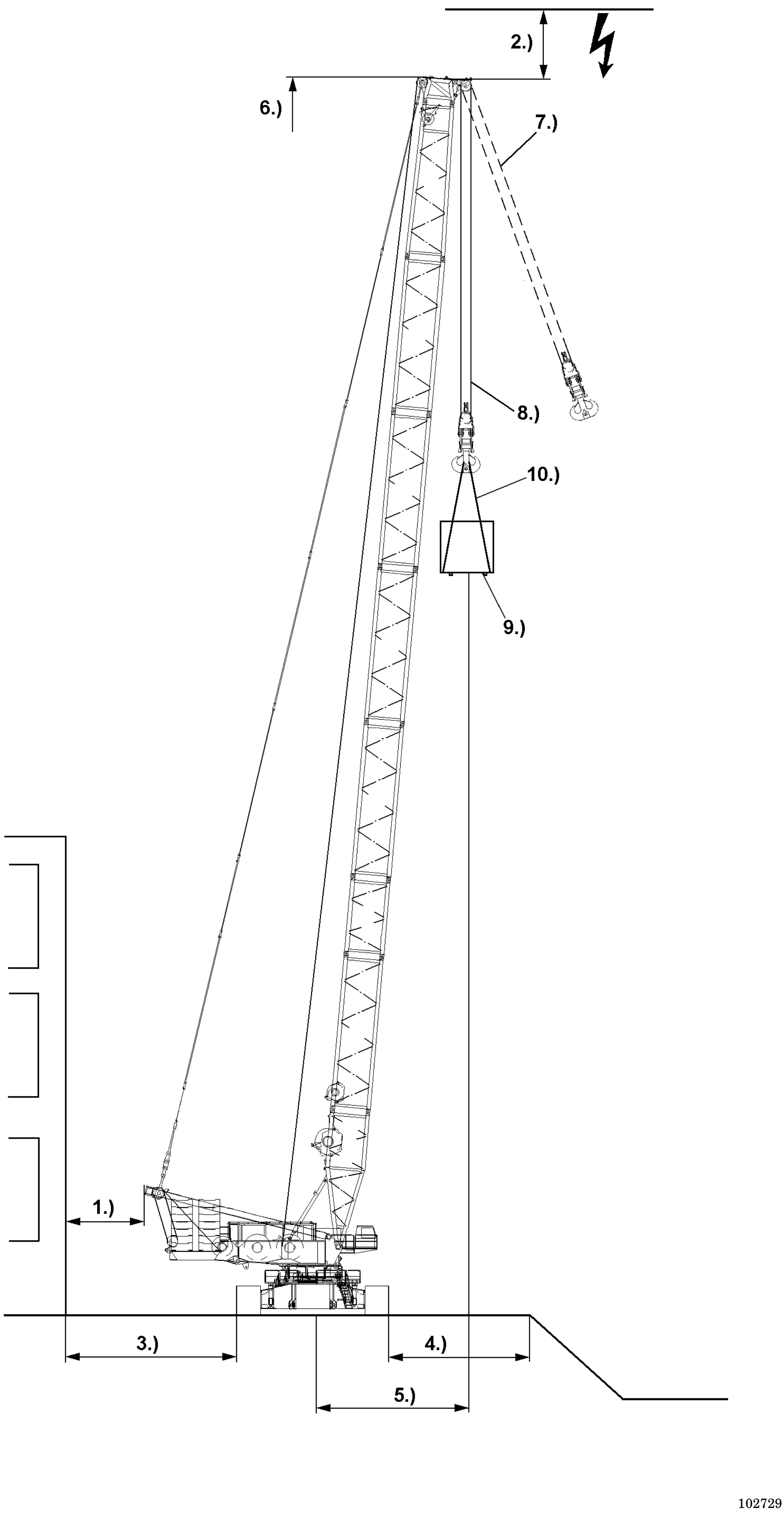
1.2 Personal protective devices

D A N G E R : **Increased danger of accidents!**
If protective devices are not worn, the crane operator or the auxiliary personnel can be killed or severely injured!
The crane operator and auxiliary personnel are obligated to carry personal protective devices along and to wear them!
Use personal protective devices according to relevant standards!

Personal protective devices include the following equipment:
- Hard hat
- Protective gloves
- Catch belt to prevent falling
- Safety shoes
- Warning apparel

1.3 Obligations of the crane operator

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


2.)
6.)
7.)
8.)
10.)
9.)
1.)
3.)
4.)
5.)
102729

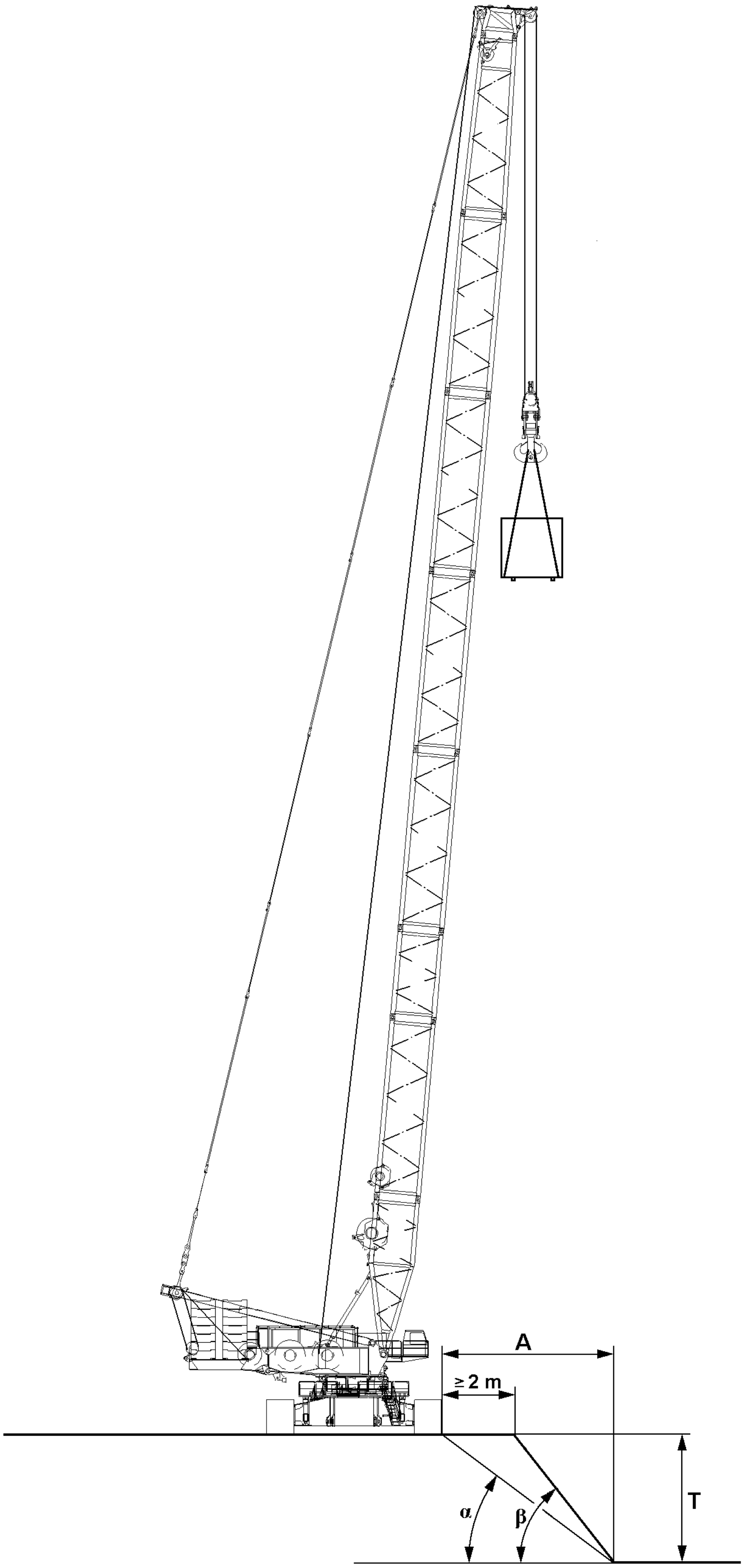
2. Selecting an operating site

To avoid accidents from the outset, the correct selection of an **operating site** is extremely important.

D A N G E R : **Risk of accidents due to ground with insufficient load bearing capacity!**
If the crane is supported on ground with insufficient load bearing capacity, then it can topple over and kill personnel!
Support the crane only on ground with sufficient load bearing capacity!
Note the following points!

When selecting the placement location of 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.) 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.



102730

3. Slopes and trenches

The crane must not be set up too close to slopes or trenches and depending on the type of soil, a safe distance must always be kept from them.

D A N G E R : Crane can topple over!
The edge of the slope or ditch can break in if the safety distance A or slope angle of β is not observed. If the edge of the slope or ditch breaks in, the crane can topple over and kill personnel!
Support the sides of the slope or ditch!
Keep a safety distance!
Observe the slope angle!

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

Note: Without calculated proof of safe placement, the slope angles of **β** given in the chart may not be exceeded!

Ground	Slope angle
for non-cohesive and soft cohesive ground	$\beta = 45°$
for stiff or semi-solid cohesive ground	$\beta = 60°$
for rock	$\beta = 80°$

Calculating safety distance A		
Soil type	**required load entry angle α**	**Formula**
soft ground	$\alpha \leq 30°$	A = 2 x T
solid ground	$\alpha \leq 45°$	A = 1 x T

4. Permissible ground-bearing load

During crane operation, significant forces are transferred into the ground. It is imperative that the ground can withstand the pressure. If the surface of the crawlers is not sufficient, then they must be supported from below, depending on the load bearing capacity of the ground .

D A N G E R : Danger of tipping over due to improper support!
The support must be large enough, depending on the ground conditions, and be made of strong materials such as wood, steel or concrete plates!

Permissible ground-bearing load

Type of Soil	**[N / cm2]**
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 b) silt, consisting of poor clay and coarse clay c) plastic clay, consisting of potter's clay and fill stiff semi-solid solid d) mixed granular ground, clay to sand, gravel and rocky areas stiff semi-solid solid	 12 13 9 14 20 15 22 33
5.) Rock in evenly solid condition: a) brittle, with traces of decomposition b) not brittle	 150 400

If there is any doubt as to the load-bearing capacity of the ground at the operating site, the ground must be investigated; for example, with a dynamic sounding rod.

5. Checking safety measures

Crane supported

- Has the operating site been selected so that the crane may operate within the smallest possible boom radius?
- Is the load-bearing capacity of the ground sufficient?
- Is there a sufficiently safe distance from slopes and trenches?
- Has it been established that the crane is not in the vicinity of electrical overhead wires?
- Are there any obstacles in the area that will hinder necessary crane movements?
- Is axle suspension blocked?
- Are all 4 sliding arms and support jacks extended to the support base as given in the load-capacity tables?
- Are the sliding arms secured with pins?
- Are the support pads secured?
- Is the crane horizontally aligned?
- Have the axles been relieved of loads, i.e., is there no longer contact between the ground and the tires?

6. Crane operation with a load

Before beginning any work, the crane operator must be convinced that the crane is in safe operating condition. The safety devices, such as load moment limiter, hoist limit switch, brakes, and so forth, must all be operational.

- The load torque limiter must be set to the current operating status of the crane.
- The load capacities as given in the load capacity tables must be adhered to.
- The crane must never be operated with a load exceeding the permissible load capacities.
- Before beginning any operations, the crane operator must know the weight, the center of gravity and dimensions of the load.
- All hoisting and slinging tackle must meet the requirements of the work to be carried out.
- It must be ensured that the weights of the hoisting, slinging and staying tackle are deducted from the load capacity.

Example:

Highest permissible load capacity according to table		30.000 t
Weight of the hook block	350 kg	- 0.350 t
Weight of the slinging rope	50 kg	- 0.050 t
Actual useful load of the crane		=29.600 t

In this case, the load to be lifted may not exceed **29.6 t.**

Counterweight
The required ballast is dependent on the load to be lifted and necessary boom radius for operating with that load. Data in the corresponding load capacity table is decisive in selecting ballast.

D A N G E R : **If ballast is not mounted according to the load capacity table, there is danger of the crane toppling over.**

Hoisting gear, hoisting cable
The lifting capacity of the crane depends on the tensile force, or pull, of the hoisting cable and the number of possible hoist reeving cables. When working with a single cable, the crane can only lift as much as the hoisting gear pulls.
If the load to be lifted is greater than the pull of the hoisting gear, the hoisting cable must be reeved between the pulley head on the boom and the hook block as many times as necessary according to the principle of a block and pulley.
When reeving, ensure that the data given in the load capacity table book and operating instructions are observed and adhered to.

D A N G E R : **If the maximum tensile force is exceeded, there is the danger that the cable(s) may snap or that the hoisting gear and/or drive motor may be damaged.**

Crane operation

D A N G E R exists if:

1. The load torque limiter is not set to the actual equipment 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 limit switches are defective or put out of operation.

4. The angle indicators and the strain gauges are not in function.

5. The support pads are not supported with stable base material sufficiently large for the soil conditions.

6. If the load is pulled at an angle.
   It is particularly dangerous when pulling to the side since the telescopic boom has a lower torque resistance to the side. **The load may not be pulled at an angle.**

7. An excessive load is attached to the hook during dismantling work, which then hangs freely on the crane when it is detached.

8. 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.

9. Work is carried out in strong winds. Refer to the data given in the load capacity table.

10. The crane is not aligned horizontally and the load is slewed toward the slope.

11. The hook load begins swinging because the crane operator has not properly controlled the movements.

12. The loads and radii contained in the load capacity tables are exceeded.

13. 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	
	[m]	[ft]
up to 1 kV (1000 V)	1	3
above 1 kV up to 110 kV	3	9
above 110 kV up to 220 kV	4	13
above 220 kV up to 380 kV	5	16
if rated voltage is unknown	5	16

Note: 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.

D A N G E R : Not observing the above points can lead to (fatal) accidents and damage!

7. Grounding

7.1 Grounding the crane

D A N G E R : Danger of accidents due to electrical shock !

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

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

D A N G E R : Danger of accidents due to electrical shock !

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
- 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 16mm^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.

C A U T I O N : 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 pin on the crane.

C A U T I O N : The connection between the crane and the ground must 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.

D A N G E R : Danger of accidents due to electrical shock !
There is a risk of elektrical 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 .

7.2 Grounding the load

DANGER: Danger of accidents due to electrical shock !

The load should be grounded before operation :
- near transmitters (radio and TV transmitters, radio stations, etc.)
- near high frequency switching systems
- 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 tackle (for example plastic or manila ropes).

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.

DANGER: Danger of accidents due to electrical shock !

CAUTION: The connection between the load and the ground must 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.

CAUTION: 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 accidents due to electrical 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.

8. 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, take the boom down and bring it into a safe condition.
- Turn the crane engine off.

D A N G E R : Danger of accidents due to lightning!

Make sure that there are no persons near the immediate area of the crane .

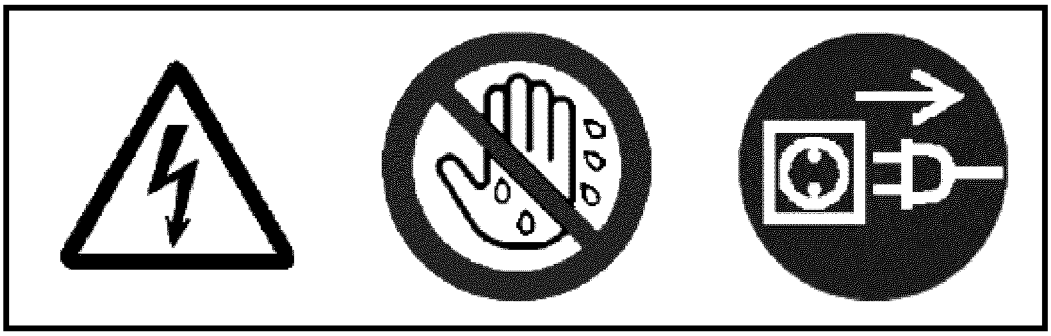
9. Welding work on the load

C A U T I O N : 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 cable, crane superstructure or crane chassis .

C A U T I O N : Danger of damage to the heater control units .

Disconnect the negative and positive cable from the batteries and place the positive cable onto the vehicle ground.




DANGER
Electrical hazard.
Contact with water will
cause electric shock.
Do NOT touch with wet
hands. Always unplug
when not in use.

197720

10. Safety guidelines for auxiliary power supply (230 V AC)

If the crane is supplied by an auxiliary power supply from a low voltage power supply distribution network (230V AC), then it poses a potential danger.

Electrical power is especially dangerous if there is an interruption in the protective conductor, (due to mechanical wear of the flexible supply line or the house installation), in case of loose terminal connections, high line and transfer resistance, interchanged conductors, defective or non-existing protective measures in connection with an insulation fault on the crane.

D A N G E R : **Moisture infiltration and / or defective machines can cause voltage displacement due to an insulation fault.
The person touching the unit will be exposed to a dangerous voltage surge.
There is a DANGER OF LIFE AND DEATH!**

For that reason, it must be assured that the flexible auxiliary supply line is fully functioning and in proper order.
If necessary, we recommend to connect a power isolating transformer.

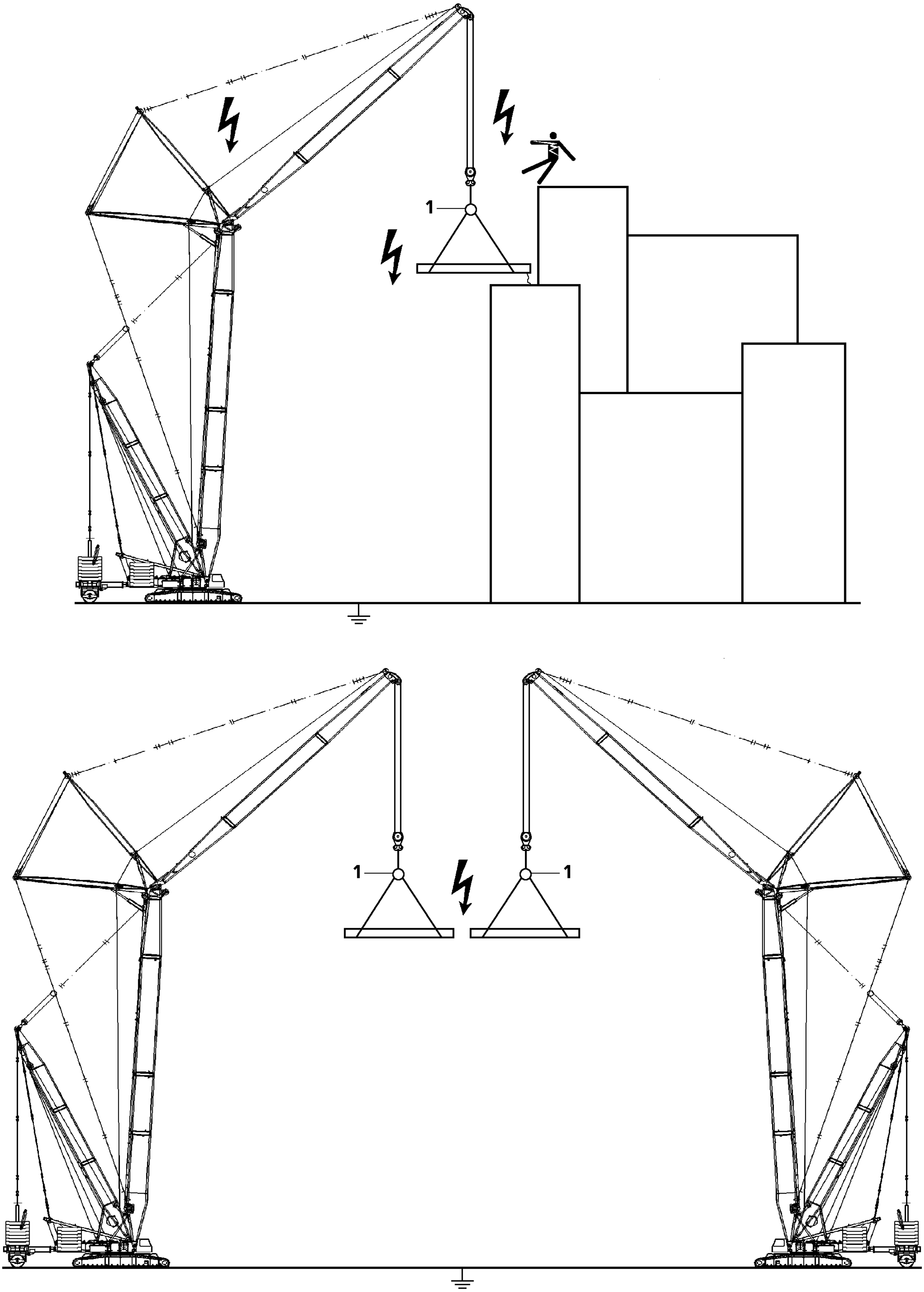
C A U T I O N : **To check the protective measures and to decide if the crane can be supplied with power from the general power supply distribution network, a competent trained electrician must be called in with the appropriate test instruments according to VDE** (Association of German Electrotechnical Engineers)**.**

11. Working near transmitters/ transformers

If there is a transmitter / transformer near the job site, strong electro-magnetic fields may exist.

D A N G E R : **These electro-magnetic fields can pose direct or indirect danger to persons or objects, for example:**
- **Effect on human organs due to temperature increase**
- **Danger of burns or inflammation due to temperature increase**
- **Spark or electric arc formation**

In any case, before working with the crane near transmitters / transformers, contact your LIEBHERR representative .
In addition, consult a high frequency specialist.



189694

The high frequency (HF-) rays from a transmitter require an increased working protection and special UVV-guidelines (Accident Control Regulations) **for crane operator and crane personnel**

1. Every crane must be "totally" grounded. Check visually or with a simple tester to ensure that ladder, cab and cable pulleys are grounded.

2. All persons working on the crane or on larger metal parts must carry special protective gloves without metal connectors and suitable protective suits to protect them from burns while working.

3. If one should feel an increase in temperature, there is no need for panic. Simply act as if the affected tool, component or carrier is "hot".

4. The temperature of the tools affected by high frequency depends on their "size". Cranes, carriers and coverings, for example, are "hotter".

5. When moving the crane, do not allow it to touch other crane loads (light arcs).
   Since burn nicks reduce the load carrying capacity of the cables significantly, contact your supervisor (master) any time such a contact has occurred, so that the cables can be checked and inspected.

6. An insulator (1) must always be between the load hook of the crane and the tackle. This insulator (1) may not be removed. This is strictly prohibited.

7. The cable may not be touched above the insulator (1). This is strictly prohibited!

8. Never touch the crane with attached loads with unprotected body parts after lift off or after set down.

9. Never work with exposed, unclothed upper body or short pants, this is strictly prohibited!

10. If possible, transport larger loads in horizontal direction, to reduce high frequency absorption!

11. Before carrying out any necessary manual work, ground the loads first or insulate them (place a rubber cloth between the tool and the glove).

12. The temperature of the tool can be checked with a suitable tester.
    If, for example 500 V can be measured on a tool at a distance of 1 to 2 cm, then the tool may not be touched with bare hands.
    The larger the distance, the higher the voltage is on the tool:
    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 prevent accidents, work on components located higher up, may only be carried out with a safety belt.

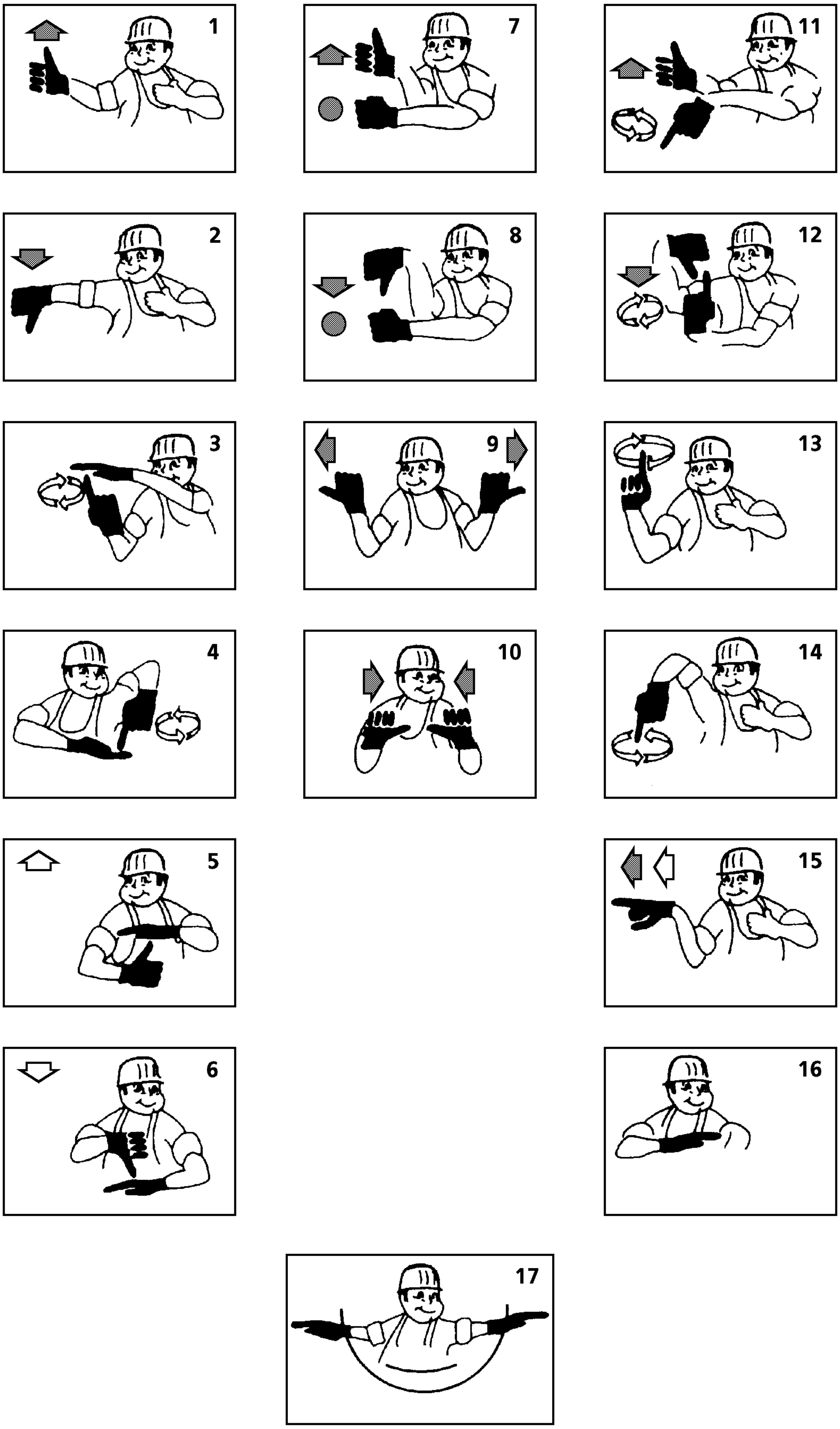
14. Handling explosive matter (such as refueling) may only be done at least 6 m away from the place where sparks could form due to handling of larger metal parts.
    To refuel, use only appropriate and approved rubber hoses .

15. All accidents or special occurrences must be reported immediately to the local construction supervisor and the safety engineer.

12. Endangering the air traffic

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

D A N G E R : **Endangering air traffic!**
If no protective measures are taken, this can result in endangerment to air traffic! Get the approval from the agency responsible for air traffic! Install the airplane warning light on the boom head and turn it on!



180003

13. Hand signals for guides

When performing any movement, the crane operator must always keep his eye on the load, and when moving the crane without a load, he should observe the crane hook or the lifting tackle.

D A N G E R : **A suspended load is always a risk!**
Constantly keep loads in sight!
Do not remain under a suspended load!

If this is not possible, he must only operate the crane according to instructions given to him by a signaler. These instructions may be given in the form of hand signals or over a two-way radio. Whatever method is used, precautions must be taken to eliminate the risk of misunderstandings.

C A U T I O N : **Hand signals must first be discussed and agreed upon and then clearly given.**
Misunderstandings can lead to serious accidents.

The hand signals illustrated on the opposite page are given as recommendations for safe working.

When operating in foreign countries, always observe NATIONAL TRAFFIC REGULATIONS.

Explanation of hand signals

1 = Raise boom
2 = Lower boom
3 = Lift load slowly
4 = Lower load slowly
5 = Raise boom slowly
6 = Lower boom slowly
7 = Raise boom and hold load
8 = Lower boom and hold load
9 = Extend boom
10 = Retract boom
11 = Raise boom and lower load
12 = Lower boom and raise load
13 = Raise load
14 = Lower load
15 = Slew load this way
16 = Shut down all systems
17 = Stop!

14. 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.

If the wind speed is larger than the maximum permissible wind speed, then crane operation must cease. The boom and the attachments must be taken down. The crane operator must check with the appropriate weather bureau about the expected wind speeds, at :
1.) the start of crane operation
2.) interruption of crane operation
3.) when resuming crane operation.

D A N G E R : **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		Effects of Wind in the inland
Beaufort degree	Description	[m/s]	[km/h]	
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 - 10,7	29 - 38	Small deciduous trees begin to sway, foam forms at sea
6	Strong wind	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)
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

15. Interruption of crane work

15.1 Interruption of crane work

If the crane operator leaves the equipped crane during crane operation, then it must be ensured that no danger to crane or surrounding area can occur in case of an unforeseen event.

D A N G E R : **If the crane is not guarded, events can occur which could bring the crane to an unsafe condition.
This can cause the crane to topple over and as a result, severe personal injury or property damage can occur.
For that reason, always keep the crane under control!**

Events are, for example:
- The ground giving way due to severe rain
- Melding ice under the supports
- Storms, thunderstorms
- Land slide
- Wash outs
- Support cylinder giving way
- Luffing cylinder giving way
- 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.

D A N G E R : **If it is not possible to keep the equipped crane constantly under guard, then the attachments and the boom must be taken down.
There is a danger of accidents!**

15.2 Taking up crane operation again

If the crane operation is taken up again, then the crane operator is obligated to check the crane condition and the safety devices.

D A N G E R : **If the crane operator leaves the crane operator's cab, even if only for a short time, then he is obligated before starting to work again with the crane, to check the operating mode settings and to reset them, if necessary.
There is a danger of accidents!**

15.3 Ending crane operation

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

- Remove the load on the crane hook or place it on the ground.
- Telescope the telescopic boom all the way in and place the boom down.
- Bring the control lever (master switch) to 0–position.
- Turn the heater off.
- Apply the parking brake on the crane chassis.
- Turn the engine off and pull the ignition key.
- Secure the mobile crane to prevent unauthorized use. close all control platforms with a lock, if they are not used at the time or if they are not occupied.
- Secure the mobile crane to prevent it from rolling off. See paragraph ‚Parking the vehicle“.

16. Parking the crane

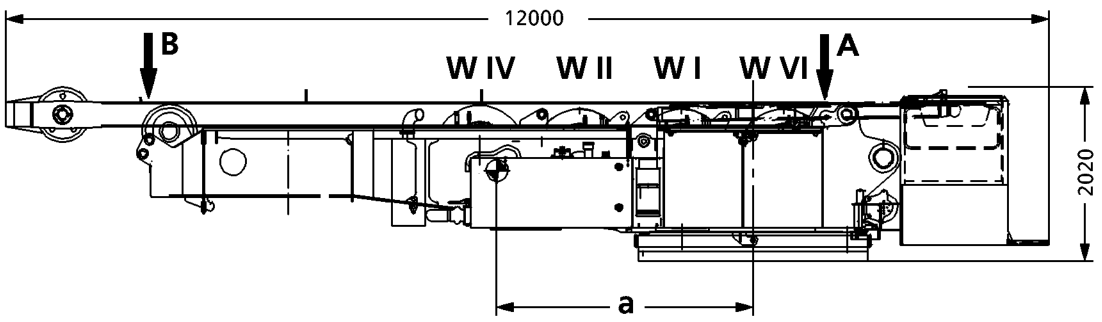
D A N G E R : **Danger of accidents due to uncontrolled slipping or movement of the crane! I fthe following points are not observed by the crane operator, then personnel can be fatally injured.**

- **Do not part the crane on a downhill or on an unhill slope!**
- **Park the crane only on level ground with sufficient load bearing capacity!**

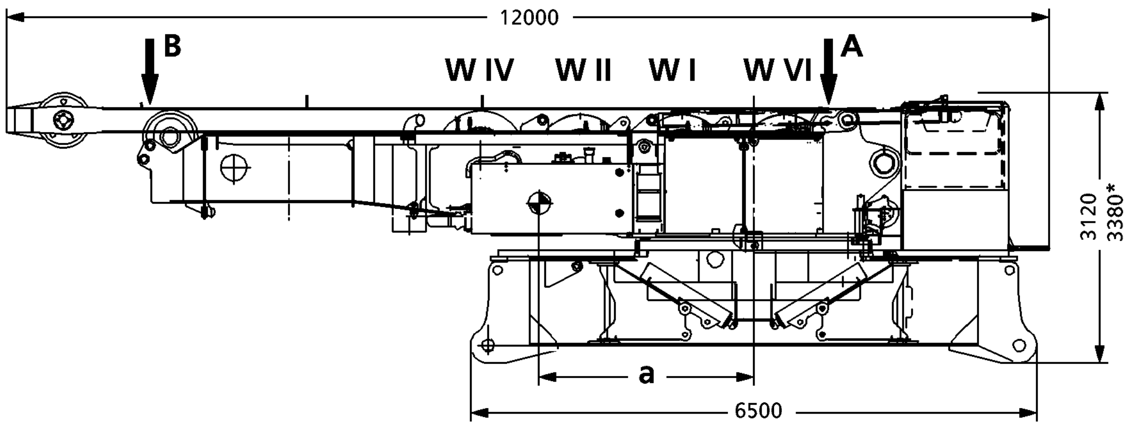
Chapter 3

Crane assembly

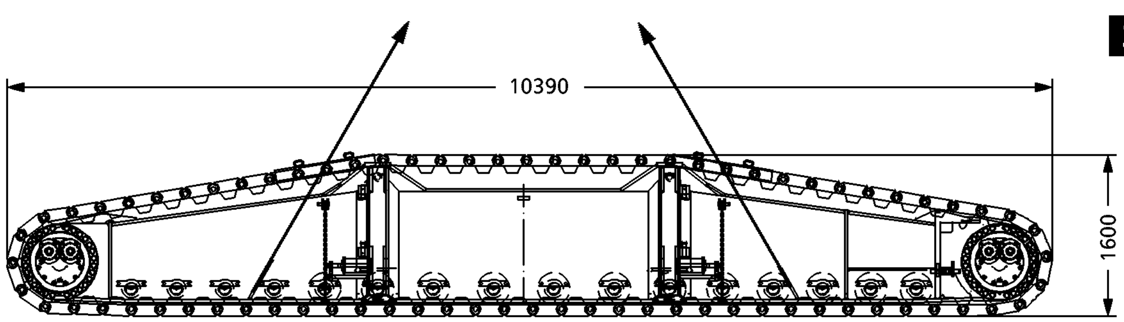
1


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

186765

Transport weights and centers of gravity

Weigh with:
- assembly winch + cable
- A-bracket with assembly cylinder
- Fall back cylinder
- Supports

Slewing platform (Fig.1)

Crane with Quick Connection	weight (t)	center of gravity (mm)	A (t)	B (t)
with winch IV +cable	31.3	2672	17.1	14.2
with winch I+IV +cable	35.5	2510	20.1	15.4
with winch I, II+IV +cable	39.7	2456	22.9	16.8
with winch VI, I, II IV +cable	43.9	2180	26.9	17.0

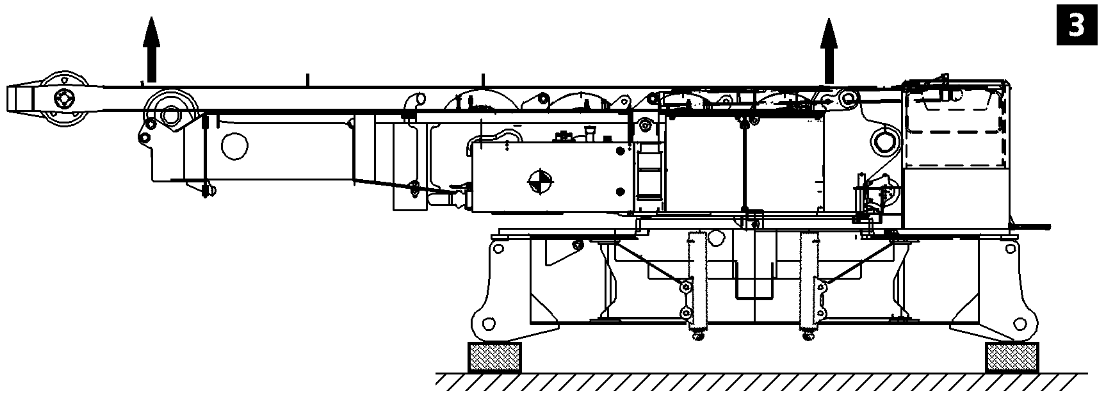
Slewing platform and crawler mid section (Fig.2)
* with Quick Connection

Crane with Quick Connection	weight (t)	center of gravity (mm)	A (t)	B (t)
with winch IV +cable	47.5	1761	31,5	16,0
with winch I+IV +cable	51.7	1452	36,4	15,3
with winch I, II+IV +cable	55.9	1745	37,3	18,6
with winch VI, I, II IV +cable	60.1	1598	41,2	18.9

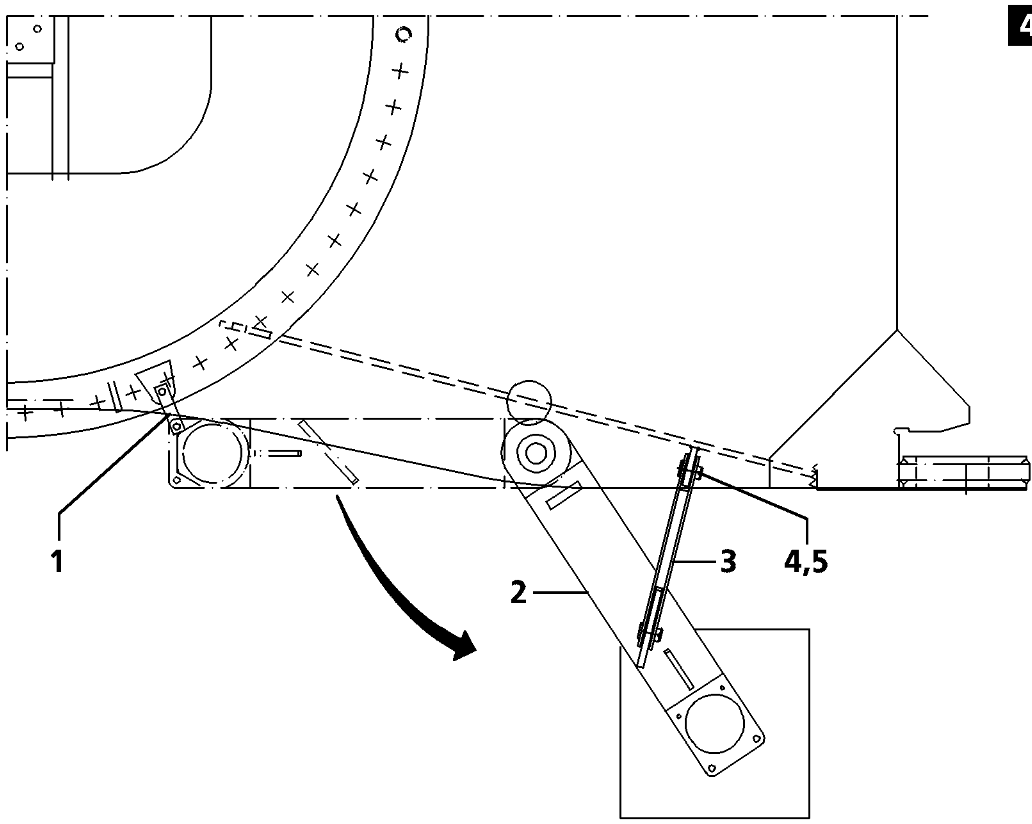
Crawler (Fig.2)

weight approx. 28,0 t each

3



4



187844

Crawler track attachment if the slewing platform and the crawler mid section are delivered separately

Attachment procedure:

1. Place slewing platform and crawler mid section onto the foundation (Fig. 3).
2. Place supports into operation position (Fig. 4)
3. Raise LA strut (Fig.5)
4. Raise crane by extending support jacks (Fig.6).
8. Attachment of crawler track with LA strut (Fig.7,8,9)

1. Place slewing platform and crawler mid section onto the foundation (Fig.3)

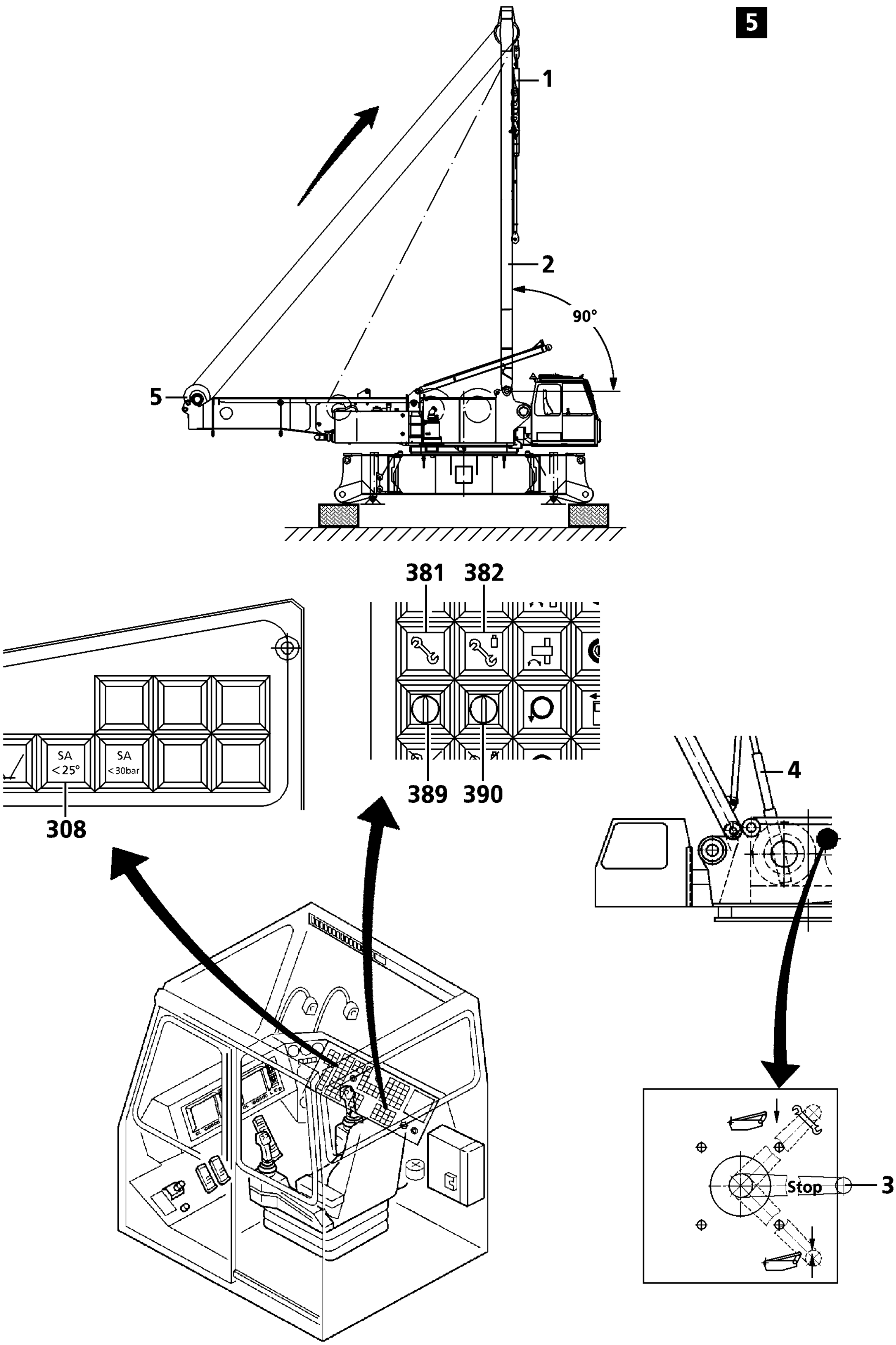
Using the auxiliary crane, hoist slewing platform and crawler mid section from the transport vehicle. Lower it onto the foundation.

Note: Weights see charts!

C A U T I O N : The crawler mid section must be horizontally aligned.

2. Place supports into operating position (Fig. 4)

Take off transport safety plate (1).
Swing the supports (2) to the attachment points.
Insert pin (4) and secure with spring keepers (5).


5
1
2
90°
5
381 382
389 390
SA
< 25°
SA
<30bar
308
4
Stop
3
187851

4. Raising the A- bracket, (Fig. 5)

Requirements:

- The cable of winch IV - boom adjustment - is reeved in.
- Engine on - see chap. 4.03
- Activate key-operated "assembly" switch (389) and key-operated switch (390) "crawler-and boom assembly", indicator light " assembly (381) and "crawler- and boom assembly" (382) is on.
- Set the LICCON to operating mode needed

Note: Use of manual control lever when key-operated switches are activated - see chap. 4.05

D A N G E R: **As long as the key - operted switch (390) is activated, there is no overload safety cut off for assembly cylinder (1) and also for the crane.**
There is a risk of accidents.

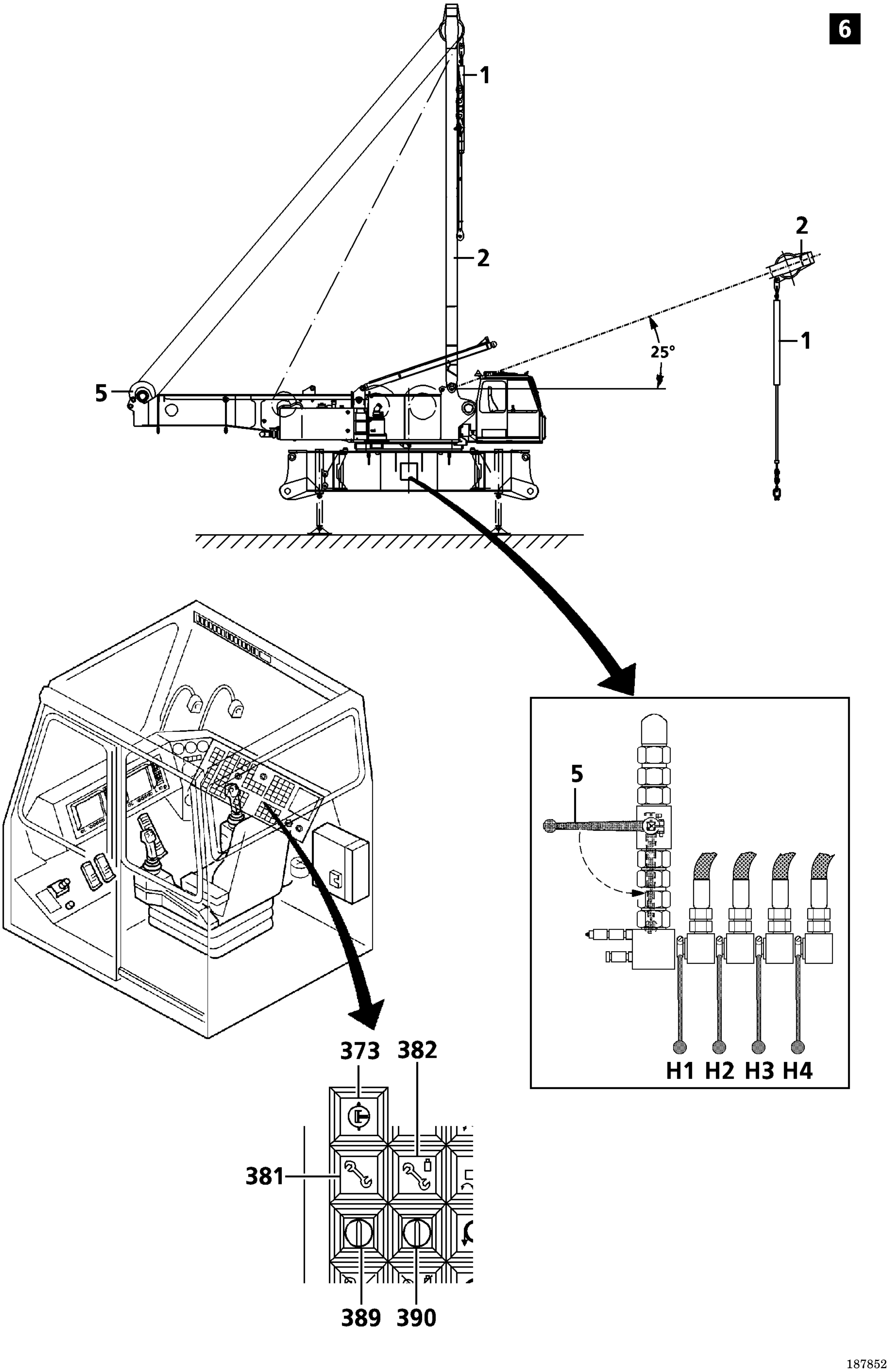
Erection
Move the ball tab (3) "down" into operation position. The A- bracket is being pushed upward by the erection cylinder (4) until the cables between the A- bracket (2) and the slewing platform pulley bracket (5) are tensioned.

Positions of ball tab (3)

"Up" position	-	Lower A-bracket to slewing platform (transport position)
"Vertical" position	-	STOP, extension and retraction of piston rod is blocked
"Down" position	-	Operating position extend piston rod.

C A U T I O N: **Make a visual inspection! The ropes must lay correctly in the respective rope pulleys! The ball tab remains in operating position.**

Activate manual control lever and spool out winch IV. A- bracket (2) is pushed up by raising cylinder (4) until it is raised to min. 90°degrees.


6
1
2
2
1
25°
5
5
H1 H2 H3 H4
373 382
381
389 390
187852

4. Raising the crane with hydraulic support rams (Fig. 6)

Requirements:
- A- bracket (2) must be min. at 90 ° degrees.
- Activate key-operated "assembly" switch (389) and key-operated switch (390) "crawler assembly", indicator light " assembly (381) and "crawler assembly" (382) is on.
- The pressure change-over switch (373) for the support rams must be switched on in the cab.
- Ball tab (5) must be opened - vertical position.

H 1 = Manual lever for support ram front right
H 2 = Manual lever for support ram rear right
H 3 = Manual lever for support ram rear left
H 4 = Manual lever for support ram front left

Support
The support pads must be given a foundation of suitable, stable materials such as wood, steel or concrete slabs.

Note: Refer to the safety notes on permissible ground compression (Chap. 2.04).

D A N G E R : **Only suitable materials may be used for providing a foundation.**
The foundation material must be centered beneath the support pads.
The A-bracket (2) must be raised to at least 90°.
If this is not observed, accidents may result.

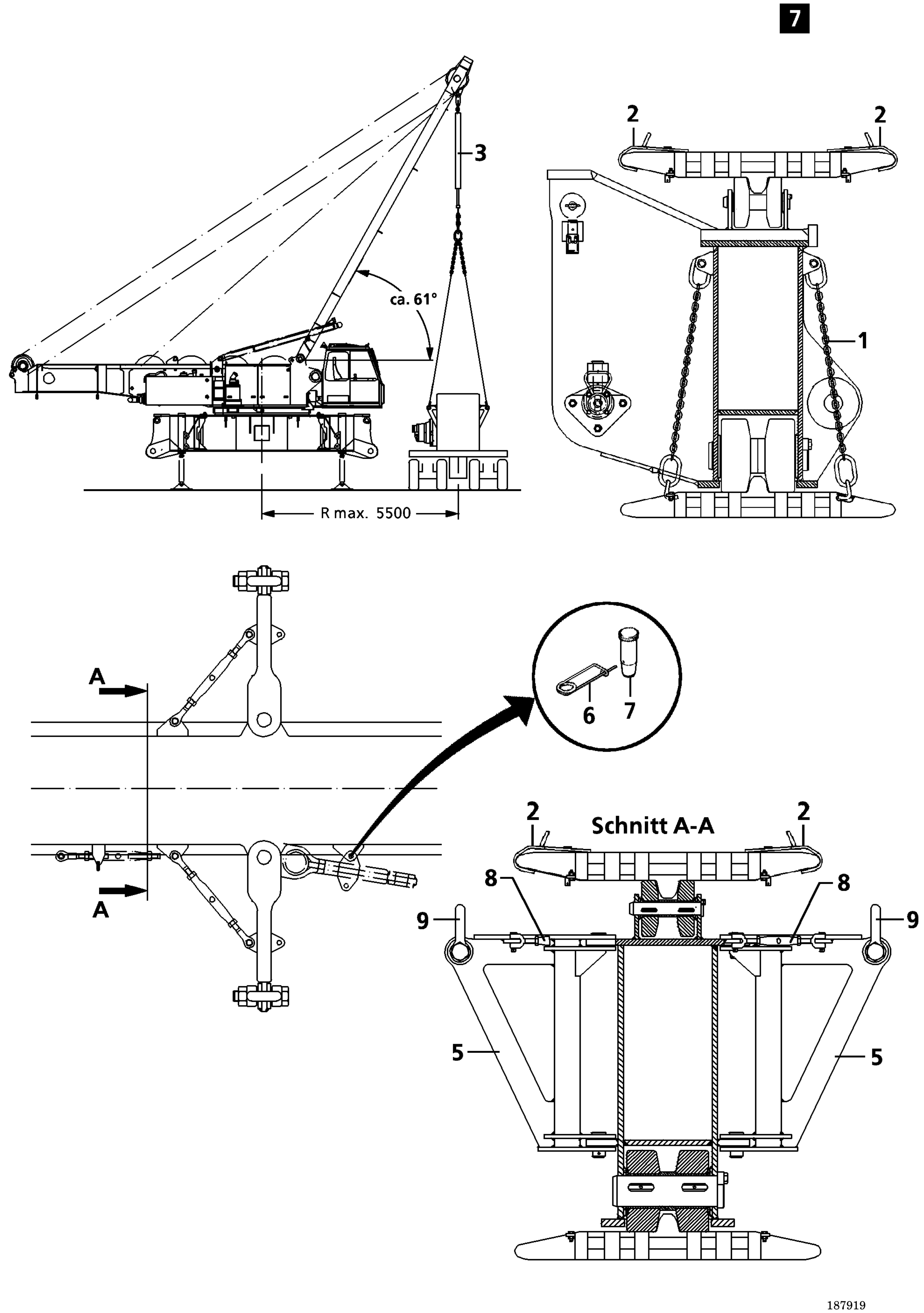
Activate manual lever ”push” and extend support ram. Raise crane horizontally up to appr. 1095 mm.

D A N G E R : **During this raising procedure, the horizontal position of the crane must be ensured.**
After raising and horizontal alignment.
Ball tab (5) must be closed.
Ball tab (3) must be in operating position ”down” during assembly and crane operations.
The ball tab positions "STOP" (horizontal) and "up" are only permissible when lowering the A- bracket onto the slewing platform (transport position)!
When spooling out winch IV, ensure that no slack forms in the rope.

4.1 Lower A- bracket to the front

Activate manual control lever futher and spool out winch IV. A- bracket (2) is pushed up by raising cylinder (4) until it is raised in excess of the vertical position (center of gravity). It will then lower forward from its own weight.

With the A- bracket to the front 25°, angle to horizontal smaller 25°, winch IV "spool out" is switched off!
Indicator lamp (308) is on.
Hang on assembly chains to the cylinder.


7
2
2
3
1
ca. 61°
R max. 5500
A
A
6
7
Schnitt A-A
2
2
8
8
9
9
5
5
187919

5. Attaching the crawler track with LA-bracket, Fig. 7

Attaching the first crawler track

Move the transport vehicle with the crawler as close as possible to the mid section.
Luff A-bracket, slew slewing platform and place assembly cylinder above crawler .
Remove spring clip (6) and transport pins (7).
Swing out assembly panel (5) on both sides and stop with locks (8).
Extend the assembly cylinder (3) and fasten the stop items on the shackles (9) to the assembly panels.

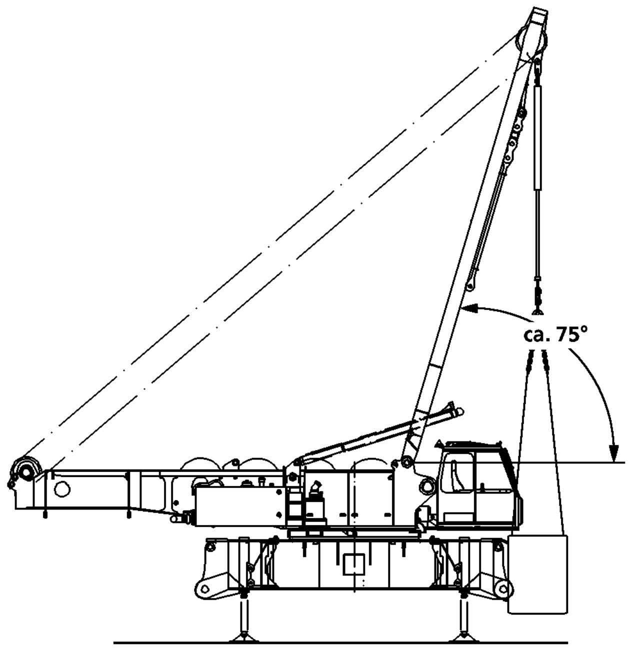
C A U T I O N: The track itself of the crawler track must be prevented from hanging. Attach transport safety clamps (1).
Use cable protection (2) on the upper crawler plates.

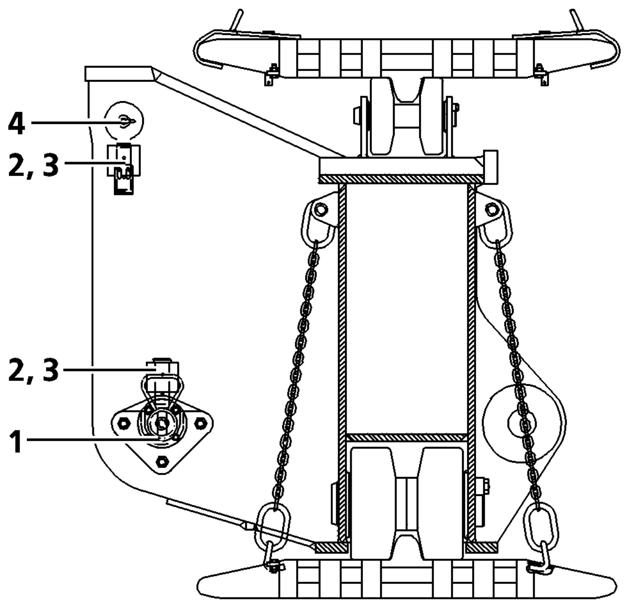
Using the assembly cylinder, hoist the crawler track from the transport vehicle.

Note: Activate key-operated "assembly" switch and key-operated switch "crawler assembly", indicator light assembly and "crawler assembly" is on.
Weight of the crawler track approx. 28 t.
Note markings on crawler track and seats.

D A N G E R: The maximum radius of 5.5 m must never be exceeded when hoisting the crawler track - note display above pendulum on the LA strut.
Pendulum (4) must be within the green range of approx. 61° - 75°.
Otherwise, there is a danger of the crane toppling.
As long as the key - operted switch is activated, there is no overload safety cut off for assembly cylinder and also for the crane.
There is a risk of accidents.

8





187920

6. Attachment of crawler track with A strut, Fig. 8,9

Attaching the first crawler track

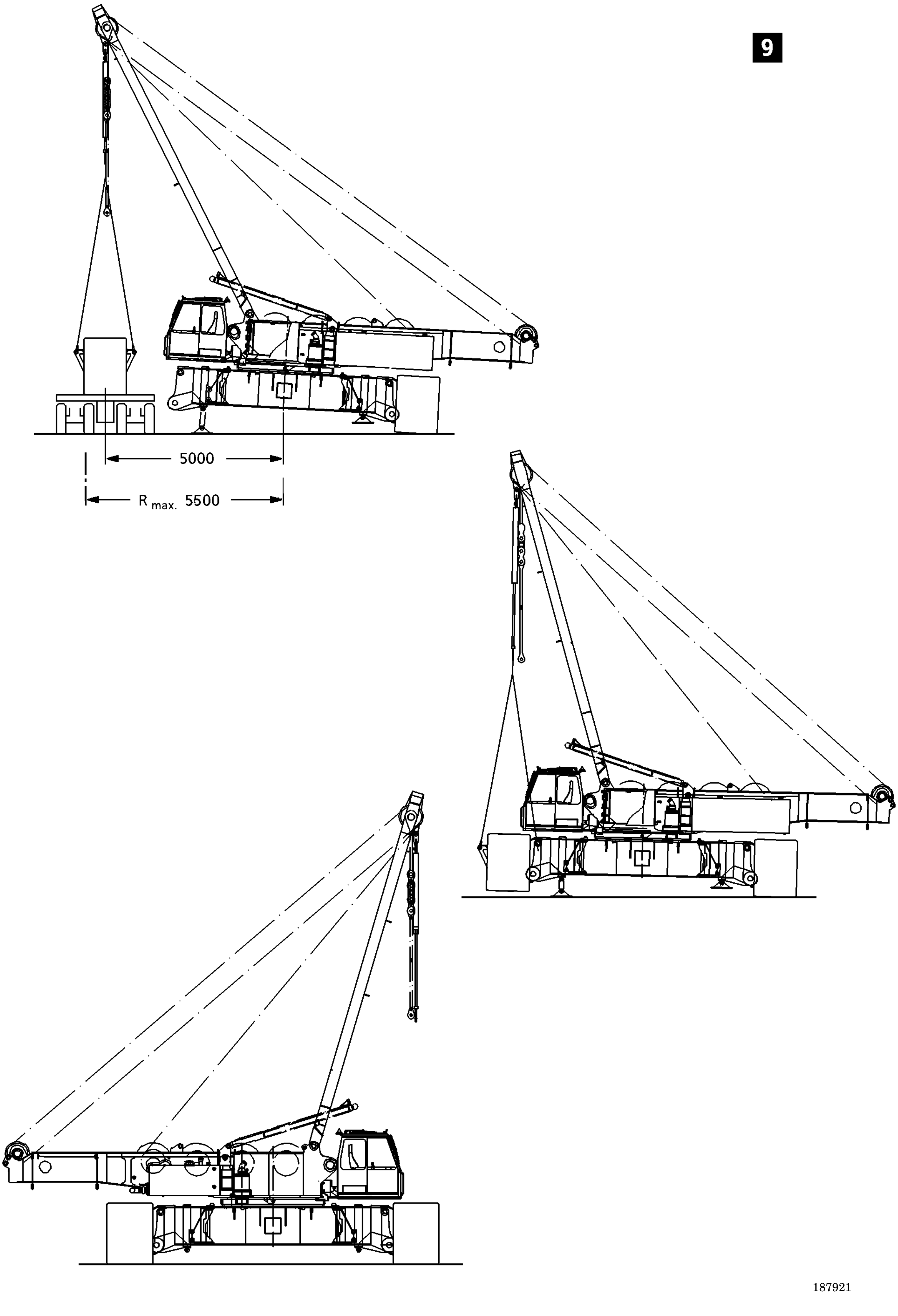
Carefully move the track carrier to the appropriate side of the mid section.
Pin the track carrier to the mid section and secure it.

The lower connector pins (1) are pinned with the hydraulic pin pulling device, and secured with locking pins (2) and with spring clips (3).

The upper connector pins (4) are pinned manually and secured with locking pins (2) and with spring clips (3).

Lower the crawler track **onto the ground on the crawler side** by retracting both support jacks.

C A U T I O N : **Before slewing the slewing platform, the crawler track which was attached first must be firmly on the ground - otherwise, there is the danger of the crawler toppling.**


9
5000
R max. 5500
187921

Attaching the second crawler track
Slew slewing platform.

C A U T I O N : **Before slewing the slewing platform , the first crawler track attached must be on the ground and the support cylinders jacks must be fully retracted.**
Otherwise there is the risk of the crane toppling over.

D A N G E R : **The maximum radius of 5.5 m must never be exceeded when hoisting the crawler track - note display above pendulum on the LA strut.**
Pendulum (4) must be within the green range of approx. 61° - 75°.
Otherwise, there is a danger of the crane toppling.
As long as the key - operted switch is activated, there is no overload safety cut off for assembly cylinder and also for the crane.
There is a risk of accidents.

Attachment of the second crawler track must be carried out in accordance with the description of the attachment of the first crawler track.

After attaching the second crawler track, it must be lowered onto the ground by retracting the support rams.

Completely retract the support rams.
Swing in and secure the assembly panels and turnbuckles .
Close ball tab - horizontal position.

Switch off pressure change-over switch in the cab.

Retract assembly cylinder and switch off "crawler-and boom assembly" with button. Indicator light goes out - see chap. 4.01.

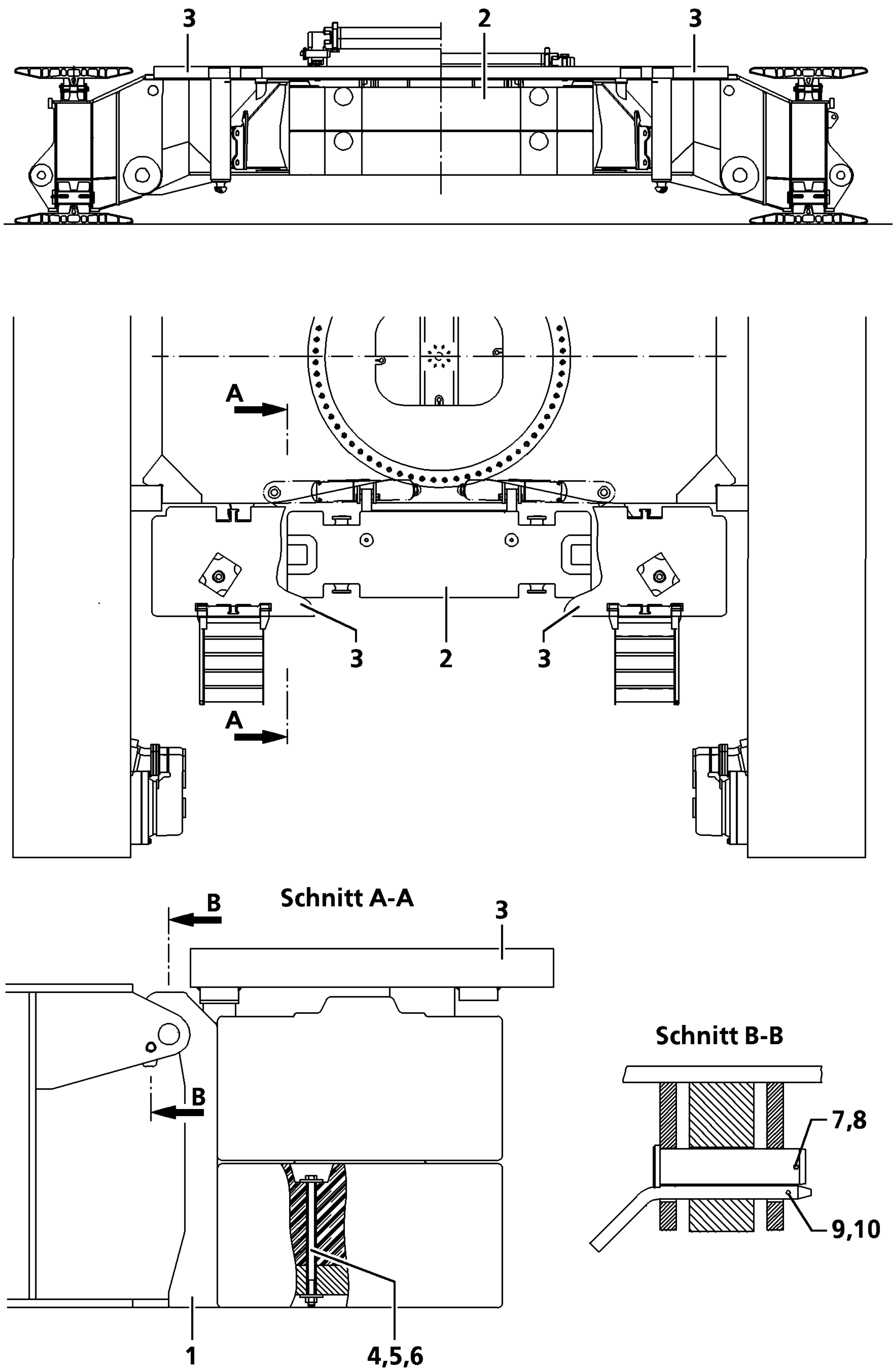
Make hydraulic connection to both crawler tracks via the Quick Connections.

Note: The relevant Quick Connections are so identified.

Connecting or disconnecting the hydraulic lines via the Quick Connections

D A N G E R : **When connecting or disconnecting the hydraulic lines via Quick Connections, ensure that the coupling procedures are correctly performed.**
- **The requirements of a proper connection are:**
- **All pressure must be removed from the hydraulic system before connecting or disconnecting (engine at standstill - wait 5 minutes).**
- **Coupling parts (socket and plug) plugged into each other and screwed together using the hand nut.**
- **Turn the hand nut over the O-ring until a firm and tight fit is attained.**
- **The couplings may only be tightened by hand and without tools (damage to coupling).**

Improperly connected couplings my lead to a loss of pressure or sudden leaking, thereby causing accidents.



187922

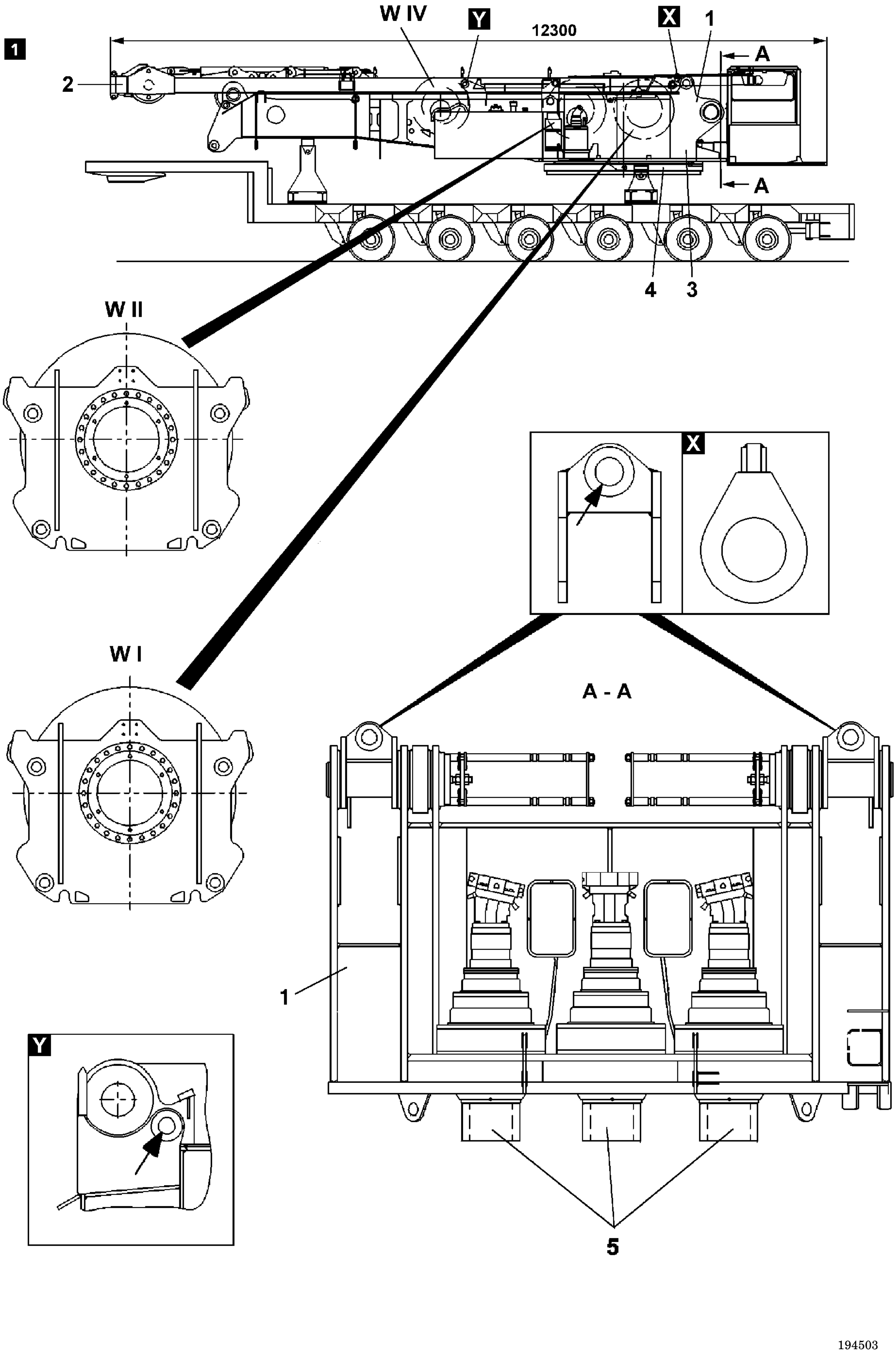
Installation of central counterweight(43 t resp. 11 t)

Components:

1	counterweight frame	approx. 0,35 t	2 pieces
2	slab	approx. 8,00 t	4 pieces
3	slab	approx. 5,50 t	2 pieces
4	screw M 20×390 mm		4 pieces
5	washer		8 pieces
6	nut M 20		4 pieces
7	pin ∅ 55 mm		4 pieces
8	spring clip ∅ 4,5 mm		4 pieces
9	lock pin		4 pieces
10	spring clip ∅ 3,0 mm		4 pieces

Installation

Lock the counterweight frame (1) on both sides to the mid-section, lock with pins (7) and secure with spring clip (8).
Secure the counterweight frame (1) to the mid-section with lock pins (9) and spring clip (10).
Put on the slab (2) and screw it to the counterweight frame (1), use screw (4), washer (5) and nut(6).
Put on the second slab.
Place the slab (3) on the supports.
The slabs (3) are fixed on the supports.


1
W IV
Y
12300
X
1
A
2
A
4
3
W II
X
W I
A - A
1
Y
5
194503

1. Transport weights and center of gravity of slewing platform

Slewing platform (1) on flatbed trailer (fig. 1)
installed are:

- Winch IV incl. cable
- A-bracket incl. pulleys (2)
- Installation winch incl. cable (3)
- Upper section of roller slewing connection (ROD) with Quick Connection(4)
- 1-3 slewing gears (5) depending on equipment (slewing gear 2 or 3, as option)

Weights of slewing platform:

Slewing platform	Winch **I** incl. cable (4,2 t)	Winch **II** incl. cable (4,2 t)
Weight (t) **33,1**	**- - -**	**- - -**
Weight (t) **37,3**	**- - -**	**X**
Weight (t) **41,5**	**X**	**X**

Center of gravity of slewing platform:
(Chapter 3.01 / 1. Transport weights and center of gravity)

2. Montage der slewing platform

Prerequisite:
- Brackets (X) are pinned on receptacle points for pivot section (A-A).

D A N G E R: It must be ensured that the brackets (X) are pinned correctly. If this is not observed, there is a danger of accidents!

- The tackle devices are attached on the receptacle points (X / Y) (arrow).
- Bring the tackle deviced to **"Tension"** .
- Release and remove the transport retainers of the slewing platform.
- Lift the slewing platform with the auxiliary crane from the flatbed trailer

D A N G E R: Attach the tackle devices only on the intended receptacle points (X / Y) (fig. 1 // fig. 2)
It must be ensured that the tackle are attached correctly and secured sufficiently to prevent them from loosening up.
If this is not observed, there is a danger of accidents!

Installation procedure:

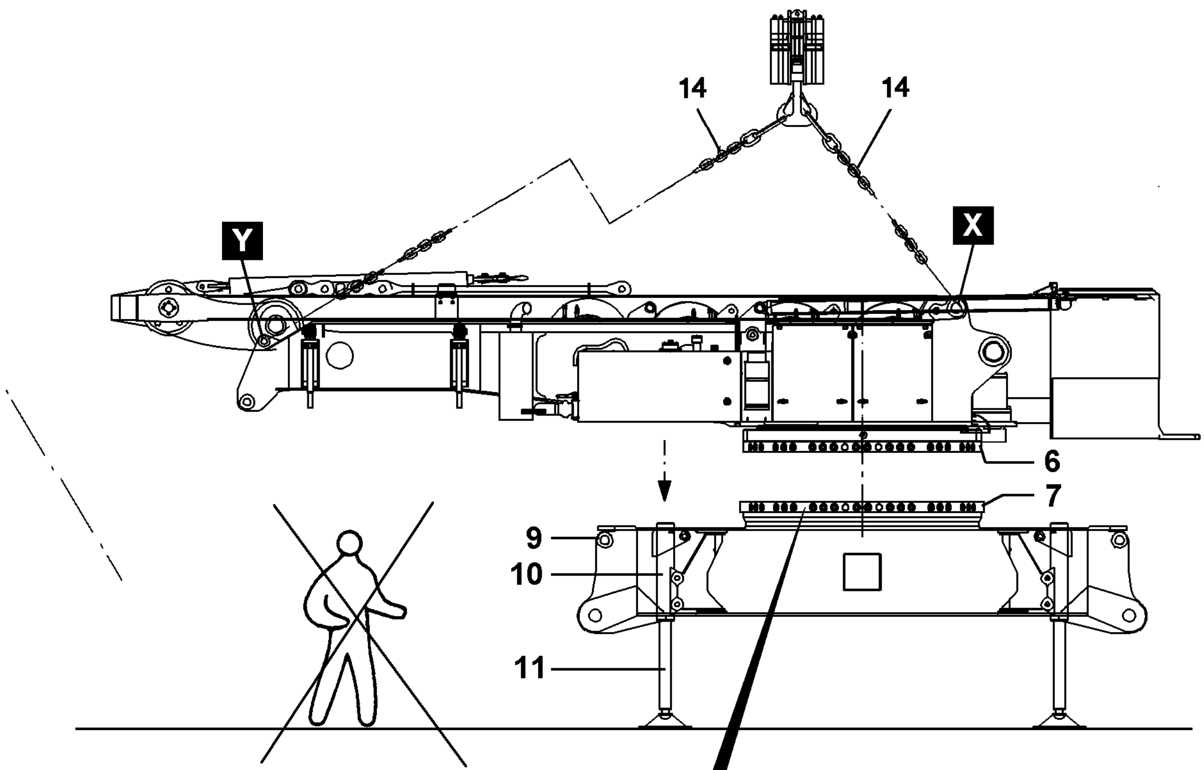
2.1 Clean the receptacle and contact surfaces of the roller slewing connection .

2.2 Set the slewing platform with the auxiliary crane onto the crawler center section.

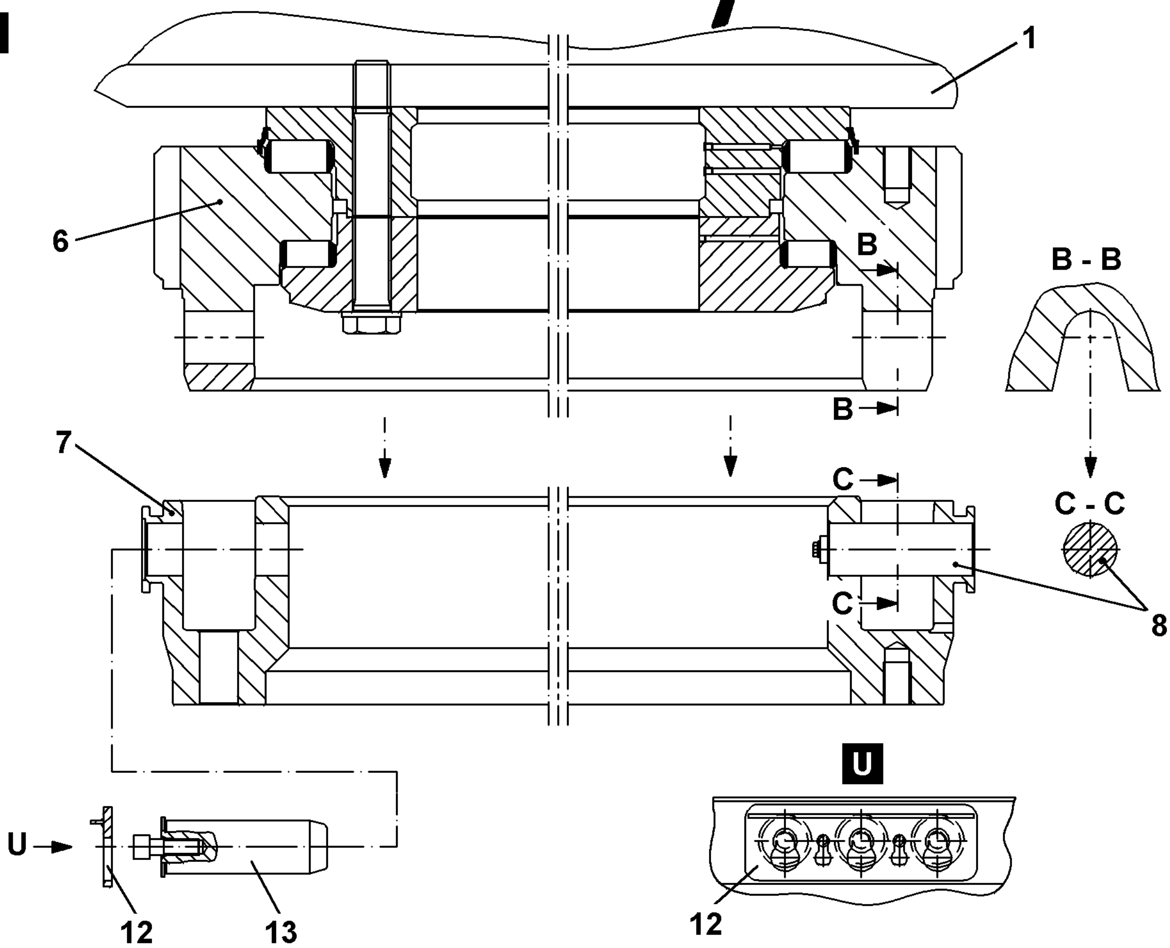
2.3 Pin the slewing platform with crawler center section.

2.4 Establish the hydraulic connection to the slewing platform.

2



3



194500

2.1 Clean the receptacle or contact surfaces of the roller slewing connection (ROD)

- The receptacle or contact surfaces on the upper (6) and lower section (7) of the roller slewing connection (ROD) must be cleaned before installation.
- Clean the pin bores on the upper and lower section of the roller slewing connection .

2.2 Set the slewing platform with the auxiliary crane onto the crawler center section

Prerequisite:
- The hydraulic support (10) on the crawler center sectionl (9) is swung out, locked and pinned.
- The support cylinders (11) are extended.
- The crawler center sectionl (9) is horizontally aligned.
- The upper (6) and lower section (7) of the ROD have been cleaned.
- The two centering pins (8) on the lower section of the ROD are installed and secured.
- The centering pins (8) have been greased with waterproof grease.

Installation procedure:
- The tackle devices (14) are attached on the receptacle points of the slewing platform (X / Y) (fig. 2).

D A N G E R : It must be ensured that the tackle devices are correctly attached on the receptacle points (X / Y) and sufficiently secured to prevent them from loosening up.
There is a danger of accidents!

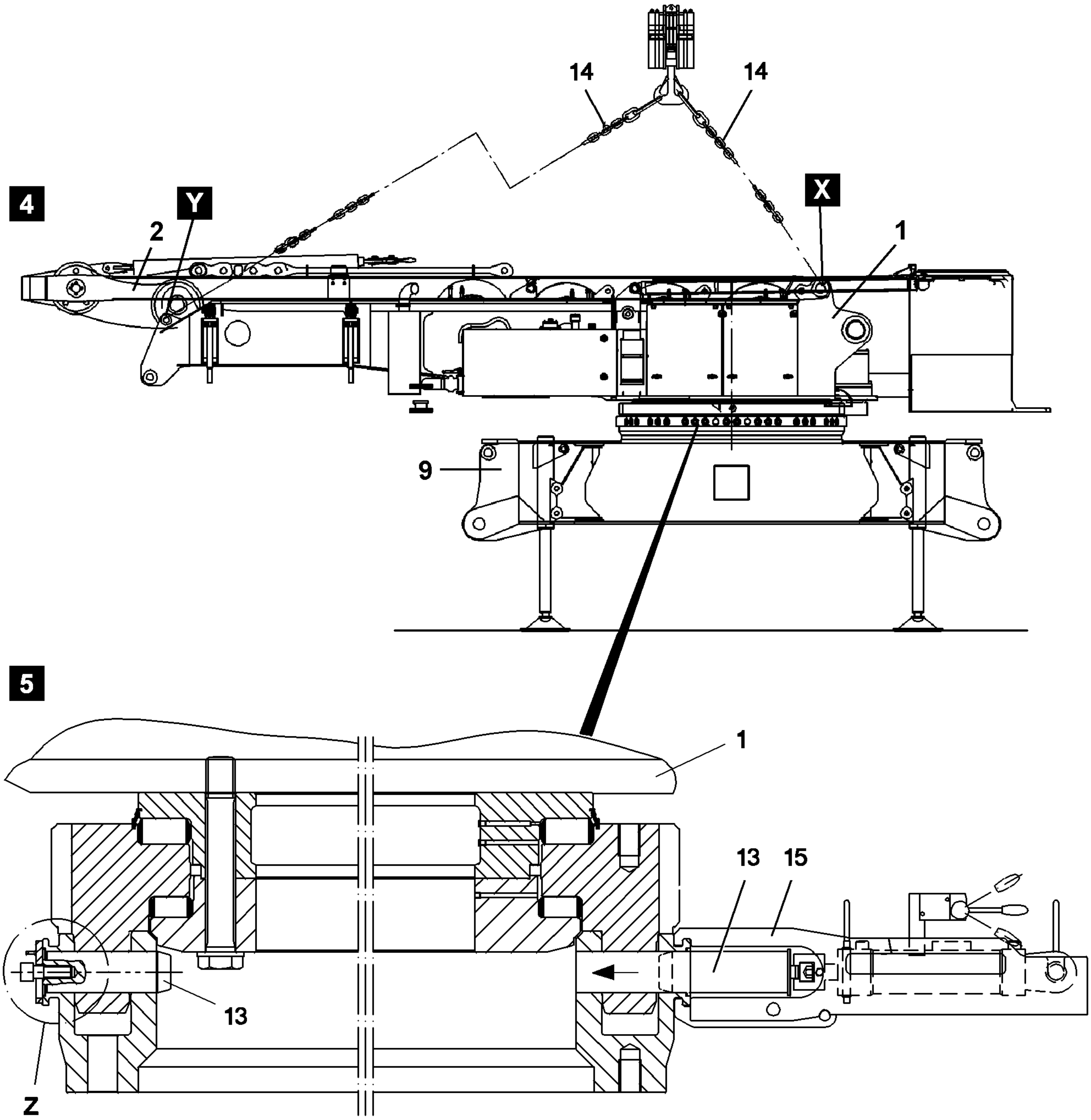
- With the auxiliary crane, slowly swing in the slewing platform (1) over the supported and horizontally aligned crawler center section.
- Lower the slewing platform slowly.

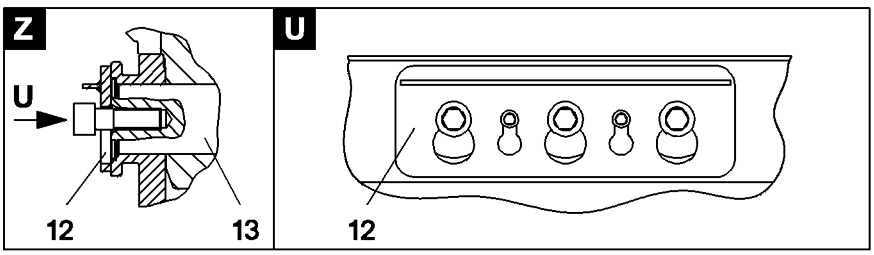
Note: Before lowering, bring the slewing platform in position so that the centering pin (8) (C - C) on the lower section (7) and the receptacles (B - B) on the upper section (6) can be **"paired up"** .
It is not possible to **"incorrectly "** set the slewing platform onto the lower section (7) due to the design of the location of the centering pins.

C A U T I O N: However, the slewing platform or the receptacles to the centering pins must be aligned correctly.

D A N G E R : It is not permitted for anyone to remain in the swing range of the auxiliary crane and under the slewing platform when swinging the slewing platform in or lowering it.
There is a danger of accidents!

- Carefully set the slewing platform on the crawler center section.
- The slewing platform must be lowered with the upper section to the stop on the lower section.





194501

2.3 Pin the slewing platform with the Quick Connection

Prerequisite:
- slewing platform (1) sitzt auf crawler center sectionl (9).
- the tackle devices (14) between the slewing platform and the auxiliary crane are **"tensioned"**
- the pin bores on the circumference of the roller slewing connection are clear.

Installation procedure:
- All 64 connector pins (13) have been greased with waterproof grease.
- Insert all 64 connector pins (13) by hand to the stop in the pin bores (Z) and pin the slewing platform with the crawler center section. (fig. 5)
- If it is too hard, use a pin pulling device (15) for pinning.
- Attach the retaining bar (12) and secure the connector pins (13) (U).

D A N G E R . **The connector pins must be secured immediately after pinning the slewing platform with the crawler center section.**
If this is not observed, there is a danger of accidents!

- After the roller slewing connection is pinned and secured, remove the tackle devices .

2.4 Establish the hydraulic connection to the slewing platform.

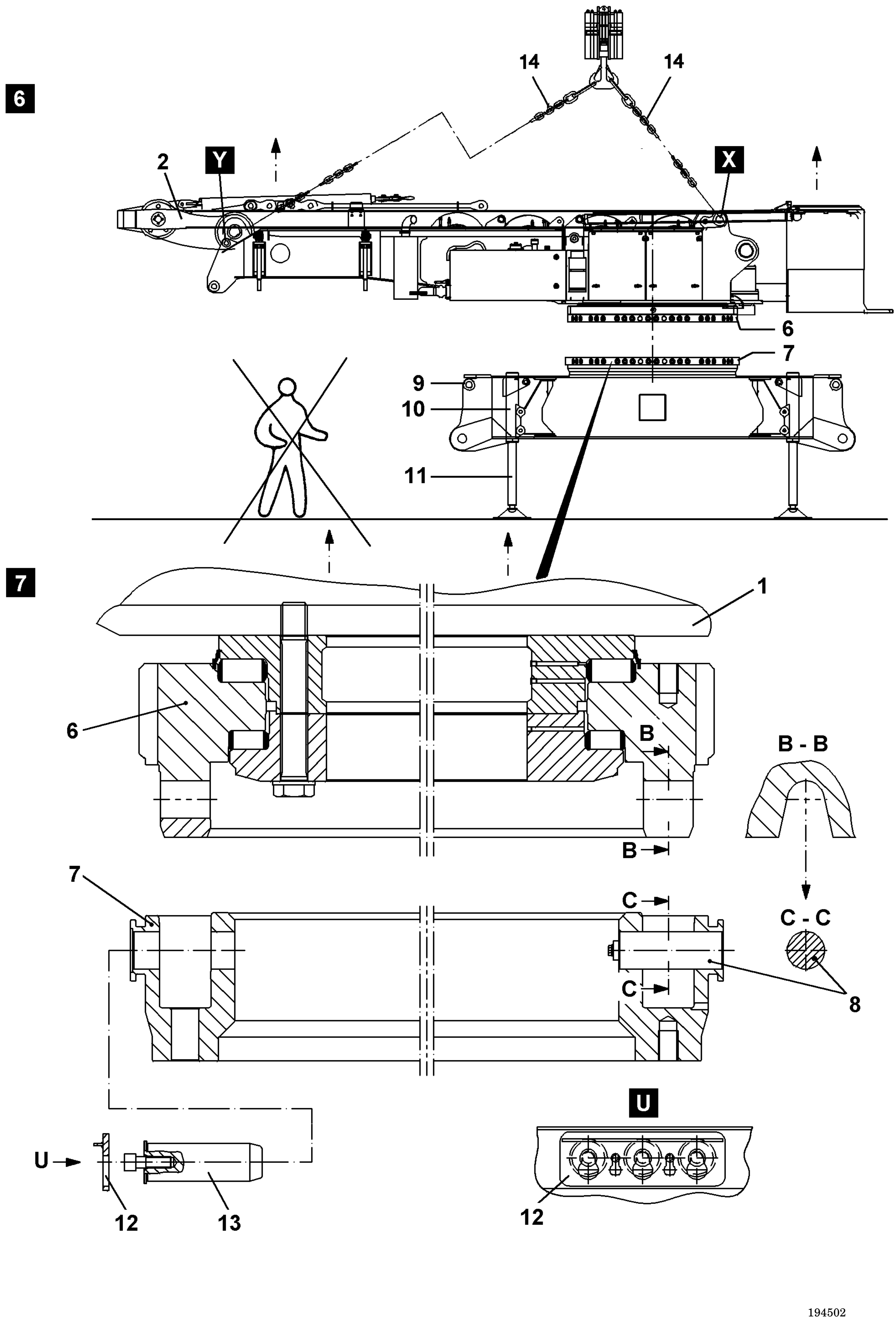
The hydraulic connection from the rotary connection in the crawler center section to the slewing platform is established with quick couplings.

Note: The quick couplings which belong together are marked.

To connect or release the hydraulic lines with quick couplings

D A N G E R : **When connecting or releasing the hydraulic lines with quick couplings, it must be ensured that the coupling procedure is carried out correctly.**

Prerequisites for a correct coupling connections:
- **The pressure in the hydraulic system must be released before connecting or releasing the couplings (the engine must be at a standstill - wait 5 minutes).**
- **Push the coupling sections (sleeve and plug) into each other and screw together with the hand nut.**
- **Turn the hand nut past the O-ring until you feel a noticeable, fixed stop.**
- **The couplings may only be tightened by hand - without tools - (they could damage the couplings).**
- **Improperly connected couplings could cause loss of pressure or sudden leakage and could cause accidents.**


6
14
14
2
Y
X
6
7
9
10
11
7
1
6
B
B - B
B
7
C
C - C
C
8
U
U
12
13
12
194502

3. Removal of the slewing platform

Remove the slewing platform with the auxiliary crane after crane operation.

Prerequisite:
- The slewing platform ballast and the boom systems have been removed.
- The crawler carriers are removed.
- The hydraulic support (10) on the crawler center sectionl (9) is swung out, pinned and secured.
- The support cylinders (11) are extended.
- The crawler center section is horizontally aligned.
- The A-bracket (2) is placed on the slewing platform (1) .
- The hydraulic connections on the rotary connections to the slewing platform have been disconnected.
- The brackets (X) are installed and pinned (fig. 1).
- The tackle devices are attached on the receptacle points (X / Y) on the slewing platform (fig. 6).

C A U T I O N: It must be ensured that all hydraulic connections between the rotary connection and the slewing platform are disconnected.

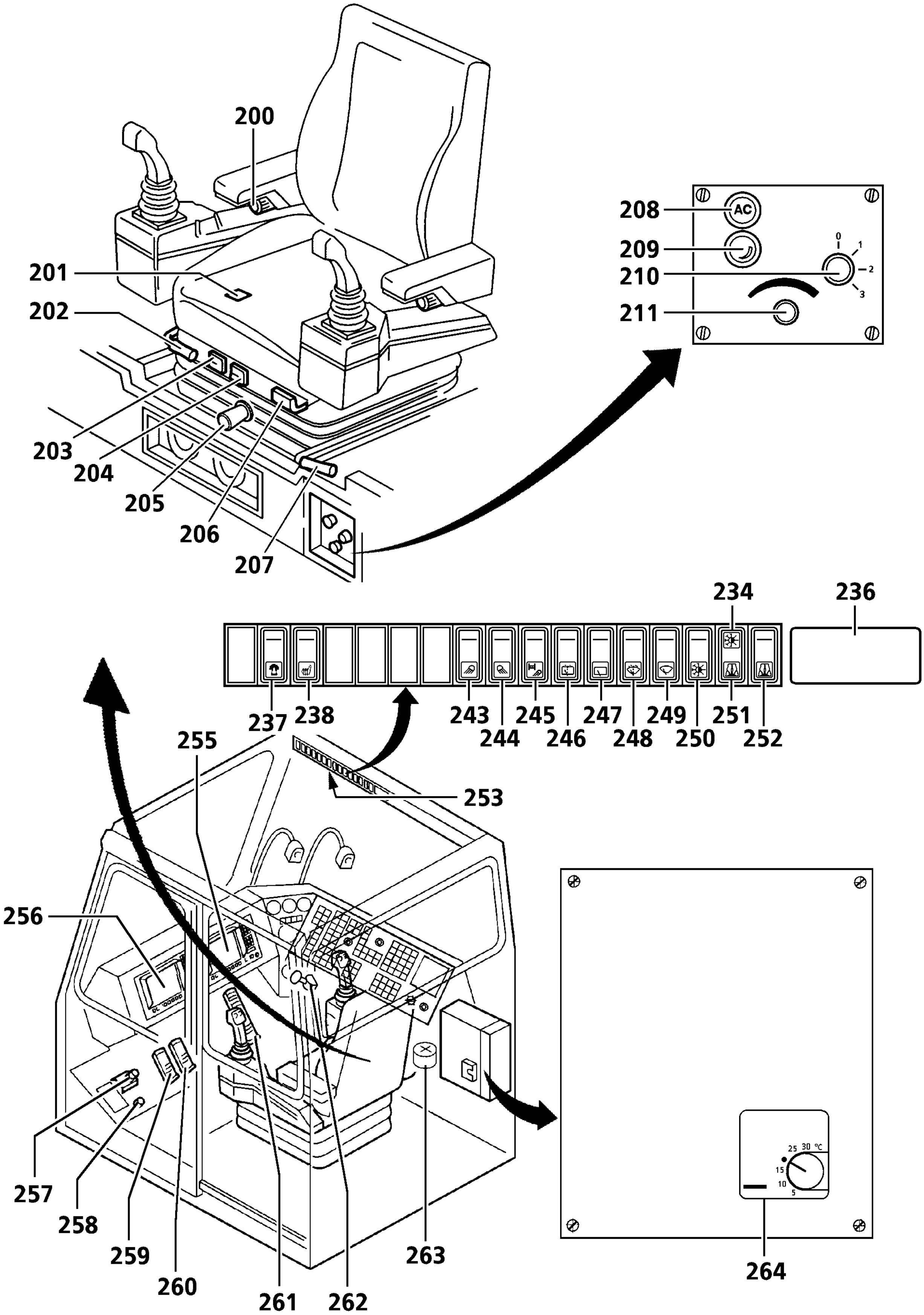
Removal procedure
- Bring the tackle devices (14) with the auxiliary crane to **"tension"** .
- Release and remove the retaining bar (12) (U).
- Unpin all connector pins (13) by using the pin pulling device.
- When all connector pins have been removed, carefully lift the slewing platform with the auxiliary crane.

C A U T I O N: Before lifting the slewing platform with the auxiliary crane, make sure that ALL connector pins for the Quick Connection have been removed.

D A N G E R : It is strictly prohibited for anyone to remain in the danger zone of the slewing platform while lifting and swinging the slewing platform (fig. 6).
It is prohibited to remain in the swing range of the auxiliary crane.
There is a danger of accidents!

Chapter 4

Operation of the Superstructure

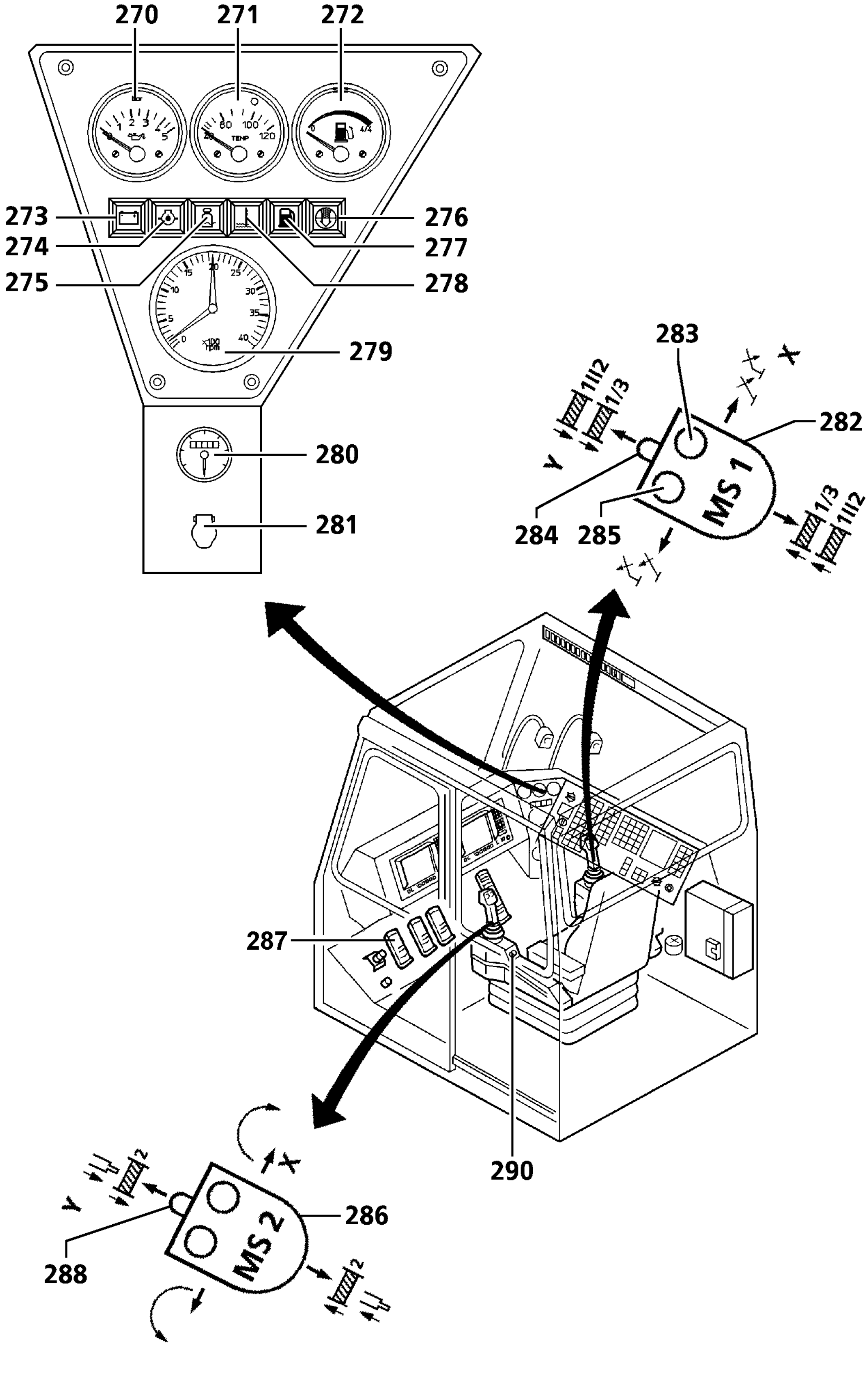

200
201
202
203
204
205
206
207
208
AC
209
210
0
1
2
3
211
234
236
237
238
243
244
245
246
247
248
249
250
251
252
253
255
256
257
258
259
260
261
262
263
25 30 °C
15
10
5
264

186198

Item.:

200	Rotary knob	-	Arm rest adjustment
201	Seat contact switch		
202	Manual lever	-	Seat angle adjustment
203	Button	-	Back support in the lower seat back
204	Button	-	Back support in the upper seat back
205	Rotary knob	-	Bodyweight adjustment
206	Manual lever	-	Seat back adjustment
207	Manual lever	-	Horizontal seat adjustment release
208*	Rotary controller	-	Air condition
209	Switch	-	Change- over from recirculated air/fresh air, air amount
210	Rotary switch	-	3- stage blower
211	Rotary controller	-	Heater temperature
234*-	Indicator lamp	-	Air condition ”ON”
236*	Digital clock	-	with the following indicators:
		-	Time of day and day of the week,
		-	Problems in added heater system,
		-	Air temperature,
		-	Preselection of heating operation for added heater with 3 preselection times, each one can be preprogrammed up to 7 days in advance.
237	Switch	-	Aircraft warning light
238*	Switch	-	Seat heating
243*	Switch	-	Working spot lights ,cab platform
244*	Switch	-	Working spot lights, cab roof rear
245*	Switch	-	Working spot lights, winches
246	Button	-	Windshield wipe/wash, roof window
247	Switch	-	Windshield wipers, roof window
248	Button	-	Windshield wipe/wash, front window
249	Switch	-	Windshield wipers, front window
250*	Switch	-	Air condition
251	Indicator lamp	-	Additional heating switched on
252*	Switch	-	Additional heating
253	Ceiling lamp with switch		
255	LICCON Monitor 0		
256	LICCON Monitor 1		
257	Foot switch	-	Slewing gear brake ”open”
258	Foot switch	-	Signal horn
259	Foot pedal resp. Manual control lever - crawler left side		
260	Foot pedal resp. Manual control lever - crawler right side		
261	Foot pedal	-	Accelerator
262	Lever	-	manual engine speed
263	Manometer	-	Hydraulic raim for raising A- bracket
264*	Thermostat	-	Additional heater

* if installed


270
271
272
273
274
275
276
277
278
279
280
281
283
282
284
285
MS 1
X
Y
1/3
1/2
287
290
286
288
MS 2
X
Y
2

189343

Item:

270	Oil pressure gauge	-	Diesel engine
271	Temperature gauge	-	Coolant, diesel engine
272	Fuel gauge	-	Diesel tank
273	Charge indicator lamp		
274	Warning lamp	-	Oil pressure, diesel engine
275	Warning lamp	-	Radiator water too low
276	Warning lamp	-	Air filter contaminated
277	Warning lamp	-	Fuel level too low
278	Warning lamp	-	Radiator water temperature too high
279	Rpm gauge	-	Diesel engine
280	Operational hours counter		
281	Socket 24 V		

282 Manual control lever (**MS 1**)

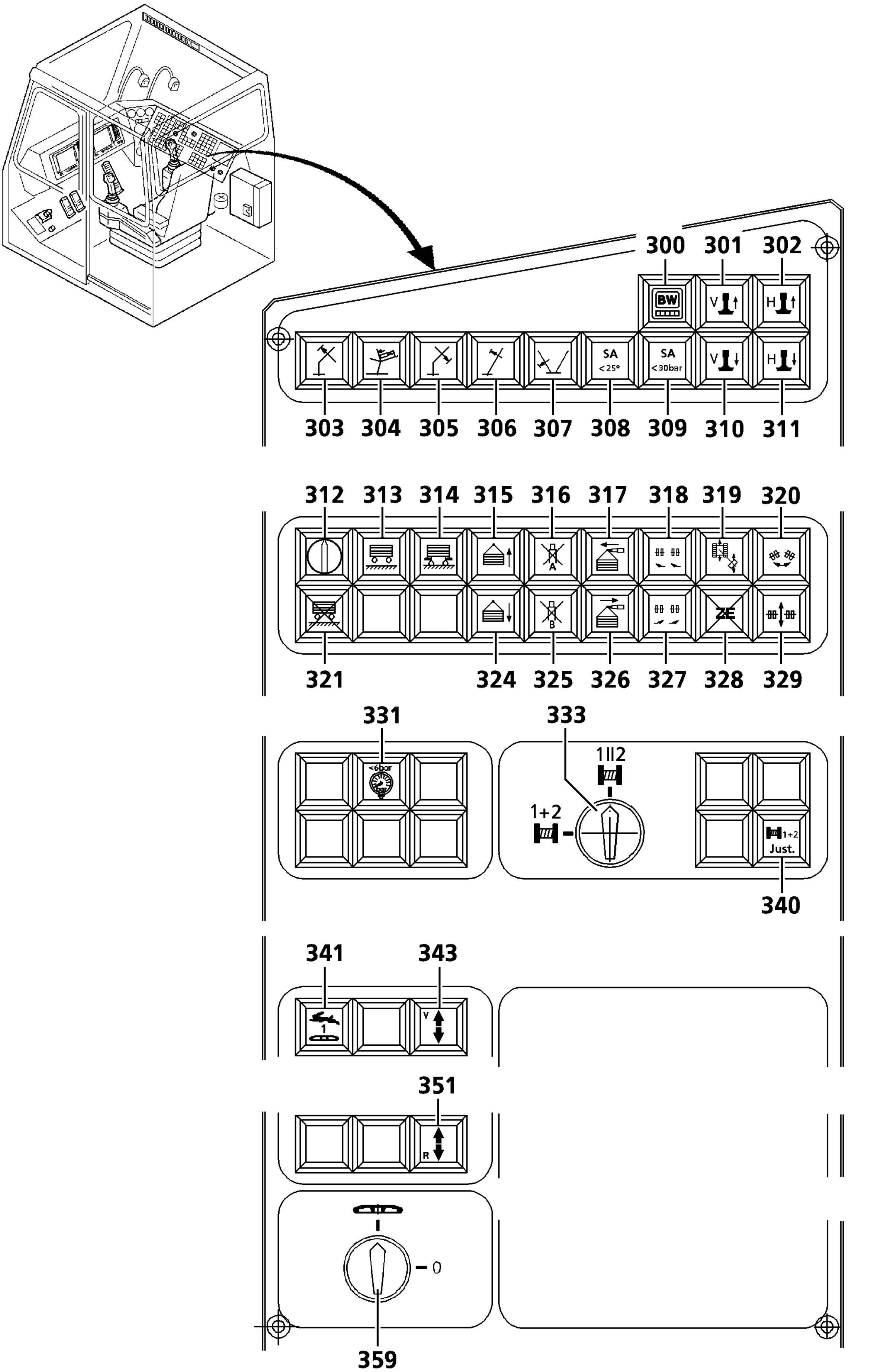
Note: Allocation of hand control lever (MS) to the operating modes see chart chapter 4.05

284 Button - Control enable bypass seat contact switch

286 Manual control lever (**MS 2**)

Note: Allocation of hand control lever (MS) to the operating modes see chart chapter 4.05

287*	Foot pedal	-	Slewing gear block
288	Button	-	Control enable bypass seat contact switch
290	Button	-	Bypass of the overload safety device for luffing at overload


300
301
302
BW
V
H
SA
< 25°
SA
< 30bar
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
A
B
ZE
321
324
325
326
327
328
329
331
<6bar
333
1II2
1+2
1+2
Just.
340
341
343
1
V
351
R
0
359
188415

Item:

300*	Switch	-	Changeover to special view on monitor "1"
	Note:		Changeover possible when engine "off" only.
301*	Button	-	Retracting front support rams on counterweight trailer
302*	Button	-	Retracting rear support rams on counterweight trailer
303	Warning lamp	-	Fly jib at ”steepest” position, mechanic fall back guard
304	Warning lamp	-	Fly jib at ”steepest” position, fall back guard cylinder
305	Warning lamp	-	Boom "lowest" position
306	Warning lamp	-	Boom "steepest" position, fall back guard cylinder
307*	Kontrolleuchte	-	Derrickausleger ”unten”
308	Warning lamp	-	A- bracket facing to the front, angle less than 25° to horizontal
309	Warning lamp	-	Shut off winch IV, is falling below the required pressure (at least 30 bar) in the A-bracket relapse retainer.
310*	Button	-	Extending front support rams on counterweight trailer
311*	Button	-	Extending rear support rams on counterweight trailer

312* **Key- operated button ”Ballast trailer raised”**

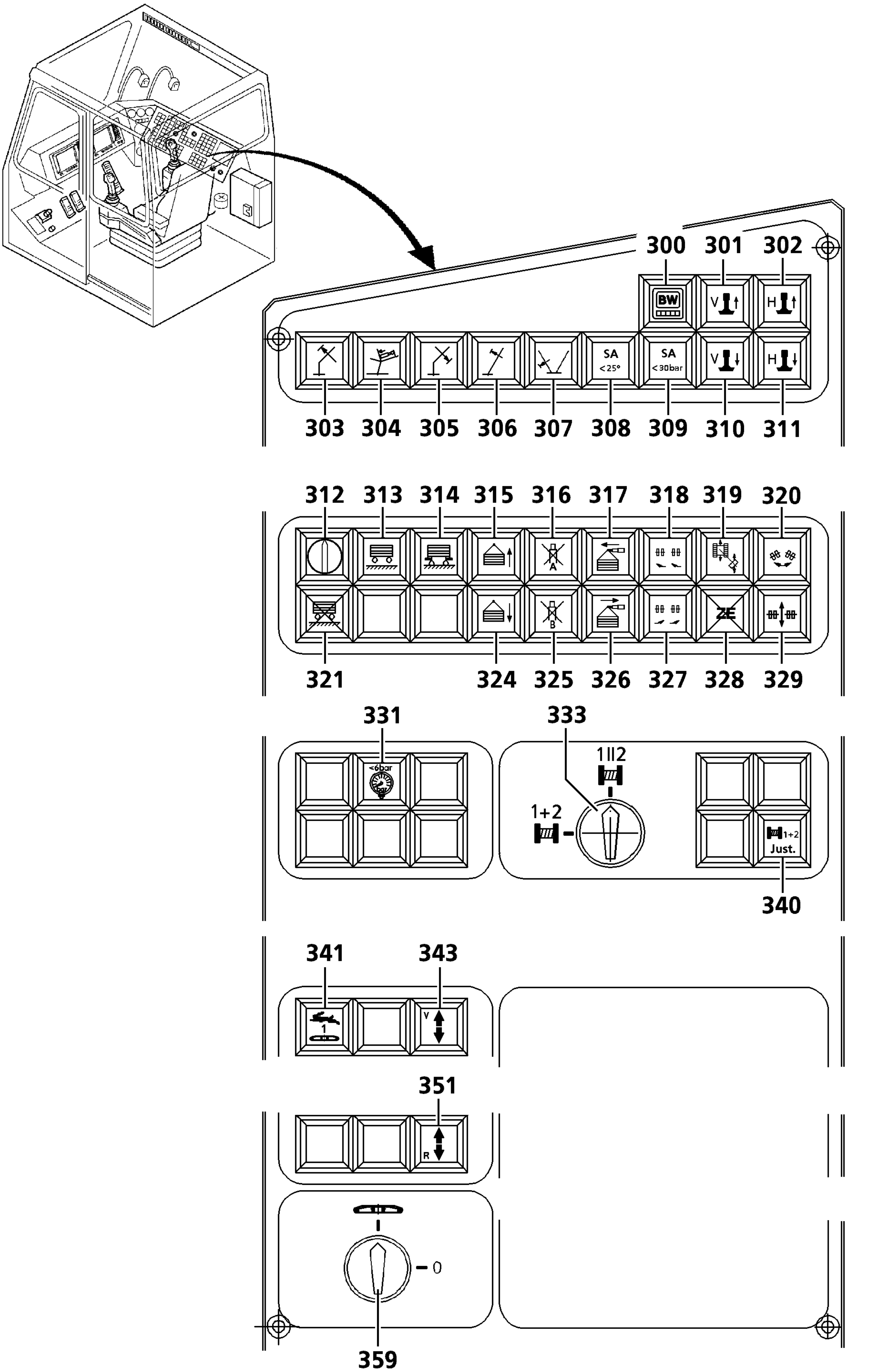
Actuate the key- operated switch briefly to select the operating mode **"ballast trailer raised"** (self-retention).

D A N G E R: "Ballast trailer raised" must be turned on when the ballast trailer has lifted off during driving and the wheels are no longer in contact with the ground. Must be kept under constant visual observation!
- see also chap. 5.11, Ballast trailer.

When **"ballast trailer raised"** is turned on, the indicator light (313) blinks and the red beacon on the crane operator`s cab is on. Also ”ballast trailer raised” symbol is shown on monitor 1.

313*	Warning lamp	-	Indicator lamp blinks when assembly key- operated switch (312) is actuated
314*	Warning lamp	-	Support rams fully retracted on counterweight trailer
315*	Button	-	Raise derrickballast /counterweight trailer
316*	Button	-	Blocking hydraulic cylinder (A) on derrickballast /counterweight trailer
317*	Button	-	Extending derrickballast /counterweight trailer
318*	Button	-	Cramping of counterweight trailer wheels to the right for driving on narrow sites. - see also chap. 5.11, Ballast trailer.
319*	Button	-	Cramping of counterweight trailer wheel in parallel position - indicator lamp blinks. Indicator lamp comes on when wheels in parallel position. - see also chap. 5.11, Ballast trailer.
320*	Button	-	Cramping of counterweight trailer wheel position - indicator lamp blinks. Indicator lamp comes on when wheels in turning position. - see also chap. 5.11, Ballast trailer.

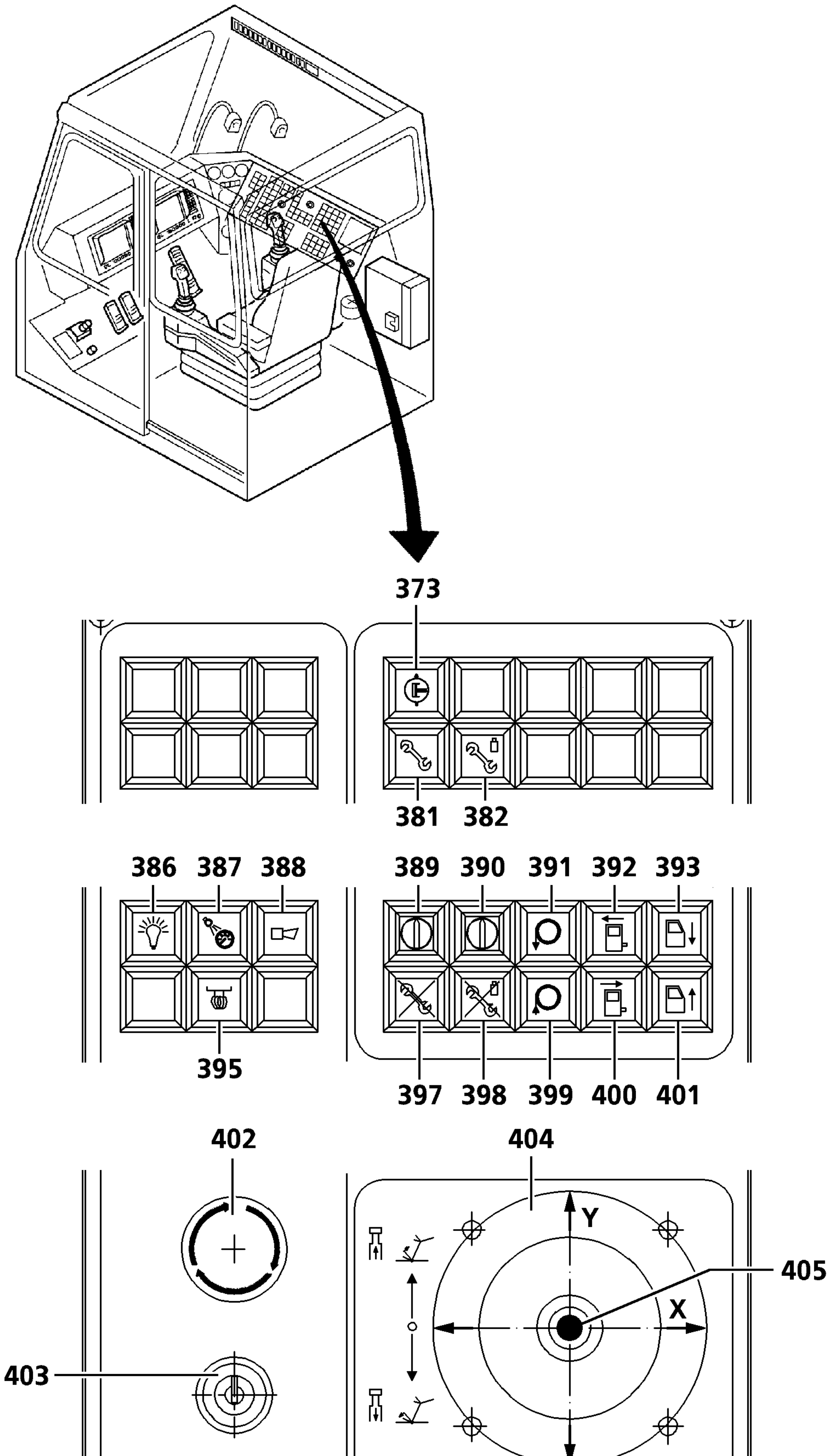
* if installed


300
301
302
BW
V
H
SA <25°
SA <30bar
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
A
B
ZE
321
324
325
326
327
328
329
331
<6bar
333
1II2
1+2
1+2 Just.
340
341
1
343
V
351
R
0
359
188415

Pos.:

321*	Button	-	Switch off retension of key operated button (312)
324*	Button	-	Lowering derrickballast /counterweight trailer
325*	Button	-	Blocking hydraulic cylinder (B) on derrickballast /counterweight trailer
326*	Button	-	Retracting derrickballast /counterweight trailer
327*	Button	-	Cramping of counterweight trailer wheels to the left for driving on narrow sites. - see also chap. 5.11, Ballast trailer.
328*	Warning lamp	-	Central unit for counterweight trailer is not booting - see also chap. 5.11, Ballast trailer.
329*	Button	-	Setting counterweight trailer wheels in driving position - indicator lamp blinks. Indicator lamp omes on when wheels in driving position. - see also chap. 5.11, Ballast trailer.
331	Warning lamp	-	Feed oil pressure in winches I-VI less than 10 bar **Note:** The LICCON test system - special view- right monitor indicates the winch number, on wich the problem occurs.
333	Preselection switch		
	Position 1+2	-	Winch I+II,single operation, separate manual control lever
	Position 1 ‖ 2	-	Winch I+II, parallel operation with one manual control lever only
340	Button	-	Adjusting parallel control of winches I//II **Note:** Only when hook blocks from winch I//II are parallel, adjust parallel control
341	Switch	-	Crawler high speed
343	Indicator lamp	-	Slewing platform positionto crawler track to front (V)
351	Indicator lamp	-	Slewing platform position to crawler track to the rear (R)
359	Preselection switch		crawler operation O = crawler operation Out I = crawler operation On

* if installed


373
381
382
386
387
388
389
390
391
392
393
395
397
398
399
400
401
402
404
405
Y
X
403

186328

Item:

373	Button	- Change over hydraulic circuit. Pump 9 is used for "LA- bracket raising-and lowering". When activating this button, pump 9 will be change- over to following: - cab movement - boom locking - assembly winch
381	Indicator lamp	- is on during assembly, assembly - keyed switch (389) is on
382	Indicator lamp	- is on during crawler assembly, keyed switch (390) is on
386	Button	- Functional check of the indicator and warning lamps
387	Switch	- Control panel lighting
388	Button	- Horn

389 **Assembly key- operated button**

By briefly activating the key-operated switch, the operating mode **Assembly** is selected (self-retention). Observe safety notes in Chap. 4.04.

C A U T I O N : - the LICCON overload safety device is no longer operational

The engaged operating mode **Assembly** is indicated by the indicator lamp in button (381), symbol on monitor and the red flash light on top of the crane operator's cab.

390 **Key operated button**

By briefly activating the key-operated switch, crawler assembly with hydraulic cylinder is selected (self-retention).

The engaged key operated switch is indicated by the indicator lamp (382) symbol on monitor, and the red flasch light on top of the crane operator`s cab..

C A U T I O N: As long as the key operted switch (390) is activated, there is no overload safety cut off for assembly cylinder and also for the crane.
There is a risk of accidents.

391	Button	- Spool "out" assembly winch
392	Button	- Rotate cab out
393	Button	- Cab adjustment "down"
395	Indicator lamp	- Preheat engine, flame starter system
397	Button	- Switch off selfretension of key - operated button (389)
398	Button	- Switch off selfretension of key - operated button (390)
399	Button	- Spool "in" assembly winch
400	Button	- Rotate cab in
401	Button	- Cab adjustment "up"
402	Mushroom head button	- **EMERGENCY "OFF"**
403	Ignition-start switch	
404	Manual control lever (**MS 3**)	
405	Button	- Control enable bypass seat contact switch

Note: Allocation of hand control lever (MS) to the operating modes see chart chapter 4.05

1. General

Note: The illustrations in this chapter are only examples.
The values in the individual symbols may not match in all cases.
In addition, the illustrations show the maximum possible placement if symbols on the operating view on monitor 0.
In normal crane operation, the LICCON screen would not show identical views.

1.1 LMB-safe load indicator - monitor "0"

The LICCON safe load indicator system is processed on the central microprocessor unit 0. It is displayed on monitor 0.
The LICCON works by comparing the actual load and the maximum permissible load according to the load capacity chart and the reeving.

Actual load
The actual load is determined by registering changing values:
The load stress on the crane is combined of load momentum and boom momentum. It affects a force in the boom guying, which is measured by the force test boxes.

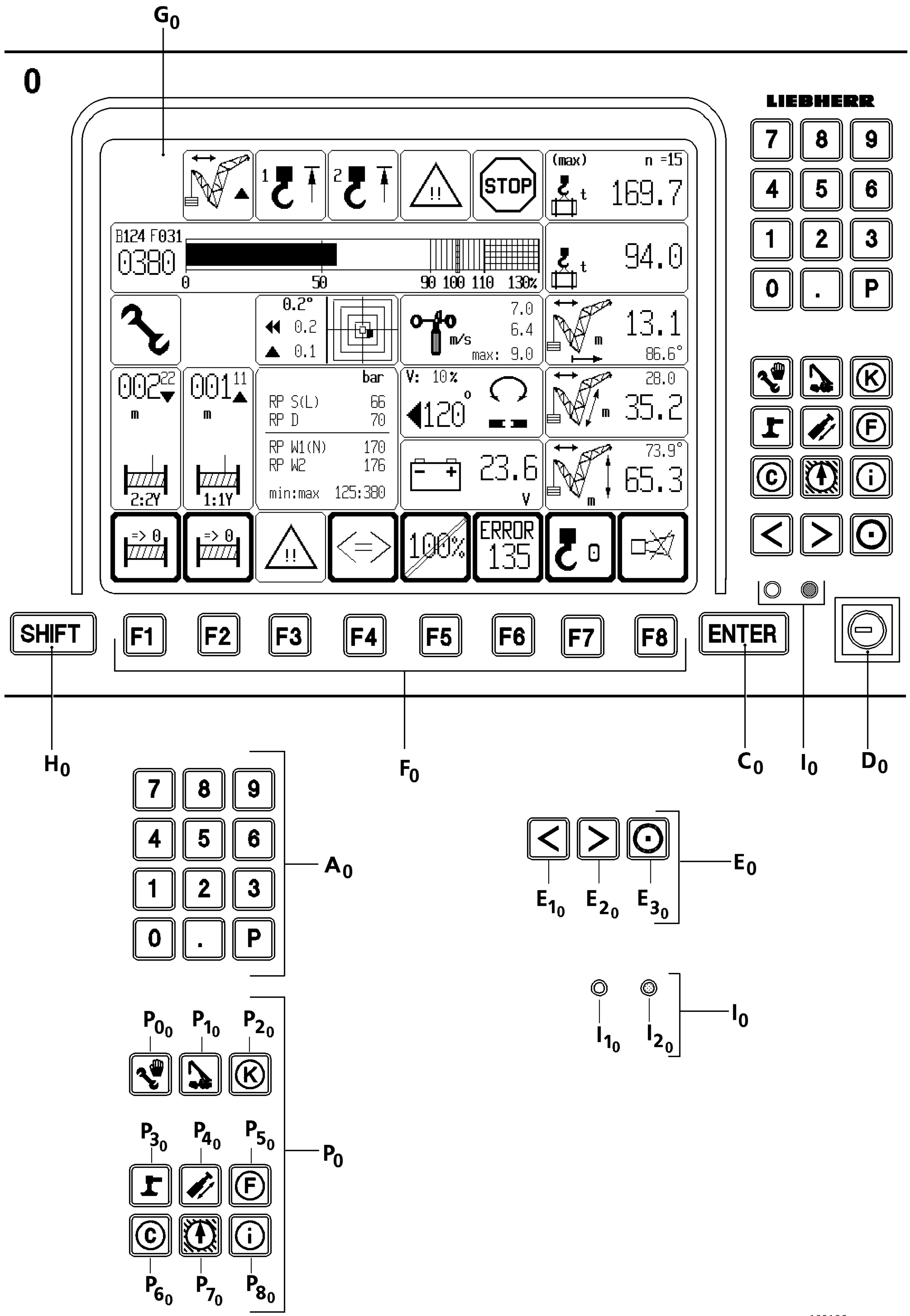
The boom momentum is calculated from the angle sensor information (boom angle) and the crane data (boom weights) for the adjusted operating mode.

The radius is calculated with the aid of the angle sensor information (boom angle) and the geometry data for the adjusted operating mode. A boom flexation due to its own weight and the weight of the load are taken into account.

The actual load is calculated from the total load, the boom momentum and the radius .

Maximum load according to load capacity chart and reeving
The crane data, such as load charts, boom weights and geometry data are stored in the central memory bank of the LICCON .
The "maximum load according to load capacity chart and reeving" is constantly being determined from load capacity charts for the adjusted equipment configuration, for the adjusted reeving and the calculated radius.

Comparison
The actual load and the "maximum load according to load capacity chart and reeving " are compared. As soon as the values get close to the preset limit, a prewarning is given. When this limit is reached or exceeded, the overload warning is triggered and all load moment increasing crane movements are turned off.



G_0
0
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H_0
F_0
C_0
I_0
D_0
A_0
E_0
$E1_0$
$E2_0$
$E3_0$
$I1_0$
$I2_0$
$P0_0$
$P1_0$
$P2_0$
$P3_0$
$P4_0$
$P5_0$
$P6_0$
$P7_0$
$P8_0$
P_0

189136

2. The control elements of the LICCON

The LICCON control and indicator elements are located in the crane operator's cab, in direct view of the operator.

The LICCON system includes 2 identical monitors, monitor "0" and "1".

MONITOR "0"
consists of a screen and various control elements:

A_0 Alpha numerical keyboard

P_0 Program keys to start the various LICCON programs
$P0_0$: SET UP
$P1_0$: OPERATION
$P2_0$: CRANE DELIVERY (corrective coefficients)
$P3_0$: not used
$P4_0$: not used
$P5_0$: CAMERA MONITORING *
$P6_0$: CONTROL (Preselection of slewing , hoist , luffing speed and lock winches)
$P7_0$: not used
$P8_0$: LICCON TEST SYSTEM *

C_0 Input key "ENTER" to confirm changes

D_0 Keyed switch
- Position to the right (press) ⇒to bypass hoist limit switch and/or shut off of LML
- Center position (self retaining) ⇒Normal operation

E_0 Special function keys

Brightness adjustment of monitor
The brightness level of the monitor can be adjusted with this key.
- "E1" background illumination ON /OFF
- "E2" brightness adjustment in three stages

Note: Additional functions of special function keys depend on the program and will be explained in detail in the description of the individual LICCON programs.

F_0 Function keys
The function keys must always be viewed together with the function key symbol line shown on the monitor above.

G_0 Display (Monitor)
Shows individual program views (example : Operating view).

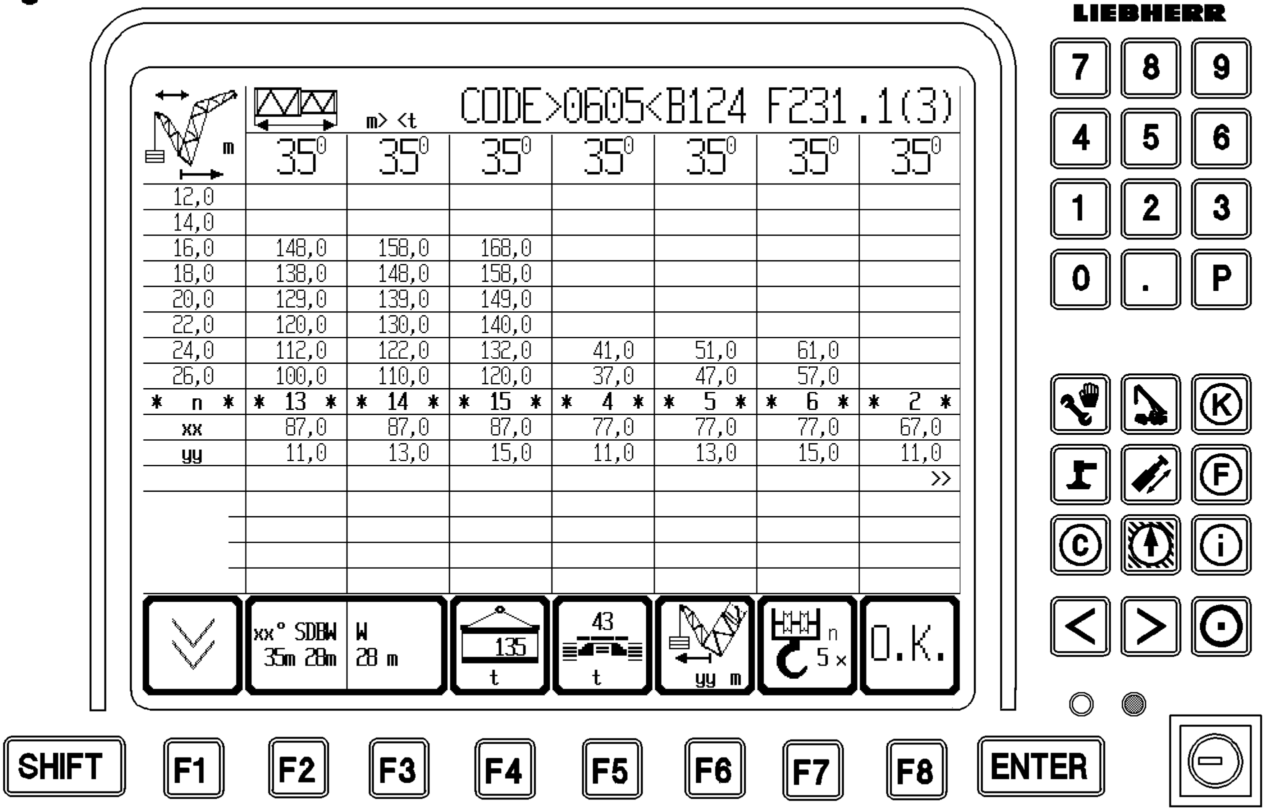
H_0 SHIFT key
Key assignment on 2nd level, "Supervisory function".

I_0 LED indicators
I1: (LED red) Monitor error
I2: (LED yellow) Power supply for monitor available.

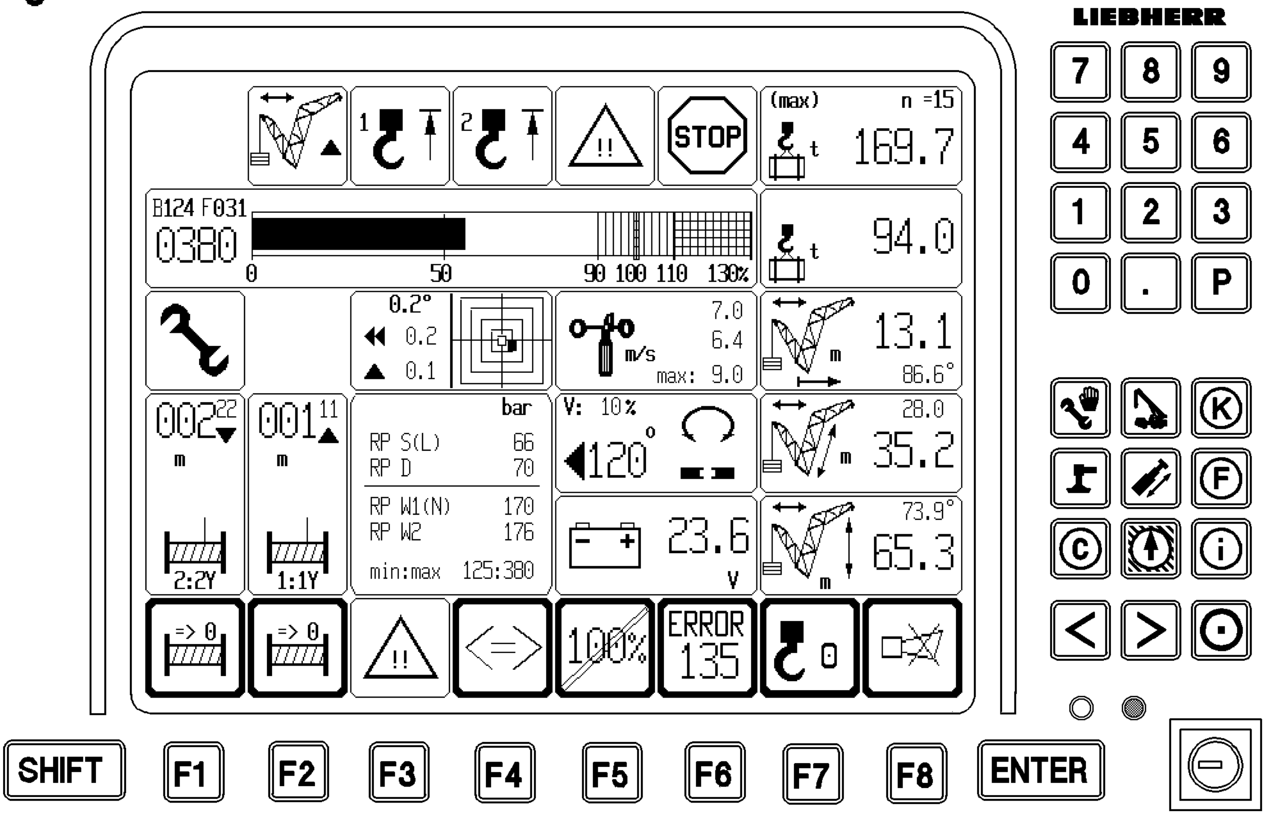
Note: The function of the individual monitor control elements depends on the program, which means it might differ depending on the currently executed LICCON program. It will be explained in detail in the description of the individual LICCON programs.

* Optional

0


LIEBHERR
CODE>0605<B124 F231.1(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 5 ×
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

0


LIEBHERR
1
2
STOP
(max) n =15
t 169.7
B124 F031
0380
0 50 90 100 110 130%
t 94.0
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
m 13.1
86.6°
002 22
m
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
m 35.2
73.9°
23.6
V
m 65.3
2:2Y
1:1Y
=> 0
=> 0
100%
ERROR 135
0
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189137

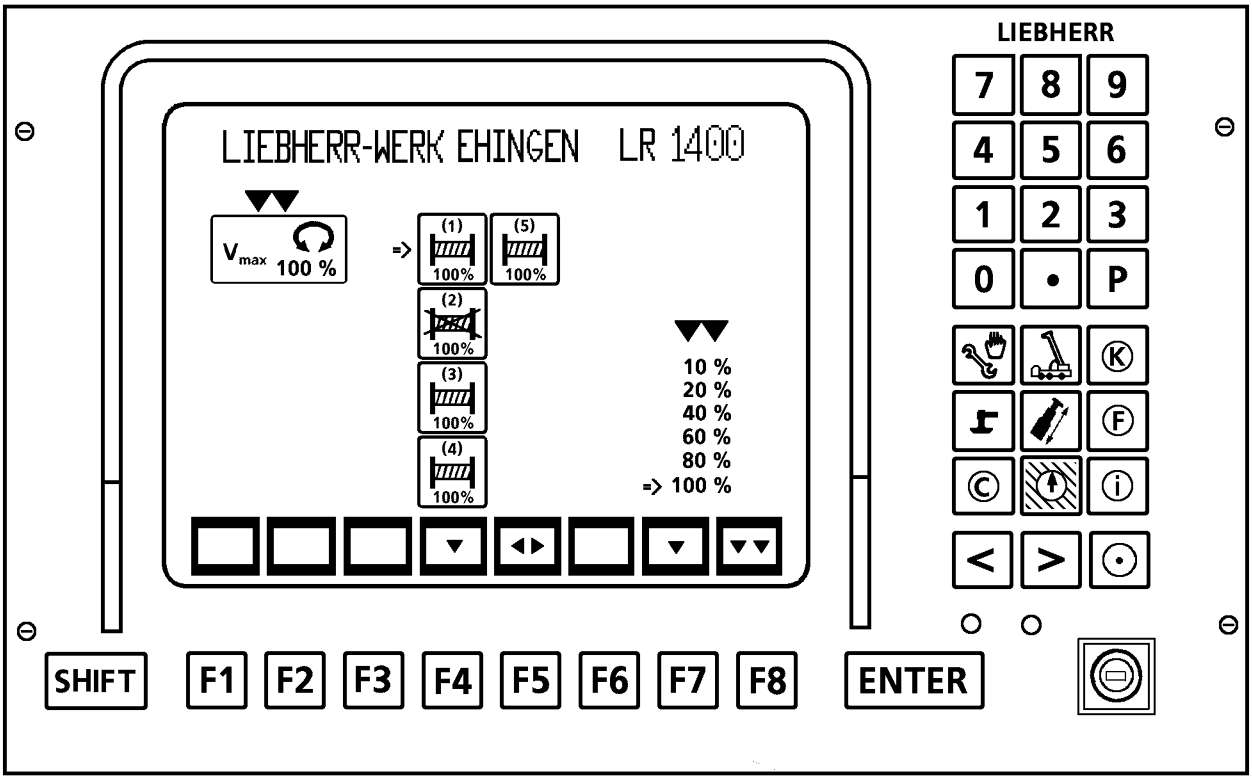
3. LICCON programs for crane operation

3.1 The "SET UP" program

shown on the screen in the **"equipment configuration view"**
Description, see paragraph 5.

3.2 The "OPERATION" program

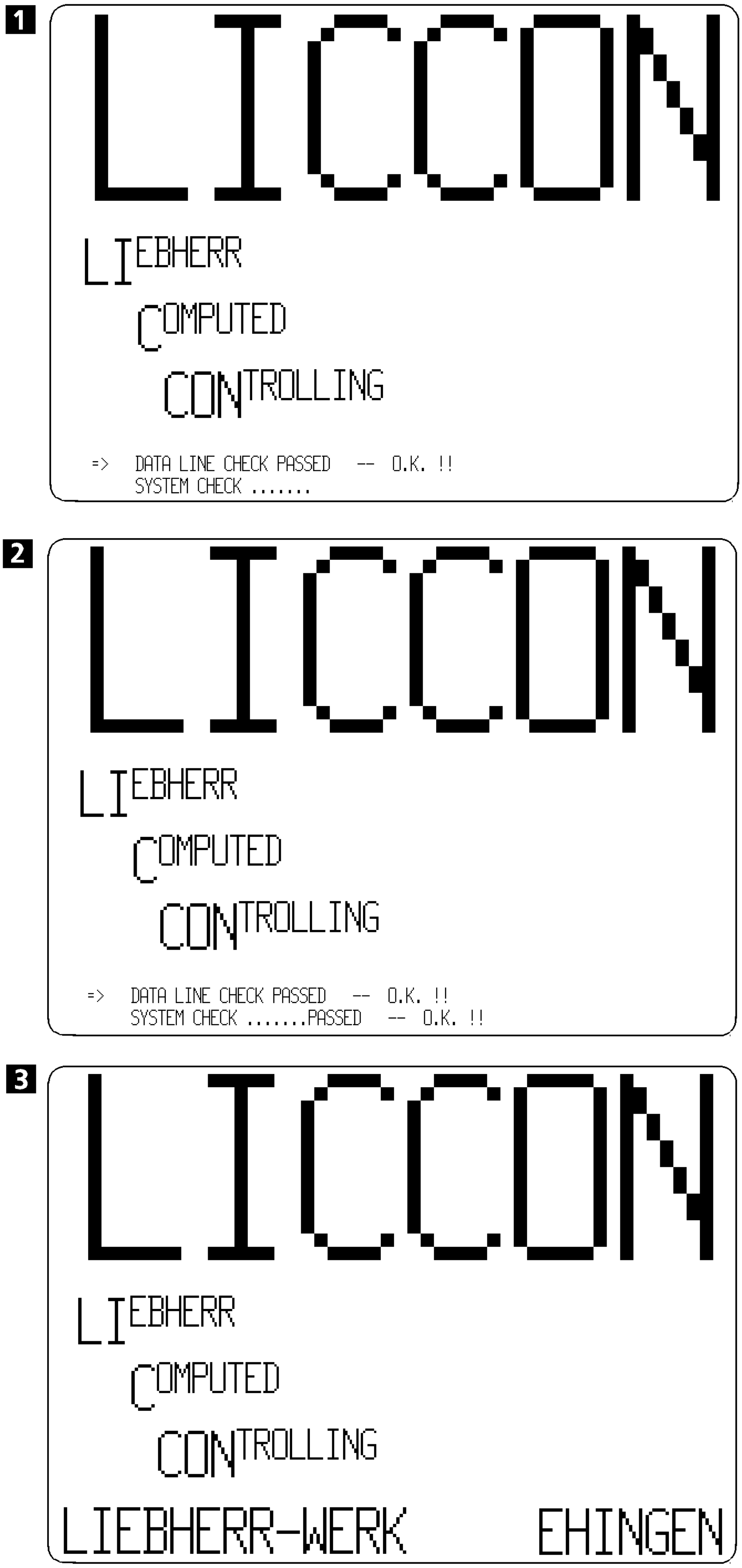
shown on the screen in the **"crane operation view"**
Description, see paragraph 6.


LIEBHERR
LIEBHERR-WERK EHINGEN LR 1400
Vmax 100 %
(1)
100%
(5)
100%
(2)
100%
(3)
100%
(4)
100%
10 %
20 %
40 %
60 %
80 %
=> 100 %
7 8 9
4 5 6
1 2 3
0 • P
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER

189138

3.3 The "CONTROL" program

Description, see paragraph 8.


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

186221

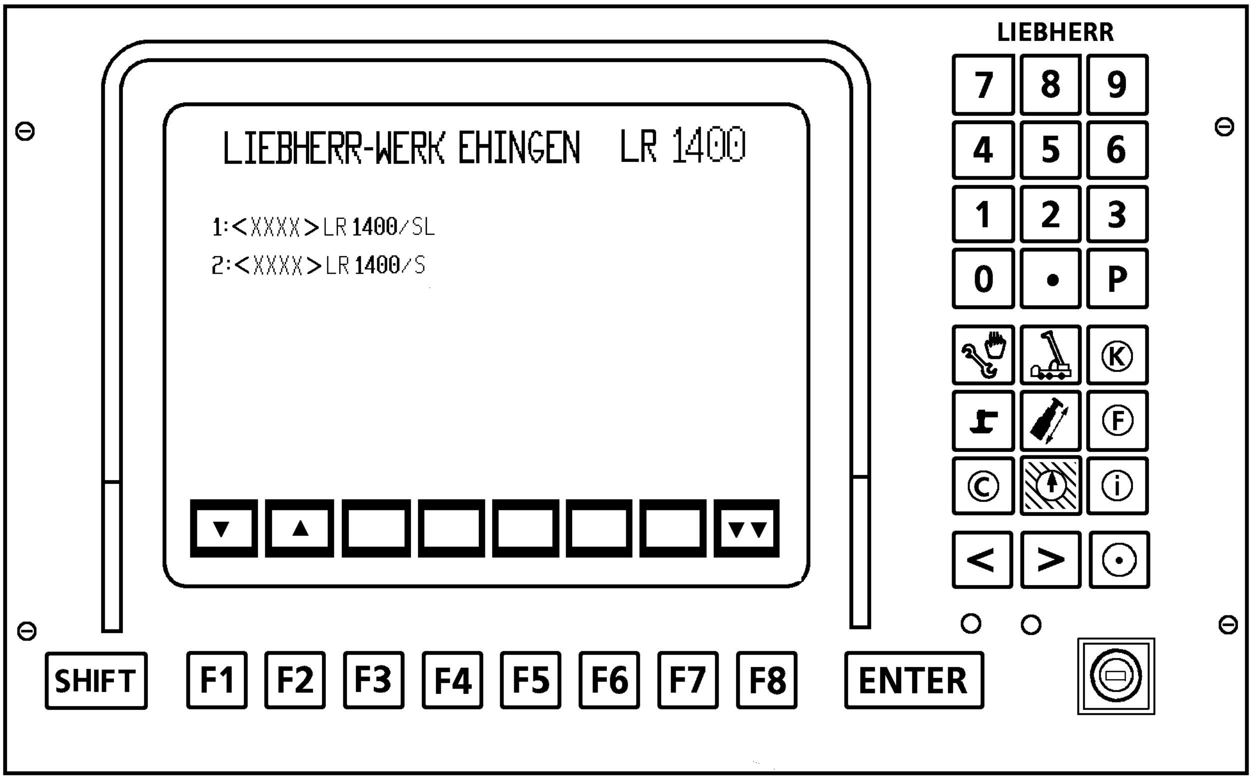
4. **Booting the LICCON system after turning it on (= Boot -up phase)**

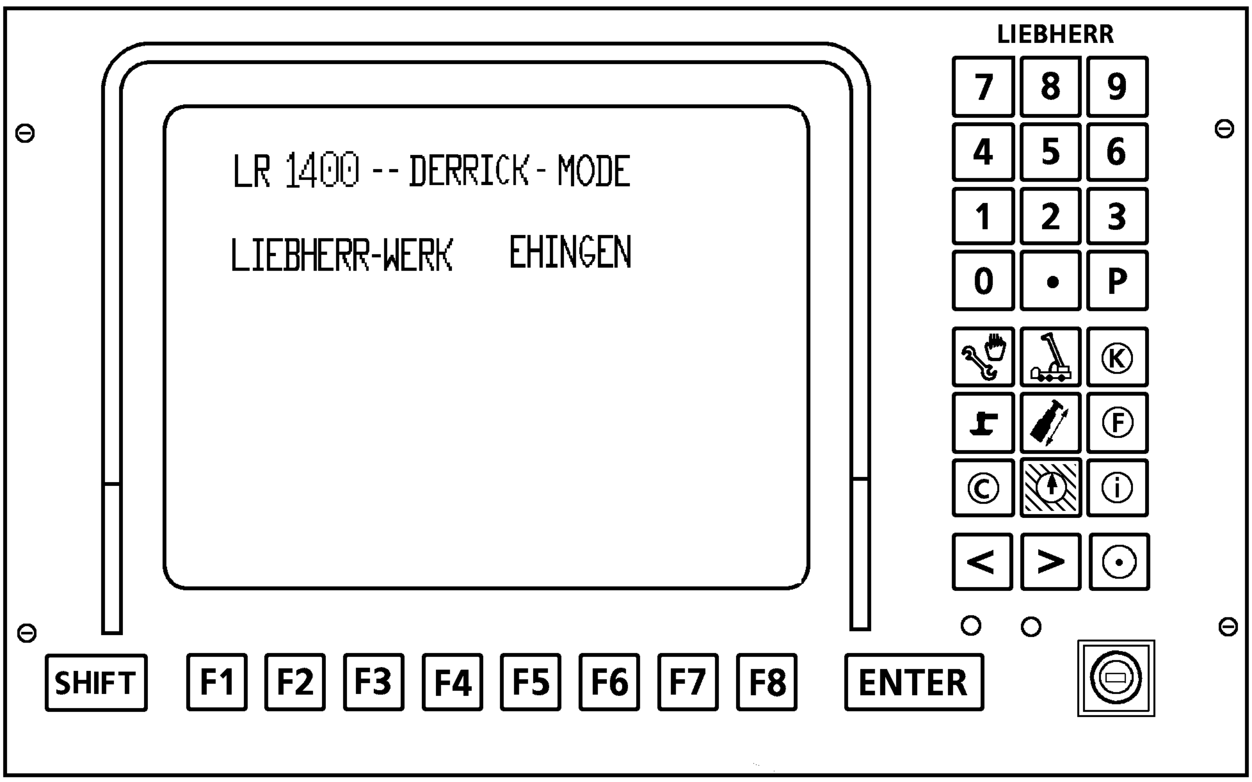
After the LICCON system is turned on, it runs through a self test.

It first checks the connections from the central processing units (CPUs) to the monitors 0 and 1. If no error is found during this check, then the monitor displays "Data Line Check Passed --OK!!" (Fig. 1).

If the test found no problems with the connections, then a system test is carried out on all central micro processing units (CPUs). The step-by-step self test procedure can be monitored on the 7-segment CPU indicators. These indicators are described in more detail in chapter "Localizing and fixing system errors". If no error was found during this test, then the monitor displays "System Check Passed -- OK!!" (Fig. 2).

After that, all 4 LICCON monitors display the general initialization view "LIEBHERR-WERK EHINGEN" (Fig. 3).


LIEBHERR
LIEBHERR-WERK EHINGEN LR 1400
1:<XXXX>LR 1400/SL
2:<XXXX>LR 1400/S
7 8 9
4 5 6
1 2 3
0 • P
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER


LIEBHERR
LR 1400 -- DERRICK - MODE
LIEBHERR-WERK EHINGEN
7 8 9
4 5 6
1 2 3
0 • P
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER

189139

Booting up the LICCON system (continuation)

When the starting procedure has been completed successfully, the view to preselect the operating mode (operating mode preselection view) will appear on the monitor.

Normally, the operating mode preselection group is shown on the operating mode preselection view which had been selected last, before the system had been turned off.

Only if there was a loss of data in the memory (cold start), then the first operating mode preselection group will be shown.

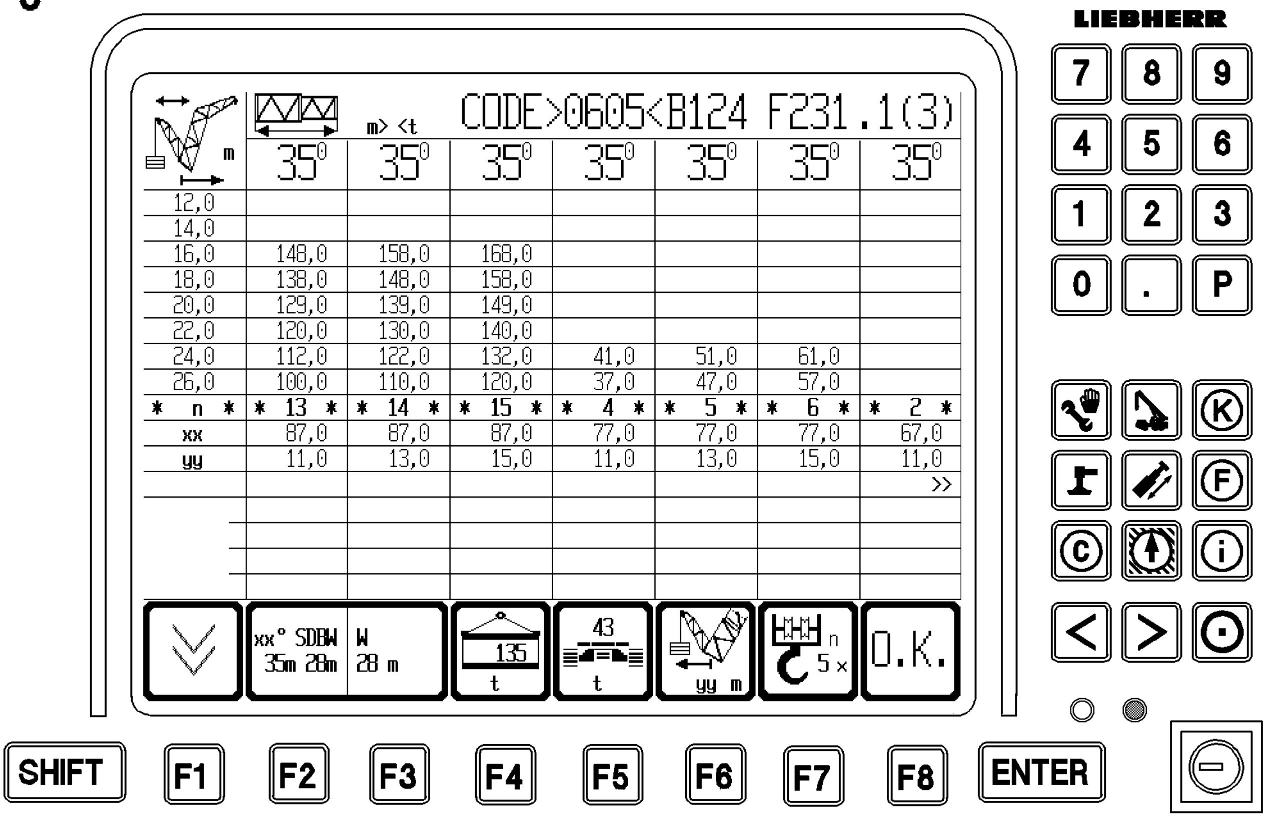
The crane operator must now make a preselection to determine the operating mode he wants to use for crane operation.
He can use the function key $F1_0$ (moving the cursor down) and $F2_0$ (moving the cursor upward) to select the operating mode preselction group which corresponds to the actual equipment configuration of the crane.

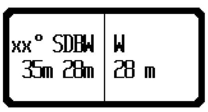
Pressing function key $F8_0$ or the "ENTER" key confirms this preselction.
After a few seconds, the **Equipment Configuration View** will appear on the monitor.

Note: If the crane operator does not change the operating mode preselection group within 3 seconds after the operating mode preselection view appears by pressing function key $F1_0$ or $F2_0$, then the LICCON system assumes that the previous operating mode group should remain set and Equipment Configuration View appears without any entry being made.
i. e. if the same previous operating mode group is to be selected, then nothing needs to be done, if another group is to be selected, the operator must make any change quickly after the view appears for preselection of the operating mode by pressing $F1_0$ or $F2_0$.

After successfully completing the starting procedure, cover picture will appear on the monitor 1.

0


LIEBHERR
m> <t
CODE>0605<B124 F231.1(3)
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 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


xx° SDBW 35m 28m
W 28 m

189140

5. The "SET UP" program - the equipment configuration view

The "SET UP" program permits the crane operator to set the LICCON on the monitor with the aid of the equipment configuration view and the control elements of the LICCON to the current operating mode, the current equipment configuration view of the crane and the reeving number of the hoist cable .

In addition, after corresponding operating mode preselection, all load capacity charts stored in the system can be viewed with the "SET UP" program.

After turning the system on the operating mode preselection view, the "SET UP" program appears automatically and shows the equipment configuration view.
If, before the LICCON system had been turned off, **the same operating mode preselection group** had been set, then, after confirmation of this operating mode preselection group, normally the exact same equipment configuration view will appear, which means, the system automatically sets and displays the last equipment configuration and the reeving which was used then.
If, before the LICCON system had been turned off, **another operating mode preselection group** had been selected or if the LICCON is **turned on for the first time**, or if there was a **memory loss (cold boot)**, then, after confirming this operating mode preselection group, the equipment configuration view for the 1st valid equipment configuration for the 1st valid operating mode of the selected operating mode preselection group will appear.

C A U T I O N: When rebooting the system (cold boot), the setting for the hoist cable reeving is set to "0"!

If the LICCON is in the "OPERATION" program (the operating view is shown on monitor 0), then the "SET UP" program can be started by pressing the program key "SET UP" ($P0_0$) .

All setting, which the crane operator must carry out in the "SET UP" program must be made on monitor 0. Monitor 1 shows no equipment configuration view.

The operating mode and the equipment configuration can be set two ways:

1. With function keys:
   Push the function key $F2_0$ until the desired main geometry condition is selected,
   Push the function key $F3_0$ until the desired auxiliary equipment condition is selected,
   Push the function key $F4_0$ until the desired slewing platform counterweight is selected,
   Push the function key $F5_0$ until the desired central ballast is selected ,
   Push the function key $F6_0$ (no function)
   Push the "ENTER" key

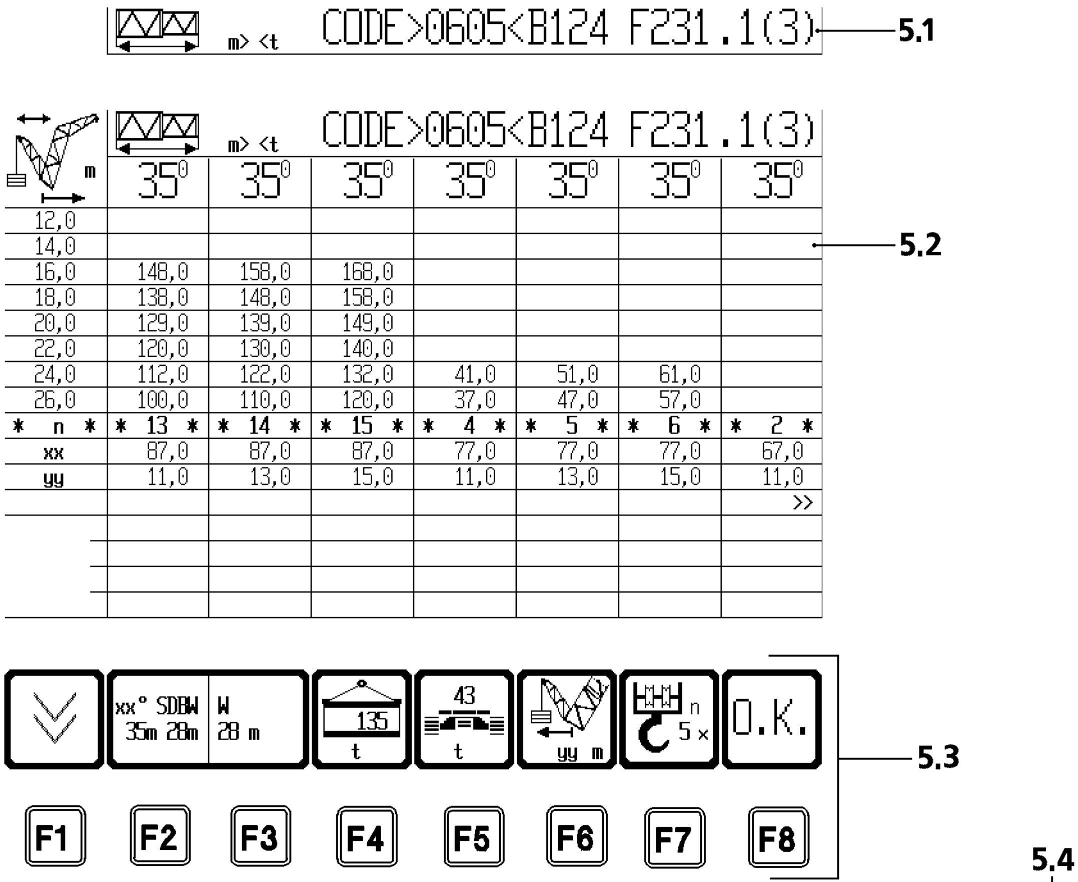
2. With a short code:
   Enter the 4-digit short code with the numeric keys of the alpha numeric key board (A) on the monitor 0 ,
   Push the "ENTER" key .

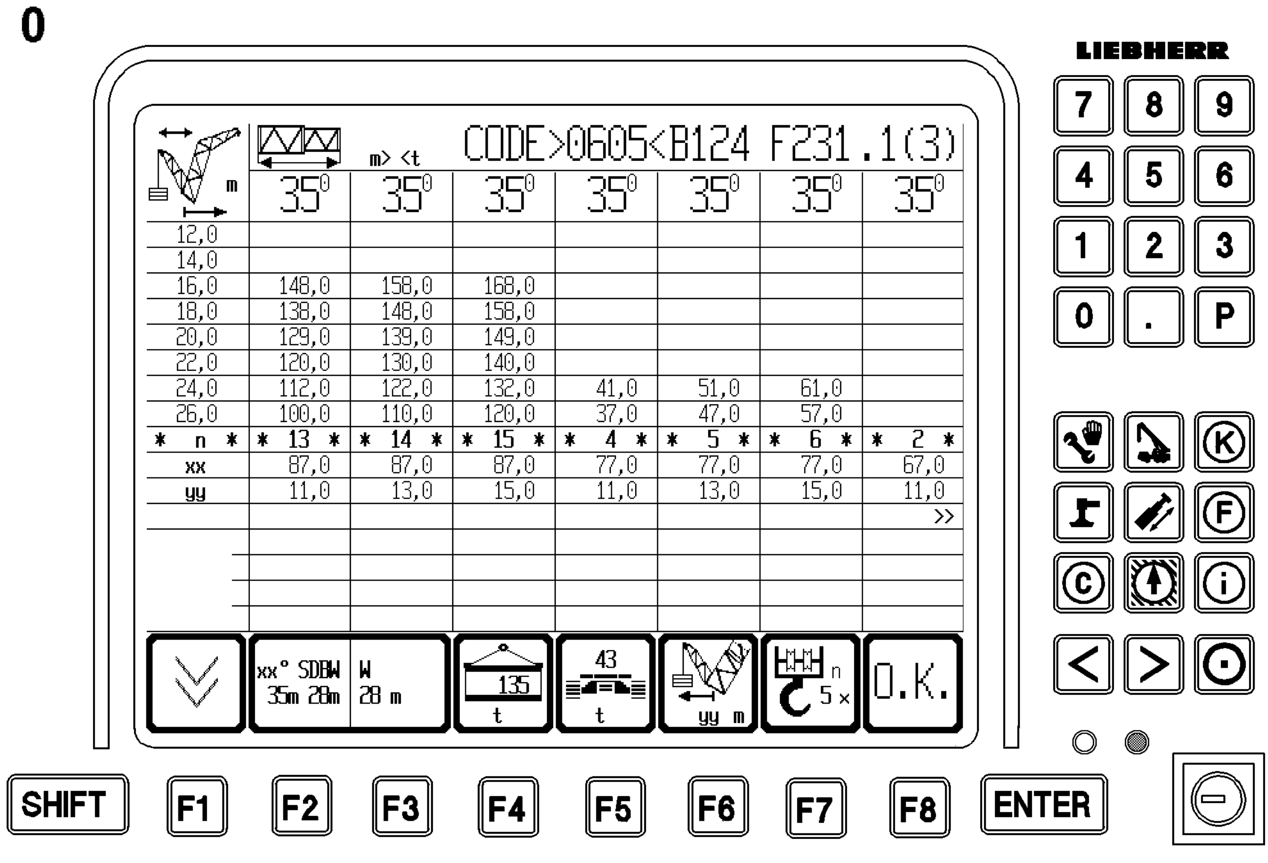
Then the data in the selected load capacity chart can be viewed.

Set the current reeving on the current pulley head by pushing the function key $F7_0$ until the correct value is set.

When the set equipment configuration and the reeving has been checked, push function key "$F8_0$" ="O.K." to end the "SET UP" program and to take over the selected parameters into the "OPERATION" program.

If the equipment configuration has been confirmed with "O.K." at least once, then the "SET UP" program can be ended by pushing one of the program keys ($P1_0$ - $P8_0$). The LICCON throws out the adjustments made in the "SET UP" program and continues to use the old operating condition, which has been confirmed last with "O.K.".


m> <t CODE>0605<B124 F231.1(3)
5.1
m> <t CODE>0605<B124 F231.1(3)
m
35° 35° 35° 35° 35° 35° 35°
12,0
14,0
5.2
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×
O.K.
5.3
F1 F2 F3 F4 F5 F6 F7 F8
5.4


0
LIEBHERR
m> <t CODE>0605<B124 F231.1(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 5×
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

189141

The screen in the "SET UP" program (equipment configuration view) is divided into four sections:

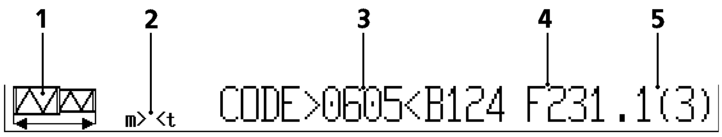
5.1 General information line

5.2 Indicator range for the values of the load capacity chart

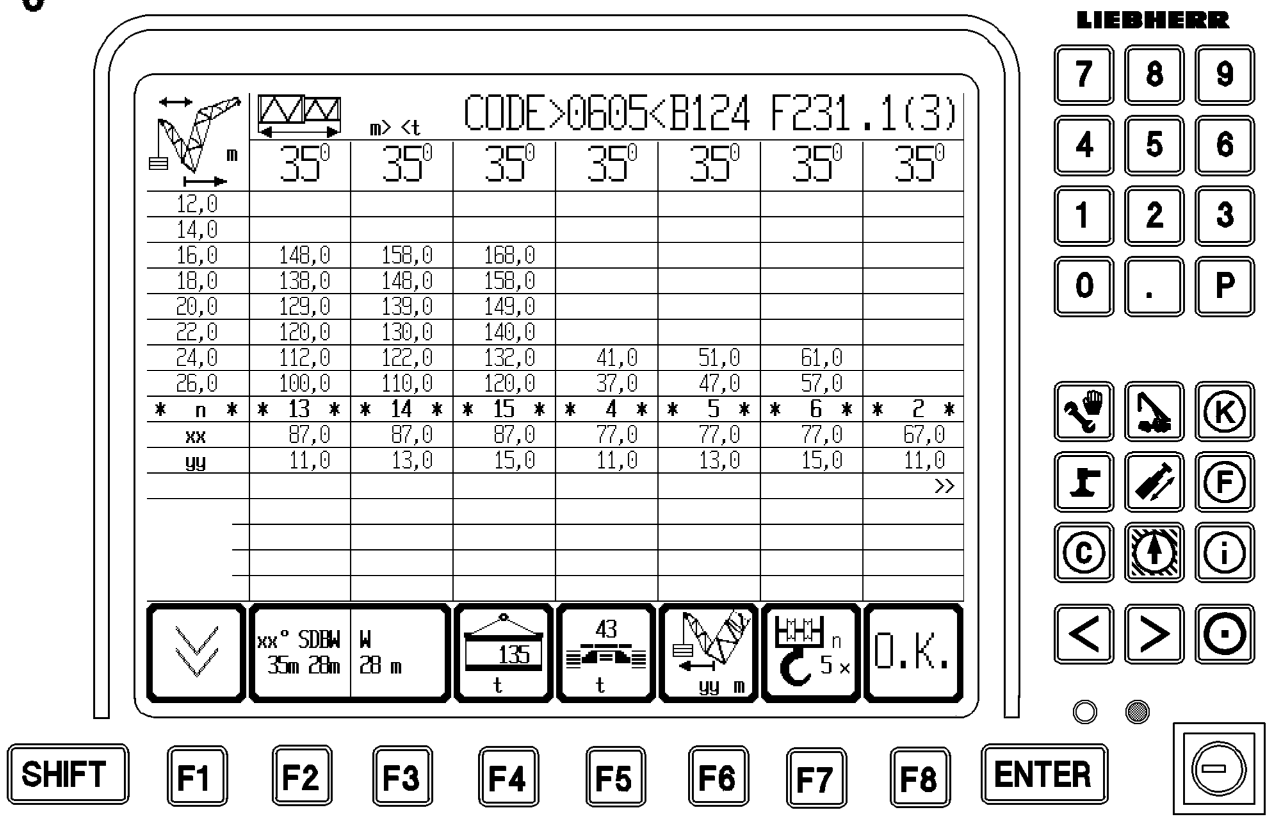
5.3 Function key bar

5.4 Other control elements

Note: The illustrations in this chapter are used **only as an example.**
The numeric values in the various symbols and charts will not necessarily match your crane configuration.
In addition, the illustrations show the maximum possible symbols on the LICCON screen.
In normal crane operation, an identical view would not appear on the LICCON monitor.


1
2
3
4
5
m> <t
CODE>0605<B124 F231.1(3)

0


LIEBHERR
m> <t
CODE>0605<B124 F231.1(3)
m
35⁰ 35⁰ 35⁰ 35⁰ 35⁰ 35⁰ 35⁰
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

189142

5.1 General information line

This line, from left to right, are the following symbols and data :

1) Symbol "main boom length" (looks the same for all operating modes)

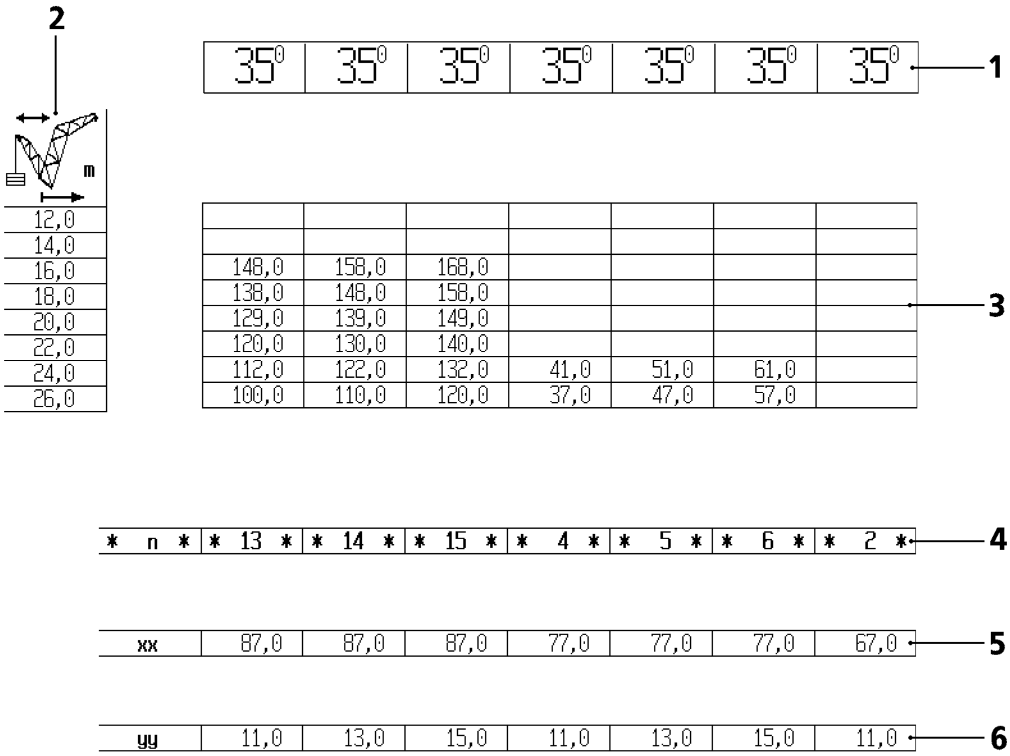
2) Abbreviation for programmed length units (LE) and weight units (GE). Length units include meters [m] and feet [ft]. Weight units are shown either in tons [t] or pounds [lbs].

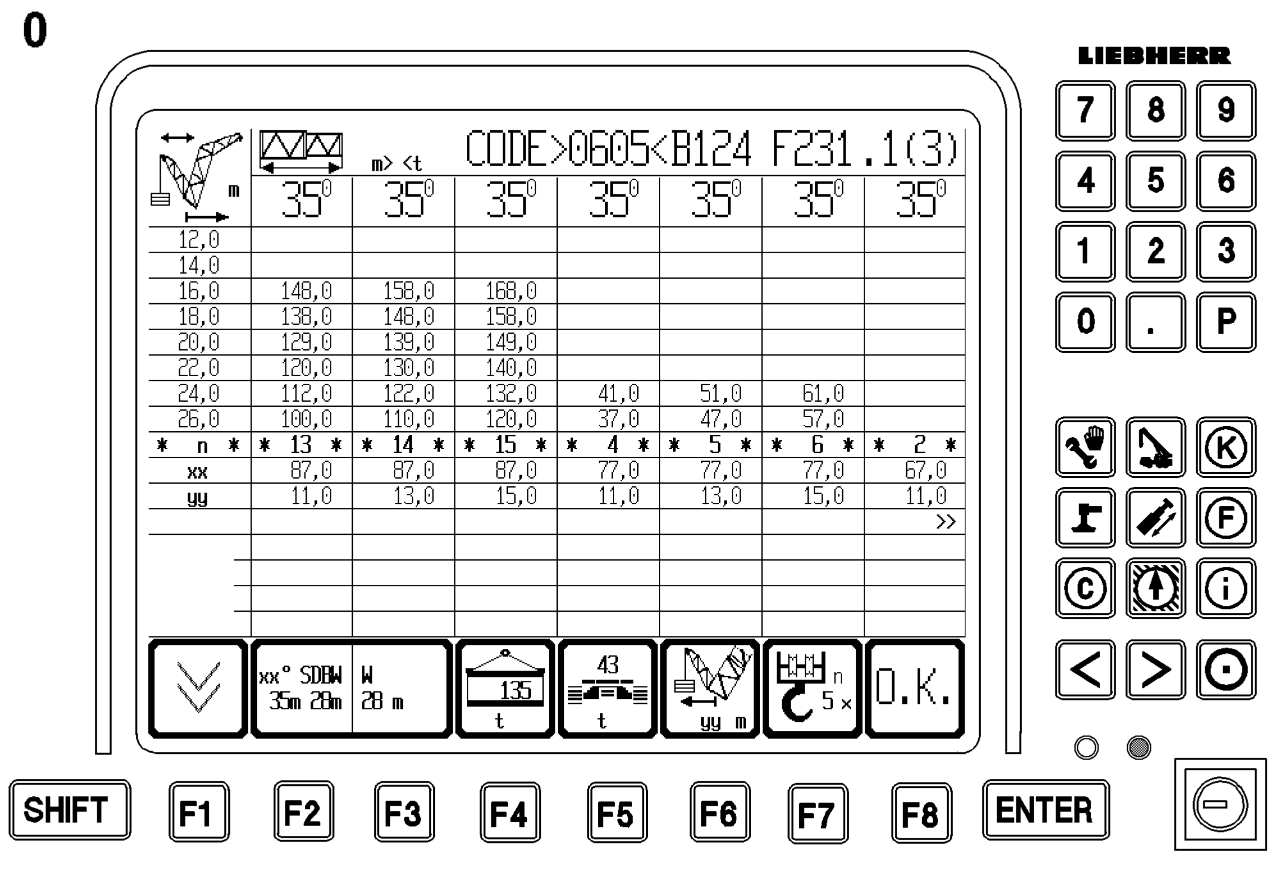
3) Next to the word "CODE" , inside pointed brackets, it a 4-digit short code (0605). Every short code describes an crane equipment configuration. The valid equipment configuration and the corresponding short code for the crane are taken from the crane's load capacity book.

4) an 8-digit code number (B124 F231), depending on the operating mode, of the set load-capacity chart. The letter (B) designates the basis for calculations specific to a country of the load-capacity chart (e.g. "B" = DIN, BS 75%), the combination of digits that follows (124) defines the type of crane (e.g. "124" = LR 1400).

   The 4-digit number block (F231) defines the corresponding operating mode:
   F2 defines the main geometry condition ,
   31 defines the auxiliary geometry condition .

5) A period "." separates the organization number from the page number of the currently shown section of the load capacity chart, behind it, in parenthesis ( ) is the total number of pages for this load capacity chart (see also description of function key "$F1_0$").


2
35⁰ 35⁰ 35⁰ 35⁰ 35⁰ 35⁰ 35⁰
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
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
3
* n * * 13 * * 14 * * 15 * * 4 * * 5 * * 6 * * 2 *
4
xx 87,0 87,0 87,0 77,0 77,0 77,0 67,0
5
yy 11,0 13,0 15,0 11,0 13,0 15,0 11,0
6


0
LIEBHERR
m> <t
CODE>0605<B124 F231.1(3)
m
35⁰ 35⁰ 35⁰ 35⁰ 35⁰ 35⁰ 35⁰
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 ×
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

189143

5.2 Indicator range for load chart values

This section is divided into the following areas:

1) Main boom lengths in length unit meters ([m] or foot [ft]) in max. 7 columns per page. They form the horizontal axle of the load capacity value field.

2) The operating mode dependent symbol "radius" in length unit meters ([m] or foot [ft]) in max. 10 lines of radii values. They form the vertical axle of the load capacity value field.

3) Load capacity value field
In the columns below the main boom lengths and the lines to the right of the radii values are the load capacity values, which depend on boom length and radius.

4) Line * n * = Hoist cable reeving
The numbers in his line show how often the hoist cable must been reeved between the boom head and the hook block(s) in single winch operation, in order to be able to lift the maximum load according to the corresponding load hart column.
If a load capacity value in the column exceeds the load which can be lifted with the maximum reeving, then an exclamation mark ("!") appears next to the reeving number to signify that special equipment is required to lift this load.
For parallel operation of hoist winches, always reeve and enter an even reeving number. If the minimum value happens to be an uneven number, then set the next higher even reeving number.

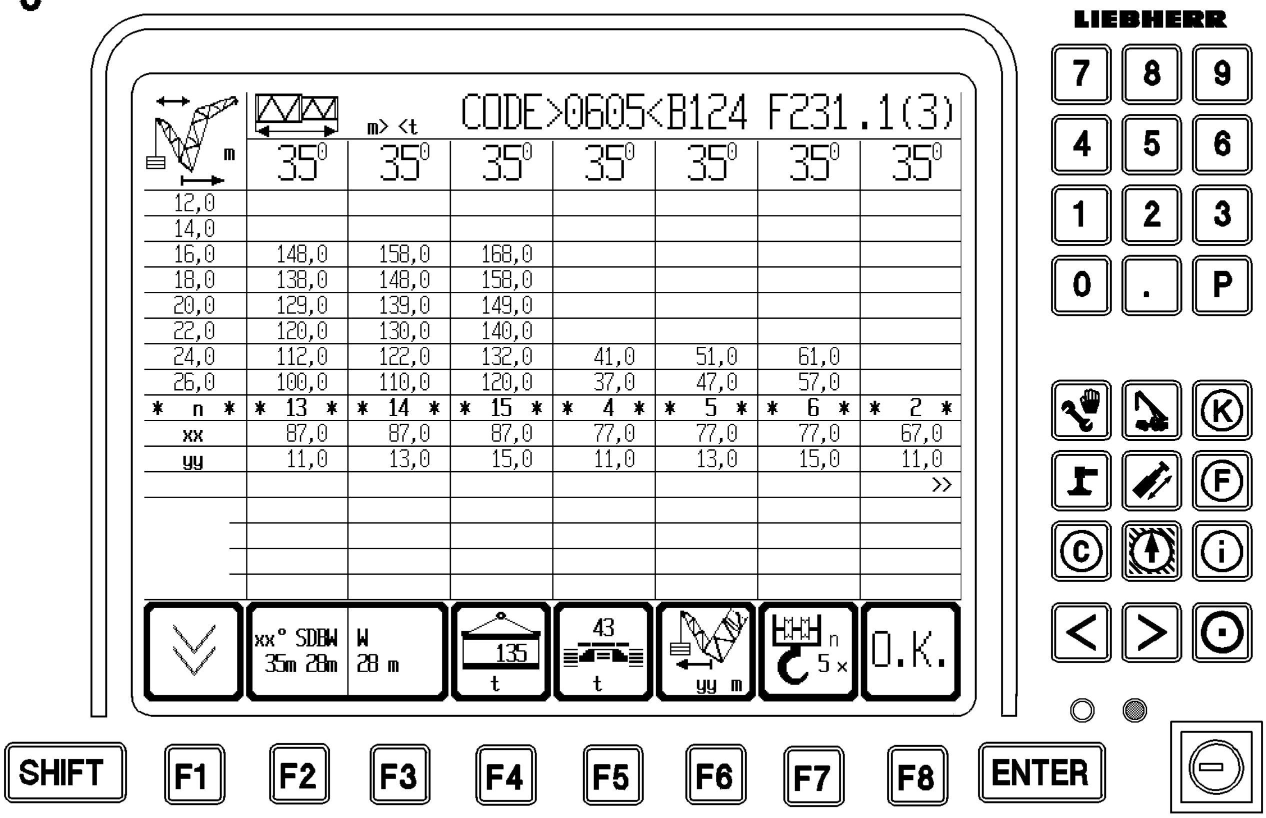
5) Line **xx** = Main boom angle in [°]
Appears only in operating modes with luffing lattice jib .
In the columns are the main boom angles listed next to each other, which must be set in order to be able to lift the load values in the corresponding load chart column.

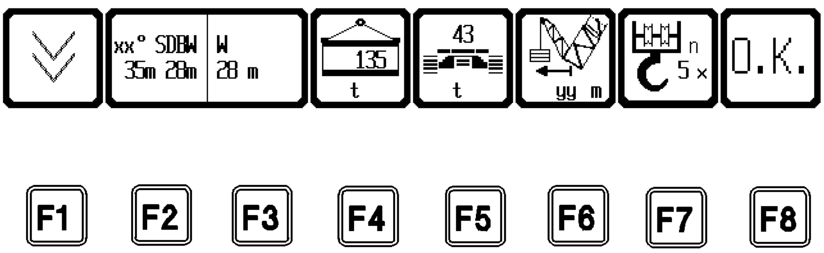
Note: See also paragraph 6.2.2 Main boom angle interpolation and paragraph 6.2.4 Combination of main boom angle and derrick ballast radius interpolation.

6) Line **yy** = Derrick ballast radius in [m]
Appears only in operating modes with derrick ballast.
In the columns are the derrick ballast distances listed, which must be set in order to be able to lift the load values in the corresponding load chart column.

Note: See also paragraph 6.2.3 Derrick ballast radius interpolation and paragraph 6.2.4 Combination of main boom angle and derrick ballast radius interpolation.

0


LIEBHERR
m> <t
CODE>0605<B124 F231.1(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 5 ×
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


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

189144

5.3 The function key bar

The function key bar contains 8 function key symbols, which correspond to the function keys below, which means they either designate a function, which can be triggered with the function key ($F1_0$...$F8_0$) or they change their view or their contents and designate a change of operating mode or equipment configuration.

$F1_0$ Vertical paging
Due to the size of the screen, no more than 10 lines of the load capacity chart can be shown at the same time. If a chart consists of more than 10 lines, then they are shown on several pages. By pushing the button, the next page of the load capacity chart is shown, and the number of the current page is increased by 1 in the ”General information line”. When the last page is reached and the $F1_0$ key is pushed, page 1 will reappear.

$F2_0$ To set the operating mode (main boom)
The various main boom operating modes of the crane can be entered here. The types are described in the symbol with abbreviations for length data,
for example xx° SDBW, 35 m
By pressing the "SHIFT" key and the "$F2_0$" key at the same time, the main geometry condition can be backed up by one length step.

$F3_0$ To set the operating mode (auxiliary equipment condition)
Here, the crane operator can select various auxiliary equipment types and type them in. The types are described in the symbol with abbreviations for length and angle data (for example: ”W 28 m = luffing fly jib 28 m)
By pressing the "SHIFT" key and the "$F2_0$" key at the same time, the auxiliary equipment geometry condition can be backed up by one length step.

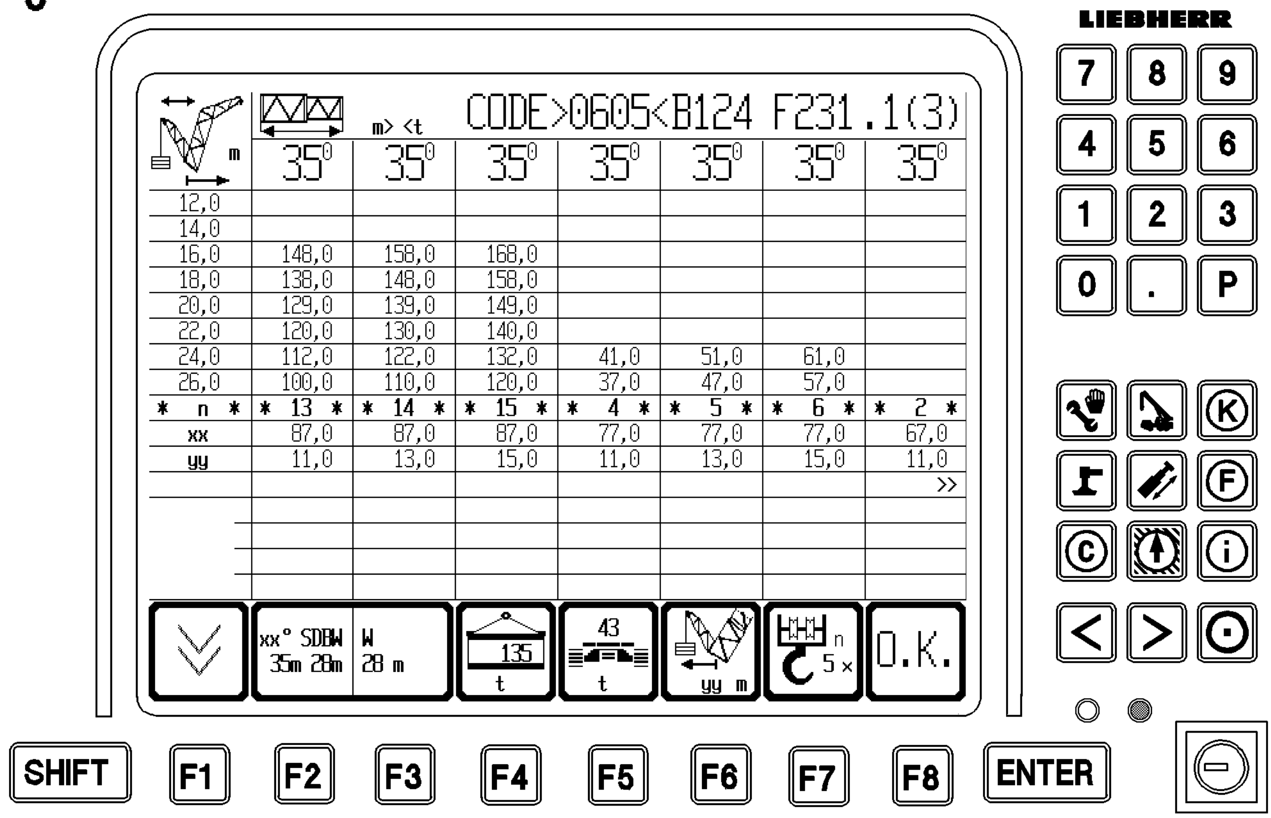
Note: If function keys $F2_0$ and / or $F3_0$ are pushed, all operating mode and equipment configuration dependent data is deleted from the screen and the short code in the ”General information line ” is set to ”CODE >? ? ? ?<”(if it was shown before).

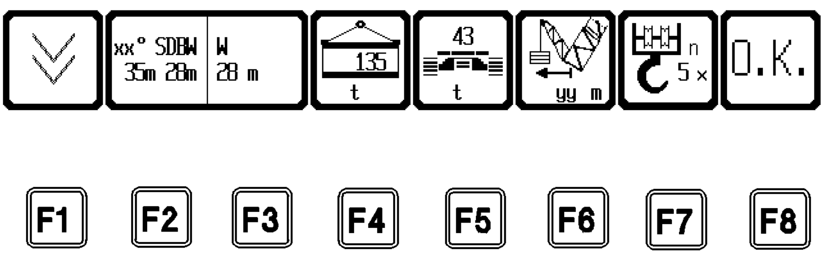
Operating mode depending data are:
- Boom length symbol for the general information line
- Length units and weight units
- Organization number of load capacity chart
- Radius symbol
- boom length

Equipment configuration dependent data are:
- Numbering of current page number and total page numbers of load capacity chart
- Radius values in length units
- Load capacity values in weight units

$F4_0$ To set the counterweight (slewing platform)
Use this key to set the current counterweight on the crane’s slewing platform in the LICCON. By pushing the key, the next symbol with text will appear in the counterweight symbol.

0


LIEBHERR
m> <t
CODE>0605<B124 F231.1(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 5 ×
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


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

189144

$F5_0$ Chassis (Crawler)
In operating modes, which have different undercarriage or chassis versions (for example ballast on the undercarriage, variable supports) , it can be set with the $F5_0$ key.

$F6_0$ no function

Note: If function keys $F4_0$ or $F5_0$ are used, all operating mode dependent data (if it was not shown before and the chosen operating mode exists) and all equipment configuration dependent data is deleted from the screen and the short code in the "General information line " is set to "CODE >????<"

$F7_0$ Hoist cable reeving
Use the F7 key to set the reeving number of the hoist cable, which is reeved on the pulley head (boom or folding jib), which has been selected via the load capacity chart.
The number of hoist cable reevings shown in the symbol is increased by 1 every time the button is pressed, until a maximum value, which is preset for the corresponding operating mode; then the counter starts again with the maximum value. For parallel operation of hoist winches, always reeve and enter an even reeving number. If the minimum value is an uneven number, then enter the next higher reeving number for parallel operation of hoist winches.
When changing the operating mode, if the set value is within this range (minimum value $\leq$ actual value $\leq$ maximum value), then it remains valid. Otherwise, it is set to the minimum value for the new operating mode.
The reeving number can be reduced by 1 by pressing the "SHIFT" key and the "$F7_0$" key simultaneously.

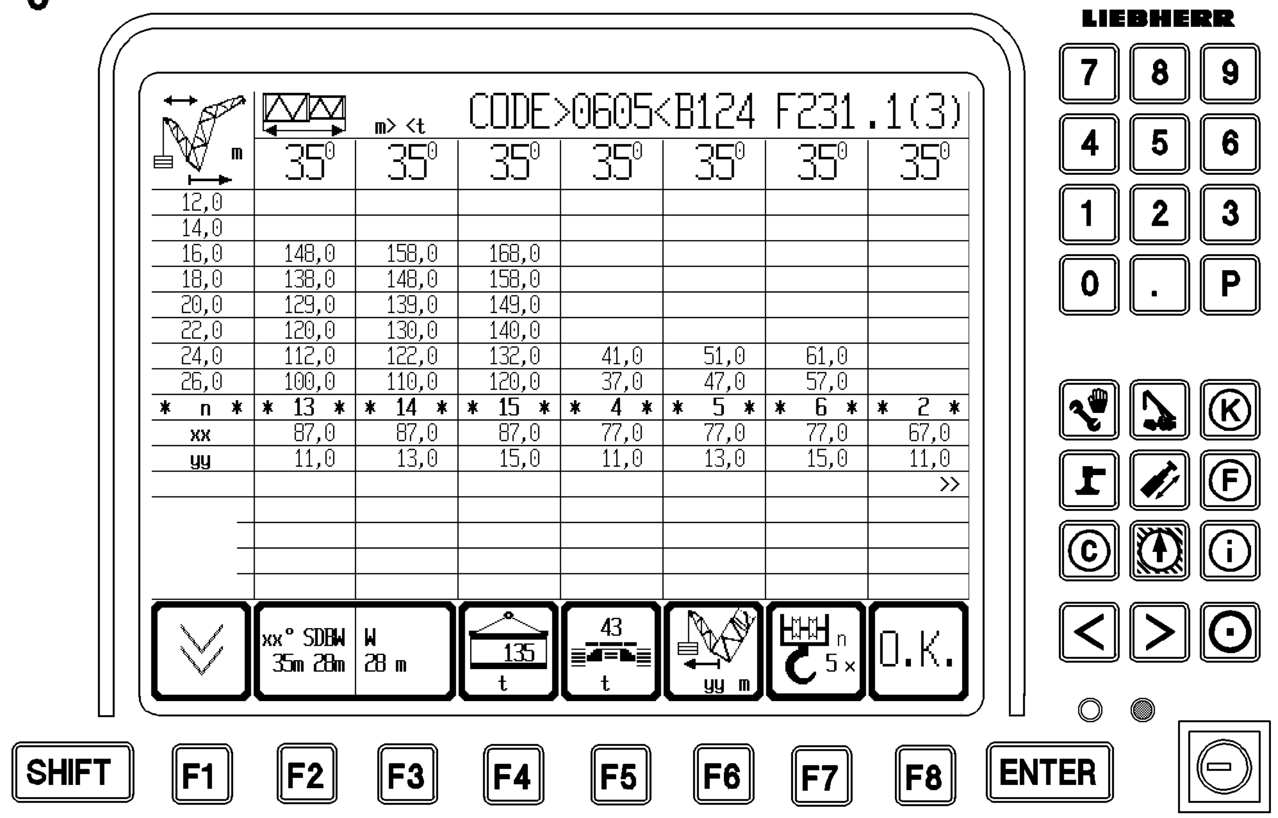
Note: After rebooting "cold start" (for example after a loss of data in the memory), the indicator for the hoist cable reeving is at "0".

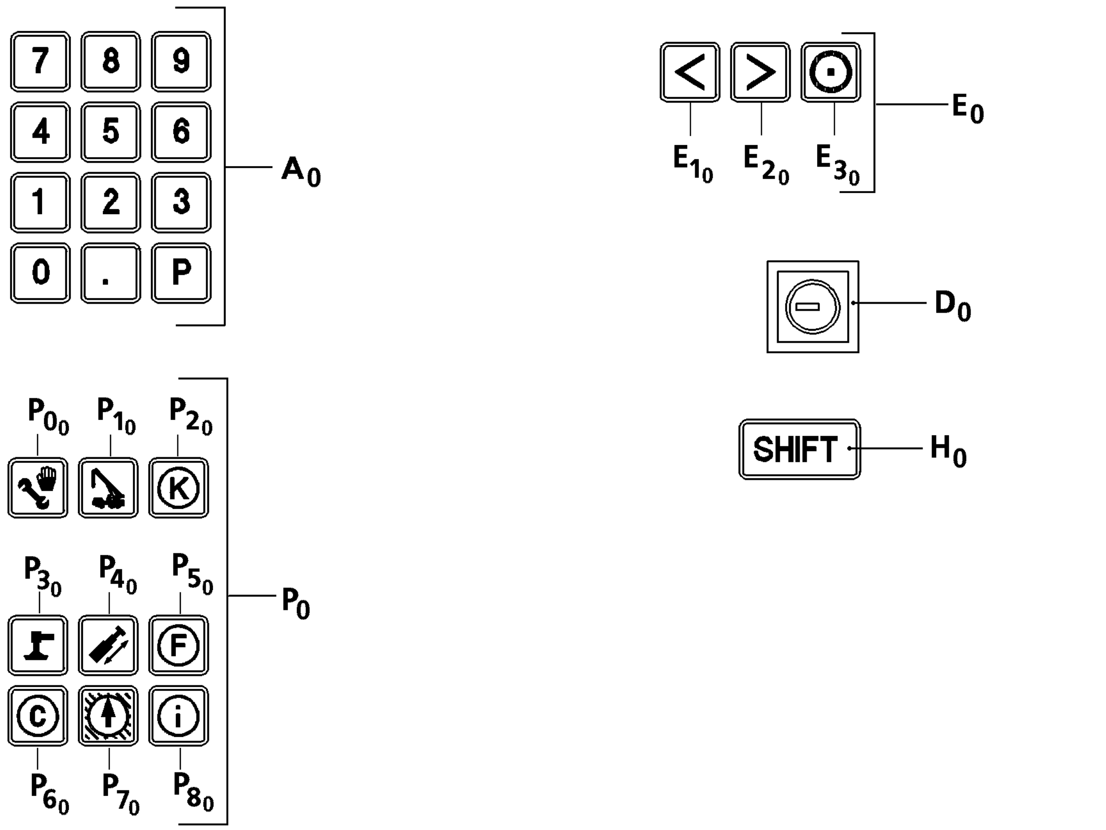
$F8_0$ O.K. - confirmation of set equipment configuration
The crane operator confirms the chosen equipment configuration and the chosen reeving (which matches the actual equipment configuration of the crane) with "O.K." and transfers the parameters to the "OPERATION" program.
The following must be noted:

- The equipment configuration input must be completely finished, which means a valid short code must be shown and load capacity values are shown in the chart fields.
  Otherwise, "ERROR 50" will be shown.
- If required, the external condition for this equipment configuration must be fulfilled, (for example superstructure lock).
  Otherwise, "ERROR 51" will be shown.
- The crane may not be utilized by more than 20% in the previous configuration, or the load hanging on the hook may not be heavier than 0.5 tons.
  Otherwise, "ERROR 52" will be shown.
  Otherwise, the program can only be switched to the "OPERATION" program via the program key P 1. In this case, the new equipment configuration settings are not taken over.

Note: The crane operator must assure before changing into the operating view, that the selected equipment condition (short code) and hoist cable reeving (n) have been accepted.

0


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
m> <t
CODE>0605<B124 F231.1(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 W
35m 28m 28 m
135
t
43
t
yy m
n
5 x
O.K.
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


7 8 9
4 5 6
1 2 3
0 . P
A0
E0
E10
E20
E30
D0
SHIFT
H0
P00
P10
P20
P30
P40
P50
P0
P60
P70
P80

189145

5.4 Other control elements

The remaining control elements on the indicator and control unit of the LICCON in the "SET UP" program have the following functions:

A_0 Alpha numeric key board
With the keys 1..9 on the alpha numeric keyboard, the short code field of the General information line can be directly accessed and the short code can be entered.

Note: Use of the alpha numeric keys deletes all operating mode and equipment configuration dependent data from the screen.

The keys "P" and "." have no function in the "SET UP" program.

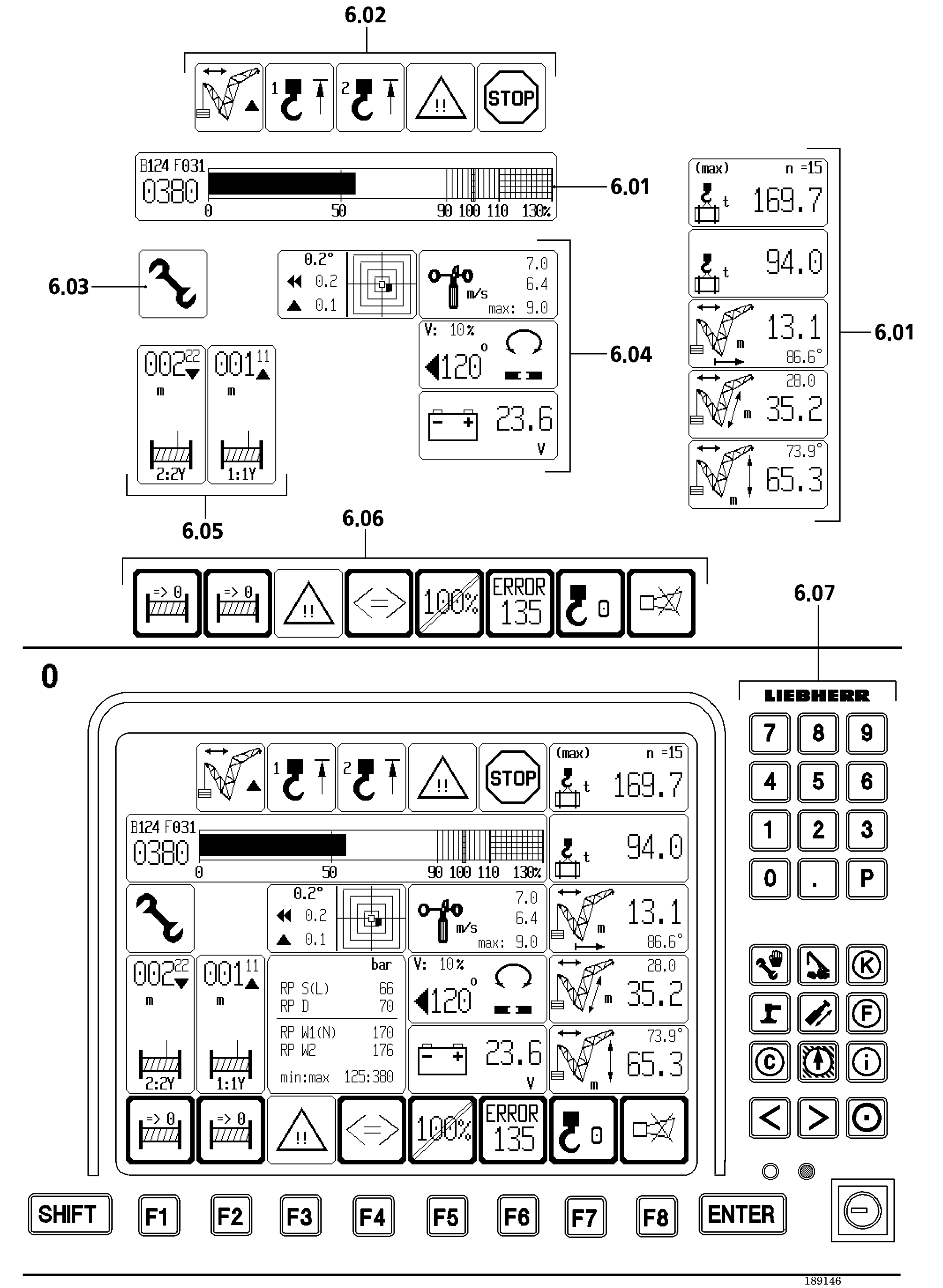
P_0 Program keys
Use the program keys to select the various programs. Setting made in the equipment configuration program are thrown out and the equipment configuration and reeving is used, which was last confirmed by the "O.K." key (F8o) .
The currently running program **cannot** be called up again via its program key.

C_0 Input key "ENTER" "
"ENTER" is the input confirmation for entering the short code as well as changing the operating mode or the equipment configuration via the function keys.
"ENTER" after short code input searches the short code in all stored load capacity charts. If the appropriate load capacity chart has been programmed, then it will be shown in full (including new lettering for symbols in the function key bar), otherwise, an error message in the form of question marks "????" will appear in the 2nd part of the organization number and the horn will sound.
"ENTER" after changing the operating mode via the function keys searches this operating mode, if successful sets the 1st equipment configuration and shows the corresponding load capacity chart and its short code. In case of error, the short code indicator remains on CODE >????<. The organization number is shown as "Bxx????" and the horn will sound.
"ENTER" after changing the equipment configuration shows this load capacity chart, if it is available, with short code, on the screen. In case of error, the short code indicator remains on CODE >????< and the horn will sound.

D_0 Keyed switch
has no function in the "SET UP" program.

E_0 Horizontal paging "E1" and "E2"
If a load capacity chart consists of more than 7 columns, then columns 1 to 7 are always shown during the first display of the equipment configuration.
The double arrow on the right edge of the line shows that there are additional columns in the corresponding direction. If the cursor is moved to one of the arrows, then the next three columns of the chart will be displayed during the next movement in this direction.
The cursor is automatically reset to the center.

H_0 SHIFT key
By pressing the "SHIFT" key and one of the function keys, the main geometry condition, the auxiliary equipment condition and the reeving can be reduced. See paragraph 5.3, the function keybar.


6.02
STOP
B124 F031
0380
0 50 90 100 110 130%
6.01
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
6.03
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
V: 10%
120°
23.6
V
6.04
002
001
2:2Y
1:1Y
6.05
6.06
=> 0
100%
ERROR
135
6.07
0
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
189146

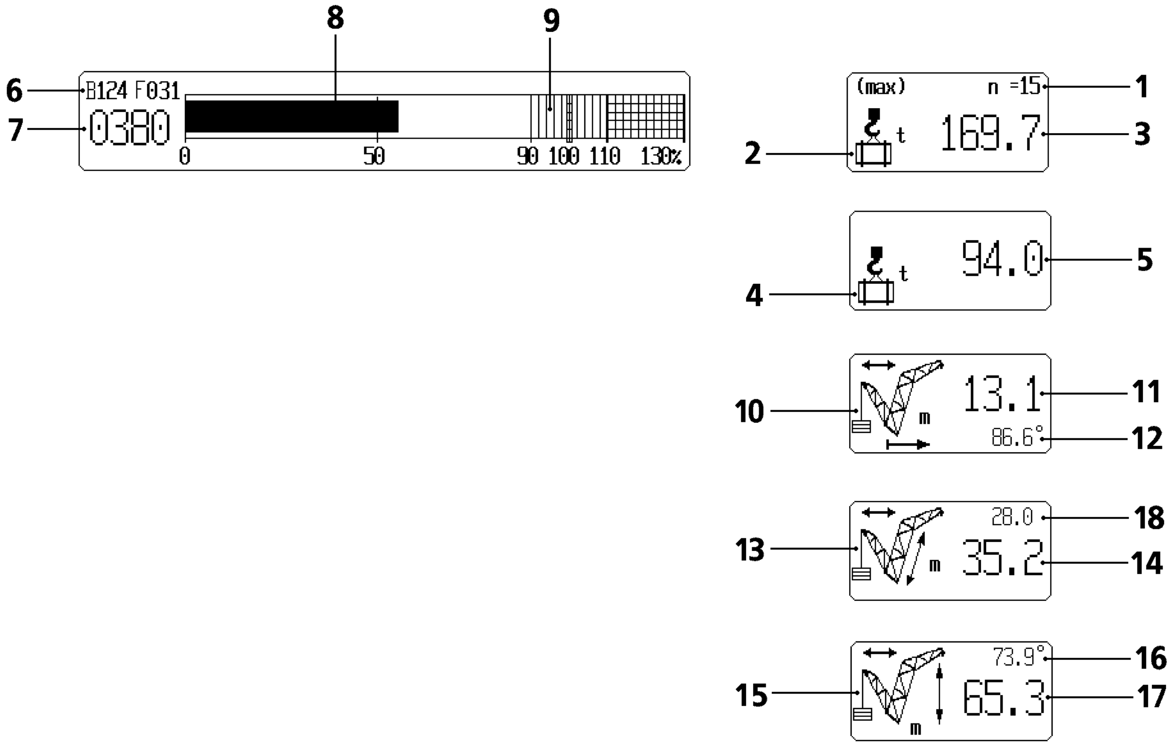
6.0 The "OPERATION" program - crane operation view on Monitor 0

The LICCON "OPERATION" program supports the crane operator by constantly displaying data relevant for the crane operation on the monitor (crane operation view). In addition, the crane operator is alerted to upcoming overload conditions. In case of overload and many error conditions, which could lead to dangerous conditions, the dangerous crane movements are shut off.

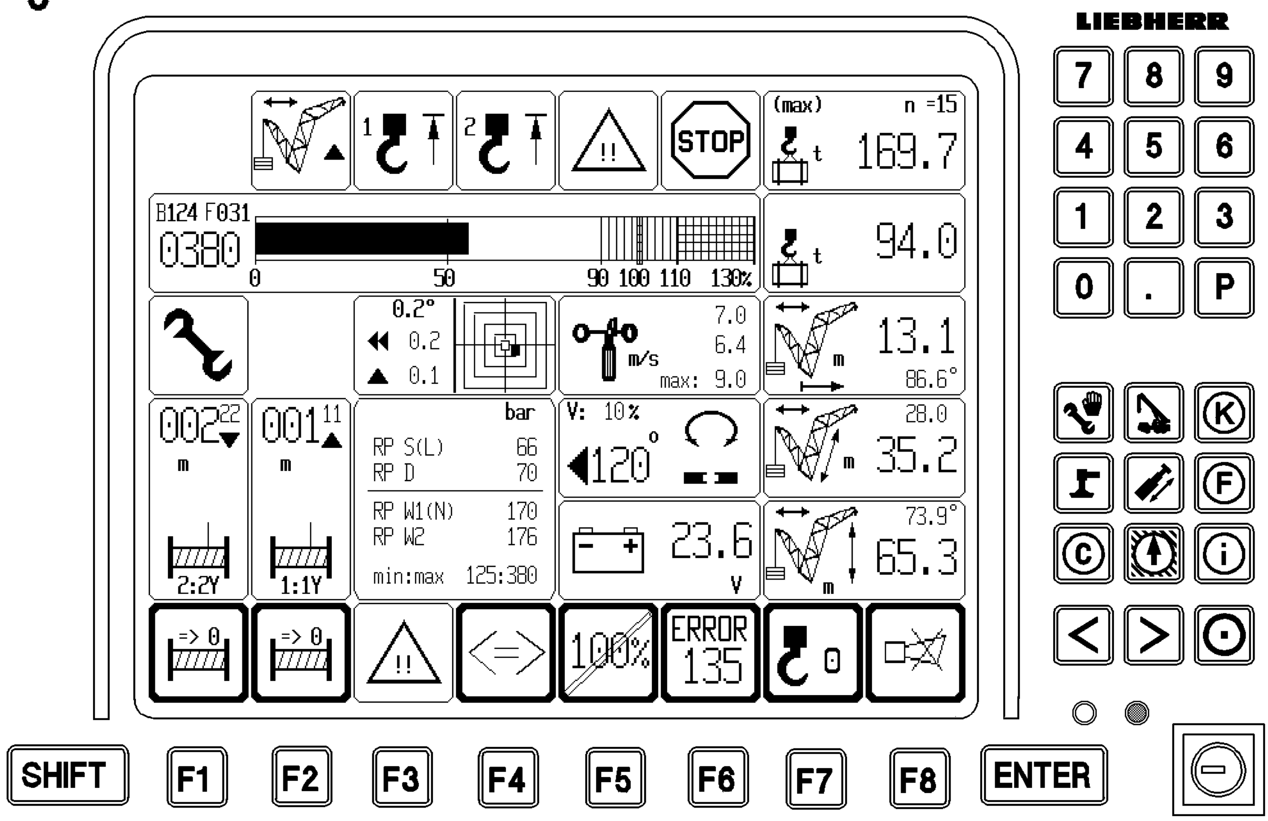
The monitor 0 is divided into 6 sections in the crane operation view :

6.01	**Information about crane geometry and load**
6.02	**Alarm functions**
6.03	**Special functions**
6.04	**Monitored additional functions**
6.05	**Winch indication - winch 1 and 2**
6.06	**Function key symbol bar**
6.07	**Other control elements**

Note: The illustrations in this chapter are **only examples.**
The values in the individual symbols may not match in all cases.
In addition. the illustrations show the maximum possible placement if symbols on the operating view on the monitor .
In normal crane operation, the LICCON screen would not show identical views.


8
9
6
7
B124 F031
0380
0 50 90 100 110 130%
(max) n =15
169.7
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
1
2
3
4
5
10
11
12
13
14
15
16
17
18

0


LIEBHERR
STOP
ERROR 135
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
23.6 V
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189147

6.01 Information about load and crane geometry

1) The reeving number of the hoist cable is given as "n = <number>", which is reeved via the pulley head which was chosen via the load capacity chart (previously set in the equipment configuration view).

2) Symbol "maximum load carrying capacity " in weight units of tons [t] or pounds [lbs]

3) Maximum load carrying capacity according to load capacity chart and reeving:
The "maximum load carrying capacity according to load capacity and reeving" is shown in the indicated weight unit of either tons [t] or pounds [lbs] .
The "maximum load carrying capacity according to load capacity chart and reeving " is dependent on the chosen operating mode and the chosen equipment configuration (→ load chart), on the radius and the reeving of the hoist cable. The "maximum load carrying capacity according to load capacity chart and reeving" is dependent on the size of the derrick ballast.
In operating modes without derrick ballast, the "maximum load carrying capacity according to the load capacity chart" is the maximum load, which the crane can lift in the present operating condition.
In operating modes with derrick ballast, the "maximum load carrying capacity according to the load capacity chart" is the maximum load, which the crane can lift in the present operating condition with the optimum (large) derrick ballast. The calculation of the optimum derrick ballast is described in the load carrying capacity chart manual. If the derrick ballast is smaller than the optimum ballast, then the load shown in 3) can usually not be lifted. Most often, the system is shut off via the test point 1 - maximum operating force.

"????" is shown if no load capacity chart value is available, for example because the crane is not in a range for a load capacity chart or one or more sensors are missing or are defective, so that the radius cannot be calculated.

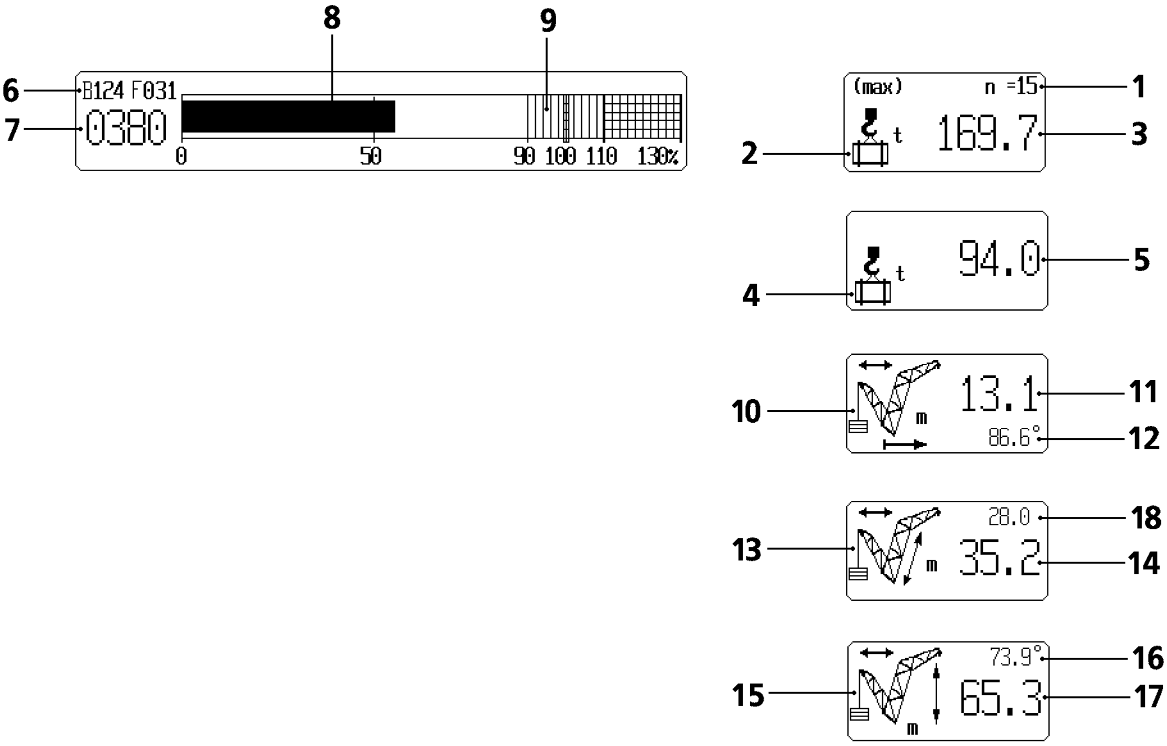
4) Symbol "Momentary load " with weight unit of tons [t] or pounds [lbs]

5) Momentary load (Actual load indication)
=Load (in weight units of tons [t] or pounds [lbs]), which is suspended at the moment on the crane hook preselected by operating mode. Indicated is the calculated total load, including the weight of the load carrying, take up and / or tackle. When actuating the "tare" function, (see description $F7_0$ in chapter 6.06) the indication can be changed over to net load indication. In the symbol appears also the word "net", the weight unit is then directly next to the load symbol.
"????" is shown if one or more sensors are missing or are defective, so that the momentary load cannot be calculated.

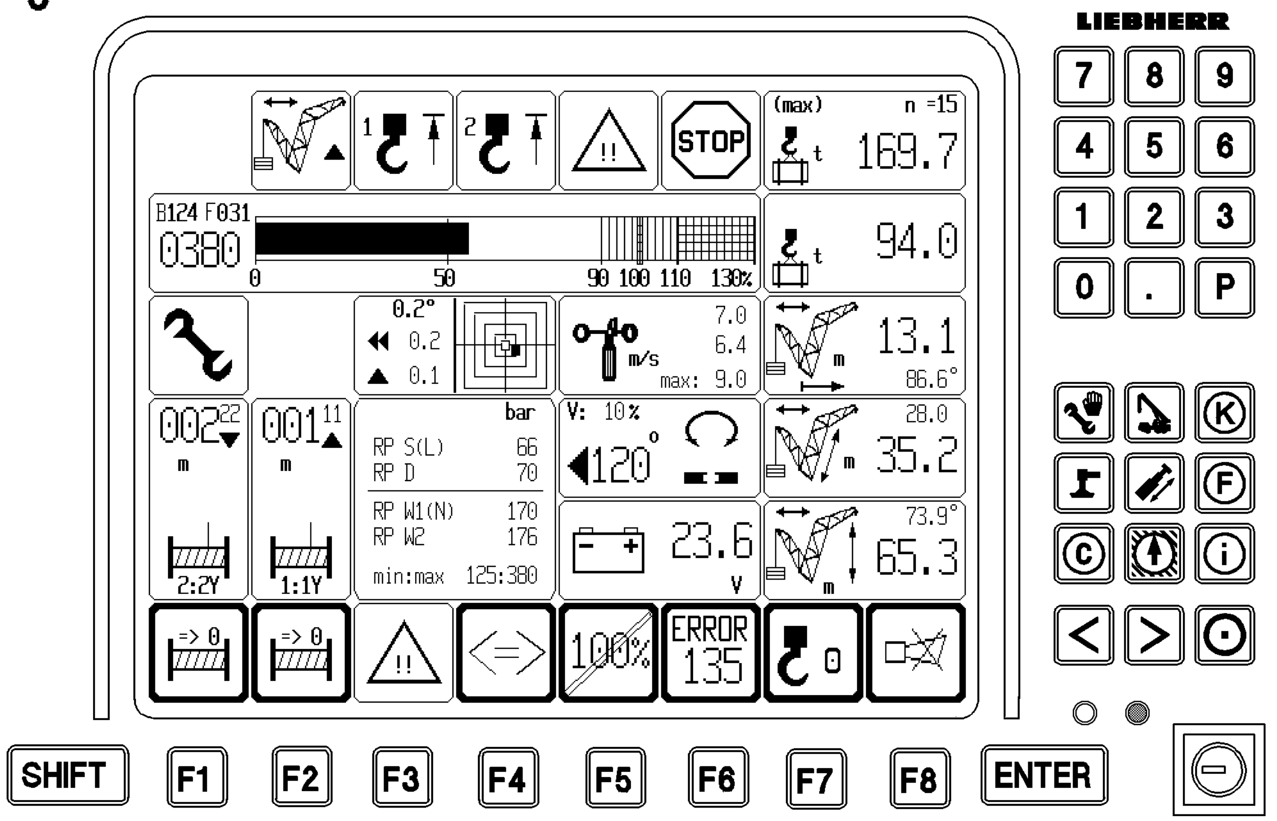
6) 8digit organization number (denotes the type of the set load capacity chart and the operating mode see section 5.01)
7) Short code (CODE >number<) of the set equipment configuration, see paragraph 5.01.

8) Dynamic utilization bar indication
=(momentary load) /(maximum load according to load capacity chart and reeving in percentages (%))
In operating modes without derrick ballast, this bar is the only measurement for crane utilization .
In operating modes with derrick ballast, the utilization bar shows the crane utilization at optimum (large ballast (for example 250 t). In case of partial derrick ballast, this utilization bar is not the only measurement for crane utilization, because the utilization on test point 1 is then also a criteria for the utilization of the crane (see F1 utilization bar on monitor 1).

9) Utilization scale , which is marked at important points with percentage values (static view) .
- Prewarning 90 %
- Stop- cut off 100 %


8
9
6
7
B124 F031
0380
0 50 90 100 110 130%
1
2
3
(max) n =15
169.7
4
5
94.0
10
11
12
13.1
86.6°
13
14
18
28.0
35.2
15
16
17
73.9°
65.3

0


LIEBHERR
STOP
ERROR 135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189147

10) "Radius " symbol with length units in meters [m] or feet [ft]

11) Radius in meters [m] or feet [ft]
= horizontal distance from the center of gravity of a load on the load hook, chosen by the operating mode from the axle of rotation of the crane superstructure, measured on the ground. The flexation of the boom due to its own weight and the suspended load is taken into consideration.

"????" is shown if geometry data or sensor values are missing, so that the radius cannot be calculated.

12) Main boom angle to the horizontal in degrees [°]
The value from the angle sensor in the main boom pivot section is shown. If this angle sensor value is invalid, then the value of the angle sensor on the main boom pulley head is shown.

"???" is shown if both angle sensor values are invalid or if the difference between both angle sensors is unbelievably great.

13) "Main boom length " symbol in length units in meters [m] or feet [ft]

14) Length of main boom in meters [m] or feet [ft]

15) "Pulley head height" in length units in meters [m] or feet [ft]

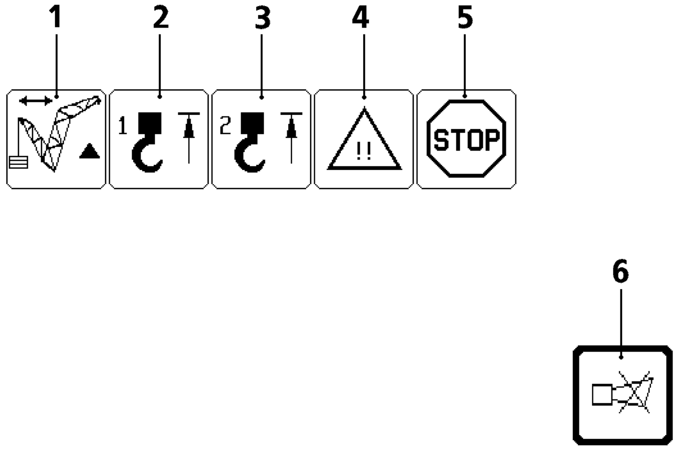
16) Angle of lattice jib to the horizontal in degrees [°]
The value from the angle sensor in the pivot section of the luffing jib (bottom) is shown. If this angle sensor value is invalid, then the value of the angle sensor on the pulley head of the luffing jib is shown.

"???" is shown if both angle sensor values are invalid or if the difference between both angle sensors is unbelievably great.

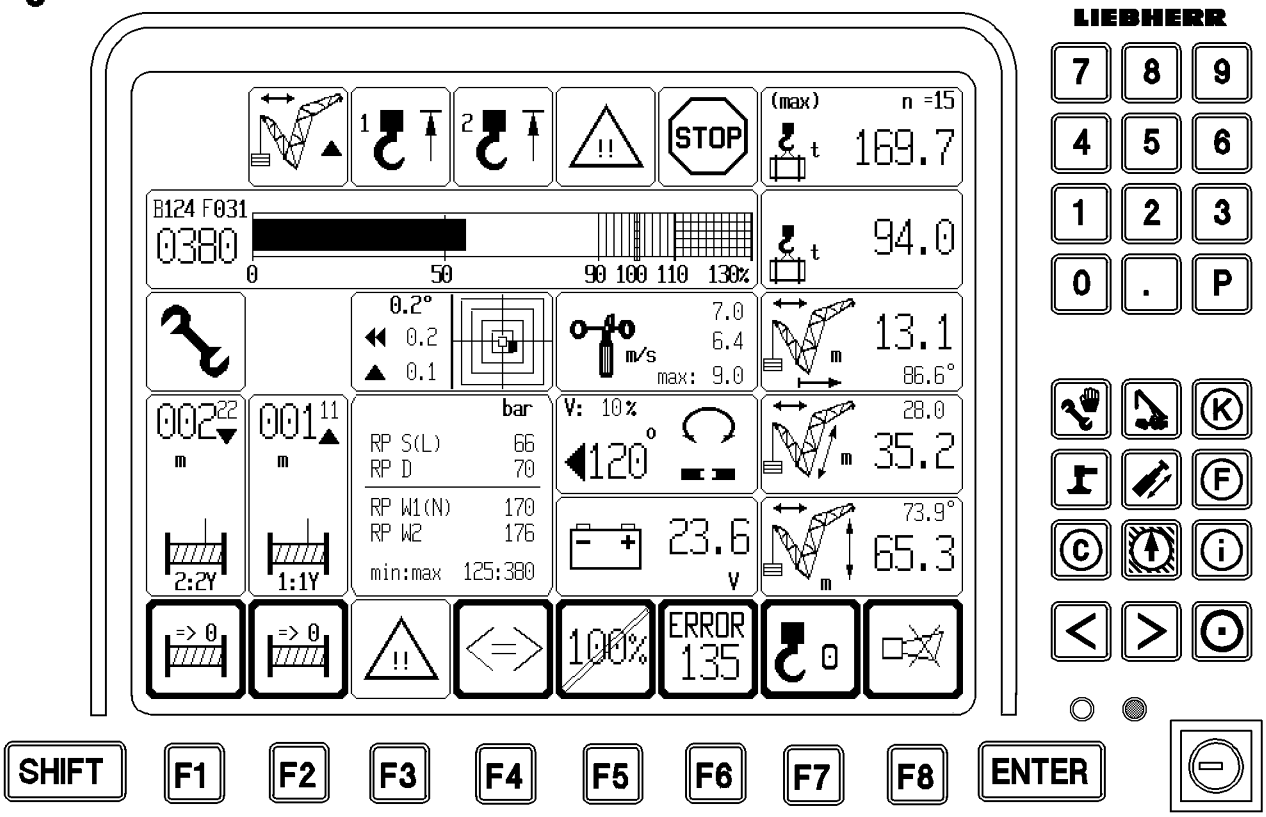
17) Pulley head height in meters [m] or feet [ft]
= vertical distance from ground level to selected pulley head axle, for which the indicated maximum load capacity is valid.

"????" is shown if geometry data or sensor values are missing, so that the pulley head height cannot be calculated.

18) Length of equipment for example fly jib, boom nose, in [m]or [ft]


1
2
3
4
5
STOP
6

0


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
STOP
(max) n =15
169.7
94.0
B124 F031
0380
0 50 90 100 110 130%
13.1
86.6°
28.0
35.2
73.9°
65.3
23.6
V
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
V: 10%
120
7.0
6.4
max: 9.0
m/s
002
001
2:2Y
1:1Y
=> 0
100%
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189148

6.02 Alarm functions

The crane movements are monitored in their limit ranges. As soon as the limit is reached, the crane operator is alerted by the following blinking symbols on the monitor:

1) Boom limit
The luffing range of the boom is limited upward as well as downward. If , when luffing the boom, an end position for the selected load capacity chart is reached, then this symbol will appear.

One upward directed arrow show that the movement was shut off because the upper limit had been reached, it is still possible to luff down.
Possible causes:
1) lower limit is reached,
2) if, in operating modes with jib / luffing jib, the luffing up function of the main boom is turned off because the load limit is $> 95\%$ and the maximum load carrying capacity of the crane is not increased by luffing up the main boom. In this case, the jib can still be luffed up.

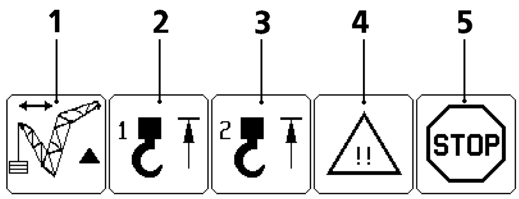
One downward directed arrow shows that the movement was shut off because the lower limit had been reached, it is still possible to luff up.

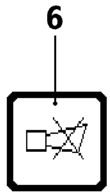
2) Upper hoist limit on the main boom
appears if the hook block runs against the upper hoist limit switch on the main boom or on the auxiliary jib of the main boom .
Then the crane movements "spool up hoist winch 1 ", "spool up hoist winch 2 "and "luff down boom " are shut off (see bypass possibility, see description of keyed switch in paragraph 6.07).

3) Upper hoist limit on the lattice jib
appears if the hook block runs against the upper hoist limit switch on the lattice jib or on the auxiliary jib of the lattice jib .
Then the crane movements "spool up hoist winch 1 ", "spool up hoist winch 2 "and "luff down boom " are shut off (see bypass possibility, description of keyed switch in paragraph 6.07).

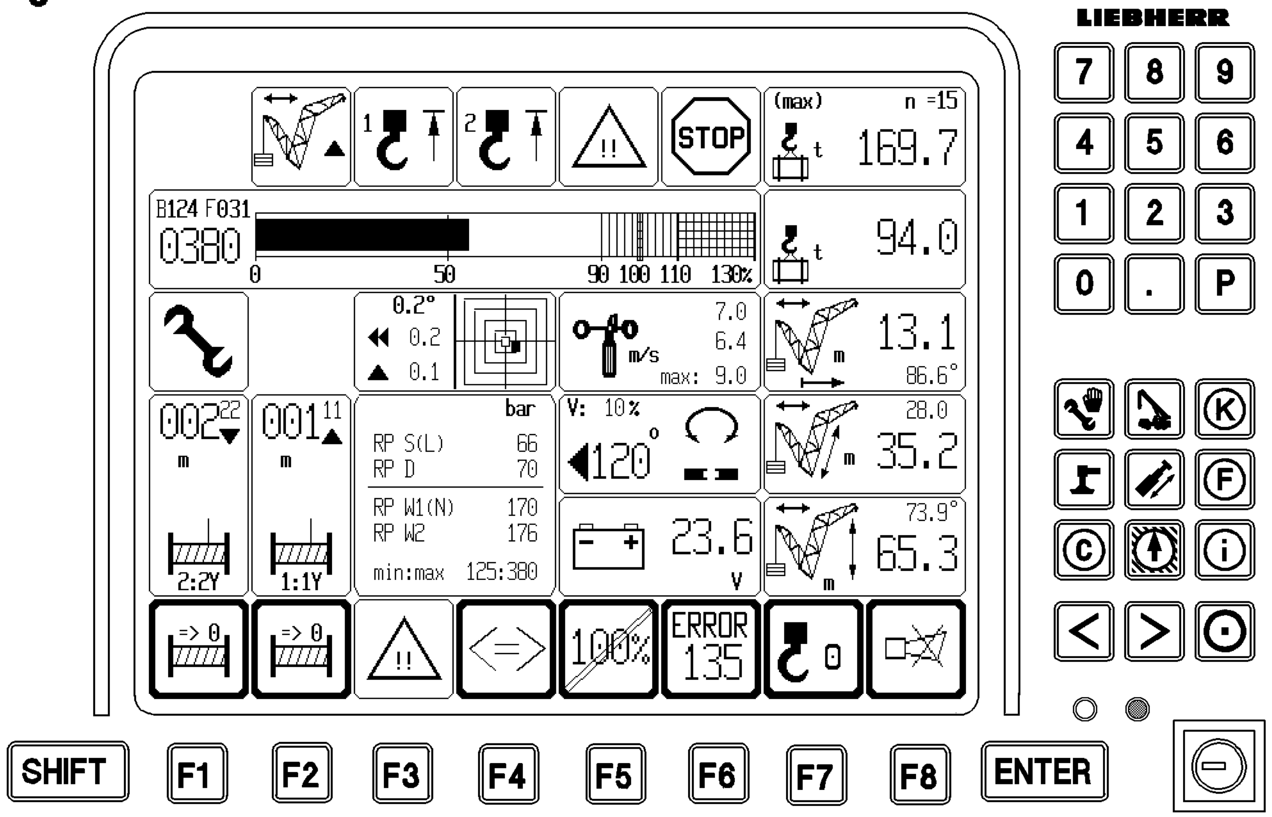
4) Prewarning symbol
From the "current load " and the "maximum load carrying capacity according to load capacity chart and reeving" the current load capacity chart utilization can be calculated.
The prewarning symbol appears if the current load capacity chart utilization has exceeded the preprogrammed limit (such as 90 %).

5) STOP symbol
appears if the "current load " exceeds the "maximum load carrying capacity according to load capacity chart and reeving" (100%).
All crane movements, which would increase load momentum are turned off .


1
2
3
4
5
STOP


6

0


LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
ERROR 135

189148

6) "Horn" acoustical signal

Any errors found on the central processing unit in the electronics basic components group,

- operational errors, which cause the movement to shut off , and
- application errors with error number
  for example sensor errors, which occur due a insufficient sensor signals or defective sensor, in addition to the optical indication, are also reported through an acoustical signal "HORN" by the monitor.
  "HORN" is a 0.5 second long sound, which is being repeated in second intervals.

Operational errors are :

- Overload
- Boom outside the angle range of the load capacity chart
- Boom outside the radius range of the load capacity chart

Monitored sensors are :

- Hoist limit switch
- Pull test brackets
- Angle sensor
- Wind sensor
- Battery voltage

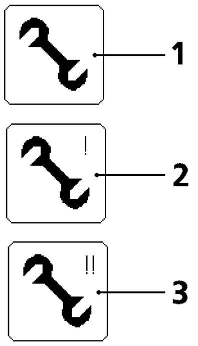
"Short horn"
Error messages, which have no error number and which do not lead to an immediate shut down of crane movements by the LICCON overload safety device are also reported, in addition to the optical indication, with an acoustical signal "SHORT HORN" . "SHORT HORN" is a 0.1 second long sound, which is repeated in 2 second intervals.

Monitored errors are:

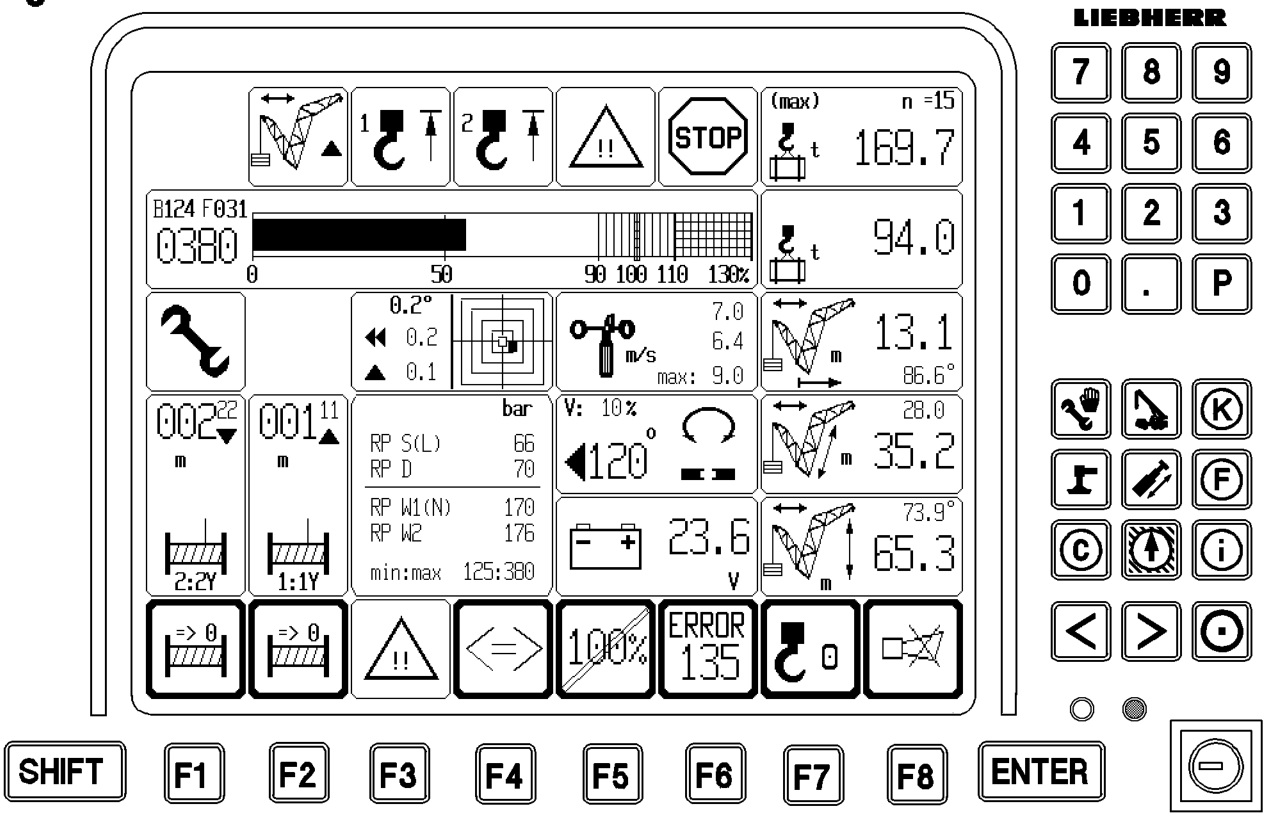
- Maximum permissible wind speed has been exceeded (only at activated wind sensor)
- Crane utilization value for "CAUTION" (90%) has been reached.

Priority and "Horn off"
The alarm "HORN" has a higher priority than the alarm "SHORT HORN", which means "HORN" supersedes "SHORT HORN".

"HORN" as well as "SHORT HORN" can be shut off via function key F8, however, they are activated again as soon as a new error occurs.


1
2
3

0


LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
STOP
ERROR
135
169.7
94.0
13.1
35.2
65.3
23.6

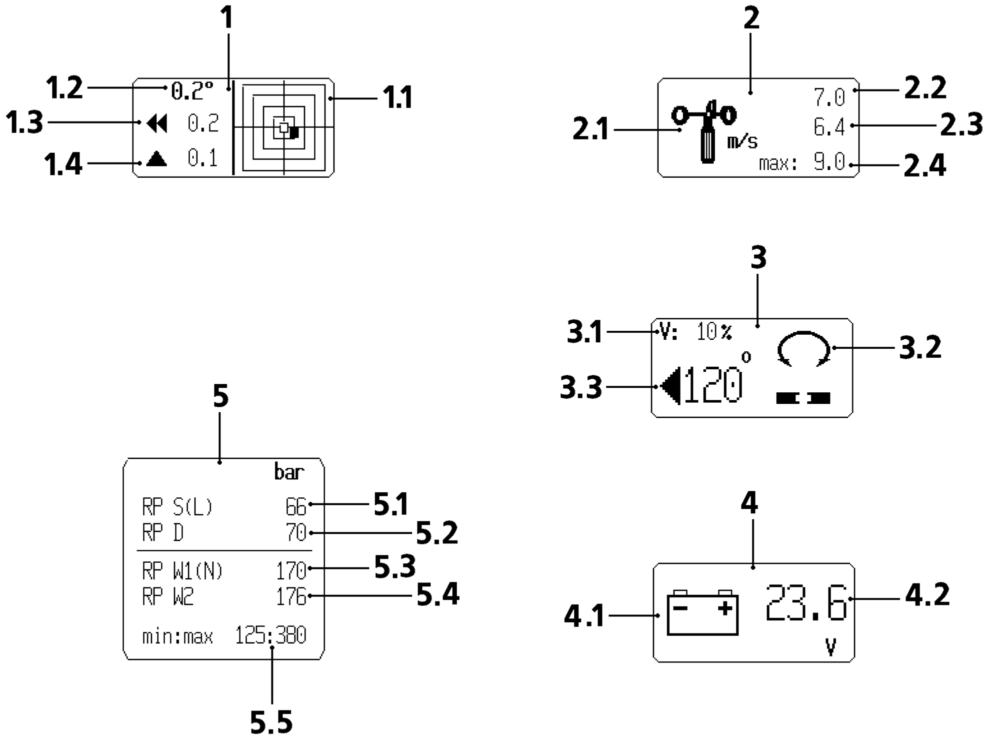
189149

6.03 Special functions

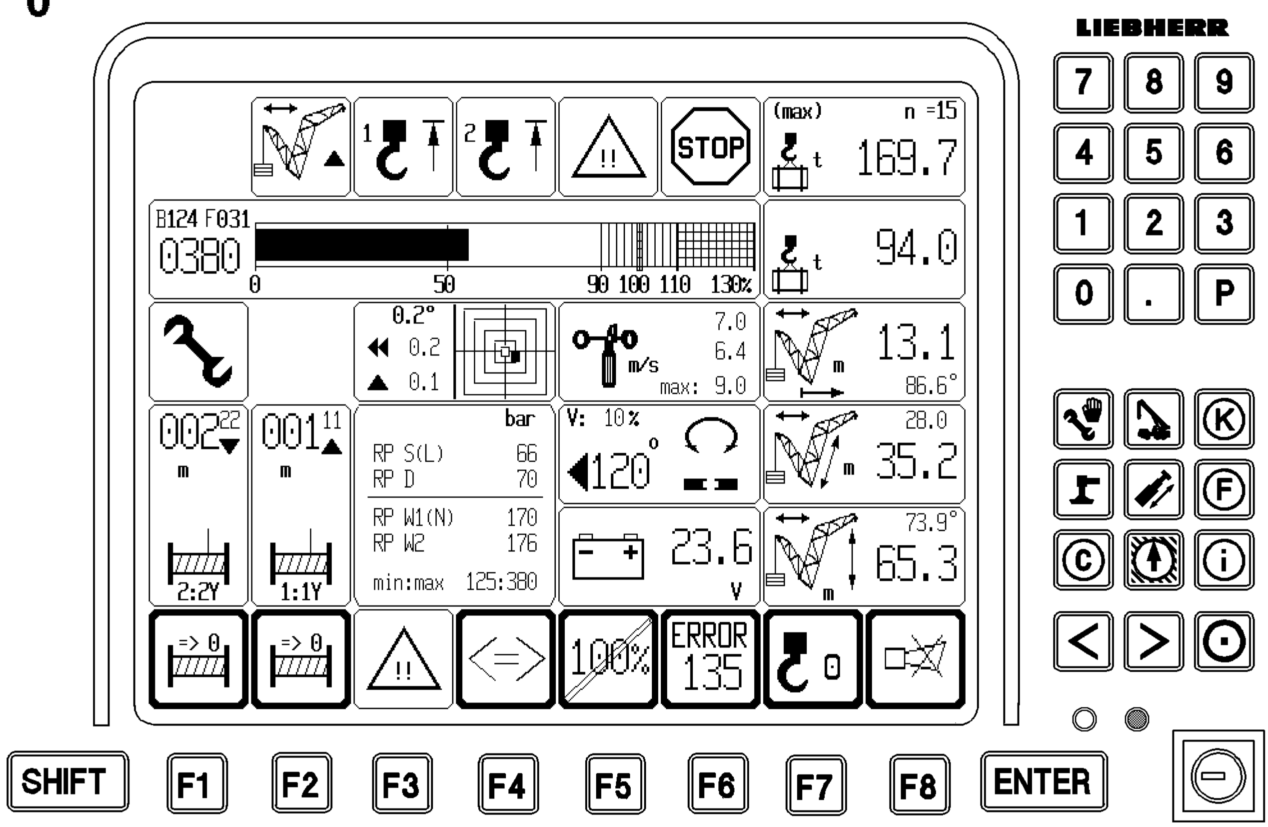
1 The "Installation operation" symbol
blinks, if the crane control is turned to ”installation”“ position via the installation keyed switch. Then the operation view is **locked**, which means no other program can be turned on via the program keys (P).

2 "Emergency operation **without** installation " symbol
blinks in "emergency operation", if the keyed switch is not set to "installation", in case the monitor is still operational.
In this case, the operation view is **not locked.**

3 "Emergency operation **and** installation " symbol
blinks in "emergency operation", if the keyed switch is set to "installation", in case the monitor is still operational.


1
1.1
1.2
1.3
1.4
0.2°
0.2
0.1
2
2.1
2.2
2.3
2.4
7.0
6.4
m/s
max: 9.0
3
3.1
3.2
3.3
V: 10%
120°
4
4.1
4.2
23.6
V
5
5.1
5.2
5.3
5.4
5.5
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380

0


LIEBHERR
(max) n =15
169.7
STOP
B124 F031
0380
0 50 90 100 110 130%
94.0
13.1
86.6°
28.0
35.2
73.9°
65.3
002
001
2:2Y
1:1Y
ERROR
135
100%
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P

189150

6.04 Monitored additional functions

Via the function key $F3_0$, additional symbols with additional information for crane operation can be displayed, if necessary. These symbols have a fixed place on the monitor.
The following symbols can be shown:

Page 1
1 Crane incline
2 Wind speed
3 Slewing range
4 Battery voltage

Page 2
5 fall back cylinder control

If an error occurs in one or more of these functions , then the view is as follows:

a) Monitored additional functions, turned **off** via F3:
- Error in a function on page 1 ⇒ Symbol shown on page 1
- Error in a function on page 2 ⇒ Symbol shown on page 2
- Error in a function on page 1 and 2 ⇒ Symbol shown on page 1 and function key symbol above F4 blinks = Notes error on page 2

b) Monitored additional functions, turned **on** via F3:
- No error ⇒ the „purchased" symbols are shown, there are also some on page 2, if the function key symbol "paging" for key F4 is actuated = notes change over possibility
- Error in a function on page 1 ⇒ Symbol is already shown
- Error in a function on page 2 ⇒ Function key symbol „paging" blinks = notes error on other page
- Error in a function on page 1 and 2 ⇒ Symbol shown on page 1, function key symbol „paging" blinks = notes error on other page

1 Additional function „crane incline"

This symbol shows the incline of the crane superstructure to the horizontal in lengthwise and crosswise direction. The indication is shown graphically as well as numerically.

1.1 he graphic view looks like a sight gauge, a point (small square) represents the air bubble. The center of the point shows the exact incline value.

1.2 In the numerical section of the symbol appear 3 numeric values, which have the following designation:

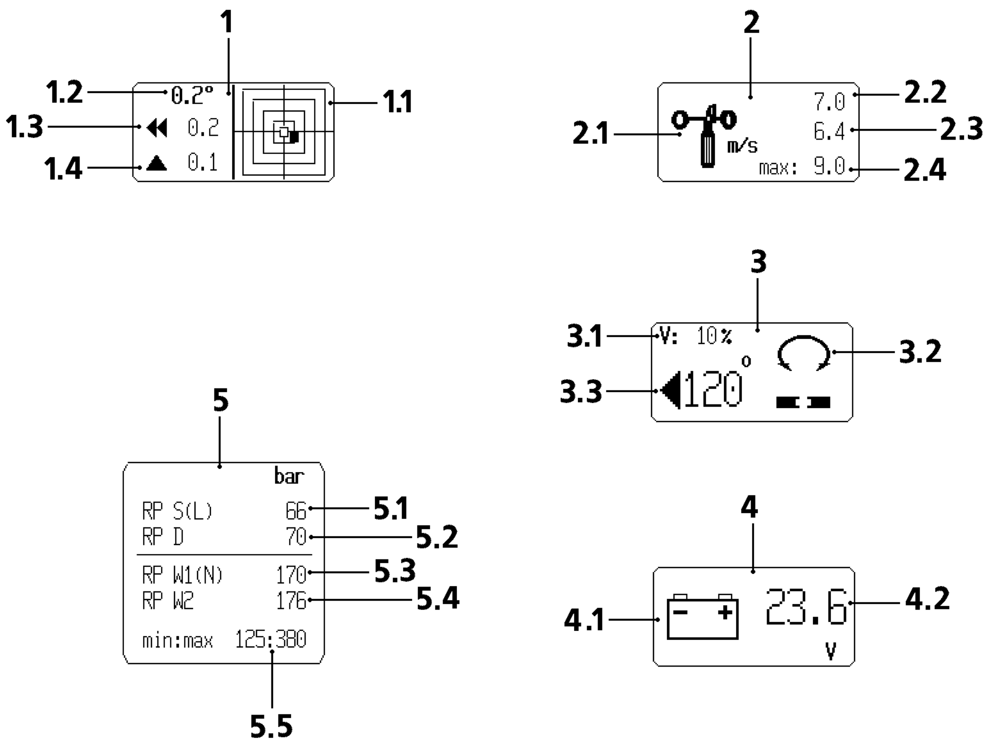
This value shows the graphic view, the sight gauge distance of 2 lines (lengthwise and crosswise). It is shown in the unit of degrees [°] and can only take on the values "0.2" or "1" . The change occurs automatically. If the crane incline is in crosswise <1,1 [°] **and** in length wise direction <0,9 [°], then the gauge moves in the 0.2 degree range. If at least one value exceeds the above limit, then it changes into the 1 degree range.

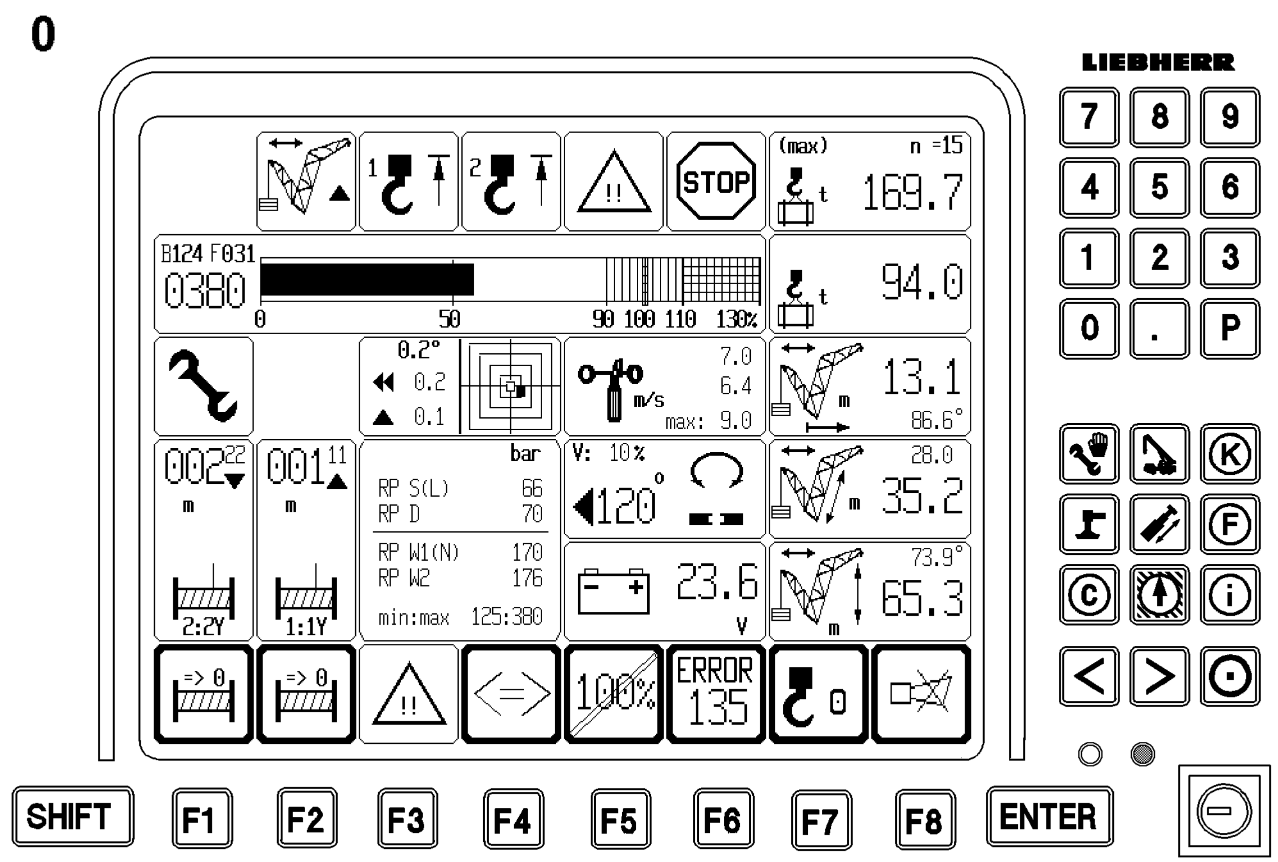
1.3 Incline of crane superstructure in degrees [°] in crosswise direction .
The dual arrow shows the direction of the slope :

Dual arrow to the left = The crane superstructure slopes to the left
Dual arrow to the right = The crane superstructure slopes to the right

1.4 Incline of crane superstructure in degrees [°] in lengthwise direction .
The arrow shows the direction of the slope :

Arrow pointing upward = The crane superstructure slopes to the front
Arrow pointing downward = The crane superstructure slopes to the rear


1
1.1
1.2
1.3
1.4
0.2°
0.2
0.1
2
2.1
2.2
2.3
2.4
7.0
6.4
m/s
max: 9.0
3
3.1
3.2
3.3
V: 10%
120°
4
4.1
4.2
23.6
V
5
5.1
5.2
5.3
5.4
5.5
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380


0
LIEBHERR
STOP
(max) n =15
t 169.7
B124 F031
0380
0 50 90 100 110 130%
t 94.0
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
m
86.6°
002 22
m
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
m
2:2Y
1:1Y
23.6
V
73.9°
65.3
m
=> 0
=> 0
100%
ERROR 135
0
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

189150

2 Additional function „Wind speed”

The wind speeds are shown in the unit of measure used in the load capacity chart, either meters [m/s] or feet [ft/s] .

2.1 Symbol "Wind speed" in measuring units of meters [m/s] or feet [ft/s]

2.2 Current wind speed on the main fly jib head

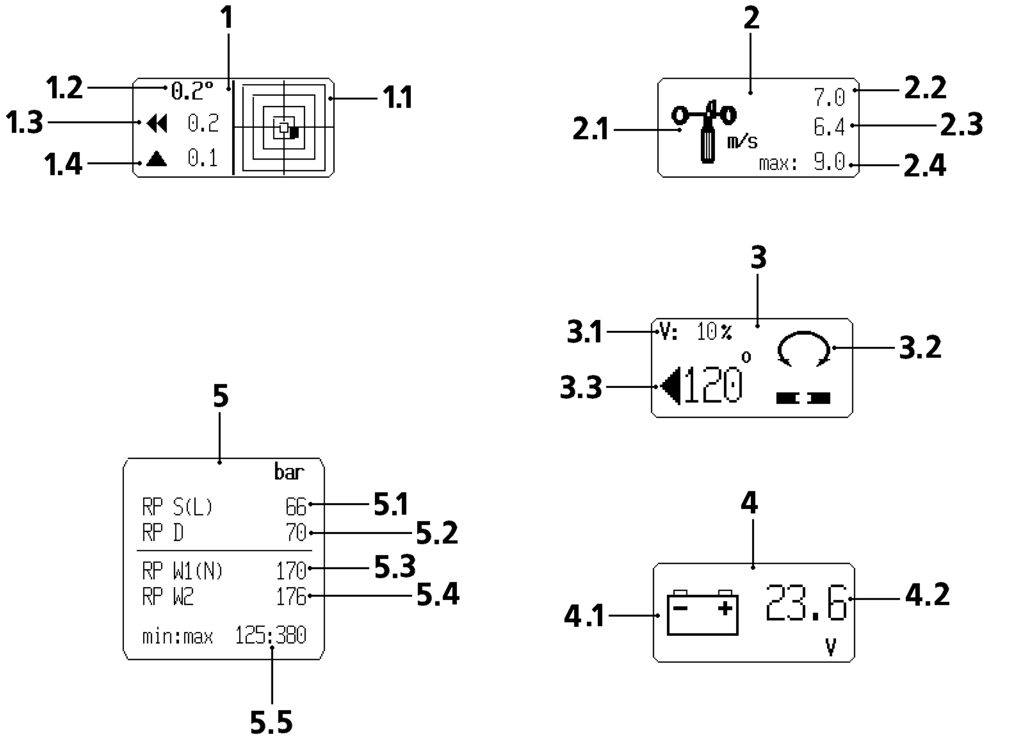
2.3 Current wind speed on the boom head

2.4 Maximum permissible wind velocity with symbol text "max:"

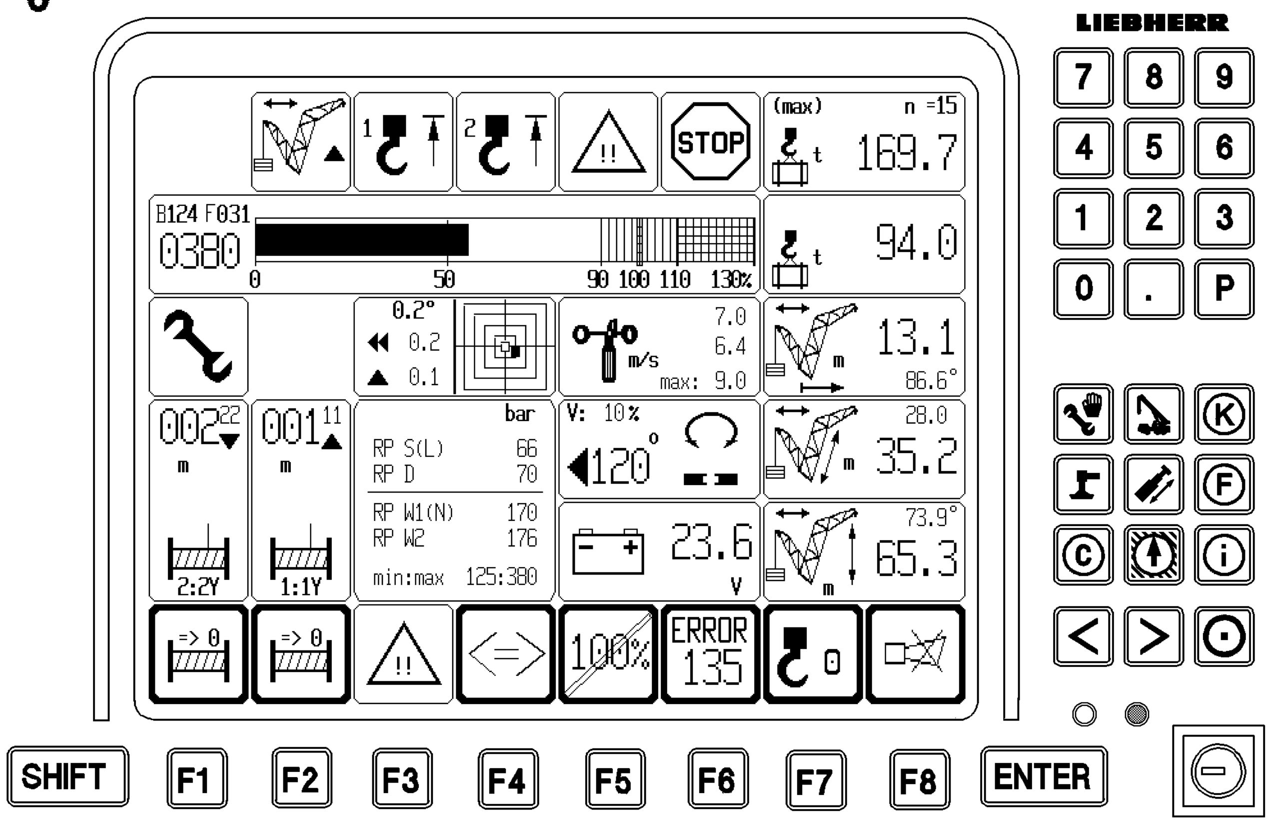
The value depends on operating mode and equipment configuration.

If the current wind velocity value exceeds the indicated maximum value, the value starts to blink and the acoustical alarm ”SHORT HORN” can be heard.

D A N G E R: However, the crane movements are not shut off .


1
1.1
1.2
1.3
1.4
0.2°
0.2
0.1
2
2.1
2.2
2.3
2.4
7.0
6.4
m/s
max: 9.0
3
3.1
3.2
3.3
V: 10%
120°
4
4.1
4.2
23.6
V
5
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380
5.1
5.2
5.3
5.4
5.5

0


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max) n =15
169.7
B124 F031
0380
0 50 90 100 110 130%
94.0
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
86.6°
002 22
001 11
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
2:2Y
1:1Y
23.6
V
73.9°
65.3
STOP
ERROR 135
100%
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189150

3 Additional function „Slewing range"

The function "slewing range" offers the crane operator the following information to turn the crane superstructure:

3.1 Set slewing speed range in percentages [%]
= current (selected) "maximum slewing speed" of the slewing gear at fully deflected manual control lever, in relation to the maximum obtainable slewing speed of the slewing gear, at a preselected speed of 100%. In the LICCON program "CONTROL" (see paragraph 8) this value can be preselected in fixed percentage intervals.

C A U T I O N : The slewing speed must be preselected according to the data in the load chart manual .
If the slewing speed is too fast, there is a great danger of causing a serious ACCIDENT!

3.2 Symbol for slewing gear

3.3 Momentary position of the crane superstructure in relation to the main working direction "to the FRONT" (0°, degrees) and increases until the maximum value of 180°.

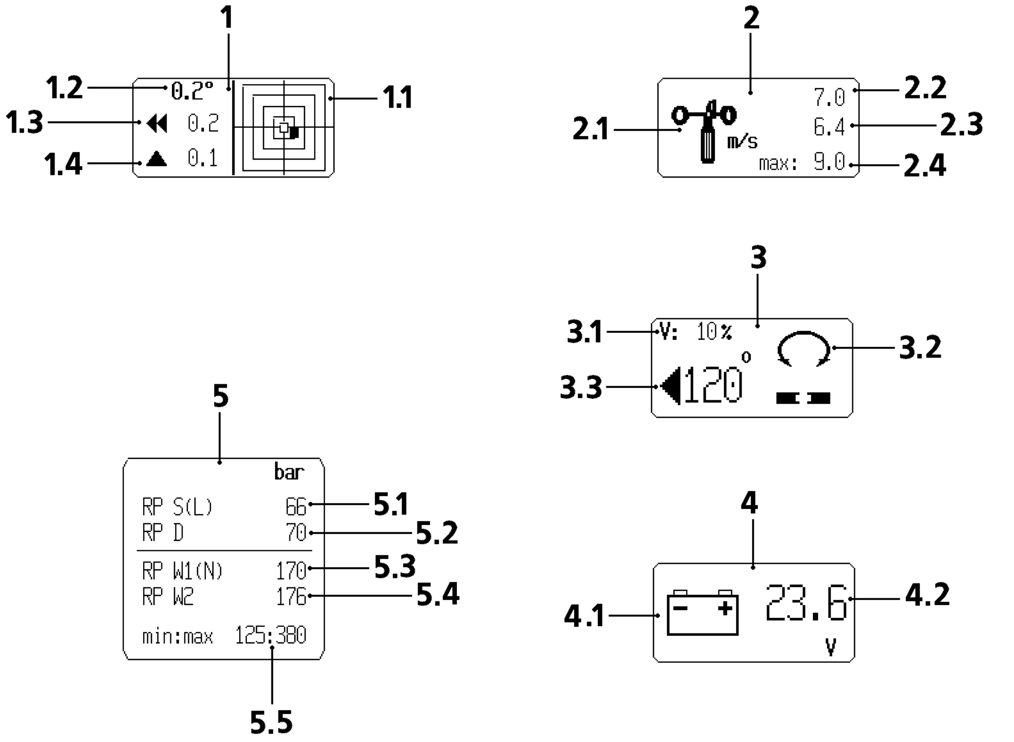
	180°	exact to the REAR!
Arrow <	179°	to the left
Arrow >	179°	to the right

The arrow in front of the value shows the direction of the deviation .

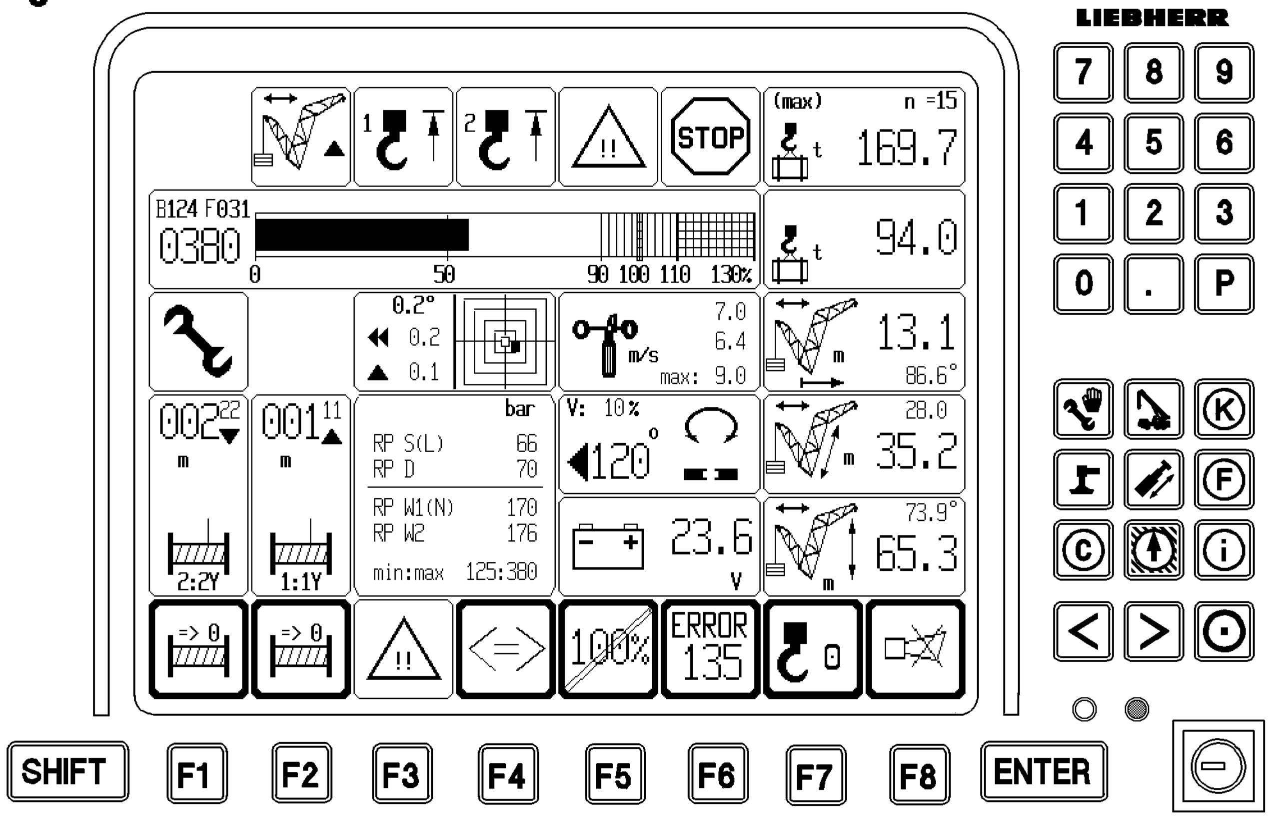
4 Additional function „Battery voltage"

4.1 Symbol battery voltage

4.2 current value of the battery voltage in the unit of volts [V].
The exact indication is ±1/10 V.


1
1.1
1.2
1.3
1.4
0.2°
0.2
0.1
2
2.1
2.2
2.3
2.4
7.0
6.4
m/s
max: 9.0
3
3.1
3.2
3.3
V: 10%
120°
4
4.1
4.2
23.6
V
5
5.1
5.2
5.3
5.4
5.5
bar
RP S(L) 66
RP D 70
RP W1(N) 170
RP W2 176
min:max 125:380

0


LIEBHERR
(max) n =15
169.7
B124 F031
0380
0 50 90 100 110 130%
94.0
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
86.6°
002
001
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
2:2Y
1:1Y
23.6
V
73.9°
65.3
STOP
100%
ERROR 135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P

189150

5 Additional function „fall back cylinder"

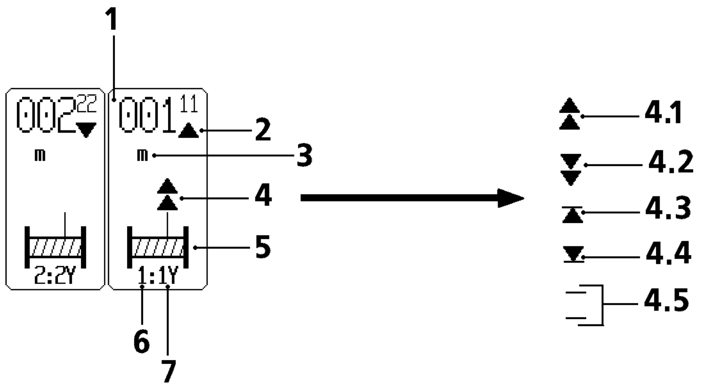
5.1	RP S (L)	=	Pressure (bar) in the fall back - cylinders S or. L - boom
5.2	RP D	=	Pressure (bar) in the fall back cylinders - Derrick
5.3	RP W1 (N)	=	Pressure (bar) in the fall back cylinder - W lattice fly jib (=RPW1) at W - operating mode, or, pressure (bar) in the fall back cylinder - N lattice fly jib (=RPN) at N - operating mode
5.4	RP W2	=	Pressure (bar) in the W-fall back cylinder - W lattice fly jib (=RPW2) at W - operating mode only
5.5	min. : max	=	min. : max. pressure for RPW1 (N) andRPW2

Note: Only one fall back cylinder (RP) - RPN - is built in N-fly jib
Two fall back cylinders (RP) - RPW1 right side and RPW2 left side - are built in W-fly jib

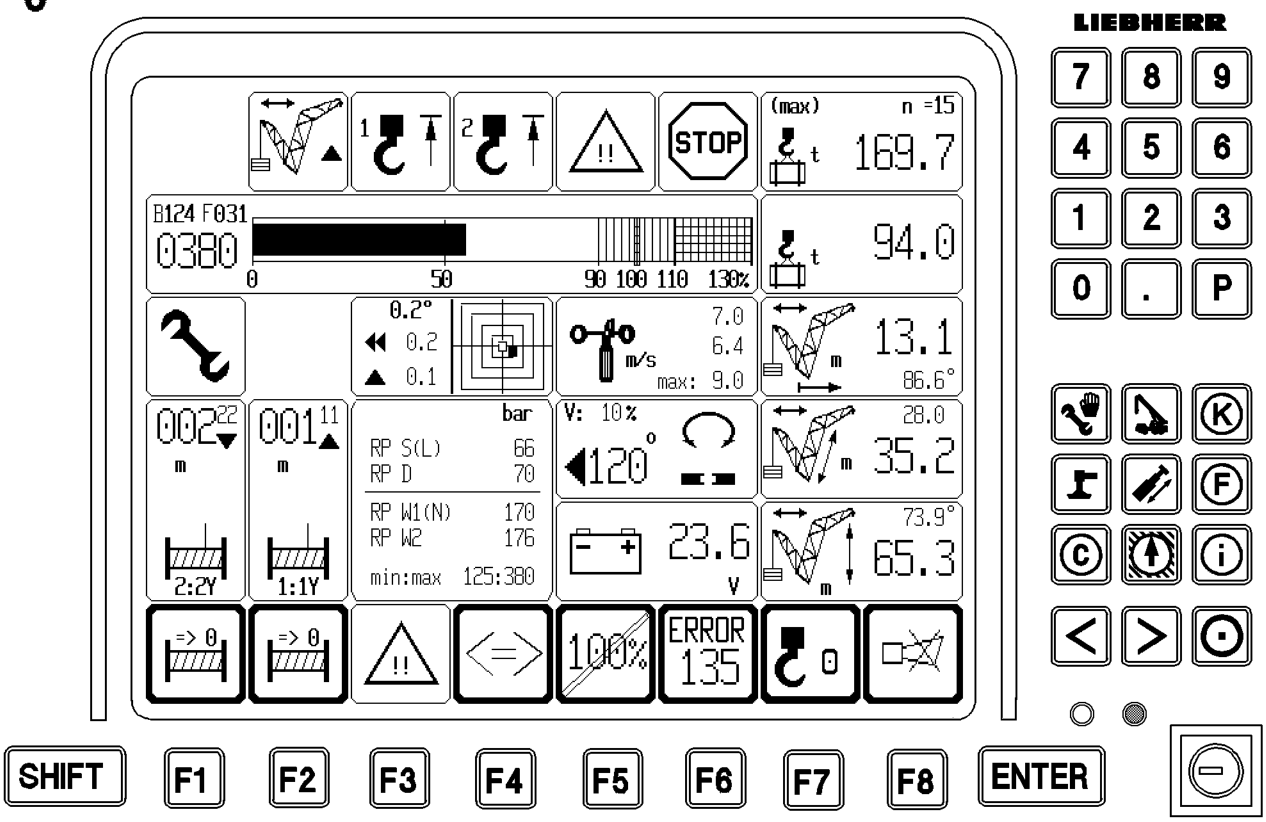
General
Pressure indication = "0", if this fall back cylinder (n) is not available for this entered operating mode.
Pressure indication = ???, if the pressure sensor signal is erroneous (due to broken wire or short circuit), then the error indication with error number is given - see chapter 4.14.

Monitored fall back (RP) cylinder pressure limits in jibs - fall back cylinder (W/N - lattice fly jib)
min. : max 125 : 380

"125" = monitored minimum pressure for jib RP (W/N) (fall back cylinder / lattice fly jib). This monitored minimum pressure is the result of a calculation of the angle of the main boom and jib. If one of the angles is invalid and shown in the indication with question marks "???", then no monitoring can occur for the minimum pressure.
"380" = monitored maximum pressure for jib RP (W/N) (fall back cylinder / lattice fly jib). If the pressure limit value is exceeded, then this is indicated by the blinking "pressure actual value" and also through an error number - see chapter 4.14.


1
2
3
4
5
6
7
4.1
4.2
4.3
4.4
4.5
002 22
m
2:2Y
001 11
m
1:1Y

0


LIEBHERR
STOP
(max) n =15
169.7
B124 F031
0380
0 50 90 100 110 130%
94.0
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
86.6°
002 22
001 11
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
100%
ERROR 135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P

189151

6.05 Winch indication, winch 1 and 2

The monitor shows the function on winches 1 and 2.
The designation of symbols for winch 1 and 2 is the same, explained on one symbol .

1) If the winch is operated individually with the reeving set in the equipment configuration view or if the winch is operated in parallel operation, then the indicated value is the completed hook path (in parallel operation: path of hook block) from a predetermined zero point in the indicated length units of meters ([m] or feet [ft])
The numbers in front of the period are shown with maximum 3 large figures.
The numbers after the period are shown in small figures.
(see also paragraph 6.06, description of function keys $F1_0$ and $F2_0$).

The entered value and the actual number of cable skeins between boom head and hook block must be the same.

If the set reeving does not match the reeving of the corresponding winch, (for example: winch on mast stub, but load capacity chart was set for main boom) , then the correct hook path can be calculated from the indicated hook path as follows:

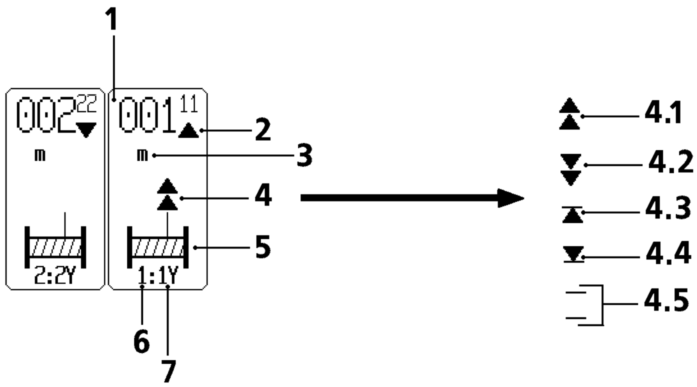
$$\text{correct hook path} = \frac{\text{indicated hook path} \times \text{set reeving}}{\text{actual reeving}}$$

The hook path calculation only works correctly if the load is freely suspended and if you don't luff down during the hoisting procedure.
Flexation and cable stretch are not taken into account.

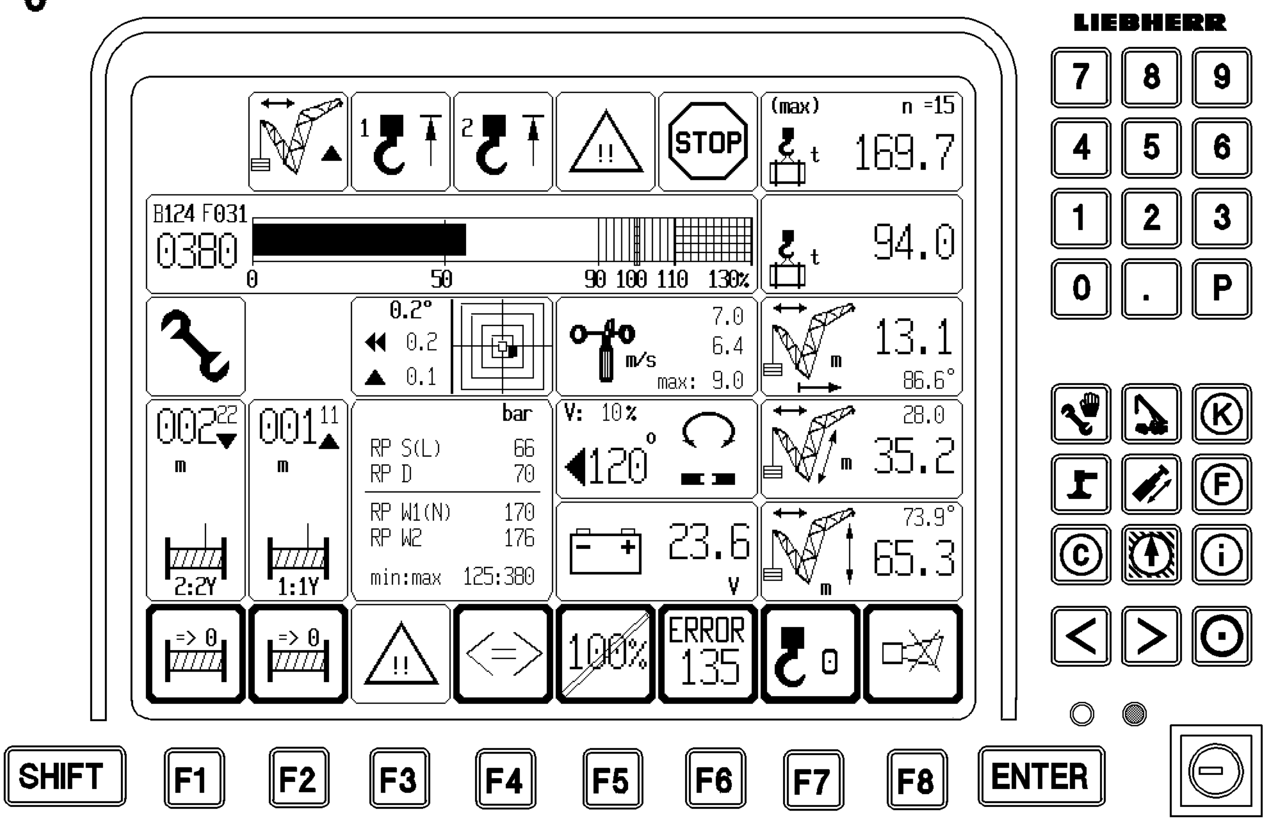
The length indication (hook path indication) is only correct and the layer jump is only then correctly taken into account if the winch has been calibrated and since that time, there was no power supply interruption to the CPUs. This means , you can only rely on the hook path indication if it has been checked before and found to be correct.
The calibration of the hook path indication is done by spooling the cable up / out until the calibrating switch is triggered.

2) The arrows on the length value show the direction of the hook movement in relation to the zero point:
Arrow pointing upward = Hook has moved from the zero point upward,
Arrow pointing downward = Hook has moved from the zero point downward..

3) Length unit for hook path indication : [m] or [ft]


1
2
3
4
5
6
7
4.1
4.2
4.3
4.4
4.5
002
22
m
2:2Y
001
11
m
1:1Y

0


LIEBHERR
STOP
(max) n =15
169.7
B124 F031
0380
0 50 90 100 110 130%
94.0
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
=> 0
100%
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P

189151

4) Winch status indication (continue)
The following winch status symbol are available (all blinking) :

4.1 spool out
4.2 spool up
4.3 spooled out → spool out is locked
4.4 spooled up → pool up is locked

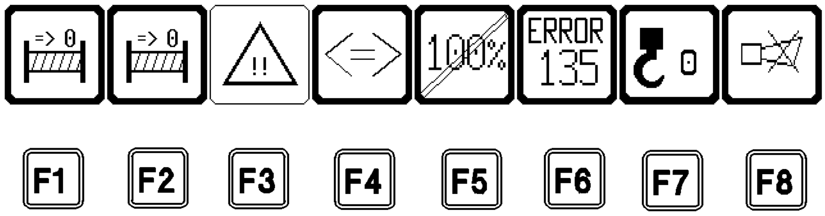
4.5 Winch is deactivated → spool out and spool up is locked
or winch is spooled out and up at the same time, according to the sensor

If no winch status symbol appears, then the activated winch is at a stand still and is neither spooled out nor up.

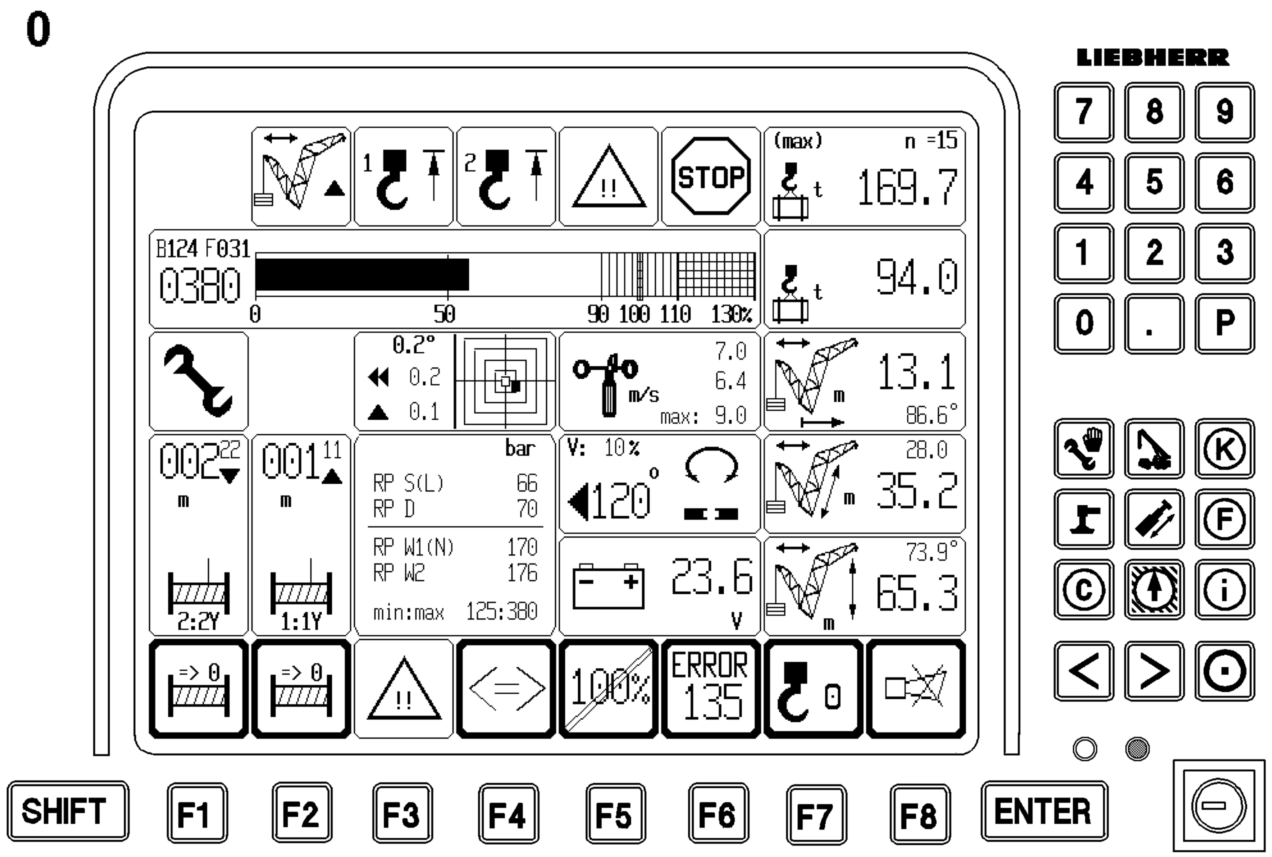
5) Winch symbol (with cable end for winch status symbol)

6) Winch number
1: = winch 1

7) Allocation the manual control lever (MS) to winches.
1Y = manual control lever ”MS 1” operated to Y-direction



=> 0
=> 0
!!
<=>
100%
ERROR
135
0
F1
F2
F3
F4
F5
F6
F7
F8



0
LIEBHERR
(max)
n =15
169.7
B124 F031
0380
0
50
90 100 110 130%
94.0
STOP
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
86.6°
002
001
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
2:2Y
1:1Y
23.6
V
73.9°
65.3
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189152

6.06 Function key symbol bar

The function key symbol bar contains up to 8 function key symbols, which correspond to the functions keys $F1_0$...$F8_0$ underneath , i.e. they designate either a function, which can be triggered with the corresponding key and /or, when the key is pushed, changes its depiction and thereby its meaning.

$F1_0$ Zero point for hook path indication, winch (2)
Via the key $F1_0$ appears the symbol „set winch indication to zero", i.e. by pushing the key, the hook path indication of winch 2 is set in the above winch symbol to "000,00" and the path measurement starts at this point

$F2_0$ Zero point for hook path indication, winch (1)
Same as $F1_0$ for winch 2.

Addition for $F1_0$ and $F2_0$:
If winch 1 and winch 2 work in parallel operation, then the length indicators of winch 1 and 2 can only be set to 000.00 together, via the $F1_0$ key. The function key $F2_0$ has no function and the corresponding symbol is turned off.

$F3_0$ Turn monitoring symbols on or off
With the function key $F3_0$ ("Caution" symbol in the function key frame) the crane operator is able to turn all monitored additional functions for his crane off or on . The function key symbol changes accordingly:

thick frame	=	added function symbols turned off
thin frame	=	added function symbols turned on

The monitoring mode for the added functions (wind speed, battery voltage) is always turned on; only the symbols can be turned off. If the monitored limits are being exceeded, then a warning is given with the horn and the corresponding symbol is shown, even if the monitoring symbols had been turned off.

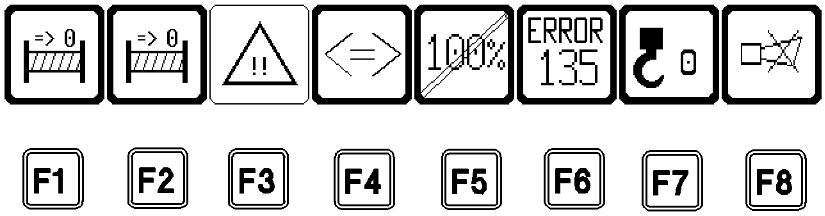
$F4_0$ Change monitoring side
This function key is only active and is only shown in the function key symbol (arrows in the function key frame) via the keys on the monitor, if the triggered function has any meaning (see also paragraph 6.04 "Monitored additional functions ").

$F5_0$ Selection of bypass
If the keyed switch D_0 on monitor 0 is held in position "right touching", then all movement limiting shut off mechanisms for the LICCON overload safety device can be bypassed, which had been previously selected with the $F5_0$ key.

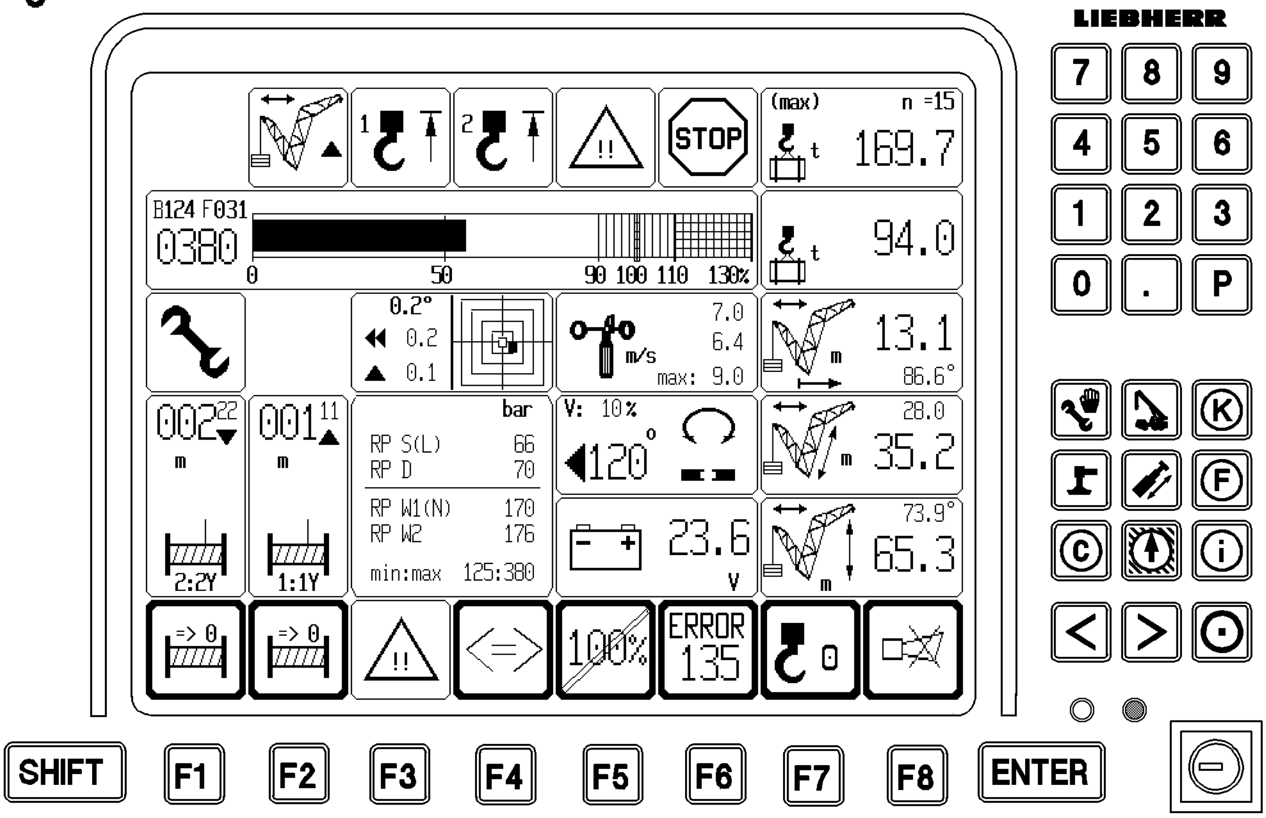
Two different types of bypasses can be preselected:

1. Bypass of overload shut off ("Utilization according to load capacity chart and reeving" =100%). In the FK symbol appears the text "100%", diagonally crossed out. This is also the basic setting.
2. Upper hoist shut off
In the FK symbol appears a diagonally crossed out load hook with the arrow on the "upper" stop.

If the shut off is being bypassed, the FK symbol starts to blink.


ERROR
135
100%
F1
F2
F3
F4
F5
F6
F7
F8

0


LIEBHERR
STOP
169.7
94.0
13.1
35.2
65.3
23.6
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189152

$F6_0$ ERROR

If an application error appears, the text ”ERROR” appears in the $F6_0$ key symbol frame and the 3digit error number. As soon as the error is fixed, the symbol disappears from the screen. The $F6_0$ key only affects a reactivation of the turned off acoustical warning.

$F7_0$ Tare

The load hook symbol and the number ”0” in the FUNCTION KEY symbol frame describe the function. When actuating the $F7_0$ key, the actual load indicator (6.01 Pos. 5) is set to ”zero”. At the same time, the word ”net” appear in the symbol of the actual load indicator. This function makes it possible, for example, to eliminate the weights of hoist cable, carrier unit and tackle and shows only the weight of the load to be lifted (net load). This tare function is eliminated again by 3 actions:

1. repeated actuation of the $F7_0$ key,
2. Luffing by more than $\pm$ 4 °

The words “net“ disappear again from the actual load indicator system (6.01, Pos. 5) and the gross load values are shown.

$F8_0$ Horn OFF

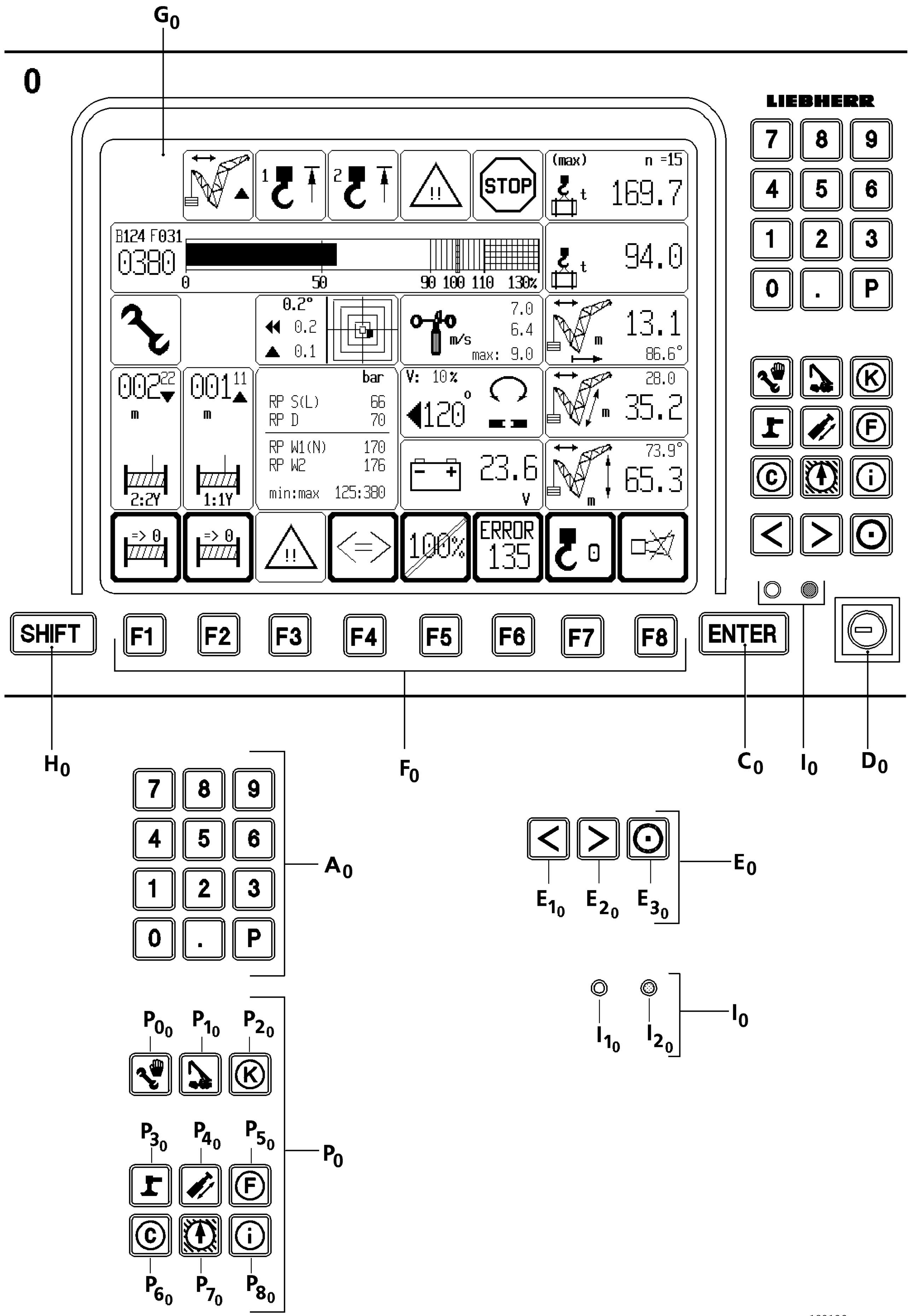
The crossed out horn symbol in the function key frame via the F8 key describes the function. The acoustical warning signals "HORN" and "SHORT HORN" from monitor 1 can be turned off by pressing the F8 key. A new error will turn the acoustical warning on again.

Special function FUNCTION KEY symbol $F8_0$

For crane delivery, a special program is available in the LICCON system. To prevent errors, access is only permitted for trained LIEBHERR personnel. After completion of crane delivery, access to this program is locked.

The delivery program condition can be seen in the function key symbol Horn OFF in the crane operation view.

Note: An additional mark (claw) in the symbol shows that the crane delivery program is not yet locked .


G_0
0
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H_0
F_0
C_0
I_0
D_0
A_0
E_0
$E1_0$
$E2_0$
$E3_0$
$I1_0$
$I2_0$
$P0_0$
$P1_0$
$P2_0$
$P3_0$
$P4_0$
$P5_0$
$P6_0$
$P7_0$
$P8_0$
P_0

189136

6.07 Other control elements

The remaining control elements in the indicator and control unit of the LICCON in the "OPERATION" program have the following functions:

A_0 Alpha-numeric keyboard

- Keys "0" to "9", "P"
  have no function in the "Operation" program.

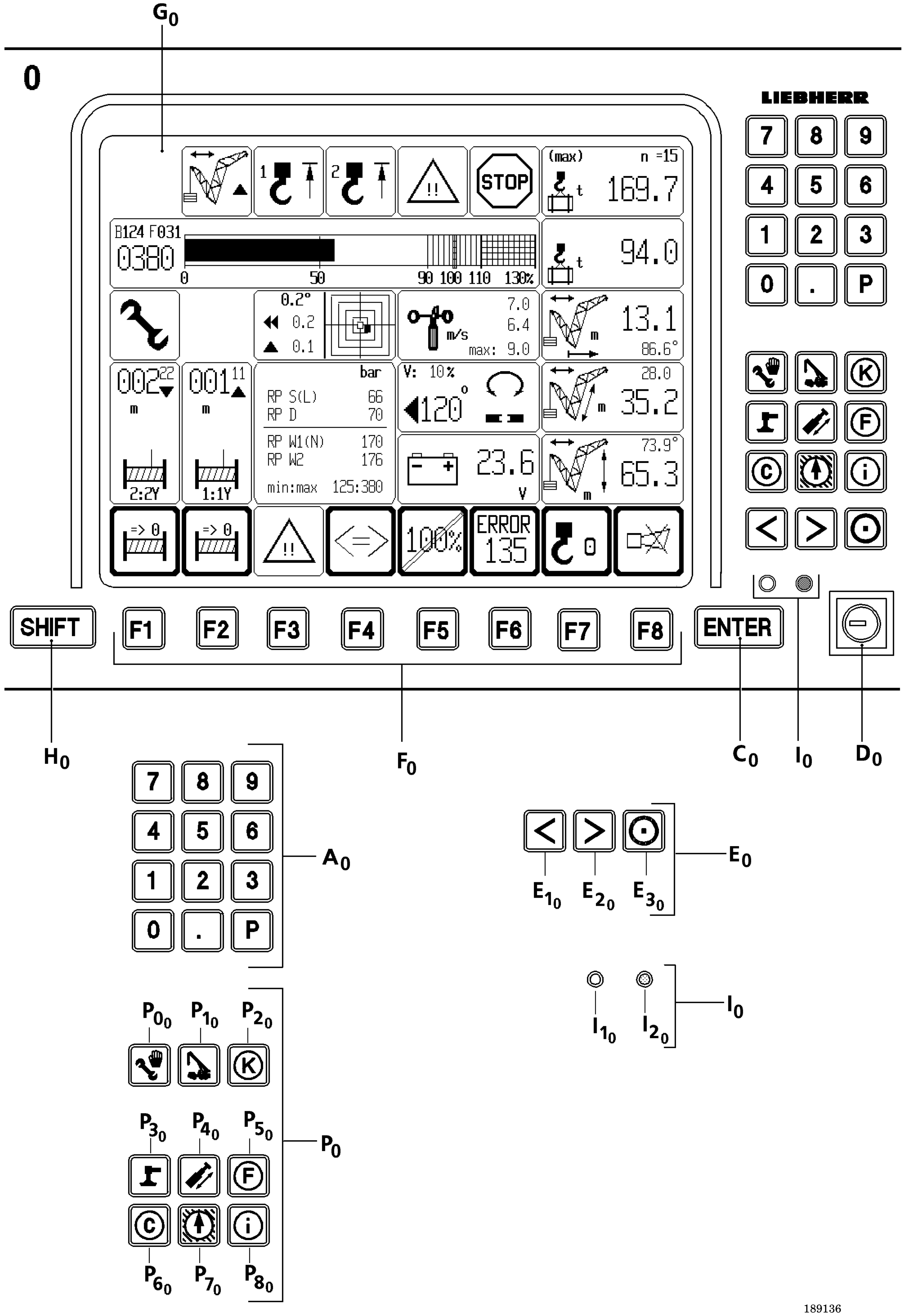
- Keys "SHIFT" + "."
  With the key **"."** the so-called test view functions are turned on / off, which means all existing symbol elements appear with an erroneous indicator value on the monitor.

Note: However, the monitored added functions must be shown on the desired page, if they are to appear in the test view. After 10 seconds or after pressing the **"."** key again, the normal operating view will reappear.

P_0 Program keys
Use the program keys to select between the individual programs. However, the program specific peculiarities must be noted, such as shifting from "Set up" to "Operation" by pressing 1× O.K.

Note: The currently running program **cannot** be called up again via its program key. The programs can only be called up with their programs keys if the keyed "Installation" switch is not in "Installation" position.

C_0 "ENTER" Key
This key has no function in the "Operation" program .


G0
0
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H0
F0
C0
I0
D0
A0
E0
E10
E20
E30
I10
I20
P00
P10
P20
P30
P40
P50
P60
P70
P80
P0
189136

D_0 Keyed switch (see chapter 4.04 too)
The keyed switch D_0 has 2 switch positions.
- engaged in center (Normal operation)
- touching to the right.

In the "right touching" position, any shut off function which limit movements can be bypassed.
After preselection via function key $F5_0$, either the overload shut off or the upper hoist shut off can be bypassed.

1. Bypassing the overload shut off
   When the "maximum load capacity according to load capacity chart and reeving" is being exceeded, the LICCON overload safety device shuts off all movements, which would increase load momentum. If you push function key F5 to bypass the "maximum load capacity according to load capacity chart and reeving" ("100% crossed out" appears in the F5 symbol), then the shut off can be bypassed by holding the keyed switch D_0 in "right touching" position.
   However, this may only be done in the presence of supervisory personnel, at utmost care and caution. All indicators of the LICCON safe load system remain fully functioning. However, there is no other protection against overload. A red beacon on the crane operator's cab signals that the crane operator has bypassed a shut off function.

   D A N G E R: **If the overload safety device is bypassed, there is no protection against overloading the crane.**
   This increases the risk of ACCIDENTS !

