LIEBHERR

LATTICE BOOM CRAWLER TRACK CRANE

LR 1750

crane no.: 074704, 074706

Operating instructions

BAL-No. **12802-04-02**

pages : 1 up to 1079

Crane number	
Date	

The operating instructions are part of the crane !

Always keep on hand !

Comply with road travel and crane operating regulations !

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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 "

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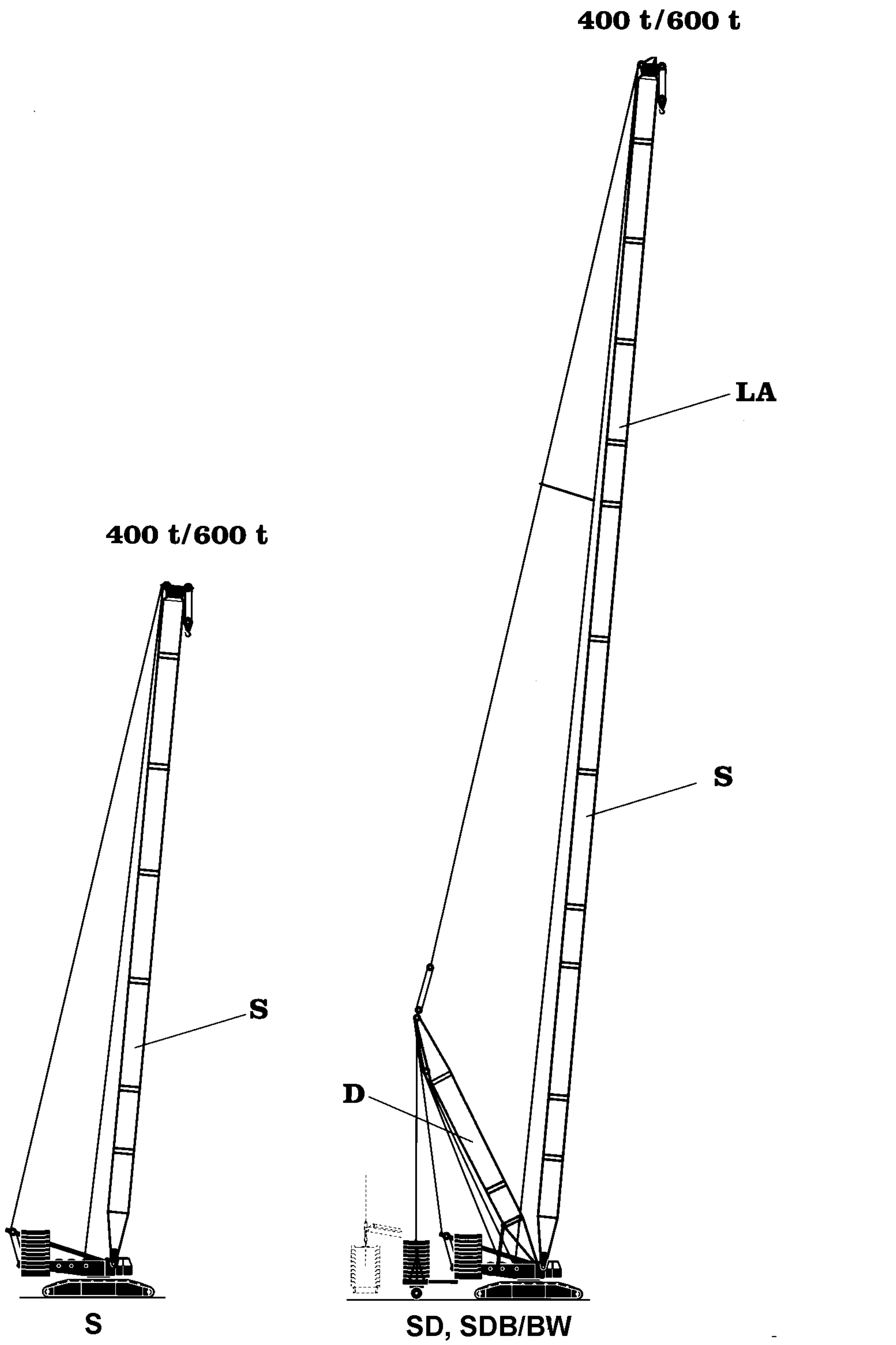
Chapter 1

Description of the Crane

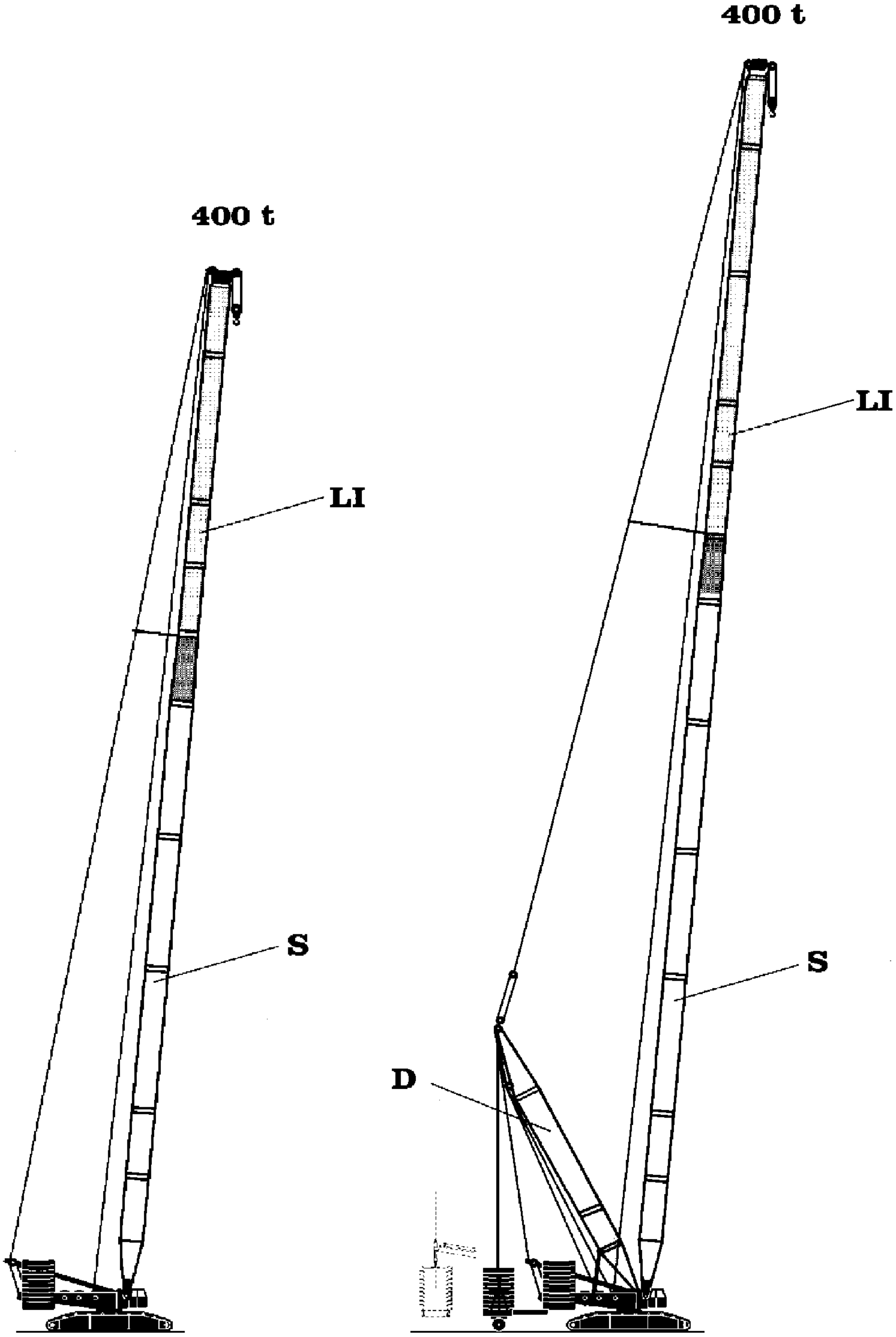

400 t/600 t
LA
S
400 t/600 t
S
D
S
SD, SDB/BW
190569

Short description of boom systems

S	-	Main boom,	System 2826.20
D	-	Derrick boom,	System 2421.10
B	-	Suspended ballast	
BW	-	Ballast trailer	

S	-	2826.20
LA	-	2826.10
D	-	2421.10

Boom combination								**System**
S	-	Boom combination	S	=	21,0 m	-	84,0 m	**S 2826.20**
SD, SDB/BW	-	Boom combination	S	=	35,0 m	-	140,0 m	**S 2826.20 / LA 2826.10**
			D	=	31,5 m			**D 2421.10**



SL

SLD, SLDB/BW

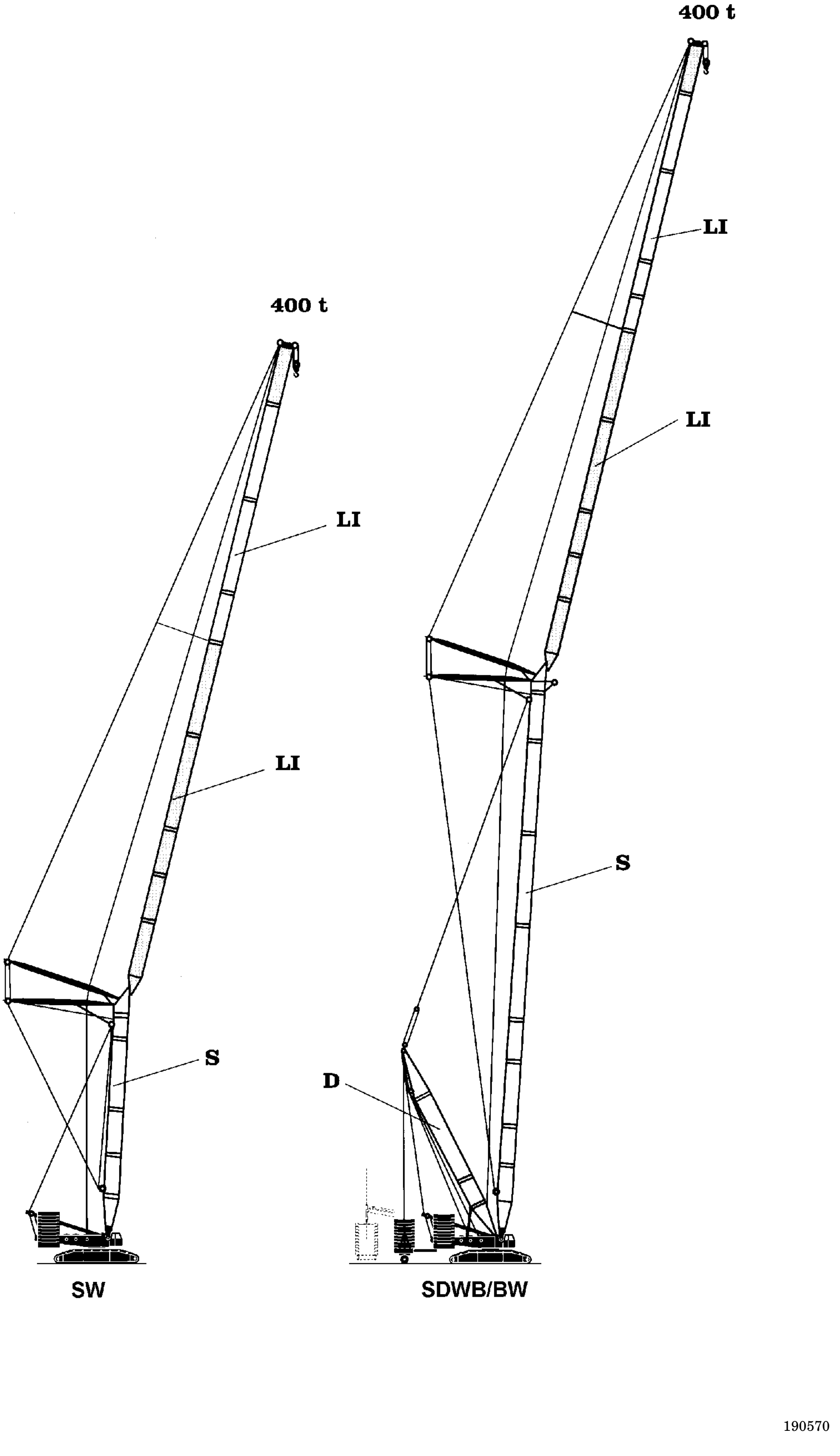
190568

Short description of boom system

SL	-	Main boom,	System 2826.20 / 2421.10
D	-	Derrick boom,	System 2421.10
B	-	Suspended ballast	
BW	-	Ballast trailer	

S	-	2826.20
LI	-	2421.10
D	-	2421.10

Boom combination								**System**
SL	-	Boom combination	SL	=	28,0 m	-	105,0 m	**S 2826.20 / LI 2421.10**
SLD, SLDB/BW	-	Boom combination	SL	=	35,0 m	-	133,0 m	**S 2826.20 / LI 2421.10**
			D	=	31,5 m			**D2421.10**

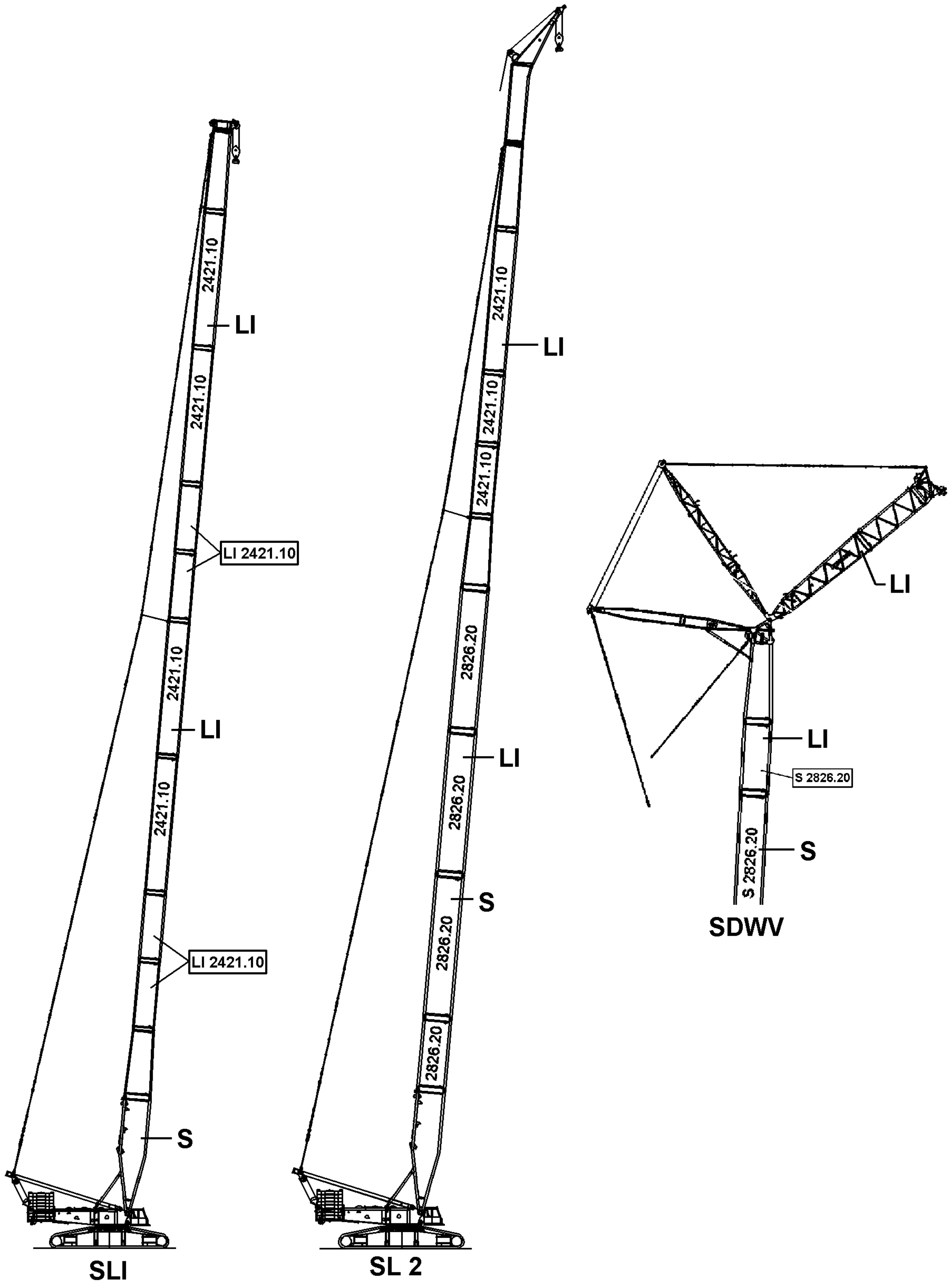

400 t
LI
LI
S
SW
400 t
LI
LI
S
D
SDWB/BW
190570

Short description of boom systems

S	-	Main boom,	System 2826.20
W	-	Luffing lattice jib ,	System 2421.10 / 2421.8
D	-	Derrick boom	System 2421.10
B	-	Suspended ballast	
BW	-	Ballast trailer	

S	-	2826.20
LI	-	2421.10
LI	-	2421.8
D	-	2421.10

Boom combination							**System**
SW	- Boom combination	S	=	35,0 m	-	63,0 m	**S 2826.20**
		W	=	28,0 m	-	105,0 m	**LI 2421.10 / LI 2421.8**
SDWB/BW	- Boom combination	S	=	35,0 m	-	91,0 m	**S 2826.20**
		W	=	28,0 m	-	105,0 m	**LI 2421.10 / LI 2421.8**
		D	=	31,5 m			**D 2421.10**


2421.10
LI
2421.10
LI 2421.10
2421.10
LI
2421.10
LI 2421.10
S
SLI
2421.10
LI
2421.10
2421.10
2826.20
LI
2826.20
S
2826.20
2826.20
SL 2
LI
LI
S 2826.20
S 2826.20
S
SDWV

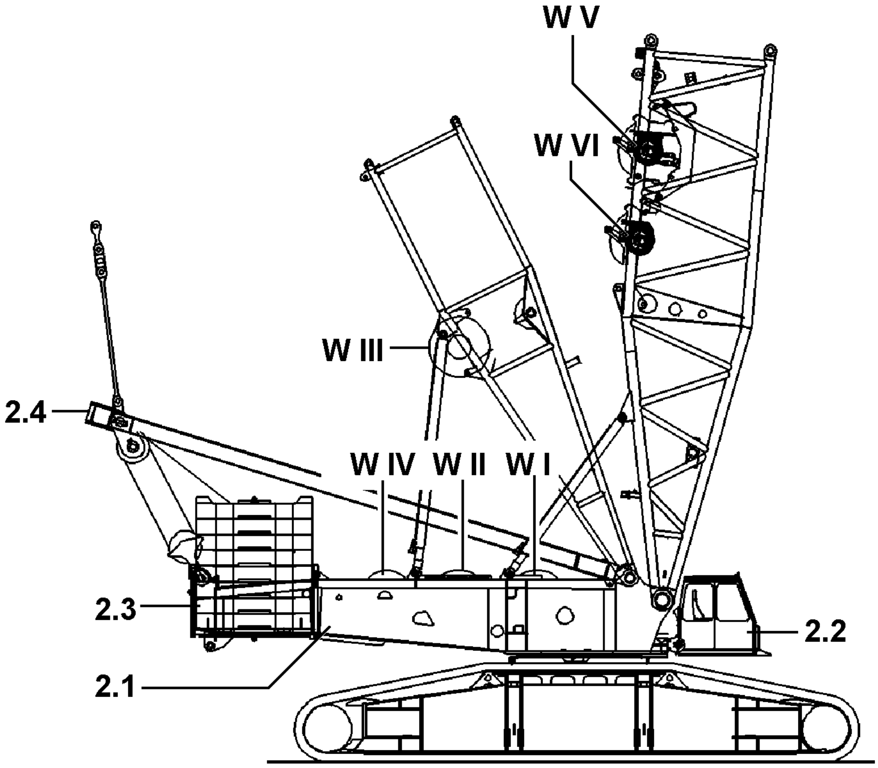
192584

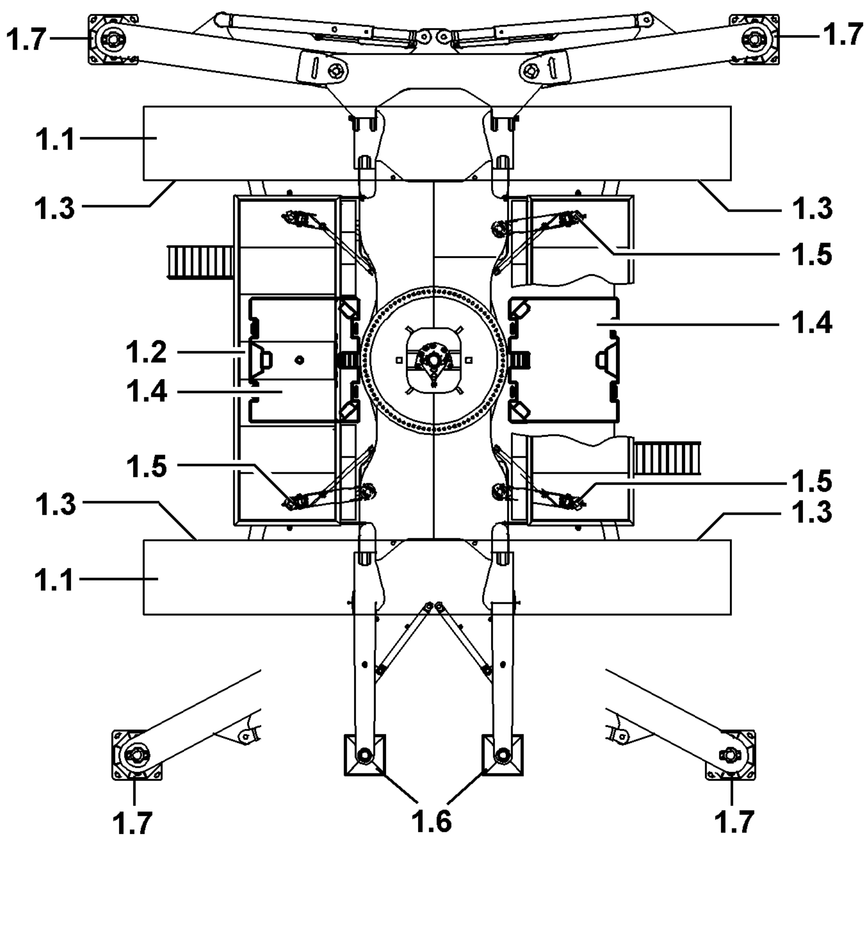
Short description of boom systems

SLI	-	Main boom,	System 2421.10
SL2	-	Main boom	System 2826.20 / 2421.10
S	-	Main boom	System 2826.20
D	-	Derrick boom	System 2421.10
WV	-	Lattice jib	System 2421.10
B	-	Suspended ballast	
BW	-	Ballast trailer	

S	-	2826.20
LI	-	2421.10
LI	-	2421.8
D	-	2421.10

Boom combination								**System**
SLI	-	Boom combination	SL	=	28,0 m	-	112,0 m	**S 2826.20 / LI 2421.10**
SL 2	-	Boom combination	SL	=	76,0 m	-	118,0 m	**SL 2826.20 / 2826.10 / LI 2421.10**
SDWVBW	-	Boom combination	S	=	35,0 m	-	91,0 m	**S2826.20**
			WV	=	14,0 m	-	21,0 m	**LI 2421.10 / LI 2421.8**
			D	=	3,5 m			**D2421.10**


W V
W VI
W III
2.4
W IV
W II
W I
2.3
2.2
2.1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1.3
1.1
1.7
1.6
1.7
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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 installation supports

1.6 Mechanical added supports

1.7* Crane support

2 Slewing platform

I Winch I

II Winch II

III Winch III

IV Winch IV

V Winch V

VI Winch VI

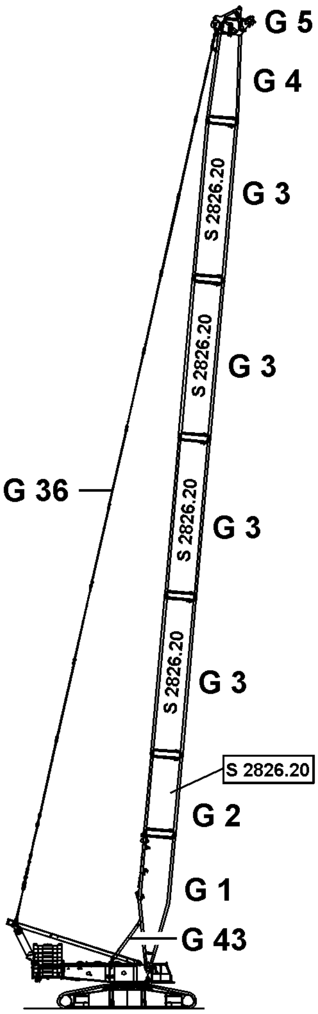
2.1 Diesel engine

2.2 Crane operator's cab

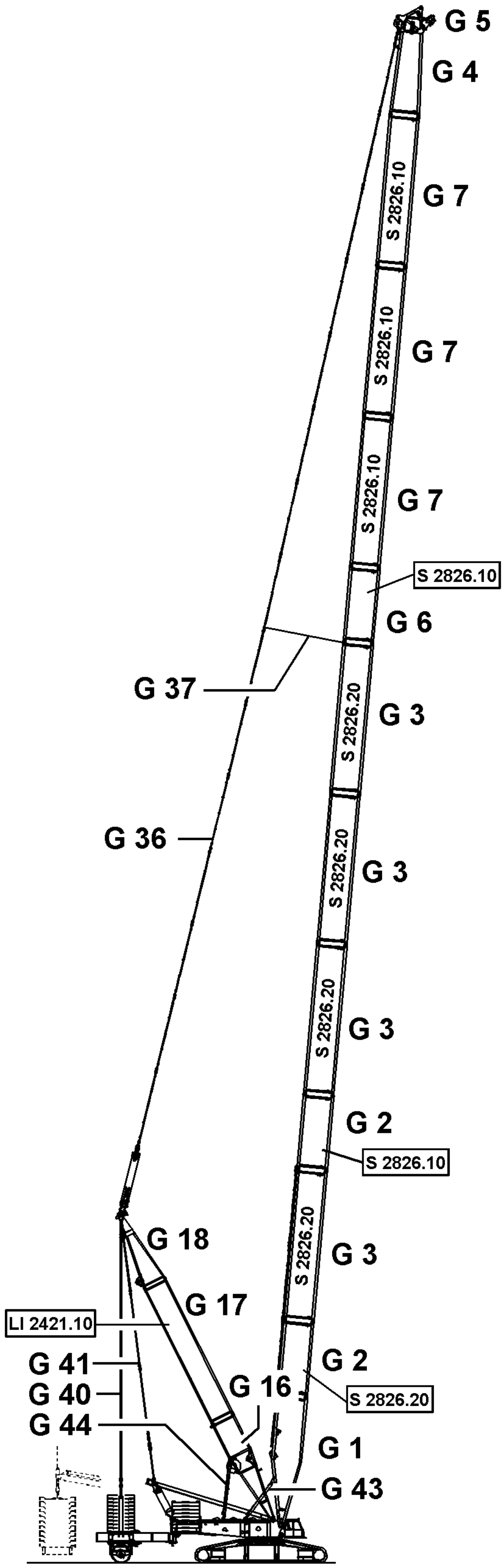
2.3 Counterweight

2.4 LA - Bracket

* = If installed



S



SD, SDB / BW

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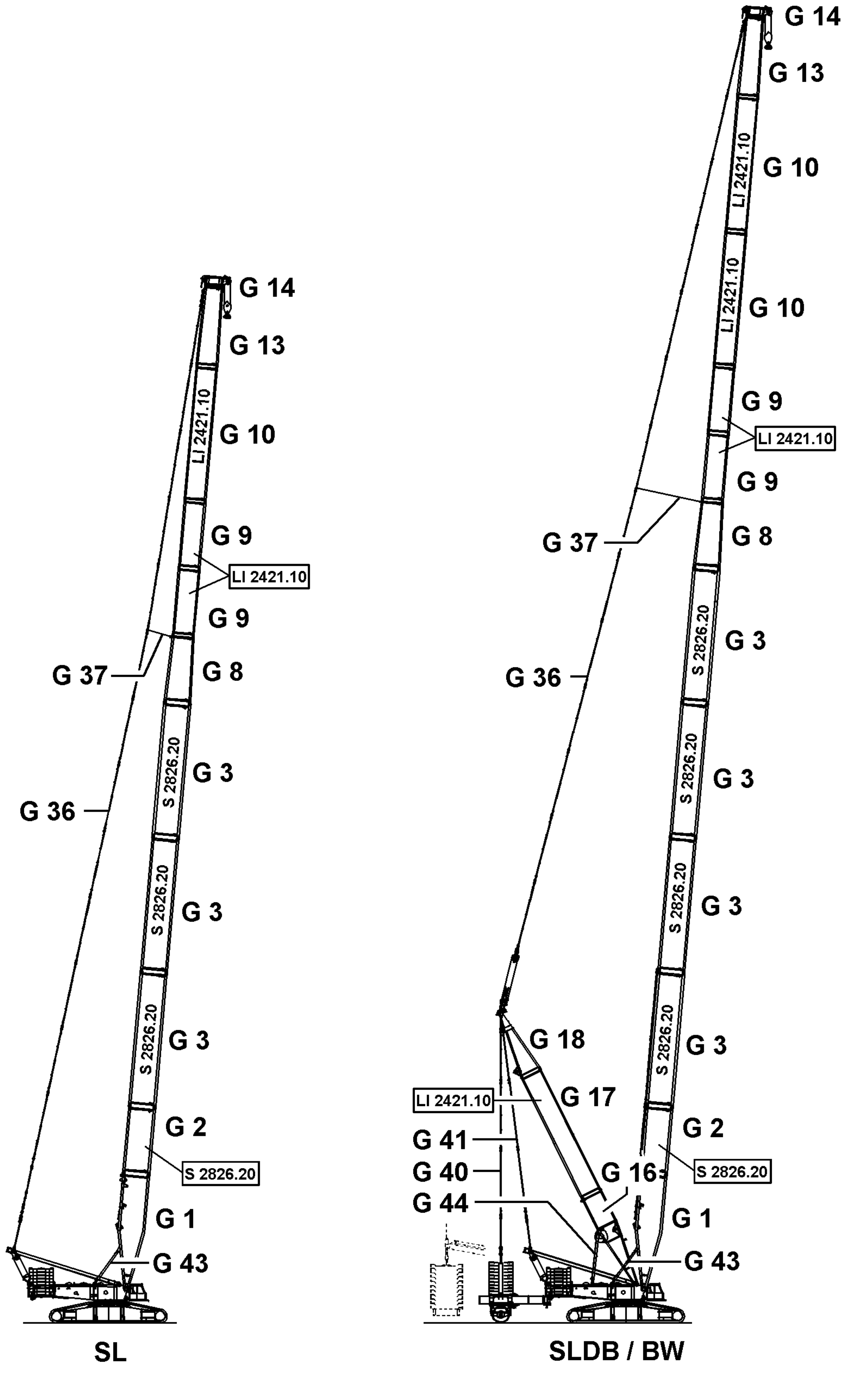
G 14
G 13
LI 2421.10
G 10
G 9
LI 2421.10
G 9
G 37
G 8
S 2826.20
G 3
G 36
S 2826.20
G 3
S 2826.20
G 3
G 2
S 2826.20
G 1
G 43
SL
G 14
G 13
LI 2421.10
G 10
LI 2421.10
G 10
G 9
LI 2421.10
G 9
G 37
G 8
S 2826.20
G 3
G 36
S 2826.20
G 3
S 2826.20
G 3
S 2826.20
G 3
G 18
G 17
LI 2421.10
G 41
G 2
G 40
G 16
S 2826.20
G 44
G 1
G 43
SLDB / BW

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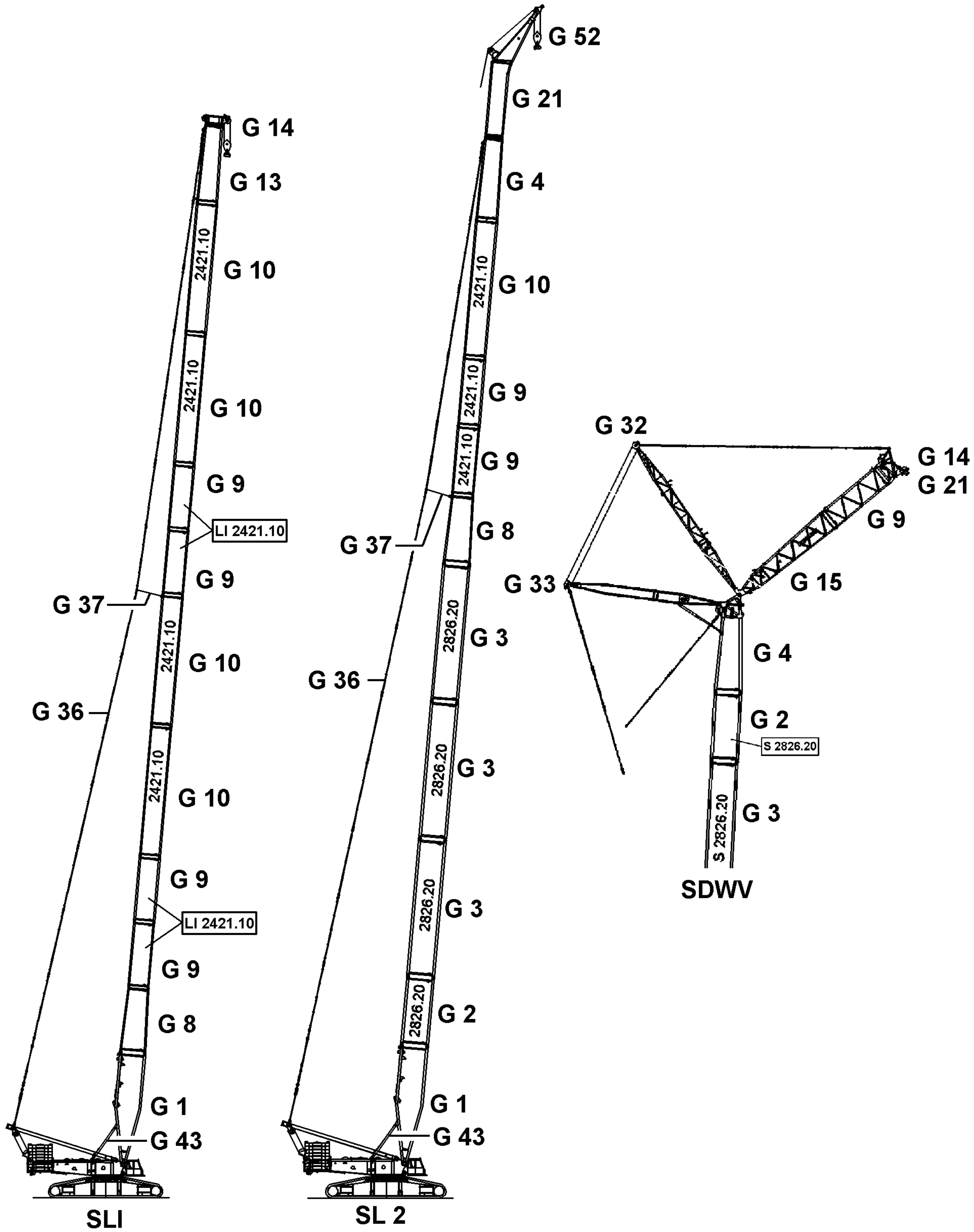

G 14
G 13
2421.10
G 10
2421.10
G 10
G 9
LI 2421.10
G 9
G 37
2421.10
G 10
G 36
2421.10
G 10
G 9
LI 2421.10
G 9
G 8
G 1
G 43
SLI
G 52
G 21
G 4
2421.10
G 10
2421.10
G 9
2421.10
G 9
G 8
G 37
2826.20
G 3
G 36
2826.20
G 3
2826.20
G 3
2826.20
G 2
G 1
G 43
SL 2
G 32
G 14
G 21
G 9
G 33
G 15
G 4
G 2
S 2826.20
S 2826.20
G 3
SDWV

192478

Combination of maximum possible attachment

	Description	System	Length (m)	Weight (t)
G 1	S -Pivot section with S + W-rods + retaining cylinder	2826.**20**	12,0	17,0
	S -Pivot section with winch V	2826.**20**	12,0	23,9
	S -Pivot section with winch VI	2826.**20**	12,0	20,8
G 2	S -Intermediate section	2826.**20**	7,0	6,2
G 3	S -Intermediate section	2826.**20**	14,0	11,3
G 4	S-End section		9,0	11,9
G 5	Pulley set 600 / 400 t for S-End section		1,7	2,7
G 6	LA -Intermediate section	2826.**10**	7,0	4,5
G 7	LA -Intermediate section	2826.**10**	14,0	8,1
G 8	SL - Reducer section		7,0	4,3
G 9	LI -Intermediate section	2421.**10**	7,0	3,8
G 10	LI -Intermediate section	2421.**10**	14,0	7,0
G 11	LI -Intermediate section	2421.**8**	7,0	3,1
G 12	LI -Intermediate section	2421.**8**	14,0	5,8
G 13	L - Adapter		8,4	6,0
G 14	L -End section (400 t)		0,6	3,6
G 15	W -Pivot section		12,0	10,6
G 16	D -Pivot sectionwith rods and pulley block	2421.**10**	10,5	12,7
	D -Pivot section with winch III	2421.**10**	10,5	15,4
G 17	D -Intermediate section	2421.**10**	14,0	8,6
G 18	D -End section	2421.**10**	7,0	11,2
G 21	WV- Adapter f. pulley set 600 / 400 t			5,1

Note: Example: 2826.**20** = **.20** (welded on plate on intermediate section)
For two 7 m intermediate sections, one 14 m intermediate section can be installed.

D A N G E R: **No other combination of lattice sectiosn or guy rods than that described in the Operating Manual or the assembly drawings is allowed!**
There is a danger that the intermediate sections, which are sized differently but do NOT differ externally, will be mixed up!
They only differ externally by different welded on plates (.8, .10, .20)
When installing the boom, it must be observed that the intermediate sections are installed according to their description. If this is not observed, there is a danger of accidents!

Combination of maximum possible attachment

	Description	System	Length (m)	Weight (t)
G 31	W- Installation unit		13,40	10,6
G 32	WA- bracket I		17,50	5,6
G 33	WA- bracket II with rods and cylinder		15,50	11,2
G 34	L- guying			
G 35	L- added guying			
G 36	S- guying			
G 37	S- added guying			
G 38	W- guying			
G 39	W- added guying			
G 40	B or BW- guying			
G 41	D- guying			
G 43	S- retainer			
G 44	D- retainer			
G 45	W- retainer			
G 50	Boom nose (L-End section)		3,1	0,8
G 51	Boom nose (S-End section)		2,8	1,0
G 52	Boom nose 100 t, (for Sl 2- boom)		6,0	

Note: Example: 2826**.20** = **.20** (welded on plate on intermediate section)
** = S- End section (roller set 600 t)
For two 7 m intermediate sections, one 14 m intermediate section can be installed.

D A N G E R: **No other combination of lattice sectiosn or guy rods than that described in the Operating Manual or the assembly drawings is allowed!**
There is a danger that the intermediate sections, which are sized differently but do NOT differ externally, will be mixed up!
They only differ externally by different welded on plates (.8, .10, .20)
When installing the boom, it must be observed that the intermediate sections are installed according to their description. If this is not observed, there is a danger of accidents!

Crawler track chassis.

Frame:	Self-manufactured, torsion resistant, welded ocnstruction 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: 1,5 m (optional 2 m), track gauge: 8,8 m.
Drive:	Per crawler carrier, 1 (optional 2) hydraulic travelling drive with planetary gear. The crawler chains can be controlled independently and opposed, i.e. there is no preferential travelling direction.
Driving performance:	Infinitely variable speed from 0 to 1,75 km/h.

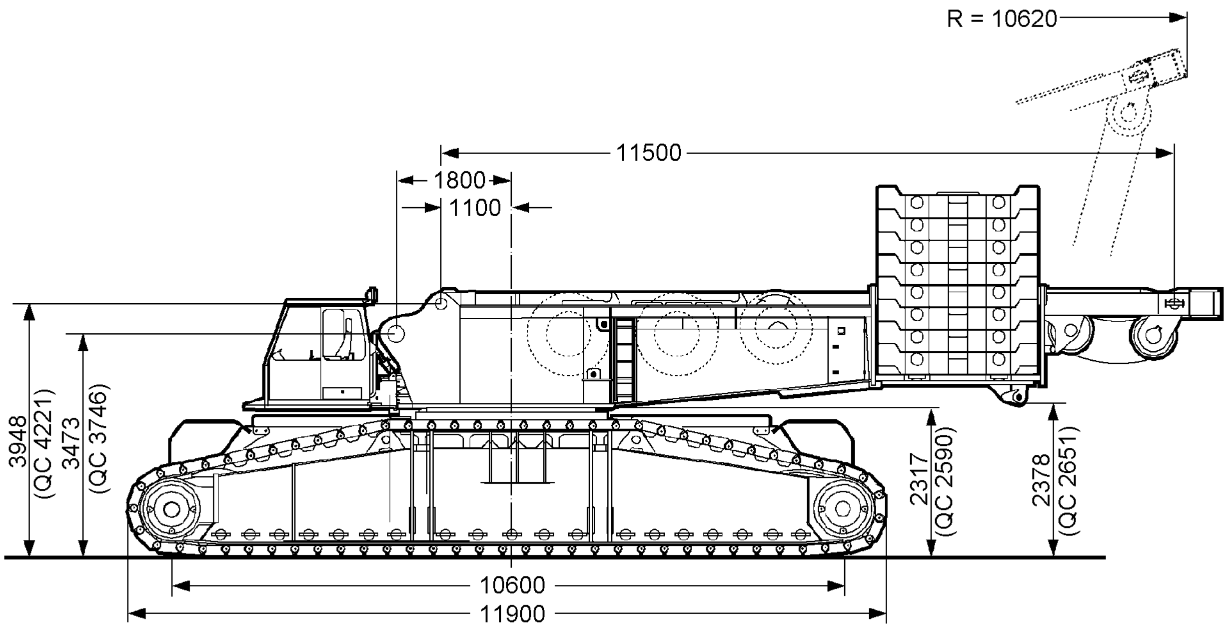
Crane superstructure.

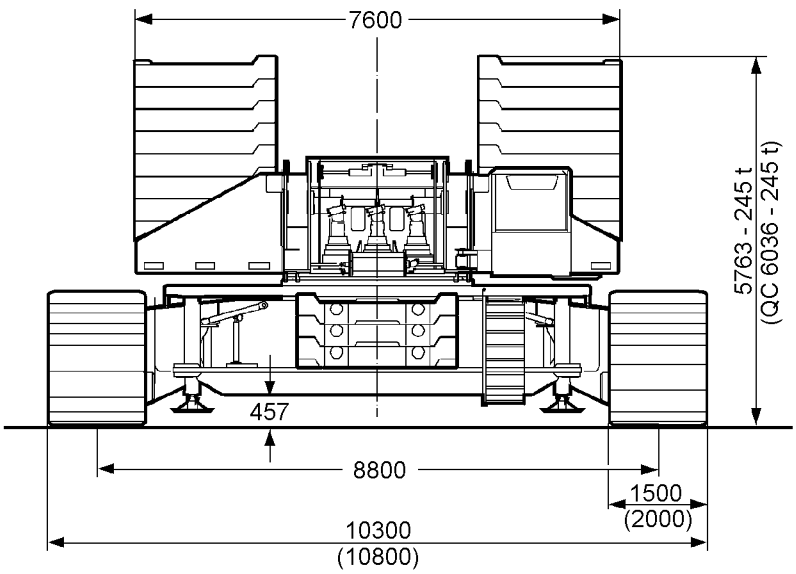
Frame:	Self-manufactured, torsion resistant, welded construction of high-tensile steel. Connected to chassis by a 3-row roller slewing ring, 360° slewing range.
Engine:	8 cylinder Liebherr Turbo Diesel, type D 9408 TI-E A4, water cooled, output acc. to DIN 400 kW (544 HP) at 1800 min-1, max. torque 2425 Nm at 1000 min-1. Fuel tank capacity: 850 litres.
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 1, 2 and 4:	Winches 1 and 2 as hoist gears and winch 4 as luffing gear, hydraulically controlled by axial piston variable displacement pumps and planetary gears. Spring-load multi-disc brake with hydraulic release.
Slewing gear:	Hydraulically controlled by axial piston pump and planetary gear, spring-loaded multi-disc brake with hydraulic release. Infinitely variable slewing speed 0 – 0,8 min-1.
Counterweight:	245 t, consisting of: 2 base slabs of 10 t each, 18 slabs of 12,5 t each.
Operator's cab:	Sheet steel design with safety glazing, movable sidewards and inclinable to the rear, including operating equipment and check instruments, warm water heating.
Safety devices:	LICCON safe load indicator, hoist limit switch, electronic display of inclination (inclinometer), safety valves to protect hydraulic system against pipe and hose fracture.
Electrical system:	24 V DC – 2 batteries, 143 Ah each.

Boom configurations and optional features.

Winches 3, 5 and 6:	Winch 3 for luffing motion S or SL at derrick mode. Winch 5 for luffing motion of jib. Winch 6 as winch for boom nose.
Supporting devices:	4 hydraulic supporting rams, at the crawler center section for the self-erection of the crane.
Quick Connection:	For separating the crane superstructure from the crawler.

Dimensions
QC = with Quick Connection





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Weights

Basic machine without boom

Crane super-structure (without winch 1 u. 2) (t)	Counter-weight (t)	Center section		Crawler travel gear				Central ballast (t)
				1 drive		2 drives		
		normal (t)	re-inforced (t)	normal (t)	re-inforced (t)	normal (t)	re-inforced (t)	
53.9	245	27,4	42,5	41.5*	44.1*	45.8*	46.5*	95

* = Weight withone bottom plate width of 1.5 m . With a 2.0 m plate width, the weight increases by about 10.0 t.

The load tackle

Load carrying capacity	Rollers	Sheaves	Weight in t
600	2 × 11	2 × 22	*
400	2 × 7	2 × 14	*
312	11	23	*
215	7	15	*
107	3	7	*
47	1	3	*
16	--	1	*

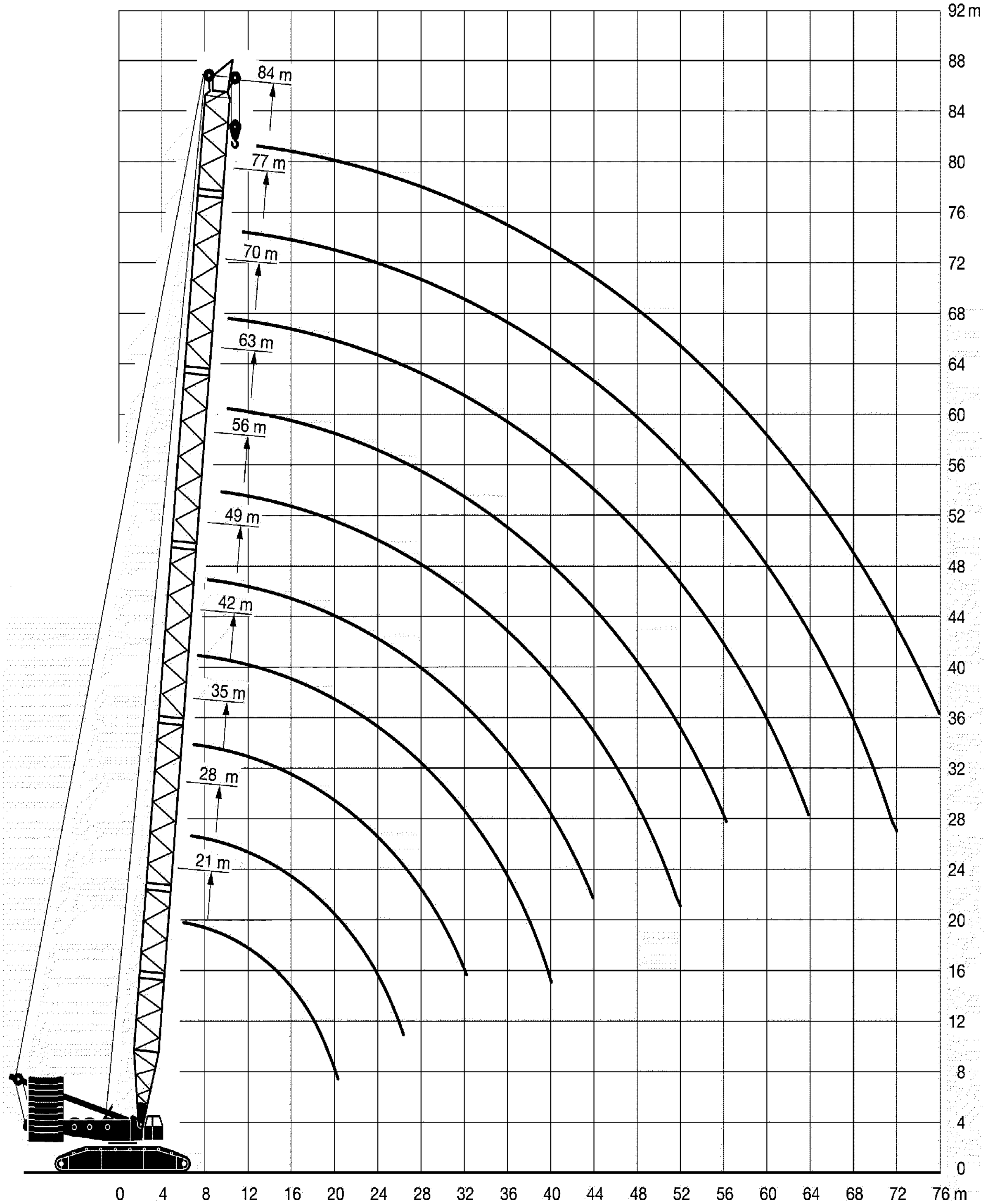
* = see chapter 4.06

Speeds

The crane speeds at an engine RPM of 1900 min^{-1}

Drives	stepless	Cable diameter ∅
Winch I, II	0 - 130 m / min for single strand	28 mm
Winch III	0 - 130 m / min for single strand	28 mm
Winch V	0 - 130 m / min for single strand	28 mm
Winch VI	0 - 130 m / min for single strand	28 mm
Winch IV	2 × 70 m/ min for single strand	28 mm
Slewing gear	0 - 0,8 min^{-1}	

Hoisting heights
S - Boom system



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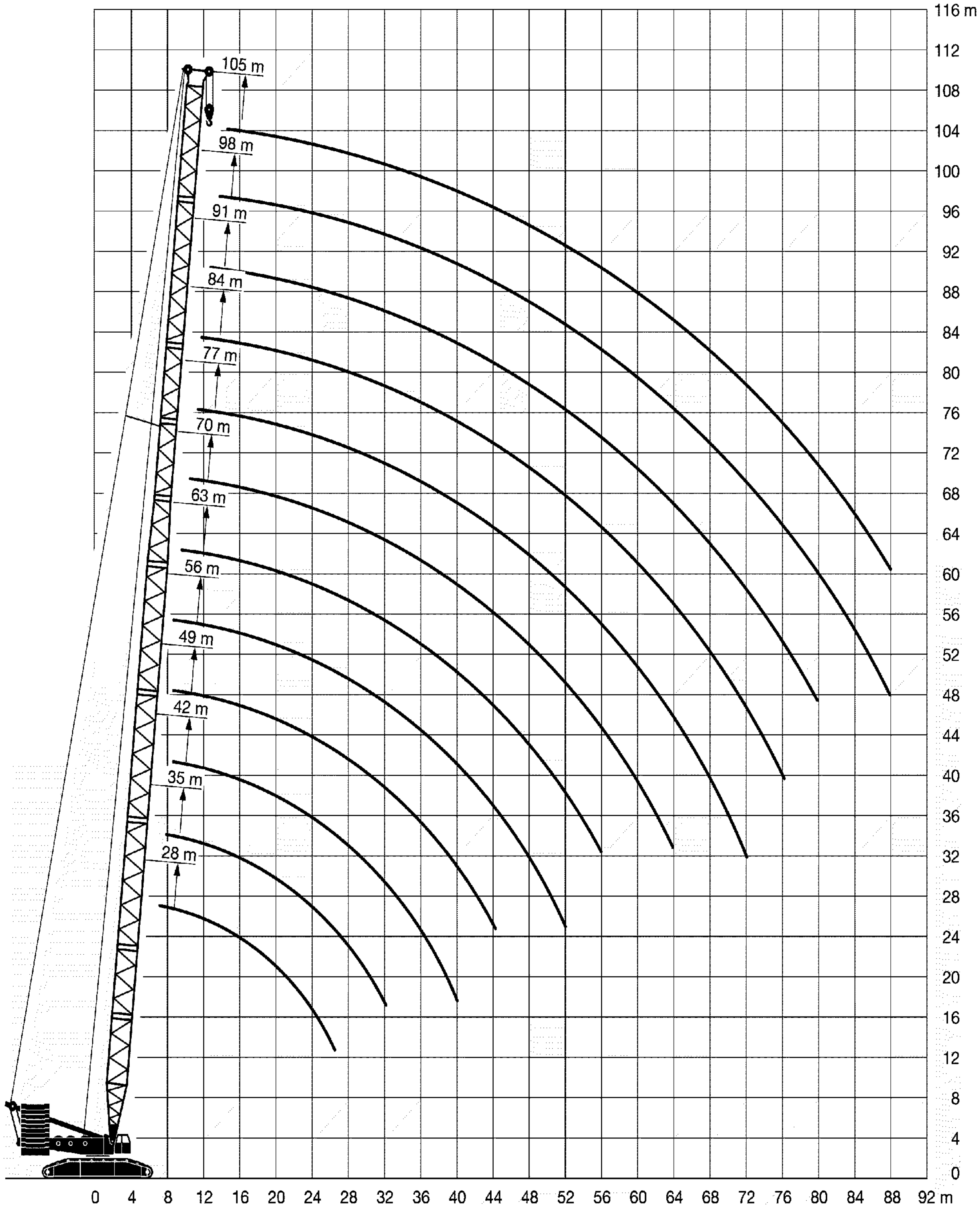
Hoisting heights
SL - Boom system



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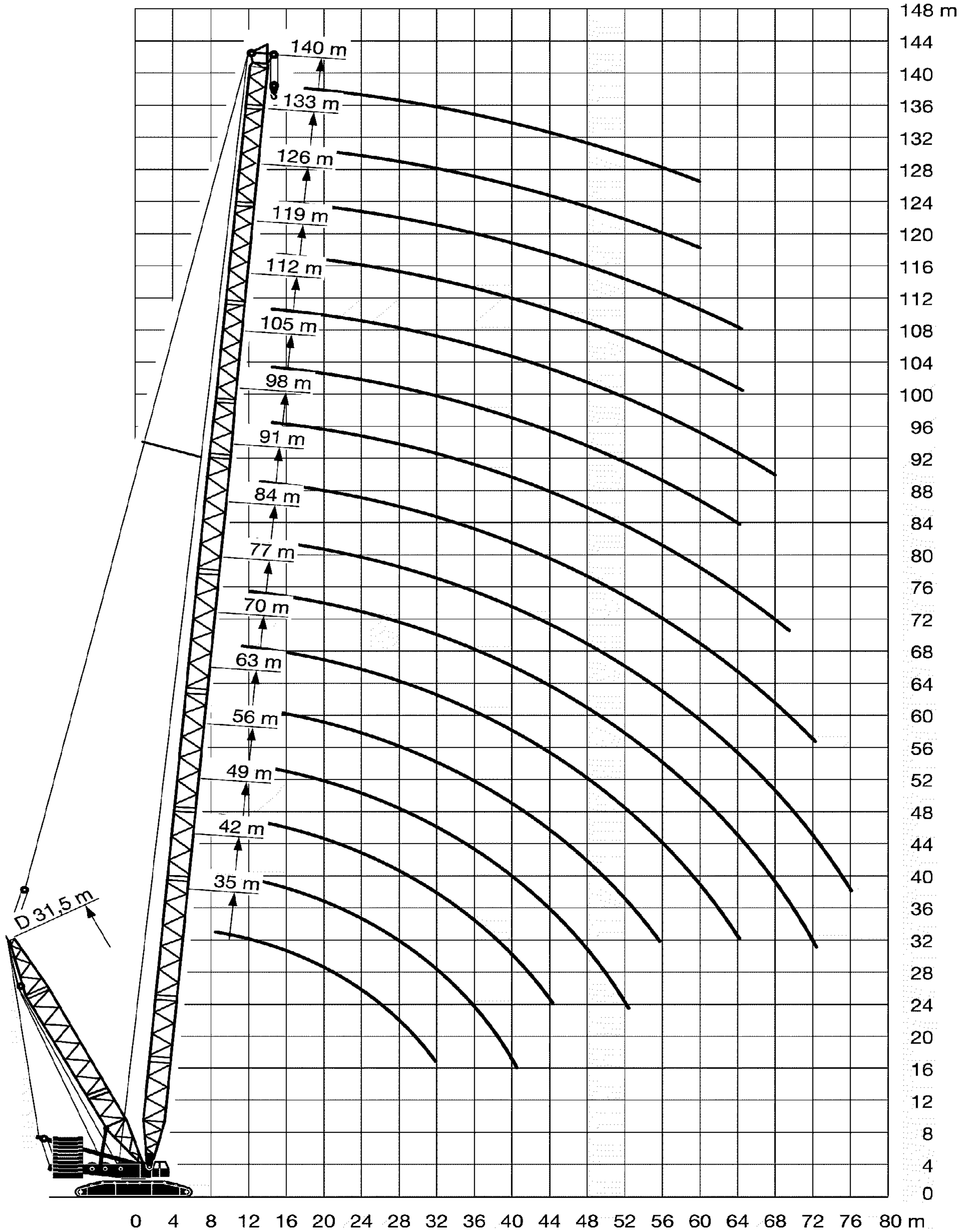
Hoisting heights
SD - Boom system



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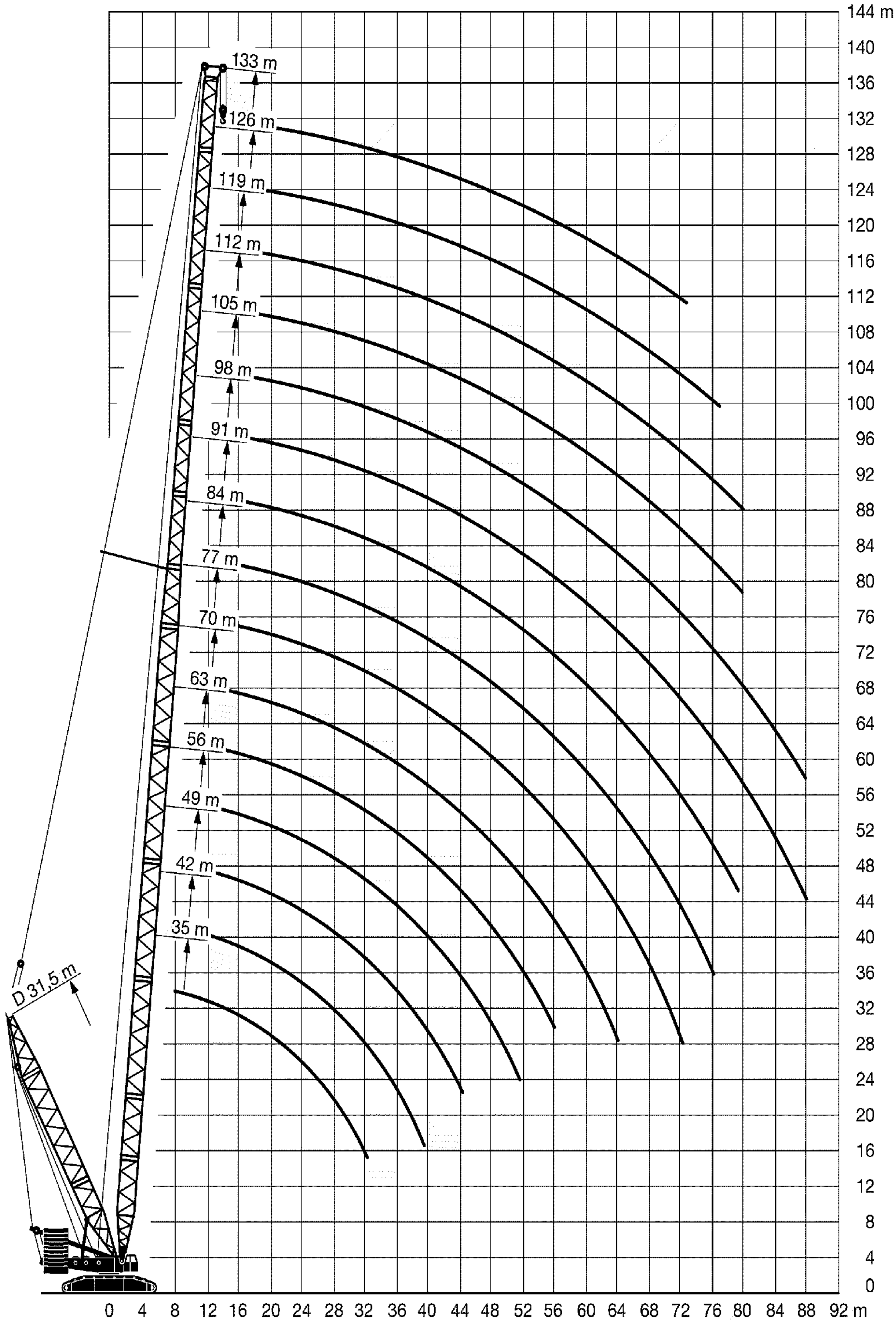
Hoisting heights
SLD - Boom system



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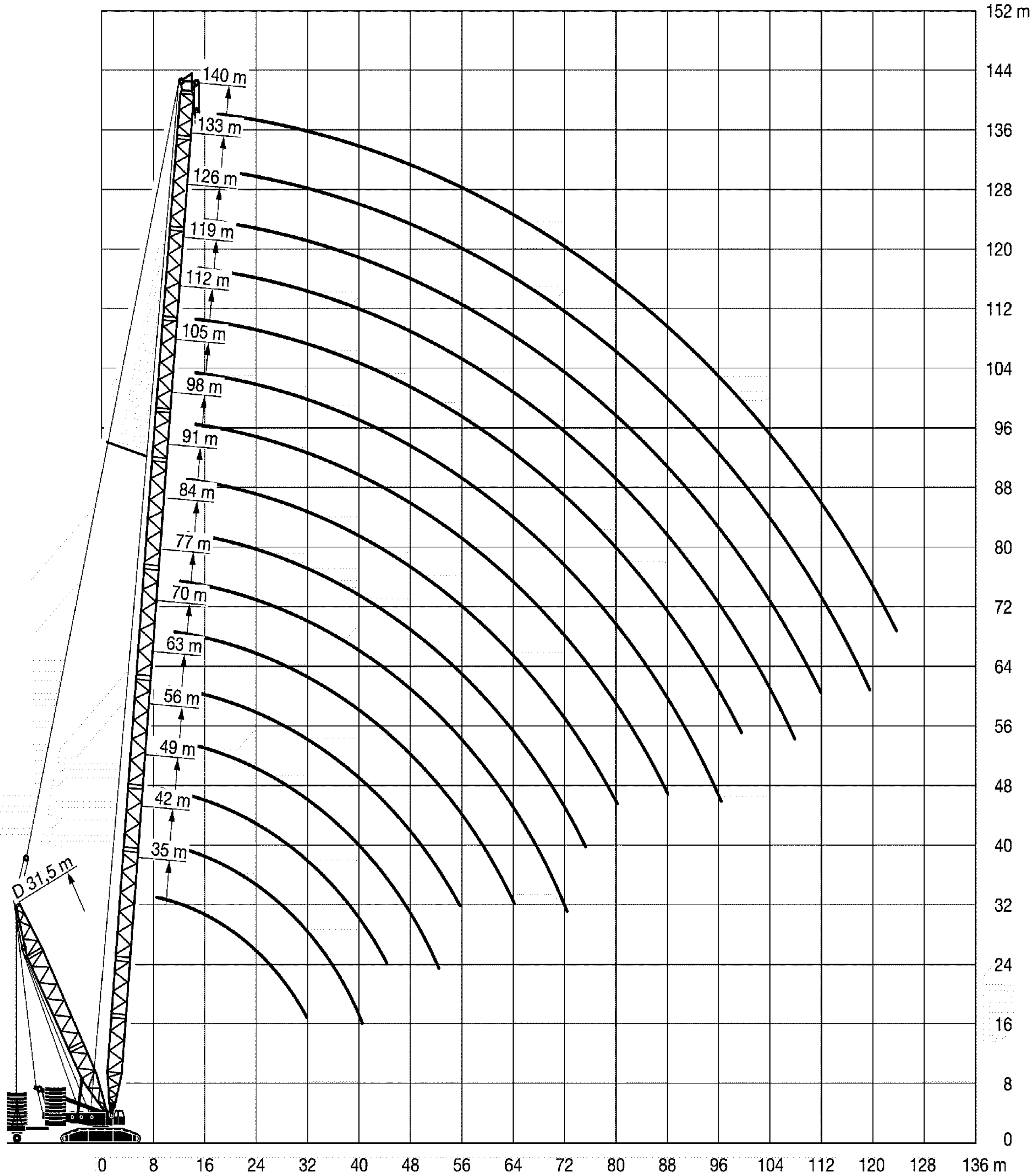
Hoisting heights
SDB / BW - Boom



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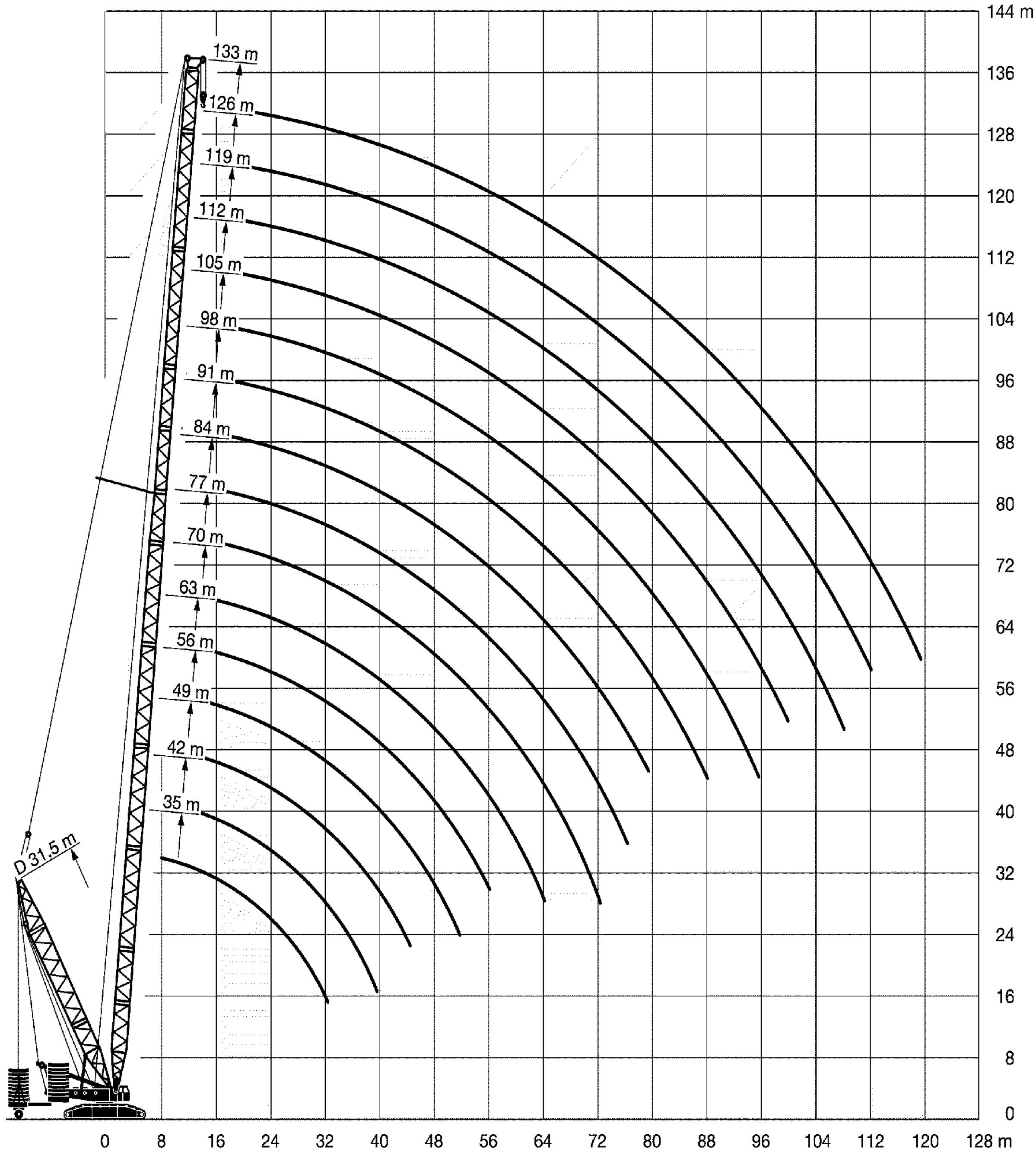
Hoisting heights
SLDB / BW - Boom system



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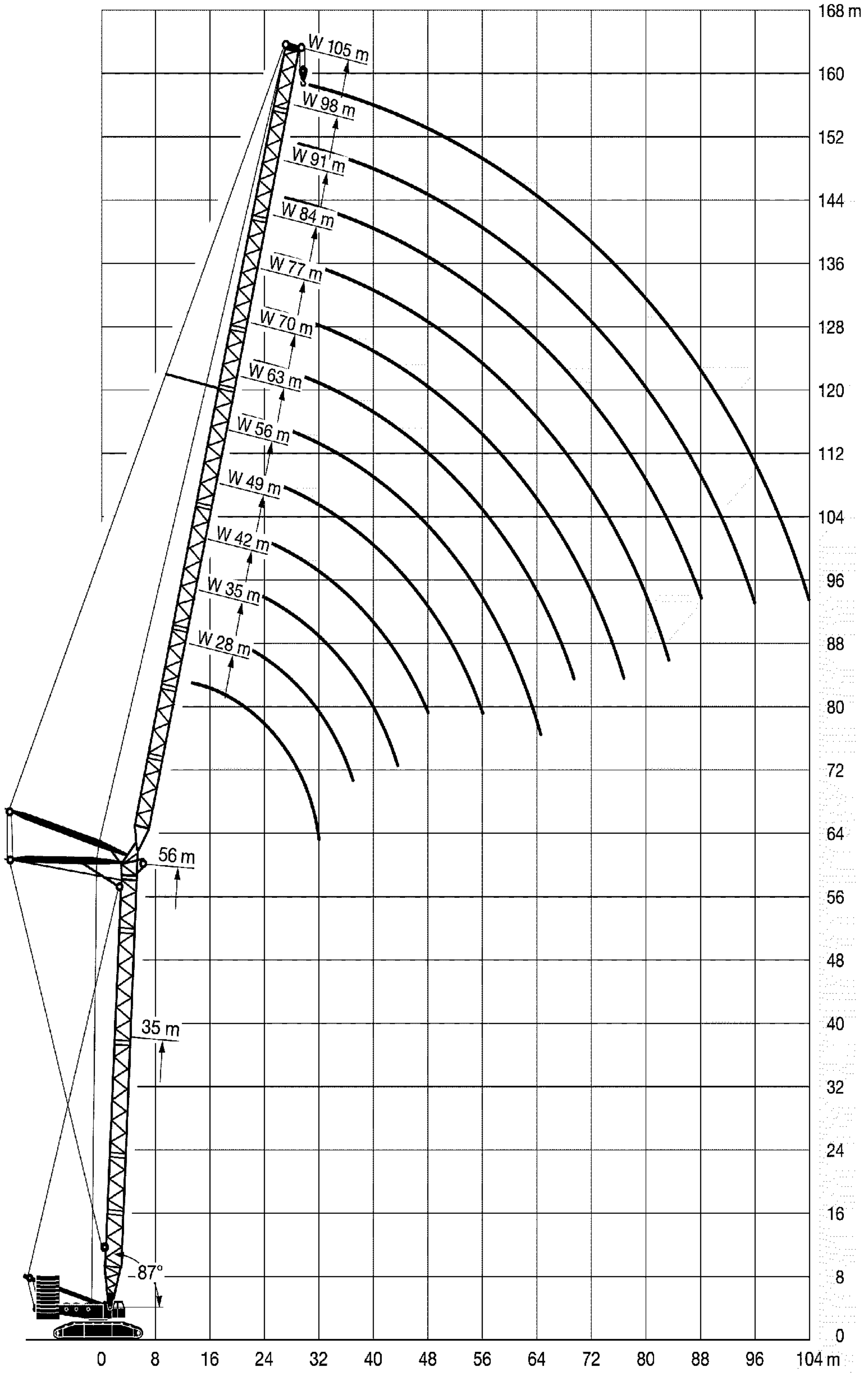
Hoisting heights
SW - Boom system; S = 67°



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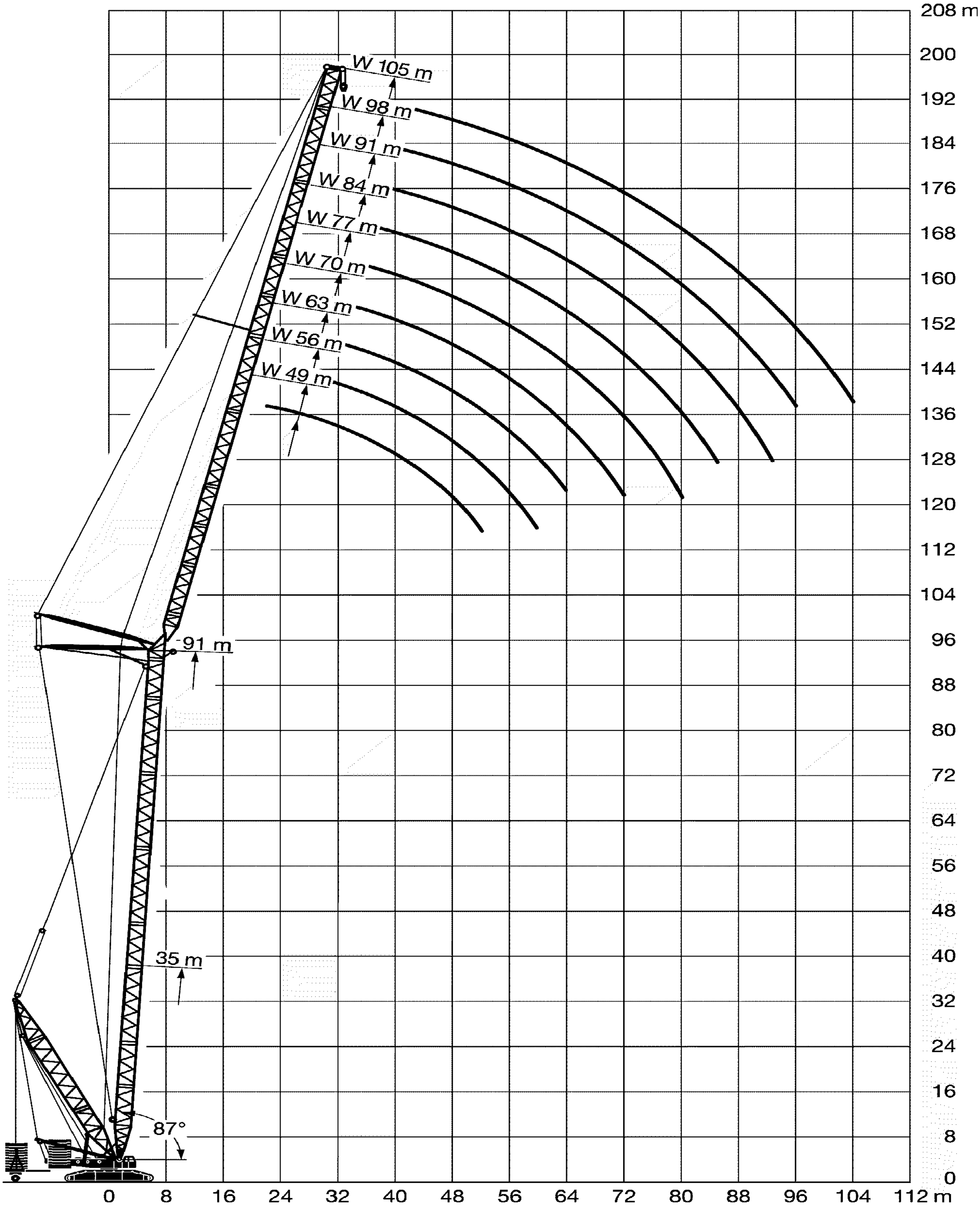
Hoisting heights
SDWB / BW - Boom system, S = 87°



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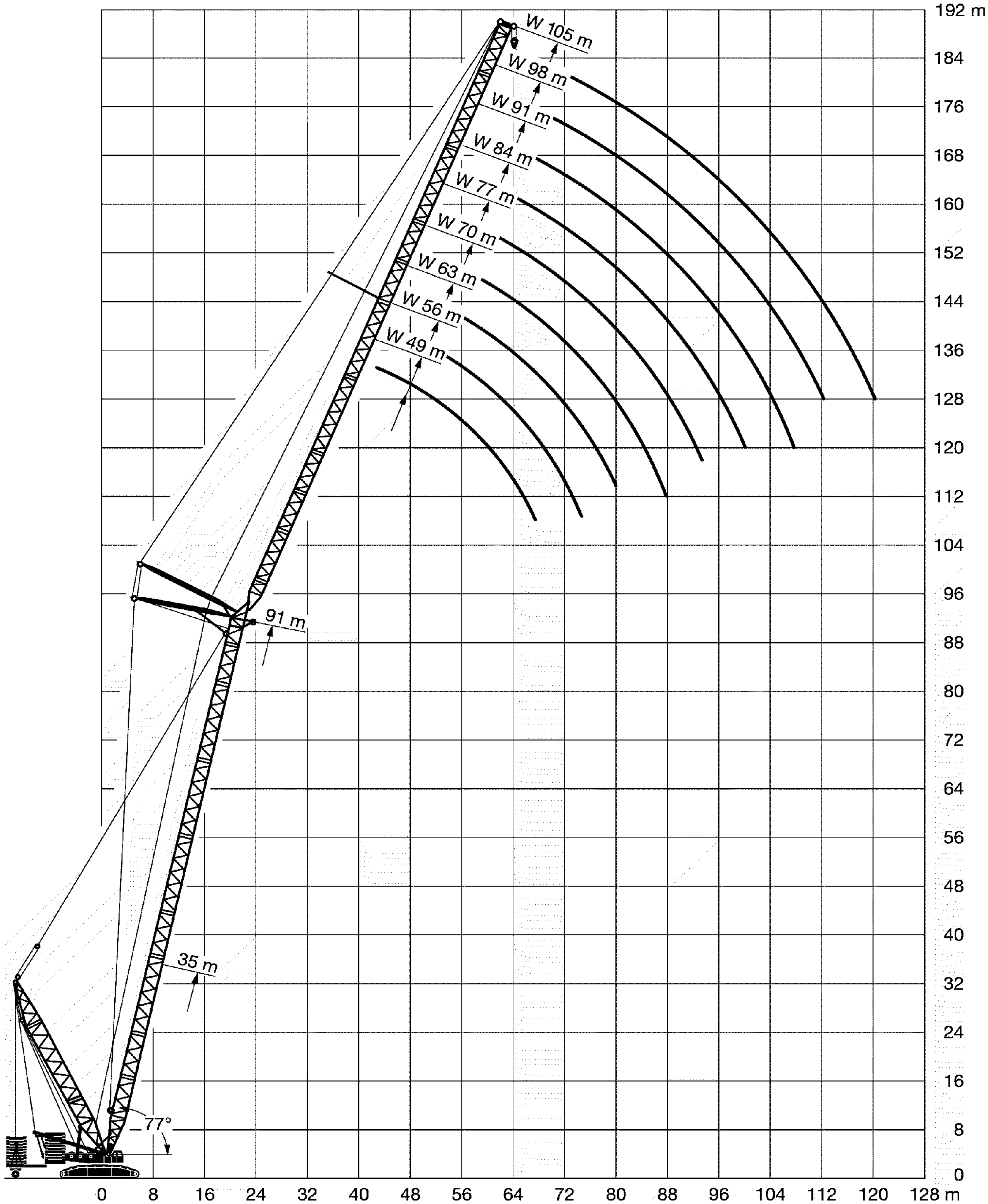
Hoisting heights
SDWB / BW - Boom system, S = 77°



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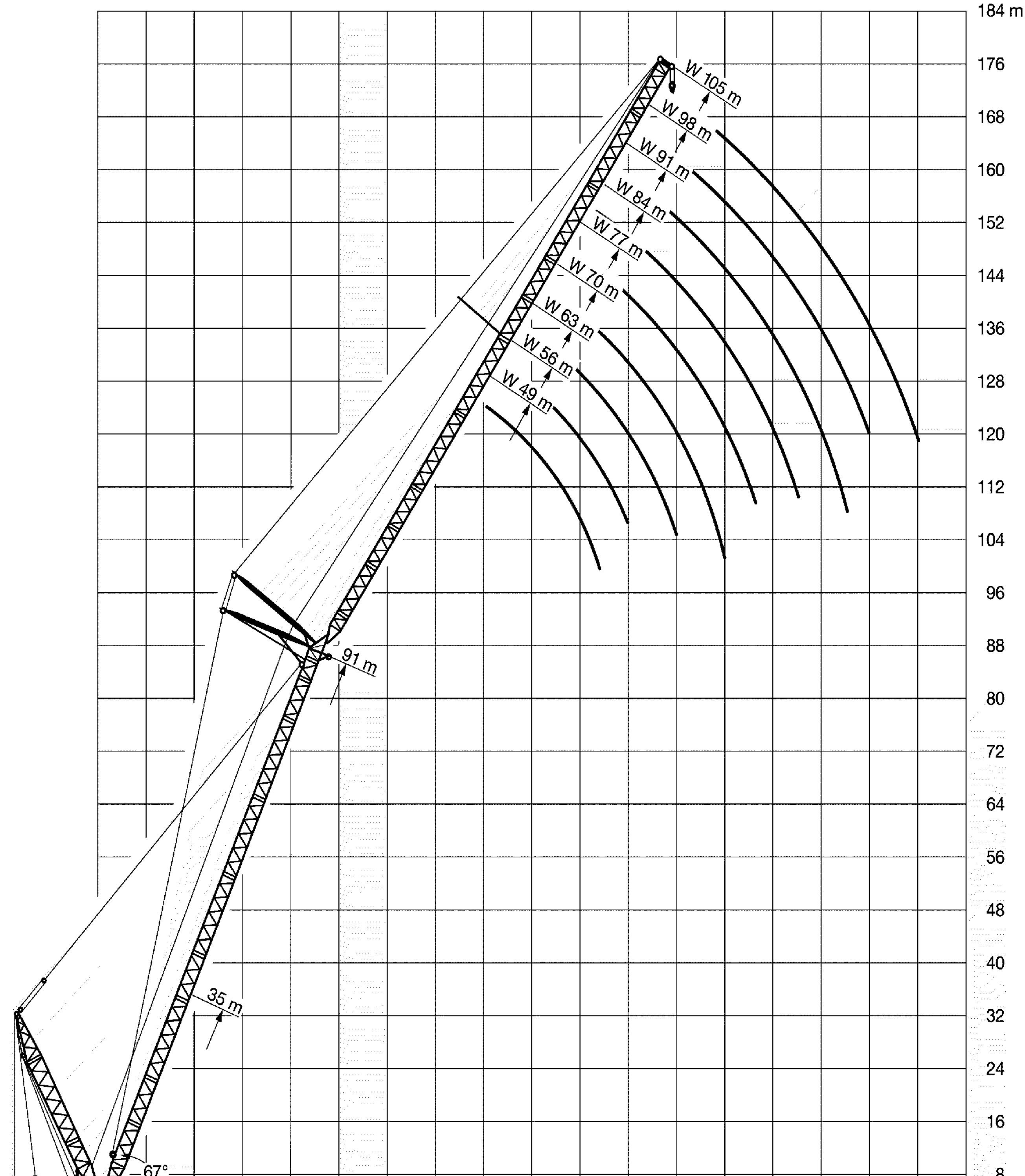
Hoisting heights
SDWB / BW - Boom system, S = 67°



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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.**

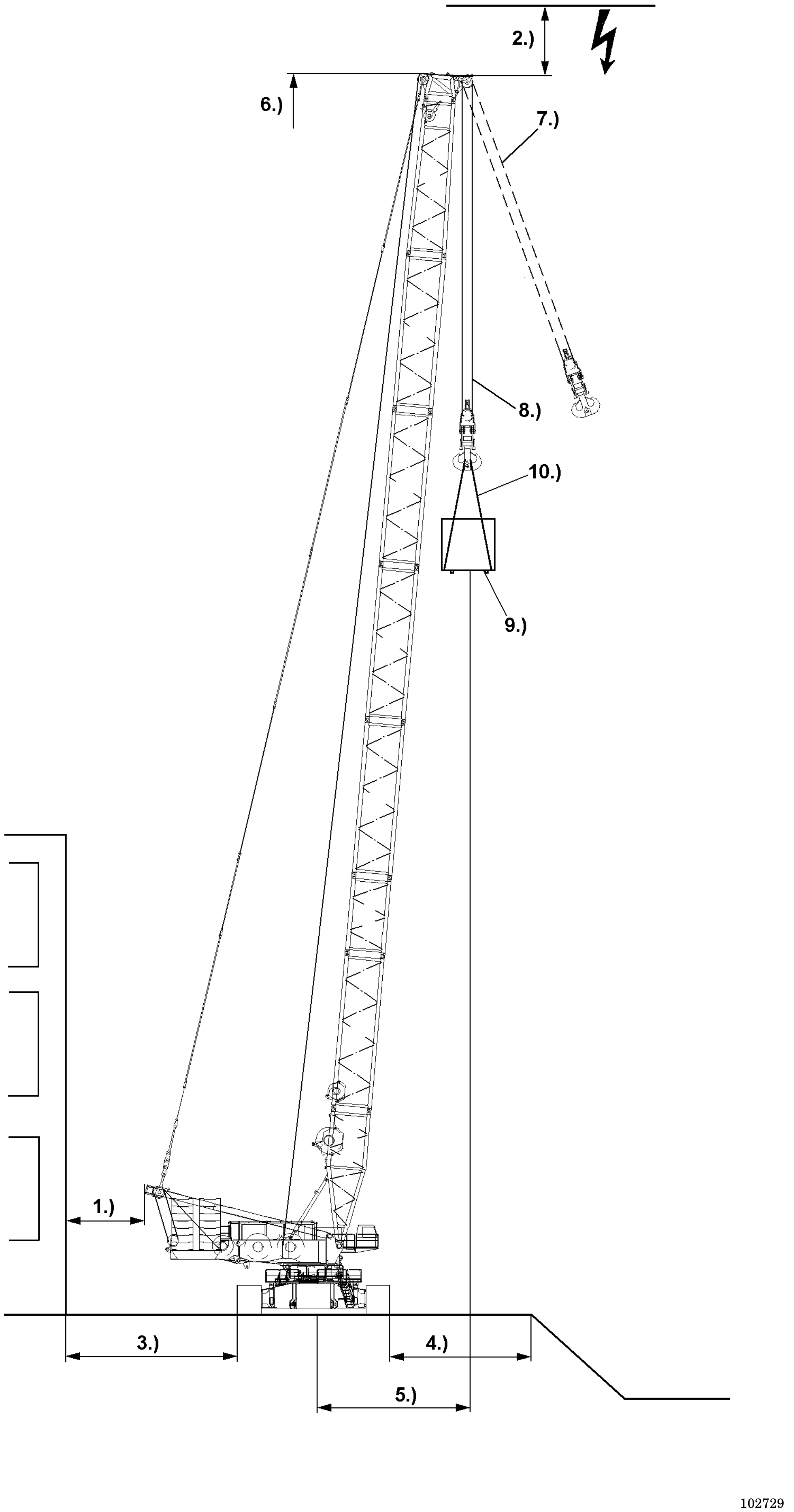
1.2 Personal protective devices

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.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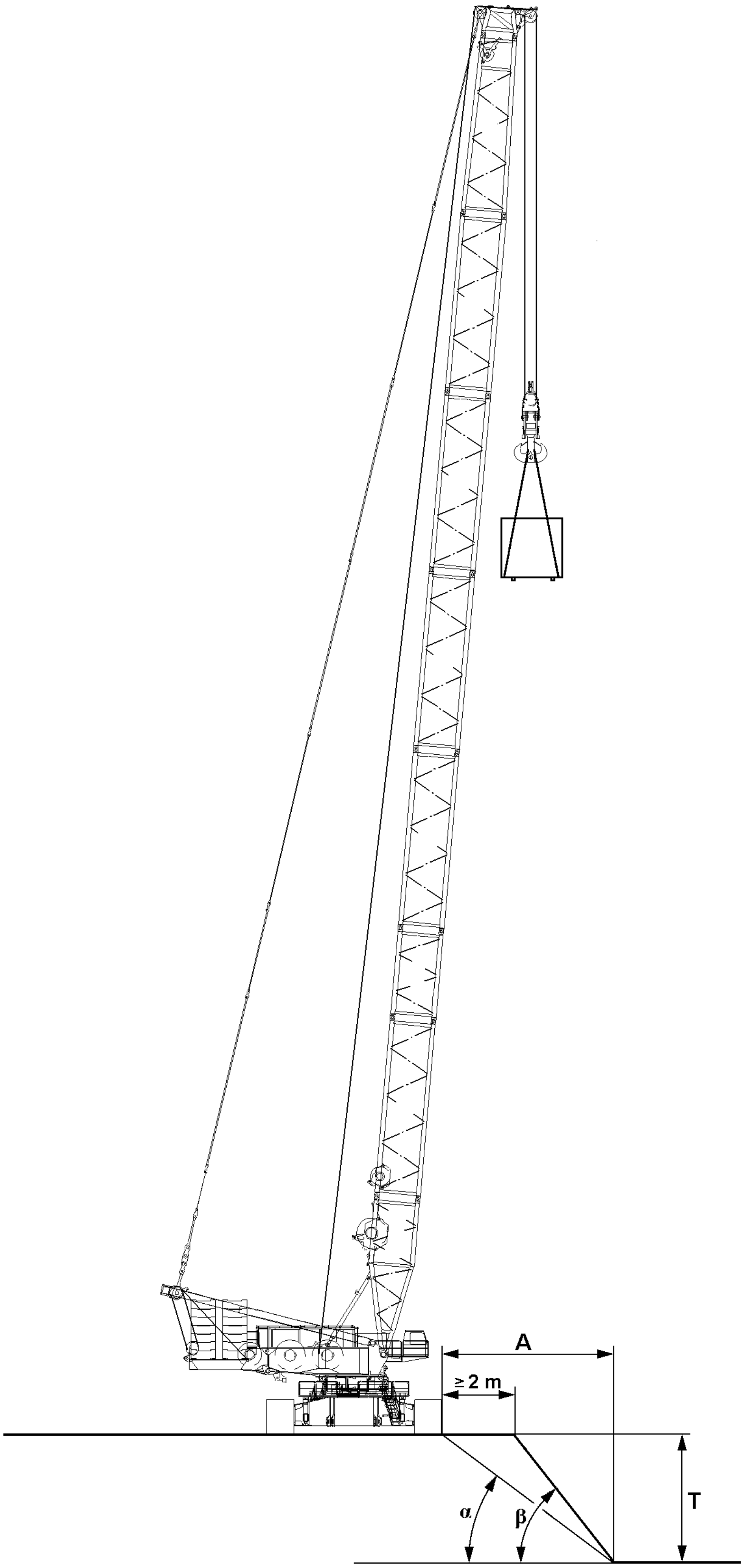
2. Selecting an operating site

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.



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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	$\alpha \leq 30°$	$A = 2 \times T$
solid ground	$\alpha \leq 45°$	$A = 1 \times T$

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

D A N G E R : **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.

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

C A U T I O N : **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.

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 metal rod with insulated handle.

D A N G E R : **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 .

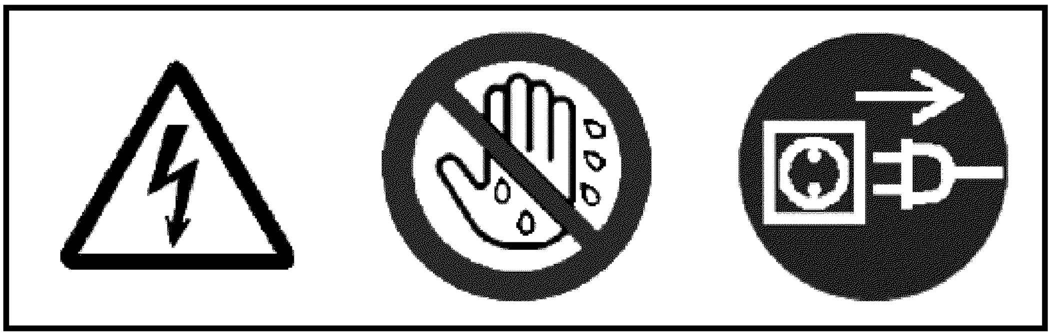
9. Welding work on the load

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.

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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 (230 V 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)**.**

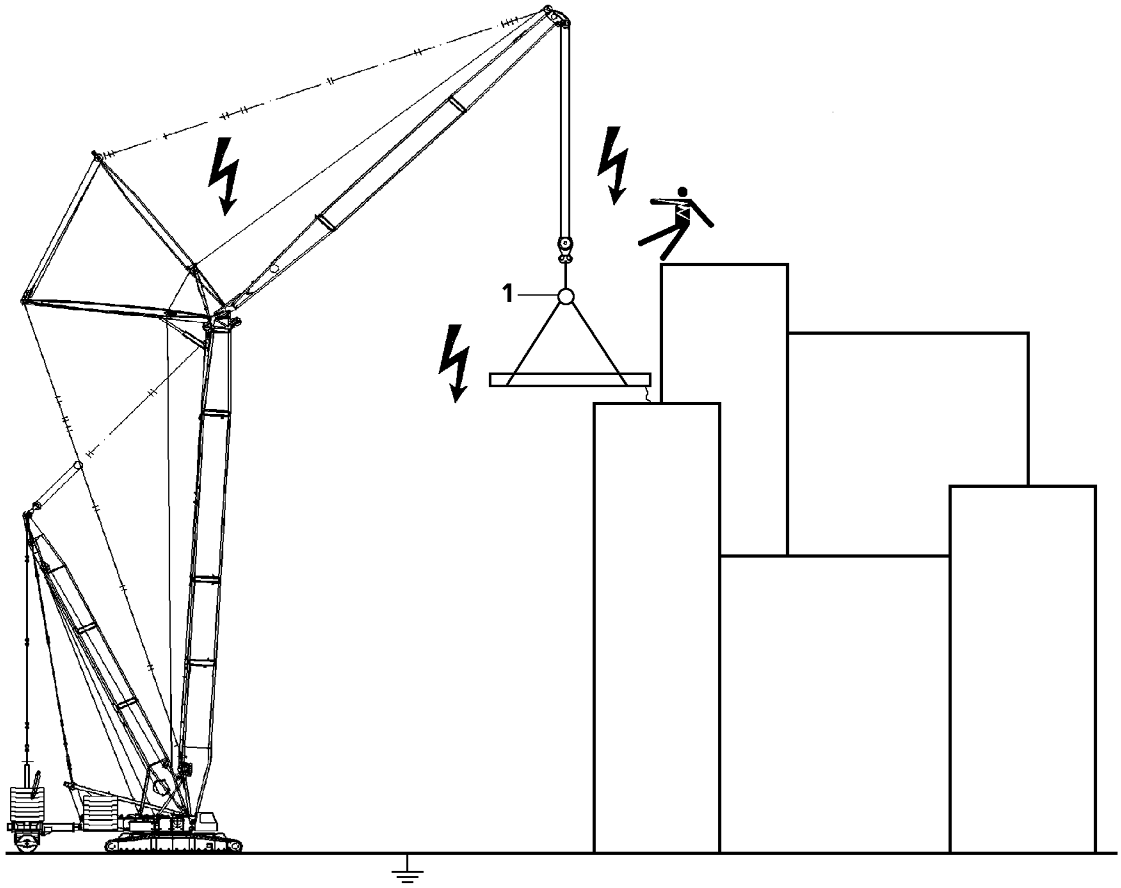
11. Working near transmitters/ transformers

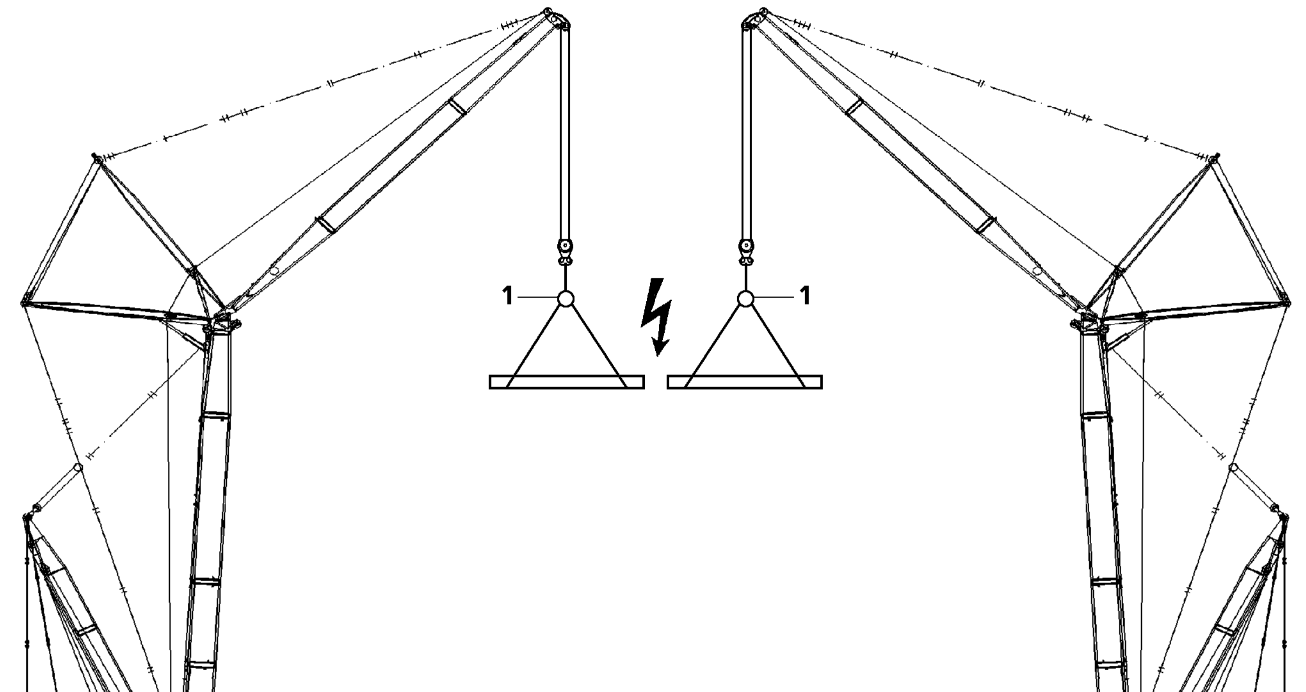
If there is a transmitter / transformer near the job site, strong electro-magnetic fields may exist.

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.





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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.

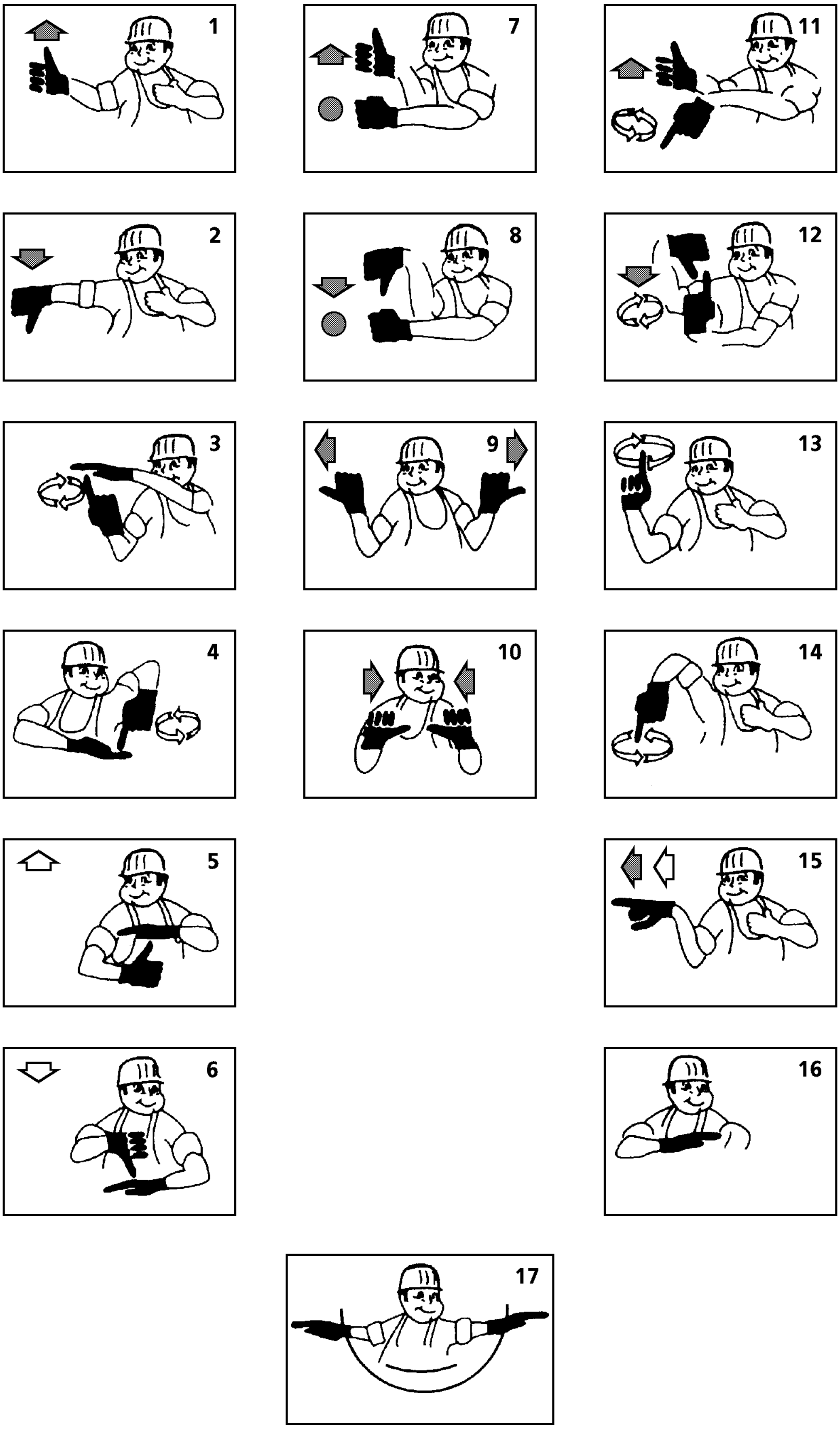
14. Handling explosive matter (such as refueling) may only be done at least 6 m away from the place where sparks could form due to handling of larger metal parts.
    To refuel, use only appropriate and approved rubber hoses .

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!



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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

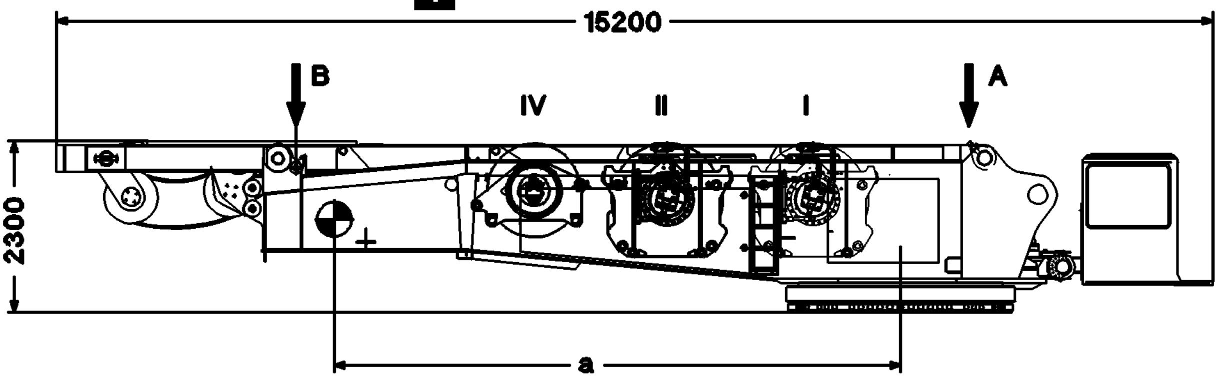
D A N G E R : **Danger of accidents due to uncontrolled slipping or movement of the crane! I fthe following points are not observed by the crane operator, then personnel can be fatally injured.**

- **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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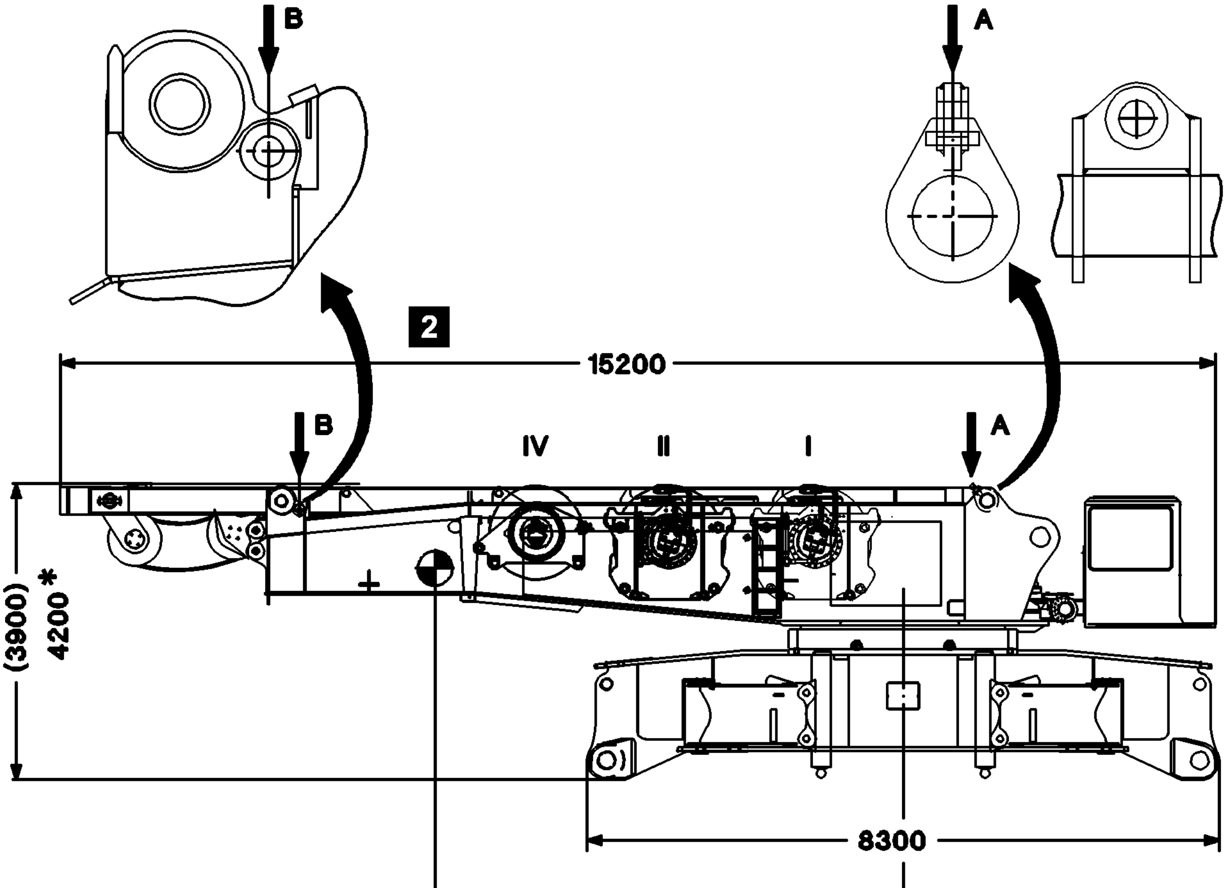
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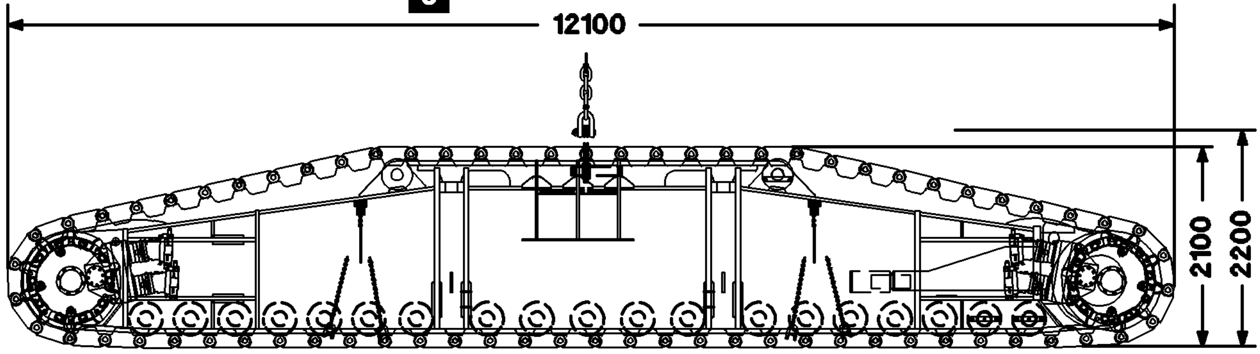
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1. Transport weights and center of gravity

Slewing platform (fig.1)
installed are:

- Installation winch + cable
- A-bracket with crawler installation cylinder

Dimensions and weights - slewing platform:

Condition with Q.C	Weight (t)	Center of gravity (mm)	A (t)	B (t)
with winch IV+cable	56,2	4100	23,8	32,4
with winch I+IV+cable	64,9	3660	30,6	34,3
with winch I+II+IV+cable	73,6	3530	35,8	37,8

Slewing platform and crawler center section (fig. 2)
installed are:

- Installation winch + cable
- A-bracket with crawler installation cylinder
- Relapse cylinder
- Hydr. support

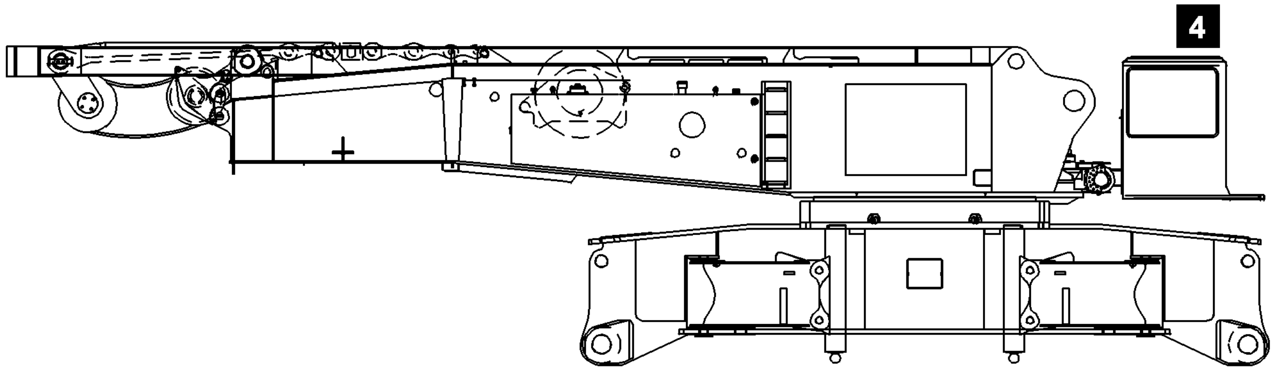
Dimensions and weights - slewing platform with crawler center section :
* mit Q.C.

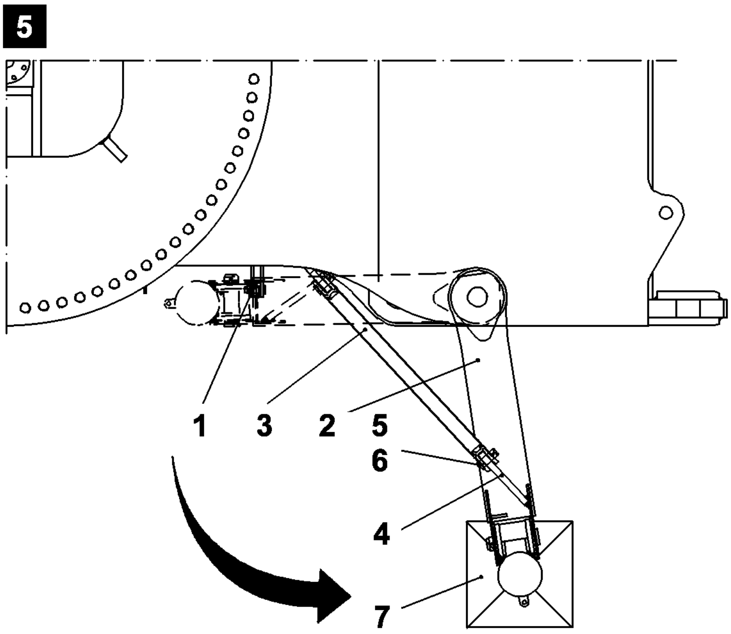
Condition with Q.C	Weight (t)	Center of gravity (mm)	A (t)	B (t)
with winch IV + cable	98,7	2320	61,3	37,4
with winch I+IV+cable	107,4	2210	68,0	39,4
with winch I+II+IV+cable	116,1	2240	73,1	43,0

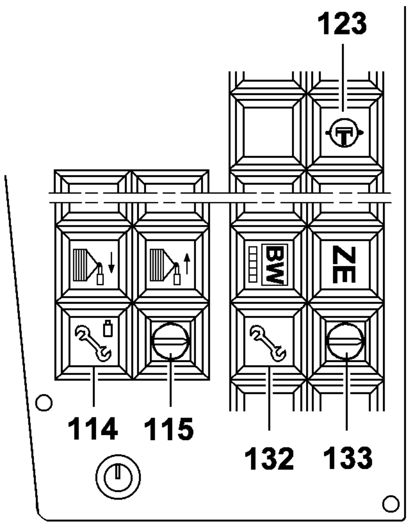
Crawler carrier (fig. 3)

Crawler carrier	Track pad width (mm)		Number of travel drives	
	1500	2000	1	2
Weight (t) **43,6**	**X**		**X**	
Weight (t) **45,8**	**X**			**X**
Weight (t) **52,8**		**X**	**X**	
Weight (t) **55,0**		**X**		**X**

- At a track pad width of **1500 mm**, the crawler carrier height is **2100 mm.**
- At a track pad width of **2000 mm**, the crawler carrier height is **2200 mm.**







192649

2. Installation of crawler carrier

Prerequisites:

- The crane engine is running - see chapter 4.03
- Press installation keyed button (133) and keyed button "Crawler installation" (115) betätigen. Die The indicator lights "Installation" (132) and "crawler installation" (114) light up.
- Set the operating mode, which is being installed, on the LICCON.
- The pressure supply change over switch to the auxiliary users (123) must be turned on in the cab.

Installation procedure:

2.1 Swing out the hydraulic support, lock and pin

2.2 Lift the slewing platform and crawler center section (fig. 4) from the flatbed truck with the support.

2.3 Erect the A-bracket - see chapter 5.02

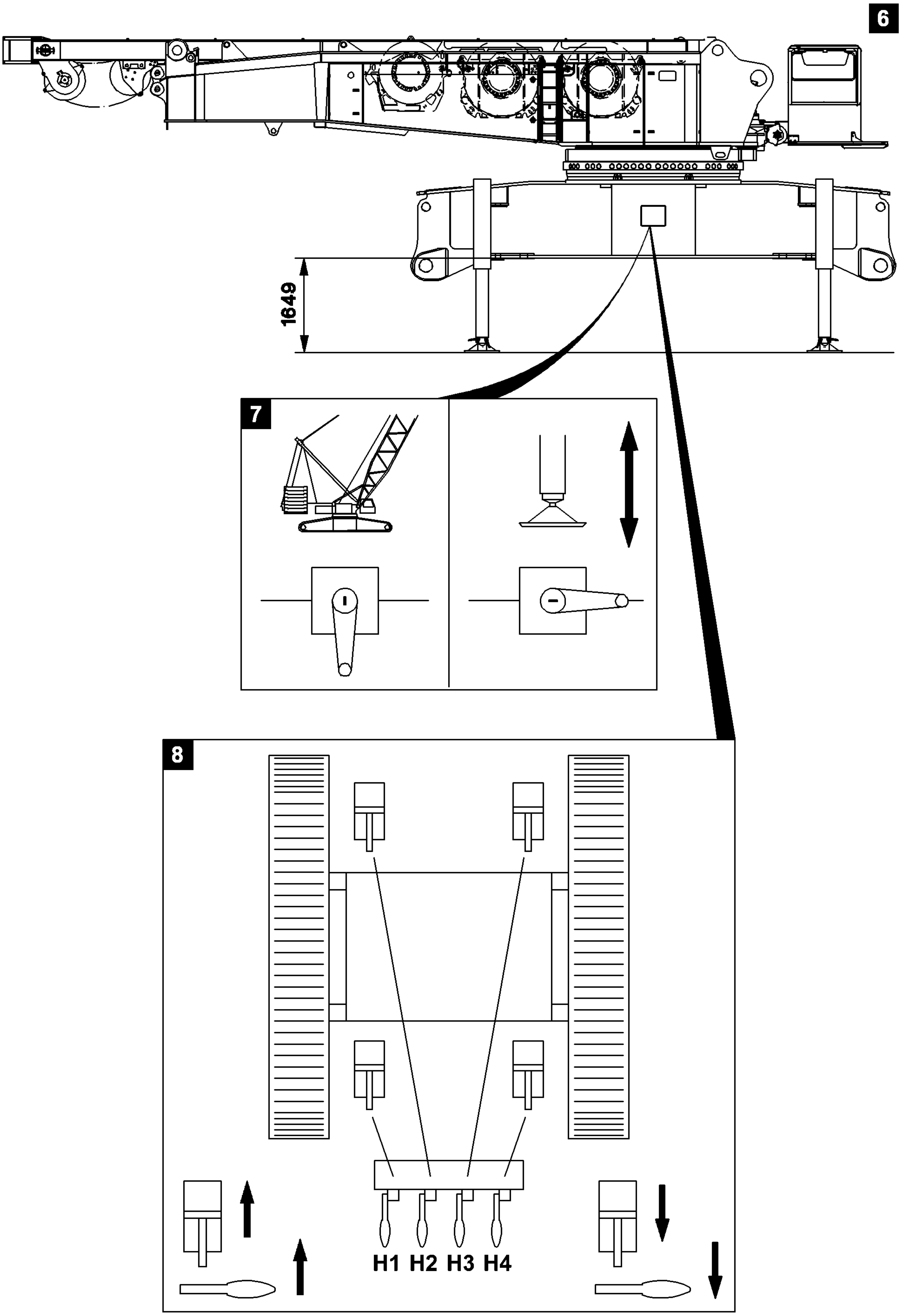
2.4 Installation of crawler carrier with the A-bracket
2.4.1 Installation of the first crawler carrier
2.4.2 Installation of the second crawler carrier

2.5 Hydraulic connections for quick couplings

2.1 Swing out the hydraulic support, lock and pin (fig. 5)

- Release the transport retainer (1) .
- Swing out the support (2) .
- Lock the support pipe (3) on bracket (4) .
- Insert pin (5) and secure with spring retainer (6) .

D A N G E R: Make sure that there are no persons or objects within the swing range of the support .
There is a great danger of accidents!



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2.2 Lift the slewing platform and crawler center section (fig.6) from the flatbed trailer with the support

Prerequisite:
- No central ballast and no slewing platform ballast may be installed on the crane.
- The hydraulic support must be swung out, locked and pinned.
- The ball cock (fig. 7) must be open .
- The support cylinders are actuated with the manual control levers H1, H2, H3, H4 (fig. 8).
  H 1 = Manual control lever for support cylinder, left front
  H 2 = Manual control lever for support cylinder, left rear
  H 3 = Manual control lever for support cylinder, right rear
  H 4 = Manual control lever for support cylinder, right front

Support
The support plates (7) (fig. 5) must be supported from below with suitable, stable materials, such as wood, steel or concrete plates, depending on the ground conditions.

Note: Note the safety guidelines and permissible ground pressures (Chapter 2.04) !

D A N G E R : **Only suitable materials may be used for the ground support. The support must be placed in the center underneath the support plates. If this is not observed, there is a danger of accidents!**

Actuate the manual lever "push" and lift the slewing platform and crawler center section with the hydraulic support cylinders to approx. 1649 mm (fig. 6). The slewing platform and the crawler center section must be aligned in horizontal direction !

D A N G E R : **Before lifting the crane, make sure that all transport retainers have been removed between the flatbed trailer and the crane. During the lifting procedure, make sure that the crane always remains in horizontal position. After lifting and alignment, close the ball cock (fig. 7) .**

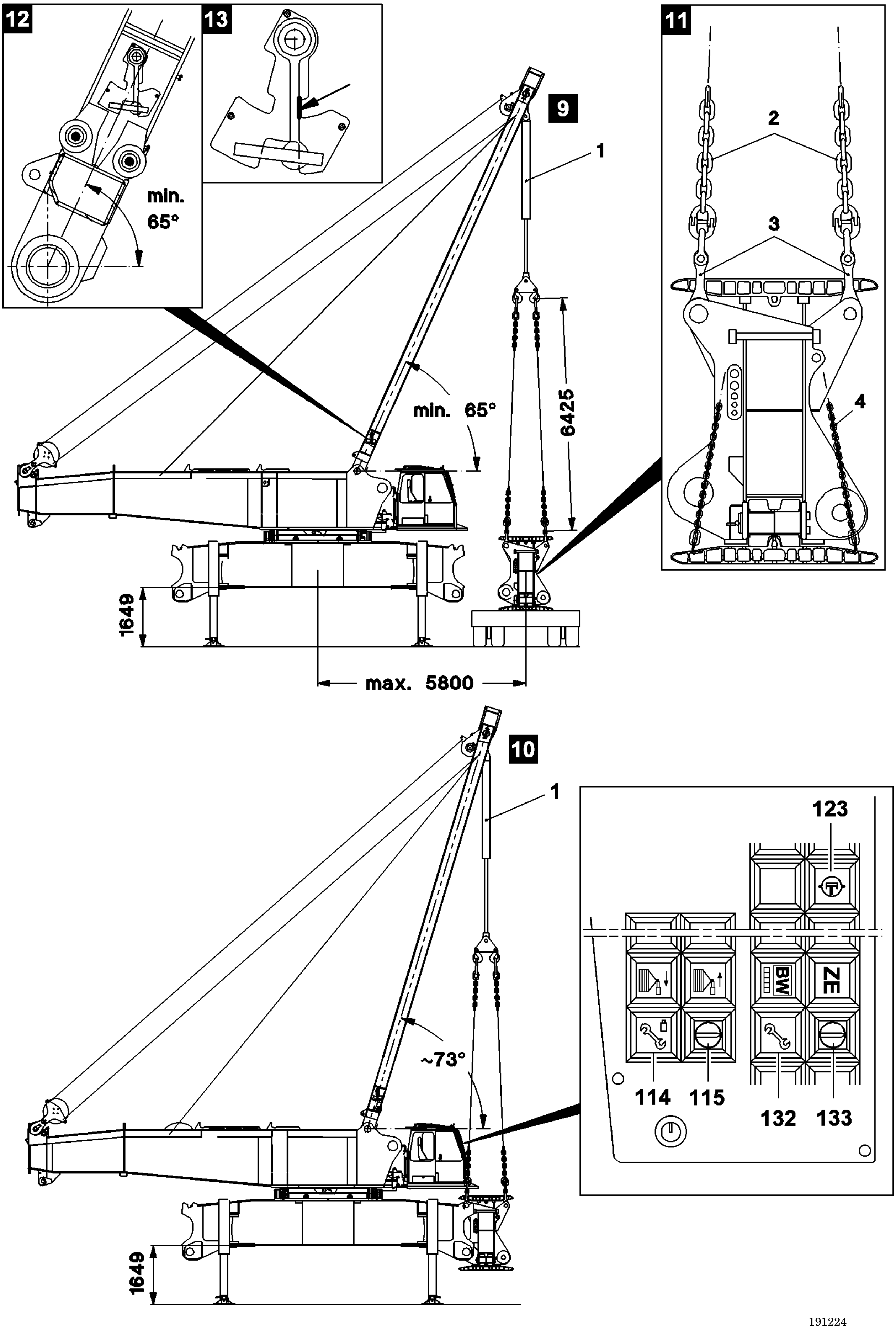
Remove the flatbed trailer from the installation area of the crane.

2.3 Erect the A-bracket

For procedure to erect the A-bracket, see chapter 5.02 / 3. - Erection

With supported and aligned crane :
- the A-bracket can be moved between 0° and 163° .
- the slewing platform can be turned by 360° .

D A N G E R : **On the supported crane, no central ballast and no slewing platform ballast may already be installed or maybe installed later! There is a danger of tipping over!**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123
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114
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132
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1649
191224

2.4 Installation of the crawler carrier with the A-bracket

Prerequisiste:
- The crane must be horizontally aligned.
- Drive the transport vehicle with the crawler carrier as close as possible to the crane. The maximum permissible distance of the crawler carrier to the slewing platform center point **may not exceed** 5800 mm (fig. 9).

C A U T I O N: Make sure the crane is horizontally aligned!
The distance of 5800 mm max not be exceeded!

2.4.1 Installation of the first crawler carrier

Attach the crawler carrier (fig. 9 / fig. 11))
- Lower the A-bracket to the front.
- Do not fall below 65° on the A-bracket (fig. 12)
- 65° on the A-bracket are reached if the pendulum (fig. 13) remains in the drawn position.
- Extend the installation cylinder (1) and attach the tackle (2) on the installation brackets (3). To do so, the installation brackets must be folded upward (fig. 11).

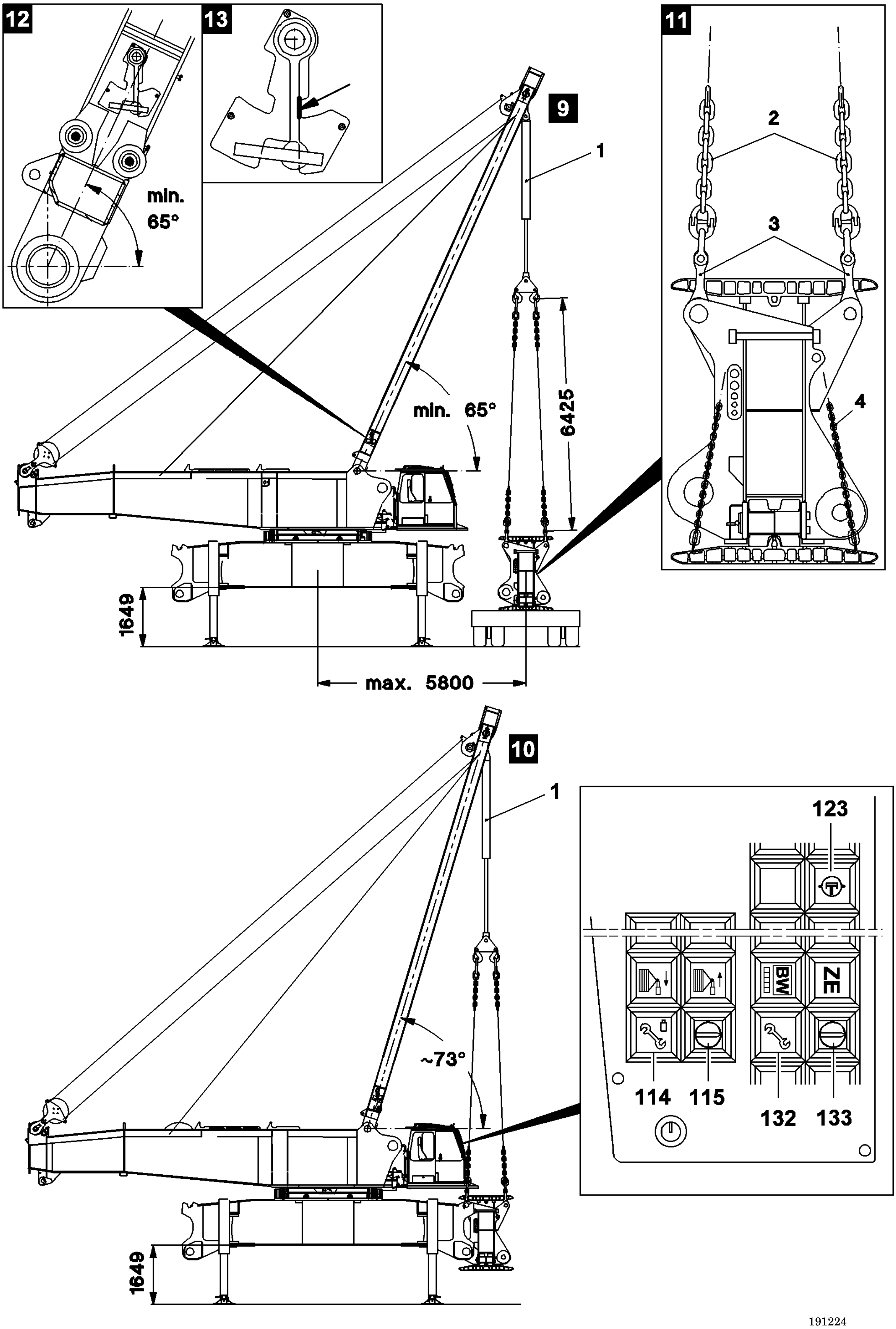
D A N G E R: The crawler plates of the crawler carrier must be secured with the transport retainers (4) (fig. 11) to prevent them from hanging through.
Otherwise there is a danger of accidents!

Lift the crawler carrier with the installation cylinder from the transport vehicle.

Note: The weight of the crawler carrier, depending on the equioment configuration, is max. 55 t - see chart in chapter 3.01 / 1.Crawler carrier.
Pay attention to the mark on the crawler carrier and on the receptacle.

D A N G E R: The max. distance of 5800 mm (fig. 9) may not be exceeded when lifting off the crawler carrier, since there is no overload shut off for the SA-bracket .
Indication via pendulum on the SA-bracket (fig. 13).
There is a danger of tipping over!

In operating mode, keyed button " crawler installation" (115) turned on - there is no overload shut off for the installation cylinder as well as for the crane.
There is a danger of accidents!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123
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132
133
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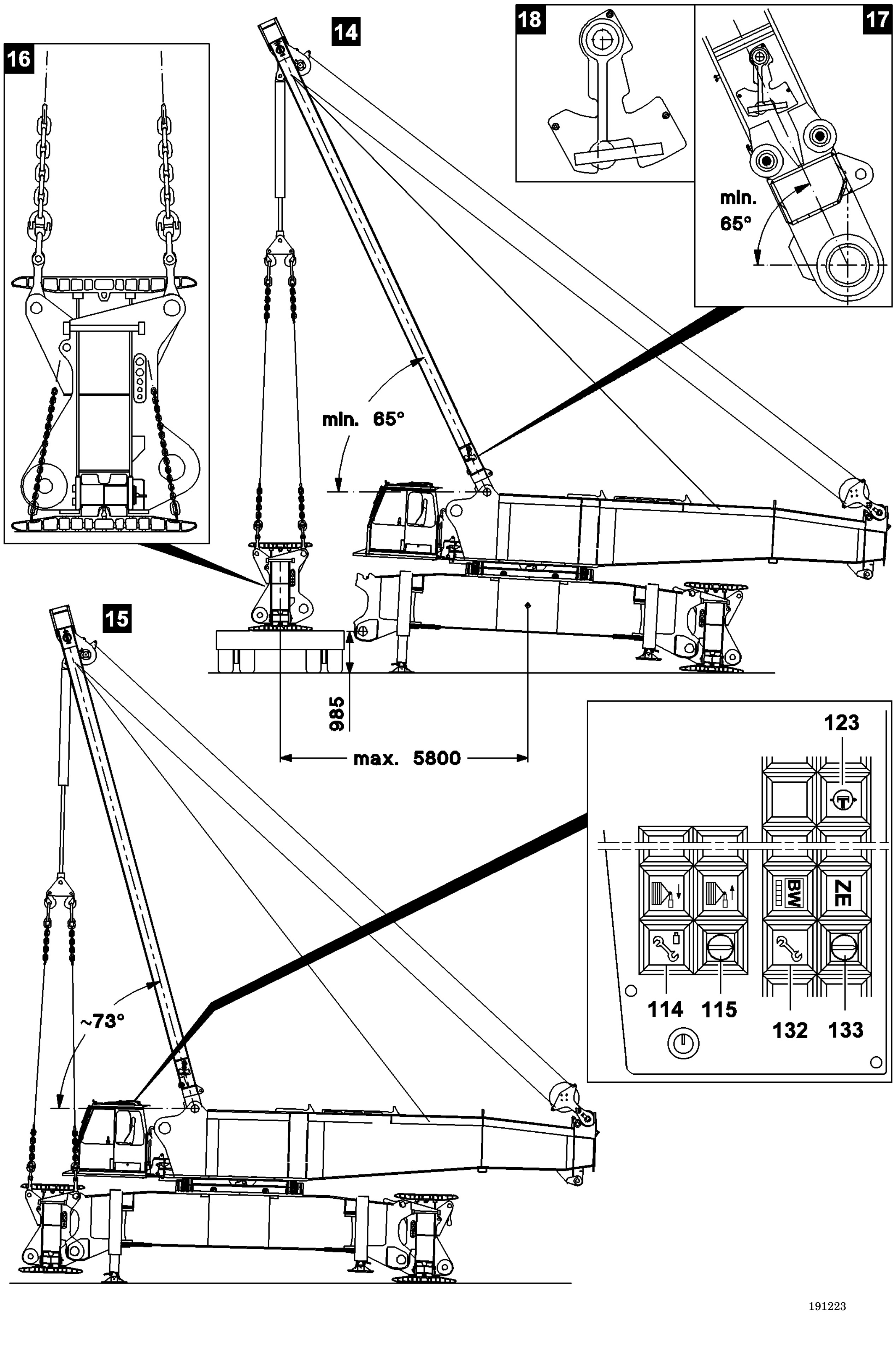
Installation of the first crawler carrier (fig. 10)

- Swing the crawler carrier, with the A-bracket to the receptacle on the crawler center section.
- Carefully retract the crawler carrier and pin and secure on the receptacles on the crawler center section.
- Release the tackle (2) from the installation brackets (3) and remove. Fold down the installation brackets.
- Lower all supports from 1649 mm to 985 mm .

C A U T I O N : Make sure the crane is aligned in horizontal position!

- Set down the first crawler carrier onto the ground by retracting the two support cylinders o**n the crawler side**. Fully retract the support cylinder on the side of the pinned on crawler carrier .

**D A N G E R : Before turning the slewing platform, the first crawler carrier must be positioned on the ground.
Otherwise there is a danger of tipping over!**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2.4.2 Installation of the second crawler carrier

Turn the slewing platform .

C A U T I O N : **Before turning the slewing platform, the installed first crawler carrier must be on the ground and the support cylinders on the crawler center section must be fully retracted (fig. 14).**
There is a danger of tipping over!

D A N G E R : **The max. distance of 5800 mm (fig. 14) may not be exceeded when lifting the crawler carrier, since there is no overload shut off for the SA-bracket .**
Indication via pendulum on the SA-bracket (fig. 18).
There is a danger of tipping over!

In operating mode, keyed button " crawler installation" (115) turned on - there is no overload shut off for the installation cylinder as well as for the crane.
There is a danger of accidents!

The installation of the second crawler carrier must be carried out according to the description for the installation of the first crawler carrier.

After the installation of the second crawler carrier, lower it by retracting the support cylinders to the ground.

- Fully retract the support cylinder.
- However, the support remains swung out.
- Release and remove the tackle from the installation brackets, fold the installation brackets down.
- Close the ball cock (fig. 7) .
- Turn the pressure change over in the cab off.
- Fully retract the installation cylinder and turn the crawler installation off.

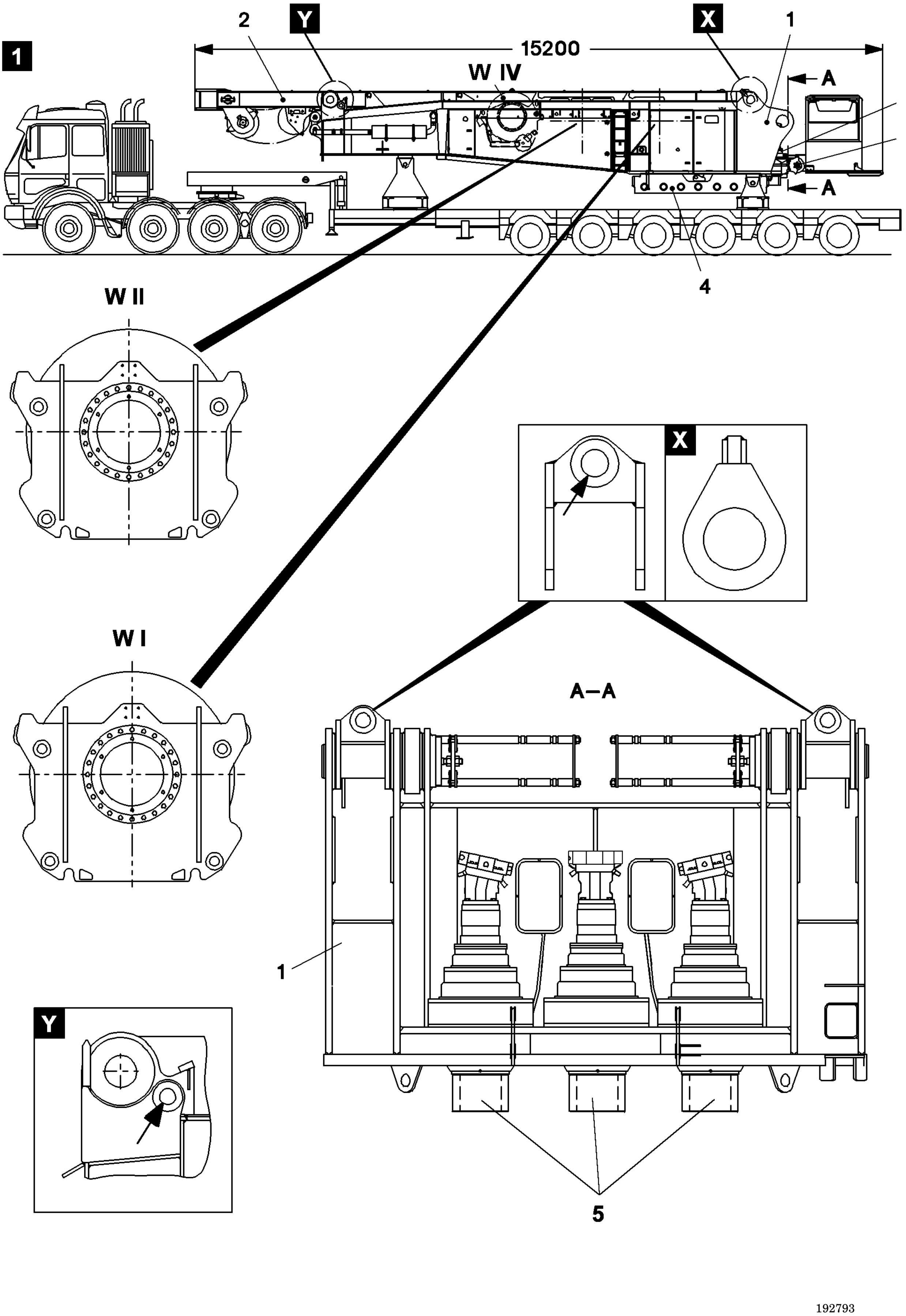
2.5 Establish the hydraulic connection to the two crawler travel gears

The hydraulic connection to the crawler travel gears is established with quick couplings.

Note: The corresponding quick couplings are marked.

Connect or release the hydraulic lines with quick couplings

D A N G E R : **When connecting or releasing hydraulic lines via quick couplings 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 released before connecting or releasing the couplings (the engine must be at a standstill - wait for 5 minutes).
- Push the coupling sections (sleeve and plug) into each other and screw together with hand nut.
- Turn the nut past the O-ring until you can feel a noticeable, fixed stop.
- The couplings may only be tightened by hand - without tools (this could damage the couplings).
Improperly connected couplings can cause loss of pressure or sudden leakages, which in turn can cause serious accidents.



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192793

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 (8,7 t)	Winch **II** incl. cable (8,7 t)
Weight (t) **56,2**	**- - -**	**- - -**
Weight (t) **64,9**	**- - -**	**X**
Weight (t) **73,6**	**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!

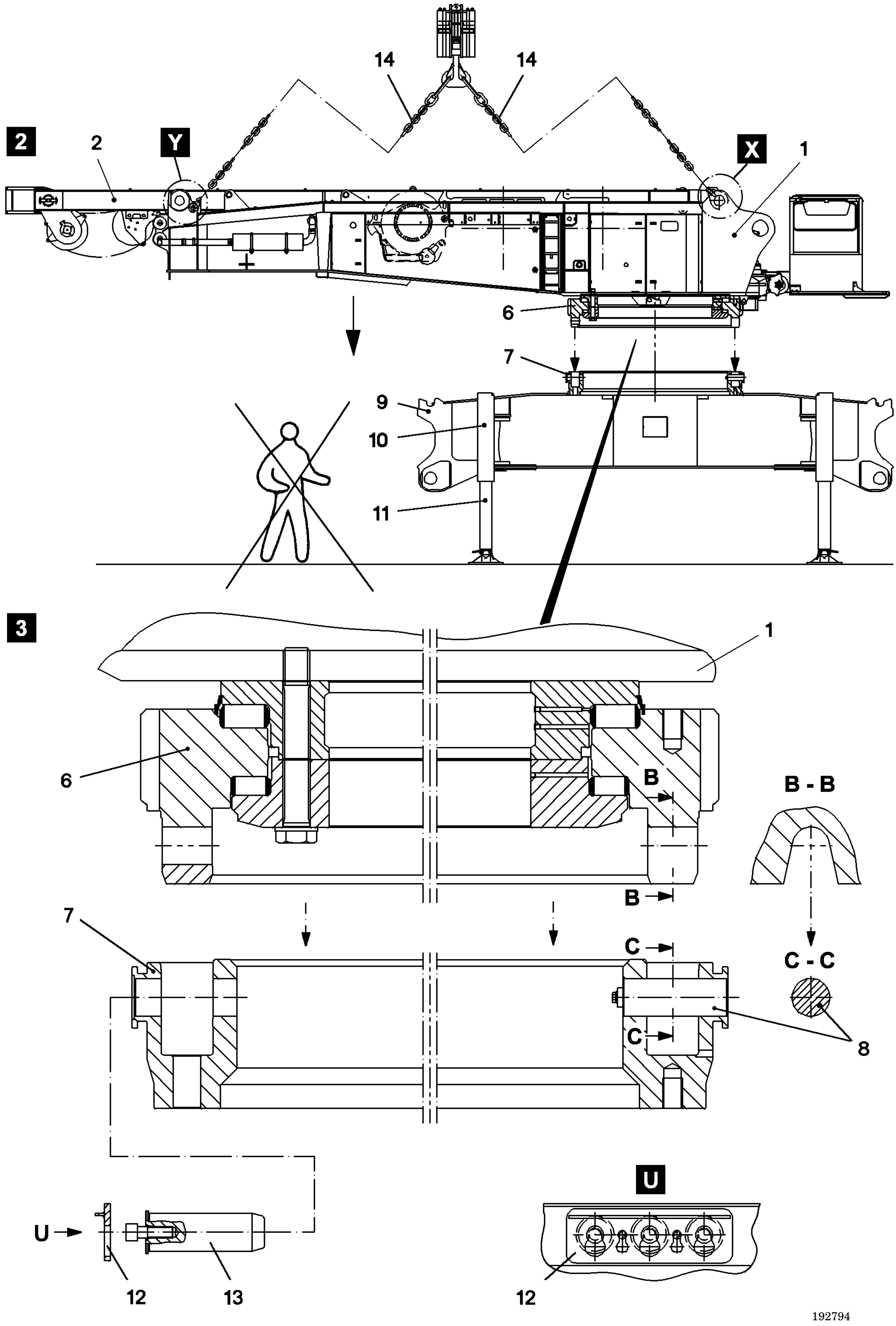
Installation procedure:

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.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192794

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!

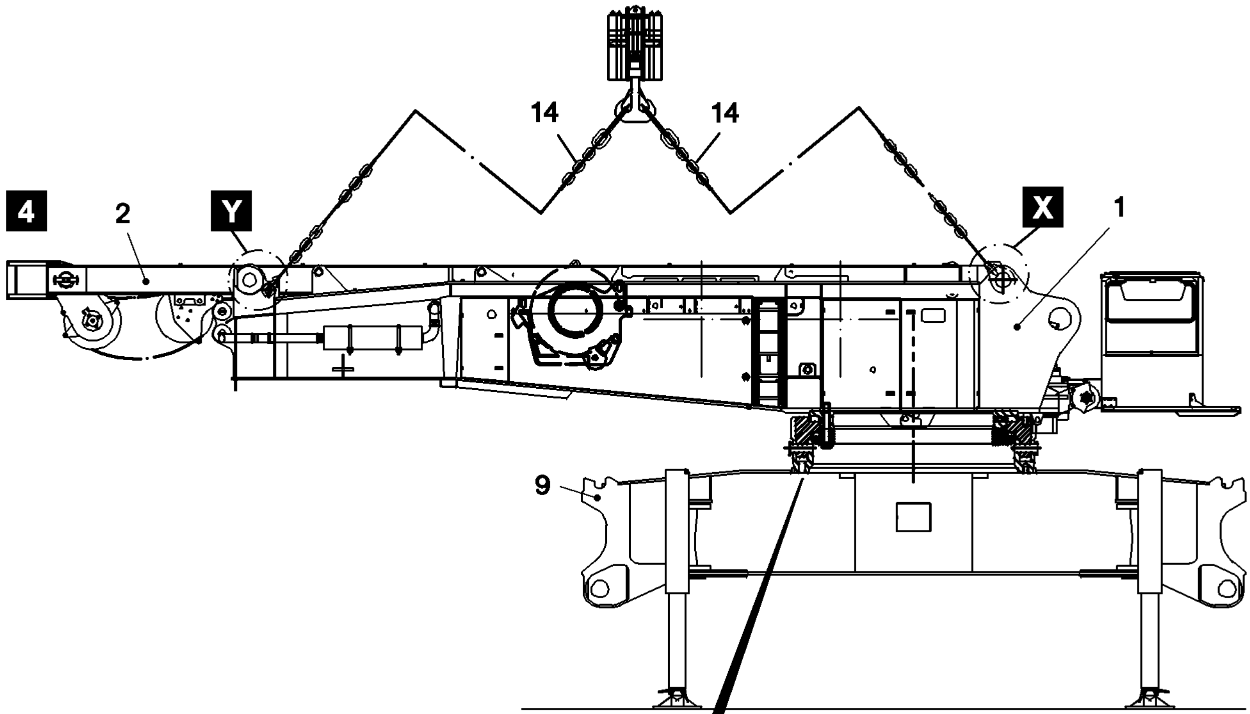
- With the auxiliary crane, slowly swing in the slewing platform (1) over the supported and horizontally aligned crawler center section.
- Lower the slewing platform slowly.

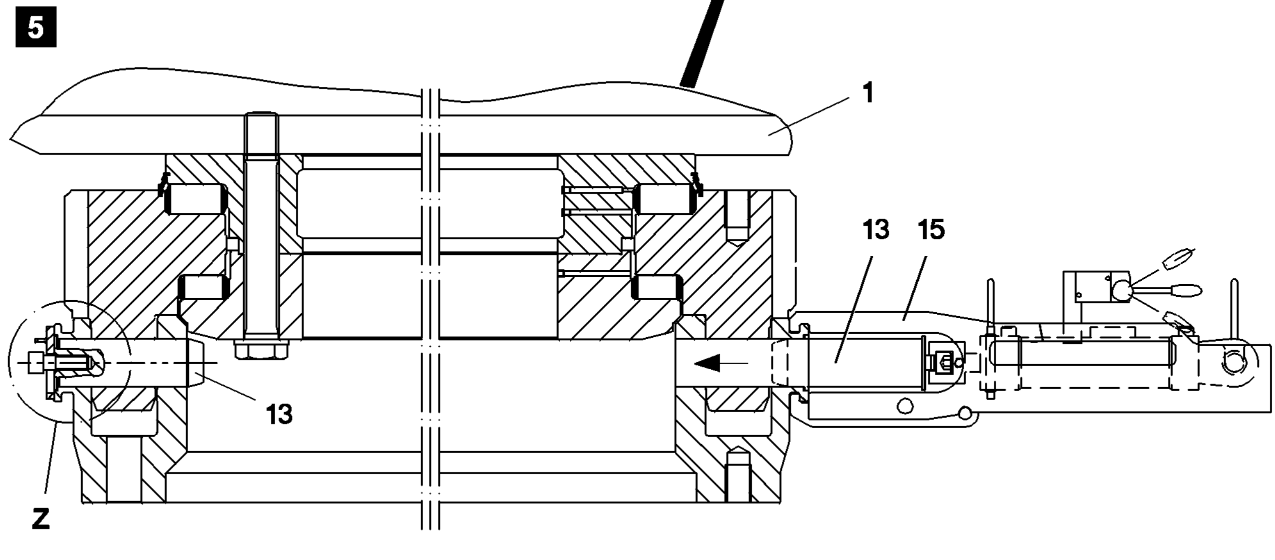
Note: Before lowering, bring the slewing platform in position so that the centering pin (8) (C - C) on the lower section (7) and the receptacles (B - B) on the upper section (6) can be **"paired up"** .
It is not possible to **"incorrectly "** set the slewing platform onto the lower section (7) due to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

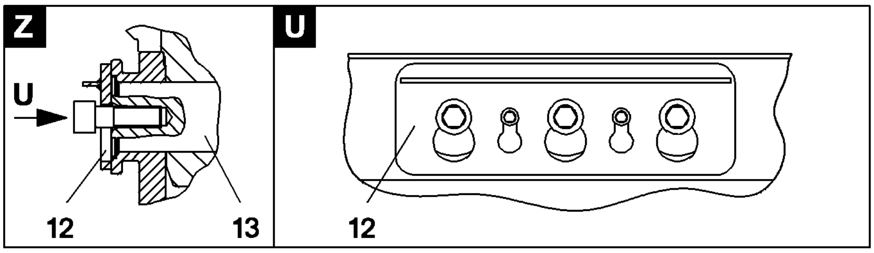
C A U T I O N: **However, the slewing platform or the receptacles to the centering pins must be aligned correctly.**

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.







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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.

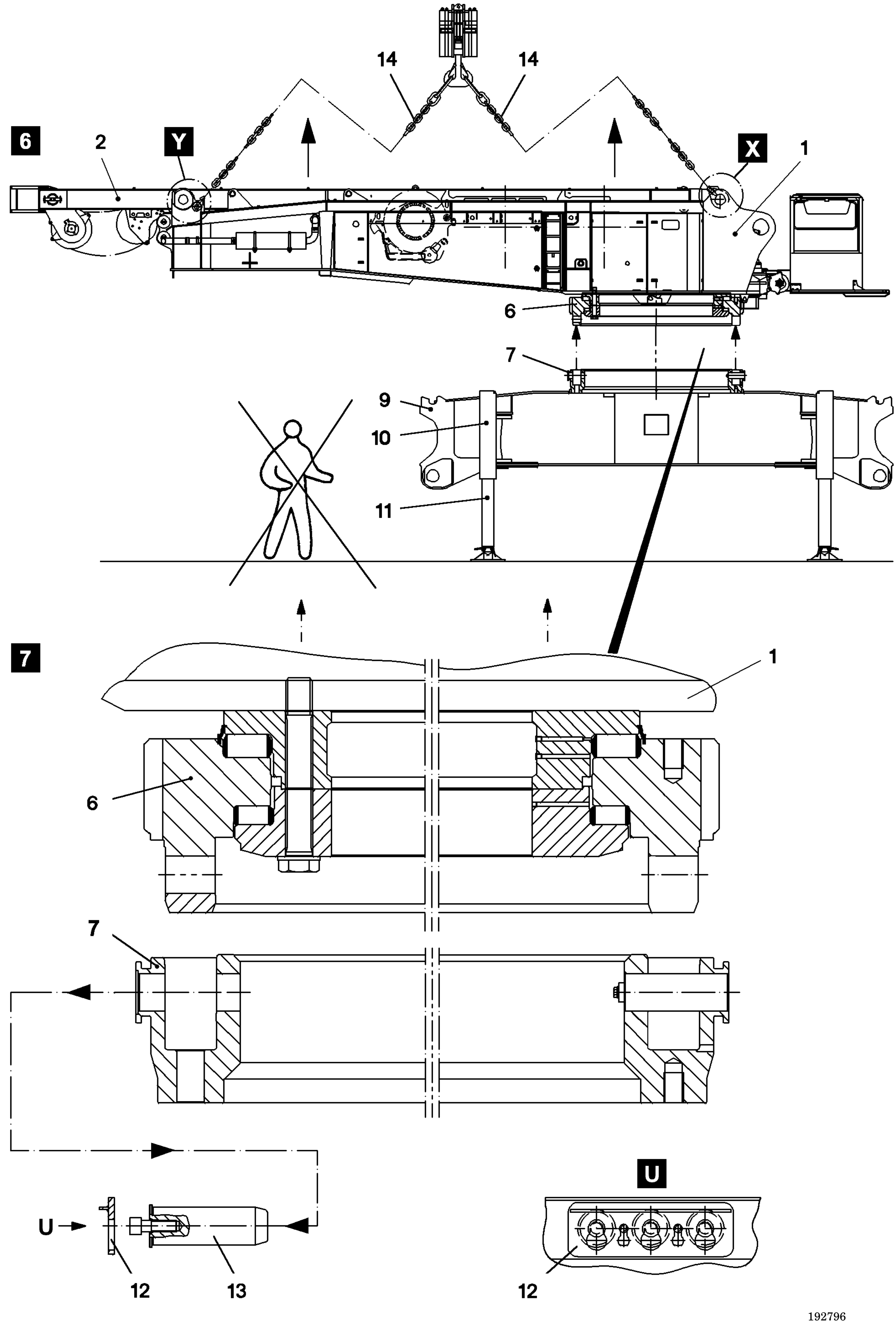
The hydraulic connection from the rotary connection in the crawler center section to the slewing platform is established with quick couplings.