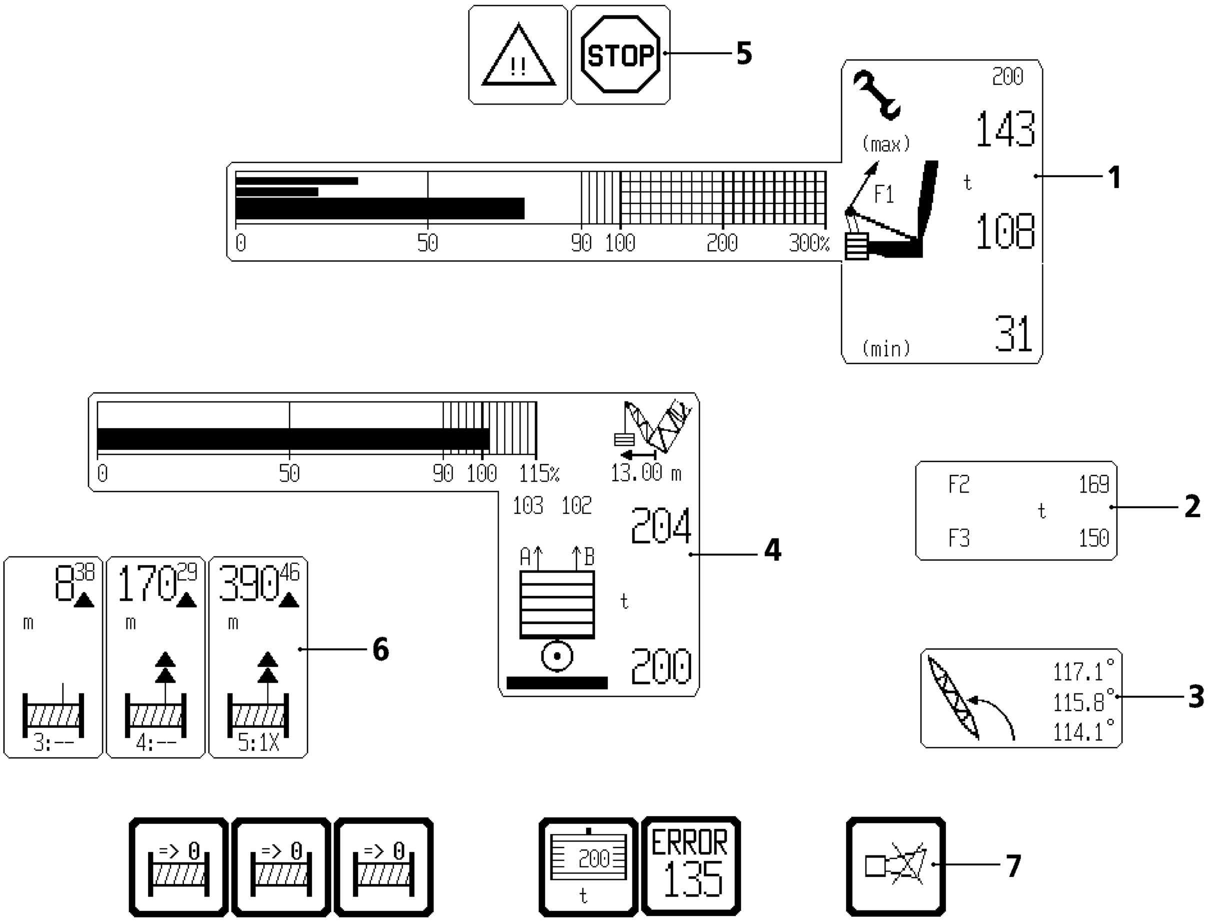
2. Bypassing the upper hoist limit shut off
   If, during the upward movement, the hook block lifts the hoist limit switch weight, then the hoist limit switch is triggered. The crane movements "spool in winch 1", " spool in winch 2"and "luff down boom" are turned off. If, by pressing the function key $F5_0$, the bypass for the "upper hoist limit shut off" has been chosen ("diagonally crossed out load hook with arrow on upper stop" appears on the $F5_0$ symbol), then this shut off can be bypassed by holding the keyed switch D_0 in the "right touching" position .
   This may only be carried out in the presence of supervisory personnel and with a guide. This guide must be in direct contact with the crane operator, he must monitor the distance between the hook block and the boom head at all times. The crane movement must be carried out with extreme care and at the slowest possible speed. A red beacon on the crane operator's cab signals that the crane operator has bypassed a shut off function.

   D A N G E R: **If the upper hoist limit is bypassed, there is no protection against overloading the cable or the crane.**
   This increases the risk of ACCIDENTS !

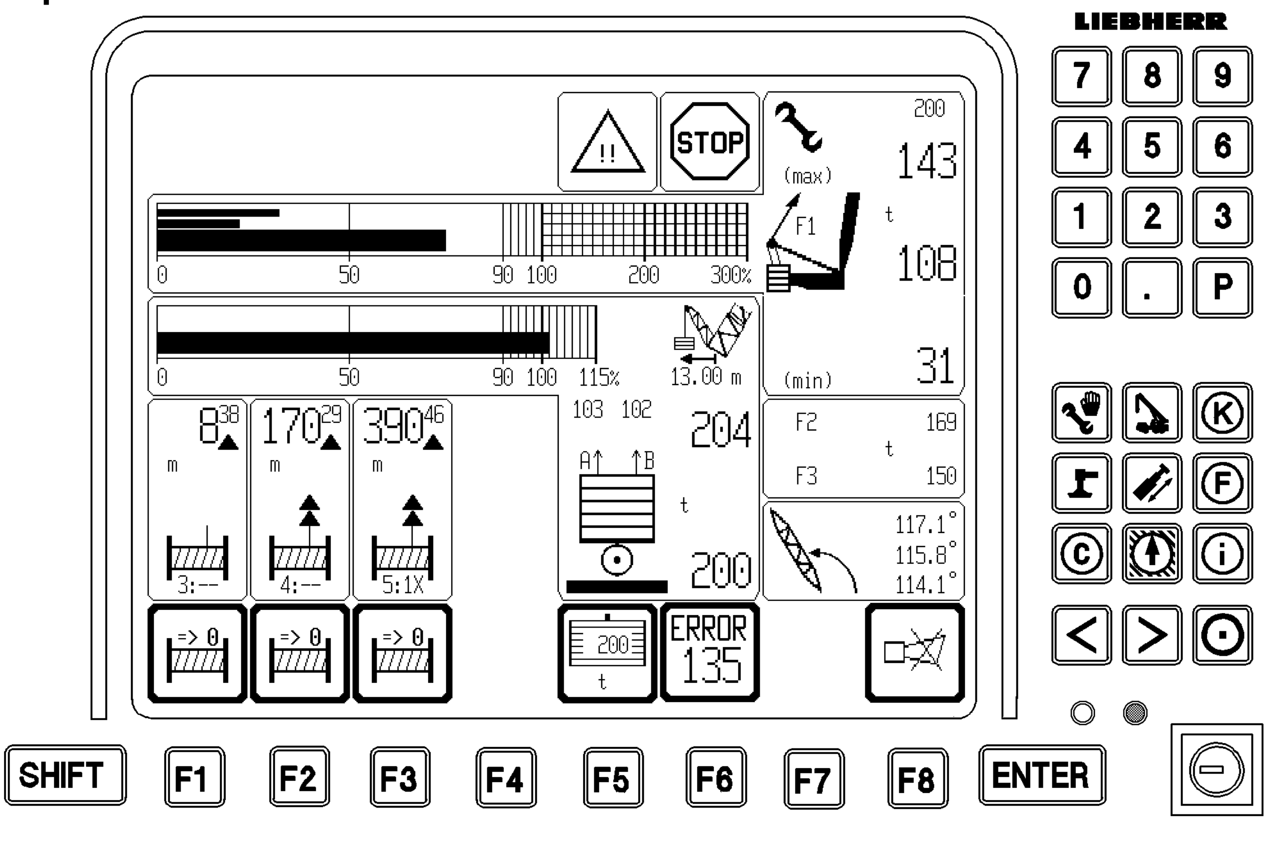
E_0 Special function keys

Brightness adjustment of monitor
The brightness level of the monitor can be adjusted with this key.
- "E1" background illumination ON /OFF
- "E2" brightness adjustment in three stages

H_0 "SHIFT" key
Has no function in the operation program


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

1


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
ERROR
135

189153

6.1 THE "OPERATION" PROGRAM - CRANE OPERATION ON MONITOR 1

6.1.1 General

On cranes with derrick ballast *, the maximum and minimum load necessary for balancing the crane can be increased or decreased even under load during operation (after setting the operating mode and the equipment configuration) by increasing or reducing the derrick ballast .

If now a partial load is lifted, then most often only a partial derrick ballast is used. In this case, the maximum load shut off occurs through the derrick safe load indicator on the LICCON CPU1 with the assistance of the F1max operating value. The corresponding values are shown on monitor 1, see illustration on the left.

The "OPERATION" program - crane operation on Monitor 1

The LICCON ”OPERATION” program supports the crane operator by constantly displaying data relevant for the crane operation on monitor (crane operation view). In addition, the crane operator is alerted to upcoming overload conditions. In case of overload and many error conditions, which could lead to dangerous conditions, the dangerous crane movements are shut off.

The monitor 1 in the ‘operation‘ view is divided into 7 sections (see illustration on the left):

1	Test point 1	= F1,	pull test brackets test point 1A and 1B in the SA - bracket tensioning
2	Test point 2	= F2	pull test brackets test point 2A and 2B in the N/W -tensioning
	Test point 3	= F3	pull test bracket test point 3A and 3B in the S-tensioning when in derrick operation

3 derrick boom angle

4 derrick ballast, weight and utilization

5 Alarm functions

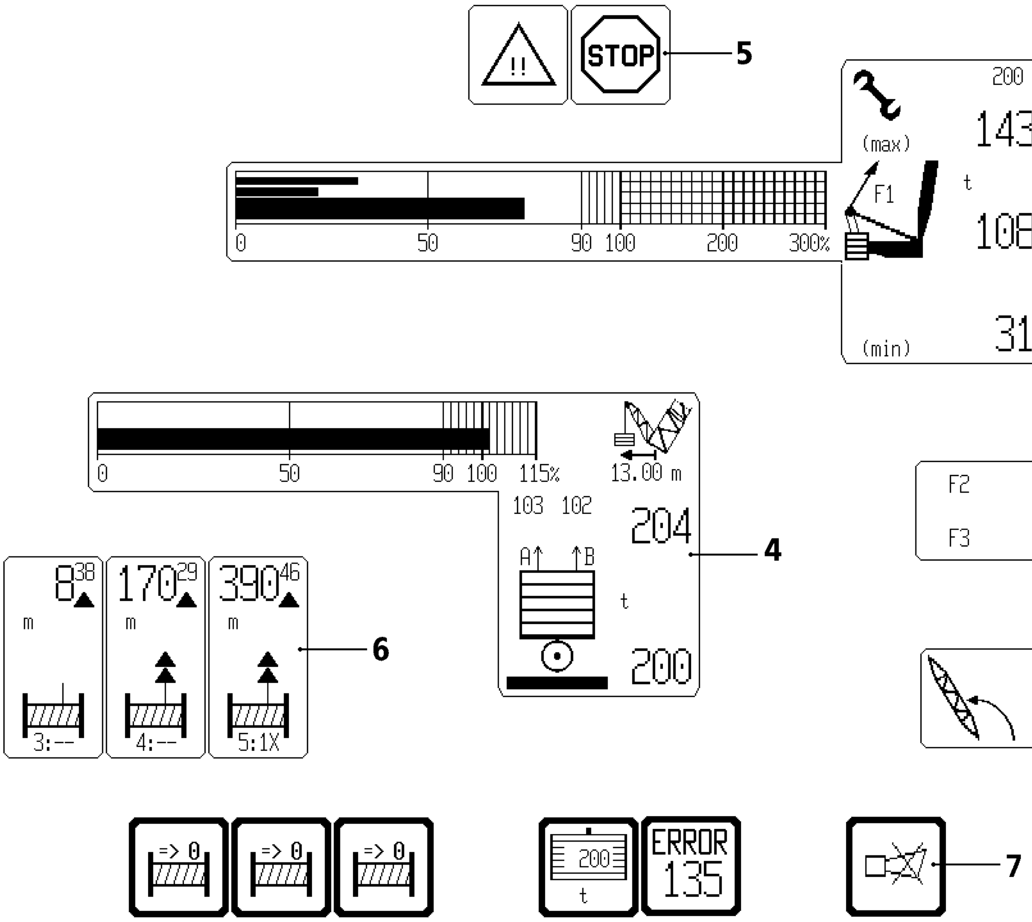
6 Winch indication - winch 3*, 4, 5* and 6*

7 Function key bar

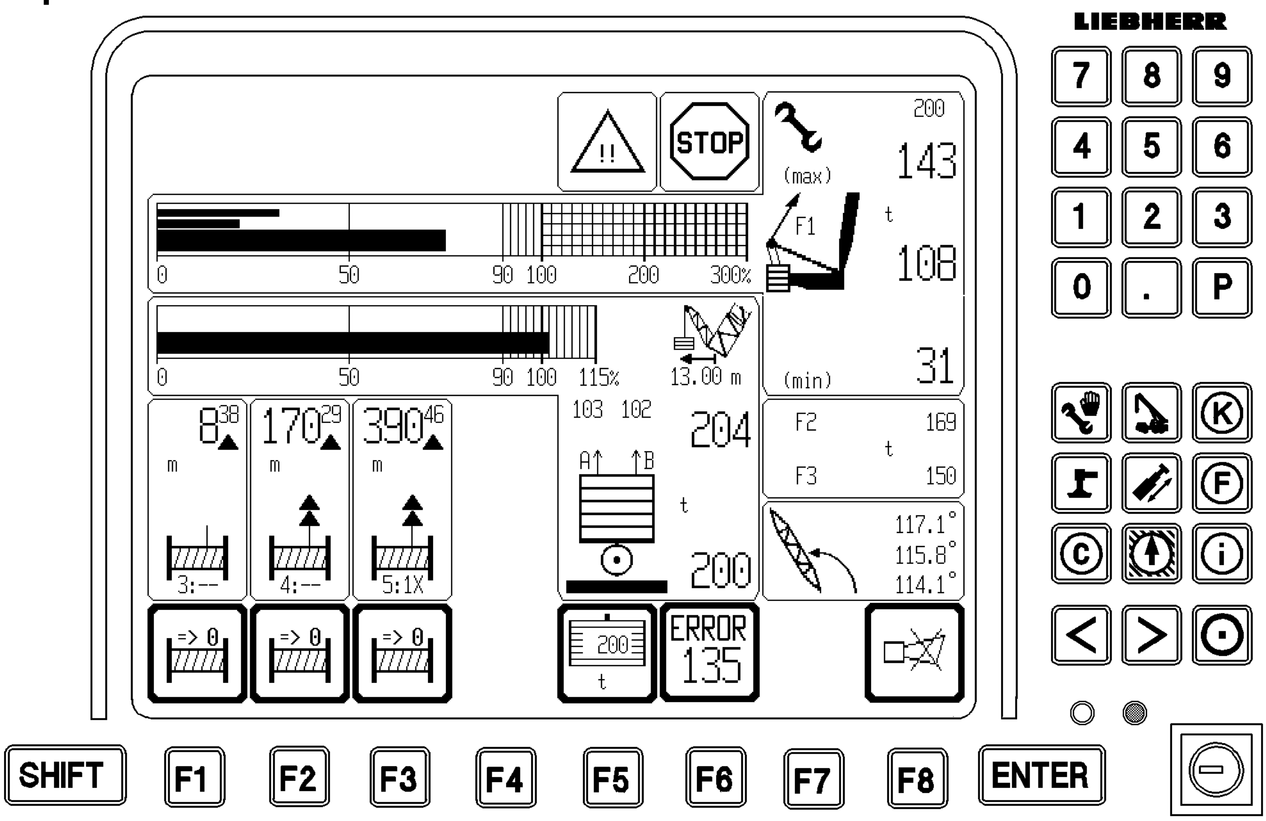
Note: The illustrations shown in this chapter are **only examples.**
The values shown in the individual symbols might not match in every case.
In addition, the illustrations show the maximum items on the operation view on monitor with symbols.
In normal crane operation, an identical view would not appear on the LICCON monitor.

Counterweight is the fixed mounted equalizing weight on the slewing platform

* if installed


5
1
2
3
4
6
7
STOP
200
143
(max)
F1
t
108
(min)
31
0
50
90 100
200
300%
115%
13.00 m
103 102
204
A
B
200
F2
169
F3
150
117.1°
115.8°
114.1°
ERROR
135

1


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
ERROR
135

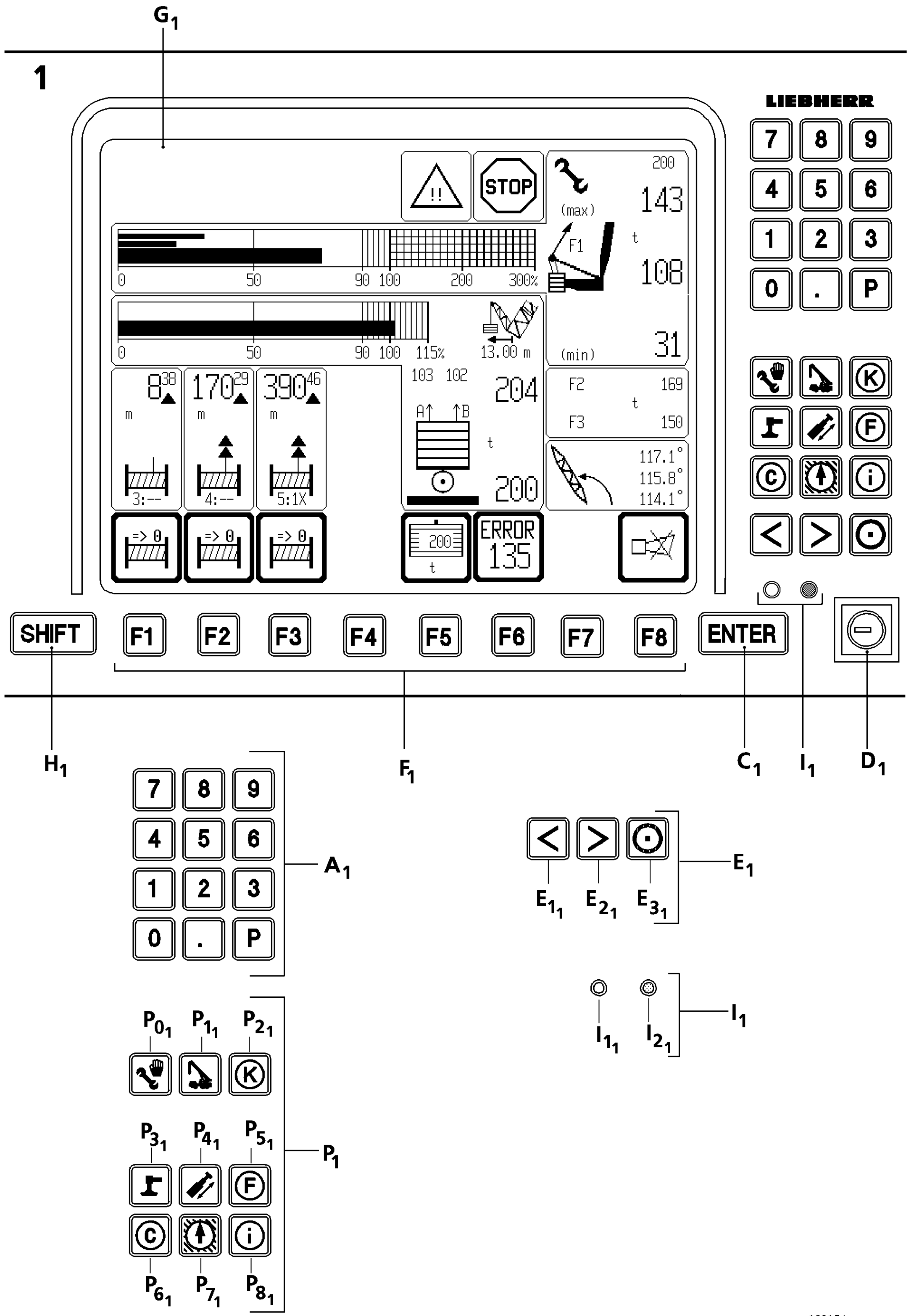
189153

6.1.1 General, continuation

Test point 1 - Installation - max. limit
The monitoring function carried out by the LICCON system of test point 1 - installation - limit is an additional safety function. Due to the complexity of the installation procedure, it is not possible to state generally valid and exact test point 1 - installation limits.

D A N G E R : **This means, the crane may not be utilized until this installation limit. The crane may only be erected without a load and according to the instructions given in the Operation manual.**

1


G1
LIEBHERR
STOP
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
ERROR 135
H1
F1
C1
I1
D1
A1
E1
E11
E21
E31
I11
I21
P01
P11
P21
P31
P41
P51
P61
P71
P81
P1

189154

Monitor 1
consists of a screen and various control elements:

A_1 Alpha-numerical keyboard
To edit the derrick ballast input value

P_1 Program keys
no function

C_1 Input key "ENTER"
To confirm changes

D_1 Keyed switch
no function
The keyed switch may not be positioned to the "left" .

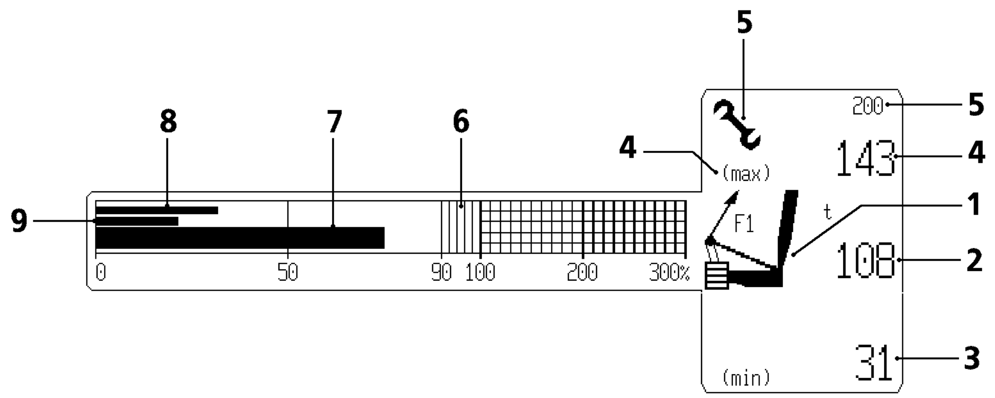
E_1 Brightness control
for screen on monitor 1, see brightness control for monitor 0

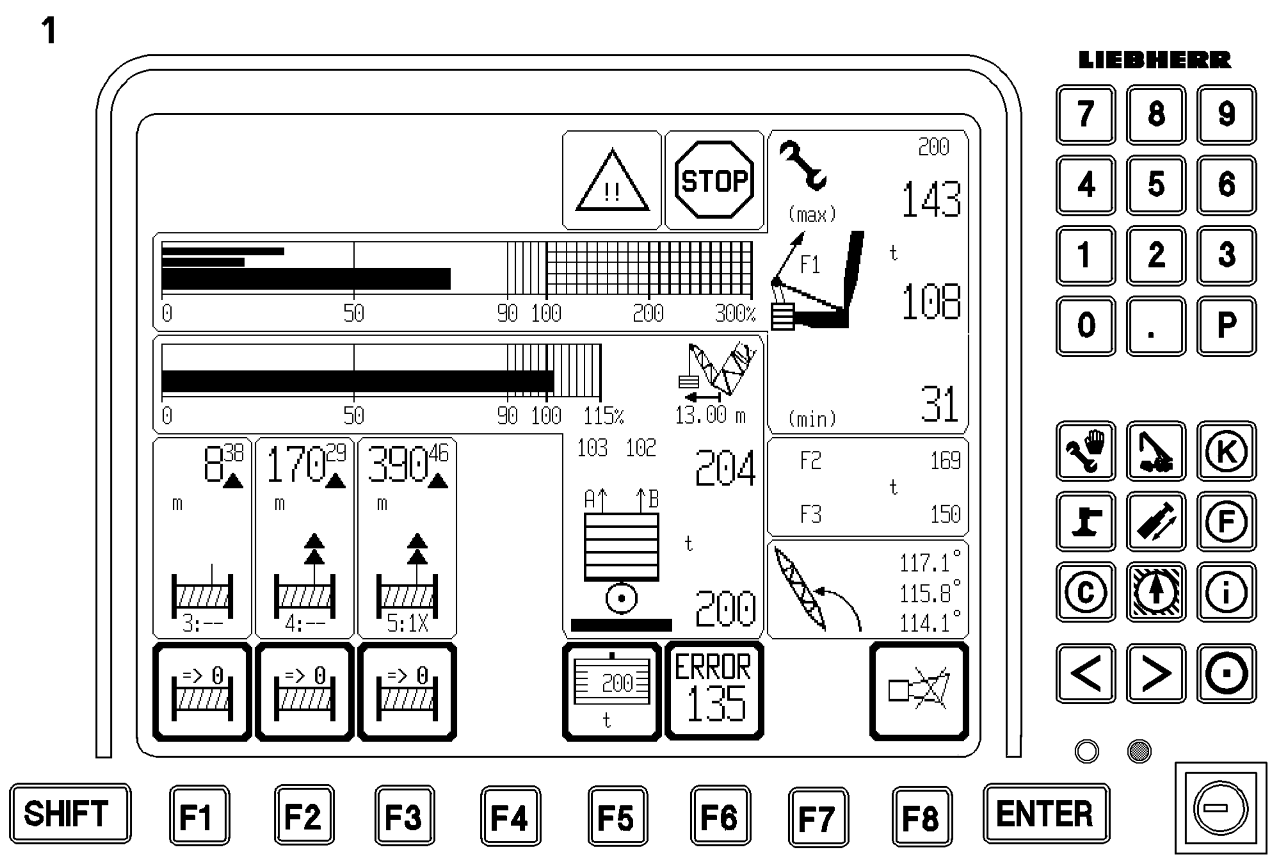
F_1 Function keys.
The function keys are only functioning in the "OPERATION" program and should always be viewed together with the function key symbol bar shown above on the screen.

G_1 Screen
The Monitor 1 shows the operating view in all programs, as shown on the illustration on the left.

H_1 SHIFT-Taste
no function

I_1 LED indicators
I1: (LED red) Monitor error
I2: (LED yellow) Power supply for monitor available.


5
5
200
4
(max)
143
4
8
7
6
9
F1
t
1
0
50
90
100
200
300%
108
2
(min)
31
3

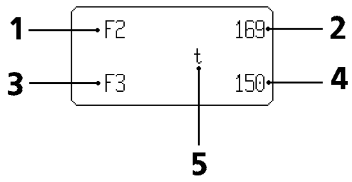

1
LIEBHERR
STOP
200
(max)
143
F1
t
108
0
50
90 100
200
300%
115%
13.00 m
(min)
31
103 102
204
A B
t
200
F2 169
t
F3 150
117.1°
115.8°
114.1°
3:--
4:--
5:1X
=> 0
200
t
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189155

6.1.2 Test point 1 = F1

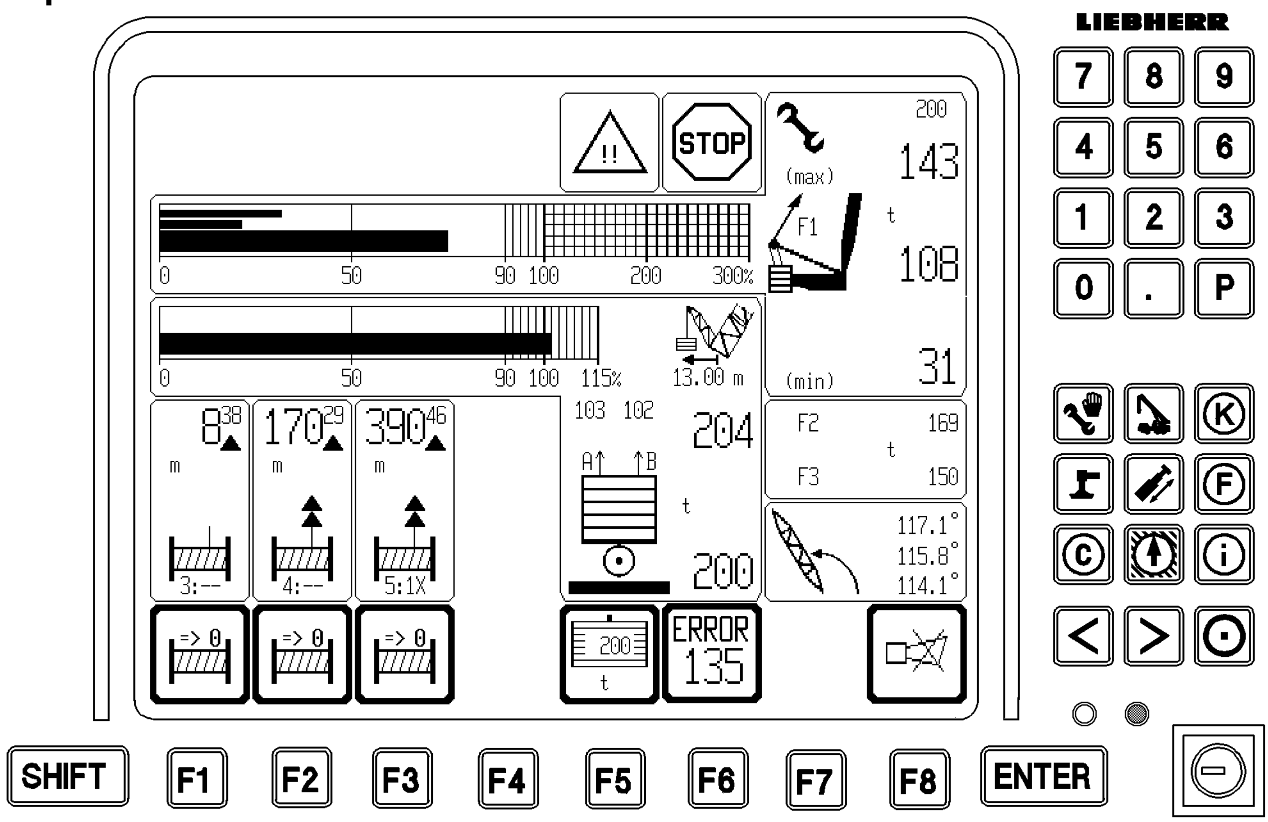
<table>
<tr><th>Pos.</th><th>Indicator symbols / Indicator values

Test point 1</th><th>Type</th><th>when shown</th></tr>
<tr><td>1</td><td>Symbol Force on test point 1 = "F1"
(F = force)
with indication of dimension ([t] or [klbs]) and frame</td><td>static</td><td>always</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Test point 1 - Force - actual value (=F1=F1ist)
F1=F1A + F1B (for valid values)
F1A = test point 1A (A-bracket left)
F1B = Force test point 1B (A-bracket right)</td><td>static</td><td>in case of valid value</td></tr>
<tr><td>???
blinking</td><td>for invalid value, which means
|F1A-F1B| tolerance > 15 t
or
M1A and M1B is defective
(=ERROR 135)</td></tr>
<tr><td>3</td><td>Test point 1 - Minimum force (=F1min)
with text ”(min)”</td><td>static</td><td>always
(Shut off via F1min occurs only in B- or Bw- operating modes, for all other operating modes, F1min=0, in these operating modes, the F1=F1min condition cannot be reached during operation)</td></tr>
<tr><td>4</td><td>Test point 1 - Operation Maximum Force
(=F1max- operation) with text ”(max)”</td><td>static</td><td>for B- or Bw operating modes</td></tr>
<tr><td rowspan="3">5</td><td rowspan="2">Test point 1 - Installation Maximum Force
(=F1max installation)</td><td>static</td><td>for ”Installation” and ”boom not in operating range” and ”F1<F1max- installation”</td></tr>
<tr><td>blinking</td><td>for ”installation” and ”boom not in operating range” and ”F1≥F1max- installation</td></tr>
<tr><td>Installation symbol</td><td>static</td><td>for ”installation” and ”boom not in operating range”</td></tr>
<tr><td>6</td><td>F1 - utilization scale</td><td>static</td><td>always</td></tr>
<tr><td>7</td><td>F1 - Utilization bar indicator
= F1 / F1max- operation in percentages (%),
The bar is ”0”
at F1max operation =0
or F1 = invalid .</td><td>dynamic</td><td>at B- or Bw- operating modes</td></tr>
<tr><td>8</td><td>F1min- warning bar (Threshold)
= F1min warning value / F1max operation in percentages %,
(F1min- warning value = F1min + 20 t).
The bar is ”0”
at F1max- operation =0
or F1max- operation = invalid.</td><td>dynamic</td><td>at B- or Bw- operating modes</td></tr>
<tr><td>9</td><td>F1min- Stop- bar (Threshold)
=F1min / F1max operation in %,
The bar is ”0”
at F1max- operation =0
or F1max- operation = invalid.</td><td>dynamic</td><td>at B- or Bw- operating modes</td></tr>
</table>



1
F2
169
2
3
F3
150
4
t
5

1



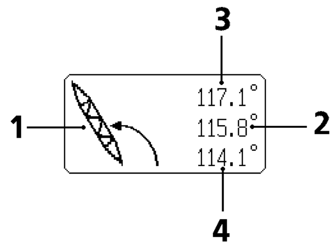
LIEBHERR
STOP
!!
200
143
(max)
F1
t
108
31
(min)
0
50
90
100
200
300%
115%
13.00 m
F2
169
t
F3
150
103
102
204
A
B
200
117.1°
115.8°
114.1°
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

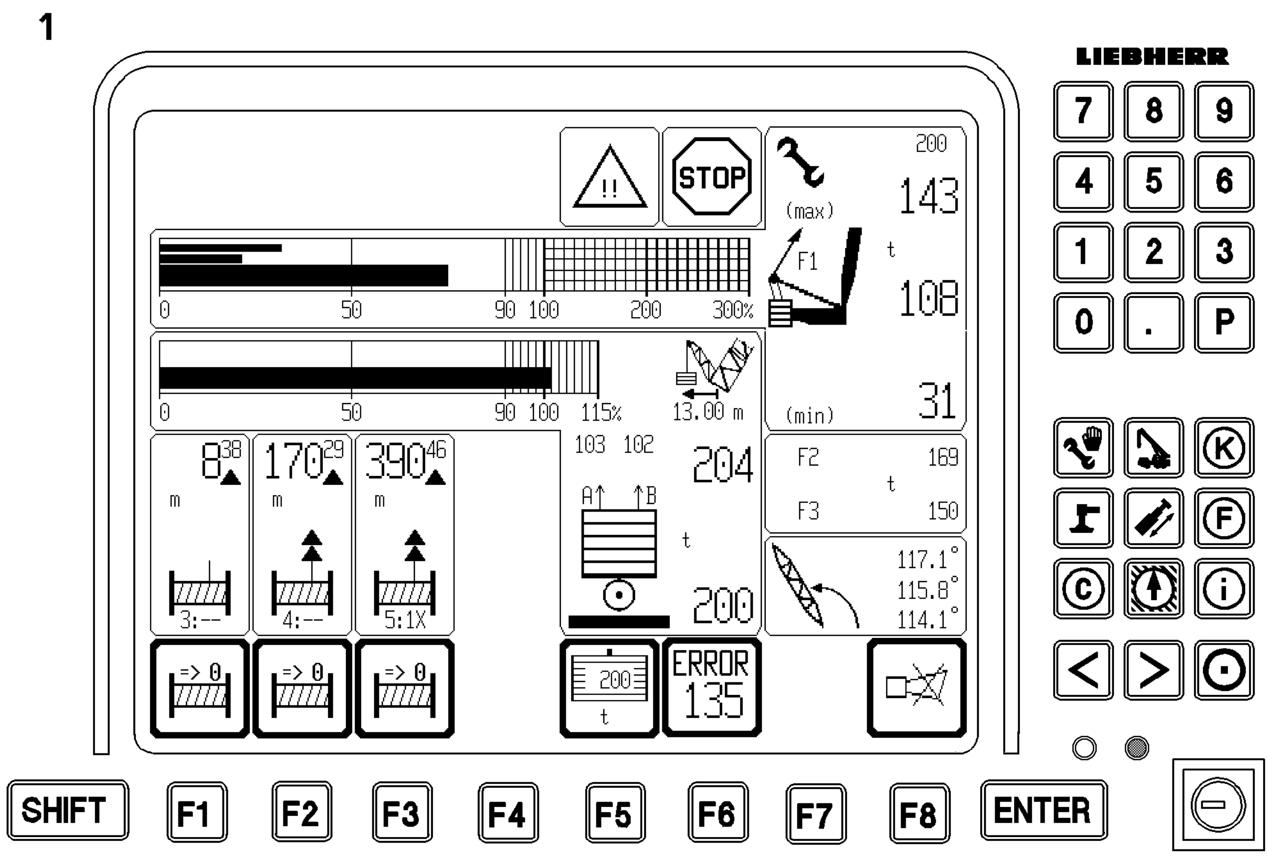
189156

6.1.3 Test point 2 = F2 and Test point 3 = F3

Pos.	Indicator symbols / Indicator values Test point 2 and test point 3 *	Type	when shown
1	Symbol force on test point 2 = "F2" (F = force)	static	In operating modes with lattice jib
2	Test point 2 -Force - actual value = F2- value F2=F2A + F2B (for valid values) test point 2A/B installed in the fly jib tensioning above the NA (WA) bracket 1 test point 2 A = left side test point 2 B = right side	static	In operating modes with lattice jib and **valid** F2-value, tolerance < 15 t
		??? blinking	In operating modes with lattice jib and **invalid** F2-value, i.e. F2A-F2B tolerance > 15 t (= ERROR 136)
3 *	Symbol force on test point 3 = "F3" (F = force)	static	In operating modes with derrick
4 *	Test point 3 - Force - actual value = F3- value F3=F3A + F3B (for valid values) test point 3A/B installed in the Derrick-main boom tensioning on main boom head test point 3 A = left side test point 3 B = right side	static	In operating modes with derrick and **valid** F3- value
		??? blinking	In operating modes with derrick and **invalid** F3- value, i.e. F2A-F2B tolerance > 15 t (= ERROR 137)
5	Force unit for "F2" and "F3": [t] or [klbs] and symbol frame	static	In operating modes with lattice jib or derrick

* in operating modes with derrick and main boom

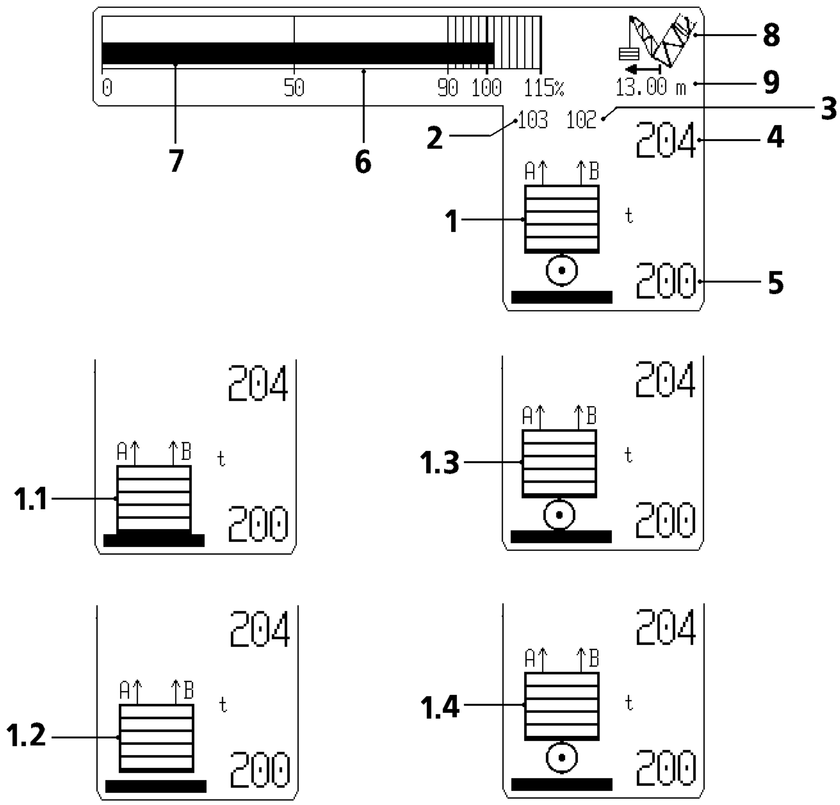

3
1
2
4
117.1°
115.8°
114.1°


1
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
8 38
170 29
390 46
m
3:--
4:--
5:1X
103 102
204
A↑ ↑B
t
200
F2 169
t
F3 150
117.1°
115.8°
114.1°
=> 0
200
ERROR
135
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

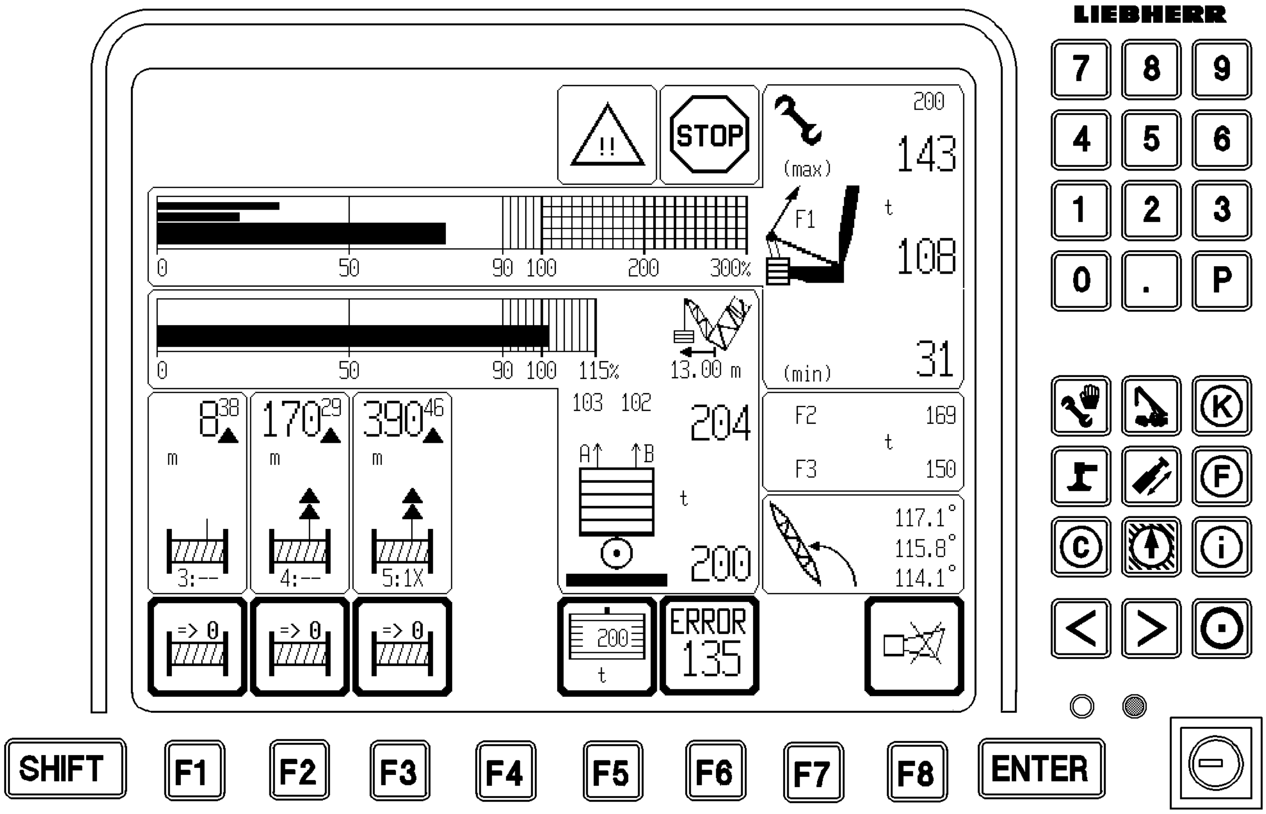
189157

6.1.4 Derrick boom

Pos.	Indicator symbols / Indicator values Derrick boom	Type	*when shown*
1	Symbol "Derrick angle"	static	in D operating modes
2	Derrick angle - actual value (= Dact)	static	in D operating modes and at **valid** value
		??? blinking	in D operating modes and at **invalid** value
3	Derrick maximum operating angle (= Dmax)	static	in D operating modes and when Dact ≤ Dmax
		blinking	in D operating modes and $D_{act} > D_{max}$
4	Derrick minimum operating angle (= Dmin)	static	in D operating modes and $D_{act} \geq D_{min}$
		blinking	in D operating modes and $D_{act} < D_{min}$


0
50
90 100
115%
13.00 m
103 102
204
A↑ ↑B
t
200
1
1.1
1.2
1.3
1.4
2
3
4
5
6
7
8
9

1

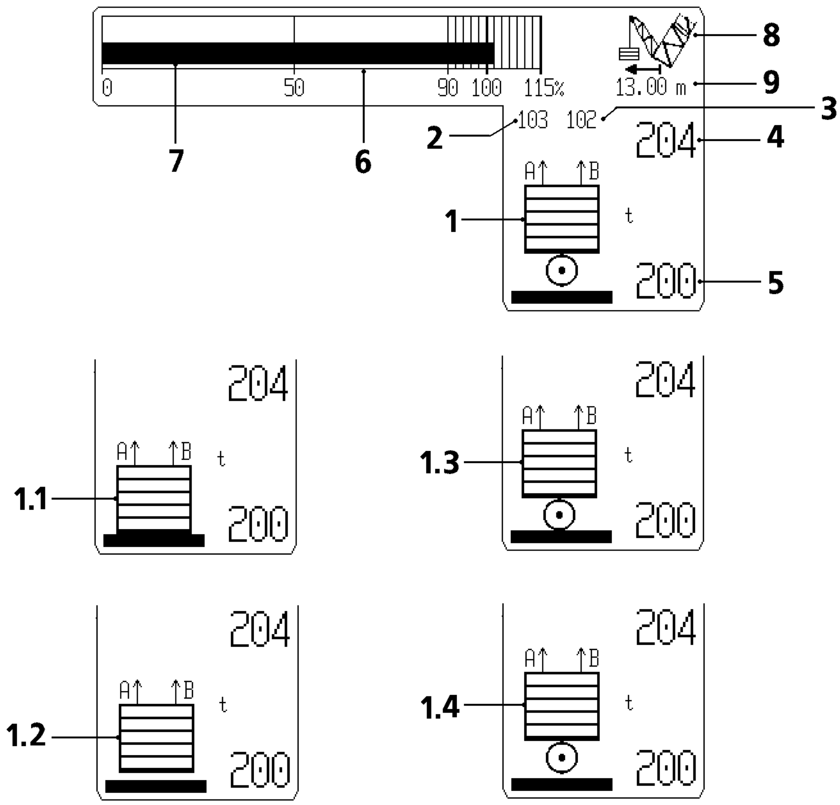

LIEBHERR
STOP
(max)
F1
143
108
(min)
31
0
50
90 100
200
300%
115%
13.00 m
103 102
204
200
F2 169
F3 150
117.1°
115.8°
114.1°
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189158

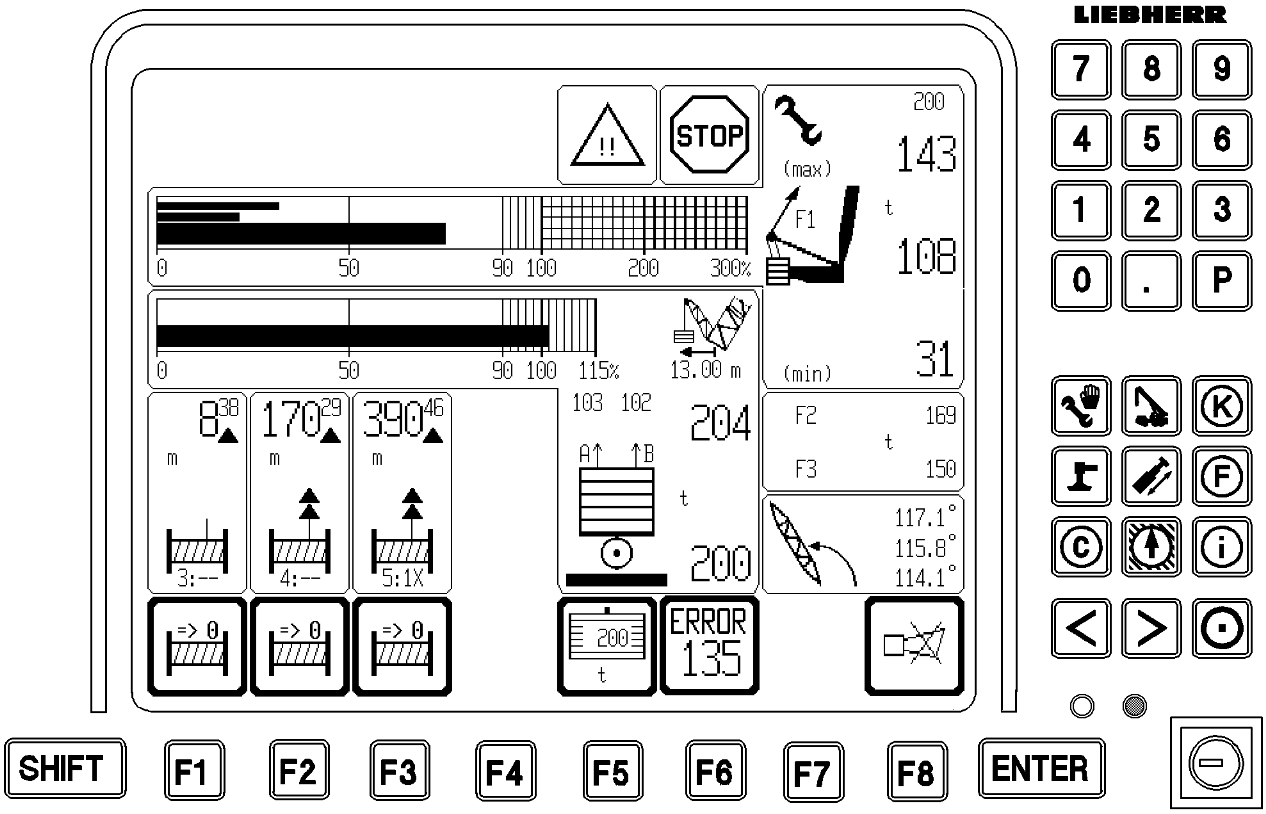
6.1.5 Derrick ballast

<table>
<tr><th>Pos.</th><th>Indicator symbols / Indicator values

Derrick ballast</th><th>Type</th><th>when shown</th></tr>
<tr><td>1</td><td>Derrick ballast symbol with force unit (t) or (klbs). (This force unit is valid for all values shown in the frame)</td><td>static</td><td>in B/Bw operating modes, depending on type (suspension ballast or ballast trailer) and condition (suspended or not) of the derrick ballast, see 1.1 - 1.4</td></tr>
<tr><td>1.1</td><td>Symbol "Suspension ballast on the ground"</td><td>static</td><td>in B operating modes and B not suspended according to limit switch</td></tr>
<tr><td>1.2</td><td>”Symbol "Suspension ballast suspended"</td><td>static</td><td>in B operating modes and B suspended according to limit switch</td></tr>
<tr><td>1.3</td><td>Symbol "Ballast traileron the ground"</td><td>static</td><td>in Bw operating modes and Bw not suspended according to key switch</td></tr>
<tr><td>1.4</td><td>Symbol "Ballast trailer suspended"</td><td>static</td><td>in Bw operating modes and BW suspended according to key switch</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Force in derrick ballast tensioning B (right)
=F4B5 = F4B - F5 / 2
(test point 4B = Pressure ring surface left,
test point 5 = Pressure piston surface right and left,
if test point 5 is invalid
(= ERROR 626/627), then F5 = 0 is used)</td><td>static</td><td>in B/Bw operating modes and F4 B valid</td></tr>
<tr><td>blinking</td><td>in B / BW operating modes and F4A and F4B valid and |F4A-F4B| >tolerance 1 (= 45 t),</td></tr>
<tr><td>???
blinking</td><td>in B / Bw operating modes and F4A and F4B invalid or |F4A-F4B| >tolerance 2 (approx. 200 t)(=ERROR 664)</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Force in derrick ballast tensioning A (left)
=F4A5 = F4A - F5 / 2
(test point 4A = Pressure sensor ring surface right,
test point 5 = Pressure sensor piston surface right and left,
if test point 5 is invalid
(= ERROR 626/627), thenF5 = 0 is used)</td><td>static</td><td>valid in B / Bw- operating modes and F4A</td></tr>
<tr><td>blinking</td><td>in B / Bw operating modes and F4A and F4B valid and |F4A-F4B| >tolerance 1 (= 45 t),</td></tr>
<tr><td>???
blinking</td><td>in B / Bw operating modes and F4A and F4B invalid or |F4A-F4B| >tolerance 2 (approx. 200 t)(=ERROR 664)</td></tr>
</table>


0
50
90 100
115%
13.00 m
103 102
204
A↑ ↑B
t
200
8
9
3
4
2
7
6
1
5
1.1
1.2
1.3
1.4

1


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

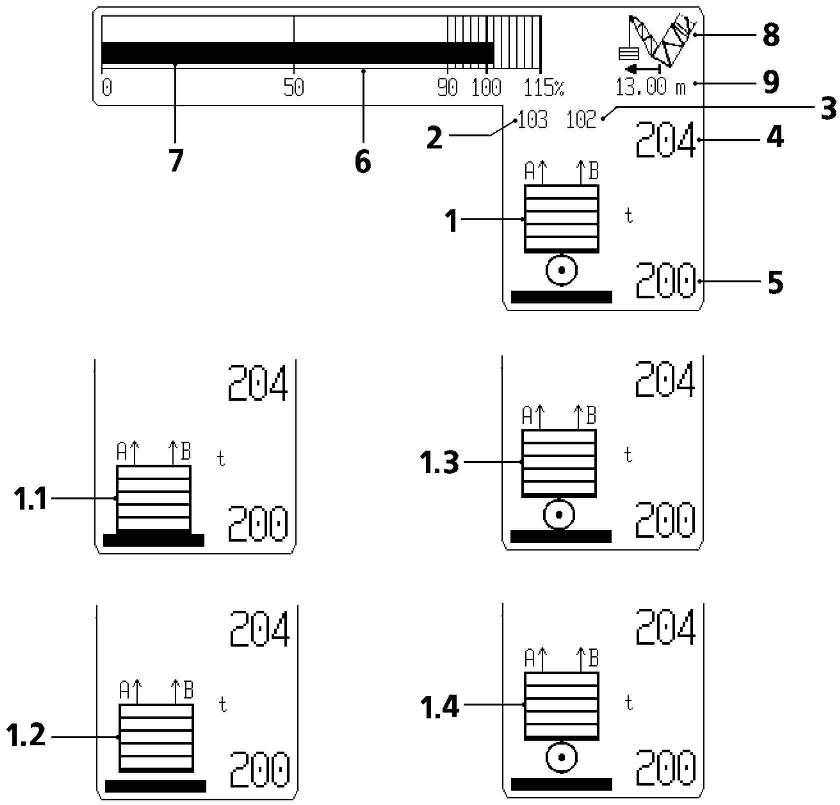
189158

6.1.5 Derrick ballast (continued)

<table>
<tr><th>Pos.</th><th>Indicator symbols / Indicator values

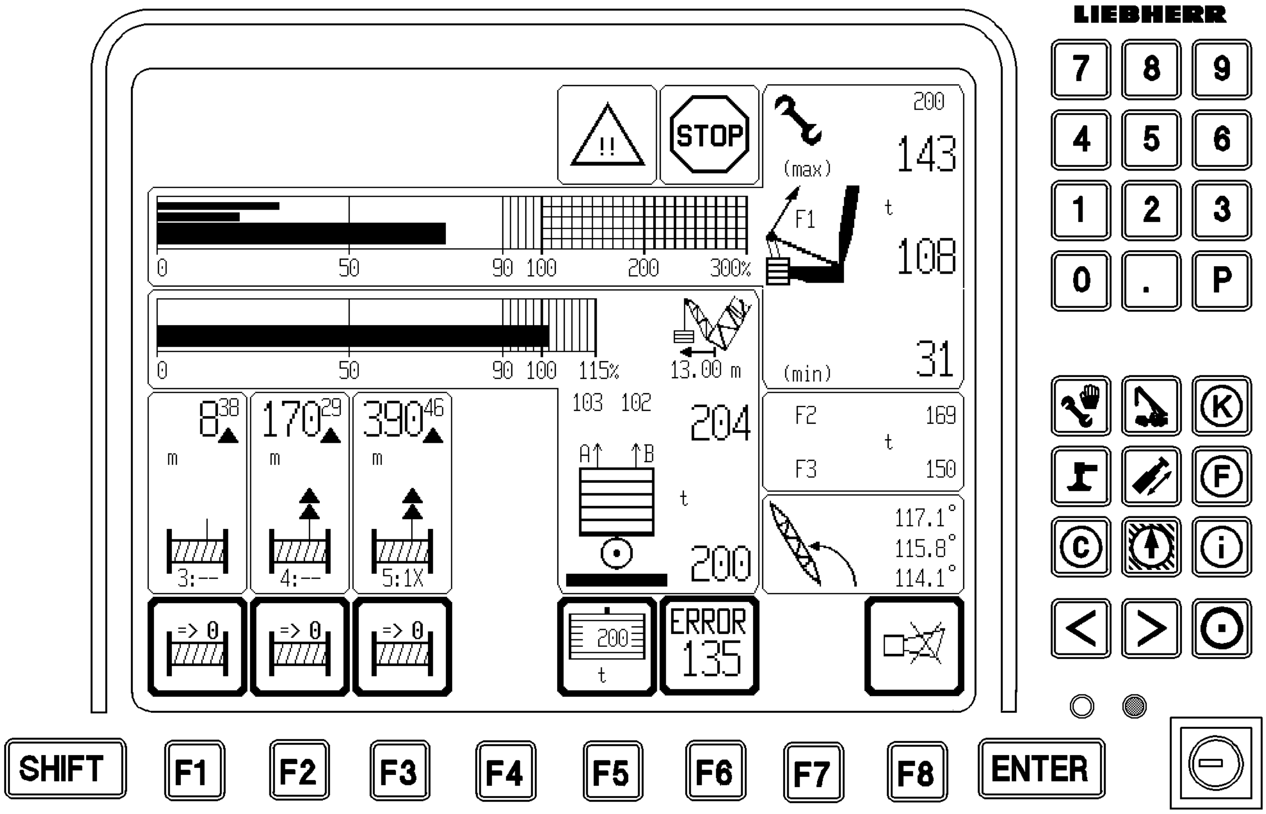
Derrick ballast</th><th>Type</th><th>when shown</th></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Tensioned derrick ballast =BA_GEZ
= vertical force components of the force in the derrick ballast tensioning (=F4A5+ F4B5) calculated from test points 4A, 4B and 5.

Remarks: The sum of the forces F4A5 and F4B5 is greater than or equal to tensioned derrick ballast =BA_GEZ,</td><td>static</td><td>in B / Bw operating modes, if valid and ballast utilization ≤90 %, and/or. >90 % when horn is switched off via F8</td></tr>
<tr><td>blinking</td><td>in B / Bw operating modes, as warning with brief honks of the horn when ballast utiliz. > 90 % (indicator becomes static, if horn is switched off via F8)</td></tr>
<tr><td>???
blinking</td><td>in B / Bw operating modes, if value=invalid, i.e. |F4A-F4B|>Tolerance 2
(= approx.200t) (→ERROR 664), or
M4A and M4B defective
(=ERROR 665),
(if M5 is defective, a pressure of M5=0 is calculated
→ indicator remains static)</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Placed derrick ballast =BA_AUF
(this value was entered manually and confirmed via the "ENTER" key, the value is saved when the machine is shut off and is valid after restarting until changed via function key F5)</td><td>static</td><td>in B / Bw operating modes, if value for BA_AUF allowable</td></tr>
<tr><td>blinking</td><td>in B / Bw operating modes, if value for BA_AUF questio-nable, i.e. Derrick ballast use > 100 % + %Tolerance and BA_AUF>BA_GEZ + tons tolerance
or
derrick ballast is suspended and derrick ballast utiliz. < 100 % - %Tolerance and BA_AUF<BA_GEZ
- tons tolerance</td></tr>
<tr><td>???
blinking</td><td>in B / Bw operating modes, if BA_AUF<0 or >9999</td></tr>
<tr><td>6</td><td>Ballast utilization</td><td>static</td><td>in B / Bw operating modes</td></tr>
<tr><td>7</td><td>Derrick ballast-Utilization display on indicator bars
=BA_GEZ / BA_AUF in percent (%),
the bar is ”0”
at BA_AUF <5 t
or BA_GEZ =invalid
Bar can indicate a maximum of 115 %.</td><td>dynamic</td><td>in B / Bw operating modes</td></tr>
</table>



0
50
90 100
115%
13.00 m
103 102
204
A↑ ↑B
t
200
1
1.1
1.2
1.3
1.4
2
3
4
5
6
7
8
9

1

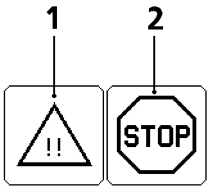


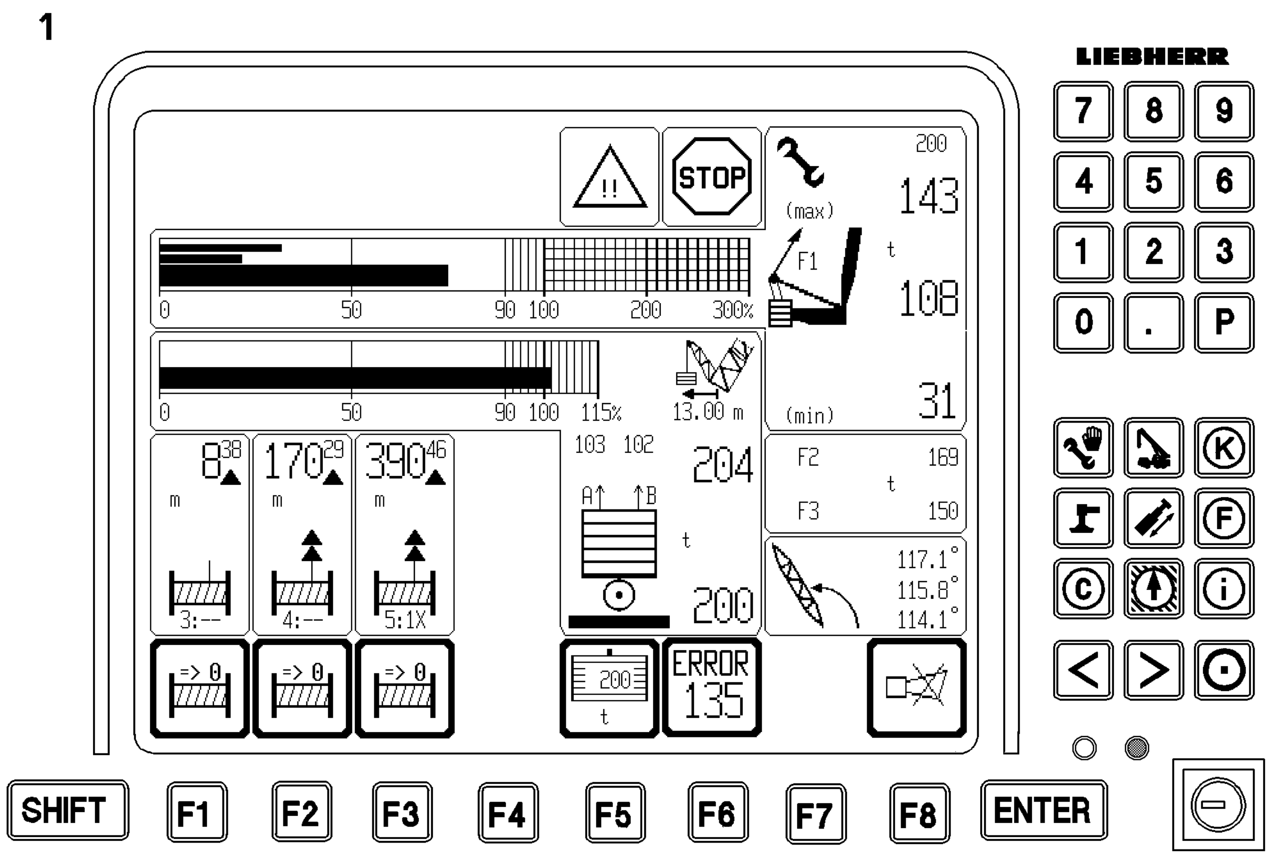
LIEBHERR
STOP
200
143
(max)
F1
t
108
(min)
31
0
50
90 100
200
300%
115%
13.00 m
103 102
204
200
8 38
170 29
390 46
m
3:--
4:--
5:1X
=> 0
F2 169
F3 150
117.1°
115.8°
114.1°
ERROR
135
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189158

6.1.5 Derrick ballast (continuation)

Pos.	Indicator symbols / Indicator values Derrick ballast	Type	when shown
8	Symbol "Derrick ballast radius symbol"	static	In B/BW operating modes with variable derrick ballast radius
9	Indication "Derrick ballast radius" [m] or [ft]	static	Valid in B/BW operating modes with variable derrick ballast radius and derrick ballast radius value
		blinking	**Invalid** in B/BW operating modes with variable derrick ballast radius and derrick ballast radius value

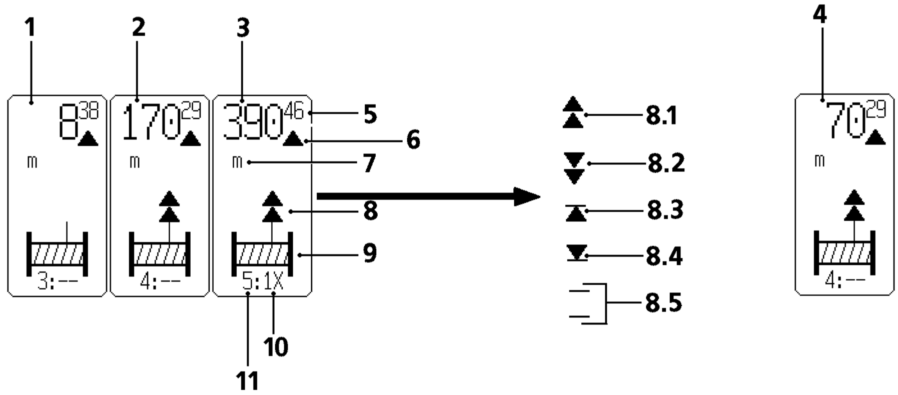

1
2
STOP


1
LIEBHERR
STOP
200
143
(max)
F1
t
108
(min)
31
0
50
90
100
200
300%
115%
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:--
4:--
5:1X
=> 0
ERROR
135
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

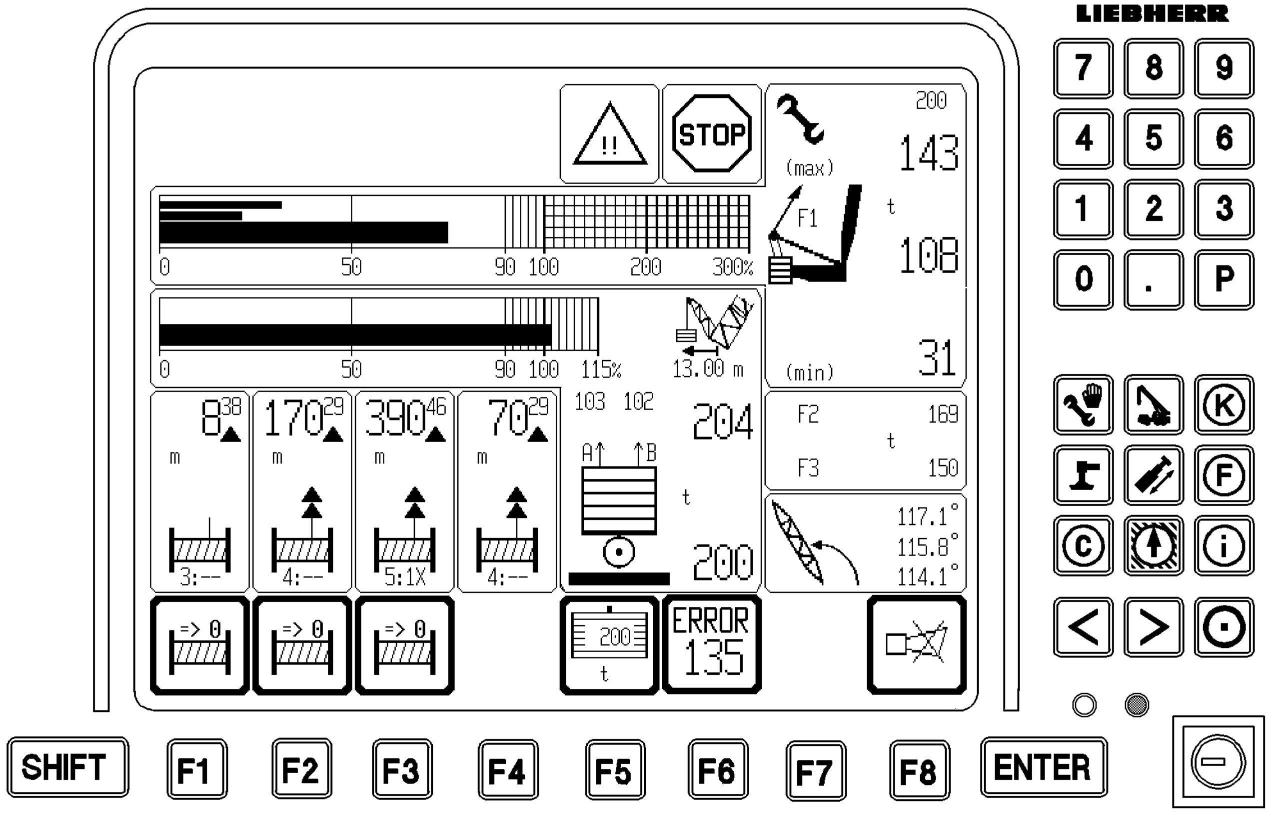
189159

6.1.6 Monitoring symbols

Pos.	Indicator symbols / Indicator values Alarm functions	Type	when shown
1	Symbol "CAUTION"	blinking	at M1min- prewarning ($F1ist < F1min$- warning value) or at F1max- operation prewarning (90%) ($F1 \geq F1max$- operation - warning value) or at F1min- Stop- after run or at F1max- operation -Stop- after run
2	Symbol "STOP"	blinking	at F1min- Stop ($F1ist < F1min$, with 3 second after run) or F1max- operation -Stop ($F1 \geq F1max$- operation) with 3 second after run) or F1max- installation -Stop ($F1ist \geq F1max$- installation) with 3 second after run) or Error with error numbers, which cause shut off ($64 \leq$ ERROR- No. ≤ 255, or ERROR- No. ≥ 664) shown on monitor 1 with 3 second after run


1
2
3
4
5
6
7
8
9
10
11
8.1
8.2
8.3
8.4
8.5

1


LIEBHERR
STOP
ERROR
135
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

189160

6.1.7 Winch indication - winch 3* , 4, 5* and 6*

The winch indication for winch 3 - 6* is in the operation view, if the crane is equipped with these winches.

The indication of winches 3 - 6* functions the same as indication for winch 1 and 2 on monitor 0. In addition, the following notes apply:

If one of these winches. according to entered operating mode, is used as a hoist winch (for example winch 3 at D- operation), then the **hook path** is shown in the winch symbol. The calculated value by the corresponding function key is shown unchanged after turning the system off and on again or after an operating mode change.

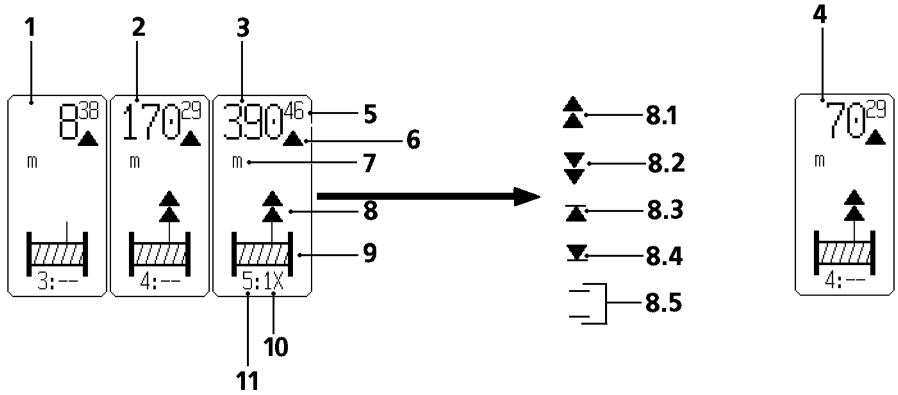
However, if one of the winches is used as a control winch, then the hook path is not shown, but **the current cable length on the winch drum.** Calculation is possible, but after turning the system off and on again or after an operating mode change, the original value "cable length on cable drum" is shown again.

The indication only shows 3 number positions before the period. Any numbers before 3 are cut off, the crane operator must determine himself if , for example, 200 m or 1200 m of cable should be on the winch. The indicated value is in both cases "200^{00}".

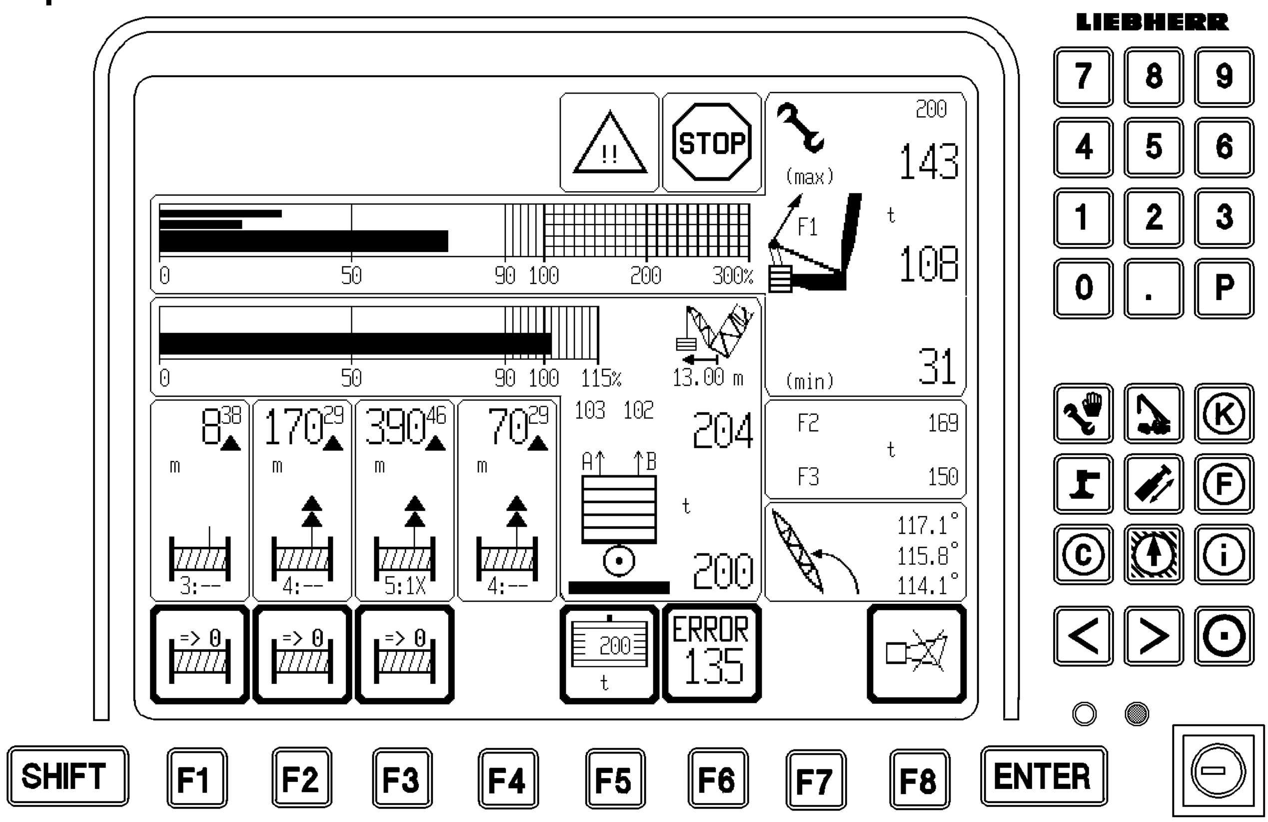
The length indication is only exact if the winch was calibrated and since then, no data loss occurred (see chapter paragraph 6.0.5)

Pos.	Indicator symbols / Indicator values Winch indication Winch 3*, 4, 5* and 6*	Type	when shown
1	Winch indication Winch 3*	static	if winch is installed
2	Winch indication Winch 4	static	if winch is installed
3	Winch indication Winch 5*	static	if winch is installed
4	Winch indication Winch 6*	static	if winch is installed
5	Hook path = Cable length on winch / Hoist cable reeving as entered manually or	static	if winch is utilized as a hoist winch, according to set chart
	Cable length on winch drum (for intake gear, the cable length applies evenly for the left and right side of the cable drum	static	if winch is utilized as a control winch, according to set chart
		??? blinking	in case of error in winch path calculation → Recalibrate the winch

* if installed


1
2
3
4
5
6
7
8
9
10
11
8.1
8.2
8.3
8.4
8.5

1


LIEBHERR
STOP
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
ERROR 135

189160

6.1.7 Winch indication , continuation

6) The arrows on the length value show the direction of the hook movement in relation to the zero point:
Arrow up = Hook has moved upward from the zero point,
Arrow down = Hook has moved downward from the zero point .

7) Length unit for hook path indication: [m] or [ft]

8) Winch status indication
The following winch status symbols are available (all blinking) :

8.1 spool out

8.2 spool up

8.3 spooled out → spooling out function is shut off

8.4 spooled up → spooling up function is shut off

8.5 Winch is deactivated → spooling up and out function is shut off
or
Winch is spooled up and out at the same time, according to sensor

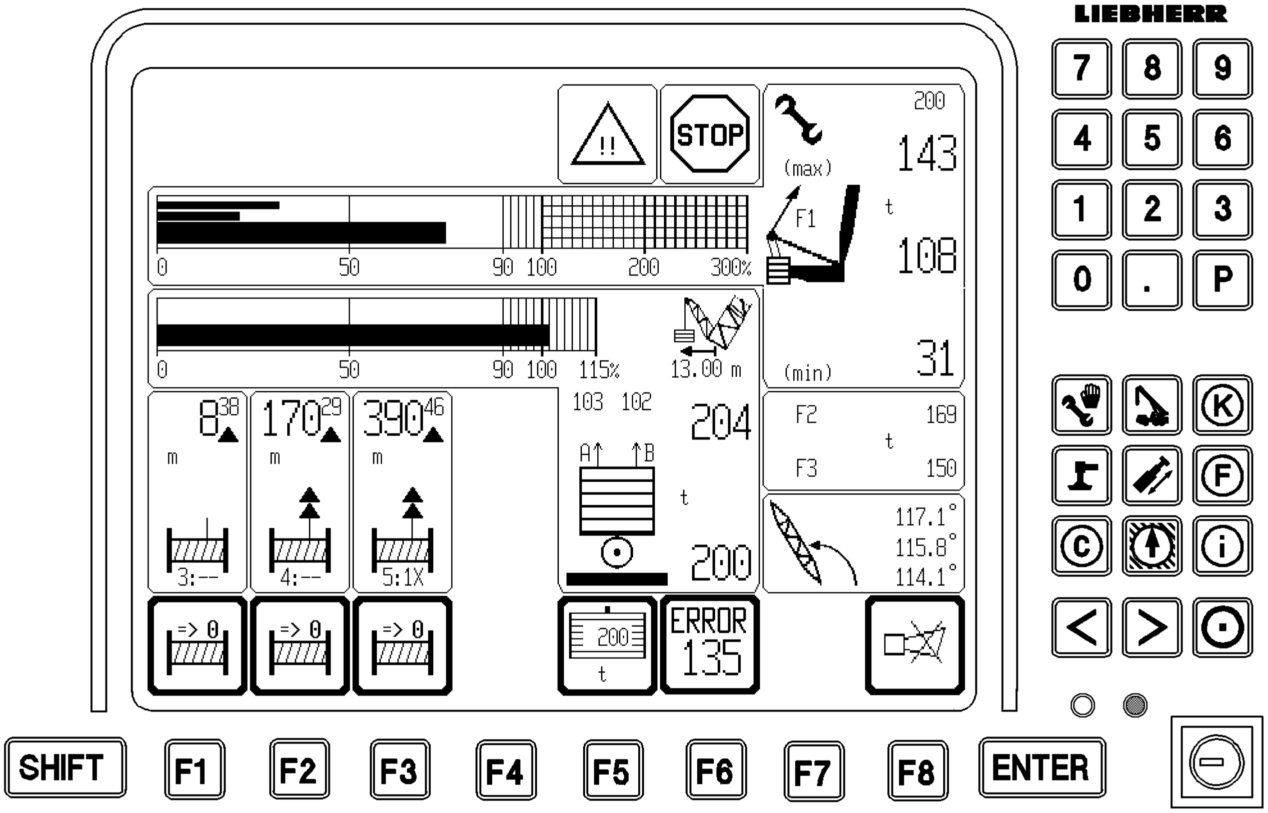
If no winch status symbol appears, then the activated winch is at a standstill and is neither spooled up nor out.

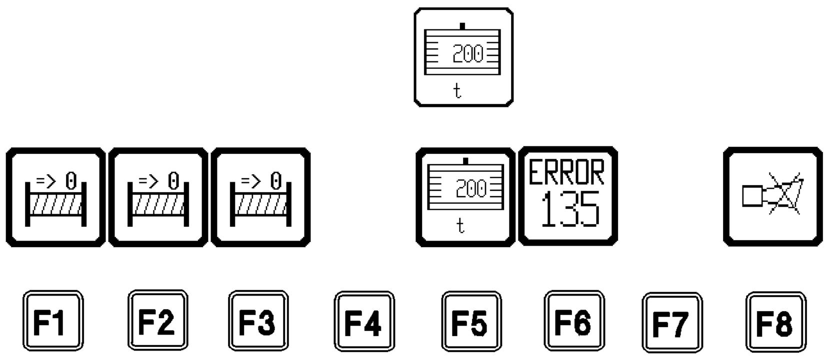
9) Winch symbol (with cable end for winch status symbol)

10) Winch number
5 : = Winch 5

11) Assignment of manual control levers (MS) to winch
1X = manual control lever ”MS 1" actuated in X - direction

1


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
STOP
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
ERROR
135


ERROR
135
F1
F2
F3
F4
F5
F6
F7
F8

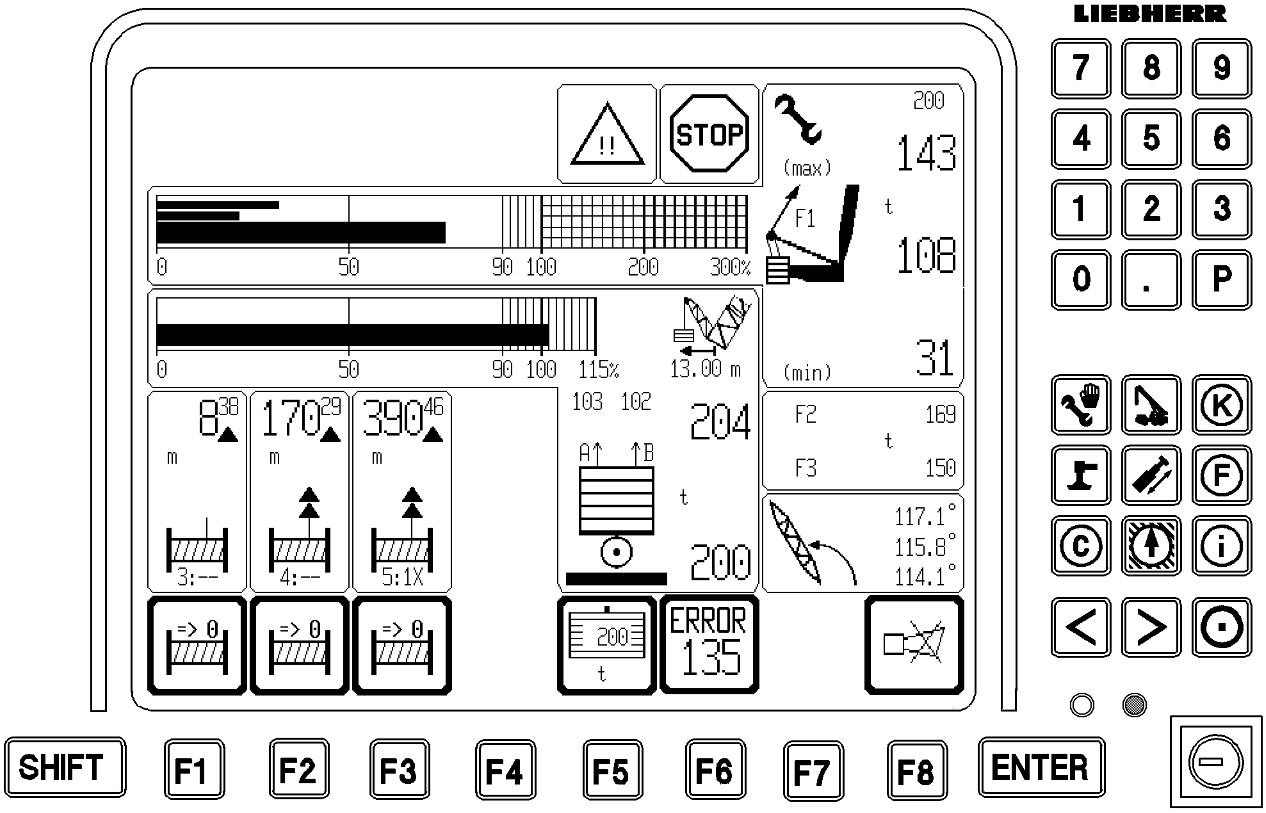
187341

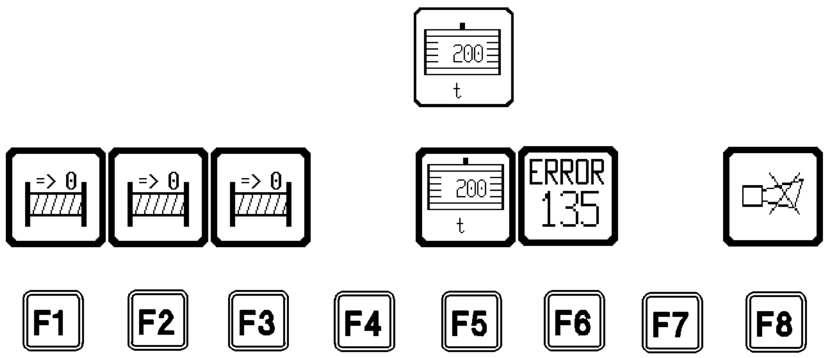
6.1.8 Function key bar

Pos.	Function Function key bar	Type	when shown
$F1_1$	Tare of length indication of winch 3 * (Tare means: length indication is set to 0^{00})	static	if winch indication for winch 3 is shown
$F2_1$	Tare of length indication of winch 4	static	if winch indication for winch 4 is shown
$F3_1$	Tare of length indication of winch 5*	static	if winch indication for winch 5 is shown
$F4_1$	Tare of length indication of winch 6*	static	if winch indication for winch 6 is shown

* if installed

1



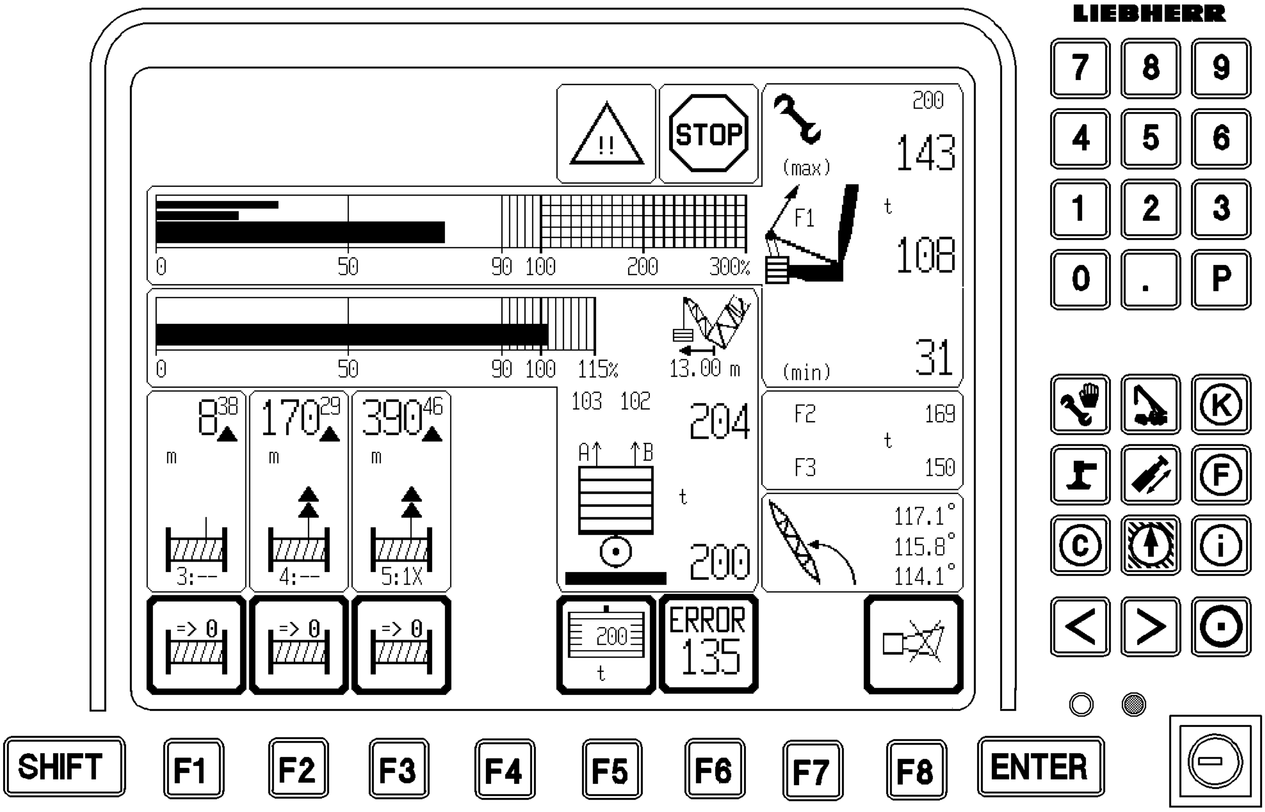


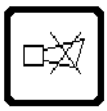
189161

6.1.8 Function key bar (Continuation)

Pos.	Function Function key bar	Type	when shown
$F5_1$	* Ballast editing key When the $F5_1$ key is pushed the thick frame is changed to a thin symbol frame and a blinking cursor appears in the ballast editing field. The value for the added ballast can now be entered in the indicated weight unit of tons ([t] or kilo pounds [klbs]) via the numeric keyboard A_1 on monitor 1 . Ballast editing can be completed by: Pushing the "ENTER" key = to enter the value. The entered value appears now as a value for the added ballast (=BA_AUF) in the ballast symbol or pushing the $F5_1$ key = interrupt editing. The change is thrown out. The old value of BA_AUF remains in the ballast symbol . **CAUTION:** When editing the ballast, the notes in chapter 4.03 line 1.6 must be observed.	static	in B / Bw- operating modes
$F5_1$	* Ballast input value = BA_EDI =edited ballast value in function key symbol of $F5_1$	static	If value of BA_EDI is in input value range, which means: BA_EDI$\geq$40 t BA_EDI$\leq$280 t
		??? blinking	if value BA_EDI is not in input value range
$F6_1$	Error symbol with frame and test "ERROR" and error number of application error The $F6_1$ key has no function.	static blinking	if an application error is found on the CPU 1
$F7_1$	The $F7_1$ key has no symbol and no function.		
$F8_1$	Symbol "Horn off on monitor 1" The $F8_1$ key causes the horn on monitor 1 to turn off.	blinking	if the horn on monitor 1 sounds off (see paragraph 6.1.9)

1





189162

6.1.9 Acoustical warning on monitor 1

"HORN" on monitor 1

Any
- operational errors, which cause shut off of a movement, and
- application errors with error numbers
  for example transmitter errors, which are the result of improper transmitter or sensor signals or defective transmitters or sensors,

found on CPU 1 in the electronic basic component group 0 are also given as an acoustical signal "HORN" of monitor 1, in addition to the optical display "HORN" is a 0.5 second long sound, which is repeated in one second intervals.

Operational errors are :
- Exceeding test point 1 - installation - maximum threshold (lattice fly jib only)
- Exceeding test point 1 - operational maximum threshold
- Exceeding test point 1 - minimum threshold

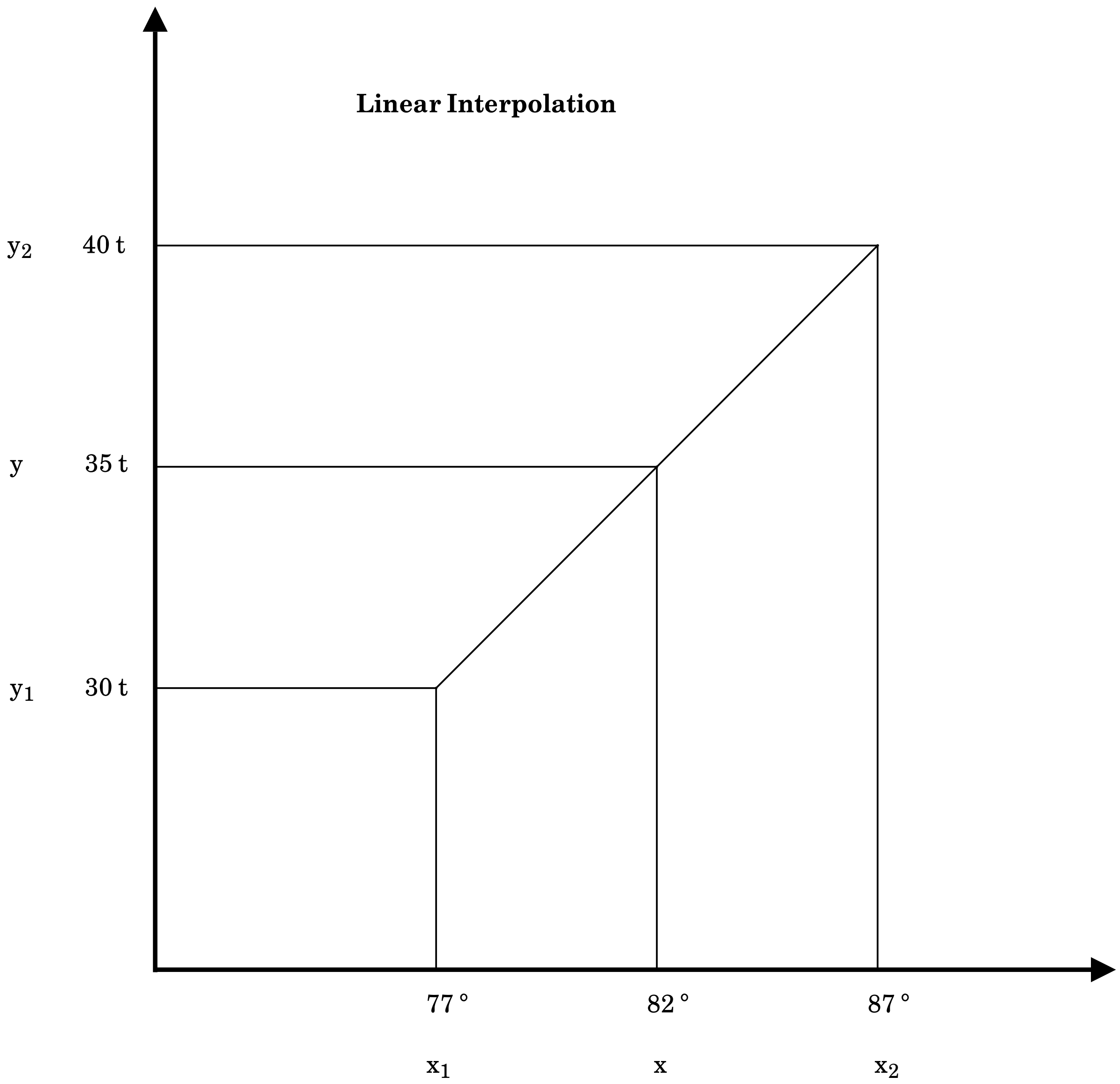
Monitored sensor (transmitters) are :
- Pull test brackets
- Pressure sensor
- Angle sensor

"SHORT HORN" on monitor 1
Error messages, which have no error number and which do not cause shut off of a crane movement through the LICCON safe load indicator system as also reported as an acoustical signal "SHORT HORN" in addition to the optical indication. "SHORT HORN" is a 0.1 second long sound, which is repeated in 2 second intervals.

Monitored errors are:
- Prewarning threshold of test point 1 - Operational maximum force is reached (="CAUTION" at 90%)
- Prewarning threshold of test point 1 - Minimum force is reached (="CAUTION" at about 15 t above F1min)

Priority and "Horn off " on monitor 1
The alarm "HORN" has a higher priority as the "SHORT HORN" alarm, which means "HORN" supersedes the "SHORT HORN ".

The "HORN" as well as the "SHORT HORN" can be turned off on monitor 1 via the function key $F8_1$, they are reactivated if another error occurs.


Linear Interpolation
y2 40 t
y 35 t
y1 30 t
77 °
82 °
87 °
x1
x
x2

6.2 Load capacity chart access procedure

6.2.1 General

The radius access is the simplest access procedure for simple boom configurations. For complex configurations, such as luffing lattice jib, there is not a separate load capacity chart column for every crane condition, but there are only load capacity chart columns for defined nominal positions. So that the crane operator can also work between these nominal positions, complex load capacity chart access procedures are available, where the current load capacity for the current condition is calculated from the load capacity chart values of the load capacity column for the neighboring nominal positions (for example through linear interpolation) .

6.2.1.1 Radius access

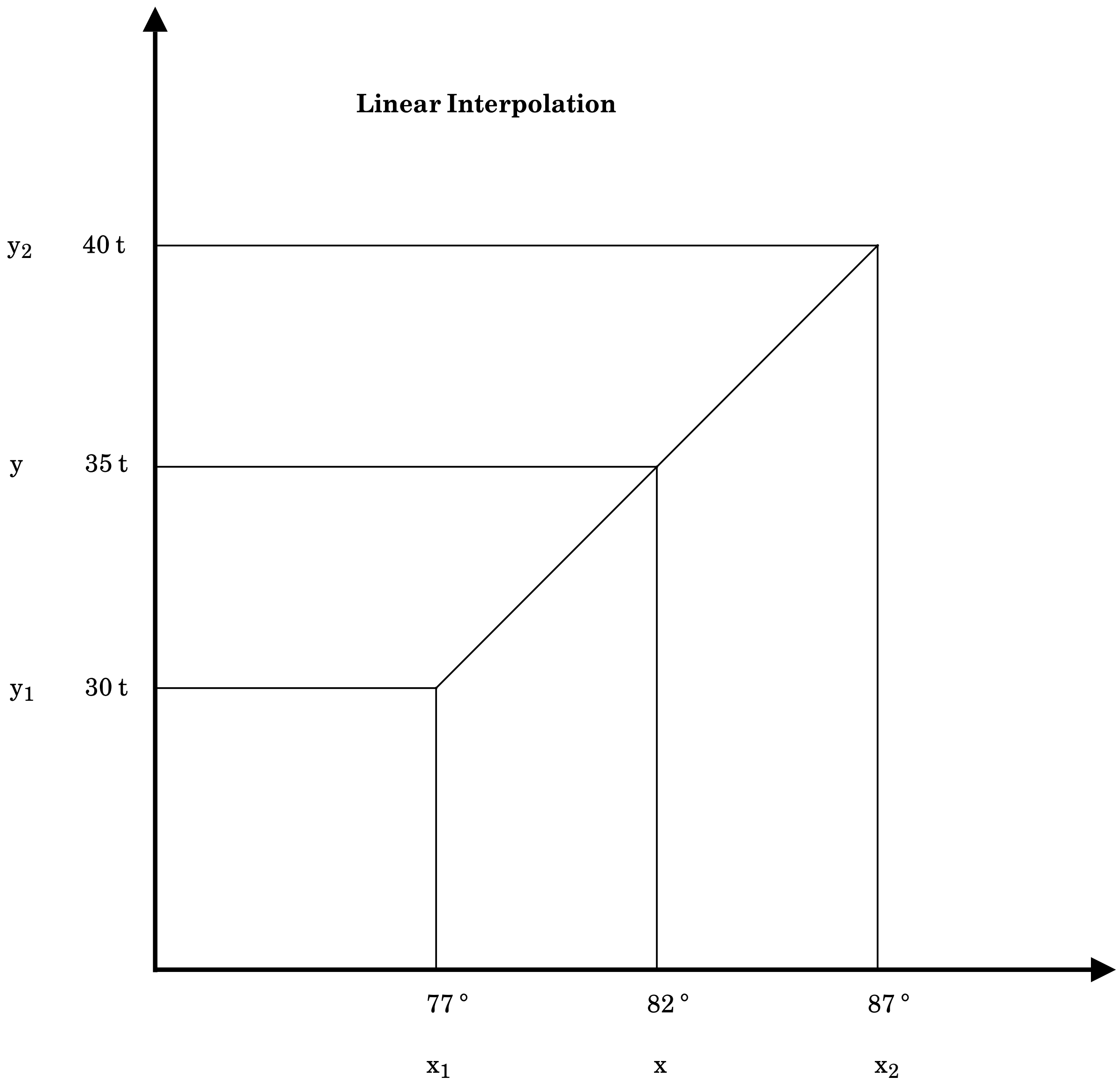
The radius access is valid for all operating modes with main boom, without luffing lattice jib and derrick ballast. One accesses the valid chart for the adjusted equipment configuration with the current radius and obtains the load capacity value.

6.2.1.2 Linear interpolation

Linear interpolation means that in the intermediate range between 2 support points x_1 and x_2 the result value y transfers linearly from the result value y_1 to the result value y_2 . (See also graphic view on the left).

The formula is as follows:

$$y = y_1 + \frac{(x - x_1)}{(x_2 - x_1)} \times (y_2 - y_1)$$


Linear Interpolation
y_2 40 t
y 35 t
y_1 30 t
77 °
82 °
87 °
x_1
x
x_2

6.2.2 Main boom angle interpolation

Note: The main boom angle interpolation is available only for operating modes with main boom and luffing lattice jib.

For operating modes with main boom and luffing lattice jib, only the load capacity charts for certain main boom nominal angles (such as 87°, 77°, 67°) are stored in the crane. With the interpolation procedure, the load capacities for the boom angles in between can be calculated from these load chart values.
The load capacity is calculated through linear interpolation via the main boom angle. However, access to the load capacity chart columns with the various main boom nominal angles (such as 77° and 87°) is made at various radii, which result if the main boom is being turned with the luffing lattice jib from the current main boom angle, such as 82° to the main boom nominal angle (77° and 87°) .

6.2.2.1 Calculation example 1

Wanted:
Current load carrying capacity =?
at:
Main boom angle = 82°
Luffing lattice jib angle = 42°

Given according to load capacity chart:

1. Main boom angle = 87°, luffing lattice jib angle = 47°
   ⇒ max. load carrying capacity = 40 t

2. Main boom angle = 77°, luffing lattice jib angle = 37°
   ⇒ max. load carrying capacity = 30 t

Formula:

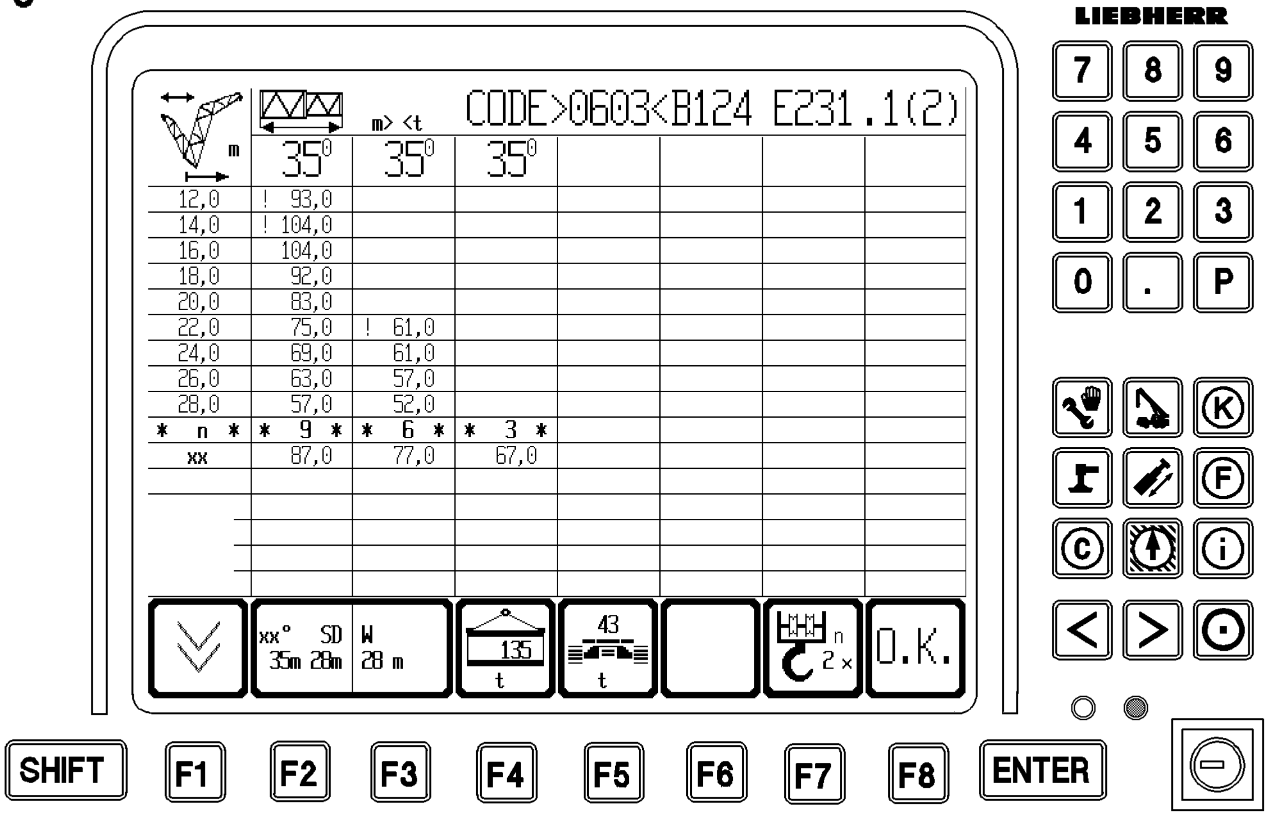
$$y = y_1 + \frac{(x - x_1)}{(x_2 - x_1)} \times (y_2 - y_1)$$

Calculation:

$$\text{Current load carrying capacity} = 30\text{ t} + \frac{(82° - 77°)}{(87° - 77°)} \times (40\text{ t} - 30\text{ t}) = \mathbf{35\text{ t}}$$

Result:
The current load carrying capacity at a main boomangle of 82° and a luffing jib angle of 42° = **35 t**.

0


LIEBHERR
CODE>0603<B124 E231.1(2)
m> <t
35⁰ 35⁰ 35⁰
m
12,0 ! 93,0
14,0 ! 104,0
16,0 104,0
18,0 92,0
20,0 83,0
22,0 75,0 ! 61,0
24,0 69,0 61,0
26,0 63,0 57,0
28,0 57,0 52,0
* n * * 9 * * 6 * * 3 *
xx 87,0 77,0 67,0
xx° SD
35m 28m
W
28 m
135
t
43
t
n
2 ×
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

189166

6.2.2.2 Calculation example 2

Wanted:

Current load carrying capacity = ?
at:
Main boom angle = 80°
Luffing lattice jib angle = 40°

Given according to load capacity chart:

1. Main boom angle = 87°, luffing lattice jib angle = 47°
   ⇒ max. load carrying capacity = 40 t

2. Main boom angle = 77°, luffing lattice jib angle = 37°
   ⇒ max. load carrying capacity = 30 t

Formula:

$$y = y_1 + \frac{(x - x_1)}{(x_2 - x_1)} \times (y_2 - y_1)$$

Calculation:

$$\text{Current load carrying capacity} = 30\,t + \frac{(80° - 77°)}{(87° - 77°)} \times (40\,t - 30\,t) = \mathbf{33\,t}$$

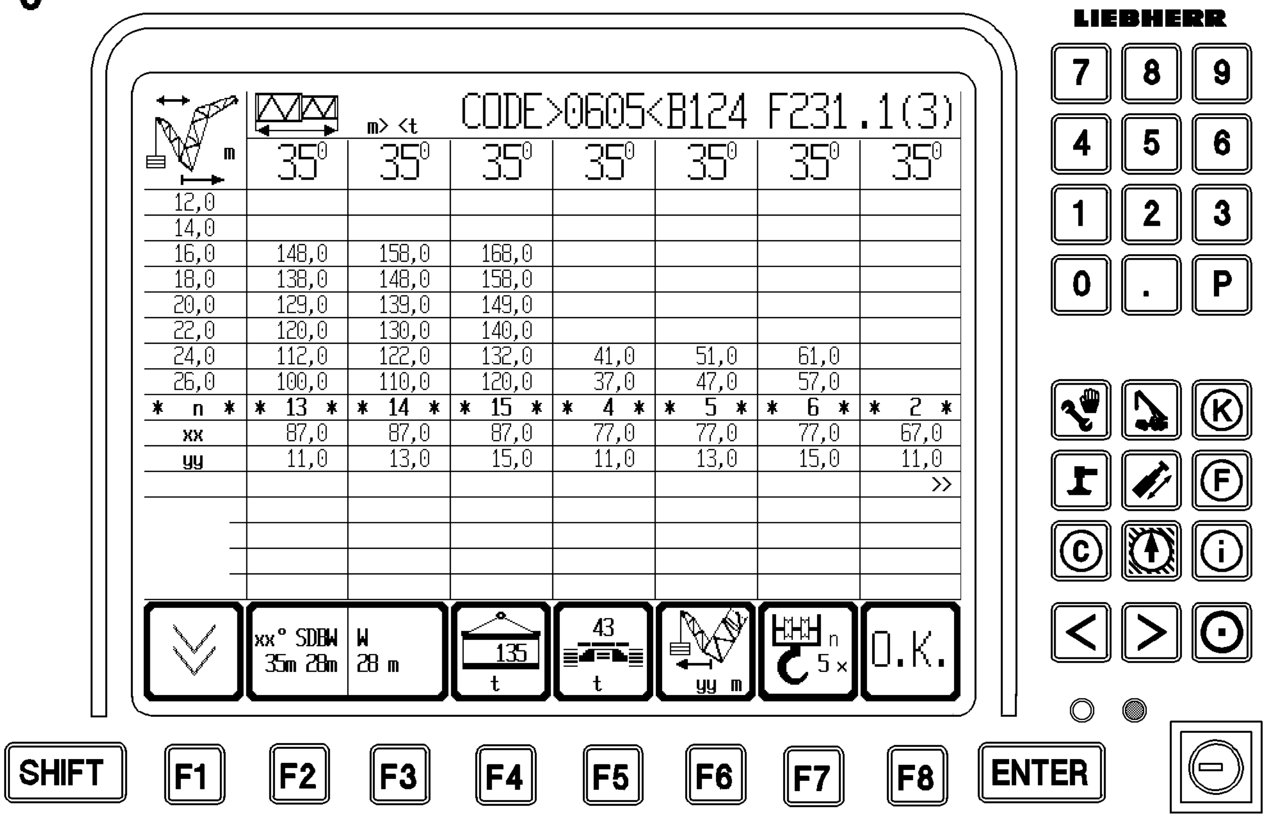
Result:

The current load carrying capacity at a main boom angle of 80° and a luffing jib angle of 40° = **33 t**.

Note: These calculations cannot be simply made by hand. The calculation of the maximum load carrying capacity and the required derrick ballast can only be made with the aid of the Crane work planer program.

D A N G E R: **The crane operator may only lift a load with main boom angles between the given main boom nominal angles (such as 77° and 87°) if he has determined before with the Crane work planer program that the crane can even lift the load at this point.
If a work planer program is not available, then the may only lift loads in the main boom nominal positions (such as 77°) and he may only lift loads, which are noted for this main boom nominal angle.**

0



m> <t CODE>0605<B124 F231.1(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 5 ×
O.K.
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

189165

6.2.3 Derrick ballast radius interpolation

Note: Derrick ballast radius interpolation is available only for operating modes with derrick ballast without luffing lattice jib.

The load capacity and the test point 1-operation max. force is interpoled linearly via the derrick ballast radius, which means at a derrick ballast radius of 12 m, the exact mid-value of the values given for 11 m and 13 m derrick ballast trailer radius is valid for the maximum load carrying capacity.

Calculation example
Wanted:
Current load carrying capacity = ?
Test point 1 operation max. force = ?
at:
Derrick ballast radius = 12 m

Given according to load capacity chart:

1. At derrick ballast radius = 11 m
   ⇒ max. load carrying capacity = 30 t
   ⇒ Test point 1 -operation max. force = 130 t

2. At derrick ballast radius = 13 m
   ⇒ max. load carrying capacity = 40 t
   ⇒ Test point 1 -operation max. force = 140 t

Formula:

$$y = y_1 + \frac{(x - x_1)}{(x_2 - x_1)} \times (y_2 - y_1)$$

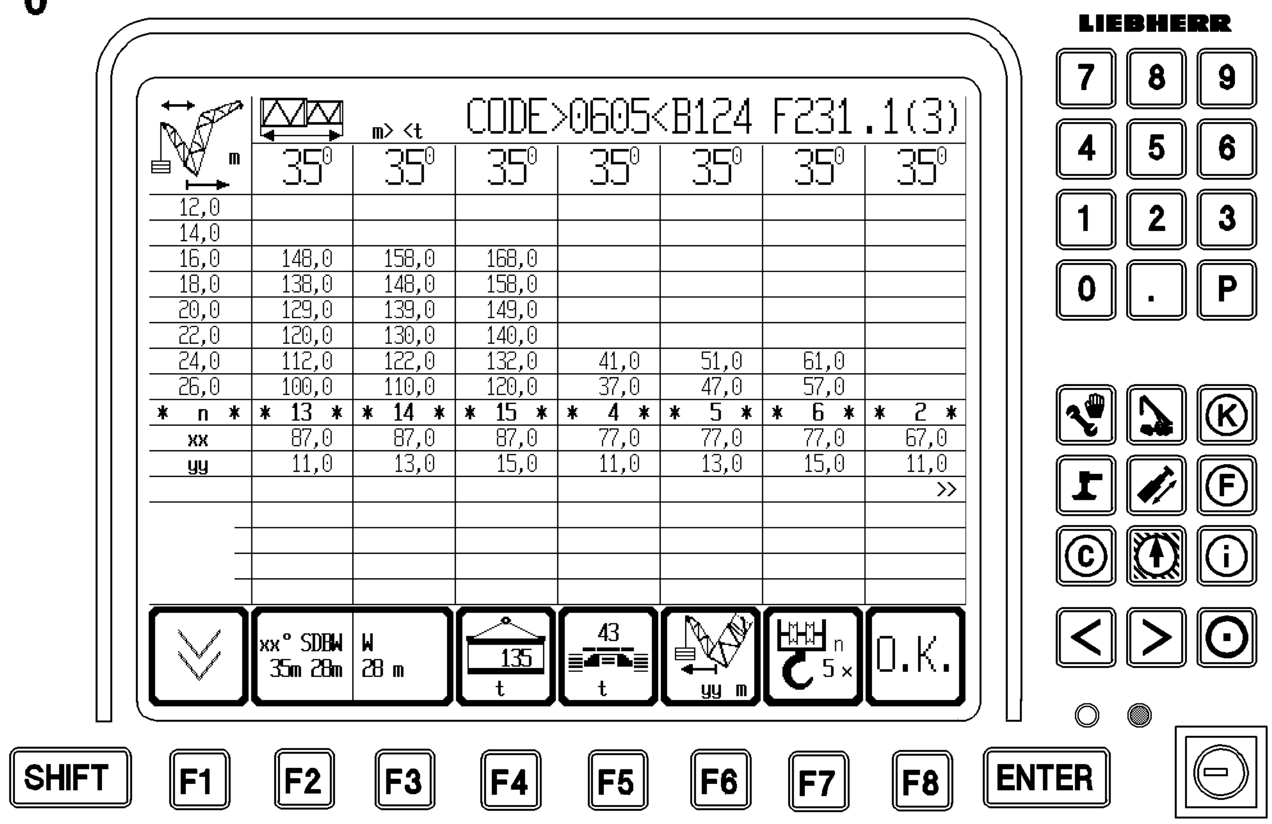
Calculation:

$$\text{Current load carrying capacity} = 30\ \text{t} + \frac{(12\ \text{m} - 11\ \text{m})}{(13\ \text{m} - 11\ \text{m})} \times (40\ \text{t} - 30\ \text{t}) = \mathbf{35\ t}$$

$$\text{Test point 1 -operation max. force} = 130\ \text{t} + \frac{(12\ \text{m} - 11\ \text{m})}{(13\ \text{m} - 11\ \text{m})} \times (140\ \text{t} - 130\ \text{t}) = \mathbf{135\ t}$$

Result:
The current load carrying capacity at a derrick ballast radius of 12 m = **35 t** and the test point 1 operation max. force **135 t**.

0


LIEBHERR
m> <t
CODE>0605<B124 F231.1(3)
m
35⁰ 35⁰ 35⁰ 35⁰ 35⁰ 35⁰ 35⁰
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

189165

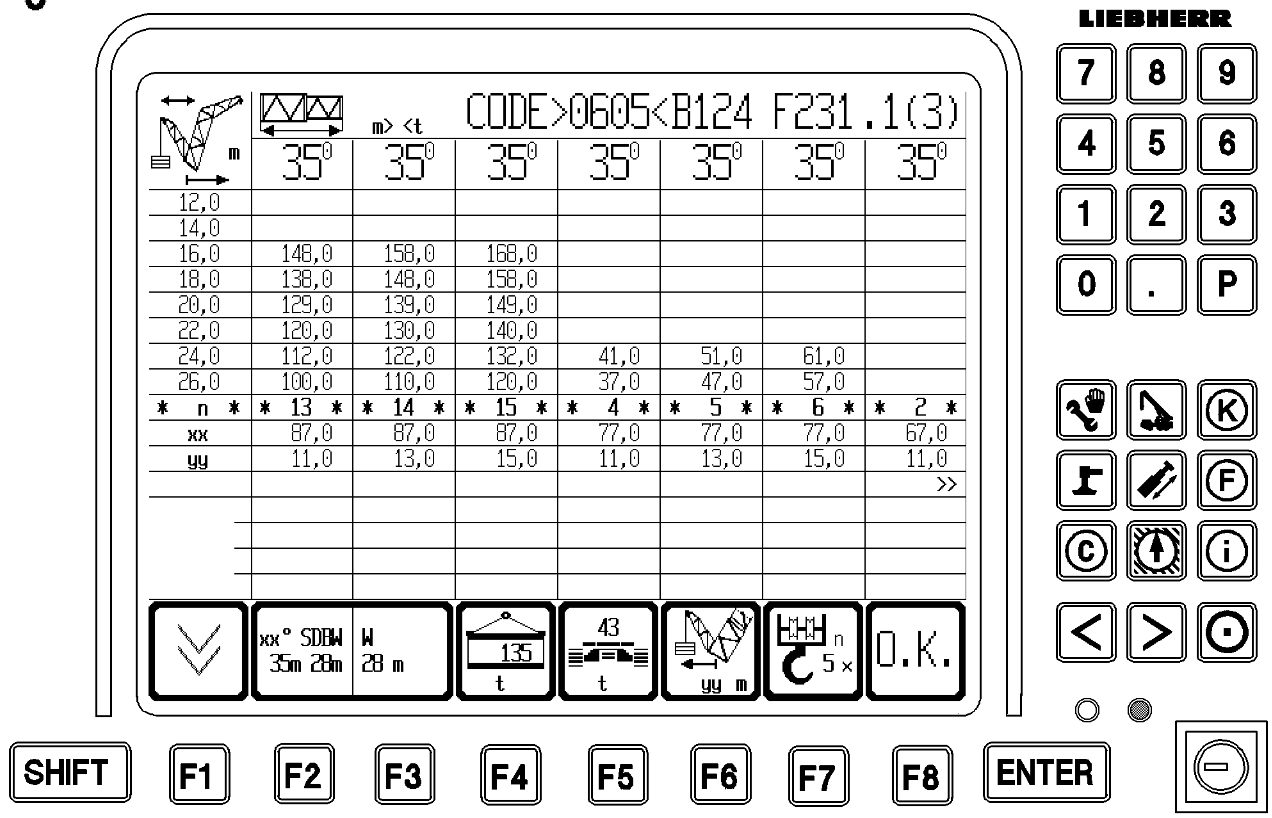
6.2.3 Derrick ballast radius interpolation, continuation

Note: For a simple estimation, it can be said, that for the range between 2 derrick ballast radii (for example between 11 m and 13 m), always the smaller load capacity value and the smaller test point 1- operation -max- force of the two derrick ballast nominal radii is valid.

D A N G E R: **With derrick ballast radii between the given derrick ballast nominal radii (for example 11 m and 13 m), the crane operator may lift a load only if he has checked before with the Crane work planer program or by hand through a simple calculation that the crane can even lift this load in this position.**

Note: The calculation for the required derrick ballast for a load capacity value can only be made with the work planer. If the current derrick ballast (for example: 12 m) is between 2 derrick ballast nominal radii, then the required derrick ballasts for the two next derrick ballast nominal radii (for example: 11 m and 13 m) must be determined. The required derrick ballast for the current derrick ballast radius (for example: 12 m) is obtained through linear interpolation via the derrick ballast radius from the derrick ballast values in the derrick ballast nominal radius positions (for example: 11 m and 13 m). This means, for a derrick ballast radius of 12 m, exactly the mid- value from the corresponding ballast values for 11 m and 13 m derrick ballast radius is valid as the required derrick ballast.

0


LIEBHERR
CODE>0605<B124 F231.1(3)
m> <t
m
35⁰ 35⁰ 35⁰ 35⁰ 35⁰ 35⁰ 35⁰
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 ×
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

189165

6.2.4 Combination of main boom angle and derrick ballast radius interpolation

Note: There is a combination of main boom angle and derrick ballast radius interpolation only for operating modes with derrick ballast and jib / luffing jib attachment.
In addition to this paragraph, also observe paragraph 6.2.2 main boom angle interpolation and paragraph 6.2.3, derrick ballast radius interpolation.

This access procedure for operating modes with jib or luffing jib and derrick ballast is based on a derrick ballast radius interpolation (for example for: 11 m and 13 m) of load carrying capacity and test point 1 - operation -max. force for each main boom nominal angle (for example: 77° and 87°) and a main boom angle interpolation for - for example 82° - from the results.

Calculation example:
Wanted:
Current load carrying capacity =?
Test point 1 operation max. force =?
at:
Main boom angle = 82°
Luffing jib angle = 42°
Derrick ballast radius = 12 m.

Given according to load capacity chart:

1. Main boom angle = 87°, luffing jib angle = 47°, derrick ballast radius = 11 m
   ⇒ max. load carrying capacity = 40 t
   ⇒ Test point 1 -operation max. force = 140 t

2. Main boom angle = 87°, luffing jib angle = 47°, derrick ballast radius = 13 m
   ⇒ max. load carrying capacity = 50 t
   ⇒ Test point 1 -operation max. force = 150 t

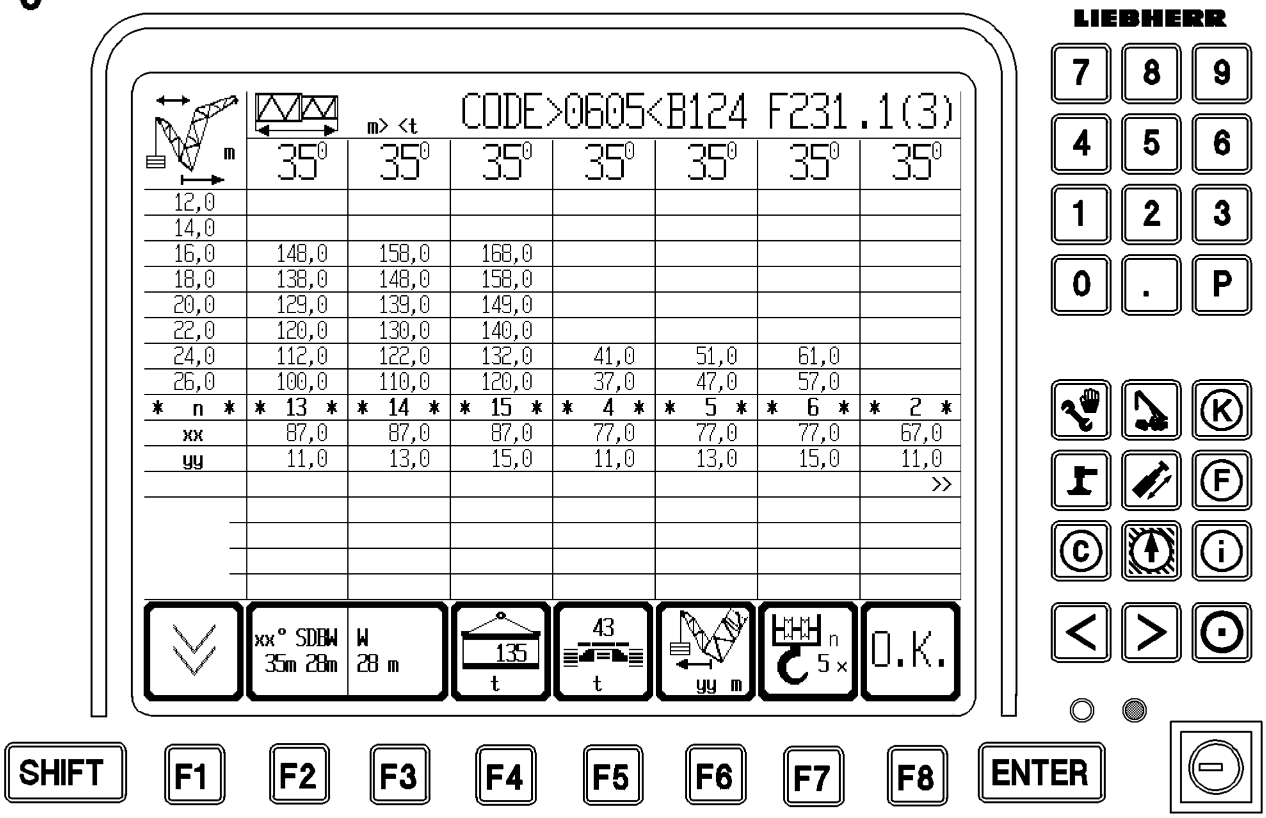
3. Main boom angle = 77°, luffing jib angle = 37°, derrick ballast radius = 11 m
   ⇒ max. load carrying capacity = 20 t
   ⇒ Test point 1 -operation max. force = 120 t

3. Main boom angle = 77°, luffing jib angle = 37°, derrick ballast radius = 13 m
   ⇒ max. load carrying capacity = 30 t
   ⇒ Test point 1 -operation max. force = 130 t

Intermediate result with derrick ballast radius interpolation
Intermediate result from 1. and 2.
⇒ Main boom = 87°
⇒ Luffing jib angle = 47°
⇒ Derrick ballast radius = 12 m
⇒ max. load carrying capacity = 45 t
⇒ Test point 1 - operation max. force = 145 t

Intermediate result from 3. and 4.
⇒ Main boom = 77°
⇒ Luffing jib angle = 37°
⇒ Derrick ballast radius = 12 m
⇒ max. load carrying capacity = 25 t
⇒ Test point 1 - operation max. force = 125 t

0


LIEBHERR
m> <t
CODE>0605<B124 F231.1(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 5 ×
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

189165

6.2.4 Combination of main boom angle and derrick ballast radius interpolation, continuation

End result with main boom angle interpolation

End result from 1. + 2. + 3. + 4.

⇒ Main boom = 82°
⇒ Luffing jib angle = 42°
⇒ Derrick ballast radius = 12 m
⇒ Load carrying capacity = **35 t**
⇒ Test point 1 - operation max. force = **135 t**

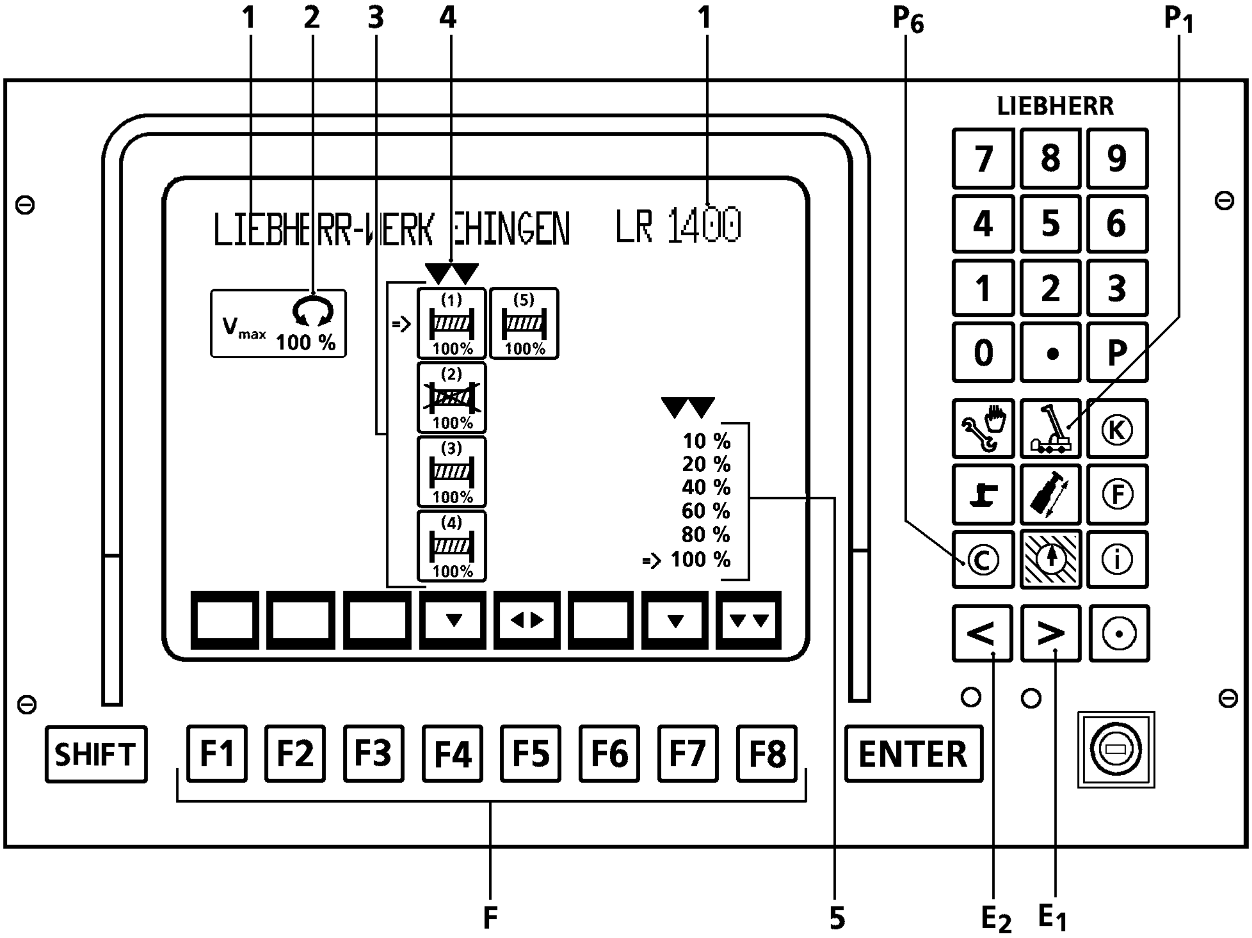
Result:
The current load carrying capacity is **35 t** and the Test point 1 - operation max. force is **135 t**, at a main boom angle of 82° and a luffing jib angle of 42° as well as a derrick ballast radius of 12 m.

Note: This calculation cannot simply be made by hand as in paragraph 6.2.2 Main boom angle interpolation .

For a simple estimation, it can be said, that for the range between 2 derrick ballast radii (for example between 11 m and 13 m), always the smaller load capacity value and the smaller test point 1 -operation - max.-force of the two derrick ballast nominal radii is valid.

D A N G E R: **The crane operator may only lift a load with main boom angles between the given main boom nominal angles (such as 77° and 87°) if he has determined before with the Crane work planer program that the crane can even lift the load at this point.**
If a work planer program is not available, then the may only lift loads in the main boom nominal positions (such as 77°) and he may only lift loads, which are noted for this main boom nominal angle.
The crane operator may only lift a load with derrick ballast radii between the given derrick ballast radii (such as 11 m and 13 m) if he has determined before with the Crane work planer program that the crane can even lift the load in this position.

Note: The calculation for the required derrick ballast for a load capacity value can only be made with the work planer.
For the derrick ballast radii between the derrick ballast nominal radii , the calculation can be made by hand as noted in paragraph 6.2.3 Derrick ballast radius interpolation.


1
2
3
4
1
P6
P1
LIEBHERR-WERK EHINGEN LR 1400
Vmax 100 %
(1) 100%
(5) 100%
(2) 100%
(3) 100%
(4) 100%
10 %
20 %
40 %
60 %
80 %
=> 100 %
LIEBHERR
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
F
5
E2
E1

189163

8. The ”CONTROL” program

The ”CONTROL” program makes it possible to set the maximum slewing, speed and to turn off (=deactivate) the cable winches, which are not necessary for the current operation and to turn the required winches on again (=activate).
The program can be started on the monitor 0 with program key P6 (C key) .

Note: During the ”CONTROL” program, installation and bypass switches are monitored. If one of these switches is actuated, the system returns immediately to the ”OPERATION” program. Change the percentage values (%) only if the manual control lever is in ”O” position.

D A N G E R: Do not change the slewing, speed or lock the winches if any movement is activated!

8.1 Monitor sectioning

In the ”CONTROL” program, the monitor is divided into 5 sections:

1 Headline (top)
- LIEBHERR lettering
- Crane type

2 Symbol ”v $_{max.}$” = maximum slewing speed
The value shown in the symbol for the current "maximum slewing speed" is shown also in the “slewing range “ symbol in the ”OPERATION” program on the monitor 0.

3 Cable winch symbols with adjustment arrow "=>"

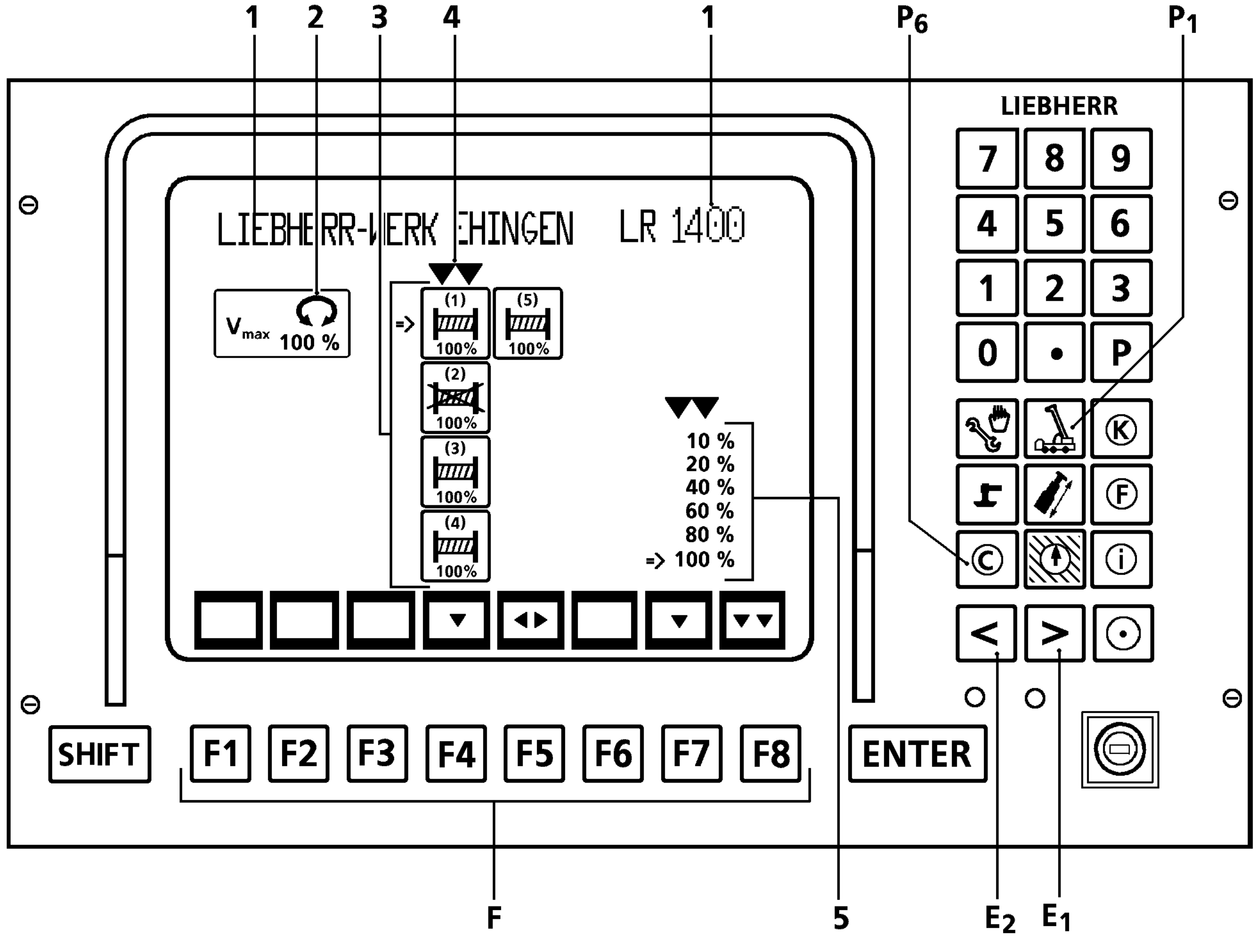
Symbol "Winch not crossed out" means:	Winch is turned on (activated)
Symbol "Winch crossed out" means:	Winch is turned off (deactivated)
The percentage value (%) shown in the symbol :	maximum winch speed

4 Double arrow to mark the function, which is to be actuated.

5 Value field and adjustment arrow "=>"
- The percentage values designate the speed at maximum deflection of the manual control lever, in relation to the maximum obtainable drive speed (at speed preselection 100%).

Function key bar with corresponding symbols
- F1, F2, F3 and F6 have no function
- F4: Move the cursor "=>" from one cable winch symbol to the next
- F5: Turn the chosen cable winch on or off with the cursor "=>"
- F7: Move the cursor "=>" from one speed stage (%-value) to the next
- F8: Function key = END (return to the ”OPERATION” program).
  The previously speed adjustment, which had been confirmed with "ENTER" is taken over.

E Special function keys
- E1) moves the double arrow (4) from right to left to the symbol of the function, which is to be actuated
- E2) moves the double arrow (4) from left to right to the symbol of the function, which is to be actuated.


1
2
3
4
1
P_6
P_1
LIEBHERR
LIEBHERR-WERK EHINGEN LR 1400
V_{max} 100 %
(1) 100%
(5) 100%
(2) 100%
(3) 100%
(4) 100%
10 %
20 %
40 %
60 %
80 %
=> 100 %
7 8 9
4 5 6
1 2 3
0 • P
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
F
5
E_2
E_1

189163

8.2 Change maximum slewing speed

Push E1 or E2 to move the double arrow (4) to the next symbol to be changed.
Pushing function key F7 moves the arrow to the next percentage value, when the arrow has reached the last value, it returns to the first value.
Push the ”ENTER” key to confirm the displayed percentage value, and to take it over .
Push the function key F8 or the program key P1 to return to the crane operation view. The previous speed setting, which had been confirmed with ”ENTER” is taken over .

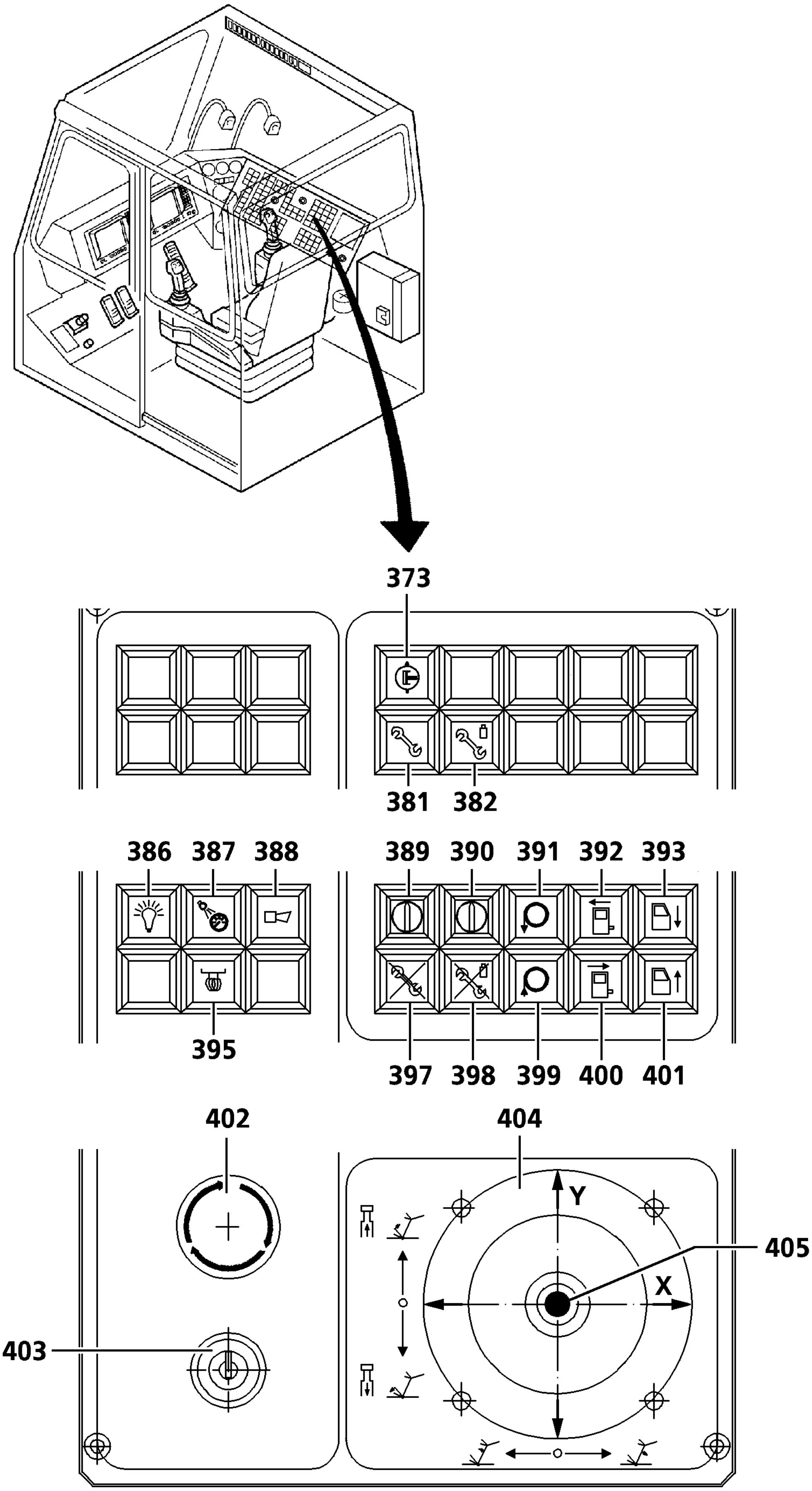
D A N G E R: The maximum permissible slewing speeds are noted in percentage value in the load chart manual. These values, depending on boom length and operating mode, MAY NOT BE EXCEEDED during crane operation!

8.3 Turn the cable winches on / off (= activate and deactivate)

The cable winches can be turned off in the ”CONTROL” program, so that it is not possible to accidentally activate a cable winch by inadvertently moving the manual control lever.
Push the special function keys E1 or E2 to move the double arrow (4) over the winch symbol (3).
Push function key F4 to move the arrow from one cable winch symbol to the next and select this winch.
Push the function key F5 to turn the selected, activated cable winch off.
The winch symbol view changes to ”cable winch crossed out”. The selected turned off cable winch can also be turned on again by pushing the F5 function key. The winch symbol view changes to ”cable winch not crossed out”.

8.4 Change maximum winch speed

- Select symbol element group "Winches" (3) with "E1" or "E2" keys.
  A double arrow (4) appears above the symbol element group.
- Selection of symbol element for corresponding winch via the "F4" key,
  a double arrow (=>) points to the selected winch.
- Select maximum winch speed in percentages [%] with the "F7" key,
  a double arrow (=>) points to the selected percentage value.
- Confirm the selected maximum winch speed with the "ENTER" key.
- Taken over.


373
381
382
386
387
388
389
390
391
392
393
395
397
398
399
400
401
402
404
405
Y
X
403

186328

Crane cab adjustment

1. **From transport to operating position**
   During transport, the cab is swung to the front of the slewing platform.
   Push button (392) and swing the cab into its operating position.
   Push button (401) and tilt the cab to the desired position.

2. **From operating to transport position**
   Pusch button (393) and set cab to the horizontal position.
   Push (400) and swing in cab completely

C A U T I O N: **Before swinging in the cab take off the central ballast. Otherwise there is a danger of collision.**

Prechecks before starting up
Before moving off, the following prechecks must be carried out:

Note: For a more detailed description of the following prechecks, see Chapter 7.05, NOTES ON MAINTENANCE.

Check the filter and oil level
- oil level of the diesel engine
- oil level of the hydraulic reservoir for the crane hydraulics
- filter on the hydraulic reservoir

Check the fuel level
Check the fuel level on the fuel gauge in the cab.

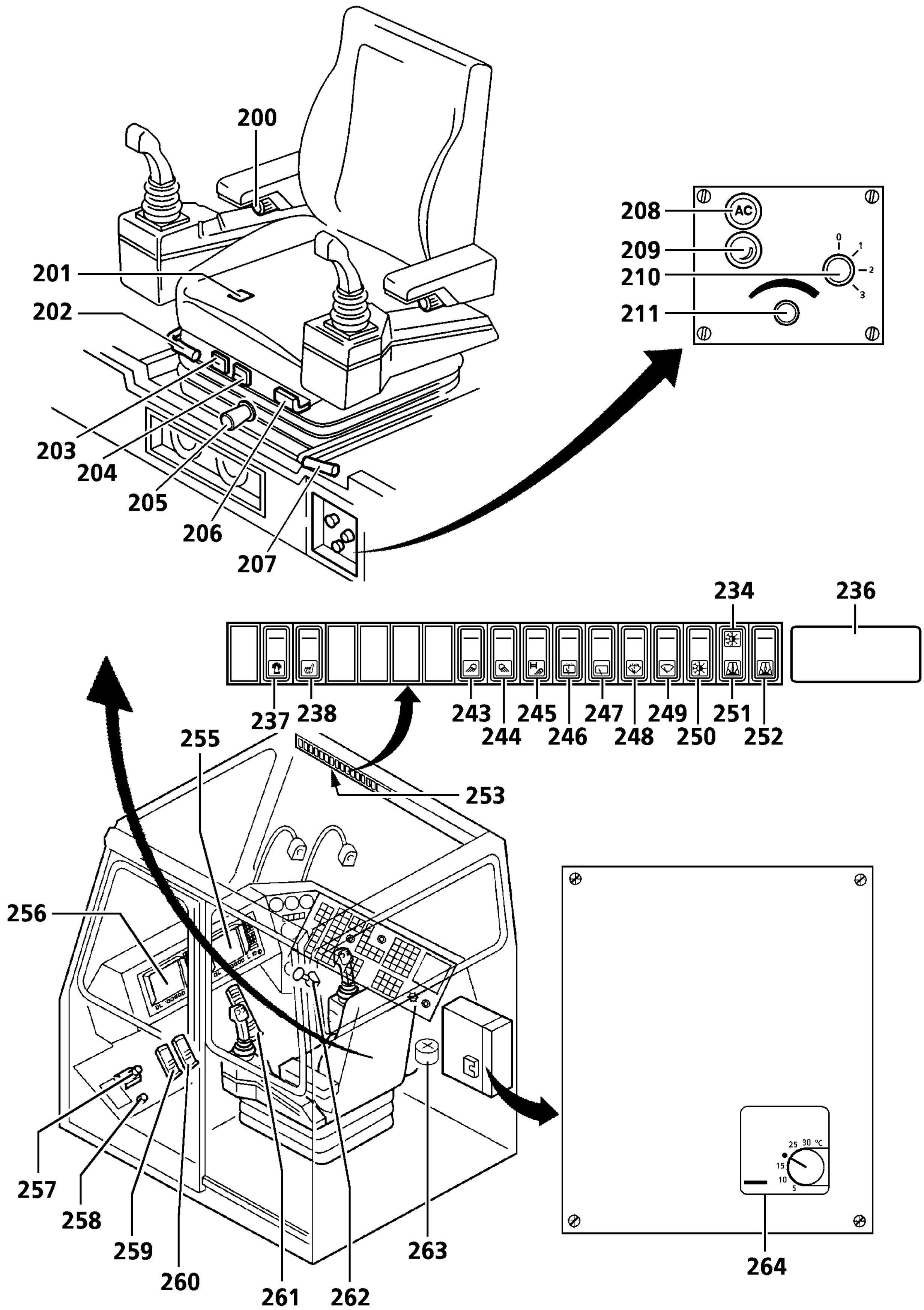
Check the coolant level
The coolant must be filled to the rim on the filling nozzles.

D A N G E R: **NEVER check the coolant level if the engine is still warm.
To check it, the engine must be cold, otherwise there is the danger of serious skin burns.**

Checking the general condition of the crane
Before starting up the crane, the operator must ensure that the following conditions are fulfilled:

- The crane is horizontally aligned.
- The toothed gear of the slewing ring must be clean and greased.
- Air inlets in oil and coolant radiator must be unobstructed.
- All cowlings and covers on the sides must be closed and locked.
- There are no persons or objects within the slewing range of the crane.
- Cable and rope spool as well as the limit switch must be free of snow and ice.
- There must be no loose objects on the slewing platform or on the boom.

D A N G E R: **Before operating the boom in any way, it must be ensured that there are no loose objects resting on it, such as pins, spring keepers or ice.
If this is not ensured, there is a danger of accidents due to these objects falling off and striking persons or other objects on the ground.**


200
201
202
203
204
205
206
207
208
AC
209
210
211
0
1
2
3
234
236
237
238
243
244
245
246
247
248
249
250
251
252
253
255
256
257
258
259
260
261
262
263
264
25
30
°C
15
10
5

186198

Adjust the seat
The pneumatically suspended driver's seat may be adjusted to any body size and weight.
- Adjustment of arm rest angle (200)
- Adjustment of the seat angle (202)
- Adjustment of seat back (206)
- Release for horizontal seat adjustment (207)
- Adjustment of back support in upper seat back (204)
- Adjustment of back support in lower seat back (203)
- Adjustment of bodyweight for seat suspension (205)

Heating/ventilation
The crane cab can be heated or ventilated according to the desired temperature.
The operating elements for heating/ventilation are found underneath the cab operator's seat.

Operation:

Ventilation	Switch change-over switch (209) to fresh-air mode. Switch on the blower with rotary switch (210).
Heating	See also chapter 6.01, HEATING Switch change-over switch (209) to recirculated-air mode. Switch on the blower with rotary switch (210). Cab temperature can be controlled with regulator (211).

Windshield wipers
The windshield wipers on the front windshield as well as on the roof window can be activated with switches (247, 249).
The windshield wipe/wash on the front windshield as well as on the roof window can be activated with switches (246, 248).

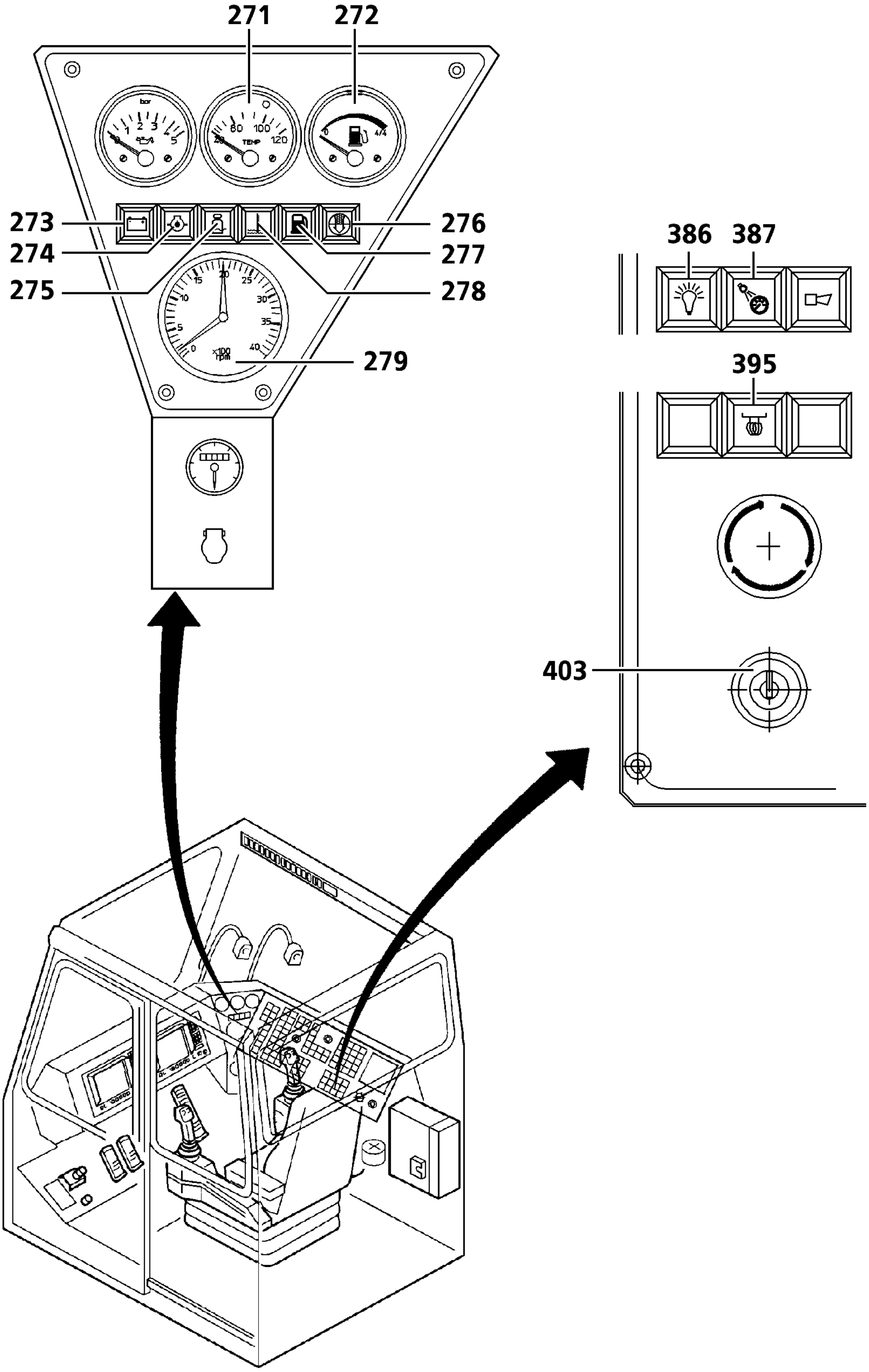
Front windshield
The front window may be opened by simply pushing it from the inside. Its travel is aided by a pair of nitrogen cylinders.
If the window only needs to be partially opened, it can be secured on the perforated belt to the desired angle.

D A N G E R: There is the danger of injuring the hands by closing them in the window.

Horn
Before beginning work, the horn must be tested with the foot switch (258).

D A N G E R: The horn should only be used in dangerous situations to ensure its effectiveness on all personnel working around the crane.

Lighting
The working spotlight on the cab roof are switched on with switch (244).
The working spotlight on the cab platform are switched on with switch (243).
The working spotlight for winches are switched on with switch (245).


271
272
273
274
275
276
277
278
279
386
387
395
403
185685

Switch on crane engine ignition - instrument check
Insert the key into the ignition (363), turn one notch clockwise.

The following indicator and warning lamps come on
- Charge indicator lamp (273)
- Engine oil pressure (274)
- Fuel level (277)

Note: The warning lamp (277) comes on if the fuel level in the tank is too low.

Coolant level (275)
Hinweis: Warning lamp (275) is on if the coolant level in the tank is too low.

Fuel level (277)
Hinweis: Warning lamp (277) is on if the fuel level in the tank is too low.

Fuel gauge(242)
The amount of fuel in the tank is displayed; refill when necessary.

C A U T I O N: **The crane must never be driven until the fuel tank is empty as residue and dirt can be ingested - if this happens, the fuel system must be cleaned and ventilated. Never drive until the fuel level warning lamp (277) comes on.**

Air filter (276)
The air filters are monitored electrically. If the air filter elements are contaminated, the corresponding warning lamp (276) comes on. In this case, clean or replace the filter elements.

Functional check of the indicator and warning lamps
When button (386) is pressed, all indicator and warning lamps must come on.

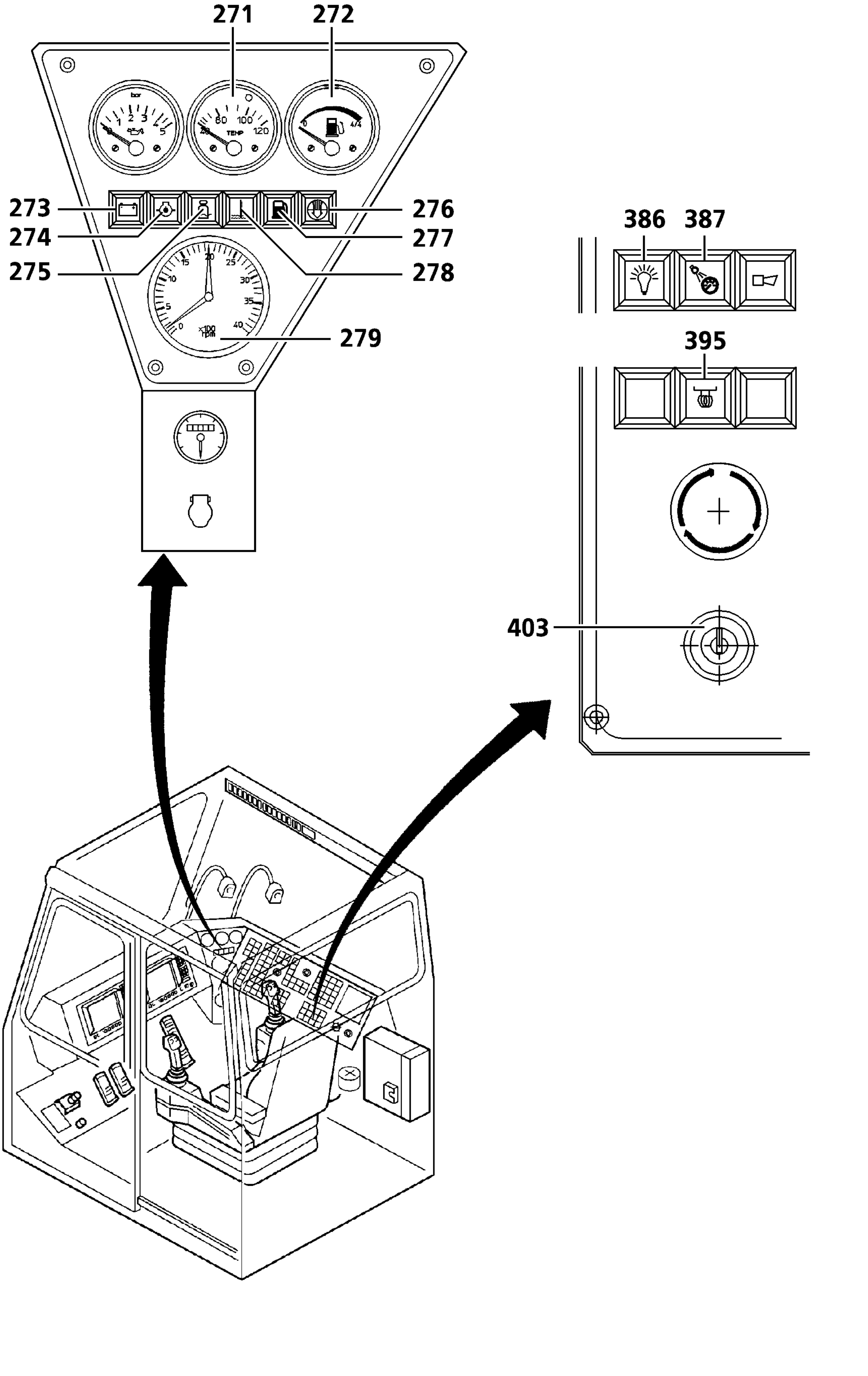
D A N G E R: **Defective lamps must be changed before beginning any work. If the crane is operated without functioning warning devices, accidents could result.**

Control panel lighting
The control panel lighting can be switched on and off with switch (387).

Start the engine
Continue to turn the ignition key clockwise and start the engine.

Note: Start the engine without using the accelerator.
If the engine fails to start after approx. 5 seconds, slowly press the accelerator all the way down.
If necessary, give up the starting attempt after approx. 20 seconds and wait approx. 1 minute before trying again.
The starter may not run more than 3 times at 20 seconds each time, and always wait 1 minute between each attempt.
If the engine is **warm**, start it without depressing the accelerator to avoid soot emissions.

C A U T I O N : **The crane engine may only be fully loaded after reaching the operating temperature.**


271
272
273
274
275
276
277
278
279
386
387
395
403
185685

Start the engine with integrated flame glow system
At a engine temperature of more than >20°C +/- 5° , the flame glow system is automatically turned off, and below < 20° +/- 5°, automatically turned on.

N o t e : If the indicator light (395) blinks very fast (appr. 1.2 Hz), then there is a problem in the flame glow system.

Indicator light (395) comes on, when engine temperature is below < 20° C and ignition is switched on.
The flame glow system is automatically turn on, when the current dependent preglow time starts, and the indicator light (395) comes on.

1. Preglow
The charge indicator light (273) must be on.

- Turn the ignition starter switch to position ”1” , the preglow time period starts, which is indicated by the indicator light (395), which is on.
  If the engine is being started during the preglow time, the preglow phase is automatically interrupted.
  In this case, return the ignition key to the stop and preglow again.

2. Start the crane engine
The starting readiness of about 30 seconds begins, when the indicator light (395) blinks slowly (appr. 0.8 Hz),.

C A U T I O N: The engine may only be started if
- the indicator light (395) flame glow system blinks.

- Turn the ignition starter switch to position ”2” and start the crane engine **by** pressing the gas pedal down.
  If the engine is **not** being started during the starting readiness period, the readiness period is automatically over.
  In this case, repeat point 1 and 2.

The engine is running - instrument check
The following indicator and warning lamps must go out when the engine is running:
- Charge indicator lamp (273).
- Engine oil pressure (274)

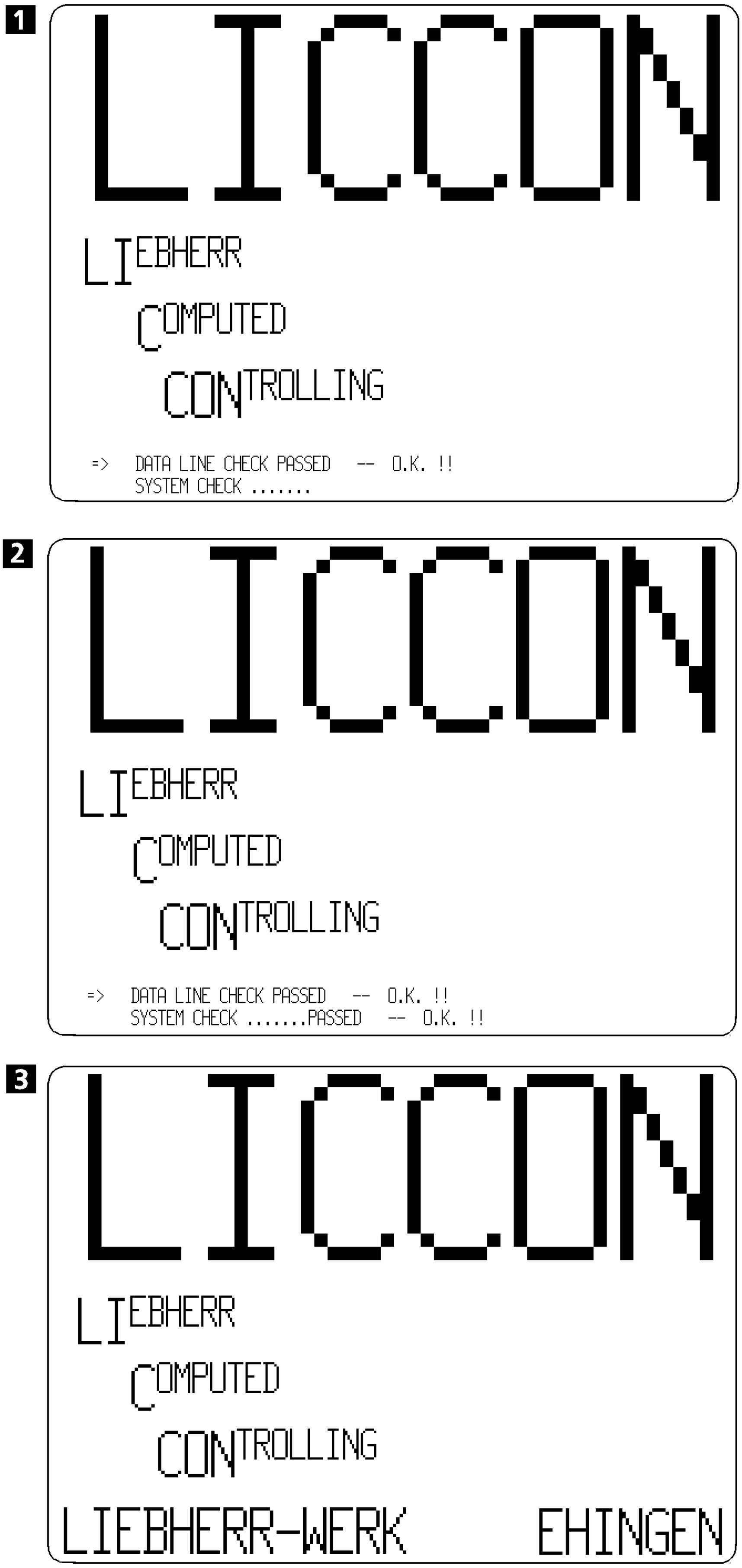
Observe the oil pressure warning lamp (274) immediately after starting the engine.

C A U T I O N: If this warning lamp does not go out, or if it comes on during crane operations, the engine must be immediately shut down as engine damage can result due to a lack of oil pressure.

Coolant temperature to high (278)
During crane operation, watch the warning light (278) for the engine coolant

Note: The warning light (278) turns on when the coolant temperature is to high.

C A U T I O N: if the warning light for the engine coolant lights up during crane operating, turn the engine off immediately.
If you do not turn the engine off, it will be severely damaged.
Turn the engine 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

186221

1. Control of the LICCON system during set up and starting the crane

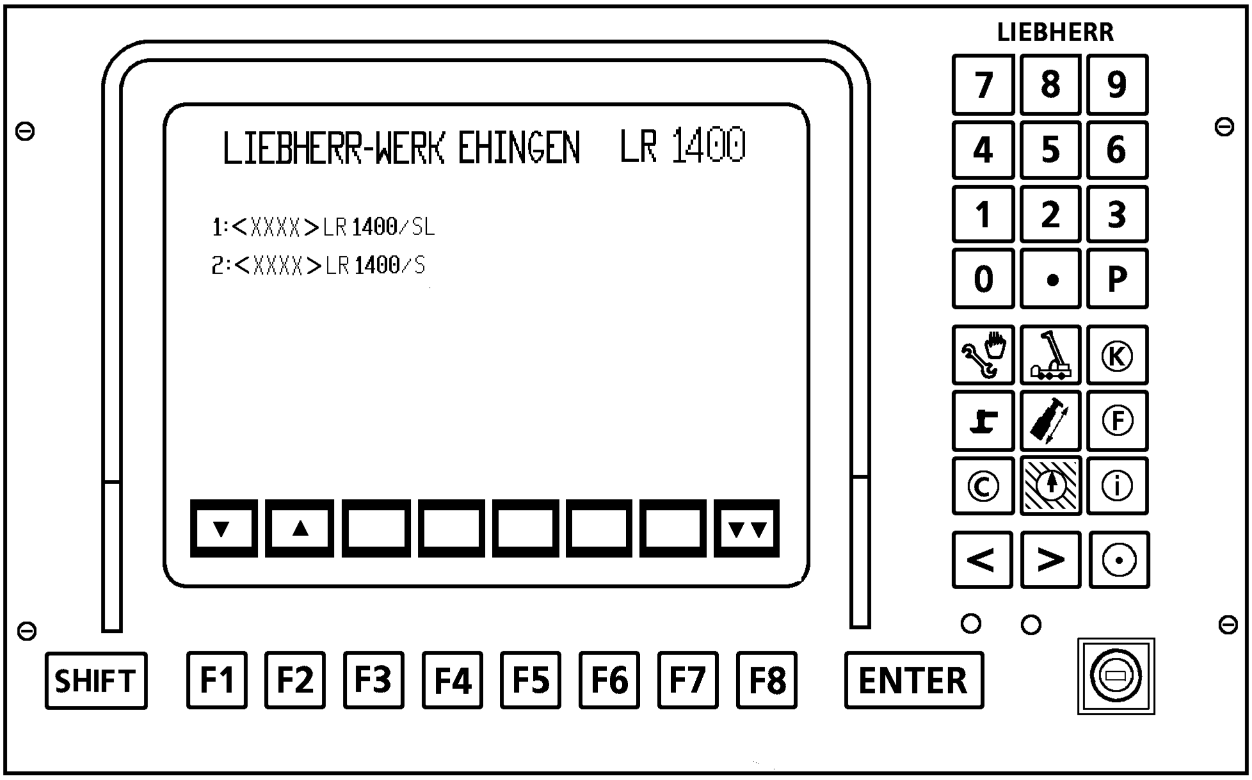
1.1 Booting the LICCON system up after turning it on (= boot phase)

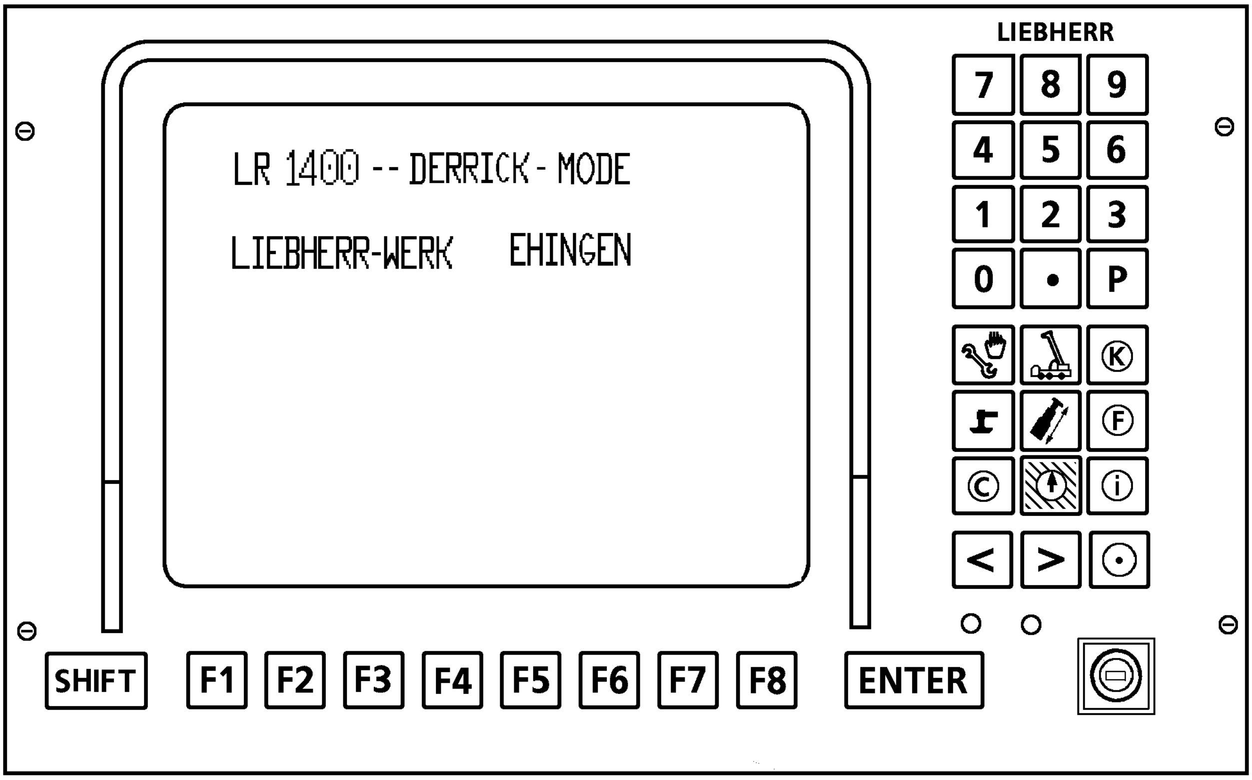
After turning it on, the LICCON system will run through a self check.

It first checks the connections from microprocessor central processing units (CPU) to the monitors 0 and 1 . If no error is found, then the monitor will show the message "Data Line Check Passed --OK!!" (fig. 1).

If no error has been found on the connection, all microprocessor central processing units (CPU's) will run through a system test . The sequence of this self check can be monitored on the 7 segment indicators of the central processing units. These indicators are described in detail in "Localizing and fixing system errors" .
If no error is found during the system test, the message "System Check Passed -- OK!!" (fig. 2) will appear for a short time on the monitor.

Then the initialization view will appear for a short time on the monitor "LIEBHERR-WERK EHINGEN" (fig. 3).


LIEBHERR
LIEBHERR-WERK EHINGEN LR 1400
1:<XXXX>LR 1400/SL
2:<XXXX>LR 1400/S
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
LR 1400 -- DERRICK - MODE
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

189139

1.1 Booting up the LICCON system (continuation)

When the starting procedure has been completed successfully, the view to preselect the operating mode (operating mode preselection view) will appear on the monitor.

Normally, the operating mode preselction group is shown on the operating mode preselection view which had been selected last, before the system had been turned off.

Only if there was a loss of data in the memory (cold start), then the first operating mode preselection group will be shown.

The crane operator must now make a preselection to determine the operating mode he wants to use for crane operation.
He can use the function key $F1_0$ (moving the cursor down) and F20 (moving the cursor upward) to select the operating mode preselction group which corresponds to the actual equipment configuration of the crane.

Pressing function key $F8_0$ or the "ENTER" key confirms this preselction.
After a few seconds, the **Equipment Configuration View** will appear on the monitor.

Note: If the crane operator does not change the operating mode preselection group within 3 seconds after the operating mode preselection view appears by pressing function key F10 or F20, then the LICCON system assumes that the previous operating mode group should remain set and Equipment Configuration View appears without any entry being made.
i. e. if the same previous operating mode group is to be selected, then nothing needs to be done, if another group is to be selected, the operator must make any change quickly after the view appears for preselection of the operating mode by pressing F10 or F20.

After successfully completing the starting procedure, cover picture will appear on monitor 1.

1.2 Setting a new operating mode when the crane engine is at not running

Initial condition: Engine is off

- **Start the crane engine**
  The LICCON boots up, runs through several self checks and shows various views on the monitor. As soon as the starting procedure has been completed successfully, the operating mode preselection view appears on the monitor 0.
  After successfully completing starting procedure, cover picture will appear on monitor 1.

- **Preselect the operating mode on monitor 0**
  With function key $F1_0$ (move cursor down) and $F2_0$ (move cursor up), select the operating mode preselection group which corresponds to the actual equipment configuration of the crane.
  Note: If the crane operator does not change the operating mode preselection group within approx. 3 seconds after the appearance of the operating mode preselection view by pushing function key $F1_0$ or $F2_0$, then the LICCON system assumes that the same operating mode group is to remain set and the **equipment configuration view** appears without any entry being made.
- Push function key $F8_0$ or the "ENTER" key to confirm this preselection.
  Now **the equipment configuration view** appears with the selection operating mode preselection group. If the equipment configuration from the same operating mode preselection group had been set before the LICCON was turned off, **then the same** equipment configuration group will reappear, i.e. the previous equipment configuration view and the previous reeving will appear automatically.

- **Setting the operating mode and equipment configuration on the monitor 0**
  The previously set and displayed operating mode can be changed two ways:

1. Adjustment with function keys:
   Push function key $F2_0$ until the desired main geometry condition is selected,
   Push function key $F3_0$ until the desired auxiliary equipment condition is selected,
   Push function key $F4_0$ until the desired slewing platform counterweight is selected,
   Push function key $F5_0$ until the desired central ballast is selected
   Push function key $F6_0$ until the desired derrick ballast radius is selected (only on cranes with variable derrick ballast radius),
   Confirm by pushing the "ENTER" key.

2. Adjustment with short code:
   Type in the 4-digit short code with the numerical keys on the alphanumeric keyboard (A) on the monitor,
   Confirm by pushing the "ENTER" key .

   Then you can view the data in the selected load capacity chart.

- Checking the selected load capacity chart
- Checking the selected reeving,

- **If required, set the current reeving number of the hoist cable**
  by pushing the function key $F7_0$ until the desired reeving has been selected.

- **Push the function key "$F8_0$" = "O.K."**, when the selected equipment configuration and the reeving has been checked.
  The "SET UP" program is finished and the adjusted parameters will be taken over into the new "OPERATION" program.

- Check that the **short code** and the **reeving**, which the crane operator intended to set is actually set in the **OPERATING VIEW** .

  For detailed description of the SETUP program, see chapter 4.02.

1.3 Setting a new operating mode, when the crane engine is running

Initial condition: the crane is running, the LICCON is in the **operating view.**

If the new operating mode belongs to another operating mode preselection group, then the crane must be turned off for selection and the system must be rebooted (see initial condition: Engine off, paragraph 1.2). If the new operating mode is part of the selected operating mode preselection group, but the operating mode, the equipment configuration and the reeving are to be changed, then the following adjustments must be made on the monitor:

- **Push program key P_0** to start the **"set up "** program.
- If the operating mode and the equipment configuration are to be changed :
  To set the operating mode and equipment configuration with function keys or with short code push the "ENTER" key.
  Then the data in the selected load capacity chart can be views.
  Check the selected load capacity chart.

- If the reeving is to be changed:
  Set the reeving number for the hoist cable by pushing the function key $F7_0$ until the selected reeving has been selected.
- **Push the function key "F8" = "O.K."**, when the selected equipment configuration and the reeving has been checked.
  The "SET UP" program is completed and the set parameters are taken over into the new ”OPERATION’ program.
  Check that the correct short code and the correct reeving have been set in the **Operating view**.
  For detailed description of the ”**SET UP** “ program, see chapter 4.02.

1.4 Setting the previous operating mode, when the crane engine is not running

Initial condition: engine is off

- **Start the crane engine**
  The LICCON boots up, runs through several self checks and shows various views on monitor 0. The previous operating mode preselection group is selected.

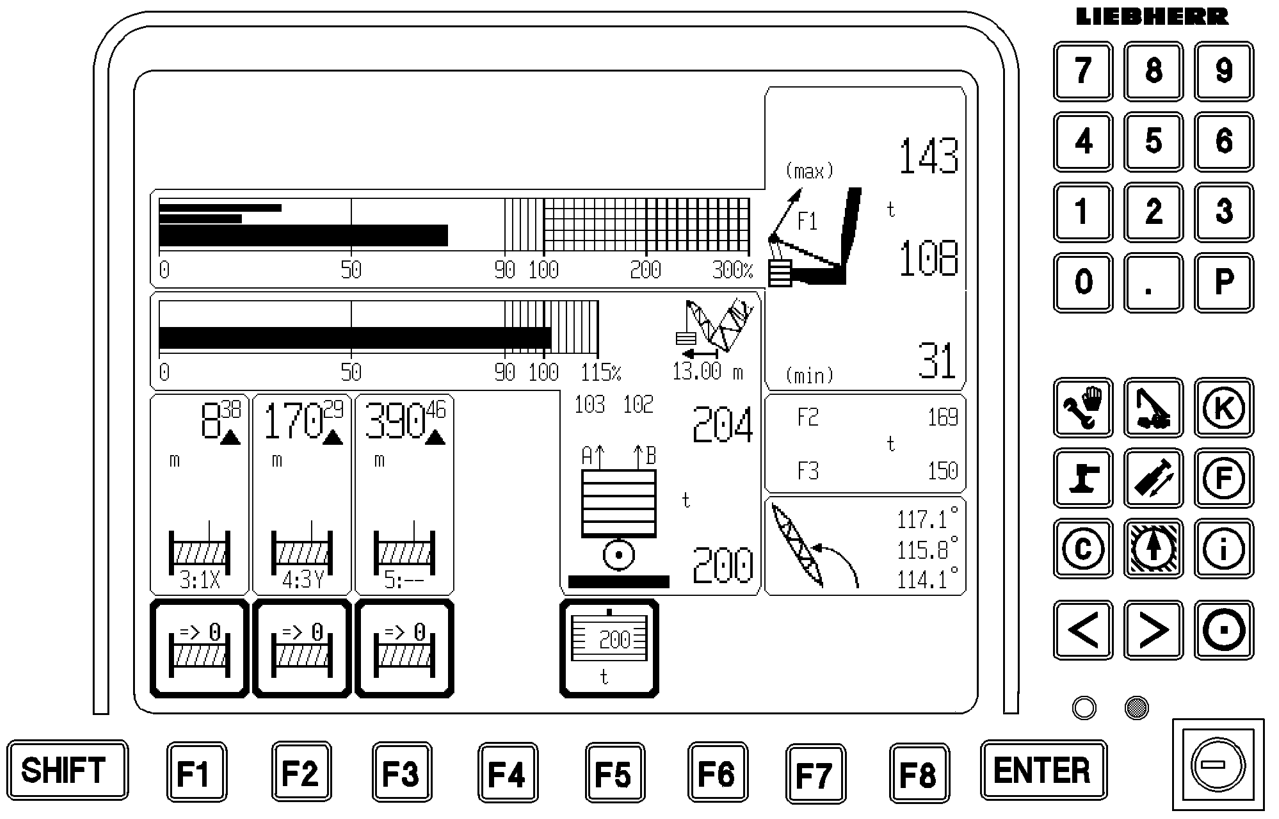
- **Preselect the operating mode**

Note: If the crane operator does not change the operating mode preselection group within 3 seconds after the appearance of the operating mode preselection view by pressing function key $F1_0$ or $F2_0$, then the LICCON system assumes that the previous operating mode preselection group should remain set and the equipment configuration view appears on the monitor without any entry being made, i.e., if the same previous operating mode group is to be selected, then nothing needs to be done. Now the previous equipment configuration view appears and the previous reeving is reset.
(For details of the boot up procedure, see paragraph 1.1)

- **Setting the operating mode and equipment configuration**
- Check the selected load capacity chart
- Check the selected reeving

- **Push the function key "$F8_0$" = "O.K."**
  The "SET UP" program is finished and the adjusted parameters will be taken over into the new ”OPERATION” program.
  Check that the short code and the reeving , which the crane operator intended to set is actually set in the OPERATING VIEW .
  For detailed description of the SETUP program, see chapter 4.02.

1



LIEBHERR
143
(max)
F1
t
108
31
(min)
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
8
38
m
170
29
m
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
=> 0
=> 0
200
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

188681

1.5 Set the derrick ballast on monitor 1

When using the crane with a derrrick ballast, the current size of the derrick ballast must be set, including the weight of the empty ballast pallet (and/or of the empty counterweight trailer) and the weight of the derick ballast plates.

Operation:

- **Push the function key $F5_1$** → on the symbol above $F5_1$ the thick symbol frame will be replaced with a thin frame and a blinking cursor will appear in the ballast editing field.

- **Enter the value for the ballast** with the numerical keyboard A_1 on monitor 1 in the given weight unit tons (t) or kilo pounds (kips).

- **Push the "ENTER" key = register value** → the entered value will now appear as the value for the placed ballast (=BA_AUF) in the ballast symbol

(**Push the $F5_1$ key = stop the editing mode** → The change is thrown out. The old value for the placed ballast (BA_AUF) remains in the ballast symbol)

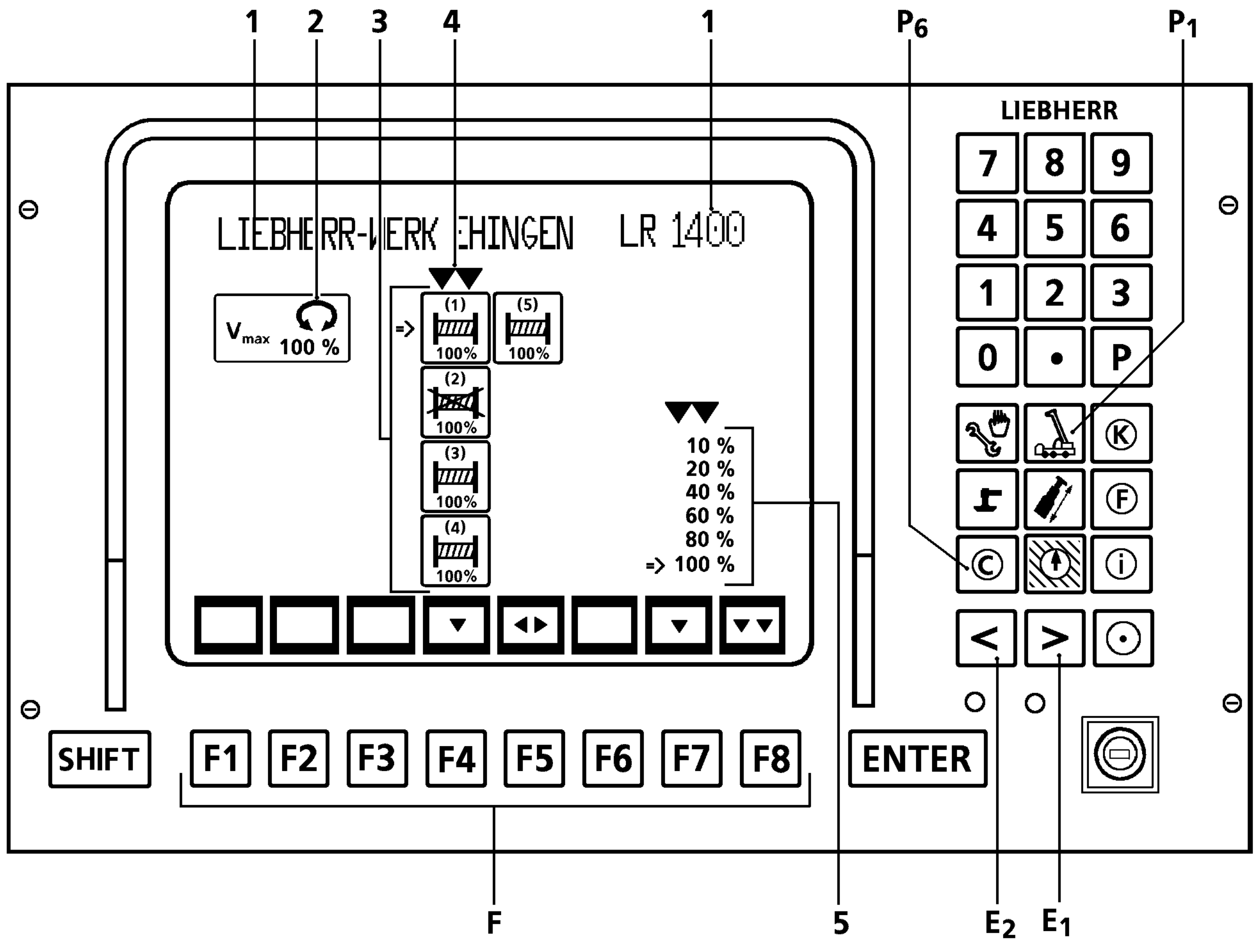
DANGER: **During ballast editing, the remaining views cannot be accessed on monitor 1. The operating view on monitor 1 is frozen, and therefore might possibly show the wrong information. For that reason: complete the ballast editing mode quickly. (If during ballast editing a manual control lever is actuated, then the ballast editing is automatically interrupted. The old value of the placed ballast (BA_AUF) remains in the ballast symbol).**

The set derrick ballast value must match the actually installed derrick ballast weight.

If the derrick ballast value is set too low, then the derrick ballast utilization indication is too high, the 90% warning is given too early.

If the derrick ballast value is set too high, then the derrick ballast utilization indication is too small, and the ballast utilization dependent safety shut off functions of test point 1 (F1min) are ineffective.

This can be a very dangerous situation!


1
2
3
4
1
P6
P1
LIEBHERR-WERK EHINGEN LR 1400
Vmax 100 %
(1) 100%
(5) 100%
(2) 100%
(3) 100%
(4) 100%
10 %
20 %
40 %
60 %
80 %
100 %
LIEBHERR
7 8 9
4 5 6
1 2 3
0 • P
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
F
5
E2
E1

189163

1.6 Setting the control parameter

Note : see also detailed description in Chap. 4.02, section 8.

In the indictor in the OPERATING VIEW 0, the adjustable parameters in the **"CONTROL"** program can be viewed.

1. The adjusted, maximum slewing speed of the crane superstructure is shown in percentages (%)

2. activated (actuated) winch: the direction status indicator is empty if the winch is at a standstill.

   deactivated (turned off) winch: the direction status indicator has 2 blinking dashes (the winch, which is not being used for the present operation can be deactivated, to prevent it from being actuated inadvertently)

Only if the adjusted control parameter is to be changed:

Start the "CONTROL" program with program key $P6_0$.

Change the maximum slewing speed of the crane superstructure, by
- actuating the function key $F7_0$ to set the desired percentage value (%) with the arrow key "= >"
- Push the "ENTER" key to confirm the adjusted value. The value is taken over into the "maximum slewing speed " = "$v_{max.}$" symbol .

D A N G E R: Change the % value only when the manual control levers are in "O" position.

The hoist, slewing and luffing speed may not be changed, the winches may not be locked if any movement is actuated!

When working with maximum load, under no circumstances may the crane operator set a higher "maximum slewing speed" than the percentage value given in the load chart manual for the selected operating mode.

We recommend always to set the given or a lower speed.

The longer the boom length, the heavier the attachment and the larger the load is, the lower the set "maximum slewing speed" must be.

At maximum load, the manual control lever for the slewing movement may not be deflected all the way.

This could be extremely dangerous!

Turn the cable winches on and off :

- Push the function key $F4_0$ to select the winch with the arrow "= >"
- Push the function key $F5_0$ to deactivate or activate the selected winch.
  Winch symbol is crossed out or not crossed out.
- Push the function key $F8_0$ = END to return to the "OPERATION" program.

Note: Check all adjustments in the operating view.

1.7 Calibrate winches

General

All cable winches are equipped with one increment counters to measure the relative path (measurement of relative turn angle). So that the LICCON can calculator the absolute path or the cable length in length units, the system must know the cable length in a certain winch position (calibrating position). The data belonging to this winch position (cable length and current spool radius) are stored in the remaining geometric data on the program memory cards of the CPU 0 and 1.
Winch 1 - 6 recognize via the calibrating switch (cam limit switch) when the winch is in this calibrating position.
Note: Winch 4 does not have any calibrating switch (cam limit switch).

The calibrating switch for the winches is set in such a way that it shifts in calibrating position from 0 to 1 when th e spool spools out.

When to calibrate the winches:

Winches must be calibrated when the hook path indication / cable length indication is to be correct.
Winches must always be recalibrated if the absolute path information of the increment transmitter in the memory was lost somehow.

This is the case:

- if the LICCON has been separated from the power supply (when disconnecting the LICCON from the battery) → recalibrate all winches again
- if the power pack has been pulled from the LICCON basic component group 0 , → recalibrate all winches again
- if one of the following CPU's has been pulled:

CPU 0 pulled: → recalibrate winch 1 and 2

CPU 1 pulled: → recalibrate winch 3

CPU 3 pulled: → recalibrate winch 5

CPU 5 pulled: → recalibrate winch 6

- if an error occurred in the winch calculation or on the increment transmitter then it might be necessary to recalibrate the winch, for description, see chapter 4.14 - troubleshooting .

If the winch is not calibrated, then the absolute path cannot be measured. The relative path measurement is then shown, but it is not very exact, because the current winch winding radius is not known.
The winches must always be calibrated correctly, so that the control is able to calculate the current winch winding radius and therefore the winch rotational momentum. If the winch is calibrated incorrectly or not at all, then it is possible that the control takes an erroneous winch momentum into account, which can cause a slight jerk when the winch is actuated, because the winch brake opens a little too soon or a little too late.

Note: The calibrating positions have been set in such as way that they can be triggered in crane operation, see chart.

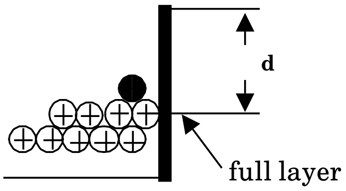
To calibrate winch 1, 2, 5, 6*

- Spool the winch up / out until the calibrating position (Condition layer No. X full, see chart)
- run over the calibration point by some turns, when spooling the winch up
- then run over the calibration switch when **spooling out**
- check the winch indication

To calibrate winch 4

- Spool the winch up / out until the calibrating position (Condition layer No. X full, see chart)
- press (1×) calibrating button in the switch box.
- check the winch indication

Calibrating positions :



Winch	Calibrating position at	Distance **d** (full layer to rim)	full layer has : (for intake gear left drum half applies)
Winch 1, 2, 5, 6	layer 4 full (=ca. 390 m)	132 mm	right incline
Winde 3	layer 5 full	107 mm	right incline
Winch 4	layer 4 full (= ca. 170 m)	107 mm	right incline

Definition: A cable layer is considered full when the cable diameter is for the first time in a layer above the full layer.

C A U T I O N: When changing the cable, do not pull the cable from the stationary winch, nor turn an empty winch. This is especially dangerous for limit switches "Winch spooled up" and "Winch spooled out". Otherwise the cam limit switches for the winch must be reset.

If a guide is used to signal the crane operator how far he can raise or lower the load, then the crane operator must determine thorough a test, how accurate his hook path indication is, before he uses it.

* if installed

1.8 To calibrate the slewing gear

General
The slewing gear is equipped with an increment counter to measure the relative path (measure of relative slewing angle). So that the LICCON can calculate the absolute slewing angle in degrees (=slewing angle on upper structure to the **front section** of the lower section), the system must know the absolute slewing angle via absolutetransmitter, wich is adjusted straight forward (0°) .

The LICCON recognizes via a absolutetransmitter,when the slewing gear is in this calibration position.

When to calibrate the slewing gear:

The slewing gear must be calibrated when the absolute slewing angle indication is to be correct. The absolute slewing angle indication is helpful for all operating modes as an orientation aid for slewing movements.

The slewing gear must always be recalibrated when the absolute path information of the increment transmitter in the memory was lost somehow.

Note: Error 35 is shown, see chapter 4.14 .

This is the case

- if the LICCON has been separated from the power supply (when disconnecting the LICCON from the battery),
- if the power pack has been pulled from the LICCON basic component group.
- if CPU 4 has been pulled.

To calibrate the slewing gear

Run over the calibration point (=0°) when turning from **right** to the **left**.

Check the slewing angle indicator: If the slewing platform is positioned straight forward parallel to the crawlers, then the angle indicator in the operating view must also show 0° and increase when slewing to theleft.

Note: The slewing angle indicator is always calibrated when turning from **right** to the **left** past the 0° position.

1.9 Weighing a load and load indication

**D A N G E R: The crane operator must know the weight of the load before lifting it.
Before lifting the load, the crane operator must check, if he may even lift the load.**

Weighing a load
Prerequisites of exact load indication:

D A N G E R: The load must be weighed exactly, otherwise the crane may be overloaded if the correct weight is not known!

- The moment or point in time when the main boom relapse cylinders (RP) are actuated must be exactly recognized by the LICCON, otherwise the influence of the relapse cylinders (RP) on the weight is too great (weighing errors of up to 10 tons).
  To do so, the angle sensor in the main boom pivot section and the lengthwise incline sensor in the slewing platform must be functioning properly,
  or the slewing platform must be positioned in lengthwise direction, in exact horizontal position.
  If only the angle sensor on the main boom pulley head is functioning correctly, the load will be incorrect, and especially the moment when the main boom relapse cylinders are actuated.
- Both angle sensor on the main boom must be functioning.
- The load and hook must be on or just above the ground.
- The number of reevings must be set correctly on the LICCON, the reeving number may not be higher than the nominal reeving number.

- For the calculation of the indicated actual load, subtract the weight of the hoist cable from pulley head to the ground from the total load, which is attached on the pulley head.
  The number of reevings, which have been set on the LICCON are taken into account, up to the maximum of the nominal reeving number, which has been set for the maximum reeving of load capacity values for a load capacity chart.
  Exception: If the crane is in a position outside of the load capacity chart, then the weight of the hoist cable must be added to the weight of the hoad, because no nominal reeving number is known when outside the load capacity chart.

- Which means:
  If the crane is lowered below the level of the crane (pit or below ground excavation), then the hoist cable **below the crane level** is calculated and indicated as a load.
  The values of the load capacity chart cannot be obtained below the crane level.

  If the load is lifted above the crane level (hi-rise building), the weight of the hoist cable to the ground is subtracted, the load seems to be getting lighter when raised then on the ground. For that reason, in greater heights, a slightly heavier load can be raised than on the ground, without triggering the LML overload shut off a 100%
  This is dangerous:

**D A N G E R: At LML overload, all crane movements, which would increase the danger of overload are shut off. However, the load may still be lowered even when the 100% LML shut off has been triggered, because it is assumed that the overload situation was caused by lifting the load.
However, esspecially with high reevings with high hoist cable weight on the pullex head, the crane can also be overloaded by lowering the load.
The crane operator must be aware of this, so that he can relieve the crane in this special case by carefully raising the load, even though it is the lifting of the load, which is again automatically shut off and not the lowering of the load.**

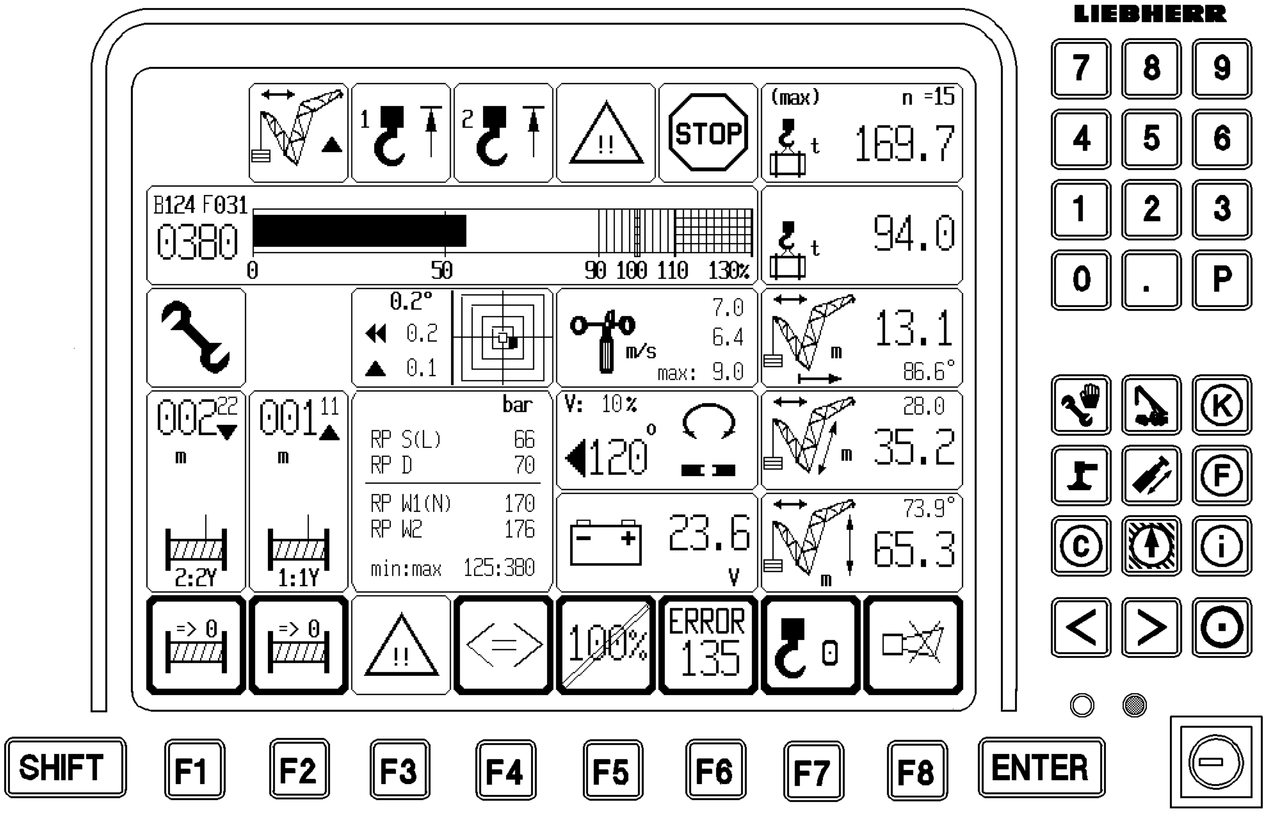
Possible weighing errors

For an exact weight of the load, exact signals from the pull force brackets, angle sensors and pressure sensor are required.
Since all sensor values are always within a certain tolerance, weighing errors may occur:

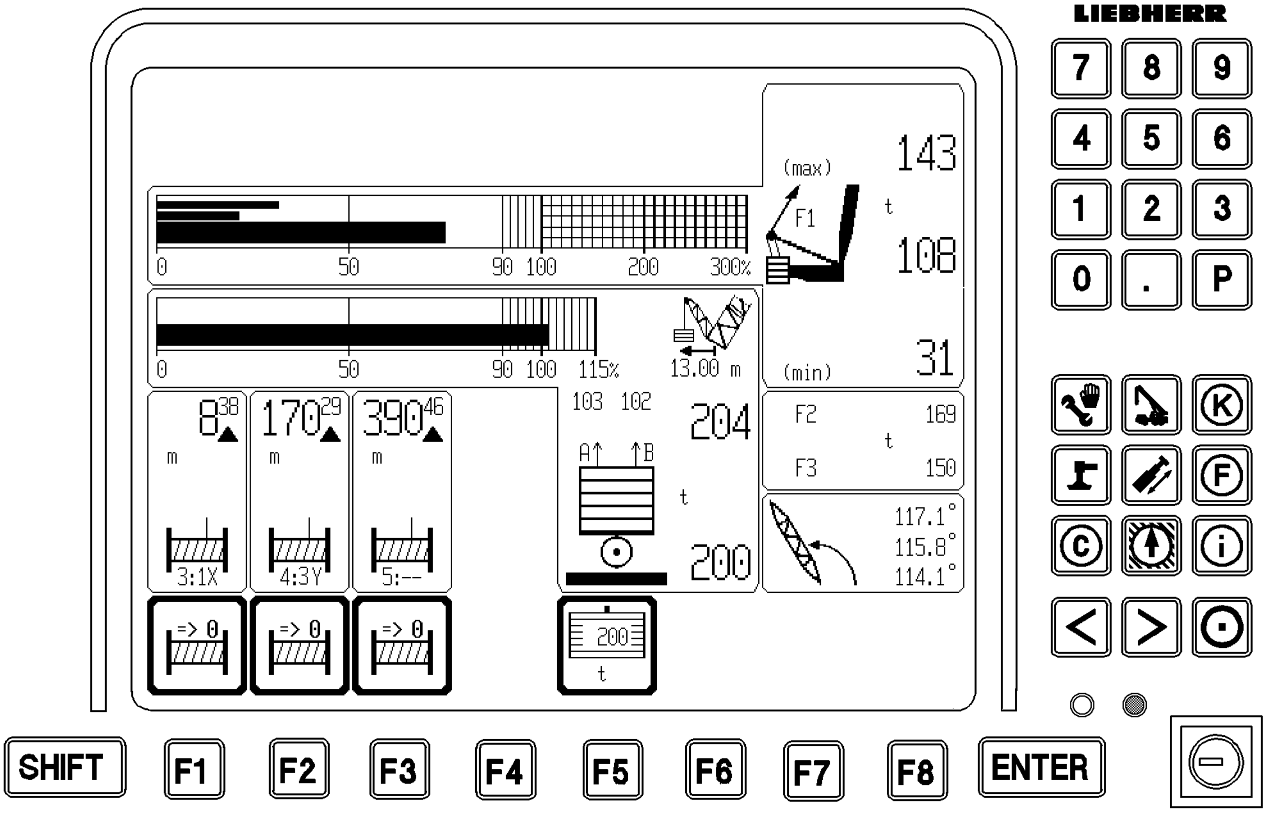
The weighing error is increasingly larger, if:
- the hoist winch is on the slewing platform,
- the reeving number is small,
- the hoist winch is positioned far to the rear of the slewing platform,
- several hoist winches are used (parallel operation),
- the boom, on which the load is suspended, is short
- the boom, on which the load is suspended, is in a steep position.

D A N G E R: Special attention and caution must be paid if prerequistes for small weighing errors are given!

0


LIEBHERR
STOP
(max) n =15
169.7
B124 F031
0380
0 50 90 100 110 130%
94.0
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
86.6°
002 22
001 11
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

1


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

189179

Check the safety devices
The crane operator MUST CHECK EVERY TIME before he operates the crane, that all safety devices function properly.

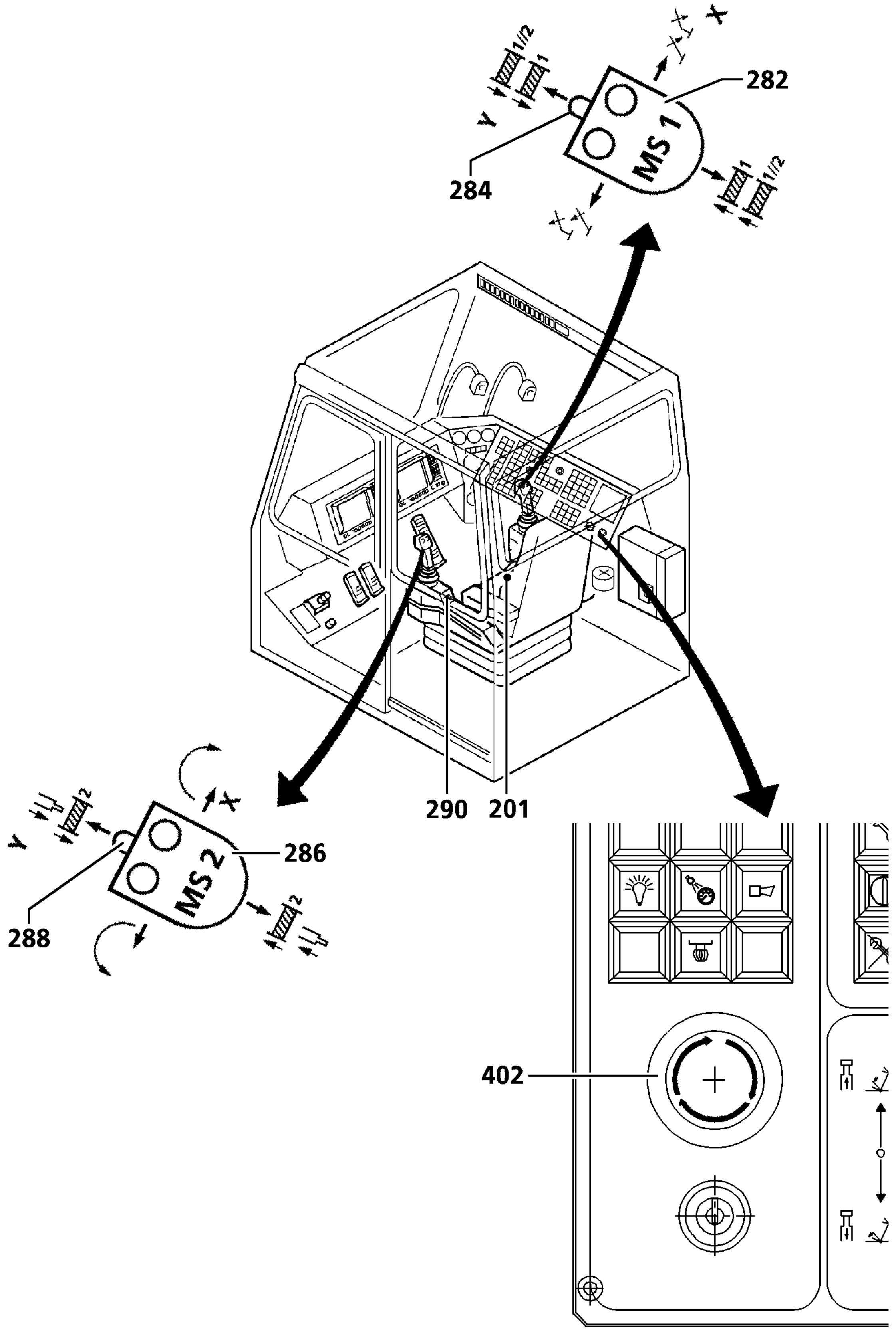
D A N G E R : **Crane operation with defect safety device is prohibited.**

LIEBHERR **C**OMPUTED **CON**TROLLING (**LICCON**)

Safe load indicator
The electronic safe load indicator turns all **load moment increasing** crane movement off as soon as the permissible load moment is exceeded.
Only **load moment decreasing** movements can then still be carried out.
However, the fact that the crane is equipped with this load moment limiter does not free the operator from his responsibility with regard to operating safety.
For that reason, before lifting a load, he must know the approximate weight of the load and decide, by checking the load capacity table, if the crane is able to lift such a load.

D A N G E R : **The safe load indicator / load moment limiter is a safety device, it may not be used as an operational shut off control when extending the boom or luffing it with a suspended load .**
Before operating the crane, the load moment limiter must be adjusted to the actual equipment configuration according to the load capacity chart, only this way will it be able to fulfill its protective duty.
If the crane operator does not observe this safety obligation, then there is a great danger that the crane overturns and is damaged beyond repair, despite a functioning load moment limiter.
The safe load indicator /load moment limiter cannot monitor and control all possible operating conditions, this is still primarily the responsibility of the operator.
The safe load indicator checks, but does not monitor the incline.
The safe load indicator checks, but does not turn off the system, for example at high wind.

.



186729

Emergency ”OFF” button (402)
If this button is pressed, the electronic crane control and the Diesel engine are shut off.
Each movement can be stopped immediately.

D A N G E R: **The emergency "OFF" button may only be used in true emergency situations, NOT as an operational shut off device !**
There is the danger of accidents caused by swinging load, if the crane movement stopps immediately!

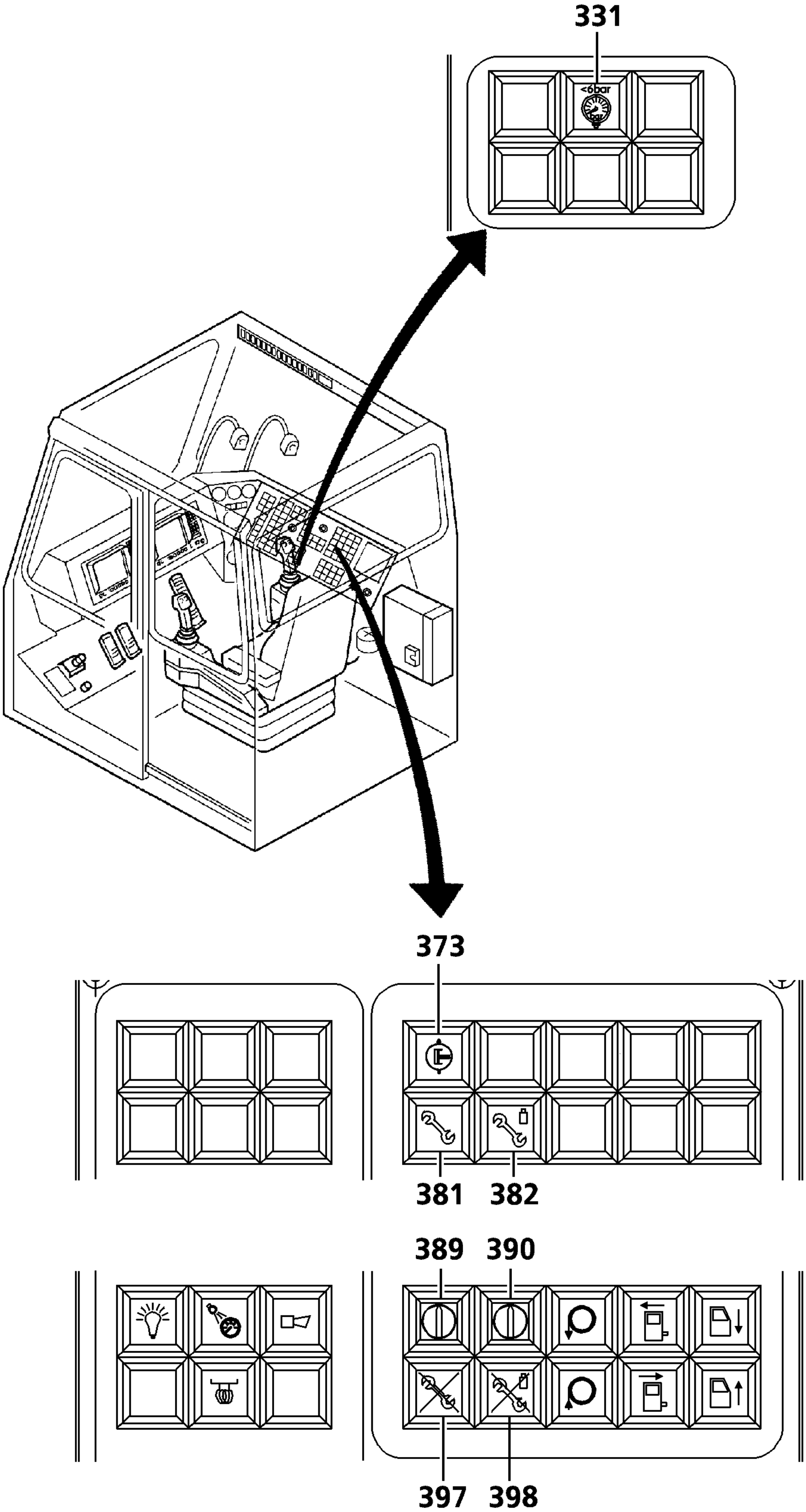
"Control Release" foot button (284, 288)
If the crane operator works standing up, he must hold down the button. If he works in seated position, then the button (284) is bypassed by the seat contact switch (201).

Note: This safety control is installed in order to prevent any unintentional crane movement which may be accidentally caused if the manual control lever (282, 286) is touched when entering or exiting the cab.

Seat contact switch (201)
When working while seated, the control release for the crane operation is enabled by the depressed seat contact switch .

Button ”Luffing at overload” (290)
In case of an overload, the luffing up crane movement is also turned off, even though, with freely suspended load, this would almost always lead to an increase of the maximum load carrying capacity. If button (290) is held down, and the manual control lever is deflected in luff up direction, then the crane movement is carried out anyway.

D A N G E R: **It is strictly prohibited to lift a load by luffing up the boom., if it has caused the overload safety device to shut off when it was tried to lift the load off the ground via the hoist gear.**
This action will cause the crane to topple over.
In rare cases there are load capacity charts, which, for smaller radii, show smaller load capacity values instead of larger ones.
For that reason, it is only permitted to luff up the freely suspended load with the button Luffing up at overload with one boom section (main boom or jib), if the overload has been caused previously by luffing down this boom section or if the crane operator can clearly prove, according to the load capacity chart, that the desired luffing up movement would lead to an increase of the maximum load carrying capacity.
If the load is luffed up with one boom section, even though this action would lead to a smaller load capacity, then there is the danger that the crane is continued to be mechanically overloaded or that it will tip over to the rear.



186730

Assembly key- operated button (389)
The operating mode **Assembly** is activated by briefly activating the key- operated button (self- retention).

D A N G E R : This is only needed and permissible for installation procedures.
Following safety device functions are not operational:
- **the safe load indicator system is no longer effective**
- **upper/lower limit operating range (OGW/UGW) boom, fly jib**
- **limit switch ,hoist ”top”, boom, fly jib (additionals)**

Shut off diagram
For non-bypassable and bypassable conditions, refer to shut off diagrams in electrical wiring plans.
The engaged operating mode **Assembly** is indicated by the indicator lamp (381), symbol on monitor (see chap. 4.02, section 6.03.) and the red rotating beacon on top of the crane operator's cab.
The operating mode **Assembly** is switched off by:
- activating button (397)
- switching off the crane - ignition-start switch set to ”0”.
- standing up from the driver's seat, seat contact switch

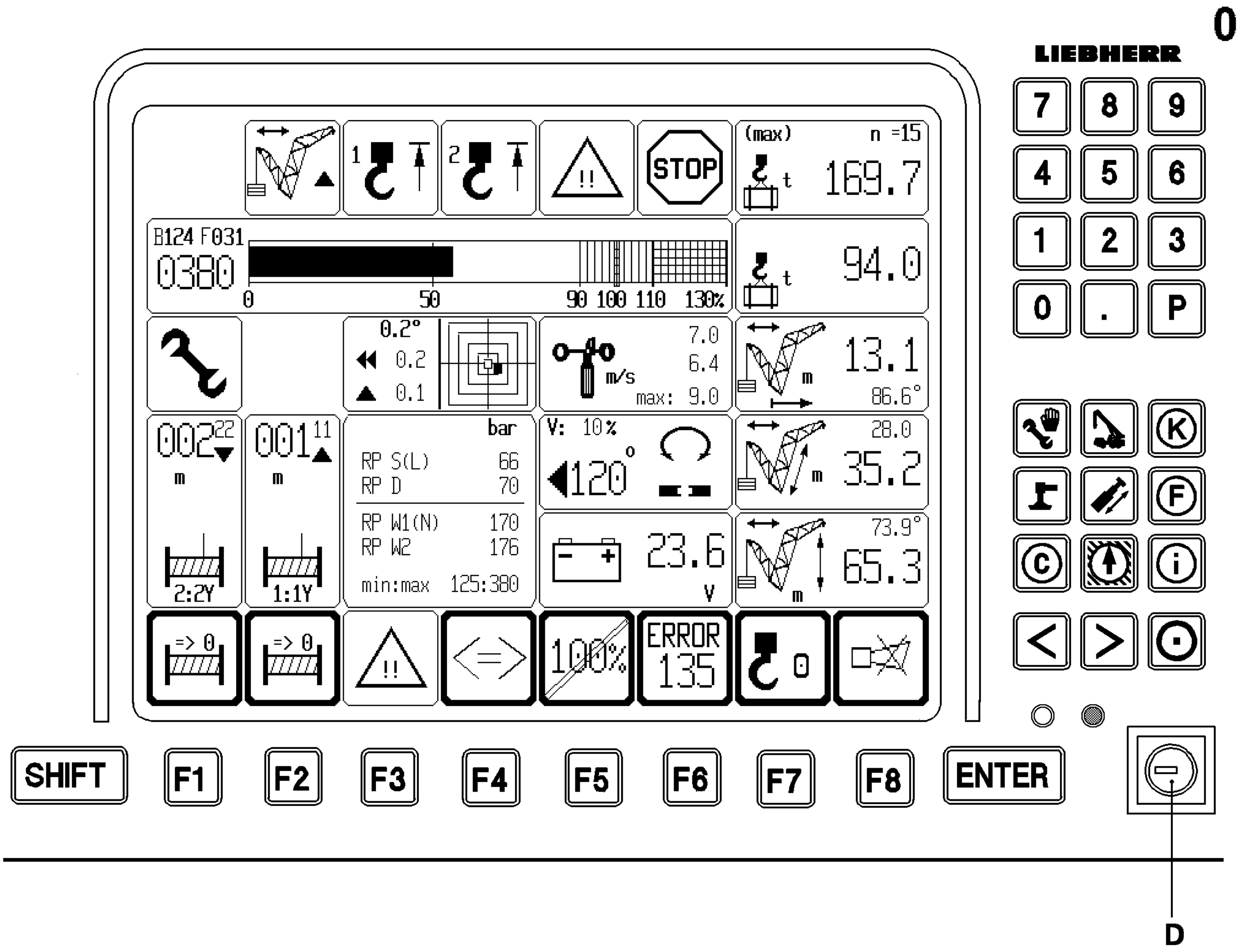
Note: The self- retention for **Assembly** is thus cleared and switched back to crane operation.

Bypassing the load moment limiter safety device by the assembly key- operated button (389)

D A N G E R : As long as the key- operated button is activated, the safe load indicator is not operational. Various components of the safety devices are bypassed via the assembly key- operatedbutton.
Activation is only necessary and permitted for assembly procedures.
During crane operations, activating the key- operated buttonis prohibited!
Activating the Bypass keyed button may only be carried out by persons completely familiar with the crane and who are aware of the possible consequences of bypassing safety device functions.
After each assembly operation, the key to the Bypass keyed button is to be removed and given to persons authorized to it.
Bypassing the load moment limiter during crane operation increases the risk of accidents.

Key- operated button (390) - crawler assembly
By briefly activating the key- operated button, crawler assembly with hydraulik cylinder is selected (self- retention).
Switch off by activating button (398).
The engaged key operated button is indicated by the indicator lamp (382) and the red flasch light on top of the crane operator's cab.

C A U T I O N: As long as the key operted button (390) is activated, there is no overload safety cut off for assembly cylinder and also for the crane.
There is a risk of accidents.



189180

Bypass keyed switch (D)
The keyed switch (D) on the monitor of the LICCON control unit has two different functions.

Note: **Bypass keyed switch (D)- see separate LICCON safe load indicator cap. 4.02.**

It can be used to bypass :
1. the LICCON safe load indicator or
2. the shut off for hoist ”top”.

Via the keyed switch (D), the LICCON safe load indicator can be bypassed by holding the keyed switch to the ”right” position.

With the F5 key, you can select the bypass reason, if the button is pushed, the next bypass reason appears in the symbol - and is then triggered by holding the keyed switch to the ”right” position.
The symbol starts to blink.

Two different shut off reasons can be selected for bypass:
1.1 Shut off by the **LICCON (100%)**
In the symbol, ”100%” will appear crossed out.

2.1 Shut off due to **Hoist ”top”**
In the symbol, a load hook will appear crossed out, with an arrow on ”upper stop“.

1.1.1 Bypassing the **LICCON safe load indicator system .**

D A N G E R : **As long as the key- operated switch is activated, the LICCON safe load indicator is not operational.**
This is indicated by the red rotating beacon on the crane cab.
Various components of the safety devices are bypassed via the Bypass keyed switch.
During crane operations, activating the Bypass keyed switch is prohibited!
Activating the Bypass keyed switch may only be carried out by persons completely familiar with the crane and who are aware of the possible consequences of bypassing safety device functions.
After each assembly operation, the key to the Bypass keyed switch is to be removed and given to persons authorized to it.
Bypassing the load to the safe load indicator during crane operation increases the risk of accidents.

Bypassing the limit switch **upper limit of the hoisting movement**

D A N G E R : **As long as the key- operated switch is activated, the limit switch "upper limit of the hoisting movement" remains bypassed.**
The hoisting limit switch may only be bypassed during crane operations if an observer carefully monitors the distance between the hook block and the telescopic boom. The observer must be in direct contact with the crane operator. The hoisting movements must be carried out with the utmost care and with the smallest possible speed.
Bypassing the hoisting limit switch is only permissible in an emergency situation by authorized personnel.

Hoist limit switch- hoist gear ”top“
The hoist limit switch is installed to prevent the hook block from hitting the boom head.
The switch must be checked every time before using the crane by running the hook block against the weight.
The ” hoist” and ”luffing down ” crane movements must be turned off.

D A N G E R : **The hoisting limit switch may only be bypassed during crane operations if an observer carefully monitors the distance between the hook block and the boom head.**
The observer must be in direct contact with the crane operator.
The hoisting movements must be carried out with the utmost care and with the smallest possible speed.
Bypassing the hoisting limit switch is only permissible in an emergency situation by authorized personnel.

Limit switch- winch spooled in / out
A cam limit switch is installed in the winches I, II, III, V and VI and turns off the “ downward “ crane movement, if there are at least 3 safety loops remaining on the drum.
If this limit switch should fail, or if the LICCON is down, a second limit switch prevents the cable from spooling out after 1 to 2 turns (forced release contact on brake control).
If this occurs, the cable can be spooled up only in emergency operation, until the limit switch is clear again.
A third limit switch prevents continued spool up function (over spooling) when the end of the cable has been reached (winches). However, to be able to fully spool up the cable, this shut off can be bypassed with the installaton switch.

D A N G E R : **If the hoist cable is spooled up during installation, make sure that the end of the cable still remains in front of the winch and is not spooled up over the winch, because if the end of the cable is then pulled over the winch by another turn, the shut off could no longer be guaranteed when the cable gets to the three safety loops.**
In this case, the cam limit switch must be reset.
In addition, if the hoist cable is replaced with a new cable, then the cam limit switch must be reset, so it shuts off when it gets to the point when there are still three safety loops on the drum.
If this point is not observed, the cable mount can be torn out, causing the load to fall.

Limit switches

for	Hoist ”top”	-	boom and fly jib
	boom "top"	-	steepest position, fall back cylinder
	,jib "top"	-	steepest position, fall back cylinder
		-	steepest position, mechanical fall back support
	jib "down"	-	lowest position
	LA - bracket 25° to the front		

D A N G E R : **The limit switches may not be used as a regular shut off system .**
If this point is not observed, in case of malfunction, various crane components can be severely damaged or the crane can topple over.

Angle sensor
Two angle sensors each are mounted to the boom, and the fly jib.
One angle sensor is mounted to the derrick.
The boom radius (reach) is determined by measuring the boom angle in relation to the horizontal line.

Tension force sensor (KMD)
The load of the crane, which is a combination of load momentum and boom momentum, creates a certain force in the boom guying, and this force is measured by force sensors.

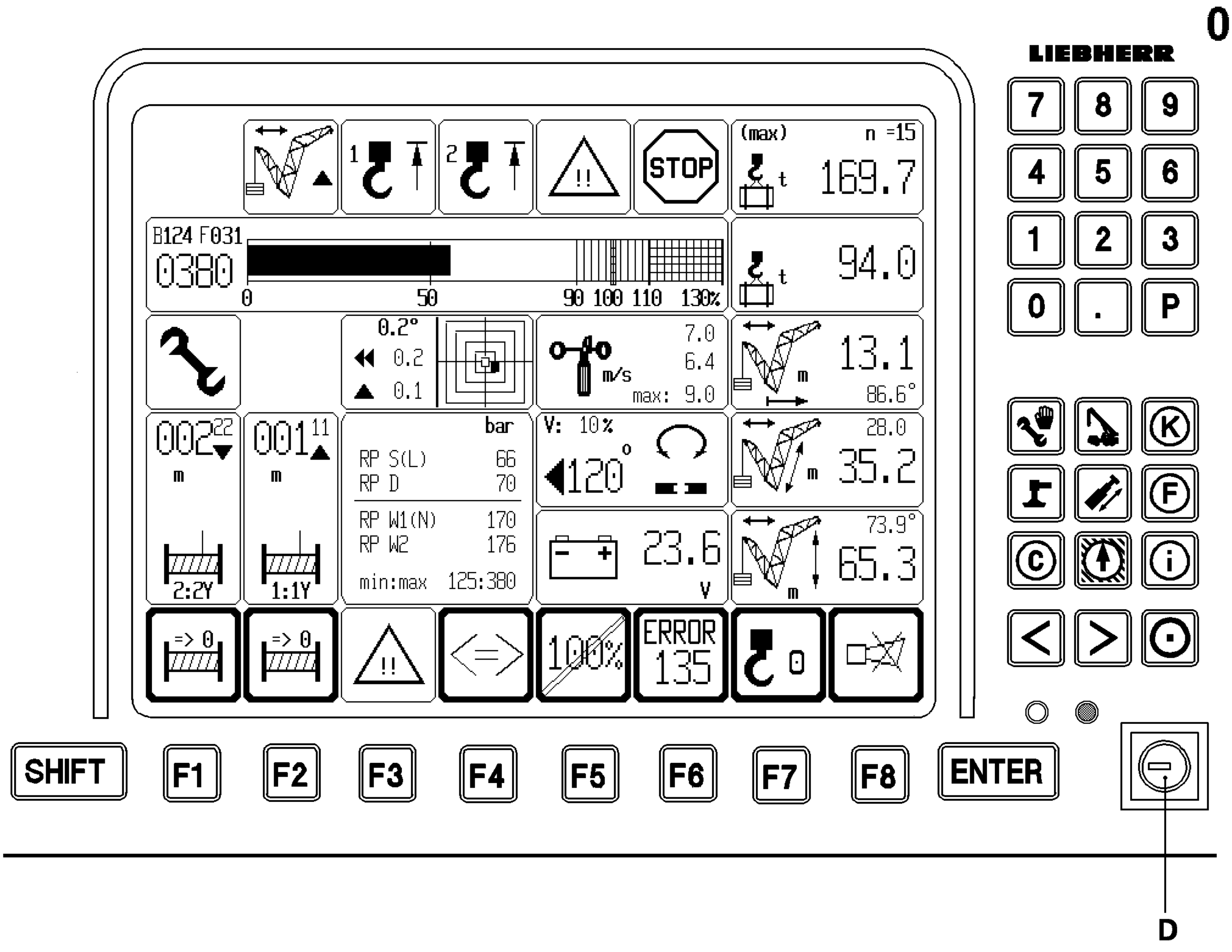
Tension force sensors are mounted:
KMD 1 on the boom- tension; force between LA- bracket and boom at all operating modes **without derrick.**
KMD 2 on the fly jib - tension; force between A- bracket I and fly jib head section - at all operating modes with fly jib.

*KMD 1 on the D- tension; force between A- bracket and derrick - at all operating modes **with derrick.**
*KMD 3 on the boom- tension; force between derrick and telescopic boom - at all D- operating modes**.**

Pressure sensor on fall back cylinder [1)]
A pressure sensor each is installed in the hydraulic section of the cylinder.
An electrical signal corresponding to the hydraulic pressure will be shown on the monitor ”0”.
The hydraulic pressure in the cylinders must observed during crane operation.

1) see also detailed description Chap. 4.02, paragrahp 6.04 ”additional functions”

* if installed


0
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
STOP
ERROR 135
D

189180

Indication of direction of rotation of w inch and hook path
Integrated into the ”LICCON”
Via this symbol on the ”LICCON”crane operating view, the direction of rotation of the winch is shown.
If the winch spools in or out, even even if the actual movement of the hook block is hard to detect due to multiple reeving or due to slow speed.

C A U T I O N: **When the cable is spooled in /out, keep watching the winch to make sure that there is no excess loose cable spooling up on the winch.**
Loose cable can damage the winch cable.

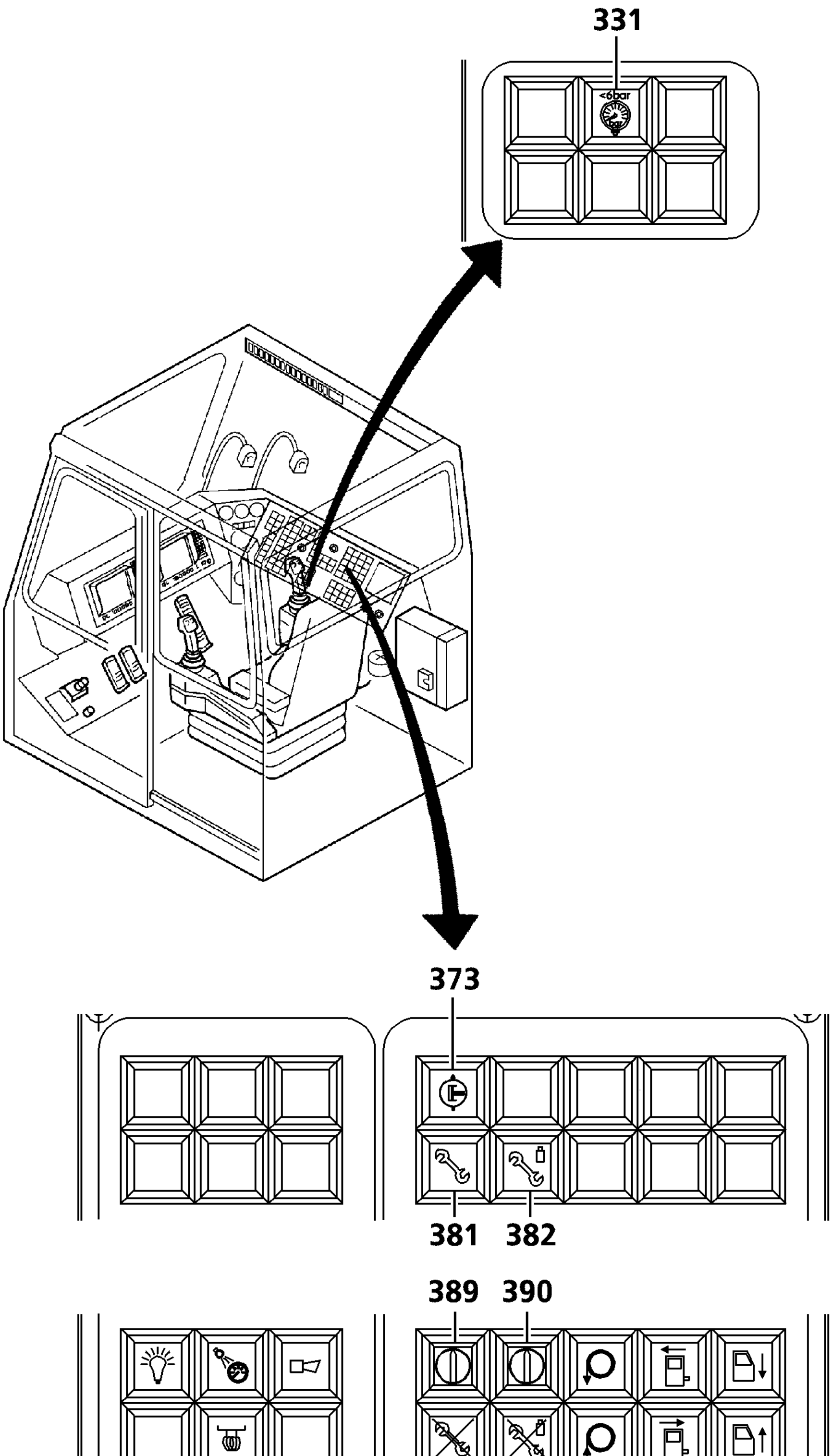
Wind velocity warning device [1)]
The wind velocity warning device is integrated into the ”LICCON”
The wind speeds are shown on monitor ”0”-operating programm.
The symbol shows the current wind speed on the lattice fly jib resp. boom. as well as the maximum wind speed.
If the current wind velocity value exceeds the indicated maximum value, the value starts to blink and the acoustical alarm ”SHORT HORN” can be heard.

D A N G E R: If the permissible wind speed is exceeded, shut down is not carried out automatically. This is only a warning system!
YOU YOURSELF MUST cease crane operation and lower the boom.
If you do not adhere to this rule, the risk of causing a serious accident is significantly increased.

Tilt display [1)]
The indication is shown graphically as well as numerically.
The tilt display has 2 measuring ranges, 0,2° oder 1°

D A N G E R: The system does NOT SHUT OFF if the permissible support force is being exceeded.

[1)] see also detailed description Chap. 4.02, paragrahp 6.04 ”additional functions”



186730

Diesel engine speed governor

If any excessive rise in engine speed is detected during operation, brake pumps will be automatically cut in stage by stage.

engine brake ON at > 2200 min $^{-1}$
OFF at <2100 min $^{-1}$

Bremspumpe 9
ON at > 2200 min $^{-1}$
OFF at < 2100 min $^{-1}$

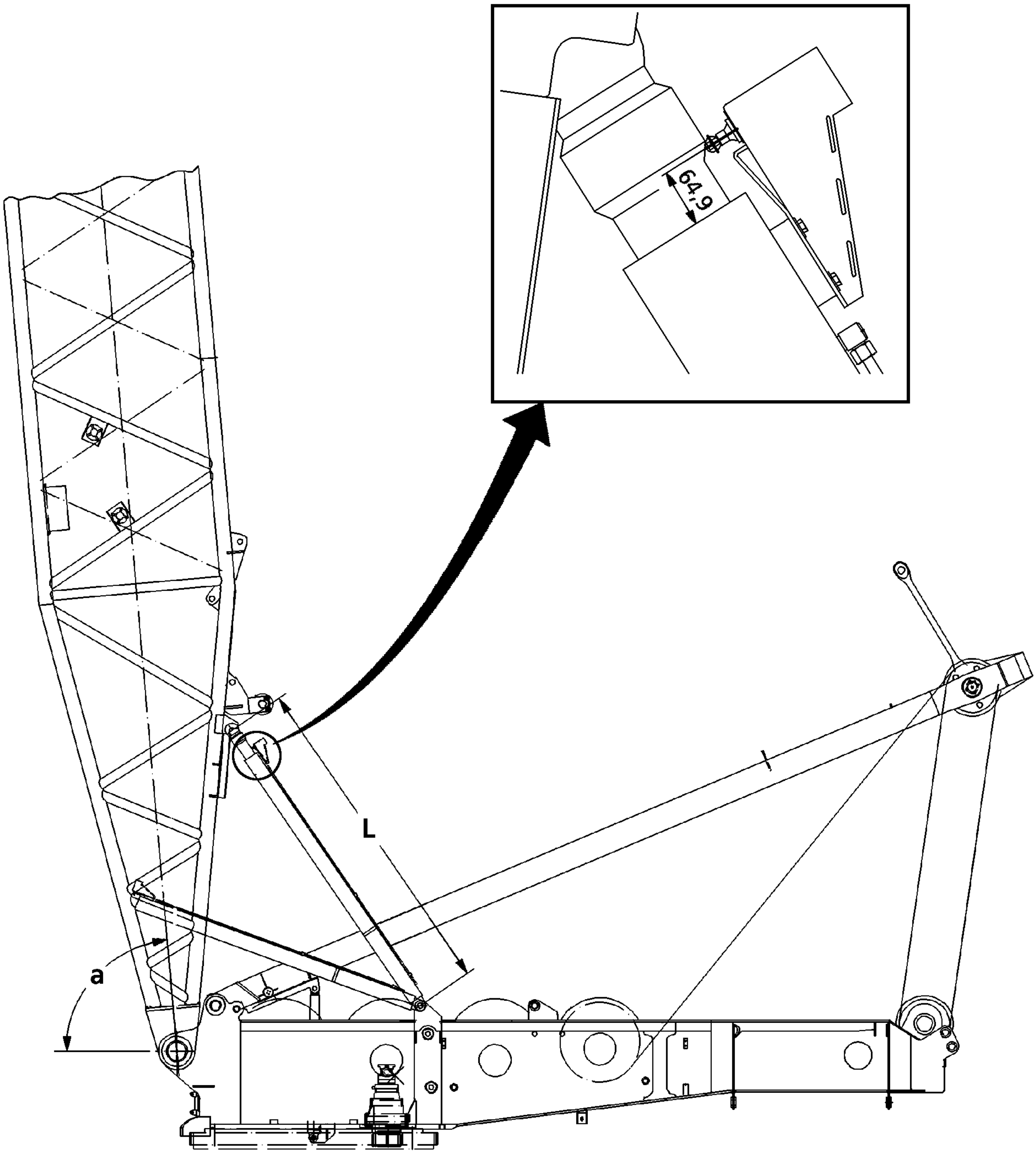
Bremspumpe 10
ON at > 2250 min $^{-1}$
OFF at < 2150 min $^{-1}$

If the speed drops sufficiently, the engine brake and the brake pumps cuts off again.

Note: If engine speed increases 2400min $^{-1}$, the diesel engine stops automatically and also emergency stop is actuatet.

Control oil pressure monitoring in winch I, II, III, IV, V, VI

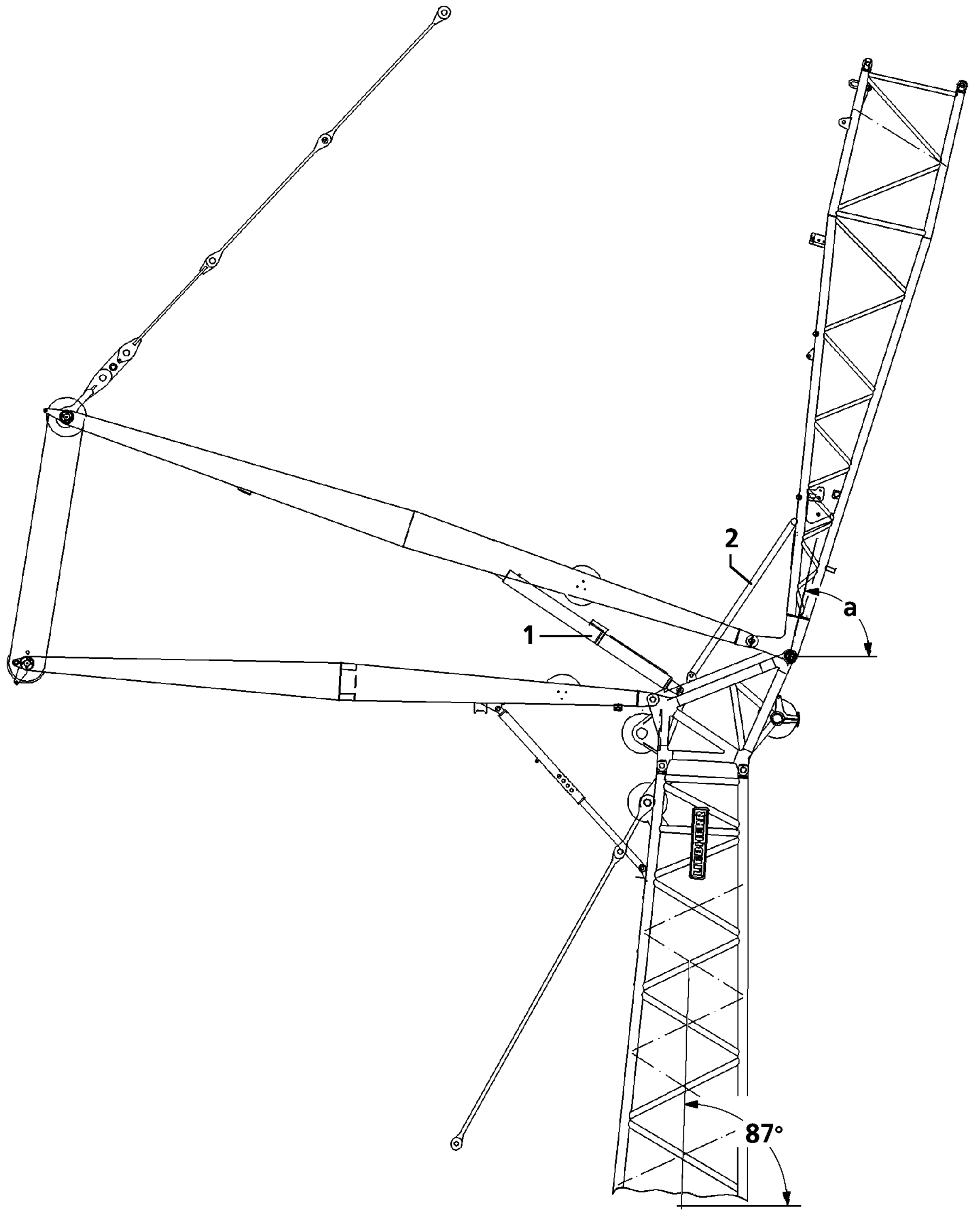
At a control pressure of less than 10 bar, the warning light (331) lights up.
The LICCON test system- special view- indicates the winch number, on which the problem occurs.



186995

Fall back cylinder for L/LL/SL/S -boom
Two hydraulic cylinders preventing the boom from falling back.
The hydraulic cylinders will be controlled with low and high pressure depending of the load.
The crane movement ”luffing” is shut down when the limit switch on the fall back cylinders are activated.

Operation mode	L/SL/S	LL-mode	LN/SLN/SW	LD/SLD/SD	SDW
operating position	85°	83°	87°	85°	87°
Length of cylinder (mm)	3655	3741	3568	3655	3568
Electrical switch point	88°	88°	88°	88°	88°
Length of cylinder (mm)	3524	3524	3524	3524	3524
Blockposition	89°	89°	89°	89°	89°
Length of cylinder (mm)	3480	3480	3480	3480	3480



186733

N- luffing fly jib- fall back guard

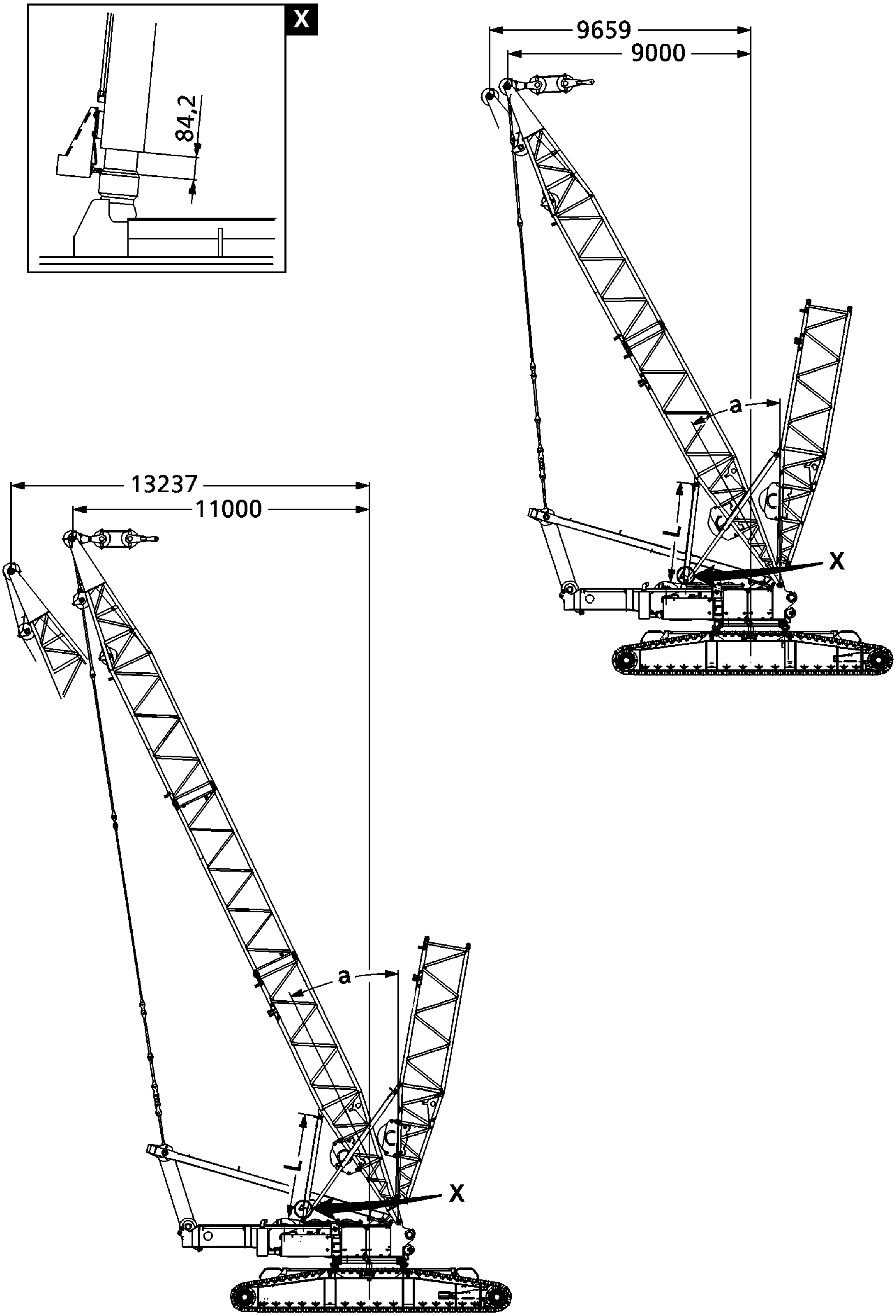
N - luffing fly jib fall- back accumulator cylinder (1)
A hydraulic accumulator cylinder pre - charged prevents the A- bracket I and the luffing fly jib from falling back.
If luffing fly jib topping movement continues, the piston rods are forced into the hydraulic accumulator cylinders.
The crane movement "luffing" is shut down when the limit switch on the fall - back accumulator cylinders are activated.

Note: Checking fall - back accumulator cylinder, see chap. 8.13 resp. 8.14
Checking limit switches on the fall - back guard cylinder , see chap. 8.12

Mechanical N- luffing fly jib fall- back guard (2)
Additional to the fall - back accumulator cylinder a mechanical fall - back guard prevents the N- luffing fly jib from overturning in steepest position.
The crane movement "luffing" is shut down when the limit switch on the mechanical fall - back guard is activated.

	fly jib - angle [a] *	Cylinder- length [mm]	stroke [mm]	Pressure [bar]			
				-20° C	0° C	+20° C	+40°C
Lowest operating position	25°	--	--	--	--	--	--
Steepest operating position	80°	4920	1380	273	294	315,5	336,5
Mechanical block oposition on the mechanical fall - back guard	83°	--	--	--	--	--	--
Accumulator cylinder fully extended [1]	32°	6300	0	57,5	62	66,5	71
Check position, cylinder presssure [1]	38° +2°	6100	200	64,5	69,5	74,5	79,5

1 = boom luffed to 87° degrees

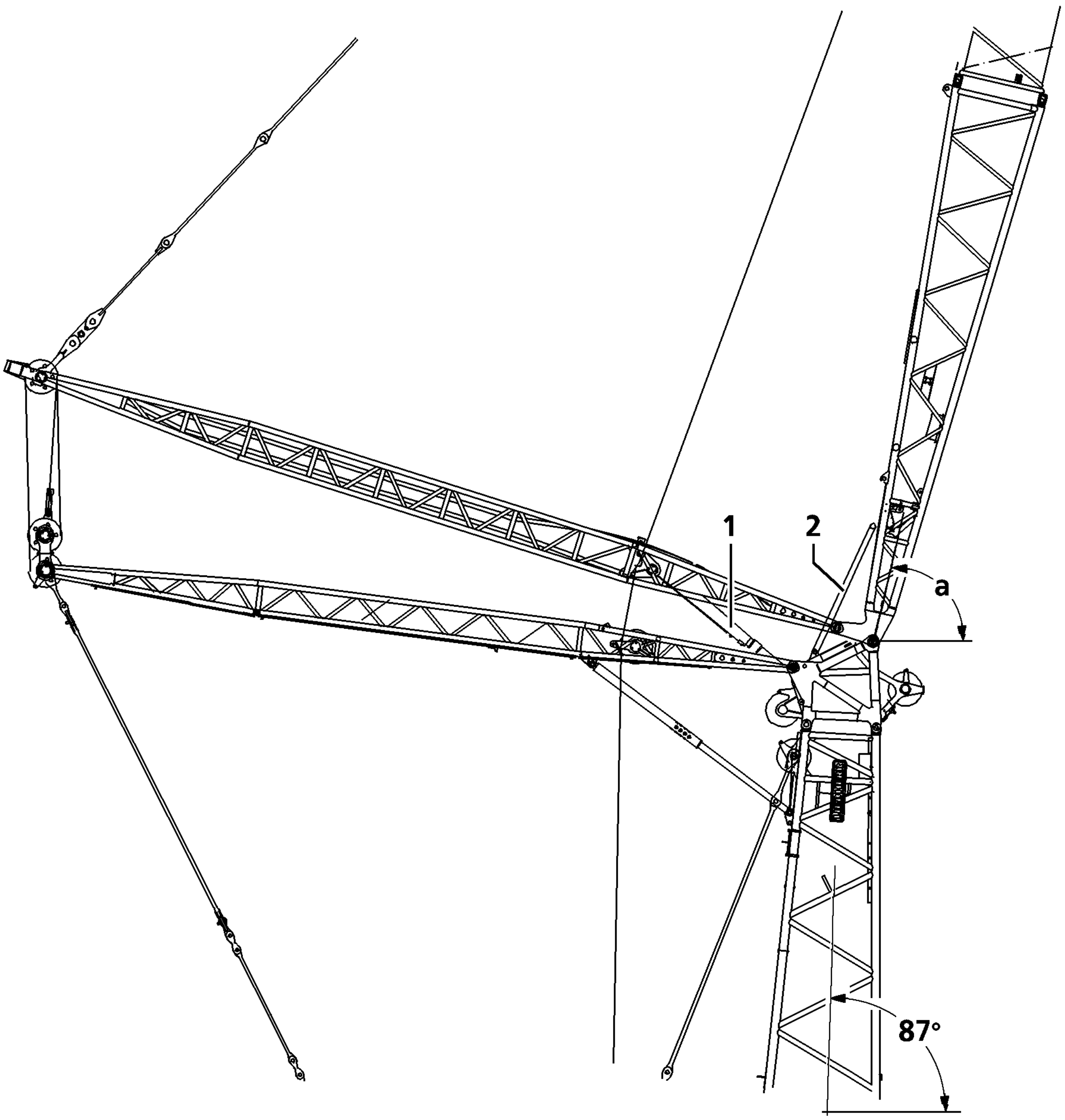


186996

Derrick - fall back guard
Two hydraulic cylinders preventing the Derrick from falling back.

The crane movement ”winch IV spooling in” is shut down when the limit switch on the fall cylinders are activated. At the same time a warning lamp and a accoustic signal comes on.

	D-21/9 m	D-28/9 m	D-28/11 m	
Distance from slewing center to derrick head	9000 mm	9000 mm	11000 mm	
theoretical operating position	28,7°	21,1°	25,5°	
Cylinder length (mm)	3726 mm	4182 mm	3915 mm	
Distance from slewing center to derrick head	9330 mm	12798 mm	12798 mm	
electr. switch point	29,7°	29,7°	29,7°	
Cylinder length (mm)	3665 mm	3665 mm	3665 mm	
Distance from slewing center to derrick head	9646 mm	13220 mm	13220 mm	
Block position	30,7°	30,7°	30,7°	
Cylinder length (mm)	3600 mm	3600 mm	3600 mm	



188549

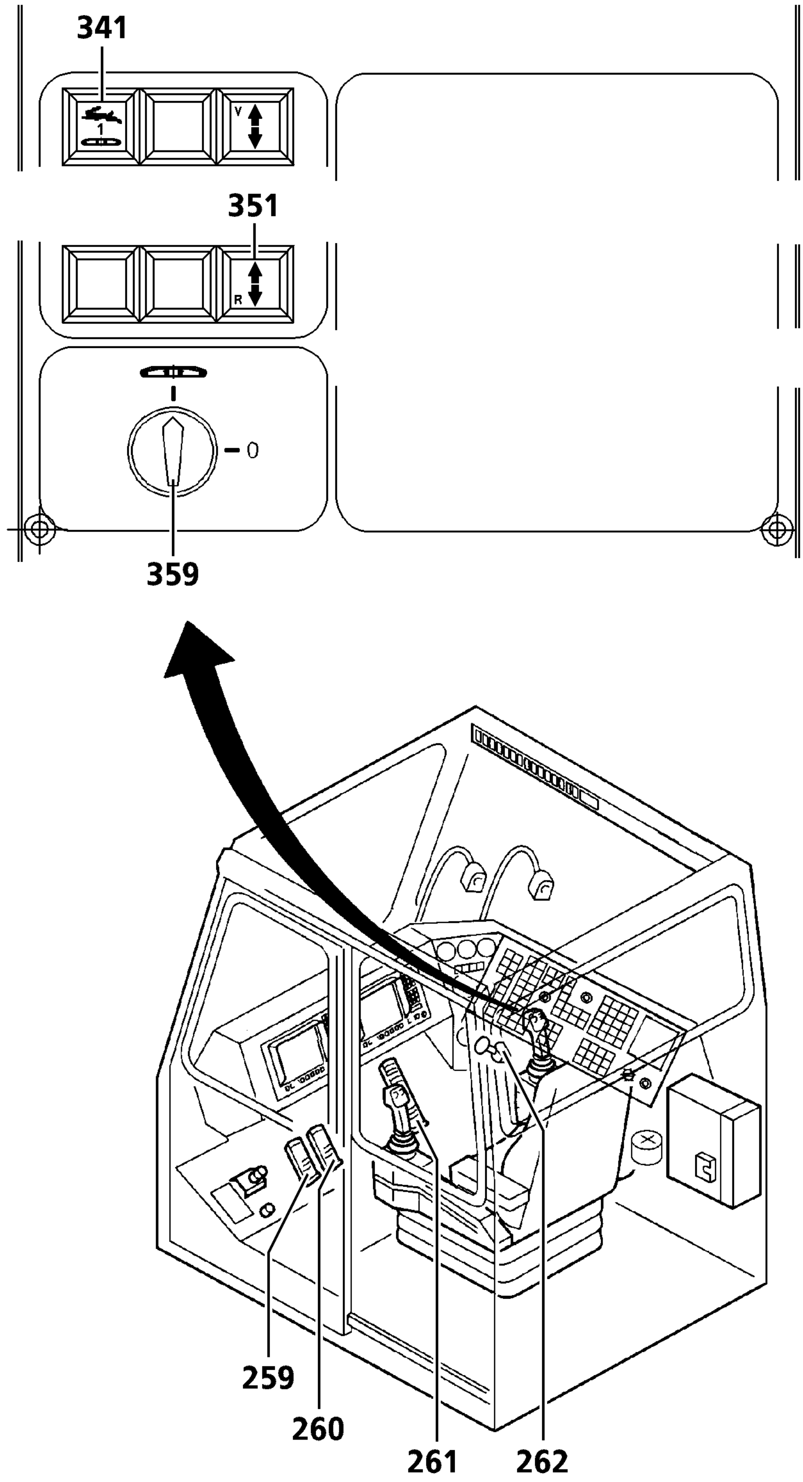
W- luffing fly jib- fall back guard

W - luffing fly jib fall- back accumulator cylinder (1)
A hydraulic accumulator cylinder pre - charged prevents the WA- bracket I and the luffing fly jib from falling back.
If luffing fly jib topping movement continues, the piston rods are forced into the hydraulic accumulator cylinders.
The crane movement ”luffing” is shut down when the limit switch on the fall - back accumulator cylinders are activated.

Note: Checking fall - back accumulator cylinder, see chap. 8.13 resp. 8.14
Checking limit switches on the fall - back guard cylinder , see chap. 8.12

Mechanical W- luffing fly jib fall- back guard (2)
Additional to the fall - back accumulator cylinder a mechanical fall - back guard prevents the W- luffing fly jib from overturning in steepest position.
The crane movement ”luffing” is shut down when the limit switch on the mechanical fall - back guard is activated.

	fly jib - angle [a] *	**Cylinder- length [mm]**	**stroke [mm]**	**Pressure [bar]**			
				-20° C	**0° C**	**+20° C**	**+40°C**
Lowest operating position		--	--	--	--	--	--
Steepest operating position	80°	3735	85	280	303	326	347
Mechanical block oposition on the mechanical fall - back guard	83°	--	--	--	--	--	--
Accumulator cylinder fully extended [1]	36,2°	4850	1200	93	100,5	108	115
Check position, cylinder presssure [1]	38° +2°	4801	1151	95,5	103,6	111,3	118,5



186581

Crawler operation

Switch on crawler operation by actuating preselection switch (342) into position I.

Operate pedal with the foot or with the control levers inserted:

- Depress the front of the left pedal (259) for forward movement of the left crawler track and the rear of the pedal for reverse movement.
- Depress the front of the right pedal (260) for forward movement of the right crawler track and the rear of the pedal for reverse movement.

Engine speed is controlled either at accelerator pedal (261) or hand throttle (262).

Actuate switch (341) to select high-speed operation of the travel gear.

Note: At crane operation actuate preselection switch (359) , from crawler operation position I, to crane operation position O.

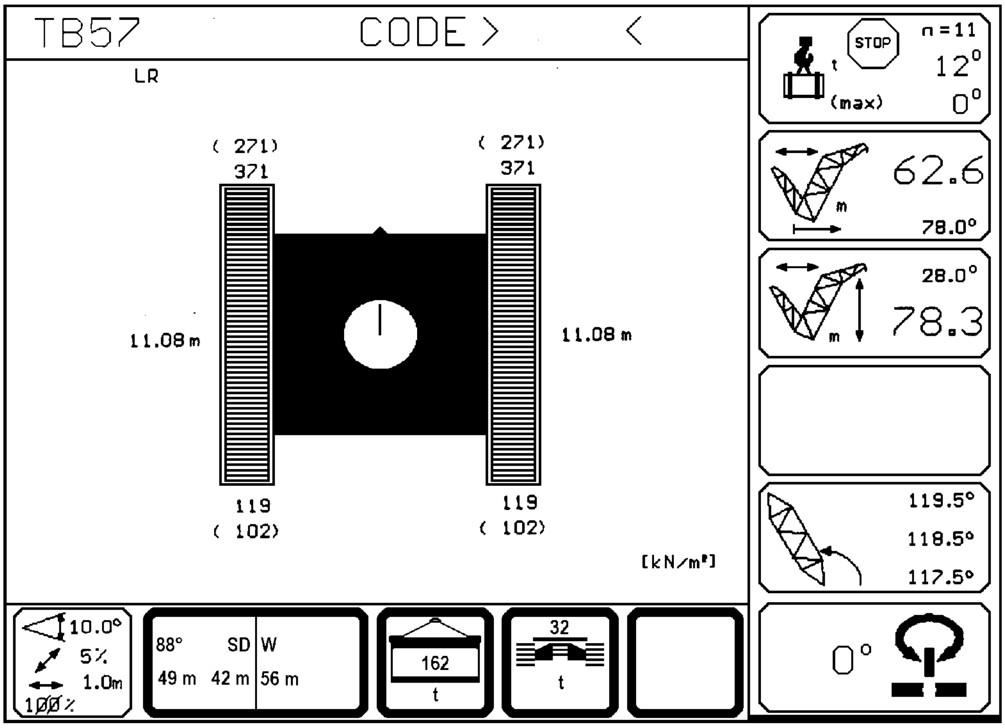
C A U T I O N: **When steering the crawler, the slewing coasting gear must be actuated. This prevents that the boom system is suddenly accelerated, which could cause crosswise boom movements. If this is not observed, if can cause damage to the boom.**

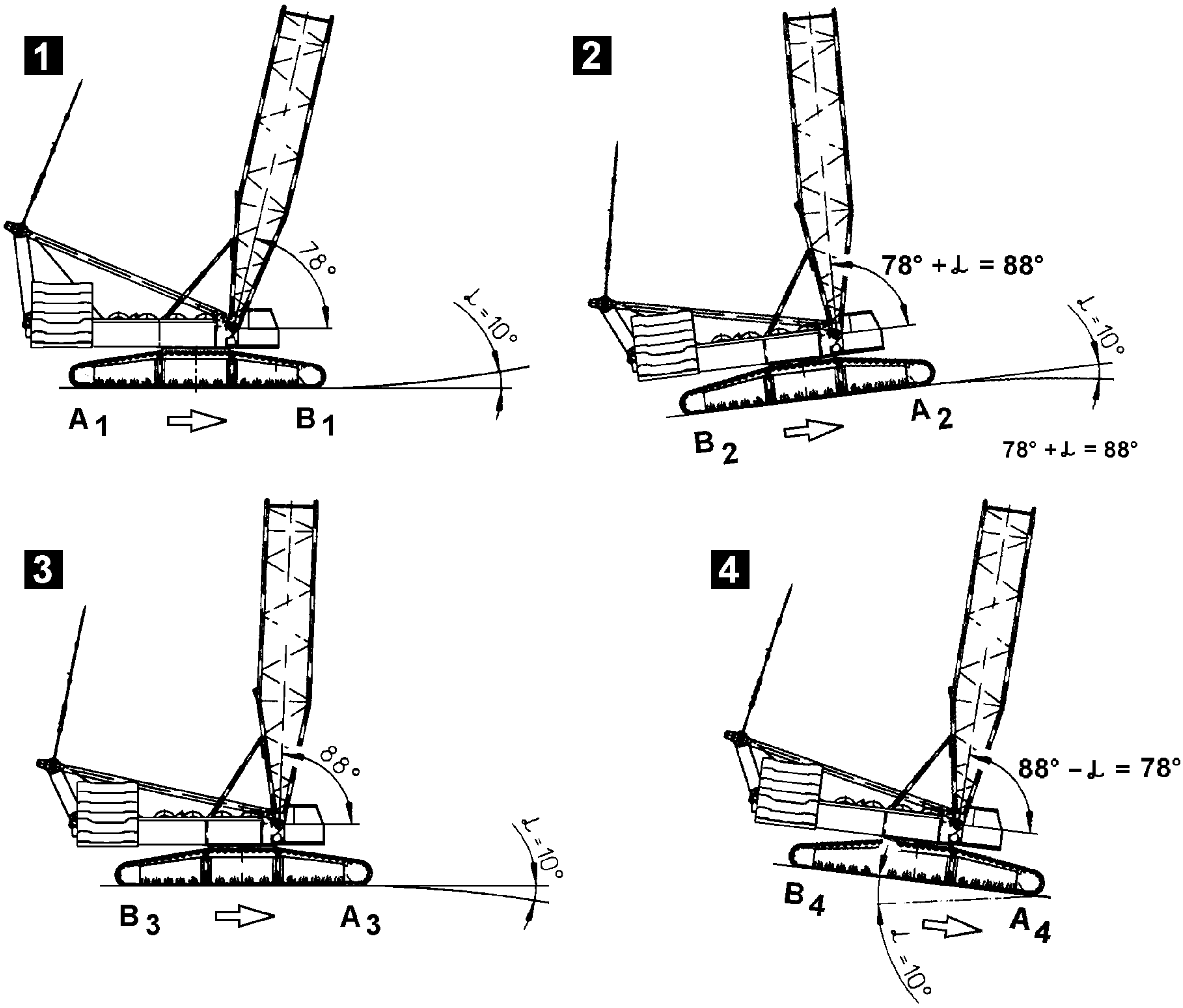
The crane must be monitored when driving the crane or when working with the slewing gear , either with a camera or by a guide.

Travel movement with suspended load - Straight on travel

The stated loads can be left suspended during crane travel movements, providing that the following precautions are taken:

1. The ground surface must be smooth and level (no gradient).
2. The subsoil must be capable of bearing the crane's maximum service weight plus the weight of the suspended load.
3. Only minimum driving speed is permitted.
4. Jerky crane movements must be avoided.
5. The suspended load must be lashed to prevent it from swinging.
6. Steering of crawler is not required


TB57
CODE >
<
LR
(271)
371
(271)
371
11.08 m
11.08 m
119
(102)
119
(102)
[kN/m²]
n = 11
STOP
12°
0°
(max)
62.6
78.0°
28.0°
78.3
119.5°
118.5°
117.5°
10.0°
5%
1.0m
100%
88°
SD
W
49 m
42 m
56 m
162
t
32
t
0°


1
78°
A 1
B 1
2
78° +⊥ = 88°
B 2
A 2
78° +⊥ = 88°
3
88°
B 3
A 3
4
88° −⊥ = 78°
B 4
A 4

192820

Driving crawler cranes with attachments on uphill slopes
The maximum climbing ability of a crawler crane is limited by the following criteria:

- the center of gravity for the complete crane
- the friction coefficient between roadway and track pads
- the transfer between the horizontal and the incline
- max. 10° incline to a boom length of 150 m, with ballast trailer or suspended ballast max. 5°.

CAUTION: **To drive uphill with crawler cranes, the following conditions must be observed:**

- **The ground must be able to take on the ground pressure, which will occur.**
- **The friction coefficient between roadway and ground must be large enough to take on any drive forces which will occur. Slippery ground can cause the crane to slip sideways and to move it into an impermissible side incline position. There is a danger of accidents!!**
- **The slewing platform must be aligned parallel to the crawler carriers and must be secured to prevent it from turning.**
- **The maximum permissible wind speed is 9 m / sec.**
- **Side incline is not permitted!!**
- **Slow travel speed, all acceleration and delay procedures must be carried out very carefully.**
- **The transfer from the horizontal to the incline and from the incline to the horizontal must be made very evenly, which means there may be no edges over which the crane tips. The incline change must be continous.**
- **Before driving observe the ground pressure which will occur, with the operating planner.**

The required length (L) of the transfers is calculated from the existing incline angle (Alpha) and the length of the crawlers (LC):

Fig.	Travel direction	
	from	to
1	Horizontal	Uphill slope
2	Uphill slope	Horizontal
3	Horizontal	Downhill slope
4	Downhill slope	Horizontal

L = 0,5 x Alpha x LC

L = Ground length of required transfer
Alpha = Angle of incline in degrees
LC = Length of crawler between drive / steering wheels

Example: LR 1800, Incline Alpha = 10°, LC = 12,6 m
L = 0,5 x 10 x 12,6 m = 63 m

While driving uphill, the ratio between the front and the rear ground pressures (or between the rear and the front) must be larger than 0.3 in all travel conditions:

A : B must be larger than 0.3
A = max. ground pressure on the side of the two crawlers with less pressure
B = max. ground pressure on the side of the two crawlers with higher pressure

Example: LR 1800, S 49, D 42, W 42 with 162 t slewing platform ballast and 32 t central ballast.
With the job planer, slope the boom in such a way that the above ratio is given at the calculated maximum ground pressures .
A=119, B=371,A/B=0,32>0,3 ok

Crane operatioin
Requirements
- The crane is horizontally aligned.
- Counterweight is mounted and secured in accordance with the load capacity table.
- The Diesel engine is running.
- Hook block is properly reeved in according to the reeving chart.
- All safety devices are set in accordance with the load capacity table.
- Danger zone free of personnel and objects.

C A U T I O N: **Always operate the hand control lever slowly and carefully. This not only ensures longer crane life, but also helps to avoid accidents.**

D A N G E R: **During all crane movements, always make sure there are neither obstacles nor persons in the danger zone.**
Before each crane movement a accoustic signal has been given.
Before crane operation, the dummy plugs, which were inserted for set up, must be changed over to the appropriate connector boxes

LICCON safe load indicator system
During operation, always check the indicators on the LICCON monitor. When carrying out a crane movement, the operator should be able to see the changing load condition and changing forces. The overload condition should be recognized early on, and the crane movement should be slowed down accordingly.

Select the slewing speed in the ”CONTROL” program, and lock out the winches, which are not used (see chapter 4.02, 4.03).

The operator must monitor the indicators especially carefully when carrying out the ”turn the slewing platform” and ”crawler” movement, because this movement does not have an automatic shut off function.

The crane operator must calculate constantly in his head if the data shown in the operating view can even be correct. The crane operator should not blindly depend on the system, he must always be alert and must be able to recognize a possible error.

Working with a load in operating modes without derrick ballast

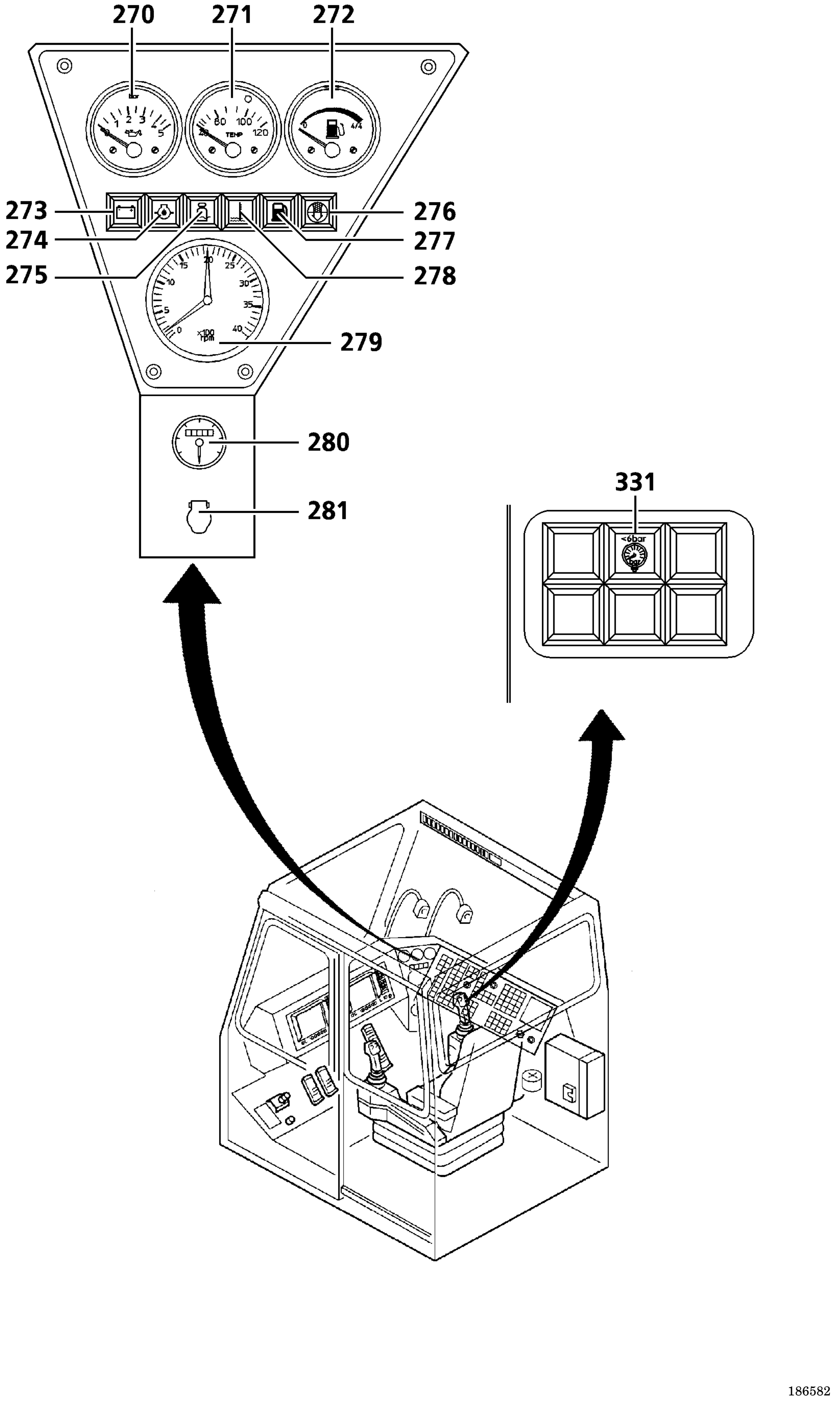
In operating modes without derrick ballast, the ”maximum load of the current crane condition” is monitored solely via the ”maximum load according to the load capacity chart and reeving”. It is shown in the operating view, monitor 0. The current load of the crane is shown on the load utilization bar on the monitor. The ”maximum load of the current crane condition” is reached if the load utilization bar has reached 100%.

At 90%, a prewarning is given with the CAUTION symbol and ”SHORT HORN“ on the monitor.

At 100%, all load moment increasing movements are shut off with the STOP symbol and the acoustical warning ”HORN” on the monitor 0 will sound.

The "maximum load according to the load capacity chart and reeving" and thereby the 100% limit of the load utilization bar can be bypassed as follows:
1. Hold keyed switch D_0 on monitor 0 (after corresponding preselection with function key $F5_0$) in "right touching" position. This bypasses only the "maximum load capacity according to the load capacity chart and reeving" (see exact description in chapter 4.02, section 6.07).
2. Installation keyed switch in instrument panel
   This bypasses the "maximum load capacity according to load capacity chart and reeving" and a number of other limit values and limit switches (see exact description in chapter 4.04).

D A N G E R: Bypassing safety devices can be a very dangerous situation !


270
271
272
273
274
275
276
277
278
279
280
281
331
<6bar
186582

During crane operation observe:

Warning lamp (274)	-	oil pressure and gauge (270)
Warning lamp (278)	-	coolant temperature too high and gauge (271)
Warning lamp (247)	-	fuel level too low and gauge (272)
Warning lamp (273)	-	battery charge
Warning lamp (275)	-	Radiator water too low
Warning lamp (276)	-	Air filter contaminated
Warning lamp (331)	-	Feed oil pressure in winches I-VI less than 10 bar

C A U T I O N: **If the warning lamp (274) does not go out after engine start, or one of the warning lamps (274 resp.278) comes on during crane operations, the engine must be shut down immediately.**
If this is not done, the engine can be damaged due to a lack of oil pressure.

Winch operation
When operating with long boom/jib configurations and with non-loaded hooks, special attention has to be paid to the fact that there will be no slack rope at the winch when lowering.

C A U T I O N: **Spool it in at about 1.000 kg rope tension!**

Hook blocks
By bolting on additional plates the weight of the hook blocks can be raised.

Double hook block 400 t /200 t
Weight = 8,00 t with 2 hook blocks

Hook block 200 t
Weight = 5,40 t

Double hook block 250 t / 125 t
Weight = 6,00 t with 2 hook blocks

Hook block 125 t
Weight = 3,80 t

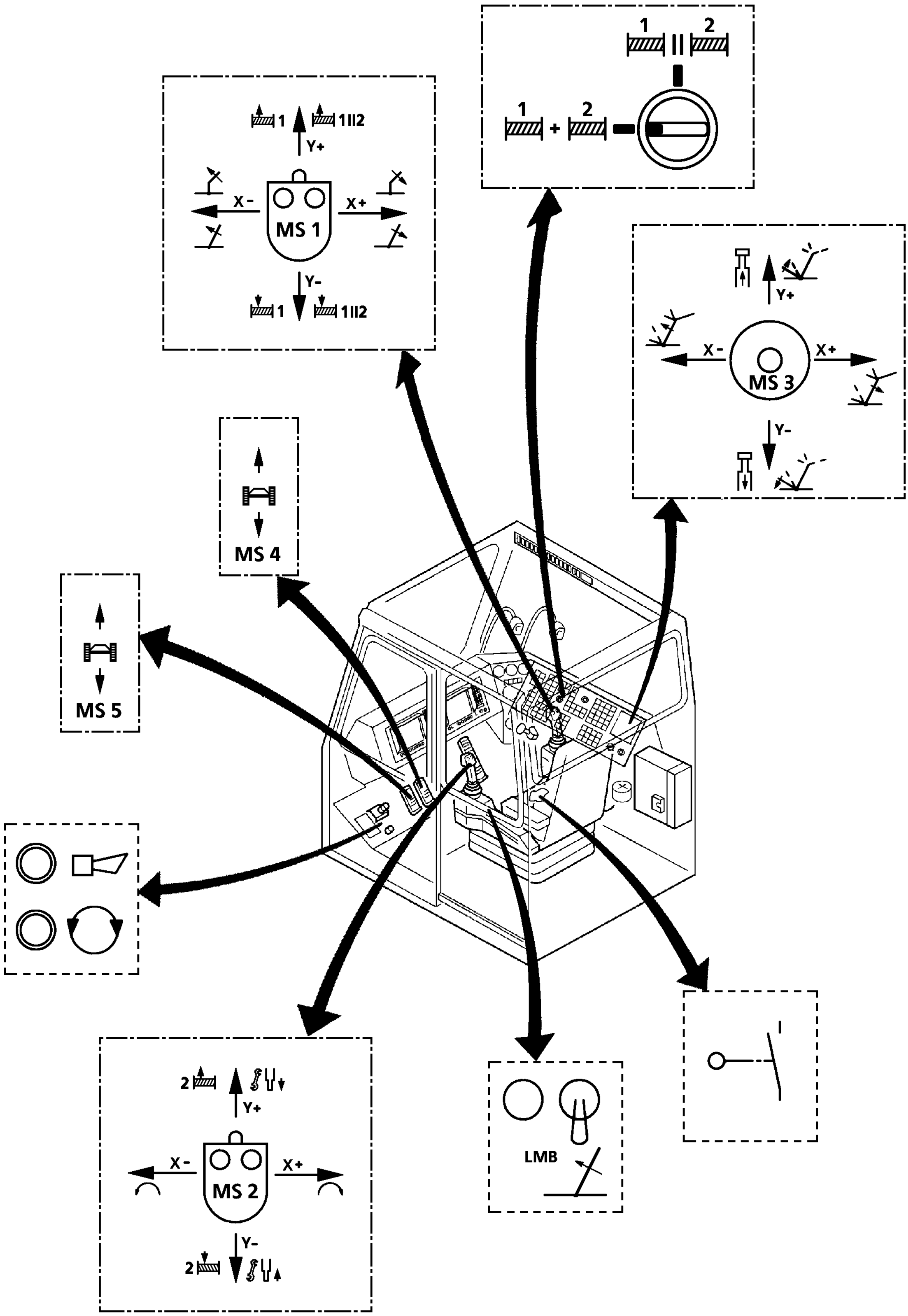
Hook block 160 t
Weight = 3,50 t with 2 additional plates (2×0,60 t)
Weight = 2,30 t without additional plates

Hook block 80 t
Weight = 2,60 t with 2 additional plates (2×0,45 t)
Weight = 1,70 t without additional plates

Hook block 36 t
Weight = 1,50 t

Load hook 12 t
Weight = 0,60 t

Note: Required minimum hook block weights at crane operation - see load charts.



186583

Allocation of winches,pumps and hand control lever (master switch, MS) to the operating modes

Operating mode	W1			W2			W1 // 2			W3			W4		
	P	MS	F	P	MS	F	P	MS	F	P	MS	F	P	MS	F
R assembly	--	--	--	--	--	--	--	--	--	--	--	--	4	1x	EZW
S SL,L,LL,SF,SV,SLF LF,SNZF,SLNZF	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	--	--	--	4	1x	SV
SW SN,SLN,LN	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	--	--	--	4	3y	SV
SNF SWV,SLNF,LNF	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	--	--	--	4	1x	SV
SNZ SLNZ	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	--	--	--	4	3y[*2]	EZW
SD SLD,LD,SDF, SLDF,SDNZF	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	3	1x	SV	4	3y	EZW
SDW SDWN,SDN	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	3	3x	SV	4	3y	EZW
SDNF SDWV	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	3	1x	SV	4	3y	EZW
SDNZ	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	3	3x	SV	4	3y[*2]	EZW
SDB (W) SLDB(W), LDB(W),SDFB(W), SLDFB(W),SDNZFB(W)	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	3	1x	SV	4	3y	EZW
SDWB (W) SDNB(W)	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	3	3x	SV	4	3y	EZW
SDNFB (W) SDWVB(W)	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	3	1x	SV	4	3y	EZW
SDNZB (W)	1	1y	H1	2	2y	H2	1/2	1y	H1 // H2	3	3x	SV	4	3y[*2]	EZW
Crawler	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Emergency control	1	1y	--	2	2y	--	--	--	--	3	1x	--	4	3x	--
Switchposition at emergency mode															

*1 At switch position H1 // H2 only
*2 Only when MS 1x is not actuated
*3 At switch position H1 // H2 only and winch 4 not actuated
*4 Only when MS 3y is not actuated

Note: Slewing gear pump 6 Hand control lever 2x

MS	Hand control lever (master switch)	F	Function
MN	Boom nose	R	Crawler
SV	Boom luffing	NV	Fly jib luffing
EZW	Derrick luffing	D	Slewing gear
H1	Hoisting gear 1	P	Pump
H2	Hoisting gear 2	Z	Assemblycylinder

Allocation of winches,pumps and hand control lever (master switch, MS) to the operating modes

Operating mode		W5			W6		
		P	MS	F	P	MS	F
R	assembly	--	--	--			
S	SL,L,LL,SF,SV,SLF LF,SNZF,SLNZF	5	2y*1	H2			
SW	SN,SLN,LN	5	1x	NV	4	2y*3	H2
SNF	SWV,SLNF,LNF	--	--	--	4	2y*3	H2
SNZ	SLNZ	5	2y*1	H2	--	--	--
SD	SLD,LD,SDF, SLDF,SDNZF	5	2y*1	H2	--	--	--
SDW	SDWN,SDN	5	1x	NV	4	2y*3	H2
SDNF	SDWV	--	--	--	4	2y*3	H2
SDNZ		5	2y*1	H2	--	--	--
SDB (W)	SLDB(W), LDB(W),SDFB(W), SLDFB(W),SDNZFB(W)	5	2y*1	H2	--	--	--
SDWB (W)	SDNB(W)	5	1x	NV	4	2y*3	H2
SDNFB (W)	SDWVB(W)	--	--	--	4	2y*3	H2
SDNZB (W)		5	2y*1	H2			
Crawler		--	--	--	--	--	--
Emergency control		5	3y	--	4	3x	--
Switchposition at emergency mode					H1 // H2		

*1 At switch position H1 // H2 only
*2 Only when MS 1x is not actuated
*3 At switch position H1 // H2 only and winch 4 not actuated
*4 Only when MS 3y is not actuated

Note: Slewing gear pump 6 Hand control lever 2x

MS	Hand control lever (master switch)	F	Function
MN	Boom nose	R	Crawler
SV	Boom luffing	NV	Fly jib luffing
EZW	Derrick luffing	D	Slewing gear
H1	Hoisting gear 1	P	Pump
H2	Hoisting gear 2	Z	Assemblycylinder

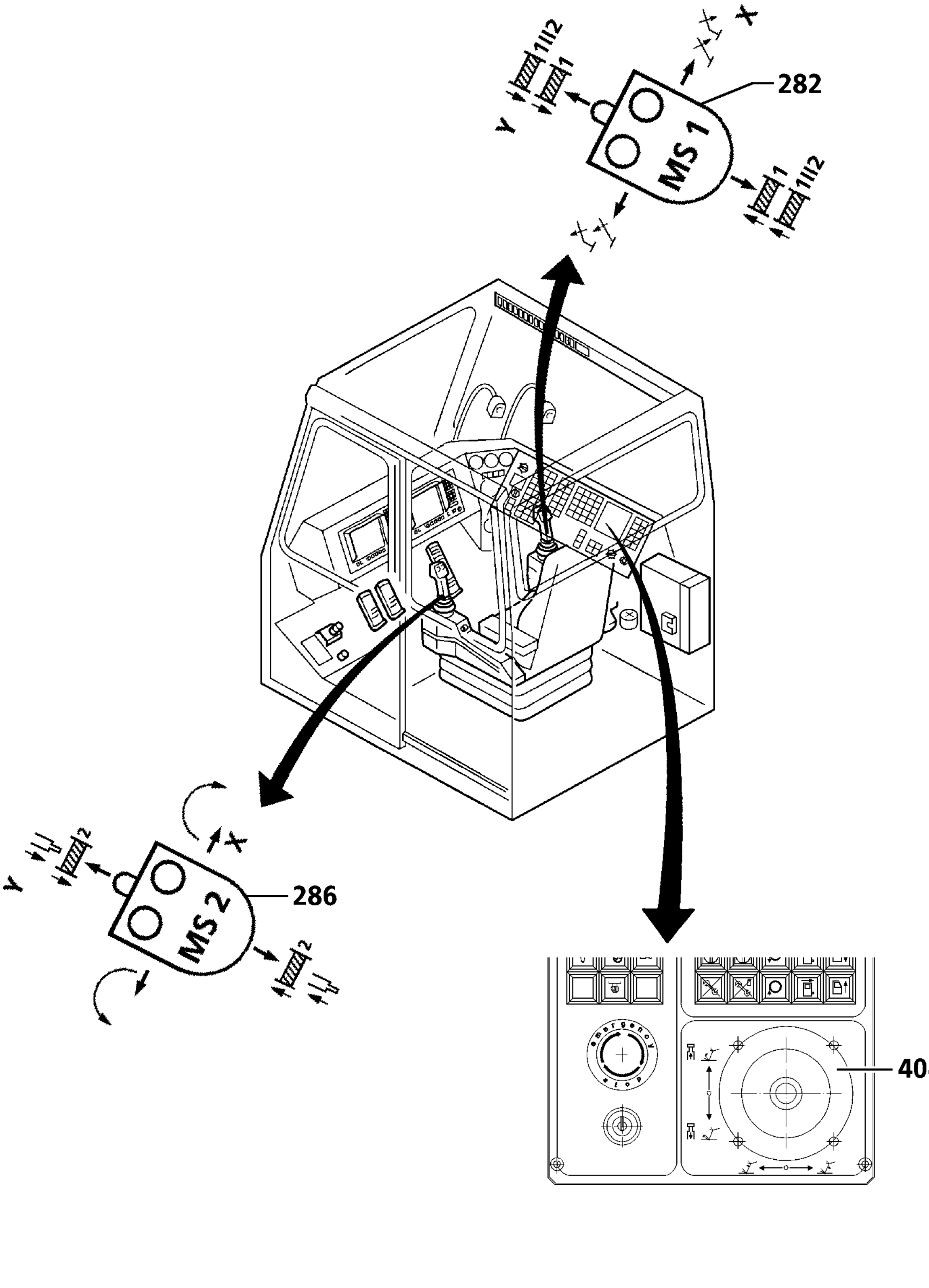
Allocation of winches,pumps and hand control lever (master switch, MS) to the operating modes

Operating mode		Fly jib luffing			Assembly cylinder			Crawler right			Crawler left		
		P	MS	F	P	MS	F	P	MS	F	P	MS	F
R	assembly	--	--	--	2	2y	Z	--	--	--	--	--	--
S	SL,L,LL,SF,SV,SLF LF,SNZF,SLNZF	--	--	--	--	--	--	--	--	--	--	--	--
SW	SN,SLN,LN	--	--	--	--	--	--	--	--	--	--	--	--
SNF	SWV,SLNF,LNF	--	--	--	--	--	--	--	--	--	--	--	--
SNZ	SLNZ	9	1x*4	NV	--	--	--	--	--	--	--	--	--
SD	SLD,LD,SDF, SLDF,SDNZF	--	--	--	--	--	--	--	--	--	--	--	--
SDW	SDWN,SDN	--	--	--	--	--	--	--	--	--	--	--	--
SDNF	SDWV	--	--	--	--	--	--	--	--	--	--	--	--
SDNZ		--	--	--	--	--	--	--	--	--	--	--	--
SDB (W)	SLDB(W), LDB(W),SDFB(W), SLDFB(W),SDNZFB(W)	--	--	--	--	--	--	--	--	--	--	--	--
SDWB (W)	SDNB(W)	--	--	--	--	--	--	--	--	--	--	--	--
SDNFB (W)	SDWVB(W)	--	--	--	--	--	--	--	--	--	--	--	--
SDNZB (W)		--	--	--	--	--	--	--	--	--	--	--	--
Crawler		--	--	--	--	--	--	3	4y	R	4	5y	R
Emergency control		--	--	--	2	2y	--	3	4y	--	4	5y	--
Switchposition at emergency mode					assembly switch crawler			pre selection switch I			pre selection switch I		

*1 At switch position H1 // H2 only
*2 Only when MS 1x is not actuated
*3 At switch position H1 // H2 only and winch 4 not actuated
*4 Only when MS 3y is not actuated

Note: Slewing gear pump 6 Hand control lever 2x

MS	Hand control lever (master switch)	F	Function
MN	Boom nose	R	Crawler
SV	Boom luffing	NV	Fly jib luffing
EZW	Derrick luffing	D	Slewing gear
H1	Hoisting gear 1	P	Pump
H2	Hoisting gear 2	Z	Assemblycylinder



186584

Controlling the crane movements

Crane movement "boom adjustment"at operating mode: S, Sw, L, LL
Luffing with hand control lever (282), MS1x.
Move the hand control lever (282) to the left = boom luffs up
Move the hand control lever (282) to the right = boom luffs down

Crane movement "boom adjustment"at operating mode: SW, LN
Luffing with hand control lever (404), MS3y.
Move the hand control lever (404) backward = boom luffs up
Move the hand control lever (404) forward = boom luffs down

Crane movement "adjusting the fly jib" at operating mode: SDW, LN
Luffing with hand control lever (282), MS1x.
Move the hand control lever (282) to the left = fly jib luffs up
Move the hand control lever (282) to the right = fly jib luffs down

Crane movement 'Derrick control' for all Derrick operating modes
The boom is controlled in these operating modes with the manual control lever (404), MS3y.
Deflect the manual control lever (404) to the rear = to luff derrick up
Deflect the manual control lever (404) to the front = to luff derrick down

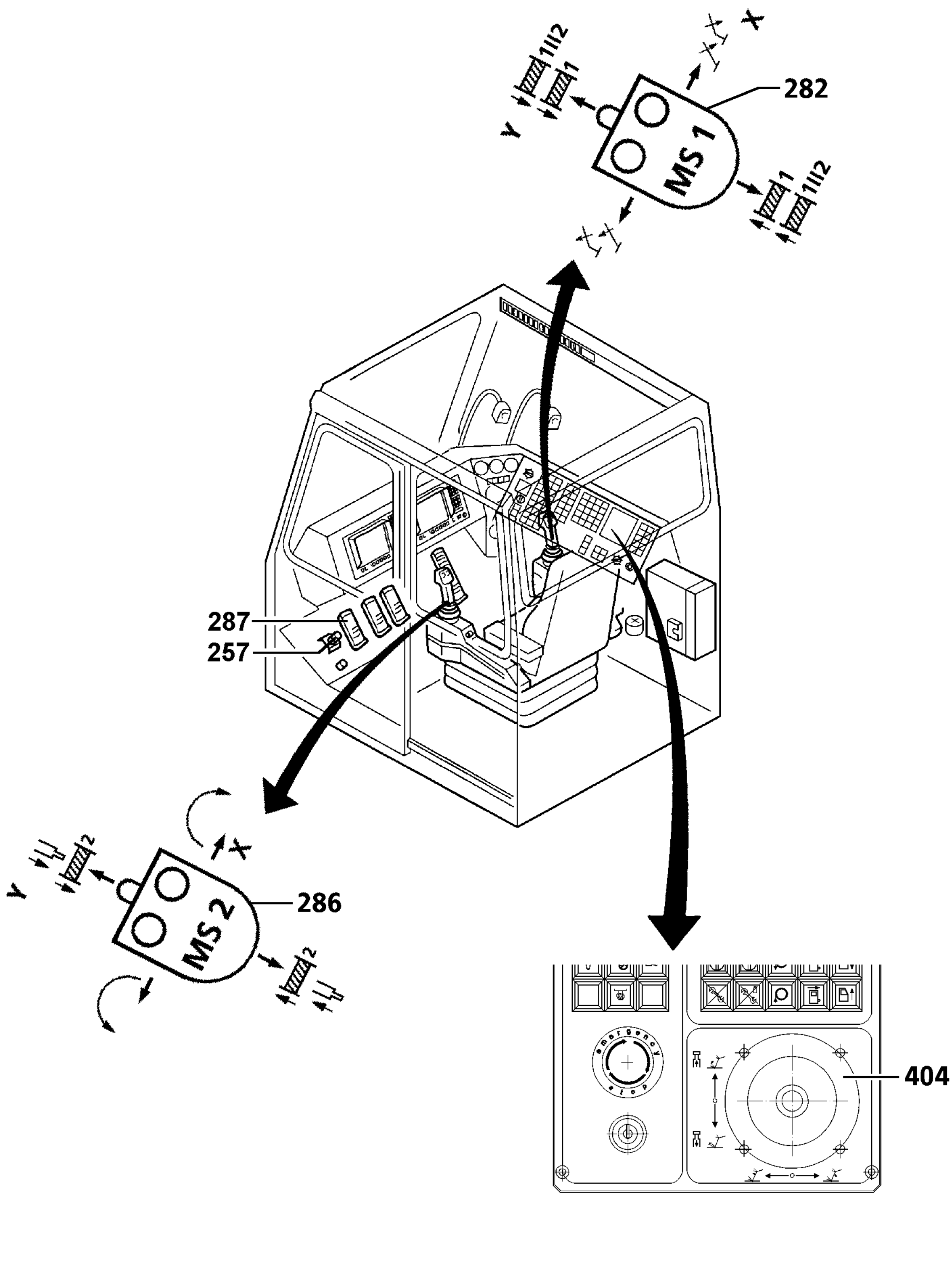
Note: The speed of the crane movement is controlled by varying lever and engine speed.

Crane movement " Up / down" with hoist gear (winch 1)
Move the manual control lever (282), MS1y, forward = hoist down
Move the manual control lever (282), MS1y, backward = hoist up

N
Crane movement " Up / down" with hoist gear (winch 2)
Move the manual control lever (286), MS2y, forward = hoist down
Move the manual control lever (286), MS2y, backward = hoist up

Note: The speed of the crane movement is controlled by the deflection of the manual control lever (and via the foot pedal for the engine regulation .
On the LICCON crane operating view, the direction of rotation of the winch is shown on the screen, even if it is not always possible to detect any movement of the hook block, due to the number of rope runs and slow speed.

C A U T I O N : When spooling the hoist cable in or out, keep watching the winch to make sure that there is no excess loose cable on the winch. Keep an eye on the winch!
Loose cable can damage the winch cable.



189344

Crane movement "slewing"

On the LICCON monitor select the speed range (%) of the slewing movement according the load capacity chart - see LICCON, chapter 4.02.

DANGER: **The speed range of the slewing movement must be set according the load capacity table.**
Operating with slewing speed to high there is an increased risk of ACCIDENTS!
Before beginning any slewing movements, the crane operator must make sure there are no persons or obstacles in the slewing radius - otherwise, there is an increased risk of accidents.
Before slewing crane a accoustic signal has been given.

Move the hand control lever (282), MS2x, to the right = slew to the right.
Move the hand control lever (282), MS2x, to the left = slew to the left.

Note: The speed of the crane movement is controlled by varying lever and engine speed.

DANGER: **Slewing movements must always be started and braked gently to prevent the load from swinging and getting out of control. A swinging load can cause the boom to break off, or can cause the crane to topple over.**

The crane must be monitored when driving the crane or when working with the slewing gear , either with a camera or by a guide.

In general, the following is valid:
Longer boom - slower slewing speed
More load - slower slewing speed

Note: The slewing gear can be disengaged with foot switch (257) making it easier to position the boom above a load to be lifted.

Slewing gear block*
An additional pedal is installed in the crane to block the slewing gear (287), which effects about 50% of the maximum braking action. If the crane is turned against the wind - in case of strong side wind and long boom systems - the crane superstructure is turned in the opposite direction due to leakage in the hydraulic motor. This can be prevented by actuating the pedal for the slewing gear block (287) and by deflecting the master switch (286) into the desired turning direction. By slowly releasing the pedal (287), the superstructure will turn into the desired direction.

The slewing gear block may only be used at minimum slewing speeds, which means the master switch (286) must be almost in zero position, and only in the following cases:

1. Starting the slewing movement in case strong side winds
   Actuate the pedal for the slewing gear block (287) and deflect the master switch (286) into the desired direction. Slowly release the pedal (287) until the crane superstructure turns into the desired direction.
2. Stopping the slewing movement in case of strong side winds
   With the master switch (286), slow the crane down to minimum speed. Carefully actuate the pedal for the slewing gear block (187) until the crane comes to a standstill at the desired point.

CAUTION: **The slewing gear block may never be used as an additional slewing brake.**
If this is not observed, the slewing brake will be destroyed. This in turn can damage the slewing gear or slewing ring.

* if installed

Guy ropes of jib

When the jib is not raised, but the guy rods of the jib remain installed on the main boom, then one must be aware that , in reality , the max. load, which is noted in the load charts, cannot be obtained.
The weight of the guy rods of the jib , which remain on the main boom, is not considered in the LICCON in the main boom program.
Even though the weight of the rods is registered by the LICCON, and as a result, the empty weight is higher and the remaining load to be lifted is smaller.
This difference varies depending on the boom angle: the smaller the angle, the larger the influence.
The guy rods must be removed before turning the LICCON off.

Crane operations

Regard all notes in this chapter.

Prerequisites:
- The LICCON safe load indicator is set, according the to data given in the load capacity chart.
- The installation keyed switch has been turned off
- The installation symbol on the LICCON indicator turns off .

D A N G E R: Check horizontal position of the crane before and during all operations. If the crane operator leaves the cab for any reason, even for brief periods, he must recheck to operating mode setting to make sure it is correct.

Adjustments / Checks

Check the function of the safe load indicator (overload warning device) by triggering the ”top” and ”bottom” operating positions ,
Check the function of the hoist limit switch ”top” by triggering the hoist limit switch weight.
Check the function of the limit switch ”steep boom position ” by triggering the relapse cylinders. resp. mechanical fall back guard.
Check the function of the limit switch ”steep lattice jib position” by triggering the steepset operating position.

Guy rods placed on the lattice sections

If the guy rods are not required for the selected combination, then they can remain on the intermediate sections. However, the following points must be observed:

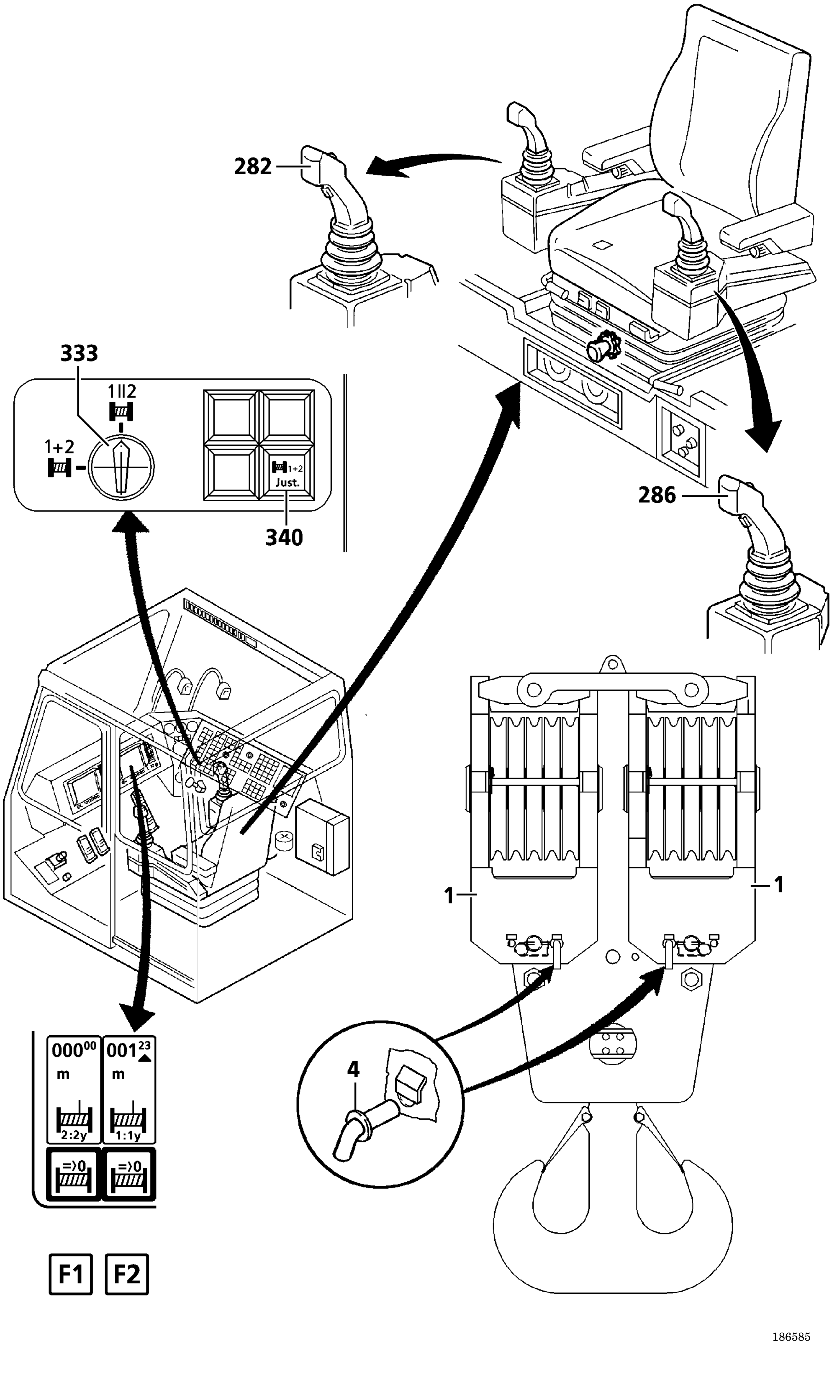
Note: If the guy rods are not taken off, then the values given in the load capacity chart are reduced correspondingly.

Danger conditions without "shut down"

Block position - relapse cylinders - lower the load

D A N G E R: If the block position of boom and Derrick is triggered with attached, freely suspended load, then there is a danger of damaging the boom and relapse cylinder when the load is set down on 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 down of "hoist gear down" function. For that reason, after the buzzer sounds and the corresponing indicator light lights up, the counter-direction of the movement which triggered the block position must be initated, to eleminate the block position.


282
333
1II2
1+2
1+2
Just.
340
286
1
1
4
000⁰⁰
m
2:2y
001²³
m
1:1y
=›0
=›0
F1
F2
186585

Parallel operation (winch 1 // 2) - Crane operation with two hook blocks (2 x 125 t), (1)
When working with two hook blocks, the ropes of winches I and II are reeved and 2 x 125 t -hook blocks are used.

Note: Assembly of the hookblocks for operation with two hookblocks - see Chap. 4.06.
Set LICCON to total reeving number.

Operation
Before lifting a load, adjust the hook blocks horizontally - check it visually - as follows:

- Move the preselector switch (333) to position 1 + 2 (winch 1+2).
- Actuate the manual control lever (282) - winch 1 or the manual control lever (283) - winch 2 and spool out or in until the hook block is aligned horizontally - check visually.

C A U T I O N: Before adjusting the hook blocks horizontally and starting crane operation the transport safety pins (4) must be unpinned again.

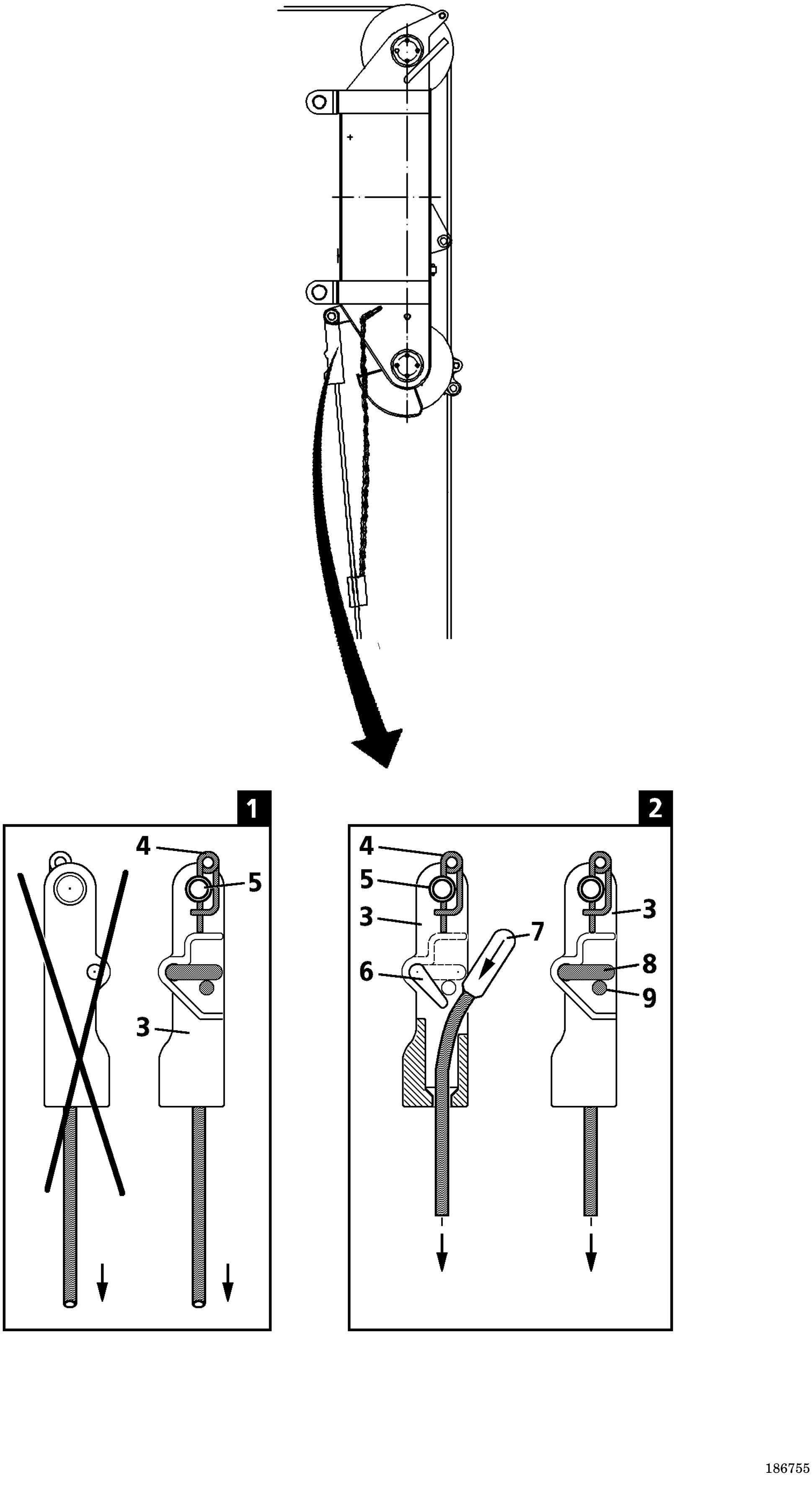
-Change the preselector switch (333) to position 1 // 2 (winch 1//2, parallel operation)

Note: Parallel operation winch 1 and 2with one manual control lever MS1y (282) only

- Then adjust the parallel control for winch 1 // 2 by pushing the button (340).
- Set zero point for hook path indication:
- If winch 1 and winch 2 work in parallel operation, then the length indicators of winch 1 and 2 can only be set to 000.00 together, via the $F1_0$ key. The function key $F2_0$ has no function and the corresponding symbol is turned off.

During crane operation, the winch movement is turned off if the difference range in the parallel control is exceeded.
In that case, the winches must be reset for parallel control, as described above.

C A U T I O N: The electronic parallel control only conrols for an identical number of revolutions of the two winches. However, it does not account for the following errors:
1. differences in the rope lengths
2. different hoisting characteristics
3. inequal reeving in of the two hook blocks (prohibited)
Despite the electronic control, the crane operator is responsible for keeping the hook blocks constantly on the same level.


1
2
4
5
3
4
5
3
6
7
3
8
9
186755

Reeving the hook block

Prerequisite:
- The crane is horizontally aligned.
- An assistant is present to guide the cable .

Installation procedure:

- Loosen the spring retainer and pull out the cable retaining bars (1) on the pulley head (2).
- Place the required hook block under the pulley head of the boom.
- On the hook block, remove the spring retainers and pull out cable retaining bars.
- Start the crane engine.

Note: While the assistant guides the hoist cable to the pulley head, the crane operator must operate the winch. This procedure must be done in such a manner, that the cable does not slacken up on the cable drum.

D A N G E R: **This work should be completed while standing on a secure base.**
If it is unavoidable that the cable must be hand-guided on the boom to the pulley head, use utmost caution when walking on the boom.
There is a great danger of causing a serious accident if the crane function is not operated properly and the person guiding the cable slips on the boom.

- Lay the hoist cable over the top cable pulley and reeve the hoist cable between the pulley head and the hook block as shown on the reeving plan for the appropriate load capacity chart.
- Reinsert the cable retaining bars and secure them with spring retainers.

Note: Reeving may be done manually or with the aid of a reeving winch .
If the reeving winch is used, the auxiliary cable must first be reeved in reverse direction between the hook block and the pulley head and then connected with the hoist cable.
During the reeving procedure, the crane operator must spool out the hoist cable from hoist winch and at the same time, spool up the auxiliary cable with the auxiliary winch .

Insert the hoist cable

Fig.: 1
- Depending on the reeving, bolt the cable lock (3) either to the pulley head or to the hook block and secure with the spring retainer (4).

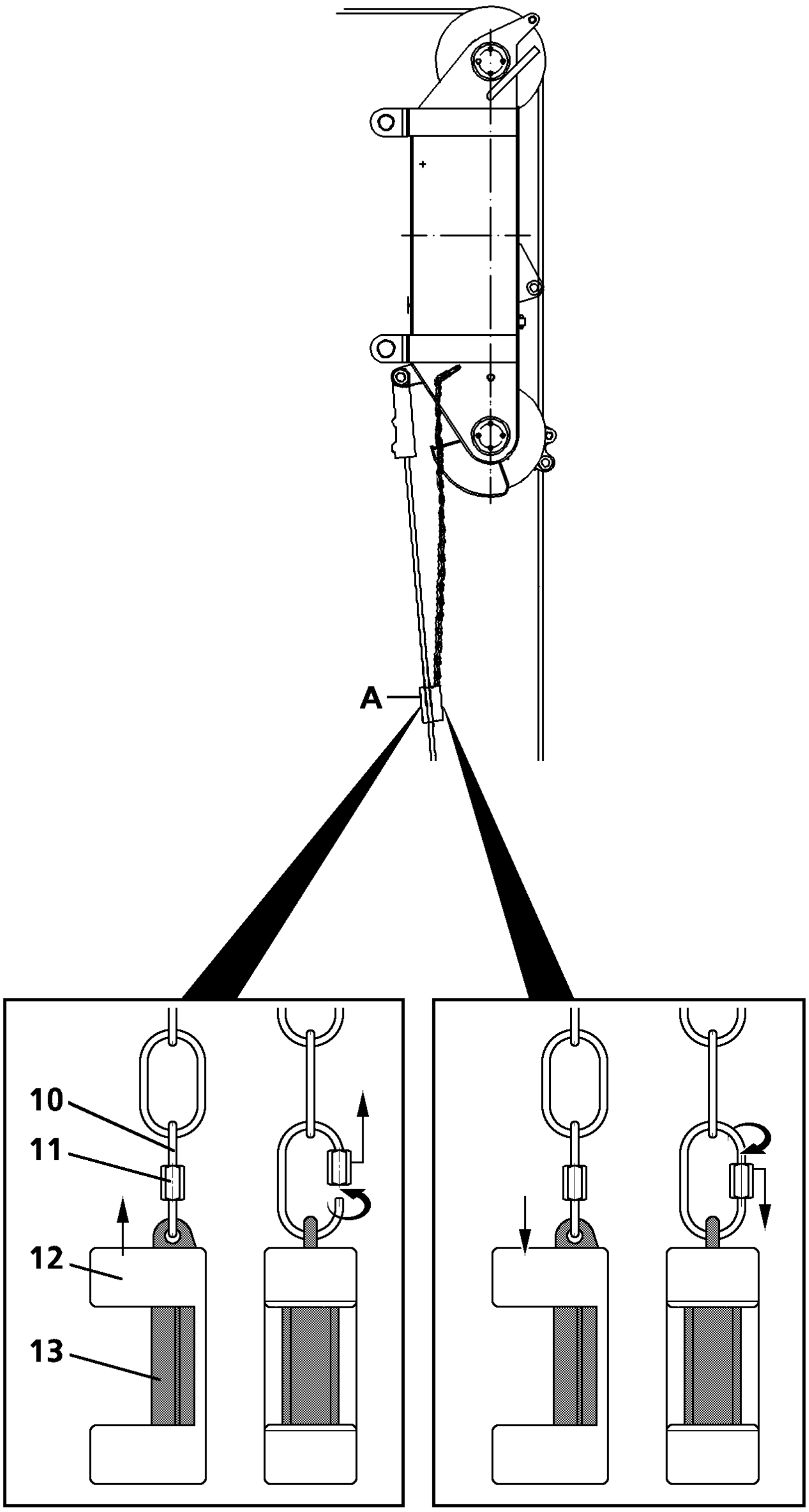
D A N G E R: **The pin (5) must always be placed from the inside to the outside and secured from the outside, to prevent the hoist cable from rubbing against the pin (5) or the spring retainer (4).**

Fig.: 2
- On the cable lock (3), push in the retainer pin (9), with the lever (6) downward and hold it in this position.

Note: This causes the locking lever (8) to swing downward.

- Insert the end of the cable with the cable fitting (7) into the cable lock (3) and strongly pull it ”downward” .

C A U T I O N: **The cable fitting (7) must touch the taper in the cable lock (3) , the lever (6) must be locked with the lock pin (9). The locking mechanism (6,8 and 9) on the cable lock must be freely movable.**



186756

Install the hoist limit switch weight

- Open the chain lock (10) on the hoist limit switch weight (A) .
- Using a 13 mm wide (SW 13) open end wrench, loosen the hex head nut (11) and turn it ”up” by hand .
- Release the hoist limit switch weight.

C A U T I O N: **The hoist limit switch weight (A) consists of two interconnected parts (12 and 13) . When releasing or attaching the weight, make sure that the two parts do not slide apart and cause the weight (12) to fall out.**
Danger of foot injuries!

- Push the weight (12) by hand onto the cable and hold it,
- with the other hand, guide the carrying part (13) behind the cable, underneath the weight (12).

D A N G E R: With multiple reeving, the hoist limit switch weight must always be routed around the ”FIXED CABLE”, meaning around the cable, whose end makes up the cable fixed point.

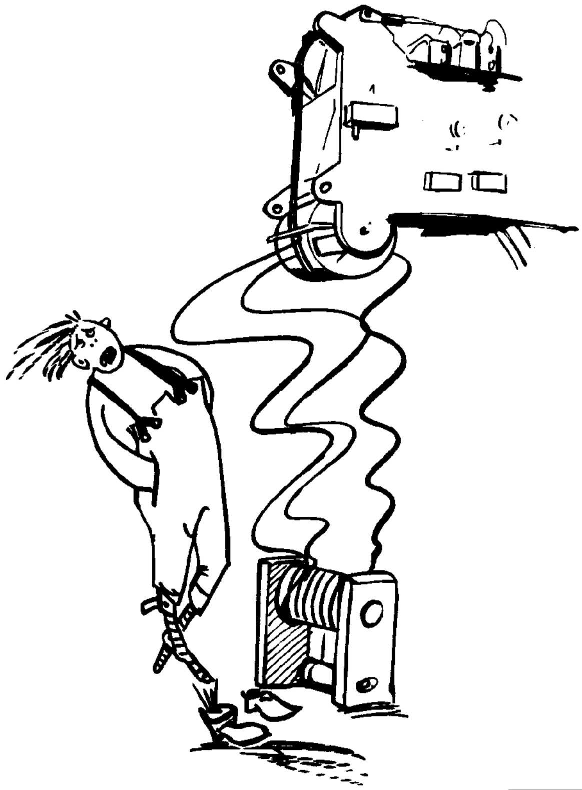
- Push the weight (12) over the carrying part (13) .
- Hang the hoist limit switch weight again into the chain lock (10).
- Turn the lock nut (11) down and manually tighten it with a SW 13 open end wrench.

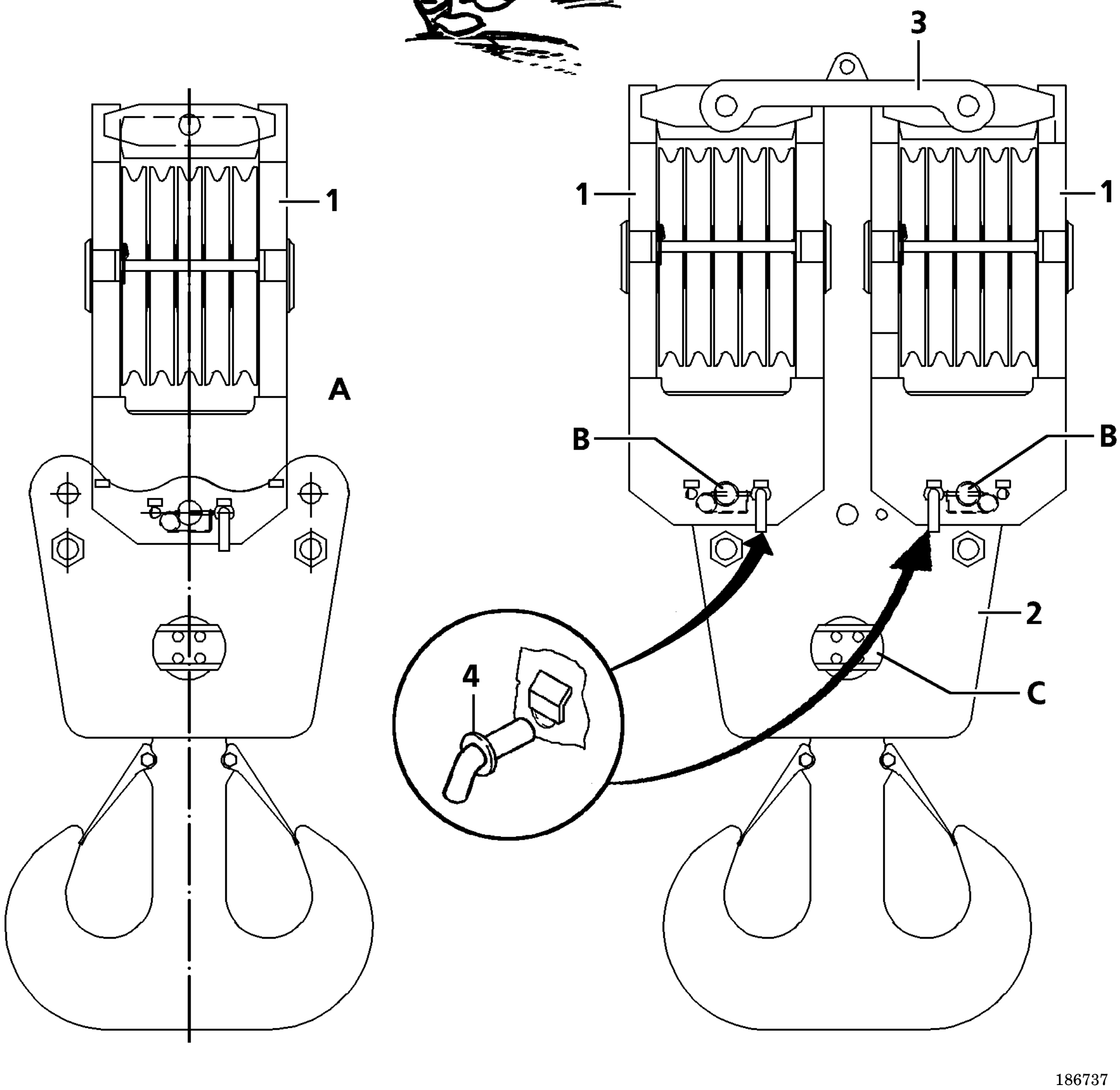
D A N G E R : The chain lock (10) serves at the same time to secure the weight (12).
It may not be replaced with another part, such as a shackle, snap etc.
The chain lock (10) must always be attached in such a way that the lock nut (11) is on ”top”, meaning on the chain (14) and the chain lock is closed by turning the lock nut (11) ”downward”.
This procedure assures that the lock nut (11) does not loosen up by itself, causing the chain lock to open.

Visual inspection: Is the chain lock (10) fully closed?
Is the hoist limit switch weight attached to the **”fixed or stationary cable”**?

- Enter the number of reeves into the ”LICCON” safe load moment indicator or recheck it.

D A N G E R : The crane operator must make sure that the reeving process has been done properly and that the safe load indicator has been set correctly.
Incorrect reeving or entering an incorrect number of reeves can lead to serious accidents.





186737

Unreeving the hook block

Assembly sequence:

- Lower the hook block to the ground and check to make sure it is standing in a stable position.
- Unhook cable end on the cable joint
- Slowly rewind the hoisting cable.

D A N G E R: **There must be no persons in the area around the hook block. During rewinding, the cable can lash out like a whip. It must be ensured that there is no loose cable on the winch.**

- Attach the hoisting cable with the cable joint onto the pulley head, or rewind the complete hoisting cable onto the winch.

C A U T I O N: **Always rewind the hoisting cable so that there is at least 2 m remaining - never rewind the cable end onto the winch!**

Assembly of the hookblocks for operation with two hookblocks

Unpin the double hook from the hookblocks (A)

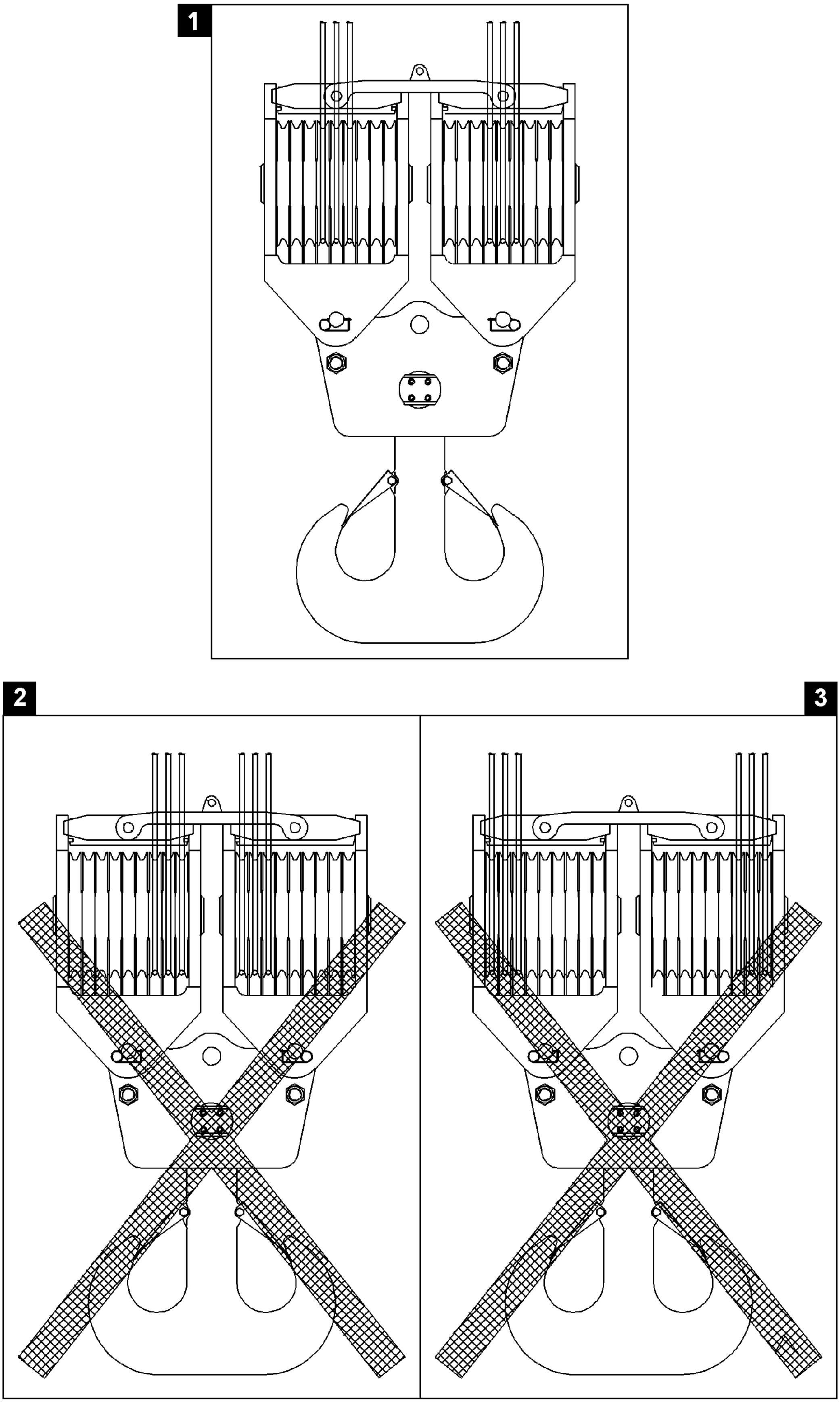
Pin the hookblocks (1) to the rocker (2) and connect with cross-strut (3).

At assembly and rope reeving the hook blocks must be pinned with pin (4) to prevent topple over.

Note: Turn handle down to secure.

C A U T I O N: **Before starting crane operation the hook blocks must be unpinned again.**

Pin (C) the double hook on the rocker (2).



193295

Asymmetric reeving

Only the hook blocks shown in the chart are suitable for **asymmetric** reeving of the individual blocks in parallel operation.

Description	Id. No. of hook block	Cable diameter [mm}	Number of pulleys
Double hook block 125/250 t	9144117208	25	5/10
Double hook block 200/400 t	914205108	25	9/18

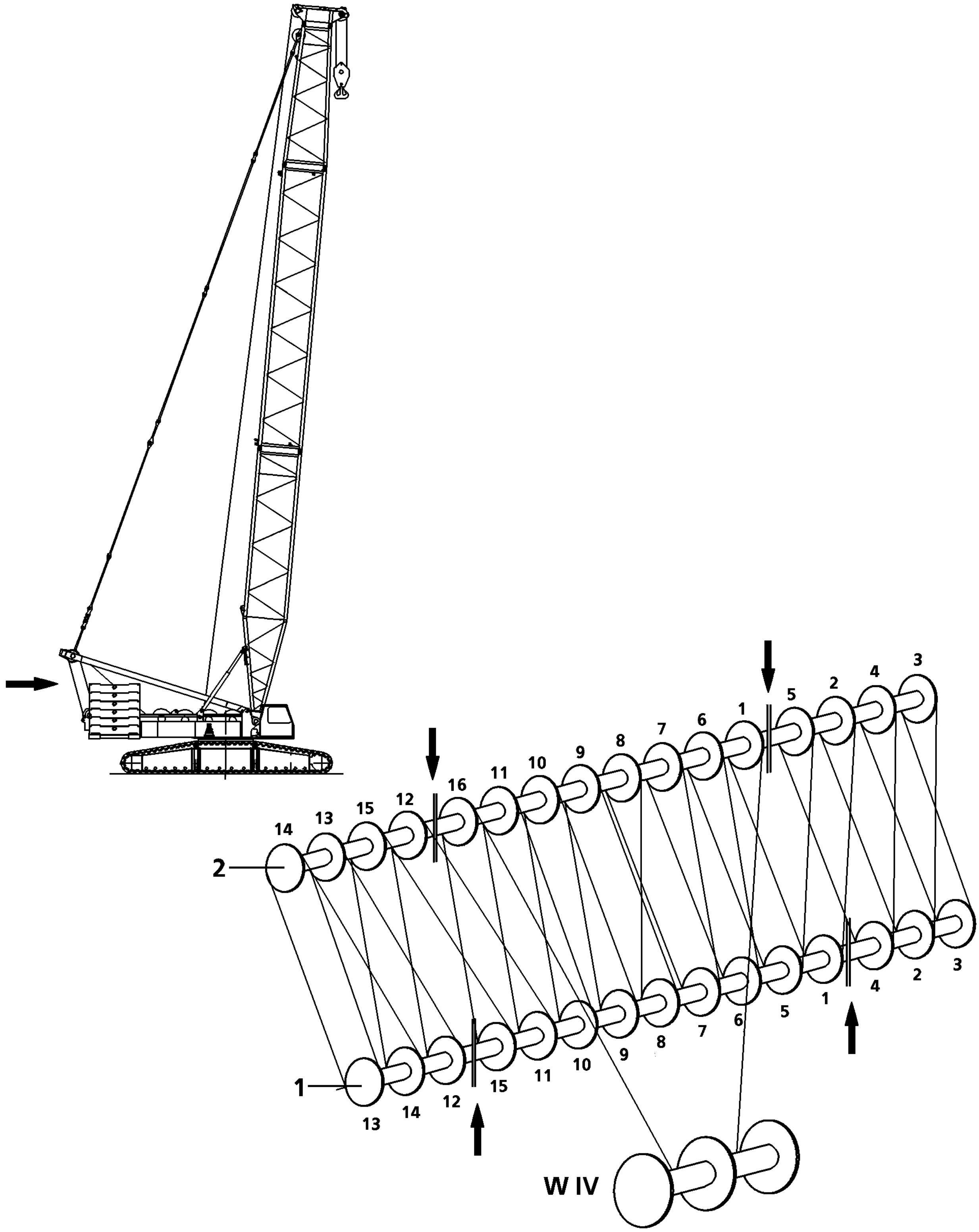
Fig. 1 In parallel operation, the individual block**s must be reeved symetrically to the center pulley** (centered).

Fig. 2+3 In parallel operation, an **asymmetric** reeving of the indivual blocks (from inside to outside) **is not permissible**.

D A N G E R: If this is not observed, there is a danger of accidents!

Reeving between pulleys on the slewing platform and A- bracket

Note: Reeving (32 times) for all operating modes
1 = pulley block on the slewing platform 2 = pulley block on the A- bracket
IV = winch IV



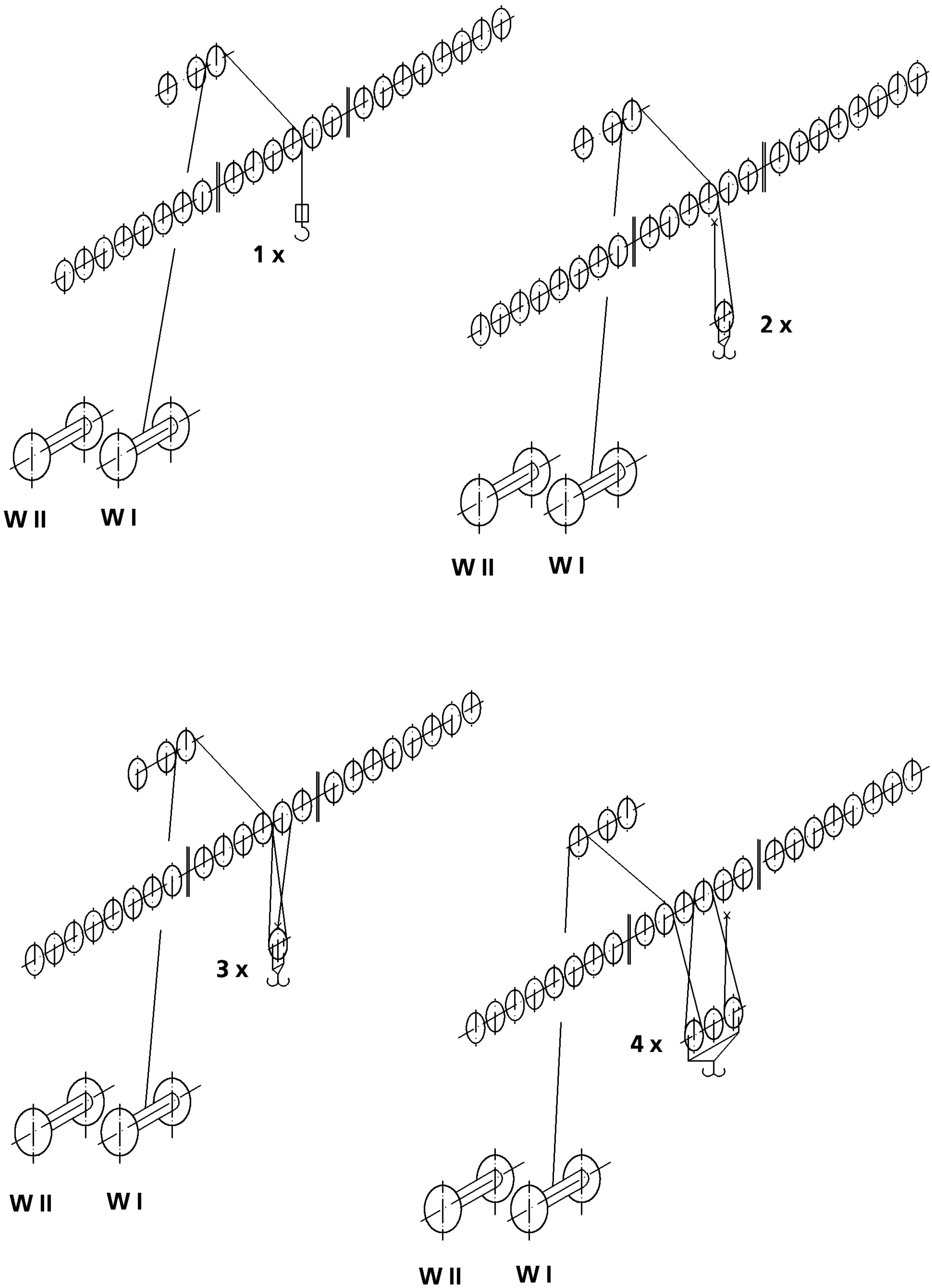
186734

Reeving plans

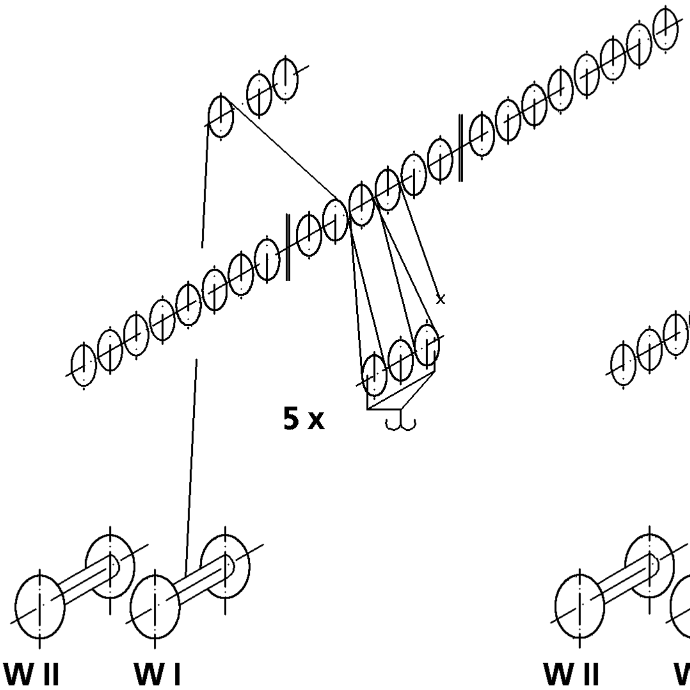
250 t / 400 t- Head section,

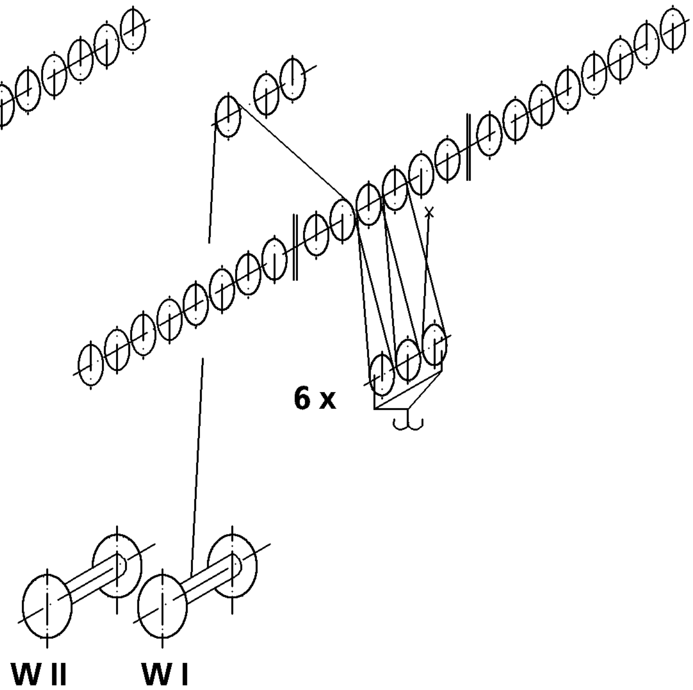
250 t - head section - 14 pulley
400 t - head section - 22 pulley

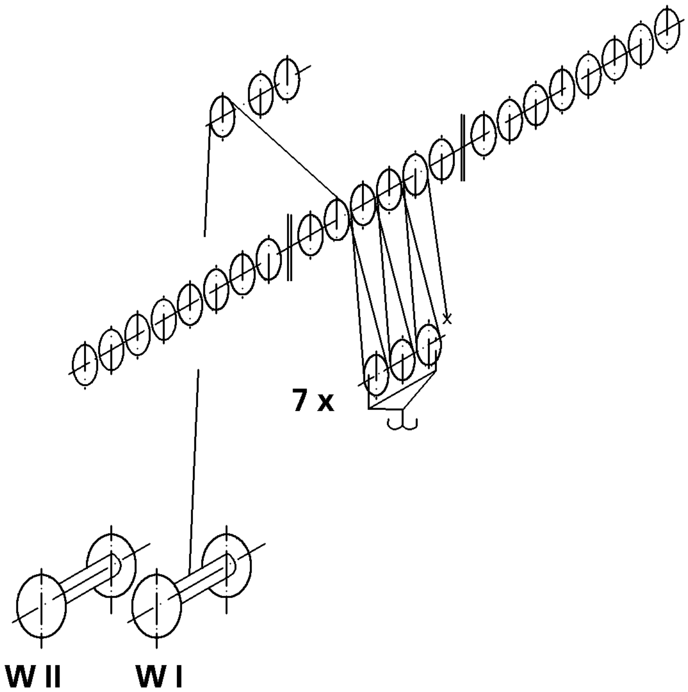
1 - pulley hook block,	30 t hook block
3 - pulley hook block,	80 t hook block
5 - pulley hook block,	125 t hook block
7 - pulley hook block,	160 t hook block
9 - pulley hook block,	160 t hook block



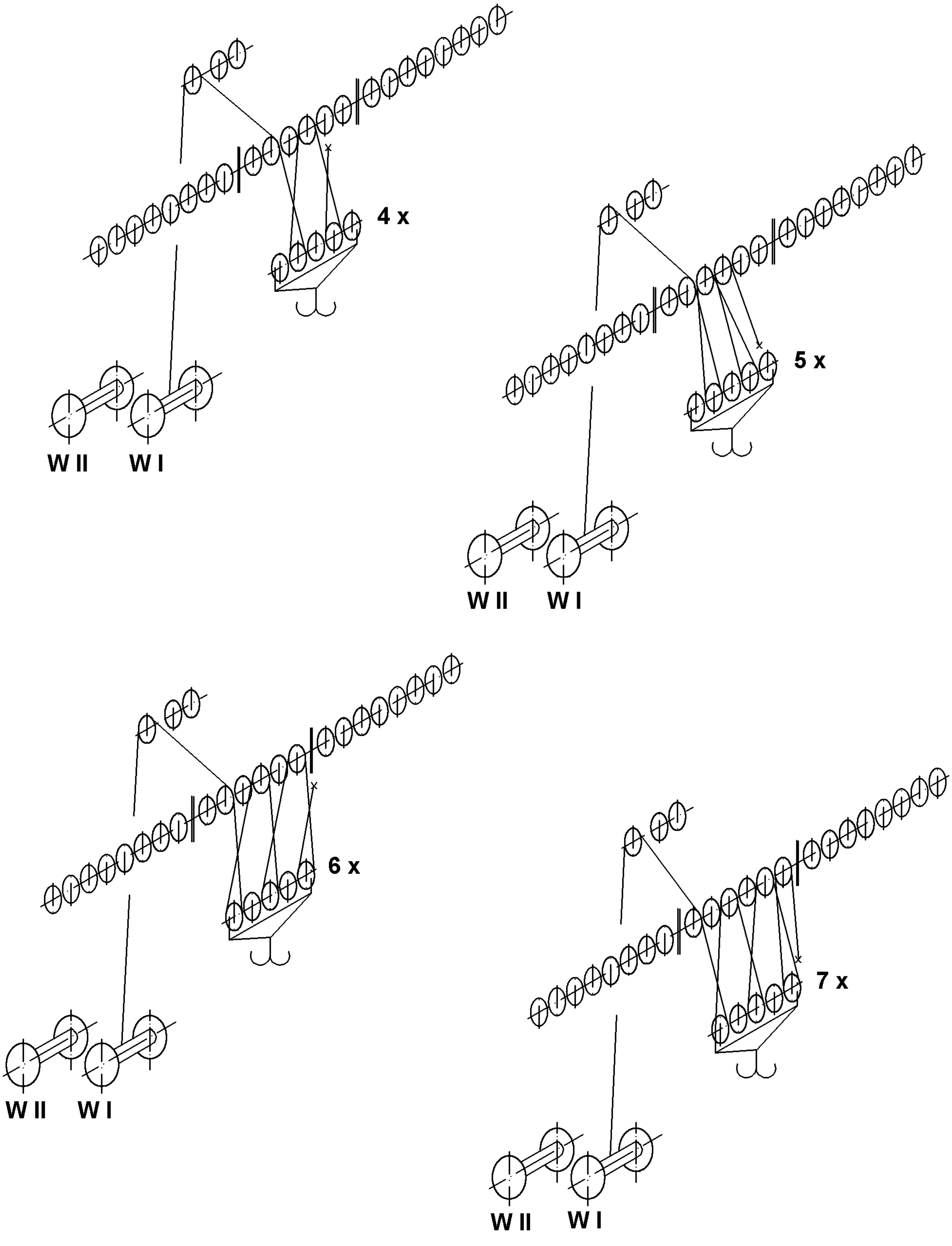
186998



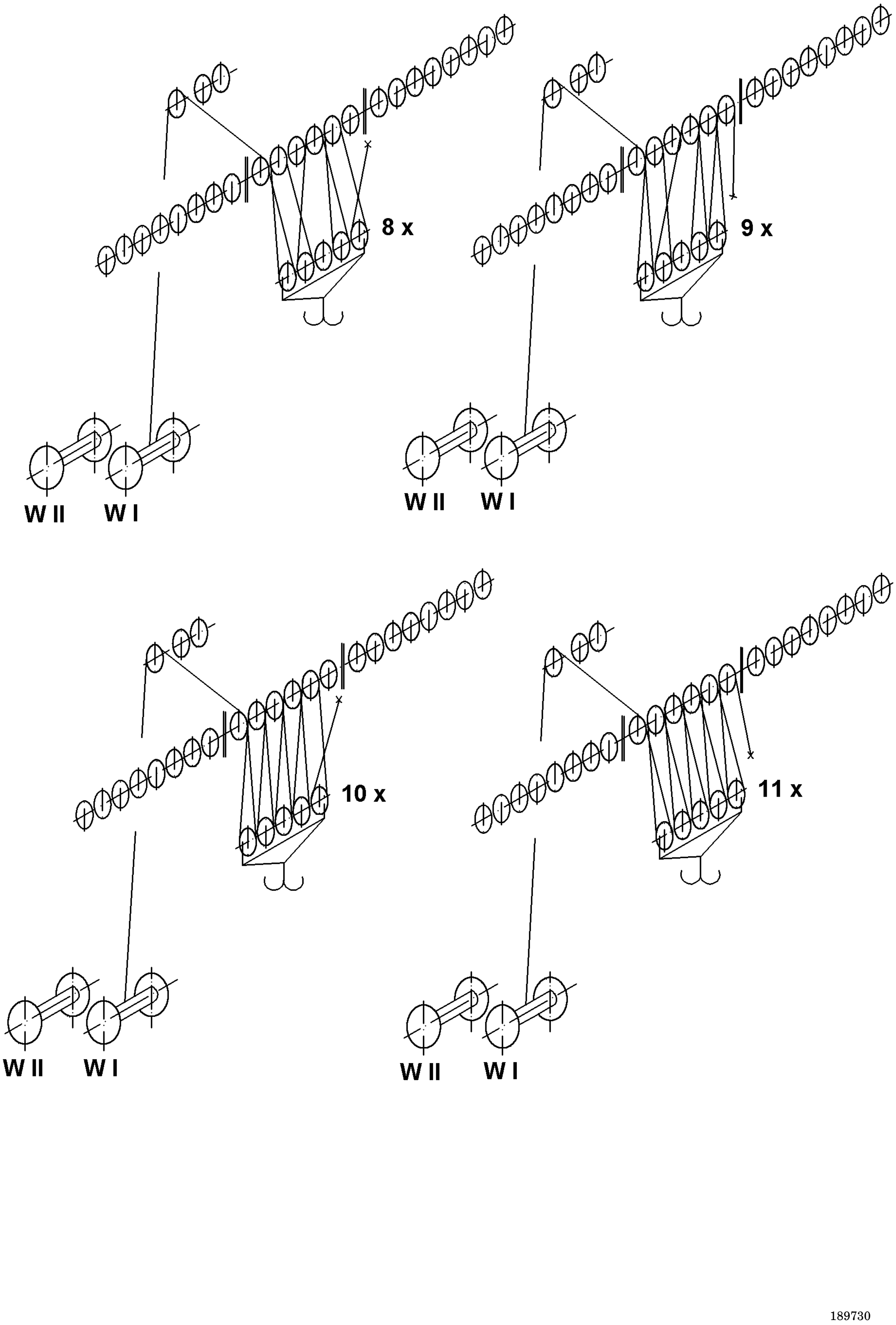


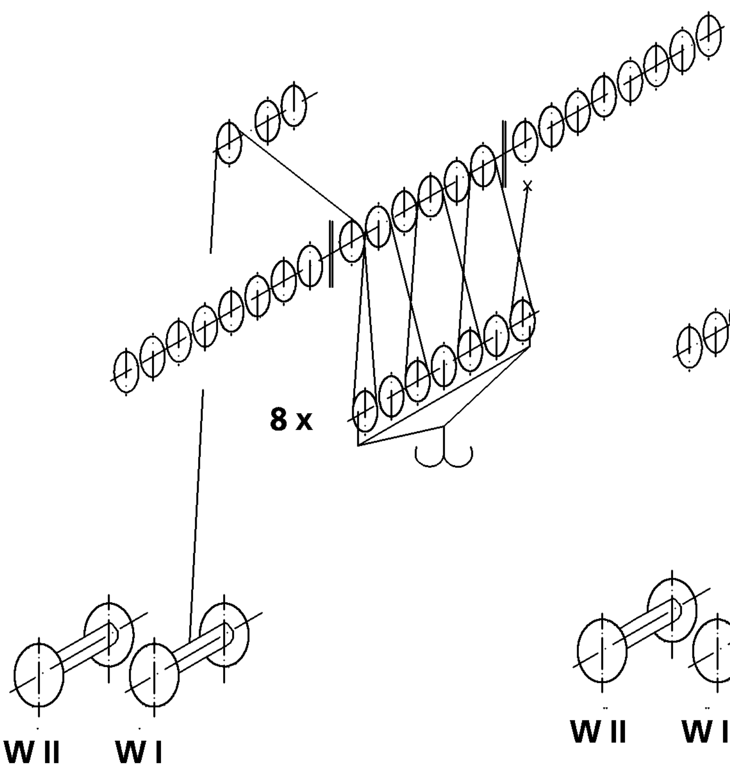


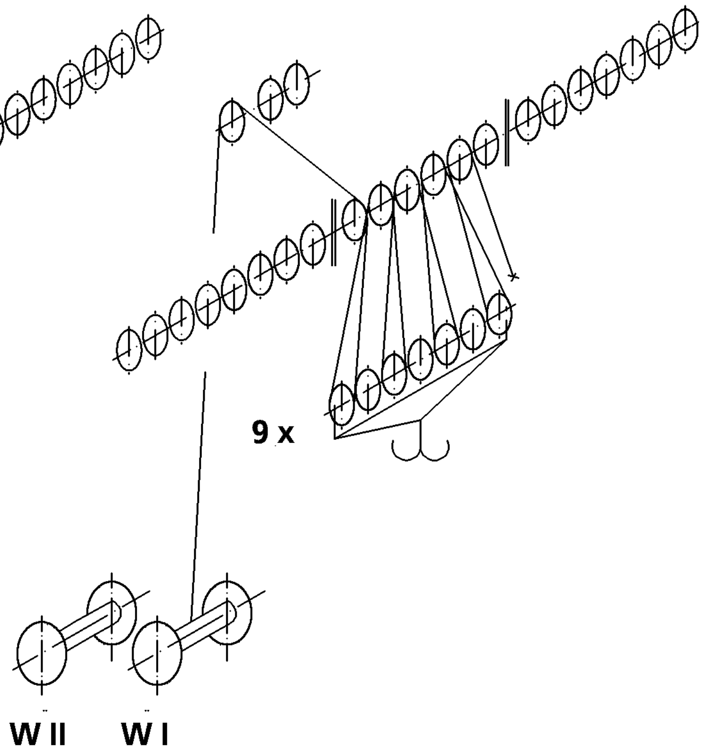
186999

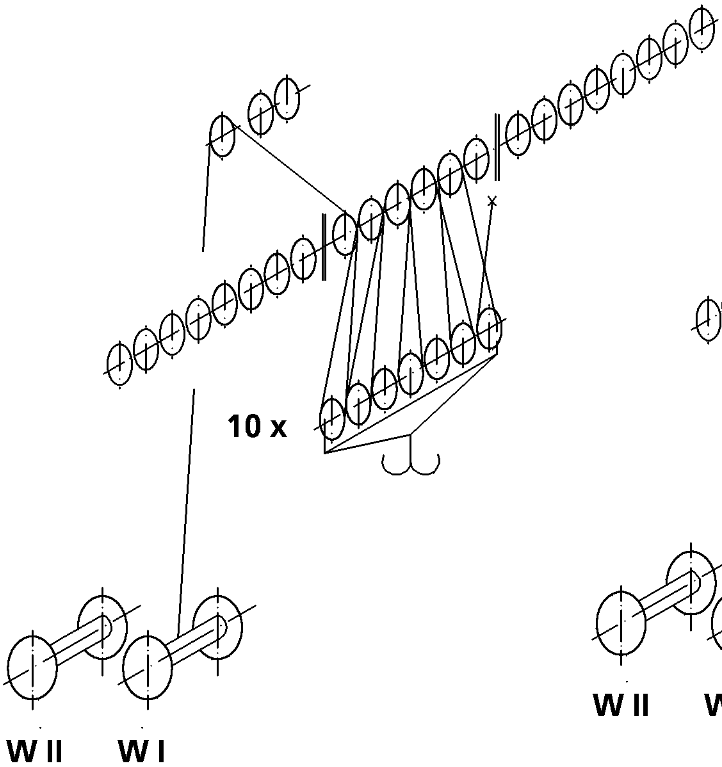


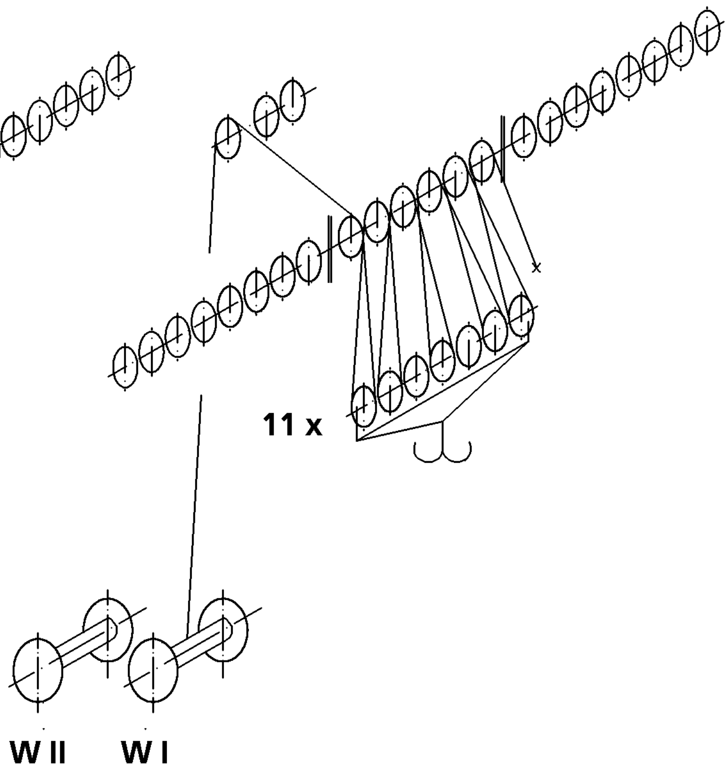
189729


8 x
W II
W I
9 x
W II
W I
10 x
W II
W I
11 x
W II
W I
189730

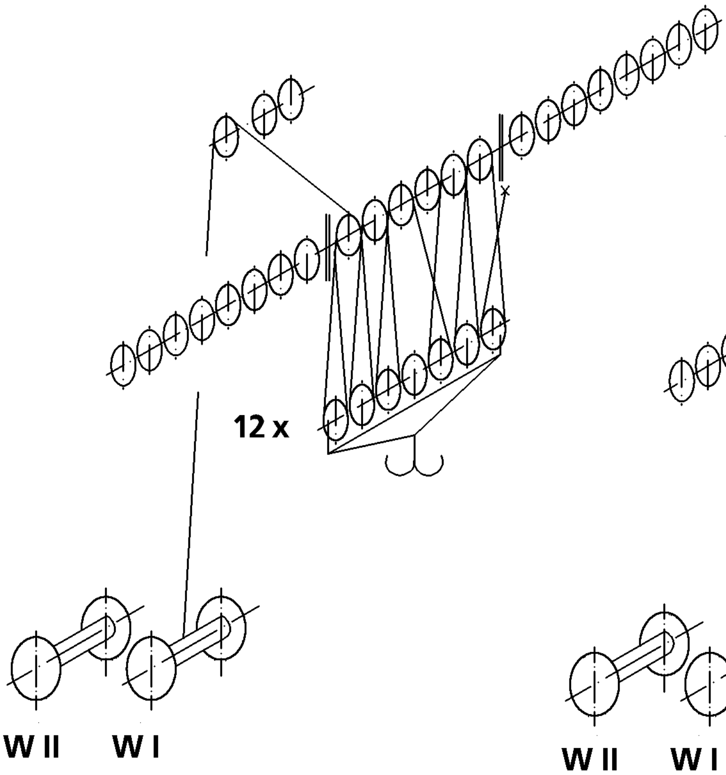


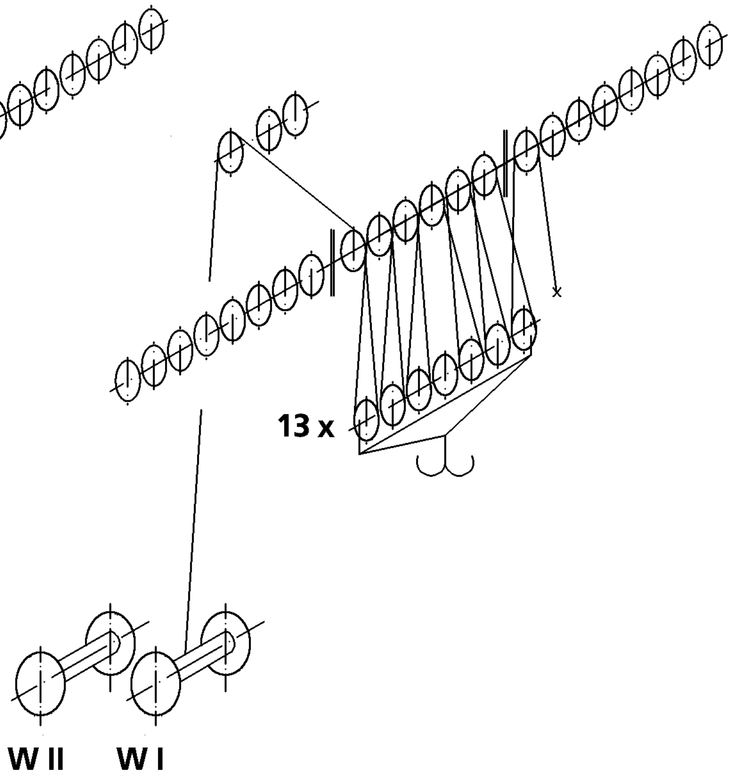


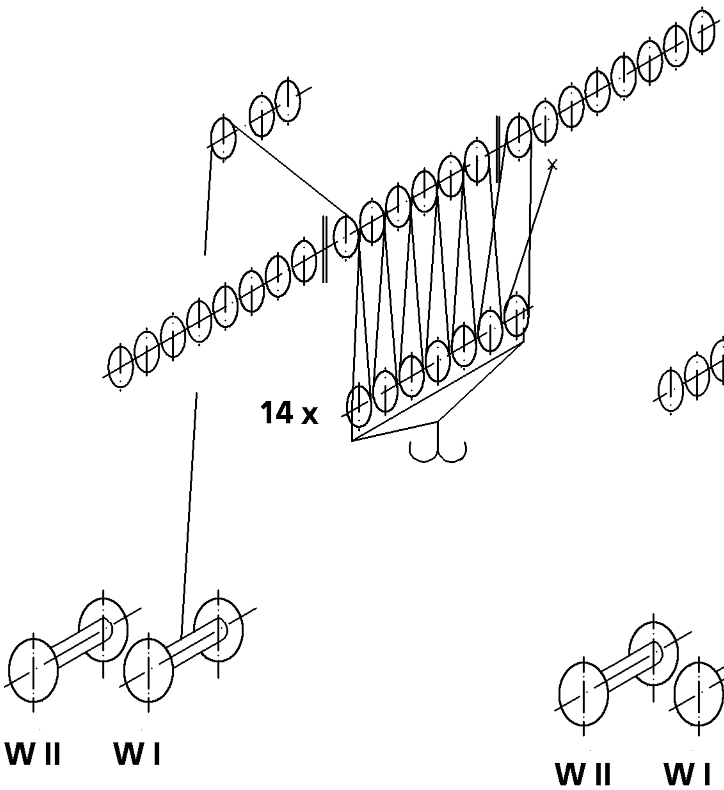


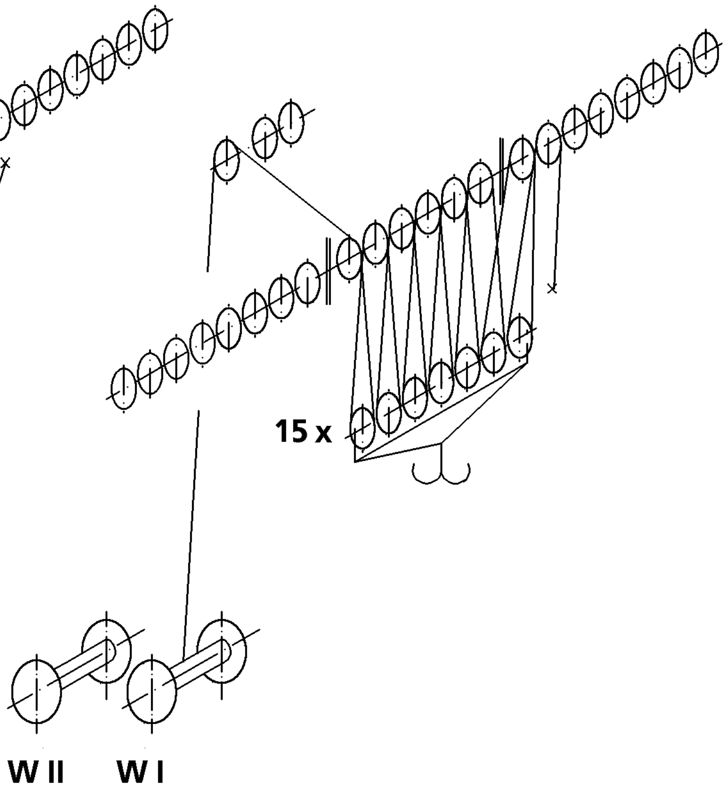


187000

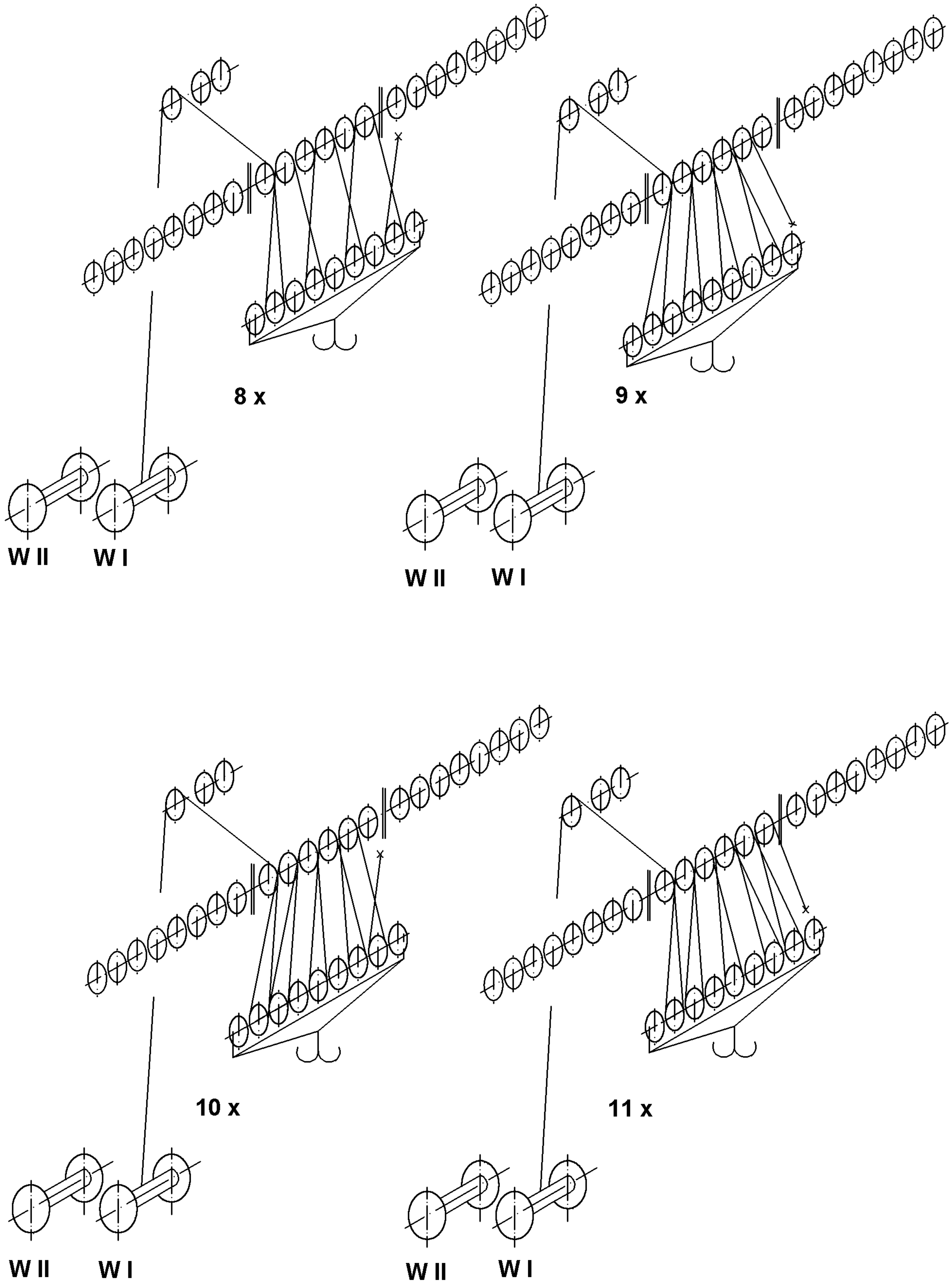




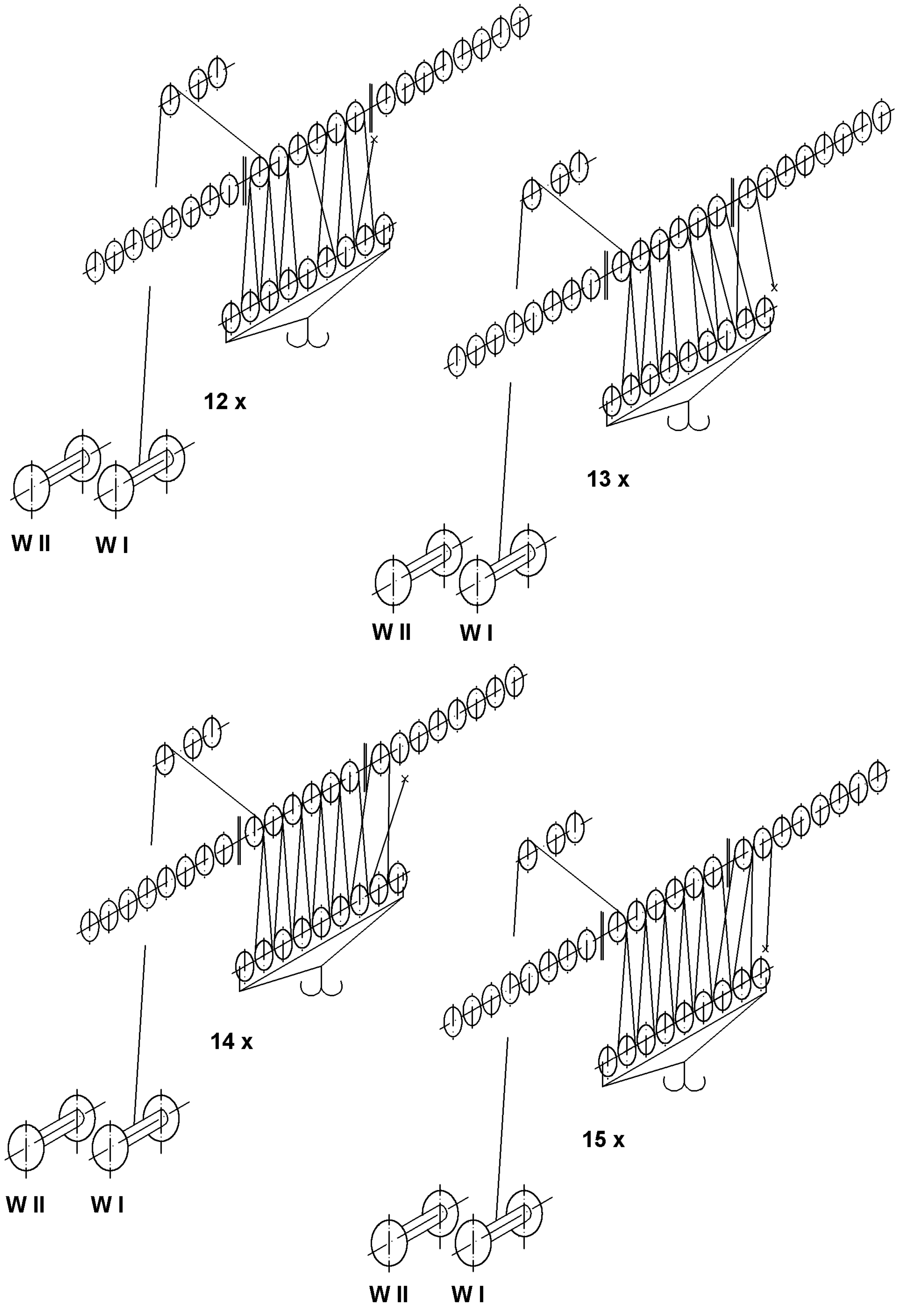




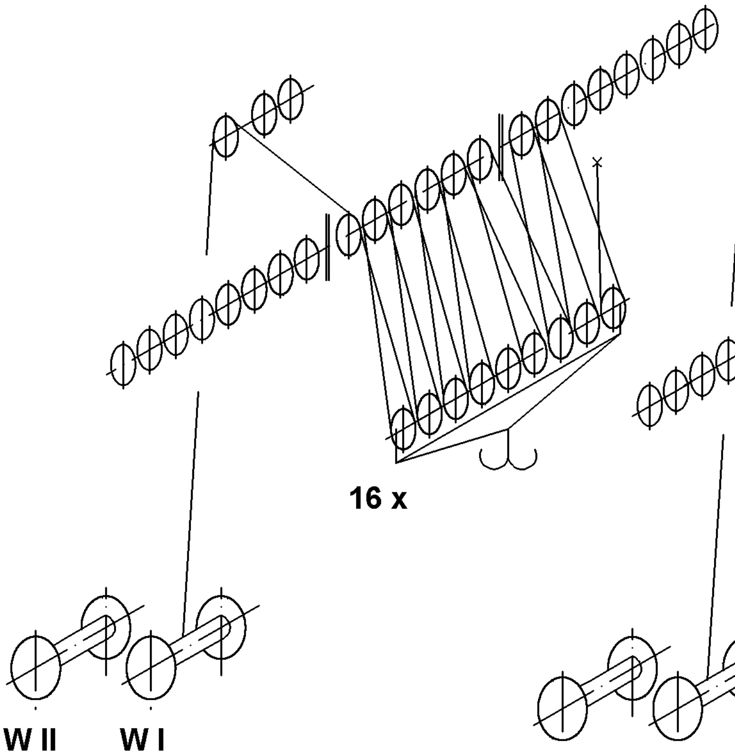
187001



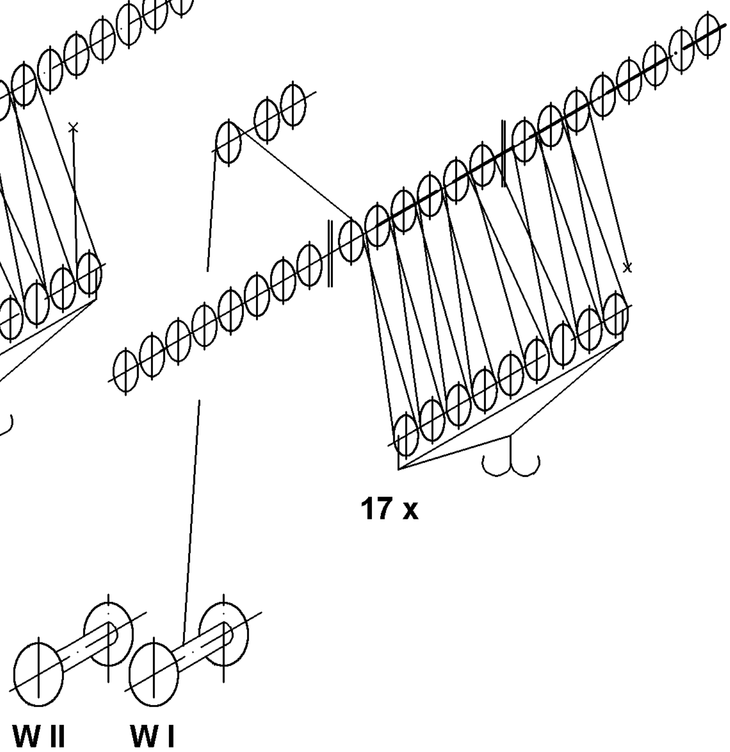
190595



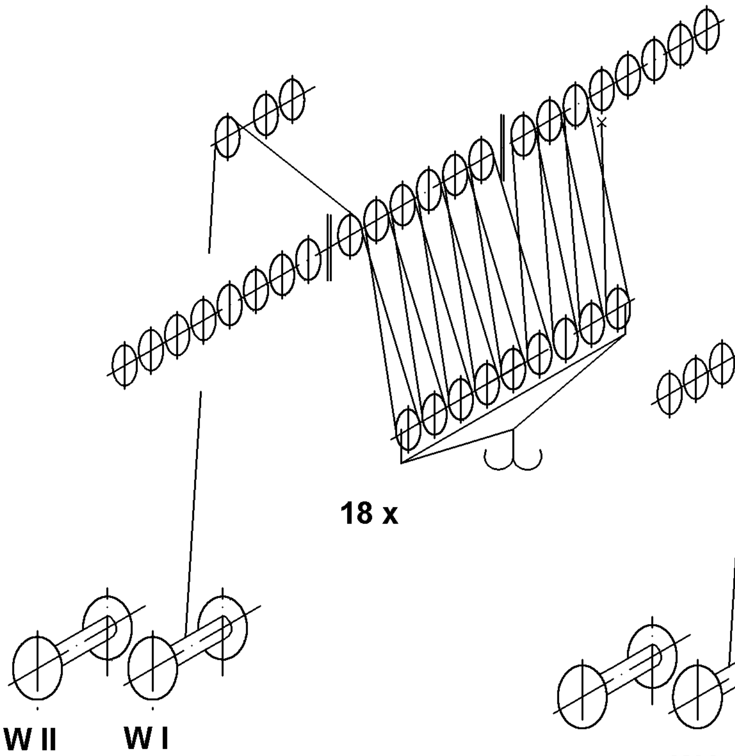
190596



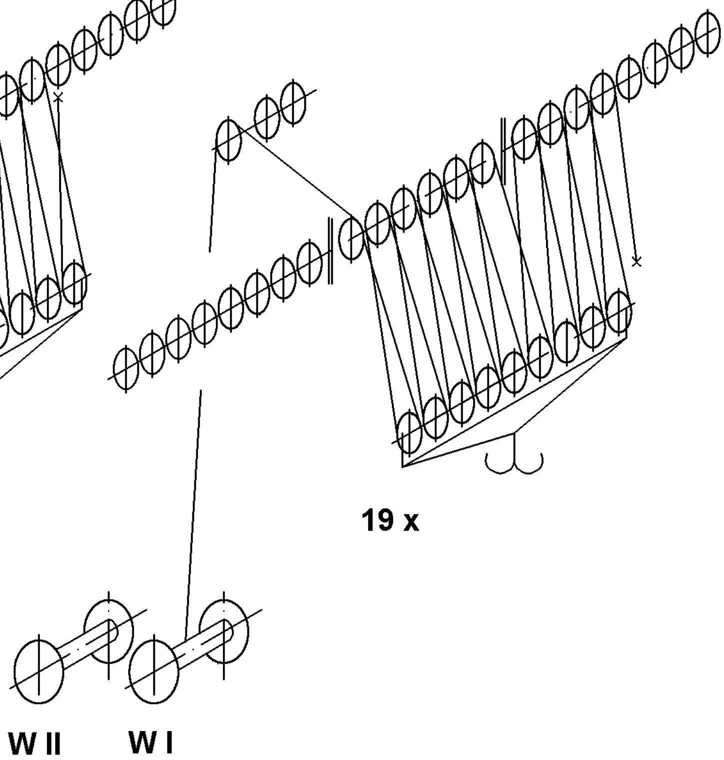
16 x



17 x



18 x



19 x

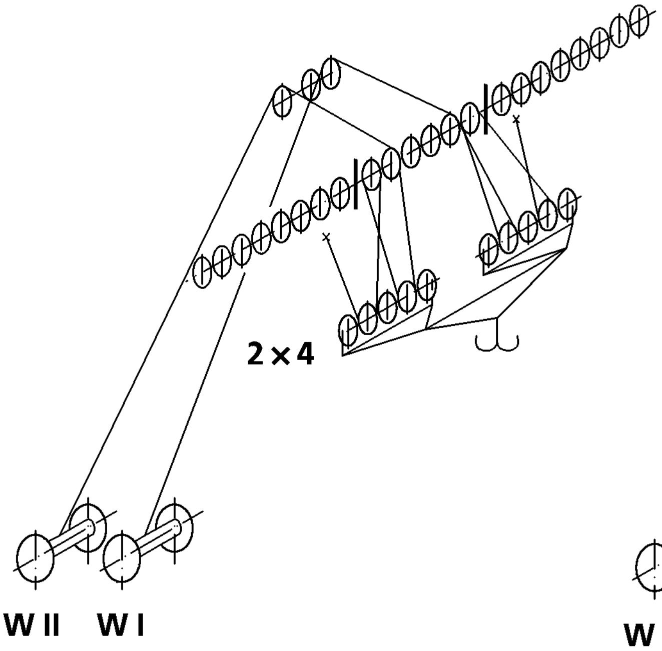
190597

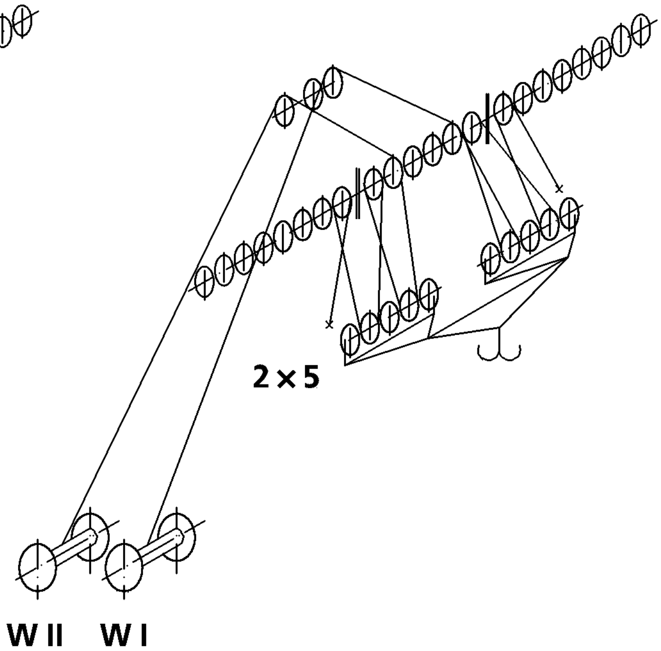
Reeving plans

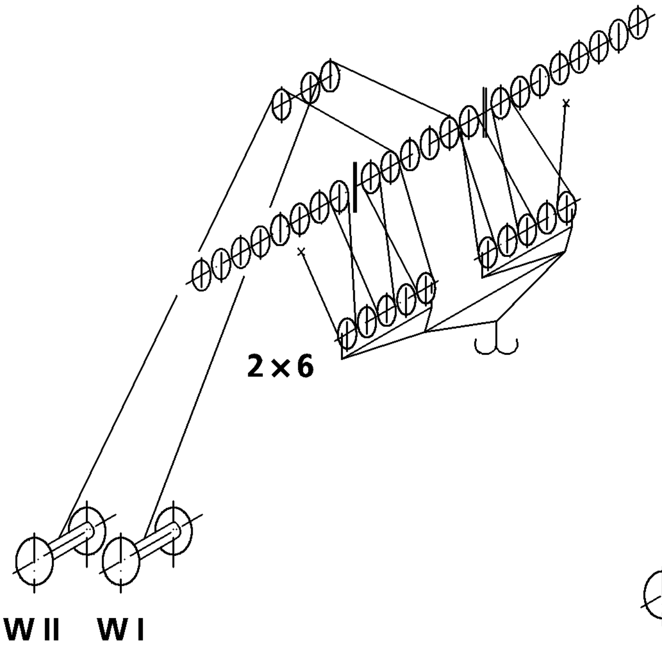
250 t / 400 t - Head section,

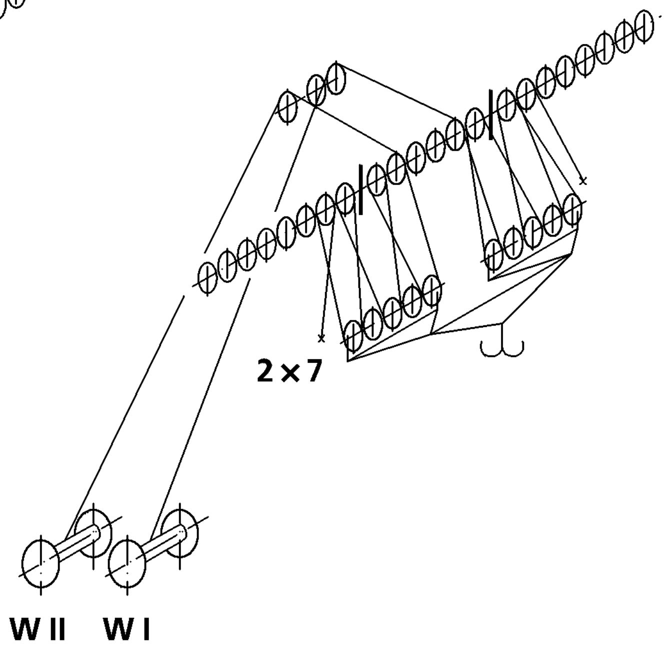
250 t - head section - 14 pulley
400 t - head section - 22 pulley

2×5 - pulley hook block (250 t hook block)

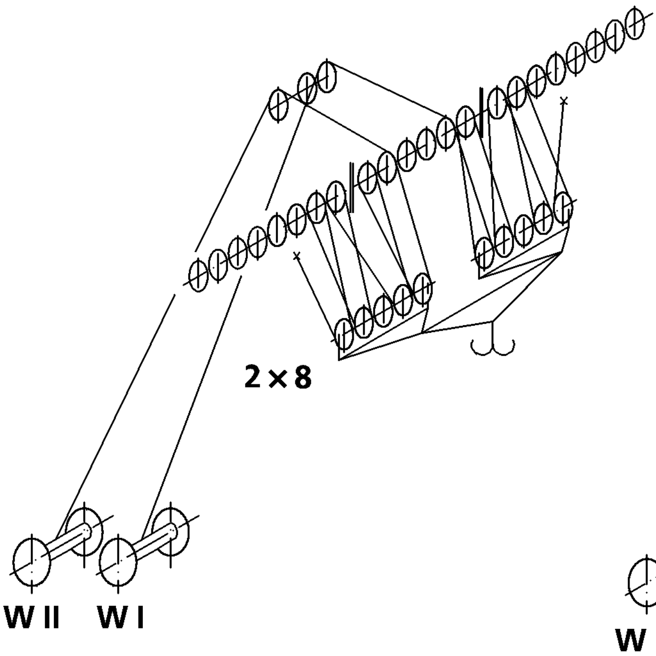


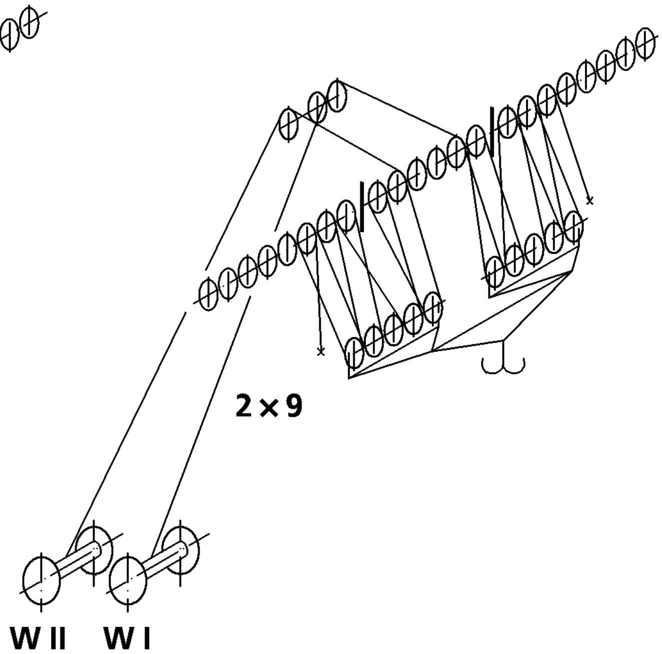


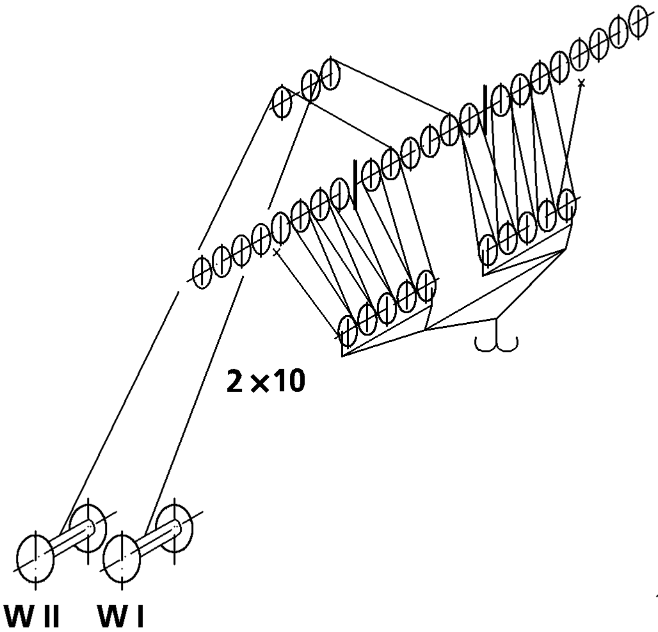


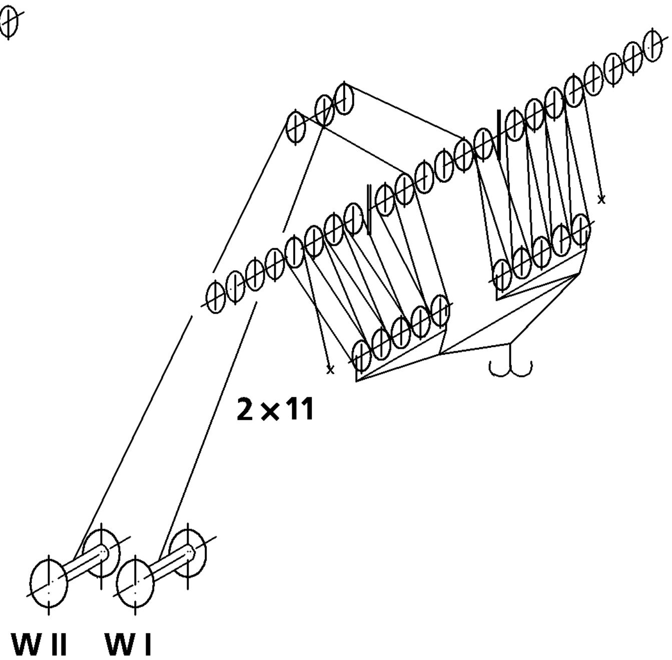


187002









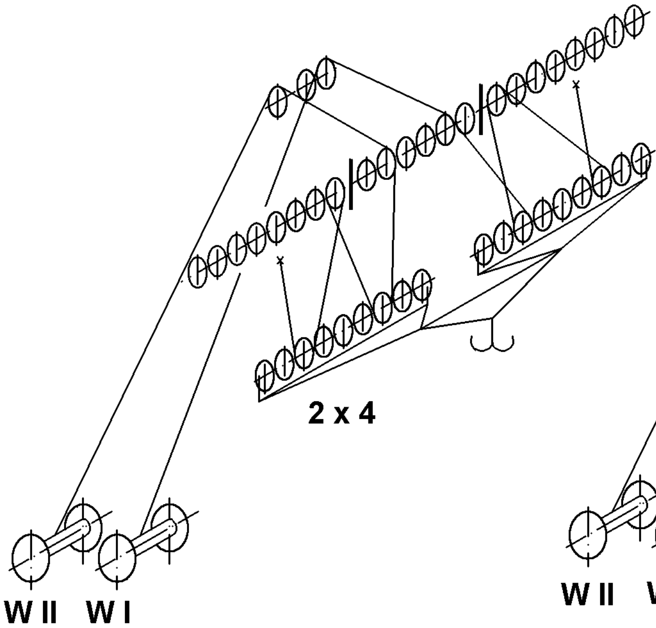
187003

Reeving plans

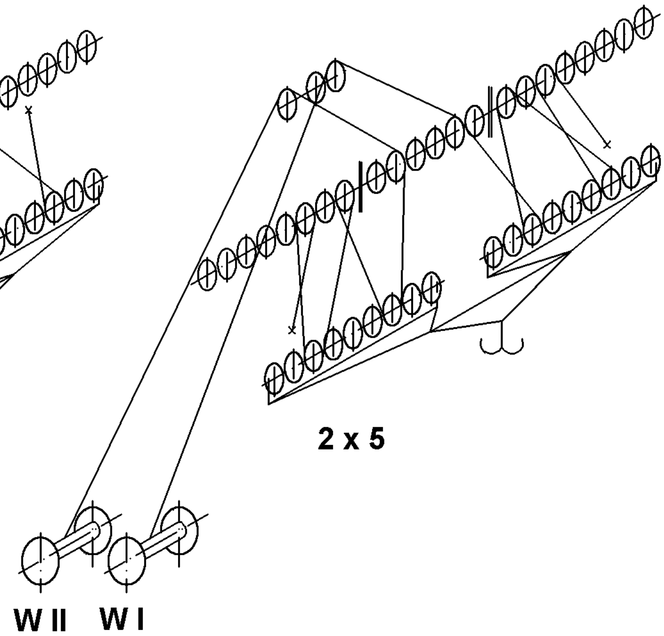
250 t / 400 t - Head section,

250 t - head section - 14 pulley
400 t - head section - 22 pulley

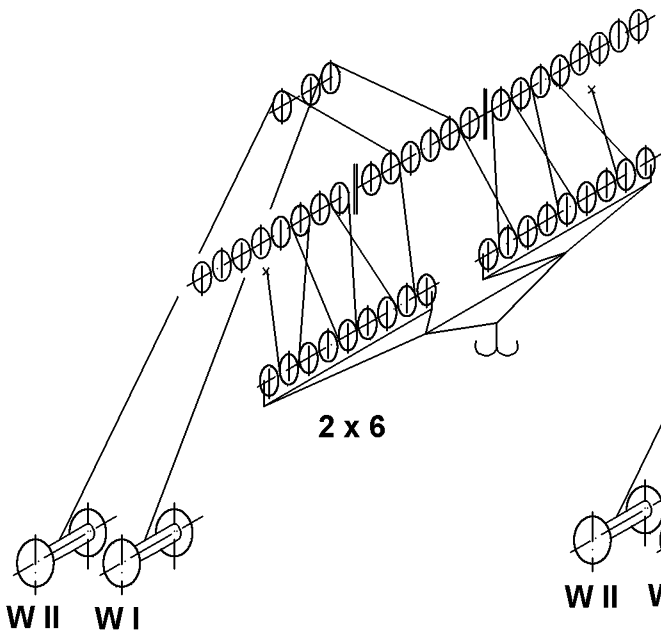
2×9 - pulley hook block (250 t hook block)



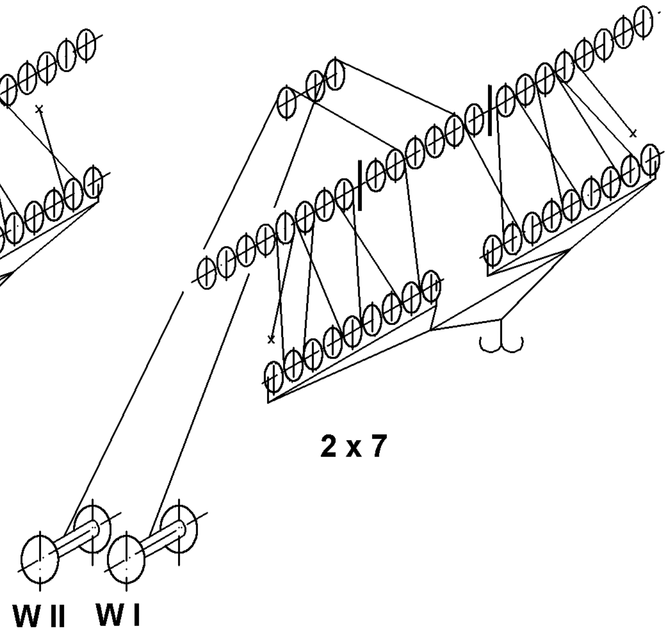
2 x 4



2 x 5

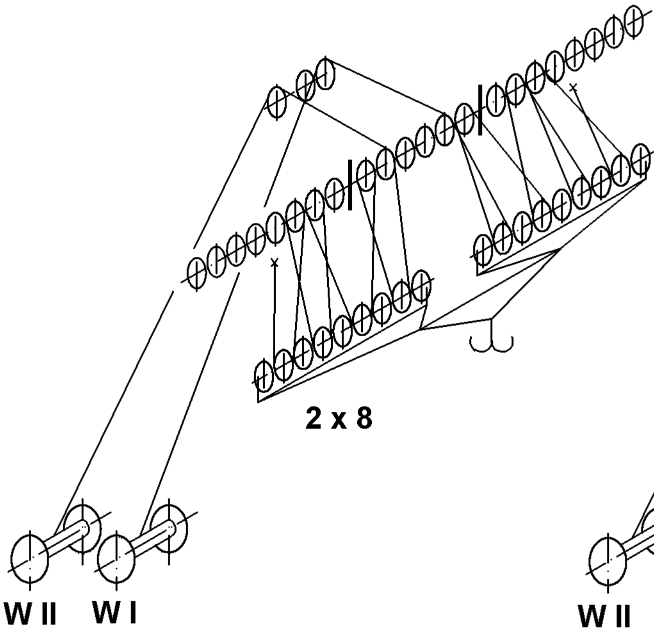


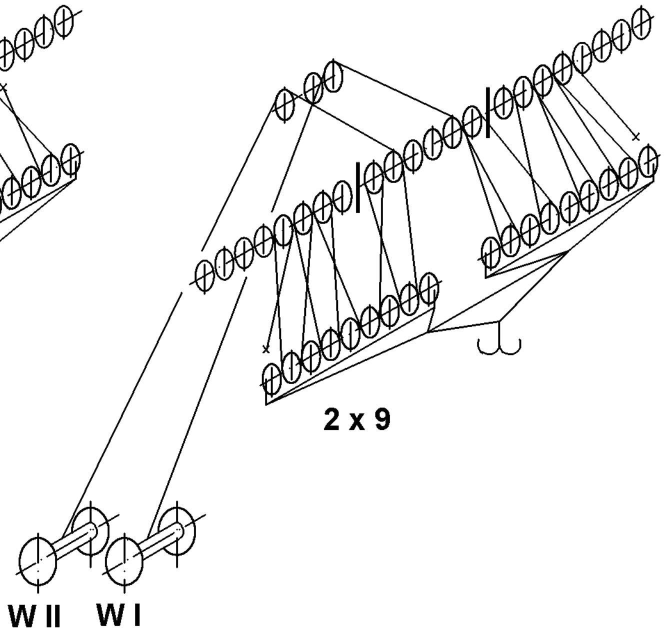
2 x 6

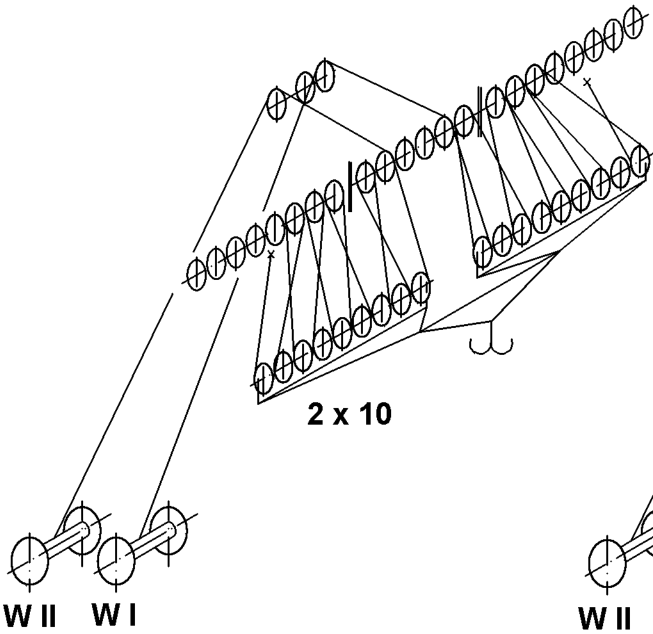


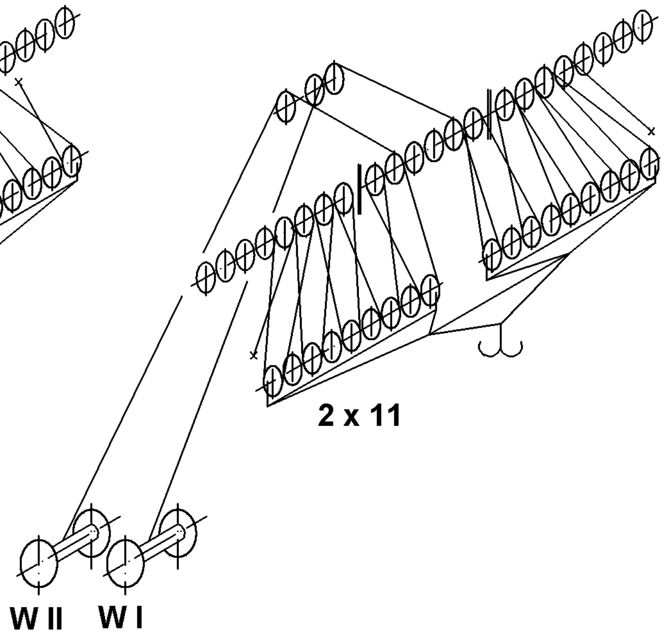
2 x 7

189335

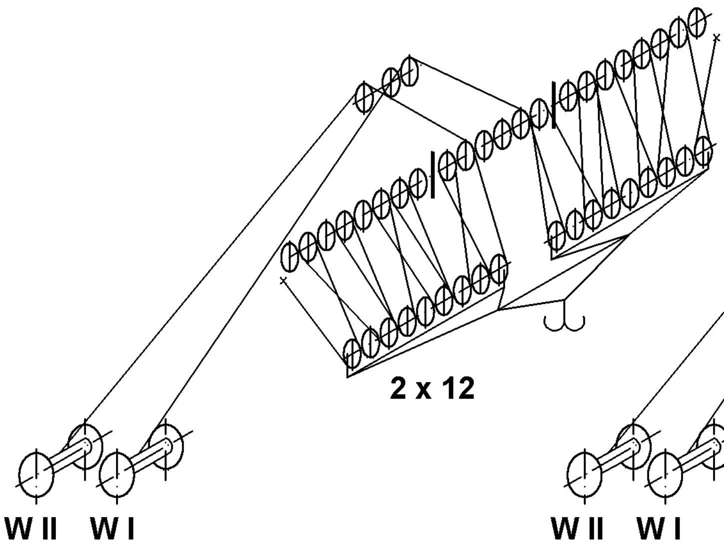


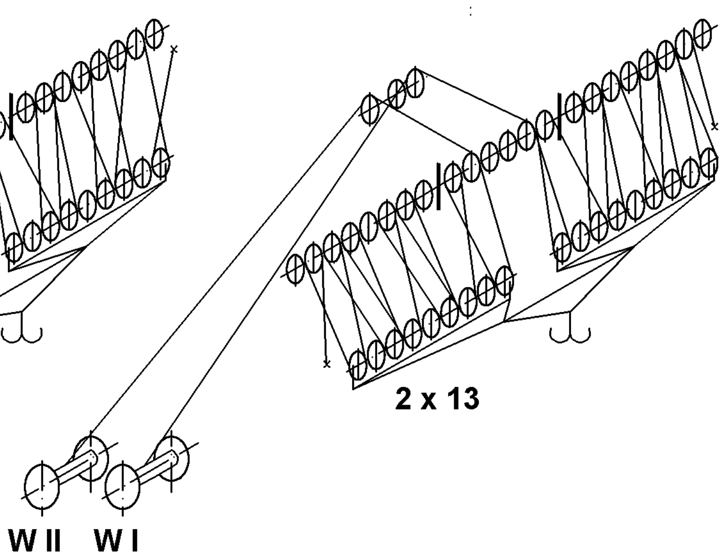


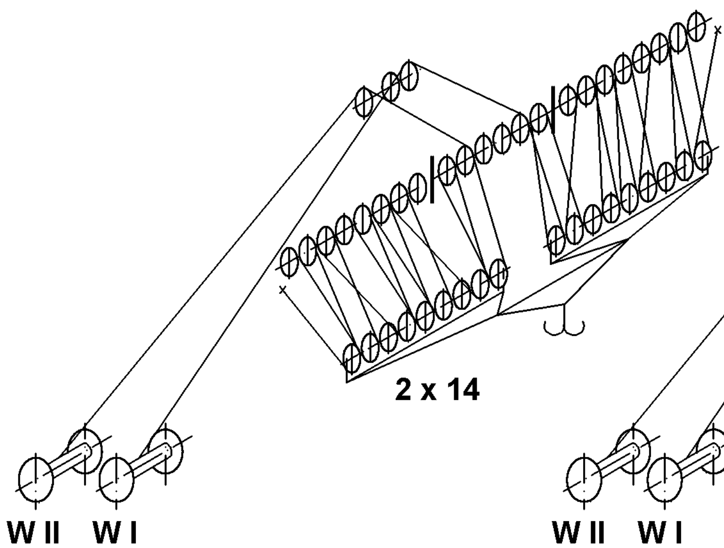


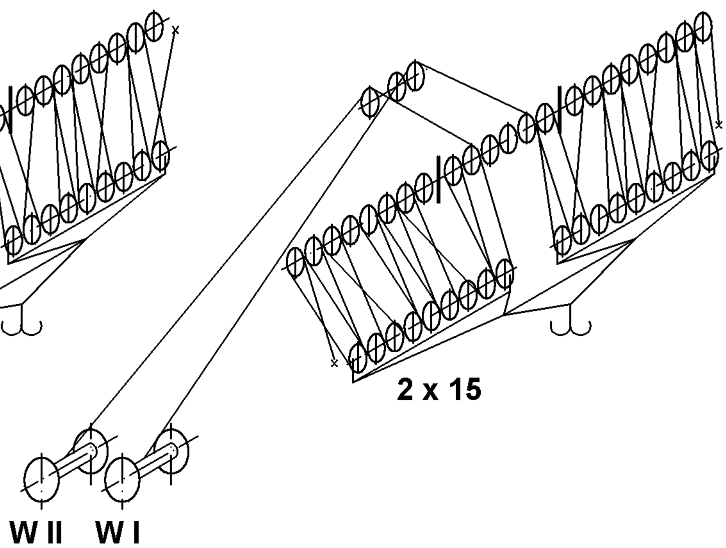


189336

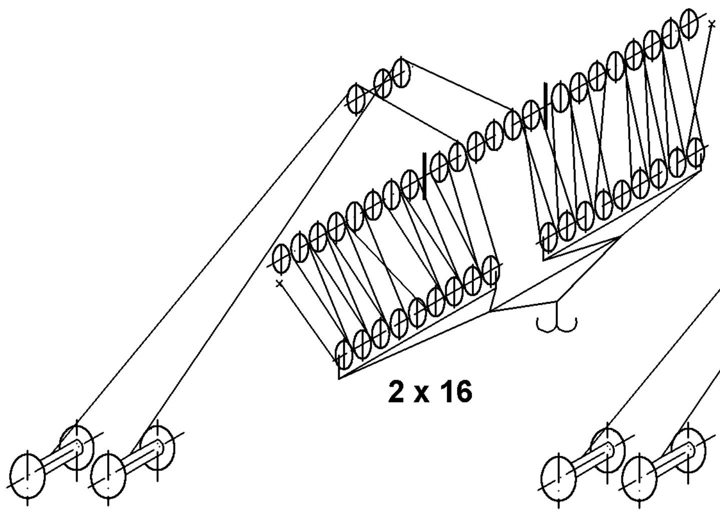




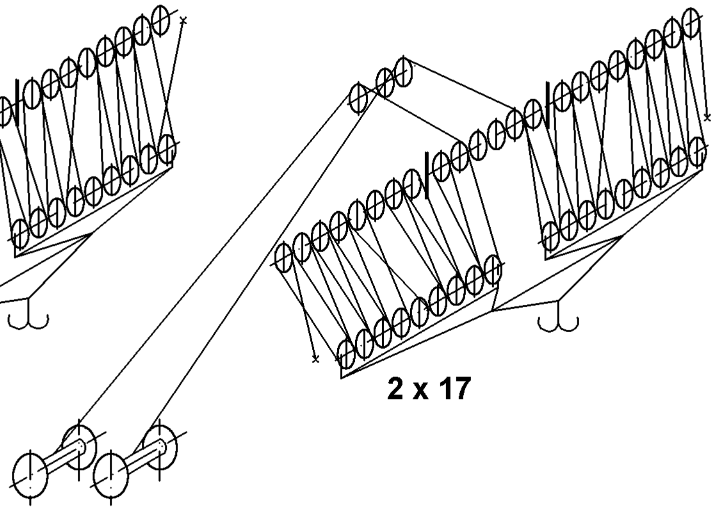




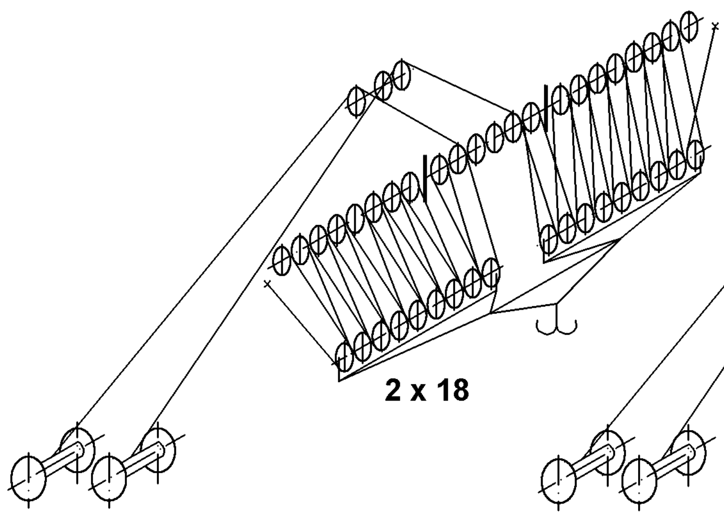
189337



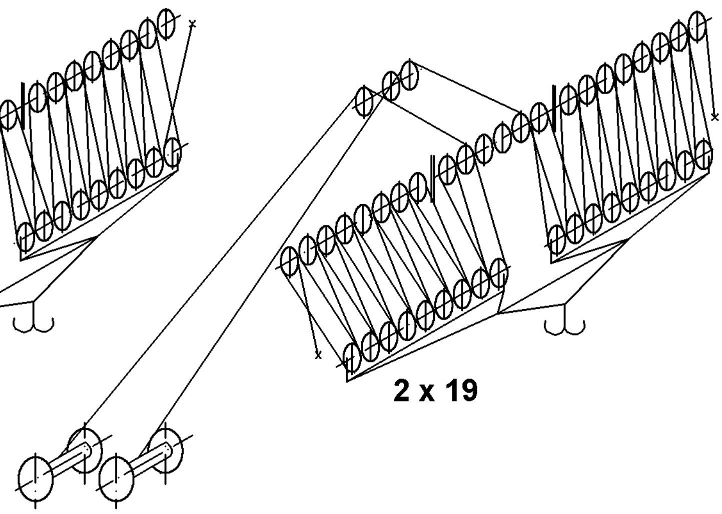
2 x 16



2 x 17



2 x 18

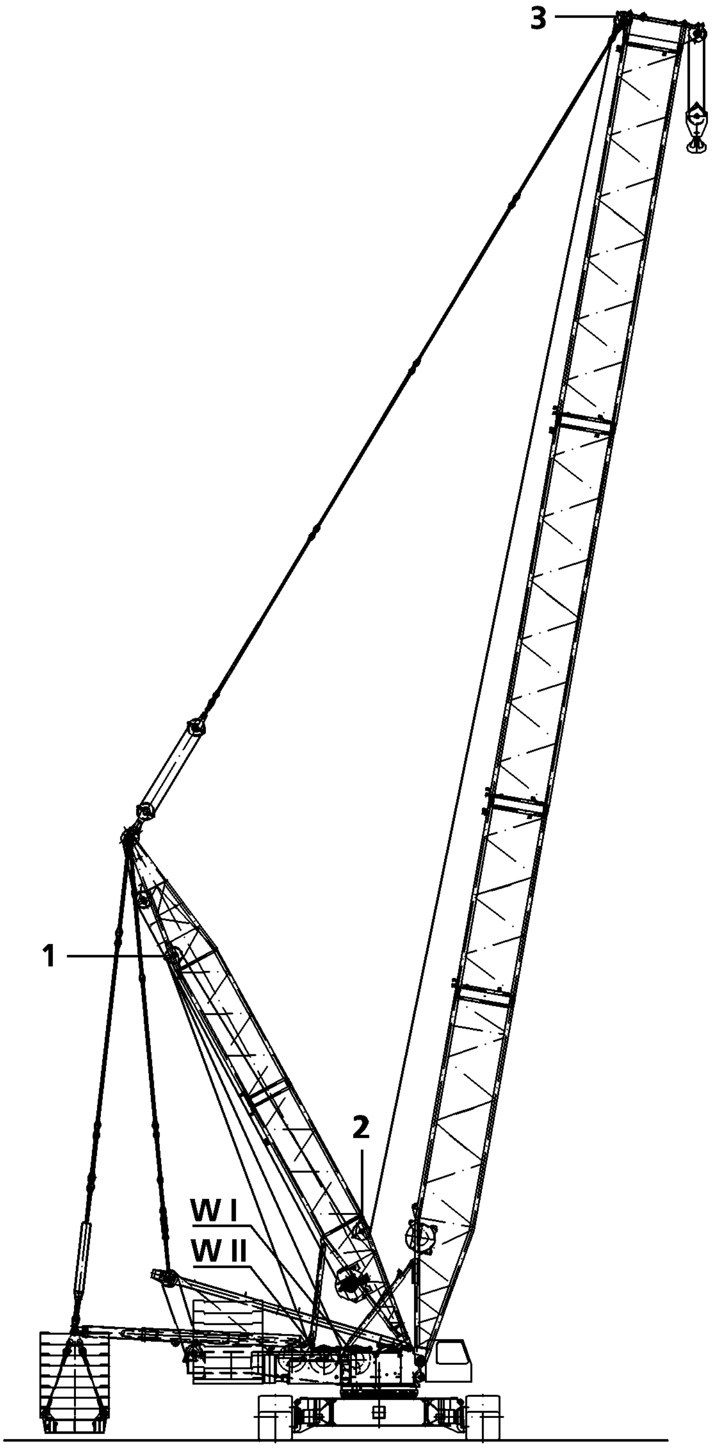


2 x 19

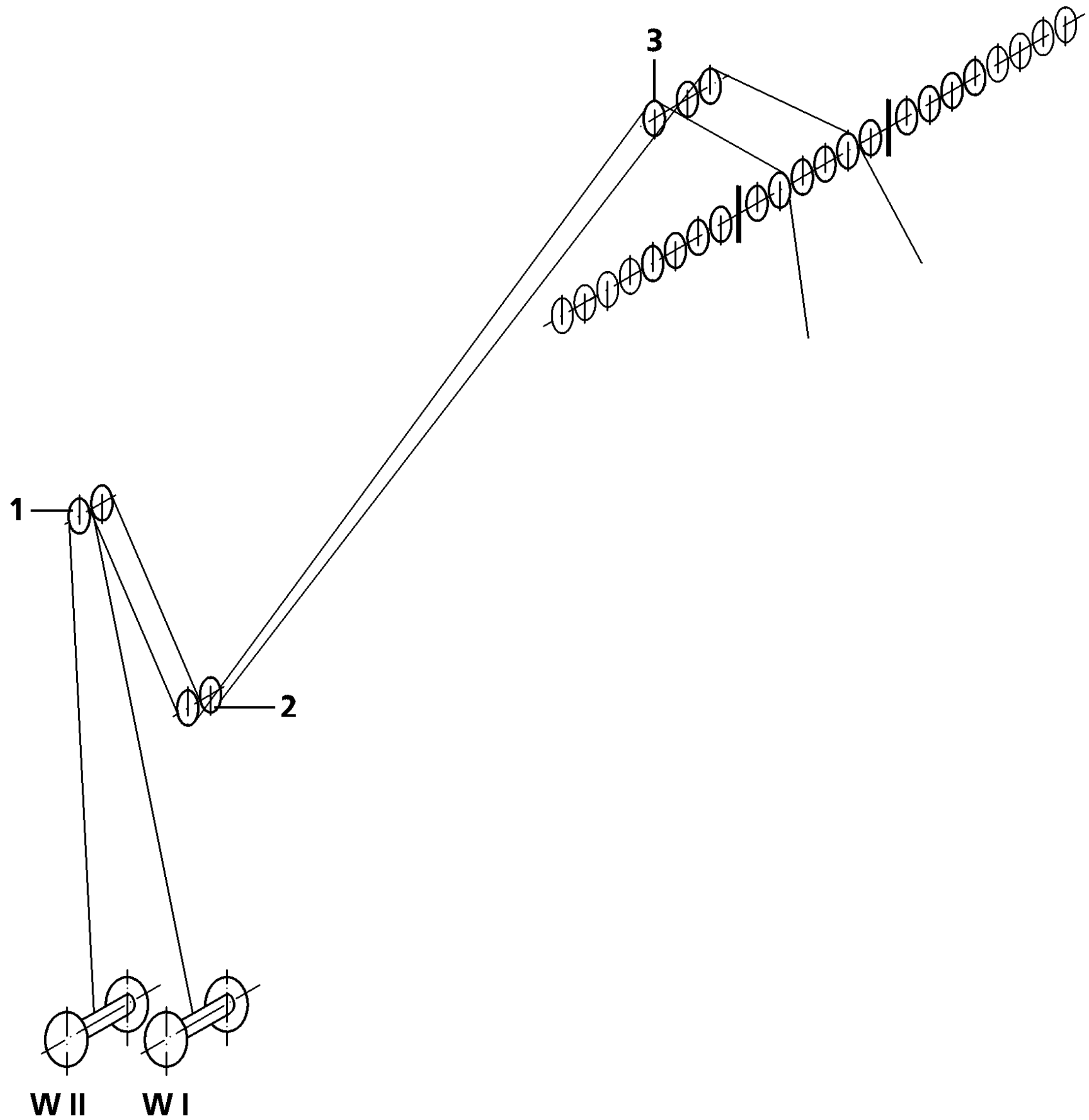
189338

Hoisting rope guidedance for Derrick

1 = Pulley D- head
2 = Pulley D- pivot section
I / II = winch I / II
3 = Pulley 250 t / 400 t head



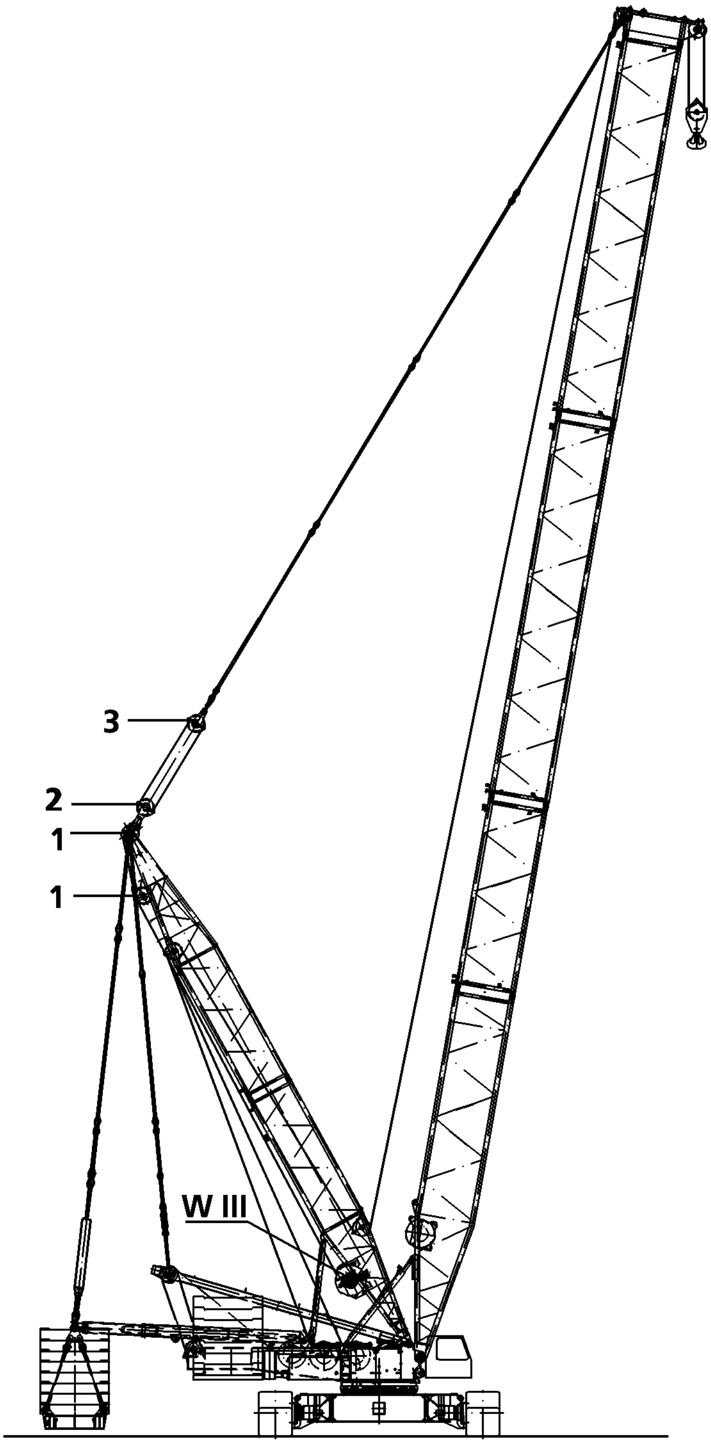
187015



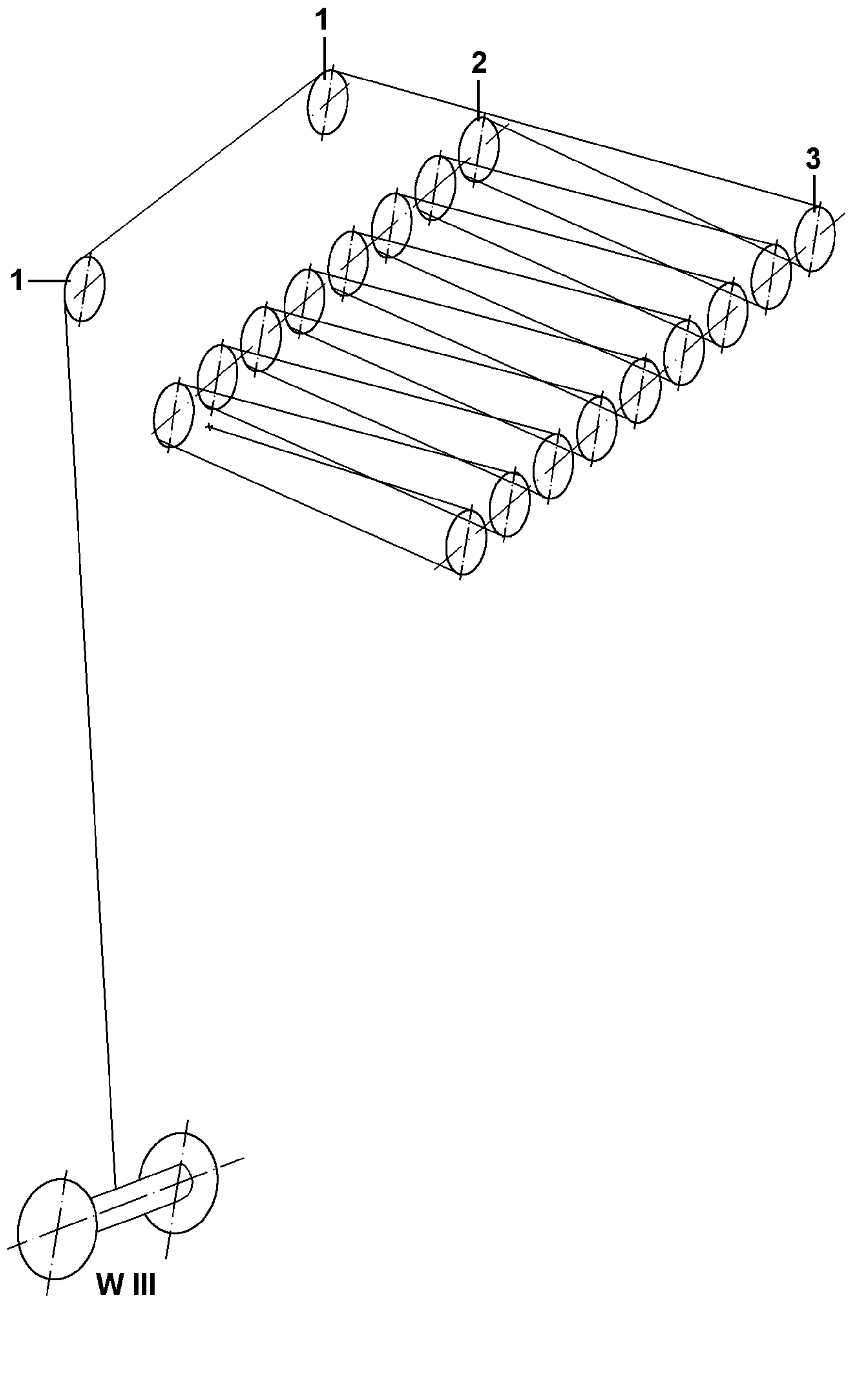
187016

Reeving L / S - adjusting

1 = Pulley D- head
2 = Pulley lower adjusting block
III = winch III
3 = Pulley upper adjusting block



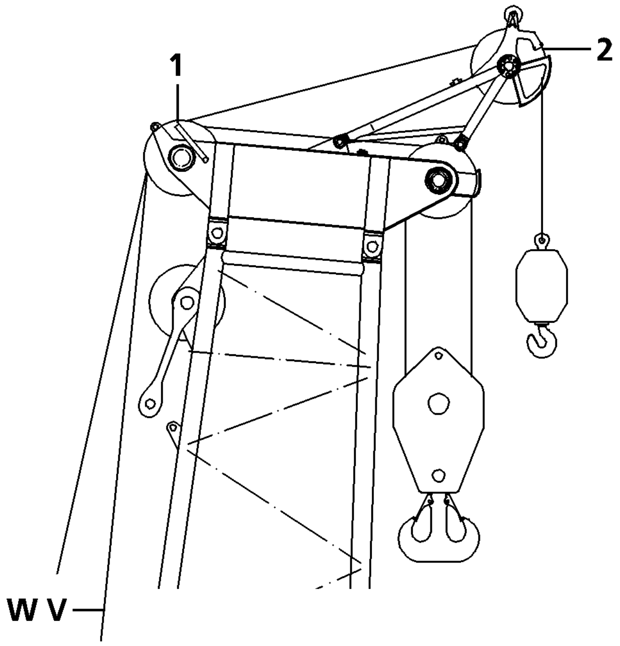
187017

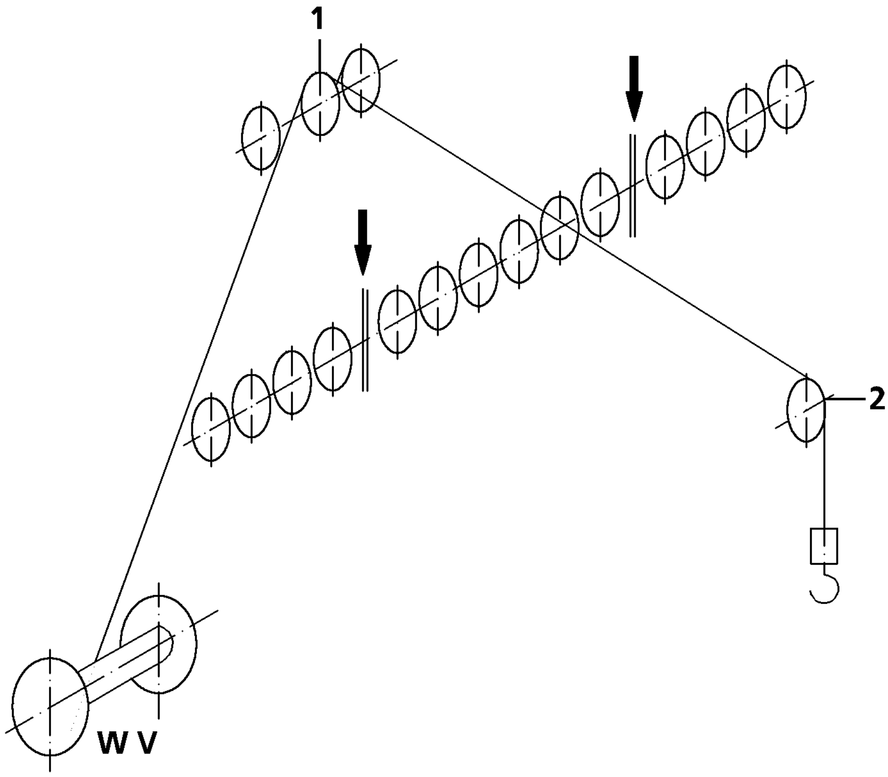

1
2
3
1
W III
193858

Hoisting rope guidedance for 12 t boom nose at 250 t head section

1 = Pulley head section W V = Winde V

2 = Pulley boom nose



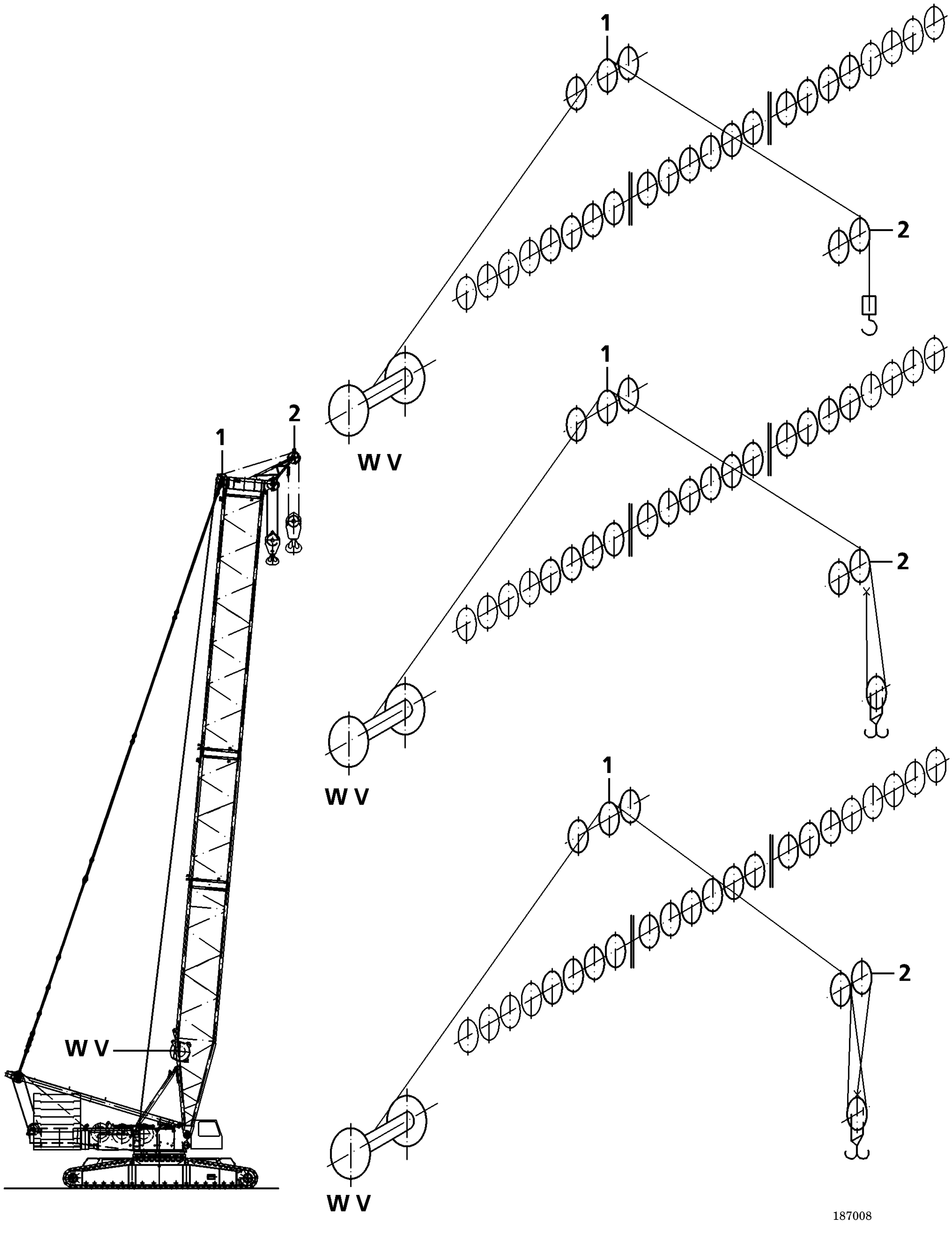


186746

Hoisting rope guidedance for 36 t boom nose at 250 t / 400 t head section

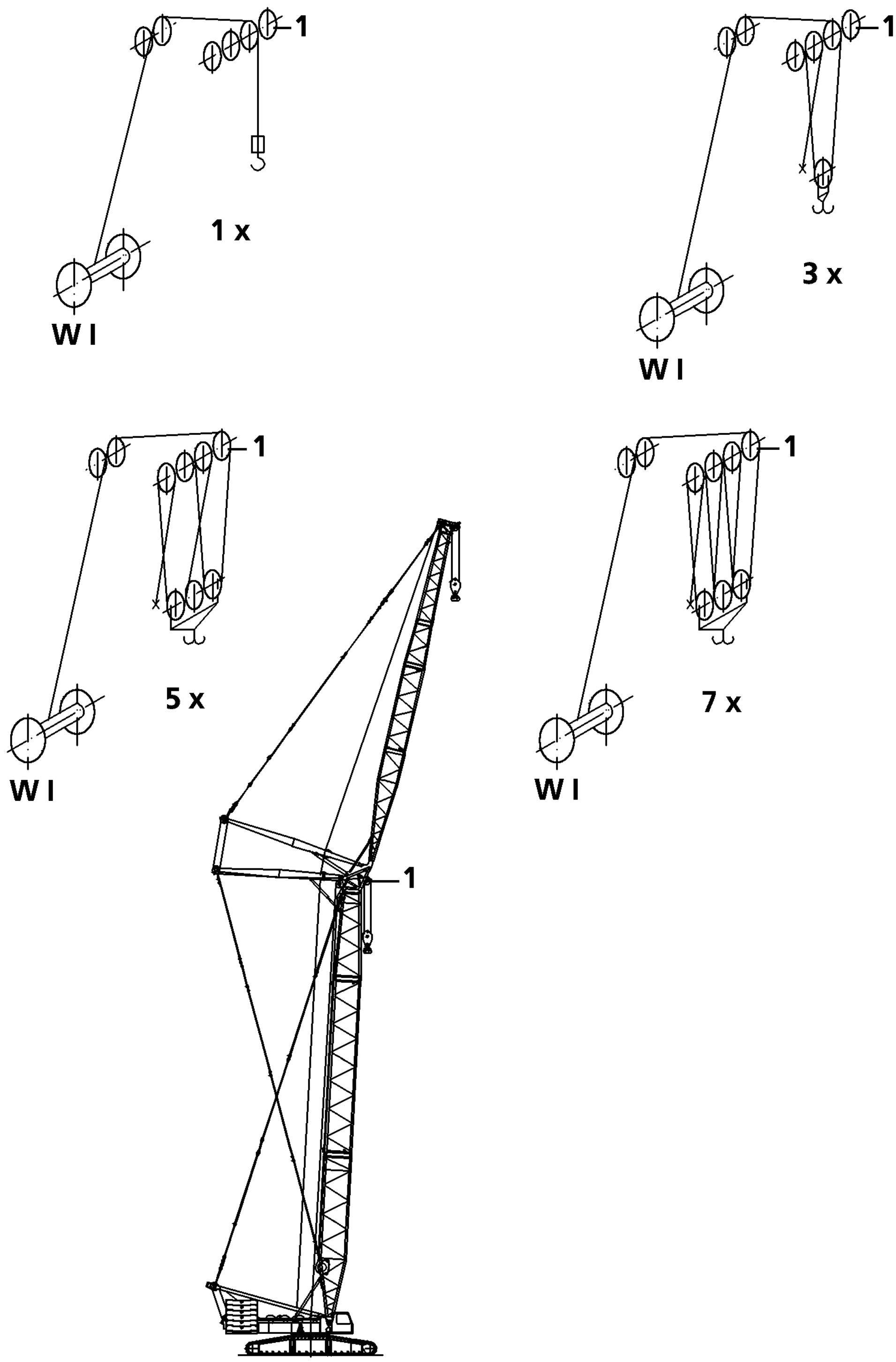
1 = Pulley head section W V = Winde V

2 = Pulley boom nose



Reeving plan at boom head

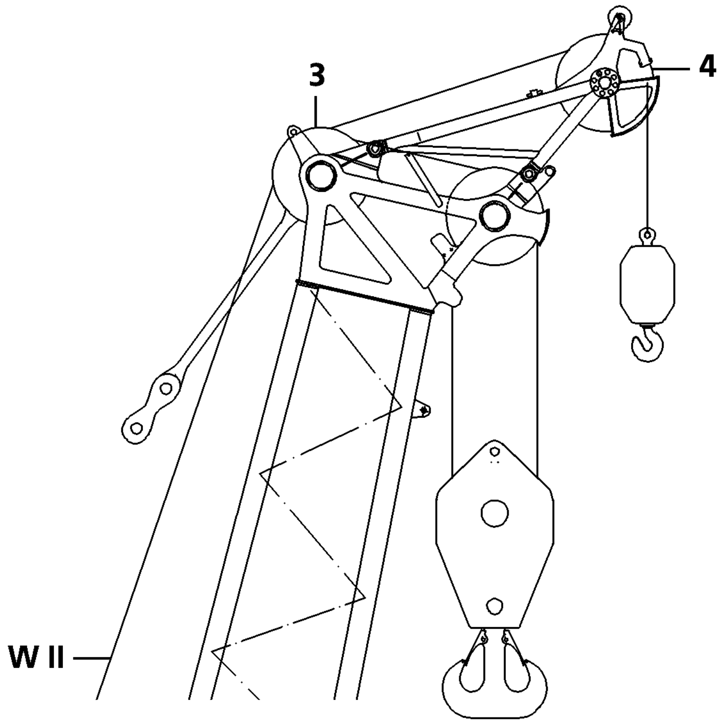
1 = boom head
W1 = winch I

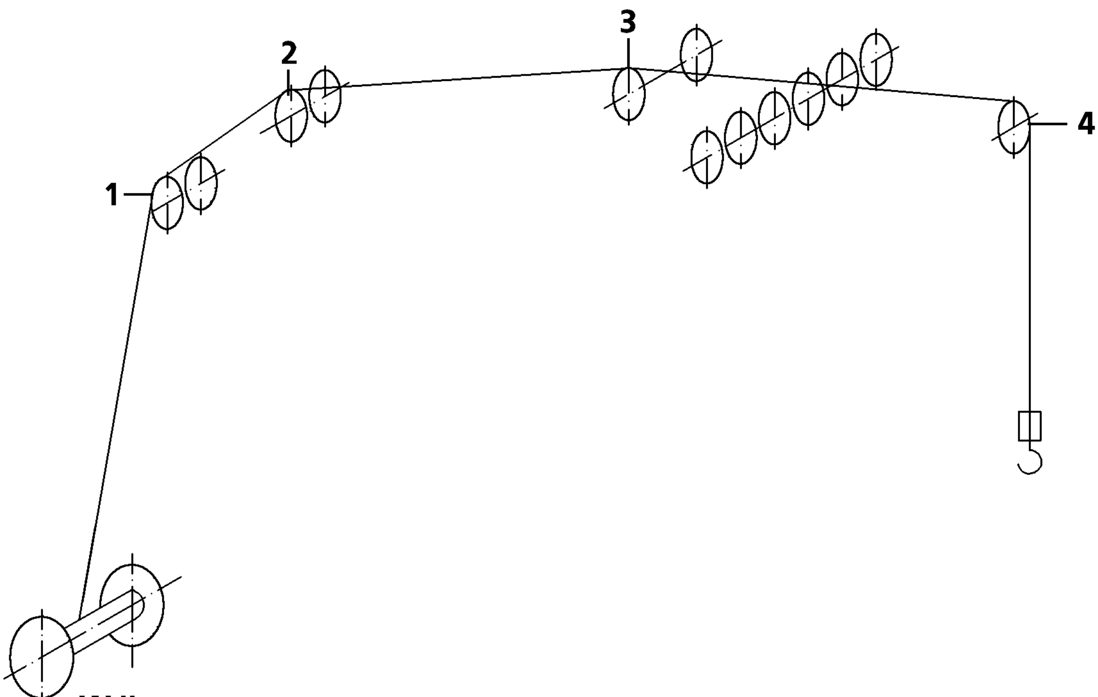


186736

Hoisting rope guidedance for boom nose at N- head section

1 = NA- Bock II
2 = NA- Bock I
WII = Winde II
3 = Seilrolle N-Kopfstück
4 = Seilrolle Mastnase

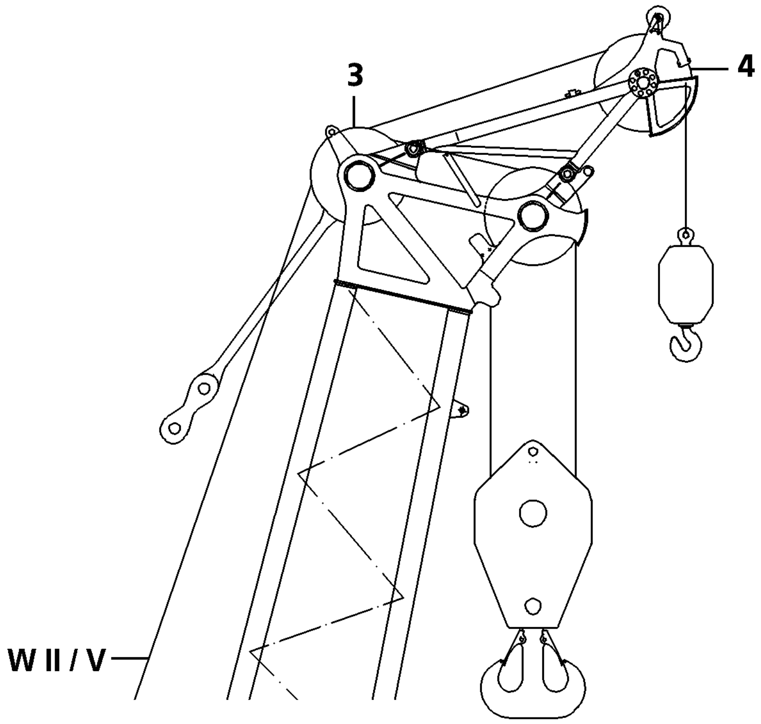


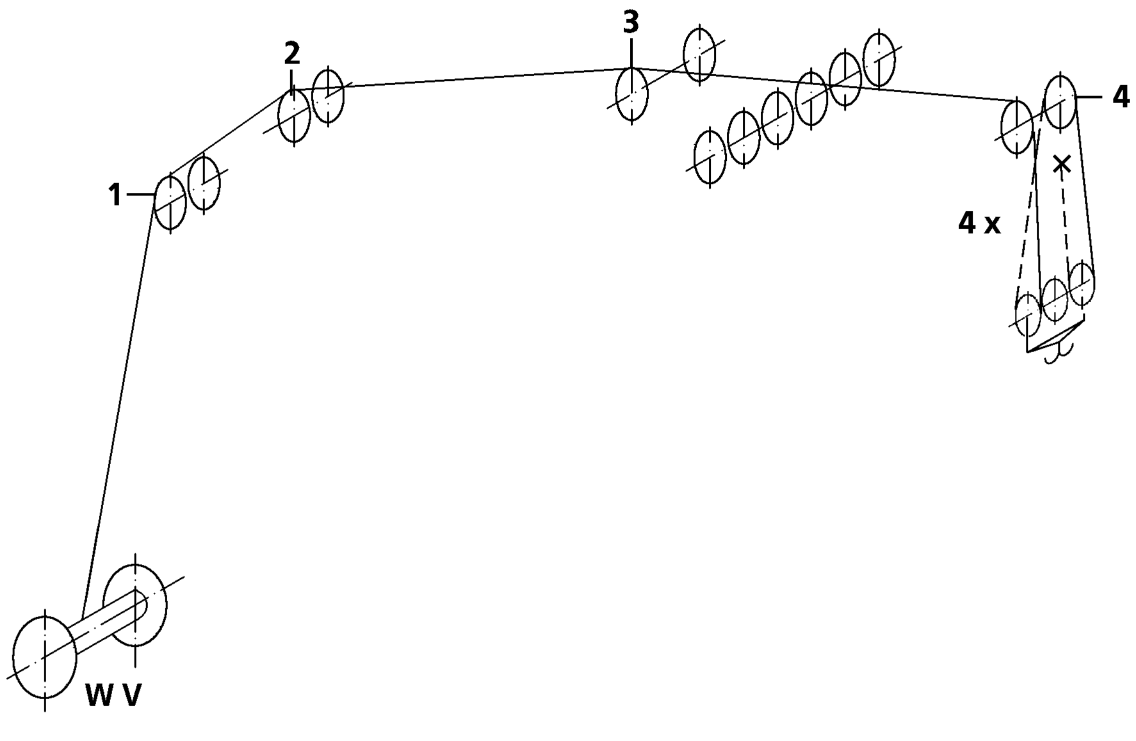


186747

Hoisting rope guidedance for 48 t boom nose at N- head section

1 = NA- Bock II	3 = Seilrolle N-Kopfstück
2 = NA- Bock I	4 = Seilrolle Mastnase
WII = Winde II	WV = Winde V

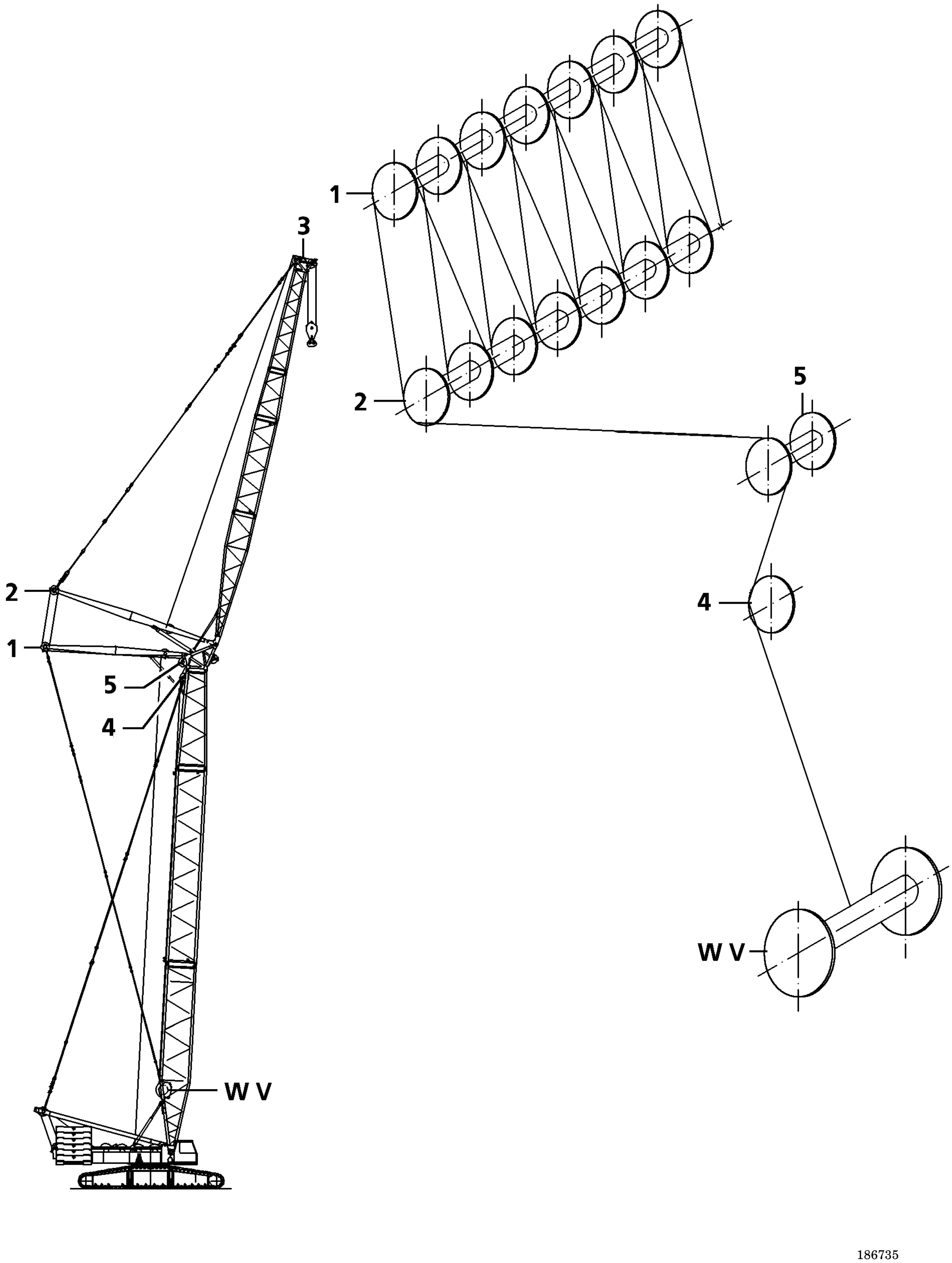




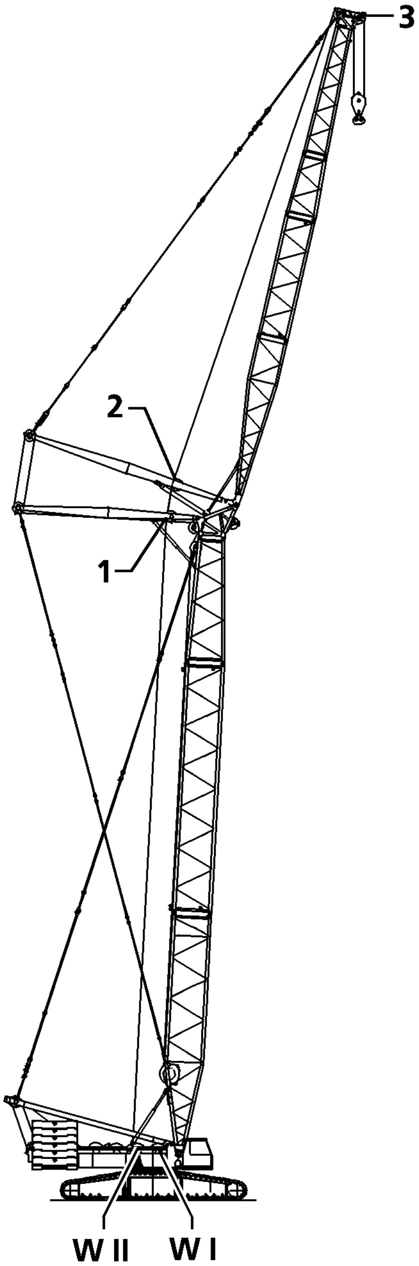
190025

Reeving plans at N - fly jib adjusting

1 = NA - bracket II
2 = NA - bracket I
3 = N- head piece
4 = L- adapter
5 = boom head
WV = WinchV



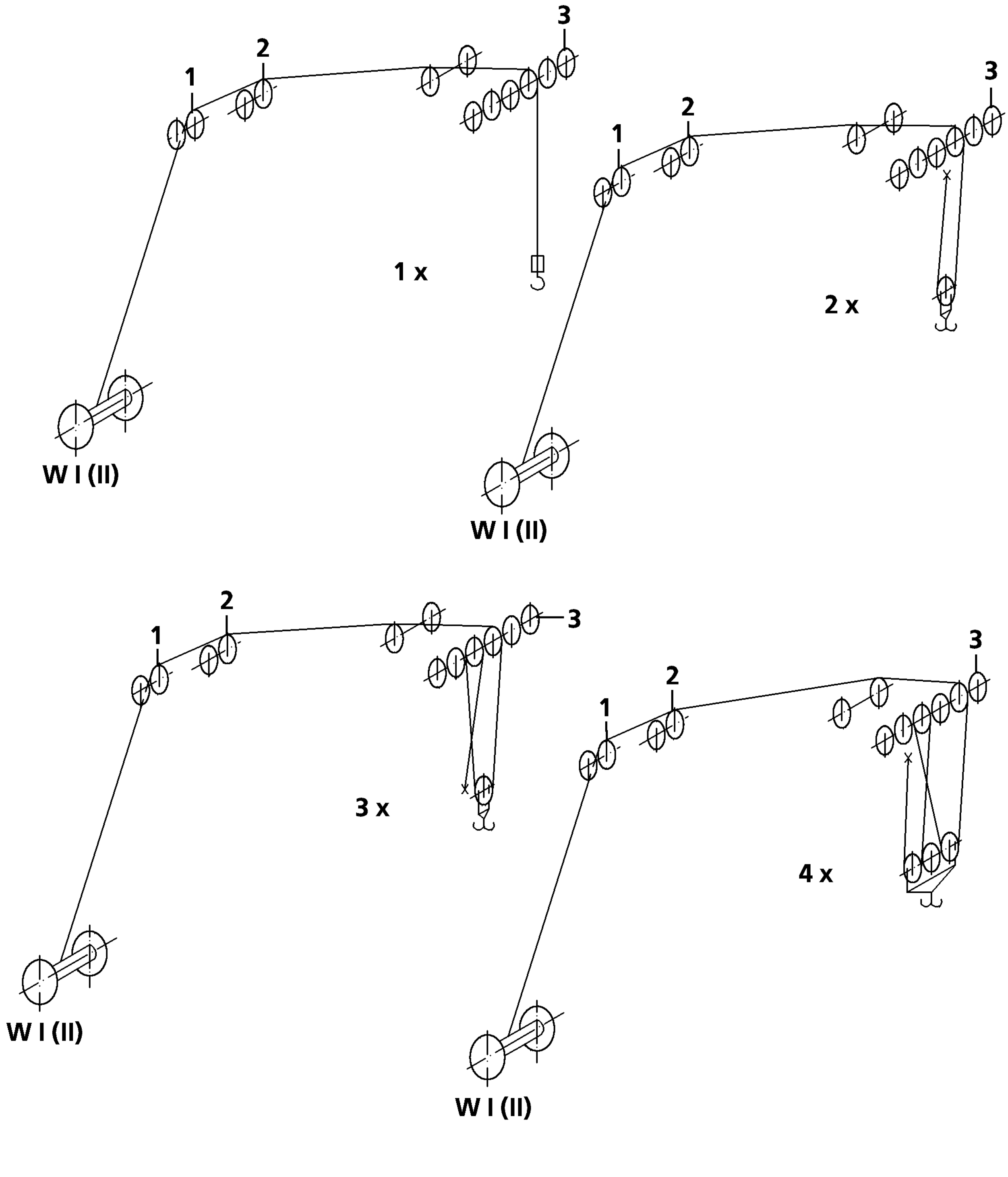
Hoisting rope guidedance at N - operation
1 = NA- Bock II
2 = NA- Bock I
W I (II) = winch I (II)
3 = N- head piece



186738

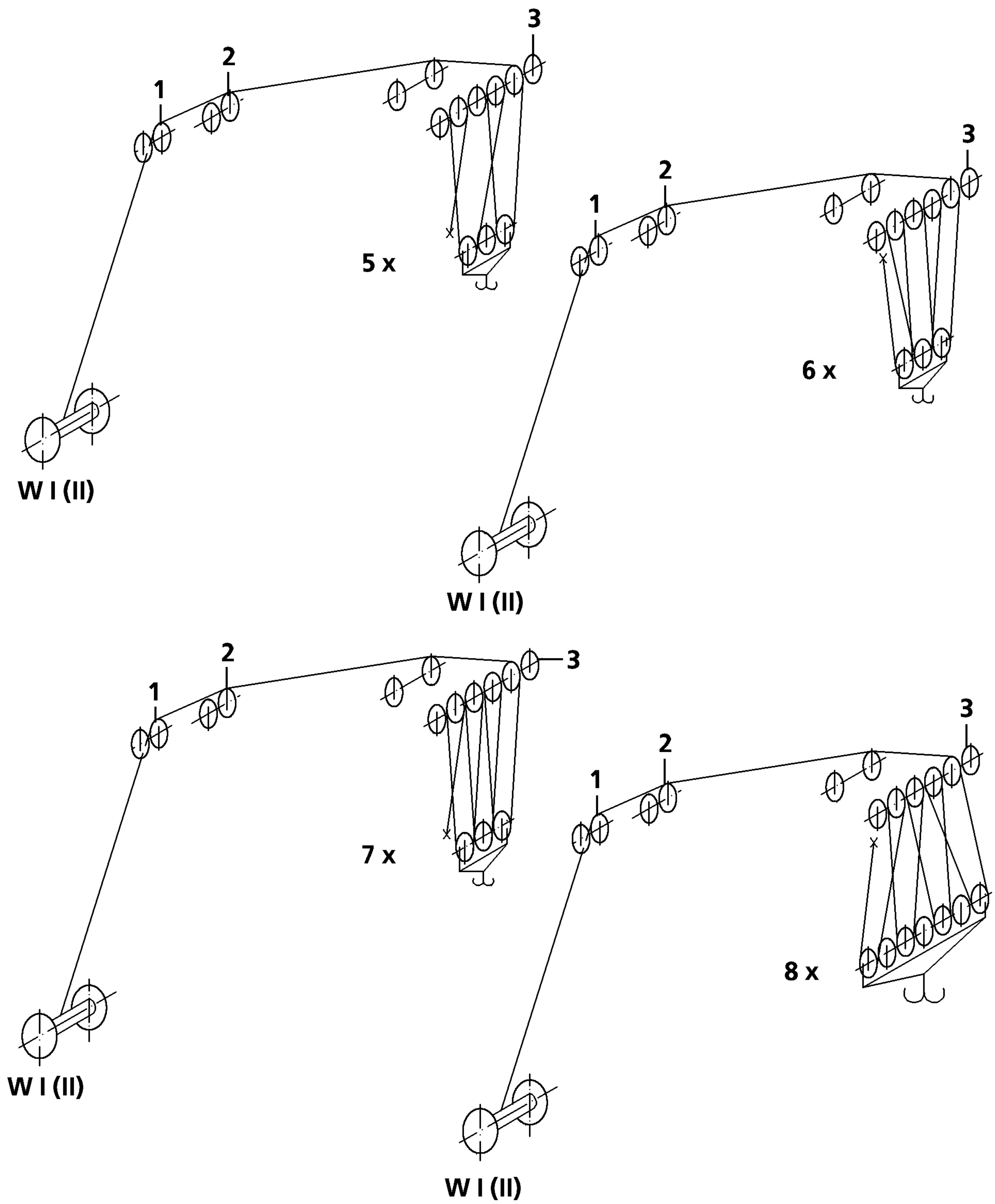
Reeving plan, N - operation

1 = NA- Bock II
2 = NA- Bock I
W I (II) = winch I (II)
3 = N- head piece



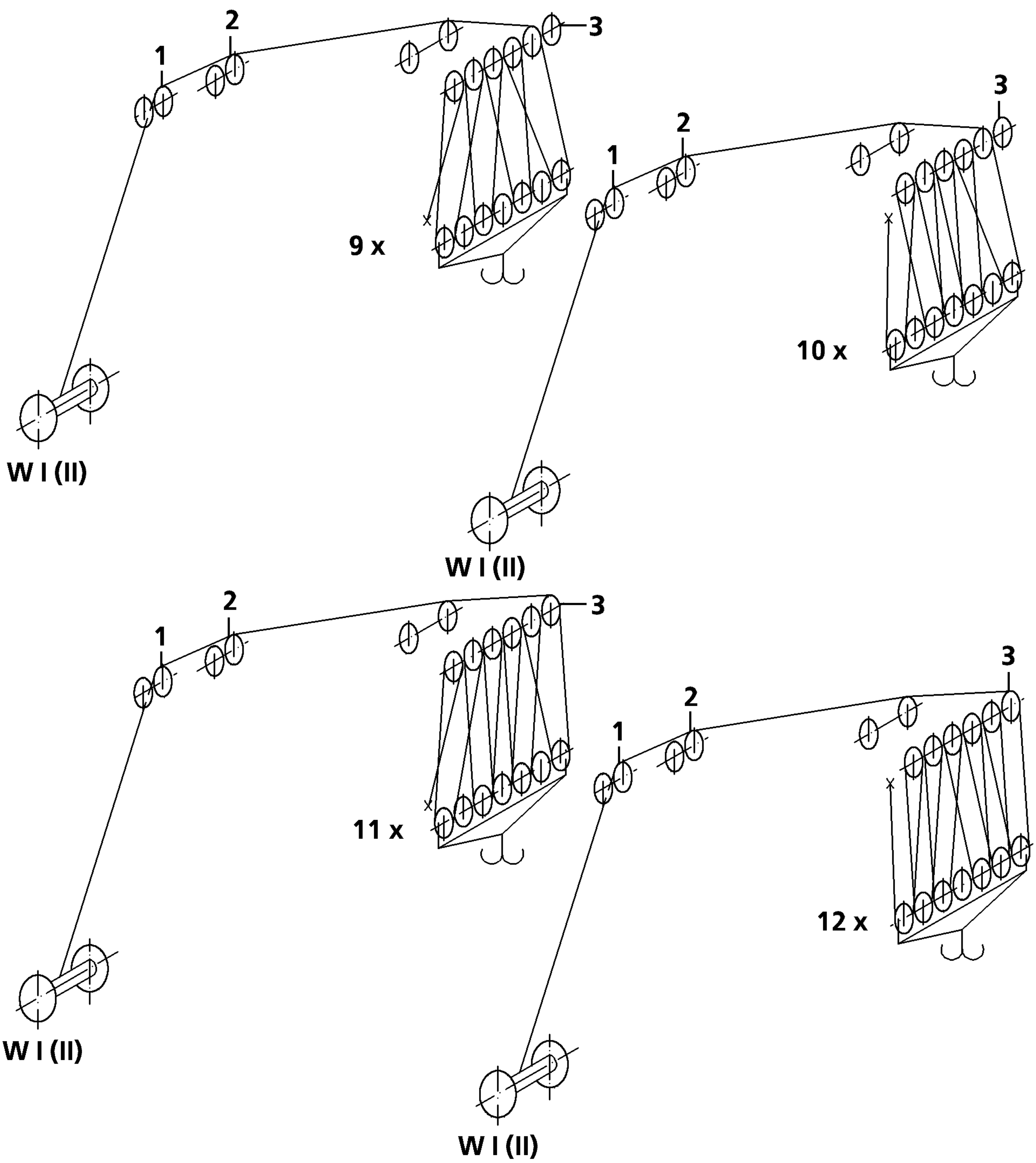
190592

Reeving plan, N - operation (continue)



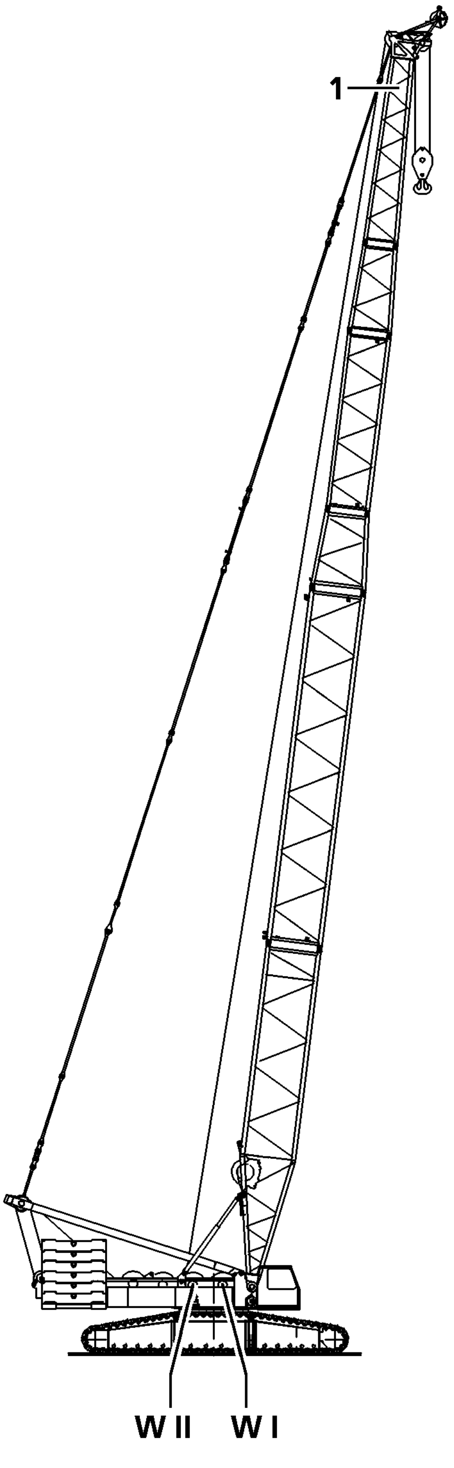
186740

Reeving plan, N - operation (continue)



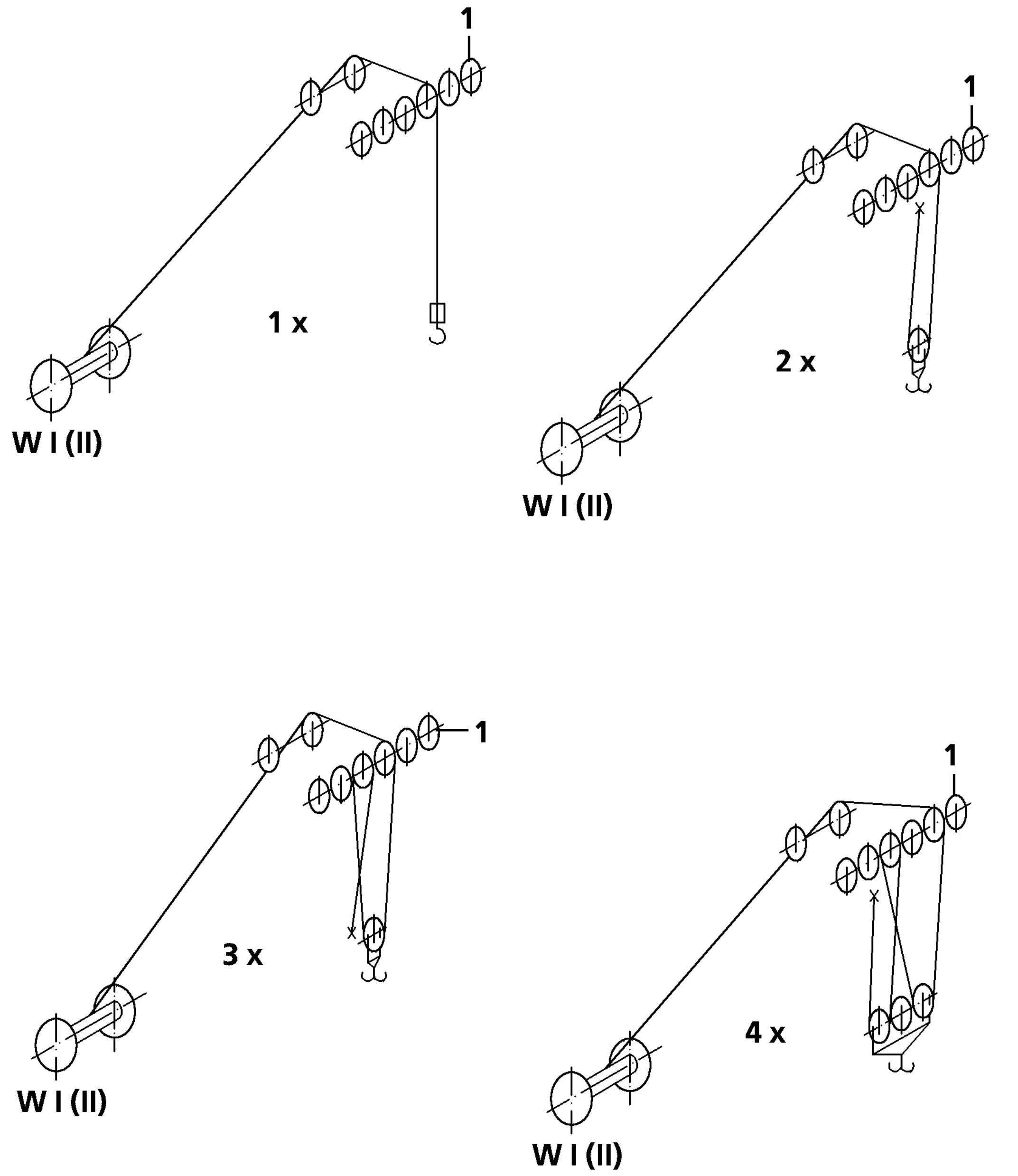
186741

Hoisting rope guidedance and reeving at LL - operation
1 = N-head piece
W I(II) = winch I(II)



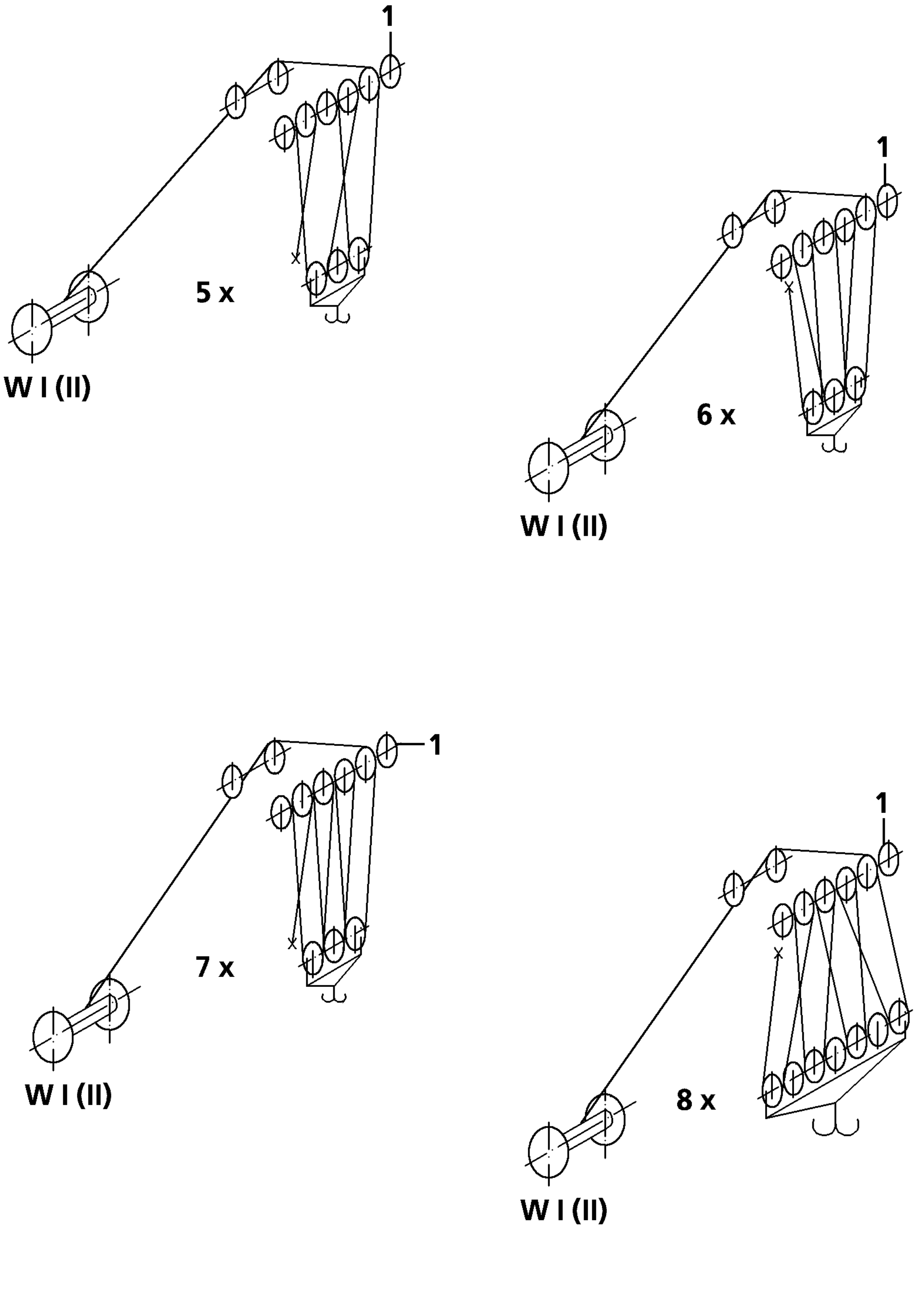
186750

Hoisting rope guidedance and reeving at LL - operation (continue)



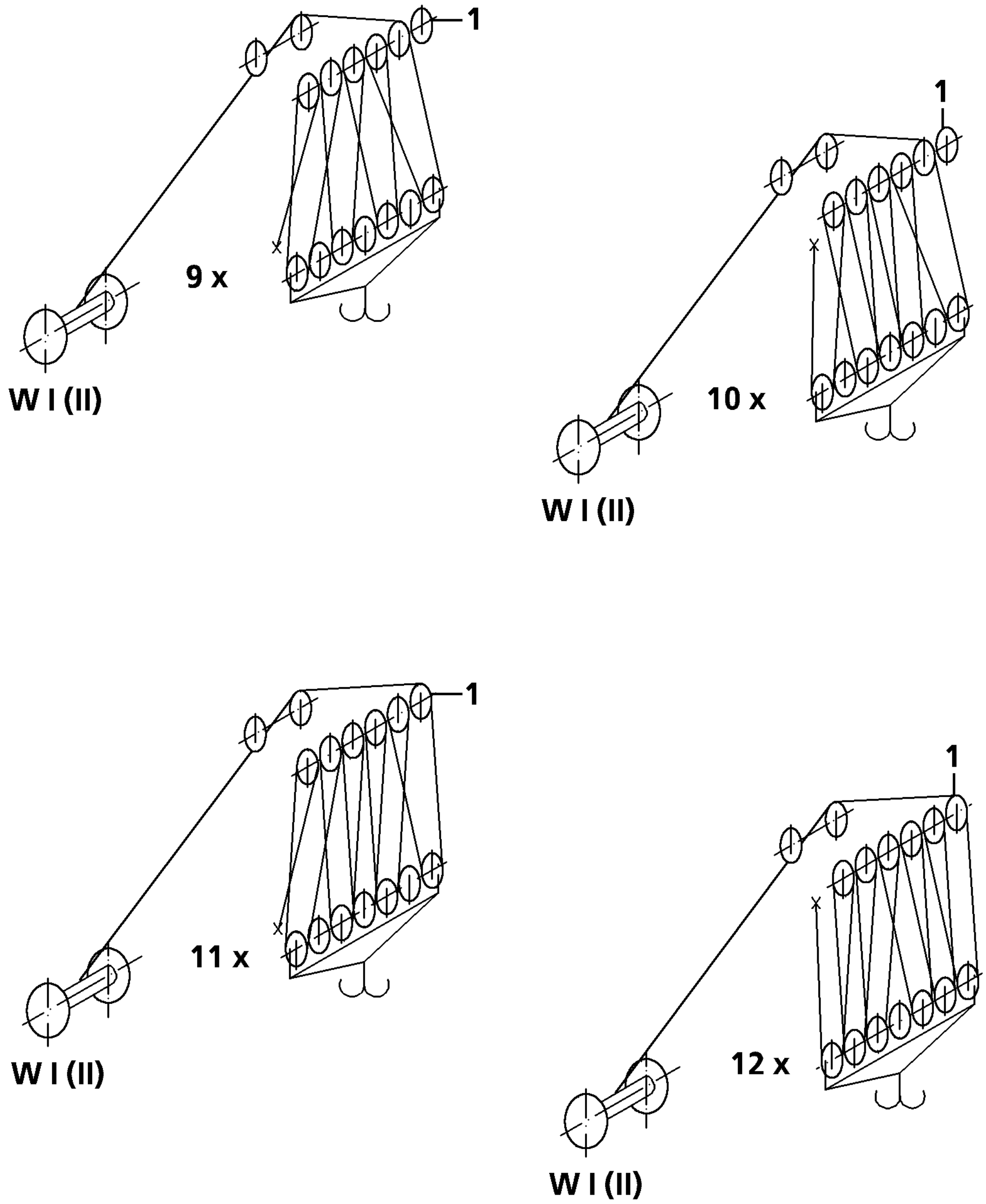
186751

Hoisting rope guidedance and reeving at LL - operation (continue)

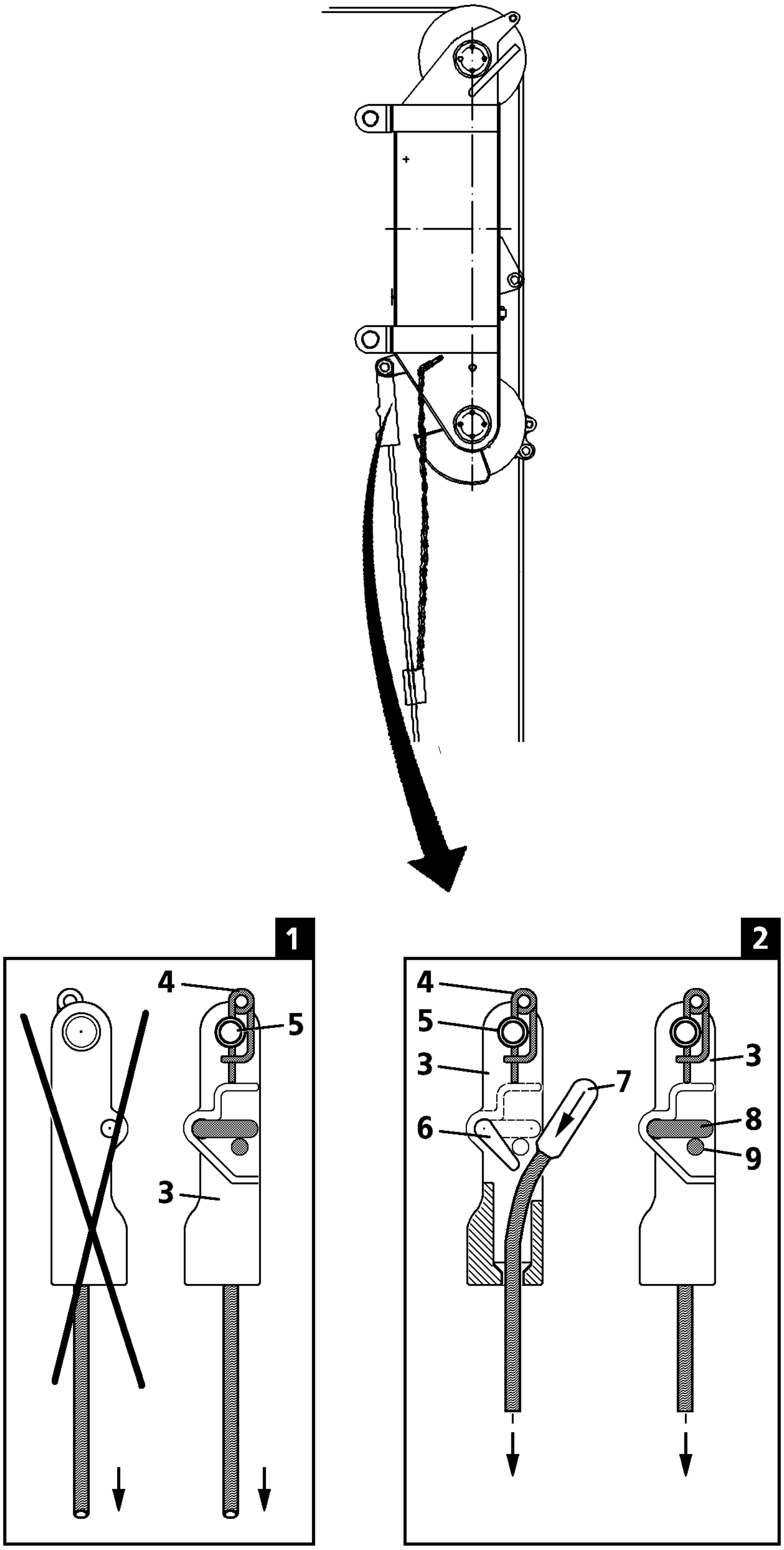


186752

Hoisting rope guidedance and reeving at LL - operation (continue)



186753



186755

Reeving the hook block

Prerequisite:
- The crane is horizontally aligned.
- An assistant is present to guide the cable .

Installation procedure:

- Loosen the spring retainer and pull out the cable retaining bars (1) on the pulley head (2).
- Place the required hook block under the pulley head of the boom.
- On the hook block, remove the spring retainers and pull out cable retaining bars.
- Start the crane engine.

Note: While the assistant guides the hoist cable to the pulley head, the crane operator must operate the winch. This procedure must be done in such a manner, that the cable does not slacken up on the cable drum.

D A N G E R: **This work should be completed while standing on a secure base.**
If it is unavoidable that the cable must be hand-guided on the boom to the pulley head, use utmost caution when walking on the boom.
There is a great danger of causing a serious accident if the crane function is not operated properly and the person guiding the cable slips on the boom.

- Lay the hoist cable over the top cable pulley and reeve the hoist cable between the pulley head and the hook block as shown on the reeving plan for the appropriate load capacity chart.
- Reinsert the cable retaining bars and secure them with spring retainers.

Note: Reeving may be done manually or with the aid of a reeving winch .
If the reeving winch is used, the auxiliary cable must first be reeved in reverse direction between the hook block and the pulley head and then connected with the hoist cable.
During the reeving procedure, the crane operator must spool out the hoist cable from hoist winch and at the same time, spool up the auxiliary cable with the auxiliary winch .

Insert the hoist cable

Fig.: 1
- Depending on the reeving, bolt the cable lock (3) either to the pulley head or to the hook block and secure with the spring retainer (4).

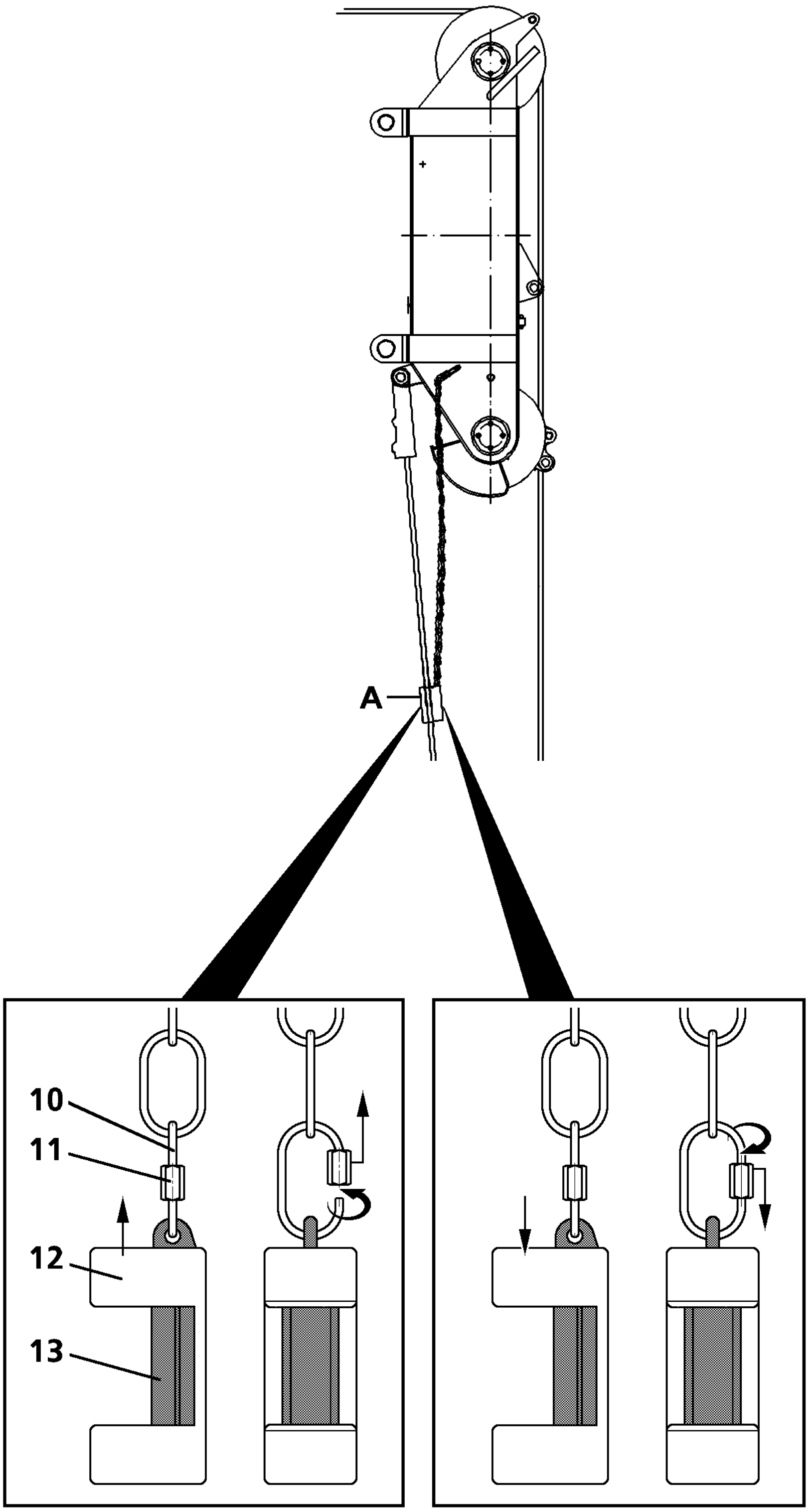
D A N G E R: **The pin (5) must always be placed from the inside to the outside and secured from the outside, to prevent the hoist cable from rubbing against the pin (5) or the spring retainer (4).**

Fig.: 2
- On the cable lock (3), push in the retainer pin (9), with the lever (6) downward and hold it in this position.

Note: This causes the locking lever (8) to swing downward.

- Insert the end of the cable with the cable fitting (7) into the cable lock (3) and strongly pull it ”downward” .

C A U T I O N: **The cable fitting (7) must touch the taper in the cable lock (3) , the lever (6) must be locked with the lock pin (9). The locking mechanism (6,8 and 9) on the cable lock must be freely movable.**



186756

Install the hoist limit switch weight

- Open the chain lock (10) on the hoist limit switch weight (A) .
- Using a 13 mm wide (SW 13) open end wrench, loosen the hex head nut (11) and turn it ”up” by hand .
- Release the hoist limit switch weight.

C A U T I O N : **The hoist limit switch weight (A) consists of two interconnected parts (12 and 13) . When releasing or attaching the weight, make sure that the two parts do not slide apart and cause the weight (12) to fall out. Danger of foot injuries!**

- Push the weight (12) by hand onto the cable and hold it,
- with the other hand, guide the carrying part (13) behind the cable, underneath the weight (12).

D A N G E R: **With multiple reeving, the hoist limit switch weight must always be routed around the ”FIXED CABLE”, meaning around the cable, whose end makes up the cable fixed point.**

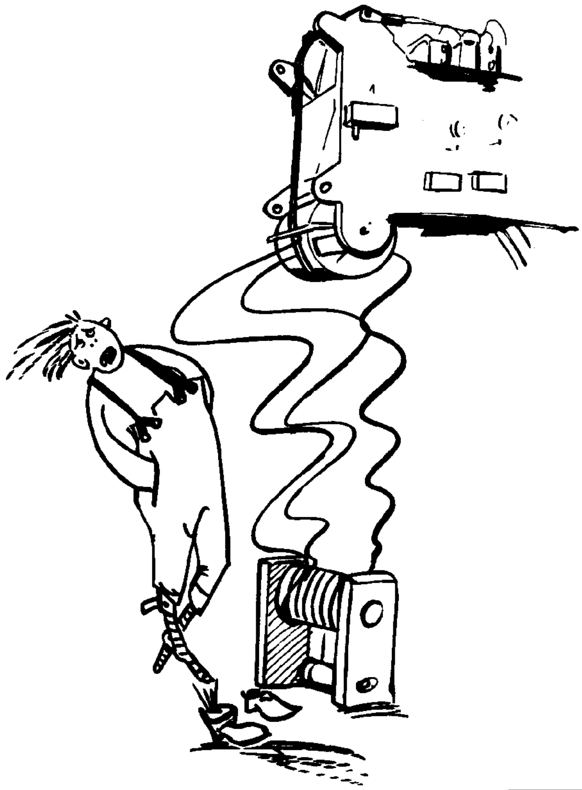
- Push the weight (12) over the carrying part (13) .
- Hang the hoist limit switch weight again into the chain lock (10).
- Turn the lock nut (11) down and manually tighten it with a SW 13 open end wrench.

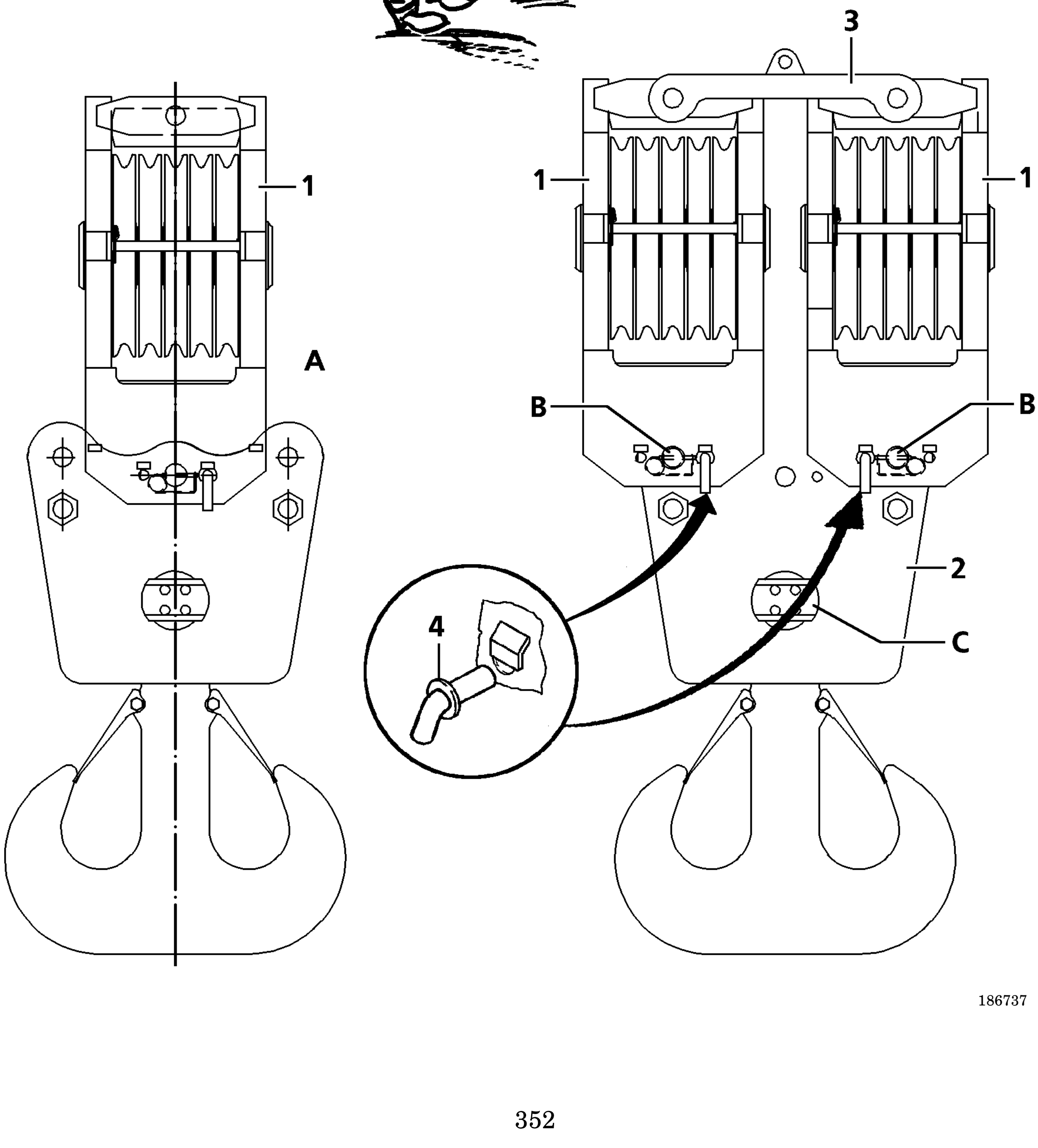
D A N G E R : **The chain lock (10) serves at the same time to secure the weight (12). It may not be replaced with another part, such as a shackle, snap etc. The chain lock (10) must always be attached in such a way that the lock nut (11) is on ”top”, meaning on the chain (14) and the chain lock is closed by turning the lock nut (11) ”downward”. This procedure assures that the lock nut (11) does not loosen up by itself, causing the chain lock to open**.

Visual inspection: Is the chain lock (10) fully closed?
Is the hoist limit switch weight attached to the **”fixed or stationary cable”**?

- Enter the number of reeves into the ”LICCON” safe load moment indicator or recheck it.

D A N G E R : **The crane operator must make sure that the reeving process has been done properly and that the safe load indicator has been set correctly. Incorrect reeving or entering an incorrect number of reeves can lead to serious accidents.**





186737

Unreeving the hook block

Assembly sequence:

- Lower the hook block to the ground and check to make sure it is standing in a stable position.
- Unhook cable end on the cable joint
- Slowly rewind the hoisting cable.

D A N G E R: There must be no persons in the area around the hook block. During rewinding, the cable can lash out like a whip. It must be ensured that there is no loose cable on the winch.

- Attach the hoisting cable with the cable joint onto the pulley head, or rewind the complete hoisting cable onto the winch.

C A U T I O N: Always rewind the hoisting cable so that there is at least 2 m remaining - never rewind the cable end onto the winch!

Assembly of the hookblocks for operation with two hookblocks

Unpin the double hook from the hookblocks (A)

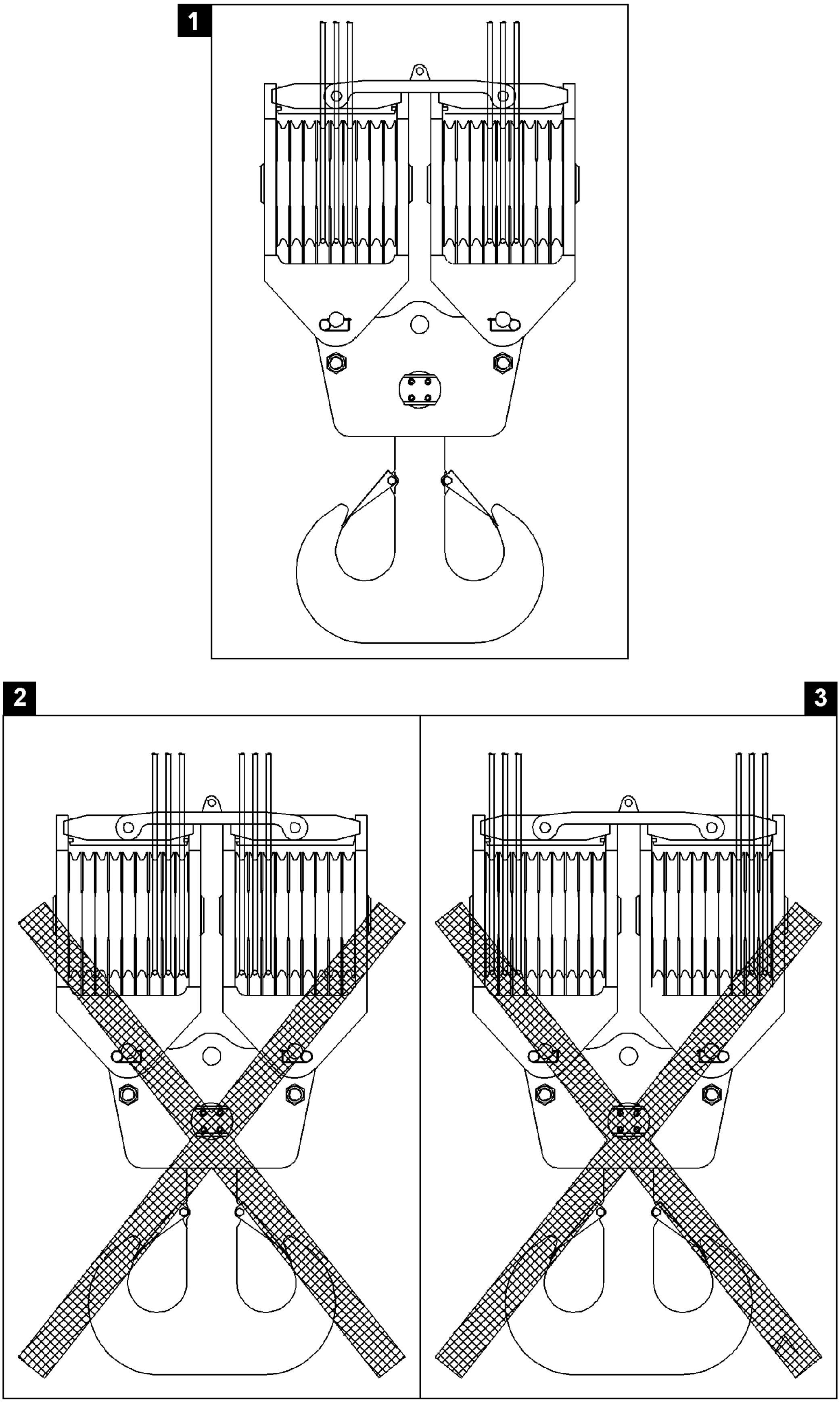
Pin the hookblocks (1) to the rocker (2) and connect with cross-strut (3).

At assembly and rope reeving the hook blocks must be pinned with pin (4) to prevent topple over.

Note: Turn handle down to secure.

C A U T I O N: Before starting crane operation the hook blocks must be unpinned again.

Pin (C) the double hook on the rocker (2).



193295

Asymmetric reeving

Only the hook blocks shown in the chart are suitable for **asymmetric** reeving of the individual blocks in parallel operation.

Description	Id. No. of hook block	Cable diameter [mm}	Number of pulleys
Double hook block 125/250 t	914117208	25	5/10
Double hook block 200/400 t	914205108	25	9/18

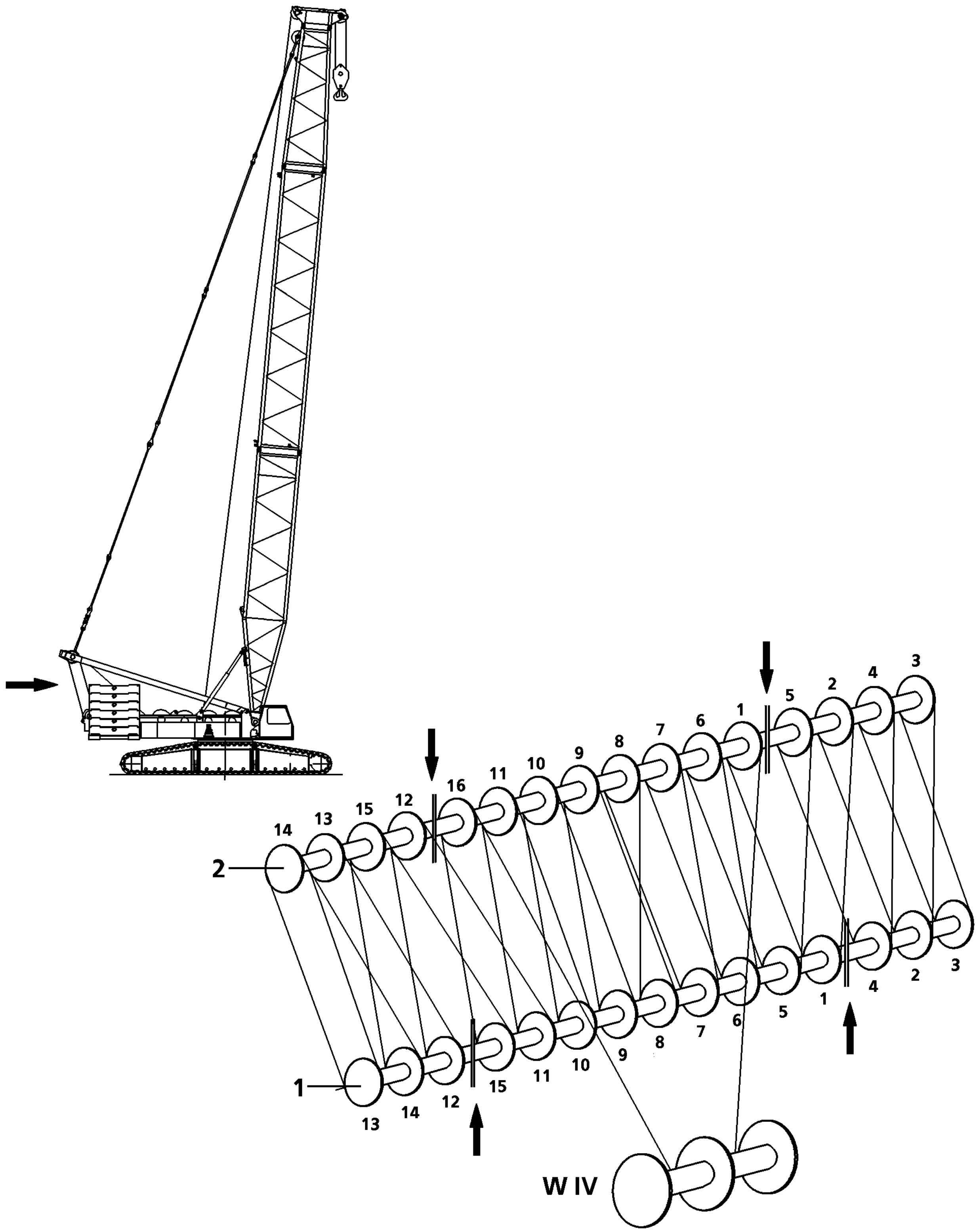
Fig. 1 In parallel operation, the individual block**s must be reeved symetrically to the center pulley** (centered).

Fig. 2+3 In parallel operation, an **asymmetric** reeving of the indivual blocks (from inside to outside) **is not permissible**.

D A N G E R: If this is not observed, there is a danger of accidents!

Reeving between pulleys on the slewing platform and A- bracket

Note: Reeving (32 times) for all operating modes
1 = pulley block on the slewing platform 2 = pulley block on the A- bracket
IV = winch IV



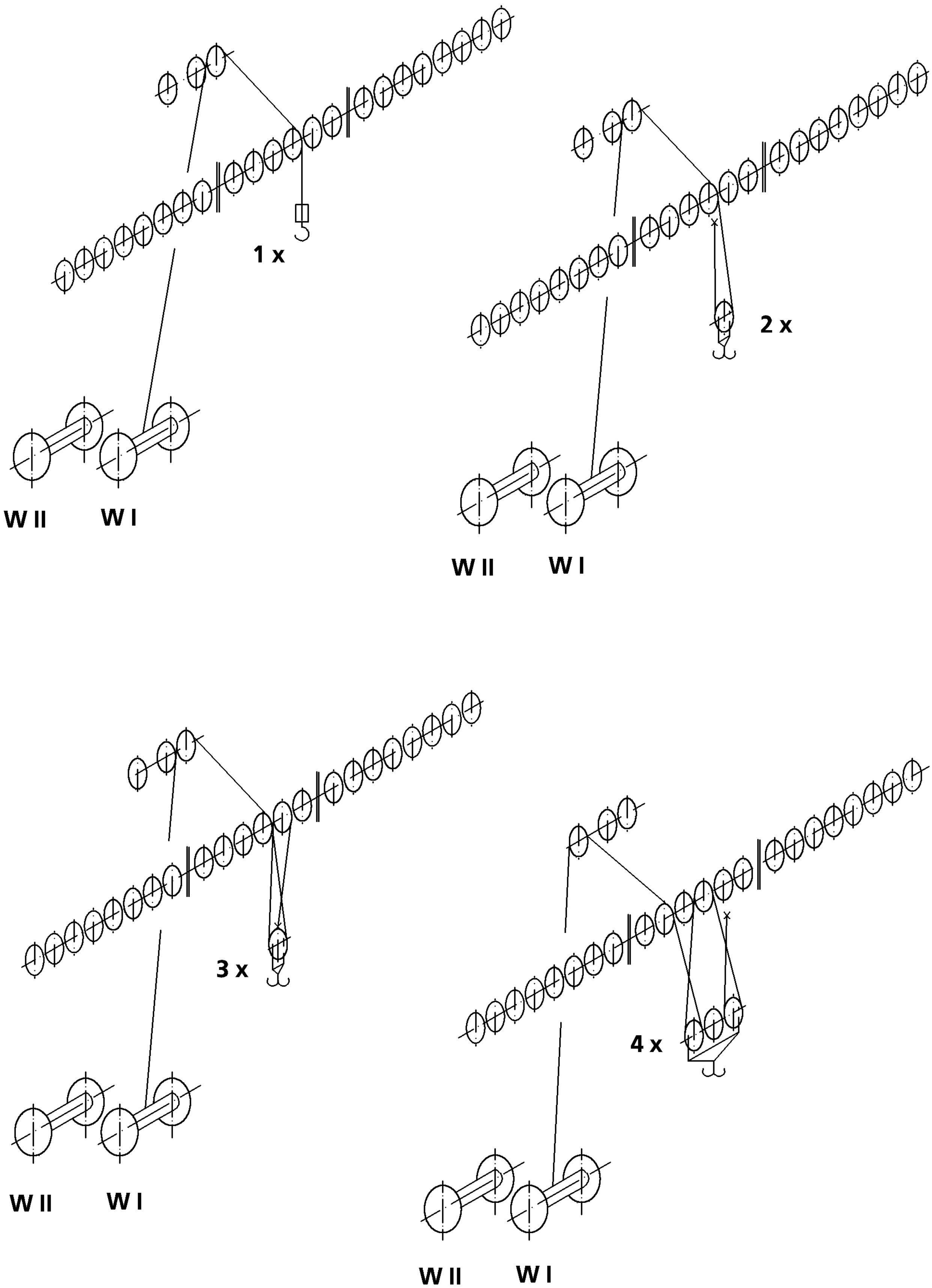
186734

Reeving plans

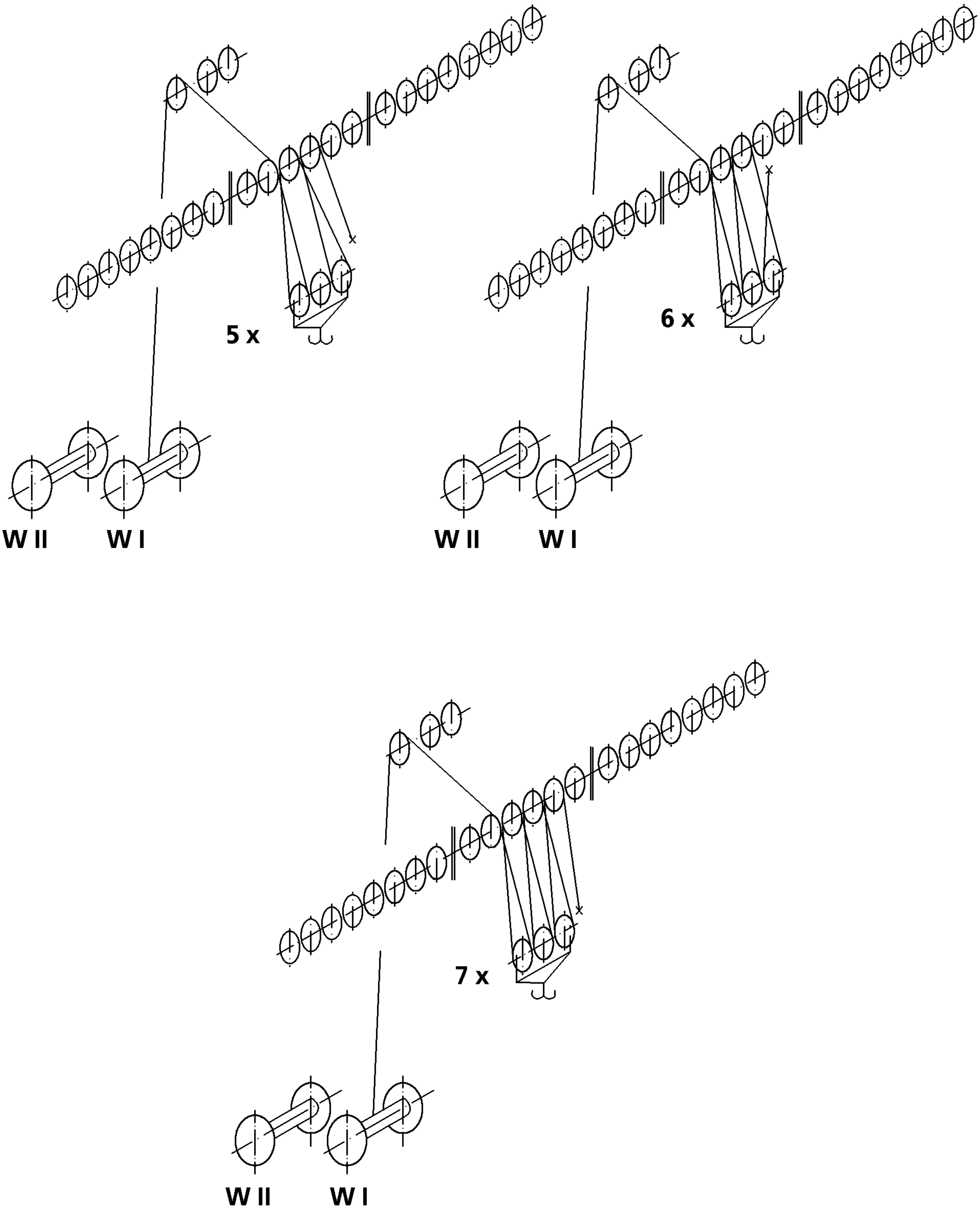
250 t / 400 t- Head section,

250 t - head section - 14 pulley
400 t - head section - 22 pulley

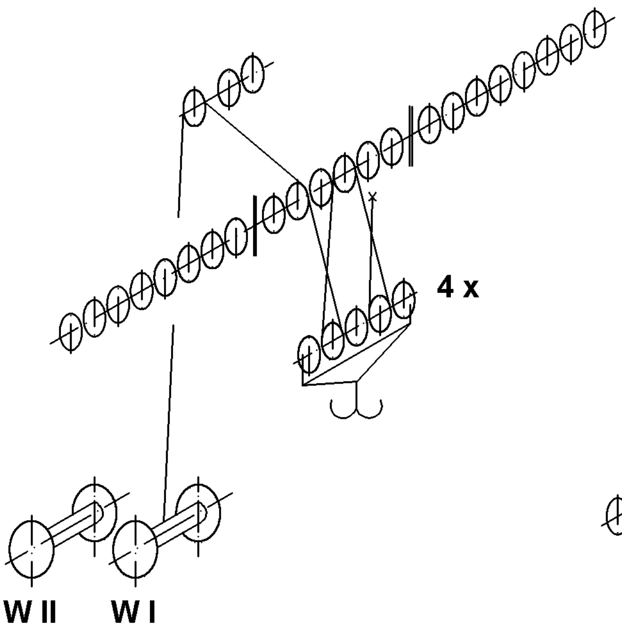
1 - pulley hook block,	30 t hook block
3 - pulley hook block,	80 t hook block
5 - pulley hook block,	125 t hook block
7 - pulley hook block,	160 t hook block
9 - pulley hook block,	200 t hook block

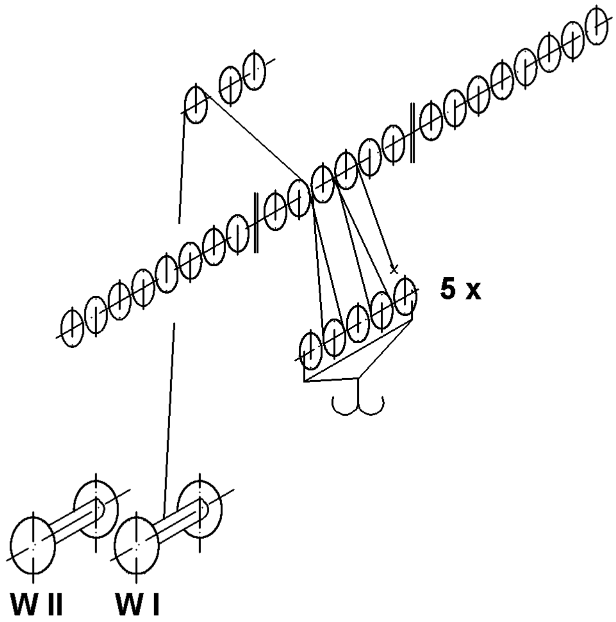


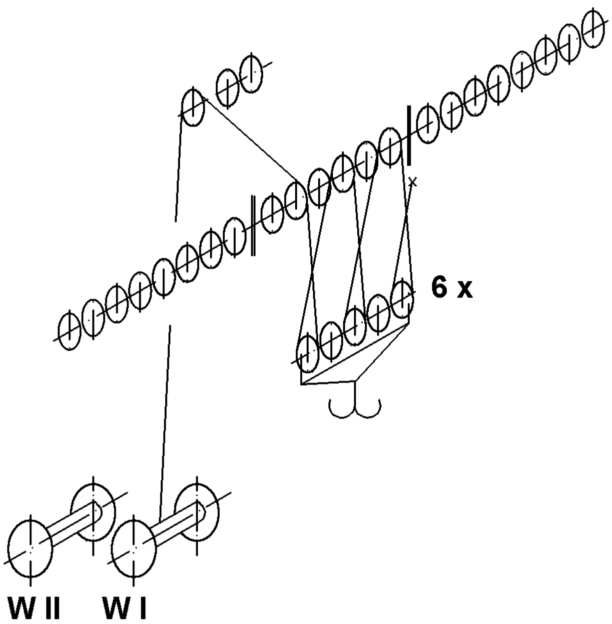
186998

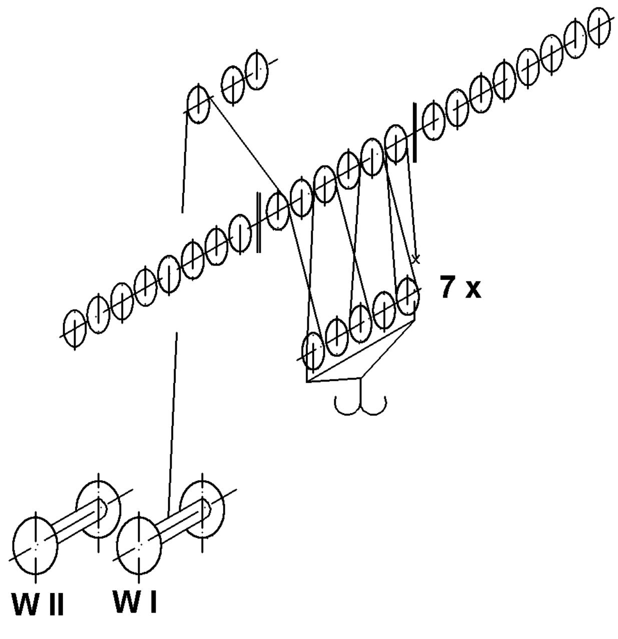


186999

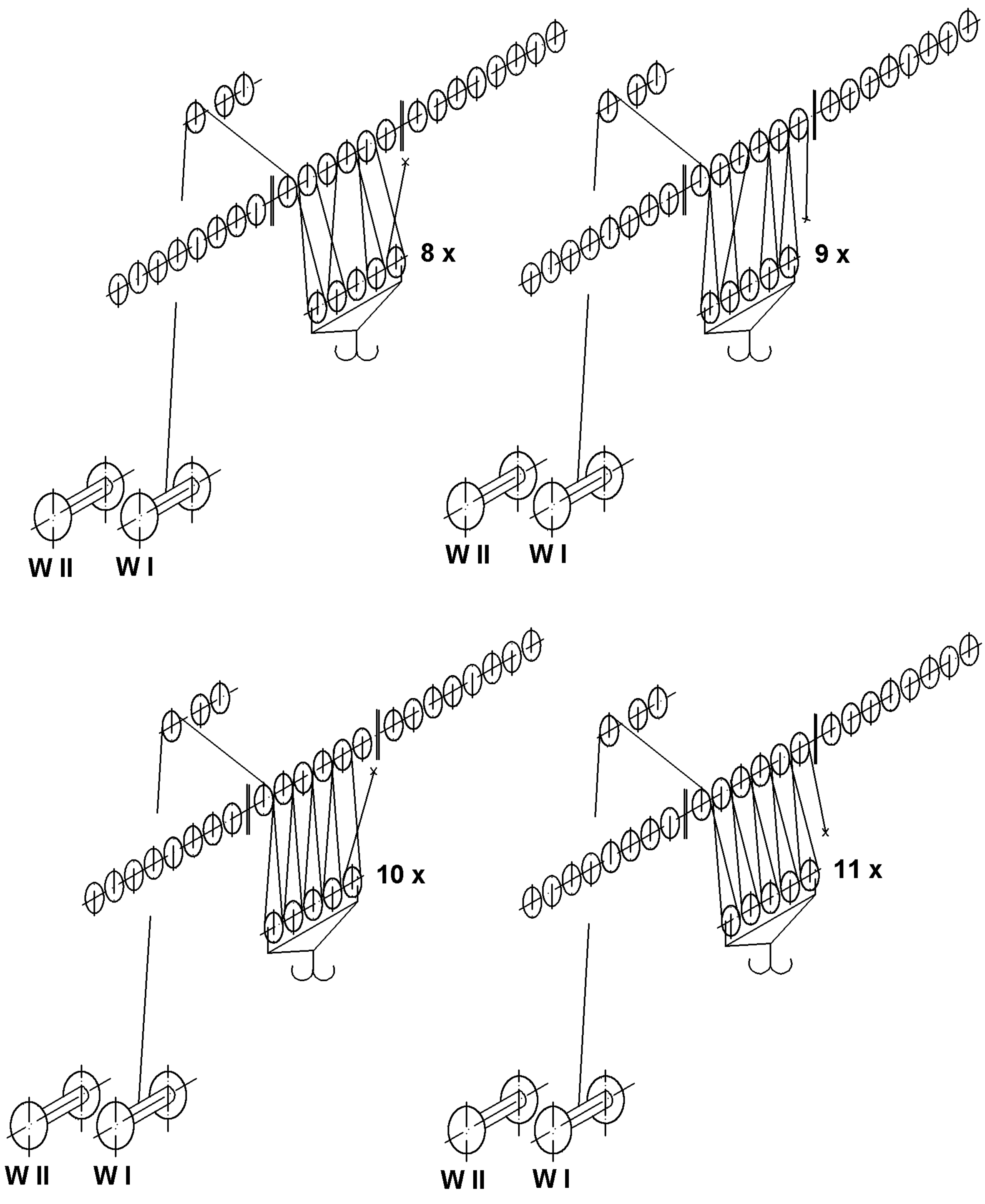


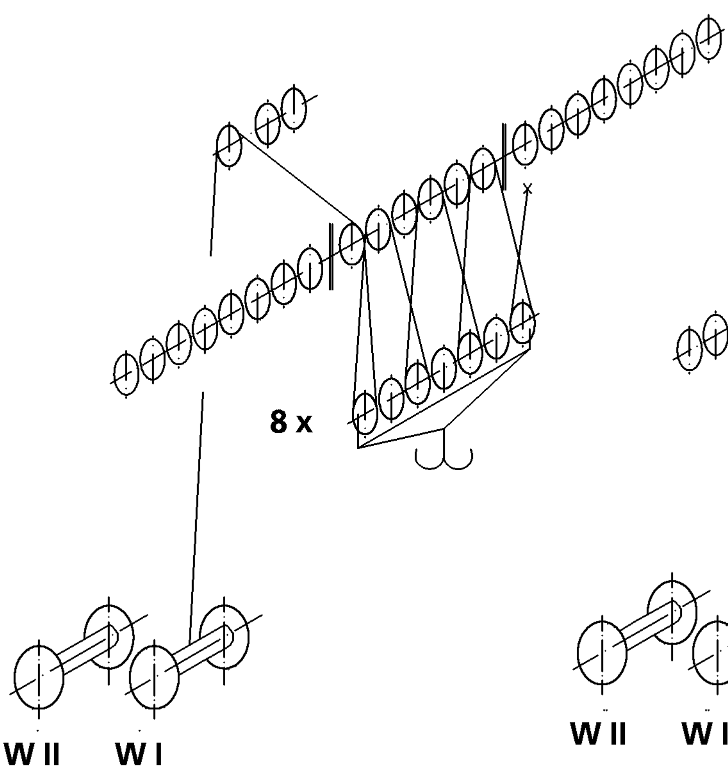


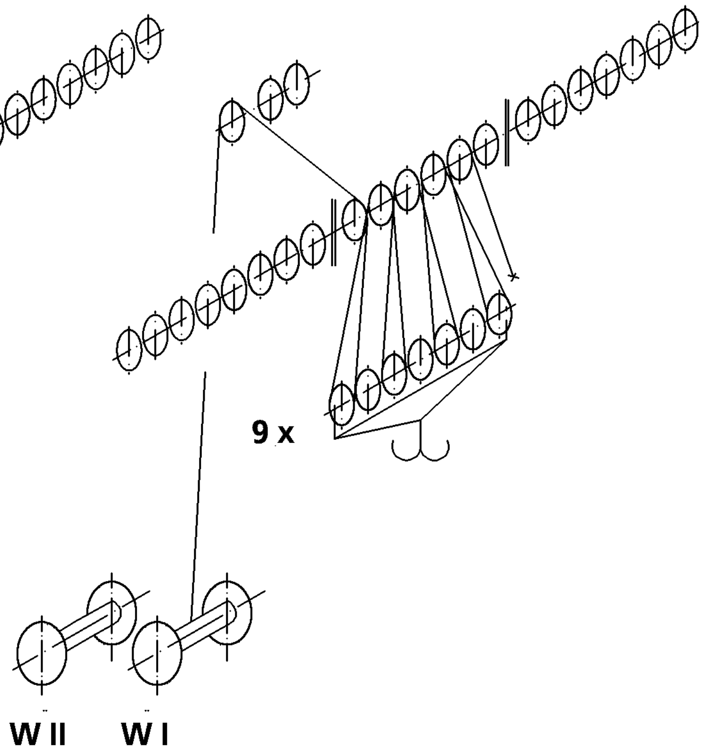


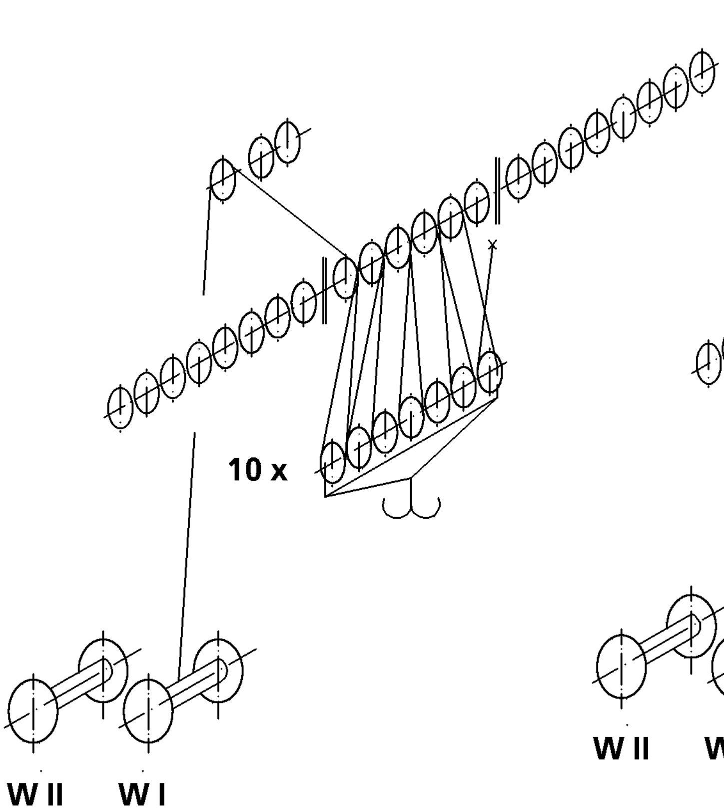


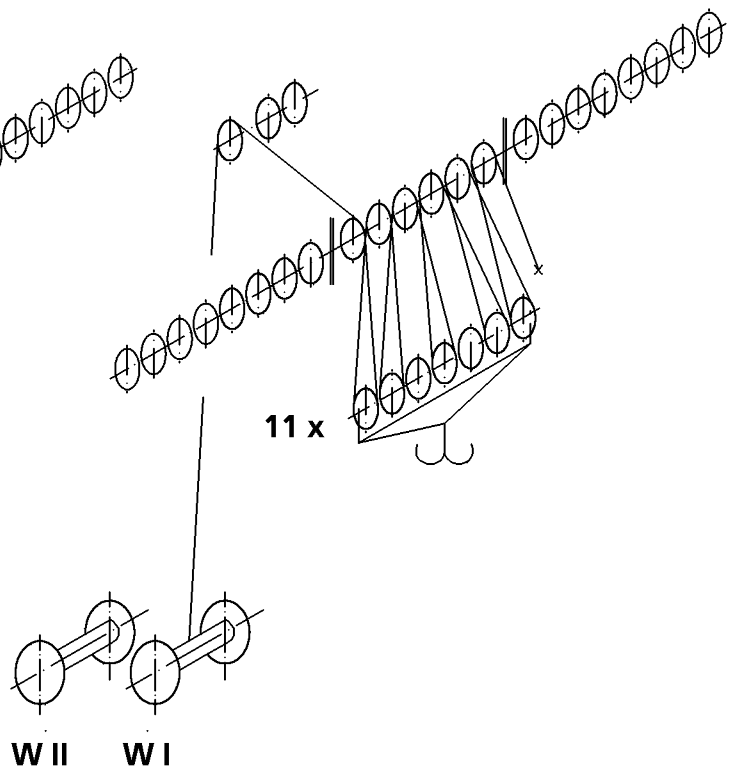
189729


8 x
W II
W I
9 x
W II
W I
10 x
W II
W I
11 x
W II
W I
189730

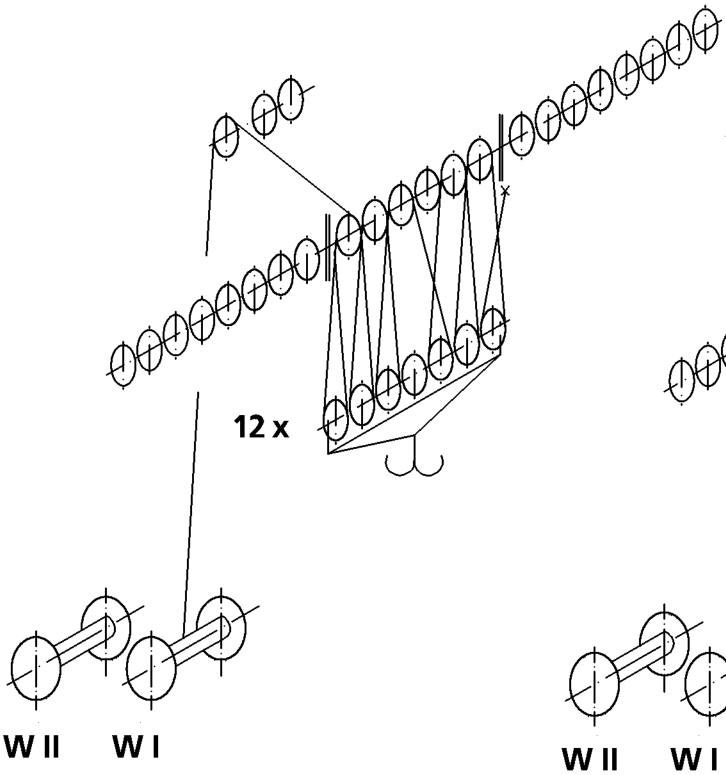


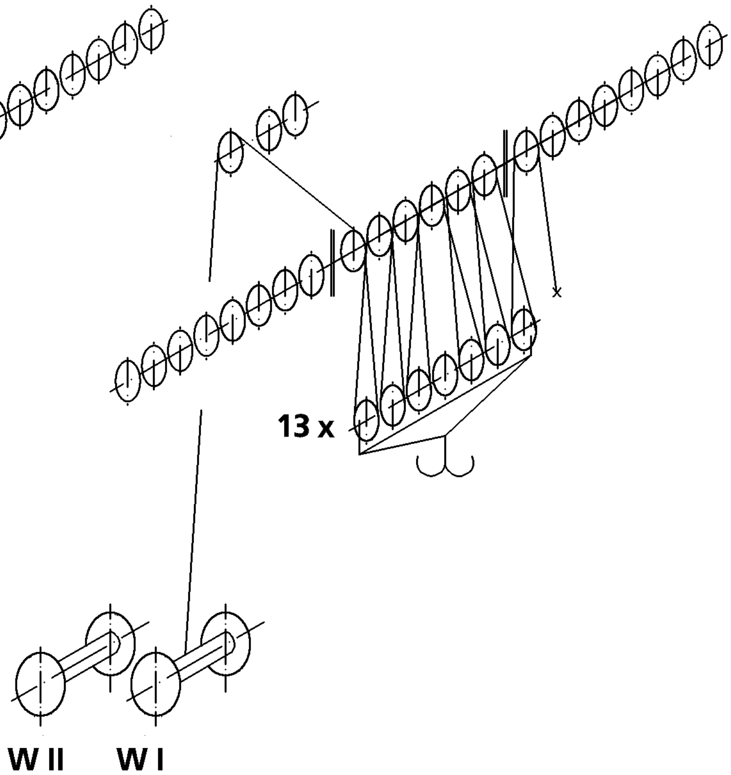


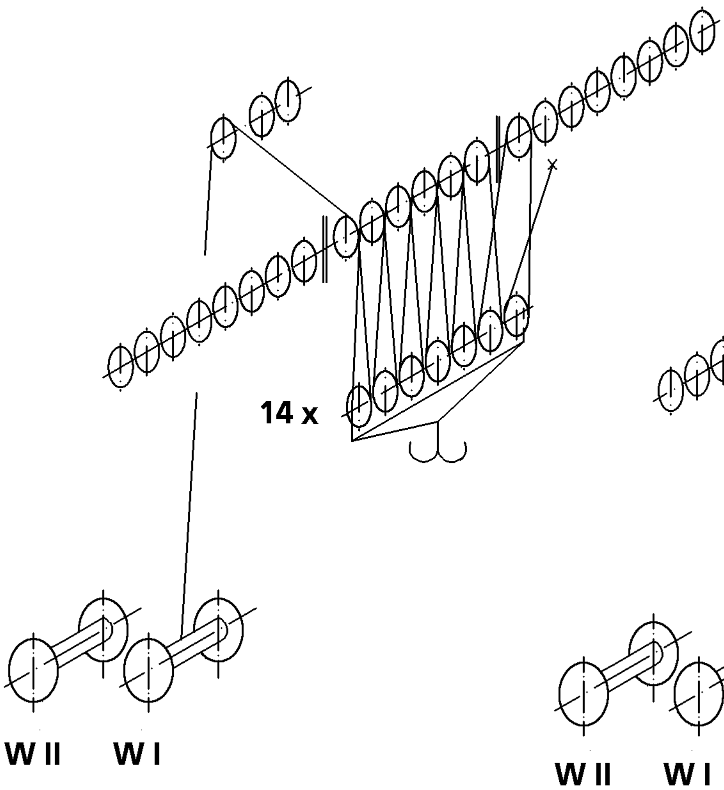


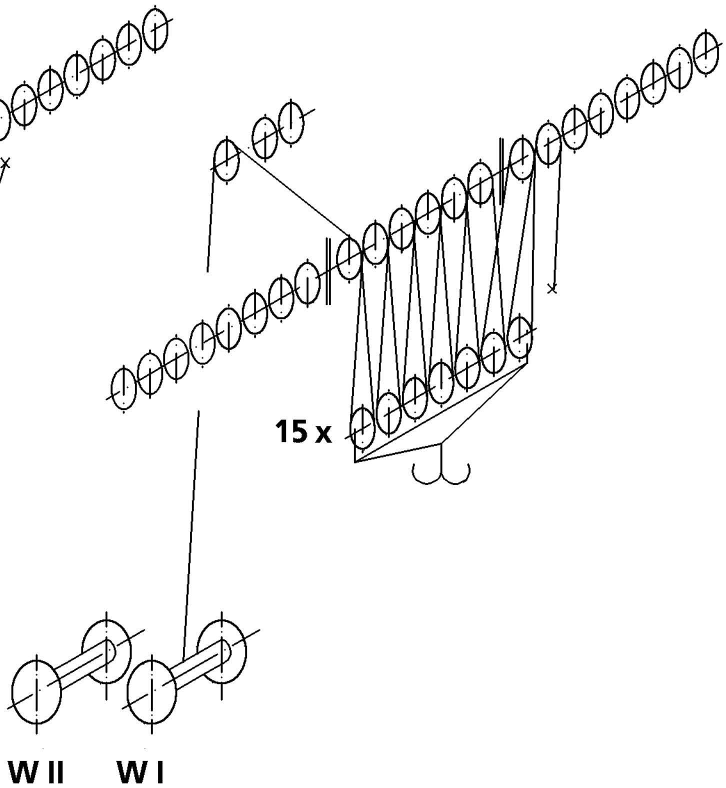


187000

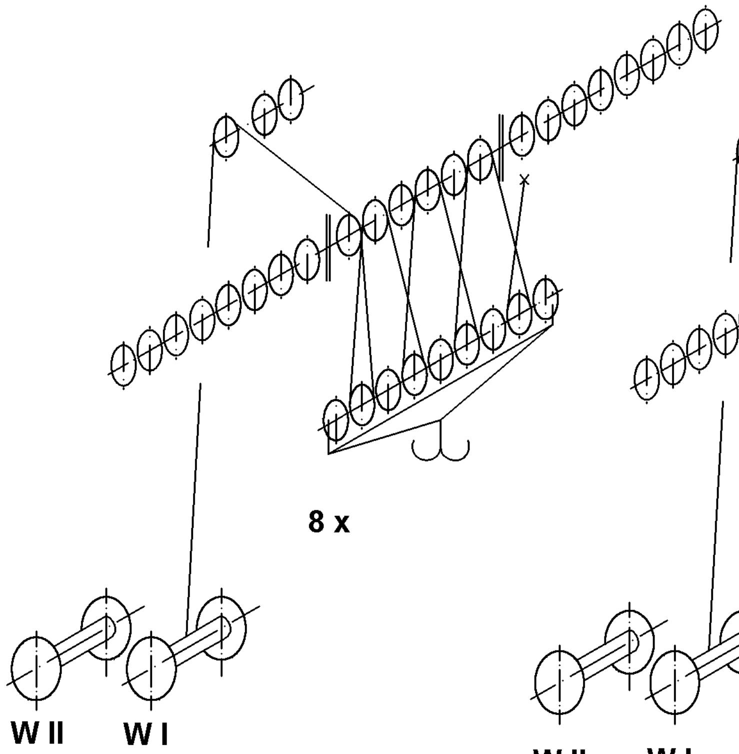


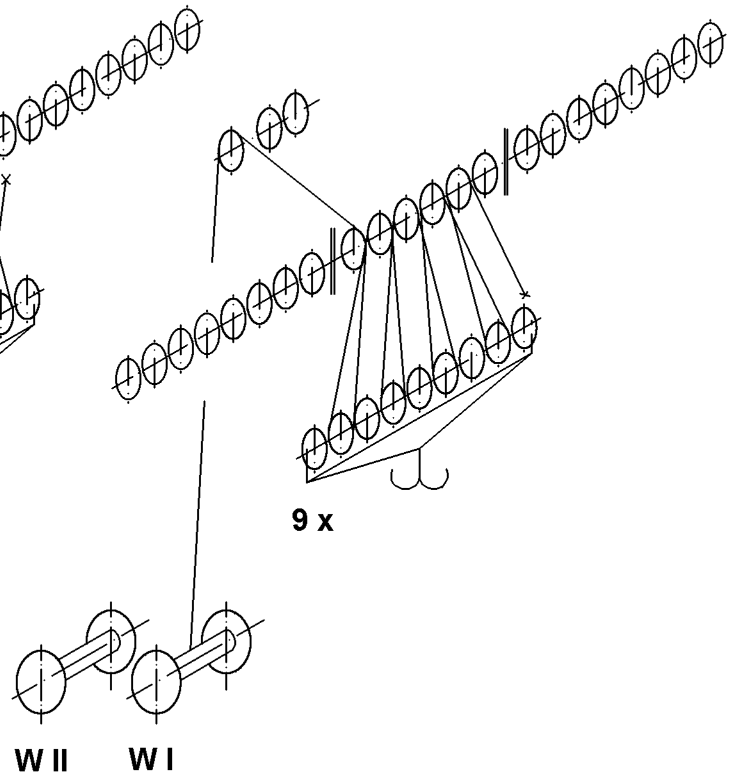


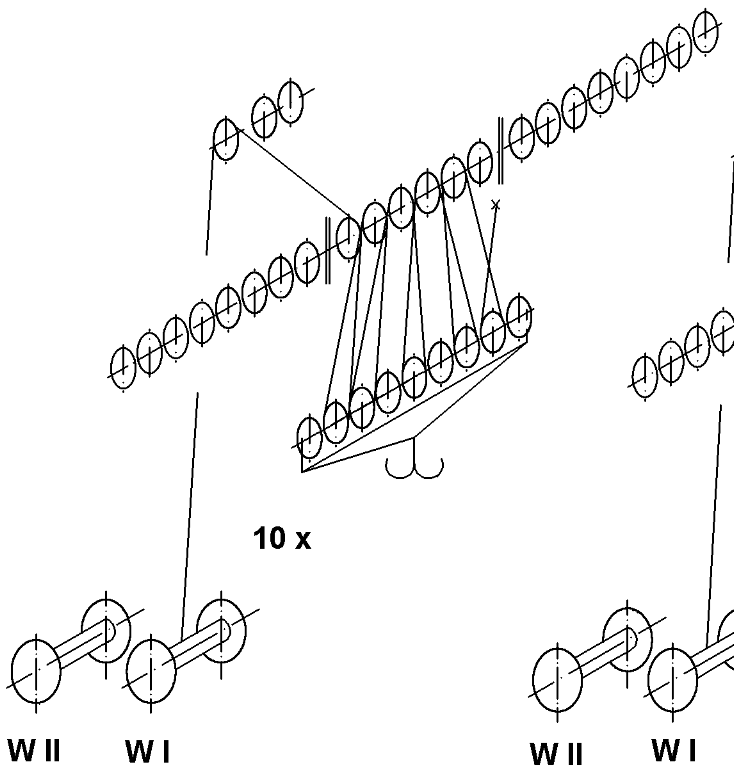


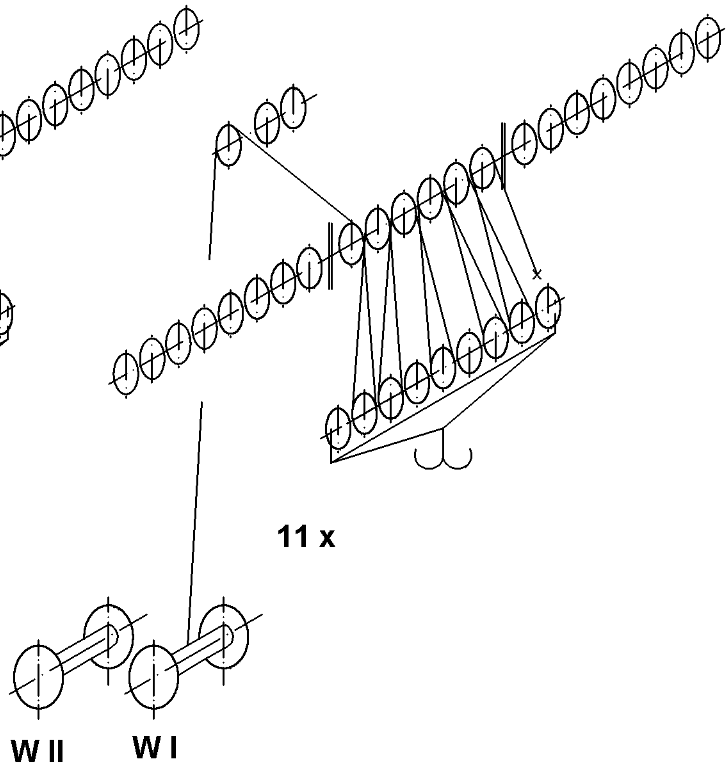


187001

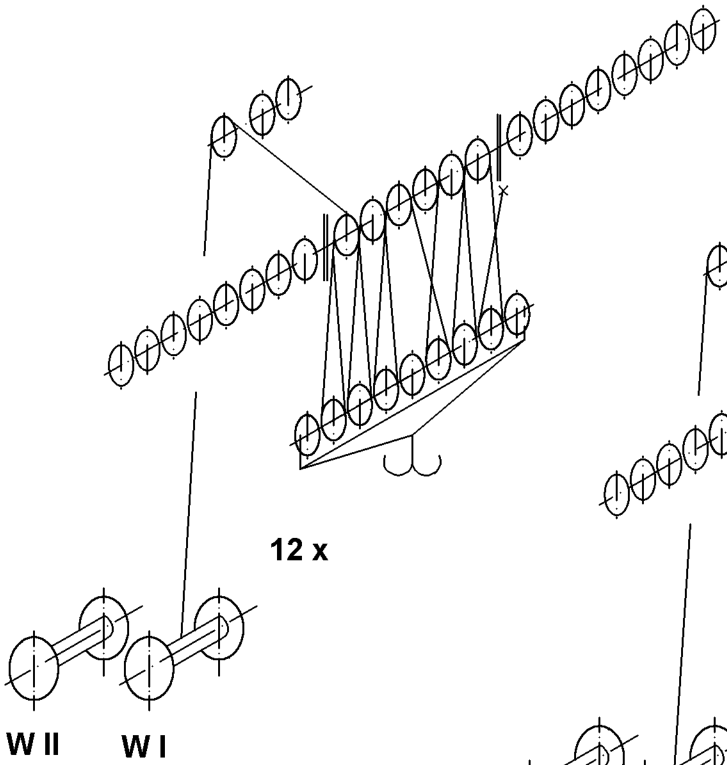




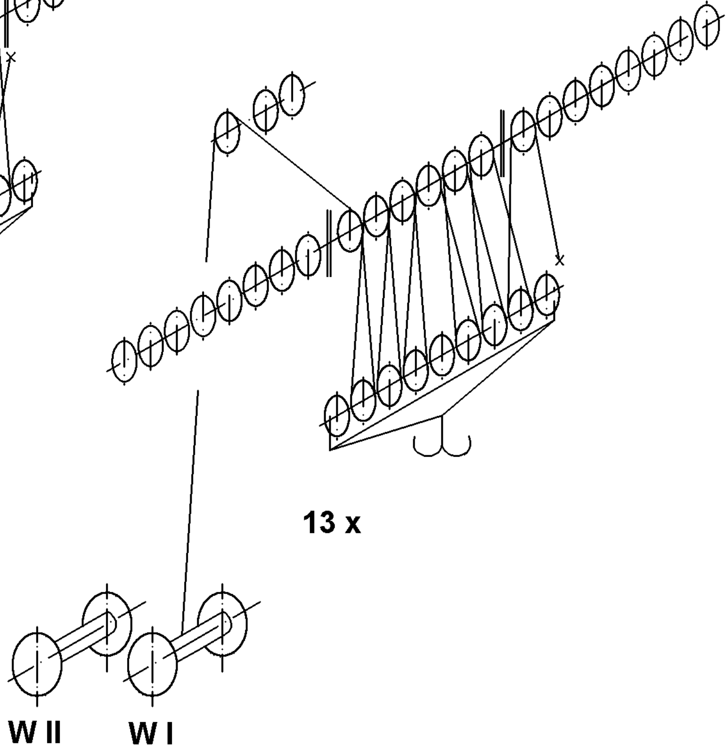




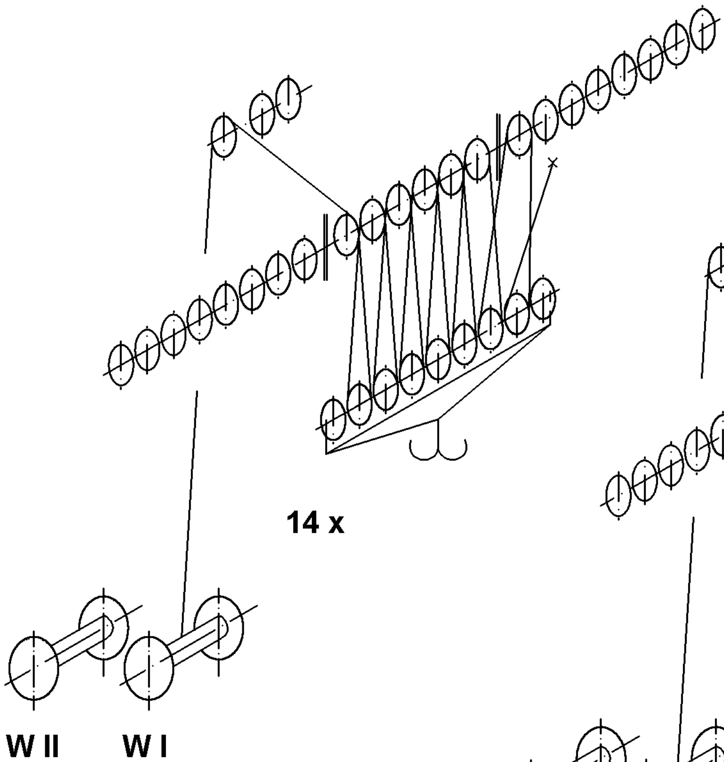
190595



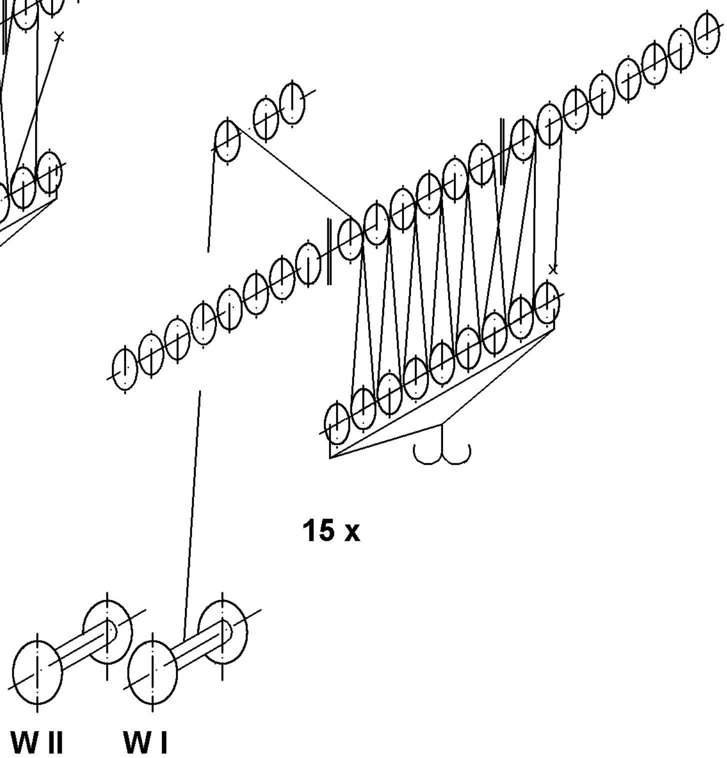
12 x



13 x

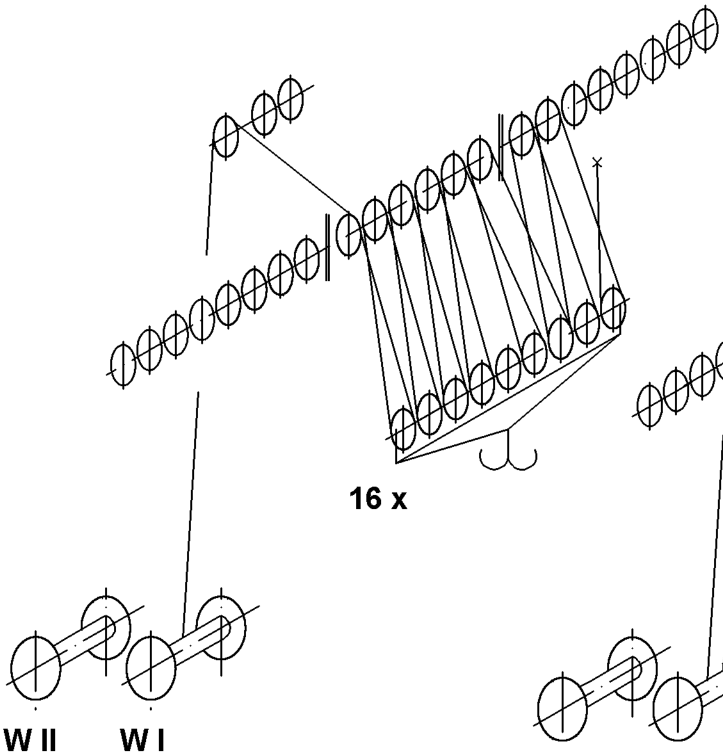


14 x

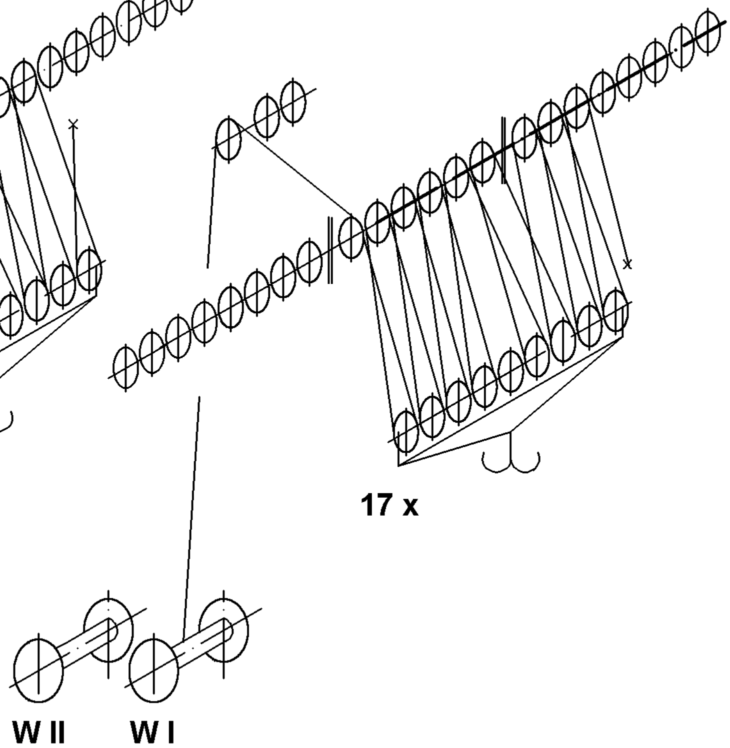


15 x

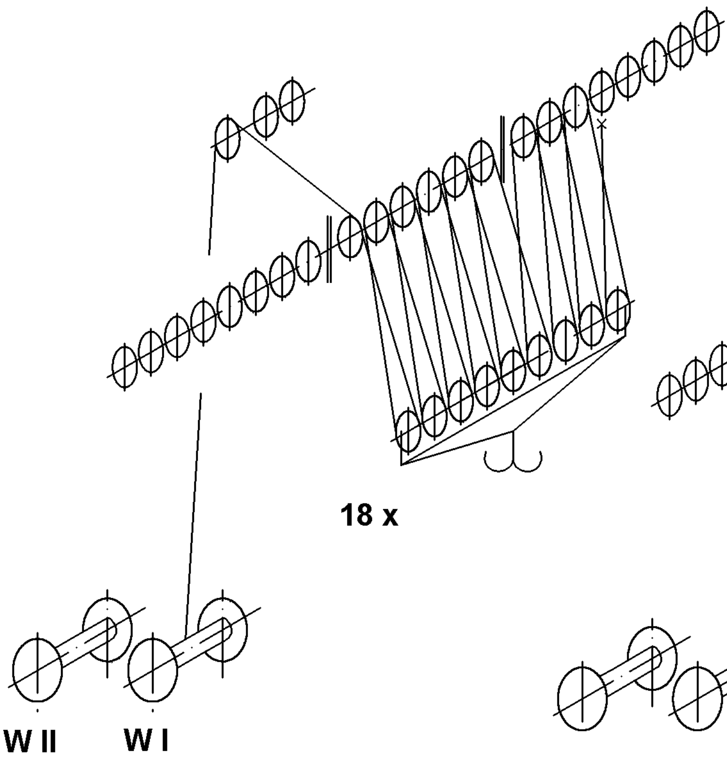
190596



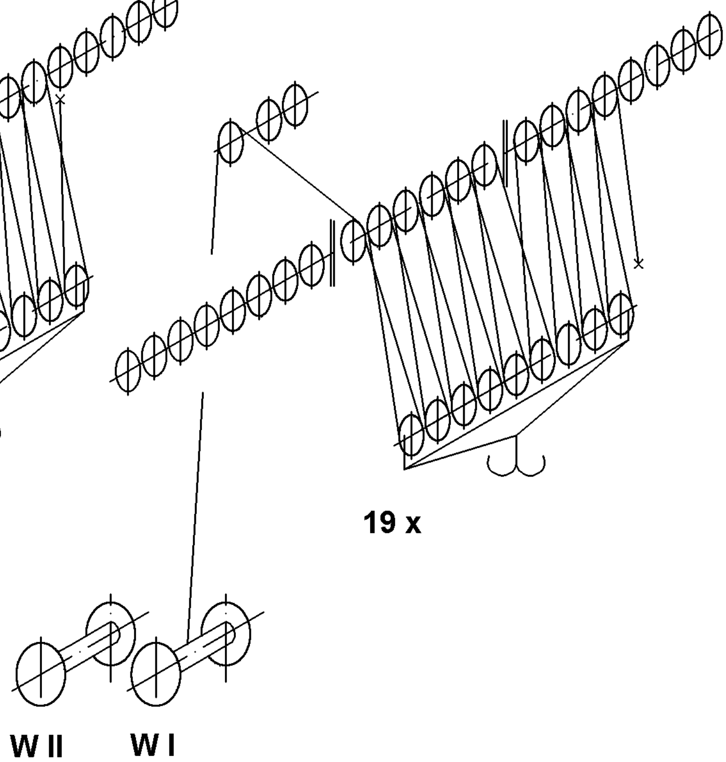
16 x



17 x



18 x



19 x

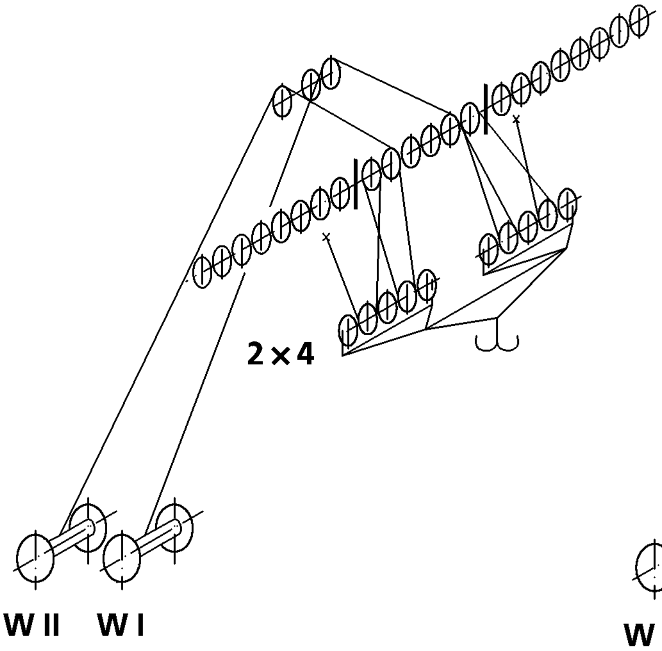
190597

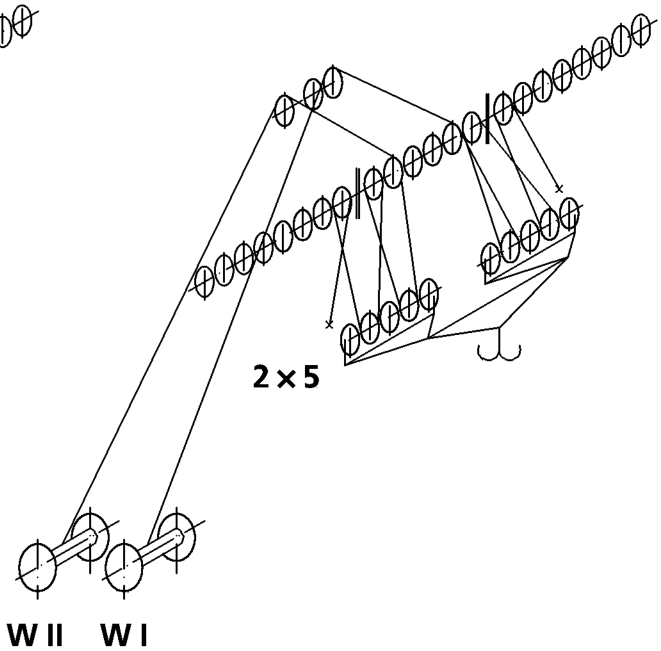
Reeving plans

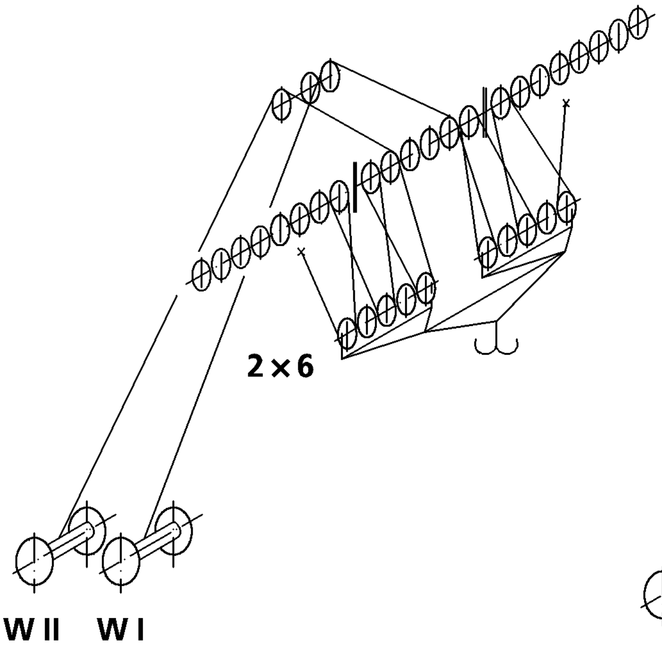
250 t / 400 t - Head section,

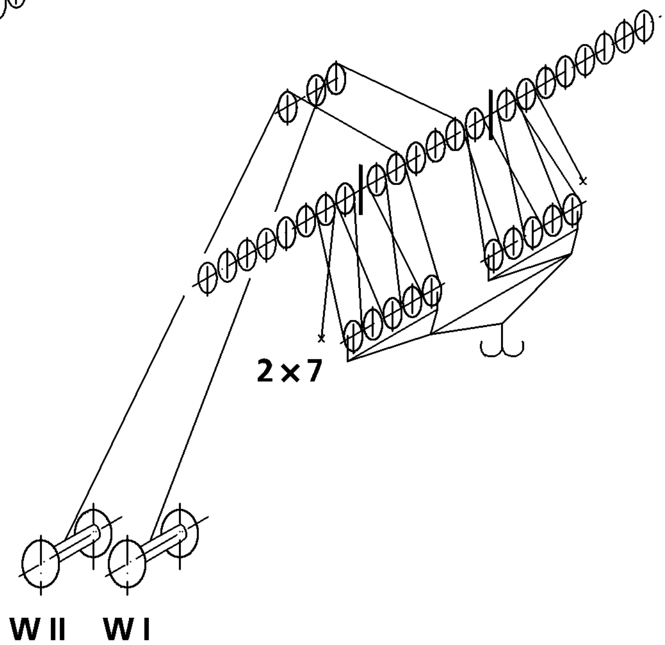
250 t - head section - 14 pulley
400 t - head section - 22 pulley

2×5 - pulley hook block (250 t hook block)

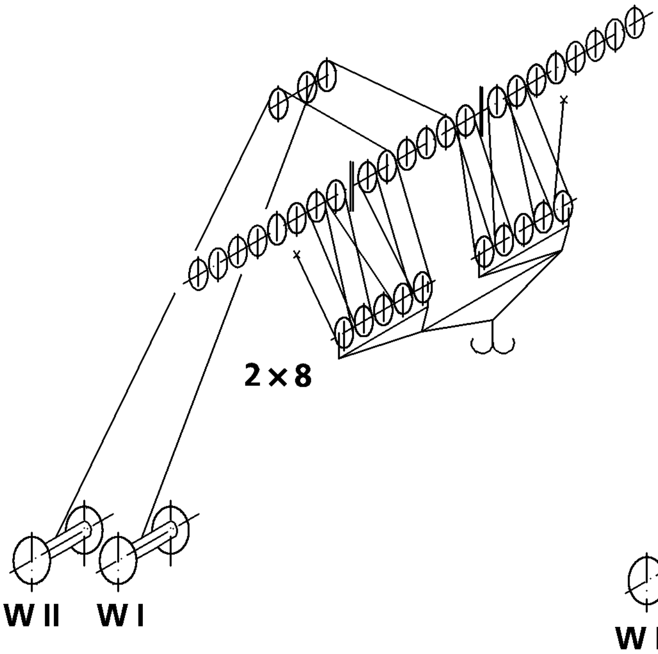


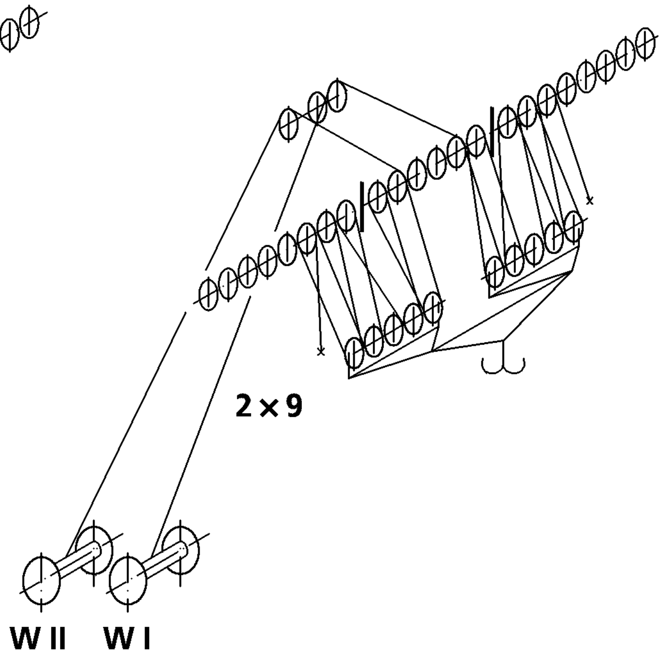


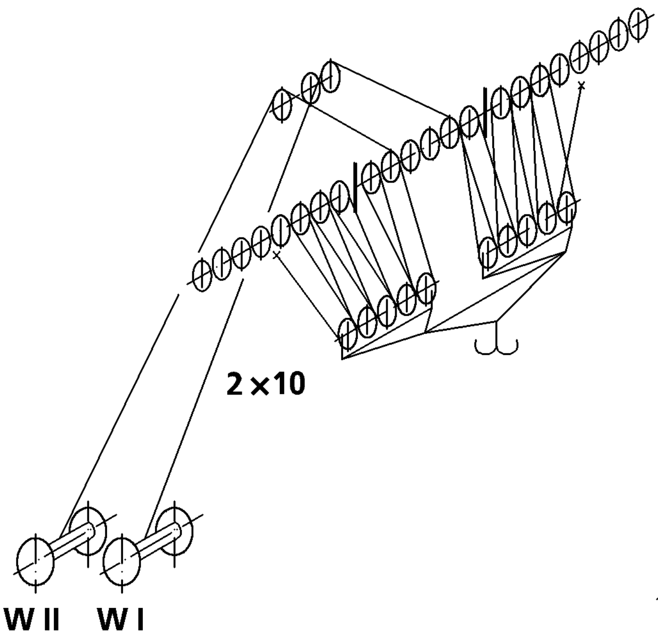


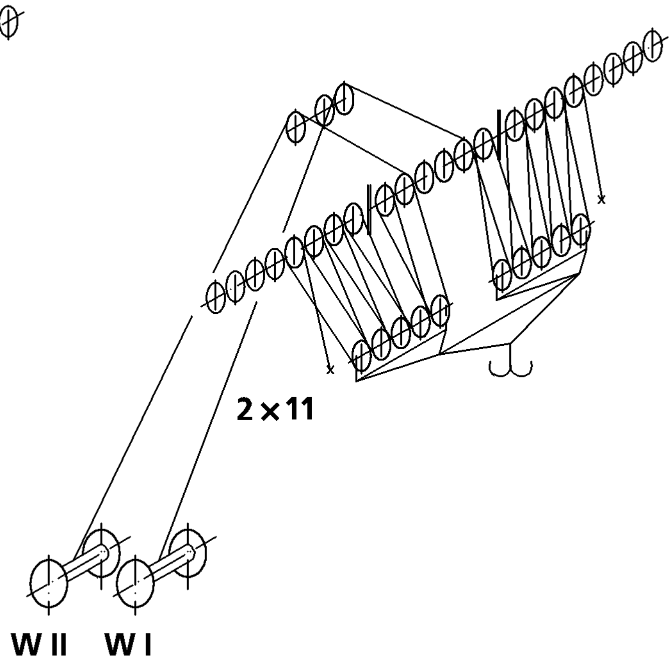


187002









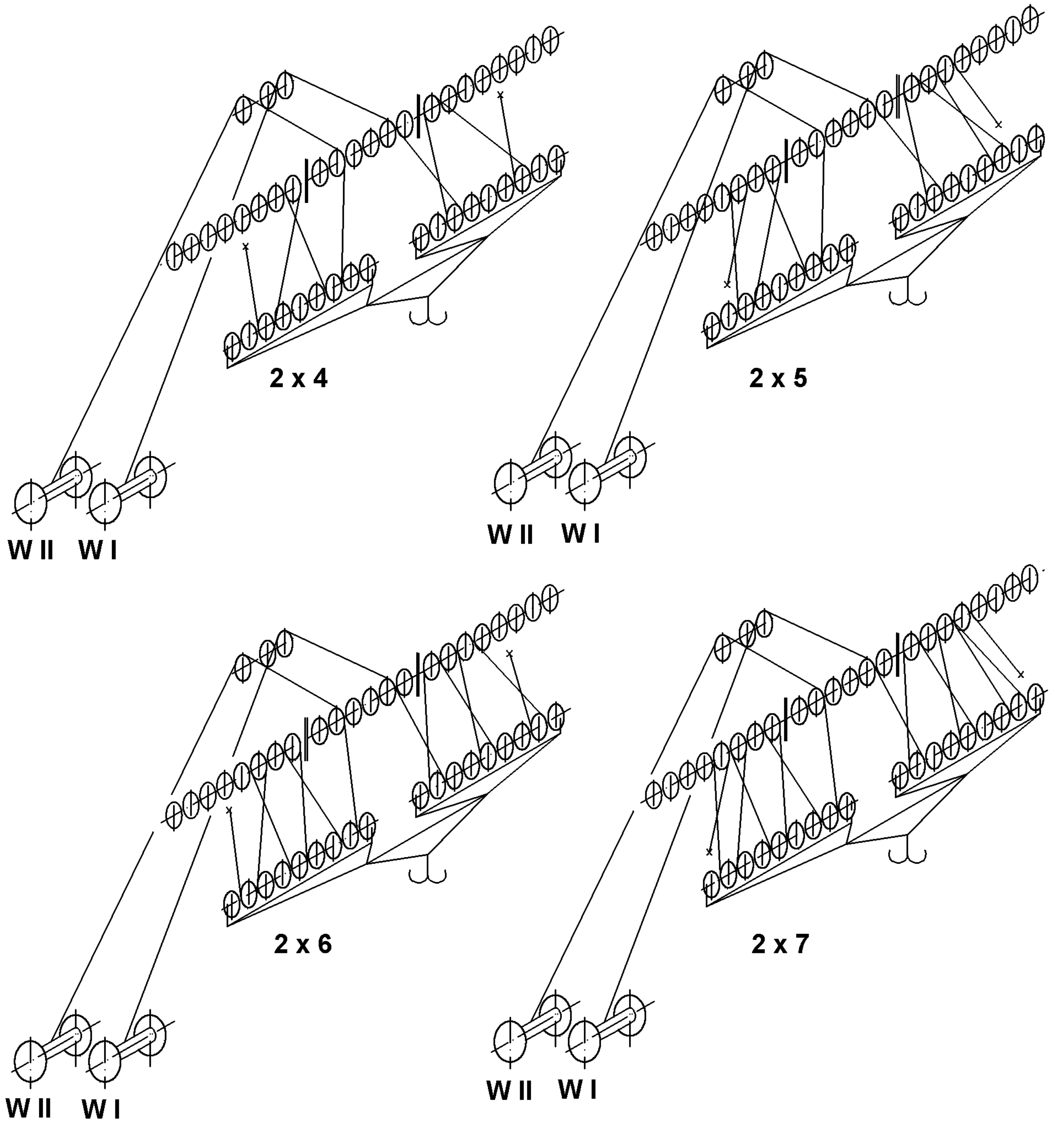
187003

Reeving plans

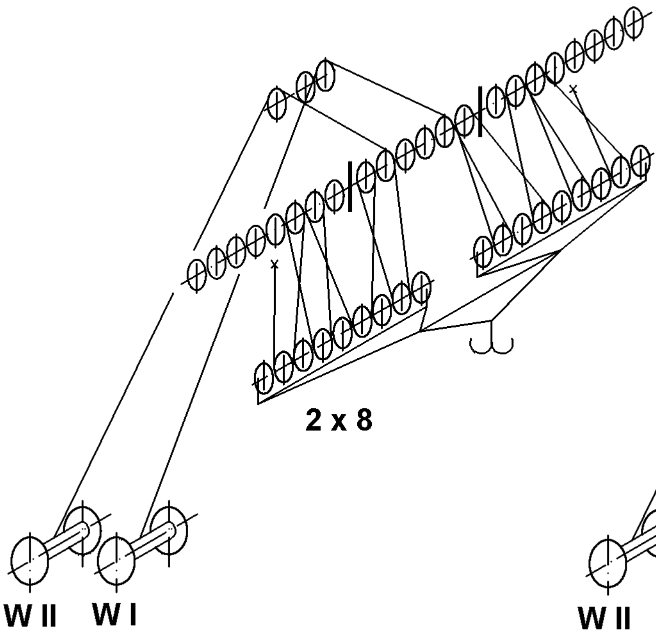
250 t / 400 t - Head section,

250 t - head section - 14 pulley
400 t - head section - 22 pulley

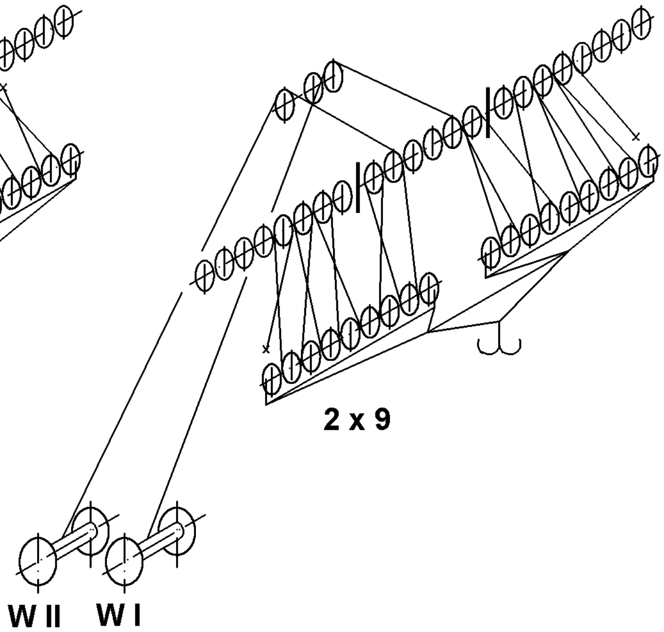
2×9 - pulley hook block (250 t hook block)



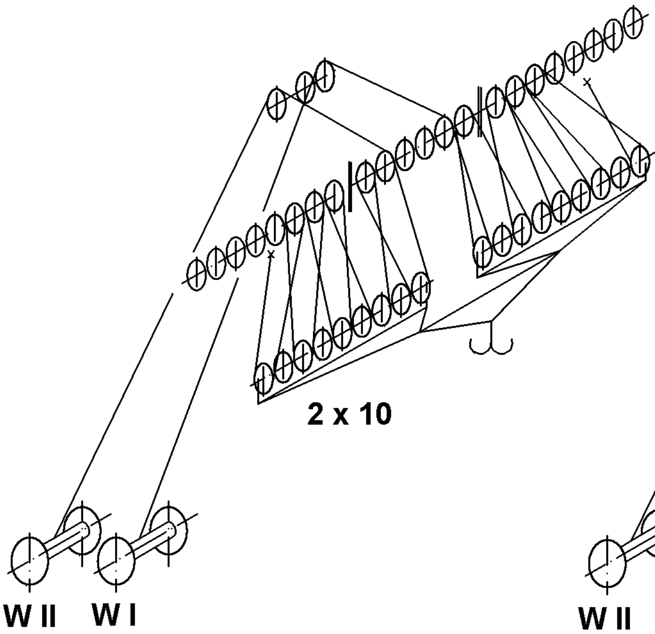
189335



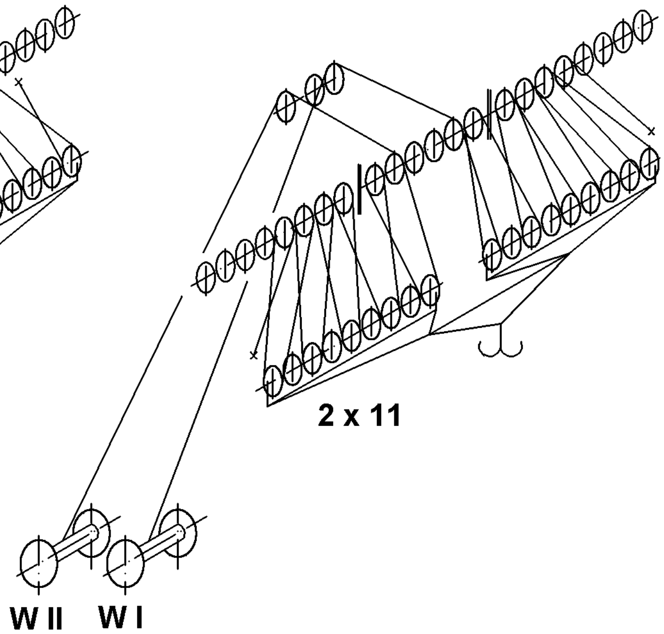
2 x 8



2 x 9

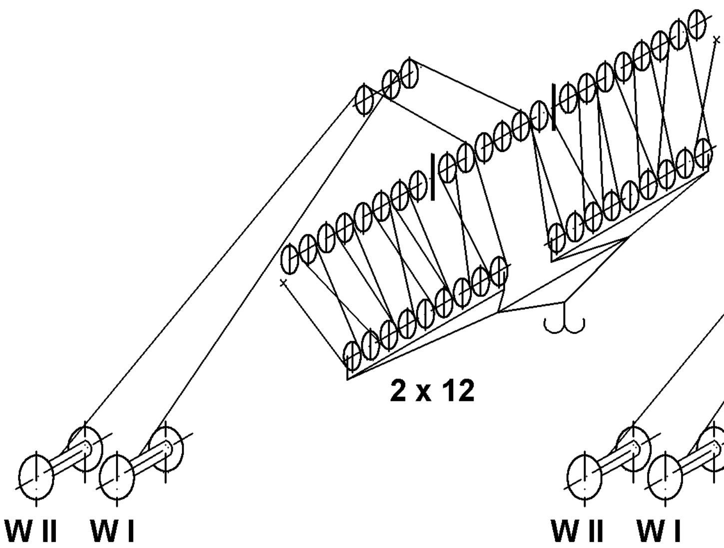


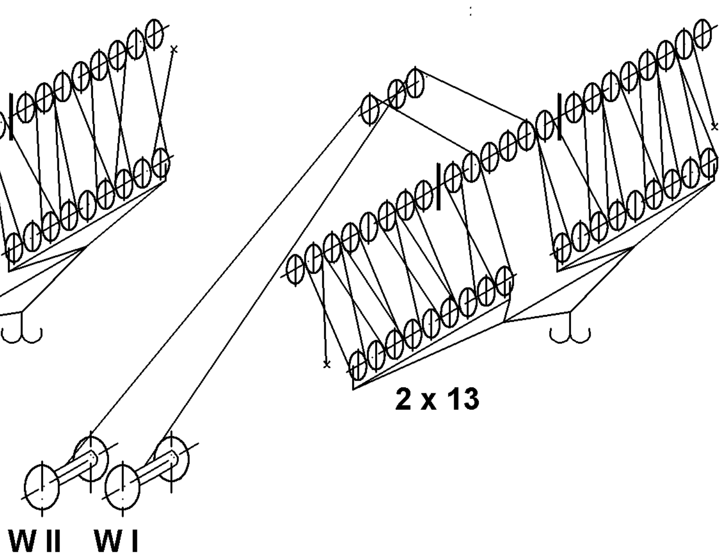
2 x 10

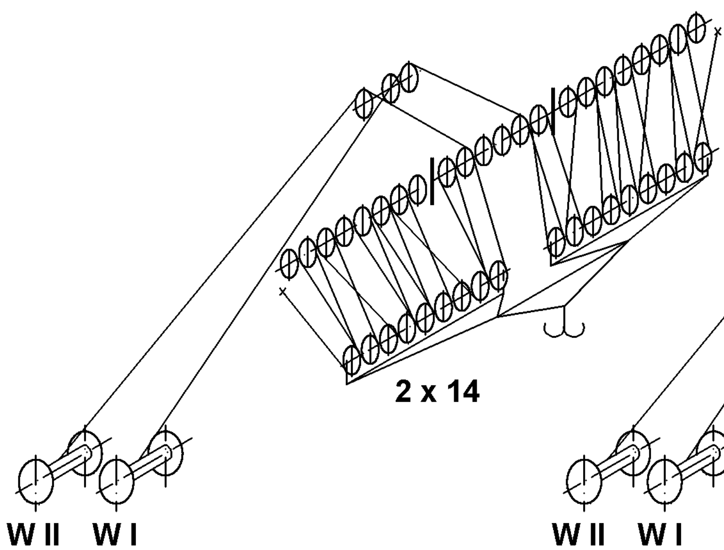


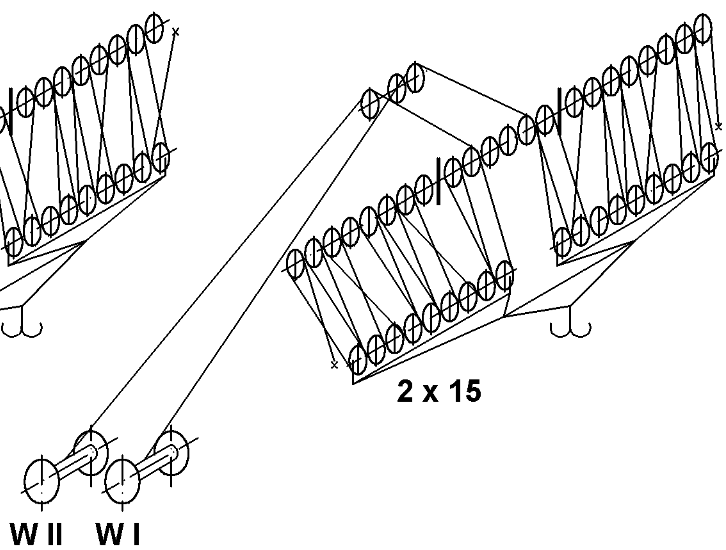
2 x 11

189336

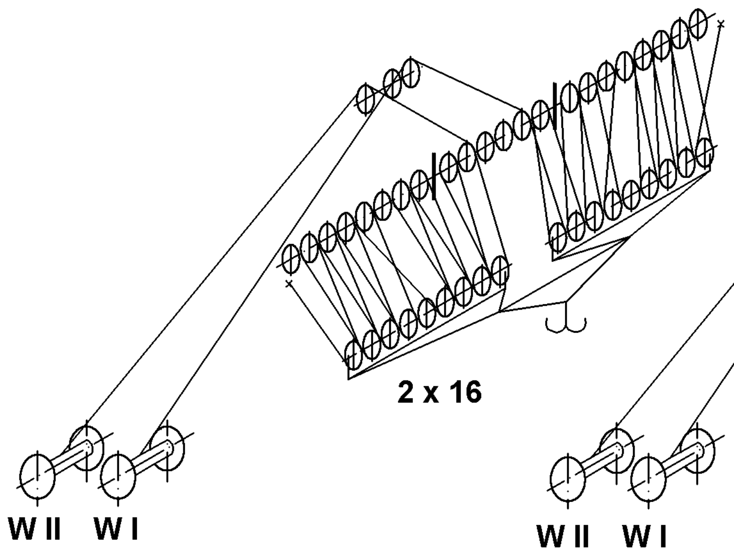




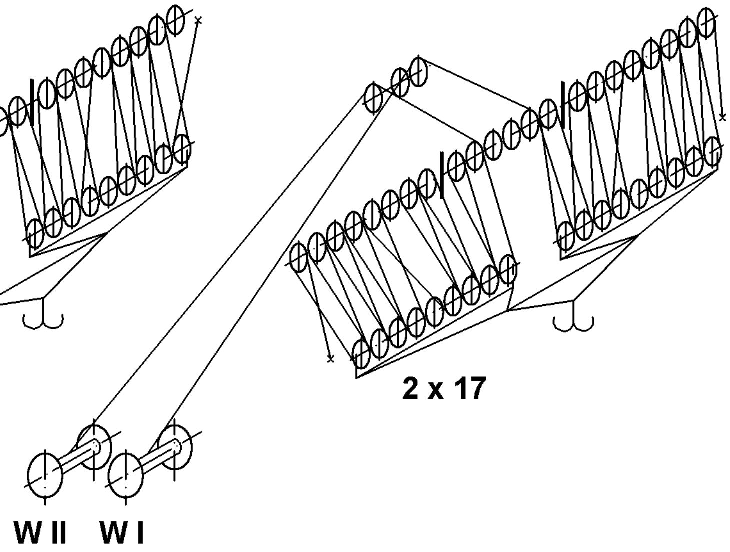




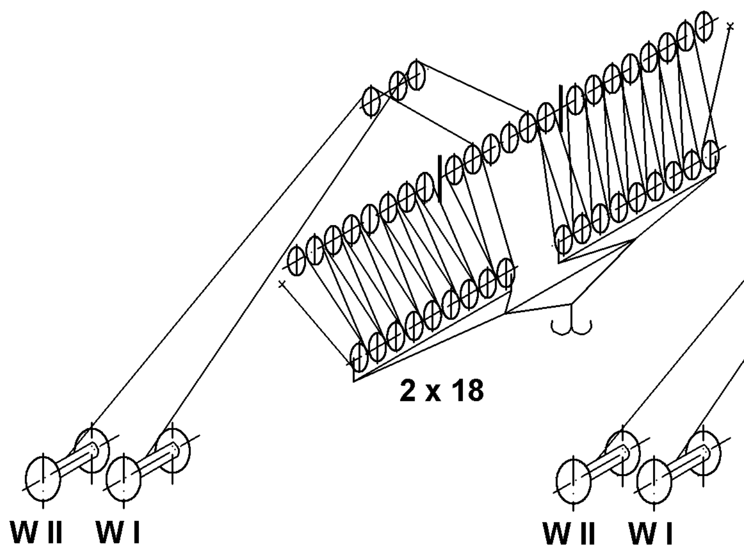
189337



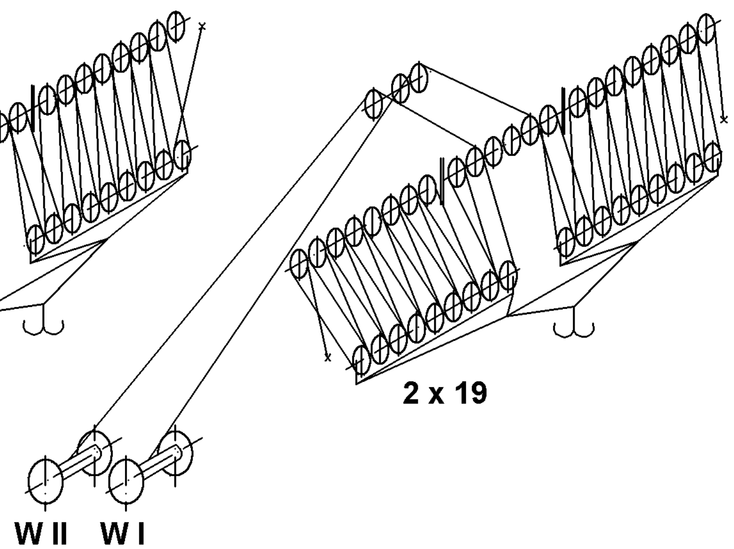
2 x 16



2 x 17



2 x 18

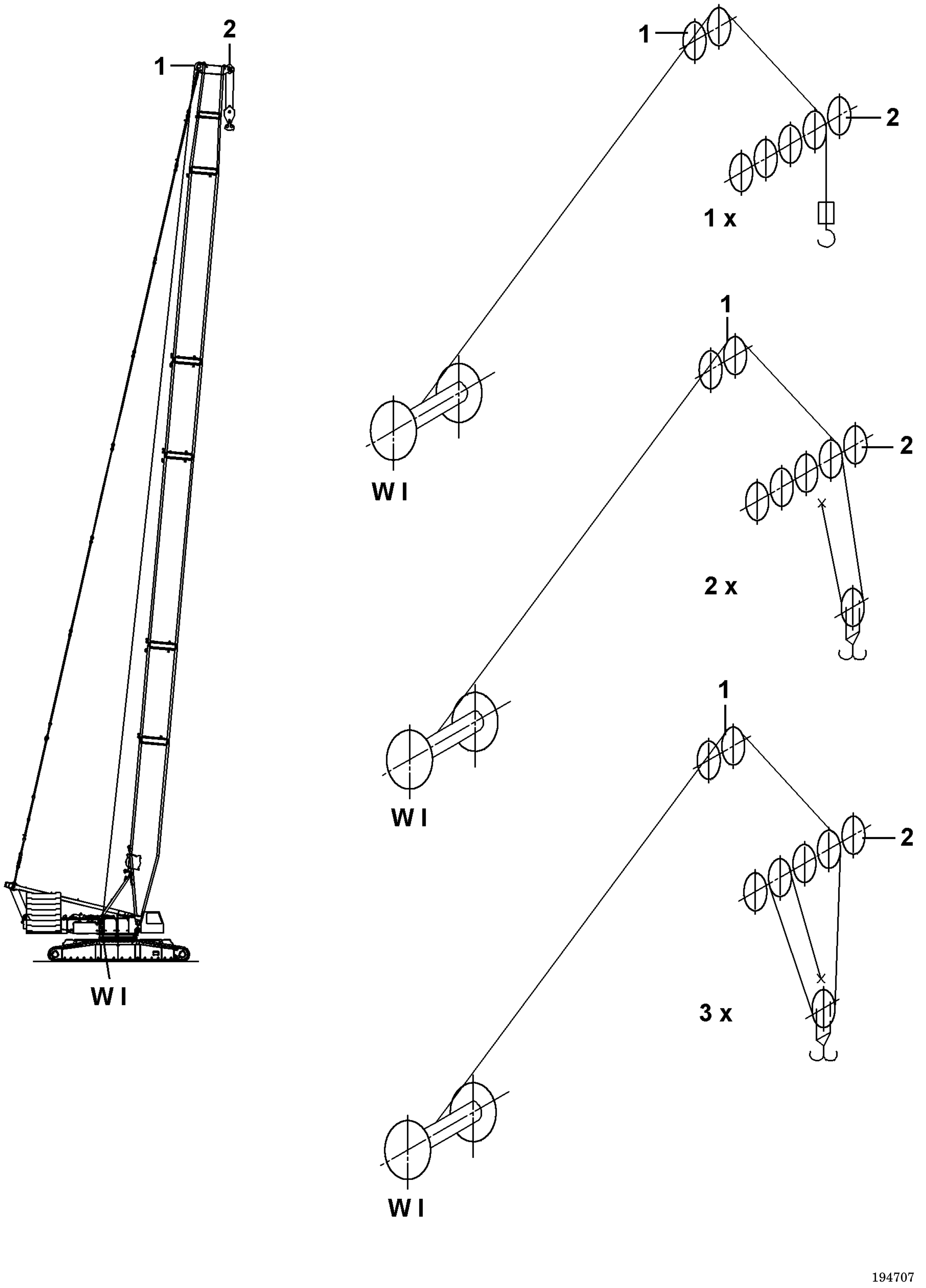


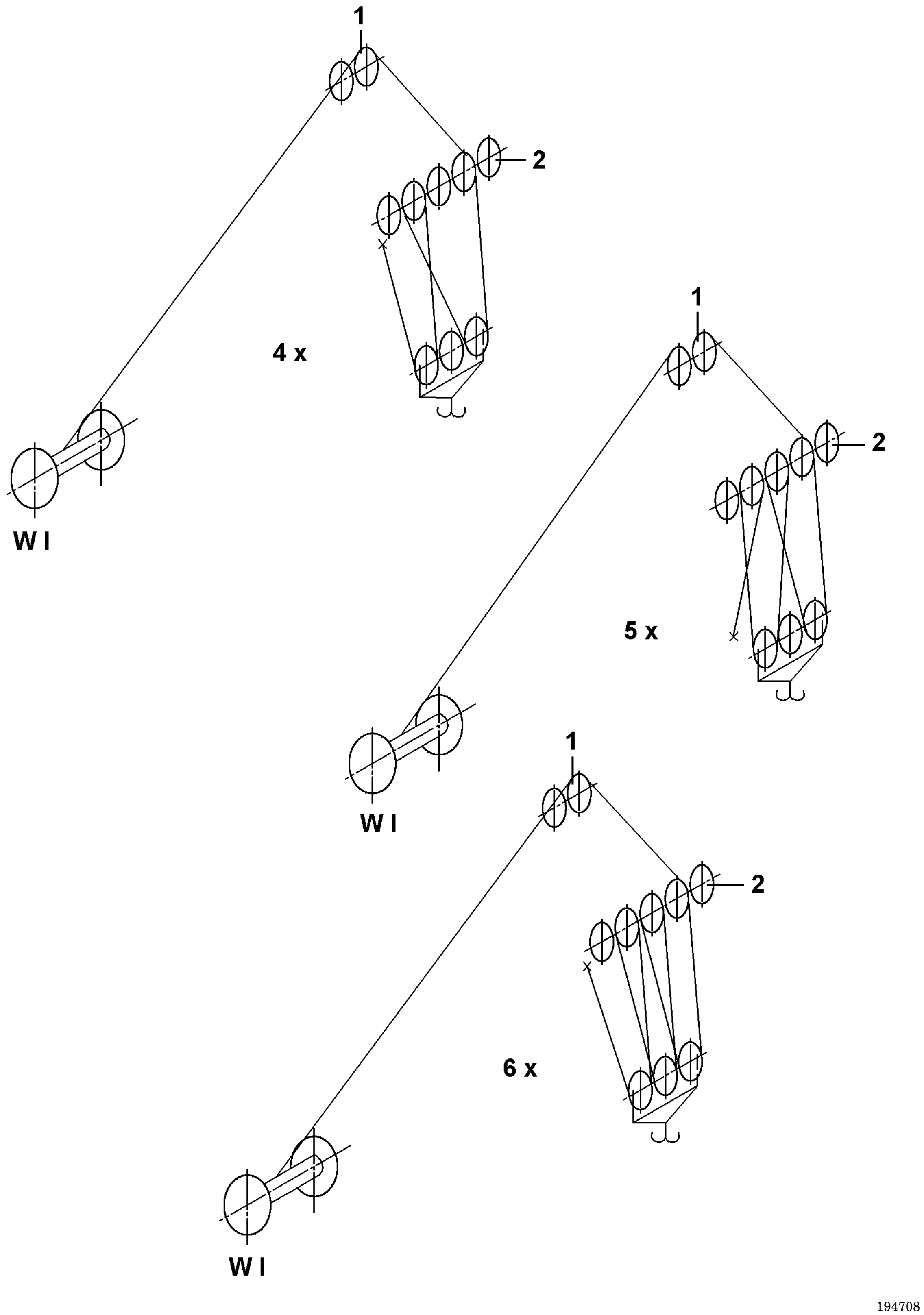
2 x 19

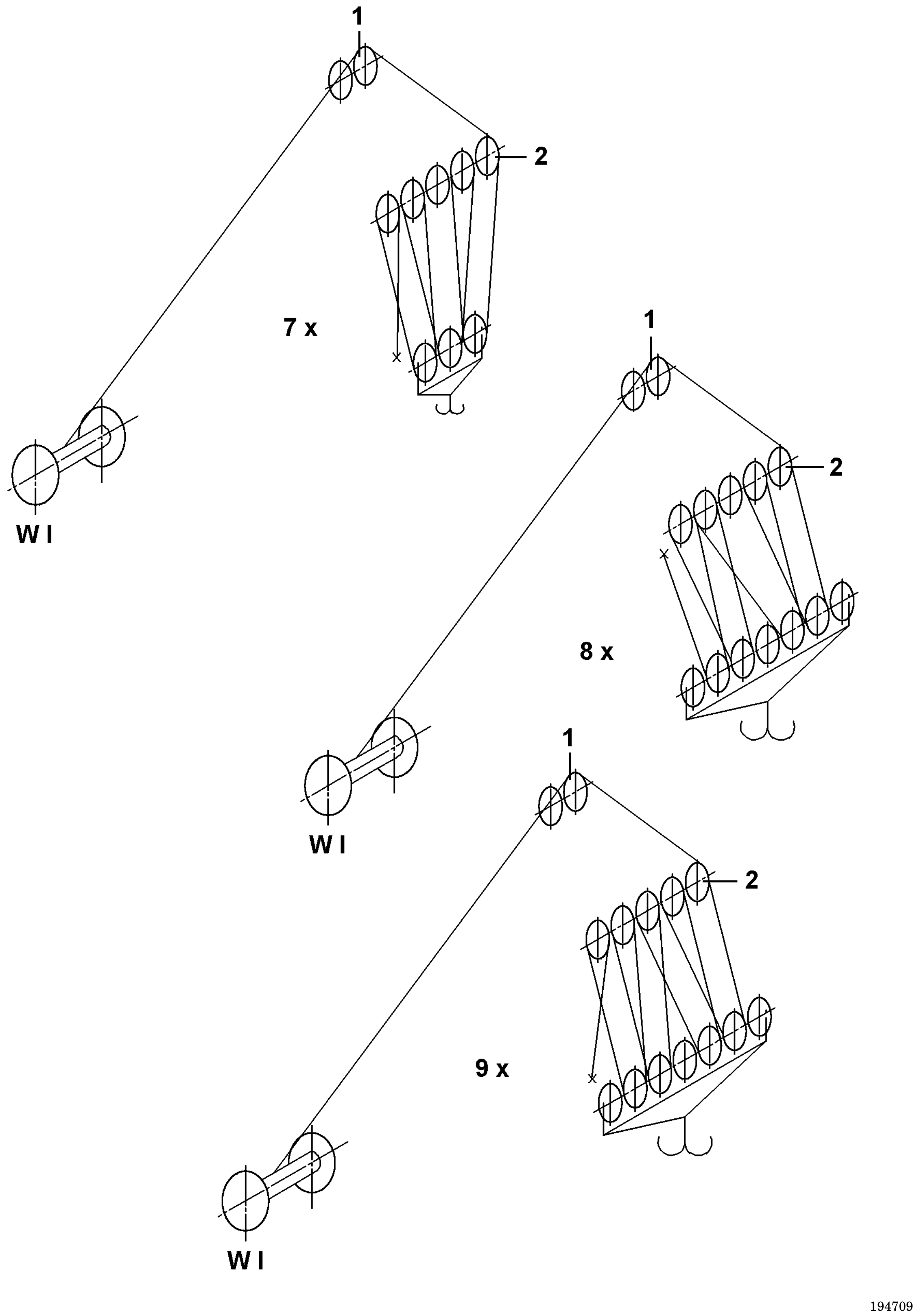
189338

Hoist cable guide and reeving for SL end section 100 t

1 = Back pulley I = Winch I
2 = Cable pulley for 100 t end section




1
2
4 x
W I
1
2
5 x
W I
1
2
6 x
W I
194708


1
2
7 x
W I
1
2
8 x
W I
1
2
9 x
W I
194709

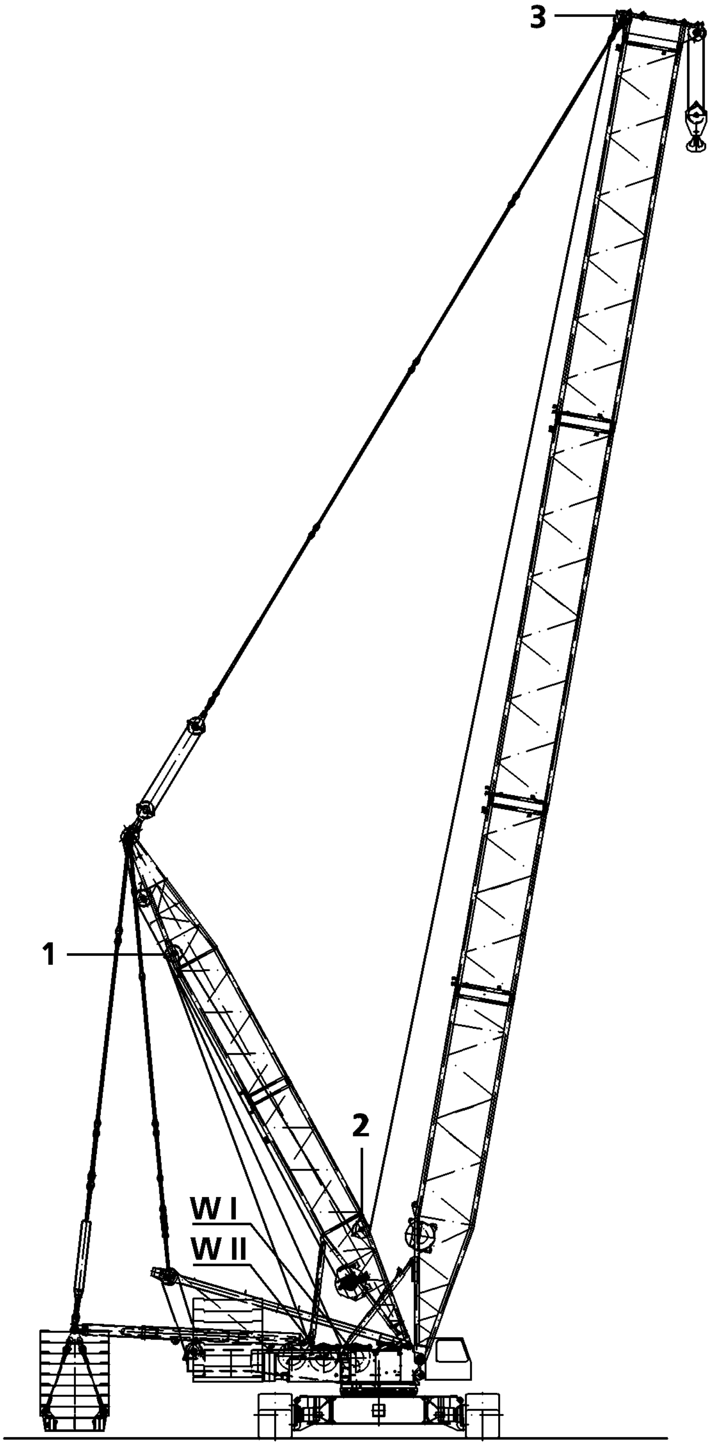
Hoisting rope guidedance for Derrick

1 = Pulley D- head

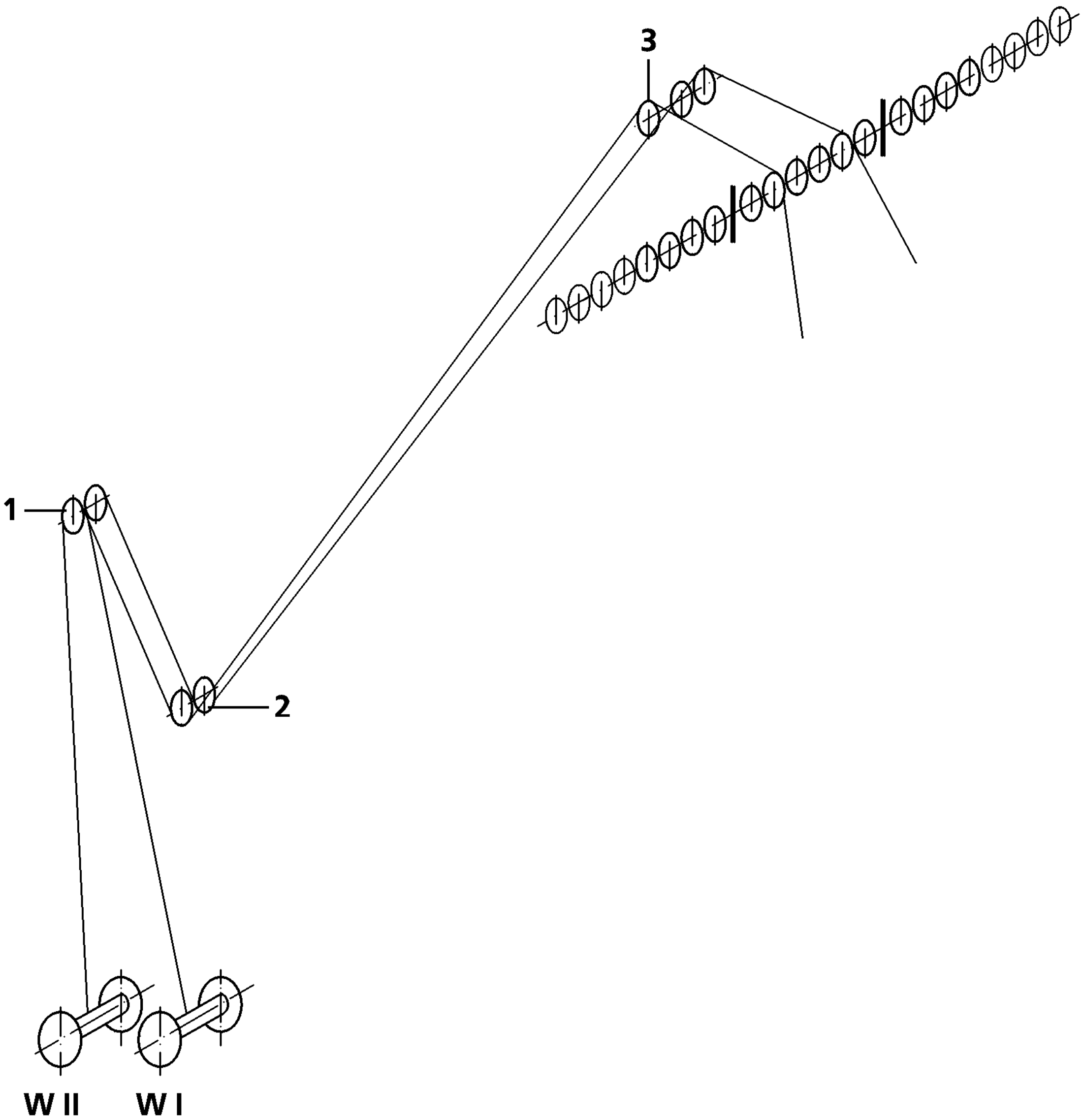
2 = Pulley D- pivot section

I / II = winch I / II

3 = Pulley 250 t / 400 t head



187015



187016

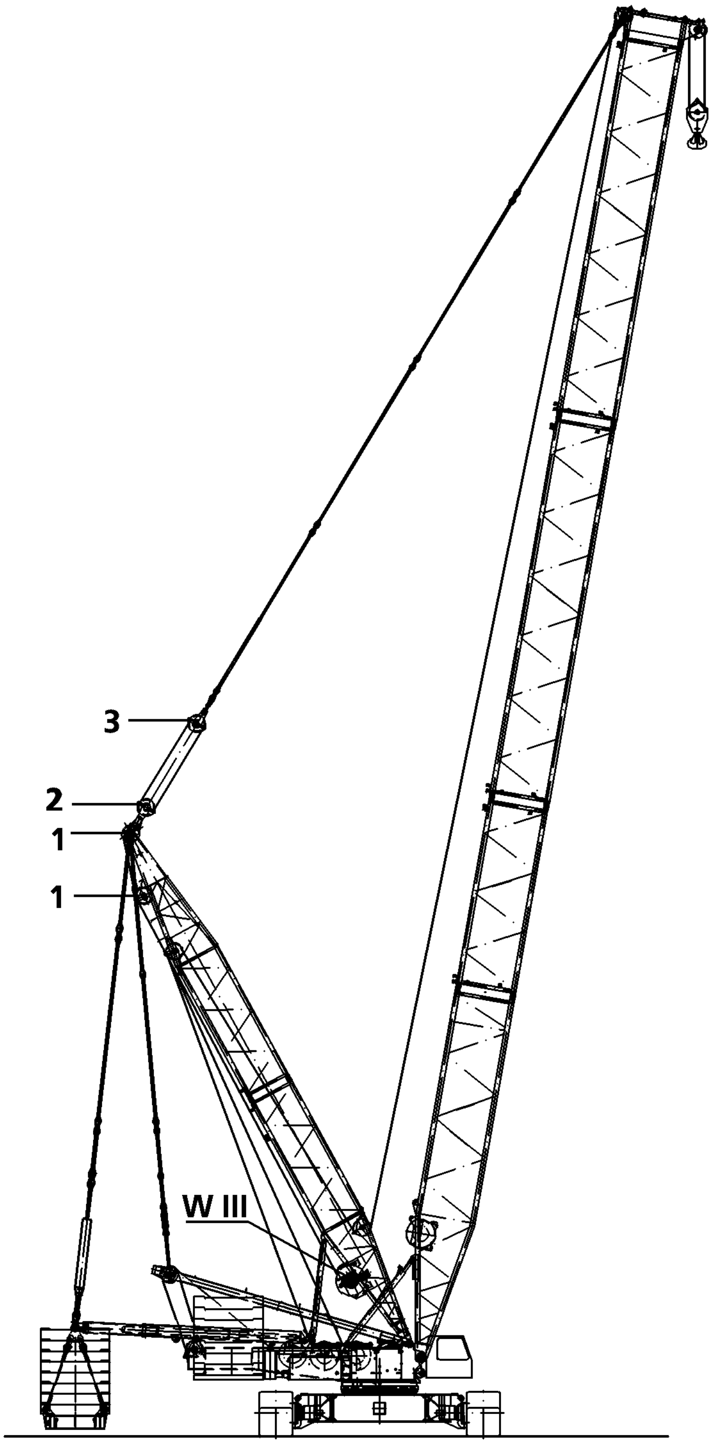
Reeving L / S - adjusting

1 = Pulley D- head

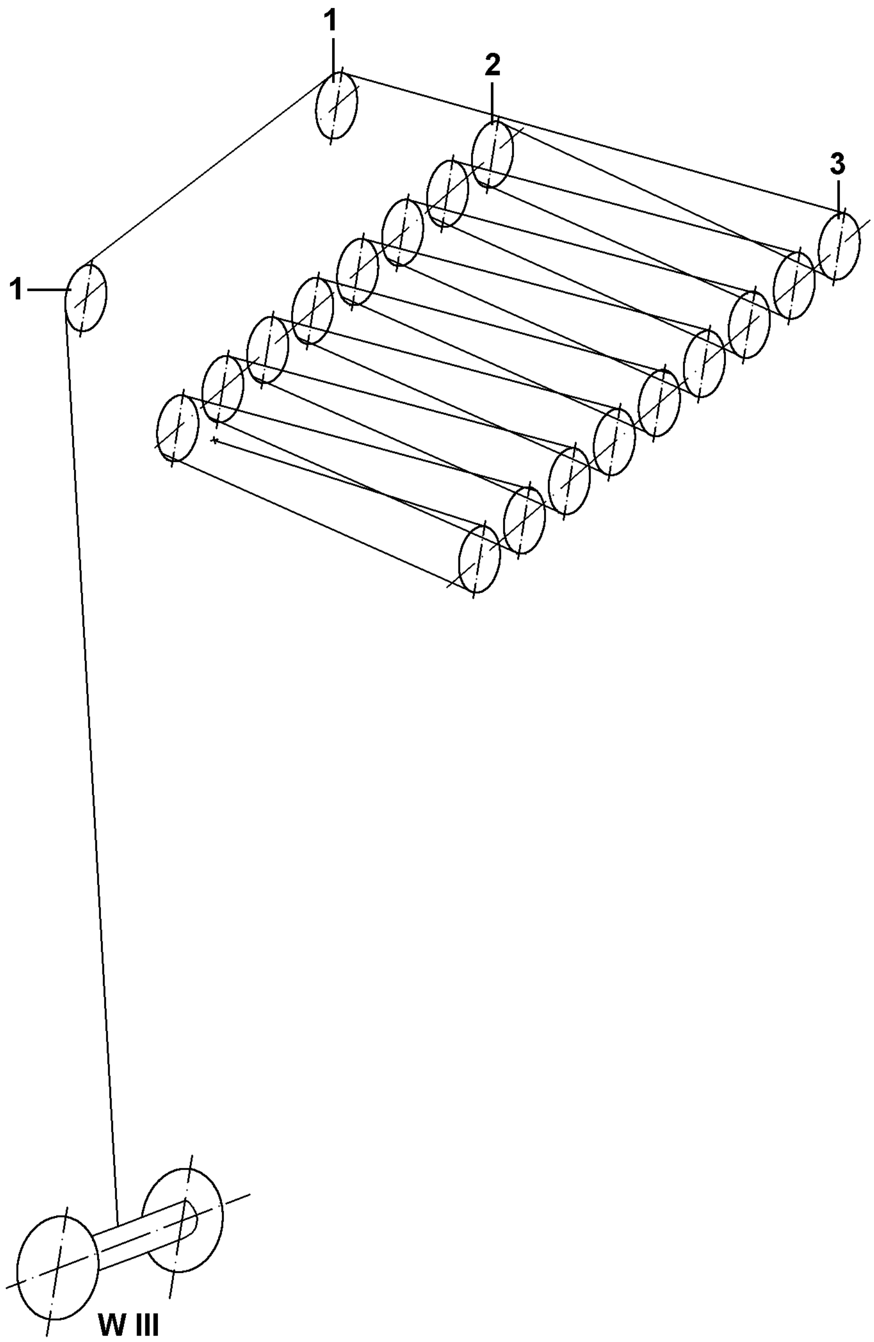
2 = Pulley lower adjusting block

III = winch III

3 = Pulley upper adjusting block



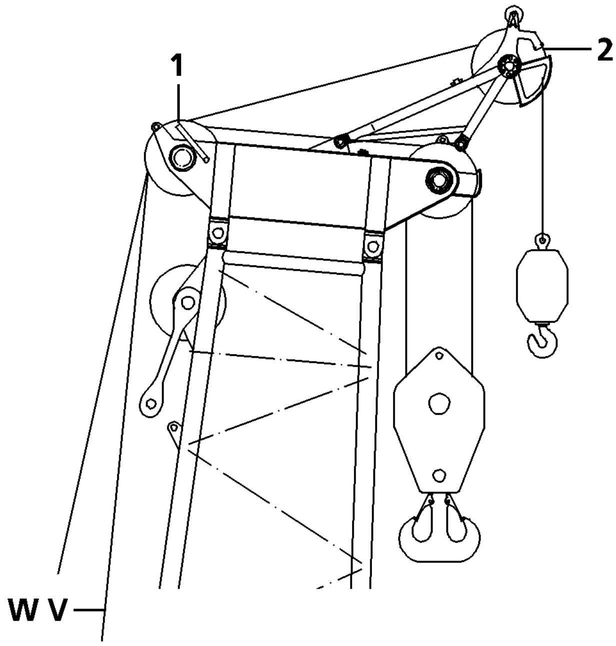
187017

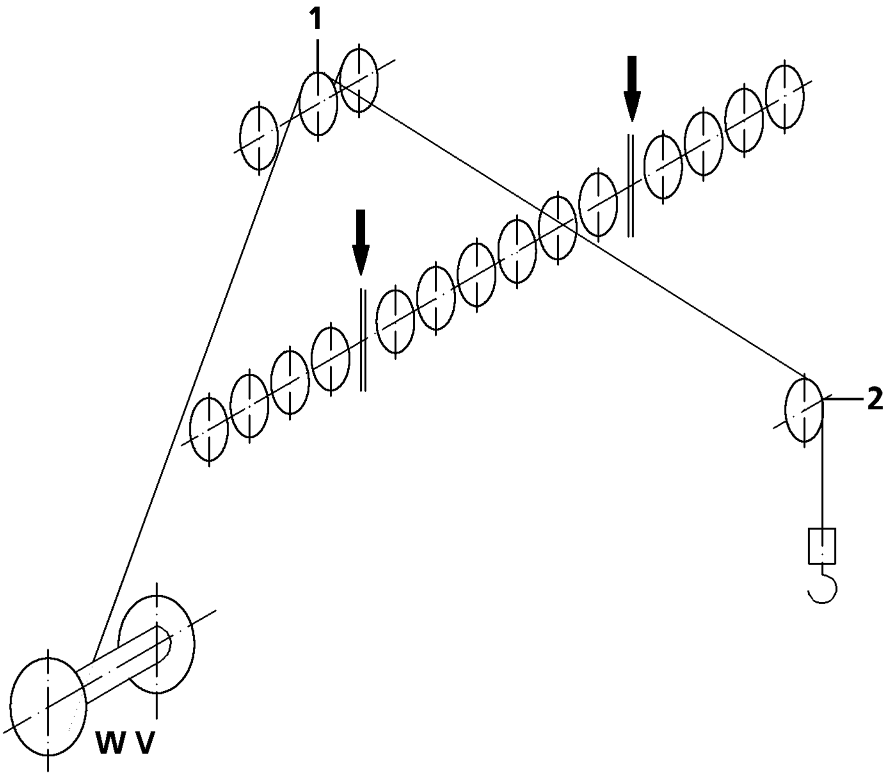


193858

Hoisting rope guidedance for 12 t boom nose at 250 t head section

1 = Pulley head section W V = Winde V
2 = Pulley boom nose



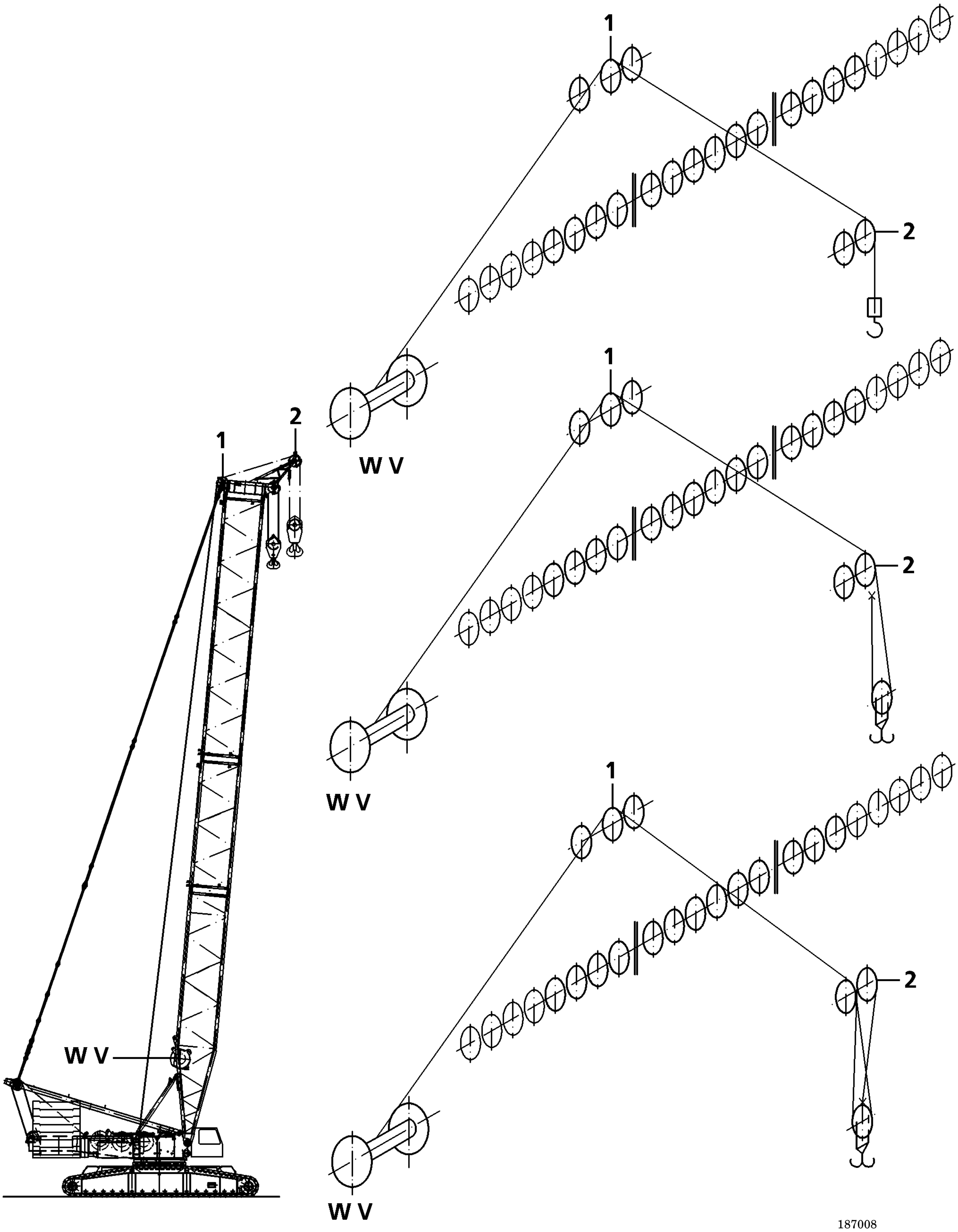


186746

Hoisting rope guidedance for 36 t boom nose at 250 t / 400 t head section

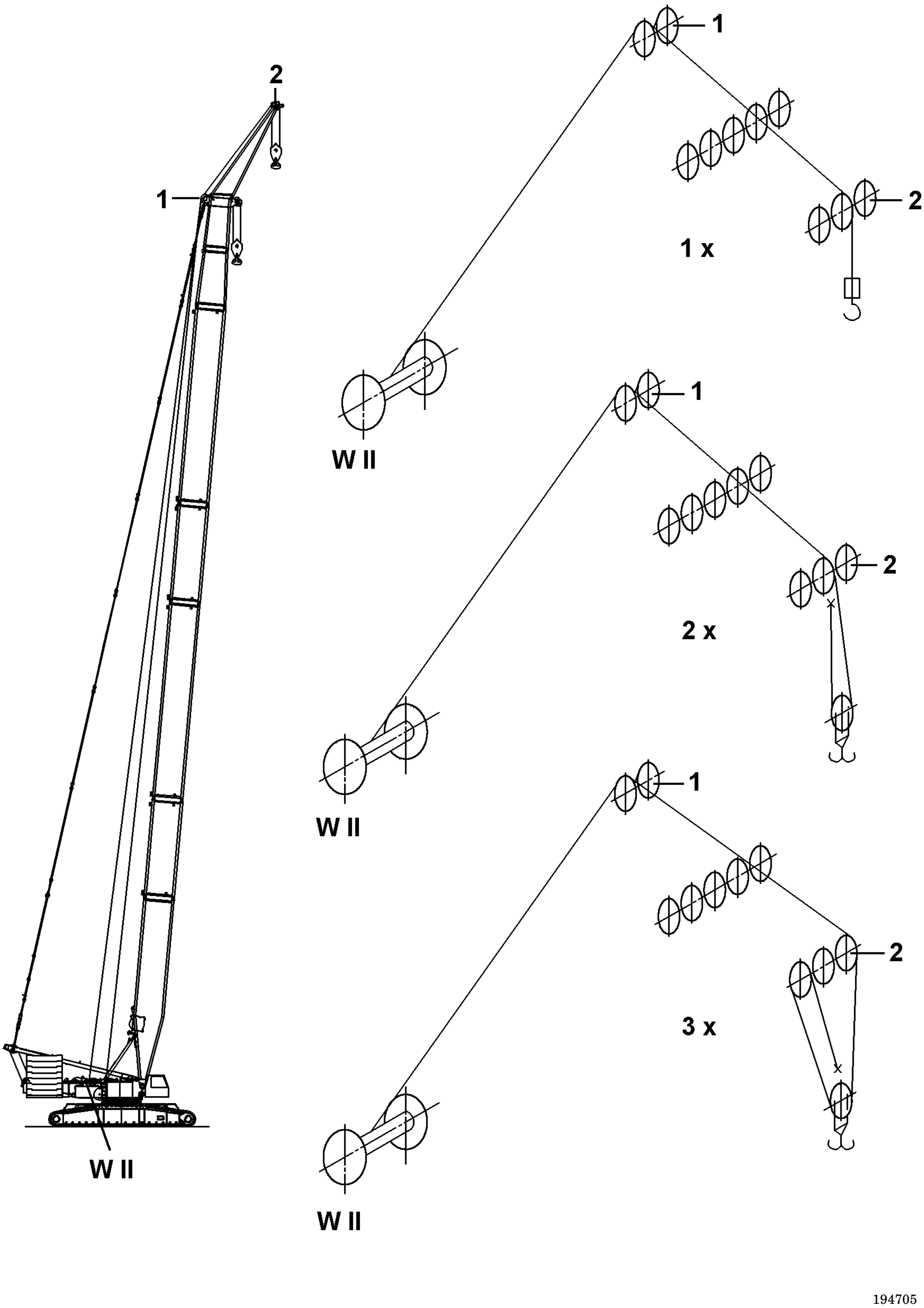
1 = Pulley head section W V = Winde V

2 = Pulley boom nose



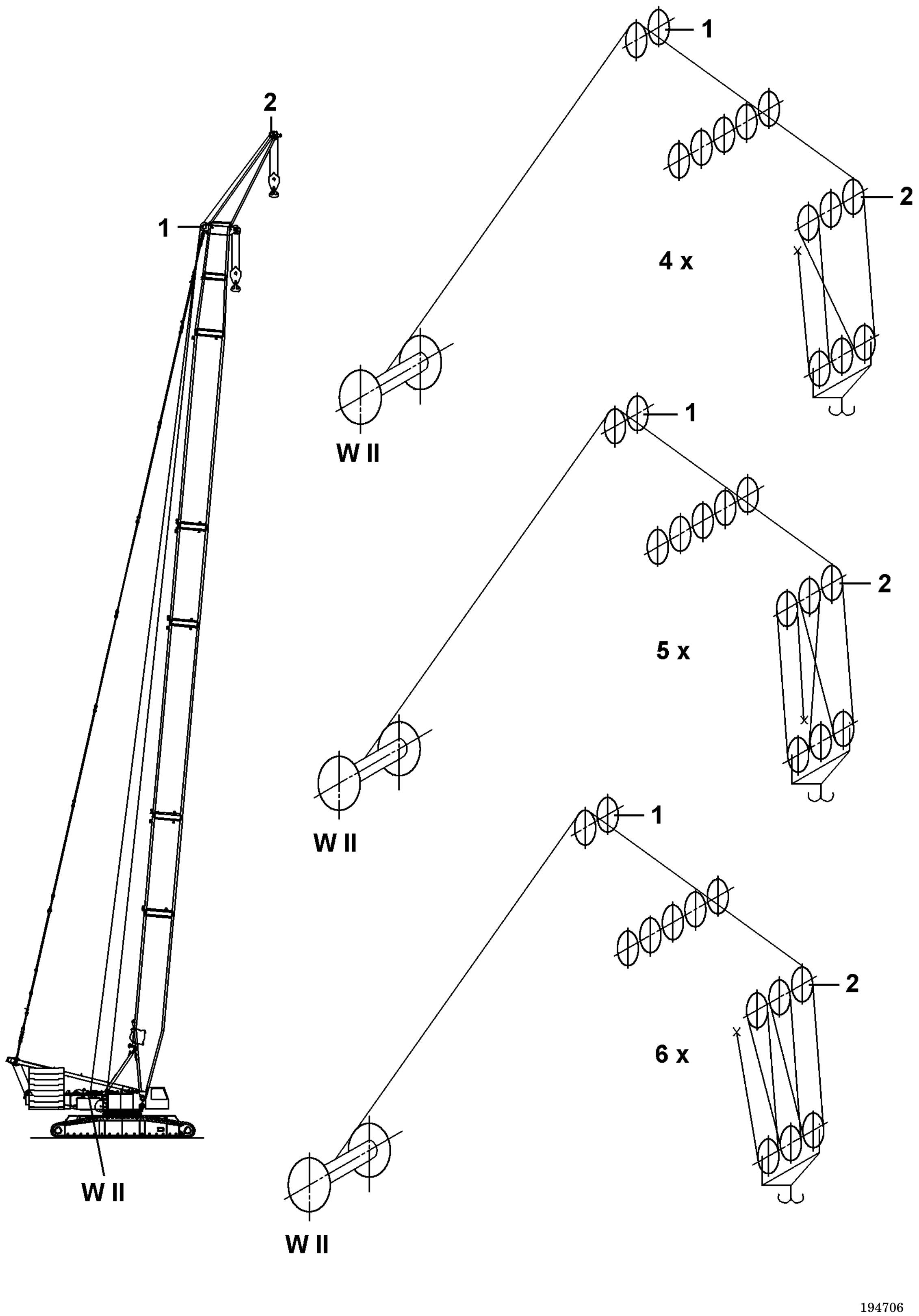
Hoist cable guide and reeving for 72 t boom nose on SL end section

1 = Pulley for end section W II = Winch 2
2 = Pulley boom nose



Hoist cable guide and reeving for 72 t boom nose on SL end section

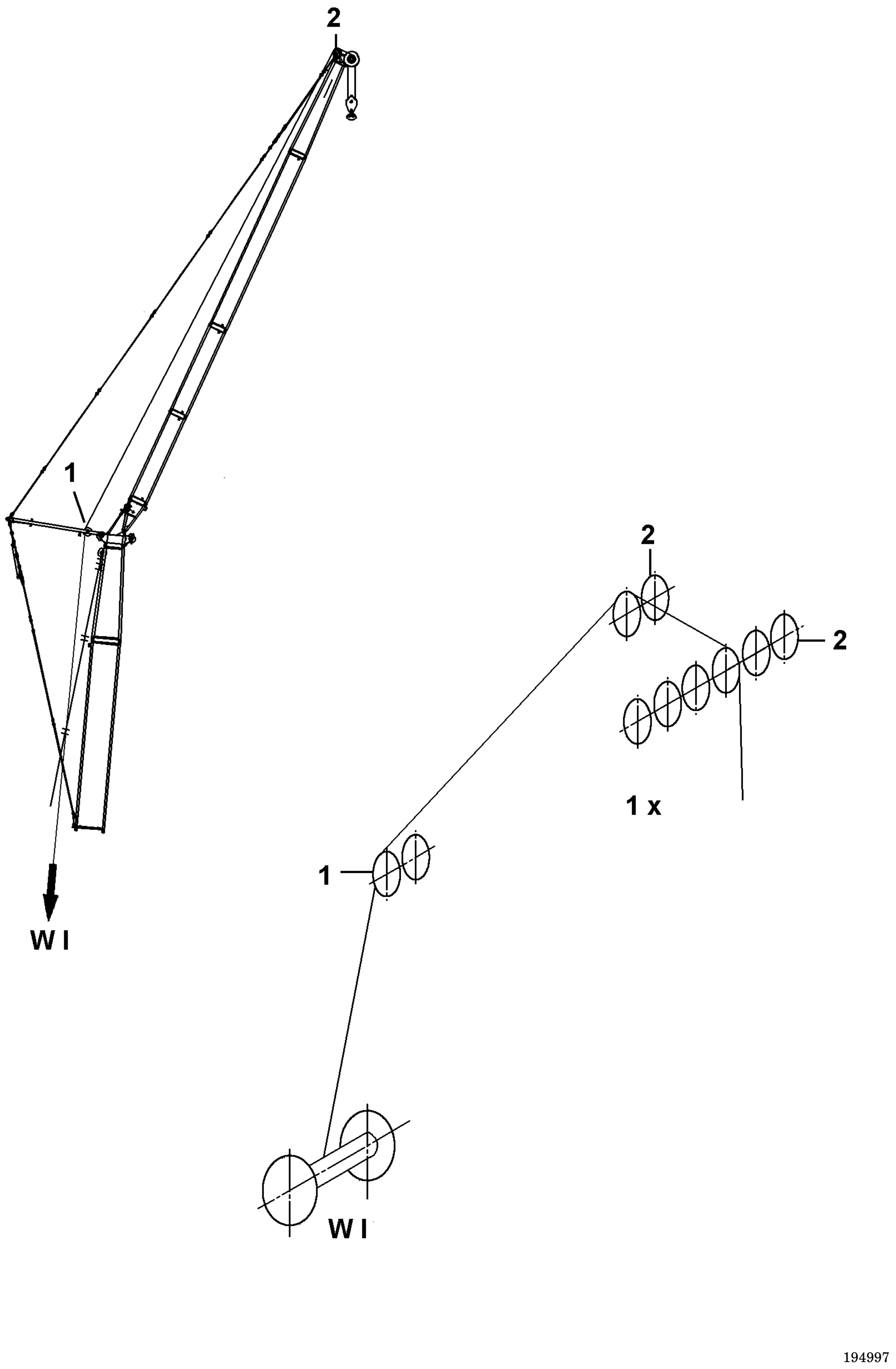
1 = Pulley for end section W II = Winch 2
2 = Pulley boom nose



Hoisting rope guidedance for F - operation

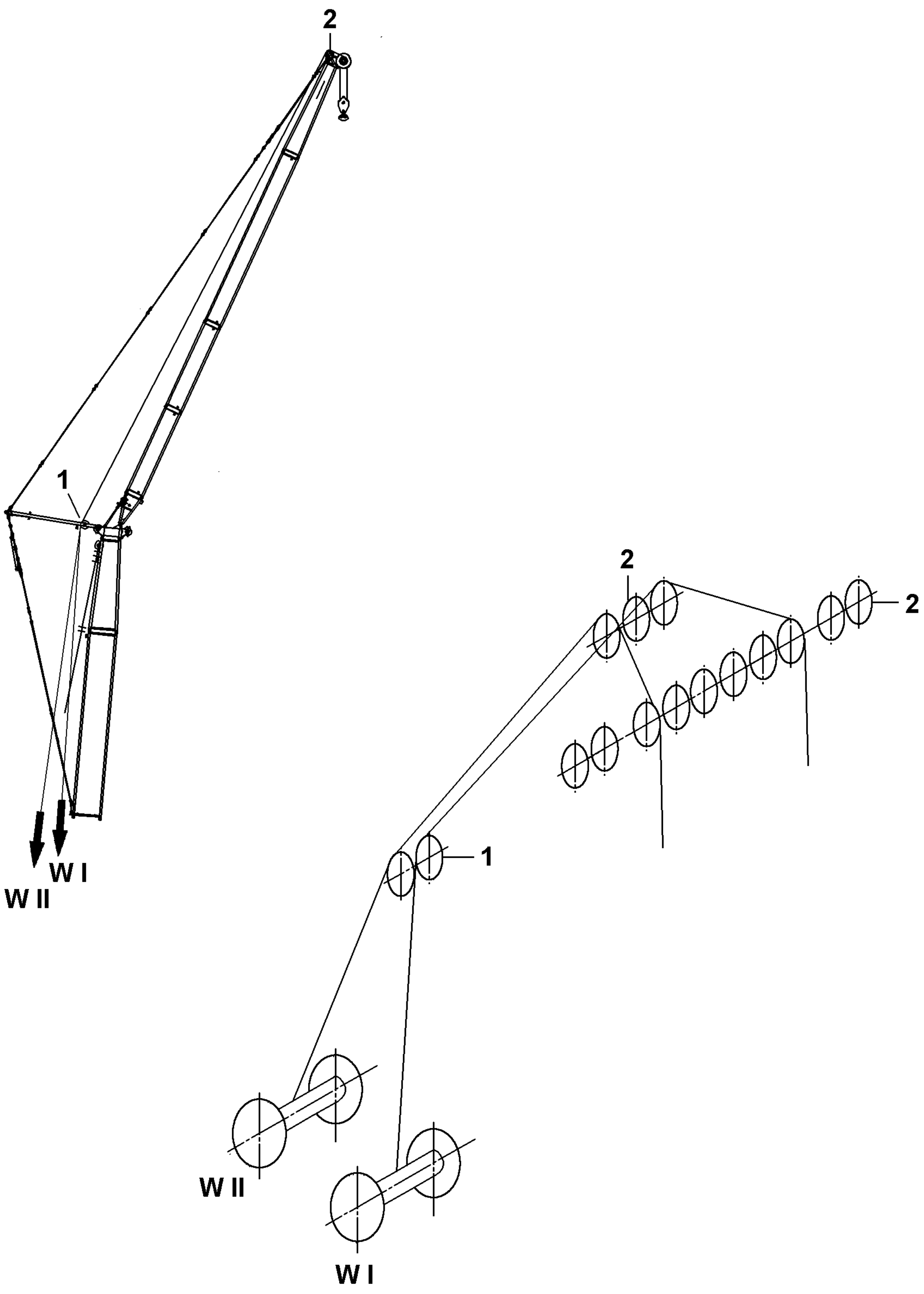
1 = FA - bracket W I = Winch 1

2 = F - head section



Hoisting rope guidedance for F - operation (parallel operation)

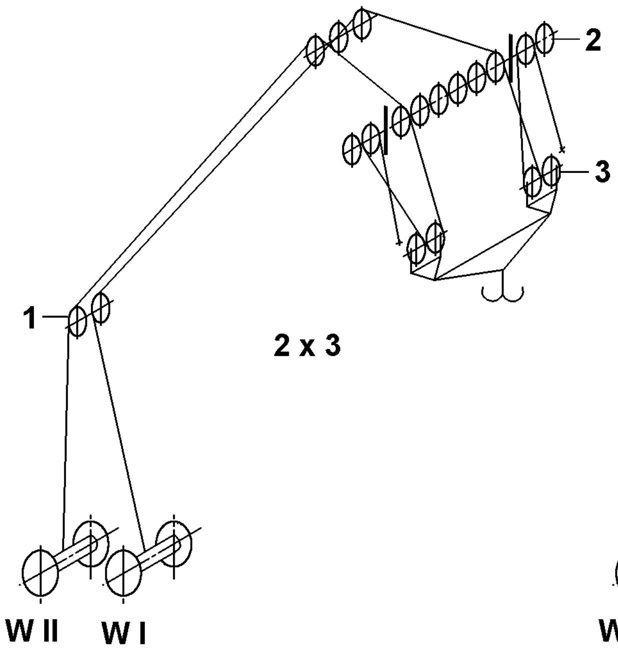
1 = FA - bracket	W I = Winch 1
2 = F - head section	W II = Winch 2

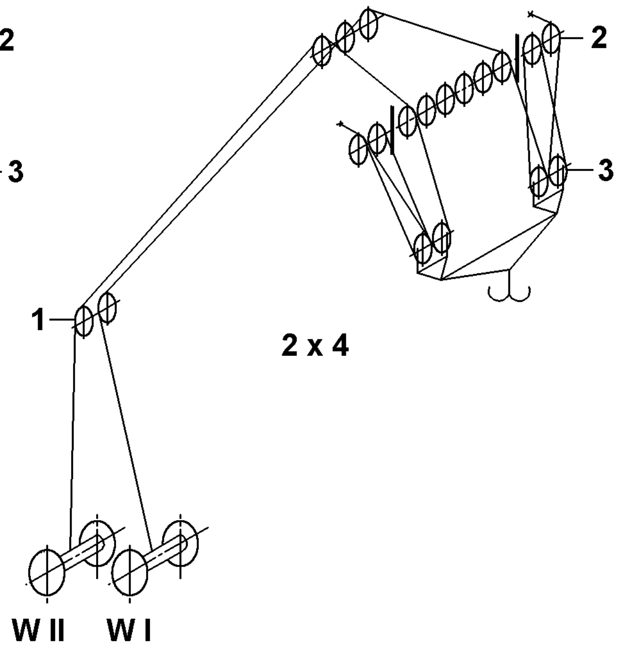


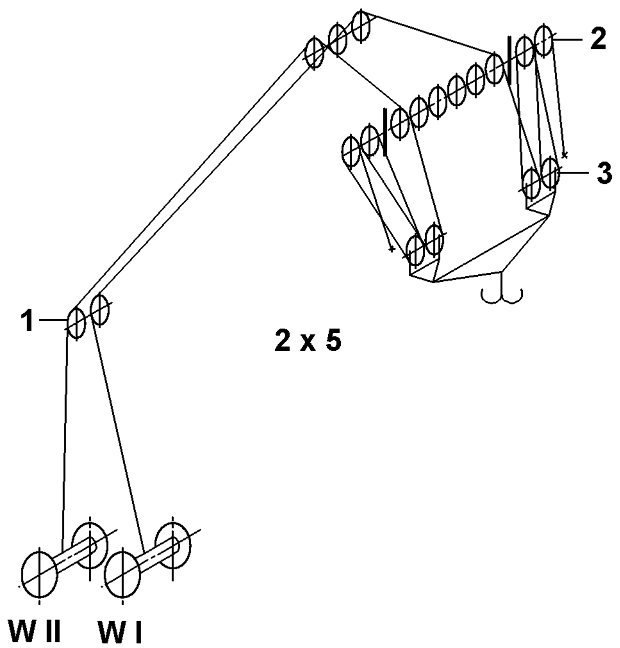
194998

Hoisting rope guidedance and reeving at F - operation

1 = FA - bracket W I = Winch 1
2 = F - head section W II = Winch 2





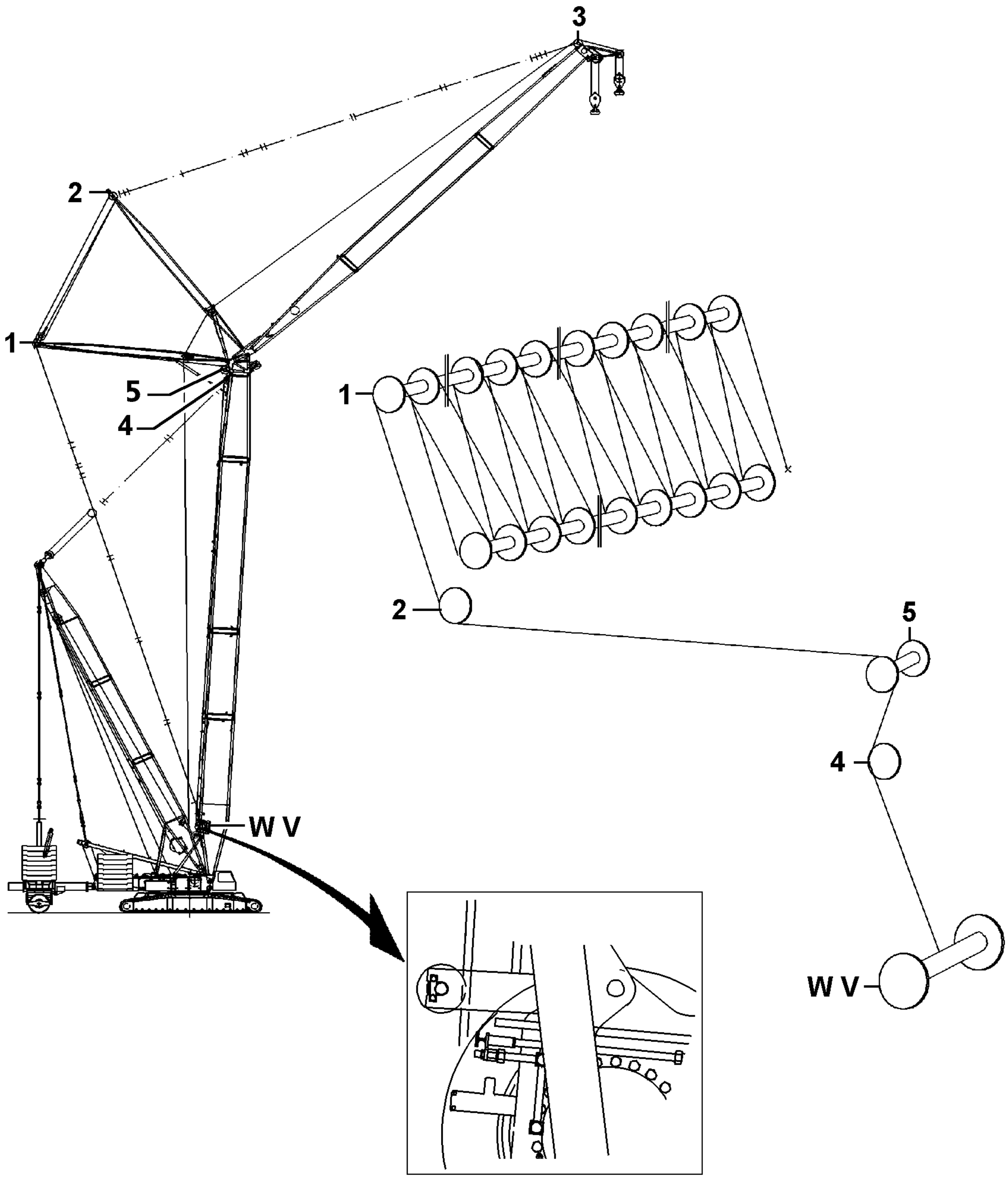


194999

Reeving W - adjusting

1 = WA - bracket II
2 = WA - bracket I
3 = W - W- boom head
4 = S - adapter
5 =S - head 100 t
WV = WinchV

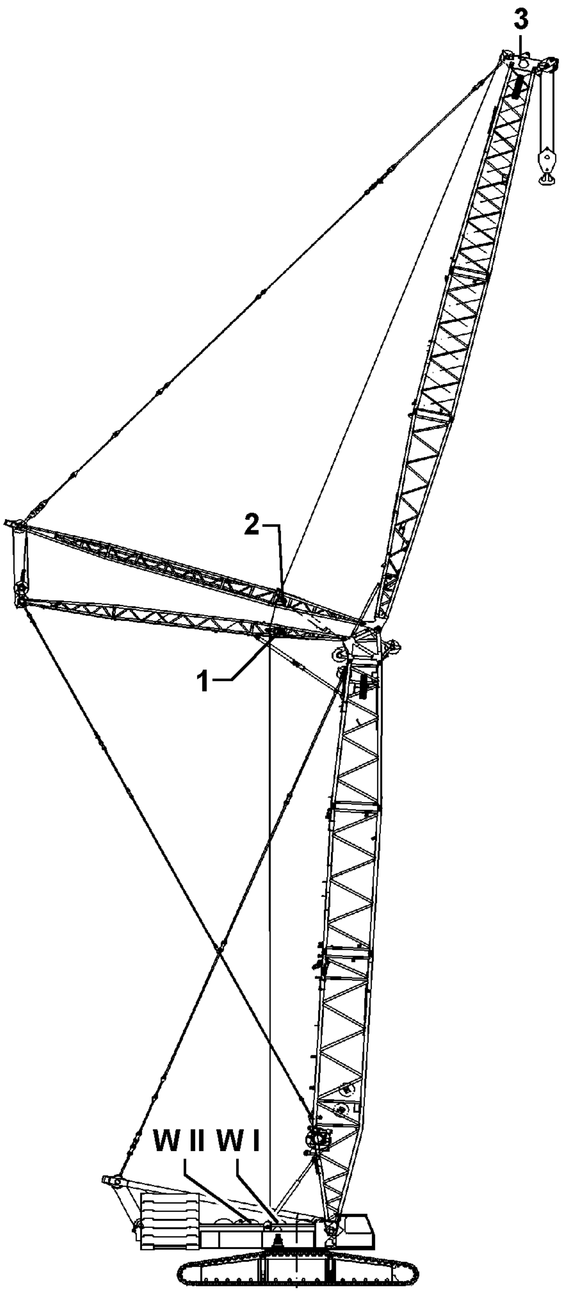
C A U T I O N: The hoist cable of winch V must be routed underneath the protective drum!