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.**



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3. Removal of the slewing platform

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

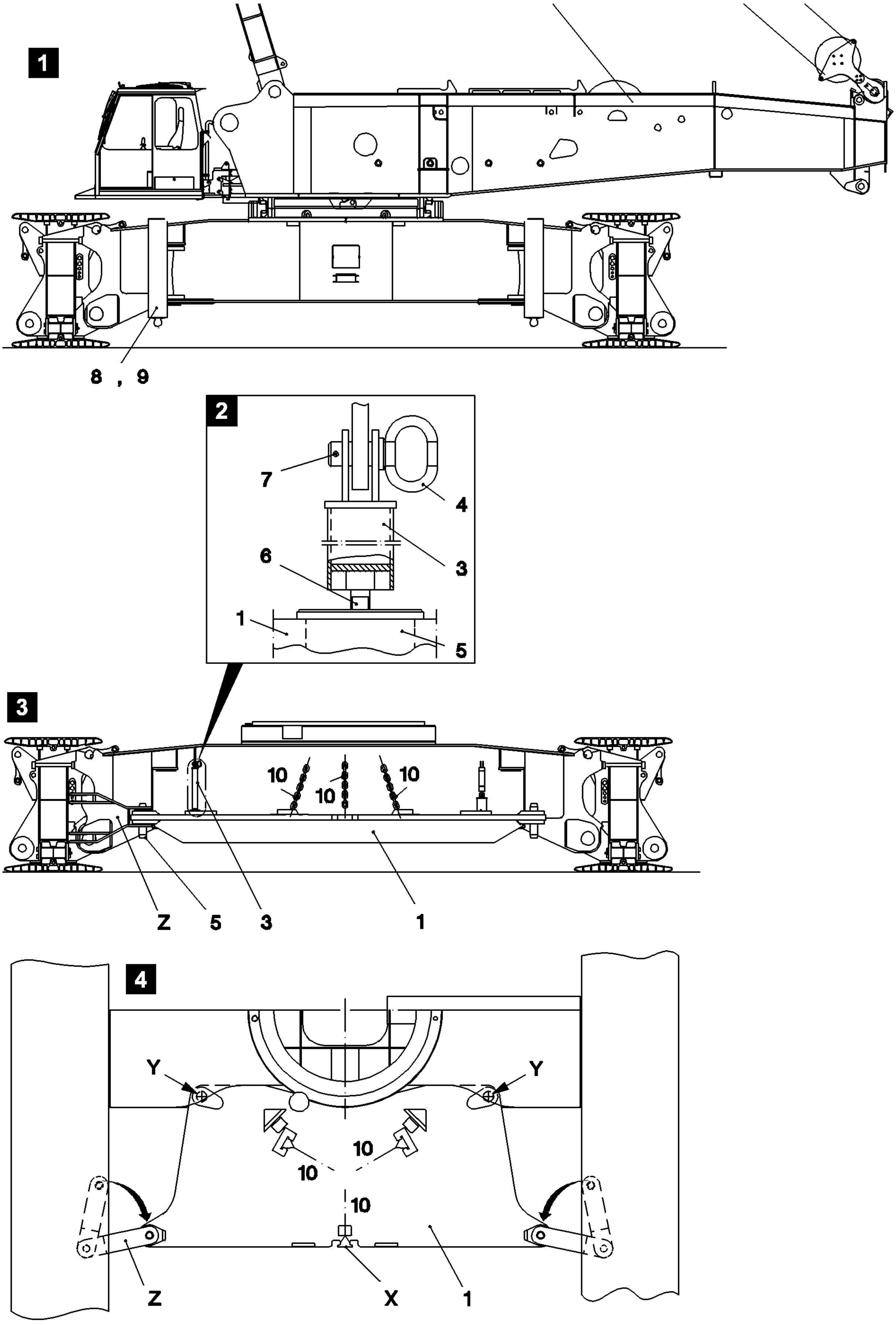
Prerequisite:
- The slewing platform ballast and the boom systems have been removed.
- The crawler carriers are removed.
- The hydraulic support (10) on the crawler center sectionl (9) is swung out, pinned and secured.
- The support cylinders (11) are extended.
- The crawler center section is horizontally 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!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1. Installation of central ballast 20t / 45t / 95t , at crane mode on crawlers

Prerequisites:
- The installation of the crawler carrier (chapter 3.01) is completed.
- All connections between crawler carrier center carrier and crawler carrier are pinned and secured.
- The hydraulic support (8) **must** be swung out, locked and pinned.
- The hydraulic support cylinders (9) are fully retracted.
- Both crawler carriers are standing on the ground.
- The slewing platform is positioned 90° to the crawler carriers (fig. 1)
- Install the centeral ballast only according to the load charts .

C A U T I O N . **When driving the crane, the base plates must always be installed! The base plates have the task to take on the resulting steering forces on the crawler carriers.**

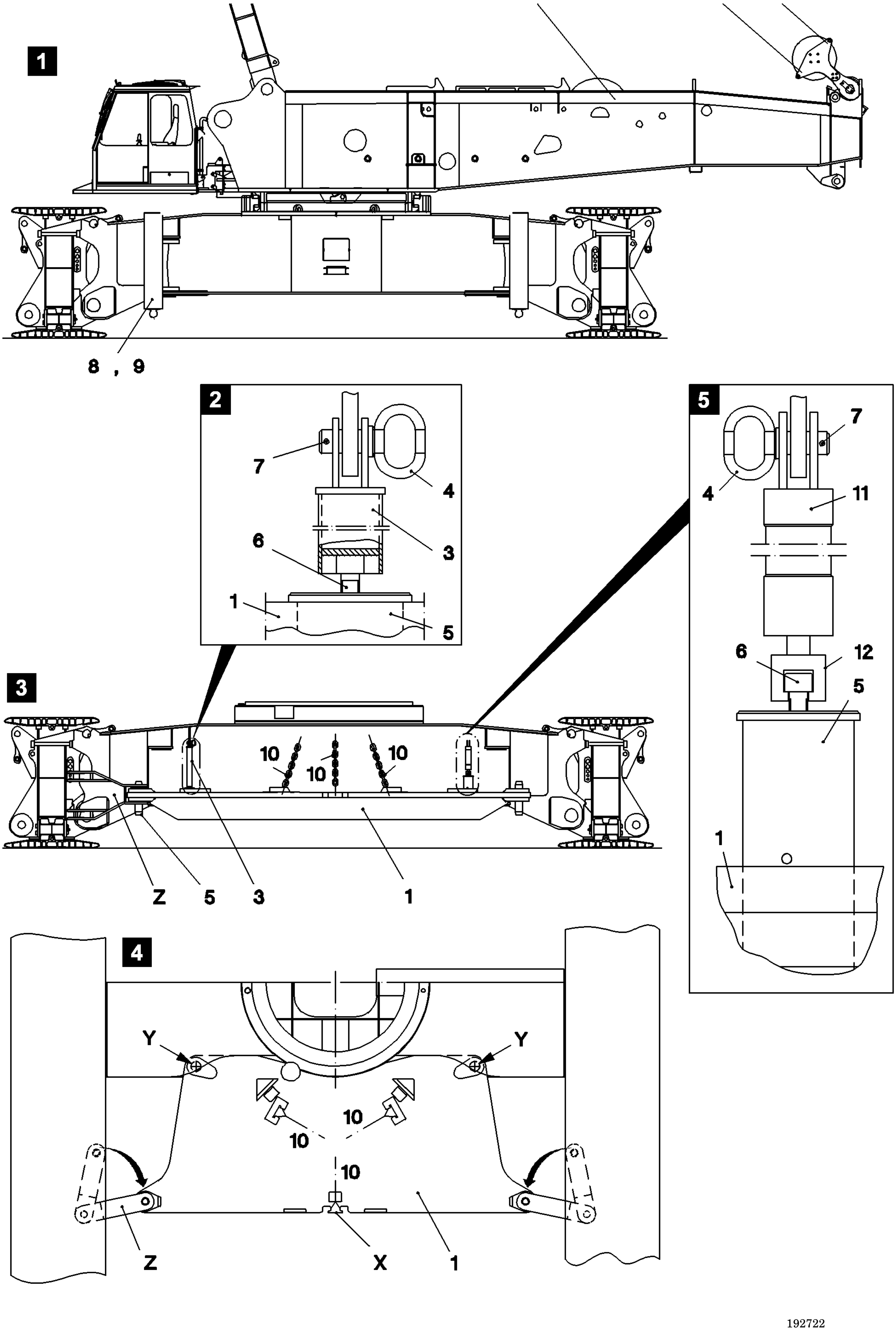
D A N G E R : **The central ballast may only be installed according to the load charts! When driving the crane, the base plates must always be installed! If this is not observed, there is a danger of accidents !**

1.1 Components for installation of central ballast (ZB / CB) :

Pos.	Description	Quantity
1	Base plate approx 10 t	2
2	Counterweight 12,5 t	6
3	Pipe	4
4	Pin	4
5	Pin ∅ 145 x 405 mm	4
6	Screw M 24 x 60 DIN912 10.9	4
7	Spring retainer 6	4

1.2 Assembly of central ballast (ZB / CB)

ZB 20 t:	2	**x**	Base plate approx	10,0 t	Pos. 1
ZB 45 t:	2	**x**	Base plate approx.	10,0 t	Pos. 1
	2	**x**	Counterweight	12,5 t	Pos. 2
ZB 95 t:	2	**x**	Base plate approx.	10,0 t	Pos. 1
	6	**x**	Counterweight	12,5 t	Pos. 2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192722

1.3 Installation Base plate

Install the base plate (1) with the auxiliary crane, attach tackle (10) to holders (X).
Lift the base plate with auxiliary crane and run it in to the stop on the crawler center section. First pin and secure the base plate on the pin points (Y) (fig. 4) on the crawler center section with pins (5) and secure. Swing out the brackets (Z) (fig. 4), pin and secure them with pin on the base plate.

D A N G E R : **It must be ensured that the tackle is correctly attached on the holders and secured sufficiently to prevent it from loosing up.
There is a danger of accident as the base plate can tip over or fall down!**

1.3.1 Installation procedure :

- Pins (5) are seated in the pin bores (Y) of the base plate .
- Lift the base plate with the auxiliary crane and run it in to the stop on the crawler center section .

Note: Weight of base plate is approx. 10 t

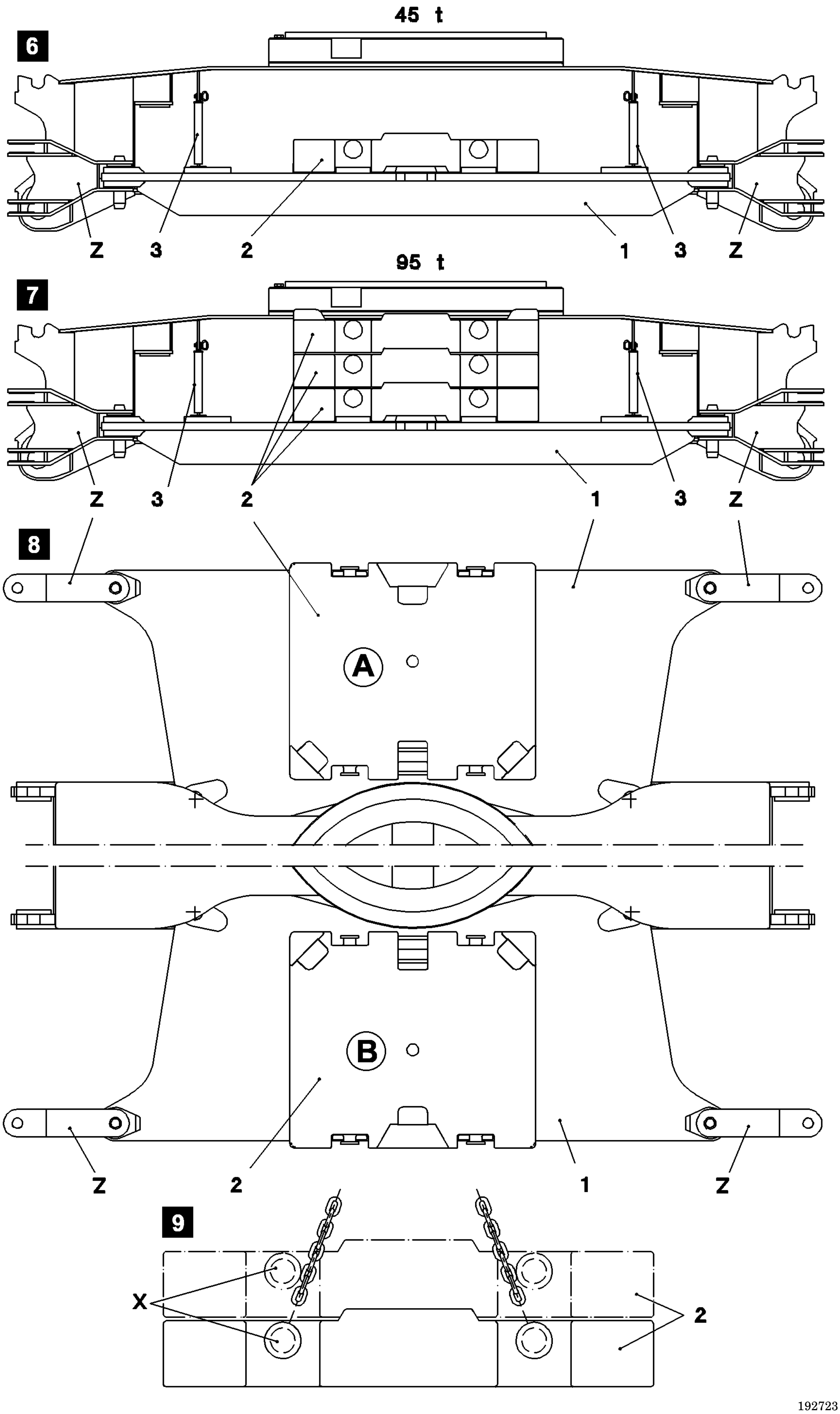
D A N G E R : **Make sure that no one is between the base plate and the crawler center section or the crawler carriers while the base plate is run in! This is strictly prohibited!
There is an increased danger of accidents due to crushing !**

- Carefully lower the base plate and align it until the bores of the base plate and the crawler center section align and the pins (5) slip into the bore due to their own weight. If necessary, help it along.
- If the pins (5) do not move easily, use a pin pulling device (fig. 5). To do so, push the pin pulling device (11) with the fork head (12) over the screw head, pin with pins (4) on the pin pulling device and secure with the spring retainer (7) . Push the pin (5) into the bore hole.
- Remove the pin pulling device.

D A N G E R: **Before pinning, make sure that the pin bore holes are clear.
After pinning, secure the pin immediately!**

- Secure the pin (5) with pipe (3) to prevent it from loosening up (fig. 2)
- Push the pipe (3) over the screw head (6), pin with pin (4) and secure with spring retainer (7) .
- Swing out the brackets (Z) of the crawler carriers (fig. 4), pin and secure with the base plate, using pins.
- When all pin points on the base plate are pinned and secured, remove the tackle (10) .

D A N G E R : **Make sure that there are no persons within the swing range of the brackets.
There is a danger of accidents !**


45 t
6
Z 3 2 1 3 Z
95 t
7
Z 3 2 1 3 Z
8
A
B
Z 2 1 Z
9
X
2
192723

1.4 Installation of counterweight plates

Prerequisite:
- The slewing platform is turned by 90° to the crawler carriers (fig. 1)
- The base plate is pinned and secured .
- The central ballast may only be installed according to the load charts.

DANGER : **The central ballast may only be installed according to the load charts!**
At A and B (fig. 8) always place the same counterweight!
If this is not observed, there is a danger of accidents!

1.4.1 Installation procedure:
- Place the counterweight plates (2) with the auxiliary crane onto the base plate (1) (fig. 6 / 7).
- Attach the tackle to the holders (X) of the counterweight plates (fig. 9).

DANGER : **It must be ensured that the tackle is correctly attached on the holders and secured sufficiently to prevent it from loosing up.**
There is a danger of accident !

- Do not attach more than **max. two** counterweight plates at the same time (fig. 9)
- Place the counterweight plate (s) with the auxiliary crane onto the base plate (1) .
- The counterweight plates must be placed on the base plate in such a way that they are laying on it with the complete surface and centered in the receptacles .
- Always place the same counterweight on sides **A** and **B**, (fig. 8) .

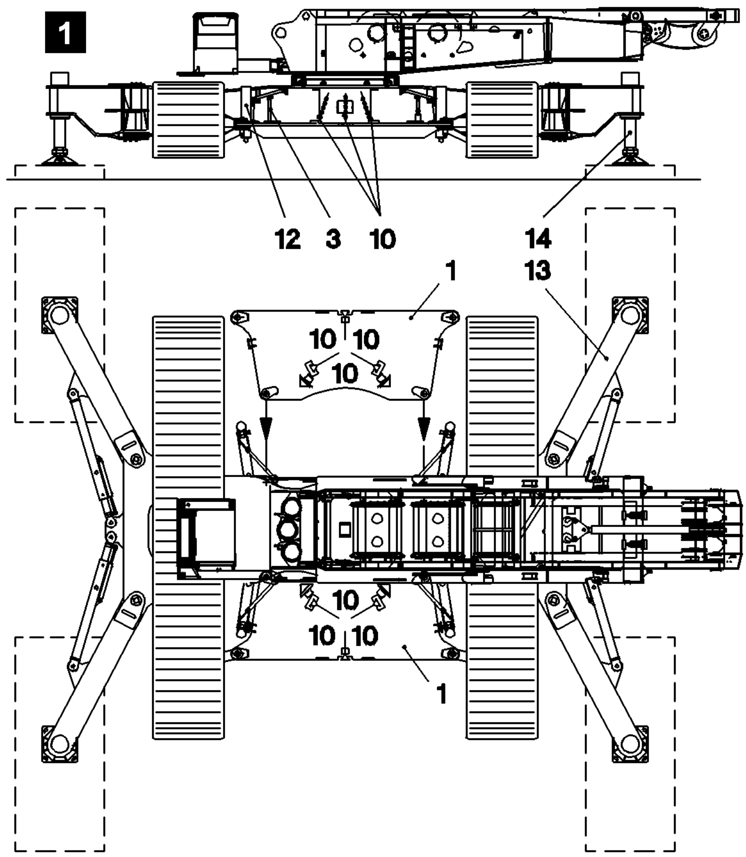
DANGER : **Make sure that no one is between the base plate and the crawler carriers during the run in of the counterweight plates! This is strictly prohibited.**
There is a danger of accident!

Do not place more than max. two counterweight plates at the same time.
If this is not observed, there is a danger of accidents!

1.5 Removal of counterweights and base plates

- Lift the counterweights with the auxiliary crane from the base plates.
- Attach the tackle to the holders (X) of the base plate (1) (fig. 3) .
- With the auxiliary crane, bring the tackle (10) to "tension" (fig. 3) .
- Release the pins on the brackets (Z) .
- Loosen and remove the pins on the brackets (Z) .
- Swing in the brackets .
- Remove the pin retainer, pipe (3).
- Loosen and remove the pin (5) on the crawler center section. If it does not move easily, use the pin pulling device.
- Lift the base plate with the auxiliary crane and run it out.

DANGER : **Make sure that no one is between the base plate and the crawler carriers during the run out of the counterweight plates! This is strictly prohibited.**
There is a danger of accident !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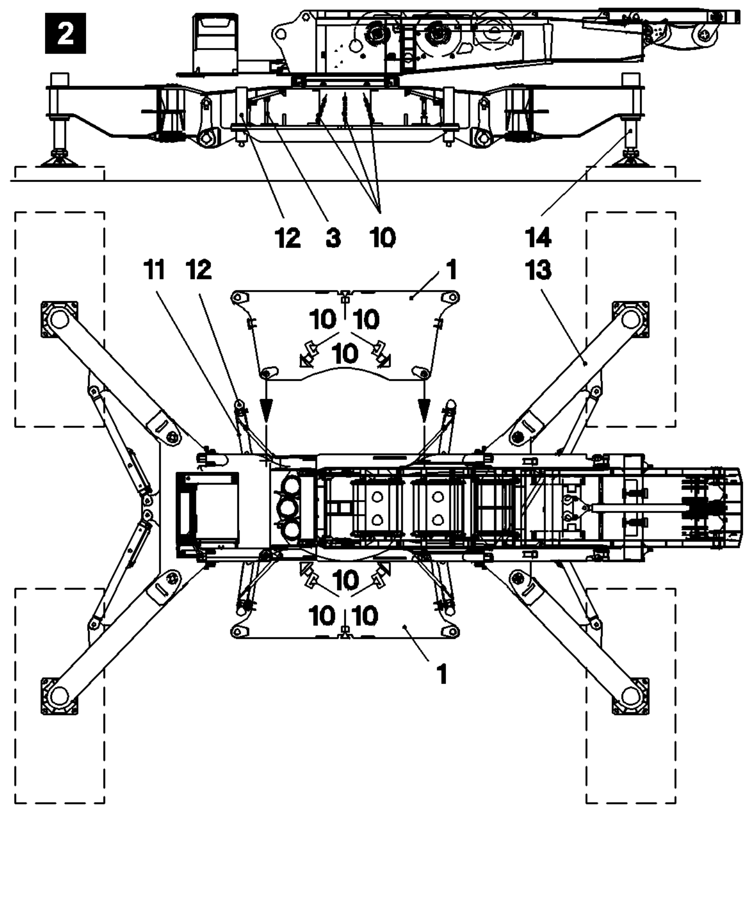
10
1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192737

2. Installation of central ballast at cran mode on hydraulic supports

Prerequisites:

- Installation of crane support on crawler carrier (fig. 1) or installation of crane support on crawler center section (fig. 2) is completed.(Chapter 3.05 / 3. Install support)
- All pin connections between crawler center section, crawler carriers and crane support (fig. 1) or between crawler center section and crane support (fig. 2) are pinned and secured.
- The hydraulic support (11) **must** be swung out, locked and pinned.
- The hydraulic support cylinders (12) are fully retracted.
- The support arms (13) for the crane support are folded out.
- The support cylinders (14) for the crane support are extended.
- The crane is properly supported and horizontally aligned.
- Turn the slewing platform into a position so that it is possible to install the base plates and the counterweights without restriction (fig. 1 / fig. 2)
- The central ballast may only be installed according to the load charts.

D A N G E R: The central ballast may only be installed according to the load charts! If this is not observed, there is a danger of accidents!

2.1 Components for installation of central ballast (ZB/ CB) :

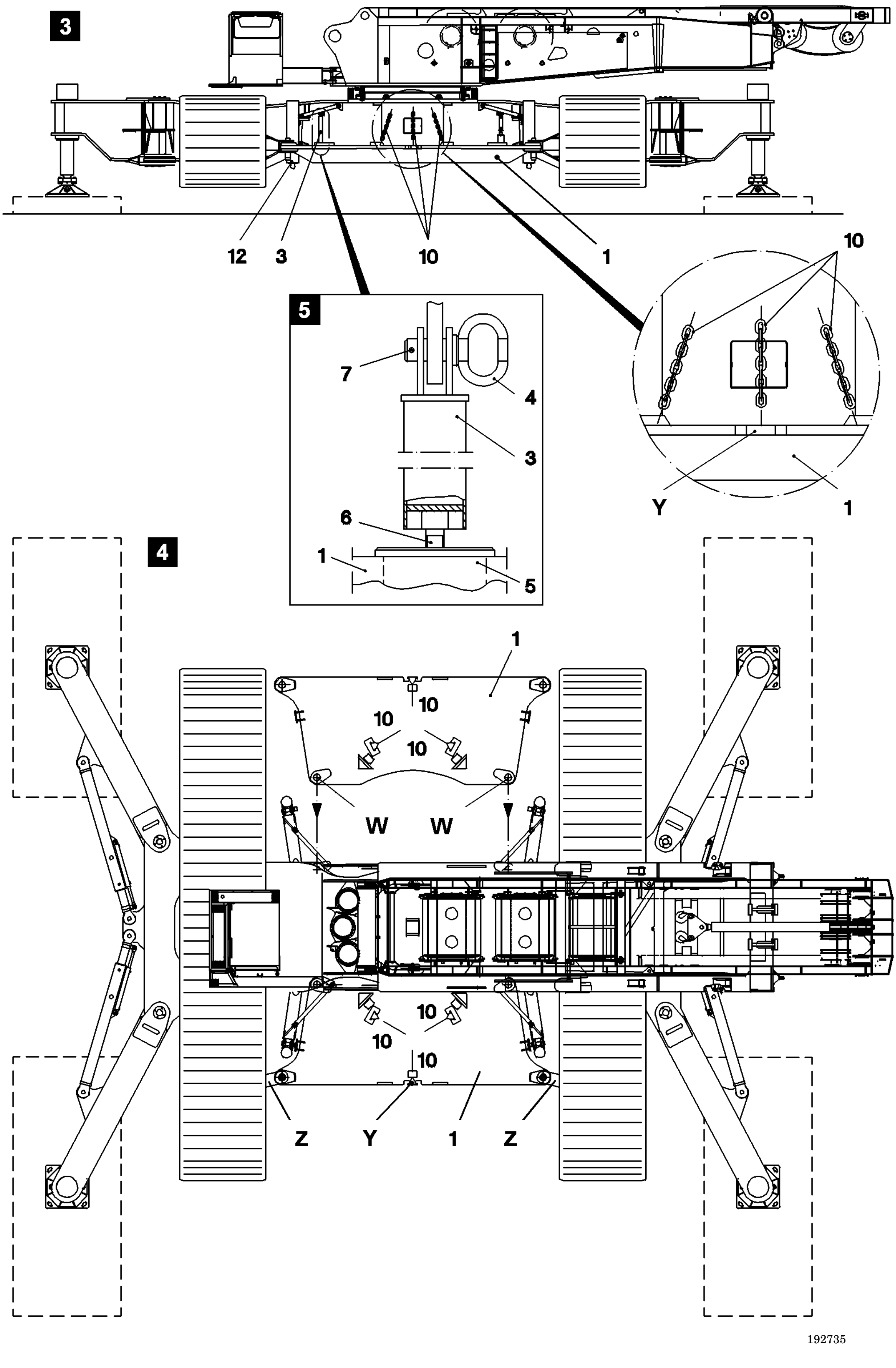
Pos.	Description	Quantity
1	Base plate approx. 10,00 t	2
2	Counterweight 12,50 t	2
3	Pipe	4
4	Pin	4
5	Pin ∅ 145 x 405 mm	4
6	Screw M 24 x 60 DIN912 10.9	4
7	Spring retainer	4
8	Counterweight 25,00 t	2
9	Counterweight 3,75 t	4

2.2 Assembly of 110 t Central ballast (ZB / CB)

ZB 20 t:	2	x	Base plate approx	10,00 t	Pos. 1
ZB 110 t:	2	**x**	Base plate approx	10,00 t	Pos. 1
	2	**x**	Counterweight	12.50 t	Pos. 2
	2	**x**	Counterweight	25,00 t	Pos. 8
	4	**x**	Counterweight	3,75 t	Pos. 9

C A U T I O N: ZB 20 t: at cran mode on supports, crawlers installed

ZB 110 t: only permissible at cran mode on hydraulic supports
(crawlers **N O T** installed)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7
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Y
1
4
1
10
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10
W
W
10
10
10
Z
Y
1
Z
192735

2.3 Installation base plate / crawler carrier installed

Install the base plate (1) with the auxiliary crane, attach tackle (10) to holders (Y).
Lift the base plate with auxiliary crane and run it in to the stop on the crawler center section. Pin and secure the base plate on the pin points on the crawler center section with pins (5) . Swing out the brackets (Z) (fig. 4) and pin and secure with pin on base plate .

D A N G E R : **It must be ensured that the tackle is correctly attached on the holders and secured sufficiently to prevent it from loosing up.**
There is a danger of accident as the base plate can tip over or fall down!

2.3.1 Installation procedure :

- Pins (5) are seated in the pin bores (W) of the base plate (1).
- Lift the base plate with the auxiliary crane and run it in to the stop on the crawler center section (fig. 4) .

Note: Weight of base plate is approx. 10 t

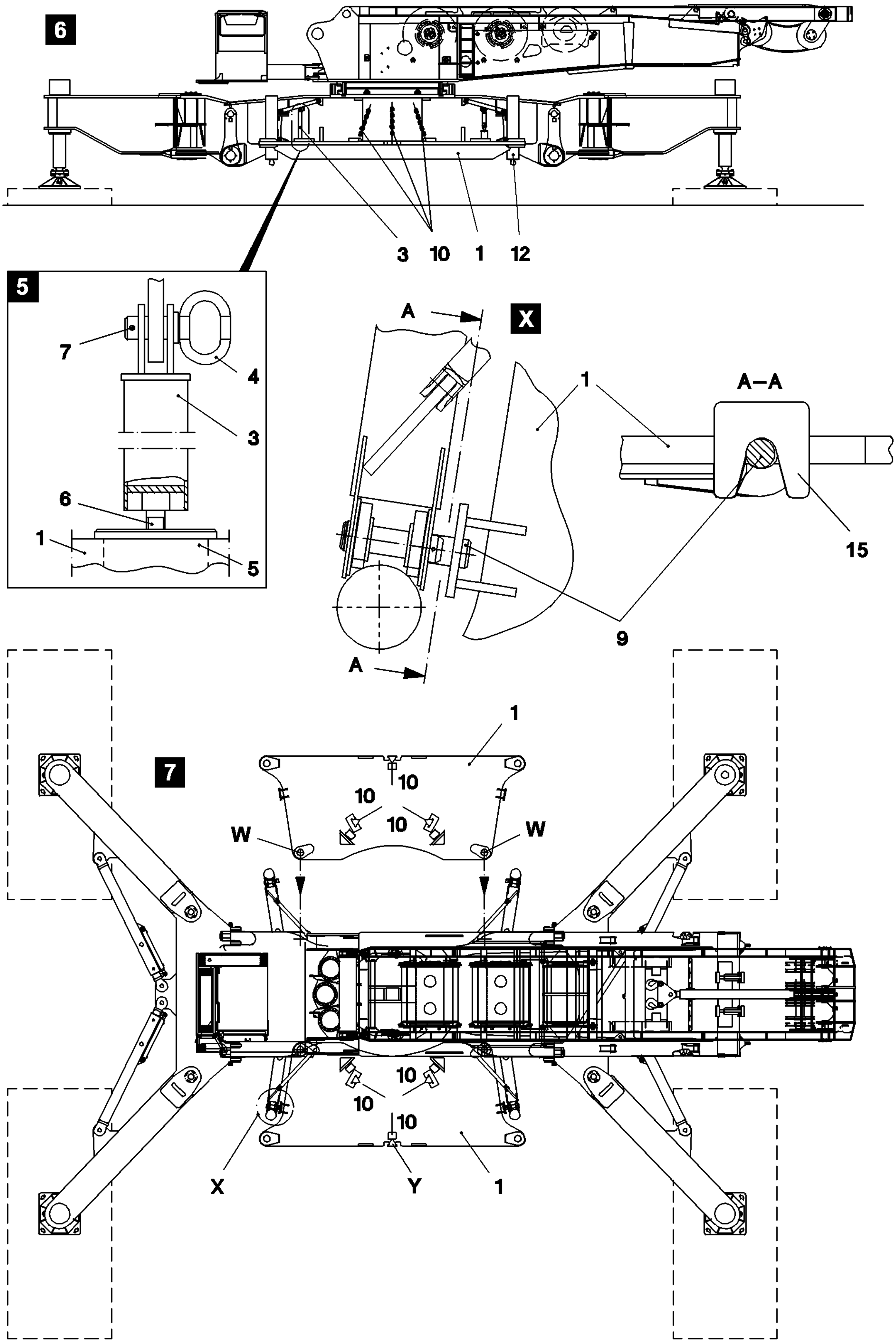
D A N G E R : **Make sure that no one is between the base plate and the crawler center section or the crawler carriers while the base plate is run in! This is strictly prohibited!**
There is an increased danger of accidents due to crushing !

- Carefully lower the base plate and align it until the bores of the base plate and the crawler center section align and the pins (5) (fig. 5) slip into the bore due to their own weight. If necessary, help it along.
- If the pins (5) do not move easily, use a pin pulling device. To do so, pin the pin pulling device with the pin (4) on bracket (fig. 5) and secure with the spring retainer (7) .
  Push the pin (5) into the bore hole.
- Remove the pin pulling device.

D A N G E R: **Before pinning, make sure that the pin bore holes are clear.**
After pinning, secure the pin immediately!

- Secure the pin (5) with pipe (3) to prevent it from loosening up (fig. 5)
- Push the pipe (3) over the screw (6), pin with pin (4) and secure with spring retainer (7) .
- Swing out the brackets (Z) of the crawler carriers (fig. 4), pin and secure with the base plate .
- When all pin points on the base plate are pinned and secured, remove the tackle (10) .

D A N G E R : **Make sure that there are no persons within the swing range of the brackets.**
There is a danger of accidents !



192736

2.4 Installation of base plate / crawler carrier not installed

Install the base plate (1) with the auxiliary crane. Attach the tackle (10) to the handles (Y).
Lift the base plate with the auxiliary crane to the stop on the crawler center section. Lower the base plate, until the receptacles (15) of the base plate are centered on the extended pins (9) of the cylinder mount and are touching (A-A). Pin and secure the base plate on the pin points with pins (5) and secure.
The base plate is laying loosely at X, without being secured .

D A N G E R : It must be ensured that the tackle is correctly attached on the holders and secured sufficiently to prevent it from loosing up.
There is a danger of accident as the base plate can tip over or fall down!

2.4.1 Installation procedure:

- The pins (5) sit in the pin bores (W) of the base plate (fig. 7).
- Lift the base plate with the auxiliary crane and run it in to the stop on the crawler center section.

Note: The weight of the base plate is approx. 10 t

D A N G E R : Make sure that no one is between the base plate and the crawler center section or the crawler carriers while the base plate is run in! This is strictly prohibited!
There is an increased danger of accidents due to crushing !

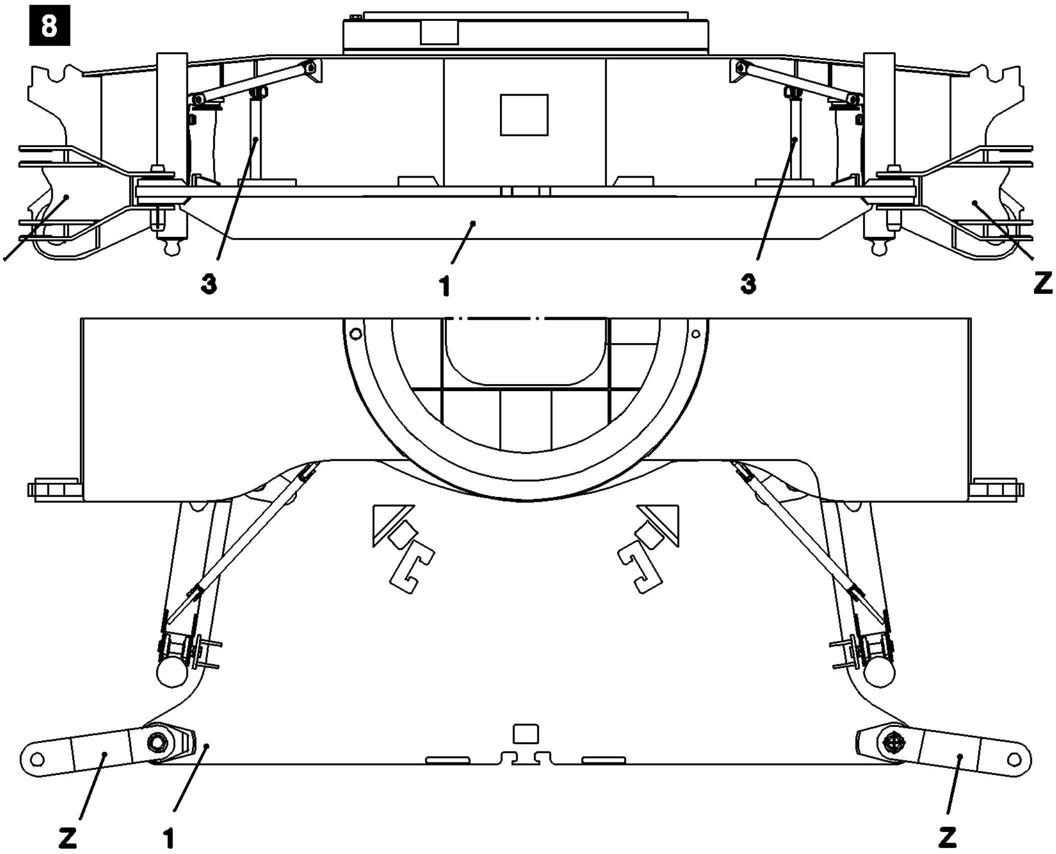
- Carefully lower the base plate and align it until the bores of the base plate and the crawler center section align and the pins (5) (fig. 5) slip into the bore due to their own weight. If necessary, help it along.
- If the pins (5) do not move easily, use a pin pulling device. To do so, pin the pin pulling device with the pin (4) on bracket (fig. 5) and secure with the spring retainer (7) .
  Push the pin (5) into the bore hole.
- Remove the pin pulling device.

D A N G E R : Before pinning, make sure that the pin bore holes are clear.
After pinning, secure the pin immediately!

- Attach the base plate (1) with receptacles (15) on the extended pins (9) of the cylinder mount (X) .
- Secure the pin (5) with pipe (3) to prevent it from loosening up (fig. 5)
- Push the pipe (3) over the screw (6), pin with pin (4) and secure with spring retainer (7) .
- Only when the base plate is pinned to the crawler center section nd the receptacles (15) of the base plate are laying on the extended pins (9), remove the tackle (10) .

D A N G E R : It must be ensured that all pins (5) are secured and the receptacles (15) are laying on the extended pins (9) (A-A).
If this is not observed, there is a danger of accidents!

8



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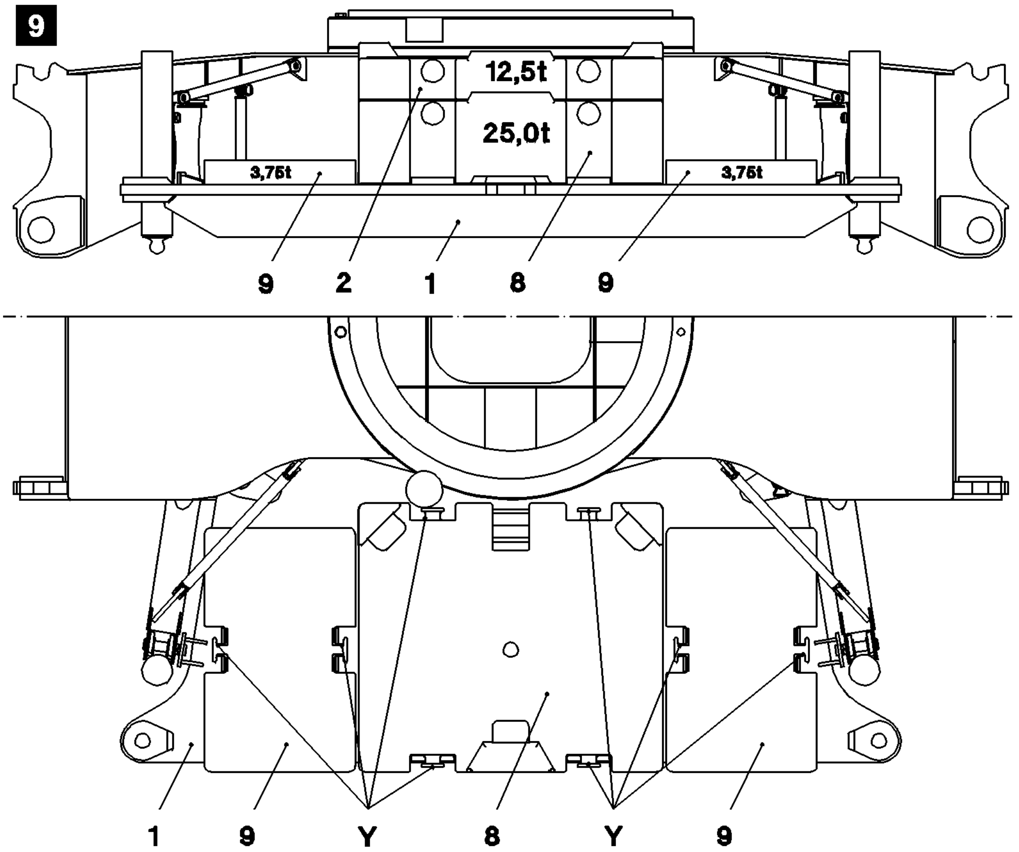


192893

2.5 Installation of counterweight plates

Prerequisite:
- Turn the slewing platform into position that access to install the counterweights is unrestricted (fig. 6).
- The base plate is pinned and secured.
- The crane is aligned in horizontal direction.
- The central ballast may only be installed according to the load charts.

D A N G E R : **The central ballast may only be installed according to the load charts! If this is not observed, there is a danger of accidents!**

2.5.1 Installation procedure:
- Place the counterweight plate (8) with the auxiliary crane onto the base plate (1) (fig. 9).
- Place the counterweight plate (2) with the auxiliary crane onto the counterweight (8) (fig. 9)
- Place the counterweight plate (9) with the auxiliary crane onto the base plate (1) (fig. 9)
- Attach the tackle to the holders (Y) of the counterweight plates.

D A N G E R : **It must be ensured that the tackle is correctly attached on the holders and secured sufficiently to prevent it from loosing up.
There is a danger of accident !**

- Place and add the counterweight plates individually with the auxiliary crane .
- Always place the same counterweight on both base plates.

D A N G E R : **Make sure that no one is between the base plate and the crawler carriers or the base plate and the crane supports during the run in of the counterweight plates! This is strictly prohibited.
Always place the same counterweight on both base plates.
There is a danger of accident !**

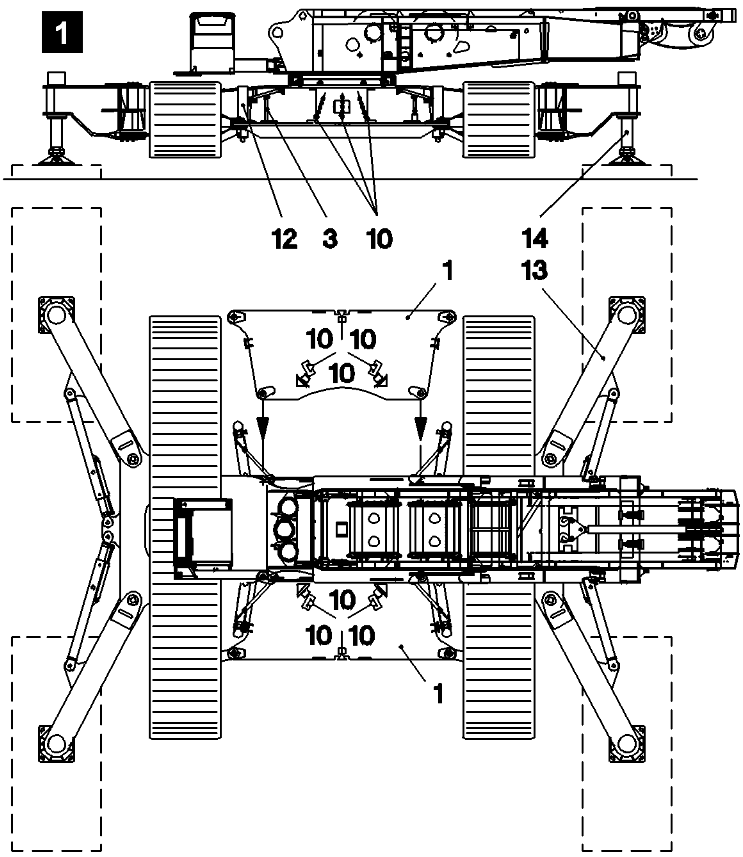
2.6 Removal of counterweights and base plates

- Lift the counterweights with the auxiliary crane from the base plates.
- Attach the tackle to the holders (Y) of the base plate (1) .
- With the auxiliary crane, bring the tackle to "tension" .

- Release the pins on the brackets (Z) .
- Loosen and remove the pins on the brackets (Z) .
- Swing in the brackets .

- Remove the pin retainer, pipe (3) .
- Loosen and remove the pin (5) on the crawler center section. If it does not move easily, use the pin pulling device.
- Lift the base plate with the auxiliary crane and run it out.

D A N G E R : **Make sure that no one is between the base plate and the crawler carriers or the base plate and the crane supports during the run out of the counterweight plates! This is strictly prohibited.
There is a danger of accident !**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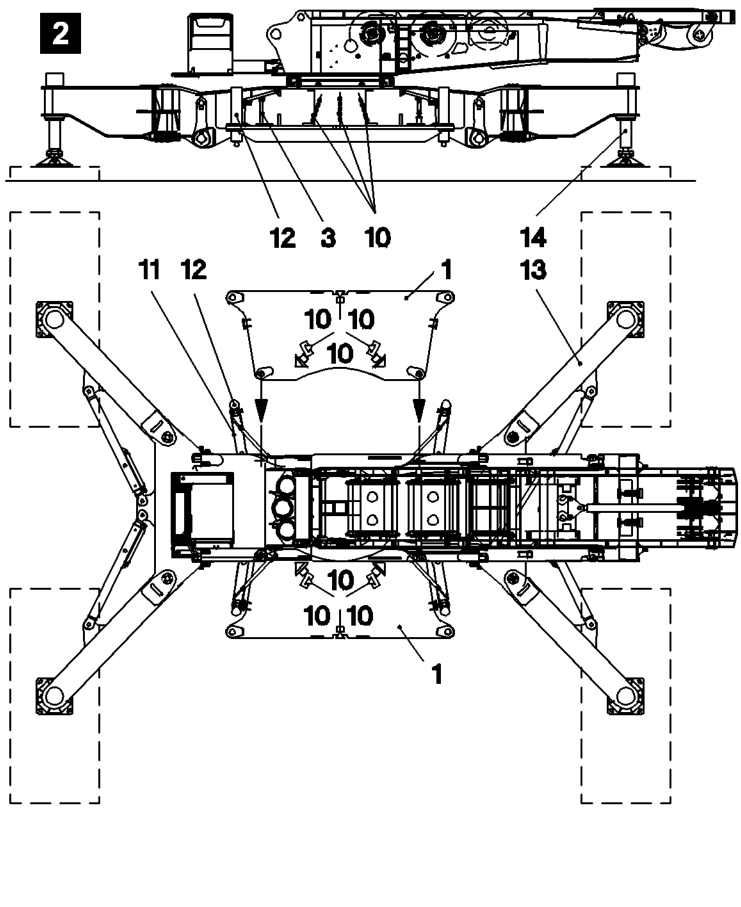
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1

192737

1. Installation of central ballast 110 t

Prerequisites:
- Installation of crane support on crawler carrier (fig. 1) or installation of crane support on crawler center section (fig. 2) is completed.(Chapter 3.05 / 3. Install support)
- All pin connections between crawler center section, crawler carriers and crane support (fig. 1) or between crawler center section and crane support (fig. 2) are pinned and secured.
- The hydraulic support (11) **must** be swung out, locked and pinned.
- The hydraulic support cylinders (12) are fully retracted.
- The support arms (13) for the crane support are folded out.
- The support cylinders (14) for the crane support are extended.
- The crane is properly supported and horizontally aligned.
- Turn the slewing platform into a position so that it is possible to install the base plates and the counterweights without restriction (fig. 1 / fig. 2)
- The central ballast may only be installed according to the load charts.

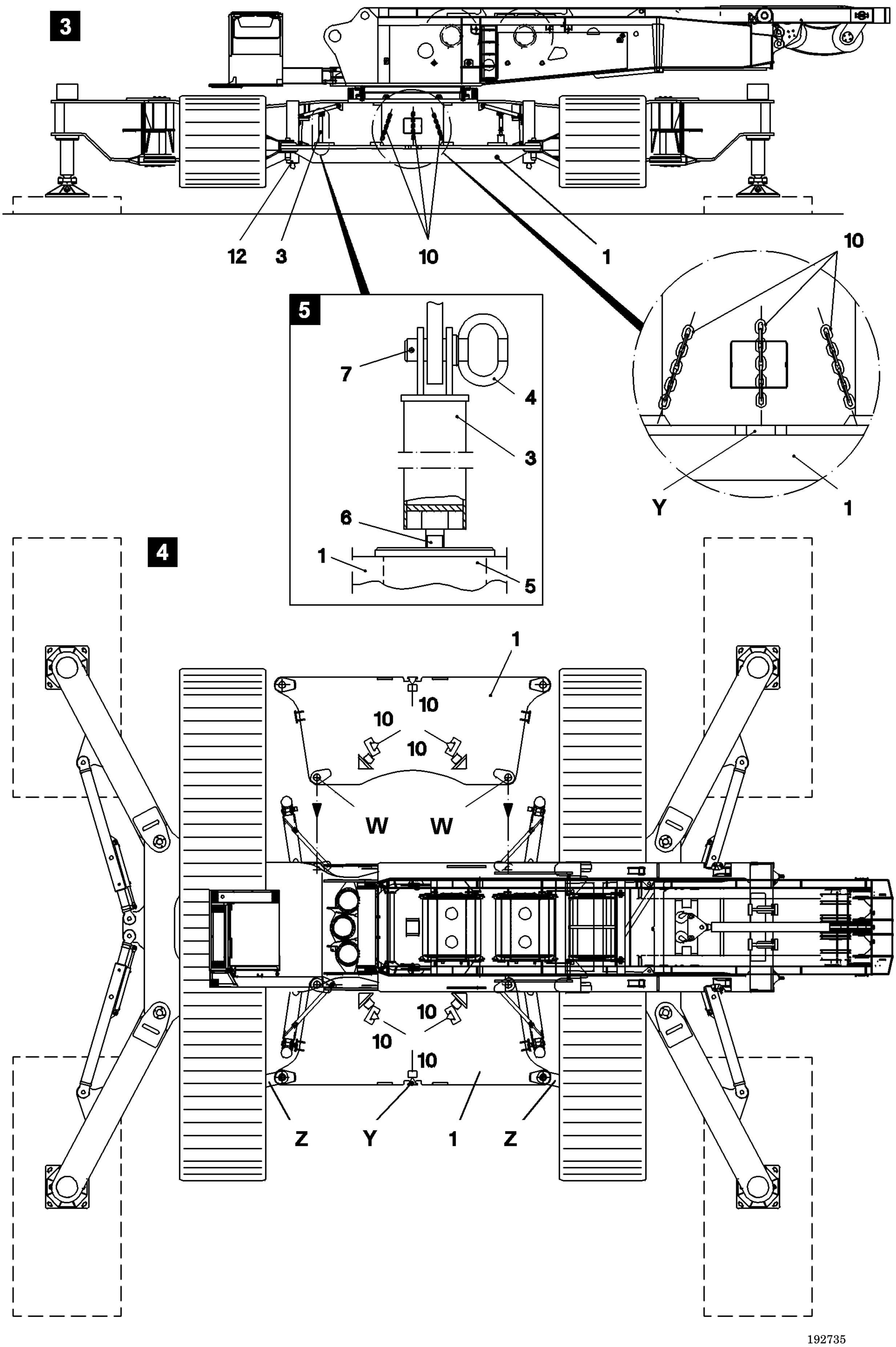
D A N G E R : The central ballast may only be installed according to the load charts! If this is not observed, there is a danger of accidents!

1.1 Components for installation of central ballast (ZB/ CB) :

Pos.	Description	Quantity
1	Base plate approx. 10,00 t	2
2	Counterweight 12,50 t	2
3	Pipe	4
4	Pin	4
5	Pin ∅ 145 x 405 mm	4
6	Screw M 24 x 60 DIN912 10.9	4
7	Spring retainer	4
8	Counterweight 25,00 t	2
9	Counterweight 3,75 t	4

1.2 Assembly of 110 t Central ballast (ZB / CB)

ZB 110 t:	2	**x**	Base plate approx.	10,00 t	Pos. 1
	2	**x**	Counterweight	12.50 t	Pos. 2
	2	**x**	Counterweight	25,00 t	Pos. 8
	4	**x**	Counterweight	3,75 t	Pos. 9


3
12
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5
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3
6
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5
Y
1
4
1
10
10
10
W
W
10
10
10
Z
Y
1
Z
192735

2. Installation base plate / crawler carrier installed

Install the base plate (1) with the auxiliary crane, attach tackle (10) to holders (Y).
Lift the base plate with auxiliary crane and run it in to the stop on the crawler center section. Pin and secure the base plate on the pin points on the crawler center section with pins (5) . Swing out the brackets (Z) (fig. 4) and pin and secure with pin on base plate .

D A N G E R : It must be ensured that the tackle is correctly attached on the holders and secured sufficiently to prevent it from loosing up.
There is a danger of accident as the base plate can tip over or fall down!

2.1 Installation procedure :

- Pins (5) are seated in the pin bores (W) of the base plate (1).
- Lift the base plate with the auxiliary crane and run it in to the stop on the crawler center section (fig. 4) .

Note: Weight of base plate is approx. 10 t

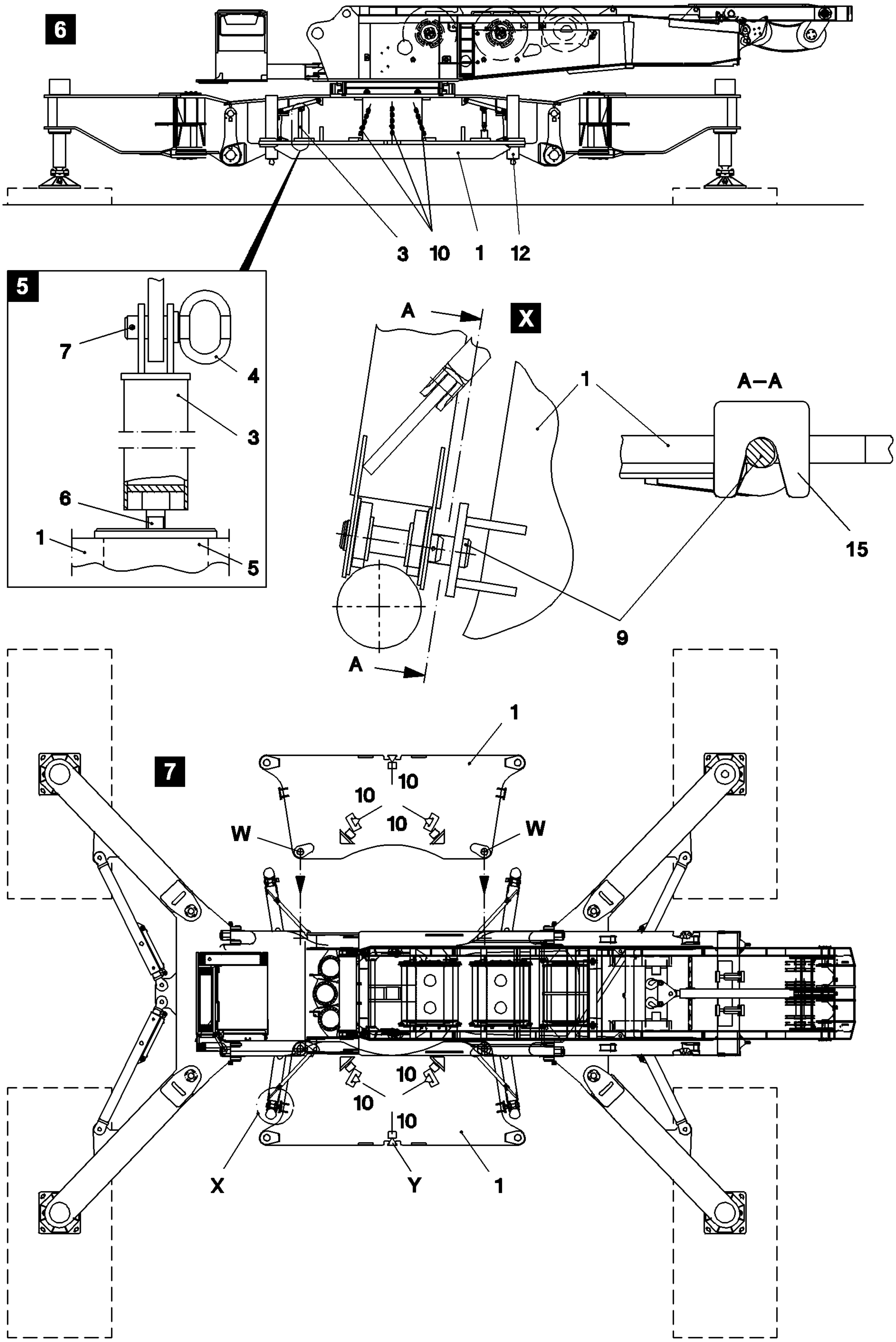
D A N G E R : Make sure that no one is between the base plate and the crawler center section or the crawler carriers while the base plate is run in! This is strictly prohibited!
There is an increased danger of accidents due to crushing !

- Carefully lower the base plate and align it until the bores of the base plate and the crawler center section align and the pins (5) (fig. 5) slip into the bore due to their own weight. If necessary, help it along.
- If the pins (5) do not move easily, use a pin pulling device. To do so, pin the pin pulling device with the pin (4) on bracket (fig. 5) and secure with the spring retainer (7) .
  Push the pin (5) into the bore hole.
- Remove the pin pulling device.

D A N G E R: Before pinning, make sure that the pin bore holes are clear.
After pinning, secure the pin immediately!

- Secure the pin (5) with pipe (3) to prevent it from loosening up (fig. 5)
- Push the pipe (3) over the screw (6), pin with pin (4) and secure with spring retainer (7) .
- Swing out the brackets (Z) of the crawler carriers (fig. 4), pin and secure with the base plate .
- When all pin points on the base plate are pinned and secured, remove the tackle (10) .

D A N G E R : Make sure that there are no persons within the swing range of the brackets.
There is a danger of accidents !



192736

3. Installation of base plate / crawler carrier not installed

Install the base plate (1) with the auxiliary crane. Attach the tackle (10) to the handles (Y).
Lift the base plate with the auxiliary crane to the stop on the crawler center section. Lower the base plate, until the receptacles (15) of the base plate are centered on the extended pins (9) of the cylinder mount and are touching (A-A). Pin and secure the base plate on the pin points with pins (5) and secure.
The base plate is laying loosely at X, without being secured .

D A N G E R : **It must be ensured that the tackle is correctly attached on the holders and secured sufficiently to prevent it from loosing up.**
There is a danger of accident as the base plate can tip over or fall down!

3.1 Installation procedure:

- The pins (5) sit in the pin bores (W) of the base plate (fig. 7).
- Lift the base plate with the auxiliary crane and run it in to the stop on the crawler center section.

Note: The weight of the base plate is approx. 10 t

D A N G E R : **Make sure that no one is between the base plate and the crawler center section or the crawler carriers while the base plate is run in! This is strictly prohibited!**
There is an increased danger of accidents due to crushing !

- Carefully lower the base plate and align it until the bores of the base plate and the crawler center section align and the pins (5) (fig. 5) slip into the bore due to their own weight. If necessary, help it along.
- If the pins (5) do not move easily, use a pin pulling device. To do so, pin the pin pulling device with the pin (4) on bracket (fig. 5) and secure with the spring retainer (7) .
  Push the pin (5) into the bore hole.
- Remove the pin pulling device.

D A N G E R: **Before pinning, make sure that the pin bore holes are clear.**
After pinning, secure the pin immediately!

- Attach the base plate (1) with receptacles (15) on the extended pins (9) of the cylinder mount (X) .
- Secure the pin (5) with pipe (3) to prevent it from loosening up (fig. 5)
- Push the pipe (3) over the screw (6), pin with pin (4) and secure with spring retainer (7) .
- Only when the base plate is pinned to the crawler center section nd the receptacles (15) of the base plate are laying on the extended pins (9), remove the tackle (10) .

D A N G E R : **It must be ensured that all pins (5) are secured and the receptacles (15) are laying on the extended pins (9) (A-A).**
If this is not observed, there is a danger of accidents!

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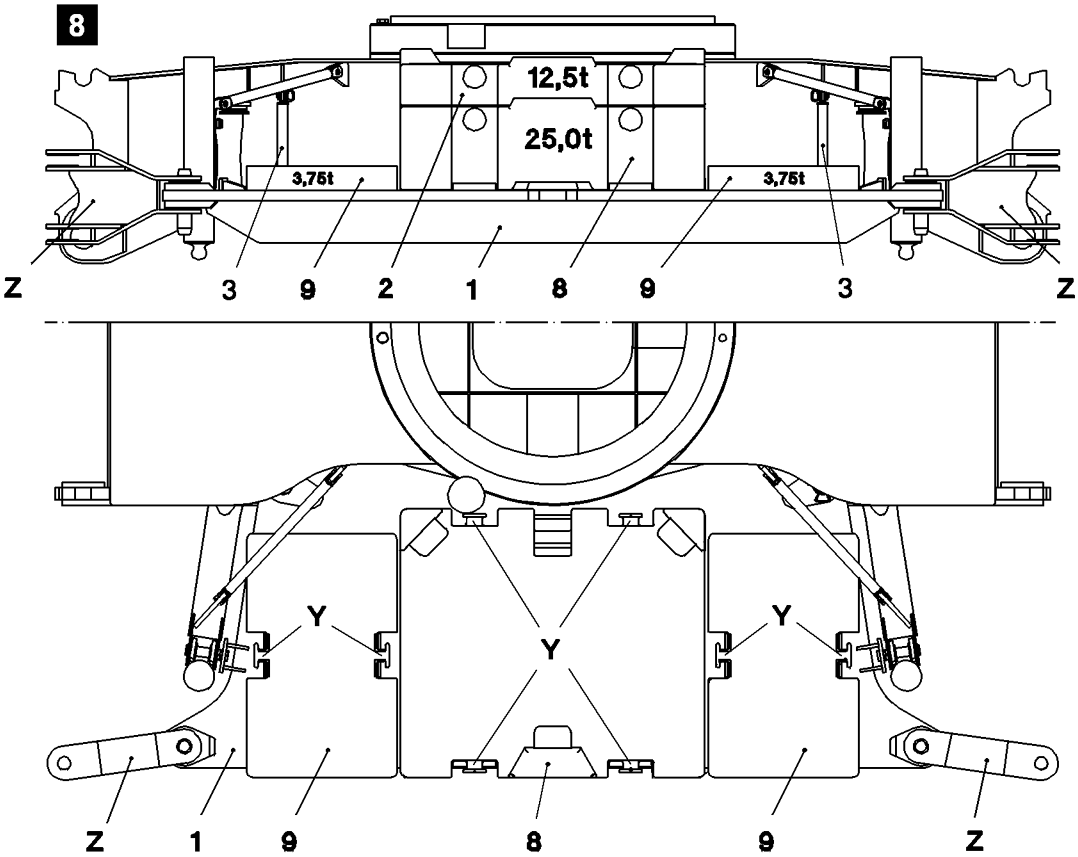
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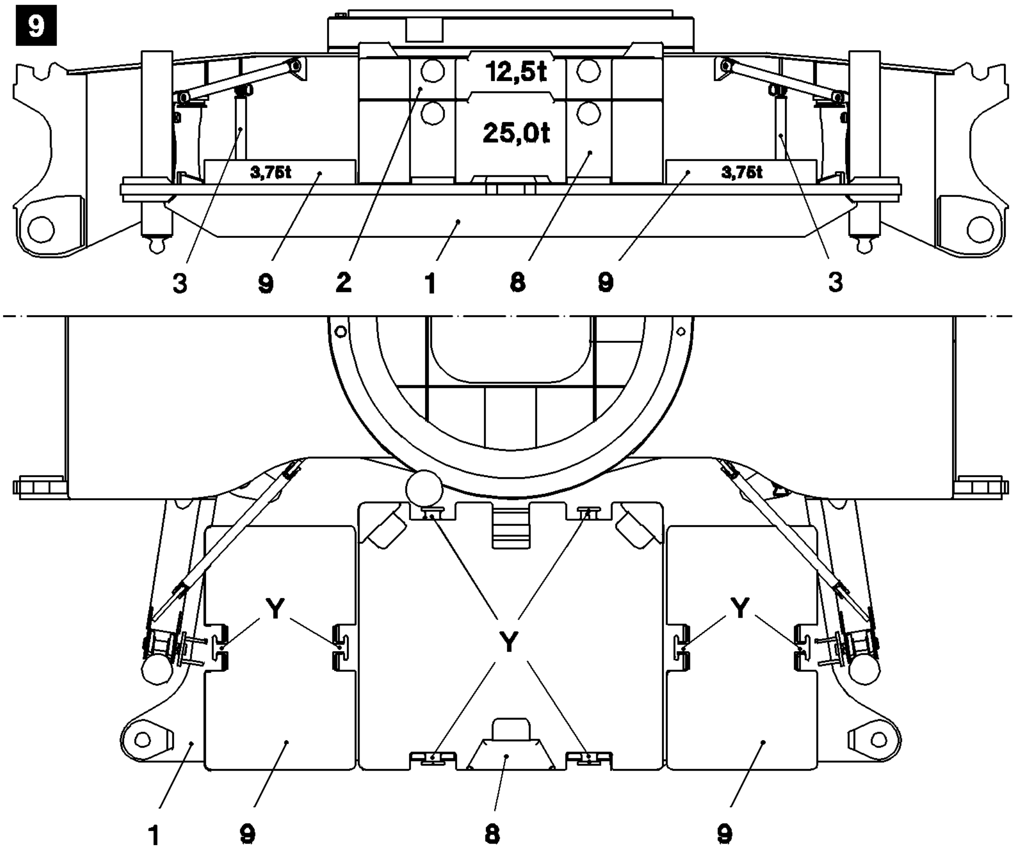
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192738

4. Installation of counterweight plates

Prerequisite:
- Turn the slewing platform into position that access to install the counterweights is unrestricted (fig. 3 // 6).
- The base plate is pinned and secured.
- The crane is aligned in horizontal direction.
- The central ballast may only be installed according to the load charts.

D A N G E R : The central ballast may only be installed according to the load charts! If this is not observed, there is a danger of accidents!

4.1 Installation procedure:
- Place the counterweight plate (8) with the auxiliary crane onto the base plate (1) (fig. 8 // 9).
- Place the counterweight plate (2) with the auxiliary crane onto the counterweight (8) (fig. 8 // 9)
- Place the counterweight plate (9) with the auxiliary crane onto the base plate (1) (fig. 8 // 9)
- Attach the tackle to the holders (Y) of the counterweight plates.

D A N G E R : It must be ensured that the tackle is correctly attached on the holders and secured sufficiently to prevent it from loosing up. There is a danger of accident !

- Place and add the counterweight plates individually with the auxiliary crane .
- Always place the same counterweight on both base plates.

D A N G E R : Make sure that no one is between the base plate and the crawler carriers or the base plate and the crane supports during the run in of the counterweight plates! This is strictly prohibited. Always place the same counterweight on both base plates. There is a danger of accident !

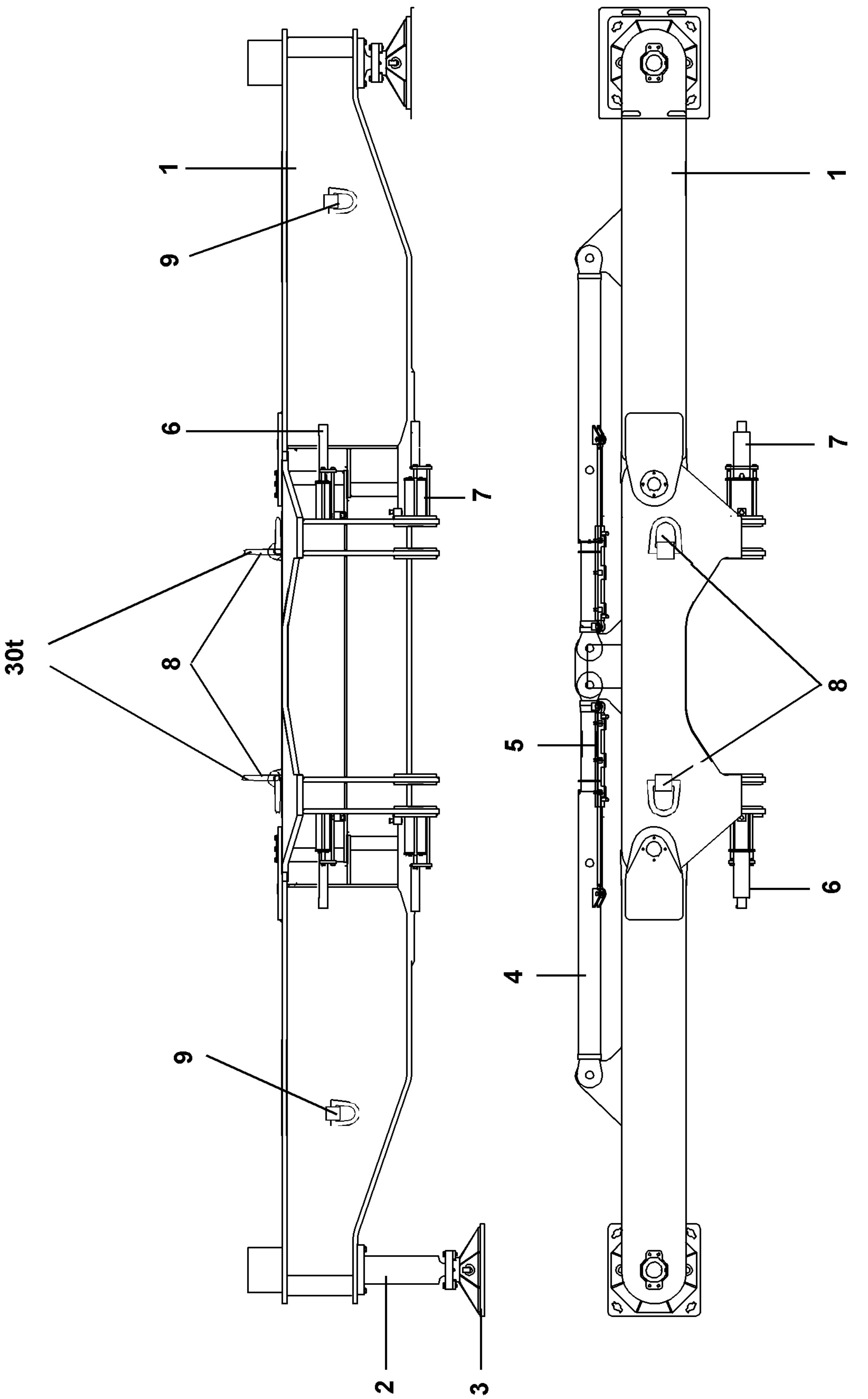
5. Removal of counterweights and base plates

- Lift the counterweights with the auxiliary crane from the base plates.
- Attach the tackle to the holders (Y) of the base plate (1) .
- With the auxiliary crane, bring the tackle to "tension" .

- Release the pins on the brackets (Z) .
- Loosen and remove the pins on the brackets (Z) .
- Swing in the brackets .

- Remove the pin retainer, pipe (3) .
- Loosen and remove the pin (5) on the crawler center section. If it does not move easily, use the pin pulling device.
- Lift the base plate with the auxiliary crane and run it out.

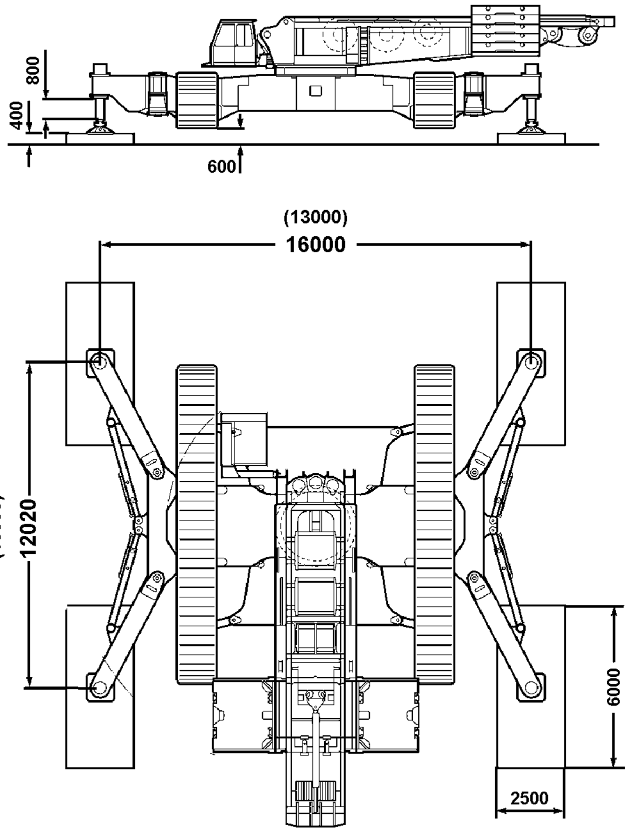
D A N G E R : Make sure that no one is between the base plate and the crawler carriers or the base plate and the crane supports during the run out of the counterweight plates! This is strictly prohibited. There is a danger of accident !



192177

1. Support components overview

1 Support arms
2 Support cylinder
3 Support plates
4 Swing cylinder
5 Scale for support base
6 Pinning, top
7 Pinning, bottom
8 Eye hooks
9 Rigging hooks for transport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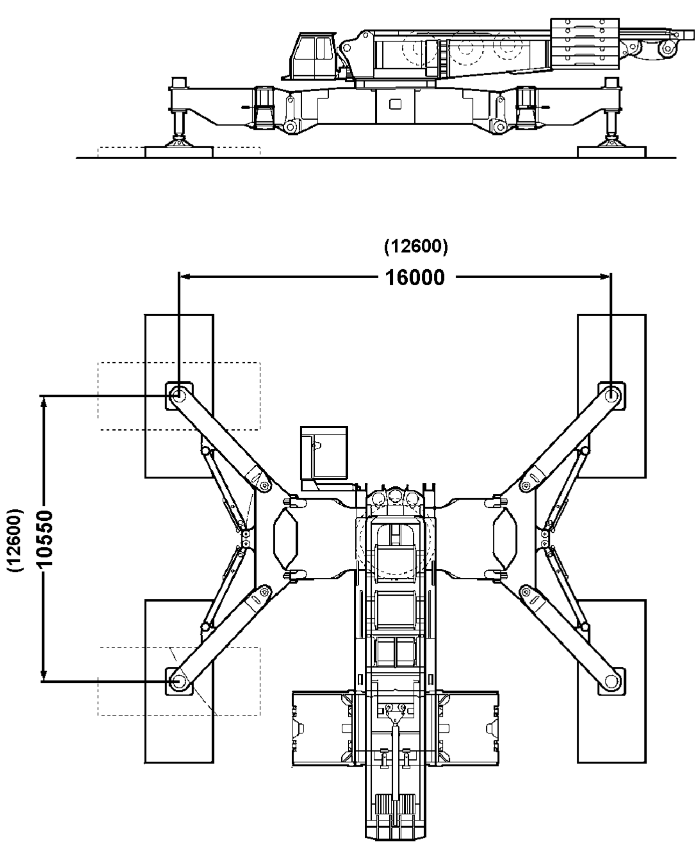
16000
(13000)
12020
6000
2500

1


(12600)
16000
(12600)
10550

2

192175

2. Hydraulic crane support

The hydraulic crane support consists of :
- Center section with support control unit and pinning device
- 4 support arms which can be folded out, with hydraulic cylinders

2.1 Support base

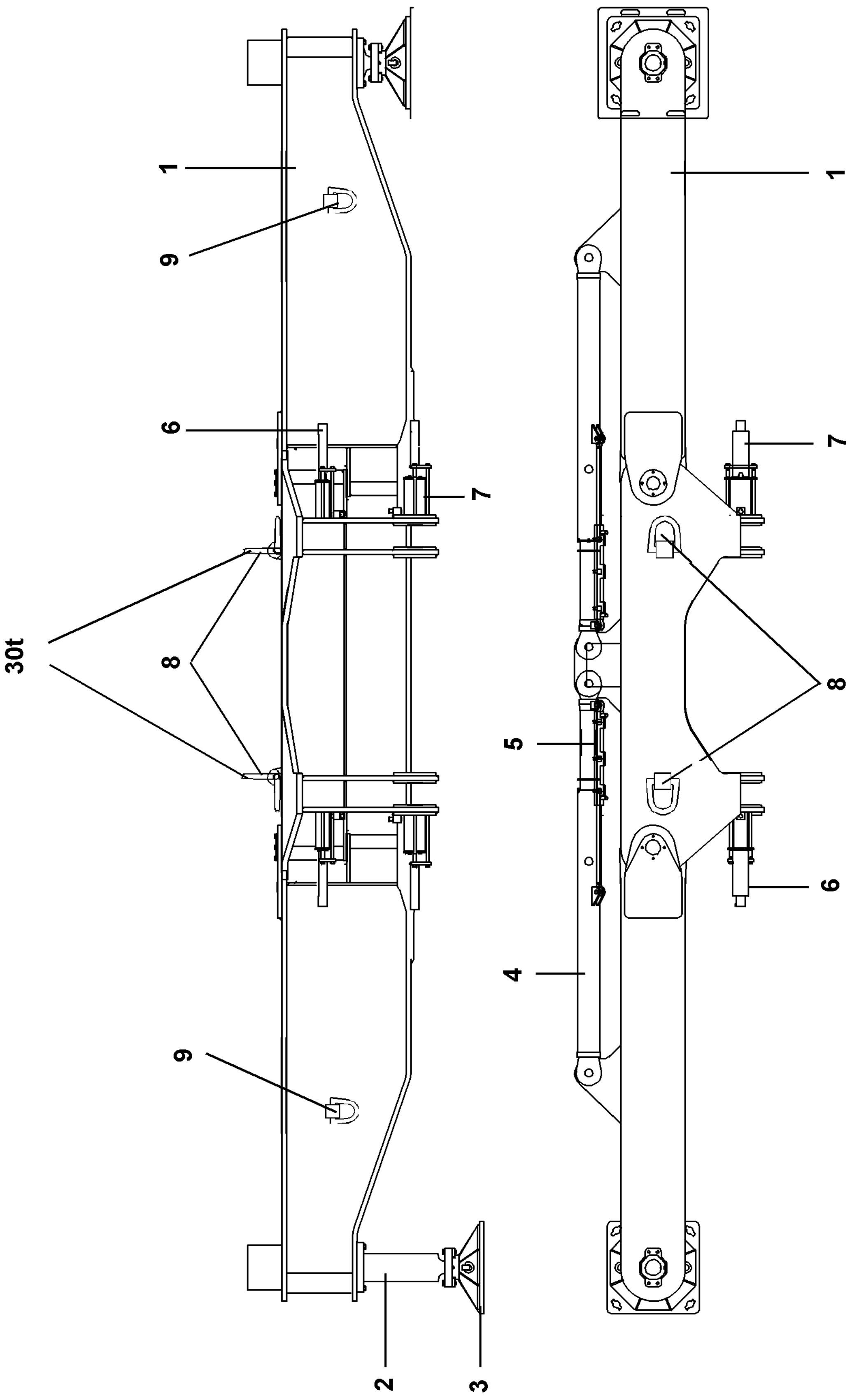
Fig. 1
Support base for installation on crawler carrier

- square	13m × 13m
- rectangular	16m × 12m

Fig. 2
Support base, for installation directly on crawler center section

- square	12,6m × 12,6m
- rectangular	16m × 12m

-



192177

3. Install support

Take on the complete support on the eye hooks and swing in to the pin points on the crawler carrier or on the center section.

Note: Weight, approx.30t

D A N G E R: **Make sure that there are no persons or obstacles between the support and the crawler carrier or the center section when swinging the support in. This is strictly prohibited.**
There is a danger of accidents!

Establish the hydraulic connections, 4× quick couplings
Establish the electrical connection
Turn the ignition on
Start the engine .

Pin the support on the crawler carrier or on the center section .

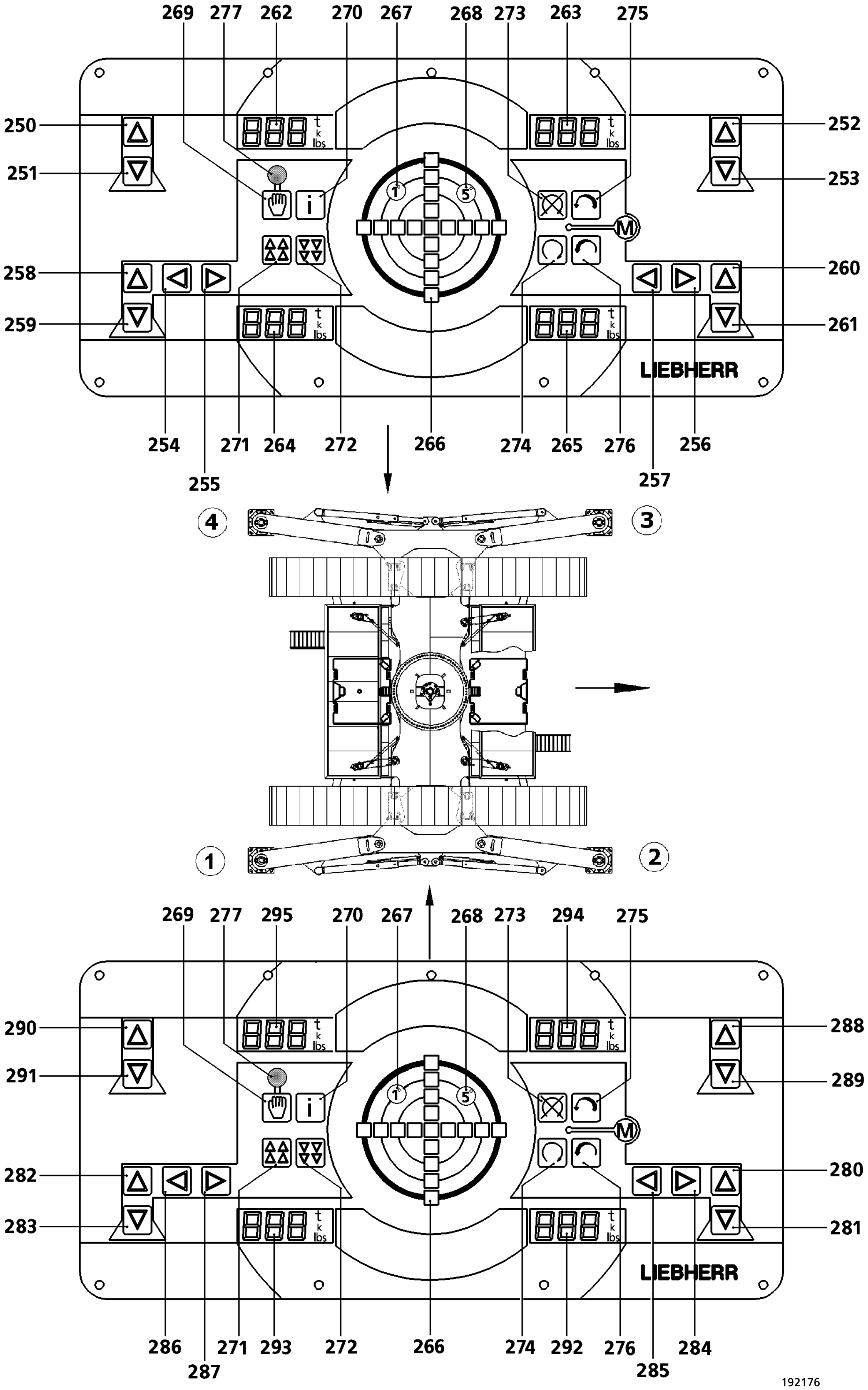
Actuate the radio remote control and pin and secure the support on the crawler carrier or on the center section with pins on top and bottom .

Note: For control of radio remote control, see chapter 5.08, Radio remote control.

D A N G E R: **Before pinning, it must be ensured that the pin bore is clear. Thepin must be secured immediately after pinning.**

Before unpinning, the retainer on the pin which is to be unpinned must be removed. All other pins must remain secured.

If this is not observed, there is a danger of accidents!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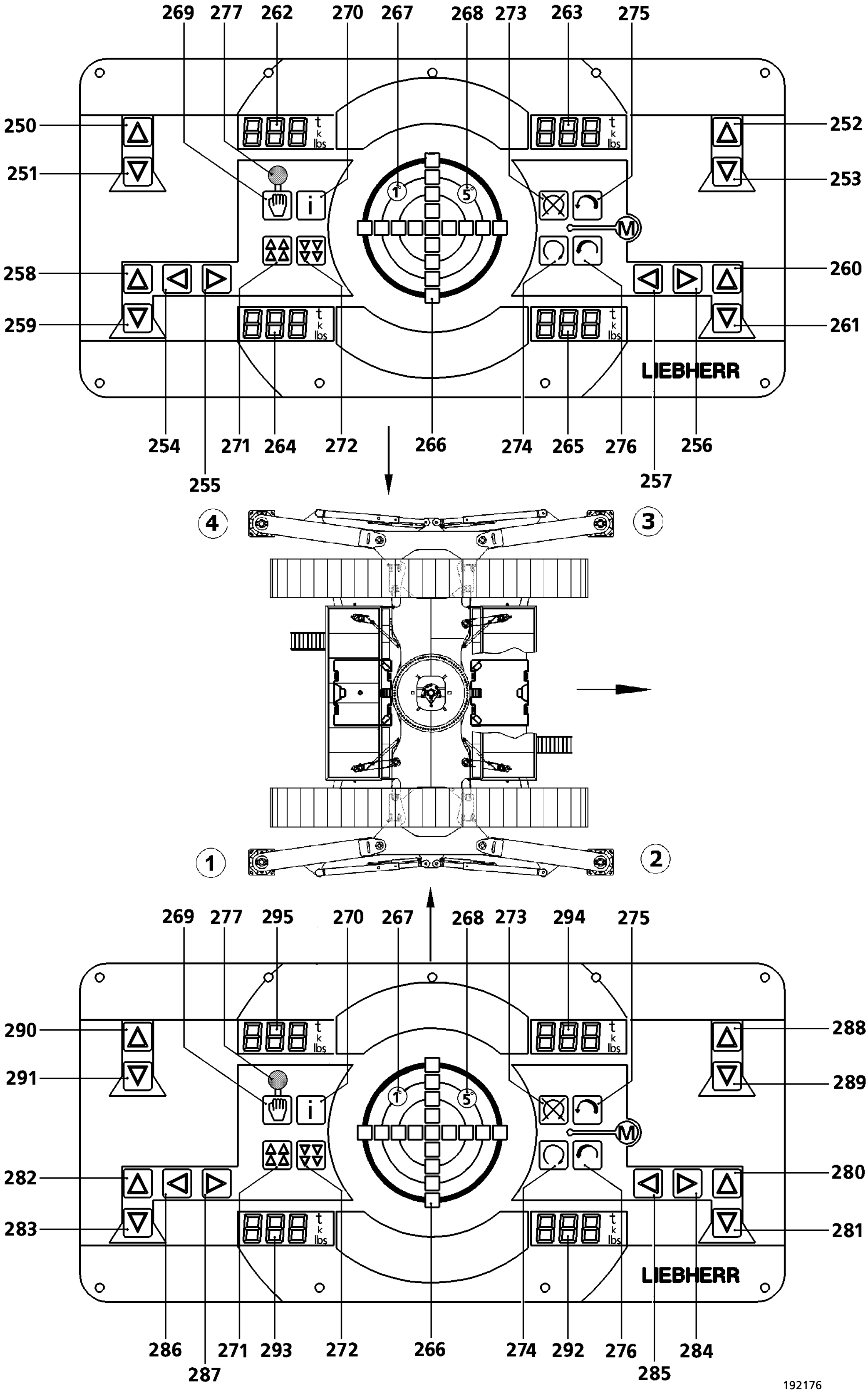
LIEBHERR
286 271 293 272 266 274 292 276 284
287
285
192176

4. Control elements, support control unit left / right

	Support control unit left	Support control unit right	
250	Support cylinder - right front in	Support cylinder - right front in	280
251	Support cylinder - right front out	Support cylinder - right front out	281
252	Support cylinder - right rear in	Support cylinder - right rear in	282
253	Support cylinder - right rear out	Support cylinder - right rear out	283
254	Support arm - left front out	Support arm - right front out	284
255	Support arm - left front in	Support arm - right front in	285
256	Support arm - left rear out	Support arm - right rear out	286
257	Support arm - left rear in	Support arm - right rear in	287
258	Support cylinder - left front in	Support cylinder - left front in	288
259	Support cylinder - left front out	Support cylinder - left front out	289
260	Support cylinder - left rear in	Support cylinder - left rear in	290
261	Support cylinder - left rear out	Support cylinder - left rear out	291
262	Support force indicator - right front	Support force indicator - right front	292
263	Support force indicator - right rear	Support force indicator - right rear	293
264	Support force indicator - left front	Support force indicator - left front	294
265	Support force indicator - left rear	Support force indicator - left rear	295
266	Incline indicator	Incline indicator	266
267	LED 1°	LED 1°	267
268	LED 5°	LED 5°	268
269	Release support control unit	Release support control unit	269
270	not used	not used	270
271	Retract all support cylinders and align horizontally	Retract all support cylinders and align horizontally	271
272	Extend all support cylinders and align horizontally	Extend all support cylinders and align horizontally	272
273	Engine OFF	Engine OFF	273
274	Engine ON	Engine ON	274
275	RPM lower	RPM lower	275
276	RPM higher	RPM higher	276
277	LED Release support control unit	LED Release support control unit	277



269 277 262 270 267 268 273 263 275
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254 271 264 272 266 274 265 276 256
255
257
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269 277 295 270 267 268 273 294 275
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288
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280
281
286 271 293 272 266 274 292 276 284
287
285
LIEBHERR
192176

5 Support the crane via the support control unit

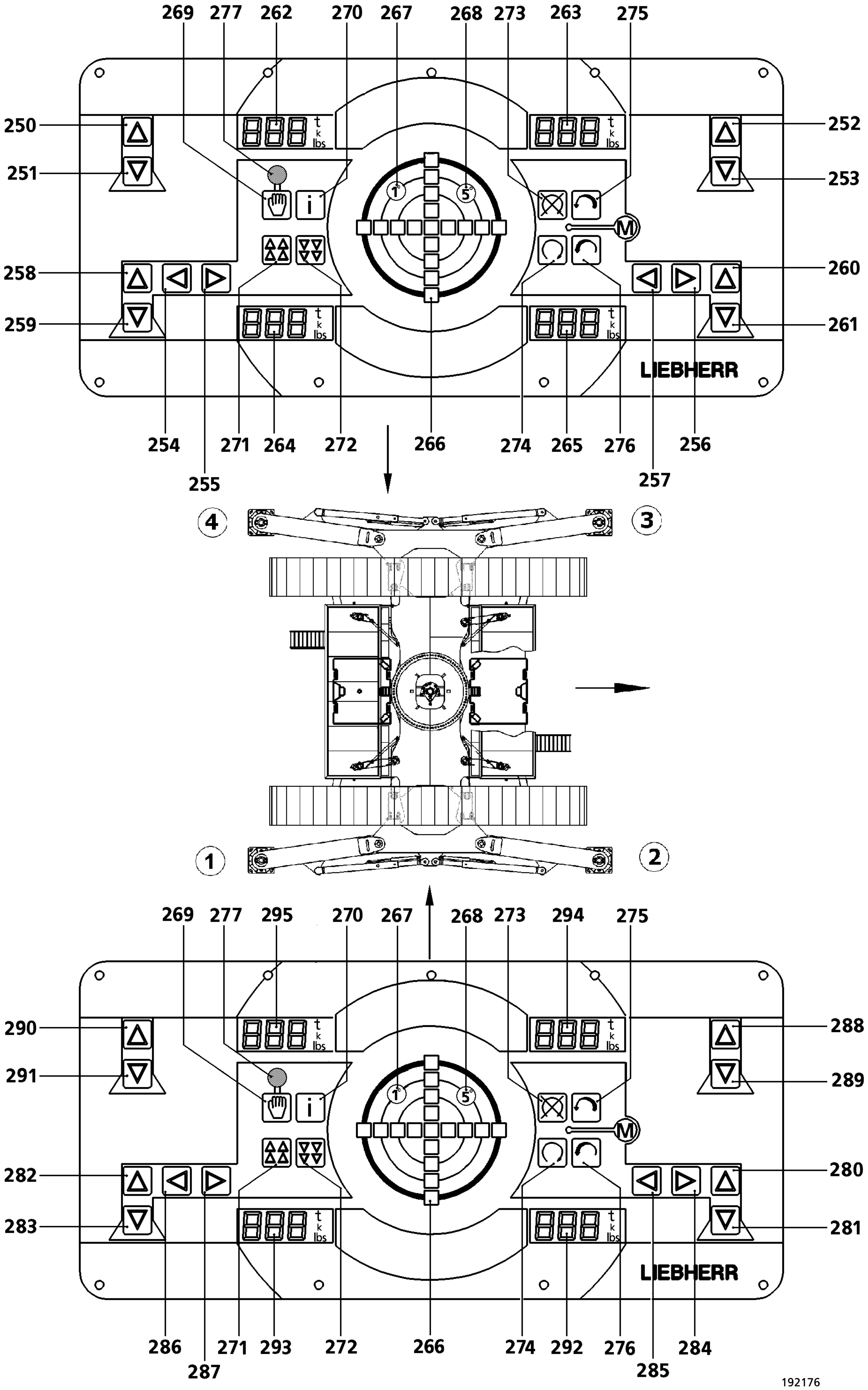
The crane can be supported via the support control units on the support as well as from the crane cab.
A support control unit to control the support system is installed on both sides.

- Turn the ignition on.

The engine can be started with button (274) or turned off with button (273) .
The engine RPM can be changed during the support procedure with buttons (276) and (275) .

Note: Before the support cylinder or the support arms can be moved, the **release support control unit** (269) must be actuated.
The button and the green LED (277) "Release support control unit" lights up if the support control unit is actauted.
The release turns off if no other button is actuated within 120 seconds or if the button (269) is pressed again.
If the support control unit is deactivated, the button bleft and the green LED (277) turns off.

**D A N G E R : The crane operator is obligated the set the correct load chart in the LICCON overload safety system which corresponds to the current support width .
The support cylinders must be supported properly from below.**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287
285
192176

5.1 Extend the support arms with the support control unit

Note: The support arms on the left side of the crawler can only be actuated from the suupport control unit installed on that side.
The support arms installed on the right side of the crawler can only be actuated from the suupport control unit installed on that side.

- Unpin the retaining pins (B) on the four swing cylinders.
- Open the switch box for the left or right support control unit.

D A N G E R : The operator must monitor the extension / retraction of the support arms . When extending or retracting the support arms, it must be ensured that there are no persons or objects within the danger zone.

- Extend the support arms to the support base given in the load chart.
  Support control unit left: button (254 and 256).
  Support control unit right: button (284 and 286)
- Pin and secure all 4 swing cylinders.

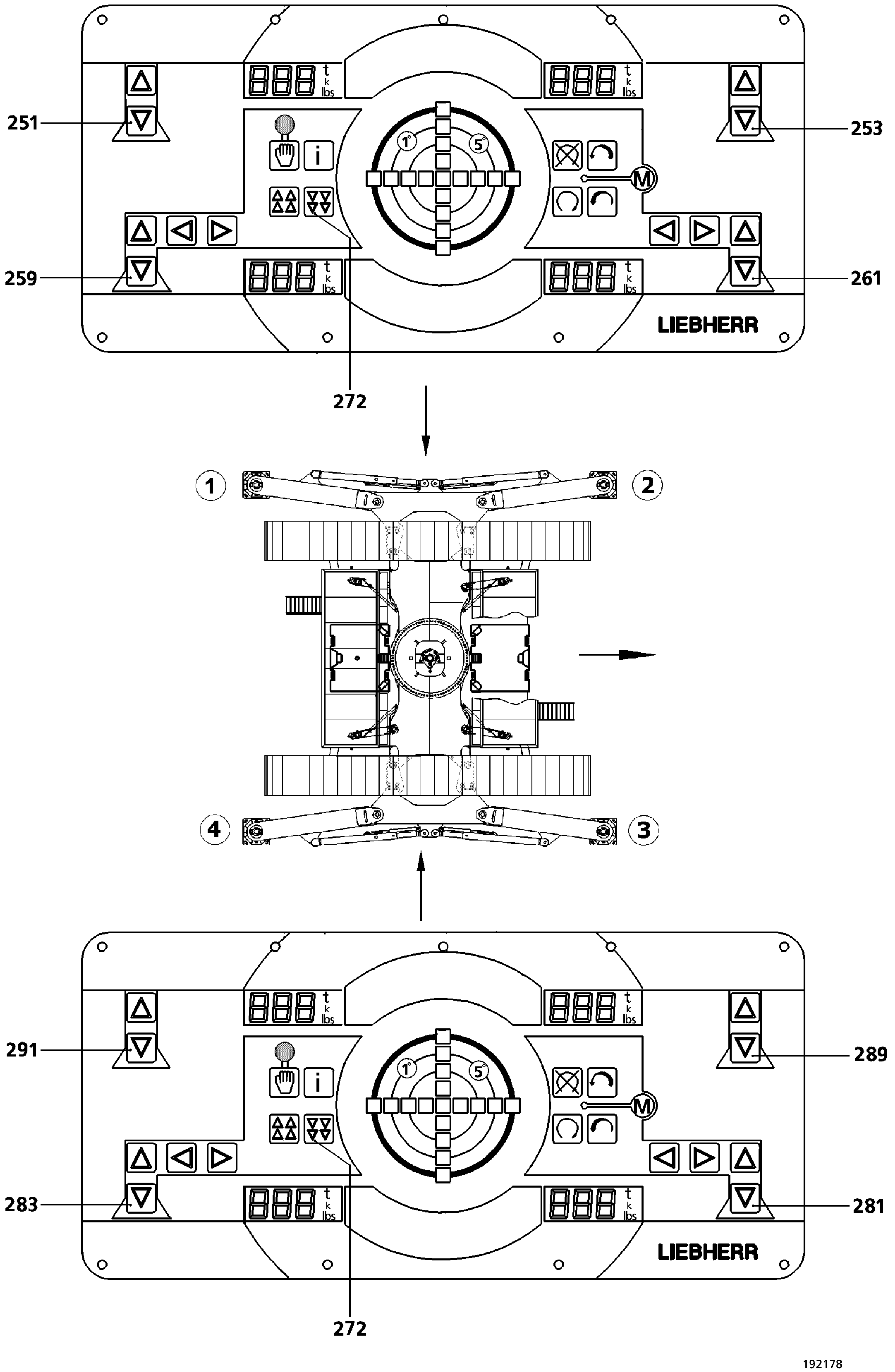
D A N G E R : The support arms must be pinned to prevent the support surfaces from shifting, otherwise there is a danger of accidents!
All retaining pins must be pinned and secured.
The crane may not be supported in intermediate positions!

5.2 Extend the support cylinder with the support control unit

All support cylinders can be actauted from both support units on the left and right hand side of the crawler.

C A U T I O N : For crane supports with installed crawler carrier, the crane must be raised until the crawler has no more contact with the ground. Otherwise there is a danger of tipping over due reduced stability momentum. For safety reasons, the support cylinders may not be extended all the way (to the stop) in crane operation.
If the support cylinders are fully extended, then all support cylinders must be retracted by at least 10 mm .

D A N G E R : When extending or retracting the support cylinder, it must be ensured that there are no persons or objects within the danger zone


251
253
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261
272
LIEBHERR
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3
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291
289
283
281
272
LIEBHERR
192178

5.2.1 Manual supporting

- Evenly extend the individual support cylinders by actuating the corresponding button and support the crane.
  Support control unit left: button (251, 253, 259, and 261).
  Support control unit right: button (281, 283, 289, and 291)

5.2.2.1 Align the crane horizontally

- Align the crane in horizintal direction by extending and retracting the individual support cylinders.
  The crane is aligned in horizontal direction when the innermost LEDlights up.

Note: The maximum permissible deviation from thehorizontal crane position is ± 0.5% (± 0.3°).

D A N G E R : If the crane is not horizontally aligned, there is a danger of accidents.

5.2.3 Automatic supporting and horizontal alignment

- By pressing the button (272), all support cylinders are extended and the crane is horizintally aligned.

D A N G E R : The crane is automatically aligned in horizontal direction via the automatic support. However, the operator must still check if the alignment is within the permissible tolerance and if all four support plates are in contact with the ground. If this is not the case, there is a danger of accidents.

5.2.4 Check the supports

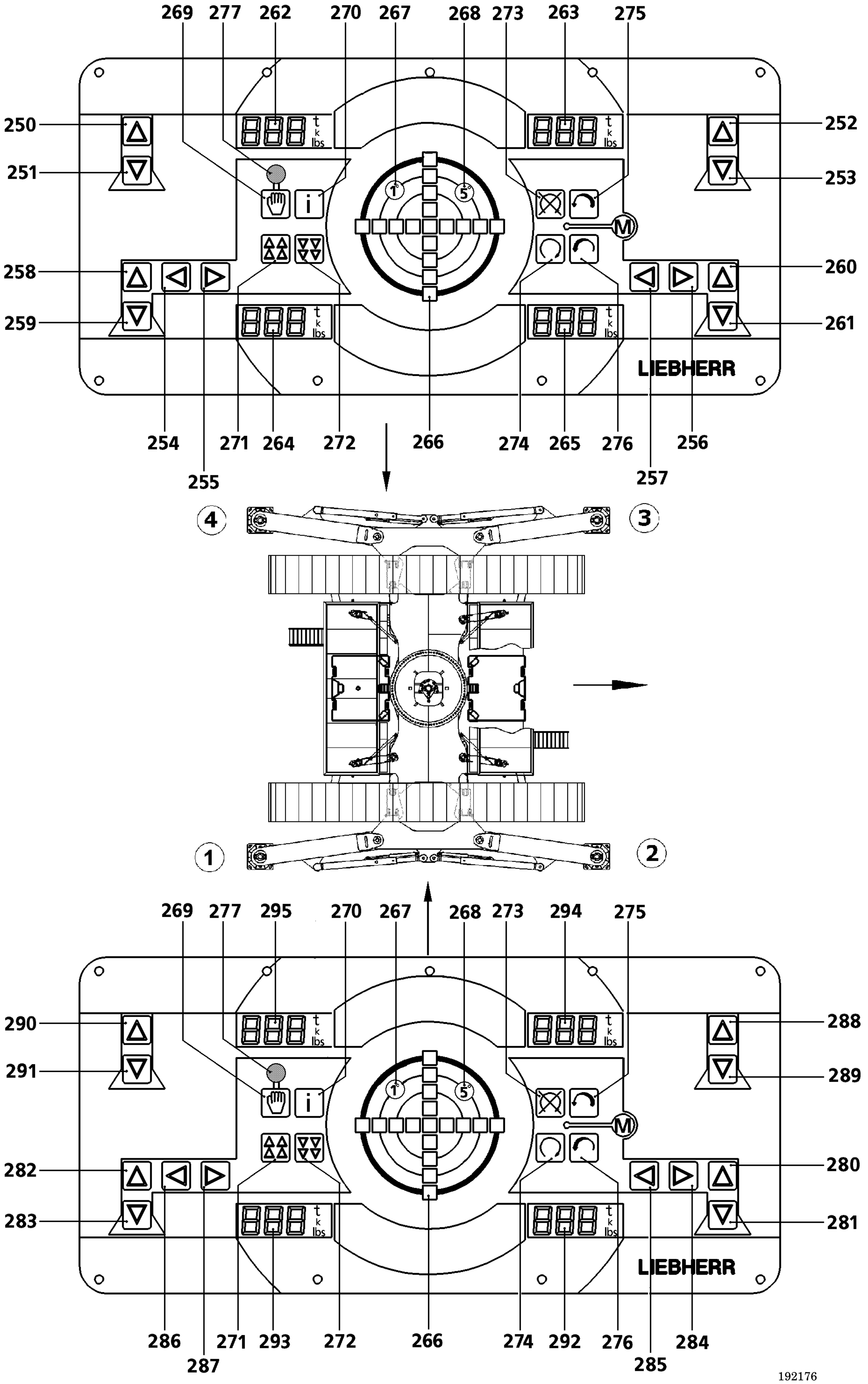
D A N G E R : It must be checked again, if the support base and the following safety regulations have been adhered to.

All 4 support arms of the support system must be extended, even those on the opposite side of the load. If only the support arms on the side of the load are extended, then this could have serious consequences.

1. **Due to the load hanging on the hook, the hoist cable and the boom (when in use, also the auxiliary boom and the guy ropes) are tensioned and distorted.**
   If in this situation the load should fall from the tackle cables or the tackle or hoist cable breaks, then a sudden relief will occur. The boom will snap backward which can cause the crane to topple over.

2. **Despite previous assumption, it might become necessary to swing the load to the opposite side. This can cause the crane to topple over.**

3. **When turning from crawler lengthwise direction, the crane can topple over due to the boom or counterweight momentum.**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LIEBHERR
254 271 264 272 266 274 265 276 256 257 255
4 3 1 2
269 277 295 270 267 268 273 294 275
290 291 282 283 288 289 280 281
LIEBHERR
286 271 293 272 266 274 292 276 284 285 287
192176

5.3 Retract the support cylinder

- Open the switch box for the left or right side of the vehicle.
- Start the engine.
- Retract the support cylinders individually by pressing the corresponding buttons until the wheels are in contact with the ground.
  Support control unit left: button (250, 252, 258, and 260).
  Support control unit right: button (280, 282, 288, and 290)
  or
  retract all support cylinders by pressing button (271) .

- Fully retract all four support cylinders.

D A N G E R : **The operator must monitor the extension / retraction of the support cylinders .**
When extending or retracting the support arms, it must be ensured that there are no persons or objects within the danger zone.

5.4 Retract the support arms

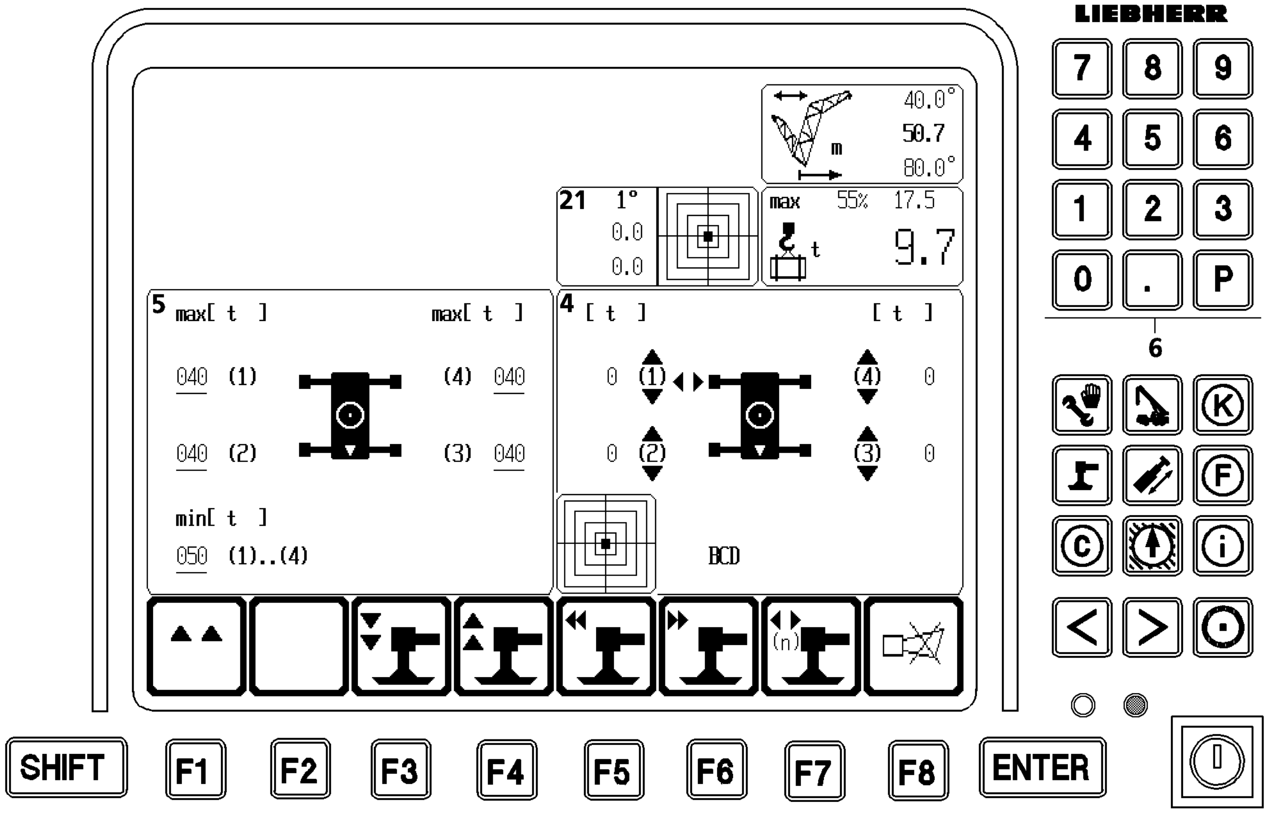
Note: The support arms on the left side of the crawler can only be actuated from the suupport control unit installed on that side.
The support arms installed on the right side of the crawler can only be actuated from the suupport control unit installed on that side.

- Unpin the retaining pins on the swing cylinder.

- Retract the support arms individually and pin and secure with the retaining pins in transport position.
  Support control unit left: button (255 and 257).
  Support control unit right: button (285 and 287)

D A N G E R : **Only those support arms may be actuated which can be seen from the operator.**
When extending and retracting the support arms, it must be ensured that there are no persons or objects within the danger zone.

- If necessary, reduce the engine RPMs to low idle speed.
- Turn the engine off.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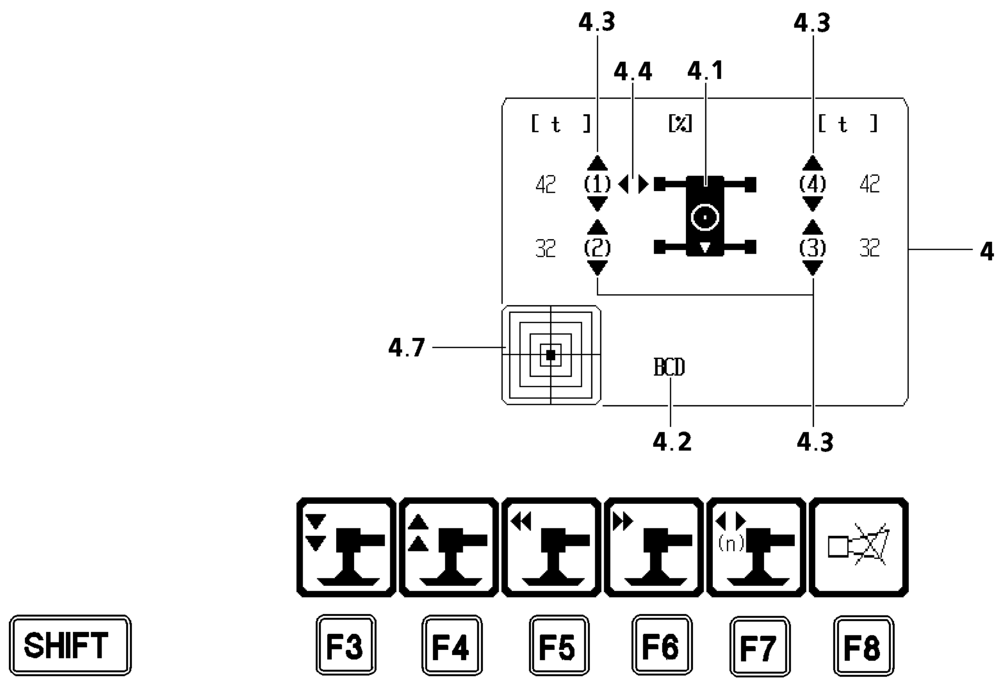
F4
F5
F6
F7
F8
ENTER


4.3
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32 (2) (3) 32
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F3
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F7
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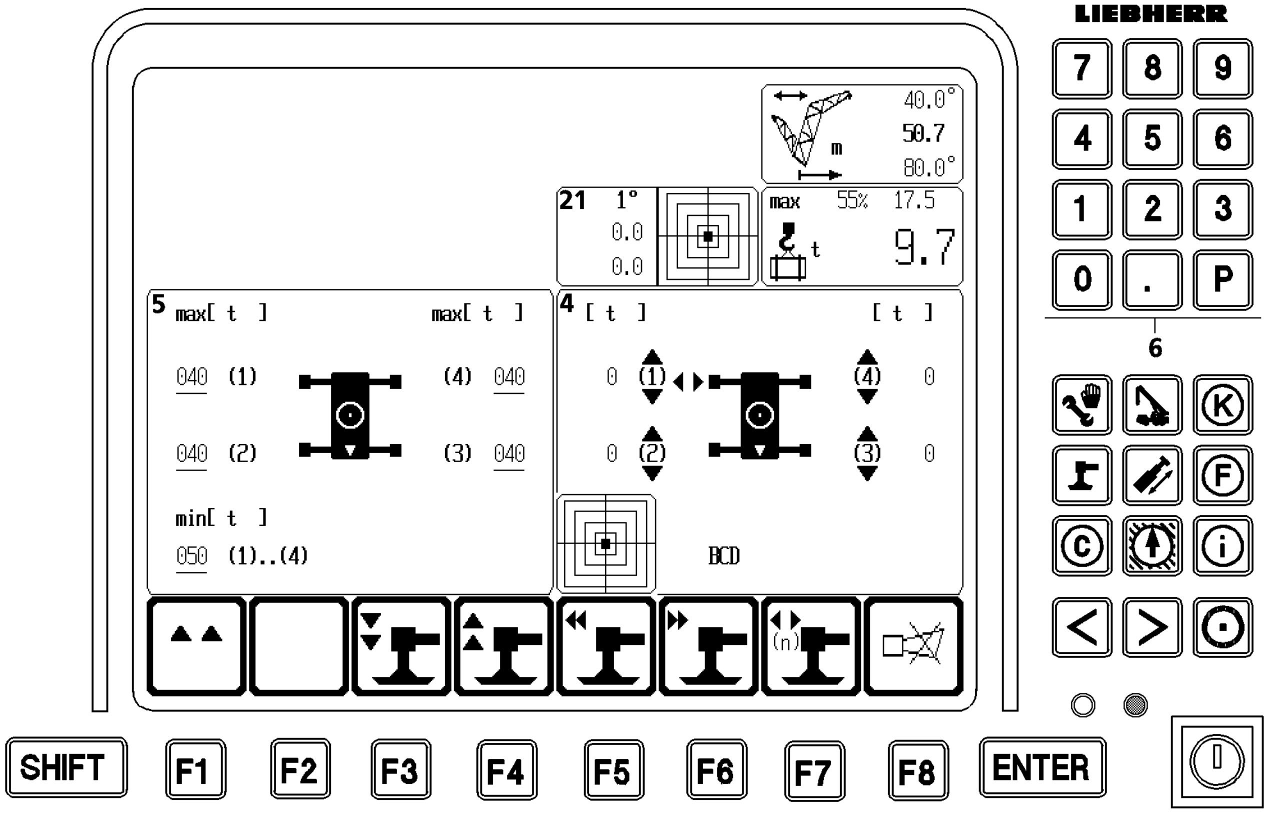
191204

6. Crane support from the crane cab

The support system can also be operated from the crane cab, via a process visualization on the LICCON monitor.

Note: See also **Chapter 4.02 "LICCON COMPUTER SYSTEM"**, paragraph "The support program"
The crane can also be operated and driven in the "Support" program. If support procedures have to be repeated within short intervals, then the operator does not need to switch back to the "Operation" program.

D A N G E R : The operator must monitor the extension / retraction of the support arms
When extending or retracting the support arms without visual contact with the corresponding support cylinder or support arm, a guide must be available.
When extending or retracting the support arms, it must be ensured that there are no persons or objects within the danger zone.
If the crane is not horizontally aligned, there is a DANGER OF ACCIDENTS!
All 4 support arms and support cylinders must be extended, even those on the opposite side of the load.
Observe all regulations and danger notes in paragraph 2 "Crane support with support control unit" !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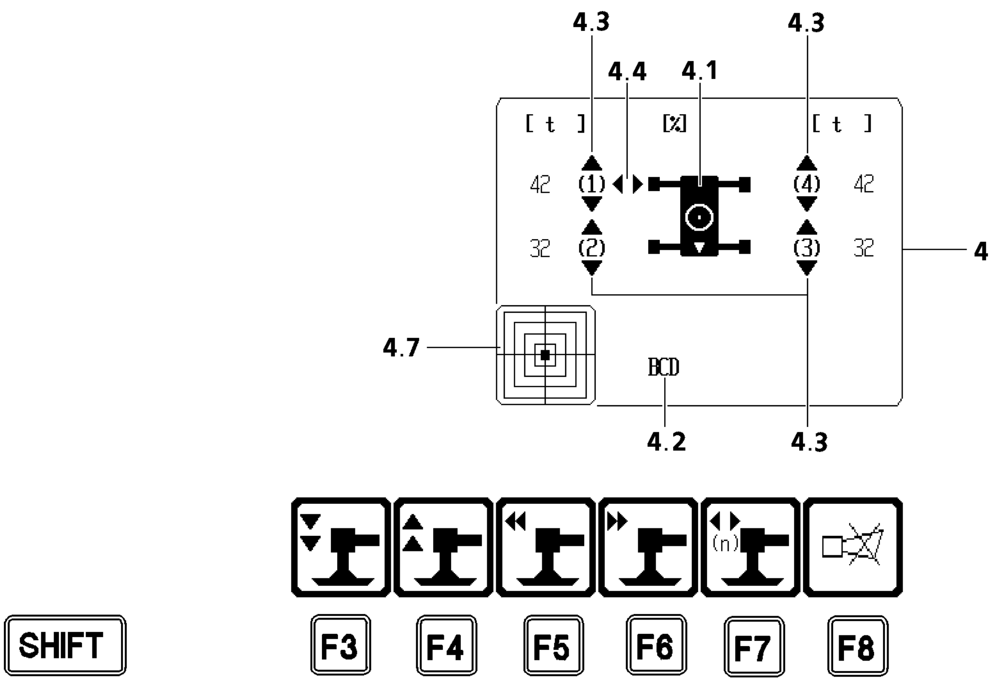
ENTER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32 (2)
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F5
F6
F7
F8

191204

6.1 Control elements for supporting from the crane cab

The following elements are important for supporting from the crane cab.

P_3 Start the "Support" program

P_1 End the "Support" program and switch back into the operating view

4 Monitoring and control field

4.1 Crane symbol

4.2 Dimension of maximum support in given unit [m/ft]

4.3 Function selectors to control the support cylinders

4.4 Function selectors to control the support arms

10 Symbol element
"Radius and main boom angle"

20 Symbol element
Current load, maximum load carrying capacity and dynamic utilization in %

21 Symbol "Crane incline "
In this symbol, the incline of the crane is shown. The indication is graphic as well as numeric.

21.1 Graphic section
The graphic view is in the form of a sight gauge, in which a moveable dot (small square) depicts the air bubble. The center of the point shows the excact incline value.

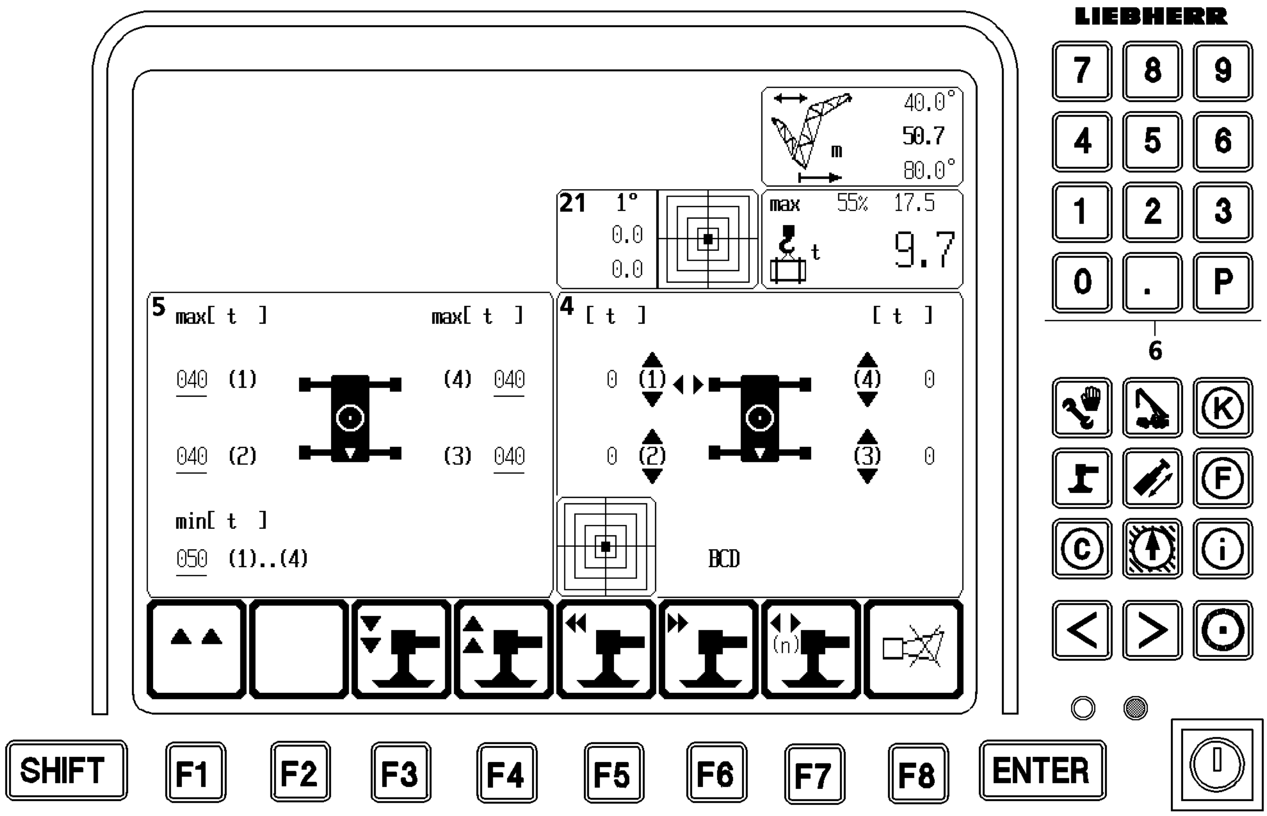
21.2 Numeric section

21.2.1 Incline range 1° or 5°
This value shows the resolution of the graphic view, the distance of 2 lines (lengthwise and crosswise) of the sight gauge. It is shown in the units of [°] = [degrees] and can take on the two values ”1°” or ”5°” .
If the crane incline is in crosswise **and** in lengthwise direction <1°, then the gauge is in the 1° - range. If at least one value exceeds the 1 ° limit, then it shifts into the 5° range.

Note: The range shift occurs automatically.

21.2.2 Incline of crane in [°] in crosswise direction
The double arrow shows the direction of the incline:
Double arrow left = the crane slopes to the left
Double arrow right = the crane slopes to the right

21.2.3 Incline of crane in [°] in lengthwise direction.
The arrow shows the direction of the incline:
Arrow up = The crane slopes to the front
Arrow down = The crane slopes to the rear


LIEBHERR
40.0°
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80.0°
21
1°
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max
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17.5
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min[t]
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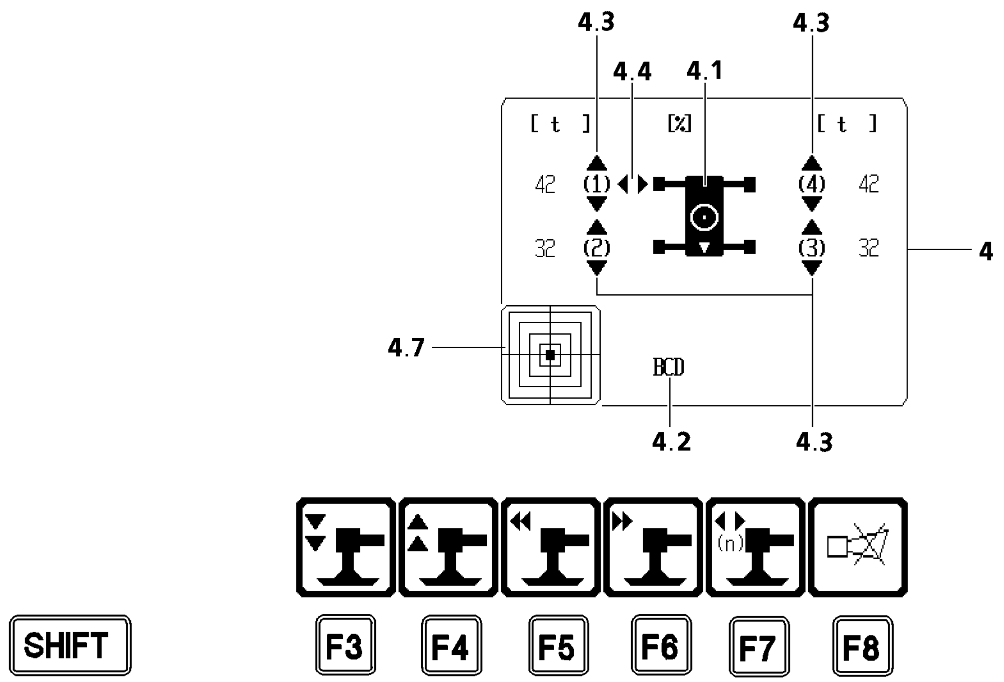
F7
F8
ENTER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32 (2)
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SHIFT
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F7
F8

191908

6.1 Control elements for supporting the crane from the crane cab, continuation

5 Function keyboard in the monitoring mode and control mode (program start)
The function keys should always be viewed with teh function key symbol bar shown above it on the monitor.
"F3" Extend the preselected support cylinder

"SHIFT" + "F3"
Press key combination "SHIFT" + "F3" to extend all support cylinders and to align the crane in horizontal direction.
"F4" Retract the preselected support cylinder

"SHIFT" + "F4"
Press the keycombination "SHIFT" + "F4" to retract all support cylinders and to align the crane in horizontal direction.

"F5" Extend the preselected support arm
"F6" Retract the preselected support arm
"F7" Select the support arm
"F8" Turn off horn / error diagnostics

Note: Functions "F3" and "F4" (extend / retract support cylinder) only make sense if at least one support cylinder has been preselected. If no support cylinder has been preselected, then the horn will sound.

C A U T I O N : For safety reasons, functions for "F3" to "F6" are active only as long as the corresponding button is pressed. For that time period, a rhythmic sound of the horn can be heard as an acoustical confirmation.

6 Keyboard
With keys 1 - 4, select or deselect the corresponding support.

6.2 Extend the support arms from the crane cab

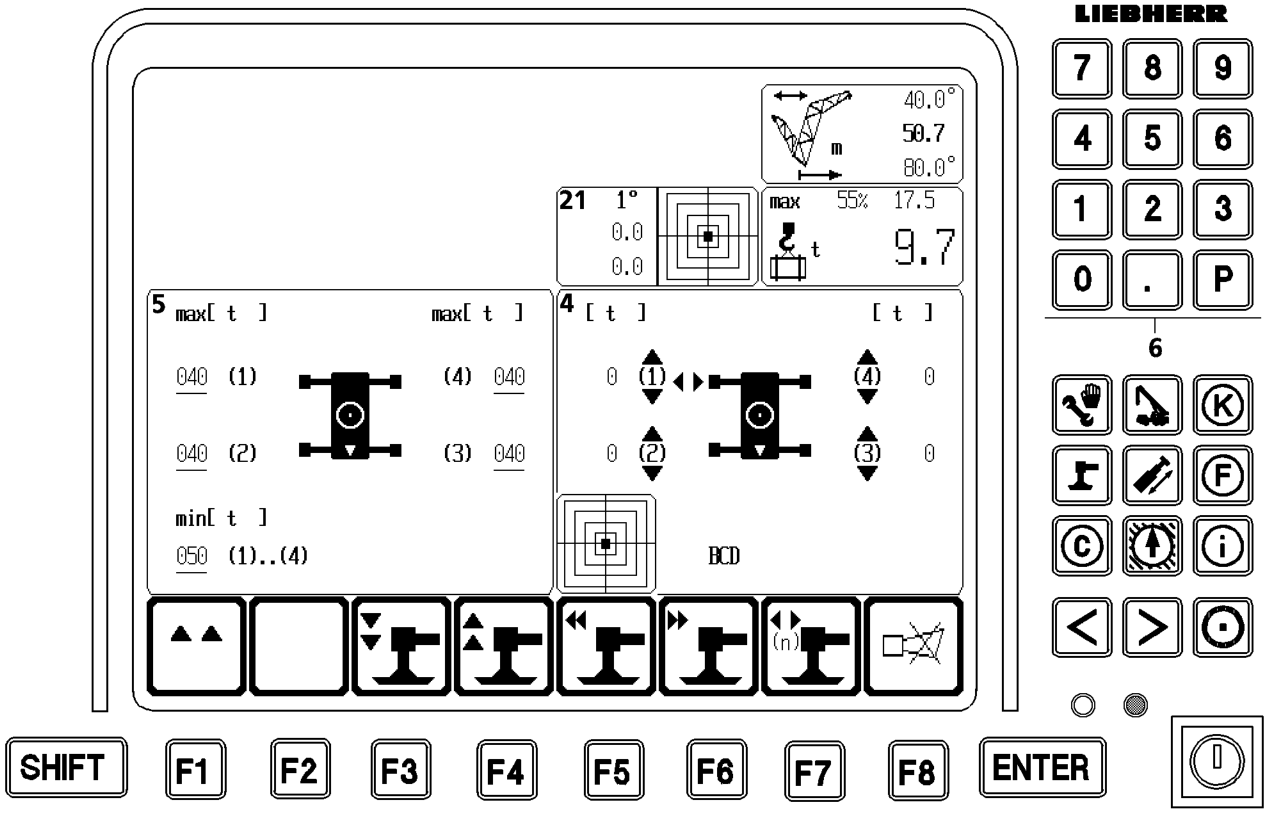
D A N G E R : All 4 support arms must be extended, even those on the opposite side of the load.

Note: Only one support arm can be extended at the same time.

- With selector **F7** , select the desired support arm , a double arrow appears on the selected support arm
- with function key **F5** , extend the selected support arm to thesupport base given on the corresponding load chart.

- Pin and secure all 4 swing cylinders.

D A N G E R : The support arms must be pinned to prevent the support surfaces from shifting, otherwise there is a danger of accidents!
All retaining pins must be pinned and secured.
The crane may not be supported in intermediate positions!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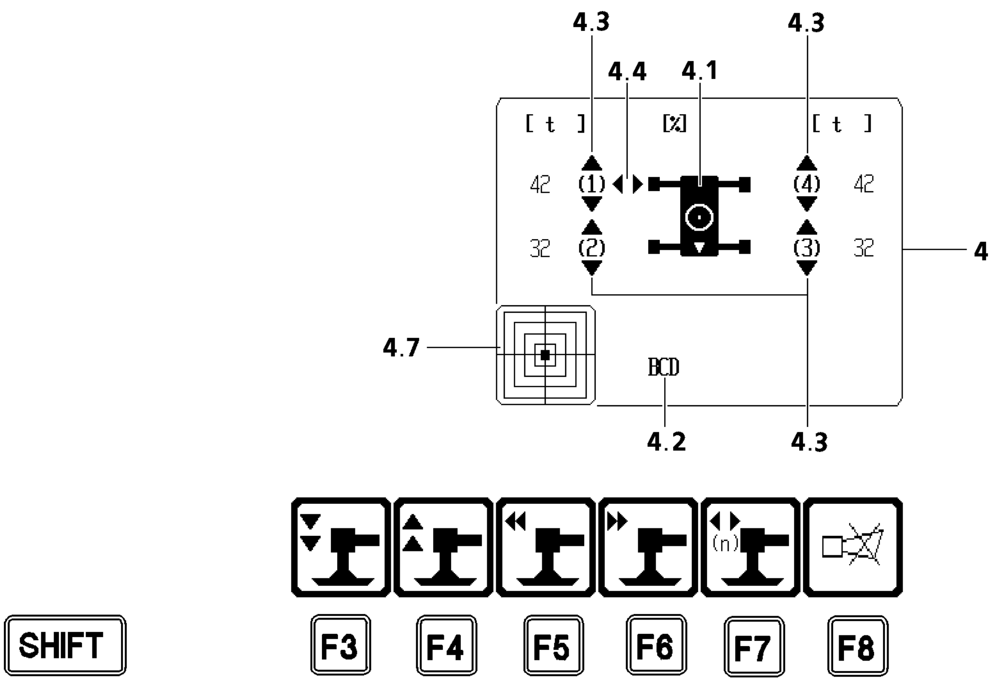
F6
F7
F8
ENTER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F5
F6
F7
F8

191908

6.3 Extend the support cylinder from the crane cab

D A N G E R : The crane must be raised until the crawler has no more contact with the ground. Otherwise there is a danger of tipping over due reduced stability momentum. For safety reasons, the support cylinders may not be extended all the way (to the stop) in crane operation.
If the support cylinders are fully extended, then all support cylinders must be retracted by at least 10 mm .

6.3.1 Manual supporting

- With the numeric keyboard (1 - 4) on the LICCON monitor, select or deselect the corresponding support or support combinations,
  the selector (s) appear or disappear on the selected support or support combination.

Note: Support cylinders can be moved at the same time.

- Extend the preselected support or support combination with function key **F3** .

6.3.1.1 Align the crane in horizontal direction

- Align the individual support cylinders inhorizontal direction by extending or retracting the individual support cylinders.

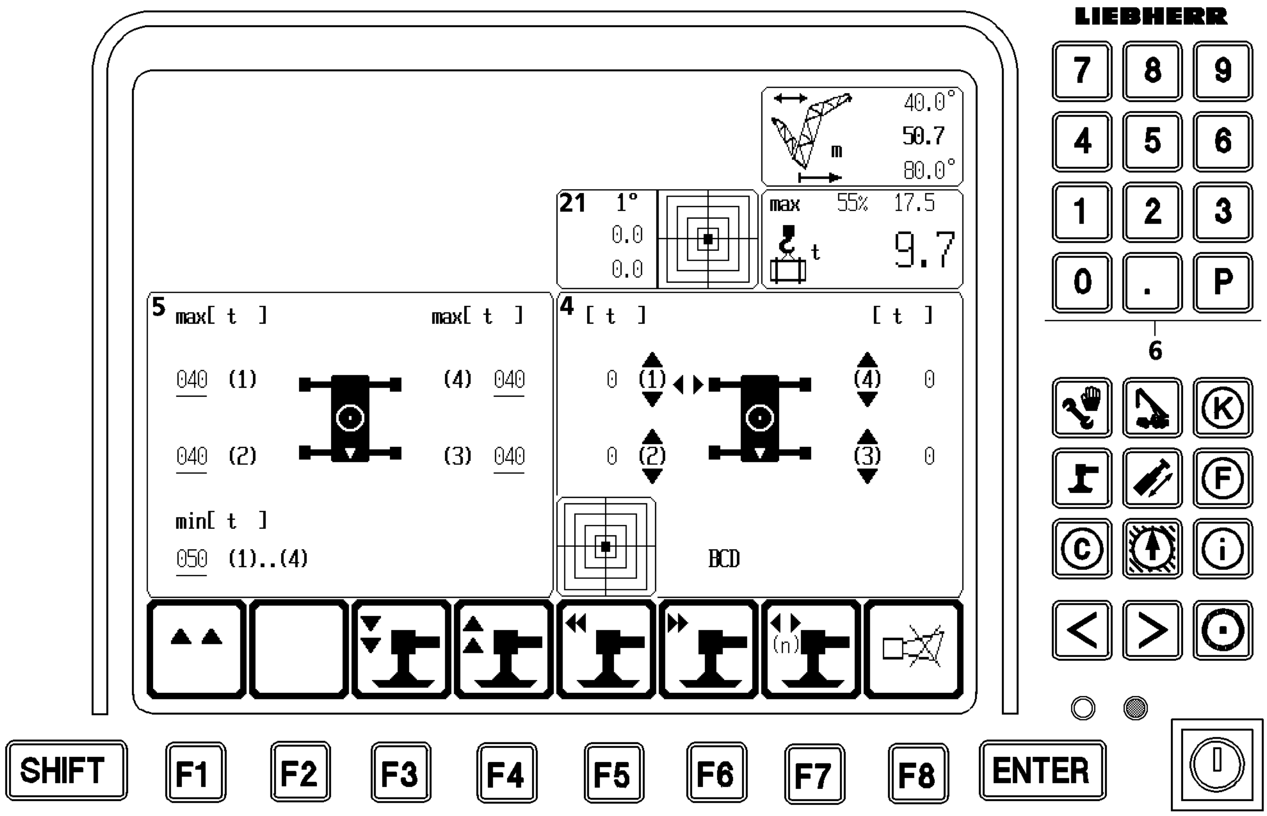
This point is reached when the dot (small square) is in the center of the graphic sight gauge.
The maximum permissible deviation from the horizontal crane position is ± 0.5% (± 0.3°).

D A N G E R : If the crane is not horizontally aligned, there is a DANGER OF ACCIDENTS!

6.3.2 Automatic supporting and horizontal alignment

"SHIFT" + "F3"
By pressing the key combination "SHIFT" + "F3" , all support cylinders are extended and the crane is horizintally aligned.

D A N G E R : The crane is automatically aligned in horizontal direction via the automatic support. However, the operator must still check if the alignment is within the permissible tolerance and if all four support plates are in contact with the ground. If this is not the case, there is a danger of accidents.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(4) 040
040 (2)
(3) 040
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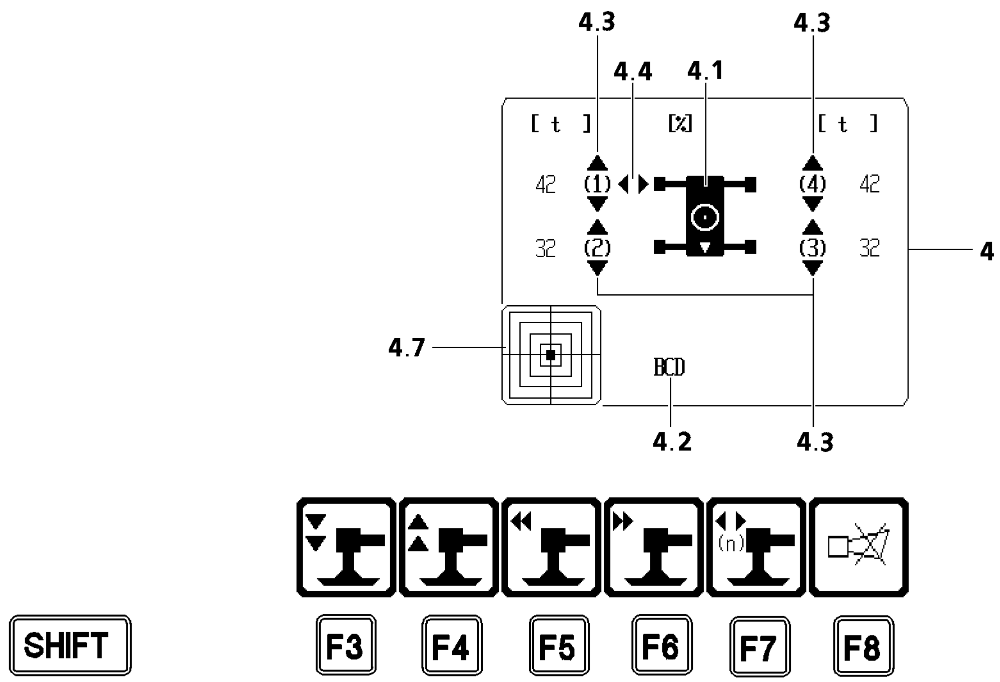
ENTER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32 (2)
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4
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191908

6.4 Retract the support cylinders from the crane cab

Note: Support cylinders can be moved at the same time.

- With the numeric keyboard (1 - 4) on the LICCON monitor, select or deselect the corresponding support or support combinations,
  the selector (s) appear or disappear on the selected support or support combination.
- Retract the preselected support or support combination with function key **F4** .
  or
- Press the key combination "SHIFT" + "F4" to retract all support cylinders.

- Retract all four support cylinders all the way.

6.5 Retract teh support arms from the crane cab

Note: Only one support arm can be retracted at the time.

- Unpin the retaining pins on the swing cylinder .
- With the support arm selector **F7** .select the desired support arm ,
  the selector (double arrow) appears on the selected sliding arm
- with function key **F6** , retract teh selected support arm .
- Retract the support arms individually and secure and lock with the retaining pin in transport position.

D A N G E R : **Only those support arms may be actuated which can be seen from the operator.**
When extending and retracting the support arms, it must be ensured that there are no persons or objects within the danger zone.

- If necessary, reduce the engine RPM to low idle speed.
- Turn the engine off.

1. Installation conditions

1 = with placed down SA bracket (with and without cable on winch IV)
2 = 90° SA bracket (with and without cable on winch IV)
3 = with placed down SA bracket, winch I and IV mit Seil
4 = 90° SA- bracket, winch I and IV with cable
5 = 90° SA- bracket, winch I and IV with cable, S- pivot section installed

Chart 1: **Max. permissible slewing platform ballast for the following installation conditions in operation on crawlers**

Installation condition		A 360°on crawler 9,1 m x 8,8 m Central ballast				B 360°on crawler 9,1 m x 8,8 m Supports installed incl. central ballast 20 t
		95 t	70 t	45 t	20 t	
1	Max. permissible slewing platform ballast	170	170	120	70	170
2		220	170	170	70	220
3		170	170	120	70	170
4		220	170	170	70	220
5		245	170	170	70	245
1	Max. permissible slewing platform ballast on slewing platform extension	---	---	---	---	---
2		---	---	---	---	---
3		---	---	---	---	---
4		---	---	---	---	---
5		---	---	---	---	---

Chart 2: **Max. permissible slewing platform ballast for the following installation conditions in operation on supports**

Installation condition		C 360° on supports 12,6 m x 12,6 m	D * 360° on supports 12,6 m x 12,6 m central ballast 110 t	E to the side on supports 16,0 m x 10,5 m	F 360° on supports 16,0 m x 10,5 m
1	Max. permissible slewing platform ballast	245	245	245	170
2		245	245	245	170
3		245	245	245	170
4		245	245	245	195
5		245	245	245	195
1	Max. permissible slewing platform ballast on slewing platform extension	125	250	225	75
2		125	250	250	75
3		125	250	250	75
4		150	250	250	100
5		150	250	250	100

* = **Special central ballast**

Chart 3: **Max. permissible slewing platform ballast for the following installation conditions in operation on supports with installed crawler**

Installation condition	D 360° on supports 13,0 m x 13,0 m crawler installed incl. central ballast 20 t	G 360° on supports 16,30 m x 12,0 m crawler installed incl. central ballast 20 t	H to the side on supports 16,0 m x 12,0 m crawler installed incl. central ballast 20 t
1 2 Max. 3 permissible 4 slewing 5 platform ballast	245 245 245 245 245	245 245 245 245 245	245 245 245 245 245
1 Max. 2 permissible 3 slewing 4 platform 5 ballast on slewing platform extension	250 250 250 250 250	250 250 250 250 250	200 200 200 225 225

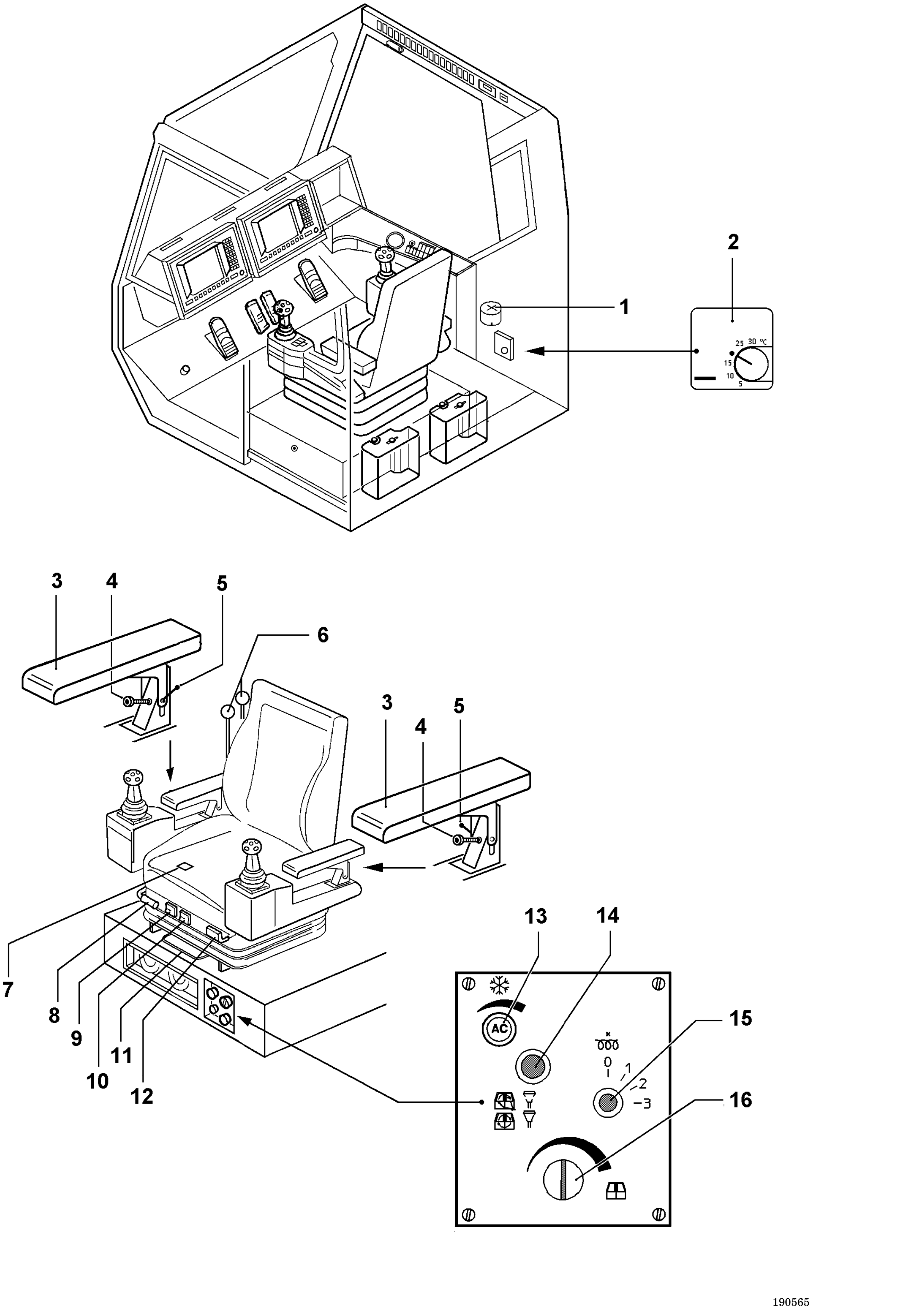
2. Erection / take down of main boom systems in operation on supports

C A U T I O N : The determining factors are the corresponding erection charts and taking into account charts (1 - 3)

Erection	**Erection**
Required slewing platform ballast according to erection chart <= max. permissible slewing platform ballast according to chart 1-3	Required slewing platform ballast according to erection chart > max. permissible slewing platform ballast according to chart 1-3
Procedure as for erection in operation on crawlers.	1. Before installation of the boom, only the max. permissible slewing platform ballast according to chart 1-3 may be placed. 2. Before pulling the main boom guying, the max. permissible slewing platform ballast according to chart 1-3 must be placed. 3. The main boom guying must be tensioned. The relieved supports may not lift off. Check figure data via max. permissible guy force / slewing ring overload 4. The required slewing platform ballast according to the erection charts must be placed. 5. The boom can be pulled up.
Take down	**Take down**
Required slewing platform ballast according to erection chart <= max. permissible slewing platform ballast according to chart 1-3	Required slewing platform ballast according to erection chart > max. permissible slewing platform ballast according to chart 1 - 3
Procedure as for take down in operation on crawlers .	1. Place down the boom; the main boom guying must remained tensioned 2. Remove the slewing platform ballast until only the max. permissible slewing platform ballast according to chart 1-3 is placed. 3. The main boom guying can be relieved. 4. The main boom can be removed.