193299

Hoisting rope guidedance and reeving at W - operation

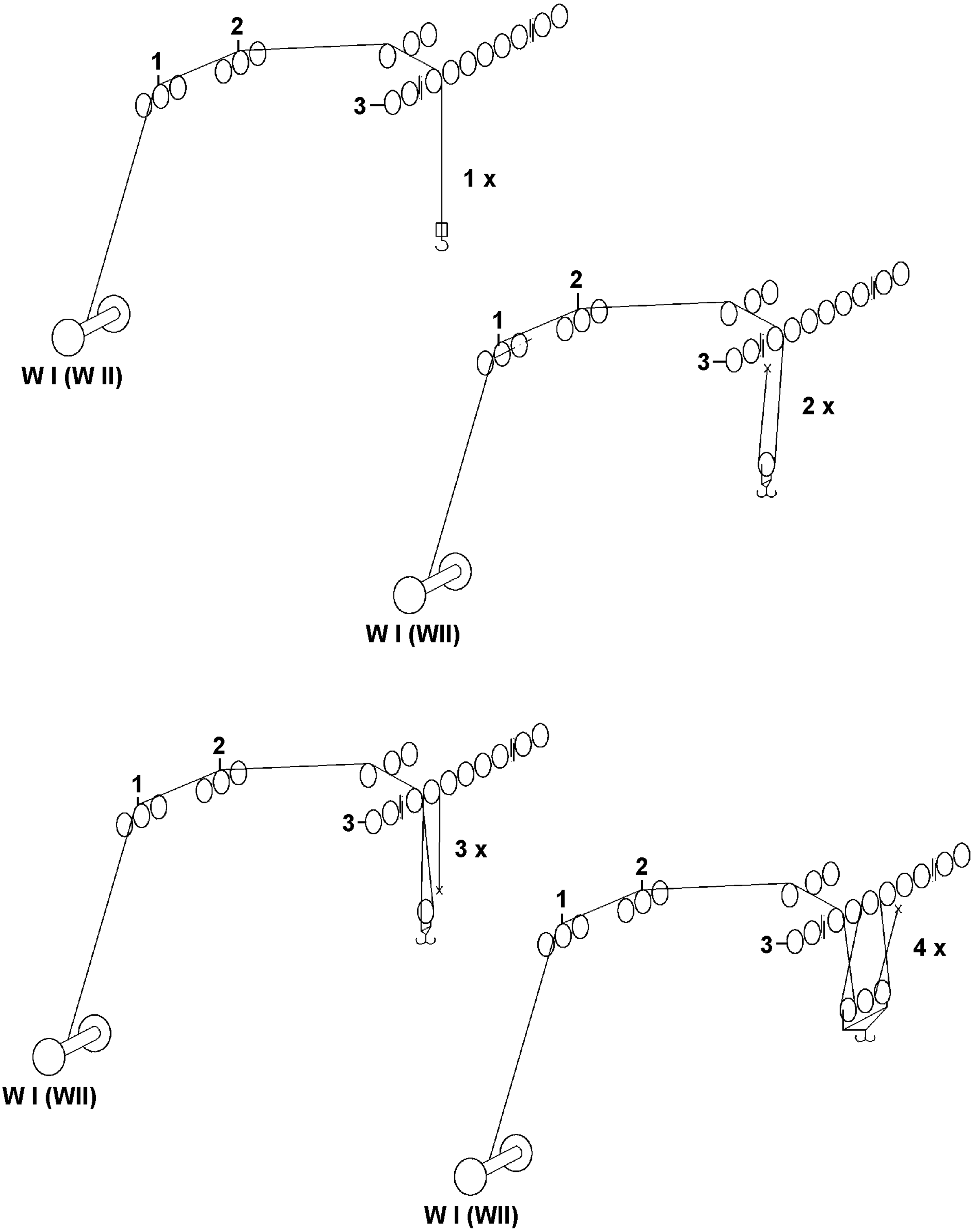
1 = WA- bracket II
2 = WA- bracket I
W I (II) = Winch I (II)
3 = W- boom head



188552

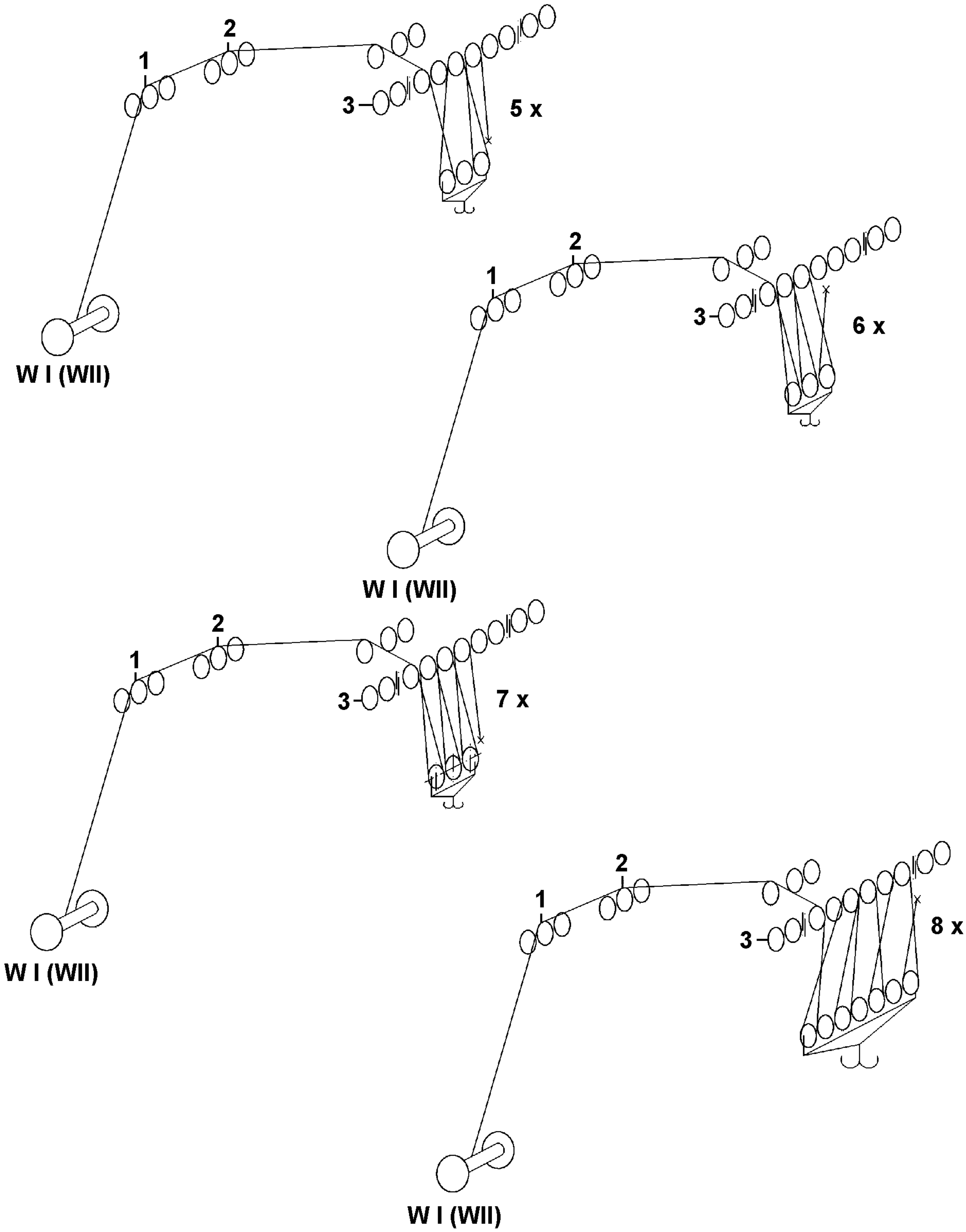
Hoisting rope guidedance and reeving at W - operation

1 = WA - bracket II
2 = WA - bracket I
W I (II) = Winch I (II)
3 = W- boom head



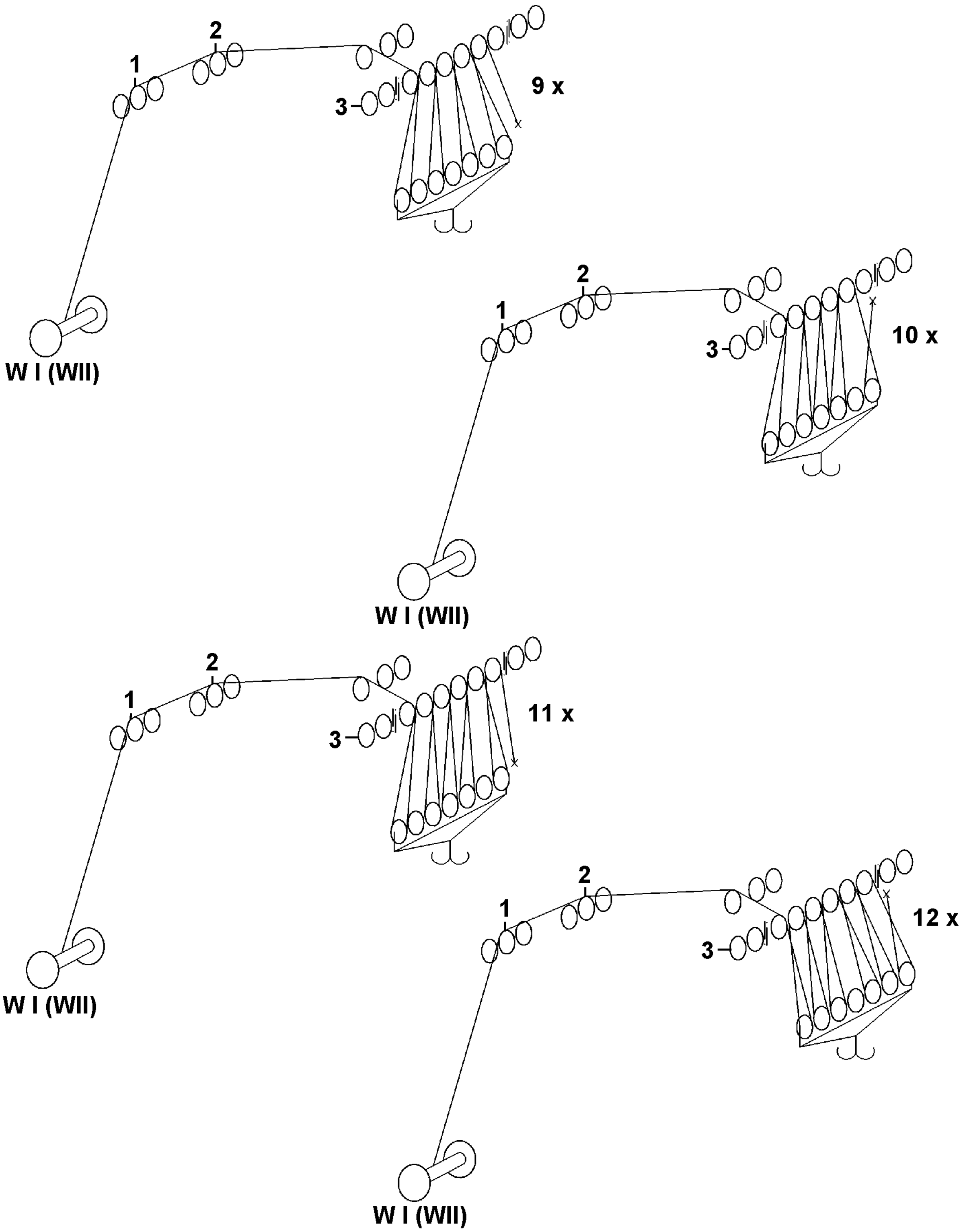
188553

Hoisting rope guidedance and reeving at W - operation (continue)



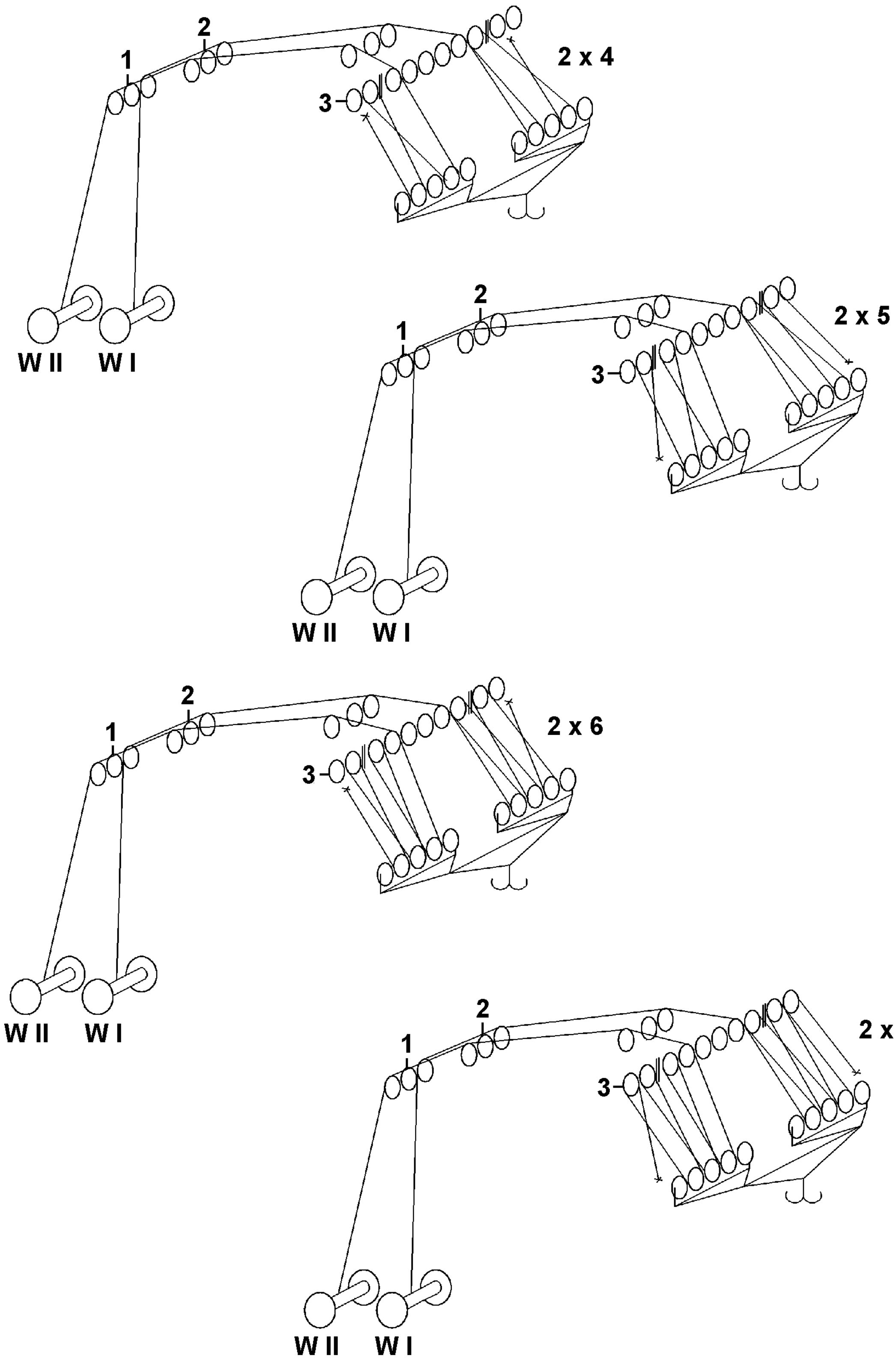
188554

Hoisting rope guidedance and reeving at W - operation (continue)

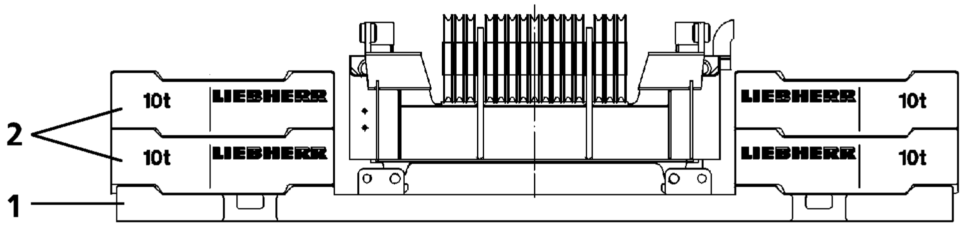


188555

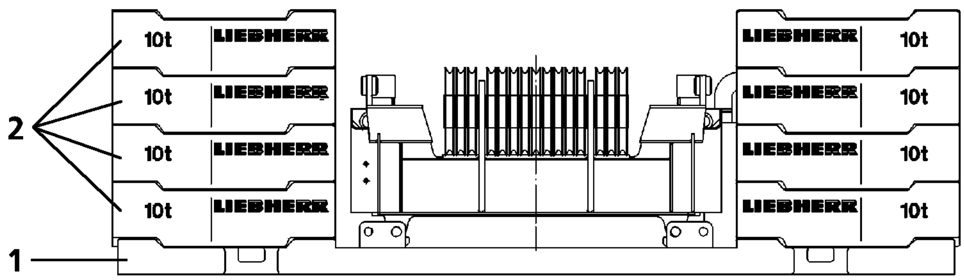
Hoisting rope guidedance and reeving at W - operation (continue)



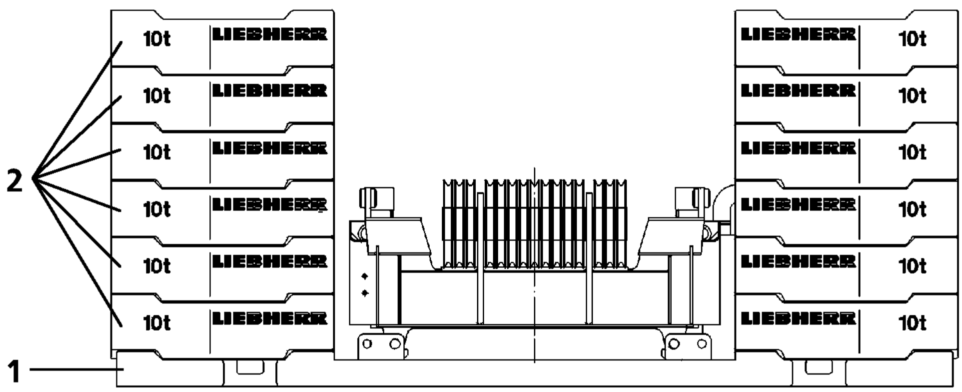
188556



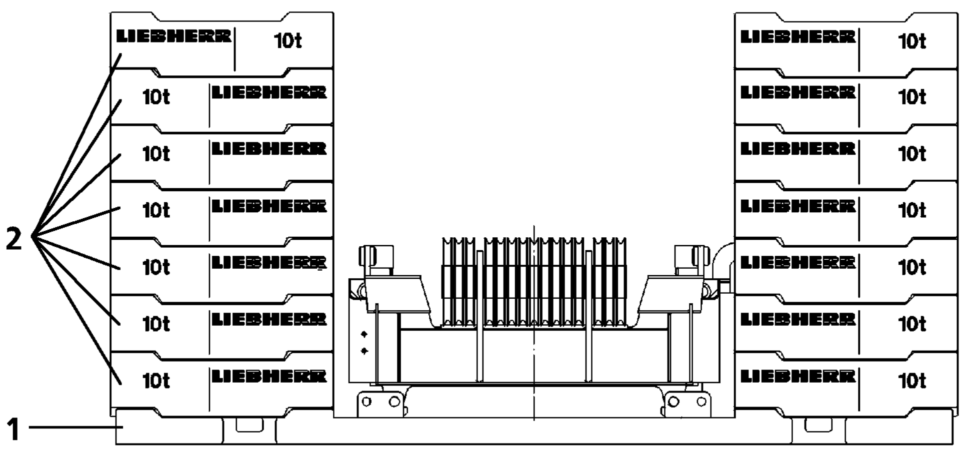
55 t



95 t



135 t



155 t

189334

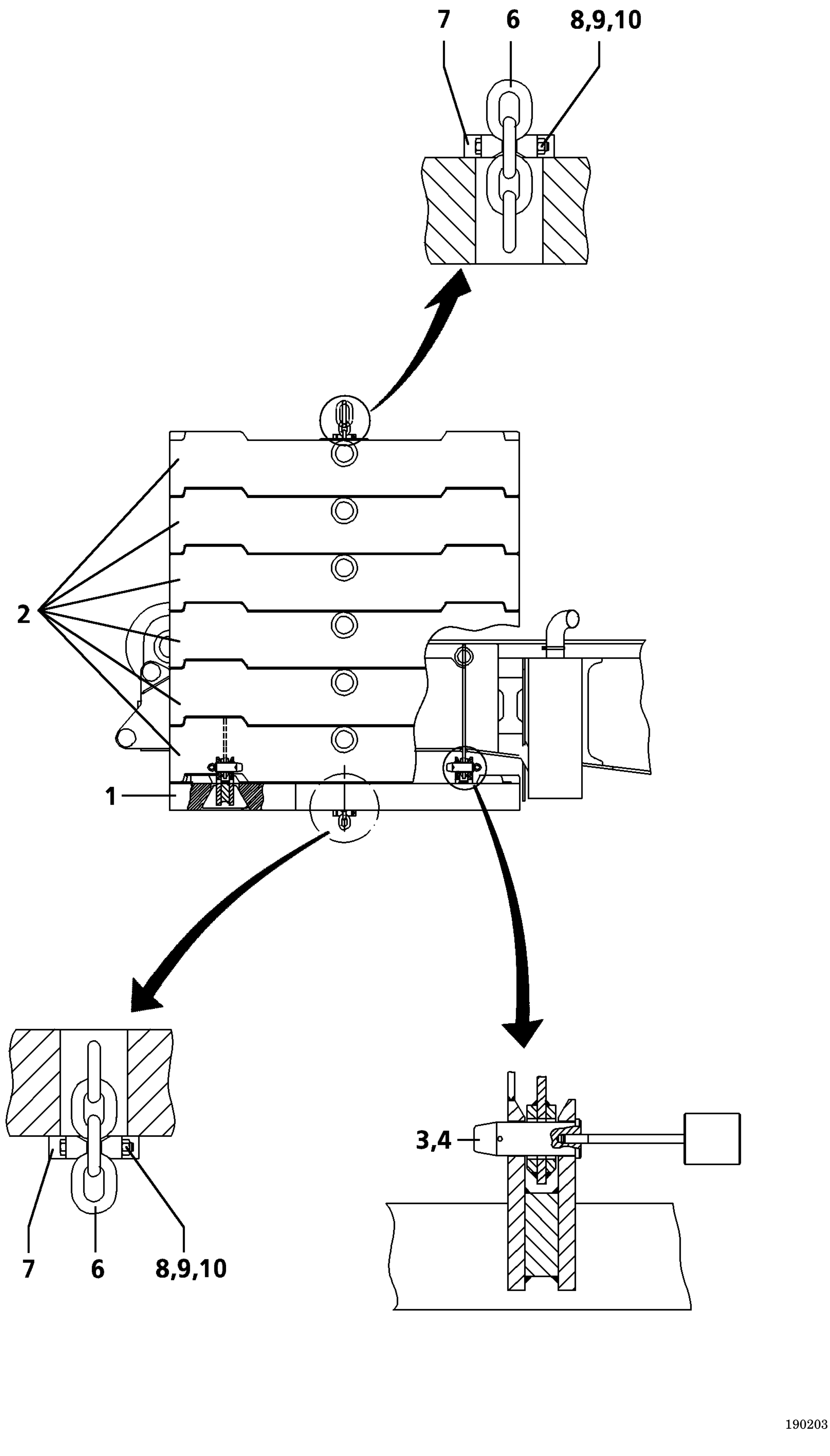
Counterweight slabs
The slabs are marked with their own weights.

1	Base slab	=	15 t
2	Slab 2	=	10 t

D A N G E R : **The mounting of the counterweightslabs must correspond to the information given in the load capacity table - otherwise, there is the danger of accidents.**

The following combinations are possible:

Counterweight	Combination
55 t	1 × Base slab 1 4 × Slab 2
95 t	1 × Base slab 1 8 × Slab 2
135 t	1 × Base slab 1 12 × Slab 2
155 t	1 × Base slab 1 14 × Slab 2


7
6
8,9,10
2
1
3,4
7
6
8,9,10
190203

Mounting counterweight

Requirements:

- the crane must be horizontally aligned.
- if the boom is not mounted, attention must be paid to the following:

When slewing the platform 360° **without mounted** boom, and with raised LA- bracket at a minimum angle of >90° degrees , following counterweights are permissible:

- at **155 t** counterweight centralballast of **43 t** min.must be attached
- at **135 t** counterweight centralballast of **43 t** min.must be attached
- at **95 t** counterweight centralballast of **11 t** min.must be attached
- at **55 t** counterweight centralballast of **11 t** min.must be attached

D A N G E R: **If this is exceeded, the crane can topple over.**

Mounting

Lift the base slab (1) with an auxiliary crane. Swing it from the back side under the slewing platform and lift into the support plates.
Secure base slab (1) with pin (3) on the attaching lugs and secure with safety spring (4).
Stack the required counterweight slabs (2) onto the base slab (1).

D A N G E R: **Put the slabs on one at time, alternating from left to right, otherwise there will be a risk of overturning.**
As long as the boom is not mounted or the boom is mounted but the boom head is still resting on the ground, a maximum of 135 t counterweight can be attached.
Jf the counterweight is increased to 155 t, the boom head must be raised from the ground!
Otherwise there will be a risk of overturning!

Insert retaining chain (6) at both sides to secure the counterweight slabs, attach plate (7) and secure with bolt (8), washer (10) and nut (9).

1. Safety technical notes for working with a load

Note: Observe the SAFETY TECHNICAL NOTES in chapter 2.04 !

- Always maintain the maximum load as specified in the load capacity chart!
- Always maintain the given radii as specified in the load capacity chart !

D A N G E R : When the boom is in a steep position, for which there is no load capacity in the load charts, there is the danger of tipping "to the rear", i.e. the counterweight side, when the slewing platform is turned.

This danger is especially acute :
- **at reduced support base**
- **supported, but with retracted sliding arms.**

It is strictly prohibited to work at a smaller radius than given in the load chart! This also applies if there is no load on the hook.
There is a danger of accidents!

- Always maintain the reeving numbers as noted in the load chart, corresponding to the maximum load carrying capacity!

D A N G E R : If this is not observed, the cable could snap!
There is a great danger of accidents!

- Always initiate all crane movements carefully, apply the brakes very carefully to prevent the load from swinging.
- When the lowest layer on the winch drum is reached, have a guide check that at least three coils remain on the winch drum.

D A N G E R : If this is not observed, it can cause serious accidents!

- Never reeve in a larger hook block than is required to lift the maximum load.

2. Checking before starting to work with the crane

The crane operator must make a walk-around inspection before starting to work to assure that the crane is safe to operate.

- 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.

D A N G E R : **Before initiating a slewing movement, the crane operator:**
- must give a warning signal (horn),
- must make sure before turning the superstructure, especially in tight job sites, there are no persons or objects within the danger zone, incl. in the rear of the counterweight to the chassis. There is a danger of accidents!
- Make sure that there are no personnel or objects within the danger zone of the crane .

2.1 Visual inspection for damage

The crane operator must report all problems on the crane to the supervisory personnel at the job site, and also to the operator who relieves him at a shift change.

D A N G E R : **If there are any problems which would endanger the operational safety of the crane, the crane operator must cease crane operation immediately, especially in any of the following cases:**

- Damage to load -bearing parts of the crane, such as boom, supports, etc.

- If the load slips due to failure of the hoist brake.

- In case of functional errors of the crane control.

- In case of non-functioning indicator and warning lights.

- In case of damage of the hoist cables.

- In case of damage of the stay ropes and guy posts.

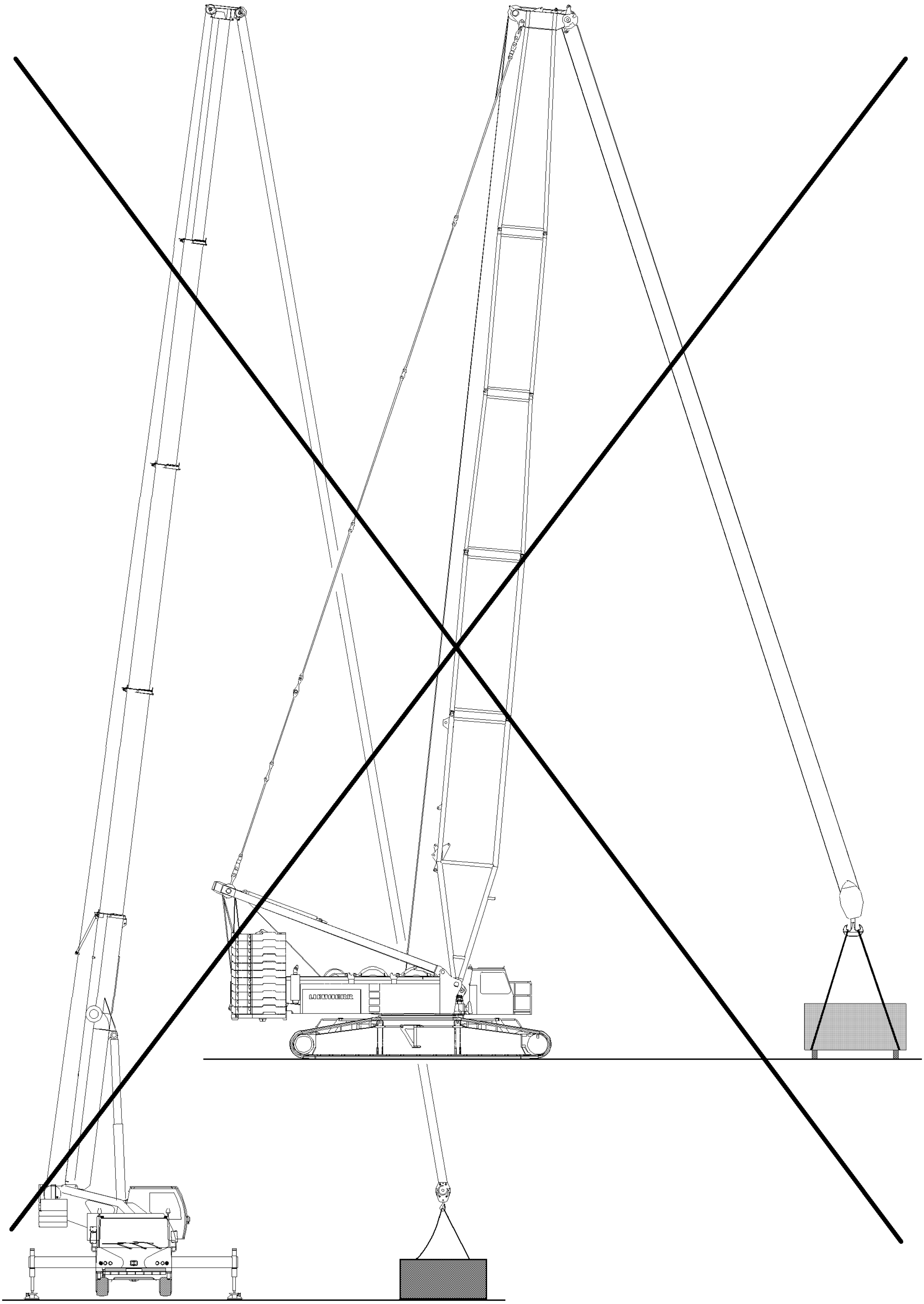
- In case of non-functioning safety devices.

- In cases of leakage on the crane hydraulic.

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 length difference of approximately 22 mm results between both sides of the telescopic boom at a temperature difference of 30 °C between the two sides of the boom and a boom length of 60 m.
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.

D A N G E R : Danger 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 the crane so that both sides of the boom are brought to about the same temperature, therefore preventing side deformation!



102716

3. Taking on a load

The crane must always be operated in such a way, that its load bearing parts are not damaged and the safety of the crane is never compromised.

3.1 Lift a load

When lifting a load, utmost care must be taken! There is a danger of crushing any persons, which is in immediate vicinity of the crane and the load to be lifted. If the tackle cable has to be attached by a person to the load to be lifted, then the crane operator must ensure :

- that the hands of the person placing the tackle are not crushed by the tight cables between the load and the tackle cable.
- that body parts (hands, legs, etc.) are not crushed by a swinging load, when the load is raised.

D A N G E R : If there are any persons within the area of the load, there is a danger of crushing and serious injury.

It is strictly prohibited to lift a load by luffing up the boom, if it has triggered the LICCON system when attempting to lift the load via the hoist gear. This causes overload or can topple the crane over.

Note: Use the auxiliary winch (installation and reeving winch) only for installation, not to lift loads.
Lifting of loads with the auxiliary winch is prohibited!

3.2 Pulling a load at an angle

The crane is built to lift load vertically. In angular 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.

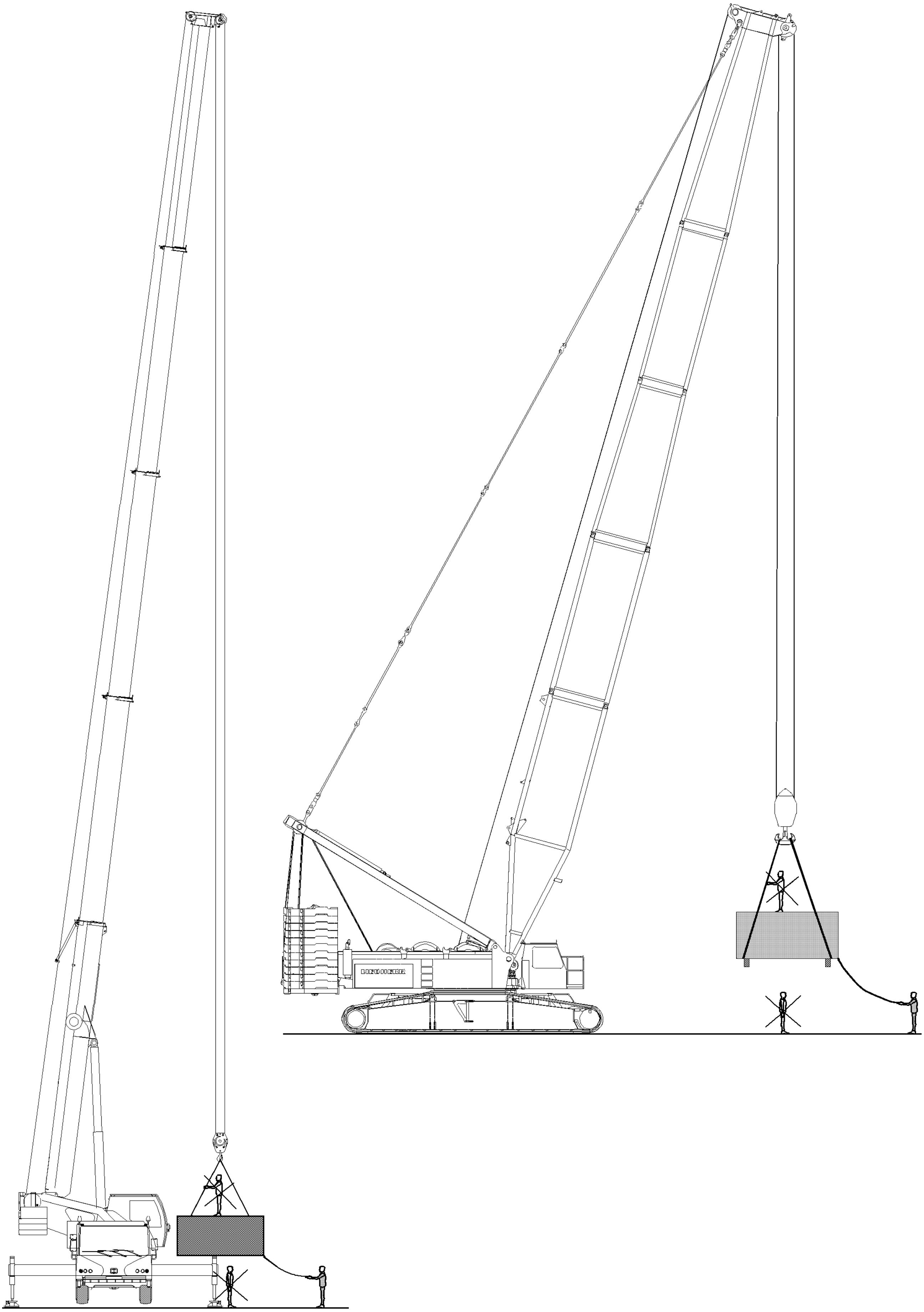
D A N G E R : Diagonal pull can destroy the crane or cause it to topple over!
Diagonal pull is p r o h i b i t e d!
The hook block must be attached (hung) vertically over the center of gravity of the load to be lifted !

3.3 Breaking away fixed loads

It is strictly **prohibited** to pull stuck or jammed loads free with the crane.

D A N G E R : It is strictly prohibited to pull stuck or jammed loads free with the crane !
This can cause the crane to topple over.

C A U T I O N : When taking down the hook blocks, booms, folding jibs, auxiliary booms and boom noses, it must be ensured that the cable pulleys do not touch or lay in the ground. If this is not observed, the cable pulleys can be damaged.



102717

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 In General

A suspended load must always be kept under control. A safe, sensitive actuation of crane functions is the basic requirement.

D A N G E R : **A swinging load can damage the crane or cause it to topple over.
There is an increased danger of accidents!
- All crane movements must be executed slowly and delicately.
- Initiate all crane movements slowly.
- Apply the brakes slowly in all crane movements.**

C A U T I O N : **Danger of damage to the rope pulleys!
When taking down the hook blocks, booms, folding jibs, auxiliary booms and boom noses, it must be ensured that the cable pulleys do not touch or lay in the ground. If this is not observed, the cable pulleys can be damaged.**

4.2 Tag lines

To aid the crane operator in accurately guiding the load, we recommend the use of tag lines to prevent any unintentional movement of the load and subsequent damage.

4.3 Transporting persons

This crane is not designed to move persons. It is strictly prohibited, to allow any person to be carried on the raised load.

D A N G E R : **Transporting persons along with the load or the load tackle is strictly prohibited. There is a great danger of accidents!**

4.4 Danger of crushing

When lowering the load, utmost care must be taken. There is a great danger of crushing any person, which is in the immediate vicinity of the load to be lowered.

D A N G E R : **When lowering a load, make sure that no persons or objects are within the danger zone. In general, it is never permitted for any person to be under the load. There is a great danger of accidents!**

4.5 Working near overhead electrical wires and lines

If there are any electrical lines / overhead wires in the immediate vicinity of the job site, they must be disconnected by trained electricians. If this is not possible, then the danger zone must be covered or blocked off. If even these measures are not possible, then the following safe distances must be kept between the crane and the wires at all times:

Rated voltage	Min. distance in meters
to 1 kV	1
above 1 kV to 110 kV	3
above 110 kV to 220 kV	4
above 220 kV to 380 kV	5
if the rated voltage is unknown	5

Note: If, despite all precautionary measures, a flashover occurs, observe the following:
- Keep calm.
- Do not leave the crane operator's cab.
- Warn all those around the crane to remain standing where they are and not to touch the crane!
- Move the crane from the danger zone.

D A N G E R : If this is not observed, serious damage, injury or death can occur!

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.

D A N G E R: Important instructions when carrying out ram work or pulling sheet piles!
If the crane is used for ram work or pulling sheet piles 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 as per the load chart! Restricting the maximum lifting power via the crane overload protection o n l y is forbidden. The lifting force restriction can be achieved by suspending a crane scale between the load hook and the pulling equipment.**

LICCON - ERROR LOCALIZING

1 General

Any errors, which might possibly occur on the LICCON are classified into various criteria. The most common designation is the classification according to cause of the error , as follows

- Monitor errors
- Power pack errors
- Central processing unit errors
- Component group frame errors
- Line errors
- Control unit errors
- Sensor errors
- Actuator errors
- Operational errors

The LICCON encompasses a large number of error diagnosis and self monitoring routines. However, for many errors, the LICCON cannot determine without a doubt which component is defective. If, for example, there is a problem in the data transfer between 2 components, then each one of the affected components (for example, monitor or central processing unit, power pack or central processing unit, sensor or central processing unit) as the transfer route in between (for example monitor cable, component group frame, sensor lines or actuator lines) can be defective.
For that reason, except for monitor errors and clear power pack errors, errors are not classified according to the defective component, but according to the type of appearance. The errors are sorted in the sequence, as they are checked by the LICCON.

1. Monitor errors (Section 3)
Monitor errors are errors, which point to an error on the monitor, at the beginning of or during operation. Monitor errors are recognized by a message or a bad picture on the screen.

2. Basic component group errors (Section 4)
These are errors, which most often occur due to a problem with parts of basic component groups (hardware or software) . The basic component group errors are classified according to the following sub group errors:

2.1 Clear power pack errors (Section 4.1)
These are errors, which, point to a problem with the power pack, when the LICCON is turned on. However, they can also have other causes.

2.2 Initialization errors (Section 4.2)
Initialization errors are errors, which are recognized during boot- up by a special check, for example micro processor errors, hardware errors, initialization errors. Initialization errors are shown on the 7-segment indicator of the CPU and possibly also through an error number and message on the screen.

2.3 System errors (Section 4.3)
System errors are errors, which are found shortly after boot- up or in operation through the operating system of the LICCON. System error programs monitor especially the function of the electronic and the data transfer. System errors are differentiated by:

2.3.1 Fatal system errors (FATAL SYSTEM ERROR) (Section 4.3.1)
They are shown through system error numbers on the screen .

2.3.2 Other system errors (Section 4.3.2)
They are shown only on the 7- segment indicator of the central processing unit (CPU indication).

3. Application errors (Section 5 and 6)
   Application errors are errors, which are found by the application programs. They encompass a large number of transmitter and operating errors. Application errors are shown in the program view (equipment configuration view, operation view,..) through error numbers or blinking values or symbols and additionally through the monitor horn (=beeping sound, buzzer) .
   Application errors are differentiated by the monitor, on which they are displayed

2 Procedure to localize and fix errors:

- If the monitor screen is defective (for example, if there is no picture, if the screen flickers or if only an error message without an error number is given, for example "⇒ DATA LINE FAILURE !!", then refer to → Monitor errors (Section 3).

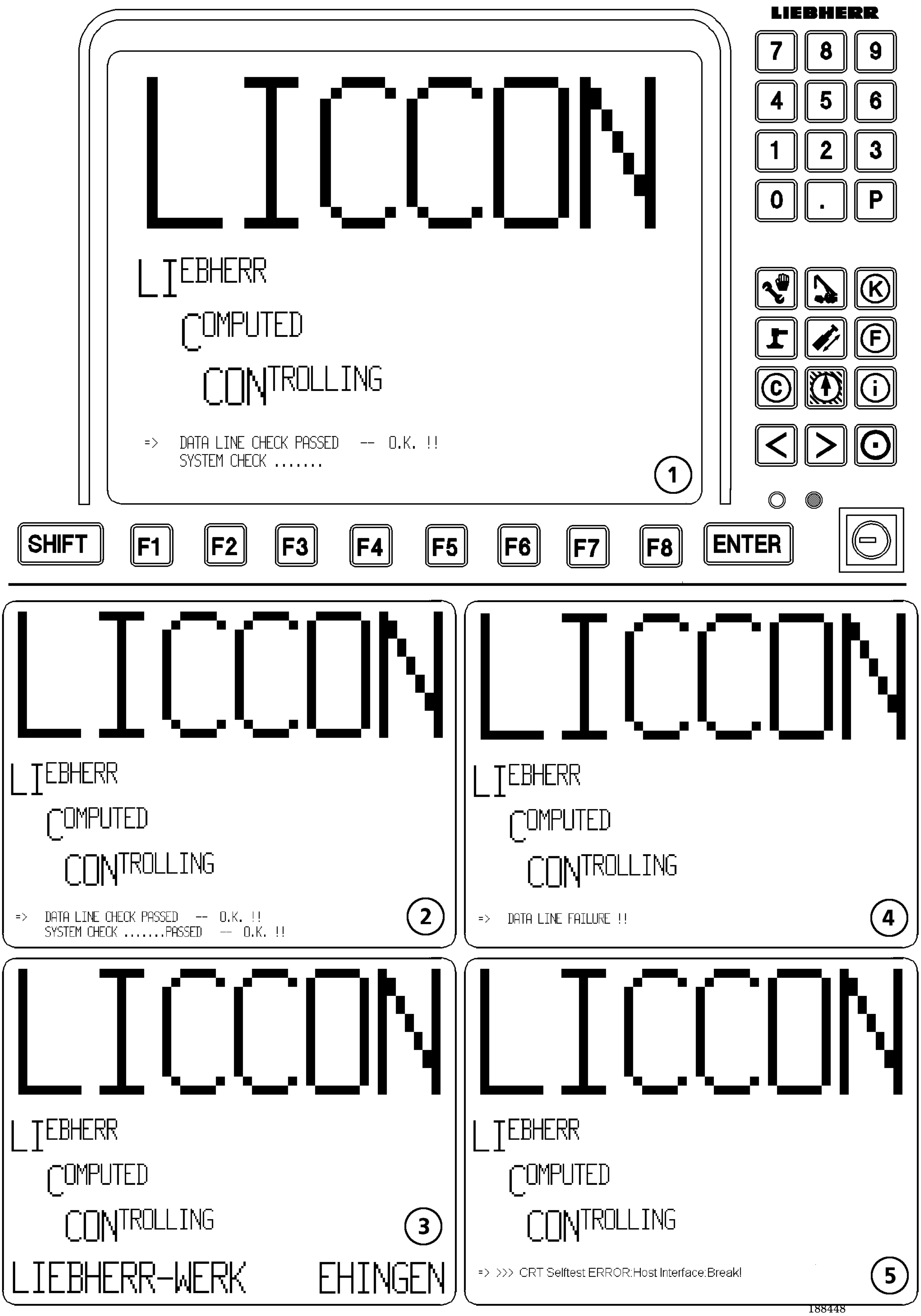
- If an error occurs, which does not show the operation view at all or if suddenly disappears, then refer to → Fixing basic component group errors (Section 4.4).

- If an error occurs, which is shown in the program view (equipment configuration view, operation view,..) with a horn and blinking value or symbol or error number, then refer to → Application errors (Section 5 and 6)

The LICCON error messages make it possible for the crane operator to immediately recognize any errors, which might occur. With the error description in the LICCON Operation Manual, the crane operator himself is often able to find the error himself and to fix the problem.
If the crane operator cannot take care of the problem himself, then he must contact LIEBHERR Service.

The operator must be able to have the following data ready when contacting LIEBHERR Service:

- Crane type
- Crane number
- Type of error according to above differentiation
- Error number and error message on monitor, if applicable
- for basic component group errors also 7 segment indicator of power pack and central processing units
- Operational conditions of crane
- Action when error occurs
- if applicable, how often error occurs


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK ....
1
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK ....PASSED -- O.K. !!
2
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE FAILURE !!
4
LICCON
LIEBHERR
COMPUTED
CONTROLLING
3
LIEBHERR-WERK EHINGEN
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> >>> CRT Selftest ERROR:Host Interface:Break!
5
188448

3. Monitor error

Monitor errors are errors which point to a defective monitor when the system is turned on. However, monitor errors can also be caused by errors in the basic component group. In addition, the power supply to the monitor might be missing; in that case the screen stays dark.

The status of the monitor and the monitor controller is shown via two illuminated diodes (LEDs), which are located on the lower right hand corner on the monitor (fig. ① Pos. I_1 and I_2).

LED 1 (I1) red	Monitor error
LED 2 (I2) yellow	Power supply for monitor (24 V) available

The booting up procedure must look like on fig. ① to ③ (= Booting the LICCON system). When the LICCON is turned on, the connection from the monitor to the CPU is checked first.

If the connection is alright, the following message is shown on the monitor:

"DATA LINE CHECK PASSED - - O.K.!" (fig. ①)
SYSTEM CHECK .....

If the connection is defective, the following message is shown on the monitor :

"⇒ DATA LINE FAILURE !!" (fig. ④)

or **"⇒ > > > CRT Selftest ERROR:Host Interface Break!"** (fig. ⑤)

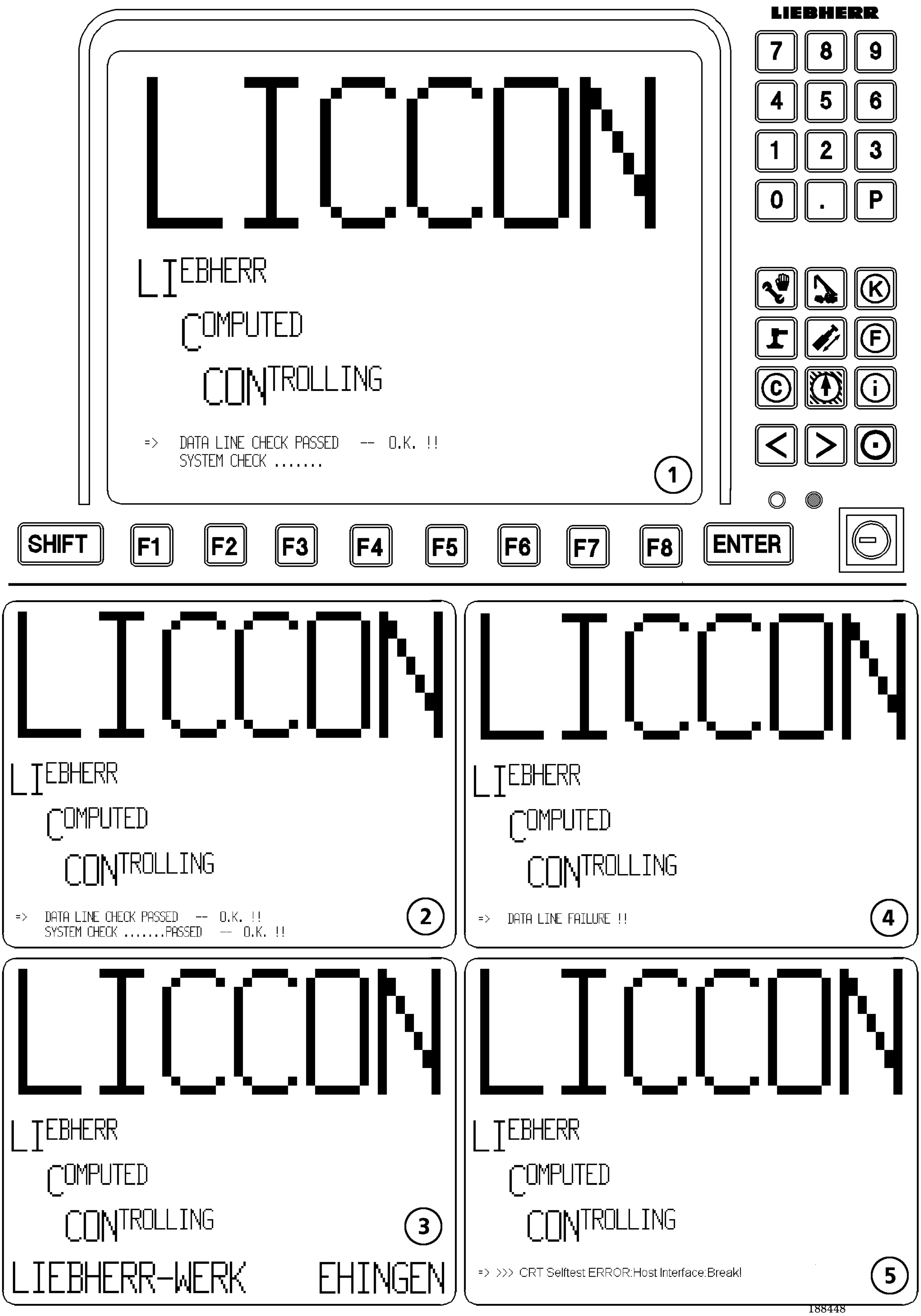
3.1 Localizing and fixing of monitor errors

Procedure in case of monitor errors

The following listing shows possible monitor errors, their possible causes and possible remedies. Monitor errors are sorted in the sequence, as they are recognized by the crane operator or the LICCON.

Error:	**When the system is turned on, both monitors stay dark** **LED (I_2) "yellow" DOES NOT light up**
Possible cause:	Power supply is missing, safety automat is turned off
Possible remedy:	Check power supply , actuate the safety automat for the monitors.

Error :	**One monitor has no picture**
Possible cause:	Line to monitor is unplugged or defective or monitor is defective.
Possible remedy:	replace the LICCON monitor without picture with a functioning replacement monitor monitor (see section 3.2). First off all functioning monitor can be used as substitude. If the previously functioning monitor also stays dark : Check safety automat,input circuit boards and monitor connector cable incl. plugs for break down and short circuit. Otherwise replace dark monitor. otherwise: Check power supply on monitor connector plug (Should be : 18 - 36 V, nominal: 24 V)

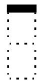

LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK ....
1
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK ....PASSED -- O.K. !!
2
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE FAILURE !!
4
LICCON
LIEBHERR
COMPUTED
CONTROLLING
3
LIEBHERR-WERK EHINGEN
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> >>> CRT Selftest ERROR:Host Interface:Break!
5
188448

Error: **Screen shows the following error message when it is turned on:**
"⇒ DATA LINE FAILURE !!" (fig. ④)
and LED "yellow" (I_2) on monitor DOES NOT light up

Possible causes: Monitor is defective, connection monitor to CPU (via Input circuit board) has no power supply or CPU is defective.

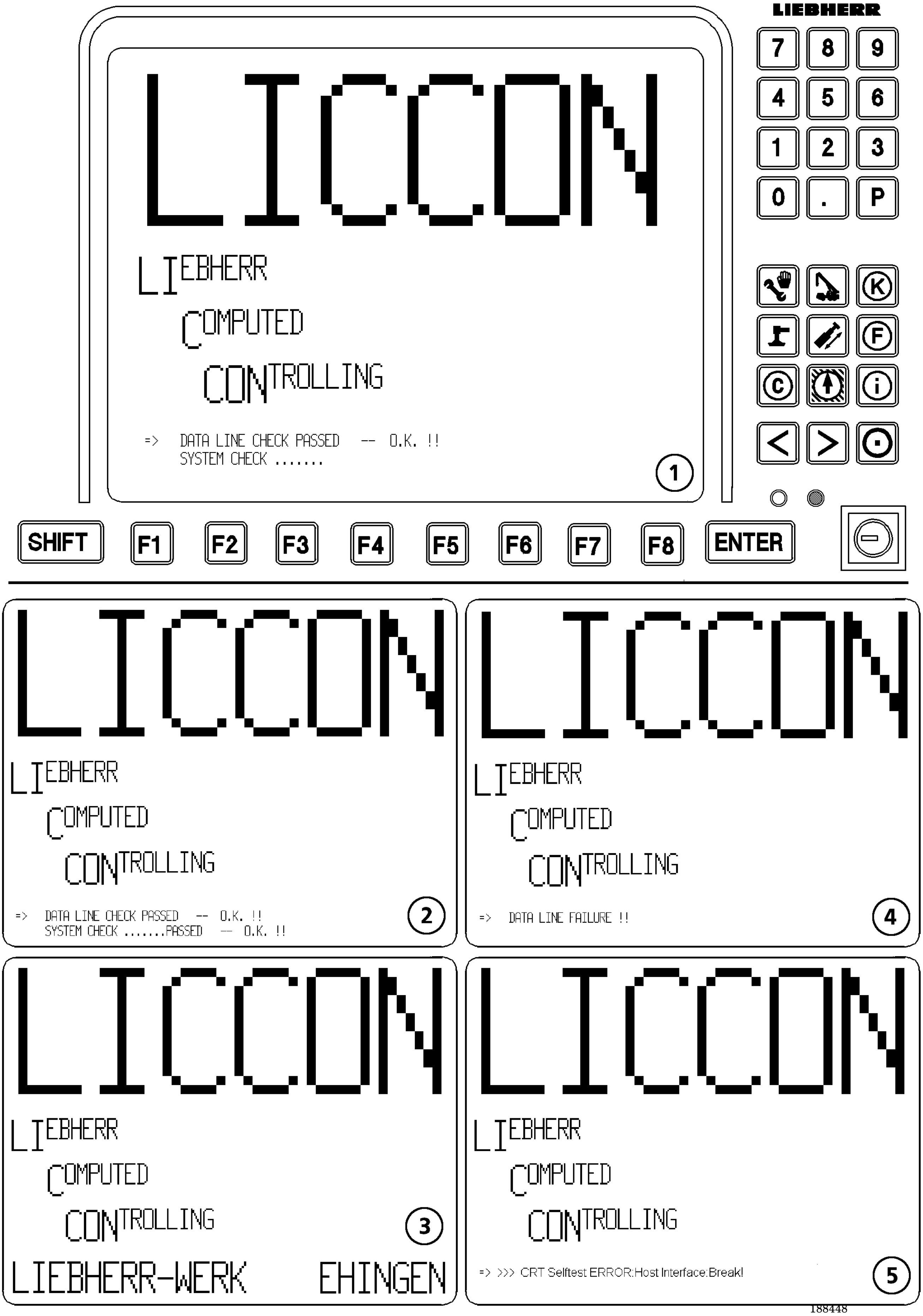
Possible remedy: Open the control box and check the CPU indicator.

If the status of the CPU is

 blinking with 

then the connection between CPU - Input circuit board and the connection from input circuit board to the monitor must be checked for interruption. If the connections are O.K., then the CPU for the monitor with error indication must be checked and replaced, if necessary (see notes to check the CPU when taking care of basic component group errors in paragraph 4.4).
If, after turning it on, this blinking indication is not shown on the CPU indicator, then the CPU or program memory card must be checked and replaced, if necessary (see notes to check the CPU when taking care of basic component group errors in paragraph 4.4).

Replace the LICCON monitor with error indication with a functioning replacement monitor (paragraph 3.2).


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK ....
1
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK ....PASSED -- O.K. !!
2
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE FAILURE !!
4
LICCON
LIEBHERR
COMPUTED
CONTROLLING
3
LIEBHERR-WERK EHINGEN
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> >>> CRT Selftest ERROR:Host Interface:Break!
5
188448

Error:	**Bildschirm zeigt beim Einschalten den Fehlertext:**
	"⇒ > > > CRT Selftest ERROR: Host Interface: Break!" (Abb. ⑤)
	and LED "red" (I_1) lights up
Possible cause:	Monitor might be defective, connection might be defective, power pack might be defective, CPU might be defective.
Possible remedy:	Replace the LICCON monitor with error message with a functioning replacement monitor (see description, section 3.2). If the previously functioning monitor also shows the error message > > > CRT Self test: Host interface: BREAK!, then: Open the control box and check the power pack indicator (see error in section 4.1) . If, after turning it on, the power pack shows "7" , then the power pack is O.K.. check the connection of the CPU input circuit board and the connection of input circuit board to monitor for interruption. If the connections are O.K., then check the CPU on the monitor with the error message and replace it, if necessary (see notes to check the CPU when fixing errors in the basic component group, section 4.4). If the power pack does not show “7“, then see power pack error, section 4.1).

Error:	**When the system is turned on, the following error message appears on the screen:**
	Monitor horn does not work, Keyboard is defective, Brightness control is defective, Keyed switch is defective, Monitor symbols are wrong or missing
Possible cause:	Various monitor parts are defective (picture tube, keyboard, keyed switch)
Possible remedy:	Replace the defective LICCON monitor with a functioning replacement monitor (see description, section 3.2).

3.2 To check and replace the monitors

Note: If a monitor is connected, then it must be functioning for the electronic basic component group also.
If necessary, in emergency case, the LICCON still runs if monitor 1 is unplugged.
- if monitor 1 is defective: Remove and unplug monitor 1
- if monitor 0 is defective: Install monitor 1 instead of monitor 0.

D A N G E R: The control as well as the safe load indicator system work, but are not displayed on monitor 1.
For that reason, there is an increased risk of danger due to missing information.

The monitor can easily be exchanged by the crane operator, using simple tools.

To remove the monitor :

- Turn the crane off
- Release the 4 mounting screws on the front plate of the monitor
- Lift out the monitor
- On the monitor connector cable, open the screw connection and unplug the plug
- Unscrew the monitor ground.

To install the monitor:

- Attach the monitor ground
- Insert the plug on the monitor connector cable and tighten the screws
- Insert the monitor into the instrument panel
- Attach the monitor with the 4 mounting screws.

D A N G E R: Crane operation without monitor indication is dangerous. If a LICCON monitor is defective, then it must be replaced!

9.4 Basic component group errors

Basic component group errors are errors, which are most often caused by errors in parts of the basic component group (hardware) .

The basic component group errors are classified as follows:

1. Clear power pack errors (Section. 4.1)

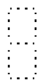
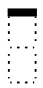
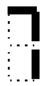
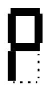
2. Initialization errors (Section. 4.2)

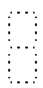
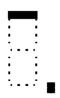
3. System errors (Section. 4.3)

Even if the crane operator is able to take care of a basic component group error without outside help, he still must inform LIEBHERR Service about the error.

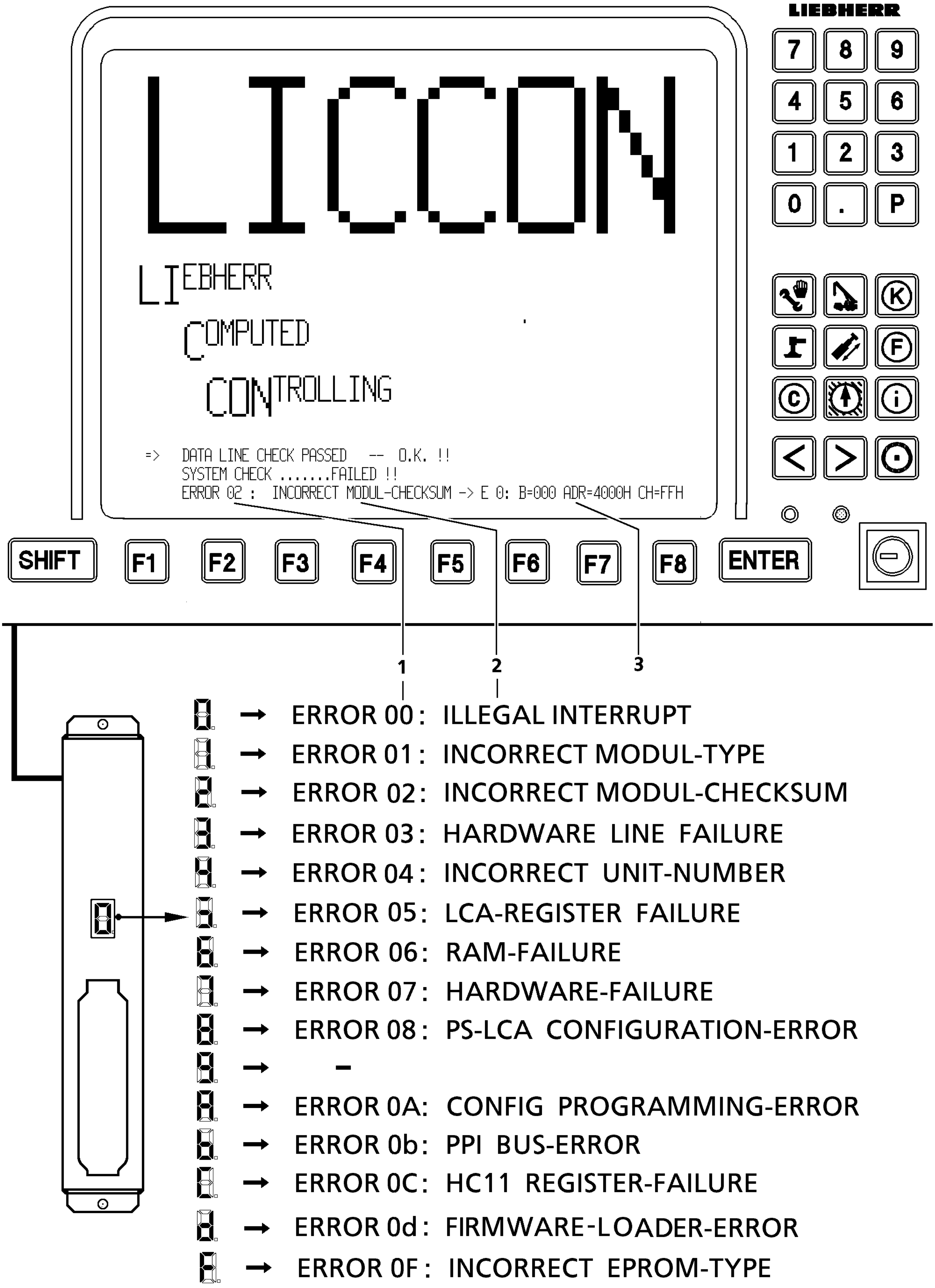
4.1 Clear power pack errors

These are errors which, when the LICCON is turned on, point to a defective power pack. However, they can also have other causes.
Power pack errors can be checked by opening the control box and watching the power pack indicator, when the unit is turned or in operation.
The power pack looks similar to the CPU. The power pack, however, is always as in the far left slot of the basic component group. Normally, the 7- segment indicator on the unit shows the following indicators. Below is a description of possible power pack errors.

Power pack indicators in normal operation		
Power pack indicator	Type of indication	Meaning
	-	Power pack indicator is dark: Control if off and power supply is missing. The basic component group is disconnected from the battery. (This is the case when the slewing platform is dismantled into the sections).
	static	Control is off, battery voltage is on basic component group, stand-by power supply for memory (CPU RAM and COMMON-RAMs) is available.
	static	Control is on, battery voltage is on basic component group, power pack is O.K.
	static	Control is off (= power down) is shown for 1 to 2 seconds after turning the control off. During this time, the power pack continues to run to save data.

Clear power pack errors				
Power pack indicator	Type of indication	Error description for Service Dept., possible error causes	Possible error causes	Possible error remedy
	-	Power pack indicator is dark: No power supply, battery is disconnected. Power pack safety automat is off	Line interrupted, contact problems with plug, power pack is defective	Check line, check plug, check safety automat, check power pack
	static	Control is off, auxiliary transformer is running, stand-by power supply is available, but over or under-voltage, → check voltage	Power pack defective, CPU defective	Check power pack, check CPUs, one after the other

Section 4.4 describes how component group errors can be recognized and also the systematic procedure to fix any problems, how to check and change the power pack.


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK ....FAILED !!
ERROR 02 : INCORRECT MODUL-CHECKSUM -> E 0: B=000 ADR=4000H CH=FFH
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
1
2
3
0 → ERROR 00 : ILLEGAL INTERRUPT
1 → ERROR 01 : INCORRECT MODUL-TYPE
2 → ERROR 02 : INCORRECT MODUL-CHECKSUM
3 → ERROR 03 : HARDWARE LINE FAILURE
4 → ERROR 04 : INCORRECT UNIT-NUMBER
5 → ERROR 05 : LCA-REGISTER FAILURE
6 → ERROR 06 : RAM-FAILURE
7 → ERROR 07 : HARDWARE-FAILURE
8 → ERROR 08 : PS-LCA CONFIGURATION-ERROR
9 → -
A → ERROR 0A: CONFIG PROGRAMMING-ERROR
b → ERROR 0b: PPI BUS-ERROR
C → ERROR 0C: HC11 REGISTER-FAILURE
d → ERROR 0d: FIRMWARE-LOADER-ERROR
F → ERROR 0F : INCORRECT EPROM-TYPE

188370

4.2 Initialization errors

Initialization errors are hardware errors, which are found when rebooting the system in the self test through special LICCON test runs .

Initialization errors are displayed through a blinking initialization error sign (=number or letter) on the 7-segment indicator unit of the CPU .

If an initialization error occurs on a CPU, which has a monitor connected to it, then this error, if there is time, is also shown on the monitor . The indicator shown in the left illustration are shown on the monitor. They consists of:

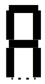
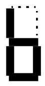
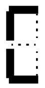
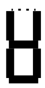
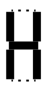
1) Error number. The initialization error corresponds to the CPU indicator.
2) Error description message
3) partially with other additional information in the form of values of relevant memory cells.

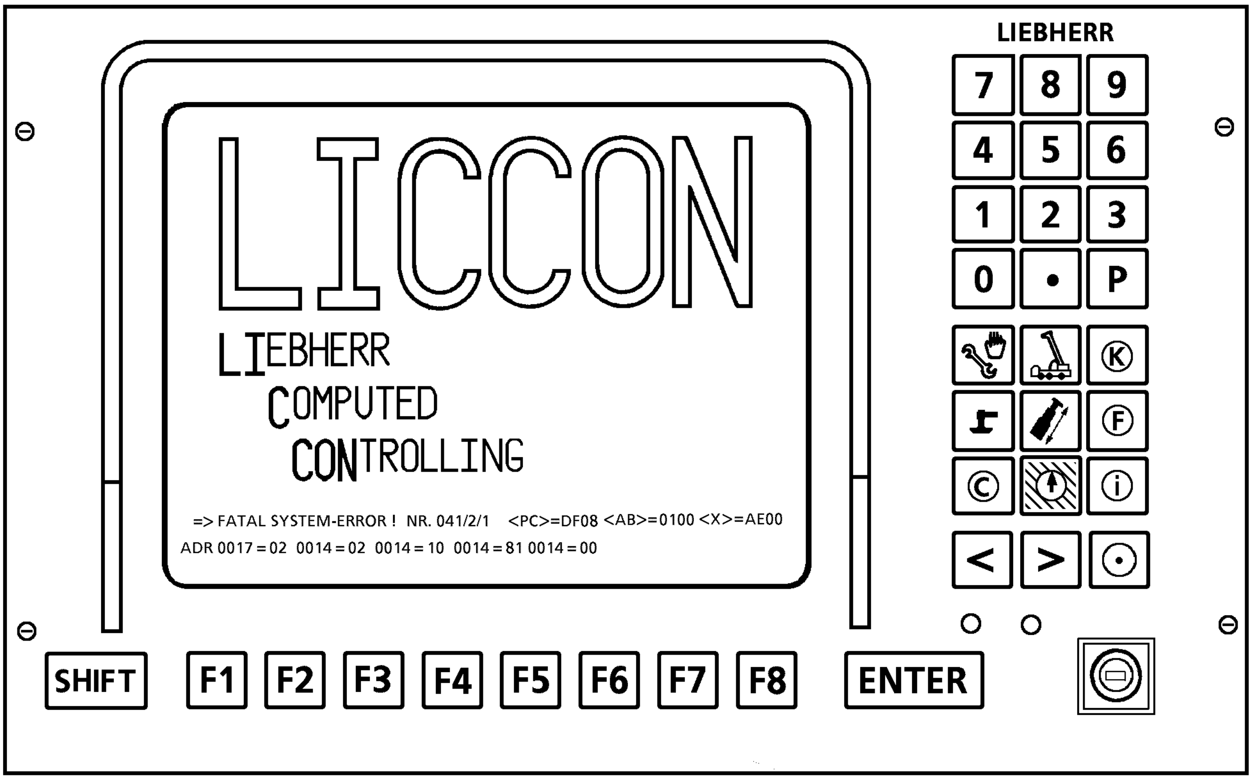
If an initialization error occurs on a CPU, which has no monitor connected to it, then this error is not immediately visible on a monitor. The LICCON continues to run for a short time. However, the initialization error will then create a system error, which stops program execution and is shown on the monitor (see also description of system error in section 4.3).

If a hardware error occurs during operation, for example ”EPROM defective”, then a system error will be shown first, or the monitor stops or becomes dark (see also description of system errors in section 4.3).

Initialization errors are always found with the CPU indicator. Possible initialization error signs with notes to possible error causes and possible error remedies are listed in the following chart. In case of initialization and system errors, the crane operator must open the control box and check the CPU indicators. See section 4.4 for description to take care of basic component group errors.

Initialization error				
CPU Indicator	Type of indication	Error description for Service Dept. , possible error causes	Possible error causes	Possible error remedy
	-	CPU indicator is dark: power supply is missing, program memory board is missing or defective, CPU defective	CPU defective	Check CPU
0	blinking	HC11 defective (RAM-REG-A/D), non- permissible interruption in initialization phase	CPU defective	Check CPU
1	blinking	Wrong type of module : Wrong EPROM, EPROM is defective, program memory board is wrong / defective	Program memory board or CPU defective	Check program memory board and CPU
2	blinking	Module check sum is wrong: EPROM is defective, program memory board is defective	Program memory board or CPU defective	Check program memory board and CPU
3	blinking	Hardware error (line test)	CPU defective	Check CPU
4	blinking	Invalid CPU number: wrong EPROM, program memory board is defective	Program memory board or CPU defective	Check program memory board and CPU
5	blinking	LCA register is wrong, LCA is defective, power pack status is wrong, component group carrier is wrong	CPU is defective, power pack is defective	Check CPU, check power pack
6	blinking	RAM - error, RAM defective	CPU defective	Check CPU
7	blinking	Hardware error, defect at: Math processor (APU), HC11, AD converter, DA converter	CPU defective	Check CPU
8	blinking	power pack - LCA charge error: LCA on power pack is defective, component group carrier is defective	Power pack is defective	Check power pack
9	blinking	Monitor is defective, line from monitor to CPU is defective, CPU is defective	Monitor defective, line is defective, CPU defective	Check monitor, line and CPU, see section 9.3

Initialization error				
CPU Indicator	Type of indication	Error description for Service Dept. , possible error causes	Possible error causes	Possible error remedy
	blinking	"CONFIG" programming error, HC11 defective, CPU defective	CPU defective	Change CPU
	blinking	Bus Controller error, Common memory board in power pack is missing, component group carrier is defective	Power pack defective, Common memory board or CPU defective	Check Common memory board, check power pack, check CPU
	blinking	HC11 Hardware error, AD converter defective, CPU defective	CPU defective	Check CPU
	blinking	Wrong type of EPROM (P = Program -EPROM = E0, T = Table (chart) -EPROM = E1) (1st letter in directory) EPROM interchanged or defective, program memory board interchanged or defective	Program memory board is wrong or defective, CPU defective	Check program memory board, check CPU
	blinking	No monitor connected to CPU	Monitor defective, line defective , CPU defective	Check monitor, check line, check CPU
	blinking	T×D / R×D short circuited (Monitor line test with short circuit plug)	Indication only in monitor line test	-



1 2 3 4 5

=> FATAL SYSTEM-ERROR ! NR. 041/2/1 <PC> = DF08 <AB> = 0100 <X> = AE00
ADR 0017 = 02 0014 = 02 0014 = 10 0014 = 81 0014 = 00

189181

4.3 System errors

System errors are errors in the electronic basic component group, which can be recognized by the system shortly after LICCON boot- up or in operation. The system error programs are especially monitoring the function for program execution and data transfer. System errors can be follow- up errors of such errors, which can only be found during initialization. If a system error occurs as a follow- up error of an initialization errors, then the hardware is probably ok. System errors must generally be taken care of by trained service personnel. This section gives some tips how the crane operator can check or interchange component elements of the LICCON control to fix the crane. The following charts show which errors might possibly be fixed in the field, and how,

If a system error occurs, then all control programs and therefore all crane functions are interrupted. Even if an error can be taken care of by the crane operator, he must still inform the Service Dept.

Always use the CPU indicators to localize system errors. Possible system errors with notes for possible error causes and possible error remedies are listed in the following charts. In case of initialization and system errors, the crane operator must always open the control box and check the CPU indicators. The procedure is the same as described in section 4.4 . System errors are differentiated as follows :

1. Fatal system errors (FATAL SYSTEM ERROR) (section 4.3.1); they are shown on monitor and the CPU
2. Other system error numbers (section 4.3.2); they are only shown on the CPU indicator.

4.3.1 Fatal system errors

Fatal s system errors are shown on the monitor as well as in the display of the CPU.
The FATAL SYSTEM ERROR message appears on the monitor, see left illustration.

This means :

1) Error message "FATAL SYSTEM ERROR" shows the type of error
2) FATAL SYSTEM ERROR - error number
3) Task number, denotes the task, when the error was recognized
4) CPU number for the CPU, which has recognized the error ("-" means: CPU, to which this monitor is connected)
5) additional information in the form of values of relevant memory cells

At the same time, the one of the following error descriptions appear on the CPU indicator of the CPU, which has recognized the error first, in the form of letters, numbers or signs:

CPU Indicator	Type of indicator	Error description for Service Dept., possible error causes	Possible causes	Possible remedy
E	static	FATAL SYSTEM ERROR has occurred (CPU $\neq$ 0)	Error is shown on monitor	see FATAL SYSTEM ERROR chart
E.	static	FATAL SYSTEM ERROR has occurred + Global- reset (CPU = 0)	Error is shown on monitor	see FATAL SYSTEM ERROR chart

Because the CPU indicators are turned off every 10 milliseconds for 10 milliseconds to control the brightness level, there is a 50% chance after the system stop that a follow- up error is indicated on one of the other CPU indicators and there is a 50% probability that this indicator will turn off.

4.14 LICCON - ERROR LOCALIZING

024573-01

The following charts shows, which FATAL SYSTEM ERROR messages can appear on the monitor. They offer clues for possible error causes and possible error remedies:

FATAL SYSTEM ERROR

No.	Error description for Service Dept., possible error causes	Possible error causes	Possible error remedy
10	Sub program not available	Program error	
11	CPU watchdog run out on CPU- No. <A>, CPU No. <A> does not report	System overload, CPU -No. <A> defective	Check CPU -No. <A>
12	Illegal type byte in program directory, wrong EPROM, EPROM defective	Program memory board is defective, see also No. 70	Check program memory board, see also No. . 70
13	CRC- error (Check sum error), EPROM defective	Program memory board is defective	Check program memory board
14	Task is already running	Program error	
15	Program not available	Program error	
16	System watchdog run out	System overload	
17	non -permissible CPU- time, Sum too large	Program error	
18	Math overflow	Program error	
19	Division by zero	Program error	
20	Task watchdog run out, Addressing error	System overload, program error	
21	Illegal Opcode Trap <X> = PC, <A/B> = Opcode,	Program error, Address error	Check CPU
22	Task not active	Program error	
23	No running program	Program error	
24	Task exclusively covered during initialization	Program error	
25	Realtime control block not free	Program error	
26	Regulator control block not free	Program error	
27	Test value too small, Short circuit after (-)	Program error	
28	Test value too large, Short circuit after (+)	Program error	
29	Analog digital converter (ADC) works out of tolerance, ADC defective, only occurs in test program	CPU defective	Check CPU
30	Non- permissible bank address	Program error	
31	Error number, occurs only in test program	Program error	

<A> means: Contents of register A, PC = Program counter

FATAL SYSTEM ERROR			
No.	**Error description for Service Dept. possible error causes**	**Possible error causes**	**Possible error remedy**
41	Math processor error, Overflow, underflow, division by 0, root of negative number (in length format are in the user program counter in the X-register), Possible math processor defective	Program run error, unforeseen sensor signals possible increment counter error Possible CPU defective	Error in group 0, possibly reboot by pulling the power pack of group 0, then carry out all basic adjustments again, Check CPU
42	Execution time for "PI" too long (Math processor defective)	CPU defective	Check CPU
43	Memory overflow in trace program	Occurs only in test program	
44	Output not active (TKIO)	Program error , (see also error No. 70)	(see also Error No. 70)
45	Parameter undefined (Input inactive) (TKIO)	Program error , (see also error No. 70)	(see also Error No. 70)
46	Invalid regulator parameter	System overload	
47	Realtime control not available	Program error	
48	Realtime control block not active at stop	Program error	
50	File not available, wrong EPROM 0 or EPROM 1 on group 0 CPU0	Program error , (see also error No. 70)	(see also error No. 70)
51	Logical file already open	Program error , addressing error	Check CPU
52	File not open at ”CLOSE”	Program error , (see also error No. 70)	
53	System text not available, wrong EPROM 0 (= E0) on group 0 CPU0 (= G0 CPU0)	Program error , (see also error No. 70)	(see also error No. 70)
54	System test mask not available, wrong EPROM 0 on group 0 CPU0	Program error , (see also error No. 70)	(see also error No. 70)
55	"user defined symbol" not present, wrong EPROM 0 on group 0 CPU0	Program error , (see also error No. 70)	(see also error No. 70)

TKIO = Table Configuration Inputs + Outputs

FATAL SYSTEM ERROR

No.	Error description for Service Dept., possible error causes	Possible error causes	Possible error remedy
56	Invalid sign in symbol description wrong EPROM 0 on group 0 CPU0	Program error, (see also error No. 70)	(see also error No. 70)
57	Default load capacity chart is missing, wrong EPROM 0 on group 0 CPU0	Program error, (see also error No. 70)	(see also error No. 70)
58	End stage is defective: <B> = channel = outgoing number, <X> = current, <Y> = voltage	Refeed into outlet with No. <B>, possible short circuit or relay contact is sticking	Check wiring, check CPU
59	Sub program not reentered	Program error	
60	Transfer error SCI	CPU defective, Monitor defective or connection defective (possible initialization error 9 will follow)	Check monitor, check monitor connection to CPU, check CPU
61	SCI-BREAK!!	see error No. 60	see also error No. 60)
62	SCI not connected	Program error on CPU (CPU-No. $\neq 0$)	
63	Monitor error in operation	see error No. 60	see also error No. 60)
64	No permissible error number	Program error	
65	unauthorized address at bus transfer (PPI)	Program error	
66	ADC works out of tolerance → Analog digital converter (ADC) is defective	CPU defective	Check CPU
67	Math processor not available	CPU defective	Check CPU
68	Unauthorized WAKE-UP-INT PPI→ LCA-Logic defective	CPU defective, power pack defective	Check CPU, check power pack
69	Transfer error PPI (Data error at data transfer between 2 CPUs or power pack)	CPU defective, power pack defective	Check CPU, check power pack
70	Different Struktur version	Program error, wrong EPROM , (occurs during EPROM change)	In case of EPROM- change: use correct EPROMs , check program memory board
71	"STRUKTUR" file is missing (different soft ware versions)	see error No. 70	see also error No. 70)
72	Struktur entry not correct (3 * not relevant)	see error No. 70	see also error No. 70)

PPI = Parallel Peripheral Interface
SPI = Serial Peripheral Interface
SCI = Serial Communications Interface
LCA = Logic Cell Array

FATAL SYSTEM ERROR			
No.	**Error description for Service Dept., possible error causes**	**Possible error causes**	**Possible error remedy**
73	Interpreter error	Program error	
74	Error at ASCII → Binary conversion	Program error	
75	SPI- Error, maybe component group carrier is defective	CPU defective	Check CPU
76	Component on power pack input is missing	Program error, wrong or no common memory board in power pack	Check power pack
77	Error in BAF call up <X>=BAF-No., <Y>=Interpreter Pointer <A/B>=Error Code	Program error	
78	Unauthorized function code for entry into error stack (for example get)	Program error	
79	No right to error stack (only CPU 0 is authorized)	Program error	
81	User Stack Overflow	Program error	
90	Error when coupling CPU to CPU via SCI	one CPU is defective, On cranes with 2groups: connection between group 0 and group 1 is defective.	Check CPUs , Check connection between group 0 and group 1

FATAL SYSTEM ERRORS				
No.	**Sub error No. <A/B>**	**Error description for Service Dept., possible error causes**	**Possible error causes**	**Possible error remedy**
94	xxxx	Transfer error PPI (sub error number is given in <A/B> in long format , <X> = UP Address, where error occurred <Y> =KGAC, KGAB momentary bus address + status more detailed description below	The error is differentiated with <A/B> by the given sub error number, "x" stands for any number, more detailed description below	See below
94	20xx	WAKE-UP Logic is erroneous → LCA defective	CPU defective, Power pack defective	Check CPU, check power pack
94	21xx	TIMEOUT - PPI-Bus not available → maybe LCA defective	System overload, maybe CPU defective, maybe power pack defective	Check CPU, check power pack
94	22xx	PPI-Bus busy, slave does not report, <B> =KGBS Status	The CPU recognizes that the other CPU I missing, program error	Check CPU
94	23xx	TIMEOUT-Data cycle LOW-BYTE-READ → LCA on one CPU or on power pack defective	CPU defective, Power pack defective	Check CPU, check power pack
94	24xx	TIMEOUT-Data cycle HIGH-BYTE-READ → LCA on one CPU or on power pack defective	CPU defective, Power pack defective	Check CPU, check power pack
94	25xx	TIMEOUT-Data cycle LOW-BYTE-WRITE → LCA on one CPU or on power pack defective	CPU defective, Power pack defective	Check CPU, check power pack
94	26xx	TIMEOUT-Data cycle HIGH-BYTE-WRITE → LCA on one CPU or on power pack defective	CPU defective, Power pack defective	Check CPU, Check power pack
94	27xx	READ- error (wrong date)	occurs only in test	-
94	28xx	WRITE- error (wrong date)	occurs only in test	-
94	29xx	Driver interrupt still enabled	Program error	
94	2Axx	Driver busy too long <B> =Task number (too many transfers per global bus)	System overload	Check CPU
94	2Bxx	Sub program call-up without PAGE preselection	Program error	
94	2Cxx	IRQ-Interrupt no source <B> =KGBS Status positive Logic → LCA defective	CPU defective, power pack defective	Check CPU, check power pack

PPI = Parallel Peripheral Interface
LCA = Logic Cell Array

4.3.2 Other system errors

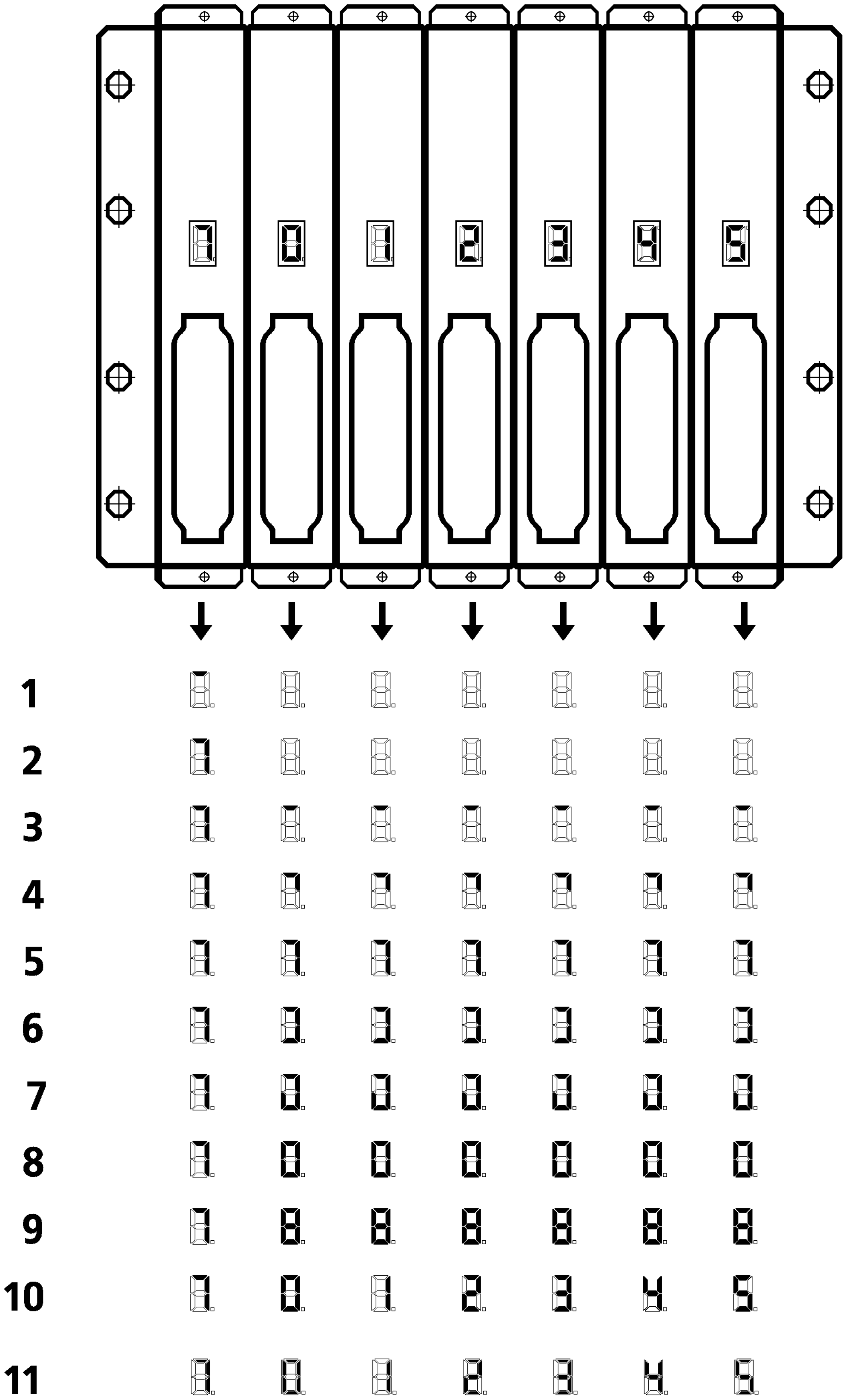
Other system error differ from fatal system errors only that they are not shown on the monitor. Due to the type of error, nothing can be displayed on the monitor
Appearance of other system errors on the monitor:
- screen picture stops
- screen gets dark
- picture is distorted

Other system errors can also be secondary errors to other errors.
If the screen remains dark, then the error can only be defined via the 7- segment indicator on the CPU.
When looking for errors, proceed as for fatal system errors (see section 4.4)

The following chart describes other system errors according to CPU indicators. The chart also shows possible error causes and remedies.

Other system errors

CPU indicator	Indication	Error description for Service Dept., possible error causes	Possible error causes	Possible error remedy
F	static	Breakpoint erreicht	occurs only in test program	
6.	static	System cell destroyed + Global reset	Program error	
8.	static	User program runs under locked interrupt + Global reset	Program error	
o.	static	Watchdog occurred + Global reset	Program error, CPU defective	Check CPU
≡.	static	recursive error PPI-Bus driver + Global Reset (possibly interrupt logic defective)	Program error, system overload, CPU defective	Check CPU, Check power pack
u.	static	Clock Monitor Fail + Global Reset, Oscillator defective, CPU defective	CPU defective	Check CPU



184827

4.4 Localizing and fixing basic component group errors (=clear power pack errors, initialization and system errors)

If one of these errors occurs during LICCON start up or in operation (indication as described in section 4.1 - 4.3), then note the following:

- The indicated error can be caused by a bad contact or fluctuations in power supply and for that reason, may only occur for a limited time.
- The error indicated on the screen can be a follow- up error and it also can have a follow- up error, which is shown on the CPU displays.
- The two basic component groups are working independent of each other regarding errors. Each group shows their clear network errors, initialization and system errors on the connected monitor. Errors on one basic component group can have no follow- up errors on the other basic component group.

4.4.1. Error localization

Proceed as follows:

- Turn the LICCON off and restart after waiting at least 5 seconds.
  Repeat this procedure up to 3 times (after 3 tries, wait 2 minutes).
  If the cause was a hardware error, then it will probably be recognized during initialization as an initialization error. Initialization errors can only be shown on the monitor if they are found on a CPU that is connected to a monitor .

- If the same error appears several times, turn the LICCON off.

- Open the control box on the slewing platform, so that the CPU indicators can be checked.

- One person must start the crane again from the crane cab and the second person must monitor the CPU indicators of the basic component group in the control box.
  The continuing display should be as shown in the left illustration:

1. Power pack shows one dash, CPU indicators are dark, which means the control is turned off.
2. Power pack shows "7" , CPUs are dark. This indication is shown when the crane is turned on.

3.-9. Power pack shows"7". During LICCON rebooting, to indicate the continuing successful self test, the various segments of the CPU indicators are shown one after the other, see left illustration. It is possible that some CPUs, especially the ones with monitor, might boot up slower.

10. After rebooting, which means after completion of the initialization error test, every CPU shows the CPU number.
11. After a few seconds, every CPU shows the CPU number only with half of the intensity level. Now begins the test for system errors .

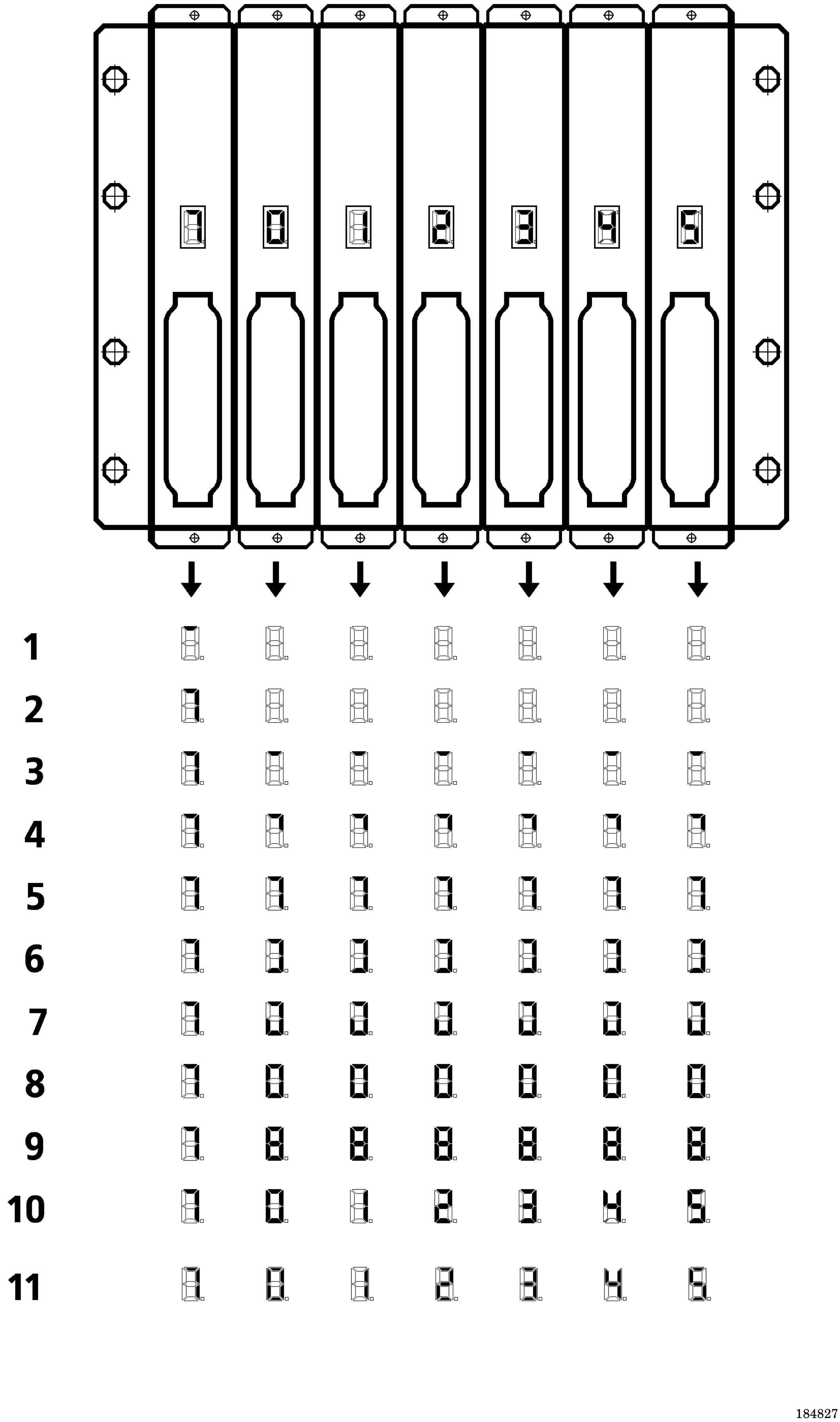
Error diagnosis:
First check the power pack indication. If the power pack indication does not match the indication, as it should be, then there is probably a **clear power pack error.**

If the power pack does not show "7" , then it is probably a power pack error. → Check power supply for LICCON, → Check power pack, see description in section 4.4.2.

If the power pack shows "7" and the CPU indicators are all dark, then the error can be on one CPU or a program memory board in this group. → check all CPUs , see description in section 4.4.3.

If the power pack shows "7" and one CPU indicator remains dark, then the error can be on this CPU or its program memory board. → Check all CPUs , see description in section 4.4.3.

Generally the following applies: The CPU, which first deviated from the nominal indicator sequence has found the error. It is probable that the error (hardware, software, inputs, outputs) is on this CPU.


1
2
3
4
5
6
7
8
9
10
11
184827

If the first deviating CPU indication occurs before the booting process is finished, which means it occurs before all CPUs in this group have shown their CPU number for the first time (=Condition No. 9), then an **initialization error** occurred. The first deviating CPU indication is a blinking sign, which is shown in section 4.2 in the chart. Possible remedies to fix the error are listed in the chart - Initialization errors, section 4.2 . The measures are described in more detail below in section 4.4 .

If the first deviating CPU indication occurs before the booting process is finished, which means this indication occurs after all CPUs in this group have displayed their CPU number for the first time (condition No. 9), ten a **system error** has occurred.

If the first deviating CPU indication is a static "E", as shown in section . 4.3.1 in the chart, then this error is probably a fatal system error. Possible remedies to fix the error are shown in the FATAL SYSTEM ERROR chart in section 4.3.2. Measures to be taken are described below in section 4.4 in more detail.

If the first deviating CPU indication is a static or blinking sign, as shown in the chart in section 4.3.1, then the error is probably one of the "other system errors". Possible error remedy measures are listed in the chart. The Measures to be taken are described below in more detail.

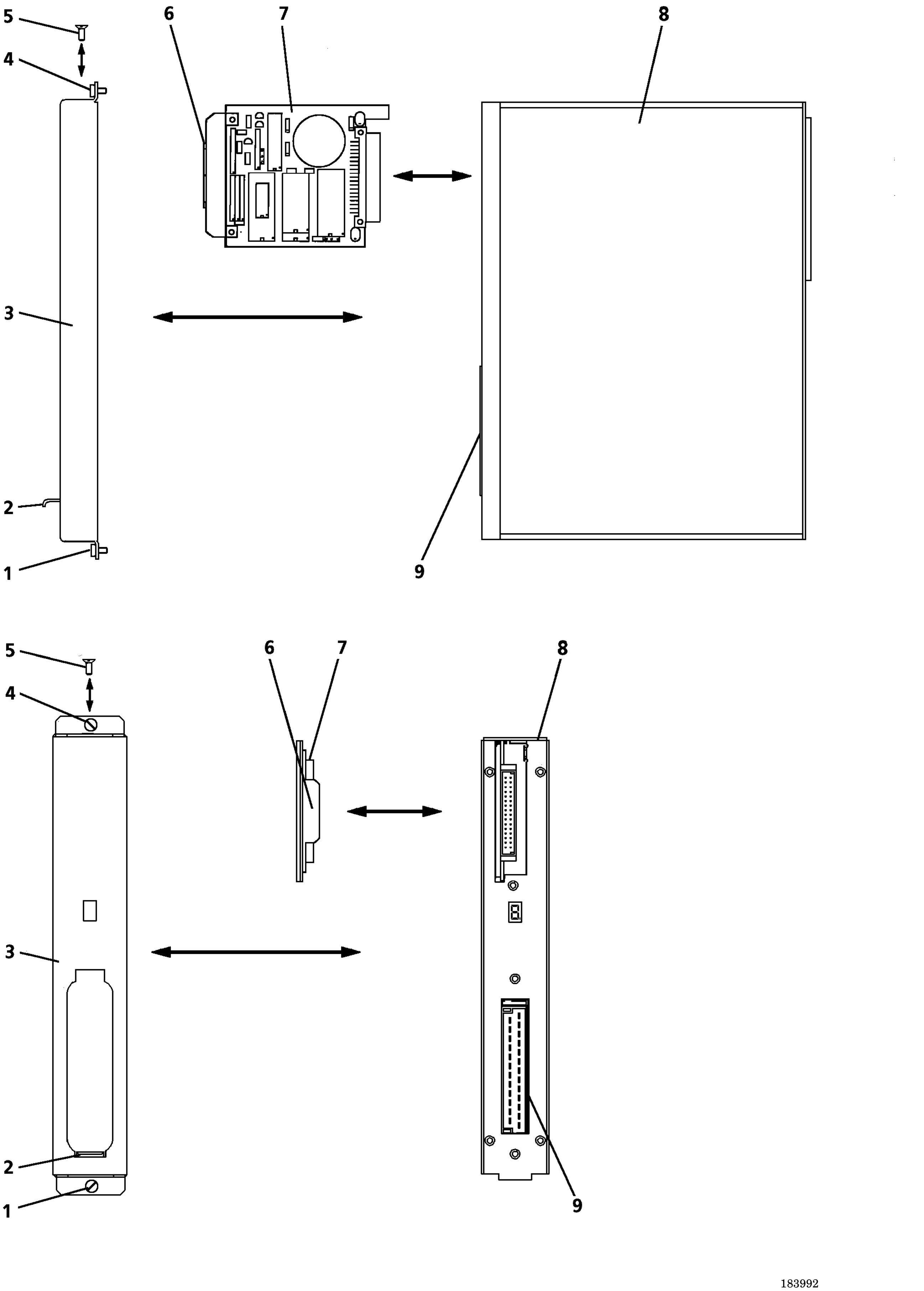
The possible error causes and remedies listed in the chart cannot be complete, due to the complexity of the system. The charts should only given the crane operator clues, in some cases, he is able to fix the system without outside help.

The terms used in the chart have the following meaning:

Program errors:	Due to an error, there is a problem with program execution.
System overload :	Due to an error, the maximum permissible times for program run, data transfer, etc. cannot be adhered to any longer.

In case of a clear power pack error, initialization error or system error, you must contact LIEBHERR Service and inform them about the error, even if the crane operator was able to fix the crane without outside help.

D A N G E R: **Working with the crane without the LICCON is technically possible. If the LICCON is not functioning due to a basic component group error or a monitor error, then, with utmost care, the crane can be operated in emergency control. In this case, the crane operator must carry the full responsibility. The crane operator may not use emergency control if he is not aware of the full range of the associated monitoring duties and dangers.**
Emergency operation is described in the crane's operation manual. The regulations and danger notes must be strictly observed!
There is a great danger of causing a serious ACCIDENT!


5
4
6
7
8
3
2
1
9
5
4
6
7
8
3
2
1
9
183992

4.4.2 Check power pack

The illustration on the left shows the power pack when it is removed. The side view of the parts is shown on top. The parts are shown in the lower section as seen when looking into the control box.
The power pack can be easily checked and exchanged by the crane operator, using simple tools.
When checking the power pack, proceed as follows:

- Turn the crane off,

Check if the power pack (8) and the inserted common memory board (7) are pushed in tightly. To check, remove and reinstall the power pack as well as the common memory board (7) (= check common memory board):

To remove the power pack
- Pull the power pack plug from the socket (9) . To do so, push the locking springs (2) on the front cap (3) slightly down with a screw driver, release it and pull the plug out at the same time.
- Turn out the two screws (1) and (4) . The screws remain on the front cap (3).
- Pull out the power pack insert (power pack with front cap and common memory board) .
- Release the screw (5) on the front cap (3) of the power pack and remove the front cap (the front cap (3) is attached on the bottom of the power pack (8)).
- Pull out the common memory board (7) on the retainer bracket (6) from the power pack (8) .

To install the power pack
- Hold the common memory board (7) on the retainer bracket (6) push it into the power pack (8), push it in slightly, then all the way.
- Install the front cap (3) : attach the front cap on the bottom of the power pack (8) and attach it with the screw (5) on top on the power pack
- Push the power pack into the basic component group carrier, push it in slightly, then all the way.
- Attach the power pack insert on the basic component group carrier with screws (1) and (4) on the front cap (3) .
- Insert the power pack plug into the socket (9). Make sure that the locking spring (2) engages and fulfills its function .

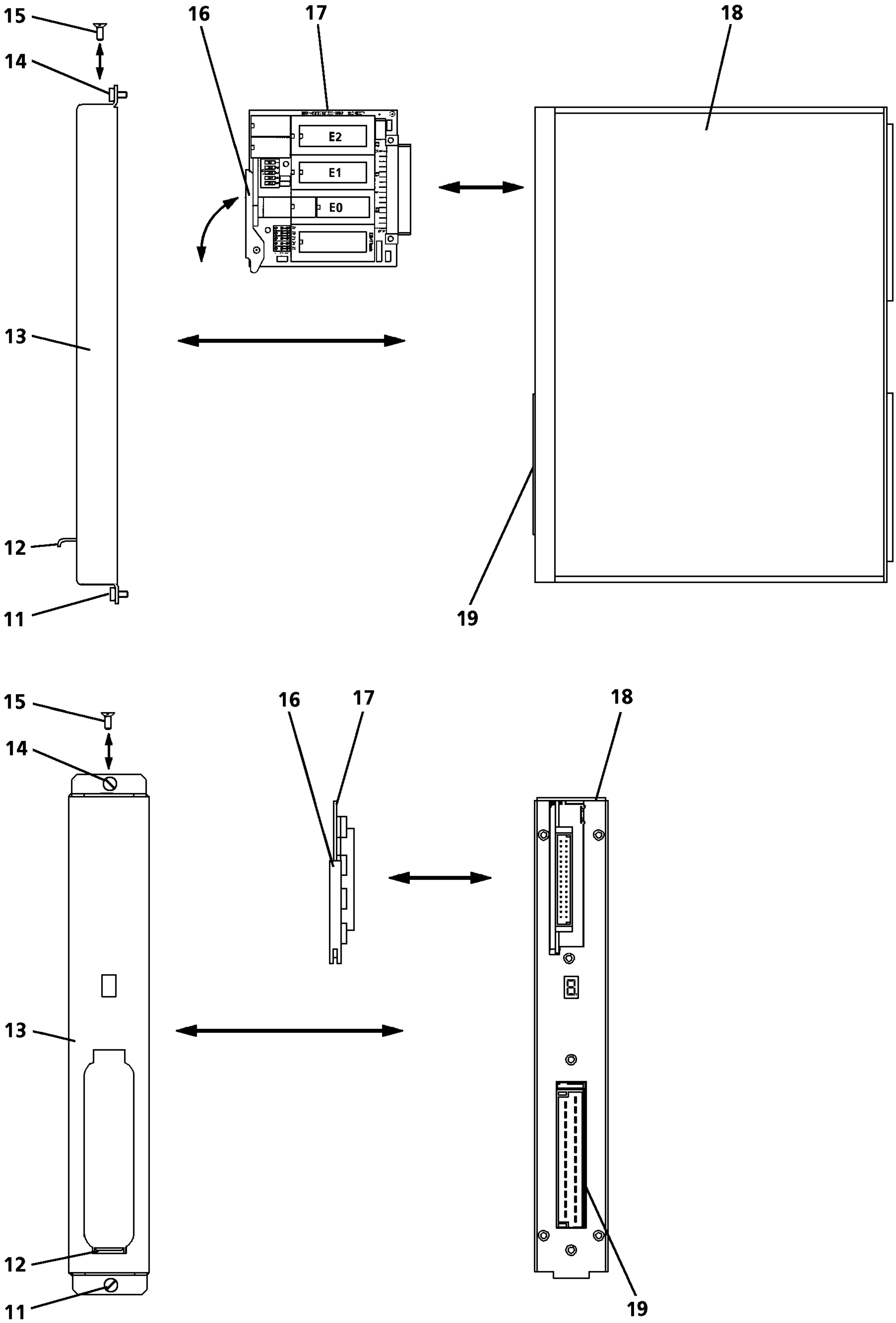
- Start the crane and check, if the error occurs again.

If the previous error appears again, then replace the previous power pack with a replacement pack:

Remove the power pack (as described above)

Install the power pack
- Hold the common memory board (7) on the retainer bracket (6) , insert it into the new power pack (8) , push it in slightly, then all the way.
- then install this power pack into the basic component group carrier as described above.

C A U T I O N: **When the power pack plug is removed from the socket (9) , the stand- by power supply for the component group is interrupted, which means, the system reboots . Either the stored equipment configuration data or the adjusting data will be lost . When inserting the common memory board and the power pack, make sure not to damage the plug connections. Push them in slightly at first, then all the way. When inserting the power pack plug into the socket (9) make sure that the locking spring (2) engages and fulfills its function .**



183993

4.4.3 Check the CPU

The illustration on the left shows the CPU when it is removed. The side view of the parts is shown on top. The parts are shown in the lower section as seen when looking into the control box.
The CPU can be easily checked and exchanged by the crane operator, using simple tools.
When checking the power pack, proceed as follows:

- Turn the crane off,

Check if the CPU (18) and the inserted program memory board (17) are pushed in tightly. To do so, remove and reinstall the CPU and the program memory board (17) (=check the program memory board):

To remove the CPU
- Pull the outgoing plug from the socket (19). To do so, To do so, push the locking springs (12) on the front cap (13) slightly down with a screw driver, release it and pull the plug out at the same time.
- Turn out the two screws (11) and (14) . The screws remain on the front cap (13).
- Pull out the CPU insert (CPU with front cap and program memory board) .
- Release the screw (15) on the front cap (13) of the CPU and remove the front cap (the front cap (13) is attached on the bottom of the CPU (18)).
- Pull out the program memory board (17) on the retainer bracket (16) from the CPU (18) .

To install the CPU
- Hold the program memory board (17) on the retainer bracket (16) push it into the CPU (18), push it in slightly, then all the way.
- Install the front cap (13) : attach the front cap on the bottom of the CPU (18) and attach it with the screw (15) on top on the CPU
- Push the CPU into the basic component group carrier, push it in slightly, then all the way.
- Attach the CPU insert on the basic component group carrier with screws (11) and (14) on the front cap (13) .
- Insert the plug into the socket (19). Make sure that the locking spring (12) engages and fulfills its function.

- Start the crane and check, if the error occurs again.

If the previous error appears again, then replace the previous CPU with a replacement unit:

Remove the CPU (as described above)

Install the new CPU
- Hold the program memory board (17) on the retainer bracket (16) , insert it into the new CPU (18) , push it in slightly, then all the way.
- then install this CPU into the basic component group carrier as described above.

C A U T I O N: **When the CPU is removed from the basic component group carrier, the stand- by power supply for the CPU is interrupted, which means, the system reboots. Either the stored equipment configuration data or the adjusting data will be lost. These values must be reentered.**
When inserting the program memory board and the CPU, make sure not to damage the plug connections. Push them in slightly at first, then all the way.
When inserting the plug into the socket (19) make sure that the locking spring (12) engages and fulfills its function .

5 Application errors

Application errors are errors which can occur during crane operation due to inadequate crane assembly, erroneous operation or external influences.

The application errors displayed on monitor 0 are differentiated as follows:

1. Application error on monitor 0 shown without an error number
2. Application error on monitor 0 shown with an error number

Errors ,which can occur due to crane operation, are differentiated:

a) Errors which cause shut off .
   The shut off is always shown through the shut off symbol.

b) Error which cause no shut off.
   In this case, a warning is given to the crane operator .

5.1 Application errors without an error number

Cold start

An error without error number, which can already be recognized in the equipment configuration view is the so-called "Cold start".
A cold start is a new LICCON system start- up after a data loss in the battery buffered data memory bank of the CPU's.

This data loss in the CPU occurs,

- If the CPU is pulled from the basic component group,
- if the power pack is pulled from the basic component group,
- if the power supply to the LICCON system is interrupted (for example when replacing the battery or when loosening the electrical connection between the front and rear slewing platform section during crane disassembly).

The following occurs in the event of data loss:

- The old operating mode preselection group is lost. In the operating mode preselection view, the 1st operating mode preselection group is dubbed in.
- The old equipment configuration is lost. The 1st equipment configuration is set in the equipment configuration.
- In the displayed equipment configuration, the reeving is set to "0" .
- The parameters of the "CONTROL" program are lost
  This means that all winches are actuated, even those, which were previously locked! In addition, an initialization value for the maximum slewing speed will be set!
- The increment counter for the affected CPU's is set to "0". For that reason, the absolute winch path measurement and the current winch spool radius are lost.

Note: The winch indicator is running, but it is wrong!
In addition, the increment counter for the slewing gear is set to "0". The slewing angle indicator of the slewing gear is running, but it is no longer absolute.

Measures to carry out in the event of a cold start data loss :

- Assure power supply for all power packs and CPU's
- Reset lost parameters in the "CONFIGURATION " and "CONTROL" program
- Readjust the winches
- Readjust the slewing gear

CAUTION
There are three dangerous operating conditions, which are indicted through a blinking symbol, but **without an Error No.**

- **Overload** LICCON shuts off
- **Hoist limit switch actuated** LICCON shuts off
- **max. permissible winch velocity has been exceeded** LICCON does not shut off

see description in chart

Error No.	Error description	Possible cause of error	Possible error remedy
No number	Overload -STOP- symbol blinks-	The permissible "maximum load according to the load capacity chart and reeving" for the corresponding equipment configuration and operating mode has been exceeded.	The remedy of the overload condition depends on how the overload occurred and each case must be decided by the crane operator , depending on the situation. Generally, only that crane movement may be carried out by bypassing the overload safety device which is opposite the one that caused the overload shut off. Take the following measure, among others: a) Set down the load with the hoist gear. b) Release luffing up by an added switch on the left arm rest, and thereby reduce the load momentum. **There is a great danger of causing an accident!**
No number	Hoist limit switch has been actuated -Hoist limit switch symbol blinks-	The hook block has raised the hoist limit switch and thereby actuated the hoist limit switch.	On the corresponding winch, lower the hoist gear until the hook block does no longer touch the hoist limit switch weight. Make sure to monitor the hook block. It must be assured that the hook block does not move further upward. **There is a great danger of causing an accident!**
No number	Wind sensor symbol is blinking.	The maximum permissible wind speed has been exceeded.	If possible, equip and set an operating mode or an equipment configuration which has a more favorable load capacity chart, otherwise cease crane operation. If necessary, take down the crane equipment. **There is a great danger of causing an accident!**

5.2 Application errors with an error number

The error number is shown in the function key symbol ”ERROR” via the function key F8 in the equipment configuration view or via F6 in the operating view.

The functions of the following sensors are monitored.

- Hoist limit switch
- Angle sensor
- Pressure sensor
- Length sensor (telescopic cranes only)
- Force test boxes

The limits of the sensors are checked by several programs in the microprocessor CPU’s for the following limit values:

- Broken wire (Lower threshold for the sensor input voltage: approx. 2,0 V)
- Short circuit after (-) ground (Lower threshold for the sensor input voltage: approx. 2,0 V)
- Short circuit after (+) system voltage (Upper threshold for the sensor input voltage: approx. 10,0 V)

(Lower threshold for sensor input voltage : approx. 2,0 V)

- Short circuit after (-) ground
- Short circuit after (+) system voltage.

The following kinds of application errors are differentiated:

- Errors due to a technical defect
- Errors due to crane operation
- Errors due to external influences

With exception of **Error No. 000**, an acoustical signal can be heard for every error report, which can be turned off via the function key F8 .

The charts on the following pages show all possible application errors, which can occur and which are indicated with an error number on monitor 0, along with a short error description, possible error causes, depending on the type, and possible measures to fix the error.

The sequence of the error number represents the priority of the error. The higher the error number, the higher is the indication priority and the higher is the danger level caused by the error.

2 Error numbers for transmitters:	even number	= fallen below lower limit value
	uneven number	= upper limit exceeded

0 < Error number < 64 : no LML shut off
64 ≤ Error number : LML shut off = Shut off of any movement which increases load momentum.

Error number	Error description	Possible cause of error	Possible error remedy
000	Memory error in power pack	Memory card of another crane has been inserted. The power pack has been replaced. The crane is not yet cleared for initial service.	**!! C A U T I O N !!** **The load and radius indicators are not exact. The crane may NOT be fully loaded (utilized).** **The crane must be serviced by customer service personnel or must be reprogrammed.**
014	Analog slewing transmitter-value too small, slewing angle not set, (display inexact)	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
015	Analog slewing transmitter-value too large, slewing angle not set, (display inexact)	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
016	N-RP-1 *1 value too small (⇒display ???). (= W-RP right or N-RP)	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
017	N-RP-1 *1 -right, value too large (⇒display ???).	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
018	N-RFP-2 *2 - =W RP-left, value too small (⇒display ???).	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
019	N-RFP-2 *2 - =W RP-left, value too large (⇒display ???).	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.

*1 Fly jib - RP -1 = W - Relapse cylinder 1 (right) or N-relapse cylinder
*2 Fly jib - RP -2 = W - Relapse cylinder 2 (left)

Error No.	Error description	Possible cause of error	Possible error remedy
020	Test point 1 A, value too small (Guying, SA- Bracket, right)	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
021	Test point 1 A, value too large (Guying, SA- Bracket, right)	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
022	Test point 1 B, value too small (Guying, SA- Bracket, left)	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
023	Test point 1 B, value too large (Guying, SA- Bracket, left)	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
024	Test point 2 A, value too small (Guying, Luffing jib, right)	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
025	Test point 2 A, value too large (Guying, Luffing jib, right)	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
026	Test point 2 B, value too small (Guying, Luffing jib, left)	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
027	Test point 2 B, value too large (Guying, Luffing jib, left)	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
028	Test point 3 A, value too small (Derrick guying, right)	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.

*1 Fly jib - RP -1 = W - Relapse cylinder 1 (right) or N- relapse cylinder
*2 Fly jib - RP -2 = W - Relapse cylinder 2 (left)

Error number	Error description	Possible cause of error	Possible error remedy
029	Test point 3 A, value too large (Derrick guying, right)	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
030	Test point 3 B, value too small (Derrick guying, left)	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
031	Test point 3 B, value too large (Derrick guying, left)	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
035	Slewing angle horizontal<analog> and <increment> are uneven. The analog slewing transmitter is in the normal (mV) range, but the difference between the analog slewing transmitter and the incremental slewing transmitter for the slewing platform is more than 7°.	Incremental - slewing transmitter platform is defective. Adjustment of this incremental slewing transmitters defective.	Check incremental slewing transmitter - slewing platform and replace, if necessary. Check adjustment (note: in the operation view., the slewing angle is shown according to the incremental transmitter, it is adjusted with the analog slewing transmitter at 0° when slewing to the left.
036	Angle sensor , luffing jib, bottom, value too small	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective. Possible parity error, see note at the end of this chapter.	Check transmitter lines, replace transmitter, if necessary.
037	Angle sensor, luffing jib, bottom, value too large	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
038	Angle sensor, luffing jib Pulley head (top), value too small	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective. Possible parity error, see note at the end of this chapter.	Check transmitter lines, replace transmitter, if necessary.
039	Angle sensor, luffing jib pulley head (top), value too large	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.

Error No.	Error description	Possible cause of error	Possible error remedy
040	No default load chart in "Konf" defined	Memory error in EPROM program .	Have EPROM program reprogrammed and replaced at the factory.
041	Default operating mode not complete (load capacity chart or geometry data is missing!)	Memory error in EPROM program .	Have EPROM program reprogrammed and replaced at the factory.
042	No valid set up configuration in this load capacity chart	Memory error in EPROM program .	Have EPROM program reprogrammed and replaced at the factory.
050	In the set up program no load capacity chart is shown	In the set up program, no load capacity values are entered in the chart columns, because it was attempted to choose an non-permissible equipment configuration or because after the equipment configuration had been chosen via the function keys, the "ENTER" key had not been pushed yet.	Choose the correct equipment configuration via CODE or when selecting via the function keys, confirm selection with the "ENTER" key.
051	External occurrence is missing	The necessary limit switch information for the equipment configuration is missing.	Check transmitter lines, replace transmitter, if necessary.
052	Changing equipment configuration under load	An attempt was made to choose a new equipment configuration under load and the load is larger than 500 kg **and** the radius is larger than 20%.	Set down the load or turn the system off and start again. After turning the system on, when confirming the 1st equipment configuration with "O.K." ,then it is permitted to do that even with a load. However, only the configuration, which was actually set up, may be entered!
056	Pressure sensor value - S- relapse cylinder too small	Broken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
057	Pressure sensor value - S- relapse cylinder too large	Short circuit against plus or transmitter is defective.	Check transmitter lines, replace transmitter, if necessary.
064	Total momentum < half empty momentum, boom touches	The boom has been relieved by placing it down, or the pull test bracket is defective	Clear the boom or replace the pull test bracket

Error No.	Error description	Possible cause of error	Possible error remedy
065	LML- core calculation routines are shut off. If the LICCON brakes off after a fatal system error 41/1/- , then all programs are at a standstill and the LICCON cannot be used for diagnosis. This error is caused by a calculation error in the LML core routines, whereby the cause is most often a transmitter error. To prevent the above system error, push the program key $P0_0$ “SET UP" after the 1st sound of the horn. Then the LML does not run through the core routines and also gives no radius, load weight measurement or maximum load capacity. Also the winch indication on monitor 1 does not run any more. The LICCON creates a STOP. However, with installation, the crane can be driven and all LICCON functions, such as test system, can be chosen. **DANGER:** **LICCON safety device is out of order.**	After the 1st sound of the horn, the $P0_0$ key (Equipment set up program) has been pushed. Input signal displayed only and LMB outputs displayed with LMB stop	Start the crane again .
079	Adjusted operating mode / boom configuration is not ok.The crane is not set up completely, i. e. not all boom sections or B/BW, which are part of the selected operating mode are installed on the crane. This is the normal installation condition of the crane during set up or take down. Compare also ERROR 80 and 200	1.The crane is not yet fully equipped with all sections, according to the selected operating mode. (Crane in installation condition or operating error). 2. One input signal for installation condition is wrong (Error on the crane).	1.Install all sections, which are required for the chosen operating mode or set the chart to the current set up condition of the crane. 2. Check the plug connections of the attachment sections and reestablish connection.

Error No.	Error description	Possible cause of error	Possible error remedy
080	Suspended ballast or counter-weight trailer are installed. However, the selected operating mode does not call for a suspended ballast or counterweight trailer. compare also ERROR No. 79 and 200.	Too many items are installed on the crane, according to the selected operating mode, 1. Operating error B/BW over-equipped. Example: SD mode is set and SDBw is installed. 2. input signal, for example, of the counterweight trailer (BW) inputs is not correct (broken wire) (= error on crane)	1. On the LICCON, set the correct operating mode, which conforms to the actual crane condition. 2. With the test system, check the input signals of the inputs: - BW1 not installed - BW2 not installed - B not installed check and fix the problem **Note:** If a crane was over-equipped, then it may be driven in installation mode.
120	Upper hoist limit switch "main boom " or "auxiliary jib of main boom " falls below the lower limit value	The hoist limit switch signal is below the lower limit value, the "switch open" signal is given. There is a broken wire or a short circuit after ground or parallel switch resistance in the hoist limit switch is interrupted	Fix line error or replace hoist limit switch
121	Upper hoist limit switch "main boom " or "auxiliary jib of main boom " exceeds the upper limit value	The hoist limit switch signal is above the upper limit value, the "switch closed" signal is given. There is a broken wire or a short circuit after Plus or serial switch resistance in the hoist limit switch is open.	Fix line error or replace hoist limit switch
122	Upper hoist limit switch "Lattice jib" or "auxiliary jib of main boom " falls below the lower limit value	The hoist limit switch signal is below the lower limit value, the "switch open" signal is given. There is a broken wire or a short circuit after ground or parallel switch resistance in the hoist limit switch is interrupted	Fix line error or replace hoist limit switch

Error No.	Error description	Possible cause of error	Possible error remedy
123	Upper hoist limit switch ”Lattice jib” or "auxiliary jib of main boom " exceeds the upper limit value	The hoist limit switch signal is above the upper limit value, the "switch closed" signal is given. There is a short circuit after Plus or serial switch resistance in the hoist limit switch is open.	Fix line error or replace hoist limit switch
135	Test point 1 A and 1B are not the same or both transmitters are defective	1. The permissible difference between test point 1A and 1B is larger than 15 tons, since both guyings are stressed differently or both test points are within the test range, but an error in the sensor electronic causes a deviating test result in one test point. 2. The error is also shown when both test point values are outside the test range of 2000 - 10000 mV .	Check sensor , replace if necessary. It is possible that both test points are not connected. **Note**: If both test points are within the test range, but both are uneven, than it is possible to continue working without LML stop by pulling the test point, which is erroneous. (See notes at the end of chapter) Depending on the test point, error 20 or 22 is shown.
136	Test point 2 A and 2B are not the same or both sensor are defective	1. The permissible difference between test point 2A and 2B is larger than 15 tons, since both guyings are stressed differently or both test points are within the test range, but an error in the sensor electronic causes a deviating test result in one test point. 2. The error is also shown when both test point values are outside the test range of 2000 - 10000 mV.	Check sensor , replace if necessary. It is possible that both test points are not connected. **Note**: If both test points are within the test range, but both are uneven, than it is possible to continue working without LML stop by pulling the test point, which is erroneous. (See notes at the end of chapter) Depending on the test point, error 24 or 26 is shown.

Error No.	Error description	Possible cause of error	Possible error remedy
137	Test point 3 A and 3 B are not the same or both sensor are defective	1. The permissible difference between test point 3A and 3B is larger than 15 tons , since both guyings are stressed differently or both test points are within the test range, but an error in the sensor electronic causes a deviating test result in one test point. 2. The error is also shown when both test point values are outside the test range of 2000 - 10000 mV .	Check sensor , replace if necessary. It is possible that both test points are not connected. **Note**: If both test points are within the test range, but both are uneven, than it is possible to continue working without LML stop by pulling the test point, which is erroneous. (See notes at the end of chapter) Depending on the test point, error 28 or 30 is shown.
147	Radius list shows incorrect entry	Memory error in EPROM program	Have the EPROM reprogrammed at the factory and replace it.
148	The current radius is smaller than the smallest radius.	Boom system is luffed up too far. No load capacity chart is available for this range.	Luff down carefully
149	The current radius is larger than the largest radius.	Boom system is luffed down too far. No load capacity chart is available for this range.	Luff up carefully.
150	The boom system is positioned in a prohibited boom position. or the derrick ballast is positioned at a prohibited radius position (only in operating modes with telescopable derrick ballast)	The boom position is determined by the angle of the main boom, possibly the angle of the luffing lattice jib. One or more of these criteria are not fulfilled. or the current derrick ballast radius is not within the permissible radius range of the selected load chart (only in operating modes with telescopable derrick ballast)	Reverse the last movement, which caused leaving of the last valid boom position. or set correct derrick ballast radius (only in operating modes with telescopable derrick ballast)
151	Programming error (unknown type of action on load capacity chart)	Memory error in the EPROM program.	Have the EPROM reprogrammed at the factory and replace it.
152	Chosen load capacity chart was not found because external signals changed.	A set up configuration is used, which requires an external limit switch signal (for example: 0 degrees to the back). This signal was changed during operation.	Reset the signal condition, or choose a load capacity chart, which does not require this signal (for example: slewing range 360 degrees)

Error No.	Error description	Possible cause of error	Possible error remedy
162	Angle sensor value - main boom pivot section falls below lower limit value	Angle sensor on section is defective or wire is broken Angle sensor base body main boom [mV] - VALUE TOO SMALL	Replace angle sensor or fix wiring defect. **Note:** If the angle sensor on the base body of the main boom is defective, then only the angle sensor on the pulley head of the main boom is used for calculation. Depending on the boom flexation, the radius calculation and the weight will be inaccurate (especially for the telescopic boom). (Also the access point of the main boom - RFP will no longer be correct). **Crane operation is at your own risk!**
163	Angle sensor value section main boom exceeds upper limit value	Angle sensor on section is defective or short circuit to plus Angle sensor base body main boom [mV] - VALUE TOO LARGE	Replace angle sensor or fix wiring defect. **Note:** See note for error number 162.
165	Difference between the angles sensor value main boom - basic body (bottom) and angle sensor value - main boom - pulley head (top) is too large	1. The permissible difference between the angles sensor main boom - basic body (bottom) and main boom - pulley head is larger then 15 degrees. Both test points are within the test range, but an error in the sensor electronic causes a deviating test result in one test point.	Check angle sensor **Note**: If both test points are within the test range, but both are uneven, than it is possible to continue working without LML stop by pulling the test point, which is erroneous. (See notes at the end of chapter)
168	Angle sensor - pulley head main boom has fallen below lower limit value. if angle indicator displays ??? in operating view,also 162 or 163 are shown	Angle sensor in pulley head is defective or broken wire Angle sensor pulley head main boom [mV] - VALUE TOO SMALL	Replace angle sensor or fix wiring defect. **Note:** If the angle sensor on the pulley head of the main boom is defective, then only the angle sensor on the base body of the main boom is used for calculation. Depending on the boom flexation, the radius calculation and the weight will be inaccurate (especially for the telescopic boom). **Crane operation is at your own risk!**

Error No.	Error description	Possible cause of error	Possible error remedy
169	Angle sensor - pulley head has exceeded upper limit value if angle indicator displays ??? in operating view,also 162 or 163 are shown	Angle sensor on pulley head is defective or short circuit toplus Angle sensor pulley head main boom [mV] - VALUE TOO LARGE	Replace angle sensor or fix wiring defect. **Note:** See note for error number 168.
180	Angle sensor - derrick has fallen below lower limit value	Angle sensor in pulley head is defective or broken wireBroken wire, short circuit against ground, transmitter supply is missing or transmitter is defective.	Replace angle sensor or fix wiring defect.
181	Angle sensor - derrick 1 has exceeded upper limit value	Angle sensor on pulley head is defective or short circuit to plus	Replace angle sensor or fix wiring defect.
182	Angle sensor values fly jib top and lower section are not the same	1. The permissible difference between angle sensors are larger than 15degrees, Both test points are within the test range, but an error in the sensor electronic causes a deviating test result in one test point. 2. The error is also shown when both test point values are outside the test range of 2000 - 10000 mV .	Raise luffing lattice fly jib or replace angle sensor or fix wiring defect 1.**Note**: If both test points are within the test range, but both are uneven, than it is possible to continue working without LML stop by pulling the test point, which is erroneous. (See notes at the end of chapter) Depending on the test point, error 36 or 38 is shown. 2.Check angle sensor and replace if needed. -may be the angle sensors are not connected
200	The crane is equipped with too many boom sections, the selected operating mode does not call for all these boom sections. Compare also ERROR No. 79 and 80. **D A N G E R: It is not permitted to install more boom sections than stated in the load capacity chart for the selected operating mode. For than reason, "Operating mode is not ok. is reported and all drive systems will be shut off. On the winches, master switch "?" is shown.**	1. At least one boom section (for example lattice main jib,relapse support or relapse cylinder of the main boom, derrick or fly jib) is installed, which does not belong to the selected LICCON operating mode. Example: S-operation is set and the jib is installed, or SN operation is set and the derrick is installed 2. The input signals for the installation condition is incorrect.	1. On the LICCON, set the correct operating mode, which conforms to the actual crane condition. 2. With the test system, check the input signals of the inputs -"lattice jib installed" -"derrick installed", and fix the problem If a crane was over-equipped, then it may not be driven, even in installation mode.

Error No.	Error description	Possible cause of error	Possible error remedy
202	RPW1* and 2* nominal pressure values are both in the permissible range, but RPW1 and 2 pressure is > than the permissible tolerance in (bar).	- not enough oil (or gas) has been added to one RP accumulator . - Oil (or gas) has escaped from one RP (leakage) - too much oil (or gas) is in the RP . - The sensor signal is incorrect.	- Check if enough or too much oil (or gas) is in the accumulators. - if necessary, check sensor
203	All RP pressure actual values are not in the permissible range at 1 RP: this RP is not in the permissible range, at 2 " RP: both RP are not in permissible range. ERROR No. 16 to 19 are overwritten.	- The sensor signals of all N-RP are incorrect. Broken wire, short circuit against ground or plus, transmitter supply is missing or transmitter is defective.	Check transmitter lines and if necessary check all N-RP- sensors
204	RPW-1 pressure actual value< minimum (low) pressure (bar) . The RP are oil and gas filled accumulators. They must always have a certain pressure ,to assure safety.The actual pressure must always be on the RP pressure characteristics. The LICCON monitors minimum and maximum pressure.´	- too little oil (or gas) is in the RP accumulators. - Oil (or gas) has escaped from the RP accumulators (leakage). - The sensor signal is incorrect.	- Check if enough oil (or gas) is in the accumulators. - check if oil or gas has escaped - if necessary, check sensor **DANGER:** **If the RP pressure is too low, there is a danger that the jib falls backward.**
205	RPW-1 pressure actual value > maximum (high) pressure (bar) . The RP are oil and gas filled accumulators. They must always have a certain pressure, to assure safety. The actual pressure must always be on the RP pressure characteristics. The LICCON monitors minimum and maximum pressure.	- too much oil (or gas) is in the RP accumulators. - The sensor signal is incorrect.	- Check if enough oil (or gas) is in the accumulators. - if necessary, check sensor. **DANGER:** **If the RPF pressure is too high,there is a danger that the RP accumulator or the NA - bracket I will be destroyed.**

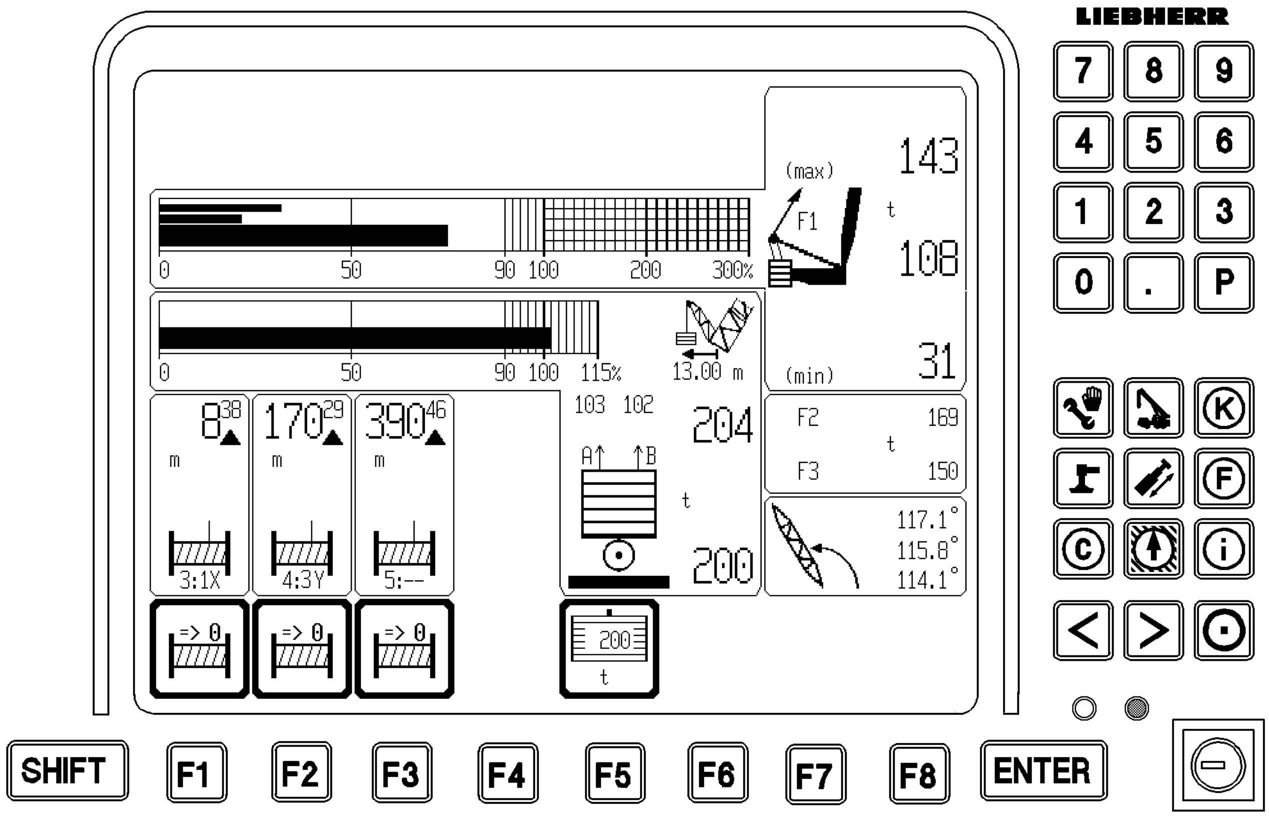
* **Note:** N = fly jib (light jib sections)
W = fly jib (heavy jib sections)
N - RP -1 = W - relapse cylinder 1 (right) or N - relapse cylinder
N - RP -2 = W - relapse cylinder 2 (left)
One relapse cylinder (RP) - RPW1(N) - is installed in N- fly jib, only
Two relapse cylinders (RP) - RPW1(N) right side and RPW2 left side - are installed in W-fly jib

Error number	Error description	Cause of error	Elimination of error
206	RPW2 pressure actual value < minimum (low) pressure (bar). The RP are oil and gas filled accumulators. They must always have a certain pressure ,to assure safety.The actual pressure must always be on the RP pressure characteristics. The LICCON monitors minimum and maximum pressure.	- too little oil (or gas) is in the RP accumulators. - Oil (or gas) has escaped from the RP accumulators (leakage). - The sensor signal is incorrect.	- Check if enough oil (or gas) is in the accumulators. - check if oil or gas has escaped - if necessary, check sensor. **DANGER:** **If the RP pressure is too low, there is a danger that the jib falls backward.**
207	RPW2 pressure actual value > maximum (high) pressure (bar). The RP are oil and gas filled accumulators. They must always have a certain pressure, to assure safety. The actual pressure must always be on the RP pressure characteristics. The LICCON monitors minimum and maximum pressure.	- too much oil (or gas) is in the RP accumulators. - The sensor signal is incorrect.	- Check if enough oil (or gas) is in the accumulators. - if necessary, check sensor. **DANGER:** **If the RP pressure is too high,there is a danger that the RP accumulator or the NA bracket I will be destroyed.**
241	Error number for overflow /under flow, i.e calculation with a number which is either too high or too low.	1. the entered reeving no. is too small (operating error) 2. sensor signal of one pull force pulley is too large 3. computer memory error or access error 4. program sections to not fit or error number for root from negative number (crane error)	1: check if the correct hoist reeving no. has been set. 2: check if the force and angle sensor show values which are too high, check sensor, if necessary, otherwise, check the error address with the LICCON test system, in case of ERROR 241, on monitor 0 it is shown in register 29 (R29) on CPU 0, in case of ERROR 241 on monitor 1 it is shown in register 29 (R29) on CPU 1. Write down the error number and the error address and selected operating mode and call Liebherr Werk Ehingen (TBS) Error 241 will only be deleted, if the cause of the error is taken care of and the set up program is confirmed again with "OK":

Error No.	Error description	Cause of error	Elimination of error
245	MEMORY ERROR or program sections do not fit together (are used several times).(Error may not occur during operation). **DANGER:With this error crane operation is forbidden.**	Memory error or program sections do not fit together	Write down the error number and the selected operating mode and call LIEBHERR-WERK EHINGEN (TBS)
248	Main boom is installed and not pinned and locked. **Danger:** **After pinning the main boom, the dummy plug must be changed over, so that the main boom is not unpinned inadvertently during operation.**	1. Plug has not been changed over. 2. input signal from one of the inputs "lattice boom installed", or "boom pinned and locked" are not correct	1.Changed over plug 2. Check input signal from one of the inputs - "lattice boom installed" - "boom pinned and locked"
254	Interpolation error determine of the max. load	Data error in EPROM	Determine condition of crane (angle, equipment configuration and load) and forward this information to Liebherr-Werk Ehingen GmbH . Replace EPROM .

Parity error
In case of all lower limit value error of angle sensors , it is also possible that a parity error occurred. In case of a parity error, the sensor current is 2 mA $\pm$ 10%. This corresponds to a voltage of 1 V $\pm$ 10% on the LICCON intake and in the test system.
The parity error is stored in the sensor and is only then reset if the error no longer occurs or the crane control is turned on and off again. The parity error reoccurs only at a certain angle position.

1


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
K
F
C
i
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
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

188681

6. Application errors displayed from monitor 1

Application errors are errors which can occur during crane operation due to inadequate crane assembly, erroneous operation or external influences.

The application errors displayed on monitor 1 are differentiated as follows:

1. Application error on monitor 1 shown without an error number
2. Application error on monitor 1 shown with an error number

Errors ,which can occur due to crane operation, are differentiated:

a) Errors which cause shut off .
   The shut off is always shown through the shut off symbol.
b) Error which cause no shut off.
   In this case, a warning is given to the crane operator .

Abbreviations used in this chapter:

G0 = Group 0
RFP = Relapse cylinder

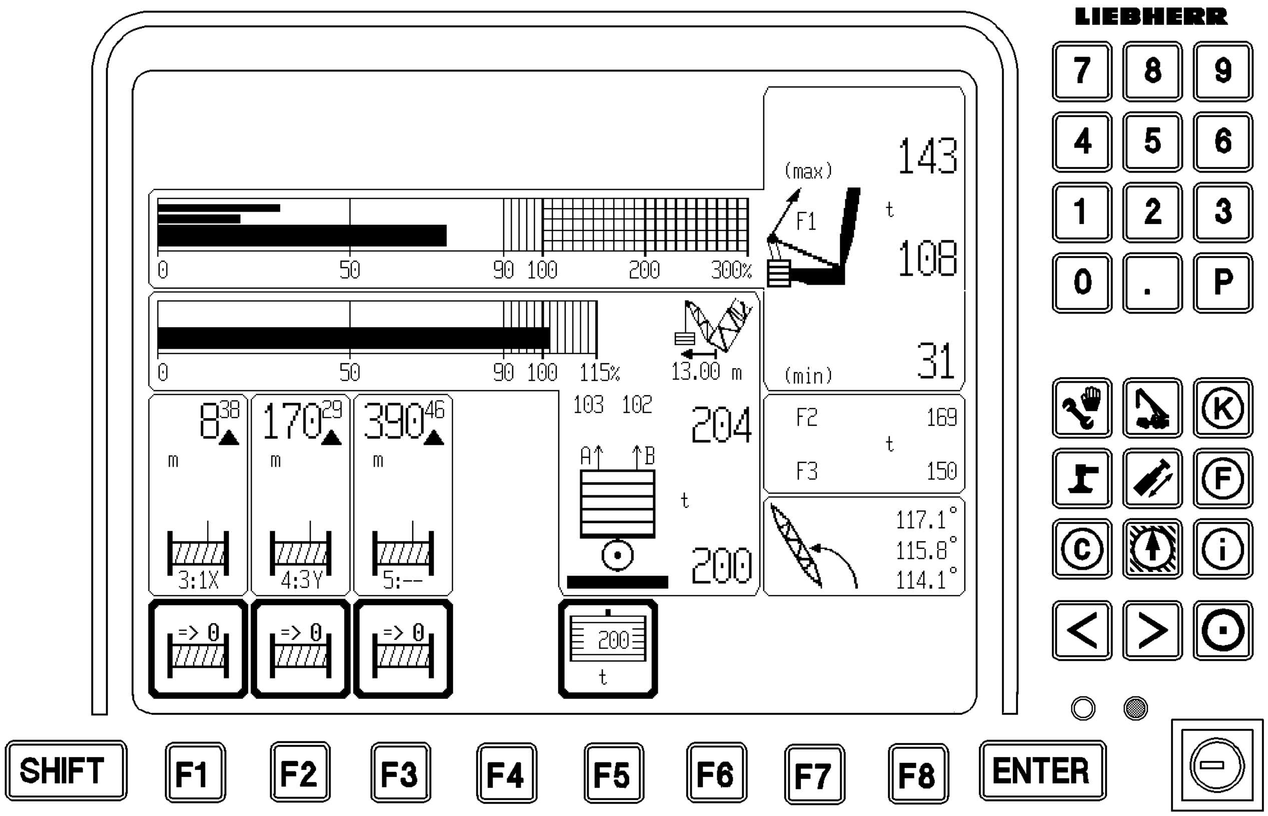
BA_AUF = ballast placed - value
BA_GEZ = ballast tensioned - value
BA_EDI = ballast edited - value.

6.1 Application errors displayed without an error number

The most important errors are operational errors:

- Exceeding test point 1 - Installation-maximum threshold → LICCON turns off
- Exceeding test point 1 - Operation - maximum threshold → LICCON turns off
- Fallen below test point 1 - minimum threshold - → LICCON turns off

1


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
K
F
C
i
(max)
143
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°
m
m
m
3:1X
4:3Y
5:--
=> 0
=> 0
=> 0
200
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

188681

There are error conditions without error numbers which appear indicated under "Error indications" on the chart below which, however, do not lead to a shut down.

Error	Error description	possible causes of error possible error remedy
Ballast entry is questionable: BA_AUF and BA_GEZ are too different, i.e. derrick ballast utilization > 110% and BA_AUF > BA_GEZ + 10 t or derrick ballast is suspended and derrick ballast utilization < 90% and BA_AUF < BA_GEZ - 10 t	- BA_AUF-value blinks - BA_EDI-value static	- incorrect ballast entry (BA_AUF), - incorrect position of keye switched "Ballast suspended", or erroneous entry "Keyed switch Ballast suspended", - incorrect ballast weighing (BA_GEZ)
BA_AUF isoutside of the normal entry range i.e, BA_EDI > 280t or BA_EDI < 40t (actual BA_EDI: 0 <= BA_EDI < 5 t or BA_EDI > 3200 t, then ballast utilization = 0 % is indicated)	- BA_AUF-value static - BA_EDI-value ???? blinking	- incorrect ballast entry (=BA_AUF)
Ballast tensioning A and B are not evenly loaded **(|F4A5 - F4B5| > 45 t)**	Ballast tensioning values A and B valid and blinking	- Derrick ballast unevenly loaded - Derrick ballast on uneven ground - Derrick ballast raised or lowered on one side - Sensor error from M4A or M4B If one of the sensor A or B is detected to be defective, operation with the correct ballast weighing can continue after pulling this test point. Error 624 or error 625 are indicated. See safety recommendations at the end of this chapter Replace defective sensor lines or- sensor(s) as soon as possible.

Illustration 1 to error "Ballast entry is questionable"

Derrick ballast according tokey switch on the floor

= Error, Ballast indication questionable because BA_GEZ and BA_AUF too diverse

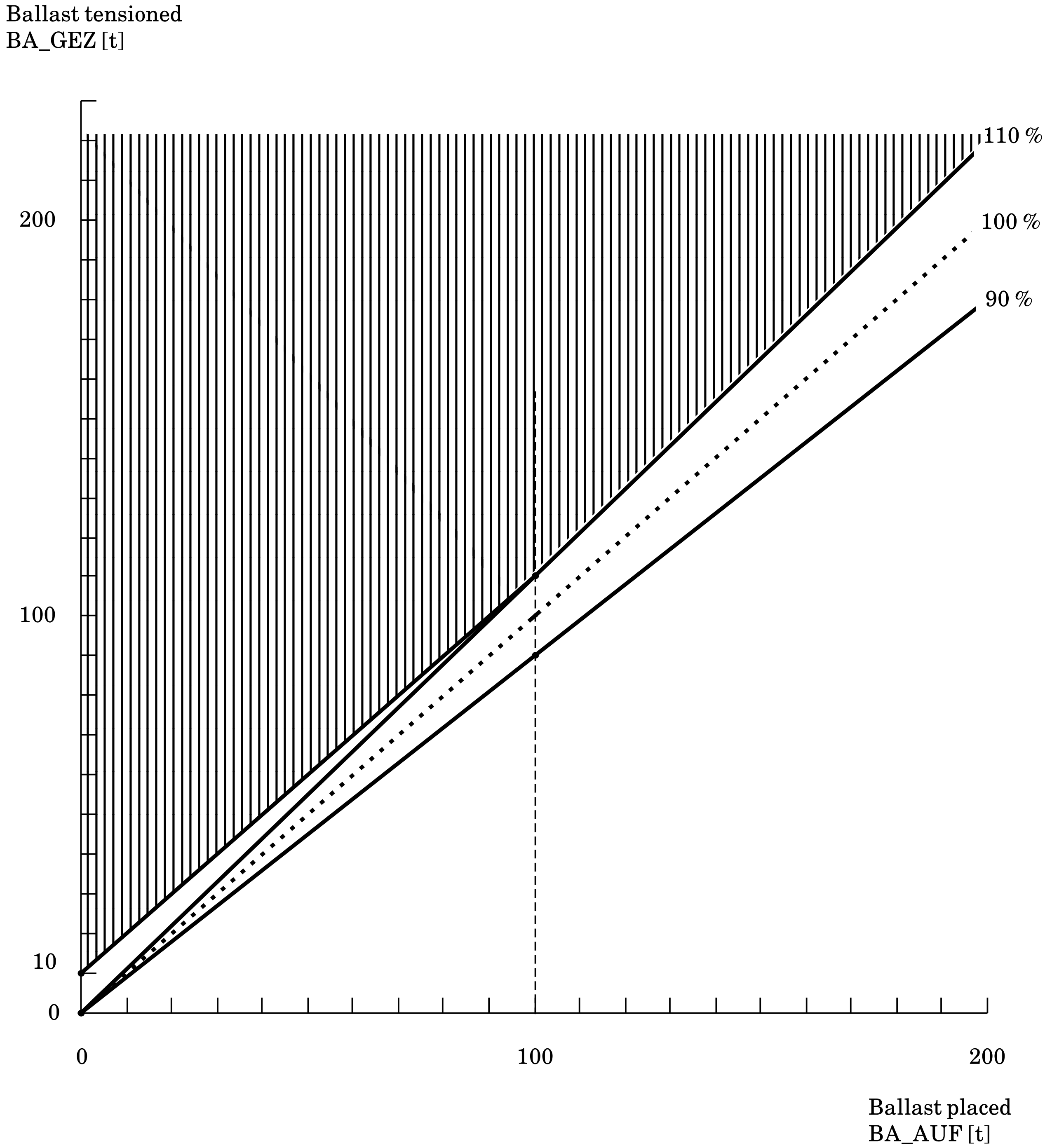
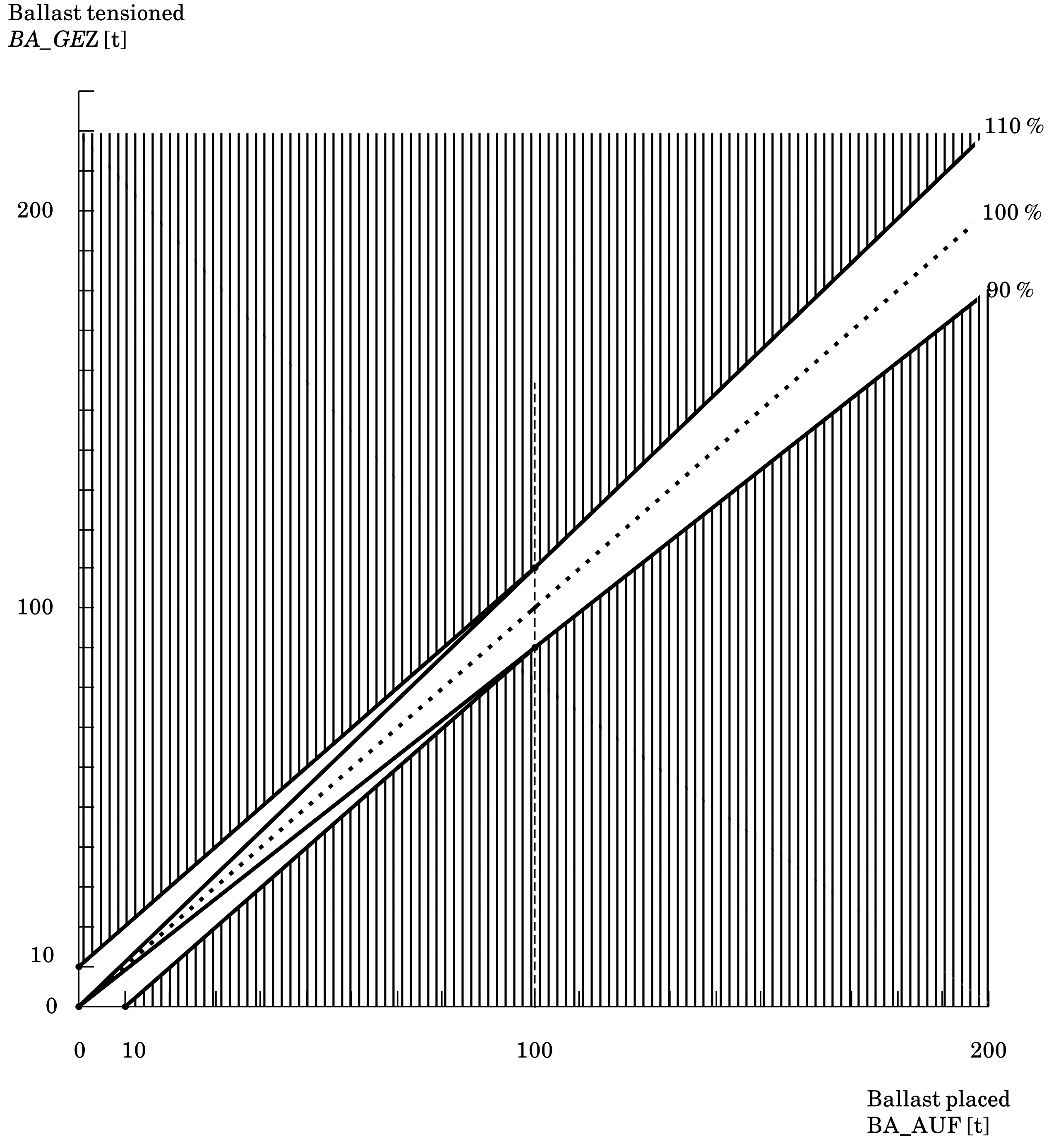


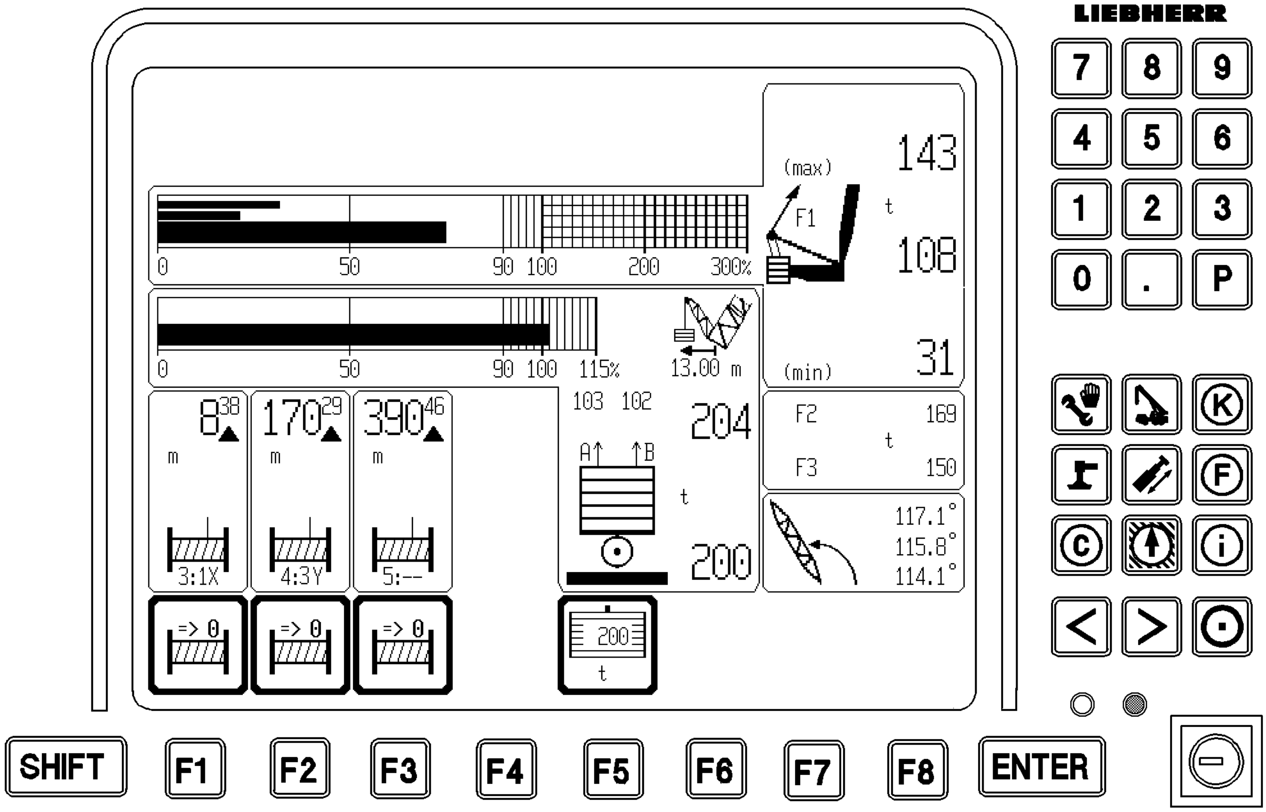
Illustration 1 to error "Ballast entry is questionable"

Derrick ballast suspended according to the key switch

= Error, Ballast indication questionable because BA_GEZ and BA_AUF too diverse



1


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

188681

6.2 Application error displayed on monitor 1 with error numbers

The error number is shown in the function key symbol "ERROR" above the function key $F6_1$ in the operating view.

The functions of the following sensors are monitored.
- Angle sensor
- Force test boxes
- Pressure sensor
- Increment sensor

The limits of the sensors are checked by several programs in the microprocessor CPU's for the following limit values:
- Broken wire (Lower threshold for sensor input voltage : approx. 2,0 V)
- Short circuit after (-) ground (Lower threshold for the sensor input voltage: approx. 2,0 V)
- Short circuit after (+) system voltage. (Upper threshold for the sensor input voltage: approx. 10,0 V)

An acoustical signal (horn) can be heard for every error report on monitor 1, which can be turned off via the function key F81 on monitor 1.
The charts on the following pages show all possible application errors, which can occur and which are indicated with an error number on monitor 1, along with a short error description, possible error causes and possible measures to fix the error.

The sequence of the error number represents the priority of the error.
$600 \leq$ Error number < 664 : no shut off
$664 \leq$ Error number < 699: Shut off of test point 1 - Operational maximum stop

In addition, monitor 1 shows error numbers 020 - 023, 032 - 035, 135, 180. These errors correspond to the errors appearing on monitor 0 under the same numbers. The description can be found in chapter "6.3.1 Application errors displayed on monitor 0".
The errors shown on monitor 1 represents the following priority: first 255 ...... 001 and then 699 ..... 600. Error numbers $>$ 600 are therefore overwritten by error numbers $<$ 255.

Error number	Error description	possible cause of error	possible error remedy
607	**(D=Derrick) Pressure in D-relapse cylinder is smaller than limit value (=100 bar),** even though the pump has been on high pressure for several seconds which means e. g. : A0.1 setting has no effect, the pump does not supply high pressure.This is **dangerous** when luffing down quickly: can cause slack cable. **Danger** when luffing up: the boom may fall backward!	- pump does not shift up at A0.1 - pump does not supply high pressure - leakage, - The D-RFP pressure sensor might be defective (and cannot supply data regarding pressure and pump)	- Check D-REP pressure sensor - Check D-RFP pressure - Check control of high pressure pumps for D-RFP
608	**The derrick has an improbable momentum to the rear, according to the calculation** which means, the forces on the derrick according to the sensor do not match for the given / calculated lever arms, a momentum to the rear remains) -To check the test points, the sum of all momentums around the derrick pivot point is calculated Sum of momentum = Test point_3_force × Test point_3_lever arm + Derrick_RFP_force × Derrick_RFP_ lever arm - Test point_1_force × Test point_1_lever arm - Test point 4/5_force × Test point 4/5_lever arm - Derrick_weight × Derrick_center of gravity lever arm - Winch_3_force × Winch_3_lever arm -Rods_weight × Rods_center of gravity lever arm Nominal value = 0, a certain tolerance is permissible; (If not in B/Bw operation, the calculation is done only if the derrick angle is between 110° and 130°.. In B/Bw operating mode the calculation is only done if the derrick is in operating position. The added force on M1, which is theoretically required to establish a balance, is indicated as the 9th entry in the special view : "6 TESTBILD-LMB ZE 1 BILD 1" with the name "theor.M1-Zus-Kr.f.D-Gl.gew" in "1/10 t" .	incorrect equipment configuration set, e.g. - incorrect boom length - incorrect derrick ballast radius - operating mode without instead of with derrick ballast set) - erroneous test signal at test points 1, 3, 4, 5 or D-relapse cylinder	- set correct equipment configuration on the LICCON. - Compare sensors 1A with 1B, 3A with 3B, 4A with 4B, to check if a sensor value A or B is erroneous, if necessary replace sensor. If one of the two sensors A or B is erroneous, pull this test point to continue with the correct value. See safety notes at the end of this chapter, inform customer service

Error number	Error description	possible cause of error	possible error remedy
609	**According to the calculation, the derrick has an unbelievable momentum to the front.** same as error 608	same as error 608	same as error 608
619	**Program key P0 on monitor 0 pushed when turning on after the beep** The program sections: relapse cylinder pressure monitoring, derrick balance monitoring and winch indication are not run through	same as error 65 on monitor "0"	same as error 65 on monitor "0"
622	**Pressure sensor ballast ring surface M4A value too small**	broken wire, short circuit against ground, sensor supply is missing or sensor is defective.	Check sensor lines, replace sensor if necessary
623	**Pressure sensor ballast ring surface M4A value too large**	short circuit against plus or sensor is defective.	Check sensor lines, replace sensor if necessary
624	**Pressure sensor ballast ring surface M4B value too small**	broken wire, short circuit against ground, sensor supply is missing or sensor is defective.	Check sensor lines, replace sensor if necessary
625	**Pressure sensor ballast ring surface M4B value too large**	short circuit against plus or sensor defective.	Check sensor lines, replace sensor if necessary
626	**Pressure sensor ballast piston surface M5 value too small**	broken wire, short circuit against ground, sensor supply is missing or sensor is defective.	Check sensor lines, replace sensor if necessary
627	**Pressure sensor ballast piston surface M5 value too large**	short circuit against plus or sensor defective.	Check sensor lines, replace sensor if necessary
628	**Pressure sensor derrick relapse cylinder value too small**	broken wire, short circuit against ground, sensor supply is missing or sensor is defective.	Check sensor lines, replace sensor if necessary
629	**Pressure sensor derrick relapse cylinder value too large**	short circuit against plus or sensor is defective.	Check sensor lines, replace sensor if necessary

Error number	Error description	possible cause of error	possible error remedy
664	**Pressure sensor ballast ring surface= test point 4A/B: 4A and 4B in permissible [mV] range (test range), but |A-B| > tolerance in bar**	- sensor or line is defective - CPU input defective (redundancy error)	- check lines - check sensor M4A and M4B, replace if necessary - check CPU inputs, replace if necessary
665	**Pressure sensor ballast ring surface = test point 4A/B: 4A and 4B are not in permissible [mV] range (test range)** i.e. M4A-value in mV too large or too small and M4B-value in mV too large or too small	- broken wire, short circuit against plus - ground, sensor supply is missing - sensor defective	- check sensor lines, replace sensor if necessary
682	Length sensor value ballast telescoping cylinder **falls below lower** limit value	- Broken wire, short circuit against ground, sensor supply is missing or sensor is defective	- Check sensor lines, replace sensor if necessary
683	Length sensor value ballast telescoping cylinder **exceeds upper** limit value	- Short circuit against plus or sensor is defective	- Check sensor lines, replace sensor if necessary

Safety notes when working with pulled sensors

The crane operation with one sensor, which shows force or pressure which is too low is dangers !!
In test points with 2 equal sensors (A and B) there is the possibility to pull a defective sensor if the other sensor is functioning. However, pulling a functioning sensor A or B, reduces the safety of the safe load indicator, even if the other is also functioning.
If a sensor is to be pulled, and which one is to be pulled must be checked out carefully. If the functioning sensor is pulled or if the sensor which was not pulled shows a wrong value (which is too low), then the crane operator might be given an incorrect, possibly too low load condition of the crane !
This can cause a serious ACCIDENT !!

D A N G E R: **By pulling the sensor, the weight value may not change in such a way that the load indication becomes smaller and the overload condition is recognized too late by the LICCON.**
The force indication on test point 1 may not be reduced in such a way that the overload condition is recognized too late by the LICCON. It is better if one of the two sensor A or B with the smaller value is pulled, then the overload of the crane might be averted. Due to the indicated error number of the pulled sensor, the error numbers with lower priority will no longer be shown. Crane operation with a pulled sensor is only permitted if the crane operator pays increased attention, it is only permitted in exceptional cases.
Defective sensor lines or sensors must be replaced immediately.

There is a great danger of causing a serious ACCIDENT.

Chapter 5

Equipment

1. Check the safety elements

To retain the pins in the lattice sections, safety elements are used. Due to mechanical damage or distortion, the spring force of the safety elements can be reduced significantly. If the spring force is not sufficient, the safety elements may no longer be used. The pin retention must be made with a **functioning** safety element.

DANGER: **Danger of accident in case of insufficient spring force of the safety element!**
If the spring force of the safety element is not sufficient, the correct retention of the pin is no longer ensured.
- Always use safety elements with sufficient spring force!

2. Check the cables

An expert cable inspection must be made before assembly and in regular intervals, to recognize any cable damage or wear in time, see chapter 8.04.
The cables must be taken down immediately if one of the following damages is found:
- Broken strand
- Broken wires
- Wire nests
- Reduction of cable diameter as compared to nominal dimension by 10% or more
- Cable distortion

2.1. Place a new hoist cable

To ensure the safety and running properties, use only Liebherr Original spare parts.
If the cable pulleys are run in, then they have to be turned out or replaced before placing a new hoist cable. If this is not observed, it can cause damage to the newly placed hoist cable.

2.1.1 Cranes with cam limit switch

The cam limit switch is adjusted at the factory, so that it turns off if only 3 cable coils are on the winch.

DANGER: **Danger of accident due to falling load!**
If the following notes are not observed, the hoist cable end mounting can be ripped out and the load can fall down.
- If a new hoist cable is placed, then the cam limit switch must be readjusted!
- The cam limit switch must be set in such a way that it turns off when only 3 hoist cable coils are on the winch!
- If the hoist cable is spooled up at assembly, then the hoist cable end must remain in front of the winch and may not be pulled over the winch, otherwise the cam limit switch must be readjusted!

3. Control measures

Note: If the crane operator leaves the crane cab, even if only for a short time, then he is obligated, before starting to work again, to check the operating mode settings and to reset them, if necessary.

Before crane operation, carry out the following checks:
- Check if the load carrying capacity of the ground is sufficient.
- Check if the safety distance to ditches and overhangs is sufficient.
- Check to ensure that there are no live power lines in the working range of the crane.
- Make sure that the crane operation can be carried out at the least possible radius.
- Check if there are any obstacles, which would hinder the required crane movements.
- Check if the crane is horizontally aligned.
- Check if the LICCON overload safety is set according to the data in the load chart.
- Check if the bypass keyed button on the monitor, the installation keyed button and the crawler installation keyed button are turned off .
- Check the shut off of the overload safety by triggering the operating position “top” and “bottom”.
- Check the shut off of the overload safety 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 switch - boom “steepest position”. See chapter 8.12.
- Check the shut off of the limit switch -Derrick. See chapter 8.12.
- Check the shut off of the limit switch -lattice jib “steepest position”. See chapter 8.12.
- Checkthe shut off of the limit switch - lattice jib “lowest position”. See chapter 8.12.
- Check the shut off of the limit switch - flap in position lattice jib “steepest position .” See chapter 8.12.
- Check the easy movement of the pendulum of the mechanical relapse retainer over the complete swing range of the pendulum .

D A N G E R : **The crane can topple over!**
If the control measures are not carried out before crane operation, then the crane can topple over and be damaged !
Persons 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 they are functioning correctly!**
- **Start crane operation only when the LICCON overload safety 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. Danger conditions without shut off

4.1 Block position of the relapse cylinder when setting down the load

D A N G E R : **Damage of boom or relapse cylinder!**
If the block position of the relapse cylinders is touched by the boom or the derrick with attached, freely suspended load, then there is a danger of damaging the boom or relapse cylinder when the load it set down on the ground! By setting down the load, the crane is relieved, which causes the boom system to move backward.
There is no shut off of the function hoist gear down!
- **Do not use components with defective pneumatic springs! Replace defective pneumatic springs!**

5. Transporting components

If components are transported on an auxiliary vehicle, then they must be secured properly. If necessary, the components must be supported from below or transported with a special transport device.

5.1 Transporting lattice section

If the lattice sections are pushed into each other for transport, then they must be secured with 2 chains each.

6. Pneumatic springs to support installation of components

On various components, pneumatic springs are installed to facilitate the installation of these components.

D A N G E R : **Danger of crushing!**
If the pneumatic springs are defective, then the supporting action on the moveable components is no longer ensured!
Personnel can be killed or severely insured due to falling components !
There is an increased danger of accidents!
- **Do not use components with defective pneumatic springs! Replace defective pneumatic springs!**
- **Check the pneumatic springs for external damage every time before actuating the corresponding component!**
- **It is strictly prohibited for personnel or objects, which are in the movement range of the components, which is supported by the pneumatic spring, to remain within that range !**
- **It is prohibited for personnel or objects to remain within the complete danger zone of the moveable components!**

7. Weights

Note: **Please observe:**
- The weight of the corresponding components is noted in the corresponding chapter or on the decal on the corresponding component!
- If the weight of the corresponding components is not noted on the decal or in the operating instructions, then you must contact the Service Dept. at Liebherr Werk Ehingen to obtain the weight.
- If components are pushed into each other (such as intermediate sections) or if components are folded together (such as folding jib) , then the total weight results from the sum of the weights 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 loads noted in the load charts do not include placed guy rods!
- When guy rods are placed, then the possible load 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 main boom is inclined to the horizontal, the larger the reduction of the load carrying capacity.


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
LIEBHERR-WERK EHINGEN
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

197716

9. By pass button LICCON

The bypass keyed button on the LICCON monitor has two positions:
- Operating position (self retaining): Crane is in normal operation
- Position to the right (touching): Hoist limit switch and shut off of LMB are bypassed.

9.1 Bypass of overload safety

If the maximum permissible load moment is exceeded, the LICCON overload safety turns off all load moment increasing crane movements. This shut off can be bypassed by the bypass keyed button in position "right touching " .

D A N G E R : Increased danger of accidents due to bypass of overload safety!
When the overload safety is bypassed, there is no additional protection against crane overload!
Due to incorrect operation, the boom can break off or the crane can topple over!
Persons can be killed!
All displays of the LICCON overload safety remain functioning.
- **The bypass of the overload safety is only permitted for assembly purposes or in emergency situations.**
- **The bypass keyed button may only be actuated by persons, who know the effects of the actuation regarding the bypass of the overload safety system!**
- **The bypass of the load safety may only be carried out in the presence of crane supervisory personnel, and only with extreme caution and care!**
- **Crane operation with bypassed overload safety is prohibited!**

9.2 Bypass of hoist-top shut off

If the hook block touches the hoist limit switch weight at an upward movement, the hoist limit switch is triggered. The crane movements "Spool up winches", "Luff down the telescopic boom" and "telescoping out" are shut off. The shut off can be bypassed with the bypass keyed button in position "right touching".

D A N G E R : Increased danger of accidents due to bypass of overload safety!
When the hoist-top shut off is bypassed, there is a danger that the hook block is pulled against the pulley head at continued lift or when luffing down the boom. This can damage the pulleys and cause the load to fall down!
- **The bypass of the hoist-top shut off may only be used in the presence of crane supervisory personnel and with a guide. The guide must be in direct contact with the crane operator and must constantly monitor the distance between the hook block and the pulley head.**
- **All crane movements must be carried out with utmost caution and at the least possible speed.**


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

197716

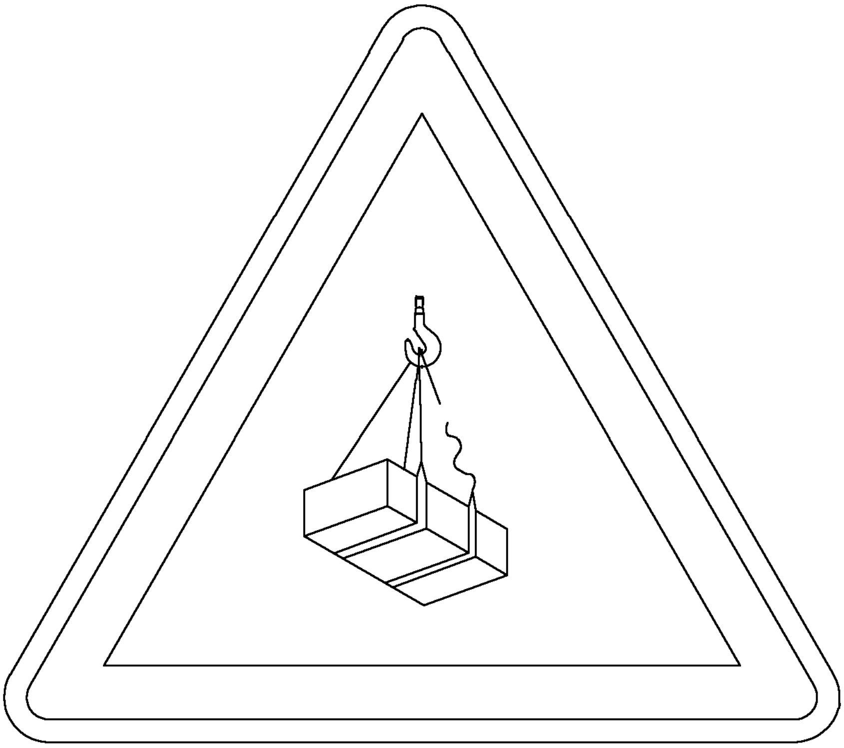
9.3 Actuate the bypass button LICCON

- Turn the bypass keyed button to the right and hold.

Result:
- The LICCON overload safety is inactive.
- The assembly symbol in the LICCON monitor blinks.
- An acoustical signal sounds.
- The red beacon on the crane cab lights up

- If the bypass keyed button is to be turned off, do not actuate the bypass keyed button any longer.

Result:
- The LICCON overload safety is active.
- The assembly symbol in the LICCON monitor turns off .
- The acoustical signal is off.
- The red beacon on the crane cab turns off.



197714

10. Assembly / disassembly

10.1 General

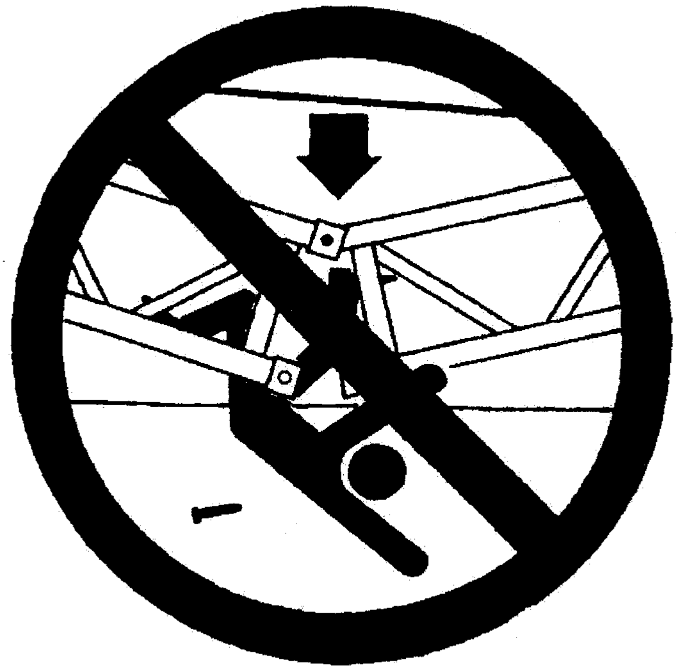
D A N G E R : **Mortal danger due to erroneous assembly or disassembly!**
The assembly/disassembly of components may never be carried out by untrained personnel. Incorrect assembly / disassembly can cause death or severe injuries.
- The assembly and disassembly may only be carried out by authorized and trained expert personnel!

Note:
- During assembly/disassembly of the individual components, also observed the chapters relating to the components!
- The auxiliary winch (assembly or reeving winch) may only be used for assembly, and not to lift loads!
- Lifting loads with the auxiliary winch is prohibited!

The normal assembly/disassembly procedure stipulates that all components which are transported separately must be transported with suitable auxiliary cranes and tackle near the ground level and must be connected safely (properly) with the crane.
Before assembly personnel may get near suspended loads, such as counterweights, lattice sections andboom, etc., these loads must be lowered to the ground, on supports or other items of sufficient load carrying capacity.

D A N G E R : **Danger of hitting or crushing!**
Staying near suspended loads will result in danger of hitting or crushing in case of side movement of loads.
During assembly / disassembly, no one may remain in the dangerous range of the suspended load or under the suspended load, before the intended mounting procedure is completed.

D A N G E R : **Danger of falling !**
At assembly and disassembly, the assembly personnel must be secured with suitable aids to prevent falling. If this is not observed, the assembly personnel can fall down and sustain mortal injuries.
- **Normally, all assembly work must be carried out from a height of 2 m with suitable aids (such as lifting platforms, scaffolding, ladders, auxiliary crane, etc.)! The height where assembly/disassembly must be carried out with aids depends on the national regulations. The national regulations must be strictly observed!**
- **If such work can be carried out either with such aids or from the ground, then the assembly personnel must secure itself with personal protective devices (for example catch belts) to prevent falling!**
- **If antifall guards (railings) are installed on the crane superstructure, then they must be brought into position for assembly/disassembly and secured.**



197715

10.2 Assembly/disassembly of boom

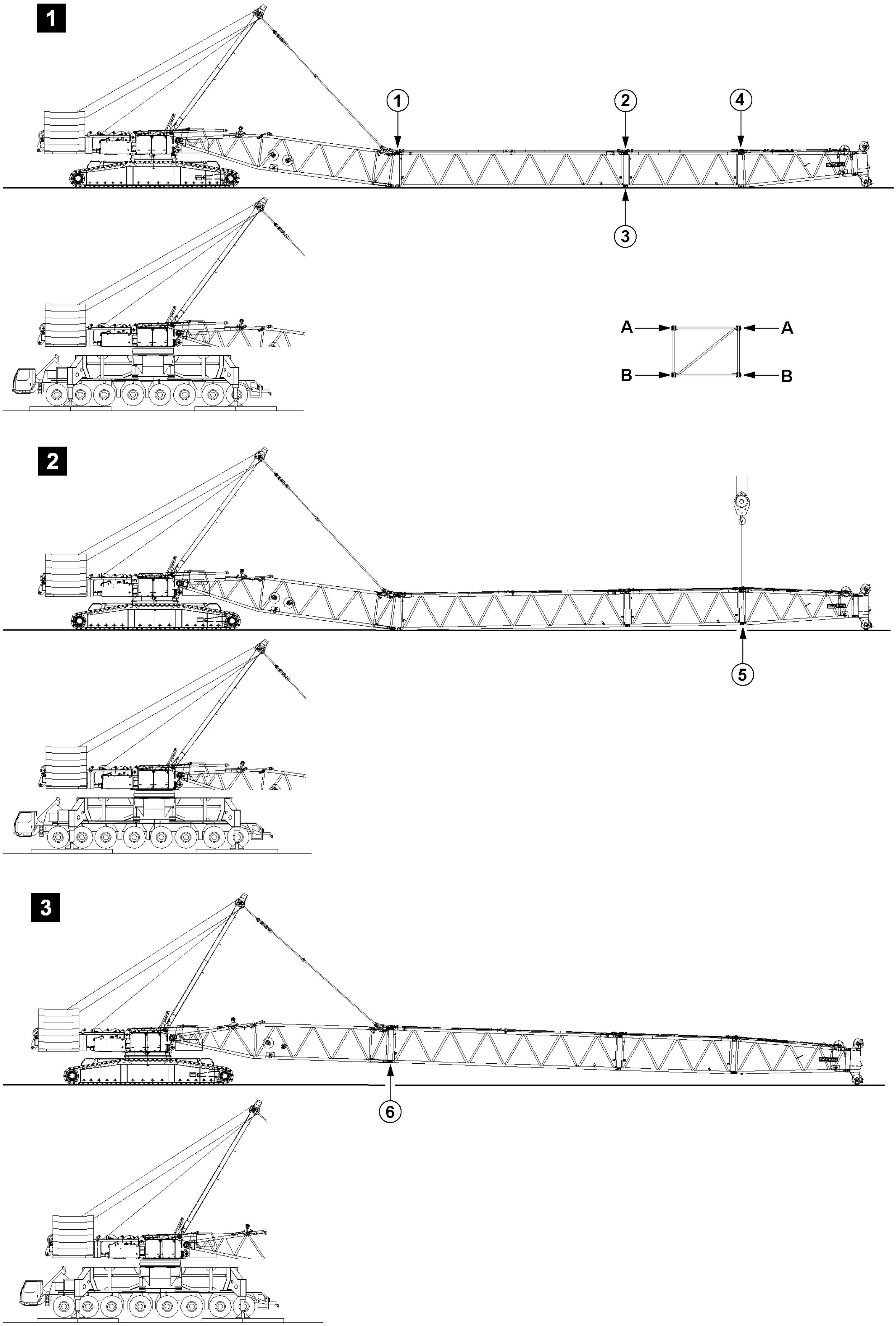
If the lattice sections are not lying on the ground during assembly/disassembly, then they must be supported with suitable materials. The height of the support must be selected in such a way that the lattice sections are no longer in contact with the ground. Make sure that is the case, especially if the lattice sections have cable pulleys. Otherwise the cable pulleys can be damaged.
At disassembly it must be ensured that the auxiliary crane pulls the load up vertically. The crane operator must ensure that the load carrying capacity of the auxiliary crane is sufficient to safely hold the part to be removed at the corresponding radius . The auxiliary crane must be attached in such a way that the hook of the auxiliary crane is over the center of gravity of the part to be removed and that the tackle ropes are attached on the load.

D A N G E R : **Danger of accident if the crane topples over!**
Diagonal pull can destroy the crane or cause it to topple over.
- The hook block must always be attached (hung) vertically over the center of gravity of the load to be lifted!
- Diagonal pull is prohibited!

D A N G E R : **Danger of accidents at assembly/disassembly of booms!**
When you remove unsecured or not supportedbooms, then you can be killed or severely injured.
- Never unpin the pins under unsecured or not supportedbooms!
- Never unpin connector pins of unsecured or not supportedbooms!
- Remaining underbooms as well as in the complete danger zone is prohibited during the pinning and unpinning procedure of theboom !
- Secure the pins in the mounting points as well as in the receptacles!
- It is not permitted to lean the auxiliary ladder on a component which is to be removed !

D A N G E R : **Danger of accident if pins are twisted!**
The pins can twist due to diagonal pull, increased or low hoist force of the auxiliary crane. Twisted parts can loosen suddenly during unpinning of the pins and severely or mortally injure the assembly personnel .
- When unpinning the pins, the hoist force of the auxiliary crane must be matched to the weight of the part to be lifted!
- Do not unpin seized pins by force!
- Remove the reason for the twisting!

Note: Notes for pinning and unpinning:
- Pin or unpin both pins, which are on one horizontal level, i.e. **left and right**!
- Pin the lower pin **from the inside to the outside** and unpin from the **outside to the inside**!
- Pin and unpin horizontally installable double tapered pins **from the outside to the inside** !
- Pin and unpin vertically installable double tapered pins from **top to bottom**!



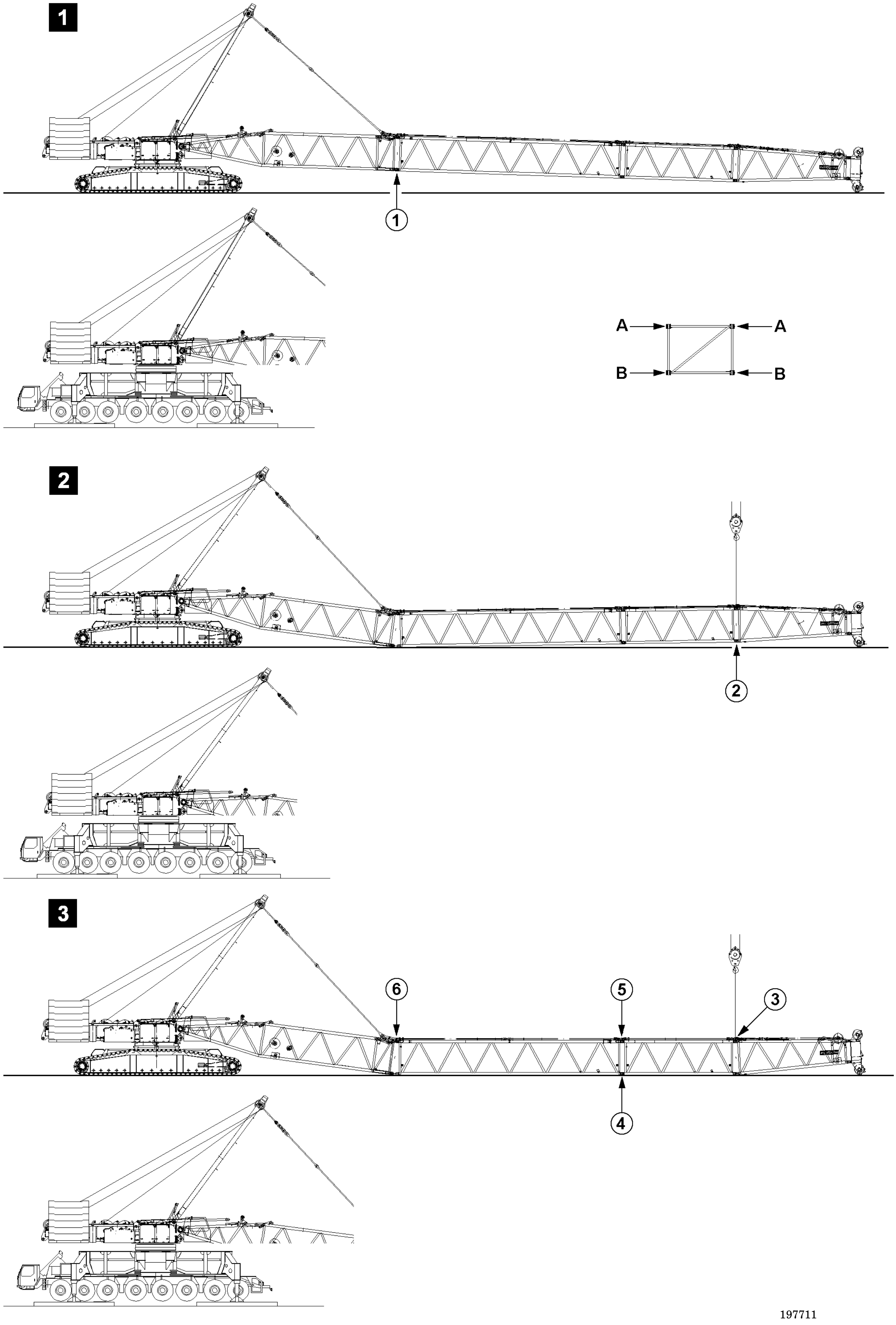
197710

10.2.1 Assembly of lattice sections

The illustrations should be viewed as examples. The illustrations might not exactly match the crane.

D A N G E R : **Mortal danger at assembly of booms!**
If the pins are not pinned in the stated sequence, the lattice sections can fold down uncontrollably and even fall down. This can cause deadly injuries to personnel.
- Pin the pins in the stated sequence!

- Pin and secure the pins on both sides (level **A**) on point **1** , fig. 1.
- Pin and secure the pins on both sides (level **A**) on point **2**, fig. 1.
- Pin and secure the pins on both sides (level **B**) on point **3** , fig. 1.
- Pin and secure the pins on both sides (level **A**) on point **4** , fig. 1.
- Lift the end section with the auxiliary crane , fig. 2.
- Pin and secure the pins on both sides (level **B**) on point **5** , fig. 2.
- Lift the lattice sections, fig. 3.
- Pin and secure the pins on both sides (level **B**) on point **6** , fig. 3.

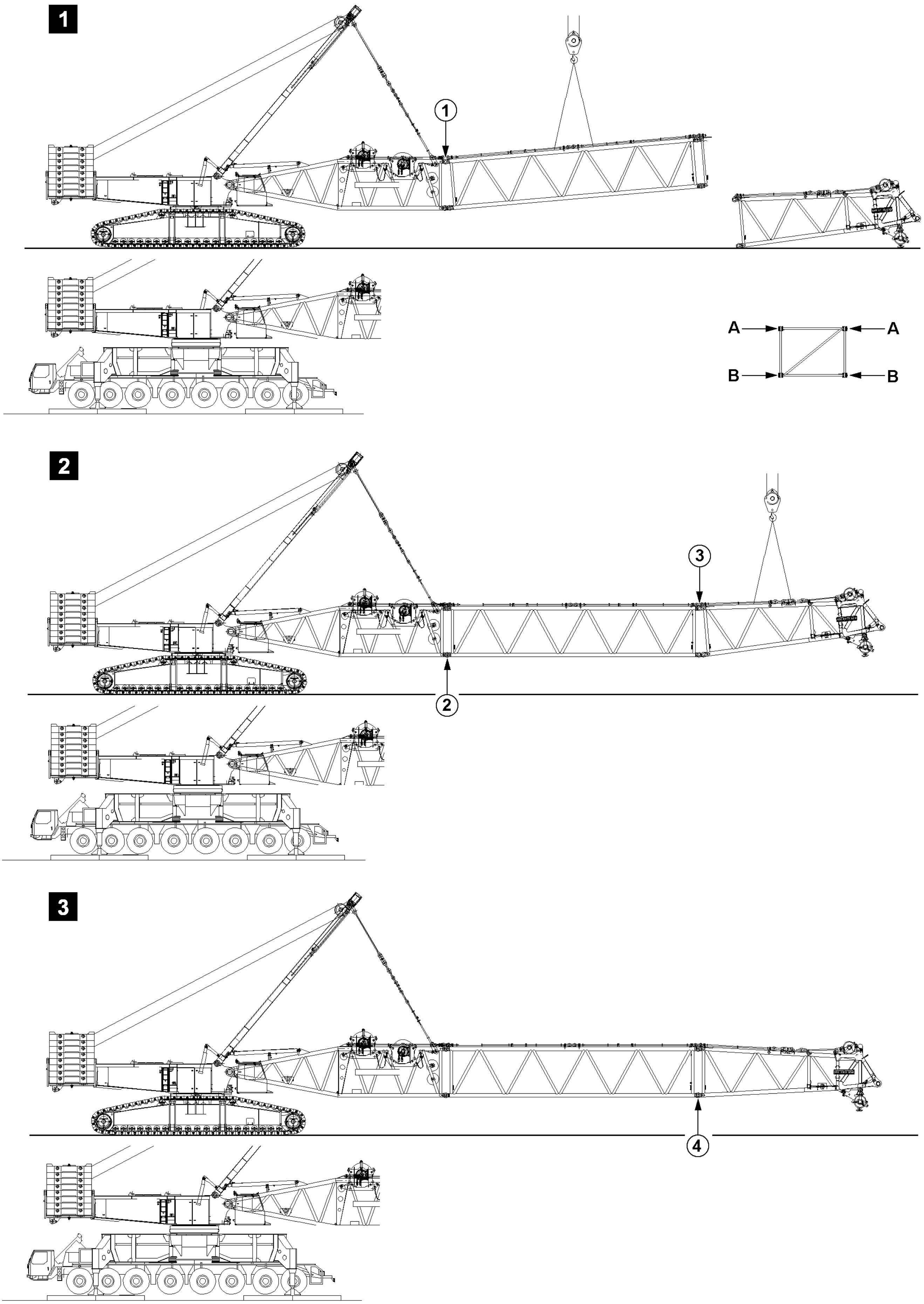

1
1
A
A
B
B
2
2
3
6
5
3
4
197711

10.2.2 Disassembly of lattice sections

The illustrations should be viewed as examples. The illustrations might not exactly match the crane.

D A N G E R : **Mortal danger at disassembly of booms!**
If the pins are not unpinned in the stated sequence, the lattice sections can fold down uncontrollably and even fall down. This can cause deadly injuries to personnel.
- Unpin the pins in the stated sequence!

- Luff the boom down until the end section touches the ground slightly, fig. 1.
- Release and unpin the pins on both sides (level **B**) on point **1** , fig. 1.
- Place the lattice sections all the way down, fig. 2
- Lift the end section with the auxiliary crane , fig. 2.
- Release and unpin the pins on both sides (level **B**) on point **2**, fig. 2
- Release and unpin the pins on both sides (level **A**) on point **3** , fig. 3.
- Release and unpin the pins on both sides (level **B**) on point **4** , fig. 3.
- Release and unpin the pins on both sides (level **A**) on point **5** , fig. 3.
- Release and unpin the pins on both sides (level **A**) on point **6**, fig. 3.



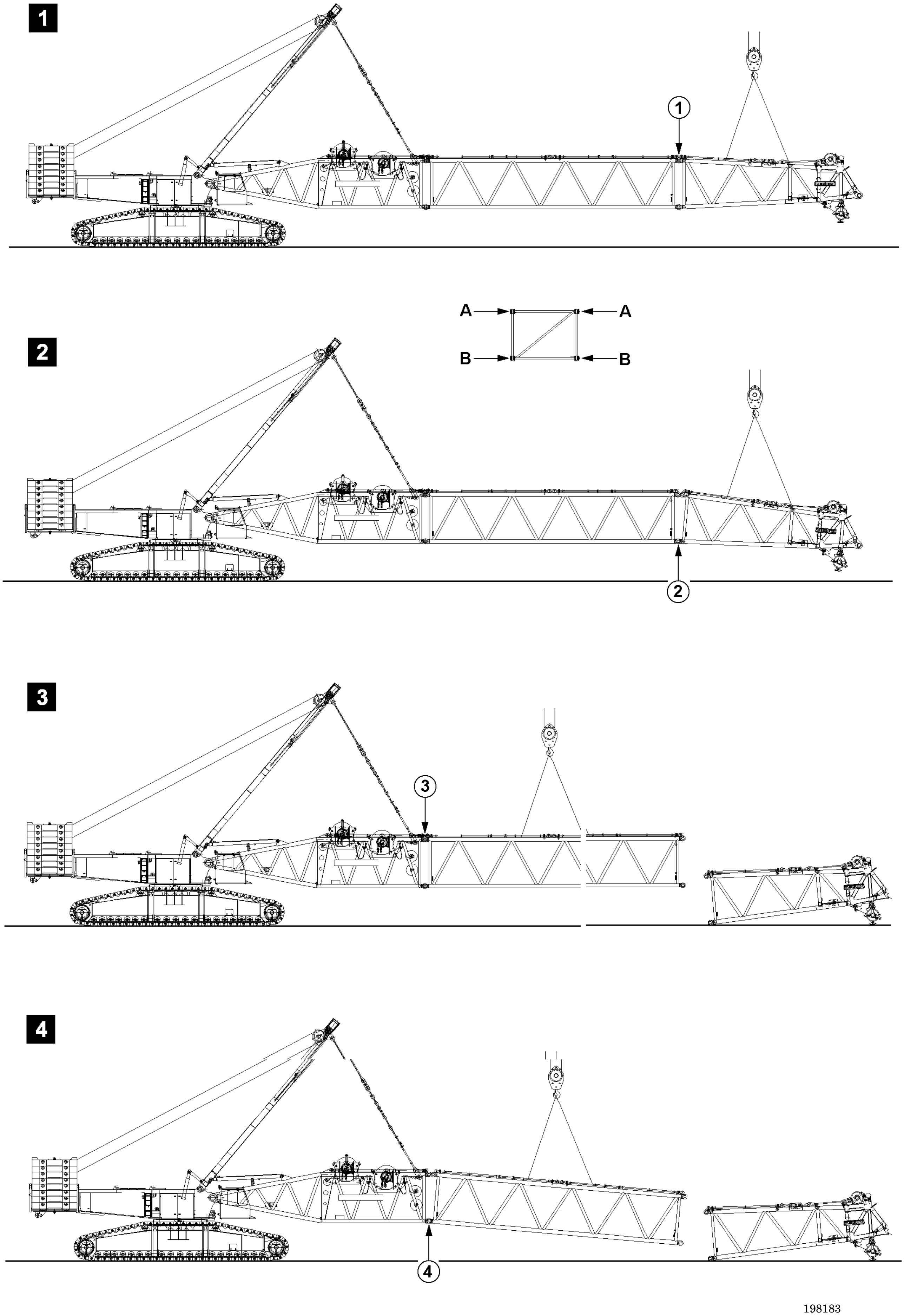
198182

10.2.3 Flying assembly of lattice sections

The illustrations should be viewed as examples. The illustrations might not exactly match the crane.

DANGER: **Mortal danger at assembly of booms!**
If the pins are not pinned in the stated sequence, the lattice sections can fold down uncontrollably and even fall down. This can cause deadly injuries to personnel.
- Pin the pins in the stated sequence!

- Pin and secure the pins on both sides (level **A**) on point **1**, fig. 1.
- Pin and secure the pins on both sides (level **B**) on point **2** , fig. 2.
- Pin and secure the pins on both sides (level **A**) on point **3** , fig. 2.
- Pin and secure the pins on both sides (level **B**) on point **4** , fig. 3.

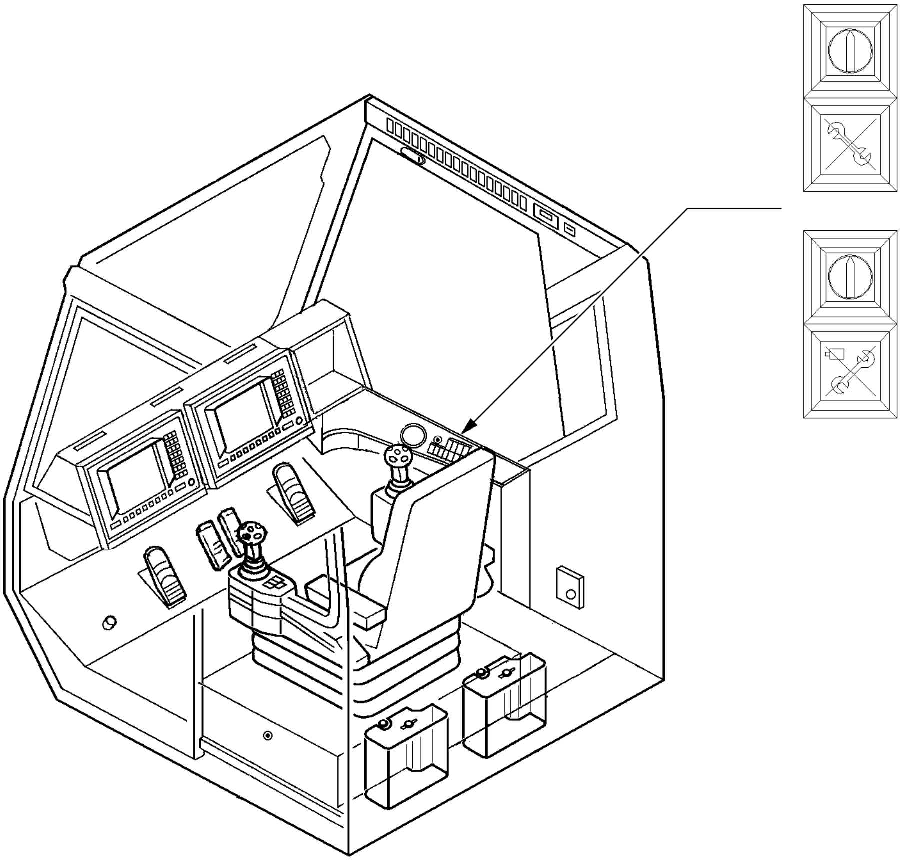

1
2
3
4
A
B
198183

10.2.4 Flying disassembly of lattice sections

The illustrations should be viewed as examples. The illustrations might not exactly match the crane.

D A N G E R : **Mortal danger at disassembly of booms!**
If the pins are not unpinned in the stated sequence, the lattice sections can fold down uncontrollably and even fall down. This can cause deadly injuries to personnel.
- Unpin the pins in the stated sequence!

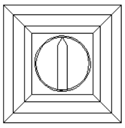
- Release and unpin the pins on both sides (level **A**) on point **1** , fig. 1.
- Release and unpin the pins on both sides (level **B**) on point **2** , fig. 2.
- Release and unpin the pins on both sides (level **A**) on point **3** , fig. 3.
- Release and unpin the pins on both sides (level **B**) on point **4** , fig. 4.



198078

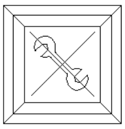
10.3 Bypass button assembly

D A N G E R : Mortal danger at crane operation with turned on assembly keyed button.
- The bypass of the overload safety is only permitted for assembly purposes.
- The assembly keyed button may only be actuated by persons, which are aware of the effects of a bypass!
- If the assembly keyed button is turned on, the hoist limit switch and the LICCON overload safety are bypassed!
- Crane operation with turned on assembly keyed button is strictly prohibited!
- The assembly keyed button must be pulled immediately after assembly work is completed and handed to an authorized person!



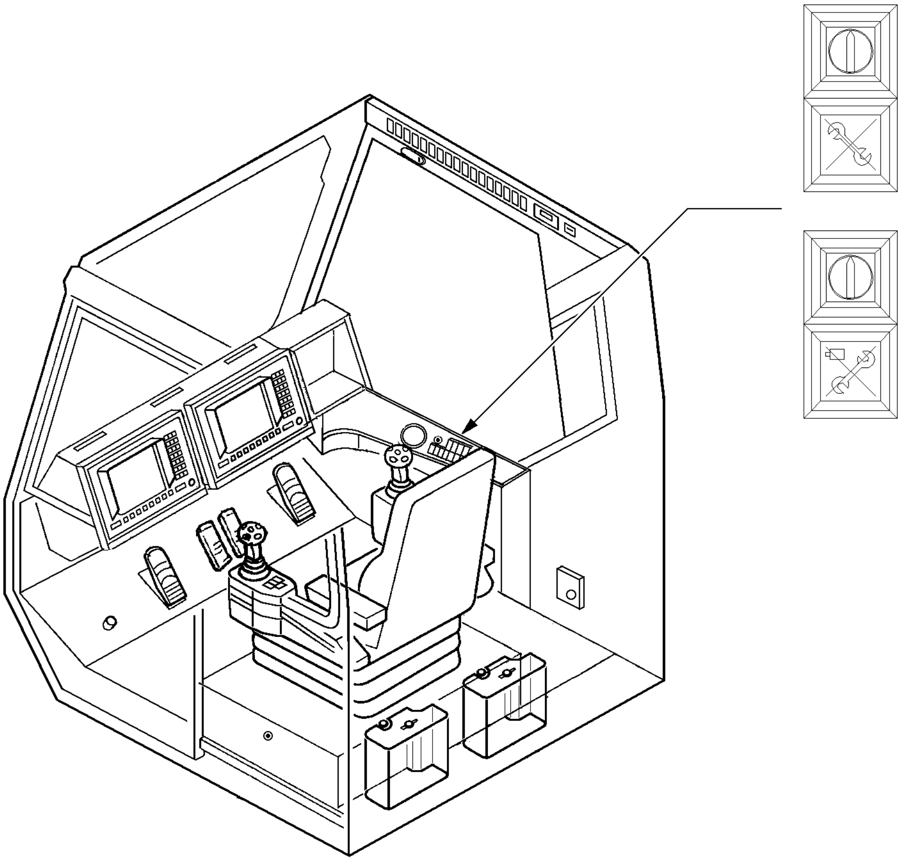
- Actuate the assembly keyed button.

Result:
- The LICCON overload safety is inactive.
- The indicator light in the button lights up.
- The assembly symbol in the LICCON monitor blinks.
- An acoustical signal sounds.
- The red beacon on the crane cab lights up.



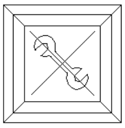
- If the assembly keyed button is to be turned off:
  Turn the assembly keyed button off by actuating the button.

Result:
- The LICCON overload safety is active.
- The indicator light in the button turns off.
- The assembly symbol in the LICCON monitor turns off .
- The acoustical signal is off.
- The red beacon on the crane cab turns off.



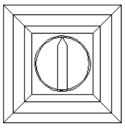
198078

10.4 Bypass button crawler assembly



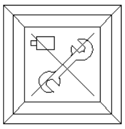
Prerequisite:
- The assembly keyed button is actuated
- The indicator light in the button lights up

D A N G E R : **Mortal danger in crane operation with turned on crawler assembly keyed button.**
If the crawler assembly keyed button is turned on, there is no overload shut off in operation with assembly cylinder and crane.
- The actuation of the crawler assembly keyed button is only permitted for assembly purposes !
- Crane operation with turned on crawler assembly keyed button is prohibited !



- Actuate the crawler assembly keyed button .

Result:
- The LICCON overload safety device is inactive.
- The indicator light in the button lights up.



- If the crawler assembly keyed button is to be turned off:
  Turn the crawler assembly keyed button * off by pressing the button * .

Result:
- The indicator light in the button turns off .

10.5 Installation / removal of hydraulic lines

When connecting or releasing hydraulic lines with quick couplings, it must be ensured that the coupling procedure is carried out correctly.

D A N G E R : **Danger of accidents due to loss of pressure or leakage!**
Not completely connected quick couplings (especially return lines) as well as quick couplings loosening up by themselves can cause serious accidents due to failure of components!
- Before starting to work with the crane, check the quick couplings to ensure they are correctly connected.

- Release the pressure in the hydraulic system before connecting or releasing them. Turn the engine off and wait for a short time.
- Connect the coupling sections (sleeve and plug) and screw together with the hand nut.
- Tighten the hydraulic couplings by hand. Turn the hand nut until you feel a noticeable, strong stop.

11. Erection / take down

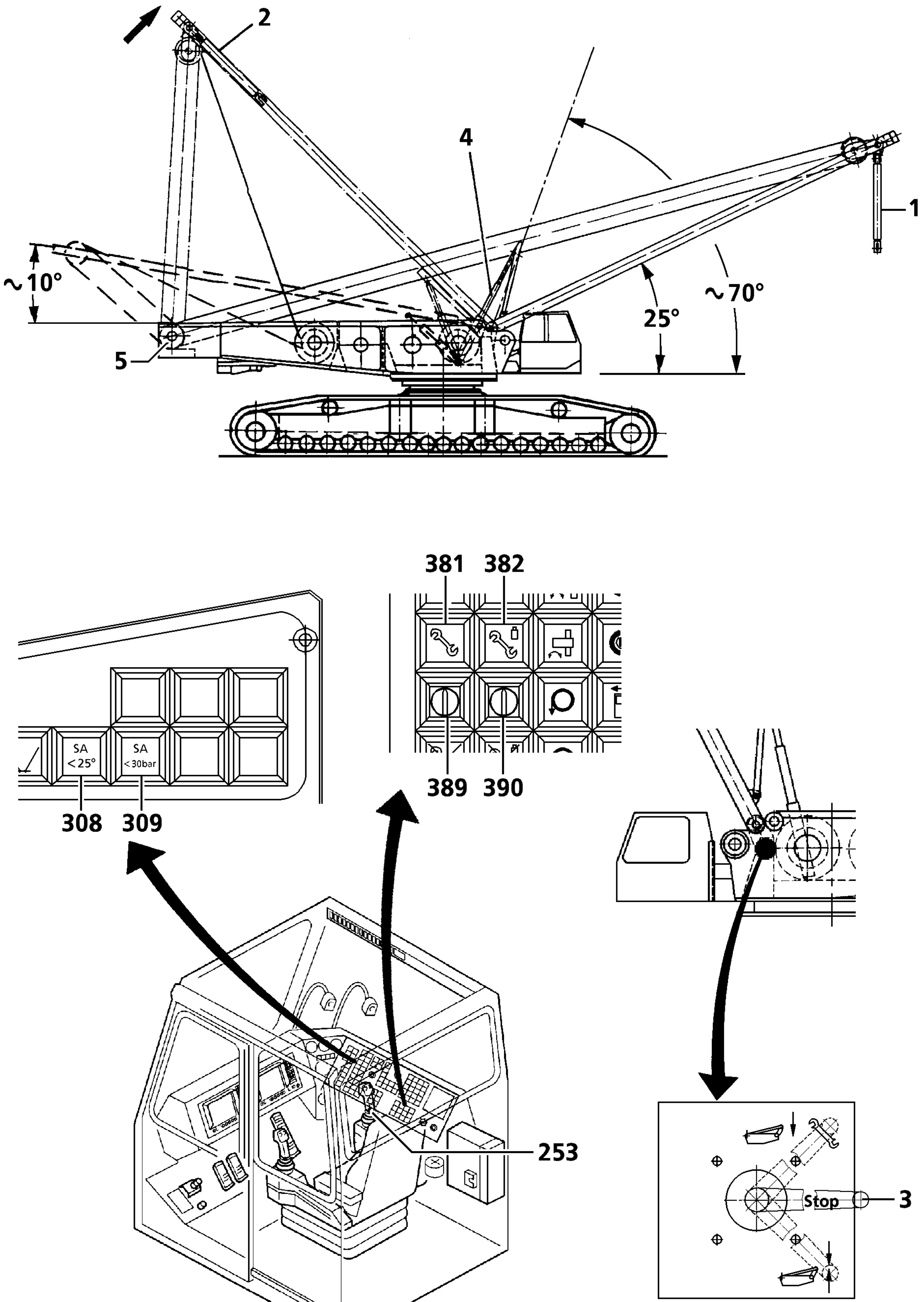
Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform, according to the load chart.
- The boom is installed according to the load chart and the operating manual.
- All limit switches are correctly installed and fully functioning.
- All pin connections are secured.
- The hoist cable is correctly placed in the cable pulleys and is secured with the cable retaining pin to prevent it from jumping out .
- There are no persons within the danger zone.
- There are no loose parts on the boom.
- In winter, the boom and its components (limit switch, cable drum, beacon, wind speed sensor etc.) are free of ice and snow.

DANGER: Incorrectly installed or non-functioning limit switches as well as falling parts (pins, spring retainers, ice, etc.) can cause accidents!

11.1 Check the prerequisities

- Check if all prerequisites are met.



186840

Raising A- bracket

Requirements:
- The cable of winch IV- boom adjustment- is reeved in.
- The 4- line slinging chain is secured in assembly cylinder (1).
- Engine on - see chap. 4.03
- Activate key- operated "assembly" switch (389) and key- operated switch (390) "crawler- and boom assembly", indicator light " assembly (381) and "crawler- and boom assembly" (382) is on.
- Set the LICCON to operating mode needed

Note: Use of manual control lever when key- operated switches are activated- see chap. 4.05

D A N G E R: **As long as the key- operted switch (390) is activated, there is no overload safety cut off for assembly cylinder (1) and also for the crane.**
There is a risk of accidents.

Erection
Move the ball tab (3) "down" into operation position. The A- bracket is being pushed upward by the erection cylinder (4) until the cables between the A- bracket (2) and the slewing platform pulley bracket (5) are tensioned.

Positions of ball tab (3)

"Up" position	-	Lower A- bracket to slewing platform (transport position)
"Vertical" position	-	STOP, extension and retraction of piston rod is blocked
"Down" position	-	Operating position extend piston rod.

C A U T I O N: **Make a visual inspection! The ropes must lay correctly in the respective rope pulleys! The ball valve remains in operating position.**

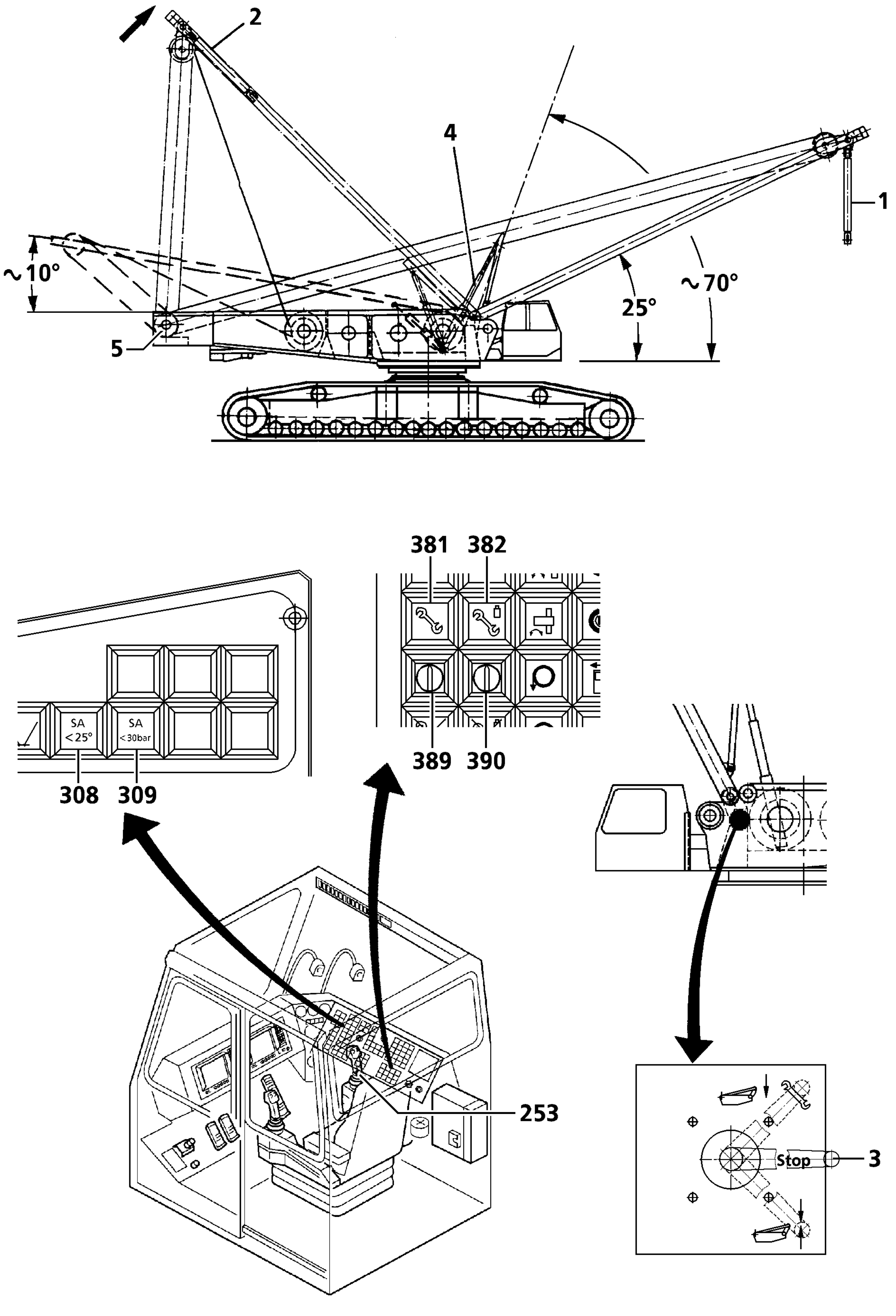
Activate manual control lever (253) and spool out winch IV. A- bracket (2) is pushed up by raising cylinder (4) until it is raised to an angle of 70° degrees to the front from horizontal (70ˆ degrees means cylinder fully extended.
It will then lower forward from its own weight.

With the A- bracket to the front 25°, angle to horizontal smaller 25°, winch IV "spool out" is switched off! Indicator lamp (308) is on.
Winch IV "spool out" is also switched off, when hydraulic pressure of cylinder is less 30 bar! Indicator lamp (309) is on.

D A N G E R: **Ball tab (3) must be in operating position ”down” during assembly and crane operations.**
The ball tab positions "STOP" (horizontal) and "up" are only permissible when lowering the LA- bracket onto the slewing platform (transport position)!

To prevent inadvertent movement, the ball cock (3) must be secured with a lock
- **<u>immediately</u> after installation of the A- bracket**
- **at crane operation.**

When spooling out winch IV, ensure that no slack forms in the rope.



186840

Lower LA- bracket onto the slewing platform

Ball tab (3) must be in position ”down” during assembly.
Activate manual control lever and by spooling in winch IV, move the A- bracket approximately 10° to the horizontal to the rear.
When the A- bracket is lowered to the rear, it is supported by raising cylinders (4).

DANGER: **Ball valve (3) must be in the "DOWN"(facing down) position during assembly and crane operations.**
The ball valve positions "STOP" (horizontal) and "UP" (facing up) are only permissible when lowering the LA- bracket onto the slewing platform (transport position)!
When lowering the LA- bracket onto the slewing platform , there must be no persons in the danger area. There is a danger of being crushed.

After reaching the LA- bracket position of approximately 10° to the rear, ball valve (3) must be switched to the **"facing up"** position. The LA- bracket is slowly lowered onto the slewing platform by the cylinder; the hydraulic fluid flows through a throttle to the reservoir.

C A U T I O N: **At the same time, slowly spool out retracting rope- winch IV- and ensure that no.**

C A U T I O N: **The boom combinations must be assembled according to the separately supplied erection drawings I**

Note: for example : 2620**.10** = **.10** (welded tag on intermediate section)
* = with winch V
** = with winch III
Instead of two 7 m sections, one 14 m section can be used.

D A N G E R: **It is forbidden to use any other set up of the latticecomponents and the tensioning rods than found in the Operation Manual and/or the constructionplans !**

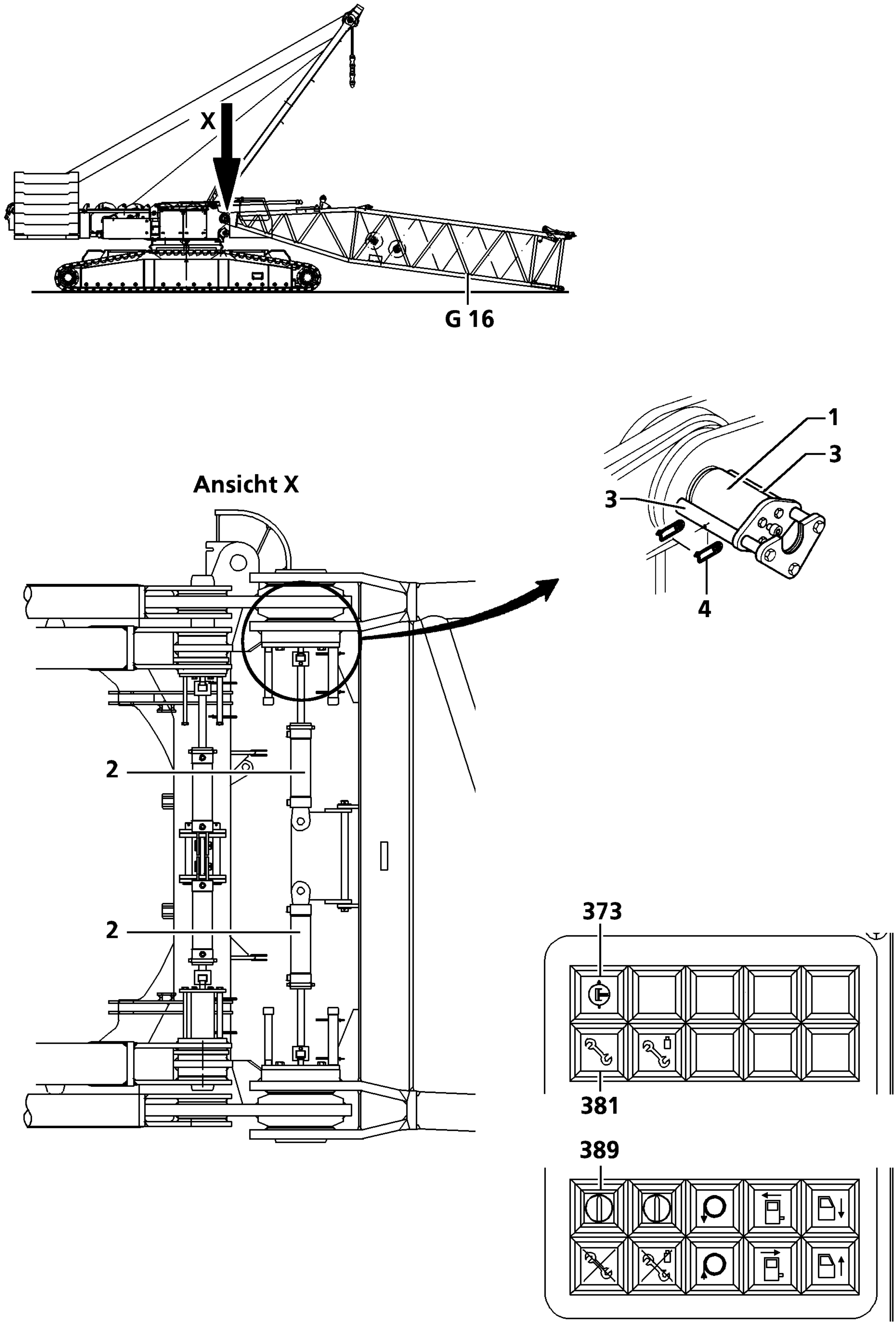
There is the risk of confusing intermediate sections which are of diverse dimensions but do not look different on the outside!

The only difference on the outside are the tags welded on (.8, .10, .20)

When installing the boom make absolutely sure, that the intermediate sections are installed in accordance with their designations.
If not observed, there is risk of accident!

Overview of the maximum possible attachments

Designation	system	lenght (m)	weight (t)
L - pivot section	2620.**10**	13,4	7,5 (11,0*)
L - intermediate section	2620.**8**	7,0	
L - intermediate section	2620.**8**	14,0	4,4
L - intermediate section	2620.**10**	3,5	1,5
L - intermediate section	2620.**10**	7,0	3,1
L - intermediate section	2620.**10**	14,0	5,7
L - adapter	2620.**10**	7,0	3,2
L - head piece 250 t		0,6	2,0
L - head piece 350 t		0,95	2,2
L - head piece (without pulleys), for S2		1,06	0,87
LL - reducing section		3,1	1,3
NA - intermediate section	2115.**10**	7,0	1,5
NA - intermediate section	2115.**10**	14,0	2,6
NI - reducing section		3,5	0,8
N - head piece 130 t		8,0	2,7
NI - intermediate section	1812.**10**	7,0	1,4
NI - intermediate section	1812.**10**	14,0	2,5
S - Pivot section	2620.**20**	13,4	9,0 (12,5*)
S - Pivot section	2620.**25**	13,4	9,4 (12,5*)
S - Intermediate section	2620.**20**	3,5	1,71
S - intermediate section	2620.**20**	7,0	3,6
S - intermediate section	2620.**20**	14,0	6,5
S - Intermediate section	2620.**25**	14,0	7,62
S - Intermediate section for flying installation	2620.**20**	14,0	6,4
S - intermediate section for fixed jib	2620.**20**	14,0	7,05
S - Adapter	2620.**20**	7,0	3.6
S - head piece 400 t		0,6	4,1
Sw - Reducer	2620.**20**	4,1	1.5
SL - head piece 100 t		3,5	2,4
D - pivot section	2115.**20**	10,5	11,0 (14,5**
D - intermediate section	2115.**20**	7,0	2,7
D - head piece	2115.**20**	10,5	6,3
W - Installation with fold - in head		10,5	14,1
W (w) - intermediate section	2116.**20**	7,0	1,7
W (w) - intermediate section	2116.**20**	14,0	3,0
W (w) - Intermediate section	2116.**20**	3,5	1.015
W - head piece 180 t		10,5	3,3
F - pivot section		2,5	0,6
F- Adapter		2,9	4.2
F - head piece with assembley winch		8,0	3,5



187229

Assembly

D A N G E R: **For assembly and disassembly:**
- **you must use a safe installation scaffolding / working platform! There is a danger of falling !**
- **Improvisations are not permitted!**
- **The lattice sections must be supported with suitable, stable material.**
- **Make sure that no personnel remains underneath the lattice jib during the pinning and unpinning procedure of the lattice sections !**

Requirements:

-The crane is horizontally aligned.
-An auxiliary crane as well as assembly scaffold/working platform are available.
-Set the LICCON safety device in accordance with the load capacity operation table.
-The assembly key-operated button (389) is activated; indicator lamp (381) "Assembly" is on.
-Pressure selector switch (373) must be actuated.

Assembly - boom

Rotate the slewing platform until is along the crawler track longitudinal axis or to the side.

Note: Refer to the raising and lowering charts.

C A U T I O N: **Requirements when slewing the slewing platform without the boom**
- **the crawler track with mounted slewing platform must be horizontally aligned**

As long as the boom is not mounted or the boom is mounted on the crane but the boom head is still resting on the ground, a maximum of 135 t counterweight can be attached.
Jf the counterweight is increased to 155 t, the boom head must be raised from the ground!
Otherwise there will be a risk of overturning!
When slewing the platform 360° without boom, the LA - bracket must be raised to a minimum angle of > 90° , following counterweights are permissible:

Min. counterweight	Min. centralballast
135/155 t	43 t
95 t	11 t
55 t	11 t

If this is not adhered to, the crane may topple!

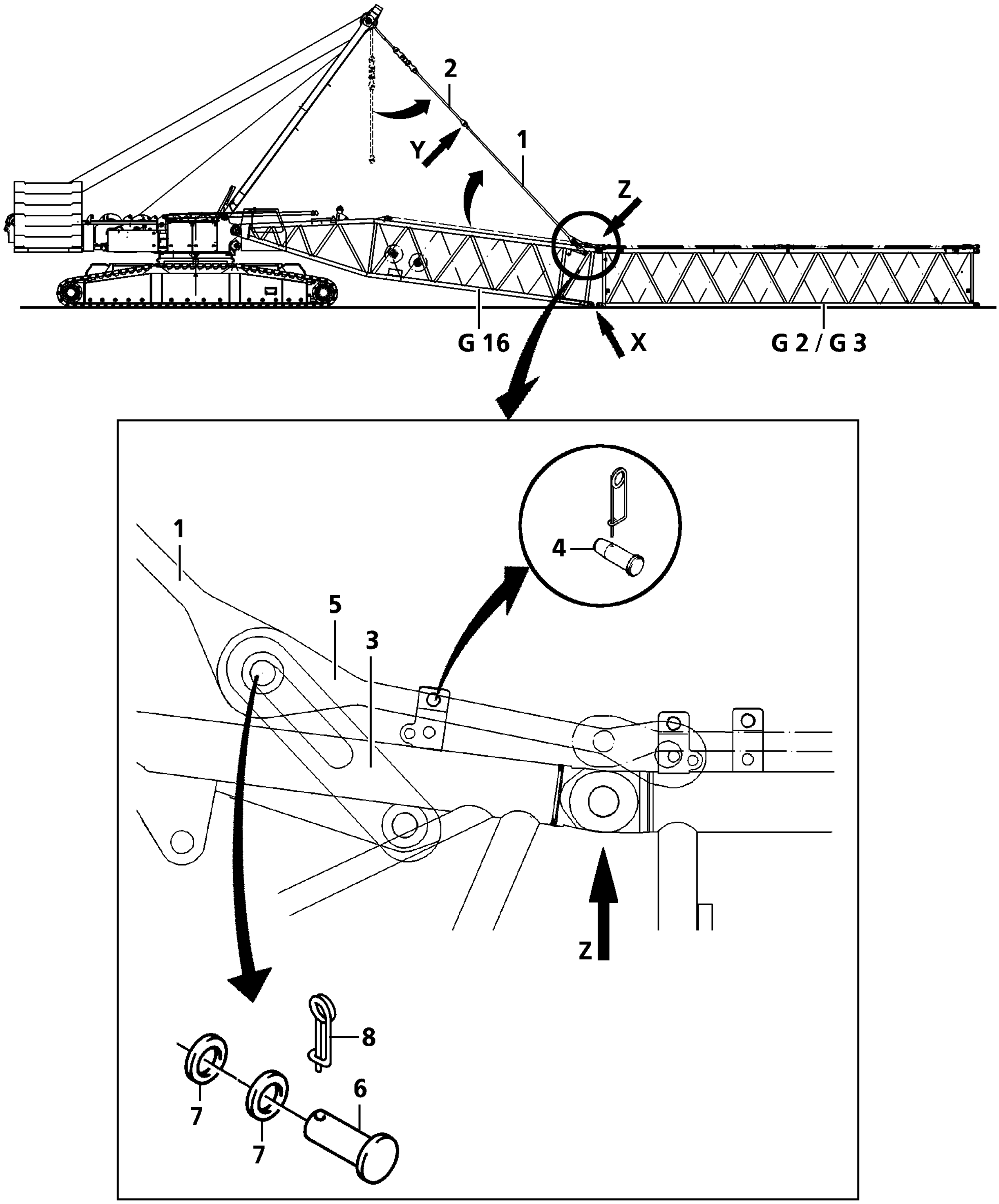
Hoist the boom pivot section with the auxiliary crane and swing on the slewing platform to the pinning points.

Note: S-Boom pivot section weight:
- without winch V, without tension rods appr. 9,0t
- without winch V, with rope, with tension rods appr. 12,5t

Make the hydr. connection, 2× quick-release couplings, from the pinning cylinders on the slewing platform.
Pin and secure the boom pivot section (G16) to the slewing platform.
The connector pins (1) are pinned by using the hydraulic pin pulling device (2), and they are secured with locking plates (3). Attach the locking plates (3) on the left and right hand side and secure them with retaining springs (4).
Turn off pressure selector switch (373).

D A N G E R: **To prevent unintentional unpinning, locking plates must be attached.**

Lower the pivot section onto the ground and withdraw the auxiliary crane.



187516

Attaching boom and Tension rods
Raise LA-strut and lower forward; refer to Chap. 5.02 ”LA-strut”
Pin and secure (Y) tension rods (2) from LA-strut to the tension rods (1) from L-pivot section (G16).
Unpin transport retaining pin (4) of tension rods.
Pin and secure assembly support plates (3) on tension rods (1 + 5), hollow axle.
Use pin (6), washer (7), and retaining spring (8).

Assemble the L/LL boom and the corresponding tension rods to the required length, pin and secure.
Pin and secure the first intermediate section (G2/G3) on the pivot section (G16) **"above" (Z)**.
Raise pivot section with LA-strut (winch IV) until pinning is possible **"below" (X)** on pivot section (G1).

D A N G E R : **Max. permissible tensioning force at the force sensor F ≤ 1100 KN.**
Raising L-boom length of max. L 105 m is possible with A-strut tension rods pinned to the pivot section.
Head piece must not be raised; it must remain on the ground.
If this is not observed, damage can occur.

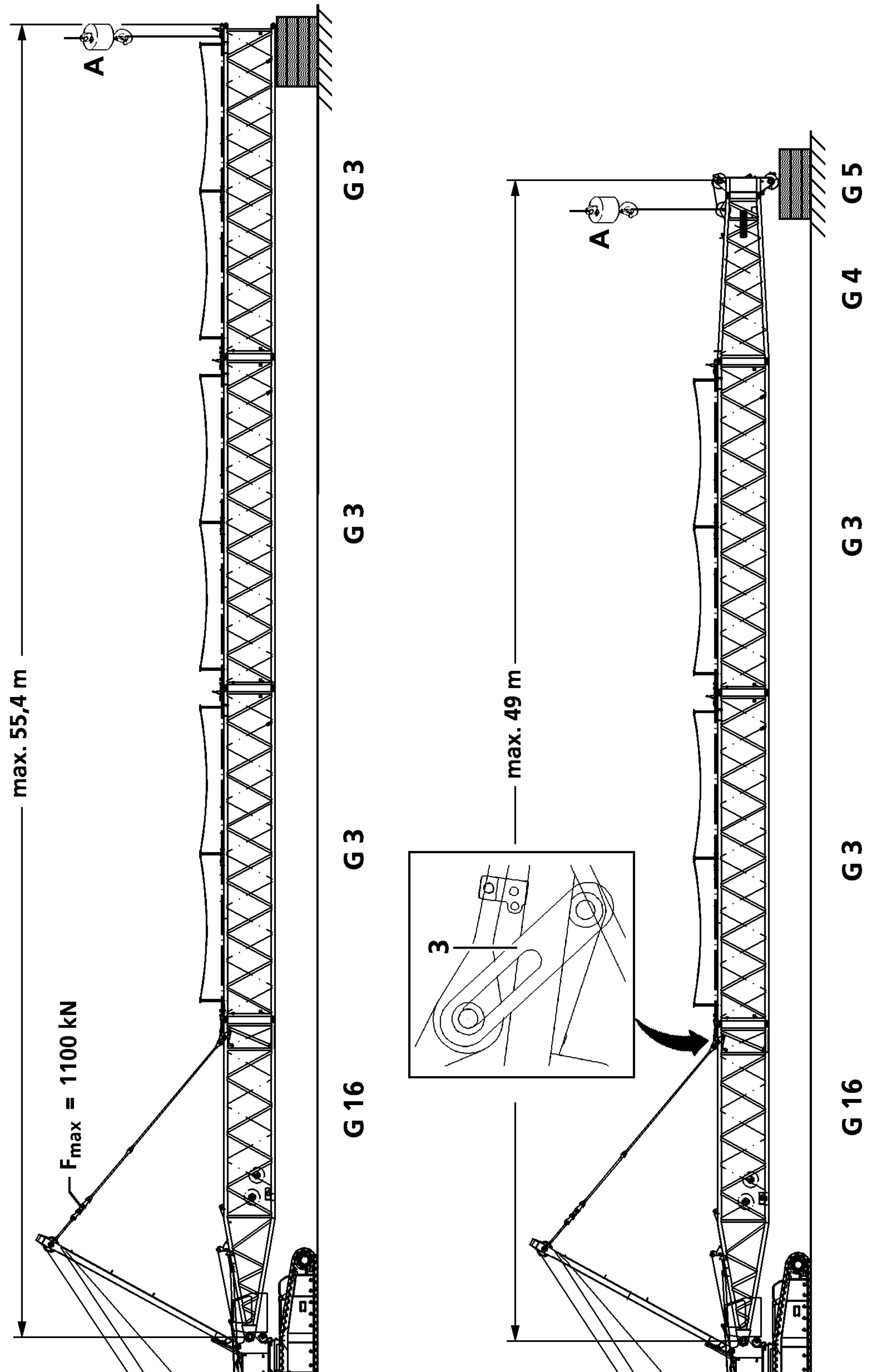
Pin and secure on the pivot section (G16) **"below" (X)**.
Unstress tension rods by lowering the LA-strut.
Remove pins of tension rod (1) on the assembly support plates (3).

D A N G E R : **Before unpinning tension rods on the assembly support plates, boom must be pinned ”below”.**
No personnel is permitted under the boom when the pins are being removed.
Otherwise, there is the danger of the boom suddenly swinging down.

Attaching the tension rods
Connect tension rods from head piece with the tension rods from LA-strut, pin and secure.
The tension rods must be attached and secured in accordance with the assembly diagrams in Chap. 5.03. Here, the numbering in the assembly diagram must be compared with the numbering on the tension rod.

D A N G E R: **The pins of the tension rods must be inserted from the inside. If this is not done, the hoisting cable will scrape against the pin. The tension rods must be regularly inspected; refer to the chapter ”Inspection and Maintenance of the Tension Rods”.**

Tension the tension rods between LA-strut and L-head piece, by using winch IV.



187517

Flying assembly of the L/LL-boom

Assembly
If the area at the operating site is limited, it is possible to carry out a flying assembly of the boom at a **max. length:**

- **55,4 m max. length** (without head section, without hookblock).
- **49,0 m max. length** (with head section, without hookblock).

D A N G E R: **Min. 55 t counterweight and min. 43 t centralballast must be attached! Max. permissible tensioning force at the force sensor F $\leq$ 1100 KN. If this is not observed, damage can occur.**

Requirements:
- Pivot section (G1) is pinned and secured to assembly support plates (3) and tension rods.

Mounting
In flying assembly, the individual intermediate sections, or the boom as a complete unit, can be pinned and secured on the pivot section (G1) with an auxiliary crane.
Insert and secure pin **"above" and ”below”**.

D A N G E R : **For flying assembly, pay attention to the max. permissible boom length. Otherwise, there is the danger of accidents.**

Weights of the lattice sections with attached tension rods:

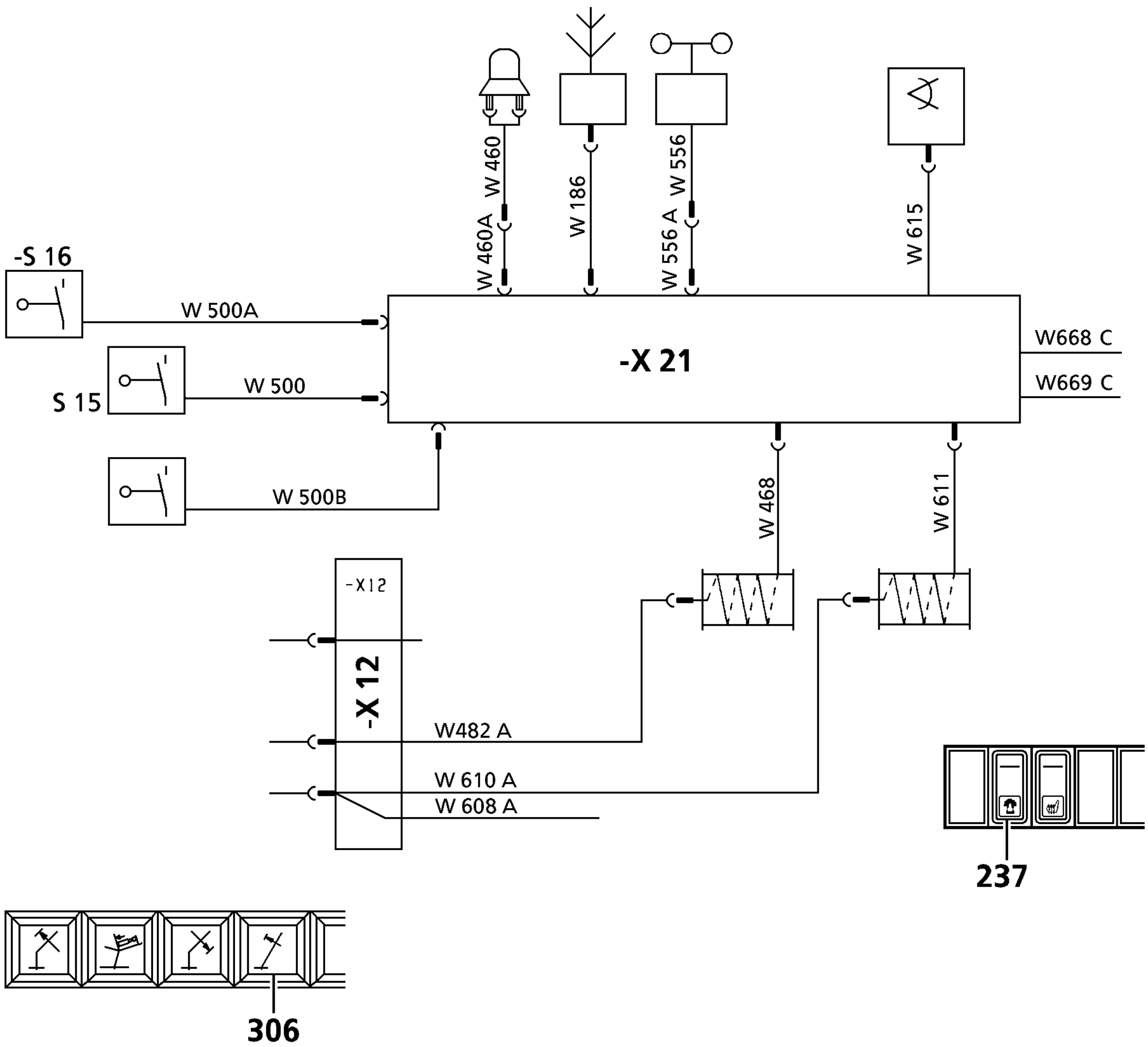
G16	S-pivot section	13.40 m	9000 kg
G2	L intermediate section	7.00 m	2870 kg
G3	L intermediate section	14.00 m	5380 kg
G4	L-adapter	7,00 m	3150 kg
G5	L-head piece	0,60 m	1950 kg

Attach auxiliary crane or support with suitable, stable materials.
Unstress tension rods by lowering the LA-strut. if head piece is mounted.
Unpin tension rods on the assembly support plates (3) on pivot section.

D A N G E R : **The boom must be held by an auxiliary crane (A); only then may tension rods on assembly support plates (3) be unpinned on pivot section (G16). Otherwise, there is a danger of accidents!**

Tension the tension rods between LA strut and L head piece by using winch IV.
Withdraw auxiliary crane.

D A N G E R : **Only withdraw auxiliary crane when the boom is held by the tension rods.**



-S 16
W 500A
S 15
W 500
W 500B
W 460
W 460A
W 186
W 556
W 556 A
W 615
-X 21
W668 C
W669 C
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A
237
306

187044

Electrical connections

L-boom (Fig. 1)
Make the electrical connection from the cable drums to the connection cabinet (-X21). Insert cable plug (W468 and W611).

Make the electrical connection from the switch cabinet (-X12) on the slewing platform to the cable drums in the pivot section. Insert cable plug (W482A and W610A) .

Attach aircraft warning light and wind speed gauge on head piece (G5).

Insert cable plug (W460) for aircraft warning light and (W556) for wind speed gauge on the connection cabinet (-X21).

Insert cable plugs (W 500, W 500A) for hoisting limit switches L head piece on the connection cabinet (-X21).

Insert cable plug (W 500B) for the boom nose hoisting limit switch on the connection cabinet (-X21).

Functions check

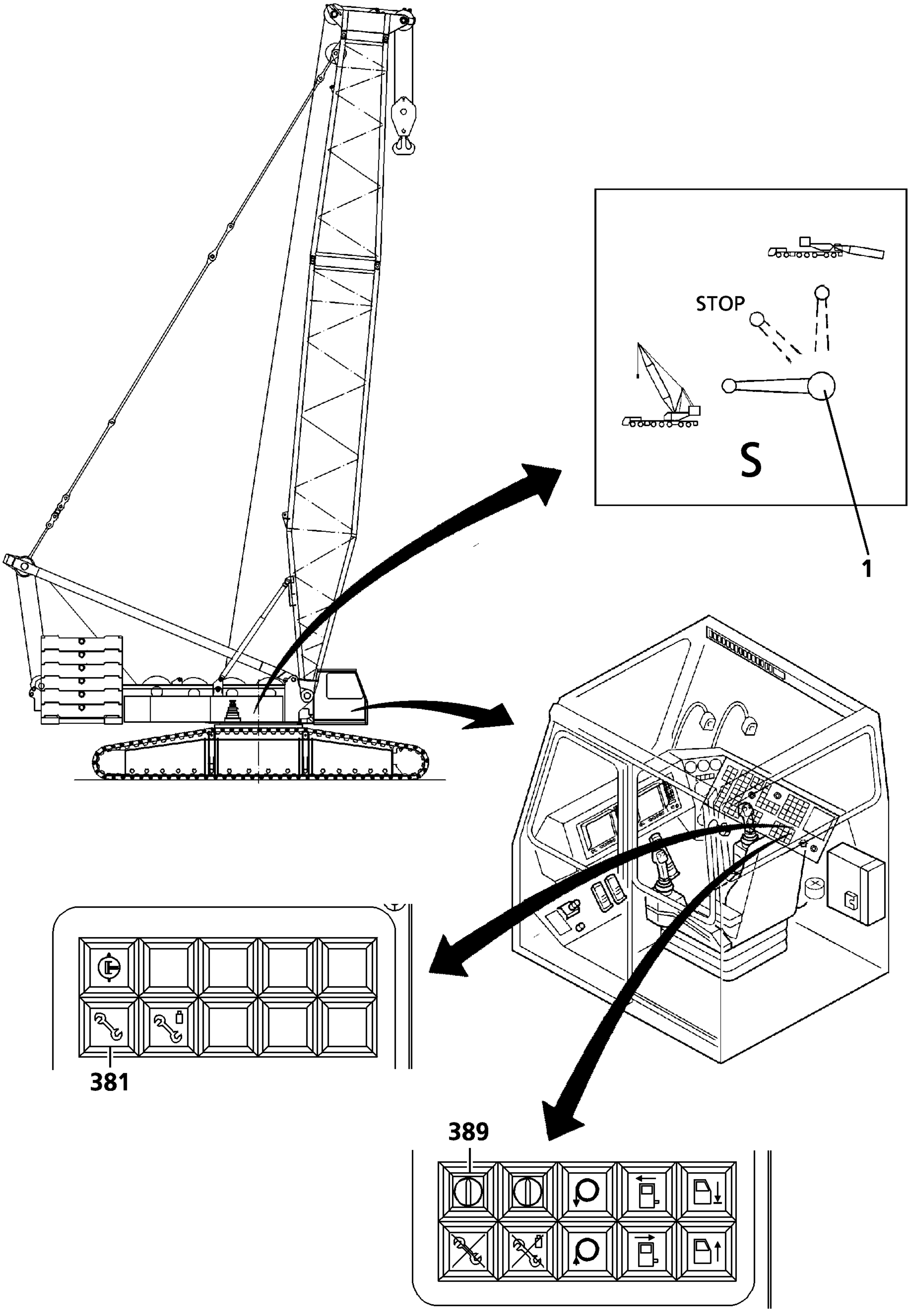
Requirements:
- All electrical connections have been made.
- Engine is running
- The limit switch activation lever has been checked for smooth movement and greased.

Aircraft warning light
Switch on the aircraft warning light with switch (237) visual inspection.

Wind speed gauge
Check the wind speed gauge for free movement and proper functioning.

Limit switches - boom, ”steepest” position
Manually activate each limit switch on the fall back cylinders separatly.
Winch IV (boom adjusting winch) movement must be shut off in spooling in direction.
Indicator lamp (306) must come on.

Hoisting limit switches
Manually activate each hoisting limit switches on the pulley head seperatly.
Winch (hoisting winch) movement must be shut off in spooling in direction.
Symbol hoist "top" on LICCON monitor blinks.



186230

Erection/lowering
The boom combinations must be erected and dismantled according to the erection and dismantling tables, chapter 5.09.

D A N G E R : Erection and dismantling must take place according to the instructions in the table. If this is not observed, the crane is overburdened or will tip over.

Requirements:
- The crane is horizontally aligned.
- The counterweight is attached to the slewing platform in accordance with the load capacity table.
- The boom is attached in accordance with the load capacity table and the operating instructions.
- All limit switches are properly attached and fully functional.
- All pin connections are secured.
- The hoisting cable is properly placed in the cable pulleys and secured with cable retaining pins to prevent it from jumping out.
- There are no persons in the danger area.
- There are no loose parts on the boom or fly jib.
- In winter: the boom, the fly jib and their components (limit switch, cable drum, aircraft warning light, wind speed gauge, etc.) are free of ice and snow.

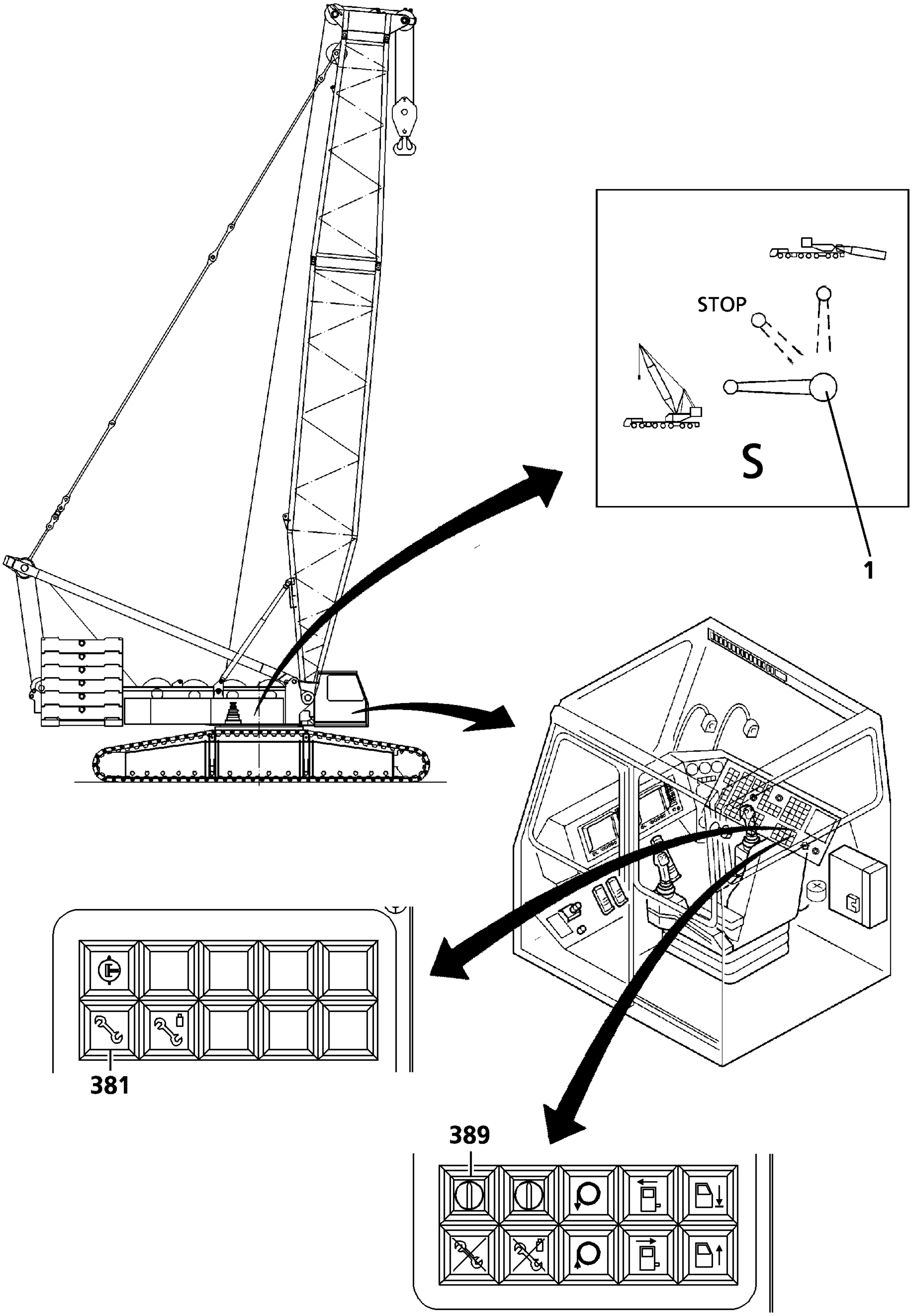
D A N G E R: Improperly attached or non-functioning limit switches, as well as falling parts (pins, spring keepers, ice, etc.), can cause accidents.

Raising procedure
Set the LICCON safety device in accordance with the load capacity operation table.
The assembly key-operated switch (389) is activated ; indicator lamp (381) is on.
Indicator symbol "Assembly" on the LICCON monitor blinks.

Extending fall back cylinders
Make the hydraulic connection to the fall back cylinders.
Set ball tap lever (1) in horizontal position and extend fall back cylinder piston rod.
Positions of ball tap lever:

Lever horizontal	= at crane operation; extending piston rod
Lever vertical	= at assembly works, retracting piston rods
Lever at 45° degrees	= stop; piston rod can not be extended resp. retracted

D A N G E R: Before raising the boom, fall back cylinders piston rods must be extended. The ball tap lever must be locked in horizontal position to preclude the possibility of unintentional activation of the lever.



186230

Raising
Luff the boom until the head piece raises from the ground.
Reeve the hoisting cable between the pulley head on the head piece and the hook block and secure at the cable socket - see chap. 4.06, reeving plans.
Attach hoist limit switch weight.
Luff the boom to the **lowest** operating position.

Indicators in the OPERATIONAL VIEW during the erection procedure
During the erection procedure, the following alarm functions are actuated (blinking) until the operating position is reached:
- ”ERROR” (150)
- ”STOP”
- ”HORN” + acoustical signal

Note: The lowest operating position is reached when the indicators turn off and the question marks (???) are replaced with the load value in -t- (tons) in the symbol ”MAX. LOAD” .

Turn the assembly key-operated switch off by pushing the button (397). Indicator lamp (381) and the assembly symbol on the LICCON turns off.

D A N G E R: **After reaching the lowest operating position, the assembly key-operated switch must immediately switched off.**
The assembly key-operated switch bypasses the safety devices!
The working radii specified in the load capacity table must be strictly adhered to, even without a load on the load hook!
If this is not observed, the crane can topple!

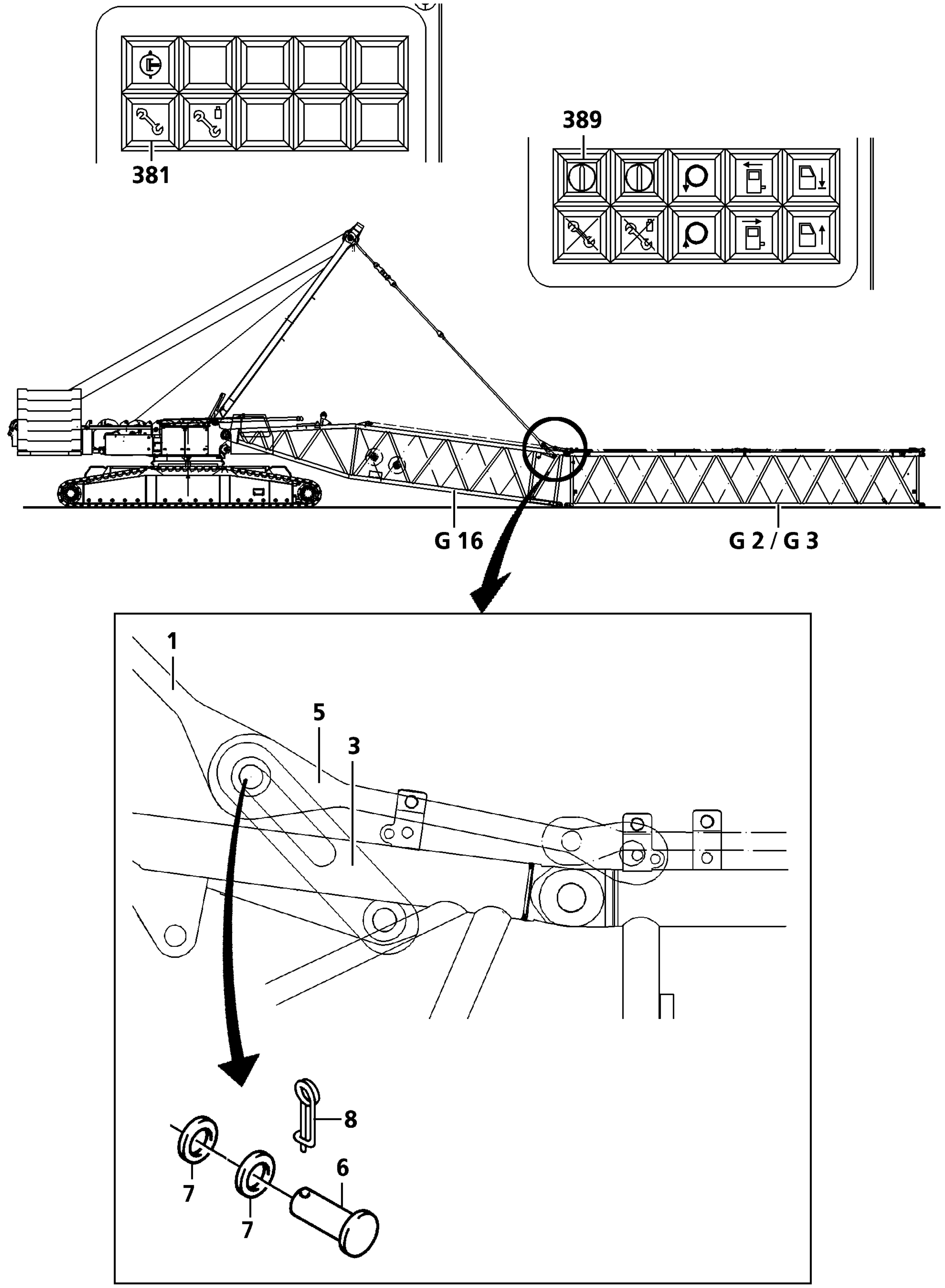
Crane operation with L/LL - boom

C A U T I O N: **Comply with notes in the chapters 4.05 ”CRANE OPERATIONS” and 4.08 ”WORKING WITH A LOAD”**

Requirements:
- The ”LICCON” safe load indicator has been set according to the data in the load capacity chart.
- The installation keyed switch (389) has been turned off via button (397)
- Indicator lamp (381) and the assembly symbol on the LICCON turns off.

D A N G E R : **Check horizontal position of crane before and during operation.**
If the crane operator leaves the cabin, even for a short time, he must check and if necessary reset operating mode setting before resuming operation.

Settings/Checks
Check function of the LICCON safety device by activating **"upper" and "lower"** operating positions
Check function of hoist limit switch "up" by activating the hoist limit switch weight.
Check function of limit switches ”boom steepest positon” by activating the limit switches on safety fall back cylinders.



187518

Lowering
Lower the boom to the **lowest** operating position.

Note: After reaching the **lowest** operating position the lowering movement is terminated.

C A U T I O N: While lowering, hoist winch must spooled out in order to prevent the hook block from colliding with the pulley head.

The assembly key-operated switch (389) is activated; indicator lamp (381) "Assembly" is on and the assembly symbol on the LICCON blinks.

D A N G E R: The safe load indicator is no longer operational.
The limit switch hoist ”top” is bypassed .

Using the manual control lever, continue to lower the boom until the hook block touches the ground.
Remove the hoist limit switch weight.
Unreeve the hook block.

D A N G E R: When unreeving the hoisting cable, there must be no persons in the danger area!

Spool back the hoist cable to the winch.

D A N G E R : Do not overspool the winch! If the cable is pulled under the winch when spooling it up, then the adjustment on the cam limit switch, which is supposed to assure a minimum number of at least 3 turns on the drum, is no longer accurate.
Reset the cam limit switch after all work on cable or winch.

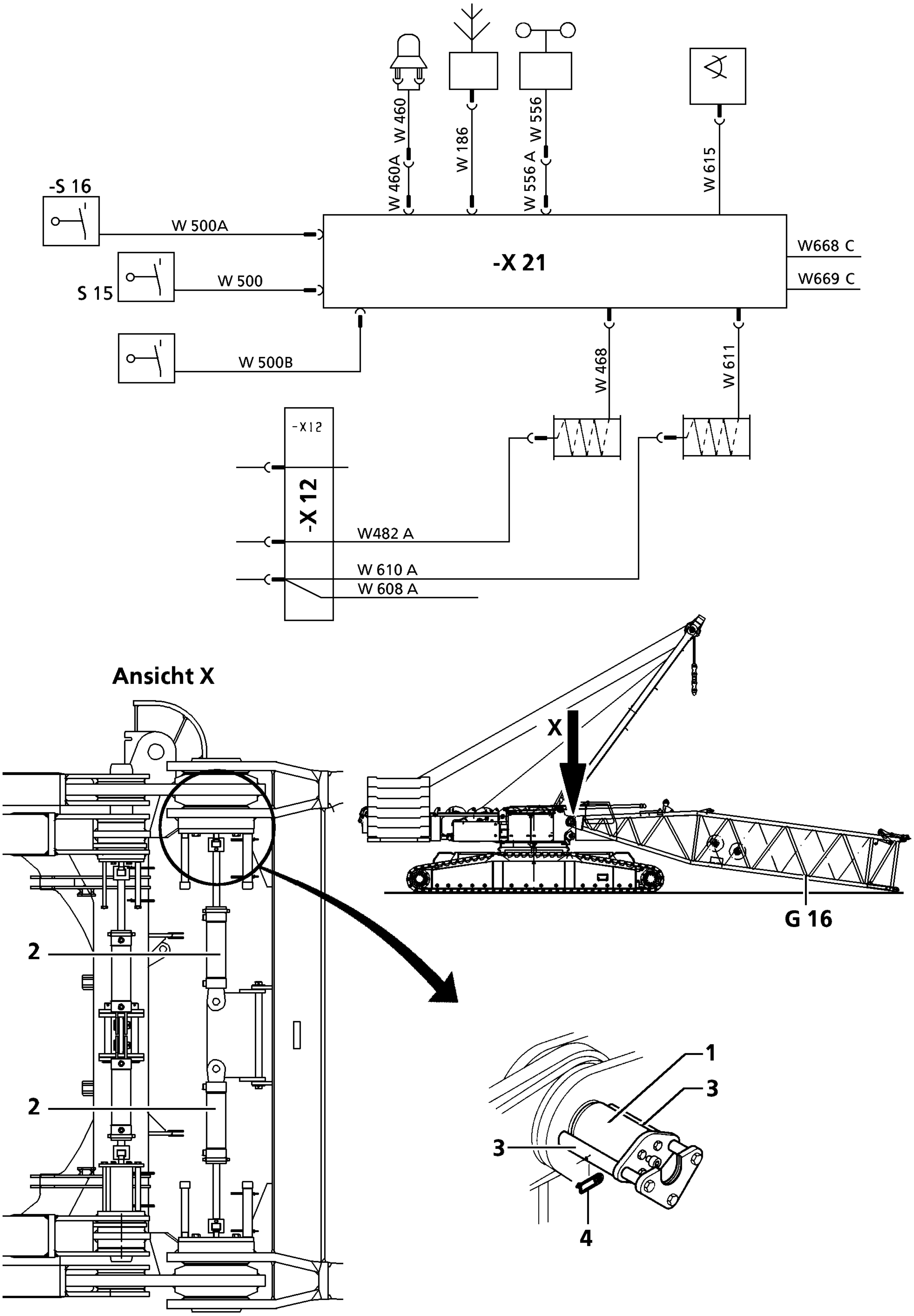
Continue to lower the boom until the pulley head is on the ground.

Operate control lever to lower the boom LA- bracket to the front and secure assembly support plates (3) on tension rods (1 + 5), hollow axle.

Use pin (6), washer (7), and retaining spring (8).

Unpin the pivot section (G16) from intermediate section **”on bottom”** and lower it to the ground. .

D A N G E R: Before unpinning, the pivot section must be hung into the mounting brackets and/or auxiliary crane, or supported.
Raising L-boom length of max. L 105 m is possible with A-strut tension rods pinned to the pivot section.
It is forbidden for anyone to be under the boom during any unpinning process.
If not observed, there is the rsik of accident if the boom were to luff downward suddenly.


-S 16
W 500A
S 15
W 500
W 500B
W 460
W 460A
W 186
W 556
W 556 A
W 615
-X 21
W668 C
W669 C
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A
Ansicht X
X
G 16
2
2
1
3
3
4

187232

Disassembly

Electrical connections
Remove the cable plugs of the aircraft warning light and the wind speed gauge and the hoisting limit switch on the connection cabinet (-X21 resp. -X19) .

Remove aircraft warning light and wind speed gauge on the head piece (G5 resp. G10).

Remove cable plugs (W482A,W610A) on the cable drums.

Disconnect electrical connection between the cable drum in the pivot section and the connection cabinet (-X21 resp. G10). Remove cable plugs (W468, W611) on the connection cabinet. Rewind, and secure cable drum from accidental unwinding.

Disassembly of the jib sections and the tension rods
Remove the tension rods, place on the respective boom section for transport and secure.

Remove boom sections with auxiliary crane.

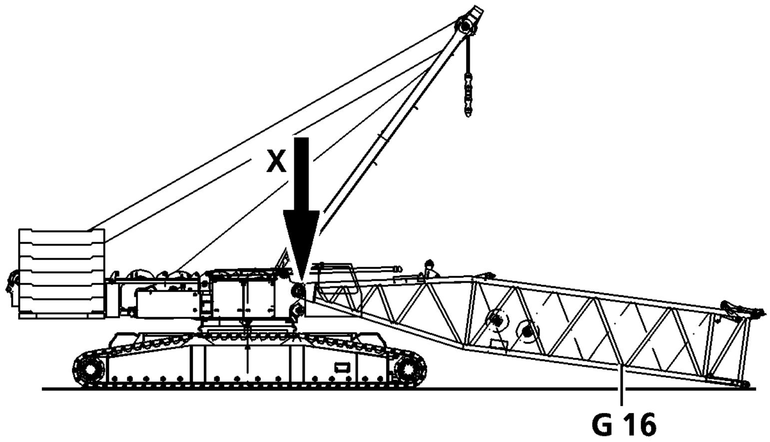
Take off retaining plates (3) on pin pulling device (2).

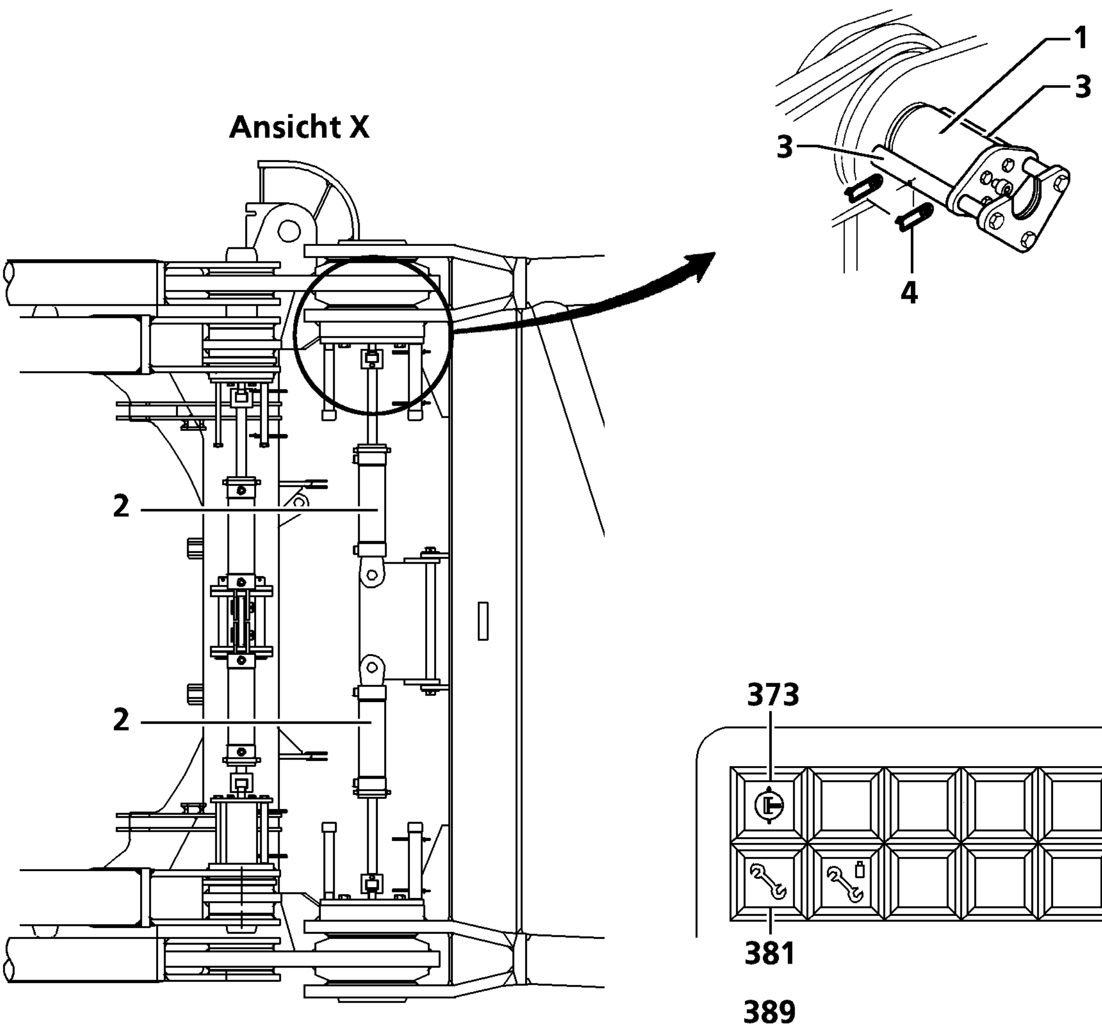
Hang on boom pivot section to an auxiliary crane and unpin from slewing platform.

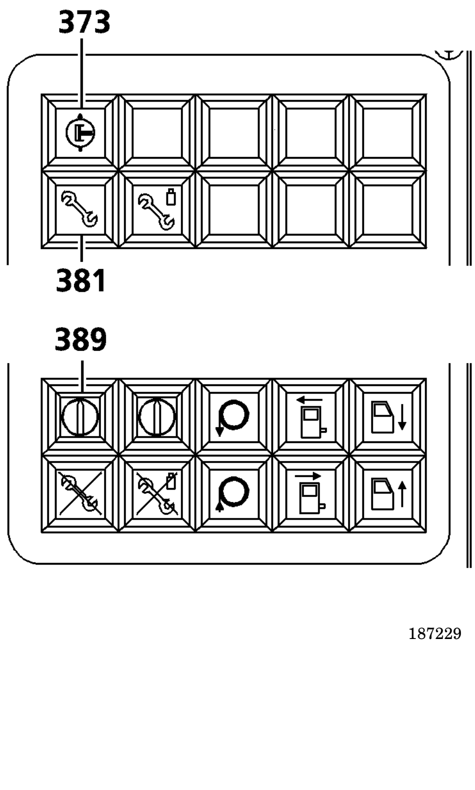
Note: S-Boom pivot section weight:
- without winch V, without tension rods appr. 9,00 t
- without winch V, with rope, with tension rods appr. 12,50 t

C A U T I O N: The warning and danger notes for assembly must also be observed during disassembly!

Placing LA-strut on the slewing platform
The LA-strut must be placed onto the slewing platform, as described in Chap. 5.02.







187229

Assembly

D A N G E R: **For assembly and disassembly:**
- **you must use a safe installation scaffolding / working platform! There is a danger of falling !**
- **Improvisations are not permitted!**
- **The lattice sections must be supported with suitable, stable material.**
- **Make sure that no personnel remains underneath the lattice jib during the pinning and unpinning procedure of the lattice sections !**

Requirements:

-The crane is horizontally aligned.
-An auxiliary crane as well as assembly scaffold/working platform are available.
-Set the LICCON safety device in accordance with the load capacity operation table.
-The assembly key-operated button (389) is activated; indicator lamp (381) "Assembly" is on.
-the assembly symbol on the LICCON indicator blinks
-Pressure selector switch (373) must be actuated

Assembly - boom

Rotate the slewing platform until is along the crawler track longitudinal axis or to the side.

Note: Refer to the raising and lowering charts.

C A U T I O N: **Requirements when slewing the slewing platform without the boom**
- **the crawler track with mounted slewing platform must be horizontally aligned**

As long as the boom is not mounted or the boom is mounted on the crane but the boom head is still resting on the ground, a maximum of 135 t counterweight can be attached.
Jf the counterweight is increased to 155 t, the boom head must be raised from the ground!
Otherwise there will be a risk of overturning!
When slewing the platform 360° without boom, the LA - bracket must be raised to a minimum angle of > 90° , following counterweights are permissible:

Min. counterweight	Min. centralballast
135/155 t	43 t
95 t	11 t
55 t	11 t

If this is not adhered to, the crane may topple!