Chapter 4

Operation of the Superstructure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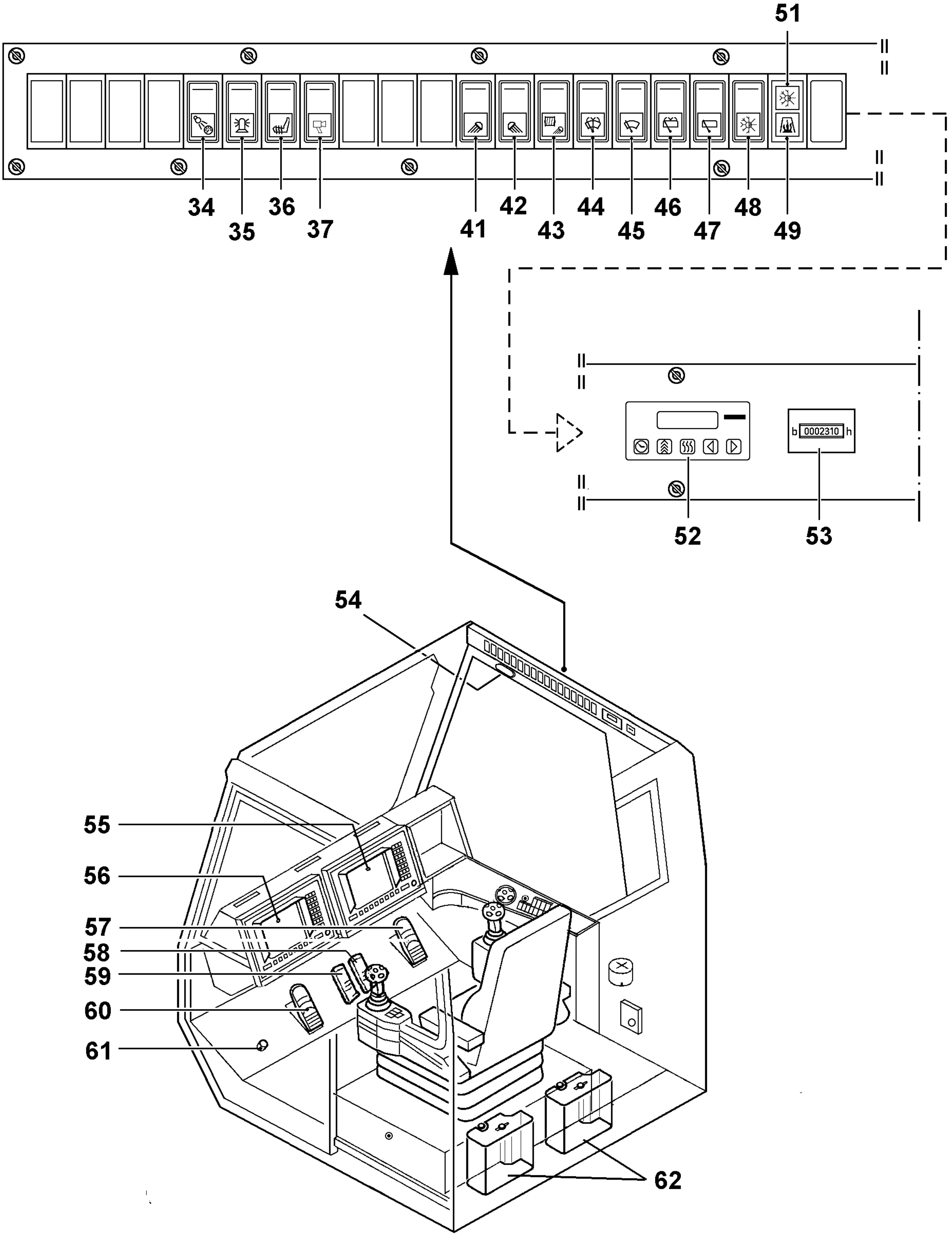
190565

Pos.:

1	Pressure gauge	-	Erection cylinder A- bracket
2	Thermostat	-	Auxiliary heater
3	Arm rest		
4	Set screw	-	Adjustment for arm rest incline
5	Lock lever	-	Adjustment for arm rest height
6	Manual control lever	-	Crawler travel gear, left
		-	Crawler travel gear, right
	Note:		The crawler travel gear can also be run via the manual control lever. - To do so, they must be inserted into the foot pedals (58, 59) .
7	Seat contact switch		
8	Manual lever	-	Seat surface incline adjustment
9	Button	-	Back support in lower area of backrest
10	Button	-	Back support in upper area of backrest
11	Manual lever	-	Lock for horizontal seat adjustment
12	Manual lever	-	Seat backrest incline adjustment
13*	Knob	-	Air conditioning system
14	Change over switch	-	Change between air circulation / fresh air, air quantity
15	Rotary switch	-	Fan, 3-stage
16	Knob	-	Temperature cab heater

17 - 29 not used

* Kundenwunsch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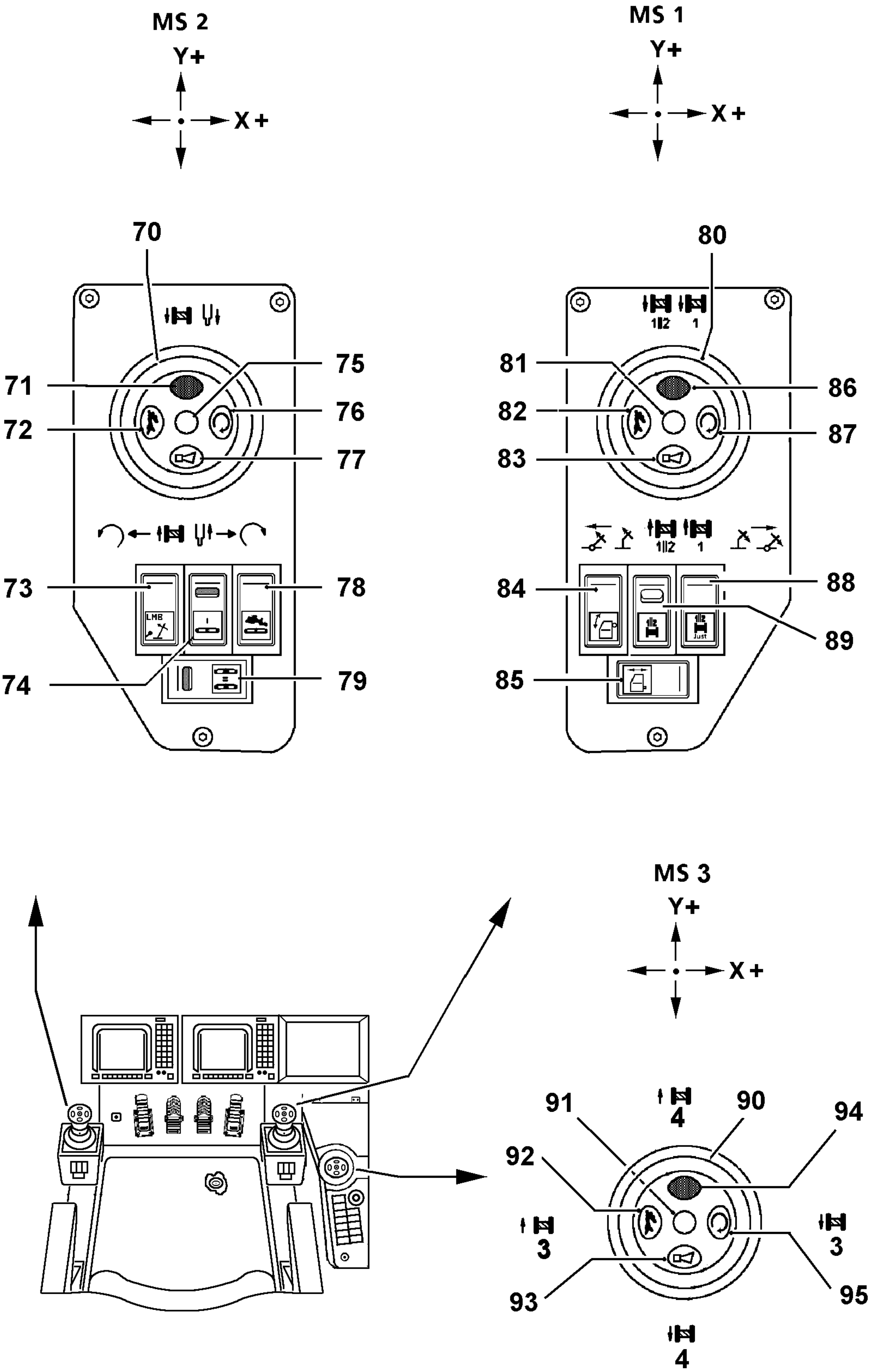
Pos.:

30-33	not used	
34	Switch	- Instrument illumination
35	Button	- Airplane warning light / beacon
36	Switch	- Seat heater
37	Switch	- Lightning cameras for winches 1, 2 and 4, 3, 5 and 6
38-40	not used	
41	Switch	- Working floodlight - cab base
42	Switch	- Working floodlight - cab roof, rear
43	Switch	- Working floodlight, winch illumination / mirror heater
44	Button	- Windshield wiper / washer, front window
45	Switch	- Windshield wiper, front window, 2 stage
46	Button	- Windshield wiper / washer, roof window
47	Switch	- Windshield wiper, roof window, 2 stage
48	Switch	- Air conditioner
49	Indicator light	- Auxiliary heater turned on
50	not used	
51	Indicator light	- Air conditioner turned on
52	Digital clock	- with the following indicators: Time of day and day of the week Problem in auxiliary heater Air temperature Preselection of auxiliary heater operation with 3 preselection times (each preselection time can be preprogrammed up to 7 days in advance.)
53	Hour meter	
54	Cab illumination	
55	LICCON Monitor 0	
56	LICCON Monitor 1	
57	Pedal	- Engine regulation / gas pedal
58	Foot pedal	- Crawler, right
59	Foot pedal	- Crawler, left
60	Pedal	- Foot brake, slewing gear
61	Foot button	- Coasting of slewing gear
62	Reservoir	- Windshield cleaning fluid


MS 2
Y+
X+
MS 1
Y+
X+
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72
73
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76
77
78
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80
81
82
83
84
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86
87
88
89
LMB
Just
MS 3
Y+
X+
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92
93
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95
4
3
3
4

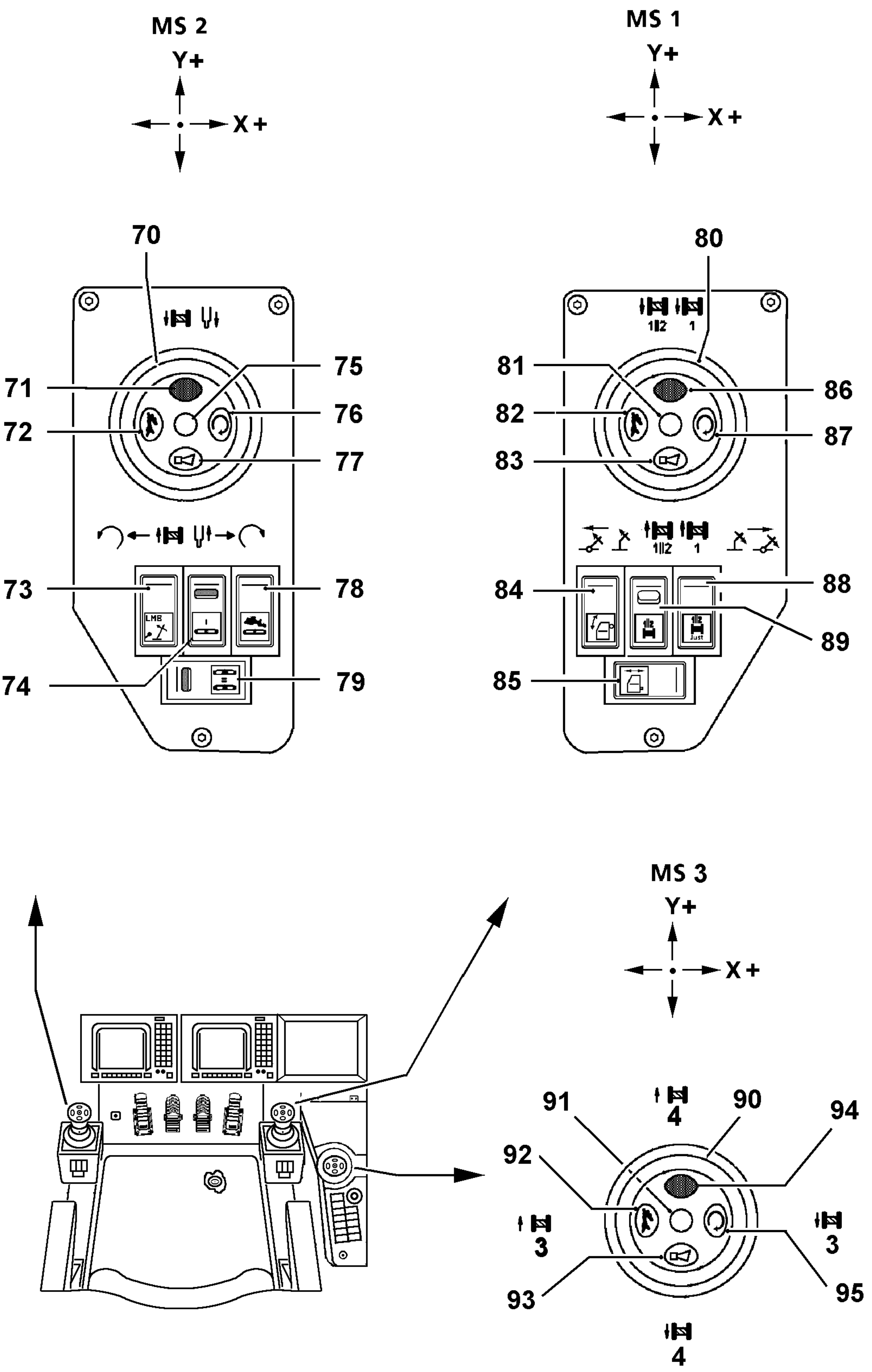
190563

Pos.:

70	Master switch (**MS 2**)	
	Note:	For assignment of master switch to operating modes, see chart, chapter 4.05
71	Button	- Bypass seat contact switch **or,** if the seat contact switch is actuated , turn vibration sensor (75) on / off
72	Button	- Turn "POWER PLUS" on / off
73	Button	- Bypass overload safety device to luff up at overload
	D A N G E R :	**The bypass may only be made if the overload was caused by luffing down with suspended load and the crane operator is absolutely sure that he can leave the overload range by luffing up.**

Turn on the crawler operation, via switch (74) .

74	Switch	Crawler "ON", unlock switch (74) and press switch on front. Crawler "OFF", press switch (74) into 0-position.
	Note:	After completion of the cawler operation, the crane must be shifted back to crane operation. Crawler "OFF", press switch (74) into 0-position
	D A N G E R:	**When working with the crane support, for safety reasons, the crawler gear must always be turned off , because the support system could be severely damaged in case the pedals for the crawler gear left / right are inadvertently pressed down!**
75	Vibration sensor	- Turn sensor for slewing gear or for winches 2, 5, 6 (depends to operating mode)
76	Button **Note:**	- Lock in the constant engine RPM By actuating it, the engine RPM is locked in the current position .
77	Button	- Horn
78	Switch	- Crawler rapid gear
79	Switch	- Crawler parallel travel, left and right crawler same speed


MS 2
Y+
X+
MS 1
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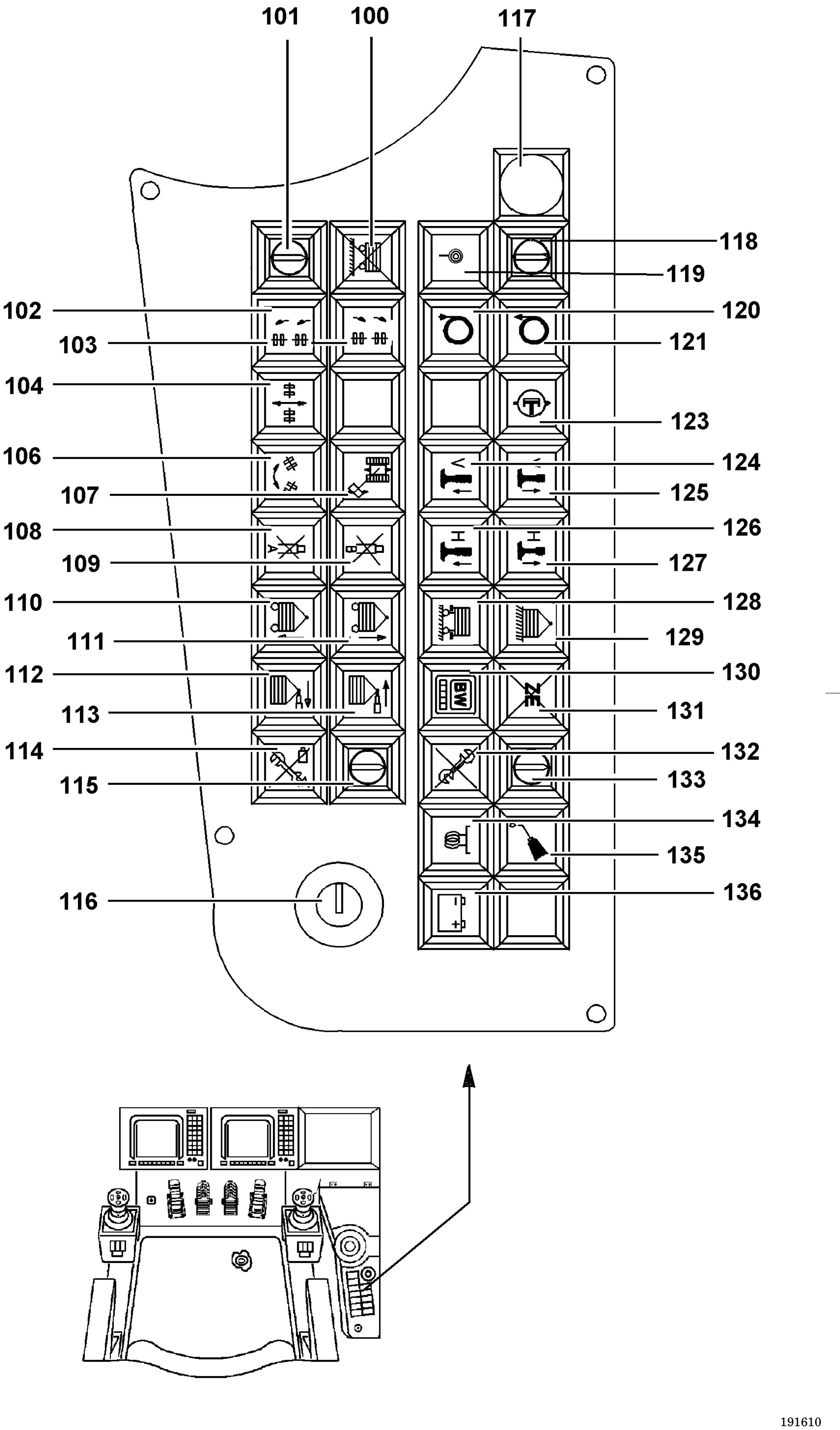
190563

Pos.:		
80	Master switch (**MS 1**)	
	Note:	Assignment of master switch to operating modes, see chart, chapter 4.05
81	Vibration sensor	- Winch rotation sensor or for winches 1, 2, 3, 4, 5 (depends on operating mode)
82	Button	- Turn "POWER PLUS" on / off
83	Button	- Horn
84	Button	- Tilt cab Position II (front) Tilt cab up Position 0 (center) OFF Position 1 (rear) Tilt cab down
85	Button	- Swing cab Position I (left) Swing cab out Position 0 (center) OFF Position II (right) Swing cab in
86	Button	- Bypass seat contact switch **or,** if seat contact switch is actuated, Turn vibration sensor (81) on / off
87	Button	- Lock in the constant engine RPM
	Note:	By actuating it, the engine RPM is locked in the current position.
88	Button	- Adjust the parallel control of winch 1 II 2
	Note:	Adjustment can only be made when the hook blocks are parallel.
89	Switch	- Parallel operation of winch 1 II 2
90	Master switch (**MS 3**)	
	Note:	Assignment of master switch to operating modes, see chart, chapter 4.05
91	Vibrationsensor	- Winch rotation sensor or for winches 3, 4, 5 (depends on operating mode)
92	Button	- Turn "POWER PLUS" on / off
93	Button	- Horn
94	Button	- Bypass seat contact switch **or,** if seat contact switch is actuated, Turn vibration sensor (91) on / off
95	Button	- Lock in the constant engine RPM
	Note:	By actuating it, the engine RPM is locked in the current position.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136
BW
191610

Pos.:

100 Button with warning light

- If "ballast trailer raised" is turned on with the keyed button (101), then this is shown by the blinking warning light (100).
  Press the button (100) to turn off "ballast trailer raised". The warning light in the button (100) turns off.
  The LICCON monitor shows the derrick ballast symbol on the ground.

101 Keyed button **"Ballast trailer lifted off "**

By actuating the keyed button momentarily, the operating mode **"Ballast trailer lifted off "** is turned on (self retaining).

D A N G E R: "Ballast trailer lifted off" must be turned on if the ballast trailer lifts off during towing and the wheels are no longer in contact with the ground. Keep constant visual check .
- see also chapter 5.11 Ballast trailer .

The **"Ballast trailer lifted off"** is turned on when the blinking warning light (100) is on. In addition, the ballast trailer symbol is shown on monitor 1 in suspended condition.

102 Button - Operating mode **"manual steering adjustment"** on **-** Indicator light is on
Ballast trailer wheels turn to the left, to drive on tight job and construction sites

103 Button - Operating mode **"manual steering adjustment"** on **-** Indicator light is on
Ballast trailer wheels turn to the right to drive on tight job and construction sites

104 Button - Set ballast trailer wheels into driving position - the indicator light blinks, wheels in driving position - indicator light lights up

106 Button - Turn ballast trailer wheels in turn position - indicator light blinks;
wheels in turn position - indicator light lights up constantly.

107 Button - Turn ballast trailer wheels to parallel drive position (crab walk) - indicator light blinks; wheels in parallel drive position - indicator light lights up constantly

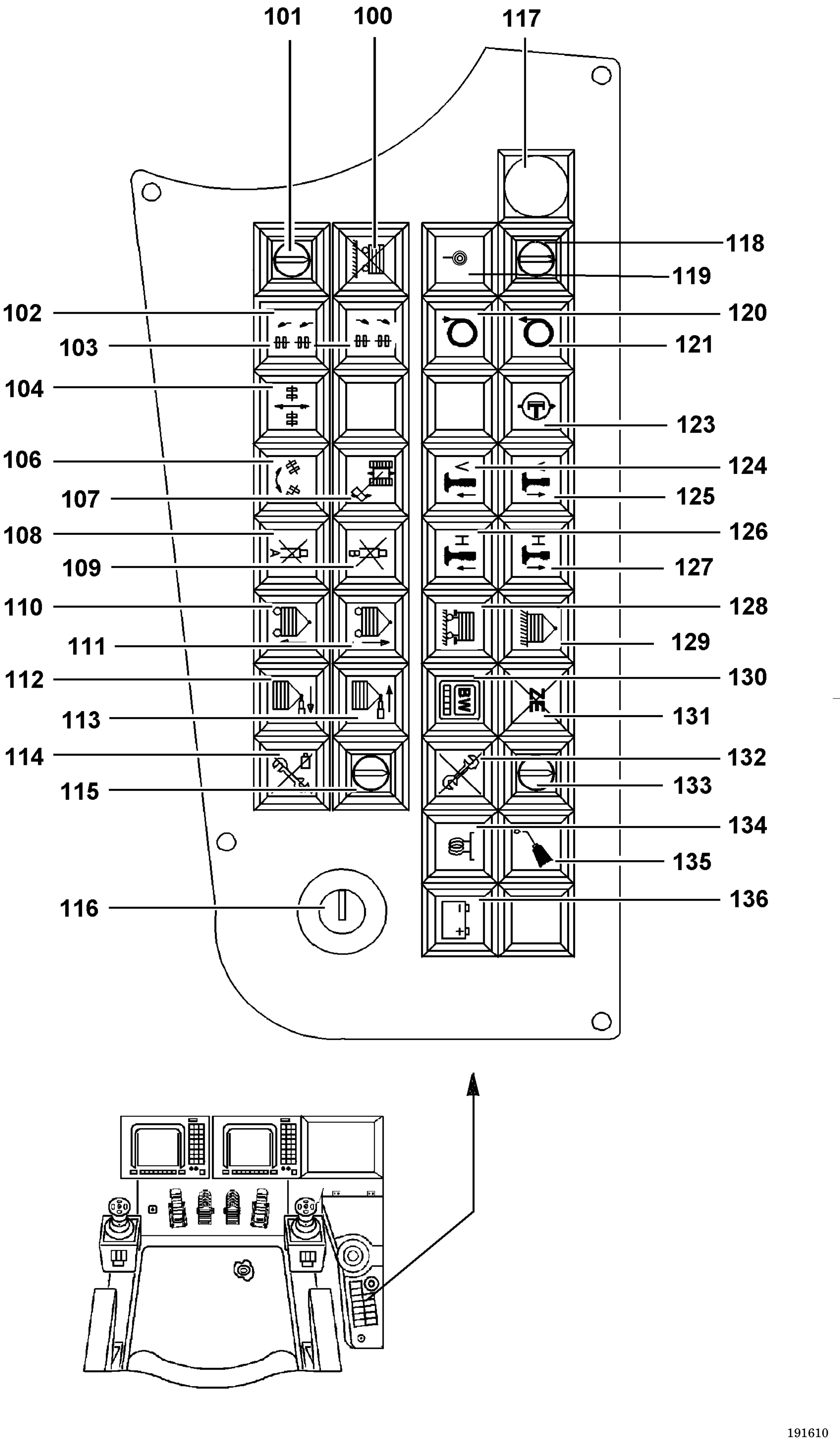
102-107 - see also chapter 5.11 Ballast trailer .

108 Button - Block cylinder (A) on derrick ballast
109 Button - Block cylinder (B) on derrick ballast
110 Button - Derrick ballast " DOWN "
111 Button - Derrick ballast " UP "
112 Button - Telescope derrick ballast in
113 Button - Telescope derrick ballast out
114 Button - Turn off self retention of keyed button (115)

115 Keyed button By pressing the keyed button for a short time, the crawler installation with hydraulic cylinder is preselected (self retention)
Prerequisite: Operating mode "Installation" on - indicator light on button lights up
The fact that the keyed button is turned on is shown by the indicator light in button (114), as well as a red beacon, which is installed on the crane operator´s cab.

D A N G E R: If operating mode " crawler installation "- keyed button (115) is turned on, no overload shut off will be made for the installation cylinder as well as for the crane. This is a dangerous situation, which can lead to accidents!

116 Ignition starter keyed switch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BW
191610

Pos.:

117	Button	- **EMERGENCY "OFF" button**
118	Keyed switch	- Position "0" (horizontal), Radio remote control Locking "ON" - Position "1" (vertical), Radio remote control Locking "ON"
118	Button	- Radio remote control
119	Indicator light	- Radio remote control ON
120	Button	- Spool up installation winch
121	Button	- Spool out installation winch
123	Button	- Pressure supplz change over to auxiliary users: - SA-Bracket erection cylinder - Installation support cylinder
	Note:	For all functions, which must be controlled with the hydraulic manual control lever, the pressure supply must be turned on .
124	Button	- Support cylinder Ballast trailer front down
125	Button	- Support cylinder Ballast trailer front up
126	Button	- Support cylinder Ballast trailer rear down
127	Button	- Support cylinder Ballast trailer rear up
128	Warning light	- Ballast trailer support retracted
129	Warning light	- Suspendedballast on the ground
130	Switch	- Change over from monitor "1" to test system ballasttrailer control
	Note:	Can only be changed over if "engine off" .
131	Warning light	- Central unit ballast trailer does not "boot up" resp. pressure sensor or length sensor are defekt or missing. - see also chapter 5.11 Ballast trailer.
132	Button	- Turn off self retention of keyed button (133)
133	**Installation keyed button**	By pressing the keyed button for a short time, the operating mode **Installation** is preselected (self retention). Observe safety instructions, see chapter 4.04 !
	D A N G E R:	**The LICCON overload safety device is no longer effective.** If the operating mode **Installation** is turned on, it is shown by the indicator light in button (132), the symbol on the monitor as well as by the red beacon which is installed on the crane operator´s cab.
134	Indicator light	- Preheat engine, flame start system
135	Indicator light	- Central lubrication system in lubrication mode or error code indication
136	Change indicator light	

Contents

Note: The monitor illustrations in this chapter are only excamples. The number values in the individual symbol elements and charts might not match the crane. In addition, some illustrations show the maximum assignment of the LICCON monitor with symbol elements. In normal crane operation, an identical view might not appear on the LICCON monitor .

1. General

The LICCON computer system is a computer system to control and monitor mobile cranes. In addition to overload safety (Loadmomentbegrenzung ⇒LMB / **L**oad **M**oment **L**imiter ⇒ LML) there are a number of other application programs used to control and monitor the crane movements. At this time, the LICCON computer system includes the following application programs:

Application programs

- The "Set up" program
- The "Operation" program
- The "Support" program (optional)
- The "Control Parameter" program
- The "Test system" program
- The "Engine monitoring" program
- The "Operation on monitor 1" program (optional)
- The "Test system ballast trailer " program (optional)

Overload safety device system (LML)

The overload safety is carried out on the micro processor unit 0 for basic component group 0. The LICCON Computer system operates according to the principle of comparison between the actual load and the maximum permissible load according to the load capacity chart and reeving.

Actual load

The actual load is determined by obtaining changing values:
The load of the crane is a combination of load momentum and boom momentum. It affects a force in the boom luffing cylinder, which is measuredby pressure sensors.

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

The radius is determined on hand of the angle sensor information (boom angle), the length sensor information (boom length), and the geometric data of the adjusted operating mode. The boom flexation due to its own weight and the weight of the load is taken into account.

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

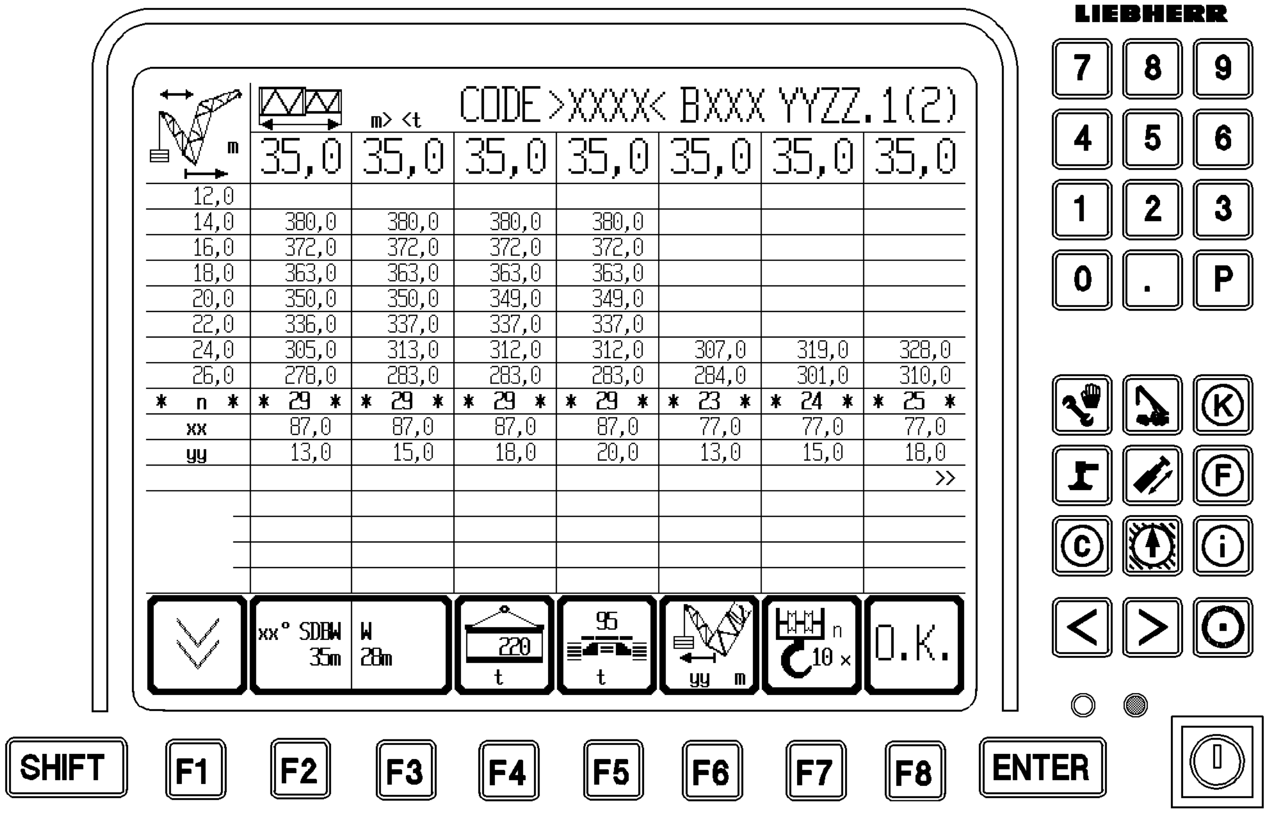
Maximum load according to load capacity chart and reeving

The crane data as well as load capacity charts, boom weights and geometric data are stored in the central data bank of the LICCON Computer system.
From the load capacity charts , the "maximum load according to the load capacity chart and reeving" is constantly being determined for the entered equipment configuration, the entered reeving and the calculated radius.

Comparison

The actual load and the "maximum load according to the load capacity chart and reeving" is compared. When the value gets close to the given limit, a prewarning is given. If this limit is reached or exceeded, the overload warning device (STOP) is triggered and the load moment increasing crane movements are turned off.

The integration of electric and electronic components in the chassis and the crane superstructure is handled via data bus transfer technology (Liebherr-System-Bus ⇒LSB).


LIEBHERR
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F4
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F6
F7
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ENTER
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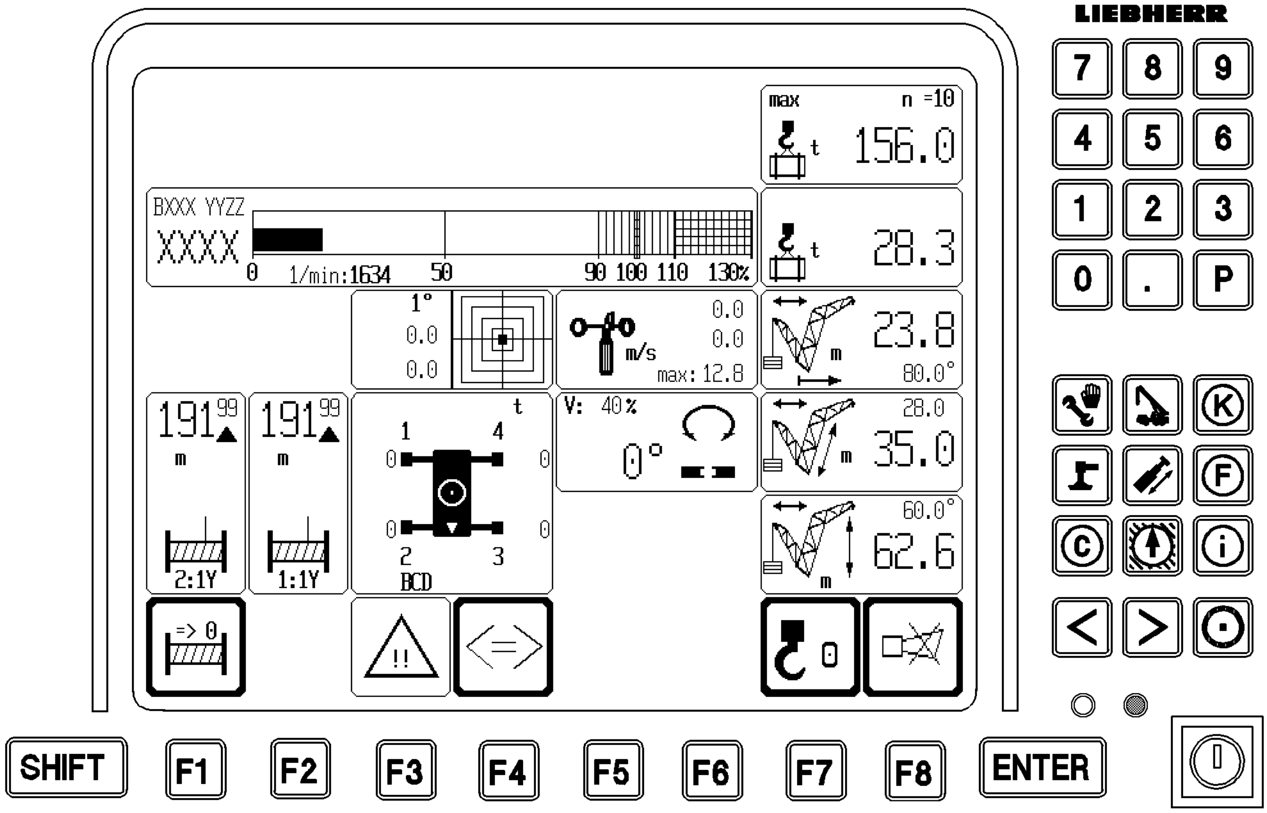
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XXXX
SHIFT
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F8
ENTER

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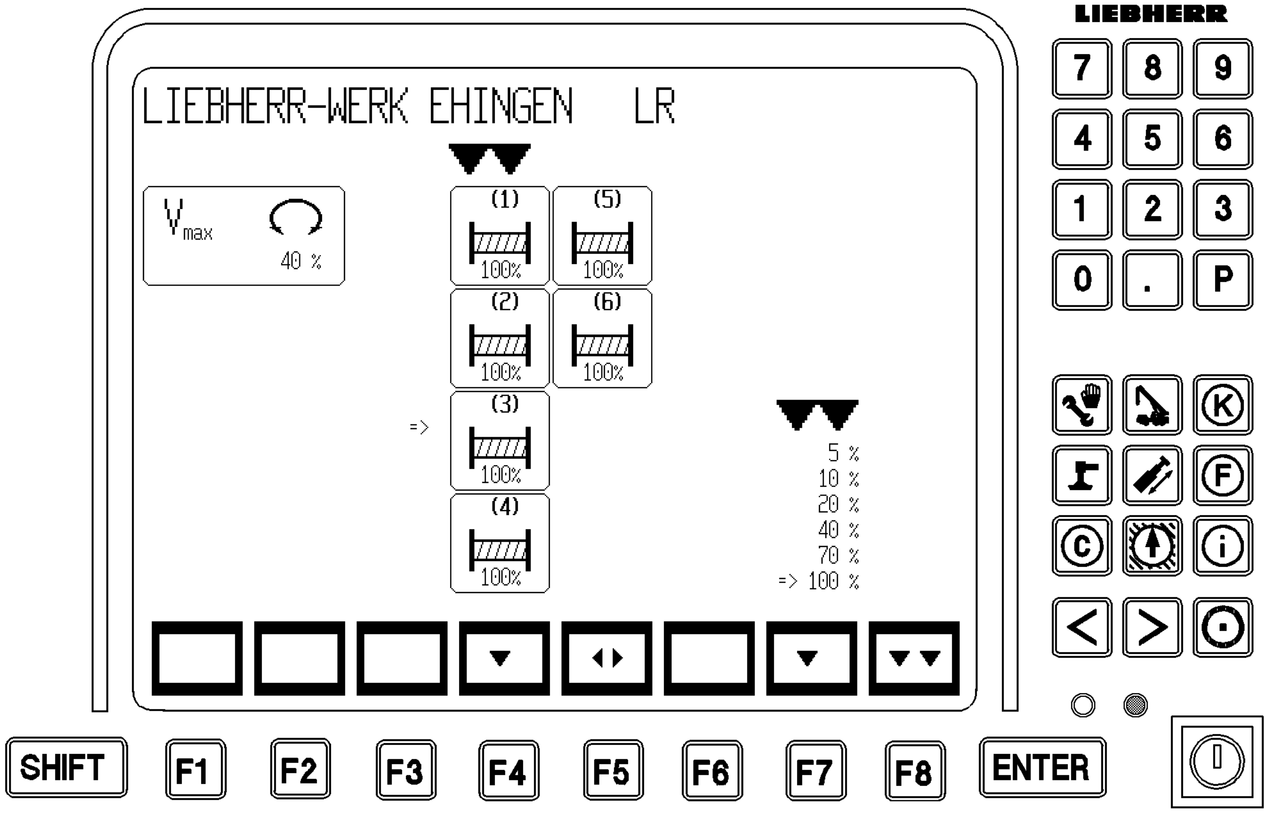
2. LICCON programs for crane operation

The "Set up" program **(Monitor 0)**
The crane operator enters the data for the selected equipment configuration in the LICCON set up program and receives the corresponding load capacity charts on the monitor. The equipment configuration is entered via dialog functions or short code.

The "Operation" program **(Monitor 0)**
In the "Operation" program , symbol elements constantly inform the operator about all important crane data. All cricital indications are also signaled via an acoustical signal. Depending on the configuration, a number of additional indicators can be added by the crane operator as auxiliary indicators, or will be added automatically in case of a problem.


LIEBHERR
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Vmax
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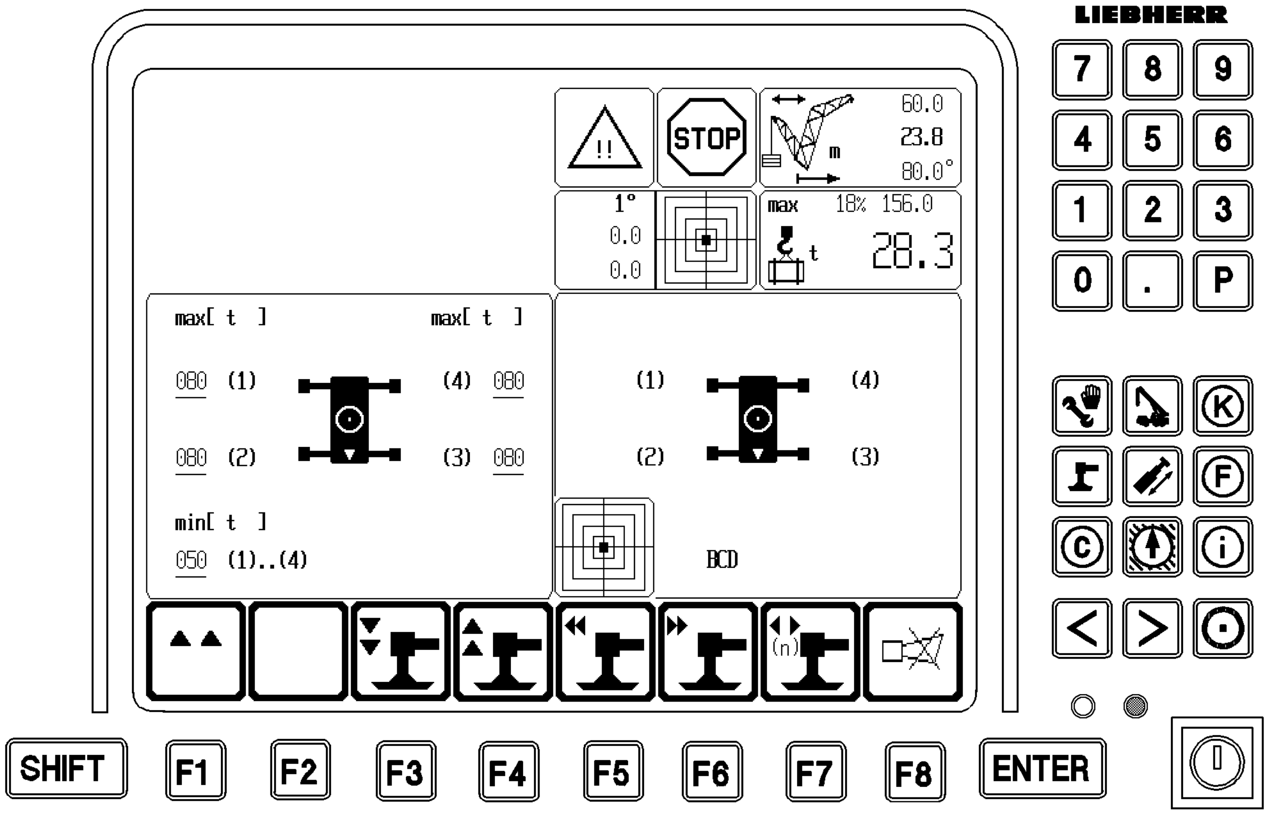
(1) 100%
(5) 100%
(2) 100%
(6) 100%
(3) 100%
(4) 100%
5 %
10 %
20 %
40 %
70 %
=> 100 %
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
STOP
60.0
23.8
80.0°
1°
0.0
0.0
max 18% 156.0
28.3
max[t]
080 (1)
(4) 080
080 (2)
(3) 080
min[t]
050 (1)..(4)
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

190980

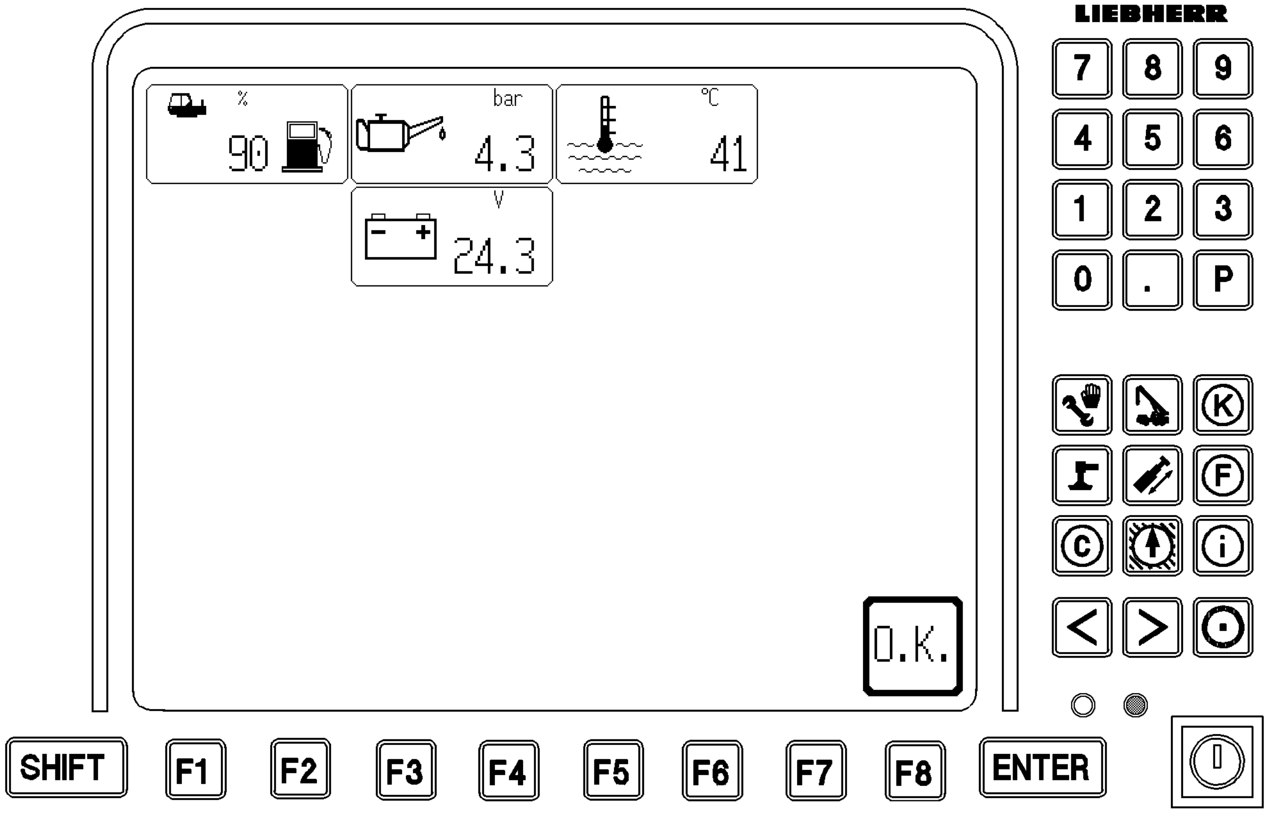
The "Control" program **(Monitor 0)**
With the "Control Parameter" program, maximum speeds for slewing and hoist gear can be preselected in stages. In addition, winches can be deactivated.

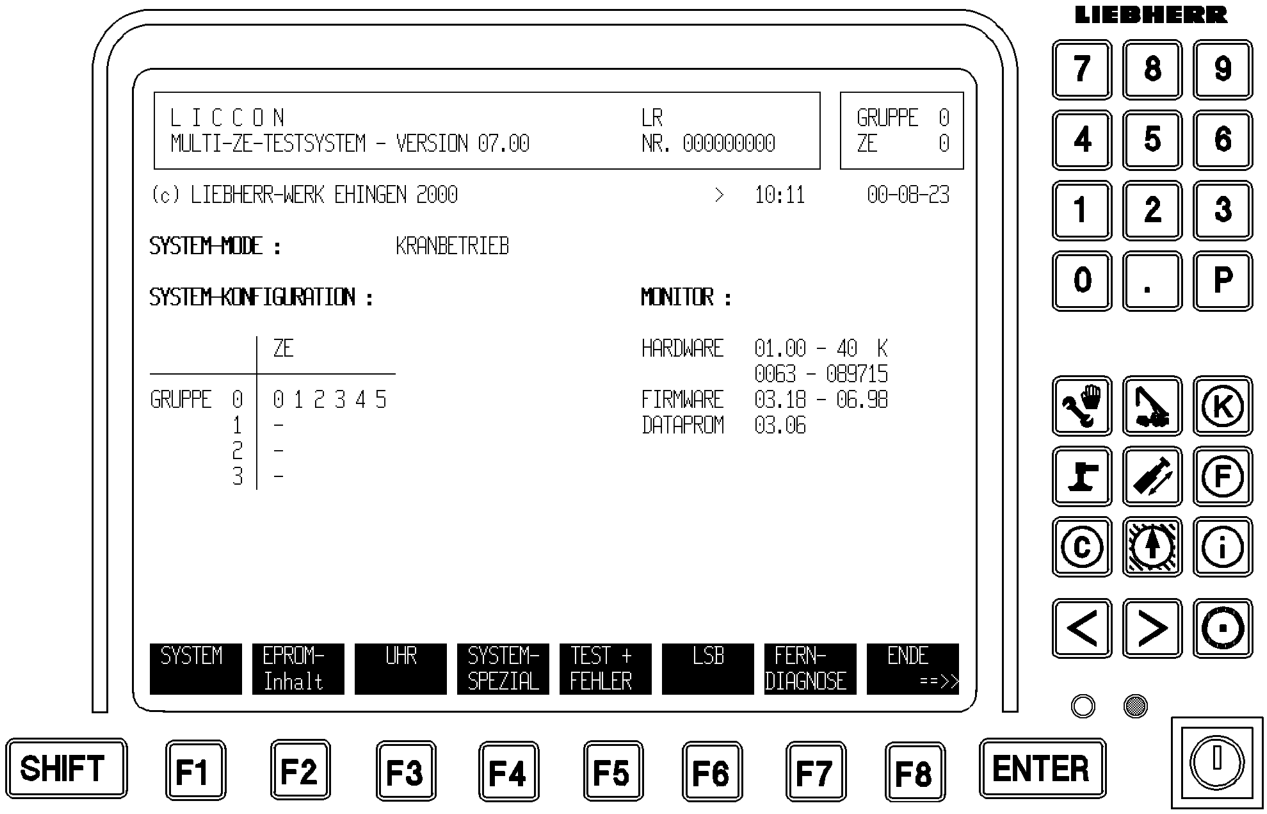
The "Support" program * **(Monitor 0)**
The control of functions is made via a process visualization on the LICCON monitor, which is linked into the support force monitoring platform.

1) Support
The folding arms as well as the support cylinders can be retracted or extended via the support function, and the crane can be horizontally aligned.

2) Support force monitoring
The support force monitoring system constantly determines the current pressure on all 4 support cylinders via pressure sensors, and shows it as support force for each support. Due to the variable programming capability of the limit values, the support force monitoring system can also be utilized as a prewarning system.

* Optional


LIEBHERR
%
90
bar
4.3
°C
41
V
24.3
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


LIEBHERR
L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 07.00
LR
NR. 000000000
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 2000
> 10:11 00-08-23
SYSTEM-MODE : KRANBETRIEB
SYSTEM-KONFIGURATION :
MONITOR :
ZE
GRUPPE 0 | 0 1 2 3 4 5
1 | -
2 | -
3 | -
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.06
SYSTEM
EPROM- Inhalt
UHR
SYSTEM- SPEZIAL
TEST + FEHLER
LSB
FERN- DIAGNOSE
ENDE ==>>
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

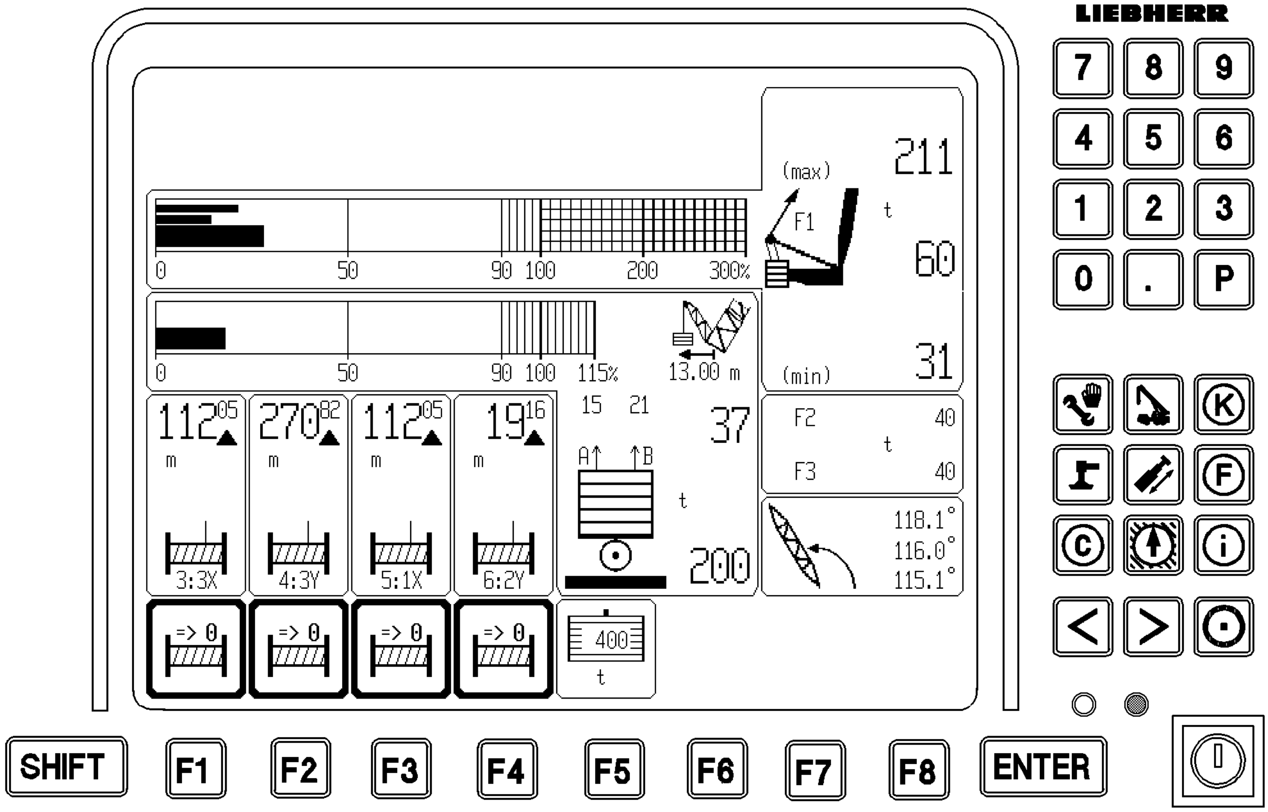
190981

The "Engine monitoring " program **(Monitor 0)**

In the engine monitoring view, all relevant data for the engine are shown, such as engine oil pressure, coolant temperature, etc. In case of a problem, the change from the "Operation", "Support" programs occurs automatically.

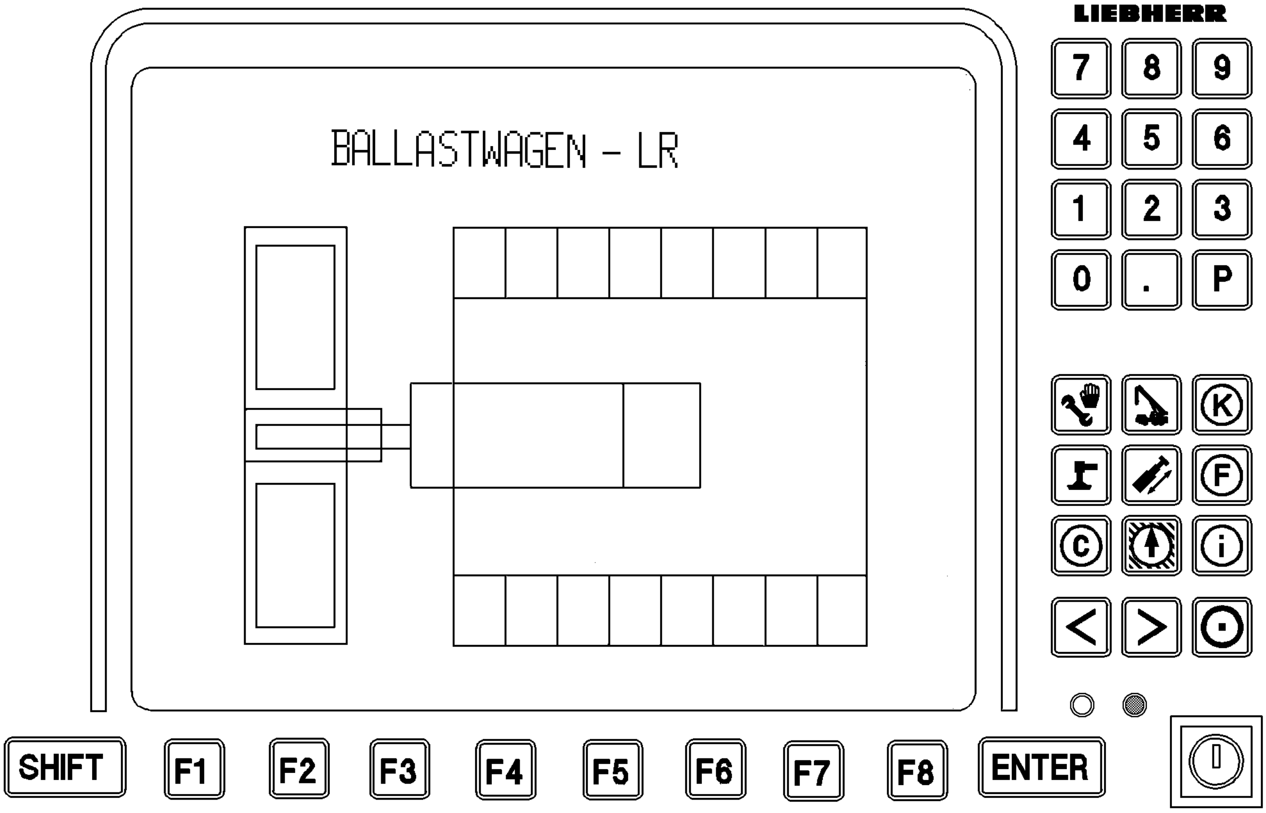
The "Test system" program **(Monitor 0)**

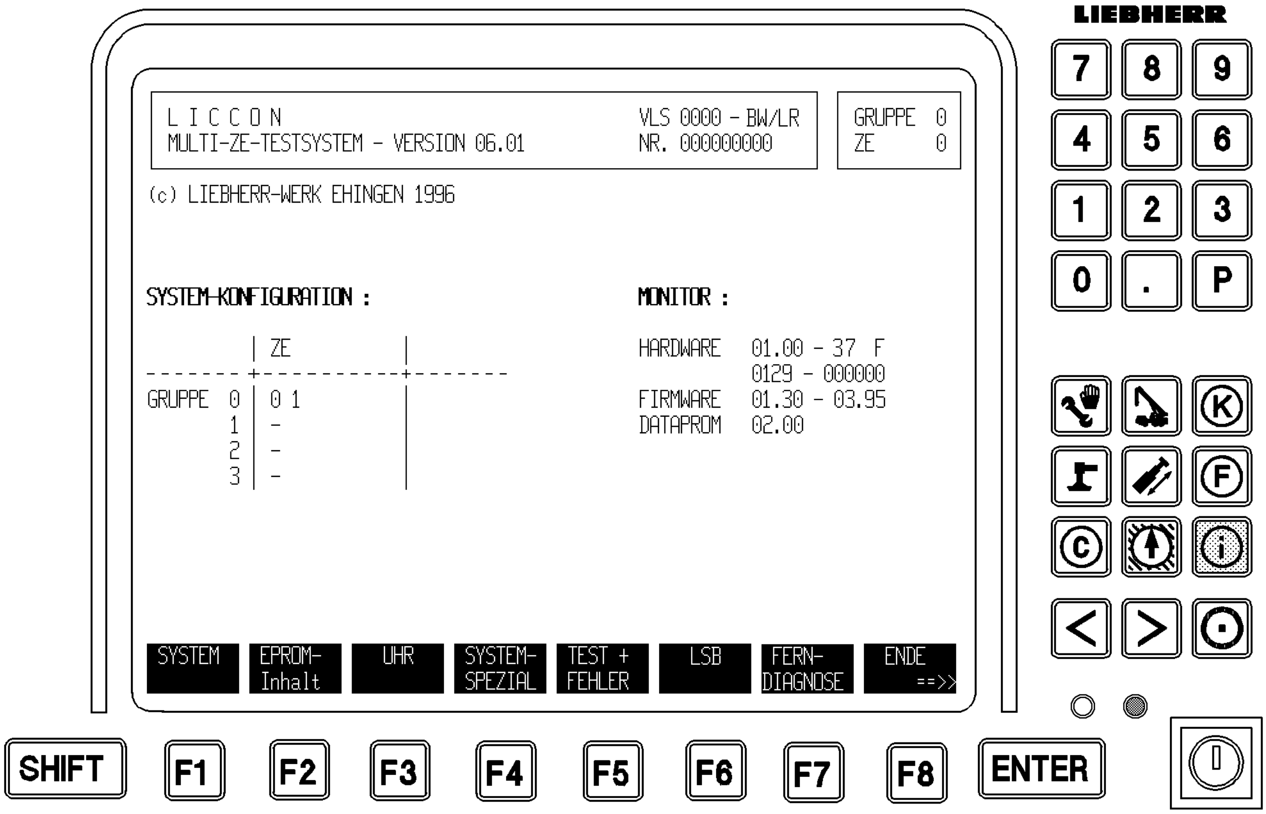
With the test system, Service personnel is able to quickly localize a problem, without test instruments, for example problems on bus participants (Liebherr System Bus ⇒LSB). Via comfortable dialog functions, all complete system inputs and outputs can be monitored during crane operation, in various views on the monitor. In addition, all registered errors (system and control errors) are documented in the test system.


LIEBHERR
211
(max)
F1
t
60
(min)
31
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
112.05 m
270.82 m
112.05 m
19.16 m
3:3X
4:3Y
5:1X
6:2Y
15 21
37
A B
t
200
F2 40
t
F3 40
118.1°
116.0°
115.1°
=> 0
400
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P

190982

The "Operation on monitor 1" program **(Monitor 1)**


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


L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 06.01
VLS 0000 - BW/LR
NR. 000000000
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 + FEHLER
LSB
FERN-DIAGNOSE
ENDE ==>>
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

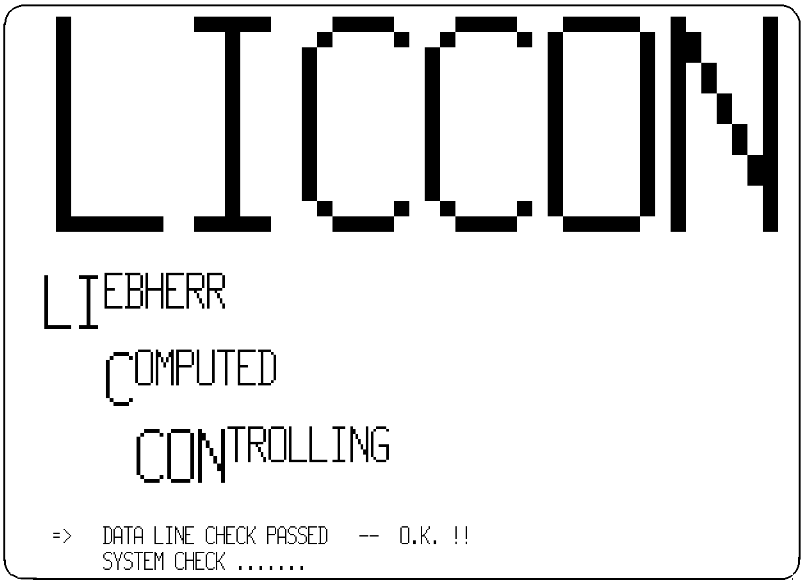
191064

The "Test system Ballast trailer" program * **(Monitor 1)**

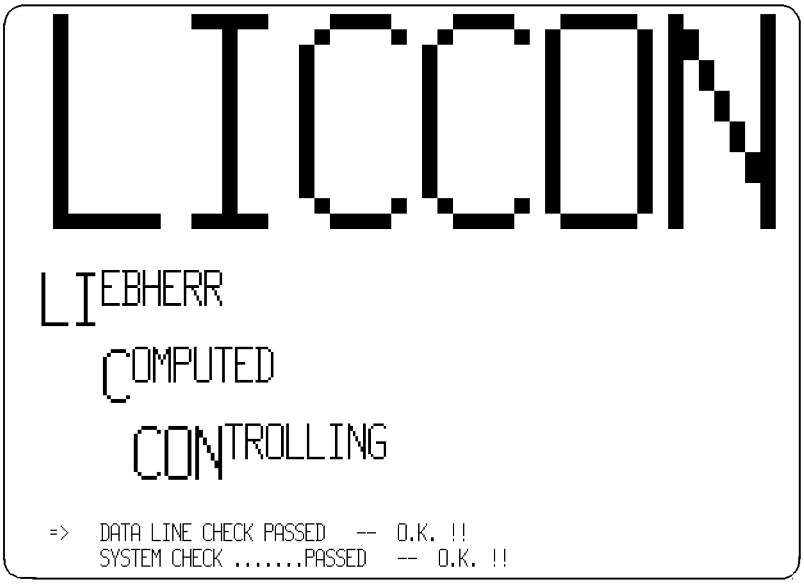
The ballast trailer is equipped with a test system. The test system is a service and diagnostics tool, which makes it possible,without additional testing devices, to find and take care of any crane problems quickly and easily. For diagnostics, monitor 1 can be assigned to the ballast trailer control.

* Optional

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

3. Booting up the LICCON computer system after turning it on

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

The connections from the micro processor central units (CPUs) to the monitor are checked first. If no error was found, the following is shown on the monitor:

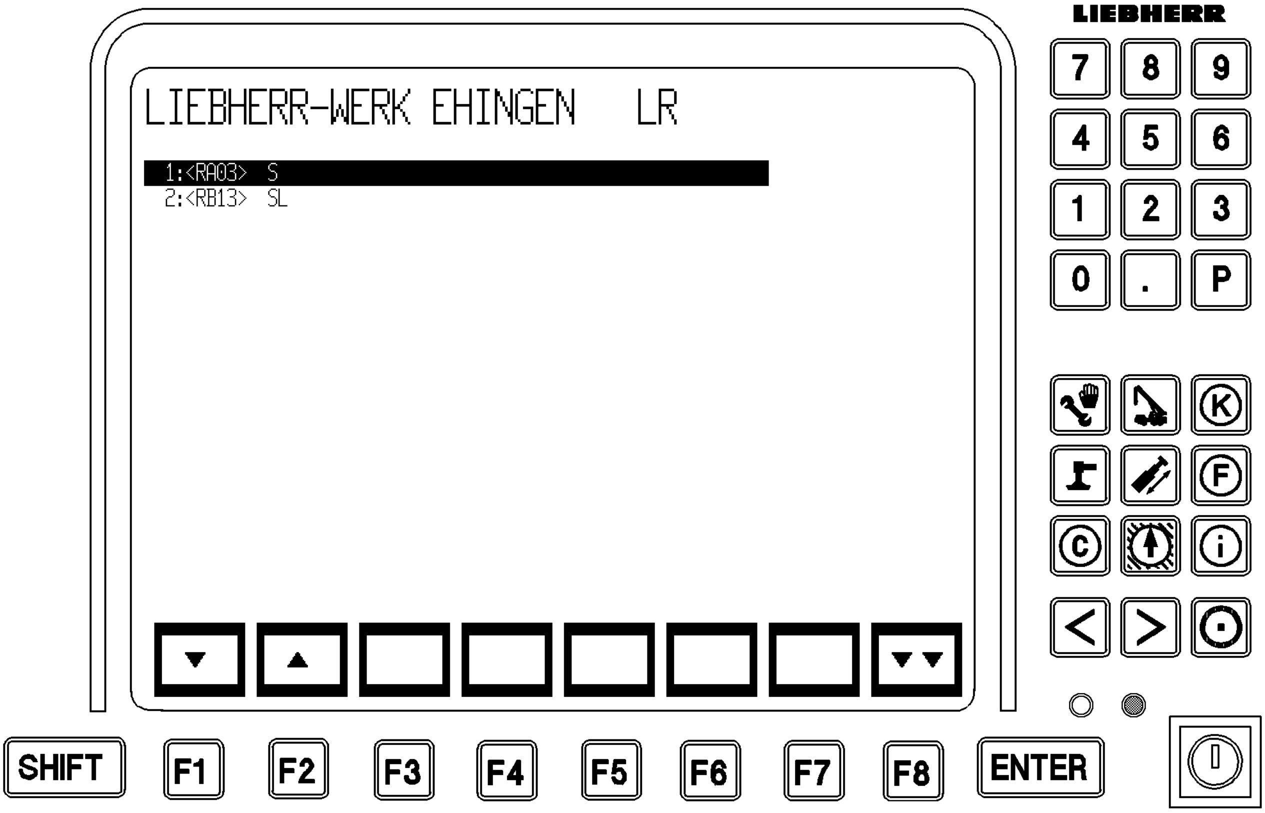
⇒ DATA LINE CHECK PASSED -- O.K. !! (fig. 1)
SYSTEM CHECK . . . . . .

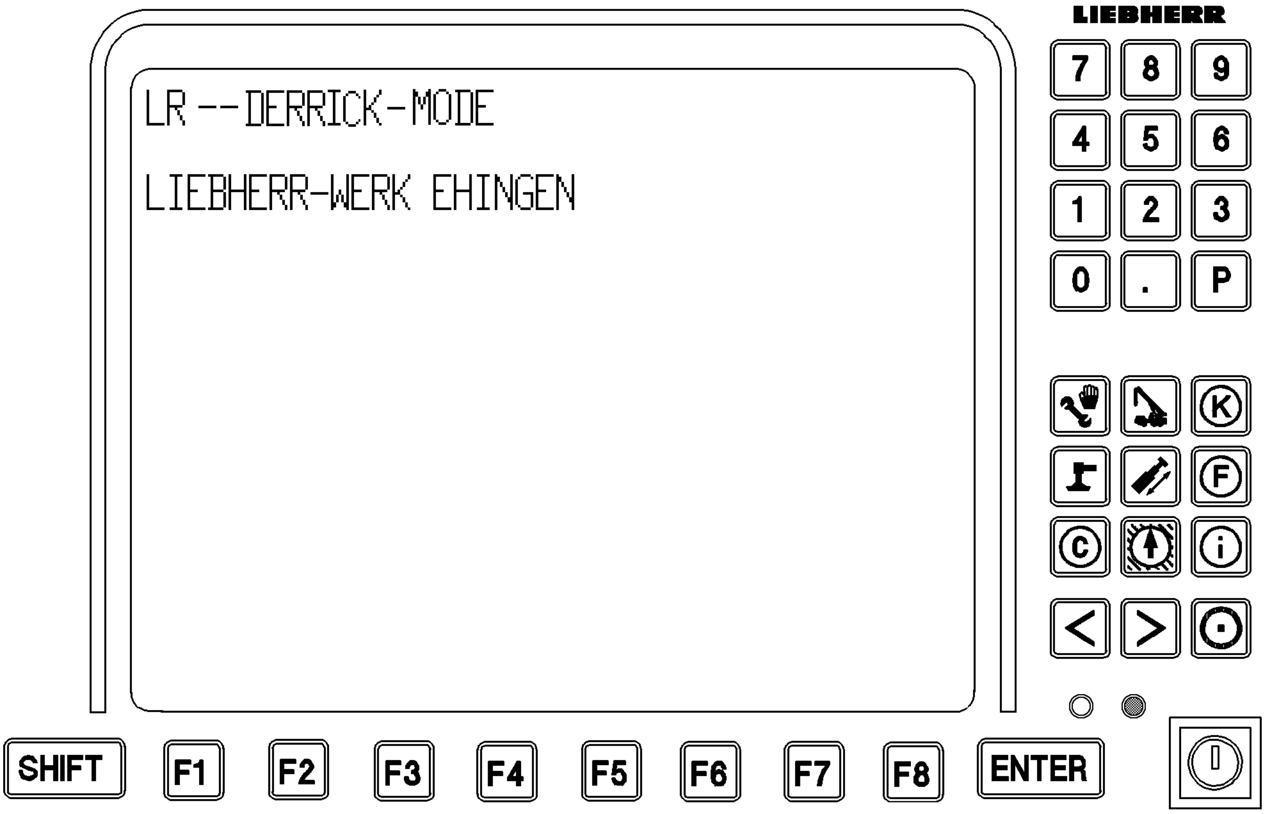
If no problems were found on the connections, a system test is carried out on all micro processor central units (CPUs). The step by step run of the self test can be viewed on the 7segment indicators of the CPUs. If no error was found during the system test, the following is shown on the monitor :

⇒ DATA LINE CHECK PASSED -- O.K. !! (fig. 2)
SYSTEM CHECK . . . . PASSED -- O.K. !!

Then the general initialization view appears on the monitor for a short time:

LIEBHERR-WERK EHINGEN (fig. 3)


LIEBHERR-WERK EHINGEN LR
1:<RA03> S
2:<RB13> SL
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LR --DERRICK-MODE
LIEBHERR-WERK EHINGEN
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191025

Booting up the LICCON computer system (continuation)
If the starting procedure is completed successfully and the LICCON computer system has run through the self test , the following appears :

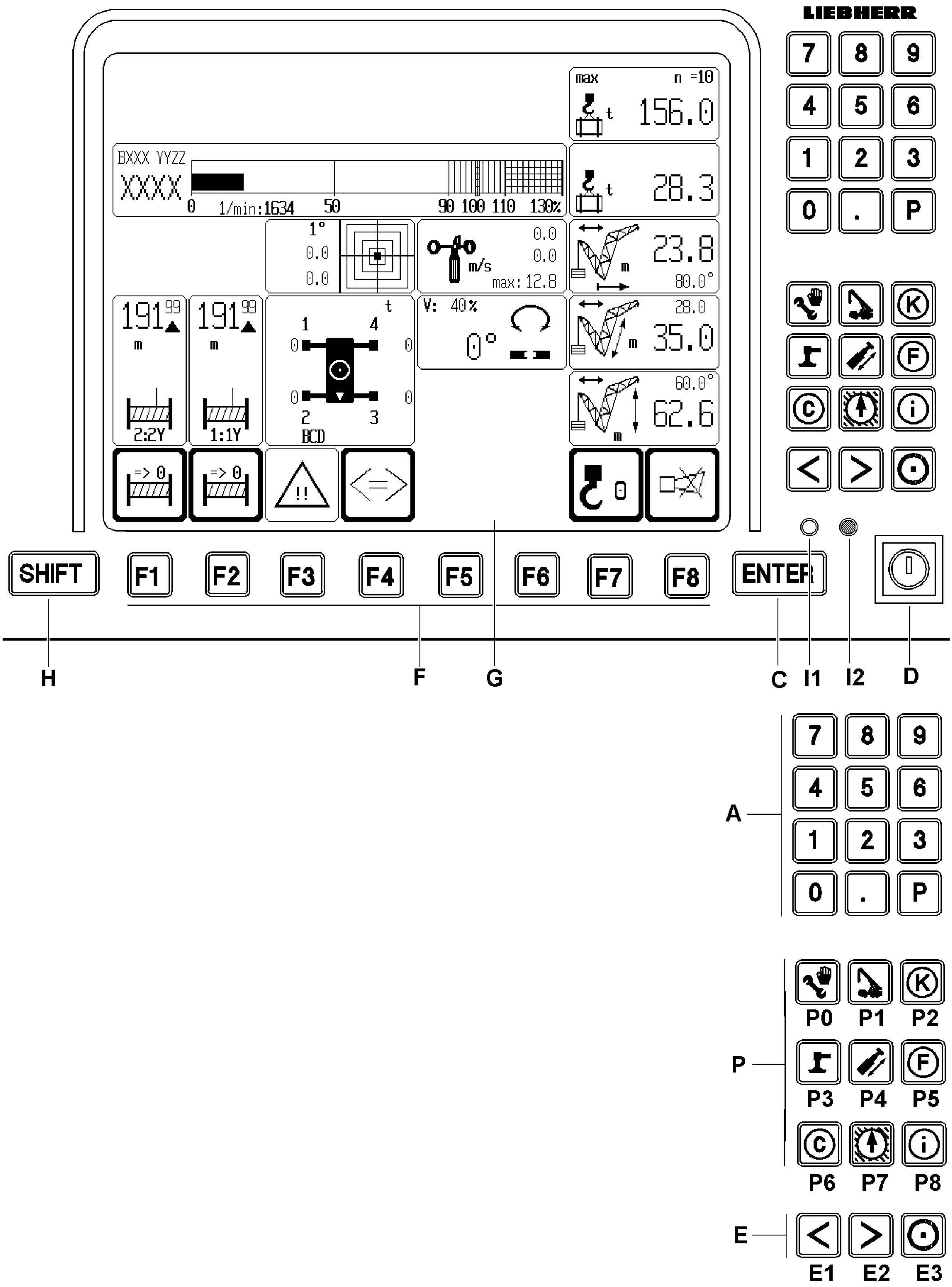
Monitor 0 The program to preselect the operating modes.

Note: Normally, the last used operating mode group is shown , which was used before the LICCON computer system was turned off. Only in case of a data loss, for example due to a cold boot (after a change of the battery or one of the CPUs, etc.) appears the 1st valid equipment configuration with the 1st valid operating mode.

- Move the cursor up or down with function key "F1" or "F2" to preselect the desired operating mode preselection group.
- Confirm the preselection with the "F8" key or "ENTER" .
  The "Set up / equipment configuration" program appears.

Note: If no new operating mode group is selected within 3 seconds, then the former operating mode group remains and the system changes into the "Set up" program. This means that if the previously set operating mode group is to remain, no entry is necessary.

Monitor 1 The monitor 1 title view (Derrick mode).


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
H
F
G
C
I1
I2
D
A
P
P0 P1 P2
P3 P4 P5
P6 P7 P8
E
E1 E2 E3

191010

10. The control elements of the LICCON computer system on monitor 0

A Alpha numeric keyboard

P Program keys

To start the individual LICCON programs
P0: Set up /Equipment configuration program
P1: Operating program
P2: Crane delivery program (Correction coefficients)
P3: Support program *
P4: not used
P5: not used
P6: Control Parameter
P7: not used
P8: LICCON test system

C Input key "ENTER"

To confirm changes.

D Keyed switch

- Position to the right (touching) ⇒ Hoist limit switch and shut off of LML bypassed
- Center position (self retaining) ⇒Normal operation

E Special function keys

Brightness adjustment of monitor

The brightness level of the monitor can be adjusted with this key.
- "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 Function keys (F1 to F8)

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

G Monitor

Shows individual program views (example : Operating view).

H SHIFT key

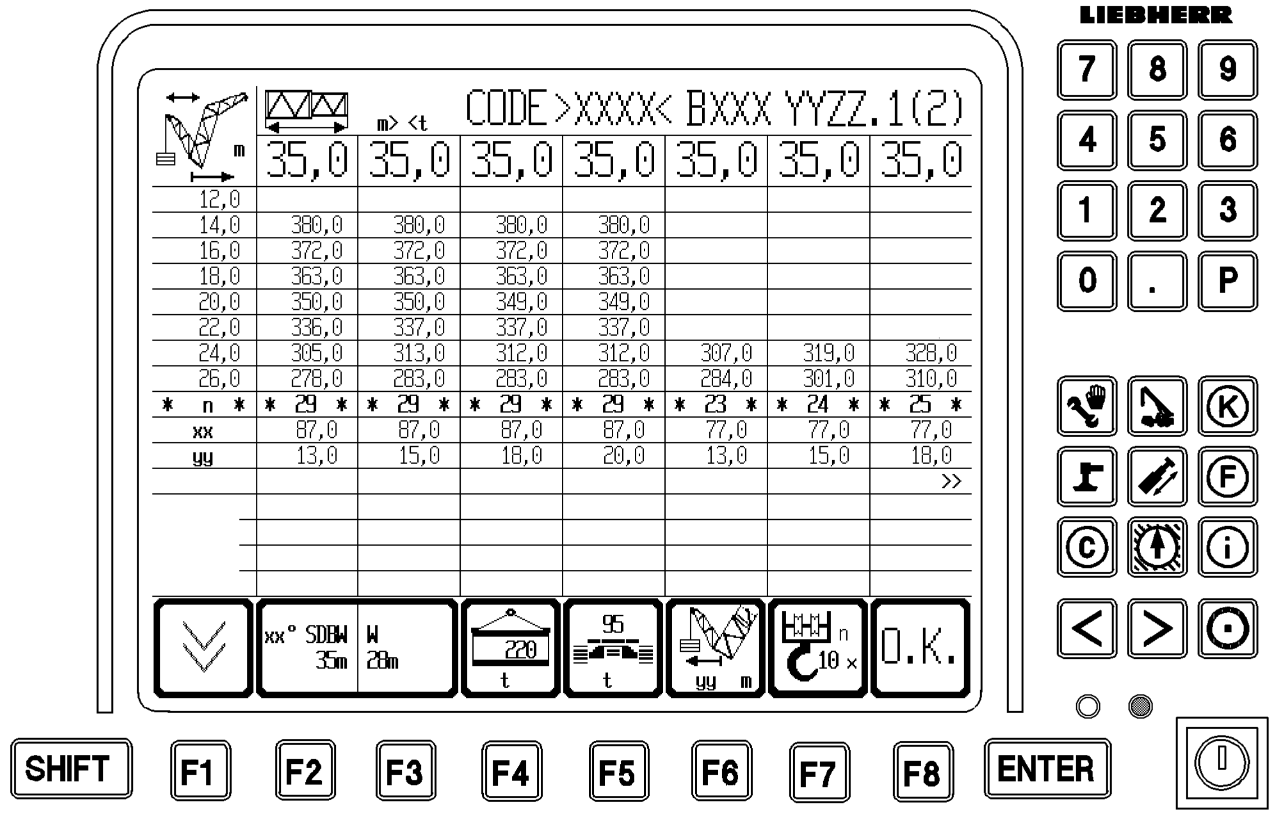
Key assignment on 2nd level, "Supervisory function".

I LED indicators

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


LIEBHERR
m> <t
CODE >XXXX< BXXX YYZZ.1(2)
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
O.K.
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

191069

11. The ”Set up” program

After turning it on, and after the LICCON computer system is booted up and the operating mode group is preselected, the system changes automatically into the "Set up" program.

Note: If an equipment configuration fromthe same operating mode group was set before the LICCON computer system was turned off, then this last used equipment configuration and the reeving used at that time is automatically reset and shown.
If another operating mode group was selected before the LICCON computer system was shut off, or if the LICCON computer system is turned on for the first time, or in case of data loss (memory loss due to cold boot), then, after this operating mode is confirmed, the first valid equipment configuration of the first valid operating mode appears in the equipment configuration view.

C A U T I O N :In case of cold boot, the setting for the hoist cable reeving is set to ”0” !

Note: All entries and settings, which are made in the ”Set up” program can only be made on monitor 0.

Setting the operating mode and the equipment configuration

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

1. With function keys :
   "F2" Setting the main geometric condition
   "F3" Setting the auxiliary equipment
   "F4" Setting the slewing platform weight
   "F5" Setting the central ballast or support
   "F6" Setting the slewing range in operating modes with various slewing ranges
   - Confirm settings with the "ENTER" key.

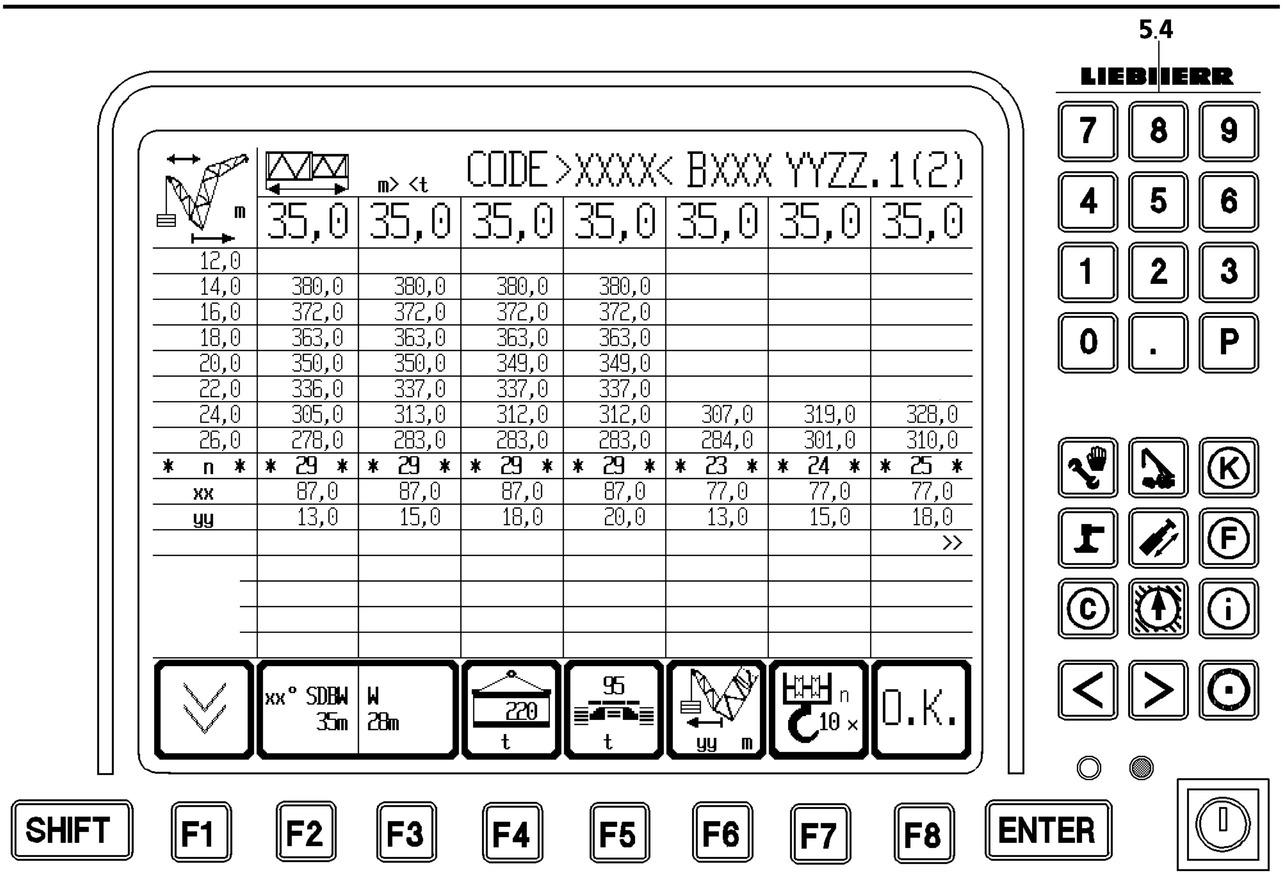
2. With the short code:
   - Enter the 4-digit short code with the alpha-numeric key on monitor 0.
   - Confirm settings with the "ENTER" key.

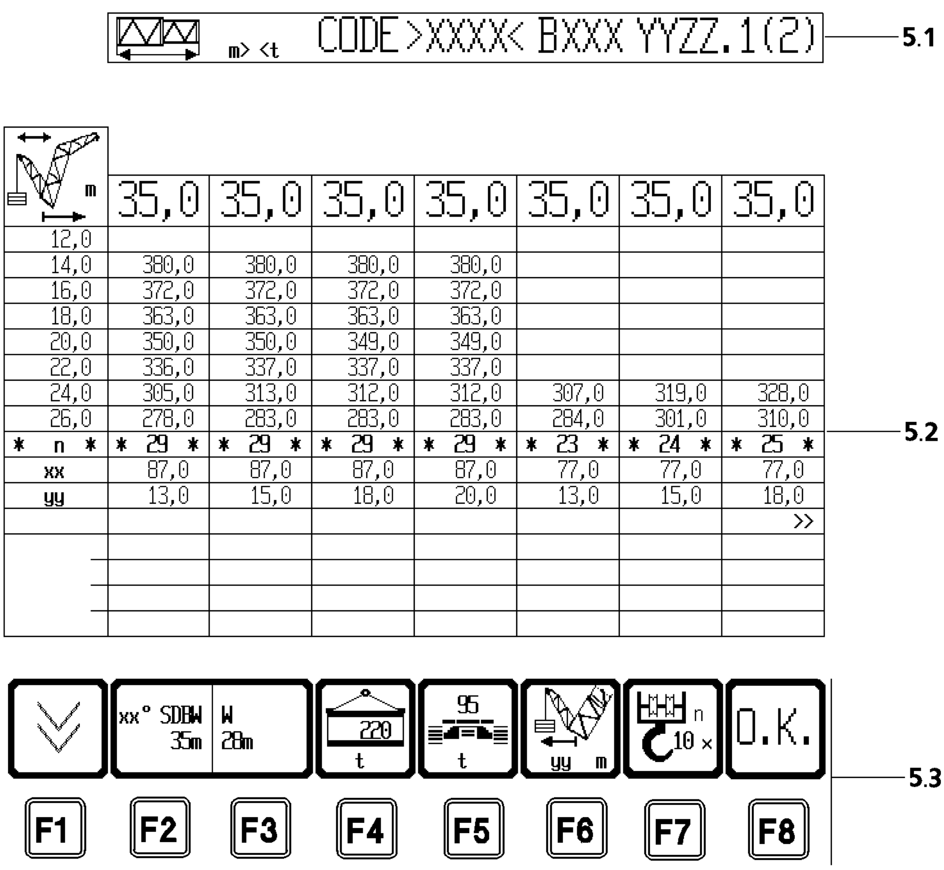
After entry, the data for the selected load capacity chart can be viewed.

Setting the hoist cable reeving

Press "F7" to set the **"Hoist cable reeving"**
Press "F8" to end the "set up" program and take over the entered parameters into the "Operation" program .

Note: If an equipment configuration has been confirmed at least once with the "O.K." key, than the "set up" program can also be ended by pressing one of the program keys ("P1" - "P8"). In that case, the LICCON computer system drops all setting made in the "set up" program and uses the previous operating condition, which had last been confirmed with "O.K."


5.4
LIEBHERR
m> <t CODE >XXXX< BXXX YYZZ.1(2)
m 35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
O.K.
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


m> <t CODE >XXXX< BXXX YYZZ.1(2)
5.1
m 35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
5.2
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
O.K.
F1
F2
F3
F4
F5
F6
F7
F8
5.3

191068

The monitor in the equipment configuration view is divided into three areas :

11.1 General information line

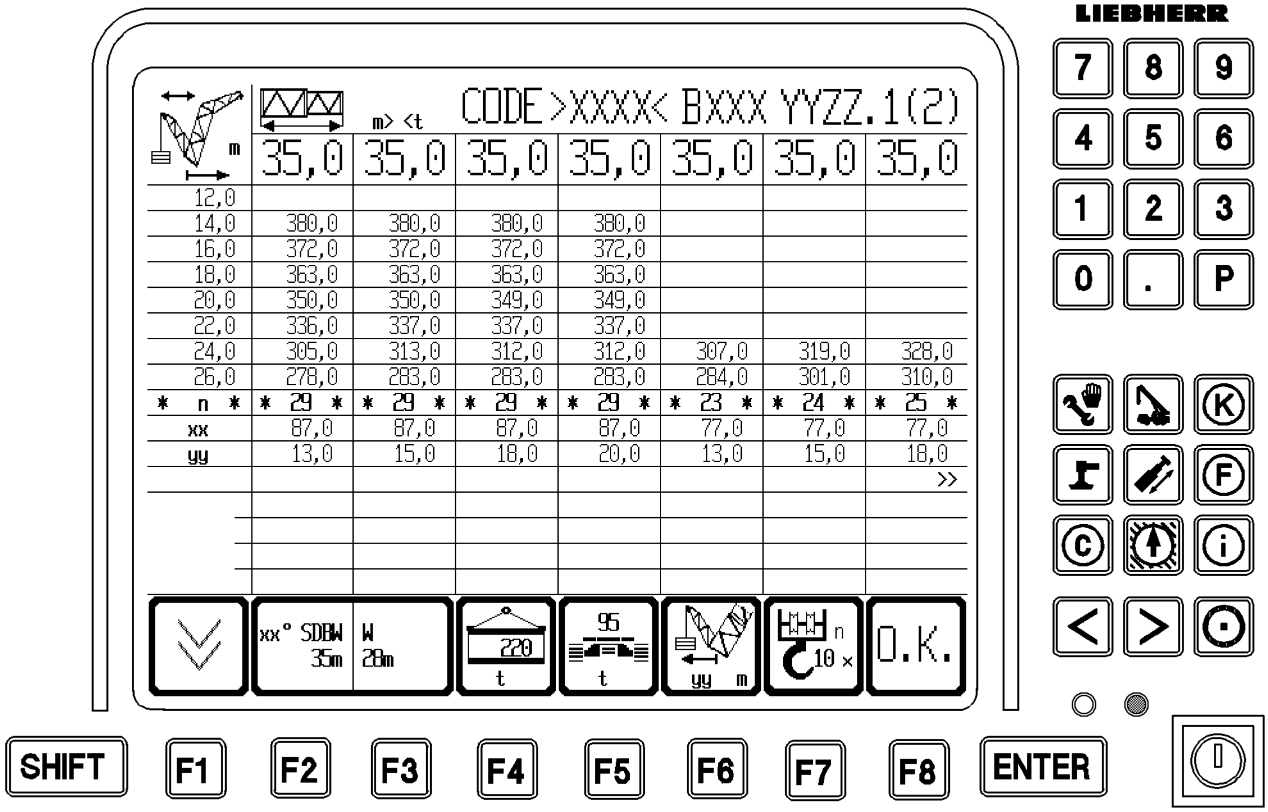
11.2 Indicator area for the values of the load capacity chart

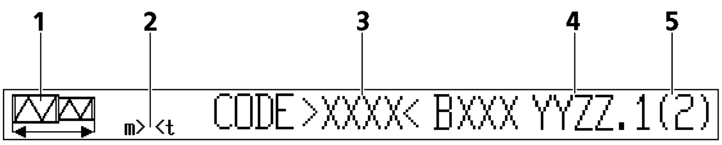
11.3 Function key bar

11.4 Other control elements

Note: The monitor illustrations in this chapter are only examples. The numeric values in the individual symbol elements and charts might not match this particular crane. The programmed load capacity charts for the crane apply.

In addition, some views on the monitor show the maximum possible assignment of the LICCON monitor with symbol elements. In normal crane operation, such an identical view would not appear on the LICCON monitor .


LIEBHERR
m> <t
CODE >XXXX< BXXX YYZZ.1(2)
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
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


1 2 3 4 5
m> <t CODE >XXXX< BXXX YYZZ.1(2)

191067

11.1 General information line

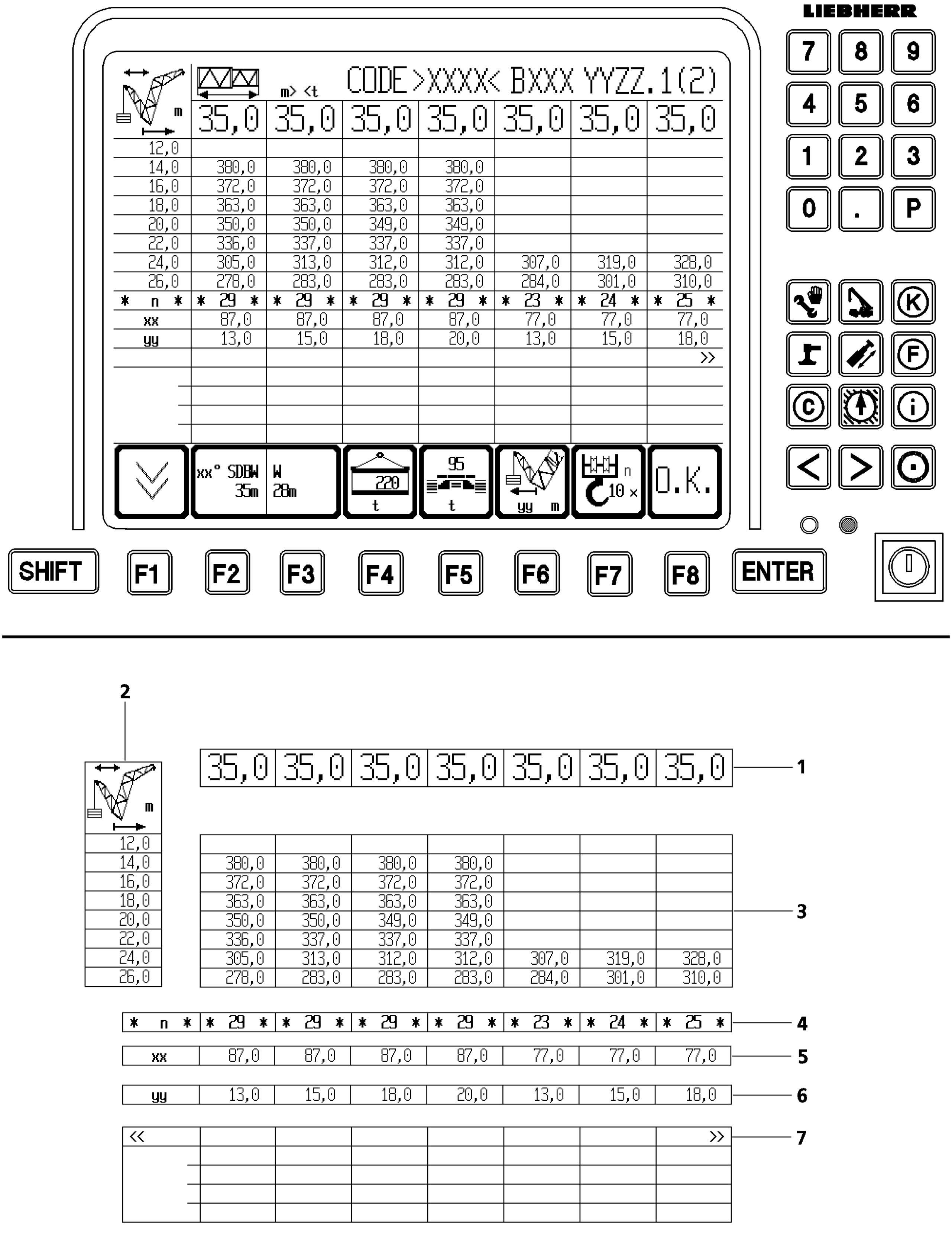
1) The symbol ”Main boom length” (the same for all operating modes)

2) Abbreviations for programmed length units (LE) and weight units (GE). Possible length units are meters [m] and feet [ft]. Possible weight units are tons [t] and pounds [lbs].

3) Next to the word ”CODE” is a 4 digit short code (XXXX) in parenthesis (> <). Each short code describes an equipment configuration for the crane. The valid equipment configurations for the crane and the corresponding short code numbers are listed in the load capacity chart manual for the crane.

4) 8-digit organization number, which depends on the operating mode (BXXX YYZZ) for the entered load capacity chart. The letter at the 1st digit defines the calculation base for the load chart by country and the measuring unit in use.
   for example "128" = LR 1600/1
   The 4-digit number block (yyzz) defines the entered operating mode.
   YY defines the main geometry condition,
   ZZ defines the auxiliary equipment geometry condition

5) The page number of the currently shown section of the load capacity chart is separated by a point ”**.**” from the organization number, the total number of pages of this chart is shown in parenthesis ( ).


LIEBHERR
CODE >XXXX< BXXX YYZZ.1(2)
m> <t
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
<< >>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
O.K.
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
1
2
3
4
5
6
7
191066

11.2 Indicator range for load capacity chart values

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

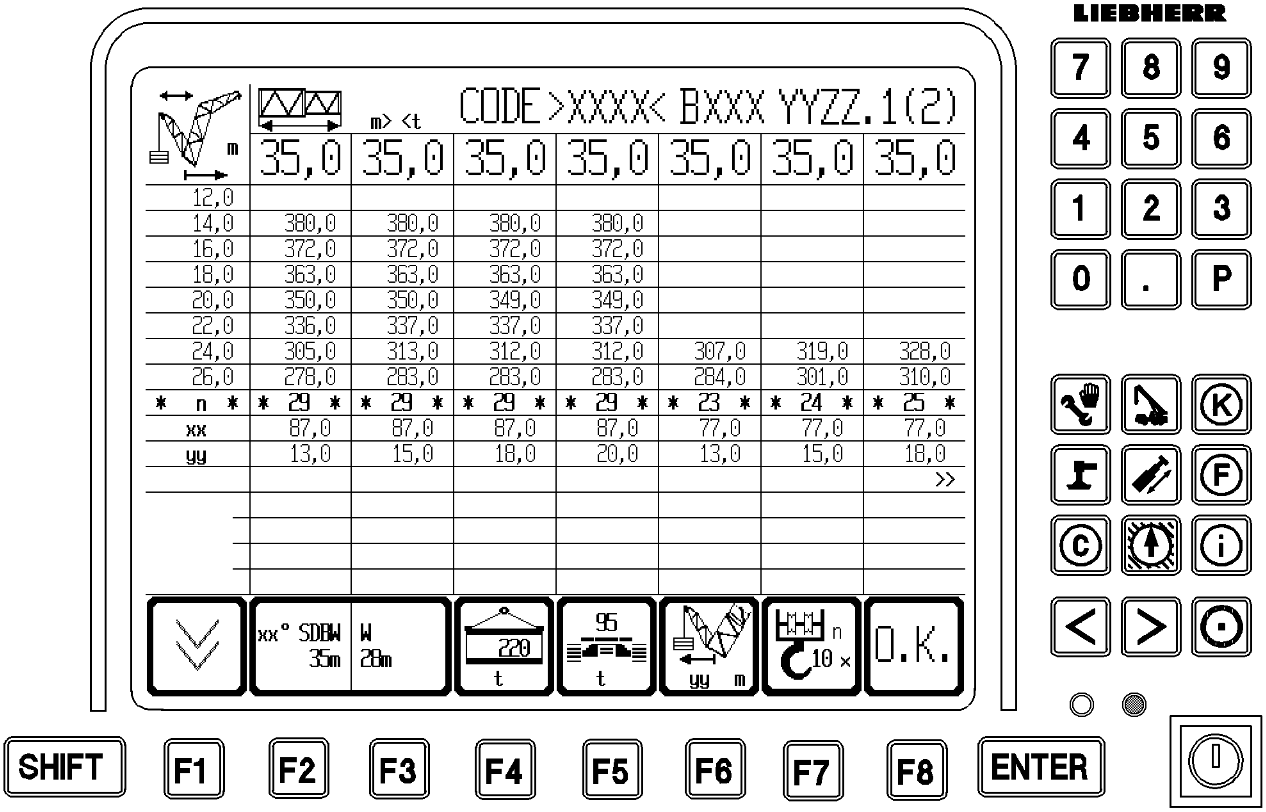
2) The operational mode dependent symbol element "radius" in length units (LU) of meters ([m] or feet [ft]), below maximum 10 lines of radius values. They form the vertical axle of the load capacity value field.

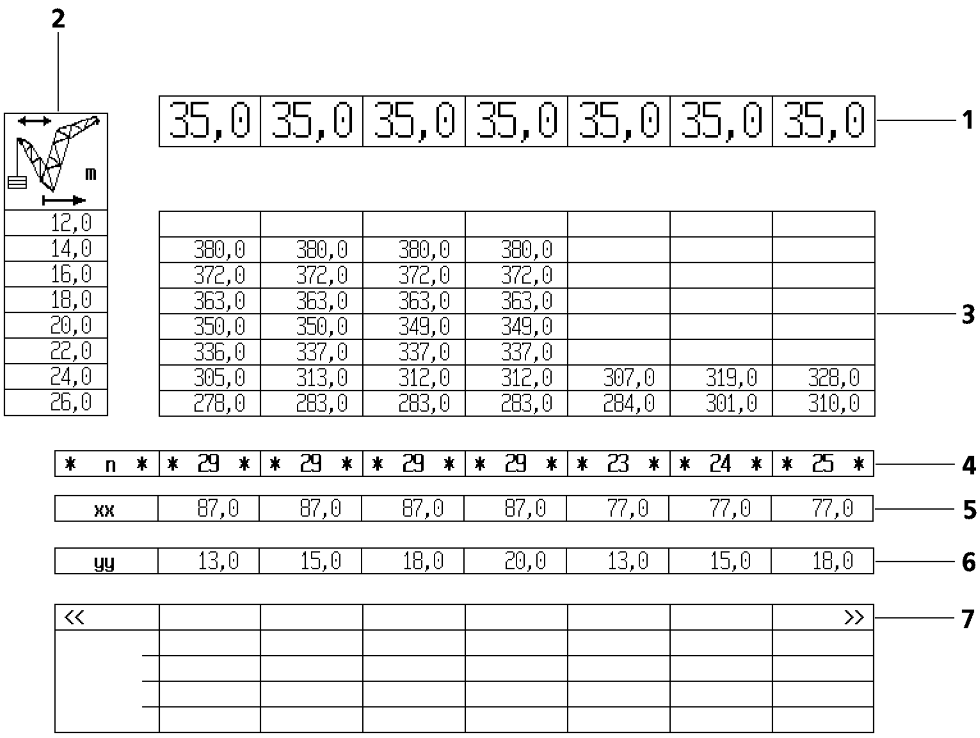
3) Load capacity value field
In columns below the main boom lengths and in lines to the right of the radius values are the **load capacity values**, depending on the boom length and the radius.

4) Line * **n** * = Hoist cable reeving
The numbers in this line show how often the hoist cable must be reeved between the boom head and the hook block (n), to be able to lift the maximum load according to the load chart column.

Note: If the load capacity value in the column exceeds the load which can be lifted with the maximum possible reeving, then an exclamation mark ("!") is next to the reeving number, to show that special equipment is necessary to lift this load.

Note: For parallel operation of hoist winches, an even reeving number must be used and entered. If the minimum value happens to be uneven, then the next higher reeving number must be used for parallel operation of the hoist winches.


LIEBHERR
CODE >XXXX< BXXX YYZZ.1(2)
m> <t
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
O.K.
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


2
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
<< >>
1
3
4
5
6
7

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5) Line **xx** = Main boom angle in [°]
Appears only in operating modes with luffing lattice jib.

a) If "xx°" appears in the symbol element main geometry (for example **xx° SDBW**) , then xx° = main boom angle in [°]. The main boom angles, which must be set to be able to lift the load values according to the corresponding load chart column are shown in columns next to each other.

Note: See also paragraph 30.3.1 Main boom angle interpolation and paragraph 30.3.4 Combination of main boom angle and derrick ballast radius interpolation.

b) If "xx°" appears in symbol element auxiliary geometry (for example **WV xx°**), then xx° = jib relative angle in [°]. This means the jib angle in relation to the main boom angle (main boom angle on pulley head jib angle bottom).

The jib relative angles, which must be set to be able to lift the load values according to the corresponding load chart column are shown in columns next to each other.

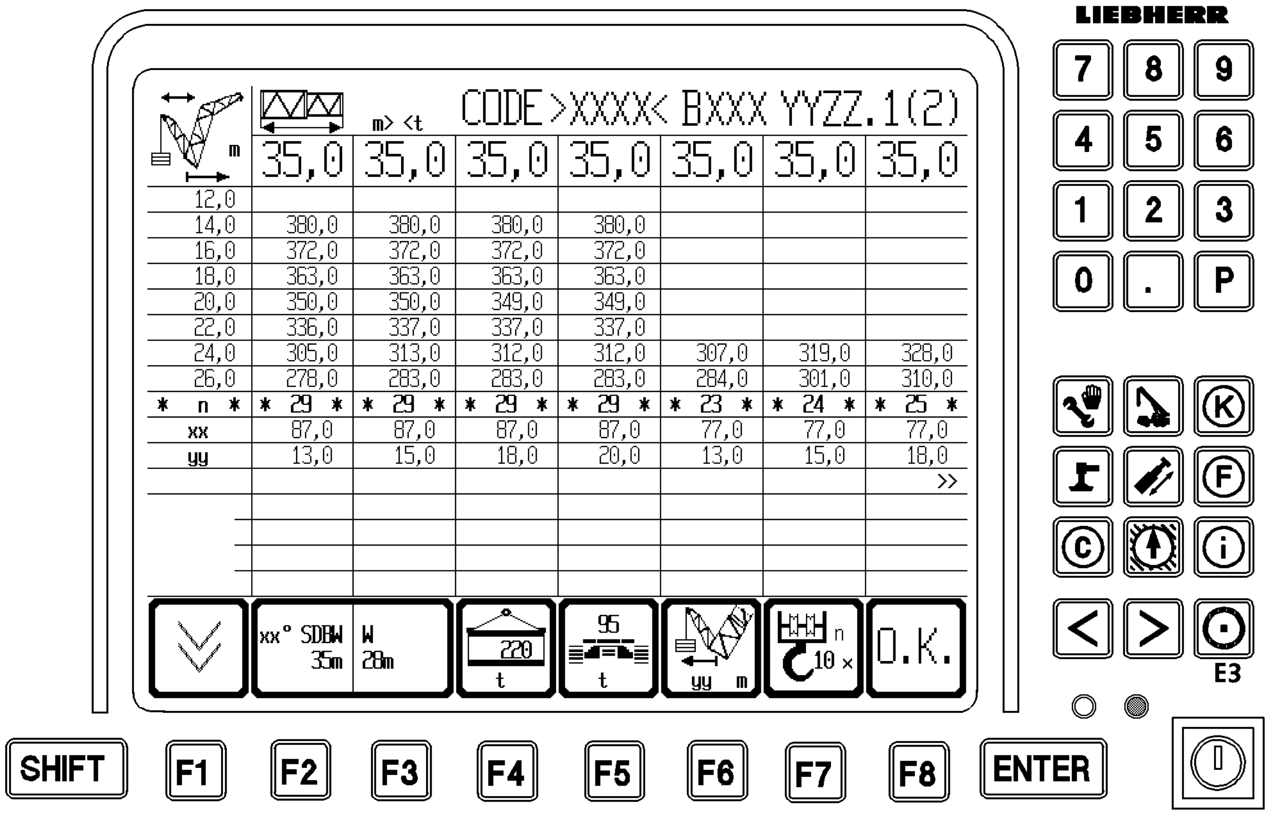
Note: See also paragraph 30.3.2 Jib relative angle interpolation and paragraph 30.3.5 Combination of jib relative angle interpolation and derrick ballast radius interpolation.

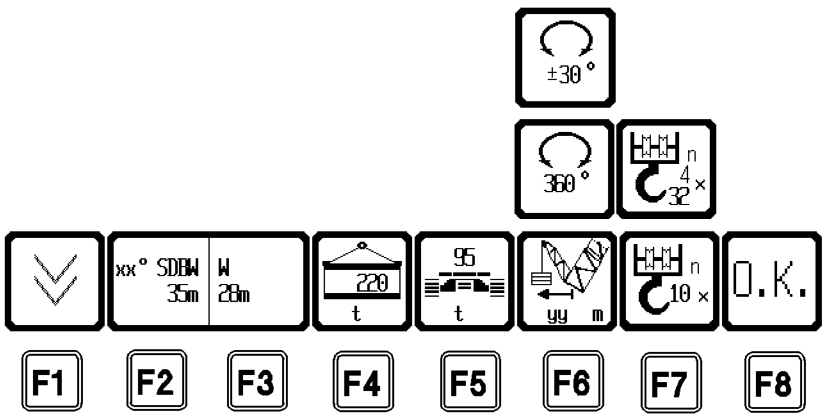
6) Line **yy** = Derrick ballast radius in [m]
Appears only in operating modes with derrick ballast.
The columns show the derrick ballast distances, which must be set to be able to lift the load values shown on the corresponding load chart column .

Note: See also paragraph 30.3.3 Derrick ballast radius interpolation, paragraph 30.3.4 Combination of main boom angle and derrick ballast radius interpolation and 30.3.5 Combination of jib relative angle interpolation and derrick ballast radius interpolation.

7) Line for special indicators
If a load capacity chart consists of more than 7 columns, then it cannot be shown completely due to the size of the monitor. In this case, arrows in the 1st field (<<) or in the 7th field (>>) in this line show that there are additional columns to the left or right, which can be viewed by pressing the arrow keys "<" or ">".

Note: Page to the left or right by 7 load chart columns (1 page) by using key combination "SHIFT" + "<" or "SHIFT" + ">" .


LIEBHERR
m> <t
CODE >XXXX< BXXX YYZZ.1(2)
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220
t
95
t
yy m
n
10 ×
O.K.
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
E3
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


±30°
360°
n
4
32 ×
xx° SDBW 35m
W 28m
220
t
95
t
yy m
n
10 ×
O.K.
F1
F2
F3
F4
F5
F6
F7
F8

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11.3 The function keybar

The function key bar contains 8 symbol elements, which correspond to the function keys underneath, which means they either depict a function, which can be triggered with the function keys ("F1" to "F8") or they change their image or their text contents and show a change of operating mode or equipment configuration.

"F1" Vertical paging
Due to the size of the monitor, maximum 10 load chart lines can be shown at the same time. If the chart consists of more than 10 lines, then the view is split to several pages. By pressing the key, the next page of the load capacity chart is shown, and the number of the current page in the "General information line " is increased by 1. When the last page is reached, and "F1" is pressed again, page 1 reappears.

"F2" Setting the operating mode "Main geometry condition)
The various main boom operating modes and main boom lengths can be set here. The types are described in the symbol by abbreviation and length data.
For example xx° SDBW, 35 m

"SHIFT" + "F2" Previous main geometry condition

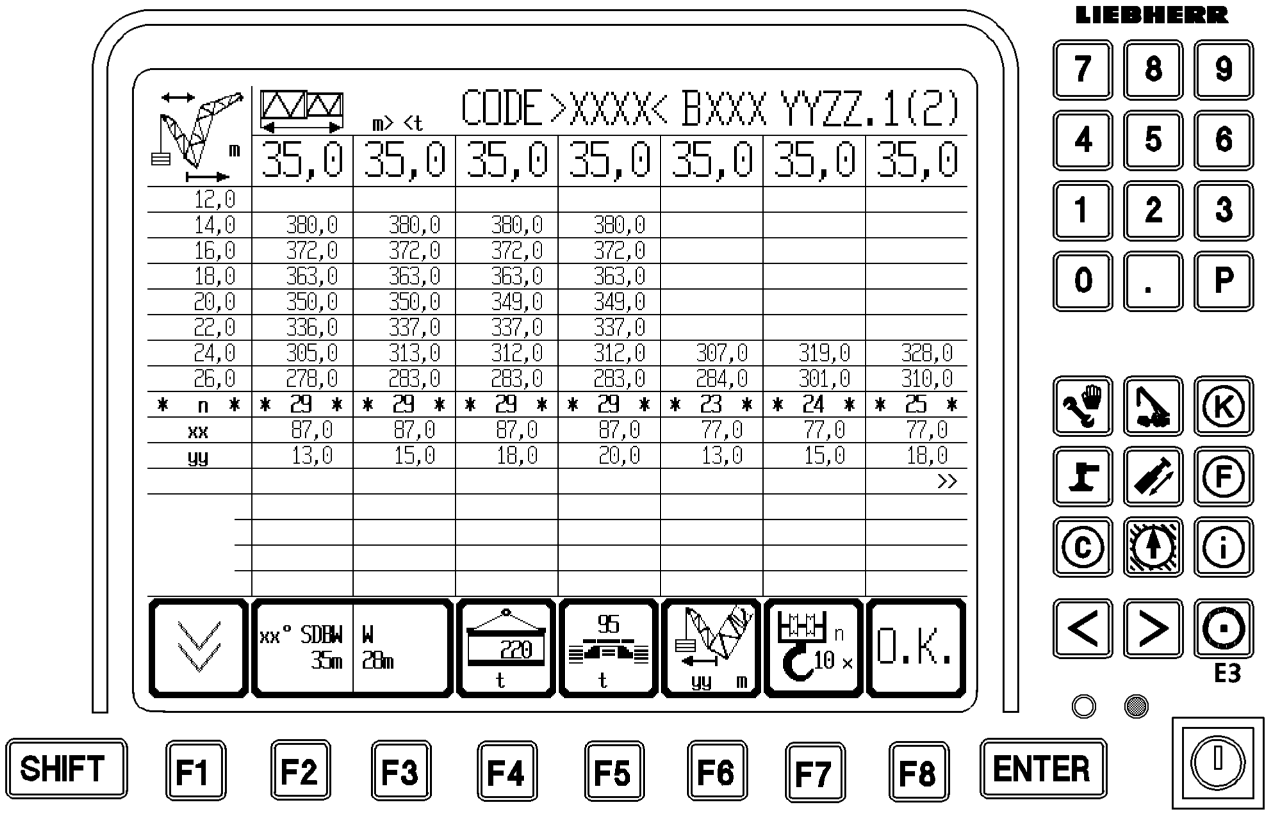
"F3" Setting the operating mode "Auxiliary equipment"
The crane operator can select the various types of auxiliary crane equipment, if available. The types are described in the symbol by abbreviation and angle and length data,
for example W 28 m = luffing lattice jib 28 m

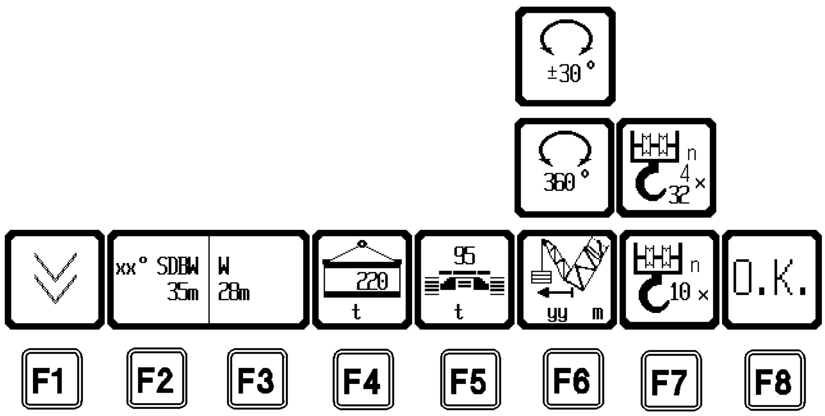
"SHIFT" + "F3" Previous auxiliary equipment condition .

Note: If function keys "F2" and / or "F3" are pressed, all operating mode and equipment configuration dependent data is deleted from the monitor and sets the short code in the "General information line " to "CODE >? ? ? ?<".

Operating mode dependent data are:
- Boom length symbol in the General information line
- Length units and weight units
- Organization number of load capacity chart
- Radius symbol
- Boom length data

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


LIEBHERR
m> <t
CODE >XXXX< BXXX YYZZ.1(2)
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
O.K.
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
< >
E3
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER


±30°
360°
n 4 32 ×
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
O.K.
F1 F2 F3 F4 F5 F6 F7 F8

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"F4" Setting the equipment configuration "Counterweight" (slewing platform)
By pressing this key, the LICCON computer system is set to the current counterweight on the slewing platform. By pressing the key, the symbol with text is shown in the counterweight symbol.

"F5" Setting the equipment configuration "Chassis" (crawler, support, central ballast)
In operating modes, which have various chassis versions, such as ballast on chassis, variable support), the configuration can be set with the F5 key.

"F6" Setting the equipment configuration "slewing range of the crane superstructure"
In operating modes with various slewing ranges.

1) 360° working range
Unlimited turning of crane superstructure possible, the same load carrying value is valid for the complete 360° working range.

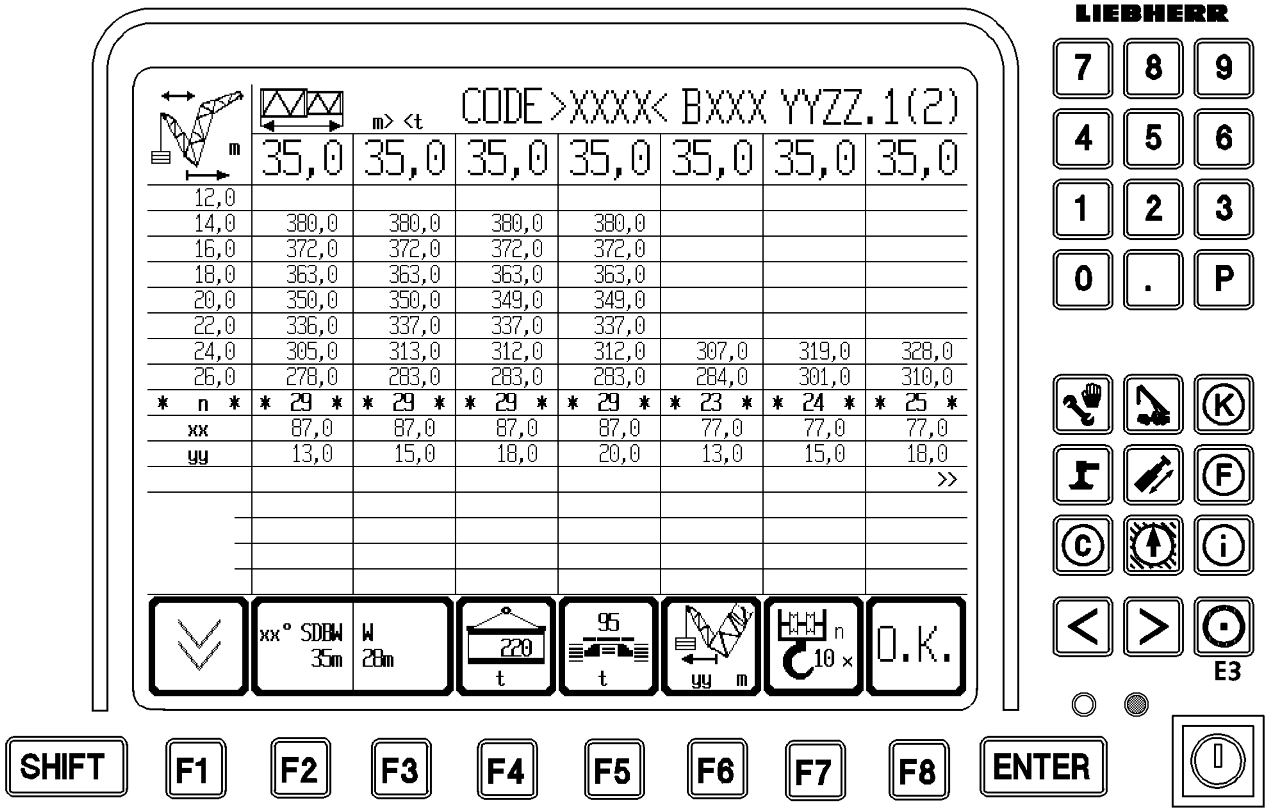
2) ±30° working range*
For the limit slewing angle range (±30° to the side), there are increased load charts. If the crane turns past this angle range, the Load Moment Limiter (LML) automatically shifts to the lower 360° load chart.

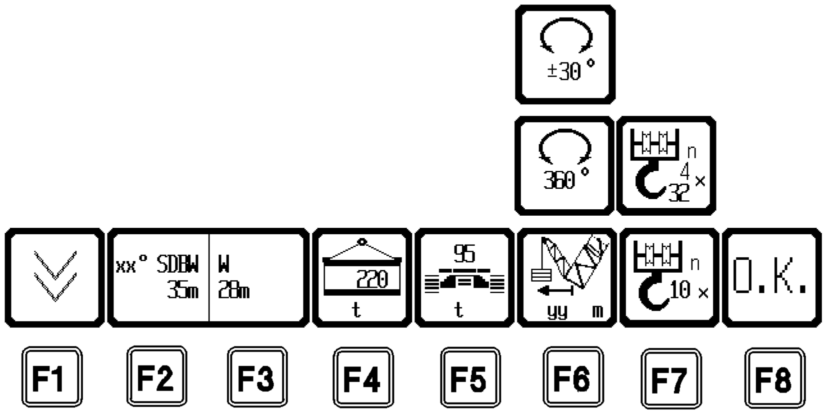
Note: If the current load can only be lifted in limited slewing angle range (±30° to the side), then the slewing speed is reduced to the limit of the slewing range, until "Zero" (slewing range shut off). This eliminates overloading the crane due to slewing.
See paragraph 40, Automatic slewing range change over.

Setting the equipment configuration "Derrick ballast radius"
In operating modes with derrick ballast.

Note: When pressing "F4", "F5" or "F6", all operating mode dependent data is shown (if they were first deleted and the selected operating mode exists). The short code is then always Code>????<.

* Optional


LIEBHERR
m> <t
CODE >XXXX< BXXX YYZZ.1(2)
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
O.K.
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
E3
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


±30°
360°
n 4 32 ×
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
O.K.
F1 F2 F3 F4 F5 F6 F7 F8

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"F7" Setting the "Hoist cable reeving"
Press the "F7" key to set the number of hoist cable strands, which is reeved on the corresponding pulley head (boom, boom nose).

Note: The reeving for the boom nose (upper number) is only shown if the boom nose is installed. If the boom nose is installed while the operation program is running, then the reeving of the boom nose must be entered correctly in the "Set up" program.

"F7" The number of the **hoist cable reeving of the boom** shown in the symbol can be increased by 1 by pressing the key, to the maximum value for the corresponding operating mode; then the counter starts again at the minimum value for this operating mode.

"SHIFT" +"F7" The number of the **hoist cable reeving of the boom** shown in the symbol can be decreased by 1 by pressing the key, to the maximum value for the corresponding operating mode; then the counter starts again at the minimum value for this operating mode.

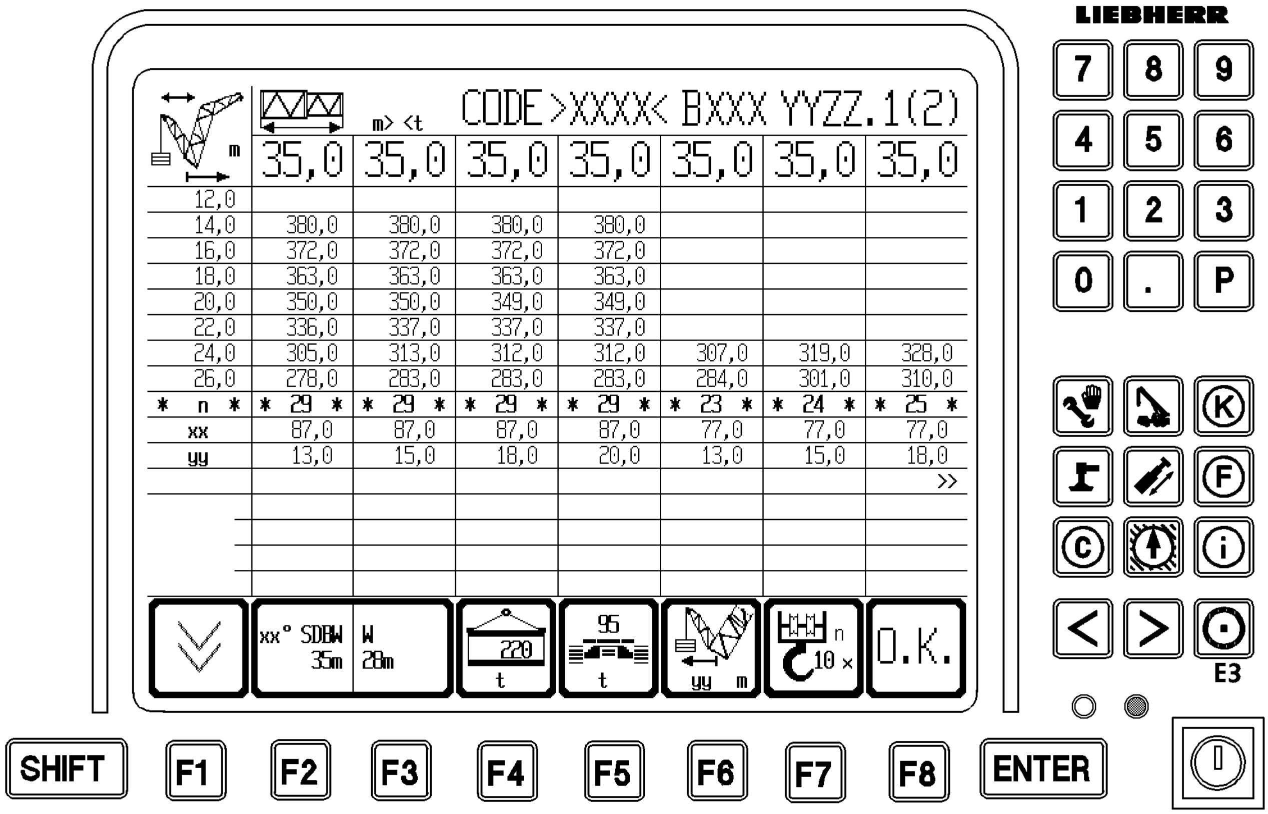
"E3" + "F7" The input value (upper number) for the **hoist cable reeving of the boom nose** can be increased by 1 by pressing the key .
(See "F7")

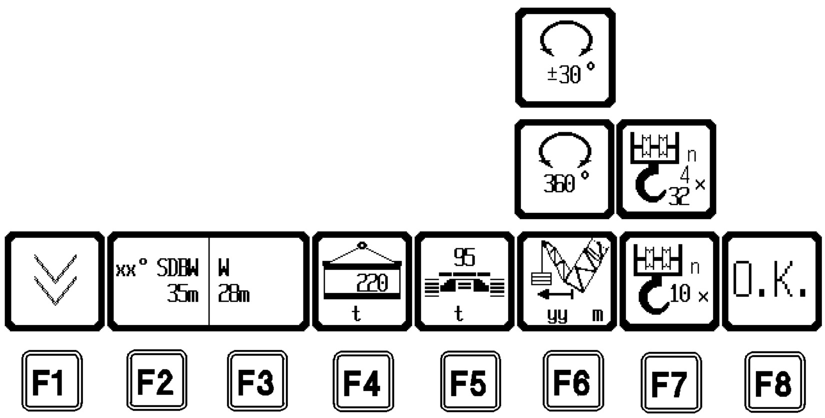
"SHIFT" + "E3" + "F7" The input value (upper number) for the **hoist cable reeving of the boom nose** can be decreased by 1 by pressing the key .
(See "SHIFT" + "F7")

Note: If the set value is within this range (minimum value $\leq$ actual value $\leq$ maximum value), when changing over, then it retains its validity. Otherwise the input value is set to the minimum value of the new operating mode.

C A U T I O N : For parallel operation of hoist winches an even reeving must always be used and entered. If the minimum value is uneven, then the next higher reeving number must be set for parallel operation of hoist winches.

Note: After a "cold start" (for example data loss in memory bank), the indication of hoist cable reeving is on "0".


LIEBHERR
m> <t
CODE >XXXX< BXXX YYZZ.1(2)
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220
t
95
t
yy m
n
10 ×
O.K.
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
E3
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


±30°
360°
n
4
32 ×
xx° SDBW 35m
W 28m
220
t
95
t
yy m
n
10 ×
O.K.
F1
F2
F3
F4
F5
F6
F7
F8

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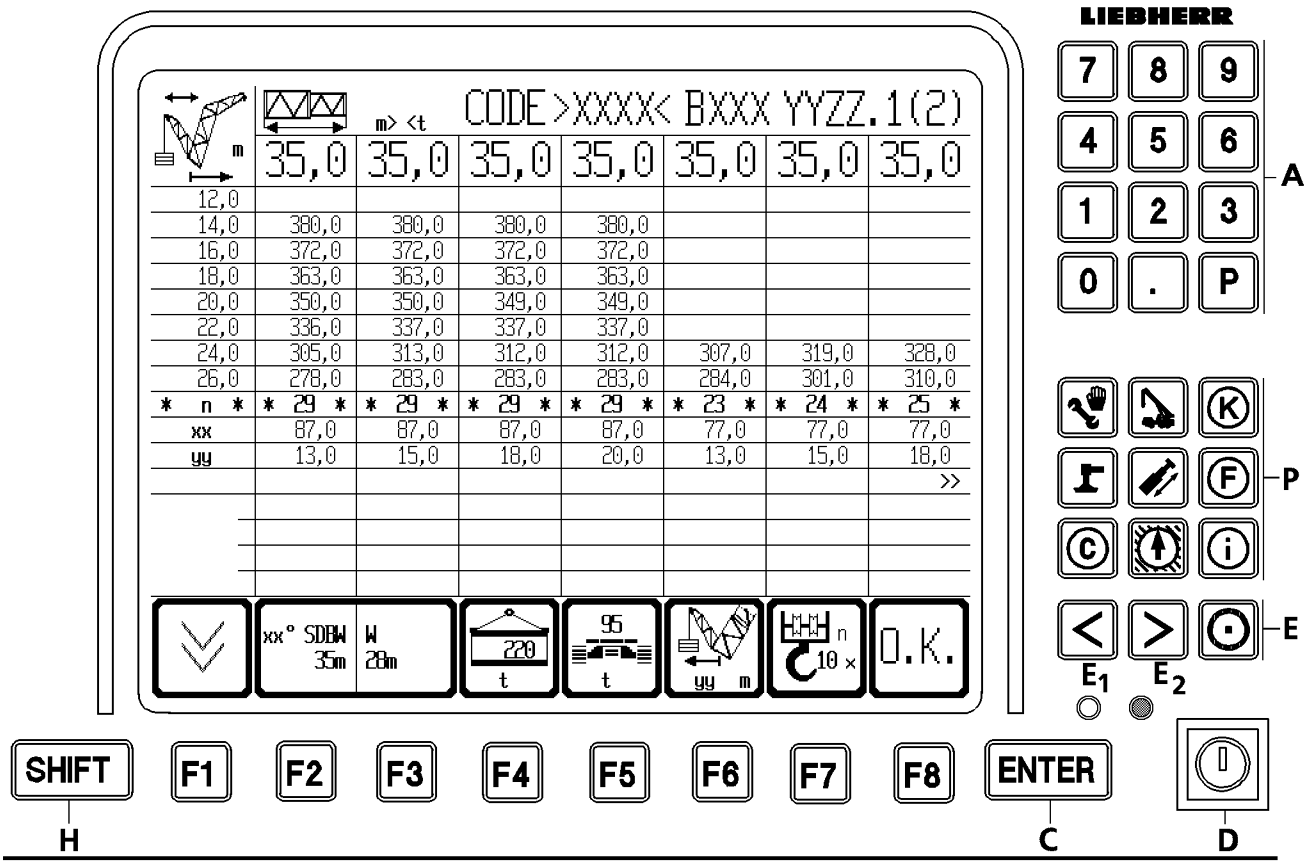
"F8" 1) Confirmation of entered equipment configuration
By pressing the ""F8 / O.K." key, the selected equipment configuration and the selected reeving is confirmed and the parameters are transferred to the "Operation" program.
The following must be observed:
- The setting of the equipment configuration must be completed, which means a valid short code is shown and in the chart field are load capacity values.
- The external conditions for this equipment configuration, if stipulated, must also be met (for example: slewing platform lock).
- The crane may not be utilized by more than 20%, or the load hanging on the hook may not be heavier than 0.5 t .

Otherwise, change over to the "Operation" program can only be made via the program key "P1". In this case, the new settings for the equipment configuration are not taken over.

Note: It must be ensured that the selected equipment configuration (short code) and the hoist cable reeving (s) have been accepted after shifting into the operation view .

2) Indication of operating errors, which were caused in the "Set up" program.
Operating error, which were created in the "Set up" program are shown for approx. 5 seconds in the symbol element above the "F8" key. If the "F8" key is pressed within 5 seconds, then the system changes automatically to the error determination view in the test system, where the error is documented. Operating errors are not stored.

Note: Operating errors are always on top of the error stack.
See also chapter 7.10, Diagnostics.


LIEBHERR
CODE >XXXX< BXXX YYZZ.1(2)
m> <t
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 x
O.K.
A
P
E
E1
E2
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
C
D

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11.4 Other control elements

The other control elements on the LICCON indicator and control unit, which are located in the "set up" program have the following functions :

A Alpha numeric keyboard

With the keys "1" to "9" of the alpha-numeric key block, direct access is provided to the short code field in the General information line and the short code is entered. .

Note: Using the alpha-numeric keys deletes all operating mode and equipment configuration dependent data from the monitor.

The keys "P" and "." have no function in the "set up " program.

P Program keys

With the program keys you can select between the various programs. The settings entered in the equipment configuration program are thrown out and the system continues to use the equipment configuration and the reeving which had been confirmed last with "O.K.".

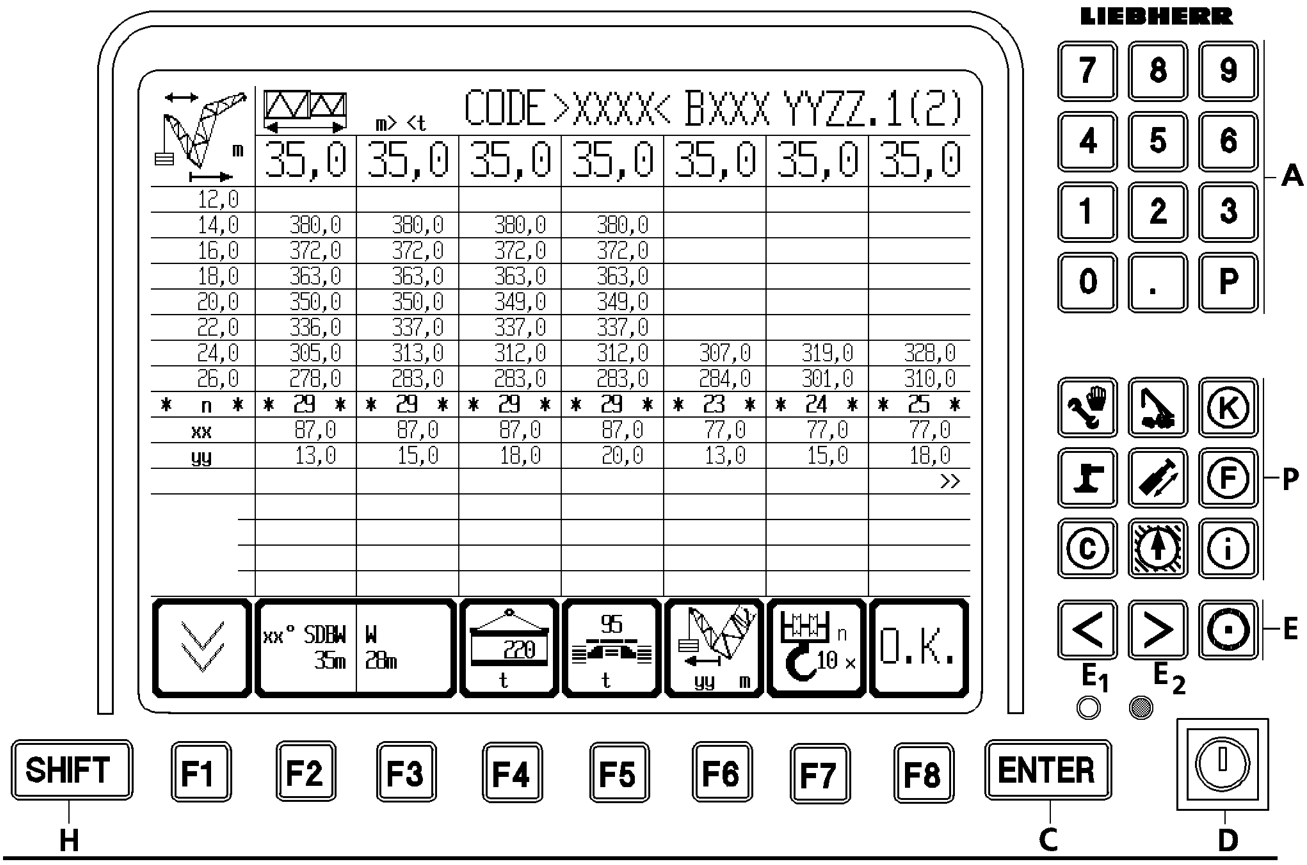
Note: The currently running program **cannot be recalled** by pressing its program key.

C Input key "ENTER"

- "ENTER" is the input confirmation when entering the short code as well as when changing the equipment configuration via the function keys.
- "ENTER" after short code input searches the short code in all stored load capacity charts. If the corresponding load capacity chart has been programmed into the system, then it is shown completely (including the lettering on the symbols in the function key bar), otherwise there is an error message in the form of question marks "????" in the 2nd part of the organization number (see General information line) and the horn can be heard.
- "ENTER" after changing the operating mode via the function keys searches for this operating mode, in case of success it sets the 1st equipment configuration and shows the corresponding load capacity chart and its short code. In case of an error, the short code indication remains on CODE >???<, "B xx????" is shown as the organization number and the horn can be heard.
- "ENTER" after changing the equipment configuration with function keys "F4", "F5", "F6" shows that load capacity chart,if available, with short code on the monitor. In case of an error, the short code remains on CODE >???< and the horn can be heard.

D Keyed switch

Bypass of overload safety and hoist top shut off, see paragraph 6.7.


LIEBHERR
CODE >XXXX< BXXX YYZZ.1(2)
m> <t
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
O.K.
7 8 9
4 5 6
1 2 3
0 . P
A
K
F
P
C
i
E
E1 E2
SHIFT
F1 F2 F3 F4 F5 F6 F7 F8
ENTER
H
C
D

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E Horizontal paging "E1" and "E2"

If a load capacity chart consists of more than 7 columns, then columns 1 to 7 are always shown during the first display of the equipment configuration.

A double arrow on the rear / front edge of the line shows that there are still additional columns in this direction.

Press "E2" , the next column to the right is shown.
Press "E1" , the next column to the left is shown .

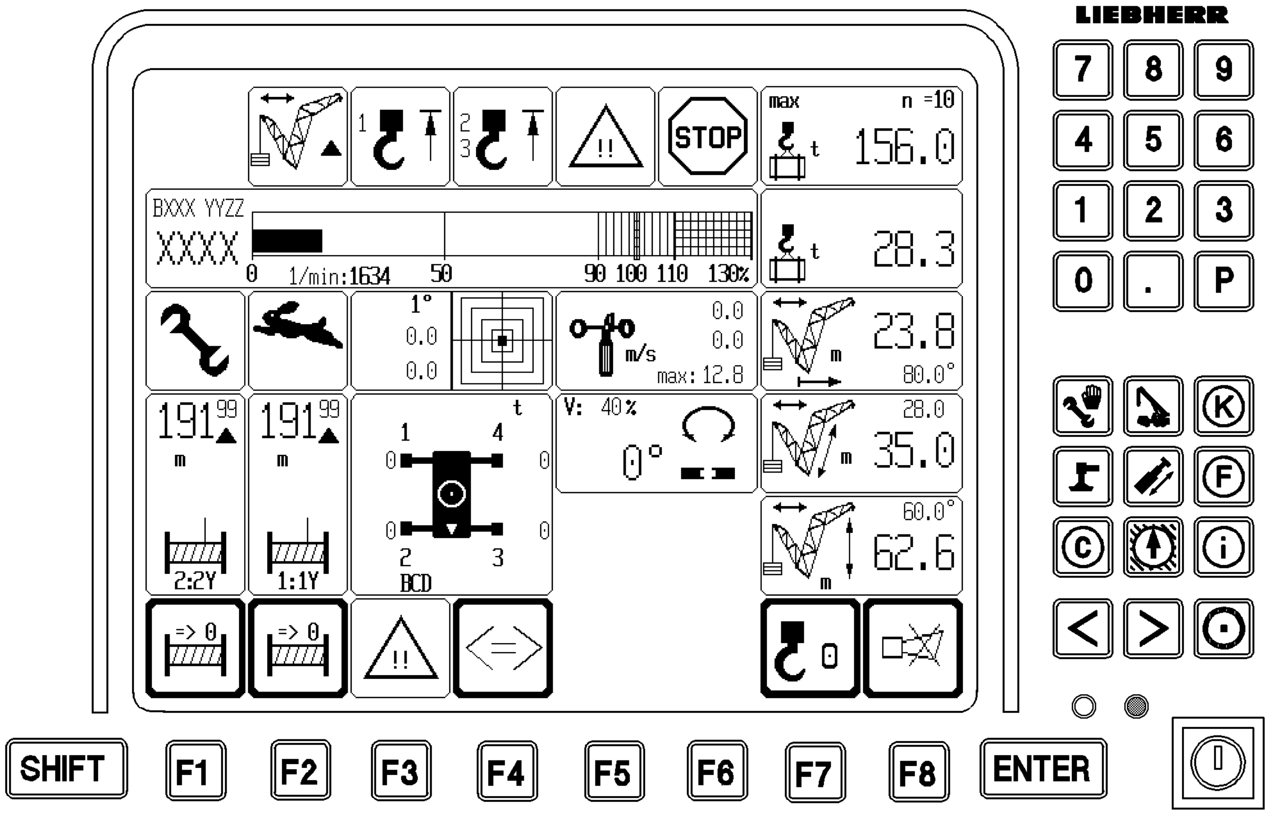
Note: The keys "E1" and "E2" are only functioning if it is noted in the ”line for special indications”.

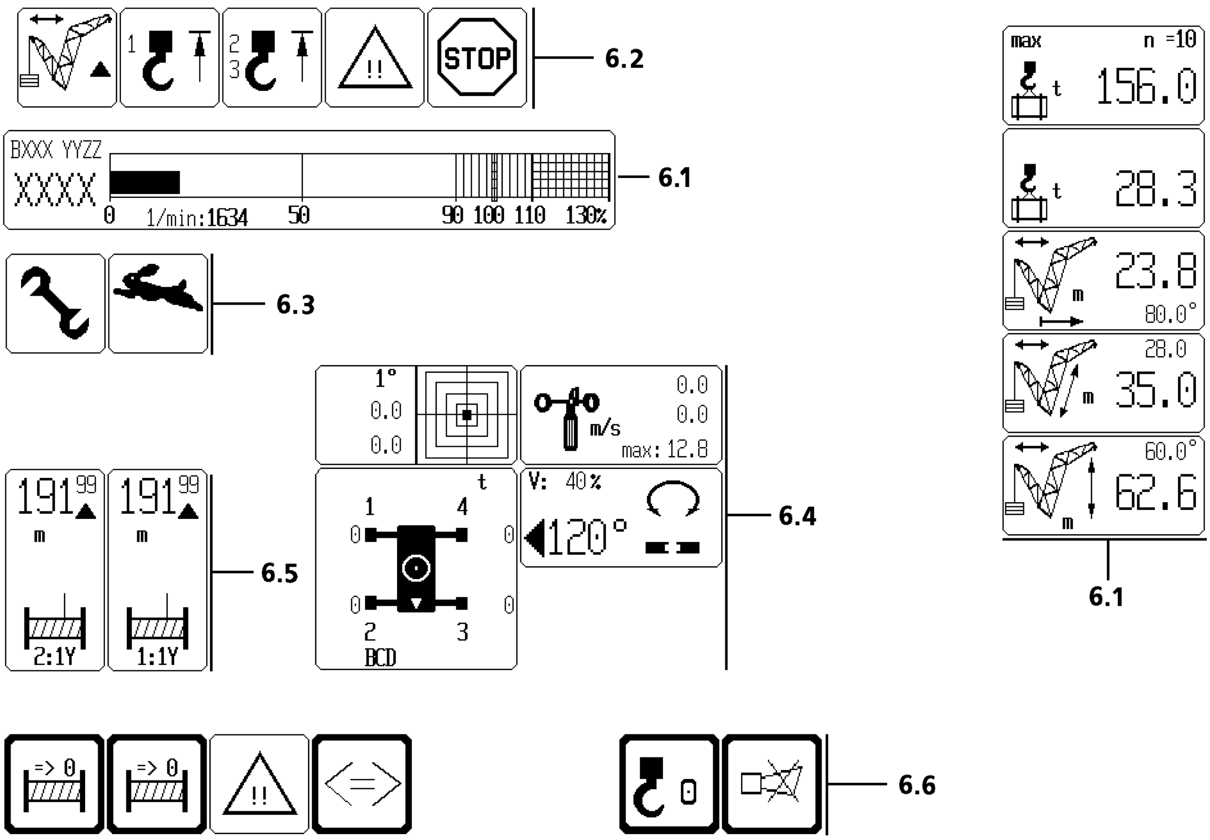
Brightness adjustment of monitor

See paragraph 4.2.4

H SHIFT key

By pressing the "SHIFT" key and a function key at the same time, the previous main geometry condition, auxiliary equipment geometry condition and the previous reeving number are reset.
See paragraph 5.3 The function keybar .





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12. The "Operation" program Monitor 0

The LICCON ”Operation” program supports the crane operator by displaying relevant data for crane operation on monitor 0, in a clear view. In addition, the crane operator is alerted about upcoming overload conditions. In case of an overload and a number of error conditions, which could endanger crane operation, the crane is shut down.

The monitor is divided into six areas in the "Operation" program:

12.1 Information about crane geometry and load

12.2 Alarm functions

12.3 Special functions

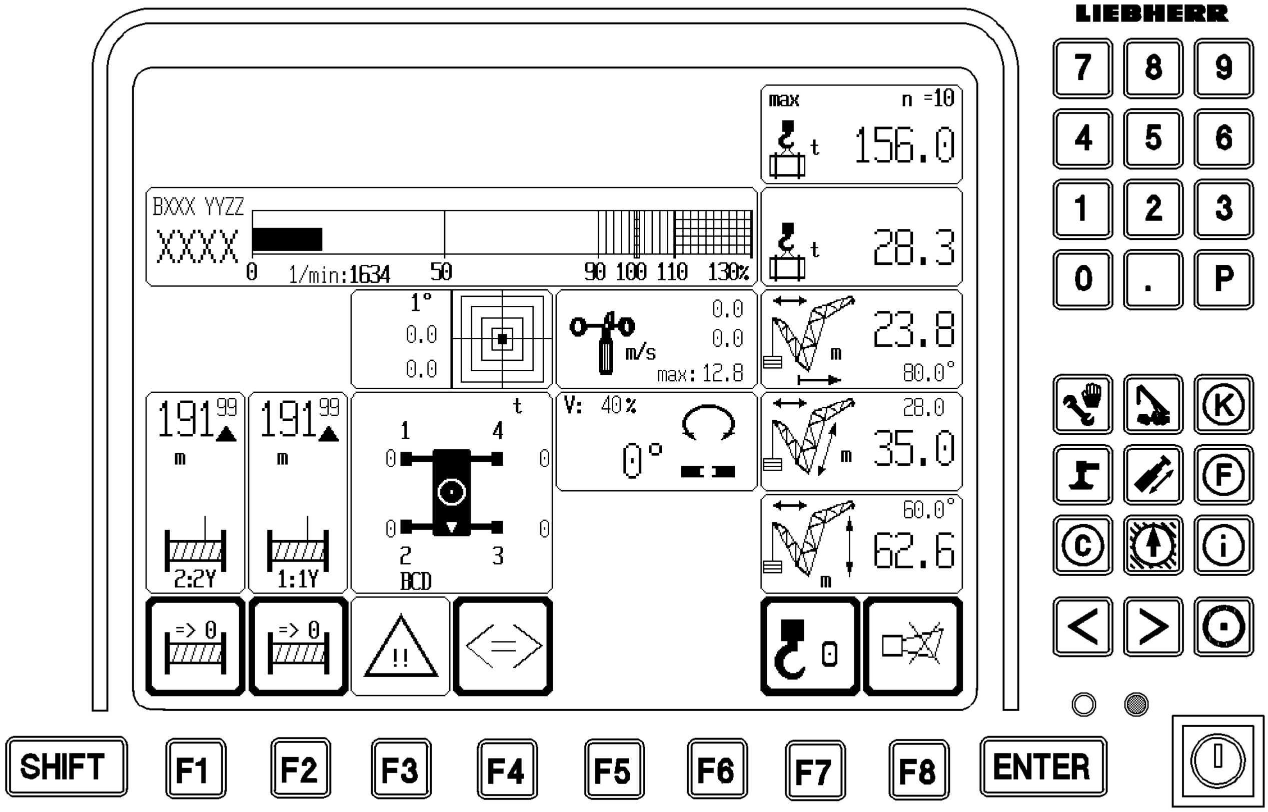
12.4 Monitored added functions

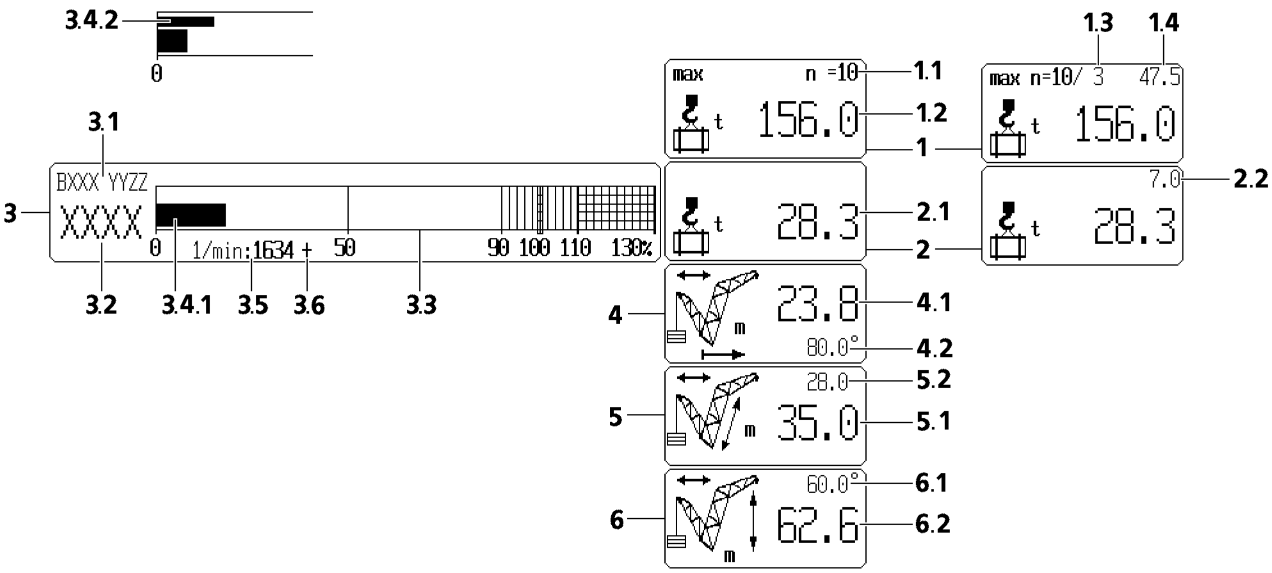
12.5 Winch indication Winch 1 and 2

12.6 Function keybar symbol line

12.7 Other control elements

Note: The monitor illustrations in this chapter **are only examples**. The numeric values in the individual symbol elements and charts might not match this particular crane. The configuration of the LICCON monitor with the symbol elements is only used to describe the system.
In addition, some illustrations of the monitor show the maximum possible assignment of the LICCON monitor with symbol elements. In normal crane operation, an identical display would not appear on the LICCON monitor.


LIEBHERR
max n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
23.8
80.0°
28.0
35.0
60.0°
62.6
V: 40%
0°
m/s
max: 12.8
2:2Y
1:1Y
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


3.4.2
3.1
3
3.2
3.4.1
3.5
3.6
3.3
1.1
1.2
1
1.3
1.4
max n=10/ 3 47.5
2.1
2
2.2
7.0
4
4.1
4.2
5
5.1
5.2
6
6.1
6.2

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12.1 Information about crane geometry and load

1) Symbol elements "Maximum load capacity" in weight unit in tons (t) or pounds [lbs]

1.1 The reeving number of the hoist cable which is reeved for the pulley head, which has been selected via the load chart .

1.2 Maximum load in [t] or [lbs], which can be carried on the selected pulley head of the boom, according to load capacity chart and reeving is shown in the indicated weight unit of tons [t] or pounds [lbs].
The "maximum load which can be carried according to the load capacity chart and reeving" depends:
- on the selected operating mode
- on the selected equipment configuration (→ Load capacity chart)
- on the radius
- on the main boom angle or jib relative angle*
- on the derrick ballast radius *
- on the reeving of the hoist cable

Note: The "maximum load carrying capacity according to the load chart and reeving" is independent of the size of the derrick ballast.

In operating modes with derrick ballast, the "maximum load carrying capacity according to the load chart " is the load, which the crane can lift in the current operating condition **with** the optimum (large) derrick ballast . The calculation of the optimum derrick ballast is described in the load chart manual. If the derrick ballast is smaller than the optimum ballast, then the load shown in 1.2 cannot be lifted. The system shuts off before via test point 1 - Operation maximum force.

Note: "? ? . ?" is shown if no load capacity chart value is available, for example if the crane is not within the range of the load capacity chart or one or more sensor errors or defects occurred, and the radius cannot be calculated.

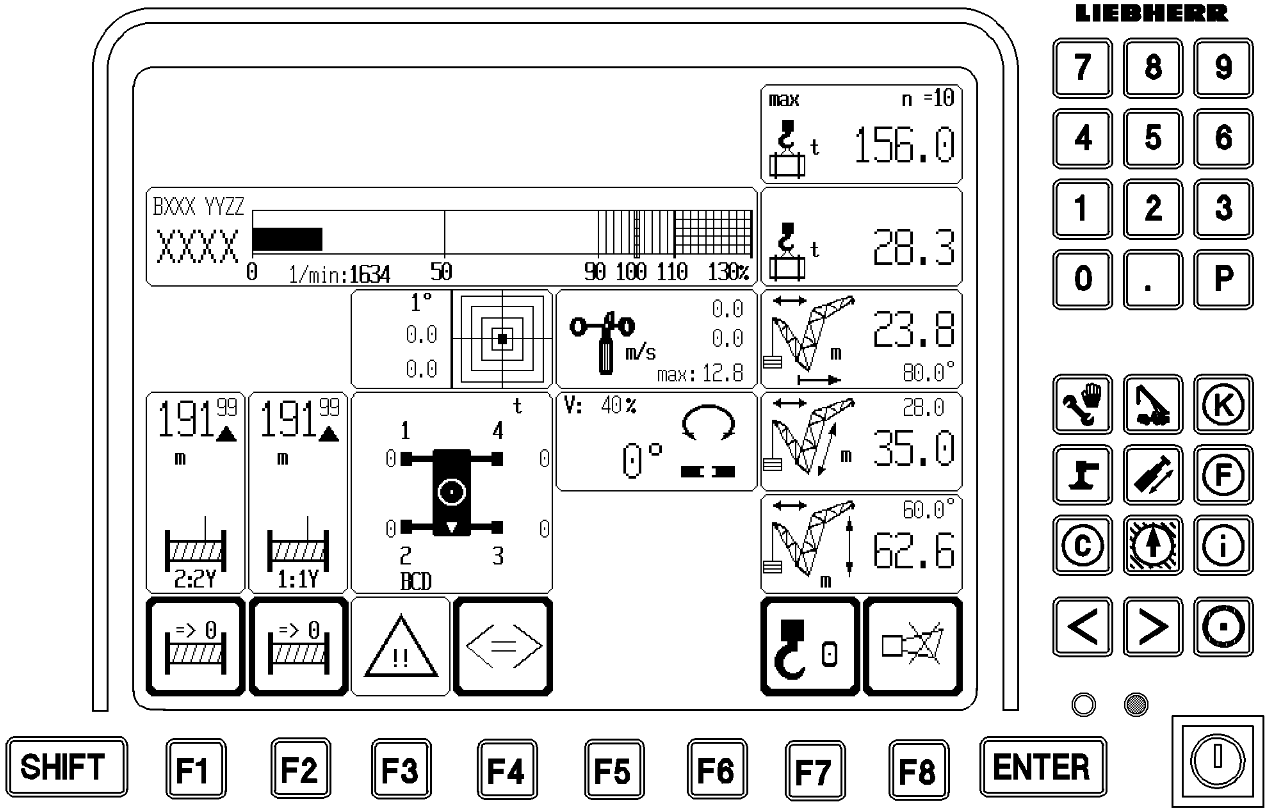
1.3* Reeving number of the hoist cable, which is reeved on the pulley head fo the boom nose * selected via the load chart.

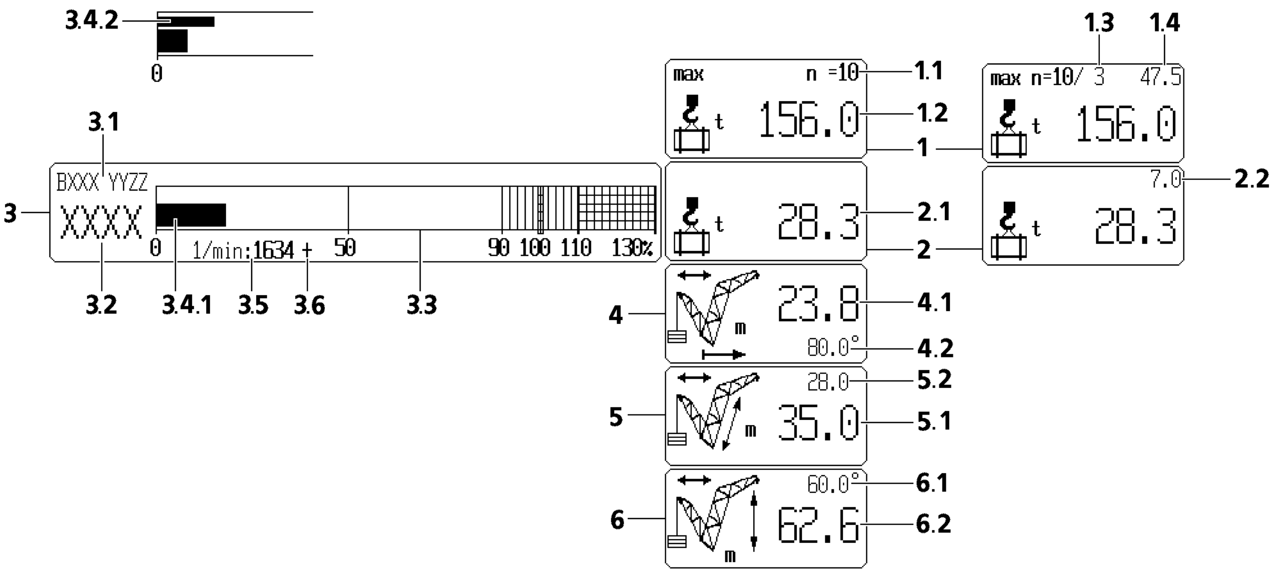
1.4* Maximum load on the installed boom nose *

Note: The maximum load carrying capacity on the boom nose depends only on the set reeving of the boom nose.

C A U T I O N : Both load carrying capacities (as described in paragraph 1.2 and 1.4) are monitored at the same time. If the load carrying capacity of the boom is being exceeded, then the LML stop is triggered. The hoist gear up function is shut off in all hoist gears. The luff down function is shut off on all booms.

* Optional


LIEBHERR
max n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
23.8
80.0°
V: 40%
0°
28.0
35.0
60.0°
62.6
BCD
2:2Y
1:1Y
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


3.4.2
3.1
3
3.2
3.4.1
3.5
3.6
3.3
1.1
1.2
1
1.3
1.4
max n=10/ 3 47.5
2.1
2
2.2
7.0
4
4.1
4.2
5
5.1
5.2
6
6.1
6.2

190983

2) Symbol elements "current load" in weight unit in tons [t] or pounds [lbs]

2.1 Current load (actual load indication) on the boom

= Load (in weight unit in tons [t] or pounds [lbs], which is currently suspended from the crane hook.

The calculated total load on the boom is shown, including hook block and tackle, but without the nominal weight of the hoist cable.

Note: Nominal weight of hoist cable = Reeving × pulley head height × specific hoist cable weight

See chapter 4.03, Weighing the load.

If the function key ”Tara” is pressed (see description "F7" in paragraph 6.6), then the indication can be changed over to net load indication. In this case, the word ”net” appears in the symbol, and the description of the weight unit is next to the load symbol.

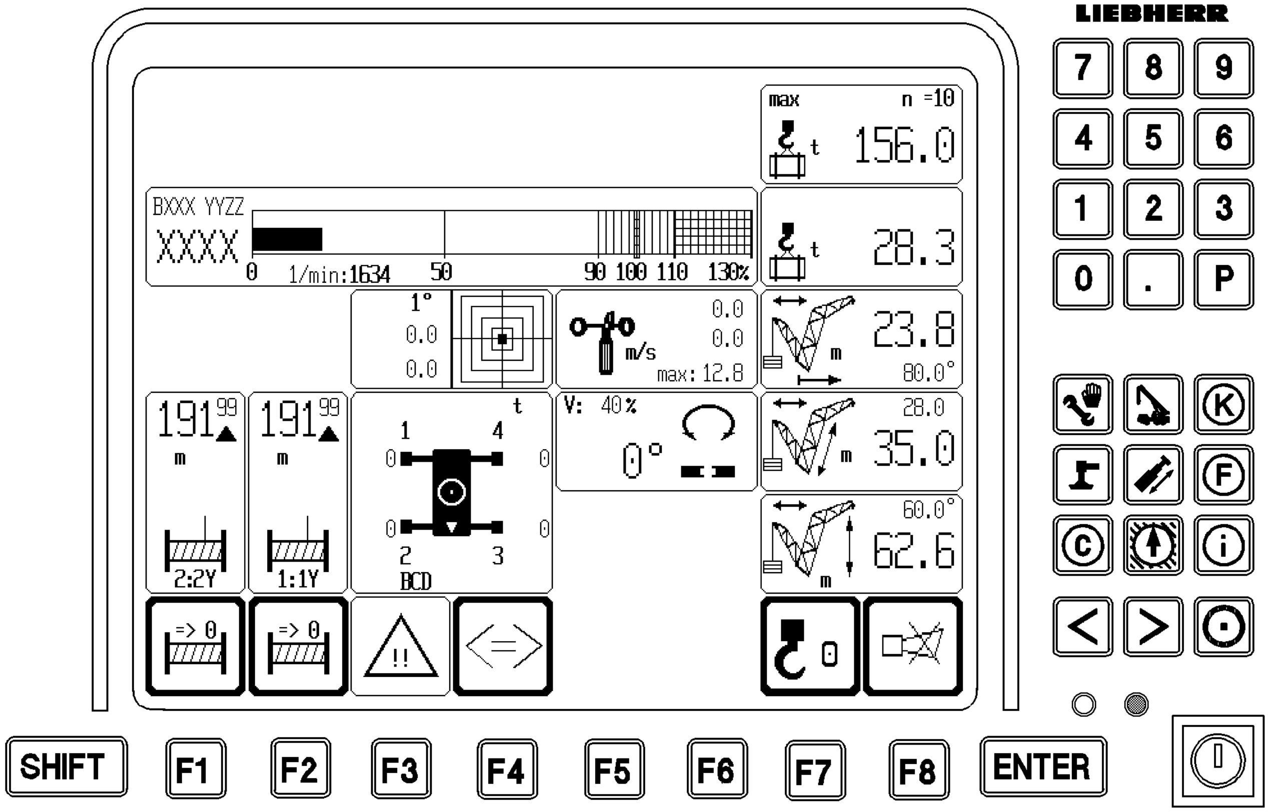
Note: "? ? ? . ?" is shown if one or more sensors are missing or are defective, so that the current load cannot be calculated.

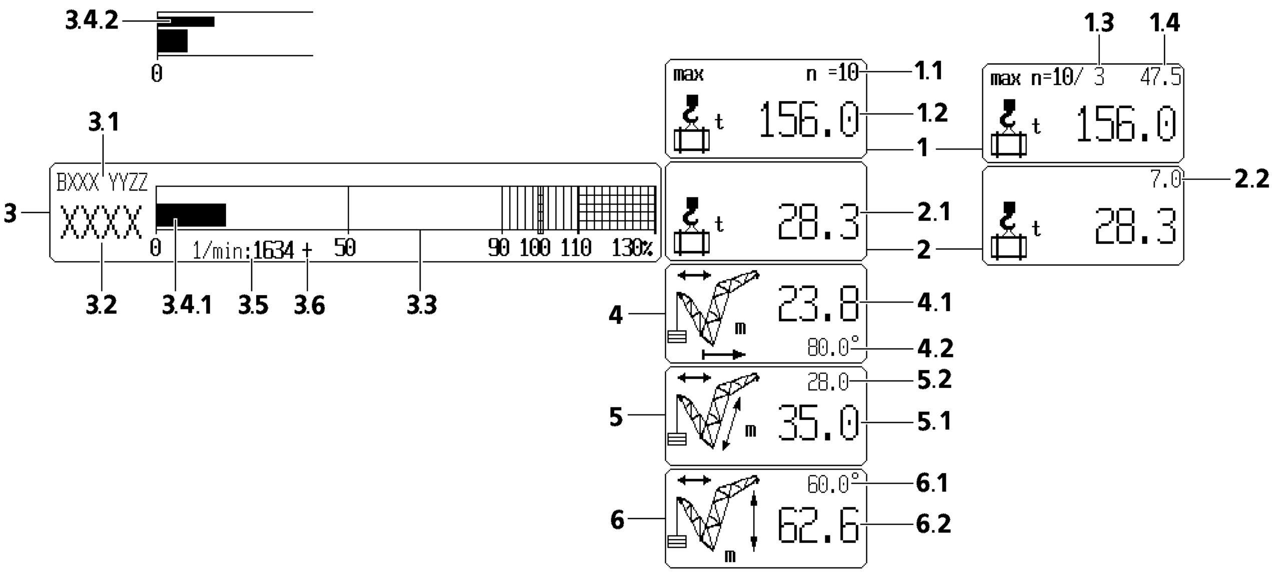
2.2 Current load (actual load indication) on the boom nose *

The calculated total load on the boom nose is shown, including the weight of the hoist cable, hook block and tackle.

If the function key ”Tara” is pressed (see description "F7" in paragraph 6.6), then the indication can be changed over to net load indication. In this case, the word ”net” appears in the symbol, and the description of the weight unit is next to the load symbol.

Note: "? ? ? . ?" is shown if one or more sensors are missing or are defective, so that the current load cannot be calculated.


LIEBHERR
max n =10
156.0
28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
23.8
80.0°
28.0
35.0
60.0°
62.6
max:12.8
V: 40%
0°
BCD
2:2Y
1:1Y
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


3.4.2
3.1
3
3.2
3.4.1
3.5
3.6
3.3
BXXX YYZZ
XXXX
0 1/min:1634 + 50 90 100 110 130%
max n =10
156.0
1.1
1.2
1
1.3
1.4
max n=10/ 3 47.5
28.3
2.1
2
7.0
2.2
4
23.8
4.1
80.0°
4.2
5
28.0
5.2
35.0
5.1
6
60.0°
6.1
62.6
6.2

190983

3) Symbol element "Utilization" [%]

3.1 8- digit organization number
shows the type of selected load capacity chart and the operating mode, see paragraph 5.

3.2 Short code (CODE >Zahl<) of the set equipment configuration , see paragraph 5.

3.3 Utilization scale
The utilization scale is marked on important points by percentages.
- Prewarning from 90 % utilization
- STOPshut off at 100 %utilization

3.4 Utilization bar

3.4.1 Utilization bar of the crane according to load chart and reeving

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

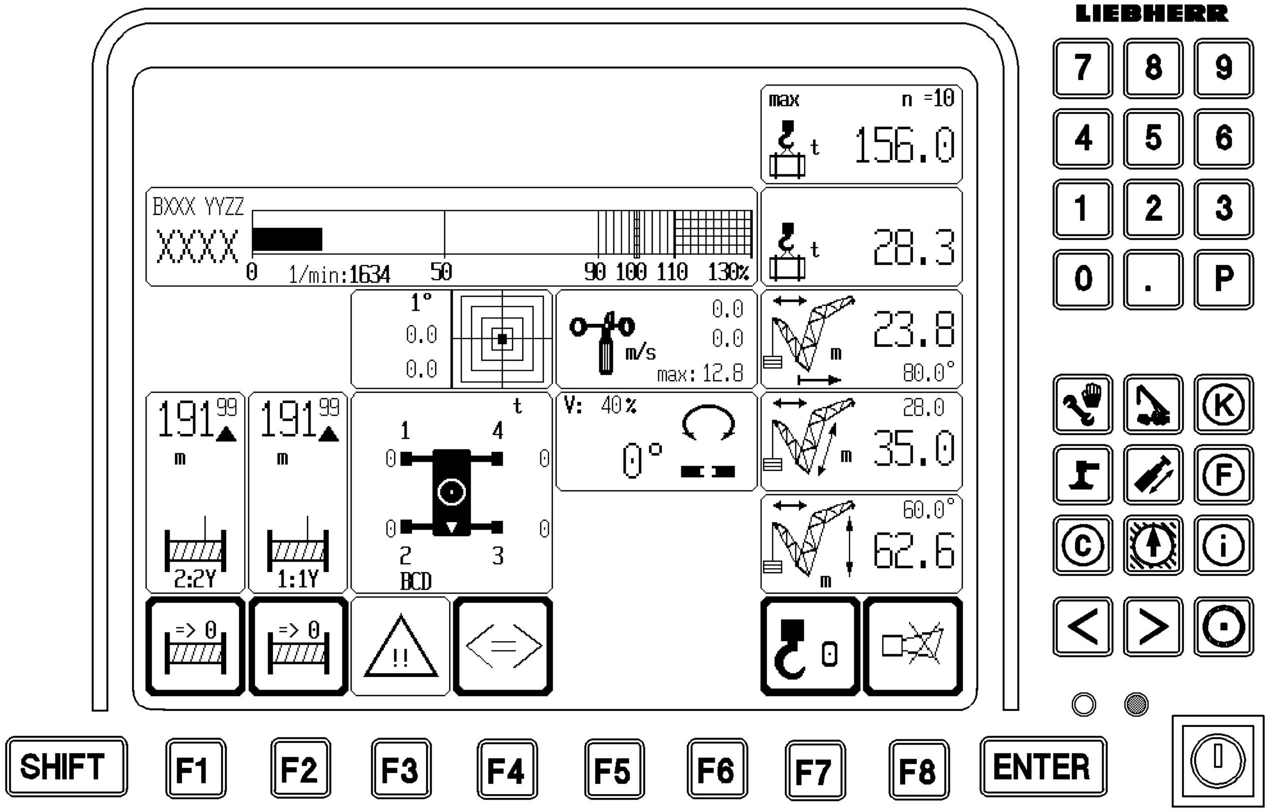
Note: In operating modes with derrick ballast, the utilization bar shows the utilization of the crane with optimum ballast. With partial derrick ballast, there is still another measurement of the utilization of the crane on test point 1 (see paragraph 21.4).

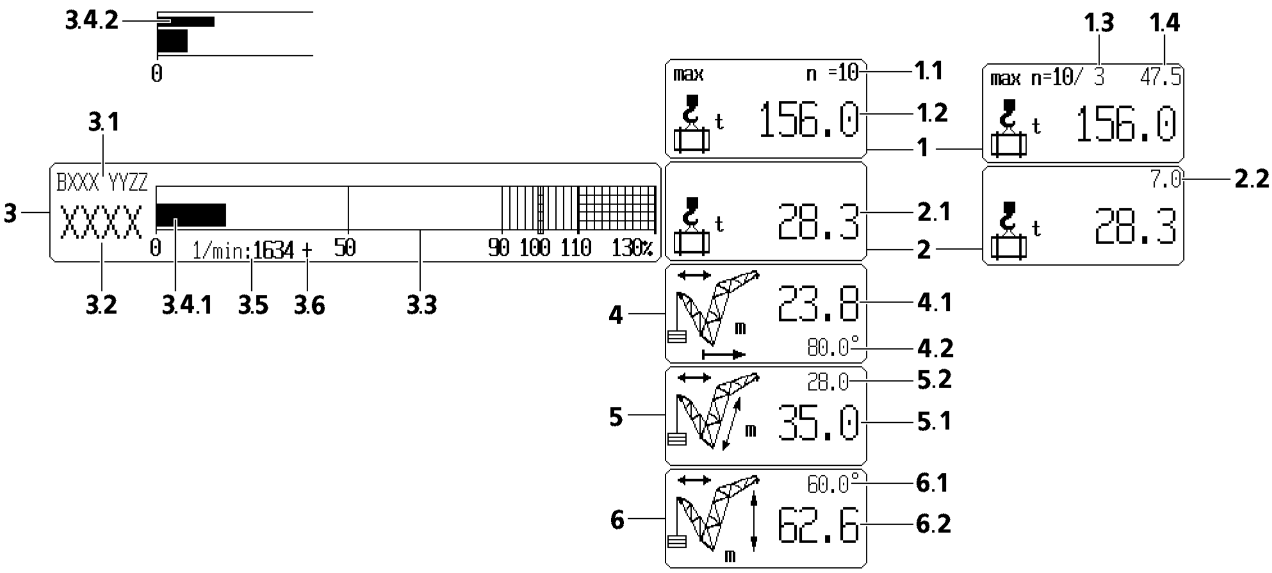
C A U T I O N : In operating modes without derrick ballast, this utilization bar is the only measurement for the utilization of the crane.

3.4.2 Utilization bar of the boom nose *

$$\text{Utilization of the boom nose} = \frac{\text{Current load on the boom nose}}{\text{maximum load on the boom nose}}$$

Note: The current load carrying capacity on the boom nose is the capacity, which the boom nose is able to lift alone, at sufficiently high maximum load carrying capacity on the boom head and in operating modes with derrick ballast at sufficiently high F1-operating max-limit.


LIEBHERR
max n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
1°
0.0
0.0
0.0 m/s 0.0 max: 12.8
23.8
80.0°
191 99 m
191 99 m
2:2Y
1:1Y
t 1 4 0 0 0 0 2 3 BCD
V: 40%
0°
28.0
35.0
60.0°
62.6
=> 0
=> 0
!!
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P


3.4.2
0
3.1
3
BXXX YYZZ
XXXX
0 1/min:1634 + 50 90 100 110 130%
3.2
3.4.1
3.5
3.6
3.3
max n =10
156.0
1.1
1.2
1
1.3
1.4
max n=10/ 3 47.5
156.0
28.3
2.1
2
7.0
2.2
28.3
4
23.8
80.0°
4.1
4.2
5
28.0
35.0
5.2
5.1
6
60.0°
62.6
6.1
6.2

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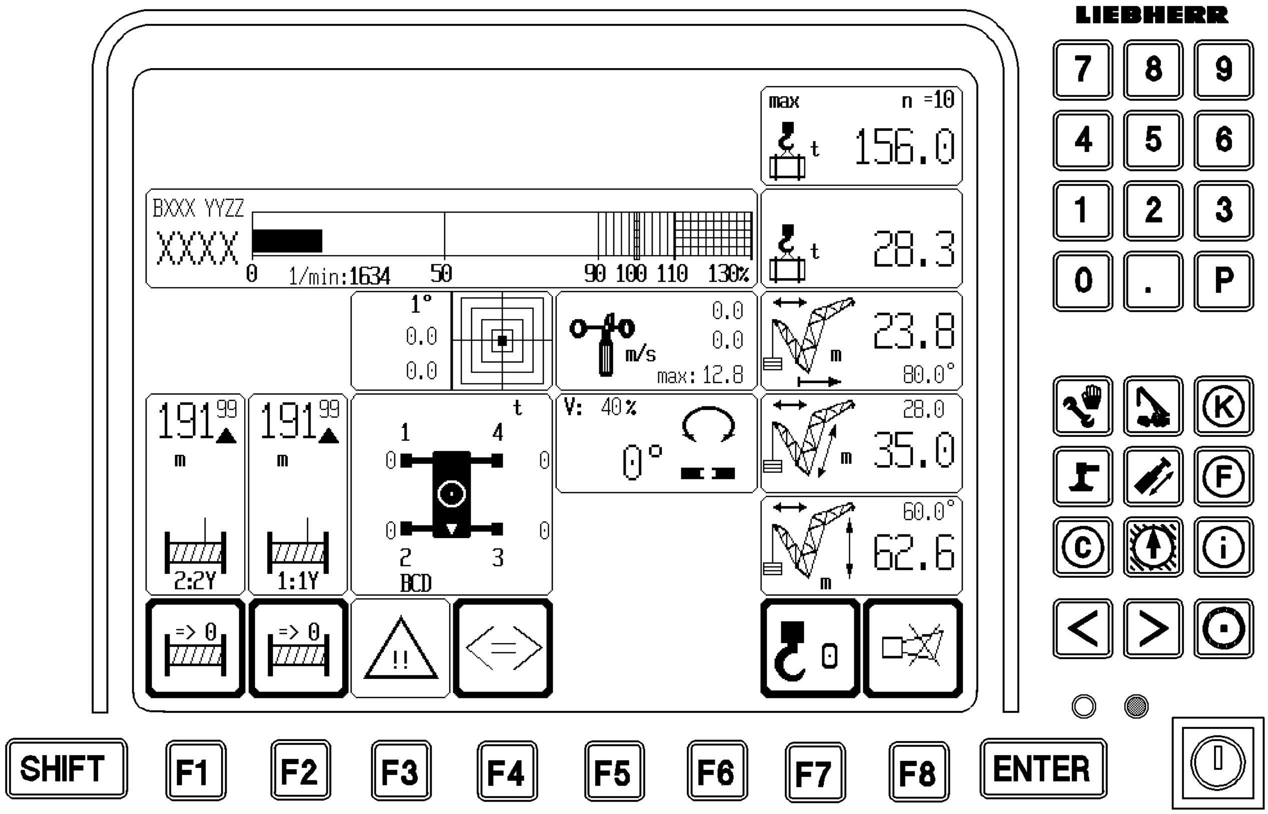
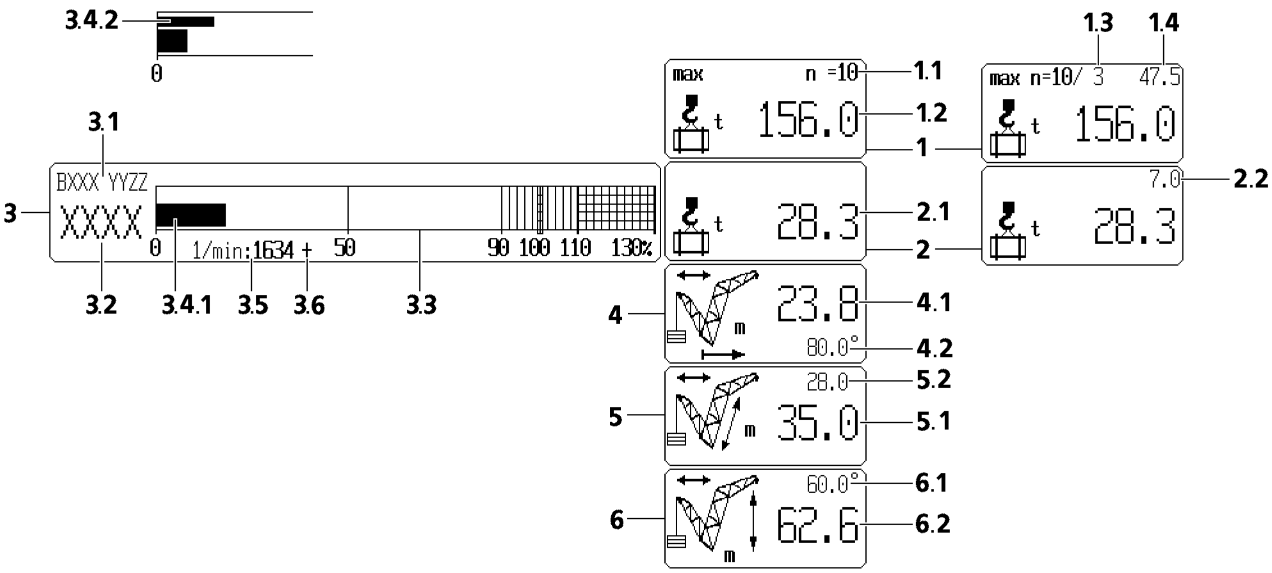
3.5 Current engine RPM in [1/min]

Note: "????" is shown in case of an invalid RPM value (for appro. 10 seconds). If there is a problem, the system changes to fixed RPM. The indicator blinks, in addition, an error message is issued.

3.6 Lock the engine RPM
The engine RPM can be locked / retained with the button on the master switch. In case of a locked engine RPM, the symbol " + " appears after the RPM data.




3.4.2
0
3.1
BXXX YYZZ
3
XXXX
0 1/min:1634 + 50 90 100 110 130%
3.2
3.4.1
3.5
3.6
3.3
max n =10
156.0
1.1
1.2
1
28.3
2.1
2
23.8
80.0°
4
4.1
4.2
28.0
35.0
5
5.1
5.2
60.0°
62.6
6
6.1
6.2
1.3
1.4
max n=10/ 3 47.5
7.0
2.2

190983

4) Symbol element "Radius" with length unit in meters [m] or feet [ft]

4.1 Radius in [m] or [ft]
= horizontal distance of load on the load hook for the operating mode from the turning axle of the crane superstructure, measured on the ground. The boom flexation due to its own weight and the suspended load has been taken into consideration.

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

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

Note: "? ? ?" is shown if both angle sensor values are invalid or if the difference of the two angle sensor is unbelievably large.

5) Symbol element "Main boom length " in length unit of meters [m] or feet [ft]

5.1 Length of main boom in [m] or [ft]

5.2 Length of auxiliary equipment, such as lattice jib in [m] or [ft]

6) Symbol element "Pulley head height" in length unit of meters [m] or feet [ft]

6.1 Angle of lattice jib to the horizontale in [°]
Shown is the value of the angle sensor in the pivot section of the lattice jib (bottom). If his angle sensor value is invalid, then the value for the angle sensor on the pulley head of the lattic jib is shown.

Note: "? ? ?" is shown if both angle sensor values are invalid or if the difference of the two angle sensor is unbelievably large.

or

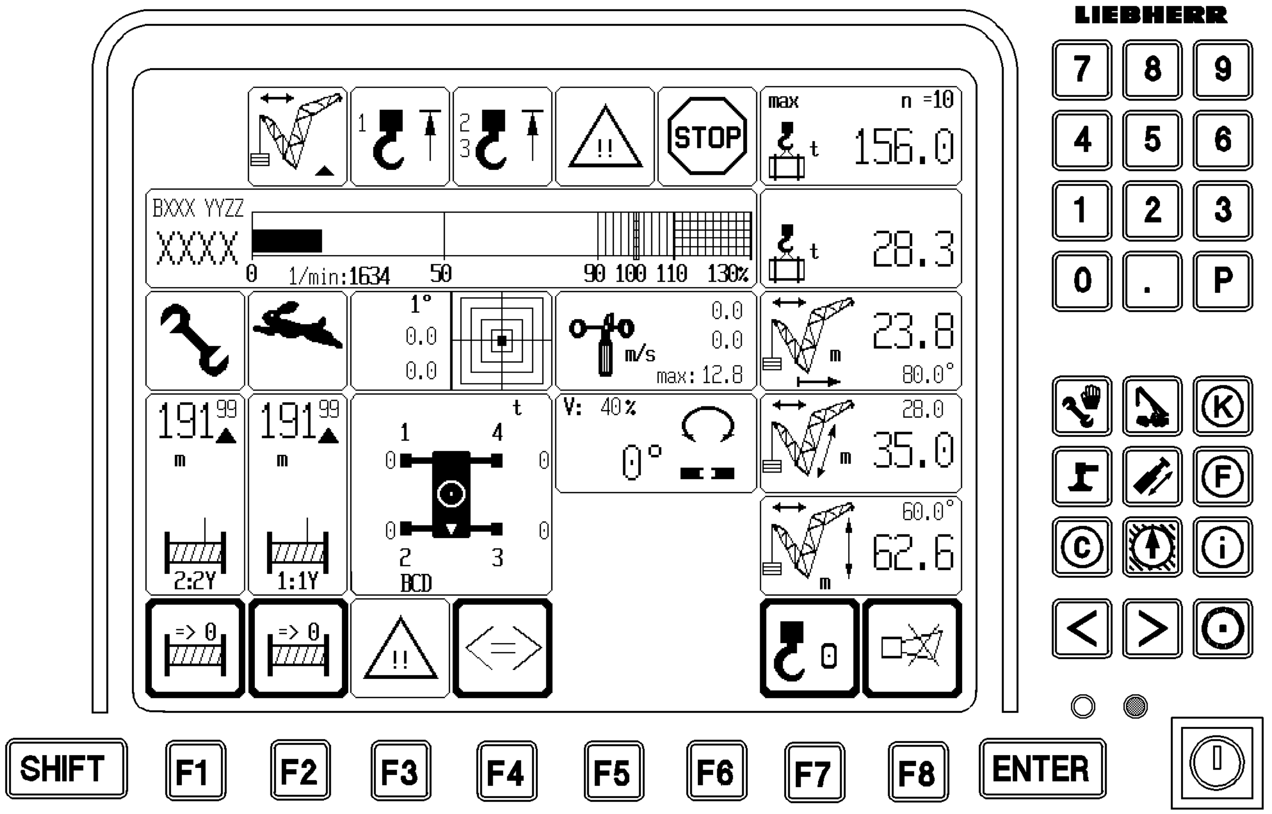
Relative angle between main boom angle (α) and jib angle (β)
($=\alpha - \beta$) in [°]

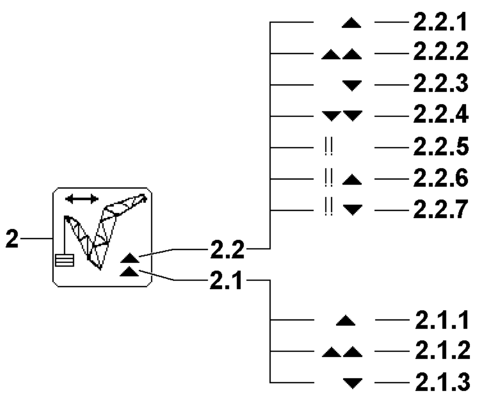
Note: Indication of relative angle alwazs in operating modes with load chart for fixed defined jib relative angle (for example WV)

Note: "? ? ?" is shown if the relative angle cannot be calculated.

6.2 Pulley head height in [m] or [ft]
= vertical distance from ground surface of the crane to the selected pulley head axle, which is valid for the indicated maximum load capacity.

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


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
max n =10
156.0
28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
1°
0.0
0.0
0.0
0.0
m/s
max: 12.8
23.8
80.0°
V: 40%
0°
28.0
35.0
60.0°
62.6
191
191
2:2Y
1:1Y
1 4
2 3
BCD
STOP
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


2.2.1
2.2.2
2.2.3
2.2.4
2.2.5
2.2.6
2.2.7
2
2.2
2.1
2.1.1
2.1.2
2.1.3

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12.2 Alarm functions

The crane movements are monitored in their limit ranges. When these limits are reached, the crane operator is alerted to that fact by blinking symbol elements:

2) Symbol element "Boom limitation "
The luffing range of the boom is limited upward as well as downward. If the end position, which is assigned by the selected load capacity chart, is reached, the operating mode dependent symbol element "Boom limitation " appears .

2.1 Limitation signs for main boom

2.1.1 An arrow pointing upward shows that the shut off of the crane movement "luff up main boom " has been made:
- by triggering the upper load chart limit or
- by utilization $>95\%$ and lowered load carrying capacity when luffing up the boom

Note: The crane movement "luff down main boom" remains possible.

D A N G E R : The shut off of the crane movement "luff up main boom " can only be bypassed with the turned on installation keyed switch.

2.1.2 Two arrows pointing upward show that the shut off of the crane movement "luff up main boom " has been made: :
- by triggering a block limit switch on the main boom
 Relapse cylinders left / right or
- by an error in a block limit switch relapse cylinders.

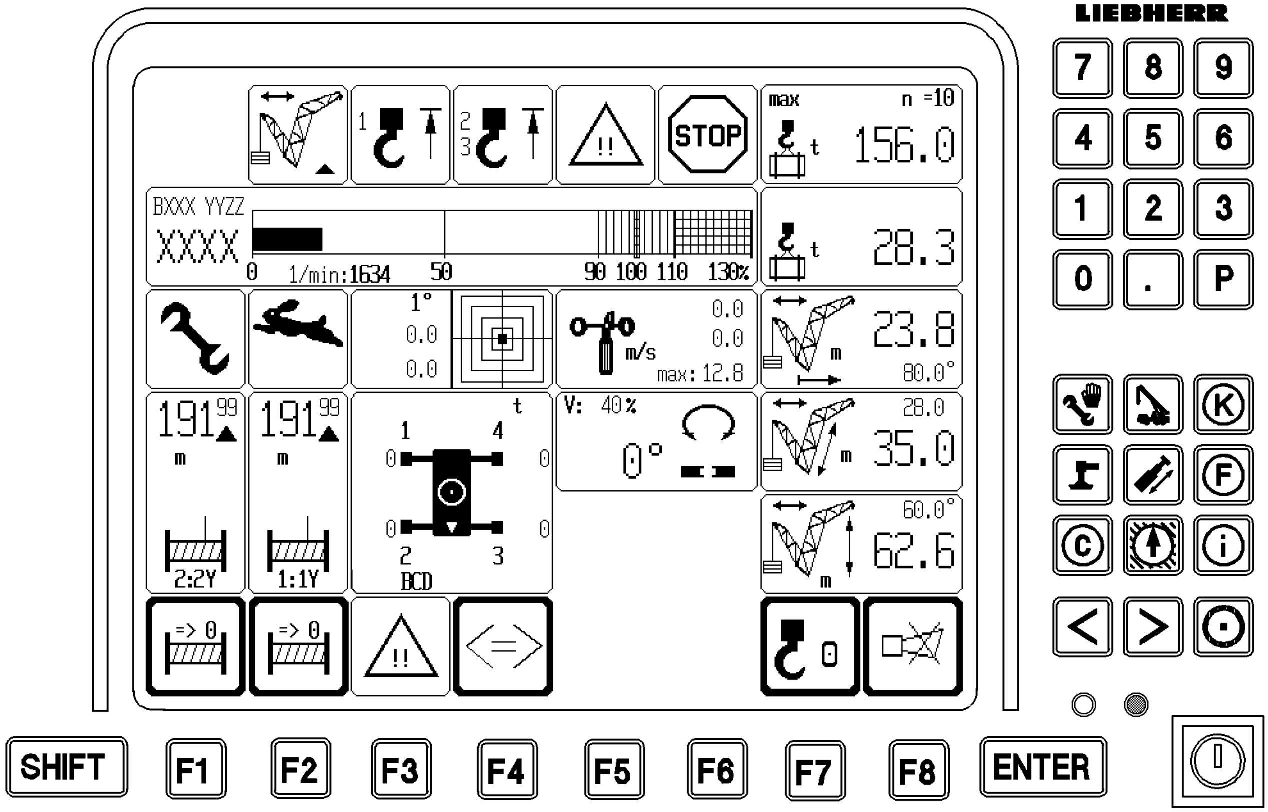
Note: The crane movement "luff down main boom " remains possible, the crane movement "luff up main boom " is shut off and **cannot be bypassed**.

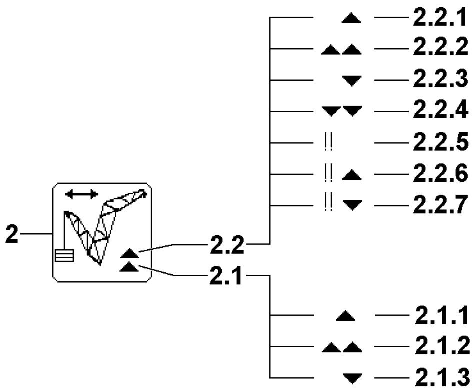
2.1.3 An arrow pointing downward shows that the shut off of the crane movement "luff down main boom " has been made by reaching the lower load chart limit.

Note: The crane movement "luff up main boom " remains possible.

D A N G E R : The shut off of the crane movement "luff down main boom " can only be bypassed with the turned on installation keyed switch.

* Optional


STOP
max
n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
1°
0.0
0.0
m/s
max: 12.8
23.8
80.0°
V: 40%
0°
28.0
35.0
60.0°
62.6
2:2Y
1:1Y
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


2
2.2
2.1
2.2.1
2.2.2
2.2.3
2.2.4
2.2.5
2.2.6
2.2.7
2.1.1
2.1.2
2.1.3

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2.2 Limit signs for attachment (luffing jib*, fixed jib*)

2.2.1 An arrow pointing upward shows that the shut off of the crane movement "luff up attachment" has been made by reaching the upper load chart limit.

Note: The crane movement "luff down attachment" remains possible.

D A N G E R : The shut off of the crane movement "luff up attachment " can only be bypassed with the turned on installation keyed switch.

2.2.2 Two arrows pointing upward show that the shut off of the crane movement "luff up attachment" has been made by :
- triggering a block limit switch on the relapse cylinder luffing jib, the relapse flap or
- by an error on this limit switch .

Note: The crane movement "luff down attachment" remains possible, the crane movement "luff up attachment " is shut off and **cannot be bypassed**.

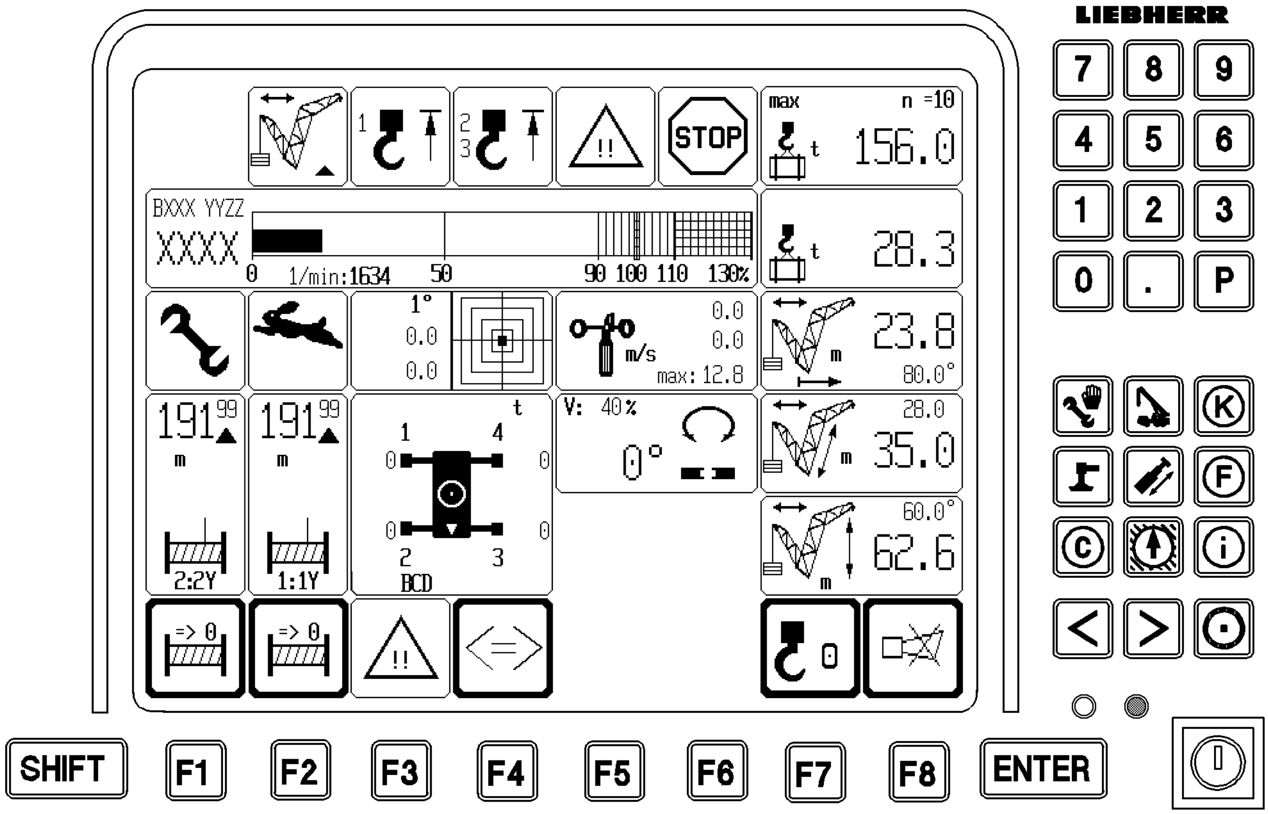
2.2.3 An arrow pointing downward shows that the shut off of the crane movement "luff down attachment" has been made by reaching the lower load chart limit.

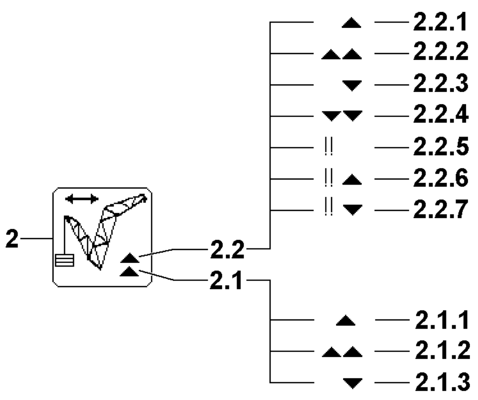
Note: The crane movement "Ausrüstung aufwippen" remains possible.

D A N G E R : The shut off of the crane movement "luff down attachment " can only be bypassed with the turned on installation keyed switch.

2.2.4 Two arrows pointing downward show that the shut off of the crane movement "luff down attachment" has been made by :
- triggering a block limit switch for the monitor "Attachment lower left / right"
- an error on this limit switch.

Note: The crane movement "luff up attachment" remains possible, the crane movement "luff down attachment " is shut off and **cannot be bypassed**.


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
STOP
max
n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
1°
0.0
0.0
0.0
0.0
m/s
max: 12.8
23.8
80.0°
V: 40%
0°
28.0
35.0
60.0°
62.6
2:2Y
1:1Y
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


2.2.1
2.2.2
2.2.3
2.2.4
2.2.5
2.2.6
2.2.7
2
2.2
2.1
2.1.1
2.1.2
2.1.3

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2.2.5 Two exclamation marks show that one or both limit switches or angle sensors of the attachment do no longer report on the LSB (LICCON-System-Bus) or are defective.

Note: If both limit switches are defective or are missing on the LSB, then the corresponding luffing movement is shut off and **cannot be bypassed**. When deflecting the master switch, a control error message is given, which shows which limit switches are missing on the LSB or are defective.

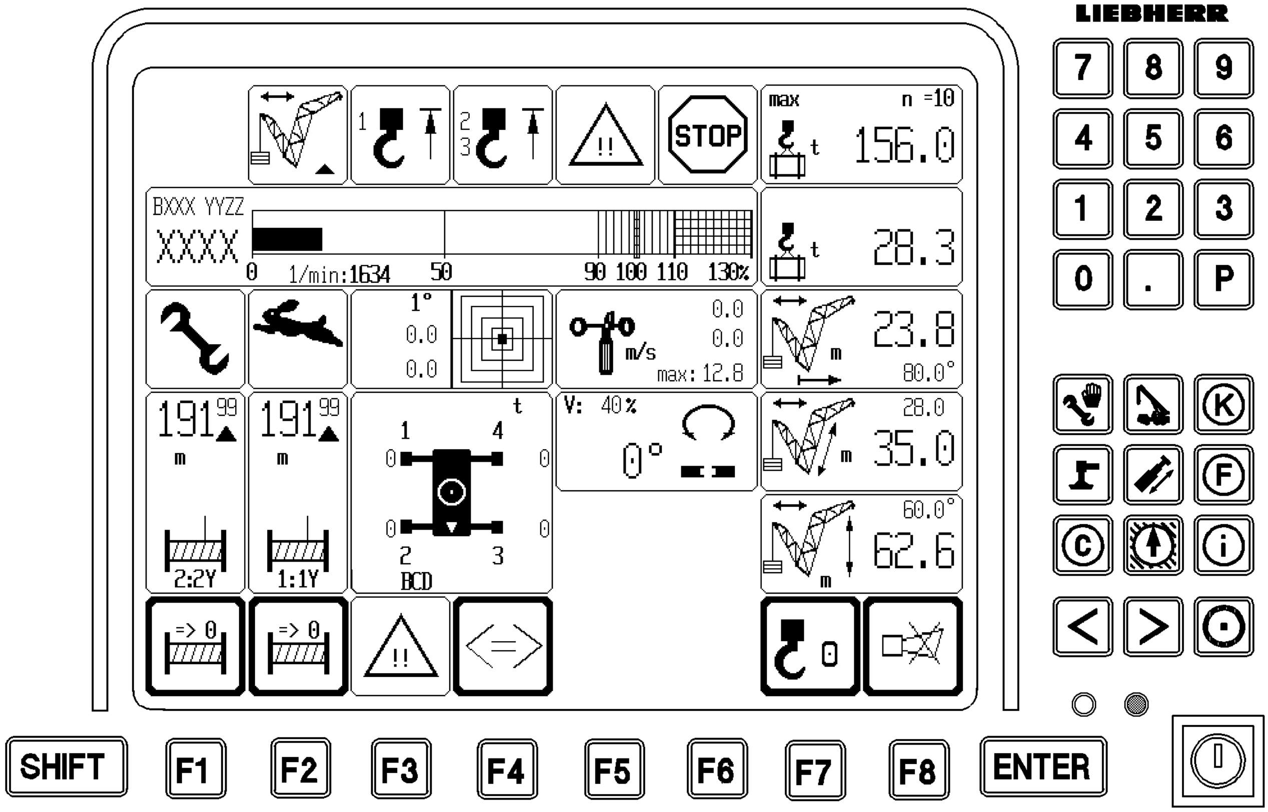
CAUTION: **If only one limit switch or angle sensor is not working properly, then the crane can still continue to be operated with "normal functions". However, the crane must be operated with utmost care, because only one of the double limit switches is functioning. The error must be fixed immediately. At the same time, a system error message will be issued.**

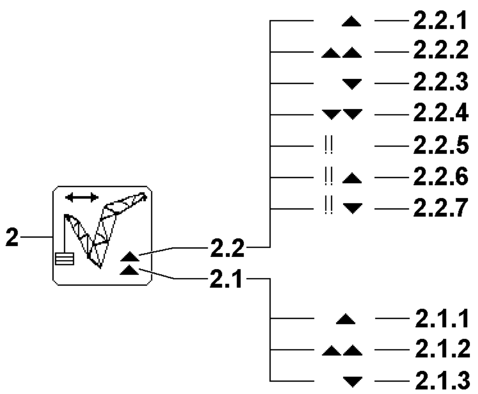
2.2.6 Two exclamation marks and one arrow pointing upward show that the shut off of the crane movement "luff up attachment" was made by:
- triggering the upper load chart limit
- triggering a block limit switch of the relapse cylinder luffing jib or relapse flap.
  In addition, one or both limit switches or angle sensors of the attachmetn do not report to the LSB or are defective.

Note: The crane function "luff down attachment" remains possible.

DANGER: **If the shut off was not created by several block limit switches, then the crane movement "luff up attachment" can be bypassed with the installation keyed switch.**

CAUTION: **If only one limit switch or angle sensor is not working properly, then the crane can still continue to be operated with "normal functions". However, the crane must be operated with utmost care, because only one of the double limit switches is functioning. The error must be fixed immediately. At the same time, a system error message will be issued.**


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
max n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
1°
0.0
0.0
m/s
max: 12.8
23.8
80.0°
191 99
m
2:2Y
1:1Y
1 4
2 3
BCD
V: 40%
0°
28.0
35.0
60.0°
62.6
=> 0
STOP
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


2.2.1
2.2.2
2.2.3
2.2.4
2.2.5
2.2.6
2.2.7
2
2.2
2.1
2.1.1
2.1.2
2.1.3

190985

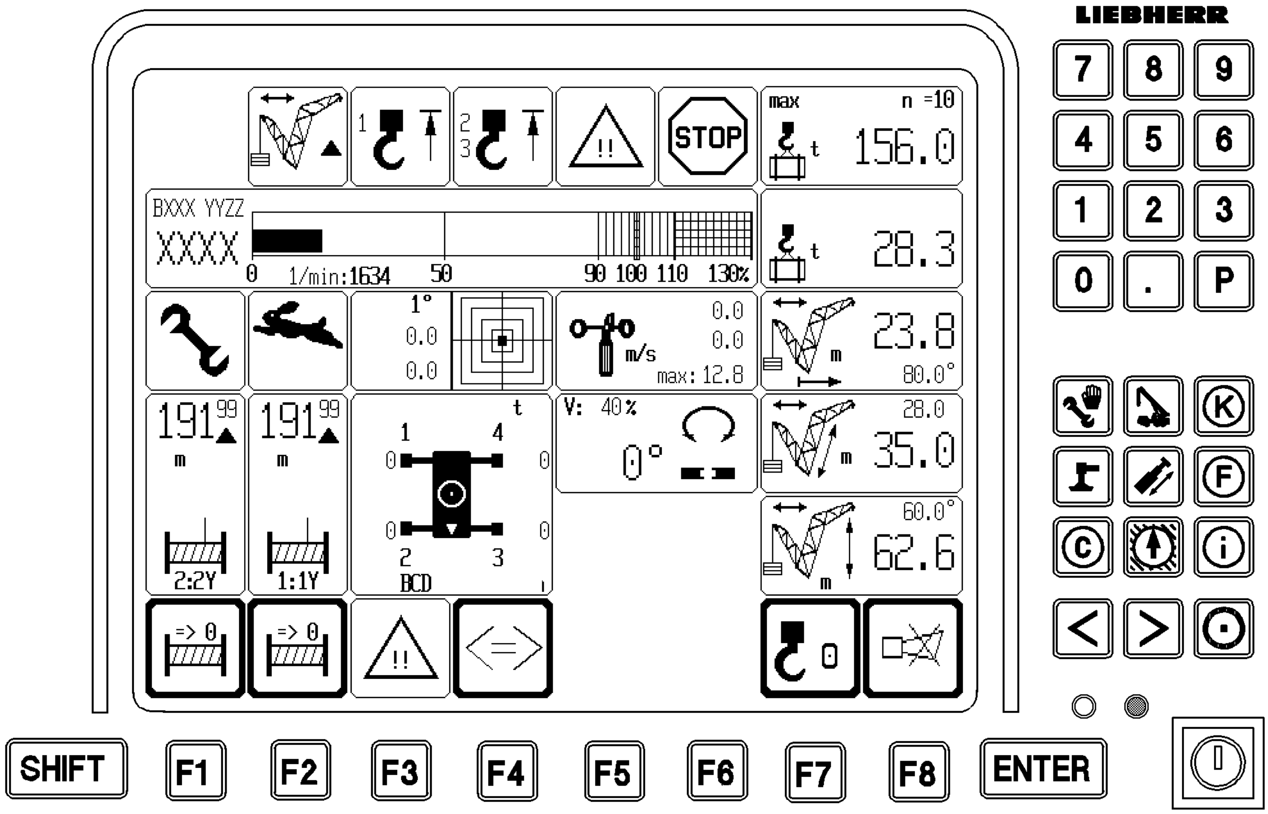
2.2.7 Two exclamation marks and an arrow pointing downward dhow that the shut off of the crane movement "luff down attachment" was made by
- triggering the lower load chart limit
- triggering a block limit switch of the monitor "Attachment lower left or right. "
In addition, one or both limit switches or angle sensors of the attachment do not report to the LSB or are defective.

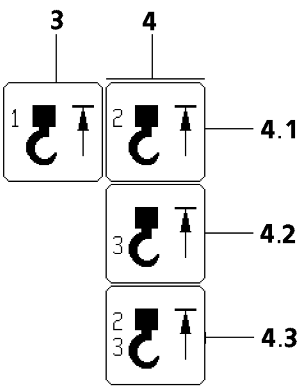
Note: The crane function "luff up attachment" remains possible.

D A N G E R: If the shut off was not created by several block limit switches, then the crane movement "luff down attachment" can be bypassed with the installation keyed switch.

C A U T I O N: If only one limit switch or angle sensor is not working properly, then the crane can still continue to be operated with "normal functions" . However, the crane must be operated with utmost care, because only one of the double limit switches is functioning. The error must be fixed immediately. At the same time, a system error message will be issued .

* Optional


LIEBHERR
max
n =10
156.0
28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
23.8
80.0°
max: 12.8
m/s
V: 40%
0°
28.0
35.0
60.0°
62.6
2:2Y
1:1Y
BCD
STOP
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P


3
4
4.1
4.2
4.3

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3) or 4) Symbol elements "Hoist top on main boom " or "Hoist top on auxiliary boom"

General
To prevent that the crane is operated without hoist top limit switch (HES), a minimum hoist top limit switch configuration is constantly being monitored to ensure it is present. If a required limit switch for a certain operating mode is not plugged in, which means it is also not active on the LSB-Bus System, then an LMB-STOP is triggered, in addition to an operating error message.

Possible hoist limit switches:

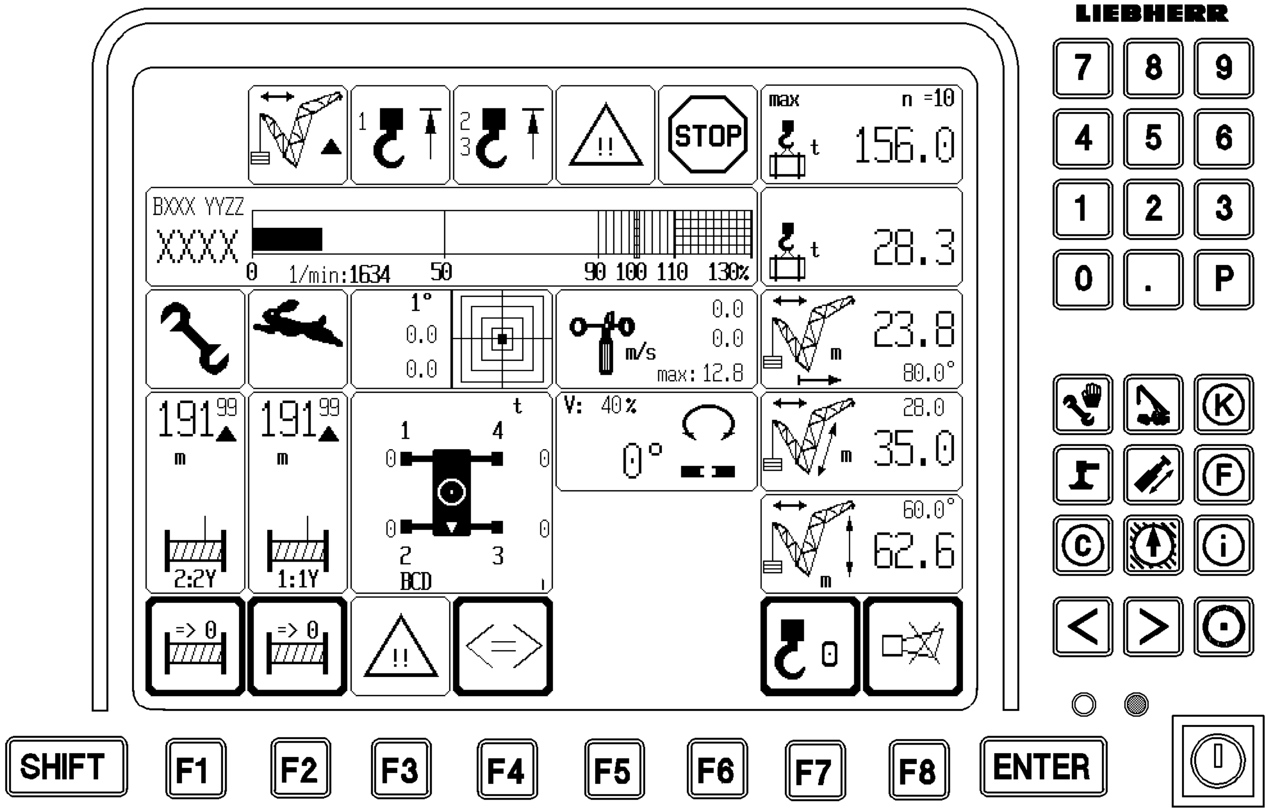
HES 1A / HES 1B	Main boom End section S	-S931 / -S932	Bus address "27" / "28"
	Main boom End section L	-S971 / -S972	Bus address "27" / "28"
HES 2A / HES 2B	Luffing jib	-S961 / -S962	Bus address "27" / "28"
	LUffing jib	-S971 / -S972	Bus address "27" / "28"
HES 3	Boom nose 2 t End section S	-S981	Bus address "25"
	Boom nose 1 t End section L	-S991	Bus address "24"

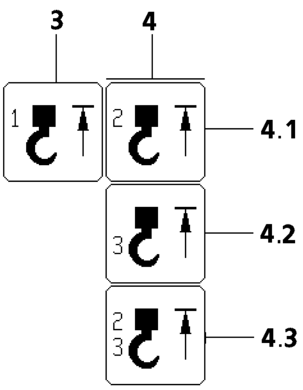
3) Symbol element "Hoist top on main boom"; HES 1 (1A /1B)
Main boom End section L, S

The symbol element appears if :
- The hookblock runs against the HES 1A and / or 1B on the end section main boom ,
- HES 1A and / or 1B not active, even though its presence is required ,
- HES 1A and / or 1B have an internal error.

The crane movements spool up hoist winches and luff down main boom as well as luff down derrick are shut off .

Note: In all operating modes with installed main boom, the HES1 must also be plugged in and turns off the same functions are the required hoist limit switch, which must be present.





190986

4) Symbol element "Hoist top on auxiliary boom"

4.1 Symbol element HES 2 (2A / 2B)
Luffing jib

The symbol element appears if:
- the hookblock runs against the HES 2A and / or HES 2B on the end section of the luffing jib,
- HES 2A and / or 2B not active, even though its presence is required ,
- HES 2A and / or 2B have an internal error.

The crane movements spool up hoist winches, luff down main boom and luffing jib as well as derrick are turned off.

Note: The HES 2A/B must be plugged in in all luffing jib operating modes. If this is not the case, an "LMB-STOP" (paragraph 6.1) is triggered and in addition, the control error message "ZE (CPU) 0: LMB STOP: HES2 A/B not connected" is issued.

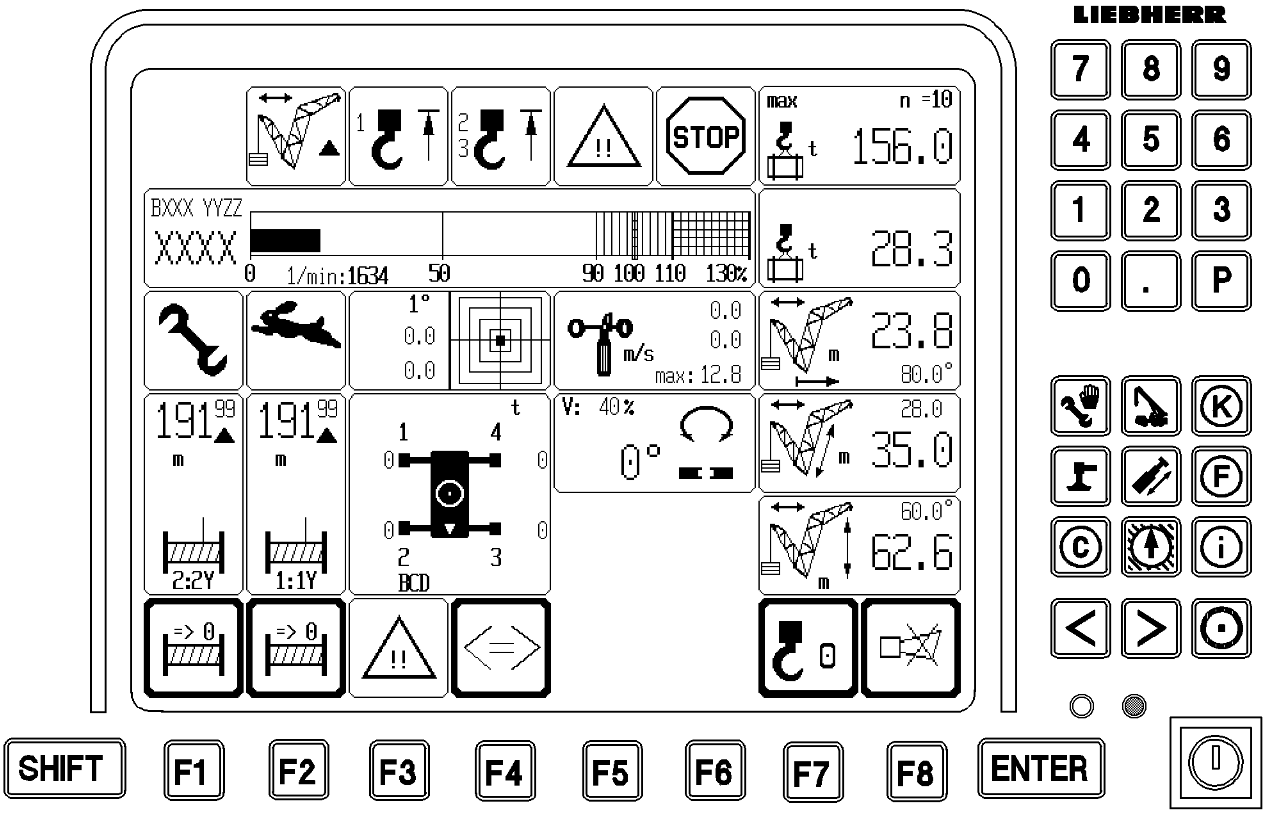
4.2 Symbol element HES 3
Boom nose

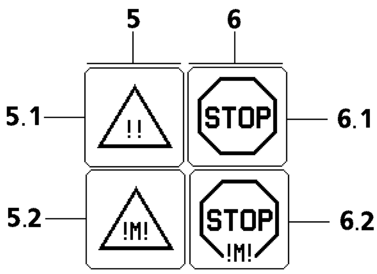
The symbol element appears if:
- the hookblock runs against the HES 3 on the boom nose ,
- HES 3 not active, even though its presence is required,
- HES 3 have an internal error.

The crane movements spool up hoist winches, luff down main boom, luffing jib and derrick are turned off.

Note: The HE3 must be plugged in if the boom nose is installed. If this is not the case, an "LMB-STOP" (paragraph 6.1) is triggered and in addition, the control error message "ZE (CPU) 0: LMB-STOP: HES not connected" is issued.

4.3 Symbol element HES 2 and HES 3
The symbol element HES 2 and HES 3 appears if the symbol elements HES 2 (see 4.1) and HES 3 (see 4.2) appear at the same time.


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
max n =10
t 156.0
t 28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
STOP
!!
1°
0.0
0.0
0.0
0.0
m/s
max: 12.8
m 23.8
80.0°
191 99
m
2:2Y
1:1Y
1 4
0 0
0 0
2 3
BCD
t
V: 40%
0°
28.0
m 35.0
60.0°
62.6
m
=> 0
=> 0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


5
6
5.1
5.2
6.1
6.2
!!
STOP
!M!
STOP
!M!

190987

5) Symbol element "Pre-warning"

5.1 Load carrying capacity utilization
The symbol element appears:
- if the current utilization of the crane according to load chart and reeving has exceeded the programmed limit for a prewarning (for example 90 %), or
- if the current utilization of the boom nose * has exceeded the programmed limit for prewarning (for example 90 %).

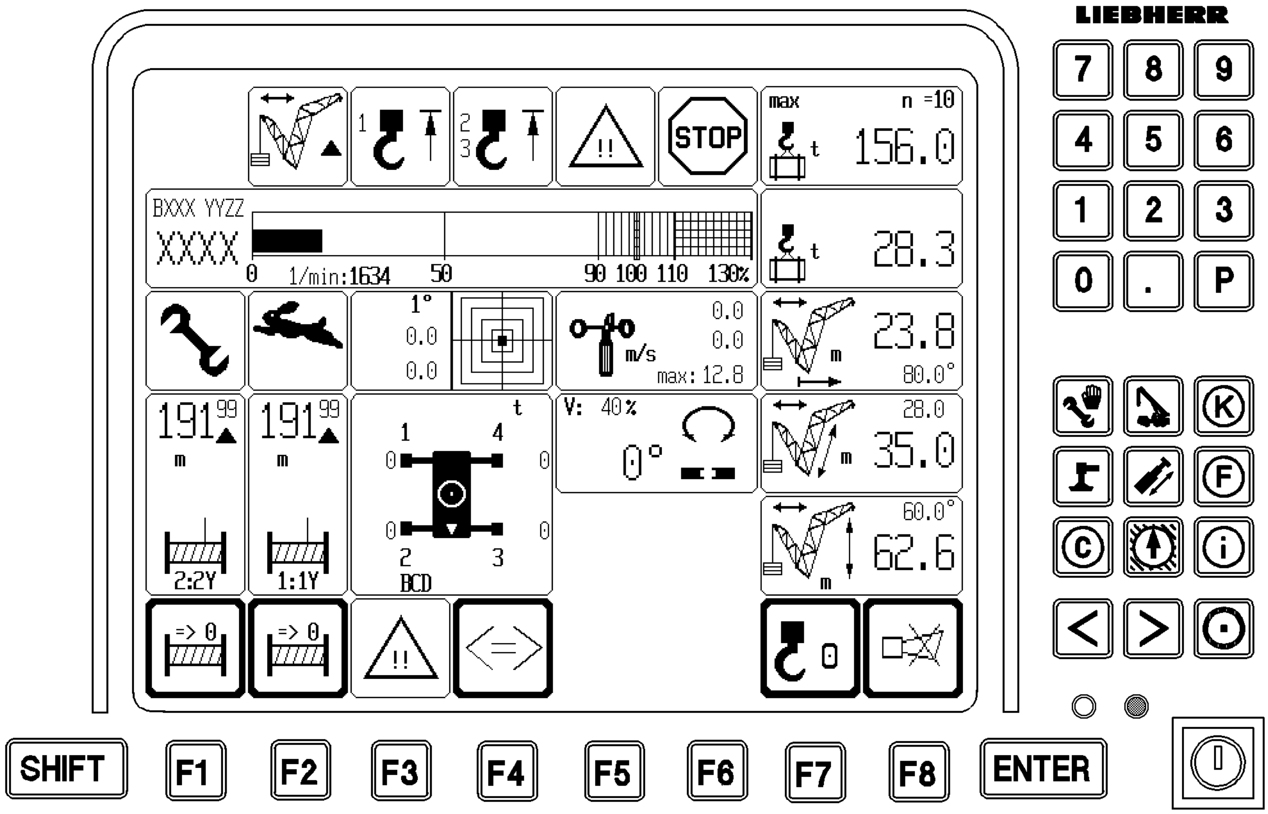
5.2 Engine monitoring
If a warn occurence happens in the engine monitoring system, then the symbol element "Prewarning - engine monitoring" appears on the LICCON monitor.
(See paragraph 12, Engine monitoring)

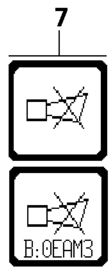
6) Symbol element "STOP"

6.1 Load carrying capacity exceeded
The symbol element "STOP" appears:
- if the current load carrying capacity on the boom head has exceeded the maximum load carrying capacitz and reeving according to the load chart (100%), or
- if the current load carrying capacity on the boom nose has exceeded the maximum load carrying capacity of the boom nose .

Note: All load moment increasing crane movements are shut off.

6.2 Engine monitoring
If a STOP occurrence happens in engine monitoring, the system switches over automatically from operating view to engine monitoring view.
(See paragraph 12, Engine monitoring)


LIEBHERR
STOP
max n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
1°
0.0
0.0
m/s
max:12.8
23.8
80.0°
191
2:2Y
1:1Y
BCD
V: 40%
0°
35.0
28.0
60.0°
62.6
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


7
B:0EAM3

190988

7) Symbol element "Horn" (accoustical signal)

Any operational errors on monitor 0, which cause the shut down of a movement and application errors with an error number (such as sensor errors, which occurred due to insufficient sensor signals or defective sensors) are shown optically and are also reported by an acoustical signal "HORN" on the monitor 0. "HORN" is a 0.5 second long sound, which is repeated in one second intervals.

Operational errors shown on monitor 0 are:
- overload
- Boom outside the angle range of the load chart
- Boom outside the radius range of the load chart

Monitored sensor are:

- Hoist limit switch	- wind sensor
- Length sensor	- pull test brackets
- Angle sensor	- Battery voltage
- Pressure sensor	- Inductive sensors

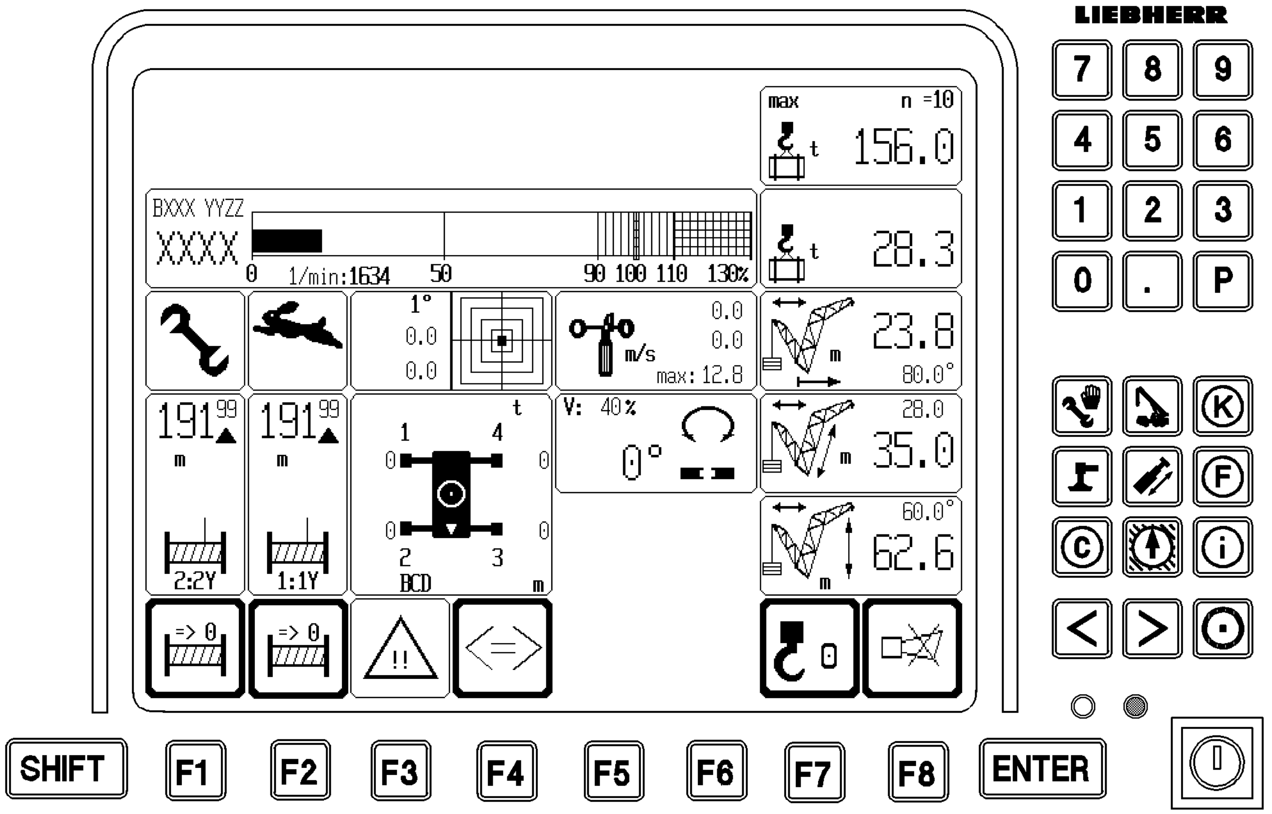
"Short horn"
Error messages, which have no error number and which do not cause a crane movements shut down by the LICCON system are also reported by an an acoustical signal ”SHORT HORN” , in addition to the optical indication. ”SHORT HORN” is a 0.1 second long sound, which is repeated in two second intervals.

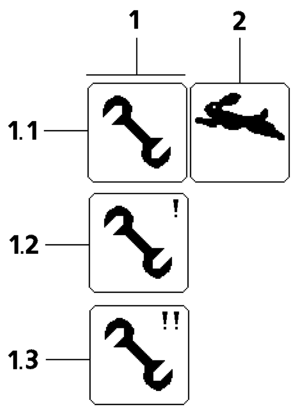
Monitored errors:
- maximum permissible wind velocity speed has been exceeded (only if wind velocity sensor is activated)
- maximum support force has been exceeded or fallen below minimum support force (only if support force monitor * is activated)
- prewarning threshold for crane utilization is reached. "CAUTION" at 90%

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

- ”Horn” as well as ”SHORT HORN” can be turned off by the monitor via the function key "F8" .
- By pressing the function key "F8" again, the system automatically changes to the error determination view in the test system. The error is documented in the error determination view.

Note: "HORN" as well as "SHORT HORN" become active again if a new error occurs.





191001

12.3 Special functions

1) Symbol element "Installation Operation"

1.1 Installation

The symbol element blinks if the crane control is set to "Installation" via the installation keyed switch. Then the operating view is locked, which means no other program can be turned on via the program keys.

1.2 Emergency operation without installation

The symbol element blinks in emergency operation, if "Installation" is not selected via the installation keyed switch.

Note: In this case, the operating view is not locked.

1.3 Emergency operation and installation

The symbol element blinks in emergency operation, if "Installation" is selected via the installation keyed switch.

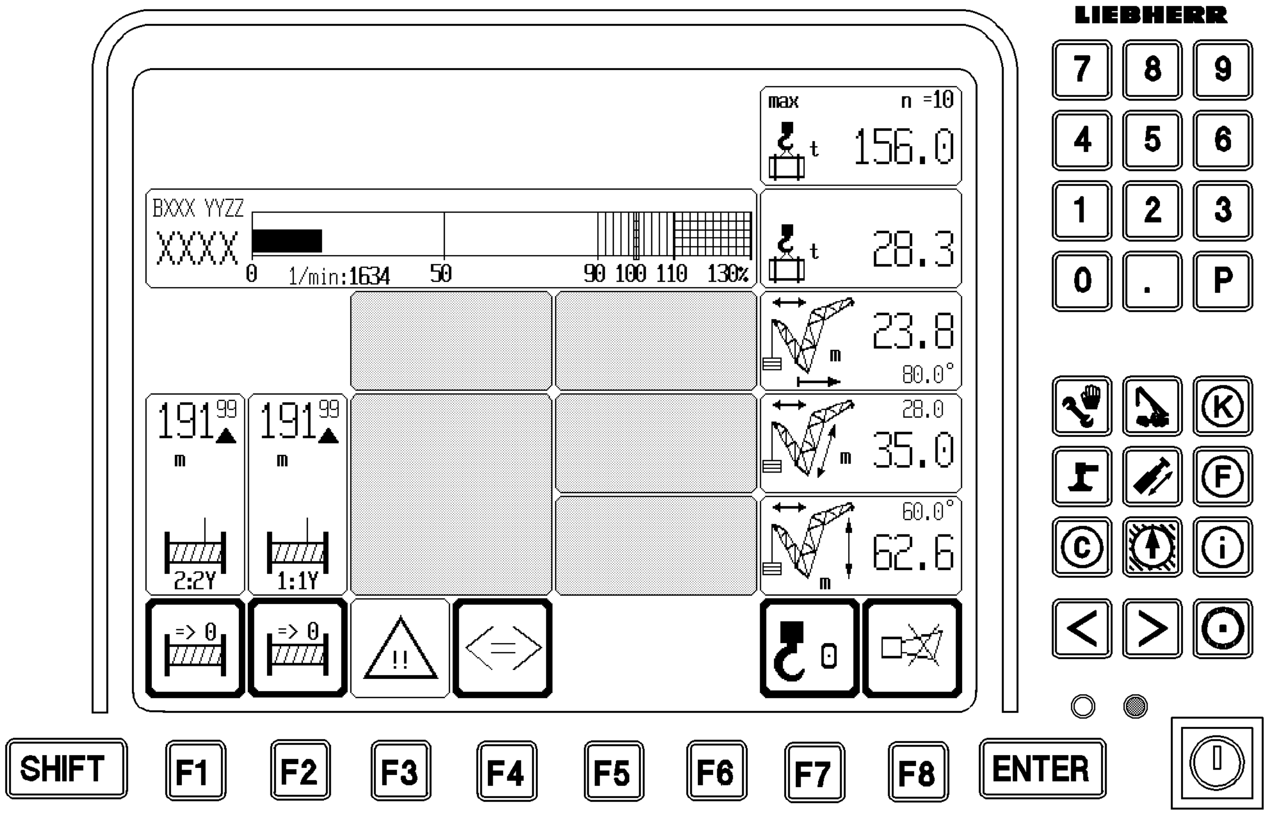
2) Symbol element "Rapid gear " (Power Plus)

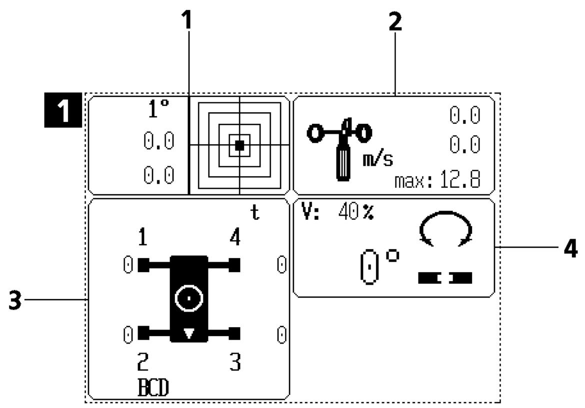
The speed increase can be added for various crane movements via master switches MS1, MS2 or MS3 . The symbol element "rapid gear" appears in the operating view.

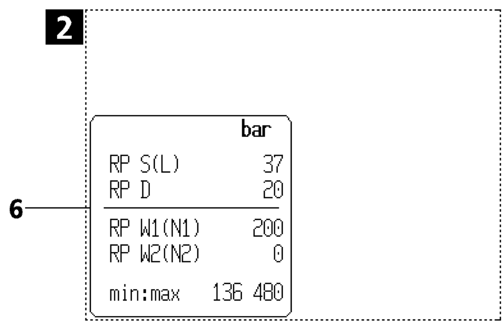
Note: If a crane movement has reached its maximum speed due to its current utilization, then no speed increase is possible by adding the rapid gear.

If the total power of all actuated crane movements is higher than the available power, then the speed for the crane movement which requires the highest power is reduced.

C A U T I O N : If another crane movement is added to one or more actuated crane movements, then it influences the other movements. For that reason, in situations where the individual crane movements are influenced, we recommend not to add the rapid gear (Power Plus) or to turn the rapid gear (Power Plus) off .


LIEBHERR
max n =10
156.0
28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
23.8
80.0°
28.0
35.0
60.0°
62.6
191 99
m
2:2Y
1:1Y
=> 0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


1
2
3
4
1°
0.0
0.0
0.0
0.0
m/s
max: 12.8
t
V: 40%
0°
BCD


2
6
bar
RP S(L) 37
RP D 20
RP W1(N1) 200
RP W2(N2) 0
min:max 136 480

191002

12.4 Monitored added functions

Via function key "F3", additional monitored added functions can be turned on. The symbol elements of the monitored added function are assigned to a fixed place on the LICCON monitor. Since not all symbol elements can be shown on one page, they are split to two pages. The symbol elements on page 2 can be viewed via the function key "F4" .

Page 1	1	Crane incline	(Fig. 1)
	2	Wind speed	
	3	Support force indicator *	
	4	Slewing range	
Page 2	6	Relapse cylinder monitor	(Fig. 2)

If an error occurs in one or more of these monitored functions, then this is shown in the crane operating view as follows:

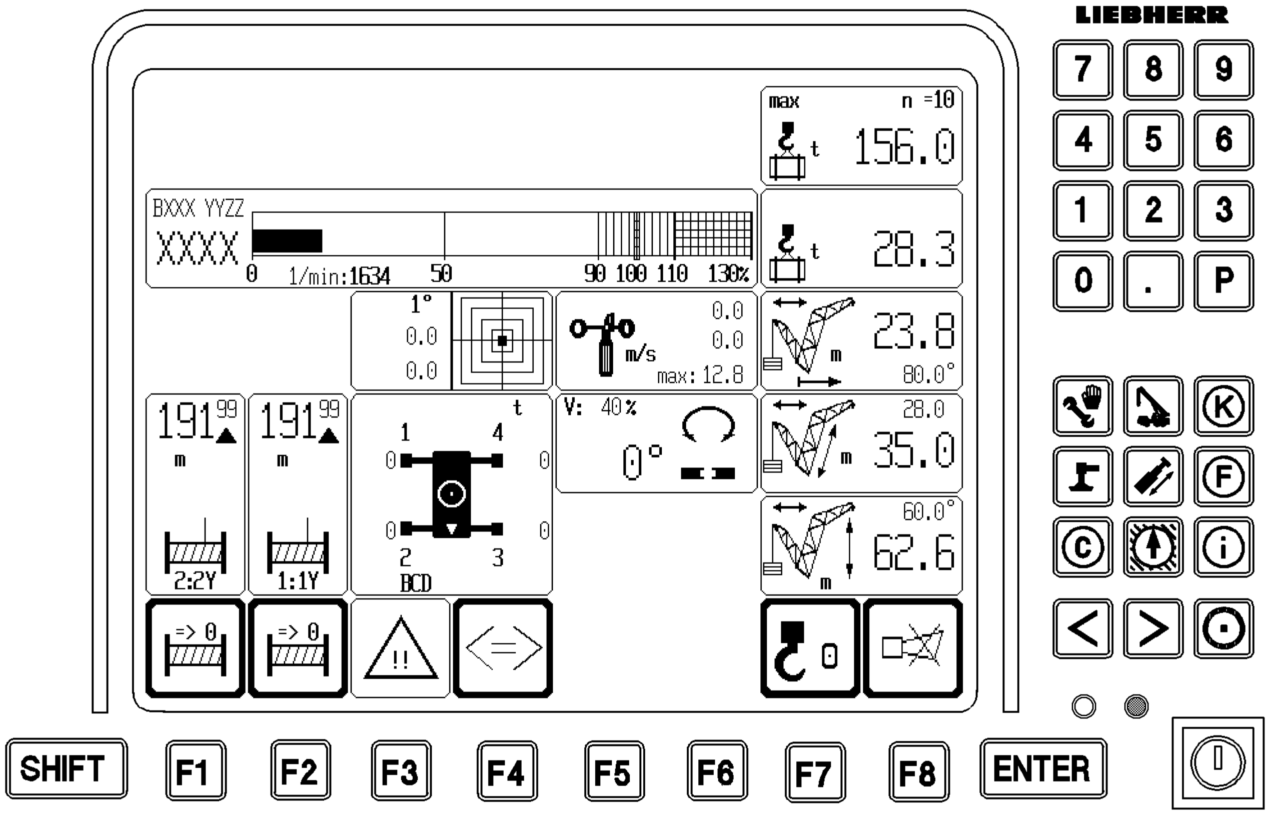
a) Monitored added functions turned off "F3"

- Error of one function on page 1	⇒ Symbol element shown on page 1
- Error of one function on page 2	⇒ Symbol element shown on page 2
- Error of one function on page 1 and 2	⇒ Symbol element shown on page 1 and symbol element above "F4" blinks = Note error on page 2

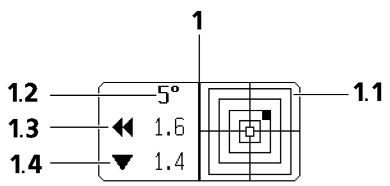
b) Monitored added functions turned on "F3"

- No error	⇒ the optional symbol elements (Optional) are shown, if there are some on page 2, then the symbol element "change page" of key "F4" is actuated = to show change over possibility.
- Error of one function on page 1	⇒ Symbol element is already shown
- Error of one function on page 2	⇒ Symbol element "change page" blinks = Note error on other page
- Error of one function on page 1 and 2	⇒ Symbol element shown on page 1. Symbol element "change page" blinks = Note error on other page

* Optional



LIEBHERR
max
n =10
156.0
28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
23.8
80.0°
28.0
35.0
60.0°
62.6
V: 40%
0°
2:2Y
1:1Y
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER



1
1.1
1.2
1.3
1.4
5°
1.6
1.4

191004

12.4.1 Added function "crane incline" Page 1

In this symbol element, the incline of the crane superstructure to the horizontal is shown in lengthwise and crosswise direction. The indication is graphic as well as numeric.

Note: The incline of the crane superstructure is determined with the aid of the incline sensor crane chassis and slewing sensor.

? ? is shown if the value of the slewing sensor is not correct.

Graphic section

1.1 The graphic view has the shape of a sight gauge, in which a dot (small square), which depicts the air bubble, moves. The center of the dot shows the exact incline value.

Numeric section

1.2 Incline range 1° or 5°

This value [°] depicts the graphic view, and can take on only the two values ”1” or ”5” .If the crane slopes in crosswise direction and in lengthwise direction is more than <1° , then the gauge is in the 1° range. If at least one value exceeds the 1° range, then it shifts into the 5° range.

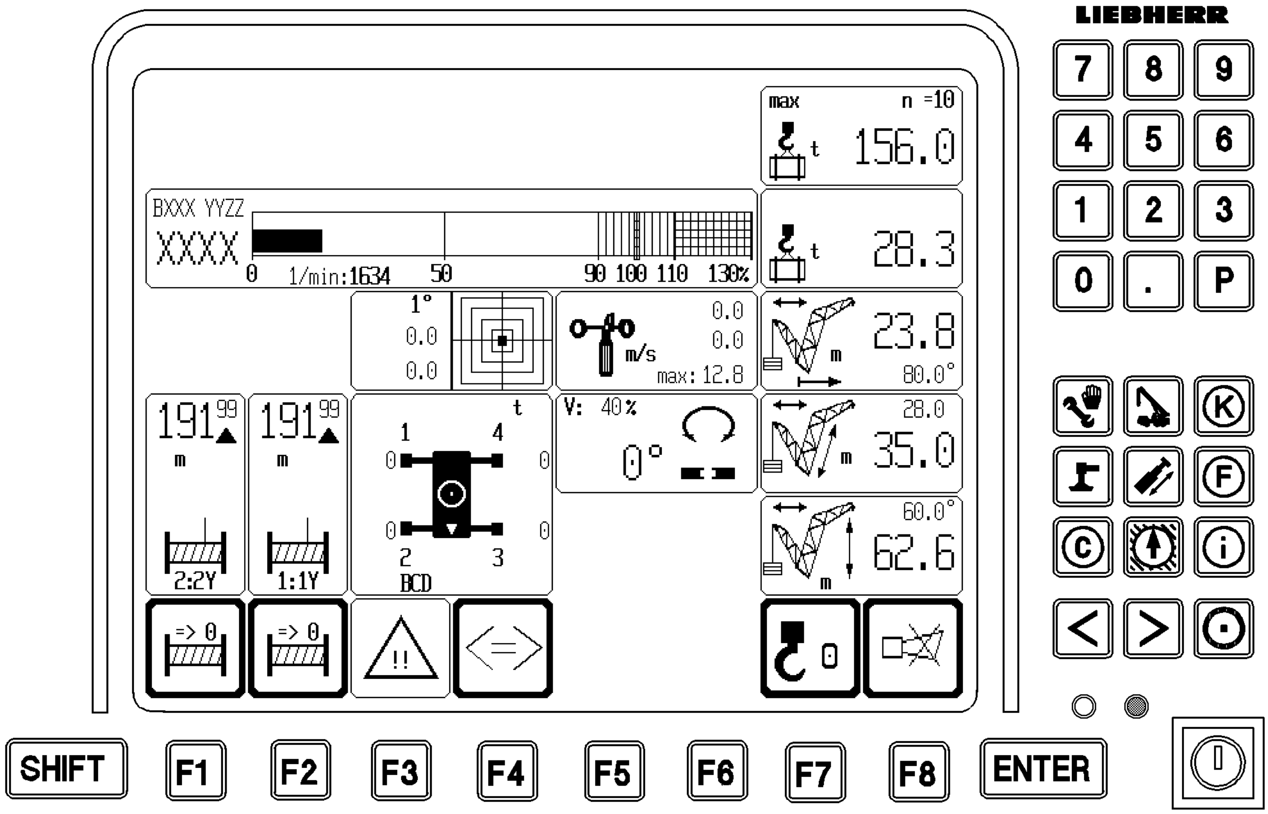
Note: The range shift occurs automatically.

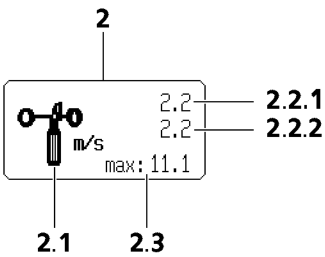
1.3 Incline of crane in degrees [°] in crosswise direction
The double arrows shows the direction of incline:

Double arrow left = Crane is sloped to the left
Double arrow right = Crane is sloped to the right

1.4 Incline of crane in degrees [°] in lengthwise direction
The arrows shows the direction of incline:

Arrow points up = Crane is sloped to the front
Arrow points down = Crane is sloped to the rear


LIEBHERR
max
n =10
156.0
t
BXXX YYZZ
XXXX
0
1/min:1634
50
90 100 110 130%
28.3
1°
0.0
0.0
m/s
max: 12.8
23.8
80.0°
191
m
2:2Y
1:1Y
BCD
V: 40%
0°
35.0
60.0°
62.6
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


2
2.2
2.2
m/s
max: 11.1
2.2.1
2.2.2
2.1
2.3

191003

12.4.2 Added function "Wind velocity"

The wind speeds are shown depending on the unit used in the load capacity chart, in meters per second [m/s] or feet per second [ft/s] .

2.1 Symbol "Wind velocity " in meters per second [m/s] or feet per second [ft/s]

2.2 Current wind speed
2.2.1 Wind sensor 2 Wind sensor - auxiliary equipment (luffing jib)
2.2.2 Wind sensor 1 Wind sensor - main boom

Note: No wind sensor can be installed on the boom nose *.

	Main boom	**Auxiliary equipment**
Wind sensor 1 available	Current wind speed is shown by wind sensor 1	Current wind speed is shown by wind sensor 1
Wind sensor 1 not available	"???" is shown at wind sensor 1 (static)	"???" is shown at wind sensor 1 (static)
Wind sensor 2 available	no indication	Current wind speed is shown by wind sensor 2
Wind sensor 2 not available	no indication	"???" is shown (static)

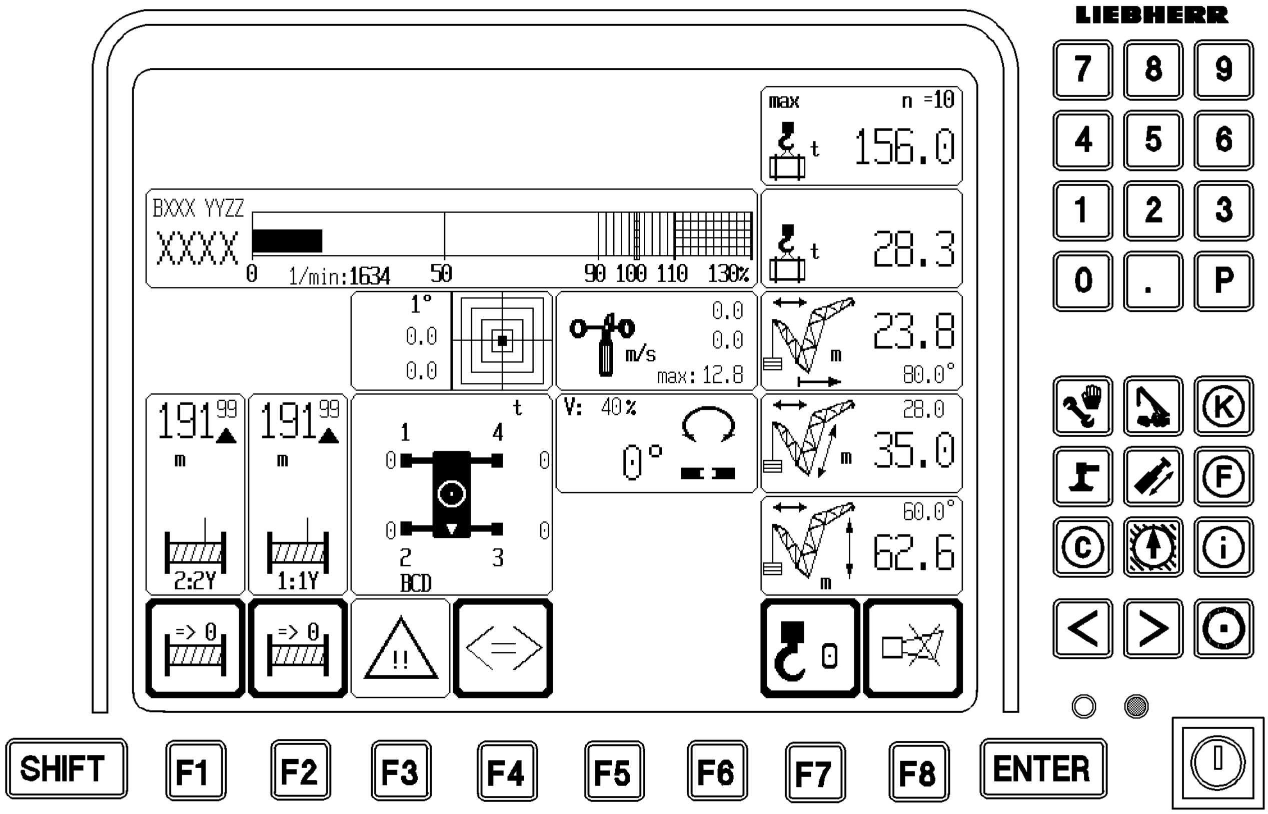
2.3 Maximum permissible wind speed with symbol text "max:"
The value depends on the operating mode and the set up condition / equipment configuration.

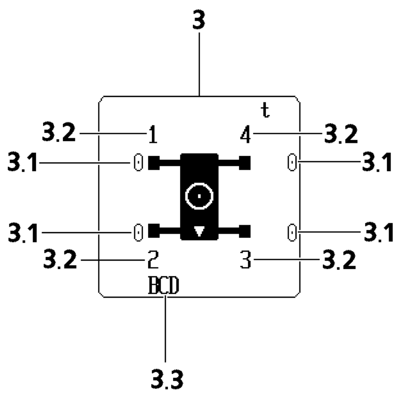
Note: If access to a load chart is no longer possible, the maximum value blinks as invalid value (???) and an acoustical alarm "SHORT HORN" can be heard.

If a current value of the wind speed exceeds the indicated maximum value (Wind sensor 1 or 2 > maximum value), then the maximum value blinks as invalid value (???) and an acoustical alarm "SHORT HORN" can be heard .

C A U T I O N : The crane movements are not shut off!

* Optional


LIEBHERR
max
n =10
156.0
28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
1°
0.0
0.0
m/s
max: 12.8
23.8
80.0°
28.0
35.0
60.0°
62.6
V: 40%
0°
191
m
2:2Y
1:1Y
BCD
=> 0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


3
3.2
3.1
3.3
BCD

191005

12.4.3 Added function "Support force indication " * **Page 1**

During crane operation, the LICCON support force monitoring system constantly checks the current hydraulic pressure in all 4 outrigger support cylinders and calculates it into a support force value [t] for each support.

Via function key "F3", the symbol element "Support force monitor" is shown, or the symbol appears automatically with the alarm signal "Short horn", when a support has either reached or exceeded the maximum force or if the minimum force has been reached or fallen below. The value(s) which triggered the warning are blinking.

Independent of the programmed minimum / maximum values, the system constantly monitors if the sum of the support forces of the two rear supports (the supports farthest away from the boom head) is less than 15% of the total support forces. If this limit is fallen below, then the two supports with the least forces are displayed blinking.

C A U T I O N: **When the minimum / maximum support forces are reached, no crane movements are shut off!**

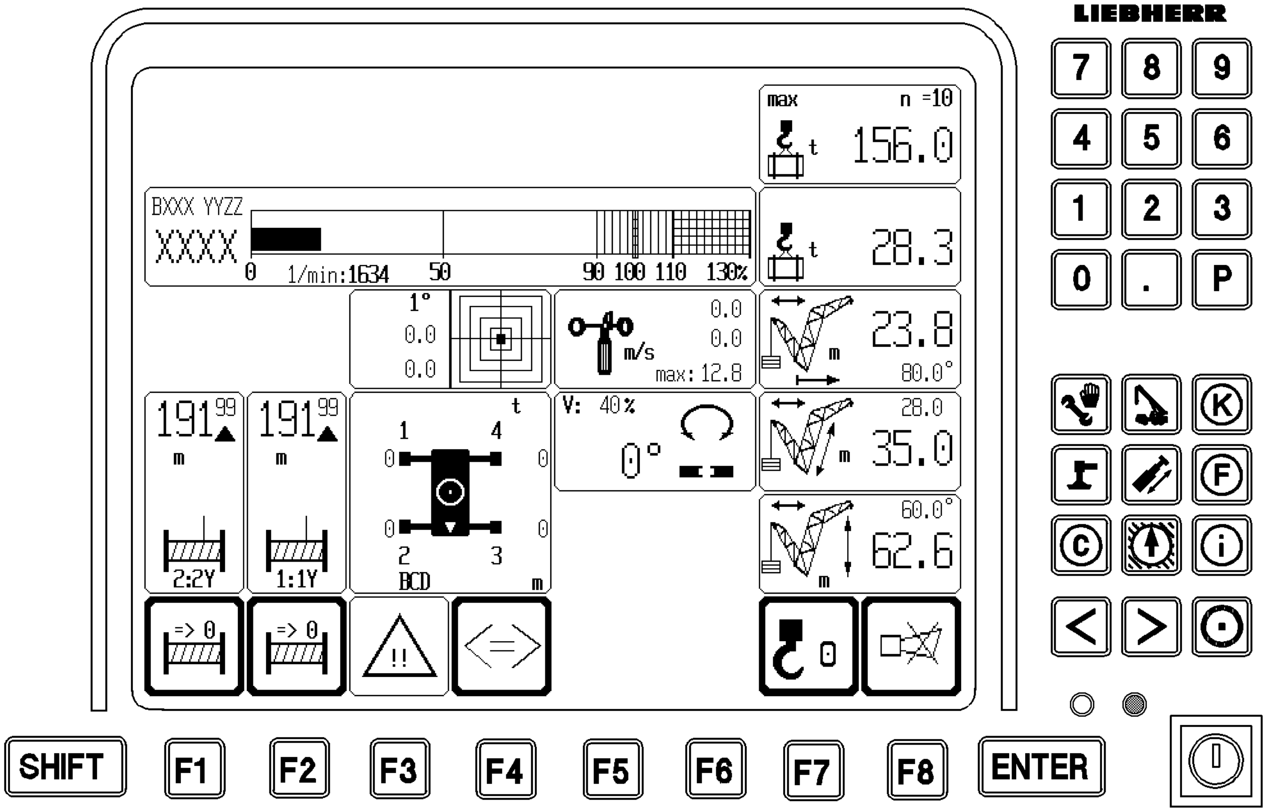
Note: The maximum and minimum support forces are programmed in the "Support" program, see chapter 10.

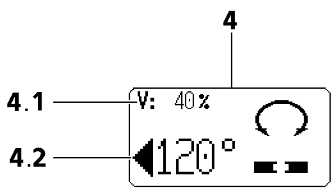
3.1 Indication of current support force [t]
The support force is shown for each support.

D A N G E R: **The support force indicator is incorrect if the support cylinders are fully extended or retracted.**
If the support cylinders are fully extended, the maximum force can be shown .
If the support cylinders are fully retracted, "0" value can be shown .

3.2 Indication of support numbers
The 4 supports are marked numerically on the crane and in the symbol element .

3.3 Indication of support base
The various support bases are shown with letters (combinations):
for example.: A, B, C, D, E, F, G, H


LIEBHERR
max
n =10
156.0
BXXX YYZZ
XXXX
0
1/min:1634
50
90 100 110 130%
28.3
1°
0.0
0.0
0.0
0.0
m/s
max: 12.8
23.8
m
80.0°
191
m
191
m
t
1
4
V: 40%
0°
28.0
35.0
2:2Y
1:1Y
2
3
BCD
m
60.0°
62.6
=> 0
=> 0
!!
7
8
9
4
5
6
1
2
3
0
.
P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


4
4.1
4.2
V: 40%
120°

191006

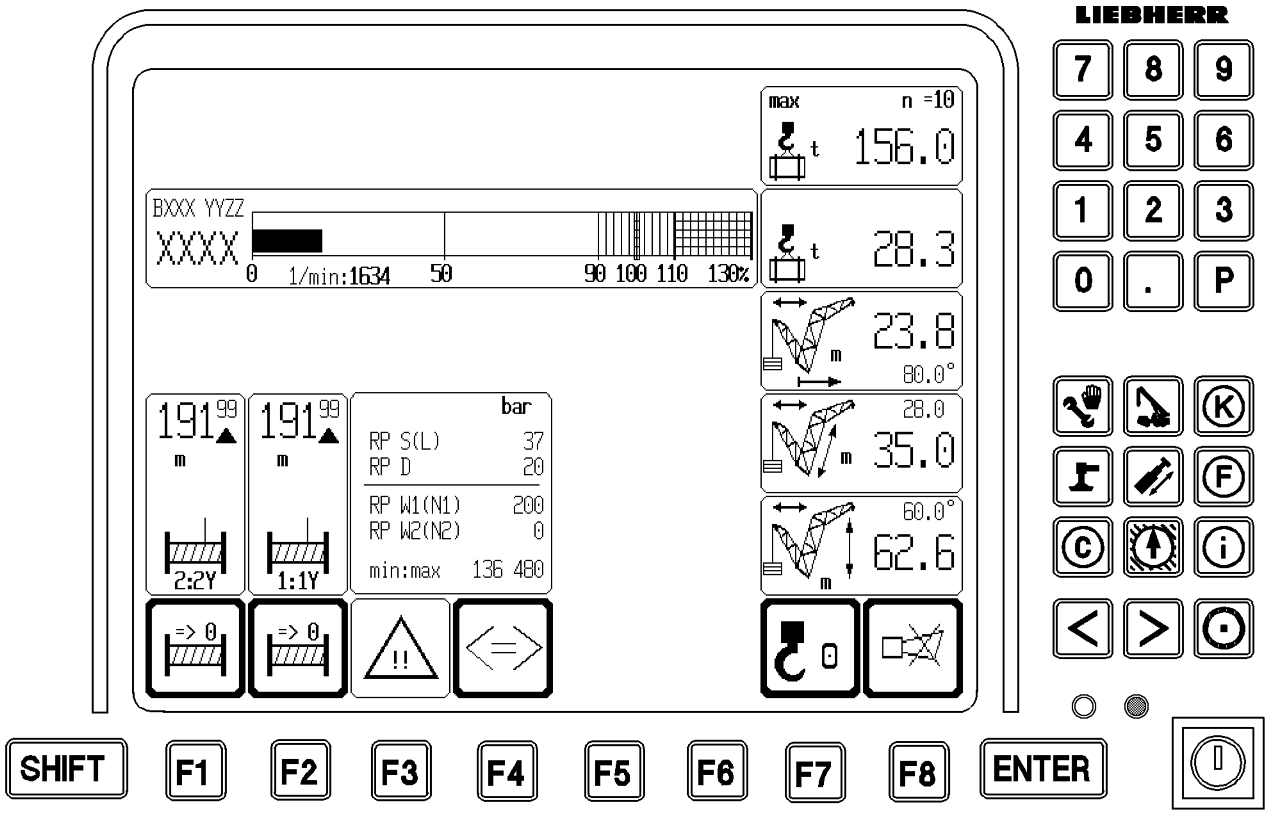
12.4.4 Added function "Slewing range" **Page 1**

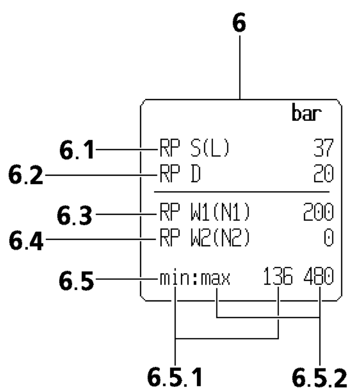
4.1 Maximum slewing speed V: [%]
= current (selected) "maximum slewing speed" of the slewing gear at fully deflected manual control lever, in relation to the maximum obtainable slewing speed of the slewing gear at 100% speed preselection .
In the LICCON program "Control Parameter" (see paragraph 8), this value can be preselected in fixed percentage stages.

D A N G E R : **The preselection must be carried out according to the data given in the load chart manual. If the slewing speed is too high, there is an increased risk of having a serious ACCIDENT!**

4.2* Current position of the crane superstructure in relation to the direction to the front (chain tension side). The arrow in front of the value shows the direction of deviation. The value increases up to a value of 180° .

0°	Position exactly to the front
> 179°	Turn to the right
< 179°	Turn to the left
180°	Position exactly to the rear


LIEBHERR
max
n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
23.8
80.0°
28.0
35.0
60.0°
62.6
191 99
m
2:2Y
1:1Y
bar
RP S(L) 37
RP D 20
RP W1(N1) 200
RP W2(N2) 0
min:max 136 480
=> 0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


6
bar
6.1 RP S(L) 37
6.2 RP D 20
6.3 RP W1(N1) 200
6.4 RP W2(N2) 0
6.5 min:max 136 480
6.5.1
6.5.2

191007

12.4.6 Added function „Relapse cylinder monitor" **Page 2**

6.1 Pressure [bar] in S or L boom relapse cylinders

6.2 Pressure [bar] in Derrick relapse cylinders

6.3 Pressure [bar] in W1 lattice jib relapse cylinder (=RPW1) in W operation or
Pressure [bar] in N1 lattice jib relapse cylinder (=RPN1) in N operation

6.4 Pressure [bar] in W2 lattice jib relapse cylinder (=RPW2) only in W operation, if available.
Pressure [bar] in N2 lattice jib relapse cylinder (=RPN2) only in W operation, if available.

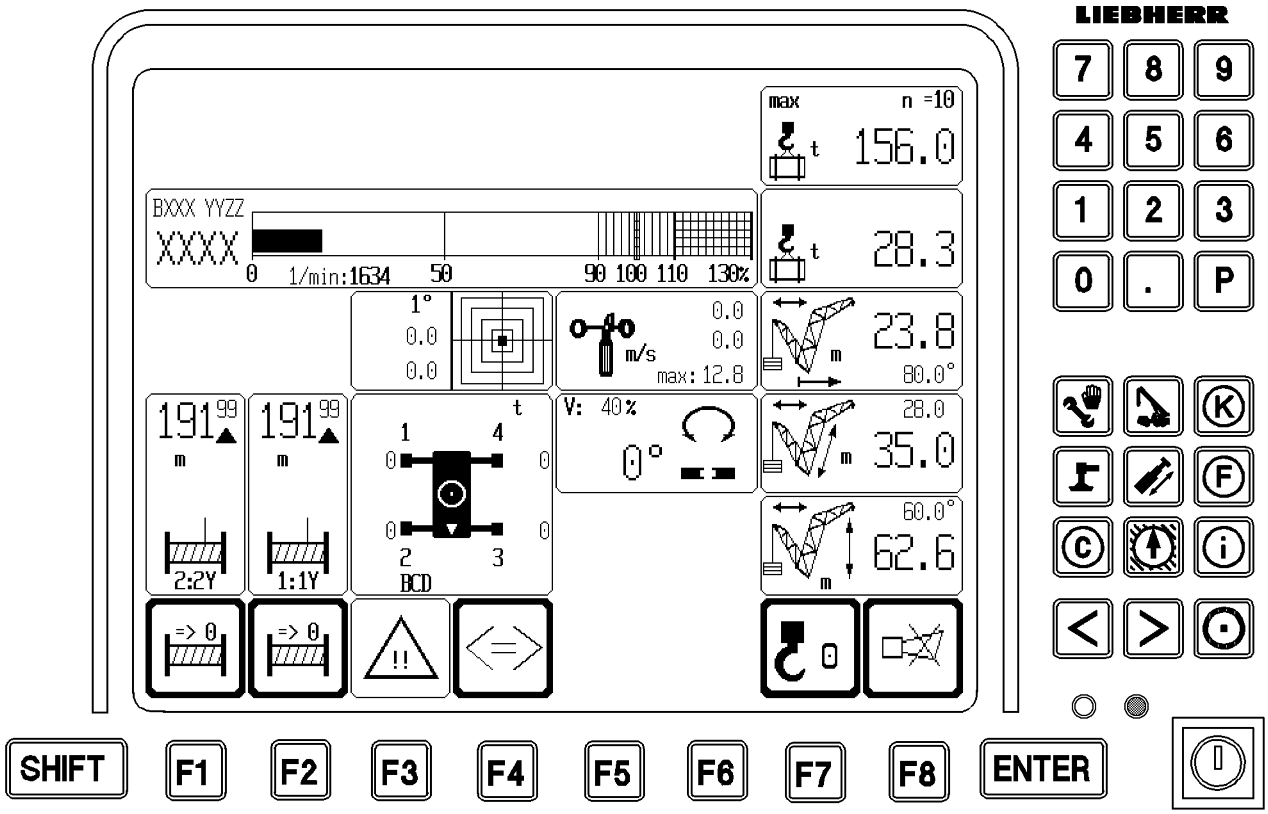
6.5 Monitored relapse cylinder (RP) - pressure limits in jib - RP (W/N)
Minimum / maximum pressure for RPW1 (N1) and RPW2 (N2)

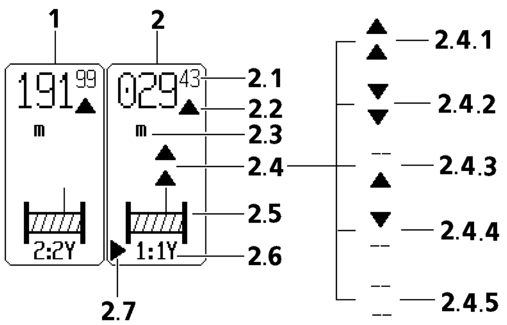
6.5.1 Minimum pressure [bar] for jib - RP (W/N).
This monitored minimum pressure is calculated from the angle of the main boom and the jib. If one of the angles is invalid and the indication is shown with "???", then there can also be no monitoring for minimum pressure.

6.5.2 Maximum pressure for jib - RP (W/N).
If a pressure limit value is exceeded, then it is shown with a blinking actual pressure value and also as an error message .

Note: Pressure indication = 0, if this relapse cylinder (s) is (are) not available for the set operating mode.

Pressure indication = ???, if the pressure sensor is not correct , (broken wire or short circuit). An error indication is issued with error number .


LIEBHERR
max
n =10
156.0
28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
23.8
80.0°
m/s
max: 12.8
V: 40%
0°
28.0
35.0
60.0°
62.6
191 99
2:2Y
1:1Y
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


1
2
191 99
029 43
2:2Y
1:1Y
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.4.1
2.4.2
2.4.3
2.4.4
2.4.5

191008

12.5 Symbol element "Winch indication winch 1 and 2"

1. Symbol element "Winch 2"
   The meaning of the individual symbols for winch 1 and winch 2 is identical and is explained on symbol element "Winch 1" .

2. Symbol ement "Winch 1"

   2.1 If the winches operate individually with the reeving set in the equipment configuration view, or if the winch is operated in parallel operation, then the indicated value is the completed hook path (for parallel operation: path of the pulleyblock) from a predetermined zero point in the indicated length unit of meters ([m] or feet [ft]).
   The numbers in front of the comma (point) are shown with maximum 3 large numbers.
   The numbers after the comma (point) are shown with small numbers. (See also chapter 6.6, description of function keys "F1" and "F2").

   As a prerequisite for correct indication, the entered value must match the actual number of cable reevings between boom head and hook block.

   If the adjusted reeving does not match the reeving of the corresponding winch , then the correct hook path can be calculated from the indicated hook path as follows:.

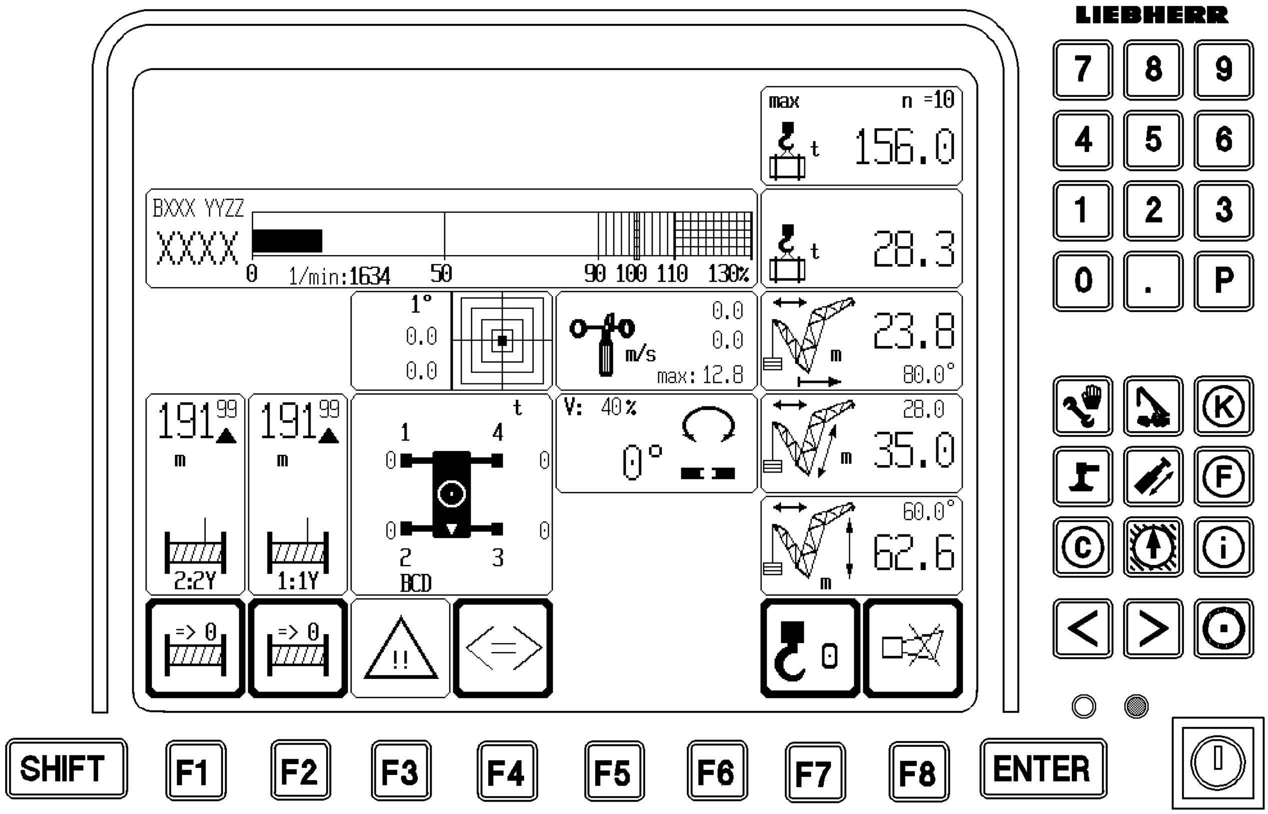
$$\text{correct hook path} = \frac{\text{indicated hook path} \times \text{adjusted reeving}}{\text{actual reeving}}$$

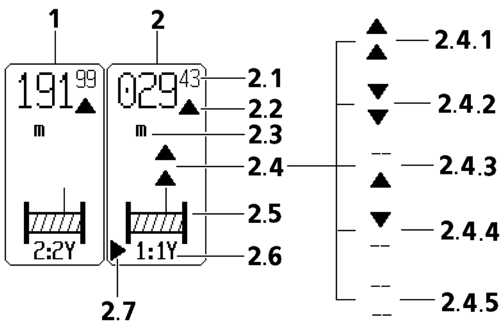
   The hook path calculation works only if the load is suspended freely, and if the boom is not luffed up or down during the hoisting procedure. Boom flexation and cable stretch are not taken into account.

   C A U T I O N : The length indication (hook path indication) is only correct and the coil jump is only taken into account correctly if the winch has been adjusted and if there was no CPU power interruption since then ("Cold start"). The adjustment of the hook path indication is done by spooling the cable on / off until the adjusting switch is triggered.

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

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


LIEBHERR
max n =10
156.0
28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
1°
0.0
0.0
m/s
max: 12.8
23.8
80.0°
191 99
m
2:2Y
1:1Y
1 4
2 3
BCD
V: 40%
0°
28.0
35.0
60.0°
62.6
=> 0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P


1
2
191 99
029 43
m
2:2Y
1:1Y
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.4.1
2.4.2
2.4.3
2.4.4
2.4.5

191008

Symbol element "Winch indication winch 1 and 2" (continuation)

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

2.4.1	Spool out		
2.4.2	Spool up		
2.4.3	Spooled out	→	spool out is locked
2.4.4	Spooled up	→	spool up is locked
2.4.5	Winch is deactivated	→	spool up and spool out is locked (via the "Control Parameter" program)

Note: If no winch status symbol appears then the active winch is at a standstill and is neither spooled up nor out.

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

2.6 Assignment of master switch and winch

Example: **1 : 1 Y**

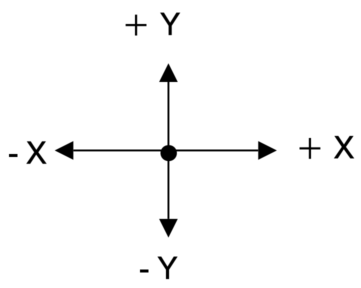
Control direction of master switch

Master switch number

Winch number

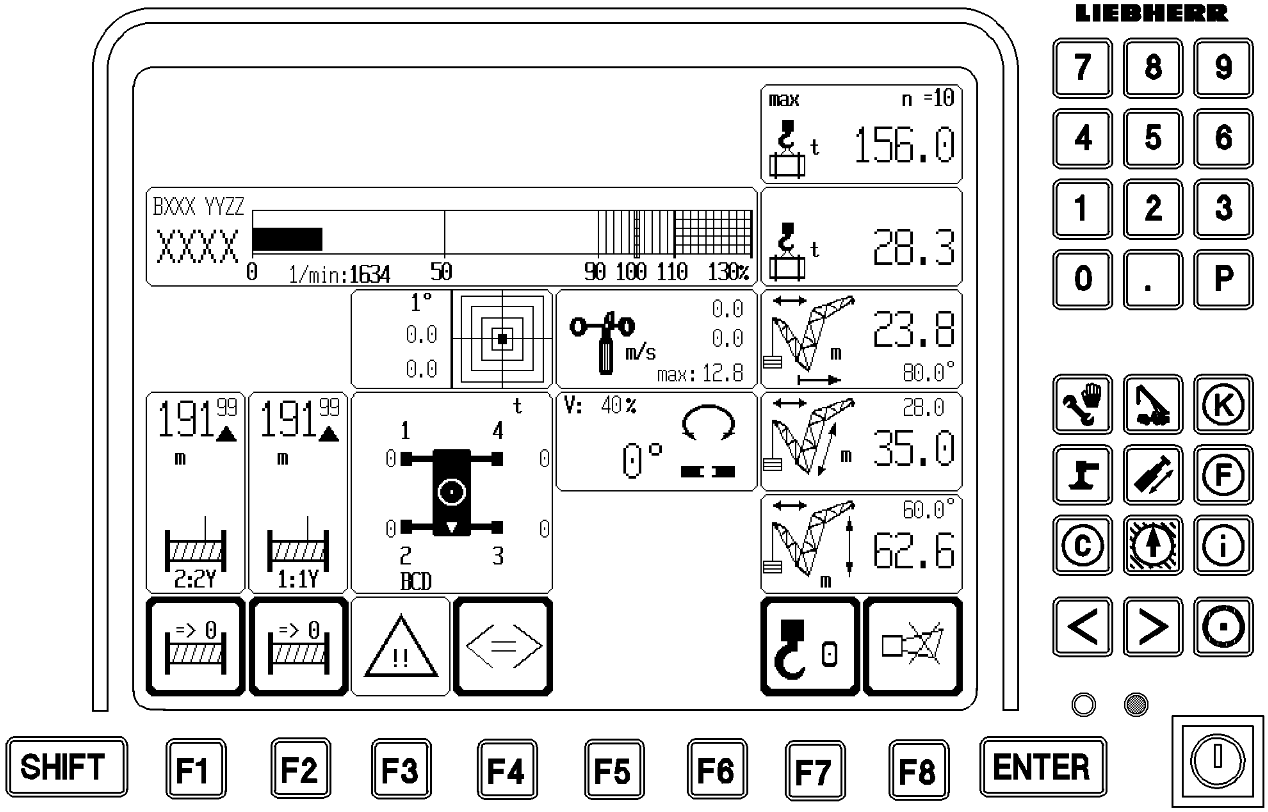
- - -
1: - -

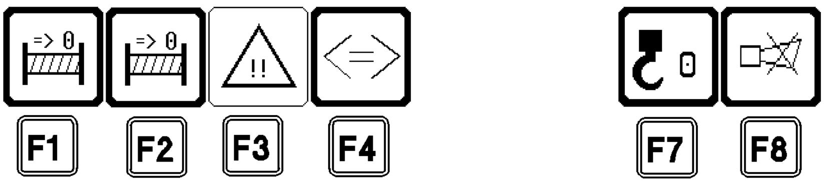
Due to incorrect settings , an assignment of master switch and winch is not possible!

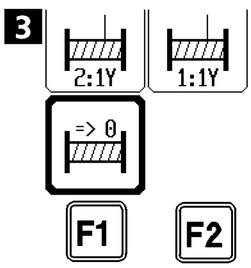


2.7 Vibration sensor
If the vibration sensor for a winch is added on the master switch, then the symbol " ▸ " (2.7) appears in the winch symbol element for the added vibration sensor.

Note: The vibration sensor is added at the first actuated crane function.


LIEBHERR
max n =10
156.0
28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
23.8
80.0°
28.0
35.0
60.0°
62.6
m/s
max: 12.8
V: 40%
0°
BCD
2:2Y
1:1Y
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


F1
F2
F3
F4
F7
F8


3
2:1Y
1:1Y
F1
F2

191009

12.6 Function keybar symbol line

The function keybar symbol line contains up to 8 symbol elements, which correspond to the function keys "F1" to "F8" below, which means they either describe a function, which can be triggered with the corresponding key and / or change their view and their meaning when the key is pressed.

"F1" Zero point for hook path indication of winch 2
Press key "F1" to show the symbol "Set winch indication to zero", which means if the key is pressed, the hook path indication of winch 2 is set in the winch symbol above to "000,00" and the path is measured from this point on.

"F2" Zero point for hook path indication of winch 1
As described for "F1" for winch 1.

Note: If winch 1 and winch 2 work in **parallel operation**, then the length indications of winch 1 and 2 can only be set together with the "F1" key to 000,00. The function key "F2" has then no function and the corresponding symbol element is blended out (Fig. 3).

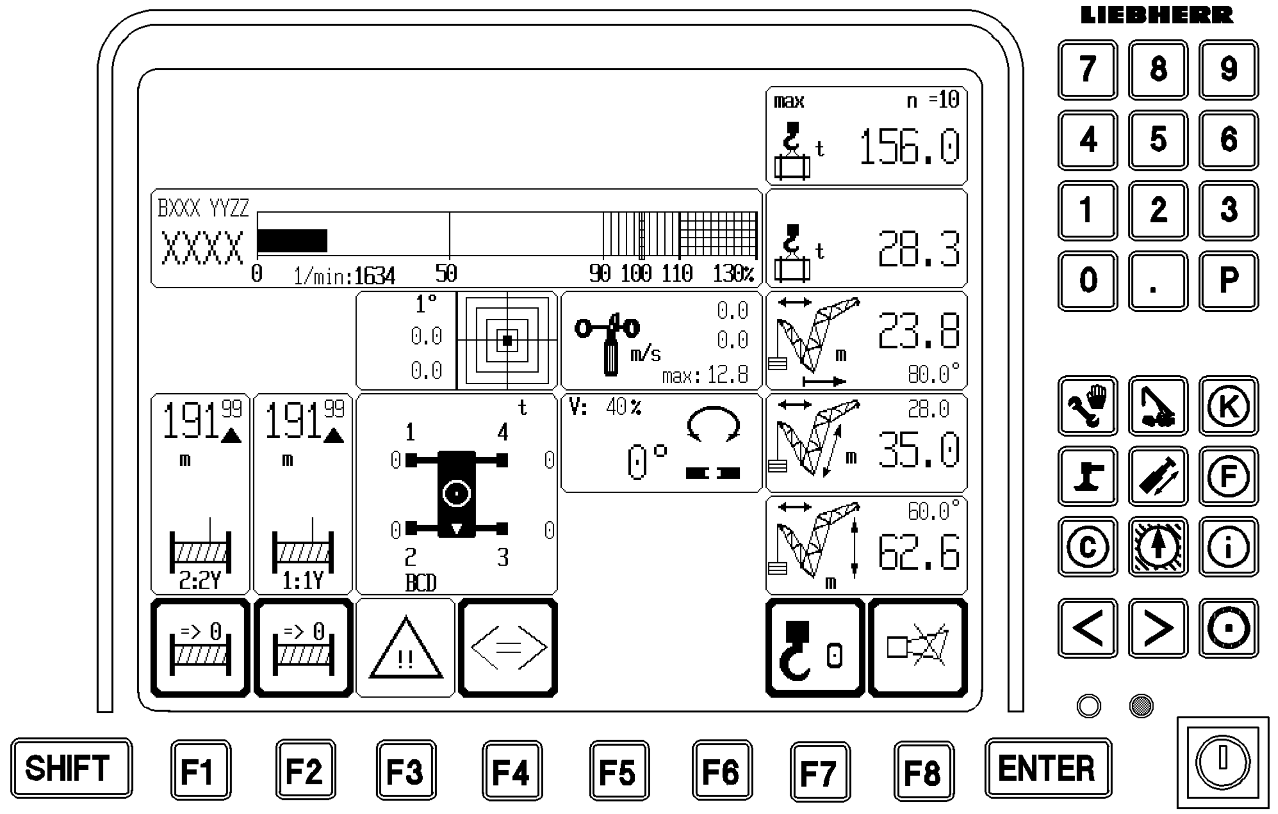
"F3" Turn monitoring symbol element on or off
With function key "F3", all symbol elements of the monitored added functions can be turned on and off. The symbol element changes accordingly:
Thick frame = Added function symbols turned off
Thin frame = Added function symbols turned on

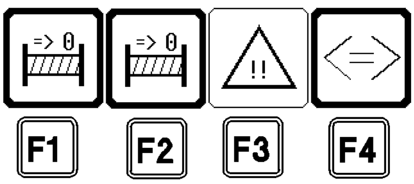
Note: The added function monitor function is always turned on; only the symbol elements can be turned off. In case a monitored limit is being exceeded, an acoustical warning can be heard (horn) and the corresponding symbol element is shown, even if the monitoring symbols had been turned off. (See also paragraph 6.4, "Monitored added functions.)

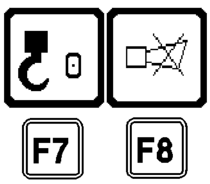
"F4" Switch over to monitoring page , if available.
(See also paragraph 6.4, "Monitored added functions.)

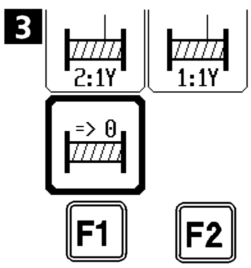
"F5" not used

"F6" not used









191009

"F7" Tara

If the function key "F7" is pressed, the actual load indication is set to "Zero". At the same time, the word "net" appears in the symbol element of the actual load indication. This function makes it possible to eliminate the weights of hoist cable, load carrying components, load receptacles and tackle and to show only the weight of the load to be lifted (net load). This tare function can be stopped 3 ways:

1. press the "F7" key again,
2. Luff by more than $\pm$ 4 °

The word "net " disappears from the symbol element for actual load indication and the gross load value is shown again.

Note: The "F7" key is effective with installed boom nose as well as actual load indication of the boom nose.

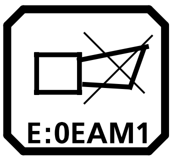
"F8" Horn OFF / Error diagnostics

1) Turn off the acoustical warning

The acoustical warning signals "Horn" and "SHORT HORN" can be turned off by pressing the "F8" key.

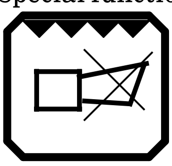
Note: A new error will turn the acoustical warning system on again.

2) Error messages in the symbol element "Horn"



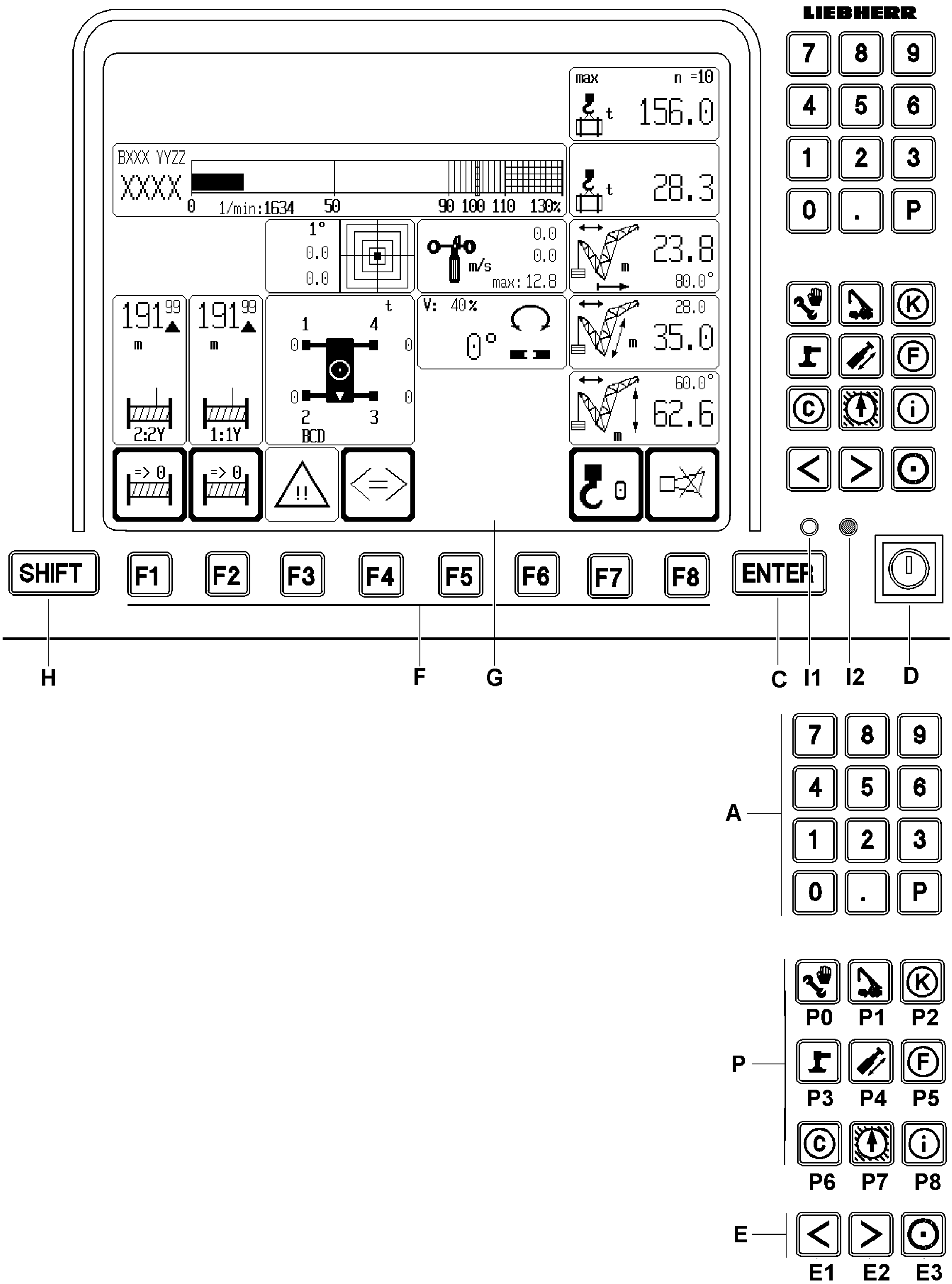
If a system application or operating error occurs, an error message appears in the symbol element "Horn" , such as E:0EAM1
By pressing the " F8" key twice, the acoustical warning is turned off and changes to the "Test system", program, error determination view, where the error is documented (see chapter 7.10, DIAGNOSTICS)

3) Special function Symbol element "Horn"



For crane delivery, a special program is available in the LICCON computer system . After the crane has been delivered to the new owner, this program is locked. If an additional mark (claw) appears in the symbol element Horn, then this means that the delivery program has not yet been locked. In this case, contact LIEBHERR Service immediately.

C A U T I O N : To prevent error functions, access to the special program is only given to trained LIEBHERR personnel .


LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
F
G
C
I1
I2
D
A
P
P0
P1
P2
P3
P4
P5
P6
P7
P8
E
E1
E2
E3

191010

12.7 Other control elements

The other control elements on the indicator and control unit of the LICCON computer system are assigned the following functions in the ”Operation” program:

A Alpha numeric keyboard

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

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

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

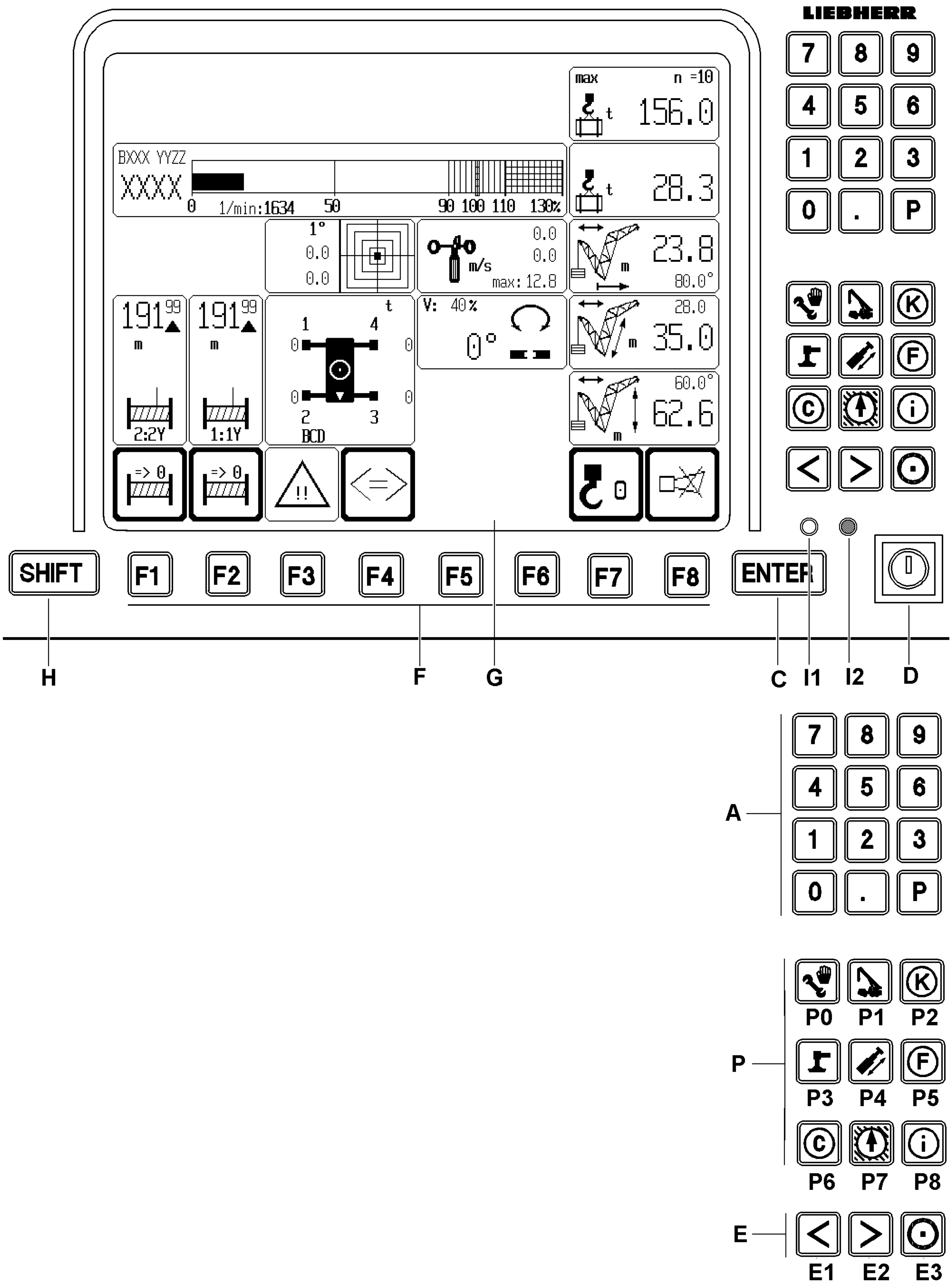
P Program keys

Use the program keys to select between the individual programs. However, the program specific peculiarities must be noted, such as shifting from ”SET UP” to ”Operation” by pressing 1× O.K. .

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

C "ENTER" key

This key has no function in the ”Operation” program .


LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
H
F
G
C
I1
I2
D
A
P
E
P0
P1
P2
P3
P4
P5
P6
P7
P8
E1
E2
E3

191010

D **Keyed switch** (see also chapter 4.04)
The keyed switch has two positions :
- Position to the right (touching) ⇒Hoist limit switch and shut off of LML bypassed
- Center position (self retaining) ⇒Normal operation

a) Bypass the overload safety device
If the maximum permissible load momentum is being exceeded, the LICCON overload safety device turns off all load moment increasing crane movements. This shut off can be bypassed with the keyed switch in position "to the right" .

C A U T I O N : The overload safety device may only be bypassed if a supervisor is present, and under utmost care. All indicators of the LICCON overload safety device remain functioning.

**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 !**

b) Bypassing the upper hoist shut off
If the hook block touches the hoist limit switch weight during an upward movement, the hoist limit switch is triggered. The crane movements 'spool up winch' is turned off. This shut off can be bypassed by turning the keyed switch to "right" .

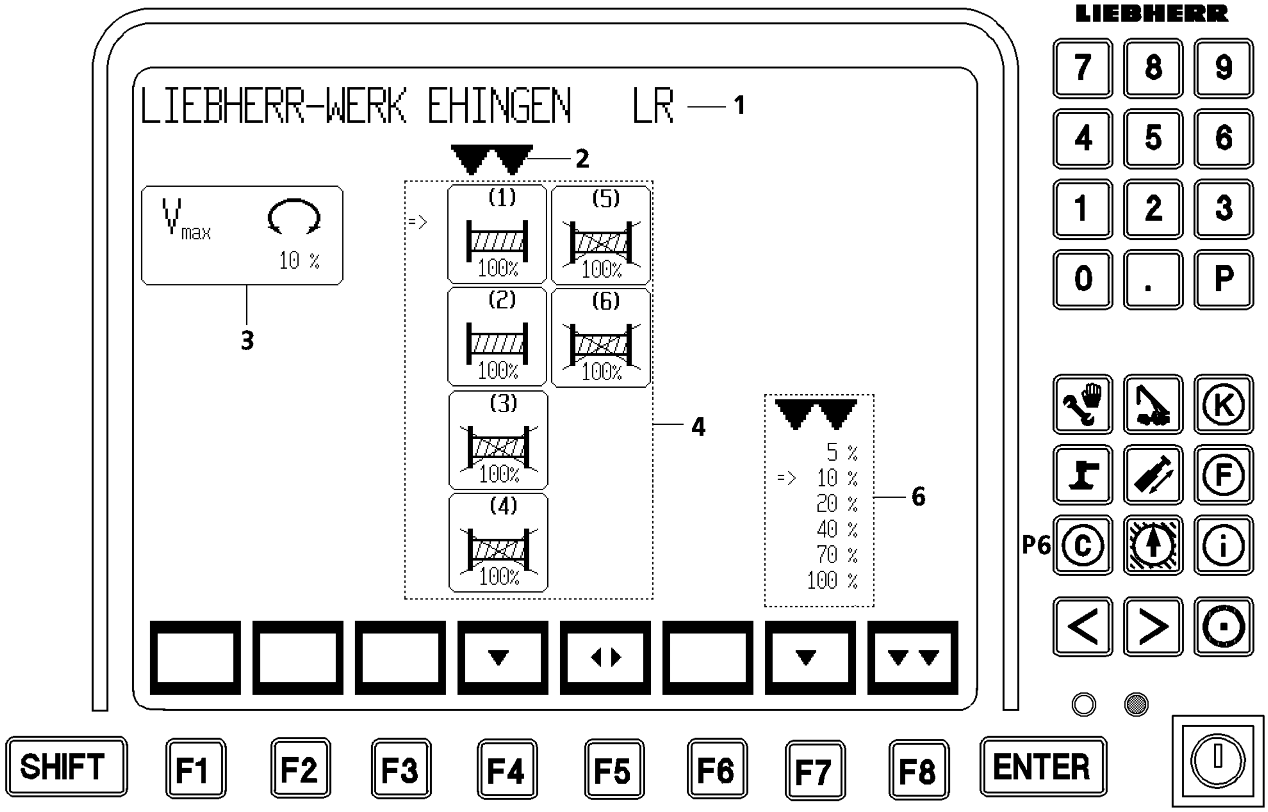
C A U T I O N : The hoist limit shut off function may only be bypassed if a supervisor is present, and if a "guide" is available. The guide must be in direct contact with the crane operator, and must monitor the distance between the hook block and the boom head at all times. All crane movements must be carried out with utmost care, at the least possible speed.

**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 **Special function keys**

Brightness adjustment of the monitors
See paragraph 4.2.4

H "SHIFT" key
- Key assignment 2nd level .
Program call up engine monitoring with "SHIFT" + "P0"


LIEBHERR-WERK EHINGEN LR
1
2
V_{max}
10 %
3
(1)
100%
(5)
100%
(2)
100%
(6)
100%
(3)
100%
(4)
100%
4
5 %
=> 10 %
20 %
40 %
70 %
100 %
6
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
P6
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191020

13. The "ControlParameter" program

The "Control-Parameter " program offers the possibility to:
- preselect the maximum slewing speed of the slewing gear
- preselect the maximum slewing speed of the winches as well as to activate or deactivate the individual winches.

Note: During the "Control-Parameter" program, the installation and bypass switches are monitored. If one of these switches is actuated during the program, then the system shifts back immediately into the "Operation" program.

C A U T I O N : A change of maximum speed as well as activation / deactivation of the winches may not be made during a control of a crane movement.

13.1 Starting the program

- start with program key "P6"

13.2 Control surface of "Control Parameter" program

1) Crane type

2) Selector (double arrow) to select the symbol elements

3) Symbol element max. slewing speed : V_{max}

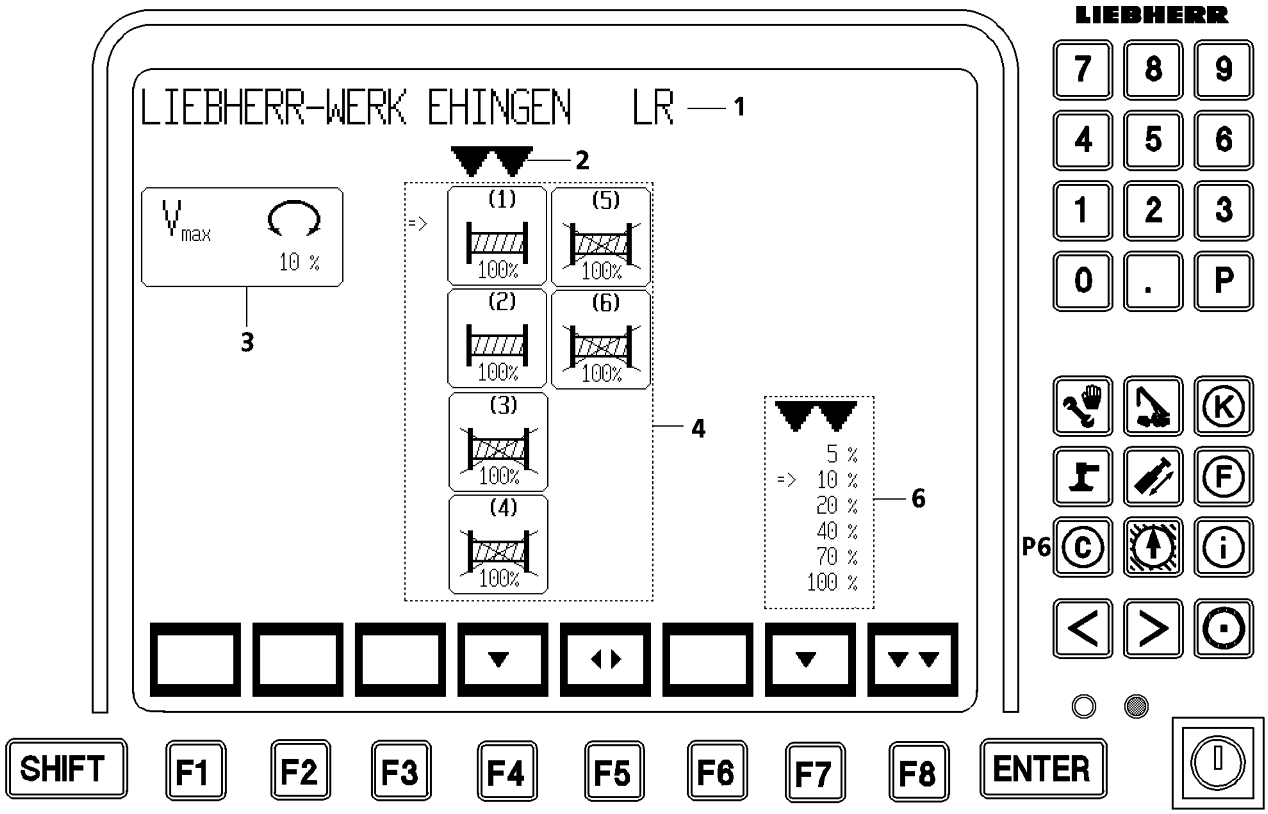
4) Symbol element groups cable winches
with selector (=>) for the individual winches

6) Value field with selector (=>)
The percentage values describe the speed at maximum deflection of manual control lever. Always refers to maximum obtainable speed of drive, at a speed preselection of 100%. 6 stages can be preselected .

7) Function keybar
"F1" not used
"F2" not used
"F3" not used
"F4" Selection of winches
"F5" Deactivate or activate the selected cable winches.
"F6" not used
"F7" Selection of percentage value for corresponding speed in value field
"F8" Shift back to "Operation" program and take over parameters

8) ENTER key
Take over selected speed setting for preset functions.

9) Special function keys
"E1" moves the selector (2) to select symbol elements to the left
"E2" moves the selector (2) to select symbol elements to the right


LIEBHERR
LIEBHERR-WERK EHINGEN LR
1
2
3
4
5
6
Vmax
10 %
(1)
(2)
(3)
(4)
(5)
(6)
100%
5 %
10 %
20 %
40 %
70 %
100 %
7 8 9
4 5 6
1 2 3
0 . P
P6
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191020

13.3 Change maximum slewing speed - slewing gear

- Select symbol element "max. slewing speed (3) "with keys "E1" or "E2" .
  Selector (2) appears above the symbol element group.
- Select maximum slewing speed in [%] with key "F7",
  Selector (= >) points to the selected maximum slewing speed in percentages.
- Confirm the selected maximum slewing speed with the "ENTER" key.
- Take over setting

D A N G E R : The maximum slewing speeds (according to load capacity charts) which depend on the boom length and the operating mode, may NOT be exceeded during crane operation with a load !

The larger the boom length, the heavier the attachment and the larger the load the smaller the adjusted "maximum slewing speed" must be.

With maximum load, the manual control lever for the slewing gear may not be deflected all the way to the stop.

13.4 Change the maximum slewing speed - winches

- Select symbol element "Winches" (4) with keys "E1" or "E2" .
  Selector (2) appears above the symbol element group.
- Select symbol element for winch 1, 2, 3, 4 , 5 or 6 with key "F4",
  Selector (= >) points to the selected winch.
- Select maximum slewing speed in [%] with key "F7",
  Selector (= >) points on selected percentage value.
- Confirm the selected maximum slewing speed with the "ENTER" key.
- Take over setting.

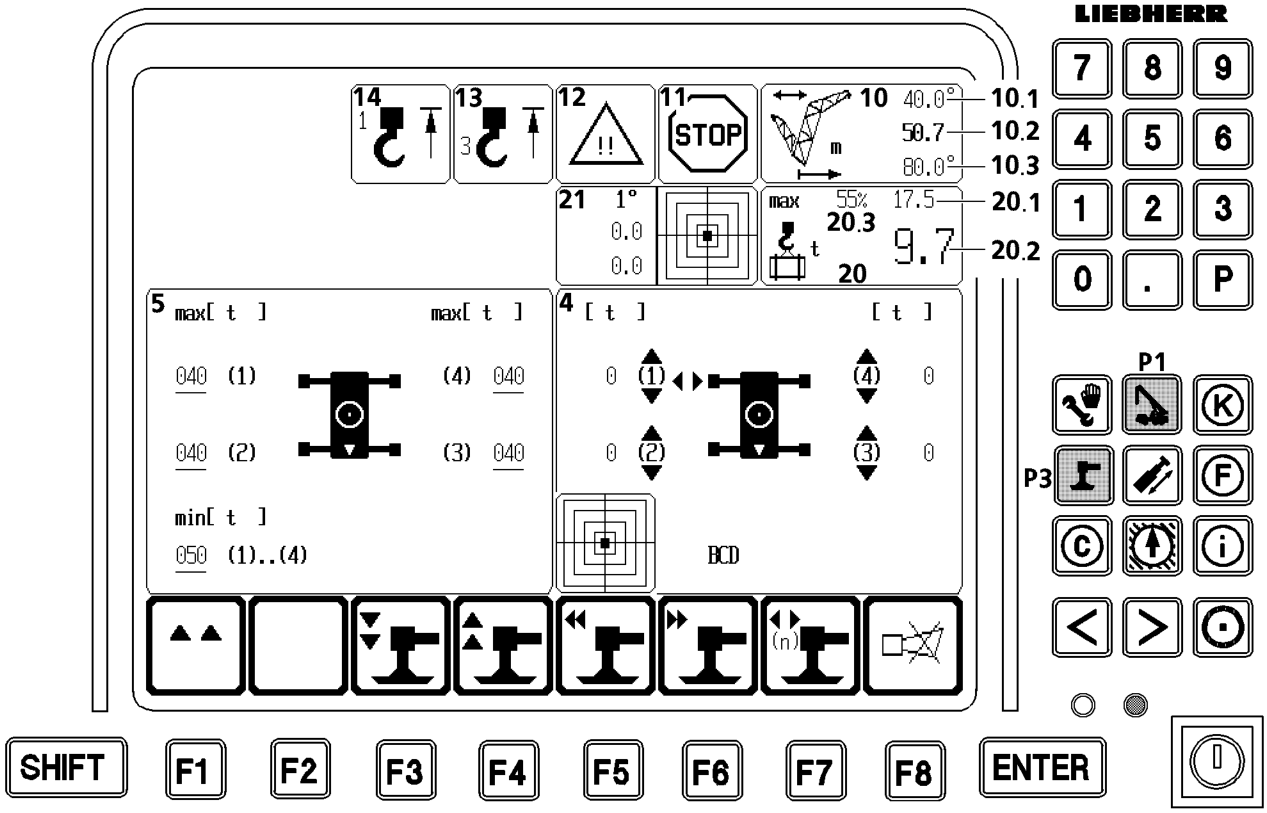
13.4.1 Activate / deactivate the individual winches

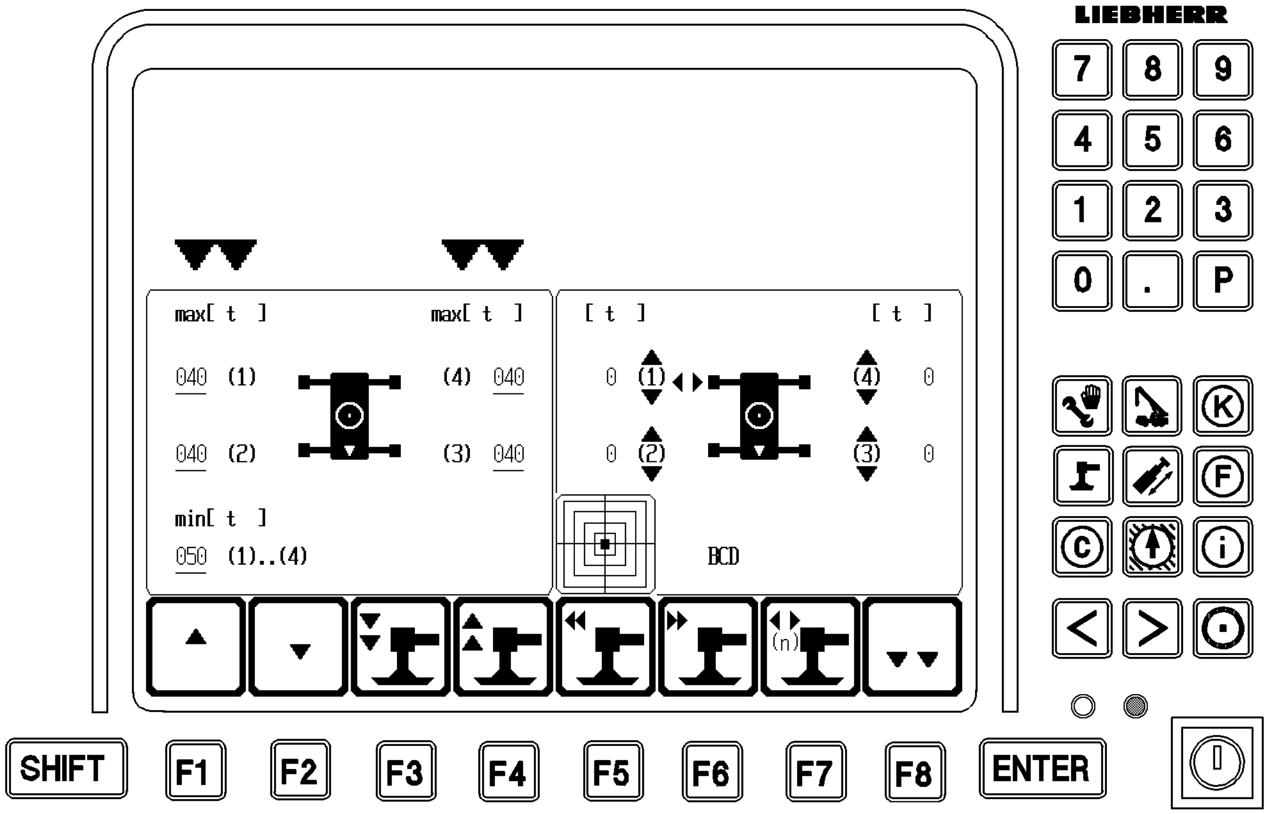
To prevent inadvertent movement of a winch, which is currently not required, the individual winches can be deactivated.