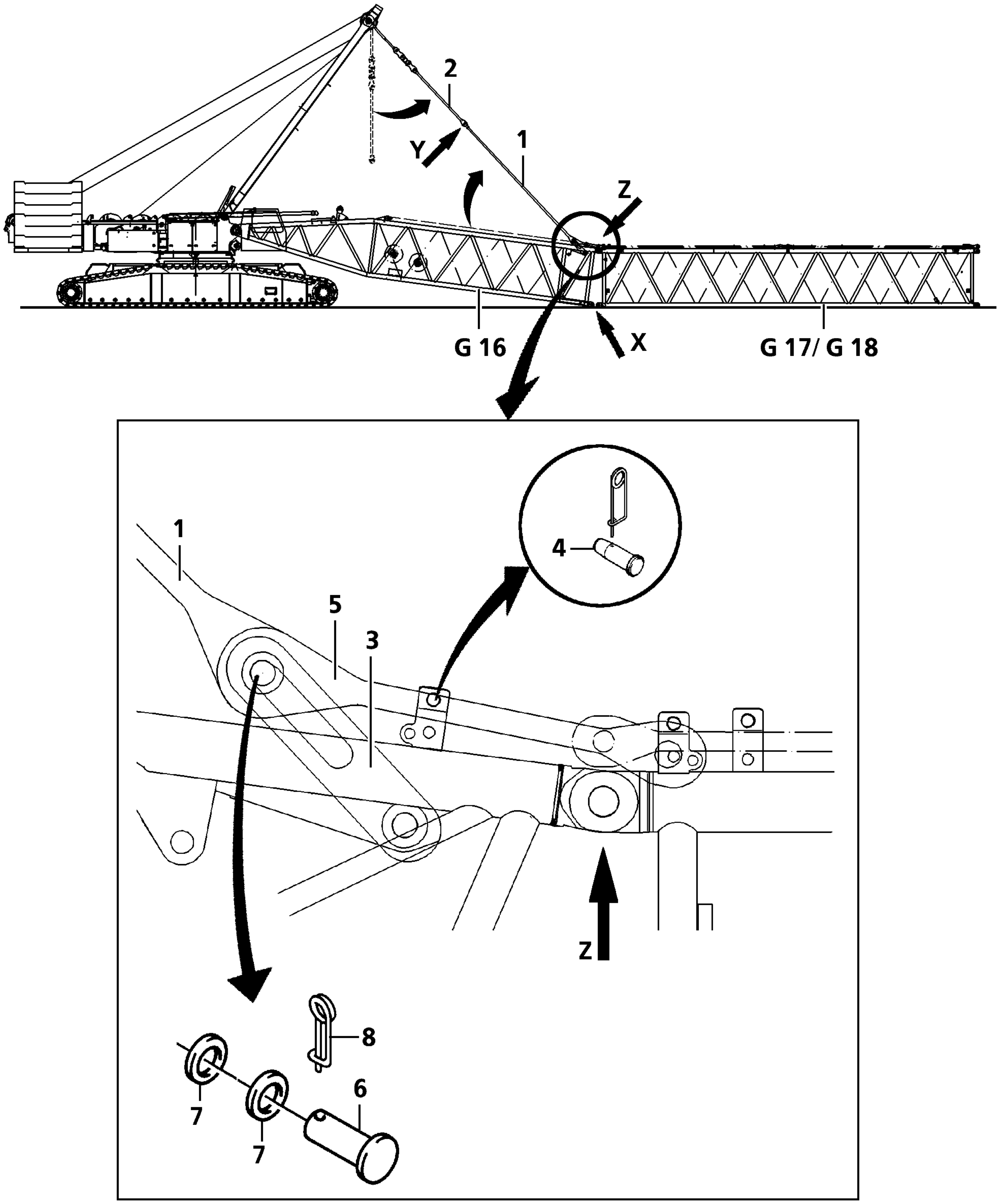
Hoist the boom pivot section with the auxiliary crane and swing on the slewing platform to the pinning points.

Note: S-Boom pivot section weight:
- without winch V, without tension rods appr. 9,0t
- without winch V, with rope, with tension rods appr. 12,5t

Make the hydr. connection, 2× quick-release couplings, from the pinning cylinders on the slewing platform.
Pin and secure the boom pivot section (G16) to the slewing platform.
The connector pins (1) are pinned by using the hydraulic pin pulling device (2), and they are secured with locking plates (3). Attach the locking plates (3) on the left and right hand side and secure them with retaining springs (4).
Turn off pressure selector switch (373).

D A N G E R: **To prevent unintentional unpinning, locking plates must be attached.**

Lower the pivot section onto the ground and withdraw the auxiliary crane.



187230

Attaching boom and Tension rods
Raise LA-strut and lower forward; refer to Chap. 5.02 ”LA-strut”
Pin and secure (Y) tension rods (2) from LA-strut to the tension rods (1) from L-pivot section (G16).
Unpin transport retaining pin (4) of tension rods.
Pin and secure assembly support plates (3) on tension rods (1 + 5), hollow axle.
Use pin (6), washer (7), and retaining spring (8).

Assemble the SL/S boom and the corresponding tension rods to the required length, pin and secure.
Pin and secure the first intermediate section (G17/G18) on the pivot section (G16) **"above" (Z)**.
Raise pivot section with LA-strut (winch IV) until pinning is possible **"below" (X)** on pivot section (G1).

Note: Raising boom length of max.**SL 112 m and S 119** m is possible.

D A N G E R : **Max. permissible tensioning force at the force sensor F ≤ 1100 KN.**
Raising boom length of max. SL 112 m and S 119 m is possible with A-strut tension rods pinned to the pivot section.
Head piece must not be raised; it must remain on the ground.
If this is not observed, damage can occur.

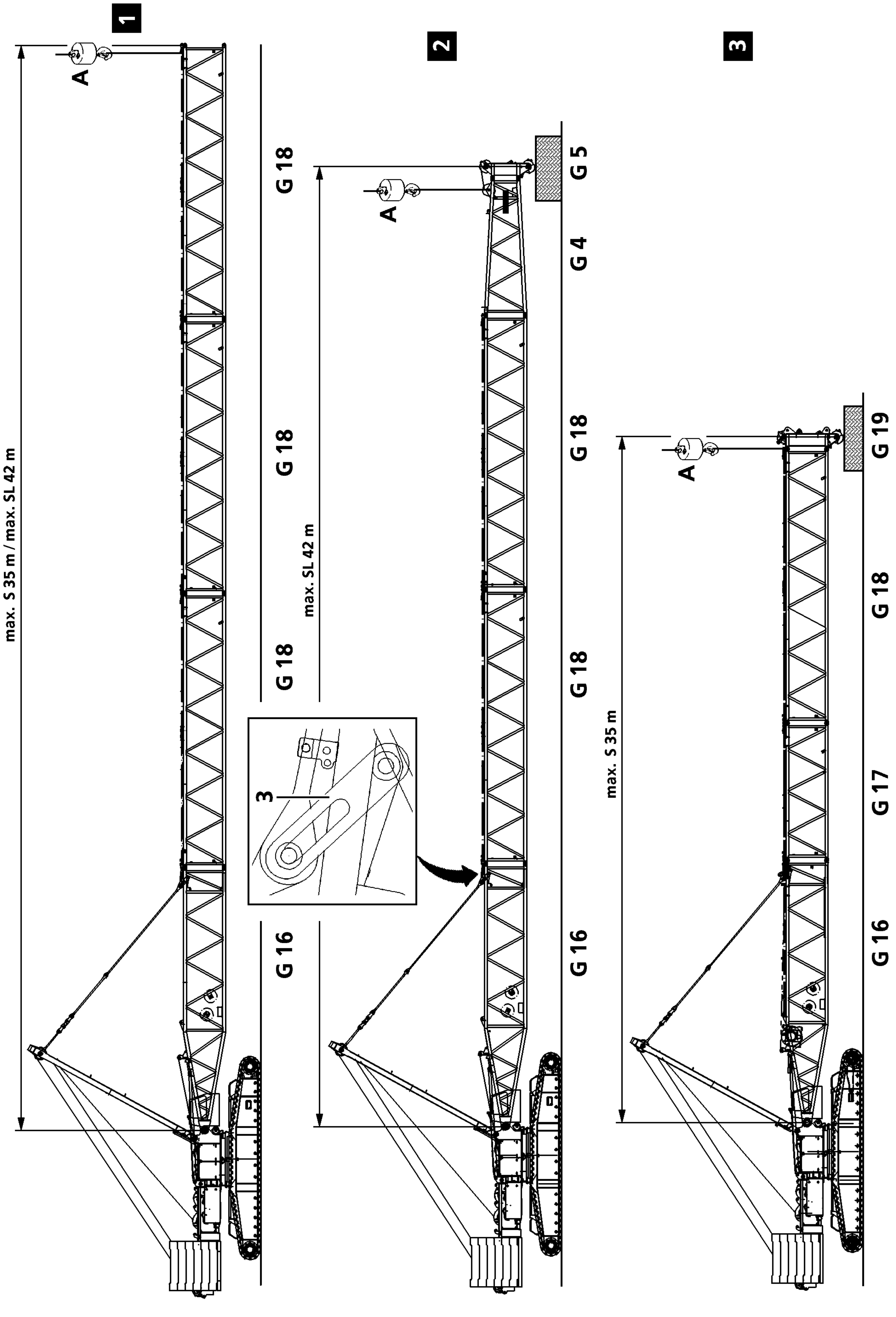
Pin and secure on the pivot section **"below" (X)**.
Unstress tension rods by lowering the LA-strut.
Remove pins of tension rod (1) on the assembly support plates (3).

D A N G E R : **Before unpinning tension rods on the assembly support plates, boom must be pinned ”below”.**
Otherwise, there is the danger of the boom suddenly swinging down.
No personnel is permitted under the boom when the pins are being removed.

Attaching the tension rods
Connect tension rods from head piece with the tension rods from LA-strut, pin and secure.
The tension rods must be attached and secured in accordance with the assembly diagrams in Chap. 5.03. Here, the numbering in the assembly diagram must be compared with the numbering on the tension rod.

D A N G E R: **The pins of the tension rods must be inserted from the inside. If this is not done, the hoisting cable will scrape against the pin. The tension rods must be regularly inspected; refer to the chapter ”Inspection and Maintenance of the Tension Rods”.**

Tension the tension rods between LA-strut and L-head piece, by using winch IV.


1
2
3
A
max. S 35 m / max. SL 42 m
G 18
G 18
G 18
G 16
A
max. SL 42 m
G 5
G 4
G 18
G 18
G 16
3
A
max. S 35 m
G 19
G 18
G 17
G 16

187043

Flying assembly of the SL/S-boom

Assembly
If the area at the operating site is limited, it is possible to carry out a flying assembly of the boom at a **max. length:**

Fig. 1	**max. SL / S**	**48,4 m**	(without head section, without hookblock).
Fig. 2	**max. SL**	**42,0 m**	(with 250 t head, without hookblock)
Fig. 3	**max. S**	**35,0 m**	(with 400 t head, without hookblock)

D A N G E R: **Min. 55 t counterweight and min. 43 t centralballast must be attached!**
Max. permissible tensioning force at the force sensor F ≤ 1100 KN.
If this is not observed, damage can occur.

Requirements:
- Pivot section (G16) is pinned and secured to assembly support plates (3) and tension rods.

Mounting
In flying assembly, the individual intermediate sections, or the boom as a complete unit, can be pinned and secured on the pivot section with an auxiliary crane.
Insert and secure pin **"above" and "below"**.

D A N G E R : **For flying assembly, pay attention to the max. permissible boom length. Otherwise, there is the danger of accidents.**

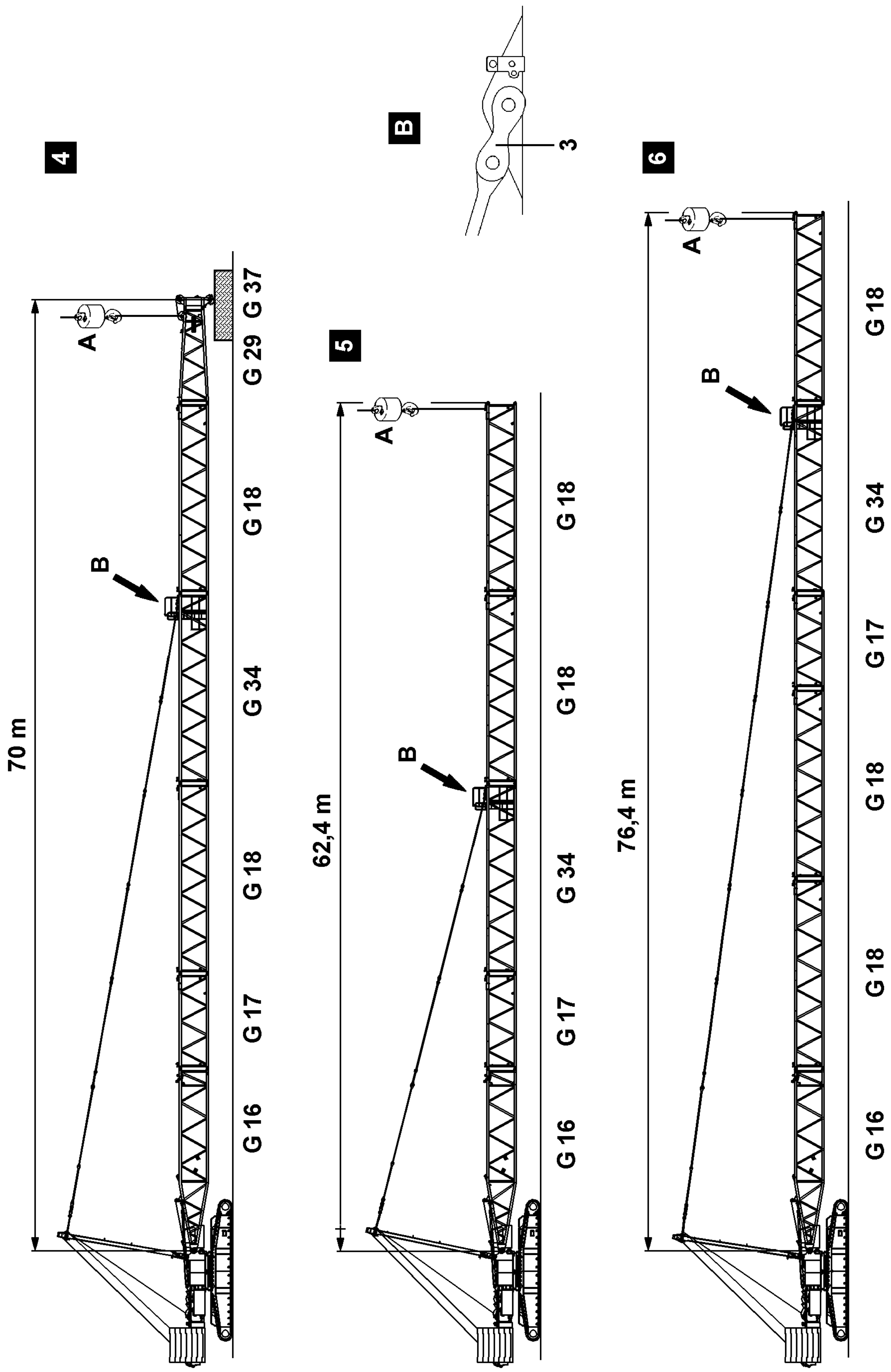
Note : Weights of the lattice sections with attached tension rods -see chap. 5.03.

Attach auxiliary crane or support with suitable, stable materials.
Unstress tension rods by lowering the LA-strut. if head piece is mounted.
Unpin tension rods on the assembly support plates (3) on pivot section.

D A N G E R : **The boom must be held by an auxiliary crane (A) or supported; only then may tension rods on assembly support plates (3) be unpinned on pivot section (G16). No personnel is permitted under the boom when the pins are being removed. Otherwise, there is a danger of accidents!**

Tension the tension rods between LA strut and head piece by using winch IV.
Withdraw auxiliary crane.

D A N G E R : **Only withdraw auxiliary crane when the boom is held by the tension rods.**


4
70 m
A
B
G 37
G 29
G 18
G 34
G 18
G 17
G 16
B
3
5
62,4 m
A
B
G 18
G 18
G 34
G 17
G 16
6
76,4 m
A
B
G 18
G 34
G 17
G 18
G 18
G 16

198312

Flying assembly of the SL/S-boom

Assembly
If the area at the operating site is limited, it is possible to carry out a flying assembly of the boom at a **max. length:**

Fig. 4	**max. SL / S**	**70,0 m**	(without head section).
Fig. 5	**max. SL**	**62,4 m**	(without Adapter and head section)
Fig. 6	**max. S**	**76,4 m**	(without Adapter and head section)

D A N G E R: **Min. 55 t counterweight and min. 43 t centralballast must be attached!**
Max. permissible tensioning force at the force sensor F ≤ 1500 KN.
If this is not observed, damage can occur.

Requirements:
- Pivot section (G16) is pinned and secured to assembly support plates (3) and tension rods.

Mounting
In flying assembly, the individual intermediate sections, or the boom as a complete unit, can be pinned and secured on the pivot section with an auxiliary crane.
Insert and secure pin **"above" and "below"**.

D A N G E R : **For flying assembly, pay attention to the max. permissible boom length.**
Otherwise, there is the danger of accidents.

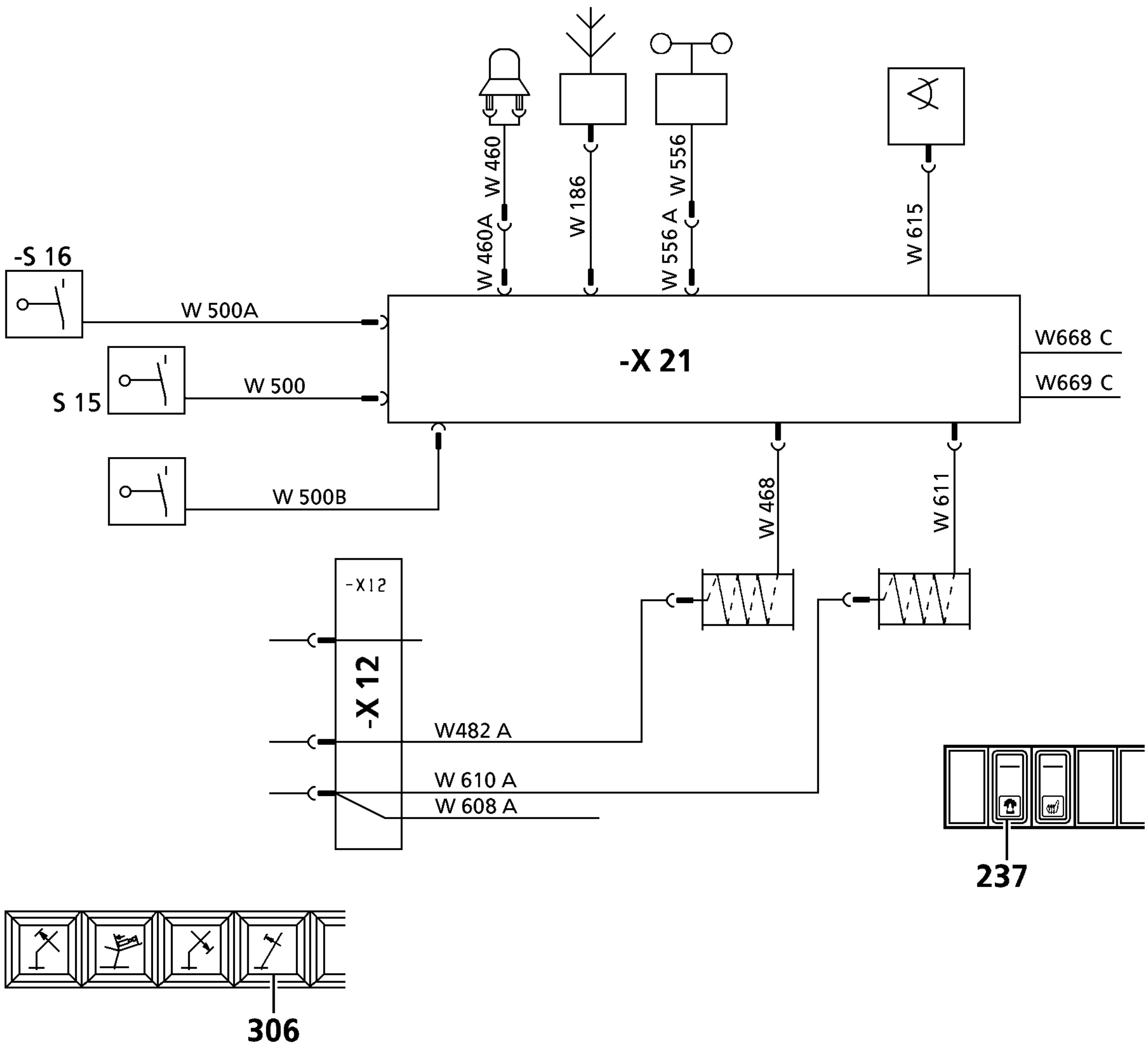
Note : Weights of the lattice sections with attached tension rods -see chap. 5.03.

Attach auxiliary crane or support with suitable, stable materials.
Unstress tension rods by lowering the LA-strut. if head piece is mounted.
Unpin tension rods on the assembly support plates (3) on pivot section.

D A N G E R : **The boom must be held by an auxiliary crane (A) or supported; only then may tension rods on assembly support plates (3) be unpinned on pivot section (G16).**
No personnel is permitted under the boom when the pins are being removed.
Otherwise, there is a danger of accidents!

Tension the tension rods between LA strut and head piece by using winch IV.
Withdraw auxiliary crane.

D A N G E R : **Only withdraw auxiliary crane when the boom is held by the tension rods.**


-S 16
S 15
W 500A
W 500
W 500B
W 460
W 460A
W 186
W 556
W 556 A
W 615
-X 21
W668 C
W669 C
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A
237
306

187044

Electrical connections

L-boom (Fig. 1)
Make the electrical connection from the cable drums to the connection cabinet (-X21). Insert cable plug (W468 and W611).

Make the electrical connection from the switch cabinet (-X12) on the slewing platform to the cable drums in the pivot section. Insert cable plug (W482A and W610A) .

Attach aircraft warning light and wind speed gauge on head piece (G5).

Insert cable plug (W460) for aircraft warning light and (W556) for wind speed gauge on the connection cabinet (-X21).

Insert cable plugs (W 500, W 500A) for hoisting limit switches L head piece on the connection cabinet (-X21).

Insert cable plug (W 500B) for the boom nose hoisting limit switch on the connection cabinet (-X21).

Functions check

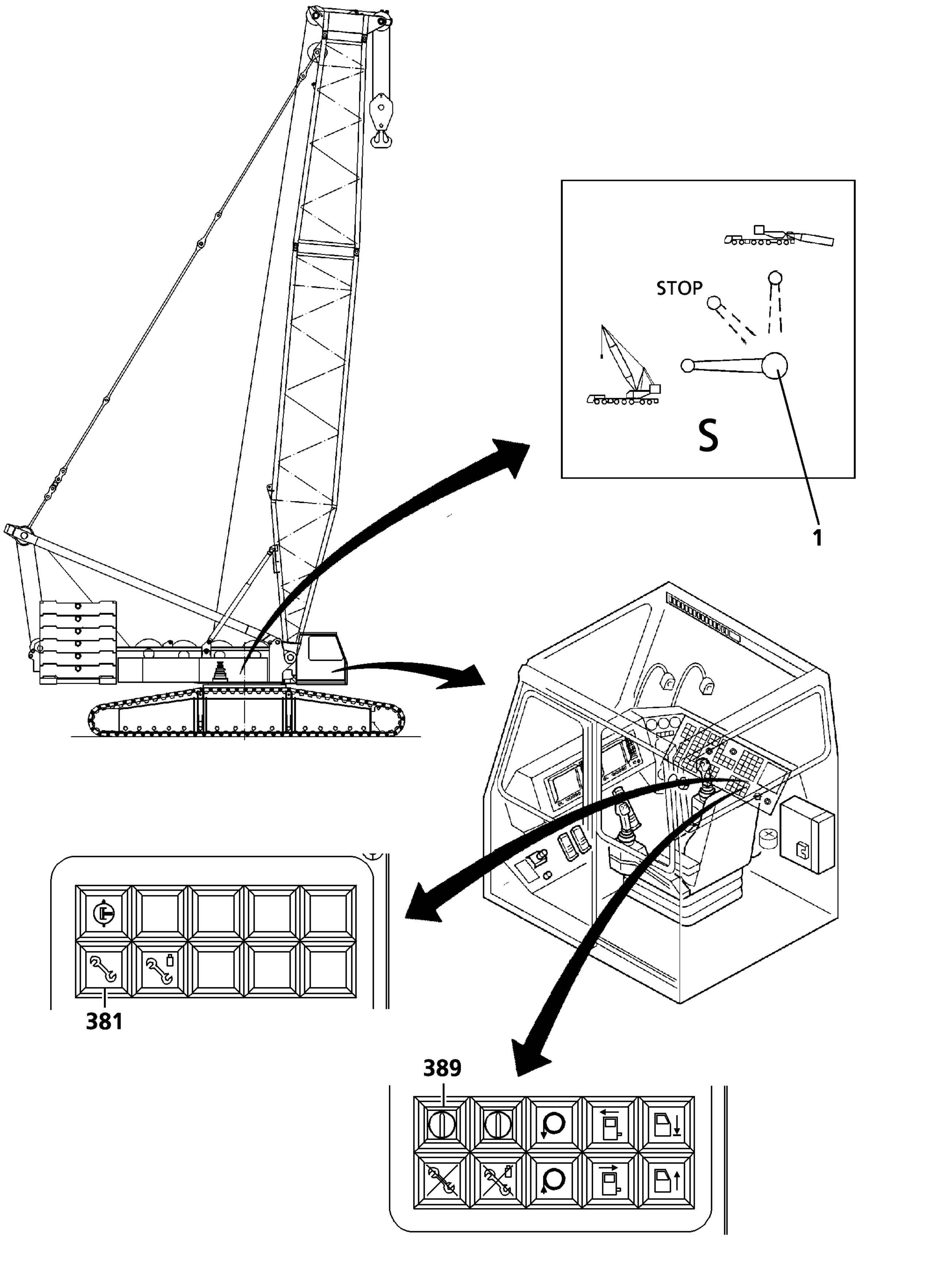
Requirements:
- All electrical connections have been made.
- Engine is running
- The limit switch activation lever has been checked for smooth movement and greased.

Aircraft warning light
Switch on the aircraft warning light with switch (237) visual inspection.

Wind speed gauge
Check the wind speed gauge for free movement and proper functioning.

Limit switches - boom, ”steepest” position
Manually activate each limit switch on the fall back cylinders separatly.
Winch IV (boom adjusting winch) movement must be shut off in spooling in direction.
Indicator lamp (306) must come on.

Hoisting limit switches
Manually activate each hoisting limit switches on the pulley head seperatly.
Winch (hoisting winch) movement must be shut off in spooling in direction.
Symbol hoist "top" on LICCON monitor blinks.



186230

Erection/lowering
The boom combinations must be erected and dismantled according to the erection and dismantling tables, chapter 5.09.

D A N G E R : **Erection and dismantling must take place according to the instructions in the table. If this is not observed, the crane is overburdened or will tip over.**

Requirements:
- The crane is horizontally aligned.
- The counterweight is attached to the slewing platform in accordance with the load capacity table.
- The boom is attached in accordance with the load capacity table and the operating instructions.
- All limit switches are properly attached and fully functional.
- All pin connections are secured.
- The hoisting cable is properly placed in the cable pulleys and secured with cable retaining pins to prevent it from jumping out.
- There are no persons in the danger area.
- There are no loose parts on the boom or fly jib.
- In winter: the boom, the fly jib and their components (limit switch, cable drum, aircraft warning light, wind speed gauge, etc.) are free of ice and snow.

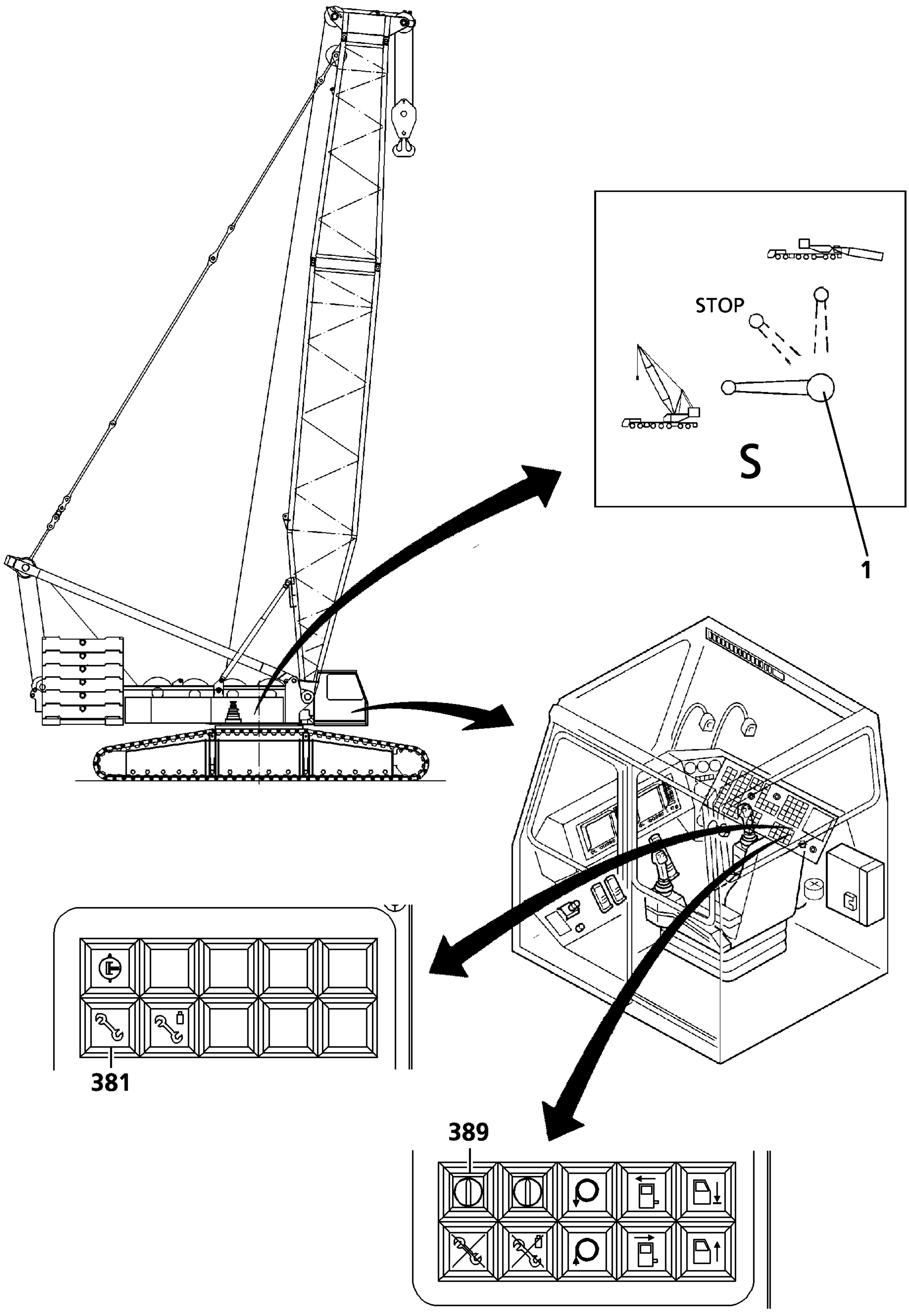
D A N G E R: **Improperly attached or non-functioning limit switches, as well as falling parts (pins, spring keepers, ice, etc.), can cause accidents.**

Raising procedure
Set the LICCON safety device in accordance with the load capacity operation table.
The assembly key-operated switch (389) is activated ; indicator lamp (381) is on.
Indicator symbol ”Assembly" on the LICCON monitor blinks.

Extending fall back cylinders
Make the hydraulic connection to the fall back cylinders.
Set ball tap lever (1) in horizontal position and extend fall back cylinder piston rod.
Positions of ball tap lever:

Lever horizontal	= at crane operation; extending piston rod
Lever vertical	= at assembly works, retracting piston rods
Lever at 45° degrees	= stop; piston rod can not be extended resp. retracted

D A N G E R: **Before raising the boom, fall back cylinders piston rods must be extended. The ball tap lever must be locked in horizontal position to preclude the possibility of unintentional activation of the lever.**



186230

Raising
Luff the boom until the head piece raises from the ground.
Reeve the hoisting cable between the pulley head on the head piece and the hook block and secure at the cable socket - see chap. 4.06, reeving plans.
Attach hoist limit switch weight.
Luff the boom to the **lowest** operating position.

Indicators in the OPERATIONAL VIEW during the erection procedure
During the erection procedure, the following alarm functions are actuated (blinking) until the operating position is reached:
- ”ERROR” (150)
- ”STOP”
- ”HORN” + acoustical signal

Note: The lowest operating position is reached when the indicators turn off and the question marks (???) are replaced with the load value in -t- (tons) in the symbol ”MAX. LOAD” .

Turn the assembly key-operated switch off by pushing the button (397). Indicator lamp (381) and the assembly symbol on the LICCON turns off.

D A N G E R: **After reaching the lowest operating position, the assembly key-operated switch must immediately switched off.**
The assembly key-operated switch bypasses the safety devices!
The working radii specified in the load capacity table must be strictly adhered to, even without a load on the load hook!
If this is not observed, the crane can topple!

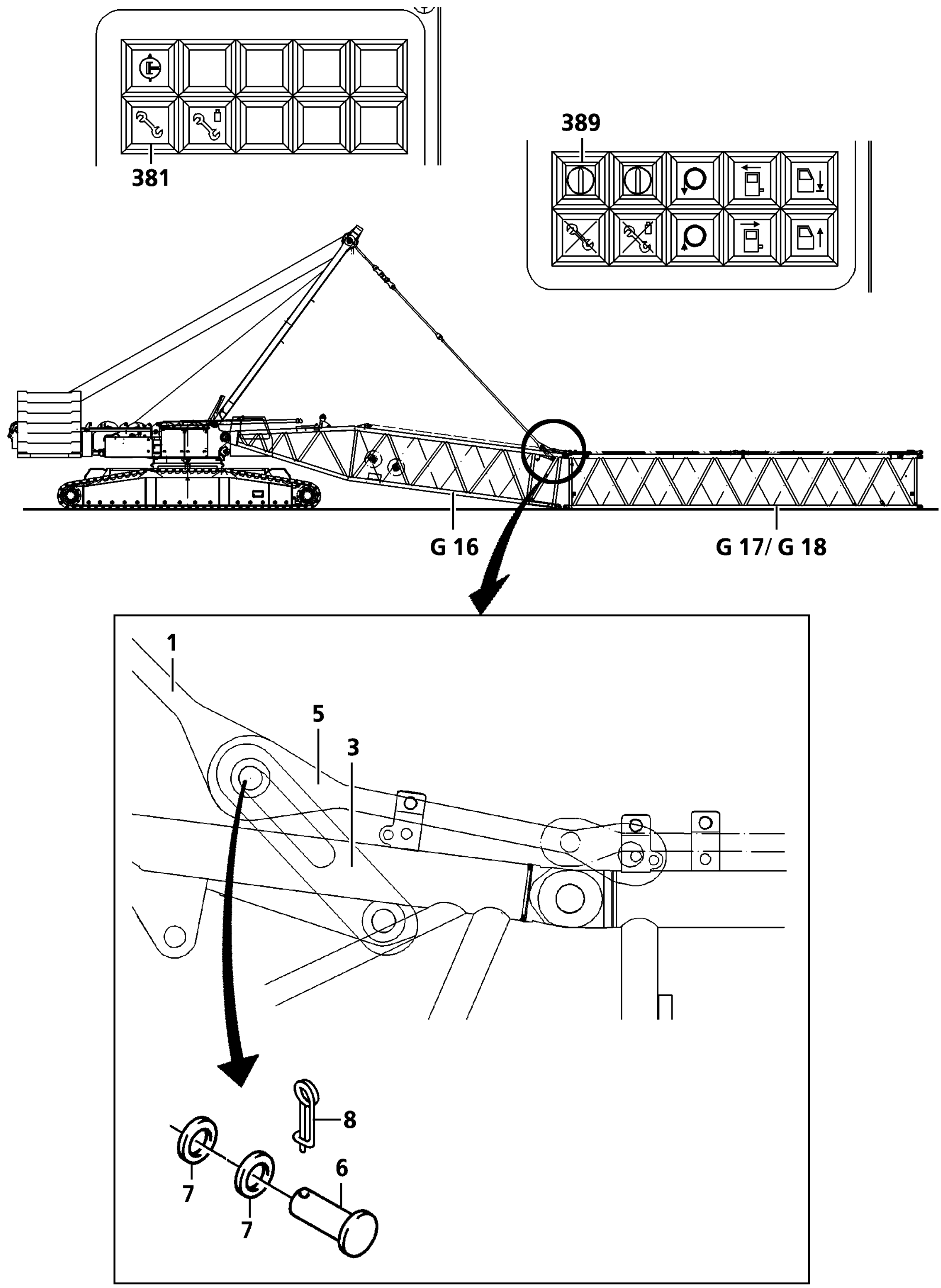
Crane operation

C A U T I O N: **Comply with notes in the chapters 4.05 ”CRANE OPERATIONS” and 4.08 ”WORKING WITH A LOAD”**

Requirements:
- The ”LICCON” safe load indicator has been set according to the data in the load capacity chart.
- The installation keyed switch (389) has been turned off via button (397)
- Indicator lamp (381) and the assembly symbol on the LICCON turns off.

D A N G E R : **Check horizontal position of crane before and during operation.**
If the crane operator leaves the cabin, even for a short time, he must check and if necessary reset operating mode setting before resuming operation.

Settings/Checks
Check function of the LICCON safety device by activating **"upper" and "lower"** operating positions
Check function of hoist limit switch "up" by activating the hoist limit switch weight.
Check function of limit switches ”boom steepest positon” by activating the limit switches on safety fall back cylinders.



187231

Lowering
Lower the boom to the **lowest** operating position.

Note: After reaching the **lowest** operating position the lowering movement is terminated.

C A U T I O N: **While lowering, hoist winch must spooled out in order to prevent the hook block from colliding with the pulley head.**

The assembly key-operated switch (389) is activated; indicator lamp (381) "Assembly" is on and the assembly symbol on the LICCON blinks.

D A N G E R: **The safe load indicator is no longer operational.**
The limit switch hoist "top" is bypassed .

Using the manual control lever, continue to lower the boom until the hook block touches the ground.
Remove the hoist limit switch weight.
Unreeve the hook block.

D A N G E R: **When unreeving the hoisting cable, there must be no persons in the danger area!**

Spool back the hoist cable to the winch.

D A N G E R : **Do not overspool the winch! If the cable is pulled under the winch when spooling it up, then the adjustment on the cam limit switch, which is supposed to assure a minimum number of at least 3 turns on the drum, is no longer accurate.**
Reset the cam limit switch after all work on cable or winch.

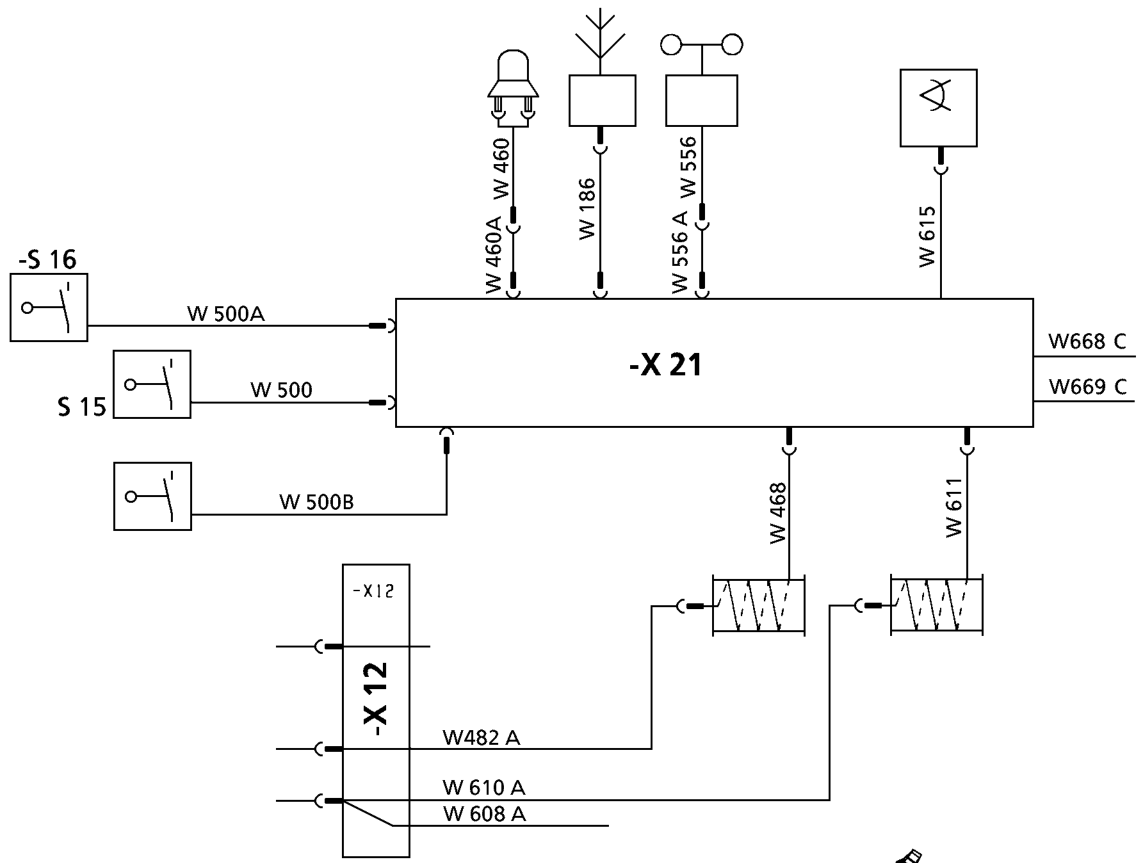
Continue to lower the boom until the pulley head is on the ground.

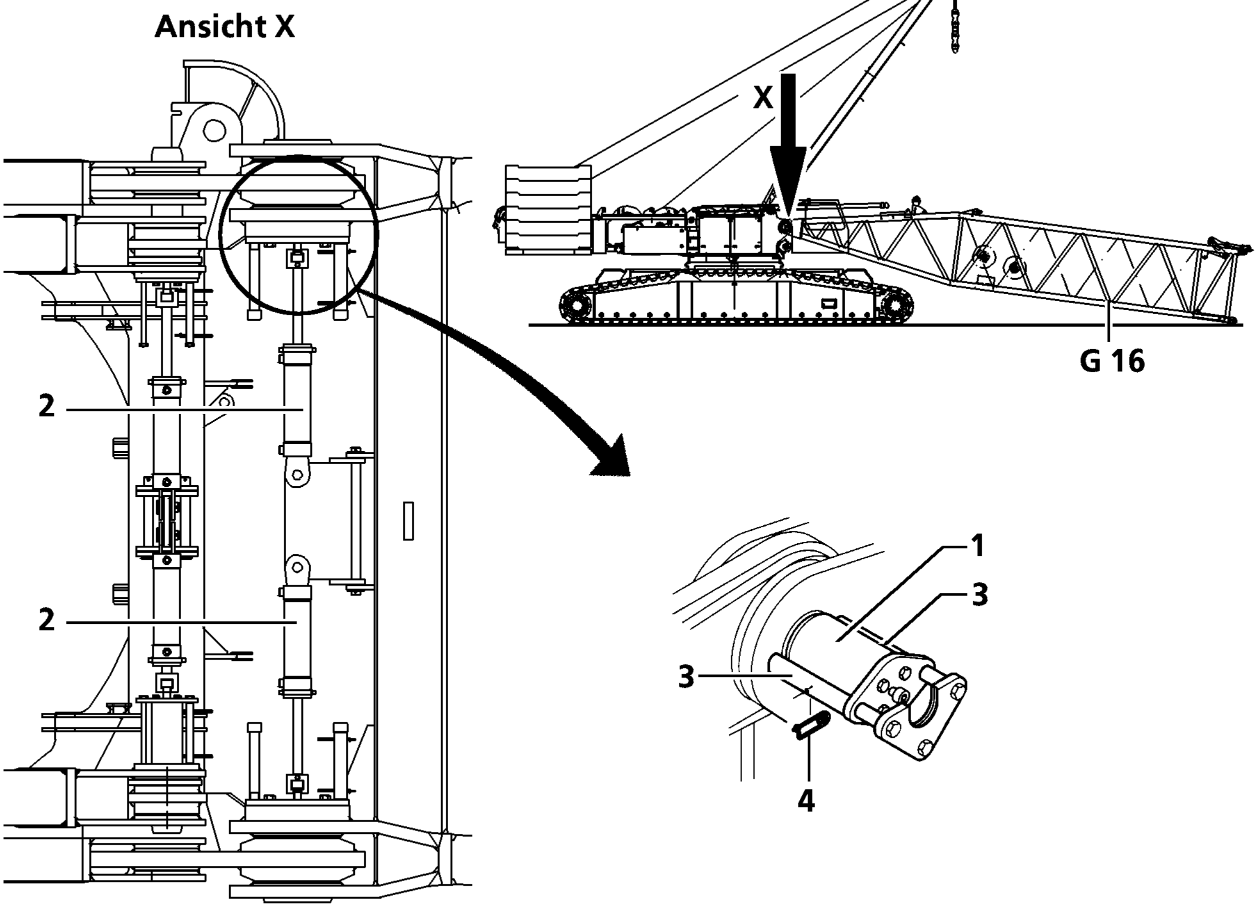
Operate control lever to lower the boom LA- bracket to the front and secure assembly support plates (3) on tension rods (1 + 5), hollow axle.

Use pin (6), washer (7), and retaining spring (8).

Unpin the pivot section (G16) from intermediate section **"on bottom"** and lower it to the ground. .

D A N G E R: **Before unpinning, the pivot section must be hung into the mounting brackets and/or auxiliary crane resp. supported.**
Raising boom length of max. SL 112 m and S 119 m is possible with A-strut tension rods pinned to the pivot section.
It is forbidden for anyone to be under the boom during any unpinning process.
Otherwise, there is the danger of the boom suddenly swinging down.


-S 16
S 15
W 500A
W 500
W 500B
W 460
W 460A
W 186
W 556
W 556 A
W 615
-X 21
W668 C
W669 C
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A


Ansicht X
2
2
X
G 16
1
3
3
4

187232

Disassembly

Electrical connections

Remove the cable plugs of the aircraft warning light and the wind speed gauge and the hoisting limit switch on the connection cabinet (-X21 resp. -X19) .

Remove aircraft warning light and wind speed gauge on the head piece (G5 resp. G10).

Remove cable plugs (W482A,W610A) on the cable drums.

Disconnect electrical connection between the cable drum in the pivot section and the connection cabinet (-X21 resp. G10). Remove cable plugs (W468, W611) on the connection cabinet. Rewind, and secure cable drum from accidental unwinding.

Disassembly of the jib sections and the tension rods

Remove the tension rods, place on the respective boom section for transport and secure.
Remove boom sections with auxiliary crane.

Take off retaining plates (3) on pin pulling device (2).
Pressure selector switch (373) must be actuated
Hang on boom pivot section to an auxiliary crane and unpin from slewing platform.

Note: S-Boom pivot section weight:
- without winch V, without tension rods appr. 9,00 t
- without winch V, with rope, with tension rods appr. 12,50 t

C A U T I O N: The warning and danger notes for assembly must also be observed during disassembly!

Placing LA-strut on the slewing platform

The LA-strut must be placed onto the slewing platform, as described in Chap. 5.02.

Installation

D A N G E R: **For assembly and disassembly:**
- **you must use a safe installation scaffolding / working platform! There is a danger of falling !**
- **Improvisations are not permitted!**
- **The lattice sections must be supported with suitable, stable material.**
- **Make sure that no personnel remains underneath the lattice jib during the pinning and unpinning procedure of the lattice sections !**

Prerequisites:
- The crane is horizontally aligned.
- An auxiliary crane as well as an installation scaffolding / working platform is available.
- The LICCON safe load indicator is set according to the data given in the load capacity chart.
- Actuate the keyed switch (389) "Installation" , indicator light "Installation" (381).
- The installation symbol on the LICCON indicator blinks.
- The boom is not installed.

Installation D - Derrick
Turn the slewing platform until it is positioned in lengthwise direction to the crawler tracks or to the side.

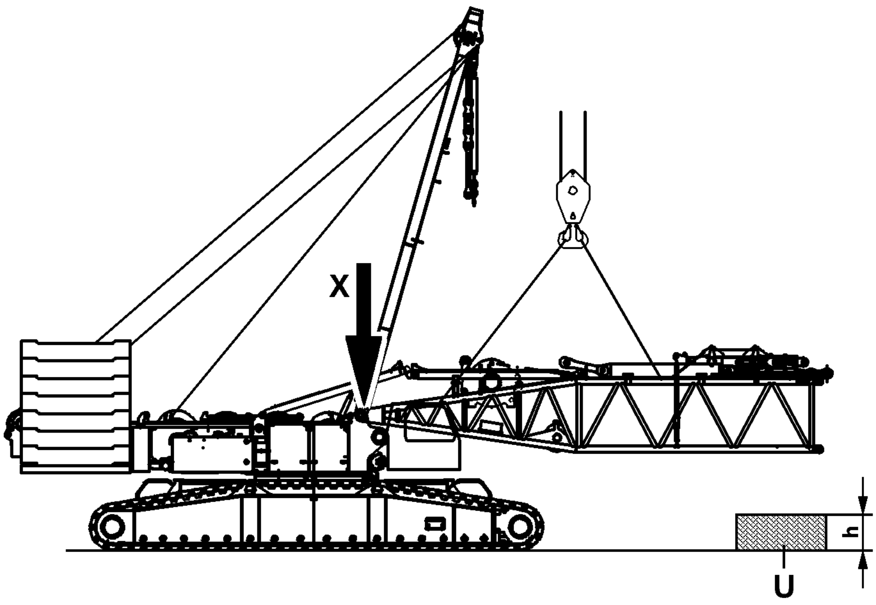
Note: Observe the data in the erection / take down charts !

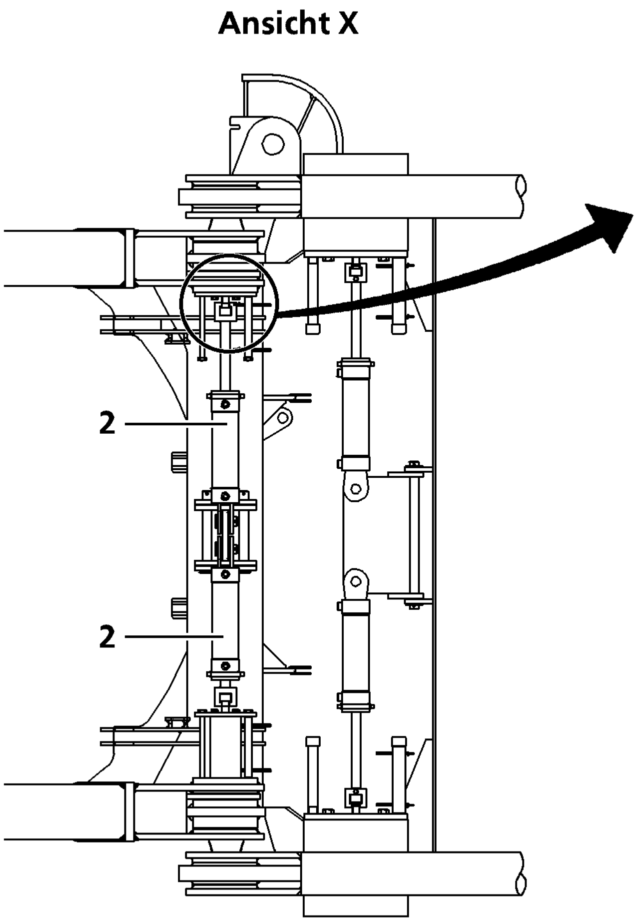
D A N G E R: **Before turning the slewing platform without the boom, observe the following:**
- **The crawler tracks with installed slewing platform must be positioned level and horizontally.**

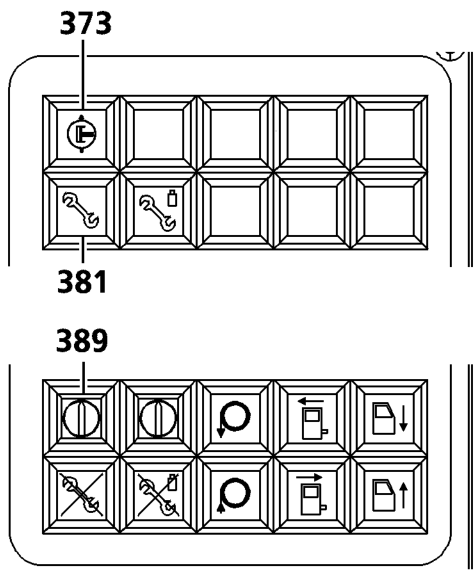
The counterweight may not weigh more than max. 135 t as long as no boom is installed or if the boom is installed and the boom head is still laying on the ground.
If the counterweight is increased to 155 t, then the boom head must be raised from the ground!
Otherwise there is a danger of tipping over!
When turning by 360° without the boom installed, the LA-bracket must be raised to at least > 90° , then the following maximum counterweights are permitted:

Min. counterweight	Min. central ballast
135/155 t	43 t
95 t	11 t
55 t	11 t

If this is not observed, there is a danger of tipping over!







189895

Install D- pivot section

Raise the D- pivot section with the auxiliary crane and swing it in to the pin points on the slewing platform.

Note: Weight of D- pivot section :

- without winch III, with guy rods, pull cylinder, D- relapse cylinder and S- luffing pulley blocks approx. 11.5 t
- with winch III + Cable, with guy rods, pull cylinder, D- relapse cylinder and S- luffing pulley blocks approx. 14.5 t

Turn on the pressure change over switch (373) .

Establish the hydraulic connection, 2 x quick couplings to the pin cylinders on the slewing platform.

Pin and secure the pivot section on the slewing platform.

The connector pins (1) are pinned with the hydraulic pin pulling device (2) and secured with the retaining plates (3) . Attach the retaining plates (3) on the left and right hand side and secure with spring retainers (4) .

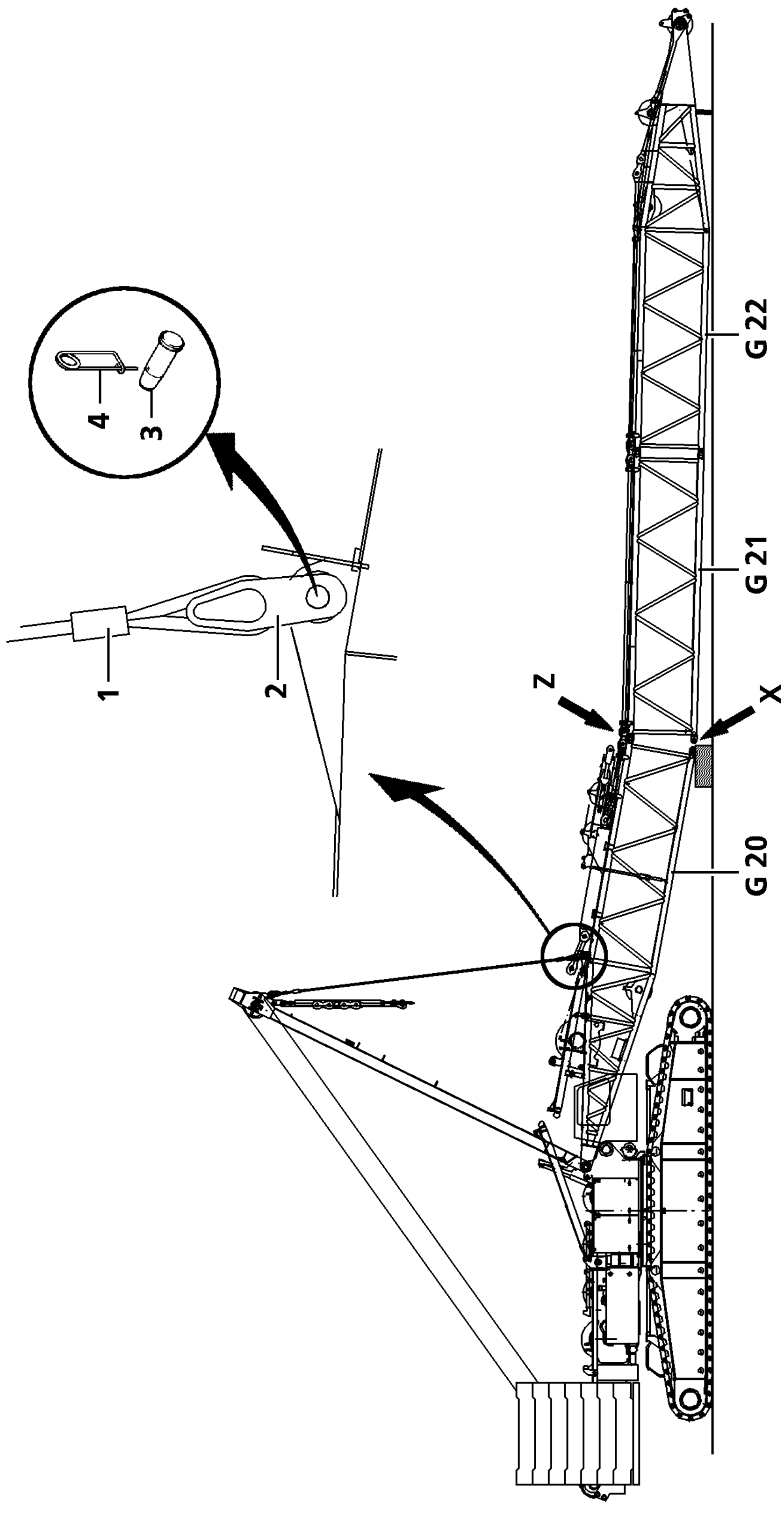
Turn off the pressure change over switch (373) .

D A N G E R: **To prevent the pins from unpinning unintentionally, they must be secured with retaining plates.**

Place the D- pivot section on the support (U) on the ground and remove the auxiliary crane.

C A U T I O N: **The pivot section must be supported, otherwise it will lay on the slewing platform and can be damaged!**
Min. height of the support:

- **without Quick connection h = 400 mm**
- **with Quick connection h = 760 mm**



187143

Install the derrick and guy rods

Lower the LA - bracket to the front, see chapter 5.02 " LA-Bracket ".

Loosen the installation cable (1) on the LA - bracket and pin and secure on the installation bracket (2) on the D- pivot section .
Use pins (3) and spring retainers (4) .

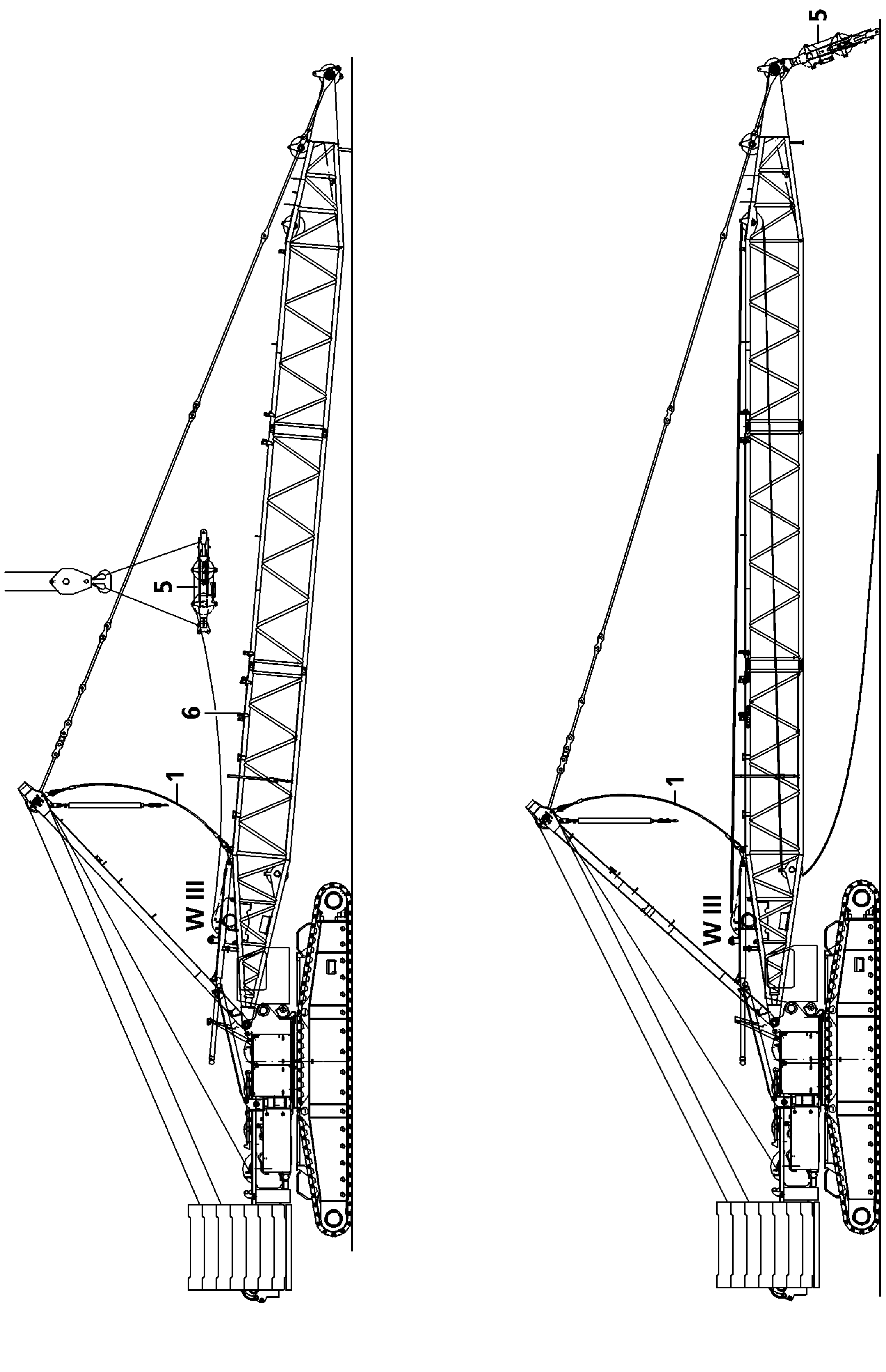
Assemble the derrick and the corresponding guy rods to the required length, pin and secure.
Pin the derrick on the D- pivot section **"on top" (Z)** .

Pull up the D- pivot section with the LA-bracket (winch IV) until it can be pinned on the pivot section **"on the bottom" (X)** .

Pin and secure pivot section **"on the bottom" (X)** .

Luff down the LA-bracket to relieve the installation cable.
Unpin the installation cable.

D A N G E R: **Before unpinning the installation cable on the installation bracket on the D-pivot section, the derrick must be pinned "on the bottom" .
The "lower" pins on the lattice sections must be inserted from the inside to the outside and secured with spring retainers.
No personnel may remain under the lattice jib during the unpinning procedure. This is strictly prohibited! There is a danger of having a serious accident as the derrick may suddenly fold down.**



187144

Installation of guy rods

Pin and secure the guy rods from the D-end section with the guy rods from the LA -bracket .

The guy rods must be installed and secured as shown on the installation drawings in chapter 5.03. When doing so, compare the numbers on the installation drawing with the numbers on the guy rod!

D A N G E R: **The pins of the derrick guy rods must be inserted from the outside to the inside. The guy rods must be checked regularly, see chapter " Inspection and maintenance of guy rods ".**

Actuate the winch IV and tension the guy rods between the LA - bracket and the end section.

Attach the S- luffing pulley blocks (5) on the auxiliary crane and unpin on the receptacle (6) on the D- pivot section .

Pull the S-luffing pulley blocks to the D-end section, while spooling out winch III at the same time, pin and secure.

Actuate the winch IV and tension the guy rods between the LA-bracket and the end section, and pull the derrick up to the horizontal.

Lower the luffing pulley block with the auxiliary crane onto the ground and unpin the transport pin.

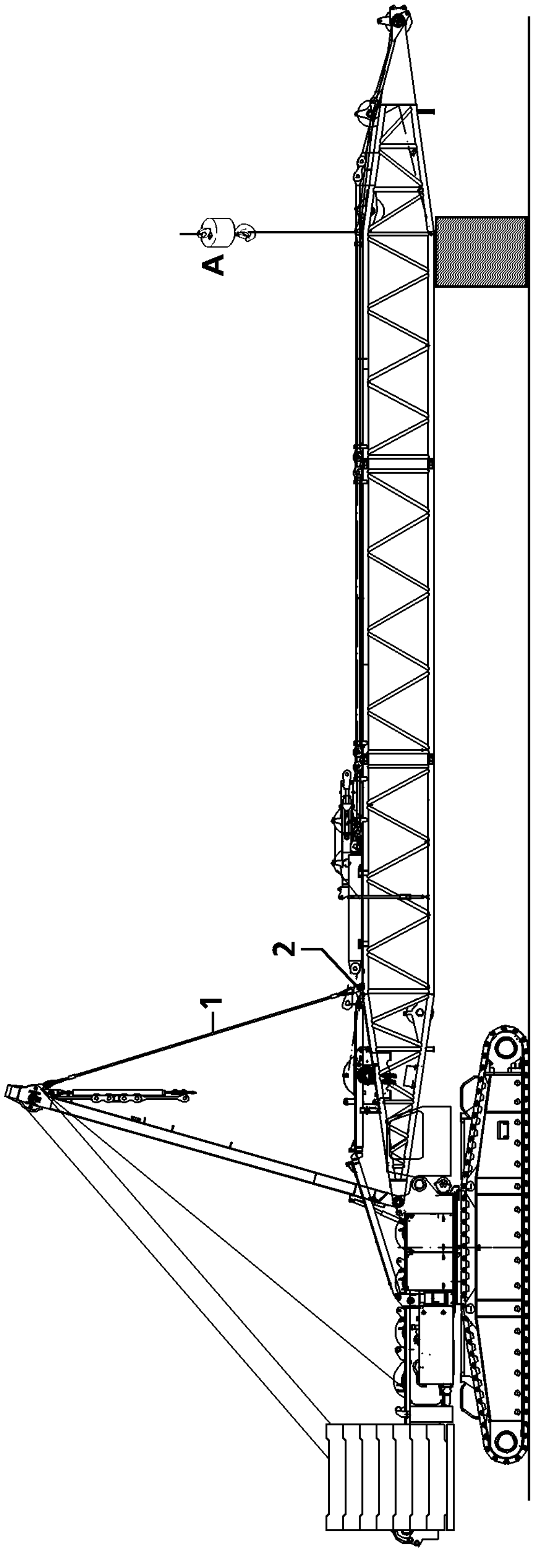
Note: The "bottom" and "top" luffing pulley blocks are secured to each other by the transport pins. During crane operation, they must be unpinned.

Remove the auxiliary crane.

Pull the hoist cable with the auxiliary winch over the cable pulleys in the D - end section and the D - pivot section .

Note: For cable routing, see chapter 4.06, Reeving.

C A U T I O N : **Guide sufficient hoist cable over the cable pulleys, so that the hoist cable is not being pulled backward due to its own weight when the derrick is erected. Otherwise there is a danger of a serious accident.**



187145

Flying installation of derrick section

Assembly
If the jobsite is too restricted in space for the installation of the derrick or if buildings etc. are too close, then it is possible to install the derrick from overhead (flying):

Prerequisites:
- The D- pivot section hangs on the installation cable (1).
  The installation cable (1) is pinned on the installation bracket (2) on the D- pivot section and secured.

Installation
In an overhead / flying installation with the auxiliary crane, the D- intermediate section can be pinned and secured by itself or complete, with D-intermediate section and D-end section.
Pin **"on top" and "bottom"** and secure.

Note: For weights of lattice sections with placed guy rods - see chapter 5.03.

Attach the D-end section to the auxiliary crane (A) or support it from below with stable materials.

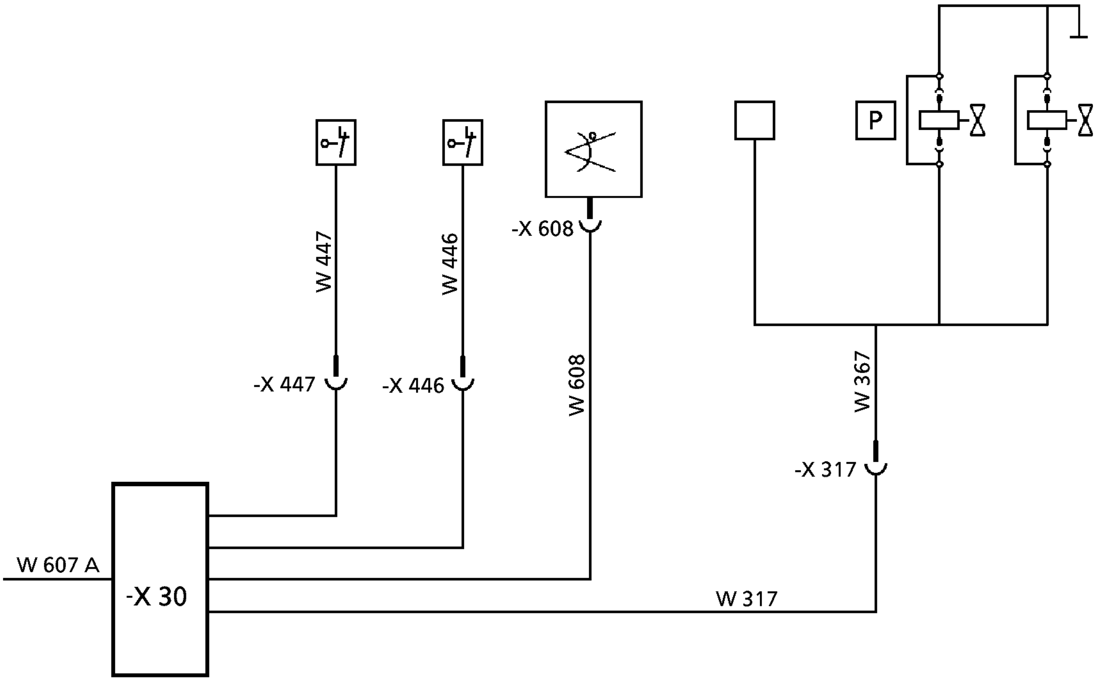
Luff down the A-bracket to relieve the installation cable (1) .
Unpin the installation cable (1) .

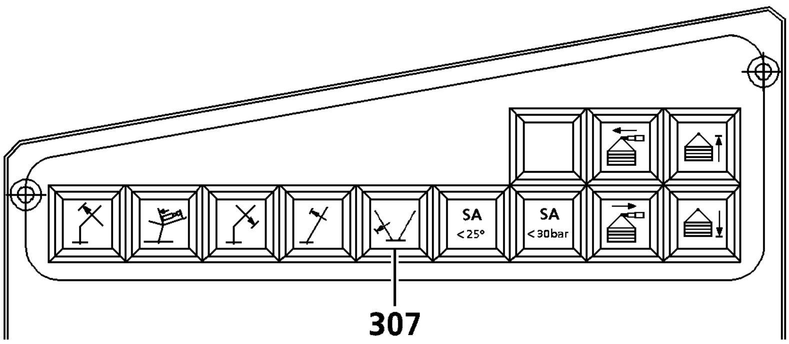
D A N G E R: **Before unpinning the installation cable (1) on the installation bracket (2) on the D-pivot section , the derrick must be held with an auxiliary crane (A) or it must be securely supported .**
During the unpinning procedure, no personnel is permitted to remain underneath the lattice jib.
A serious accident could occur if the Derrick suddenly folds down.

Lower the LA - bracket to the front, see chapter 5.02 " LA-Bracket ".
Pin and secure the guy rods from the D-end section with the guy rods from the LA-bracket .

Actuate the winch IV and tension the guy rods between the LA-bracket and the D-end section .
Remove the auxiliary crane.

D A N G E R: **Do not remove the auxiliary crane until the derrick is held by the guy rods .**
A serious accident could occur if the Derrick suddenly folds down.


W 447
W 446
-X 608
-X 447
-X 446
W 608
W 367
-X 317
P
W 607 A
-X 30
W 317


SA
< 25°
SA
< 30bar
307

187146

Electrical connections

Establish the electrical connection (W607A) from the slewing platform to the connector box (-X30) .

Establish the electrical connection to the D-relapse cylinder limit switches. Insert the cable plug (W447/W446).

Insert the cable plug (W317 in X317) for the replenishing pressure switch winch III.

Establish the electrical connection to the angle sensor. Insert the cable plug (W608) in (-X608) .

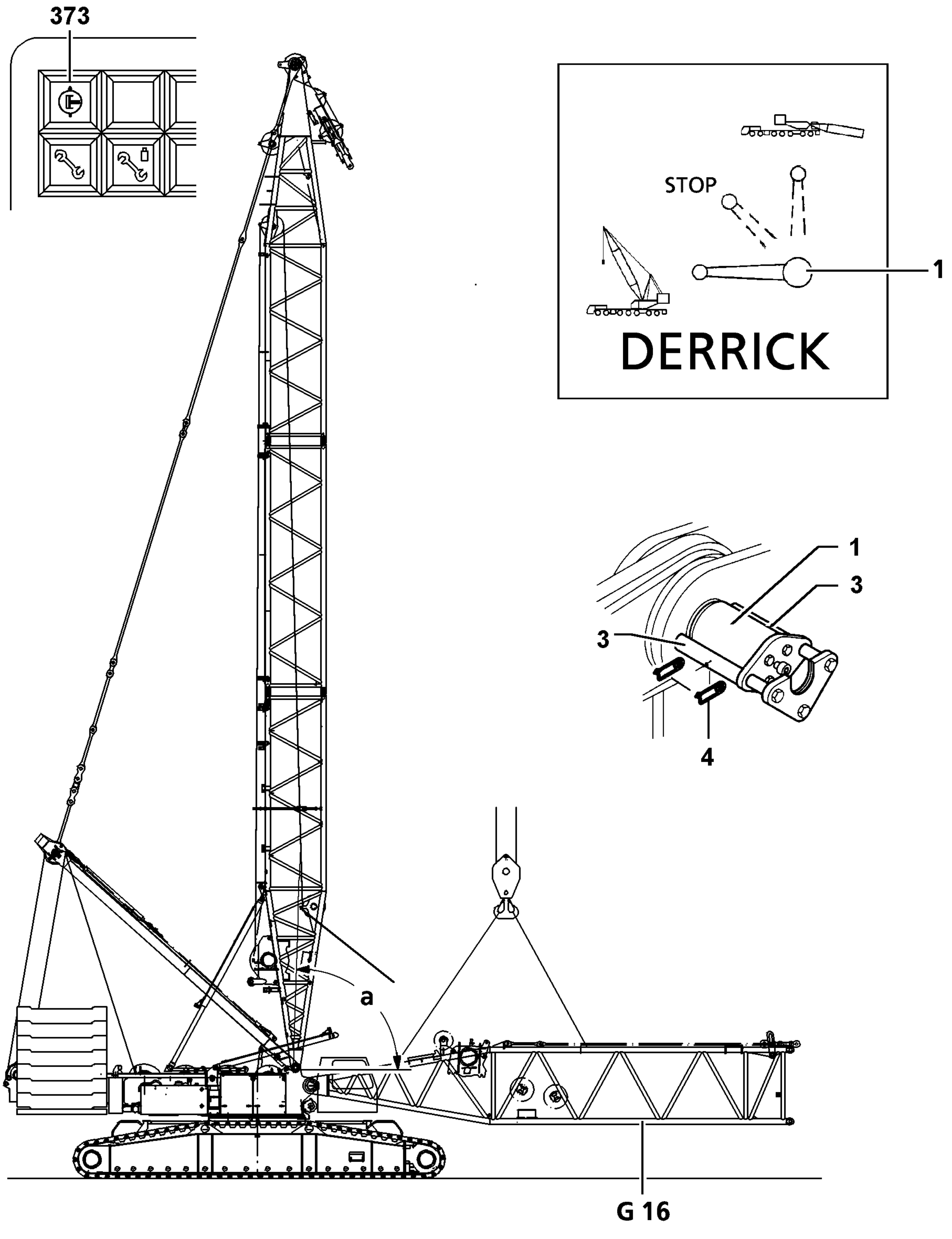
Function check of limit switches

Prerequisites:

- All electrical connections have been made.
- The engine is running.
- Check and lubricate the actuator levers on the limit switches to make sure they move easily.

Function check

Manually actuate the individual limit switches on the D-relapse cylinders.
The winch IV (D - control winch) must turn off in lift direction.
The indicator light (307) must light up.



187147

Extend the D - relapse cylinder
Extend the piston rod of the relapse cylinders by moving the ball cock lever (1) in horizontal position.
Lever positions:

Lever in horizontal position	=	crane operation, extend piston rod
Leer in vertical position	=	installation, retract piston rod
Lever at 45° angle	=	Piston rod cannot be extended or retracted

D A N G E R : The relapse cylinders must be extended before erection. The ball cock lever must be in horizontal position and must be secured to prevent inadvertent / unintentional movement during crane operation.

Erect the derrick and install the boom
Erect the derrick until the boom can be installed without any problems (approx. 75° to max. 90°).

D A N G E R: The derrick may not be raised to more than max. 90 ° to the horizontal. Otherwise there is a danger of tipping over.

Actuate the pressure change over switch (373) .

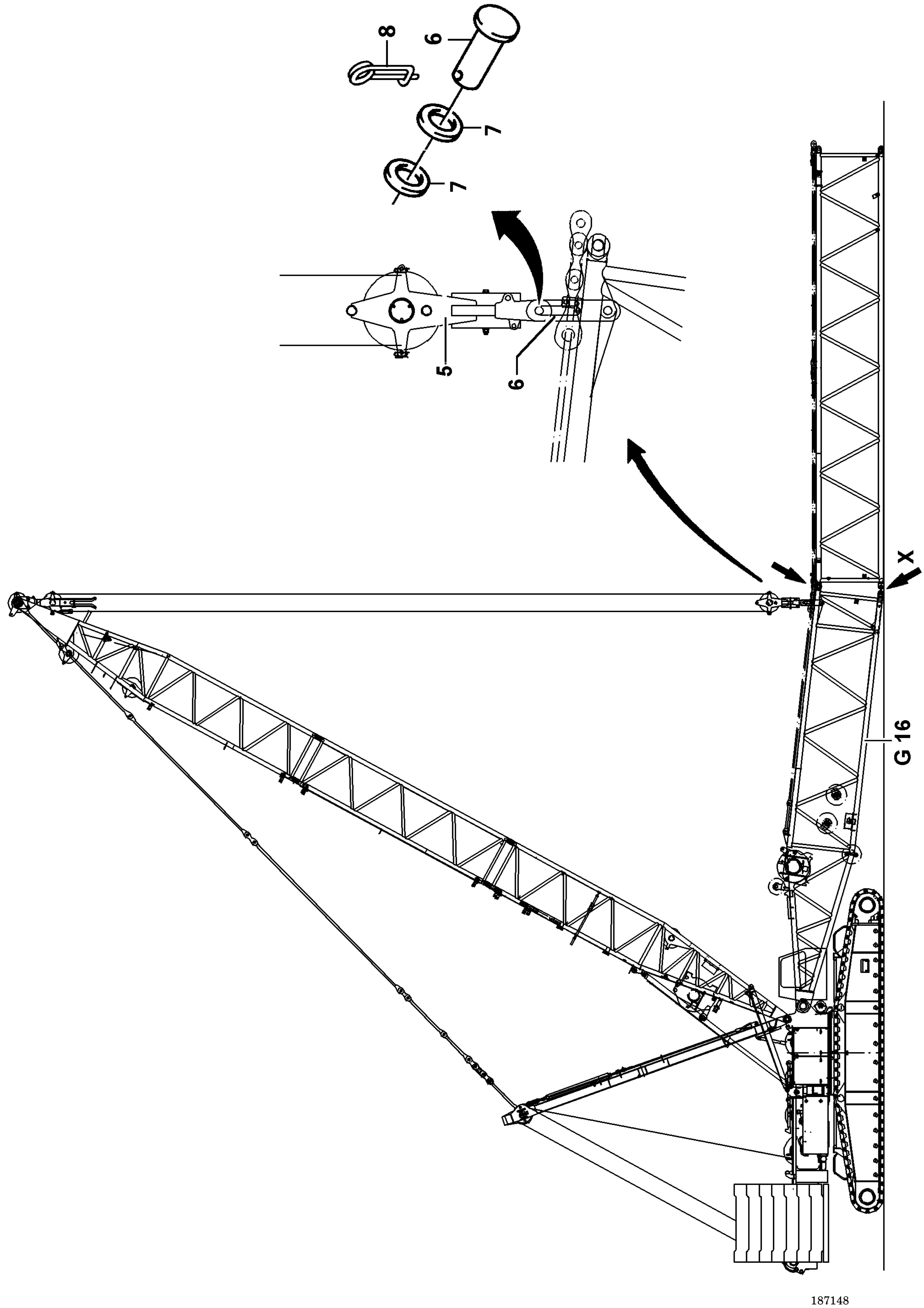
Raise the pivot section (G16) with the auxiliary crane and swing it in until the pin points on the slewing platform.

Note: The weight of the S - pivot section:
- without winch V, with guy rods = approx. 9.0 t
- with winch V and cable, with guy rods = approx. 12.5 t

Establish the hydraulic connection , 2× quick couplings, to the pin cylinders on the slewing platform.
Pin and secure pivot section (G16) on the slewing platform.
The connector pins (1) are pinned with the hydraulic pin pulling device and secured with retaining plates (3) .
Attach the retaining plates (3) on the left and right hand side and secure with spring retainers (4) .
Turn off the pressure change over switch (373) .

D A N G E R: To prevent inadvertent unpinning, the pins must be secured with the retaining plates.

Place the pivot section on the ground and remove the auxiliary crane.



187148

Install the boom

Lower the derrick and lower S- luffing pulley block (5) until it is over the installation brackets (6) .
Pin the S- luffing pulley block (5) on the installation brackets (6) and secure.
Use pins (7), washers (8) a spring retainers (9) .

Assemble the boom and the corresponding guy rods to the required length, pin and secure.
Pin the first intermediate section on the pivot section (G1) **”on top”** .
Pull up the pivot section with the S- luffing pulley block until it can be pinned on the pivot section (G1) **”on the bottom”** .

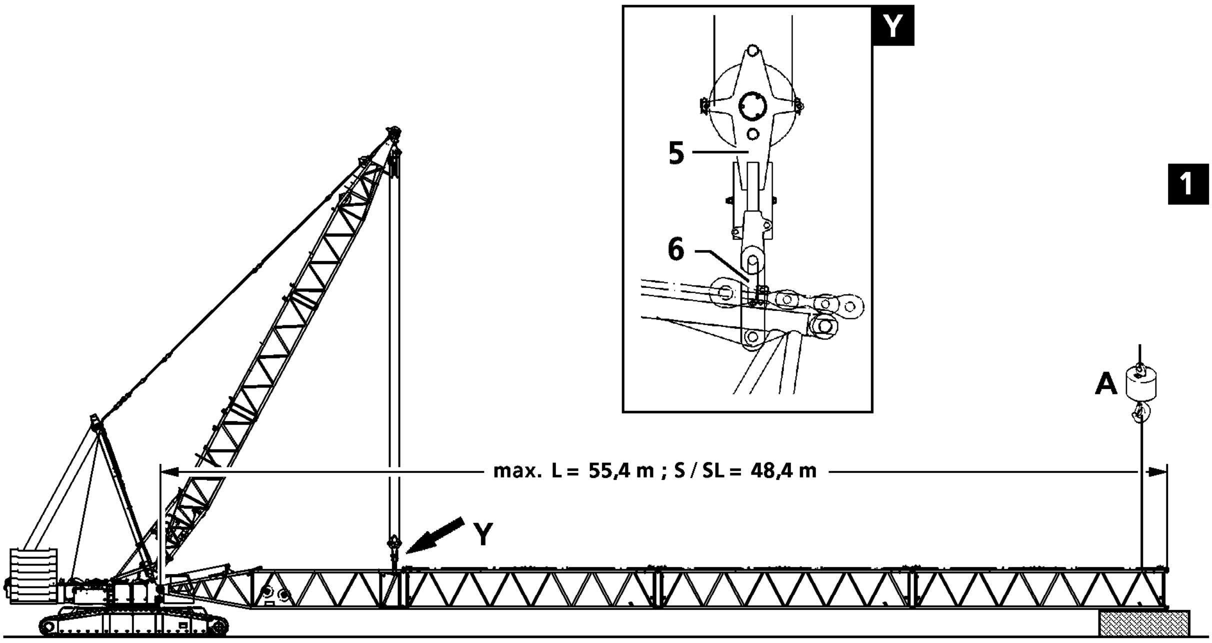
D A N G E R: **The "bottom" pins on the lattice sections must be pinned from the inside to the outside and must be secured with spring retainers.
With the S- luffing pulley block, up to max. L 105 m, SL 112 m, S 119 m boom length can be raised.
The end section may not be raised, it must stay on the ground.
If this is not observed, the crane can be damaged.**

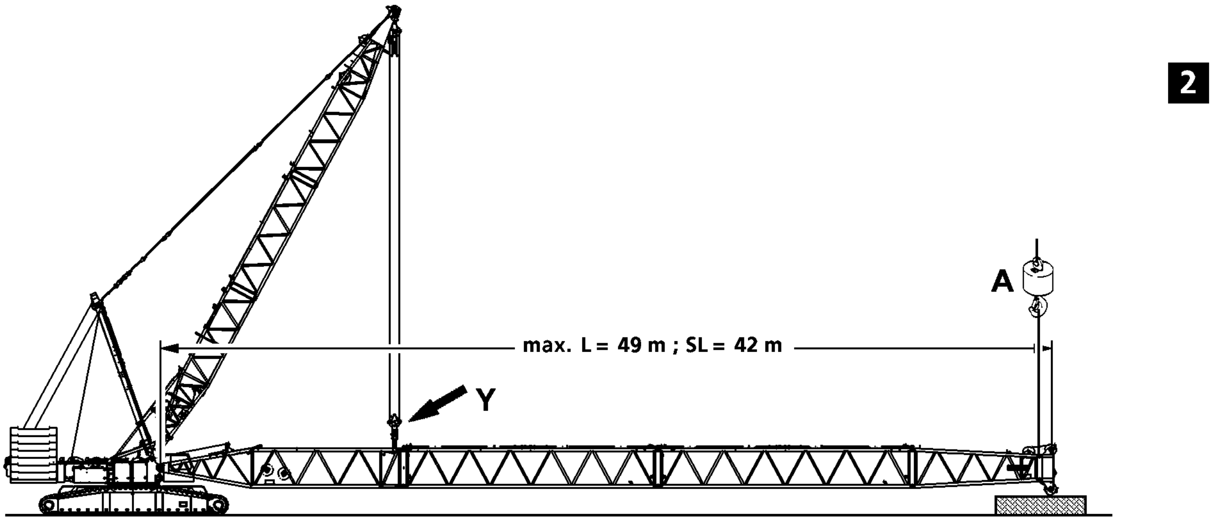
Pin and secure the pivot section (G1) **”on the bottom” (X)** .

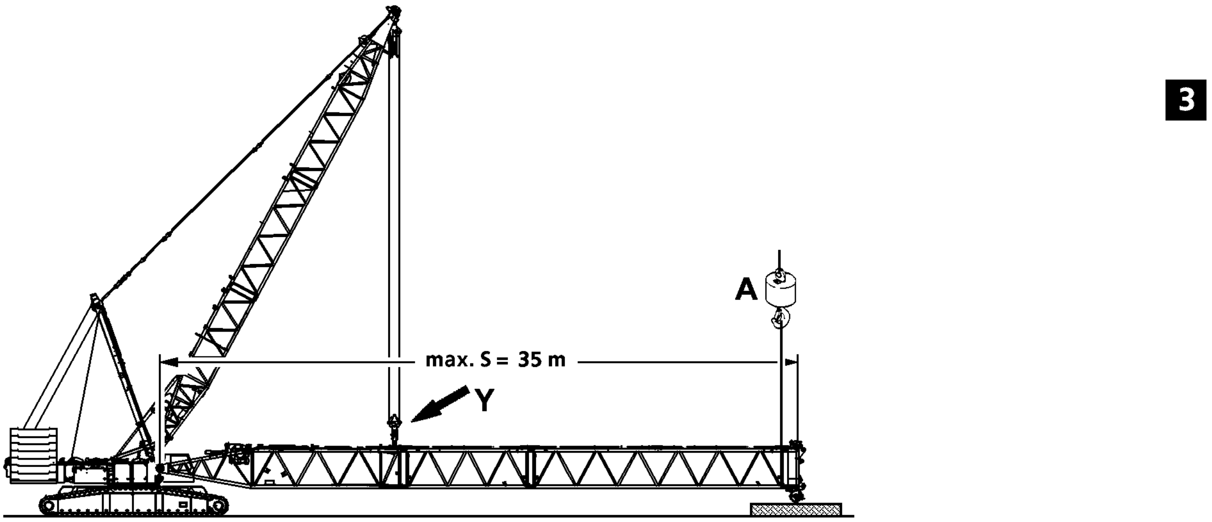
Unpin the S-luffing pulley block (5) on the installation brackets (6) .

Relieve the S-luffing pulley block (5) by lowering it and unpin on the installation brackets (6) .

D A N G E R: **Before unpinning the luffing pulley block, make sure that the boom is pinned ”on the bottom” .
Otherwise there is a danger of an accident, because the boom might suddenly fold down.
The lattice sections must be supported with suitable, stable material before disassembly and assembly .
During the pinning and unpinning procedure of the lattice sections, no personnel may remain underneath the lattice jib! This could cause a serious accident.**







187149

Flying installation of the L / SL / S - boom

Assembly
If the space on the jobsite is restricted for the installation of the boom, or if there are nearby buildings, etc. then it is possible to install it from overhead (flying) up to the following **max. length**:

Fig. 1	-	**max. L**	**55.4 m**	(without end section, without hook block)
		max. SL / S	**48.4 m**	(without end section, without hook block)
Fig. 2	-	**max. L**	**49.0 m**	(with 250 t end section, without hook block)
		max. SL	**42.0 m**	(with 250 t end section, without hook block)
Fig. 3	-	**max. S**	**35.0 m**	(with 400 t end section, without hook block)

D A N G E R: **As a minimum, a 95 t counterweight and 43 t central ballast must be installed! Max. permissible tensioning force at the force sensor F $\leq$ 1100 KN. If this is not observed, damage can occur.**

Prerequisites:

- The pivot section is pinned on the luffing pulley block (5) and the installation bracket (6) , secured and pulled up into horizontal position.

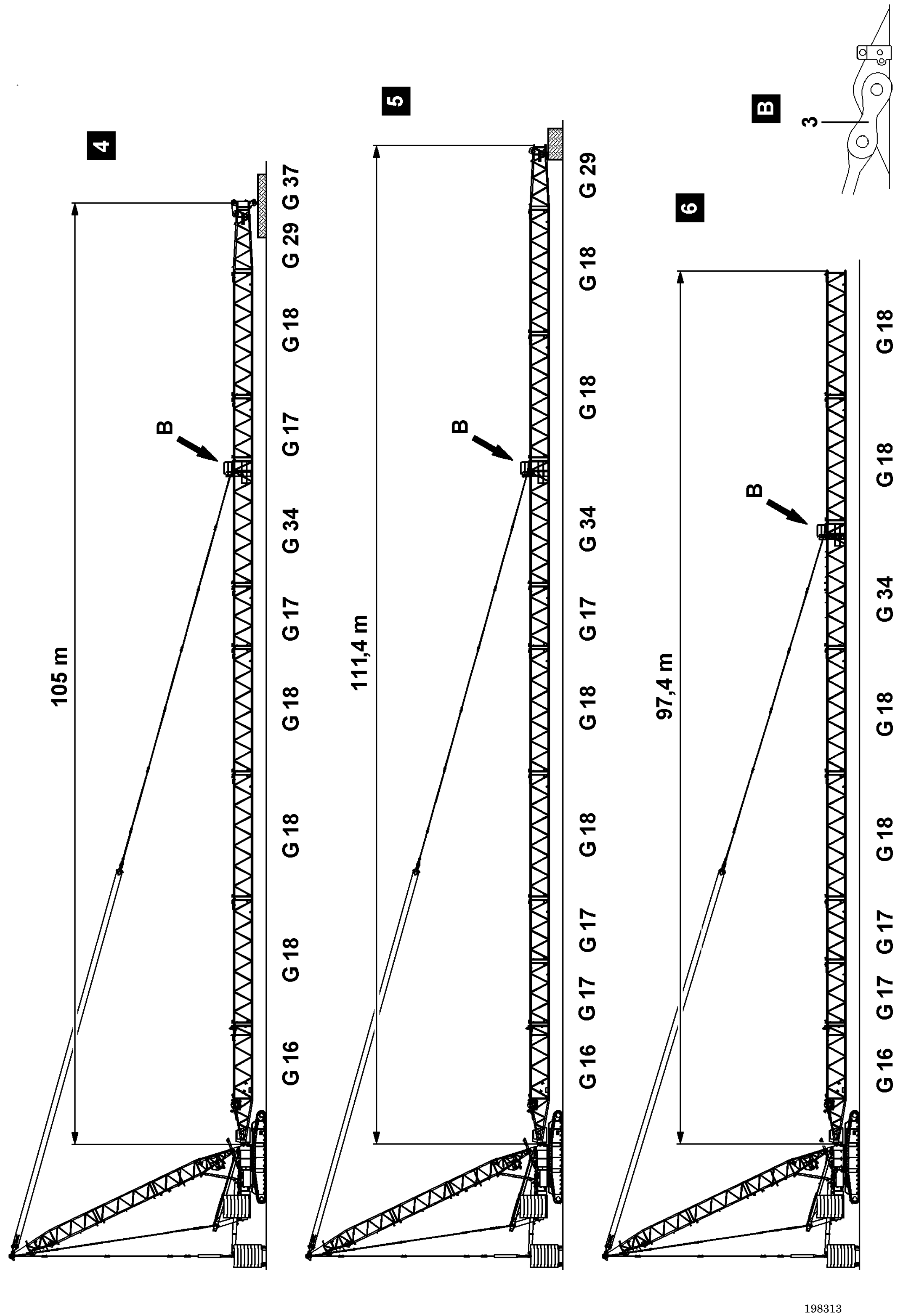
Installation
For over head/ flying installation with an auxiliary crane, the intermediate sections can be installed section by section, or the completely assembled boom can be pinned and secured on the pivot section .
Pin and secure the pins **"on top "** and **"on the bottom"** .

Notes: For weights of lattice sections with placed guy rods , see chapter 5.03

D A N G E R: **Observe the max. permissible boom lengths for overhead / flying installation. If this is not observed, a serious accident may occur.**

Attach the boom on the front on the auxiliary crane (A) or support it with stable materials.
Relieve the luffing pulley block by lowering it, unpin it on the pivot section and pin and secure with the guy rods from the end section.

D A N G E R: **The boom must be held with an auxiliary crane (A) or must be supported, before the luffing pulley block (5) is unpinned on the installation bracket (6) on the pivot section .
During the unpinning procedure, personnel may remain underneath the lattice jib! This could cause a serious accident as the derrick might suddenly fold down.**


4
105 m
B
G 16
G 18
G 18
G 18
G 17
G 34
G 17
G 18
G 29
G 37
5
111,4 m
B
G 16
G 17
G 17
G 18
G 18
G 17
G 34
G 18
G 18
G 29
6
97,4 m
B
G 16
G 17
G 17
G 18
G 18
G 34
G 18
G 18
B
3
198313

Flying installation of the SL / S - boom

Assembly
If the space on the jobsite is restricted for the installation of the boom, or if there are nearby buildings, etc. then it is possible to install it from overhead (flying) up to the following **max. length**:

Fig. 4	**max. SLD / SD**	**105,0 m**	(without hook block, without WA - bracket II, without rods for WA - bracket II)
Fig. 5	**max. SLD**	**111,4 m**	(without L - end section, without WA - bracket II, without rods for WA - bracket II)
Fig. 6	**max. SD**	**97,4 m**	(without adapter and L - end section, without WA - bracket II, without rods for WA - bracket II)

Note: **With** WA - bracket II, the boom length must be reduced by 7,0 m .

D A N G E R: **As a minimum, a 95 t counterweight and 43 t central ballast must be installed!**
Max. permissible tensioning force at the force sensor F $\leq$ 1800 KN.
If this is not observed, damage can occur.

Prerequisites:

- The pivot section is pinned on the luffing pulley block (5) and the installation bracket (6) , secured and pulled up into horizontal position.

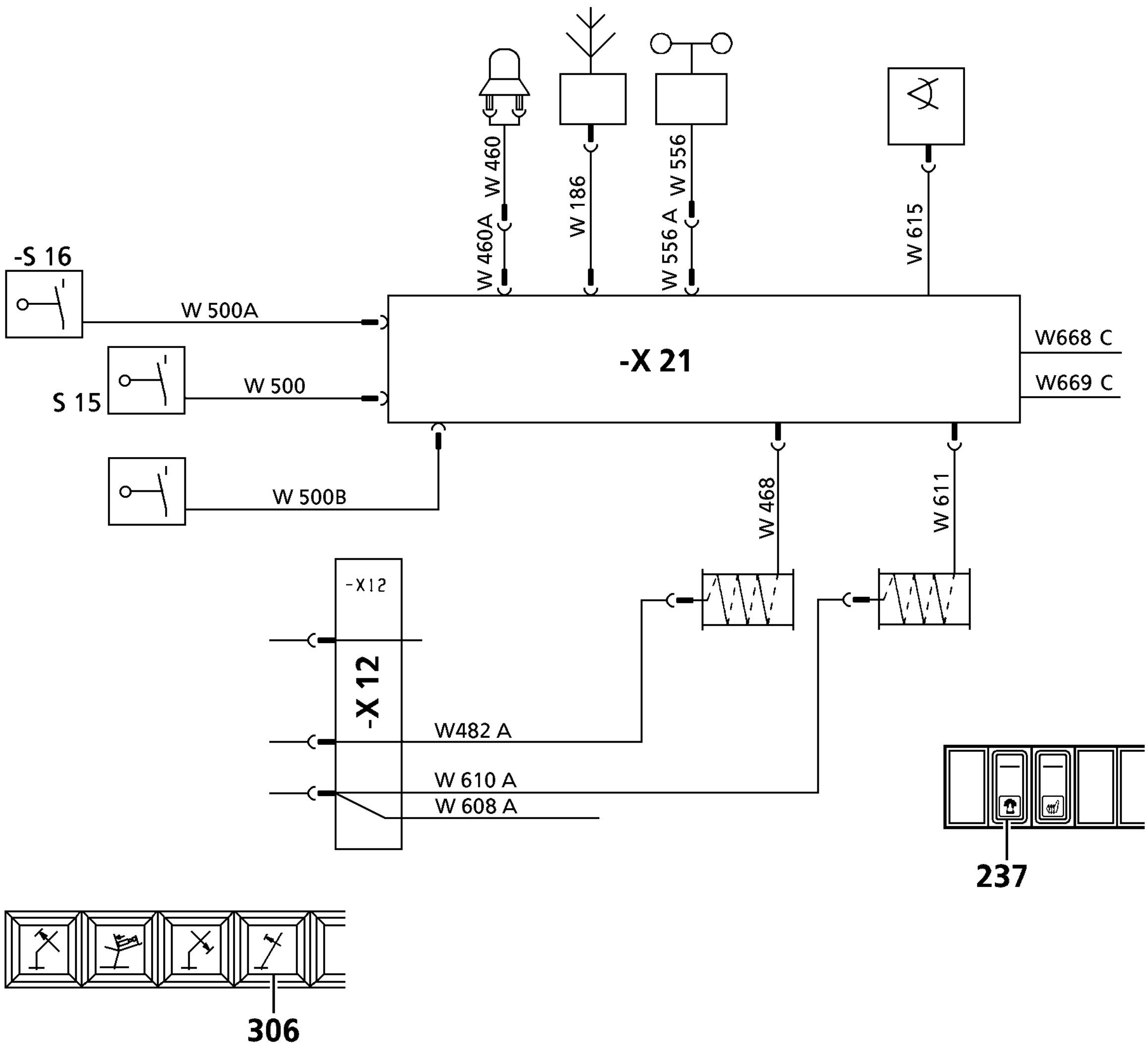
Installation
For over head/ flying installation with an auxiliary crane, the intermediate sections can be installed section by section, or the completely assembled boom can be pinned and secured on the pivot section .
Pin and secure the pins **”on top ”** and **”on the bottom”** .

Notes: For weights of lattice sections with placed guy rods , see chapter 5.03

D A N G E R: **Observe the max. permissible boom lengths for overhead / flying installation. If this is not observed, a serious accident may occur.**

Attach the boom on the front on the auxiliary crane (A) or support it with stable materials.
Relieve the luffing pulley block by lowering it, unpin it on the pivot section and pin and secure with the guy rods from the end section.

D A N G E R: **The boom must be held with an auxiliary crane (A) or must be supported, before the luffing pulley block (5) is unpinned on the installation bracket (6) on the pivot section .**
During the unpinning procedure, personnel may remain underneath the lattice jib! This could cause a serious accident as the derrick might suddenly fold down.


-S 16
W 500A
S 15
W 500
W 500B
W 460
W 460A
W 186
W 556
W 556 A
W 615
-X 21
W668 C
W669 C
W 468
W 611
-X12
-X 12
W482 A
W 610 A
W 608 A
237
306
187044

Electrical connections

Establish the electrical connection from the cable drums to the connector box (-X21) . Insert the cable plug (W468) and (W611) .

Establish the electrical connection from the connector box (-X12) on the slewing platform to the cable drums in the pivot section. Insert the cable plugs (W482A) and (W610A) .

Install the airplane warning light and the wind velocity sensor on the end section .

Insert the cable plug (W460) for the airplane warning light and (W556) for the wind velocity sensor on the connector box (-X21) .

Insert the cable plug (W500,W500A) for the hoist limit switch on the end section on the connector box (-X21) .

Insert the cable plug (W 500B) for the hoist limit switch on the mast stub on the connector box (-X21) .

Function check

Prerequisites:

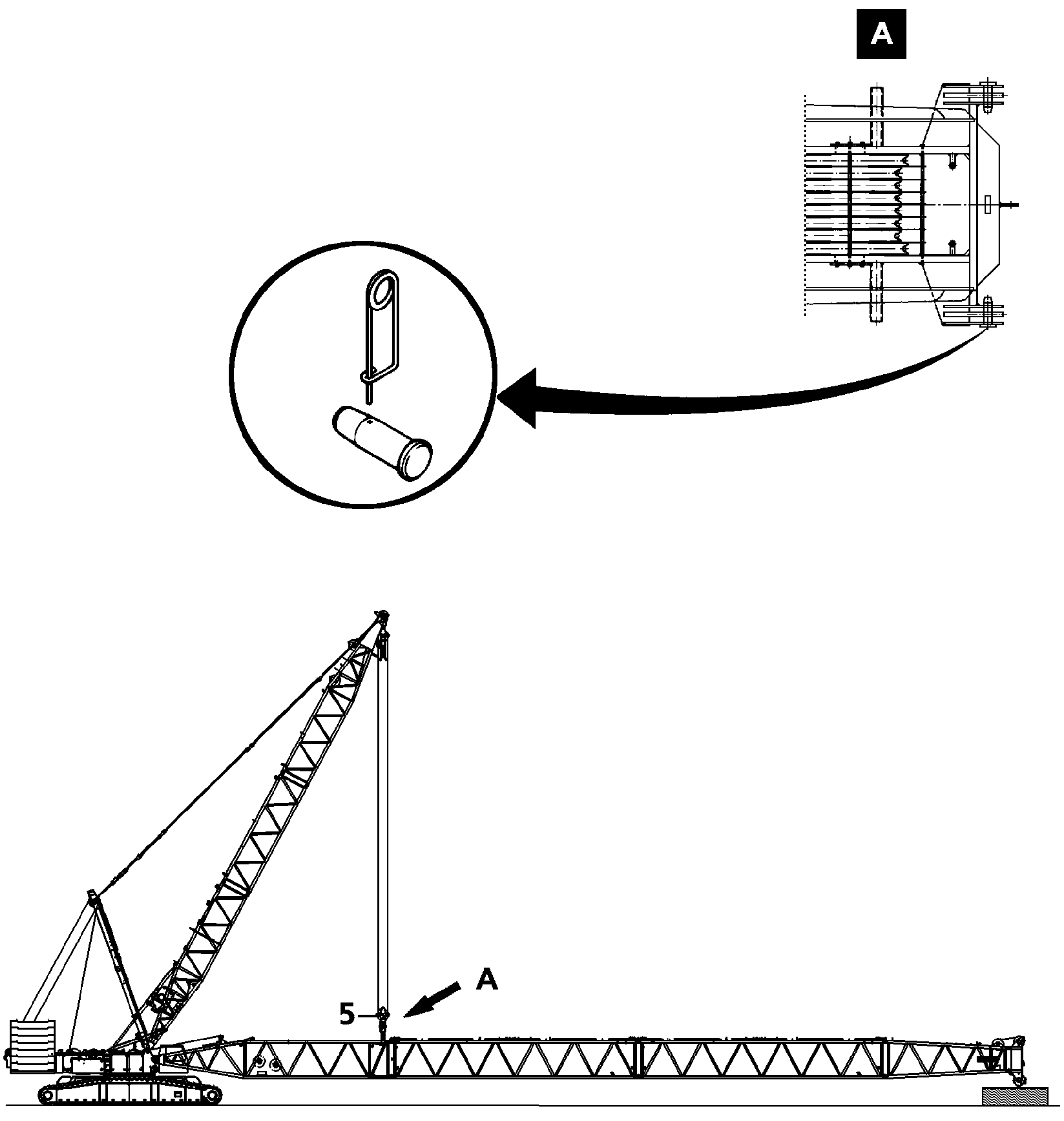
- All electrical connections are established.
- The engine is running.
- The actuator levers of the limit switches have been checked for easy movement and have been lubricated.

Airplane warning light
Turn on the airplane warning light with switch (237), check function visually.

Wind velocity sensor
Check wind velocity sensor for easy movement and function.

Limit switch - boom , ”steepest ” position
Actuate the individual limit switches on the relapse cylinders manually.
Winch IV (boom control) must turn off in upward movement.
The indicator light (306) must light up.

Hoist limit switch
Actuate the hoist limit switch on the pulley head manually.
The hoist winch must turn off in upward movement.
Hoist ”top” symbol on the LICCON indicator must blink.



187150

Installation of guy rods
If the boom is installed, lower the derrick to the front.
Lower the luffing pulley block (5) by spooling out winch III to the boom and pin and secure with the guy rods .

The guy rods must be installed and secured as shown on the installation drawings in chapter 5.03. Make sure to compare the numbers on the installation drawing with the numbers on the guy rods.

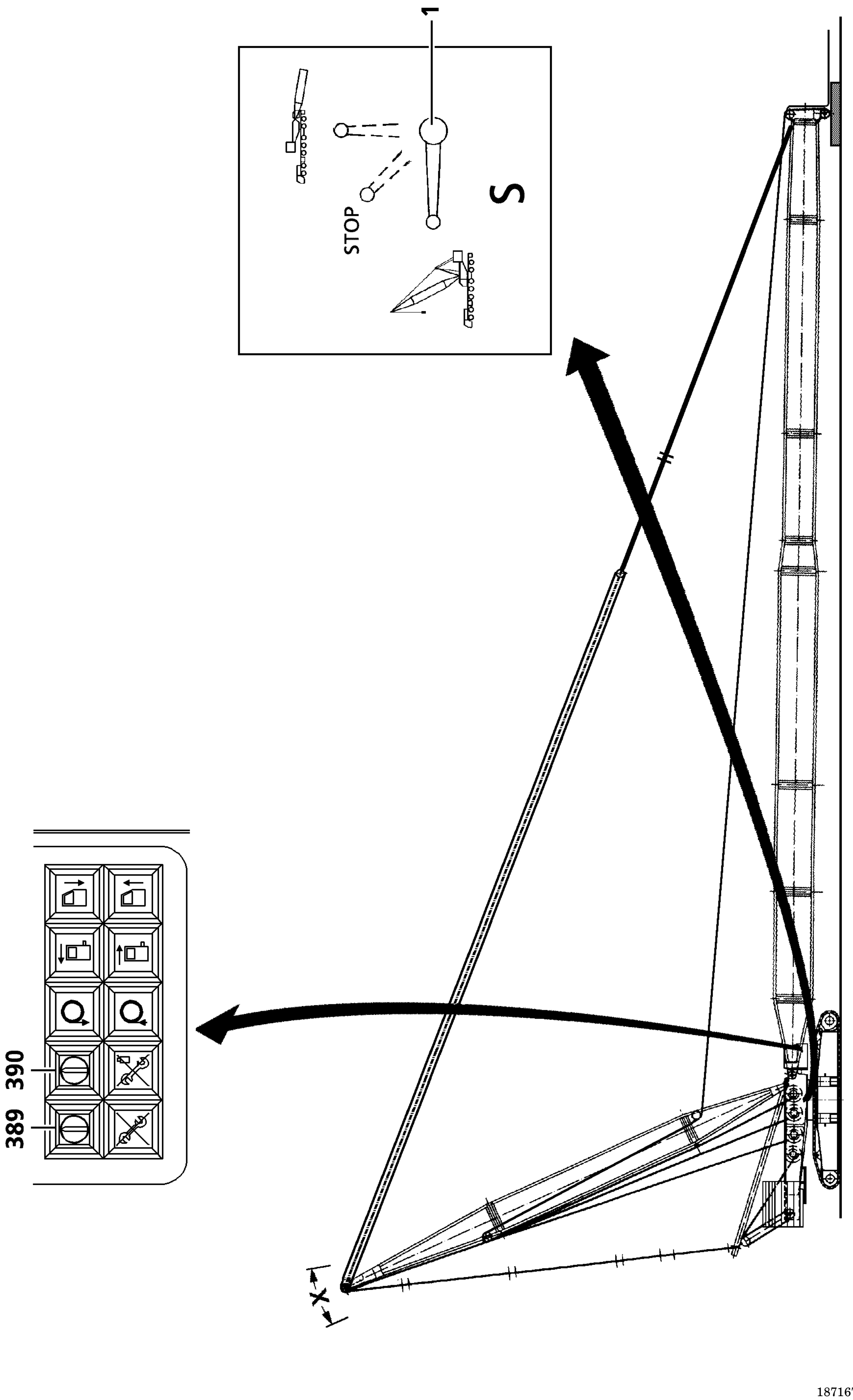
D A N G E R: The pins of the guy rods must be inserted from the inside to the outside. If this is not observed,the hoist cable will scrape on the pins.
The guy rods must be checked regularly, see chapter " Inspection and maintenance of guy rods ".

Raise the derrick to the corresponding operating position g (X = 111,1° - 115,6°, indication on monitor 1), while spooling out the winch III (boom control) at the same time, so that the boom is not pulled up too.
When the derrick is in operating position, the guying between the derrick and the boom head must be tensioned.

Remove the auxiliary crane on the boom head.

D A N G E R : Don't remove the auxiliary crane until the derrick is in operating position, the guying between the derrick and the boom head is tensioned and the boom is held by the guy rods .

Guide the hoist cable over the cable pulley on the end section .



187167

Erection / take down
The boom combinations must be erected or taken down according to the erection and take down charts, chapter 5.09.

D A N G E R: **The boom combinations must be erected or taken down according to the data given in the erection and take down charts.**
If this is not observed, the crane will be overloaded and can tip over.

Prerequisites:
- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform as noted on the load capacity chart .
- The boom is installed as noted on the load capacity chart and the operating manual.
- All limit switches are correctly installed and fully functioning.
- All pin connections are secured.
- The hoist cable has been placed correctly into the cable pulleys and is secured with cable retaining pins to prevent it from jumping out.
- There are no persons in the danger zone.
- There are no loose parts on the boom and on the lattice jib.
- In winter, the boom and the lattice jib and its components (limit switch, cable drum, airplane warning light, wind velocity sensor, etc.) are free of snow and ice.

D A N G E R : **Incorrectly mounted or non-functioning limit switches or falling items (such as pins, spring retainers, ice, etc.) can cause serious accidents!**
The derrick must be in operating position (X = 111.1° - 115.6°, indication on monitor 1) and the L/ S - relapse cylinders must be extended, before the boom is pulled up.
During the erection procedure, it must be ensured that the hoist cable is not pulled up too, which could cause it to fall down towards the back.

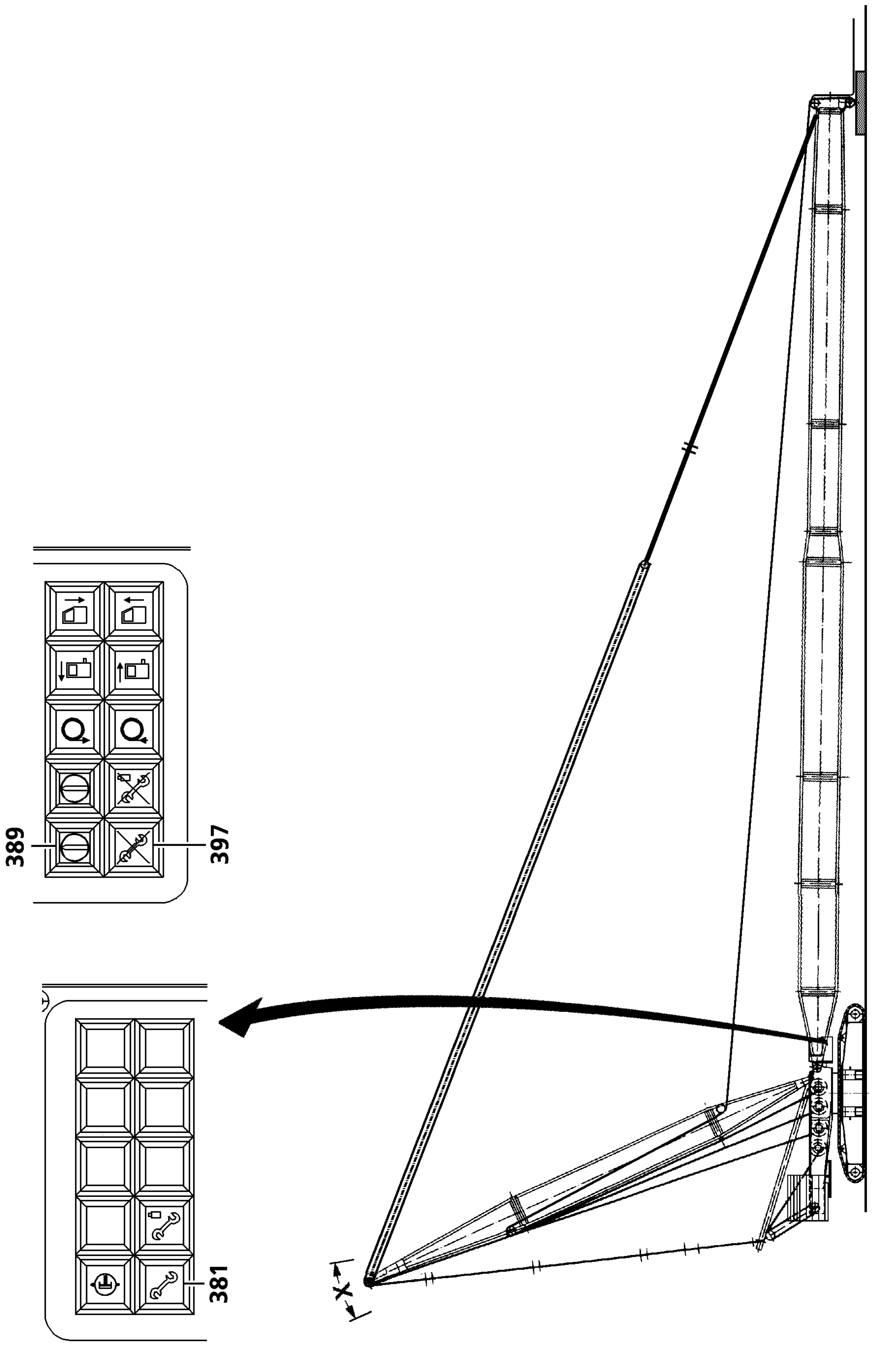
Settings
Adjust the LICCON safe load indicator system according to the data given in the load capacity chart and confirm.
Actuate the installation keyed switch (389), the indicator light (381) ”Installation” lights up.
The "Installation " symbol on the LICCON indicator blinks.

Extend the relapse cylinder
Establish the hydraulic connection from the slewing platform to the relapse cylinders.
Extend the piston rod of the relapse cylinders by moving the ball cock lever (1) into horizontal position.
Lever positions:

Lever in horizontal position	= Crane operation, extend piston rod
Lever in vertical position	= Installation , retract piston rod
Lever at a 45° angle	= Piston rod cannot be extended or retracted

C A U T I O N : **The relapse cylinders may only be extended if the derrick is completely erected. If this is not observed, they will collide with the D- relapse cylinders.**

D A N G E R : **The relapse cylinders must be extended before erection.**
The ball cock lever must be in horizontal position, and must be secured to prevent inadvertent movement during crane operation.



187168

Continuation **- Erect the boom**

Luff up the boom until the end section is raised off the ground.
Reeve in the hoist cable between the pulley head on the end section and the hook block and secure on the fixed point - see chapter 4.06, Reeving plans.
Attach the hoist limit switch weight.
Luff up the boom to the **lowest** operating position.

Indication in OPERATION VIEW during the erection procedure
The following alarm functions are activated (blink) during the erection procedure, until the operating position is reached:

- ”ERROR” (error 150)
- ”STOP”
- ”HORN” + Acoustical signal

Note: The lowest operating position is reached, when the indicators turn off and the question marks (???)in the symbol ”MAX. LAST (MAX. LOAD)” is replaced by a load entry in tons (- t -).

Turn off the installation keyed switch (389) by pressing button (397) . The indicator light (381) and the installation symbol on the LICCON indicator turns off.

D A N G E R: **The installation keyed switch must be turned off as soon as the lowest operating position is reached.**
The installation keyed switch bypasses the safety devices!
The radii given in the load capacity chart may not be exceeded or fallen below, even without a load on the hook!
If this is not observed, the crane can topple over!

Crane operation with D - boom combination

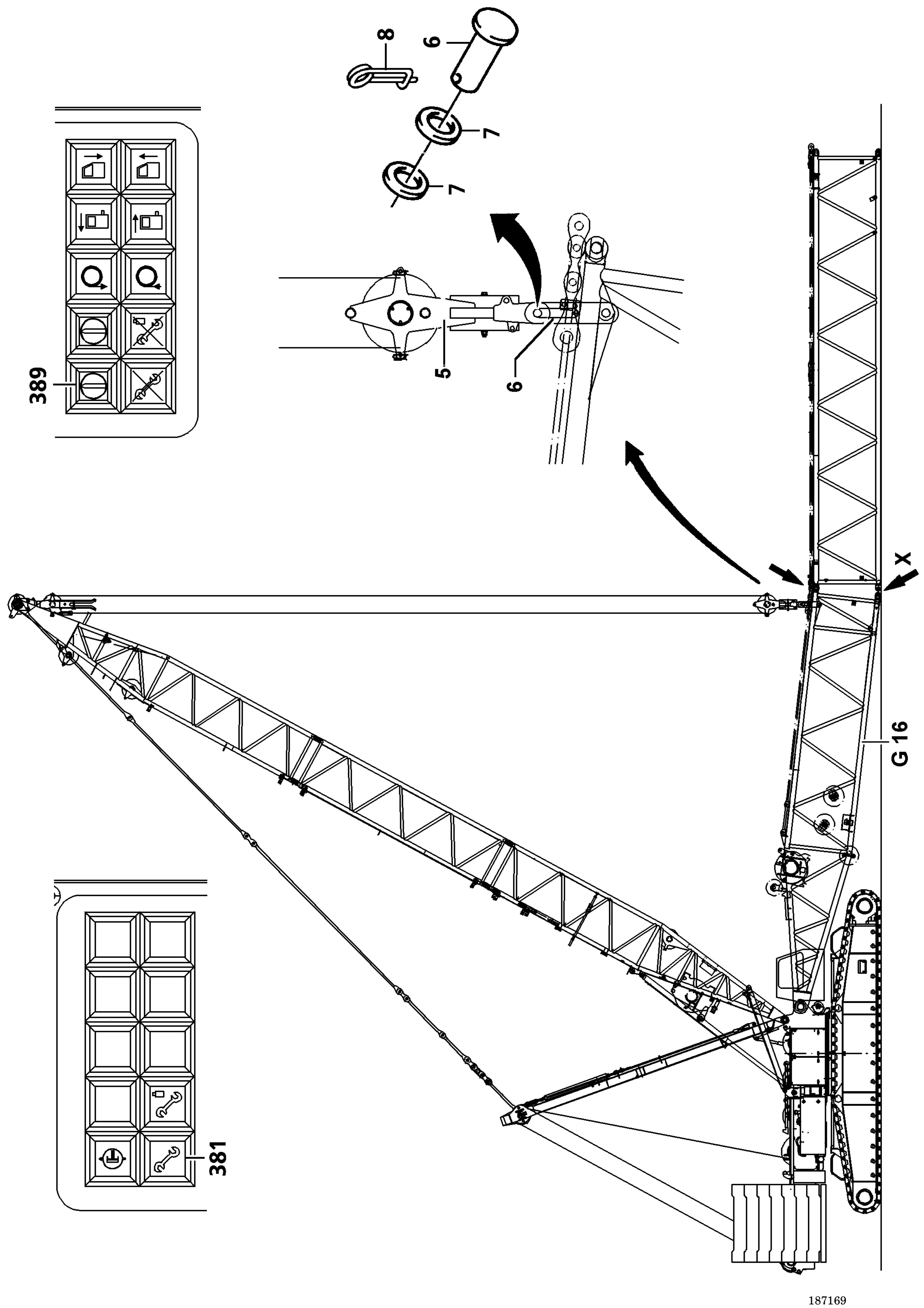
D A N G E R: **Observe all guidelines given in Chapter 4.02 ”LICCON Safe load indicator system, chapter 4.05 ”CRANE OPERATION” and chapter 4.08 ”WORKING WITH A LOAD”.**

Prerequisites:

- The LICCON safe load indicator system is set according to the data given in the load capacity chart.
- The installation keyed switch (389) has been turned off via button (397). The indicator light (381) and the installation symbol on the LICCON indicator turns off.

D A N G E R: **Check the horizontal position of the crane before and during operation.**
If the crane operator leaves the cab, even if just for a short time, then before starting to work again, he is obligated to check the operating mode settings and to reset them, if necessary.

Adjustments / checked
Check the function of the safe load indicator system, by triggering the ”top” and ”bottom” operating positions .
Check the function of the ” top” hoist limit switch , by running against the hoist limit switch weight.
Check the function of the limit switch ”Boom steep”, by running against the relapse cylinders.



187169

Place down the boom

Luff down the boom to the **lowest** operating position.

Note: When the **lowest** operating position is reached, the luffing down movement turns off.

C A U T I O N : The derrick must remain in operating position until the end section lays on the ground.
When luffing down, the hoist winch must be spooled out at the same time to prevent the hook block from colliding with the pulley head.

Actuate the keyed switch (389), the indicator light (381) ”installation” lights up. The installation symbol on the LICCON indicator blinks.

D A N G E R: The safe load indicator system is no longer effective.
The limit switch hoist ”top” is bypassed.

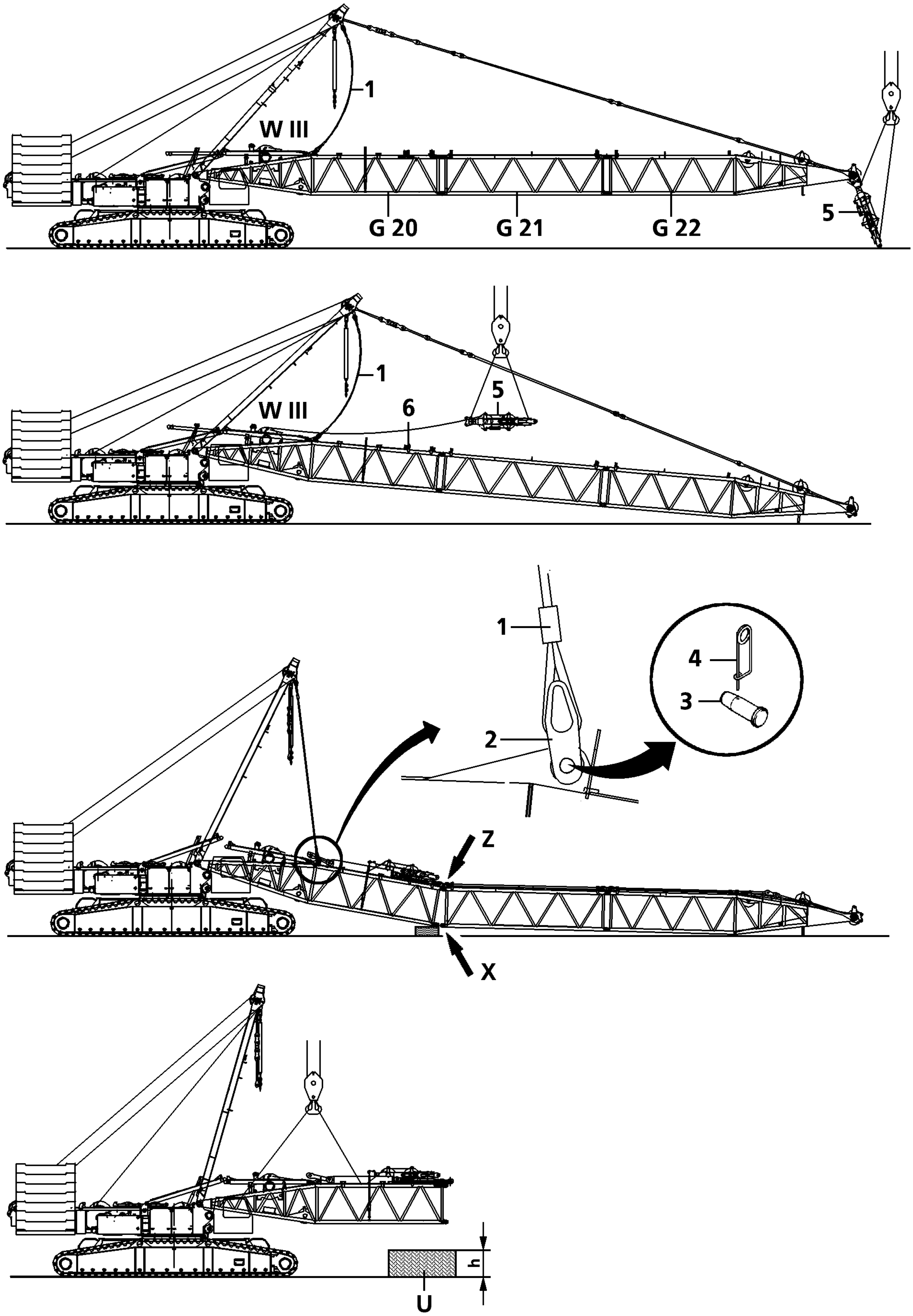
Actuate the manual control lever and luff down the boom until the hook block touches the ground.
Remove the hoist limit switch weight. Unreeve the hook block.

D A N G E R : Make sure that no persons are in the danger zone when unreeving the hoist cable.

Luff down the boom until the end section is on the ground.
Luff down the derrick until the guy rods can be unpinned on the luffing pulley block .
Unpin the guy rods and place them on the corresponding lattice sections and secure for transport.
Reerect the derrick and lower the lower S-luffing pulley block (5) until it is over the installation brackets (6) .
Pin the S-luffing pulley block (5) on the installation brackets (6), secure and tension. Use pins (7), washers (8) and spring retainers (9) .
Hold the pivot section with the S- luffing pulley block and unpin on the pivot section **”on the bottom”** .

D A N G E R: Before unpinning, the boom must hang on the luffing pulley block.
Otherwise there is a danger of having an accident as the boom may suddenly fold down.
Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections.
With the luffing pulley block, up to max. L 105 m, SL 112 m, S 119 m boom length can be lowered.
If this is not observe, the crane may be damaged.

Set down the pivot section and boom on the ground with the luffing pulley block.
Pin the first intermediate section on the pivot section **”on top”** .
Unpin the S-luffing pulley block (5) on the installation brackets (6) .
Remove the lattice sections with the installation device or auxiliary crane .
Erect the derrick until the pivot section can be removed without problems (approx. 75° to max. 90°).
Remove the pivot section with the auxiliary crane on the slewing platform.



187170

Place down and remove the derrick

Lower the derrick to the horizontal and spool up the luffing pulley block to the D - end section (winch III).

Hang the S-luffing pulley blocks (5) on the auxiliary crane and unpin on the D- end section .

Pull the S-luffing pulley block to the D-pivot section while spooling up the winch III at the same time, and pin and secure on the receptacle.

Continue to luff down the derrick until the end section is again on the ground or on the support.

Remove the guy rods .

Lower the LA - bracket to the front, see chapter 5.02 " LA-bracket ".

Loosen the installation cable (1) on the LA - bracket and pin and secure on the installation bracket (2) on the D- pivot section .

Use pins (3) and spring retainers (4) .

Luff up the LA-bracket so that the installation cable is tensioned.

Unpin the pivot section **"on the bottom" (X)** and secure.

D A N G E R: **Before unpinning the D- pivot section "on the bottom", the installation cable on the installation bracket (2) must be pinned and tensioned on the D- pivot section .**
Make sure nobody is under the lattice jib during the pinning and unpinning procedure of the lattice sections. This is strictly prohibited!
There is a danger of having a serious accident, as the boom may suddenly fold down. .

Place the D- pivot section on the support (U) on the ground and remove the auxiliary crane .

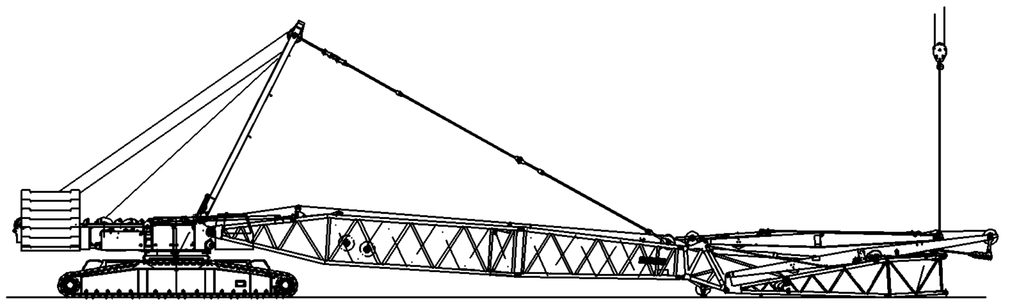
C A U T I O N : **The pivot section must be supported, otherwise it lays on the slewing platform and will be damaged!**
Min. height of support:
- **without Quick connection h = 400 mm**
- **with Quick connection h = 760 mm**

Unpin the installation cable.
Remove the D - end section and LI/D - intermediate section.

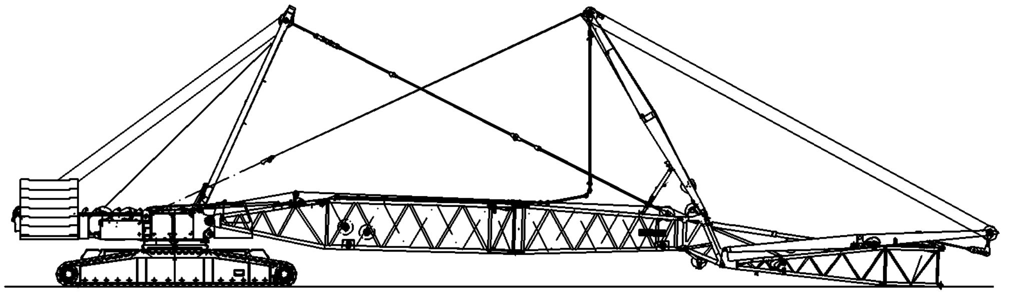
Note: The disassembly of the lattice sections is in reverse order of the installation / assembly.

C A U T I O N : **All warning and dangers notes given for the installation must also be observed for removal / disassembly!**

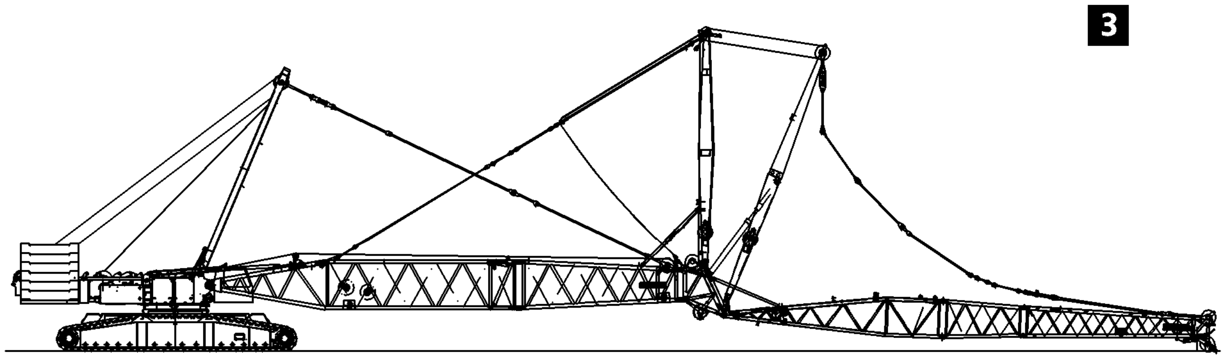
1



2



3



186841

Assembly procedure

Fig. 1

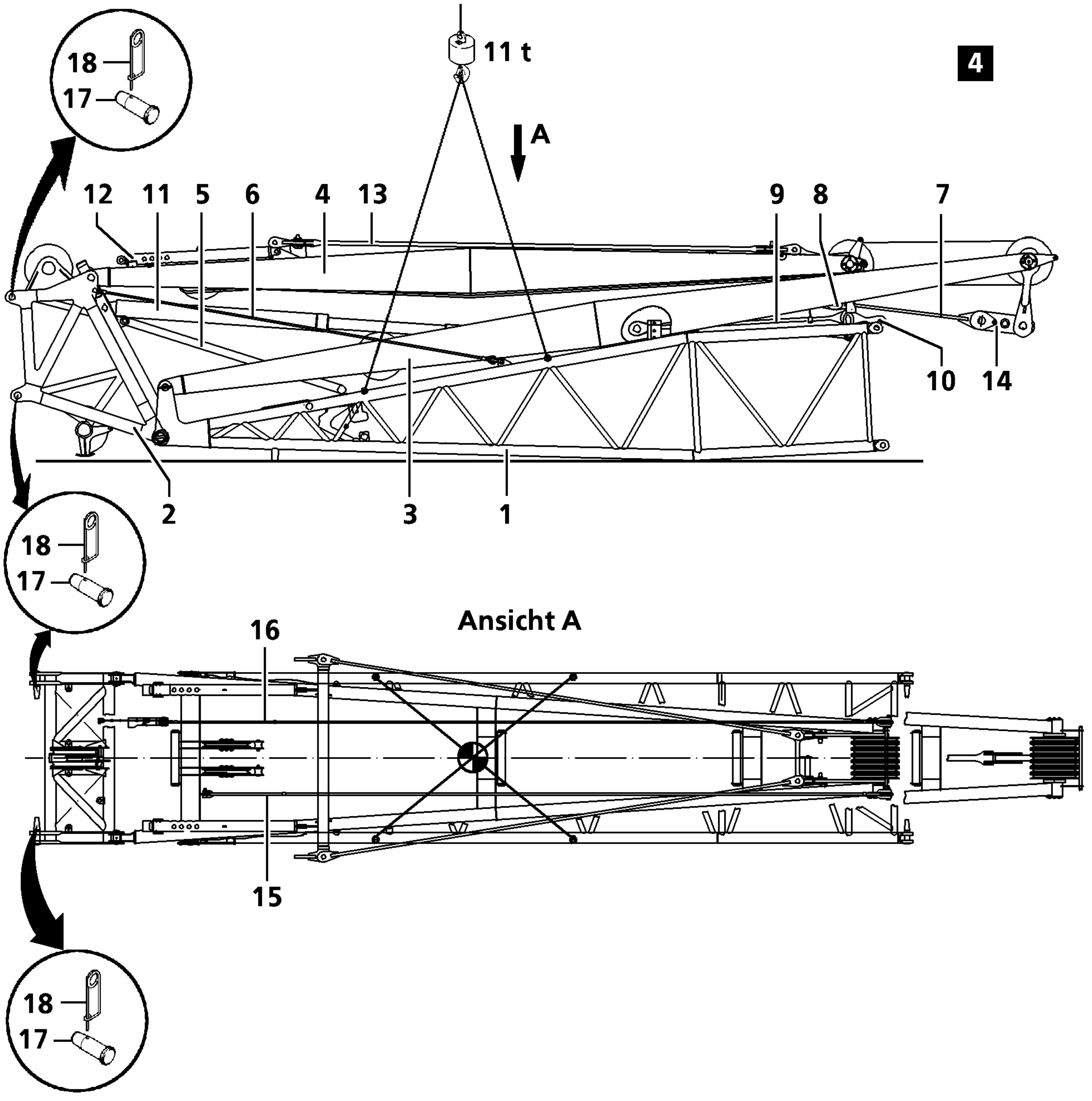
1.0 - Mounting - N- assembly unit on L / SL- boom.
1.1 - Reeve N- adjusting cable between NA- bracket I and II.

Fig. 2

2.0 - Mounting tension columns from NA- bracket II to L boom pivot section.

Fig. 3

3.0 - Raise NA- bracket II and stretch the tension column from NA- bracket II to L / SL- boom pivot section.
3.1 - Mounting N- lattice fly jib and tension columns from NA- bracket I to N- head section.


11 t
4
A
12
11
5
6
4
13
9
8
7
10
14
2
3
1
18
17
Ansicht A
16
15
186842

Assembly

D A N G E R: **At assembling and disassembling works:**

- **An operationally safe assembly scaffold / working platform must always be used for all assembly work. Danger of accident.**
- **Improvisations are prohibited.**
- **the lattice jib must be supported with suitable, stable material.**
- **It is prohibited to go under lattice jib sections while connecting pins are being removed!**

It is prohibited to go under lattice jib sections while connecting pins are being removed!

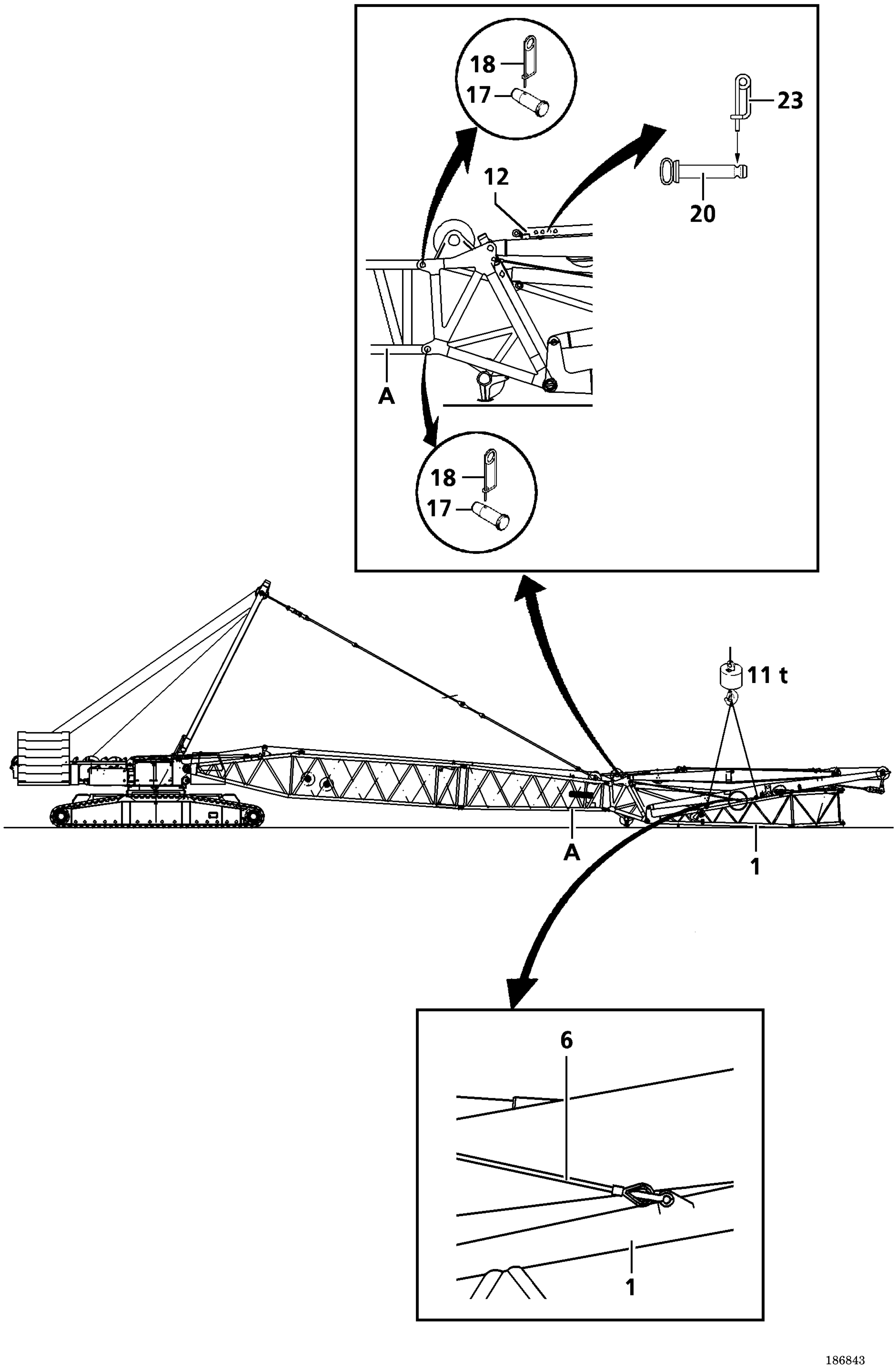
Requirements:

- The boom is assembled
- The crane is horizontally aligned.
- An auxiliary crane as well as assembly scaffold / working platform are available.
- Set the LICCON safety device in accordance with the load capacity operation, table and confirm.
- The key - operated switch ” Assembly” is activated; indicator lamp "Assembly" is on.
- Indicator symbol ”Assembly" on the LICCON monitor is flushing.

Assembly unit (Total weight approx. 11 t)

Components

1 N- pivot section
2 Folding end
3 NA- bracket I
4 NA- bracket II
5 Mecanical fall back strut
6 Retaining rope, to prevent the folding end from folding
7 Tension column 2,01 m
8 Tension column 2,63 m
9 Tension column 2,79 m
10 Connecting bracket 0,42 m
11 Fall back cylinder
12 NA- bracket II, fall back strut
13 Tension column
14 Measuring gauge
15 Mounting cable for raising NA- bracket II
16 Mounting cable for pulling adjusting cable
17 Pin
18 Retaining spring


18
17
23
12
20
A
18
17
11 t
A
1
6
1
186843

Mounting - N- assembly unit on L- boom

Raise the N- assembly unit luffing fly jib at the slinging points on the N- pivot section (1).

Note: Total weight of the assembly unit is approx. 11 t.

Pin the N- assembly unit on the L- adapter (A) with pin (17) and secure with retaining spring (18).

Note: Insert pins (17) from the outside.

Remove suspending rope (6).
Lower assembly unit with auxiliary crane to the ground.
Underlay N- pivot section (1)

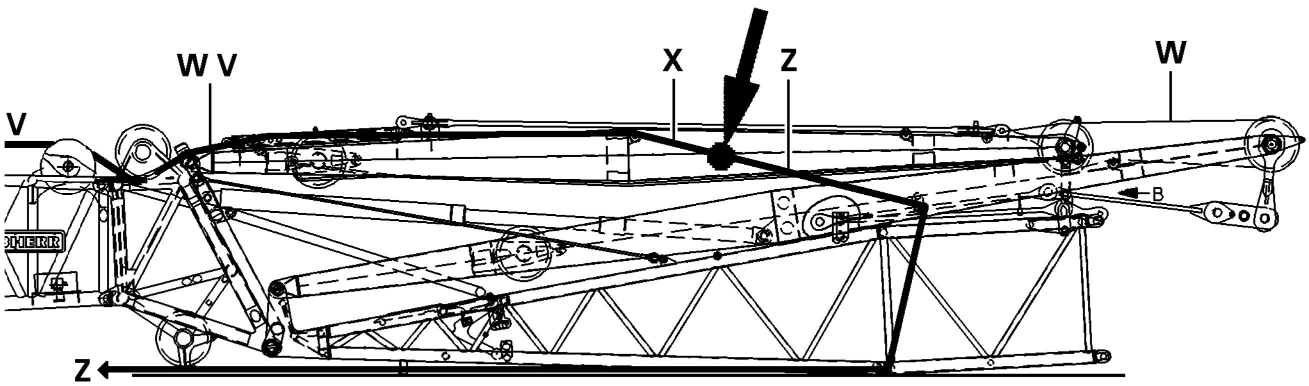
D A N G E R : When removing suspending rope (6), assembly unit must be suspended by an auxiliary crane. If this is not done, there is a danger of the pivot section swinging down.

Remove pin (20) on NA- bracket fall back strut (12). Pull out fall back strut to the last hole and pin again.

1.1 Reeve N- adjusting cable between NA- bracket I and II.

Pull auxiliary cable (Z) from auxiliary winch via guide pulley to slewing platform.
Connect auxiliary cable (Z) with adjusting cable (X) from winch V.
By spooling in auxiliary winch and simultaneously spooling out winch V, pull adjusting cable (X) forward to the NA- strut II rest - cable guide see **Fig. 5**.

5



188097

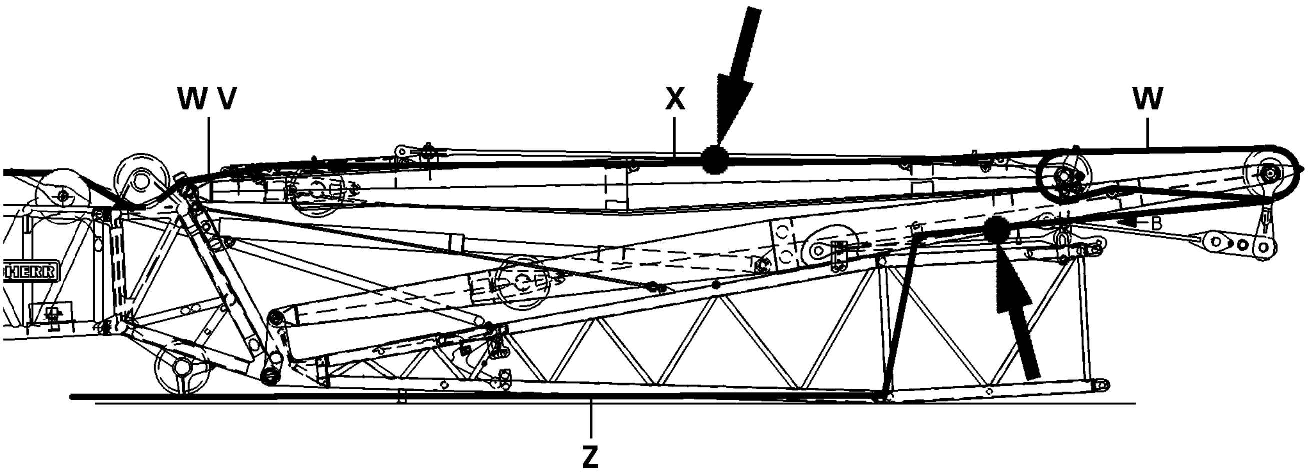
Reeve N- adjusting cable between NA- bracket I and II (continue)**.**
Connect adjusting cable (X) and auxiliary cable (Z) with already reeved in cable (W) - cable guide see **Fig. 6**.
By spooling in auxiliary winch and simultaneously spooling out winch V, reeve in adjusting cable (X) between NA- bracket I and II - reeving see chapter 4.06.
Remove auxiliary crane from N- assembly unit and attach on the mounting cable for raising NA- bracket II up to appr. 45° degrees.

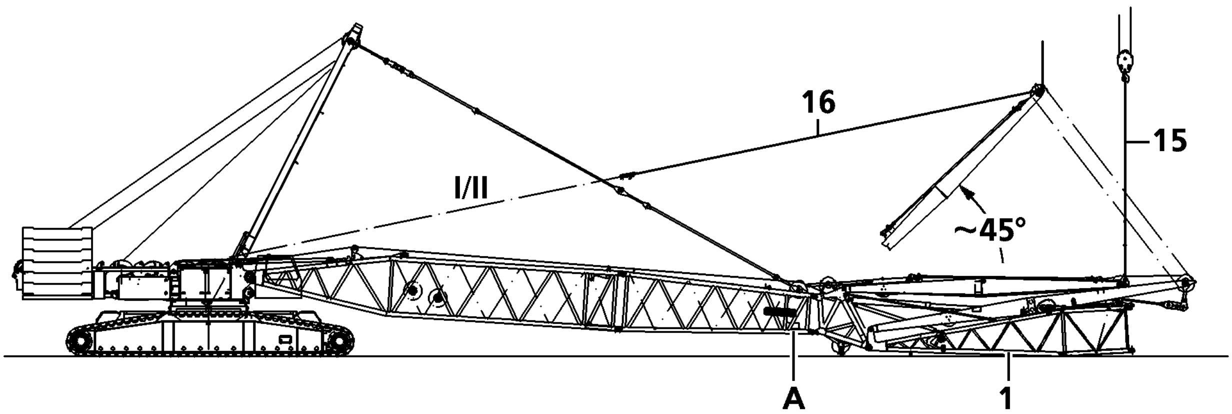
CAUTION: **NA- bracket II must be raised up to appr. 45° degrees with auxiliary crane .**

Hang on hoisting cable from winch I / II into pocket lock on mounting cable (16).

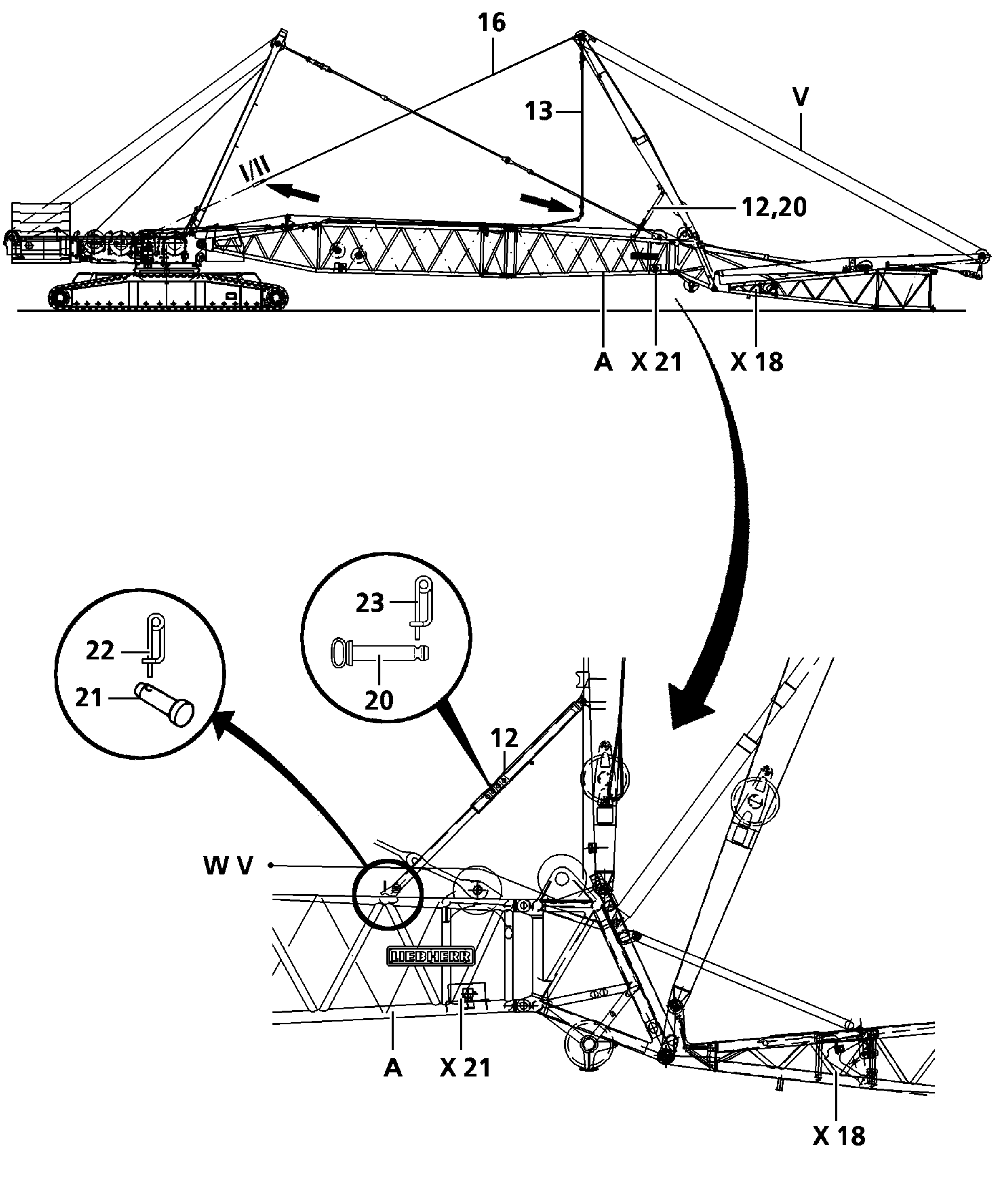
Note: To prevent raising NA- bracket I the adjusting winch (winch V) must spooled out simultaneously.

6





188096



188079

2.0 Mounting tension columns from NA- bracket II to L / SL- boom pivot section

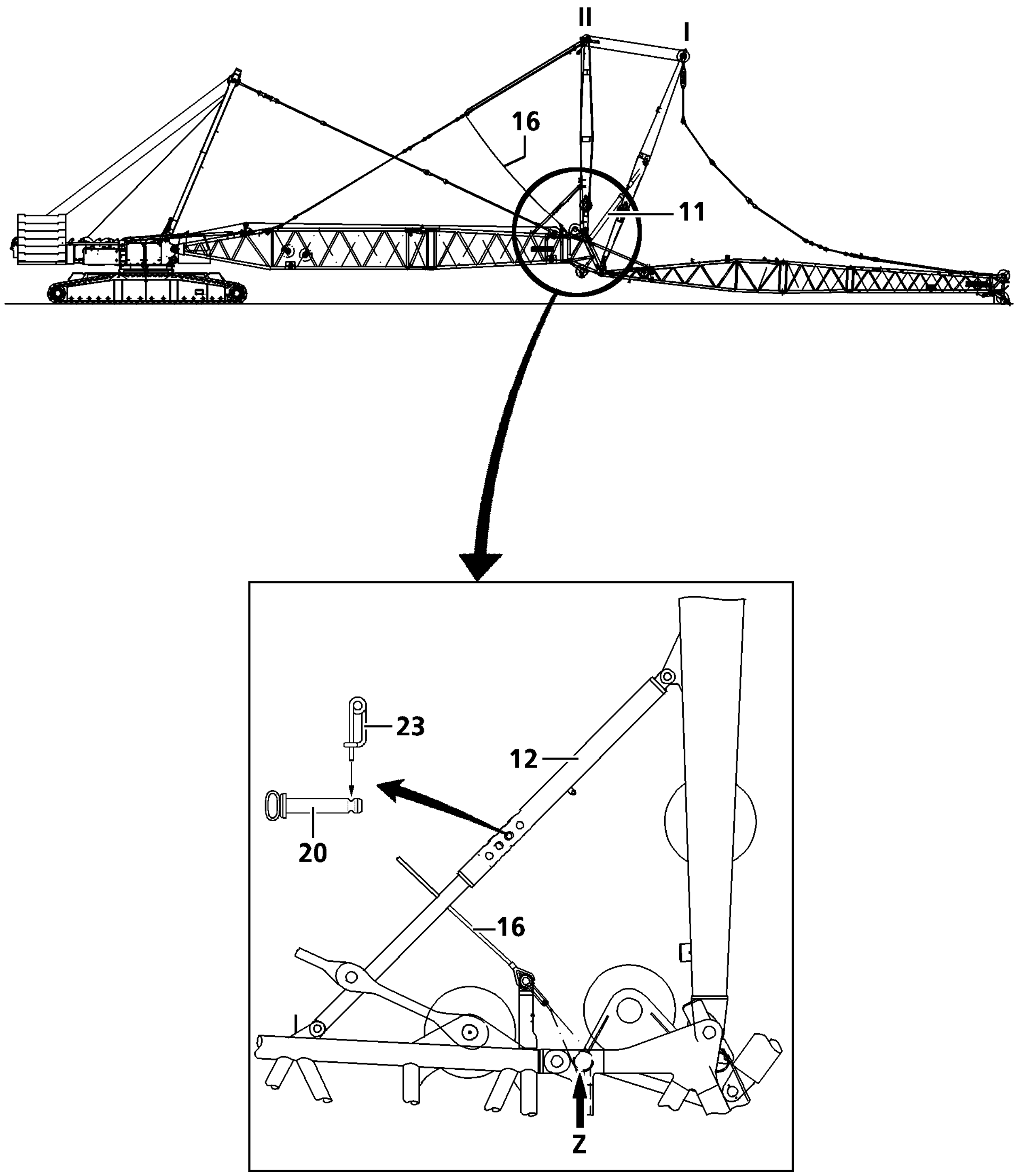
Make electrical connections from the terminal box (-X21) on the L-adapter to the terminal box (-X18) in N-pivot section. Insert plug of cable (W510A) at terminal box (-X21).

From appr. 45° continue with erection of NA- bracketII with hoisting cable and mounting cable (16) until fall back strut can be pinned and secured to the L- adapter (A), with pin (21) and retaining spring (22).
Pull out pin (20) on the mecanical fall back strut (12).

C A U T I O N: **Pin (20) must be pulled out after fall back strut is pinned to the L- adapter. If this is not done, there is a danger of the NA- bracket II when pulling back.**

Spool in hoisting winch, at the same time **spool out** N adjusting winch (winch V) and draw NA- bracket far enough back until the tension column (13) can be pinned and secured on the tension column (13) from L- pivot section.

C A U T I O N: **All pins of the tension columns must be inserted from inside and secured on outside.**



186803

3.0 Raise NA- bracket II and stretch the tension column from NA- bracket II to L- boom pivot section

Make electrical connections to end switches of N- fall- back cylinder (11).
If the tension column are bolted and secured, the hoisting winch must be **spooled out** and simultaneously the N- adjusting winch (winch V) **spooled in,** until the tension column between NA- bracket II and L- boom pivot section, are tensioned against the pressure of fall back cylinder (11).

Continue to spool out hoist cable, remove from pocket lock and attach mounting cable (16) on L- adapter at (Z).

By **spooling in** N- adjusting winch (winch V), pull up the NA- bracket I until the the limit switch on the N- fall back cylinder (11) is actuated

C A U T I O N: **Electrical connections to limit switches of N- fall- back cylinder must be established.**
Manually activate the limit switch on the fall back cylinder, before raising.
Adjusting winch movement "spooling in " must be cut off.
The indicator lamp must come on.
NA- bracket must not be pulled to the blocking position of fall back cylinder, otherwise damge can occure!

Pin and secure with pin (20) and retainig spring (23) NA- fall back strut (12) at the next possible hole.

3.1 Mounting N- lattice fly jib and tension columns from NA- bracket I to N- head section

Assemble the N- lattice jib to the required length, pin and secure it.

D A N G E R: **The lower pins on the lattice fly jib section must be inserted from the inside to the outside and secured with spring clips.**
At assembly and dismantling works the lattice jib must be supported with suitable, stable material.
It is prohibited to go under lattice jib sections while connecting pins are being removed or pinned!

Attach erecting buggy at N- head section.

Note: Buggy tire inflation pressure = **7 bar**.

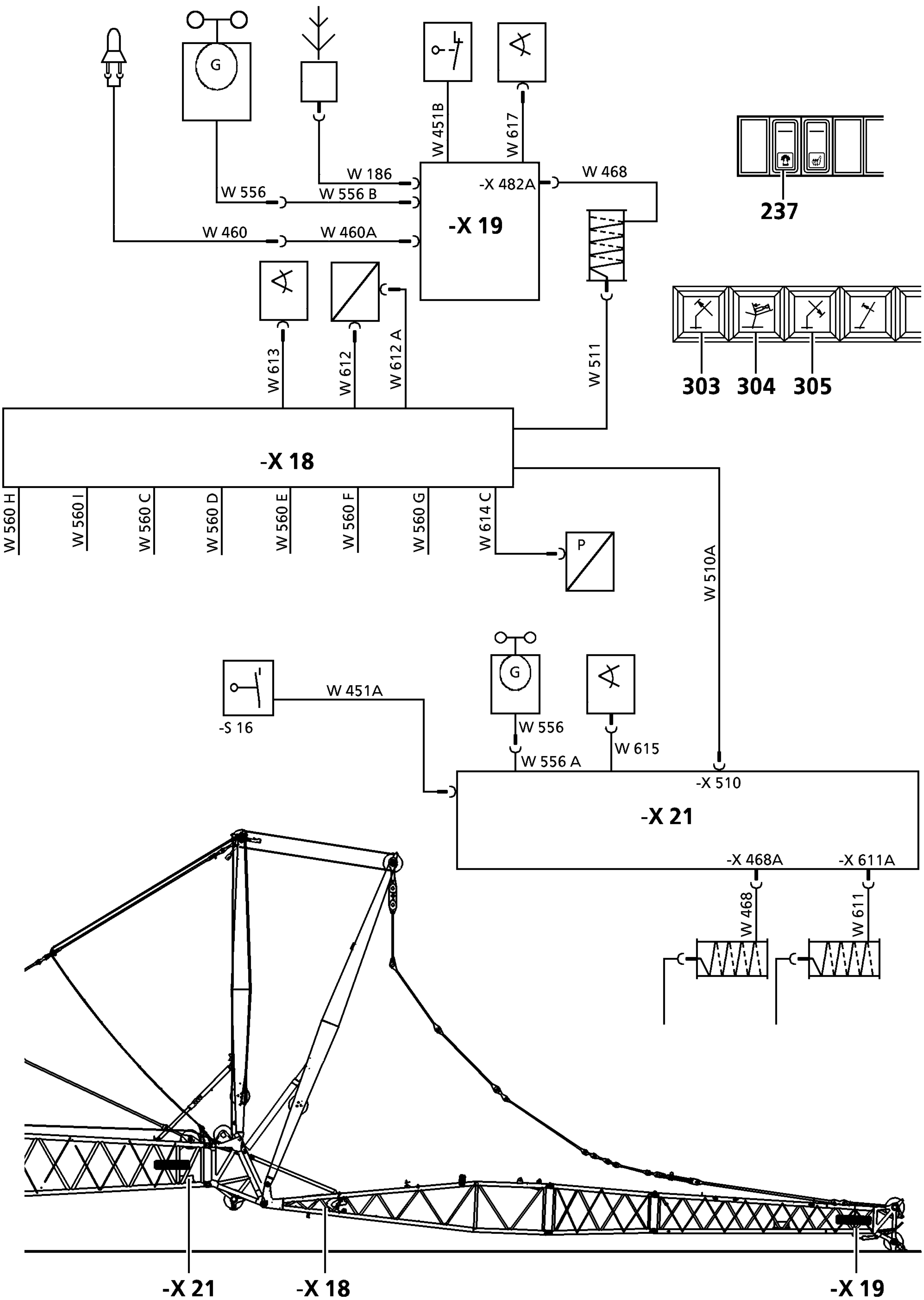
Mounting tension columns from NA- bracket I to N- head section

Assemble the tension column - from NA- Bracket I to the N- head section of the lattice jib - according to the N- lattice jib length , pin and secure them .

Note: The tension column must be placed and retained on the intermediate sections for transport.
For installation, release the transport retainers.
Connect the required tension column from the N- head section to the NA- bracket I, pin and secure.
The tension column must be installed and secured according to the installation drawings in chapter 5.03. Compare the numbers noted on the installation drawing with the numbers on the tension column.

C A U T I O N : **All pins of the tension columns must be inserted from the left as seen from the crane.**
If this is not done, the hoist cable will strike the pins during operations.
The tension column must be checked regularly, refer to the chapter covering " Inspection and maintenance of tension column".

Spool in N adjusting winch (winch V) **,** until the tension column between NA- bracket I and N- head section are streched.


G
W 451B
W 617
W 186
-X 482A
W 468
W 556
W 556 B
-X 19
W 460
W 460A
237
W 613
W 612
W 612 A
W 511
303
304
305
-X 18
W 560 H
W 560 I
W 560 C
W 560 D
W 560 E
W 560 F
W 560 G
W 614 C
P
W 510A
G
W 451A
-S 16
W 556
W 615
W 556 A
-X 510
-X 21
-X 468A
-X 611A
W 468
W 611
-X 21
-X 18
-X 19

186804

Electrical connections
Make the electrical connection from the terminal box (-X21) on the L- adapter to the terminal box (-X18) on N- pivot section. Insert cable plug (W510A) in socket (-X510) on the terminal box (-X21).

Make the electrical connection from the cable drum on N- pivot section to the N- head piece. Insert cable plug (W468) in socket (-X482B) on the terminal box (-X19).

Make the electrical connection from the terminal box (-X18) to the cable drum. Insert the cable plug (W511) into the cable drum socket.

Note: Before connecting connector box (-X18) to cable drum, spool out cable (W468) from cable drum to connector box (-X19).

Mount airplane warning light and wind velocity sensor on the N- head piece.

Insert cable plug (W556A) for wind speed gauge in socket (- X556B) and cable plug (W460) for air craft warning light in socket (-X460B), on the terminal box (-X19).
Insert cable plug (W613) in socket on the angle indicator in N- pivot section.

The following plugs must be inserted on the connector box (-X18):

- Cable plug (W612) for the force gauge on the NA- bracket I.
- Cable plug (W613) for the angle sensor on the N- pivot section .
- Cable plug (W614) for the pressure sensors on the N- fall back cylinders.

Function check
Prerequisite:
- All electrical connections have been established.
- The engine is running.
- The control levers on the limit switches have been checked for easy movement and have been lubricated.

Check airplane warning light
Turn on the airplane warning light with switch (237), check function visually.

Check wind velocity sensor
Check movement and function of wind velocity sensor.

Hoisting limit switch
Operate end switch on roller head manually.
Hoisting winch must switch off in hoisting direction.
Symbol hoist "top" on LICCON monitor blinks.

Limit switch N- lattice fly jib, "steepest position", N- fall- back cylinder
Operate limit switches on fall-back cylinders individually and manually. The N- adjustment winch movement **"spool in"** must shut down. Control lamp (304) must light up.

Note: The switch point of the limit switch on the N- fall- back cylinders must be checked before erection - **see section 8.13, checking fall-back cylinder.**

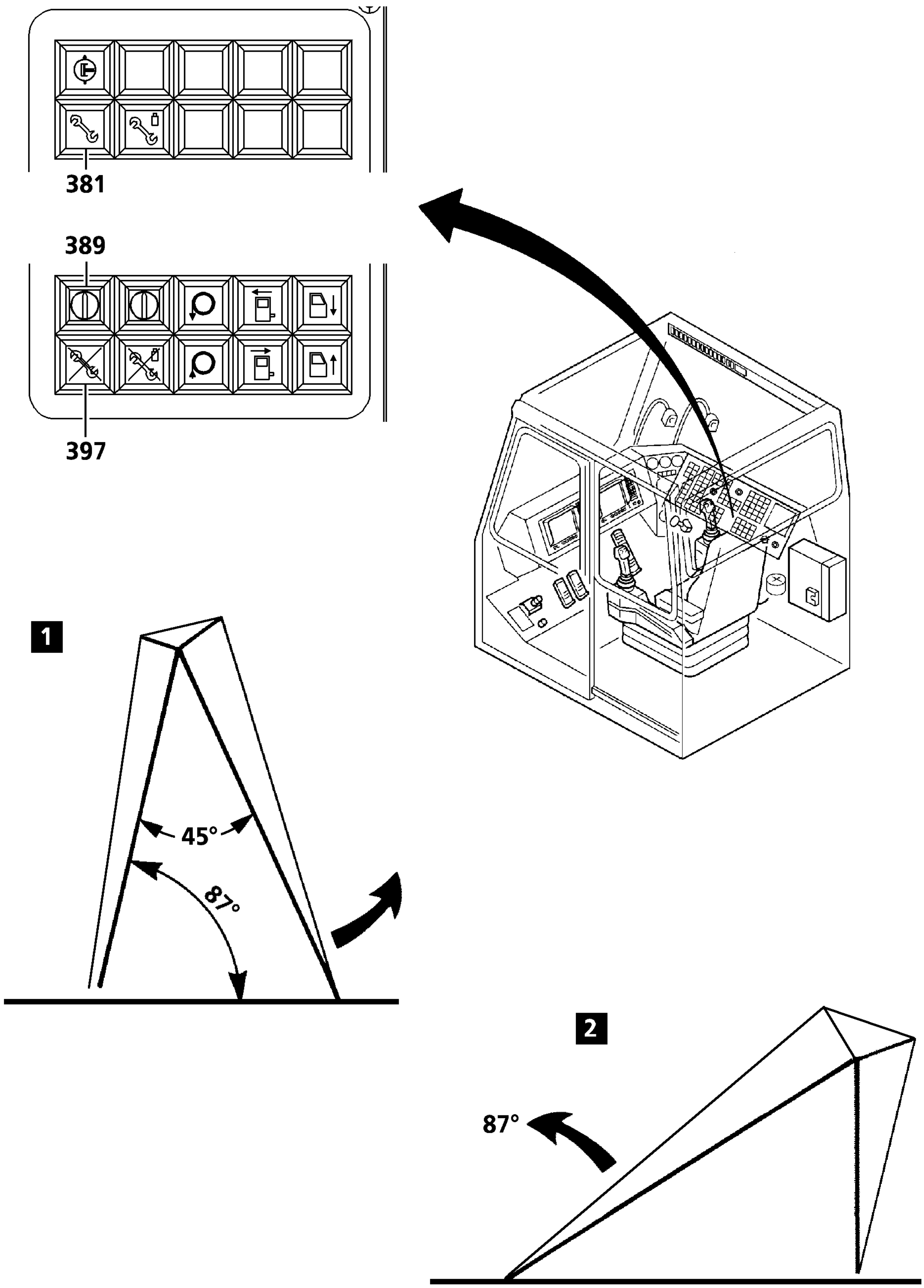
Limit switch N- lattice fly jib, "steepest" position, mechanical fall-back strut
Operate limit switch on the jib individually and manually. The N- adjusting winch movement **"spooling in"** must shut down. Control lamp (304) must light up.

Erection / lowering
The boom combinations must be erected and dismantled according to the erection and dismantling tables, section 5.09.

D A N G E R : **Erection and dismantling must take place according to the instructions in the table. If this is not observed, the crane is overburdened or will tip over.**

Pre-condition:
- The crane is aligned horizontally.
- The counter weight is attached according to the load capacity table.
- The lattice fly boom is attached according to the load capacity table and operating instructions.
- All limit switches are mounted correctly and fully functional.
- Before erection the correct running of the pendulum of the mechanical fall-back protection must be checked in the entire swivel area.
- All bolt connections are secured.
- The hoisting cable is inserted correctly in cable rollers and secured with the cable securing bolts against jumping out.
- No persons are in danger area.
- No loose parts can be found on boom or lattice flyjib.
- In Winter: Boom, lattice fly jib and their components (limit switch, cable drum, air plane safety light, wind gauge, etc.) are free from snow and ice.

D A N G E R : **Incorrectly mounted or non-functioning limit switches as well as any parts which can fall down (bolts, spring plugs, ice etc). can lead to accidents.**
Before erection the correct running of the pendulum of the mechanical fall-back locking must be checked in the complete swivel area.
If this is not observed the mechanical fall-back support does not snap into place in the steep lattice fly boom position.
Danger of accident through lattice fly boom tipping backwards.



186770

Erection process
Set the LICCON safety device in accordance with the load capacity operation table.
The assembly key- operated switch (389) is activated ; indicator lamp (381) is on.
Indicator symbol "Assembly" on the LICCON monitor blinks.
Attach hoisting cable on headpiece.

C A U T I O N: **If the hoisting cable is not attached, it can fall backwards during erection through its own weight.**
Slewing during erecting is prohibited.

Erection
Operate hand control lever and derrick boom.
Simultaneously, unreel lattice fly boom adjusting winch to hold lattice fly boom with headpiece on the ground.

D A N G E R: **The lattice fly boom must roll on ground with its total weight.**
Lower lattice fly boom adjustment in such a manner that the stay poles always sag slightly.
Watch out for loosening on adjusting winch!
If this is not observed, the crane is overloaded or can tip over.

Carry out this process so long until the boom and lattice fly boom form an angle of $\geq$ 45° or the lattice fly boom has been previously lifted from the ground (diagstrut 1 + 2)
Dismantel erecting buggy at N- head section.
Top boom only now and raise lattice fly boom from ground.
Loosen hoisting cable on headpiece reeve between roller head on the headpiece and hook- type bottom block and secure at fixed point - see reeving plans.
Attach hoisting end switch weight.
Top boom to steepest position 87°.

C A U T I O N: **When erecting, the hoisting winch must be unreeled simultaneously to prevent collision of the hook- type bottom block with headpiece of lattice fly boom.**

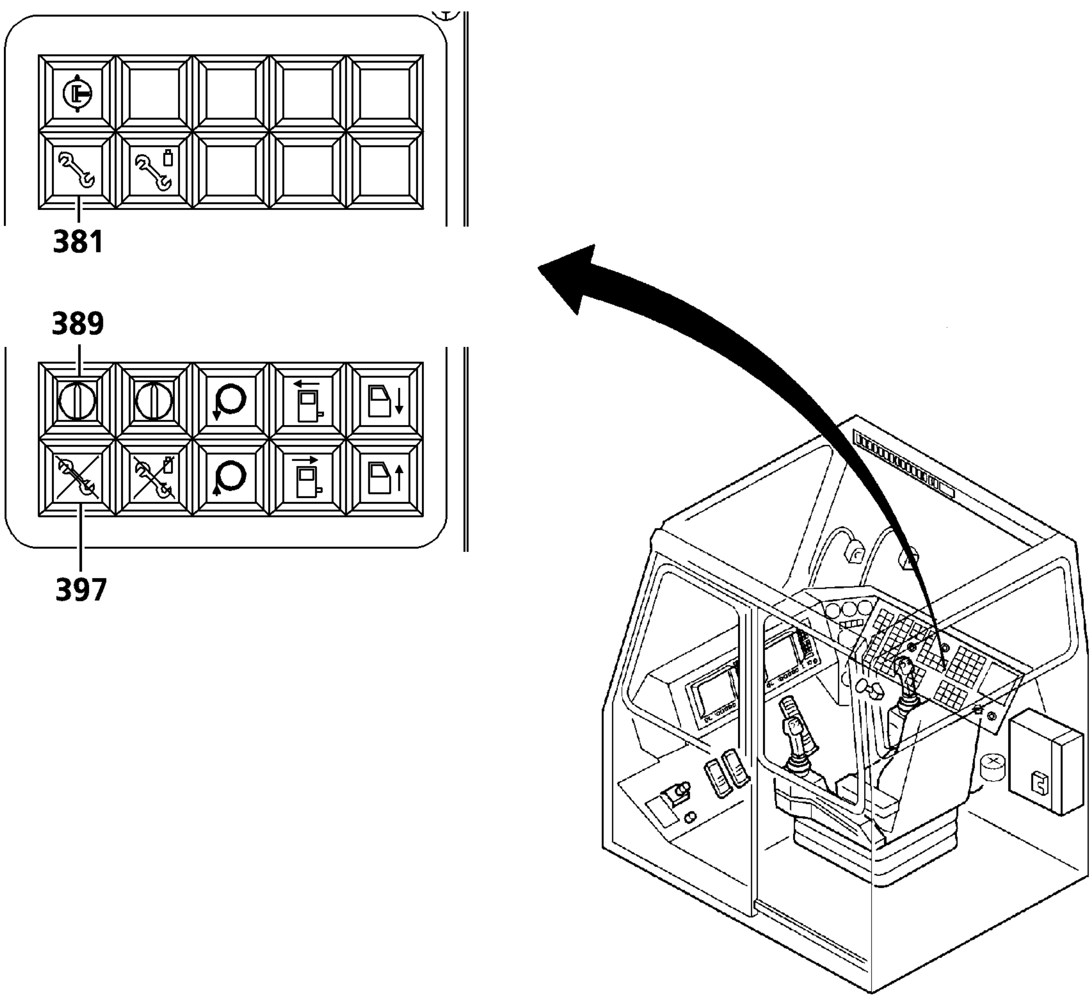
Top lattice fly boom up to operating position.

Indicators in the OPERATIONAL VIEW during the erection procedure
During the erection procedure, the following alarm functions are actuated (blinking) until the operating position is reached:
- "ERROR" (150)
- "STOP"
- "HORN" + acoustical signal

Note: The operating position is reached when the indicators turn off and the question marks (???) are replaced with the load value in -t- (tons) in the symbol "MAX. LOAD" .

Turn off assembly key- operated switch (389) by pushing the button (397). Indicator lamp (381) and the assembly symbol on the LICCON turns off.

D A N G E R: **After reaching operating position, mounting key- operated switch must be switched off. The mounting key- operated switch jumps the safety installations.**
The radii stated in the load capacity table may neither be exceeded but must also be reached.
If this regulation is not observed the crane can tip over!



186927

Crane operation with LN / SLN- boom system

C A U T I O N: Observe instructions in section 4.05 "CRANE OPERATION" and section 4.08 "WORKING WITH LOAD".

Requirements:

- The ”LICCON” safe load indicator has been set according to the data in the load capacity chart.
- The installation keyed switch (389) has been turned off via button (397)
- Indicator lamp (381) and the assembly symbol on the LICCON turns off.

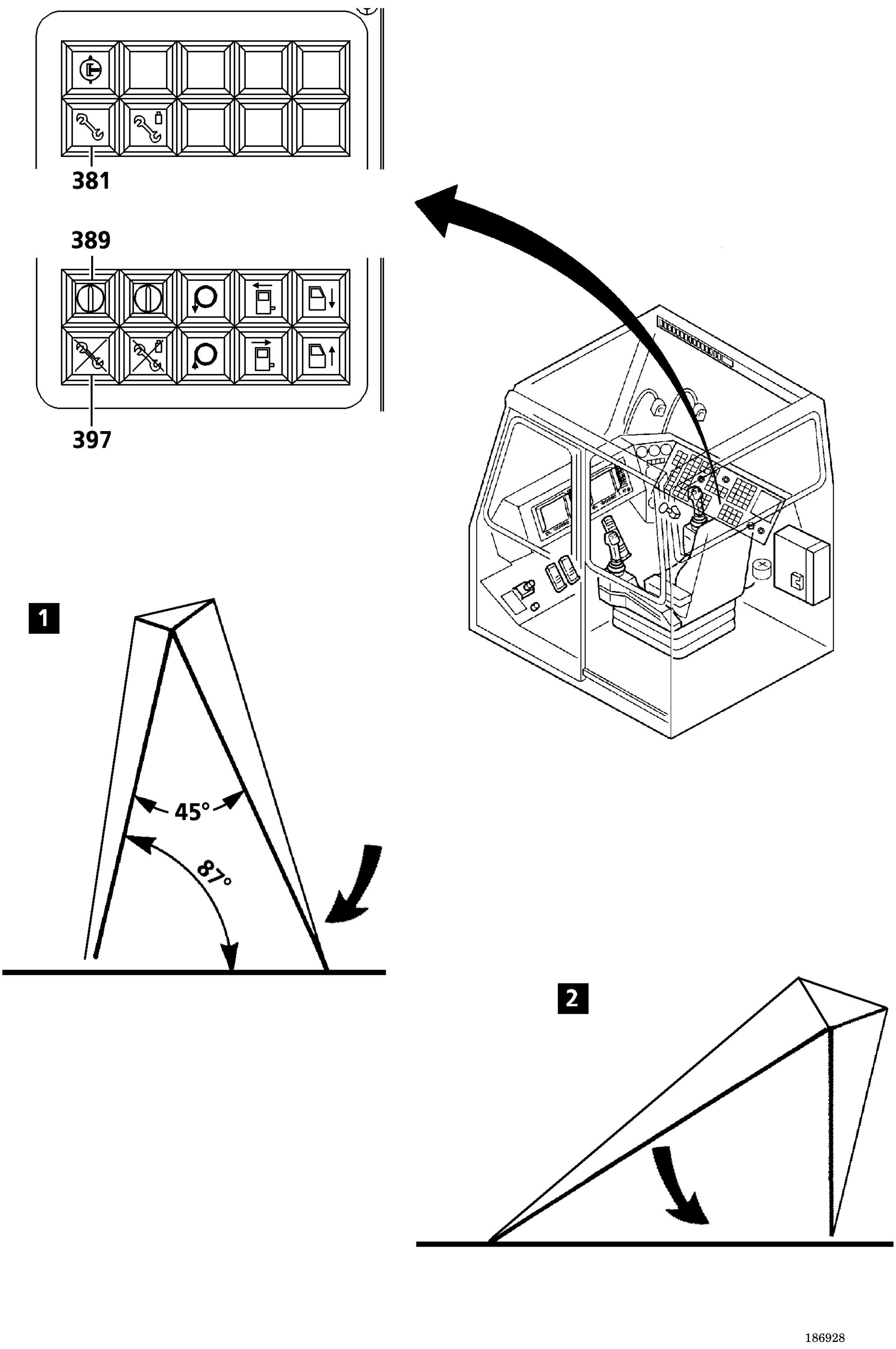
**D A N G E R : Check horizontal position of crane before and during operation.
If the crane operator leaves the cabin, even for a short time, he must check and if necessary reset operating mode setting before resuming operation.**

Settings/Checks

Check function of the LICCON safety device by activating "upper" and "lower" operating positions
Check function of hoist limit switch "up" by activating the hoist limit switch weight.
Check function of limit switches ”boom steepest positon” by activating the limit switches on mechanical safety fall back.

Setting boom to 67° resp. 77°

Before setting boom to 67° resp. 77° the boom must be erected to steepest position **87°** and the lattice fly jib in steepest operating position.


381
389
397
1
45°
87°
2
186928

Lowering process
Boom remains in steepest position 87 degrees.
Activate the manual control lever and lower the lattice fly jib to the **lowest** operating position.

Note : Shutdown is carried out after reaching the **lowest** operating position.

C A U T I O N: While lowering, hoist winch must spooled out in order to prevent the hook block from colliding with the pulley head.

The assembly key- operated switch (389) is activated; indicator lamp (381) "Assembly" is on and the assembly symbol on the LICCON blinks.

D A N G E R: The safe load indicator is no longer operational.
The limit switch hoist "top" is bypassed.

Continue to luff down the lattice fly jib until the N- head section is close to the ground resp.lattice fly jib is hanging vertically.

C A U T I O N: When luffing down the lattice jib, make sure that the hook block does not collide with the end section !
The hook block may not be dragged along the ground.

Lower boom until hook- type bottom block touches ground.
Dismount hoisting limit switch weight.
Unreeve hook block

D A N G E R: When unreeve hoisting cable, no persons may be situated in the danger area.

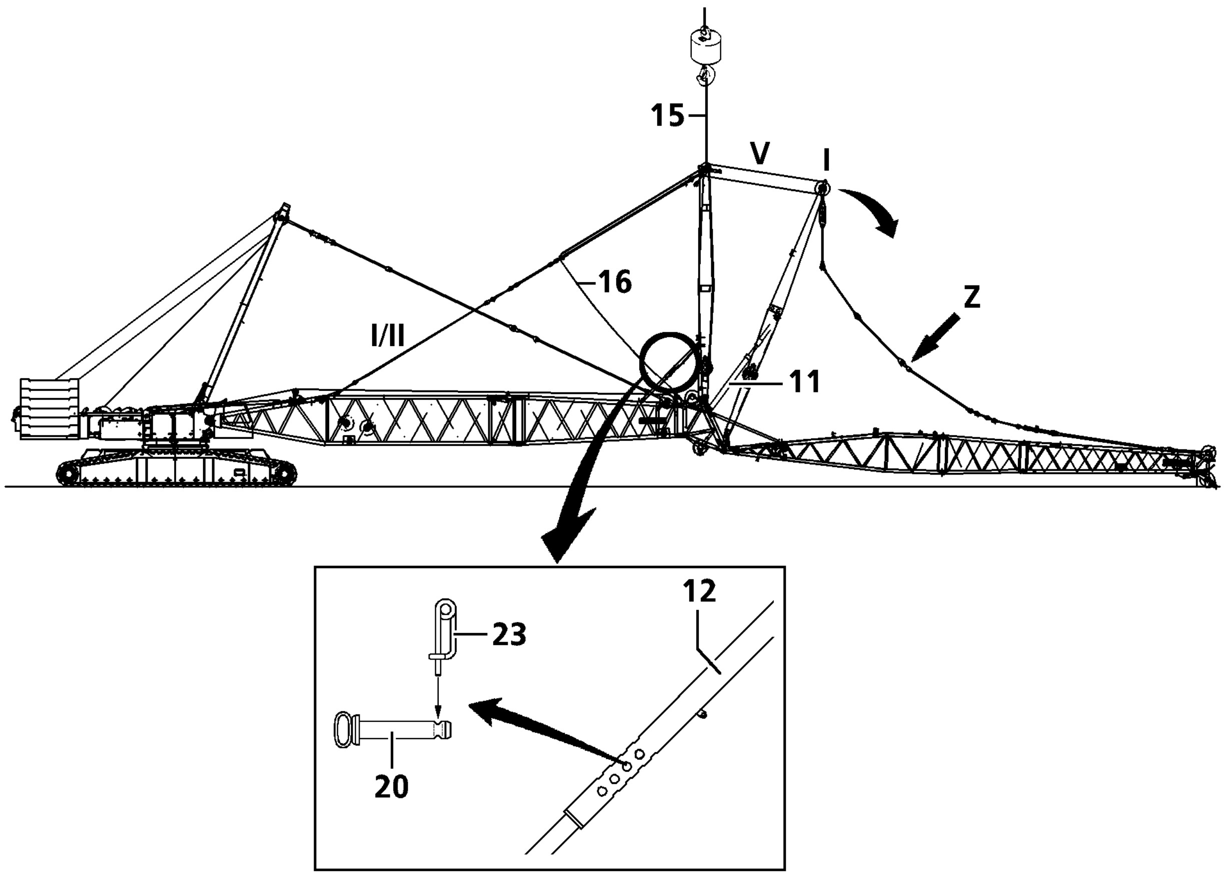
Attach erecting buggy at N- head section.
Lower boom again whereby the lattice fly jib head rolls on the ground.

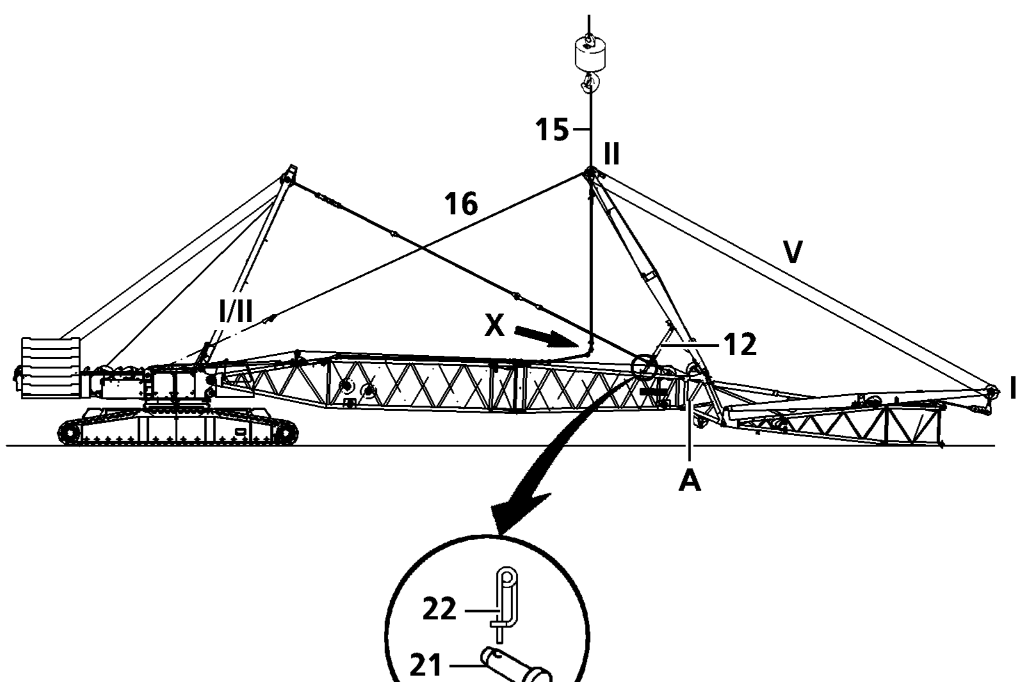
C A U T I O N: At the same time the hoisting cable must be spooled out preventing the hoisting cable frombeing tightened and damaged.

D A N G E R : The tension column must always sag a little during lowering process.
The lattice fly jib must roll on ground with its total weight.

Dismount hoisting cable.

D A N G E R: No persons may be situated in the danger area during dismounting of hoisting cable!





186929

Disconnect tension column an set down the NA- Bracket I + II
Spool back the hoist cable over the cable pulleys in the NA- brackets to the L- adapter.

D A N G E R: **Secure the hoist cable with the auxiliary cable and slowly lower it over the cable pulleys backwards to the L- adapter.**
Make sure there are no persons within the danger zone.
Danger of accidents!

Spool out the N adjusting winch (V) and lower the NA- bracket I forward, unpin the tension column (Z), place them on the lattice sections and secure them.
Detach fly jib
Unpin the lower pin between the pivot section andintermediate section **from the outside to the inside**.

D A N G E R : **Before unpinning, make sure that the pivot section is held by an second crane or supported with suitable, stable material.**
It is prohibited to go under lattice jib sections while connecting pins are being removed!
Ifhis is not assured, then a serious accident may occur because the lattice jib can suddenly drop down.

Release the installation cable (16) and attach the hoist cable from winch I/II in the cable lock.
Spool in the N adjusting winch (V) and pull up the NA- Bracket I until the tension column between NA- bracket II and L- pivot section are tensioned against the pressure of fall back cylinder (11).until fall back strut (12) can be unpinned. Remove retaining spring (23) and pin (20).

C A U T I O N: **When pulling up, the limit switch on the N fall back cylinder (11) can be actuated this cuts off spooling in of winch V, to prevent blocking of N fall back cylinder.**
The electrical connections to the limit switches on N fall back cylinder must be established.

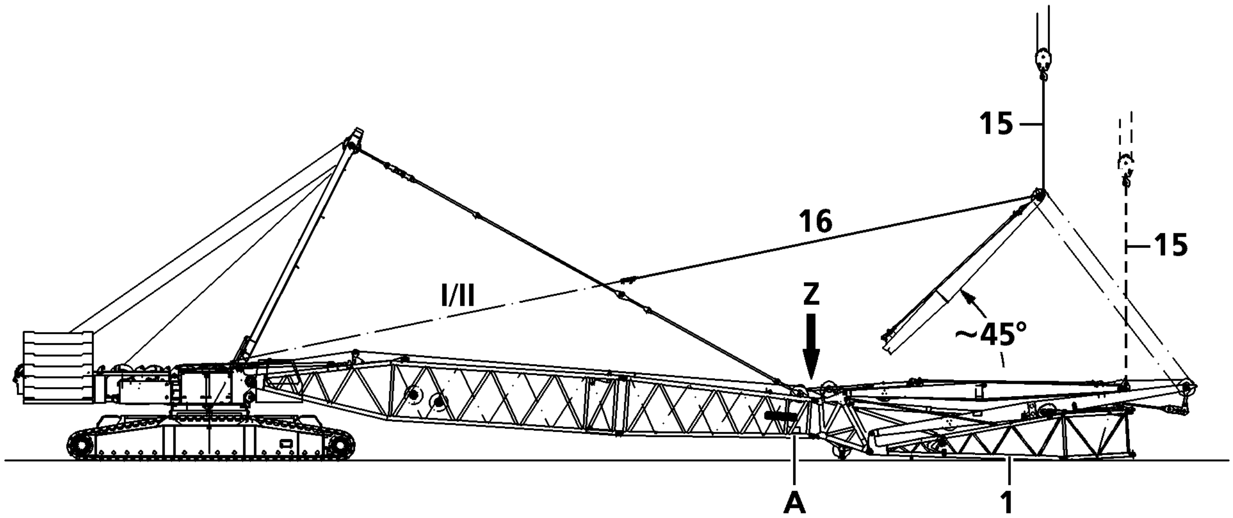
Lower the NA- bracket I.

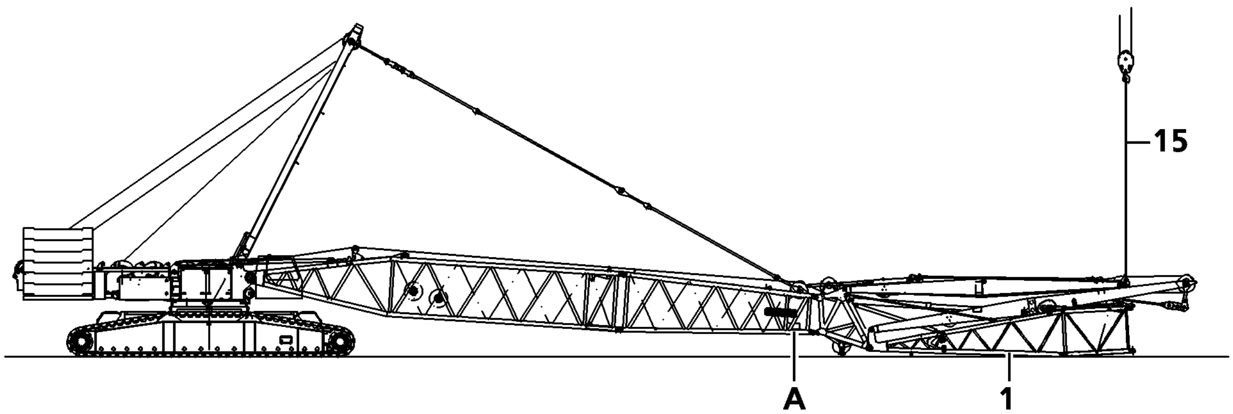
Spool in the hoist winch at the same time spool out N adjusting winch (winch V) and pull the NA- Bracket II backward until tension column from NA- bracket to L-adapter (X) can be disconnected.
Lay down and secure tension column on the lattice fly jib sections.

C A U T I O N: **Pin (20) must be unpinned before pulling back NA- bracket.**
If this is not done damage can occure.

Attach auxiliary crane and installation cable (15) to NA- bracket II.
Pull the NA- Bracket II to vertical position by spooling out the hoist winch and at the same time spooling in N adjusting winch (V).

Unpin fall back strut (12) on L- adapter (A). Remove pin (21) and retaining spring (22).





186930

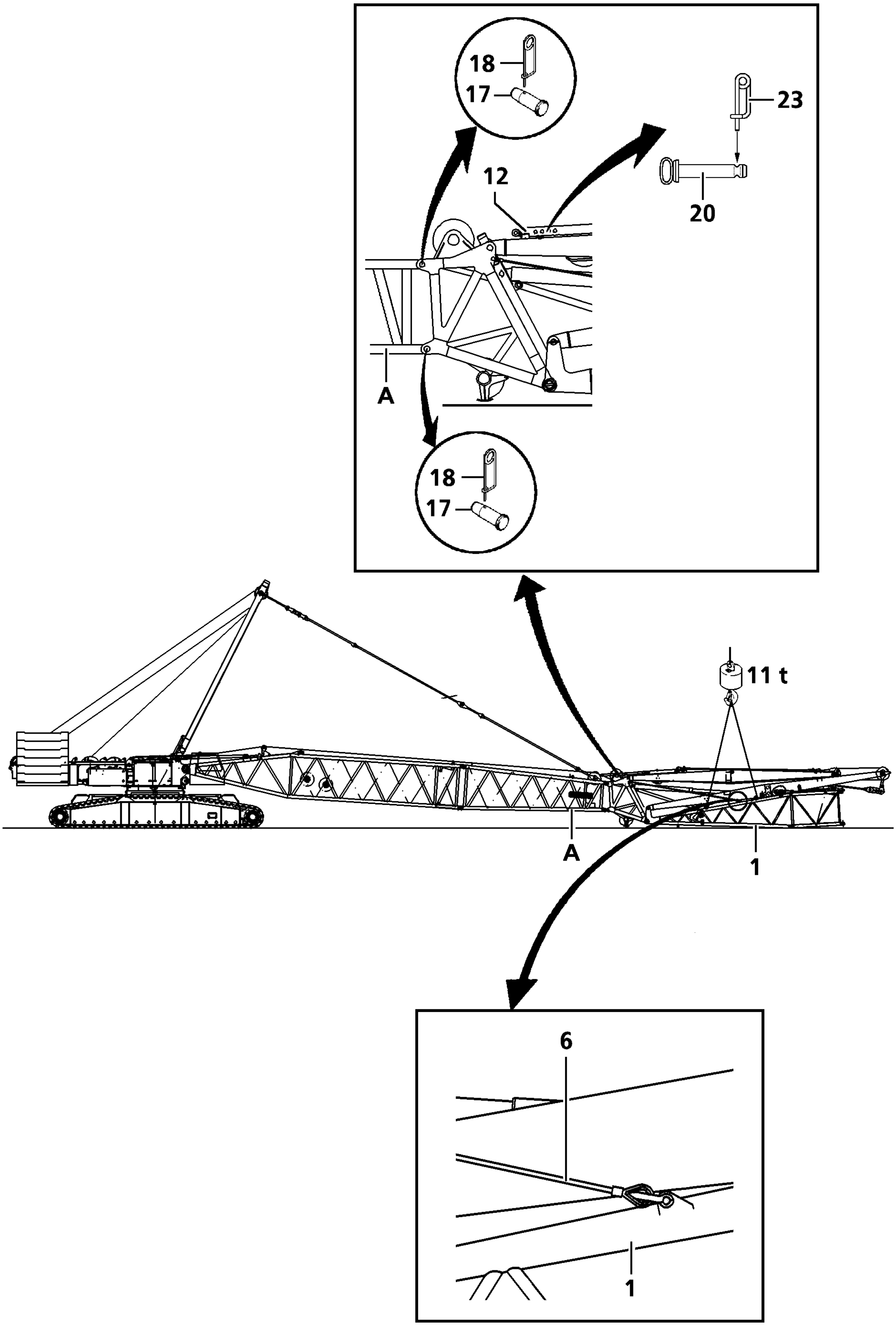
Lower NA- bracket II

Spool out hoisting winch, spool in N adjusting winch (V) simultaneously and lower NA- bracket II to the front of approx. 45° degrees to horizontal.

D A N G E R : From an angle of approx. 45° degrees to the front, NA- bracket must be further lowered with support of auxiliary crane and installation cable (15).

Lower NA- bracket II to support on NA- bracket I.
Hang out hoisting cable at pocket lock and attach insallation cable (16) on L-adapter at (Z).

Unreeve N adjusting cable and reeve auxiliary reeving cable simultaneously.



186843

Dismounting - N- assembly

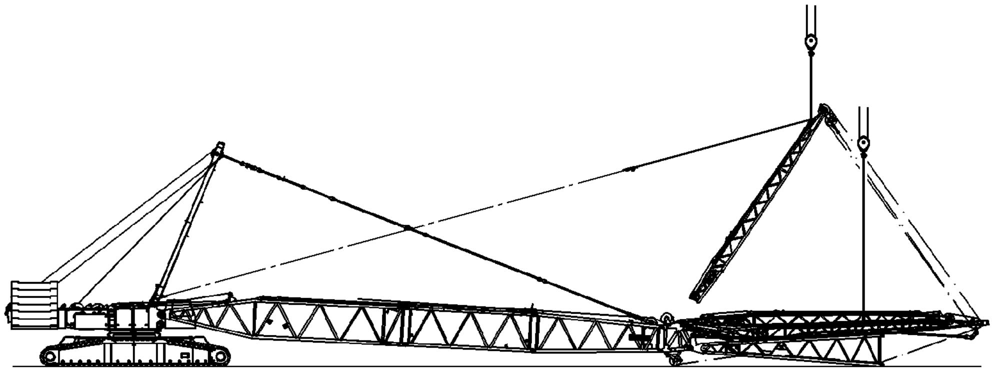
Raise the N- assembly unit luffing fly jib at the slinging points on the N- pivot section (1).

Note: Total weight of the assembly unit is approx. 11 t.

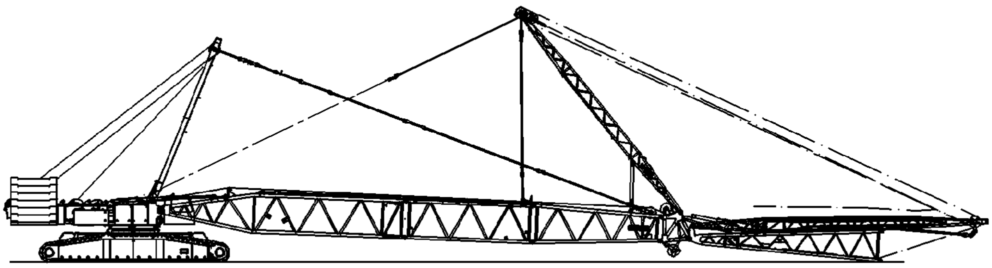
Attach suspending rope (6).on N- pivot section and secure.

Unpin the N- assembly unit on the L- adapter (A). Remove pin (17) and retaining spring (18).

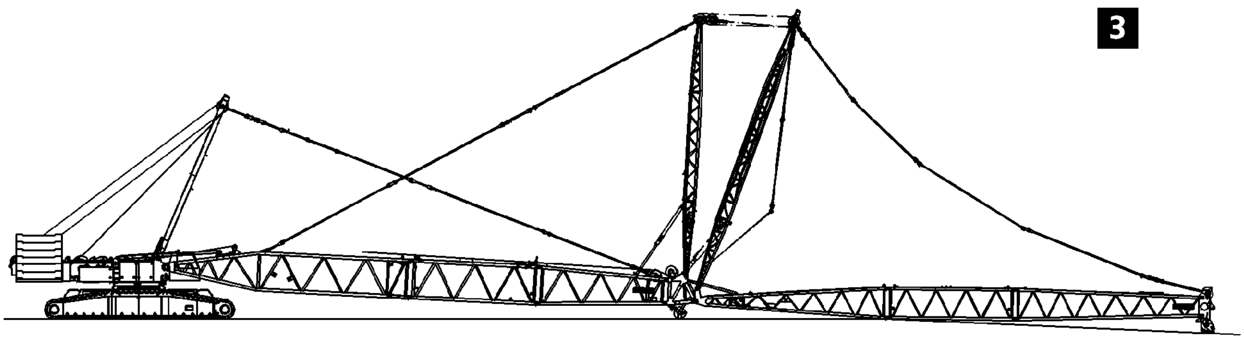
D A N G E R: **Before dismounting assembly unit must be suspended by an auxiliary crane and the suspending rope (6) must be attached and secured.**
Otherwise there is danger through lattice pieces folding down.



1



2



3

188558

Installation procedure

Fig. 1

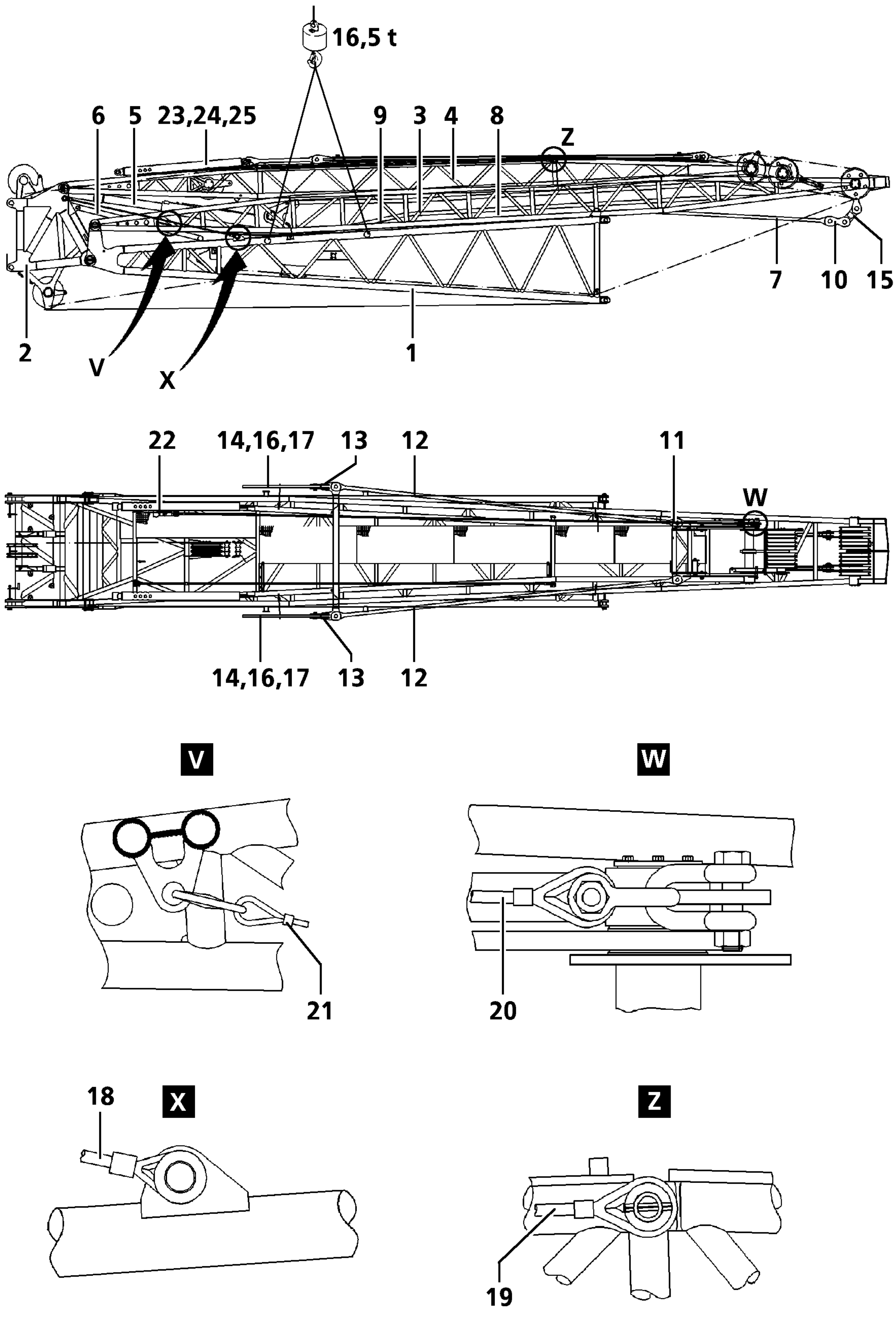
1.0 - Pin W- installation unit on the S- boom.
1.1 - Reeve W- control cable between WA- bracket I and II.

Fig. 2

2.0 - Installation of guy rods from WA- bracket II to S- pivot section.

Fig. 3

3.0 - Erect WA- brackets and tension guy rods from WA- bracket II to the S- pivot section .
3.1 - Install lattice jib and guy rods from WA- bracket I to W- end section.


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
W
21
20
18
X
Z
19

188559

Installation

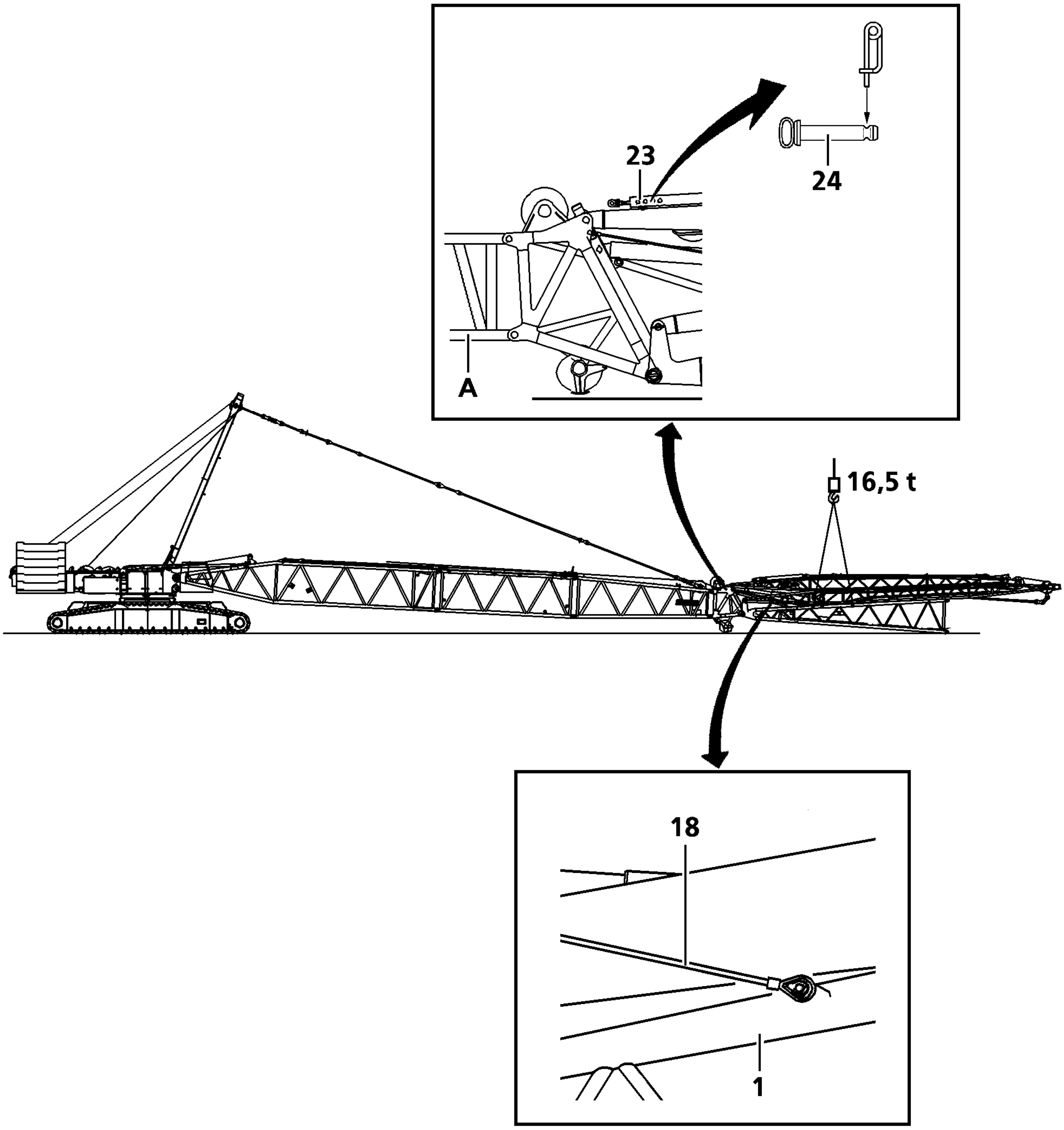
D A N G E R: For the installation and removal of the boom combination:
- **a safe installation scaffolding / working platform must be used. There is a danger of falling.**
- **improvisations are strictly prohibited.**
- **the lattice jibs must be supported with suitable, stable support materials.**
- **no persons may remain under the lattice jib during the unpinning and pinning procedure. This is strictly prohibited!**

Prerequisites:
- The boom is installed.
- The crane is horizontally aligned.
- An auxiliary crane as well as an installation scaffolding / working platform is available.
- The LICCON safe load indicator system is set according to the data given on the load capacity chart.
- The keyed switch "Installation" is actuated, the indicator light "Installation" lights up.
- The installation symbol on the LICCON indicator blinks.

Installation unit (total weight approx. 16.5 t)

Component overview

1 W- pivot section
2 S- end section 100 t
3 WA- bracket I
4 WA- bracket II
5 W- retaining cylinder
6 Mechanical relapse support
7 Guy rod 4.20 m
8 Guy rod 4.73 m
9 Connector bracket 0.32 m
10 Connector bracket 0.30 m
11 Traverse
12 Guy rod 6.99 m
13 Traverse
14 Guy rod 1.38 m
15 Test bracket
16 Spring retainer
17 Pin ∅ 65
18 Retaining cable to prevent the fold section from folding down
19 Pull up the installation cable for WA- bracket II with the auxiliary crane to approx. 45°
20 Pull up the installation cable for WA- bracket II with the hoist cable from approx. 45°
21 Tackle rope for guy rods
22 Lock
23 WA- bracket II relapse support
24 Pin
25 Spring retainer



188560

Pin W - installation unit on S- boom

Take on W- installation unit with the auxiliary crane by the tackle points on the W- pivot section (1) .

Note: The total weight of the installation unit is approx. 16.5 t.

Pin the W- Installation unit on the S- adapter (A) with the pin pulling device, on the top and bottom and secure with spring retainers.

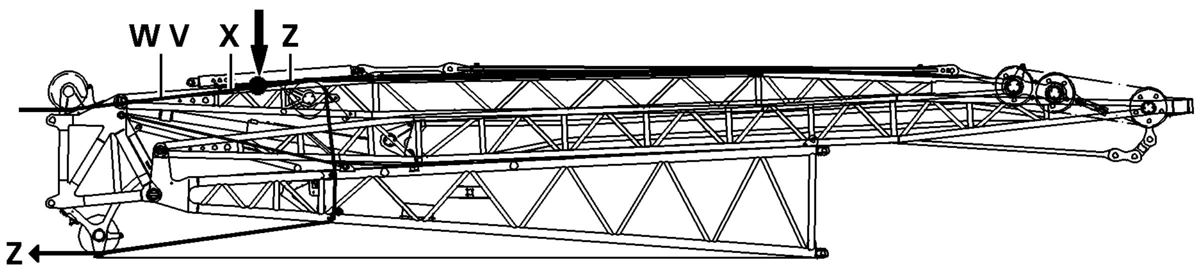
Remove the retaining cable (18).
Lower the installation unit with the auxiliary crane until it lays on the ground.
Support the W- pivot section (1) from below.

D A N G E R: **Before removing the retaining cable, make sure that the installation unit hangs on the auxiliary crane. Otherwise the pivot section will fold down. This can cause a serious accident!**

Unpin the pin (24) on the WA- bracket II relapse support (23). Pull the relapse support apart to the last hole and pin again.

Reeve the W- control cable between the WA- bracket I and II
Pull the auxiliary cable (Z) with the auxiliary winch over the change over pulleys to the slewing platform. Connect the auxiliary cable (Z) with the W- control cable (X) from winch V. Spool up the auxiliary winch and at the same time, spool out winch V and pull the W- control cable (X) to the WA- bracket II - for cable routing, see **Fig.5**.

5



188561

Reeve the W- control cable between the NA- bracket I and II (continuation)

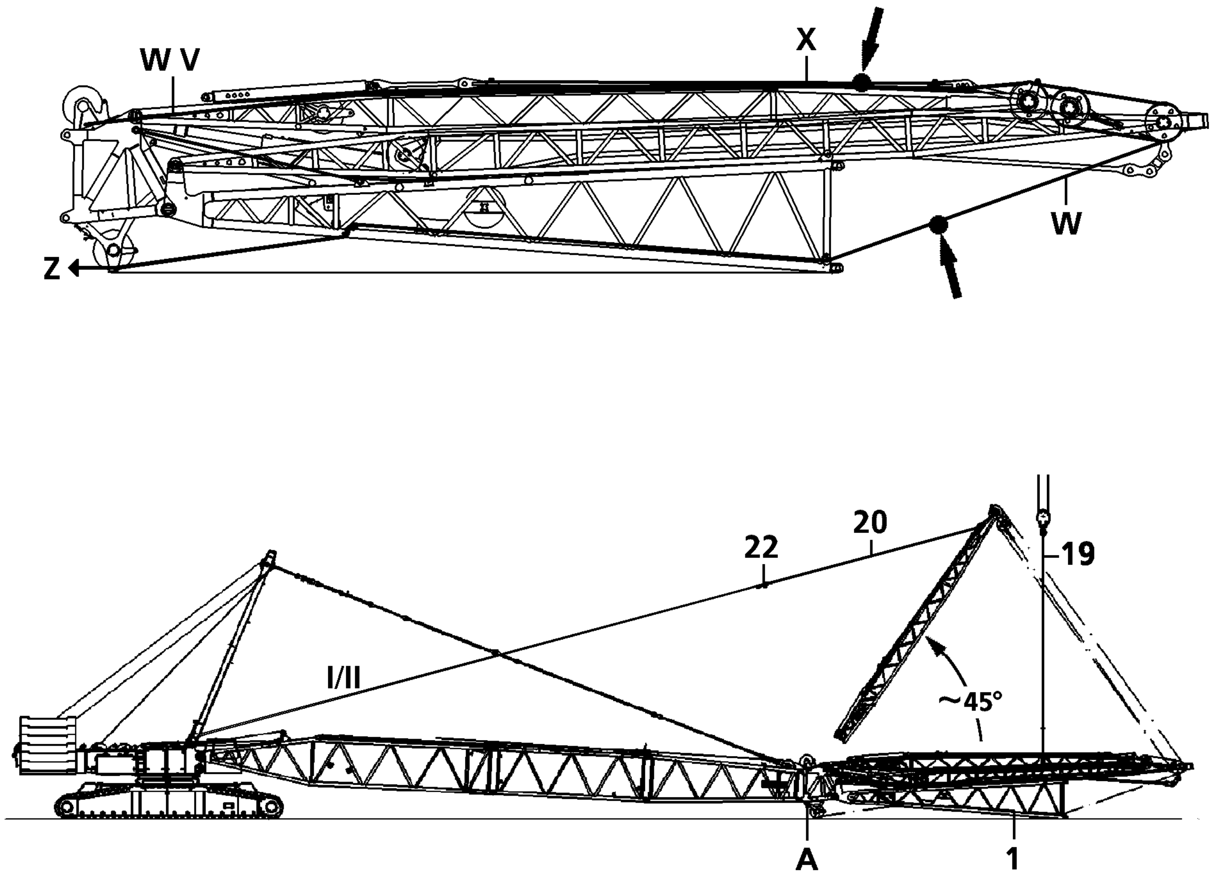
Connect the W- control cable (X) and the auxiliary cable (Z) with the already reeved in reeving cable (W) between WA- I and II - for cable routing, see **Fig.6**.
Spool up the auxiliary winch and at the same time, spool out winch V and reeve in W- control cable (X) between WA- bracket I and II - For reeving, see chapter 4.06.
Attach the auxiliary crane on the installation cable (19) of WA- bracket II and raise it to approx. 45°.

C A U T I O N : The WA- bracket II must be erected to approx. 45° with an auxiliary crane.

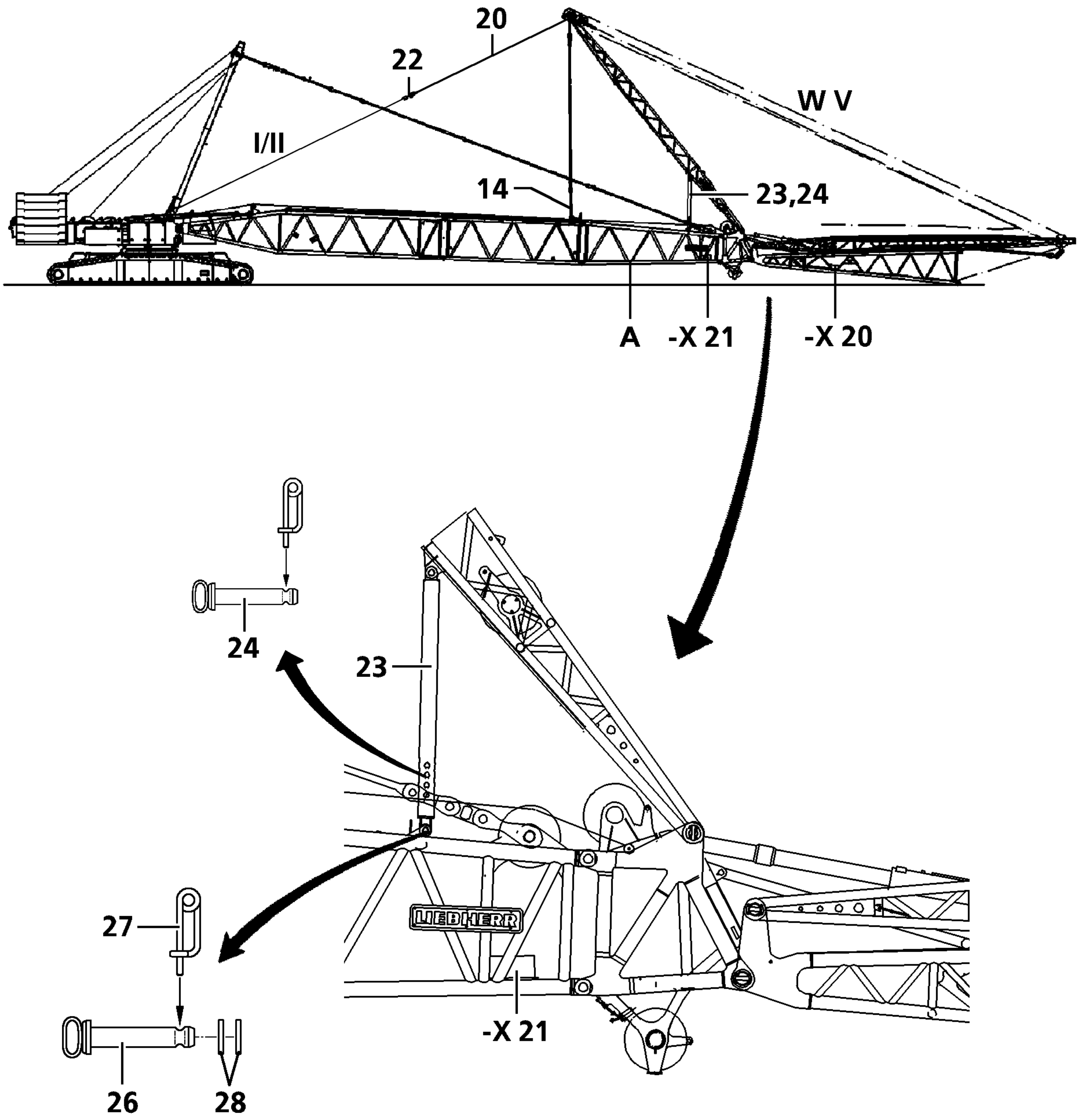
Attach the hoist cable from winch I/II into the box lock (22) on the installation cable (20) .

Note: To prevent the WA- bracket I from pulling up, the control winch (winch V) must be spooled out at the same time.

6



188562



188563

Installation of guy rods from WA- bracket II to the S- pivot section

Establish the electrical connection from the cable drums in the S- pivot section to the connector box (-X21) in the S- adapter .

Insert the cable plug (W 468 and W 611A) on the connector box (-X21) .

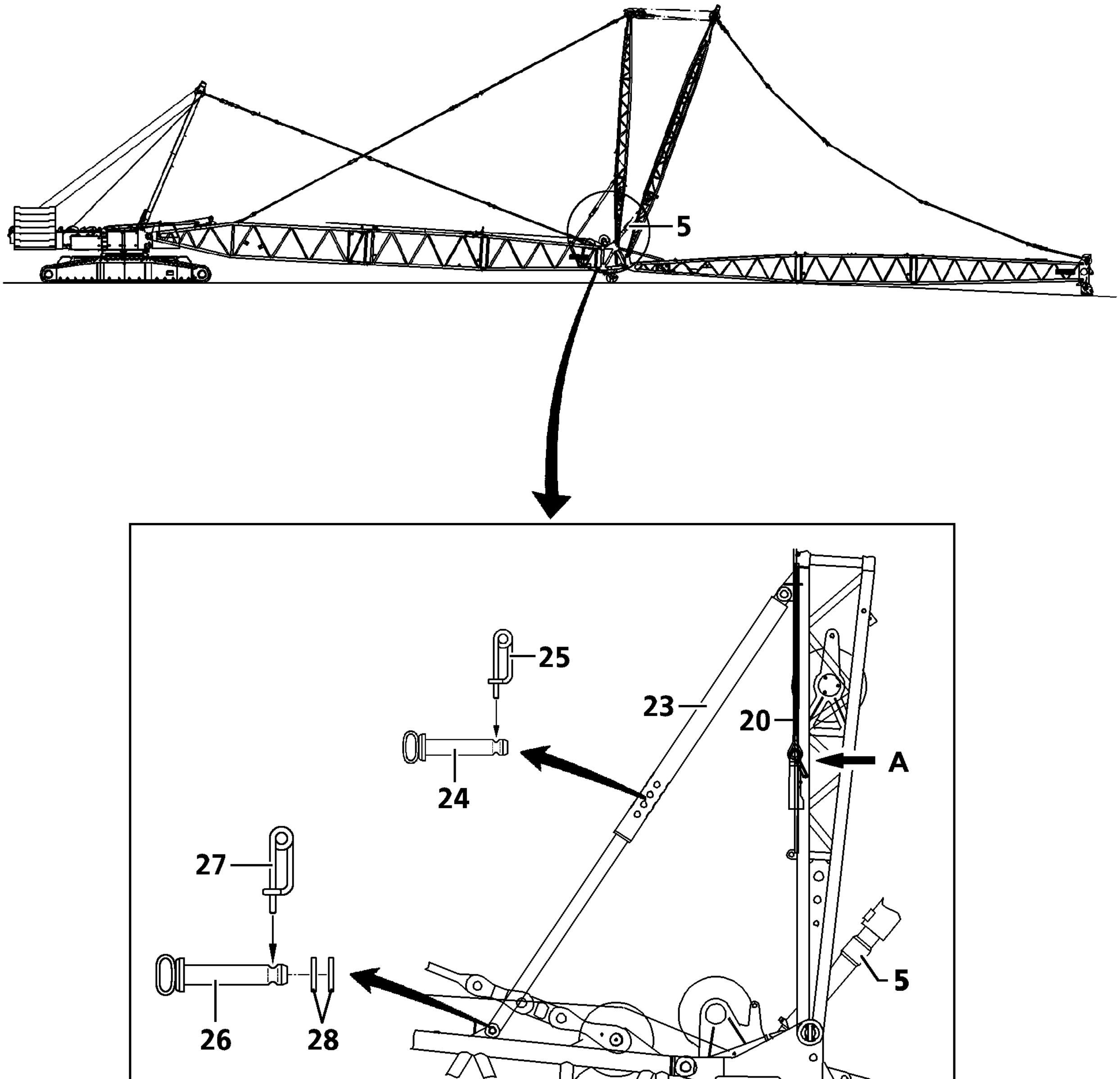
Continue to raise the WA- bracket II from approx. 45° with the auxiliary cable and the installation cable (20) until the mechanical relapse support (23) on the S- adapter (A) can be pinned and secured with pin (26),spring retainer (27) and 2 washers (28) .

Unpin the pin (24) on the mechanical relapse support (23) .

C A U T I O N : **The pin (24) <u>must be unpinned</u> after the relapse support has been pinned on the S- adapter, otherwise the WA- bracket II will be damaged when it is pulled back.**

Spool up the hoist winch, while **spooling out** the W- control winch (winch V) at the same time, and pull the WA- bracket II back until the guy rods (14) from the WA- bracket II can be pinned and secured with the guy rods from the S- pivot section.

C A U T I O N : **The pins on the guy rods must be inserted from the inside and secured on the outside.**


5
25
23
20
A
24
27
5
26
28
188564

Erect the WA- bracket and tension the guy rods from the WA- bracket II to the S- pivot section

Establish the electrical connections to the limit switches on the W- retaining cylinders (5) .
When the guy rods are pinned and secured with each other, the hoist winch must be **spooled out** and the W- control winch (winch V) must be **spooled up** at the same time, until the guying from the WA- bracket II to the S- pivot section is tensioned by the counterpressure of the retaining cylinder (5).

Continue to spool out the hoist winch, disconnect the hoist cable from the box lock and attach the installation cable (20) on the WA- bracket II on (A) .
Release the tackle rope on the guy rods .
Raise the WA- bracket I by spooling up the W- control winch (winch V) until the limit switch is pushed on the W- retaining cylinder (5) .

C A U T I O N: **The electrical connection to the limit switches on the W- retaining cylinder must be established.**
Before erecting, manually actuate the limit switches individually on the retaining cylinder . The W- control winch movement "spool up" must turn off.
The indicator light must light up.
The WA- bracket II may not be pulled back to the mechanical stop on the retaining cylinder, otherwise it can be damaged!

Pin the WA- bracket II relapse support (23) in the maximum possible length on the next hole with pin (24) and secure with spring retainer (25) .

Install the lattice jib
Assemble the lattice jib to the required length , pin and secure.

D A N G E R: **The lower pins on the lattice sections must be inserted from the inside to the outside and must be secured with spring retainers.**
Before removal and installation of the lattice sections, make sure they are supported from below with suitable, stable support materials.
During the pinning and unpinning procedure of the lattice sections, no personnel may remain under the lattice jib.

Install the set up cart on the W- end section .

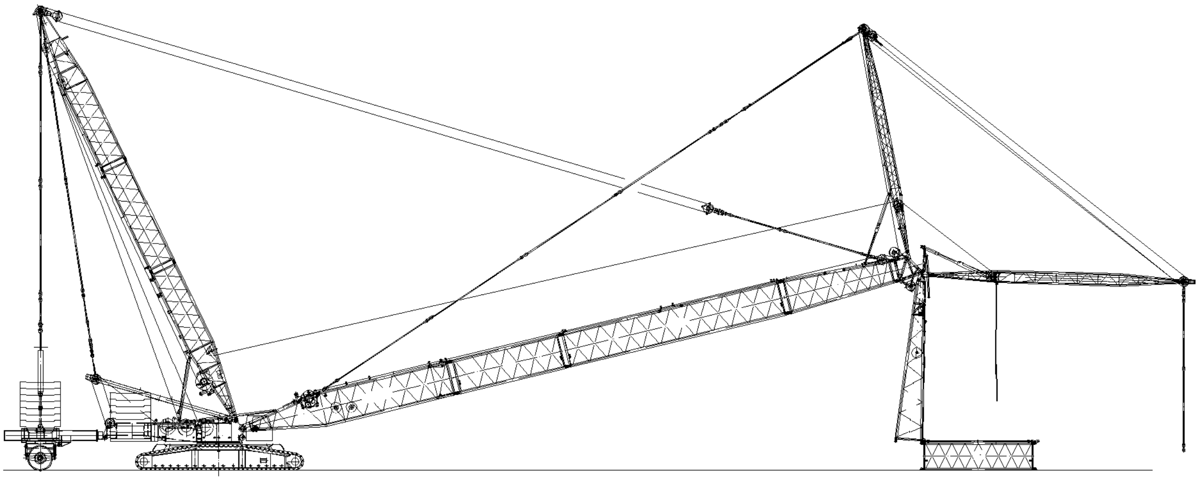
Note: The tire pressure for the set up cart = **9 bar**.

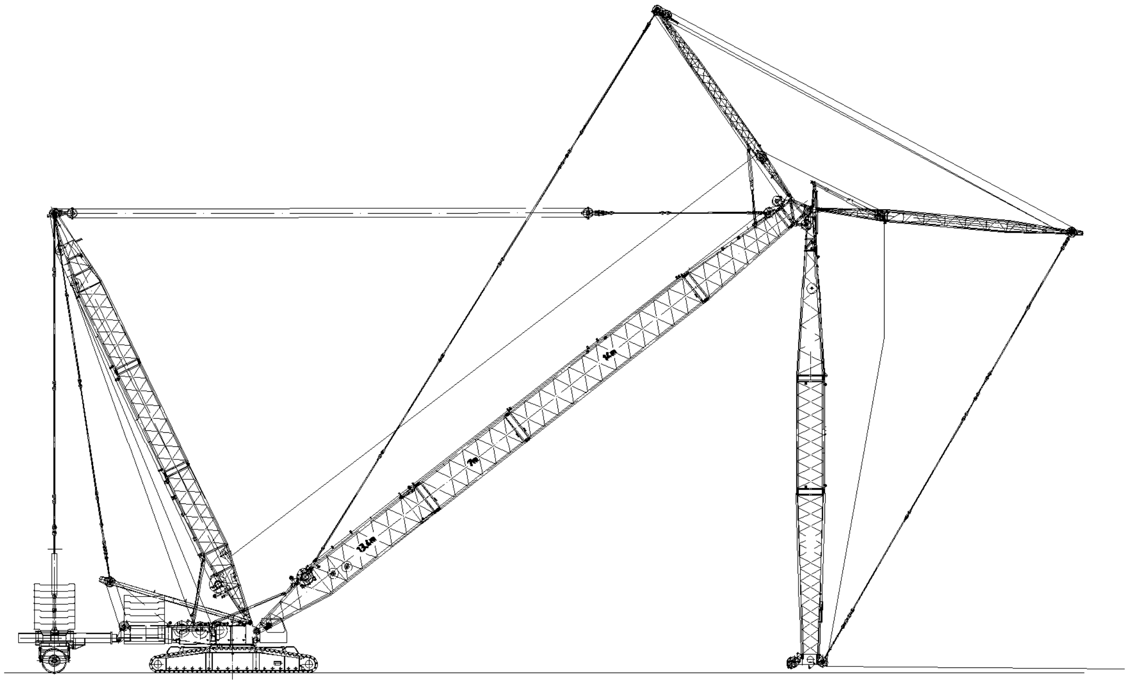
Install the guy rods from the WA- bracket I to the W- end section
Assemble the guy rods according to the lattice jib length, pin and secure.

Note: The guy rods are placed and secured on the intermediate section for transport. For the installation ,the transport retainers must be released.
Pin the guy rods from the end section with the guy rods from the WA- bracket I and secure.
The guy rods must be installed and secured according to the installation drawings in chapter 5.03. Compare the numbers on the installation drawing with the numbers on the guy rod.

D A N G E R: **All pins for the guy rods must be inserted from the left, in relation to the crane.**
If this is not observed, the hoist cable will scrape on the pins or fuses.
The guy rods must be checked regularly, see chapter " Inspection and maintenance of guy rods".

Actuate the W- control winch and tension the guy rods between the WA- bracket I and the W- end section .





195939

Flying instllation of W - lattice jib on W - pivot section

Installation
If the space on the job site is limited for the installation of the W-lattice jib , or if space is restricted due to buildings, etc. then there is the possibility to install the W- lattice jib up to the following maximum length in flying mode:

Flying installation, hanging

S-boom	W-lattice jib
S 42m	W 28m
S 49m	W 35m
S 56m	W 42m
S 63m	W 42m
S 70m	W 49m
S 77m	W 56m
S 84m	W 56m

Prerequisites
- The S-boom is installed to the corresponding length.
- The W- installation unit is installed.
- The WA-brackets I and II are erected.
- The hoist cable is placed and pulled off over the cable pulleys into the WA brackets .
- The electrical cable to the end section must be pulled off the cable drum.

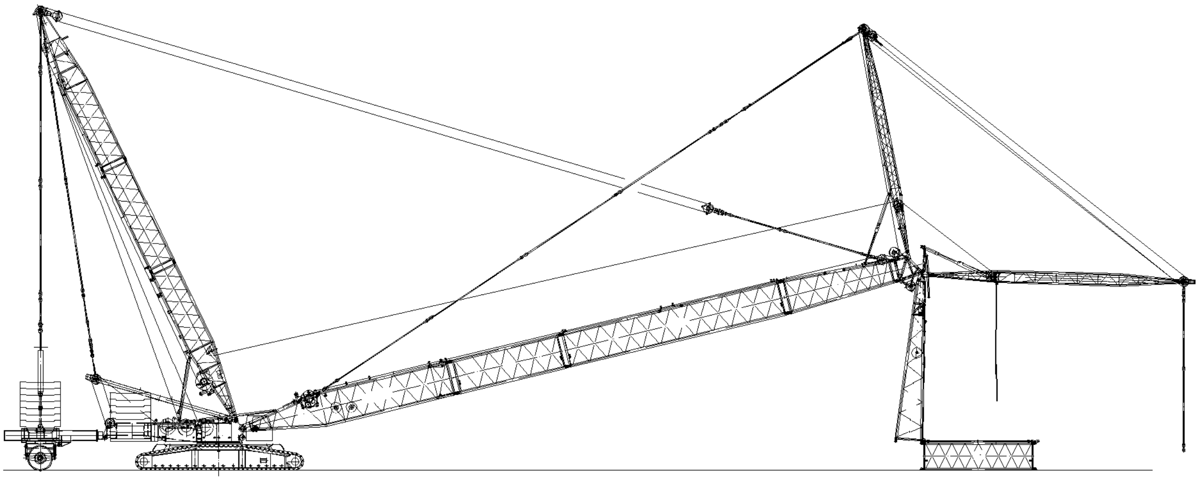
Note: For the weights of the lattice sections with placed guy rods, see chapter 5.03

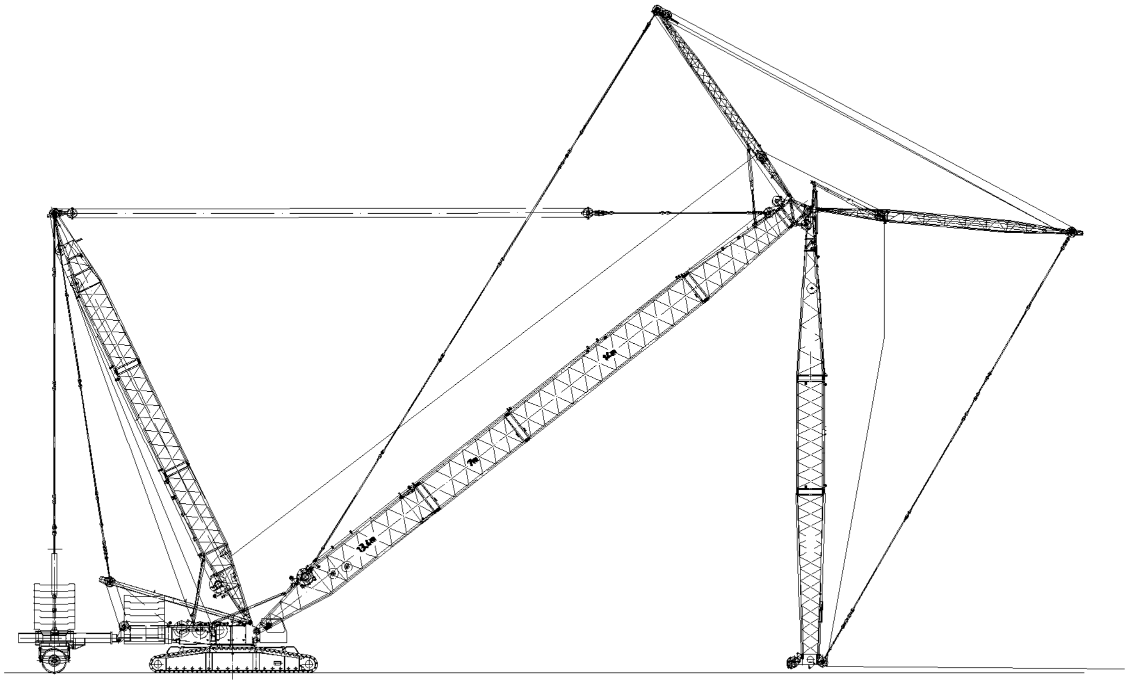
D A N G E R: **Install the slewing platform ballast, the central ballast and the derrick ballast according to the data in the load charts.
Otherwise there is a danger of accidents!**

Hanging installation
Pull up the S-boom until the W-pivot section hangs vertically, or until the angle between the S-broom and the W- pivot section is at least a minimum of 45°.

Note: Guide the W- pivot section along with the auxiliary crane so that it does not scrape on the ground and gets damaged.

Lower the WA-bracket I to the front.
Pin and secure the first intermediate section on the W-pivot section **"on top"** . First, the guy rods on the intermediate section must be removed and pinned and secured on the guy rods from the WA-bracket I .
Pull the electrical cable from the cable drum through the intermediate sections.





195939

Continue to luff up the S-boom

Continue to luff up the S-boom and pin and secure the intermediate section on the W-pivot section **"on the bottom"** .
Install additional intermediate sections and the end section individually continuously to the required length, in the same way.

Note: The guy rods on the intermediate section must be removed and pinned and secured continuously on the guy rods from the WA-bracket I .

Pin and secure the guy rods on the end section .

C A U T I O N: For W - lattice jib length up to 49 m, corresponding, additional guy rods must be installed. See chapter 5.03.

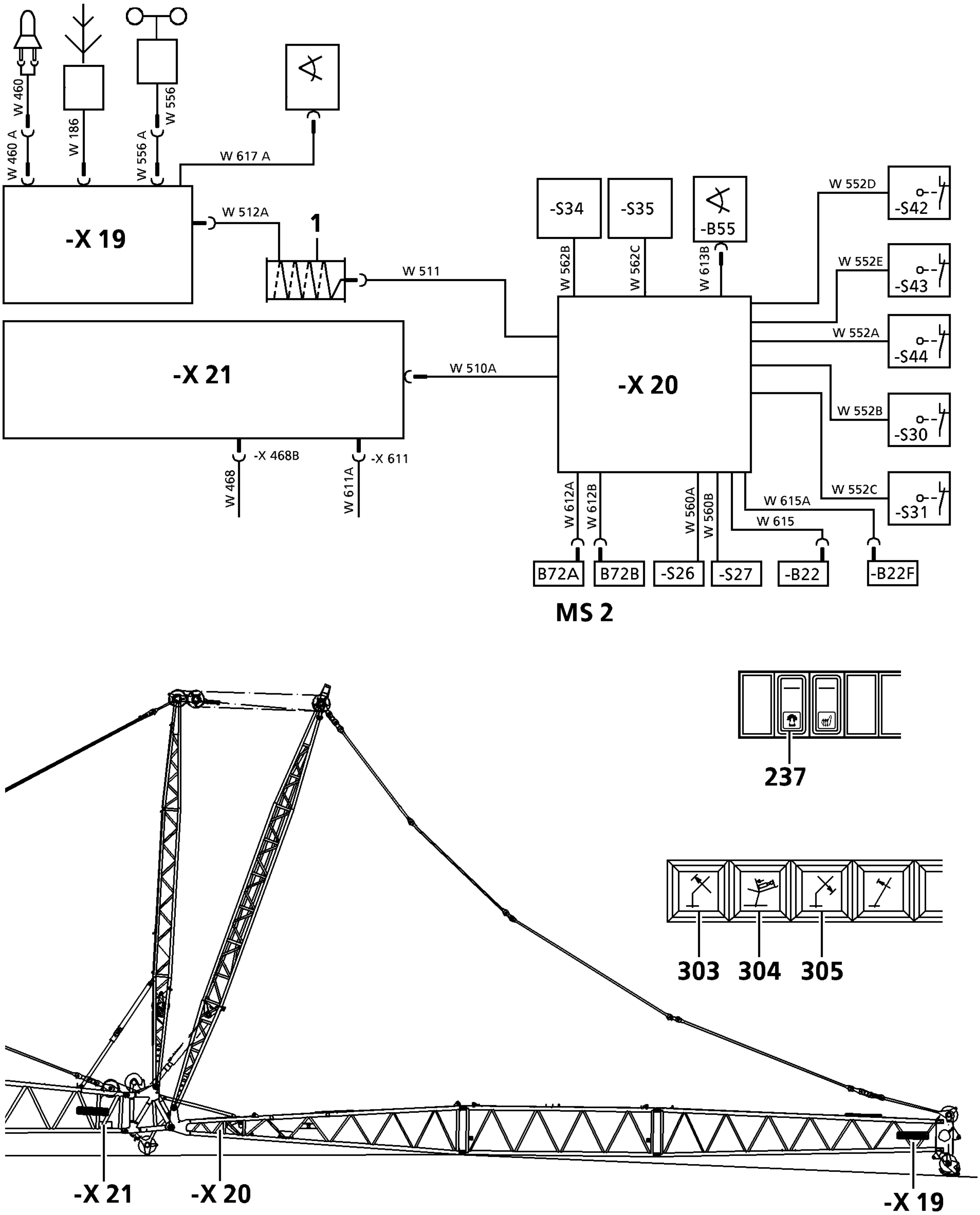
Plug in the electrical cable from the cable drum on the end section.

D A N G E R: No one may remain under the lattice sections during the pinning or unpinning procedure. This is strictly prohibited!
There is a danger of accidents!

D A N G E R: For the flying W - lattice jib installation, observe :

- **the maximum permissible W - lattice jib lengths**
- **the data in the load chart**

If this is not observed, there is a danger of accidents!


W 460
W 460 A
W 186
W 556
W 556 A
W 617 A
W 512A
1
-X 19
W 511
-S34
-S35
-B55
W 562B
W 562C
W 613B
W 552D
-S42
W 552E
-S43
W 552A
-S44
W 552B
-S30
W 552C
-S31
-X 21
W 510A
-X 20
-X 468B
-X 611
W 468
W 611A
W 612A
W 612B
W 560A
W 560B
W 615A
W 615
B72A
B72B
-S26
-S27
-B22
-B22F
MS 2
237
303
304
305
-X 21
-X 20
-X 19

188565

Electrical connections

Establish the electrical connection from the connector boxl (-X20) in the W- pivot section to the connector box (-X21) in the adapter. Insert the cable plug (W 510 A) on the connector box (-X21) .

Establish the electrical connection from the cable drum (1) in the W- pivot section to the connector box (-X19) in the W- end section. Insert the cable plug (W 512 A) on the connector box (-X19) .

Establish the electrical connection from the connector box (-X20) to the cable drum. Insert the cable plug (W 511) into the cable drum socket.

Note: Do not establish the electrical connection from the connector box (-X20) to the cable drum (1) until the cable from the cable drum is spooled out to the connector box (-X19) .

Install the airplane warning light and the wind velocity sensor on the W- end section .

Insert the cable plug (W 556A) for the wind velocity sensor as well as the cable plug (W 460) for the airplane warning light into the socket on the connector box (-X19) .

Function check
Prerequisites:
- All electrical connections have been made.
- The engine is running.
- The actuator levers on the limit switches have been checked for easy movement and have been lubricated.

Airplane warning light
Turn on the airplane warning light with switch (237) , check function visually.

Wind velocity sensor
Check the wind velocity sensor for easy movement and function.

Hoist limit switch
Actuate the limit switch on the pulley head manually.
The hoist winch must turn off in hoist direction.
The hoist "top" symbol on the LICCON indicator must blink.

Limit switch - lattice jib, "steepest " position, relapse cylinder
Manually actuate the limit switches individually on the relapse cylinders. The W- control winch movement **"spool up"** must turn off, the indicator light (304) must light up.

Note: The shift point of the limit switches on the relapse cylinder must be checked before erection - see chapter 8.13, Check the relapse cylinders.

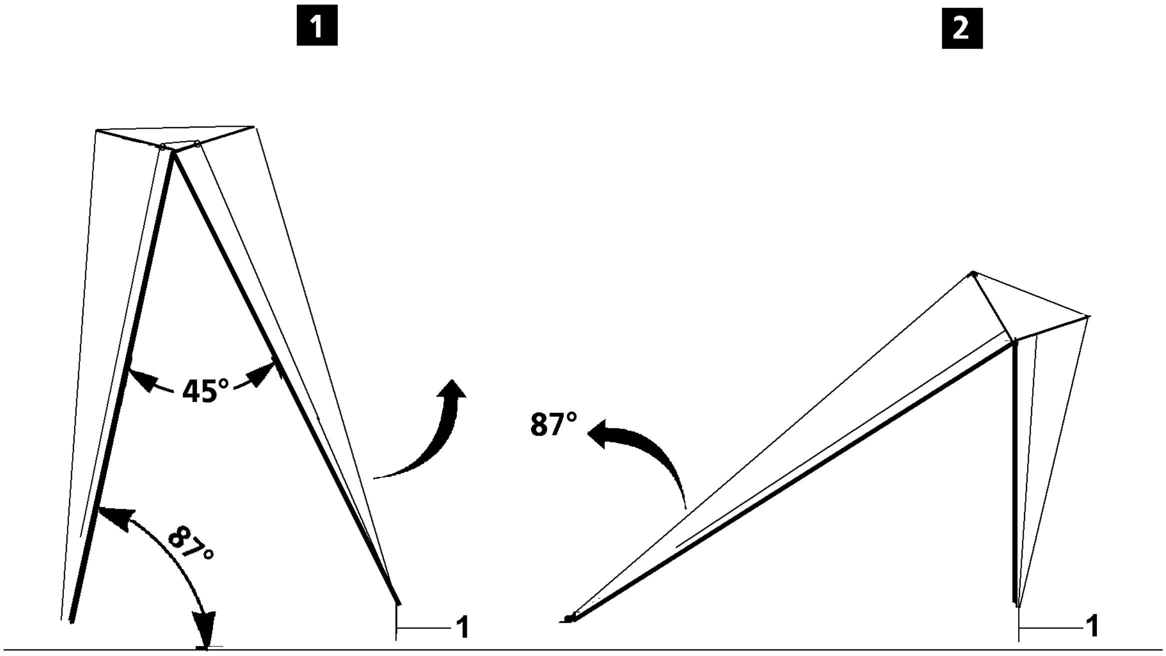
Limit switch - lattice jib, "steepest " position, mechanical relapse support
Manually actuate the limit switches individually. The W- control winch movement **"spool up"** must turn off, the indicator light (303) must light up.

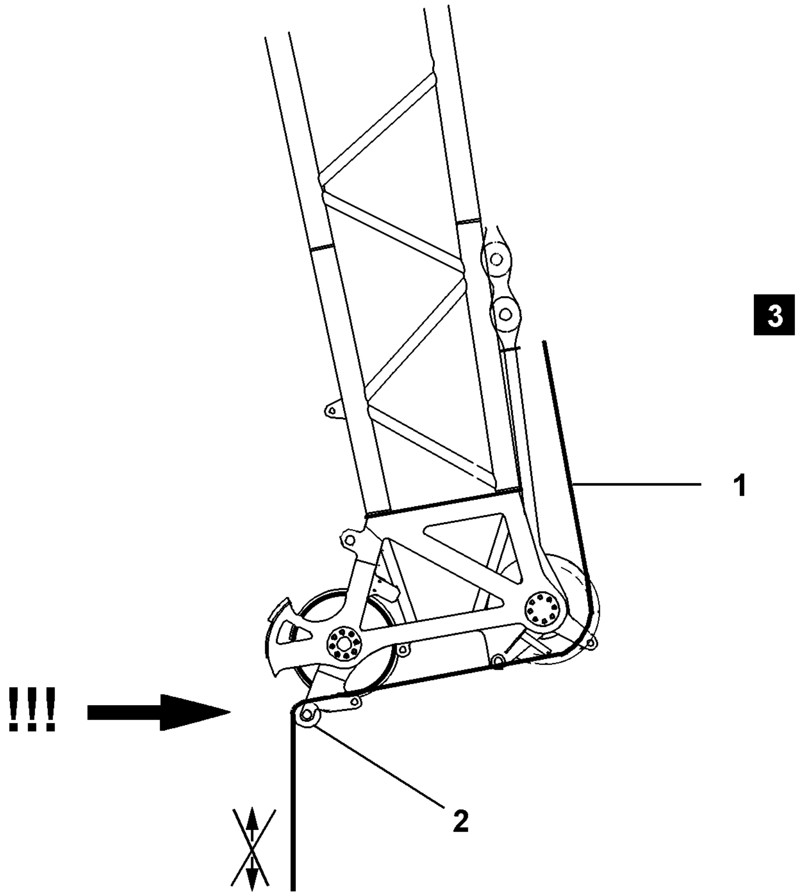
Erection / take down
The boom combinations must be erected or taken down according to the erection and take down charts, Chapter 5.09.

D A N G E R: **The boom combinations must be erected or taken down according to the data given in the erection and take down charts.**
If this is not observed, the crane can be overloaded or tip over.

Prerequisites:
- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform according to the load capacity chart.
- The derrick ballast has been placed according to the erection and take down charts .
- The lattice jib is installed according to the load capacity chart and the operating manual.
- All limit switches are correctly installed and fully functioning.
- Before erection, check the complete swing range of the pendulum of the mechanical relapse support for easy movement .
- All pin connections are secured.
- The hoist cable has been placed correctly into the cable pulleys and has been secured with the cable retaining pins to prevent it from jumping out.
- There are no persons within the danger zone.
- There are no loose parts on the boom and the lattice jib.
- In winter: The boom and the lattice jib and all components (limit switch, cable drum, airplane warning light, wind velocity sensor, etc.) must be free of ice and snow.

D A N G E R: **Incorrectly mounted or non-functioning limit switches as well as falling items (such as pins, spring retainer, ice, etc.) can cause accidents!**
Before erection, check the complete swing range of the pendulum of the mechanical relapse support for easy movement . If this is not observed, the mechanical relapse support does not engage in steep lattice jib position.
This can cause a serious accident as the lattice jib will tip backward!





194218

Erection procedure
Set the LICCON safe load indicator system according to the data given in the load capacity chart.
Actuate the installation keyed switch (389), the indicator light (381) "Installation" lights up.
The installation symbol on the LICCON indicator blinks.
Attach the hoist cable on the end section .

C A U T I O N: **If the hoist cable is not attached, then the hoist cable might fall backward due to its own weight when the boom is erected.**
DO NOT turn during the erection procedure, this is strictly prohibited.

Erection
Actuate the manual control lever and luff up the boom.
At the same time, spool out the lattice jib control winch to hold the lattice jib with the end section on the ground.

D A N G E R : **The lattice jib must roll with all its weight on the ground.**
Lower the lattice jib control in such a way that the guy rods always hang through slightly.
Watch for slack cable formation on the control winch!
If this is not observed, the crane can be overloaded or tip over!

Carry out this procedure until the boom and the lattice jib form an angle of $\geq 45°$ or until the lattice jib has lifted off the ground (fig. 1 + 2).
Remove the set up card on the W- end section.
Now you can luff up the boom and lift the lattice jib off the ground.
Loosen the hoist cable on the end section and reeve in between the pulley head on the end section and the hook block and secure on the fixed point - see reeving plans.
Attach the hoist limit switch weight.

C A U T I O N : **If the hook block is reeved and the hoist cable (1) is routed over the small protective pulleys (2) , then the hoist gear may no longer be moved , spooled up or spooled out (fig. 3) !**
If this is not observed, the hoist cable (1) will be damaged.

Luff up the boom to the steepest position of 87° .
Luff up the lattice jib to operating position.

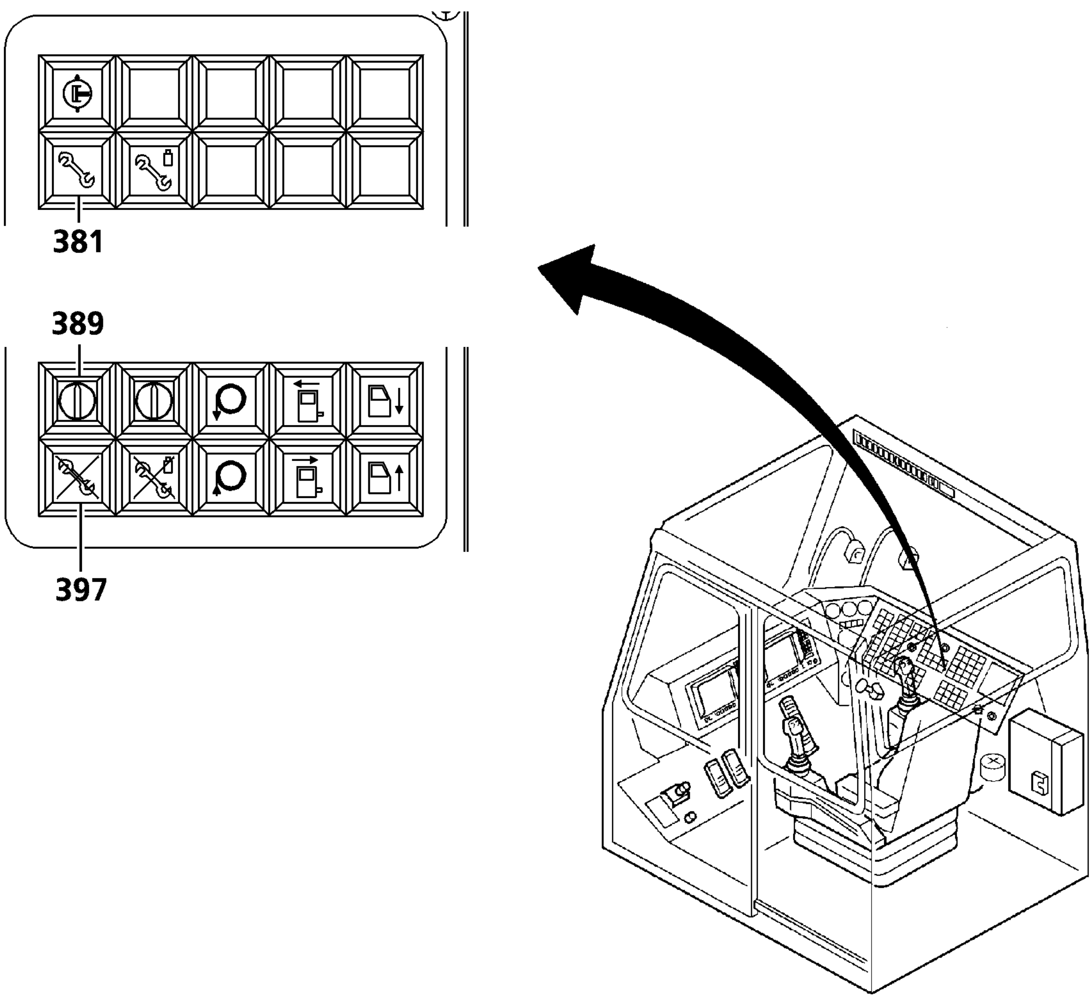
Indication in OPERATING VIEW during the erection procedure
The following alarm functions are actuated (blink) during the erection procedure, until the operating position is reached:

- "ERROR" 150
- "STOP"
- "HORN" + Acoustical signal

Note: The operating position is reached when the indicators turn off and a load indication - t - appears in the symbol "MAX. LOAD" instead of question marks (???) .

Turn off the installation keyed switch (389) by pressing the button (397) . The indicator light (381) and the installation symbol on the LICCON indicator turn off.

D A N G E R: **After reaching the operating position, the installation keyed switch must be turned off immediately.**
The installation keyed switch bypasses safety devices!
The radii given in the load capacity chart may not be exceeded nor fallen below, even without a load on the hook!
If this is not observed, the crane can tip over!


381
389
397
186927

Crane operation SW/SDW/SDWBW - boom system

C A U T I O N: Observe the instructions given in chapter 4.05 " CRANE OPERATION " and chapter 4.08 "WORKING WITH A LOAD " .

Prerequisites:

- The LICCON safe load indicator system is set according to the data given in the load capacity chart.
- The installation keyed switch (389) is turned off by pressing the button (397). The indicator light (381) and the installation symbol on the LICCON indicator turns off.

D A N G E R: Check the position of the crane before and during operation to ensure that it is still in horizontal position.
Even if the crane operator leaves the crane cab only for a short period of time, before starting to work again he is obligated to check the operating mode settings and to reset them, if necessary.

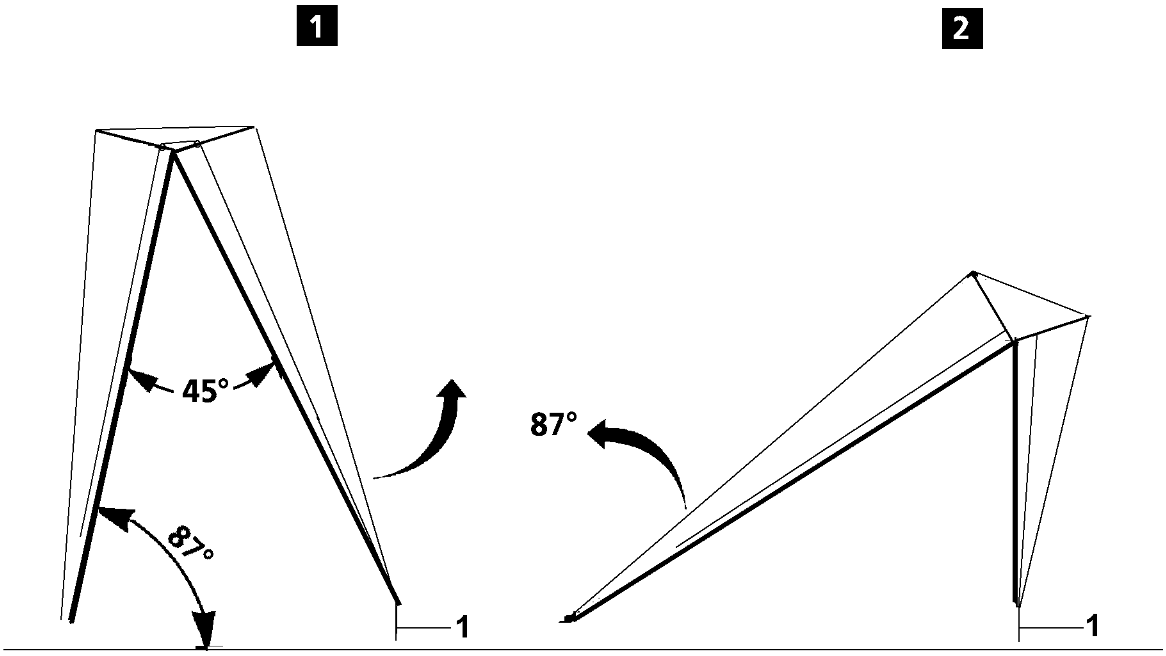
Adjustments / checks

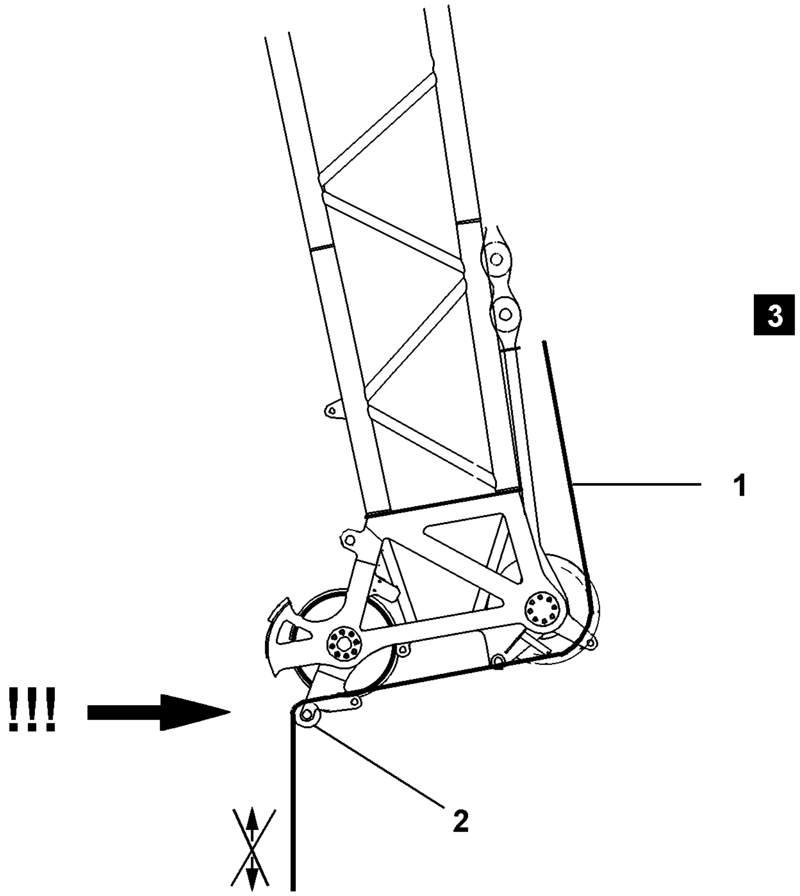
Check the function of the safe load indicator system by running against "top" and "bottom" controls.
Check the function of the hoist limit switch "top" by running against the hoist limit switch weight.
Check the function of the limit switch "Lattice jib steep" by running against the relapse safety.

Set the boom to 67° or 77°

Before changing the boom to 67° or 77° , the boom must be erected into the steepest position of **87°** and the lattice jib must also be in its steepest operating position.

D A N G E R: When changing to 67° or in SDWB operation, a suspended ballast might be required already, even without a load on the hook.





194218

Take down procedure
The boom remains in its steepest position, at 87°.
Set the hook block approx. 5 m under the pulley head of the lattice jib.

Actuate the manual control lever and luff down the lattice jib to its **lowest** operating position.

Note: When the **lowest** operating position is reached, the luffing down movement shuts off.

C A U T I O N: When luffing down, spool out the hoist winch at the same time to prevent the hook block from colliding with the pulley head.

Actuate the installation keyed switch (389), the indicator light (381) ”Installation” lights up. The installation symbol on the LICCON indicator blinks.

D A N G E R: The safe load indicator is no longer effective.
The limit switch hoist ”top” is bypassed!

Continue to luff down the lattice jib until an angle of approx. 45° is reached between the boom and the lattice jib. The shut off occurs via the limit switch ”Lattice jib - bottom”, the indicator light lights up.

Luff down the boom and place the hook block on the ground.

C A U T I O N : If the hook block is reeved and the hoist cable (1) is routed over the small protective pulleys (2) , then the hoist gear may no longer be moved , spooled up or spooled out (fig. 3) !
If this is not observed, the hoist cable (1) will be damaged.

Remove the hoist limit switch weight.
Unreeve the hook block.

C A U T I O N: The hook block may not be pulled along the ground.

D A N G E R : When unreeving the hoist cable, make sure that no persons are in the danger zone.

Luff down the boom until the end section of the lattice jib can be installed on the set up cart.

Note: If the lattice jib touches the set up cart vertically, then the lattice jib guying must be tensioned a little so that the set up cart can roll forward with the lattice jib .

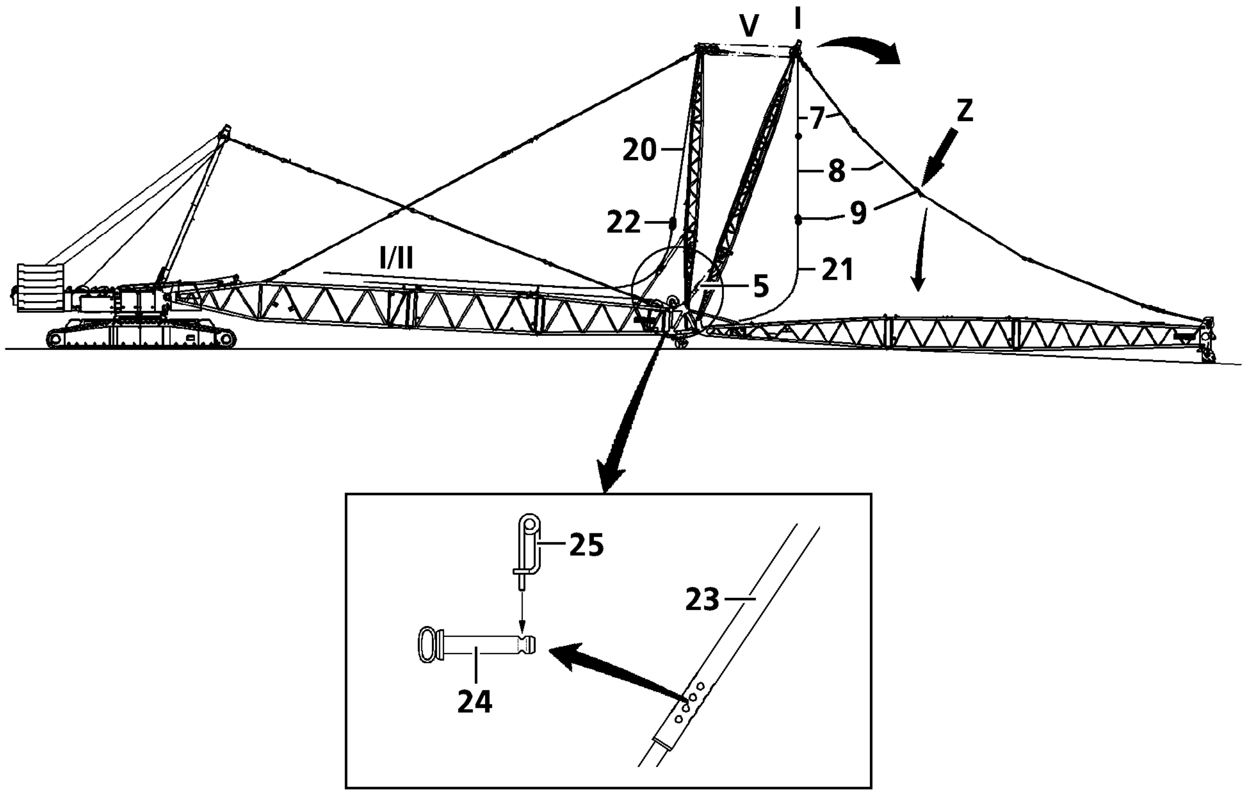
Continue to luff down the boom, while the lattice jib rolls on the ground.

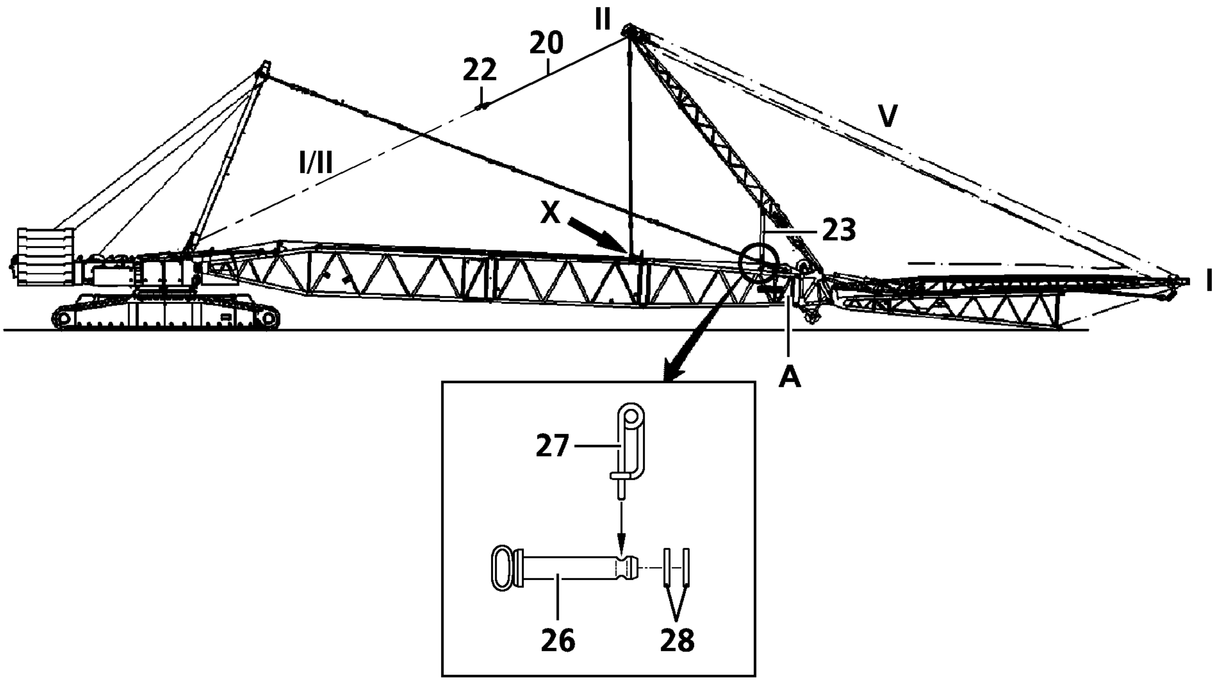
C A U T I O N: Spool out the hoist cable at the same time to prevent it from tightening, which would damage it.

D A N G E R: During the take down procedure, the guy rods must always hang through slightly.
The lattice jib must roll on the ground with all its weight.

Remove the hoist cable.

D A N G E R: When removing the hoist cable, make sure that no persons are in the danger zone!





188566

Unpin the guy rods and place down the WA- bracket I + II

Spool back the hoist cable via the cable pulleys in the WA- brackets to the S- adapter .

D A N G E R: **Secure the hoist cable with the auxiliary rope and lower it slowly via the cable pulleys to the rear to the adapter .**
Make sure that no persons are within the danger zone. This could cause a serious accident!

Spool out the W- control winch (V),lower the WA- bracket I to the front. Unpin (Z) the guy rods on the connector brackets (9) .
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.
Remove the lattice jib.
Unpin the pin between the pivot section and the intermediate section.

D A N G E R: **Before unpinning,make sure that the pivot section is held by an auxiliary crane or that it is supported with suitable, stable support material.**
During pinning and unpinning of the lattice sections, no personnel may remain under the lattice jib !
If this is not observed, there is a danger of having a serious accident as the lattice jib might suddenly fold down.

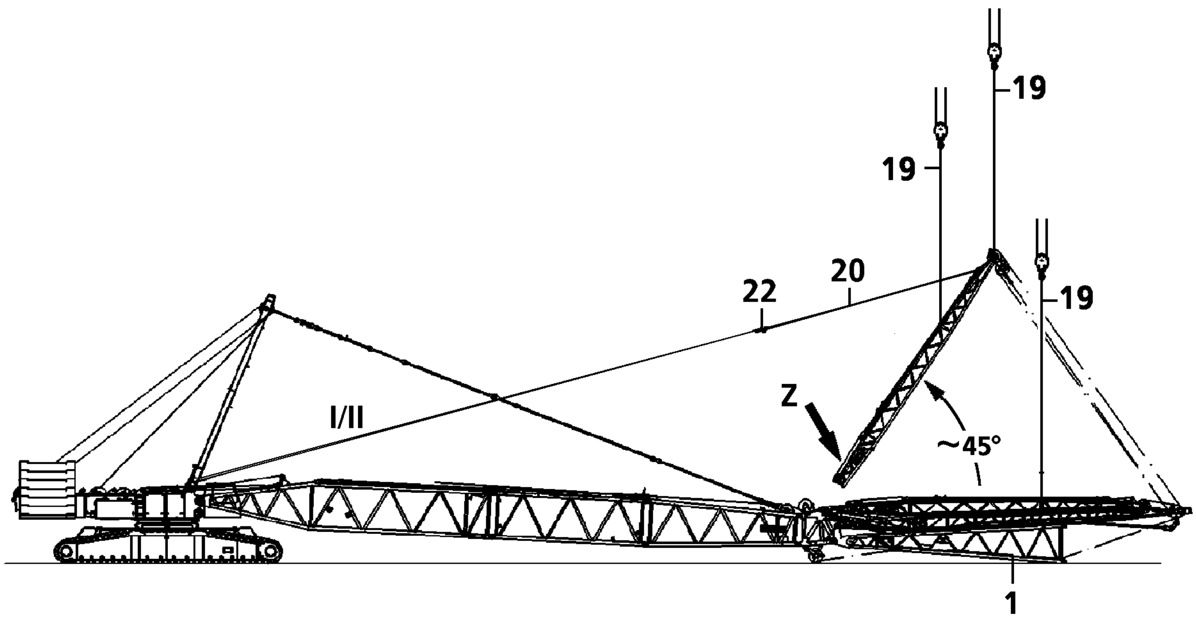
Remove the installation cable (20) on the WA- bracket II and attach hoist cable from winch I/II in the box lock (22) .
Spool up the W- control winch (V) and pull up the WA- bracket I until the guying from the WA- bracket II to the S- pivot section is tensioned due to the counterpressure of the retaining cylinder (5). This allows for the relapse support (23) to be unpinned, remove the spring retainer (25) and pin (24) .

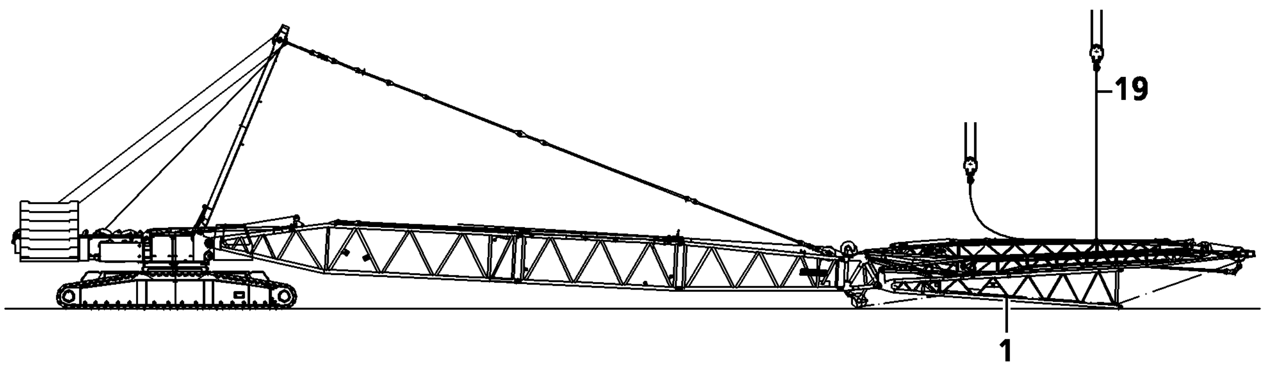
C A U T I O N: **When pulling up, the limit switch on the W- retaining cylinder (5) can be actuated and shut off the spool up function of winch V, which prevents pulling to block.**
The electrical connection to the limit switches on the W- retaining cylinder must be established.

Lower the WA- bracket I until it rests on the pivot section .
Pull the WA- bracket II to the rear by spooling up the hoist winch and simultaneously spooling out the W- control winch (winch V) and unpin the guy rods from the WA- bracket II to the S- pivot section on (X).
Place the guy rods on the lattice sections and secure.

C A U T I O N: **The pin (24) must be unpinned, otherwise it will be damaged when the WA- b racket II is being pulled back.**

Pull up the WA- bracket II, to vertical position by spooling out the hoist winch and by simultaneously spooling in the W- control winch (winch V).
Unpin the WA- relapse support (23) on the S- adapter (A). Remove pin (26), spring retainers (27) and washers (28) .





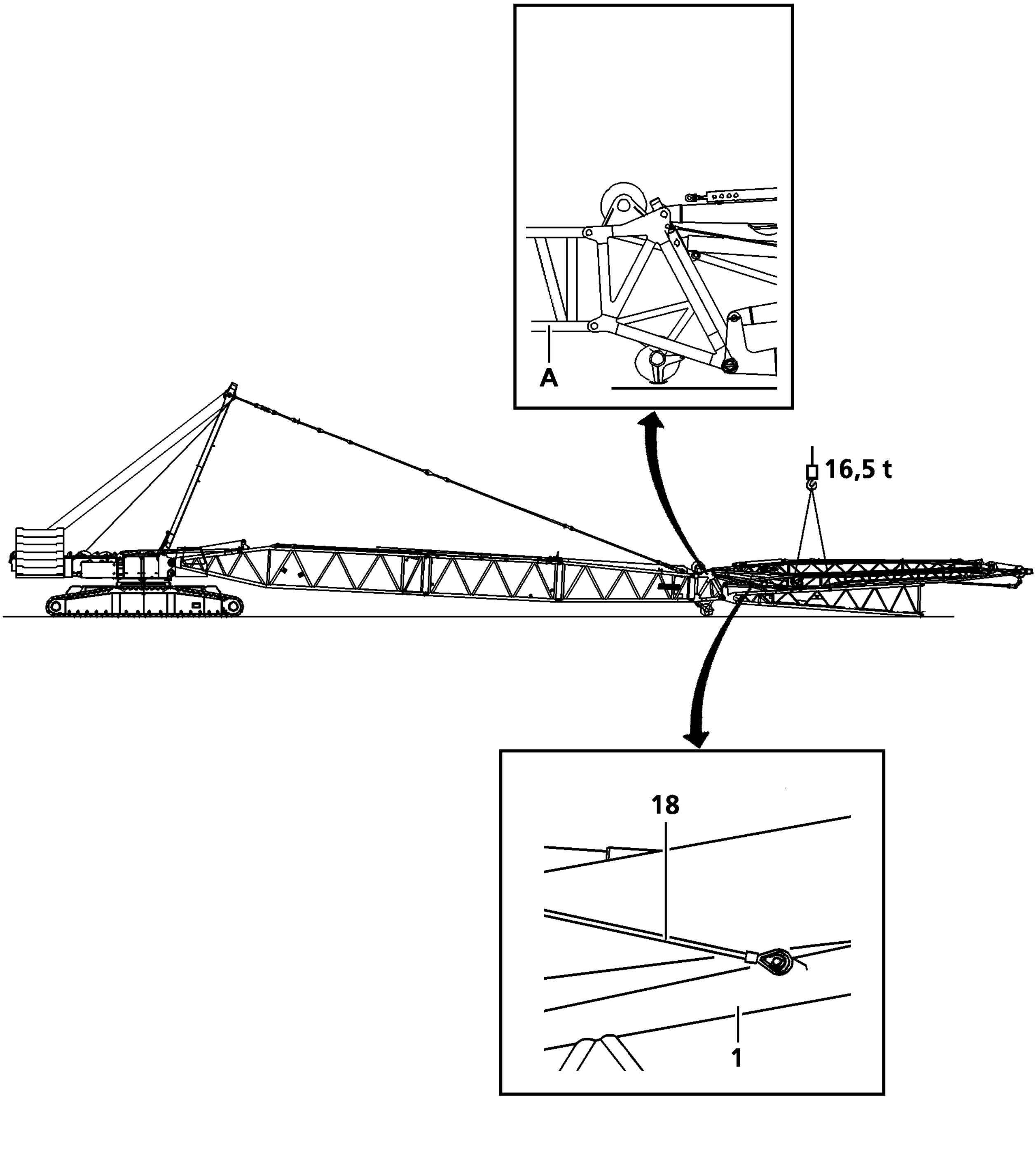
188567

Place down the WA- bracket II

Attach the auxiliary crane with installation cable (19) on the WA- bracket II.
Pull the WA- bracket II forward by spooling up winch V and by simultaneously spooling out the hoist winch, until approx. 45° to the horizontal.

D A N G E R: From approx. 45° to the horizontal to the front, the WA- bracket II must be held with the auxiliary crane - installation cable (19) - and lowered with it further.
Otherwise the WA- bracket II folds down.
This could cause a serious accident!

Lower the WA- bracket II until it rests on the WA- bracket I .
Disengage the hoist cable from the box lock (22) of the installation cable (20) and attach the installation cable on the WA- bracket II on (Z) .
Remove the installation cable (19) from the auxiliary crane and attach on the WA- bracket II .
Unreeve the control cable and reeve in the auxiliary rope for reeving at the same time.



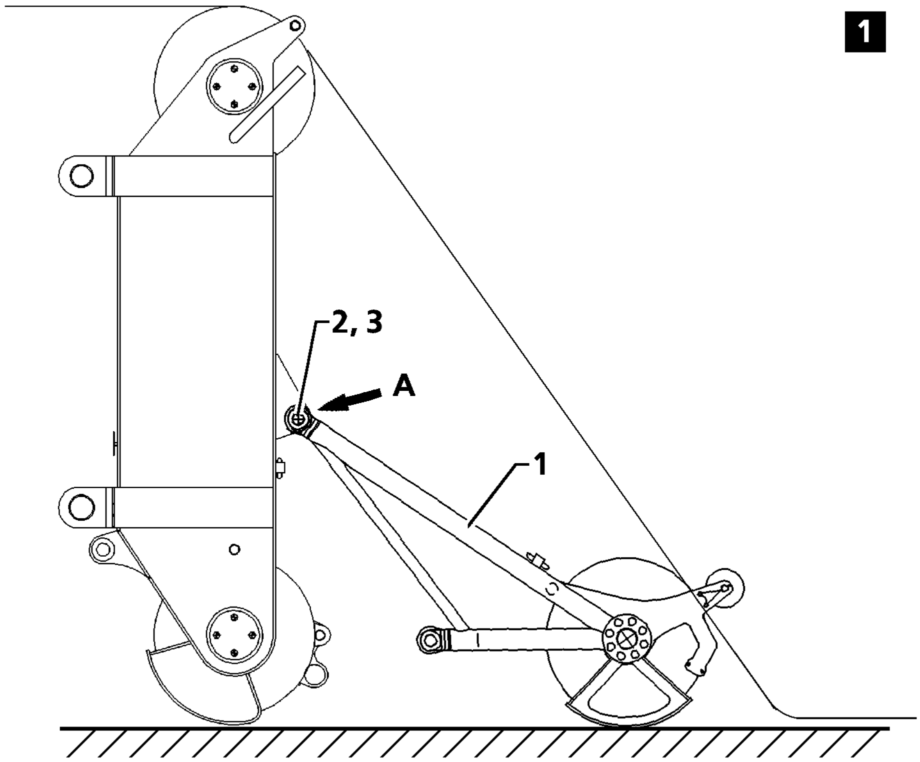
188568

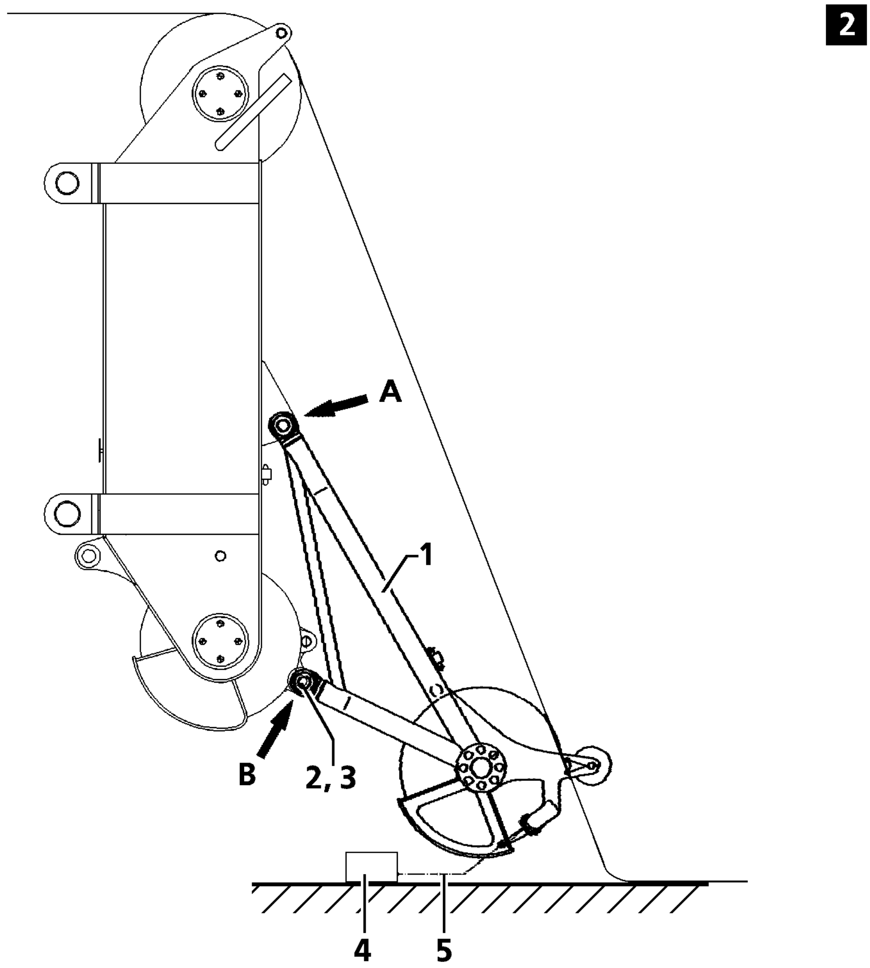
Unpin the installation unit on the S- boom
Unpin and secure the retaining cable (18) on the W- pivot section .
Take on the W- installation unit with the auxiliary crane on the tackle points on the W- pivot section .

Note: The total weight of the installation unit is approx. 16.5 t.

Unpin the W- installation unit on the S- adapter (A) with the pin pulling device on top and bottom.

D A N G E R: **Before unpinning the installation unit, it must be held with the auxiliary crane and pinned and secured with the retaining cable (18) on the pivot section .**
Otherwise an accident can occur, the fold section with the WA- bracket I + II can move away when unpinning it on the adapter.
No personnel may remain under the installation unit, this is strictly prohibited!
There is a great danger of having an accident.





186759

Assembly of the boom nose on L - head piece

Components

1	boom nose	weight appr. 0,3 t
2	pin	rd 45×210 mm
3	safety spring	rd 4,5 mm
4	weight for hoisting limit switch	
5	chain	

Fig. 1 = Assembly
Fig. 2 = Operation

Assembly of the boom nose to L-head piece

Boom head is resting on the ground.

Hang on boom nose (1) to an auxiliary crane and pin it to the boom head **"above"** (A) and secure. Use pin (2) and secure with safety spring (3).

Put down boom nose to the ground. Release auxiliary crane.

Pull hoisting cable via center pulley on L-boom head to pulley on boom nose (1).

Luff boom until the boom nose can be pinned to the boom head**"below"** (B). Use pin (2) and secure with safety spring (3).

**C A U T I O N: Do not luff boom down again.
If this is not assured, the boom nose can be damaged due to the weight of the boom.**

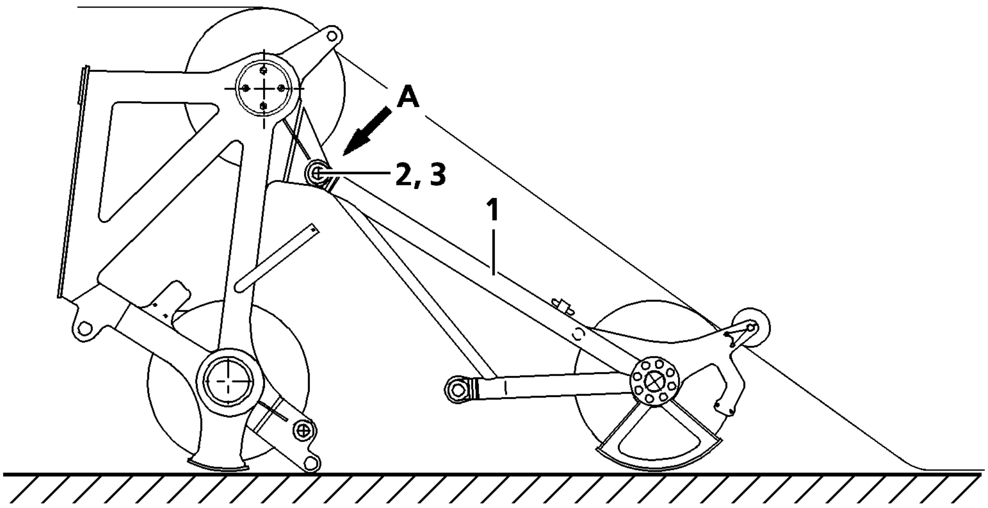
Attach chain (5) and weight for hoisting limit switch (4).

C A U T I O N: Watch the routing of the hoisting cables on L-head during erection, to assure they don't catch on the boom nose.

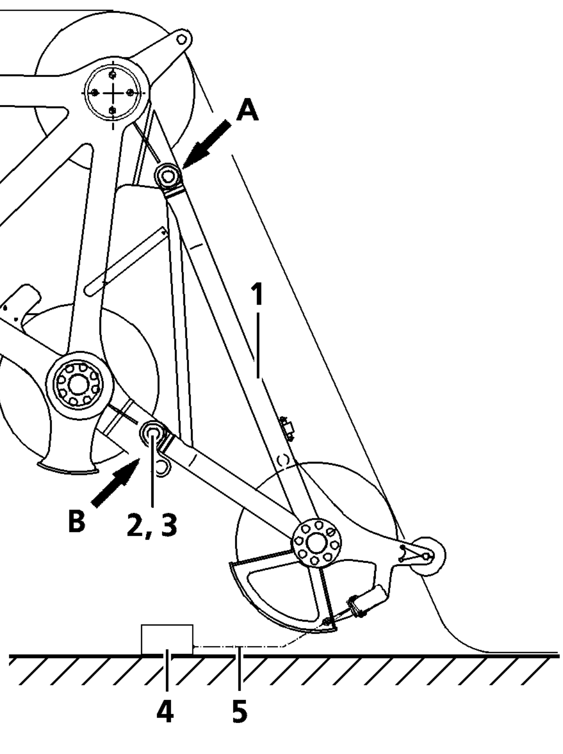
Disassembly
Remove boom nose in reverse order of assembly.

**C A U T I O N: Before the boom nose tip touches the ground, the pin (2) on the L-head "bottom" (B) must be unpinned.
If this is not assured, the boom nose can be damaged due to the weight of the boom.**

1



2



186760

Assembly of the boom nose on N - head piece (LL-boom)

Note: In this operating mode, N-head piece is used as head piece on the LL-boom.

Boom head is resting on the ground.

Hang on boom nose (1) to an auxiliary crane and pin it to the boom head **"above"** (A) and secure. Use pin (2) and secure with safety spring (3).

Put down boom nose to the ground. Release auxiliary crane.

Pull hoisting cable via center pulley on N - head to pulley on boom nose (1).

Luff boom until the boom nose can be pinned to the boom head**"below"** (B). Use pin (2) and secure with safety spring (3).

C A U T I O N: **Do not luff boom down again!**
If this is not assured, the boom nose can be damaged due to the weight of the boom.

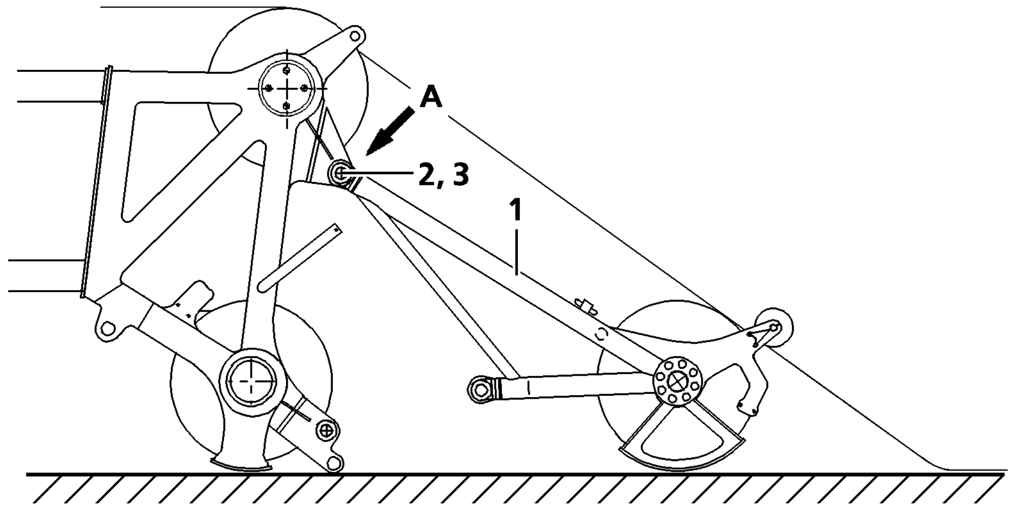
Attach chain (5) and weight for hoisting limit switch (4).

C A U T I O N: **Watch the routing of the hoisting cables on L-head during erection, to assure they don'̂t catch on the boom nose.**

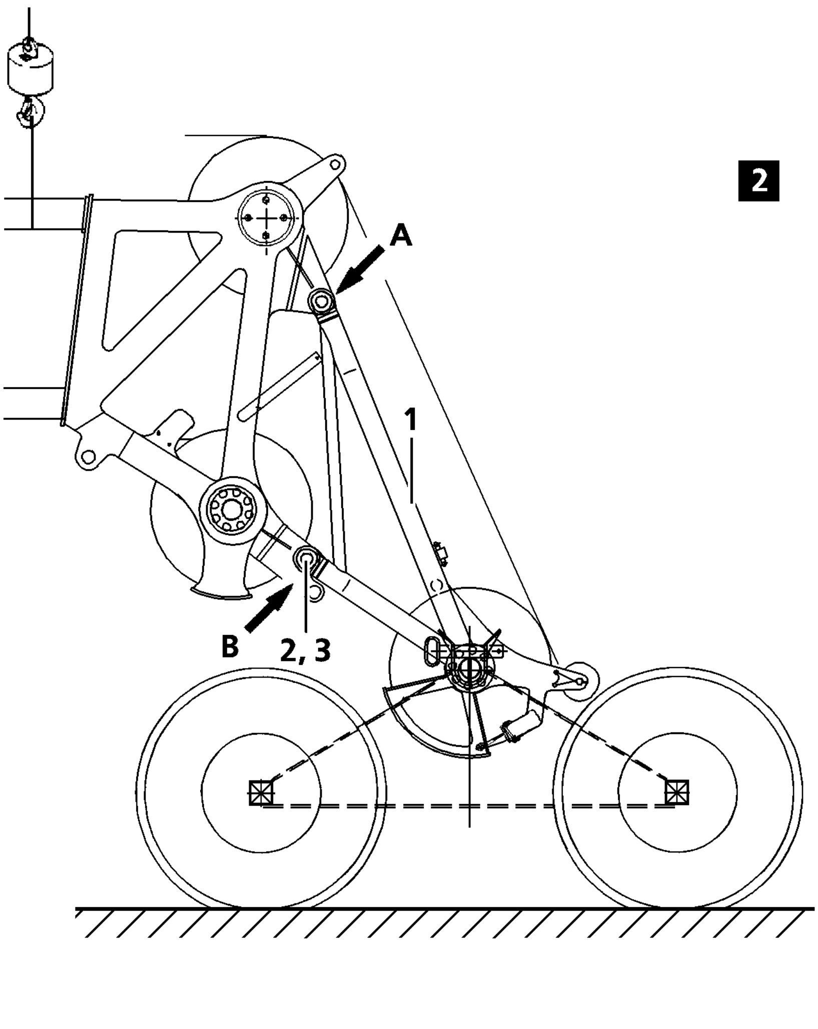
Disassembly
Remove boom nose in reverse order of assembly.

C A U T I O N: **Before the boom nose tip touches the ground, the pin (2) on the L-head "bottom" (B) must be unpinned.**
If this is not assured, the boom nose can be damaged due to the weight of the boom.

1



2



186761

Assembly of the boom nose on N - head piece (N-lattice fly jib)

N - head is resting on the ground.

Hang on boom nose to an auxiliary crane and pin it to the N - head **"above"** (A) and secure. Use pin (2) and secure with safety spring (3).

Put down boom nose to the ground. Release auxiliary crane.

Raise N - head piece with an auxiliary crane and pin the boom nose to the N - head (B) and secure.Use pin (2) and secure with safety spring (3).

Raise N - head piece with mounted boom nose further with an auxiliary crane, place the roller truck beneath the boom nose and support on it.

The hoist limit switch on the boom nose must be connected.

Attach chain (5) and weight for hoisting limit switch (4).

C A U T I O N: **Watch the routing of the hoisting cables on L-head during erection, to assure they don't̂ catch on the boom nose.**

Note: Raising and lowering refer to chapter 5.06, LN-Boom combination and chapter 5.09, Raising and lowering charts.

Disassembly
Remove boom nose in reverse order of assembly.

Operating with the boom nose on the L resp. N boom head

Description
This capability has been provided for quick hoisting with winch V at L, LL, and winch II at LN-mode. Therby, the hook block can remain reeved on the L resp. N-boom head.

Select operating mode
Set the LICCON safe load indicator system according to the load charts.

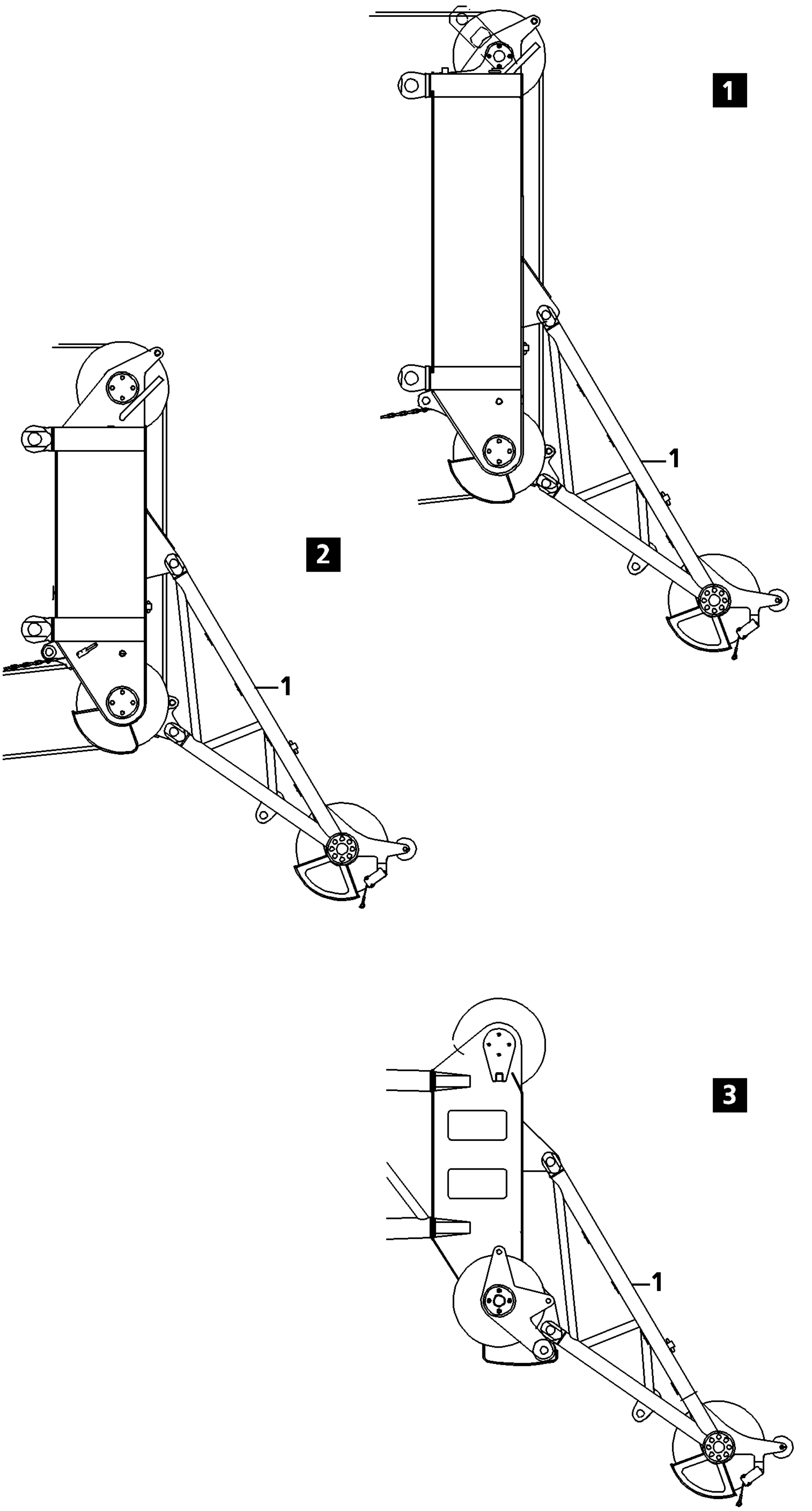
Note: Guide of the hoisting rope and reeving on the boom nose see chapter 4.06, rope reeving.

C A U T I O N: **There are no extra charts available for L, LL and LN operation with installed boom nose, because the cable pulley on the boom nose and the cable pulley on the L or N-head are located close together.**
The L, LL and LN charts are valid, however, the load carrying capacity is reduced by the weight of the boom nose, as well as the hoisting and take up tackle, which is used.

Check to make sure the hoist limit switch is functioning properly by running up the hoist limit switch weight.

Operation
When working with the boom nose, the following must be observed.

D A N G E R : **In this case, simultaneous operation with the hookblock on L resp. N - head and hookblock on the boom nose is prohibited.**
The hoist limit switch must be connected to the boom nose.
It is forbidden hoisting a load from the ground by luffing up the boom.
Load must be hoisted from the ground with hoisting gear.