- Select symbol element group "Winches" with keys "E1" or "E2".
  Selector (2) appears above the symbol element group.
- Select symbol element for winch 1, 2, 3, 4, 5 or 6 with key "F4",
  Selector (= >) points to selected winch.
- Activate or deactivate the selected winch with key "F5".
  The winch symbol in the symbol element changes as follows:
  Winch symbol crossed out = Winch deactivated
  Winch symbol not crossed out = Winch active

13.5 Shift back into the crane operating view

- with function key "F8"
  The paramenters previously confirmed with "ENTER" are taken over.


LIEBHERR
14
13
12
11
STOP
10
40.0°
50.7
m
80.0°
10.1
10.2
10.3
21
1°
0.0
0.0
max
55%
17.5
20.3
t
9.7
20
20.1
20.2
5
max[t]
040 (1)
040 (2)
(4) 040
(3) 040
min[t]
050 (1)..(4)
4
[t]
BCD
P1
P3
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
max[t]
040 (1)
040 (2)
(4) 040
(3) 040
min[t]
050 (1)..(4)
[t]
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191203

14. The "Support" * program

Note: The monitor view shows the complete configuration of the "Support" program. Depending on the options, the individual parts of the program are inactive and not visible on the LICCON monitor. The number values in the symbol elements are only examples and might not match this particular crane.

14.1 Start / end the program

14.1.1 Start the program
- with program key "P3"

14.1.2 End the program and shift back to the "Operation" program
- with program key "P1"

14.1.3 Crane operation in "support" program

Note: This function is only released for the option "Crane support*".

C A U T I O N: The utilization of the boom nose and the wind speed are not shown.

D A N G E R: During unclear wind conditions, it is prohibited to work with the boom nose and working with a load in the support program.

10) Symbol element "Radius and main boom angle"
    10.1 Auxiliary equipment angle [°]
    10.2 Radius of load on boom [m] or [ft]
    10.3 Main boom angle [°]
11) Symbol element "STOP"
12) Symbol element "Prewarning"
13) Symbol element "Hoist top on auxiliary boom" or "Hoist top on boom nose"
14) Symbol element "Hoist top on main boom"
20) Symbol element "Load carrying capacity "
    20.1 Maximum load on boom [t] or [lbs]
    20.2 Current load on boom [t] or [lbs]
    20.3 Dynamic utilization on boom in [%]
21) Symbol element "Incline superstructure"

Note: For detailed description of symbol elements, see paragraph 6.1, Information about crane geometry and load as well as paragraph 6.2, Alarm function.

- Change over into the adjustment field for support limit forces (5) with function key "F1".

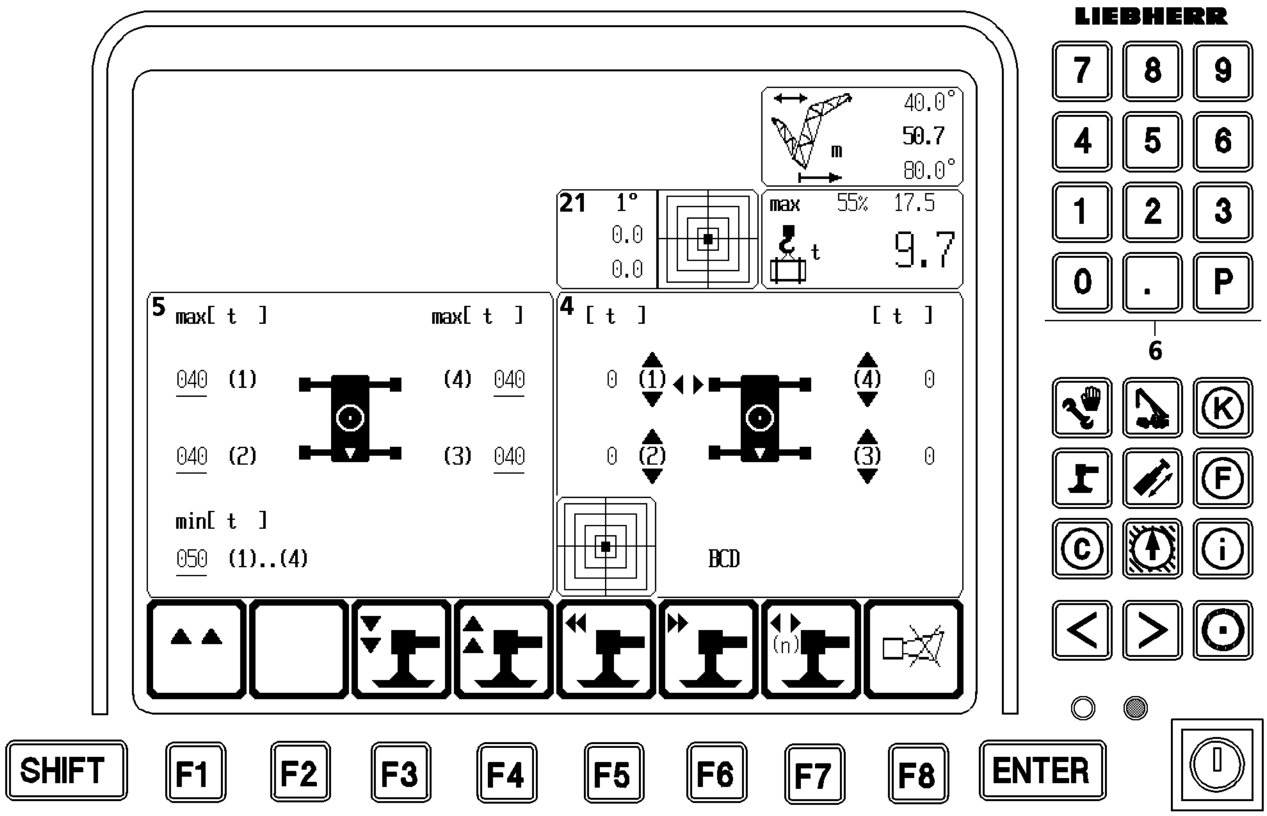
Note: However, LMB-STOP is triggered immediately. All hoist and luffing movements are stopped and the symbol elements for crane operation disappear.

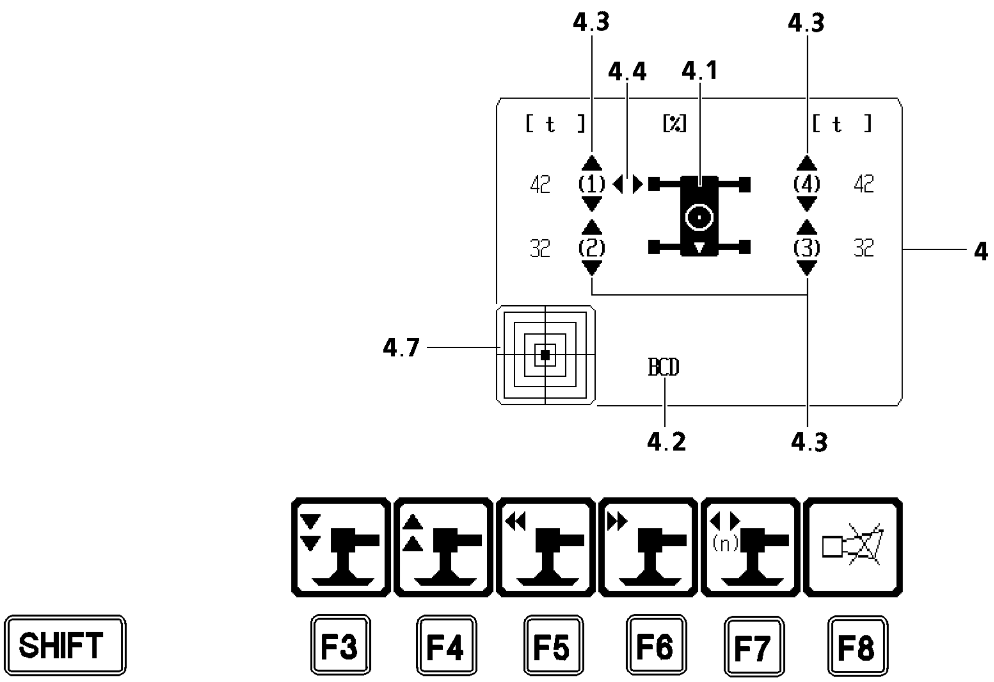
- End the adjustment mode with function key "F8".
  All symbol elements for crane operation will reappear and all crane movements are released.

14.2 Configuration of program

14.2.1 Support
    14.2.1.1 Manual support
    14.2.1.2 Automatic support and horizontal alignment
14.2.2 Support force monitor *

* Optional


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
6
40.0°
50.7
m
80.0°
21 1°
0.0
0.0
max 55% 17.5
t
9.7
5 max[t]
max[t]
040 (1)
(4) 040
040 (2)
(3) 040
min[t]
050 (1)..(4)
4 [t]
[t]
0 (1)
(4) 0
0 (2)
(3) 0
BCD
(n)
K
F
C
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


4.3
4.3
4.4
4.1
[t]
[%]
[t]
42 (1)
(4) 42
32 (2)
(3) 32
4
4.7
BCD
4.2
4.3
(n)
SHIFT
F3 F4 F5 F6 F7 F8

191204

14.2.1 Support

14.2.1.1 Manual support

see also chapter 3.05,THE CRANE AT THE JOBSITE

4) Monitoring and control field
   - 4.1 Crane symbol with numbers of support cylinders
   - 4.2 Support base
   - 4.3 Function selectors to select support cylinder
   - 4.4 Function selectors to select folding arms
   - 4.7 Symbol "Incline chassis"
     (see paragraph 6.4.1 Added fucntion "Crane incline ", graphic section)

   Function keybar in monitoring / control mode (at program start)
   - "F3" Extend preselected support cylinder
   - "F4" Retract preselected support cylinder
   - "F5" Extend preselected folding arms
   - "F6" Retract preselected folding arms
   - "F7" Select folding arm
   - "F8" Turn horn off / error diagnostics

   Note: For safety reasons, only one folding arm can be selected via the function key "F7" .

   The functions "F3" and "F4" are only of value if at least one support cylinder is preselected. If no support cylinder is preselected, then a sound can be heard.

   C A U T I O N : For safety reasons, the functions behind "F3" to "F6" are only active as long as the corresponding button is actuated. An acoustical meassage, a "rhythmic horn sound" can be heard for the duraction of the function .

6) Keyfield
   With buttons 1 to 4, select or deselect the corresponding support cylinder .

14.2.1.2 Align the support and crane automatically in horizontal direction

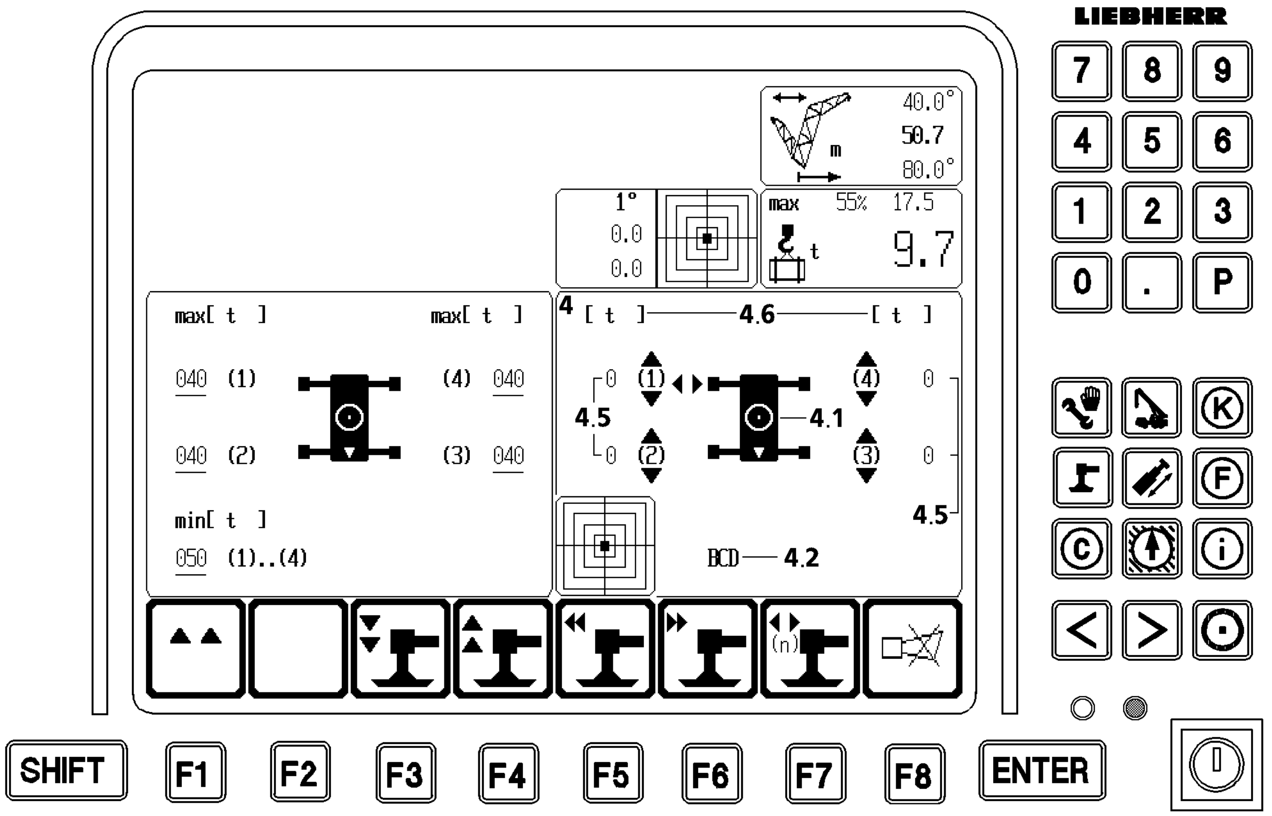
"SHIFT" + "F3" By actuating the key combination "SHIFT" + "F3", all support cylinders are extended and the crane is aligned in horizontal direction.

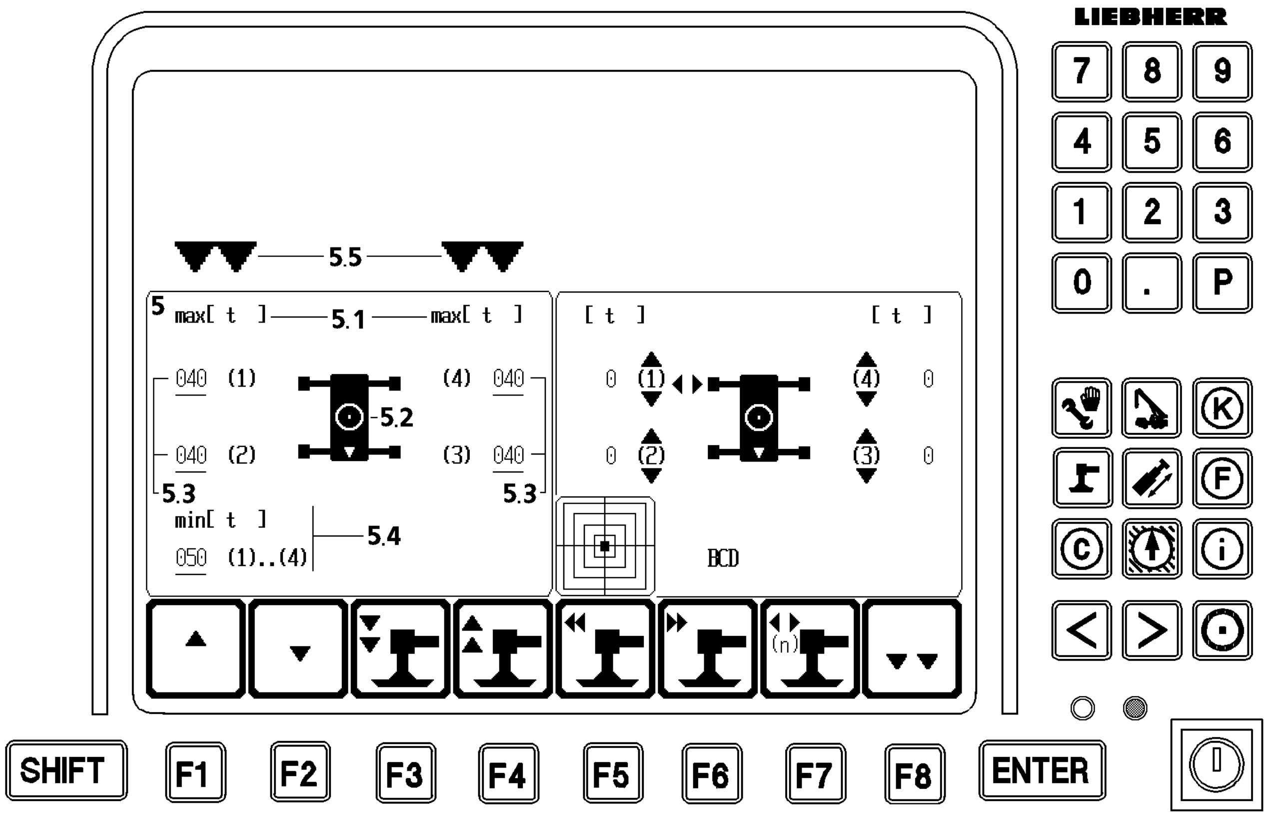
"SHIFT" + "F4" By actuating the key combination "SHIFT" + "F4", all support cylinder are retracted and the crane is aligned in horizontal direction.

Note: By taking the incline values sent by the incline sensor into account, the supports are moved independent of the selection into the preselected direction so that the crane moves into a horizontal position.

D A N G E R: However, it must be checked that all four support plates are in contact with the ground. If this is not the case, there is a danger of accidents!

The support force indication is incorrect if the support cylinders are extended or retracted all the way. There is a danger of accidents!


LIEBHERR
40.0°
50.7
m
80.0°
1°
0.0
0.0
max 55% 17.5
t 9.7
max[t]
max[t]
040 (1)
(4) 040
040 (2)
(3) 040
min[t]
050 (1)..(4)
4 [t]
4.6
[t]
4.5
4.1
4.5
BCD
4.2
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
5.5
5 max[t]
5.1
max[t]
040 (1)
(4) 040
5.2
040 (2)
(3) 040
5.3
5.3
min[t]
050 (1)..(4)
5.4
[t]
[t]
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191205

14.2.2 Support force monitoring *

D A N G E R : The LICCON support force monitor is only a tool to aid in the monitoring function. A possible overload of the crane is not prevented. The support force monitor may not be used to utilize the crane to its tipping limit!

4) Monitoring and control field

4.1 Crane symbol with numbers of support cylinder

4.2 Support base

4.5 Support force values in [t] or [kibs]

4.6 Unit of indicated support force values in [t] or [kibs]

Function keybar in monitoring / control mode (at program start)
"F1" Change over to set up field for support force monitors
"F8" Turn horn off / error diagnostics

5) Set up / adjustment field for support limit forces

5.1 Unit of maximum support limit force values [t] or [kibs]

5.2 Crane symbol with support numbers

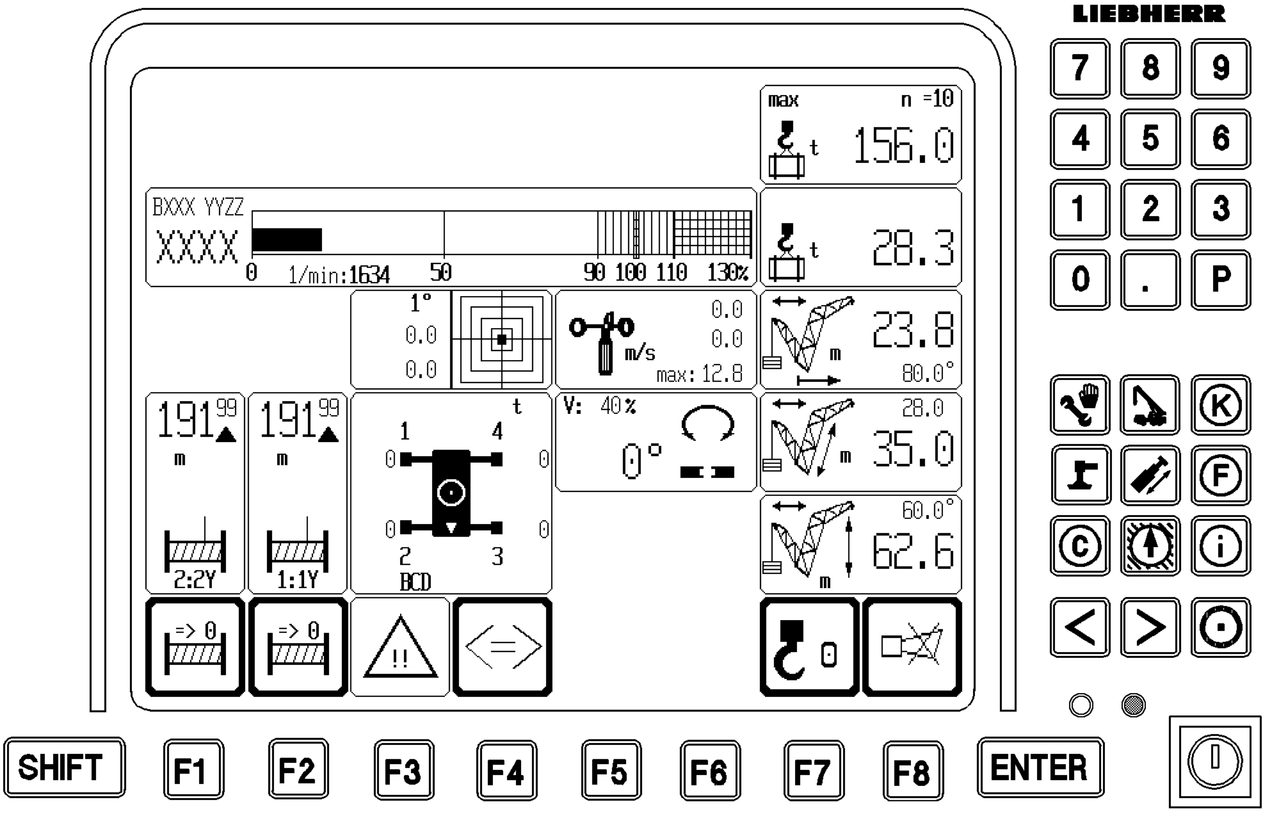
5.3 Maximum support limit force values **max** in [t] or [kibs]

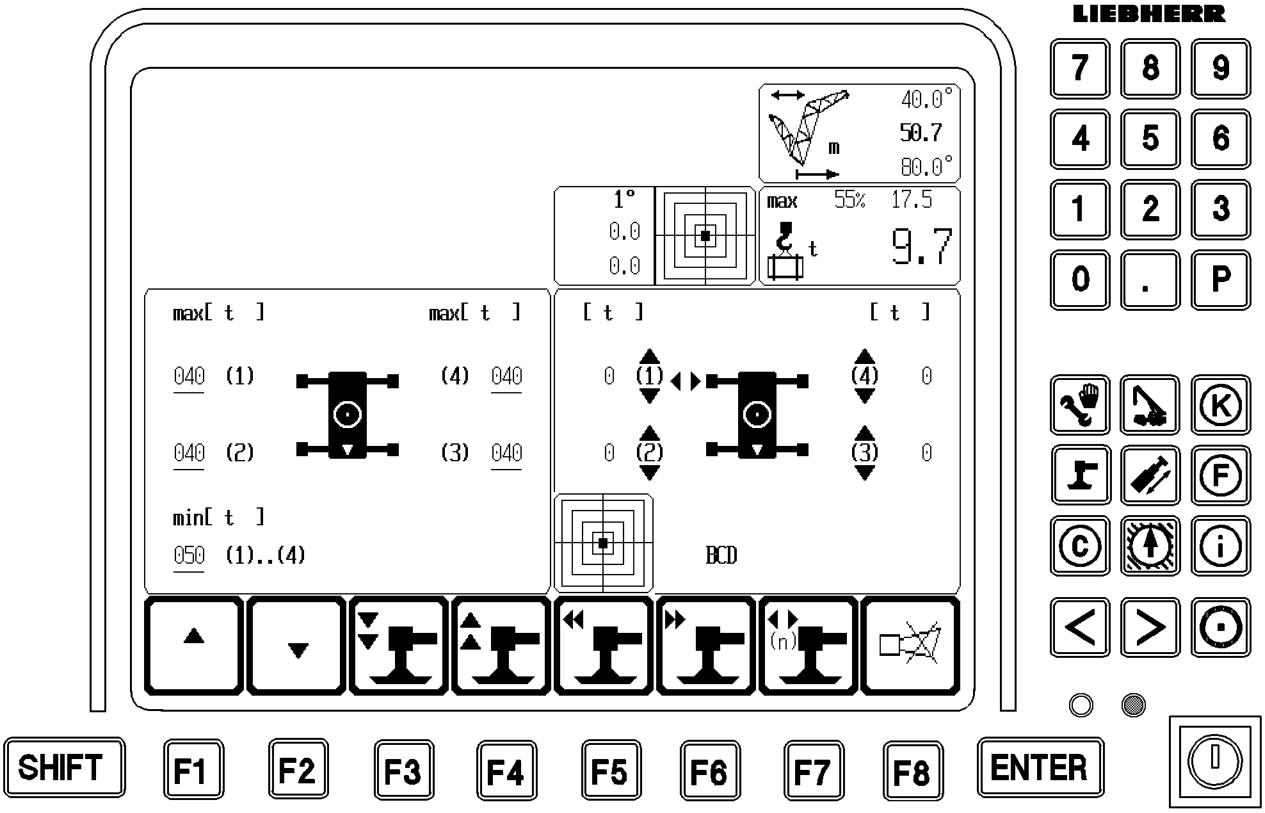
5.4 Minimum support limit force values **min** in [t] or [kibs]

Note: Valid for all four supports.

5.5 Selector arrows
Point to the set up field, if it is active.

Function keybar in set up / adjustment mode
"F1" Move cursor to next support limit force value.
"F2" Move cursor to previous support limit force value.
"F8" Shift back to monitoring and control field (4).


LIEBHERR
max
n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
1°
0.0
0.0
0.0
0.0
m/s
max: 12.8
23.8
80.0°
191 99
m
191 99
m
2:2Y
1:1Y
1 4
2 3
BCD
V: 40%
0°
28.0
35.0
60.0°
62.6
=> 0
=> 0
!!
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P


LIEBHERR
40.0°
50.7
80.0°
1°
0.0
0.0
max 55% 17.5
9.7
max[t]
max[t]
040 (1)
(4) 040
040 (2)
(3) 040
min[t]
050 (1)..(4)
[t]
[t]
0 (1)
(4) 0
0 (2)
(3) 0
BCD
(n)
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P

191206

14.2.2.1 Indication of current support forces

During crane operation, the support force monitor determines the current pressure on 4 support cylinders via pressure sensors and shows it as support force [t] or [kibs] for each support.

The support forces are shown in the equipment configuration "supported" , either as required via the function key "F3" or if a critical situation occurs in the "Operation" program. The symbol element appears together with the acoustical warning signal if the maximum force is exceeded at least on one support or if the minimum force is reached or fallen below. In these conditions, the support limit force value which is too high or too low is shown blinking.

D A N G E R : The crane movements are not shut off when the minimum and maximum support forces are reached.

Note: At the factory, the maximum and minimum support values, depending on the crane type, have been programmed into the system . With the " support force monitor", the crane operator can change these values, depending on the situation (see paragraph 10.2.2.3.

14.2.2.2 Notes

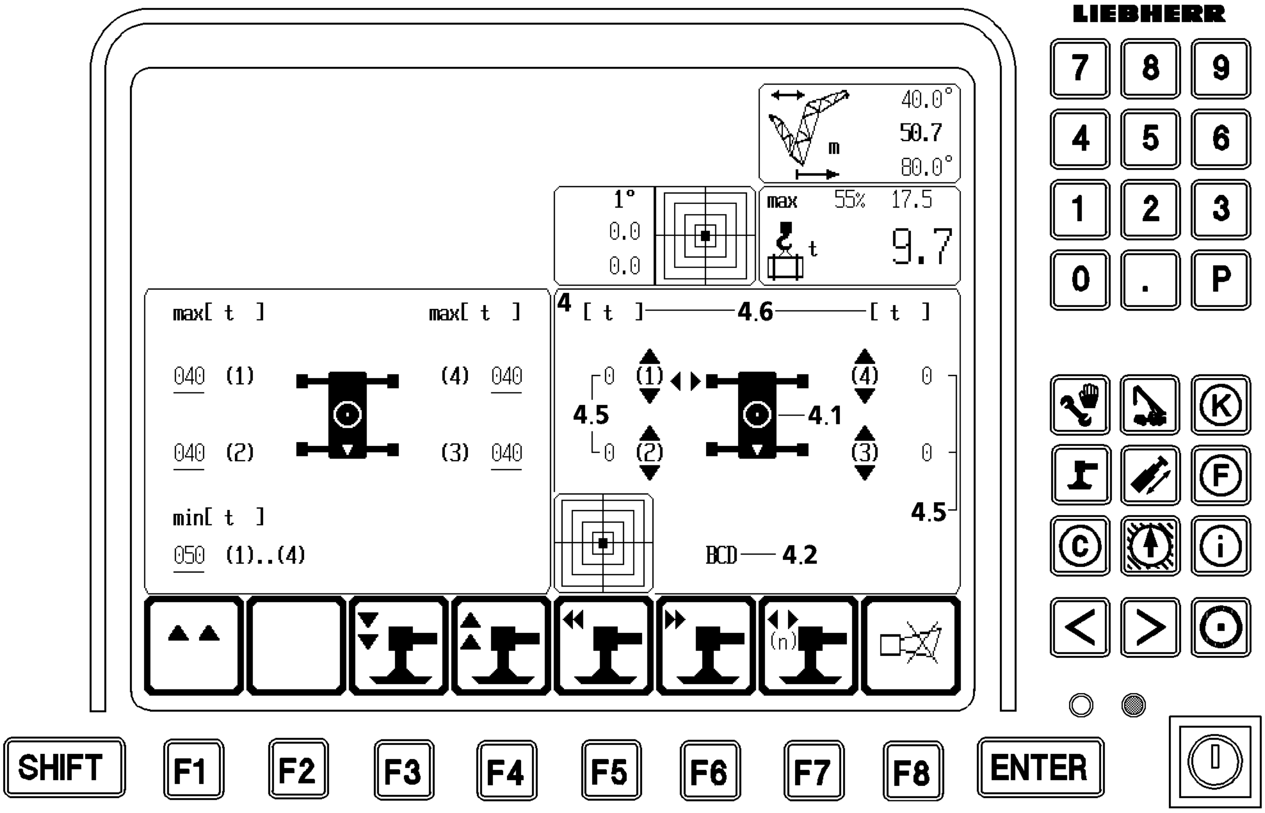
Due to the possibility to determine the limit values himself, the LICCON support force monitor can also be utilized as a prewarning device.

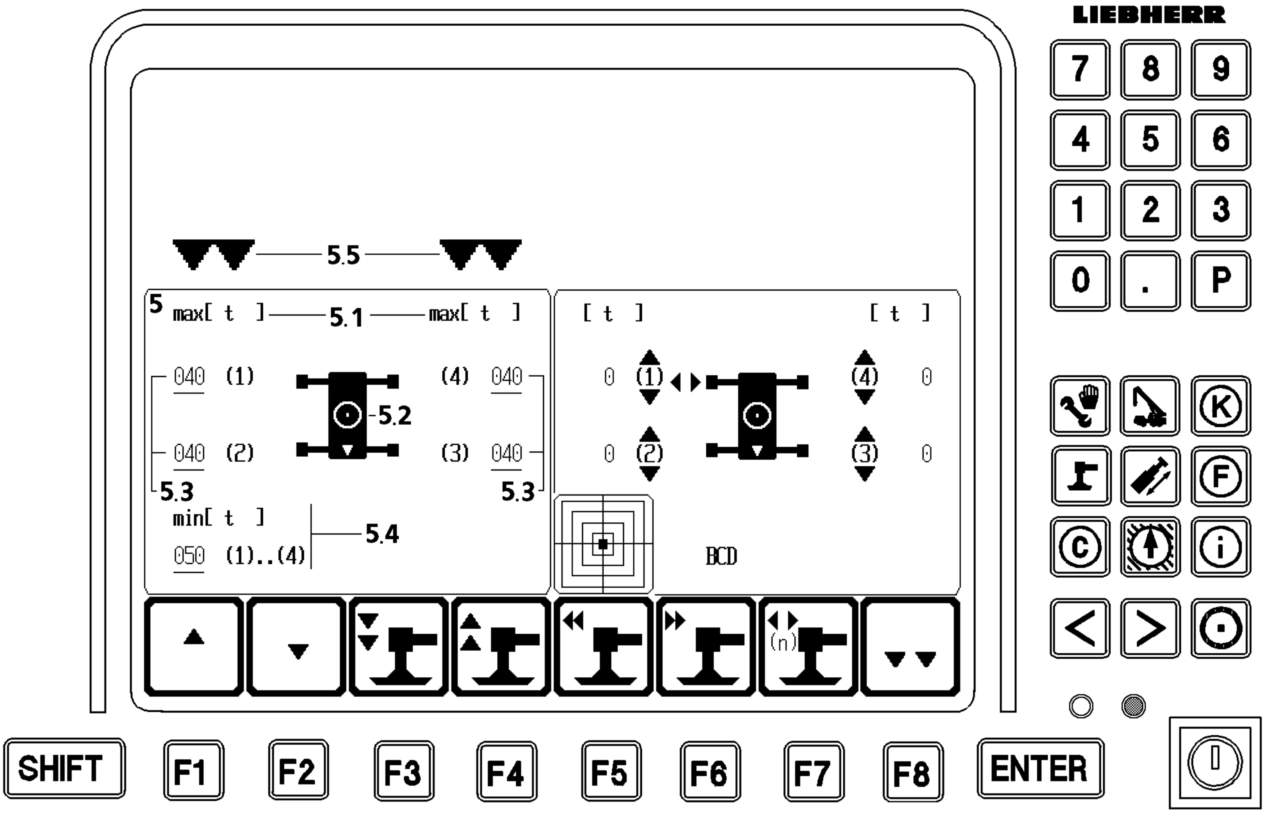
Note: Possible inaccuracy of the indication must be taken into account.

C A U T I O N : To ensure that the LICCON support force monitor works properly, the support cylinders may not be moved to "Block bottom" nor to "Block top" . Otherwise, the support forces are incorrect!

Due to friction in the support cylinders, the indicated support forces can be incorrect up to 40 t, especially in case of
- large support forces
- far extended support cylinders
- during extension of support cylinder (up to 15 minutes later).

D A N G E R : The LICCON support force monitor is only a tool to aid in the monitoring function. A possible overload of the crane is not prevented. The support force monitor may not be used to utilize the crane to its tipping limit!


LIEBHERR
4
4.1
4.2
4.5
4.6
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
5
5.1
5.2
5.3
5.4
5.5
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191205

14.2.2.3 Change the minimum and maximum support forces

Prerequisites:
The crane must be supported during operation.
The installation switch may not be actuated.

Note: As additional safety measure, this program monitors the installation switch. In case of attempted operation in installation, the system shifts back to the "Operation" program.

In the monitoring and control field (4) , the current support force values are shown.

Note: If one or more values are below the set minimum or above the set maximum values, then the depicted values will blink.

In the set up / adjustment field (5) , the programmed maximum / minimum values are shown.

The program runs first in the monitoring mode. All relevant symbol elements for crane operation are shown.

- Press function keybar "F1" .
  Two double arrows now point to the set up field for support limit forces (5), the cursor appears on the maximum value of support 1.

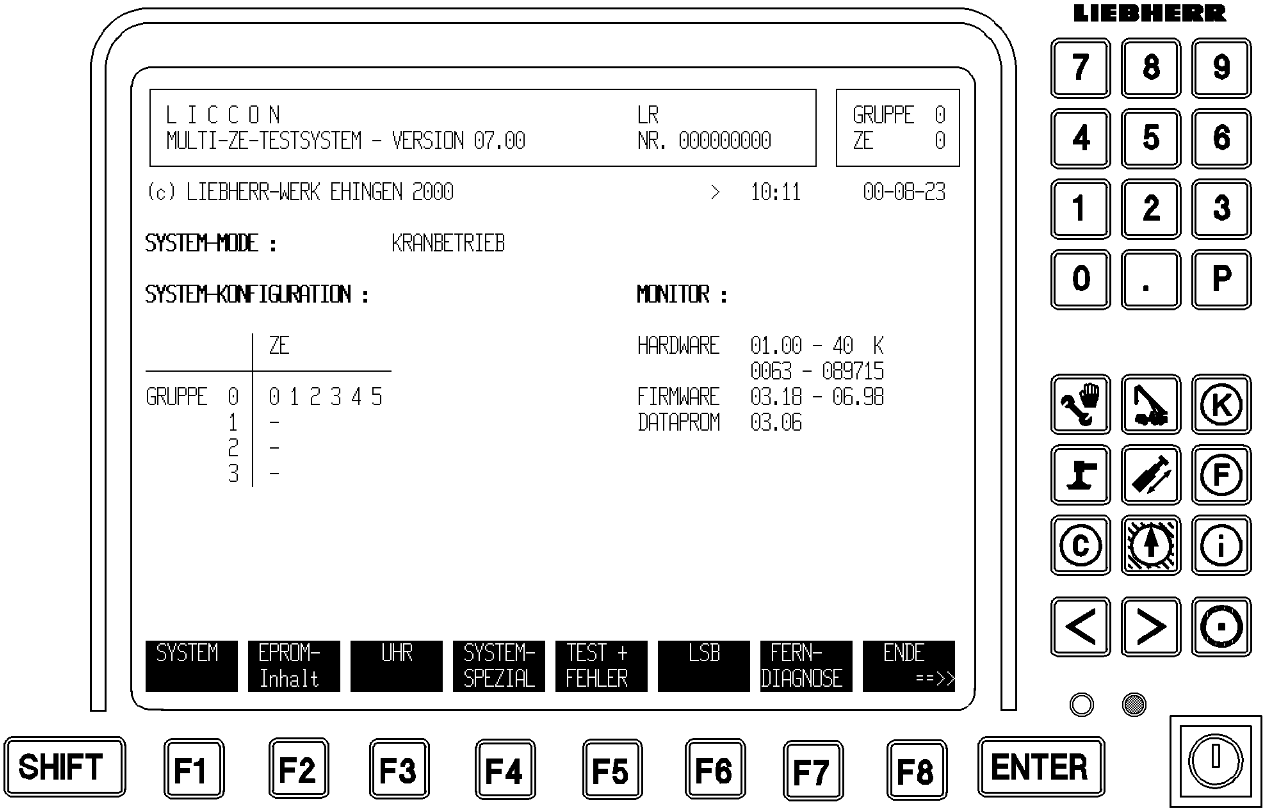
Note: However, LML STOP is triggered immediately. All hoisting and luffing movements are stopped and the symbol elements for crane operation dis appear.

- With function keys "F1" or "F2", continue the cursor to the next or previous maximum support limit force value or the minimum support limit force value (valid for all four support cylinders).
- Change the value via the alpha numeric keys.
- Close the input function with the "ENTER" key.

Note: Each new entered value is checked for its validity and then is taken over directly or returned as an error (too large / too small) ⇒ for example ERROR : X > > 600

- Return to the monitoring and control field (4) with "F8".
- Return to the "Operation" program with "P1".

* Optional


L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 07.00
LR
NR. 000000000
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 2000
> 10:11 00-08-23
SYSTEM-MODE : KRANBETRIEB
SYSTEM-KONFIGURATION :
MONITOR :
ZE
GRUPPE 0 0 1 2 3 4 5
1 -
2 -
3 -
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.06
SYSTEM
EPROM- Inhalt
UHR
SYSTEM- SPEZIAL
TEST + FEHLER
LSB
FERN- DIAGNOSE
ENDE ==>>
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191024

15. The "Test system" program

The test system program is a service and diagnostic tool, which makes it possible to quickly localize and fix any problems on the crane, without having to use testing devices.

Note: Some safety relevant functions in the test system program can only be used by trained expert service technicians, which means they are protected from unauthorized access.

LICCON in standard operation

Note: The programs and program run of the LICCON computer system is not affected, which means the crane continues to be fully functioning and the control can be checked with the extensive aids of the test system.

D A N G E R : In the test system, the LICCON monitor is used only for the functions of the test system. No warning appear which note that the crane is in limit ranges, For that reason, the crane must be operated with utmost care !

15.1 Start the test system

- Confirm the operating mode of the crane with the "F8" key.
- Use the "i" key (P8) to call up the test system from the "Operation" program.
  ⇒ MULTI-ZE-TESTYSTEM - VERSION XX.XX (⇒ MULTI-CPU-TEST SYSTEM - VERSION XX.XX)

15.2 Main menu

After starting the LICCON test system, the main menu appears and shows basic system data. All sub-functions can be called up via the function keys "F1" to "F8".

15.2.1 Selection of CPU or group

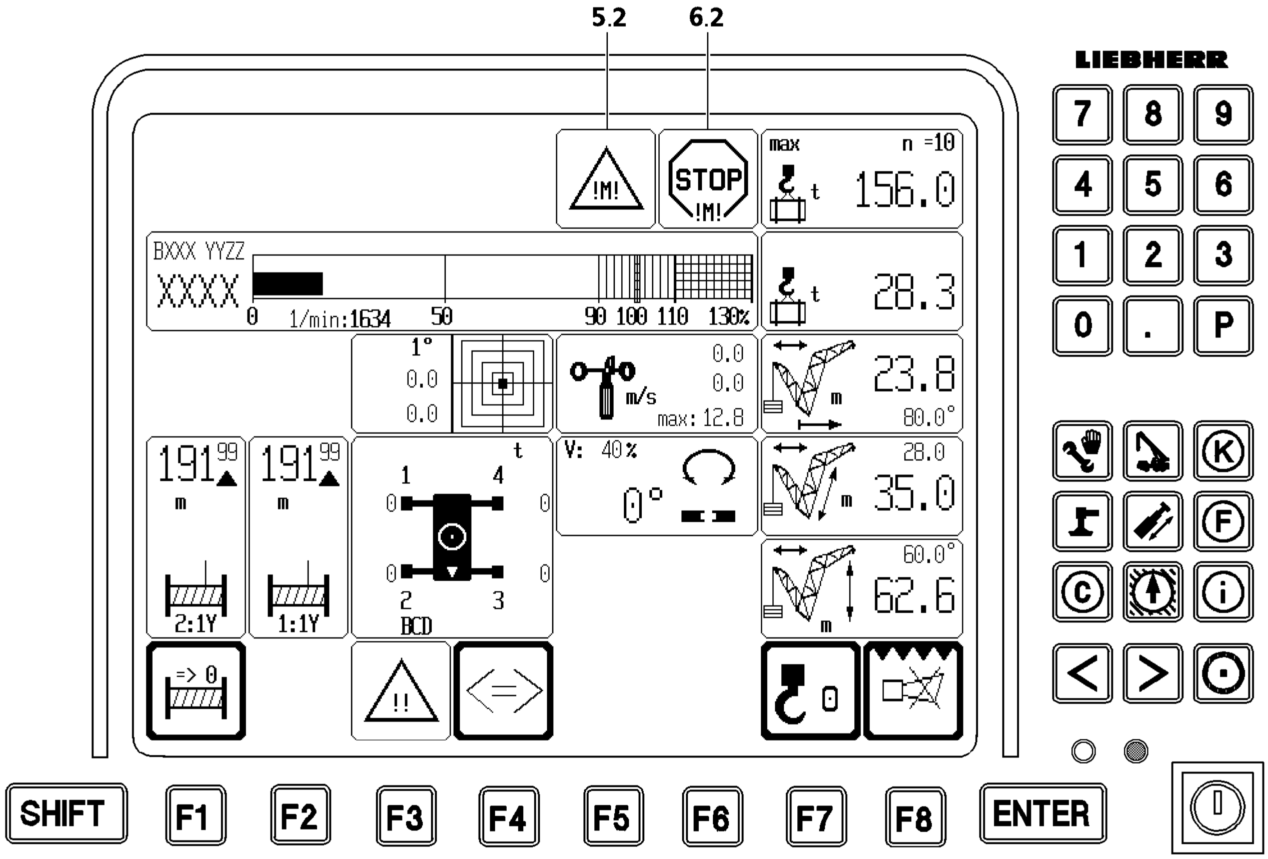
The cursor blinks in the upper right window to point to the selection of the desired CPU.
- By pressing the "ENTER" key, the cursor changes from "CPU" to "group" or back.
- Enter the desired group or CPU from the installed units with the number keys of the alpha-numeric keyboard.

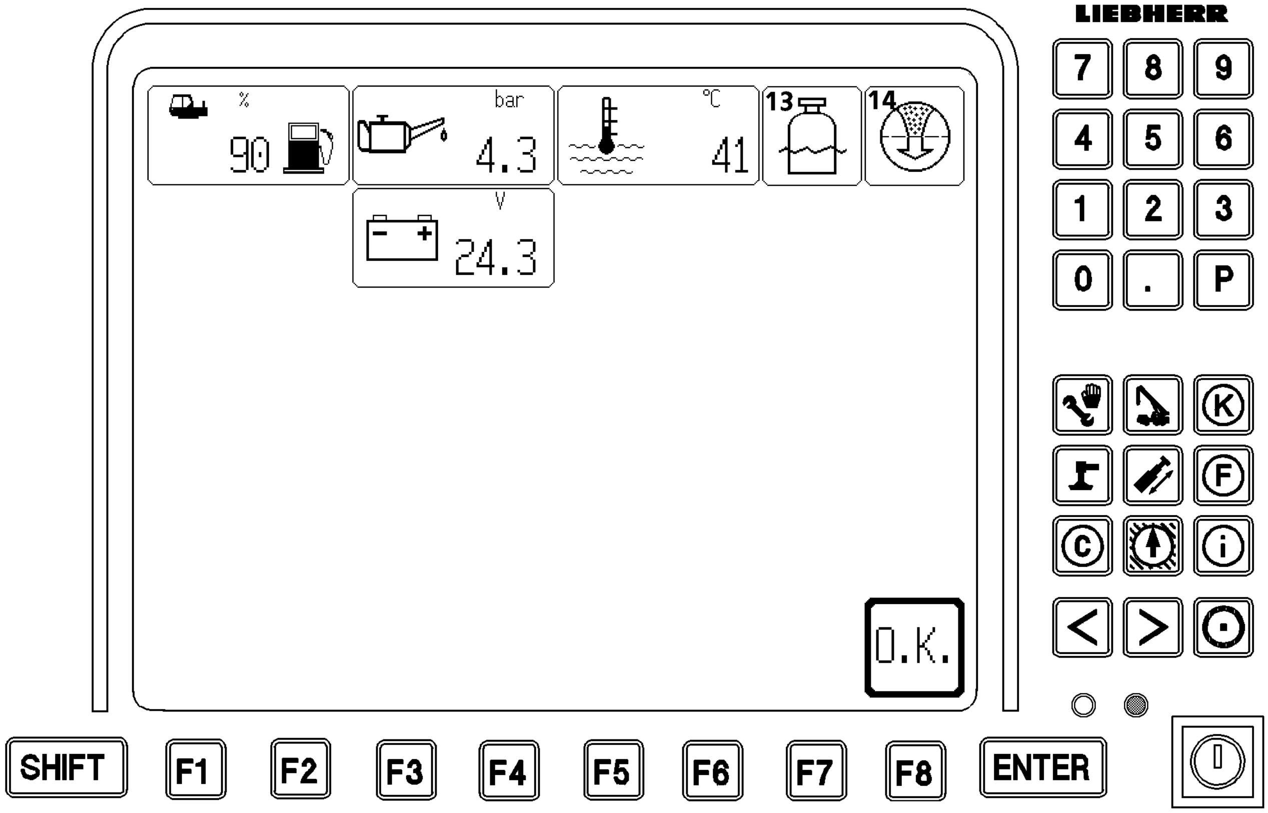
Note: The test system can only access installed units (groups, CPUs).

15.2.2 Function key bar main menu

"F1"	**SYSTEM**	Access inputs and outputs, AWL-Operands, system internal "Specialties ".
"F2"	**EPROM-Inhalt**	Software of LICCON CPUs.
"F3"	**UHR**	(CLOCK) Access protected function is used to stop or start the battery buffered real time clock
"F4"	**SYSTEM-SPEZIAL**	To check the complete crane function units
"F5"	**TEST + FEHLER**	Access to errors stored in error stacks
"F6"	**LSB**	Call up LSB-overview
"F7"	**FERN-Diagnose**	Start remote diagnostics *
"F8"	**ENDE ==>>**	Program end, return to operating view.

* Optional


5.2
6.2
LIEBHERR
STOP
max
n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
1°
0.0
0.0
m/s
max: 12.8
23.8
80.0°
191
m
2:1Y
1:1Y
BCD
V: 40%
0°
28.0
35.0
60.0°
62.6
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
%
90
bar
4.3
°C
41
13
14
V
24.3
O.K.
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191022

16. Engine monitor

16.1 Start the program

On request :
- with key combination "SHIFT" + "P0"

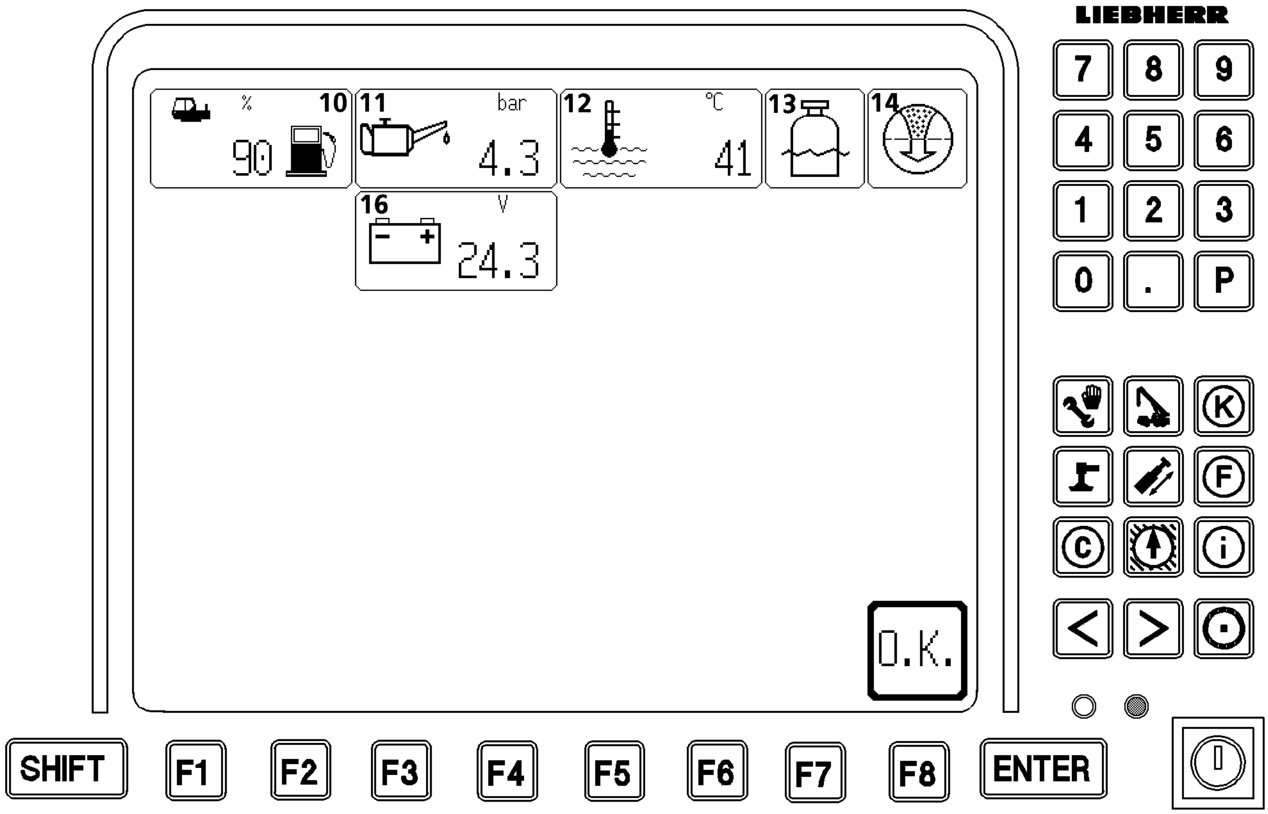
automatic:
- **Once**, if a STOP occurrence happens
- In case of a prewarning, warning or STOP occurrence while the LICCON computer system boots up

16.2 Possible prewarning, warning, STOP occurences of engine monitor

Occurences	**Prewarning at engine start**	**Warning** (5.2)	**STOP** (6.2)
Engine oil pressure (Indicator value) is missing		x	
Engine oil pressure (Indicator value) erroneous		x	
Engine oil pressure Warning active			x
Coolant temperature (Indicator value) missing		x	
Coolant temperature (Indicator value) erroneous		x	
Coolant temperature Warnung active			x
Coolant level Warning active			x
Air filter check		x	
Battery voltage (Indicator value) is missing	x		
Battery voltage (Indicator value) erroneous	x		
Battery voltage ≤16 V or ≥36V	x		
Fuel reserves (Indicator value) is missing	x		
Fuel reserves (Indicator value) erroneous	x		
Fuel reserves (Indicator value) ≤10 %	x		
Fuel reserves (Indicator value) ≤6 %		x	
Fuel reserves (Indicator value) 1 %			x

Note: The automatic change over into the "engine monitoring" program is only made from "Operation" or "Support " programs. The change over is made for approx. 5 seconds, the crane functions are not stopped.
If a monitoring occurence is confirmed in the "Engine monitoring" program with "F8", then, if the same occurence happens again, the system **will not** shift again automatically into the "Engine monitoring" program.
When shifting back into the "Operation" program, the STOP symbol element (6.2) or the warning symbol element (5.2) appears.
Prewarnings are not noted in the "Operation" program.

**C A U T I O N : If you work for a longer period of time in other programs, for example "Set up", "Test system", then it must be ensured, by occasionally changing back into the "Engine monitoring" program, that no engine monitoring occurences have happened , which could damage the engine.
The engine or crane functions are not shut off ! For that reason, do not ignore a STOP occurence, as this could severely damage the engine!**


LIEBHERR
%
10
90
11
bar
4.3
12
°C
41
13
14
16
V
24.3
O.K.
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191023

16.3 Symbol elements for engine monitoring

10) Tank contents in [%]
Symbol element blinks if the fuel reserves is <5% .

11) Oil pressure in [bar]
Number indicator in the symbol element blinks if the engine oil pressure is too low.

12) Coolant temperature in [°C]
Number indicator in the symbol element blinks if the coolant temperature is too high.

13) Coolant level too low
Symbol element appears if the coolant level is too low.

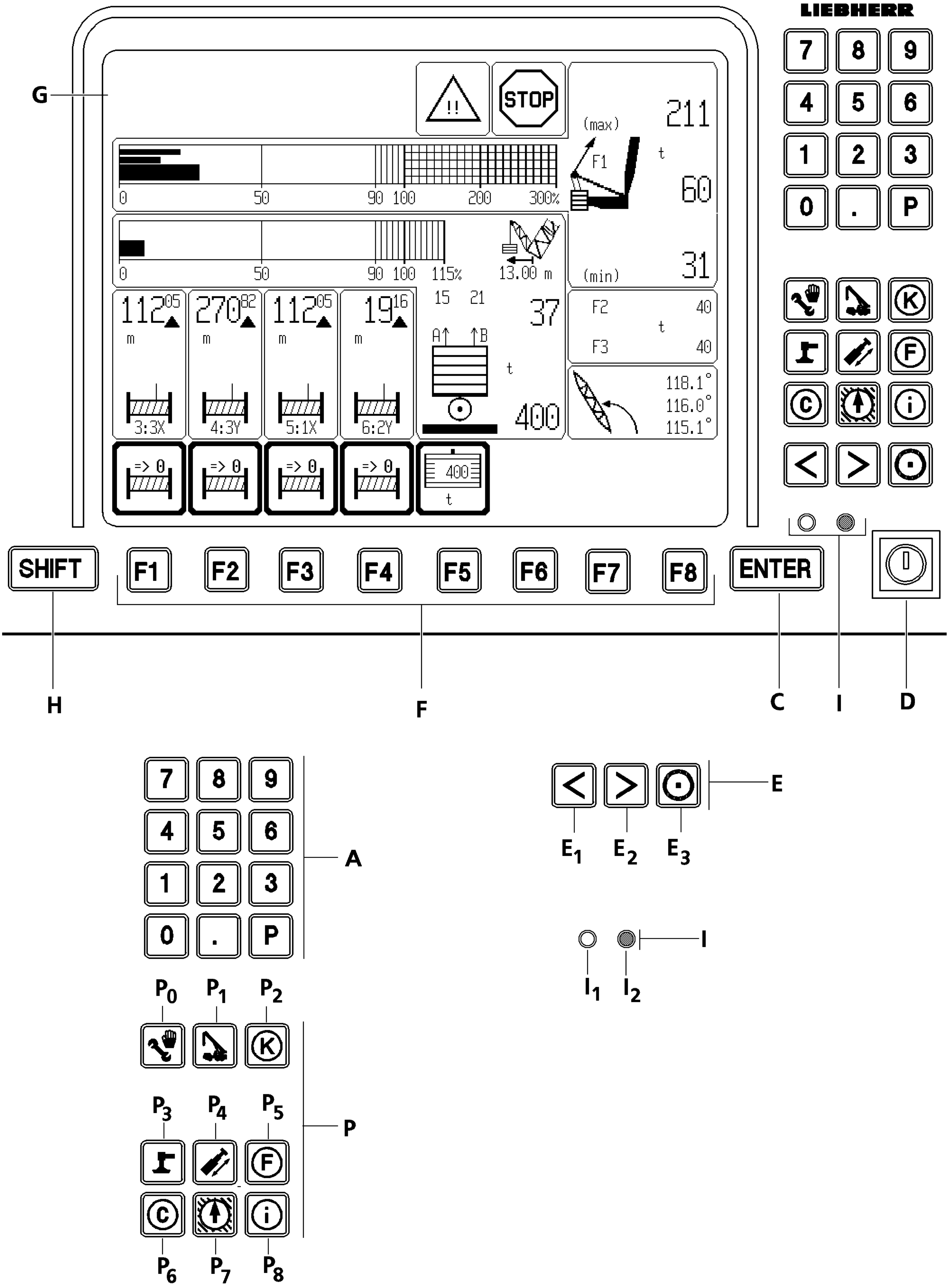
14) Air filter contaminated
Symbol element appears if the air filter is contaminated

16) Added function battery voltage in [V]
Number indicator in symbol element blinks if the operating voltage is <16 Volt or >36 Volt .

16.4 Function keys

"F1" bis "F7" not used

"F8" Back to the Operating view .


LIEBHERR
G
STOP
(max)
F1
211
t
60
(min)
31
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
112.05 m 3:3X
270.82 m 4:3Y
112.05 m 5:1X
19.16 m 6:2Y
15 21
37
A B
t
400
F2 40
t
F3 40
118.1°
116.0°
115.1°
=> 0
400 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
H
F
C
I
D
A
P
E
E1 E2 E3
I
I1 I2
P0 P1 P2
P3 P4 P5
P6 P7 P8

191012

20. The control elements of the LICCON computer systems on monitor 1

A Alpha numeric keyboard
To edit the derrickballast input values

P Program keys
No function

C Input key "ENTER"
To confirm changes.

D Keyed switch
No function.

Note: The keyed switch / button may not be positioned in shift position "left" .

E Brightness adjustment
see brightness adjustment on monitor 0

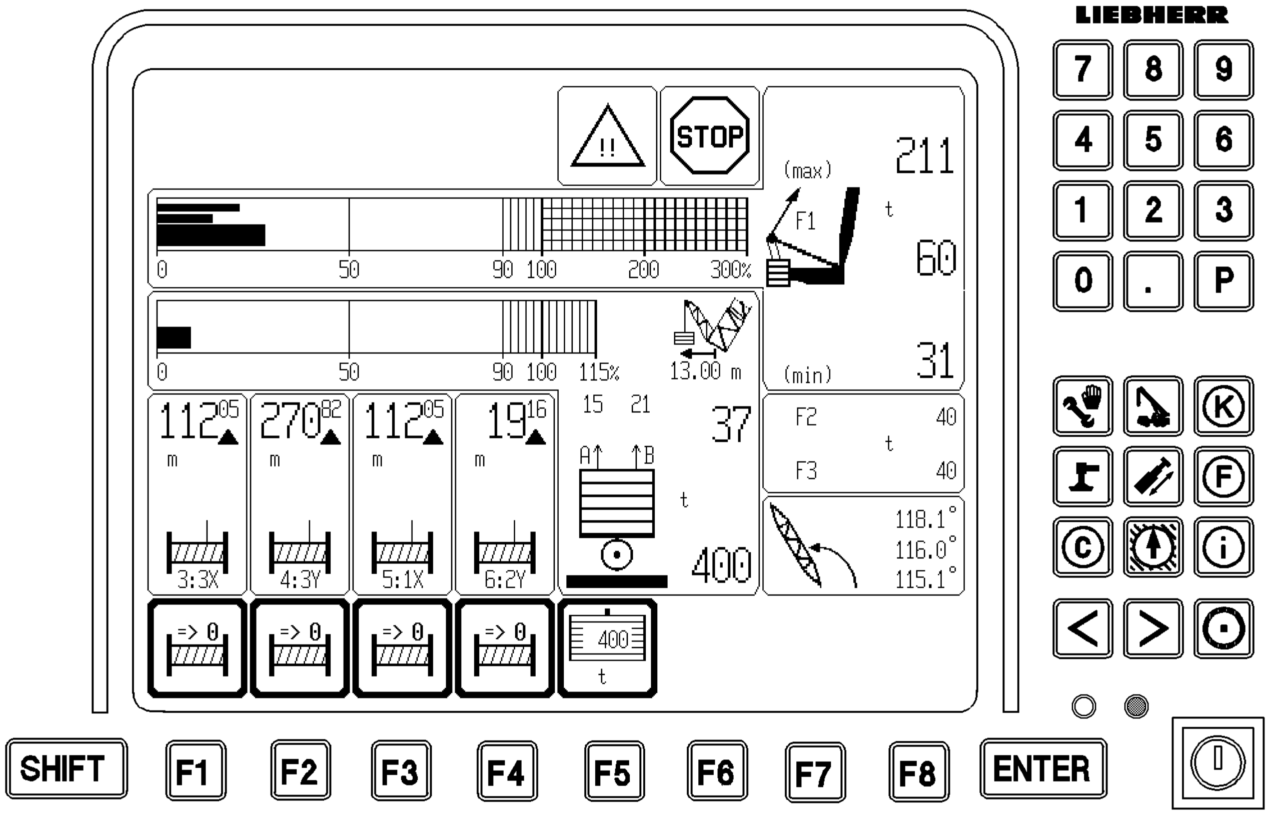
F Function keys
The function keys must always be viewed together with the function key symbol line shown on the monitor above.

G Monitor
Monitor 1 normally shows the operating view of Monitors 1.

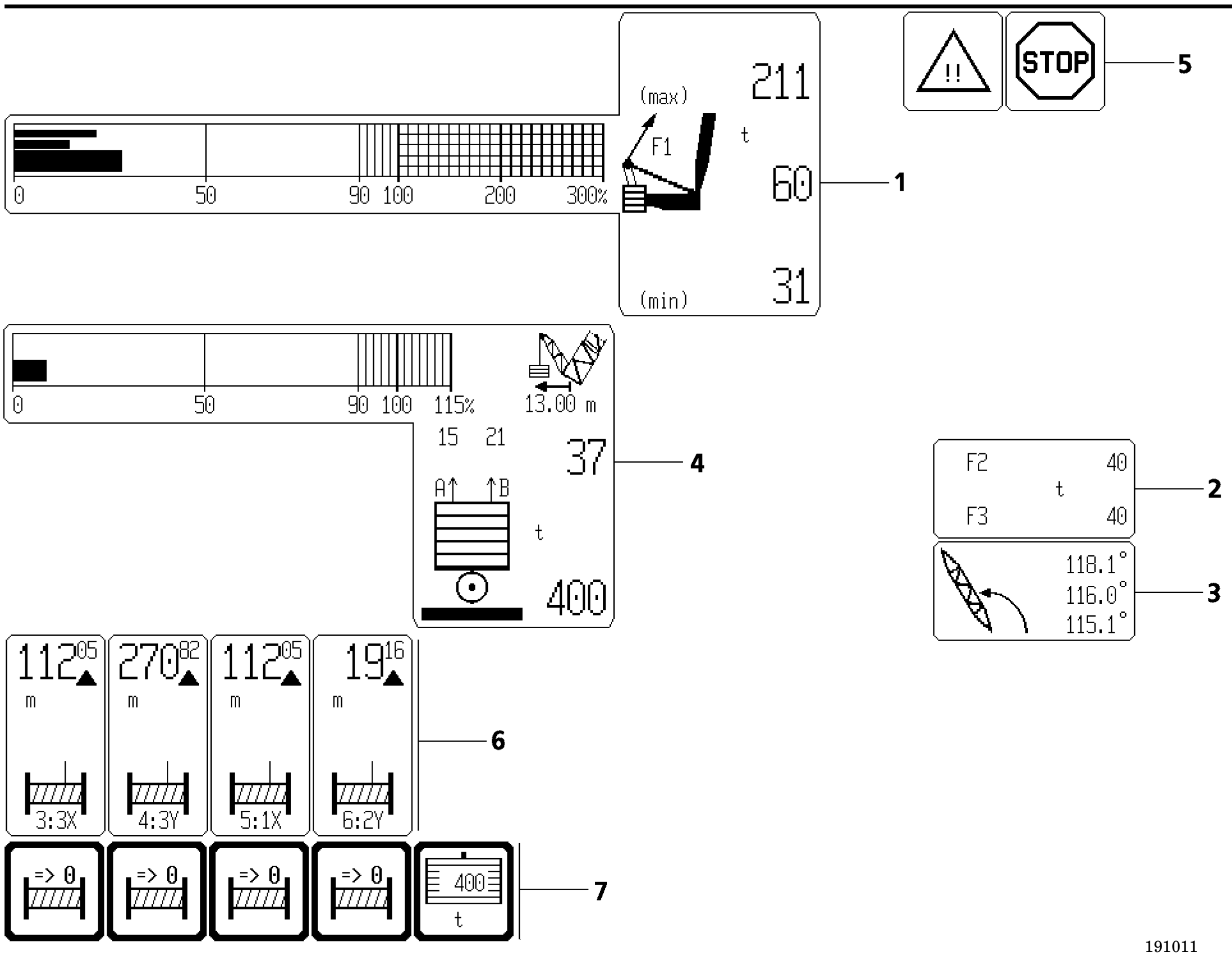
Note: For diagnostics purposes, monitor 1 can be assigned for ballast trailer control.

H SHIFT key
No function

I LED indication
I1: (LED red) Monitor error
I2: (LED yellow) Supply voltage for monitor available.



LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K F C i
STOP
(max) 211 t F1 60 (min) 31
0 50 90 100 200 300%
0 50 90 100 115% 13.00 m
15 21 37 A B t 400
F2 40 t F3 40
118.1° 116.0° 115.1°
112 05 m 3:3X
270 82 m 4:3Y
112 05 m 5:1X
19 16 m 6:2Y
=> 0
400 t
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER



STOP
5
(max) 211 t F1 60 (min) 31
0 50 90 100 200 300%
1
0 50 90 100 115% 13.00 m
15 21 37 A B t 400
4
F2 40 t F3 40
2
118.1° 116.0° 115.1°
3
112 05 m 3:3X
270 82 m 4:3Y
112 05 m 5:1X
19 16 m 6:2Y
6
=> 0
400 t
7
191011

21. The "Operation am Monitor 1" program

On cranes with derrick ballast *, the required maximum and minimum load for crane balance can be increased or reduced even during operation and under load by increasing or recuing the derrick ballast.

Note: **Ballast** is the derrick ballast, which means the suspended ballast or the ballast trailer. **Counterweight** is the fixed compensation weight installed on the slewing platform.

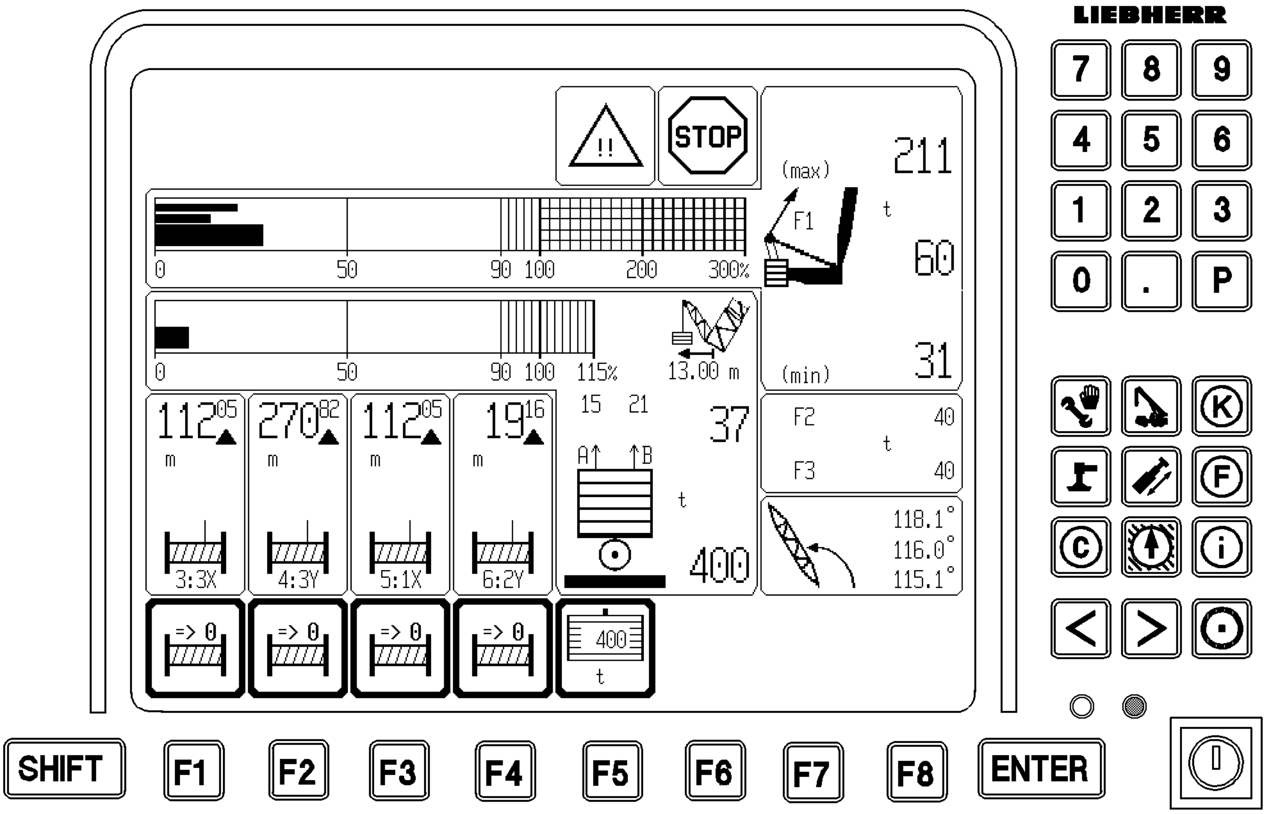
If only a partial load is lifted, then, most of the time, only a partial derrick ballast is used. In this case, the maximum load shut off is made by the derrick overload safety device on CPU1, with the aid of value $F1_{max\text{-}Operation}$. The corresponding values are shown on monitor 1, see illustration on the left.

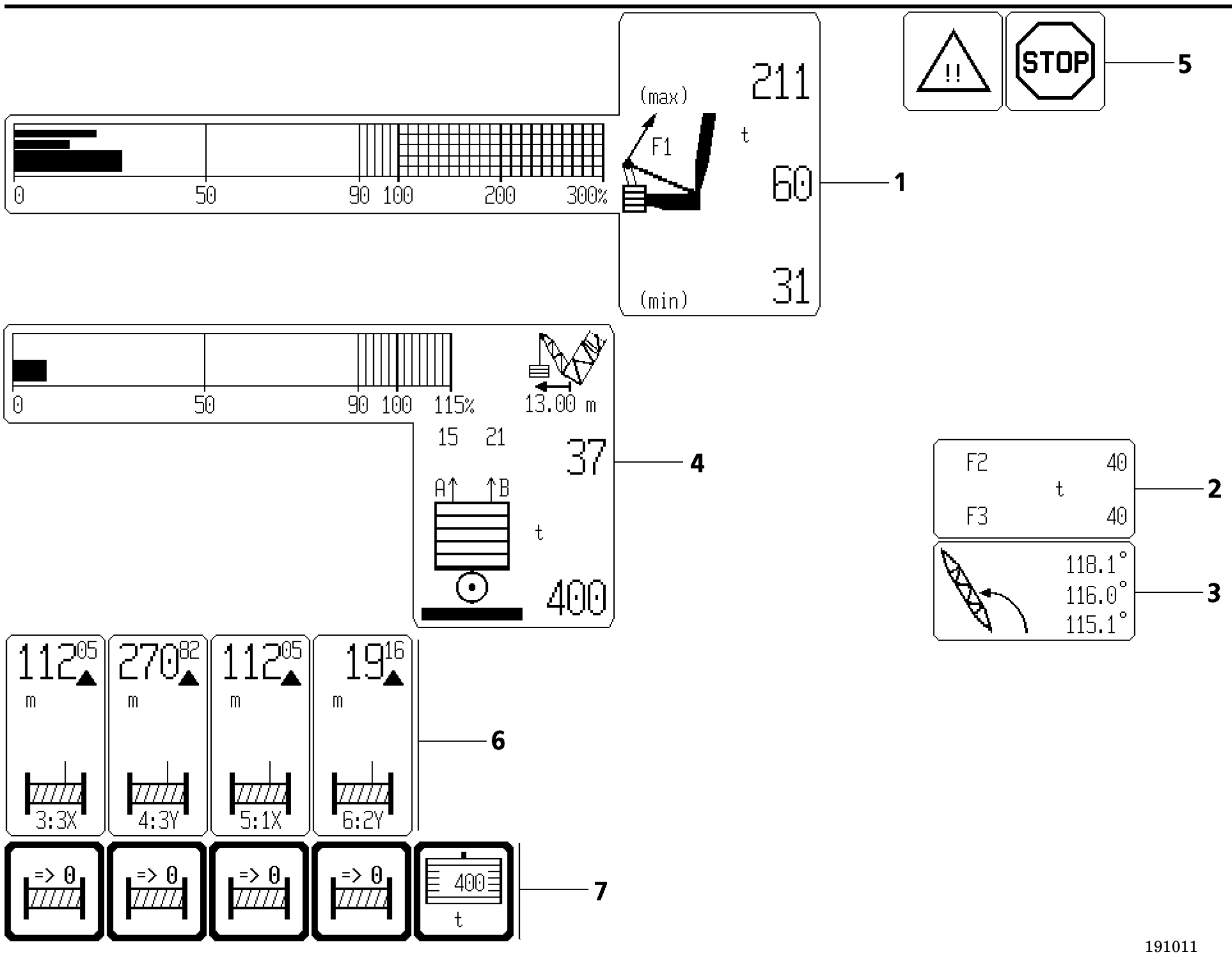
The monitor 1 in the "Operation am Monitor 1" program is split into 7 areas :

1 Test point 1 = F1 Pull test brackets Test point 1A and 1B in A - Bracket guying
2 Test point 2 = F2 Pull test brackets Test point 2A and 2B in N/W guying
  Test point 3 = F3 Pull test brackets Test point 3A and 3B in S- guying in derrick operation
3 Derrick boom angle
4 Derrick ballast, weight and utilization
5 Alarm functions
6 Winch indication winch 3*, 4, 5* and 6*
7 Function keybar symbol line

Note: The monitor illustrations in this chapter are only examples. The number values in the individual symbol elements might not match your particular crane.

In addition, some illustrations show the maximum possible assignment of the LICCON monitor with symbol elements. In normal crane operation, an identical view would not appear on the LICCON monitor .


LIEBHERR
STOP
(max)
211
F1
t
60
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
(min)
31
15 21
37
A↑ ↑B
t
400
F2 40
t
F3 40
118.1°
116.0°
115.1°
112 05 m
270 82 m
112 05 m
19 16 m
3:3X
4:3Y
5:1X
6:2Y
=> 0
400
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P


STOP
5
(max)
211
F1
t
60
1
0 50 90 100 200 300%
(min)
31
0 50 90 100 115%
13.00 m
15 21
37
4
A↑ ↑B
t
400
F2 40
t
F3 40
2
118.1°
116.0°
115.1°
3
112 05 m
270 82 m
112 05 m
19 16 m
3:3X
4:3Y
5:1X
6:2Y
6
=> 0
400
t
7

191011

21.1 Test point 1 = F1
Installation maximum force values

The monitoring function of test point 1 carried out by the LICCON computer system provides an additonal safety function. Due to the complexity of the installation procedure, the installation limits are not always valued or exact.

D A N G E R: **This means that the crane cannot be utilized to this installation limit without danger. The crane may always only be erected without a load, as noted in the Operation Manual.**

F1- installation maximum force values in operating modes without derrick
In operating modes without derrick, there are 2 different F1- installation maximum force values.

1. F1- installation maximum force value outside the operating range
   For erection and installation of the crane.

2. F1- installation maximum force value inside the operating range
   Within the boom angle range with load chart and a few angle degrees next to it.
   Maximum not bypassable F1-max limit in operating range.

Note: For statistical reasons, the F1- installation maximum force value can be higher in operating range with load chart (and a few angle degrees next to it) than outside the operating range, for example when lifting off the main boom jib or fly jib from the ground.

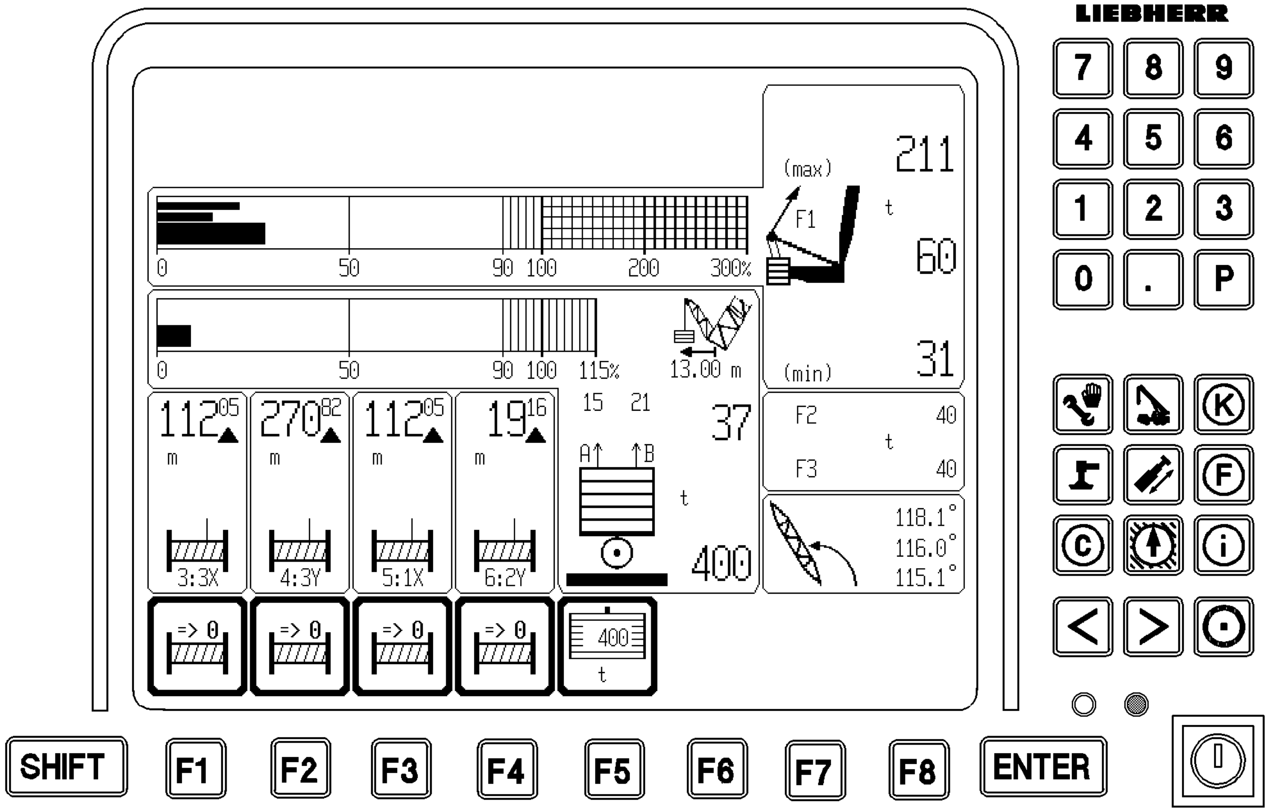
C A U T I O N: **The selection of the F1- installation maximum force values for inside or outside the operating range is made on the basis of values of angle sensor main boom and angle sensor fly jib.**
In operating range, the current F1- force may be above the F1- installation maximum force outside the operating range.

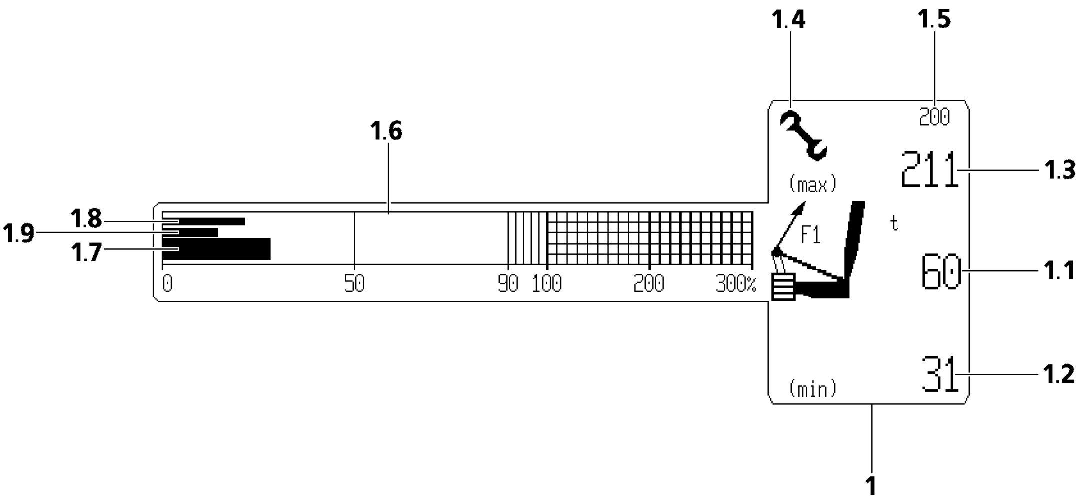
If both angle sensor on the main boom for the LML are erroneous or are missing or both angle sensors on the fly jib are erroneous or are missing, then the LML cannot determine if the boom if within the operating range or not.
So that in this case the F1- installation maximum force shut off is not shut off and cannot be bypassed, the F1- installation maximum force value of the operating range is used for the shut off.

D A N G E R: **If both angle sensors on the main boom for the LML are erreonous or are missing or both angle sensors on the fly jib are erroneous or are missing, then the LML will use the higher F1- installation maximum force value inside the operating range for the non-bypassable F1- installation force shut off.**

This ensures that the crane can be set up and taken down even in case of erroneous or missing sensors. However, the F1- installation maximum force value outside the operating range (F1max limit) for the erection is no longer shown and monitored. If the crane is not taken down exactly as noted in the Operating Manual, then it can be overloaded. In this case, there is an increased chance of having a serious accident!

* Optional

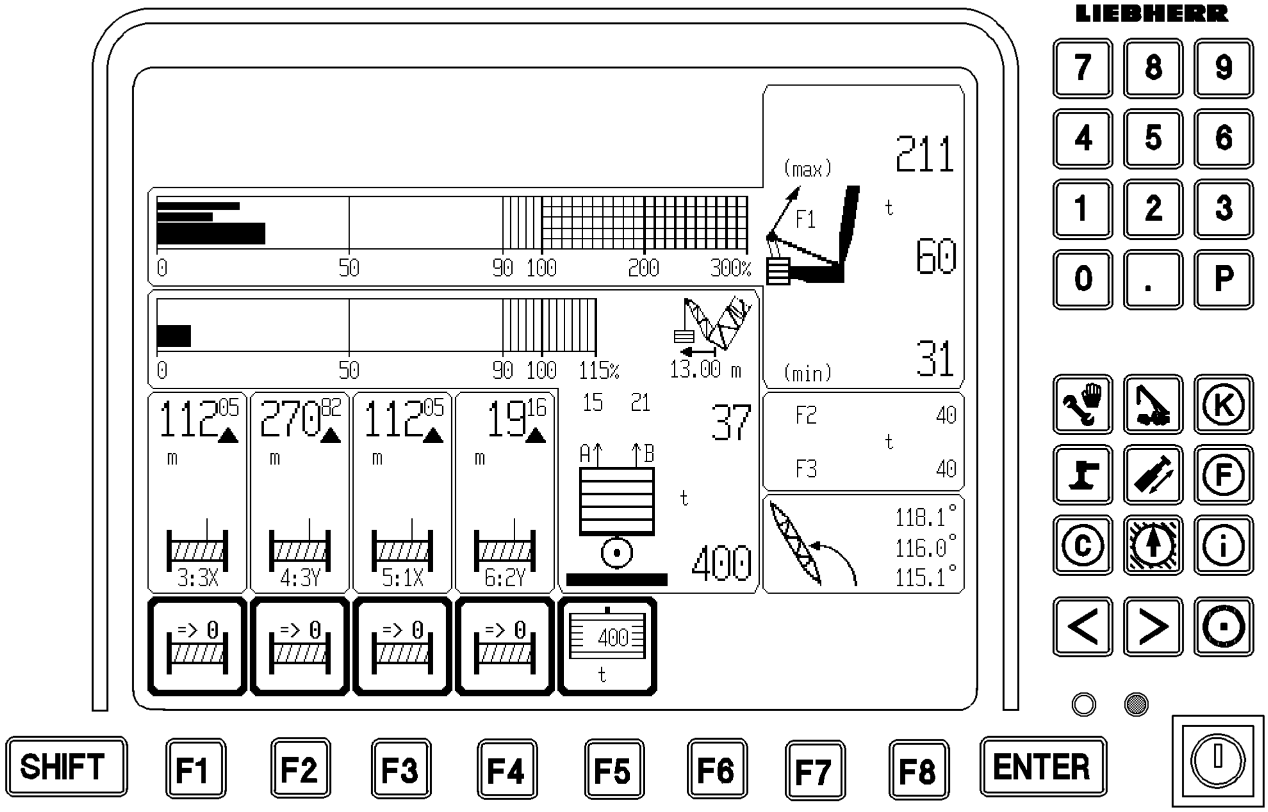

LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


1.4
1.5
1.6
1.3
1.1
1.2
1.8
1.9
1.7
1

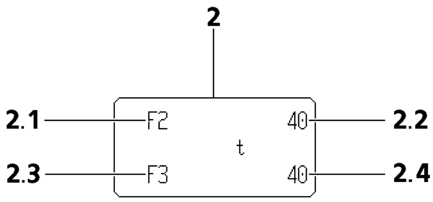
191013

21.1 Test point 1 = F1 (continuation)
Pull test brackets Test point 1A and 1B in the A- bracket guying

Pos.	Symbols / Indicator values	Type of indication	is shown
1	Symbol element "Test point 1" = F1 in units [t] or [kips]	static	always
1.1	Actual force $=F1=F1_{ist}$ F1 = F1A + F1B F1A = Kraft Test point 1A (A-Bock links) F1B = Kraft Test point 1B (A-Bock rechts)	static	for valid value
		??? blinking	for invalid value
1.2	Minimum force $=F1_{min}$	static	always **Note:** A shut off by $F1_{min}$ is only made in operating modes with suspended ballast / ballast trailer , in all other operating modes $F1_{min}=0$, for these operating modes, the condition $F1=F1_{min}$ cannot be reached during operation .
1.3	Maximum operating force $=F1_{max\text{-}Operation}$	static	in operating modes with suspended ballast / ballast trailer
1.4	Installation symbol	static	For "Installation"
1.5	Maximum installation force $=F1_{max\text{-}Montage}$	static	For "Installation" and $F1<F1_{max\text{-}Montage}$"
		blinking	For "Installation" and $F1\geq F1_{max\text{-}Montage}$"
1.6	F1 - Utilization scale in [%]	static	always
1.7	F1 - Utilization bar indicator $= F1 / F1_{max\text{-}Operation}$ 0% for: $F1_{max\text{-}Operation}$ =0 or F1 = invalid.	dynamic	in operating modes with suspended ballast / ballast trailer
1.8	F1-Min-Warning bar $= F1_{min\text{-}Warn\text{-}Wert} / F1_{max\text{-}Operation}$ ($F1_{min\text{-}Warn\text{-}Wert} = F1_{min} + 20$ t). 0 % for: $F1_{max\text{-}Operation}$ = 0 or $F1_{max\text{-}Operation}$ = invalid	dynamic	in operating modes with suspended ballast / ballast trailer
1.9	F1-Min-Stop bar $=F1_{min} / F1_{max\text{-}Operation}$ 0% for: $F1_{max\text{-}Operation}$ = 0 or $F1_{max\text{-}Operation}$ = invalid	dynamic	in operating modes with suspended ballast / ballast trailer



LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max)
211
t
F1
60
(min)
31
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
112 05 m 3:3X
270 82 m 4:3Y
112 05 m 5:1X
19 16 m 6:2Y
15 21
37
A B
t
400
F2 40
t
F3 40
118.1°
116.0°
115.1°
=> 0
=> 0
=> 0
=> 0
400
t
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER



2
2.1
F2
40
2.2
t
2.3
F3
40
2.4

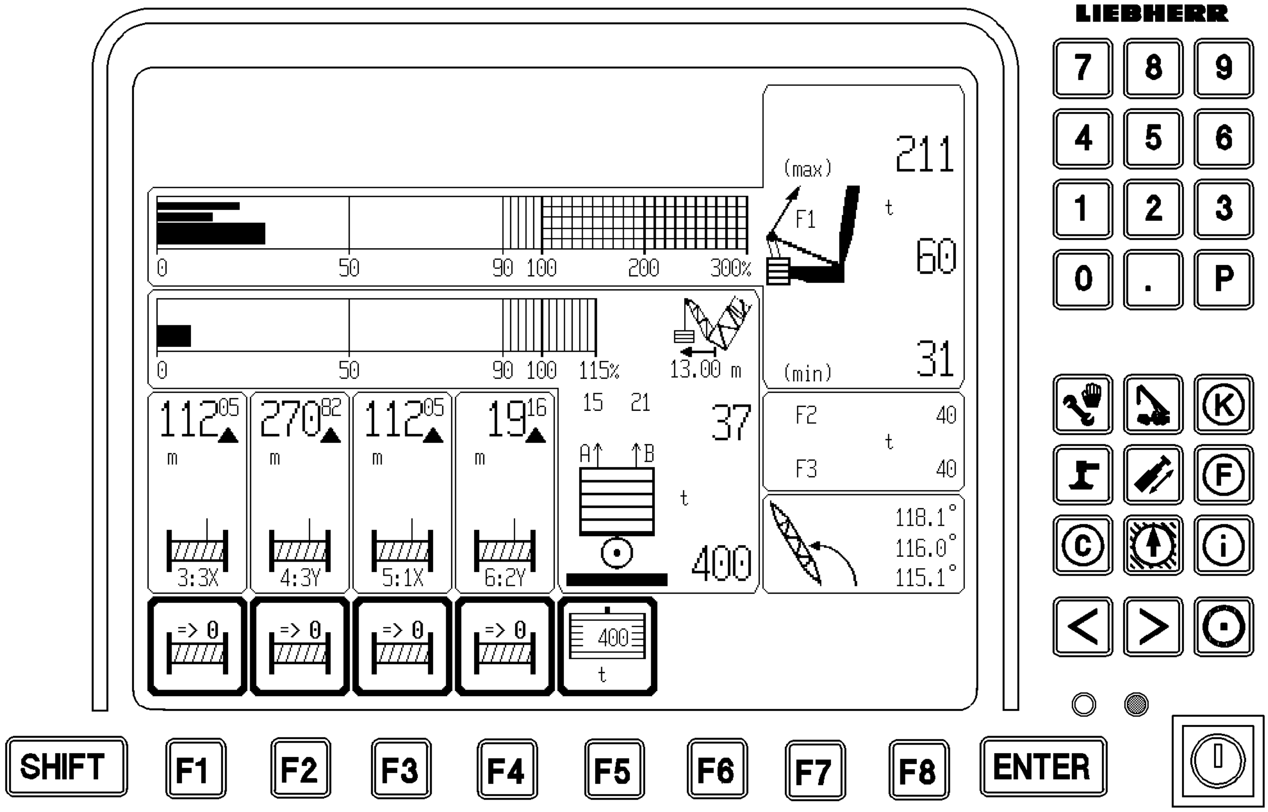
191014

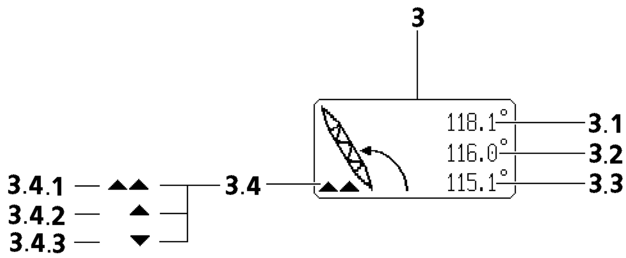
21.2 Test point 2 = F2 / Test point 3 = F3

Pull test brackets Test point 2A and 2B in N/W guying /Pull test brackets Test point 3A and 3B in S-guying for derrick operation

Pos.	Symbols / Indicator values	Type of indication	is shown
2	Symbol element for N/W guy force and main boom S-guy force for derrick operation in measuring unit [t] or [kips]	static	in operating modes with lattice jib or with derrick
2.1	Symbol F2 for N/W Guy force Test point 2	static	in operating modes with lattice jib
2.2	F2-actual value F2=F2A + F2B Test point 2A/B is in jib guying on jib head Test point 2 A = left Test point 2 B = right	static	in operating modes with lattice jib and valid F2-value
		??? blinking	in operating modes with lattice jib and invalid F2-value
2.3 *	Symbol F3 for main boom S-guy force Test point 3	static	in operating modes with derrick
2.4 *	F3- actual value F3=F3A + F3B Test point 3A/B is in the derrick main boom guying on the main boom head Test point 3 A = left Test point 3 B = right	static	in operating modes with derrick and valid F3-value
		??? blinking	in operating modes with derrick and invalid F3-value

* in operating modes with derrick and main boom

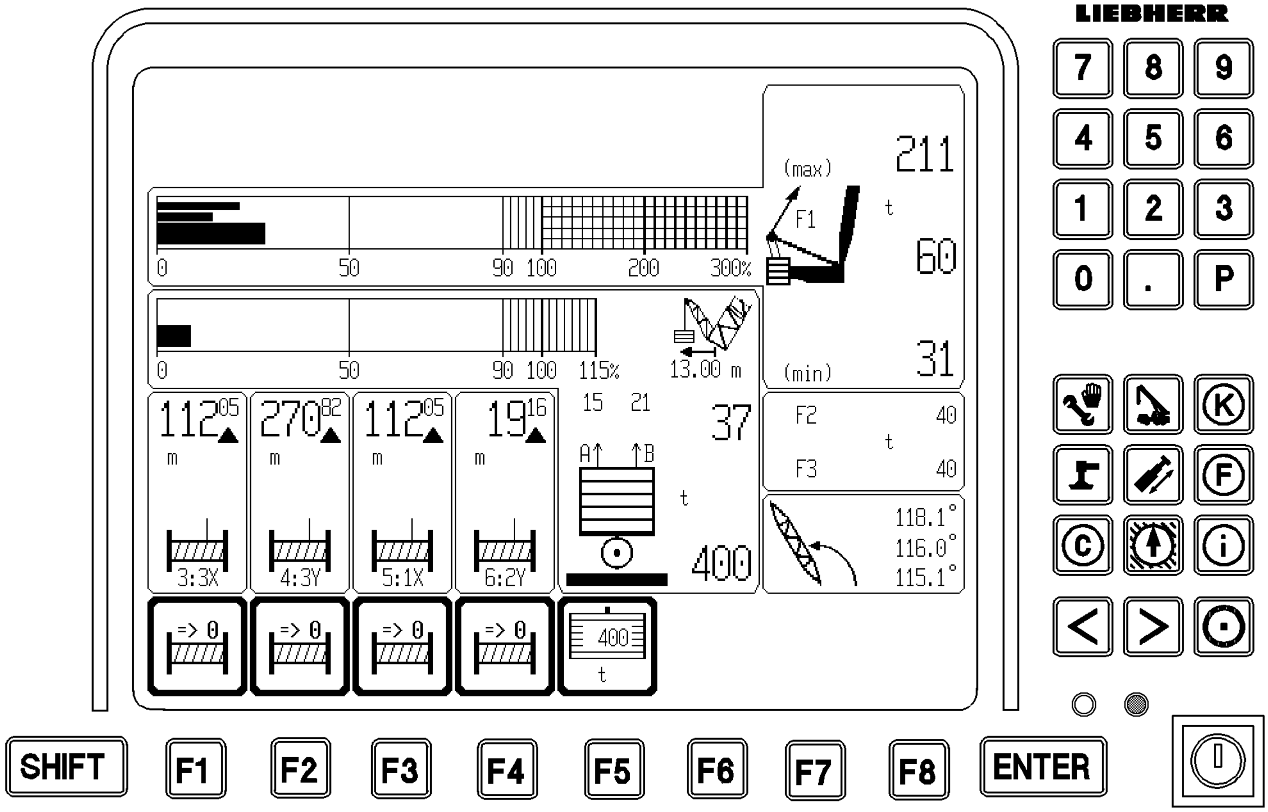

LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

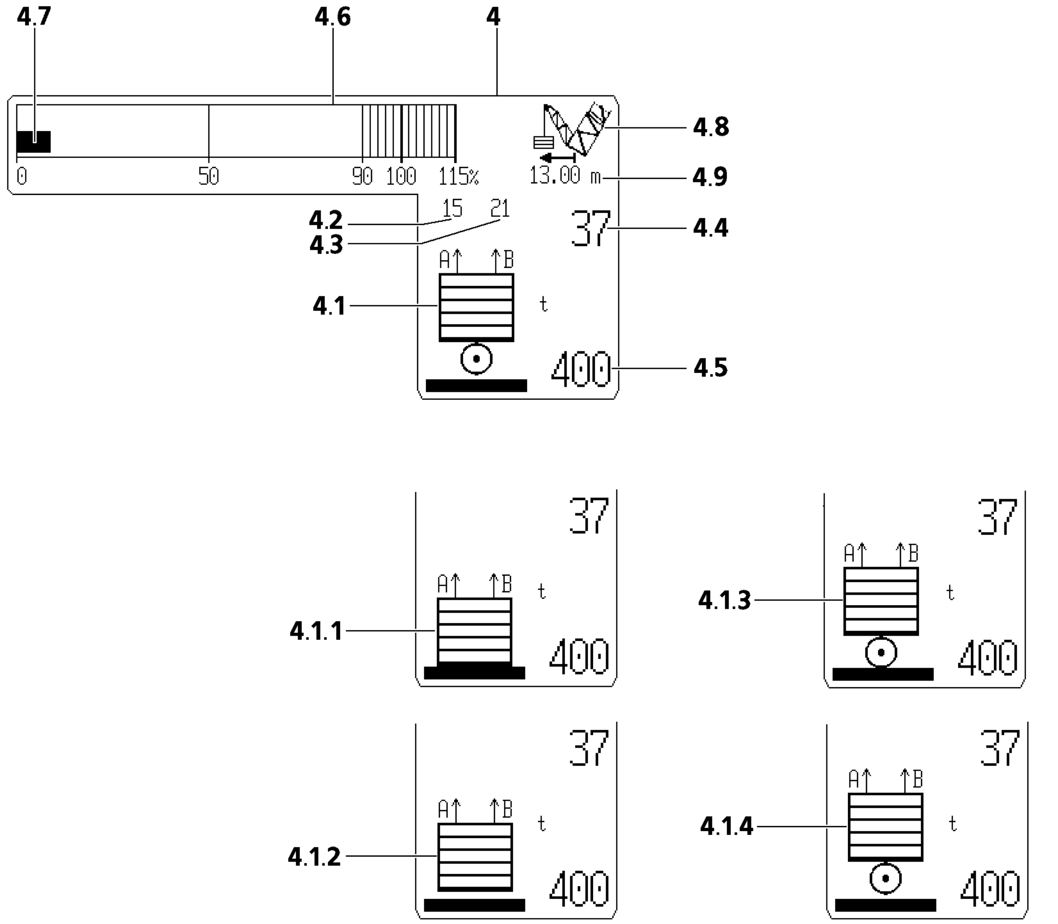

3
3.1
3.2
3.3
3.4
3.4.1
3.4.2
3.4.3
118.1°
116.0°
115.1°

191015

21.3 Derrick boom angle

Pos.	Symbole / Indicator values	Tzpe of indication	is shown
3	Symbol element "Derrick boom angle"	static	in operating modes with derrick
3.1	Maximum derrickwinkel in operation ($\measuredangle_{Dmax}$) in [°]	static	in operating modes with derrick and $\measuredangle_{Dakt} \leq \measuredangle_{Dmax}$
		blinking	in operating modes with derrick and $\measuredangle_{Dakt} > \measuredangle_{Dmax}$
3.2	Current derrick angle ($\measuredangle_{Dakt}$) in [°]	static	in operating modes with derrick and valid value
		??? blinking	in operating modes with derrick and invalid value
3.3	Minnimum derrick angle in operation ($\measuredangle_{Dmin}$) in [°]	stastic	in operating modes with derrick und $\measuredangle_{Dakt} \geq \measuredangle_{Dmin}$
		blinking	in operating modes with derrick und $\measuredangle_{Dakt} < \measuredangle_{Dmin}$
3.4	Limitation of relapse cylinder derrick boom condition symbols		
3.4.1	2 arrows upward	static	Relapse cylinder on block one limit switch actuated or erroneous
3.4.2	Arrow up	static	at $\measuredangle_{Dakt} > \measuredangle_{Dmax}$
3.4.3	Arrow down	static	at $\measuredangle_{Dakt} < \measuredangle_{Dmin}$

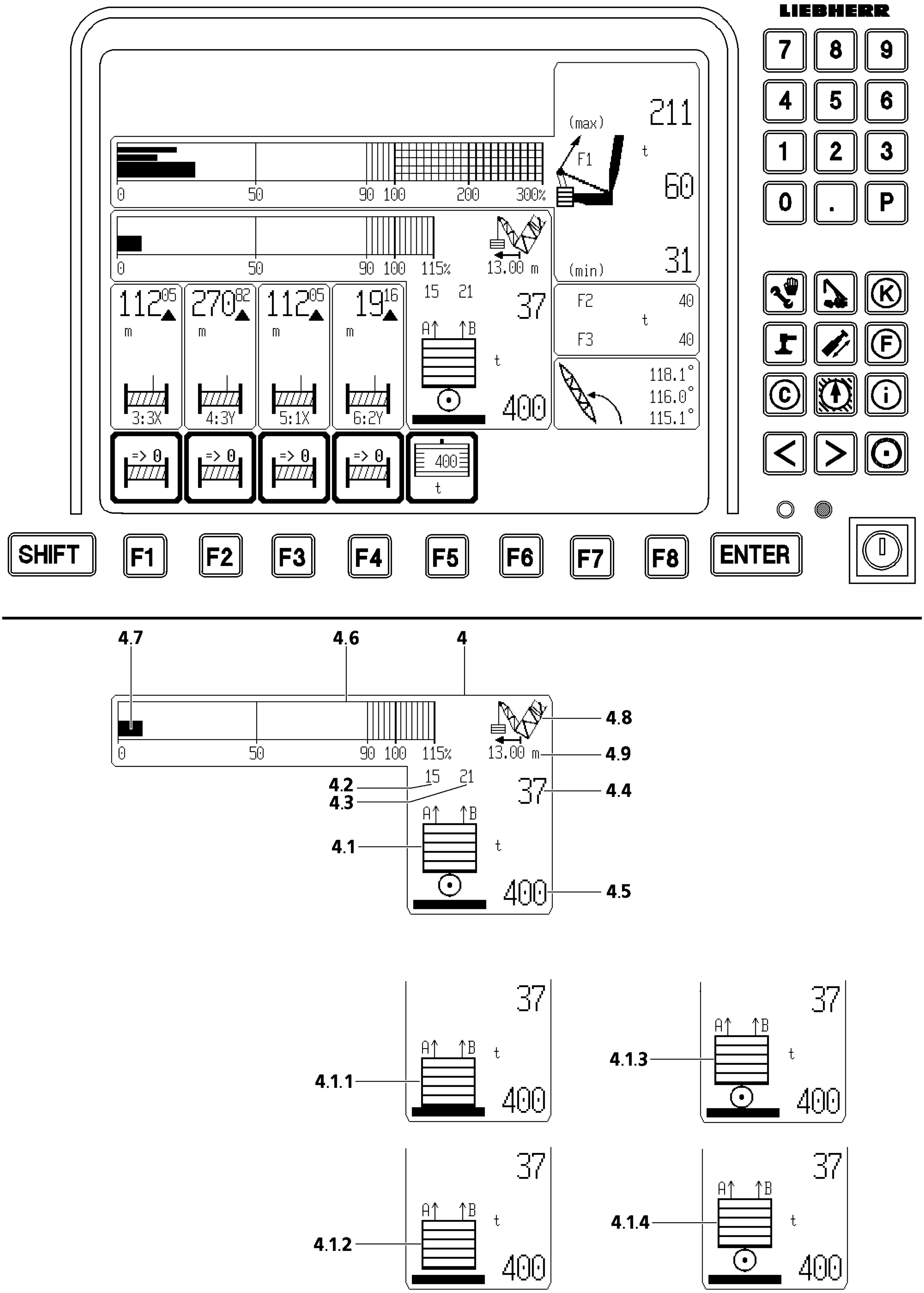

LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
(max)
F1
211
t
60
(min)
31
0
50
90
100
200
300%
115%
13.00 m
15
21
37
112
270
112
19
m
3:3X
4:3Y
5:1X
6:2Y
A
B
t
400
F2
F3
40
118.1°
116.0°
115.1°
=> 0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


4.7
4.6
4
4.8
4.9
4.2
4.3
4.4
4.1
4.5
0
50
90
100
115%
13.00 m
15
21
37
A
B
t
400
4.1.1
4.1.2
4.1.3
4.1.4

191016

21.4 Derrick ballast, weight and utilization

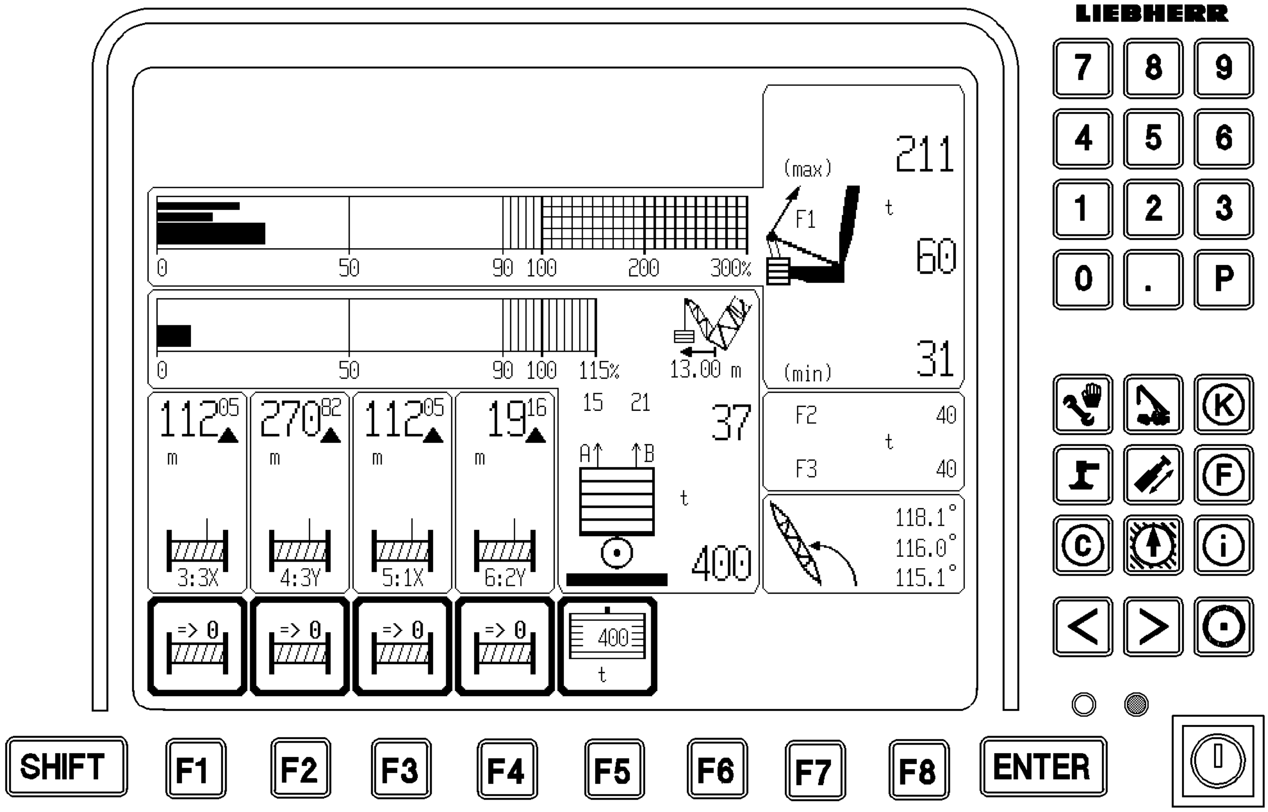
Pos.	Symbols / Indicator values	Type of indication	is shown
4	Symbol element "Derrick ballast, weight and utilization "	static	always
4.1	Symbol "Derrick ballast" in unit [t] or [kibs]. **Note:** This force unit is valid for all values shown in the frame.	static	in operating modes with suspended ballast / ballast trailer depending on type and condition of derrick ballast (see 4.1.1 - 4.1.4).
4.1.1	Symbol "Suspended ballast on ground"	static	in operating modes with suspended ballast and suspended ballast not suspended according to limit switch
4.1.2	Symbol "Suspended ballast suspended"	static	in operating modes with suspended ballast and suspended ballast suspended according to limit switch
4.1.3	Symbol "Ballast trailer on ground"	static	in operating modes with ballast trailer and ballast trailer not suspended according to keyed switch
4.1.4	Symbol "Ballast trailer suspended"	static	in operating modes with ballast trailer and ballast trailer suspended according to keyed switch
4.2	Force in derrick ballast guying A (left) =F4A5 = F4A - F5	static	in operating modes with suspended ballast / ballast trailer and F4A valid
	Test point 4A = Pressure sensor ring surface left, Test point 5 = Pressure sensor piston surface right and left, if t est point 5 is invalid , when F5=0 is used	blinking	in operating modes with suspended ballast / ballast trailer and F4A and F4B valid and the difference between the guy force A and B is larger than permissible (45t)
	F4A =Force 4A on ring surface left F4B =Force 4B on ring surface right F5 =Force F5 on piston surface	??? blinking	in operating modes with suspended ballast / ballast trailer and F4A invalid
4.3	Force in derrick ballast guying B (right) =F4B5 = F4B - F5	static	in operating modes with suspended ballast / ballast trailer and F4A valid
	Test point 4B = Pressure sensor ring surface right,	blinking	in operating modes with suspended ballast / ballast trailer and F4A and F4B valid and difference between guy force A and B is larger than permissible (45t)
	Test point 5 = Pressure sensor piston surface right and left, if test point 5 is invalid , then F5=0 is used	??? blinking	in operating modes with suspended ballast / ballast trailer and F4B invalid

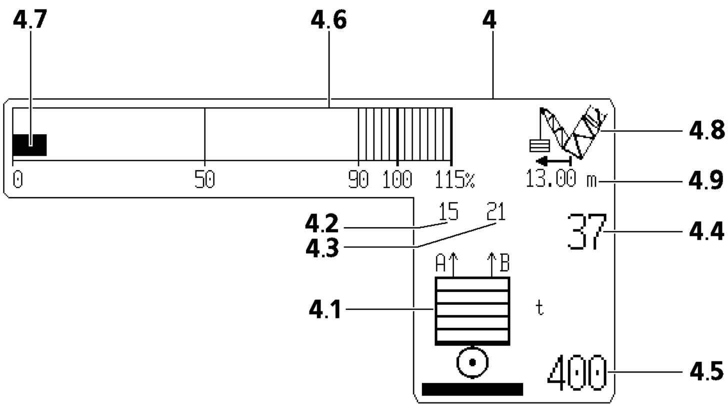

LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max)
211
F1
t
60
(min)
31
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
15 21
37
A↑ ↑B
t
400
112 05 m
270 82 m
112 05 m
19 16 m
3:3X
4:3Y
5:1X
6:2Y
F2 40
t
F3 40
118.1°
116.0°
115.1°
=> 0
400
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
4.7
4.6
4
4.8
4.9
4.2
4.3
4.4
4.1
4.5
4.1.1
4.1.2
4.1.3
4.1.4

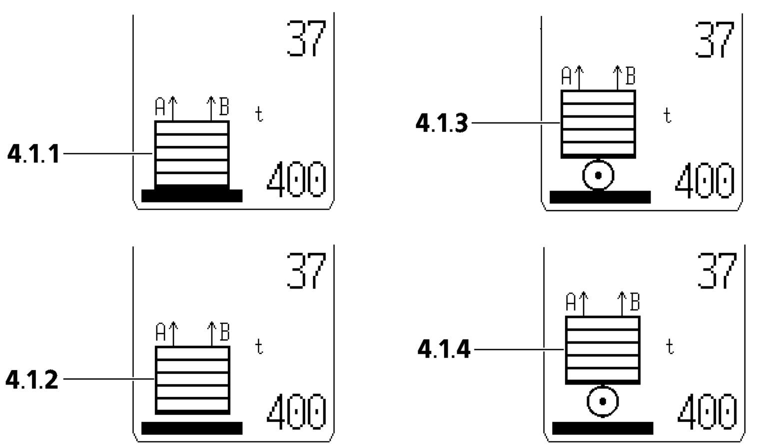
191016

Derrick ballast, weight and utilization (continuation)

Pos.	Symbols / Indicator values	indication	is shown
4.4	Pulled derrick ballast = $BA_{gezogen}$ = vertical force components of force in derrick ballast guying (=F4A5 + F4B5) calculated from test points 4A, 4B and 5. **Note:** The sum of forces F4A5 and F4B5 is larger or the same as the pulled derrick ballast = $BA_{gezogen}$	static	in operating modes with suspended ballast / ballast trailer, if valid
		??? blinking	in operating modes with suspended ballast / ballast trailer, if value is invalid, or M4A or M4B defective or derrick ballast radius invalid **Note:** in case of M5 defect, the pressure is calculated as M5 = 0 → Indication remains static
4.5	Placed derrickballast = $BA_{aufgelegt}$ **Note:** This value has been entered by hand and confirmed with the "ENTER" key. The value is stored when the system is turned off and is valid again after turning it on again, until it is changed with the "F5" function key.	static	in operating modes with suspended ballast / ballast trailer, if value for $BA_{aufgelegt}$ is not permissible
		blinking	in operating modes with suspended ballast / ballast trailer, if value for $BA_{aufgelegt}$ is questionable,
		??? blinking	in operating modes with suspended ballast / ballast trailer, if value for $BA_{aufgelegt} < 0$ or > 9999
4.6	Ballast utilization scale	static	in operating modes with suspended ballast / ballast trailer
4.7	Derrick ballast utilization bar indication = $BA_{gezogen}$ / $BA_{aufgelegt}$ in percentages (%), The bar is "0" when: $BA_{aufgelegt}$ < 5 t or $BA_{gezogen}$ = invalid The bar can show maximum 115 %.	dynamic	in operating modes with suspended ballast / ballast trailer


LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
(max)
211
F1
t
60
(min)
31
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
112 05 m 3:3X
270 82 m 4:3Y
112 05 m 5:1X
19 16 m 6:2Y
15 21
37
A B
t
400
F2 40
t
F3 40
118.1°
116.0°
115.1°
=> 0
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

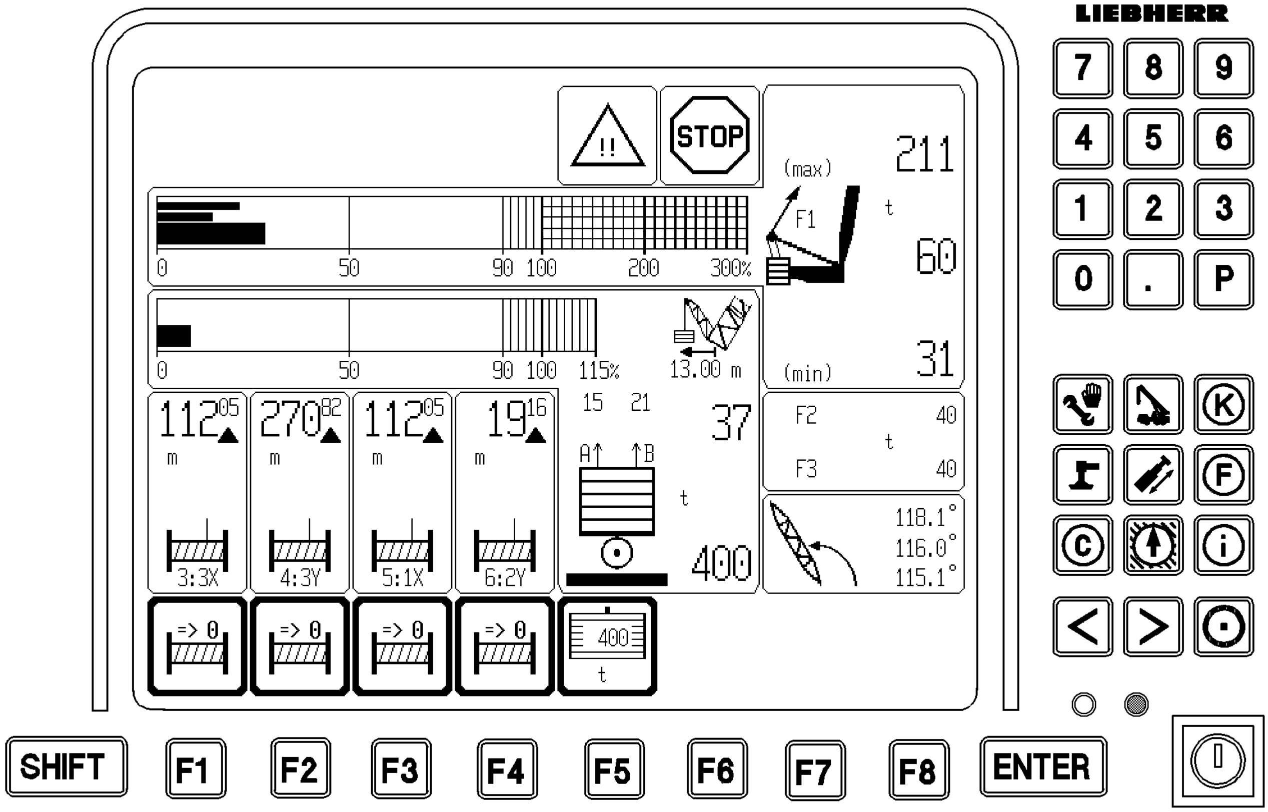

4.7
4.6
4
4.8
4.9
4.4
4.5
4.2
4.3
4.1
0 50 90 100 115%
13.00 m
15 21
37
A B
t
400

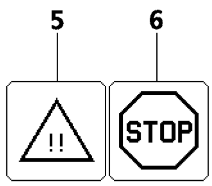

4.1.1
4.1.2
4.1.3
4.1.4
37
A B
t
400

191016

Derrick ballast, weight and utilization (continuation)

Pos.	Symbols / Indicator values	Type of indication	is shown
4.8	Symbol ”Derrick ballast radius symbol”	static	in operating modes with suspended ballast / ballast trailer with variable derrick ballast radius
4.9	Indication "Derrick ballast radius” [m] or [ft]	static	in operating modes with suspended ballast / ballast trailer with variable derrick ballast radius and derrick ballast radius value valid
		blinking	in operating modes with suspended ballast / ballast trailer with variable derrick ballast radius and derrick ballast radius value invalid

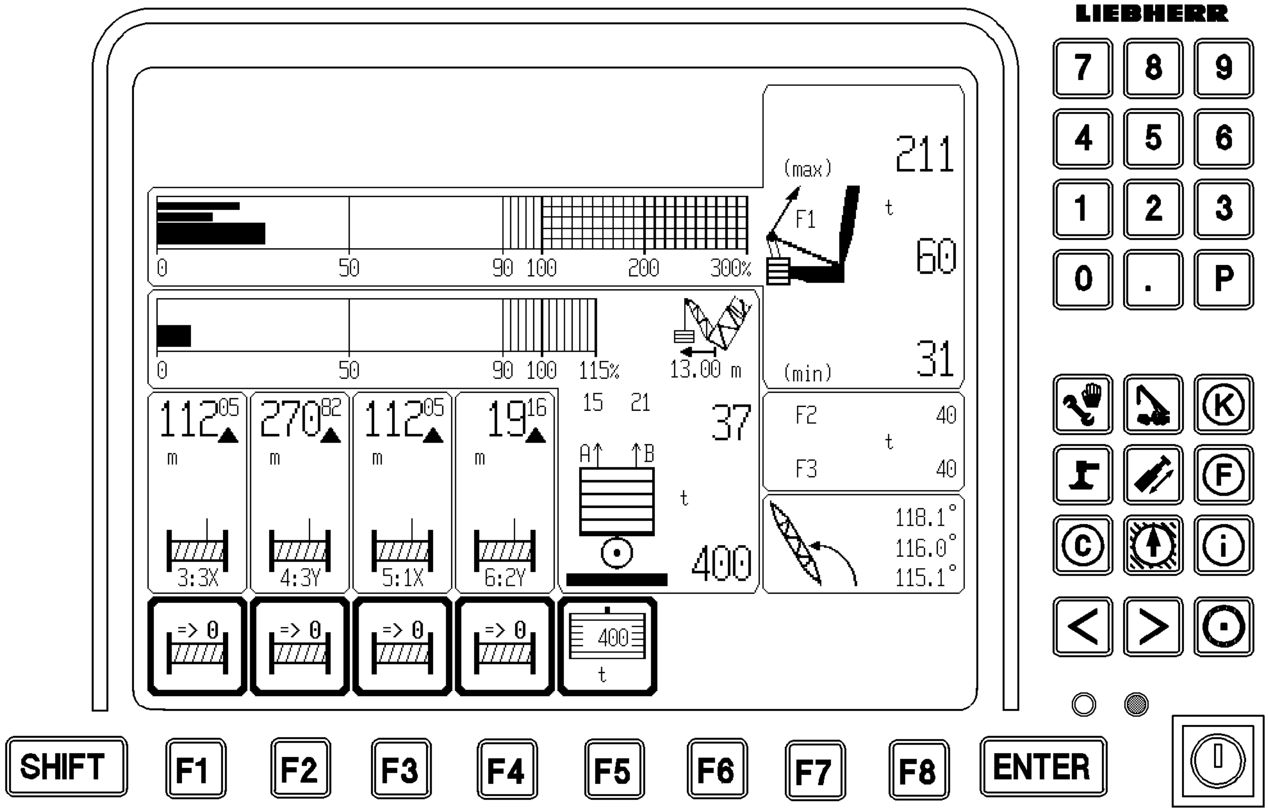

LIEBHERR
STOP
(max)
211
t
F1
60
(min)
31
0
50
90 100
200
300%
115%
13.00 m
15 21
37
A
B
t
400
F2 40
t
F3 40
118.1°
116.0°
115.1°
3:3X
4:3Y
5:1X
6:2Y
=> 0
400
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

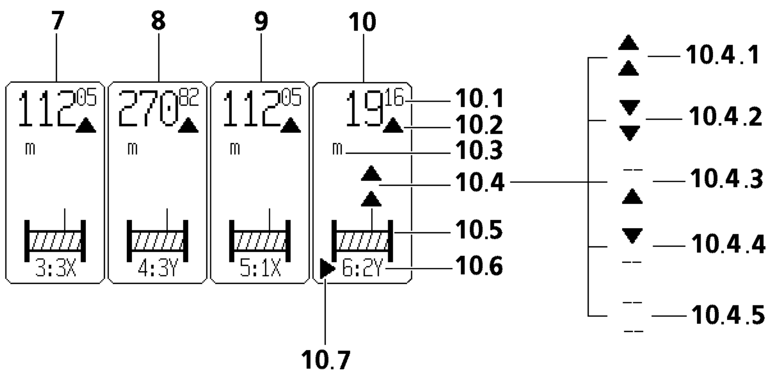

5
6
STOP

191017

21.5 Alarm functions

Pos.	Symbols / Indicator values	Type of indication	is shown
5	Symbol element "ACHTUNG / CAUTION"	blinking	for M1min-prewarning ($F1_{ist} < F1_{min\text{-}Warnwert}$) or for $F1_{max\text{-}Operation}$ - Vorwarnung / Prewarning (90%) ($F1 \geq F1_{max\text{-}Operation\ warning\ value}$) or for $F1_{min\text{-}Stop\text{-}Nachlauf\ /\ afterrun}$ or for $F1_{max\text{-}Operation\text{-}Stop\text{-}Nachlauf\ /\ afterrun}$
6	Symbol element "STOP"	blinking	bei $F1_{min\text{-}Stop}$ ($F1_{ist} < F1_{min}$, with afterrun 3 sec.) or $F1_{max\text{-}Operation\text{-}Stop}$ ($F1 \geq F1_{max\text{-}Operation}$) with afterrun 3 sec.) or $F1_{max\text{-}Montage\text{-}Stop}$ ($F1_{ist} \geq F1_{max\text{-}Montage}$) with afterrun 3 sec.)


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
K
F
C
i
(max)
F1
211
t
60
(min)
31
0
50
90 100
200
300%
0
50
90 100
115%
13.00 m
112 05
270 82
112 05
19 16
m
3:3X
4:3Y
5:1X
6:2Y
15
21
37
A
B
t
400
F2
40
F3
40
118.1°
116.0°
115.1°
=> 0
400
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


7
8
9
10
112 05
270 82
112 05
19 16
m
3:3X
4:3Y
5:1X
6:2Y
10.1
10.2
10.3
10.4
10.5
10.6
10.7
10.4.1
10.4.2
10.4.3
10.4.4
10.4.5

191018

21.6 Winch indication

The symbol elements for winches 3* 6* are shown only on monitor 1 if the crane is equipped with these winches.

The indication of winch 3* to 6* functions the same way as indiation for winch 1 and 2 on monitor 0.

In addition, the following applies:
If winch 5* or winch 6* is used as hoist winch, then the **hook path** is shown in the winch symbol. The value calculated by the corresponding function key is shown even after turning the system on or off or after an operating mode change.

If one of the winches is used as a control winch, then the **current cable length on the winch drum** is shown, not the path of the hookblock. Tare can be calculated, but after turning the system on or off and after an operating mode change, the original value "Cable length on the cable drum" is shown again.

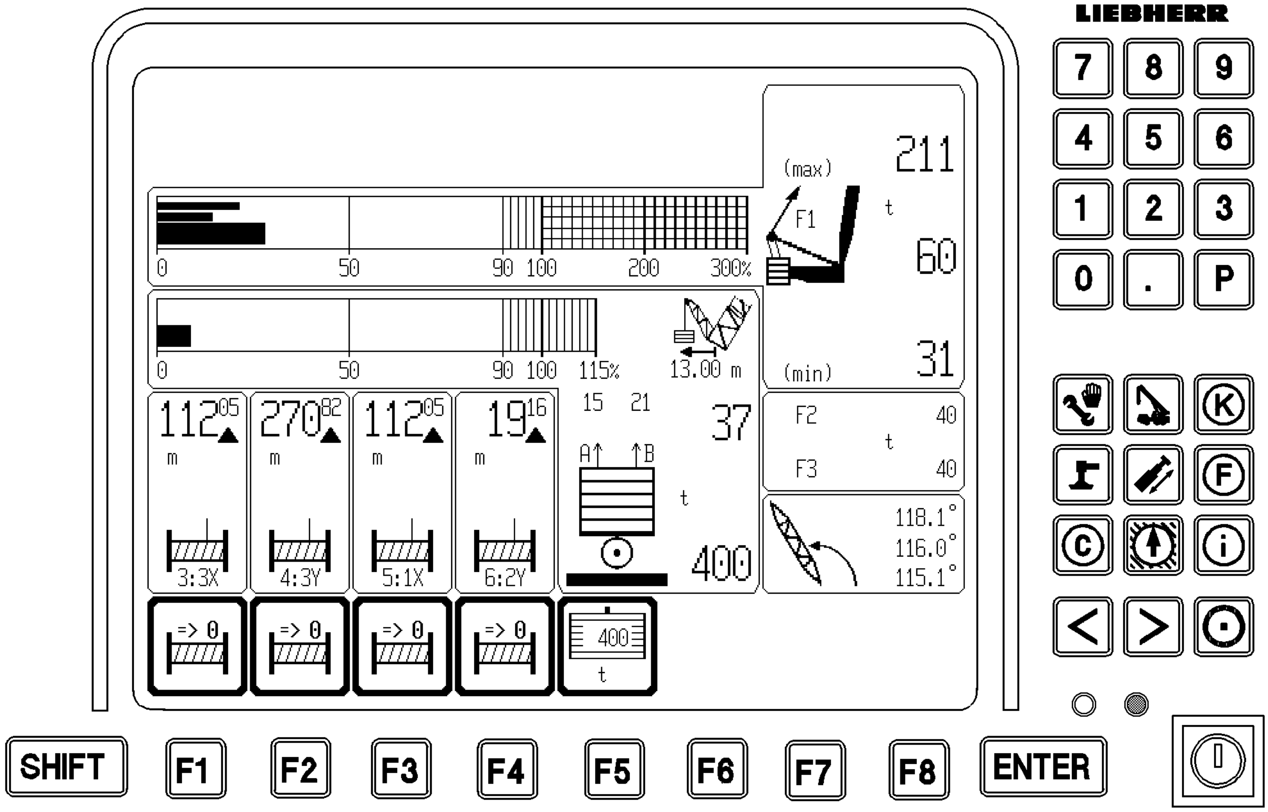
C A U T I O N : **The indication only has 3 digits in front of the comma, digits further in front are cut off. For that reason, it must be estimated if 200 m or 1200 m cable are on the winch. The indication is in both cases "200^{00}".**
The length indication is only exact if the winch has been adjusted and no data loss has occurred since then.

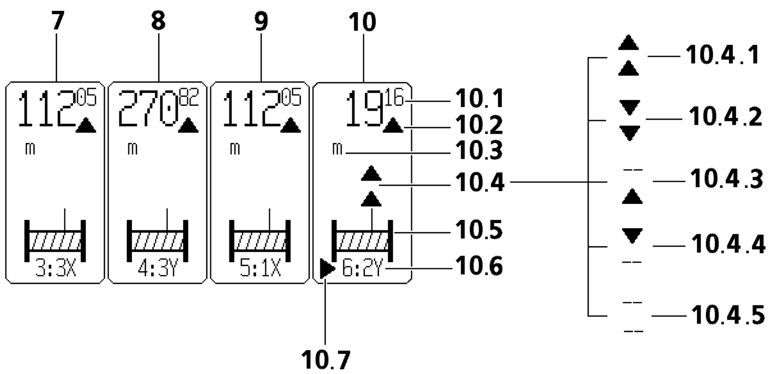
Pos.	Symbols / Indicator values	Type of indication	is shown
7	Winch indication Winch 3*	static	if winch 3 is installed
8	Winch indication Winch 4 *	static	if winch 4 is installed
9	Winch indication Winch 5*	static	if winch 5 is installed
10	Winch indication Winch 6*	static	if winch 6 is installed
10.1	Hook path = Cable length on winch / Hoist cable reeving according to entry by hand	static	if winch is calculated as hoist winch
	or = Cable length on winch drum (for intake gear, the cable length is even for the left and the right half of the cable drum)	static	if winch is calculated as control winch
		??? blinking	in case of error in winch path measurement → adjust winch again

Winch 3 and 4 are always calculated as control winch.
Winch 5 is calculated as control winch, in operating system with jib / luffing jib .
Winch 5 is calculated as hoist winch, in operating system without jib / luffing jib .
Winch 6 is always calculated as hoist winch .

Note: If winch 5 or winch 6 is calculated as hoist winch, and no boom nose is installed, then the hook path calculation is made with the reeving of the boom. If the boom nose is installed, the hook path calculation is made with the reeving of the boom nose.

* if installed


LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


7
8
9
10
10.1
10.2
10.3
10.4
10.5
10.6
10.7
10.4.1
10.4.2
10.4.3
10.4.4
10.4.5

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Symbol element "Winch indication"

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

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

10.4 Winch status indication
The following winch status symbols are shown (all blinking) :

10.4.1 Spool out

10.4.2 Spool up

10.4.3 Spooled out → Spool out function is locked

10.4.4 Spooled up → Spool up function is locked

10.4.5 Winch is deactivated or unplugged or Winch is spooled up and out at the same time, according to the sensor → Spool up and out is locked (via "Control parameter program)

Note: If no winch status symbol appears, then the activated winch is standing still and is neither spooled up nor out.

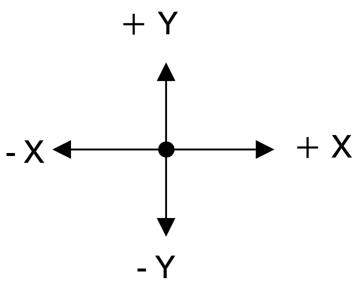
10.5 Winch symbol (with cable end for winch status symbol)

10.6 Assignment of master switch and winch

Ex.: **6 : 2 Y**

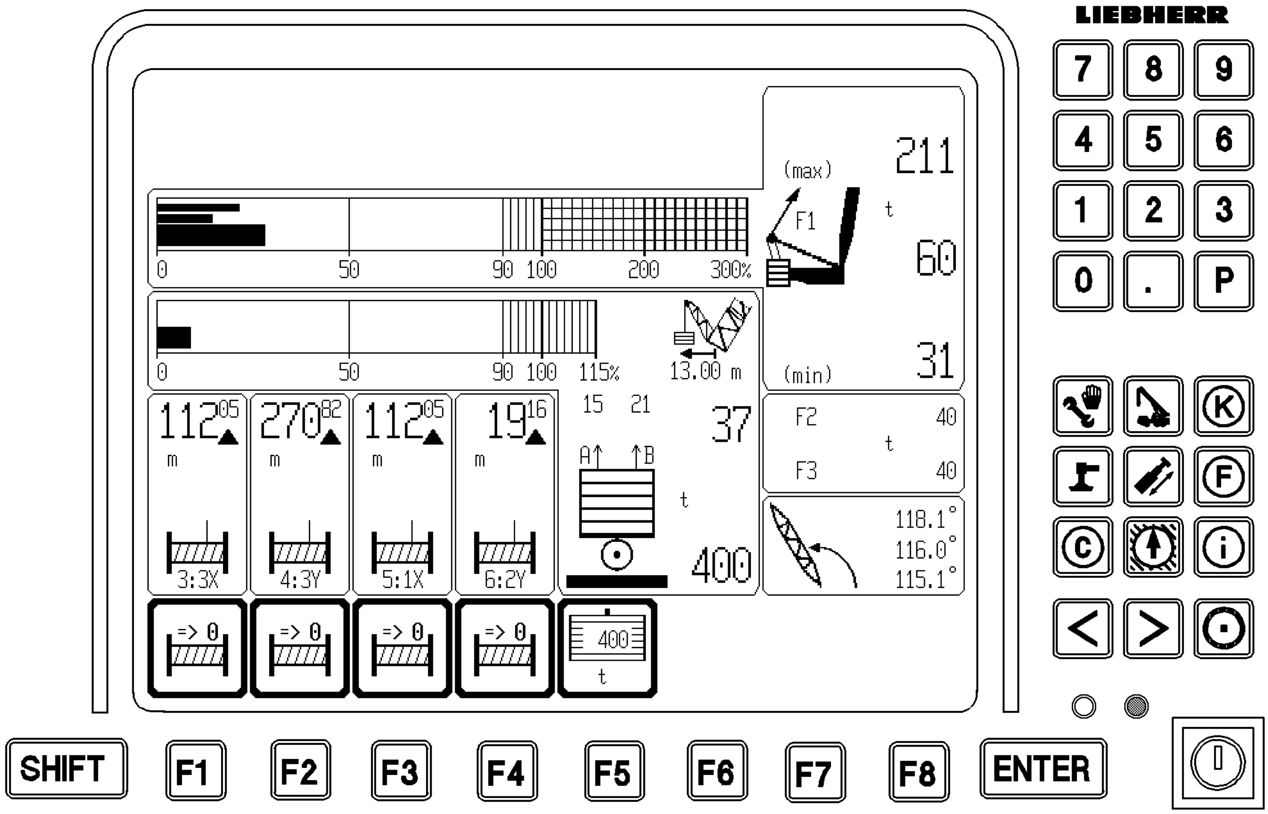
- Y — Actuation direction of master switch
- 2 — Master switch number
- 6 — Winch number

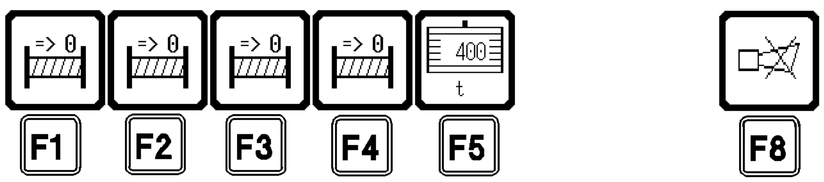
6 : - - Due to incorrect setting, an assignment of the master switch and winch is not possible!



10.7 Vibration sensor
If the vibration sensor for a winch is added on the master switch, then the symbol " ▸ " (10.7) for the added vibration sensor appears in this winch symbol element.

Note: The vibration sensor is added for the first actuated crane function .


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
K
F
C
i
211
(max)
F1
t
60
(min)
31
0
50
90 100
200
300%
0
50
90 100
115%
13.00 m
15 21
37
A
B
t
400
F2 40
t
F3 40
118.1°
116.0°
115.1°
112 05 m
270 82 m
112 05 m
19 16 m
3:3X
4:3Y
5:1X
6:2Y
=> 0
400
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


=> 0
400
t
F1
F2
F3
F4
F5
F8

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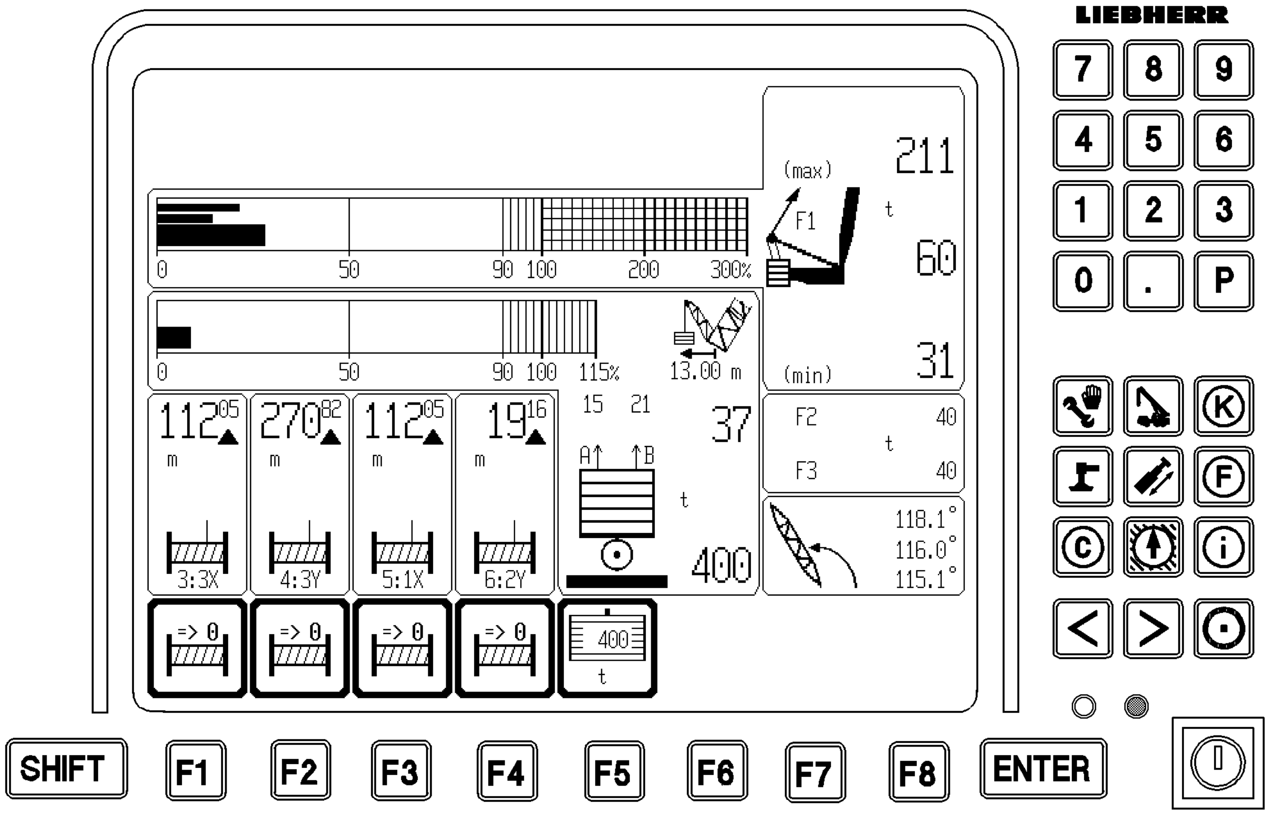
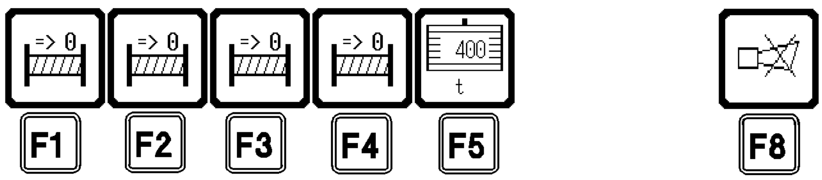
21.7 Function keybar symbol line

Pos.	Function, function keybar symbol line	Type of indication	is shown
F1	Tare the length indication of winch 3 * **Note:** Tare = Length indication is set to 0^{00}	static	if winch indication for winch 3 is shown
F2	Tare the length indication of winch 4	static	if winch indication for winch 4 is shown
F3	Tare the length indication of winch 5*	static	if winch indication for winch 5 is shown
F4	Tare the length indication of winch 6*	static	if winch indication for winch 6 is shown
F5	* Ballast editing key When pressing the "F5" key, the thick symbol frame changes into a thin symbol frame. A blinking cursor appears in the ballast editing field. The value for the placed ballast can now be entered in the given weight unit [t] or [kips] via the numeric keybar A on monitor 1 . The ballast editing can be completed : - by pressing the "ENTER" key = take over value. The entered value now appears as value for the placed ballast ($BA_{aufgelegt}$) in the ballast symbol or - by pressing the "F5" key = brake off editing. The change is dumped. The old value of $BA_{aufgelegt}$ remains in the ballast symbol . **CAUTION: When editing the ballast, the notes in chapter . 4.03 , paragraph 8 must be observed.**	static	in operating modes with suspended ballast / ballast trailer
F5	Ballast input value (BA_{edit}) * = edited ballast value in function key symbol of "F5"	static	for **valid** ballast input value
		blinking (???)	for **invalid** ballast input value
F6-F7	not used		
F8	Symbol element "Horn" - Turn off the acoustical signal "Horn" on monitor 1 by pressing the "F8" key	blinking	if acoustical signal "Horn" sounds on monitor 1 ertönt (see paragraph 21.8)





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21.8 Acoustical warning on monitor 1

"HORN"
For some of the operational errors found on CPU 1, which possibly lead to shut down of a movement, it is important to look at the Operating view on monitor 1. In addition to the optical view, these errors are also reported acoustically via the "HORN" .

Note: "HORN" is a sound which lasts approx. 0.5 seconds, and is repeated in one second intervals.

Operational erros with "HORN" on monitor 1 without LEC error are :
- Exceeding of test point 1 - Installation - maximum threshold (only lattice jib)
- Exceeding of test point 1 - Operational maximum threshold
- Falling below test point 1 - Minimum threshold
- Exceeding of maximum derrick angle
- Falling below maximum derrick angle

Additional errors with "HORN" on monitor 1and LEC errors are :
- Derrick ballast input error
- Derrick ballast guy force: Difference between right (A) and left (B) is too large

Note: The sensors (pull test bracket, pressure sensor, angle sensor) which are monitored by the CPU 1 are shown in case of an error via a LEC error on monitor 0. No acoustical signal "HORN" is issued on monitor 1.

"SHORT HORN" on monitor 1
Error without LEC (LICCON Error Code), which do not immediately lead to shut off of crane movement by the LICCON overload safety are also reported by the acoustical signal "SHORT HORN" in addition to the optical indication.

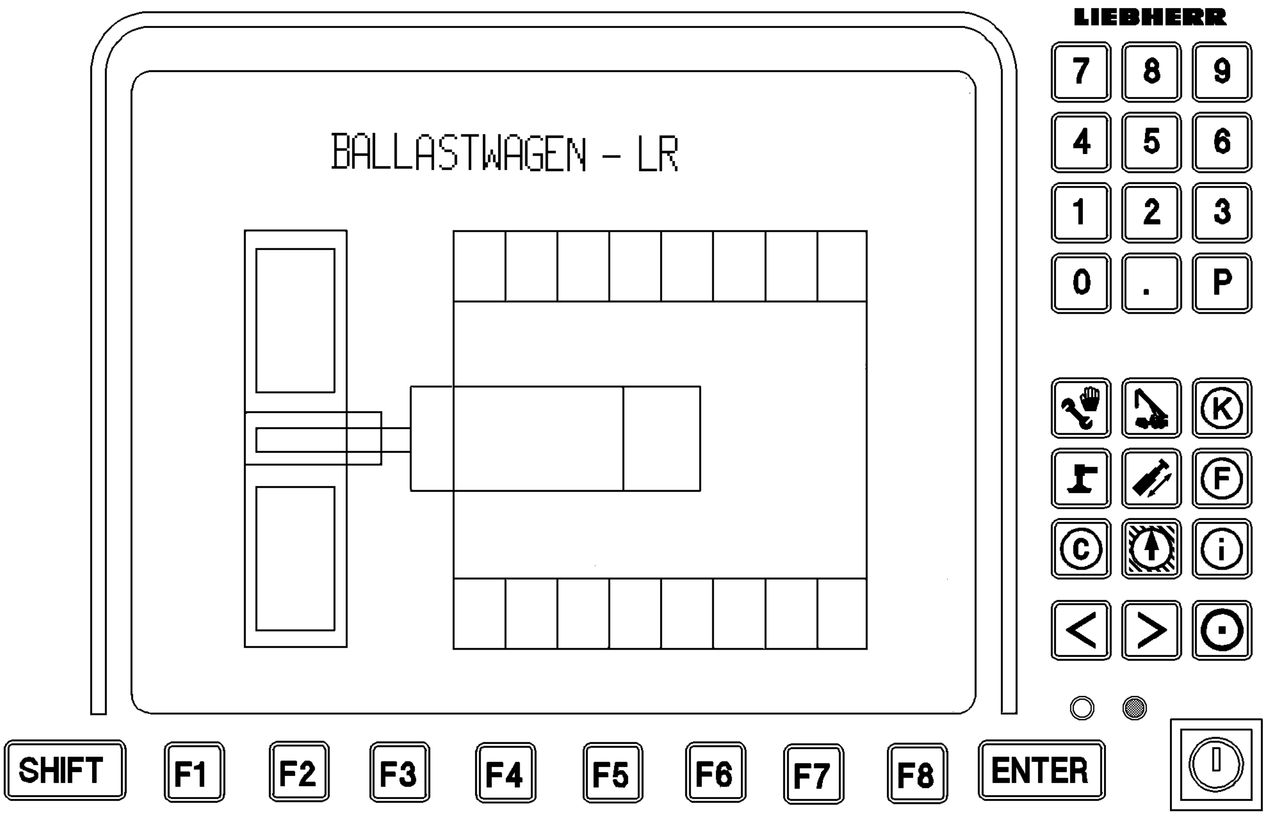
Note: "SHORT HORN" is a sound which lasts approx. 0.1 seconds, and is repeated in two second intervals.

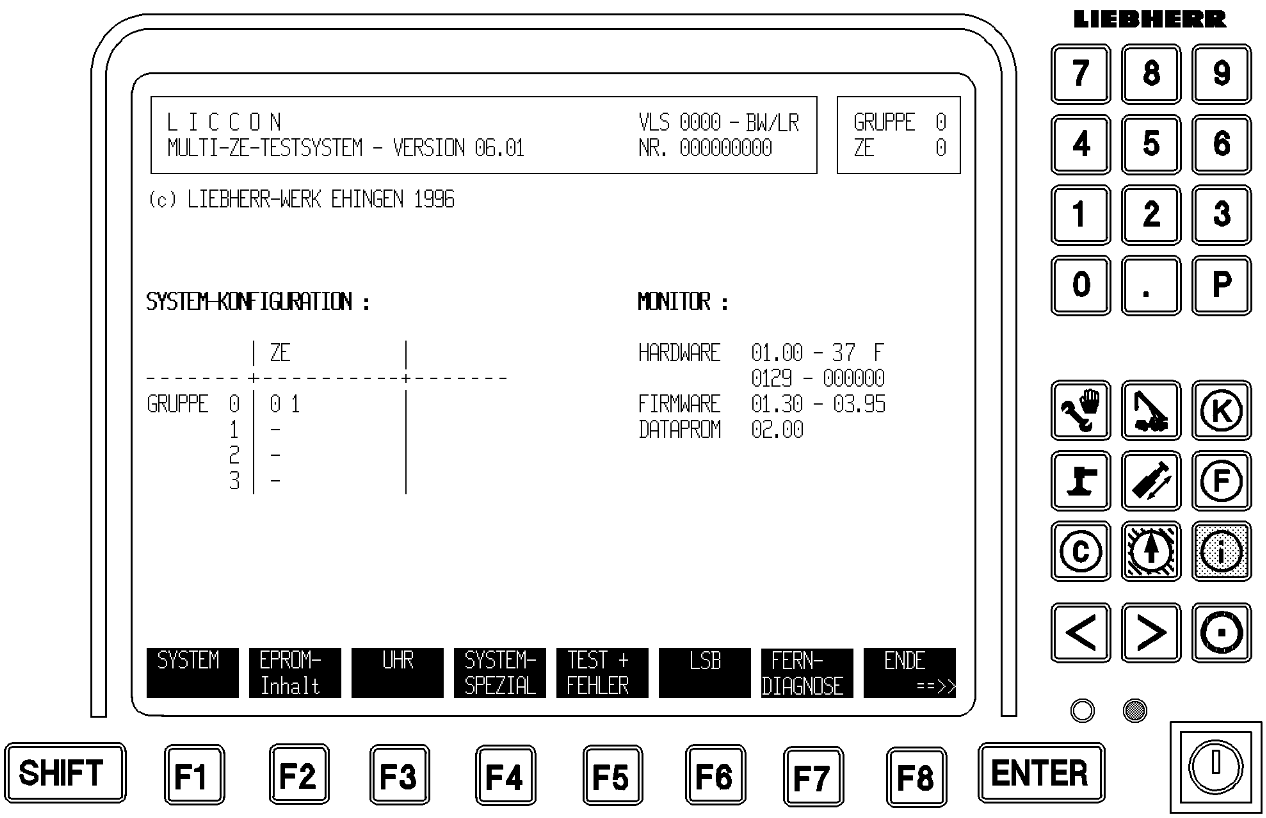
Monitored errors are :
- Prewarning threshold of test point 1 - Operational maximum force is reached ("CAUTION" at 90%)
- Prewarning threshold of test point 1 - Minimum force is reached ("CAUTION" at approx. 15 t over $F1_{min}$)

Priority of acoustical warnings
The alarm "HORN" has a higher priority than the alarm "SHORT HORN".

Turn acoustical warnings off
- "HORN" as well as "SHORT HORN" can be turned off via the function key "F8" . If an error occurs again, then the acoustical warning "HORN" or "SHORT HORN" becomes active again.

Note: Errors with LEC are indicated on monitor 0 in operating view, above the "F8" key.


LIEBHERR
BALLASTWAGEN - LR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 06.01
VLS 0000 - BW/LR
NR. 000000000
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 + FEHLER
LSB
FERN-DIAGNOSE
ENDE ==>>
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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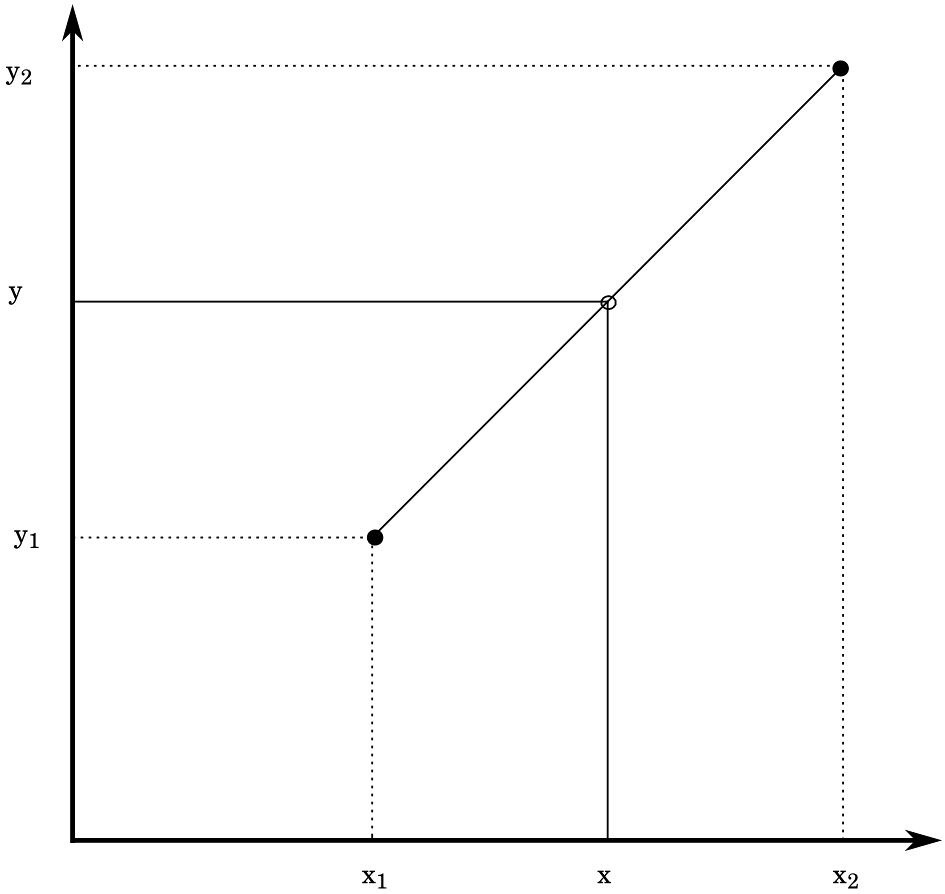
22. The "Test system Ballast trailer " program

The ballast trailer is equipped with a test system , The test system is a service and diagnostics tool, which makes it possible to quickly and simply localize and remedy problems on the crane, without the use of additional testing devices. For diagnostics purposes, monitor 1 can be assigned to the ballast trailer control .

Note: See chapter 5.11; Ballast trailer.

Linear Interpolation



30. Load chart access procedure

30.1 General

Differentiation is made between two chart access procedures:
- Radius access ⇒ for simple boom configurations
- Linear interpolation ⇒ for complex boom configurations

Note: For complex configurations, such as luffing jib, there is no separate load chart column for each crane condition, but there are only load chart columns for defined nominal positions. So that work is possible in between these nominal positions, there are load chart access procedures where the current load carrying capacity can be calculated from these nominal positions.

30.2 Radius access

The radius access applies for all operating modes with main boom, without luffing jib and without derrick ballast. The load chart values are read due to the set equipment configuraton and the current radius from the load charts.

30.3 Linear interpolation

Linerar interpolation means that in the intermediate range of two support points x_1 and x_2 the result y linear from the result y_1 transfers to the result y_2 .

Graphic view :
(See left illustration).

Formula :

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

Note: The following examples for main boom angle interpolation, derrick ballast radius interpolation or the combination from both procedures as only examples. The values are examples and might not match the crane. In any case, binding are the programmed charts of the LICCON computer system or the crane job planer.

30.3.1 Main boom angle interpolation

Note: The main boom angle interpolation is applicable only in modes with main boom und luffing jib .

In operating modes with main boom and luffing jib, the load charts for certain main boom nominal angles are stored in the crane .

Main boom nominal angles (HAN∡) are: **87°, 77° und 67°**

With the interpolation procedure, the load capacities are calculated from these load charts for the main boom angle (HA∡) lying in between.

The load carrying capacity is interpoled linearly via the main boom angle. The access to the load chart columns with different main boom nominal angles however, is made for various radii, when the main boom with luffing jib is turned from the current main boom angle to the main boom nominal angle.

Note: To calcuate the maximum load carrying capacity between two main boom nominal nagles, the job planer program must be used. Without the job planer program, this calculation cannot be made.

D A N G E R: Only one load may be lifted between the main boom nominal angles, if the calculation of the maximum load carrying capacity ensures that the crane can lift the load at this point.

If a job planer program is not available, then the loads may only be lifted in the main boom nominal positions with the corresponding load chart.

Example

Wanted:
current load carrying capacity = ?

Given :
Main boom angle (HA$\measuredangle$) = x = 82°
Luffing jib angle (WS$\measuredangle$) = 42°
Main boom nominal angle (HAN$\measuredangle_{87°}$) = x_2 = 87°
Main boom nominal angle (HAN$\measuredangle_{77°}$) = x_1 = 77°

Determinatio nof the maximum load carrying capacity on support points y_2 and y_1

Calculation of intermediate angle (Δ$\measuredangle$):
$\Delta\measuredangle = HA\measuredangle - WS\measuredangle$
$\Delta\measuredangle = 82° - 42°$
$\Delta\measuredangle = 40°$

Calculation of luffing jib angle (WS$\measuredangle$) for HAN$\measuredangle_{87°}$
$WS\measuredangle_{87°} = HAN\measuredangle_{87°} - \Delta\measuredangle$
$WS\measuredangle_{87°} = 87° - 40°$
$WS\measuredangle_{87°} = 47°$
⇒ Luffing jib angle = 47°, at a main boom nominal angle = 87°

Maximum load carrying capacity y_2 according to load chart
wtih main boom angle = 87°, Luffing jib angle = 47°
⇒ $y_2 = 40$ t

Calculation of luffing jib angle (WS$\measuredangle$) for HAN$\measuredangle_{77°}$
$WS\measuredangle_{77°} = HAN\measuredangle_{77°} - \Delta\measuredangle$
$WS\measuredangle_{77°} = 77° - 40°$
$WS\measuredangle_{77°} = 37°$
⇒ Luffing jib angle = 37°, at a main boom nominal angle = 77°

Maximum load carrying capacity y_1 according to load chart
with main boom angle = 77°, luffing jib angle = 37°
⇒ $y_1 = 30$ t

Calculation of current load carrying capacity

Formula:

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

$$y = 30\,t + \frac{(82° - 77°)}{(87° - 77°)} \times (40\,t - 30\,t)$$

$y = 35$ t ⇒ <u>current load carrying capacity = 35 t</u>

Result:
At a main boom angle of 82° and a luffing jib angle of 42°, the current load carrying capacity is **35 t**.

30.3.2 Jib relative angle interpolation

Note: The jib relative angle interpolation is only applicable for operating modes with main boom and very short luffing jib.

In operating modes with main boom and very short luffing jib, only load charts for certain jib relative nominal angles are stored in the crane.

Jib relative nominal angles (NRN_) are: **12° and 20°**

With the interpolation procedure, load carrying capacities for the jib relative angles (NR_) in between are calculated from these chart values .

The load carrying capacitz is interpoled linearly via the jib relative angle. Access to the load chart columns with different jib relative nominal angles is given, however, at different radii, which occur when the luffing jib is turned from the current jib relative angle to the jib relative nominal angle.

Note: The exact calculation of the maximum load carrying capacity between two jib relative nominal angles is not easy. The job planer program does not include this type of interpolation and shows for a jib relative angle area between 2 nominal position only " -----" , which means no calculation has been made.
2 possibilites to determine the maximum load carrying capacity at least approximately are described as follows.

D A N G E R: **Between the jib relative nominal angles, a load may only be lifted if it was ensured before by an approximate calculation that the crane can even lift the load at this point.**

Example:

Wanted:
Current load carrying capacity = ?

Given:
Main boom angle (HA∡) = 70°
Jib absolute angle (NA∡) = 54°

Jib relative angle (NR∡) = x = 70° - 54° = 16°
Jib relative nominal angle $(NRN\measuredangle_{12°}) = x_1 = 12°$
Jib relative nominal angle $(NRN\measuredangle_{20°}) = x_2 = 20°$

Determination of maximum load carrying capacity on support points y_2 and y_1
At first, the load carrying capacity at jib relative nominal angles 12° and 20° must be determined. Starting from a current jib relative angle of - for example - 12° , there is the problem, that the radius at the same main boom angle and other jib relative angles simply cannot be calculated by hand and for that reason, the load carrying capacity cannot simply be read from a chart.

But there are 2 ways to determine the maximum load carrying capacity, at least approximately:

1. **Approximate calculation from the load chart manual or the load chart values in the crane**
   The calculation of the load carrying capacity can be estimated by hand.
   Because with a jib relative angle change between 12° to 20°: 20° - 12° = 8° ,
   at a W 14 m – jib max. a radius change of dA = in (8°) * 14m = 1.95 m and
   at a W 21 m – jib max. a radius change of dA = in (8°) * 21m = 3.90 m.

   Which means, starting from an operating position with a jib relative angle of 12° and a radius A, the load can always be luffed down to a jib relative angle of 20° , which is in the load chart for the jib relative angle of 20° at a radius A + dA .
   If the crane is therefore positioned with a WV 14 m – jib at a radius A1 and a jib relative angle of 12°, then it can luff down the load to a jib relative angle of 20°, which is in the load chart column of the 20° chart at radius A2. The radius A2 is certainly smaller than A1 + dA = A1 + 1.95 m.
   Because the load carrying capacity decreases with larger radii, the load carrying capacity from the 20° chart at radius A1 + 1.95 m can be lifted safely within the complete jib relative angle range of 12° to 20° .

2. Exact calculation by hand and by actuating the jib relative nominal angle with the crane or the LICCON job planer

For the exact calculation of the load carrying capacity for a certain main boom angle and a certain jib relative angle, the load carrying capacities y1 and y2 for the corresponding jib relative nominal angles x1 and x2, for example 12° and 20°, must also be exactly determined at radii A1 and A2.

There are 2 ways:

a) By actuating the corresponding jib relative nominal angle at the same main boom angle with the crane. The LICCON computer system in the crane shows then the maximum load carrying capacity y1 at jib relative angle x1 and the load carrying capacity y2 at jib relative angle x2 .

b) By actuating the corresponding jib relative nominal angle at the same main boom angle with the LICCON job planer. The job planer shows then the maximum load carrying capacity y1 at jib relative angle x1 and the load carrying capacity y2 at jib relative angle x2 .

For the calculation of the current load carrying capacity, the loads y1 and y2 just have to be entered below into the formula .

Intermediate results:

Maximum load carrying capacity y_1 according to load chart
with: Jib relative angle = 12°,
Main boom angle (HA∡) = 70°,
Luffing jib angle = 68°
at radius A1: $y_1 = 40$ t

Maximum load carrying capacity y_2 according to load chart
with: Jib relative angle = 20°,
Main boom angle (HA∡) = 70°
Luffing jib angle = 60°
at radius A2: $y_2 = 30$ t

Calculation of current load carrying capacity:

Formula:

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

$$y = 40\,t + \frac{(16° - 12°)}{(20° - 12°)} \times (30\,t - 40\,t)$$

$y = 35$ t ⇒ <u>current load = 35 t</u>

Result:
At a jib relative angle of 16° and a luffing jib angle of 64° , the current load carrying capacity is **35 t**.

30.3.3 Derrick ballast radius interpolation

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

The load and the maximum operating force on test point 1 is interpoled linearly via the derrick ballast radius, i.e. at a derrick ballast radius of 14 m, the center value from the corresponding values at 13 m and 15 m derrick ballast trailer radius is valid for the maximum load and the maximum operating force.

Note: For a simple estimation one can conclude immediately that for the range between two derrick ballast radii always the smaller load carrying capacity and the smaller maximum operating force of both derrick ballast nominal radii applies.

D A N G E R: **Then only that load may be lifted, which is between the given derrick ballast nominal radii, if it was checked before with the crane job planner program or by hand that the crane is even able to lift this load in this position.**

Example

Wanted:
Current load carrying capacity = ?
Maximum operating force on test point 1 = ?

Given:
Derrick ballast radius = 14 m

Given according to load chart:
For derrick ballast radius = 13 m
⇒ maximum load carrying capacity = 30 t
⇒ maximum operating force = 130 t

For derrick ballast radius = 15 m
⇒ maximum load carrying capacity = 40 t
⇒ maximum operating force = 140 t

Calculation of current load carrying capacity :

Formula:

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

$$y = 30\ t + \frac{(14\ m - 13\ m)}{(15\ m - 13\ m)} \times (40\ t - 30\ t)$$

$y = \mathbf{35\ t}$ ⇒ curent load carrying capacity = 35 t

Calculation of maximum operating force :

Formula:

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

$$y = 130\ t + \frac{(14\ m - 13\ m)}{(15\ m - 13\ m)} \times (140\ t - 130\ t)$$

$y = 135\ t$ ⇒ maximum operating force = 135 t

Result:
If the currently pulled derrick ballast is larger or the same as the optimum derrick ballast, then at a derrick ballast radius of 14 m, the current load carrying capacity is **35 t** and the maximum F1-operating force **135 t**.

F1max-Interpolation via the pulled derrick ballast
In operating modes with derrick ballast without attachments (fly jib or fixed jib), there are various F1-operating max. forces for different derrick ballasts.
The calculation procedure is described as F1max-Interpolation via the pulled derrick ballast.

The load charts with F1max-Interpolation can be recognized by the fact that in each load chart with derrick ballast (SDB/BW) the load chart column for the operating mode without derrick ballast (SD) is on the front with derrick ballast radius = 0. The LICCON computer system uses it to calculate the F1max for the currently pulled derrick ballast.

Calculation:

1. The LMB calculates to the running time from the load chart at SD (TLSD) the permissible F1-operating -max- force (F1maxSD) for the pulled derrick ballast = 0 t (DBgez= 0 t).

2. The LMB calculates the permissible F1-operating -max- force (F1maxSDW) for the optimum derrick ballast and the current derrick ballast radius (DBR) from the load chart values at derrick ballast nominal radii.
   For example: F1max(DBR=14m) = (F1max(DBR=13m) + F1max(DBR=15m)) / 2

3. The LMB calculates from the load at SDBW (TLSDBW) the optimum derrick ballast (DBopt) for the current reach and the current derrick ballast radius .

4. The currently pulled derrick ballast (DBgez) is determined from the sensors .
   The force in the ballast guying with the pressure sensors in the ballast hoist cylinders is calculated. the angle of the ballast guying is determined with the length sensor on the ballast sliding cylinder and the derrick angle. The LML assumes a medium extension length of the ballast hoist cylinders.

   C A U T I O N : **The exact ballast weight is the prerequisite for a functioning overload safety!**

5. The F1-operating -max-interpolation calculates F1max (DBgez) for the currently pulled derrick ballast (DBgez). See illustration .

There are various cases :

A1) Load carrying capacity SD > 0 (TL_{SD} > 0) at the current reach:
then calculation as above.

A2) Load carrying capacity at SD = 0 (TLSD = 0) at the current reach :
then the calculation of the permissible F1-operating-max-force (F1maxSD) for the pulled derrick ballast = 0 t (DBgez= 0 t) is made from the last load at SD > 0 t (TLSD > 0 t), which means the largest reach with TLSD > 0 t.

B1) Currently pulled derrick ballast (DBgez) <= optimum derrick ballast (DBopt)
then calculation as above .

B2) Currently pulled derrick ballast (DBgez) > optimum derrick ballast (DBopt)
then F1-operating -max for the pulled derrick ballast:
F1max (DBgez) = F1max (DBopt).

Note: The intermediate results of the F1max-Interpolation and the maximum load carrying capacity resulting from the current F1max can be viewed on the special view " LMB BILD 12b (TEST: F1max-Interpolation 4)" .
The F1max- Interpolation is not available for operating modes with attachments (luffing jib or fixed jib).

C A U T I O N: The exact ballast weight is prequisite for a functioning overload safey!
When operating the crane with derrick ballast, especially with F1max-Interpolation, the crane operator must constantly check that
- the derrick angle
- the derrick ballast radius and
- the force in the derrick ballast guying
is measured and / or calculated correctly.

D A N G E R : If the calculation for the pulled derrick ballast supplies a value which is too small due to incorrect test signals, then the calculated permissible F1max-operating - force will be too high and the crane can be overloaded.
This can cause an accident!

It must be ensured that the hydraulic cylinders to lift the derrick ballast are never extended all the way. If the cylinders are extended to stop, then the cylinders are without pressure on the ring surface side with test point 4A and 4B ; the pulled derrick ballast is then much too small with 0 t and the permissible F1max-operating - force will be calculated too high . In this case, the crane can be overloaded.
This can cause an accident!

It must be monitored;
- **that the derrick ballast radius indicator increases (or reverse), when telescoping out the derrick ballast .**
- **that the indicator value for the pulled derrick ballast increases (or reverse) when lifting the derrick ballast off the ground**
- **but that the indicated value for the pulled derrick ballast always remains about the same when lifting or lowering the derrick ballast in suspended condition.**
- **that the permissible F1max- force decreases when lifting the derrick ballast off the ground, especially at larger radii and that the permissible F1max- force increases when setting the derrick ballast down, especially in larger reach.**

Note: The derrick ballast can also be lifted off the ground by load lifting movement or luffing the boom down .
The derrick ballast can also be set on the ground by load lowering movement or luffing the boom up.

Note: Errors in pressure sensors:
If one of the two pressure sensor of the ballast hoist cylinders on the ring surface side (= test point 4A or 4B) is defective, then the LML recognizes that the ballast weighing is not possible and always uses the greatest possible ballast for the calculation of F1max-operation. This way one always receives the same smallest possible value for F1max-operation, regardless of the pulled derrick ballast . This means , for the same derrick ballast, the maximum load carrying capacity in the partial ballast range can possibly be significantly reduced due to a defect in test point 4A or 4B .

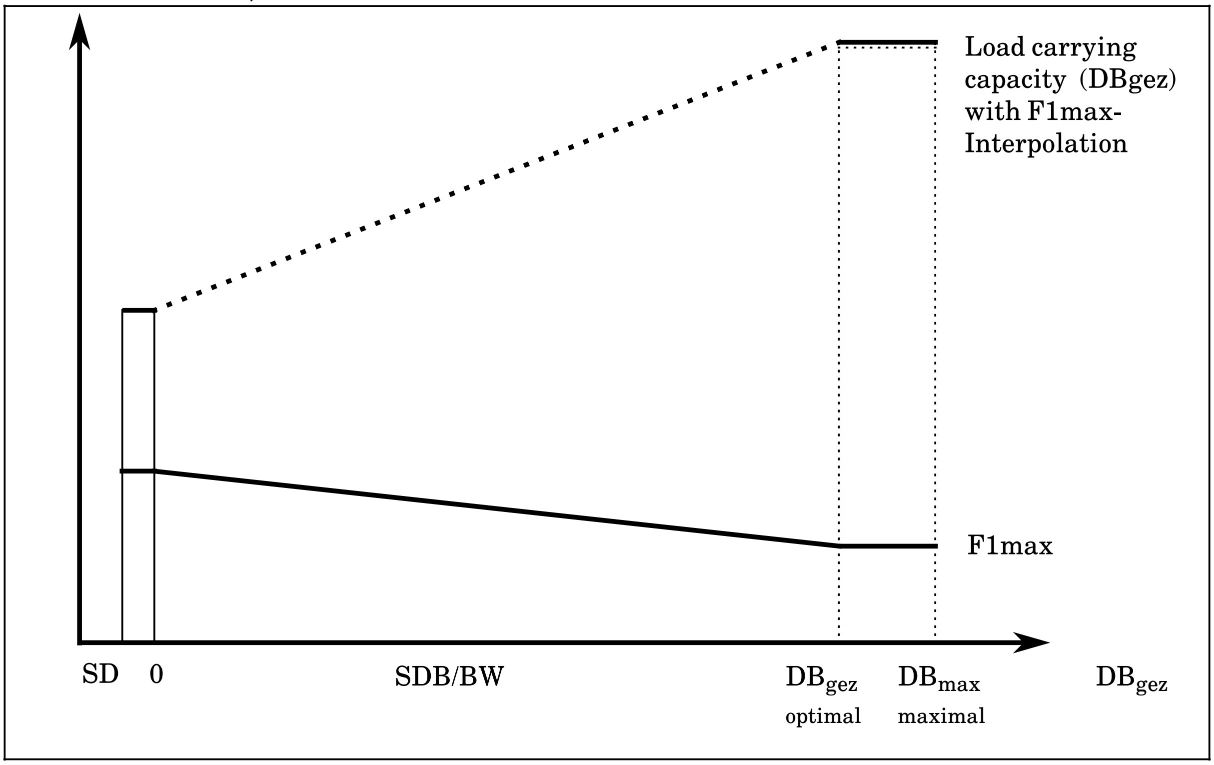
If the pressure sensor in the ballast hoist cylinder on the piston surface side (= test point 5) is defective, then the LML calculates the ballast as if the pressure in test point 5 = 0 bar . This would make the caculated ballast and the ballast utilizaion a little larger. The ballast utilization dependent F1min- shut offs would come a little sooner. The calculated value for F1max-operation would only be a little less and the crane would operate more safely.

F1-installation- maximum force:
Because F1max- operating forces at small pulled derrick ballasts are often significantly larger, then the F1max-operating force at large derrick ballast, it is possible that the F1max-operating force in operating position is also larger than the F1-installation-maximum force stored in the load chart for erection of the boom.

Die F1-installation- maximum force is constantly monitored in operation and cannot be bypassed by shut offs triggered by the F1-installation- maximum force. For that reason, in boom positions, where the calculated F1-operating maximum force is not at least 10 t smaller than the F1-installation- maximum force stored in the chart, the monitored and indicated F1-installation- maximum force is set by 10 t higher than the current F1-operating maximum force.

F1max and max. load carrying capacity depending on the pulled derrick ballastes (DB_{gez})

The maximum load carrying capacity in SD- operation and in SDB/BW- operation with derrick ballast = 0 t can be different, due to different calculations.



30.3.4 Combination of main boom angle and derrick ballast radius interpolation

Note: A combination of main boom angle and derrick ballast radius interpolation is only in operating modes with derrick ballast and N / W equipment.
In addition to this paragraph, paragraph 30.3.1 main boom angle interpolation and paragraph 30.3.2 derrick ballast radius interpolation must be observed.

This access procedure for operating modes with luffing jib and derrick ballast is based on:
- a derrick ballast radius interpolation from the maximum load carrying capacity and the maximum operating force for each main boom nominal angle and
- the main boom angle interpolation from both previous results.

Note: These calculations cannot easily be made by hand.

For a simple estimation one can conclude immediately that for the range between two derrick ballast radii always the smaller load carrying capacity and the smaller maximum operating force of both derrick ballast nominal radii applies.

D A N G E R: **Then only that load may be lifted, which is between the main boom nominal angles, if it was checked before with the crane job planner program that the crane is even able to lift this load in this position**

If no job planer program is available, then loads may only be lifted in the main boom nominal positions, and only those loads may be lifted for which the load chart lists this main boom nominal angle.

A load may only be lifted between the given derrick ballast nominal radii if it was checked before with a job planer program or by hand by a simple check if the crane can even lift the load in this position.

Example:
Wanted:
current load carrying capacity = ?
Maximum operating force on test point 1 = ?

Given:
Main boom angle = 82°
Luffing jib angle = 42°
Derrick ballast radius = 14 m

Calculation of intermediate angle (Δ∡):
Δ∡ = HA∡ - WS∡
Δ∡ = 82° - 42°
Δ∡ = 40° ⇒ Luffing jib angle = 47°, at a main boom nominal angle = 87°
⇒ Luffing jib angle = 37°, at a main boom nominal angle = 77°

Note: See example for main boom angle interpolation.

Given according to load chart :
for main boom nominal angle = 87°, Luffing jib angle = 47°, Derrick ballast radius = 11 m
⇒ Max. load carrying capacity = **40 t** (1)
⇒ Maximum operating force = **140 t** (2)

for main boom nominal angle = 87°, Luffing jib angle = 47°, Derrick ballast radius = 13 m
⇒ Max. load carrying capacity = **50 t** (3)
⇒ Maximum operating force = **150 t** (4)

for main boom nominal angle = 77°, Luffing jib angle = 37°, derrick ballastradius = 11 m
⇒ Max. load carrying capacity = **20 t** (5)
⇒ Maximum operating force = **120 t** (6)

for main boom nominal angle = 77°, Luffing jib angle = 37°, Derrick ballast radius = 13 m
⇒ Max. load carrying capacity = **30 t** (7)
⇒ Maximum operating force = **130 t** (8)

Intermediate result with derrick ballast radius interpolation of (1, 3) and (2, 4)
at: Main boom = 87°
Luffing jib angle = 47°
derrick ballast radius = 14 m

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

$$y = 40\ t + \frac{(14\ m - 13\ m)}{(15\ m - 13\ m)} \times (50\ t - 40\ t)$$

y = 45 t ⇒ <u>curent load carrying capacity = **45 t**</u> (9)

$$y = 140\ t + \frac{(14\ m - 13\ m)}{(15 - 13\ m)} \times (150\ t - 140\ t)$$

y = 145 t ⇒ <u>Maximum operating force = **145 t**</u>(10)

Intermediate result with derrick ballast radius interpolation of (5, 7) and (6, 8)

at: Main boom = 77°
Luffing jib angle = 37°
derrick ballast radius = 12 m

Formula:

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

$$y = 20\ t + \frac{(14\ m - 13\ m)}{(15\ m - 13\ m)} \times (30\ t - 20\ t)$$

y = 25 t ⇒ <u>current load carrying capacity = **25 t**</u> (11)

$$y = 120\ t + \frac{(14\ m - 13\ m)}{(15\ m - 13\ m)} \times (130\ t - 120\ t)$$

y = 125 t ⇒ <u>maximum operating force = **125 t**</u> (12)

End result with main boom angle interpolation of (9, 11) and (10, 12)

at: Main boom = 82°
Luffing jib angle = 42°
Derrick ballast radius = 14 m

Formula:

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

$$y = 25\ t + \frac{(82° - 77°)}{(87° - 77°)} \times (45\ t - 25\ t)$$

y = 35 t ⇒ <u>current load carrying capacity = **35 t**</u>

$$y = 125\ t + \frac{(82° - 77°)}{(87° - 77°)} \times (145\ t - 125\ t)$$

y = 135 t ⇒ <u>maximum operating force = **135 t**</u>

Result:
At a main boom angle of 82° and a luffing jib angle of 42° as well as a derrick ballast radius of 14 m, the current load carrying capacity is **35 t** and the maximum operating force is **135 t**

30.3.5 Combination of jib relative angle and derrick ballast radius interpolation

Note: A combination of jib relative angle and derrick ballast radius interpolation is applicable only in operating modes with derrick ballast and very short N / W attachment.
In addition to this paragraph, note also paragraph 30.3.2 Jib relative angle interpolation and paragraph 30.3.3 Derrick ballast radius interpolation !

This access procedure for operating modes with luffing jib and derrick ballast is based on:
- a derrick ballast radius interpolation of maximum load carrying capacity and the maximum F1- operating force for each jib relative nominal angle and
- the jib relative angle interpolation from both previous results.

Jib relative nominal angle (NRN∡) are: **12°** and **20°**

The load carrying capacities for the jib relative angles (NR∡) in between are calculated with the interpolation procedure from these load chart values.

The load carrying capacity is interpoled linearly via the jib relative angle. However, access to the load chart columns with various jib relative angles is made at various radii, which result if the luffing jib is turned from the current jib relative angle to the jib relative nominal angle.

Note: The exact calculation of the maximum load carrying capacity between two jib relative nominal angles is not simple. The job planer program does not include this type of interpolation and shows only "-----" in the jib relative angle between 2 nominal positions, i.e. no calculation is made.

Below we described 2 ways to estimate the maximum load carrying capacity.

For a simple estimation, one can conclude immediately that for the range between two derrick ballast nominal radii always the smaller load carrying capacity and the smaller maximum F1-operating force of the two derrick ballast nominal radii applies.

D A N G E R: **Then only that load may be lifted, which is between the jib relative nominal angles and the derrick ballat nominal radii, if it was checked before with the crane job planner program that the crane is even able to lift this load in this position**

If no corresponding calculation was made, then loads may only be lifted in the jib relative angle nominal positions and the derrick ballast radii nominal positions, and only those loads may be lifted, for which the load charts list these nominal position.

Example:

Wanted:
Current load carrying capacity = ?

Given:
Main boom angle (HA∡) = 70°
Jib absolute angle (NA∡) = 54°
Derrick ballast radius = 14 m

Jib relative angle (NR∡) = x = 70° - 54° = 16°
Jib relative nominal angle $(NRN∡_{12°}) = x_1 = 12°$
Jib relative nominal angle $(NRN∡_{20°}) = x_2 = 20°$

Determination of maximum load carrying capacities on support points y_2 and y_1
At first, the load carrying capacity at jib relative nominal angles 12° and 20° must be determined for the ballast nominal radii of 13 m and 15 m.
Starting from a current jib relative angle of - for example - 12° , there is the problem, that the radius at the same main boom angle and other jib relative angles simply cannot be calculated by hand and for that reason, the load carrying capacity cannot simply be read from a chart.

But there are 2 ways to determine the maximum load carrying capacity, at least approximately:

1. Approximate calculation from the load chart manual or the load chart values in the crane
2. Exact calculation by hand and by actuating the jib relative nominal angle with the crane or the LICCON job planer.

These calculations are described in paragraph 30.3.2 Jib relative angle interpolation .

As intermediate results, one obtains 4 load carrying capacities and 4 $F1_{max}$-forces in 4 corresponding nominal positions:

Given according to load chart:
at main boom angle = 70°, jib relative angle = 12°, derrick ballast radius = 13 m
max. load carrying capacity = **40 t** (1)
max. operating force = **140 t** (2)

at main boom angle = 70°, jib relative angle = 12°, derrick ballast radius = 15 m
max. load carrying capacity = **50 t** (3)
max. operating force = **150 t** (4)

at main boom angle = 70°, jib relative angle = 20°, derrick ballast radius = 13 m
max. load carrying capacity = **20 t** (5)
max. operating force = **120 t** (6)

at main boom angle = 70°, jib relative angle = 20°, derrick ballast radius = 15 m
max. load carrying capacity = **30 t** (7)
max. operating force = **130 t** (8)

Intermediate result with derrick ballast radius interpolation from (1, 3) and (2, 4)
At: Main boom = 70°
Jib relative angle = 12°
Derrick ballast radius = 14 m

Formula:

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

$$y = 40\ t + \frac{(14\ m - 13\ m)}{(15\ m - 13\ m)} \times (50\ t - 40\ t)$$

$y = 45\ t$ ⇒ <u>current load carrying capacity = **45 t**</u> (9)

$$y = 140\ t + \times \frac{(14\ m - 13\ m)}{(15 - 13\ m)} (150\ t - 140\ t)$$

$y = 145\ t$ ⇒ <u>max. operating force = **145 t**</u> (10)

Intermediate result with derrick ballast radius interpolation from (5, 7) and (6, 8)
At: Main boom = 70°
Jib relative angle = 20°
Derrick ballast radius = 14 m

Formula:

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

$$y = 20\ t + \frac{(14\ m - 13\ m)}{(15\ m - 13\ m)} \times (30\ t - 20\ t)$$

$y = 25\ t$ ⇒ <u>current load carrying capacity = **25 t**</u> (11)

$$y = 120\ t + \frac{(14\ m - 13\ m)}{(15\ m - 13\ m)} \times (130\ t - 120\ t)$$

$y = 125\ t$ ⇒ <u>max. operating force = **125 t**</u> (12)

End result with main boom angle interpolation from (9, 11) and (10, 12)

At: Main boom = 70°
Jib relative angle = 16°
Derrick ballast radius = 14 m

Formula:

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

$$y = 25\,t + \frac{(16° - 12°)}{(20° - 12°)} \times (45\,t - 25\,t)$$

$y = 35$ t ⇒ current load carrying capacity = **35 t**

$$y = 125\,t + \frac{(16° - 12°)}{(20° - 12°)} \times (145\,t - 125\,t)$$

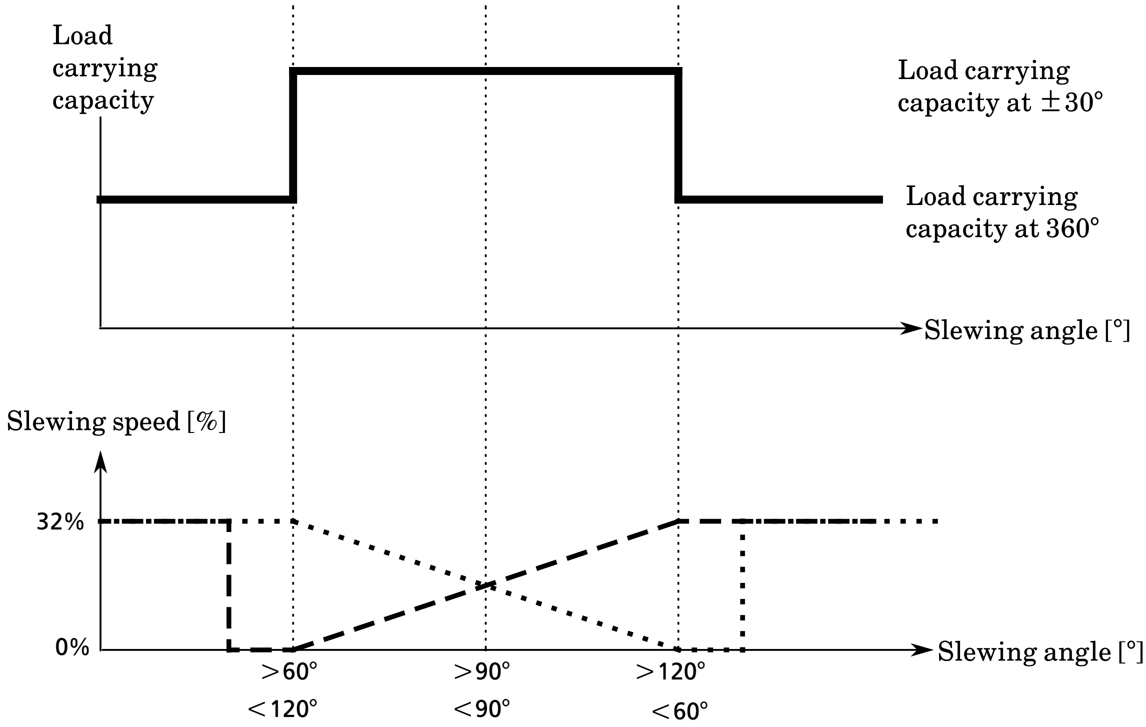
$y = 135$ t ⇒ maximum operating force = **135 t**

Result:
At a main boom angle of 70° and a jib relative angle of 16° as well as a derrick ballast radius of 14 m, the current load carrying capacity is **35 t** and the maximum operating force is **135 t.**

Load carrying capacity

Slewing speed - turn right (at current load > load carrying capacity 360°)

Slewing speed - turn left (at current load > load carrying capacity 360°)



40. Automatic slewing range change over

40.1 General

There are set up conditions, which have different load carrying capacities for different angle positions of the slewing platform.

For example: Crane with outrigger support, support base: 16 × 12 m

There is a stronger load chart for the large support base, in an angle range of ±30° to the side. This load chart for the limited slewing angle range is called the ±30°- load chart.
There are also load charts for the remaining angle range (360° load chart).

40.2 Setting the load chart

In the "Set up" program, each load chart can be selected with the function keys or the short code and "ENTER" . The selected load chart is shown.

Note: If the 360° chart is selected, then there is no slewing range change over. Only the load shown in the 360° chart can be lifted in the complete 360° slewing range.

If the ±30° chart is selected and confirmed with "F8" (OK), the slewing range change over becomes active.

C A U T I O N : Before selecting the ±30° chart, the ±30° chart and the corresponding 360° chart must be checked to see which load the crane can lift in which slewing range.

If the crane is in the ±30° range with selected slewing range change over,then the load carrying capacity in the ±30° chart applies, otherwise the load carrying capacity listed in the 360° chart applies.

After changing over from the "Operation" program to the "set up" program, always that chart is shown, which was previously confirmed with "OK" .

Note: To be able to check in the "Set up" program, which load can be lifted in the current angle position, the current slewing angle must be read in the "Operation" program and the corresponding load chart (360° or ±30°) must be selected in the "Set up" program.

40.3 Slewing gear control

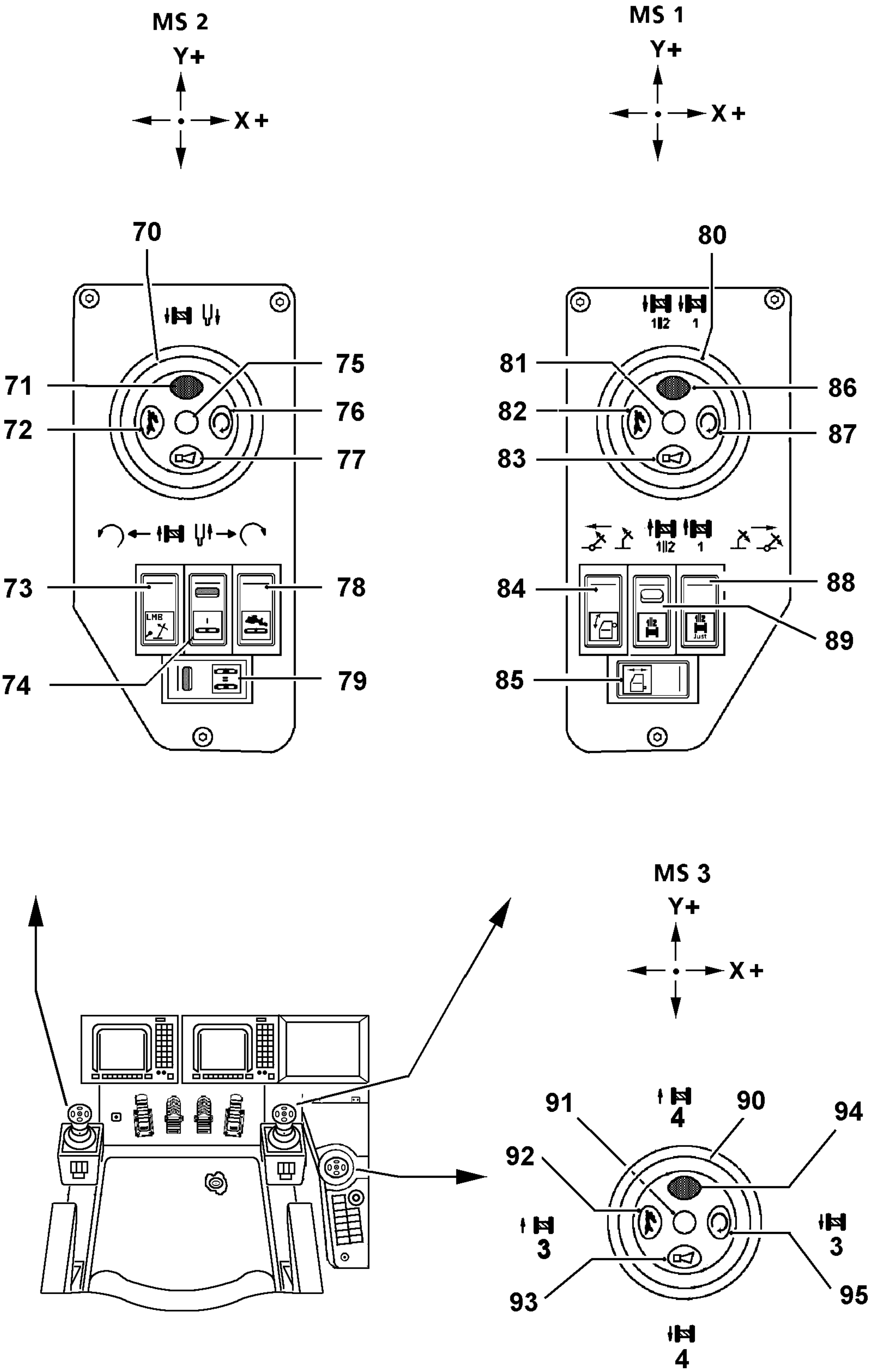
If the slewing range change over is set and a load is lifted in the ±30° range which is in the **> 360° load chart**, then - depending on the current slewing angle - the maximum slewing speed for "Turning left / right" is calculated, as shown on the illustration on the left, and the slewing movement to the edge of the ±30° range is reduced more and more until the shut off.

Note: A slewing speed reduced by the LML can only be lifted after removing the overload in the 360° slewing angle range if the crnae movement "slewing" is not actuated.

40.4 Coasting the slewing gear

At a set slewing range change over and >360° load carrying capacity, coasting the "slewing gear" by pressing the foot button is not possible.

Note: If the slewing range change over is set and the coasting slewing gear is actuated, then the load carrying capacity from the 360° chart is valid.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1. General crane condition

Before starting up the crane, the operator must ensure that the following conditions are met:
- The crane is horizontally aligned
- The gear on the slewing ring must be clean and greased.
- The air intake for oil coolant and radiator is ”clear / unobstructed”.
- The side covers are closed and locked.
- There are no persons or objects within the danger zone of the crane.
- The cable and rope drums as well as the limit switches are free of ice and snow.
- There are no loose parts on the slewing platform and the boom.

D A N G E R : **Before the boom is erected, the operator must ensure that there are no loose parts on the boom, such as pins, spring retainers or ice. If this is not observed, there is a DANGER OF ACCIDENTS due to falling items.**

2. Crane operator's cab adjustment

From transport to operating position

The cab is swung in front of the slewing platform during transport.
Press button (85) and swing out the cab into operating position.
Press button (84) and incline the cab to the desired operating position.

From operating position to transport position

Press button (84) and move the cab into horizontal position.
Press button (85) and swing the cab all the way in.

D A N G E R: **Make sure that no one remains in the swing range. There is a danger of crushing!**

3. Checks before start up

Before start up, the following checks must be made :

Note: For detailed description of the below listed check, see chapter 7.05, ”MAINTENANCE GUIDELINES”

Check the oil level and filters
- Check the oil level on the crane engine
- Check the oil level on the hydraulic tank for crane hydraulic
- Check the filter on the hydraulic tank

Fuel level

On the LICCON monitor, the tank contents is given in percentages [%] in numerical form.

C A U T I O N : **Do not wait until the fuel tank is empty before refueling, otherwise the fuel system must be cleaned and bled.**

Coolant level

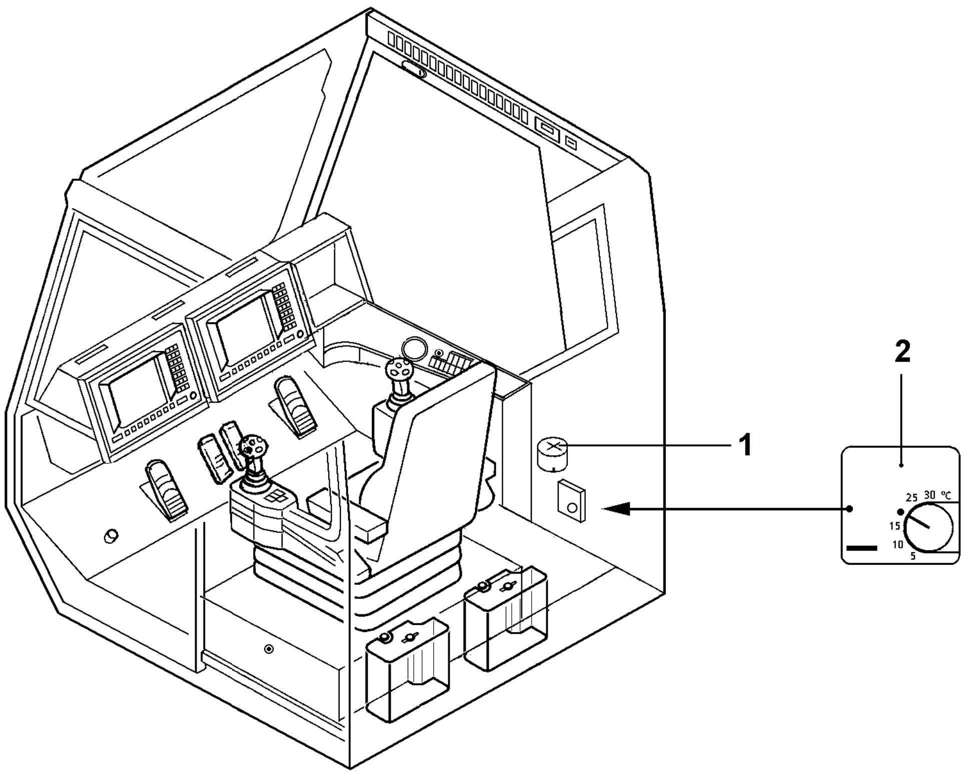
The coolant reservoir must be filled until the coolant runs over on the filler neck.

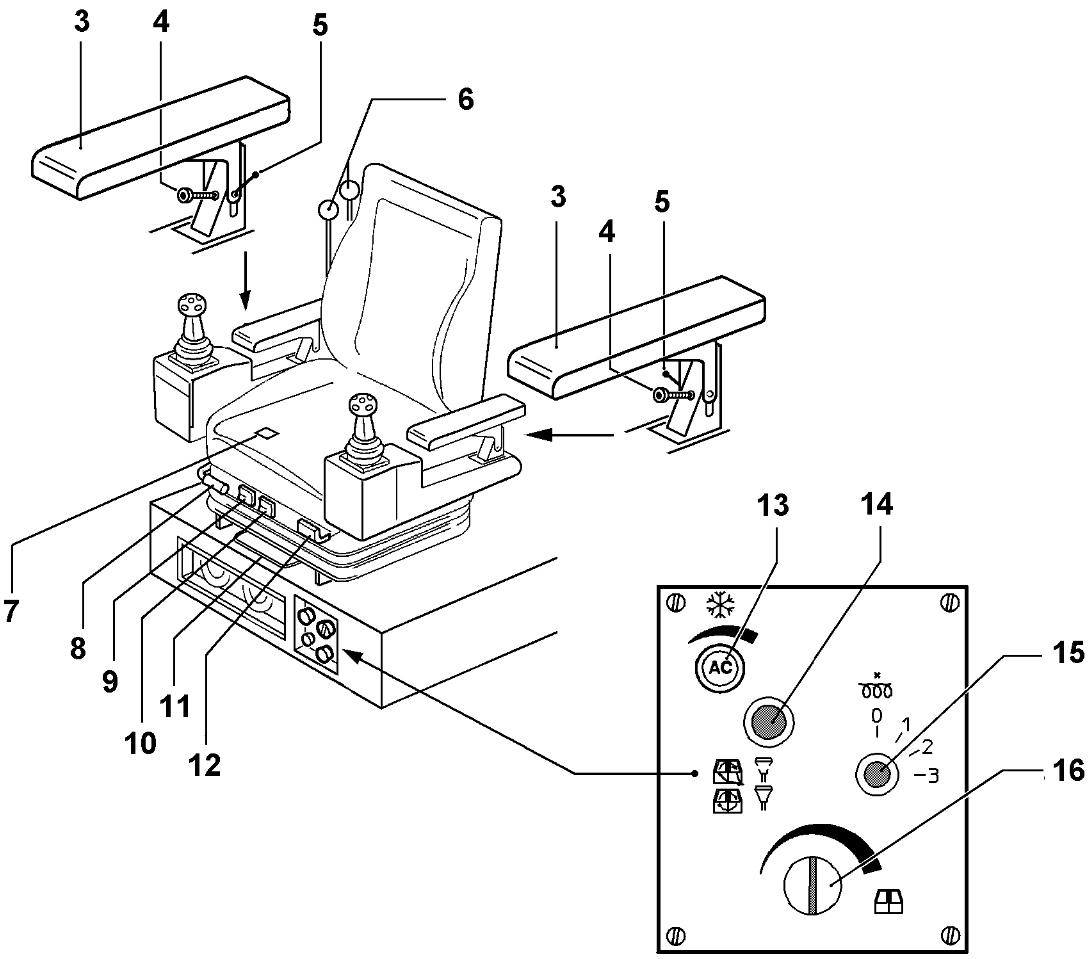
D A N G E R : **Check and add coolant only when the engine is cold There is a DANGER OF SERIOUS SKIN BURNS AND SCALDING!!**

Central lubrication system

It must be assured that the grease container is always filled with grease, according to the lubrication chart.

Note: See also chapter 7.05 "MAINTENANCE GUIDELINES, CRANE SUPERSTRUCTURE"





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4. Crane operator's cab

4.1 Adjust the seat

The suspended crane operator's seat can be adjusted to any body size.

- Adjustment of arm rest incline (5)
- Adjustment of seat surface incline (8)
- Adjustment of backrest incline (12)
- Release for horizontal seat adjustment (11)
- Adjustment of back support in the upper area of the backrest (10)
- Adjustment of back support in the lower area of the backrest (9)

4.2 Heater / ventilation

The crane operator's cab can be heated or ventilated, depending on the desired temperature.
The control elements for the heater / ventilation are below the crane operator's seat .
For detailed description, refer to chapter 6.01, HEATER .

Heat

- Switch change over switch (14) to air circulation.
- Turn on the blower with the knob (15) .
- Regulate the temperature with the knob (16) .

Ventilation

- Switch change over switch (14) to fresh air.
- Turn on the blower with the knob (15) .

4.3 Seat heater *

- The crane operator's cab can heated by turning on the switch (36) .

4.4 Adjust the crane operator's cab

The crane operator's cab can be "tilted upward" hydraulically by approx. 15° to increase the field of visibility for the operator.

D A N G E R : **When the crane operator's cab is tilted, nobody may step on the step in front or next to the cab! This is strictly prohibited!**
After completion of crane operation, the cab must be returned to horizontal position, otherwise the operator cannot leave the cab safely.

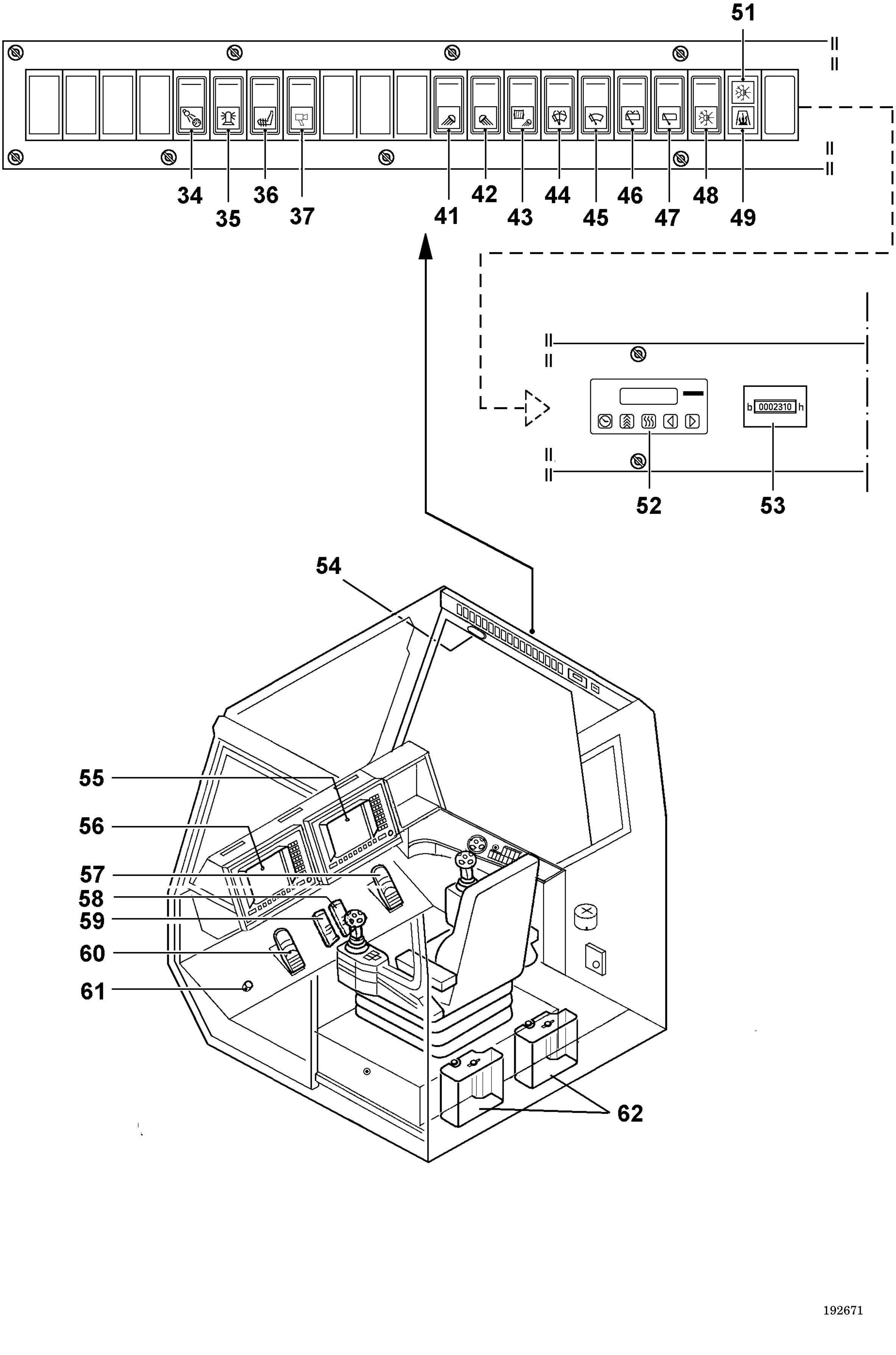
Tilt the crane operator's cab "upward"

- Press the button (84) "on the bottom" and hold it until the desired field of visibility is reached.

C A U T I O N : **When the crane operator's cab is tilted and the cab door is opened, it will run back quickly at an increased speed due to its own weight. For that reason, hold the door by the handle and open it slowly.**

Set the crane operator's cab to horizontal position

- Press the button (84) "on the top" and hold it until the horizontal position is reached.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4.5 Windshield wiper / windshield washer system

4.5.1 Windshield wiper

The windshield wipers on the front window as well as on the roof window can be actuated with the 2 stage switch
(1. Stage - Intermittent, 2. Stage - wipe).
- Windshield wiper on front window - switch (45)
- Windshield wiper on roof window - s witch (47).

4.5.2 Windshield wiper / windshield washer system

The windshield wipers on the front window as well as on the roof window can be enhanced with a windshield washer system .

Note: Before begin of the cold season, the reservoir for the windshield cleaning fluid must be filled with commercially available antifreeze fluid.

- Windshield wiper / washer on front window - button (44)
- Windshield wiper / washer on roof window - button (46).

4.6 Front window

The front window can be opened by simply pushing against it from the inside, a pair of nitrogen cylinders aids in the hoist movement.
If the window is to be opened only partially, then it can be held at any angle by holding it with the installed perforated belt.

D A N G E R : Be careful with your hands when closing the front window to prevent injury .

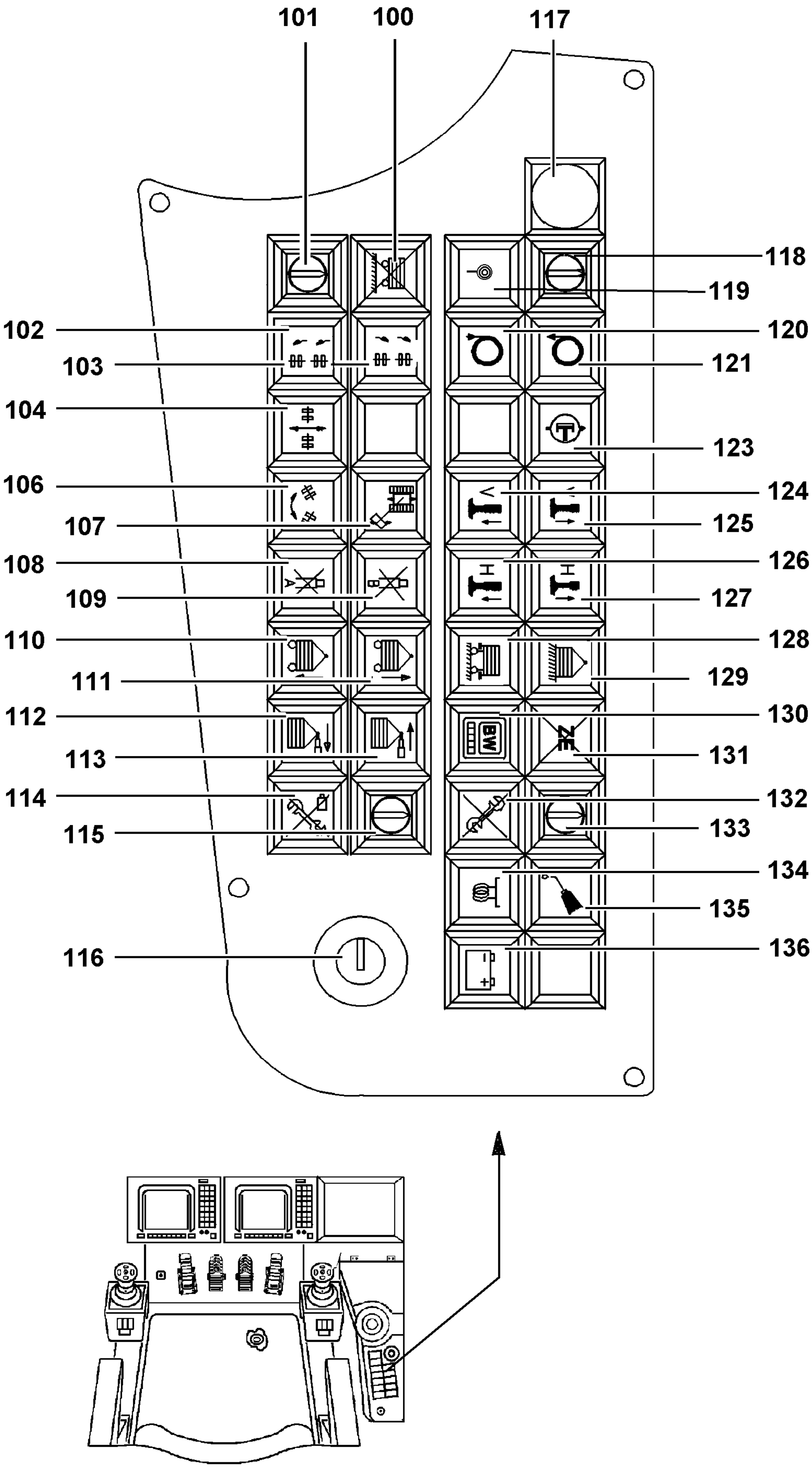
4.7 Horn

Before starting to work, check the horn for proper function .

D A N G E R: The horn may only be used in danger situations, to retain its warning effectiveness!

4.8 Turn the lights on / off

34	Switch	Instrument panel illumination
35	Switch	Airplane warning light
41	Switch	Working floodlight, on cab base
42	Switch	Working floodlight , front and rear of cab roof
43	Switch	Working floodlight for hoist winch and mirror heater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5. Start and turn the crane engine off

5.1 Start the crane engine

- Turn the ignition starter switch (116) to position "1" .
  The indicator light (134) blinks, the engine is ready to start .
- Turn the ignition starter switch to position "2" and start the engine.

C A U T I O N : **The engine may only be started if :**
- the charge indicator light (136) lights up.
- the indicator light for the flame start system (134) blinks.

If the engine does not start after max. 10 seconds, wait for 1 minute.
Do not crank the starter more than 3 times per starting procedure, with a one minute break between each attempt .

If the engine starts but stops again after 4 seconds, then there is a sensor defect in the engine control.
To prevent the engine from "turning off", turn the ignition starter switch to position "0" . Then prglow the engine for **approx. 10 seconds** , then start. The engine control now runs with default values. Howerver, the error message must be observed.

5.1.1 Start the crane engine with the flame start system

The engine is equipped with a flame start system to improve the col start procedure and the warm up phase. It automatically turns on at a coolant temperature of $\leq$15° C and remains in operation until the coolant temperature reaches 25° C .
The flame start system does not turn on at a coolant temperature above 15° C .

- Turn the ignition starter switch (116) to position "1" drehen.
  The indicator light (134) lights up and starts to blink after 5 to 35 seconds, the engine is ready to start.
- Turn the ignition starter switch to position "2" and start the engine.

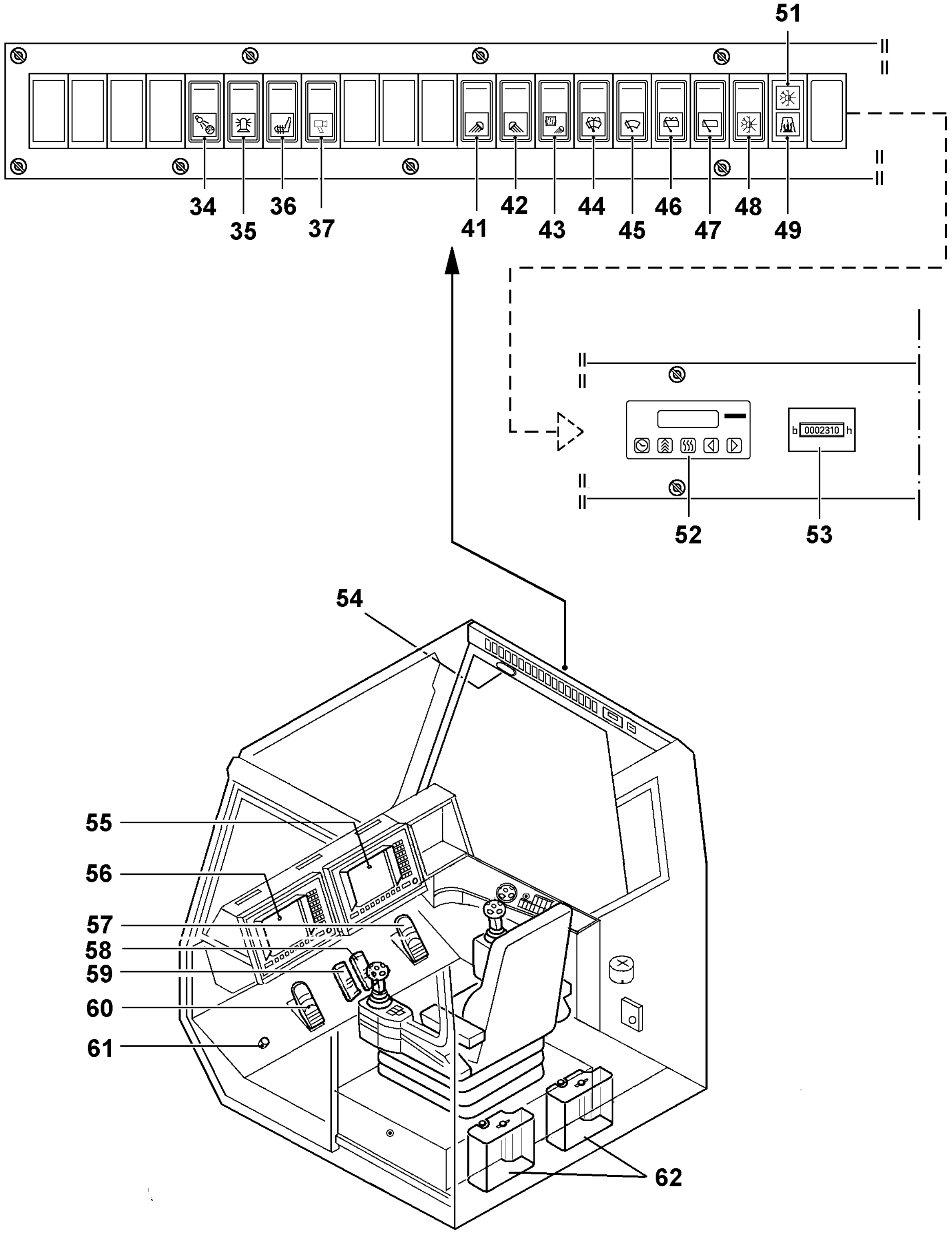
The flame start system turns off automatically if :
- the engine is not started during the starting readiness period,
- the engine is started while the indicator light (134) lights up,
- the coolant temperature reaches 25° C with the engine running.

Error recognition

The flame start control unit recognizes errors on the flame start system and shows that there is an error by **rapidly** blinking the indicator light (134) .

Recognized errors are :
- interruption of flame glow plug heater coils.
- missing power supply on terminal 30.
- Defective fuse for flame start control unit.

Note: Pay special attention to the batteries during the cold season.
The starting capacity is greatly reduced in cold temperatures; for example, at -10°C it is only 66% of its normal capacity. For that reason, after the engine is turned off, the batteries should be stored in a heated room.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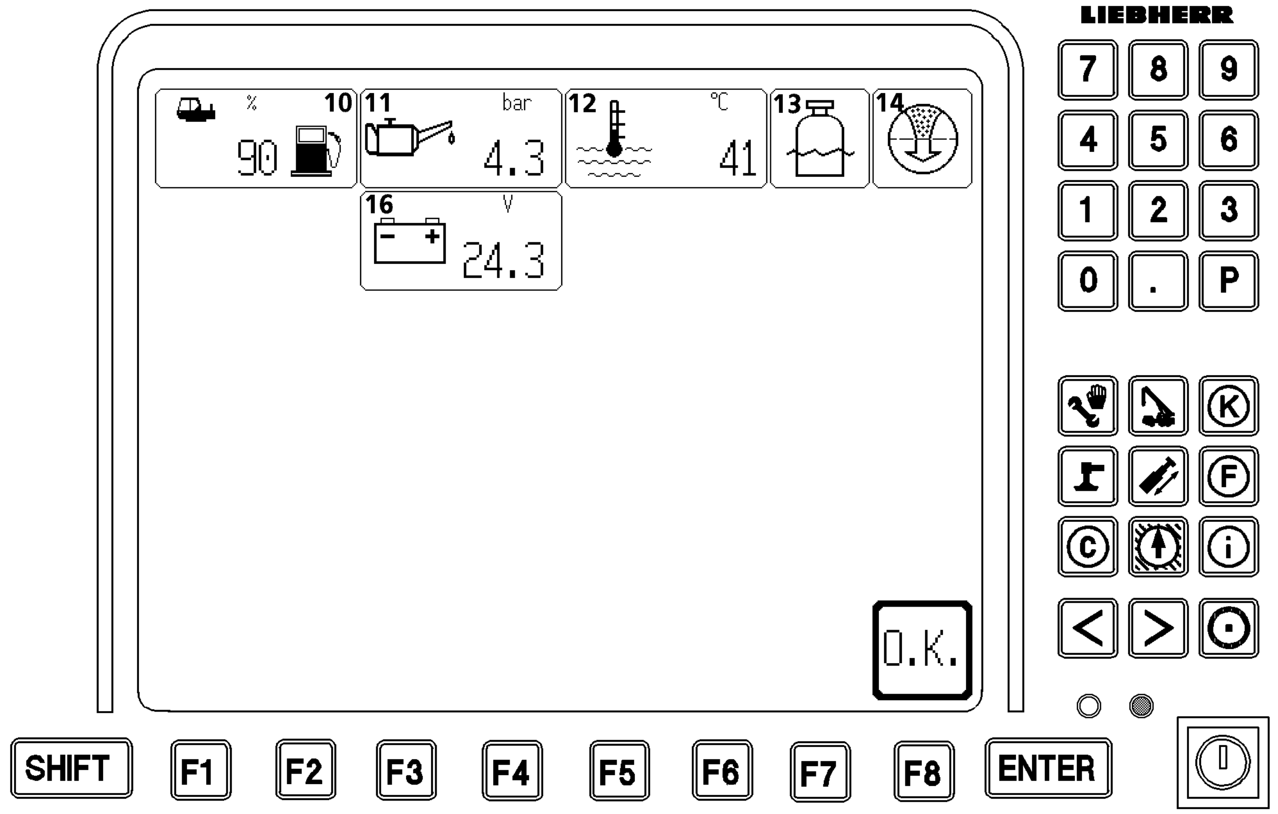
5.1.2 Engine preheating with timer

Note: See separately issued WEBASTO operating manual, Operation with timer *.

- Turn on the battery master switch .
- Depending on the ambient temperature, turn the auxiliary heater on with the timer (52) up to approx. 75 minutes before starting the engine, the indicator light (49) lights up.
- 10 to 25 seconds after turning it on (prerun), the auxiliary heater starts , the auxiliary heater runs in automatic regulation.

Turn the auxiliary heater off after completion of the preheat time
- Turn the auxiliary heater off on the timer (52) .
  The auxiliary heater continues to run for up to 150 seconds.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4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191023

5.2 Check the instruments after the start

5.2.1 The engine is running

As soon as a stable voltage is available, the electric crane control and the LICCON Computer system turns on automatically. The micro processor system runs through a self test; after a few seconds, the equipment configuration view appears on the monitor (see chapter 4.02) .

Note: **If no prewarning or STOP occurence of the engine monitoring system is present, then the system does not switch to the engine monitoring view, but directly into the equipment configuration view.**

5.2.2 Check the instruments

Note: **To check the instrument, switch into the engine monitoring view by pressing key combination "SHIFT" + "Po" .**

When the engine is running, the battery charge indicator light (136) must run off:
The number indicator for engine oil pressure in symbol element "Engine oil pressure" (11) on the LICCON Monitor may not blink.

The following symbol elements on the **monitor** must be checked when the crane engine is running:
- Tank contents (10)
- Coolant temperature (12)
- Coolant level (13)
- Air filter (14)
- Battery voltage (16)

C A U T I O N : **If the number indicator for engine oil pressure in the symbol element "Engine oil pressure" still blinks after approx. 10 seconds, or if the indicator starts to blink during crane operation, then the engine oil pressure is too low. Turn the engine off immediately and find the cause! If this is not observed, the engine can be damaged due to insufficient oil pressure.**

If the number indicator for the coolant temperatures in the symbol element "coolant temperature" blinks during operation, then it is too high. Turn the engine off immediately, increased coolant temperature can damage the engine .

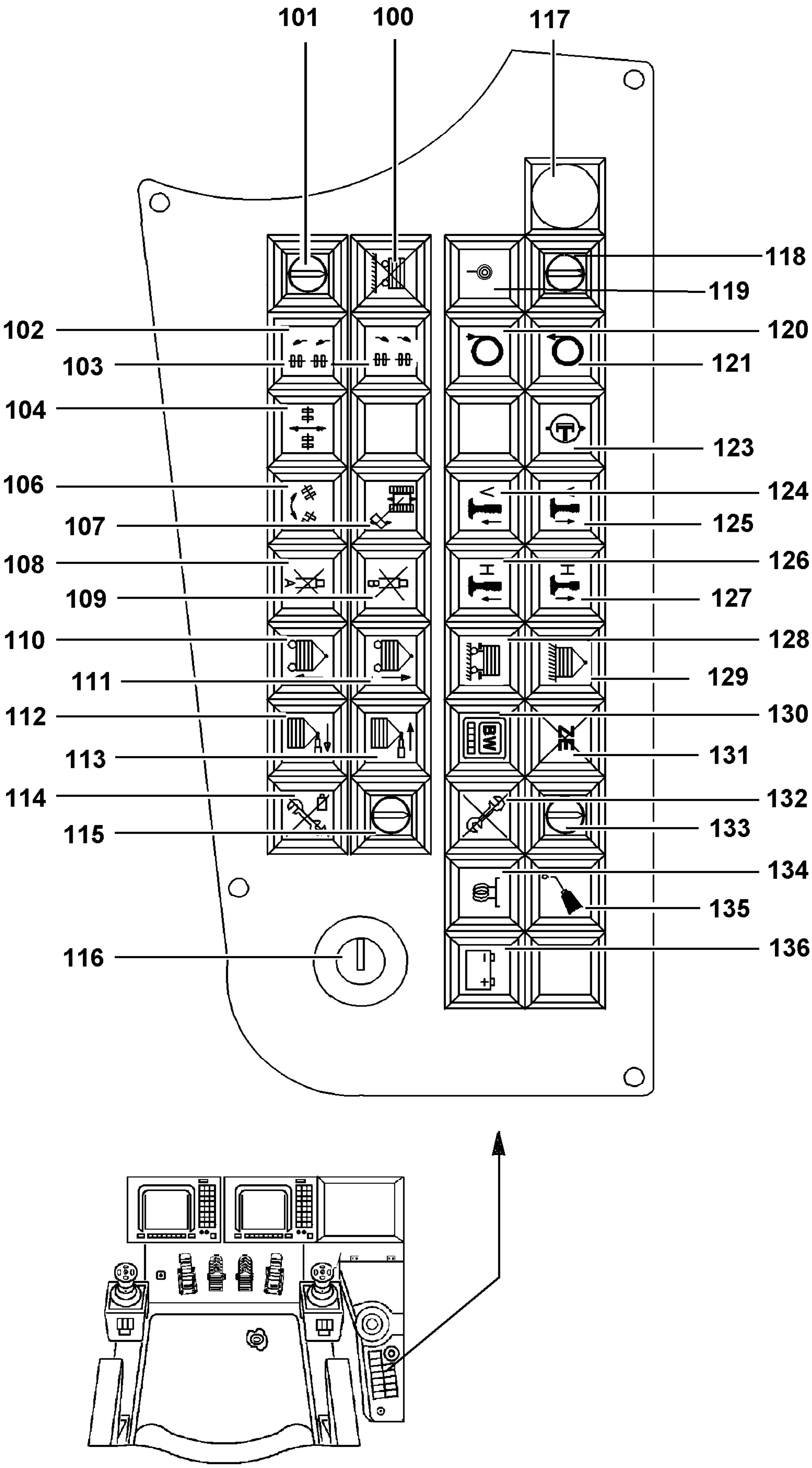
Do not put a full engine load on the engine until it is at operating temperature!

5.3 Engine monitoring

5.3.1 General

Start the program
on request:
- with key combination "SHIFT" + "P"

automatic:
- if a STOP occurrence happens
  or
- if a prewarning, warning or STOP occurrence happens during the boot up phase of the LICCON computer system


101
100
117
118
119
102
120
103
121
104
123
106
124
107
125
108
126
109
127
110
128
111
129
112
130
113
131
114
132
115
133
134
135
116
136
BW

191610

5.4 Turn the crane engine off

- Turn the ignition starter switch (116) back to the stop,
- pull the ignition starter switch (116) and store it.

Note: After operation with full engine power or in case of increased coolant temperature over 95°C, let the engine run for 1-2 minutes without load in low idle speed.

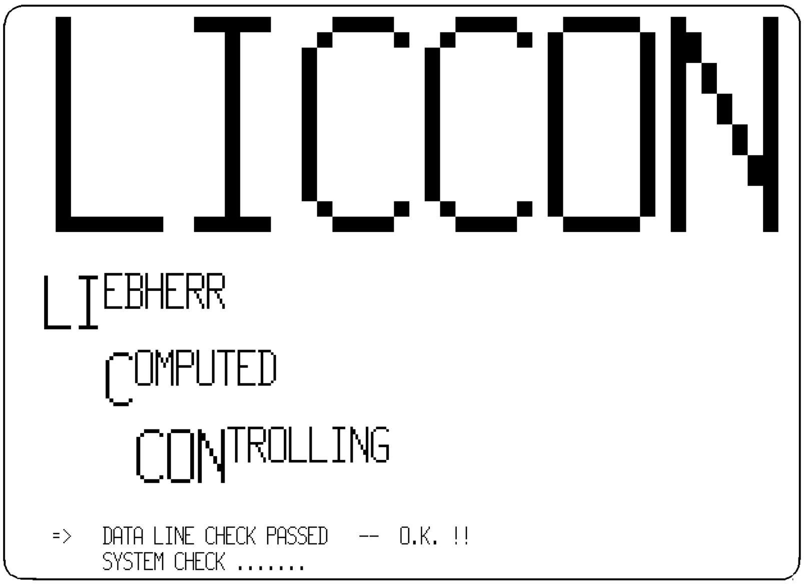
5.5 Turn the engine off in case of danger

In case of danger, turn the engine off by pressing the EMERGENCY "OFF" button (117) .

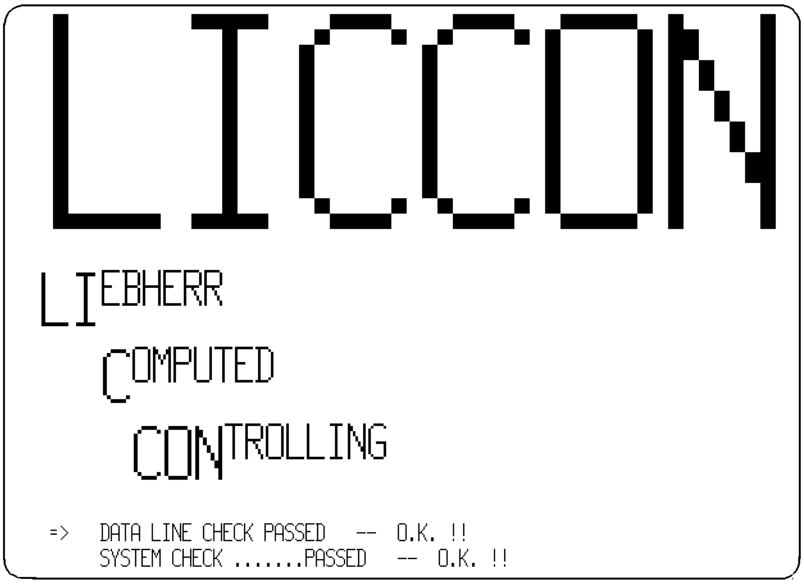
- Push the button (117), the crane is turned off immediately.

CAUTION: The emergency "OFF" button (117) may only be used in <u>true emergency situations</u>. The emergency OFF button may not be used to turn the engine off during normal operation, this is strictly prohibited!

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

6. LICCON computer system after engine start

6.1 Boot up phase

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

Note: See chapter 4.02, LICCON COMPUTER SYSTEM.

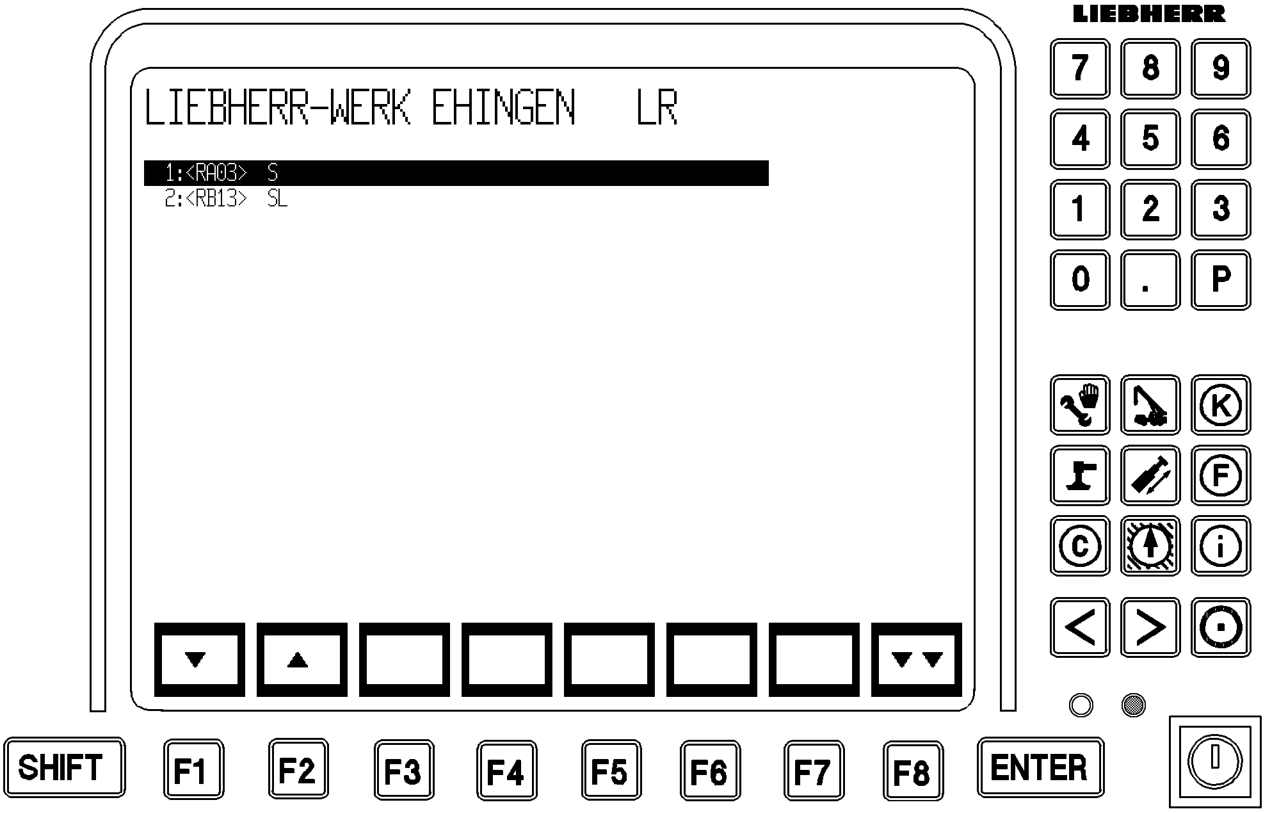
If the starting procedure is completed successfully, then the view to preselect the operating mode (operating mode preselection view, see next page) appears for a short time on the **Monitor** .

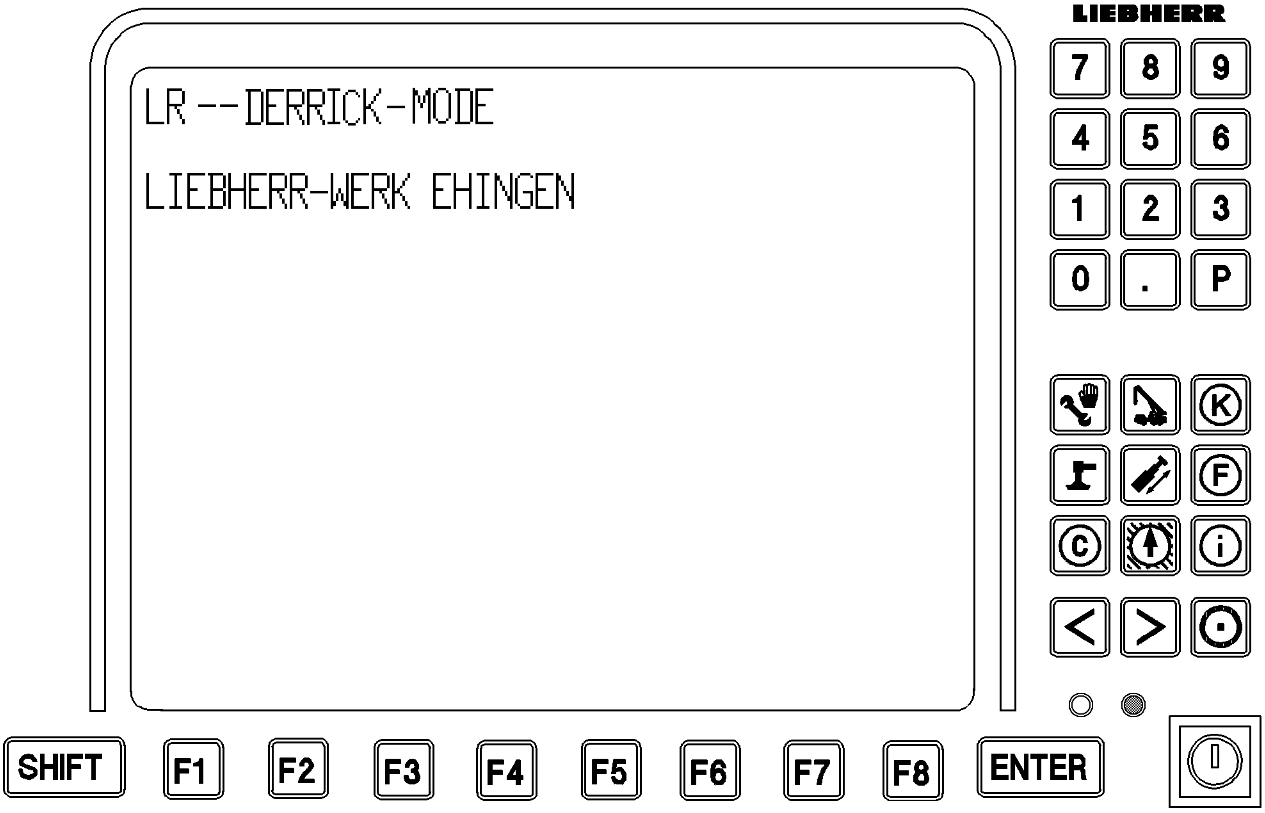
Note: In normal cases, the operating mode preselection group is set on the operating mode preselection view which had been chosen before the LICCON computer system had been turned off. Only if there was a loss of data in the memory, for example due to a cold boot (change of battery or CPU, etc.) then the first operating mode preselection group is placed.

- Select the desired operating mode preselection group with the function key "F1" (move cursor down) or "F2" (move cursor up) .
- With "F8" or "ENTER", confirm the preselection .
  The equipment configuration view appears .

Note: If no operating mode preselection group is selected within 3 seconds, the previous operating mode preselection group remains, and the equipment configuration view is shown without having to enter anything. This means, if the previous operating mode preselection group is to remain, no entry is necessary.

Note: If during the boot up phase of the computer system a master switch (manual control lever) is moved from the zero position, then the boot up phase is interrupted.


LIEBHERR-WERK EHINGEN LR
1:<RA03> S
2:<RB13> SL
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


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

191025

6.2 Set the operating condition with the crane engine at a standstill

Initial condition :
Crane engine is off

6.2.1 Start the crane engine

- Turn the ignition starter switch to stage 2.

Note: After turning it on, the LICCON computer system runs through a self test. If the starting procedure is completed successfully, then the view to preselect the operating mode (operating mode preselection view) appears for a short time on the **Monitor** . (For detailed description of the boot up function, see paragraph 6.1)

6.2.2 Make the operating mode preselection

- Select the desired operating mode preselection group with the function key "F1" (move cursor down) or "F2" (move cursor up) , which corresponds to the actual crane set up.

- With "F8" or "ENTER", confirm the preselection .
  The equipment configuration view appears with the selected operating mode preselection group.

Note: If an equipment configuration from the same operating mode preselection group had been set before the LICCON was turned off, then this equipment configuration view appears again, i.e. the previous equipment configuration and the previous reeving will be automatically reset.

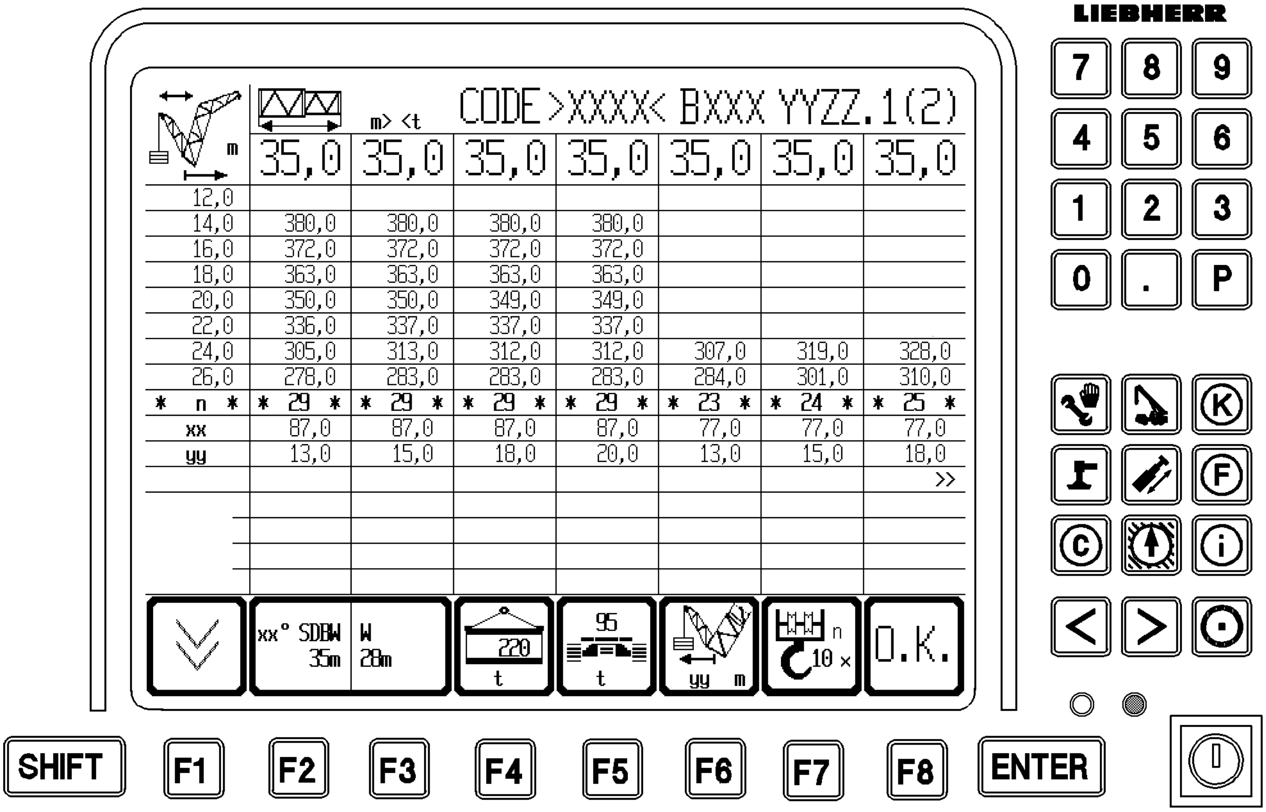
6.2.3 Set the operating mode and the equipment configuration

If the previously set and shown operating mode or the previous equipment configuration is to be changed, it can be done two ways:

1. with function keys:
   "F2" Adjust operating mode main geometry condition
   "F3" Adjust operating for selected mode equipment condition,
   "F4" Adjust equipment configuration slewing platform counterweight
   "F5" Adjust equipment configuration undercarriage (crawler,/supports, central ballast)
   "F6" Adjust slewing range of slewing platform
   - Confirm settings by pressing the "ENTER" key

2. with short code:
   - Enter the 4 digit short code with numberic keys on monitor 0.
   - Confirm settings by pressing the "Enter" key.

- Check the selected load capacity chart.
- Check the adjusted reeving,


LIEBHERR
m> <t
CODE >XXXX< BXXX YYZZ.1(2)
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220
t
95
t
yy m
n
10 ×
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

191069

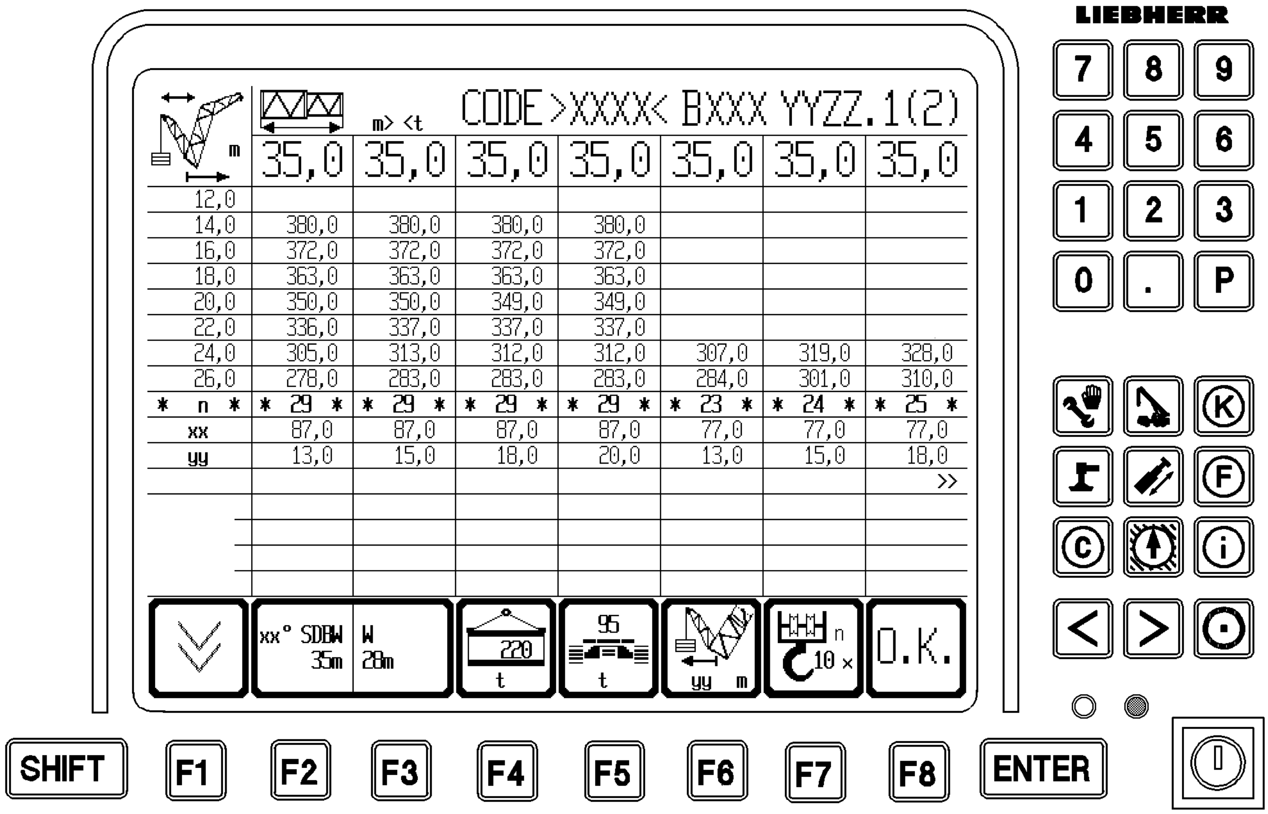
6.2.4 Set the hoist cable reeving number

"F7" Push the function key "F7" until the current reeving on the current pulley head is set.

6.2.5 Take over setting and check

- Push the function key "F8" (OK), if the set equipment configuration and the reeving have been checked.
  The "SET UP" program is completed and the adjusted parameters are taken over into the re-started "OPERATION" program.
- Check that the short code and the reeving that has been set in the operating view as intended by the crane operator.

Note: For detailed description of the **"SET UP" program, see chapter 4.02, LICCON COMPUTER SYSTEM.**


LIEBHERR
CODE >XXXX< BXXX YYZZ.1(2)
m> <t
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
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

191069

6.3 Set the new operating condition, when the engine is running

Initial condition:
The crane engine is running.
The LICCON computer system is in the Operating View.
The new operating conditions is part of the selected operating mode preselection group, but the operating mode, equipment configuration or reeving must be changed.

Note: If the new operating condition is part of another operating mode preselection group, then the engine must be turned off for selection, and the LICCON computer system must be rebooted.

6.3.1 Change the operating mode and the equipment configuration

- Press the program key "P0" to start the "Set up" program .
- Set the operating mode and equipment configuration with function keys or with short code.
- Press the "ENTER" key.
  Then the data in the selected load capacity chart can be viewed.
- Check the selected load capacity chart.

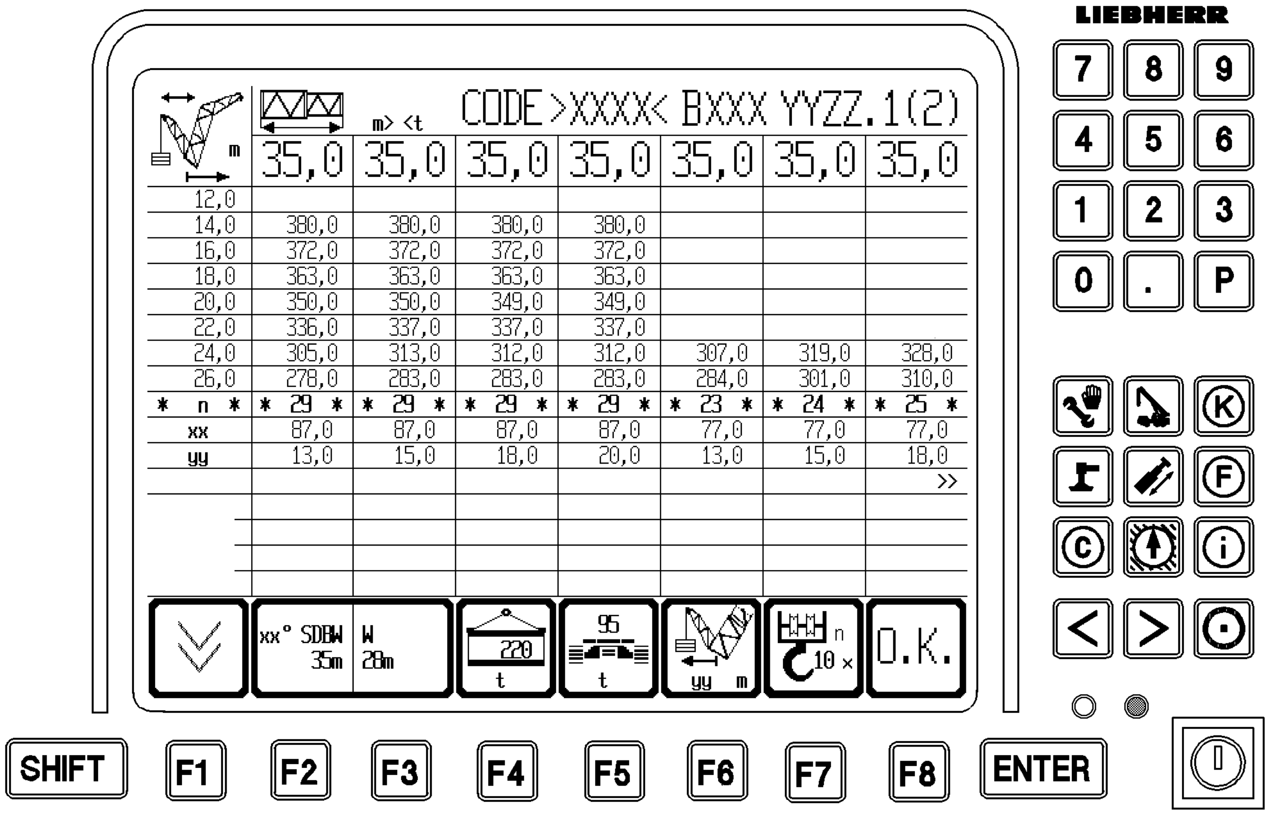
6.3.2 Change the reeving

- Set the reeving number of the hoist cable by pressing the function key "F7" until the desired reeving is selected.

6.3.3 Take over the setting and check

- Push the function key "F8" ="O.K.", when the selected equipment configuration and the reeving has been checked.
  The "Set up" program is completed and the selected parameters are taken over into the restarted "OPERATION" program.
- Check that the correct short code and the correct reeving has been set in the Operation view.

Note: For detailed description of the **"Set up" program, see chapter 4.02, LICCON Computer system.**


LIEBHERR
m> <t
CODE >XXXX< BXXX YYZZ.1(2)
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 ×
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

191069

6.4 Set the previous operating condition, the engine is not running

Initial condition :
The crane engine is not running.

6.4.1 Start the crane engine

- Turn the ignition starter switch to stage 2.

Note: After turning it on, the LICCON computer system runs through a self test. When the starting procedure has been completed successfully, then the operating mode preselection view appears for a short time on the **monitor**. The last used equipment configuration and the last used reeving are selected. (For detailed description of the boot procedure, see paragraph 4.1)

6.4.2 Make operating mode preselection

- Check the selected operating mode preselection group.

Note: If not operating mode preselection group is selected within 3 seconds, then the previous operating mode preselection group remains, and the equipment configuration view is shown without entry.

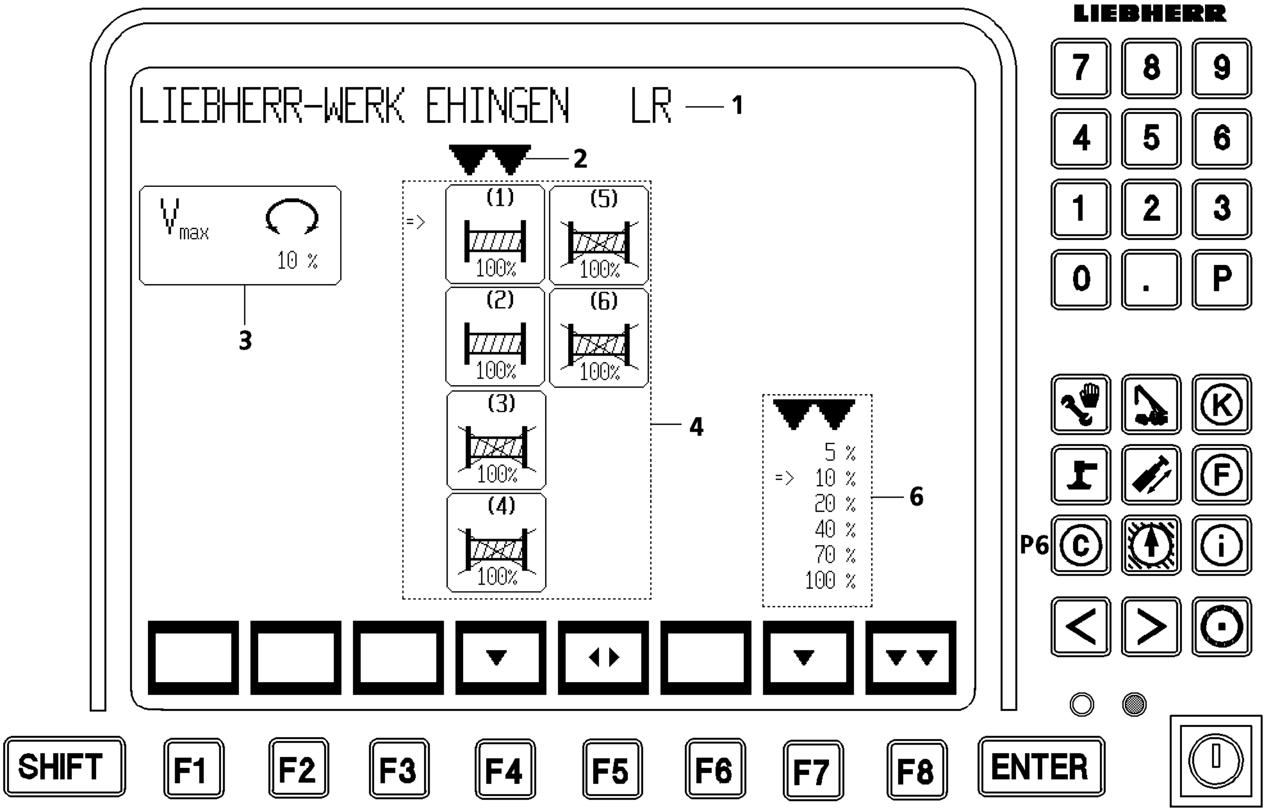
6.4.3 Set the operating mode and the equipment configuration view

- Check the selected load capacity chart.
- Check the adjusted reeving,

6.3.4 Take over the setting and check

- Push the function key "F8" ="O.K.".
  The "Set up" program is completed and the selected parameters are taken over into the restarted "OPERATION" program.
- Check that the correct short code and the correct reeving has been set in the Operation view.

Note: For detailed description of the **"Set up" program, see chapter 4.02, LICCON Computer system.**


LIEBHERR-WERK EHINGEN LR
1
2
3
4
6
Vmax
10 %
(1)
(2)
(3)
(4)
(5)
(6)
100%
=>
5 %
10 %
20 %
40 %
70 %
100 %
LIEBHERR
P6
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191020

7. Set the control parameters

The crane operater must:
- preselect and check the maximum slewing speed of the slewing gear
- preselect and check the maximum slewing speed of the winches
- as well as to activate or deactivate the individual winches.

Note: During the "Control-Parameter" program, the installation and bypass switches are monitored. If one of these switches is actuated during the program, then the system shifts back immediately into the "Operation" program.

Symbol elements
1) Header line, crane type
2) Selector to select the symbol elements
3) Symbol element max. slewing speed
4) Symbol element group, cable winches
6) Value field with selector

Function keys
"F4" Select the winches
"F5" deactivate or activate the cable winches
"F7" Select the percentage values of the corresponding speed
"F8" Shift back to the Operation program

"ENTER" Take over the selected speed setting

Special function keys
" < ", " > " Move selector to the left or right

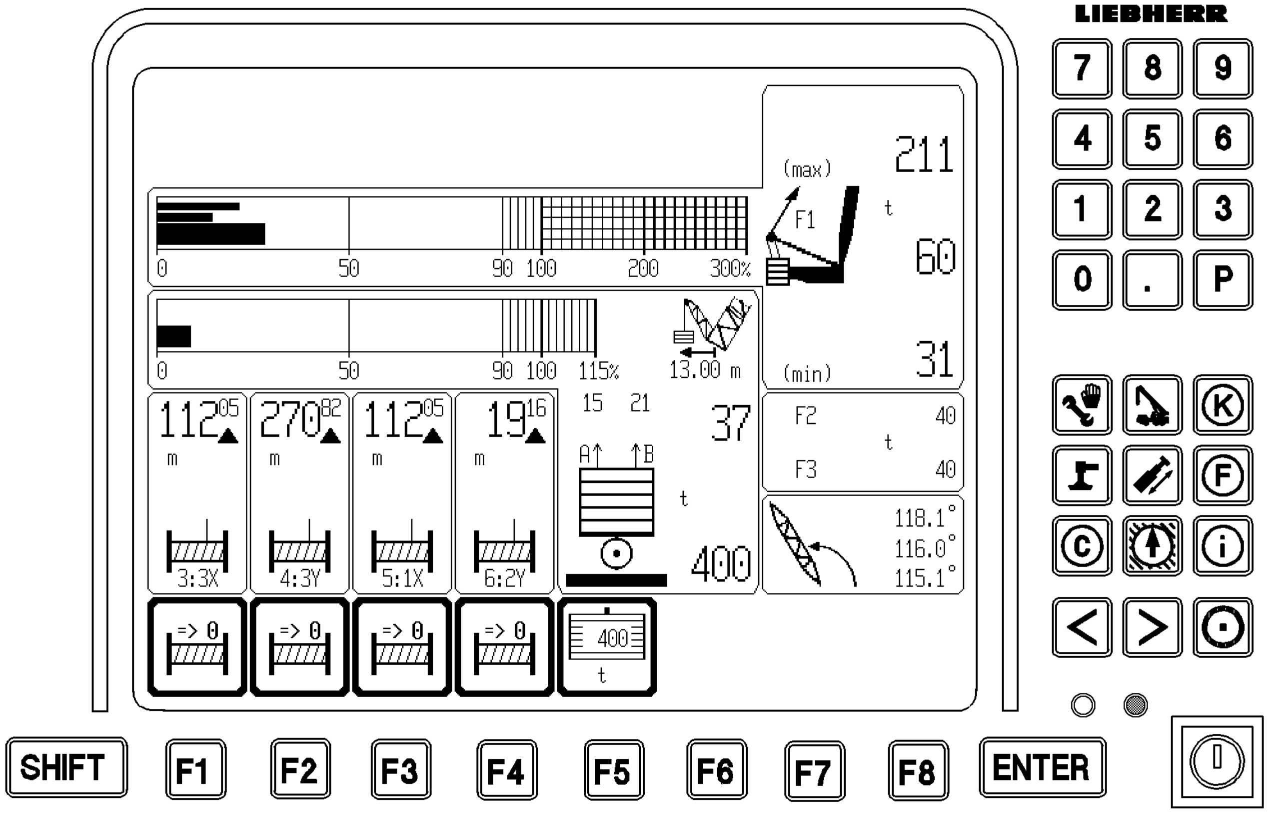
D A N G E R : The maximum slewing speeds (according to load capacity charts) which depend on the boom length and the operating mode, may NOT be exceeded during crane operation with a load !

The larger the boom length, the heavier the attachment and the larger the load the smaller the adjusted "maximum slewing speed" must be.

With maximum load, the manual control lever for the slewing gear may not be deflected all the way to the stop.

A change of the maximum speeds as well as activation / deactivation of winches may not be made while a crane movement is carried out.

Note: For a detailed description to set the control parameters, **see chapter 4.02, LICCON COMPUTER SYSTEM.**


LIEBHERR
211
(max)
F1
t
60
31
(min)
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
112 05
270 82
112 05
19 16
m
15 21
37
A B
t
400
F2 40
t
F3 40
118.1°
116.0°
115.1°
3:3X
4:3Y
5:1X
6:2Y
=> 0
400
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

191201

8. Setting the derrickballast

When operating the crane with derrickballast, the current size of the derrick ballast **must** always be set. The corresponding weight of the emptz ballast palette (or the empty ballast trailer) and the weight of the derrick ballast plates .

Control:

- **Press the F5 key** → on symbol above F5, the thick symbol frame is exchanged against the thin symbol frame and a blinking cursor appears in the ballast editing field.

- **Enter the value for the placed ballast** with the numberic keys on the monitor in the given weight unit ([t] or [kips])

- **Press "ENTER" = to take over the value** → The entered value now appears as the value for the placed ballast (=BA_AUF) in the ballast symbol

(**Press the F5 key = to discontinue editing** → The change is dumped. The old value of the placed ballast (BA_AUF) remains in the ballast symbol .)

D A N G E R: **During ballast editing, the remaining indications on the monitor cannot be shown. The operating view on the monitor is frozen and can therefore show incorrect data.**
For that reason, complete the ballast editing function quickly.
(If a manual control lever is actuated during ballast editing, then ballast editing is automatically interrupted. The old value of the placed ballast (BA_AUF) remains in the ballast symbol).

The set derrick ballast value must match the actually installed derrick ballast weight.

If a derrick ballast weight is set, which is too low, then the derrick ballast utilization indicator is too large, then the 90% warning occurs too soon.

If a derrick ballast weight is set, which is too large, then the derrick ballast utilization indicator is too small and the ballast utilization dependent safety shut offs of test point 1 (F1min) are ineffective .

There is a danger!

9. Adjust winches

General

All cable winches are equipped with an increment counter to measure the relative path (measurement of the relative turning angle). So that the LICCON can calculate the absolute path or the cable length in length units, the system must know the cable length in a certain winch position (adjusting position). The data belonging to this winch position (cable length and current angle radius) are stored with the remaining geometric data on the program memory cards of CPUs 0 and 1 .
An adjusting switch (cam limit switch) of winch 1 - 6recognizes when the winch is in this adjusting position .

Note: Winch 4 has no cam limit switch.

The adjusting switch of the winches is set in such a way that it shifts in this adjusting position from 0 to 1 when the cable spools out .

9.1 When do the winches need to be adjusted:

The winches must be adjusted when the hook path indicator / cable length indicator is to be correct.
The winches must always be adjusted when the absolute path information of the incremental sensor in the memory is lost, for whatever reason.

This is the case,

- if the LICCON is separated from the power supply (when disconnecting the LICCON from the battery), → all winches must be readjusted
- if the power for LICCON basic component group 0 is pulled → all winches must be readjusted
- if one of the following CPUs is pulled:

CPU 1 pulled: → adjust winch 1 and 2 again
CPU 3 pulled: → adjust winch 3 and 4 again
CPU 4 pulled: → adjust winch 5 and 6 again

- if an error in the winch calculation or on the incremental sensor occurred, then the winch might have to be readjusted, description is shown in description of error remedy in chapter 4.14.

If the winch is not adjusted, then no absolute path calculation can be made. In that case, a relative path calculation is shown, which can be very incorrect and not exact, because the current angle radius is not known.
The winches must always be adjusted correctly, so that the control can calculate the current winch angle radius and thereby the winch momentum. If the winch is adjusted incorrectly or not at all, then it can happen that the control uses a slightly incorrect winch momentum, which can cause the winch to start out with a slight jerk, because the brake of the winch opened too early or too late.

Note: The adjusting positions have been set in such a way that they can be actuated in crane operation, see chart on the next page.

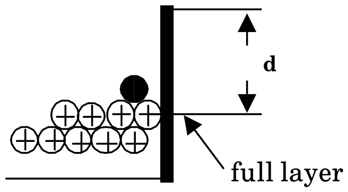
9.2 Carry out adjustment of winch 1, 2, 3, 5, 6

- Spool the winch up / out until the adjusting position (condition layer No. X full, see chart)
- run over the adjusting point by some turns, if winch is being spooled up
- then run over the adjusting switch when **spooling out**
- check the winch indicator.

Carry out adjustment of winch 4

- Spool the winch up / out until the adjusting position (condition layer No. X full, see chart)
- Push the adjusting button in the control box 1×by hand.
- check the winch indicator.

Adjusting positions:



Winch	Adjusting position at	Distance **d** (full layer until disk edge)	full layer has: (for intake gear, the left drum half applies)
Winch 1, 2, 3	Layer 8 full (approx. 960 m)	116 mm	Right sided winding
Winch 5	Layer 9 full (approx. 1112 m)	91 mm	Left sided winding
Winch 4	Layer 5 full (approx. 560 m)	80 mm	Left sided winding
Winch 6	Layer 3 full (approx. 306 m)	244 mm	Left sided winding

Explanation: A cable layer is full if the cable diameter is for the first time in the layer over a full layer .

C A U T I O N: **When changing the cable, the cable may not be pulled from a standing winch nor may the empty winch be turned. This is especially dangerous for limit switches "Winch spooled up" and "Winch spooled out" . Otherwise the cam limit switch of the winch must be reset again.**

Before the winch is taken into operation, the crane operator must check if the hook path indication is exact, before he uses it.

* Optional

10. Load weighing and load indication

D A N G E R: The crane operator must know the weight of the load, before he can lift it. The crane operator must check, before lifting the load, if he may even lift the lo-ad.

11.1 Weighing the load

Prerequisites for exact load indication:

D A N G E R: If the load is not weighed exactly, then there is a danger! The crane can be over-loaded, because the exact weight is not known!

- The point in time, when the main boom relapse cylinders (RP) come into contact must be recognized exactly by the LICCON, because otherwise the relapse cylinders (RP) effect too strongly on the load (weighing errors up to 10 t)
  In addition, the angle sensor in themain boom pivot section and the incline sensor length and crosswi-se in the chassis and the angle sensor in the slewing platform must be functioning.
  If only one of these sensor is not functioning, then the load and especially there where the main boom relapse cylinder enter are not exact.

- Both angle sensors on the main boom must be functioning.
  If only one angle sensor on the boom is not functioning properly, the LEC error is shown, but the cal-culation is made anyway, and the result will not be correct.

D A NG E R: If the load is raised far above the ground, then the load indication does not in-clude the weight of the hoist cable from the load to the ground, and is therefo-re too small.

- The load and the hook must be on or just above the ground.
- The number of reevings must be correctly set on the LICCON, but the reeving may not be more than the nominal reeving, otherwise the hoist cables reeved over the nominal reeving count to the load.

- For the calcuation of the indicated load, the weight of the hoist cable from the pulley head to the ground is deduced from the total load, which is suspended on the pulley head.
  The number of reevings (set on the LICCON) is taken into account, however, the maximum number is the nominal reeving, which determines, for which maximum reeving the load carrying capacities of a load chart are valid.
  Exception: If the crane is in a position outside the load chart, then the hoist cable is added to the load, because no nominal reeving is known outside the load chart.

- As a result :
  If the load is lowered under the crane level (for example in a ditch) , then the hoist cable **underneath the crane level** is calculated and shown .
  The values of the load chart cannot be reached underneath the crane level.

If the load is lifted above the crane level (for example a **skyscraper or high building**), then the hoist cable to the ground is always deducted, this causes the load to be lighter than on the ground, when it is lifted. For that reason, in high heights, a somewhat larger load can be **lifted** than on the ground, wit-hout triggering the LML overload shut off decive at 100% .
This is dangerous:

D A N G E R: At LML overload, all crane movements, which would increase the overload, are shut off, however, the load down function remains at 100%-LML shut off, because it is assumed that the overload was caused by lifting the load. Especially with high reevings with large hoist cable weight on the pulley he-ad, the crane is also overloaded when the load is lowered. The crane operator must know this, so that he can relieve the crane by care-fully lifting the load in this certain case, even though the lifting action auto-matically causes a shut off again and not the lowering action .

10.2 Possible weighing errors

For exact load weighing, exact signals fromthe pull test brackets, angle sensors and pressure sensors are required.
Since all sensor values are always within a certain tolerance, a weighing error can occur.

The weighing error becomes increasing larger, **if :**
- the hoist winch sits in the slewing platform
- the reeving is small
- the host winch sits far behind the slewing platform
- several hoist winches are used (parallel operation)
- the boom, on which the load is suspended, is short
- the boom, on which the load is suspended, is in a steep position.

D A N G E R: If prerequisites for small weighing errors are not given, use special care!

1. General

The crane operator is obligated to check the function of the safety devices before every crane operation .

D A N G E R : **Crane operation without functioning warning and safety devices can cause ACCIDENTS!**

2. LICCON Computer system

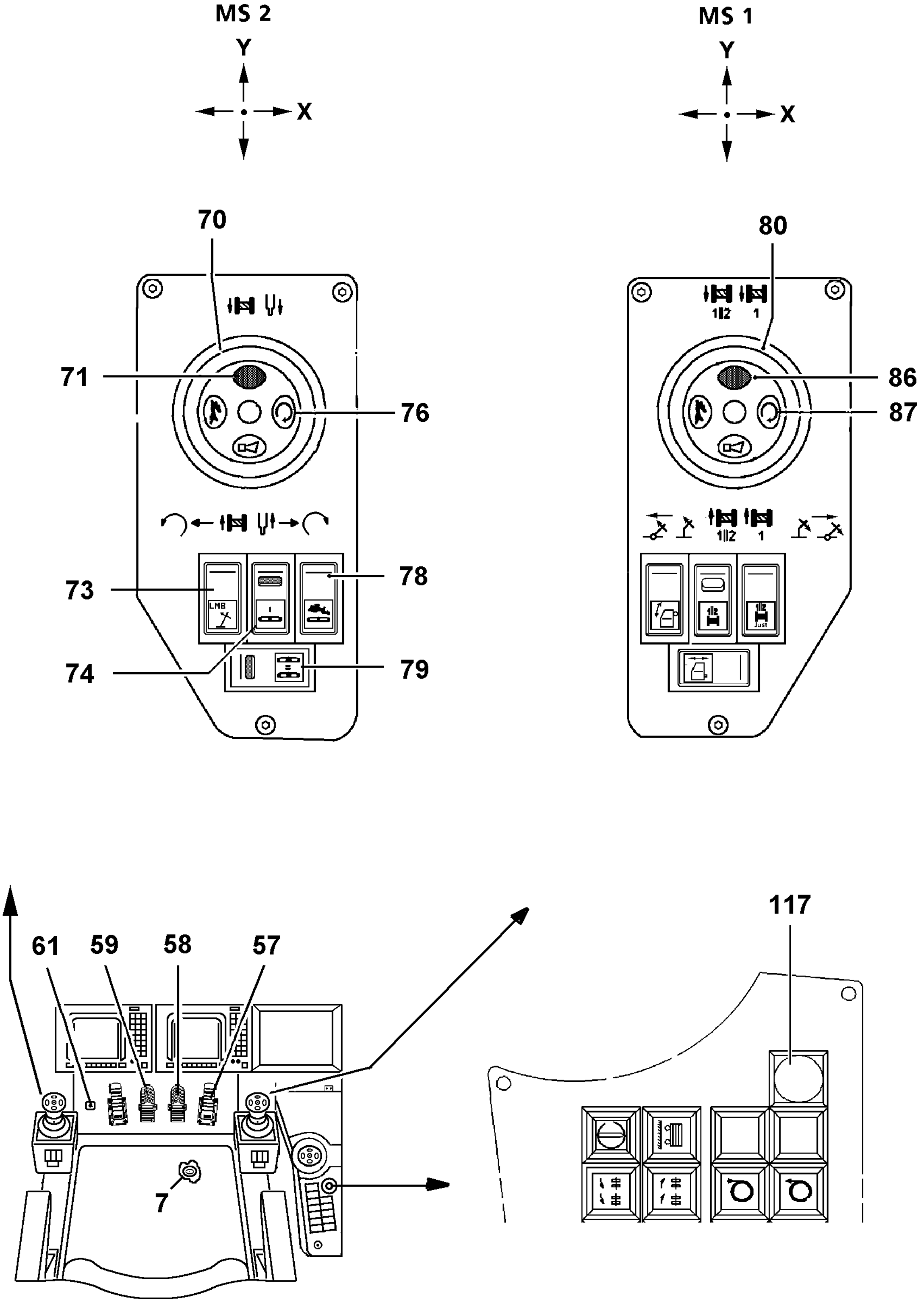
The LICCON computer system is a system to control and monitor cranes .
In addition to the overload safety device (Lastmomentbegrenzung ⇒**LMB / load moment limiter** ⇒ **LML**) there are a number of application programs to control and monitor the crane movements.
See chapter 4.02, LICCON COMPUTER SYSTEM.

2.1 Overload safety device

The electronic overload safety device turns the **load moment increasing** crane movements off if the permissible load moment has been exceeded. Only **load moment reducing** movements can be carried out.

C A U T I O N : **The presence of an overload safety device does not relieve the crane operator from his obligation to take all possible safety measurements. For example, he must know the weight of a load and the radiusbefore lifting it and must decide, by consulting the load chart, if the crane is even able to carry out this task.**

D A N G E R : **The overload safety device is a safety device, it may not be used as an operational shut off device during lifting a load or luffing down with a load.**
The overload safety device must be set before crane operation to reflect the current equipment configuration of the crane, to match the load chart. Only then can it fulfill its protective function .
If the crane operator does not use utmost care, then the crane can topple over or be severely damaged despite a functioning overload safety device .
The overload safety device cannot handle all possible operating conditions, such as counterweight, boom length, etc.
The overload safety device
- registers, but does not monitor , for example the incline.
- registers, but does not turn off, for example the wind speed.



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3. EMERGENCY "OFF" button

If the EMERGENCY "OFF" button (117) is pressed, the engine and the electric crane control are turned off.
Any movement can be stopped immediately.

D AN G E R : **The EMERGENCY "OFF" button may only be used in absolute emergency situations.**
Operational use of the EMERGENCY "OFF" button is prohibited!
By suddenly stopping crane movements, such as turning with a load - load swing, a serious accident can occur!

4. Control release

When working in a seated position, the control release for crane operation is given by the active seat contact switch (7).

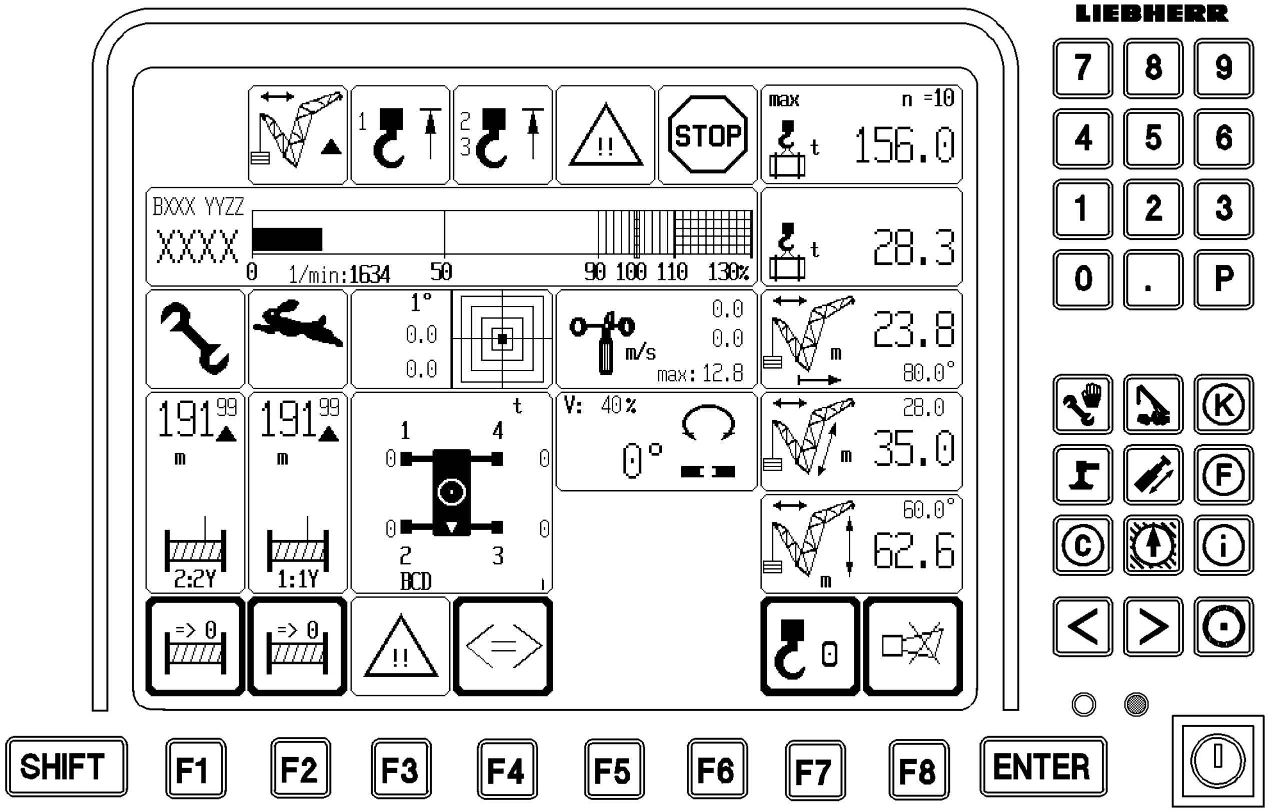
If the crane operator must work in standing position,, then the two buttons (71, 86) must be held down. When working in a seated position, the two buttons are bypassed by the seat contact switch (7).

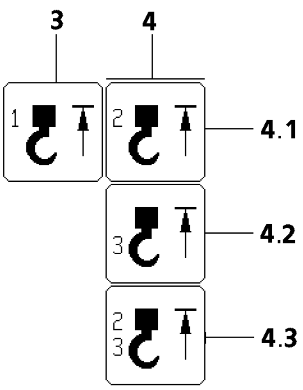
Note: This safety control is installed to prevent inadvertent crane movements when entering or leaving the cab, due to unintentional movement of the master switch.

5. Button "Luffing up at overload" (73)

In case of overload, the "luff up" crane movement is turned off, even though this is a load moment reducing crane movement, **with freely suspended load**.
If the button (73) is held down and the manual control lever is deflected in "luff up " direction, then this crane movement can be carried out anyway.

D A N G E R : **It is prohibited to lift a load from the ground via the hoist gear, if it has triggered the overload safety device and caused shut off, by luffing up the boom.**
This causes overload and can cause the crane to tip over .
In rare cases, there are load charts, which show smaller load chart values at smaller radii.
For that reason, it is only permitted , to luff up a freely suspended load with the button "Luffing up at overload" if the overload has been caused before by luffing down the boom section, or if the crane operator can clearly demonstrate according to the load chart, that the desired luffing up movement causes an increase of the maximum load carrying capacity.
If the load is luffed up with a boom section, even though this leads to a smaller load carrying capacity, then there is the danger that the crane is still subjected to mechanical overload or tips to the rear.


LIEBHERR
max
n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
23.8
80.0°
m/s
max: 12.8
V: 40%
0°
28.0
35.0
60.0°
62.6
2:2Y
1:1Y
BCD
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


3
4
4.1
4.2
4.3

190986

6. **Bypass keyed button**

The bypass keyed button (D) on the LICCON monitor has two positions:

- center engaged ⇒ Normal operation
- right touching ⇒ Hoist limit switch and shut off of LICCON overload bypassed

7. **Wind warning device**

he wind warning is given via the LICCON computer system. If the current wind speed value increases above the indicated maximum value, then the "wind warning " symbol starts to blink and the acoustical alarm »SHORT HORN« can be heard, but the crane movements are **NOT** shut off.

D A N G E R: **The crane movements are NOT shut off if the permissible wind speed is exceeded.**
Crane operation must cease and the boom must be laid down.
If this is not observed, there is a great DANGER OF ACCIDENTS !

8. **Hoist limit switch " Hoist top"**

The hoist limit switch is installed to prevent the hook block from running against the boom head. The hoist limit siwtch must be checked for proper function before every crane operation by running the hook block against the switch weight. When the hoist limit switch is triggered, the symbol element appears in the operating view. The crane movements »lift« and »luff down« are shut off.

D A N G E R: **The hoist limit switch may only be bypassed with the keyed switch during crane operation if a guide is available to monitor the distance between the hook block and the boom head.**
The guide must be in direct contact with the crane operator.
The hoist movements must be carried out with utmost care and the least possible speed.
Bypassing the hoist limit switch is only permitted in emergency situations, and only by authorized personnel! The hoist limit switch may not be used as an operational shut off. If this is not observed, crane components can be destroyed in case of an erroneous function, or the crane can topple over!

9. **Limit switch winch spooled up or out**

The cam limit switch installed in the winch turns the crane movement ”down” off if at least 3 safety coils are on the cable drum.

D A N G E R: **If the hoist cable is spooled up during installation, it must be ensured that the end of the cable is still in front of the winch and is not spooled up over the winch. If the cable end is pulled another turn over the winch, then the shut off at 3 safety coils is no longer ensured.**
The cam limit switch must be reset. In addition, if a new hoist cable is placed, the cam limit switch must be reset, so that it shuts off when the last 3 cable coils are on the drum.
If this is not observed, the cable mounting can be pulled out, which would cause the load to drop!

10. Limit switch initiators

Hoist "top"	-	on the boom, lattice jib and boom nose
Boom "top"	-	steepest position, relapse cylinders
Lattice jib "top"	-	steepest position, relapse cylinders
	-	steepest position, mechanical flap
Lattice jib "bottom"	-	lowest position
Derrick	-	D-Relapse cylinders
A-Bracket 25° to the front		

D A N G E R : The limit switches may not be used as operational shut off device. If this is not observed, crane components may be destroyed in case of an erroneous function or the crane can topple over.

10.1 Angle sensor (WG)

Each one angle sensor are installed on the main boom pivot section and on the end section.
Each one angle sensor are installed on the lattice jib pivot section and on the end section.
Two angle sensors are installed on the derrick, on the bottom.
The radius is determined by measuring the boom angle to the horizontal.

10.2 Pull test bracket (KMD = Force test box)

The utilization of the crane, which is combined of load momentum and the boom momentum affects a force in the boom guying, which is measured by the pull test brackets.

The pull test brackets are:
KMD 1,A/B in the boom guying ; force between A-bracket and boom in all operating modes **without** derrick.
KMD 1 in D- guying; force between A-bracket and derrick in all operating modes **with** derrick.
KMD 2 in lattice jib guying; force between A-bracket I and lattice jib end section in all operating modes with lattice jib.

KMD 3 in boom guying: force between derrick and boom in all D - operating modes.

10.3 Pressure monitoring on relapse cylinders 1)

A pressure sensor is installed in the hydraulic section of the cylinder.
The signal corresponding to the hydraulic pressure is shown in the operating view on monitor "0" in the crane cab.
During crane operation, the pressure in the relapse cylinders **must** be constantly monitored.

1) For detailed description, see chapter 4.02 paragraph 12.4 6"Auxiliary functions"

11. Indication of winch turning direction and hook path [1)]

Is integrated into the ”LICCON” system
This symbol shows in the crane operating view of the ”LICCON” that the winch is turning and spools up or out, even if no hook movement can be seen, due to multiple reeving or slow speed.

C A U T I O N : **When spooling the cableup / out, it must be ensured that no slack cable forms on the winch (check winch visually).
Slack cable can cause cable damage.**

11.1 Incline indicator [1)]

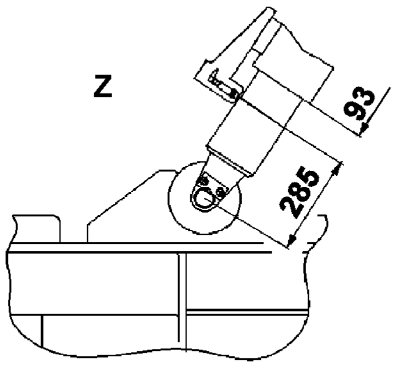
On this indicator, the position of the crane is shown graphically as well as numerically.
The incline indicator has 2 test ranges, ”0,2” or ”1” degree range.

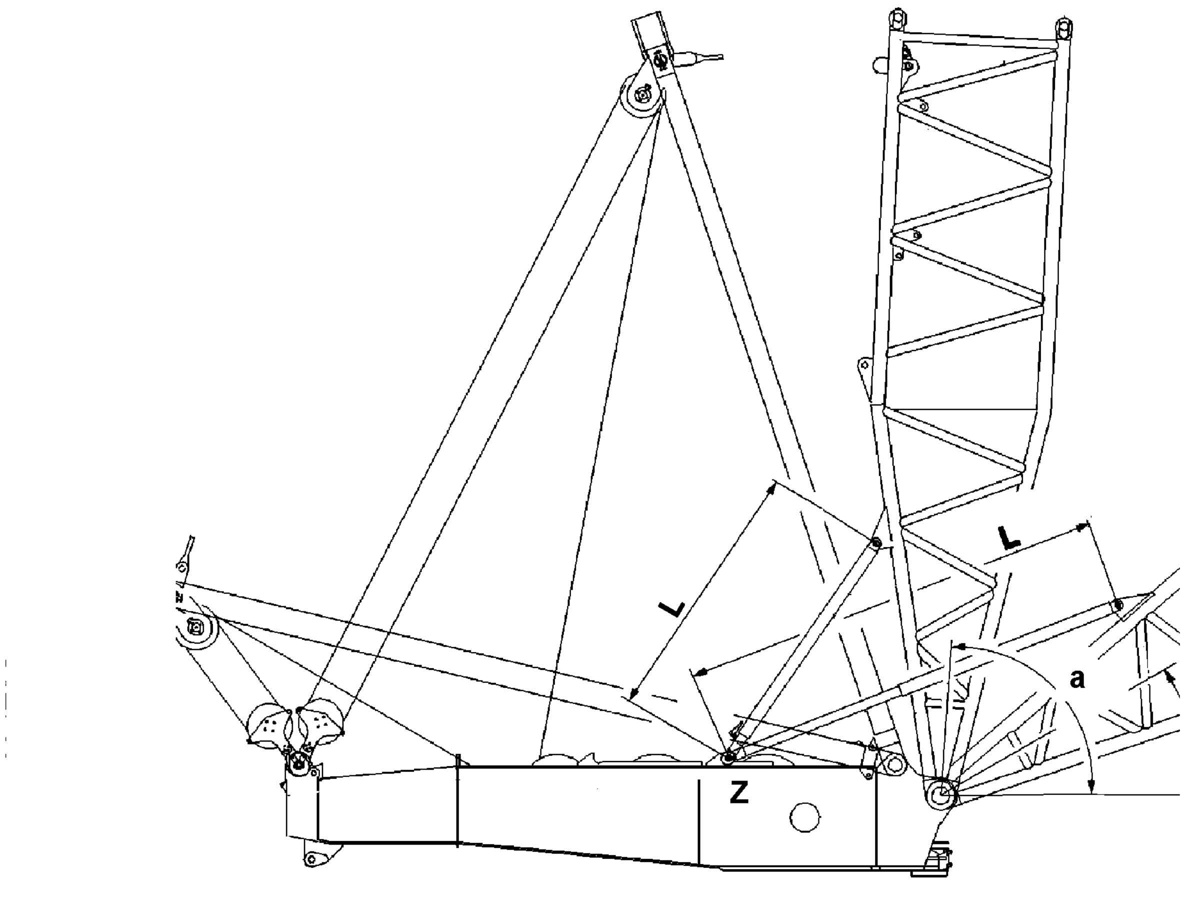
D A N G E R: If the permissible crane incline is exceeded, no shut off occurs!

1) for detailed description, see **chapter 4.02 paragraph 12.4.1 ”Auxiliary functions”**

12. Servo oil pressure monitor in winches I, II, III, IV, V, VI

If the servo oil pressure is not available and the master switch is deflected, then a corresponding error message will be issued.





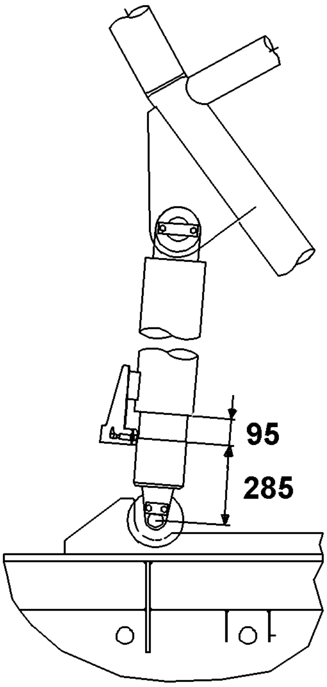
190846

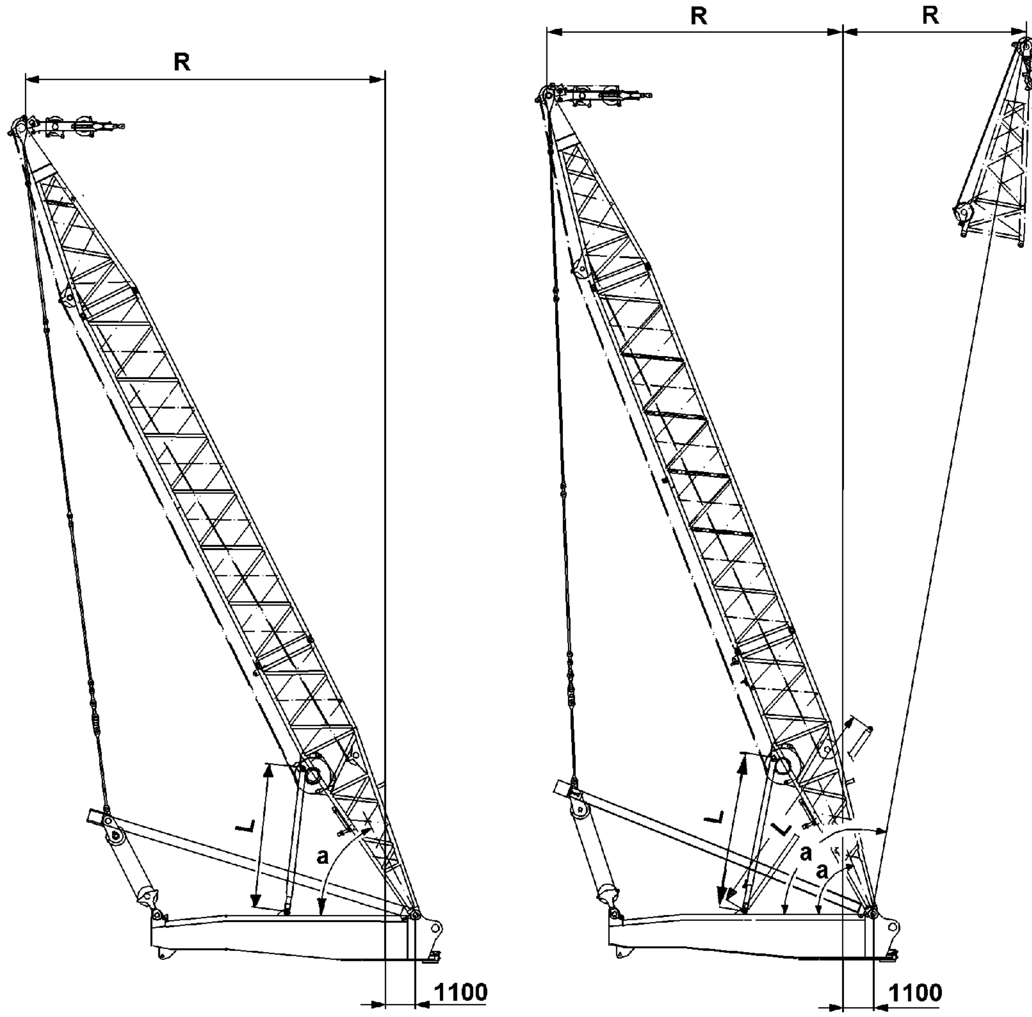
13. Relapse retainers

13.1 S - boom relapse cylinders

Two hydraulic cylinders prevent the boom from falling backward.
They are controlled to high or low pressure, depending on the operation mode or boom length.
In steepest boom position, the luffing up movement is shut off via the actuated limit switches in the cylinders.
The symbol appears on theLICCON monitor .

	Boom angle a °	Cylinder length L -mm
steepest position	87°	4051
electrical switch position	88°	3998
Block position	89°	3940
Cylinder length extended	29,7°	6490





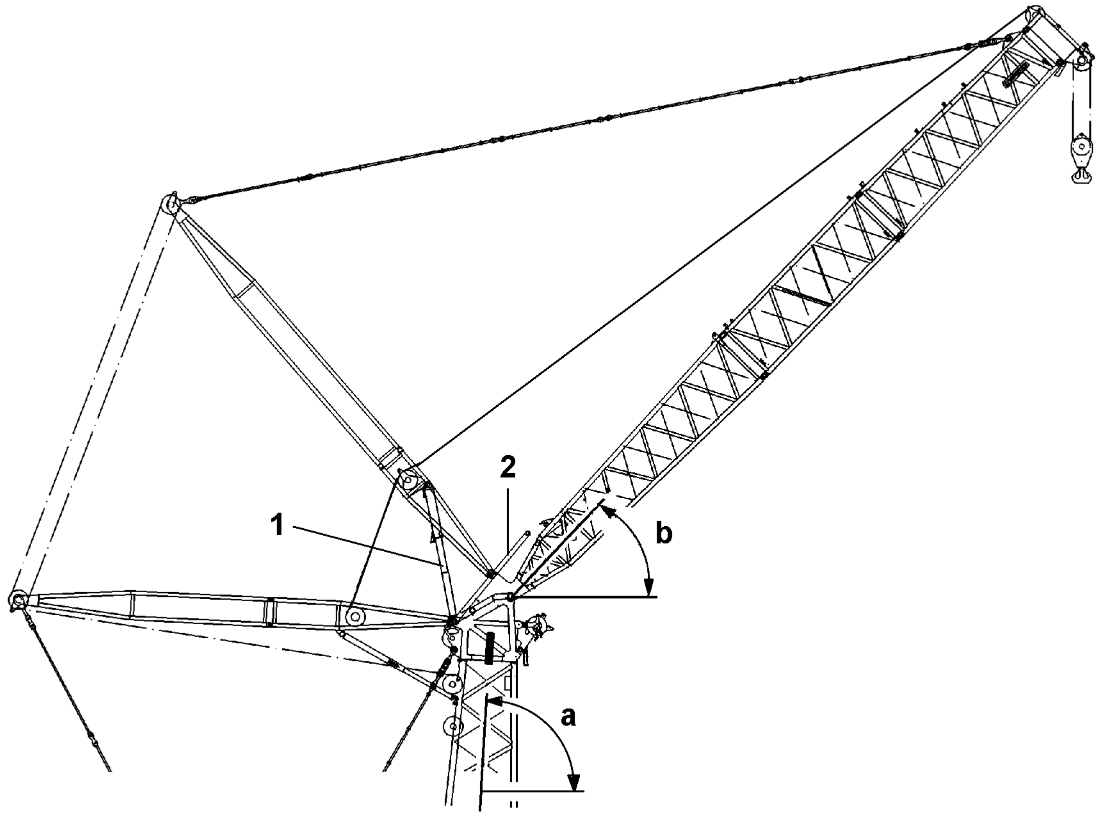
190844

13.2 Derrick relapse retainer

Two hydraulic cylinders prevent the derrick from falling backward.

If the limit switches on the cylinders are actuated, the **"spool up"** function of winch IV is shut off
The symbol appears on theLICCON monitor .

	Swing radius **R**	Angle **a**	Cylinder length **L**
Cylinder extended	6.6 m	100°	7920 mm
R min. only LD, SLD, SD	10.5 m	68.4°	5582 mm
Nominal position	13.0 m	63.4°	5185mm
Electrical switch position	14.0 m	61.4°	5020 mm
Block position	14.4 m	60.5°	4950 mm



190845

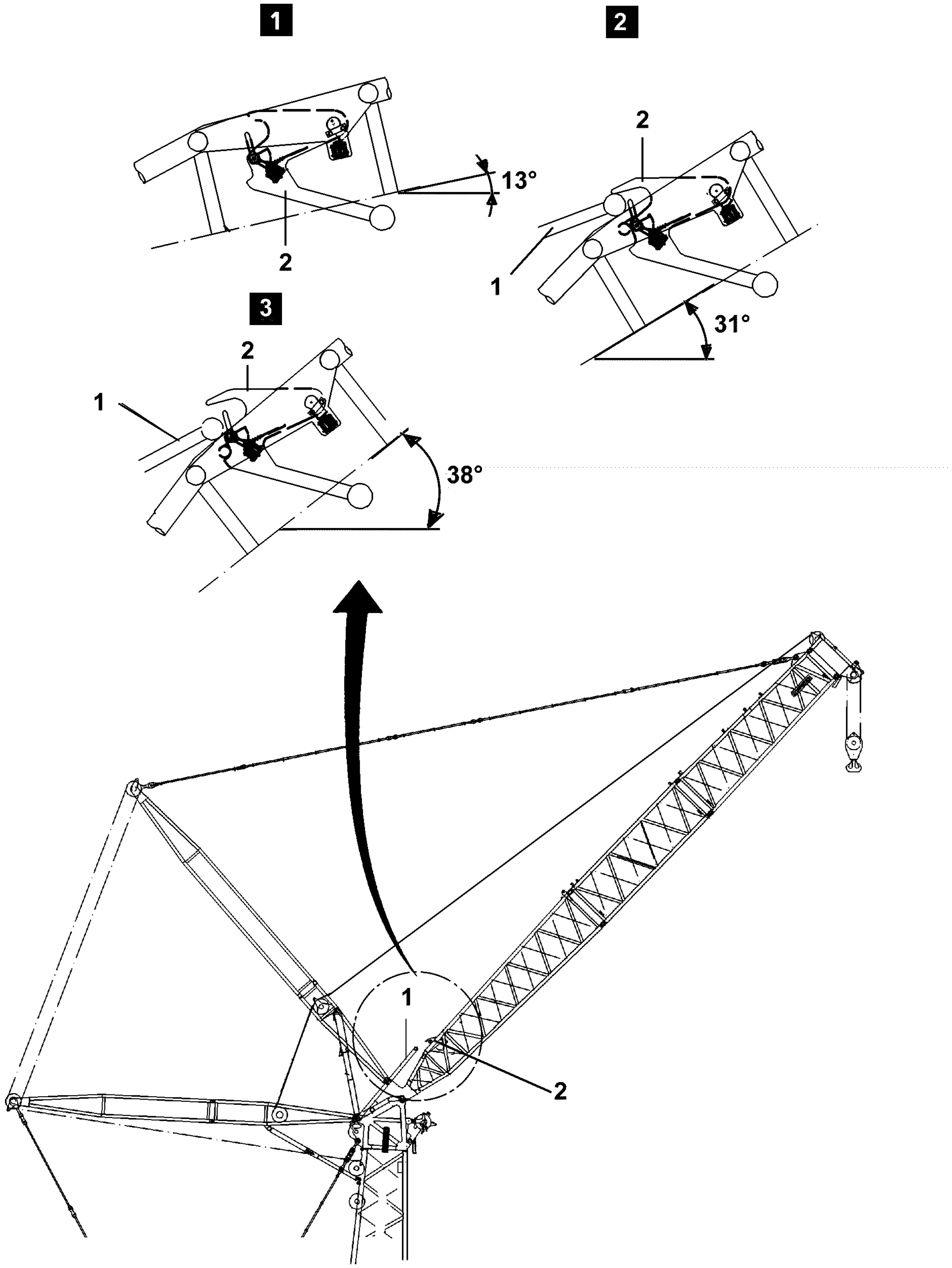
13.3 Relapse retainer W - lattice jib

W- lattice jib relapse accumulator cylinder (1)
An accumulator cylinder, pretensioned with nitrogen, prevents the relapse of the WA-bracket I and the lattice jib.
When luffing up the lattice jib, the piston rod is pushed into the accumulator cylinder .
In steepest lattice jib position, the luffing up movement is shut off by the actuated limit switches on the accumulator cylinder.

Note: Check the relapse accumulator cylinder, see chapter 8.13 or 8.14
Check the limit switches on the relapse accumulator cylinders, see chapter 8.12

	Lattice jib angle [b] *	Cylinder length [mm]	Hub [mm]	Pressure in bar				
				-40° C	-20° C	0° C	+20° C	+40°C
Flatest operating position								
Steepest operating position	77°	3826						
Test position accumulator cylinder	46°+2°	4997	53	110.0	119.5	129.0	138.4	147.9
Accumulator cylinder fully extended	44.6°	5050	0	107.3	116.5	125.7	134.9	144.1

*) = In a boom position of a=87°



191208

Mechanical W- lattice jib relapse retainer (2)
In addition to the relapse accumulator cylinders, the lattice jib is also secured with a mechanical relapse support, which enters into the flap on the pivot section in the steepest lattice jib position .
Mechanical block position by relapse support.
The luffing movement is shut off by the actuated limit switches.