187873

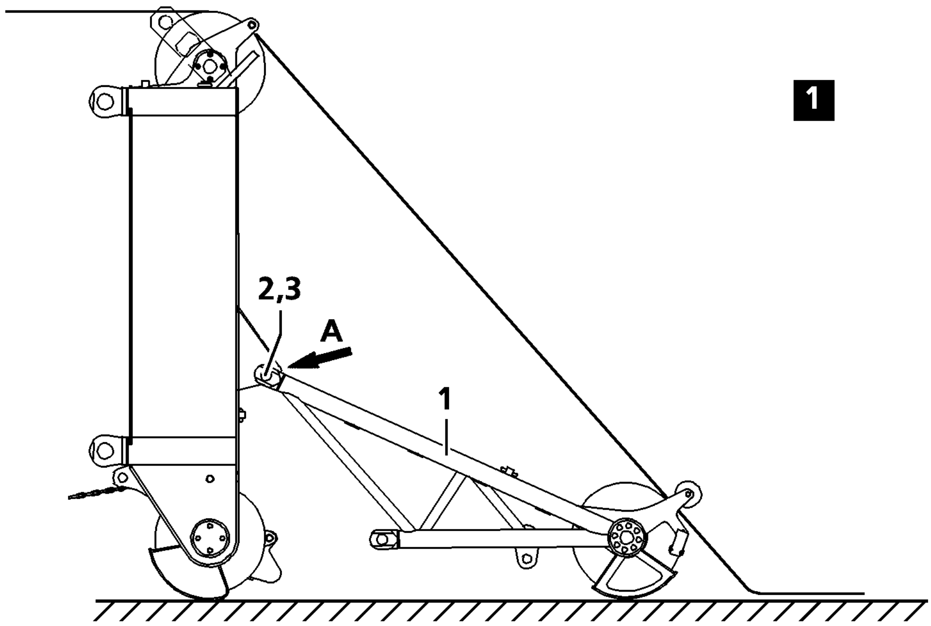
Assembly boom nose

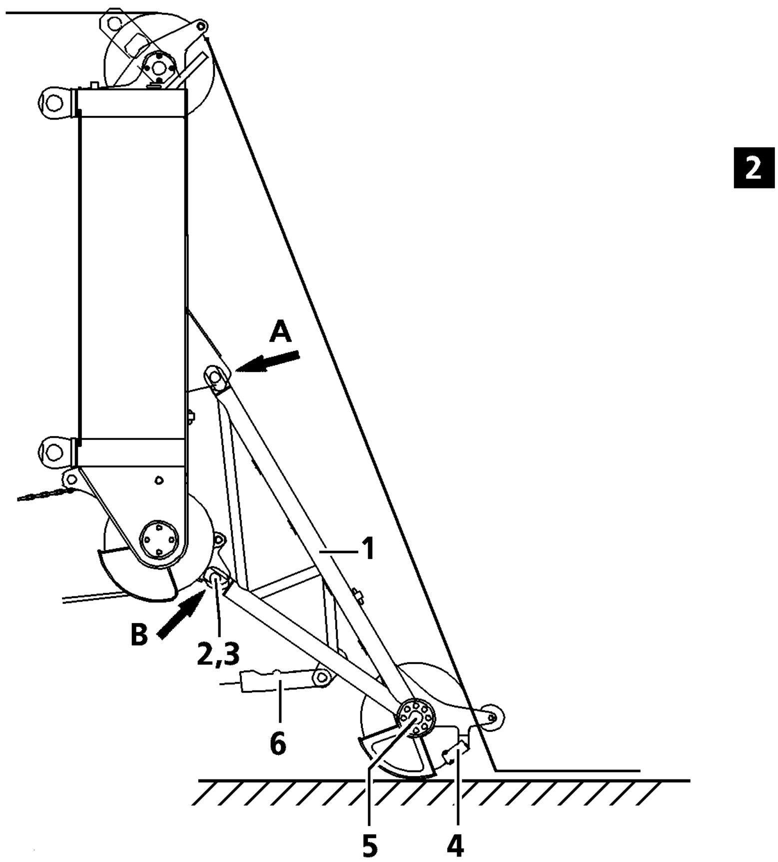
The boom nose (1) can be mounted on the following head pieces .

Fig. 1 **S -head**

Fig. 2 **L (W) -head**

Fig. 3 **N -head**





187874

Assembly of the boom nose on L / S - head piece

Components

1	boom nose	weight appr. 0,45 t
2	pin	rd 55×250 mm
3	safety spring	rd 4,5 mm
4	hoisting limit switch	
5	axle for roller truck	
6	hoisting cable fix point	

Fig. 1 = Assembling position
Fig. 2 = Operating position

Assembly

Boom head is resting on the ground.

Hang on boom nose (1) to an auxiliary crane and pin it to the boom head **"above"** (A) and secure. Use pin (2) and secure with safety spring (3).

Put down boom nose to the ground. Release auxiliary crane.

Pull hoisting cable via center pulley on boom head to pulley on boom nose (1).

Luff boom until the boom nose can be pinned to the boom head**"below"** (B). Use pin (2) and secure with safety spring (3).

C A U T I O N: **Do not luff boom down again.**
If this is not assured, the boom nose can be damaged due to the weight of the boom.

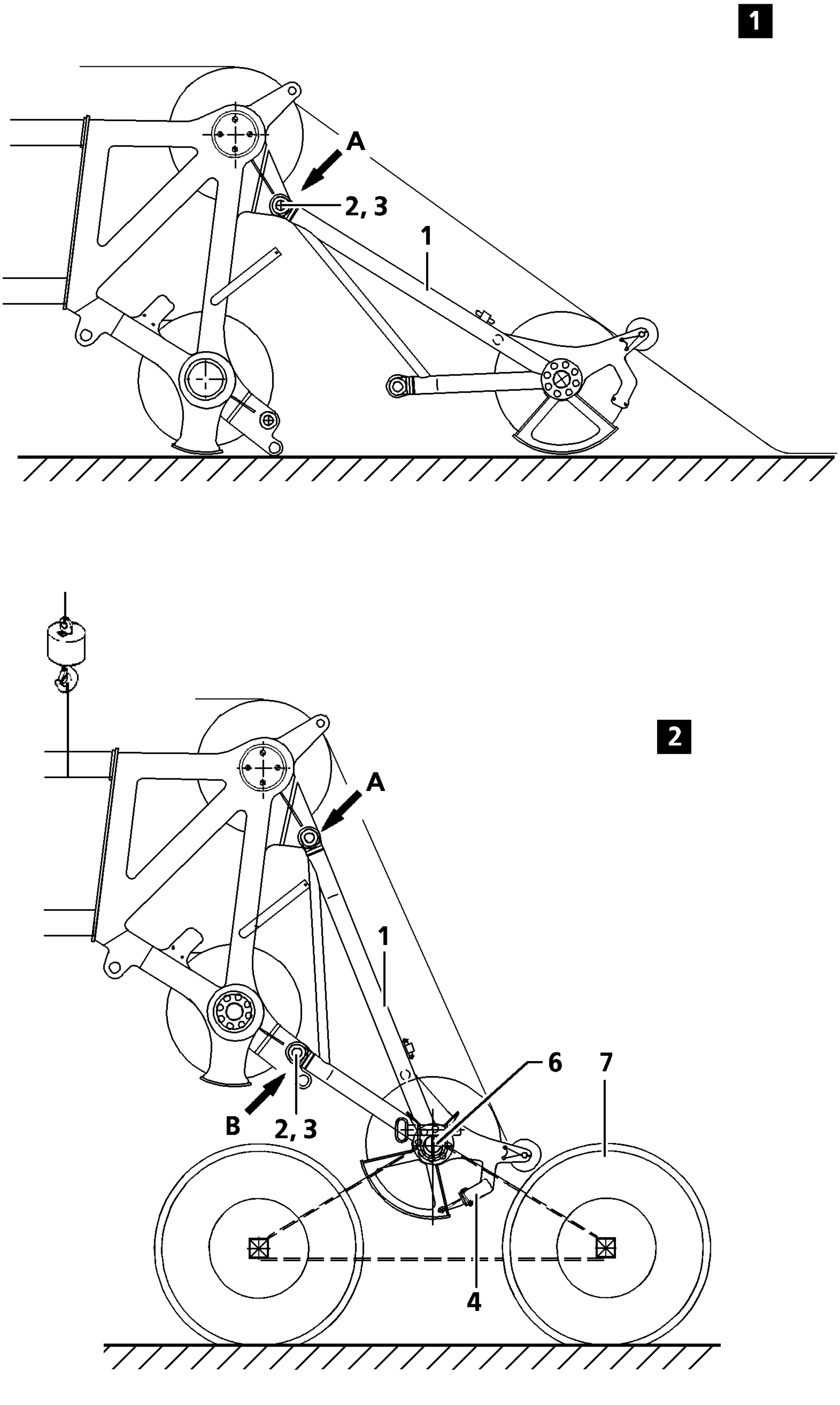
Connect hoisting limit switch (4).

C A U T I O N: **Watch the routing of the hoisting cables on boomhead during erection, to assure they don't catch on the boom nose.**

Disassembly

Remove boom nose in reverse order of assembly.

C A U T I O N: **Before the boom nose tip touches the ground, the pin (2) on the boomhead "bottom" (B) must be unpinned.**
If this is not assured, the boom nose can be damaged due to the weight of the boom.



187875

Assembly of the boom nose on N resp.W - head piece (N resp. W-lattice fly jib)

N/W - head is resting on the ground.

Hang on boom nose to an auxiliary crane and pin it to the jib head **"above"** (A) and secure. Use pin (2) and secure with safety spring (3).

Put down boom nose to the ground. Release auxiliary crane.

Raise jib head piece with an auxiliary crane and pin the boom nose to the jib head (B) and secure.Use pin (2) and secure with safety spring (3).

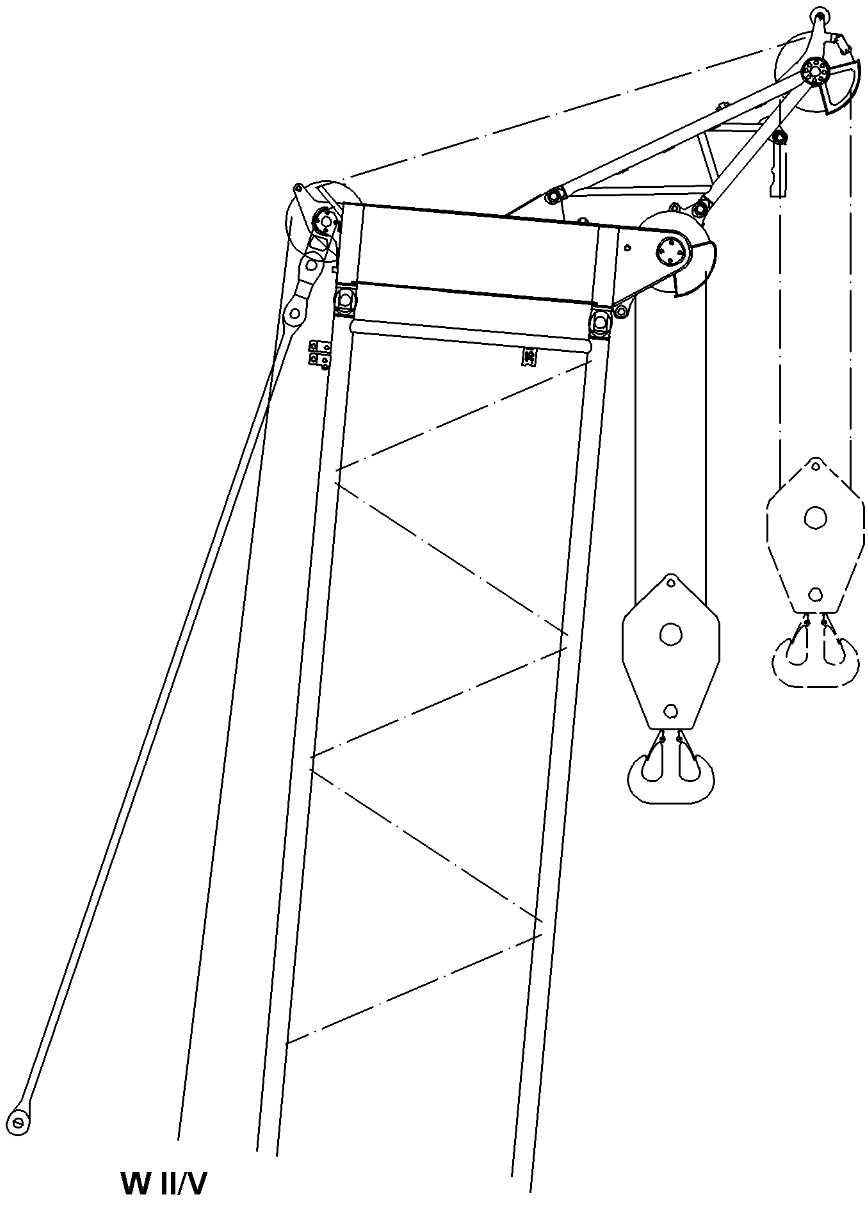
Raise jib head piece with mounted boom nose further with an auxiliary crane, place the roller truck beneath the boom nose and support on it.

Connect hoist limit switch.

C A U T I O N: **Watch the routing of the hoisting cables on jib head during erection, to assure they don't catch on the boom nose.**

Note: Raising and lowering refer to chapter 5.06, LN/SW-Boom combination and chapter 5.09, Raising and lowering charts.

Disassembly
Remove boom nose in reverse order of assembly.



187876

Operating with the boom nose

Description
This capability has been provided for quick hoisting with winch V at L, S, and winch II at LN, SW-mode. Therby, the hook block can remain reeved on the boom head.

Select operating mode
Set the LICCON safe load indicator system according to the load charts.

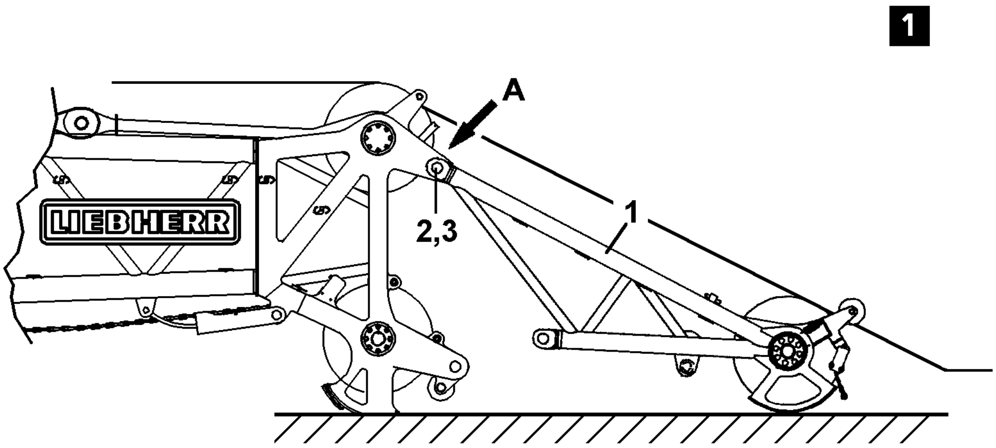
Note: Guide of the hoisting rope and reeving on the boom nose see chapter 4.06, rope reeving.

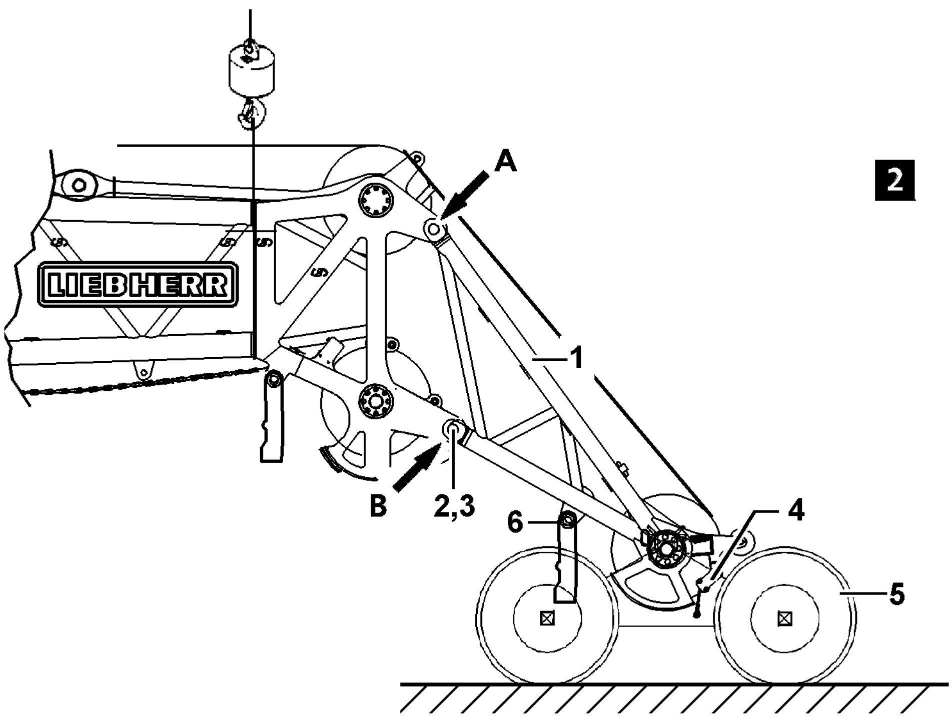
C A U T I O N: Max. 3-time reeving is permissible, otherwise the boom nose will be overloaded!

Check to make sure the hoist limit switch is functioning properly by running up the hoist limit switch weight.

Operation
When working with the boom nose, the following must be observed.

D A N G E R : In this case, simultaneous operation with the hookblock on boom head and hookblock on the boom nose is prohibited.
The hoist limit switch must be connected to the boom nose.
It is forbidden hoisting a load from the ground by luffing up the boom.
Load must be hoisted from the ground with hoisting gear.





190023

Installation of boom nose on N- end section

Components

1	Boom nose	ca. 0,54 t
2	Pin	∅ 60×260 mm
3	Spring retainer	∅ 5 mm
4	Hoist limit switch	
5	Set up cart	
6	Cable fixed point (cable lock)	

Fig. 1 = Installation position
Fig. 2 = Operating position

Installation of boom nose on N - end section (N - lattice jib)

The N - end section is laying on the ground.

Attache the boom nose (1) on the auxiliary crane and pin on the end section **"on top"** (A) and secure. Use pin (2) and spring retainer (3) .

Place the boom nose on the ground and remove the auxiliary crane .

Lift the end section with the auxiliary crane and pin the boom nose on the end section **"on the bottom"** (B) and secure. Use pin (2) and spring retainer (3) .

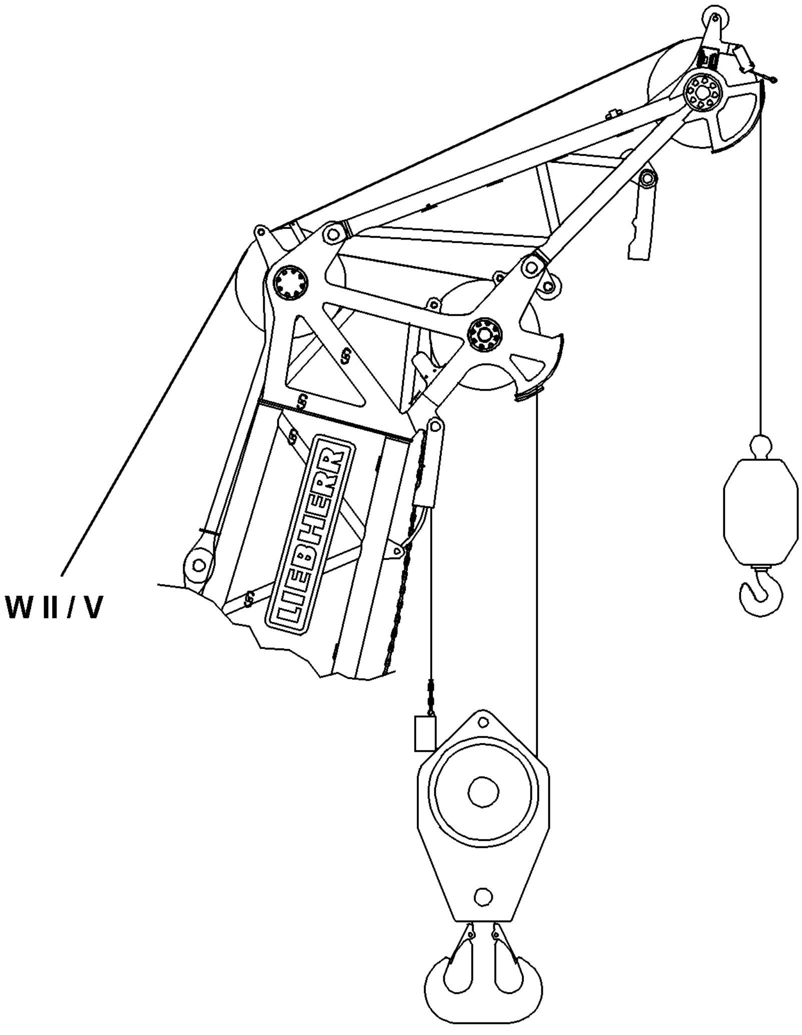
Continue to lift the end section with installed boom nose with the auxiliary crane and set the set up cart (5) under the boom nose jib and place the boom nose on it.

Connect the hoist limit switch (4) .

C A U T I O N: **Watch the routing of the hoist cable of the hook block on the end section during erection, to ensure that it will not engage on the boom nose .**

Note: The erection procedure must be carried out according to chapter 5.04, L- boom combination and chapter 5.09, Erection and take down charts.

Removal
Remove the boom nose in reverse order.



190024

Operation with boom nose

Description
This feature is installed for quick lifts with winch V in L, S- operation and winch II in LN, SW operation. The hook block may remain reeved on the boom head.

Preselect the operating mode
Set the LICCON overload safety device according to the load chart.

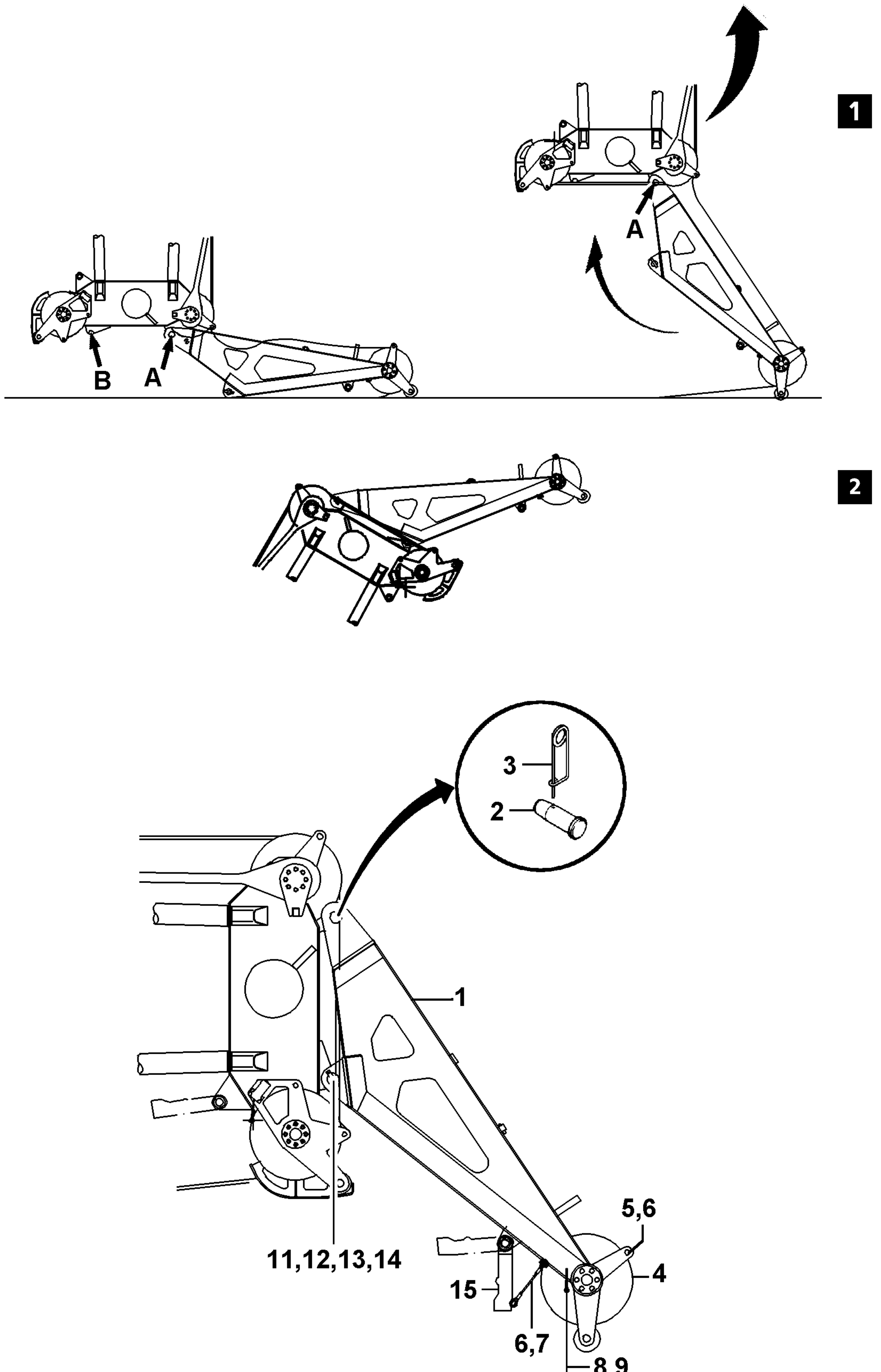
Note : For hoist cable routing and reeving on the boom nose, see chapter 4.06, Cable reeving.

C A U T I O N : Max. 4- way reeving is permitted, otherwise the boom nose will be overloaded.

Check the function of the hoist limit switch ”on top” by running against the hoist limit switch weight.

Operation
For operation with boom nose , the following must be observed.

D A N G E R : Simultaneous operation with hook block boom head and on the boom nose is prohibited in this case!
The hoist limit switch on the boom nose must be connected.
The load may not be lifted off the ground by luffing up the boom.
It must be raised off the ground via the hoist gear.



189667

Installation of 60 t boom nose on W- end section

Prerequisite:

- The S- boom with installed W- boom is in folded down position (fig. 1)

Fig. 1 = Installation position
Fig. 2 = Operating position

Components

1	Boom nose	Gewicht ca. 0,64 t
2	Pin	∅ 70×145 mm
3	Spring retainer	∅ 6 mm
4	Cable pulley	
5	Pipe	
6	Spring retainer	∅ 4,5 mm
7	Cable	∅ 8 mm× 0.350 m
8	Shakle	
9	Chain	
10	Hoist limit switch weight	
11	Pin	∅ 70×100 mm
12	Flat steel	
13	Spring ring A8	
14	Screw M 8×25 mm	
15	Twist catcher	

Install the boom nose

Pin and secure the boom nose (1) on ”top” of the boom (A) , Use pin (2) and spring retainer (3) . (Fig. 1)
Pull the hoist cable over the cable pulley (4), secure with the pipe (5) and the spring retainer (6) to prevent it from jumping out of the cable pulley.
Release the twist catcher by loosening it from the cable (7).
Luff up the boom until the boom nose lays on theboom head (B) . (Fig. 2)
Reeve in the hoist cable into the hook block and attach thehoist limit switch weight (10) . Check the function of the hoist limit switch by running against the hoist limit switch weight.

Note: For hoist cable routing and reeving on the boom nose, see chapter 4.06, Cable reeving.

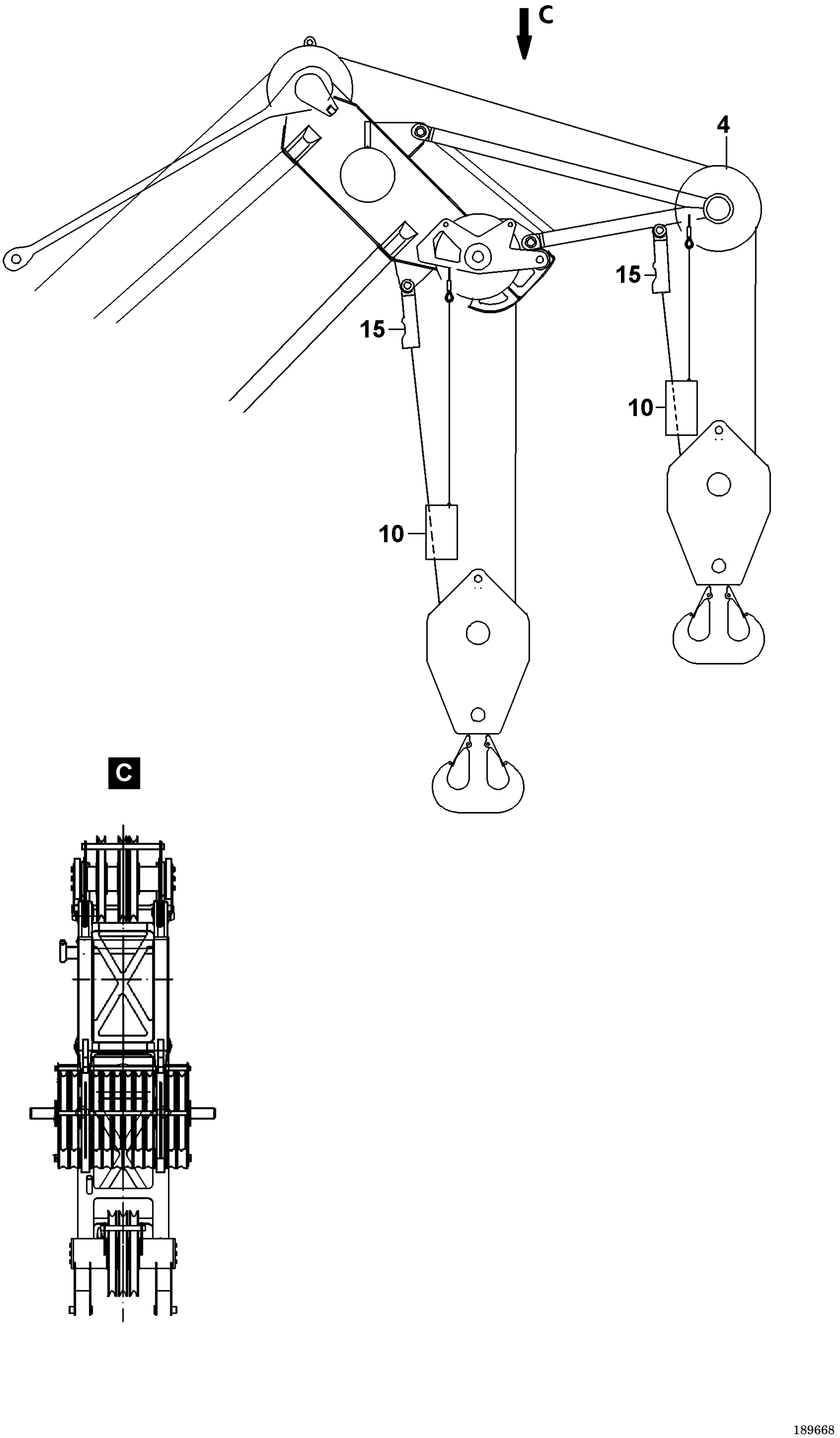
Continue to luff up the boom until it is in operating position. (Fig.2)

Removal

Remove the boom nose in reverse order.
Luff down the boom. The boom nose is not yet laying on the ground.
Detach the hoist limit switch weight (10) with chain (9) and shakle (8) on the boom nose (1) . Unreeve the hoist cable.

C A U T I O N: **Before the boom nose is lowered all the way, the twist catcher must be secured on the boom nose with cable (7) and spring retainer (6). If this is not observed, the twist catcher can be destroyed by hitting the ground.**

Continue to luff down the boom until it lays on the ground.
Unpin the boom nose (1) on ”top” of the boom (A) .


C
4
15
15
10
10
C
189668

Operation

This mode is available to turn loads with simultaneous operation of both hoist gears, via the 400 t head and the boom nose.

The load must be turned towards the main hook.

D A N G E R : **Loads on theboom nose are permitted to no more than max. 60 t !**

If this is not observed, there is a danger of accidents due to overload of the individual components of the crane.

Enter the operating mode into the overload safety system according to the equipment configuration .

Enter the cable reeving into the overload safety system according to the reeving on the boom nose.

Entering the setting of the smaller reeving of both hooks ensures that the crane cannot be overloaded.

D A N G E R : **The reeving on theboom head must be the same or larger than the reeving on the boom nose.**
If this is not observed, there is a danger of accidents due to overload of the individual components of the crane.

Connect the hoist limit switch on the boom head and on the boom nose.

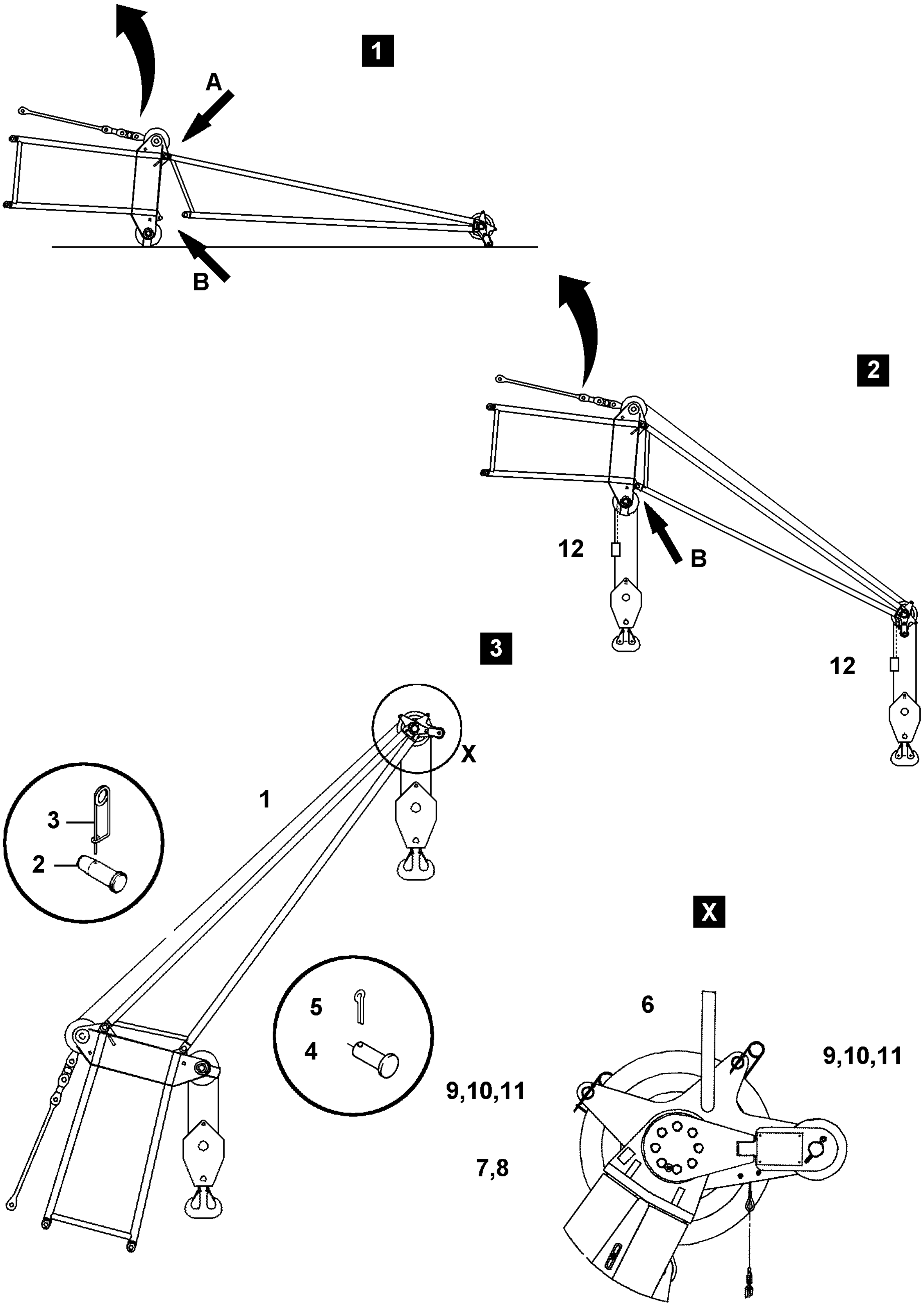
Attach the hoist limit switch weights (10) on the hoist limit switches.

Check the function of the hoist limit switch ”on top” by running against the hoist limit switches.

Note: In two hook operation, deduct the weights of both hook blocks and the tackle from the load chart value.

5.10 BOOM NOSE 60 t

025721-00



194710

Installation of the 72 t boom nose on the SL - end section

Prerequisite:

- The SL - boom is in luffed down position (fig. 1)

Fig. 1 + 2	=	Installation position
Fig. 3	=	Operating position

Components

1	Boom nose	Weight, approx. 1,75 t
2	Pin	∅ 75×305 mm
3	Spring retainer	∅ 6 mm
4	Pin	∅ 85 x 185 mm
5	Cotter pin	8 x 100 mm
6	Cable pulley	
7	Axle	
8	Cover	
9	Tube	
10	Cotter pin	6,3 x 63 mm
11	Spring retainer	∅ 4,5 mm
12	Hoist limit switch weight	

Note: The pins (4) must always be pinned and secured with the cotter pin (5) .

C A U T I O N : The pins (2) must be inserted from the outside to the inside and secured.

Install the boom nose

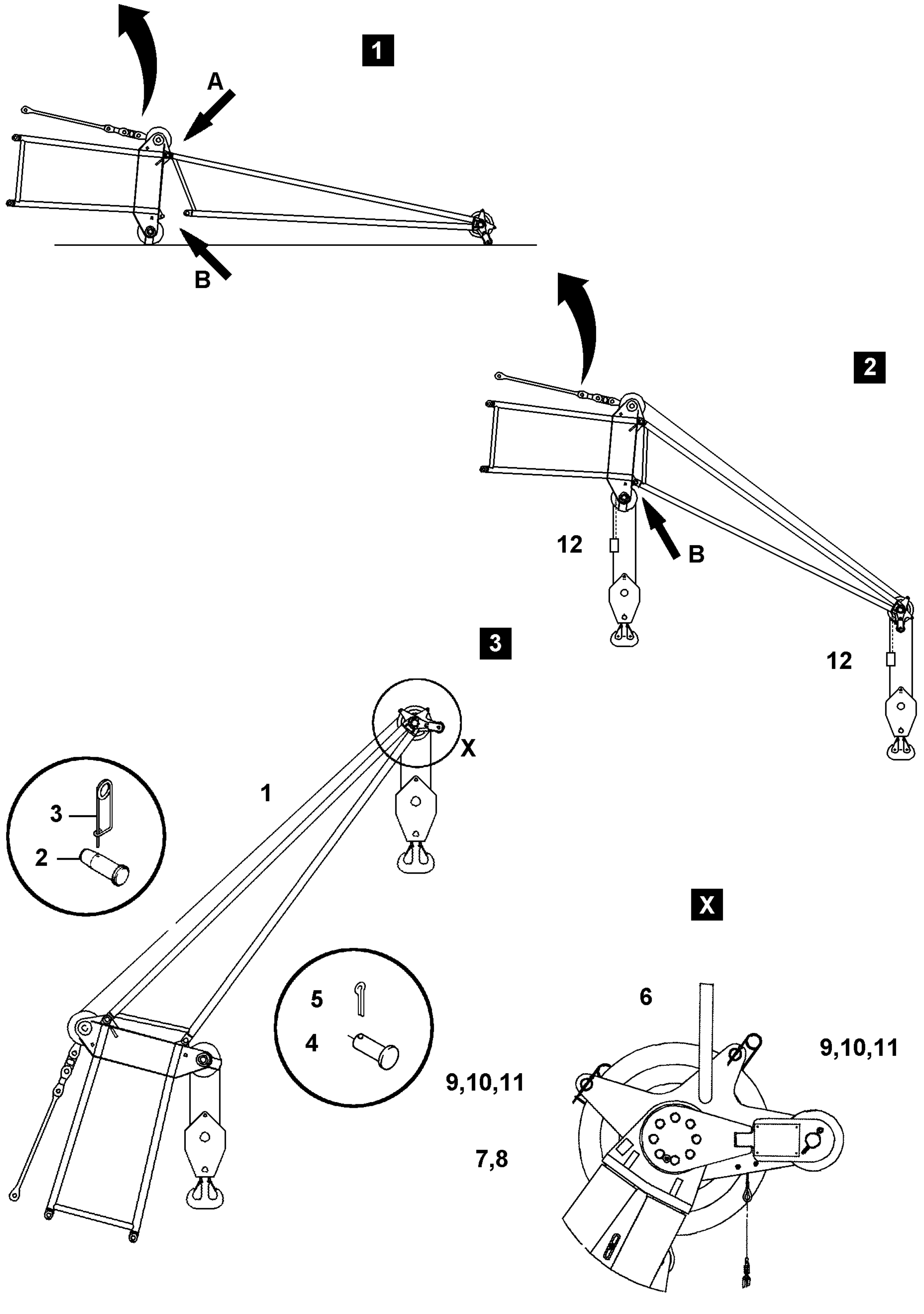
Pin and secure the boom nose (1) on the boom ”on top” (A) . Use pins (2) and spring retainers (3) . (Fig. 1)
Pull the hoist cable over the cable pulley (6), secure with the tube (9) and spring retainer (11) to prevent it from jumping out from the cable pulley.
Luff up the boom until the boom nose touches the boom head (B) . (Fig. 2)
Reeve the hoist cable into the hook block and hang in the hoist limit switch weight (12) . Check the function of the hoist limit switch by running the hook block against the hoist limit switch weight.

Note: For hoist cable routing and reeving on the boom nose, see chapter 4.06, Cable reeving.

Continue to luff up the boom until it is in operating position. (Fig.3)

Removal

The removal of the boom nose is handled in reverse order.
Luff down the boom. The boom nose is not yet laying on the ground.
Disengage the hoist limit switch weight (12) with chain and shakle on the boom nose (1) , remove the cable retainer, tube (9) and spring retainer (11) .
Unreeve the hoist cable.
Reinstall the cable retainer, tube (9) and spring retainer (11) .
Continue to luff down the boom until it lays on the ground.
Unpin the boom nose (1) on the boom ”on top ” (A) .



194710

Operation

This mode is installed to allow the changing of loads while operating both hoist gears at the same time, via the 100 t end section and the boom nose.

The load must be changed over towards the main hook.

D A N G E R : **Load carrying capacities on the boom nose of up to max. 72 t are permitted!**

If this is not observed, there is a danger of accidents due to overload of individual components of the crane .

Enter the operating mode into the overload safety system according to the equipment configuration.

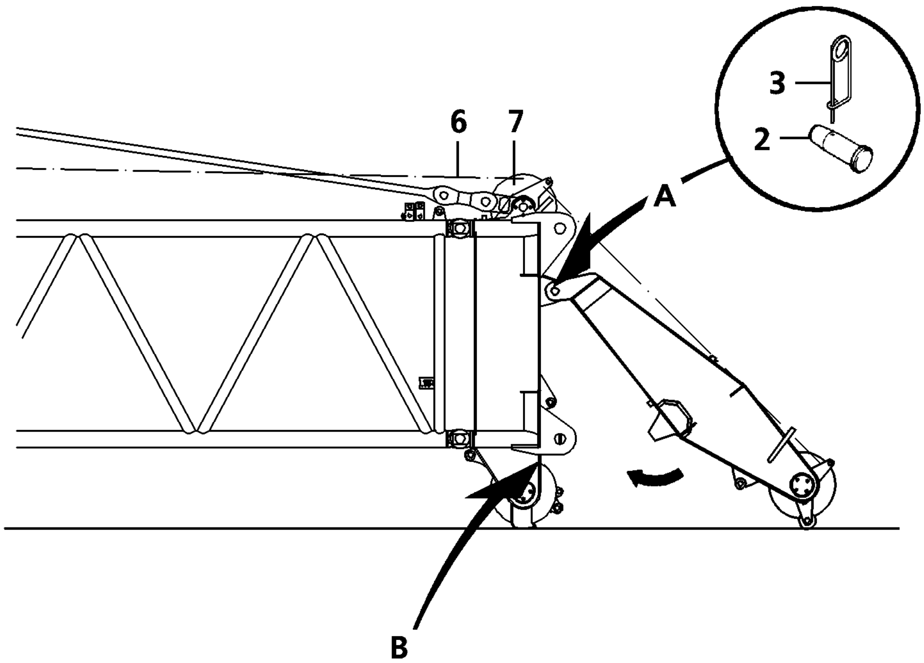
The cable reeving must be entered into the overload safety system according to the reeving on the boom nose .

Setting the adjustment to the smaller reeving number of the two hooks ensures that the crane will not be overloaded.

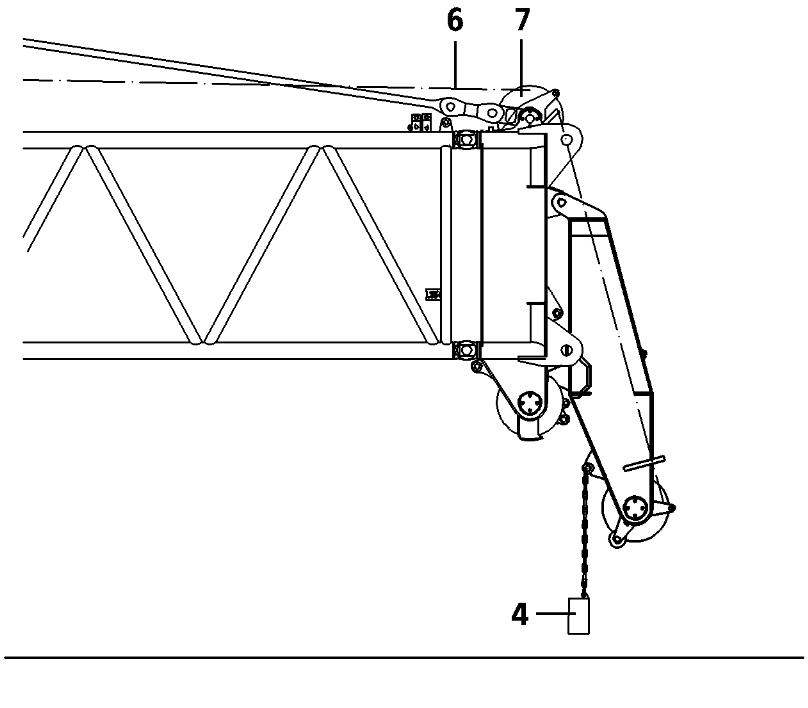
D A N GE R : **The reeving on the boom head must be the same or larger than the reeving on the boom nose.**
If this is not observed, there is a danger of accidents due to overload of individual components of the crane .

Note: For two hook operation, deduct the weights of the two hook blocks and the tackle from the load chart value.

1



2



187178

Installation of the 160 t boom nose boom on the 400 t - end section

Components

1	Boom nose	Weight, approx. 1,2 t
2	Pin	Rd 60×150 mm
3	Spring retainer	Rd 6 mm
4	Hoist limit switch weight	
5	Cable fixed point	
6	Hoist cable	
7	Cable pulley	

Fig. 1 = Installation position
Fig. 2 = Operating position

Install the boom nose
The boom head is laying on the ground .

Attach the boom nose (1) to the auxiliary crane and pin and secure on the boom "on top" (A) . Use pin (2) and spring retainer (3) .

Place the boom nose on the ground, remove the auxiliary crane.

Pull the hoist cable (6) over the cable pulley (7) .

Luff up the boom until the boom nose is touching the boom head (B) .

Reeve the hoist cable (6) into the hook block and hang in the hoist limit switch weight (4).

Note: For hoist cable routing and reeving on the boom nose, see chapter 4.06, cable reeving.

Removal

The removal of theboom nose is handled in reverse order.

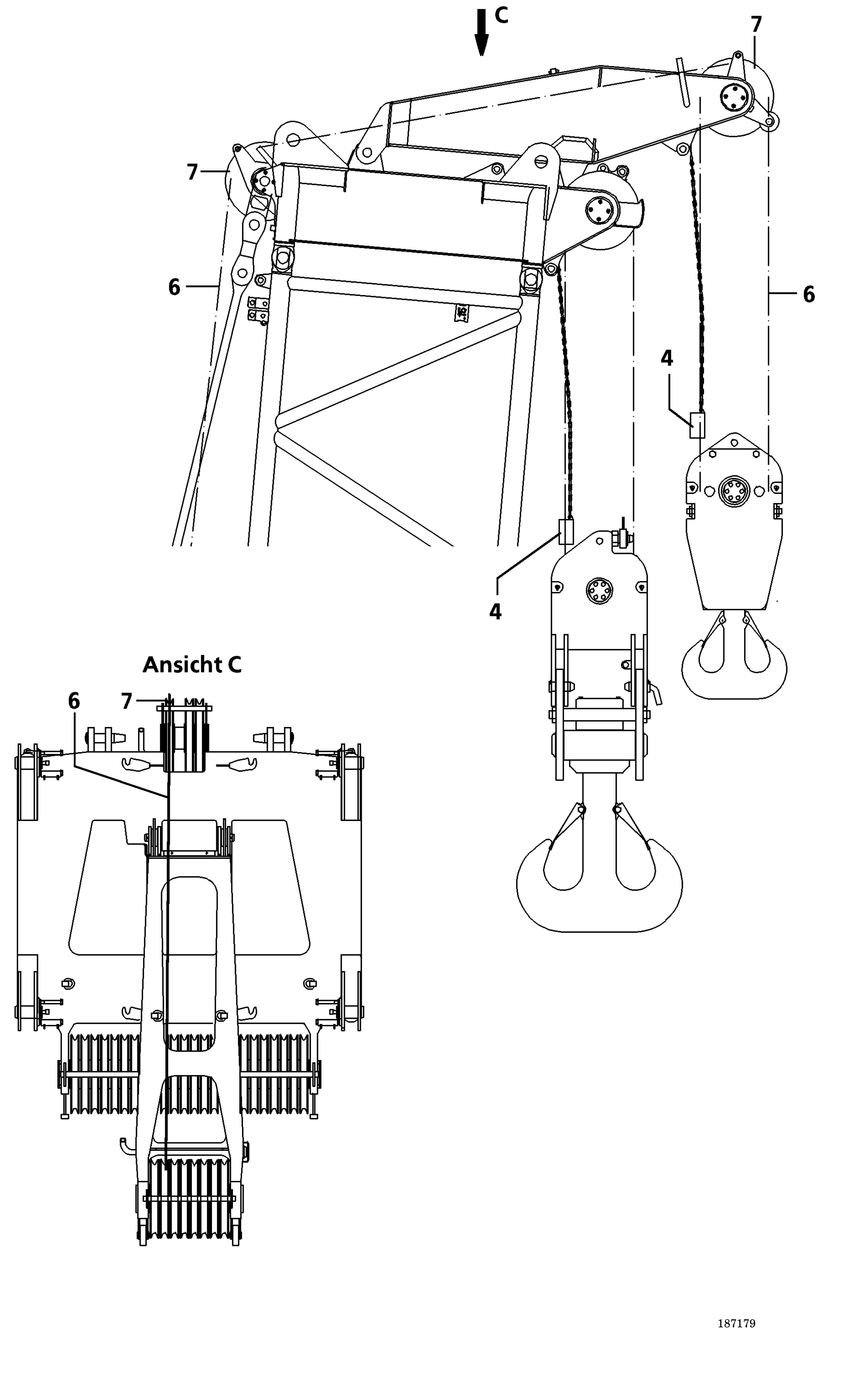
Luff down the boom.

Disengage the hoist limit switch weight (4) .

Unreeve the hoist cable (6) .

Continue to luff down the boom until it is laying on the ground, the boom nose is pushed upward.

Attach the boom nose (1) onto the auxiliary crane and unpin on the boom "on top" (A) .


C
7
7
6
6
4
4
Ansicht C
6
7
187179

Operation

This mode is installed to allow the changing of loads while operating both hoist gears at the same time, via the 400 t end section and the boom nose.

The load must be changed over towards the main hook.

D A N G E R : **Load carrying capacities on the boom nose of up to max. 160 t are permitted!**

If this is not observed, there is a danger of accidents due to overload of individual components of the crane .

Enter the operating mode into the overload safety system according to the equipment configuration.

The cable reeving must be entered into the overload safety system according to the reeving on the boom nose .

Setting the adjustment to the smaller reeving number of the two hooks ensures that the crane will not be overloaded.

D A N GE R : **The reeving on the boom head must be the same or larger than the reeving on the boom nose.**
If this is not observed, there is a danger of accidents due to overload of individual components of the crane .

Connect the hoist limit switch on the boom head and on the boom nose.

Attach the hoist limit switch weight (4) onto the hoist limit switch.

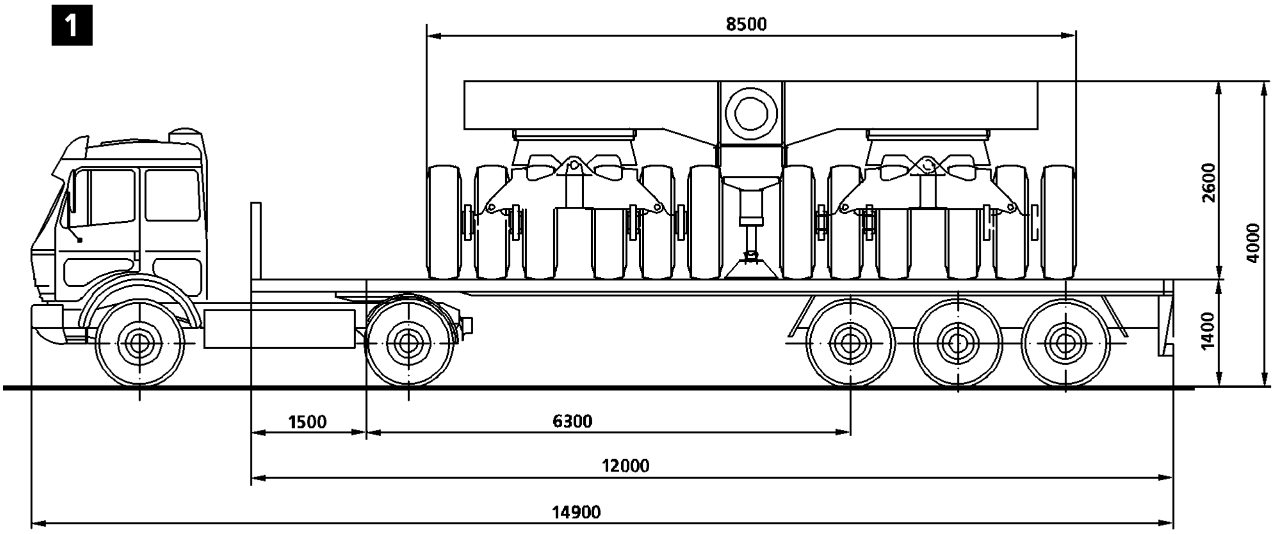
Check the function of the hoist limit switch ”on top” by running against the hoist limit switch weight (4) .

Note: For two hook operation, pull the weights of the two hook blocks and the tackle from the load chart value.

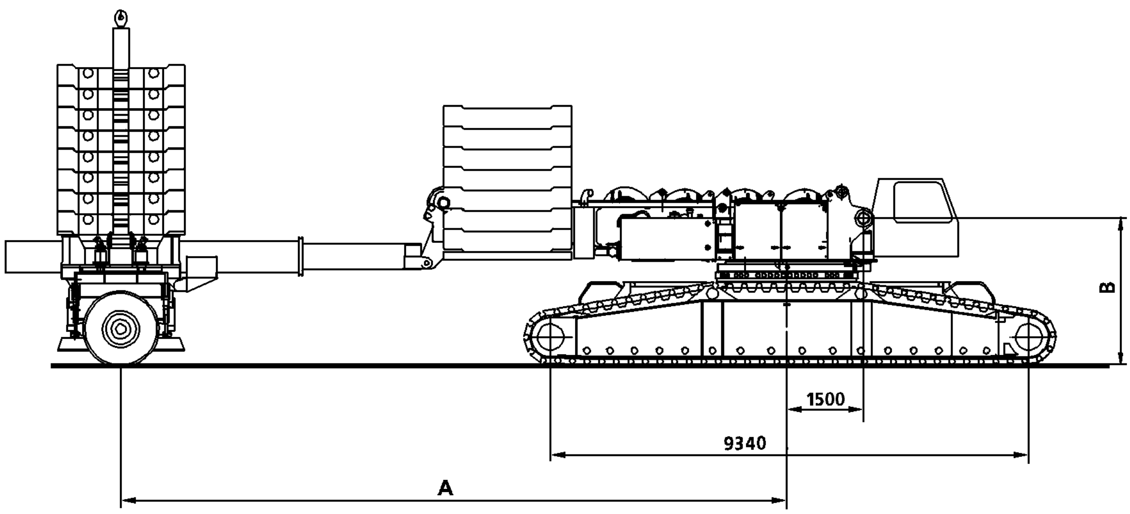
Index

5.11 BALLAST TRAILER

1

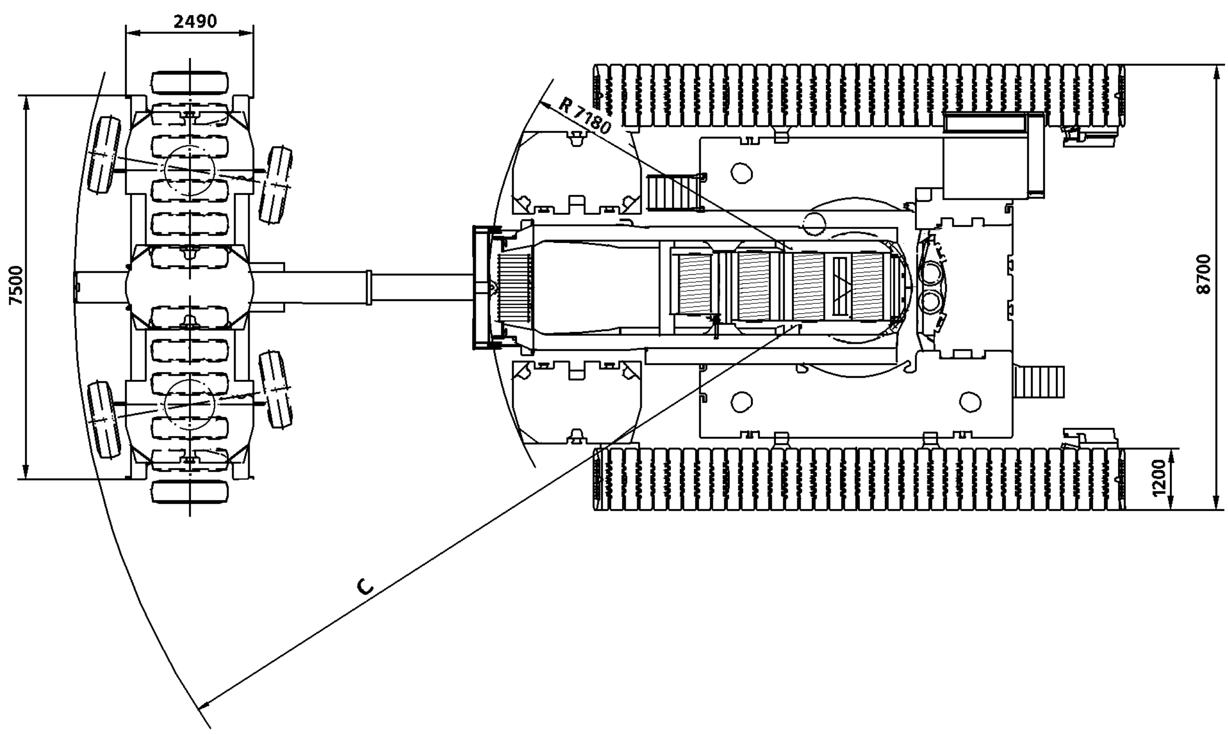


2

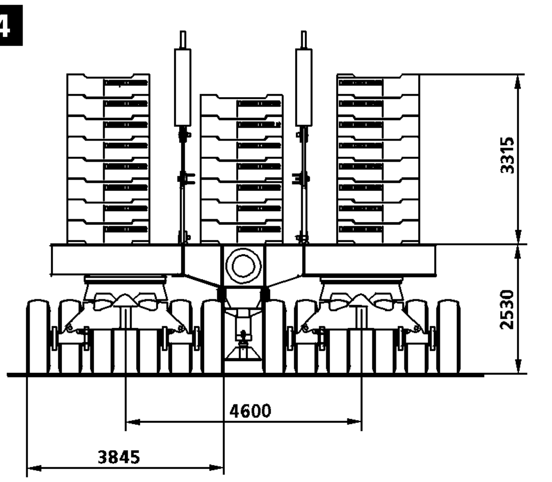


188652

3

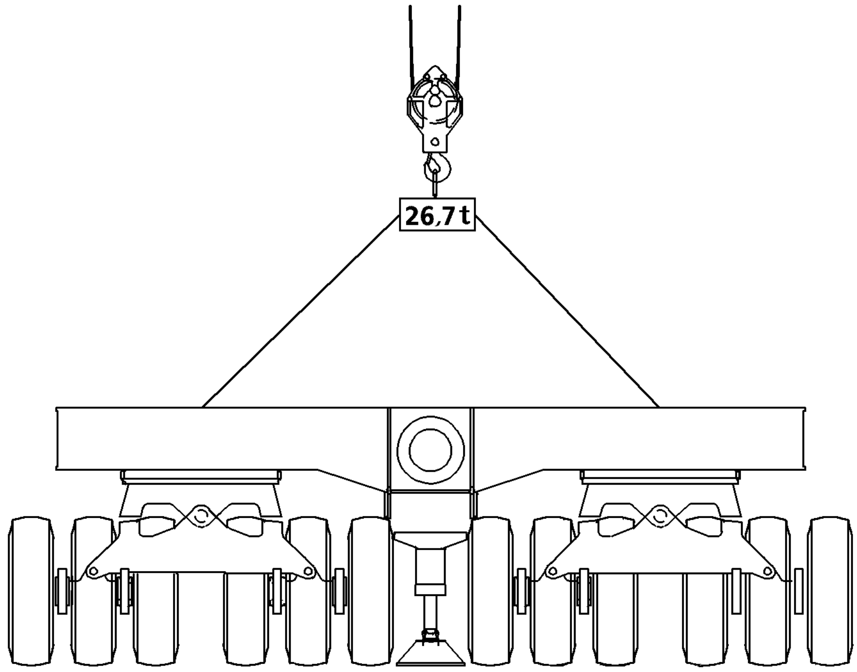


4

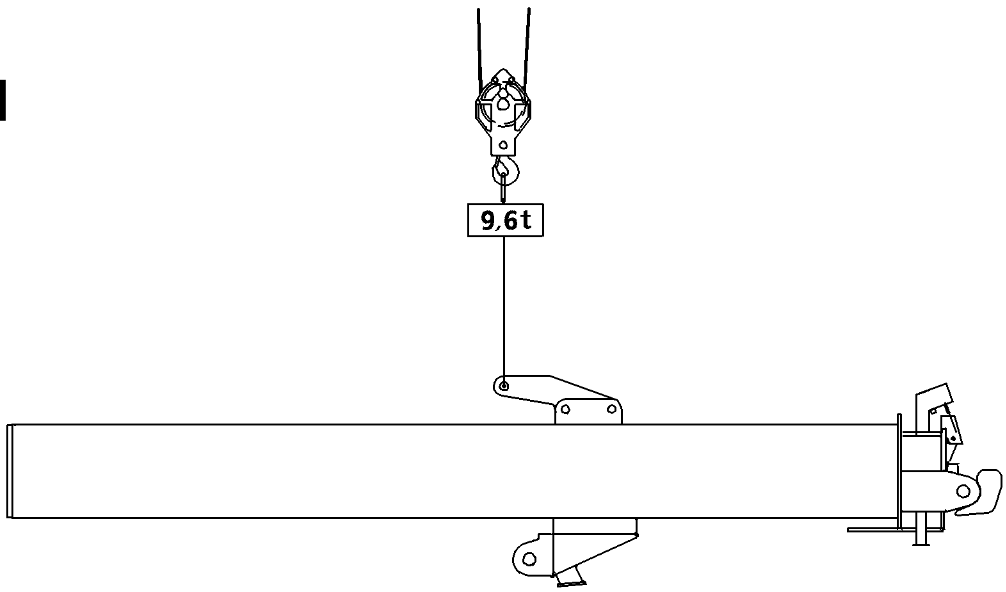


188653

5



6



188657

1. General

This crane is equipped with a ballast trailer, which makes it possible to add a 220 t counterweight.

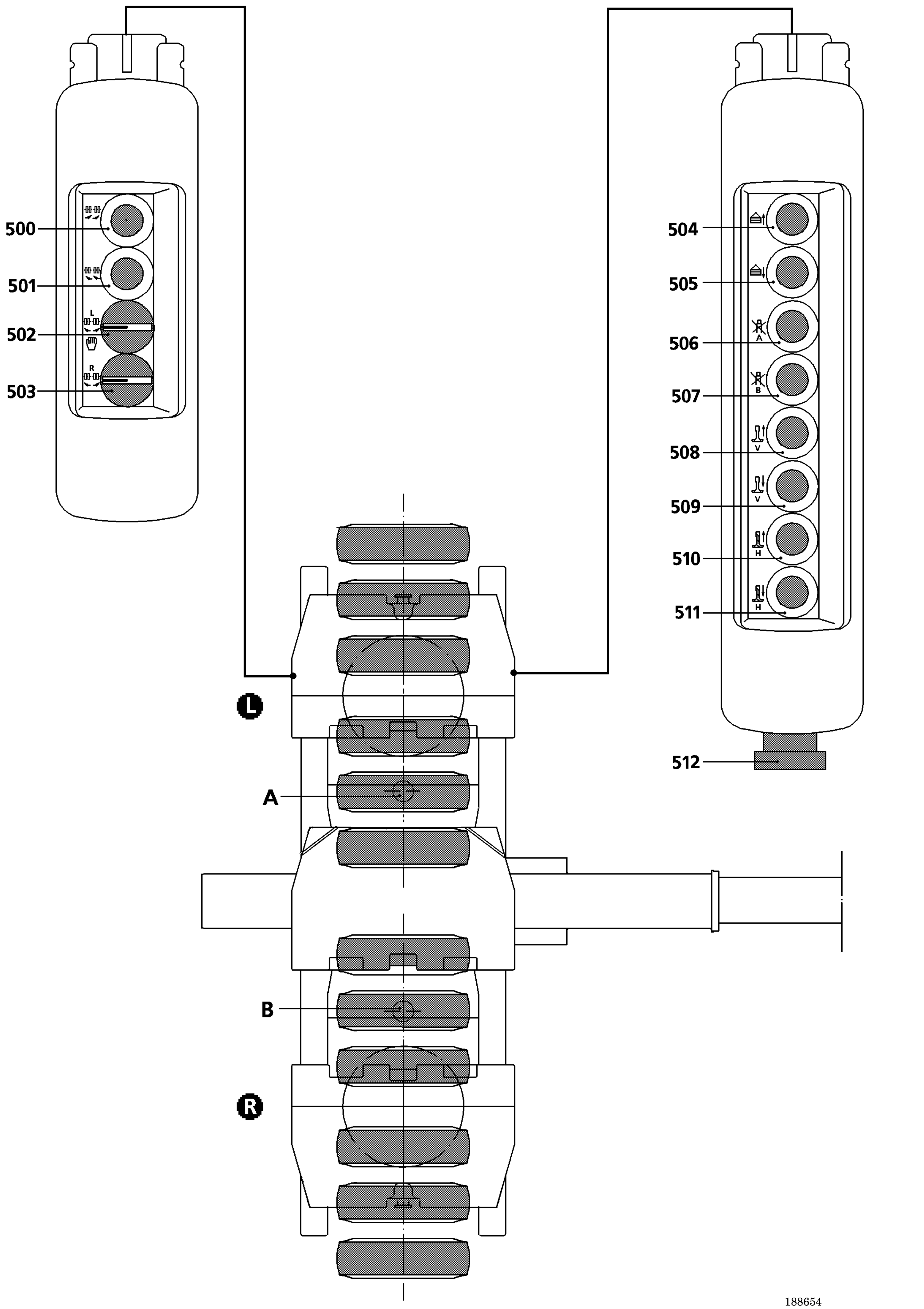
1.1 **Dimensions** [mm], fig. 1, 2, 3 and 4

Length **A**	Radius **C**
11000	R 13260
13000	R 15260
15000	R 17260

	with Quick Connection	without Quick Connection
Length **B**	2850	2592

1.2 **Weights** [t], fig. 5 and 6

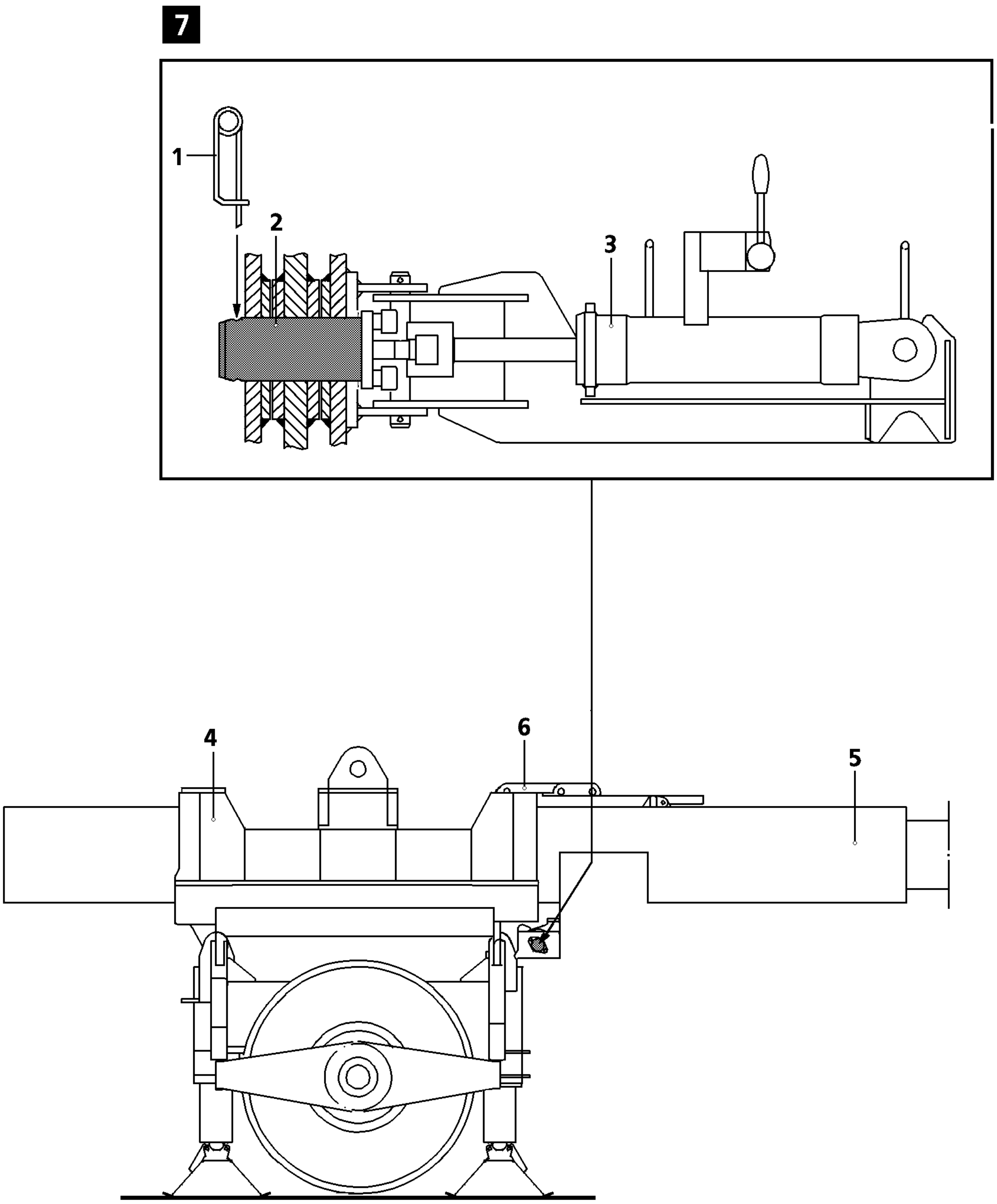
Ballast trailer	approx. 26.7 t
Ballast trailer guide	approx. 9.6 t


500
501
502
503
L
R
504
505
506
507
A
B
V
H
508
509
510
511
512
L
A
B
R
188654

2. Control elements on control panels

Pos.:

500	Button	- Turn ballast trailer wheels to the left, manual re-steering
501	Button	- Turn ballast trailer wheels to the right, manual re-steering
502	Knob	- Turn ballast trailer wheels on the left side to the right / left, manual operation for installation or emergency operation
503	Knob	- Turn ballast trailer wheels on the right side to the right / left, manual operation for installation or emergency operation
504	Button	- Raise the ballast trailer with pull cylinders
505	Button	- Lower the ballast trailer with pull cylinders
506	Button	- Block pull cylinder left (A) on ballast trailer
507	Button	- Block pull cylinder right (B) on ballast trailer
508	Button	- Retract support cylinder, front
509	Button	- Extend support cylinder, front
510	Button	- Retract support cylinder, rear
511	Button	- Extend support cylinder, rear
512	Switch	- **Emergency OFF**



188655

3. Installation of ballast trailer

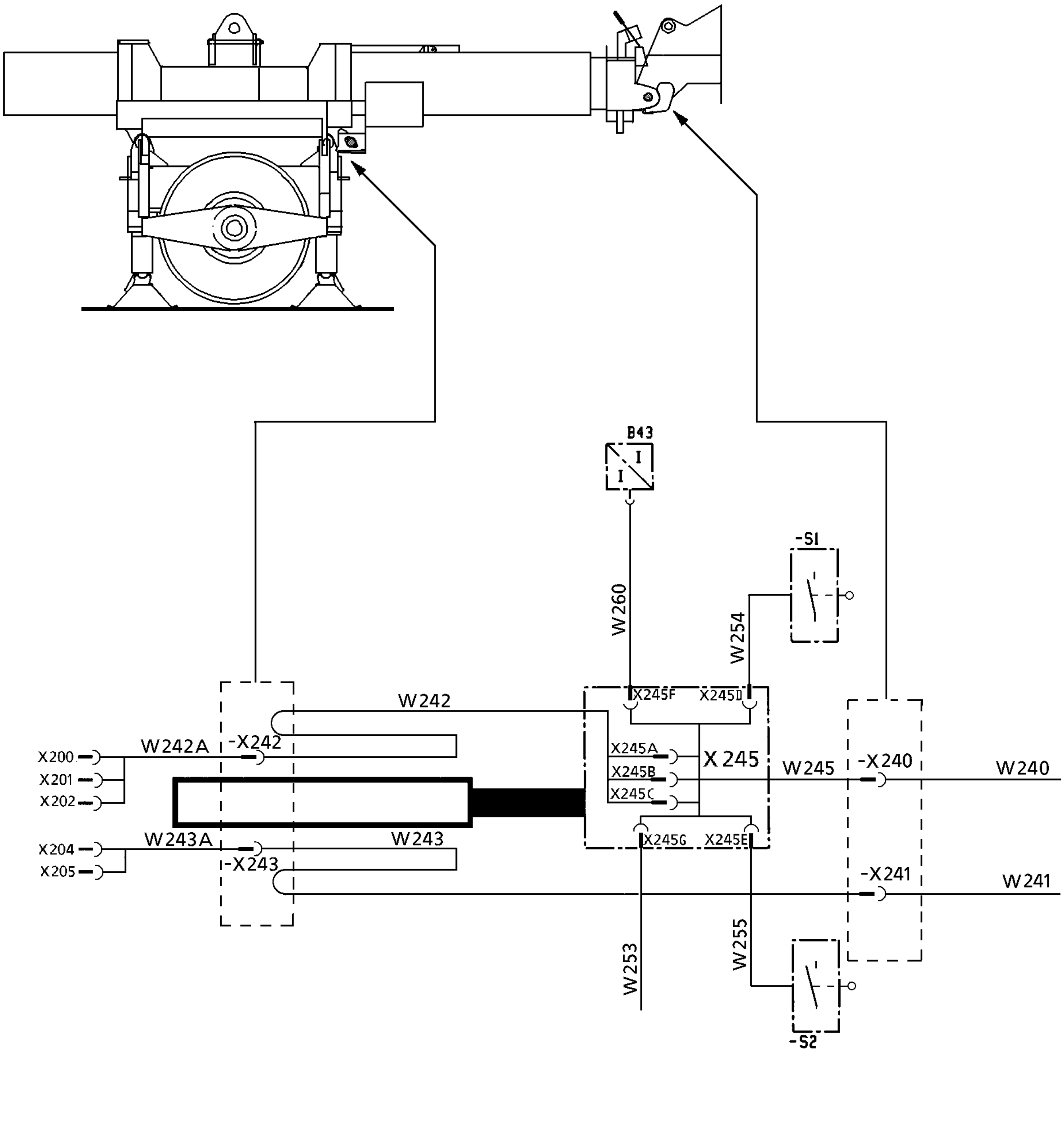
D A N G E R: **The ballast trailer is not equipped with a braking system. For that reason, it must be supported if it is not installed.**

The installation of the ballast trailer may only be carried out by authorized persons, on firm and level ground with sufficient load carrying capacity.

3.1 Pin ballast trailer guide on ballast trailer, fig. 7

- Unload the ballast trailer (4) with the auxiliary crane;
- Unload the ballast trailer guide (5) with the auxiliary crane and push it into the ballast trailer (4) ;
- Align the ballast trailer and the ballast trailer guide until the bore holes align;
- Connect the pin pulling device (3) with the hydraulic component;
- Pin the pin (2) with the pin pulling device (3) on both sides;
- Secure the pin (2) with the spring retainer (1) ,
- Unpin the hoist bracket (6) and fold it forward.

Note: The ballast trailer guide must be held with an auxiliary crane until it is pinned and secured.


B43
W260
-S1
W254
W242
X245F
X245D
W242A
-X242
X200
X201
X202
X245A
X245B
X245C
X 245
W245
-X240
W240
X204
X205
W243A
-X243
W243
X245G
X245E
-X241
W241
W253
W255
-S2

188664

3.2 Pin ballast trailer guide on the crane

Note: The electrical connection can be established for installation to be able to move the support cylinders, if needed, and the pull cylinders. The release "Ballast UP / DOWN" are available, when the conditions of the shut off diagram are met, regardless if the ballast trailer is installed. The release "Ballast UP" allows the pull and support cylinders to be retracted. The release "Ballast DOWN" allows the extension of the pull and support cylinders. This means that the support and pull cylinders can be moved, even if the signal for "Ballast trailer installed" is not yet available.

3.2.1 Connect the supply lines

- Move the crane as close as possible to the ballast trailer guide;
- Turn the engine off.

Establish the electrical connection

- Remove the dummy plug on socket -X 240 and -X 241 ;
- Plug in the cable W 245 in socket -X 240;
- Plug in the cable W 243 in socket -X 241;
- Plug in the cable W 242 in socket -X 242 ;
- Plug in the cable W 243 in socket -X 243 .

Establish the pneumatic and hydraulic connections

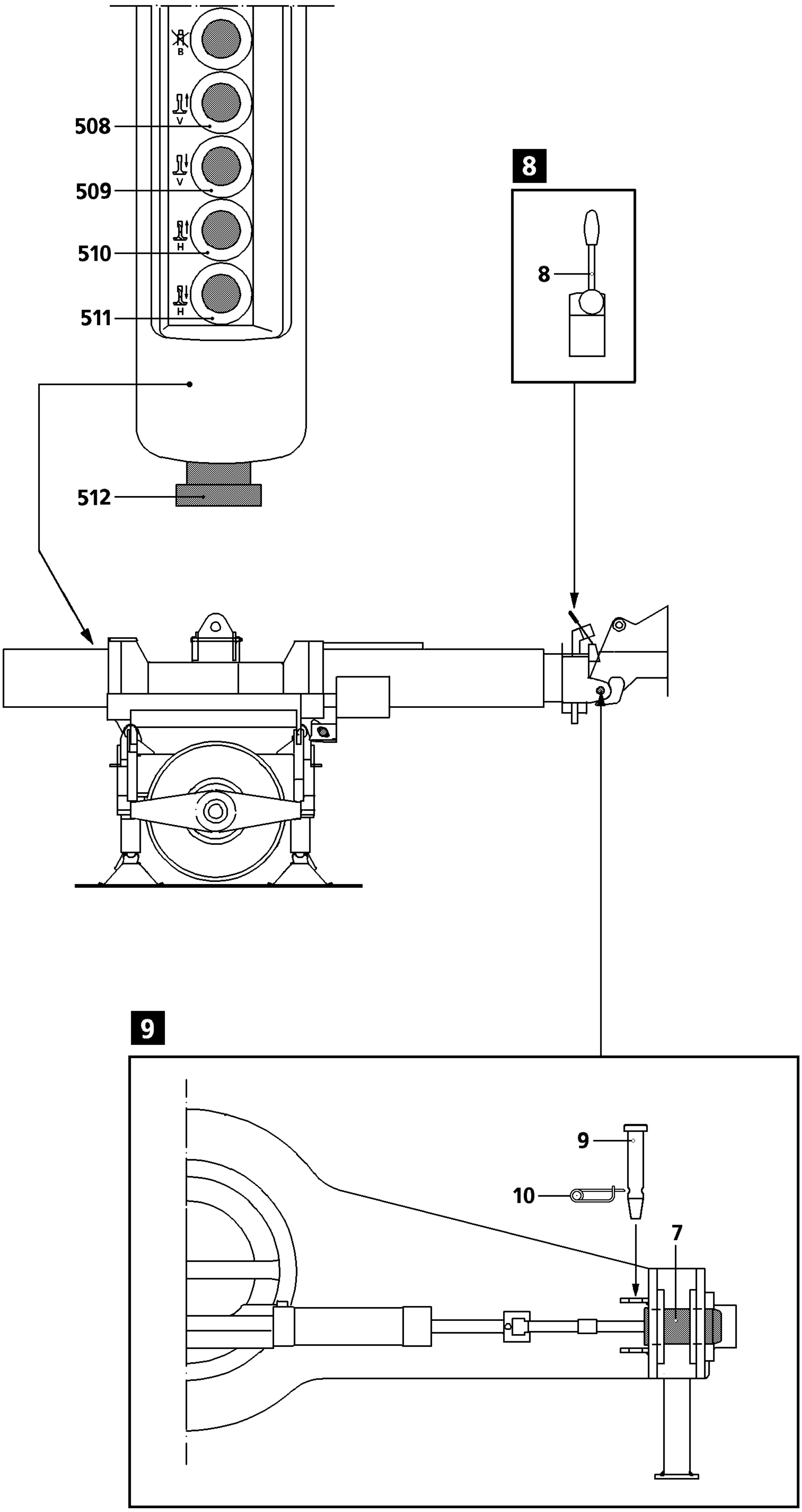
- The corresponding hydraulic quick couplings are marked.

D A N G E R: When connecting or disconnecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

Prerequisite for a correct coupling connection is:

- **Release the pressure in the hydraulic system before connecting or disconnecting the couplings (the engine must be turned off - then wait for 5 minutes).**
- **Insert the coupling sections (sleeve and plug) into each other and tighten the screw with the hand nut.**
- **Tighten the nut past the o-ring until you can feel a noticeable, solid stop.**
- **The couplings may only be tightened by hand - without tools - as this could damage the couplings.**

Improperly connected couplings can cause loss of pressure or sudden leakage, which in turn could cause a serious ACCIDENT.



188656

3.2.2 Align the ballast trailer

Raise or lower the two outrigger support cylinders to align the ballast trailer until the connector pins (7) can be inserted.

- Press button (508) to retract the outrigger cylinders on the front;
- Press button (509) to extend the outrigger cylinders on the front;
- Press button (510) to retract the outrigger cylinders on the rear;
- Press button (511) to extend the outrigger cylinders on the rear.

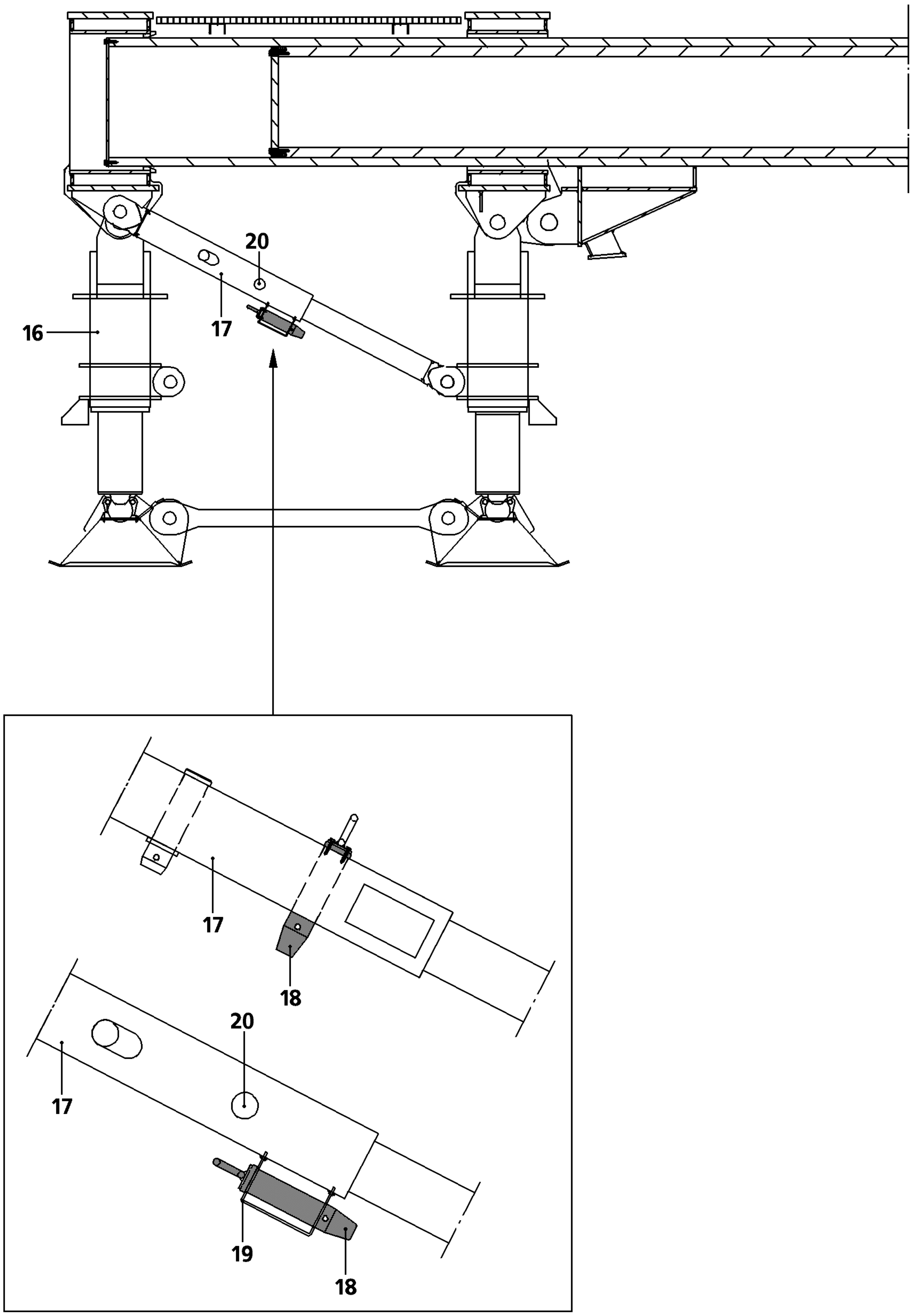
3.2.3 **Pinning procedure**, fig. 8 and 9

- Actuate the manual lever (8) to pin the crane ballast trailer guide on both sides;
- Pin the retaining pin (9) on both sides and secure with spring retainers (10) .

- Press the button (508) to retract the outrigger cylinders on the front all the way;
- Press the button (510) to retract the outrigger cylinders on the rear all the way.

Note: The outrigger cylinders can also be extended or retracted via the two corresponding buttons in the cab.

D A N G E R: **After pinning, recheck if all pins are inserted and secured properly. check if the connector lines are connected completely and correctly.**
The ballast trailer may only be operated if it is pinned completely and correctly.
If one of the two pins is not pinned or if a connector line is not connected, then the control does not receive the message "Ballast trailer installed". The crane superstructure can be turned or the crawler can be moved, even though the ballast trailer is not yet installed completely (ballast trailer is pinned with a pin to the crane).
There is an increased danger of accidents!



190332

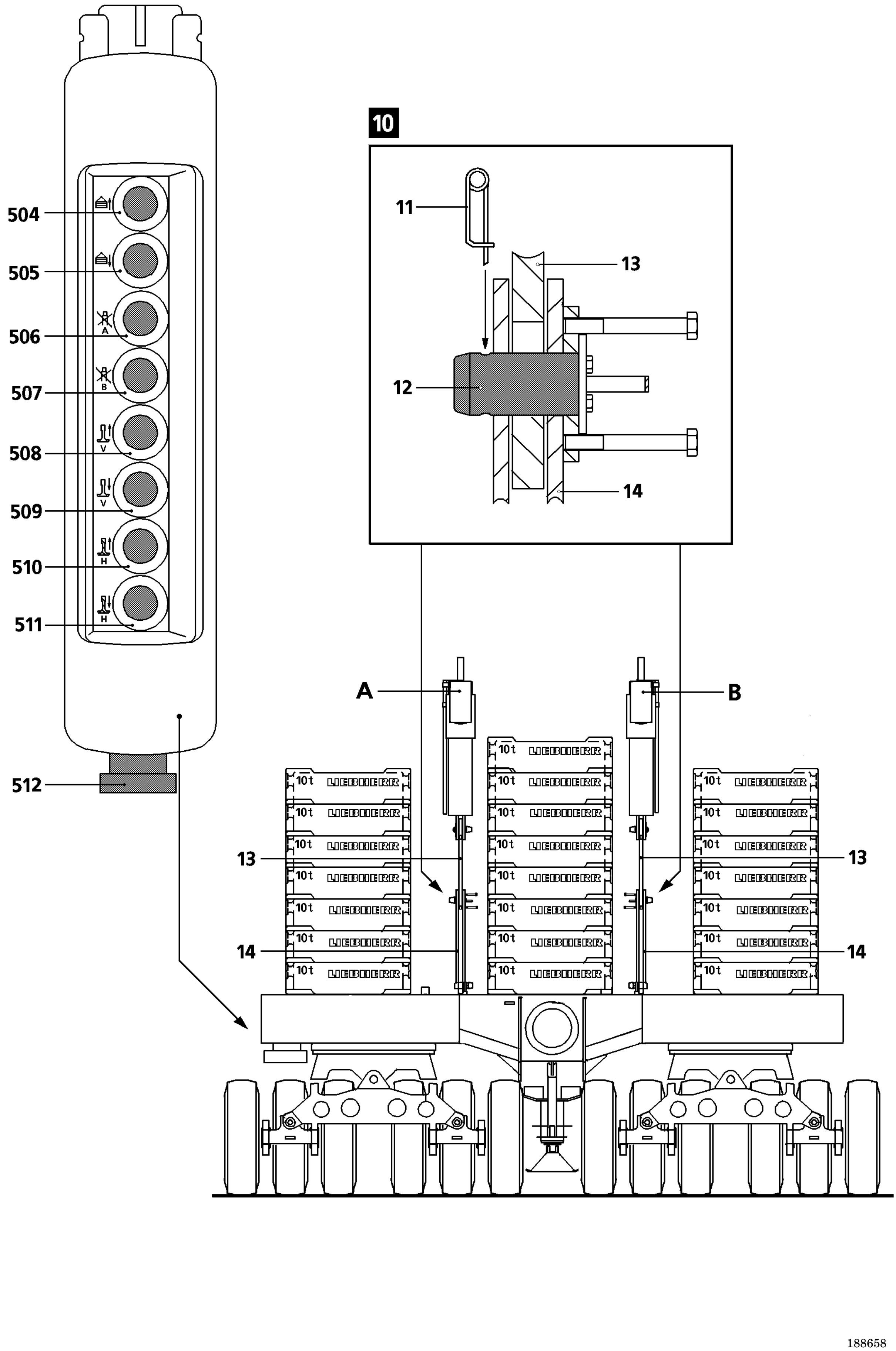
3.2.3.1 Retracting of support cylinder (16), removing of bolt (18) on the brace (17)

In case the ballast trailer is locked on the slewing platform, the support cylinders (16) have to be retracted and the bolt (18) on the brace (17) of the support cylinder has to be removed.
Put the bolt (18) in the rest.

Note: The bolt (18) can only be unlocked when the support cylinders are retracted.

C A U T I O N : Before the ballast plates are put on the ballast trailer it has to be guaranteed that the support cylinders are retracted and bolt (18) on the support cylinder brace (17) is removed.
Otherwise the ballast trailer will get damaged!

C A U T I O N : For crawler cranes with supports it is prohibited to actuate the supports while a load is attached or the guying to the ballast trailer or suspended ballast is subjected to a load. A change of the support changes the incline of the boom system and can cause significant changes to the force conditions, especially on test point 1. In addition, in this case, the relapse cylinders can move to block position. A shut off by the LMB does not exist.
There is a danger of accidents!!


504
505
506
507
508
509
510
511
512
10
11
12
13
14
A
B
13
14
13
14
10t LIEBHERR
188658

3.3 Install pull cylinders, fig. 10

- Fold up the connector rods (14) ;
- Pull the connector rods (13) with auxiliary rope to the connector rods (14);
- Pin the connector rods with pin (12) ;
- Secure pin (12) with spring retainers (11) ;
- Establish the supply lines from the ballast trailer to the slewing platform.

3.4 Ballasting the ballast trailer

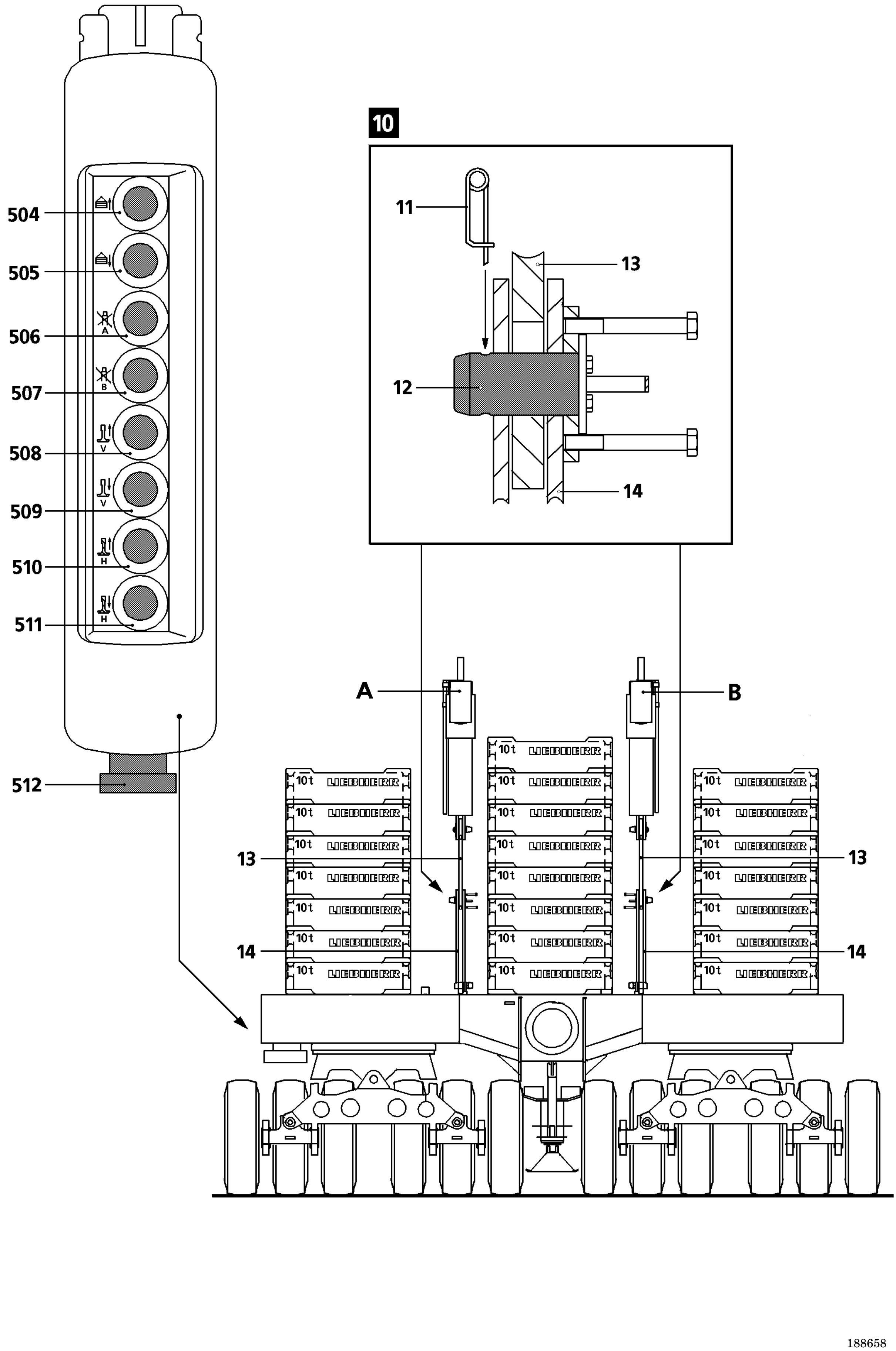
C A U T I O N: Before the ballast plates are put on the ballast trailer it has to be guaranteed that the support cylinders are retracted and bolt (18) on the support cylinder brace (17) is removed.
Otherwise the ballast trailer will get damaged!

Weight per ballast plate	10 t
max. number of ballast plates	22
Weight of ballast plates	10 t × 22 = 220 t
Weight of ballast trailer	26.7 t
Weight of ballast trailer guide	9.6 t
max. total weight	**256.3 t**

- Place ballast plates with the auxiliary crane onto the ballast trailer .

D A N G E R: When loading the ballast trailer, make sure to pay attention to ensure the ballast plates are positioned correctly.
The ballast plates must be distributed evenly on the ballast trailer .

Note: Use the LICCON job planer to determine the correct ballast weight .


504
505
506
507
508
509
510
511
512
10
11
12
13
14
A
B
13
14
13
14
10t
LIEBHERR
188658

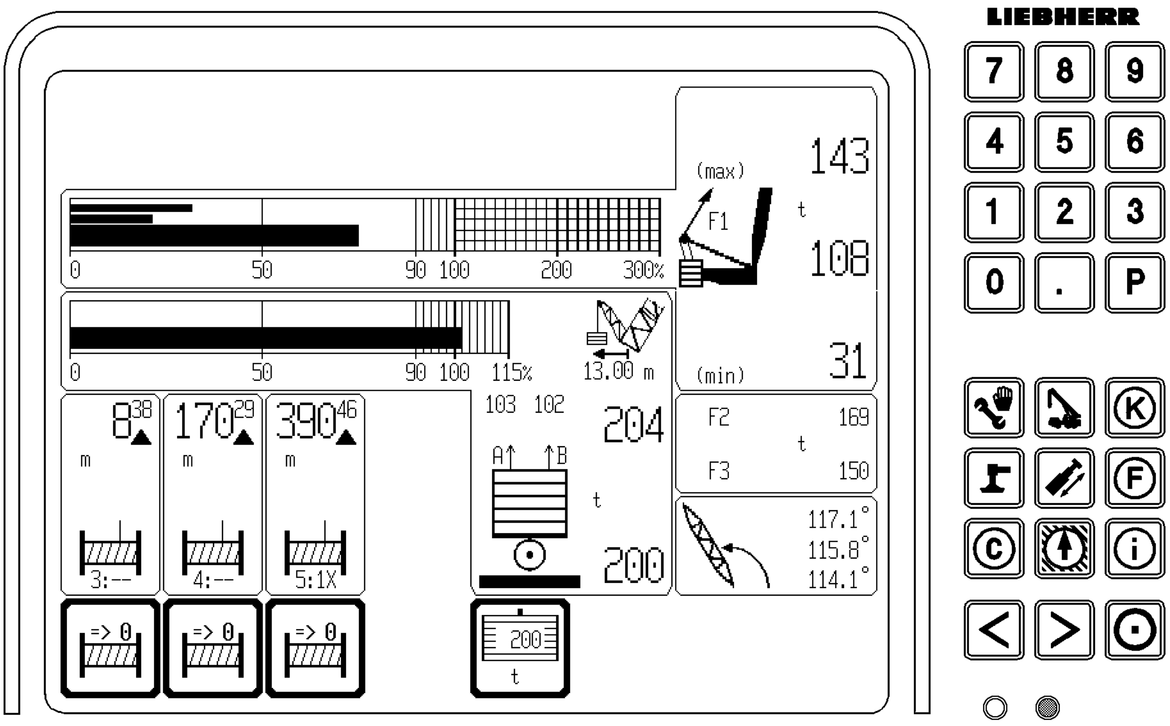
3.5 Raise and lower the ballast trailer with pull cylinders

- Press button (504) to raise the ballast trailer with pull cylinders;
- Press button (505) to lower the ballast trailer with pull cylinders;

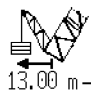
Note: If the suspended ballast is raised or lowered, it must be assured that the ballast trailer is in horizontal position.
If the ballast trailer is at an incline, then the corresponding pull cylinder must be blocked until the ballast trailer is again in horizontal position.

- Press button (506) to block the ballasting cylinder (A) on the left;
- Press button (507) to block the ballasting cylinder (B) on the right.

**D A N G E R: The control panel on the ballast trailer may only be used for installation. During crane operation, the crane operator may not raise or lower the ballast trailer from the control panel, because he cannot see the monitors from there.
During crane operation, the ballast trailer may only be raised or lowered from the crane operator's cab.
When raising or lowering the ballast trailer, it must be ensured that the difference of forces in the ballast guying is not too large. The LICCON shows both forces and sends a warning if the difference of forces is too large.
See also paragraph 8.6 Difference force monitoring of ballast guying.**

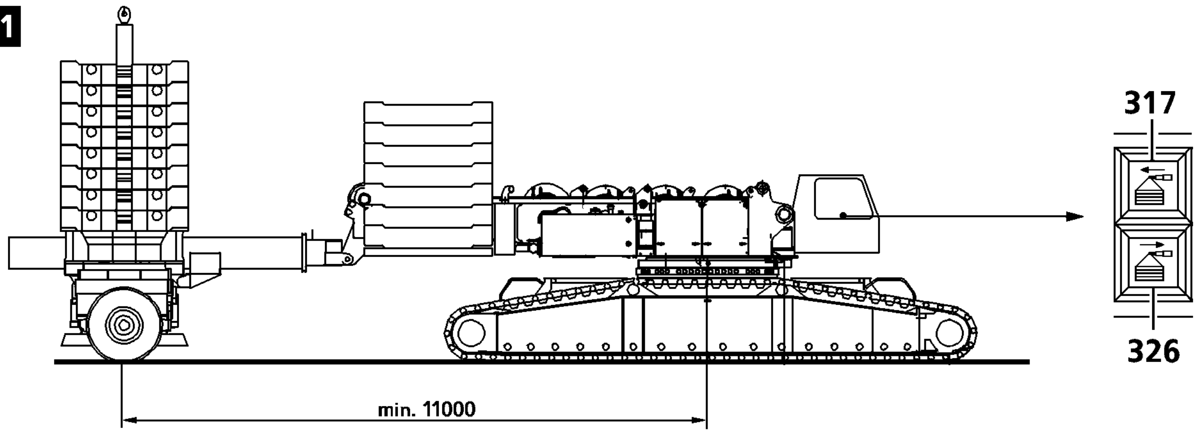


1

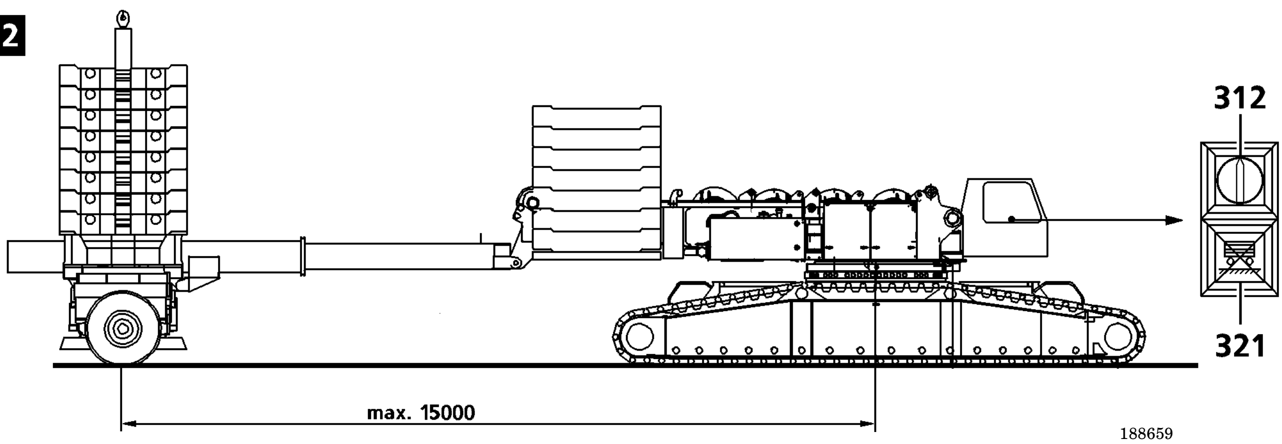


15

11



12



188659

4. **To telescope the ballast trailer in or out**, fig. 11 and 12
The ballast trailer is equipped with a telescoping ballast trailer guide. This makes it possible to match the ballast trailer length to the current surrounding or current lifting task.
The maximum length of the telescoping ballast trailer guide is 15 m and the minimum length is 11 m.
The current actual length (15) is shown on the monitor .

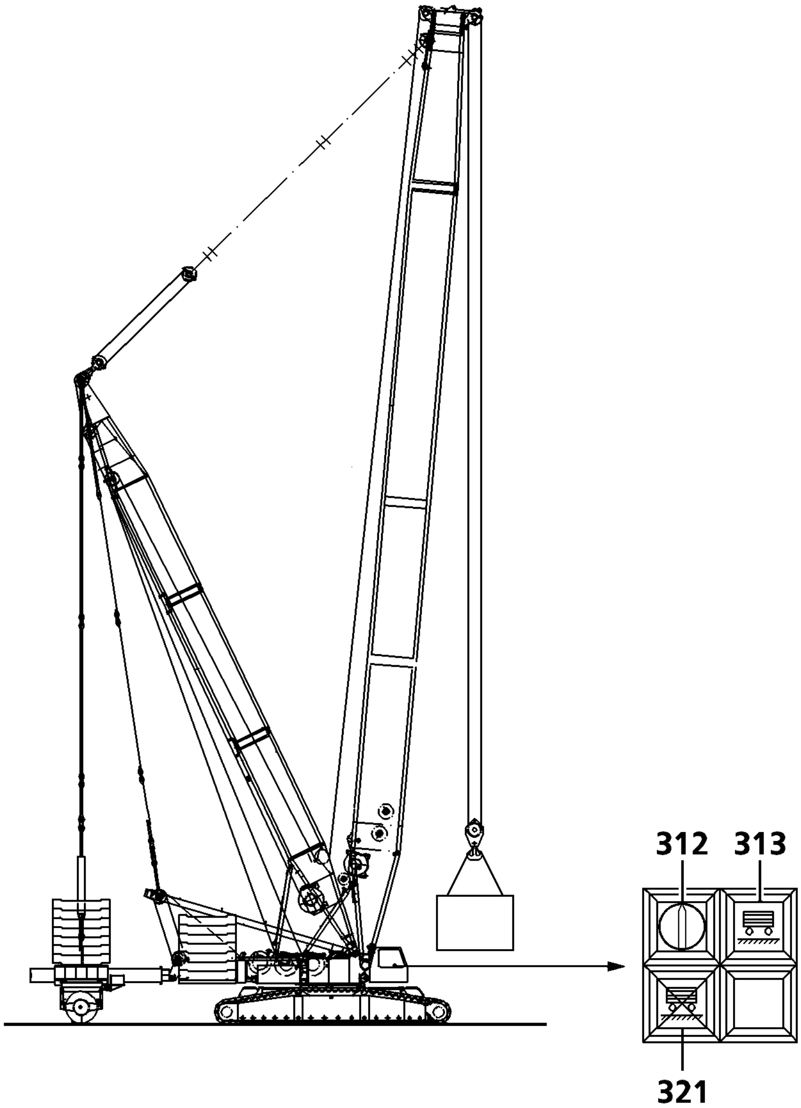
Note: Telescoping in and out is only possible if the wheels of the ballast trailer are set for towing or if the ballast trailer is suspended and the keyed button (312) has been set to "Ballast trailer raised" .

D A N G E R: **If the wheels are not set for towing or if the keyed button (312) has been set for "Ballast trailer raised" and the wheels of the ballast trailer scrape on the ground, then the ballast trailer can be damaged severely.**
There is an increased danger of accidents!

- Press button (317) to telescope the ballast trailer out;
- Press button (326) to telescope the ballast trailer in.

D A N G E R: **Make sure no persons or objects are within the danger zone of the ballast trailer.**
This could cause a serious ACCIDENT!

C A U T I O N: **When telescoping the ballast trailer in and out, the indicator actual length (15) must be monitored. The crane operator may not rely solely on the derrick ballast radius measurement, but must think for himself and check, if the measurement is still correct.**
See also paragraph 8.7 Check the length value sensor on the ballast trailer.



188950

5. Driving with the ballast trailer

The ballast trailer is equipped with computer controlled steering programs.
- Driving in turns;
- Towing;
- Parallel driving;
- Manual re-steering;
- Manual operation for installation .

5.1 General

The computer controlled steering programs driving in turns, towing and parallel driving can only be actuated from the cab.
The manual re-steering, support cylinders and ballasting can be actuated from the cab and from the remote controls.
The manual operation for installation purposes can only be carried out from the control panel.

Prerequisites

- The wheels of the ballast trailer must be in the required travel position;

Note: If the ballast trailer is operated on the ground, then the wheels must be in the correct travel position.
If the ballast trailer is suspended, the wheels can be in any position, if the keyed button (312) had been set to "Ballast trailer raised" . In this case, the crane operator must make sure that the wheels don't scrape.

D A N G E R: **If the ballast trailer is on the ground, the wheel position is not correct and the keyed button (312) has been set to "Ballast trailer raised", then the wheels of the ballast trailer and possibly the crane will be damaged when "driving the crawler" .**

- The travel route for crane and ballast trailer must be level, horizontal and of sufficient load carrying capacity;

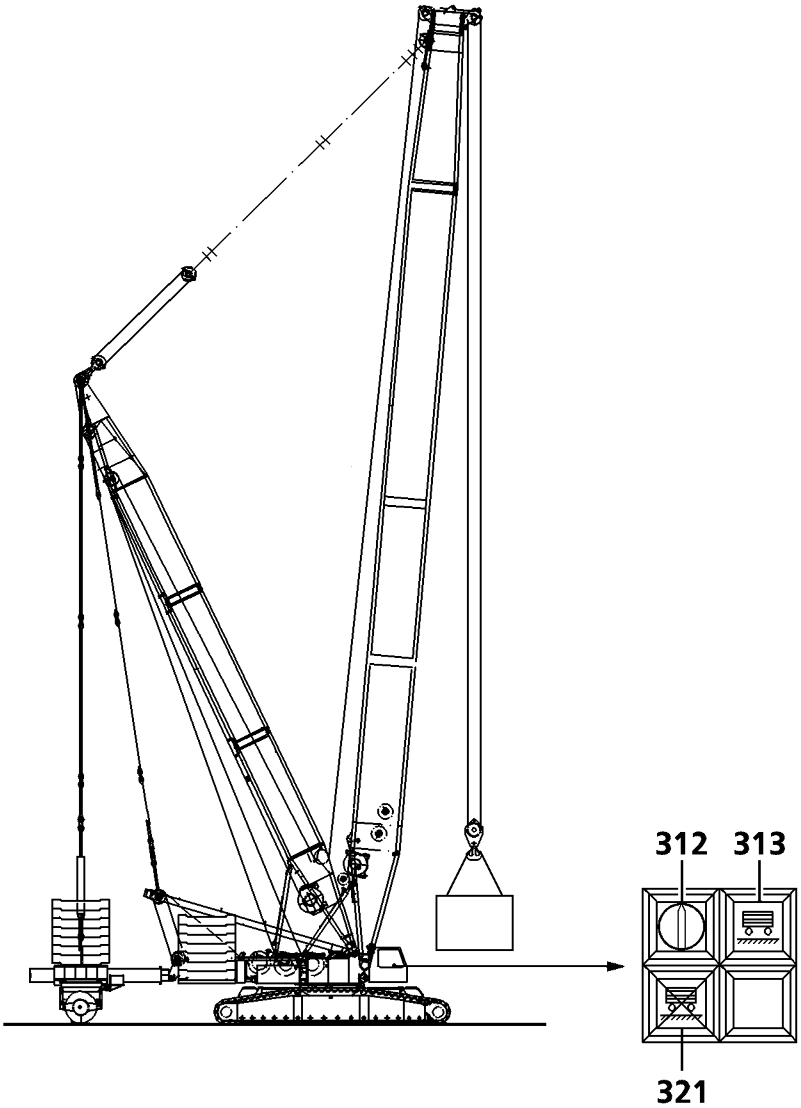
Note: During travel or slewing, a guide must monitor the crane, the luffed up boom as well as the raised load.
Driving with a load, see chapter 4.05, Crane Operation, paragraph Crawler Operation.

- Make sure to drive only at minimum speed, with utmost care and the least possible acceleration as well as careful braking action.

Note: If the ballast trailer is not loaded, then the axles can be moved without relieving the tires.
If the ballast trailer is loaded, then the tires must be relieved by supporting the ballast trailer.

C A U T I O N: **When supporting with loaded ballast trailer it has to be guaranteed that the bolt (18) on the brace of the support cylinder is unlocked.**
Otherwise the ballast trailer will get damaged!

D A N G E R: **Make sure that there are no persons or objects within the turning range of the ballast trailer.**
There is a danger of accidents!



188950

5.1.1 Keyed button (312) ”Ballast trailer raised”

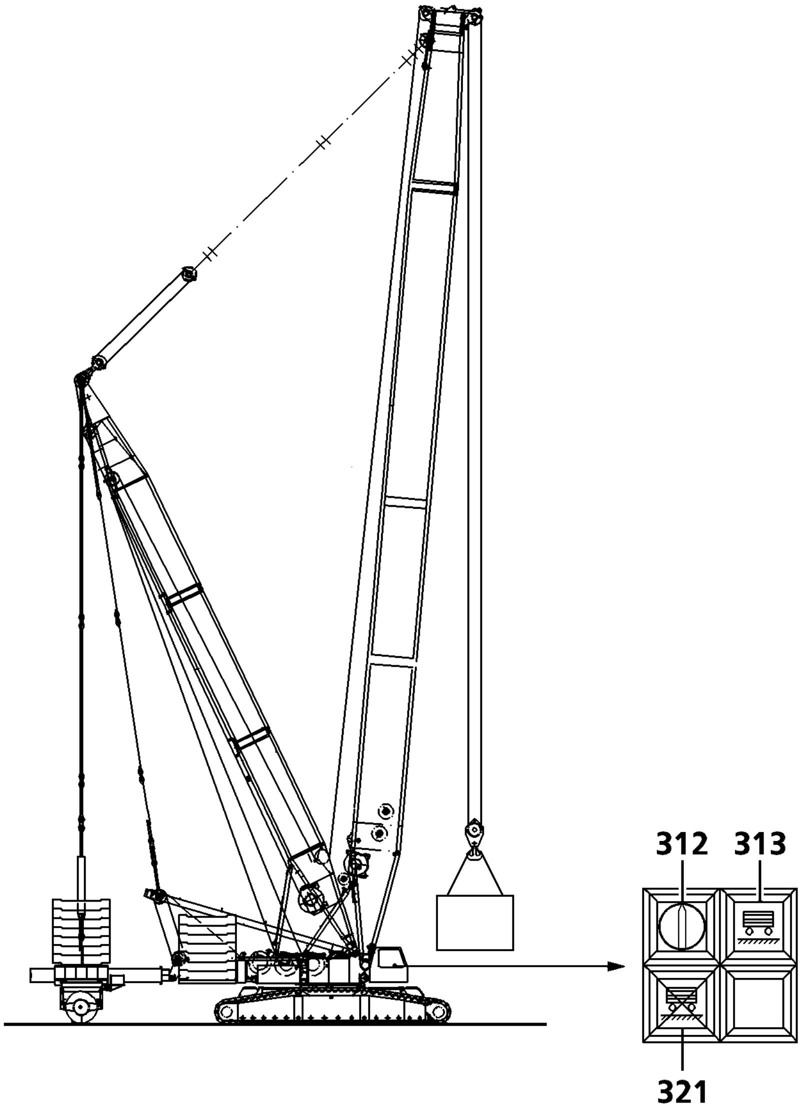
When "driving the crawler" and the keyed button (312) **not** actuated "Ballast trailer not raised", the slewing brake as well as the hydraulic coasting gear are opened.
If the "crawler is driven " with raised ballast trailer (must check visually at all times), the keyed button (312) must be turned on to "Ballast trailer raised" .

D A N G E R: If the ballast trailer is raised off the ground (keep in constant visual check), there is the danger that the wind turns the slewing platform away when "driving the crawler" , for that reason, the keyed button (312) ”Ballast trailer raised” must be turned on immediately.
This action keeps the slewing brake closed when "driving the crawler" , however, the hydraulic coasting gear remains open.
If the ballast trailer scrapes on the ground or gets stuck on the ground when "driving the crawler", causing the slewing platform with the ballast trailer to turn against the crawler gear, the slewing brake will slip. The slewing gear will not be damaged. However, if the wheels of the ballast trailer are not set to towing, the ballast trailer or the crane can be damaged.

C A U T I O N : When the function "Ballast trailer raised" is turned on, the indicator light (313) blinks, it is possible to turn the crane superstructure or to drive the crane even though the wheels of the ballast trailer are not set to driving in turns, towing or parallel driving.

If the function "Ballast trailer raised" is turned on the with the keyed button (312), then this is shown by the blinking indicator light (313) as well as by a red beacon on the crane cab. In addition, the ballast trailer symbol on monitor 1 is shown in suspended condition.

To turn the ”Ballast trailer raised” function off, the button (321) must be pressed.



188950

5.1.1.1 Defined ballast trailer operation

The ballast trailer may not be raised or lowered during travel, it must be raised or lowered before starting out to drive.

The ballast trailer should be

1) definitely set on the ground (keyed button (312) **not** pressed "Ballast trailer not raised").
   This means that the ballast trailer is resting on the ballast trailer tires with a remaining load. This remaining load is so large, that the wind cannot turn the crane superstructure if the slewing gear is released when actuating the crawler.

or

2) definitely raised off the ground (keyed button (312) actuated "Ballast trailer raised").
   This means that the slewing brake is not released when moving the crawler. The wind cannot turn the superstructure away when the crawler is driven.

D A N G E R: The ballast trailer must always be operated in defined mode (safely raised or safely on the ground). Operating the ballast trailer in non-defined mode is prohibited.
If the ballast trailer is not definitely (firmly) set down or not definitely raised, there is an increased danger of accidents!

C A U T I O N: If the ballast trailer wheels scrape on the ground even though the ballast trailer is raised, they can be damaged despite the setting "Ballast trailer raised" .

5.1.1.2 Non-defined ballast trailer operation

D A N G E R: The ballast trailer must always be operated in defined mode (safely raised or safely on the ground). Operating the ballast trailer in non-defined mode is prohibited.
If the ballast trailer is not definitely (firmly) set down or not definitely raised, there is an increased danger of accidents!

Example:
Ballasted ballast trailer is still on the ground, with 1 t .

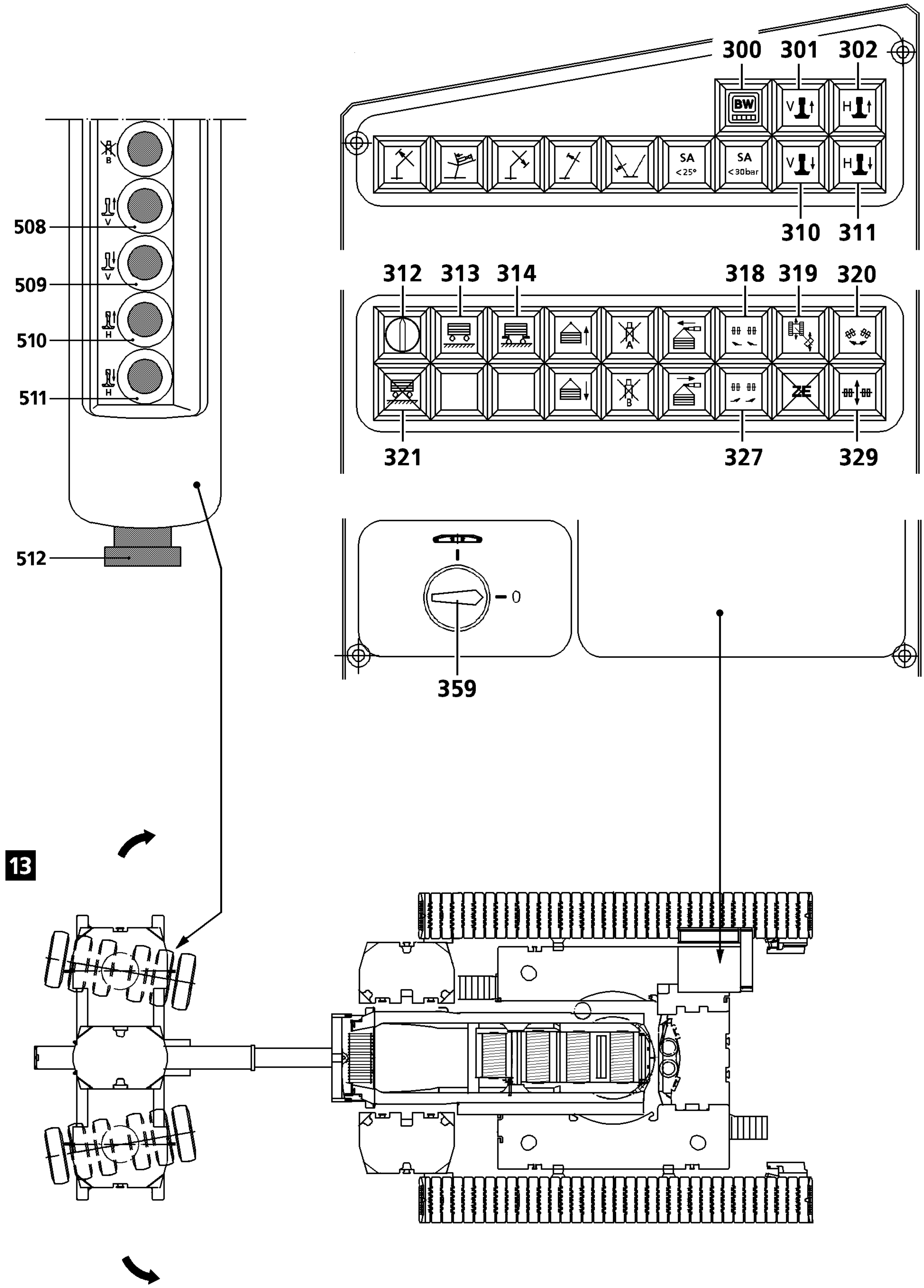
1) With keyed button (312) **not** actuated "Ballast trailer not raised"
   The slewing gear is released when driving the crawler. The wind can turn the superstructure and the load will start to swing back and forth .

D A N G E R: There is an increased danger of accidents due to collision.

or

2) With keyed button (312) actuated "Ballast trailer raised"
   The slewing gear remains applied when driving the crawler. When driving the crawler (in a curve), the ballast trailer tires slip or the slewing brake slips.

C A U T I O N: There is a danger that the ballast trailer or the slewing gear will be damaged due to wear.


300
301
302
BW
SA < 25°
SA < 30bar
310
311
312
313
314
318
319
320
ZE
321
327
329
0
359
508
509
510
511
512
13

188660

5.2 Driving in turns, fig. 13

By telescoping of ballast trailer guide, various turning radii are possible.

Prerequisites
- The crane is at a standstill;
- The ballast trailer is properly installed.

Note: When the ballast trailer is operated on the ground, the wheels must be in the correct travel position. See paragraph 5.2.1 to 5.2.3.
When the ballast trailer is suspended, the wheels can be in any position, if the keyed button (312) is set to "Ballast trailer raised" . In this case, the crane operator must make sure that the wheels don't scrape.

D A N G E R: If the ballast trailer is on the ground, the wheel position is not correct and the keyed button (312) has been set to "Ballast trailer raised", then the wheels of the ballast trailer can be damaged when turning.

5.2.1 Raise the ballast trailer with support cylinders

- Press button (310 and 311) **or**
  button (509 and 511) to extend the support cylinders on the front and rear.

5.2.2 Set axles to turning position

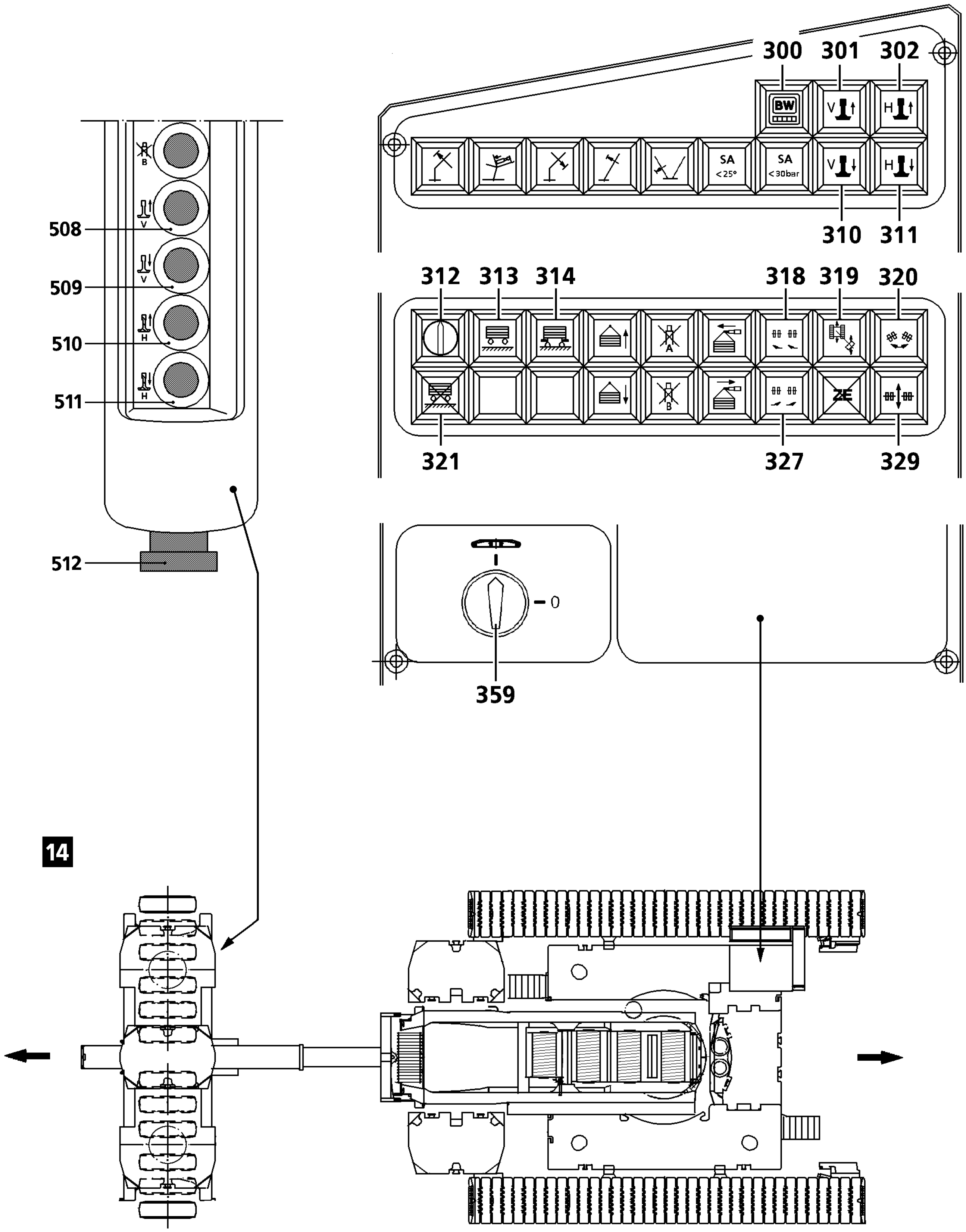
- Press the button (320) , the axles are turned in turning direction;
  The indicator light in the button blinks until the turning position is reached;
  the indicator light in the button stays on when the turning position is reached.

Note: If one of the wheel sets leaves the given angle, then the indicator light in the button (320) blinks and the axles must be reset as described above.

5.2.3 Lower the ballast trailer with support cylinders

- Press button (301 and 302) **or**
  button (508 and 510) to retract the support cylinders on the front and rear;
- The indicator light (314) stays on when the supports for the ballast trailer are retracted.

Note: The release for ”turning the slewing platform” is only given when both axles are in turning direction and the support cylinders are retracted.


300
301
302
BW
SA <25°
SA <30bar
310
311
312
313
314
318
319
320
ZE
321
327
329
I
0
359
508
509
510
511
512
14

188661

5.3 **Towing**, fig. 14

Prerequisites
- The crane is at a standstill;
- The ballast trailer is properly installed;
- The rotary switch (359) is on crawler operation (vertical position).

Note: If the ballast trailer is operated on the ground, then the wheels must be in the correct travel position. See paragraph 5.3.1 to 5.3.3.
When the ballast trailer is suspended, the wheels can be in any position, if the keyed button (312) is set to "Ballast trailer raised" . In this case, the crane operator must make sure that the wheels don't scrape.

D A N G E R: If the ballast trailer is on the ground, the wheel position is not correct and the keyed button (312) has been set to "Ballast trailer raised", then the wheels of the ballast trailer and the crane can be damaged when "driving the crawler" .

5.3.1 Raise the ballast trailer with support cylinders
- Press button (310 and 311) **or**
  button (509 and 511) to extend the support cylinders on the front and rear.

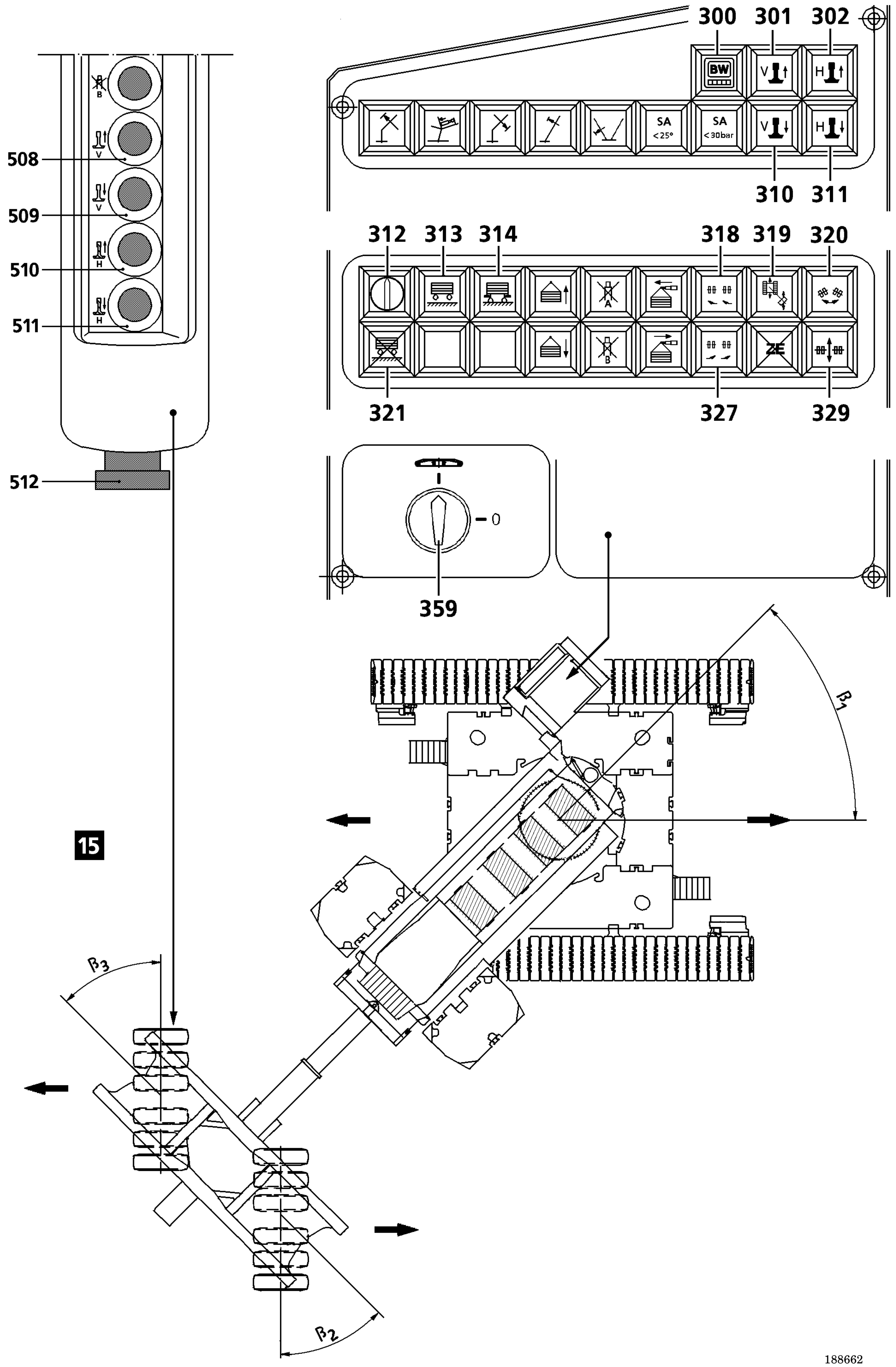
5.3.2 Set axles to towing position
- Press the button (329) , the axles are set to towing position;
  The indicator light in the button blinks until the towing position is reached;
  the indicator light in the button stays on when the towing position is reached.

Note: After reaching the towing position, the ballast trailer can be telescoped. After reaching the towing position, when driving the crawler, it is possible to change the operating mode from towing to the operating mode manual re-steering and back.
If the operating mode towing is selected when it is in manual re-steering, then the indicator light in the button (329) blinks until the towing position is reached.
If one of the wheel sets leaves the given angle, then the indicator light in the button (329) blinks and the axles must be reset as described above.

In general, the wheel sets only move when either buttons (318 or 327 or 329) are pressed in the corresponding operating mode or when the crawler is driven.

5.3.3 Lower the ballast trailer with support cylinders
- Press button (301 and 302) **or**
  button (508 and 510) to retract the support cylinders on the front and rear;
- The indicator light (314) stays on when the supports for the ballast trailer are retracted.

Note: The release for ”towing” is only given when both axles are in travel direction (zero position) and the support cylinders are retracted.


300
301
302
BW
V
H
SA <25°
SA <30bar
310
311
312
313
314
318
319
320
A
B
ZE
321
327
329
I
0
359
508
509
510
511
512
15
β1
β2
β3
188662

5.4 Parallel driving, fig. 15

Prerequisites
- The crane is at a standstill;
- The ballast trailer is properly installed;
- The rotary switch (359) is on crawler operation (vertical position).

Note: The wheel position of the ballast trailer must be in parallel driving, regardless if the "Ballast trailer is on the ground" or if the "Ballast trailer is suspended".
In any other wheel position, the control switches to the settings for towing.

D A N G E R: **If the ballast trailer is on the ground, the wheel position is not correct and the keyed button (312) has been set to "Ballast trailer raised", then the wheels of the ballast trailer and the crane can be damaged when "driving the crawler" .**

5.4.1 Raise the ballast trailer with support cylinders

- Press button (310 and 311) **or**
  button (509 and 511) to extend the support cylinders on the front and rear.

5.4.2 Set axles to parallel position

- Press the button (319) , the axles are set to parallel position;
  The indicator light in the button blinks until the parallel position is reached;
  the indicator light in the button stays on when the parallel position is reached.

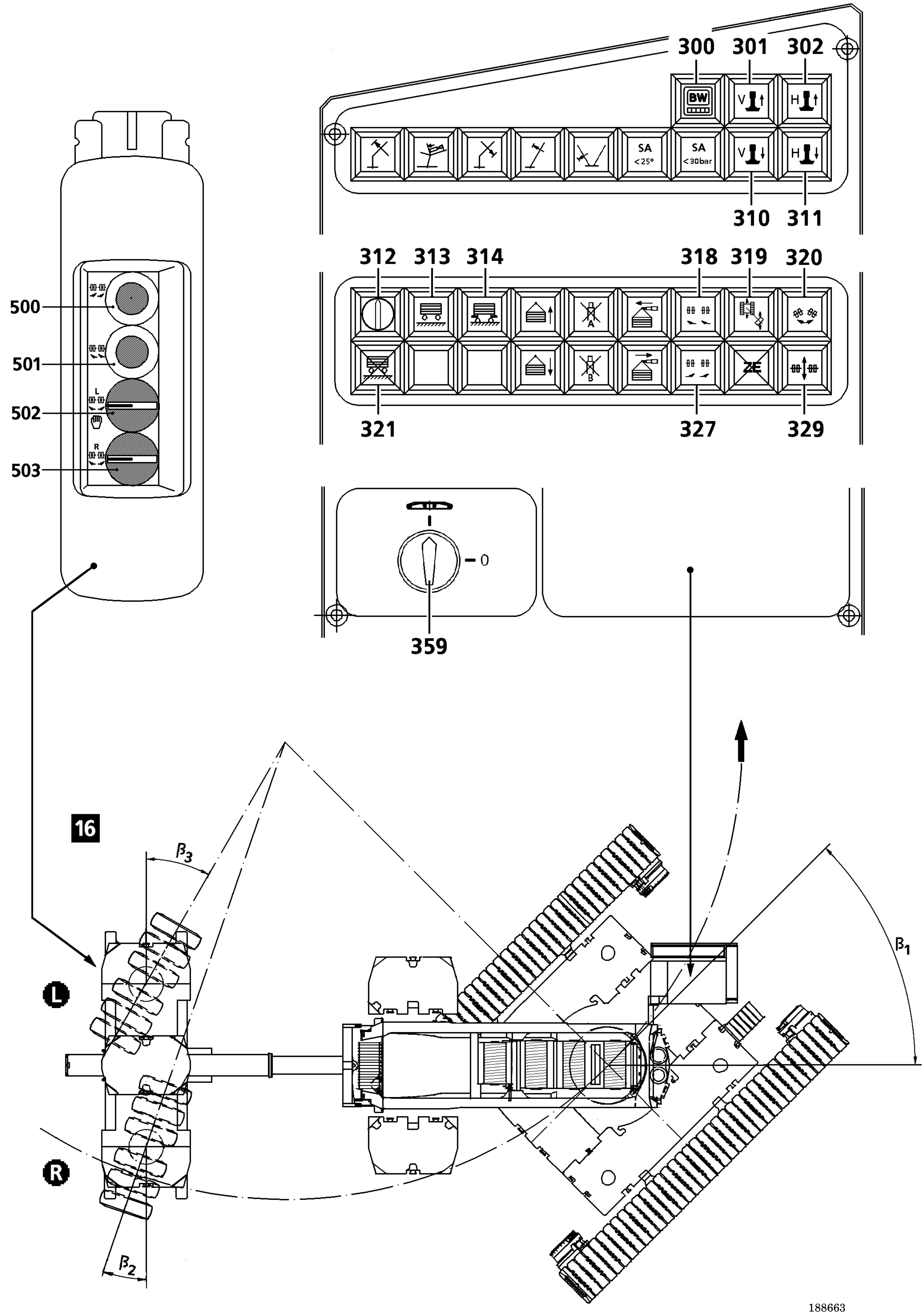
Note: If one of the wheel sets leaves the given angle, then the indicator light in the button (319) blinks and the axles must be reset as described above.

5.4.3 Lower the ballast trailer with support cylinders

- Press button (301 and 302) **or**
  button (508 and 510) to retract the support cylinders on the front and rear;
- The indicator light (314) stays on when the supports for the ballast trailer are retracted.

Note: The crawler travel drive is locked until the axles are in parallel position.
When "driving the crawler", the slewing brake of the crane remains applied, the hydraulic coasting is released.
If the angles β_2, β_3 deviate by more than the permissible limit value as compared to β_1 , then the crawler travel gear is stopped.
The indicator light (319) blinks.
The crawler travel gear will only be released again when the axles are turned to the given angle, as described above.

C A U T I O N: **In parallel travel,**
- **the tracks may not be steered, but they are not locked.**
  If they are steered anyway, then the mechanical slewing brake can slip, until the crawler travel gear is stopped due to angle deviation .
- **one person must monitor the side tire distortion. If the distortion is more than 100 mm, then the position of the axles must be corrected.**


300
301
302
310
311
312
313
314
318
319
320
321
327
329
359
500
501
502
503
SA <25°
SA <30bar
16
L
R
β1
β2
β3
188663

5.5 Manual re-steering, fig. 16

Prerequisites
- The ballast trailer is properly installed;
- The rotary switch (359) is on crawler operation (vertical position).

5.5.1 Steer and re-steer the axles

Prerequisites
- Operating mode towing has been selected
  and the ballast trailer axles have reached towing position;

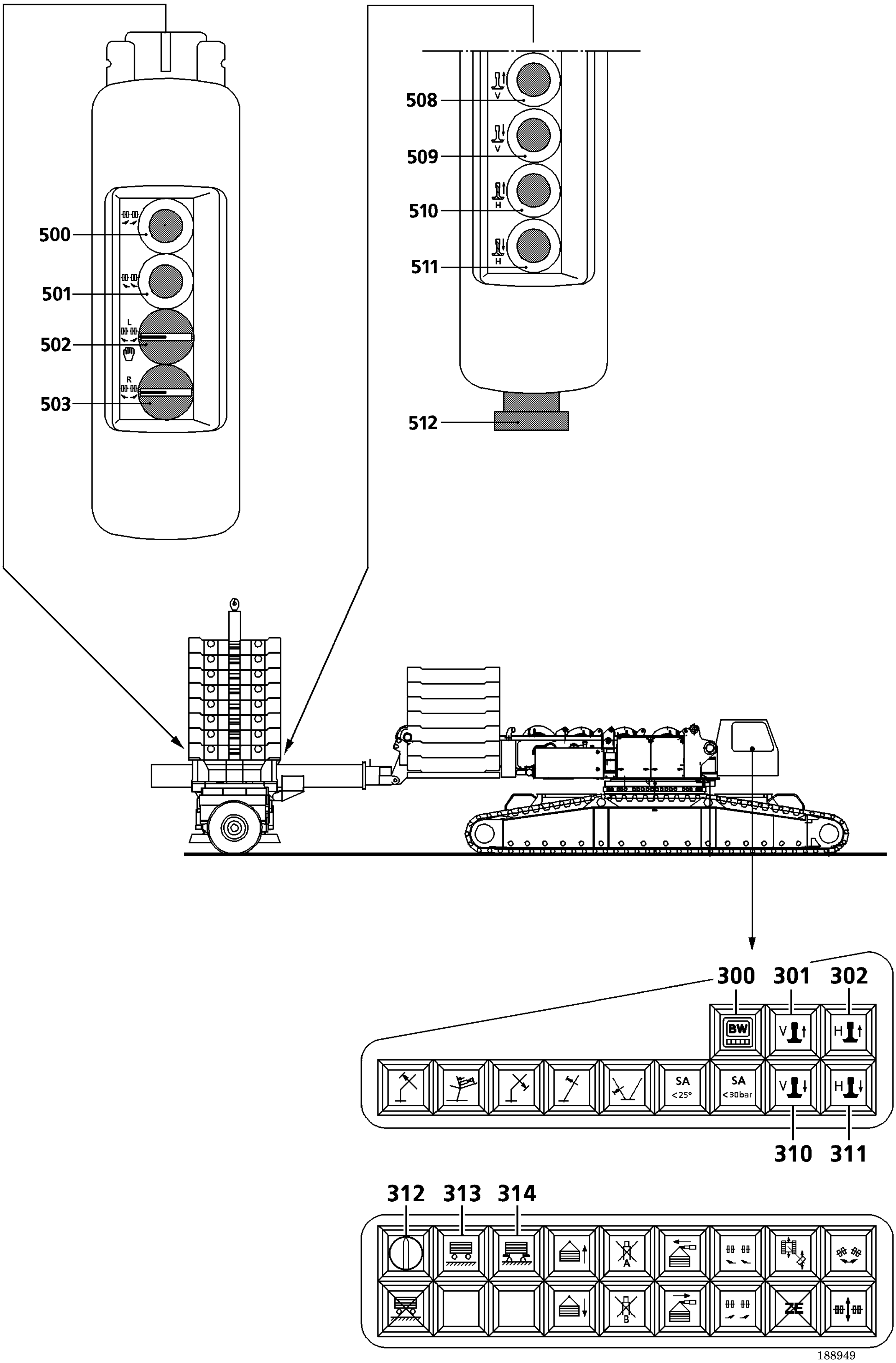
- Press the button (318) **or** (501), the ballast trailer wheels turn to the right;
- Press the button (327) **or** (500), the ballast trailer wheels turn to the left.

The right set of wheels is controlled by the computer-controlled steering program in such a way, that there is always a steering center. The angle $ß_1$ is determined by the driving action of the crawler and the angle $ß_3$ is determined by the steering action of the operator, whereby angle $ß_2$ is continuously re-adjusted.
Changing from manual re-steering operating mode to towing and back, after reaching the towing position, is possible while driving the crawler. If the manual re-steering operating mode is selected from the towing operating mode, then the indicator lights in the buttons (318 and 327) light up.

Note: The left set of wheels can be steered to a given angle $ß_3$. It is not possible to move the wheels past this limit.
The right set of wheels is regulated according to the steering center. If the re-steered right set of wheels cannot follow the steered left set of wheels, then the steered left set of wheels is stopped until the re-steered right set of wheels has caught up. If the right set of wheels leaves the given angle anyway, then the indicator lights in the buttons (318 and 327) start to blink and you must start again with towing mode.
If the angle $ß_1$ of the slewing platform exceeds the given dimension, then the system shifts over automatically to towing mode. The indicator lights in the buttons (318, 327 and 329) blink. When the towing position is reached, the axles can be re-steered again manually. The indicator lights in the buttons (318 and 327) light up.

In general, the sets of wheels only move if the buttons (318 or 327 or 329) are pressed in the corresponding operating mode or if the crawler is driven.

5.11 BALLAST TRAILER



5.6 Manual operation for installation

The ballast trailer is equipped with a program which makes it possible to turn each ballast trailer axle individually .

Prerequisites

- The crane is at a standstill;
- The ballast trailer is properly installed.

5.6.1 Raise the ballast trailer with support cylinders

- Press button (310 and 311) **or**
  button (509 and 511) to extend the support cylinders on the front and rear.

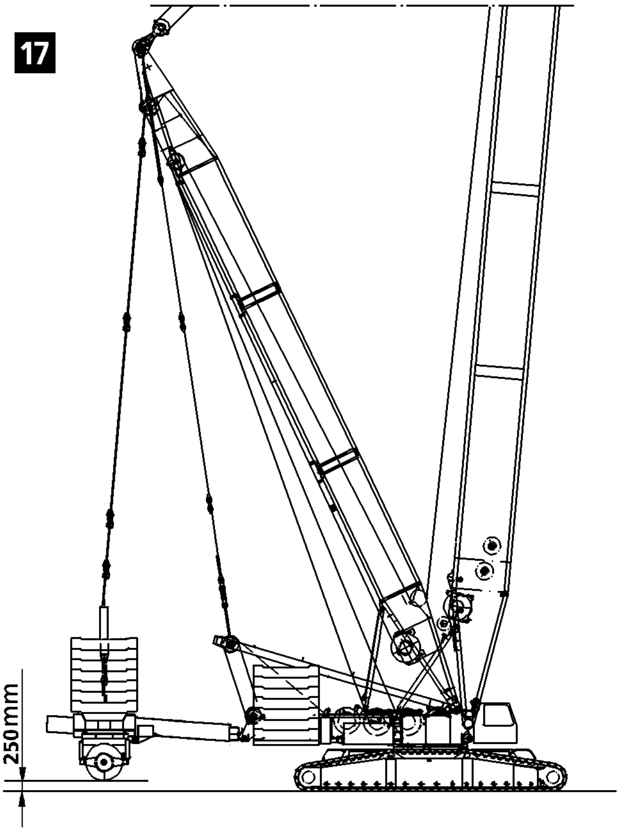
5.6.2 Adjust the axles

- Turn knob (502) to the right, the left axle turns to the right;
- Turn knob (502) to the left, the left axle turns to the left;
- Turn knob (503) to the right, the right axle turns to the right;
- Turn knob (503) to the left, the right axle turns to the left.

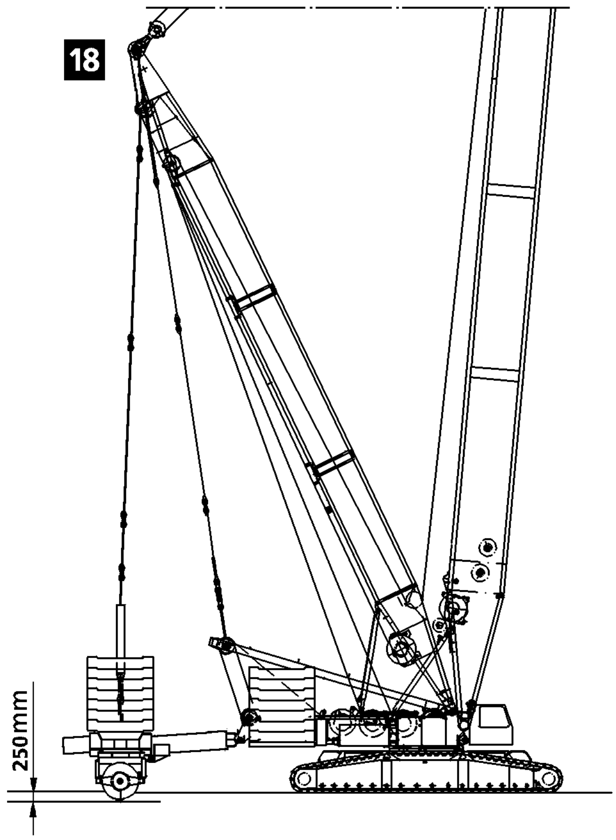
5.4.3 Lower the ballast trailer with support cylinders

- Press button (301 and 302) **or**
  button (508 and 510) to retract the support cylinders on the front and rear;
- Indicator light (314), supports for ballast trailer are retracted, lights up.

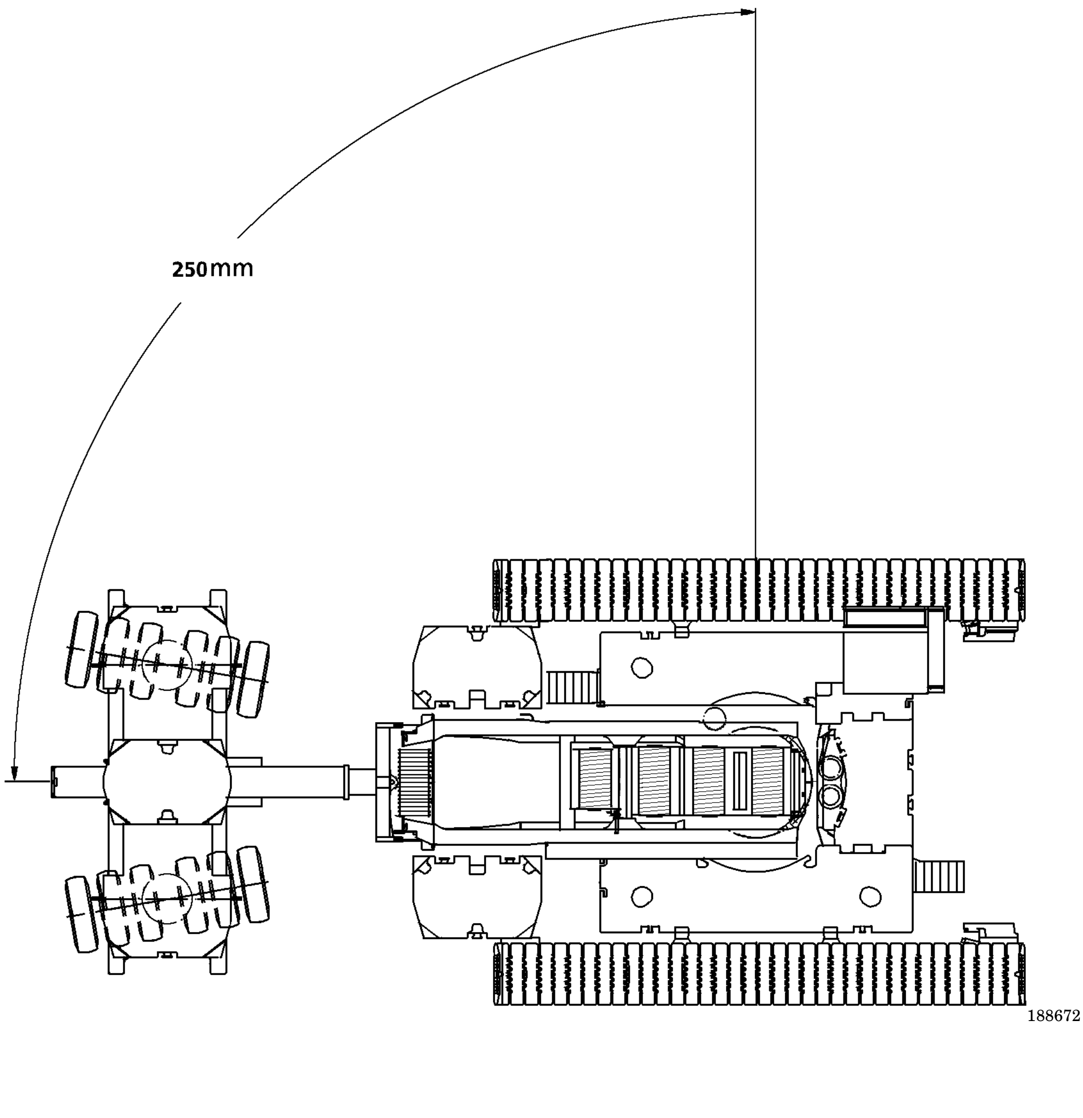
17



18



19

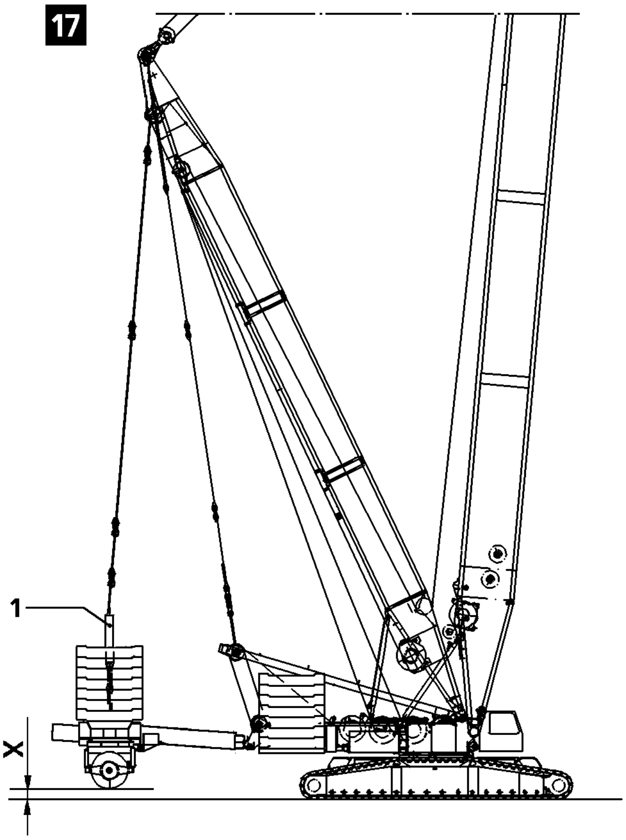


6. Maximum permissible ground level deviation for towing, parallell or turning, fig. 17, 18 and 19

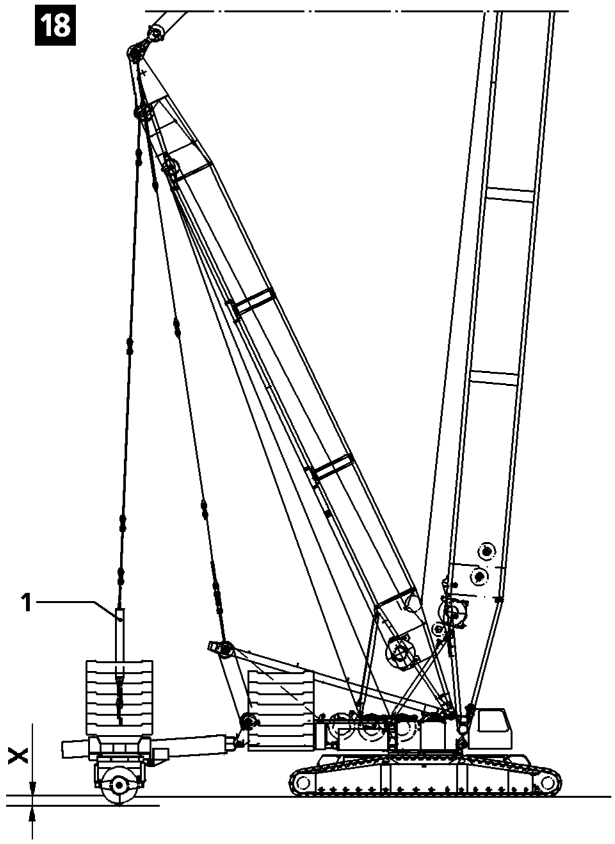
Ground level changes between the standing surface of the crane and the ballast trailer during driving or turning.

D A N G E R: The difference in ground level between the ballast trailer driving surface in relation to the crane's driving surface for towing and diagonal driving may be no more than max. ± 250 mm .
The difference in ground level between the ballast trailer driving surface in relation to the crane's driving surface for turning may be no more than max. ± 250 mm (constant uphill or downhill) for a 90° turning range.

17



18



188679

6.1 Compensation of max. permissible ground level deviation via pull cylinders, fig. 17 and 18

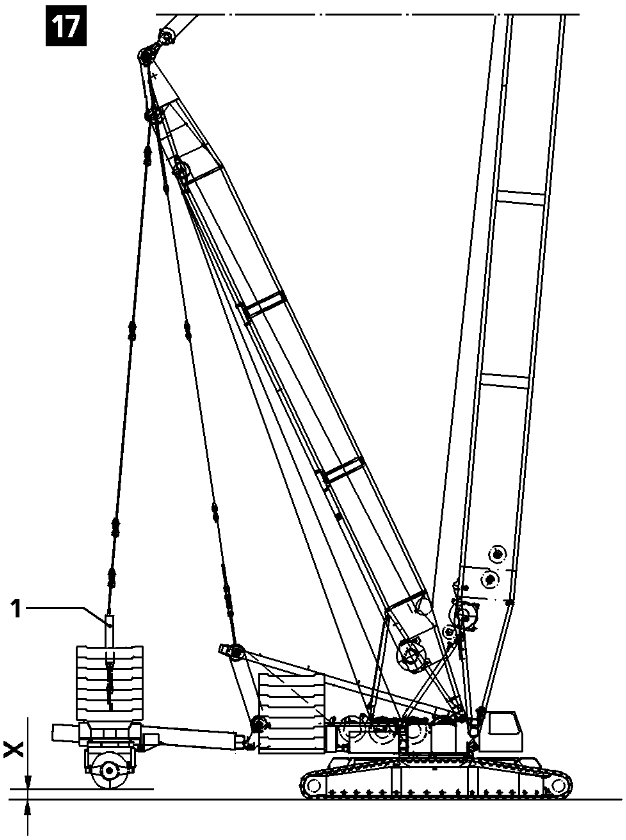
By raising and lowering the pull cylinders (1), the permissible ground level deviation can be compensated for.

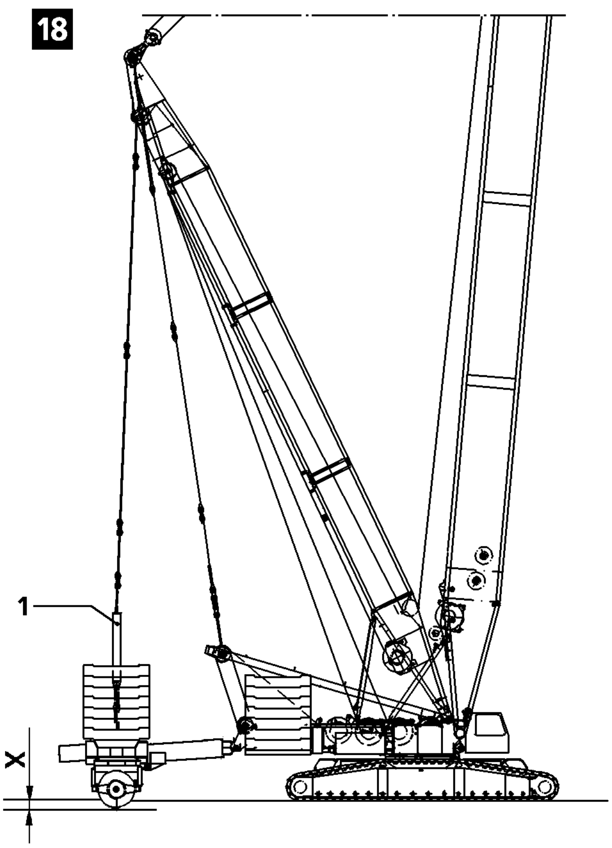
Ballast trailer radius 11 m

Ballast trailer radius **R 11 m**	**with** Quick connection		**without** Quick connection	
	Cylinder stroke **mm**	Dimension X **mm**	Cylinder stroke **mm**	Dimension X **mm**
max. permissible ground level deviation		± 250		± 250
Pull cylinder retracted	0	+ 1440	0	+ 1140
Pull cylinder in nominal position	1320	0	1060	0
Pull cylinder extended	2180	- 810	2180	- 1040

Ballast trailer radius 13 m

Ballast trailer radius **R 13 m**	**with** Quick connection		**without** Quick connection	
	Cylinder stroke **mm**	Dimension X **mm**	Cylinder stroke **mm**	Dimension X **mm**
max. permissible ground level deviation		± 250		± 250
Pull cylinder retracted	0	+ 1440	0	+ 1160
Pull cylinder in nominal position	1400	0	1140	0
Pull cylinder extended	2180	- 760	2180	- 1010



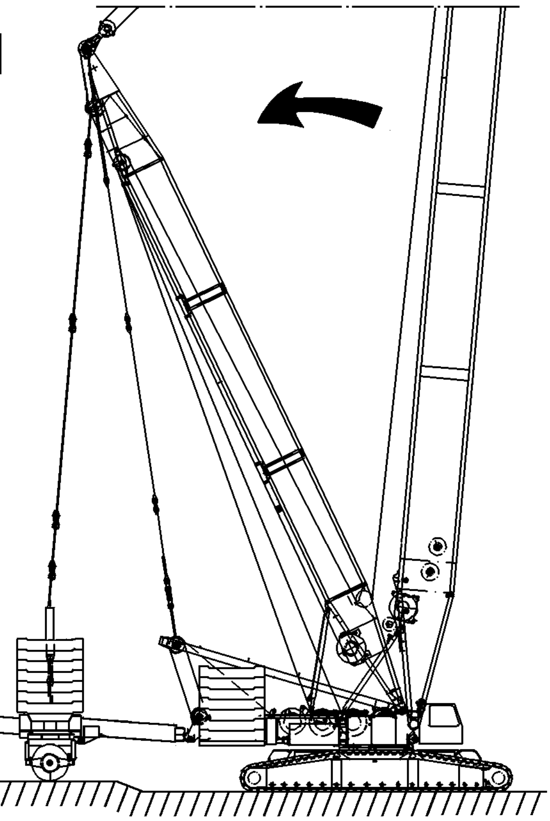


188679

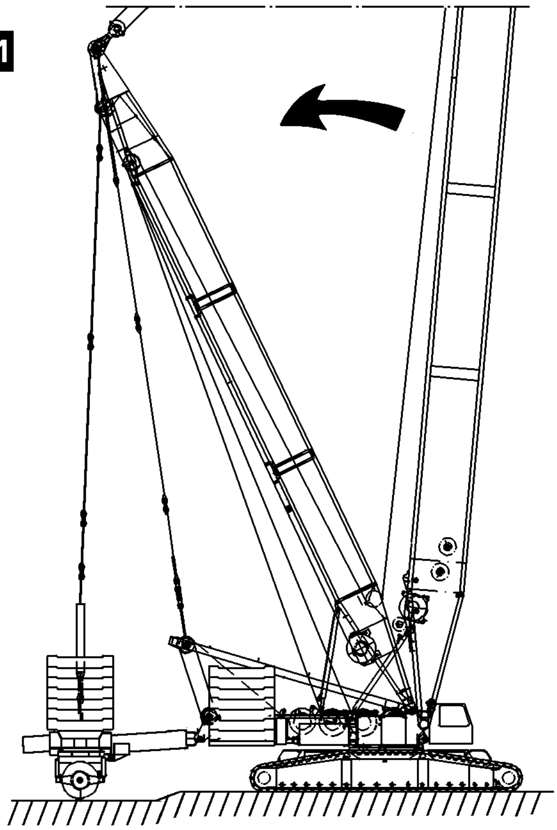
Ballast trailer radius 15 m

Ballast trailer radius **R 15 m**	**with** Quick connection		**without** Quick connection	
	Cylinder stroke **mm**	Dimension X **mm**	Cylinder stroke **mm**	Dimension X **mm**
max. permissible ground level deviation		± 250		± 250
Pull cylinder retracted	0	+ 1660	0	+ 1390
Pull cylinder in nominal position	1630	0	1370	0
Pull cylinder extended	2180	- 550	2180	- 810

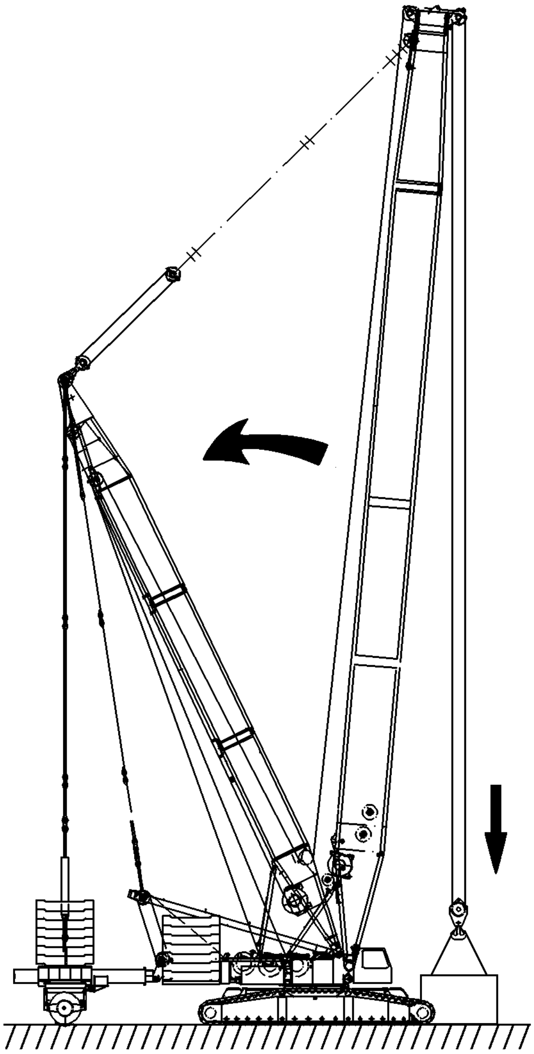
20



21



22



188673

7. Safety guidelines for travel operation

7.1 Relapse cylinder

The steepest position of the main mast is turned off in all operating modes via the overload safety system. This stops all winches, which effects further reduction of radius.

Note: However, there are cases where the relapse cylinders move mechanically to block position due to a complete crane system movement to the rear.

When driving the crawler crane, if the ballast trailer is lifted due to uneven ground conditions, the force on test point 1 (guying between the SA bracket and the derrick head) increases very quickly and the crane is overloaded. If the ballast trailer drops due to uneven ground, the force on test point 1 drops, which causes the ballast trailer to lift off the ground,

C A U T I O N: Slewing gear coasting!!

or the complete boom system is pulled to the rear, which means there is the danger that the relapse cylinders are pulled in to block position. There is no shut off by the LMB . The crane operator must make a correction of the changing forces on test point 1 already when the pre-warning of the LMB is issued, by corresponding actuation of the pull cylinders on the ballast .
If this is not done, there is a danger of accidents !!!

When turning the ballast trailer in case of uneven ground conditions, the same danger exists as when driving, which means the load threshold 1 can be exceeded or fallen below.

7.2 Block position of relapse cylinders

The block position is not possible for normal crane operation without bypassing the overload safety system. However, if a block position should occur, the movement is shut off and the indicator light in the instrument panel lights up.

D A N G E R: **If a block position of the relapse cylinders occurs in emergency operation, then the horn will sound and an indicator light in the instrument panel lights up. The movements, which have just been made must be stopped immediately. There is an increased risk of accidents since the movements are not automatically stopped!**

Check the indicator light which lights up in the crane cab to determine which limit switch on which relapse cylinder has been triggered.
The last movement, which had been made, must be reversed until the corresponding limit switch is cleared again.

7.2.1 **Case 1**, fig. 20

When driving the crane with the boom in steepest position, the ballast trailer could drop to a different level. This could pull the complete boom system to the back and there is a danger that the relapse cylinders move to block position.
The same danger occurs when turning, if the ballast trailer drops due to differences in level.

Note: When operating the ballast trailer, the movements "drive crawler" and "turning" are turned off automatically by the signals "main boom relapse cylinder on block" or "Derrick relapse cylinder on block" .

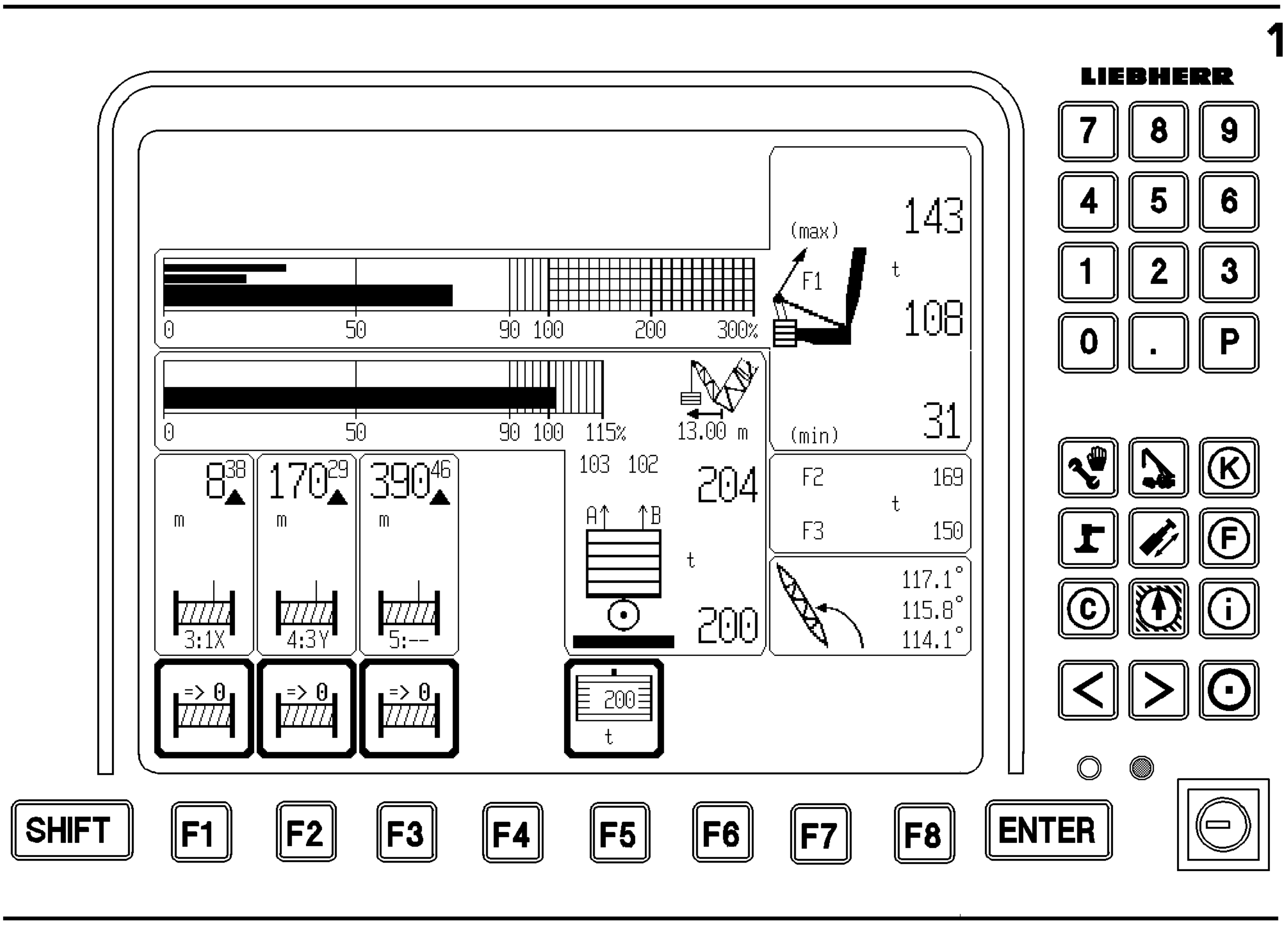
7.2.2 **Case 2**, fig. 21

If the level under the crane increases, the boom system is also pulled backward. There is a danger that the relapse cylinders move to block position .

Note: When operating the aballast trailer, the movments "drive crawler" and "turning" are turned off automatically by the signals "main boom relapse cylinder on block" or "Derrick relapse cylinder on block" .

7.2.3 **Case 3**, Fig. 22

When setting down the load with the hoist gear, the crane is relieved. This causes the boom to move backward. **The hoist gear is not shut off.**


1
LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
K
F
C
i
(max)
143
F1
t
108
(min)
31
0
50
90 100
200
300%
0
50
90 100
115%
13.00 m
8
38
m
170
29
m
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
=> 0
=> 0
200
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

188681

8. LICCON overload safety system

8.1 General

Prerequisites:
- The required derrick ballast has been placed, according to the load capacity chart;
- the derrick is in operating position.

8.1.1 Pre-adjustments

- The LICCON overload safety device has been set and confirmed to reflect the data given in the load capacity chart.
- Enter the actual ballast weight into the LICCON .

Note: Set the derrick ballast - see chapter 4.03, paragraph 1.5.
The required ballast must be determined according to data given in the load capacity chart.

D A N G E R: **The adjusted derrick ballast must match the actual ballast .**
Incorrect entry of ballast weight can cause dangerous operating situations.

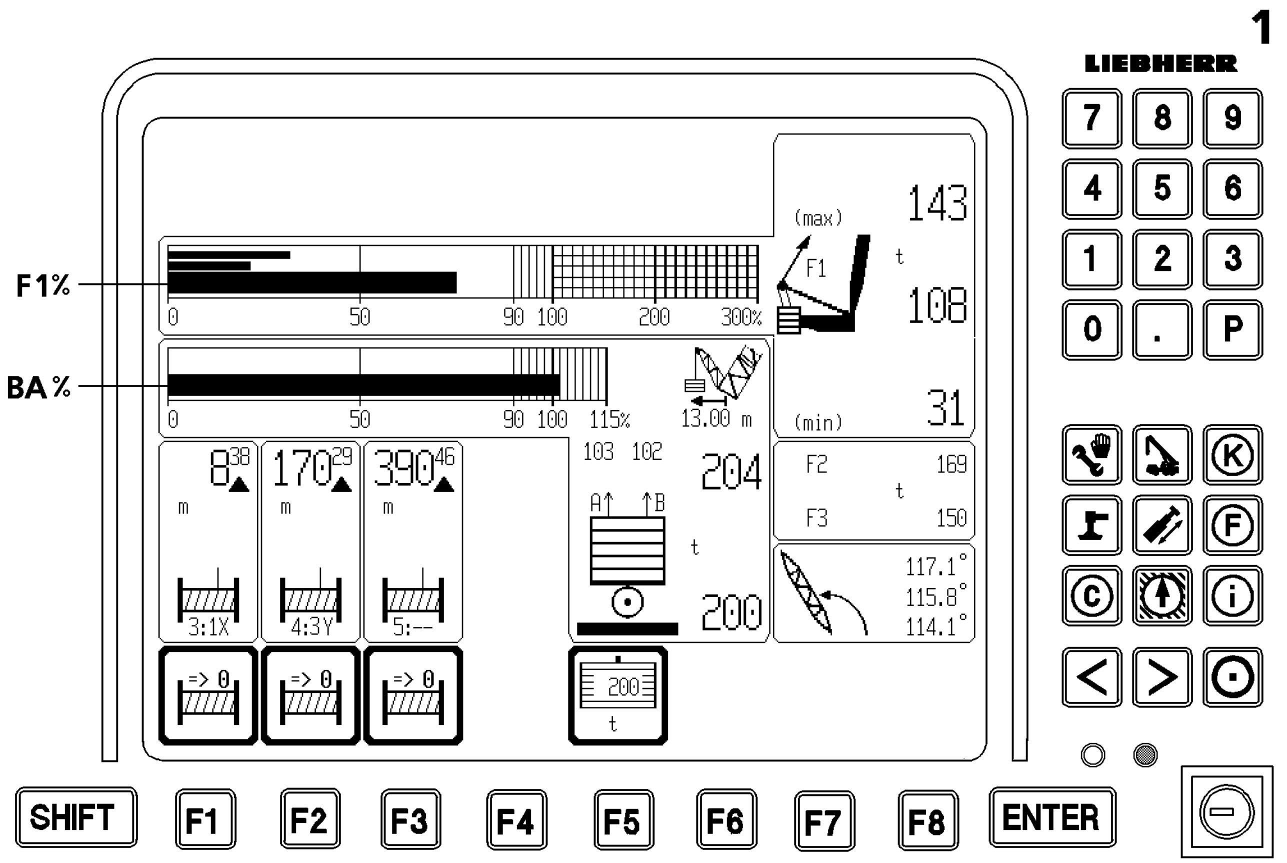
8.1.2 Operation

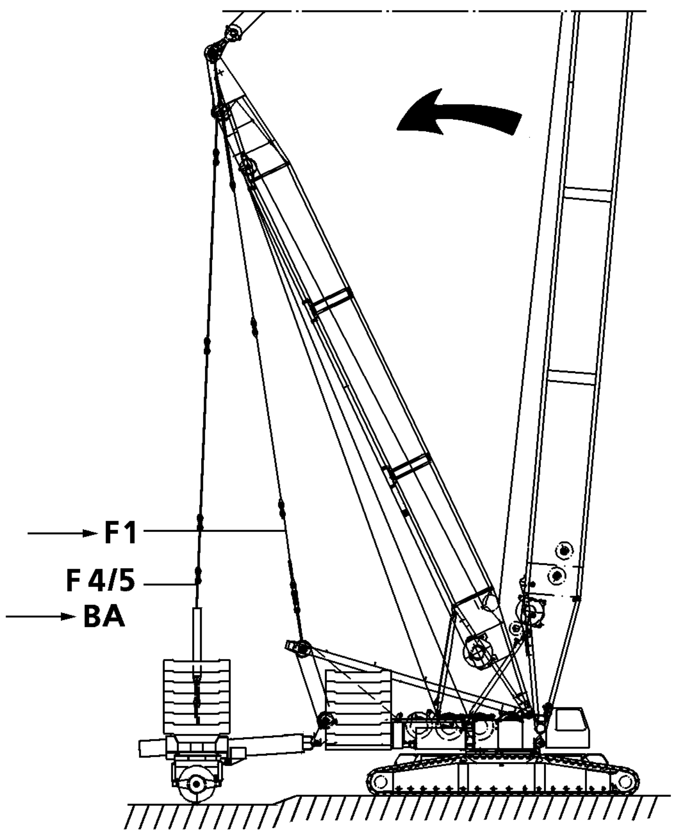
For the operation with derrick ballast observe all guidelines given in chapter 4.02, paragraph 6.1 to 6.3.

D A N G E R: **Make sure that there are no persons or obstacles within the slewing range of the derrick ballast.**
While turning, a guide must be available to monitor the boom, derrick and the derrick ballast to prevent a collision.
When turning with a load and suspended ballast (suspended derrick ballast), the slewing movement and braking action must be initiated very sensitively.
In case of jerky initiation of a slewing movement or braking action, the load or the suspended ballast (suspended derrick ballast) can start to swing. This can cause the boom to break off or cause the crane to topple over.

Note: If the **suspended derrick ballast** must be moved over any obstacles or if it must be set down at a different level than the crane, there is the possibility to raise or lower the **suspended derrick ballast** with the pull cylinders.
See paragraph 3.5 Raising and lowering the derrick ballast with pull cylinders and 8.8 Difference force monitoring of ballast guying.

D A N G E R: **The derrick ballast must be in horizontal position when raising or lowering it with the pull cylinders , otherwise there is a danger of tipping over.**
Monitor the extension condition of the ballasting cylinders.


1
LIEBHERR
F1%
BA%
(max)
143
F1
t
108
0
50
90
100
200
300%
115%
13.00 m
(min)
31
8
m
170
m
390
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


F1
F 4/5
BA

188680

8.2 Safety notes

- The test points must be checked for function before crane operation .
- The crane must be aligned horizontally on the job site.
- The weight of the load to be lifted must be known.
- The placement surface of the derrick ballast may not be more than max. 0.25 m above or 0.25 m below the placement surface of the crane.
- The placement area for the suspended derrick ballast at the end of the load lift must be level, horizontal and of sufficient load carrying capacity to take on the weight safely.

C A U T IO N : **Before setting down the load and suspended derrick ballast, the crane operator must make sure that they can be placed down safely.**

- There may be no obstacles within the slewing range of the crane, the derrick ballast and the load.
- A guide or the crane operator must monitor the derrick ballast, when it is being raised.

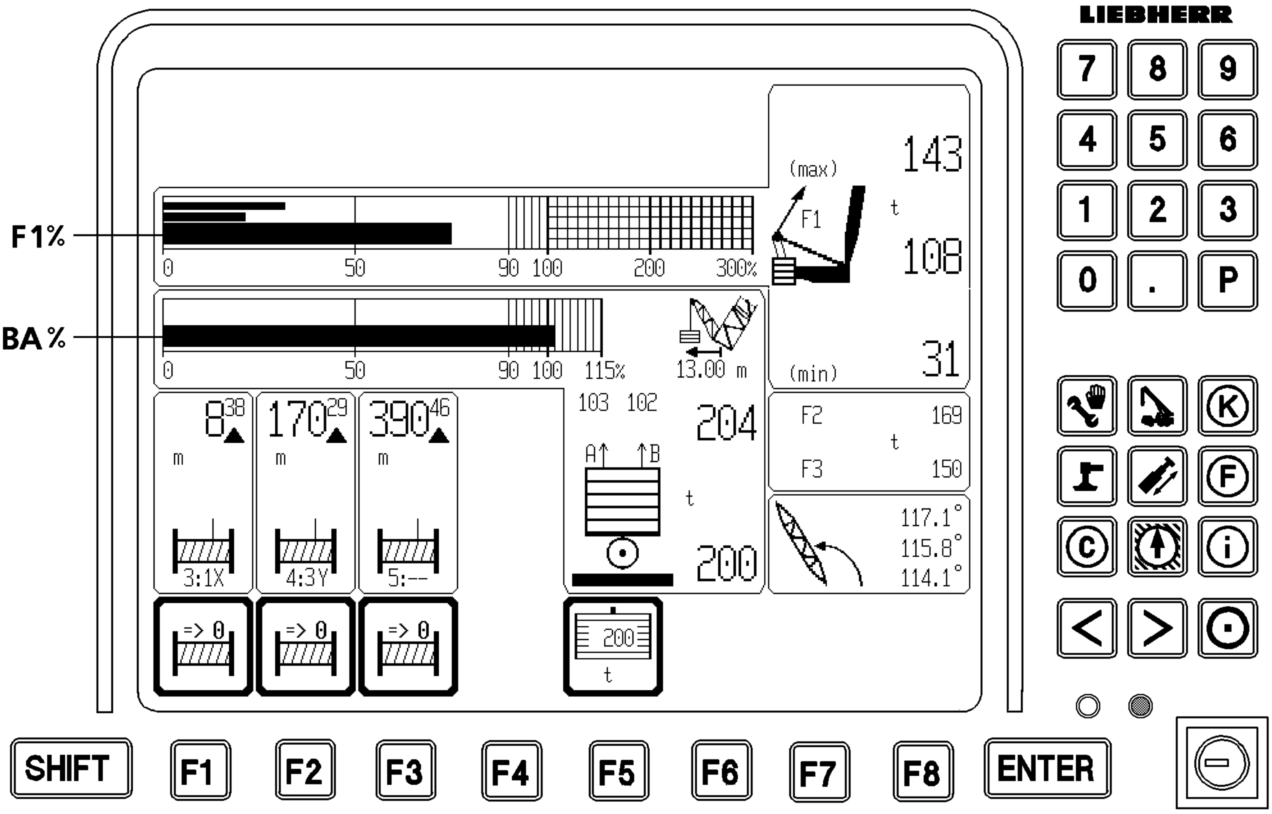
- When taking on a load, **do not pull it diagonally**, which means the derrick ballast, the center of rotation of the slewing platform and the load must be along one line !
  This ensures that the derrick ballast is lifted off the ground and placed down again by actuating the pull cylinders **before** placing the ballast plates .

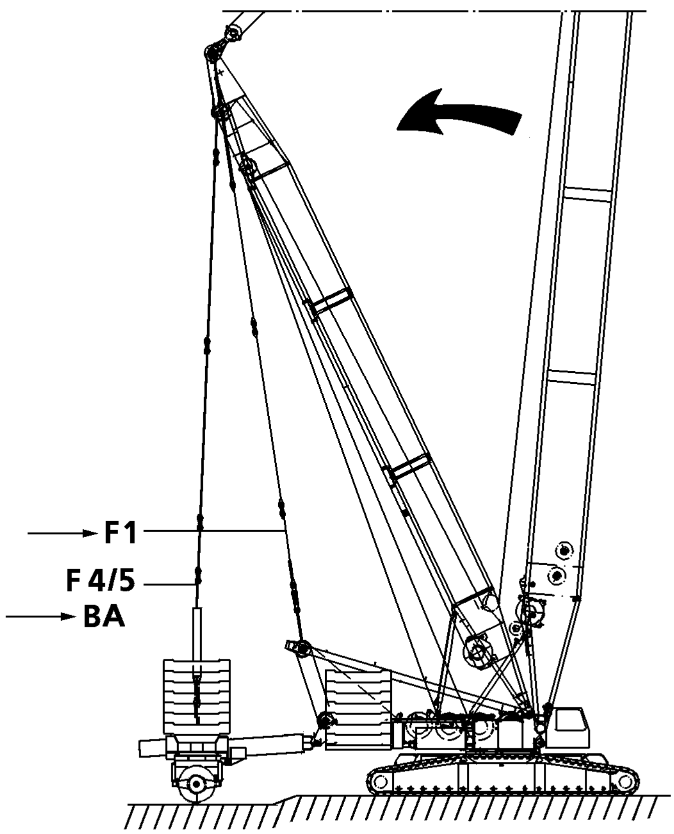
D A N G E R: **If this is not observed, there is a danger of tipping over when lifting it with the ballast plates in place, it can cause the crane to topple over.**

- When taking on a load, the guying from the derrick ballast to the derrick end section must be loose or only slightly tensioned to initially exceed the **minimum force F1 min.** on **test point 1** .
- The guying between the A-bracket and the derrick end section **test point 1** may **never be loose**.

D A N G E R: **This could cause uncontrolled movements of the boom system and thereby cause an accident.**

1


LIEBHERR
F1%
BA%
(max)
143
t
108
(min)
31
F1
0
50
90 100
200
300%
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
F3 150
117.1°
115.8°
114.1°
=> 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

188680

8.3 Determination of forces in operating mode with derrick ballast

For all operating modes with derrick ballast, the load is distributed to the guy rods from the derrick head to the A-bracket (F1) and to the derrick ballast (F4/5).

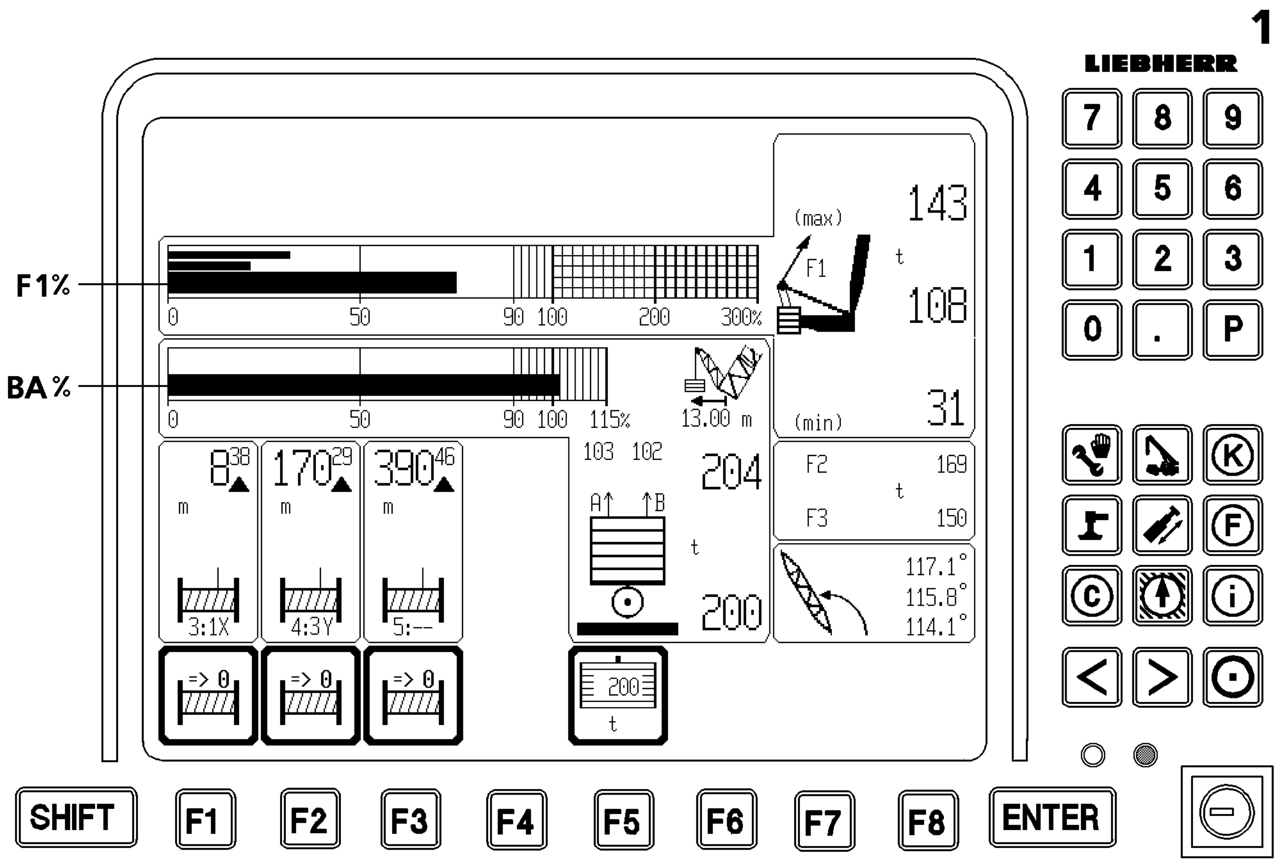
Note: See also the detailed description in chapter 4.02 CONTROL AND INDICATOR UNIT OF THE "LICCON" OVERLOAD SAFETY DEVICE.

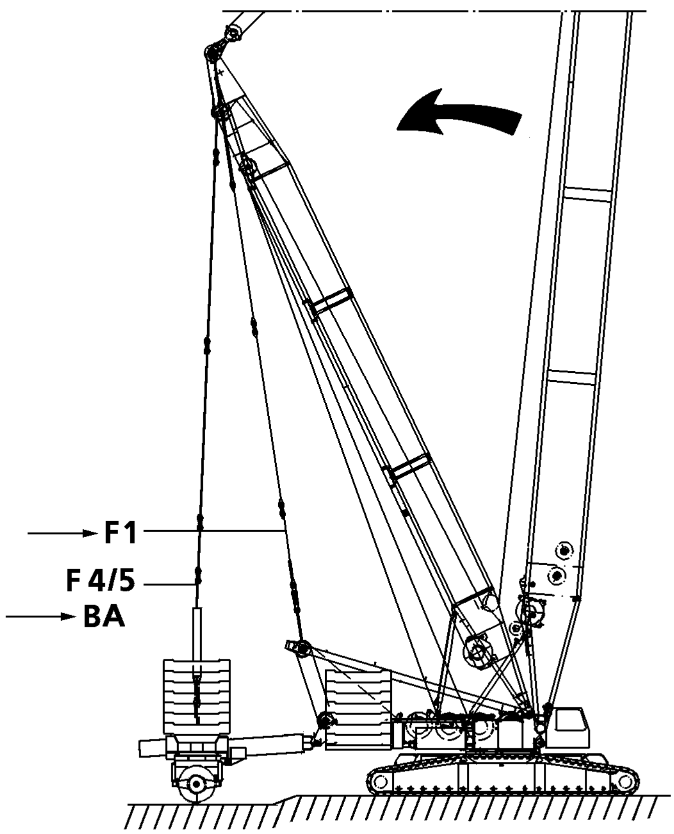
8.3.1 Force F1 (test point 1) between guying A-bracket and derrick end section

The force F1 (test point 1) is determined in the guy rods from the A-bracket to the derrick head by 2 force test boxes and is indicated on the LICCON as total force for guying. From the operating force F1 and the force F1-operation -max. force results the F1 - utilization. It is shown on the LICCON in a utilization bar graph (F1 %) .

8.3.2 Force F4 / 5 (test point 4 / 5) guying derrick ballast and derrick end section

The forces F4 / 5 (test point 4 / 5) are present in the guy rods from the derrick ballast to the derrick head. The existing forces in the guy rods (A = left and B = right) are calculated from three pressure sensor, which are installed on the pull cylinders, and shown in the LICCON as individual forces. The pulled ballast is calculated from the forces in the individual guyings , which means the part of the ballast, which is pulled upward by the guying . The remaining part is resting on the ground. The derrick ballast utilization is the result of the pulled ballast and the placed ballast. It is shown on the LICCON in a utilization bar graph (BA %) .


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


F1
F 4/5
BA

188680

8.3.3 Monitoring the minimum force F1 (test point 1), F1 min.

Note: See also graphic view and description of shut off in paragraph 8.5 Shut off in crane operation with derrick ballast.

If more than 50% is pulled by the set derrick ballast (ballast utilization bar > 50 %) and the minimum force F1 min. (test point 1) is fallen below, all **load moment increasing** crane movements are turned off.

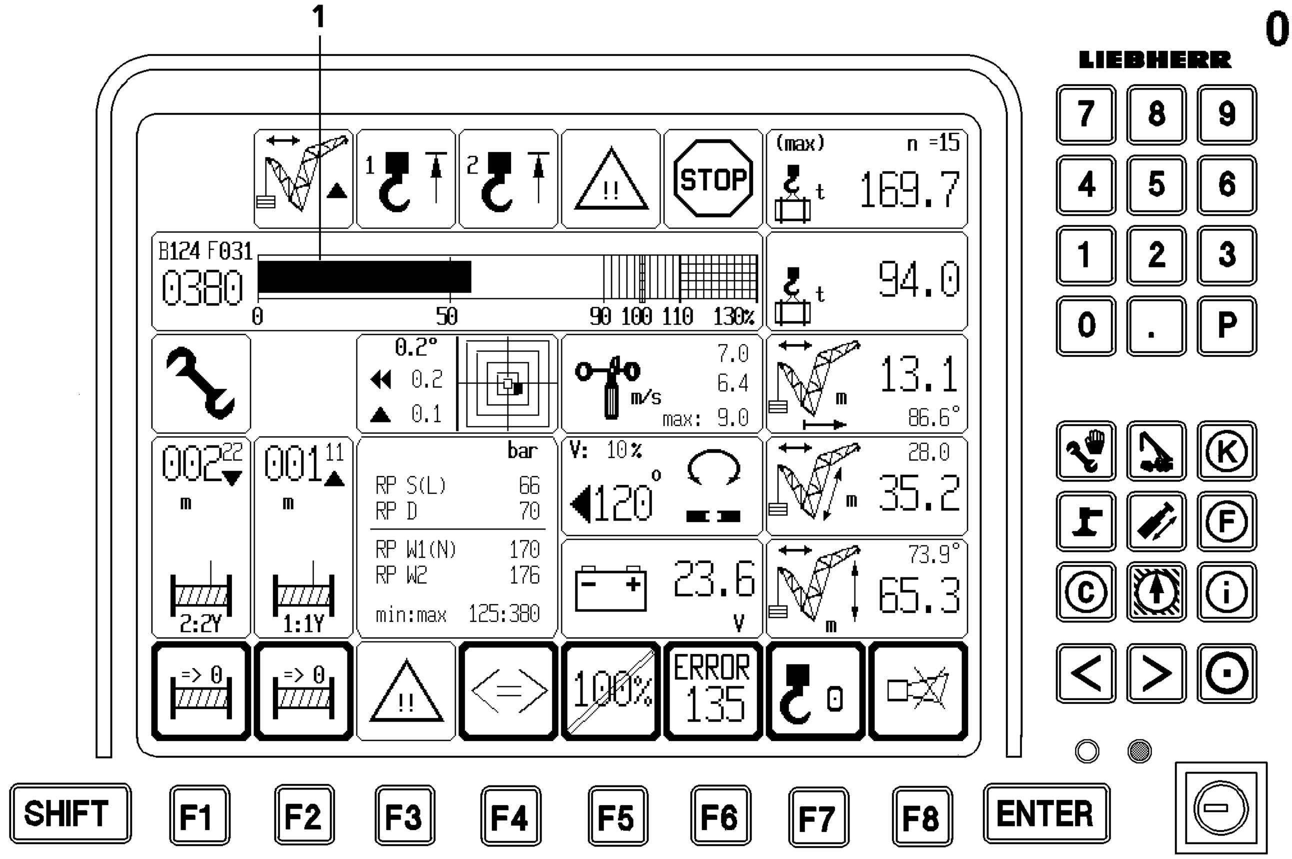
D A N G E R: **It is strictly prohibited to fall below the minimum force F1 min (test point 1), if more than 50 % of the derrick ballast is being pulled. If this is not observed, the derrick ballast can suddenly lift off the ground with the guying loose at test point 1 (F1) due to an increase of load momentum, and the boom system will suddenly move forward!**
This will cause the load to strongly swing back and forth which can damage the boom and the crane.

If more than 90% is pulled by the set derrick ballast (ballast utilization bar > 90 %) and the minimum force F1 min. (test point 1) is fallen below, **all load moment increasing and all load moment decreasing** crane movements are turned off.
This also includes the hoist gear "down" movement.

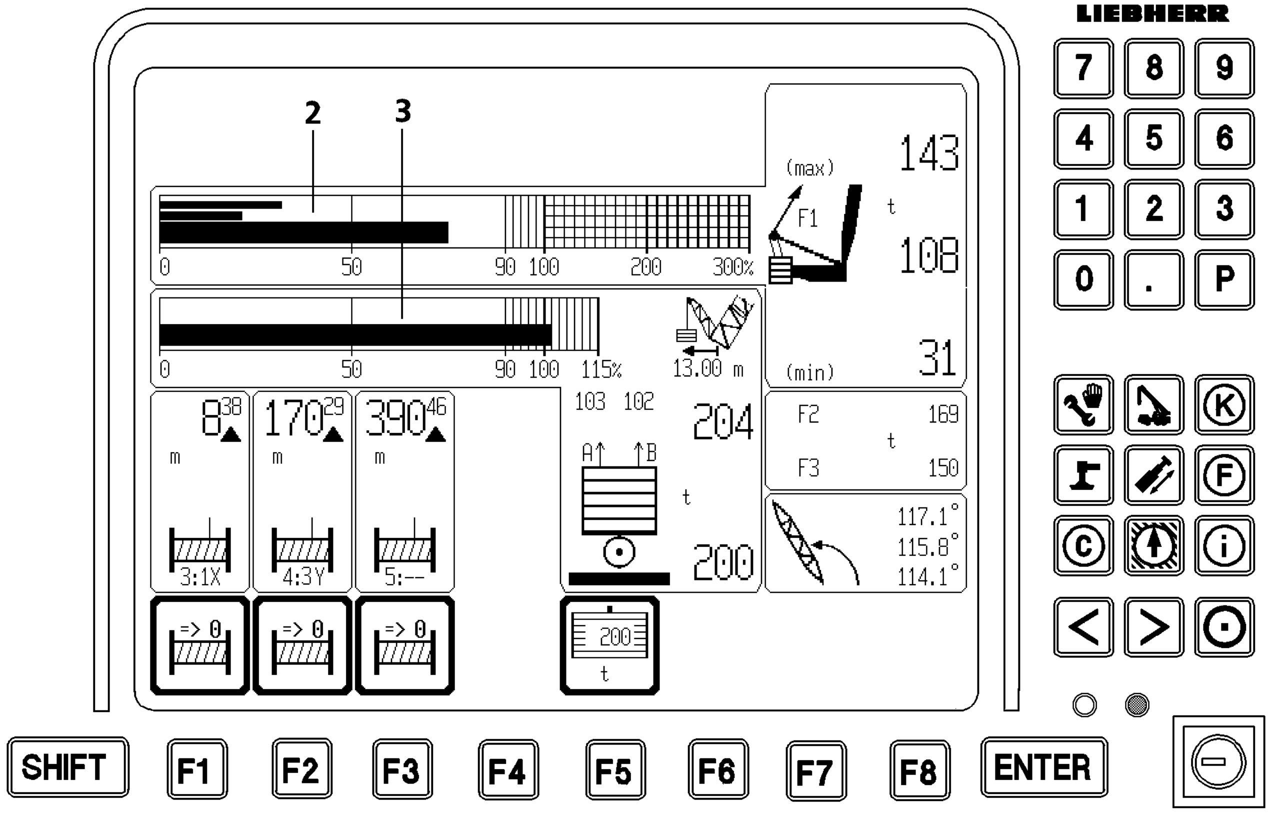
D A N G E R: **It is strictly prohibited to fall below the minimum force F1 min (test point 1), if more than 90 % of the derrick ballast is being pulled. If this is not observed, with the guying loose at test point 1 (F1) and suspended derrick ballast, the derrick ballast can suddenly set down on the ground due to an decrease of load momentum, and the boom system will suddenly move backward!**
This can press the relapse cylinders to block and overload them. There is a danger that the relapse cylinders, boom and derrick are damaged.

The only way to get out of this situation :
- is to lower the suspended derrick ballast via the pull cylinders to the ground;
- **or** by unloading ballast plates to reduce the derrick ballast utilization and to increase the load on test point 1 (F1) .

0


1
LIEBHERR
(max) n =15
169.7
B124 F031
0380
0 50 90 100 110 130%
94.0
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
86.6°
002
001
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
100%
ERROR 135
STOP
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

1


LIEBHERR
2
3
(max)
F1
143
108
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
(min)
31
8
170
390
3:1X
4:3Y
5:--
103 102
204
A B
200
F2 169
F3 150
117.1°
115.8°
114.1°
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

188682

8.4 Overload monitoring in operating mode with derrick ballast

Note: All items in quotation marks (" ") are described in chapter 4.02 CONTROL AND INDICATOR UNIT OF THE "LICCON" OVERLOAD SAFETY DEVICE, paragraph 6.01 Information about crane geometry and load.
See also graphic view, paragraph 8.5 Shut off in crane operation with derrick ballast.

In operating modes with derrick ballast, the monitoring function for "maximum load for current crane configuration" is in two parts:
1. monitoring the maximum load through LML overload safety system.
2. monitoring the test point 1-operational maximum force through derrick ballast overload safety device;

8.4.1. The LML overload safety system monitors the "maximum load according to the load chart and reeving".

In operating modes with derrick ballast, this is the maximum load for the current crane configuration with optimum derrick ballast. It is shown on monitor 0. The current utilization of the crane at optimum derrick ballast is shown on the load utilization bar graph (1) on monitor 0.

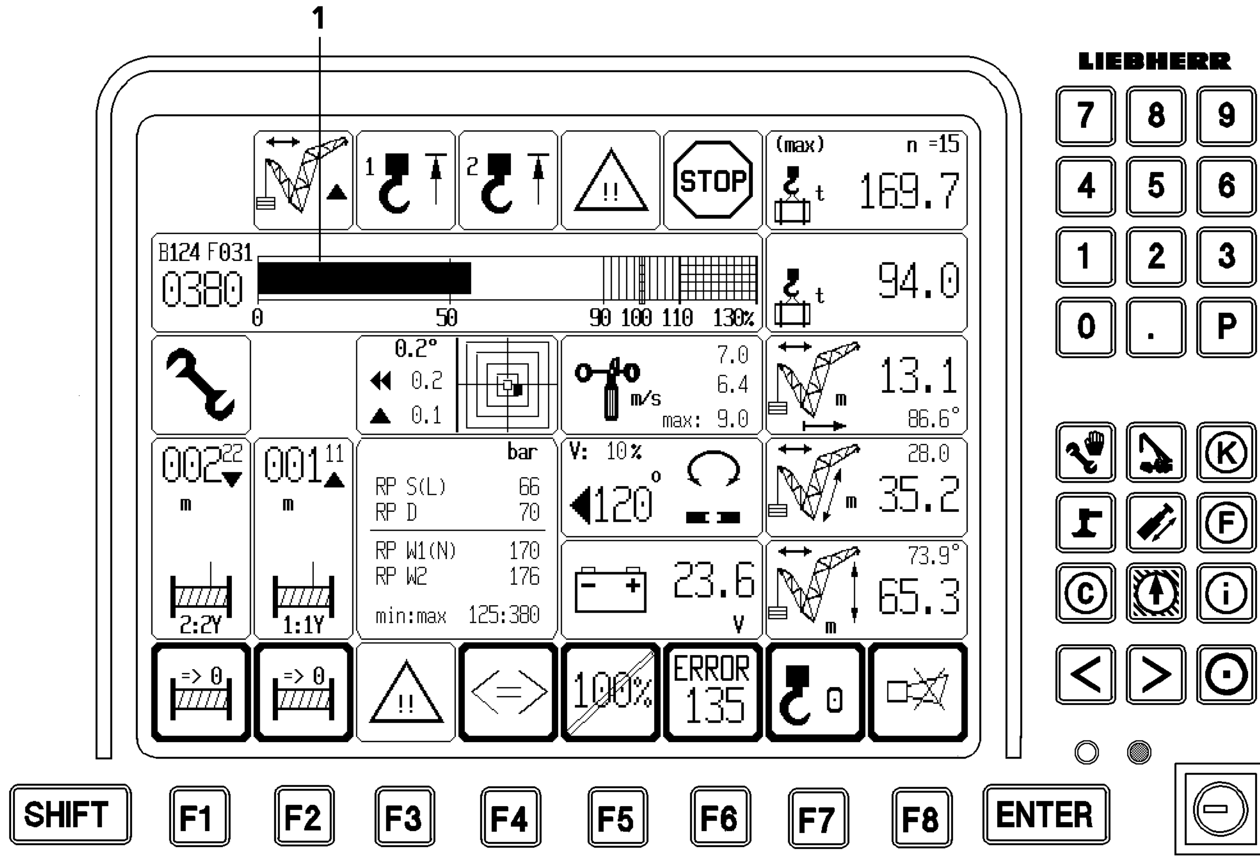
At 90 % on the load utilization bar graph, a pre-warning is given with caution symbol and "SHORT HORN" on monitor 0.
At 100% on the load utilization bar graph, all load moment increasing movements are shut off with the Stop symbol and the acoustical warning "HORN" on monitor 0.
In this case, the "maximum load of the current crane configuration " cannot be increased.

8.4.2 The derrick ballast overload safety device monitors the "test point 1- operation maximum force (=F1max)". It is shown on monitor 1 .

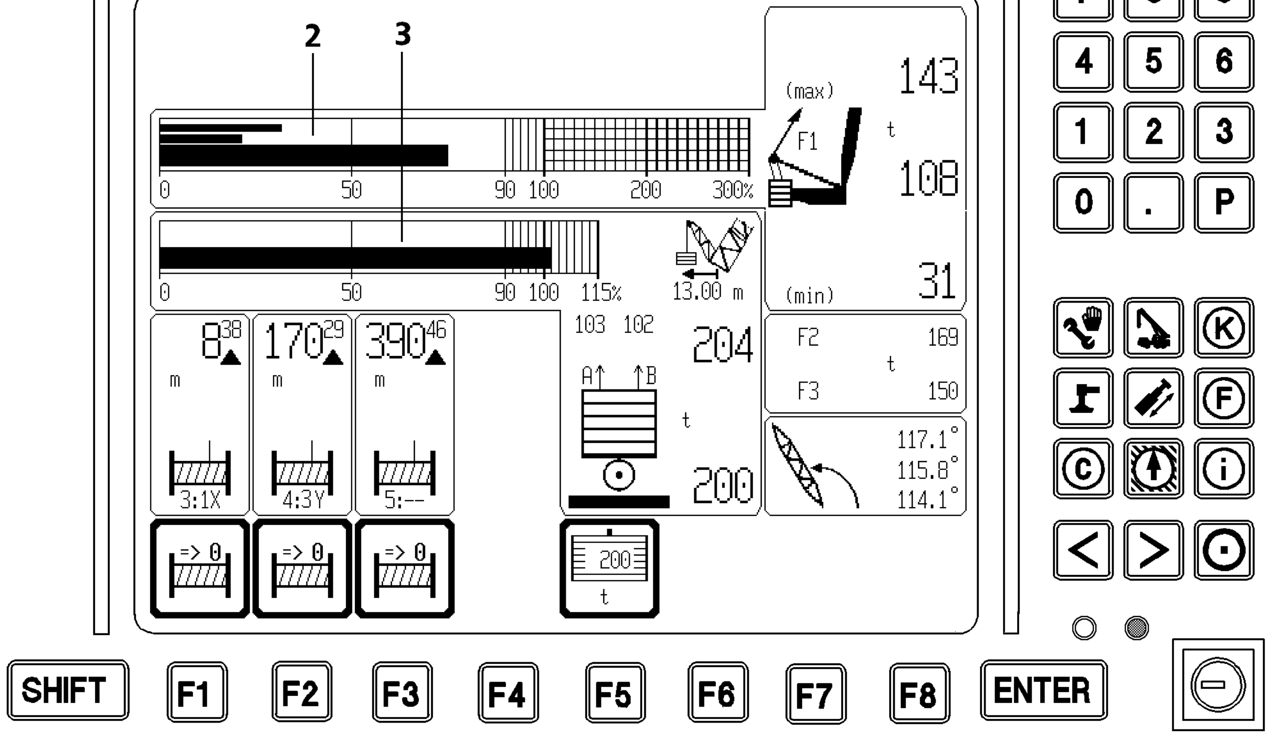
At 90 % F1max utilization (utilization bar graph (2)) a pre-warning is given with caution symbol and "SHORT HORN" on monitor 1.
At 100% on the F1max utilization bar graph, all load moment increasing movements are shut off with the Stop symbol and the acoustical warning "HORN" on monitor 1.
When the "maximum load according to the load chart and reeving" is not yet reached (utilization bar (1)) , then the "maximum load of current crane configuration " can still be increased by:

- Pulling up the derrick ballast, if the derrick ballast is not already suspended;
- Telescoping out the derrick ballast if the placed ballast is still smaller than the optimum ballast;
- Increase of 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
B124 F031
0380
0
50
90 100 110 130%
94.0
13.1
86.6°
7.0
6.4
max: 9.0
m/s
0.2°
0.2
0.1
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
73.9°
65.3
23.6
V
2:2Y
1:1Y
ERROR 135
STOP
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

1


LIEBHERR
2
3
(max)
143
F1
t
108
0
50
90 100 200 300%
90 100 115%
13.00 m
(min)
31
103 102
204
A↑ ↑B
t
200
F2 169
F3 150
117.1°
115.8°
114.1°
8
170
390
3:1X
4:3Y
5:--
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

188682

8.4.3 Utilization conditions

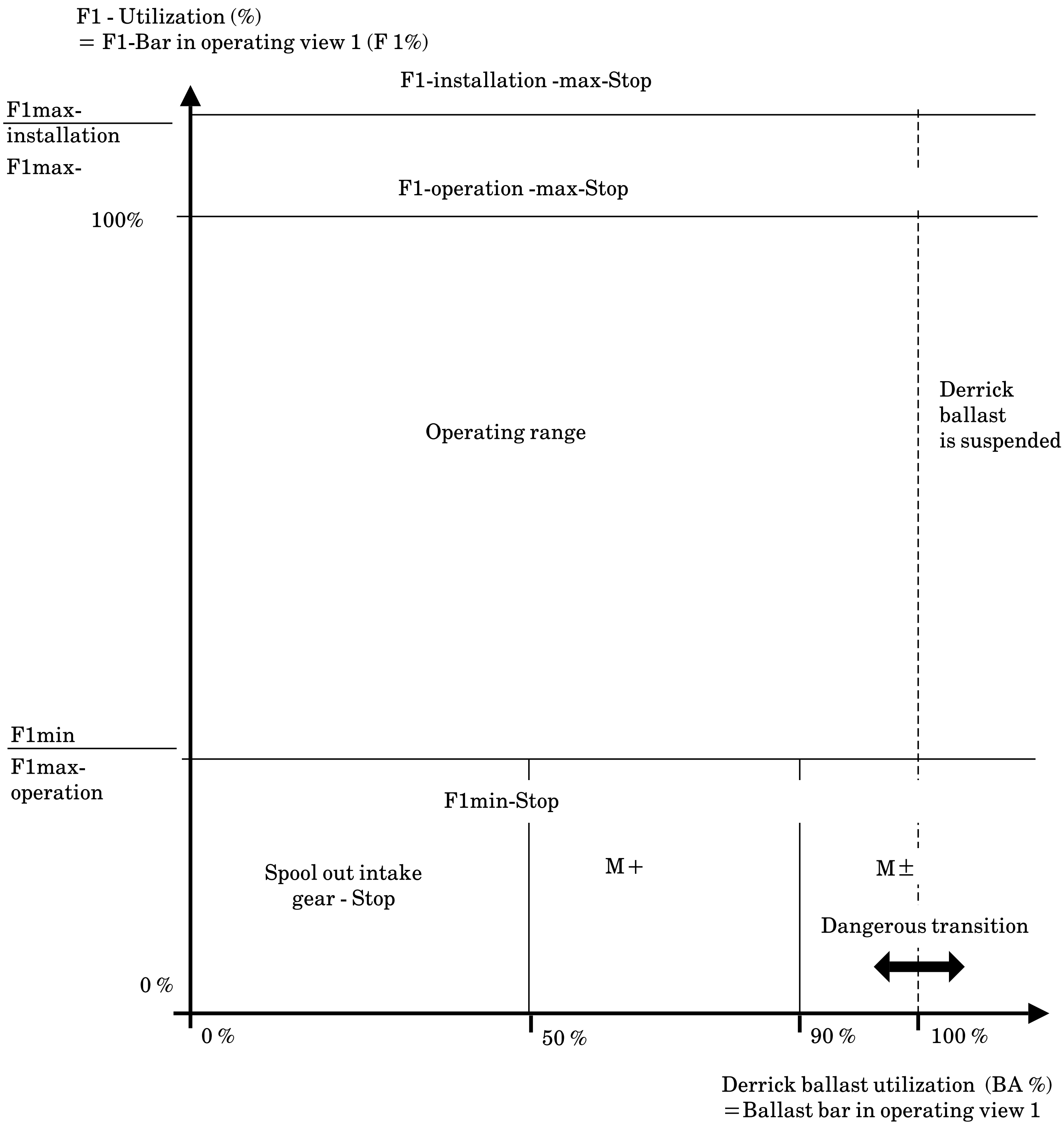
The current utilization of the crane is the result of the load utilization bar (1) on monitor 0 **and** the F1-utilization bar (2) on monitor 1.
The "maximum load for the **current crane condition**" is reached when the load utilization bar (1) reaches 100 % **or** when the F1-utilization bar (2) reaches 100 %.
The "maximum load for the **current crane configuration** " is reached when the load utilization bar (1) reaches 100% **or** when the F1-utilization bar (2) reaches 100 %. and the derrick ballast is suspended (ballast utilization bar (3) at 100 %, if the ballast input value and the ballast weight are correct).

The "maximum load according to load chart and reeving " (100%- limit of load utilization bar) and maximum load according to F1max- operation (100%- limit of F1- utilization bar) can be bypassed as follows:

1. Hold keyed switch D_0 on monitor 0 in position "right touching" (after corresponding preselection with function key $F5_0$) bypasses only the "maximum load carrying capacity according to load chart and reeving" (see detailed description in chapter 4.02, paragraph 6.07)
2. Installation keyed switch in instrument panel
   Bypasses the "maximum load carrying capacity according to load chart and reeving ", the test point 1- operation maximum force (=F1max- operation) and a number of other limit values and limit switches. The test point 1- installation maximum force (=F1max- installation) cannot be bypassed (see detailed description in chapter 4.04).

D A N G E R: **When the installation keyed button is turned on, only load moment decreasing crane movements up to a permissible operation and load range may be carried out.**
After reaching the permissible load range, the installation keyed button must be turned off immediately.
When the installation keyed button is turned on, the load moment limiter is no longer effective.
There is a danger of accidents!

The movement "lift ballast " or "lower ballast " requires a high amount of concentration. When 90% of the placed ballast is pulled, the warning "upcoming lift off of derrick ballast" is given. The warning is indicated by "short horn" and blinking value "ballast is pulled". 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) .



See also operating view on monitor 1

8.5 Shut off for crane operation with derrick ballast (suspended ballast or derrick ballast)

Graphic view of various ranges of utilization on test point 1 (F1% utilization bar) and utlization of derrick ballast (ballast utilization bar, BA %)

8.5.1 F1- Installation - max. Stop

=Shut off as for F1-operation -max-Stop, but cannot be bypassed.

8.5.2 F1-Operation - max.Stop

= All load moment increasing crane movements (”Lift load”, ”luff down boom”, ”luff up boom”, ”lower ballast ”, "telescope ballast in") are turned off. These shut offs can be bypassed via the installation keyed button . The shut off ”luff up boom” can also be bypassed via the button ”luff up at overload” .

8.5.3 Test point 1 - Minimum force (F1min)

The derrick ballast overload safety device protects the crane from sudden lift off of the derrick ballast (crane rocks forward) and against sudden set down of the derrick ballast (the crane rocks backward). This is ensured by the monitoring function of test point 1 - Minimum force.
A pre-warning is given if the given limit F1min is almost reached. When this limit is reached or exceeded, the overload warning is triggered and the dangerous crane movements are turned off, see below.

8.5.3.1 Spool out intake gear -Stop

= The crane movement ” spool out intake gear (winch 4) ” is turned off, at the same time, "telescope out ballast" is turned off.

8.5.3.2 M +

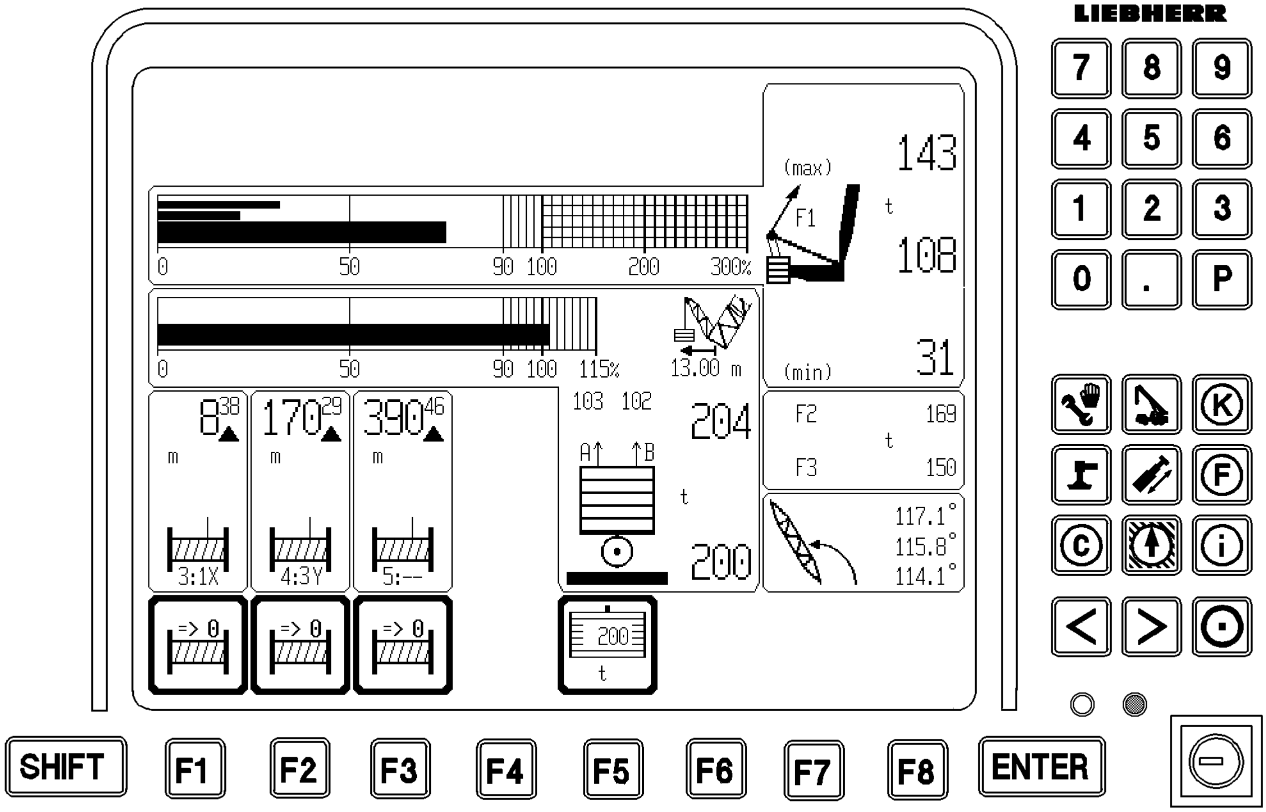
=The following load moment increasing crane movements are turned off: ”Lift load”, ”luff down main boom / jib ”, ”luff up main boom / jib ”, ”spool out intake gear” and " telescope ballast in and out".
These shut off cannot be bypassed.

8.5.3.3 M ±

=The following load moment increasing crane movements are shut off: ” Lift load”, ”lower load”, ”luff up boom”, ”luff boom down ”, "spool out intake gear”, ”spool up intake gear”, "telescope ballast in and out"".
Only "lower ballast down ” or "load off ballast " remain possible.

Note: During operation, make sure to observe all notes and guidelines given in the crane operating manual and the shut off of shut off diagram in the wiring plan.

1


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

188681

8.6 Load chart access procedure

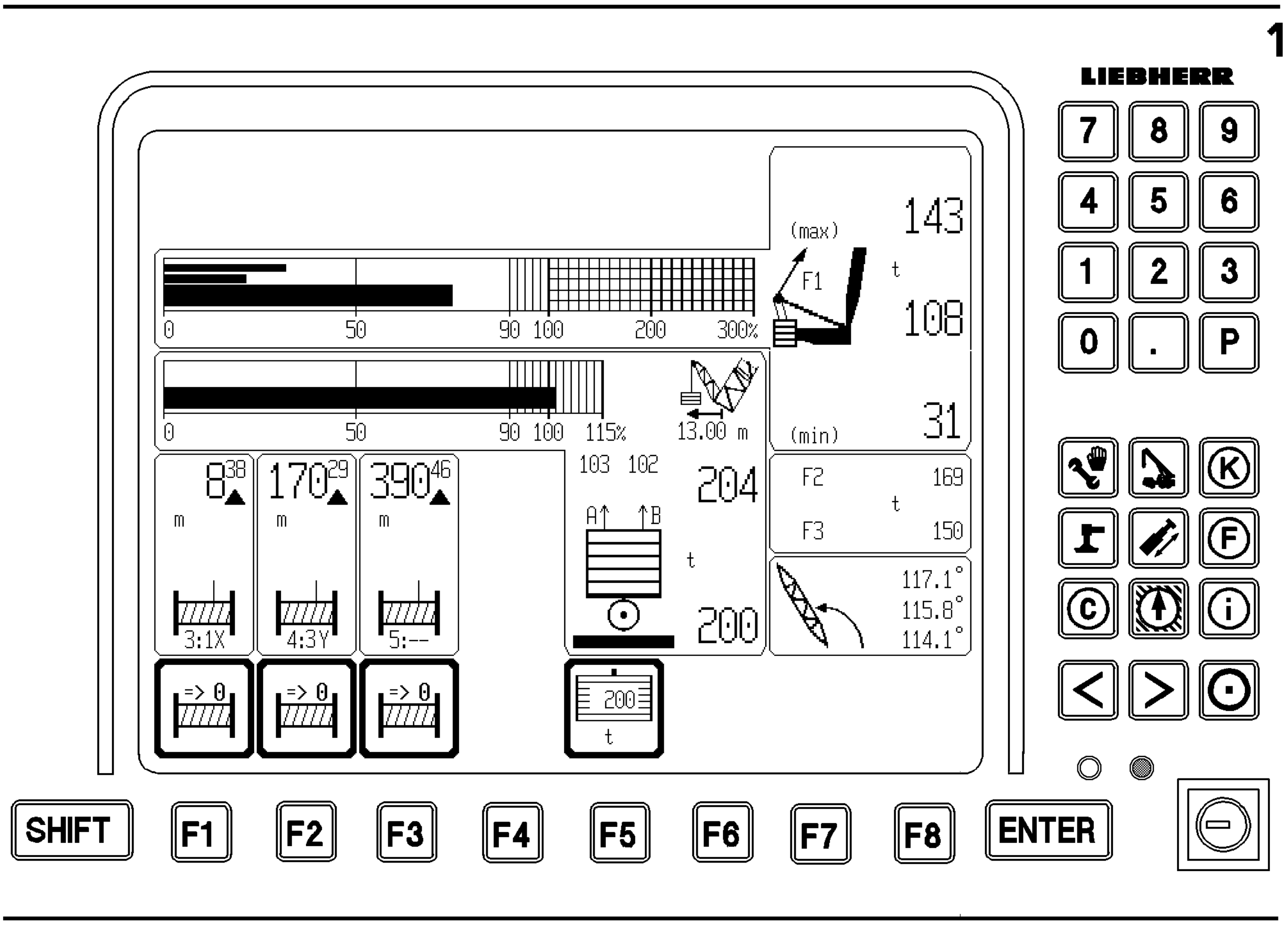
For the:
- main boom angle interpolation;
- derrick ballast radius interpolation;
- combination from main boom angle interpolation and derrick ballast radius interpolation

see chapter 4.02 CONTROL AND INDICATOR UNIT OF THE "LICCON" OVERLOAD SAFETY DEVICE, paragraph 6.2 Load chart access procedure.

8.7 Check of the length sensor value on the ballast trailer

When telescoping the derrick ballast in and out, the derrick ballast radius indicator must be watched carefully. When telescoping the derrick ballast, the indicator must change according to the movement. The crane operator is able to recognize immediately if the length sensor cable drums would get stuck when spooling up or out. When the derrick ballast is fully extended or retracted, the derrick ballast indicator must show almost exactly to the end position, for example: radius = 11 m or 15 m . The crane operator may not rely solely on the derrick ballast radius measurement, but must think for himself and check, if the measurement is still correct.

D A N G E R: If the derrick ballast radius is measured incorrectly, then the maximum load carrying capacity and the test point 1 - operation max. force may be calculated too high, due to an incorrect radius value .
There is an increased risk of accidents!



1
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max)
143
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
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
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER

188681

8.8 Difference force monitoring of ballast guying

For operating modes with derrick ballast, the difference of forces of derrick ballast guyings A and B is monitored, on monitor 1.

D A N G E R: If the difference of these forces is too high, the derrick end section or other crane components can be damaged. This could cause an accident!

The forces in the derrick ballast guyings A and B, monitor 1, are shown and compared. If the difference increases past the permissible value, an **acoustical** warning is given and both force values start to **blink**. However the movements are **not** shut off.

If the difference of forces of derrick ballast guyings A and B increases past the given limit value, it can have various causes:

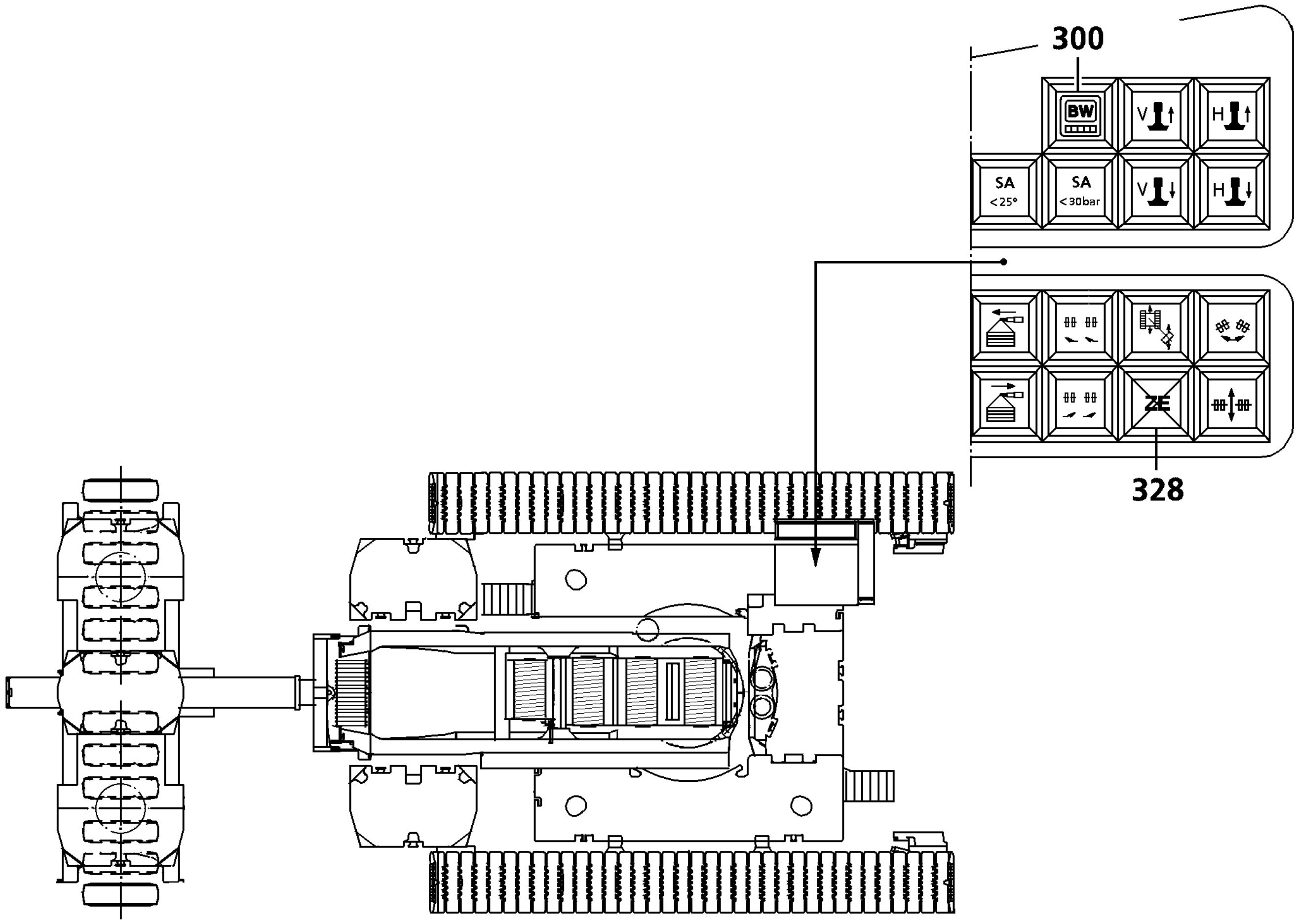
- Taking on the load , due to the relief of tires at the ballast trailer, or due to the flexation of the slewing platform;
- The ground under the derrick ballast is uneven;
- The crane is tilted to the side;
- The derrick ballast is loaded one-sidedly;
- By lifting or lowering the derrick ballast with the pull cylinders;
- The force measurement of one guying is wrong .

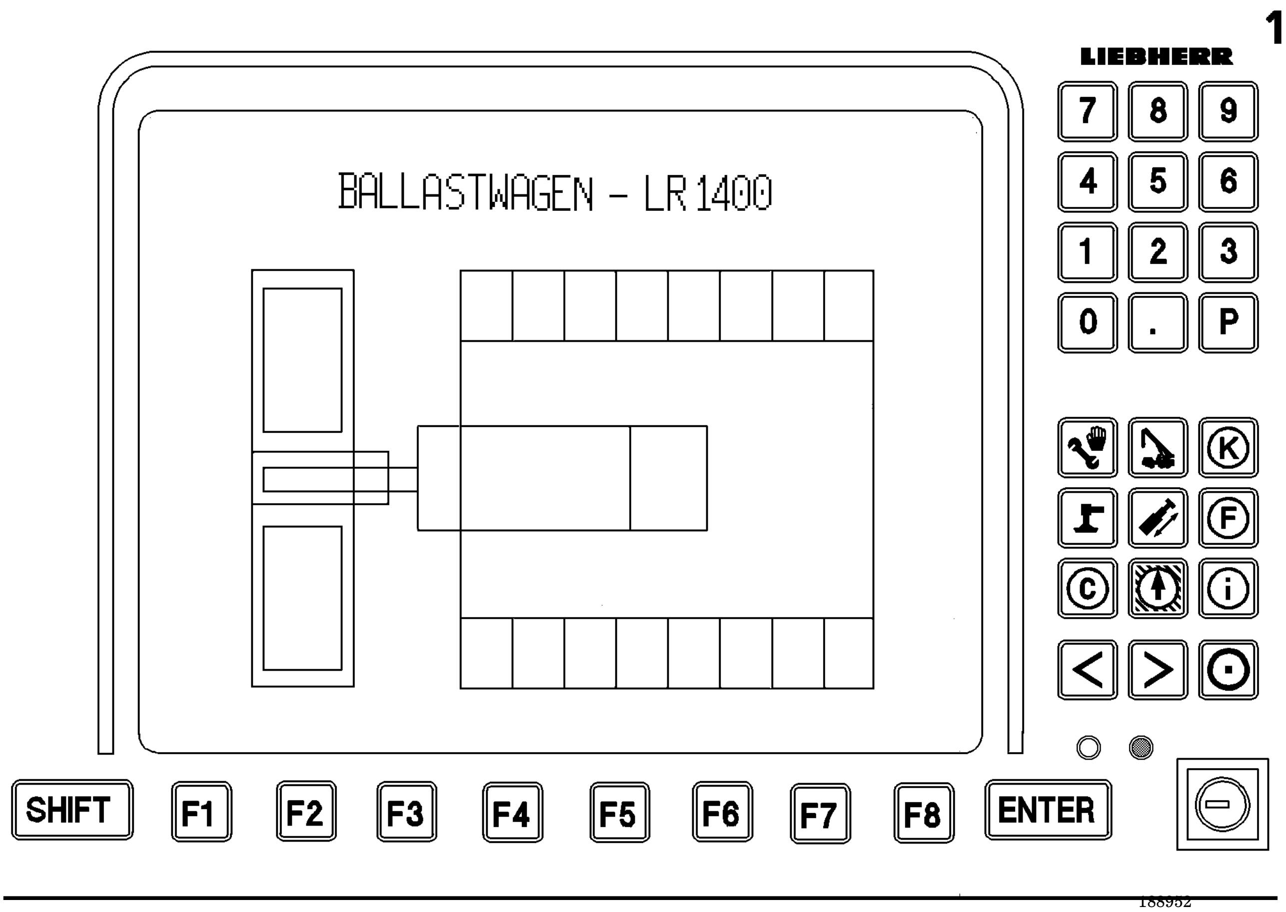
The crane operator must recognize the correct cause and must take counter-measures :

1. The error, which led to the one-sided force must be taken care of .
2. The following measure is permissible for **small** differences in ground level only: Shut off one ballast cylinder and with the other ballast cylinder, "lift ballast " or "lower ballast" until the difference between the forces gets smaller. It must be ensured that the derrick ballast is not brought into an impermissible incline position as compared to the crane, otherwise the derrick ballast guide and components will be damaged.

D A N G E R: The derrick ballast cylinder A may never be extended to more than 40 mm more or less than cylinder B! There is a danger of accidents!

3. In case of sensor values, which don't seem right: check if the pressure sensor for weighing the ballast or the inputs for weighing the ballast on CPU1 are defective , if necessary, pull the sensor or replace the CPU.


300
BW
V
H
SA
<25°
SA
<30bar
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
188952

8.9 The "Test system" program

The ballast trailer is equipped with a test system. The test system is a service and diagnostics tool, which makes it possible, without the use of additional testing devices, to quickly and simply localize and fix any problems on the ballast trailer.

Note: Some safety relevant functions of the test system can only be used by competent expert personnel, which means they must be protected from access by non-authorized operators.

LICCON in standard operation

Note: The programs and program run of the LICCON computer system is not influenced, which means the ballast trailer is still fully functioning and the control can be checked with the extensive aids of the test system.
At ballast trailer control with the LICCON, the LICCON monitor is only used for functions of the test system.

8.9.1 Starting the test system

In case of a functional problem, such as indicator light (328) lights up, the switch (300) on monitor 1 can be assigned for diagnostics purposes to the ballast trailer control.

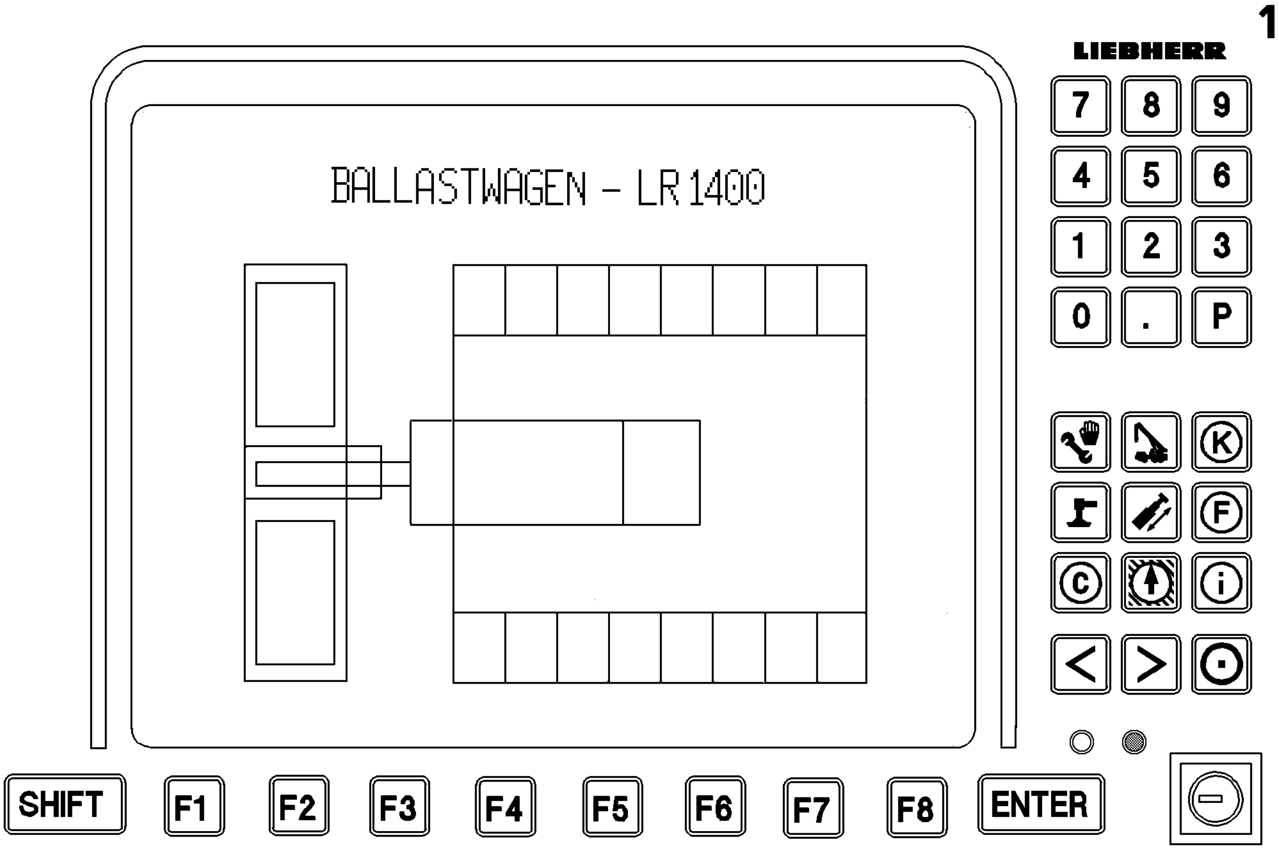
- Turn the crane engine off;
- Actuate the switch (300) ;

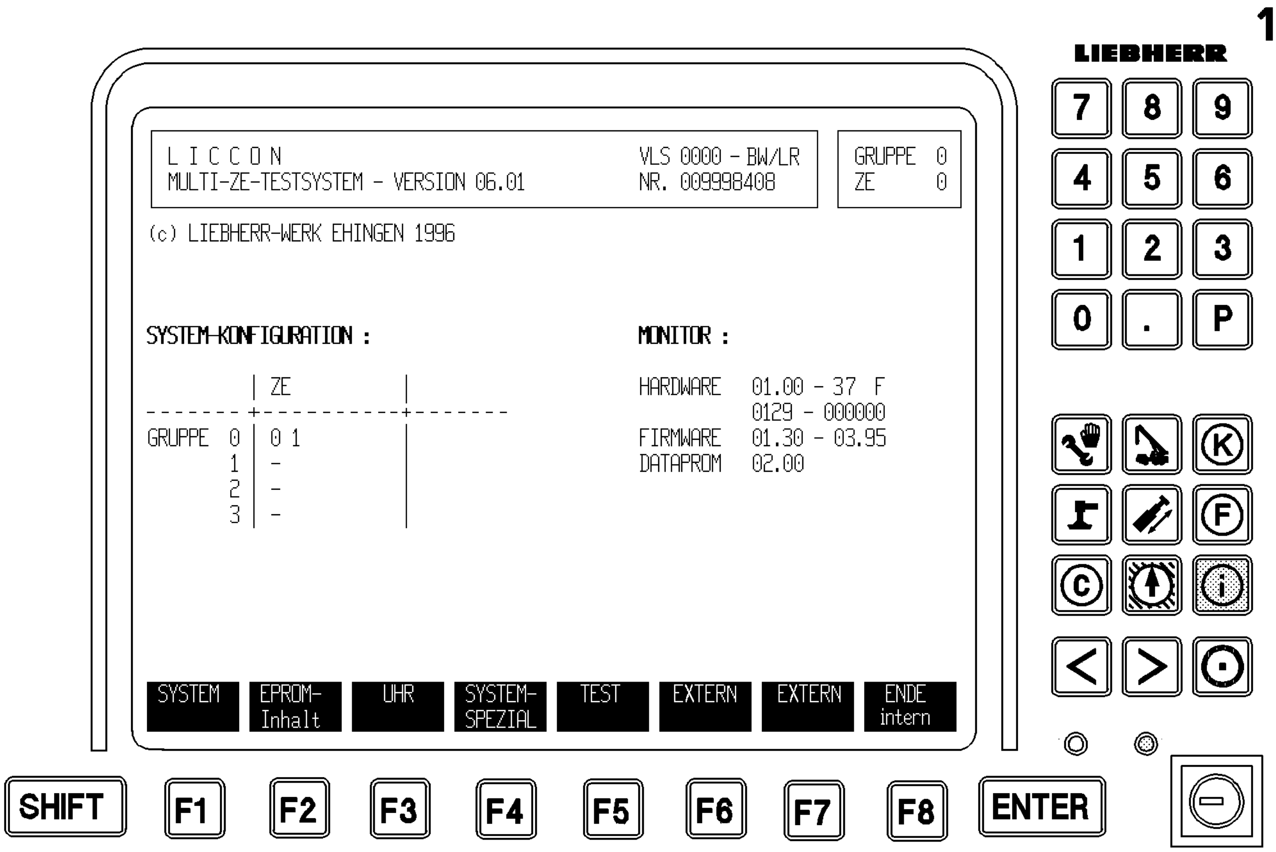
Note: The switch (300) may only be actuated if the crane engine is turned off.

- Turn the crane engine on and wait until monitor 1 shows the view "Ballast trailer - LR" ;
- Call up the test system with the "i" key.
  ⇒ MULTI-ZE-TESTYSTEM - VERSION XX.XX (MULTI CPU TEST SYSTEM - VERSION XX.XX)

8.9.1.1 The indicator light (328) lights up in case of

- failure of the LICCON;
- an error on turn sensor for left wheel set ;
- an error on turn sensor for right wheel set;
- an error on turn sensor for slewing platform (boom direction);
- an error on length sensor for movement cylinder;
- an error in the safety chain.


1
LIEBHERR
BALLASTWAGEN – LR 1400
7 8 9
4 5 6
1 2 3
0 . P
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 :
| ZE |
GRUPPE 0 | 0 1
1 | -
2 | -
3 | -
MONITOR :
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
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

188683

8.9.2 Main menu

After the start of the LICCON test system the main menu appears after the start of the program. Here is the basic data of the system. All sub functions can be called up via function keys "F1" to "F8" .

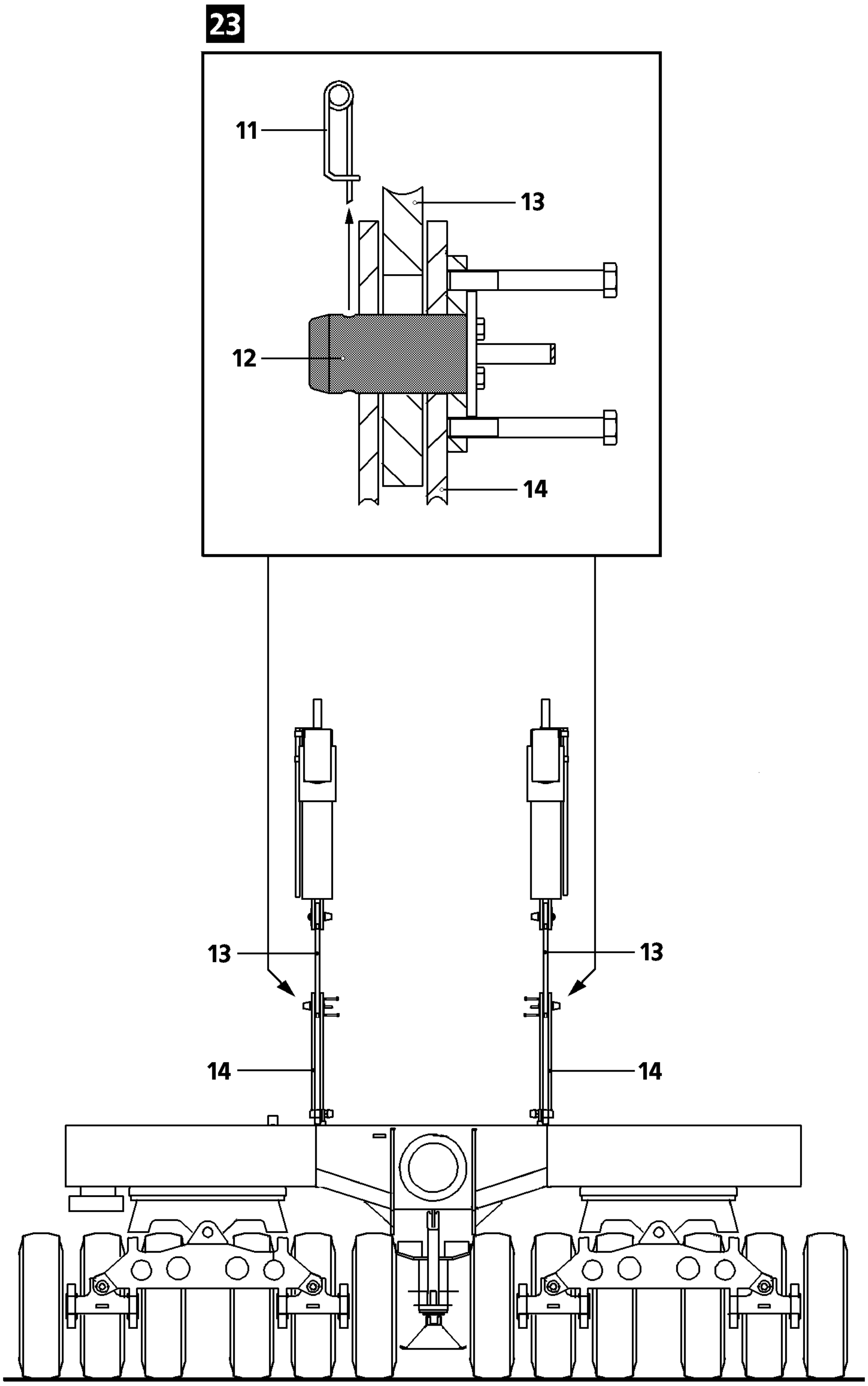
8.9.2.1 Selection of CPU or group

In the right upper selection window, the cursor blinks to point to the selection the desired CPU.
- With the "ENTER" key, the cursor changes from "CPU" to "Group" and back.
- Enter the desired group or CPU from the installed units with number keys of the alpha-numeric key board.

Note: The test system can only access the installed units (group, CPU) .

8.9.2.2 Function key bar - main menu

"F1"	**SYSTEM**	Access to inputs and outputs, AWL operands , system internal "specialties".
"F2"	**EPROM-Inhalt**	Software for LICCON CPUs.
"F3"	**UHR**	Access protected function to set or stop or start the battery buffered real time clock.
"F4"	**SYSTEM-SPEZIAL**	To check the complete function units of the ballast trailers.
"F5"	**TEST**	
"F6"	**EXTERN**	Start remote diagnostics
"F7"	**EXTERN**	
"F8"	**ENDE intern**	End of program



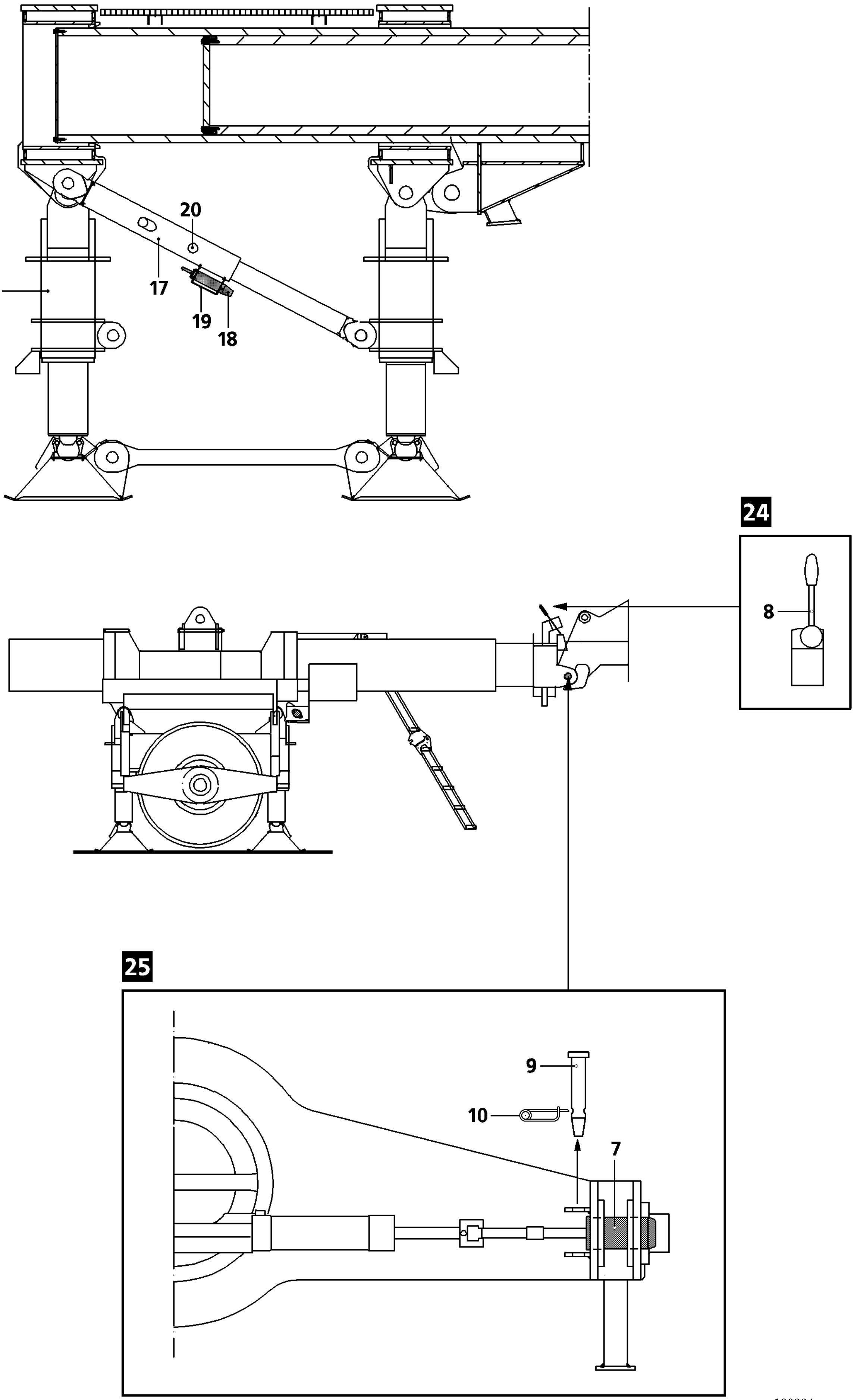
188669

9. Removal of ballast trailer

D A N G E R: The ballast trailer may only be removed by authorized personnel, on level ground of sufficient load carrying capacity .

Prerequisites:
- The ballast trailer is supported;
- The ballast trailer guide is retracted;
- The ballast is removed.

9.1 Remove the pull cylinders, fig. 23
- Disconnect the supply lines from the slewing platform to the ballast trailer ;
- Release and unpin the pin (12) on both sides;
- Fold down the connector rods (14) .



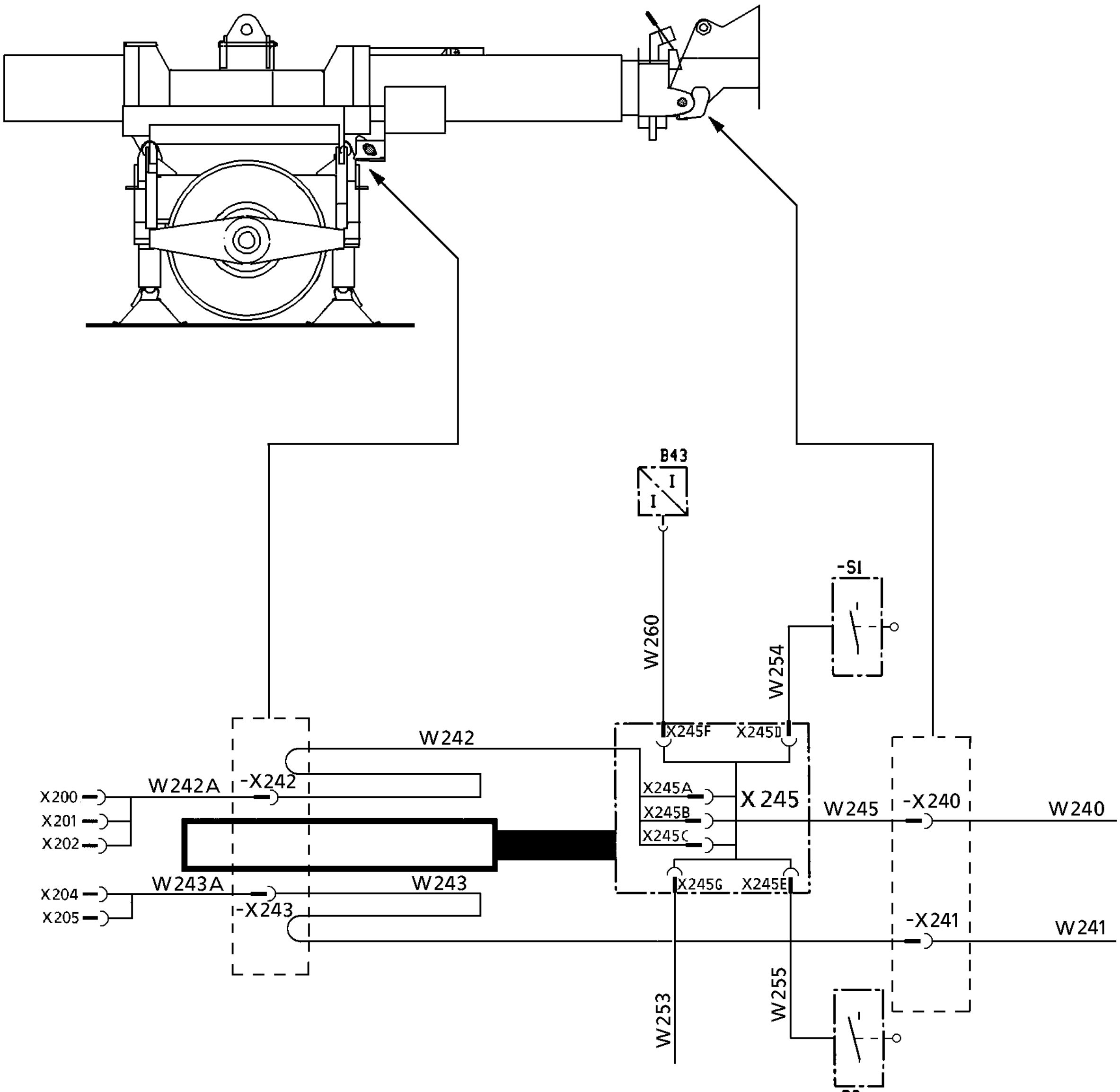
190334

9.1.1 Arresting of the equalization of the support cylinders

Retract the support cylinders (17).
Take the bolt (18) out of the rest (19) and put it in the bore hole (20) and secure it.

9.2 Unpin the ballast trailer guide on the crane , fig. 24 and 25

- Release and unpin the retaining pin (9) on both sides;
- Actuate the manual lever (8), unpin the crane ballast trailer guide on both sides .


B43
-S1
W260
W254
W242
X245F
X245D
X200
X201
X202
W242A
-X242
X245A
X245B
X245C
X 245
W245
-X240
W240
X204
X205
W243A
-X243
W243
X245G
X245E
-X241
W241
W253
W255
-S2

188664

9.3 Disconnect the supply lines

- Turn the engine off.

9.3.1 Disconnect the pneumatic and the hydraulic connections

- Loosen the coupling connections;
- Close off the coupling connections with dummy plugs.

D A N G E R: **When connecting or disconnecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.**

Prerequisite for a correct coupling connection is:

- **Release the pressure in the hydraulic system before connecting or disconnecting the couplings (the engine must be turned off - then wait for 5 minutes).**
- **Insert the coupling sections (sleeve and plug) into each other and tighten the screw with the hand nut.**
- **Tighten the nut past the O- ring until you can feel a noticeable, solid stop.**
- **The couplings may only be tightened by hand - without tools - as this could damage the couplings.**

Improperly connected couplings can cause loss of pressure or sudden leakage, which in turn could cause a serious ACCIDENT.

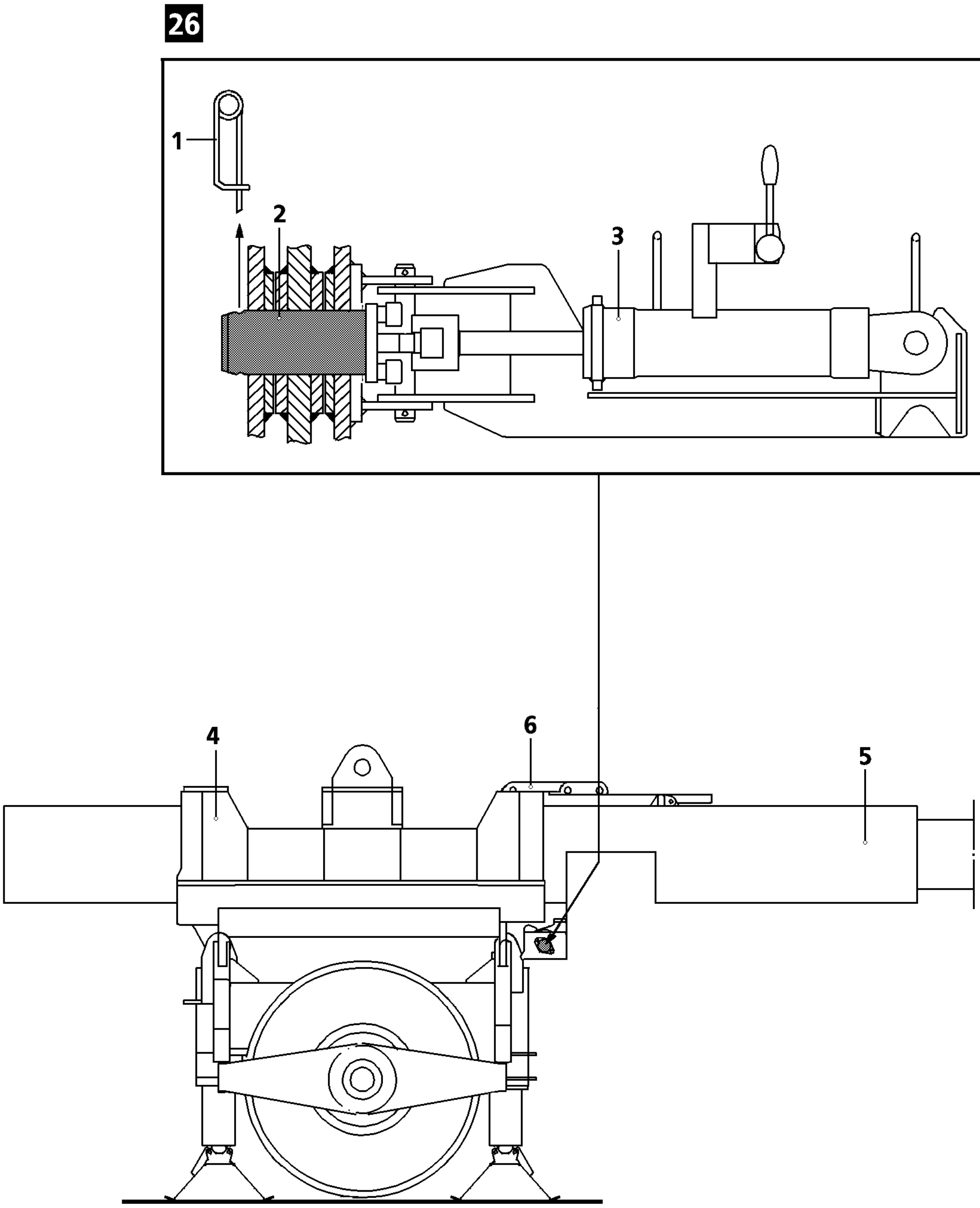
9.3.2 Release the electrical connection

- Unplug cable W 243 from socket -X 243 and plug in dummy plug on ballast trailer guide ;
- Unplug cable W 242 from socket -X 242 and plug in dummy plug on ballast trailer guide ;
- Unplug cable W 243 from socket -X 241 and plug in dummy plug on ballast trailer guide ;
- Unplug cable W 245 from socket -X 240 and plug in dummy plug on ballast trailer guide ;
- Plug in dummy plug on socket -X 240 and -X 241 .

D A N G E R : **The electrical connections may not be unplugged and plugged into the dummy plug until the ballast trailer guide is fully unpinned on the crane. As soon as one of the two pins is unpinned from the guide frame, the crane control recognizes immediately that the ballast trailer is no longer installed. Now, even though the ballast trailer is installed (ballast trailer is connected with a pin to the crane), the crane can be turned and driven.**
There is the danger of damaging the ballast trailer or the crane if the crawler is driven or if the crane superstructure is turned.

9.3.3 Move the crane off

To be able to remove the ballast trailer guide, the crane must be moved off.



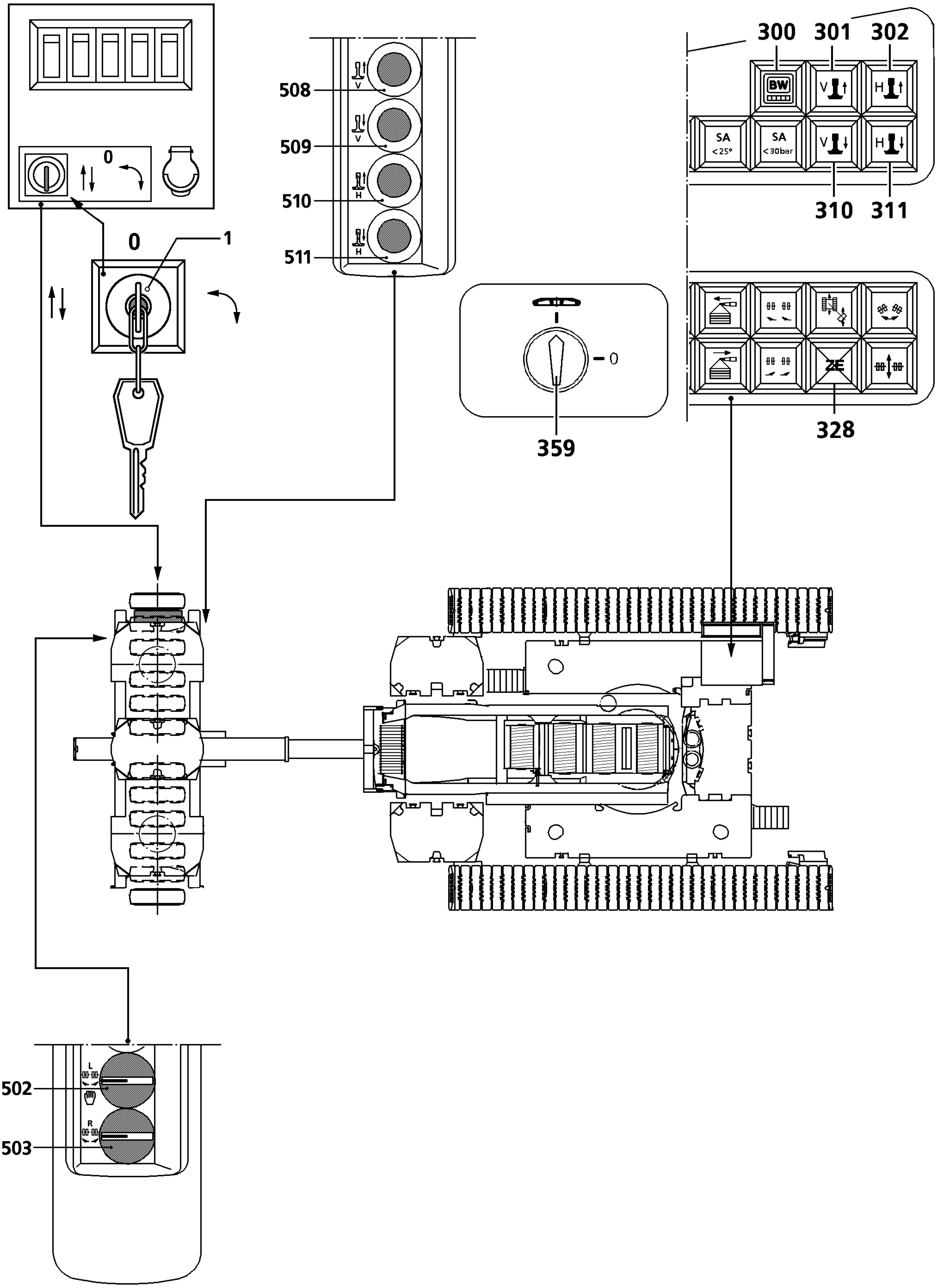
188671

9.4 Unpin the ballast trailer guide on the ballast trailer, fig. 26

- Unpin the hoist bracket (6), fold it back and pin;
- Hold the ballast trailer guide with the auxiliary crane;
- Connect the pin pulling device (3) with the hydraulic component;
- Release the pin (2) and unpin on both sides with the pin pulling device (3);
- Place the ballast trailer guide (5) with the auxiliary crane on the transport vehicle;
- Place the ballast trailer on the transport vehicle.

D A N G E R: **The ballast trailer and the ballast trailer guide must be attached properly for transport. The ballast trailer must be supported until the tires are slightly pushed in.**

The ballast trailer is not equipped with a braking system. For that reason, it must be supported if it is not installed.



300
301
302
BW
V
H
SA
<25°
SA
<30bar
310
311
0
1
508
509
510
511
V
H
328
ZE
359
0
502
503
L
R

188674

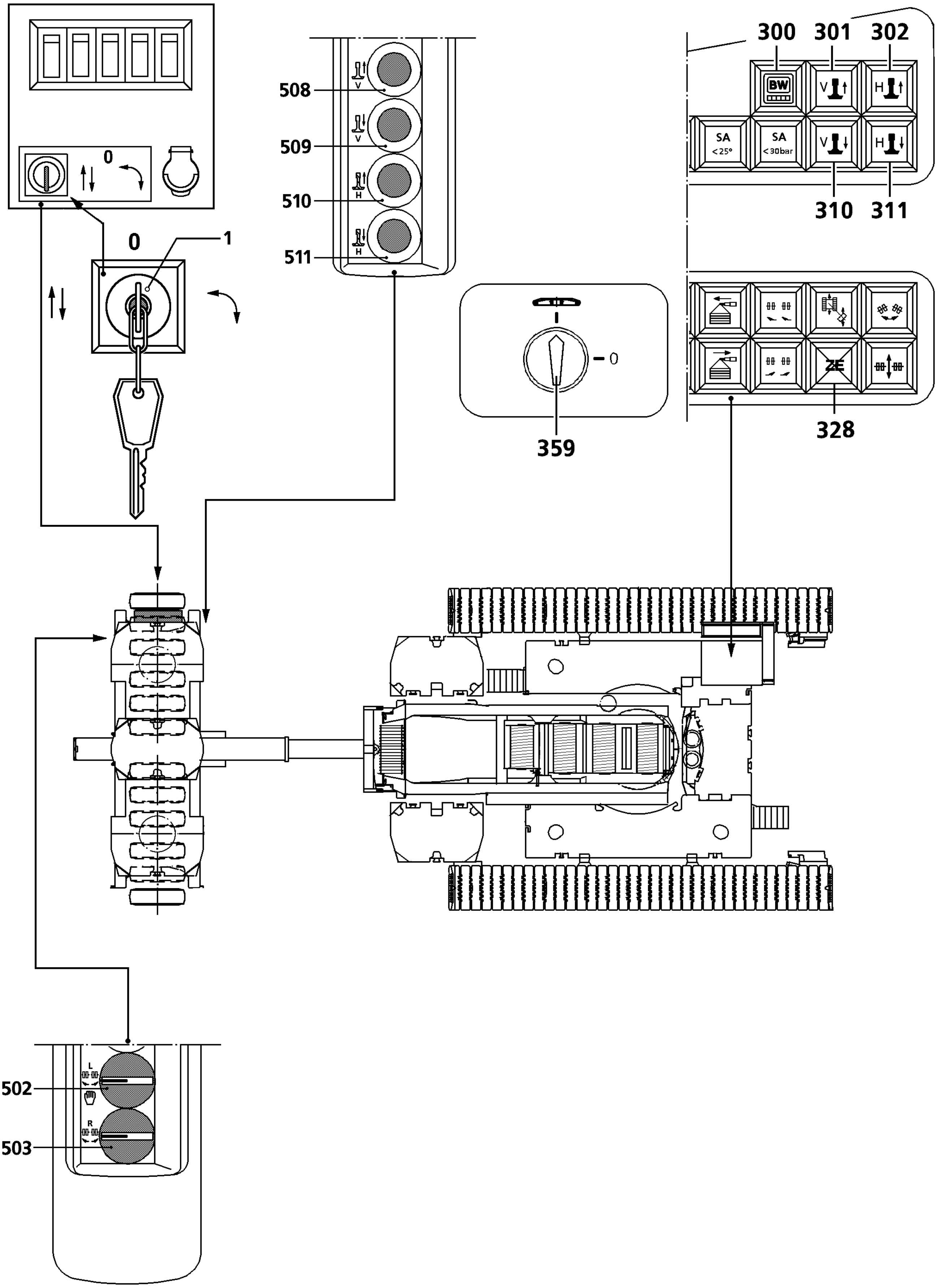
10. Emergency operation

10.1 General

In case of failure or defect of the CPU on the ballast trailer (warning light 328 lights up), the electronic steering on the ballast trailer cannot be accessed. The signals **towing** and **driving in turns** can no longer be sent from the ballast trailer control to the crane control.
However, the CPU can be bypassed by actuating the keyed button (1) on the ballast trailer.

D A N G E R : The following points must be observed for emergency operation:
- **The emergency operation may only be carried out by authorized persons;**
- **No persons may be within the danger zone of the ballast trailer;**
- **Every individual travel movement may only be carried out with greatest care, the least possible acceleration and careful braking action.**
- **The keyed button (1) may only be actuated in case of failure of the electronic.**
- **The signal ”towing” and ”driving in turns” is released to the crane, even though the wheels can be in the wrong position.**
- **The wheel position must be monitored manually. Watch the angle scale on the ballast trailer .**

Note: During crane operation (not emergency operation) the keyed button (1) must be on position 0 (center position) .


300
301
302
BW
SA <25°
SA <30bar
310
311
508
509
510
511
0
1
359
328
ZE
502
503
L
R
188674

10.2 Emergency operation - towing

Prerequisites
- The crane is at a standstill;
- The ballast trailer is properly installed;
- The rotary switch (359) is on crawler operation (vertical position).

10.2.1 Raise the ballast trailer with support cylinders

- Press button (310 and 311) **or**
  button (509 and 511) , the outrigger support cylinders extend on the front and rear.

10.2.2 Set the axles to towing position

- Switch the keyed button (1) on the ballast trailer to the left;

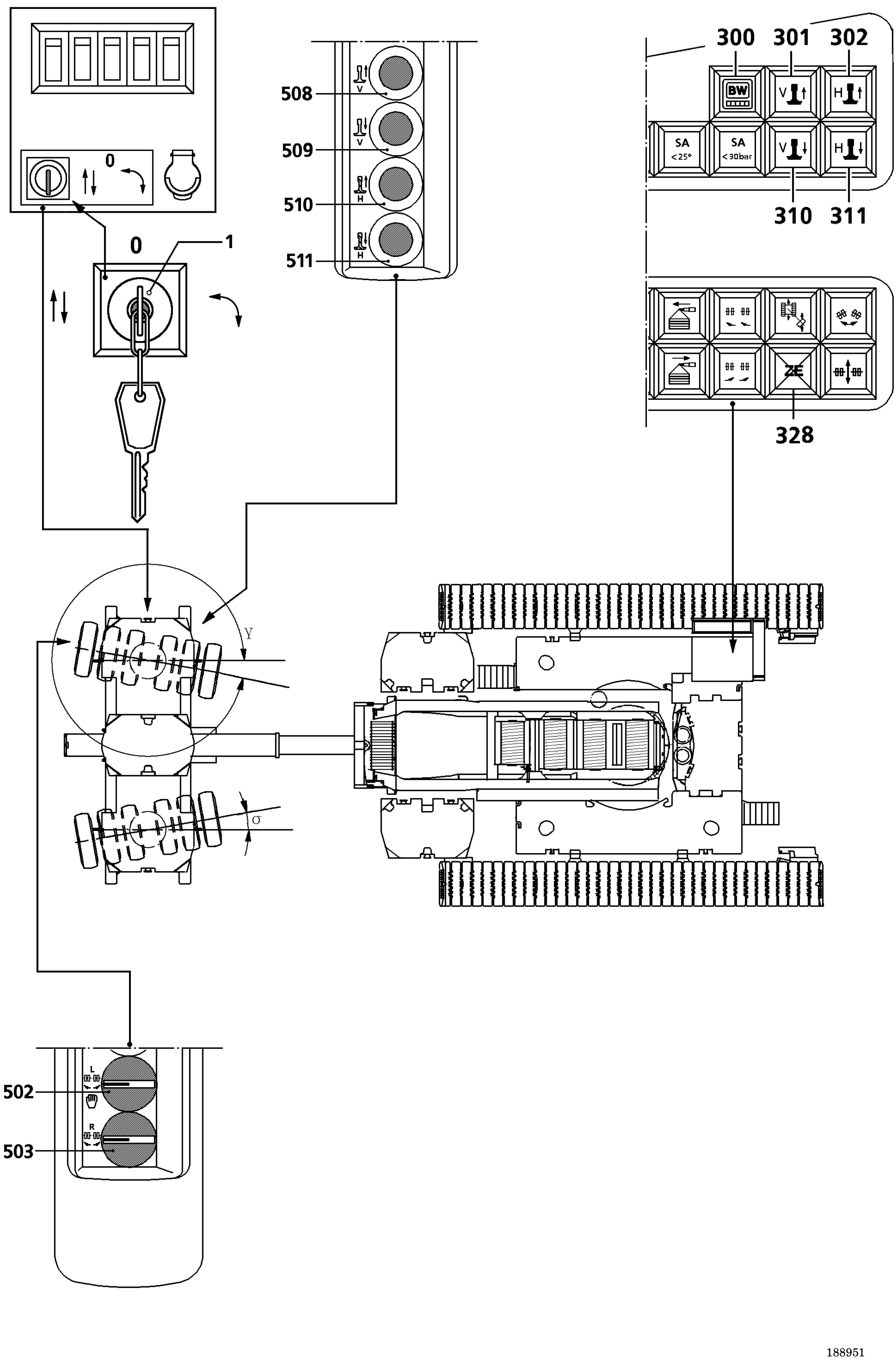
Note: By turning the keyed button (1) to the left, the order **'towing'** is sent to the crane.

- Actuate the rotary switch (502) , bring the left set of wheels to towing position;
- Actuate the rotary switch (503) , bring the right set of wheels to towing position.

**D A N G E R : The wheel position of the sets of wheels must be constantly monitored when driving. Note the angle scale on the ballast trailer .
If the tires are distorted excessively, readjust the position.**

10.2.3 Lower the ballast trailer with the support cylinders

- Press button (301 and 302) **or**
  button (508 and 510) , the outrigger support cylinders retract on the front and rear;
- The indicator light (314), Outrigger support - ballast trailer are retracted, lights up.


0
1
0
508
509
510
511
300
301
302
BW
SA
< 25°
SA
< 30bar
310
311
ZE
328
γ
σ
502
503
L
R
188951

10.3 Emergency operation - driving in turns

By telescoping the ballast trailer, various turning radii can be achieved.

Prerequisites:
- The crane is at a standstill;
- The ballast trailer is properly installed.

10.3.1 Raise the ballast trailer with support cylinders

- Press button (310 and 311) **or**
  button (509 and 511) , the outrigger support cylinders extend on the front and rear.

10.3.2 Set the axles to driving in turns

- Switch the keyed button (1) on the ballast trailer to the right;

Note: By turning the keyed button (1) to the right, the order **'driving in turns'** is sent to the crane.

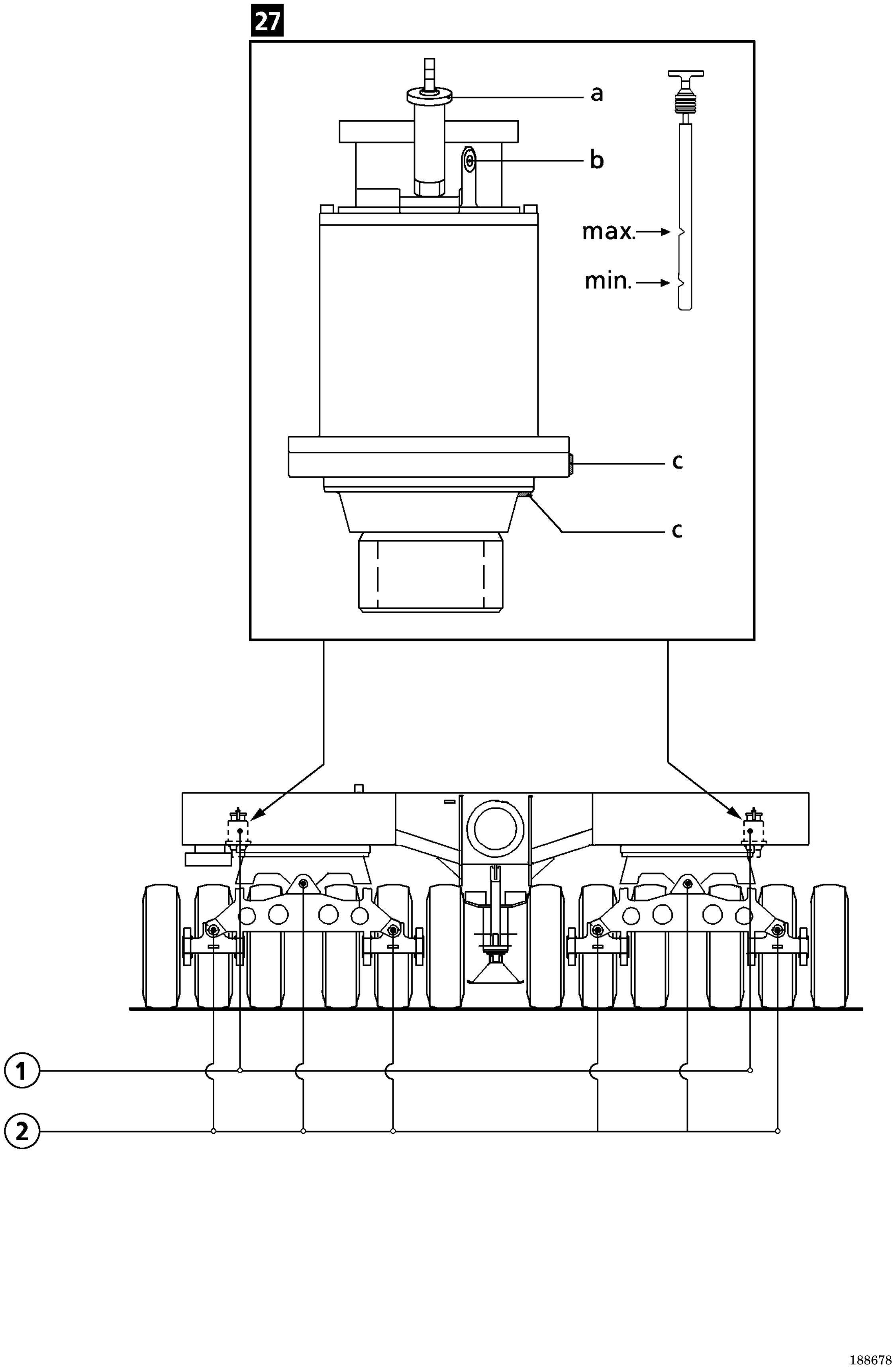
- Actuate the rotary switch (502) , bring the left set of wheels to driving in turns position;
- Actuate the rotary switch (503) , bring the right set of wheels to driving in turns position.

Ballast trailer radius [m]	Angle scale [°]	
	left [γ]	right [σ]
11 m	348.19	11.80
13 m	349.96	10.03
15 m	351.28	8.71

D A N G E R : The wheel position of the sets of wheels must be constantly monitored when driving. Note the angle scale on the ballast trailer . If the tires are distorted excessively, readjust the position.

10.3.3 Lower the ballast trailer with the support cylinders

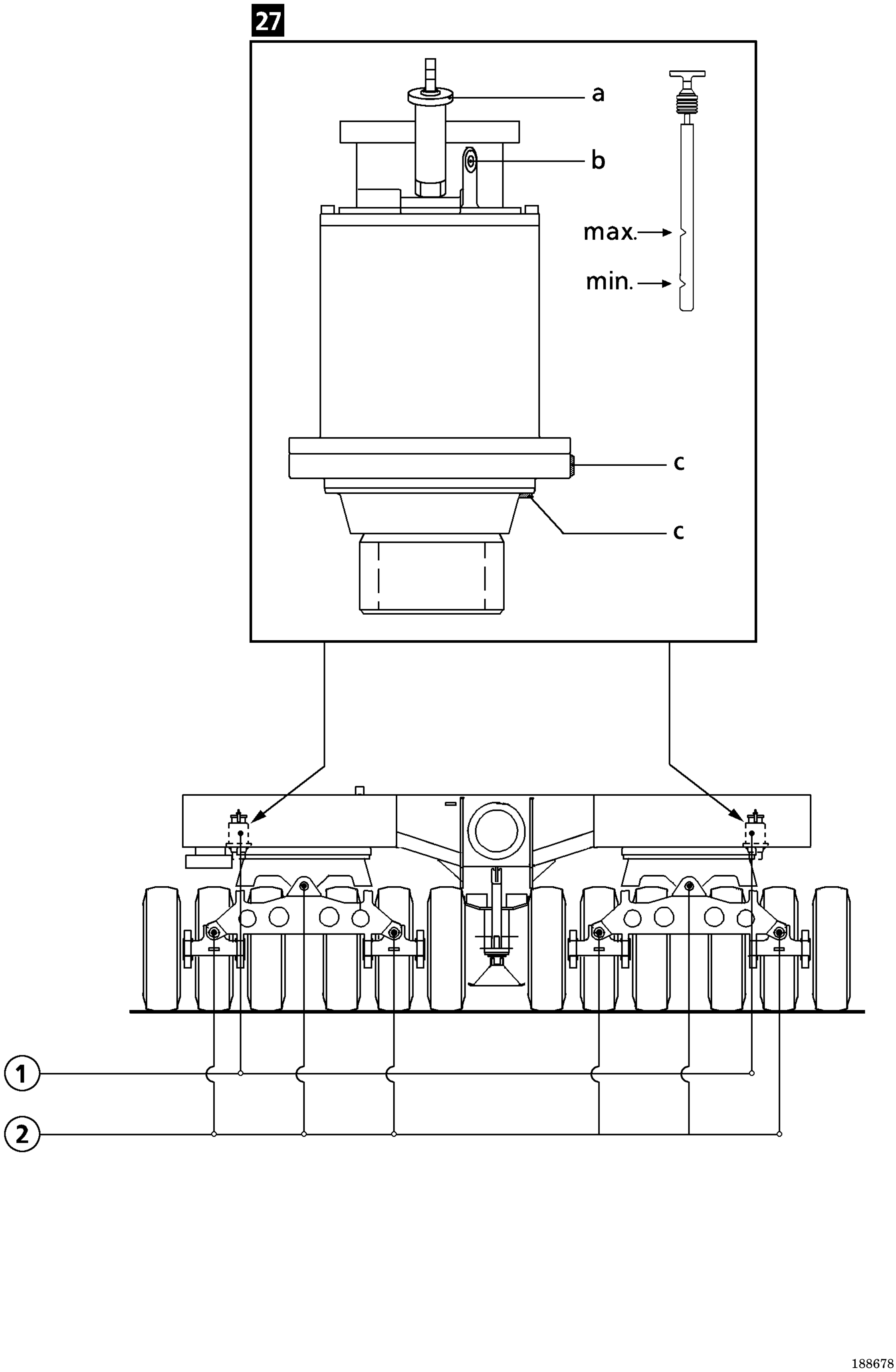
- Press button (301 and 302) **or**
  button (508 and 510) , the outrigger support cylinders retract on the front and rear;
- The indicator light (314), Outrigger support - ballast trailer are retracted, lights up.


27
a
b
max.
min.
c
c
1
2
188678

11. Maintenance

11.1 Maintenance intervals

	first maint. after	regular maintenance every				Min. maint. annually	Check	
		100 hrs.	200 hrs.	400 hrs.	1200 hrs.		daily	weekly
□ **Slewing gear**								
- check for leaks							×	
- check oil level								×
- check mounting screws for tight seating	200 hrs.			×		×		
- change oil					4000 hrs.	every 4 years		
□ **Axle linkage**								
- lubricate			×			×		


27
a
b
max.
min.
c
c
1
2
188678

11.2. **Slewing gear**, fig. 27

11.2.1 Check the oil level

The oil must be between the MIN- and MAX- mark on the dipstick.

- Check the oil level only when the crane is in horizontal position.
- Pull the dipstick, wipe it off, reinsert it and pull it out again.
- Reinsert the dipstick tightly into the test point after checking the oil level .
- If necessary, add oil **according to the lubrication chart**.

C A U T I O N : **If the oil level has dropped below the MIN mark, then oil must be added according to the lubrication chart, until the oil level is between the MIN and the MAX mark.**
If no oil is added, the gear will be damaged severely.

11.2.2 Change the oil :

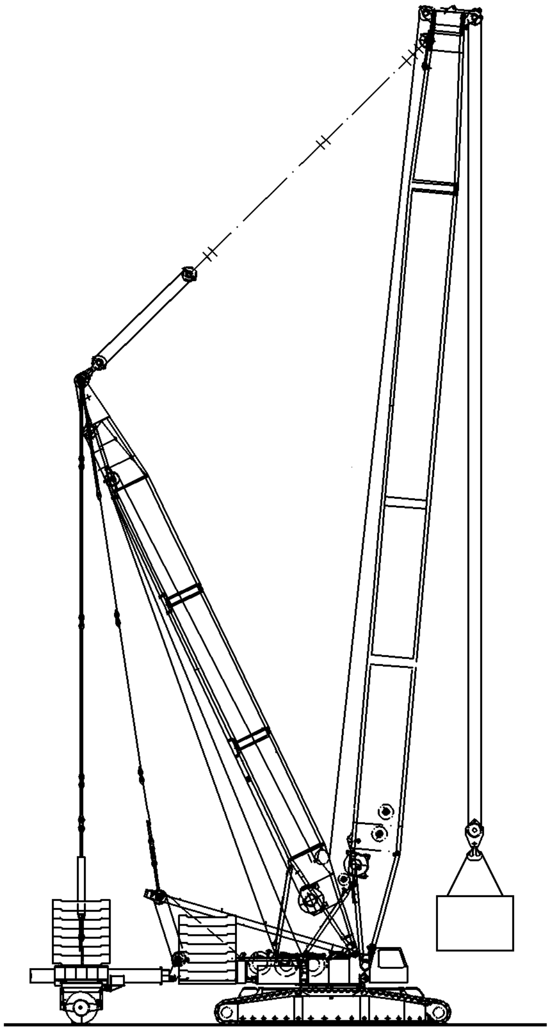
- Pull the dipstick (a) for bleeding;
- turn out the drain plug (c) with seal ring and clean the sealing surface;
- Drain off the old oil into a suitable container;
- Reinsert the drain plug (c) with a new seal ring and tighten;
- Turn out the oil filler plug (b) and clean the sealing surface;
- Add oil as specified on the lubrication chart on filler port (b) ;
- Reinsert the filler plug (b) and tighten;

- Wipe of the dipstick and reinsert it, then pull it out again;
- After checking the oil level, reinsert it tightly into the test point;
- repeat the procedure, if necessary.

C A U T I O N : **During all procedures, make sure to observe utmost cleanliness, to prevent any dirt infiltration into the gear.**

11.3 Central lubrication system

For maintenance of central lubrication system, see chapter 7.05 MAINTENANCE GUIDELINES - CRANE SUPERSTRUCTURE.



189167

11.4 Tires

- Check the tires for damage.
  The depth of the tire threads may not fall below the minimum value, as stated by law.
- The tire pressure must be 10 bar .
  The tire pressure must be checked when the tires are cold.
- Before increasing the tire pressure, make sure that the tires are seated properly on the rim, make sure the end ring is also seated properly.

C A U T I O N : The highest permissible air pressure may not be exceeded!

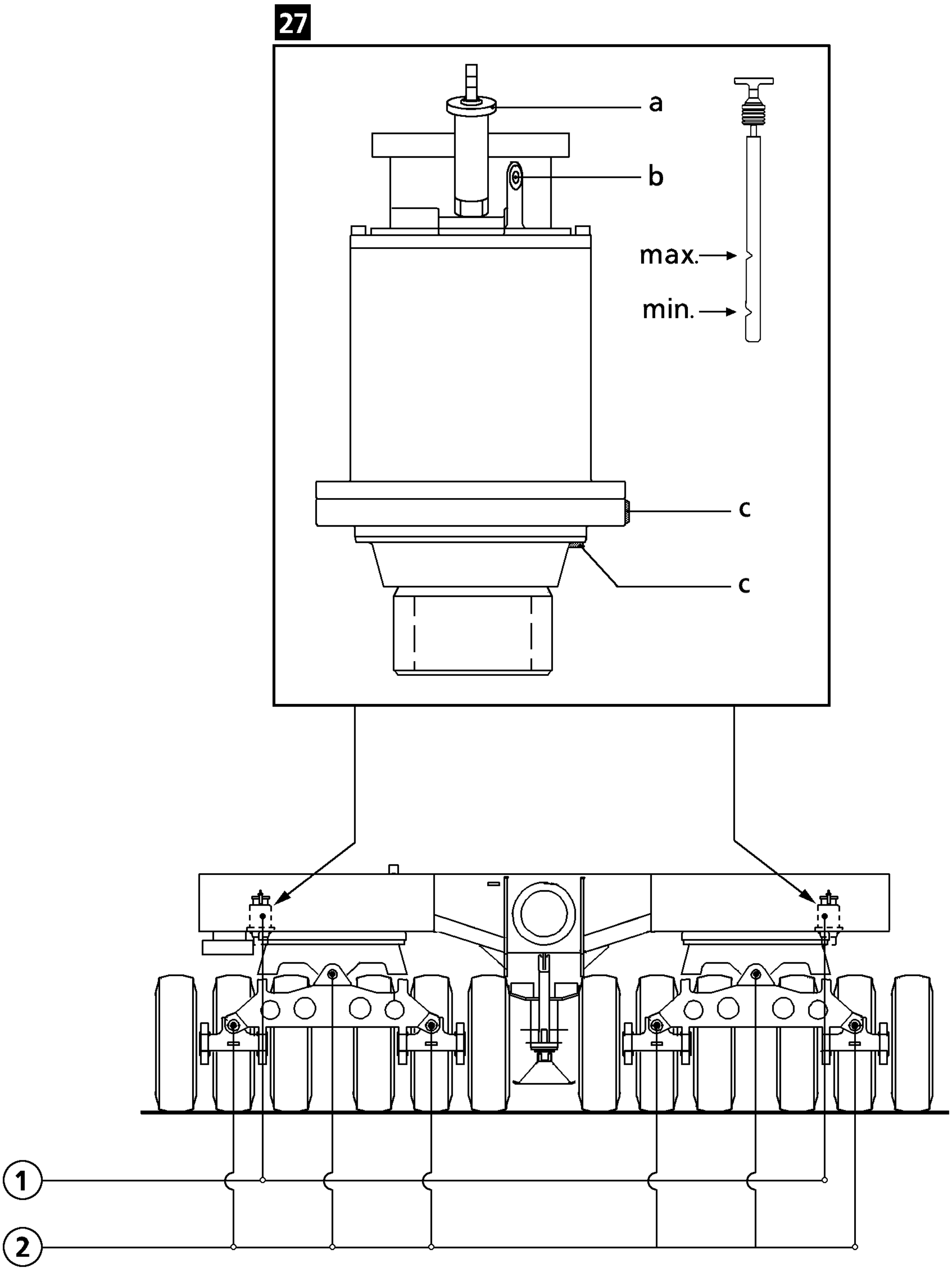
D A N G E R: Before increasing the tire pressure, make sure that nobody is in the danger zone, where they might be hit due to flying part.
In case of tire damage, insufficient thread depth, and varying air pressure in the individual tires there is an increased risk of accidents!

11.4.1 Safety and maintenance guidelines for wheels disks (rims)

The following safety and maintenance guidelines are recommendations from the manufacturer, to prevent safety problems due to damaged wheel disks.
In addition, the manufacturer's warranty is only valid if these notes are observed.
The wheel is one of the most important safety components on the vehicle, for that reason, the following points must be observed. When changing tires, the entire wheels must be checked, the dish as well as the rim for the following:
- excessive rust or corrosion
- bent rim flanges
- cracks in the rim
- cracks in the wheel dish
- damage on the side or end rings
- damage on lug nuts or bolts
- deformed bolt holes
- correctly fitting / matching rim components.

If damaged rim components are found then they must be removed and replaced with new components.
If chipped paint or slight rust formation is found, the wheels may be cleaned and repaired with commercially available paint. Special attention must be paid to ensure that the surface on the tire seating surface is smooth and in excellent condition.

D A N G E R: Any welding on rims and dishes, especially repairing deformed bolt holes and replacing or repairing the whole wheel center is strictly prohibited.
Disk wheels with defects of this nature must be scrapped immediately.
Repair of these highly - stressed sections causes structural changes in the material, which can lead to sudden and premature fractures.



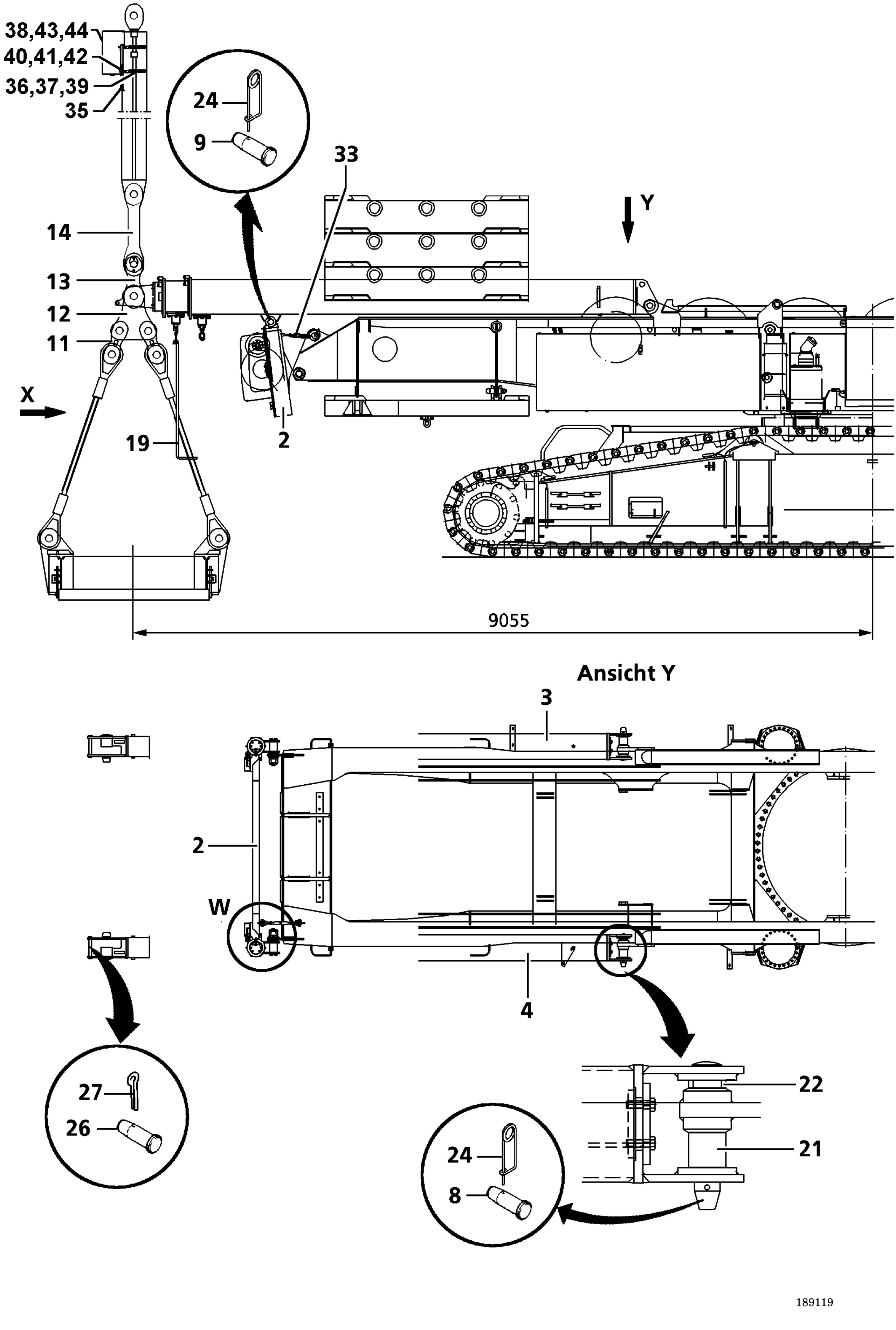
188678

11.5 Lubrication chart, filling quantities

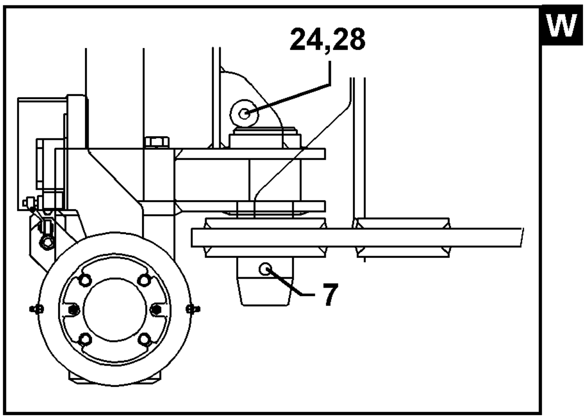
Ballast trailer	ca. Liter
Slewing gear synthetic gear oil	3.0
Central lubrication system Special grease	2.0 kg
Lubrication Special grease	0.1 kg

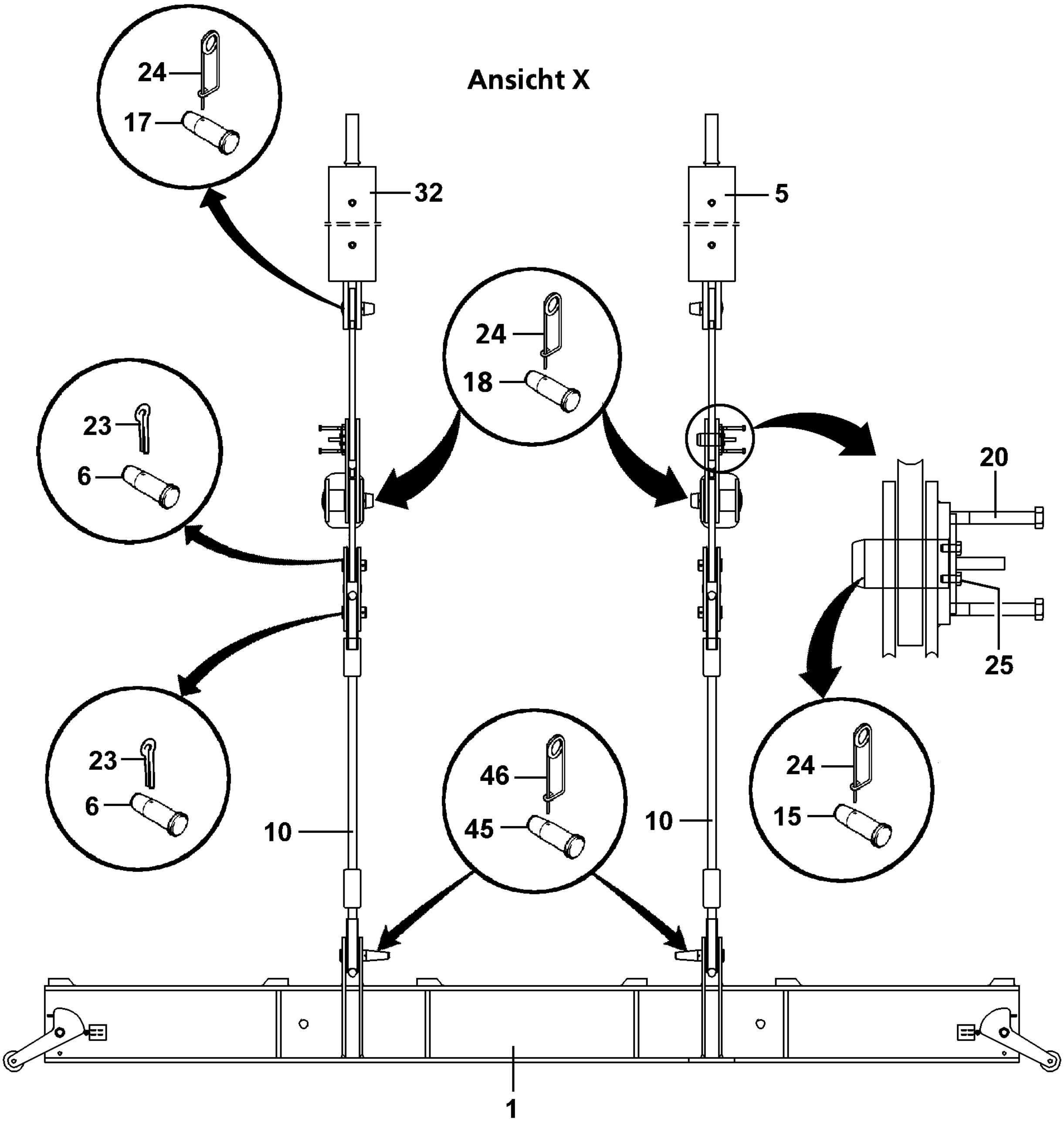
C A U T I O N : The given values are only orientation values.
Always use the markings on dipsticks, control ports or sight gauges for filling levels.