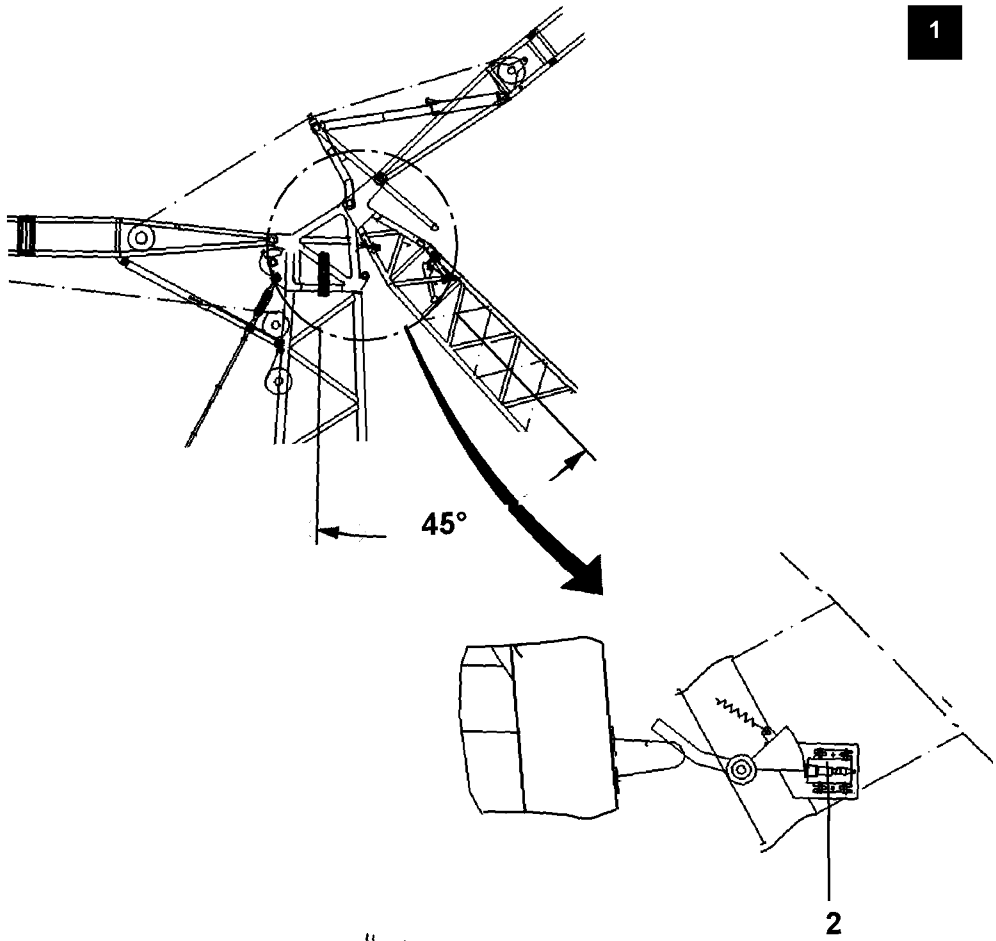
Depending on the lattice jib position, the flap (2) is swung out by the weight of the pendulum:

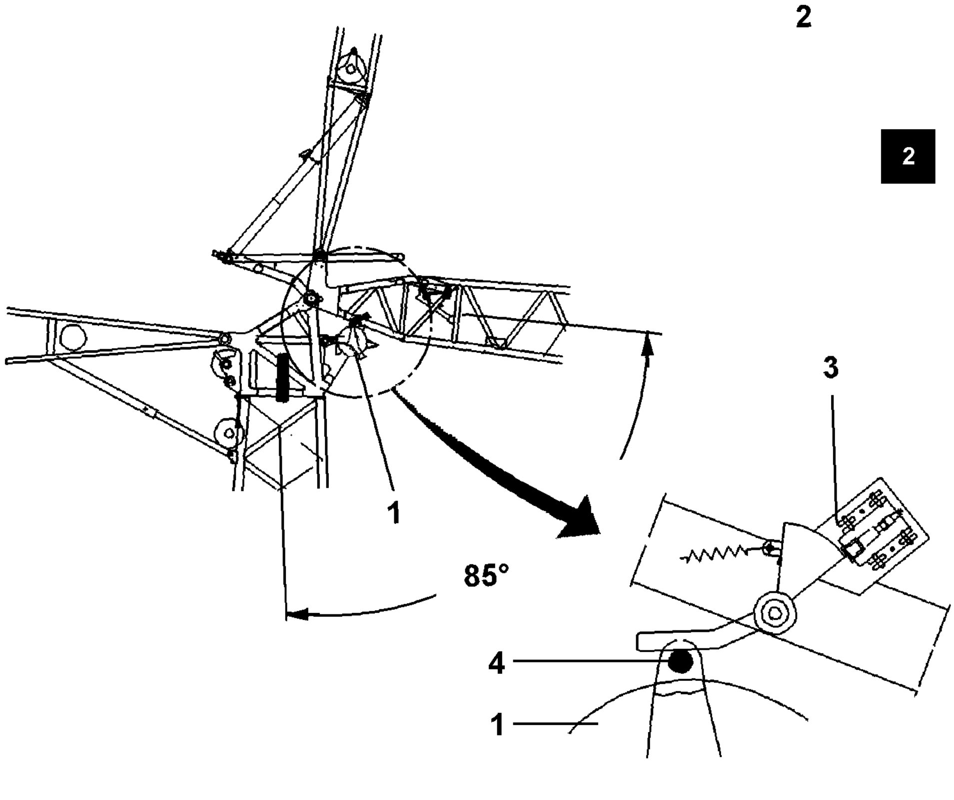
fig. 1 = 13° the flap is swung in.

fig. 2 = 31° the flap can be pushed open.

fig. 3 = 38° the flap is swung out .

D A N G E R: **Before erection, the easy movement of the pendulum of the mechanical relapse retainer must be checked over the complete swing range of the pendulum. If this is not observed, the mechanical relapse support will not engage in steepest lattice jib position.**
There is a danger of accidents, as the lattice jib may tip backward!



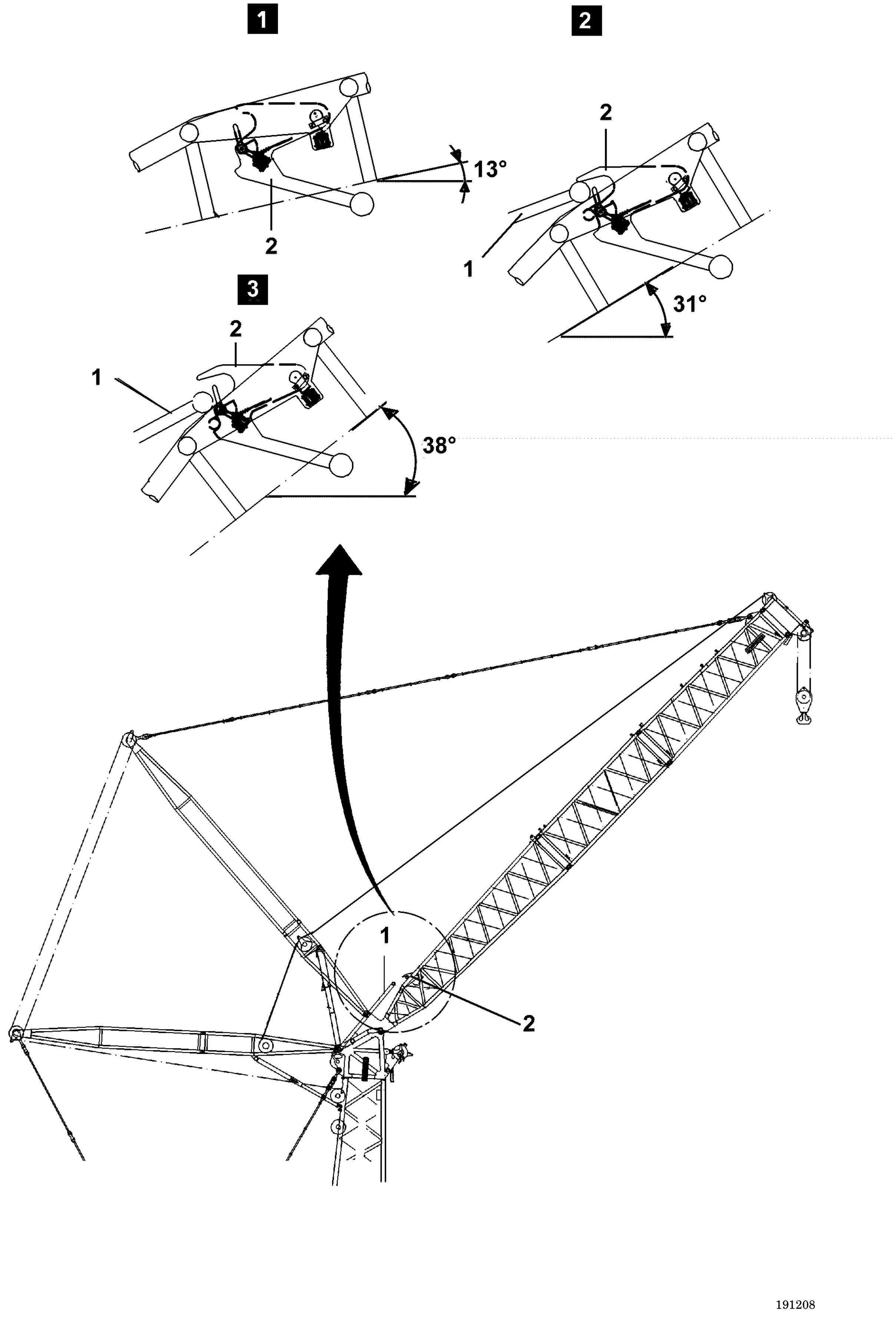


192739

Fig. 1
Switch position "luffing jib bottom" without pulley set (1), approx. 45°.
Limit switch (Initiator), Pos. 2

Fig. 2
Switch position "luffing jib bottom " with pulley set (1), approx. 85°.
Limit switch (Initiator), Pos. 3

D A N G E R: The cable protection tube must be installed for the limit switch actuation!


1
2
13°
2
2
1
31°
3
2
1
38°
1
2
191208

Shut off due to collision between jib relapse support and jib flap

If there is the danger that the jib relapse support will push against the half extended flap and that it will therefore damage it, then the LIEBHERR ERROR CODE error (LEC) is shown and the luff up the jib movement will be turned off:

In detail:
In operating mode with jib
and main boom angle on pulley head Ok
and jib angle bottom Ok
and jib angle bottom > = 10°
and jib angle bottom < = 34°
and jib relative angle (= main boom angle on pulley head - jib angle bottom) so that:
jib relative angle > = 10°
and jib relative angle < = 26°
then there is a danger : collision between jib relapse support and jib flap
Shut off luff up jib (cannot be bypassed even in installation mode)
Operation view indication: Boom limit symbol (left next to upper hoist limit switch 1-Symbol) is shown with two arrows upward in the upper row for shut off luff up jib

otherwise no danger
no shut off
no symbol indication

For this shut off , 2 LEC errors apply, which are shown only if the master switch for luffing up the jib is deflected:

1. "Upper limit angle jib not clear" = Summation error from control
   (Shut off occurence in shut off diagram says "Upper limit angle jib not clear")
2. "Jib, flap and relapse support in danger of collision" = exact error text from LMB

Note:
If the main boom angle on the pulley head is not Ok
and main boom angle bottom
then the main boom angle bottom
is used instaed the main boom angle on the pulley head.

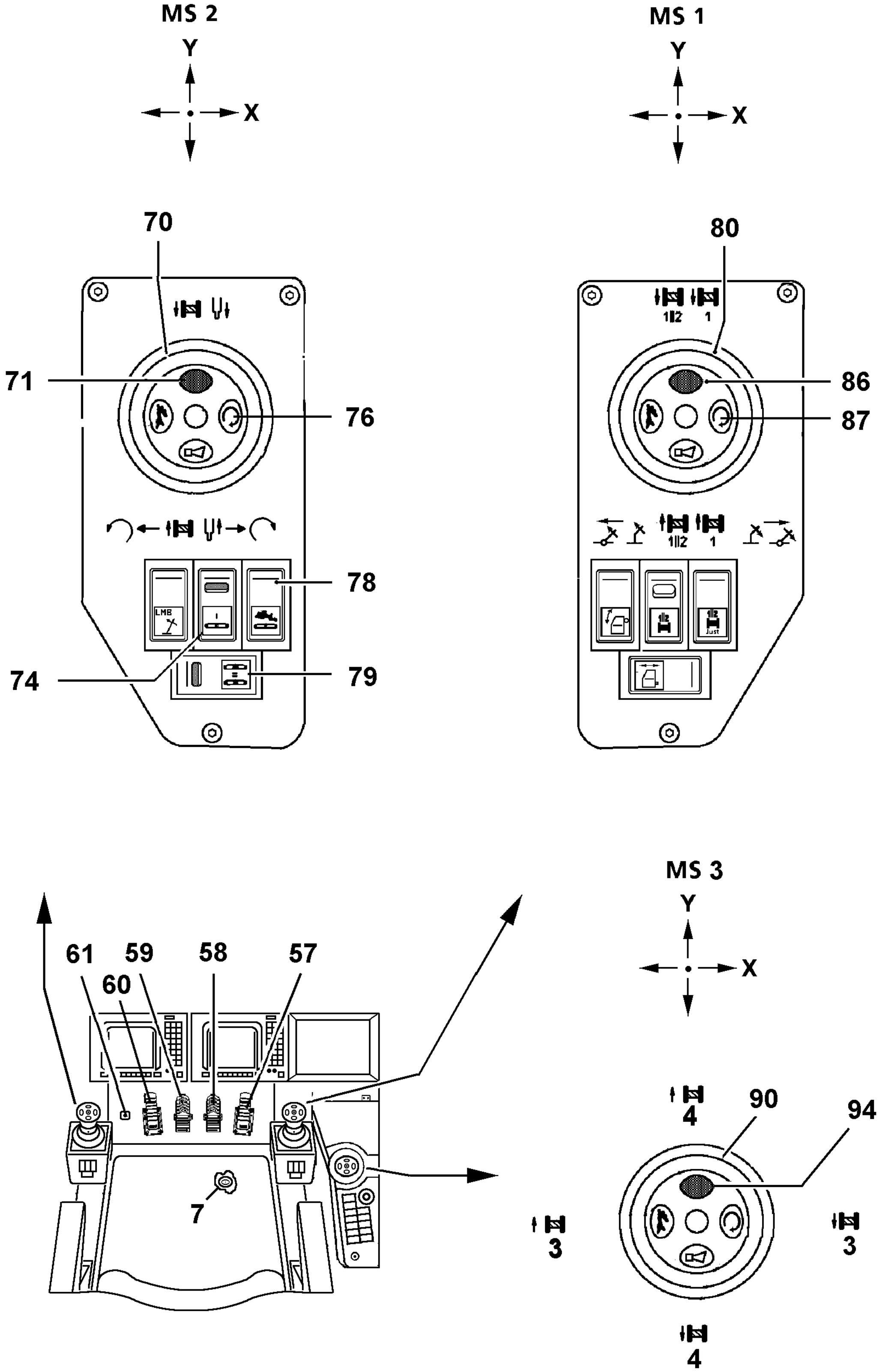
Also:
If the jib angle bottom is not Ok
and jib angle top is Ok
then the jib angle top
is used instead the jib angle bottom.

It is assumed that the boom flexaction is smaller than the safety reserve.

C A U T I O N: **If an angle sensor, required for collision monitoring, is defective or missing on a boom, then the crane operator must be more alert and observant, to ensure that there will be no collision !**

If on one boom both angle sensor are defective or missing, then no monitoring and no shut off can occur. The crane operator must monitor himself to ensure that there will be no collision.

C A U T I O N: **The crane operator may not depend on the fact that the shut off will function, he must know the dangerous angle positions and avoid them!**


MS 2
Y
X
MS 1
Y
X
70
71
76
78
74
79
80
86
87
MS 3
Y
X
61
59
58
57
60
7
90
94
4
3
3
4
LMB
1|2
1
Just

190576

1. Crawler operation

Turn on the crawler operation
- Crawler "ON", unlock switch (74) and press switch on front. If the crawler operation is turned on, the indicator light in switch (74) lights up.
- Crawler "OFF" = Crane operation "ON", press switch (74) into 0-position.

Note: The switch (74) is not a on / off switch, but a change over switch, either crawler **or** winch.
After completion of the cawler operation, the crane must be shifted back to crane operation. Crawler "OFF", press switch (74) into 0-position = Crane operation "ON".

Press the foot pedal or insert the manual control lever:

- Left pedal (59) to the front or rear	=	left crawler forward or reverse
- Right pedal (58) to the front or rear	=	right crawler forward or reverse

The engine regulation is made via the gas pedal (57).

Switch the crawler travel gear to rapid gear . Press switch (78) .

Note: Rapid gear crawler gear is only possible with the parallel operation (79) is turned off. If the rapid gear is turned on, then the indicator light in the switch (78) lights up.

Switch the crawler travel gear to parallel operation. Press switch (79) .
If parallel operation is turned on, the indicator light in the switch (79) lights up.

Note: If parallel operation is turned on, then the rapid gear, which might be turned on, will be automatically turned off. The indicator light in the switch (78) turns off, even though the switch is still turned on.

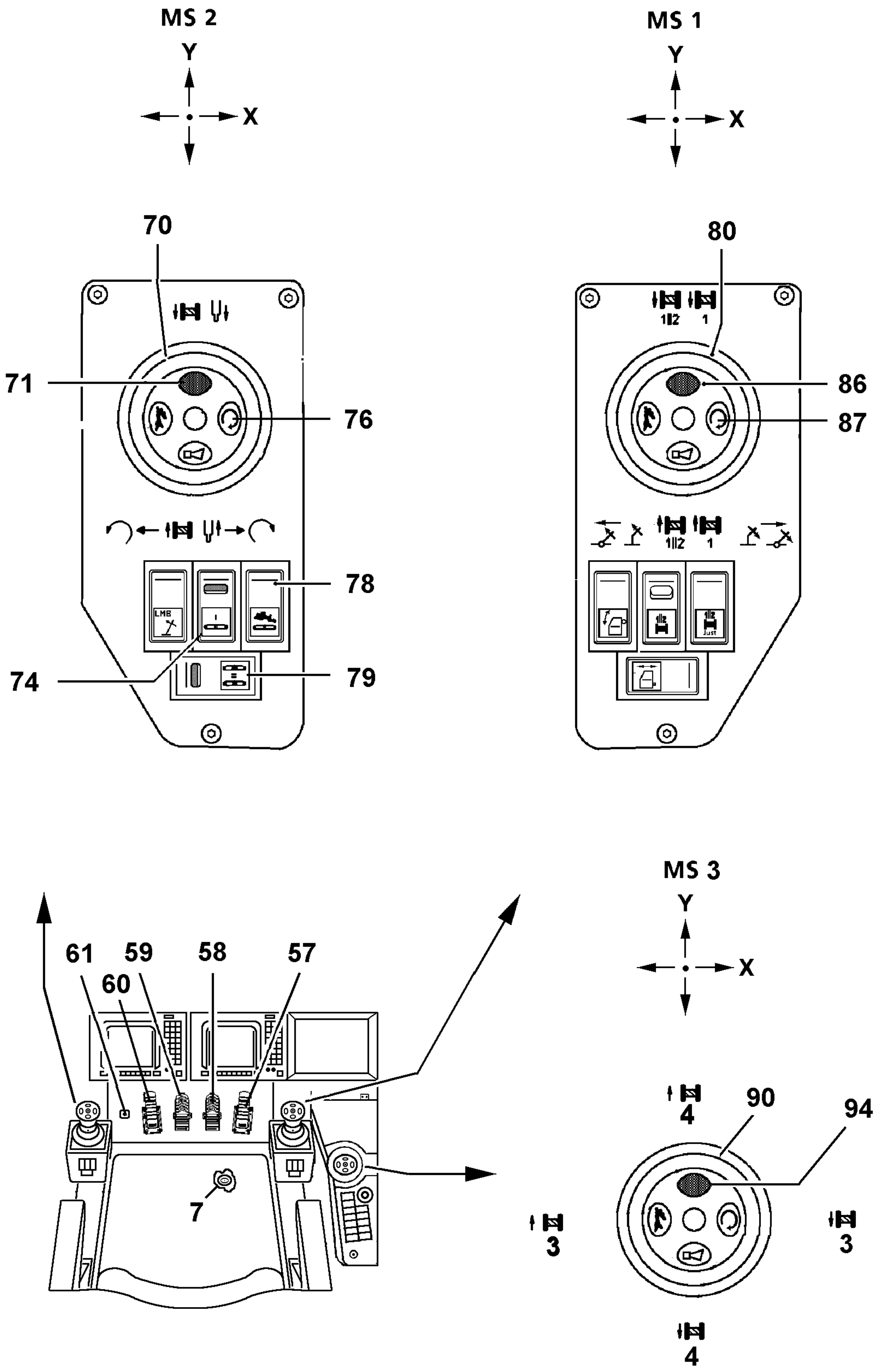
C A U T I O N : If parallel operation is turned off again, the rapis gear is automatically on again as the switch (78) is turned on, the indicator light in the switch (78) turns on again.

If the parallel operation of the crawler is turned on, then both crawlers can be moved together with one pedal, either foot pedal (58, 59). The first actuated pedal is used for the control. The control regulates the even run of both crawlers with the aid of incremental sensors. This makes it possible to drive the crawler exactly straight forward, on suitable ground.

C A U T I O N : When steering the crawler, the slewing gear coasting (61) must be actuated. This prevents that the boom system is suddenly accelerated, which could cause the boom to swing to the sides.
If this is not observed, the boom can be damaged.

During crawler operation or operation with slewing gear the driving and slewing range must be observed with cameras or by a second person.

When driving the crane, the centralballast base plates must always be installed! The base plates have the task to take on the resulting steering forces on the crawler carriers.

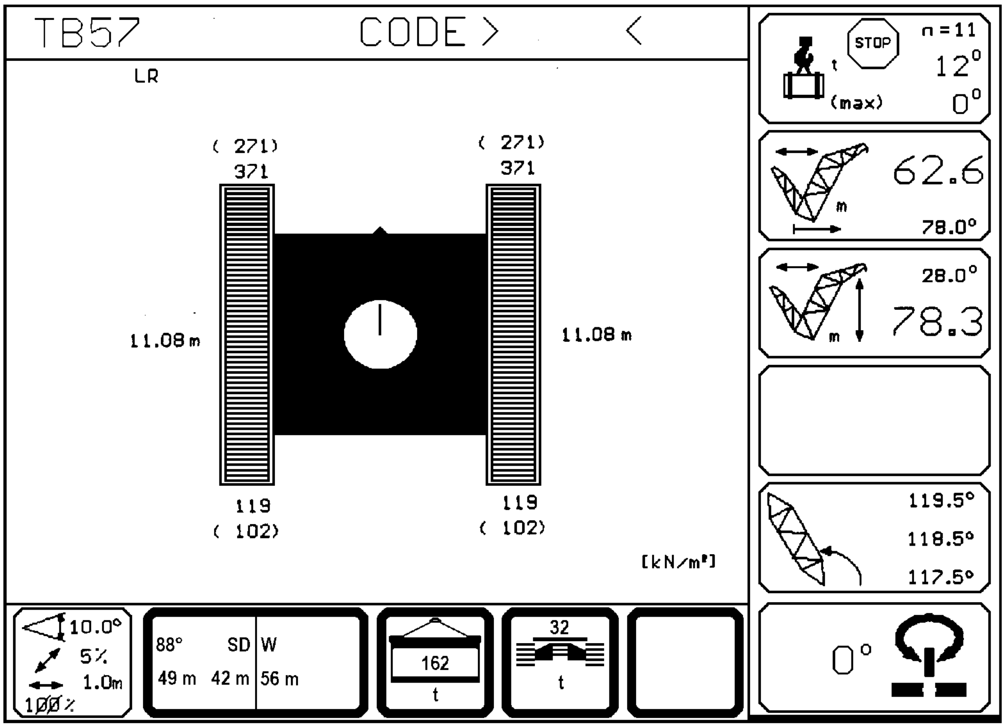

MS 2
Y
X
70
71
76
LMB
78
74
79
MS 1
Y
X
80
1|2
1
86
87
1|2
1
Just
61
59
58
57
60
7
MS 3
Y
X
4
90
94
3
3
4

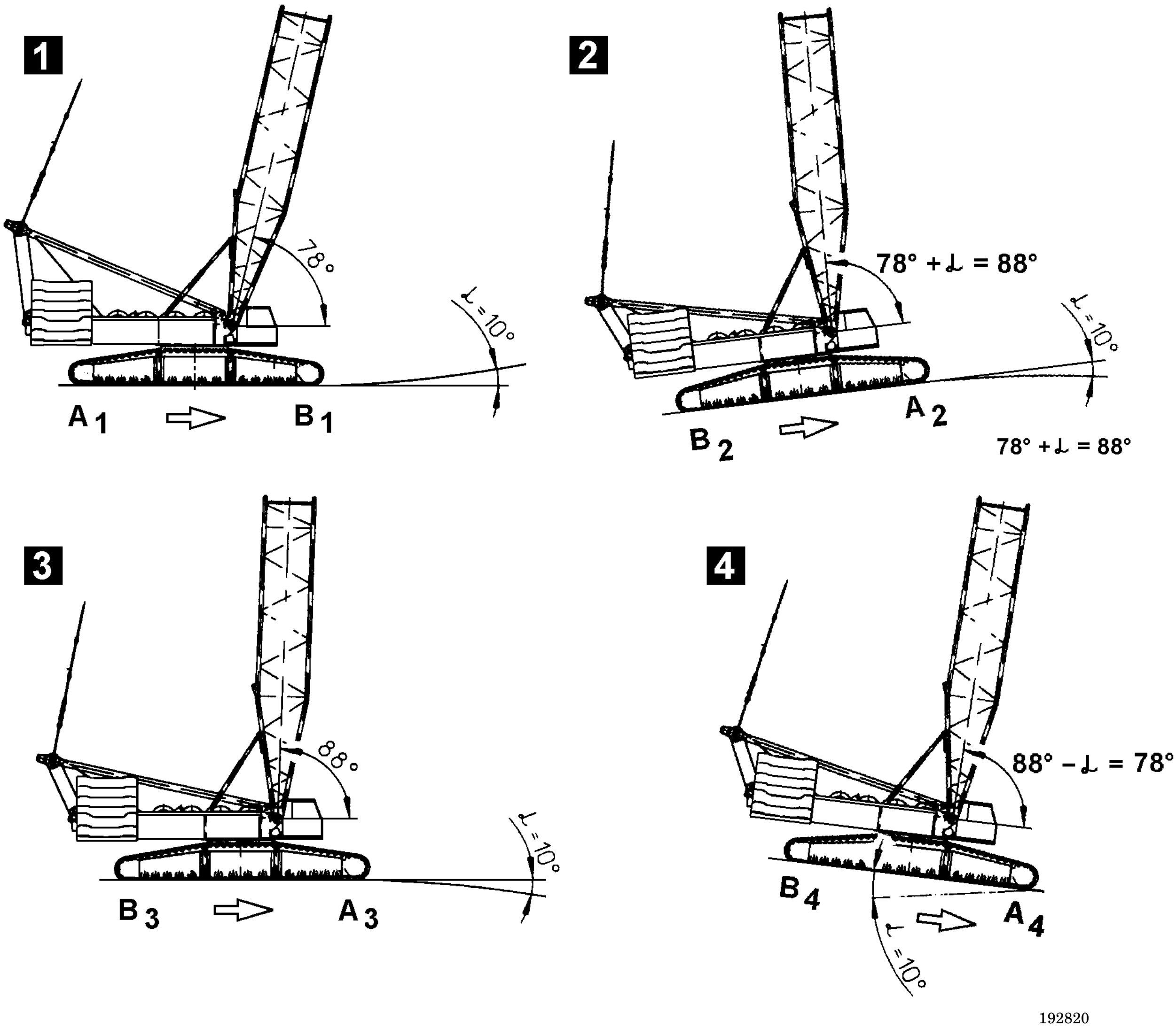
190576

1.1 Driving with suspended load - straight forward travel

The crane can be driving with the loads given in the load charts, if the following prerequisites are met:

1. The ground must be level and may not slope.
2. The ground must be able to safely support the operating weight of the crane plus the weight of the suspended load.
3. Only the lowest travel speed is permitted.
4. Jerky travel movements must be avoided.
5. The suspended load must be secured to prevent it from swinging.


TB57
CODE >
<
LR
(271)
371
(271)
371
11.08 m
11.08 m
119
(102)
119
(102)
[kN/m²]
STOP
n = 11
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°
∠ = 10°
A 1
B 1
2
78° +∠ = 88°
∠ = 10°
B 2
A 2
78° +∠ = 88°
3
88°
∠ = 10°
B 3
A 3
4
88° −∠ = 78°
B 4
A 4
∠ = 10°
192820

1.2 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°.

C A U T I O N: 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

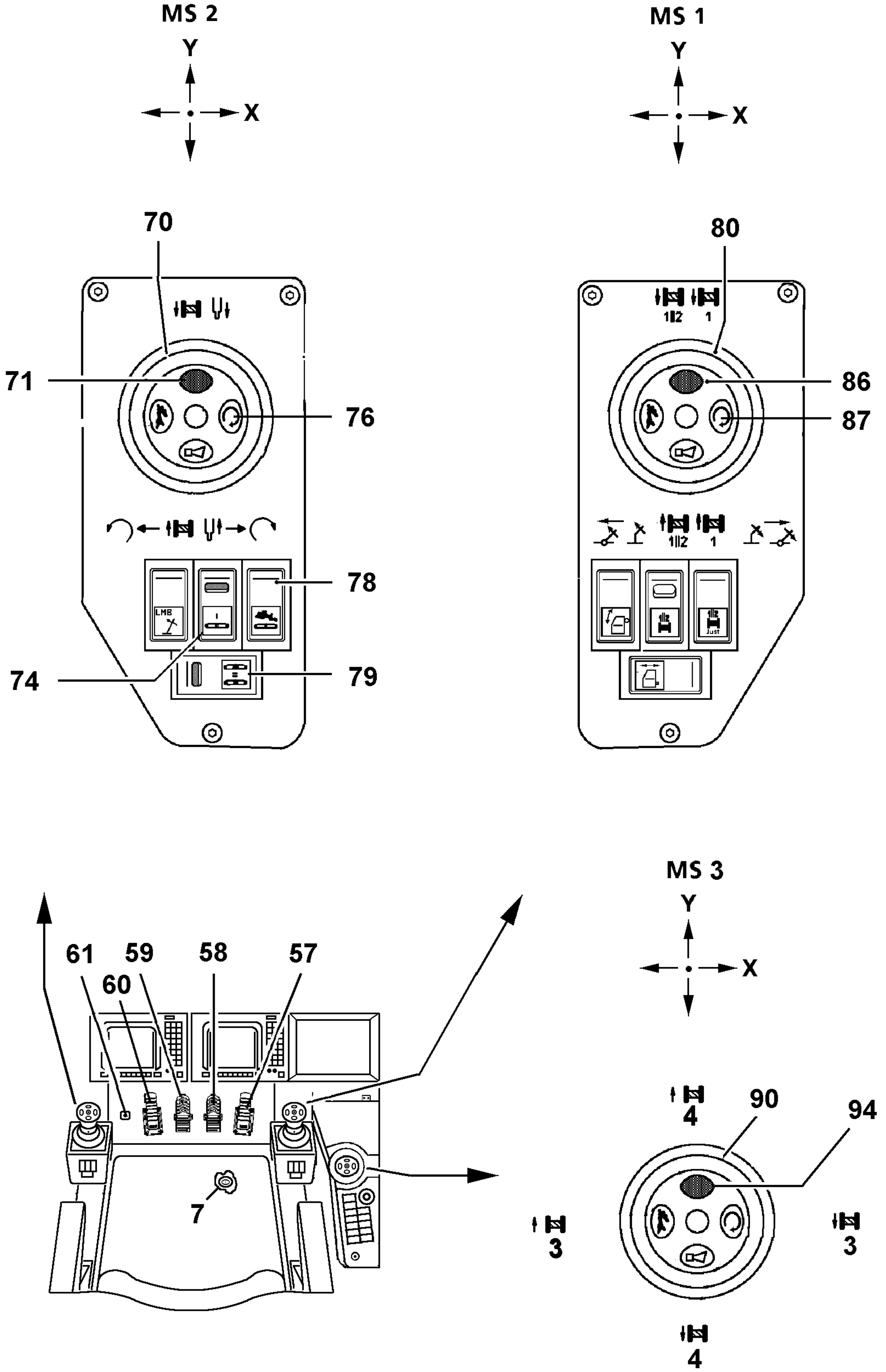
L = 0,5 x Alpha x LC
L = Ground length of required transfer
Alpha = Angle of incline in degrees
LC = Length of crawler between drive / steering wheels

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


MS 2
Y
X
70
71
76
78
74
79
LMB
MS 1
Y
X
80
86
87
1||2
1
Just
MS 3
Y
X
61
60
59
58
57
7
4
90
94
3
3
4

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2. Crane operation

Prerequisites
- The crane is horizontally aligned.
- The counterweight is installed and secured, as noted on the load charts.
- The Diesel engine is running.
- The hook block is reeved, according to the reeving plan.
- All safety devices have been set according to the data in the load charts.
- All equipment configuration data and reeving have been set on the LICCON and have been confirmed, see chapter 4.03. Monitor 0 and Monitor 1 show the operating view.
- There are no persons or objects within the danger zone.
- Crawler "OFF", press switch (74) into 0-position.

C A U T I O N : Always operate the master switch slowly and sensitively. This action spares the crane and reduces the possibility of accidents.

D A N G E R : Before any crane movements, make sure that no obstacles are within the working range of the crane and that there are no persons in the danger zone. Give a warning signal (horn) before initiating a crane movement!

3. LICCON Computer system

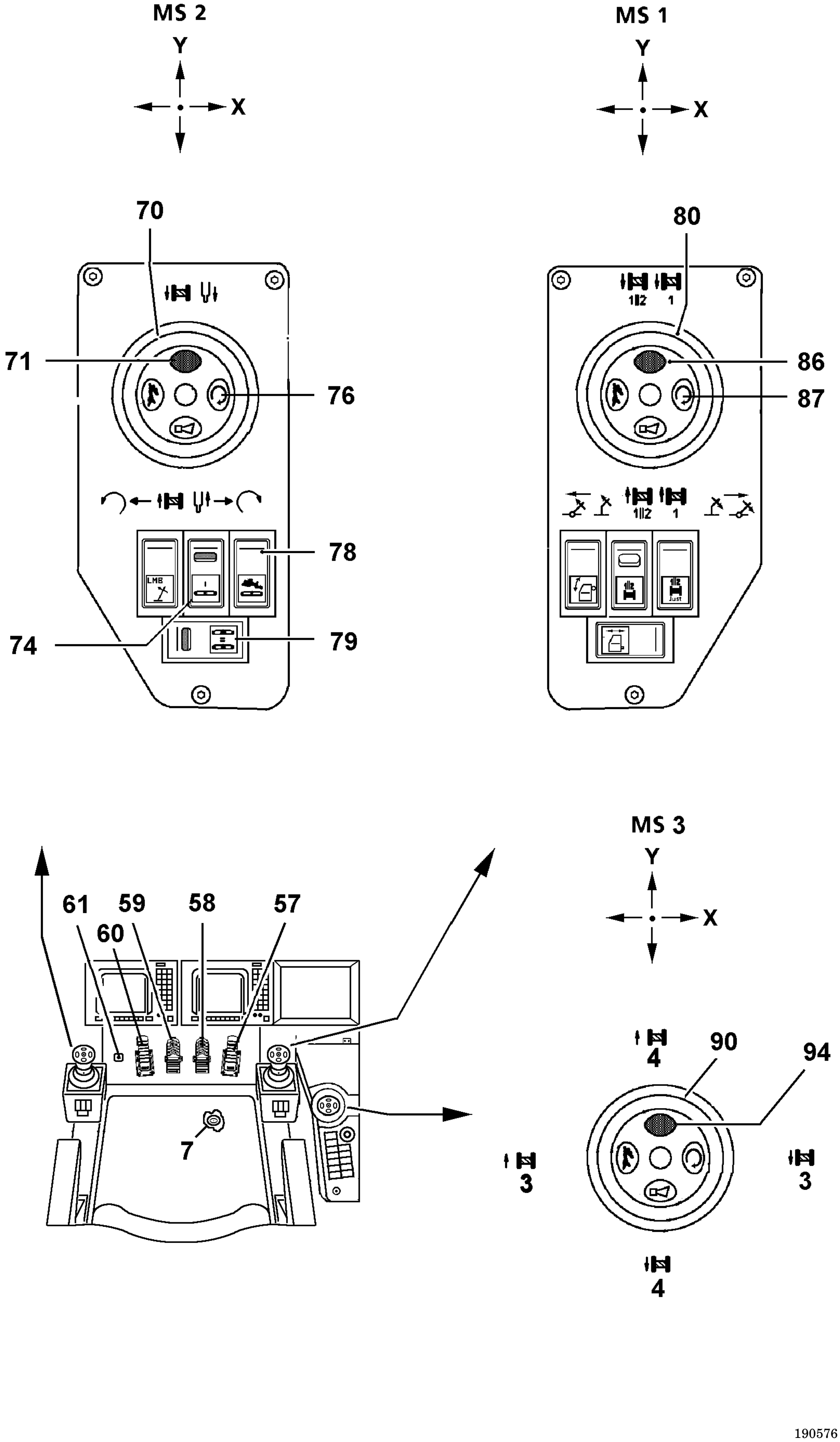
Prerequisite
- The crane engine is running.

During operation, the indicators on the LICCON monitor must be observed. When carrying out a crane movement, the changing utilization condition and the changes in force should be seen. The overload condition should be recognized early and the crane movements should be slowed down accordingly.

The indicators must be monitored especially during a "turn slewing platform" und ”drive crawler” movement, because these movements have no automatic shut off at overload.

The crane operator must constantly estimate if the data shown in the operating view can even be right. The crane operator may not blindly trust the system, he must think for himself and recognize a possible error.

D A N G E R: When bypassing the safety devices, there is a danger of accidents!


MS 2
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MS 3
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4. Release of crane control

In order to prevent inadvertent crane movements when entering and leaving the cab by inadvertently actuating the master switch, the crane control is shut off by a seat contact switch (7) as soon as the crane operator gets up from his seat.

Note: If the crane operator must work while standing, then the seat contact switch can be bypassed with two buttons (71, 86 or 94) on the corresponding master switch (70, 80 or 90) .

5. Engine monitoring

- see Engine monitoring program, chapter 4.02, paragraph 12

During crane operation, monitor the engine monitoring view by changing to it occasionally:
- Engine oil pressure
- Coolant temperature, coolant level
- Fuel level
- Air filter, battery voltage

5.1 Engine RPM

A constant engine RPM can be set. This relieves the crane operator if the crane is operated for a longer period of time.

- Press the pedal for engine regulation (57) until the desired engine RPMs are reached.
- Press the button (76 or 87,97) on master switch (70 or 80,90) , this sets a constant engine RPM, even though the pedal (57) is released.

By pushing the buttons (76,87,97) the current engine RPM, which was preselected via the foot pedal (57) is saved and held by the control until a new selection is made.
If a higher engine RPM is selected via the foot pedal (57) then the currently stored engine RPM, then the engine RPM will be increased according to the foot pedal pressure.
If the foot pedal is released again, the previously set engine RPM will be reset.

Release the engine RPM lock
- Press the pedal for engine regulation (57) again, the engine RPM lock is released.

6. Winch operation

With long booms and lattice jibs, with empty hook operation and when spooling it up or out, it must be checked that no slack cable forms on the winch .

	1			2			1 || 2			3			4		
		MS	F		MS	F		MS	F		MS	F		MS	F
NOT (W1 W2)	1	1y	H1	2	2y	H2	<> *7			3	1x	SV	4	3x	EZW
NOT (W1||W2)	1	1y	H1	2	2y	H2	<> *7			3	1x	SV	--	--	--
R	◊ *4			◊ *4			◊ *4			--	--	--	--	--	--
R RA	--	--	--	--	--	--	--	--	--	--	--	--	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
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
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

5			6			D						L			R		
	MS	F		MS	F		MS	F		MS	F		MS	F		MS	F
5	3y	H2/NV	--	--	--	6	2x	D	◊ *5			◊ *6			◊ *6		
5	3y	H2/NV	4	3x	H2	6	2x	D	◊ *5			◊ *6			◊ *6		
◊ *4			--	--	--	6	2x	D	◊ *5			3	4y	R	4	5y	R
--	--	--	--	--	--	6	2x	D	2	2y	Z	◊ *6			◊ *6		
5	2y*1	H2	--	--	--	6	2x	D	--	--	--	◊ *6			◊ *6		
5	1x	NV	4	2y*3	H2	6	2x	D	--	--	--	◊ *6			◊ *6		
5	3x	NV	4	2y*3	H2	6	2x	D	--	--	--	◊ *6			◊ *6		
5	2y*1	H2	--	--	--	6	2x	D	--	--	--	◊ *6			◊ *6		
5	1x	NV	4	2y*3	H2	6	2x	D	--	--	--	◊ *6			◊ *6		
5	3x	NV	4	2y*3	H2	6	2x	D	--	--	--	◊ *6			◊ *6		
5	2y*1	H2	--	--	--	6	2x	D	--	--	--	◊ *6			◊ *6		
5	1x	NV	4	2y*3	H2	6	2x	D	--	--	--	◊ *6			◊ *6		
5	3x	NV	4	2y*3	H2	6	2x	D	--	--	--	◊ *6			◊ *6		

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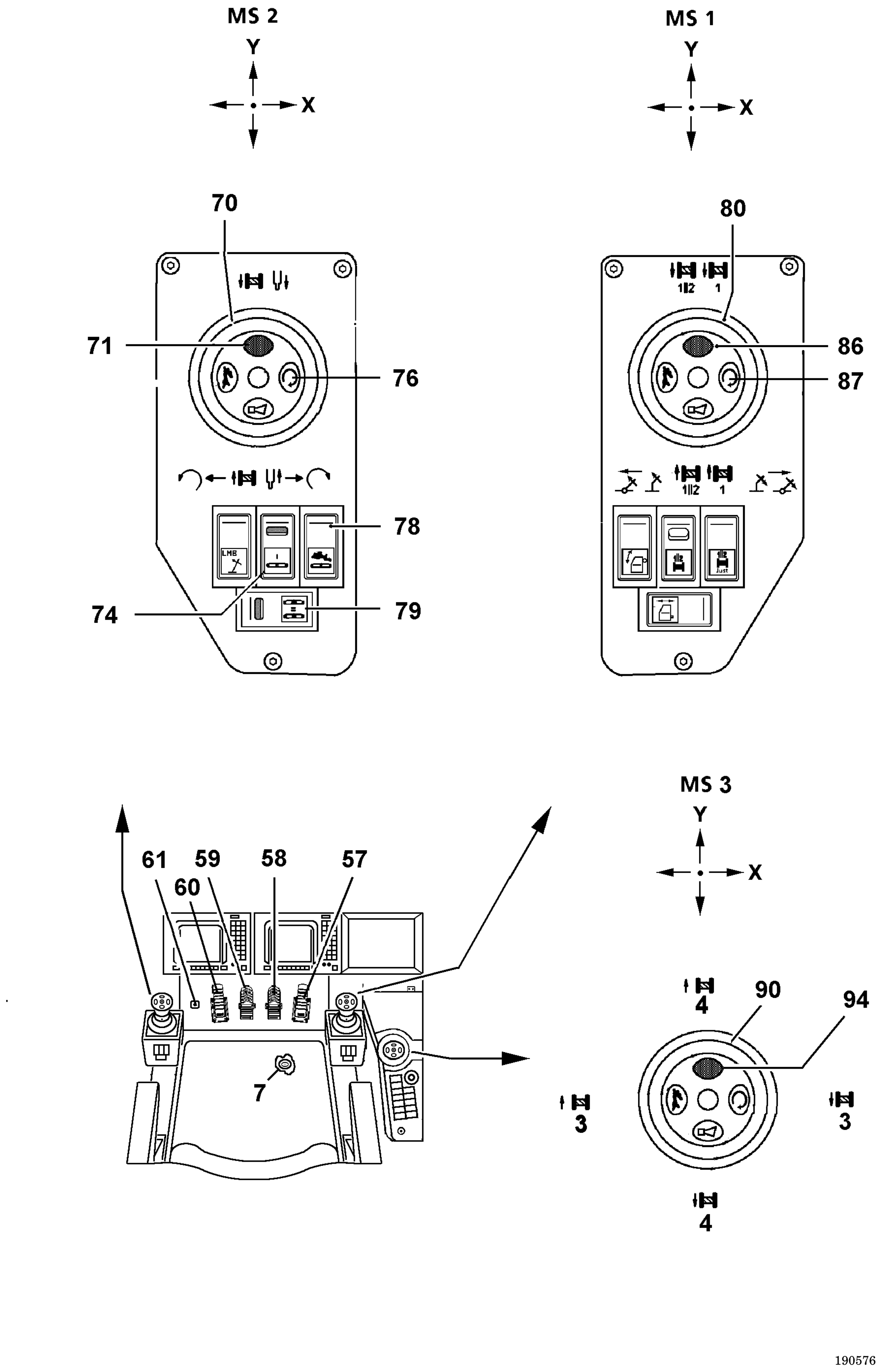
7. Winches, pumps and master switch (MS) assignment to operating modes

Slewing gear pump 6, Master switch 2x

* 1	Only in switch position H1 // H2
* 3	Only in switch position H1 // H2 and not winch 4
* 4	see above or below
* 5	see above or below
* 6	see above or below
* 7	see H1 + H2
- -	locked
↓ ↑	see above or below
⇐⇒	see left or right

H1	Hoist gear 1
H2	Hoist gear 2
P	Pump
D	Slewing gear
NV	Jib control
R	Crawler
F	Function
MS	Master switch
MN	Boom nose
SV	Main boom control
EZW	Derrick control
NOT	Emergency mode
R^{RA}	Crawler assembly
Z	Installation cylinder


MS 2
Y
X
70
71
76
78
74
79
LMB
MS 1
Y
X
80
86
87
1|2
1
Just
MS 3
Y
X
61
59
58
57
60
7
90
94
4
3
3
4
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8. Control of crane movements

C A U T I O N : When spooling the hoist cable up / out, it must be checked that no slack cable forms on the winch (check winch visually).
Slack cable can lead to cable damage.

8.1 Crane movement ”main boom control ” in operating modes: S, SL

The boom control is made via master switch (80) , MS1x in these operating modes.

Deflect master switch (80) to the left = Luff up boom
Deflect master switch (80) to the right = Luff down boom

Crane movement ”main boom control” in operating modes: SW

The boom control is made via master switch (90) , MS3y in these operating modes.

Deflect master switch (90) to the rear = Luff up boom
Deflect master switch (90) to the front = Luff down boom

Crane movement ”lattice jib control ” in operating modes : SDW

The lattice jib control is made via master switch (80) , MS1x in these operating modes.

Master switch (80) deflect to the left = Luff up lattice jib
Master switch (80) deflect to the right = Luff down lattice jib

Crane movement ”Derrick control ”in all derrick operating modes

The boom control is made via master switch (90) , MS3y in these operating modes.

Deflect master switch (90) to the rear = Luff up derrick
Deflect master switch (90) to the front = Luff down derrick

8.2 Crane movement ”Lift / lower ” hoist gear 1 - Winch 1 or 1//2

Deflect master switch (80), MS1y, to the front = Hoist down
Deflect master switch (80) , MS1y, to the rear = Hoist up

Crane movement ”Lift / lower ” hoist gear 2 - Winch 2 or 5 or 6

Deflect master switch (70), MS2y, to the front = Hoist down
Deflect master switch (70), MS2y, to the rear = Hoist up

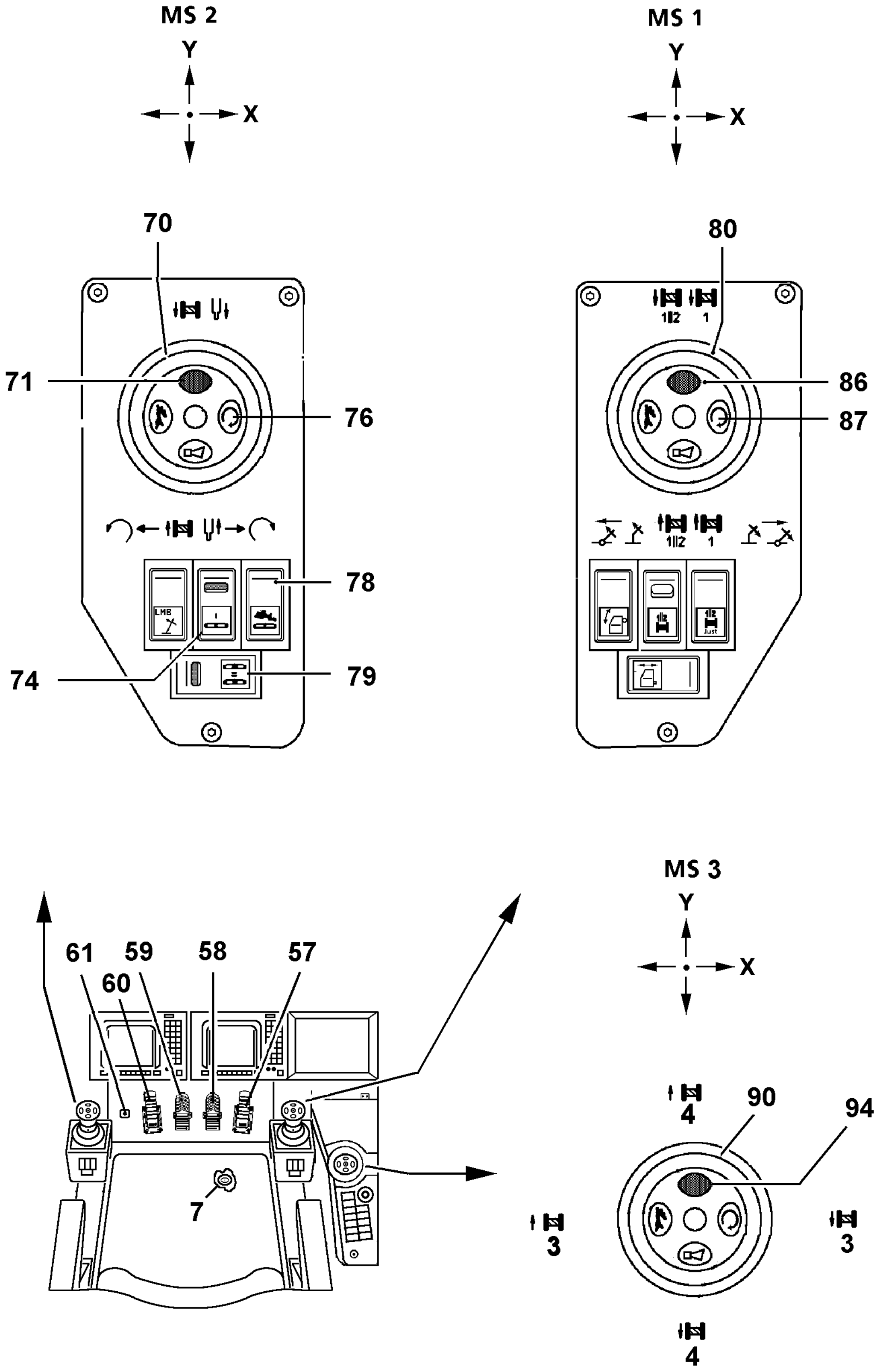
Note: The speed of the crane movement is regulated via the deflection of the manual control lever and the engine regulation.
The winch symbol on the LICCON monitor as well as a vibration sensor in the master switch show, that the winch turns, even if no hook movement can be seen due to multiple reeving and slow speed.

8.3 Preselection of maximum slewing speed of winches as well as deactivation / activation of the individual winches

In the "Control-Parameter" program it is possible to preselect the maximum turning speed of the individual winches or to deactivate / activate the individual winches.

Note: See chapter 4.02, LICCON COMPUTER SYSTEM; paragraph 8. "Control Parameter" program.

C A U T I O N : The maximum turning speed as well as deactivation or activation of the winches may not be made as long as a crane movement is carried out.


MS 2
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X
70
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MS 1
Y
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80
86
87
MS 3
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X
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57
60
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8.4 Crane movement ”slewing”

The slewing speed range must be preselected on the LICCON monitor in percentages (%) according to the data in the load chart manual - see LICCON, chapter 4.02.

D A N G E R: **Before initiating the crane movement ”slewing”, the crane operator must make sure that there are no persons or obstacles within the slewing range. Before innitiating the crane movement, the crane operator must make sure that there are no persons or obstacles within the slewing range. In addition, he must sound the warning signal (horn) .**
If this is not observed, there is a DANGER OF ACCIDENTS !

Deflect the master switch (70), MS2x, to the right = to turn to the right
Deflect the master switch (70), MS2x, to the left = to turn to the left

Note: The speed of the crane movement is controlled via the deflection of the manual control lever and the engine regulation.

D A N G E R: **When turning with a load, the slewing movement or braking movement must be initiated extremely sensitively.**
If a slewing movement or braking movement is initiated too suddenly or jerkily, the load can start to swing back and forth. A swinging load can cause the boom to brake or the crane to topple over.

8.4.1 Preselection of slewing speed

In the load chart manual, the maximum slewing speeds are given in percentages.

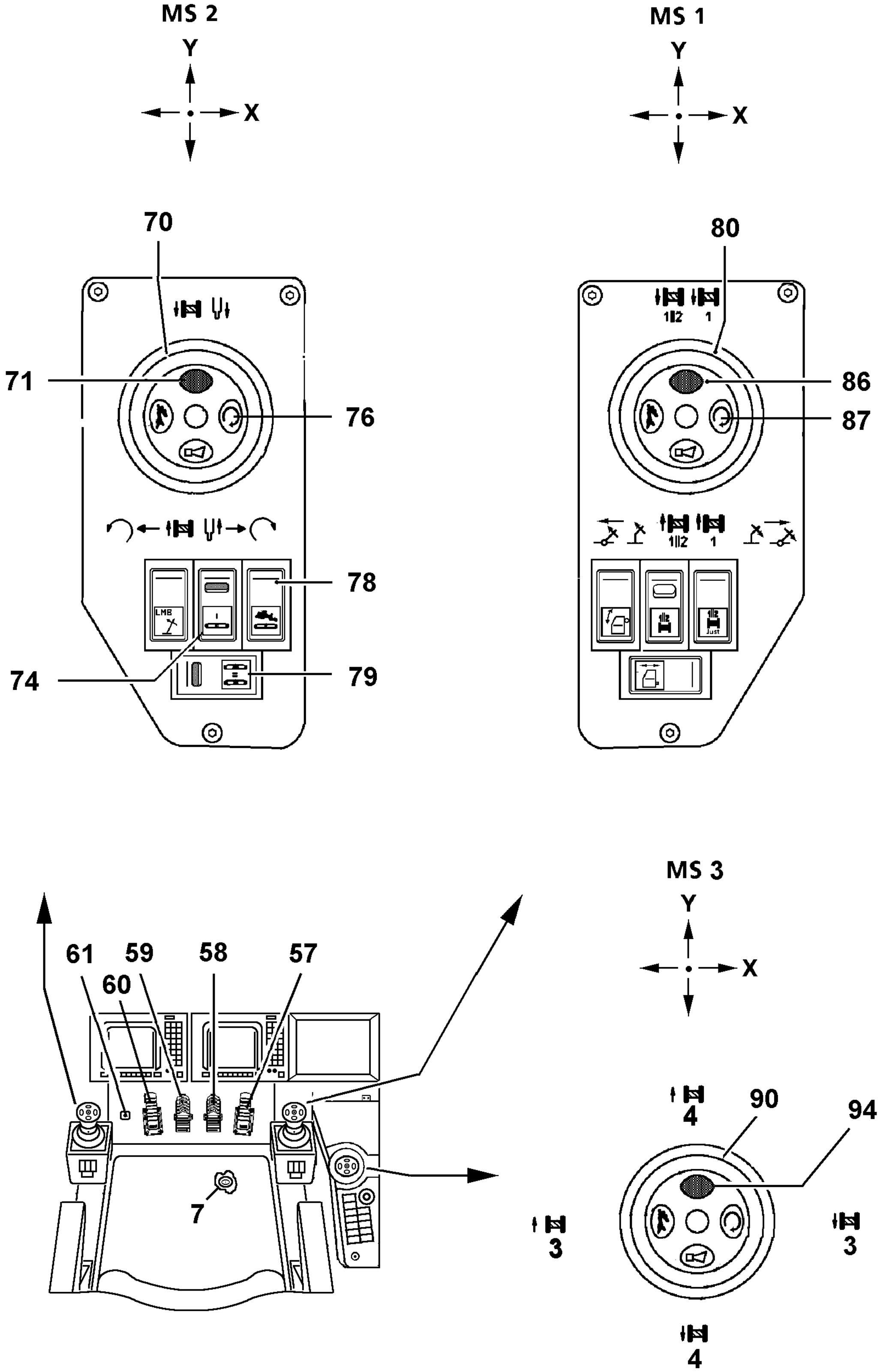
C A U T I O N : **These values depend on the boomlength and the operating mode and may not be exceeded during crane operation with a load.**

Note: The maximum slewing speeds can be set and adjusted in the "Control Parameter" program . See chapter 4.02, LICCON COMPUTER SYSTEM; paragraph 8, "Control Parameter" program.

C A U T I O N : **The maximum slewing speed may not be changed as long as a crane movement is actuated.**

The following applies:

Longer boom
Larger load } slower speed


MS 2
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LMB
MS 1
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58
57
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MS 3
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8.4.2 Coasting of slewing gear

Press the foot button (61) to switch the swing gear to coasting. This makes is easier to position the boom above the load to be lifted. The master switch 2 (70) may not be deflected.

D A N GE R : If the crane superstructure turns inadvertently (for example due to wind), then proceed as follows:

- Do not release the foot button (61)!
If the foot button is released immediately, the crane superstructure stops suddenly. This can cause the load to swing to the "rear" and can damage the crane.
- Deflect the master switch 2 (70) in turning direction, then release the foot button. Now the turning movement can be slowed down by slowly moving the master switch.

Note: The slewing gear cannot be switched to coasting if:
- the slewing gear is shut off by the LML,
- the working range limitation is activated .

8.4.3 Slewing gear block

An additional pedal (60) to block the slewing gear is installed in the crane. If the crane is turned while strong side winds are blowing and with long boom system against the wind, then the crane superstructure turns into the opposite direction, due to leakage in the hydraulic motor. This can be prevented by actuating the pedal to block the slewing gear (60) and by deflecting the master switch (70) into the desired turning direction. By slowly releasing the pedal (60) , the superstructure turns into the desired direction.

The slewing gear block may only be used at minimum slewing speed, i. e. with the master switch (70) almost in zero position and for the following applications:

1. Starting to drive with strong side wind
   Actuate the pedal for slewing gear block (60) and deflect the master switch (70) into the desired turning direciton. Slowly release the pedal (60) until the crane superstructure turns into the desired direction.

2. Stopping the slewing movement with strong side wind
   With the master switch (70) , slow down the crane to the minimum speed. Carefully actuate the pedal (60) for the slewing gear block, until the crane comes to a standstill at the desired point.

C A U T I O N : The slewing gear block may never be used as an additional slewing gear brake.
If this is not observed, the slewing gear brake can be destroyed. This in turn can damage the slewing gear or the rotary connection .

D A N G E R : If the swing movement of the crane is slowed down by swinging back into the zero position with the master switch, then this causes crane overload. Danger of accident!

9. Crane operation

Observe the general notes in this chapter!

Prerequisites:
- The LICCON overload safety system is set according to the data given in the load chart.
- The installation keyed button is turned off.
- 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. Even if the crane operator leaves the cab for only a short time, then he is obligated, before starting to work again, to check the operating mode setting and to reset them, if necessary.**

9.1 Adjustments / checks

Check the function of the overload safety system, by actuating the operating positions ”top” and ”bottom” .
Check the function of the hoist limit switch ”on top” by actuating the hoist limit switch.
Check the function of the limit switch ”Boom steep” by actuating the relapse cylinders.
Check the function of the limit switch ”Derrick” by actuating the relapse cylinders .
Check the function of the limit switch ”lattice jib steep” by actuating the relapse cylinders.
Check the function of the limit switch on the flap (pendulum).
Check the retraction of the mechanical relapse support into the flap.

D A N G E R: **Before erection, the easy movement of the pendulum of the mechanical relapse support must be checked over its complete swing range. If this is not observed, the mechanical relapse support does not engage in stepp lattice jib position. There is a danger of accidents because the lattice jib may tip backward!**

9.2 Guy rods on lattice sections in crane operation

If the guy rods are not needed for the present boom combination, then they can remain on the lattice sections. However, the following must be observed:

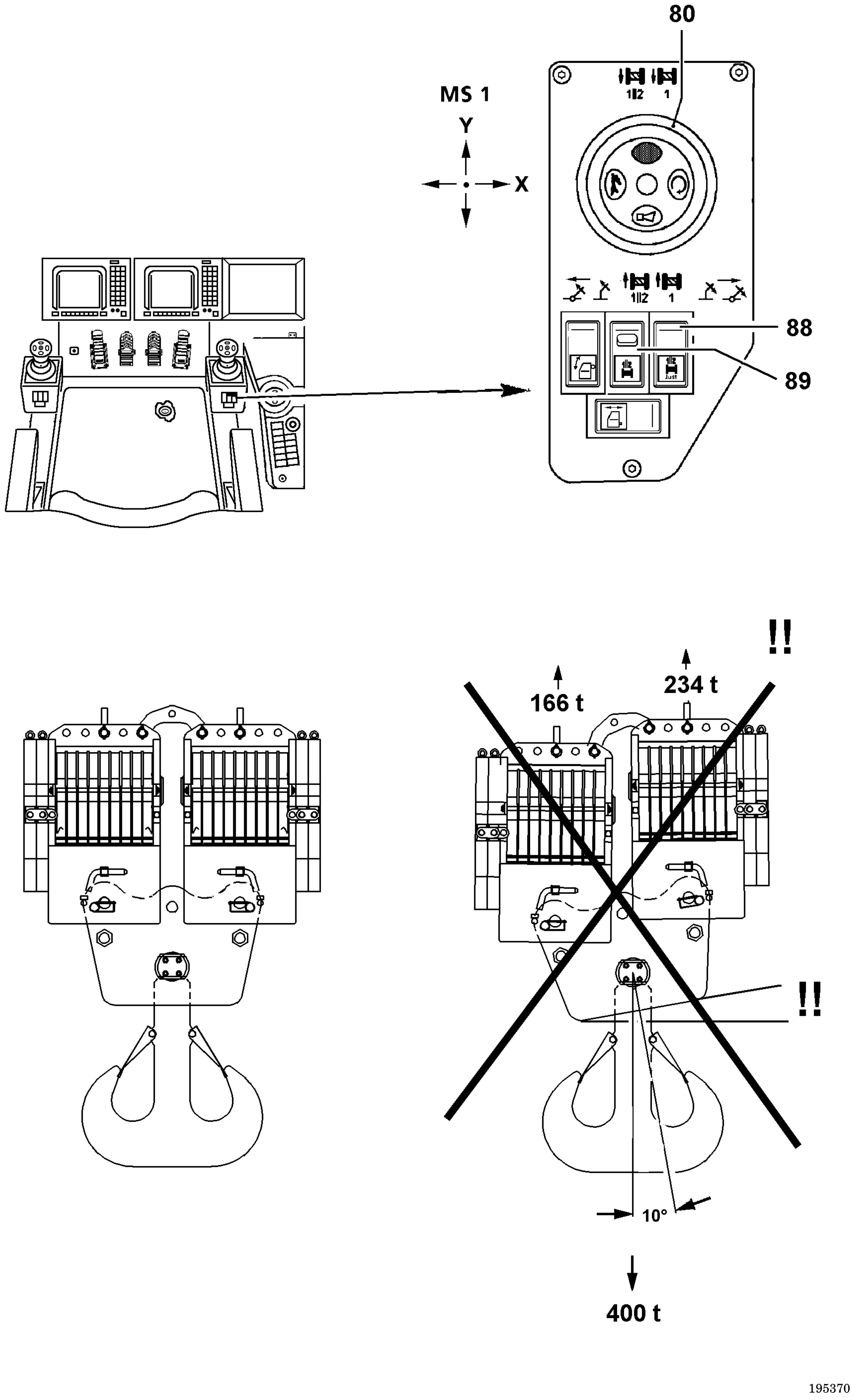
Note: If the guy rods are not removed, then the load capacity values given in the load chart must be reduced accordingly.

9.3 Danger conditions without shut off

Block position relapse cylinder - Lower load

D A N G E R: **If the crane actuates the block position of the relapse cylinders with the boom or derrick, with attached and freely suspended load, then there is dnger that the boom or relapse cylinder will be damaged when setting down the load on the ground. By setting down the load, the boom is relieved, which causes the boom system to move backward.**

There is no shut off of the hoist gear down function. For that reason, the opposite direction of the movement, which caused the block position, must be actuated to release the block position again.


80
MS 1
Y
X
88
89
!!
166 t
234 t
!!
10°
400 t
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10. Parallel operation (winch 1 // 2) - Crane operation with double pulley blocks
The cables of winch 1 and 2 are used for this operation.

Note: Installation of hook block for double pulley block operation - see chapter 4.06. Enter the total reeving into the LICCON.

C A U T I O N : Before horizontal alignment of the hook block and before crane operation, the transport pins on the hook blocks must be pulled.

Operation
Before a load is attached, the hook lbock must be aligned as follows - check visually:

- Actuate the master switch (80) - winch 1 or master switch (70) - winch 2 and spool the winches up or out until the hook blocks are aligned in horizontal direction - check visually.

- Then the parallel control of winches 1 // 2 must be adjusted with button (88) .

- Turn on the switch (89) winch 1//2, parallel operation.

Note: In parallel operation, the control for winch 1 and 2 is made only with master switch MS 1y (80).

Set the zero point for hook path indication.

Note: See chapter 4.02, LICCON COMPUTER SYSTEM

If in crane operation the difference range in the parallel control is exceeded, the winch movement is shut off.
The winches must again be set to parallel operation, as described above.

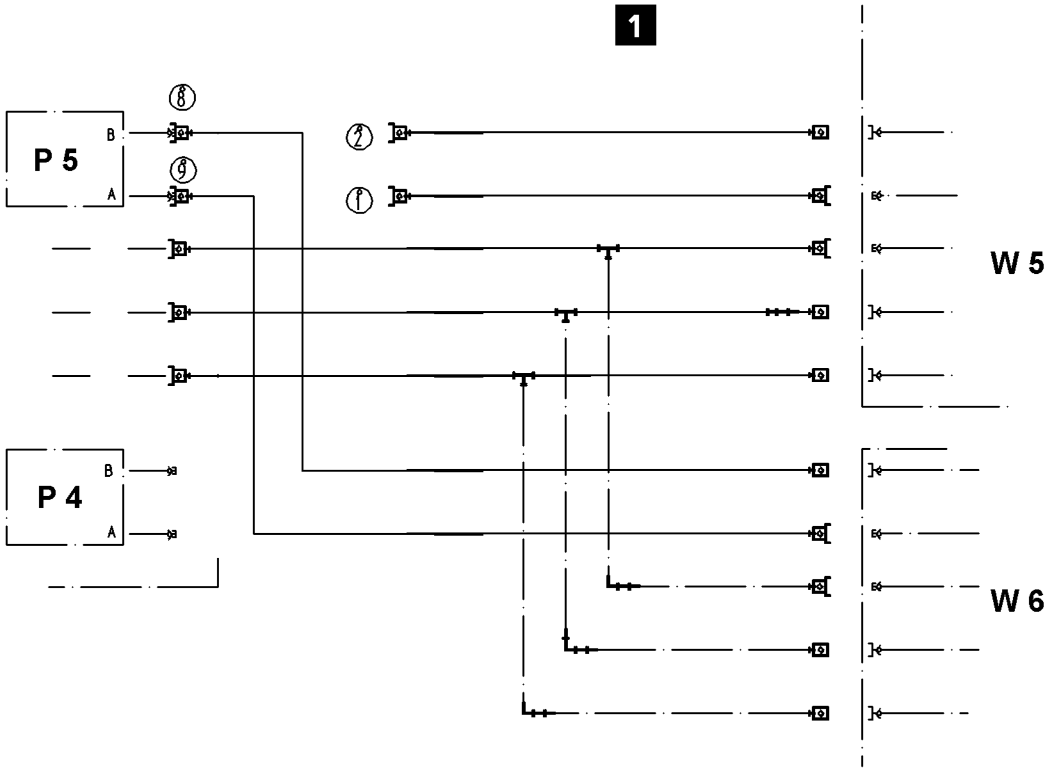
C A U T I O N : The electronic parallel control only monitors the same RPM of the two winches, it does not take the following errors into account:
1. uneven cable length
2. different winding properties
3. uneven reeving of both hook blocks (not permitted!)
The crane operator still remains responsible that the hook blocks always remain on the same level, despite electronic monitoring.

D A N G E R: In parallel operation, the crane operator must make sure that the equalitzation crossbar on the double hook blocks always remains in horizontal position
- Check visually!
If this is not observed, an overload of hook block, boom or cable can occur, which can cause property damage and personal injuries.

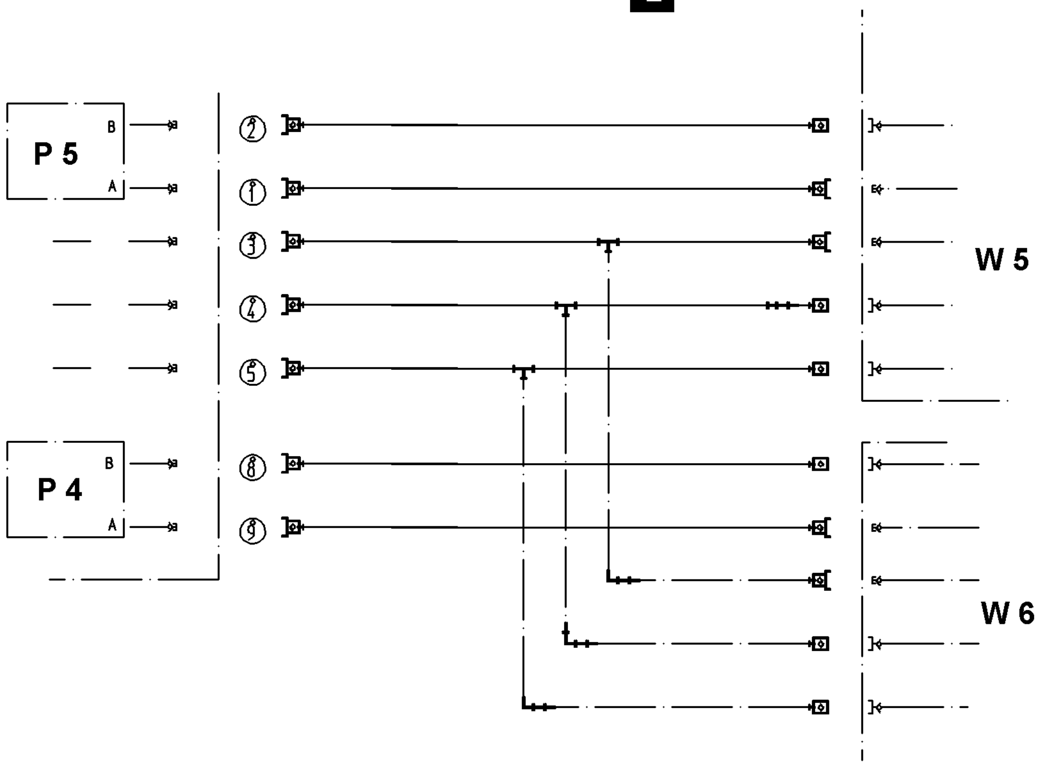
If it is not ensured that the equalization crossbar on the hook blocks always remains in horizontal position, accidents can occur!

Example : Load changes on the individual hook blocks if the equalization crossbar inclines and is positioned horizontally - see illustration!

1



2



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11. Winch 6 and 5

11.1 Winch 5 and 6 are installed in the S-pivot section.
To use winch 6 in any other than the SDW system, the winch must be connected to the hydraulic and electric connections of winch 5, as winch 6 and 4 are supplied by the same pump.
These winches cannot be operated simultaneously if they are connected to the same pump.
By connecting hydraulic hoses from winch 6 to the pump 4 of winch 5, winch 6 and winch 4 can be operated separately.

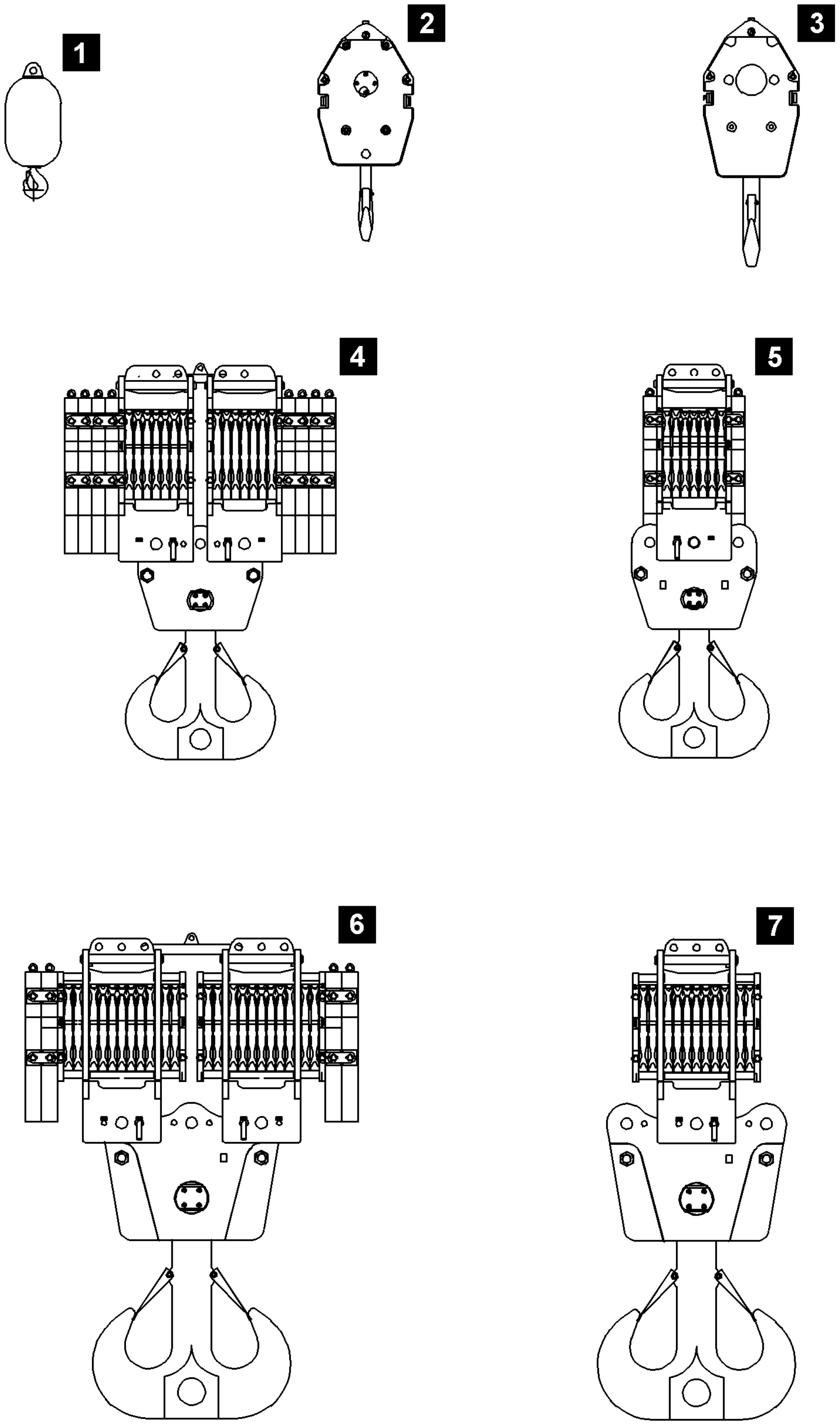
Note: When winch 6 is operated with the hydraulic and electrical connections of winch 5 as hoist winch, then winch 6 is operates as winch 5.
In the LICCON operating view, winch 5 is shown instead of winch 6.
In this case, the hook path indication is not correct for winch 6!
If winch 6 (connections on pump of winch 5) is operated and then again winch 5, the hook path indication is wrong until the winch 5 is calibrated again.

11.2 If winch 6 is not installed, a hoist cable is placed on the N/W control winch, which may only be operated for no more than a maximum of 2 months of operation.
After this operating period, the cable must be unreeved, inspected and reeved again. If this is not observed, the cable can be damaged.

Note: See chapter 8.04 for important inspection and maintenance instructions for cables.

C A U T I O N : **If the operating period is longer than 2 - 3 months, then it is necessary to place a torsionfree control cable on the control winch (winch 5) . Otherwise the cable will be damaged.**
If any damage is found, the cable must be taken down immediately!

If winch 6 is purchased, a control cable is generally placed on winch 5.



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Hook blocks
By bolting on additional plates the weight of the hook blocks can be raised.

Load hook 16 t (fig. 1)
Weight = 1,1 t

Hook block 47 t - 1 Pulley (Fig 2)
Single hook block with single hook
- 47 t load

Weight without additional plates: = 1,0 t
Weight with 2 additional plates: = 2,0 t
Weight with 4 additional plates: = 3,0 t

Hook block 107 t - 3 Pulleys (Fig 3)
- Single hook block with double hook
- 107 t load

Weight without additional plates : = 2,5 t
Weight with 2 additional plates, 80mm: = 3,5 t
Weight with 2 additional plates , 150mm: = 4,5 t
Weight with 4 additional plates: = 5,5 t

Hook block 400 t / 215 t - 2 × 7 Pulleys (Fig 4)
- Double hook block with crossbeam consisting of a double hook with 400 t load
- crossbeam and 2 pulley sets each 7 pulleys

The double hook block can be remounted to a single hook block with load of 215 t
Weight without additional plates: = 7,0 t
Weight with 2 additional plates: = 9,0 t
Weight with 4 additional plates: = 11,0 t
Weight with 6 additional plates: = 13,0 t
Weight with 8 additional plates: = 15,0 t

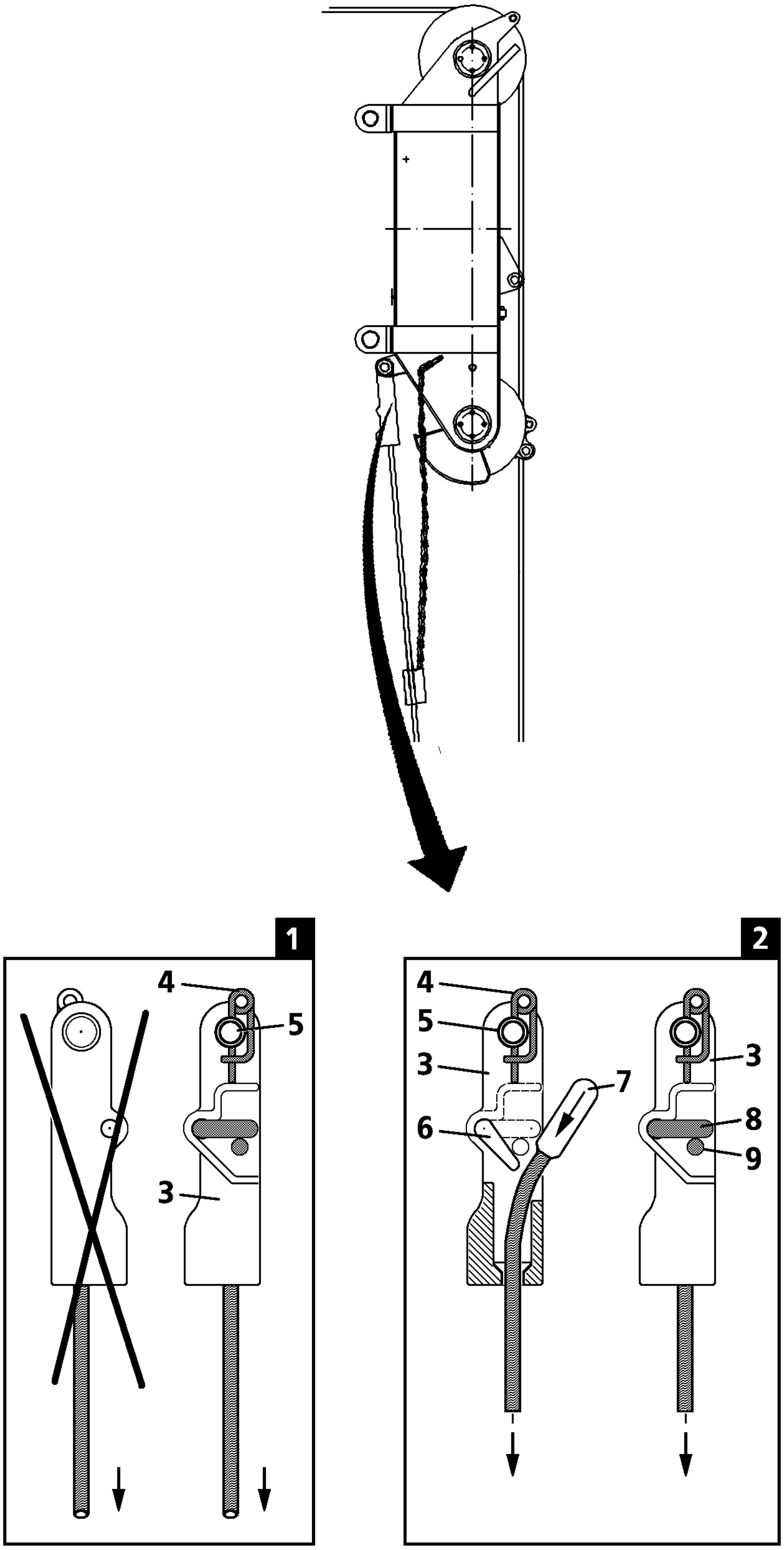
Single hook block 215 t - 7 Pulleys (Fig 5)
Weight single hook block: = 5,5 / 7,5 t

Hook block 600 t / 312 t - 2 × 11Pulleys (Fig. 6)
- Double hook block with crossbeam consisting of a double hook with 600 t load
- crossbeam and 2 pulley sets each 11 pulleys

The double hook block can be remounted to a single hook block with load of 312 t
Weight without additional plates: = 11,0 t
Weight with 2 additional plates: = 13,0 t
Weight with 4 additional plates: = 16,0 t

Single hook block 312 t - 11 Pulleys (Fig 7)
Weight single hook block: = 8,4 t

Note: Required minimum hook block weights at crane operation - see load charts.



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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).

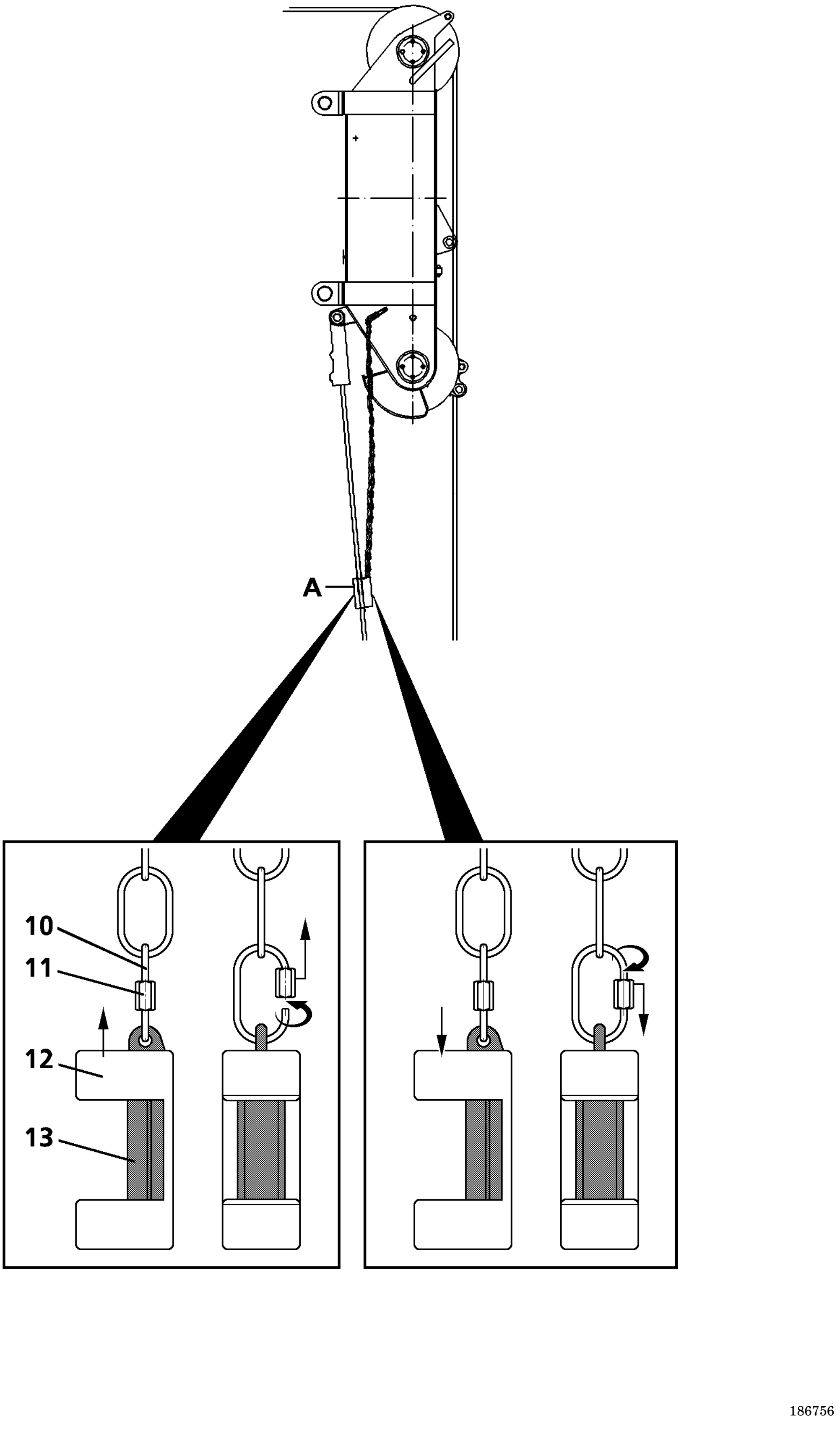
D A N G E R: **The pin (5) must always be placed from the inside to the outside and secured from the outside, to prevent the hoist cable from rubbing against the pin (5) or the spring retainer (4).**

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.**


A
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12
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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.

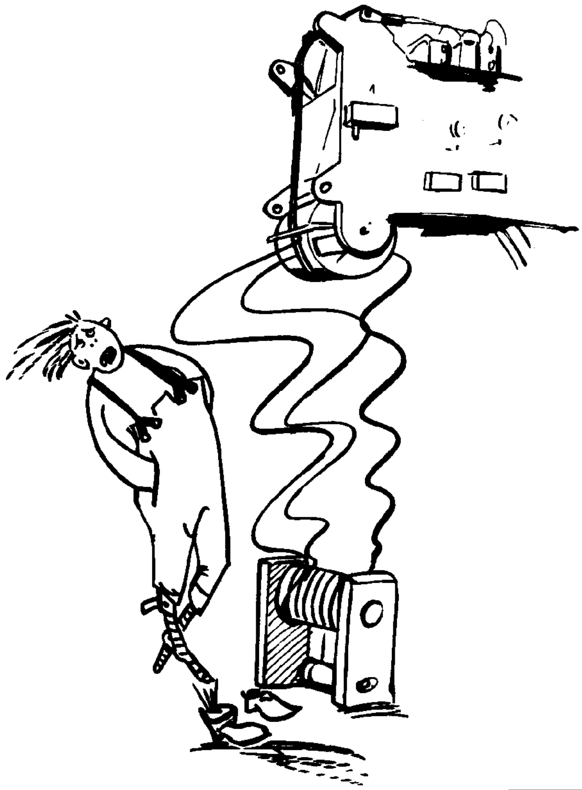
- Push the weight (12) over the carrying part (13) .
- Hang the hoist limit switch weight again into the chain lock (10).
- Turn the lock nut (11) down and manually tighten it with a SW 13 open end wrench.

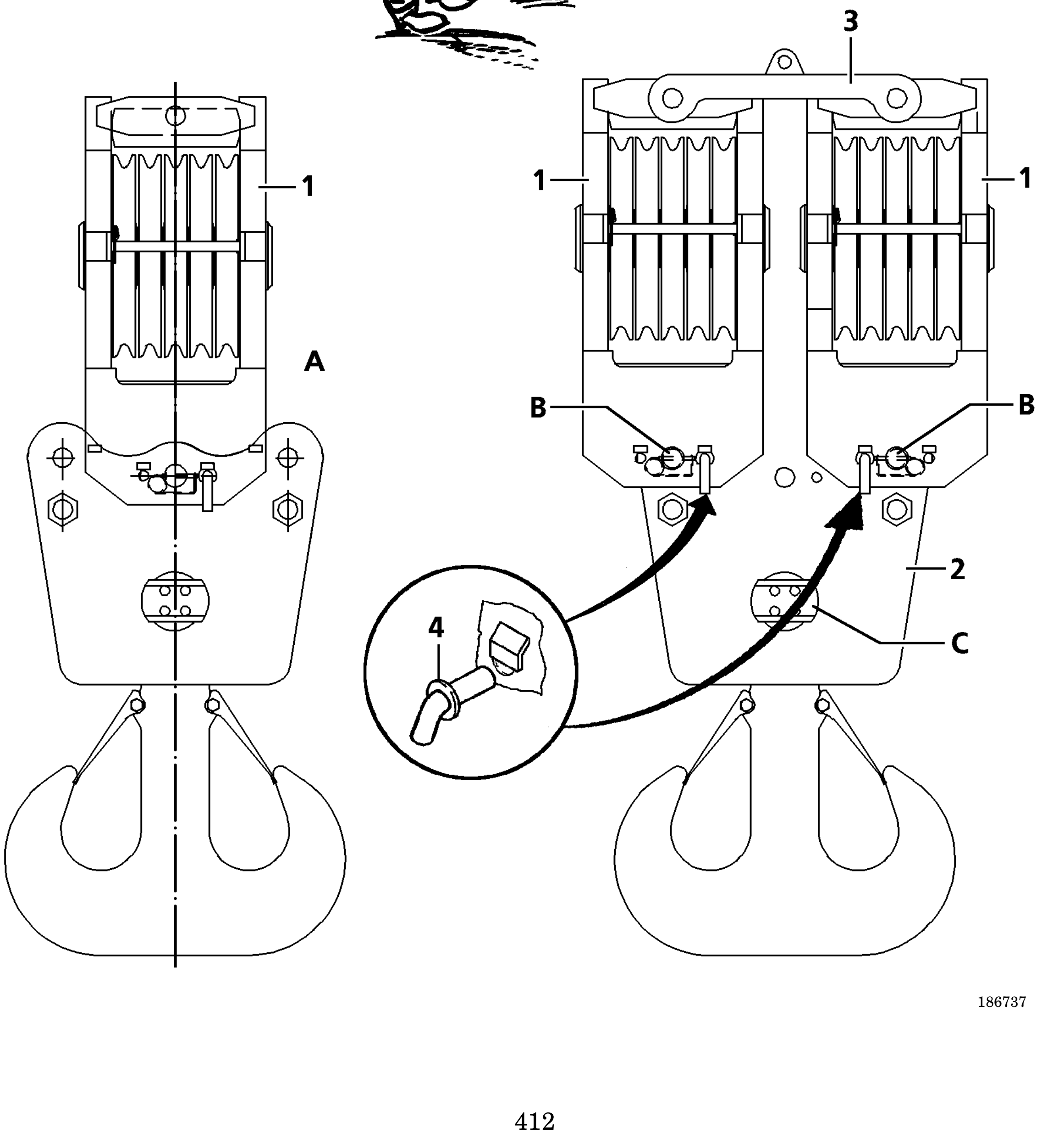
D A N G E R : The chain lock (10) serves at the same time to secure the weight (12).
It may not be replaced with another part, such as a shackle, snap etc.
The chain lock (10) must always be attached in such a way that the lock nut (11) is on ”top”, meaning on the chain (14) and the chain lock is closed 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.





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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.

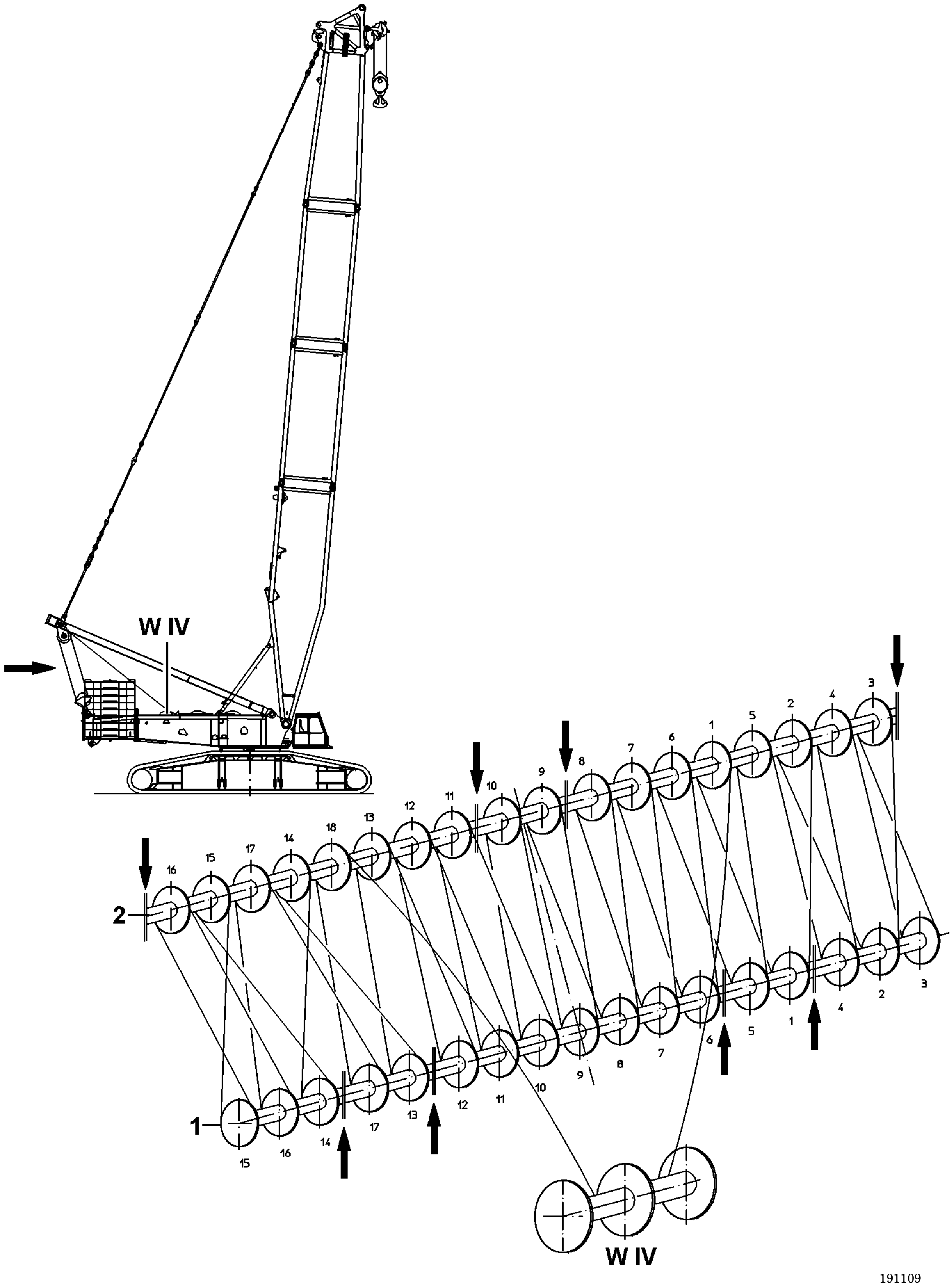
Note: Turn handle down to secure.

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).

Reeving between pulleys on the slewing platform and A- bracket

Note: Reeving (36 times) for all operating modes
1 = pulley block on the slewing platform 2 = pulley block on the A- bracket
IV = winch IV

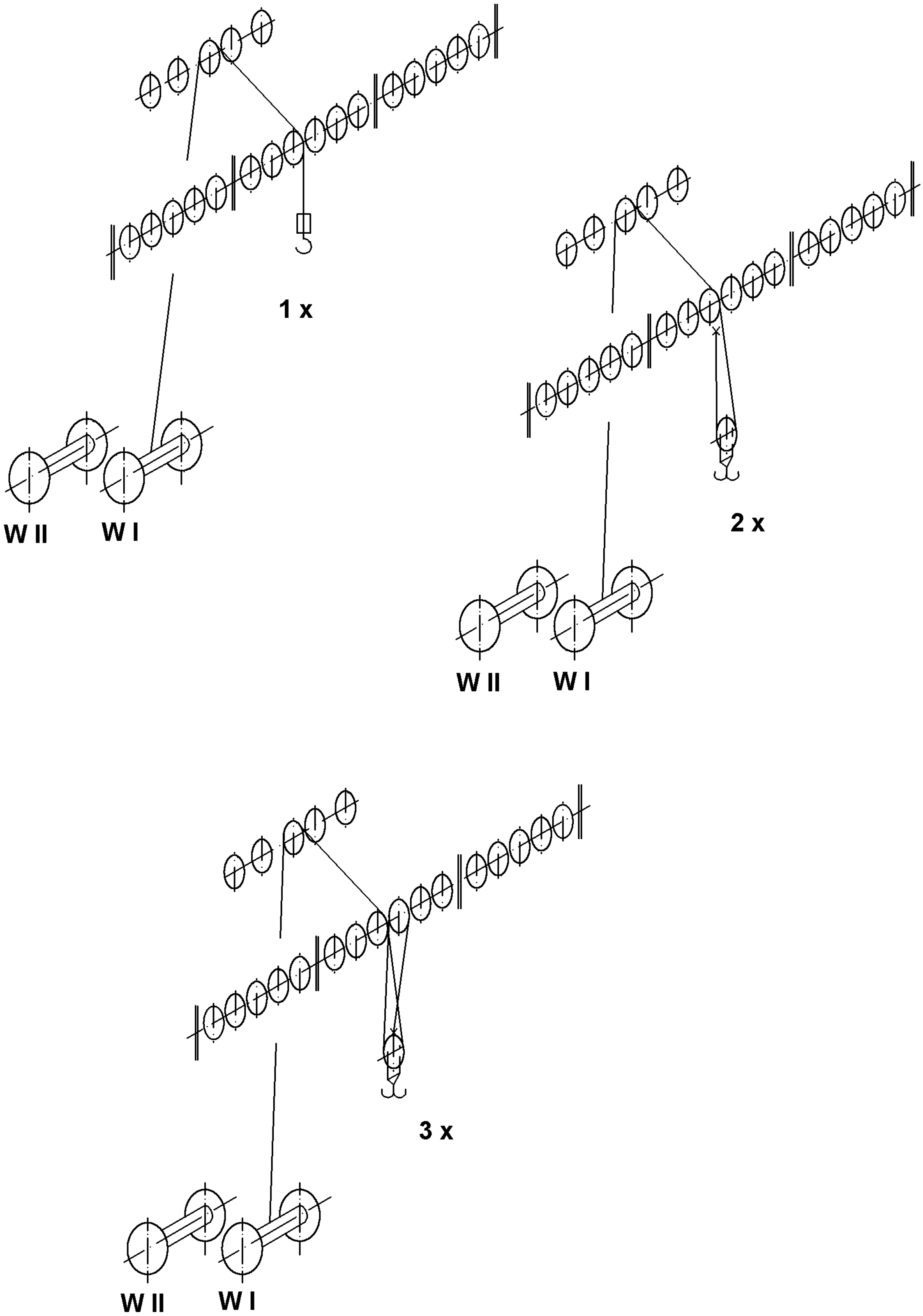


REEVING PLANS

L - Head section (400 t)

Head section - 16 pulley

Load hook	16 t
1 - pulley hook block,	47 t hook block
3 - pulley hook block,	107 t hook block
7 - pulley hook block,	215 t hook block



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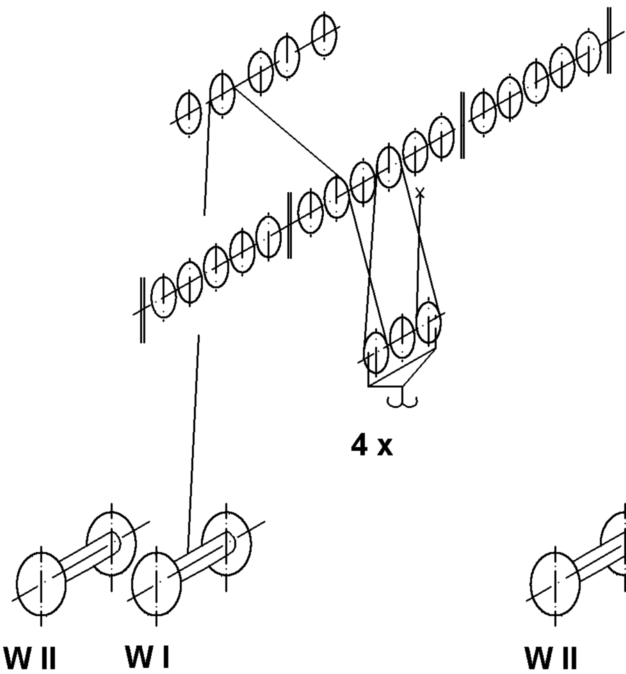

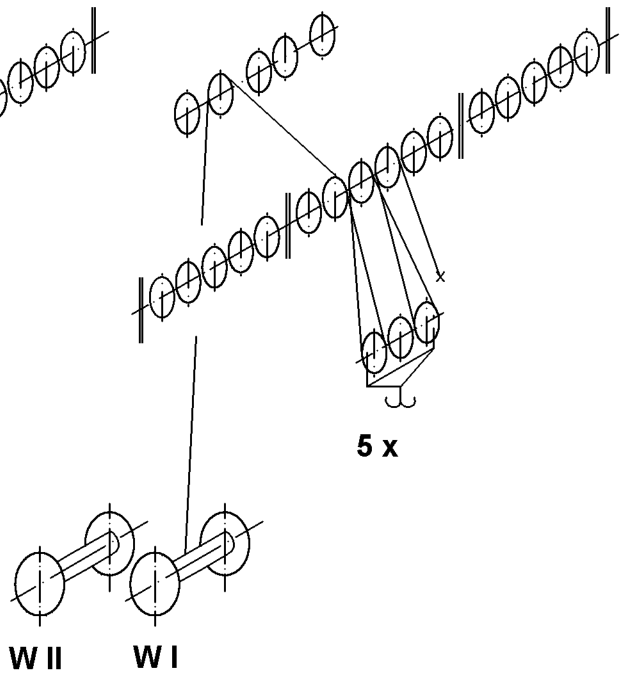

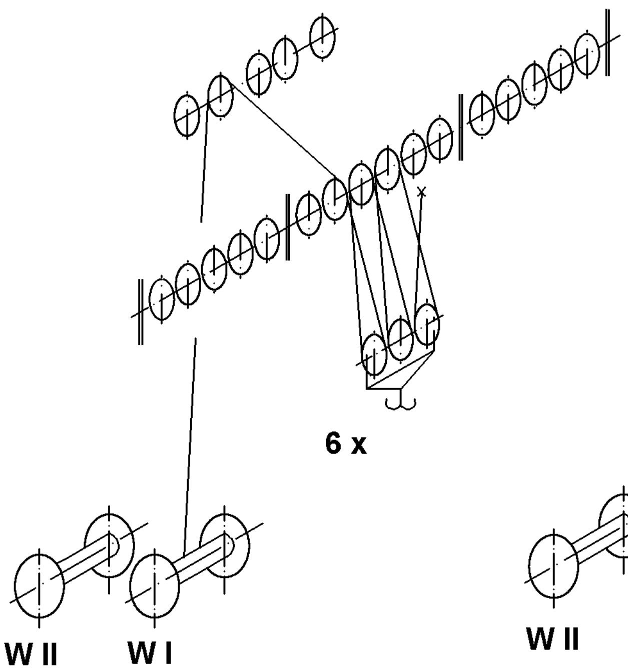

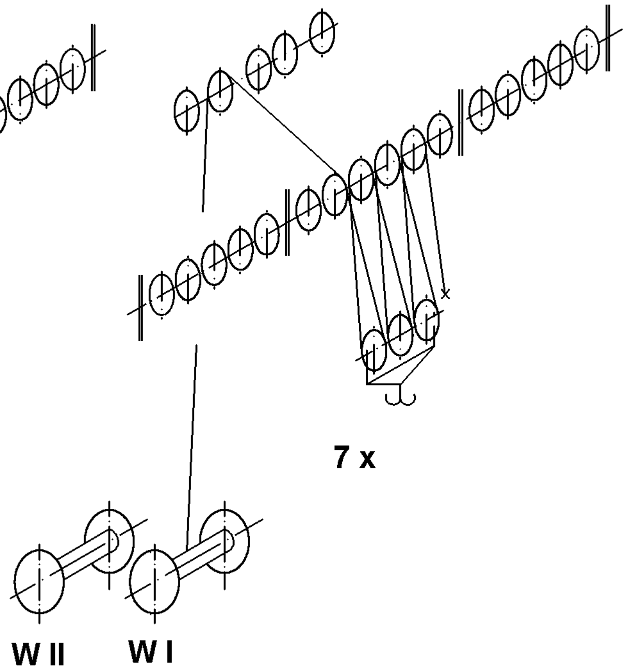

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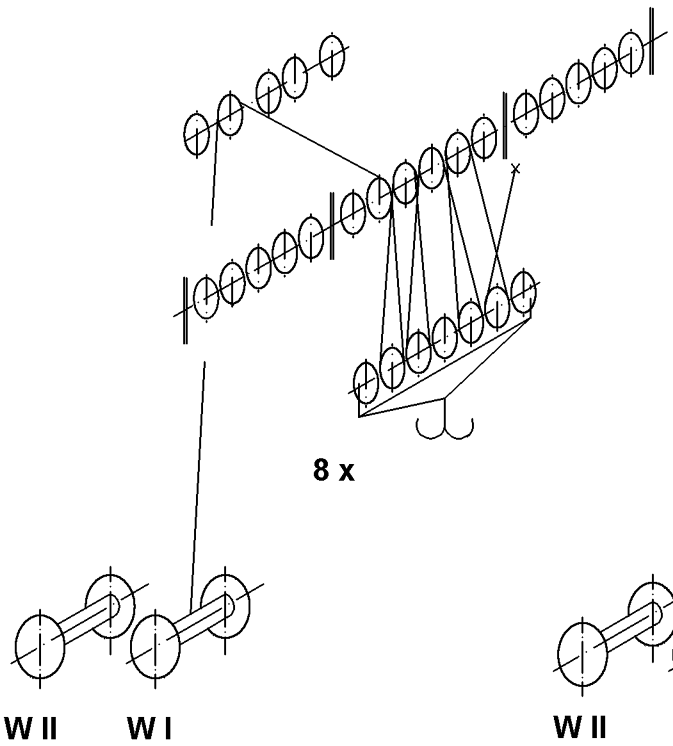

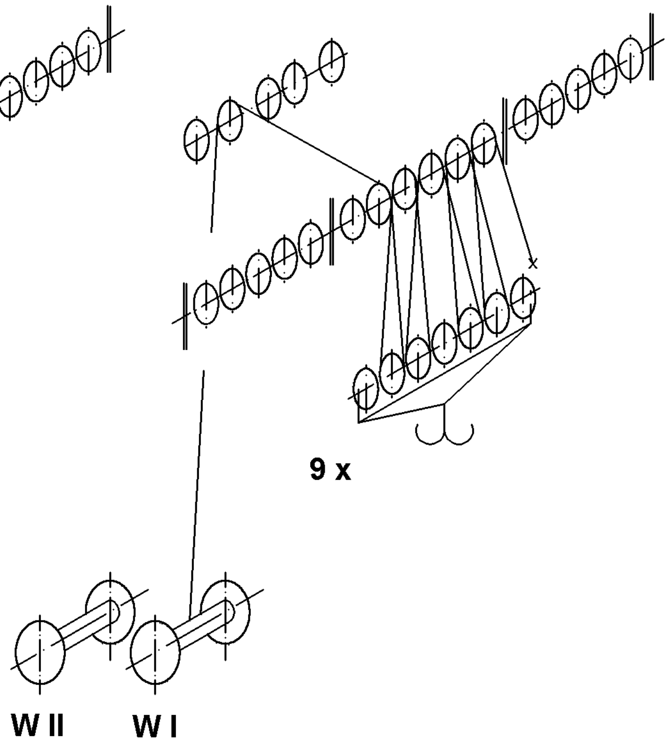

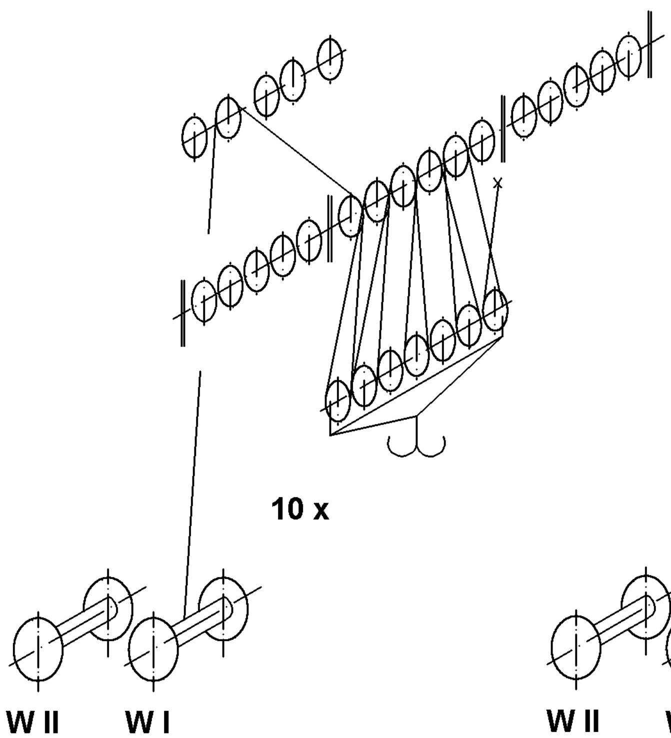

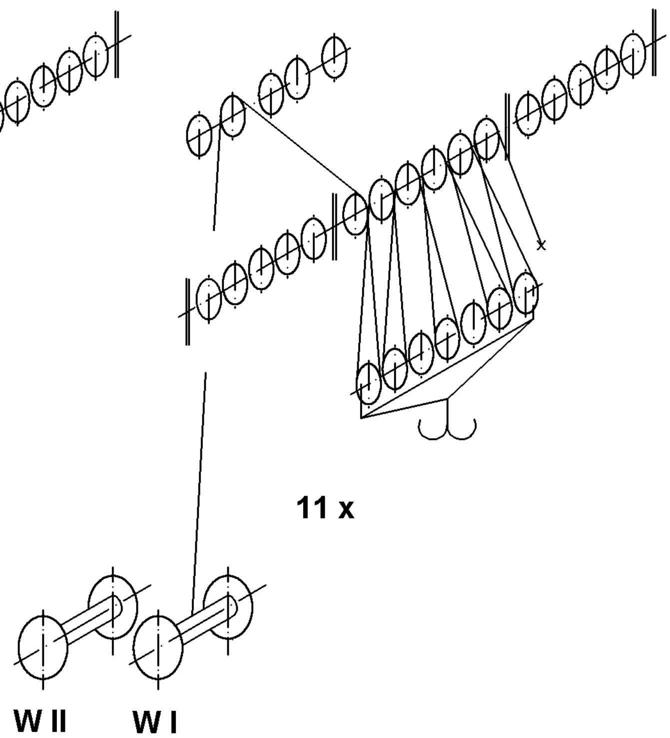

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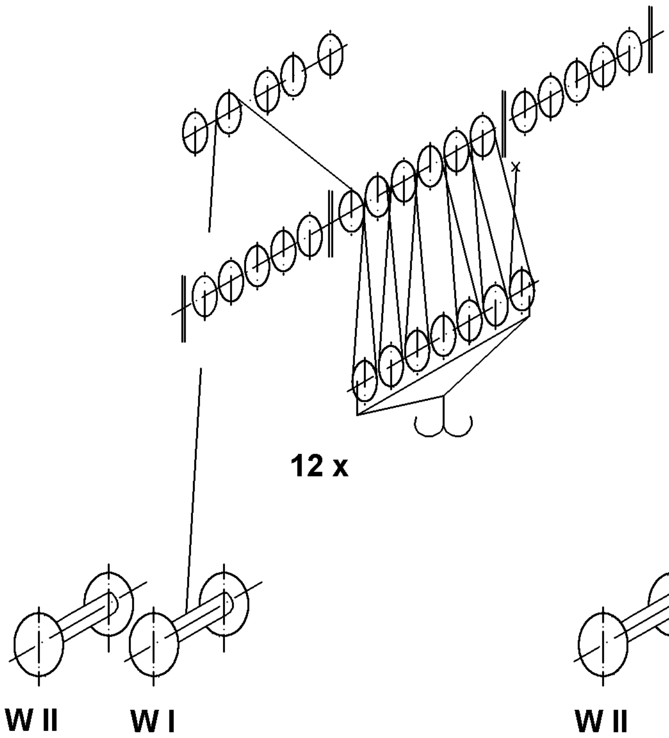

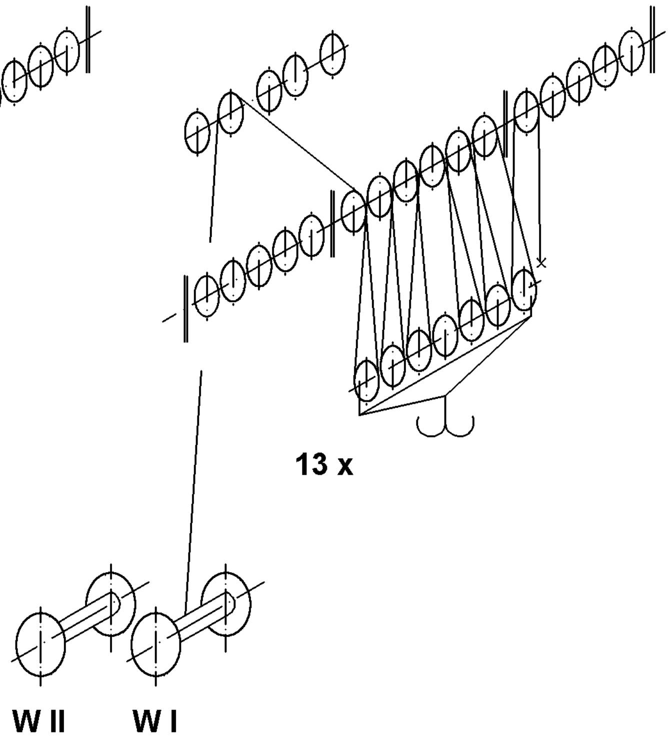

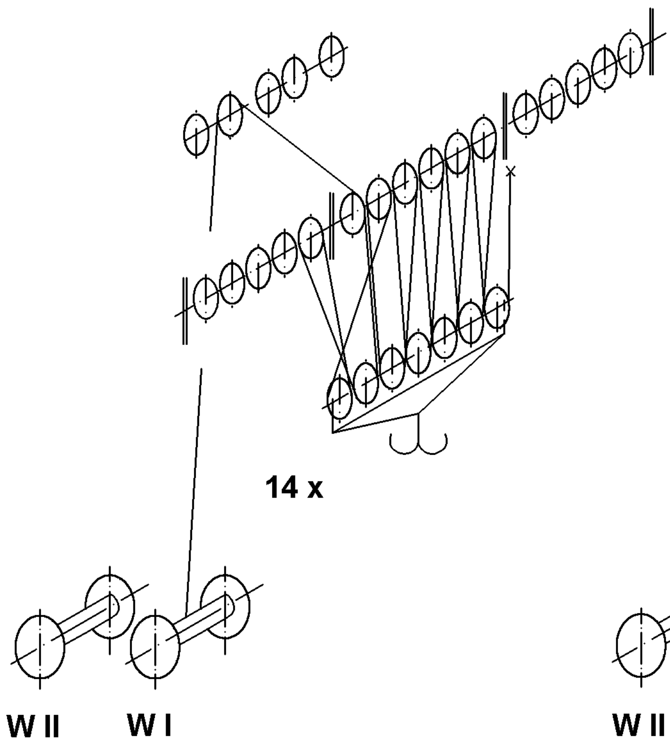

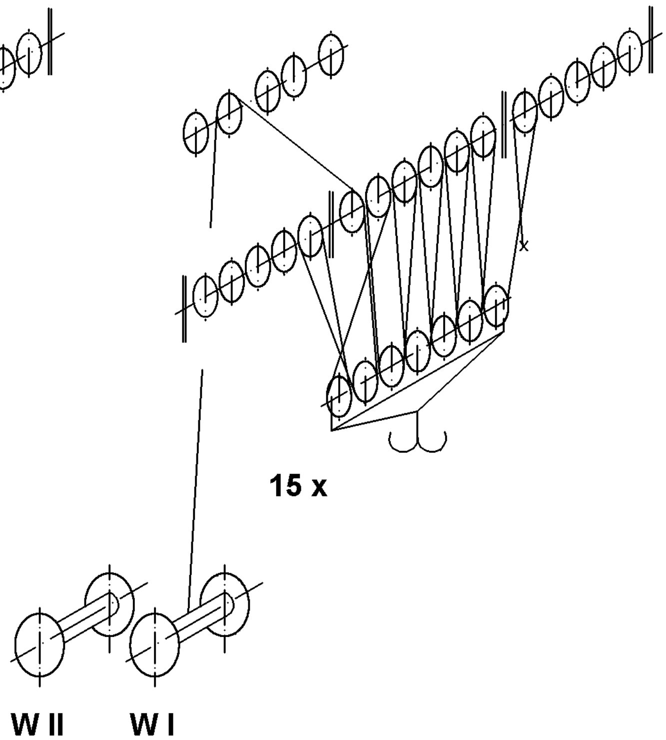

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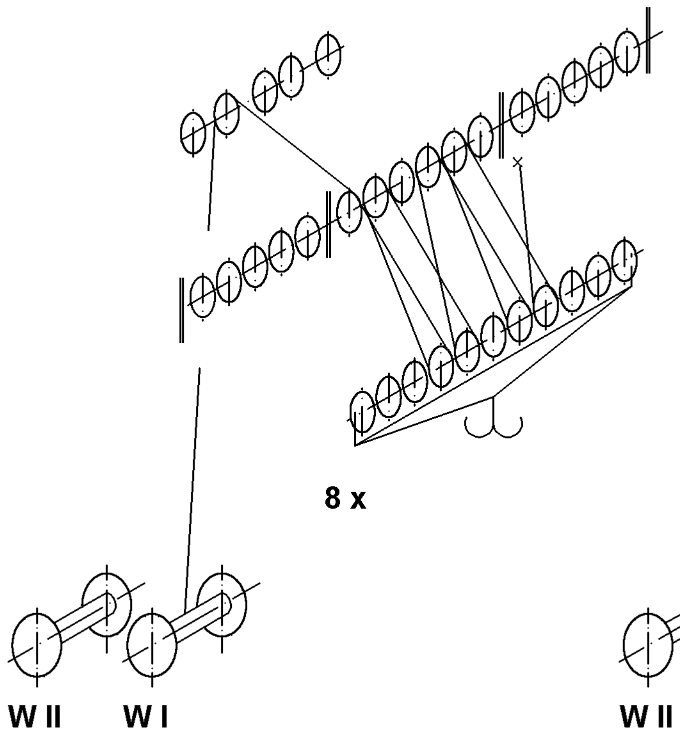

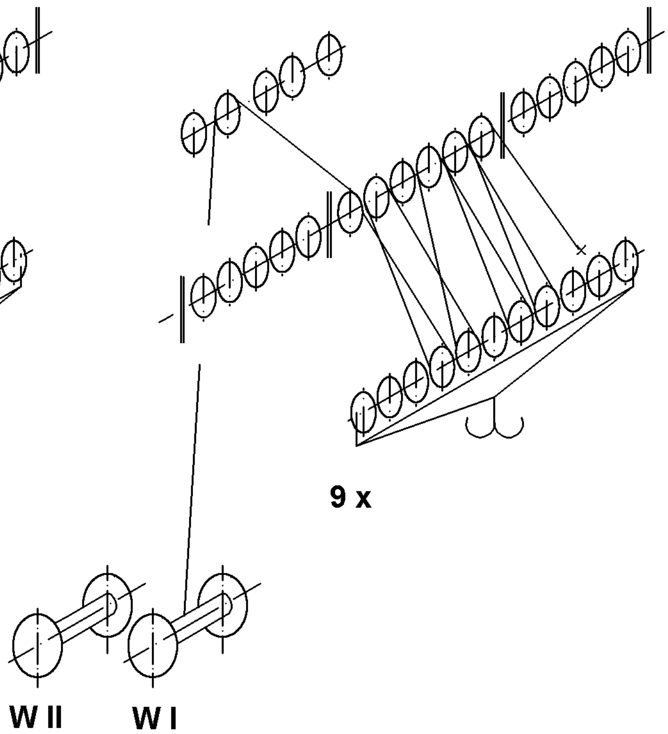

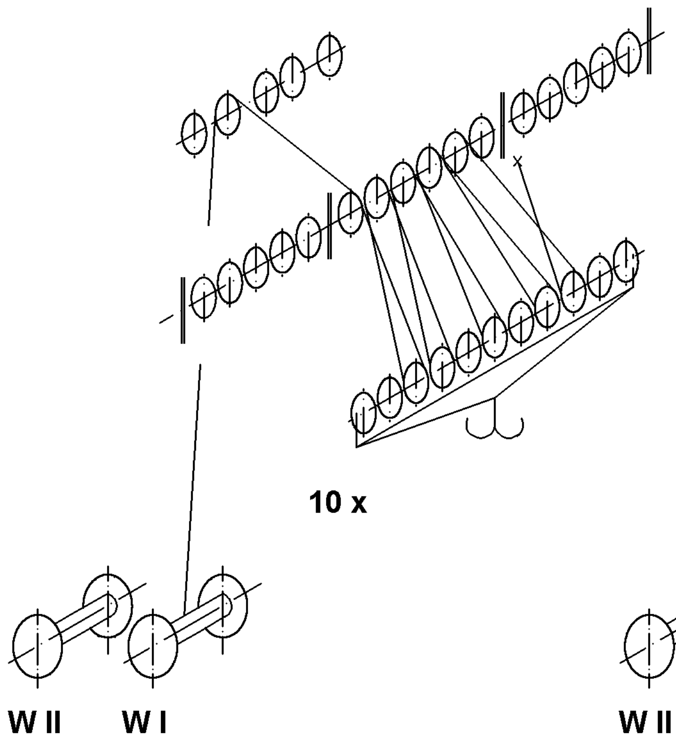

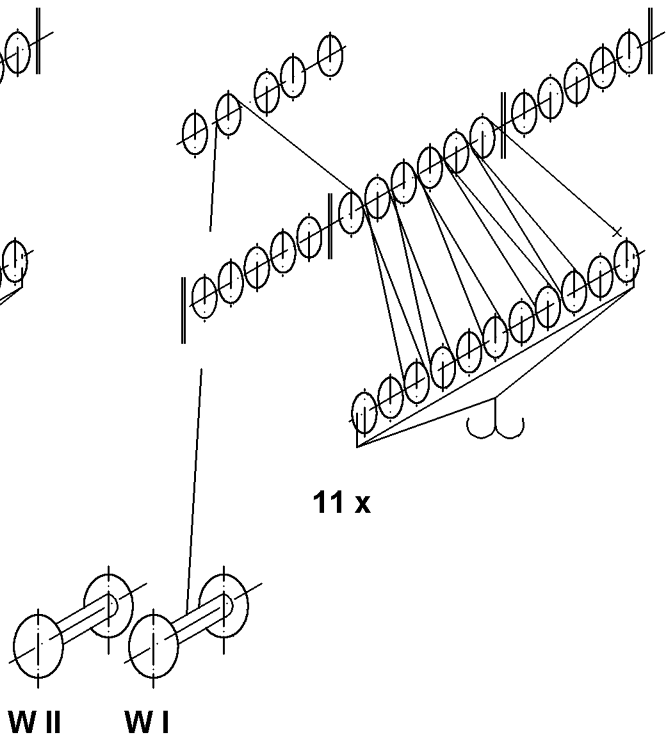

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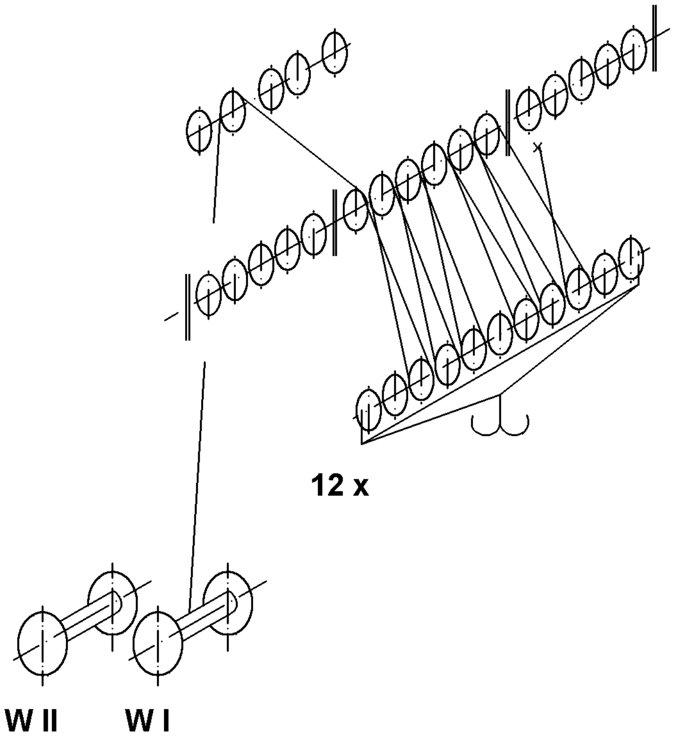

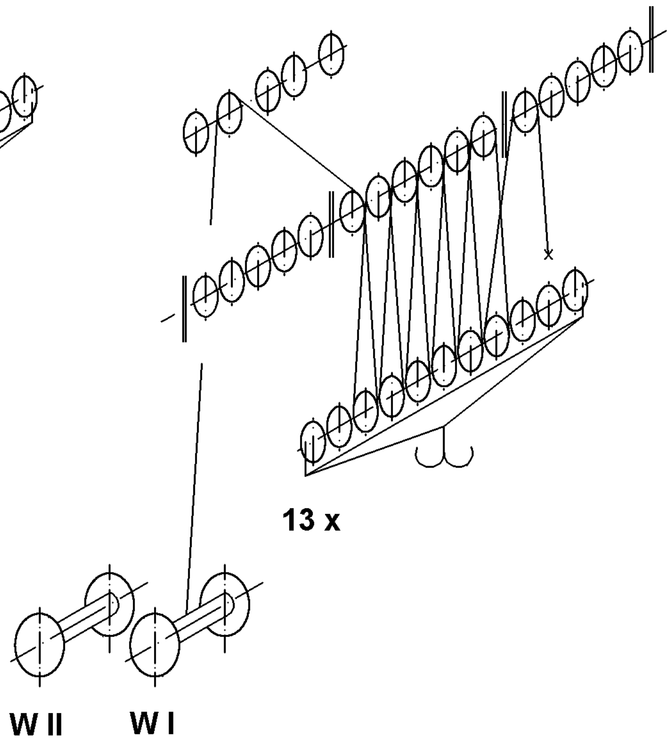

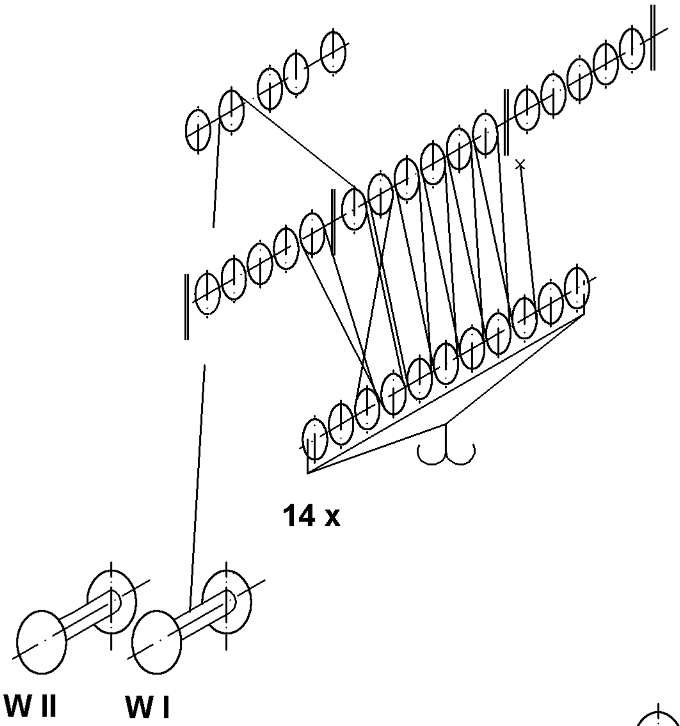

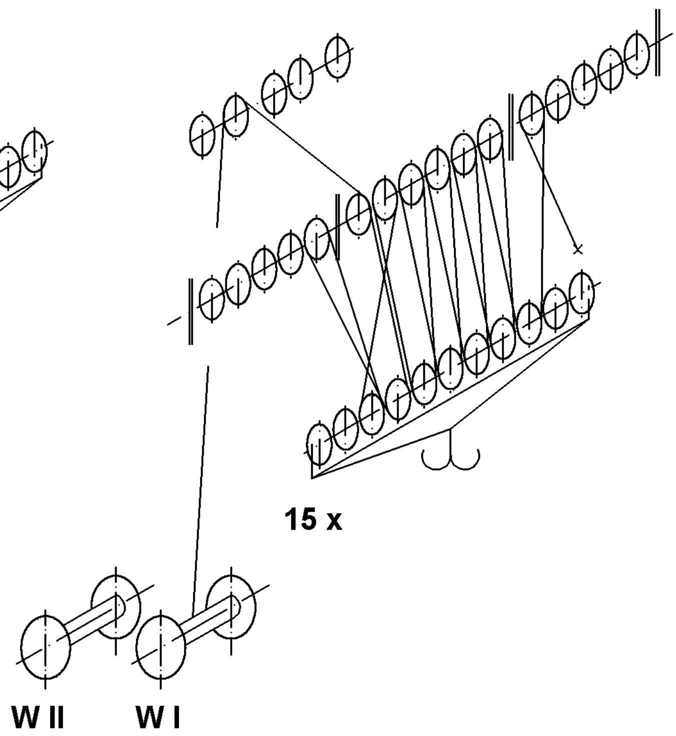

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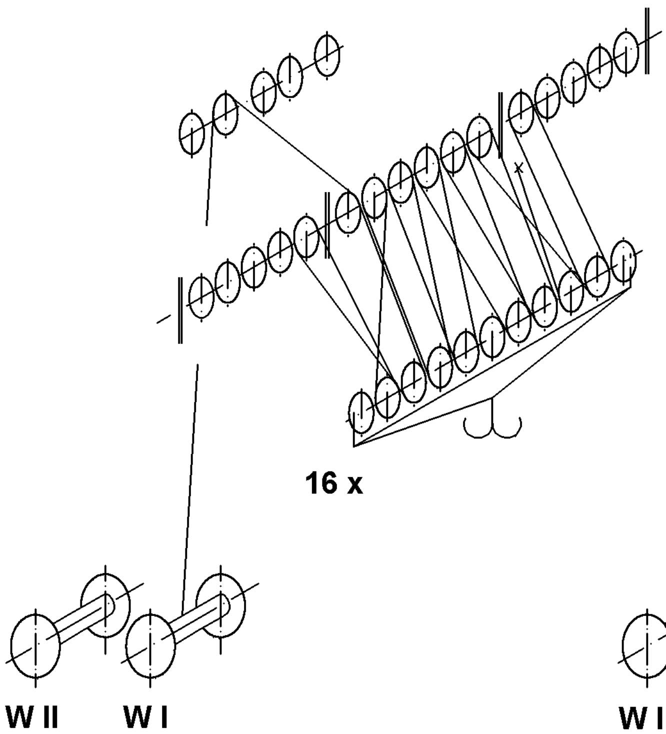

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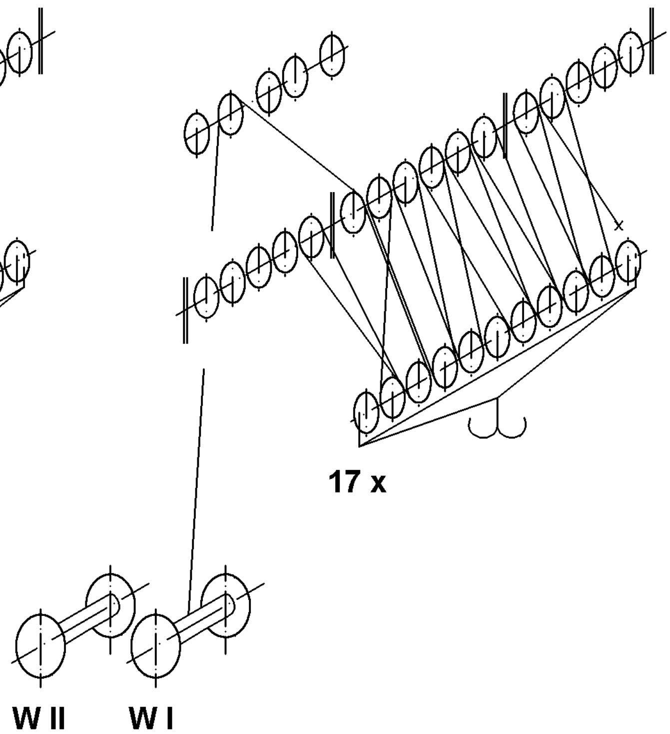

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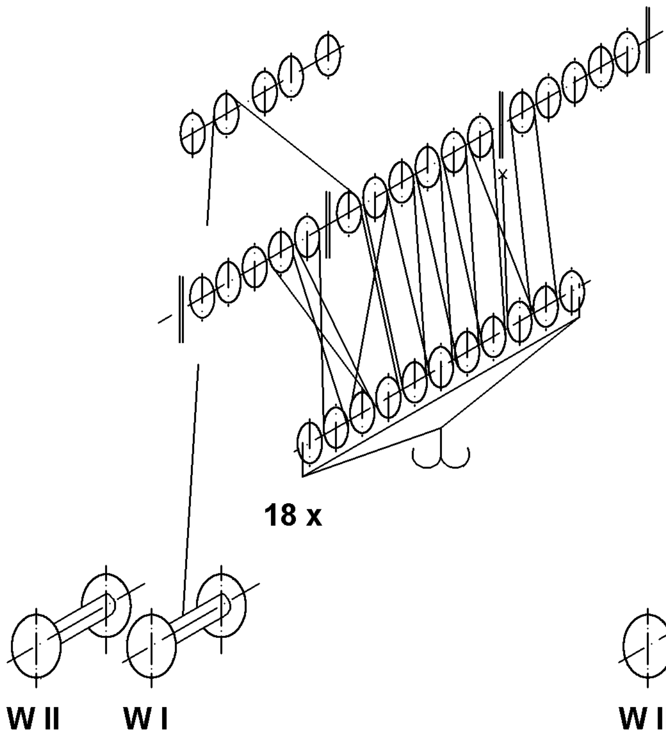

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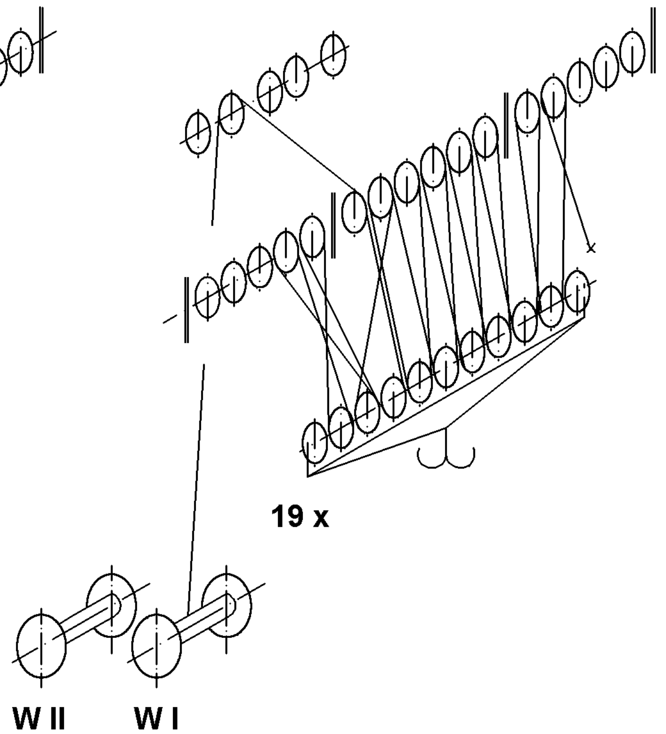

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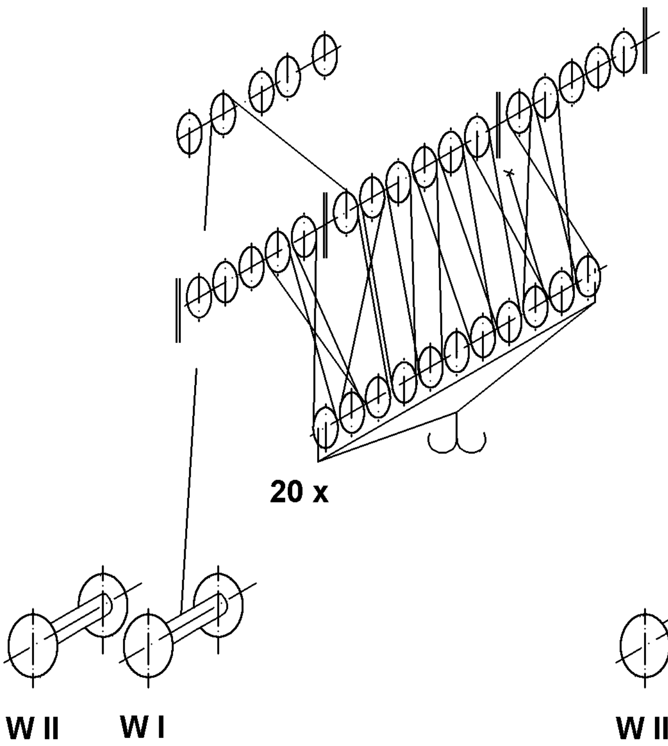
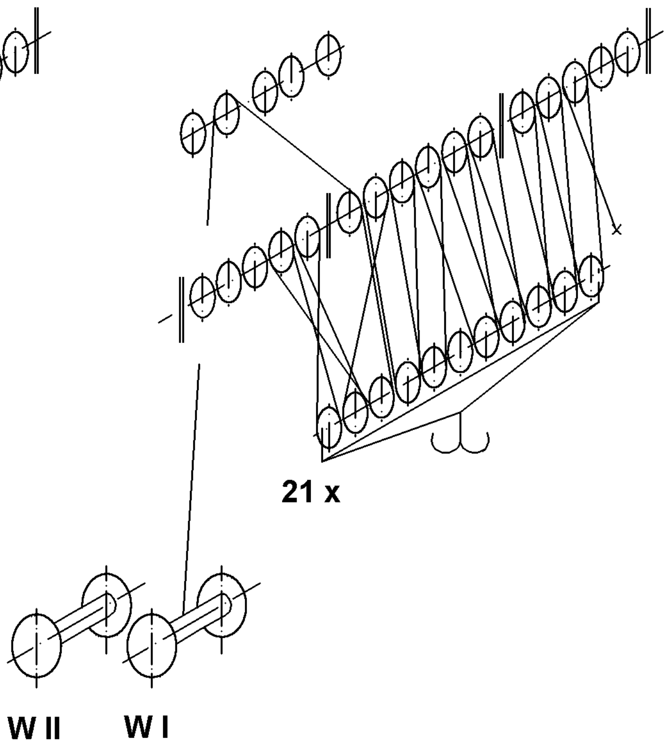
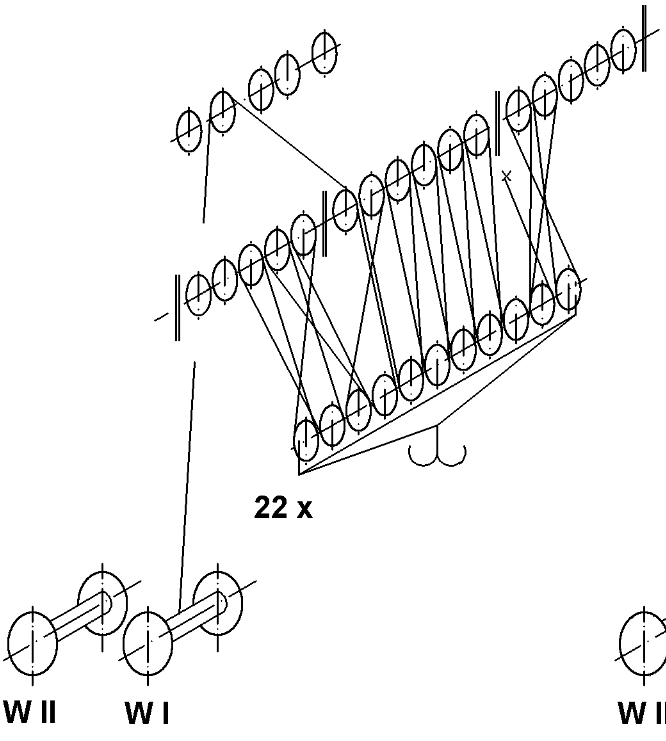
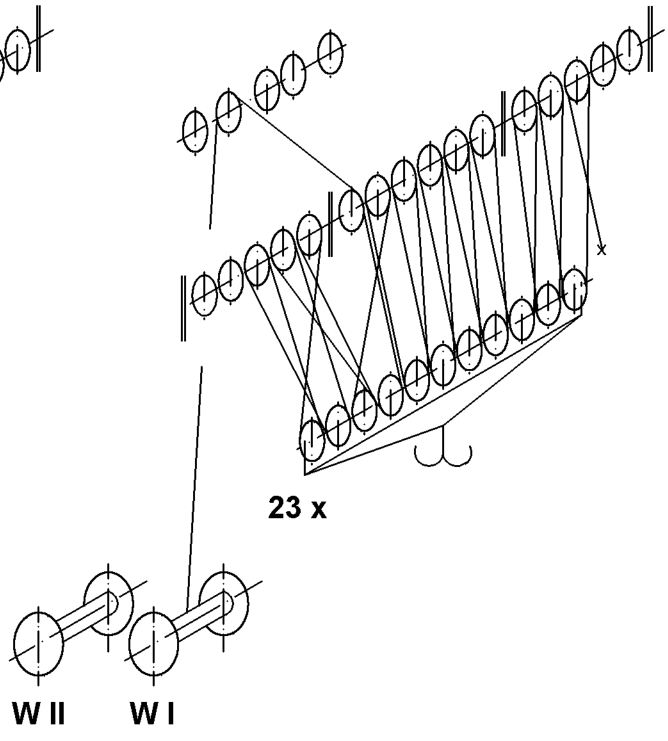








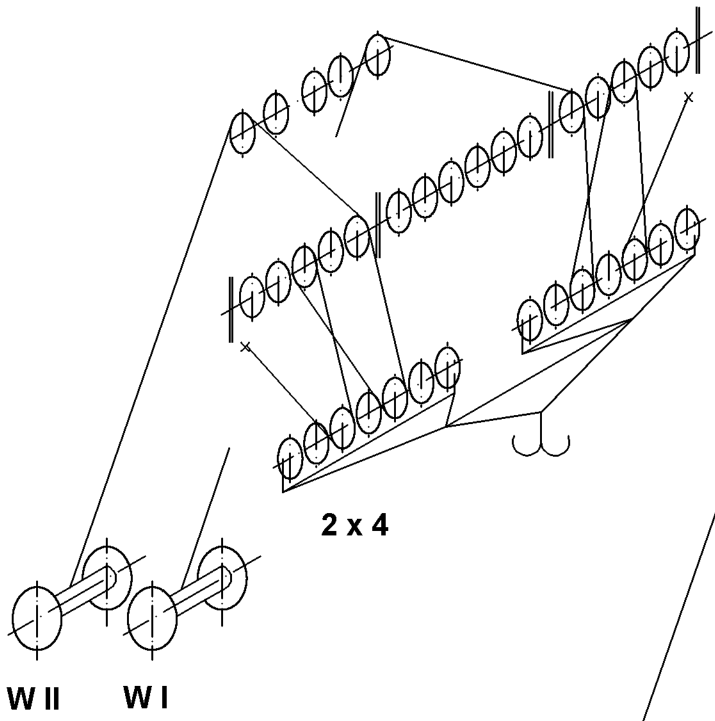
191153

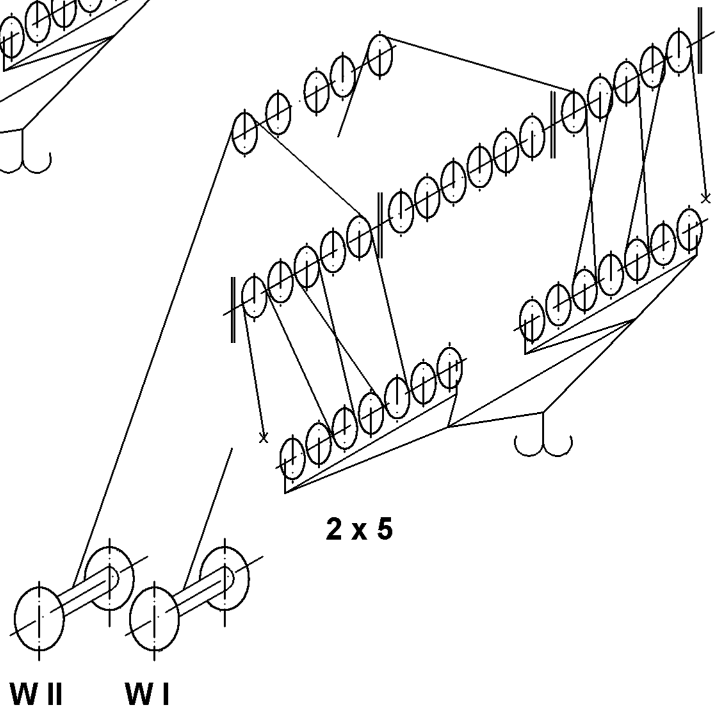
REEVING PLANS

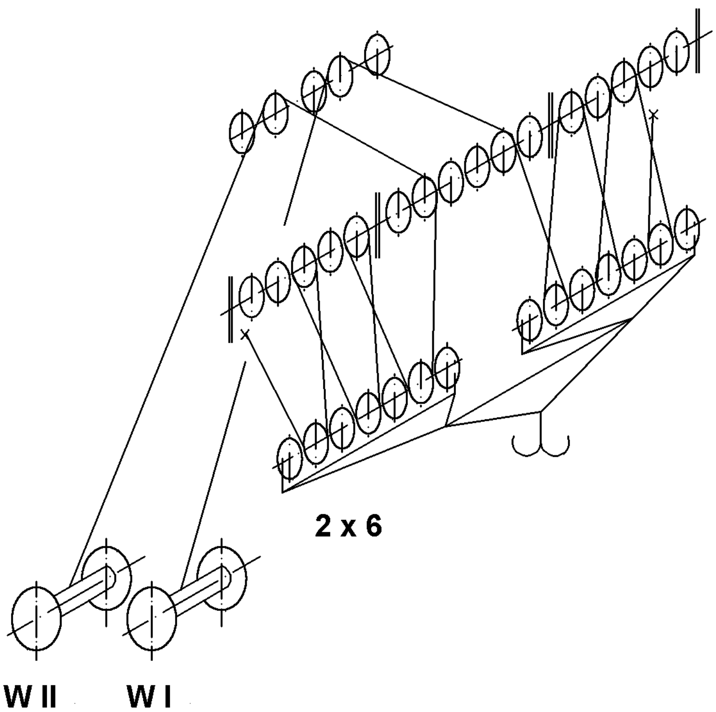
L - Head section (400 t)

400 t - head section - 16 pulley

2×7 - pulley hook block (400 t hook block)







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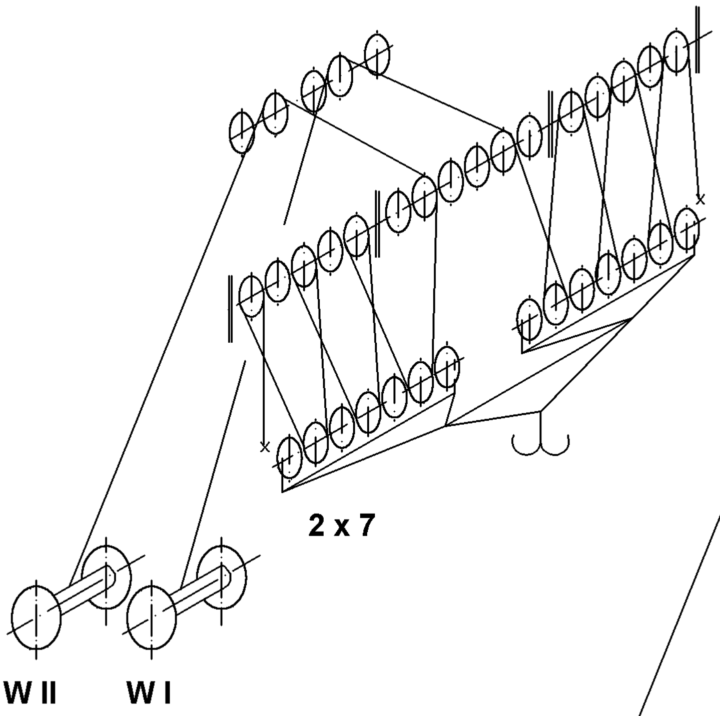

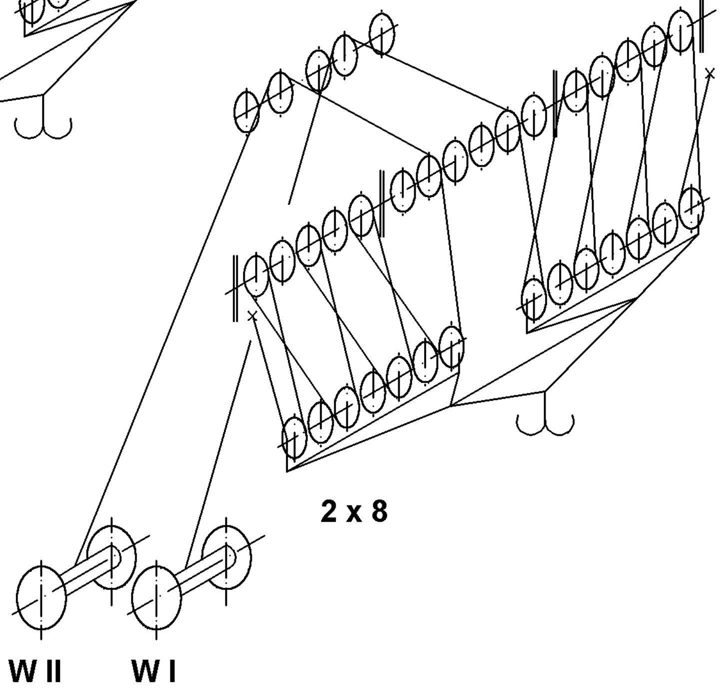

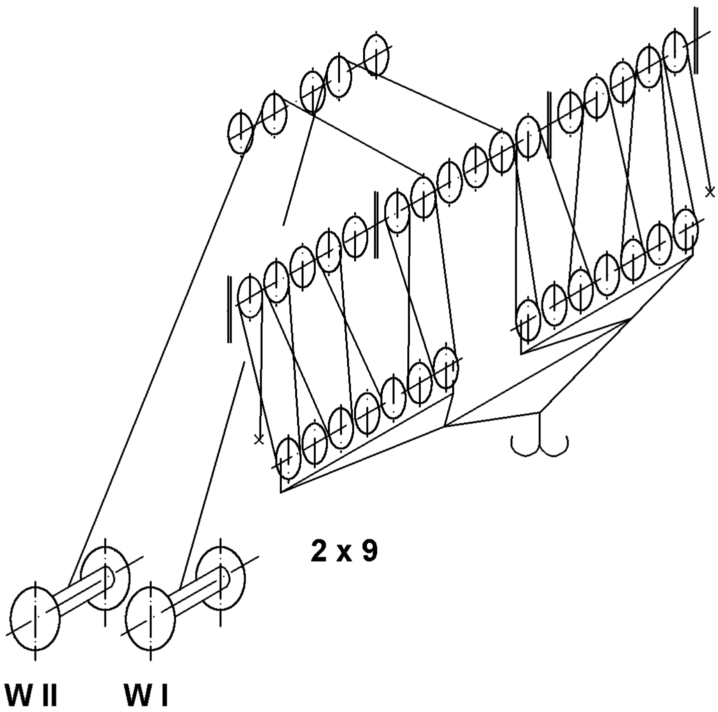

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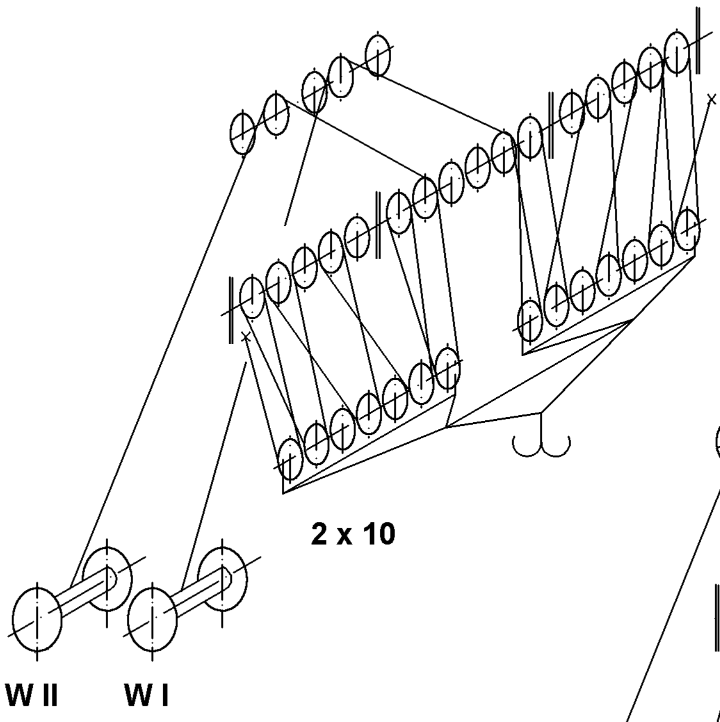