Explanation for lubrication schedule:
1 Synthetic gear oil
2 Grease



38,43,44
40,41,42
36,37,39
35
24
9
33
Y
14
13
12
11
X
19
2
9055
Ansicht Y
3
2
W
4
27
26
22
24
21
8
189119





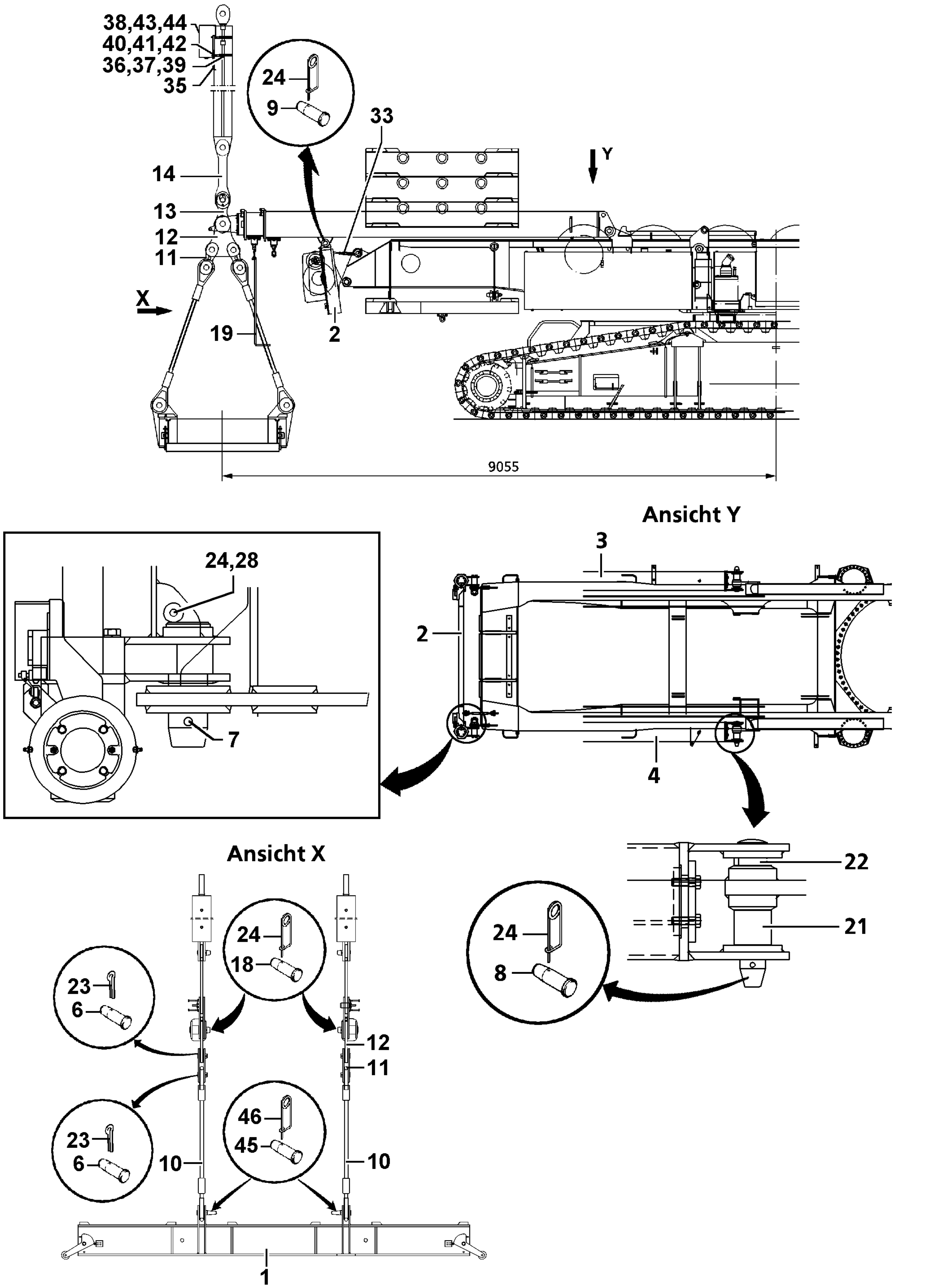
189120

1. Description

The derrick ballast consists of :

- two hydraulically telescopeable ballast guides, which are bolted to the right and left hand side of the slewing platform. They can be telescoped out to 11 m, 13 m and 15 m derrick ballast radius . The 2 m long end section must be pulled mechanically.
- the guide, complete, consisting of frames with installed cable and hose drums as well as two hydraulic cylinders to lift the ballast guides at installation or operation with additional counterweight .
- ballast pallet with cables.
- two pull cylinders on the right and left in the derrick guying, to lift and lower the derrick ballast.

Pos.	Component	Length	Qty.
1	Ballast pallet		1
2	Guide, complete		1
3	Ballast guide, right		1
4	Ballast guide, left		1
5	Pin	∅ 70 × 305 mm	4
6	Handle pin		4
7	Pin	∅ 80 × 245 mm	2
8	Pin	∅ 70 × 390 mm	2
9	Pin	∅ 70 × 330 mm	2
10	Pin bracket		2
11	Cross bracket		4
12	Pin bracket		2
13	Rod		2
14	Rod	0,400 m	2
18	Pin	∅ 100 × 321 mm	2
19	Handle		1
20	Pin	∅ 80 × 203 mm	4
21	Spacer tube	∅ 101,6 × 95 mm	2
22	Spacer tube	∅ 101,6 × 20 mm	2
24	Spring retainer	∅ 6 mm	16
26	Pin	∅ 30 × 250 mm	2
27	Cotter pin	5 mm × 40 mm	2
33	Tension lock		1
35	Console		2
36	Console		2
37	Pin	∅ 30 × 390 mm	2
38	Washer	A 31	4
39	Cotter pin	6,3 × 45 mm	4
40			
41	Screw	M 24 × 320 mm	4
42	Nut	M 24	4


38,43,44
40,41,42
36,37,39
35
24
9
33
Y
14
13
12
11
X
19
2
9055
Ansicht Y
3
24,28
2
7
4
22
21
24
8
Ansicht X
24
18
23
6
12
11
23
6
46
45
10
10
1

189121

2. Installation

Prerequisites:

- The boom and the derrick are installed.
- The derrick is in operating position, radius 9.0 m.
- The adjuster between derrick and boom is tensioned.
- The guy rods for the derrick ballast must be assembled as outlined in chapter 5.03.

Installation of the guides

Lift the guide, complete, (2) with the auxiliary crane on the eyehooks and swing to the rear section of the slewing platform, pin and secure.

Note: The weight of the complete guide (2) is approx . 1.0 t

Insert the pin (7) and pin and secure with pin (28) and spring retainer (24) .

Attach the tension lock (33) on the slewing platform, installation retainer.

C A U T I O N: The tension lock (33) must be removed as soon as the guide (2) is pinned on the ballast guides (3, 4) .

Remove the auxiliary crane .

Before installation of the ballast guides, pin and secure the triangular brackets (12), complete, as well as the brackets (13) on the end section of the ballast guides (3, 4) . Use pin (18) and spring retainer (24) .

Note: The brackets (11) are already pinned on the triangular brackets with pin (6) and secured with cotter pin (23) .

Installation of the ballast guides

Lift the ballast guide right (3) and left (4) with the auxiliary crane and swing to the slewing platform (Y), pin and secure.

Note: The weight of the ballast guide is approx. 2.2 t

Insert the pin (8) , add the spacer tubes (21 + 22) and secure with spring retainer (24) .

Lower the ballast guide, right (3) and left (4) with the auxiliary crane and pin and secure on the hydraulic cylinder of the guides (2) . Use pin (9) and spring retainer (24) .

C A U T I O N: The tension lock (33) must be removed as soon as the guide (2) is pinned on the ballast guides (3, 4) .

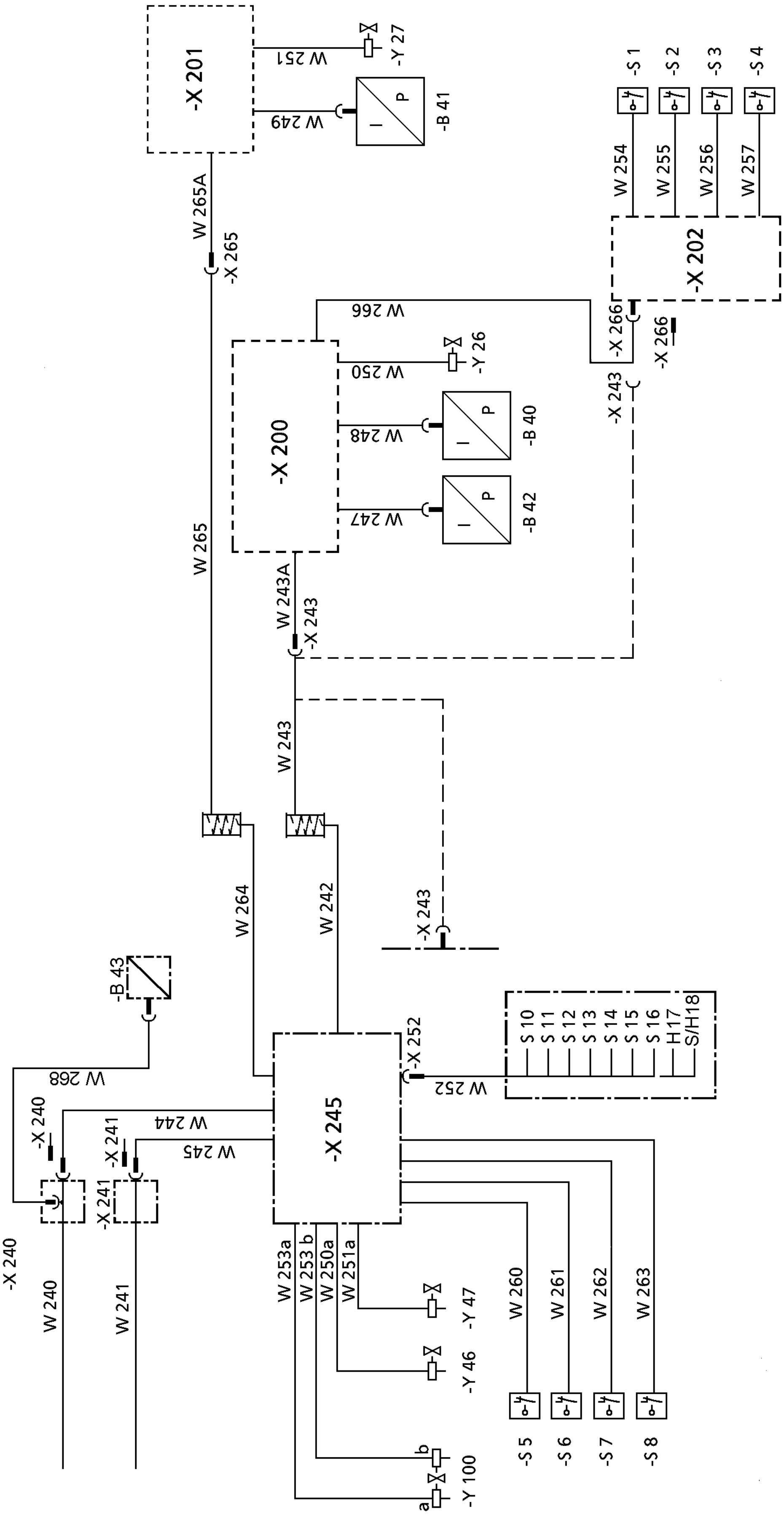
Installation of the ballast pallet

Set the ballast pallet (1) with the auxiliary crane to a radius of approx. 9 m to the center of rotation of the crane and align.

Note: The weight of the ballast pallet (1) is approx. 5.8 t

Pin and secure the cables (10) on top on the brackets (11) . Use pin (6) and spring retainer (24) .

Pin and secure the cables (10) on the bottom on the ballast pallet (1) . Use pin (45) and spring retainer (46) .

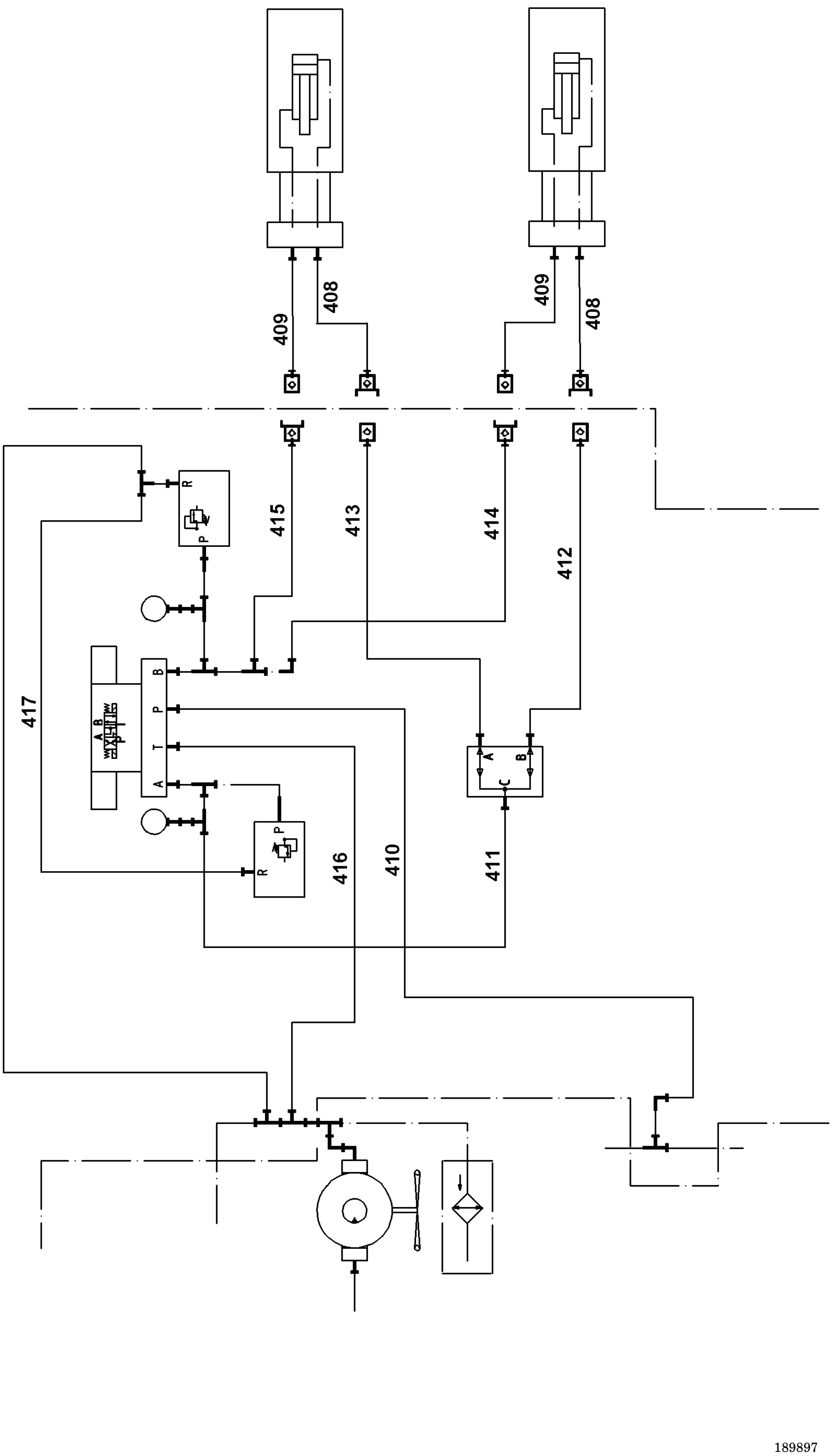

-X 201
W 251
-Y 27
W 249
-B 41
W 265A
-X 265
-S 1
-S 2
-S 3
-S 4
W 254
W 255
W 256
W 257
-X 202
W 266
-X 266
-X 266
-X 200
W 250
-Y 26
W 248
-B 40
W 247
-B 42
-X 243
W 265
W 243A
-X 243
W 243
W 264
W 242
-X 243
-B 43
-X 252
W 268
S 10
S 11
S 12
S 13
S 14
S 15
S 16
H17
S/H18
W 252
-X 245
-X 240
W 244
-X 241
W 245
-X 241
-X 240
W 240
W 241
W 253a
W 253 b
W 250a
W 251a
-Y 47
-Y 46
W 260
W 261
W 262
W 263
-S 5
-S 6
-S 7
-S 8
-Y 100

189899

Establish the electrical connections from the slewing platform to the guide (2) - see Electric wiring diagram.

Establish the electric connection from the connector box (-X245) in the guide to the slewing platform.

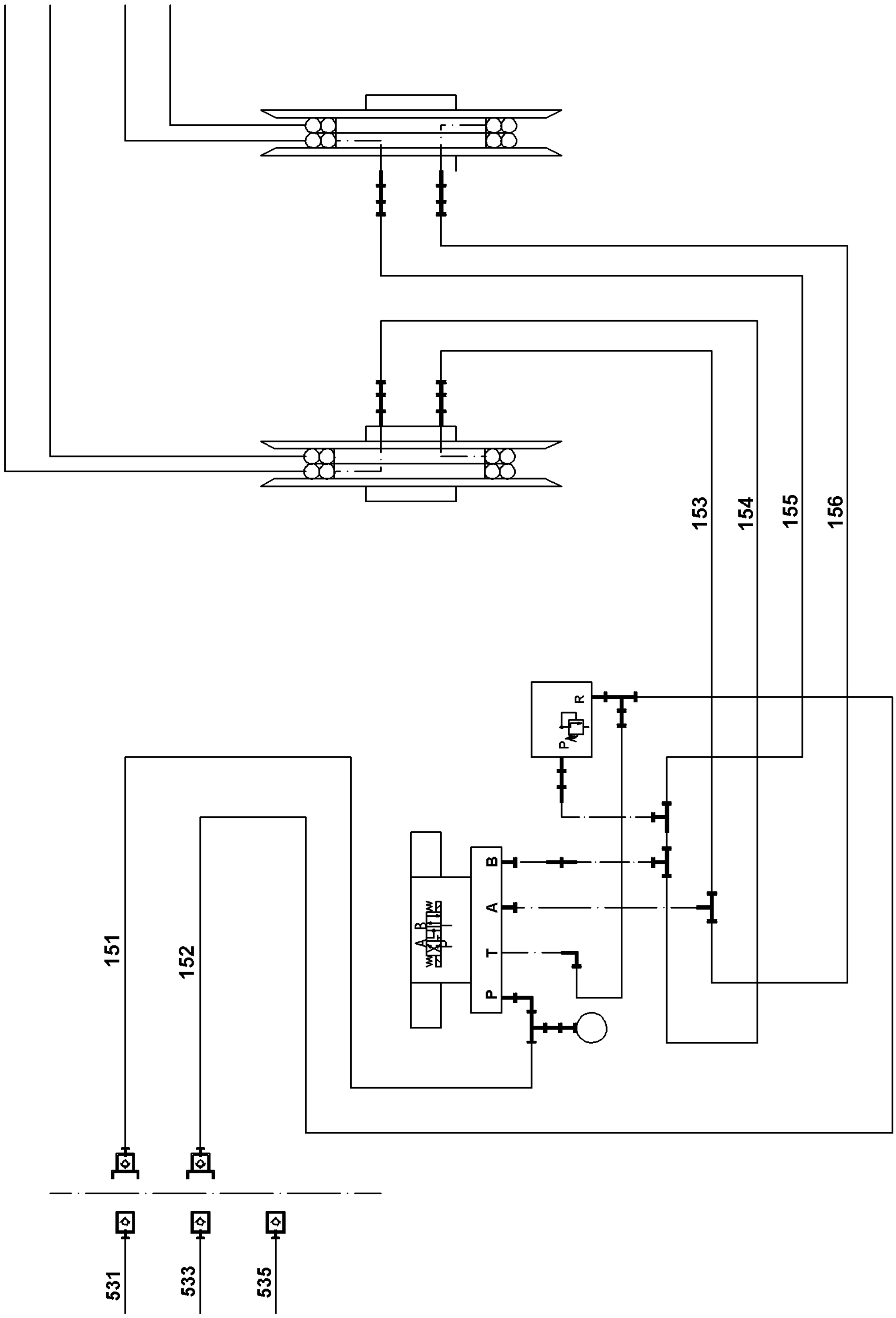
Unplug the dummy plug (-X240, -X241) and plug the cable plug (W244, W245) into the socket (-X240, -X241) .


409
408
409
408
415
413
414
412
417
407
416
410
411
189897

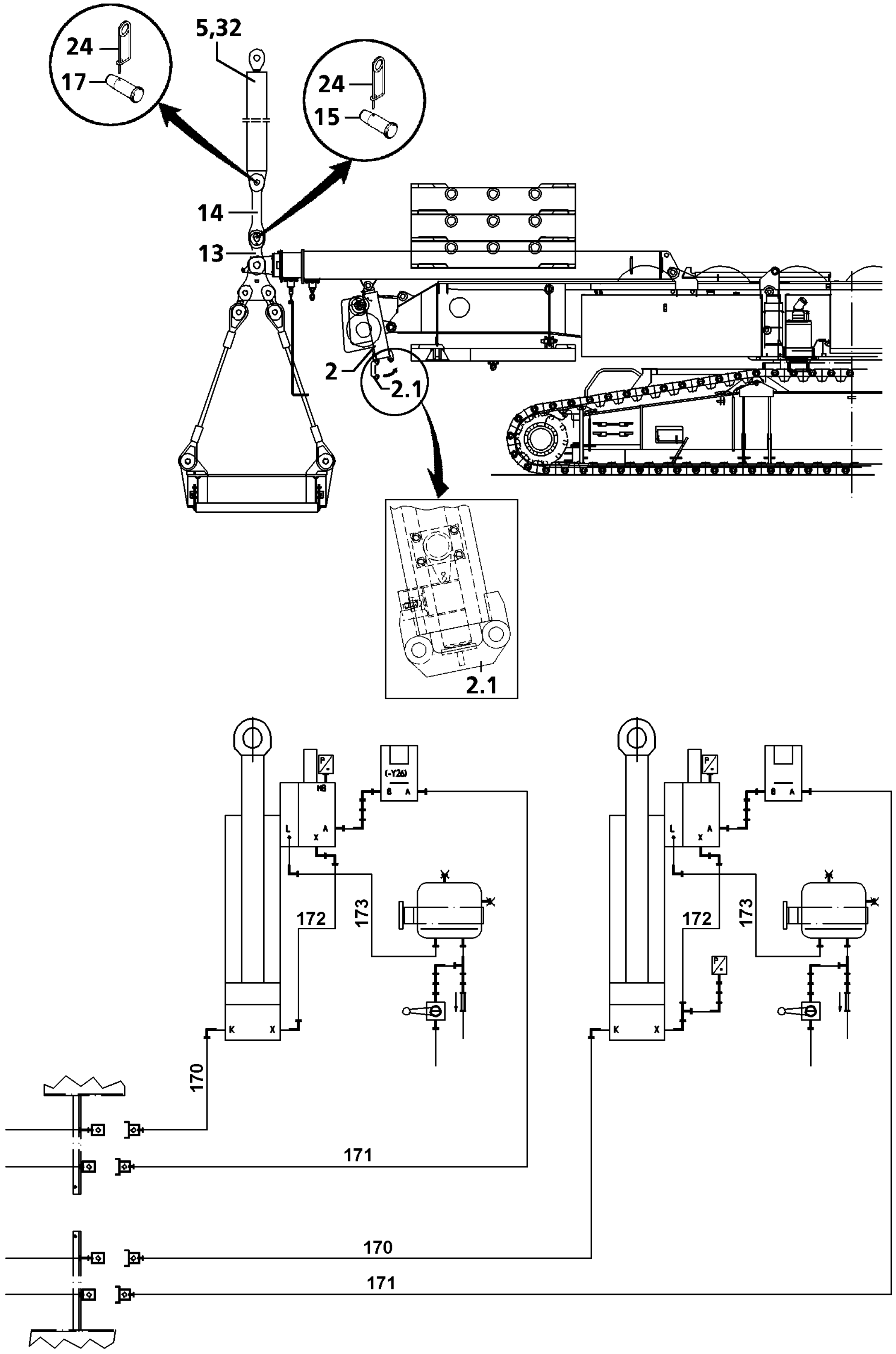
Establish the hydraulic connections from the slewing platform to the guide (2) - see Hydraulic wiring diagram.

Establish the hydraulic connections from the slewing platform to the telescoping cylinders in the ballast guide . Connect the hoses (414, 412) and (415, 413) with (409, 408) - 4 × quick couplings (see left illustration).

Establish the hydraulic connection from the slewing platform (531,533) to the cylinders and the hose drums in the guide. Connect the hoses (531,533) with (151, 152) - 2× quick couplings (see below).



189896



189898

Start the Diesel engine.

Press the button - pressure change over in the cab.

Pin and secure the brackets (14) on the pull cylinders (5, 32) . Use pin (17) and spring retainer (24) .

Close the flap (2.1) on the hydraulic cylinder in the guide (2) and set the ball cock to **"down", operation - ballast guide frame**.

Positions of the ball cock:

Position **”up”**	-	Operation, derrick ballast
Position **"horizontal"**	-	STOP, extension and retraction of the piston rod is blocked
Position **”down”**	-	Operation, ballast guide frame

Lift the ballast guides by extending the hydraulic cylinders until the brackets (14) can be pinned and secured on brackets (13) . Use pin (15) and spring retainer (24) .

The hydraulic cylinders can be controlled from the crane cab or from the manual control panel on the guide (2) .

D A N G E R: **The manual control panel may only be used to install and remove the derrick ballast. As soon as the pins are inserted, the derrick ballast functions may only be carried out from the crane cab, because the monitor is required for derrick ballast operation .**
It is prohibited to lift the derrick ballast with the control panel off the ground.
This can cause a serious accident!

Establish the electrical connections from the guide (2) to the derrick ballast pull cylinders (5, 32) - see **Electric wiring diagram.**

Establish the electrical connection from the cable drums to the connector box (-X200) and (-X201) . Insert the cable plug (W243) and (W265) .

Remove the dummy plug (-X266) and plug the cable plug (W266) for the limit switches "derrick ballast on the ground" into connector box (-X202) .

Establish the hydraulic connections from the guide (2) to the pull cylinders (5, 32) - see **Hydraulicwiring diagram**.

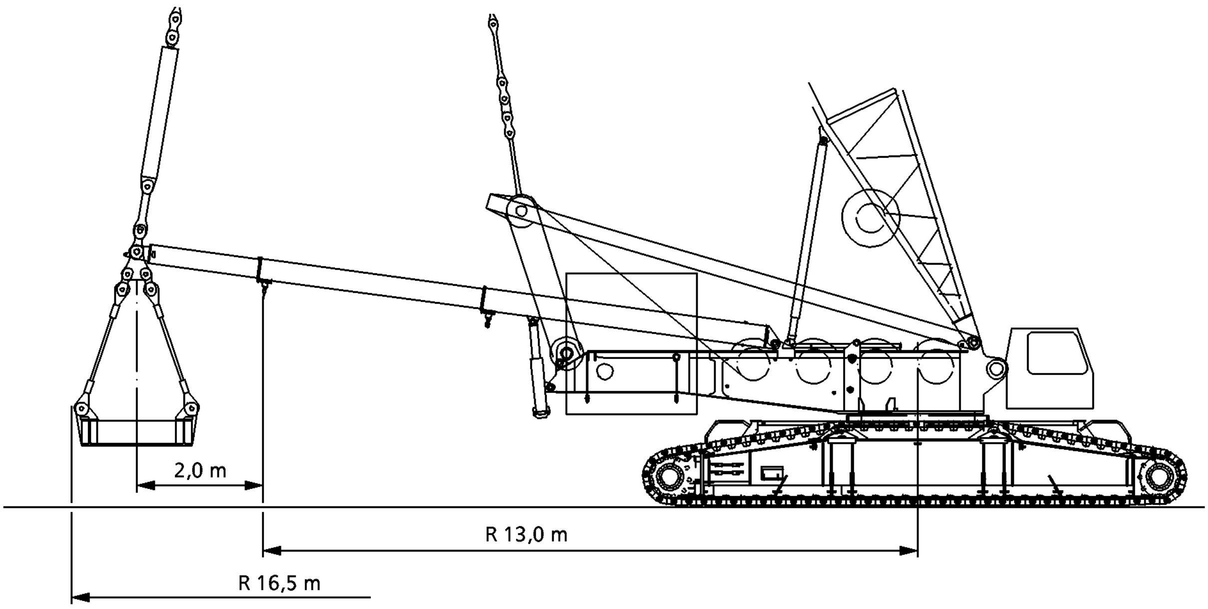
Establish the hydraulic connection from the hose drum to the derrick ballast pull cylinders . Connect the hoses from the cable drums with the hoses (170, 171) - 4 ×quick couplings.

Lift and set down the empty ballast pallet (1) again on the ground by actuating the hydraulic cylinder in the guide (2). This ensures that the ballast pallet is exactly vertically aligned before placing the ballast plates .

D A N G E R: **If this is not observed, there is a danger of tipping when lifting with placed ballast plates.**
The placement surface of the derrick ballast pallet must be level, horizontal and of sufficient load carrying capacity.

Open the flap on the hydraulic cylinder of the guide (2) . The flaps must be opened in crane operation in all operating modes with the derrick ballast .

D A NG E R: **In derrick ballast operation with closed flap, the ballast guide will be damaged when the derrick ballast is set down on the ground.**
This can lead to a sudden reduction of the derrick ballast radius and therefore to crane failure!



187218

3. Function check

Prerequisites:
- All electrical connections have been established.
- The actuator levers of the limit switches on the guide and ballast pallet have been checked for easy movement and have been greased.
- The actuator pulleys on the ballast pallet have been checked for easy movement and have been greased.

Limit switch - "derrick ballast on the ground"
Actuate the limit switches individually. The slewing gear must turn off. The warning light must light up.

Limit switch - "derrick ballast on top and bottom"
Actuate the limit switches individually. The extension and retraction of the cylinders is turned off. The warning light must light up.

Telescope the derrick ballast to the required radius
The ballast guide can be telescoped hydraulically out to 11 m and 13 m .

C A U T I O N: The crane operator must ensure that the two telescoping cylinders move out evenly, because the length sensor is installed on only one side.
In case the two telescoping cylinders run apart, the extension mechanicsm should be run to stop momentarily until both telescoping cylinders are extended or retracted to the same length.
For working with a load, the pinnng of the extension mechanism for a fixed derrick ballast radius or 11 m, 13 m or 15 m is stipulated. In intermediate positions, a "monitored installation condition" would exist, which is not permitted for general operation with a load.

For a 15 m radius, the 2 m long end section must be pulled mechanically.

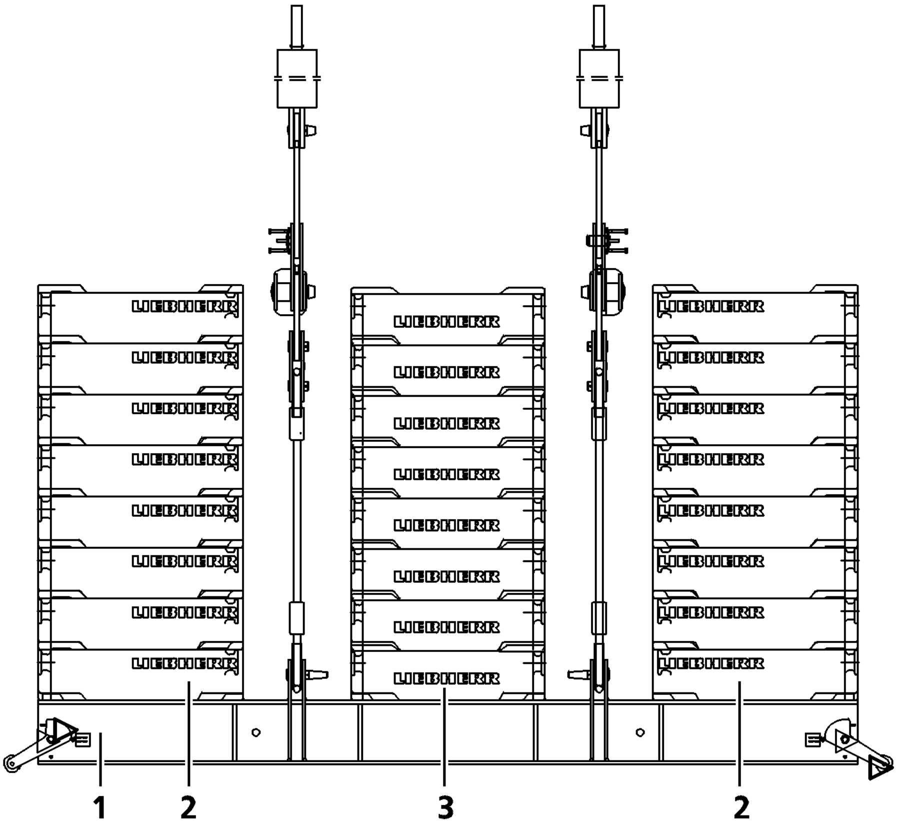
Note: To pull the 2 m long end section mechanically, **both** locking pins must be released.

Lift the ballast pallet (1) off the ground by actuating the hydraulic cylinders.
Release the locking pin with the installation rod and telescope the derrick ballast out to the required radius by pressing the corresponding button in the crane cab, then lock .
Place the ballast pallet (1) again on the ground by actuating the hydraulic cylinders.
Place the ballast plates according to the possible, permissible distribution (variation 1 + 2) onto the ballast pallet .

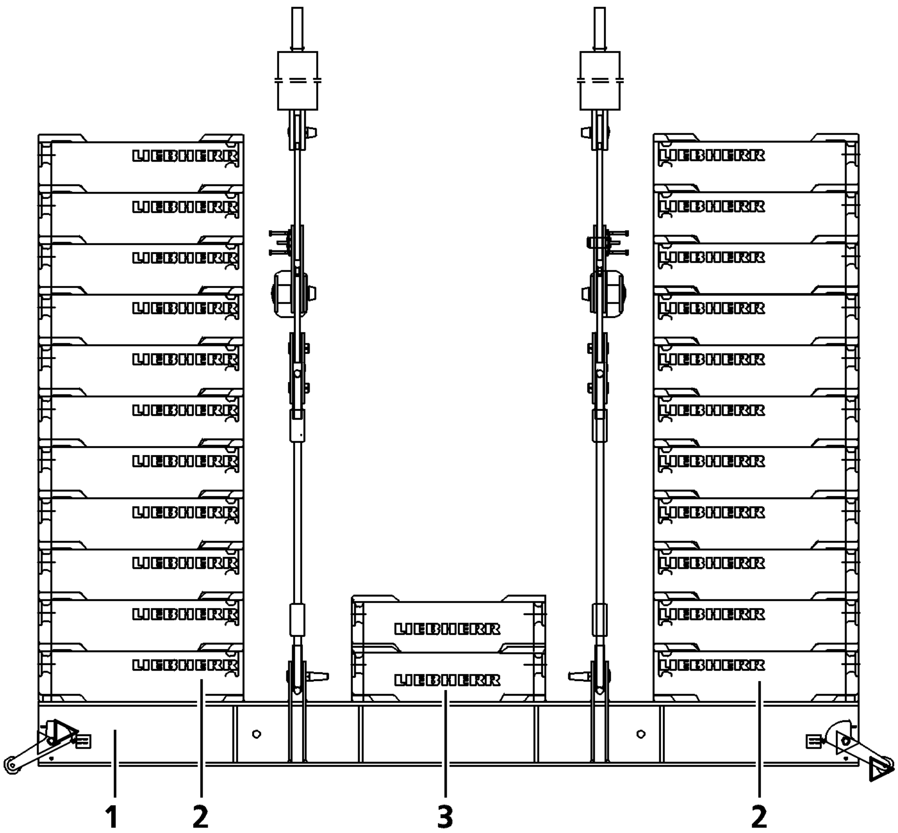
D A N G E R: The placed ballast weight must be according to the data in the load charts.
The plates must be placed in such a way that the pallet is always at an even weight.
Otherwise there is a danger of accidents.

If the ballast plates have been assembled or made by the customer, the dimensions must be the same as the original plates.

1



2



187219

4. Derrick ballast

The plates are marked with their own weight.

The max. derrick ballast of 250 t consists of:

Ballast pallet with accessories	1 × 10 t	=	10 t
Ballast plates, total	24 × 10 t	=	240 t

D A N G E R: **The installed derrick ballast must be according to the data in the load charts. The plates must be placed in such a way that the pallet is always at an even weight. Otherwise there is a danger of accidents.**

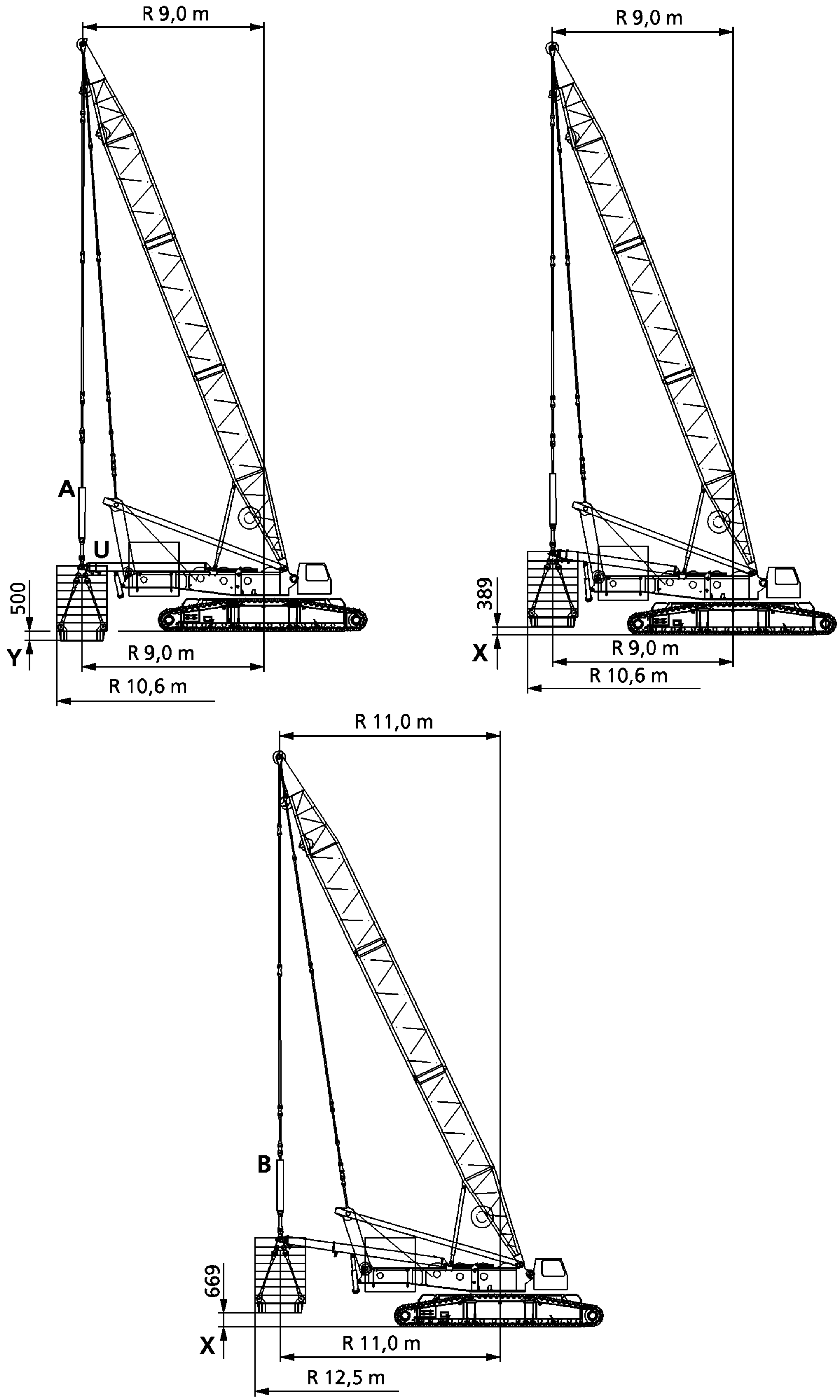
Possible permissible distribution of ballast plates

Variation 1

1	Ballast pallet with accessories	=	10 t
2	Ballast plates, left	8 × 10 t=	80 t
2	Ballast plates, right	8 × 10 t=	80 t
3	Ballast plates, center	8 × 10 t=	80 t
	max. derrick ballast	250 t	

Variation 2

1	Ballast pallet with accessories		=		10 t
2	Ballast plates, left	max.	11 × 10 t	=	110 t
2	Ballast plates, right	max.	11 × 10 t	=	110 t
3	Ballast plates, center	2 × 10 t		=	20 t
	max. derrick ballast				250 t

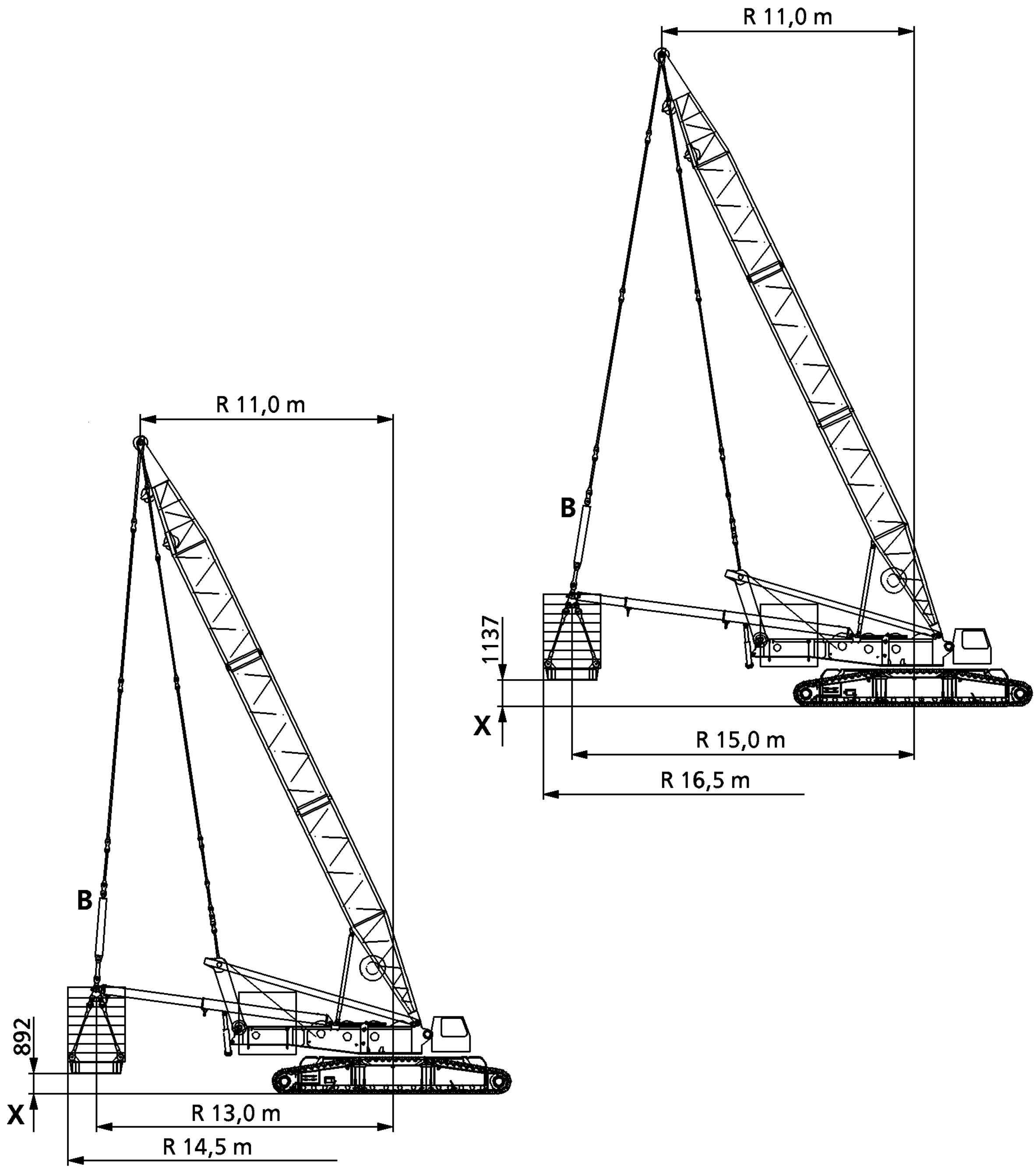

R 9,0 m
A
U
500
Y
R 9,0 m
R 10,6 m
R 9,0 m
389
X
R 9,0 m
R 10,6 m
R 11,0 m
B
669
X
R 11,0 m
R 12,5 m

187220

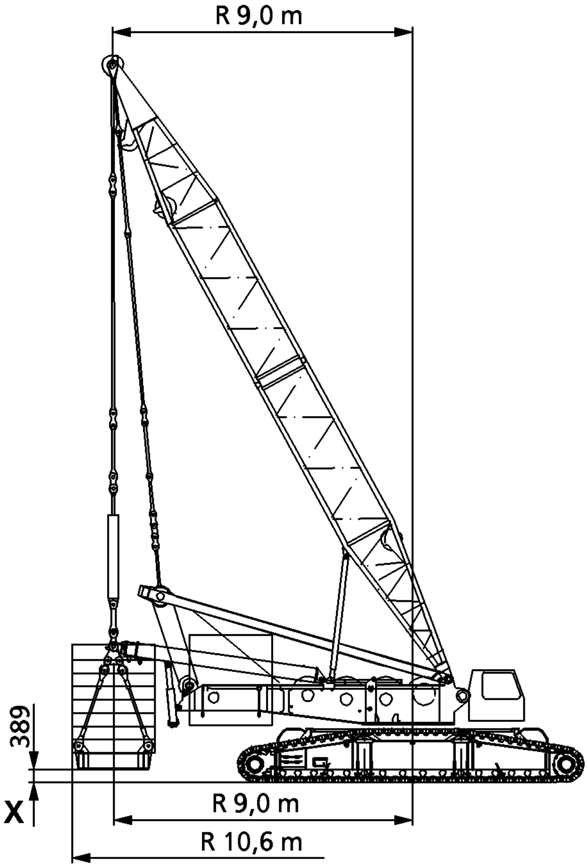
Operating positions derrick, derrick ballast radii and shut offs "under " or "over" the crane placement surface
Derrick 28 m

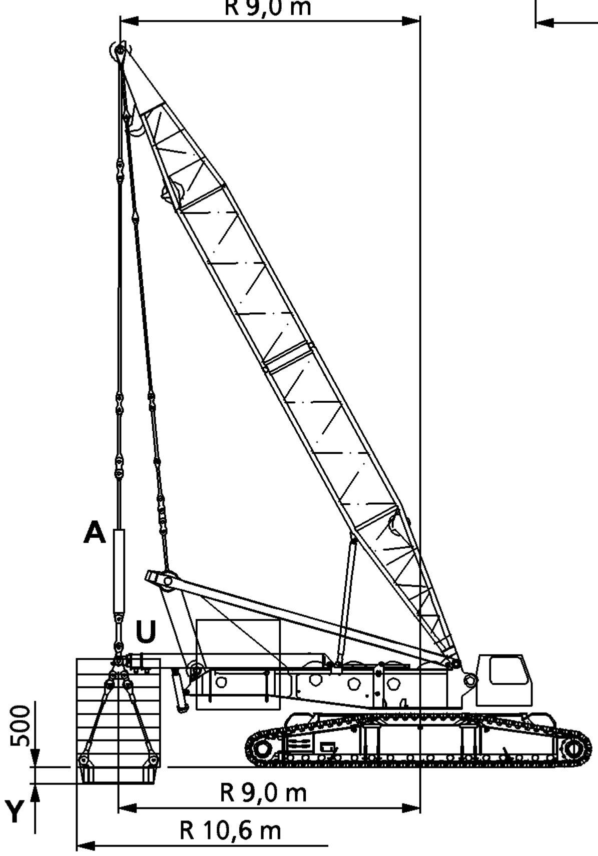
X = max. over placement surface
U = lower shut off (valid for all radii)
A = cylinder extended

Y = max. under placement surface
O = upper shut off
B = cylinder retracted



187221



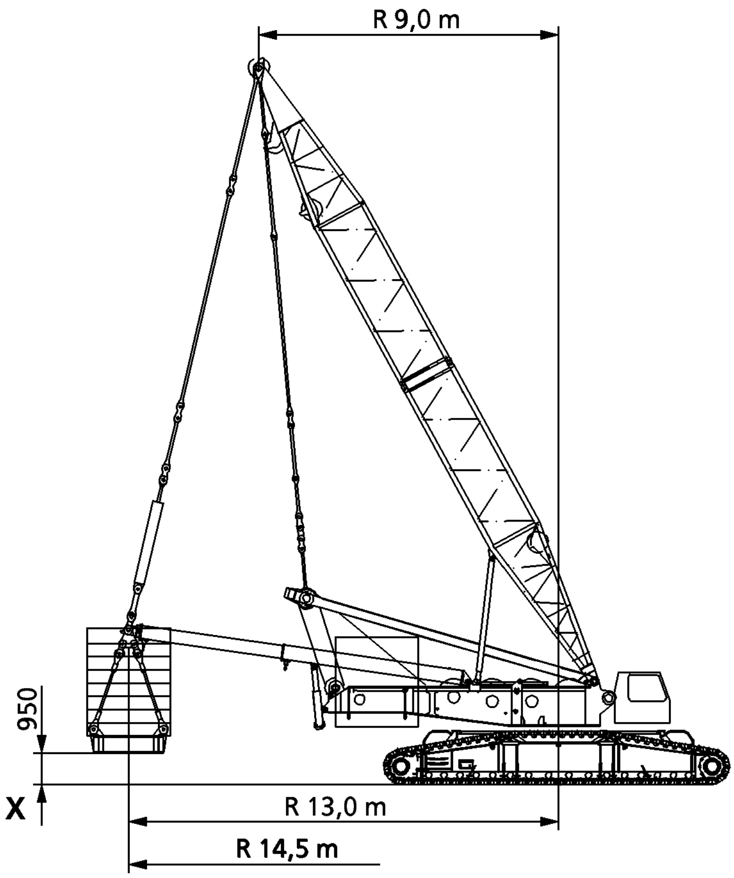


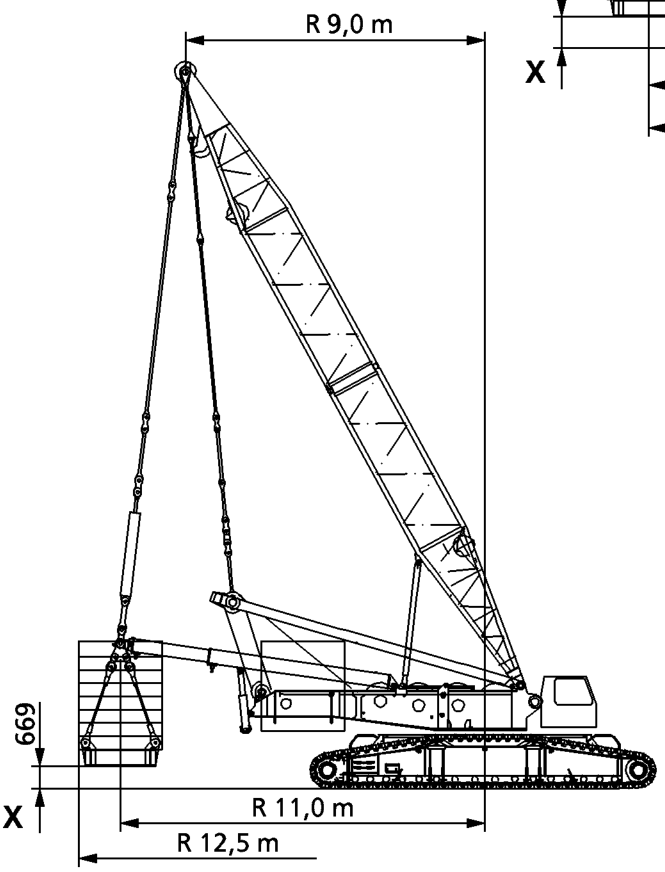
187222

Operating positions derrick, derrick ballast radii and shut offs "under " or "over" the crane placement surface
Derrick 21 m

X = max. over placement surface
U = lower shut off (valid for all radii)
A = cylinder extended

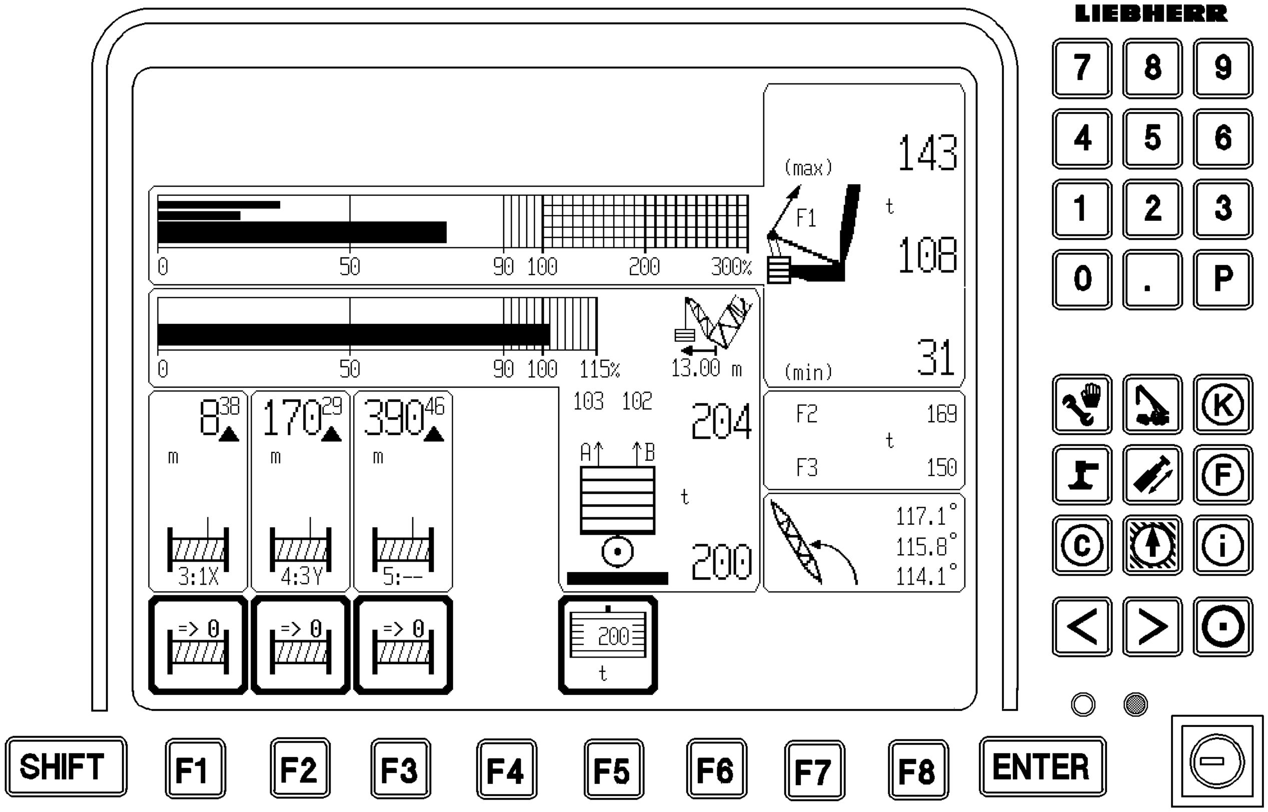
Y = max. under placement surface
O = upper shut off
B = cylinder retracted





187223

1


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max)
143
F1
t
108
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
(min)
31
8
m
170
m
390
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

188681

5. Crane operation with derrick ballast

Note: Derrick ballast = derrick ballast or ballast trailer (or suspended ballast trailer)

Prerequisites:
- The required derrick ballast according to the load charts has been placed .
- The derrick is in the required operating position, **radius 9 m or 11 m**.

Settings
Set the LICCON overload safety system according to the data in the load chart and confirm.

The actually existing ballast weight must be set on the LICCON overload safety system.

Note: To set the derrick ballast - see chapter 4.03, paragraph 1.5.
The required derrick ballast must be determined according to the data in the load chart.

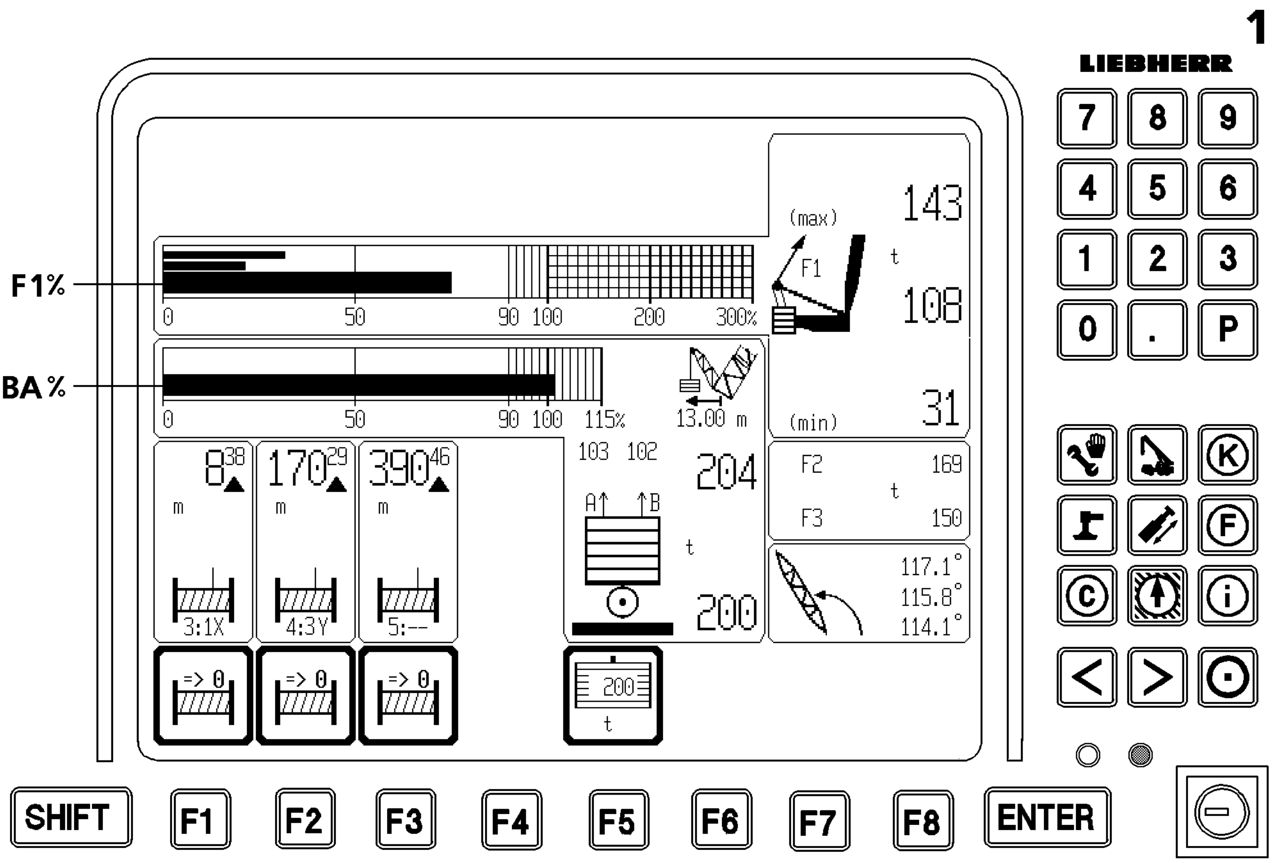
D A N G E R: **The set derrick ballast must match the actually installed ballast .**
An incorrect ballast weight entry can lead to dangerous operating situations.

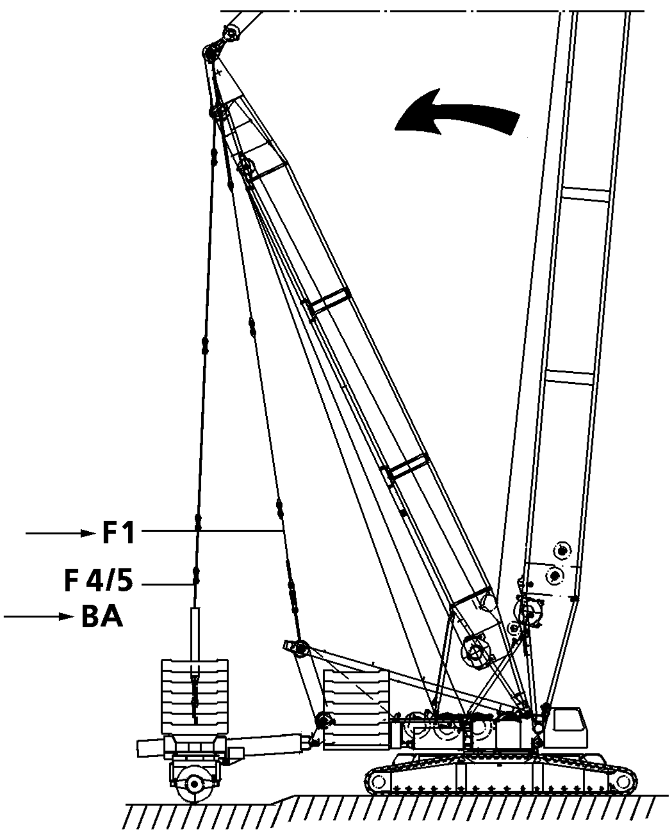
Operation
For the operation with derrick ballast, all data in chapter 4.02, paragraph 6.1 must be observed!

D A N G E R: **There may be no persons or obstacles within the turning range of the derrick ballast.**
During the turning movement, a guide must monitor the boom, derrick and derrick ballast to prevent a collision.
When turning with a load and derrick ballast (suspended derrick ballast), the turning movement must be initiated or slowed down very sensitively . If the turning movement is initiated or slowed down too abruptly or jerkily, the load or the derrick ballast (suspended derrick ballast) could start to swing. This could cause the boom to break and / or cause the crane to topple over.

Note: If the **suspended derrick ballast** must swing over any obstacles or must be set down at a different level as the crane is, there is the possibility to lower or raise the **suspended derrick ballast** with the hydraulic cylinders. The cylinders can be operated from the crane cab.

D A N G E R: **The derrick ballast functions may only be carried out from the crane cab, because the monitor is required for derrick ballast operation .**
It is prohibited to lift the derrick ballast off the ground with the control panel. This could cause a serious accident!
The derrick ballast must always be in horizontal position when raising or lowering with the cylinders, otherwise there is a danger of tipping over.
The extension condition of the cylinder piston rods must be visually monitored.


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

188680

Crane operation with derrick ballast

In all operating modes with derrick ballast, the load is distributed onto the guy rods from the derrick head to the A-bracket (F1) and to the derrick ballast (F4 / 5).
The load of the crane is monitored by test point 1 (F1), in the guying from the A-bracket to the derrick head. If the force becomes too high, all movements which would increase the load momentum are turned off.

The force distribution can change due to the following procedures:
- Taking on the load,
  due to the flexation of theslewing platform.
- by lifting or lowering the derrick ballast with the hydraulic cylinders.
- By taking on or unloading derrick ballast plates.

Safety guidelines
- The test points must be checked for function before crane operation .
- The crane must be horizontally aligned on the job site.
- The weight of the load to be lifted must be known.
- Place the ballast plates according to the data in the load charts or in the job planer.
- The placement surface of the derrick ballast may be above or below the placement surface of the crane, according to the data in the following illustrations.
- The placement point of the suspended derrick ballast at the end of the load lift must be level, horizontal and of sufficient load carrying capacity to take on the weight safely.

C A U T I O N : **Before setting down the load and suspended derrick ballast, the crane operator must make sure that he can safely do so.**

- There may be no obstacles within the slewing and turning range of crane, ballast trailer, suspended derrick ballast and load.
- The suspended derrick ballast should be lifted off the ground by approx. 0.25 m . A guide or the crane operator himself must watch the derrick ballast, as it is lifted.

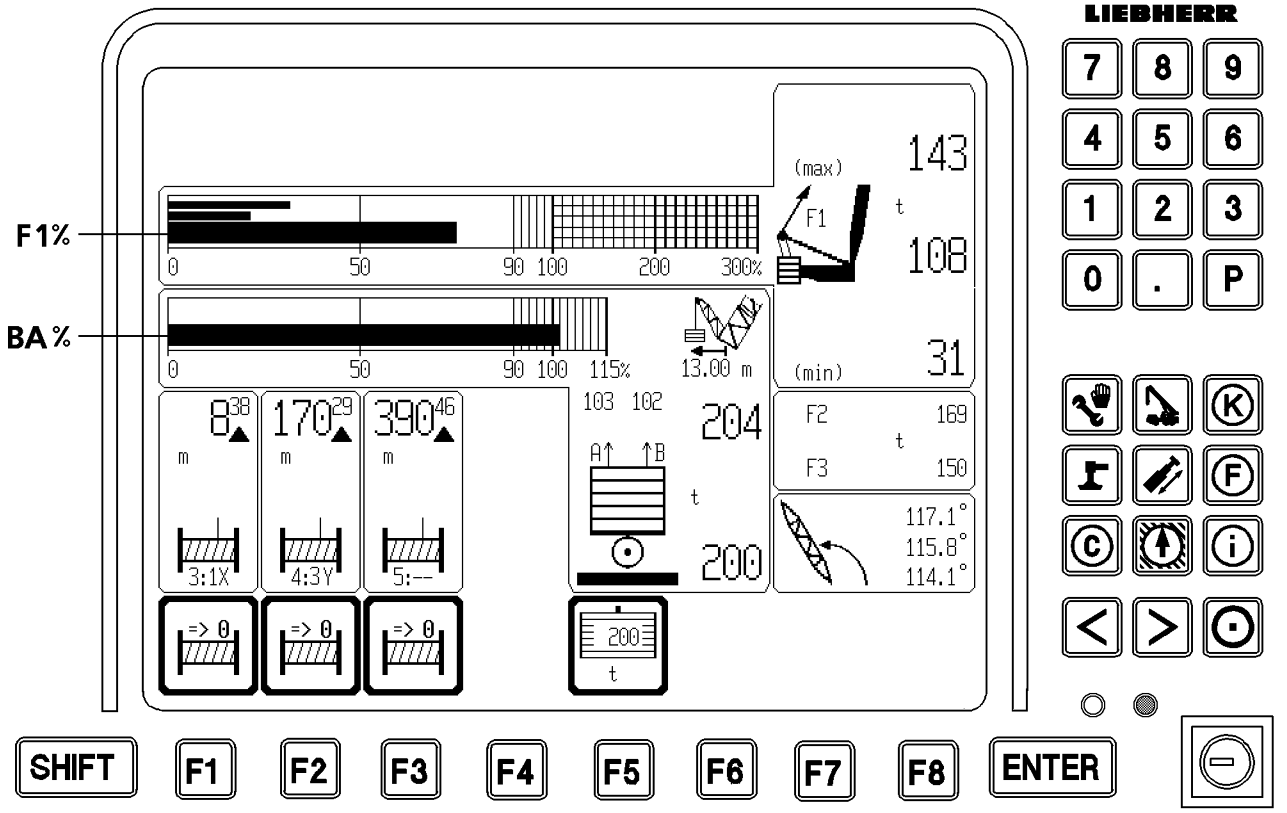
- When taking on a load, **make sure to avoid** diagonal pull , which means the derrick ballast, center of rotation of the slewing platform and the load must always be on one line !
  To ensure this, actuate the cylinders to lift the derrick ballast (ballast pallet) off the ground and set it down again **before** placing the ballast plates.

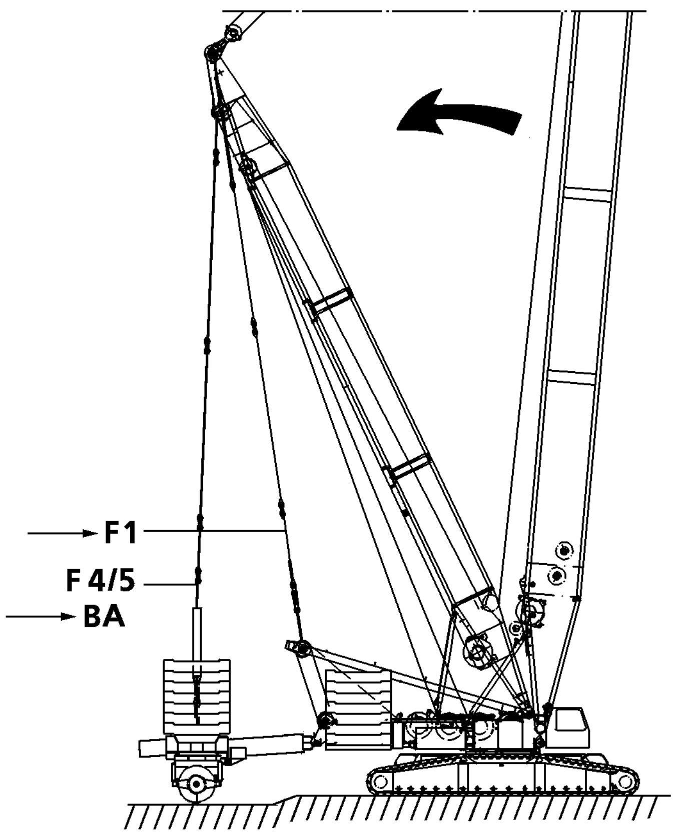
D A N G E R: **If this is not observed, there is a danger of tipping over when lifting the placed ballast plates, which can cause the crane to topple over.**

- When taking on the load, the guying of the derrick ballast to the derrick end section must be loose or just slightly tensioned so that the **Minimum force F1 min.** is initially exceeded on **test point 1 (F1)** .
- The guying between the A- bracket and the derrick end section **test point 1 (F1)** may **never be untensioned (F1)** .

D A N G E R: **This could lead to uncontrolled movements of the boom system, which could cause a serious accident.**

1


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


F1
F 4/5
BA

188680

Force F4 / 5 (test point 4 / 5) guying between derrick ballast - derrick end section
The forces F4 / 5 (test point 4 / 5) act in the guy rods from derrick ballast to derrick end section .
The existing forces in the guy rods (A = left and B = right) are calculated from three pressure sensor, which are installed on the pull cylinders, and shown in the LICCON as individual forces. The pulled ballast is calculated from the forces of the individual guying, i.e. the part of the ballast which is pulled up by the guying. The remainder is laying on the ground. The derrick ballast utilization results from the pulled ballast and the placed ballast . It is shown on the LICCON in a utilization bar (BA %) .

Force F1 (test point 1) between guying A- bracket - derrick end section
The force F1 (test point 1) is determined in the guy rods from the A-bracket to the derrick head via 2 force test boxes and shown on the LICCON as total force in the guying. From the operating force F1 and the force F1- opeation - max. force results the F1 - utilization. It is shown on the LICCON in a utilization bar (F1 %) .

Minimum force (F1 min, test point 1)
If more than 50% is pulled from the set derrick ballast (ballast utilization bar > 50 %) and the minimum force F1 min. (test point 1) is fallen below, all **load moment increasing** crane movements are turned off.

D A N G E R: **It is prohibited to fall below the minimum force F1 min (test point 1) if more than 50 % of the derrick ballast is pulled. If this is not observed, the derrick ballast may lift off the ground suddenly at slack guying from test point 1 (F1) due to increasing load momentum and the boom system will suddenly move forward!**
This also will cause the load to swing strongly, which can damage the boom and the crane.

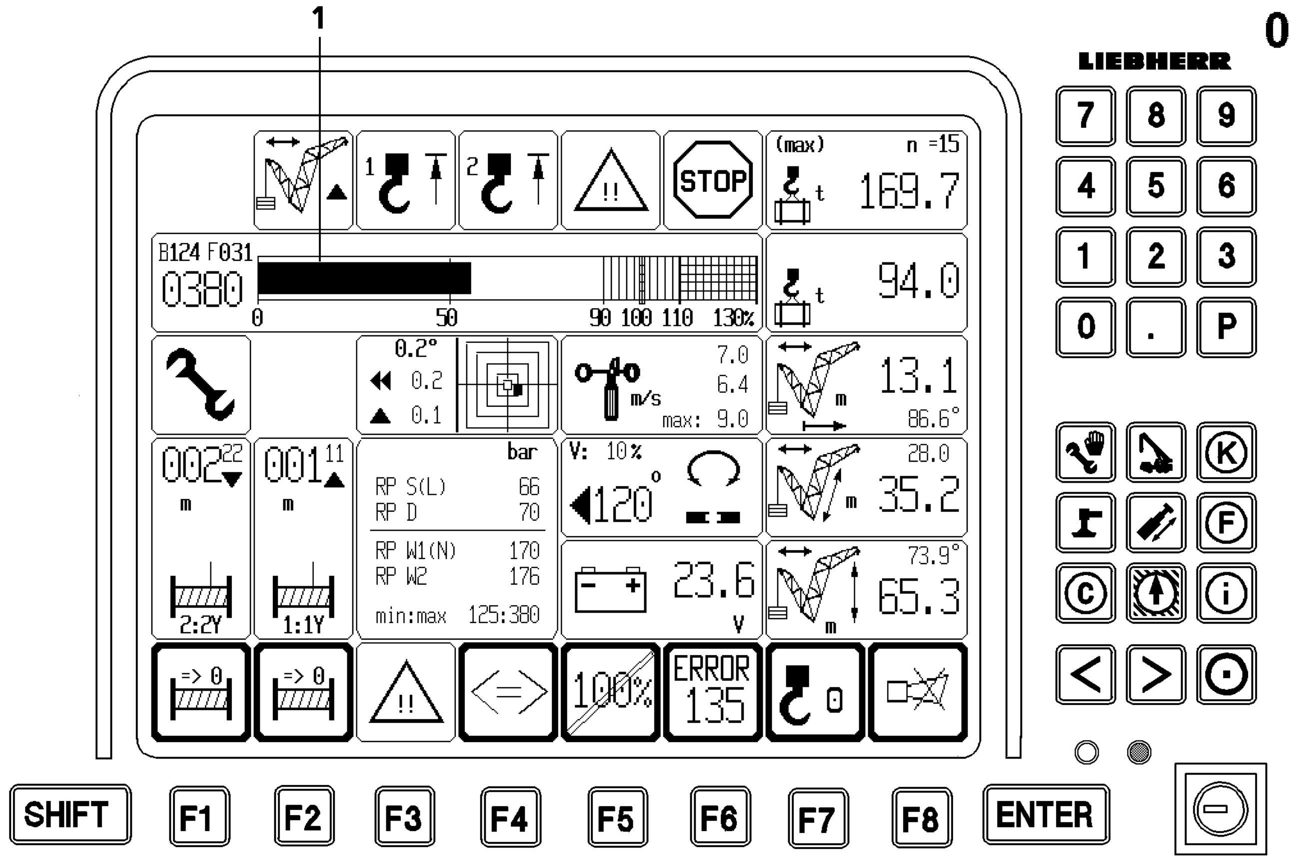
If more than 90% is pulled by the set derrick ballast (ballast utilization bar > 90 %) and the minimum force F1 min. (test point 1) is fallen below, all **load moment increasing and all load moment decreasing** crane movements are shut off.
The hoist gear "down" movement is also shut off.

D A N G E R: **It is prohibited to fall below the minimum force F1 min (test point 1) if more than 90 % of the derrick ballast is being pulled. If this is not observed, the derrick ballast may set down on the ground suddenly at slack guying from test point 1 (F1) and suspended derrick ballast due to decreasing load momentum and the boom system will suddenly move backward!**
This can press the relapse cylinder on block and overload them. There is a danger of damage to the relapse cylinders boom and derrick.

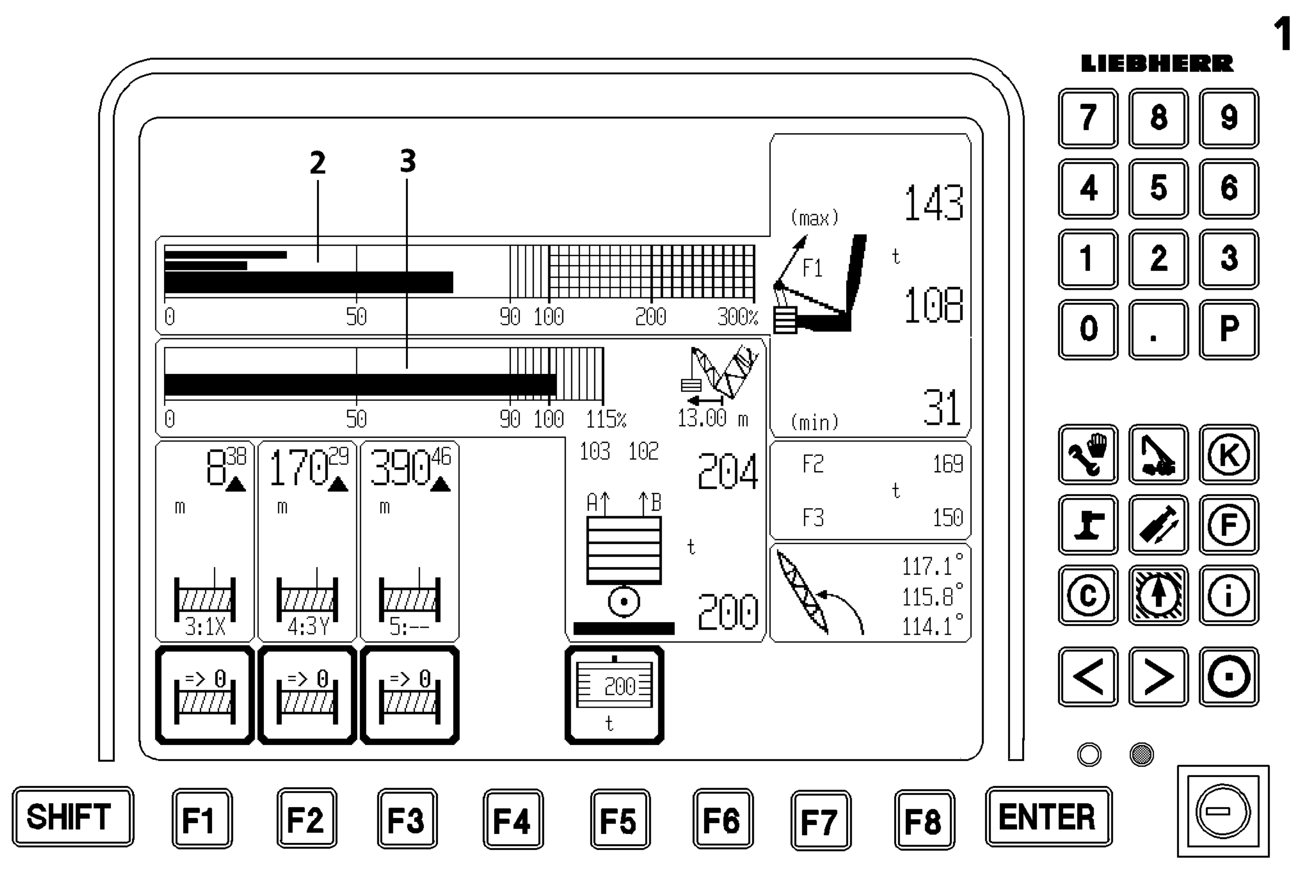
One can only get out of this situation :
- by lowering the suspended derrick ballast via the pull cylinders onto the ground;
- **or** the ballast plates are unloaded to reduce the derrick ballast utilization and to increase the load on test point 1 (F1) .

Test point1 - Installation - maximum limit
The monitoring of test point 1 - installation limit, which is carried out by the LICCON, is an additional safety. Due to the complexity of the installation procedure, it is possible that not generally valid and exact test point 1 installation limits are given.

D A N G E R: **With the turned on installation keyed switch, only load moment reducing crane movements up to a permissible load range can be carried out.**
After reaching the permissible load range, the installation keyed button must be turned off immediately.
If the installation keyed button is turned on, the load moment limitation is no longer effective.
There is a danger of accident!



1
0
LIEBHERR
(max) n =15
169.7
B124 F031
0380
0 50 90 100 110 130%
94.0
0.2°
0.2
0.1
7.0
6.4
m/s
max: 9.0
13.1
86.6°
002
001
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
100%
ERROR
135
STOP
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER



1
LIEBHERR
2
3
(max)
143
F1
t
108
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
(min)
31
8
170
390
103 102
204
t
200
F2 169
t
F3 150
117.1°
115.8°
114.1°
3:1X
4:3Y
5:--
200
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

188682

6. Overload monitoring in operating mode with derrick ballast

In operating modes with derrick ballast, the monitoring of "maximum load of current crane condition" consists of 2 parts:

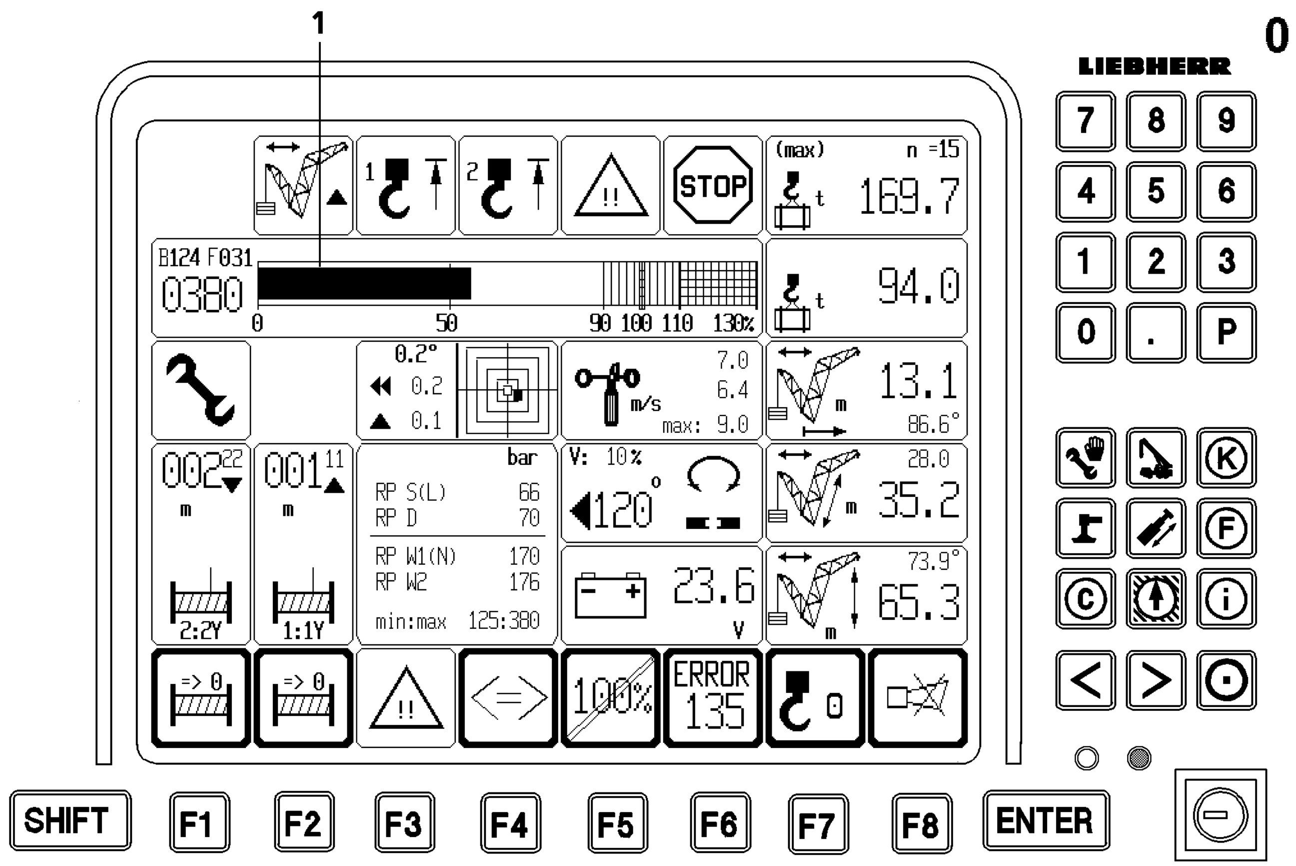
1. Monitoring of maximum load by LML overload safety system.
2. Monitoring of test point 1- operating maximum force by the derrick ballast overload safety system.

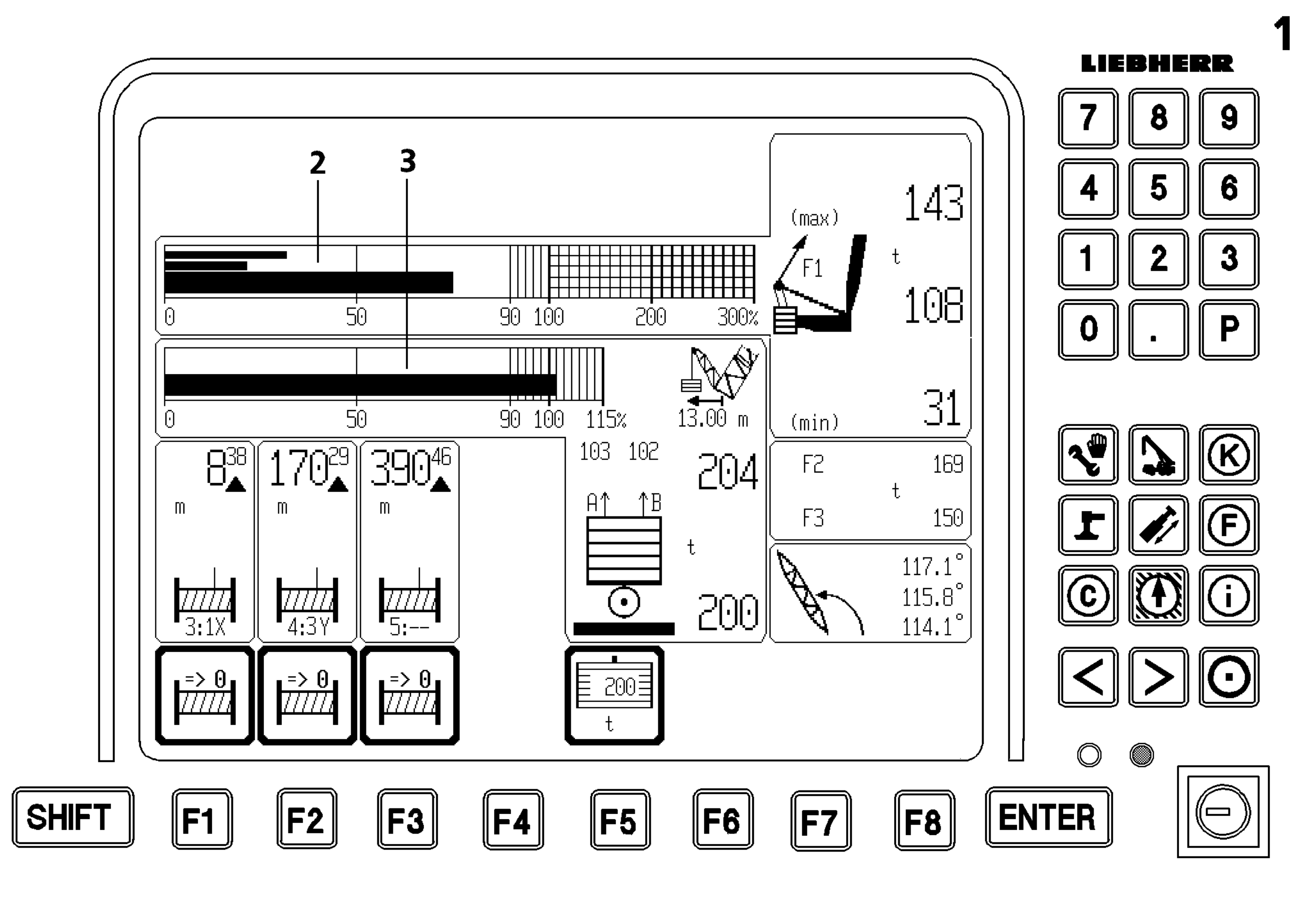
The LML overload safety system monitors the "maximum load according to the load chart and reeving".

In operating modes with derrick ballast, this is the maximum load of the current crane condition with optimum derrick ballast. It is shown on monitor 0 . The current utilization of the crane with optimum derrick ballast results from the load utilization bar (1) on monitor 0.
At 90 % on the load utilization bar , a prewarning with caution symbol and "SHORT HORN" is issued on monitor 0.
At 100%on the load utilization bar, there is a shut off of all load moment increasing movements with stop symbol and acoustical warning "HORN" on monitor 0.
The "maximum load of the current crane condition" can no longer be increased.

The derrick ballast overload safety monitors the "test point 1 - operating maximum force (=F1max)".
It is shown on monitor 1 .
At 90 % F1max- utilization (utilization bar (2)) , a prewarning is issued with caution symbol and "SHORT HORN" on monitor 1.
At 100% F1max- utilization, there is a shut off of all load moment increasing movements with stop symbol and acoustical warning "HORN" on monitor 1.
If the "maximum load according to load chart and reeving" is not yet reached (utilization bar (1)) , then the "maximum load of current crane condition" can still be increased by:

- pulling up the derrick ballast, if the derrick ballast is not yet suspended ;
- telescoping out the derrick ballast if the placed ballast is still smaller than the optimum ballast;
- increasing the derrick ballast by adding additional ballast plates, if the 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
max: 9.0
m/s
13.1
86.6°
002
001
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
100%
ERROR
135
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
7 8 9 4 5 6 1 2 3 0 . P


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

188682

7. Utilization conditions

The current utilization ofthe crane results from the load utilization bar (1) on monitor 0 **and** the F1-utilization bar (2) on monitor 1.
The "maximum load of the current **crane condition** " is reached when the load utilization bar (1) reaches 100 % **or** when the F1-utilization bar (2) reaches 100 %.
The "maximum load of the current **crane equipment** " is reached when the load utilization bar (1) reaches 100% **or** when the F1-utilization bar (2) reaches 100% and the derrick ballast is suspended (ballast utilization bar (3) at 100 %, when the ballast input value and the ballast weight is correct).

The "maximum load according to the load chart and reeving " (100% limit of load utilization bars) and the maximum load according to F1max- operation (100% limit of F1-utilization bar) can be bypassed by the following measures:

1. Hold the keyed button D_0 on monitor 0 in position "right touching" (after corresponding preselection with function key $F5_0$) to bypass the "maximum load carrying capacity according to the load chart and reeving" (see also description in chapter 4.02, paragraph 6.07) .

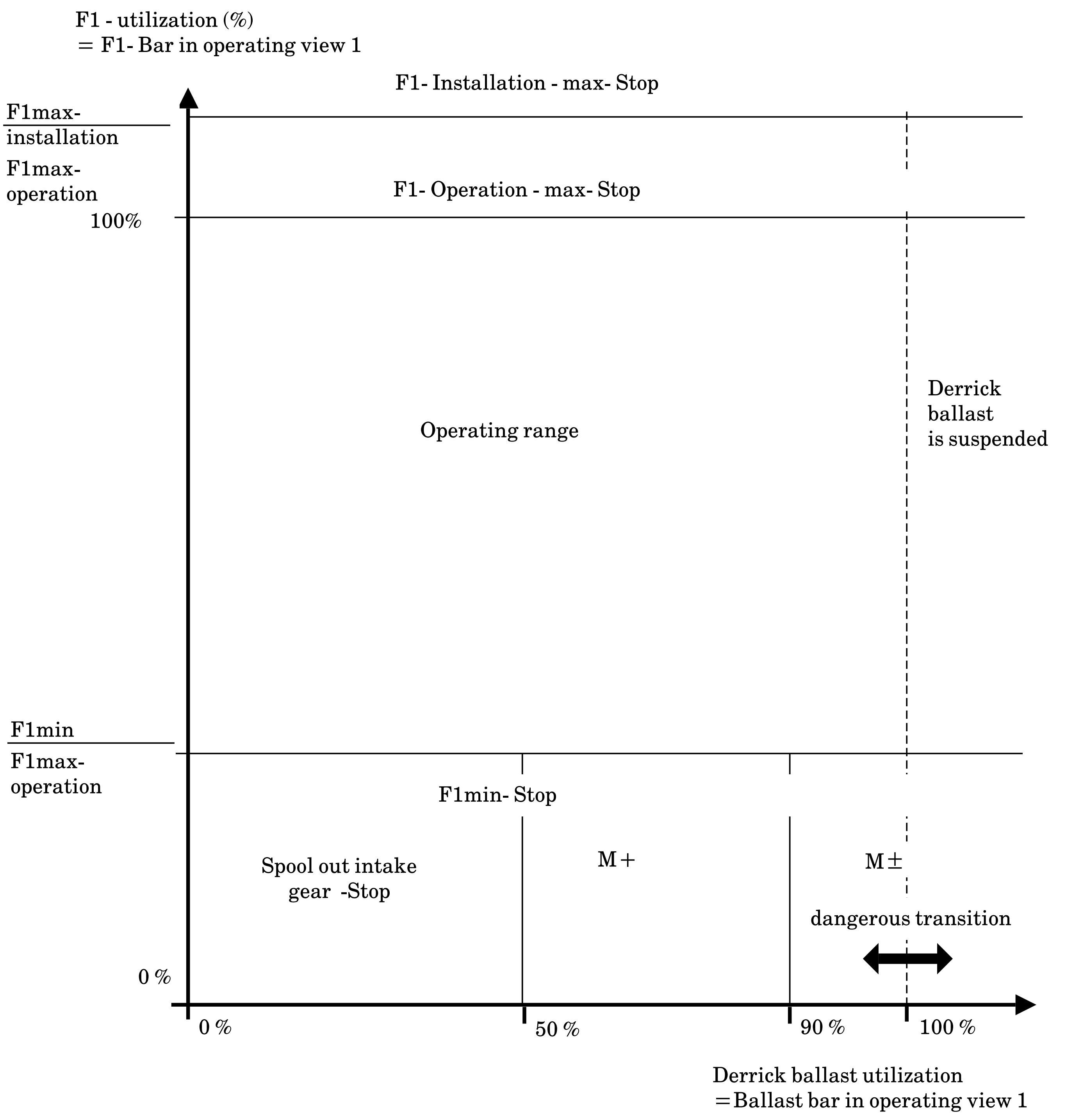
2. Installation keyed button in instrument panel

   This bypasses the "maximum load according to the load chart and reeving ", test point 1- operating maximum force (=F1max-operation) and a number of other limit values and limit switches.

   Test point 1- installation - maximum force (=F1max-installation) cannot be bypassed (see detailed description in chapter 4.04).

D A N G E R: **When the installation keyed button is turned on, only load moment reducing crane movements to a permissible operating and load range may be carried out.**
After reaching the permissible load range, the installation keyed button must be turned off immediately.
If the installation keyed button is turned on, the load moment limitation is no longer effective.
There is a danger of accidents!

The movement "lift ballast" or " lower ballast " requires utmost attention ! If 90% of the placed ballast is pulled, a warning is issued: " upcoming lift off of derrick ballast". The warning is indicated by "short horn" and blinking value "Ballast pulled". The warning is turned off, when the driver confirms, that he has recognized the warning by actuating the function key $F8_1$ (=Horn off on monitor 1) .



See also operating view on monitor 1

Shut offs in crane operation with derrick ballast (suspended ballast or ballast trailer)
Graphic view of various ranges of utilization on test point 1 (F1% utilization bar) and utilization of derrick ballast (Ballast utilization bar, BA %) .

F1 max- Installation - Stop
= Shut offs as for F1-Operations-max-Stop, but cannot be bypassed.

F1- Operation - max- Stop
= All load moment increasing crane movements (”lift load”, ”luff down boom ”, ”luff up boom ”, ”ballast down”, "telescope ballast in") are shut off. These shut offs can be bypassed via the installation keyed button. The shut off ”luff up boom” can also be bypassed with the button ”luff up at overload” .

Test point 1 - Minimum force (F1min)
The derrick ballast overload safety protects the crane from sudden lift off of the derrick ballast (the crane rocks forward) and from sudden set down of the derrick ballast (crane rocks backward). This is ensured by monitoring on test point 1 - Minimum force.
When the given limit F1min is approached, a prewarning is given. When this limit is reached or exceeded, the overload warning is triggered and the dangerous crane movements are shut off, see below.

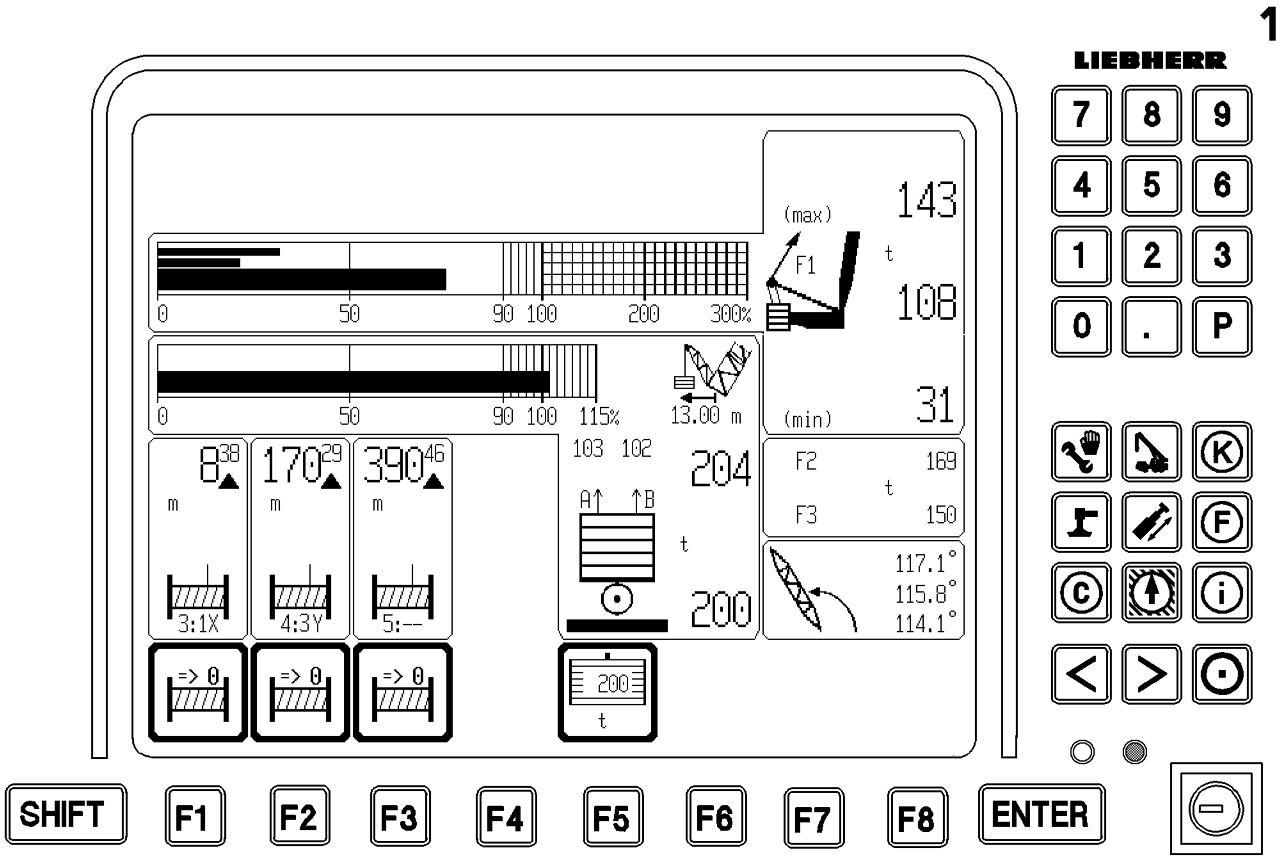
Spool out intake gear -Stop
= The crane movement ”spool out intake gear (winch 4) ” is shut off, at the same time, "telescope ballast out" is shut off.

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 crane movements are shut off :
”Lift load”, ”lower load”, ”luff up boom ”, ”luff down boom ”, ”spool out intake gear” , ”spool up intake gear” and "telescope ballast in and out".
Only " lower ballast ” or "unload ballast " remain possible.

Note: During operation, observe the notes in the crane operating manual and the shut offs in the shut off diagram in the switch diagram.

1



LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
143
(max)
F1
t
108
(min)
31
0
50
90
100
200
300%
0
50
90
100
115%
13.00 m
8 38
m
3:1X
170 29
m
4:3Y
390 46
m
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

188681

8. Load chart access procedure

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 CONTROL AND INDICATOR UNIT OF "LICCON" SAFE LOAD INDICATOR SYSTEM, paragraph 6.2." Load chart access procedure ".

Check the length sensor value on the derrick ballast

When telescoping the derrick ballast in and out, carefully monitor the derrick ballast radius indicator. When telescoping the derrick ballast, the indicator must change according to the movement. The crane operator can recognize immediately if the length sensor cable drum would get stuck when spooling up or out.

If the derrick ballast is fully extended or retracted, the derrick ballast indicator must show almost excactly the end position, for example: radius = 11 m or 15 m . The crane operator may not blindly rely on the derrick ballast radius measurement, but he must think for himself and check if the measurement even still works correctly.

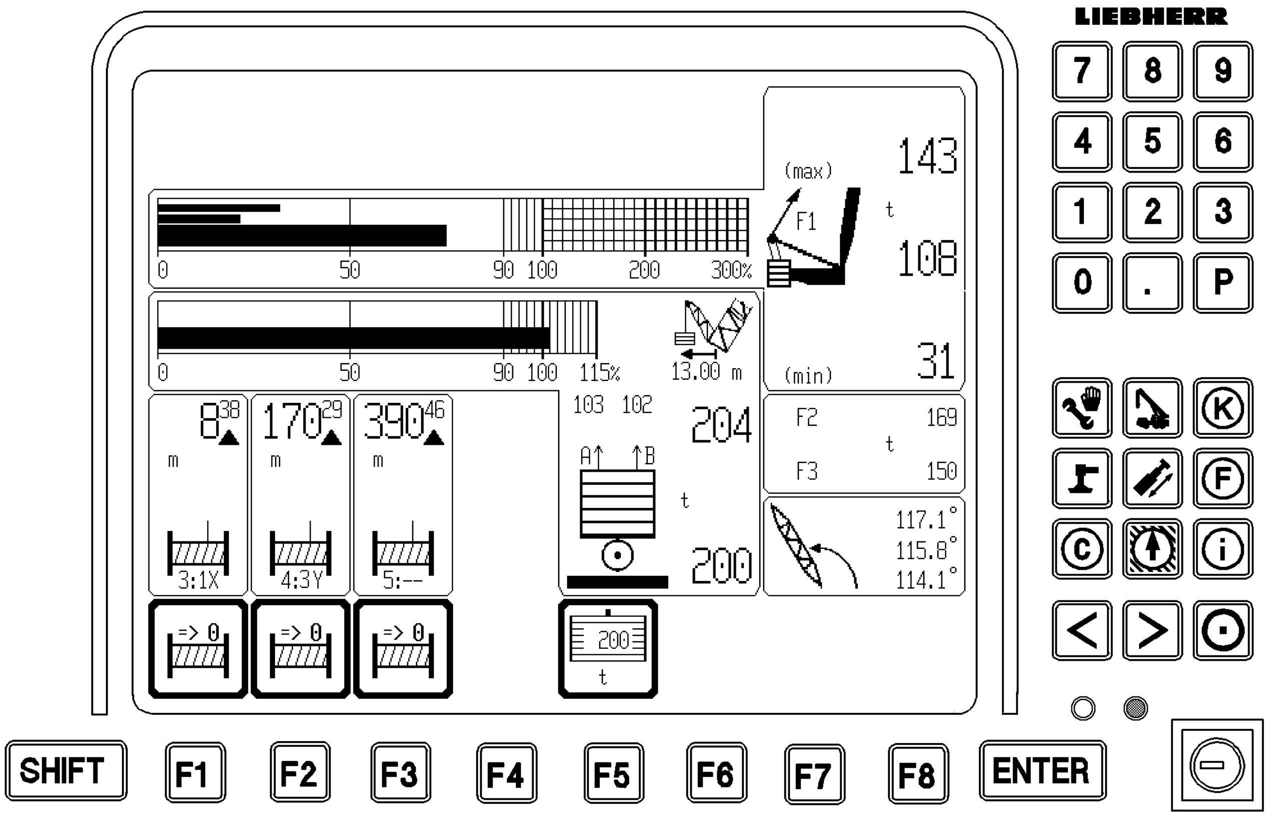
D A N G E R: **If the derrick ballast radius is measured incorrectly, then a too large maximum load and a too large test point 1 -Operations-max-force can be calculated due to the incorrect radius.**
The crane can be overloaded without noticing it.
There is an increased danger of accidents!

Suspended ballast with length sensor for the derrick ballast radius

It must be ensured that the two telescoping cylinders move out evenly because the length sensor is installed on only one side. In case the two telescoping cylinders run apart, the extension mechanicsm should be run to stop momentarily until both telescoping cylinders are extended or retracted to the same length.

C A U T I O N: **For working with a load, the pinnng of the extension mechanism for a fixed derrick ballast radius or 11 m, 13 m or 15 m is stipulated. In intermediate positions, a “monitored installation condition” would exist, which is not permitted for general operation with a load.**

1


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

188681

9. Difference force monitor of ballast guying

In operating modes with derrick ballast, the difference of forces from the derrickballast guying A and B, monitor 1, is monitored.

**D A N G E R: If the difference of these forces is too high, the derrick end section or other crane components will be damaged.
There is a danger of accidents!**

The forces in the derrick ballast guying A and B are shown on monitor 1 and compared. If the difference exceeds an impermissible value, an **acoustical** warning is given and the two force values **blink**. However, there is **no** shut off of movements.

If the difference of the forces of the derrick ballast guying A and B exceeds the given limit value, then this can have different causes :

1. The ground under the derrick ballast is uneven .
2. The crane is positioned at a side incline .
3. The derrickballast is loaded onesided .
4. A derrick ballast cylinder is locked.
5. The force measurement in the guying is incorrect .

The crane operator must recognize the correct cause and take counter -measures:

1. The error, which led to the one sided force must be removed.
2. The following measure is permitted only in **small** uneven ground conditions :

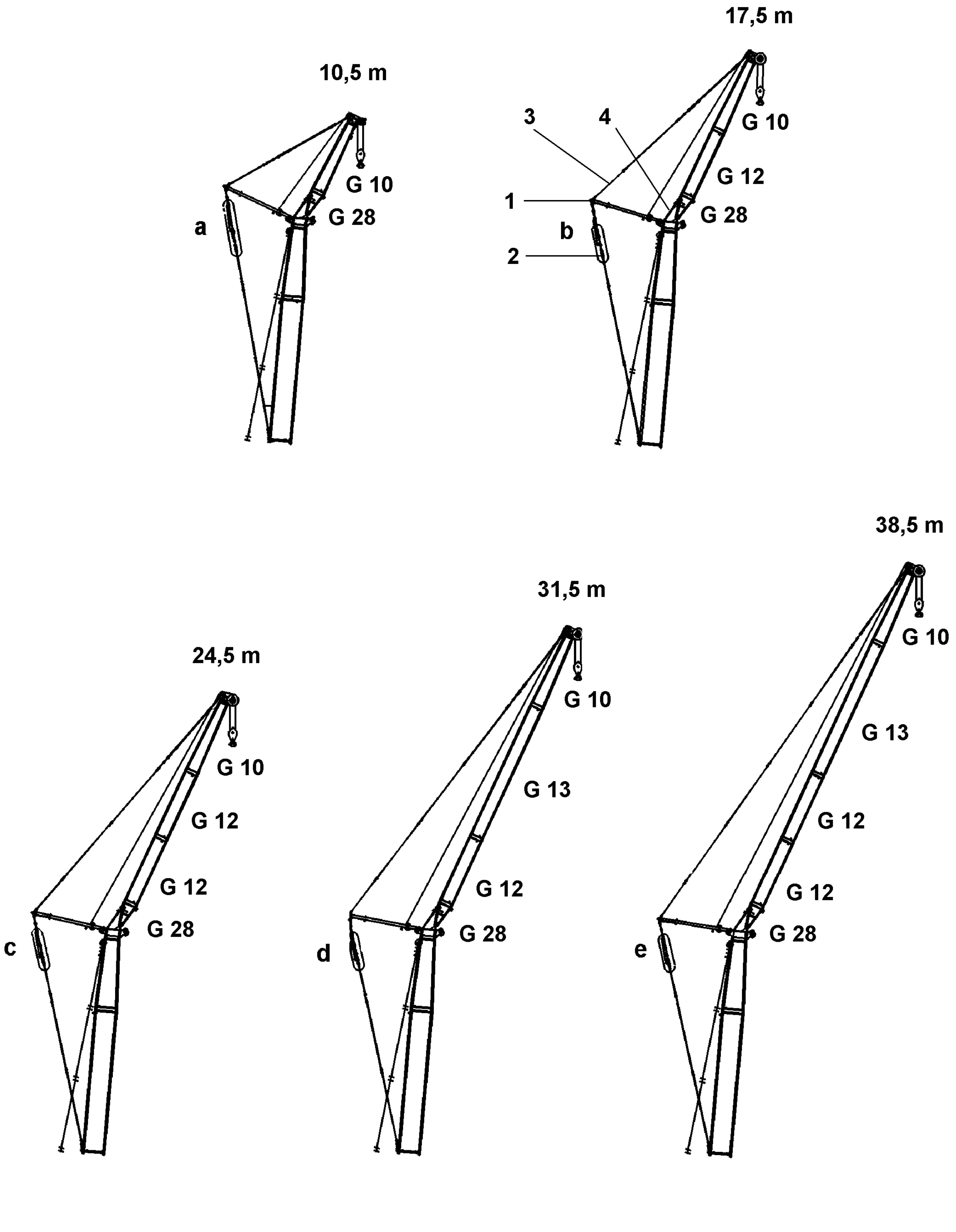
   Lock a ballast cylinder and actuate with the other ballast cylinder "lift the ballast " or " lower the ballast" in such a way that the difference between the forces gets smaller. It must be ensured that the derrick ballast is not brought into an impermissible incline position in relation to the crane, otherwise the derrick ballast guide and components will be damaged.

   D A N G E R: The derrick ballast cylinder A may be extended by maximal 40 mm more or less than cylinder B!

   There is a danger of accidents!

3. If sensor values do not seem believable:

   check if the pressure sensor for the ballast weighing or the inputs of the ballast weighing on CPU 1 are defective, if necessary, pull the sensor or replace the CPU.


10,5 m
G 10
G 28
a
17,5 m
3
4
G 10
G 12
1
G 28
b
2
24,5 m
G 10
G 12
G 12
G 28
c
31,5 m
G 10
G 13
G 12
G 28
d
38,5 m
G 10
G 13
G 12
G 12
G 28
e

195087

1. Description

The 10,5m, 17,5m, 24,5m, 31,5m and 38,5 m long F-lattice jib (F) is fixed guyed over the FA-bracket to the S - boom and to the F - end section . The F-lattice jib is secured with an hydraulic relapse cylinder. It is possible to guy the F-lattice jib at 10° and 20° with the adjustable guy rod (2), .

2. Components . lattice jib

	Description	System	Length (m)	Weight (t)
G 10	F - end section		8,0	ca. 3,0
G 12	Intermediate section	1812.**10**	7,0	1,4
G 13	Intermediate section	1812.**10**	14,0	2,5
G 28	F - pivot section		2,5	ca. 0,8

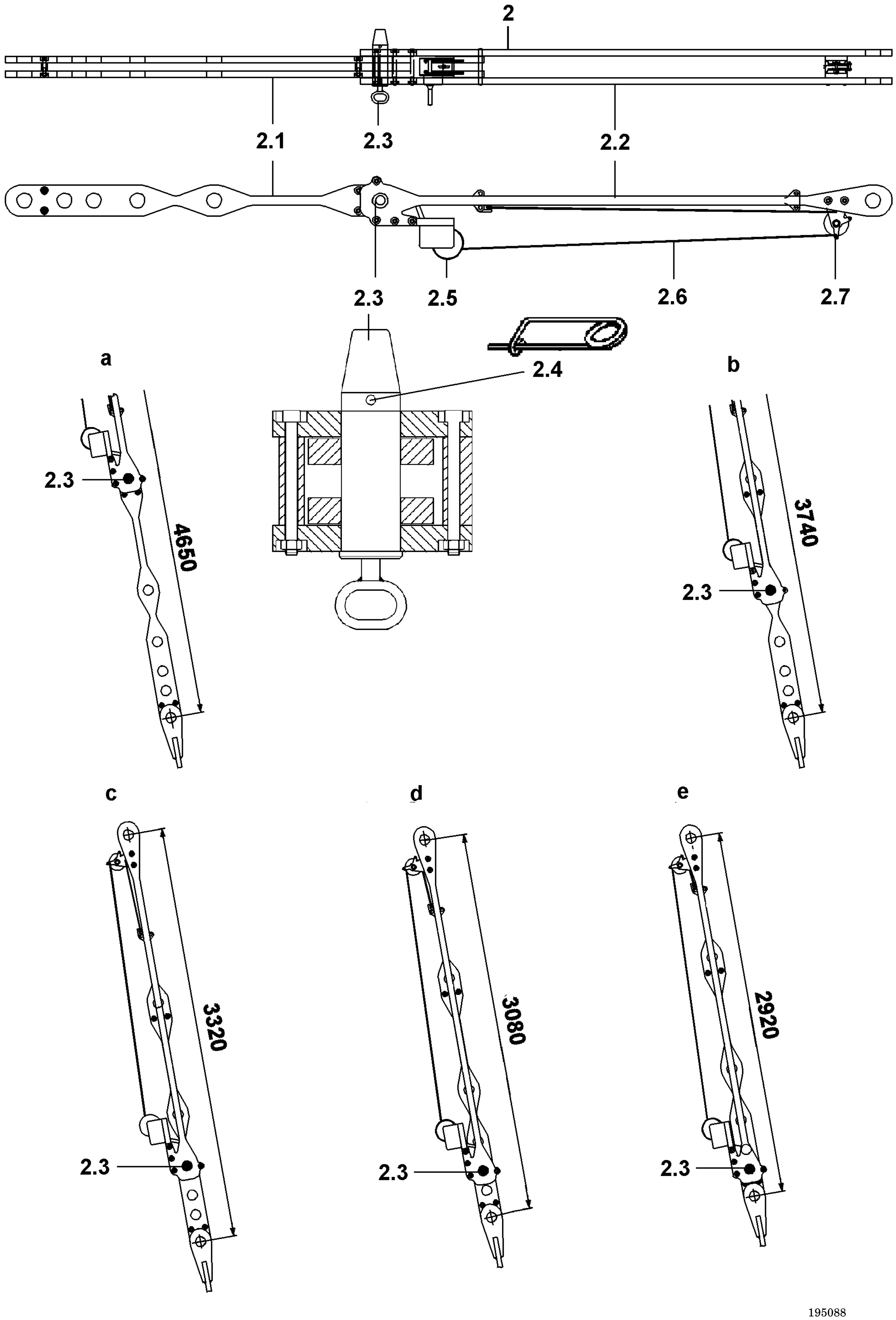
Note: Instead of a 14,0 m long intermediate section (G 13), two 7,0 m long intermediate sections (G 12) can be installed.

2.1 Components

1 FA - bracket
2 Guy rod, adjustable
3 Guy rod
4 Hydraulic relapse cylinder

Note: The length of the guying to the S-boom must be set according to the lattice jib length on the guy rod (2)
- see paragraph 3. "Guy rod, adjustable".

C A U T I O N : The guy rods to the F-end section (G10) and to the S-boom must be installed according to the instructions given in chapter 5.03.
For the 20° position of the lattice jib, additional guy rods must be installed, see chapter 5.03!


2
2.1
2.3
2.2
2.3
2.5
2.6
2.7
2.3
2.4
a
2.3
4650
b
3740
2.3
c
3320
2.3
d
3080
2.3
e
2920
2.3
195088

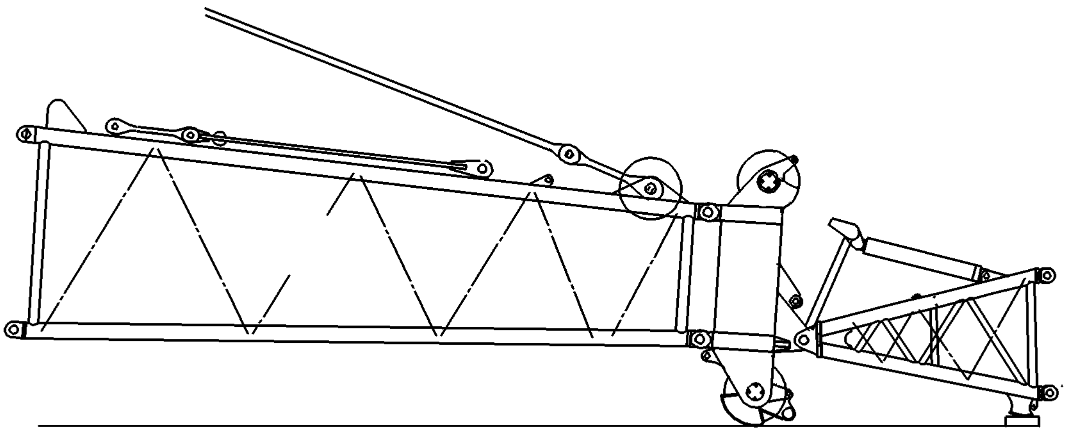
3. Guy rod, adjustable (2)

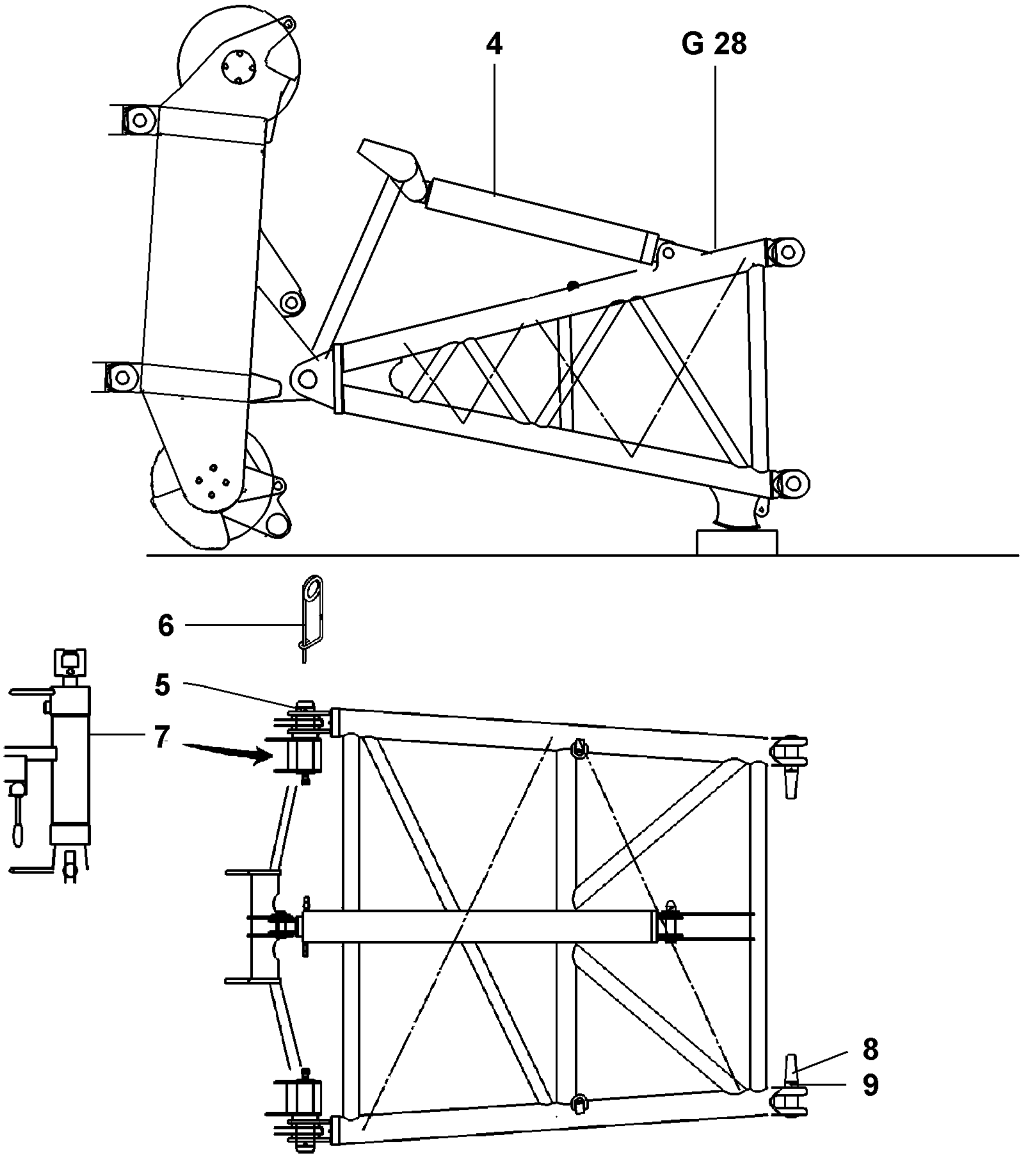
Components

2 Guy rod, adjustable
2.1 Guy rod
2.2 Guy rod
2.3 Pin
2.4 Spring retainer
2.5 Cable winch to adjust the length of the guy rod (2)
2.6 Control cable

The adjustable guy rod (2) is installed in the guying from the FA-bracket (2) to the S-boom. It must be adjusted according to the lattice jib length, pinned with pin (2.3) and secured with the spring retainer (2.4) .

C A U T I O N : For the adjustment dimension of the guy rod (2), see chapter 5.03 Equipment.





195085

4. Install the F-pivot section (G28)

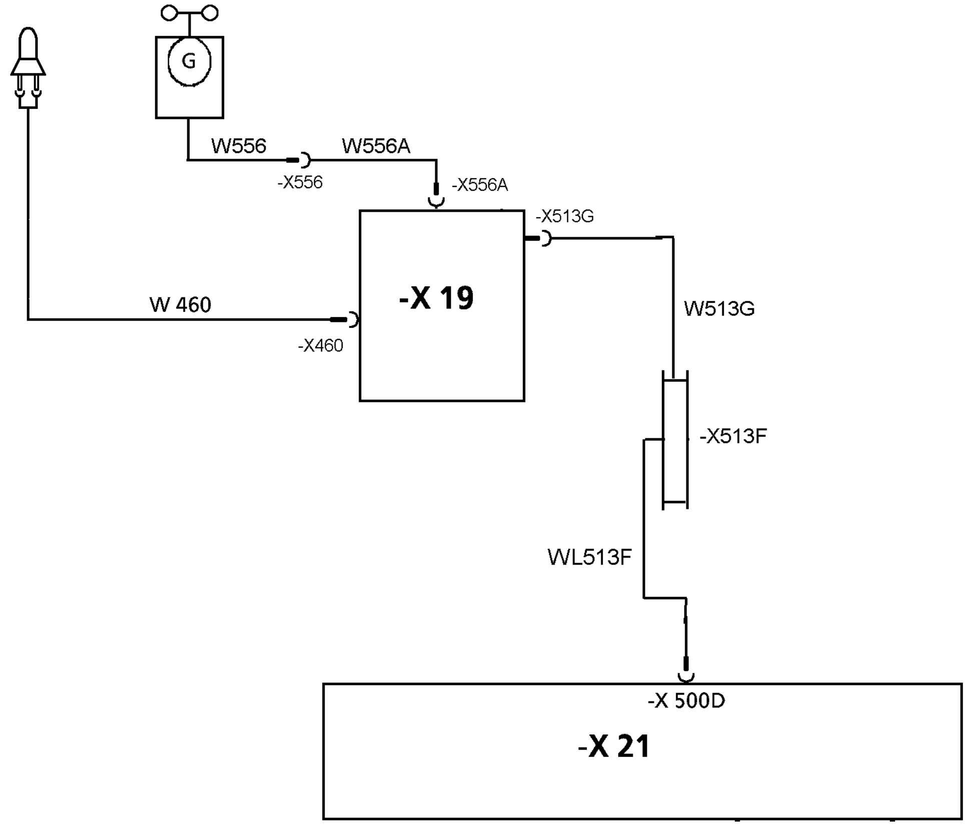
Installation

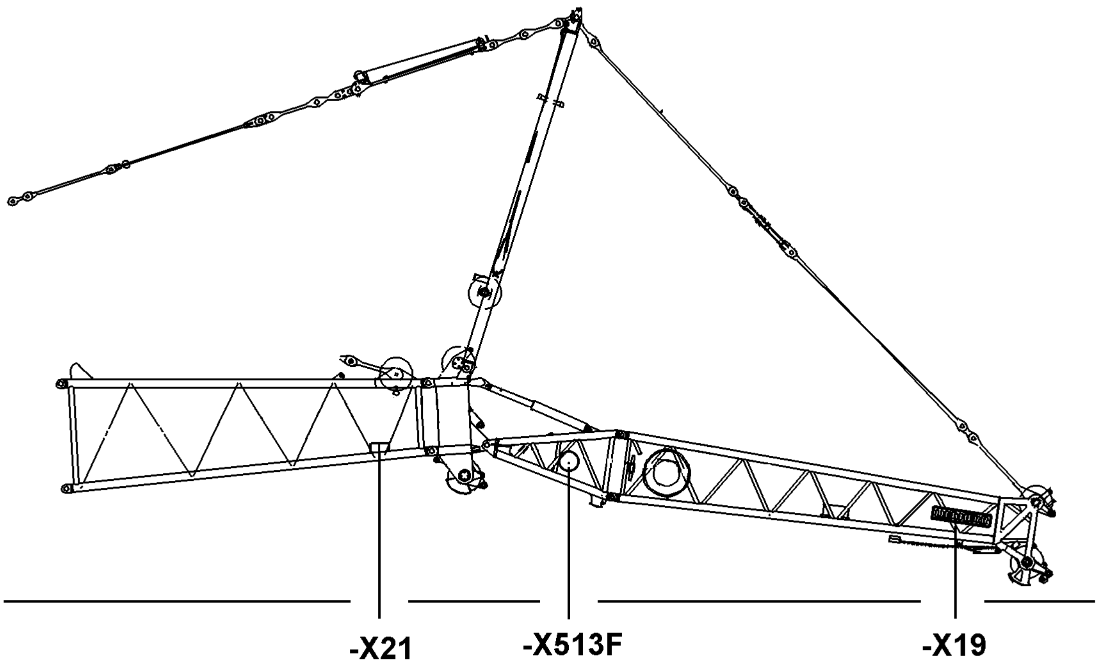
Lift the F- pivot section (G 28) with the auxiliary crane and pin on the S - head with the hydraulic pin pulling device (7) and secure. Use pin (5) and spring retainer (6) .
Support the F- pivot section (G 28) and place down.

Note: The weight of the F-pivot section is approx. 800kg.
The hydraulic relapse cylinder (4] must be retracted.

Install the lattice jib

Assemble the lattice jib to the required length and pin and secure on the F-pivot section (G28) .
Use pin (8) and spring retainer (9) .


W556
W556A
-X556
-X556A
-X513G
-X 19
W 460
-X460
W513G
-X513F
WL513F
-X 500D
-X 21


-X21
-X513F
-X19

195154

5. Electrical connections

Establish the electrical connection from the line drum (X513) to the connector box (-X19) on the F- end section . Plug cable (W513G) into the socket -X513G on -X19 .

Establish the electrical connection (WL513F) from the connector box (-X21) to the line drum (X513) in the F-pivot section.

Note: Establish the electrical connection from the connector box (-X21) to the line drum (X513) only after the cable is spooled out from the line drum to the connector box (-X19) .

Install the airplane warning light on the F- end section.

Plug the cable plug (W 460) for the airplane warning light into socket (-X 460b), on the connector box (-X19) .

Plug the cable plug (W556) from the wind speed sensor into -X556 .

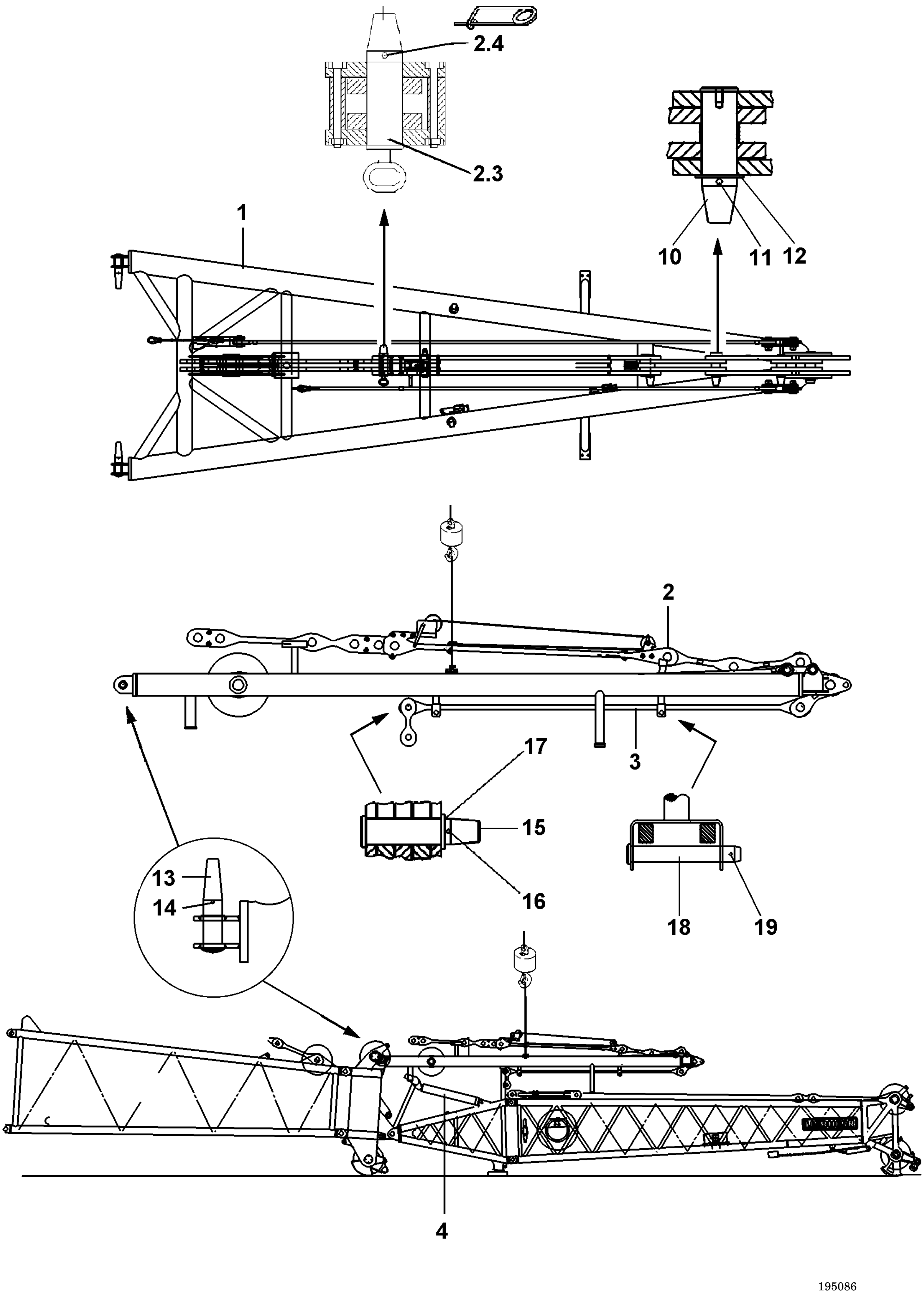
Function check
Prerequisite:
- All electrical connections have been established.
- The engine is running.

Airplane warning light
Turn on the airplane warning light, check visually for function.

Wind speed sensor
Check the wind speed sensor for easy movement and function.

Hoist limit switch
Actuate the limit switch on the pulley head manually.
The hoist winch must turn off in upward movement.
The hoist ”top” symbol on the LICCON indicator must blink.

C A U T I O N: **The limit switch functions must be checked individually before crane operation.**
The proper function of the individual limit switch initiators must be determined in the test system - See chapter 7.10 Diagnostics.


2.4
2.3
1
10
11
12
2
3
17
15
16
13
14
18
19
4
195086

6. Install the FA-bracket

Components

1	FA- bracket	7,00 m	approx.2500 kg
10	Pin ∅ 80mm×310mm		
11	Cotter pin ∅ 13mm×125mm		
12	Washer		
13	Pin ∅ 70mm×335mm		
14	Spring retainer ∅ 6mm		
15	Pin ∅ 54mm×235mm		
16	Cotter pin ∅ 8mm×80mm		
17	Washer		
18	Pin ∅ 40mm×275mm		
19	Spring retainer ∅ 5mm		

Installation

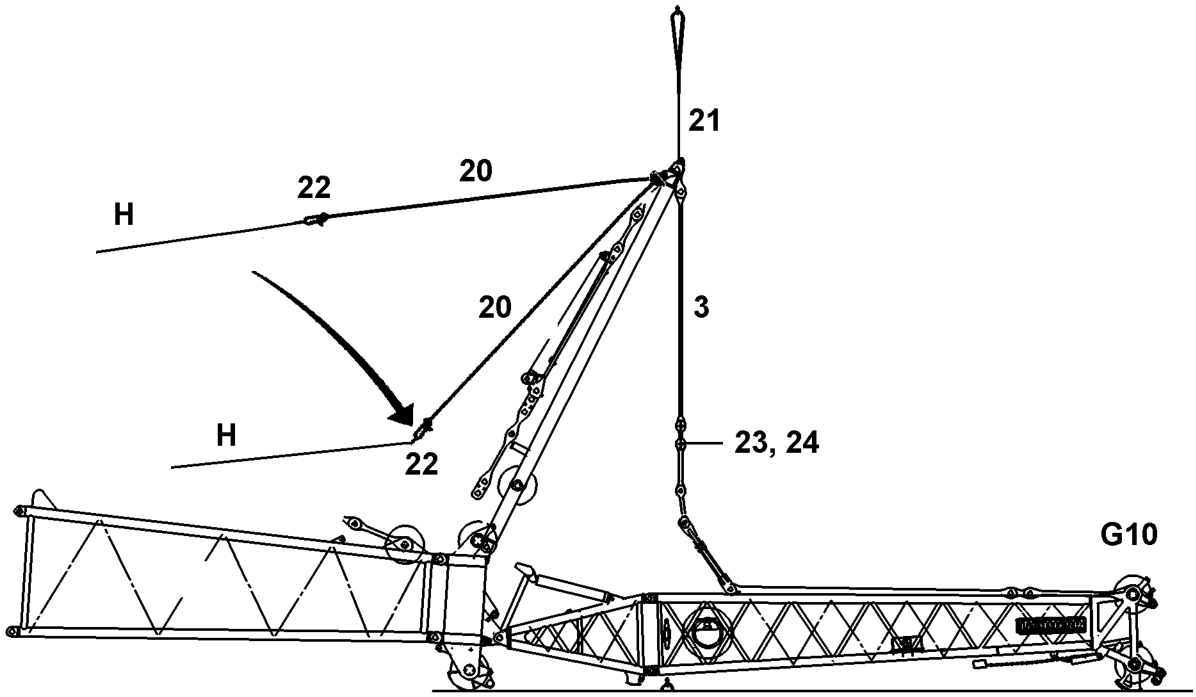
Lift the FA - bracket (1) with the auxiliary crane and pin and secure on the S- head. Use pin (13) and spring retainer (14) .

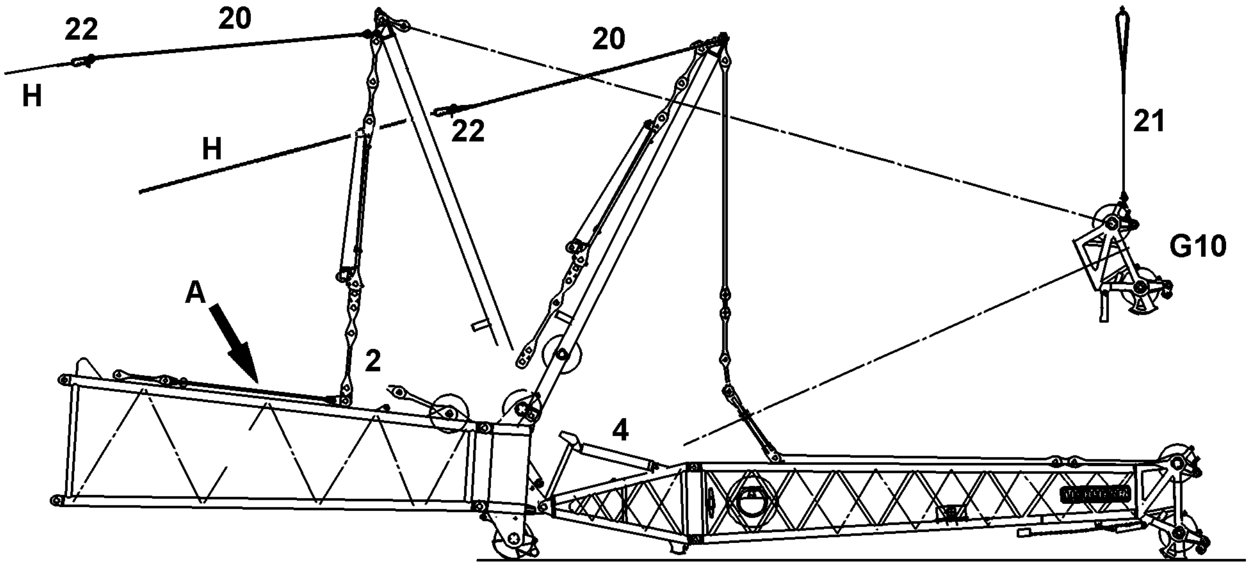
Note: The weight of the FA - bracket is approx. 2500 kg.

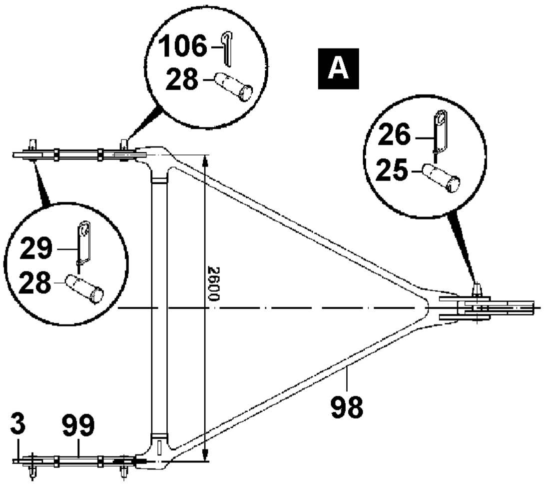
Place the FA - bracket (1) on the lattice jib.

Remove the spring retainer (19) and remove the transport retaining pin (18) .

D A N G E R : **No one may remain under the FA - bracket during the pinning and unpinning procedure.**


21
20
22
H
20
3
H
23, 24
22
G10


22
20
20
H
22
H
21
G10
A
2
4


106
28
A
26
25
29
28
2600
98
3
99

198311

7. Install the guy rods on the FA-bracket

Connect the guy rods from the F-lattice jib with the guy rod (3) from the FA-bracket . Use pin (23) and spring retainer (24) .

Pull up the FA-bracket with the auxiliary crane and the installation cable (21) .

Hang the hoist cable (H) into the cable lock (22) on the installation cable (20) .
Continue to pull up the FA-bracket with the auxiliary crane and the installation cable (21) until the guy rods are tensioned to the F-end section (G10) .

Then spool up the hoist cable (H) until the installation cable (20) is tensioned.

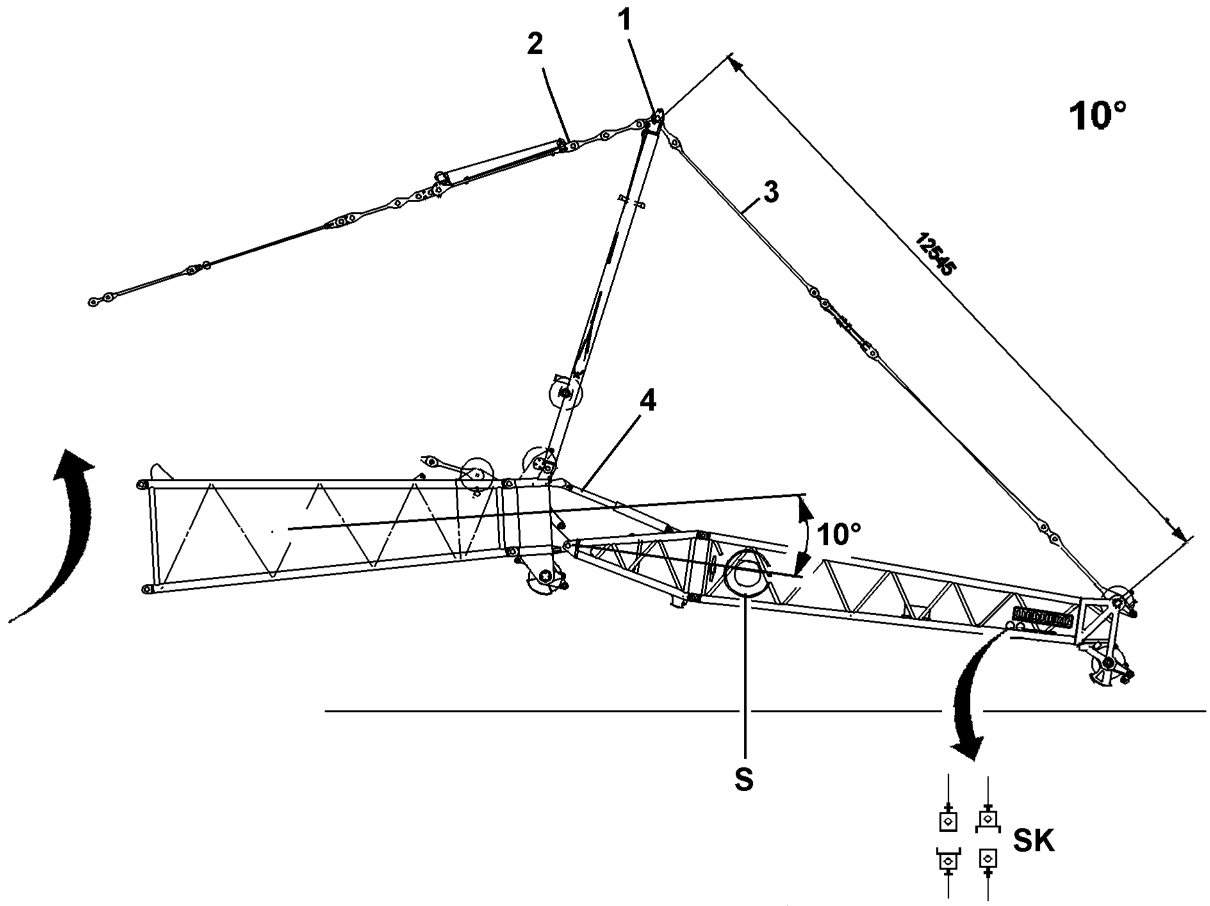
Lower the auxiliary crane and detach the installation cable .

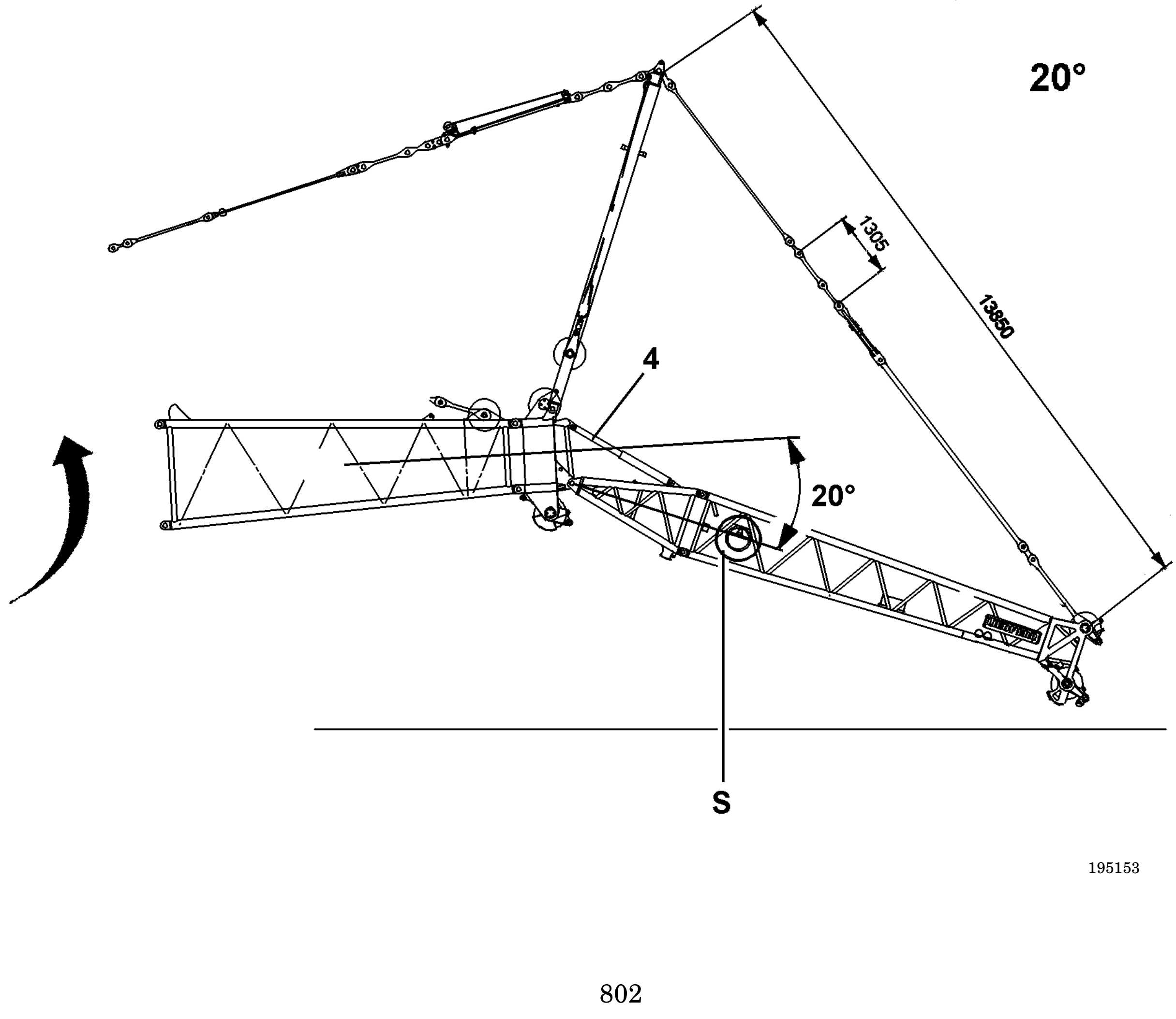
Attach the auxiliary crane on the F-end section (G10) and lift the F-lattice jib until the guy rods from the S-boom can be pinned with the guy rods (2) from the FA-bracket .

C A U T I O N: When lifting the F-lattice jib, the hoist cable must be spooled up at the same time and tensioned slightly!
The hydraulic relapse cylinder (4) must be retracted!

Pin the guy rods. Use pin (25) and spring retainer (26) .

D A N G E R: The connection from bracket (99) and swing (98) by pin (28) and cotter pin (106) may not be released for assembly and disassembly of the F-jib.
DANGER OF ACCDENTS!!





195153

8. Installation

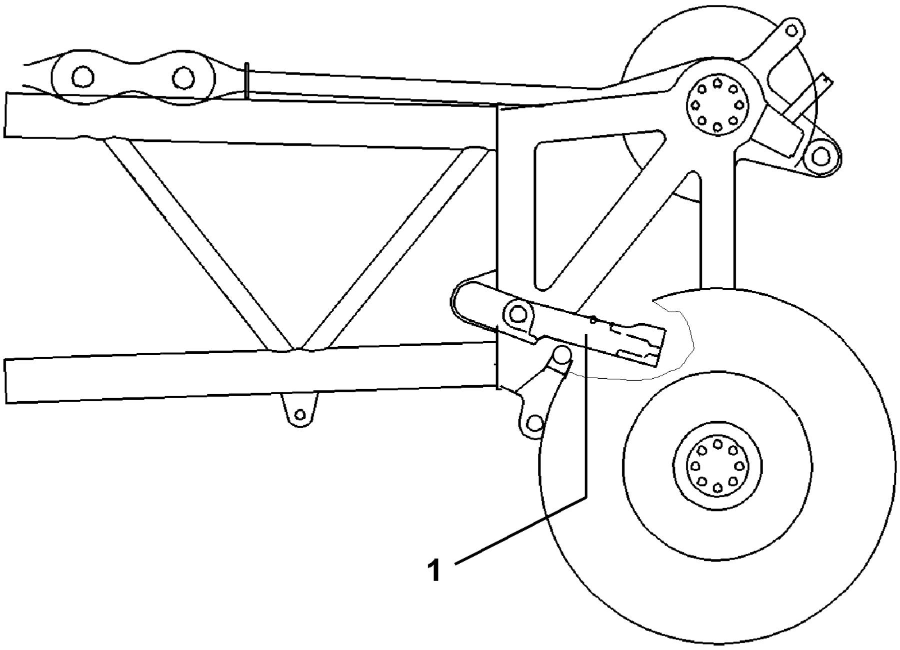
Establish the hydraulic connection from the hose drum (S) in the F-end section to the relapse cylinder (4).

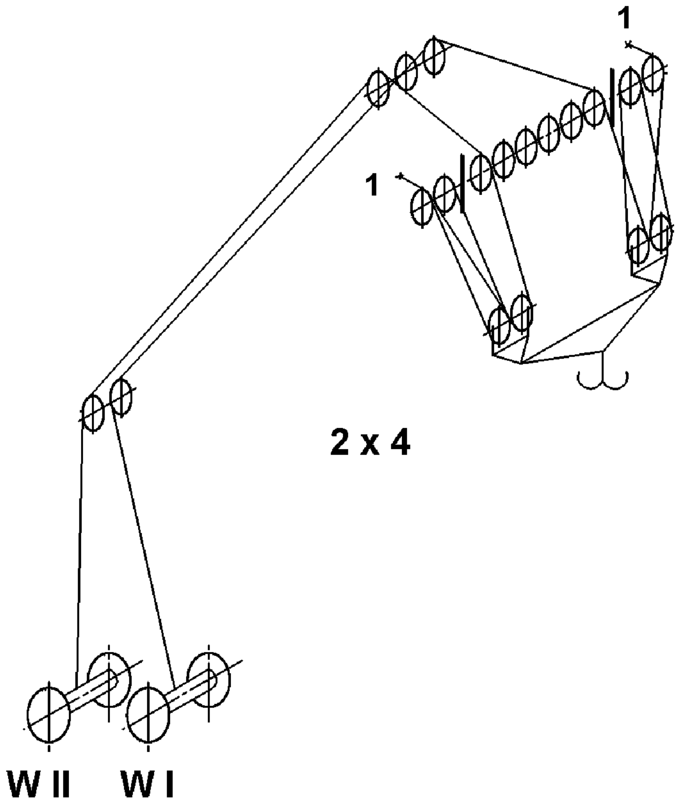
Luff up the S-boom until theF-lattice jib (10° or 20°) hangs in the guy rods and the F-end section lifts off the ground.

Connect the hydraulic component of the pin pulling device on the F-end section (SK- quick coupling), start it and pretension the hydraulic relapse cylinder (4) with approx. 180bar .

C A U T I O N : Before pretensioning the relapse cylinder (4), the end section must have lifted off the ground!

Disconnect the hydraulic component.





195155

9. Erection / take down

The boom ck combinations must be erected or taken down according to the erection and take down charts, chapter 5.09.

D A N G E R : **The erection or take down procedure must be carried out according to the data given in the chart.
If this is not observed, the crane will be overloaded or topple over.**

Prerequisite:

- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform according to the load chart.
- The F-lattice jib is isntalled according to the load chart and the instructions given in the operating manual.
- All limit switches are installed and fully functioning.
- All pin connections are secured.
- The hoist cable has been placed correctly in the cable pulleys and is secured with the cable retaining pins to prevent it from jumping out.
- There are no persons within the danger zone.
- There are no loose parts on theboom and the lattice jib.
- In winter: Is theboom and the lattice jib and their components (limit switches, cable drum, airplane warning light, wind speed sensor etc.) free of snow and ice.

D A N G E R : **Incorrectly installed or non-functioning limit switches as well as falling parts (such as pins, spring retainers, ice, etc.) can cause accidents!**

9.1 Erection procedure

Set the LICCON overload safety system according to the data in the load chart and the equipment configuration **(see chapter 4.02, 4.03).**
Actuate the installation keyed button, the indicator light ”Installation” lights up.
The installation symbol on the LICCON indicator blinks.

Erection

Luff up the boom until the end section lifts off the ground.
Reeve the hoist cable between the pulley head on the end section and the hook block and secure on the fixed point - **see chapter 4.06, Reeving plans.**

D A N G E R : **In case of 2 x 4 reeving in parallel operation, the cable locks (1) must be installed according to the illustration.
For all other reevings, the fixed points are on the hook blocks.**

Attach the hoist limit switch weight.
Luff up the boom until the **lowest** operating position.

9.2 Indications in the OPERATING VIEW during the erection procedure

The following alarm functions are activated (blink) during the erection procedure, until the operating position is reached:
- ”ERROR” (Error 150)
- ”STOP”
- ”HORN” + Acoustical signal

Note: The lowest operating position is reached when the indicators turn off and a load indication - t - appears in the symbol ”MAX. LOAD” instead of the question marks (???) .

Press the button to turn the installation keyed button off .
The indicator light and the installation symbol on the LICCON indicator turns off.

D A N G E R : After reaching the lowest operating position, the installation keyed button must be turned off immediately.
The installation keyed button bypasses safety devices!
The radii given in the load chart may not be exceeded nor fallen below, even without a load on the hook!
If this is not observed, the crane can tip over!

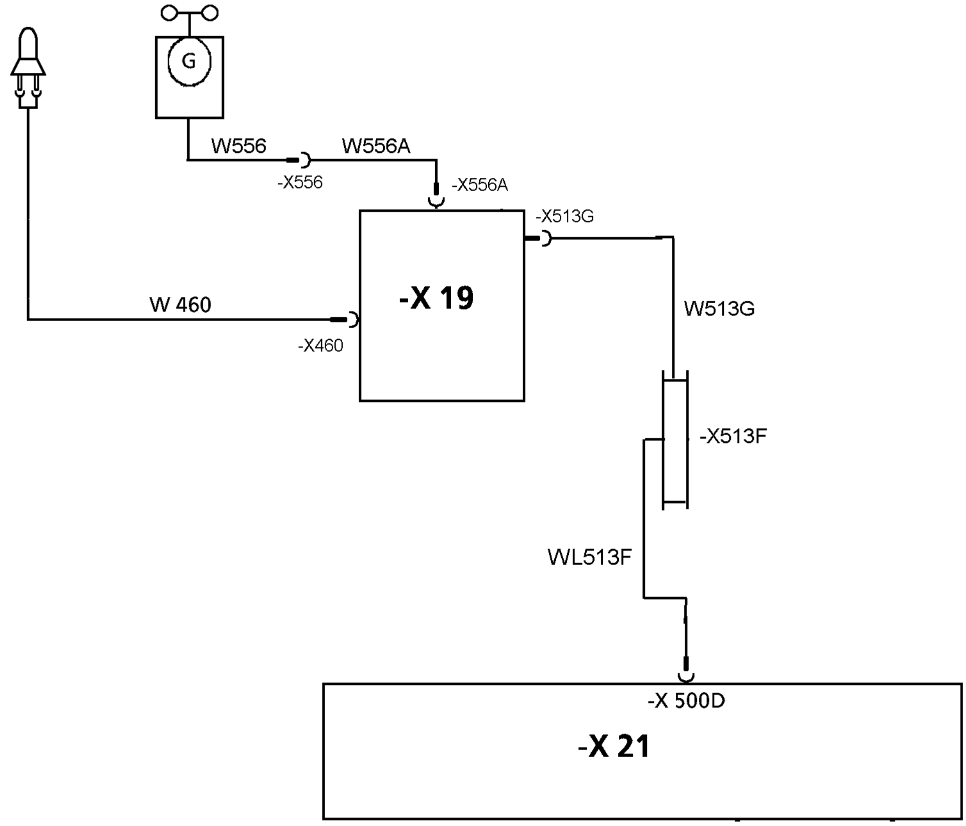
10. Crane operation

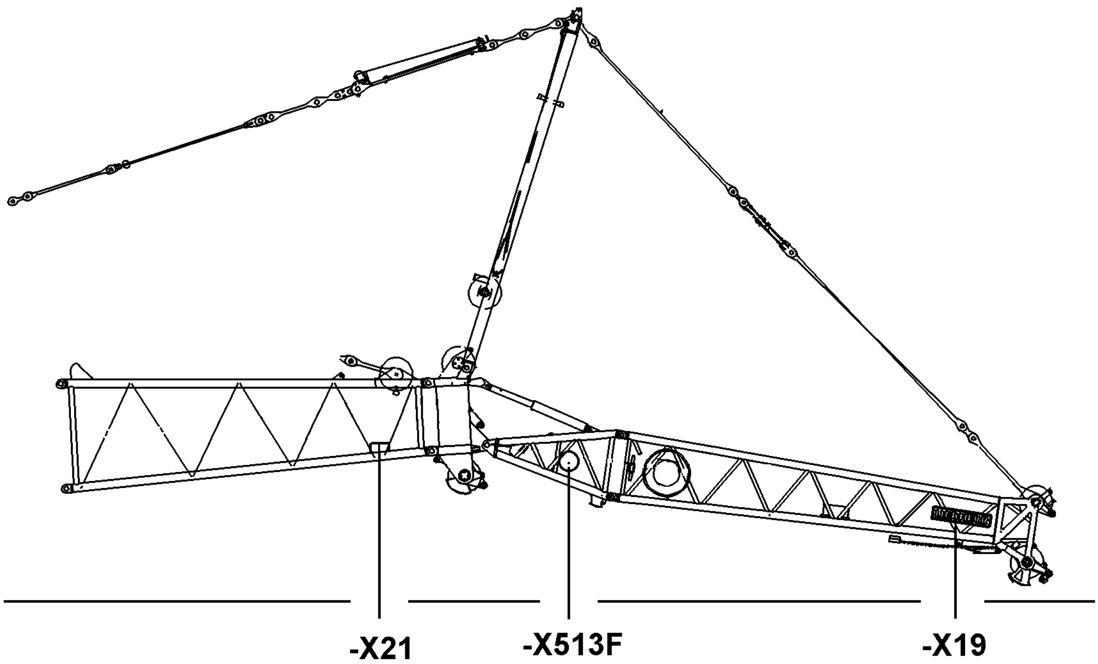
C A U T I O N : Observe all notes given in chapter 4.05. ”CRANE OPERATION” and chapter 4.08 ”WORKING WITH A LOAD” !

Prerequisite:
- The LICCON overload safety system is set, according to the data in the load chart.
- The installation keyed button has been turned off by pressing the button. The indicator light and the ”Installation” symbol on the LICCON indicator turns off.

D A N G E R : Check the horizontal position of the crane before and during operation. If the crane operator leaves the crane cab, even for a short time, then he is obligated, before operating the crane again, to check the operating mode setting and to reset it, if necessary.

Adjustments / Checks
Check the function of the overload safety system by running against the operating positions **”top” and ”bottom”** .
Check the function of the hoist limit switch ”on top” by running against the hoist limit switch weight.


G
W556
W556A
-X556
-X556A
-X513G
-X 19
W 460
-X460
W513G
-X513F
WL513F
-X 500D
-X 21


-X21
-X513F
-X19

195154

11. Take down

Luff down the boom until the **lowest** operating position.

Note: When the **lowest** operating position is reached, the luffing down movement is turned off.

C A U T I O N : When luffing down, the hoist winch must be spooled out at the same time to prvent the hook block from colliding with the pulley head.

Press the installation keyed button, the indicator light ”Installation” lights up. The installation symbol on the LICCON indicator blinks.

D A N G E R : The overload safety system is no longer effective.
The limit switch hoist ”top” is bypassed.

Actuate the manual control lever and continue to luff down the boom until the hook block touches the ground.
Remove the hoist limit switch weight.
Unreeve the hook block.

D A N G E R : Make sure that there are no persons within the danger zone when unreeving the hoist cable .

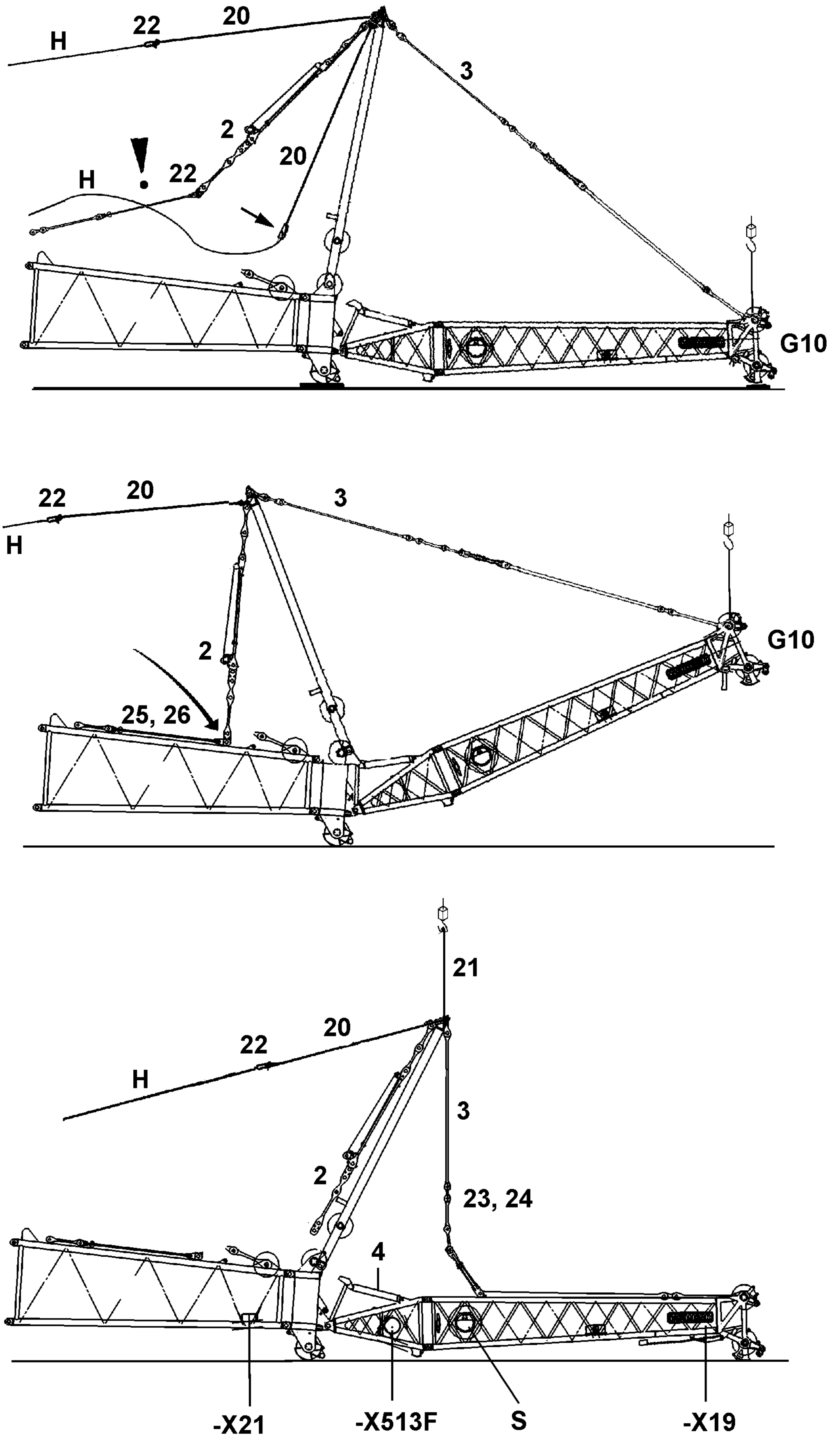
Spool the hoist cable back to the winch.

D A N G E R : Do not overspool the winch! If the cable is pulled under the winch when spooling it up, the setting of the cam limit switch, which is to ensure a minimum number of 3 coils on the drum, would no longer be excact.
The cam limit switch must be reset after any work on the cable or on the winch.

Continue to luff down the boom until theF-end section is just above the ground.
Connect the hydraulic component of the pin pulling device on the F-end section (SK- quick coupling), start it and fully retract the hydraulic relapse cylinder (4) .

D A N G E R : It is prohibited to luff down the boom to the point where the F-end section is laying on the ground, if the relapse cylinder (4) is not retracted!
Otherwise there is a danger of accidents due to overload.

Disconnect the hydraulic component of the pin pulling device again.


H
22
20
3
2
20
H
22
G10
22
20
3
H
G10
2
25, 26
21
20
22
H
3
2
23, 24
4
-X21
-X513F
S
-X19

195196

12. Removal of the fixed guyed F-lattice jib

C A U T I O N : The warning and danger notes given for the installation must also be strictly observed during the removal procedure!

Luff down the boom and F-lattice jib all the way until it is laying on the ground.

Hang the hoist cable (H) into the cable lock (22) on the installation cable (20) .

C A U T I O N : The hoist cable (H) must be guided over the guying!

Then spool up the hoist cable (H) until the installation cable (20) is tensioned.

Attach the auxiliary crane on the F-end section (G10) and lift the F-lattice jib until the guy rod from the S-boom can be unpinned on the guy rods (2) from the FA-bracket .

C A U T I O N : When lifting the F-lattice jib, the hoist cable (H) must be spooled up simultaneously and slightly tensioned!
The hydraulic relapse cylinder (4) must be retracted!

Unpin the guy rods. Remove the pin (25) and the spring retainer (26) .
Spool out the hoist cable (H) and place the F-lattice jib on the ground.
Hang the FA-bracket on the auxiliary crane and the installation cable (21) .
Spool out the hoist cable (H) and lower theFA-bracket with the auxiliary crane and the installation cable (21) down to the front until the guy rod (3) hangs vertically and can be unpinned.
Unpin the guy rods. Remove the pin (23) and the spring retainer (24) .
Continue to spool out the hoist cable (H) and lower the FA-bracket with the auxiliary crane and the installation cable (21) to the front until it lays on the F-pivot section.

C A U T I O N : For the take down procedure, the guy rod (3) must be swung to the FA-bracket .

Secure the guy rod (3) on the FA-bracket with the transport retaining pin (18) and spring retainer (19) .

D A N G E R : During the lowering procedure, no one may remain under the FA - bracket, this is strictly prohibited.

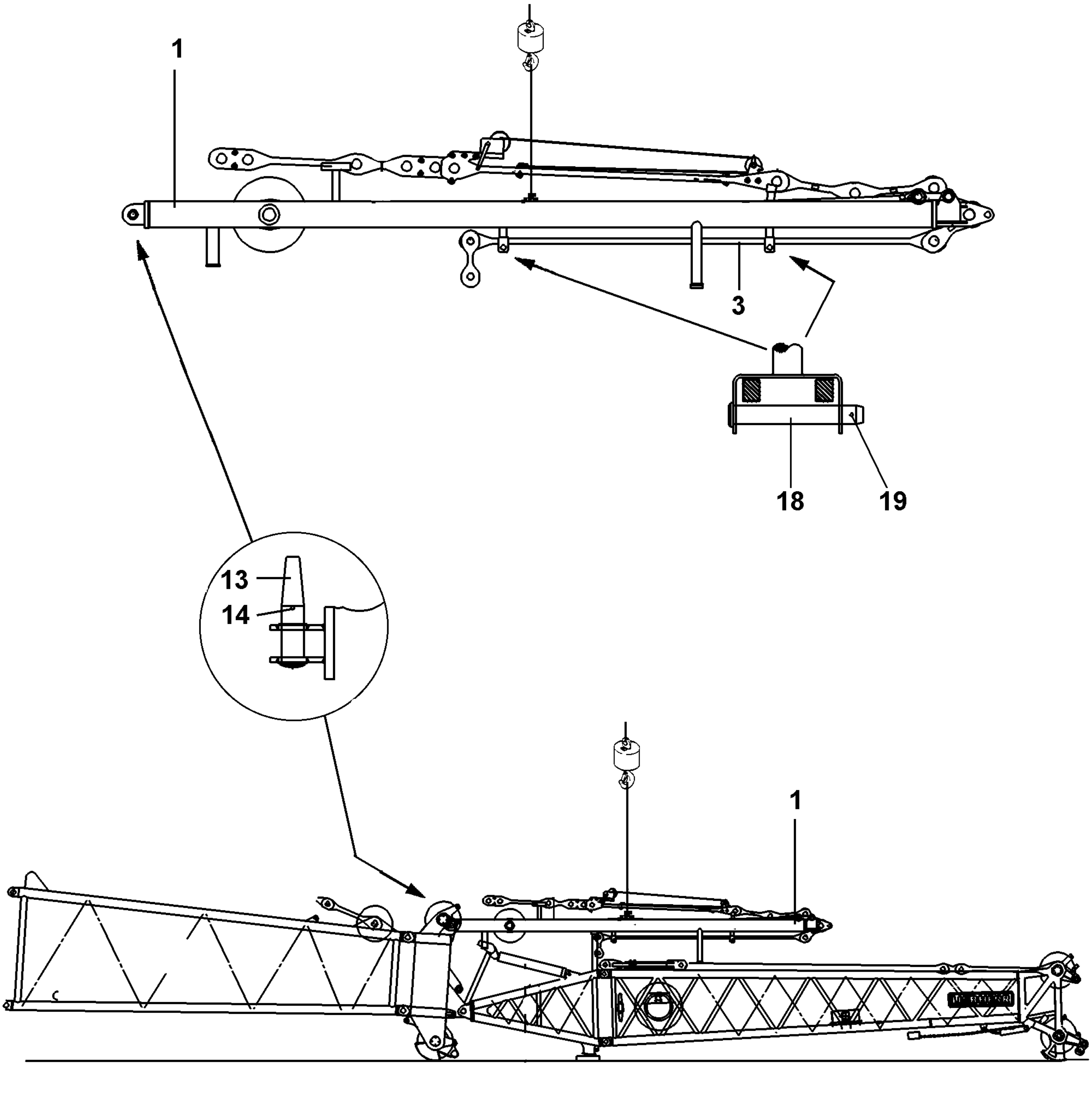
Disconnect the hydraulic and electrical connections

Loosen the hydraulic connection from the hose drum (S) in the F-end section to the relapse cylinder (4) .

Unplug the electrical connection (WL513F) from the connector box (-X21) to the line drum (X513F) .

Note: Unplug the electrical connection from the line drum (X513F) on the connector box (-X21) and then unplug the cable on -X19 and spool it up on the line drum.

Remove the airplane warning light on the F- end section .
Unplug the cable plug (W 460) for the airplane warning light in socket (-X 460b), on the connector box (-X19) .
Unplug the cable plug (W556) from the wind speed sensor in -X556.


1
3
18
19
13
14
1
195197

13. Remove the FA-bracket

Components

1	FA- bracket	7,00 m	approx.2500 kg
3	Guy rod		
13	Pin ∅ 70mm×335mm		
14	Spring retainer ∅ 6mm		
18	Pin ∅ 40mm×275mm		
19	Spring retainer ∅ 5mm		

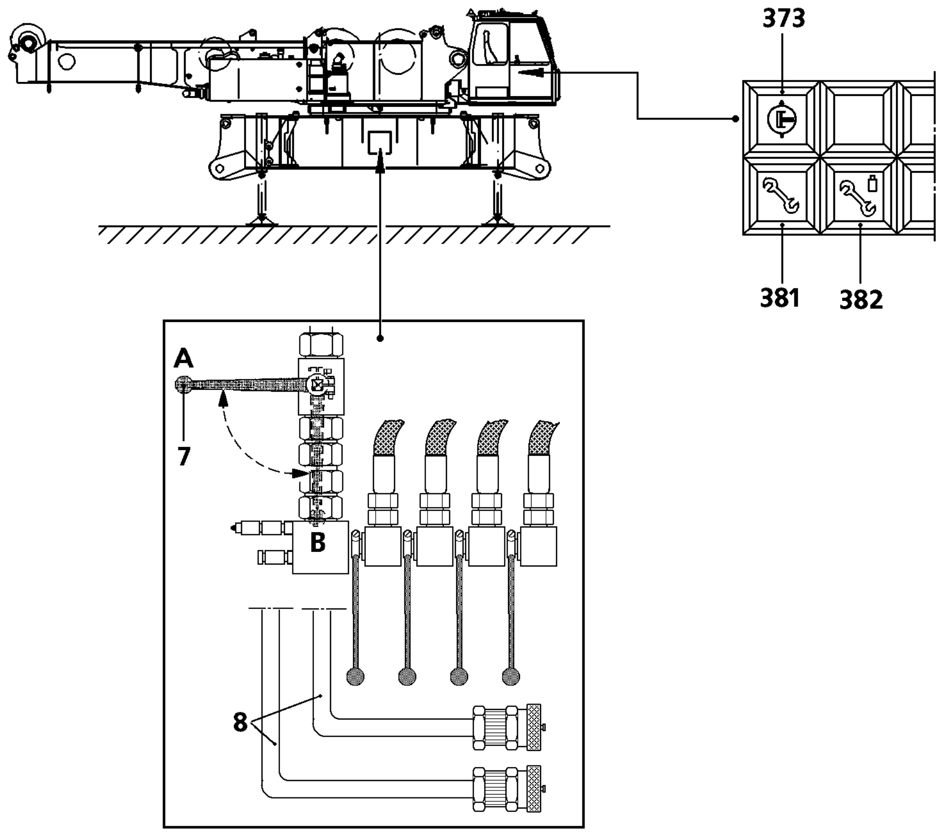
Removal

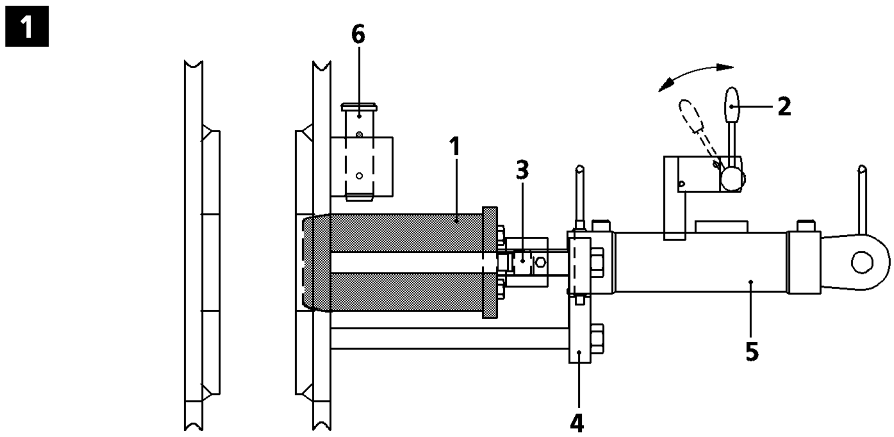
Unpin the FA - bracket (1) on the S- head and lift with the auxiliary crane. Remove the spring retainer (14) and unpin the pin (13) .

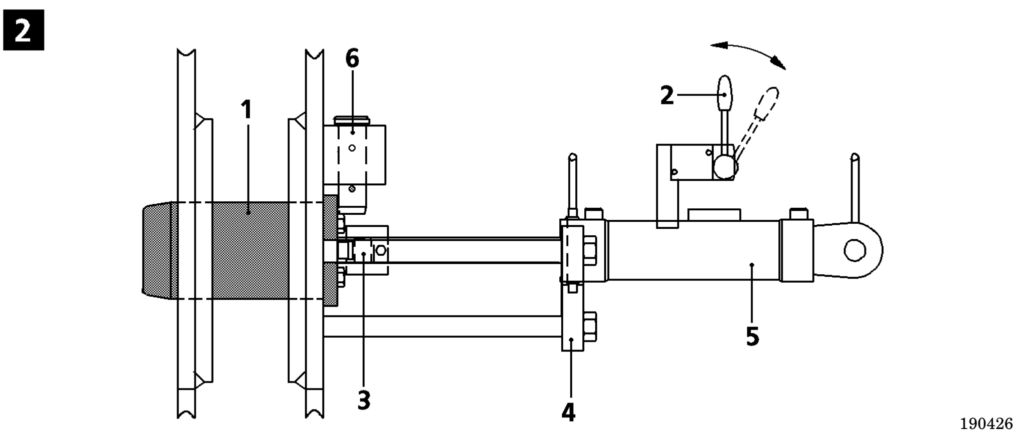
Note: The weight of the FA - bracket is approx. 2500 kg.

Secure the guy rod (3) on the FA-bracket with transport retaining pins (18) and spring retainer (19) .

D A N G E R : **During the pinning and unpinning procedure, no one may remain under the FA - bracket, this is strictly prohibited!**


373
381
382
A
7
B
8


1
6
1
3
2
5
4


2
1
6
2
5
3
4
190426

1. Connect the crawler center section with the crawler carrier

When pinning the crawler carrier with the crawler center section, the pin pulling cylinder must be coupled to the hydraulics of the slewing platform.

D A N G E R: When pinning the crawler carrier with the crawler center section, use the pin pulling device with the touch operated manual lever (2) .

1.1 Preparations

- Remove the plug on the hydraulic connections.
- Establish the hydraulic connections from the slewing platform (8) to the pin pulling cylinder (5) .
- Open the ball cock (7) , position B.
- Start the crane engine.
- Press the button (373) and add the pressure boost.

1.2 **Pin the crawler center section - crawler carrier with the pin pulling device**, fig. 1

- Attach the pin pulling cylinder (5) between the retainer (4) and the pull screw (3) ,
- Move the manual control lever (2) to the front and carefully insert the connector pin (1) .
- Secure the connector pin (1) with the retaining pin (6) .
- Secure the retaining pin (6) with the spring retainer.

D A N G E R: Make sure that no persons are within the danger zone during the pinning and unpinning procedure! Be especially careful during the pinning and unpinning procedure , there is a danger of crushing limbs!

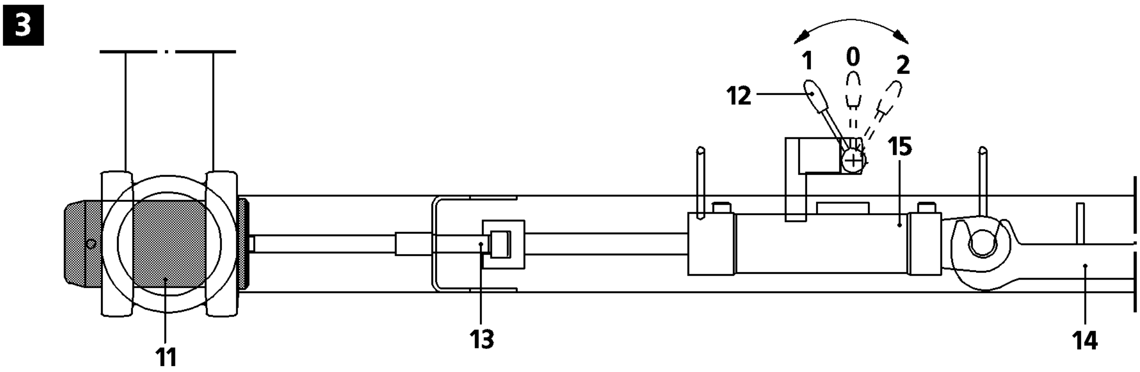
1.3 **Unpin the crawler center section - crawler carrier with the pin pulling device**, fig. 2

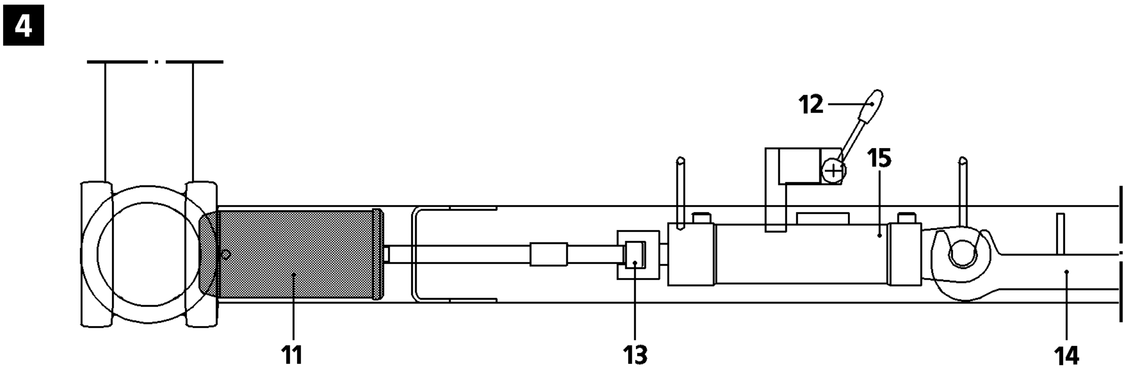
- Release the retaining pin (6) .
- Unpin the retaining pin (6) .
- Attach the pin pulling cylinder (5) between the retainer (4) and the pull screw (3) .
- Move the manual lever (2) back and carefully unpin the connector pin (1) .

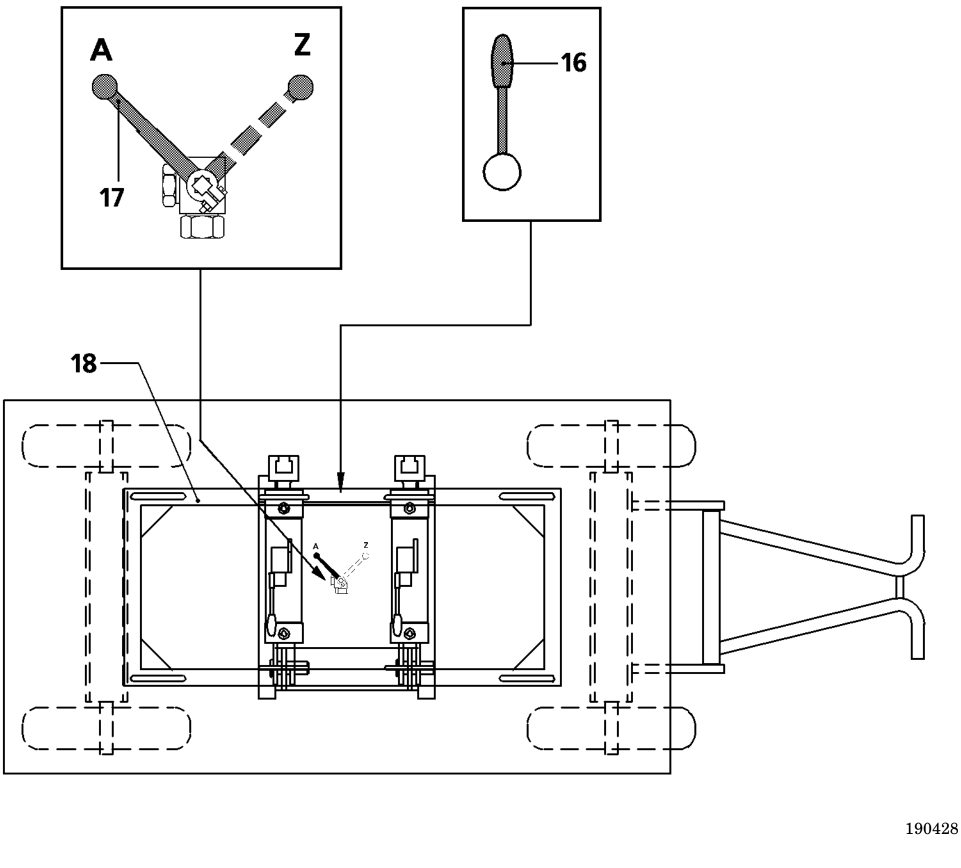
D A N G E R: Make sure that no persons are within the danger zone during the pinning and unpinning procedure! Be especially careful during the pinning and unpinning procedure , there is a danger of crushing limbs!

1.4 Final tasks

- Press the button (373) and add the pressure boost.
- Turn the crane engine off.
- Close the ball cock (7) , position A.
- Release the hydraulic connection between slewing platform - pin pulling cylinder and close with plug.


3
1
0
2
12
15
11
13
14


4
12
15
11
13
14


A
Z
17
16
18
190428

2. Pin the boom sections

When pinning the boom sections, the pin pulling cylinder (15) must be coupled to a mobile pin pulling component (18) .

D A N G E R: When pinning the boom sections, use the pin pulling device with the engaging manual lever (12) .

Note:

Position 0	Pin pulling cylinder in resting position
Position 1	Extend the pin pulling cylinder
Position 2	Retract the pin pulling cylinder

2.1 Preparations

- Remove the plug on the hydraulic connections.
- Establish the hydraulic connections from the pin pulling component (18) to the pin pulling cylinder (15) .
- Turn the crank to start the pin pulling component.
- Change the ball cock (17) to position Z.

Note: The engine RPM can be set via a separate engine speed regulation on the pin pulling component.

2.2 Pin the boom sections with teh pin pulling device, fig. 3

- Attach the pin pulling device between the retainer (14) and the pull screw (13) .
- Move the manual control lever (12) to the front and preselect the pinning procedure.
- Move the manual control lever (16) and pin the pin (11) .

D A N G E R: Make sure that no persons are within the danger zone or under the boom sections during the pinning and unpinning procedure!

2.3 To unpin pins with the pin pulling device, fig. 4

- Attach the pin pulling device between the retainer (14) and the pull screw (13) .
- Move the manual control lever (12) to the rear and preselect the unpinning procedure.
- Move the manual control lever (16) and unpin the pin (11) .

D A N G E R: Make sure that no persons are within the danger zone or under the boom sections during the pinning and unpinning procedure!

2.4 Final tasks

- Turn the pin pulling component (18) off and close the ball cock (17) (position A).
- Release the hydraulic connections and install the plug.

2. Maintenance of pin pulling device

2.1 Maintenance intervals

	first maintenance after	regular maintenance after				Minimum maintenance annually	Controls	
		100 hrs.	200 hrs.	400 hrs.	1000 hrs.		daily	weekly
□ **Diesel engine**								
- Check the oil level For all additional maintenance tasks, observe the engine manufacturer instructions							×	
□ **Hydraulic system**								
- Check the oil level							×	
- check for leaks								×
- replace the return filter elements	50 hrs.			×				
- check the hydraulic oil (take oil samples and have them checked by the oil supplier)	400 hrs.				×	×		

2.2 Oil level in the hydraulic tank

C A U T I O N : **If no oil is visible in the upper sight gauge, then oil must be added according to the lubrication chart (ATF 86) until the oil level is again in the center of the upper sight gauge.**
If the oil level is too low, the hydraulic pump can be damaged.

2.2.1 Return filter on hydraulic tank

The return filter must be changed according to stated maintenance intervals.

2.3 Engine maintenance

C A U T I O N : Maintenance work on the engine as well as on the fuel, oil and air filters must be made according to the separately issued operation manual.

2.3.1 Check the engine oil level

The oil must be between the MIN and MAX mark on the dipstick.

C A U T I O N : Observe utmost cleanliness during all maintenance tasks to prevent dirt infiltration into the interior of the engine.

- Turn the engine off , wait 2 to 3 minutes until the oil has collected in the oil pan.
- Pull the dipstick, wipe it off and reinsert it and pull it out again.
- After checking the oil level, reinsert the dipstick again tightly into the test point.
- Add engine oil, if necessary.

C A U T I O N : If the oil level has dropped below the MIN mark, then engine oil must be added according to the lubrication chart, until the oil level is again between the MIN and MAX mark.
If no engine oil is added, then there is the danger of serious engine damage.

2.3.2 Change the engine oil

See separate operation manual.

2.4 Quantities

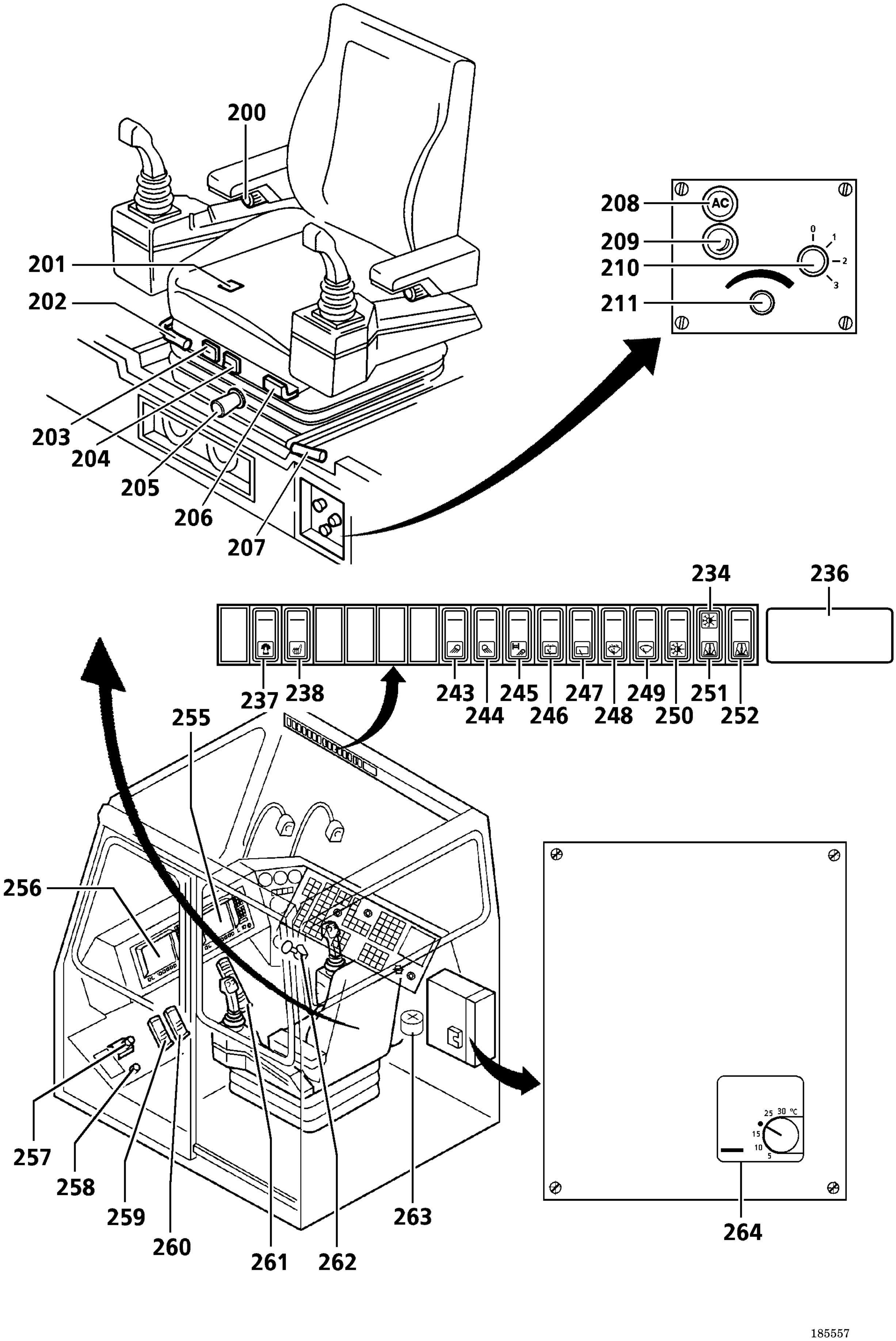
Pin pulling device	approx. Liter
Diesel engine Engine oil	1.2 l
1 Hydraulic tank ATF 86	40.0 l
2 Hydraulic tank * ATF 86	80.0 l

C A U T I O N: The given quantities are orientation values.
The determining factor for the addition of engine oil are the marks on the dipsticks, the inspection ports or sight gauges.

* Optional

Chapter 6

Additional Equipment


200
201
202
203
204
205
206
207
208
AC
209
210
211
0
1
2
3
234
236
237
238
243
244
245
246
247
248
249
250
251
252
255
256
257
258
259
260
261
262
263
264
25
30
°C
15
10
5
185557

1. Crane cab heating

The cab can be heated with two* independent heating systems.

1.1 Engine- dependent heating

Cab heating is carried out with the engine coolant water. The amount of coolant water fed to the cab heating system is controlled with the temperature rotary controller (211).
The amount of warm air can be regulated with the 3- stage blower switch (210).
Fresh air or recirculated air can be chosen with the switch (209).

1.2 Engine-independent heating 1) (additional heating)

The engine- independent heating serves to preheat the diesel engine as well as to heat the driver's cab at engine standstill; it is also used for heating when outside temperatures are extreme and engine heating proves insufficient.

D A N G E R : The heater <u>may not</u> be operated in closed areas, such as garages or workshops, not even with timer operation 2) or Tele start 2).
If this rule is not followed, there is a danger of poison or suffocation!
The heater must be turned off at gasoline stations.
If this rule is not followed, there is a danger of causing an EXPLOSION!

1.2.1 Additional heating as standstill heating (with the engine at standstill)

Set blower switch (210) to step 1, temperature rotary controller (211) to "WARM", and switch on additional heating with switch (252). Indicator lamp (251) will come on.
With the temperature rotary controller (211), the amount of water can be controlled; with the blower switch (210), the amount of air can be controlled.

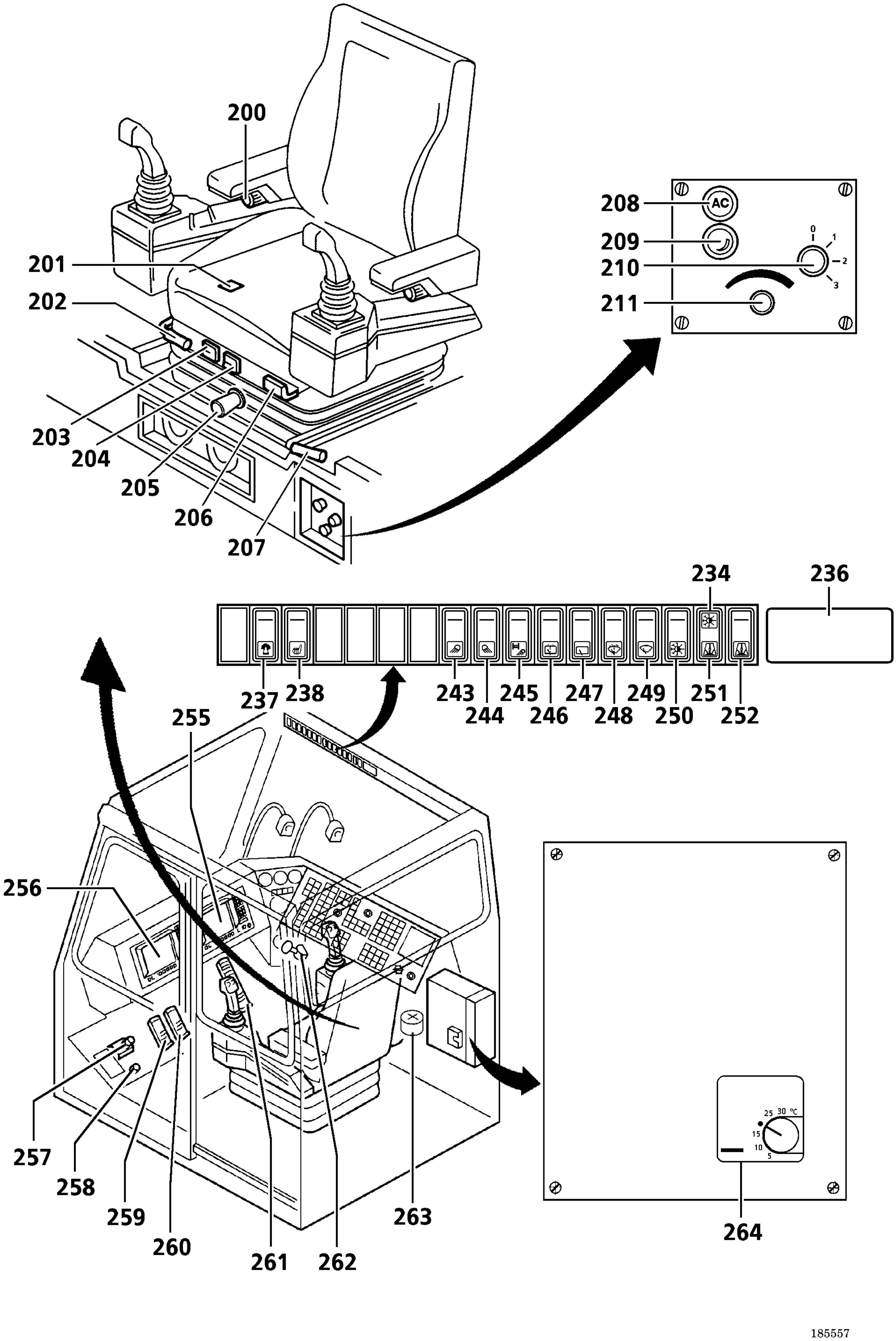
1.2.2 Engine preheating 2) with additional heating

At temperatures less than ≤-15° C, the engine can be preheated with the additional heating.
To operate engine preheating 2), set the heating to "COLD" with the temperature rotary controller (211).
With switch (252), switch on additional heating; indicator lamp (251) will come on.
The diesel engine coolant water is now prewarmed via the additional heating.
At extremely low temperatures, the time required to preheat the engine can be up to one hour.

1.2.3 Thermostat 3)

The desired cab temperature can be controlled with the thermostat (264).
The temperature rotary controller (211) must be set to "WARM".

1), 2) *) customers request.


200
201
202
203
204
205
206
207
208
AC
209
210
0
1
2
3
211
234
236
237
238
243
244
245
246
247
248
249
250
251
252
255
256
257
258
259
260
261
262
263
264
25
30
°C
15
10
5
185557

Bleeding the system
The additional heating water circuit is within the engine circuit; i.e., when bleeding the engine coolant water, the contents of the heating system is also to be bled from the circuit.

When refilling the system, it must be carefully bled; the quickest way to carry this out is to bleed both engine and heating systems at the same time.

Fill the compensator reservoir with water, start the engine, set temperature rotary controller (211) to "WARM".

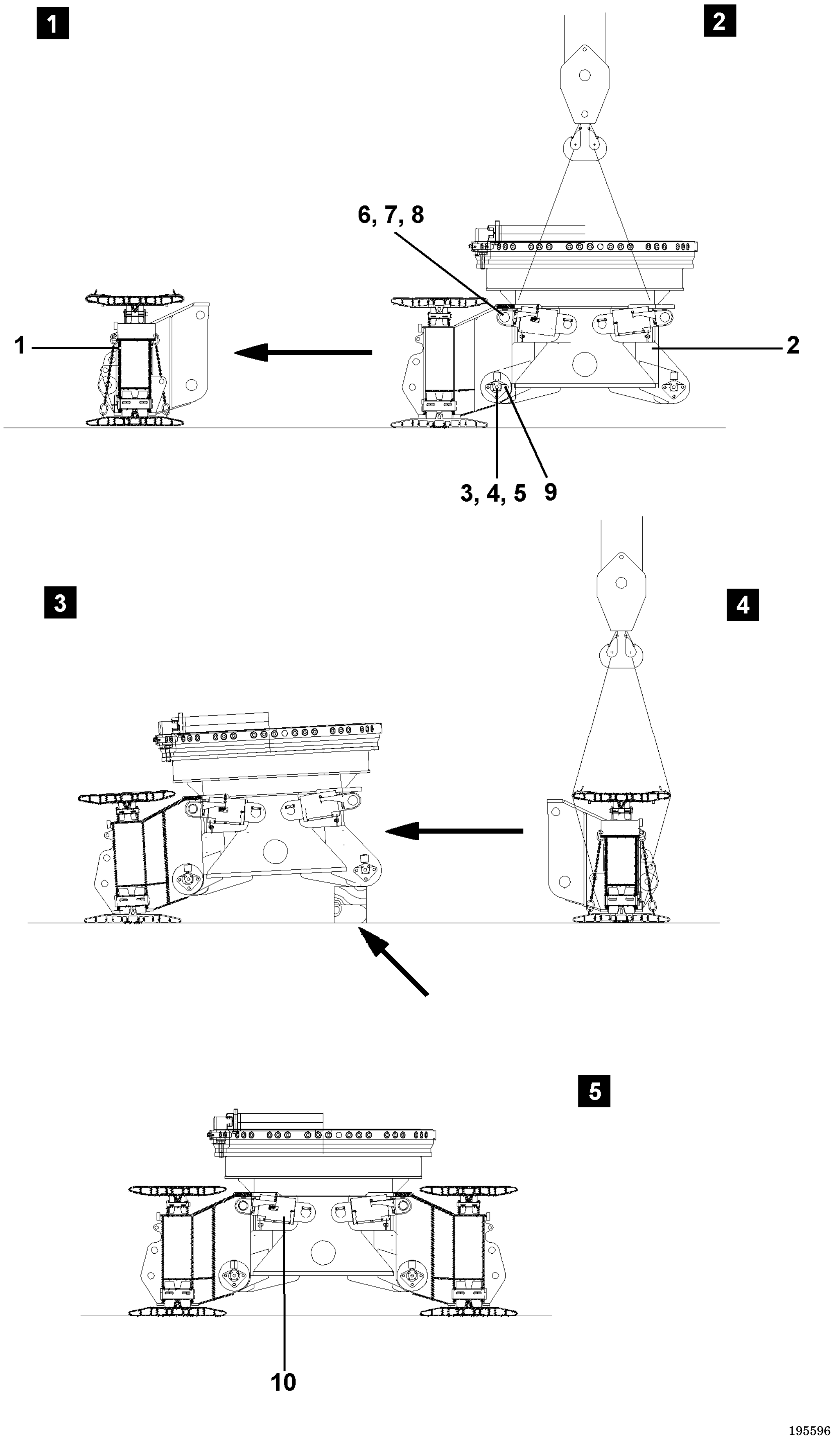
Observe the compensator reservoir to see if any air bubbles rise.

When no more air bubbles can be seen in the compensator reservoir, set the temperature rotary controller (211) to "COLD" - the circuit for engine preheating is then bled.

When no more air bubbles can be seen at this point in the compensator reservoir, this circuit is bled as well.

C A U T I O N : **The battery master switch may only be turned off after the heater has stopped running!**
If arc welding must be done on the crane, remove the negative and positive battery cable from the vehicle and the crane superstructure batteries to protect the heater control unit. Attach the positive cable to the vehicle ground.

Note:
For further notes on additional heating, see Webasto operating instructions.
The battery master switch (on the battery box) may only be switched off after conclusion of heating run- down.
In the summer months, run the additional heating once a month for approx. 15-20 minutes.


1
2
6, 7, 8
1
2
3, 4, 5
9
3
4
5
10
195596

1. Installation of crawler carriers

Weight
Crawler carrier (1) approx. 28,0 t
Crawler center section (2] approx. 10,8 t

Components
1 Crawler carrier
2 Crawler center section
3 Connector pins - bottom , ∅140mm
4 Retaining pins
5 Spring retainer ∅4
6 Connector pins - top, ∅100mm
7 Retaining pins
8 Spring retainer ∅4
9 Pin pulling device
10 Hydraulic cylinder,adjustment of crawler carrier

Fig. 1, 2

1.1 Installation of 1. crawler carrier

Park the crawler carrier (1). Detach the auxiliary crane.
Hang the crawler center section (2) on the auxiliary crane. Use the 4 eyehooks in the crawler center section.
Swing the crawler center section (2) to the receptacle on the crawler carrier and move it in carefully to the stop.
Pin and secure the crawler center section (2) on the crawler carrier (1).

Pin the lower connector pins (3) with the hydraulic pin pulling device (9) and secure with retaining pins (4) and spring retainer (5).

Insert the upper connector pins (6) on the hydraulic cylinder (10) by hand and secure with retaining pins (7) and spring retainer (8).

Fig. 3, 4, 5

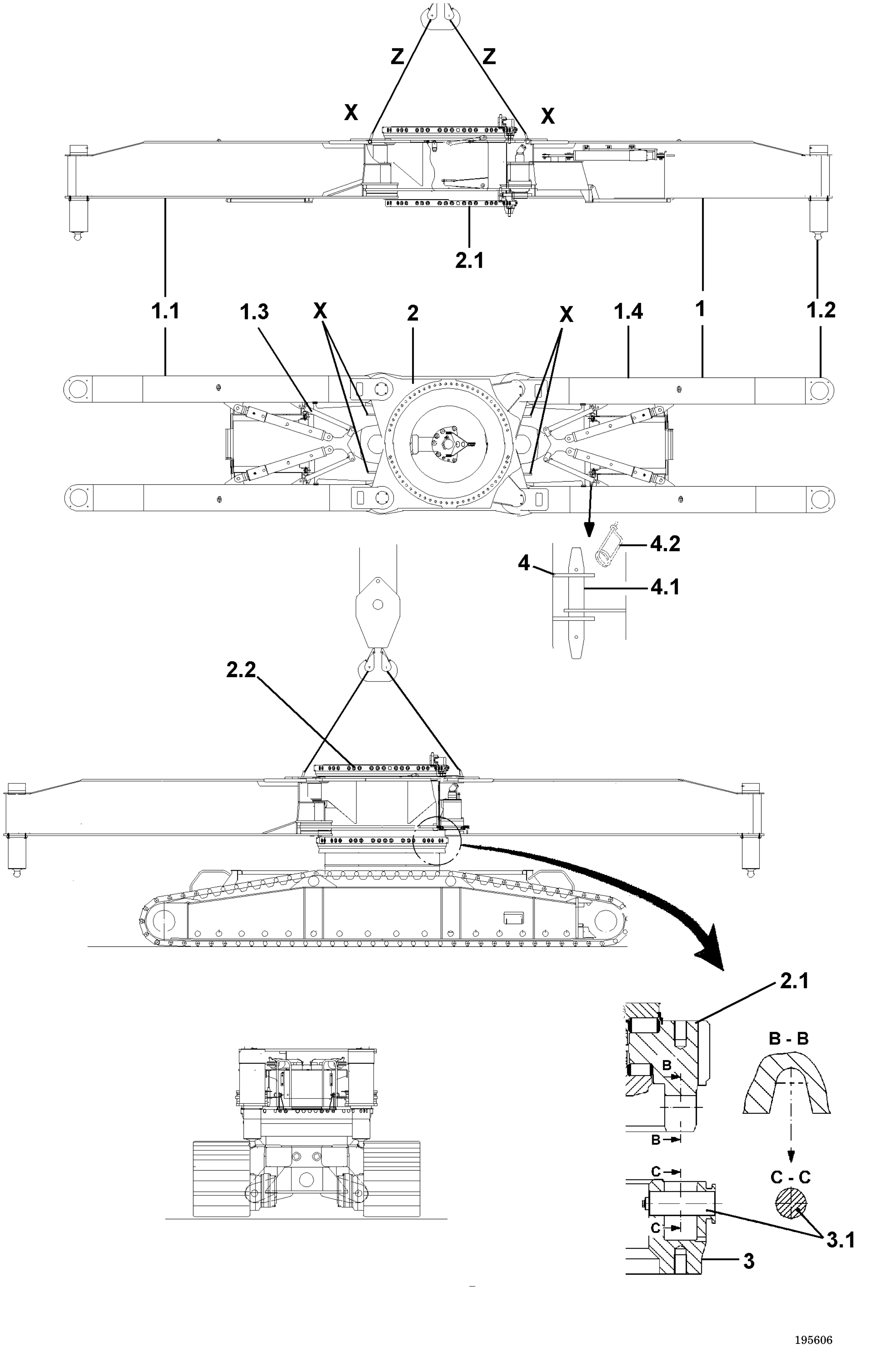
1.2 Installation of 2. crawler carrier

Support the crawler center section, so that the second crawler carrier can be installed.
Carefully swing the crawler carrier (1) to the receptacle on the crawler center section (2) and move it in carefully to the stop.
Pin and secure the crawler carrier (1) on the crawler center section (2)

Pin the lower connector pins (3) with the hydraulic pin pulling device (9) and secure with retaining pins (4) and spring retainer (5).

Insert the upper connector pins (6) on the hydraulic cylinder (10) by hand and secure with retaining pins (7) and spring retainer (8).

Remove the support and lower onto the crawler tracks.


Z
Z
X
X
2.1
1.1
1.3
X
2
X
1.4
1
1.2
4.2
4
4.1
2.2
2.1
B - B
B
B
C - C
C
C
3.1
3
195606

2. Installation of crane support

Components

1 Crane support
1.1 Support arm
1.2 Support cylinder
1.3 Hydraulic cylinder to swing the support arms out and in
1.4 Rod to mark the support base
2 Center section with slewing gear and rotary connection
2.1 Slewing ring
2.2 Bolt ring for connection with slewing platform
3 Bolt ring for connection with crawler center section
3.1 Centering pin
4 Transport retainer
4.1 Pin, also used to hold the rod (1.4)
4.2 Spring retainer

Prerequisites:
Clean the mating or contact surface of the slewing ring.

Installation procedure:
- Attach the tackle (Z) on the tackle points (X) of the crane support .

Note: The weight of the crane support is approx. 44 t

D A N G E R: **It must be ensured that the tackle (Z) is correctly attached on the tackle points (X) and secured sufficiently to prevent it from coming loose. There is a danger of accidents !**

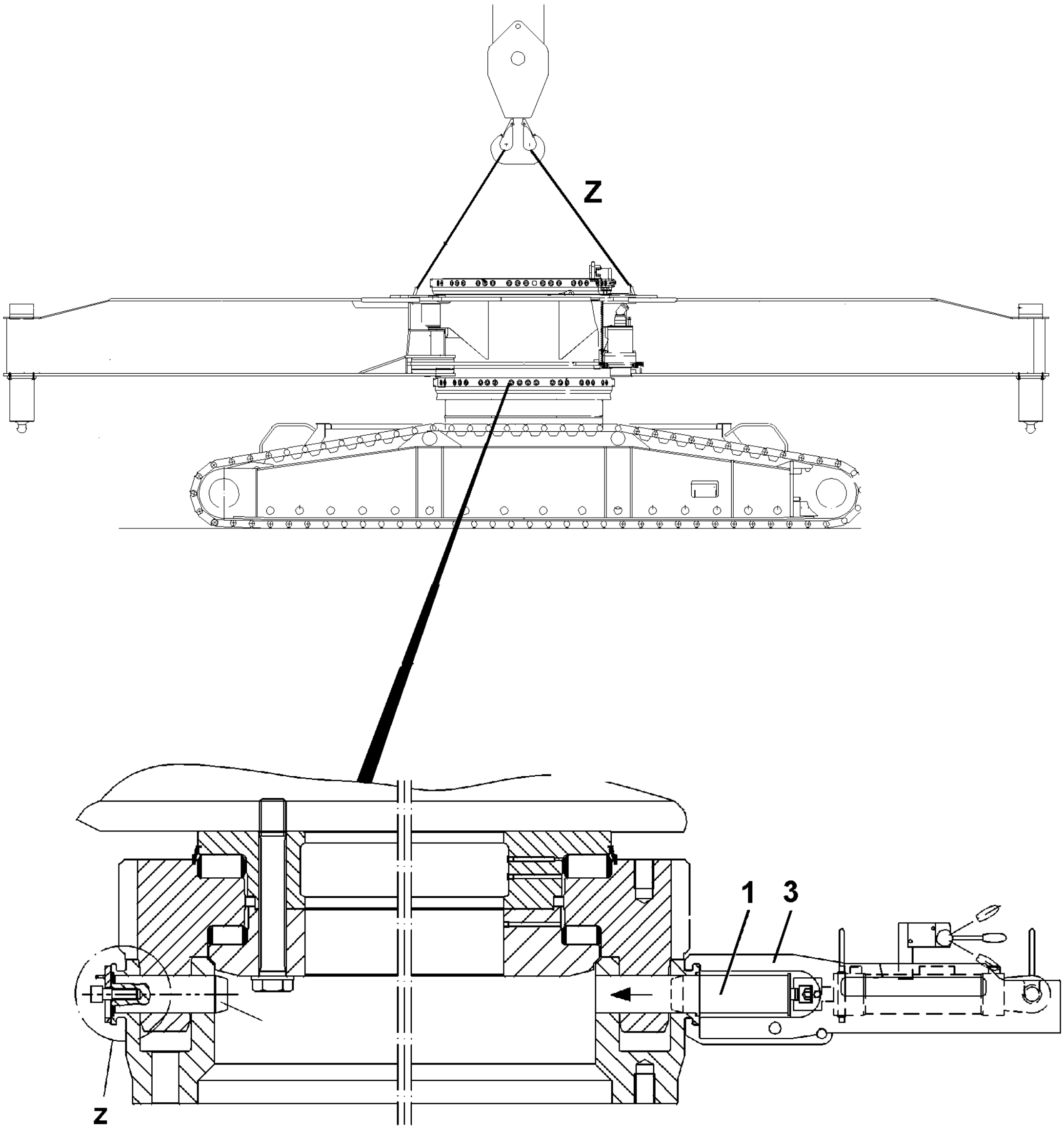
- With the auxiliary crane, slowly swing in the crane support (1) over the crawler center section.
- Lower the crane support slowly.

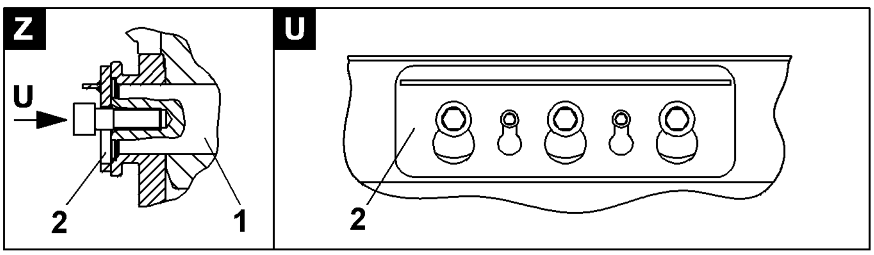
Note: Before lowering it, position the crane support in such a way that the centering pins (3.1) (C-C) **"pair up"** on the bolt ring (3) and on the pocket receptacles (B-B) on the slewing ring (2.1).
Due to the design of the centering pins, it is not possible to place the crane support **"incorrectly"** on the crawler center section.

C A U T I O N: **Make sure that the crane support or the pocket receptacles are aligned properly to the centering pins.**

D A N G E R: **No one may remain within the slewing range and under the crane support during the swing in and lowering procedure! This is strictly prohibited! There is a danger of accidents !**

- Carefully place the crane support on the crawler center section .
- The crane support must be lowered all the way until it stops on the bolt ring (3) .





195607

2.1 Pin the crane support with Quick Connection

Prerequisite:
- The crane support is centered on the crawler center section .
- The tackle (Z) between the crane support and the auxiliary crane is **"tensioned" .**
- The pin bores on the circumference of the slewing ring are clear.

Installation procedure:
- Grease all connectors pins (1) with waterproof grease
- Insert all connector pins (1) by hand all the way into the pin bores and bolt the crane support with the crawler center section .
- If it is too difficult to do by hand, use the pin pulling device (3) for the pinning procedure
- Attach the retaining bar (2) and secure the connector pin (1).

D A N G E R. **The connector pins must be secured immediately after pinning the slewing platform with the crawler center section.**
If this is not observed, there is a danger of accident!

- After the slewing ring connection is pinned and secured, remove the tackle .

2.2 Establish the hydraulic connection to the slewing platform .

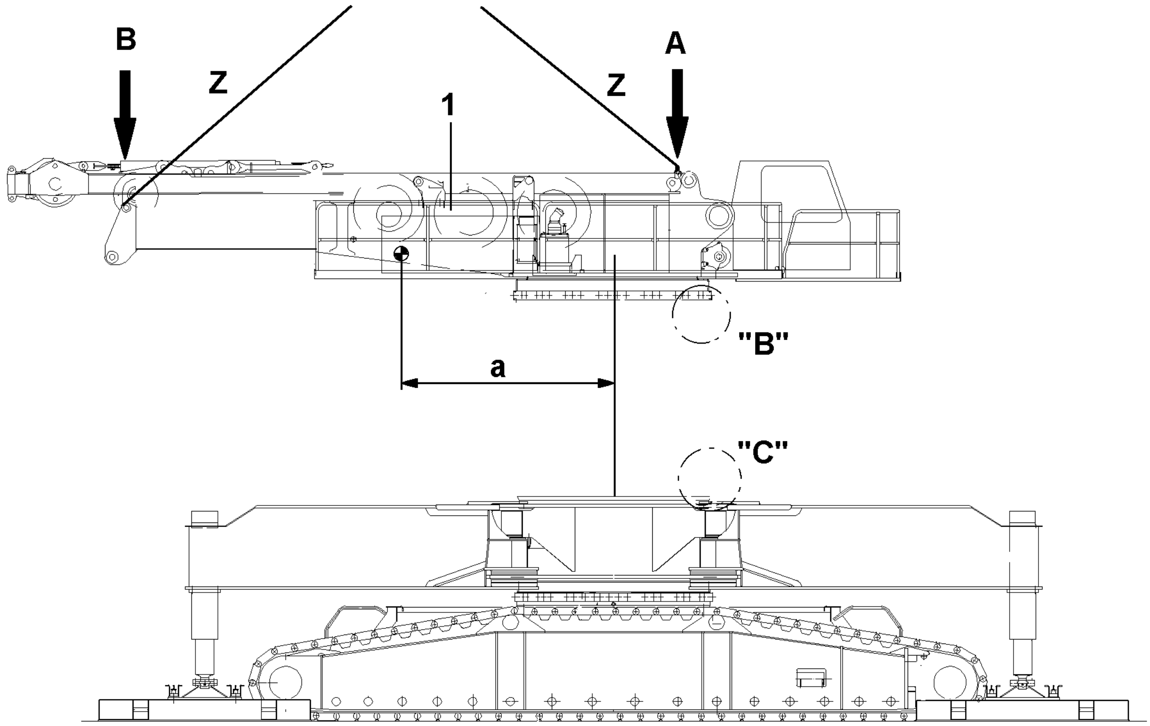
The hydraulic connection from the rotary connection in the crawler center section to the slewing platform is established with quick connection couplings.

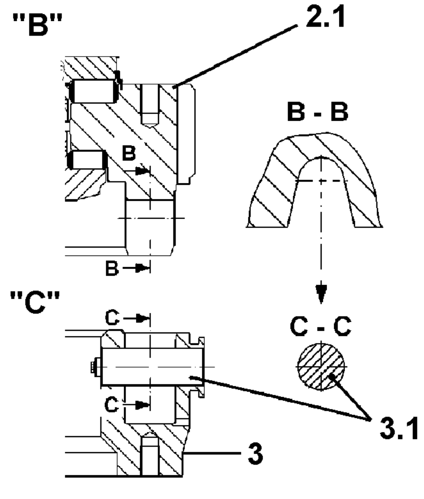
Note: The quick connections which belong together are marked.

Connecting or disconnecting hydraulic lines with quick connections

D A N G E R : **When connecting or disconnecting hydraulic lines with quick connections, it must be ensured that the coupling procedure is carried out correctly.**

Prerequisite for a correct coupling connection is:
- **The pressure in the hydraulic system must be relieved before connection or disconnection. (Turn the engine off - then wait 5 minutes).**
- **Connect the coupling sections (sleeve and socket) and screw them together by hand with the nut .**
- **Turn the nut past the O-ring until you feel a noticeable, firm stop.**
- **The couplings may only be tightened by hand - without using any tools (to avoid damage to the couplings).**
- **Improperly connected couplings could cause loss of pressure or sudden leakage and result in serious accidents.**





195608

3. Transport weights and center of gravity of slewing platform

Slewing platform
- Winch IV incl. cable
- A-bracket incl. pulley set
- Installation winch incl. cable
- Upper section of slewing ring with Quick Connection

Weights and center of gravity

Condition with Q.C	Weight (t)	Center of gravity **a** (mm)	A (t)	B (t)
with winch IV + cable	31.3	2672	17.1	14,2
with winch I+IV + cable	35.5	2510	20,1	15,4
with winch I, II+IV + cable	39.7	2456	22,9	16,8
with winch VI, I, II IV + cable	43.9	2180	26,9	17,0

4. Installation of slewing platform

Prerequisite :
Clean the mating or contact surface of the slewing ring -

Installation procedure:
- Attach the tackle (Z) on the slewing platform .

D A N G E R: **It must be ensured that the tackle (Z) is correctly attached on the tackle points and secured sufficiently to prevent it from coming loose. There is a danger of accidents!**

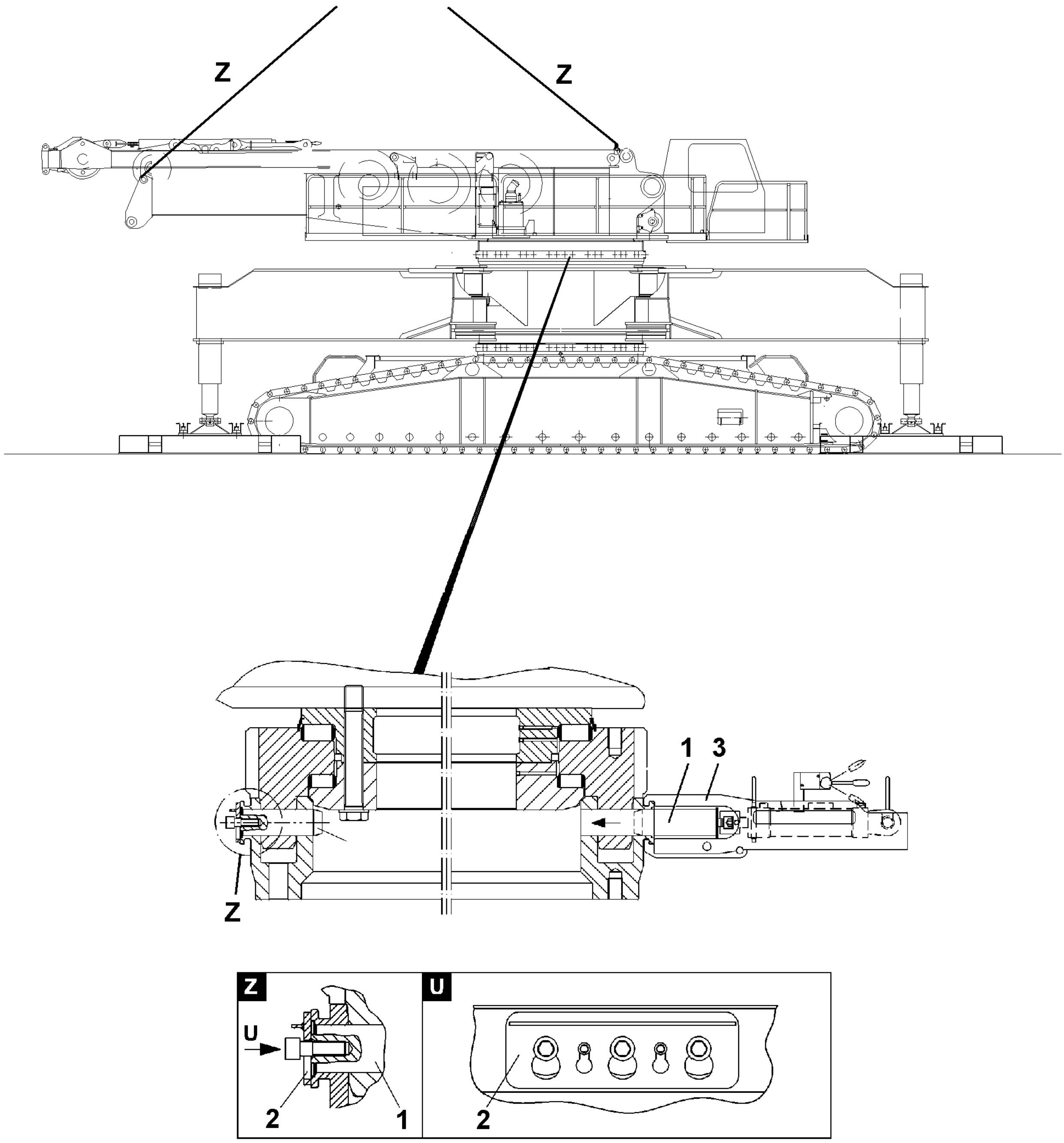
- With the auxiliary crane, slowly swing in the slewing platform (1) over the crane support.
- Slowly lower the slewing platform.

Note: Before lowering it, position the crane support in such a way that the centering pins (3.1) (C-C) **"pair up"** on the bolt ring (3) and on the pocket receptacles (B-B) on the slewing ring (2.1).
Due to the design of the centering pins, it is not possible to place the crane support **"incorrectly"** on the crawler center section.

C A U T I O N: **Make sure that the crane support or the pocket receptacles are aligned properly to the centering pins.**

D A N G E R: **No one may remain within the slewing range and under the crane support during the swing in and lowering procedure! This is strictly prohibited! There is a danger of accidents !**

- Carefully place the slewing platform on the crane support .
- The slewing platform must be lowered until it stops on the bolt ring (3).



195609

4.1 Pin the slewing platform with Quick Connection

Prerequisite:
- The slewing platform (1) is centered on the crane support .
- The tackle (Z) between the slewing platform and the auxiliary crane is **"tensioned."**
- The pin bores on the circumference of the slewing ring are clear.

Installation procedure:
- Grease all connectors pins (1) with waterproof grease
- Insert all connector pins (1) by hand all the way into the pin bores and bolt the slewing platform with the crane support .
- If it is too difficult to do by hand, use the pin pulling device (3) for the pinning procedure.
- Attach the retaining bar (2) and secure the connector pin (1).

D A N G E R: **The connector pins must be secured immediately after pinning the slewing platform with the crane support.**
If this is not observed, there is a danger of accident!

- After the slewing ring connection is pinned and secured, remove the tackle.

4.2 Establish the hydraulic connection to the slewing platform .

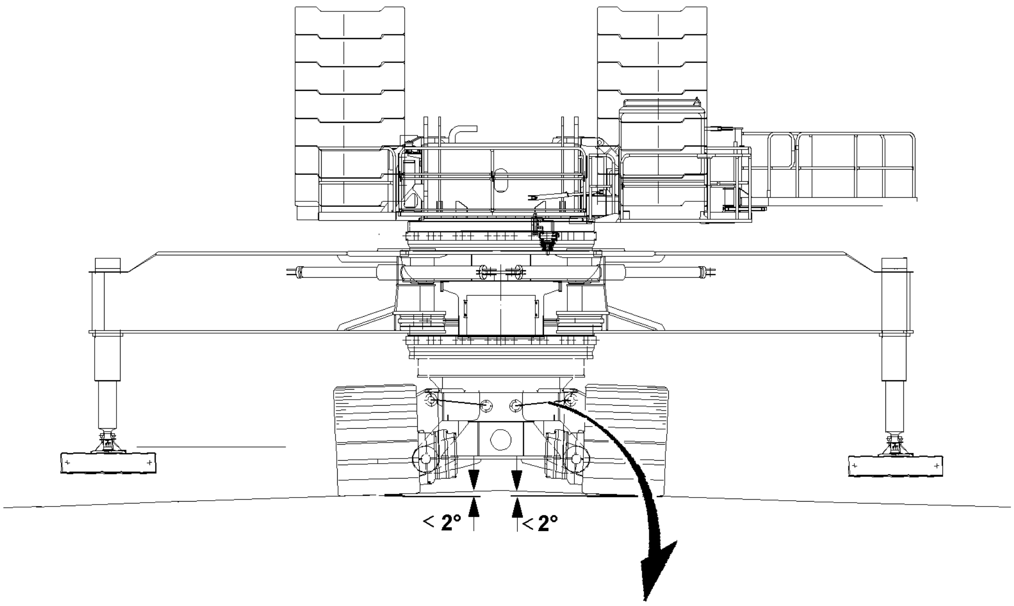
The hydraulic connection from the rotary connection in the crawler center section to the slewing platform is established with quick connection couplings.

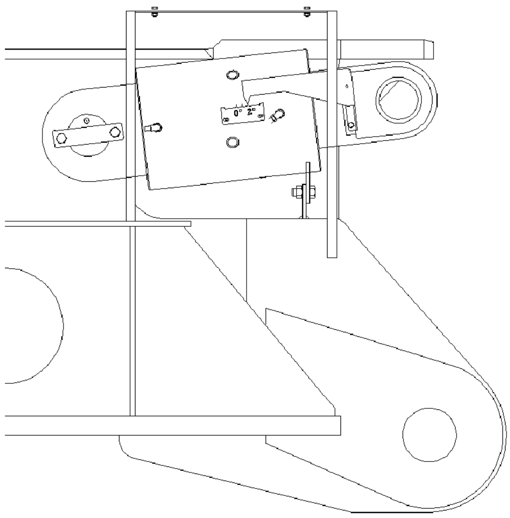
Note: The quick connections, which belong together, are marked.

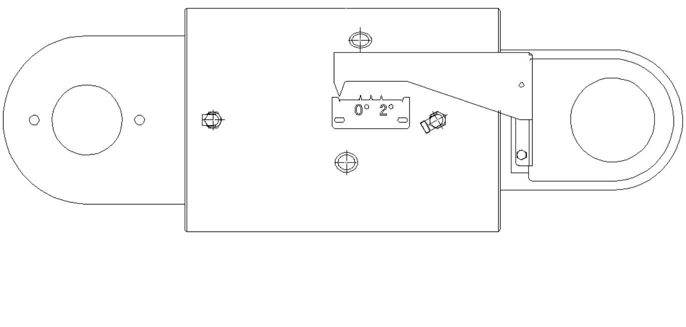
Connecting or disconnecting hydraulic lines with quick connections

D A N G E R : **When connecting or disconnecting hydraulic lines with quick connections, it must be ensured that the coupling procedure is carried out correctly.**

Prerequisite for a correct coupling connection is:
- **The pressure in the hydraulic system must be relieved before connection or disconnection. (Turn the engine off - then wait 5 minutes).**
- **Connect the coupling sections (sleeve and socket) and screw them together by hand with the nut .**
- **Turn the nut past the O-ring until you feel a noticeable, firm stop.**
- **The couplings may only be tightened by hand - without using any tools (to avoid damage to the couplings).**
- **Improperly connected couplings could cause loss of pressure or sudden leakage and result in serious accidents.**







195932

5. Description

The crawler crane with narrow track can be driven with the complete equipment between installation locations, even on narrow and curvy roads.
Due to two slewing rings, the crawler travel gear, the crane support and the slewing platform can be turned to each other, as desired, so that the crawler crane can even pass through the tightest curves without damaging the ground with the crawler travel gear.
When changing travel direction, the crane is supported and raised and the crawler travel gear is turned into the new travel direction, as desired.
Turn the slewing platform until it is parallel to the crawler travel gear.
Then retract the support cylinders until the crane is on crawlers.
Turn the crane support parallel to the slewing platform and the crawler travel gear.

5.1 Crawler incline

On off road - road inclines up to 2°, the crawler travel gears can be leveled with the hydraulic cylinders.

D A N G E R: During the crawler travel gear adjustment, make sure that the crane is in horizontal position ± 2° .
If this is not observed, there is a danger of accidents!

Note: As soon as the indicator value (INCLI.X: +0.0 °, Y: +0.0 °) for the x- and y-axle is out of the **±2°** range, an acoustical warning sounds on the remote control panel.

Display indicators

CRAWLER L: 40BAR >0 °

Crawler carrier left, pressure in bar.
Incline position of crawler
>0°/ <0°/ >2°/ ><

Possible conditions:
1. < 0° Crawler incline 0° to - 1,5°
2. > 0° Crawler incline 0° to < 2°
3. > 2° Crawler incline 2° to 3,5°
4. >< Crawler incline< - 1,5° or >3,5°
or limit switch erroneous = Block position

If "><" is shown, crawler block position, then the releases to turn the slewing platform or the crawler are removed.

CRAWLER R: 40BAR >0 °

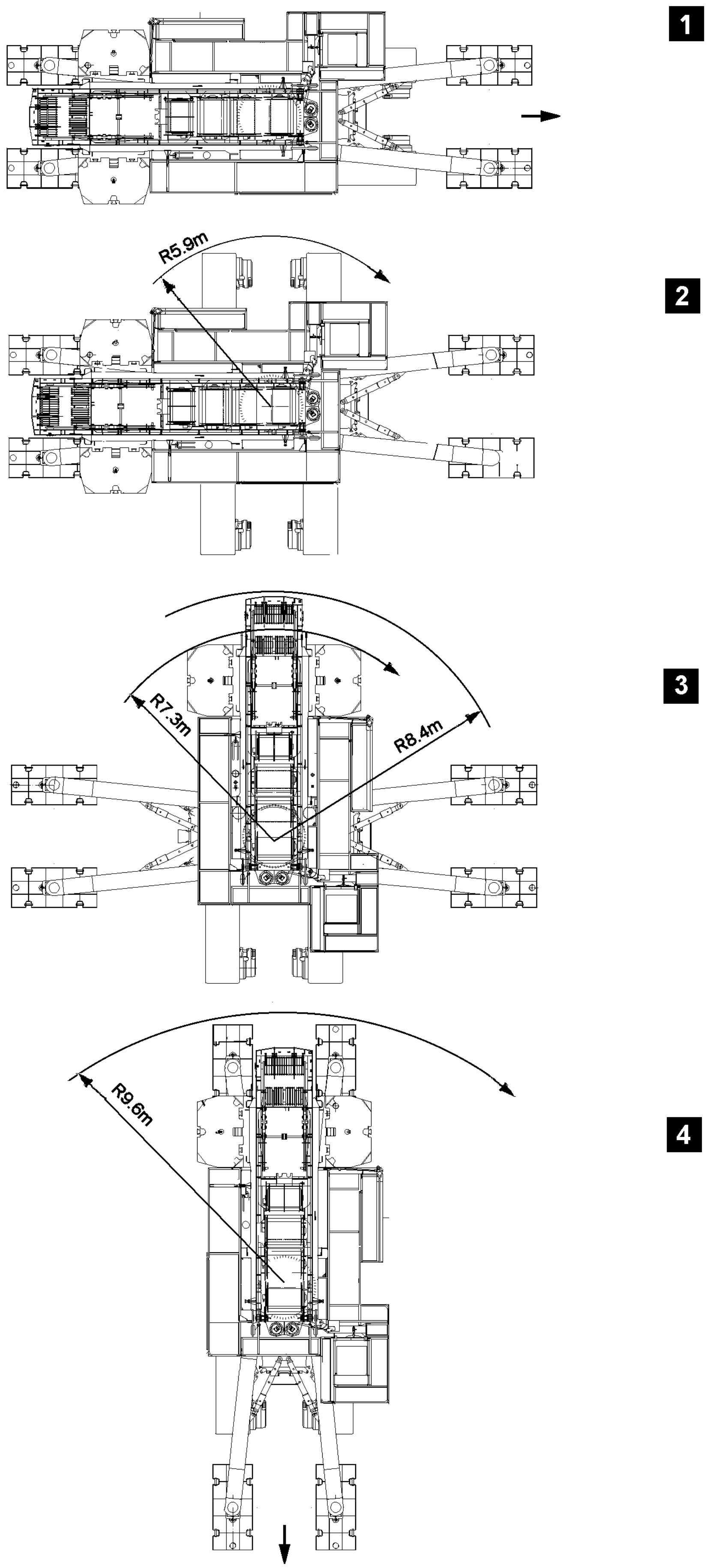
Crawler carrier right, pressure in bar.
Incline position of crawler
>0°/ <0°/ >2°/ ><

Possible conditions:
1. < 0° Crawler incline 0° to - 1,5°
2. > 0° Crawler incline 0° to < 2°
3. > 2° Crawler incline 2° to 3,5°
4. >< Crawler incline< - 1,5° or >3,5°
or limit switch erroneous = Block position

If "><" is shown, crawler block position, then the releases to turn the slewing platform or the crawler are removed.

INCLI. X: +0.0 ° Y: +0.0 °

Incline sensor, x-axle +6,3° to -6,3°
y-axle +6,3° to -6,3°



195610

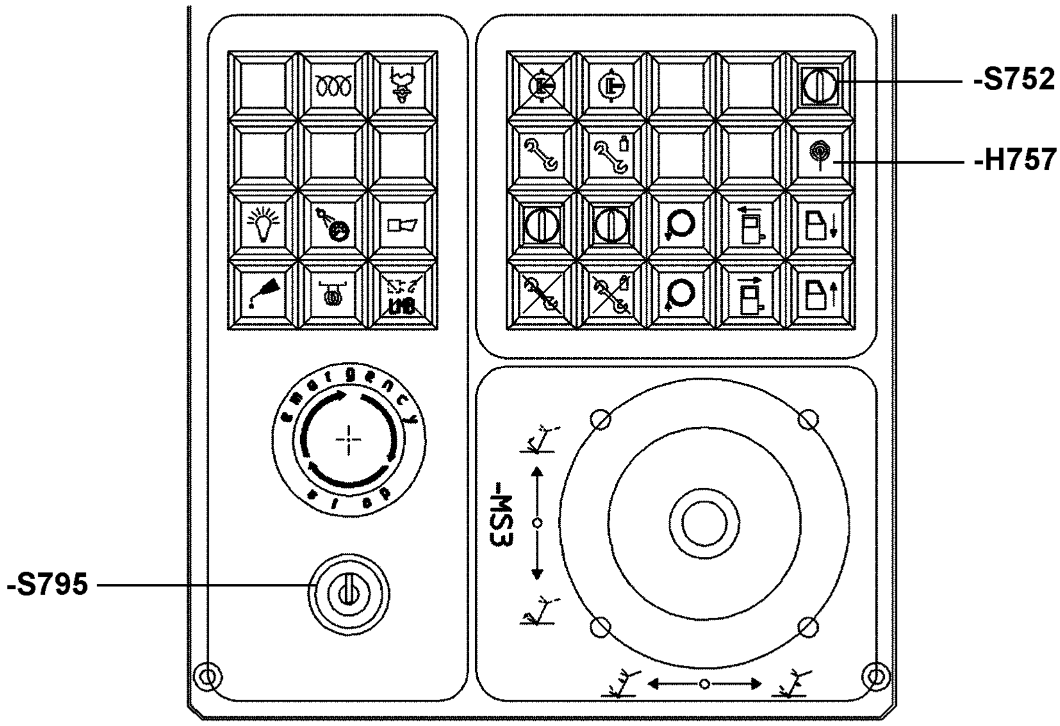
5.2 Procedure for change of travel direction

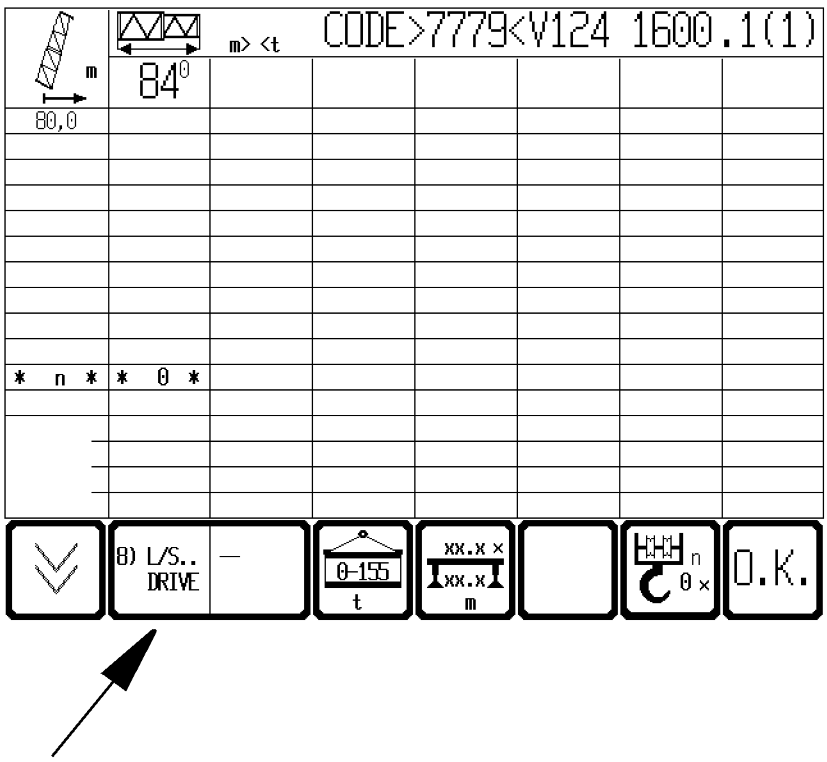
Fig. 1
Initial position
- On crawler
- Support clear

Fig. 2
Turn the crawler travel gear into a new travel direction
- On outrigger supports
- Crawler clear
- Turn crawler travel gear into the desired new travel direction

Fig. 3
Turn the slewing platform parallel to the crawler travel gear
- On outrigger supports with a minimum of 8t support force per support
- On crawler with a minimum of 5bar per tracks on the ground
- Turn the slewing platform until it is parallel to the crawler travel gear, +/- 5°.

Fig. 4
Turn the crane support parallel to the slewing platform and the crawler travel gear
- On crawlers
- Support clear
- Turn the crane support by simultaneously turning the slewing platform and the support until it is parallel to the crawler travel gear and the slewing platform.


-S752
-H757
-S795
-MS3
emergency stop
LMB


CODE>7779<V124 1600.1(1)
m> <t
84°
m
80,0
* n * * 0 *
8) L/S..
DRIVE
0-155
t
xx.x ×
xx.x
m
n
0 ×
O.K.

195914

6. Remote control

Prerequisite:

- The ignition is turned on (-S795 in the cab).
- The remote control in the cab is turned on, keyed switch -S752 turned on, the indicator light -H757 lights up.
- The keyed switch (14) on the remote control panel is turned on.
- The crane engine is running, started with button (9) "Engine start" from the remote control panel.

- In the LICCON equipment configuration view, the operating mode **[8) L/S..DRIVE]** was preselected and confirmed with the "OK" key.

Turn on the remote control:

1. First, turn on the keyed switch (14) for the radio transmitter.
2. Then press the button (9) Engine start, this switches on the radio transmitter, now the indicators appear on the radio display.
3. Then press the button (9) Engine start again, the engine can be started.

Note: To control a crane via remote control makes working significantly easier. However, the crane operator must first get used to the remote control !

When the remote control is turned on , the master switches MS4, MS5 and MS2x in the crane cab as well as the coasting function of the slewing platform (foot switch) are always deactivated.

In addition, the switches "Crawler On" and "Crawler rapid gear" and the throttle control for the Diesel engine are also changed over to the remote control panel.

Note: The remaining control elements in the crane operator's cab continue to be active when the remote control is turned on.

D A N G E R: **Crane operation with turned on remote control is not permitted! In this operating condition, no other person may remain in the crane operator's cab or use any control elements in the crane operator's cab! THIS IS STRICTLY PROHIBITED!**

C A U T I O N: **The monitoring of the turn angle of crawler and slewing platform to support is always active when the remote control is turned on, except:**

- if the crane is supported at 11,5 × 11,5m support base and a corresponding load chart is set in the equipment configuration view and confirmed with the "OK" key.
This is only permissible to be able to control the support. In this condition it is possible to turn the slewing platform with the aid of the remote control panel, despite the shutoff of the slewing gear slewing platform, as shown in the display.

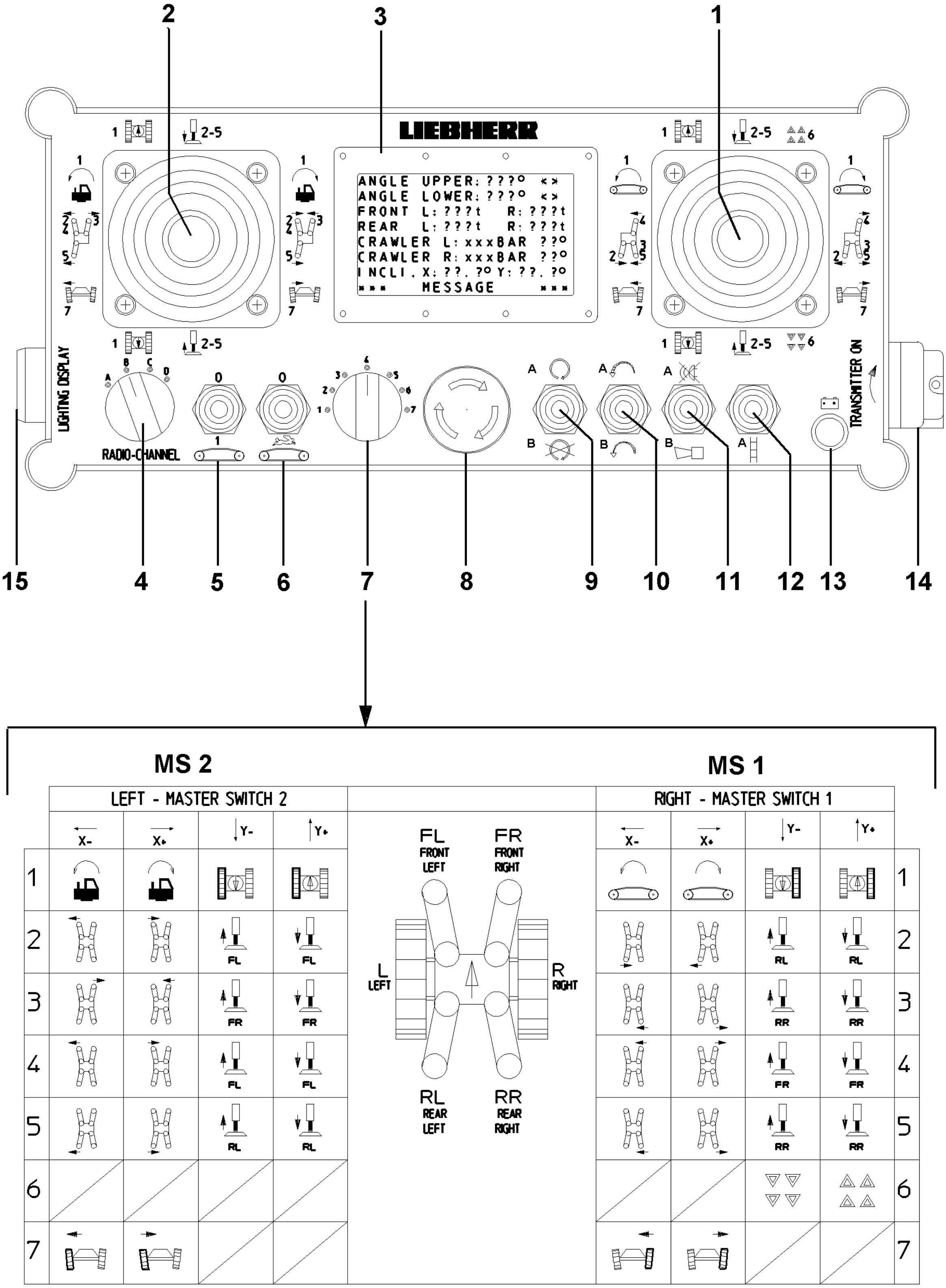
Shut off / release

Monitor the display during operation. When a crane movement is carried out, the changing condition and the change of forces / pressures should be seen . The danger condition should be recognized early and the crane movement should be slowed down accordingly or shut off .

The crane operator must constantly determine if the data shown in the display can even be correct. The crane operator may not blindly trust the system, he must think for himself and be able to recognize an eventual error in time.

Drive crawler	-	No shut off
Support	-	No shut off
	-	when the slewing platform and the crawler are not parallel (+/-5°), then an acoustical warning is given when you want to actuate the function "retract support " .
Slewing	-	Shut off , release
-	-	The support force threshold is a minimum of 8t "for crane is supported", a maximum of 1t for "crane is not supported"
	-	The track pressure is a minimum of 5bar "for crane is standing on tracks", a maximum of 1bar for "crane is standing on outrigger supports"
	-	Window +/- 5°

D A N G E R: The shut offs do not relieve the operator from his obligation to be careful. If the crane operator does not fulfill his obligation to take care, then the crane can topple over or be destroyed, despite a functioning shut off system. The shut off cannot register all operating conditions which might possible occur.

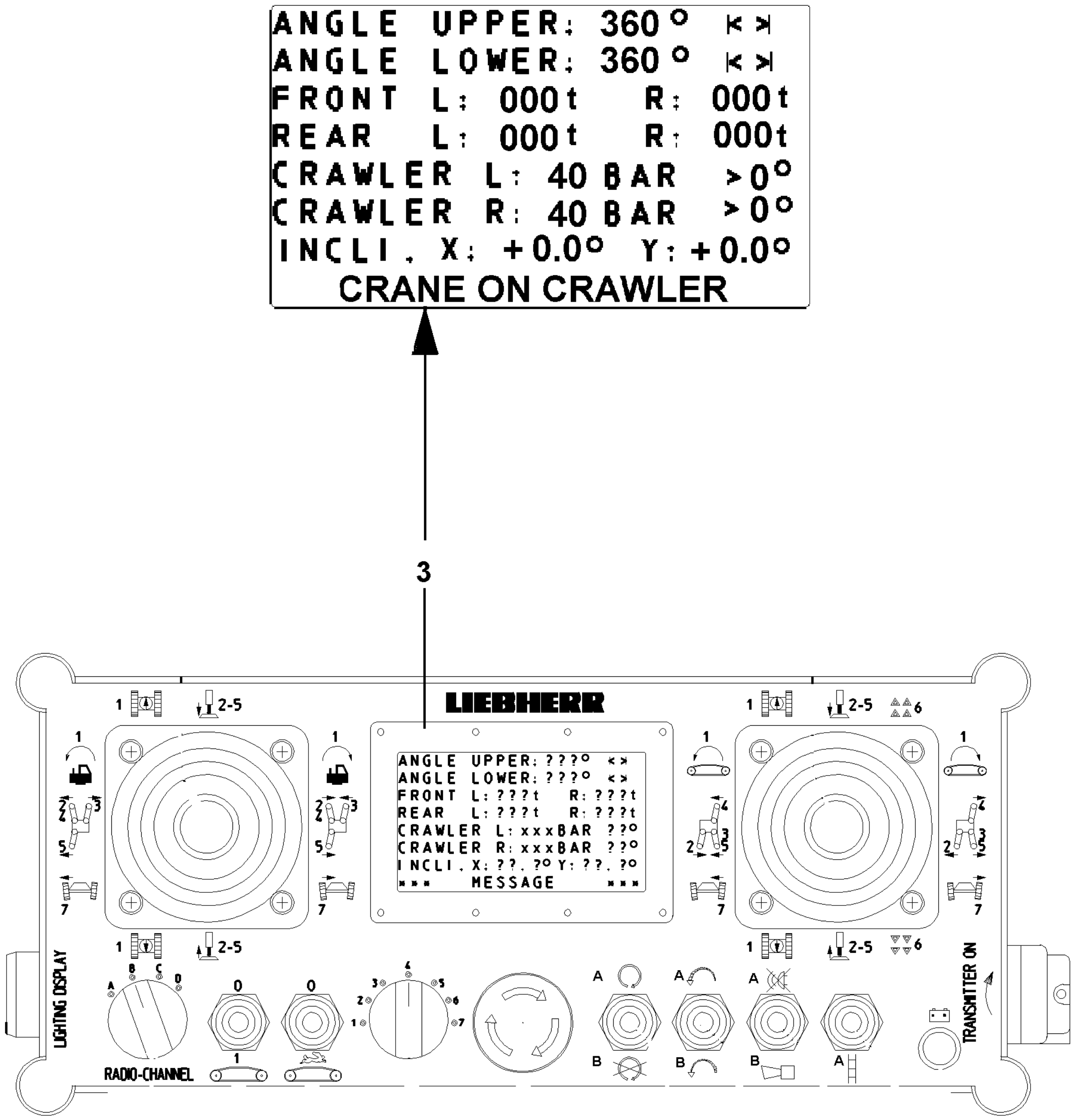


LIEBHERR
ANGLE UPPER: ???° <>
ANGLE LOWER: ???° <>
FRONT L: ???t R: ???t
REAR L: ???t R: ???t
CRAWLER L: xxxBAR ??°
CRAWLER R: xxxBAR ??°
INCLI. X: ??.?° Y: ??.?°
*** MESSAGE ***
LIGHTING DISPLAY
RADIO-CHANNEL
TRANSMITTER ON
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
MS 2
MS 1
LEFT - MASTER SWITCH 2
RIGHT - MASTER SWITCH 1
X- X+ Y- Y+
FL FRONT LEFT
FR FRONT RIGHT
L LEFT
R RIGHT
RL REAR LEFT
RR REAR RIGHT

195706

6.1 Remote control panel, indicators and control element

1	Master switch MS 1		
2	Master switch MS 2		
	Note:		Up to 80% max. deflection of the master switch = slow gear. If the master switch is deflected by more than 80% = rapid gear.
3	Display		
4	Switch	-	Radio - Channel "A/B/C/D"
5	Switch	-	Crawler operation ON/OFF
6	Switch	-	Rapid gear Crawler ON/OFF
7	Preselector switch		**see Fig.**
8	Button	-	**NOT "AUS"**
9	Button	-	Engine START/STOP A = START B = STOP
10	Button	-	Engine RPM regulation A = Increase B = Decrease
11	Button	-	Acoustical warning A = Buzzer remote control panel or bell slewing platform turn off B = Horn at engine start
12	Button	-	Ladder A = Ladder down - up
13	Indicator light	-	Blinks green, transmitter ON
		-	Blinks red, charge battery
14	Keyed switch	-	Remote control transmitter ON/OFF
15	Button	-	Display illumination ON/OFF


ANGLE UPPER: 360°
ANGLE LOWER: 360°
FRONT L: 000t R: 000t
REAR L: 000t R: 000t
CRAWLER L: 40 BAR >0°
CRAWLER R: 40 BAR >0°
INCLI. X: +0.0° Y: +0.0°
CRANE ON CRAWLER
3
LIEBHERR
ANGLE UPPER: ???°
ANGLE LOWER: ???°
FRONT L: ???t R: ???t
REAR L: ???t R: ???t
CRAWLER L: xxxBAR ??°
CRAWLER R: xxxBAR ??°
INCLI. X: ??.?° Y: ??.?°
*** MESSAGE ***
LIGHTING DISPLAY
RADIO-CHANNEL
TRANSMITTER ON

195915

6.2 Display (3), Indicators

Note: The display shown is **only an example.**
The number values in the individual symbols and charts do not always match the crane.

ANGLE UPPER: 360 ° |← →| Turn angle of slewing platform,
0°-360°. Turn right / left, clear / locked
Possible conditions:
1. ← → turn left/ right clear
2. ← →| turn left clear, right locked
3. ← →| turn left locked, right clear
4. |← →| turn left/right locked

ANGLE LOWER: 360 ° |← →| Turn angle of crawler travel gear,
0°-360°.Turn right / left, clear / locked
Possible conditions:
1. ← → turn left/ right clear
2. ← →| turn left clear, right locked
3. ← →| turn left locked, right clear
4. |← →| turn left/right locked

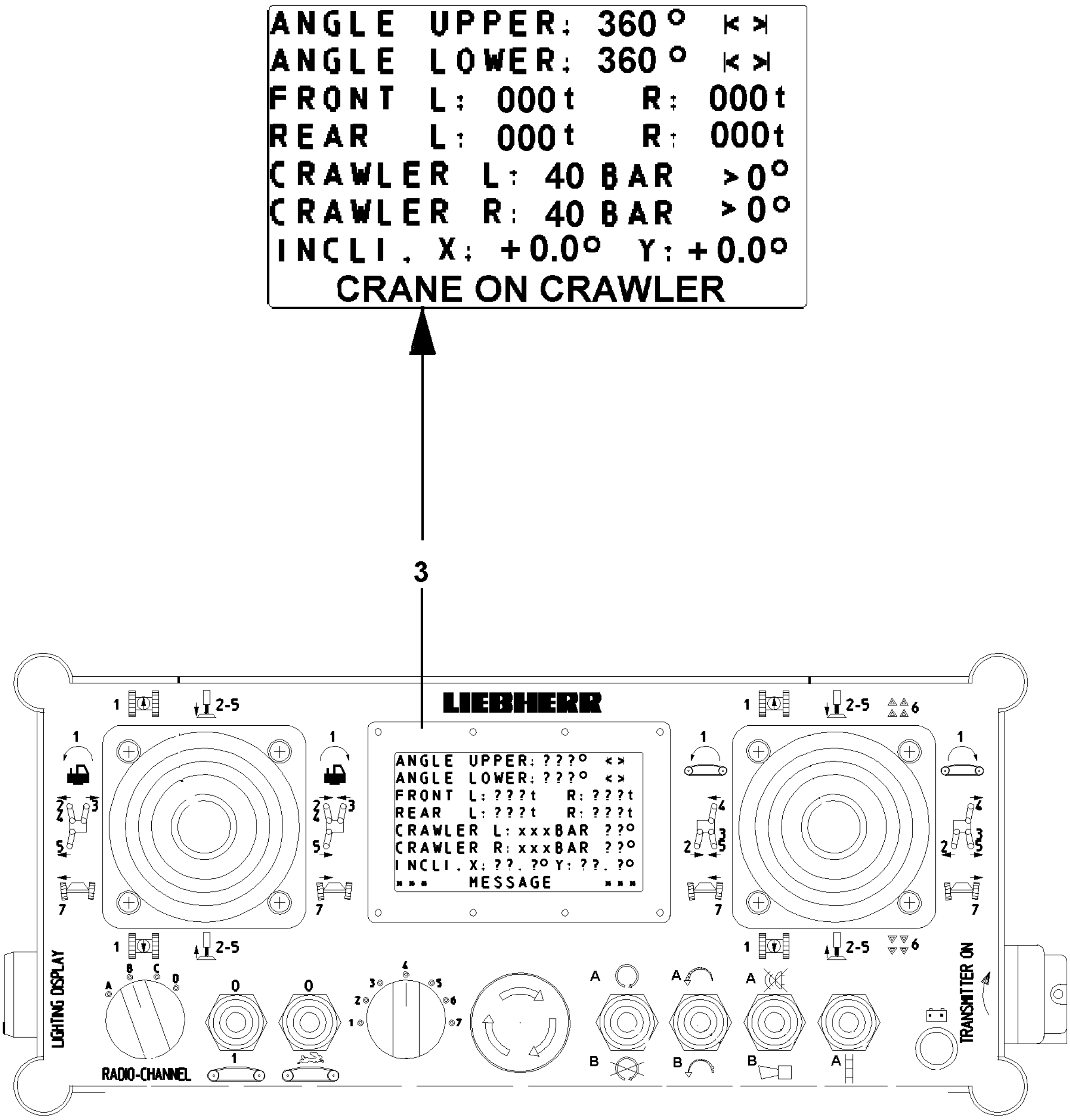
FRONT L: 0 t R: 0 t Support front left / right, support force indication in tons
REAR L: 0 t R: 0 t Support rear left / right, support force indication in tons

CRAWLER L: 40BAR >0 ° Crawler carrier left, pressure in bar. incline position crawler
>0°/<0°/>2°/><
Possible conditions:
1. < 0° Crawler incline 0° to - 1,5°
2. > 0° Crawler incline 0° to < 2°
3. > 2° Crawler incline 2° to 3,5°
4. >< Crawler incline< - 1,5° or >3,5°
or limit switch erroneous = Block position
If the indication "><" Crawler Block position appears, then the releases for turning the slewing platform or tracks are removed.

Note: As soon as one or several of the indicated values are invalid (shown by "???"), except the incline indication, then the release for turning the slewing platform and tracks are removed. Same for CRAWLER R.

CRAWLER R: 40BAR >0 ° Crawler carrier right, pressure in bar. incline position crawler
>0°/<0°/>2°/><
Possible conditions:
1. < 0° Crawler incline 0° to - 1,5°
2. > 0° Crawler incline 0° to < 2°
3. > 2° Crawler incline 2° to 3,5°
4. >< Crawler incline< - 1,5° or >3,5°
or limit switch erroneous = Block position
If the indication "><" Crawler Block position appears, then the releases for turning the slewing platform or tracks are removed.

INCLI. X: +0.0 ° Y: +0.0 ° Incline sensor, x-axle +6,3° to -6,3°
y-axle +6,3° to -6,3°
As soon as the indicator value of the x- and y- axle is outside the range of ±2°, an acoustical warning is given on the remote control panel. This warning can always be turned off with button "Turn remote control buzzer off" .

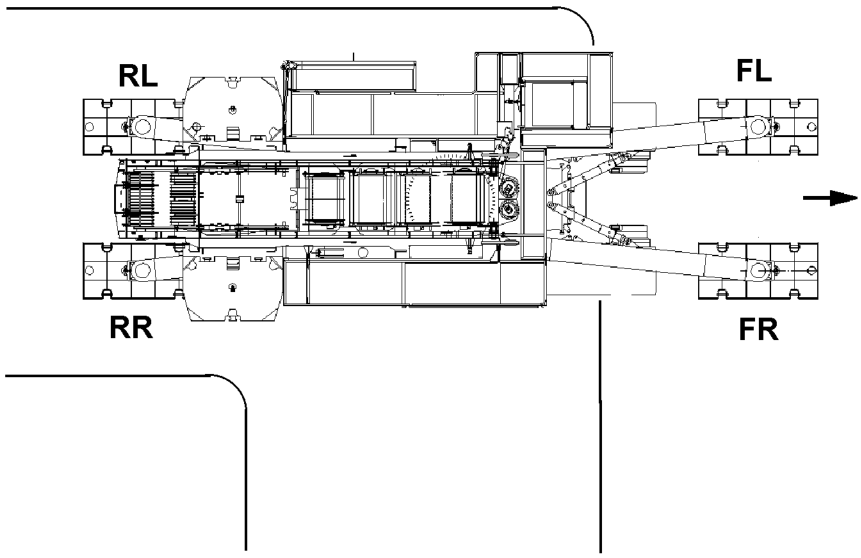

ANGLE UPPER: 360°
ANGLE LOWER: 360°
FRONT L: 000t R: 000t
REAR L: 000t R: 000t
CRAWLER L: 40 BAR >0°
CRAWLER R: 40 BAR >0°
INCLI. X: +0.0° Y: +0.0°
CRANE ON CRAWLER
3
LIEBHERR
ANGLE UPPER: ???°
ANGLE LOWER: ???°
FRONT L: ???t R: ???t
REAR L: ???t R: ???t
CRAWLER L: xxxBAR ??°
CRAWLER R: xxxBAR ??°
INCLI. X: ??.?° Y: ??.?°
*** MESSAGE ***
LIGHTING DISPLAY
RADIO-CHANNEL
TRANSMITTER ON

195915

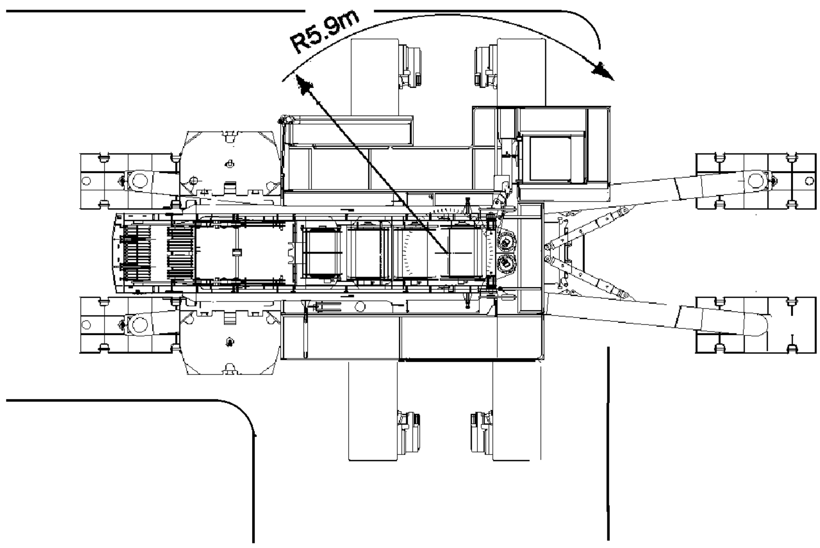
CRANE ON CRAWLER

Possible reports:

"CRANE ON CRAWLER"	=	Crane is only standing on tracks. All outrigger supports report ≤1t Support force and crawler pressure left / right both >5bar.
"CRANE ON OUTRIGGER"	=	Crane is only standing on outrigger supports. All outrigger supports report >8t Support force and crawler pressure left / right both ≤1bar.
"CRANE ON CRAWL. + OUTRI"	=	Crane is standing on tracks and outrigger supports. All outrigger supports report >8t Support force and track pressure left / right both >5bar.
"CRANE POS. NOT DEFINED"	=	Support condition of crane is not permitted. None of the above conditions is met.
"DANGER OUTRIGGER IN?"	=	Danger , retract outrigger supports ? This message appears when the crawler and slewing platform are not parallel (±5°) to each other, the crane is no longer on outrigger supports and the outrigger supports are being retracted. **D A N G E R: If the outrigger supports are too far retracted, then the crane will topple over!**
"LICCON ERROR MESSAGE"	=	An error is found in the control of the outrigger supports . If this message appears, then the error message can be read in the error determination view of the monitor in the switch box - outrigger supports.



1



2

195707

7. Change of travel direction

Initial position (Fig. 1)

- The crane is standing on crawlers and is not supported.

C A U T I O N : The pins on the struts for the support base must be inserted and secured!

- The main boom is set to the angle from **TAB 14700023**, **Driving with the boom**.

7.1 Turn the crawler travel gear into a new travel direction

7.1.1 Support

- Place the support pads on the ground, by manually extending the support cylinders .

Note: Extend the cylinders, preselector switch position 2 -5:
- individually /as a pair, right (3) or left (2)
- individually /as a pair, front (4) or rear (5)

By carefully actuating the master switch MS1 (1) or MS2 (2) in y-direction, the outrigger supports are extended or retracted.
Up to a master switch deflection of maximum 80%, the outrigger supports run in slow gear.
If the master switch is deflected by more than 80% , the outrigger supports run in rapid gear.

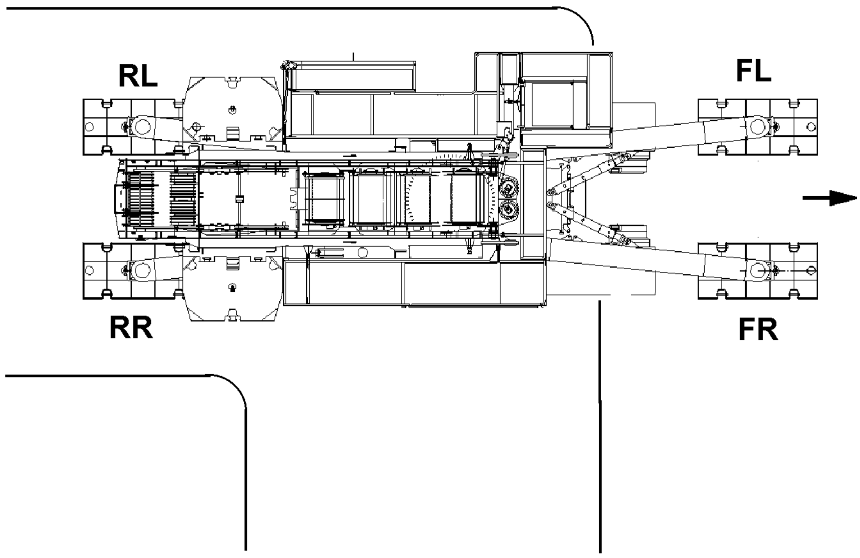
**D A N G E R: The rapid gear may only be used as long as the outrigger supports are not on the ground.
During the support procedure, the slewing platform must be parallel to the crawler travel gear - aligned in lengthwise direction !
The support cylinder extend / retract is not monitored.
There is no shut off of the function extend / retract.
The operator alone must decide if it is possible to extend / retract the outrigger supports safely.**

- When the support pads are placed on the ground, then the crane support can be switched over in preselector switch position 6 "Leveling" . Now the crane can be automatically supported and leveled by deflecting the master switch MS1 (1) in y-direction. To be able to ensure the proper function of the automatic support function, the master switch may only be deflected up to a maximum of 80% - slow gear.

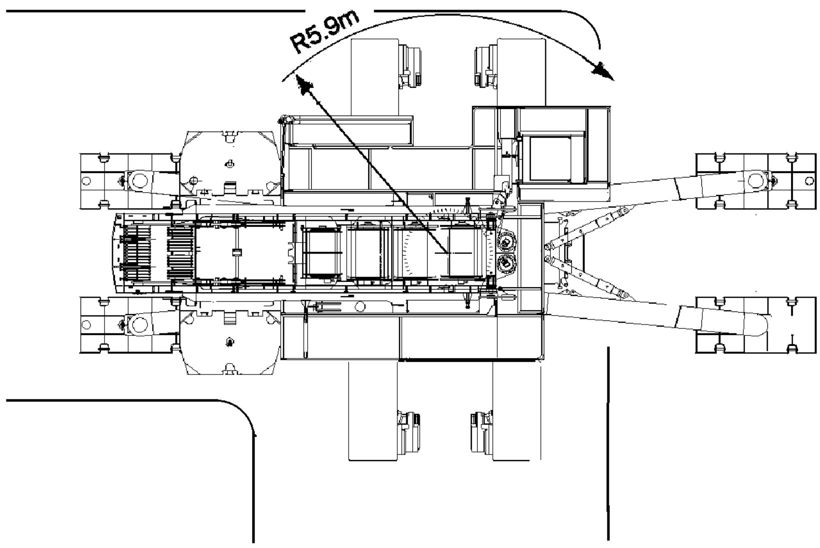
- Continue to extend the support cylinder until the crawlers are clear, i.e. no longer subjected to a load. All supports report >8t Support force and crawler pressure left / right are both ≤ 1bar, the message **"CRANE ON OUTRIGGER"** is shown in the display of the remote control panel.
  It must be ensured that the crawler is relieved and can turn freely.

D A N G E R: Make sure that there are no obstacles within the turning range of the crawler!

Release to turn the crawler travel gear.
The function to extend and retract the outrigger supports remains always.



1



2

195707

7.1.2 Turn the crawler

Preselector switch (7) set to position 1.

- Actuate the master switch (MS1) in x-direction and turn the crawler travel gear into the new travel direction.
  The new travel direction depends on the path, which is to be traveled.

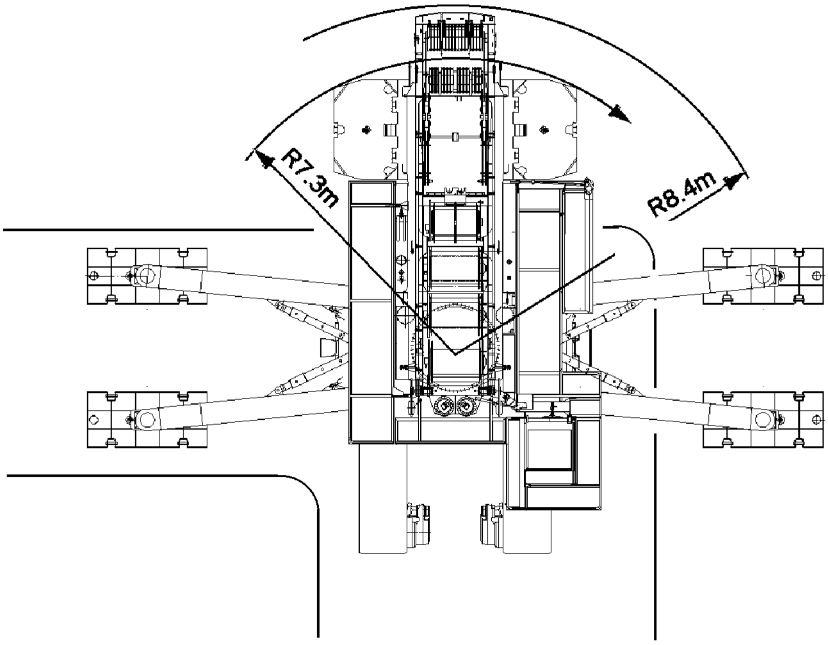
Note: The function to turn the slewing platform is shut off.

The crane can also be lowered onto the crawler travel gear, in addition to being placed on the outrigger supports, by retracting the support cylinders.

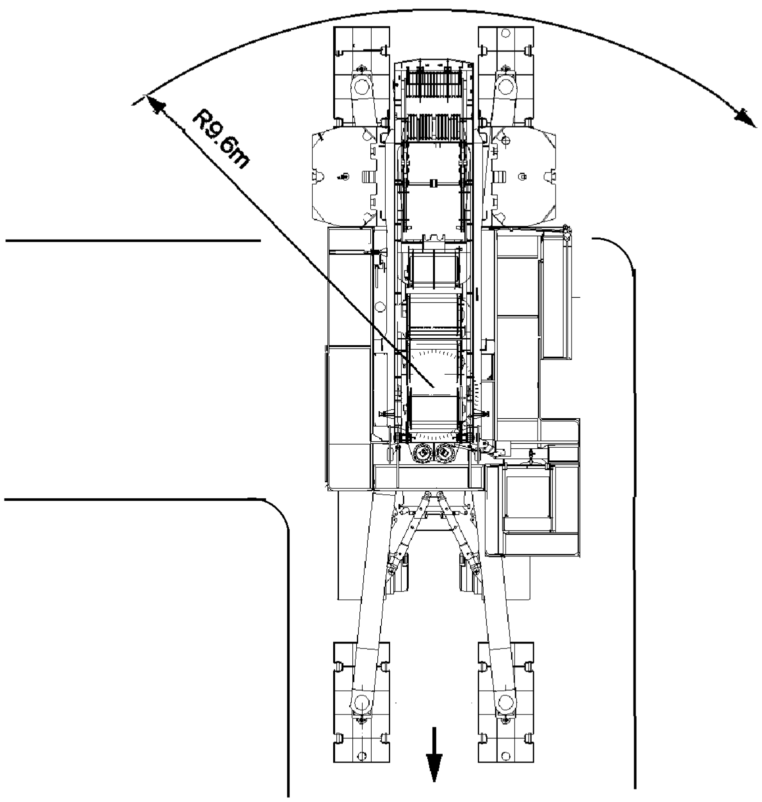
D A N G E R: The supports may only be retracted to the point where the crawler pressure left / right is at least 5bar but 8 t per support remain. The support force in the support cylinders may not be smaller than 8 t, and the crawler pressure must be at least 5 bar!
If the supports are retracted further, the crane can topple over!

In all intermediate positions where the support pressure and the crawler pressure are not within the permissible support conditions, the message **"CRANE POS. NOT DEFINED"** is shown.
Turning the slewing platform and the crawler to the right / left is shut off .
The function to extend and retract the outrigger supports remains .

D A N G E R: For that reason, it must be checked with utmost care if it is even possible to move the outrigger supports in this condition in or out without any danger .



3



4

195708

7.2 Turn the slewing platform

It must be ensured that a support force of at least 8 t per support cylinder and a crawler pressure of at least 5 bar is available. The message "CRANE ON CRAWLER + OUTR." appears in the display of the remote control.

D A N G E R: **There must be a support force of at least 8 t per support cylinder and a crawler pressure of at least 5 bar !**
Otherwise there is a danger of accidents as the crane may tip over!

Turn the slewing platform, Preselector switch (7) set to position 1.

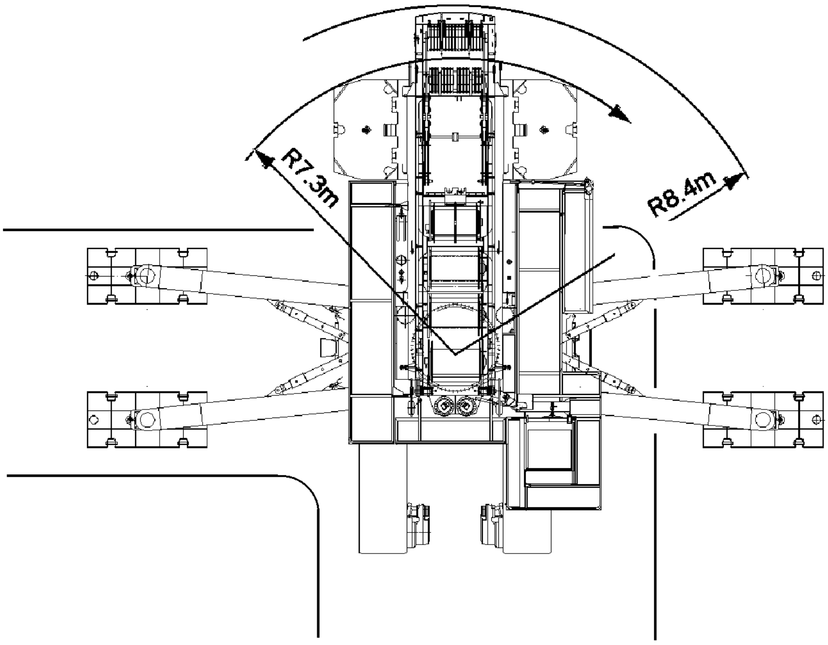
Note: Turning the crawler right / left is shut off in this condition.

The slewing platform can now be turned in the direction in which the slewing platform must pass the shortest way to be parallel to the crawler .

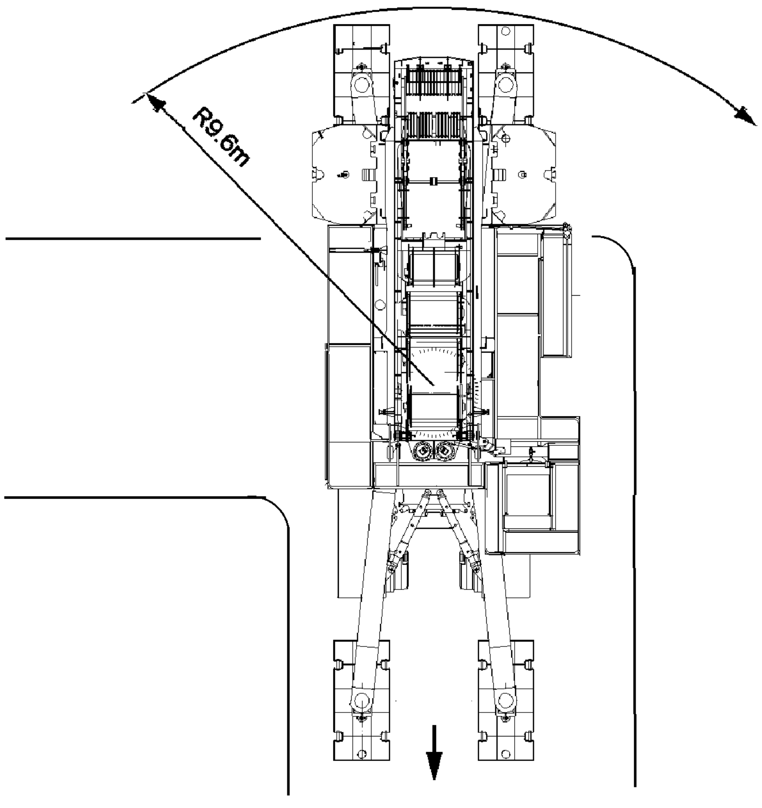
Move the master switch (MS2) in X-direction and turn the slewing platform in lengthwise direction (parallel) to the crawler travel gear.

Note: Due to the weight change when turning, it is possible that the message **"CRANE POS. NOT DEFINED"** appears and the release for turning the slewing platform is shut off.
In this case, reestablish the condition **"CRANE ON CRAWL + OUTR"** by actuating the support.

It must be ensured that the slewing platform is aligned parallel to the crawler travel gear before lowering it onto the crawler. Maximum deviation : ±5°



3



4

195708

7.3 Turn the crane support in travel direction

It must be ensured that the slewing platform is aligned parallel to the crawler travel gear.
Lower the crane with its complete weight onto the crawler travel gear by retracting the support cylinders. As soon as the crawler pressures on the left / right are $>$5bar and all support forces are $\leq$1t, the message **"CRANE ON CRAWLER"** appears.
Now the slewing platform and the crawler may be turned as long as the crawler and the slewing platform are parallel to each other by $\pm$5° .

C A U T I O N : **Since the release for turning is already issued from a support pressure of 1 t per support, it is necessary to check that the support pads do not hit an obstacle when the support cylinders are further retracted and the crane supports are turned. For that reason, it is only permitted to turn, despite previous release, if the support can freely turn without running into an obstacle.**

Turn the slewing platform and crawler , Preselector switch (7) set to position 1.

Move the master switch (MS1) in X- direction and turn the crane support until it is in lengthwise direction of the crawler travel gear.

Note: Shut off of the turning movement is given when the deviation of the slewing platform to the crawler travel gear exceeds $\pm$5° (window) .
For this condition not to occur, the slewing platform must be turned into the opposite direction when turning the crane support by moving the MS 2 in X-direction .

As soon as the crawler and the slewing platform are within $\pm$5° parallel to each other, the crane can continue to drive in the new direction.
Drive the crawler , preselector switch (7) set to position 1 and move the switch crawler operation ON/OFF (5) to position ON.
Move the master switch (MS1) and master switch (MS2) in Y-direction to drive the crane into the desired direction.

Note: In preselector switch position 1 , it is neither possible to turn the crawler /slewing platform nor to drive the crawler right / left.
The turning and driving functions cannot be carried out simultaneously.
The movement ,which was initiated first, has priority.

8. Driving with the boom SF2 - operation

TAB 14700023
System: S 2620.20
NI/F 1812.10

The chart is valid for equipment configuration on narrow crawler 7.80m×3.60m×1.20m
with installed supports 11.50m×11.50m
Equipment **S-73,5 / F-10,5 / 10°** intermediate angle
without hook block on S-boom, with 3.5 t hook block on F-boom

Length incline	**Cross incline**	**Boom incline to the horizontal** for slewing platform ballast	
(°)	(°)	155 t	135 t
+8	-2...+2	58° - 71°	61° - 73°
+5	-2...+2	59° - 72°	63° - 75°
0	-2...+2	62° - 75°	65° - 77°
- 5	-2...+2	65° - 78°	68° - 85°
- 8	-2...+2	67° - 79°	71° - 79°

Remarks:
- The boom incline always refers to the horizontal!
- It must be ensured, before lowering to the narrow track crawler and during the procedure, that the superstructure is aligned parallel to the crawler carriers.
  Maximum deviation: +/- 5°
- Positive length incline - uphill slope in direction of the boom
  negative length incline - downhill slope in direction of the boom

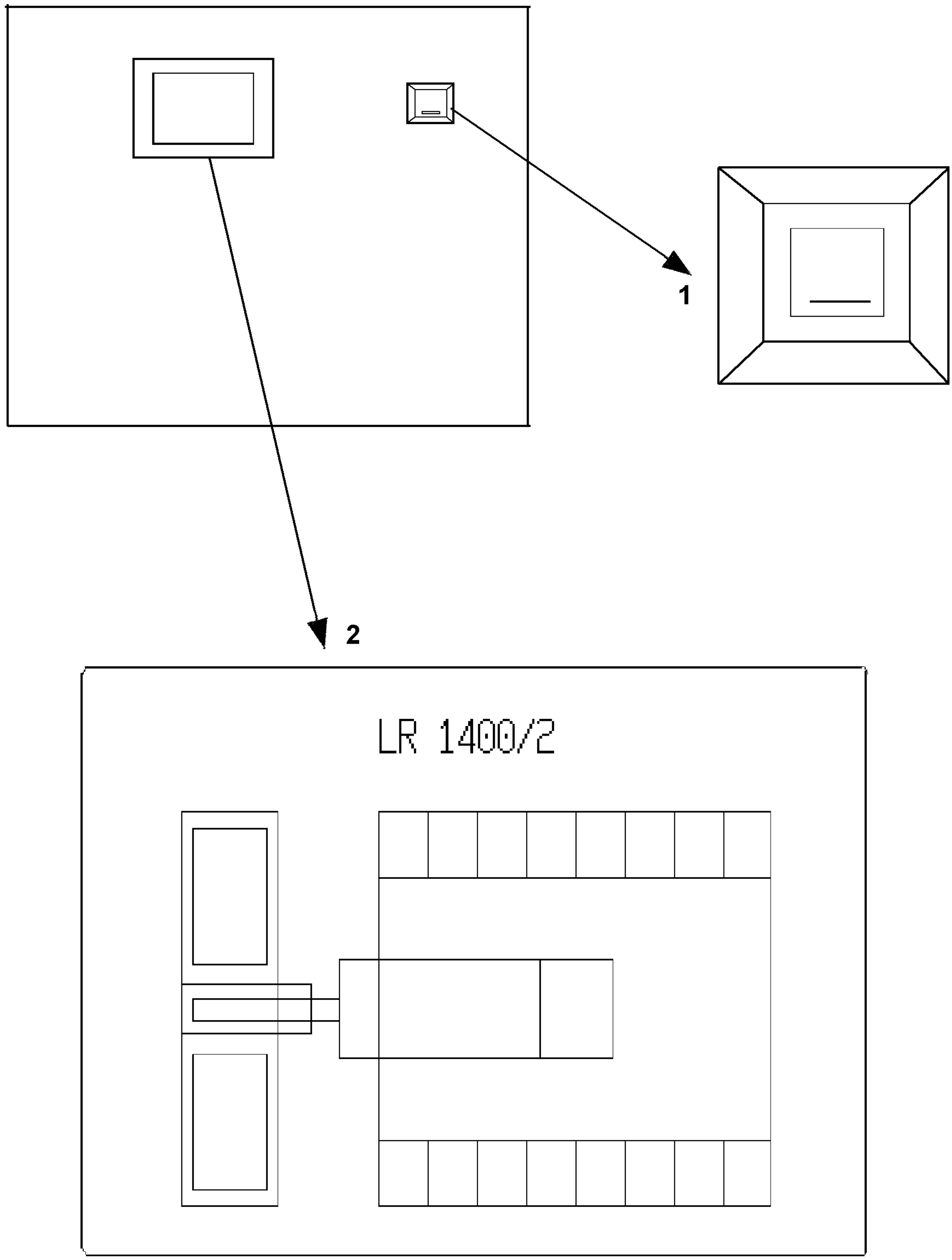
D A N G E R:
- **Maximum length incline: +/- 8°**
- **Maximum cross incline: +/- 2°**
- **Check the center of gravity position of the crane constantly with the LICCON job planer while driving, and correct it by adjusting the boom, as necessary.**

If this is not observed, there is an increased chance of having an A C C I D E N T !

- The given max./min. boom angles correspond to a distribution of the support forces of approx. 60% : 40% or 40% : 60% of the total weight distributed on two outrigger supports each.
- Keep the supports during the driving procedure to a support base of 11,50m x 11,50m, if possible, while keeping the support pads directly above the ground level.

D A N G E R : **The crane may only be driven according to the data in the chart!**
- **The ground must be able to absorb the ground pressures, which occur.**
- **The friction coefficient between the travel route and the ground must be large enough to absorb any drive forces, which occur. Slippery ground can cause the crane to slip sideways and cause the crane to incline sideways, which is not permitted. There is a danger of accidents!!**
- **The slewing platform must be aligned parallel to the crawler carriers and secured to be prevent it from turning.**
- **Slow travel speed, all acceleration and delay procedures must be carried out very carefully.**
- **Any ground pressures, which occur, must be determined with the job planer before the driving procedure.**
- **The transfer from the horizontal into an uphill incline and from an uphill incline into the horizontal must be very even, i.e. there may be no edges which could cause the crane to tip over! This is not permitted! The incline change must be gradually and continuously.**

If this is not observed, there is an increased chance of having an A C C I D E N T !



195916

9. The "Test system" program

The switch box for the outrigger supports is equipped with a test system . The test system is a service and diagnostics tool, which makes it possible, without having to use additional test units, to quickly and simply located and remedy possible problems in the outrigger support system.

Note: Some safety relevant functions of the test system can only be utilized by competent expert personnel, i.e. they are protected from access by **unauthorized** users.

LICCON in Standard operation

Note: The programs and program run of the LICCON computer system are not affected, i.e. the support control is still fully functioning and the control can be checked with the extensive aids of the test system.
For the support control with LICCON, the LICCON monitor is used just for the functions of the test system.

9.1 Starting the Test system

In case of function problems, such as the message "LICCON ERROR MESSAGE" in the display of the remote control panel, the monitor (2) in the switch box for the outrigger supports can be turned on for diagnostic purposes.

- Turn the crane engine off;
- Open the switch box
- actuate the switch (1);

Note: The switch (1) may only be actuated if the crane engine is "OFF" .

- Turn the crane engine on and wait until the monitor shows the view **"LR1400/2"** ;
- Call up the test system with the "i"-key.
  ⇒ MULTI-ZE-TESTYSTEM - VERSION XX.XX

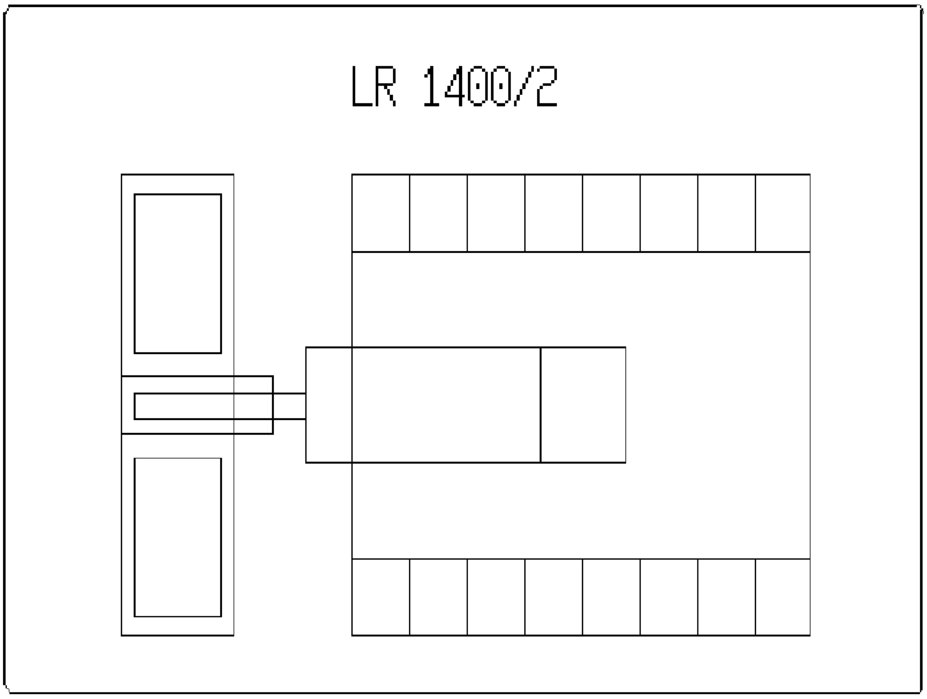
9.1.1 The message "LICCON ERROR MESSAGE",

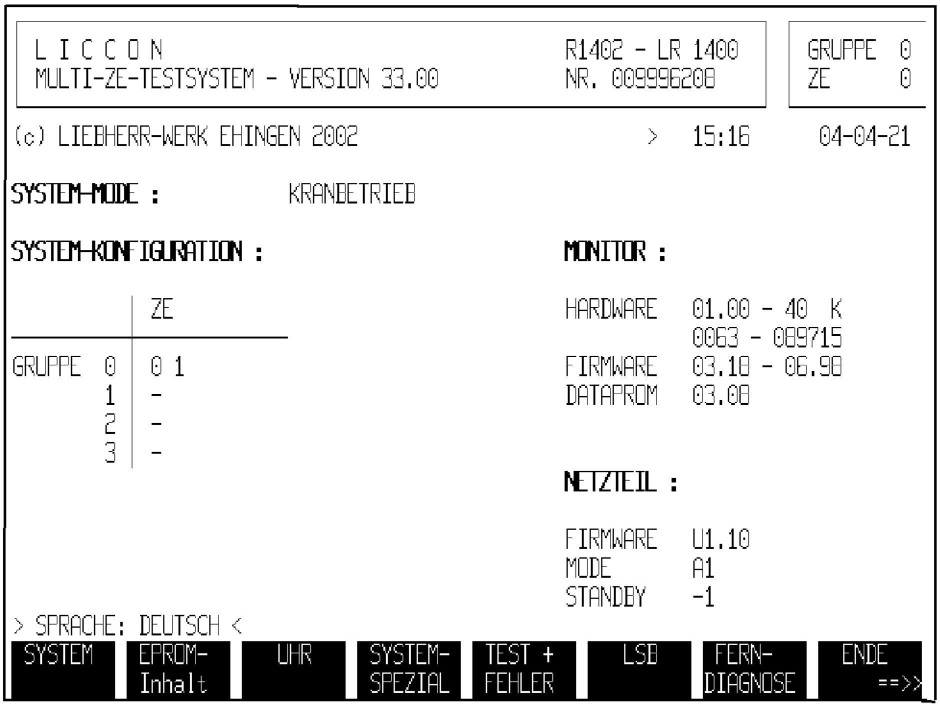
appears as soon as the LICCON system finds an error in the control of the support system and narrow track crawler , for example :

- erroneous or missing sensors and limit switch

- Error on output and inputs of CPU and I/O modules

- Error in safety circuit


LR 1400/2


L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 33.00
R1402 - LR 1400
NR. 009996208
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 2002
> 15:16 04-04-21
SYSTEM-MODE : KRANBETRIEB
SYSTEM-KONFIGURATION :
ZE
GRUPPE 0 | 0 1
1 | -
2 | -
3 | -
MONITOR :
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.08
NETZTEIL :
FIRMWARE U1.10
MODE A1
STANDBY -1
> SPRACHE: DEUTSCH <
SYSTEM
EPROM- Inhalt
UHR
SYSTEM- SPEZIAL
TEST + FEHLER
LSB
FERN- DIAGNOSE
ENDE ==>>

195917

9.2 Main menu

After the start of the LICCON Test system appears the main menu, after the program has started, where the basic data of the system is stored. All sub functions can be called up via the function keys "F1" to "F8" .

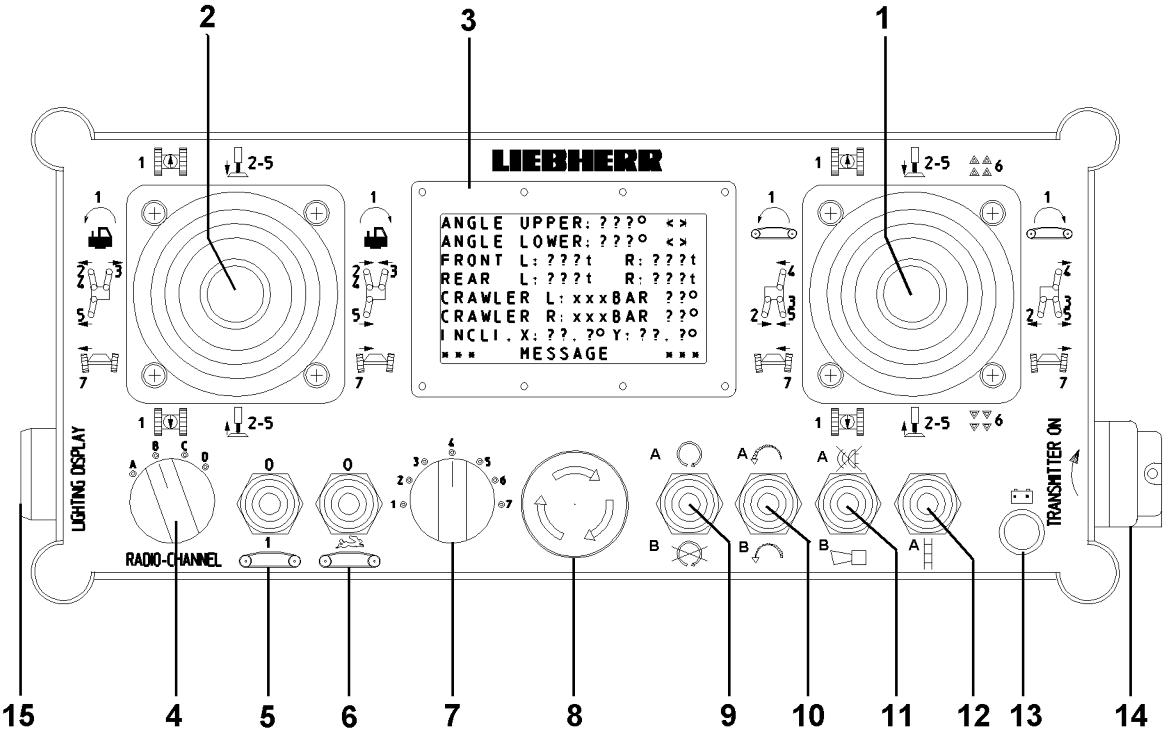
9.2.1 Selection of CPU or group

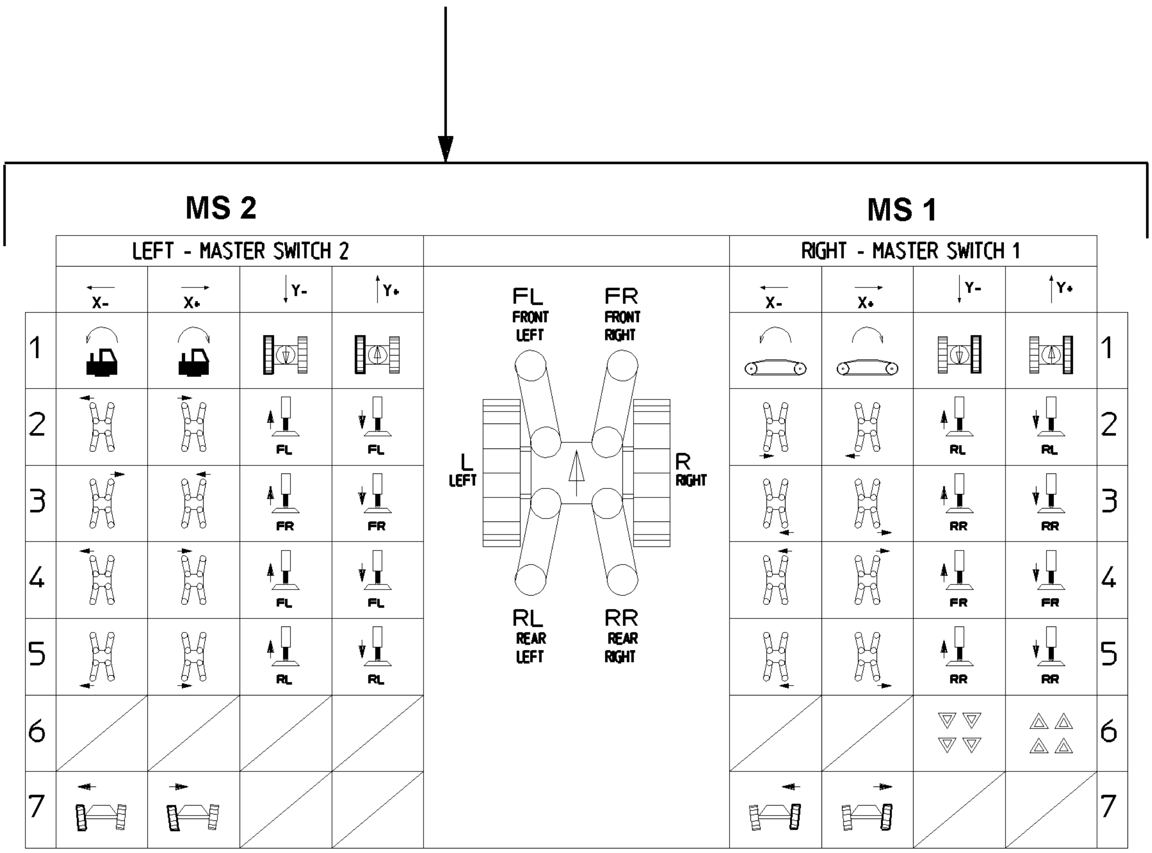
In the upper right selection window, the curser blinks to request the selection of the desired CPU.
- With the "ENTER" key, the curser changes from "CPU" to "Group" or back.
- Enter the desired group or CPU from the installed units with the number keys on the alpha-numeric keypad.

Note: The Test system can only access installed units (group, CPU) .

9.2.2 Function key bar- Main menu

"F1"	**SYSTEM**	Access to input and outputs, AWL-Operands, system internal "Specialties".
"F2"	**EPROM-Inhalt**	Software of LICCON CPUs.
"F3"	**UHR**	Access protected function used to set or stop or start the battery buffered real time clock.
"F4"	**SYSTEM-SPEZIAL**	To check complete function units of ballast trailer.
"F5"	**TEST**	
"F6"	**EXTERN**	Start the remote diagnostics
"F7"	**EXTERN**	
"F8"	**ENDE intern**	Program end


1
2
3
LIEBHERR
ANGLE UPPER: ???° <>
ANGLE LOWER: ???° <>
FRONT L: ???t R: ???t
REAR L: ???t R: ???t
CRAWLER L: xxxBAR ??°
CRAWLER R: xxxBAR ??°
INCLI. X: ??.?° Y: ??.?°
*** MESSAGE ***
LIGHTING DISPLAY
RADIO-CHANNEL
TRANSMITTER ON
15 4 5 6 7 8 9 10 11 12 13 14


MS 2
MS 1
LEFT - MASTER SWITCH 2
RIGHT - MASTER SWITCH 1
X- X+ Y- Y+
FL FRONT LEFT
FR FRONT RIGHT
L LEFT
R RIGHT
RL REAR LEFT
RR REAR RIGHT
1 2 3 4 5 6 7

195706

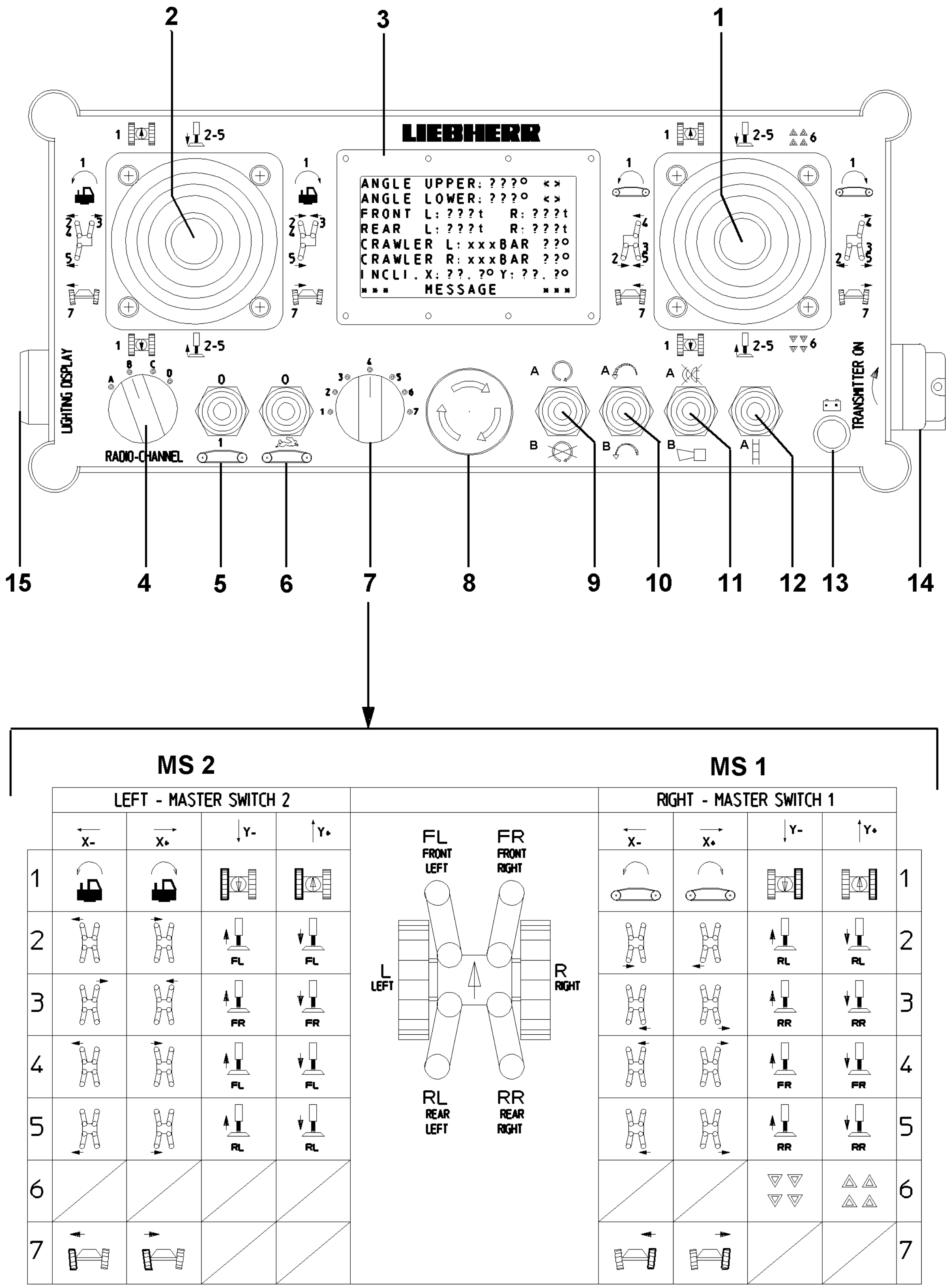
10. Crane operation on supports

10.1 Swing out the support arms

Release and unpin the transport retaining pins.
Swing out the support arms to the desired support base and insert and secure the struts with the transport retaining pins.
Carefully deflect the master switch MS1 (1) or MS2 (2) in x-direction to swing out the support arms.
Up to 80% max. deflection of the master switch, the support arms move in slow gear.
If the master switch is deflected by more than 80%, they move in rapid gear.

Note: Swing out the support arms, preselector switch in position 2 -5:
- individually / in pairs, right (position 3) or left (position 2)
- individually / in pairs , front (position 4) or rear (position 5)

D A N G E R: When swinging out, the slewing platform must be aligned parallel to the crawler travel gear - in lengthwise direction!
The swinging in / out of the support arms is not monitored.
There is no shut off for the swinging out / in function.
The operator alone must decide if it is possible to swing the support arms in or out.
The swung out folding arms must be secured on the struts with the transport retainer pins and with the spring retainers, otherwise there is a danger of accidents!


2
3
1
LIEBHERR
ANGLE UPPER:???° <>
ANGLE LOWER:???° <>
FRONT L:???t R:???t
REAR L:???t R:???t
CRAWLER L:xxxBAR ??°
CRAWLER R:xxxBAR ??°
INCLI.X:??.?° Y:??.?°
*** MESSAGE ***
LIGHTING DISPLAY
RADIO-CHANNEL
TRANSMITTER ON
15 4 5 6 7 8 9 10 11 12 13 14
MS 2
MS 1
LEFT - MASTER SWITCH 2
RIGHT - MASTER SWITCH 1
X- X+ Y- Y+
FL FRONT LEFT
FR FRONT RIGHT
L LEFT
R RIGHT
RL REAR LEFT
RR REAR RIGHT
1 2 3 4 5 6 7

195706

10.2 Support

When the support arms are all swung out, pinned and secured, the crane can be supported.
Support the support pads from below with sufficiently sized materials, such as wood, steel or concrete plates, according to the ground conditions.

Note: Observe the safety notes and the permissible ground pressures (chapter 2.04) .

**D A N G E R : Only suitable materials may be used for the support under the pads. The support must be placed under the center of the support pads.
If this is not observed, there is a danger of accidents!**

Place the support pads on the ground, by manually extending the support cylinders.

Note: Extend the support cylinders, preselector switch position 2 -5:
- individually / in pairs, right (position 3) or left (position 2)
- individually / in pairs , front (position 4) or rear (position 5)

Carefully deflect the master switch MS1 (1) or MS2 (2) in y-direction to extend or retract the support cylinders.
Up to 80% max. deflection of the master switch, the support cylinders move in slow gear.
If the master switch is deflected by more than 80%, they move in rapid gear.

**D A N G E R: The rapid gear may only be used as long as the support cylinders are not on the ground.
The extension and retraction of the support cylinders is not monitored.
There is no shut off of the extension and retraction function .
The operator alone must decide if it is possible to extend and retract the support cylinders safely.**

10.3 Automatic support and horizontal alignment (leveling)

- When all support pads are placed on the ground, the crane support can be switched via the preselector switch position 6 to "leveling"
- by deflecting the master switch MS1 (1) in y-direction, all support cylinders are extended and the crane is automatically horizontally aligned.

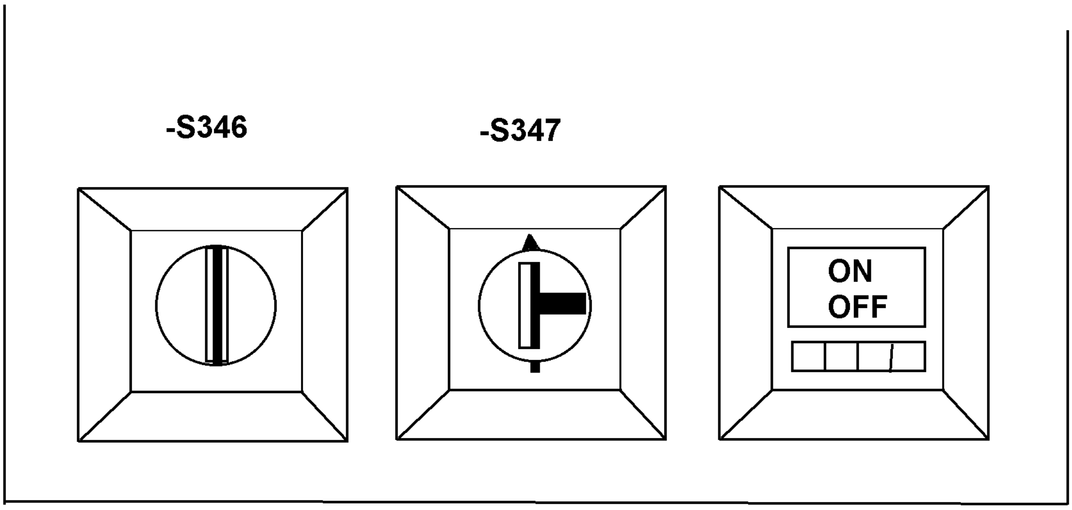
D A N G E R : The crane is automatically horizontally aligned by actuating the automatic support. However, the operator must still check if the alignment is within the permissible tolerance and if all four support pads are in contact with the ground. If this is not the case, there is a danger of accidents.

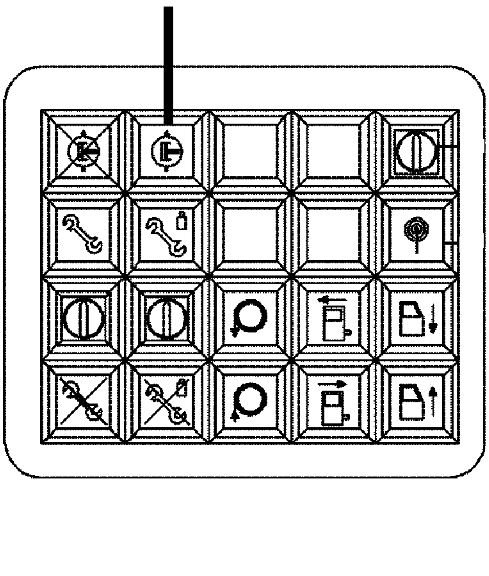
Continue to extend the support cylinders until the crawlers are clear, i.e. no longer subjected to a load.

Note: All supports report > 8t support force and crawler pressure left / right are both ≤ 1bar, the message **"CRANE ON OUTRIGGER"** is shown in the display of the remote control panel.

**D A N G E R : The crane operator is obligated to set the corresponding load chart in the LICCON overload safety system, which corresponds to the current support base.
The support cylinders must be properly supported from below .**

C A U T I O N: When lifting a load with the crane supported, the crawlers may not be subjected to the load. The crane operator must constantly monitor the crawler tracks, to ensure they do not come in contact with the ground, because the narrow track crawler travel gear is not designed to lift a load!





195933

11. EMERGENCY OPERATION

11.1 Keyed switch -S346 - Emergency operation:

Prerequisites for emergency operation
- the crane engine is running
- the radio remote control is functioning
- the hydraulic system is functioning
- the keyed switch -S346 (switch box crane support) is turned on.

Emergency operation - General
The emergency operation is turned on via the keyed switch -S346 (switch box crane support) .
In emergency operation, the LICCON outputs (slewing gear bottom, incline crawler carriers) are switched off by the control valves via the CPU ok relay contacts .
The control valves for the lower slewing gear (turn left / right) are controlled via a fixed resistance, in connection with the corresponding directional contacts of the master switch (manual control lever) .
The control valves for the lower slewing brake and the incline cylinders for the crawler control are only controlled with the corresponding directional contacts of the master switch (manual control lever) .
The control of the valves is made in "black - white operation".

Slewing gear

**D A N G E R: Before initiating the "slewing"crane movement, the operator must ensure that there are no persons or obstacles within the slewing range.
If this is not observed, there is a danger of accidents.**

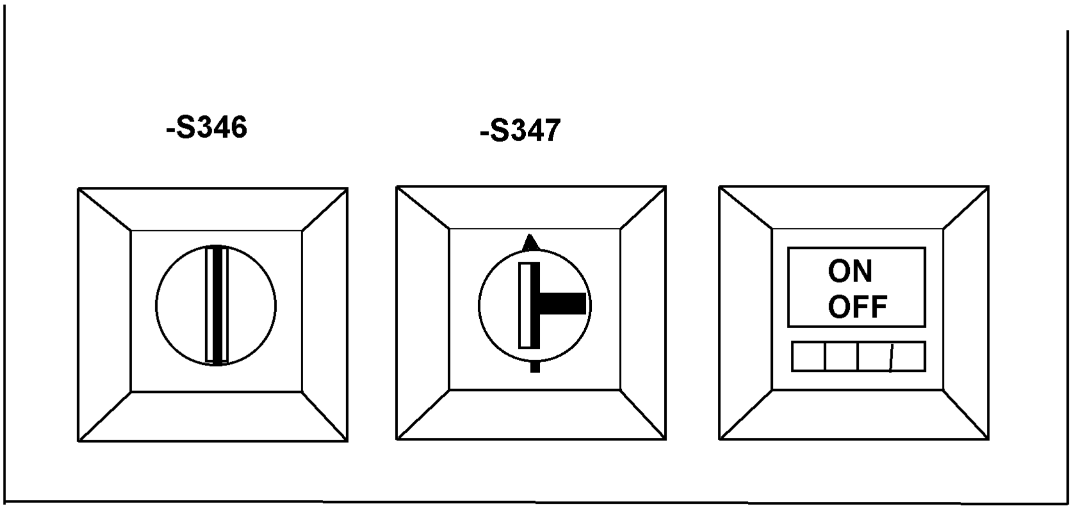
Deflect the manual control lever (MS1 - radio remote control) to the left (X-) = to turn to the left
Deflect the manual control lever (MS1 - radio remote control) to the right (X+) = to turn to the right
Deflect the manual control lever (MS1 - radio remote control) into zero position = the brake is applied, the slewing gear slows down softly (due to hydraulic accumulator)

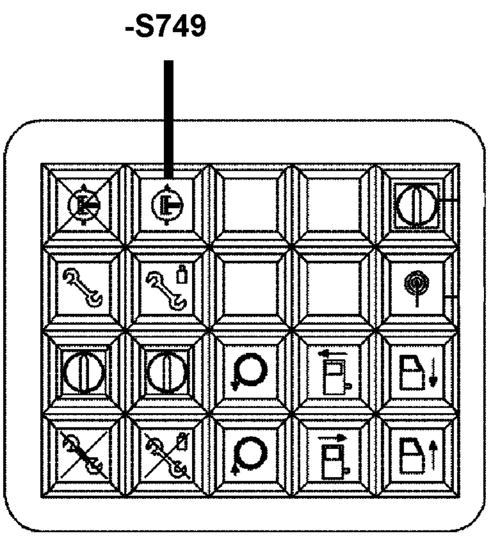
Note: The slewing gear turns at reduced speed.

Incline crawler carrier

**D A N G E R: Before initiating the "incline crawler carrier"crane movement, the operator must ensure that there are no persons or obstacles within the incline range.
If this is not observed, there is a danger of accidents.**

Deflect the manual control lever (MS1 - radio remote control) to the left (X-) = the crawler carriers incline to the right inside
Deflect the manual control lever (MS1 - radio remote control) to the right (X+) = the crawler carriers incline to the right outside
Deflect the manual control lever (MS2 - radio remote control) to the left (X-) = the crawler carriers incline to the left outside
Deflect the manual control lever (MS2 - radio remote control) to the right (X+) = the crawler carriers incline to the left inside





195933

10.2 Switch -S347 - Emergency operation pressure supply:

Emergency operation - General
In case of failure or defect of one or both CPUs, the valves for the crane support for the crawler adjustment and for the lower slewing gear can no longer be actuated.

By actuating the switch -S347 and -S749, the CPUs can be bypassed.
The manual pressure supply (-Y201) is turned on with switch -S347.
In addition, the switch -S749 (manual pressure supply) must be turned on in the crane operator's cab to actuate the pressure supply valves -Y15, -Y17 and -Y18 in the slewing platform.
Now the required valves for the crane function can be manually actuated.

The following crane movements can be carried out:

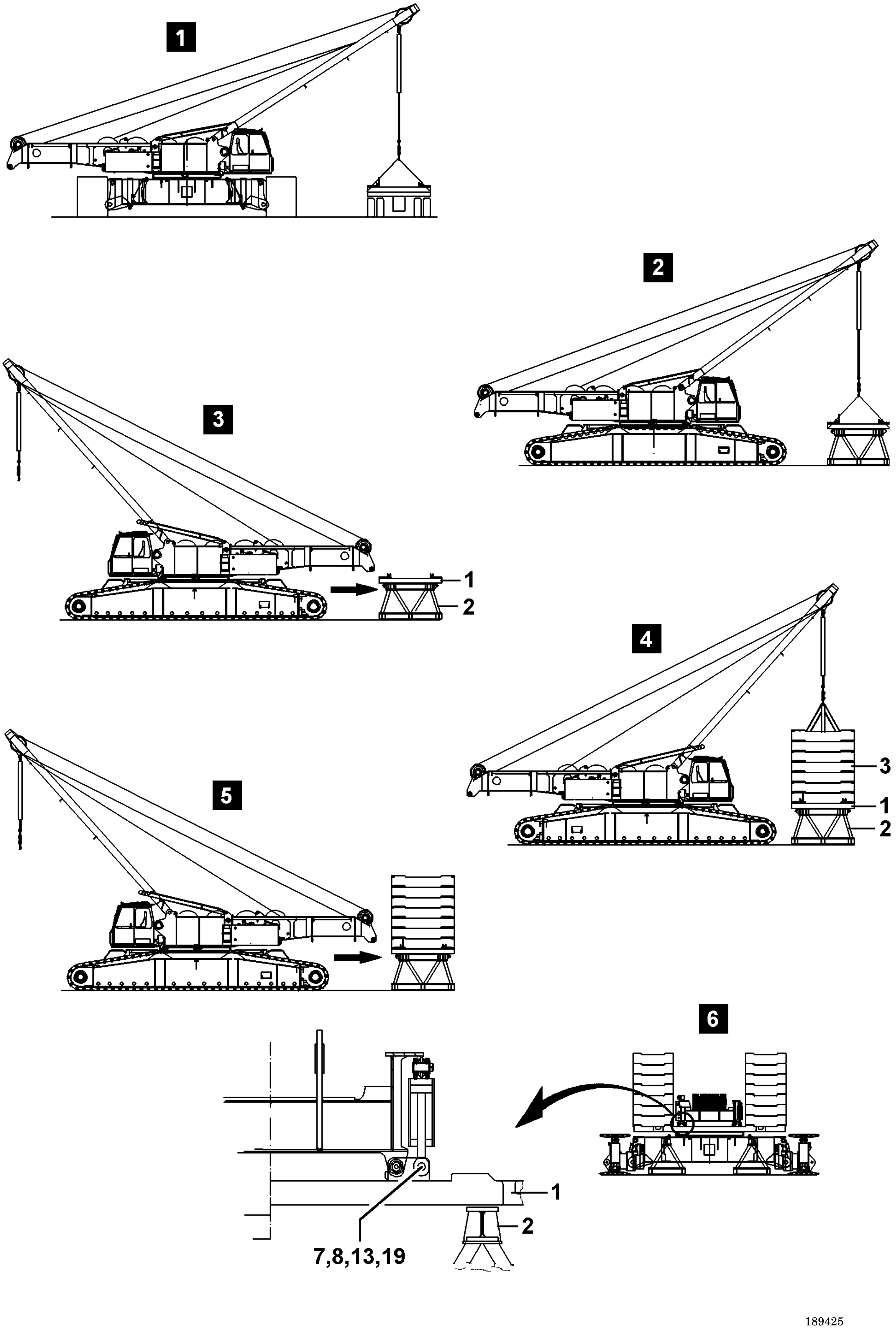
Support	Fold out / fold in
Support	Up / down
Crawler carrier	Incline
Slewing gear support	Turn left / right, brake

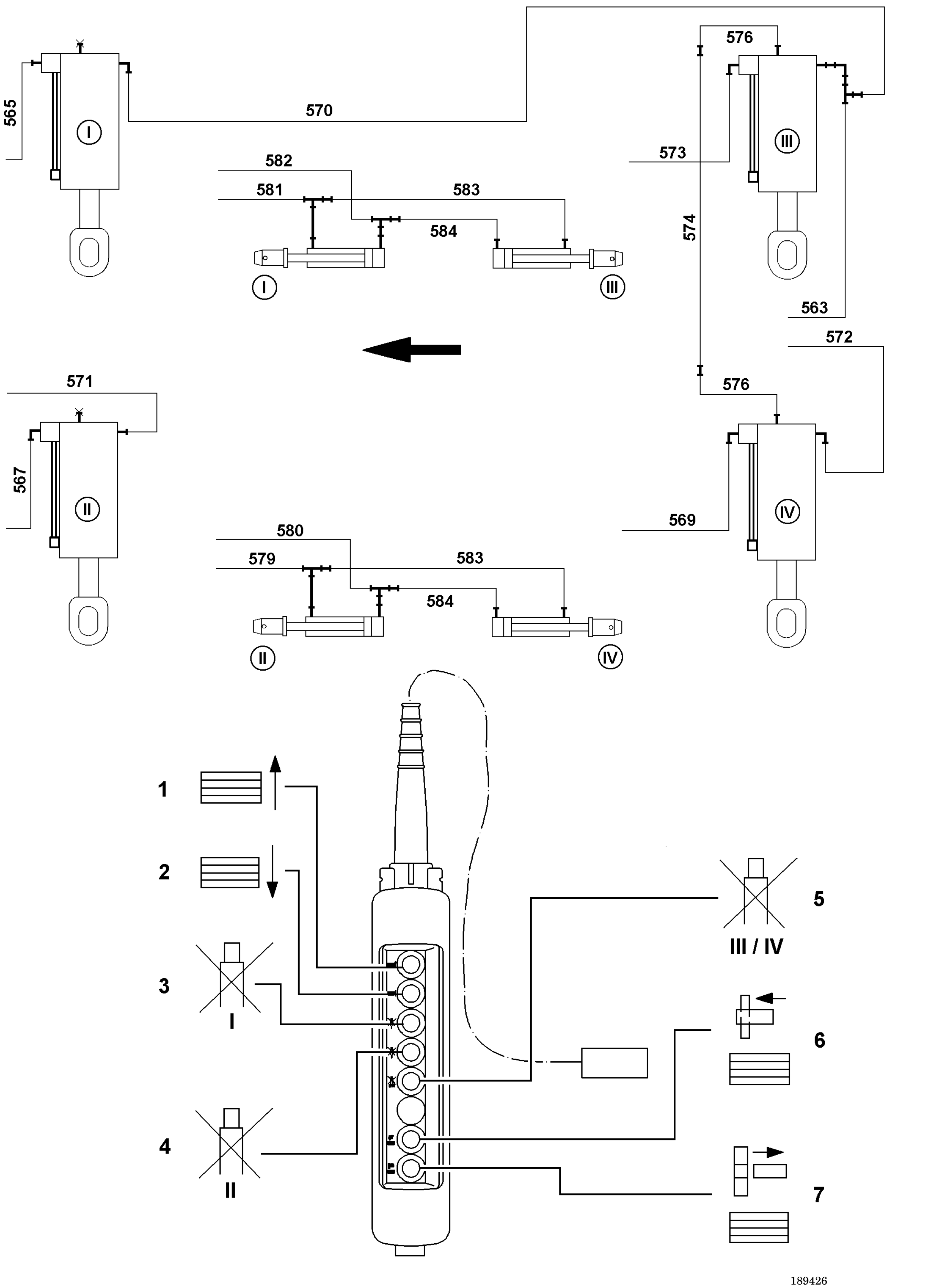
D A N G E R: The following points must be observed in emergency operation :
The emergency operation may only be carried out by authorized personnel.
There may be no persons within the danger zone of the crane.
Each individual crane movement may only be carried out with utmost care and caution.
The keyed button -S346 and the switch -S347 may only be actuated if the electronic failed.

Note: In crane operation (no emergency operation) , the keyed switch -S346 and the switch -S347 must be turned off.

D A N G E R: Under no circumstances may the operator use the emergency operation to bypass safety shut offs of the LICCON if the crane is functioning.
There is a danger of accidents!

If a movement cannot be slowed down or shut off by taking back the manual control lever or by releasing the corresponding button, then the crane must be shut down immediately with the EMERGENCY OFF button.


1
2
3
1
2
4
3
1
2
5
6
1
2
7,8,13,19
189425


565
570
582
581
583
584
576
573
574
563
572
571
567
576
569
580
579
583
584
I
II
III
IV
I
III
II
IV
1
2
3
I
4
II
5
III / IV
6
7
189426

Installation

Prerequisite:

- The central ballast is installed.
- The control panel for ballasting is plugged in.

Fig. 1 + 2: Take on the base plate (1) with the A-bracket from the other vehicle and place it on the two bases (2).

Fig. 3: Turn the superstructure by 180° , and center with the base plate (1) which has been placed on the two bases (2) by driving the crane backwards .

Fig. 4: Place the required number of counterweight plates (3) - see load chart - on the base plate.

C A U T I O N : **Make sure that the ballast plates are placed evenly, which means the plates (3) must always be placed alternately - 1x left, 1x right - on the base plate (1) .**

There is a danger of accidents!

Turn the superstructure.

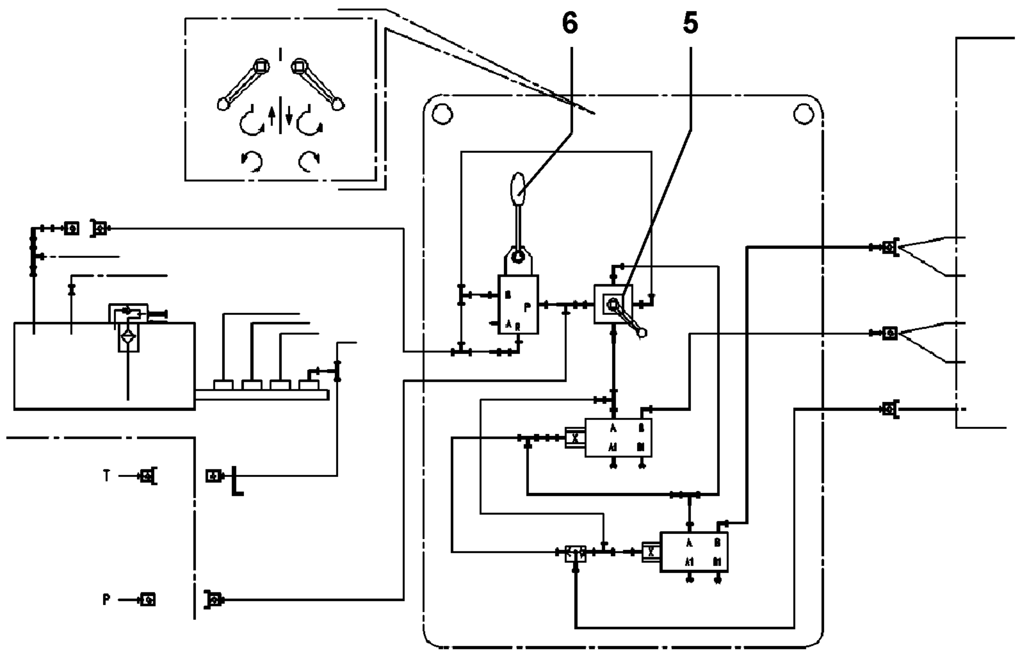
Fig. 5 + 6: Drive the crane back, extend the cylinder (13) , take on the ballast and pin and secure with pins (7), spring retainer (8) and washer (19) on cylinder (13) .

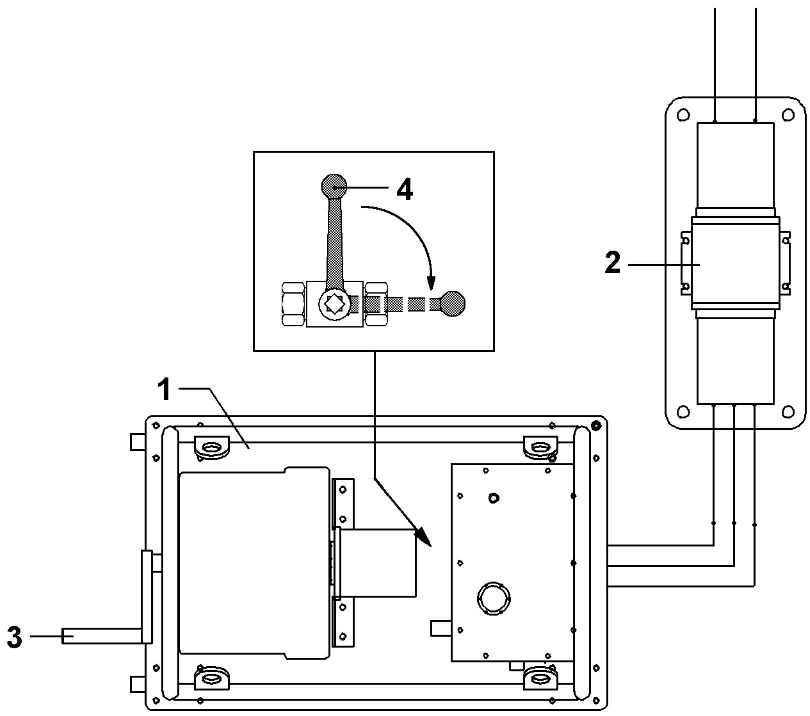
Lift the ballast by retracting the cylinder (13) and lock with the pin pulling device.

Place down the ballast in reverse order.

Symbols on control panel

1	Ballast up	
2	Ballast down	
3	Cylinder I	right front
4	Cylinder II	left front
5	Cylinder III / IV	left and right rear
6	Lock ballast	
7	Unlock ballast	





194711

1. Emergency control - crane superstructure

1.1 General danger notes

1. The emergency control on the crane may only be carried out:
   - To take care of a dangerous situation.
   - After consultation with LIEBHERR Service.
   - By authorized personnel only, who are aware of the dangers of emergency control.
   - To carry out load reducing movements.
2. The danger zone must be roped off.
3. No persons or objects may be within the danger zone.
4. If there is a load on the hook, it must be set down first to relieve the boom.
5. In emergency control, all safety devices (except winch spooled out) are bypassed automatically.
6. In case of a problem or failure of the LICCON computer system, every step must be carried out and checked with utmost care and caution, since an optical control on the LICCON monitor is no longer possible. Check visually!
7. All crane movements must be carried out with utmost care.
   - The crane operator must be in visual contact with guides / auxiliary personnel.

D A N G E R : **If these points are not observed, there is an increased danger of accidents!**

C A U T I O N : **To carry out emergency controls, the engine must be running and the hydraulic system must be functioning! .**
The supply can also be handled by an emergency control component *, if the crane is equipped for it.
If this is not the case, the crane equipment must be taken down with the aid of additional auxiliary cranes. The boom may then only be luffed down if the crane stability allows it.

1.2 Prepare the crane for emergency control

- Engine off
- Remove the dummy plugs on the hydraulic connections.
- Establish the hydraulic connections from the emergency control component (1) to the transformer (2).
- Establish the hydraulic connections (suction line) from the transformer (2) to the crane.
- Establish the hydraulic connection (pressure line) from the transformer (2) to the winch or slewing gear.

Note: Due to the different diameters of the hydraulic lines, the lines cannot be connected incorrectly.

The type of movement (up or down - turn left or right) can be preselected with ball cock (5) on the installation plate.
The valve (6), also on the installation plate, is used to regulate the speed of the set movement.

1.3 Emergency control component

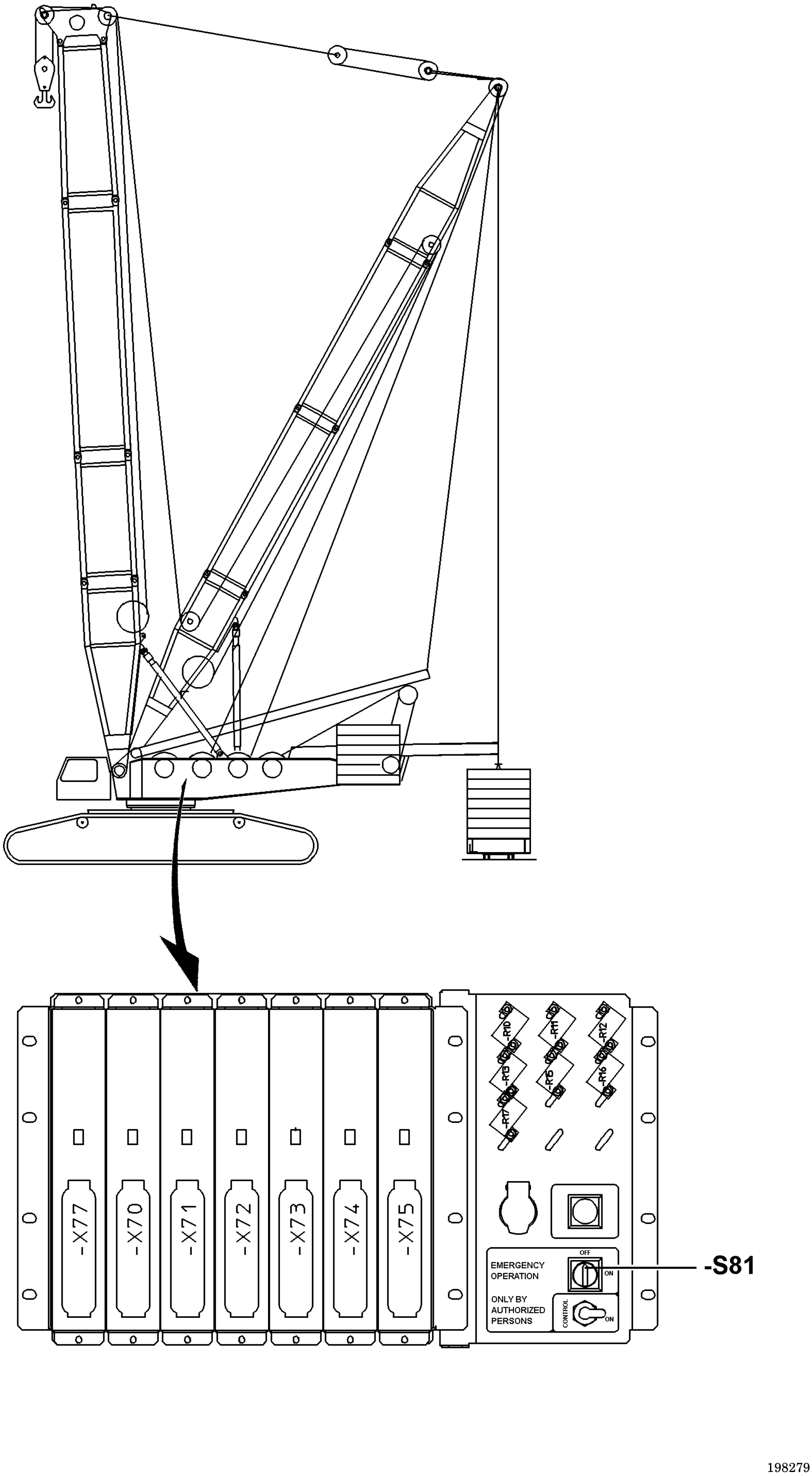
- Turn the crank (3) to start the emergency control component .
- Change over the ball cock (4) (horizontal position).

Note: The engine RPM can be adjusted via a separate engine speed control on the emergency control component.

1.4 End emergency control

- Turn the emergency control component (1) off and close the ball cock (4) .
- Release the hydraulic connections and close off with dummy plugs .

* = Optional



-X77
-X70
-X71
-X72
-X73
-X74
-X75
-R10
-R11
-R12
-R13
-R15
-R16
-R17
EMERGENCY OPERATION
ONLY BY AUTHORIZED PERSONS
OFF
ON
CONTROL
ON
-S81
198279

2. EMERGENCY CONTROL in case of problems or failure of the LICCON monitor or the LICCON overload safety system

The monitor on the control and indicator unit of the LICCON is not functioning, the working procedures are no longer shown optically.

2.1 Emergency control - general

The emergency control is turned on via the keyed switch (-S81) in the control box, position **"ON"**.

Note: The bell on the slewing platform as well as the beacon on the roof of the cab are actuated in case of:
- Block position - relapse cylinder D
- Block position - relapse cylinder G (Main boom)
- Block position - relapse cylinder W

In emergency control, the LICCON outlets are shifted away from the control valves of the hydraulic pumps, via the CPU-ok relay contacts.
Resistances, in connection with the corresponding directional contacts of the master switch (manual control level are actuated. This allows only "black - white operation" . A slights speed change is possible with the aid of the engine regulation.

D A N GE R: **In emergency operation, all safety devices, such as the LICCON overload safety system, straight run control in parallel operation, monitoring (limit switch) of the relapse cylinder block positions, monitoring of the forces (test brackets), hoist limit switch, monitoring of "turning" and "driving" in ballast trailer operation, 25° limit siwtch SA bracket are out of service.**

2.2 Prerequisite for emergency control

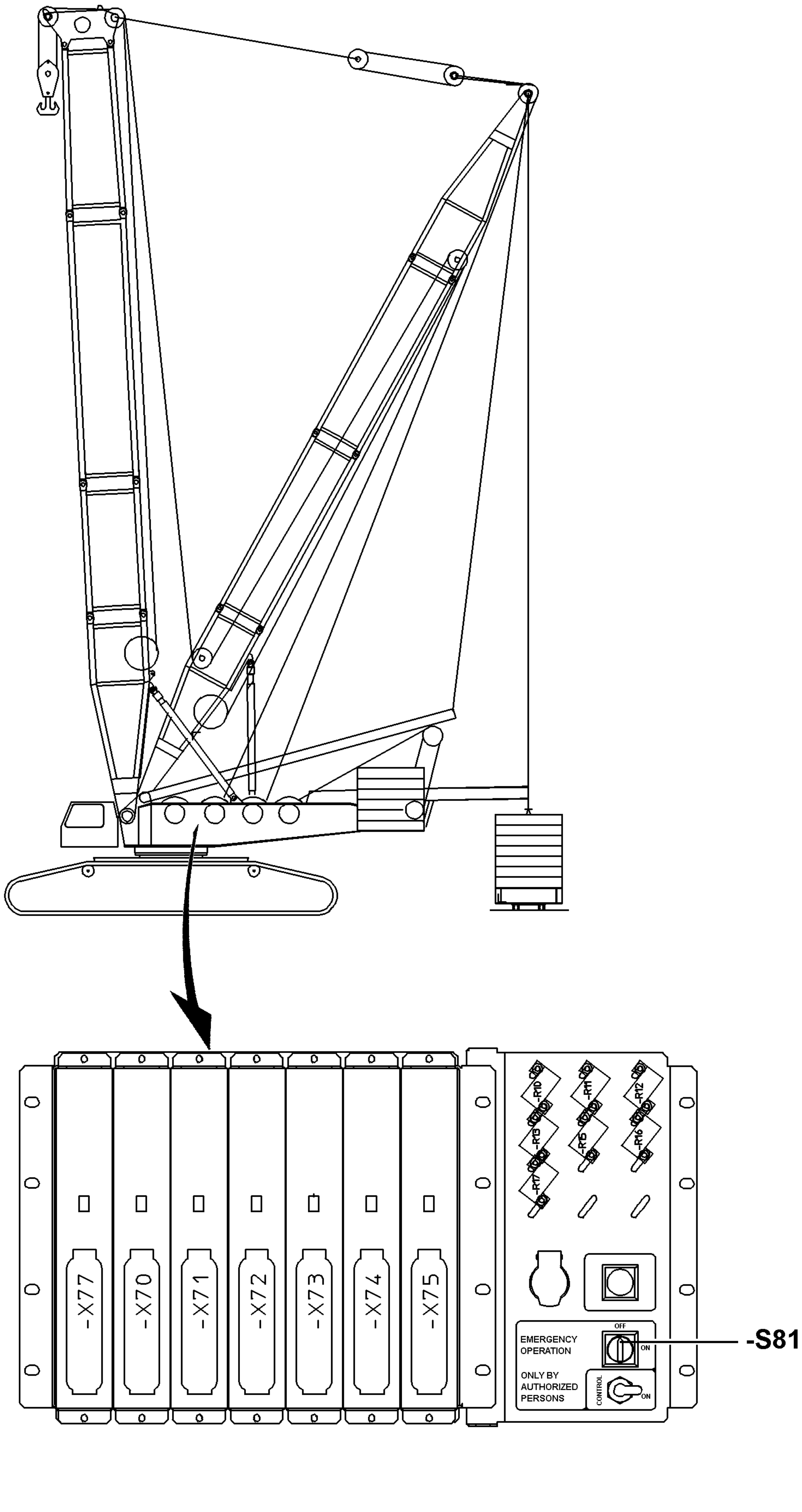
- Running crane engine,
- functioning hydraulic system in crane superstructure.
- Keyed switch - S 81 (large control box) is set to "ON" position.

D A NG E R : **Emergency control may only be carried out to end a lift in case of a problem on the crane or to take care of a dangerous situation.**
If a load is hanging on the hook, then it must be set down first and the boom must be relieved. Only those crane movements may be carried out, which are necessary to set down the load, place down the boom as well as to drive and turn the crane into a range, where it is no longer an obstacle.
Since - in case of a problem or failure of the LICCON overload safety system . the monitor is not functioning and the working procedures are no longer shown optically, every step must be carried out and checked with utmost care and caution .

C H E C K V I S U A L L Y.

In emergency control, all safety devices are automatically bypassed.
The emergency control of the crane may only be carried out by authorized personnel, who are aware of the dangers of emergency control!

The hydraulic monitoring of the replenishing pressures for the winches remains in function. If there is no replenishing pressure, the brake for the corresponding winch cannot be released.
In addition, it is also not possible to spool out the ewinches all the way, the safety coils remain on the winch.


-R10
-R11
-R12
-R13
-R15
-R16
-R17
-X77
-X70
-X71
-X72
-X73
-X74
-X75
EMERGENCY
OPERATION
ONLY BY
AUTHORIZED
PERSONS
OFF
ON
CONTROL
ON
-S81

198279

Keyed switch - S 81:

D A N G E R: **The keyed switch - S 81 (large control box) bypasses the LICCON-Overload safety system and may only be turned on in emergency sistuations by persons, who are aware of the effects of this bypass!**

Crane operation with turned on switch - S 81 is stricly PROHIBITED.

After completing the emergency control and fixing the LICCON overload safety system, the keyed switch - S 81 (large control box) must be switched again to the "OFF" position ! The crane must also be turned off (engine stop). This is necessary for the crane function and safety to be rechecked before it is put into service again. The key must be pulled off after emergency control and must be handed to an authorized person.

There is a DANGER of LIFE AND DEATH!

D A N GE R: **In emergency control, the movement is not controlled in proportion to the manual lever deflection, but it is digitally turned on or off via the directional contact of the manual control lever . This results in jerky movement of starts and stops . The movement occurs at reduced, constant speed.**

In emergency control, part of the sensor is not active or the signals are not used.

In emergency control, the crane control is handled without the LICCON, which means the crane control works as a simple relay control without computer controlling. Even though the LICCON and the monitor display are still functioning, in emergency control, all outlets of the LICCON and therefore all LICCON software emergency shut offs are ignored.

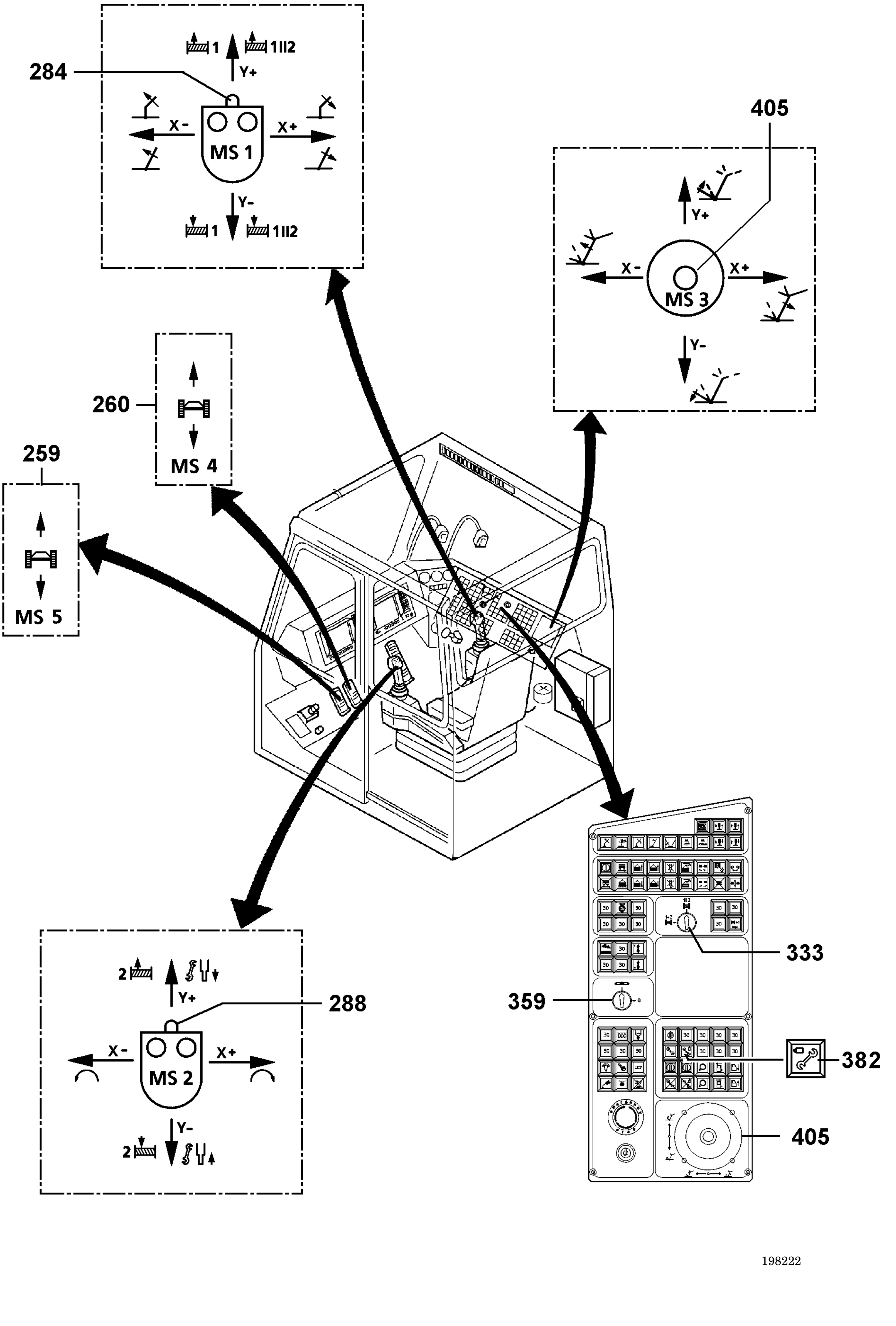
For that reason, the crane operator is fully responsible for all movements carried out in emergency control. The instructions for emergency control must be adhered to exactly. Each step must be carefully thought out. If the LICCON is still functioning, only these movements may be carried out in emergency control which cannot be carried out any longer in normal operation due to a technical defect, but which are still otherwise permissible according to the operating manual and load condition.

The crane operator may never use the emergency control for a functioning crane to bypass the safety shut offs of the LICCON !

There is a DANGER OF ACCIDENTS.

If a movement cannot be slowed down or stopped by moving the manual control lever or releasing the corresponding button, then the crane must be shut down immediately by pressing the EMERGENCY OFF button.

There is a DANGER OF LIFE AND DEATH!


284
1
1II2
Y+
X-
X+
MS 1
Y-
1
1II2
405
Y+
X-
X+
MS 3
Y-
260
MS 4
259
MS 5
333
359
382
405
2
Y+
288
X-
X+
MS 2
Y-
2

198222

2.3 Master switch (MS) - assignment in emergency control

Winch 1:	MS1Y	
Winch 2:	MS2Y	Button (382) not actuated → installation cylinder shut off
Winch 3:	MS1X	Switch (359) not turned on → crawler shut off
Winch 4:	MS3X	Switch (359) and (333) not turned on → winch 6 shut off
Winch 5 *	MS3Y	
Winch 6 *	MS3X	Switch (359) not turned on, switch (333) turned on → winch 4 shut off
Slewing gear:	MS2X	
Installation cylinder:	MS2Y	Button (382) actuated → winch 2 shut off
Crawler left:	MS5Y	Switch (359) turned on → winch 3, 4 and 6 shut off.
Crawler right:	MS4Y	Switch (359) turned on → winch 3, 4 and 6 shut off.

2.4 The following crane movements must be carried out:

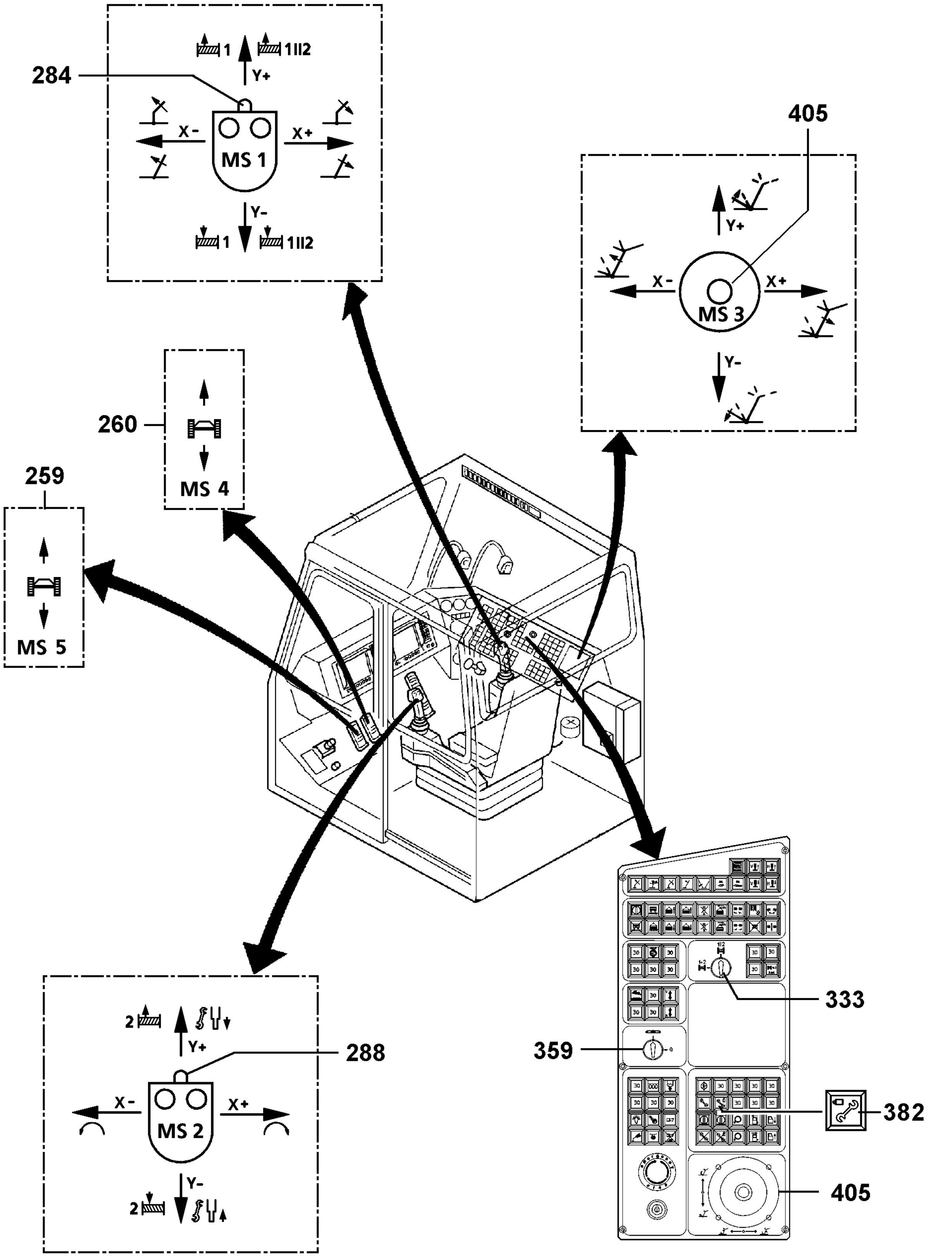
Winch 1 - 6	spool up / spool out
Slewing gear	turn left / right
Installation cylinder	extend / retract
Crawler	drive

Note: Parallel operation with winch 1 ‖ 2 is not possible!

C A U T I O N : **With reeved double hook, winches must be run with MS1Y and MS2Y . The horizontal alignment of the two pulley sets in the double hook must be monitored by the crane operator.**

D A N G E R : **If there is a load on the hook, it must be set down first to relieve the boom. There may be no persons or objects in the danger zone!**

* = if installed



1
1II2
Y+
284
X-
X+
MS 1
Y-
1
1II2
405
Y+
X-
X+
MS 3
Y-
260
MS 4
259
MS 5
2
Y+
288
X-
X+
MS 2
Y-
2
333
359
382
405

198222

2.4.1 Winches 1 to 6

Winch 1
Release of the manual control lever (MS1) with the seat contact switch or by pressing the button (284) on the manual control lever .

Deflect the manual control lever (MS1) to the rear (Y –)	=	spool up
Deflect manual control lever (MS1) to the front (Y +)	=	spool out
Manual control lever (MS1) in zero position	=	brake is applied, winch 1 stops.

Note: Winch 1 turns at reduced speed
If the limit switch ”Winch spooled out” is triggered, then winch 1 can be spooled up again even in emergency control. The spool up direction remains clear .

Winch 2
Release of the manual control lever (MS2) with the seat contact switch or by pressing the button (288) am manual control lever .

Deflect the manual control lever (MS2) to the rear (Y –)	=	spool up
Deflect manual control lever (MS2) to the front (Y +)	=	spool out
Manual control lever (MS2) in zero position	=	brake is applied, winch 2 stops.

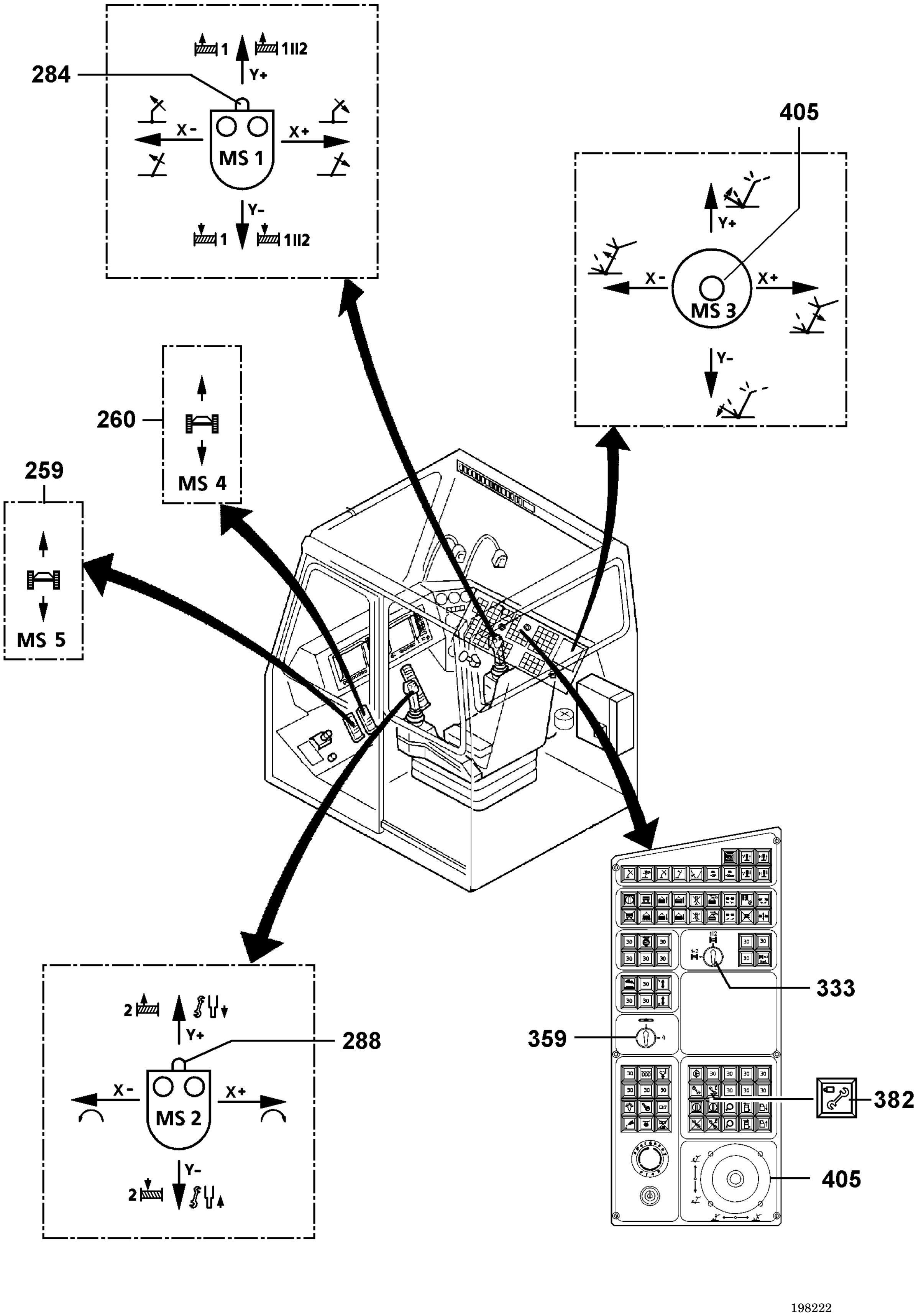
Note: Winch 2 turns at reduced speed.
If the limit switch ”Winch spooled out” is triggered, then winch 2 can be spooled up again even in emergency control. The spool up direction remains clear.

Winch 3
Release of the manual control lever (MS1) with the seat contact switch or by pressing the button (284) am manual control lever .

Switch (359) not turned on.

Deflect the manual control lever (MS1) to the left (X –)	=	spool up
Deflect the manual control lever (MS1) to the right (X+)	=	spool out
Manual control lever (MS1) in zero position	=	brake is applied, winch 3 stops.

Note: Winch 3 turns at reduced speed.
If the limit switch ”Winch spooled out” is triggered, then winch 3 can be spooled up again even in emergency control. The spool up direction remains clear.



284
Y+
X-
X+
MS 1
Y-
405
Y+
X-
X+
MS 3
Y-
260
MS 4
259
MS 5
288
Y+
X-
X+
MS 2
Y-
333
359
382
405
198222

Winch 4
Release of the manual control lever (MS3) with the seat contact switch or by pressing the button (405) am manual control lever .

Switch (359) and (333) not turned on.
Deflect the manual control lever (MS3) to the left (X –) = spool up
Deflect the manual control lever (MS3) to the right (X+) = spool out
Manual control lever (MS3) in zero position = brake is applied, winch 4 stops.

Note: Winch 4 turns at reduced speed.
If the limit switch ”Winch spooled out” is triggered, then winch 4 can be spooled up again even in emergency control. The spool up direction remains clear.

Winch 5 *
Release of the manual control lever (MS3) with the seat contact switch or by pressing the button (405) am manual control lever .

Deflect the manual control lever (MS3) to the rear (Y –) = spool up
Deflect the manual control lever (MS3) to the front (Y +) = spool out
Manual control lever (MS3) in zero position = brake is applied, winch 5 stops.

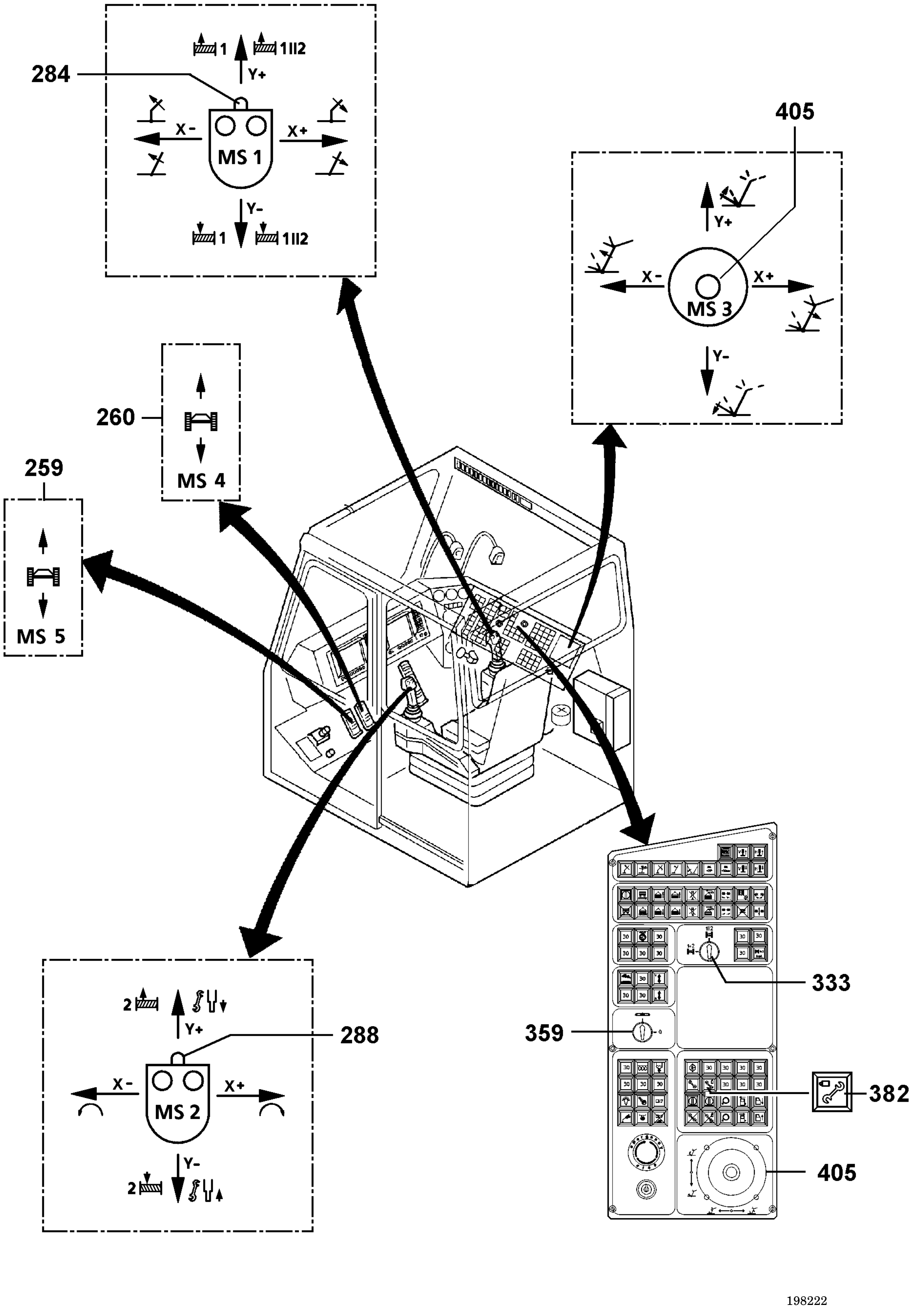
Note: Winch 5 turns at reduced speed.
If the limit switch ”Winch spooled out” is triggered, then winch 5 can be spooled up again even in emergency control . The spool up direction remains clear.

Winch 6 *
Release of the manual control lever (MS3) with the seat contact switch or by pressing the button (405) am manual control lever .

Switch (359) not turned on.
Switch (333) is turned on.
Deflect the manual control lever (MS3) to the left (X –) = spool up
Deflect the manual control lever (MS3) to the right (X +) = spool out
Manual control lever (MS3) in zero position = brake is applied, Winch 6 stops.

Note: Winch 6 turns at reduced speed.
If the limit switch ”Winch spooled out” is triggered, then winch 6 can be spooled up again even in emergency control. The spool up direction remains clear.

* = if installed


284
Y+
X-
X+
MS 1
Y-
405
Y+
X-
X+
MS 3
Y-
260
MS 4
259
MS 5
2
Y+
288
X-
X+
MS 2
Y-
2
333
359
382
405
198222

2.4.2 Slewing gear

**D A N G E R: Before initiating the crane movement ”turn”, the crane operator must ensure that there are no persons or obstacles within the slewing range.
If this is not observed, there is a danger of accidents.**

Release of the manual control lever (MS2) with the seat contact switch or by pressing the button (288) on the manual control lever .

Deflect the manual control lever (MS2) to the left (X –)	=	turn left
Deflect the manual control lever (MS2) to the right (X +)	=	turn right
Manual control lever (MS2) in zero position	=	brake is applied, slewing gear slows down softly (hydraulic accumulator).

Note: In emergency operation, coasting is not possible. The slewing gear turns at reduced speed.

2.4.3 Installation cylinder

Release of the manual control lever (MS2) with the seat contact switch or by pressing the button (288) on the manual control lever (MS2).

Turn on switch (382)

Deflect themanual control lever (MS2) to the rear (Y –)	=	retract the installation cylinder
Deflect the manual control lever (MS2) to the front (Y +)	=	extend the installation cylinder
Manual control lever (MS2) in zero position	=	the movement of the installation cylinder stops

Note: The installation cylinder moves at reduced speed.

2.4.4 Crawler travel gear

Turn on the crawler travel gear with switch (359)

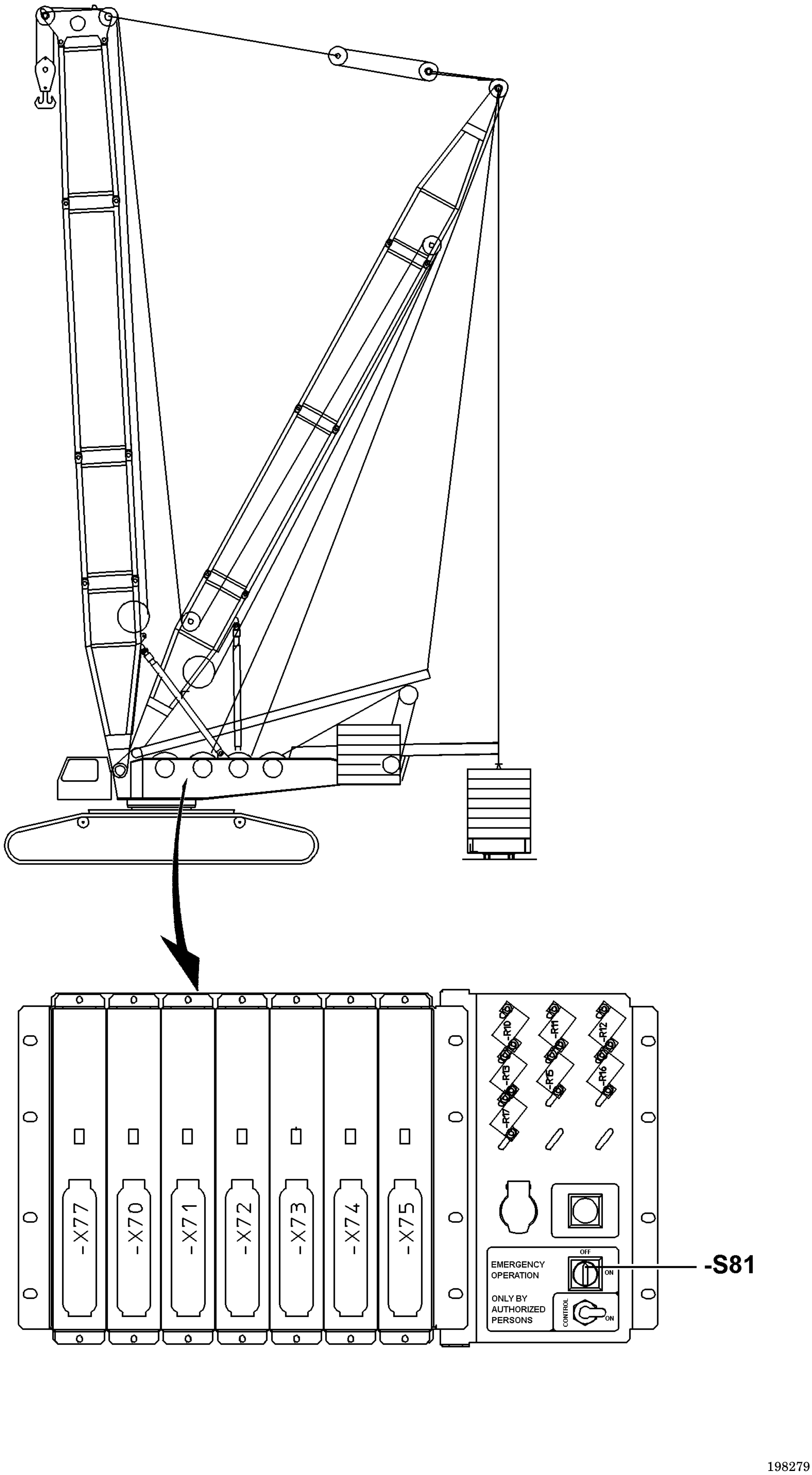
Crawler left

Press the foot pedal left (MS5 (259) to the front (Y +)	=	drive forward
Press the foot pedal left (MS5 (259) to the rear (Y –)	=	drive reverse
Foot pedal left (MS5 (259) in zero position	=	brake is applied, travel gear slows down softly (hydraulic accumulator).

crawler rechts

Press the foot pedal right (MS4) (260) to the front (Y +)	=	drive forward
Press the foot pedal right (MS4) (260) to the rear (Y –)	=	drive reverse
Foot pedal left (MS4) (260) in zero position	=	brake is applied, travel gear slows down softly (hydraulic accumulator).

Note: The travel gear runs at reduced speed.


-X77
-X70
-X71
-X72
-X73
-X74
-X75
-R10
-R11
-R12
-R13
-R15
-R16
-R17
EMERGENCY OPERATION
ONLY BY AUTHORIZED PERSONS
OFF
ON
CONTROL
ON
-S81
198279

3. Emergency operation with ballast trailer

Function - Ballast ”up or down”
It is possible to lift and lower the ballast, however without monitoring of test point 1 (KMD1 = force between A-bracket and derrick) and the S - and D - relapse cylinders.

Function ”turn”
It is possible to turn, however without monitoring of supports and wheel position of the ballast trailer. For that reason, it must be ensured that the wheels are in position **”turn”** if the ballast trailer is **not suspended** and the support is retracted.

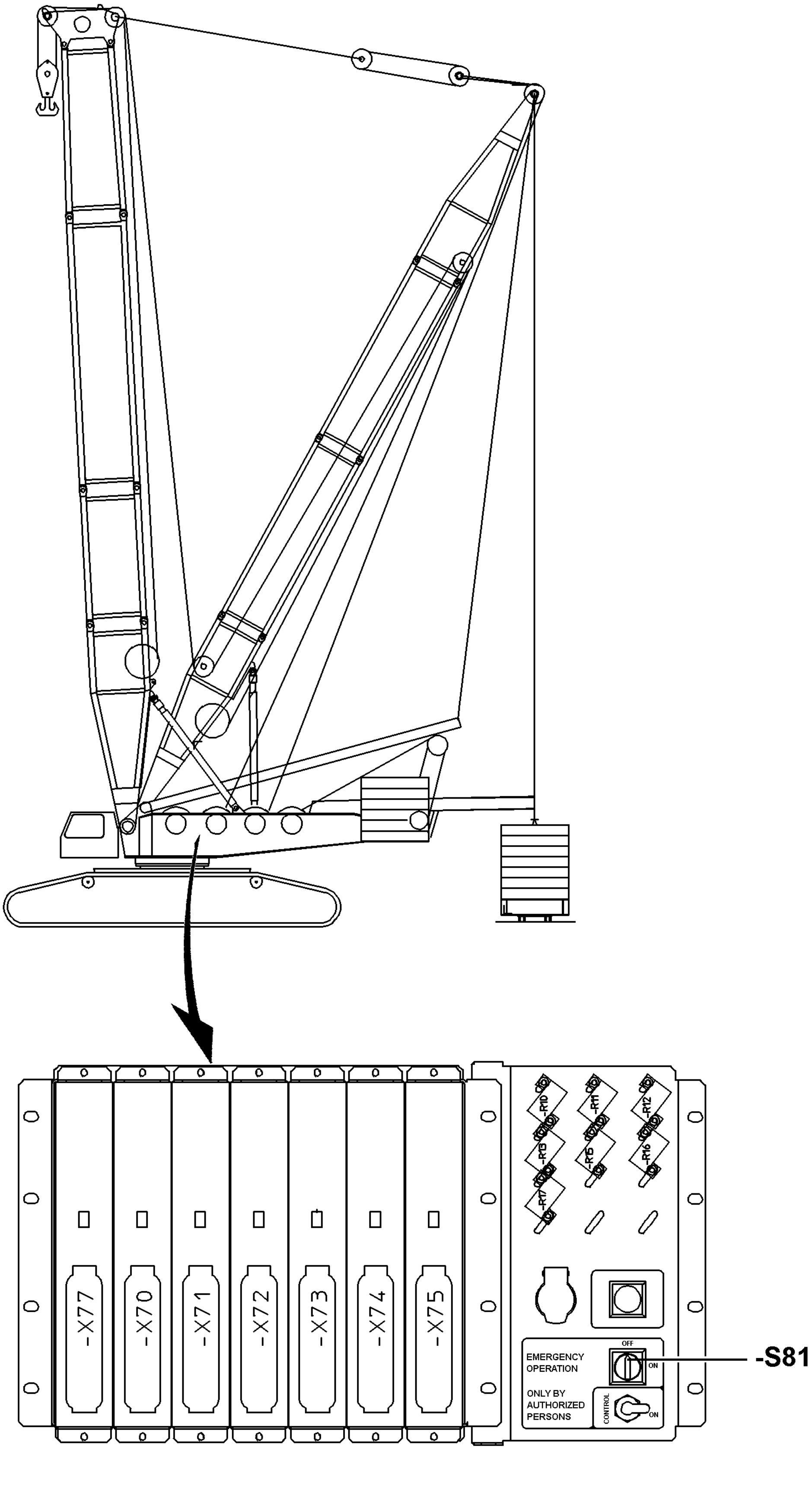
Function ”drive”

Towing :

C A U T I O N : **Towing is not possible, since the slewing gear coasting mode cannot be turned on.**

Parallel driving:

C A U T I O N : **It is not possible since the hydraulic coasting mode of the slewing gear cannot be turned on.**


-X77
-X70
-X71
-X72
-X73
-X74
-X75
-R10
-R11
-R12
-R13
-R15
-R16
-R17
EMERGENCY OPERATION
ONLY BY AUTHORIZED PERSONS
OFF
ON
CONTROL
ON
-S81

198279

4. EMERGENCY CONTROL in case of a problem or failure of the central processing unit (CPU) or the power supply unit (NT)
⇒ Basic component group error

Note: For basic component group error , see chapter 7.10, DIAGNOSTICS; paragraph 2.2.3.

Possible causes

1. Central processing unit (CPU) defective

Note: All central processing units must be functioning.

2. Poer supply unit (NT) defective

Error recognition
- NT indication
- CPU indication
- System error message

Remedy
- Replace the defective CPU with a spare CPU.
- Replace the defective power supply unit with a spare unit.

Note: When replacing the CPU, take over the program memory from the removed CPU. When replacing the power supply unit, take over the common memory of the removed unit.

Note: A spare CPU as well as a spare power supply unit is located in the control box for the crane control. To change the CPU or the power supply unit, see chapter l 7.10, DIAGNOSTICS; paragraph 2.2.3, System error.

C A U T I O N : The CPU or the power supply unit must be changed without power. The stand-by power supply for the component group can be interrupted by pulling the power supply plug from the socket or by pulling the CPU from the component group carrier . This means, a cold boot occurs. The stored equipment configuration data and the adjusting data will be lost.

Chapter 7

Service and Maintenance

1. Liebherr Service for you

C A U T I O N : **Damage to mobile crane components!**
If the mobile crane components are not maintained according to the maintenance intervals and maintenance guidelines, or if other lubricants are used than specified in the lubrication chart, the corresponding mobile crane component can be damaged and/or loose its function.
The warranty for the corresponding mobile crane component will become void!
- Always maintain mobile crane components according to the data in the maintenance intervals, maintenance guidelines and lubrication chart!

D A N G E R : **Danger to life due to damaged mobile crane components!**
If damaged mobile crane components, for example due to maintenance errors, are not replaced immediately, personnel can be mortally injured!
- Always maintain mobile crane components according to the data in the maintenance intervals, maintenance guidelines and lubrication chart !
- Replace damaged mobile crane components immediately!

1.1 Liebherr service for you

Liebherr truck-mounted, mobile and crawler cranes are products incorporating mature engineering which is able to cope day in, day out with the roughest operating conditions to which a crane may be subjected.

The high standards of engineering embodied in these cranes are reflected in their operation reliability, their insusceptibility to faults and in their ease of servicing and maintenance.

Liebherr is constantly further developing their drive and control elements. The combination of tried and tested components and modern production methods produces cranes which are reliable operating partners with a range of convenient operating features.

We build many hundreds of cranes each year for the international market and provide the backup services for them worldwise, too. For ”After Sales Service” ranks high at Liebherr to ensure that your crane is always available and operational.

Service at Liebherr begins from the moment the crane is handed over to you, the customer. We will provide your crane operators with the specialist training tailored to their particular needs.

Also we will train your maintenance personnel in all questions relating to crane servicing and repairs because we know that you are able not only to deal with all their minor repairs, but often have the specialists who can quickly and reliably perform major crane repairs.

A further benefit of our After Sales Service are our special Service Advisors who are only a telephone call away whenever a problem arises. This immediate contact saves you time and money and you should always take advantage of it whenever your crane is ”down”.

Our Field Technicians are also specialists with many year's experience who operate from strategically located bases. They bring with them their specialist knowledge and a range of special tools for the job. They are at your disposal as the last link in the range of Liebherr After Sales Services, although in most cases, your technical problems can be solved by contacting our Service Advisors.

N o t e : The buyer may submit warranty claims and receive possible reimbursement only if Original Liebherr spare parts are used in the Liebherr mobile crane.
Original Liebherr spare parts have been tested and are designed specifically for crane operation and can be utilized without any safety concerns.

D A N G E R : LIEBHERR-WERK EHINGEN GMBH, accepts no liability for utilization of replacement parts not manufactured originally by Liebherr. This applies to the functioning capability as well as to the actual parts!

2. Cleaning and care of the crane

2.1 Care of sound-absorbing mats

Sound-absorbing mats in the engine area or other noise sources are an integrated part of the total design . They have the task, together with all sound-aborbing material and the constructive design of the machine, to keep the noise levels for vehicles - as specified by law - as well as noise levels on the work place within the specified levels. They are an intergral part of the machine design and permission to operate. They may not be removed and in case of damage, they must always be replaced with Original spare parts.

They are designed to be maintenance free. They are made with dirt, oil and water repelling surfaces, they are fire retardent and in part, depending on the application, even non-flamable .

Therefore, these parts need no special care. Light deposits of dirt can be overlooked, since the acoustical properties of the mats are not reduced.

Crude dirt deposits can be removed with suitable tools (soft plastic scrapers). Tools with sharp edges are unsuitable. Steam cleaners may only be used with utmost case, i.e. with sufficient distance to the sound-absorbing mats and low water pressure. Cleaning solutions may not be used for cleaning.

It is especially dangerous if contaminants contain solutions or foreign matter, such as oils (engine oils, gear oils or hydraulic oils) and fuel, since these substances could ignite and / or significantly affect the flame retardent qualities of the mats.

For that reason, if any such substances are found on these mats, the mats must be removed and replaced immediately with Original replacement parts.

2.2 Care of the driver's cab and the crane operator's cab

The steering wheel, center console, control panel cover, floor covering and dirty upholstery in the driver's and crane operator's cab should be cleaned with warm water mixed with dish detergent.

Do not use scouring pads!

3. Putting the crane out of service for downtime

Note: Danger of corrosion on the hydraulic cylinders!
If the crane is out of service for an extended period of time, then it must be taken down.
In aggressive environmental conditions, such as on locations with sea climate and especially salty air, the hydraulic cylinders (support cylinder, luffing cylinder, telescoping cylinder) can corrode.

- Take down the crane equipment!
- Fully retract the hydraulic cylinders of the crane!
- Protect free sections of the piston rod from corrosion, for example by greasing these points!
- Grease the free sections of the piston rod of the luffing cylinder especially!

4. Maintenance instructions

Note: **Maintenance work on the crane chassis** is carried out according to the number of operating hours or kilometers covered.

Maintenance work on the crane superstructure is carried out according to the number of operating hours only.

Please, refer to following chapters before performing maintenance of the crane:

7.02 MAINTENANCE INTERVALS CRANE CHASSIS

7.03 MAINTENANCE INTERVALS CRANE SUPERSTRUCTURE

These chapters contain a list of maintenance intervals for all maintenance work. Only the relevant work must carried out.

7.04 MAINTENANCE INSTRUCTIONS CRANE CHASSIS

7.05 MAINTENANCE INSTRUCTIONS CRANE SUPERSTRUCTURE

For individual assemblies note manufacturers instructions.

7.06 LUBRICATION CHART, FILLING CAPACITIES

7.07 TABLE OF LUBRICANTS

	1st maintenance after	regular maintenance every			minimum maintenance annually	inspections	
		200 hrs. 5000 km	400 hrs. 10000 km	800 hrs. 20000 km		daily	weekly
□ **Diesel engine**							
- Check oil level For all further maintenance work, observe manufacturer's instructions						×	
- Check coolant level in equalizing reservoir						×	
- Change coolant liquid					every 2 years		
□ **Air filter**							
- Observe monitoring device						×	
- Clean the filter element (Observe the guidelines issued by the engine manufacturer!)					If necessary		
- change the filter element (and after having it cleaned 5×.)					every 2 years		
□ **Steering**							
- Check the steering hydraulic oil level							×
- Test steering rod and tie rod tightness and split pin keepers		×					
- Check hydraulic system for proper seals						×	
- Test tie rod setting, test if necessary		× *					
- Oil change				×			
- Replace oil filter	100 hrs.		×				
- Test hydraulic steering stop, test if necessary				×			
- Check hydraulic pressure, set if necessary				×			

* If used heavily off-road, at least 1× per year.

	1st maintenance after	regular maintenance every			minimum maintenance annually	inspections	
		200 hrs. 5000 km	400 hrs. 10000 km	800 hrs. 20000 km		daily	weekly
□ **Automatic transmission**							
- Check oil level						×	
- Check oil pressure						×	
- Check operating temperature						×	
- check for proper seals							×
- Check / tighten fastening screws		×					
- Oil change	100 hrs.			×	×		
- Replace oil filter	100 hrs.			×	×		
□ **Power shift gearbox**							
- Check oil level						×	
- check for proper seals							×
- Oil change	100 hrs.		×		×		
- Replace oil filter	100 hrs.		×		×		

	1st maintenance after	regular maintenance every			minimum maintenance annually	inspections	
		200 hrs. 5000 km	400 hrs. 10000 km	800 hrs. 20000 km		daily	weekly
□ **Displacement gear**							
- check for proper seals							×
- check fastenings		×					
- oil change	1000 km			×	×		
□ **Distribution gearbox**							
- Oil change	1000 km	×			×		
- Check oil level							×
- Check for proper seals						×	
- Check/tighten fastening screws		×					
- Check road/off-road gear switchover function							×
- Check all-wheel drive switch-on function							×
- Check tachometer connection		×					
- Clean ventilation nipple				×	×		
□ **Pump distributor gearbox**							
- check for proper seals							×
- check fastenings		×					
- oil change	200 h			×	×		

	1st maintenance after	regular maintenance every 200 hrs. 5000 km	400 hrs. 10000 km	800 hrs. 20000 km	minimum maintenance annually	inspections daily	weekly
□ **Drive shafts (universal drive shafts) and bearing bracket**							
- Grease				25000 km	every 2 years *		
- Check flange screws, tighten if necessary	100 km	2500 km					
□ **Driven axles**							
- Test for proper seals						×	
- Oil level check at axle housing, differential housing and wheel hubs		×					
- Grease steering knuckle bearings				25000 km	every 2 years **		
- Check mounting tightness		×					
- Oil change	1000 km			×	every 2 years		
- Replace grease filling in wheel bearings (if lubricated with grease)					every 2 years		
- Clean ventilation on axle housing				×	×		
□ **Axle drive DK-7**							
- Oil change	1000 km			×	every 2 years		
□ **Non-driven axles**							
- Grease steering knuckle bearings				25000 km	every 2 years **		
- Check mounting tightness		×					
- Change wheel hub grease filling				×	×		
- Set wheel bearings				×	×		

* Maximum grease pressure: 15 bar. If used heavily off-road, at least 1×per year.

** If used heavily off-road, at least 1×per year.

	1st main-tenance after	regular maintenance every 200 hrs. 5000 km	regular maintenance every 400 hrs. 10000 km	regular maintenance every 800 hrs. 20000 km	minimum main-tenance annually	inspections daily	inspections weekly
□ **Electrical system**							
- Check vehicle lighting system for function						×	
- Check cable connections and battery acid level							×
□ **Fuel system**							
- Check for leaks						×	
- Check condition and mounting			×		×		
- Drain off water and contamination			×		×		
- Clean pre-filter for fuel auxiliary pump			×		×		
□ **Tires**							
- Check lug nut tightness, tighten if nec.	100 km	×					
- Check tire pressure							×
□ **Brake system**							
- Check function of service brake and parking brake					×		
- Check brake lining wear		×					
- Adjust brakes, if necessary, replace linings		×					
- Grease		×					
- Oil fork head connections		×					
- Check service brake and hand brake functioning						×	
□ **Eddy current retarder**							
- Check mechanical and electrical sections (Observe manufacturer's guidelines)	5000 km		×				

	1st maintenance after	regular maintenance every			minimum maintenance annually	inspections	
		200 hrs. 5000 km	400 hrs. 10000 km	800 hrs. 20000 km		daily	weekly
□ **Compressed air system**							
- Test for proper seals							×
- Check brake system operating pressure						×	
- Check shutdown pressure						×	
- Check pressurized air reservoir automatic water bleeder valve functioning		×					
- Replace air dryer granulate cartridges					×		
- Clean air dryer pre-filter					×		
□ **Axle suspension**							
- Check hydraulic tank oil pressure							×
- Check hydraulic system seals							×
- Blocking cylinder function test		×					
- Replace oil filter	100 h		×				
- Check hydraulic pressure, set if necessary				×			
- Check pressure reservoir priming pressure (nitrogen)				× *	× *		
- Oil change				×	×		
□ **Outrigger support plates with equalizer**							
- Replace grease supply					×		
- Complete funktion test					×		

* refer to chapter 7.04, **MAINTENANCE INSTRUCTIONS CRANE CHASSIS**

	1st maintenance after	regular maintenance every			minimum maintenance annually	inspections	
		200 hrs. 5000 km	400 hrs. 10000 km	800 hrs. 20000 km		daily	weekly
□ **Hydraulic supports**							
- Check hydraulic system seals							×
- Check hydraulic tank oil pressure							×
- Check sliding arm movement / oil		×					
- Grease fleyer chains		×					
- Oil sliding arm keeper pins							×
- Oil operating level fork heads							×
- Check level, adjust if nec.							×
- Oil change (oil sample)				×	×		
- Replace hydraulic filter	100 hrs.		×				
- Replace bleeder filter on hydraulic tank	100 hrs.		×				
- Check hydraulic system operating pressure				×			
□ **Hydraulic accessories, e.g. ventilator, ballasting cylinders**							
- Check hydraulic operating pressure, set if necessary			×				
□ **Driver's cab**							
- Check armature function						×	
- Check indicator light function						×	
- Check motor brake activation						×	
- Check retarder activation						×	
□ **Emergency control**							
- Check emergency control function					×		

For crawler cranes only	regular maintenance every			minimum maintenance annually
	10 hrs.	100 hrs.	800 hrs.	
□ **Running gear**				
- Oil change			×	×
- Check seals	×			
- Grease tumbler bearing	×			
□ **Track carrier**				
- Check seals on track rollers (with oil lubrication)	×			
- Grease track rollers (with oil lubrication)	×			
- Grease support rollers	×			
- Grease guide rails on sliding piece				×
□ **Track shoes**				
- Check shoe tension, tighten if necessary	×			
- Inspect for fastening and damage	×			

	1st maintenance after	regular maintenance every				minimum maintenance annually	inspections	
		100 hrs.	200 hrs.	400 hrs.	1200 hrs.		daily	weekly
□ **Diesel engine**								
- check oil level for further inspections please refer to manufacturers maintenance instructions							X	
- check cooling water level in the extension tank							X	
- change cooling water						every 2 years		
□ **Air filter**								
- check dust indicator							X	
- clean resp. change according to manufacturers maintenance instructions								
□ **Slewing ring**								
- lubricate						every 3 months *		
- inspect and check bolts for tightness	200 hrs.				X	X		
- check tilt play					X	X		
□ **Rope winches**								
- inspect for leaks							X	
- check oil level								X
- check fastening bolts for tightness	200 hrs.			X		X		
- oil change					3 000 hrs.	every 4 years		
□ **Propeller shafts**								
- check flange bolts		X						
- lubricate		X				X		

* if the crane is not moved

	1st maintenance after	regular maintenance every				minimum maintenance annually	inspections	
		100 hrs.	200 hrs.	400 hrs.	1200 hrs.		daily	weekly
□ **Tension rods**								
- check condition						×		
□ **Overtopping guard struts**								
- lubricate pivots			×			×		
□ **Fall back cylinders**								
- inspect for leaks	× *							
- check preload pressure (nitrogen gas)				×		×		
- check oil quantity				×		×		
□ **A bracket mounting**								
- lubricate			×					
□ **Counterweight**								
- check tightening torque of fastening bolts	1 000 km			or 10 000 km		×		
□ **Ballasting system**								
- lubricate pivots			×			×		
□ **Rope drum contact rollers**								
- grease guides			×			×		
□ **Rope pulleys**								
- inspect and lubricate					×	×		
□ **Ropes**								
- inspect, grease if necessary			×			×		
□ **Hook blocks**								
- lubricate			×			×		

* visual check before starting up the crane

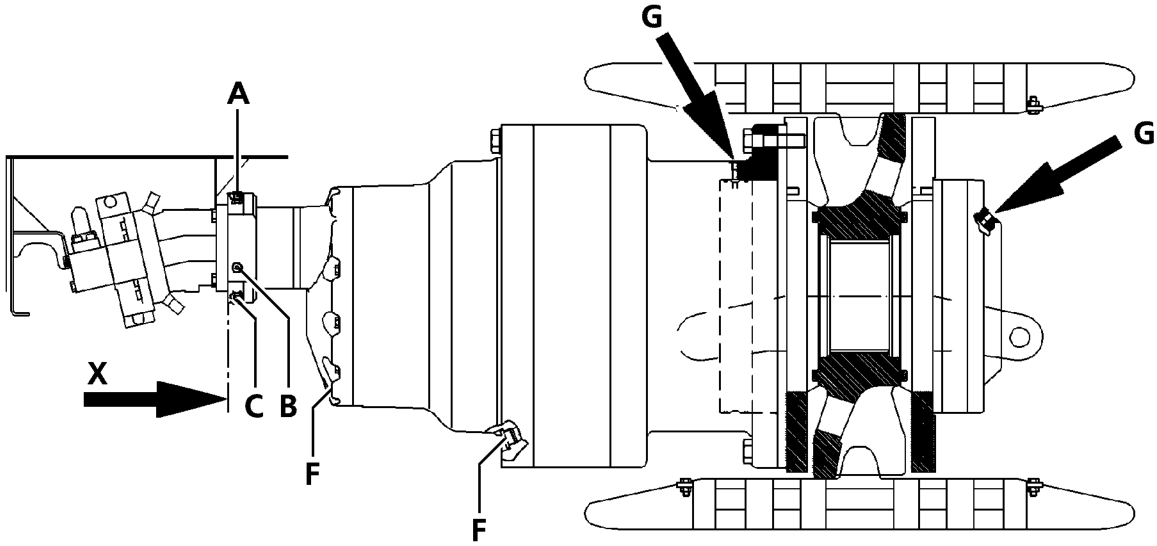
	1st maintenance after	regular maintenance every				minimum maintenance annually	inspections	
		100 hrs.	200 hrs.	400 hrs.	1200 hrs.		daily	weekly
□ **Crane cab**								
- check operation of instruments							×	
- check operation of tell-tale warning lights							×	
- check liquid level in the reservoir of the engine speed control							×	
□ **Extending crane cab**								
- check operation			×					
- lubricate pivots			×			×		
□ **Load moment limiter**								
- check operation							×	
□ **Electrical system**								
- check cable connections and battery acid level								×
□ **Fuel system**								
- check for leaks							×	
- check condition and mounting				×		×		
- drain off water and contamination				×		×		
□ **Slewing gear transmission**								
- inspect for leaks							×	
- check oil level								×
- check fastening bolts for tightness	200 hrs.			×		×		
- change oil					4 000 hrs.	every 4 years		
□ **Locking of the slewing brake**								
- check operation		×						
- lubricate			×			×		

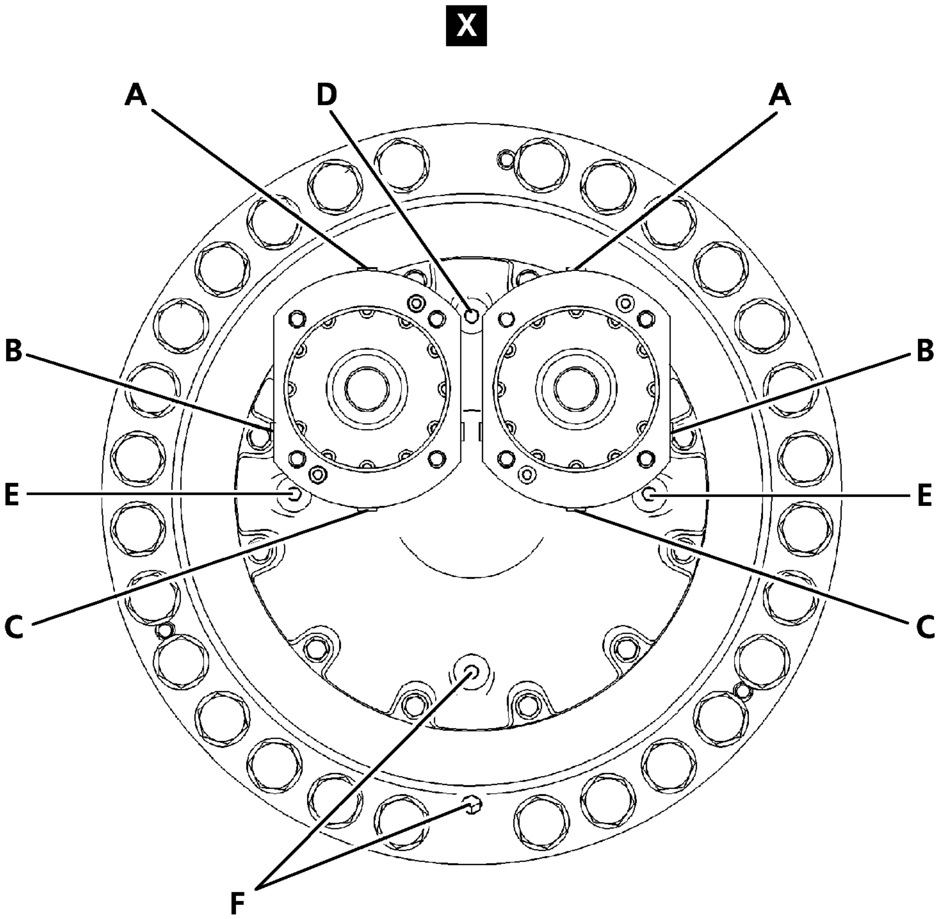
	1st maintenance after	regular maintenance every				minimum maintenance annually	inspections	
		100 hrs.	200 hrs.	400 hrs.	1200 hrs.		daily	weekly
□ **Pump distributor gearbox**								
- check oil level							×	
- oil change	400 hrs.				×	×		
□ **Hydraulic system**								
- check oil level							×	
- check for leaks								×
- replace control and feed circuit pressure filter element	200 hrs.			×				
- replace returnline filter element (cranes with open hydraulik circuit only)	200 hrs.			×				
- replace bleeder filter on hydraulic tank	200 hrs.			×				
- check hydraulic oil (oil sample test)	400 hrs.				×	×		
□ **Hydraulic cylinders**								
- inspect for leaks								×
□ **Hydraulic pressure reservoirs (nitrogen gas)**								
- check preload pressure				× *		× *		
□ **Emergency control**								
- check emergency control function						×		

* refer to chapter 7.05, **MAINTENANCE INSTRUCTIONS CRANE SUPERSTRUCTURE**

	1st maintenance after	regular maintenance every				minimum maintenance annually	inspections	
		100 hrs.	200 hrs.	400 hrs.	1200 hrs.		daily	weekly
□ **Telescopic boom with cable mechanism**								
- lubricate the telescopic boom pivots		×				×		
- lubricate change over pulley for push out mechanism		×				×		
- check cable mechanism, adjust if necessary	200 hrs.			×				
- disassemble boom and inspect it					20 000 hrs.	every 10 years		
□ **Pneumatic boom locking**								
- clear the air filter for compressed air		×				×		
- check boom locking holes				×		×		
- lubricate boom locking bolts					×	×		
□ **Telescopic boom system TELEMATIC**								
- check telescopic boom for distortion, cracks and leaks						×		
- check telescopic cylinder for proper condition				×		×		
- check push out tong for proper condition				×		×		
- check locking pins and locking bores for proper condition				×		×		
- check inner and outer glide surfaces for proper condition				×		×		
- lubricate glide surfaces						× *		

* and as necessary





186806

Checking oil level at the crawler track gear

Check oil level at the fill in hole.

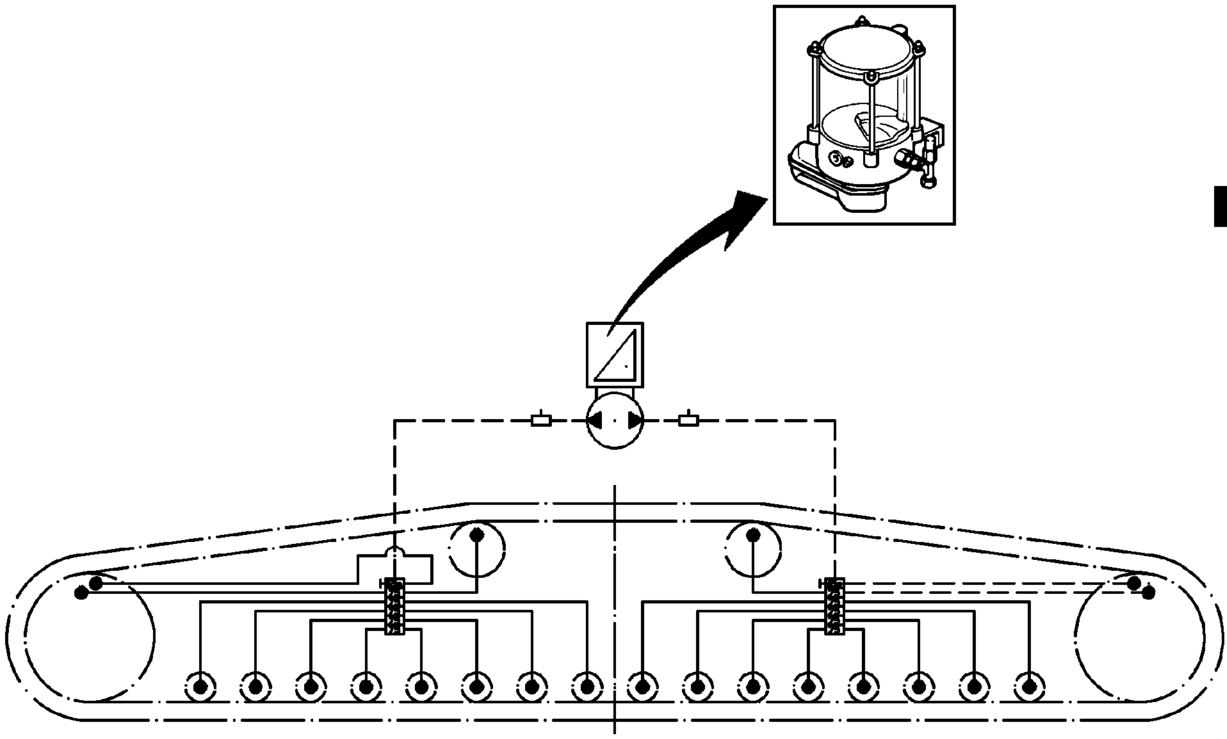
A = Oil fill in hole - brake
B = Oil level - brake
C = Oil drain - brake

D = Oil fill in hole - track gear
E = Oil level - track gear
F = Oil drain - track gear

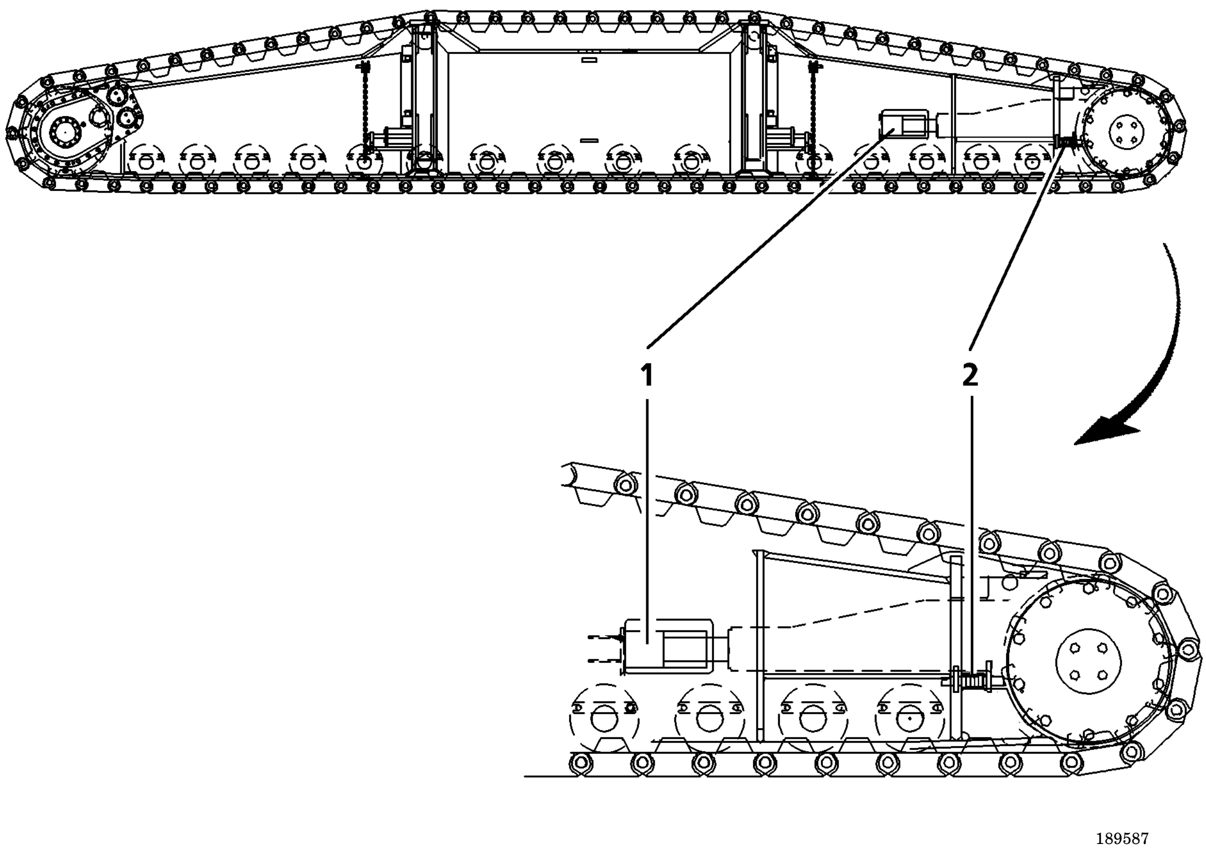
G = Grease fill in hole - track gear

Note: After refill oil wait approx. 2 min. and check oil level again.

1



2



Central lubrication system for crawler
The crawler is equipped with a central lubrication system.

Grease points are:
- crawler rollers
- turras bearing

These points are supplied automatically with the correct amount of grease, when travelling with crawler

Note : Refer to the enclosed, more detailed description of the BEKA-MAX grease central lubrication system.

Access to the automatic lubrication
With the ignition turned on, press red button on case, this provides access to the automatic grease lubrication system to carry out an intermediate lubrication, or to repack the grease lines with grease after a repair.

C A U T I O N : **Make sure that the grease containers are always filled with grease, as specified on the lubrication chart.**

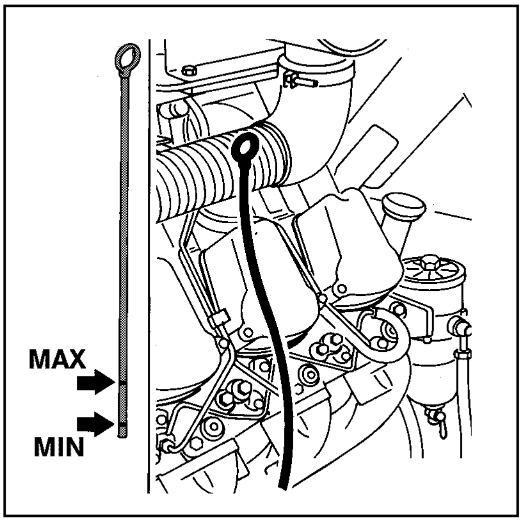
After any repair work on grease lubricated components, refill the grease lines via the red button to prevent the components from running dry.

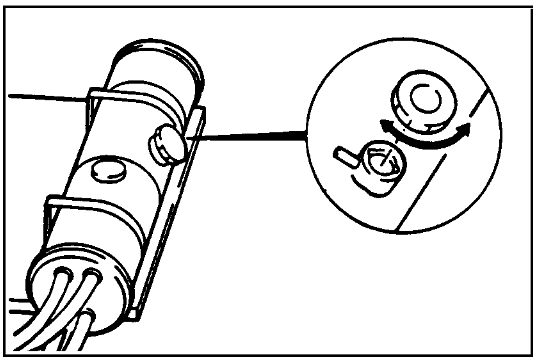
Before and after longer service breaks, especially before and after a break before the cold season, make sure that the lubrication has been performed especially well, in order to provide the best possible corrosion protection.

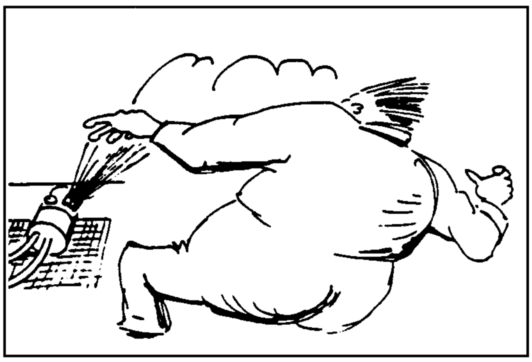
- clean and crease slewing ring at the outer teeth.

Tension the track chain
The crane must be positioned on level ground.
The track chain is tensioned with the hydraulic tension cylinder (1).
Tension cylinder and hand pump are in the tool box.

Tensioning procedure
- Install the tension cylinder (1) in the crawler carrier and extend it with the hand pump, until the tension resistance is larger than the force on the hand pump.
- Insert spacers (2) between the sliding section and the crawler carrier and secure with pins.
- Relieve the tension cylinder again.
- Move the crawler by at least one crawler length straight forward or backward to relieve the tension in the lower chain area.
- If necessary,repeat the tensioning procedure and insert additional spacers (2).







185694

Checking oil level and filter
Check the oil level in the engine while the crane is standing horizontally.
With the engine switched off, the oil has collected in the oil pan.

Oil in the crane engine
The oil must be at a level between the minimum and maximum markings on the oil dipstick.

C A U T I O N : **If the oil level has fallen below the minimum marking, engine oil MUST be refilled according to the lubrication table until it reaches a level between the Min. - Max. markings. If it is not refilled, the engine could be damaged.**

Reinsert the dip stick.

When carrying out maintenance or repair work in the vicinity of the engine, the following must be observed:
Never walk on fuel lines.

D A N G E R : **The engine area must be absolutely free of diesel fuel, as otherwise there is the risk of F I R E. Extreme cleanliness must always be ensured, especially when changing filters and bleeding air. All fuel spills must be dried up. When changing filters, before unfastening the filter is advisable to spread out absorbent wool to absorb the diesel fuel.**

Air filter - crane engine
The air filters are monitored electrically. If a partial vacuum occurs in the air intake line because the air filter elements are contaminated, the corresponding warning lamp comes on the control panel. In this case, clean or replace the filter elements.

Note: Maintenance work on the engine and the air filters must be carried out according separate operating instructions of the Mercedes-Benz company.

Engine coolant

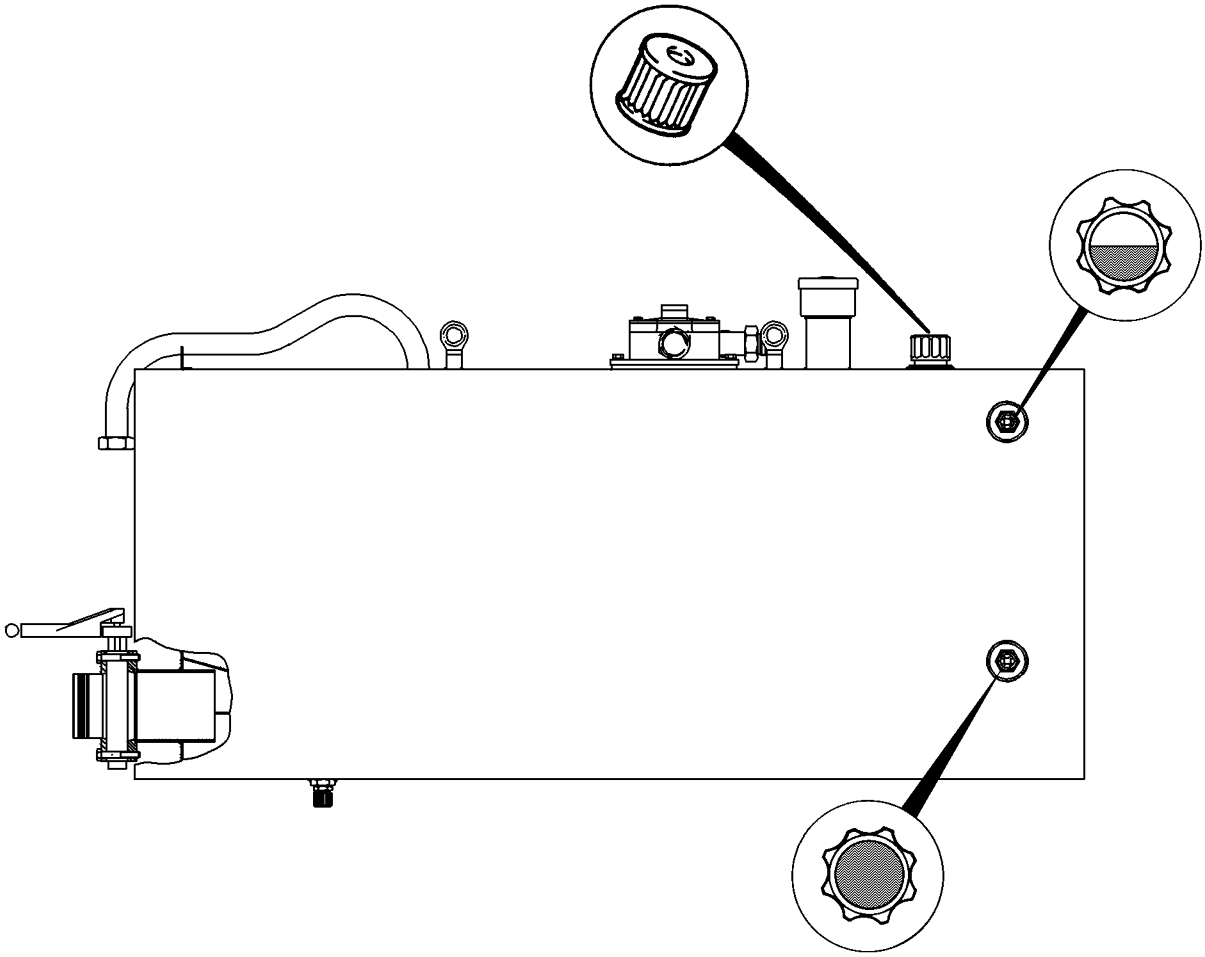
D A N G E R : **The coolant must only be checked when the engine is cold. Otherwise, t here is the risk of skin burns!**

Turn the protective cover of the filler neck of the radiator compensator reservoir to the first notch, release excess pressure
Remove protective cover.
If required, top up coolant to overflowing.

Note: The radiator compensator reservoir must only be topped up at the filler neck, with coolant according to the lubrication table.

Mixture ratio: 50 % volume anticorrosive / antifreeze
50 % volume make-up water

After coolant loss use coolant with the same mixture ratio for topping up!



186474

Oil level - hydraulic fluid reservoir
The oil level must be in the middle of the glass view port.

C A U T I O N : **If the fluid level is not visible in the upper glass view port, hydraulically fluid must immediately be refilled with fluid according to the lubrication table until the fluid level is in the middle of the view port. If the fluid level is too low, the pumps could be damaged. The cylinders cannot be fully extended.**
The cylinders must be completely retracted to check the fluid level. If they are extended, there is the danger of overfilling, that is, when retracting, the fluid will flow out of the aerator. If the jacks are retracted too quickly, the reservoir could be damaged.

Refilling fluid
Refill fluid to the middle of the glass view port.

C A U T I O N : **For filling, use a fine-mesh sieve.**

Start the crane engine.
Start all crane movements slowly
Recheck fluid level and if necessary, top off.

Aeration and bleed air filter
Open cap with turn-lock fastener and check filter for contamination (visual inspection)

Note: If the filter is extremly dirty, it must be changed.

Replace the cap.

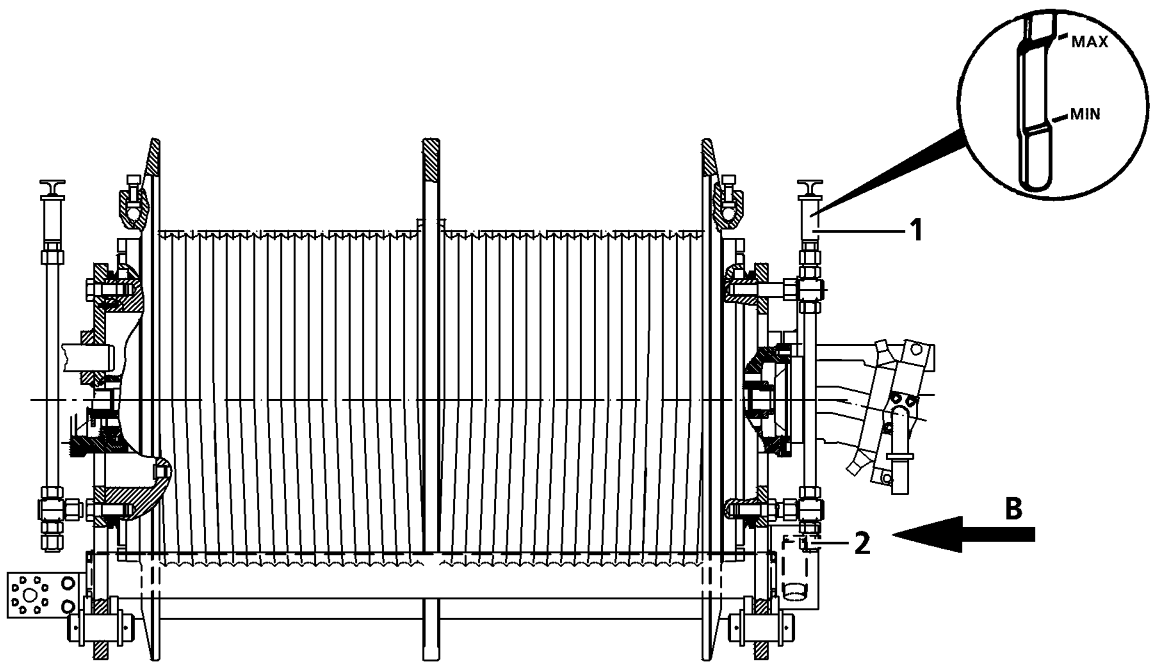
Hydraulic hose lines
The operational safety of the hydraulic hoses must be checked at least once per year by a competent person.

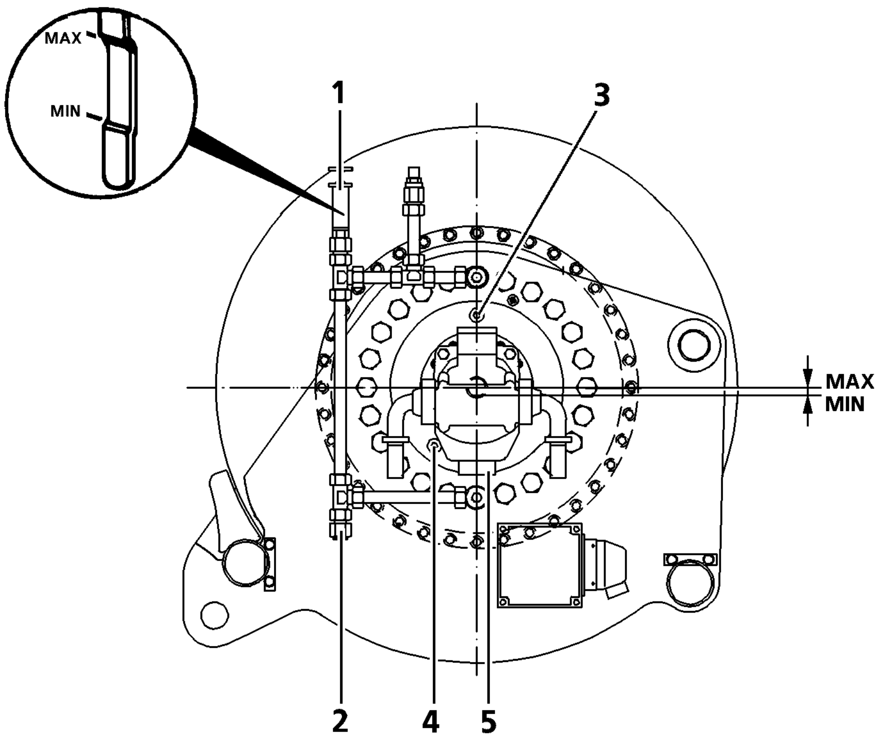
Replacing the hose lines
The hose lines must be replaced at appropriate intervals.

On the basis of our experience we recommend the following maximum periods of use for mobile cranes:

- in hard loading and unloading operation with high operating temperatures and frequent movement cycles	approx	3	years
- in loading and unloading operation	approx	6	years
- iin assembly operation with infrequent maximum output	approx	12	years

C A U T I O N : **The hoses on the suction ducts of the oil pan must be visually inspected monthly for tears and damage, and if required, changed.**





186234

Rope winches

1 = Oil dipstick, oil fill in hole - gear
2 = Oil drain - gear
3 = Oil fill in hole - brake
4 = Oil level - brake
5 = Oil drain - brake

Check the oil level with the oil dipstick
The oil must be at a level between the minimum and maximum markings on the oil dipstick.

Note: When checking the oil level, the dipstick must not screwed in.

C A U T I O N: **If the oil level is fallen below the minimum marking, oil MUST be refilled according tothe lubrication table until it reaches a levelbetween the Min. - Max. markings.If it is not refilled, the gear could be damaged.**

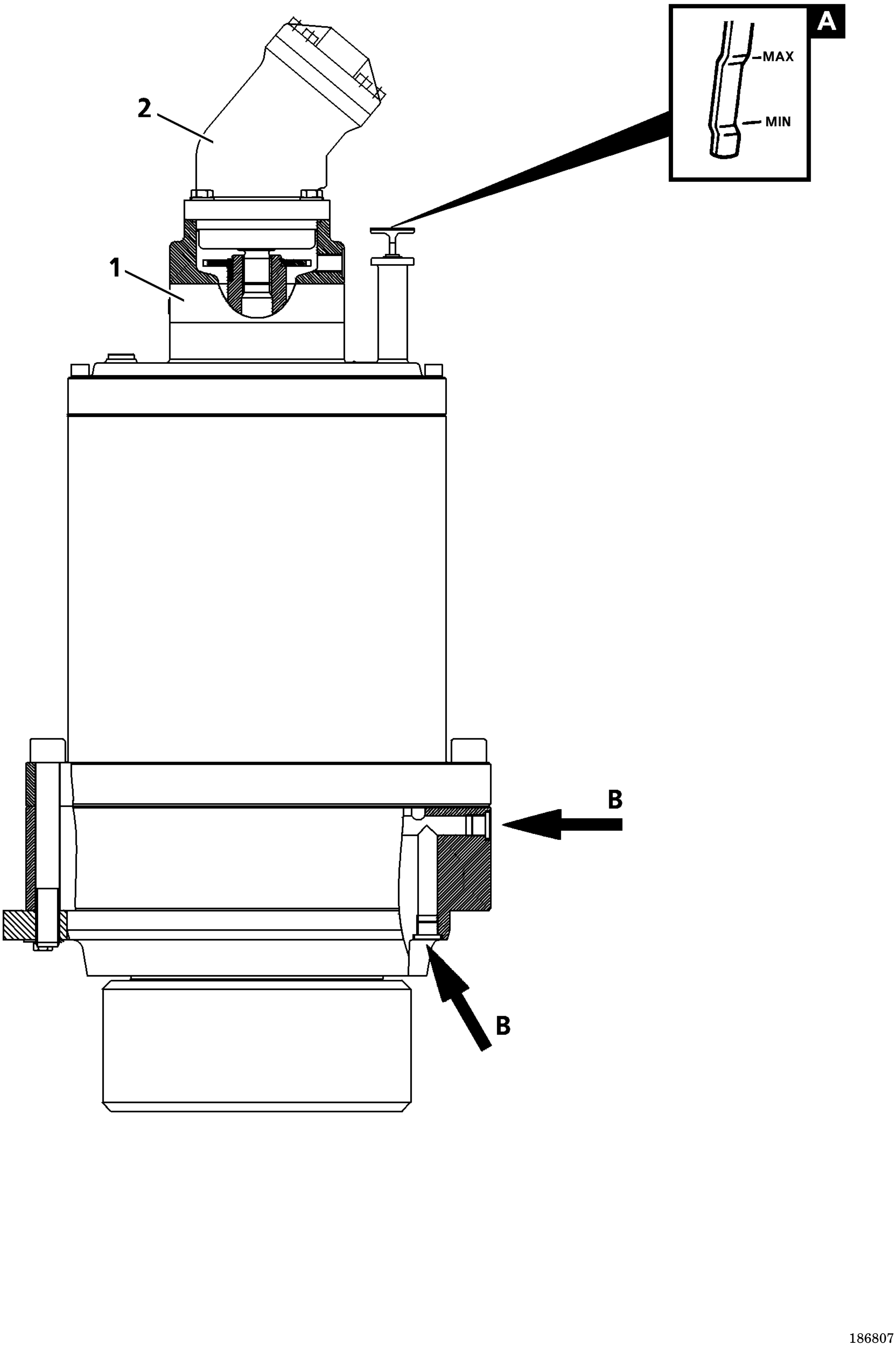
Reinsert the dipstick.

Pump transfer case
With the gears at a standstill, check the oil level with the oil dipstick.
The oil must be at a level between the minimum and maximum markings on the oil dipstick.

Note: When checking the oil level, the dipstick must not screwed in.

C A U T I O N: **Loss of oil indicates defective shaft seal rings or defective housing sealing. This must be rectified immediately.If the oil level is fallen below the minimum marking, oil MUST be refilled according tothe lubrication table until it reaches a levelbetween the Min. - Max. markings.If it is not refilled, the gear could be damaged.**

Changing oil
Drain oil immediately after standstill of the gears. Before refilling, rinse through with oil according to the lubrication table.


A
MAX
MIN
2
1
B
B
186807

Slewing gear transmission
Check the oil level with the oil dipstick

A = Oil dipstick, Oil filler
B = Oil drain

The oil must be at a level between the minimum and maximum markings on the oil dipstick.

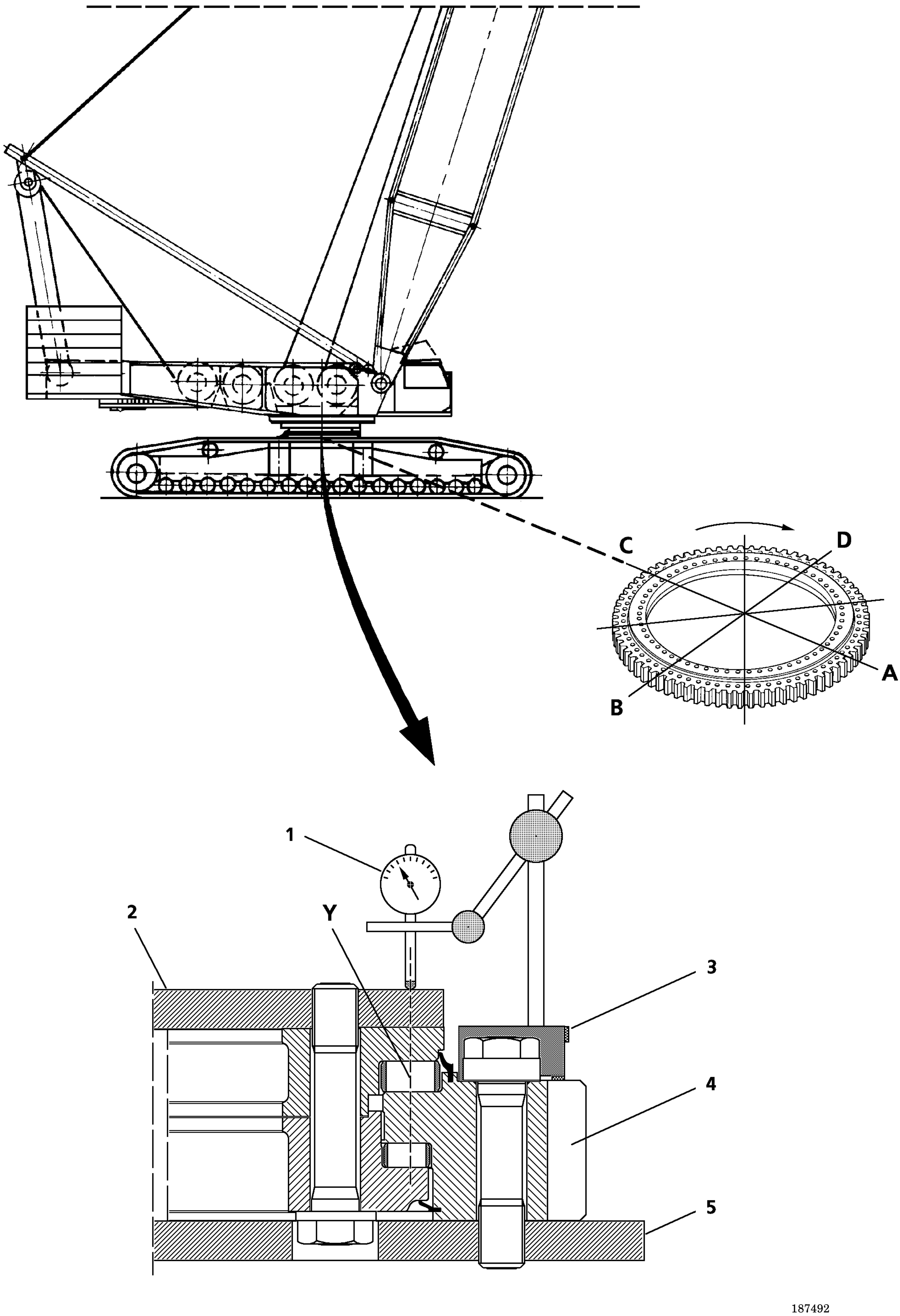
Note: When checking the oil level, the dipstick must not screwed in.
After refill oil wait approx. 2 min. and check oil level again.

C A U T I O N: **If the oil level is fallen below the minimum marking, oil MUST be refilled according tothe lubrication table until it reaches a levelbetween the Min. - Max. markings.
If it is not refilled, the gear could be damaged.**

Reinsert the dipstick.

Slewing gear brake (1)

C A U T I O N: **Slewing gear brake must be filled with ATF hydraulic oil approx. 0,2 liter, before assembling of hydraulic motor (2)!**


C
D
A
B
1
2
Y
3
4
5
187492

Roller bearing slewing connection (ROD)
Grease the outside of the gear ring, the bearings are greased by the central lubrication system.

CAUTION : **Lubrication should be carried out with special care immediately before and after prolonged breaks in crane operation - especially winter breaks - to provide the greatest possible protection against corrosion.**

Roller slewing connections (ROD) have bearing play, which guarantees good rolling and safety. Application readiness is limited by the maximum level of wear of the running system. The amount of wear can be determined by measuring the tilt play when roller slewing connection is installed.

Maximum tilt play = 1,2 mm + 0,1 mm (tolerance), (single roller track run - reworking possible)
The limit is the maximum tilt play when a single run - reworking is possible.
If the track runs of the bearing rings are still below the limit, a single reuse is possible.

DANGER: **If impermissible deformations and/or damage have occurred to the bearing rings due to overloading, external force, accident or faulty maintenance, reworking is no longer possible. The slewing connection must be replaced.**

Danger Limit = 2,0 mm + 0,1 mm (tolerance), (replace slewing connection)
The danger limit is the absolute wear limit or the maximum permissible tilt play, where no impairment of operatingsafety is expected. If tilt play reaches or exceeds the danger limit, the slewing connection must be replaced.

DANGER : **If the danger limit is exceeded by more than 15 %**
- **there is a RISK of ACCIDENT !**
- **the slewing connection must be replaced!**

Test procedure
To attain as slight as possible influence of the test values by deformation of the connections (under - /uppercarriage), the test measurement should be as close as possible to test axis **"Y"** (mid-bearing track surface).
If this is not possible due to design,slight test deviations occur.

1. Set the overload safety to the load-capacity chart corresponding to 360° equipment configuration of the crane
2. Support the crane properly and according to the load-capacity chart and set up horizontally
3. Luff up the boom and turn uppercarriage to **test point (A)**
4. Fix test gauge clamp (3) to the slewing connection (4)
   - Place feeler pin on mid test axis **"Y"** (mid-bearing track surface)
   - Set test gauge (1) to **"0"**
5. Luff down loaded boom until shut-off limit of overload safety device is reached.
6. Read tilt play on test gauge (1)
7. Remove test gauge, remove test gauge bracket.
8. Prüfvorgänge (3 bis 6) an den **Meßpunkten B,C** und **D** wiederholenRepeat test procedures (3 to 6) on **test points B, C** and **D**.

Note: Measurement is authorized only longitudinally.
The test gauge should assure precision up to at least 1/10 mm.

Diaphragm reservoir in the hydraulic system
Following diaphragm reservoirs are equipped in the hydraulic system:

- Feed pressure (2 reservoir) each 10 bar
- L-Fall back cylinder (1 reservoir) 10 bar

The preload pressure is indicated on the diaphragm reservoirs and must measured in each diaphragm reservoir.

Requirements:
- The crane engine must be at a standstill in order to relieve pressure on the fluid side.

Check the precharge pressure with a testing and inflating device and correct if necessary.

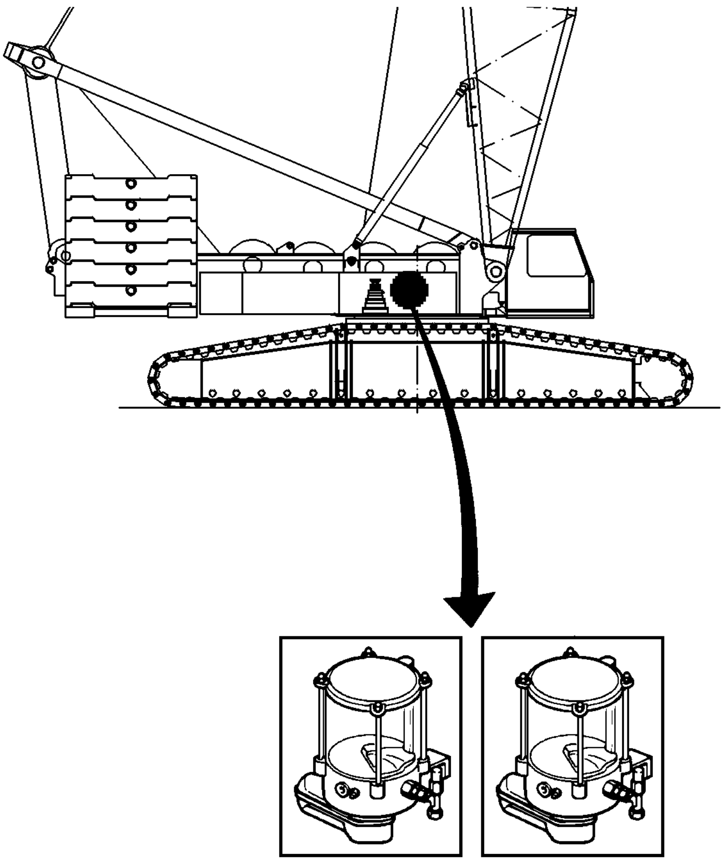
DANGER: **When filling the blower reservoirs, NEVER use air or oxygen - this can cause an**

EXPLOSION.

The pressure in the nitrogen cylinder must not exceed the maximum permissible operating pressure of the reservoir or the manometer. Otherwise, a pressure reducing device must be connected between the cylinder and the inflating device.

Note: In addition, the national regulations regarding pressure reservoir tests must be observed.

Pressure filter and hydraulic system
The pressure filter is equipped with a maintenance indicator. If the indicator pin or the red bar indicator if visible when the oil is warm from operating (check weekly), the filter element of the corresponding filter must be replaced. Before replacing the filter element, the filter bell must be rinsed.



186236

Central lubrication system
The crane uppercarriage is equipped with two central lubrication systems.

1. - for slewing ring

2. - winches
   - pivot section boom, derrick and LA-bracket
   - cab folding arm
   - assembly winch
   - balancing bar, LA- bracket adjusting

Depending on the operating hours.all grease points are supplied automatically with grease.
The lubrication time is 3 minutes, in 1,0 hour intervals.

N O T E : Refer to the enclosed, more detailed description of the BEKA- MAX grease central lubrication system.

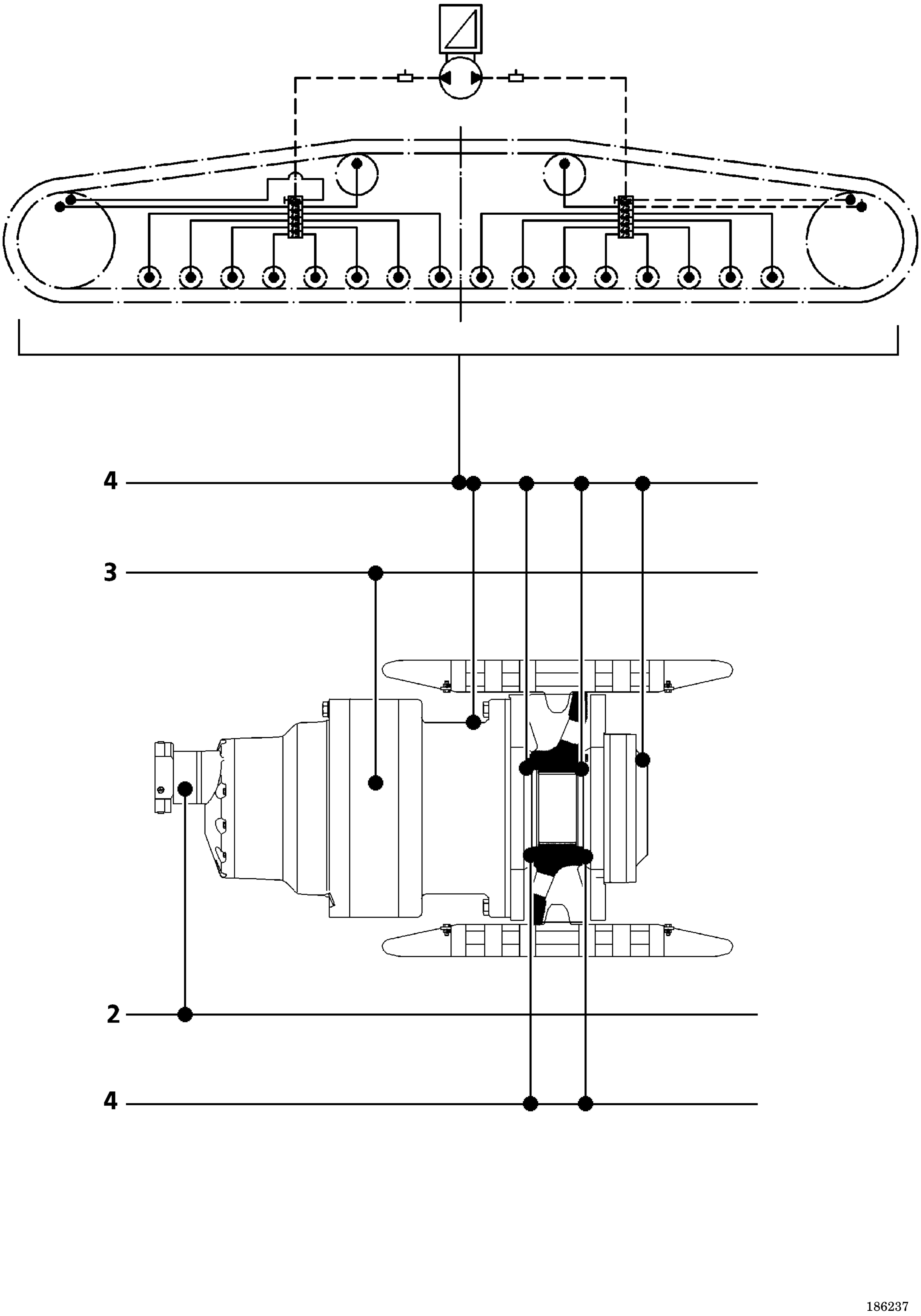
Access to the automatic lubrication
With the ignition turned on, press red button on case, this provides access to the automatic grease lubrication system to carry out an intermediate lubrication, or to repack the grease lines with grease after a repair.

C A U T I O N : **Make sure that the grease containers are always filled with grease, as specified on the lubrication chart.**

After any repair work on grease lubricated components, refill the grease lines via the red button to prevent the components from running dry.

Before and after longer service breaks, especially before and after a break before the cold season, make sure that the lubrication has been performed especially well, in order to provide the best possible corrosion protection..

- Clean the swing ring externally and grease it.


4
3
2
4
186237

Filling capacities

CRANE CHASSIS	approx. Liter
Travel gear boxes **each** Gear oil Type SAE 90 W, API - GL 5	27.0
Slewing gear brake ATF	0,2
Central lubrication system - crawler rollers, turras bearing Special grease	appr. 4 kg

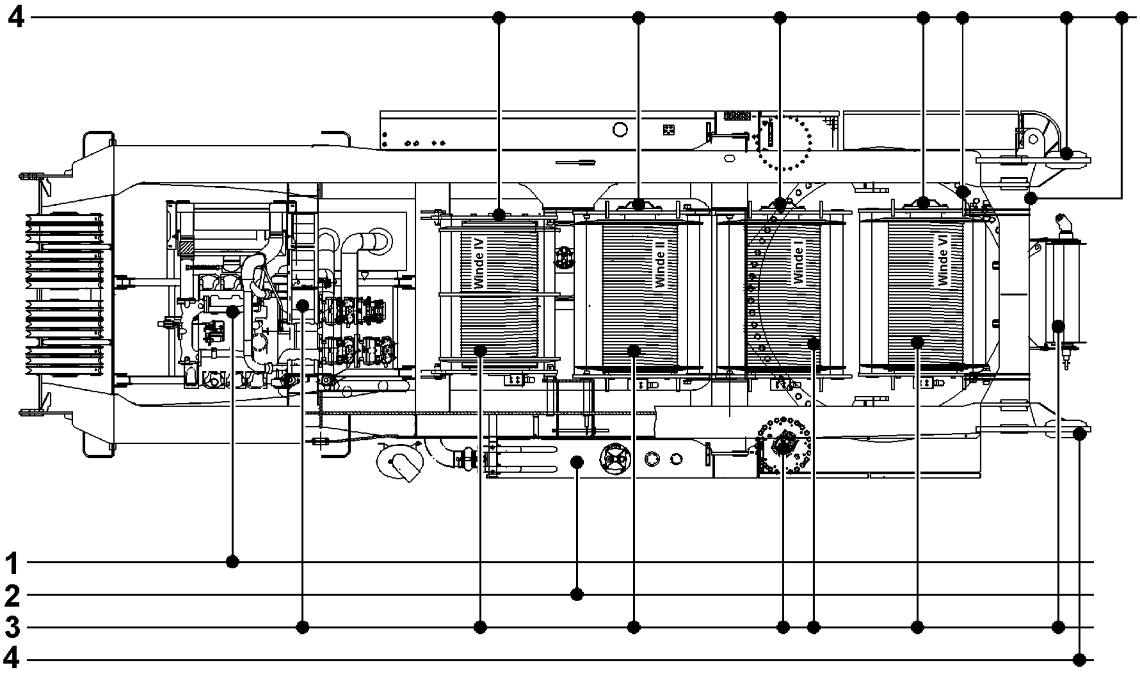
The given quantities are only orientation values.
All filling requirements must be carried out and fulfilled according to the markings on the dip sticks, the glass view ports, etc.

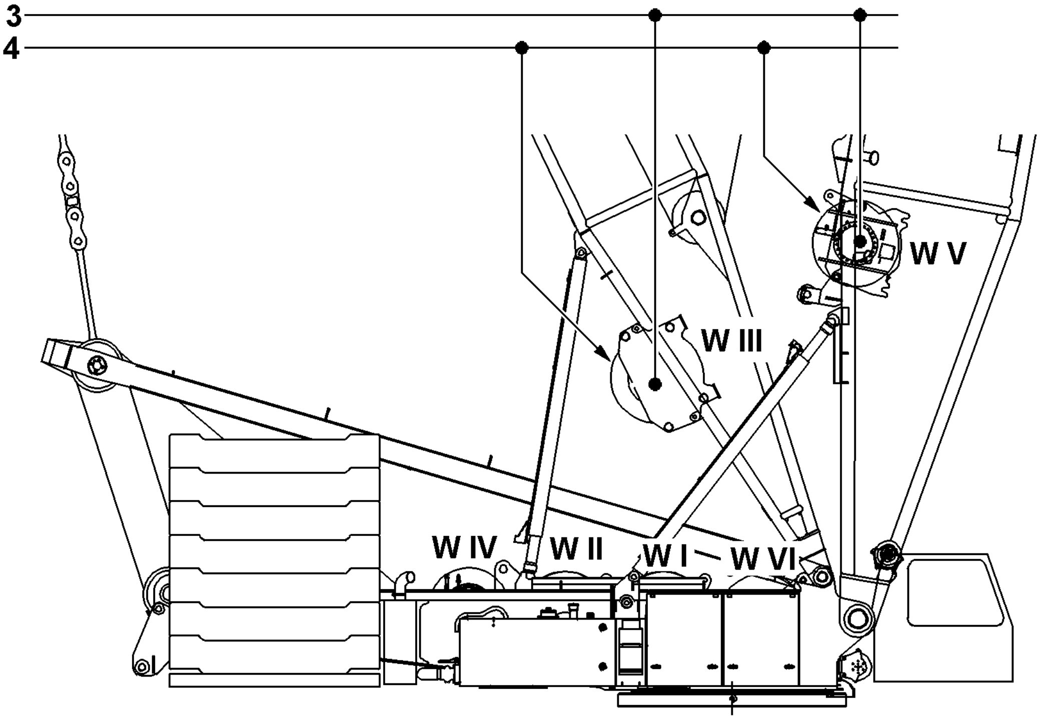
* **Note:** When checking the oil level, all hydraulic jacks must be **retracted.**
The upper markings on the view ports must not be exceeded.

C A U T I O N: Synthetic oil and natural mineral oil cannot be mixed!

Explanation to the lubrication plan:

1 = Engine oil
2 = ATF
3 = Gear oil
4 = Grease


4
Winde IV
Winde II
Winde I
Winde VI
1
2
3
4


3
4
W V
W III
W IV
W II
W I
W VI

189126

Filling capacities

CRANE SUPERSTRUCTURE		appr. Liter
Crane engine Engine oil Coolant		 26,0 40,0
Fuel tank Diesel		 700,0
Pump distribution gear synthetic gear oil		 7,7
Winch I, II, III, V, VI synthetic gear oil	per winch	9,0
Winch IV synthetic gear oil		 12,0
Slewing gear Synthetic gear oil		23,0
Slewing gear brake ATF		0,2
Assembly winch synthetic gear oil		 0,4
Hydraulic fluid tank, crane hydraulic* ATF		 350,0
Central lubrication system - slewing connection Special grease		appr. 4 kg
Central lubrication system - winches etc. Special grease		appr. 4 kg

The given quantities are only orientation values.
All filling requirements must be carried out and fulfilled according to the markings on the dip sticks, the glass view ports, etc.

* **Note:** When checking the oil level, all hydraulic jacks must be retracted.
The upper markings on the view ports must not be exceeded.

C A U T I O N: **Synthetic oil and natural mineral oil cannot be mixed!**

Explanation to the lubrication plan:

1 = Engine oil
2 = ATF
3 = Gear oil
4 = Grease

Hinweis: Um die Kaltstartfähigkeit des Dieselmotors bei einer Umgebungstemperatur unter -10 °C zu verbessern, empfehlen wir die Verwendung von folgendem Motorenöl: Viskositätsklasse SAE 5W-30 nach Spezifikation ACEA E4.

To improve the cold start ability oftheDiesel 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.

Afin d'améliorer la capacité de démarrage à frois du moteur Diesel à des températures ambiantes inférieures à -10 °C, nous recommandons l'utilisation de l'huile moteur suivante :
Classe de viscosité SAE 5W-30 selon spécification ACEA E4.

<table>
<tr><td colspan="4">Vorgeschriebene Schmierstoffe für LIEBHERR Krane
Approved lubricants for LIEBHERR cranes
Lubrifiants prescrits pour les grues LIEBHERR</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Verwendungszweck

Intended use

Application</td><td colspan="2">Umgebungstemperatur für den Fahr- und Kranbetrieb
Ambient temperature for travel and crane operation
Température ambiante pour le mode translation et le mode grue</td></tr>
<tr><td>– 25 °C → + 50 °C</td><td>– 40 °C → + 30 °C</td></tr>
<tr><td>1</td><td>Dieselmotor
diesel engine
moteur Diesel</td><td>SAE 10W-40
API CG-4
ACEA E3-96, E4-96
LWE-Identnr.: 861005408

unter – 20 °C mit Vorwärmung
below – 20 °C with preheating
en-dessous de – 20 °C avec préchauffage</td><td>SAE 10W-40
API CG-4
ACEA E3-96, E4-96
LWE-Identnr.: 861005408

unter – 20 °C mit Vorwärmung
below – 20 °C with preheating
en-dessous de – 20 °C avec préchauffage</td></tr>
</table>

Vorgeschriebene Schmierstoffe für LIEBHERR Krane
Approved lubricants for LIEBHERR cranes
Lubrifiants prescrits pour les grues LIEBHERR

	Verwendungszweck **Intended use** **Application**	**Umgebungstemperatur für den Fahr- und Kranbetrieb** **Ambient temperature for travel and crane operation** **Température ambiante pour le mode translation et le mode grue**	
		– 25 °C → + 50 °C	**– 40 °C → + 30 °C**
2	Antriebsachse mit Differentialen, Planetengetrieben und angebautem Verteilergetriebe driving axle with differential, planetary gears and flanged transfer case essieu moteur à différentiel, réducteurs planétaires et boîte transfert Achsantieb ZF DK-7 axle drive ZF DK-7 entraînement des essieux ZF DK-7 Fahrzeug Verteilergetriebe transfer box boîte de transfert KESSLER VG 1800 / 2400 / 2550 / 2600 / 3750 W 3750 ZF Passau, STEYR PUCH VG 1200 / 1600 / 2000 / 3800 Versatzgetriebe (drop box) drop box decaleur de boîte de transfert ZF Passau, STEYR PUCH	SAE 90 API GL 5 ZF TE-ML 05 LWE-Identnr.: 861901008	SAE 75W-90 API GL 5 ZF TE-ML 05 LWE-Identnr.: 861904014
3	Pumpen-Verteilergetriebe pump transfer cases boîtes transfert de pompes	SAE 90 API GL 5 ZF TE-ML 05 LWE-Identnr.: 861901008	SAE 75W-90 API GL 5 ZF TE-ML 05 LWE-Identnr.: 861904014
	Pumpen-Verteilergetriebe pump transfer cases boîtes transfert de pompes PVG 351 C 385	SAE 75W-90 API GL 5 ZF TE-ML 05 LWE-Identnr.: 861904014	SAE 75W-90 API GL 5 ZF TE-ML 05 LWE-Identnr.: 861904014

Vorgeschriebene Schmierstoffe für LIEBHERR Krane
Approved lubricants for LIEBHERR cranes
Lubrifiants prescrits pour les grues LIEBHERR

	Verwendungszweck **Intended use** **Application**	**Umgebungstemperatur für den Fahr- und Kranbetrieb** **Ambient temperature for travel and crane operation** **Température ambiante pour le mode translation et le mode grue** **– 25 °C → + 50 °C**	 **– 40 °C → + 30 °C**
4	Wendegetriebe ZF reversing transmission ZF boîtes d'inversion ZF WG-120, WG-150, WG-180, WG-181, WG-200, WG-201 Versatzgetriebe (drop box) drop box decaleur de boîte de transfert ALLISON Lastschaltgetriebe power shift gears boîtes de vitesse et d'inversion CLARK	SAE 10W-40 API CG-4 ACEA E2-96, E3-96, E4-96 ZF TE-ML 03 LWE-Identnr.: 861005408 **unter – 20 °C** warmfahren gemäß Betriebsanleitung **below – 20 °C** warm up in accordance with operating instructions **en-dessous de – 20 °C** mise en température conformément aux instructions du manuel d'utilisation	ATF II D ALLISON C4 ZF TE-ML 03 LWE-Identnr.: 861900608 **unter – 20 °C** warmfahren gemäß Betriebsanleitung **below – 20 °C** warm up in accordance with operating instructions **en-dessous de – 20 °C** mise en température conformément aux instructions du manuel d'utilisation
5	Automatikgetriebe automatic transmissions boîtes de vitesses automatiques ALLISON CLBT 740 / 750 / 754 / 755 HT 755 / HD 4560	ATF Dexron III ALLISON C4 **unter – 20 °C** warmfahren gemäß Betriebsanleitung **below – 20 °C** warm up in accordance with operating instructions **en-dessous de – 20 °C** mise en température conformément aux instructions du manuel d'utilisation	CASTROL Transynd LWE-Identnr.: 861903708 **unter – 20 °C** warmfahren gemäß Betriebsanleitung **below – 20 °C** warm up in accordance with operating instructions **en-dessous de – 20 °C** mise en température conformément aux instructions du manuel d'utilisation
	Automatikgetriebe ZF automatic transmissions ZF boîtes de vitesses automatiques ZF Wendegetriebe ZF reversing transmission ZF boîtes d'inversion ZF 6 WG-210, 6 WG-251*, 6 WG-260 ZF Ergopower 6 WG-310 * auch bei Umgebungstemperaturen über -10 °C in case of an ambient temperature over -10°C as well aussi en cas d'une température ambiante au-dessous de -10°C	ATF II D ZF TE-ML 03 LWE-Identnr.: 861900608 **unter – 20 °C** warmfahren gemäß Betriebsanleitung **below – 20 °C** warm up in accordance with operating instructions **en-dessous de – 20 °C** mise en température conformément aux instructions du manuel d'utilisation	ATF II D ZF TE-ML 03 LWE-Identnr.: 861900608 **unter – 20 °C** warmfahren gemäß Betriebsanleitung **below – 20 °C** warm up in accordance with operating instructions **en-dessous de – 20 °C** mise en température conformément aux instructions du manuel d'utilisation

<table>
<tr><th colspan="4">Vorgeschriebene Schmierstoffe für LIEBHERR Krane
Approved lubricants for LIEBHERR cranes
Lubrifiants prescrits pour les grues LIEBHERR</th></tr>
<tr><th rowspan="2"></th><th rowspan="2">Verwendungszweck

Intended use

Application</th><th colspan="2">Umgebungstemperatur für den Fahr- und Kranbetrieb
Ambient temperature for travel and crane operation
Température ambiante pour le mode translation et le mode grue</th></tr>
<tr><th>– 25 °C → + 50 °C</th><th>– 40 °C → + 30 °C</th></tr>
<tr><td>6</td><td>Automatisiertes Schaltgetriebe
automatic transmission
boîte automatisée
ZF AS-Tronic
ZF TC-Tronic
ZF TC-Tronic HD

Wandlerschaltkupplung ZF TC HD
Converter shifting clutch ZF TC HD
Convertisseur-embrayage ZF TC HD</td><td>ZF-Ecofluid M
ZF TE-ML 02
LWE-Identnr.: 10218305</td><td>ZF-Ecofluid M
ZF TE-ML 02
LWE-Identnr.: 10218305

unter – 35 °C Getriebe gemäß Betriebsanleitung vorwärmen
below – 35 °C preheat gears in accordance with operating instructions
en-dessous de – 35 °C préchauffer la boîte de vitesses conformément aux instructions du manuel d'utilisation</td></tr>
<tr><td>7</td><td>Wandlerschaltkupplung ZF TC 2
Converter shifting clutch ZF TC 2
Convertisseur-embrayage ZF TC 2</td><td>ATF II D
ZF TE-ML 14
LWE-Identnr.: 861900608</td><td>ATF II D
ZF TE-ML 14
LWE-Identnr.: 861900608</td></tr>
<tr><td>8</td><td>Schaltgetriebe ZF
gear box ZF
boîte de vitesses ZF
ECO-Split</td><td>Motorenöl oder Getriebeöl
ZF TE-ML 02
LWE-Identnr.: 861004208</td><td>SAE 75W-90
ZF TE-ML 02
LWE-Identnr.: 861904014</td></tr>
</table>

Vorgeschriebene Schmierstoffe für LIEBHERR Krane
Approved lubricants for LIEBHERR cranes
Lubrifiants prescrits pour les grues LIEBHERR

	Verwendungszweck **Intended use** **Application**	**Umgebungstemperatur für den Fahr- und Kranbetrieb** **Ambient temperature for travel and crane operation** **Température ambiante pour le mode translation et le mode grue**	
		– 25 °C → + 50 °C	**– 40 °C → + 30 °C**
9	Seilwinde winch treuil Drehwerksgetriebe slewing gears mécanismes d'orientation TA-Abspannwinde mit Klinkensperre TA-pawl guy rope winch TA-treuil de haubanage à cliquet	ISO VSG 220 PGLP 220, DIN 51 502 LWE-Identnr.: 861901208 nicht mischbar mit Mineralölen! do not mix with mineral oils! non miscible avec des huiles minérales!	ISO VSG 220 PGLP 220, DIN 51 502 LWE-Identnr.: 861901208 nicht mischbar mit Mineralölen! do not mix with mineral oils! non miscible avec des huiles minérales!
10	Kranhydraulik für Kranfahrgestell und Kranoberwagen crane hydraulics for crane carrier and crane superstructure hydrauliques pour châssis porteur et partie tournante	ATF II D LWE-Identnr.: 861900608	AVILUB Artic 32 LWE-Identnr.: 10038346
	Kranhydraulik für LTC Krane crane hydraulics for LTC cranes hydrauliques pour grues LTC	Syntofluid PE-B 30 LWE-Identnr.: 10115282	Syntofluid PE-B 30 LWE-Identnr.: 10115282
11	Bremsanlage, wenn hydraulisch betätigt brake system if hydraulically actuated système de frein, si il est commandé hydrauliquement Kupplungsbetätigung clutch actuation commande du dispositif d'accouplement	DOT 4 SAE J 1703e LWE-Identnr.: 861000108	DOT 4 SAE J 1703e LWE-Identnr.: 861000108

Vorgeschriebene Schmierstoffe für LIEBHERR Krane **Approved lubricants for LIEBHERR cranes** **Lubrifiants prescrits pour les grues LIEBHERR**			
	Verwendungszweck **Intended use** **Application**	**Umgebungstemperatur für den Fahr- und Kranbetrieb** **Ambient temperature for travel and crane operation** **Température ambiante pour le mode translation et le mode grue**	
		– 25 °C → + 50 °C	**– 40 °C → + 30 °C**
12	Allgemeine Gleit- und Wälzlagerungen wälzgelagerte Gelenke general plain and roller bearings joints on rolling bearings paliers lisses et à rouleaux courants articulations à palier Zentralschmieranlage Kranoberwagen centralized lubricating system crane superstrcture graissage central partie tournante Auslegerverriegelung boom locking verrouillage de la flèche Drehkranz-Wälzlagerungerungen slewing ring rolling bearings paliers couronnes d'orientation Gelenkwellen, wenn nicht wartungsfrei cardan shafts if not maintenance-free arbres articulés, si ils ne sont pas exempts d'entretien	Sondervorschrift: LIEBHERR Spezialfett 9610 PLUS LWE-Identnr.: 861301308 special prescription: LIEBHERR special grease 9610 PLUS prescription spéciale: LIEBHERR graisse spéciale 9610 PLUS	Sondervorschrift: LIEBHERR Spezialfett 9610 PLUS LWE-Identnr.: 861301308 special prescription: LIEBHERR special grease 9610 PLUS prescription spéciale: LIEBHERR graisse spéciale 9610 PLUS
13	Kunststoff-Gleitlagerungen des Teleskopauslegers synthetic sliding bearings of the telescopic boom paliers de guidage synthétique de la flèche télescopique Kunststoff-Gleitlagerungen der Schiebeholme synthetic sliding bearings of the outriggers paliers de guidage synthétique des stabilisateurs Abstützplatten mit Ausgleich Outrigger plates with compensation Patins de calage avec compensation	Sondervorschrift: LIEBHERR Spezialfett 9613 LWE-Identnr.: 861303608 special prescription: LIEBHERR special grease 9613 prescription spéciale: LIEBHERR graisse spéciale 9613	Sondervorschrift: LIEBHERR Spezialfett 1026 LS LWE-Identnr.: 861302608 special prescription: LIEBHERR special grease 1026 LS prescription spéciale: LIEBHERR graisse spéciale 1026 LS

Vorgeschriebene Schmierstoffe für LIEBHERR Krane Approved lubricants for LIEBHERR cranes Lubrifiants prescrits pour les grues LIEBHERR			
	Verwendungszweck **Intended use** **Application**	**Umgebungstemperatur für den Fahr- und Kranbetrieb** **Ambient temperature for travel and crane operation** **Température ambiante pour le mode translation et le mode grue**	
		– 25 °C → + 50 °C	**– 40 °C → + 30 °C**
14	Außengleitlagerung des Teleskopauslegers external slide bearing application of the telescopic boom palier lisse extérieur de la flèche télescopique Innengleitlagerung des Teleskopauslegers (nur bei Montage) internal slide bearing application of the telescopic boom (only at assembly) palier lisse intérieur de la flèche télescopique (seulement lors du montage)	Sondervorschrift: LIEBHERR Spezialfett 1336 mit Lösungsmittel LM (Sprühfett) LWE-Identnr.: 861303308 special prescription: LIEBHERR special grease1336 with LM carrier (spray grease) prescription spéciale: LIEBHERR graisse spéciale1336 à véhicule LM (graisse à pulvériser)	Sondervorschrift: LIEBHERR Spezialfett 1336 mit Lösungsmittel LM (Sprühfett) LWE-Identnr.: 861303308 special prescription: LIEBHERR special grease1336 with LM carrier (spray grease) prescription spéciale: LIEBHERR graisse spéciale1336 à véhicule LM (graisse à pulvériser)
15	Offene Verzahnung der Drehkränze open toothing of slewing rings denture des couronnes d'orientation Laufende Seile running ropes câbles déroulants	Haftschmierstoff OGPF 2 S-30, DIN 51 502 (wasserbeständig) LWE-Identnr.: 861301508 adhesive lubricant OGPF 2 S-30, DIN 51 502 (water resistant) lubrifiant adhésif OGPF 2 S-30, DIN 51 502 (résistant à l'eau)	Haftschmierstoff OGPF 2 S-30, DIN 51 502 (wasserbeständig) LWE-Identnr.: 861301508 adhesive lubricant OGPF 2 S-30, DIN 51 502 (water resistant) lubrifiant adhésif OGPF 2 S-30, DIN 51 502 (résistant à l'eau)

	Vorgeschriebene Schmierstoffe für LIEBHERR Krane **Approved lubricants for LIEBHERR cranes** **Lubrifiants prescrits pour les grues LIEBHERR**		
	Verwendungszweck **Intended use** **Application**	**Umgebungstemperatur für den Fahr- und Kranbetrieb** **Ambient temperature for travel and crane operation** **Température ambiante pour le mode translation et le mode grue**	
		– 25 °C → + 50 °C	**– 40 °C → + 30 °C**
16	Kühlerfüllung für Dieselmotoren und Heizanlagen radiator filling for Diesel engines and heatings remplissage de radiateur pour moteurs Diesel et chauffages	Kühlerschutzmittel LIEBHERR-Norm 50 % Korrosions- / Frostschutzmittel LWE-Identnr.: 861600508 50 % Wasser radiator protective agent LIEBHERR standard 50 % corrosion preventatives / antifreeze fluids 50 % water agent de protection de radiateur norme LIEBHERR 50 % produit antigel / anticorrosion 50 % eau	Kühlerschutzmittel LIEBHERR-Norm 50 % Korrosions- / Frostschutzmittel LWE-Identnr.: 861600508 50 % Wasser radiator protective agent LIEBHERR standard 50 % corrosion preventatives / antifreeze fluids 50 % water agent de protection de radiateur norme LIEBHERR 50 % produit antigel / anticorrosion 50 % eau
17	Fahrgetriebe für Raupenkran travel gear transmission for crawler crane réducteur de translation pour grues sur chenilles	siehe Typenschild see gear rating plate voir la plaque signalétique	siehe Typenschild see gear rating plate voir la plaque signalétique
18	Bergewinde recovery winch treuil de remorquage	siehe Typenschild see gear rating plate voir la plaque signalétique	siehe Typenschild see gear rating plate voir la plaque signalétique
	Seil der Bergewinde rope of the recovry winch câble du treuil de remorquage	Sondervorschrift: special prescription: prescription spéciale: Motorex TW-Fluid LWE-Identnr.: 861008608	Sondervorschrift: special prescription: prescription spéciale: Motorex TW-Fluid LWE-Identnr.: 861008608

Chapter 8

Crane inspections

General
This crane has been inspected before delivery at the factory, according to the valid ISO, FEM and DIN standards or BGV D6 (BGG 905).

During crane operation, deviation may occur from the safety standard, which had existed at initial delivery. Such deviations can be the result of wear, corrosion, intentional force, environmental changes or application changes.
The operator must take care of the required tasks to maintain the same initial standard of safety at all times. For that reason, the crane must be inspected by an experienced technician, depending on conditions of application and operational conditions, at least once a year, counting from the day of initial service. See also: ISO 9927-1, EU machine guidelines (EWG Maschinenrichtlinie) 89/655, BGV D6.
The crane must be inspected by an expert engineer at least once every 4 years, counting from the day of initial service .
After the 12th year in operation, an expert engineer must check the crane annually.

C A U T I O N : **If significant changes had been made on the crane, or after repairs of load carrying part, the operator must have the crane inspected by an experienced technician before putting the crane back in service.**

In addition, national and regional regulations apply.

Experienced technicians are persons who, due to their vocational background and experience, have sufficient knowledge in the field of lifting appliances (cranes) and are sufficiently familiar with the relevant regulations, such as labor laws, OSHA regulations, accident preventions regulations, to determine deviations from the proper and safe conditions (they are specially trained personnel).

Expert engineers are engineers experienced in the design, construction and maintenance of lifting devices, such as cranes, with sufficient knowledge of the relevant regulations and standards, who have equipment necessary to carry out the inspection and are in a position to judge the safe condition of the lifting appliance (crane) and to decide which measures have to be taken in order to ensure further and continued safe operation.

A repeat crane inspection is generally a visual inspection, where the experienced technician / expert engineer inspects the condition of the crane and components. .
This inspection should prevent accidents through timely recognition of defects.
Any defects found by an experienced technician / expert engineer must be documents, remedied and reinspected.

Below, as an example, we have listed certain important items, which must be checked especially during repeat crane inspections. We note that the experienced technicians / expert engineers are solely responsible for carrying out the crane inspection. For that reason, we cannot list the complete range of inspections in this chapter.
Attached is a checklist for the inspector for repeat inspections of **LIEBHERR** mobile and crawler cranes.

If the inspector has any questions, they should be directed via our Service Dept. to the appropriate departments at LIEBHERR-WERK EHINGEN GMBH.

D A N G E R : **Non-observance of the following inspection guidelines or non-adherance of the inspection intervals can lead to a serious accident !**

1. Inspection of load bearing / load carrying steel constructions

The load bearing steel constructions, such as boom , slewing platform, chassis, support systems (sliding arms or folding supports) must be part of a careful inspection at least once a year. Even though the welding seams normally are not in high stress areas, it is nevertheless important to pay special attention to them during this repeat inspection.

We refer to DIN 15018, part 3, point 1, which lists permissible stress figures for highly resilient steel. They also determine the life expectancy of the steel frame work. It cannot only be calculated from the stress figures alone, but also depends on the collective load figures during time of operation. LIEBHERR cranes are designed and sized for installation operation, whereby the following design calculations have been used as a basis (DIN 15018, part 3):
Load collective : S_O (light)
Stress figure: 25 000
For that reason, the load bearing or load carrying parts of the steel construction and the welding seams must be subjected to an especially intensive check during the repeat inspection by an expert engineer.

If the crane was subjected to excessive stress, for example an unusual shock or impact during its time in operation , the inspection of load baring components must be carried out immediately.

If any damage, such as cracks, can be found at any point of the steel construction, then the extend of damage must be determined by expert personnel with the aid of material analysis methods, such as magnetic powder test, ultra sound or X-ray tests. Then it must be determined by expert personnel if the defective section can be repaired by repair welding or by other means.

The following drawings show examples of load bearing welding constructions. For example, welding seams which need to be checked can occur in multiple areas on the steel components and in a variety of shapes. The connections or zones around the points marked by arrows must be checked.

C A U T I O N : **We note that all crane inspections, as far as content and extend, are the sole responsibility of the inspector. The following drawings are given only as an aid for the inspector. The drawings are only examples, and we do not claim that they are complete!**

1.1 Repair welding

In case any problems, such as cracks or distortions are found on the load carrying steel construction, then they must be reported immediately to **LIEBHERR-WERK EHINGEN GMBH** (LWE), **Service Dept.**. In addition, the defect must be inspected immediately by an expert to evaluate the rules of welding techniques. For safety reasons and danger of accidents, he must immediately determine if it is possible to operate the crane until it can be repair welded.

C A U T I O N : In reference to repair welding, the following points must be noted:

1.1.1 Repair welding may only be carried out bz the following persons or service stations:

1.1.1.1 Personnel of **LWE**, or personnel with the corresponding welding certifications according to EN 287-1 for the corresponding material (W 03) and welding procedure, as assigned by **LWE** .

1.1.1.2 Service operations, which hold a Large Qualification certificate according to DIN 18800, Part 7, DIN 15018, and DIN 4132 with expansion for cranes, crane tracks and the following highly and highest tensile fine grained steel:

Sheet metal	S690QL1	W. Nr. 1.8988
Sheet metal	S690QL	W. Nr. 1.8928
Sheet metal	S700MC	W. Nr. 1.8974
Sheet metal	S960QL	W. Nr. 1.8933
Sheet metal	S960MC	W. Nr. -
Sheet metal	S1100QL	W. Nr. 1.8942
Pipes	S770QL	W. Nr. 1.8938
Pipes	S890QL1	W. Nr. 1.8925

Experience in repairs of mobile and crawler cranes with the appropriate material and usage of welding procedures MAGM (135), we well as special arc welding E(111) is a must.

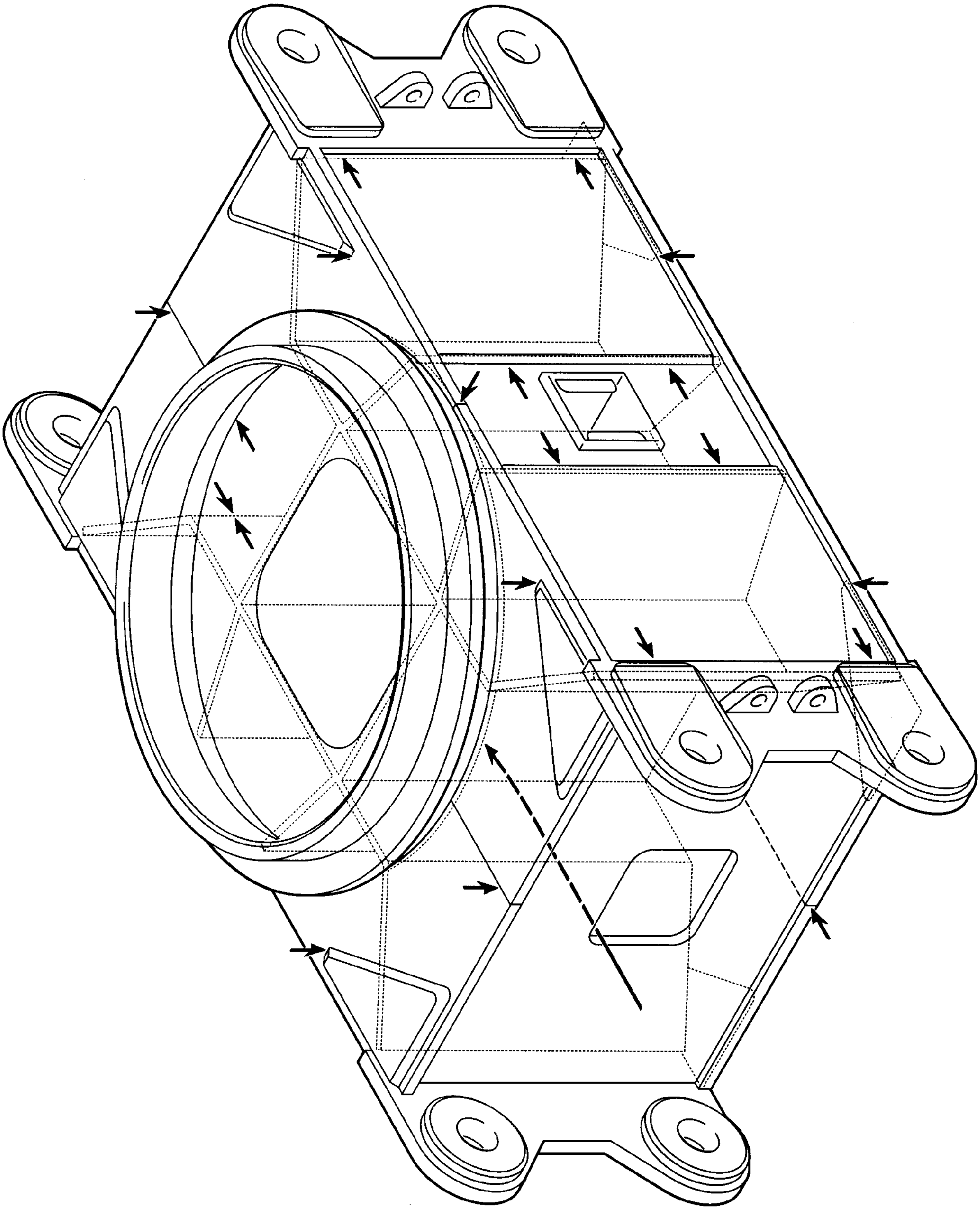
1.1.2 For the repair, a repair instruction with notation of the basic material and the correspoinding welding additives and auxiliary materials must be requested. The required inspections (ZfP) must be carried out and documents.

1.1.3 The repair welding must be carried out according to the latest version of **LWE**' s internal welding guidelines ISR B 010!

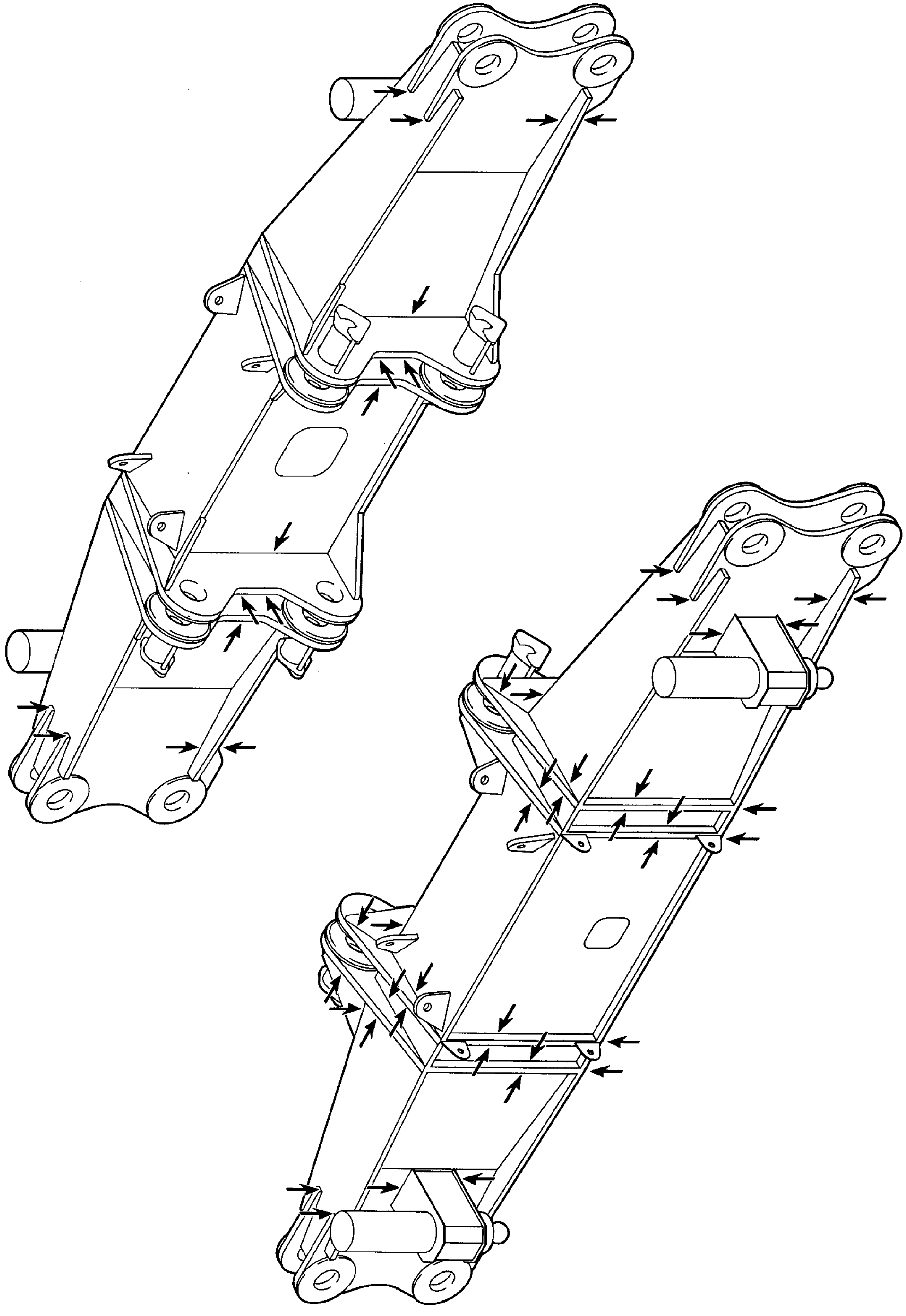
1.1.4 The repaired component must be checked with a **stress test**:
The required test loads and boom configurations must be requested from **LWE** Service!
The successful test must be documented in the crnae inspection ahandbook!

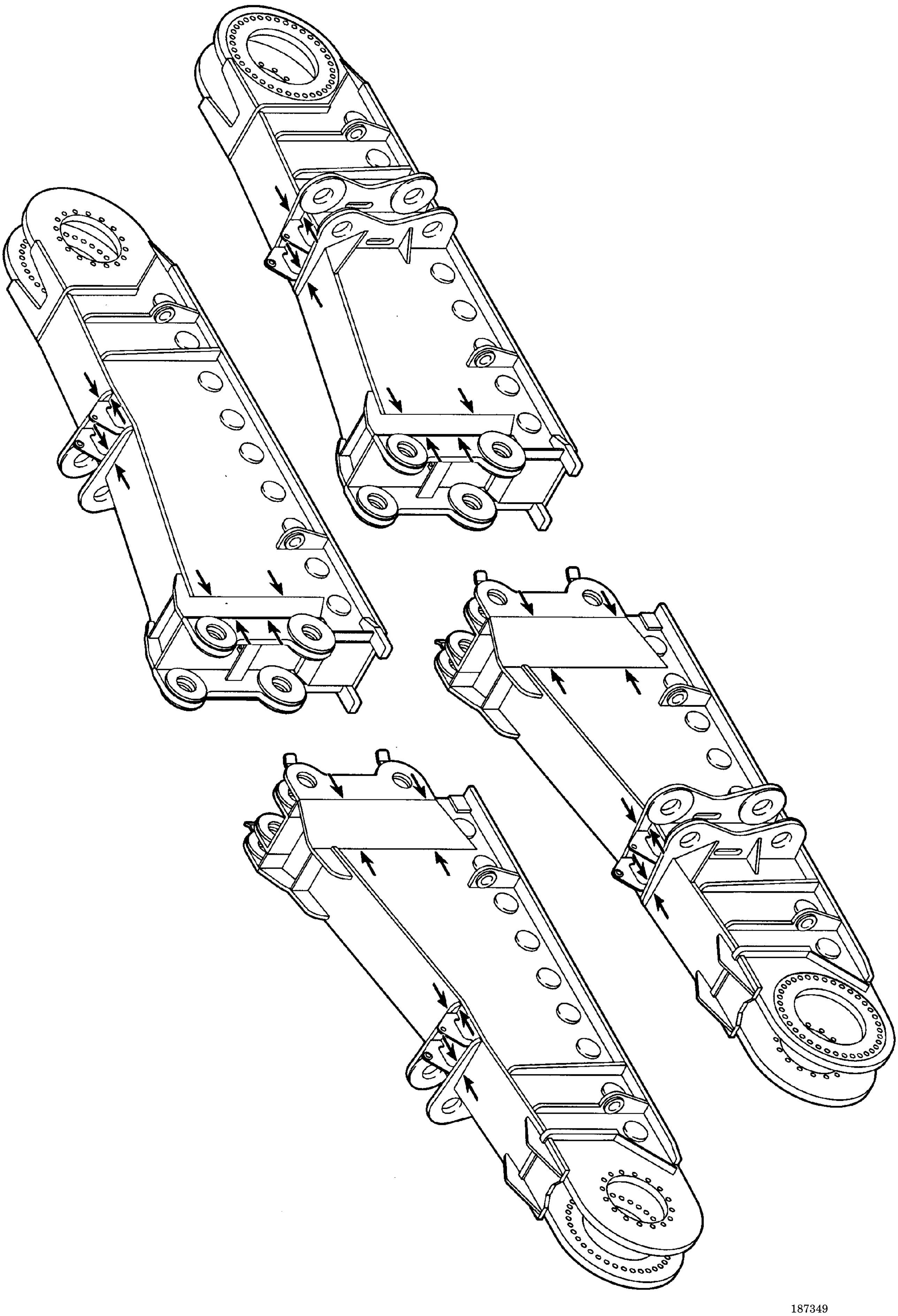
1.1.5 In addition, the accident prevention guidelines **"Basic rules for inspection of cranes by expert or trained personnel according to UVV "Krane" (Cranes) BGV D6 and BGG 905"**, (formerly VBG 9) must be observed !

D A N G E R : **Any violation against these regulations, especially non-observance of welding instructions, can cause severe personnel and property damage!**

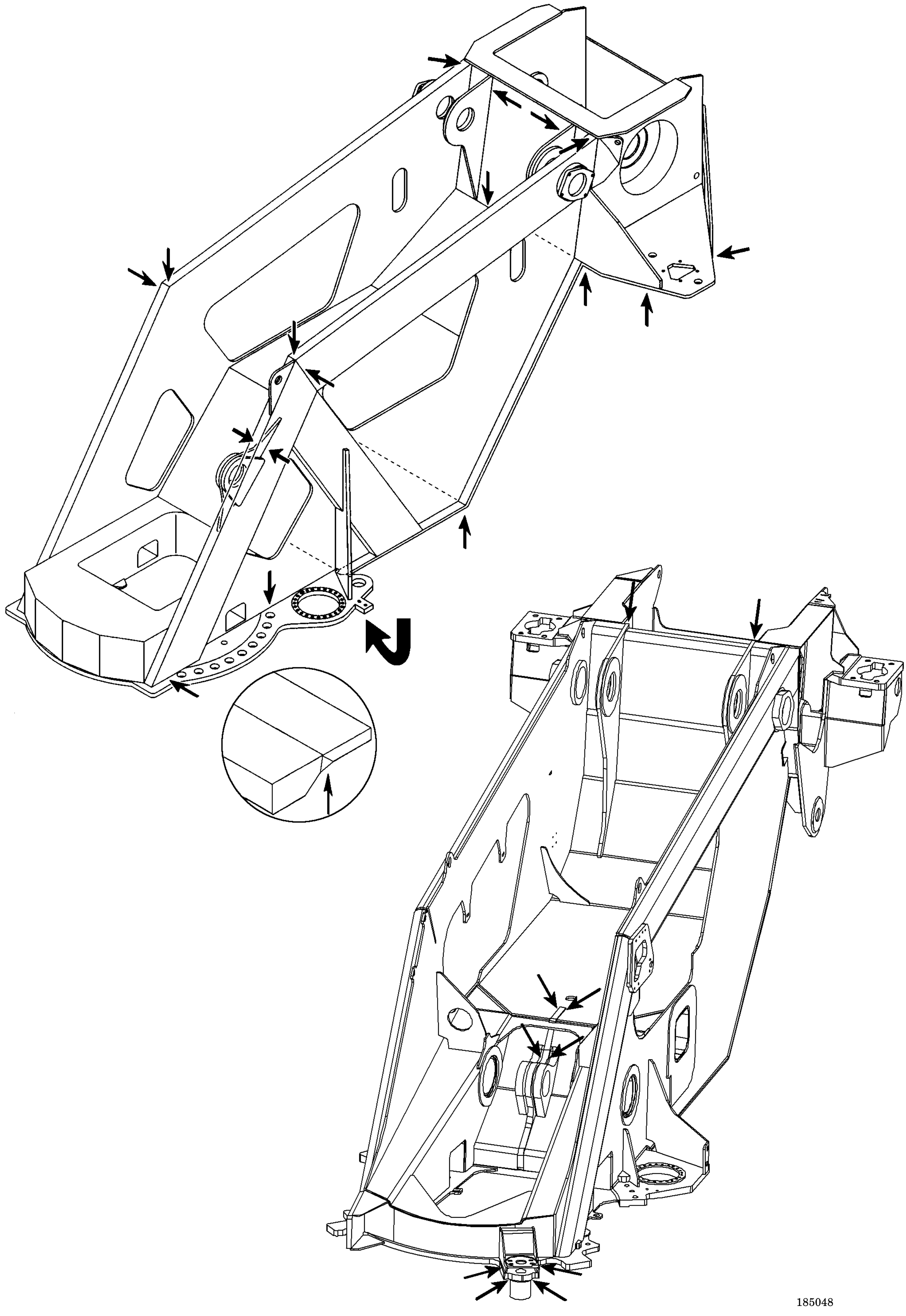


187347

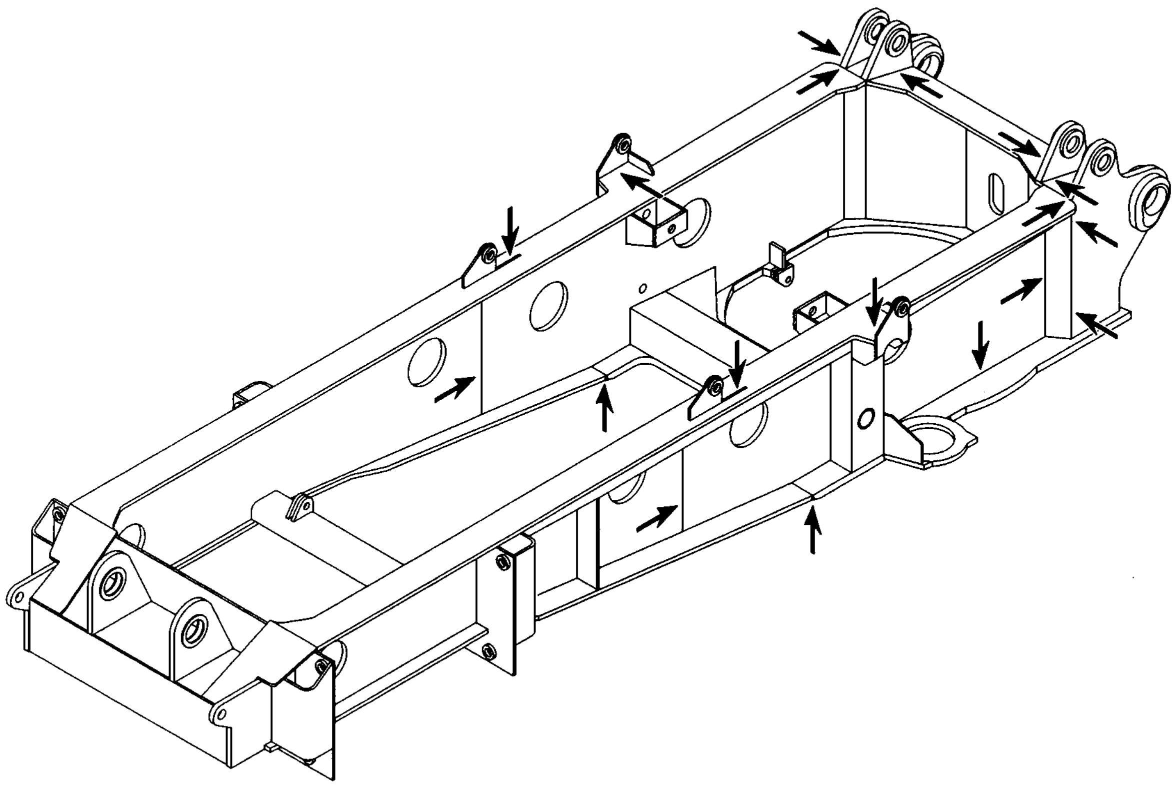

187348


187349

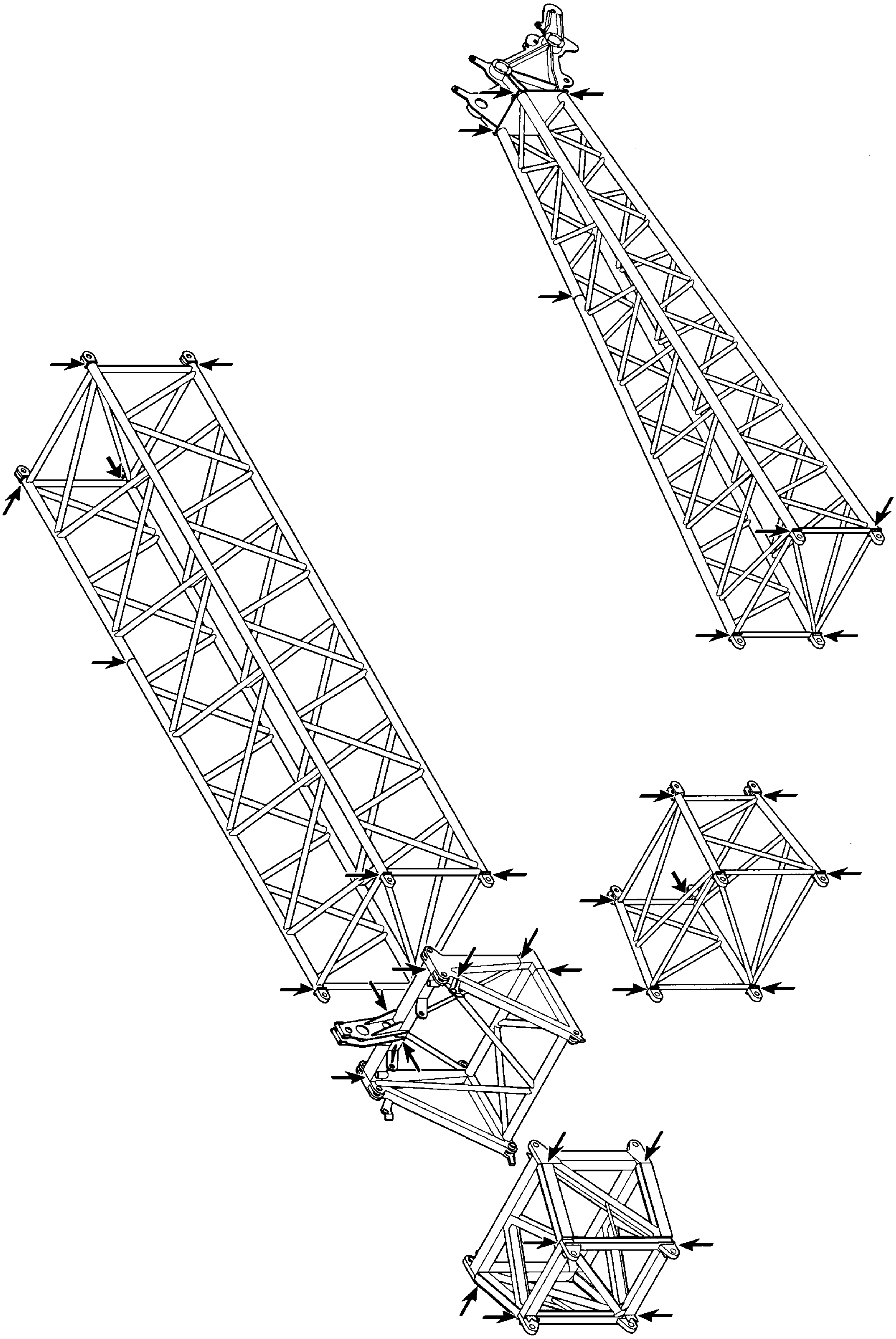
Slewing platform frame



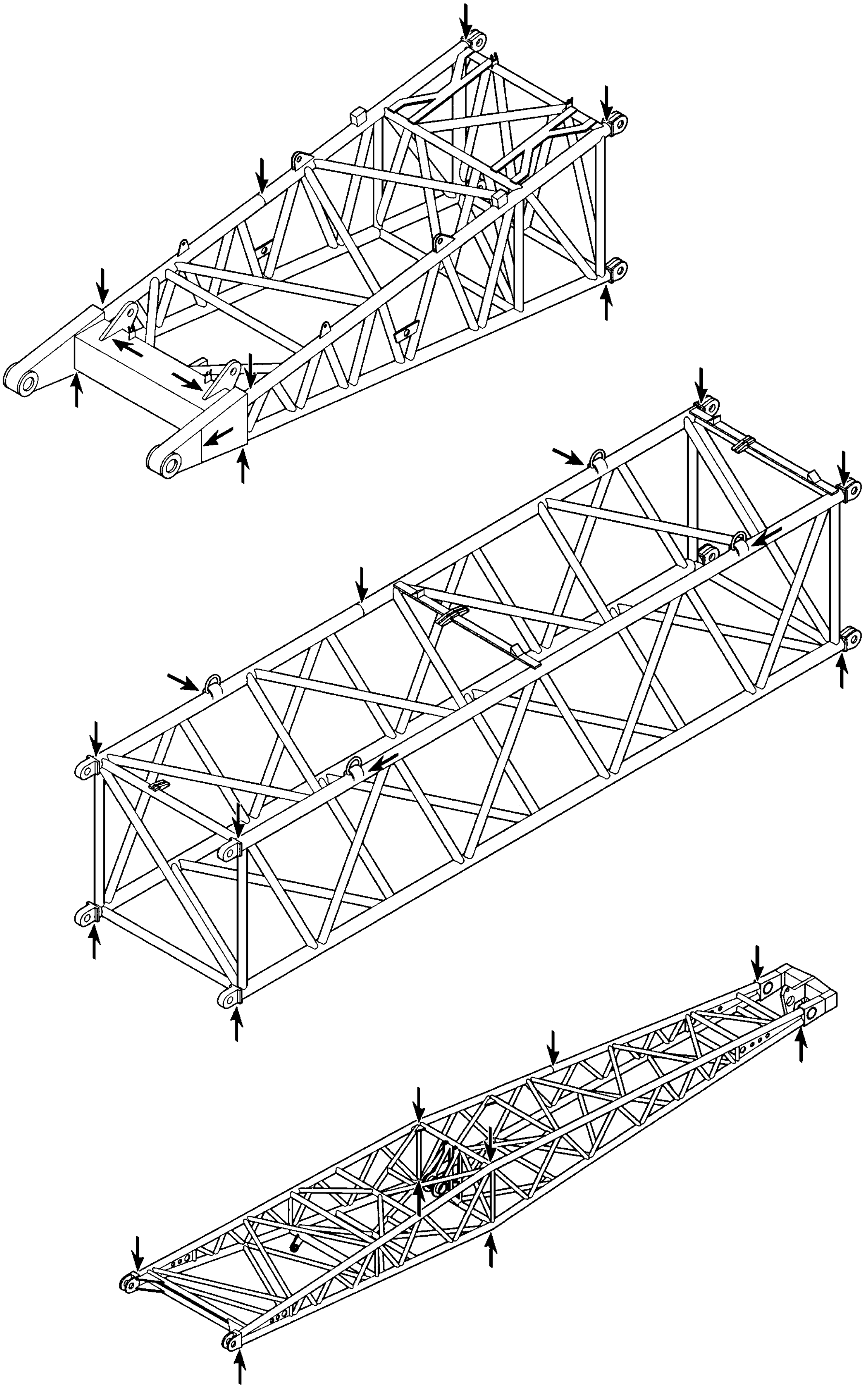
Slewing platform frame



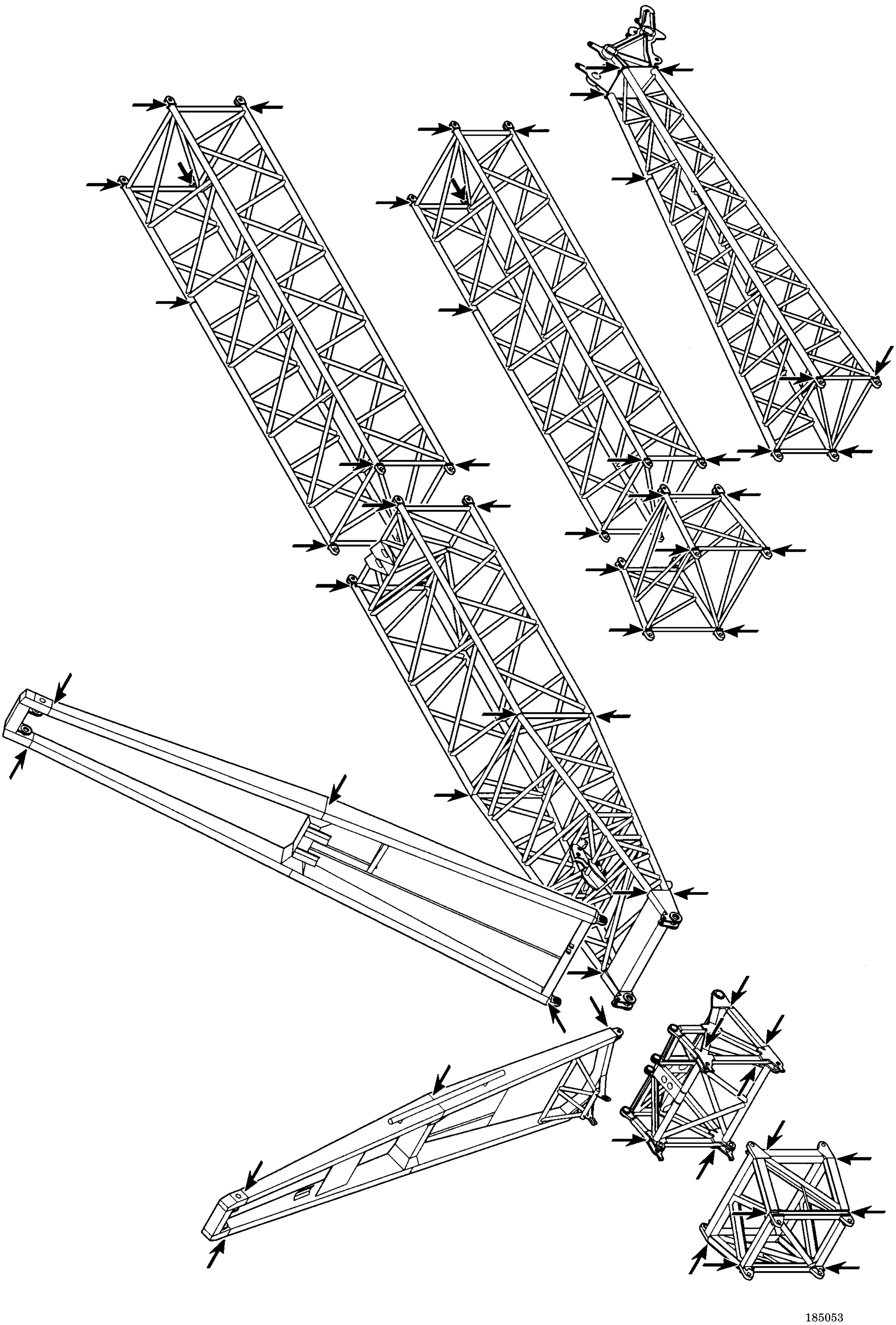
185049

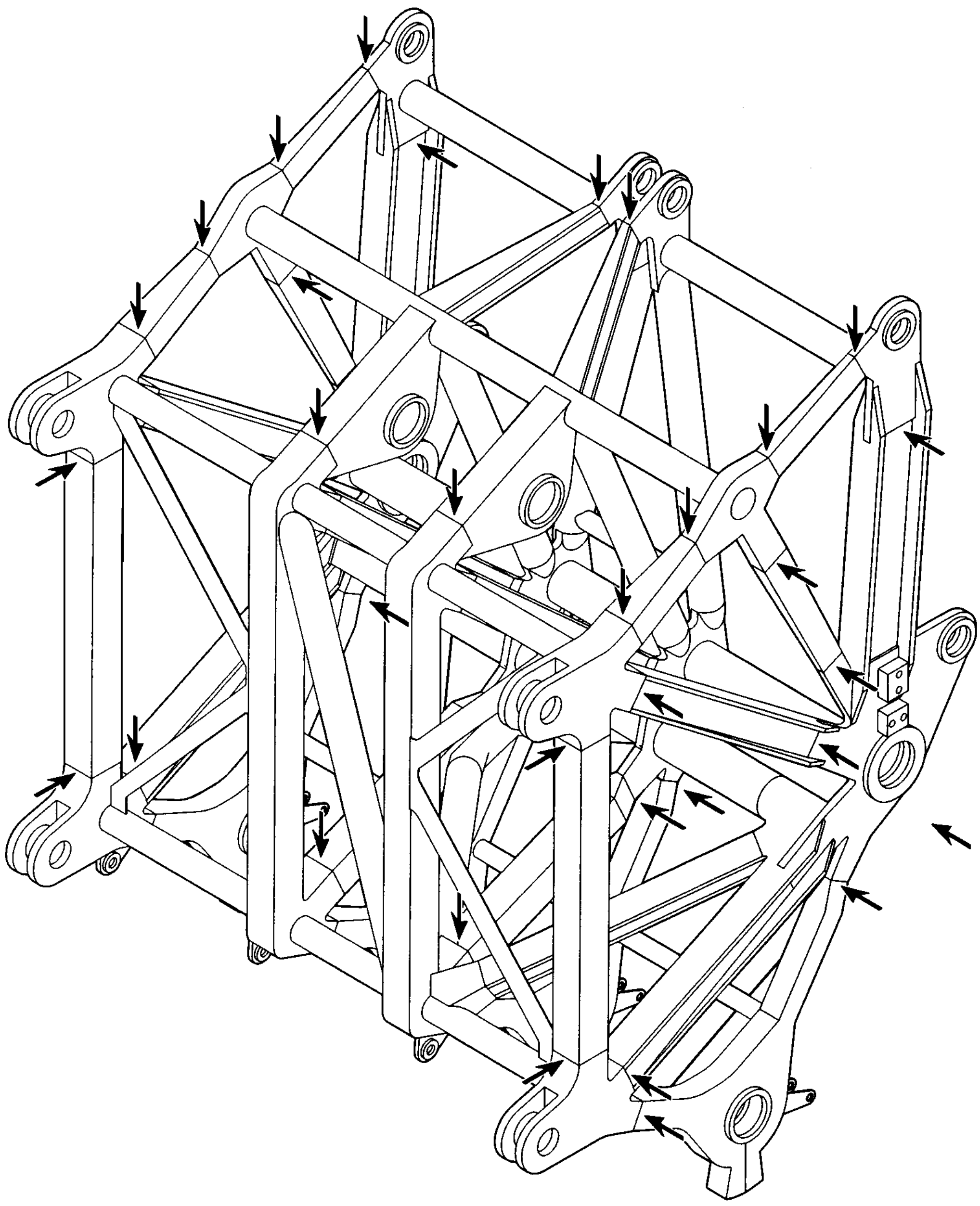

185051

NA / WA- bracket

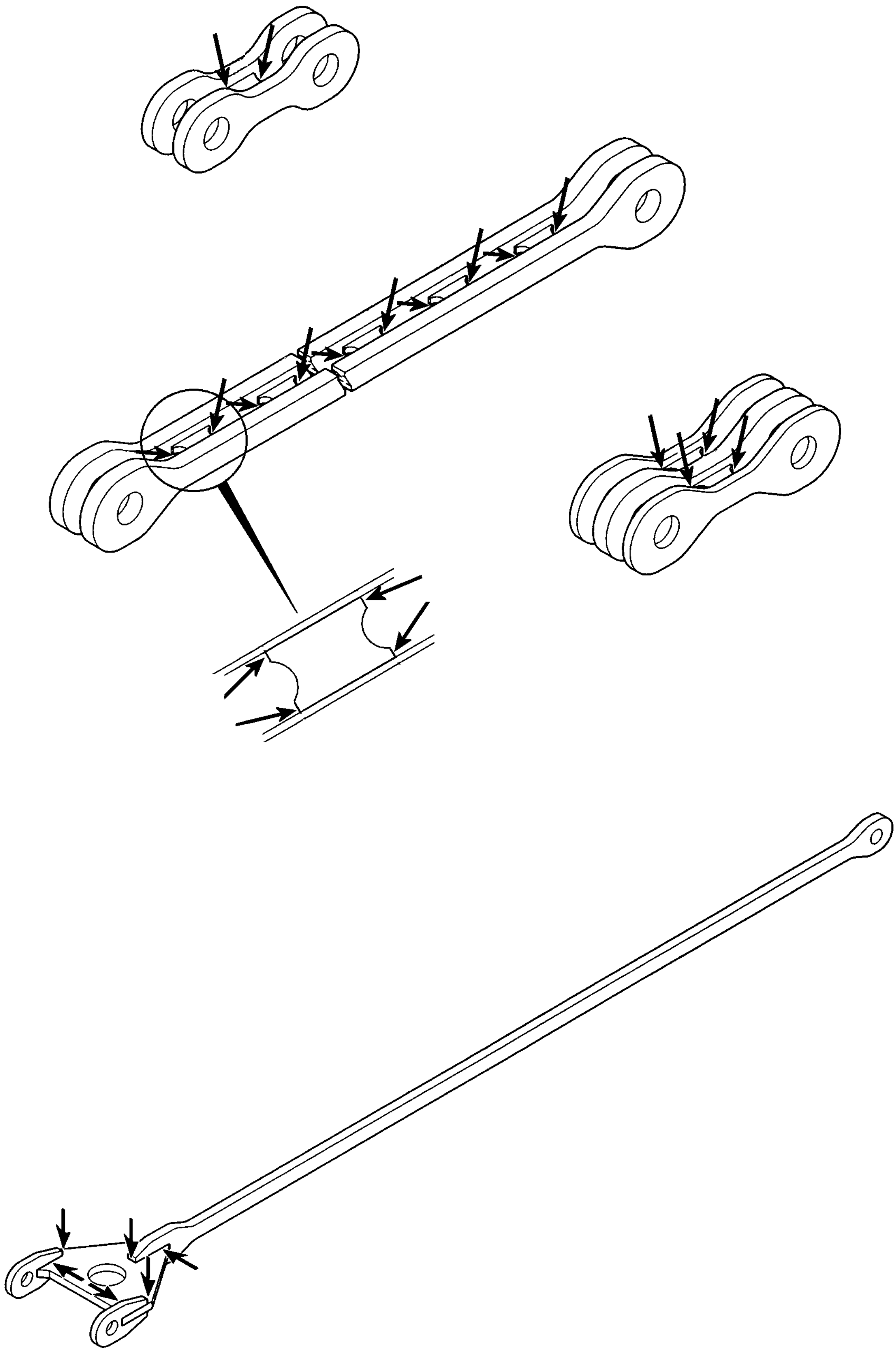


185052

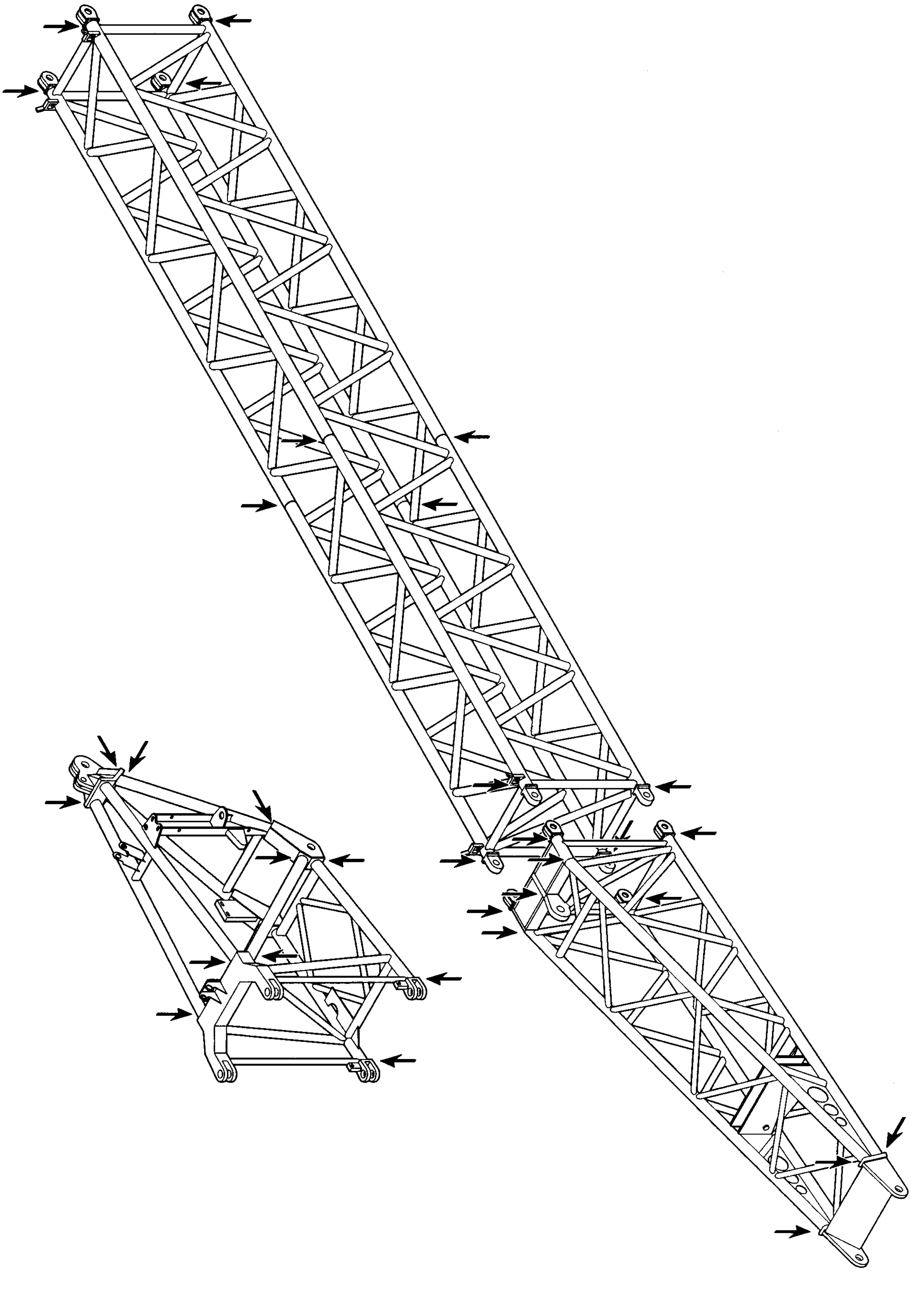

185053



185054



185055


185056

2. Inspection of hoist and pull in winches

The hoist and pull in winches and slewing gears are closed planetary gear versions. These gears have been designed for long service life, drive shafts and gear wheels are also long lasting.

Even though these gears have been designed for long service life, an external visual inspection is not sufficient in this case, because the service life can be influenced by insufficient maintenance (lack of oil), defective seals, improper operation or overuse. For that reason, the inspection must be made by experienced technicians according to the following guidelines:

2.1 Inspections

2.1.1 Inspection intervals
Every 1000 operating hours, at least once a year (annually)

2.1.2 Inspection
Check oil level. On hoist and pull in winches, we recommend to drain the oil and compare the amount with the stipulated oil quantity.

2.1.3 Check color of oil
If the oil is blackened and / or if the oil smells burnt, one can assume that the oil has been overheated. In that case, the oil must be changed.

2.1.4 Check for foreign particles
This test should be done in a qualified lab. The used oil is dropped onto specified filter paper. The oil sample is visually checked under a microscope for foreign particles. If any are found, then the oil must be analyzed by a qualified lab to determine the make up of the particles.

2.1.5 Evaluation of foreign particles found in oil
Maximum permissible foreign particle parts are 0.15% of the total oil quantity, by weight.
Maximum permissible foreign particle size from fine shavings to 0.25 my.
If the above values have been exceeded, remove the gear and check out the cause of increased contamination. Replace any damaged parts and fill the gear with new oil.

C A U T I O N : These repairs may only be made by expertly trained personnel.

2.1.6 Visual inspection
The gears must be checked for leaks, since any loss of oil - aside from environmental contamination - can also lead to gear failure.

2.1.7 Check brakes in gears
Check the brakes at the same time you check the gears.
If the brakes should not hold the required test load of +33% cable pull increase on single line and fully coiled drum, then they must be removed and the cause must be found. If the planetary gear is removed due to increased oil contamination, check the brakes at the same time.

C A U T I O N : Only expertly trained personnel may inspect gears and brakes!

2.1.8 Document completed inspection
The result of annual inspections and repair / reconditioning work, including all completed tasks, must be recorded by the expert or the trained service technician, if necessary, and signed off by the inspection station or specialty shop.
This documentation must be enclosed in the crane inspection booklet and must be recorded in the repeat inspection column.

2.2 Required measures to monitor the winches

2.2.1. Theoretical service life

When calculating and dimensioning the winches for your crane, the designer took certain operating conditions and a calculated total service life time into account, which resulted in a theoretical service life.

The winches in your crane are classified according to DIN report 1, ISO 4301/1 or FEM 9.511, as follows:

Drive group:	M3 (1 Bm)
Load collective:	Q1 (L1)
Factor of load collective Km:	0.125
Theoretical service life D:	3200 hrs.

C A U T I O N : The "theoretical service life" may not be equated with the real (actual) service life of a winch!

The real service life for a winch is influenced by many external matters, such as :

1. Overloads: because the crane was not utilized as intended

2. Insufficient maintenance: oil has not been changed at the proper intervals

3. Erroneous operation : extreme acceleration or deceleration of the load
   Load fell into the cables

4. Maintenance errors: Use of wrong oil
   Wrong quantity
   Contamination during oil change

5. Installation errors during repair or maintenance

6. Leakages which were not taken care of

7. Improperly adjusted safety devices

8. Hidden accident damage

9. Extreme ambient conditions: Low or high temperatures
   aggressive atmosphere
   Dust and dirt

2.2.2 Used portion of theoretical service life

The crane operator is obligated to have the crane inspected at least once a year (ISO 9927-1 and BGV D8).

The used portion of the theoretical service life must also be determined. If necessary,the crane operator must call in an expert.

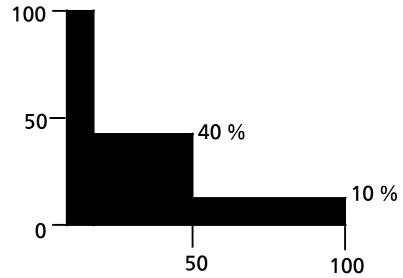
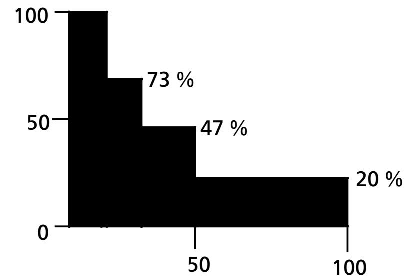
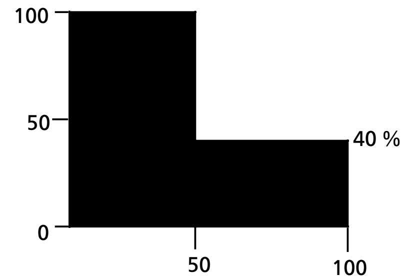
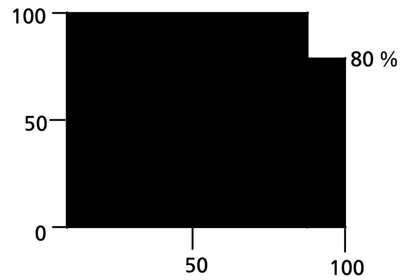
When determining the used portion of the theoretical service life, the actual operating conditions (load collective) and the operating hours of hoist gears per inspection interval must be determined. The user is responsible to have it documented in the crane inspection booklet.

2.2.2.1 Determining the operating conditions (Load collective)

The load collective of the crane is divided into groups; see also DIN report 1, ISO4301/1 or FEM 1.001.

From the determination of the actual operating conditions, choose one of the following load collectives and enter them in the crane inspection book for the corresponding inspection interval.
A more exact determination of the load collective is permissible (see FEM 9.755).

Note: For mobile cranes in assembly operation, we normally use the load collective L1 (Q1), with the load collective factor Km = 0.125.

Load collective Classification	Definition	Service life portion	Factor of load collective	Graphic view
Light Q 1 L 1	Drive gear or parts thereof, which run only at high utilization in exceptional cases , but are subjected to constant, but only light duty	10 % of running time with largest load (dead load + 1/1 load capacity) 40 % of running time with dead load + 1/3 load capacity) 50 % of running time with only dead load	Km = 0,125	Load %  Running time %
Medium Q 2 L 2	Drive gear or parts thereof, which often run at high utilization, but are subjected to light duty	1/6of running time with largest load (dead load + 1/1 load capacity) 1/6 of running time with dead load + 2/3 load capacity 1/6 of running time with dead load + 1/3 load capacity 50 % of running time only with dead load	Km = 0,25	Load %  Running time %
Heavy Q 3 L 3	Drive gear or parts thereof, which often run at high utilization, but are subjected to constant medium duty	50 % of running time with largest load (dead load + 1/1 load capacity) 50 % of running time only with dead load	Km = 0,5	Load %  Running time %
Very heavy Q 4 L 4	Drive gear or parts thereof, which regularly run at high utilization, and are subjected to constant heavy duty	90 % of running time with largest load (dead load + 1/1 load capacity) 10 %of running time only with dead load	Km = 1	Load %  Running time %

2.2.2.2 Determining the effective operating hours T_i
The effective operating hours, as determined as follows, must be entered in the crane inspection booklet for the corresponding inspection interval.

Differentiation is made for the following 4 cases:

2.2.2.2.1 Hour meter is on every winch
If your crane is equipped with an hour meter on every winch, then the effective umber of operating hours T_i per inspection interval can be read directly.

2.2.2.2.2 Hour meter for the total crane operation
The winch operation portion of the total operating hours of the superstructure must be guessed.

Note: For mobile cranes in assembly operation, normally, when hoist winches are used, 20% of the total superstructure operating hours can be contributed to winch operation.

2.2.2.2.3 Hour meter for both travel and crane operation
The winch operation portion of the total operating hours of the superstructure must be guessed.

Note: For mobile cranes in assembly operation, normally, 60% of the total operating hours can be contributed to superstructure operation. If 20% of the total superstructure operating hours can be contributed to winch operation (see paragraph 2.2.2.2.2), the result would be 12% of the **total** crane operating hours.

2.2.2.2.4 If there is no hour meter at all
In this case, the operator must guess and document the actual winch operating hours .

Note: The given percentage values apply normally for the main hoist winch. For auxiliary hoist winches or adjustable boom winches, the actual share of total operating hours can be significantly less and must therefore be guessed by the operator.

2.2.2.3 To determine the used portion of the theoretical service life

For an inspection interval i (max. 1 year after ISO 9927-1 or BGV D8), the used portion S_i of the theoretical service life is determined according to the following formula:

$$S_i = \frac{Km_i}{Km} \times T_i$$

Km = Factor of load collective, which was the basis when calculating the winch. This factor can be taken from the Operation Manual.

Km_i = Factor of load collective in the inspection interval i according to paragraph 2.2.2.1

T_i = effective operating hours in the inspection interval i according to paragraph 2.2.2.2

This used portion is taken off after each inspection interval from the remaining theoretical service life D_i (see example).

If the remaining theoretical service life is insufficient for the next operating period, then the winch must be reconditioned or overhauled.

When the theoretical service life D has been reached (see paragraph 2.2.1), then the winch may only be operated again after it has been reconditioned or overhauled.

A general overhaul must be made at least every 10 years after initial operation of the winch
The general overhaul must be scheduled by the operator and must be carried out by the manufacturer or personnel authorized by the manufacturer and must be documented in the inspection handbook.
After the general overhaul, a new theoretical service life D is issued by the manufacturer or the person authorized by the manufacturer.

If the theoretical service life is not expired after 10 years, then the winch can be operated without a general overhaul, if the crane expert has confirmed the purpose and the correctness of the determination of utilized part of the service life and signed the crane inspection book after every expert test or inspection.

In this case, the crane expert must subject the winch to another more extensive test. It includes at least the following:

1. External visual check (leakages, damage, distortions, etc.)
2. Oil check, especially for metallic residue
3. Stress test with minimum and maximum cable pull and each at maximum possible speed. At least one layer must be coiled up. During this stress test, any unusual noise must be noted.

This test must be confirmed by the expert in the crane inspection book and a notation must be made for continued operation of the winch. The next test must be made before the completion of the 12th year of operation and then annually thereafter.

2.2.3. Example

According to the Operation Manual, a mobile crane with separate hour meter for travel drive and crane operation is classified by the manufacturer as follows:

Drive gear group:	M 3
Load collective:	light L1, Km = 0.125
Theoretical service life:	D = 3200 hrs.

The used part S of the theoretical service life can be calculated for the individual inspection intervals as follows:

1st Inspection (1st year)

The crane has been utilized during the past year for assembly work:
Load collective L1, which means $Km_1 = 0.125$.

The superstructure hour meter read 800 hrs. Winch operation was about 20 % of that, which means $T_1 = 160$ hrs.

At the 1st inspection, the used part S of the theoretical service life is therefore as follows:

$$S_1 = \frac{0.125}{0.125} \times 160 \text{ hrs} \qquad = 160 \text{ hrs.}$$

remaining theoretical service life:

$$D_1 = 3200 \text{ hrs - } 160 \text{ hrs.} \qquad = 3040 \text{ hrs.}$$

The above values are entered in the chart in the crane inspection booklet, see paragraph 2.2.4)

2nd Inspection (2nd year)

The crane has been utilized for unloading ships in the harbor:
Load collective: L3, which means $Km_2 = 0.5$

The superstructure hour meter read 2000 hrs, which means during this period:
2000 hrs. - 800 hrs. = 1200 hrs. (800 hrs. were used in the first year of operation)

Of that, the winch was used about 40 %, which means $T_2 = 480$ hrs.

The used portion S_2 of the theoretical service life can be calculated for the 2nd individual inspection interval as follows:

$$S_2 = \frac{0.5}{0.125} \times 480 \text{ hrs.} \qquad = 1920 \text{ hrs.}$$

remaining theoretical service life:

$$D_2 = 3040 \text{ hrs. - } 1920 \text{ hrs.} \qquad = 1120 \text{ hrs.}$$

3rd Inspection (3rd year)

The crane has been used for assembly work and sometimes for unloading work in the harbor:
Load collective: L2,which means $Km_3 = 0.25$

The superstructure hour meter reads 3000 hrs, which means that during this period:
3000 hrs. - 2000 hrs. = 1000 hrs. (2000 hrs. were used up in the first two years of operation)

Of that, the winch was used about 30 %, which means $T_3 = 300$ hrs.

The used portion S_3 of the theoretical service life can be calculated for the 3rd individual inspection interval as follows:

$$S_3 = \frac{0.25}{0.125} \times 300 \text{ hrs.} = 600 \text{ hrs.}$$

remaining theoretical service life:

$$D_3 = 1120 \text{ hrs.} - 600 \text{ hrs.} = 520 \text{ hrs.}$$

The above values are entered in the chart in the crane inspection booklet as shown in chart 1.

2.2.4. Addendum

Chart 1 shows an example.

Document the remaining theoretical service life on chart 2.

Chart to determine the remaining theoretical service life of winch No. 1 (Main hoist winch)

Crane type:	LTM 1050
Fabrication No.:	0010 540 08
Put in service :	12345
Serial number of winch according to data tag:	0815
Last general overhaul performed on:	....
Configuration data of winch (see Operating Manual):	
Drive gear group:	M 3
Load collective:	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 according to paragraph 2.2.2.1
T_i = Effective operating hours in inspection interval i according to paragraph 2.2.2.2

(*) 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 paragraph 2.2.2.3

General overhaul last performed on : ....

Chart to determine the remaining theoretical service life of winch No. ....

Crane type:	....
Fabrication No.:	....
Put in service:	....
Serial number of winch according to data tag:	....
Last general overhaul performed on:	....
Configuration data of winch (see Operating Manual):	....
Drive gear group:	M................
Load collective:	Q.......(L.....)
Factor of load collective Km:	....
Theoretical service life D:	....

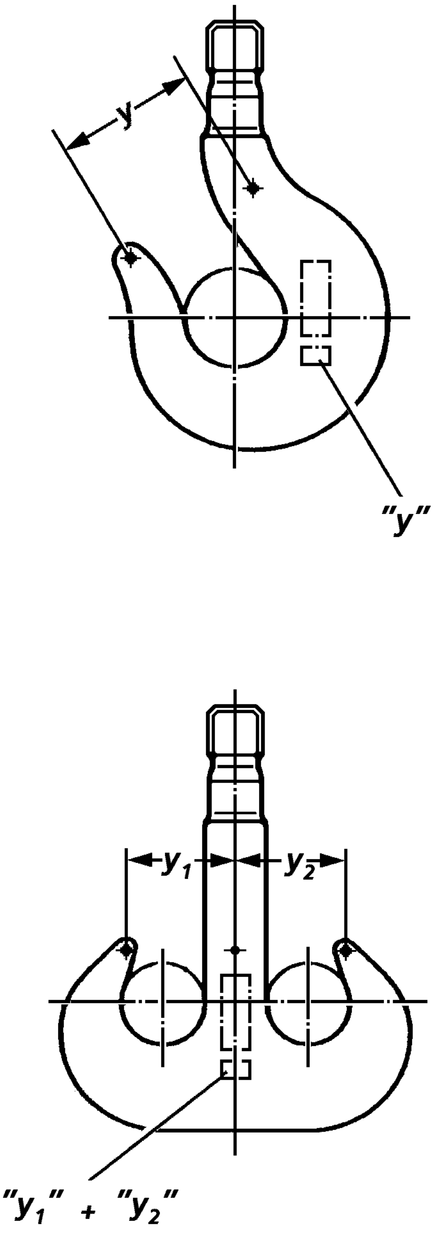
S_i = Used part of theoretical service life since last inspection
D_i = Remaining theoretical service life
D_{i-1} = Remaining theoretical service life after previous inspection
Km = Factor of load collective, which was taken for calculation of winch. This factor is to be taken from the Operating Manual
Km_i = Factor of load collective in inspection interval i according to paragraph 2.2.2.1
T_i = Effective operating hours in inspection interval i according to paragraph 2.2.2.2

*) 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
(*)															

CAUTION: Perform general overhaul at least once every 10 years. In case of deviation, see paragraph 2.2.2.3

General overhaul last performed on : ....



180068

3. Inspection of load hook

The load hooks must be regularly checked by an expert.
These inspections are made to prevent accidents through early detection of problems.
Any problems found during these inspections must be documented, remedied and then reinspected .

3.1 Inspections and monitoring procedures

3.1.1 Distortion

Check for any distortions, for example on the open end of the hook, regularly, but at least on an annual basis.
The open end of the hook may not have stretched by more than 10% in relation to the initial measurement ”y” or exceed ”y1” and ”y 2”.

D A N G E R : **If the hook opening is now wider by more than 10 % of the initial measurement, then the load hook may no longer be used.**
In that case, contact the Service Department at Liebherr Ehingen .

Note: The initial measurements ”y” or ”y1” and ”y2” are noted on the load hook. Measure from point to point, as shown.

3.1.2 Corrosion

For this test, the nut must be removed from the hook shaft, so that the threads can be checked for corrosion and wear.

D A N G E R : **In case corrosion and wear is found on the threads, the load hook may no longer be used.**
In that case, contact the Service Department at Liebherr Ehingen .

4. inapplicable

5. inapplicable

6. Check the safety control or the limit switch in the relapse support and the boom A-brackets,

refer to chapter 8.12.

7. Check the nitrogen reservoir for correct gas pressure, especially that of the relapse supports and suspension accumulators (observe instructions).

refer to chapter 7.04, 7.05, 8.13, 8.14.

8. Check the cable pulleys

8.1 The cable pulleys must be checked once a year all around for damage and cracks.
If the cable pulleys have been hit during crane operation (for example on buildings, etc.) or if they were subjected to any other stress factors, then they must be extensively checked for damage or cracks.

D A N G E R : If any damage or cracks are found, then the cable pulley must be replaced immediately. If this is not observed, there is great danger of causing a serious accident!

8.2 In addition, check the wear in the cable groove. If the cable groove base is run in by more than ¼ of the cable diameter, then the pulley must be replaced.

9. Check the safe load system for function.

9.1 With the longest boom, move to the minimum and maximum radius: Check the load indication, take the hook block as a test weight.
The deviation may not be more than 10% of the load capacity in these two extreme positions.

9.2 The given radius must be measured again for the longest boom for the smallest radius and at a boom angle of 45°.
The deviation may not be more than 10% of the measured radius.

10. Check the slewing ring connection

10.1 For tilt play measurement, see chapter 7.05

11. Check the mounting tightness of the load carrying components

Check the mounting screws of the pulley rotary connection, winches, slewing gears and tackle couplings for tight seating.

11.1 The mounting screws of the rotary connections are pretensioned at the factory, and normally should not loosen up during normal operation.
However, if the crane has been overloaded or if the load broke off, then it is possible that the screw connection has been overloaded and the screw has been stretched.
For that reason, check these screws during the annual inspection or after an overload to make sure they are seated tightly.
Any loose screws, as well the the two screws next to them on both the left and right hand side should be completely removed and carefully checked for damage.
The screws must be especially inspected for cracks or distortion. If the screw has been stretched by more than 0.2% (in relation to it original length) or if cracks or other damage can be seen, then the damaged screws must be replaced. In case the screws were stretched or damaged, the screws next to the damaged screw should also be replaced.

12. Check the oil and fuel tanks

Check the oil and fuel tanks at least once a year and in subsequent inspections every 4 years all around for leaks.

Repairs may only be made by especially trained expert personnel.
Improper repairs, for example welding, brazing or soldering are not permitted without consulting the Service Dept. at LIEBHERR Ehingen!

13. Check the reeving auxiliary winch

Check the corresponding manufacturer for the life expectancy of the reeving auxiliary winch.

Addendum

To aid the inspector, attached find a check list for repeat inspections of **LIEBHERR** mobile and crawler cranes.

Inspection guidelines for repeat inspection of LIEBHERR mobile and crawler cranes according to §26(1) or (2) UV "Cranes" (BGV D6)

Company: .... Inspector: .... Date: ....

Crane manufacturer:**LIEBHERR** Crane type: .... S/N: ....

Year: .... Inventory number: ....

Signature of inspector for No. 1 to 20: ....

1. Inspection group: Crane documentation

Item to be checked	A	B	C	D	E	Remarks
Crane inspection book						
Operation- / installation manual						
Crane control book						
Load chart manual						
Work planer						

2. Inspection group:Decals / signs

Item to be checked	A	B	C	D	E	Remarks
Data tag						
Load capacity data						
Decal for operating instructions						
Warning and safety decals						
Other safety signs						

3. Inspection group:Travel gear 1)

Item to be checked	A	B	C	D	E	Remarks
Frame 2)						
Supports 2)						
Axles						
Wheels						
Tires						
Bearing						
Gear						
Universal drive shaft						
Springs						
Shock absorber						
Steering						
Brakes						
Hydraulic axle suspension						

A: existing / complete B: Condition / Maintenance C: Function
D: Repair / Replacement E: Reinspection required

done = × not done = - not required = 0

Inspection guidelines for repeat inspection of LIEBHERR mobile and crawler cranes according to §26(1) or (2) UV "Cranes" (BGV D6)

Company: . . . . Inspector: . . . . Date: . . . .

Crane manufacturer:**LIEBHERR** Crane type: . . . . S/N: . . . .

Year: . . . . Inventory number: . . . .

Signature of inspector for No. 1 to 20: . . . .

4. Inspection group: Chassis [1)]						
Item to be checked	A	B	C	D	E	Remarks
Covers						
Steps						
Counterweight retainers [2)]						
Tackle devices						
Ladders						
Retainer for hook block [2)]						
Boom receptacle [2)]						

5. Inspection group: Chassis - Driver's cab [1)]						
Item to be checked	A	B	C	D	E	Remarks
Doors						
Window / windshields						
Windshield wiper						
Mirror						
Seat						
Heater						
Ventilation						
Noise protection						
Recorder						
First aid kit						
Spare bulbs						
Warning triangle						
Warning vest						

A: existing / complete B: Condition / Maintenance C: Function
D: Repair / Replacement E: Reinspection required

done = × not done = - not required = 0

Inspection guidelines for repeat inspection of LIEBHERR mobile and crawler cranes according to §26(1) or (2) UV "Cranes" (BGV D6)

Company: .... Inspector: .... Date: ....

Crane manufacturer:**LIEBHERR** Crane type: .... S/N: ....

Year: .... Inventory number: ....

Signature of inspector for No. 1 to 20: ....

6. Inspection group: Chassis - Drive [1)]						
Item to be checked	A	B	C	D	E	Remarks
Engine						
Exhaust system						
Fuel tank						
Filter						
Muffler						
Engine suspension						
Oil levels						
Fuel lines						

7. Inspection group: Chassis - Hydraulic system [1)]						
Item to be checked	A	B	C	D	E	Remarks
Oil tank						
Filter						
Pumps						
Motors						
Valves						
Lines						
Hoses						
Cylinder						
Pressure relief valves						

8. Inspection group: Chassis - Air pressure system [1)]						
Item to be checked	A	B	C	D	E	Remarks
Compressor						
Filter						
Air tank						
Valves						
Lines						
Hoses						
Cylinder						

A: existing / complete B: Condition / Maintenance C: Function
D: Repair / Replacement E: Reinspection required

done = × not done = - not required = 0

Inspection guidelines for repeat inspection of LIEBHERR mobile and crawler cranes according to §26(1) or (2) UV “Cranes“ (BGV D6)

Company: .... Inspector: .... Date: ....

Crane manufacturer:**LIEBHERR** Crane type: .... S/N: ....

Year: .... Inventory number: ....

Signature of inspector for No. 1 to 20: ....

9. Inspection group: Chassis - Electrical system [1)]						
Item to be checked	A	B	C	D	E	Remarks
Motors						
Generators / Alternators						
Battery						
Schalter						
Lines						
Fuses						
Resistors						
Lighting						
Brake lights						
Blinkers						
Tail lights						
Floodlights						
Signal devices						
Indicator lights						
Battery switch						
Limit switch: Gear, steering, drive						
Support force indicator [2)]						

A: existing / complete B: Condition / Maintenance C: Function
D: Repair / Replacement E: Reinspection required

done = × not done = - not required = 0

Inspection guidelines for repeat inspection of LIEBHERR mobile and crawler cranes according to §26(1) or (2) UV "Cranes" (BGV D6)

Company: .... Inspector: .... Date: ....

Crane manufacturer:**LIEBHERR** Crane type: .... S/N: ....

Year: .... Inventory number: ....

Signature of inspector for No. 1 to 20: ....

10. Inspection group: Chassis - Control systems [1]						
Item to be checked	A	B	C	D	E	Remarks
Engine regulation						
Gears						
Couplings / clutches						
Gear shifts						
Brakes						
Steering						
Indicators						
Engine stop line						
Control of outrigger supports [2]						
Axle suspension						
Crane leveling control						
Rear axle steering						
11. Inspection group: Superstructure						
Item to be checked	A	B	C	D	E	Remarks
Frame						
Covers						
Steps						
Mounting						
Counterweight						
Relapse retainer						
Slewing ring: tilt play						
Slewing ring: mounting screws						
Slewing ring: gear						
Slewing gear: Mounting screws						
Slewing gear: Gear						

A: existing / complete B: Condition / Maintenance C: Function
D: Repair / Replacement E: Reinspection required

done = × not done = - not required = 0

Inspection guidelines for repeat inspection of LIEBHERR mobile and crawler cranes according to §26(1) or (2) UV "Cranes" (BGV D6)

Company: .... Inspector: .... Date: ....

Crane manufacturer:**LIEBHERR** Crane type: .... S/N: ....

Year: .... Inventory number: ....

Signature of inspector for No. 1 to 20: ....

12. Inspection group: Superstructure - Crane operator's cab						
Item to be checked	A	B	C	D	E	Remarks
Doors						
Windows / windshields						
Windshield wiper						
Mirror						
Seat						
Heater						
Ventilation						
Shock absorber						
Control lever for working functions						
Gear controls						
Retention: Scrapes / chafings/ kinks						

13. Inspection group: Superstructure - Retention and protective devices						
Item to be checked	A	B	C	D	E	Remarks
Handles and ladders / steps						to the cab and to drive gears
Covers						
Coverings						
Flaps						

14. Inspection group: Superstructure - Drive system						
Item to be checked	A	B	C	D	E	Remarks
Engine						
Exhaust system						
Fuel tank						
Filter						
Muffler						
Engine suspension						
Fuel lines						

A: existing / complete B: Condition / Maintenance C: Function
D: Repair / Replacement E: Reinspection required

done = × not done = - not required = 0

Inspection guidelines for repeat inspection of LIEBHERR mobile and crawler cranes according to §26(1) or (2) UV "Cranes" (BGV D6)

Company: .... Inspector: .... Date: ....

Crane manufacturer:**LIEBHERR** Crane type: .... S/N: ....

Year: .... Inventory number: ....

Signature of inspector for No. 1 to 20: ....

15. Inspection group: Superstructure - Hydraulic system						
Item to be checked	A	B	C	D	E	Remarks
Oil tank						
Filter						
Pumps						
Motors						
Valves						
Lines						
Hoses						
Cylinder						
Pressure relief valves						
Brake lowering valves						
Brake control: Hoist gear						
Brake control: Slewing gear						

16. Inspection group: Superstructure - Electrical System						
Item to be checked	A	B	C	D	E	Remarks
Motors						
Generators / Alternators						
Batteries						
Switches						
Lines						
Fuses						
Resistors						
Lighting						

A: existing / complete B: Condition / Maintenance C: Function
D: Repair / Replacement E: Reinspection required

done = × not done = - not required = 0

Inspection guidelines for repeat inspection of LIEBHERR mobile and crawler cranes according to §26(1) or (2) UV “Cranes“ (BGV D6)

Company: .... Inspector: .... Date: ....

Crane manufacturer: **LIEBHERR** Crane type: .... S/N: ....

Year: .... Inventory number: ....

Signature of inspector for No. 1 to 20: ....

17. Inspection group: Superstructure - Control systems						
Item to be checked	A	B	C	D	E	Remarks
Engine regulation						
Gear						
Elastic couplings						
Controls						
Engine stop line						
Indicators						

18. Inspection group: Superstructure - Cable drive systems						
Item to be checked	A	B	C	D	E	Remarks
Winch I [3)]						
Winch II [3)]						
Winch III [3)]						
Winch IV [3)]						
Cable pulleys						
Cable end mounting						
Cable for winch I						
Cable for winch II						
Cable for winch III						
Cable for winch IV						
Guy ropes						

19. Inspection group: Superstructure - Hook						
Item to be checked	A	B	C	D	E	Remarks
Pulleys						
Cable guide bar on pulleys						
Axle retainer						
Load hook						
Load hook mounting						
Hook retainer						

A: existing / complete B: Condition / Maintenance C: Function
D: Repair / Replacement E: Reinspection required

done = × not done = - not required = 0

Inspection guidelines for repeat inspection of LIEBHERR mobile and crawler cranes according to §26(1) or (2) UV "Cranes" (BGV D6)

Company: .... Inspector: .... Date: ....

Crane manufacturer: **LIEBHERR** .... Crane type: .... S/N:

Year: .... Inventory number: ....

Signature of inspector for No. 1 to 20: ....

20. Inspection group: Superstructure - Safety and Control devices						
Item to be checked	A	B	C	D	E	Remarks
Hoist limit switch I						
Hoist limit switch II						
Lowering limit switch I						
Lowering limit switch II						
Boom limit switch I						
Boom limit switch II						
Luffing jib: boom limit switch I						
Luffing jib: boom limit switch II						
Load moment limiter						
Angle indicator: Boom						
Angle indicator: Luffing jib						
Angle indicator: Slewing gear						
Safety devices: Steuerung						
Working range limitation						
Pressure sensor						
Speed sensor						
Wind velocity sensor						
Sliding arm monitor						
Support force monitor						
Incline monitor						
Length indicator: radius, boom length						
Emergency off						
Engine stop						

A: existing / complete B: Condition / Maintenance C: Function
D: Repair / Replacement E: Reinspection required

done = × not done = - not required = 0

Inspection guidelines for repeat inspection of LIEBHERR mobile and crawler cranes according to §26(1) or (2) UV "Cranes" (BGV D6)

Company: .... Inspector: .... Date: ....

Crane manufacturer:**LIEBHERR** Crane type: .... S/N: ....

Year: .... Inventory number: ....

Signature of inspector for No. 1 to 20: ....

20. Inspection group: Boom						
Item to be checked	A	B	C	D	E	Remarks
Welding construction						
Cable pulleys						
Luffing cylinder						
Telescoping cylinder						
Push out cables						
Return pull cables						
Boom bearing / mounting						
Boom pinning						
Guy rods						
Relapse cylinder						

A: existing / complete B: Condition / Maintenance C: Function
D: Repair / Replacement E: Reinspection required

done = × not done = - not required = 0

Remarks:

1) The inspection of the road safe condition of the carrier vehicle is also recommended if an error free expert inspection result according to highway safety regulations is available. For vehicle cranes, which are not cleared for use on public highways, the experienced technician or expert inspector should also check the vehicle for road safe condition (see also UVV "Vehicles" (BGV D29)).

2) These inspections must be made by an expert engineer even if an error free expert inspection result according to highway safety regulations is available.

3) Inspection of winches regarding used part of theoretical utilization time.

8.04 CODE OF PRACTICE FOR EXAMINATION AND DISCARD OF CRANE WIRE ROPES

023648-04

1. Introduction

In a crane, the rope should be regarded as an expendable component requiring replacement when examination shows its strength to have diminished to the point where its further use would be unwise. In all cases, however, the safe handling of loads by correctly operated equipment requires regular examination of the rope so that it is removed from service in adequate time.
In all conditions of use, the discard criteria relating to wire breaks, wear, corrosion and deformation can be applied immediately. These different factors are considered in ISO 4309, which is intended for the guidance of competent persons involved in the maintenance and examination of cranes.
The criteria outlined are aimed at retaining, until the rope is discarded, an adequate safety margin for the handling of loads by cranes.

D A N G E R : **Failure to recognize these criteria is dangerous.**

2. Wire rope

2.1 State before fitting

A rope of the same type as that initially fitted will normally be adopted for replacement purposes. If it is of a different type, the user shall ensure that it possesses properties at least equivalent to those of the rope being discarded.
Before re-equipping the appliance, all grooves in drums and pulleys should be checked to ensure that they will correctly accept the replacement rope (see clause 4).

2.2 Fitting

When drawing the wire rope from a reel or coil, every precaution should be taken to avoid the inducement of loss of turn, because to allow such a condition may result in loops, kinks or bends forming in the rope.
If the rope rubs against any part into operation on the appliance when it is not under tension, then the points of contact should be suitably protected.
Before bringing the rope into operation on the appliance, the user shall ensure that all the devices associated with the wire rope operation are set functioning correctly.
A number of operations of the crane shall be carried out at approximately 10 % of the normal load to stabilize the wire rope.

2.3 Maintenance

The maintenance of the wire rope shall be carried out relative to the lifting appliance, its use, the environment and the type of rope involved. Unless otherwise indicated by manufacturer either of the crane or the rope, the wire rope should be cleaned, where possible, and covered with a service dressing of grease or oil, particularly on those lengths which bend when passing over pulleys.
The service dressing shall be a suitable lubricant for steel wire ropes .
A shorter working life of the rope will result from lack of maintenance, particularly when the crane works in a corrosive environment and, in certain cases, for reasons connected with the operation, where no service dressing can be used.

2.4 Examination

2.4.1 Frequency

2.4.1.1 Daily observation

As far as possible, all visible parts of any rope should be observed each working day with the object of detecting general deterioration and deformation. Particular attention should be paid to the rope at points of attachment to the appliance. Any appreciable change suspected in the rope condition shall be reported and the rope examined by a competent person in accordance with 2.4.2.

2.4.1.2 Special examination in accordance with 2.4.2

In all cases when an incident has occurred which may have caused damage to the rope and/or its termination, or on every occasion when the rope has been brought back into operation after dismantling followed by re-assembly, the rope shall be examined.

2.4.2 Points to be covered by examination

2.4.2.1 General

Although the wire rope shall be examined throughout its length, particular care shall be taken at the following positions:
- the termination points at the end of both moving and stationary ropes;
- that part of a rope which passes through the block or over pulleys; particular attention shall be paid, in the case of appliances performing a repetitive operation, to any part of the rope which lies over the pulleys while the appliance is in a loaded condition (see annex 1);
- that part of the rope which lies over a compensating pulley;
- any part of the rope which may be subject to abrasion by external features (for example hatch coamings);
- internal examination for corrosion and fatigue;
- any part of the rope exposed to heat.

The results of the examination shall be recorded in the examination record for the appliance (see clause5 and annex 2 for a typical example).

2.4.2.2 Terminations – excluding slings

The rope shall be examined in the area where it passes out from the termination, as this position is critical for the onset of fatigue (wire breaks) and corrosion. The terminal fittings themselves shall also be examined for signs of distortion or wear.
Terminations involving pressed or swaged ferrules shall be similarly examined, and the ferrule checked for cracks in the material and possible slippage between the ferrule and the rope.
Detachable terminations (wedge sockets, grips) shall be examined for broken wires within and under the termination and to ensure the tightness of wedges and screwed grips. The examination shall also ensure that the requirements of the standards and codes of practice laid down for the termination of the rope have been met.

2.5 Discard criteria

The safe use of rope is qualified by the following criteria (see 2.5.1 to 2.5.9):

1) number of broken wires;

2) the localized grouping of wire breaks;

3) the rate of increase of wire breaks;

4) the fracture of strands;

5) reduction of rope diameter, including that resulting from core deterioration;

6) external and internal wear;

7) external and internal corrosion;

8) deformation;

9) damage due to heat or electric arcing;

All examinations shall take account of these individual factors, recognizing the particular criteria. However, deterioration will frequently result from a combination of factors giving a cumulative effect which shall be recognized by the competent person, and which will reflect on the decision to discard the rope or to allow it to remain in service.
In all cases, the examiner should investigate whether the deterioration has been caused by a defect in the appliance; if so, he should recommend action to overcome the defect before fitting a new rope.

2.5.1 Number of broken wires

The number of broken wires must be determined by a visual inspection on the whole rope length. When a broken wire is found, mark sections with a lenght of $30 \times d$ (d = nominal rope diameter) up and down the rope from this point. These sections must be examined very closely. All broken wires in each section are now carefully counted. Please compare the number of visible broken wires with annex 4. If the number of visible broken wires are less than mentioned in the table, mark the area where the most broken wires were found with the length of $6 \times d$. Count the visible broken wires once again and compare with annex 4. If the number of visible broken wires are less than mentioned in the table, the rope has not to be removed yet.

Note: Depending on the number of visible broken wires the period for the next eximination has to be fixed.

2.5.2 Localized grouping of broken wires

Where broken wires are very close together, constituting local grouping of such breaks, the rope shall be discarded. If the grouping of such breaks occurs in a length less than **6 d** or is concentrated in any one strand, it will be prudent to discard the rope even if the number of wire breaks is smaller than the maximum number indicated in the tables.

2.5.3 Rate of increase of broken wires

In application where the predominant cause of rope deterioration is fatigue, the commencement of broken wires will begin after a certain period of usage, but the number of breaks will progressively increase at ever-shortening intervals.
In these cases, it is recommended that careful examination and recording of the increase of broken wires should be undertaken.

2.5.4 Fracture of strands

If a complete strand fracture occurs, the rope shall be discarded.

2.5.5 Reduction of rope diameter resulting from core deterioration

Reduction of rope diameter resulting from deterioration of the core can be caused by:

1) internal wear and indentation;

2) internal wear caused by friction between individual strands and wires in the rope, particularly when it is subject to bending;

3) fracture of a steel core;

4) fracture of internal layers in a multi-strand construction.

If these factors cause the rope diameter (average of two diameter measurements normal to each other) to decrease by 3 % of the nominal rope diameter for rotation-resistant ropes, or 10 % for other ropes, the ropes shall be discarded even if no broken wires are visible.

Note: New ropes may have an actual diameter greater than the nominal diameter so that the wear permissible will therefore be greater by the same amount.

2.5.6 External wear

Abrasion of the crown wires of outer strands in the rope results from rubbing contact, under pressure, with the grooves in the pulleys and the drums. The condition is particularly evident on moving ropes at points of pulley contact when the load is being accelerated or decelerated, and shows itself as flat surfaces on the outer wires.
Wear is promoted by lack of lubrication, or incorrect lubrication, and also by the presence of dust and grit.
Wear reduces the strength of ropes by reducing the cross-sectional area of the steel.
When owing to external wear the actual rope diameter has decreased by 7% or more of the nominal rope diameter, the rope shall be discarded even if no wire breaks are visible.

2.5.7 External and internal corrosion

Corrosion occurs particularly in marine and industrial polluted atmospheres, and will not only diminish the breaking strength by reducing the metallic area of the rope but will also accelerate fatigue by causing the irregular surface from which stress cracking will commence. Severe corrosion may cause decreased elasticity of the rope.

1) External corrosion
   Corrosion of the outer wires may be detected visually.

2) Internal corrosion
   This condition is more difficult to detect than the external corrosion.

Note: If there is any suggestion of internal corrosion, the rope should be examined by a competent person.

CAUTION: **Confirmation of severe internal corrosion is justification for immediate rope discard.**

2.5.8 Deformation

Visible distortion of the rope from its normal formation is termed ”deformation” and may create a change at the deformation position which will result in an uneven stress distribution in the rope.
Distinction is made between the following main deformations of rope on the basis of their appearance (see 2.5.8.1 to 2.5.8.7):

1) waviness;

2) basket or lantern distortion;

3) strand extrusion;

4) wire extrusion;

5) flattened portions;

6) kinks or tightened loops;

7) bends.

2.5.8.1 Waviness (see annex 3, plate 1)

In the case of waviness (see figure 1), the wire rope shall be discarded if

$$\mathbf{d_1} > \frac{\mathbf{4\,d}}{\mathbf{3}}$$

where **d** is the nominal diameter of the rope and $\mathbf{d_1}$ is the diameter corresponding to the envelope of the deformed rope, and the length of the rope under consideration does not exceed **25 d**.

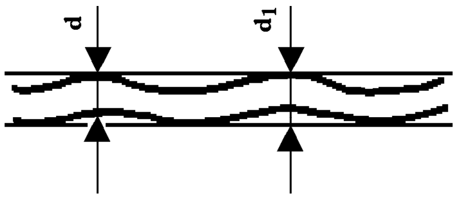


Figure 1 - Waviness

2.5.8.2 Basket or lantern distortion (see annex 3, plate 2)

A basket or lantern formation is justification for immediate discard.

2.5.8.3 Strand extrusion (see annex 3, plate 3)

Strand extrusion is justification for immediate discard.

2.5.8.4 Wire extrusion (see annex 3, plates 4 and 5)

In this condition, certain wires or groups of wires rise up, on the opposite side of the rope to the pulley groove, in the form of the loops – this feature usually results from shock loading.
If the deformation is severe, there is justification for rope discard.

2.5.8.5 Flattened portions (see annex 3, plates 8 and 9)

Flattened portions occur as a result of mechanical damage; if severe, they are justification for rope discard.

2.5.8.6 Kinks or tightened loops (see annex 3, plates 6 and 7)

C A U T I O N : A kink or tightened loop is justification for immediate discard.

2.5.8.7 Bends (see annex 3, plate 10)

Bends are angular deformations of the rope caused by external influence.
The condition is justification for immediate discard.

2.5.9 Damage due to heat or electric arcing

Wire ropes which have been subjected to exceptional thermal effects, externally recognized by the colors produced, shall be discarded.

3. Operating performance of wire rope

Accurate recording of information by the examiner can be used to predict the performance of a particular type of rope on a crane. Such information is useful in regulating maintenance procedures and also stock control of replacement rope. If such forecasting is used, it should not have the effect of relaxing examinations or prolonging the operating period beyond that indicated by the criteria specified in the preceding clauses of this code of practise for examination and discard of crane wire ropes.

4. Condition of equipment related to rope

Winding drums and pulleys shall be checked periodically to ensure that all these components rotate correctly in their bearings.
Stiff or jammed pulleys or rollers wear heavily and unevenly, causing severe abrasion of the rope.
Ineffective compensating pulleys can give rise to unequal loading in the rope reeving.
The radius at the bottom of the groove in all pulleys and the drum shall be appropriate to the nominal diameter of the rope. If the radius has become too great or too small, the groove shall be remachined or the pulley replaced.

Note: In no case the radius shouldbe smaller than the actual wire rope diameter.

5. Rope examination record

For each periodic examination, users shall provide a record in which shall be recorded the information from each examination of the rope; see annex 2 for a typical example of a record.

6. Rope storage and identification

Clean and dry storage shall be provided to prevent deterioration of ropes not in use and means provided to enable ropes to be clearly identified with their examination records.

7. Wire ropes and rope end connections

The wire ropes and rope end connections in use are selected according to their use. It must be determined if a **torsion resistant** or a **non-torsion resistant** rope is required for the application. The selected rope type subsequently requires the corresponding rope end connections.

C A U T I O N: **The correct selection and use of the wire ropes and rope end connections are deciding prerequisites for proper and accident free crane operation.**

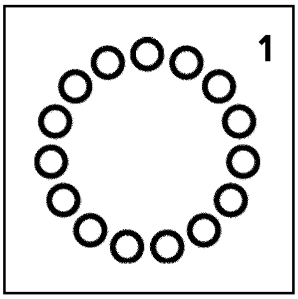
7.1 Torsion resistant ropes and their rope end connections

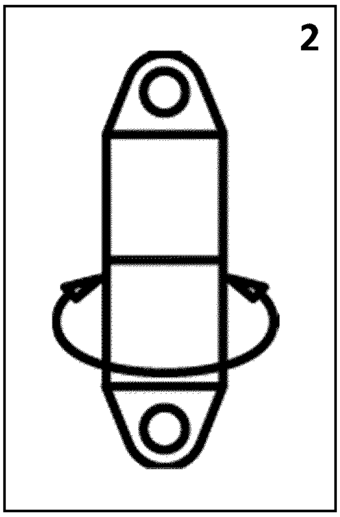
Torsion resistant ropes are special ropes, which, under load, create an extremely low torque or extremely low twist on the rope end connection. Due to this rope property, these ropes are used as **hoist ropes**.
Typical torsion resistant wire rope construction designs are ropes with 15 to 18 outer strands. Torsion resistant ropes are shown symbolically with 15 outer strands (circles) (plate 1).

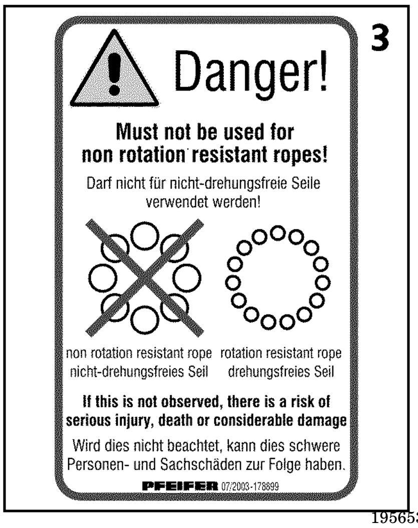
Torsion resistant ropes can be utilized with the following rope end connections :
- **Twistable** rope end connection in form of a PFEIFER rope lock with swivel or twist catch / swivel
- **Non-twistable** rope end connection in form of a PFEIFER rope lock **without** swivel or spline lock

If possible, for **torsion resistant** ropes, the use of a twistable rope end connection is favored to reduce torsional tensions. (plate 2).

D A N G E R: **Twistable rope end connections may never be used with non-torsion resistant ropes!**
If this is not observed, it can result in severe damage to personnel and property!







195653

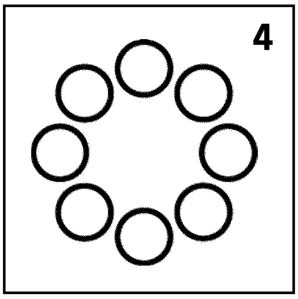
Note: The user warning on the twistable PFEIFER rope lock with swivel shows that this rope end connection may **not** be used for non-torsion resistant ropes (plate3)!

7.2 Non-torsion resistant ropes and their rope end connections

Under load, non-torsion resistant ropes create high torque on the rope end connection. For that reason, the rope ends must be secured by a special cable end connection to prevent them from twisting, so that the rope cannot twist open when in use.
Due to this rope property, these ropes are used as **control, intake or retaining ropes**.
Typical non-torsion resistant wire rope construction designs are ropes with 8 or 10 outer strands. Non-torsion resistant ropes are shown symbolically with 8 outer strands (circles) (plate 4).

Non-torsion resistant ropes may only be utilized with the following rope end connections :
- **Non-twistable** rope end connection in form of a PFEIFER rope lock **without** swivel or spline lock
  A non-twistable rope end connection is also the rope attachment on the fixed point of the winch drum.

D A N G E R : **Non-torsion resistant ropes may never be used with twistable rope end connections!**
No twist catch / swivel may be installed!
If this is not observed, it can result in severe damage to personnel and property!



195654

Note: The user warning on the PFEIFER rope lock **without** swivel and spline locks shows that this rope end connection may **not** be used for non-torsion resistant ropes **in connection with** a twist catch / swivel (plate5)!

8. Extension torsion in rotation resistant ropes and how to solve the problem

A T T E N T I O N : Be very carefull during the following operations!

1. The number of falls should be the number by which the hook block rotates the most.
2. The boom will be fully extendet and the block will be lowered.
3. The hook block is to be loaded with at least appr. 10-15 % of the nominal tension per fall.
4. Before this load is lifted, the following steps must be carried out by an assistant: The twisted hook block must be untwisted by hand to the straight position (the falls will not touch each other anymore). Afterwards the hook block will be further rotated by hand additionally with 360° (the falls will touch each other).
5. When the load is lifted, the hook block must be maintained in the given twisted position until the load clears the floor.

A T T E N T I O N : When the hook block comes under load, it will try to twist back to the straight position. Now release the hook block.

6. In the next step the load will be lifted to a height of approx. 15 m below the highest possible position. The boom remains fully extended.
7. Finally the load will be lowered and set down. The rotation of the hook block will now be much less or none at all.
8. If necessary repeat the above procedure.

C A U T I O N : If this is not observed, the rope can be damaged!

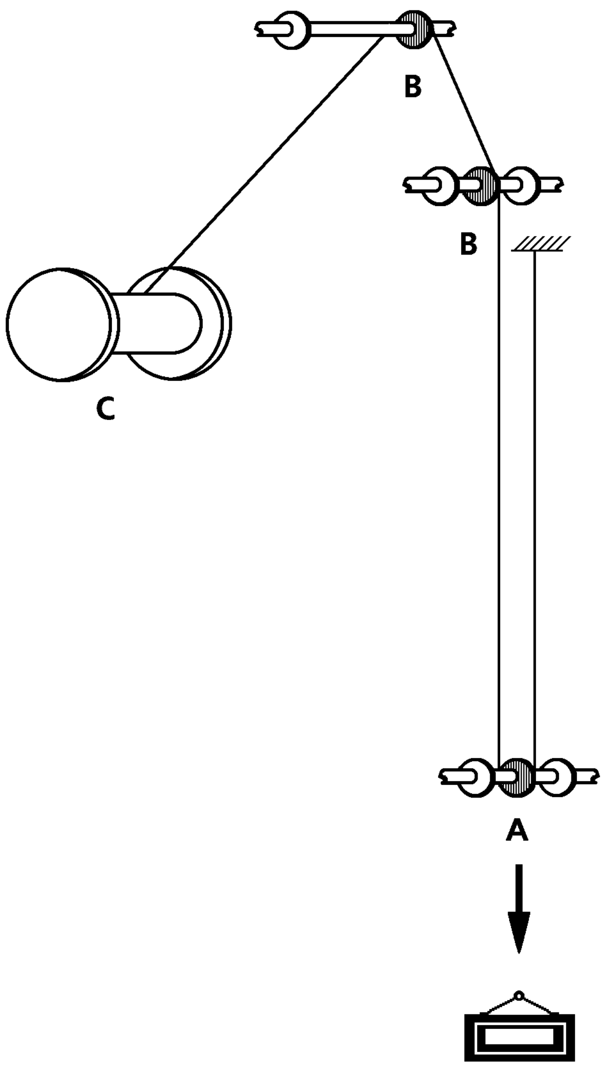


Fig. 1

193940

Annex 1

Explanation for Fig. 1

A: Pulley block
B: Pulley
C: Drum

Diagrammatic illustration of possible defects to be considered during examination, with reference to different areas

1) Examine termination of rope at drum.

2) Examine for defective coiling, which causes deformations (flattened portions) and wear, which can be severe at cross-over positions.

3) Examine for wire breaks.

4) Examine for corrosion.

5) Look for deformations caused by snatch loading.

6) Examine portion which winds over pulley for wire breaks and wear.

7) Points of attachment:
- check for wire breaks and corrosions;
- similarly, check section of rope which lies on or adjacent to compensating pulleys.

8) Look for deformation.

9) Check rope diameter.

10) Examine carefully length which runs through pulley block, particularly that length which lies on the pulley when the appliance is in loaded condition.

11) Examine for wire breaks or surface wear.

12) Examine corrosion.

Annex 2

Typical example of examination record

Datasheet for ropes

Machine: ....
Application: ....

Construction: ....

Direction of rope lay: RH / LH [1)]

Type of lay: Ordinary / Langs [1)]

Nominal diameter: ....

Tensile grade: ....

Quality: ungalvanized / galvanized [1)]

Type of core:

steel / natural or synthetic textile / mixed [1)]

Preformation: ....

Length of rope: ....

Type of termination: ....

Date fitted: ....

Date discarded: ....

Minimum breaking load: ....

Working load: ....

Diameter measured: ....

under a load of: ....

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: ....

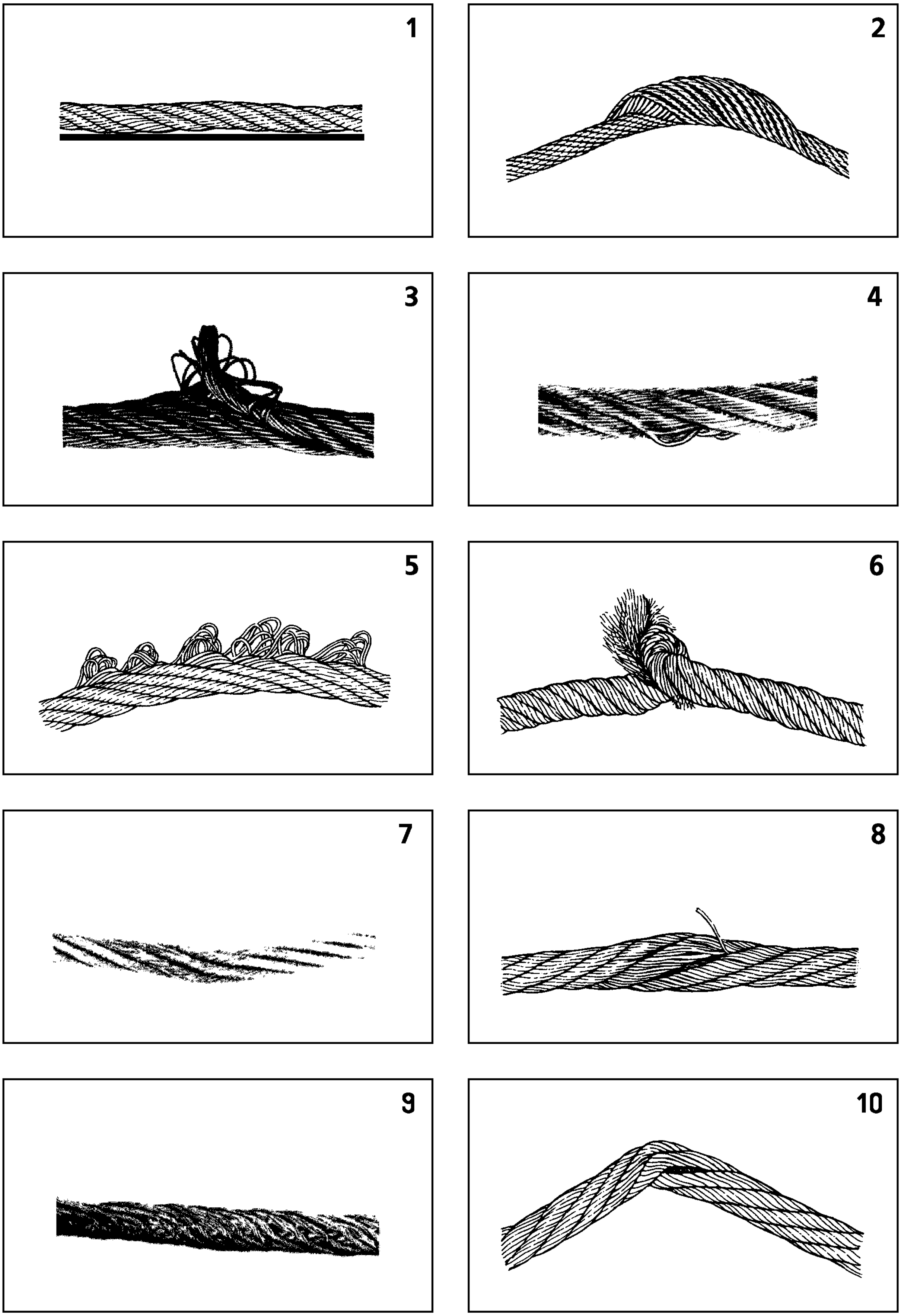
Rope supplier: ....

Other observations: ....

Number of working hours: ....

Reasons for discard: ....

1) Delete as applirope.
2) In these columns, describe the latter as: slight, medium, high, very high, discard.



194071

Annex 3

Typical examples of defects that may occur in wire rope

N o t e : For emphasis many plates show exaggerated deterioration, and the ropes depicted should been discarded at an earlier stage.

Plate 1 Waviness: a deformation where the longitudinal axis of the rope takes the shape of a helix
If the deformation exceeds the value indicated in 2.5.8.1, the rope shall be discarded

Plate 2 Basket (bird cage) or lantern deformation of a multi -strand construction
Justification for immediate discard

Plate 3 Extrusion of a steel core, generally associated with a basket or lantern deformation in adjacent position
Justification for immediate discard

Plate 4 One strand only affected by wire extrusion, although examination over a length of rope shows that deformation is visible at regular intervals, normally of one lay length
Justification for immediate discard

Plate 5 Aggravation of the previous fault (plate 4) (typical of a hoist rope on a piling machine) to a degree of severity
Justification for immediate discard

Plate 6 A severe kink or tightened loop
Note the screwed-up lay, causing the extrusion of the fibre core
Justification for immediate discard

Plate 7 A wire rope which has been kinked during installation but which has been placed in operation, and is now subject to localized wear and to wire slackness
Justification for discard

Plate 8 Flattened portion due to local crushing, creating imbalance in the strands and associated with broken wires
Justification for discard

Plate 9 Flattened portion of multi -strand rope caused by miscoiling on a drum
Note how the lay length of the outer layer of strands has increased. Again there will be imbalance of stress under load conditions
Justification for discard

Plate 10 Example of severe bend
Justification for discard

Annex 4

Guidance for the number of broken wires according to ISO 4309;
Classification groups for M1, M2, M3 and M4 mechanisms

Hoist ropes

Crane type LR 1400/2	Rope ∅ [mm]	Type of lay	Number of visible broken wires at time of discard over a length of	
			6 × Rope ∅	30 × Rope ∅
Winch 1	25	Lang lay (LL)	2	4
Winch 2	25	Lang lay (LL)	2	4

C A U T I O N : **If a torsion resistant hoist rope is placed on winch 5, then the rope for winch 5 can be used for jib adjustment or as hoist rope for the boom nose.**
If very frequent jib adjustment movements are necessary, then a non-torsion resistant adjusting rope must be placed on winch 5.
No twist catches or swivels may be used as rope end connection. The twist catch and - or swivel must be removed!

Crane type LR 1400/2	Rope ∅ [mm]	Type of lay	Number of visible broken wires at time of discard over a length of	
			6 × Rope ∅	30 × Rope ∅
Winch 5 with hoist rope	25	Lang lay (LL)	2	4
Winch 5 with adjusting rope	25	Lang lay (LL)	5	10

D A N G E R : **Non-torsion resistant adjusting ropes may never be used with twistable rope end connections!**
No twist catch / swivel may be installed!
If this is not observed, it can result in severe damage to personnel and property!

Adjusting ropes

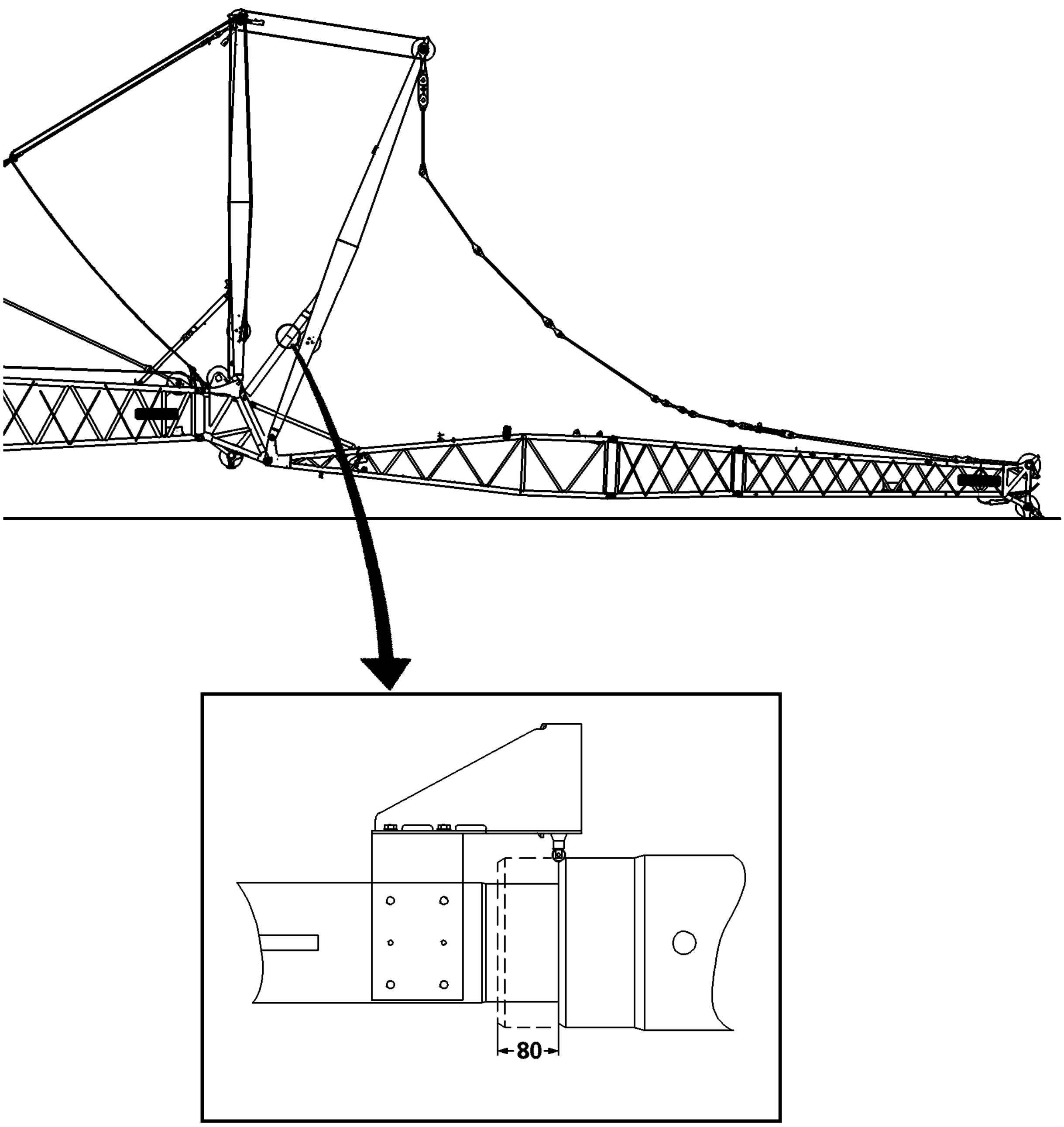
Crane type LR 1400/2	Rope ∅ [mm]	Type of lay	Number of visible broken wires at time of discard over a length of	
			6 × Rope ∅	30 × Rope ∅
Winch 3	25	Lang lay (LL)	5	10
Winch 4	25	Lang lay (LL)	5	10

Assembly rope

Crane type LR 1400/2	Rope ∅ [mm]	Type of lay	Number of visible broken wires at time of discard over a length of	
			6 × Rope ∅	30 × Rope ∅
Assembly winch	8	Ordinary lay (OL)	6	13

8.12 CHECKING THE SAFETY SWITCH POINTS ON THE RELAPSE ACCUMULATOR CYLINDERS

024439-01



188856

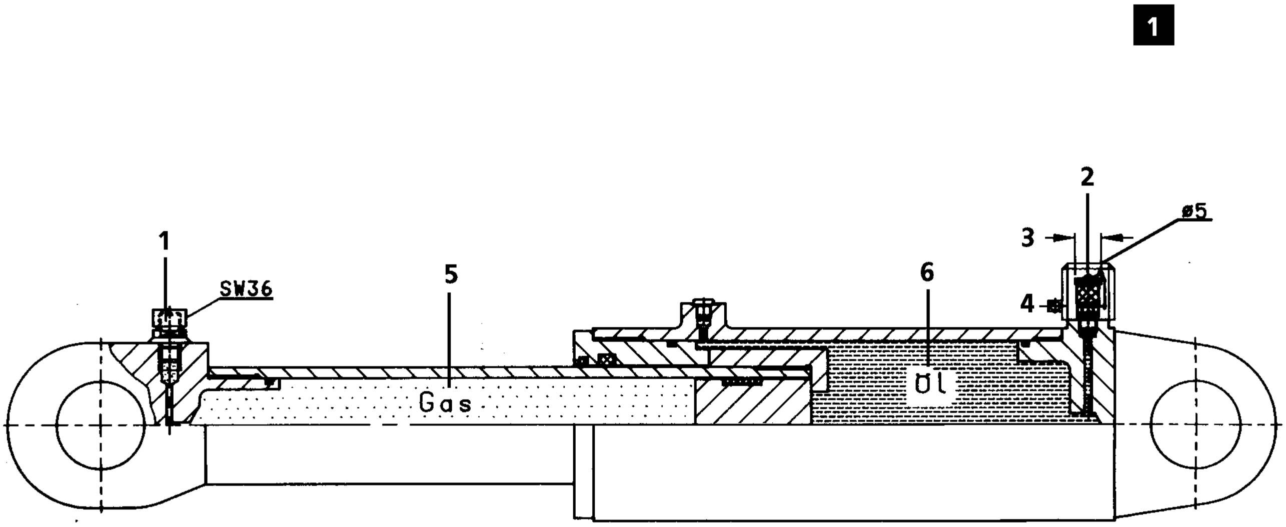
Check the function of the limit switch on the accumulator cylinders

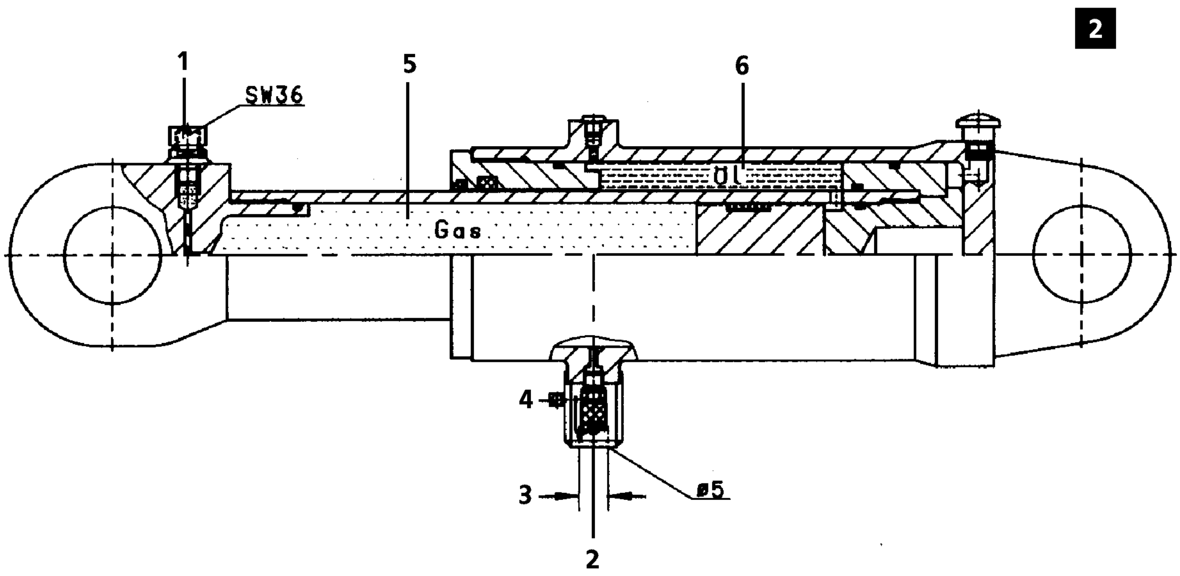
1. The limit switch activation lever has been checked for smooth movement and greased.
2. Manually activate each limit switch on the accumulator cylinders seperatly. The winch to move the lattice fly jib upward is turned off. Indicator lamp in the cab must come on.
3. Check switch point:

- When installed, check the function of the limit switch before raising the boom.Move the two A- brackets together resp. raise the A- brackets until the switch contact opens up at the specified point (see fig.) and the winch to move the lattice fly jib upward is turned off.
  After the test is completed, return the A- brackets to their original setting.

Note: Fig. = fly jib fall back guard with accumulator cylinder, item no **512396808**

The crane can be put in operation as soon as the additional limit switches for the lattice fly jib angle limitation has been checked for proper function.





181989

Hydro - accumulator cylinder used as a relapse cylinder for the lattice fly jib

I. Description of cylinder's function and use

On a crane with luffing lattice fly jib, the hydro - accumulator cylinder is used to absorb any retroactive momentum when the lattice fly jib is in a steep position, thereby preventing a "relapse". In order to assure this function, the cylinder must be filled with the specified nitrogen gas pressure and with the necessary oil quantity.

If the lattice fly jib is moved to a steeper position, then the cylinder is pushed in and the oil moves the gas accumulator piston in the piston rod, which in turn increases the pressure in the cylinder. This causes a spring type action, creating a momentum for the lattice fly jib system in load direction and prevents the lattice fly jib from falling backward or from "relapsing".

II. To check the cylinders

a) Visual inspection

Before every operation, the cylinder must be inspected visually:
- check the piston rod for external damage or corrosion and
- check for leaks.

If a recognizable amount of oil can be detected, then the cylinder must be inspected by a representative of the cylinder manufacturer.

CAUTION: **Nitrogen (gas accumulator) cylinders may only be opened by authorized trained personnel!**

b) Check gas pressure and oil quantity

The gas pressure and oil quantity must be checked in regular intervals. It is also imperative that the cylinder is inspected after an extended period of non - use or storage. If the cylinder is used regularly, then the inspection can be made together with the specified crane inspection, but it must be inspected at least once a year. If any external signs can be seen which might influence the operating safety, then the cylinder must be checked **immediately by qualified, authorized personnel.**

c) Check the gas pressure

CAUTION: **The gas pressure may only be checked by authorized personnel or only under the supervision or guidance of an authorized representative.**

The test may only be done if the **pressure** cylinder is not pressurized (extend piston rod approx. 5cm to block, see **fig. 1**) or if the **pull** cylinder is not pressurized (retract the piston rod, see **fig. 2**).

The gas pressure can be checked via a gas supply device. Remove the protective cap and connect the gas supply device via the gas filler connection (see **fig. 3**).

After opening the plug, the gas pressure can be read on the pressure gauge on the bas bottle. The gas pressure must be increased, if necessary.

Note: Make sure to the check the chart **"Gas pressure depending on ambient temperatures" -** see chap. 8.14.

Then close the plug on the filler connection on the accumulator, remove the hose and reinstall the protective cap. Attach a lead seal to prevent access by unauthorized personnel.

d) Check the oil quantity on the mini test connection (oil connection)

Note: This test may also only be performed by personnel authorized to work on pressurized cylinders.

The mini test connection is secured with a protective cap from external damage. On some cylinders, the cap can only be removed after first breaking a retaining point. After the test, the cap can be reinstall, it is not necessary to reattach the retaining point. Use a wire retainer to prevent the cap from loosening up, then secure the wire retainer with a lead seal.

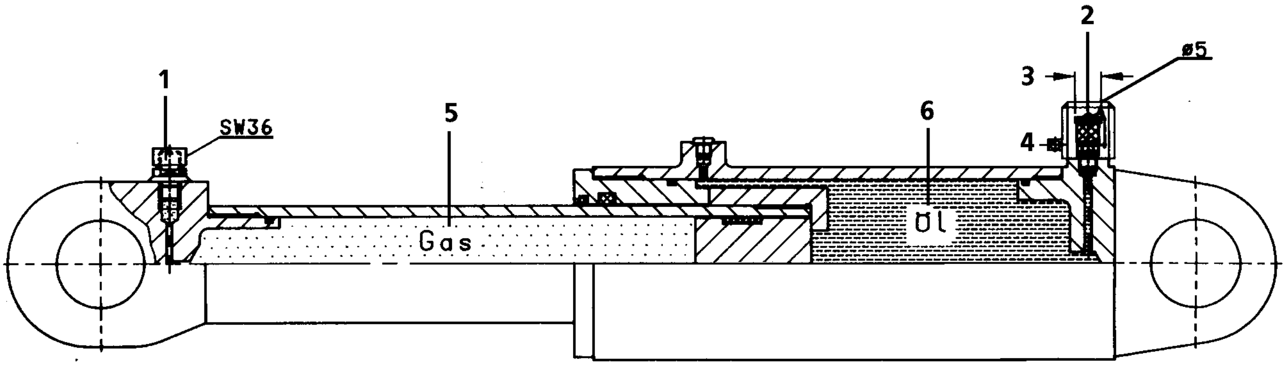
Connect the hose connection of a manual pump to the mini test connection (**fig. 4**). Then open the lock valve to release the oil pressure. Close the valve, then add oil by pumping the manual pump until the oil pressure matches the preset gas pressure. At this point, the oil pressure rises quickly, then add only about 10 cm^3! After that the pressure will rise only a little. Depending on the piston pump used, recalculate the manual strokes to 10 cm^3.

It is very important that this procedure to add oil is performed according to specifications, because the preset pressure curve of the hydro accumulator cylinder will not comply to specification if this procedure is not followed strictly. It is imperative that the **exact** amount of oil is added, no more, no less.

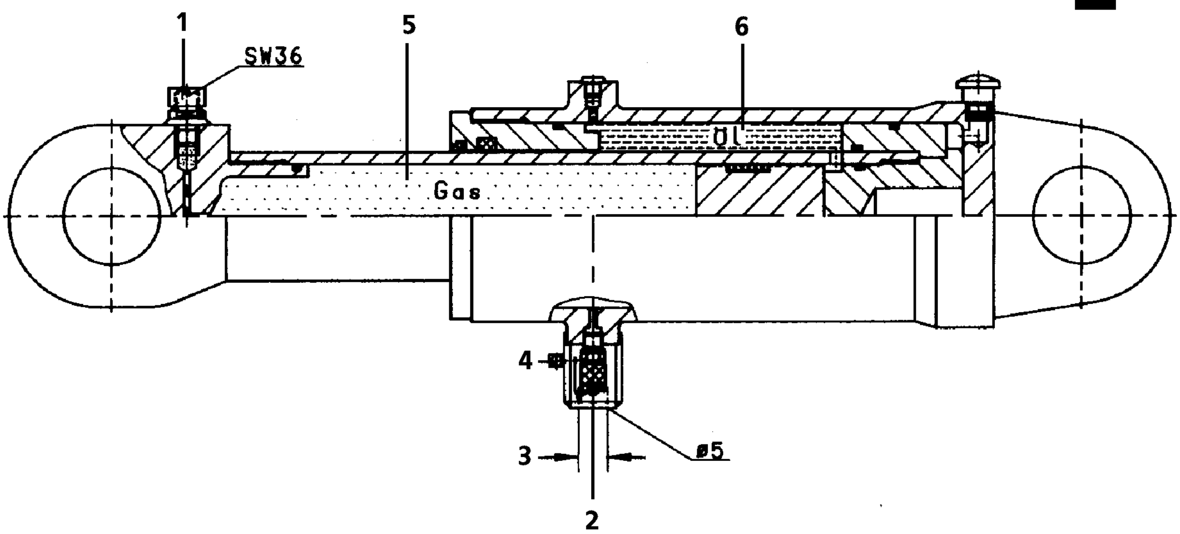
Then loosen the hose again, close of the mini test point and reinstall the protective cap.

e) Check the function of the limit switch on the accumulator cylinders
Check the function of the limit switches before putting the crane in operation, according chapter 8.12.

1



2



181989

Components

Components of the hydro - accumulator cylinder (Fig. 1 + 2)

1 Gas connection
2 Oil connection
3 Opening - 35mm
4 Allen head screw - M8×20
5 Gas chamber
6 Oil chamber

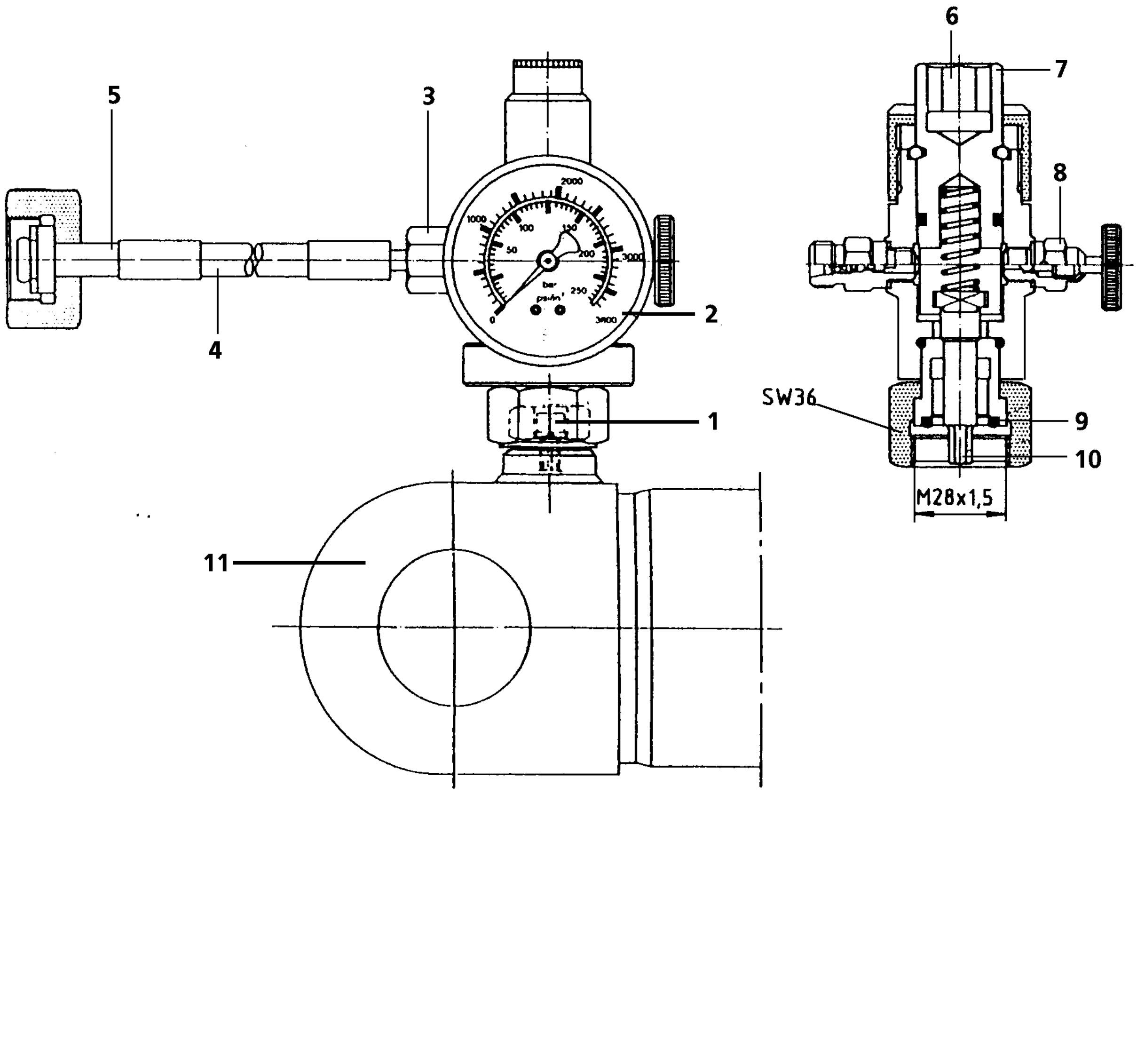
Components of the gas filling device (Fig. 3)

1 Plug
2 Pressure gauge
3 Check valve
4 Hose line
5 Connection for nitrogen gas bottle
6 Square nut for torque wrench
7 Bracket
8 Bleeder valve
9 O - Ring
10 Hex head screw / bracket
11 Hydro - accumulator cylinder

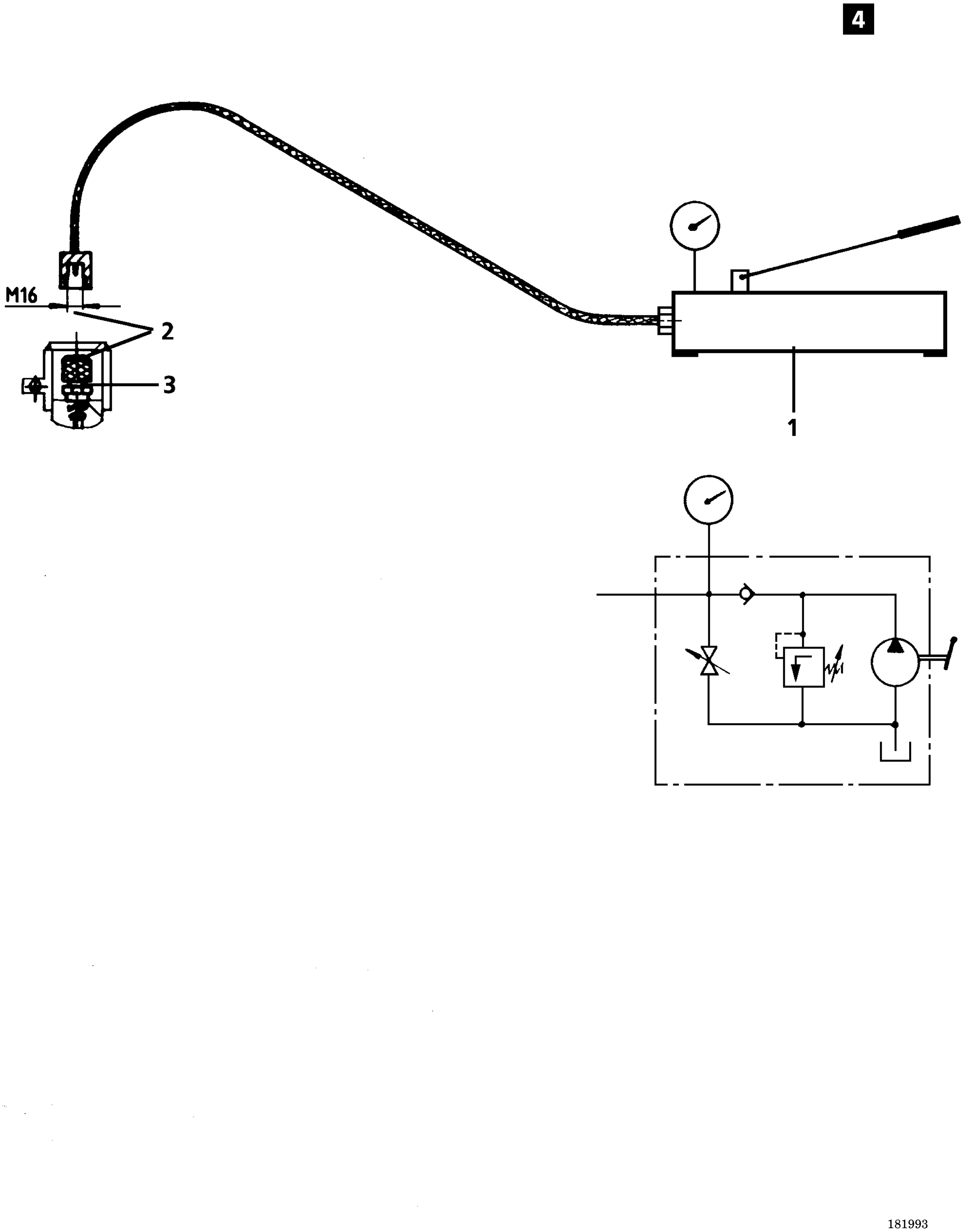
Components of the oil filling device (Fig. 4)

1 Manual pump
2 Mini test connection
3 Cylinder connection

3

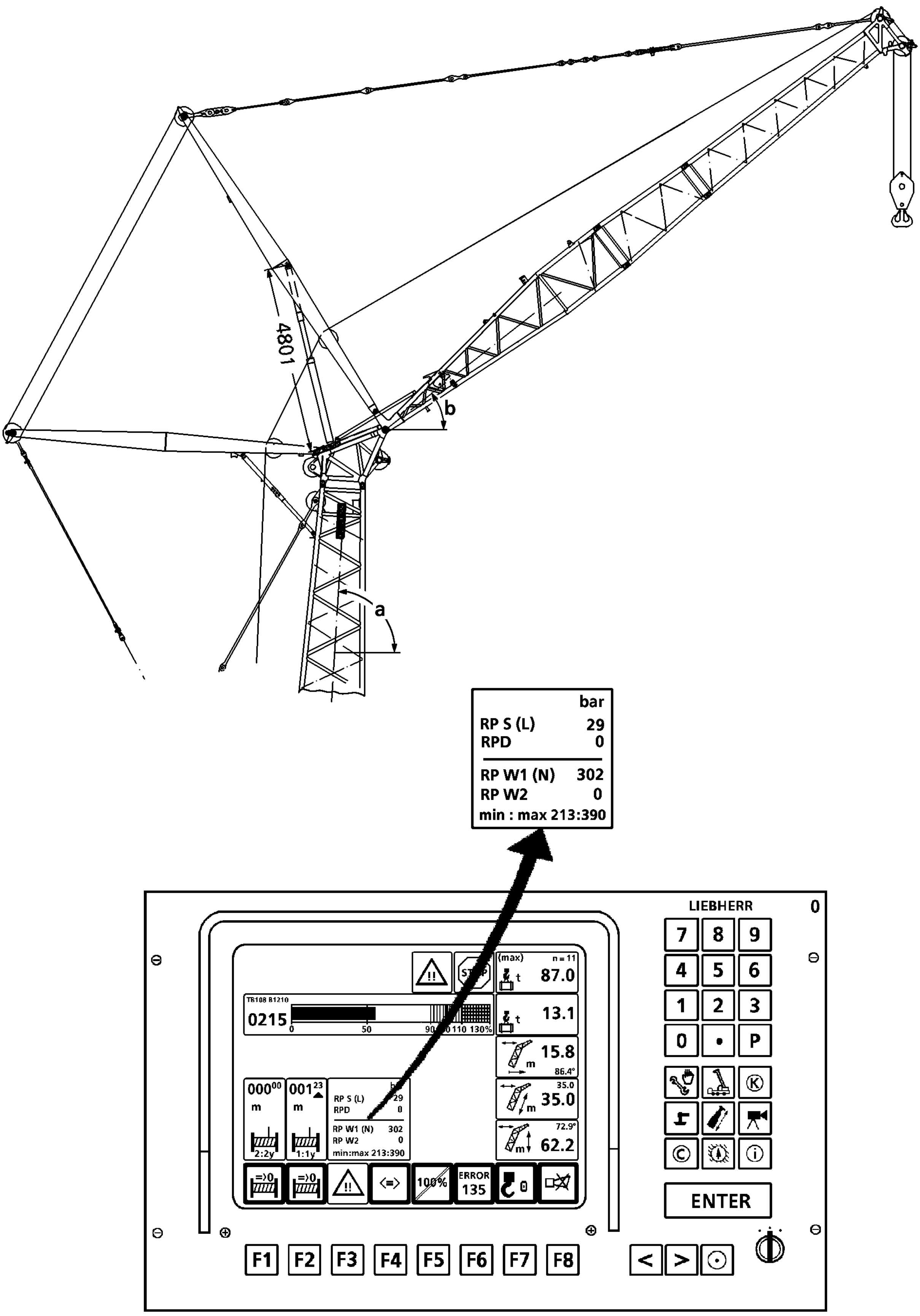


181991


4
M16
2
3
1
181993

8.14 CHECKING THE RELAPSE ACCUMULATOR CYLINDERS WITH PRESSURE MONITOR

024441-00



188855

8.14 CHECKING THE RELAPSE ACCUMULATOR CYLINDERS WITH PRESSURE MONITOR

024441-00

Hydro - accumulator cylinder used as a relapse cylinder for the lattice fly jib

When these cylinders are installed, the hydro accumulator pressure must be checked on LICCON monitor "0" operating view.
One pressure sensor each is installed in the hydraulic section of the cylinder. An electrical signal corresponding to the hydraulic pressure is forwarded to the LICCON monitor "0" in the crane cab.
The monitor "0" shows the corresponding cylinder pressure .
During operation, the **oil pressure = gas pressure**.

To check the specified cylinder pressure
The Hydro - accumulator cylinder must be checked before putting in operation, as follows:

1. Check the specified cylinder pressure at **assembly position**, boom and fly jib **not raised**. as well
2. Check the specified cylinder pressure at **operating position**, boom and fly jib **raised**

to **1.** **Check the specified cylinder pressure on assembly posizion, boom and fly jib not raised:**
Checking position: boom and fly jib still on the ground, WA-bracket not raised, Hydro - accumulator cylinder fully extended.
The displayed operating pressure on monitor "0" must be the same as the nominal pressure noted on chart 1 below.

Chart 1

	Boom angle [a]	Fly jib angle [b]	Cylinder length [mm]	Strok e [mm]	Pressure (bar)			
					-20° C	0° C	+20° C	+40°C
Checking position cylinder fully extended	87 °	36,2 °	4850	1200	93	100,5	108	115

to **2**. **Check the specified cylinder pressure on operating position, boom and fly jib raised:**

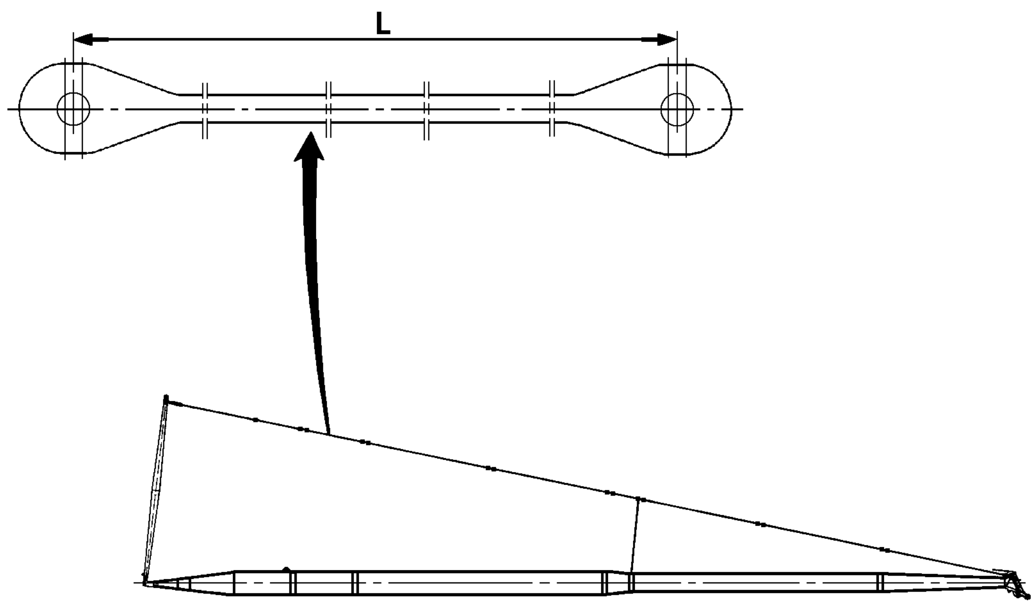
Checking position: Adjust the main boom and the lattice fly jib to an angle in relation to the horizontal line, as noted on the chart 2.
The displayed operating pressure on monitor "0" must be the same as the nominal pressure noted on chart 2 below.

Chart 2

	Boom angle [a]	Fly jib angle [b]	Cylinder length [mm]	Strok e [mm]	Pressure (bar)			
					-20° C	0° C	+20° C	+40°C
Checking position	87 °	38 °+2 °	4801	1151	95,9	103,6	111,3	118,5

C A U T I O N: The pressure noted depends on the ambient temperature. The actual pressure may not deviate more than +/- 10 bar from the nominal pressure.

Note: In case of a problem, it is possible to replace the pressure sensor, since the check valve prevents any emergence of oil.



180875

Inspecting the tension rods / tension columns
The rods and columns must be inspected whenever they are attached.
The rods and columns must be inspected over their entire length, including concealed surfaces and bore holes.

Inspections:

1. Cracks and nicks
The tension rods must be checked visually at least once a year to make sure there are no cracks or nicks. The rods must be replaced if there are any cracks. If there is any doubt, then the affected areas must be subjected to a closer inspection, for example with a magnetic powder test.

2. Elongation
The elongation of the rods and columns must be inspected by measurement. Maximum permissible elongation is **0.2%**; for example, over a length of 7000 mm (23 ft) = 14 mm (20/36").

Note: Initial dimension (L), refer to Chap. 5.03 (LG / LR cranes), Chap. 5.04 (LTM cranes)

3. Wear and abrasion
The bore holes and pins must be inspected for signs of wear and abrasion, including the spring keepers and cotter pins used for securing the pins.

4. Enamel coating
The rod/column coating must be inspected regularly for signs of corrosion. Eroded spots must be repainted. The rods and columns must not be stored in aggressive agents, such as sea water.

5. In case of distortion
for example, after being twisted, the rods and columns must not be used again and must immediately be replaced.

Inspection
The rods and columns must be inspected at least once a year by a specialist. In addition, they must also be inspected in accordance with the conditions at the operating site as well as actual operational applications as required.

The inspection intervals should be carried out in accordance with operational applications and should become shorter in accordance with more frequent use.

D A N G E R : **If damage as described above is established, the rods and/or columns must not be used and must immediately be replaced.**

A damaged guy rod / pull rod can cause serious accidents.

Chapter 9

General Notes

9.01 CODE OF PRACTICE FOR OVERLOAD SAFETY DEVICES OF BOOM CRANES 021687-00

Issued by: VDMA (association of german mechanical- and plant engineers) - January 1970

The telescopic boom crane which has been supplied to you is equipped in conformity with the Accident Prevention Regulations Relating to Telescopic Boom Cranes with an overload safety device (overload motion cut device) by means of which the hoist and the telescoping gear are switched off if the maximum permissible load moment of the crane is exceeded. It must still be possible, after the overload safety equipment has been activated, to perform the opposite movement in order to reduce the crane load, in other words, it must still be possible to lower the load after the hoist has been switched off.

Installation of an overload safety device (overload motion cut device) is intended to prevent loads being lifted with the crane which jeopardise the crane's stability. The overload safety device (overload motion cut device) is thus an emergency switch which switches off any movement which increases the load moment of the crane once the crane has been overloaded and thus prevents a possible accident or damage or injury to persons or property.

It is essential to observe a number of points in order to ensure that the overload safety device is able to perform its safety function:

1. Overload safety devices (overload motion cut devices) mut not be used in normal operations for switching off the hoist or the telescoping gear. The crane operator is required to satisfy himself that lifting the load will not exceed the specified maximum lifting capacity of the crane prior to performing the lifting operation. Excessively heavy loads, which are in excess of the load lifting capacity of the crane, must not be lifted even though an overload safety device is fitted. This safety device must not be used as a means of checking the weight of the load to be lifted and the crane must not be loaded beyond its safe working load.

2. Duties involving freeing stuck loads may only be performed with the prior approval of the crane manufacturer and only using such cranes as are properly equipped for such duties. If the crane is used for such duties, the overload safety device (safe load limiter) must not be used as a means of measuring the force.

3. The overload safety device fitted requires to be inspected and serviced at regular intervals and an operational check should be performed each time before crane operations are commenced. A regular inspection of the overload safety device is an integral part of the crane maintenance procedures in conformity with the Accident Prevention Regulations for Telescopic Boom Cranes.

4. The overload safety device does not normally adjust automatically to the different operating states of the crane. It is therefore the responsibility of the crane operator to also correctly set the overload safety device to the altered lifting capacity or load moment range when the crane is to be used for different duties. The instructions given in the manufacturer's operating manual in this connection should be strictly observed.

   Strict adherence to these instructions is essential to ensure proper operation of this safety device and to ensure safe operation of the crane. An overload safety device which is incorrectly set, e.g. set to an excessively large load moment with the outriggers retracted, is a far greater hazard than a crane not fitted with such a device because this gives the crane operator a false sense of security, which in turn can be the cause of a serious accident.

5. The crane operator is required to set the overload safety device (overload motion cut device) which is fitted to the crane to the altered lifting capacity or load moment range when the crane is to perform different duties, for instance:
   a) when extending or retracting the outriggers (switching over to large or small load moment)
   b) when altering the boom length by
      - manually extending or retracting (telescoping)
      - fitting or dismantling intermediate sections
   c) when turning or slewing the crane into the range of the greater or lesser moment of stability (changing over to the large or small load moment)
   d) when changing over to a different lifting capacity range by reeving the hoist or the telescopic gear with several falls

6) Attention is expressly drawn to the fact that the overload safety device may not be activated or the gear may not be switched off quickly enough if the crane is incorrectly operated. In such cases, it is not possible to completely rule out an accident despite an overload safety device being fitted. This is particularly true for
   - hooking the load or the lifting tackle from below
   - excessive braking forces
   - loads dropping into the rope
   - pulling at an angle
   - moving the crane to an area of ground with a greater slope
   - ground which gives way
   - wind load

7) If a device is provided which enables the overload safety device (safe load limiter) to be switched off or overridden, this may only be used if special safety measures are taken and in the presence of a crane supervisor, e.g. when conducting a test of the crane, and when performing the duties specifically authorised by the crane manufacturer.
   On no account may the overload safety device be switched off or overridden in order to lift a load which exceeds the maximum permissible load lifting capacity of the crane.

Careful observance of the instructions contained in this Code of Practice and in the operating manual of the crane manufacturer are essential requirements for safe and reliable operation of the overload safety device (overload motion cut device). If there is any doubt, the manufacturer's operating instructions should be consulted. If the information contained therein is not sufficient, it is essential to contact the company concerned. Unauthorized interference in the mechanism of the overload safety device will invalidate the warranty provisions.

9.02 GUIDELINES TO PREVENT FIRES IN THE ENGINE AREA AND IMPORTANT SERVICE WORK TO BE PERFORMED

022373-02

1. Inspections

1.1 Check the engine area daily before starting the crane, and check all oil and fuel lines for leaks and make sure they are dry. In addition, check the fuel and oil filter as well as the injection pump for leaks.

1.2 During the daily check up, also check all hydraulic components, the hydraulic motors for the fan drives and corresponding hydraulic lines to assure that they are tight and that there are no leaks.

1.3 Check the exhaust system, especially the exhaust flange and the exhaust flap brakes to assure that they are not leaking and are easily movable. The return springs to open the exhaust flaps must be functioning properly, as stuck and therefore closed exhaust flaps during engine operation cause great increases in temperatures and overheating.

1.4 Check if electrical lines are still routed and mounted properly, with sufficient distance to exhaust pipes, and assure that they are not damaged and still properly insulated.

1.5 To reduce noise emission, insulating baffle mats have been installed in the engine and gear compartments on some crane models. They are fire retardent and, depending on the job location, even inflamable.

It must be checked if the baffle mats are in any way contaminated with solutions, covered with oil and fuel or are damaged. In any of these cases, they must be removed immediately and replaced with original replacement parts.

When cleaning the engine or gear area, note the instructions for maintenance of these mats, see chapter7.01.

2. Care during repairs and maintenance work

2.1 When changing the fuel and oil filters, you must observe utmost cleanliness and carefully clean up any spilled Diesel fuel or oil. Check the fuel and hydraulic system for leaks.

2.2 The V-area of the engine must be especially checked after repairs and service tasks, in addition to regular intervals, to assure it is free of oil and fuel. Any fuel in the V-area can run throughout the engine compartment during travel and cause a fire, if it hits hot engine parts.

2.3 We note again, that all electrical lines and wires must be properly routed and must be attached in their harnesses, any chafings or defects of the insulation and wiring covers must be taken care off immediately. Any improper installation lines must be replaced immediately.

2.4 Be aware that fuel and oil lines can become porous or brittle due to age. Any lines which look brittle or porous must be replaced immediately. (See also Guidelines about the life expectancy of hoses and lines).

2.5 Please note, while carrying out repairs and service task, that you do not step on any pipe or hose lines in the engine area. This applies especially to fuel injection lines. If you must step in that area during installation, then the engine must be covered with a board or similar support plate.

3. Important service tasks

3.1 Gear and engine oil levels must be checked regularly. Add oil to compensate for normal oil consumption. However, if an unusual amount of oil must be added or has been lost, you must check for and remedy the problem.

4. Maintenance guidelines for replacement components

4.1 When replacing drive components, such as Diesel engine, gear, axles, etc. you must observe the following:
- Before putting these components into service, make sure to add the specified oil to the max. mark; for type of oil, check data tag and lubrication chart.
- Perform the first maintenance check as noted in chapter MAINTENANCE INTERVALS; then carry out all regular maintenance intervals as noted.

4.2 Make sure to follow initial operational instructions.

5. Disposal

5.1 Engine, gear and hydraulic oils, grease, fuel:
To prevent pollution, these service fluids may not be spilled onto the ground, to prevent them from getting into ground water, sewage, or drainage systems.
Observe all state and local regulations applicable to the disposal of these items.

5.2 Radiator fluids for Diesel engines and heater systems:
For disposal, undiluted antifreeze fluids / corrosion protective oils must be handled as special hazardous material.
When disposing of used coolant fluids (mixture of antifreeze / corrosion protective oils and water, observe all state and local regulations applicable to the disposal of these items.