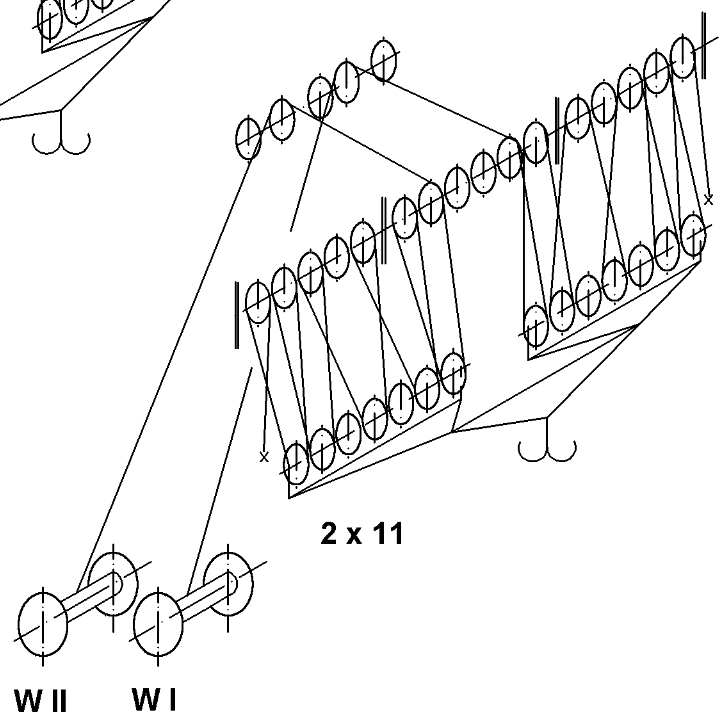

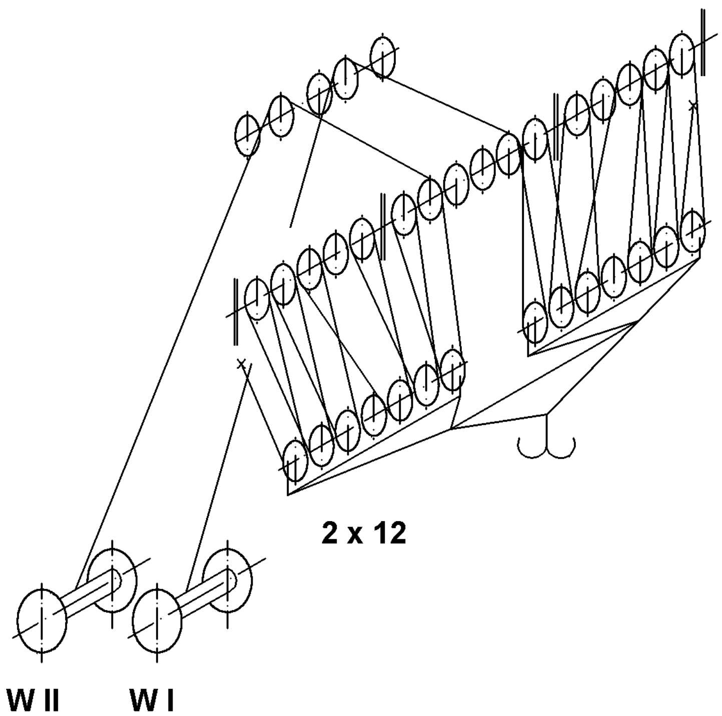

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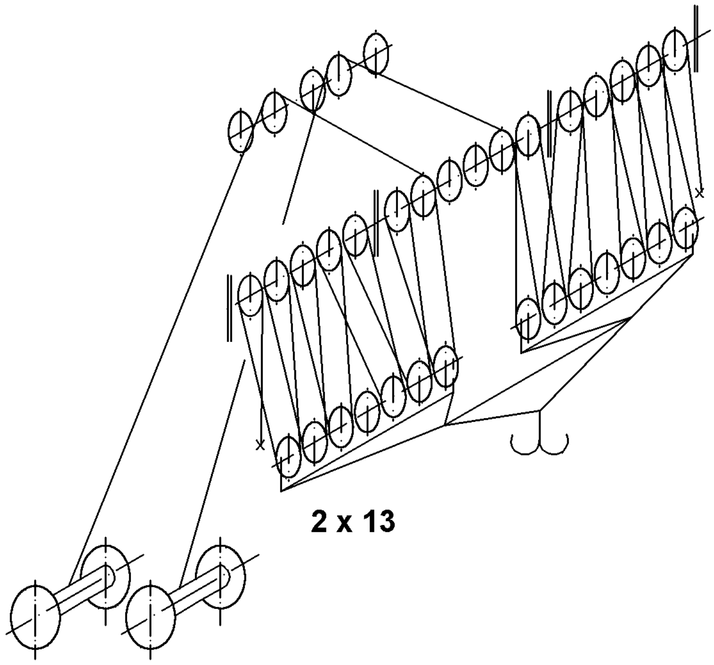
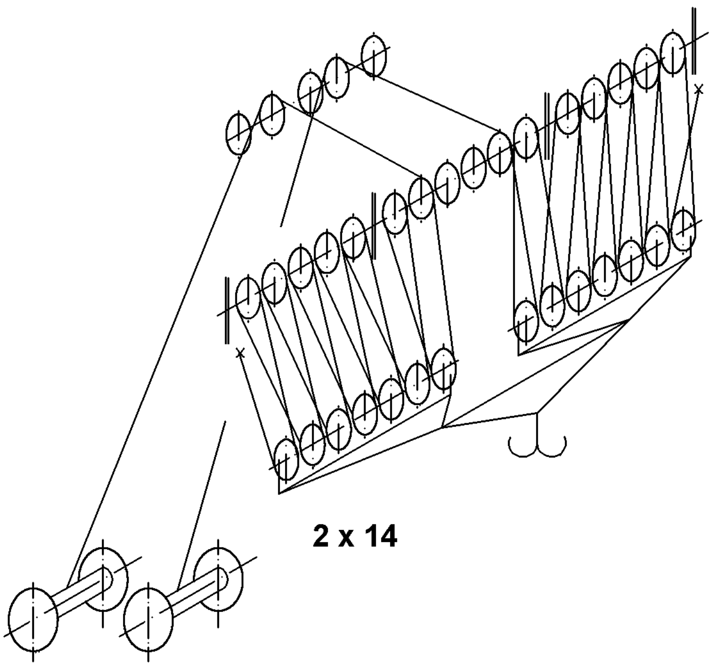




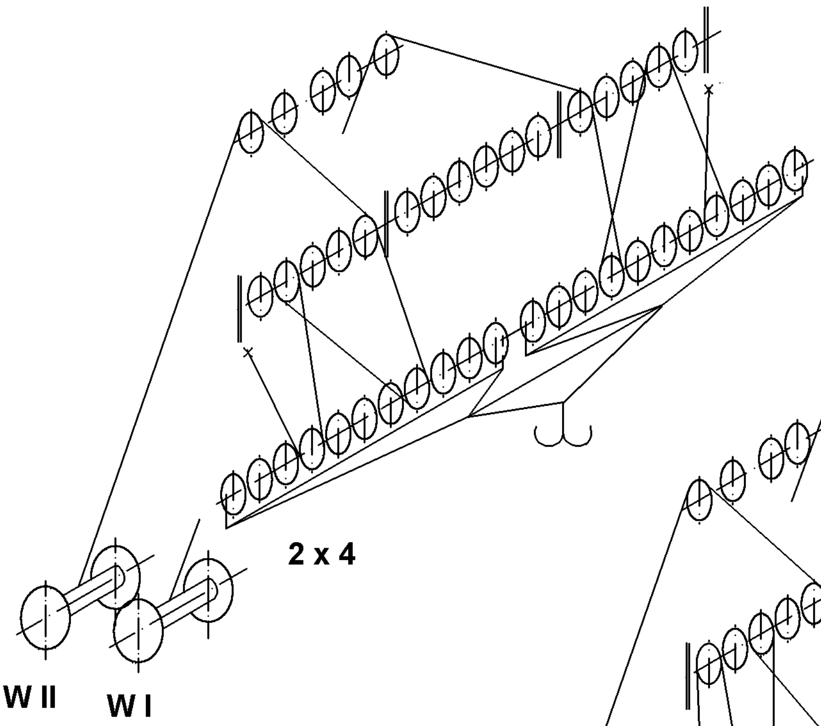
191157

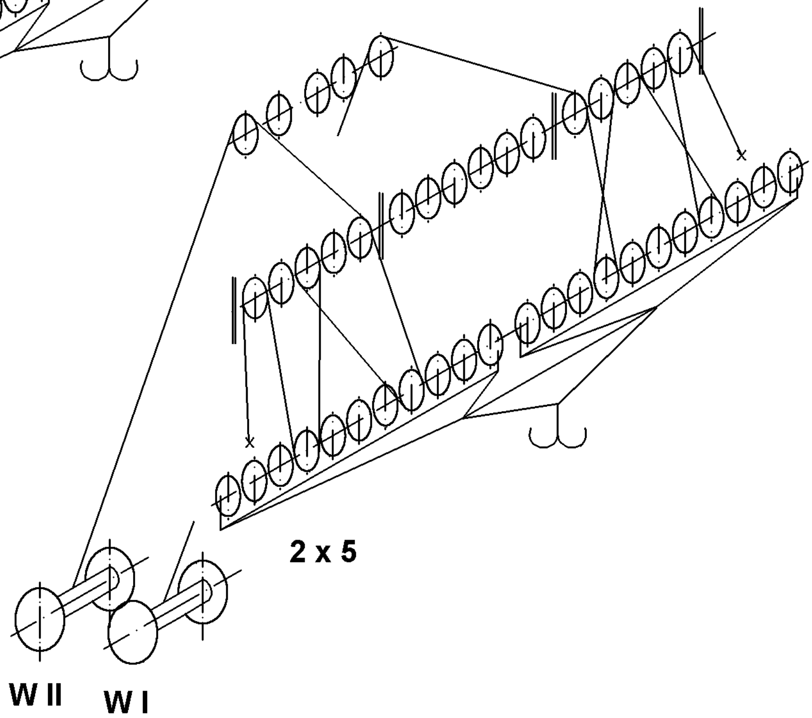
REEVING PLANS

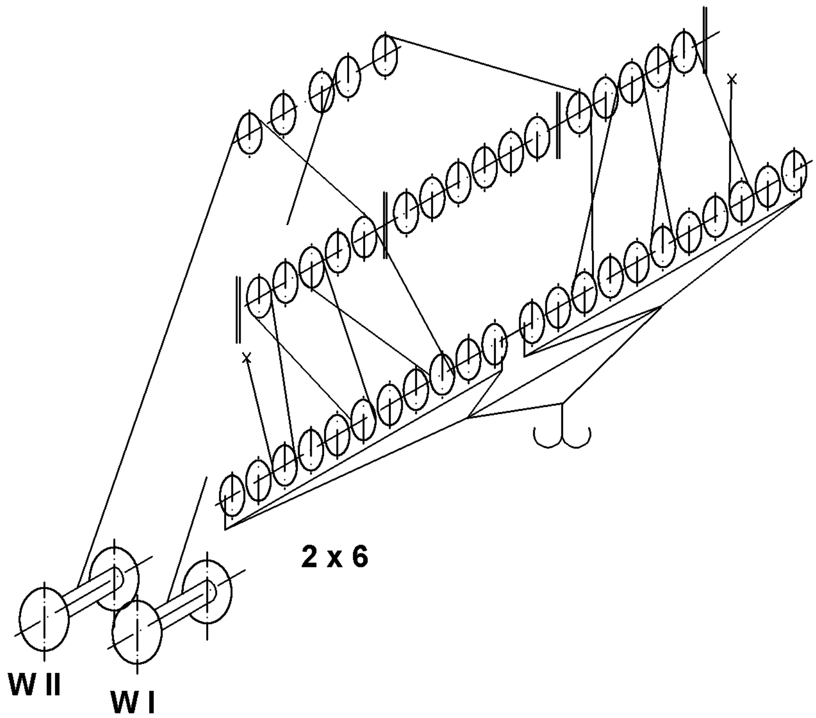
L - Head section (400 t)

400 t - head section - 16 pulley

2×11 - pulley hook block (600 t hook block)







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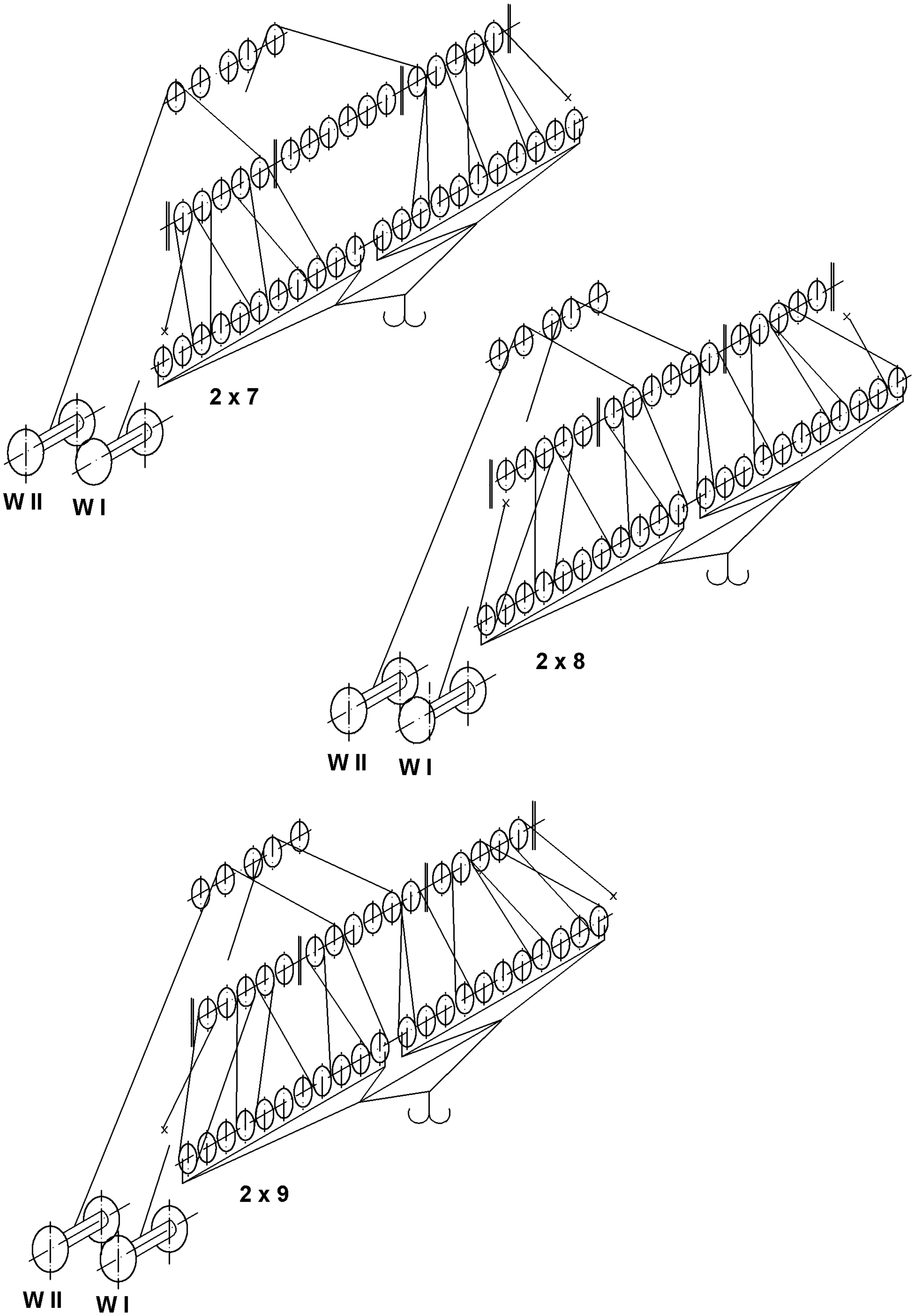

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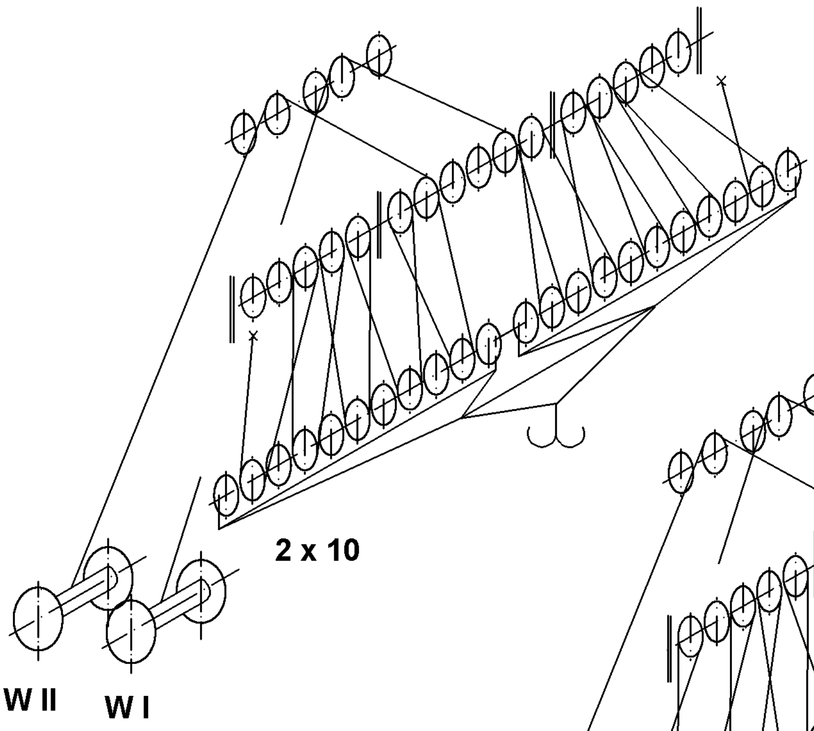

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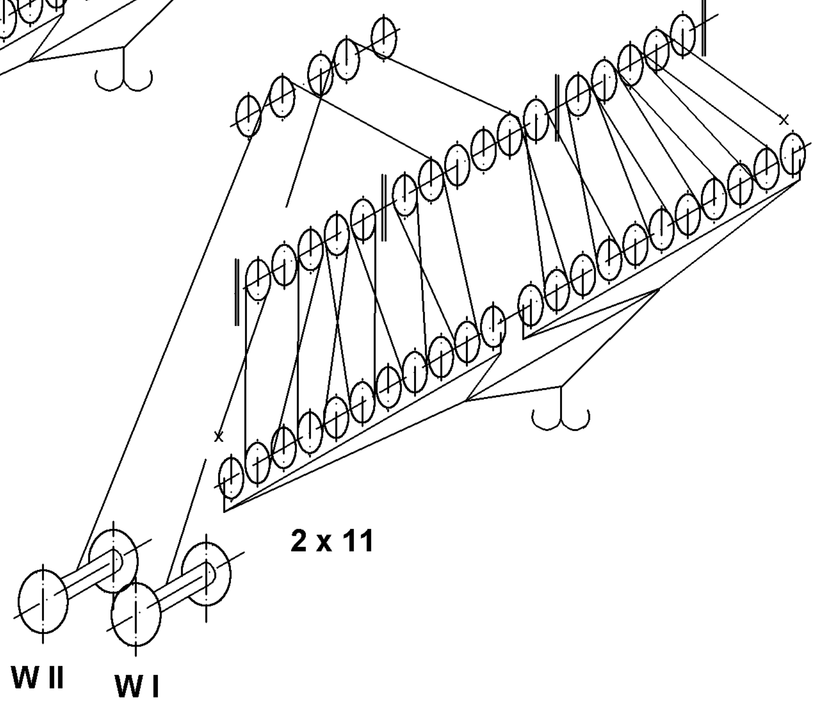

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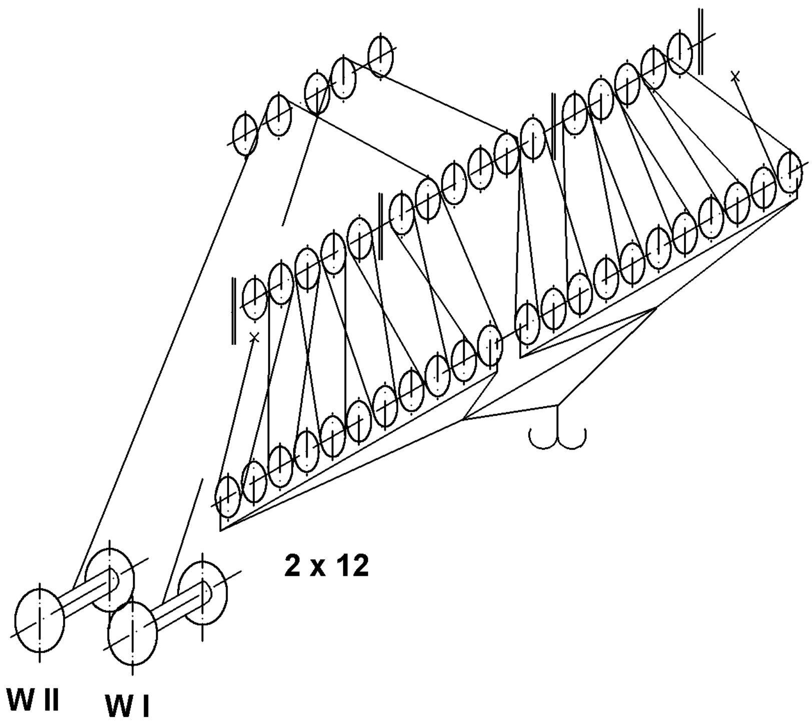

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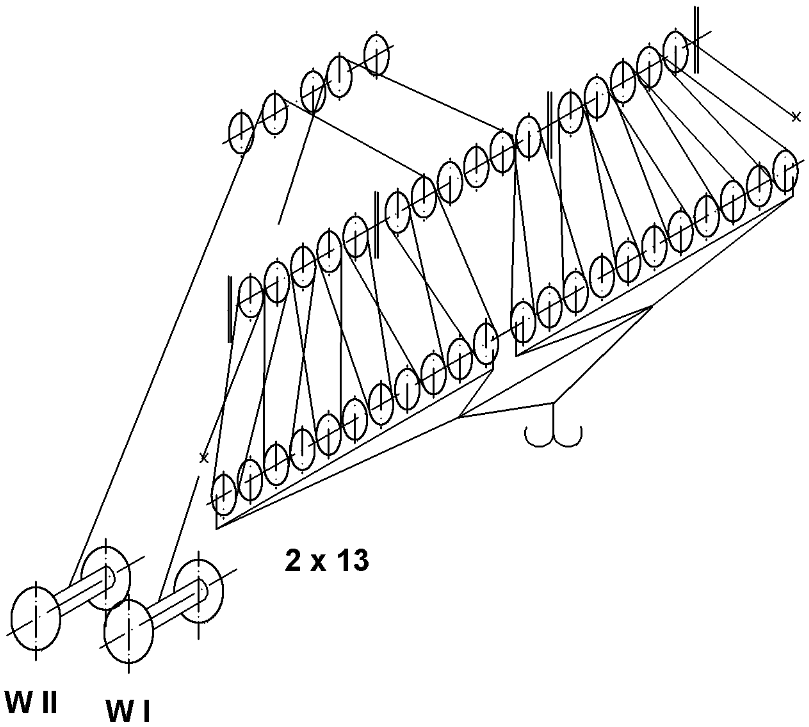
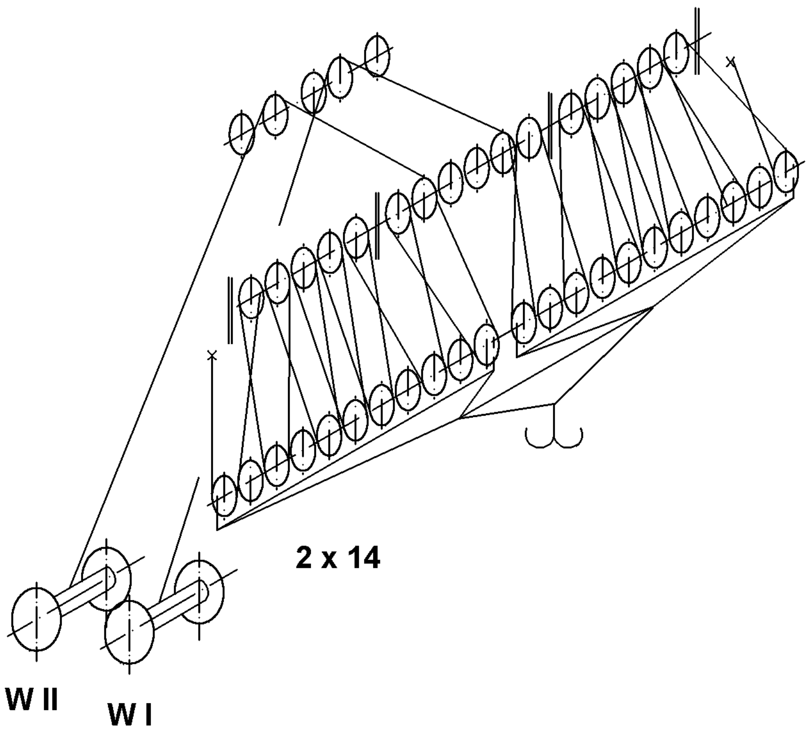




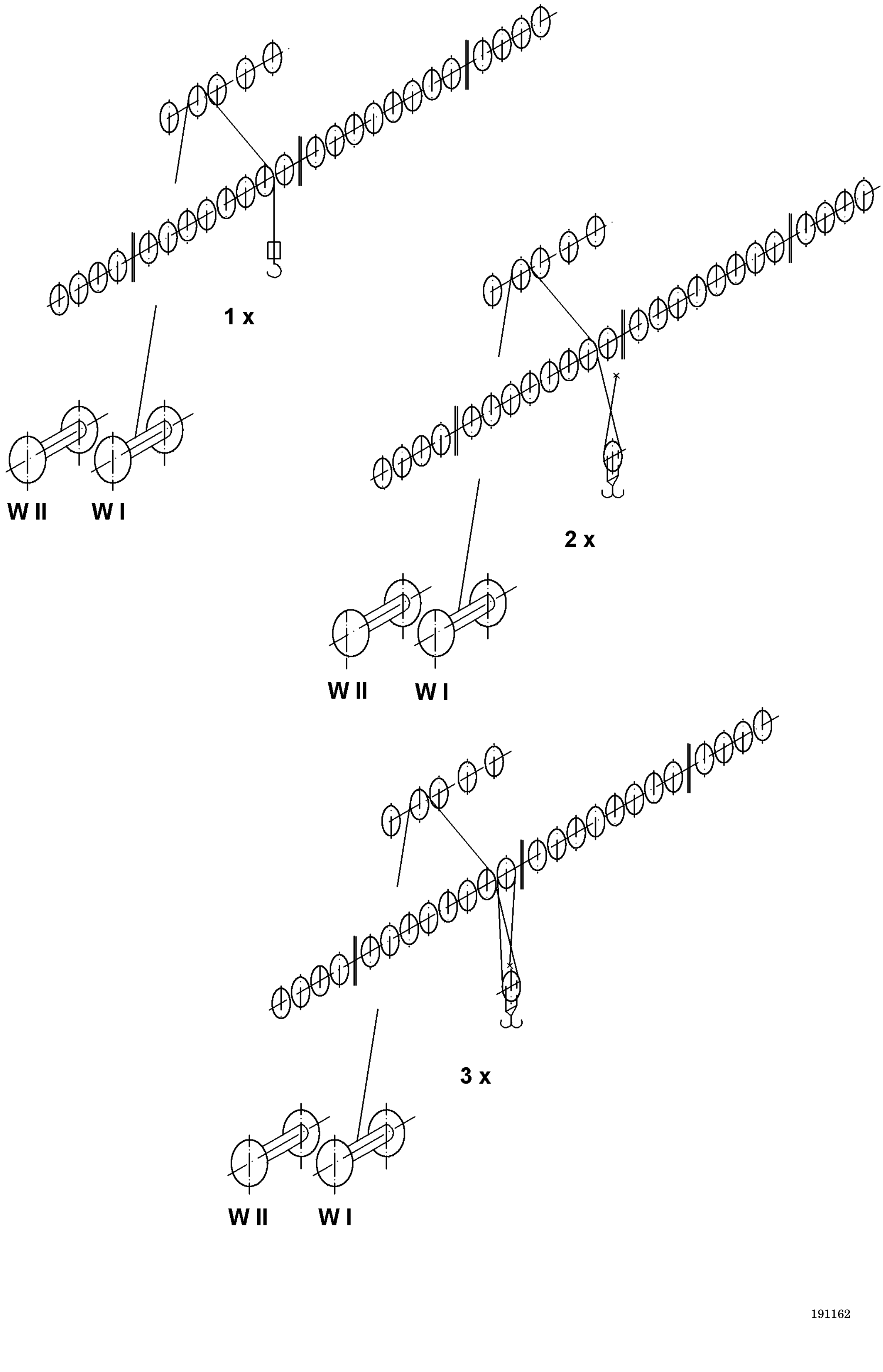
191161

REEVING PLANS

S - Head section (400 / 600 t)

Head section - 24 pulley

Load hook	16 t
1 - pulley hook block,	47 t hook block
3 - pulley hook block,	107 t hook block
7 - pulley hook block,	215 t hook block



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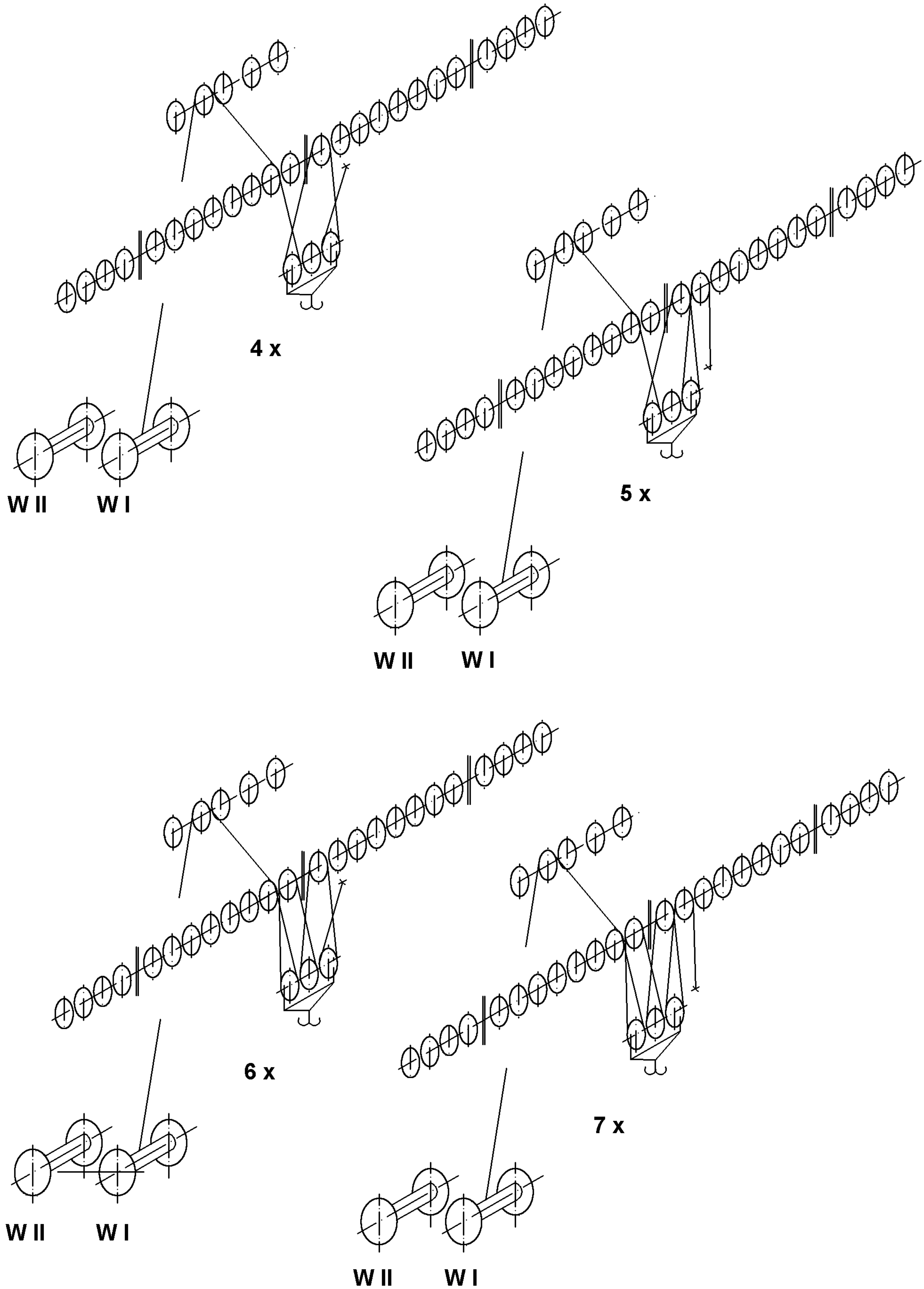

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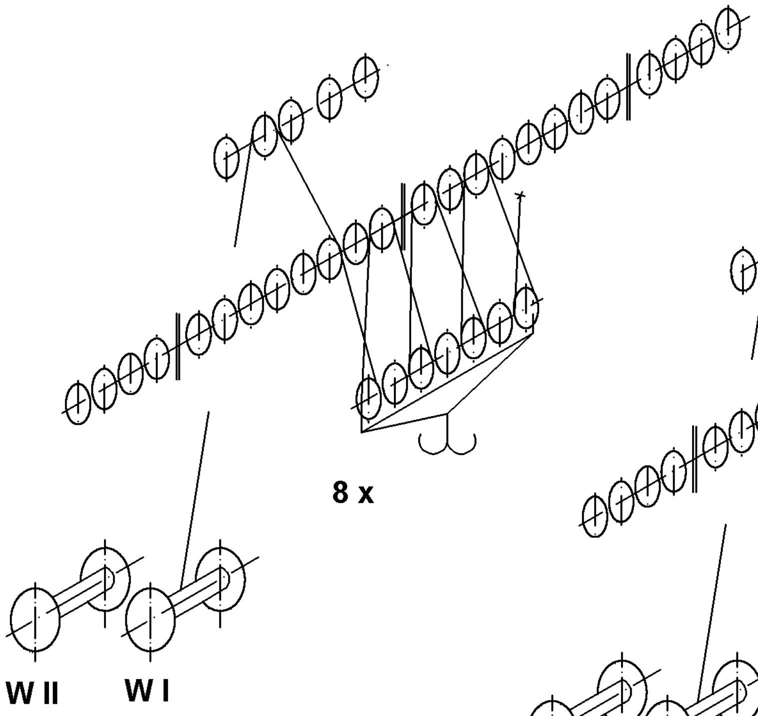

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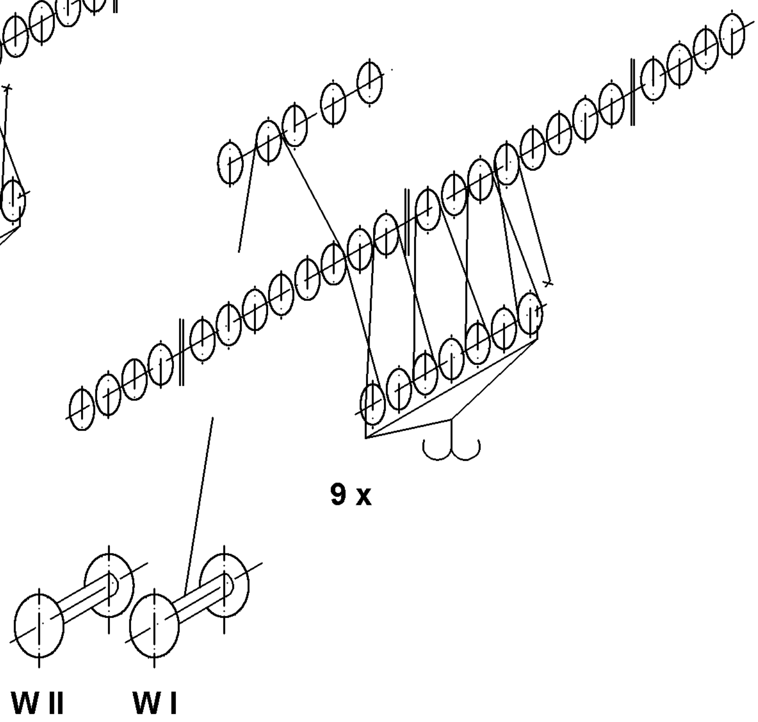

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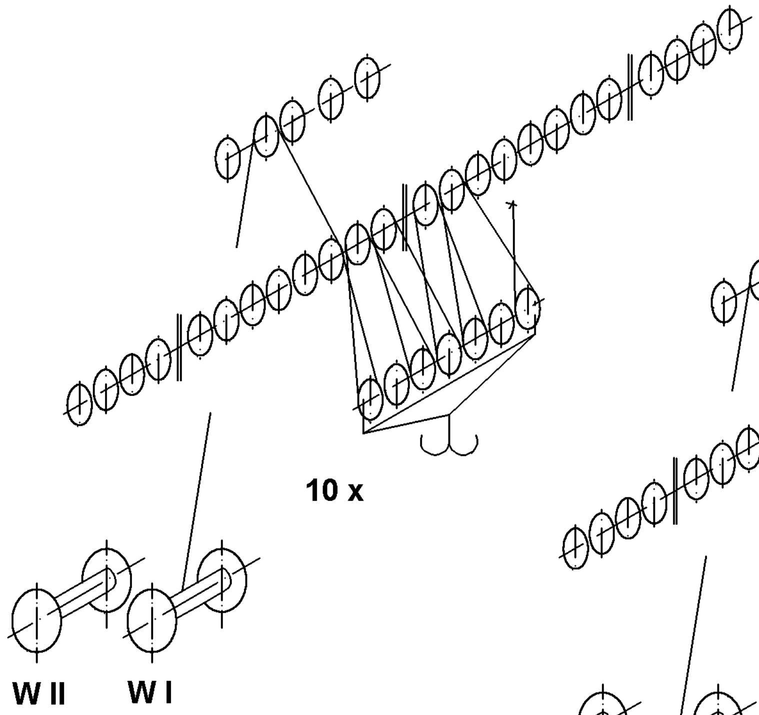

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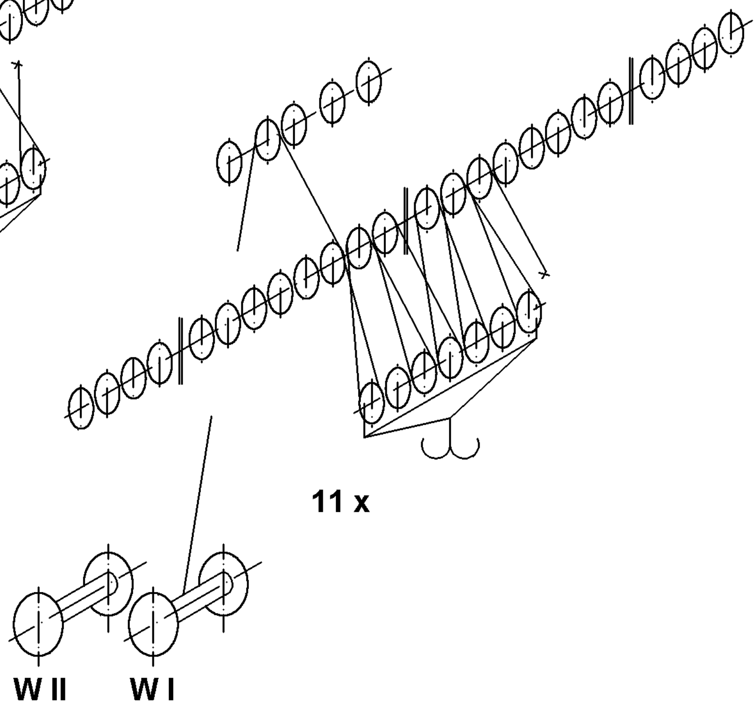

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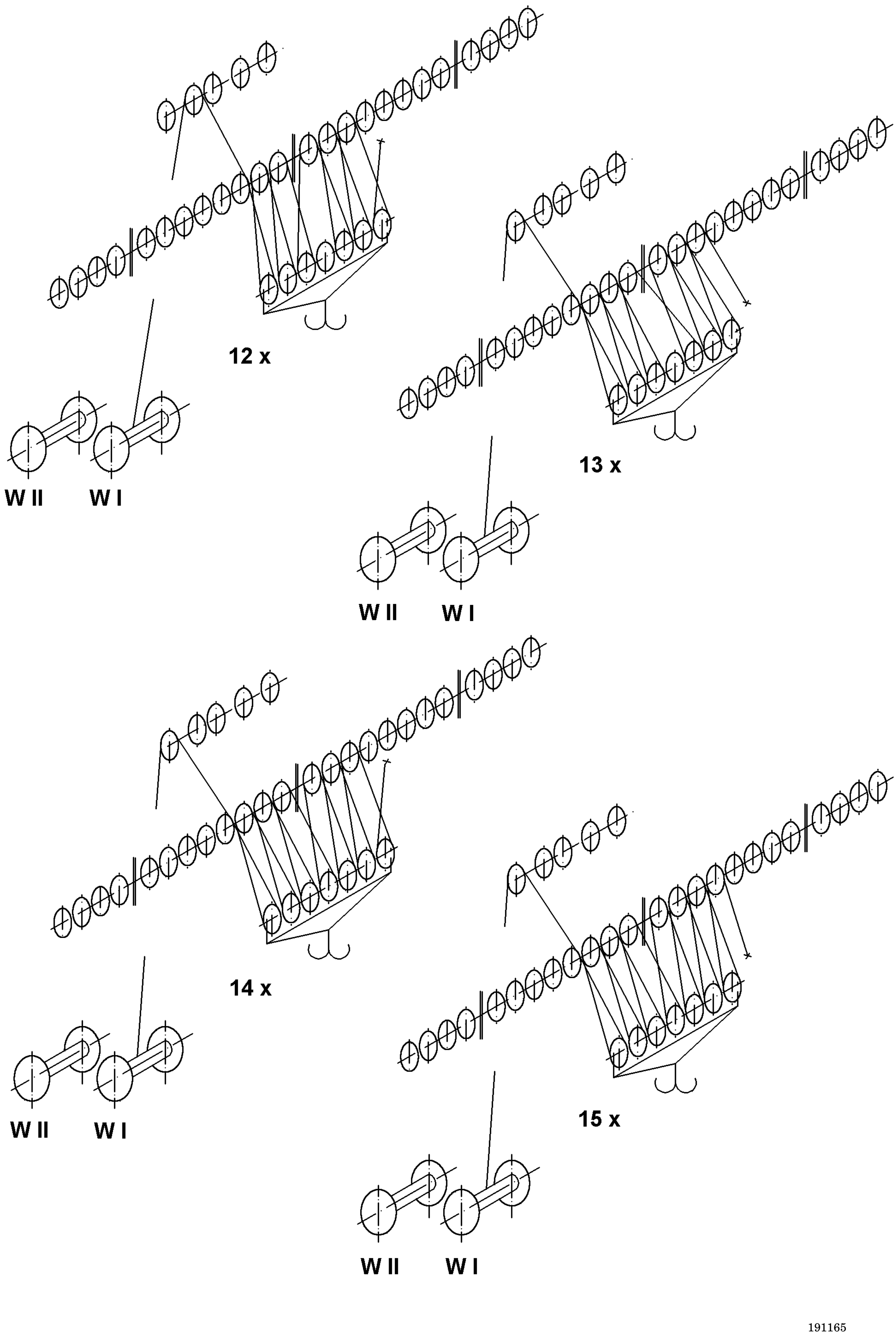
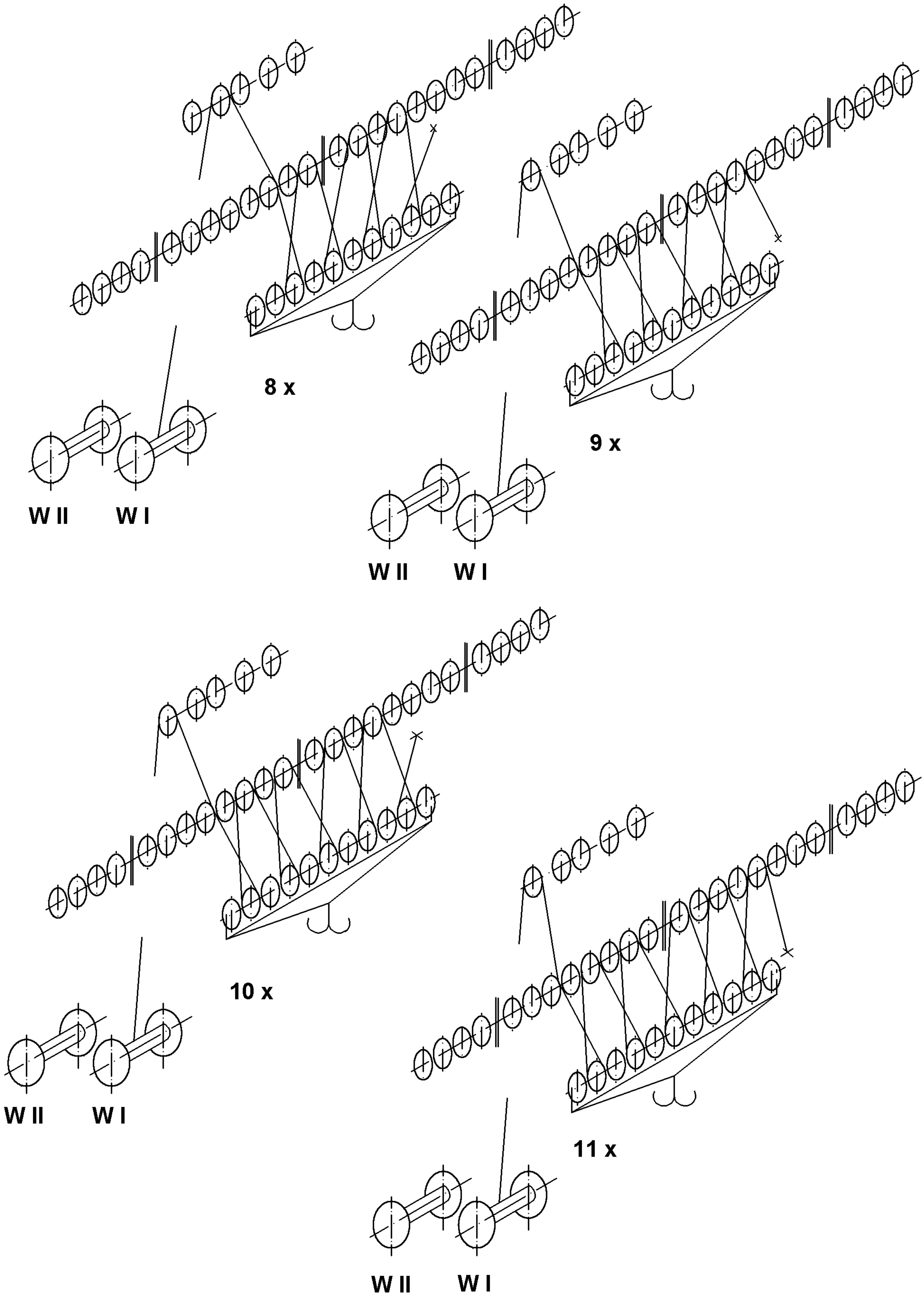

12 x
W II
W I
13 x
W II
W I
14 x
W II
W I
15 x
W II
W I
191165

REEVING PLANS

S - Head section (400 / 600 t)

Head section - 24 pulley

11 - pulley hook block, 312 t hook block



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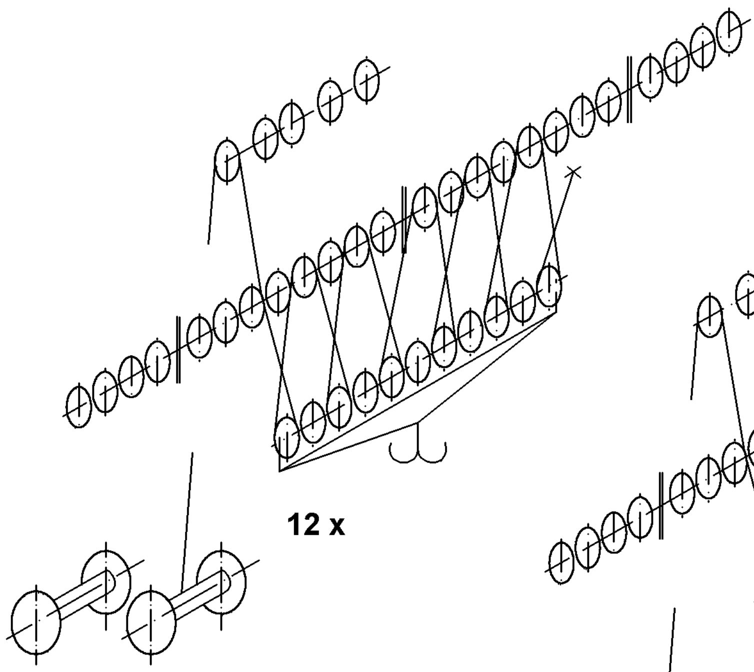

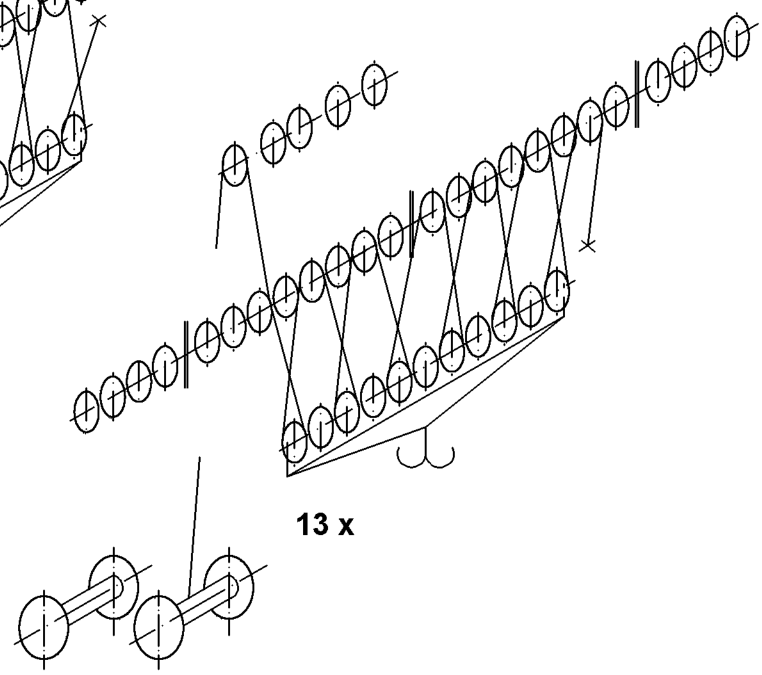

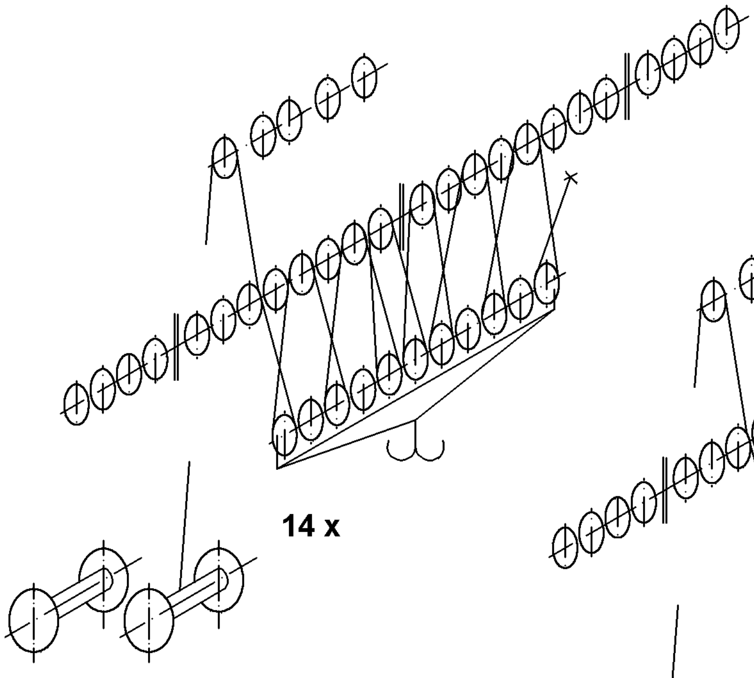

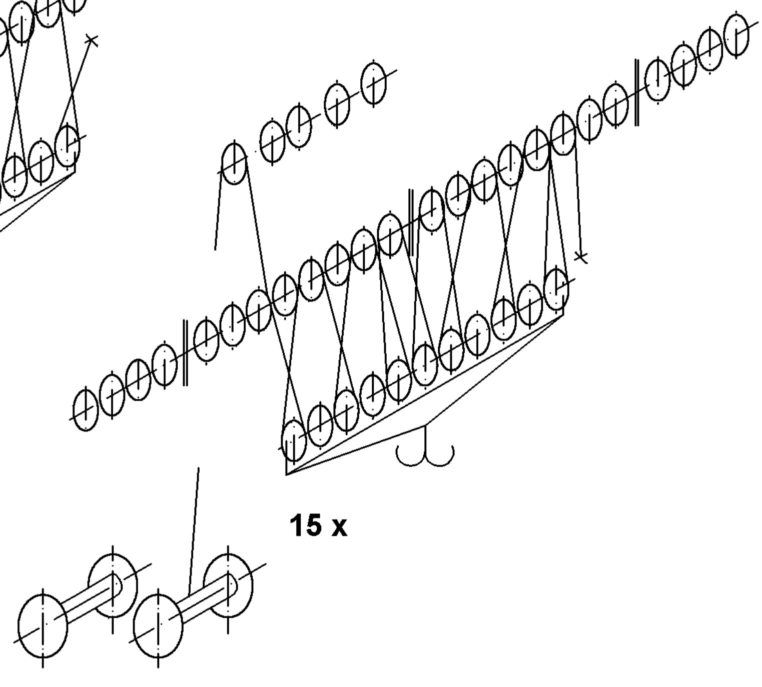

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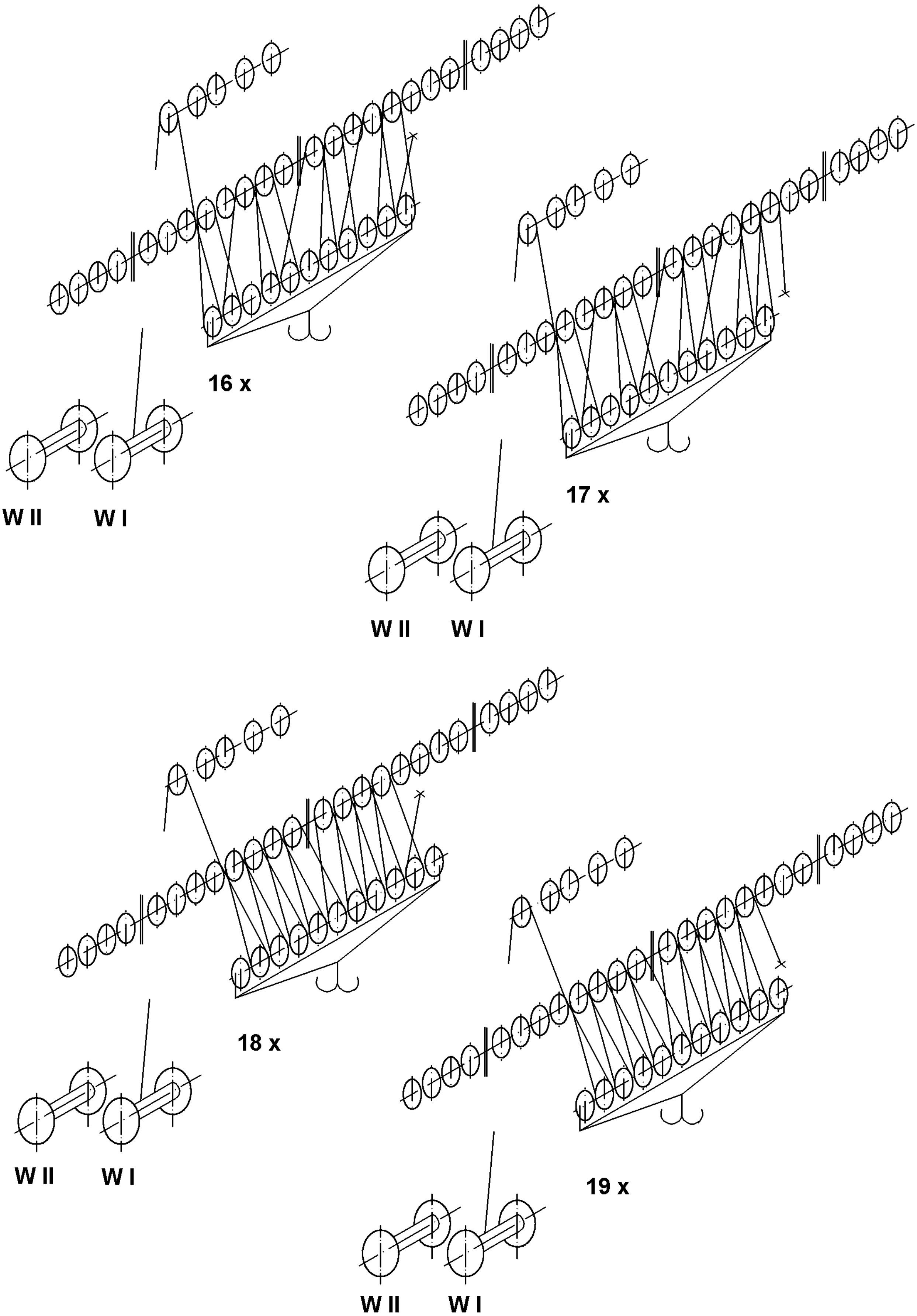

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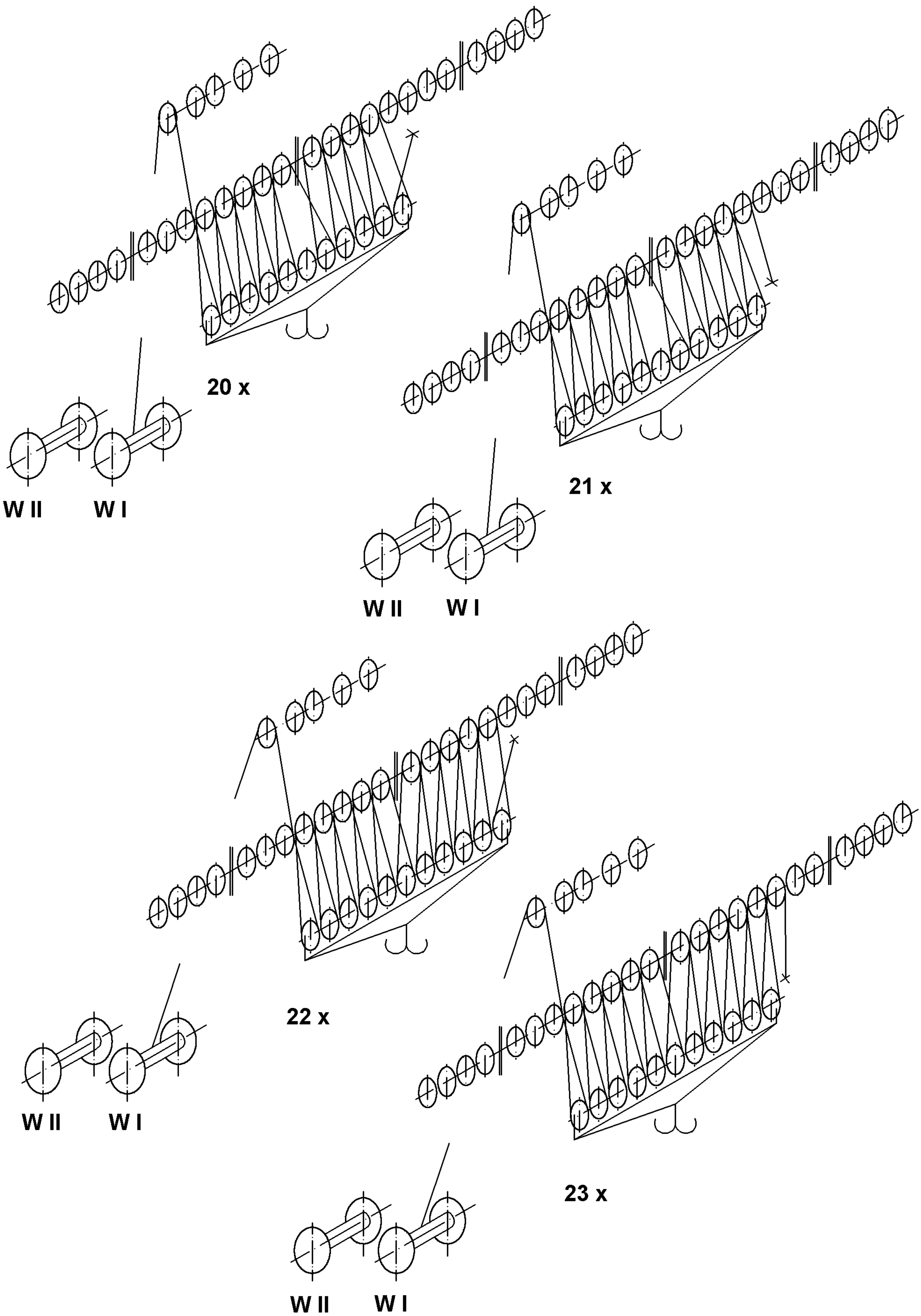


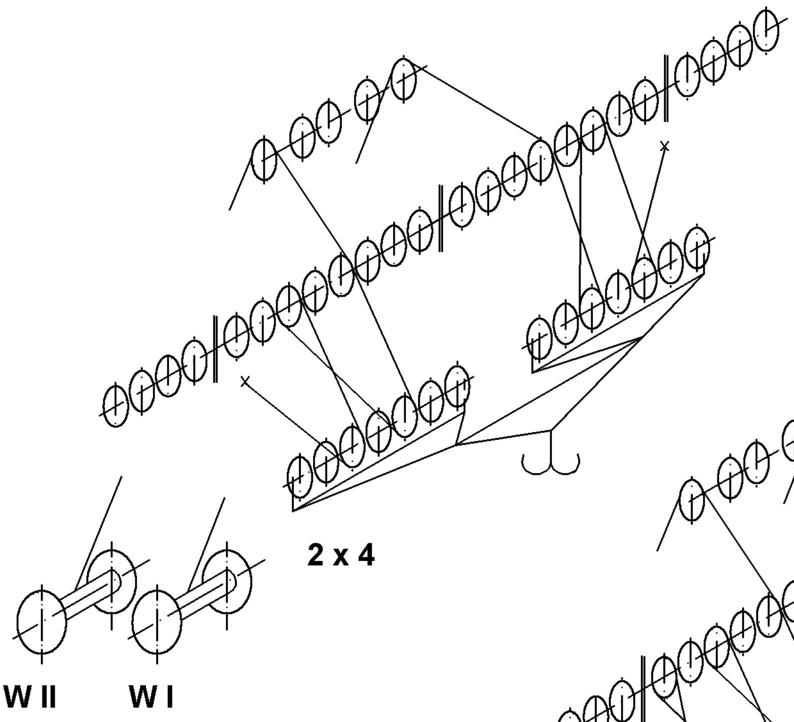
191169

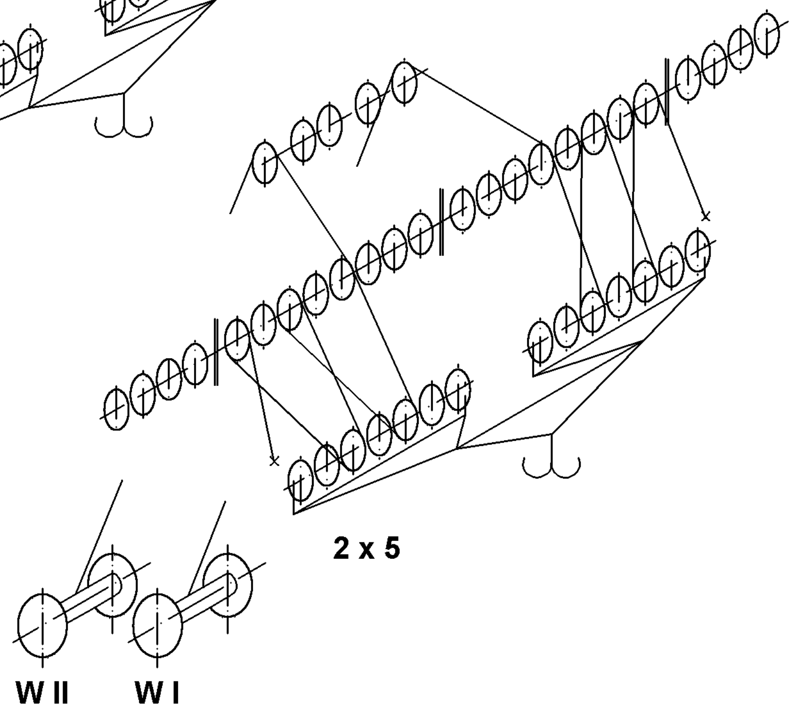
REEVING PLANS

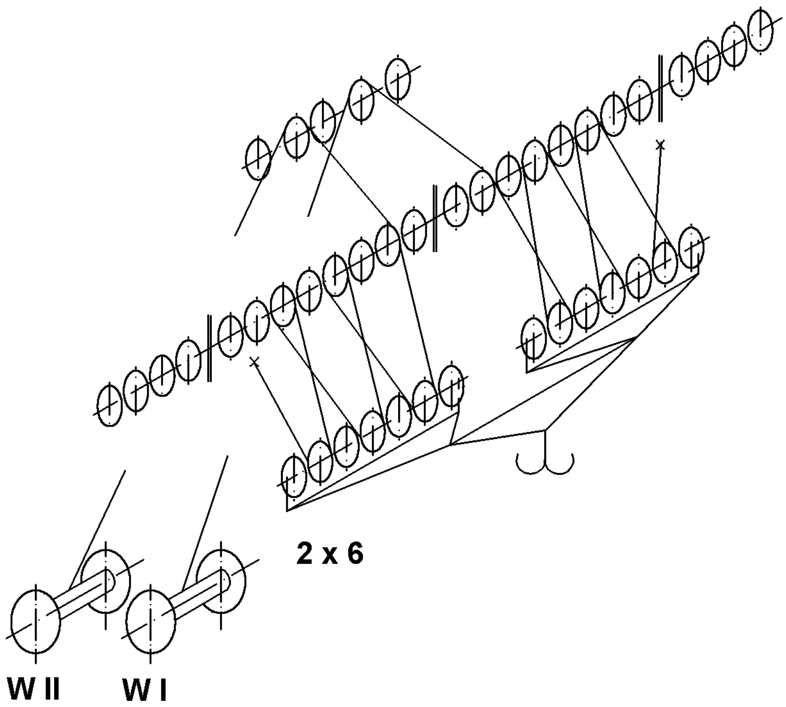
S - Head section (400 / 600 t)

Head section - 24 pulley

2×7 - pulley hook block (400 t hook block)







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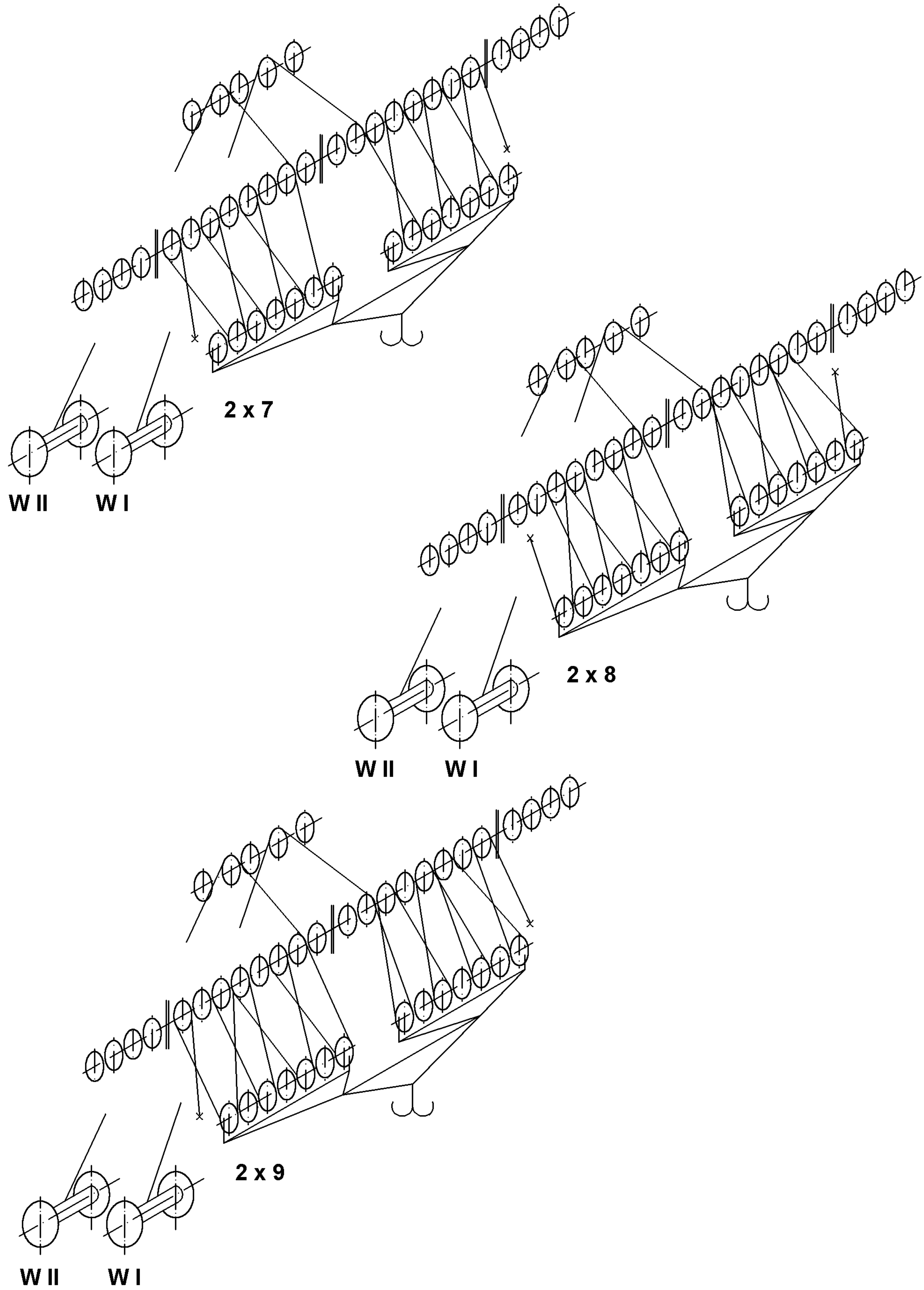

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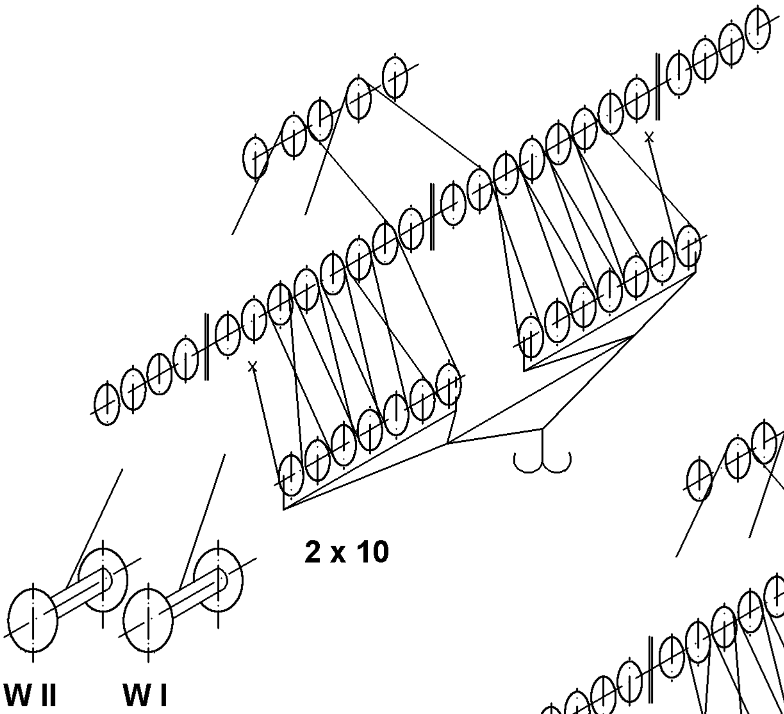

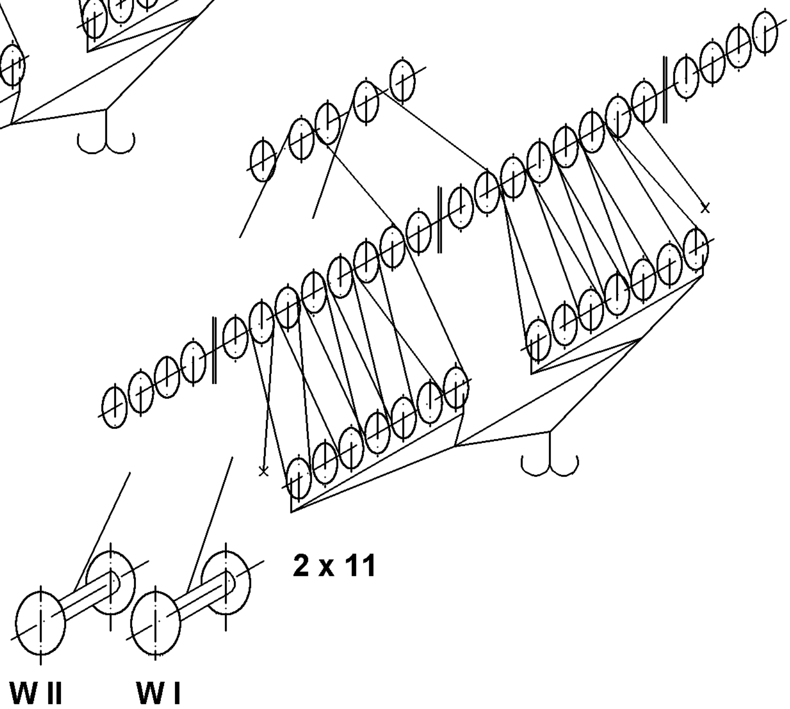

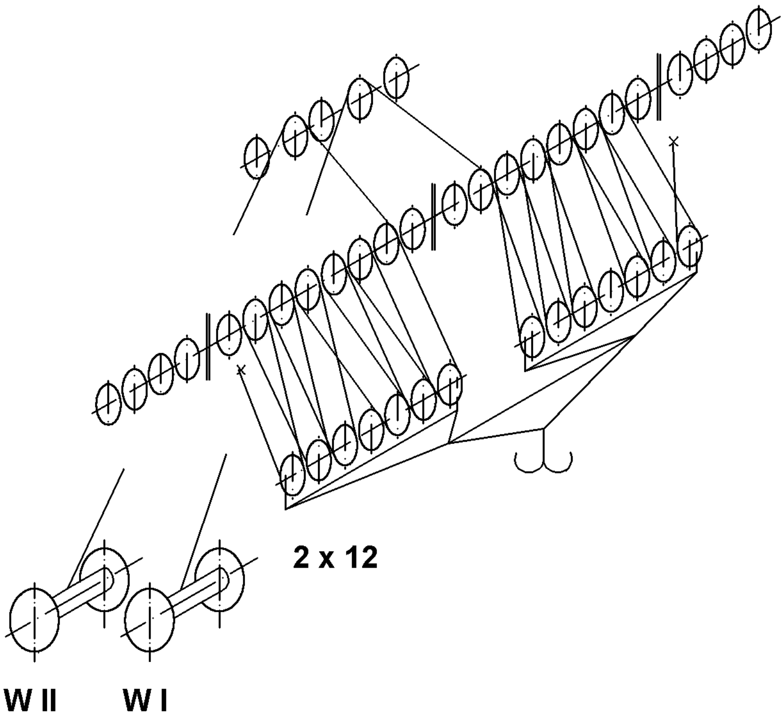

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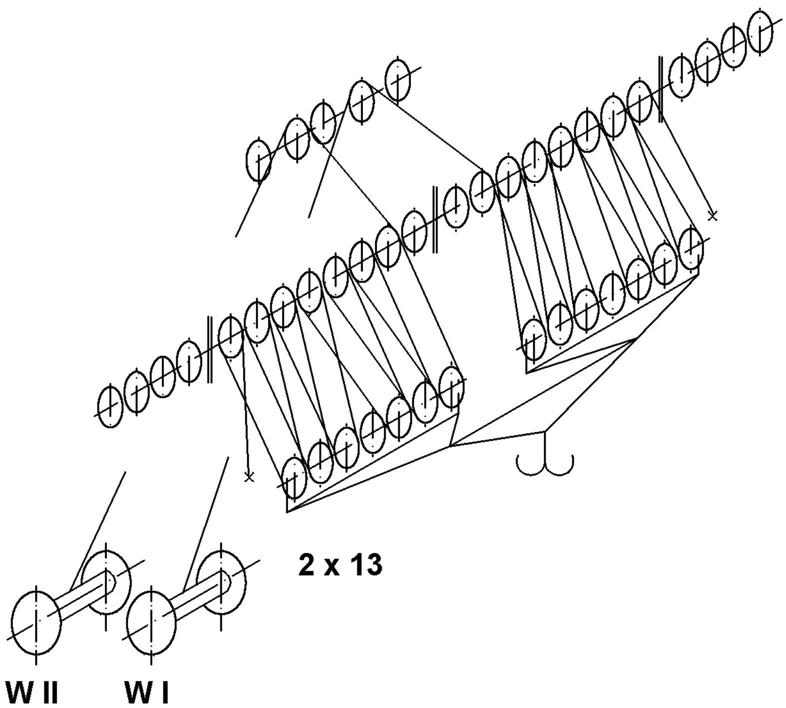
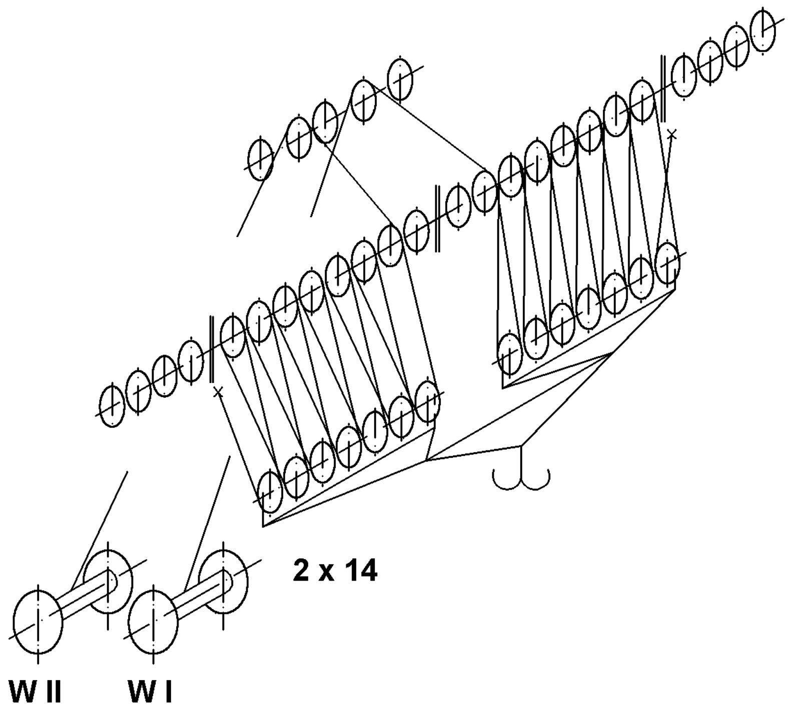




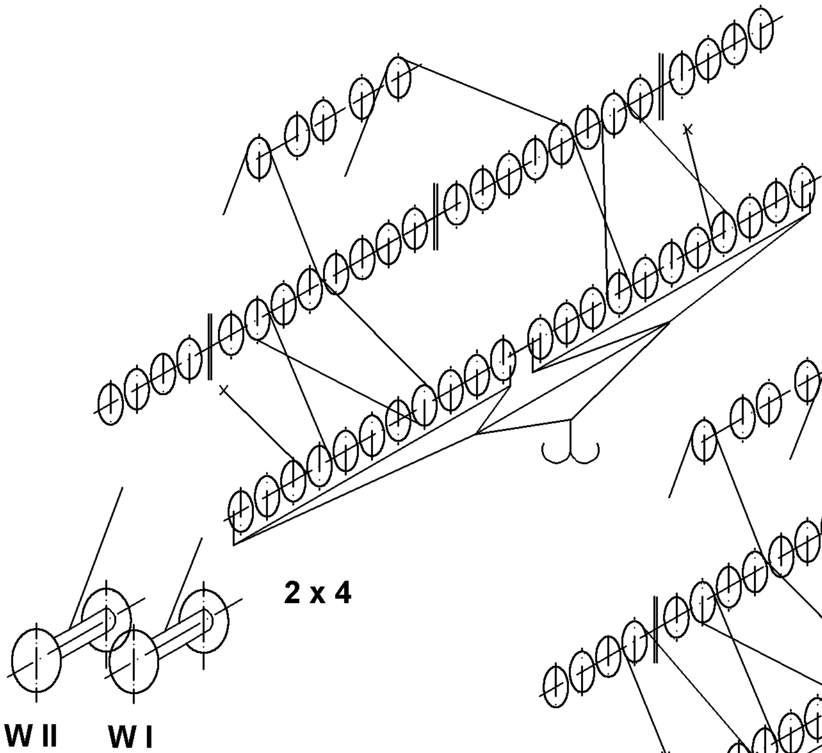
191173

REEVING PLANS

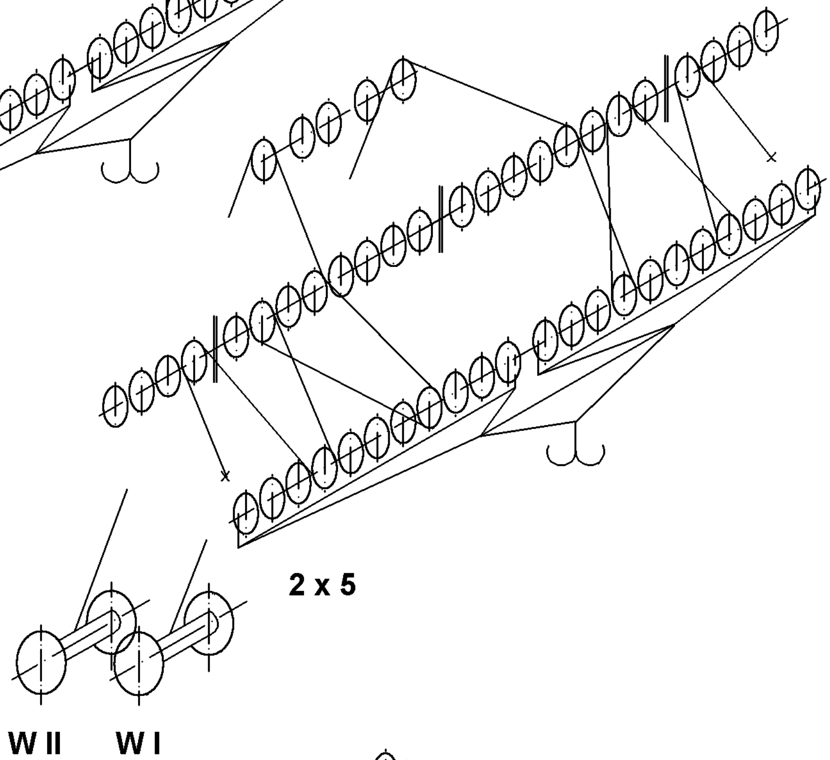
S - Head section (400 / 600 t)

Head section - 24 pulley

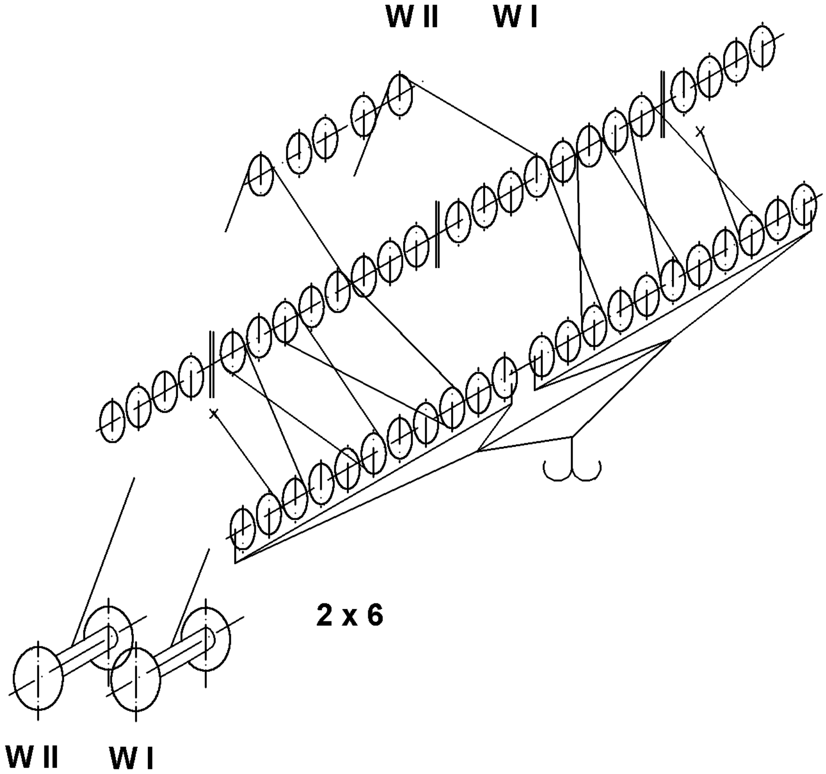
2×11 - pulley hook block (600 t hook block)



2 x 4

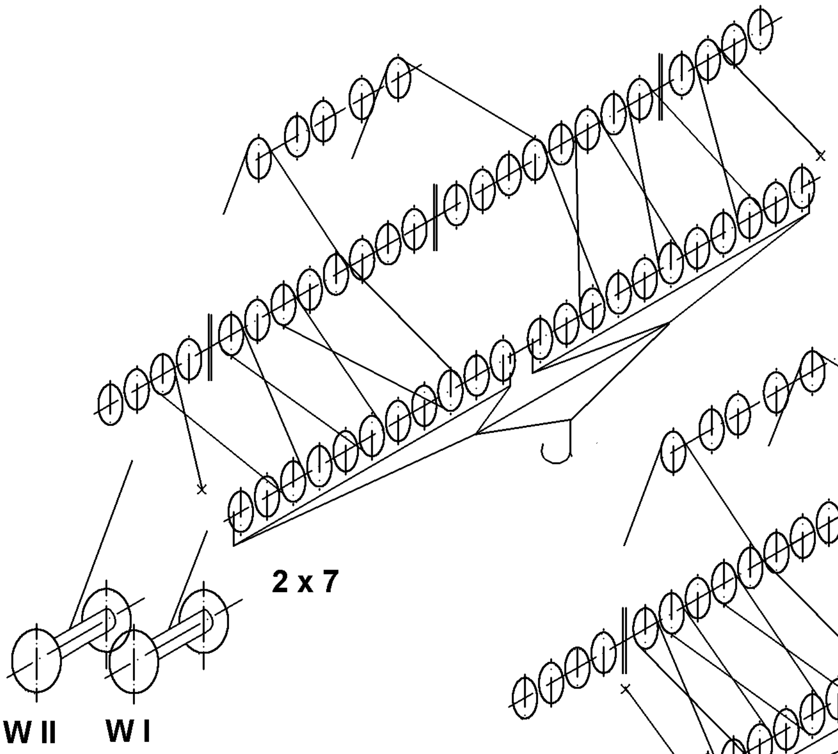


2 x 5

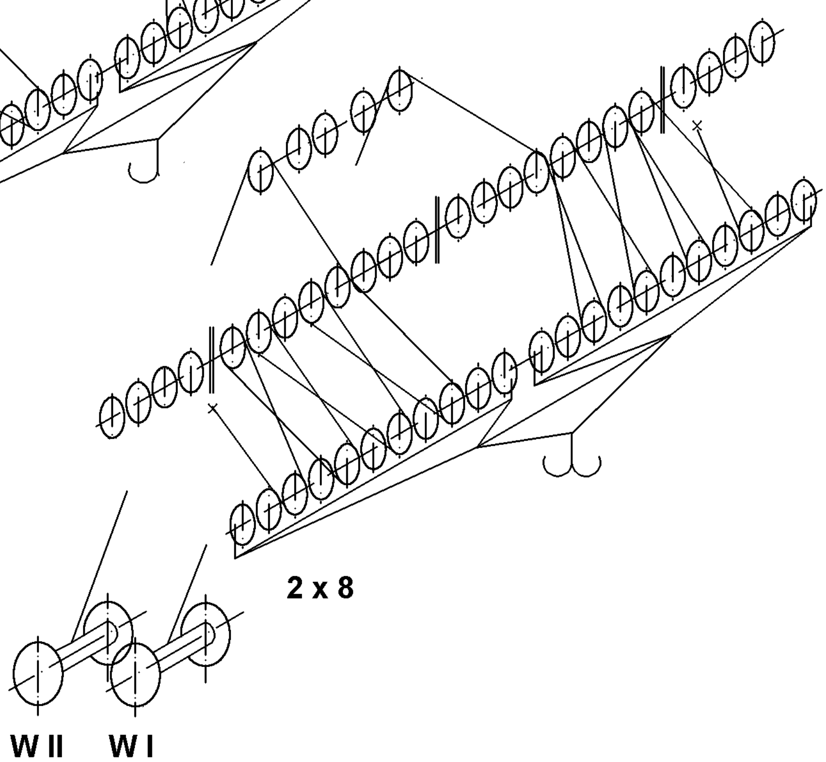


2 x 6

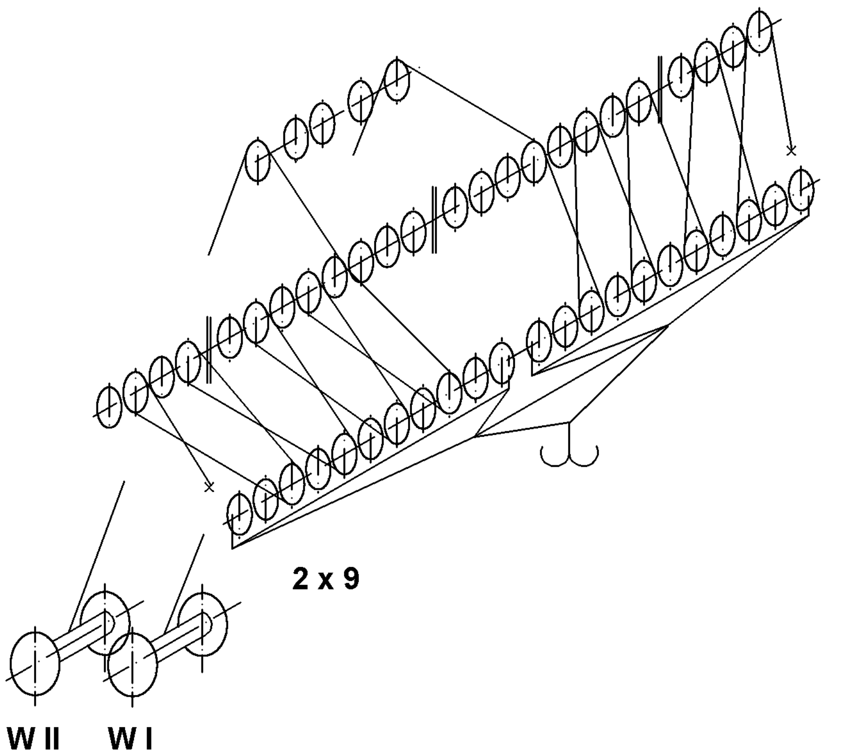
191174



2 x 7

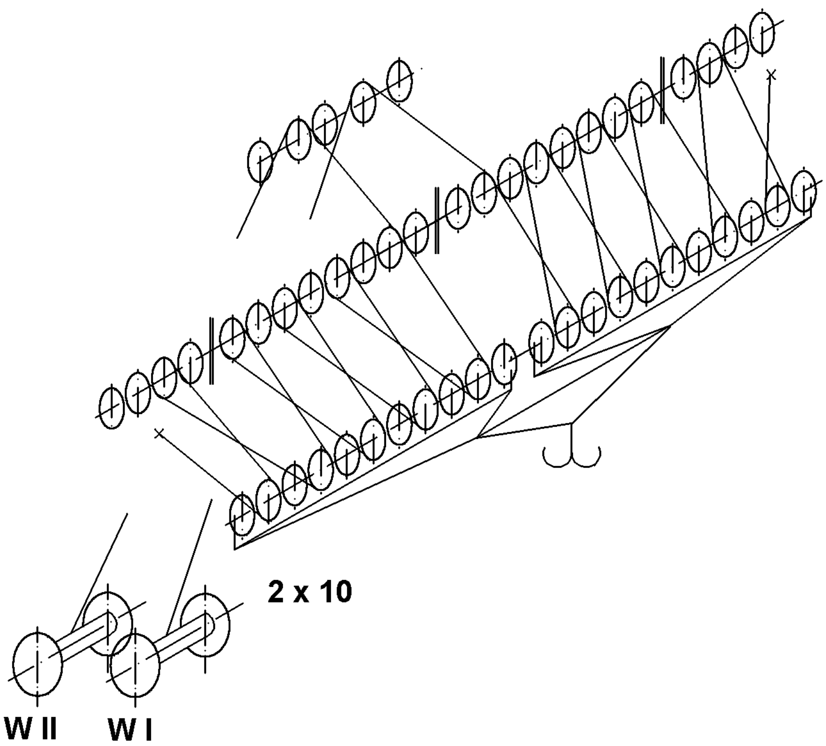


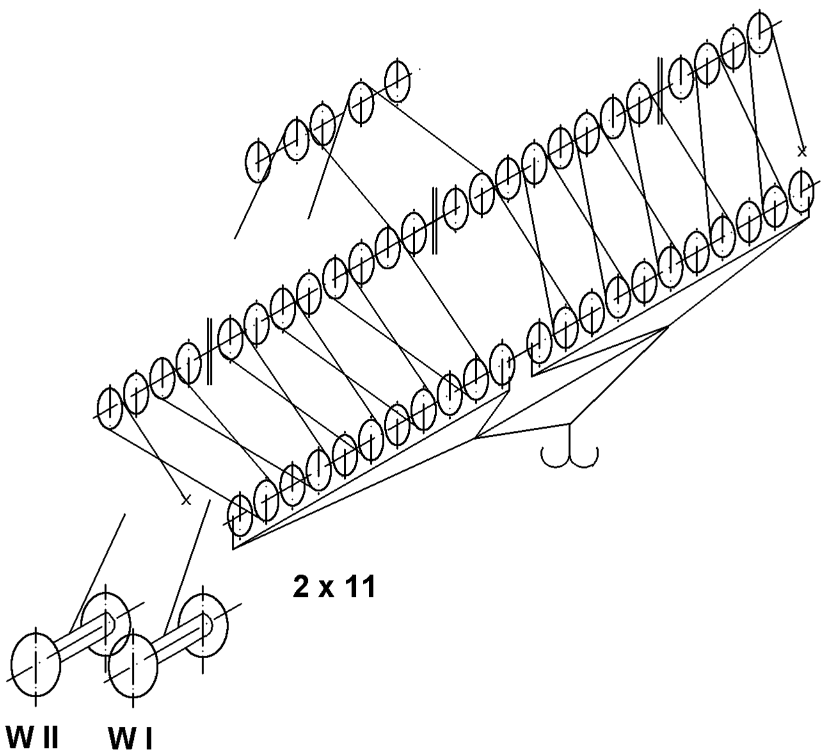
2 x 8



2 x 9

191175





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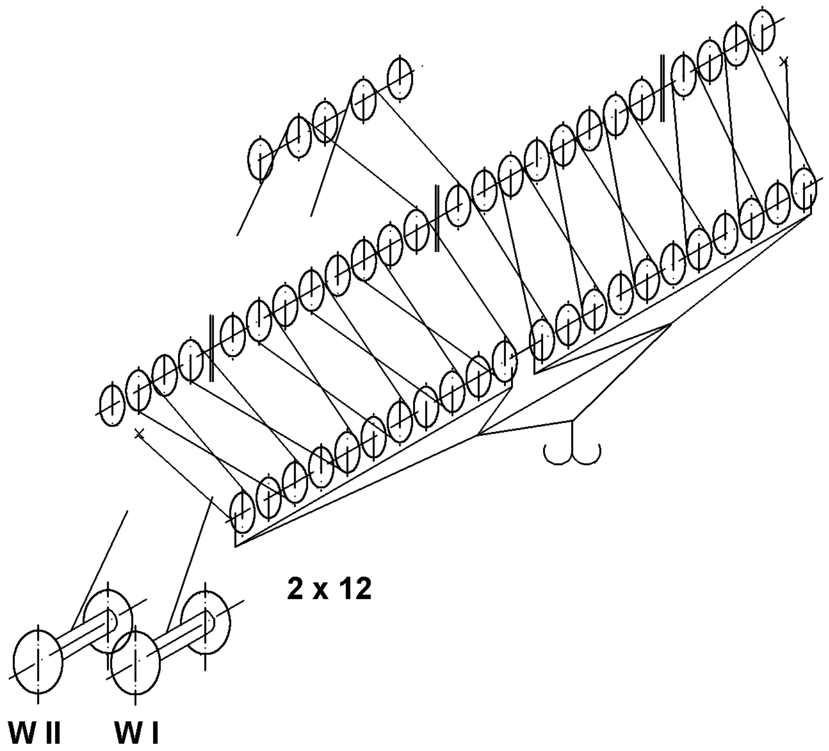

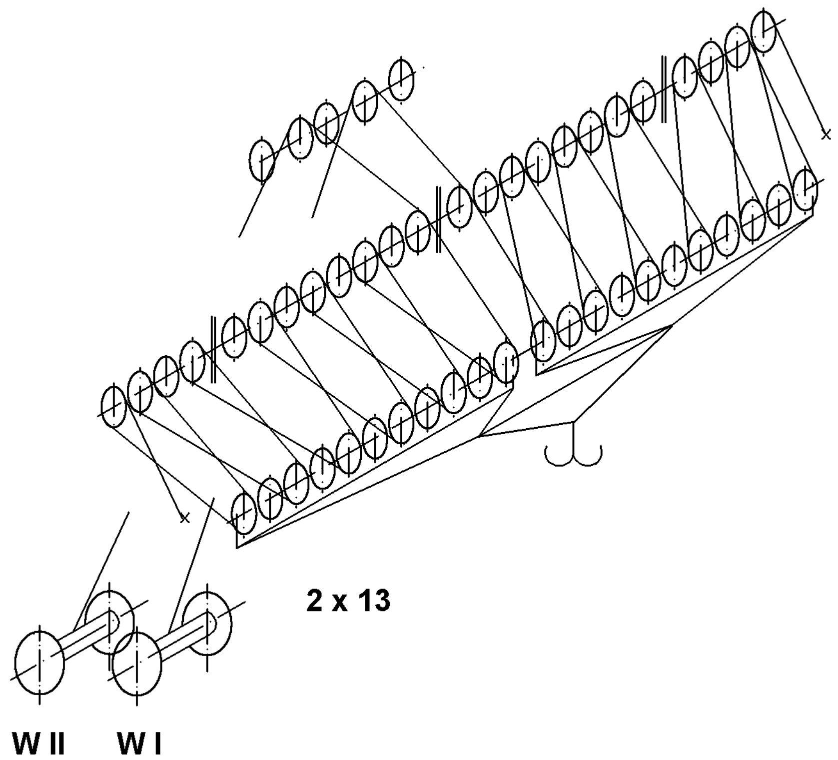

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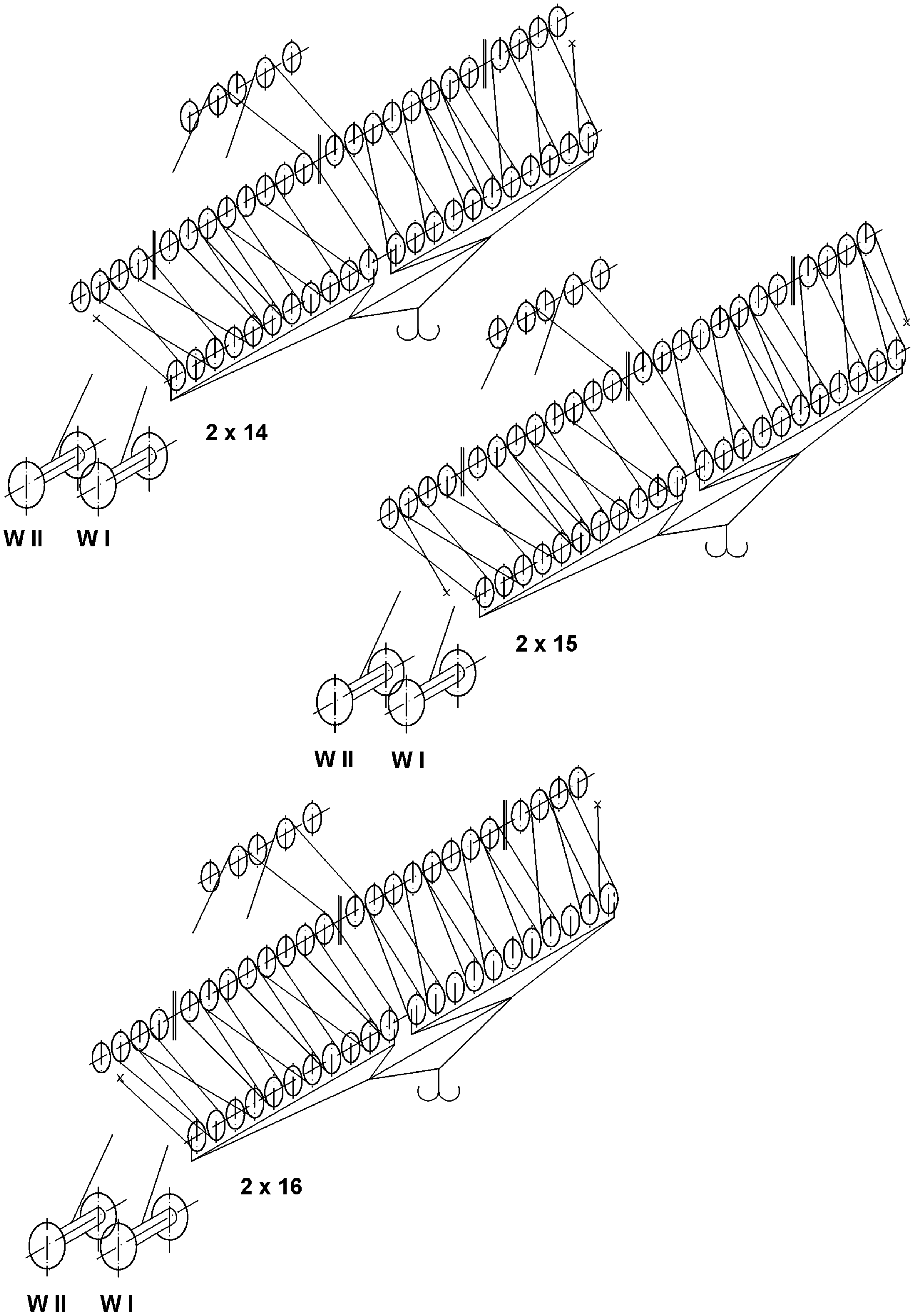

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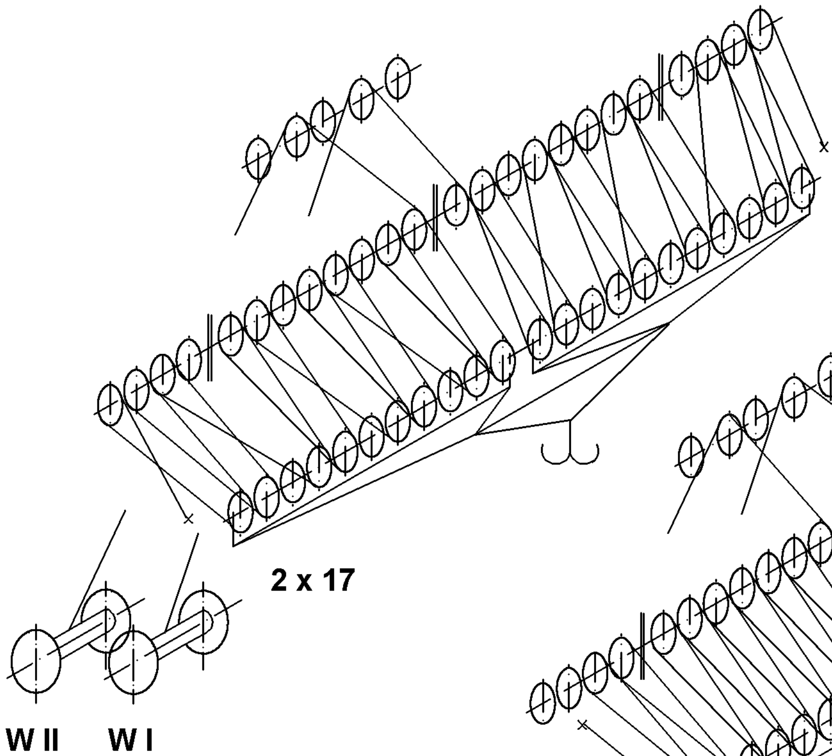

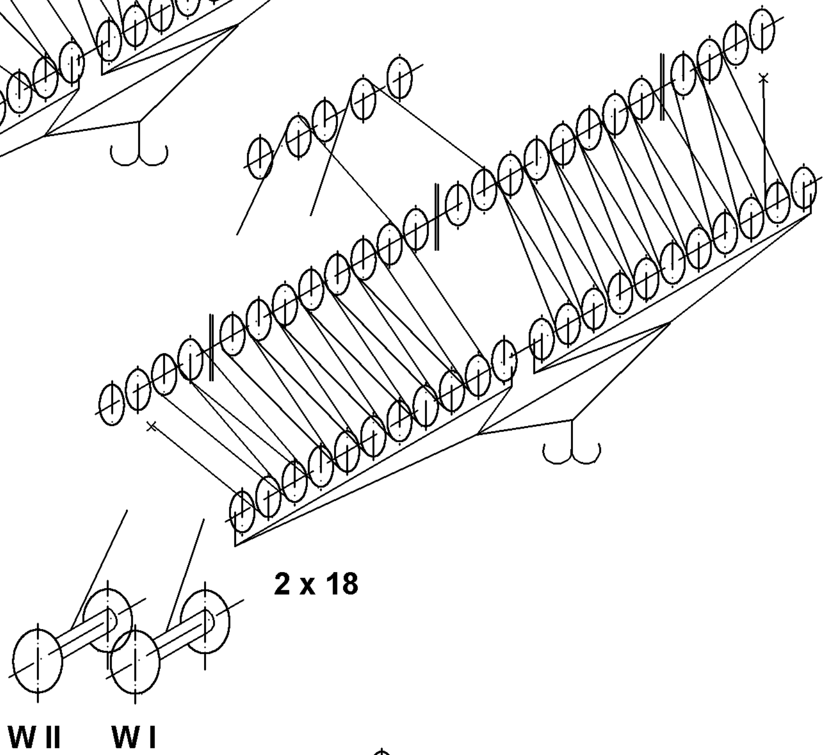

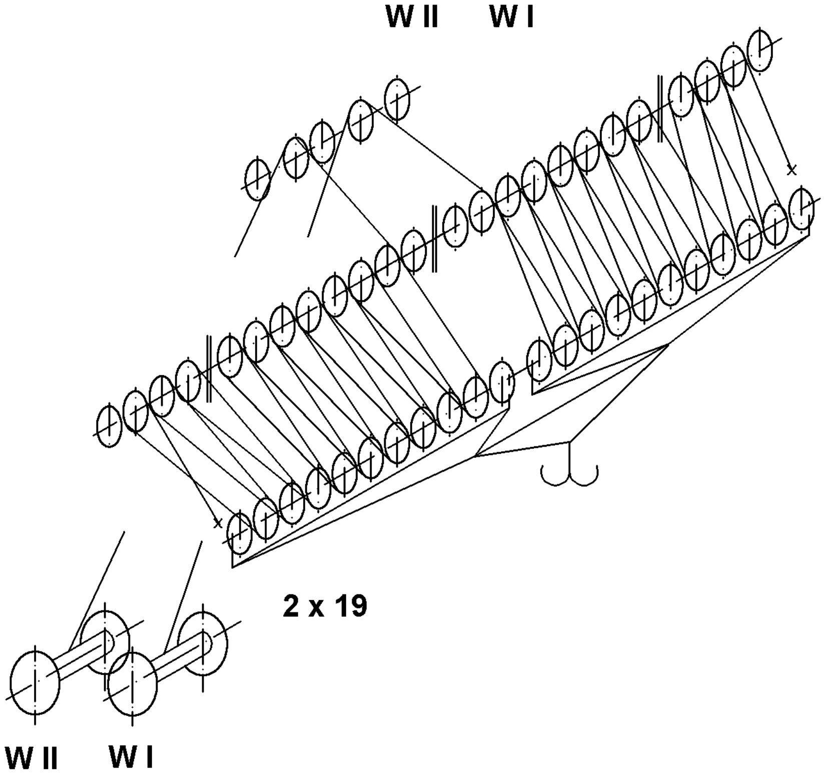

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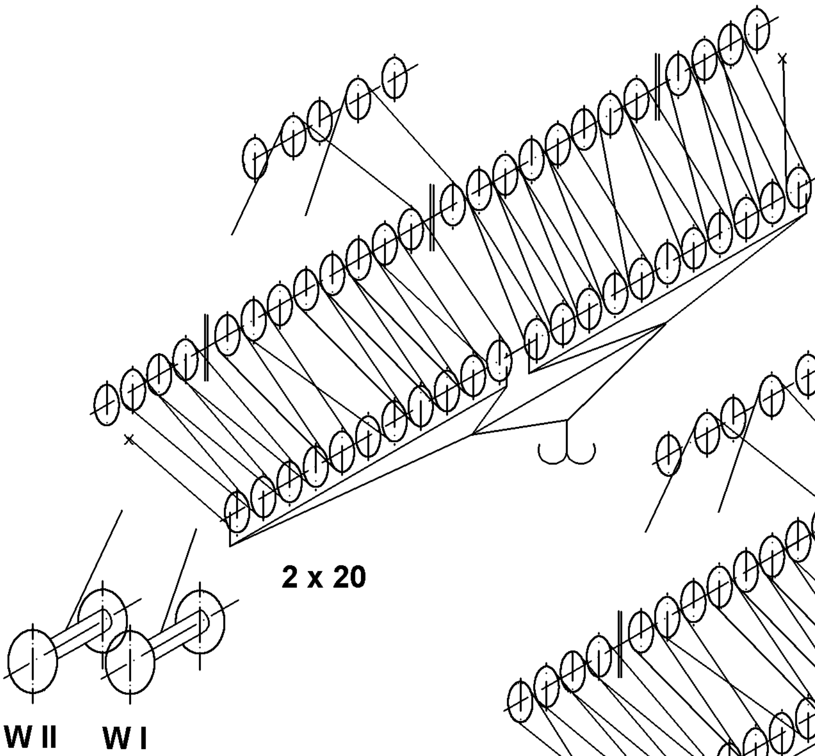
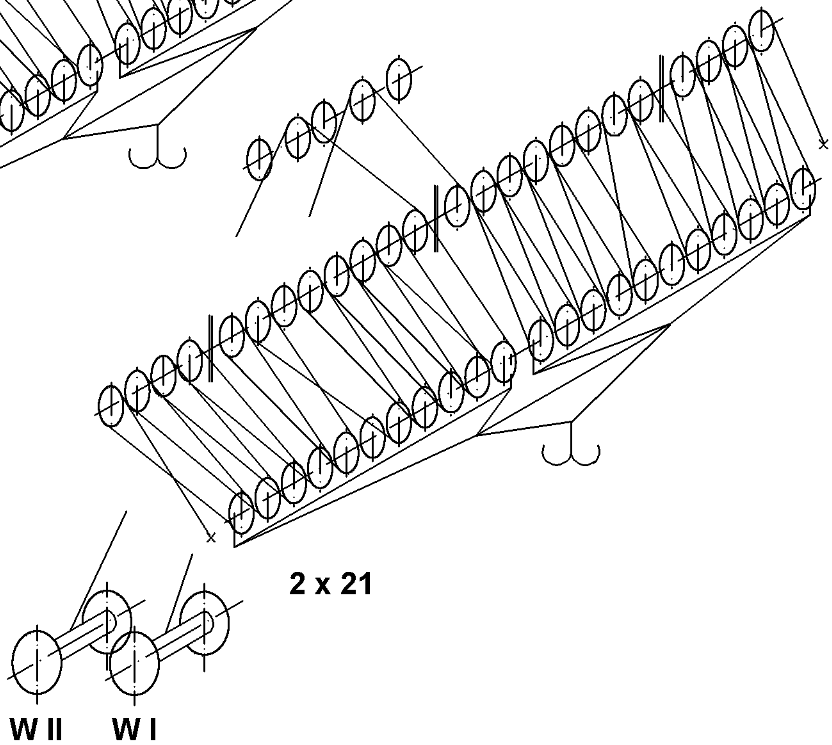
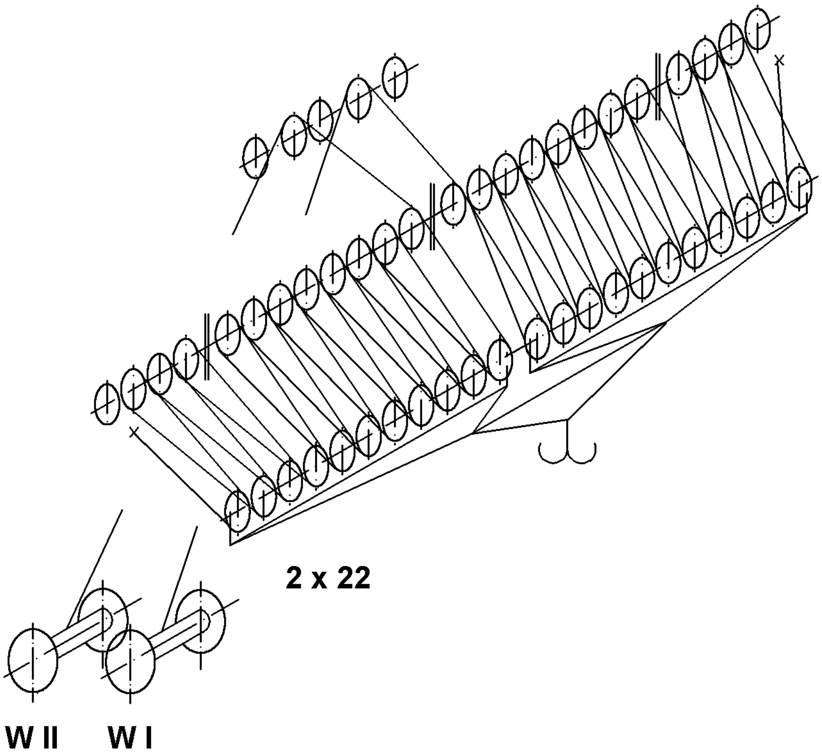


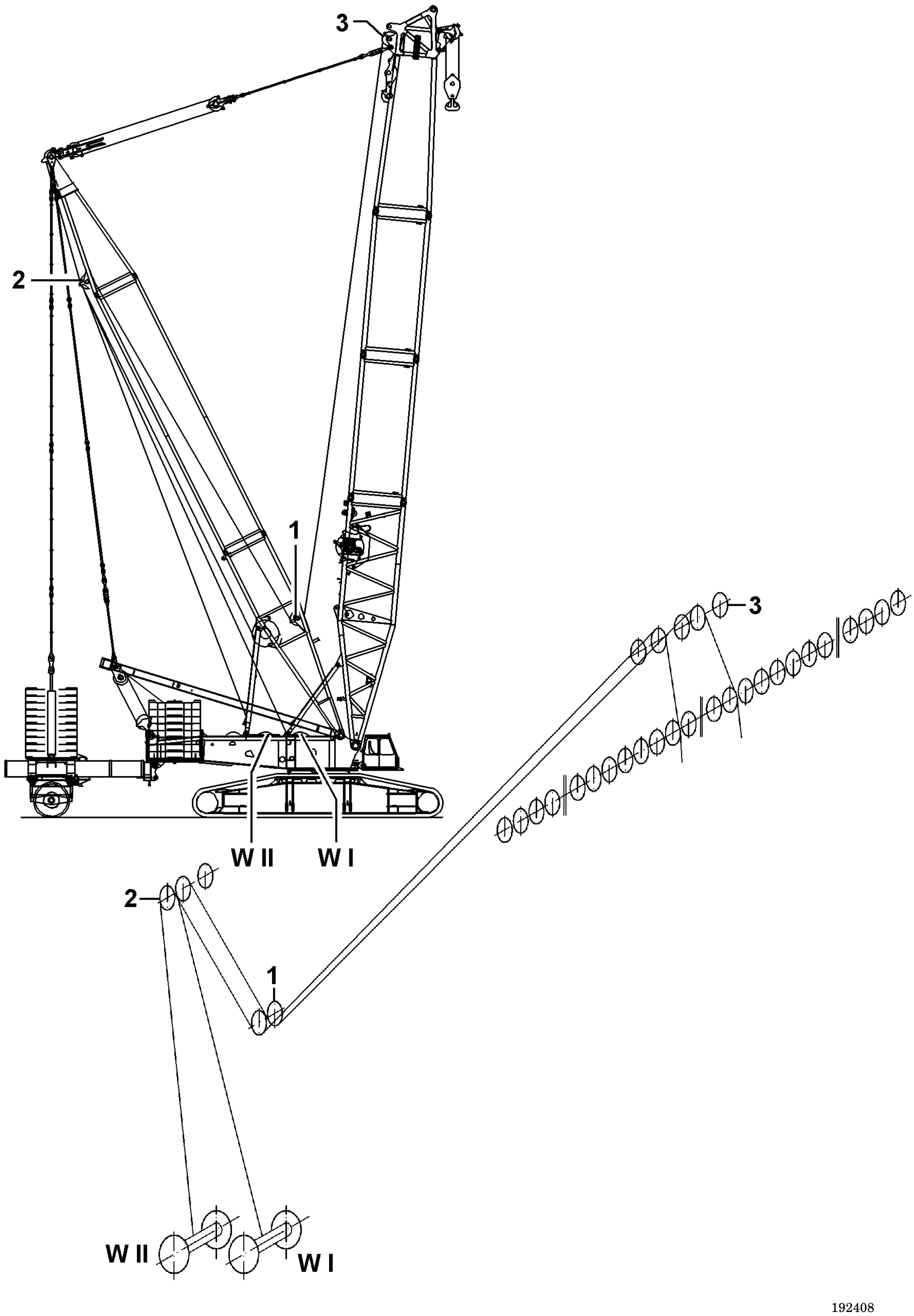




191180

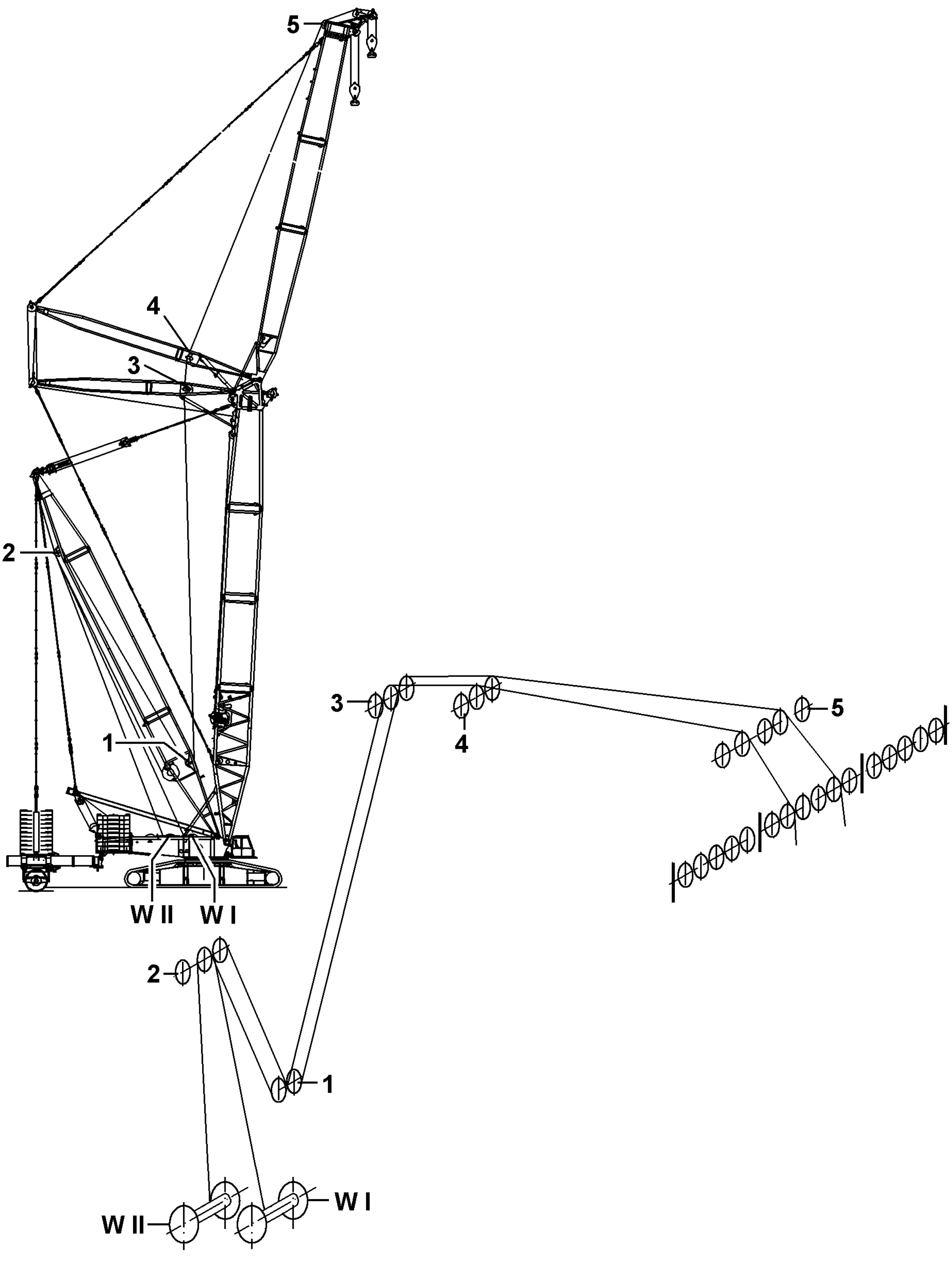
Hoisting rope guidedance for Derrick

1 = Pulley D- head
2 = Pulley D- pivot section
W I / II = winch I / II
3 = Pulley 400 t / 600 t head



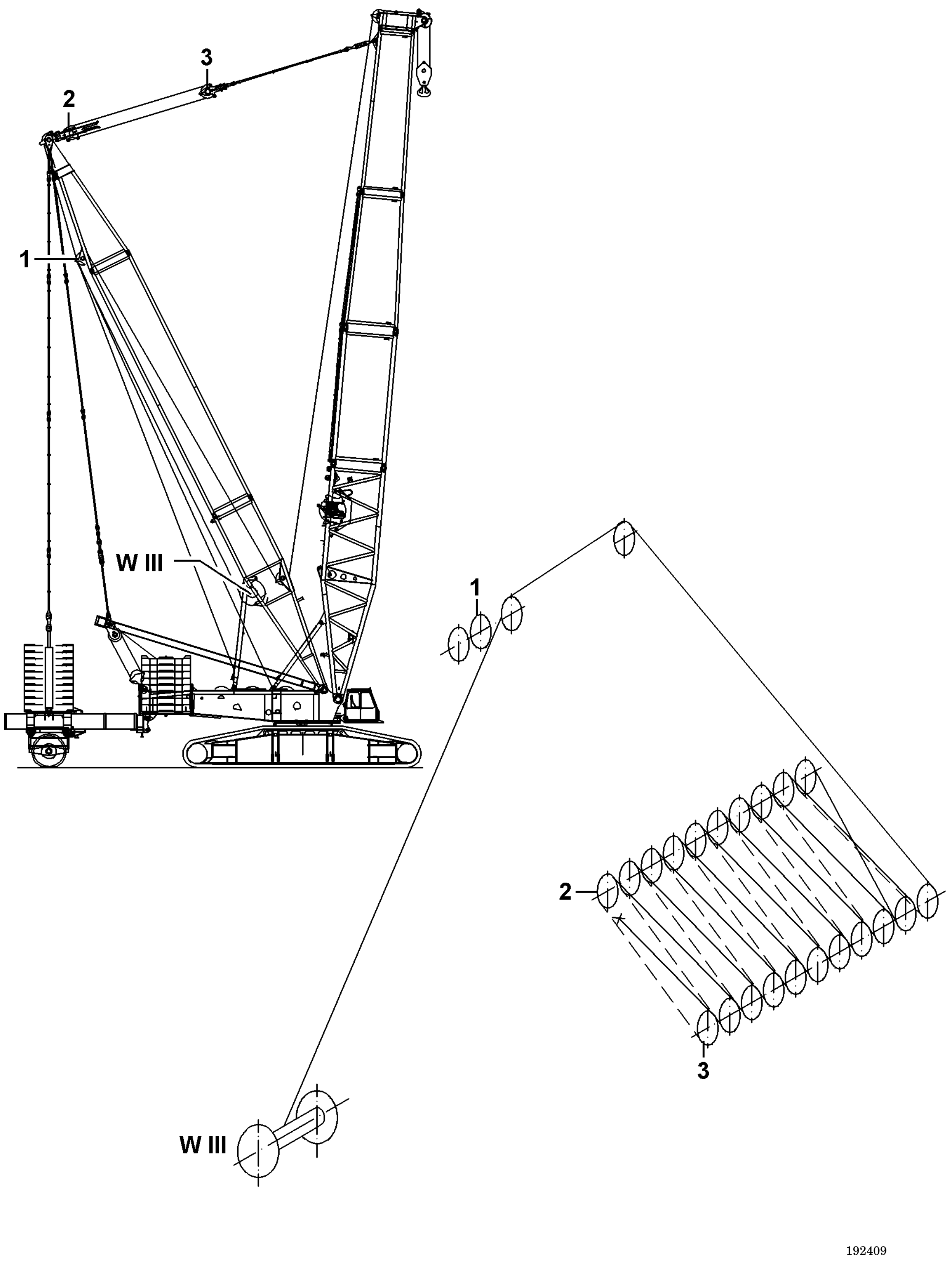
Hoisting rope guidedance for Derrick at W-mode

1 = Pulley D- pivot section
2 = Pulley D- head
3 = Pulley WA- bracket II
4 = Pulley WA- bracket I
5 = L- head section
W I / II = Winch I / II



Reeving S - adjusting

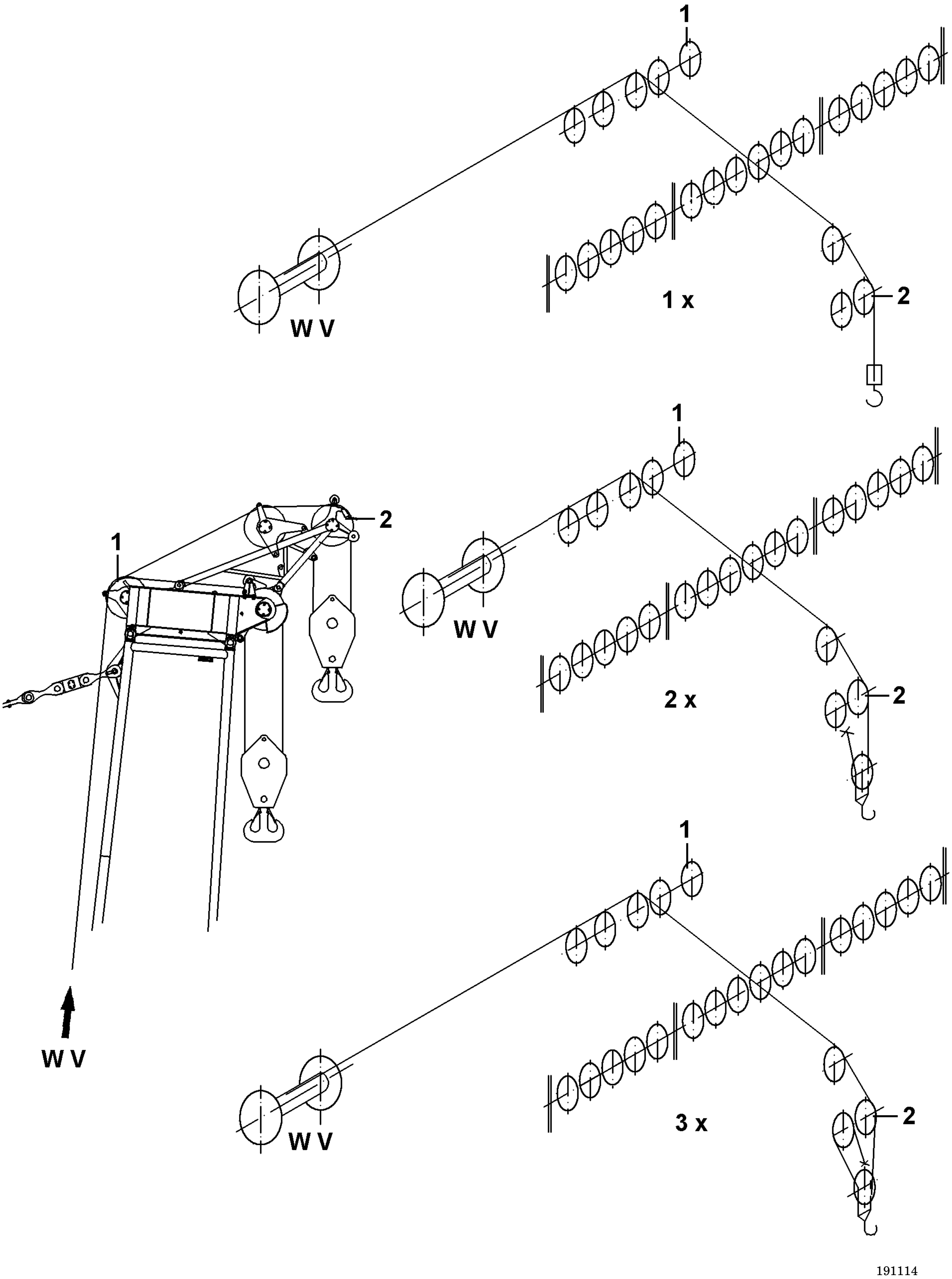
1 = Pulley D- head
2 = Pulley lower adjusting block
W III = winch III
3 = Pulley upper adjusting block



Hoisting rope guidedance for 60 t boom nose at L-head section

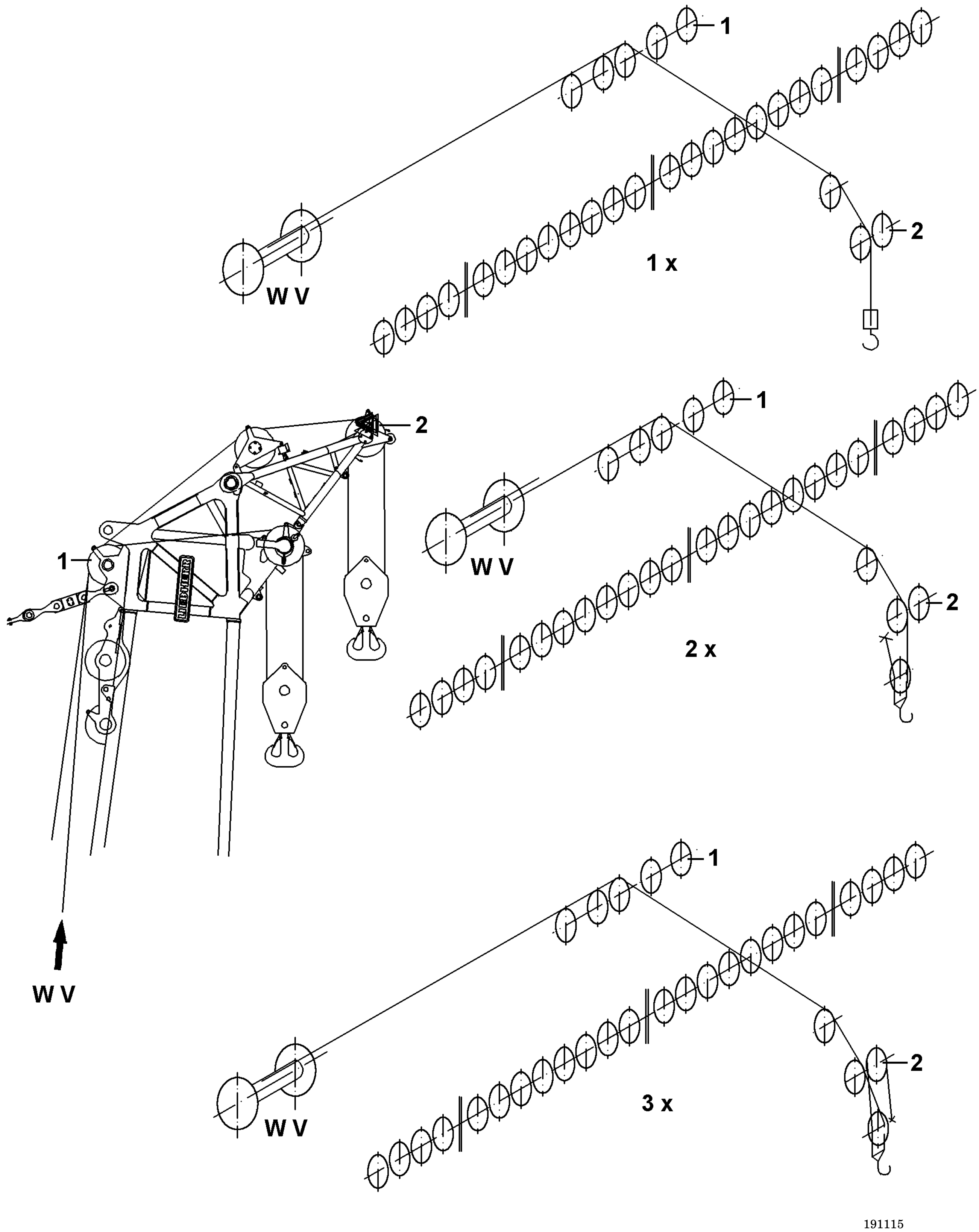
1 = Pulley head section W V = Winde V

2 = Pulley boom nose



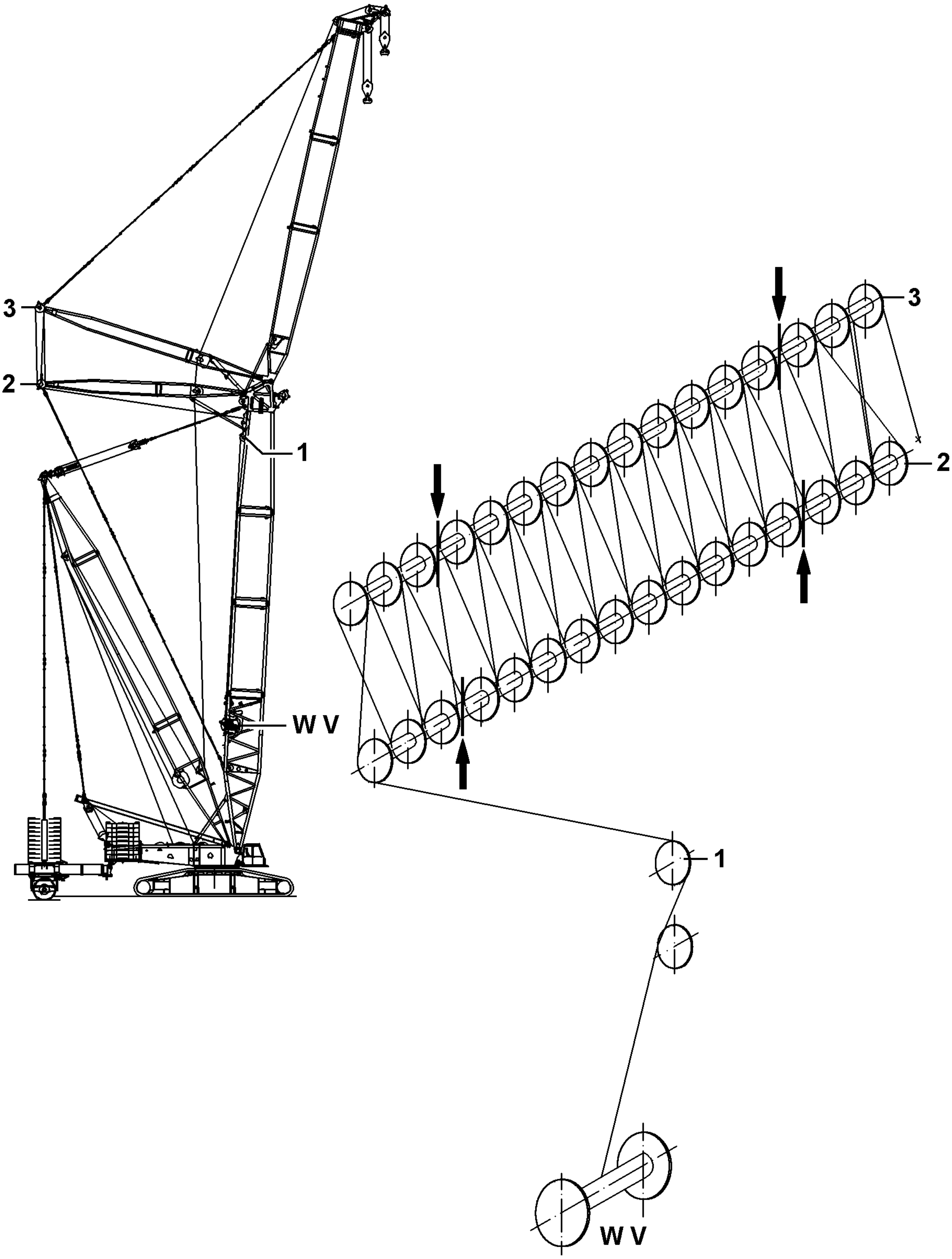
Hoisting rope guidedance for 60 t boom nose at S-head section

1 = Pulley head section W V = Winde V
2 = Pulley boom nose



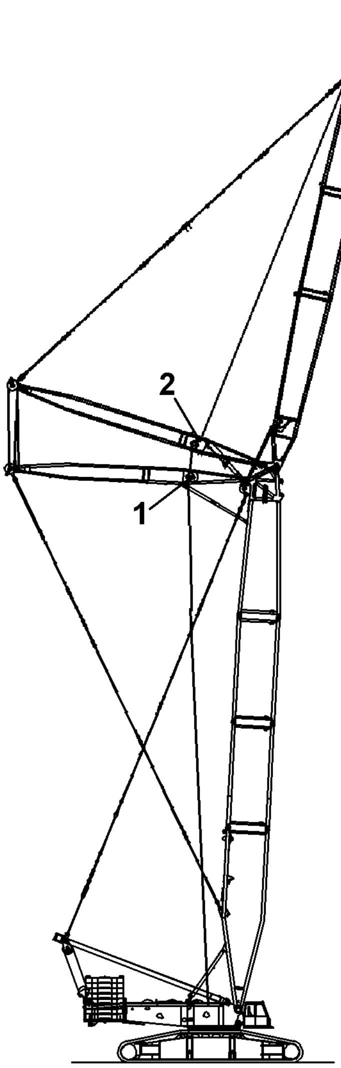
Reeving plan W-fly jib adjusting

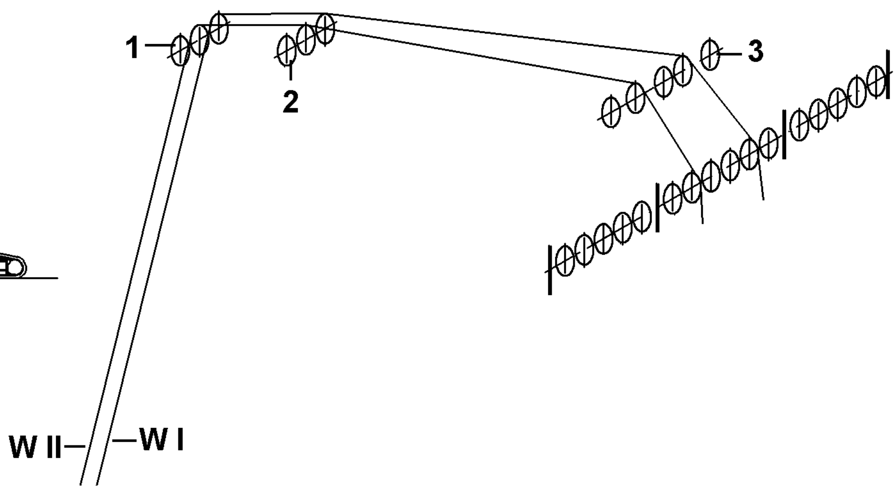
1 = S- head section
2 = WA - bracket II
3 = WA- bracket I
WV = Winch V



Hoisting rope guidedance at W - operation

1 = Pulley WA- bracket II
2 = Pulley WA- bracket I
3 = W- head section
W I (II) = Winch I (II)





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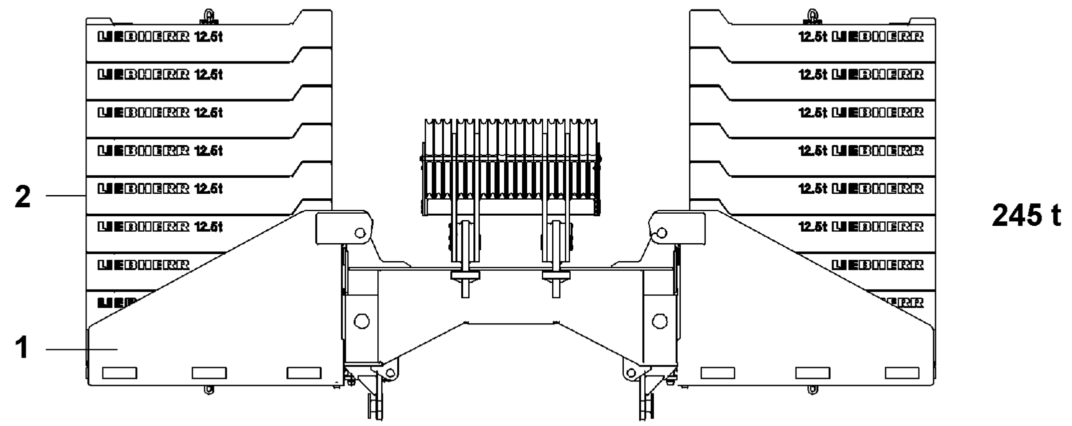
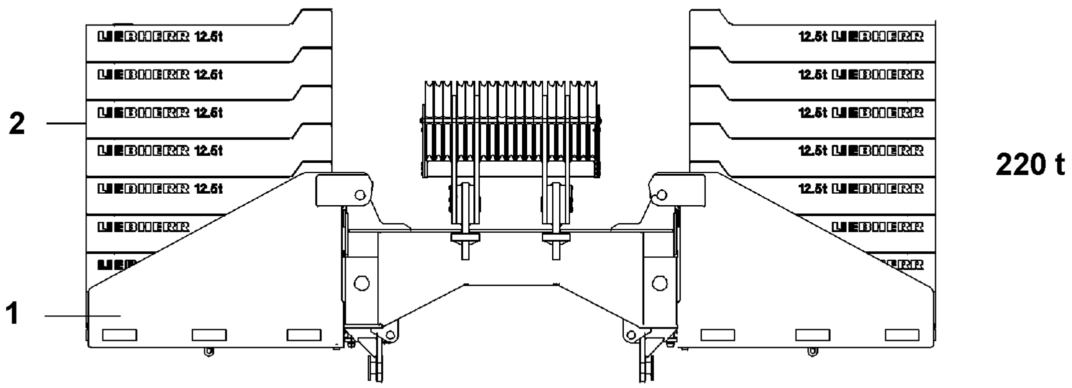
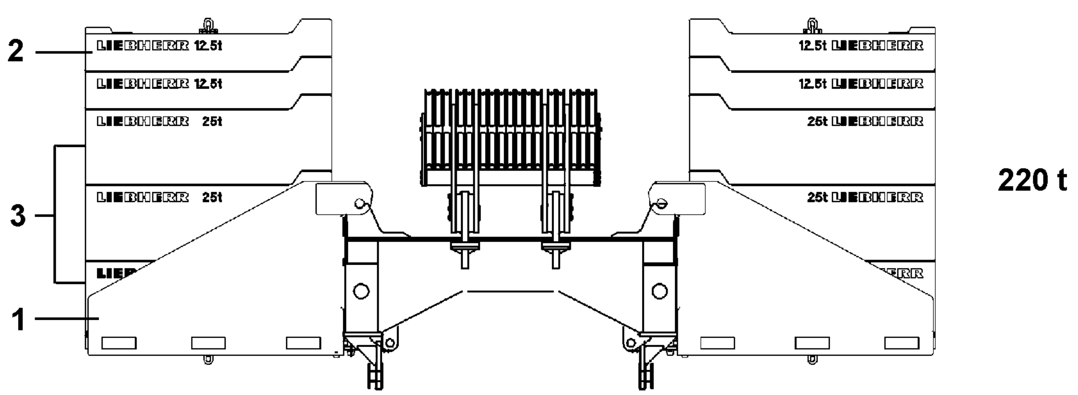






191802

1. SLEWING PLATFORM BALLAST INSTALLED ON SLEWING PLATFORM

1.1 Ballast plates

The ballast plates are marked with their own weight.

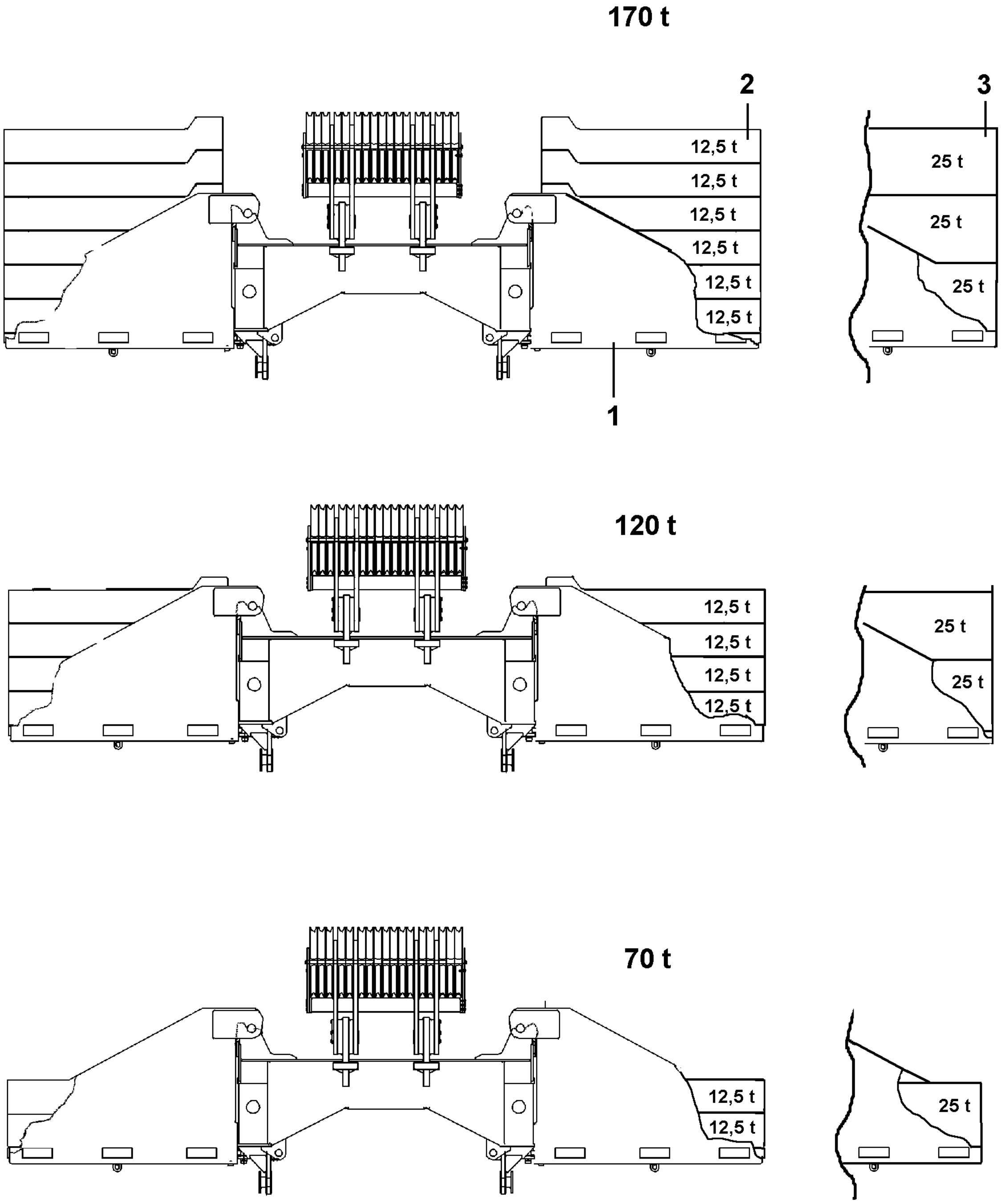
	1	bracket	=	10.0 t
	2	plate	=	12.5 t
*	3	plate	=	25.0 t

D A N G E R: The installed slewing platform ballast must correspond to the data in the erection and take down charts and the data in the load charts. Otherwise there is a danger of accidents!

The following combinations are possible:

	Ballast	Combination			
	245 t	18	×	plate	2
		2	×	bracket	1
	220 t	16	×	plate	2
		2	×	bracket	1
*	**220 t**	4	×	plate	2
		6	×	plate	3
		2	×	bracket	1

* Optional


170 t
2
3
12,5 t
12,5 t
12,5 t
12,5 t
12,5 t
12,5 t
25 t
25 t
25 t
1
120 t
12,5 t
12,5 t
12,5 t
12,5 t
25 t
25 t
70 t
12,5 t
12,5 t
25 t

191841

Ballast plates
The ballast plates are marked with their own weight.

1	bracket	=	10.0 t
2	plate	=	12,5 t
* 3	plate	=	25.0 t

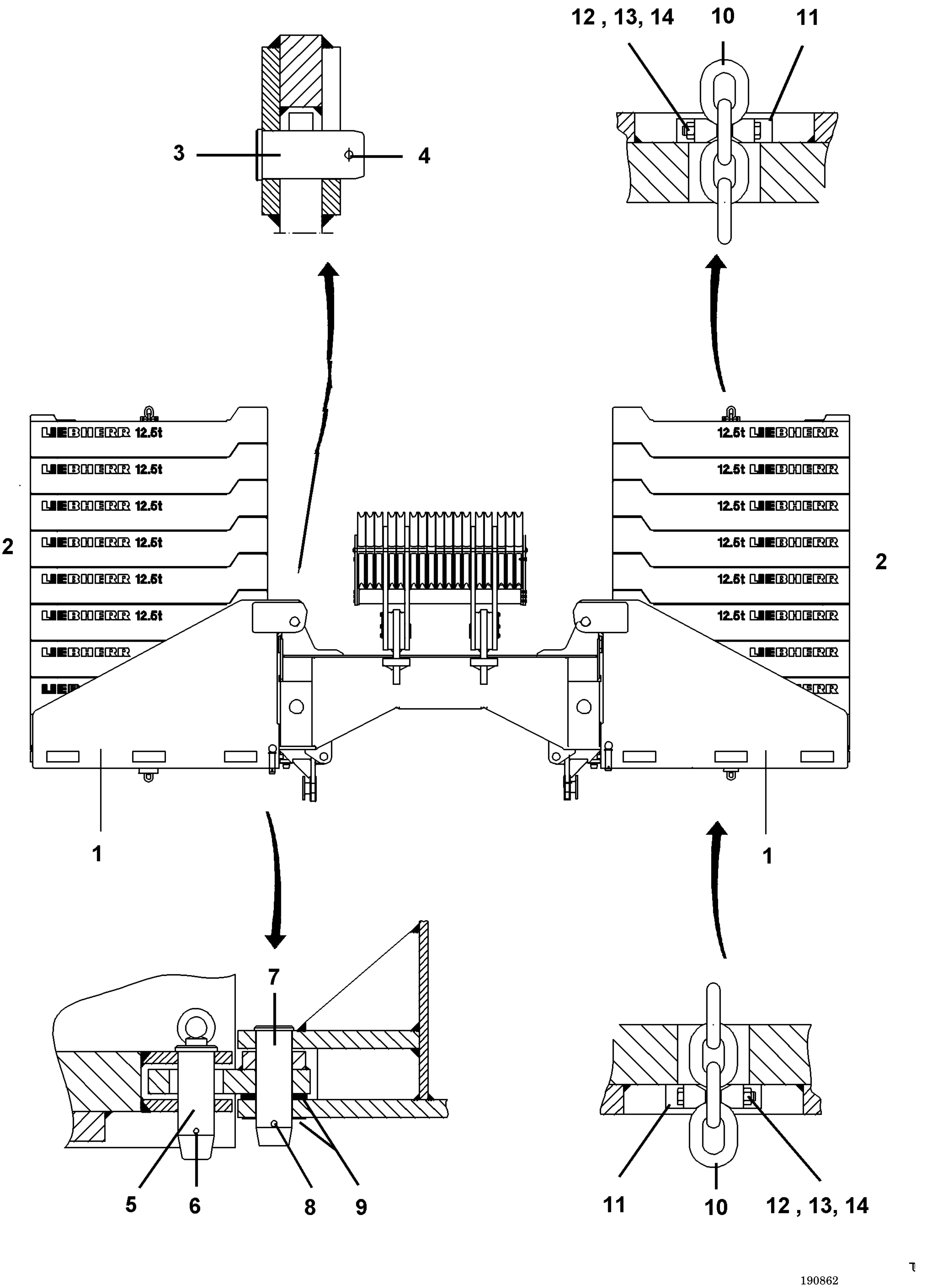
D A N G E R: The installed slewing platform ballast must correspond to the data in the erection and take down charts and the data in the load charts. Otherwise there is a danger of accidents!

The following combinations are possible:

Ballast	Combination			
170 t	12	×	plate	2
	2	×	bracket	1
120 t	8	×	plate	2
	2	×	bracket	1
70 t	4	×	plate	2
	2	×	bracket	1

* Ballast	Combination			
170 t	6	×	plate	3
	2	×	bracket	1
120 t	4	×	plate	3
	2	×	bracket	1
70 t	2	×	plate	3
	2	×	bracket	1

* Optional


12 , 13, 14
10
11
3
4
LIEBHERR 12.5t
LIEBHERR 12.5t
LIEBHERR 12.5t
LIEBHERR 12.5t
LIEBHERR 12.5t
LIEBHERR 12.5t
LIEBHERR
2
12.5t LIEBHERR
12.5t LIEBHERR
12.5t LIEBHERR
12.5t LIEBHERR
12.5t LIEBHERR
12.5t LIEBHERR
LIEBHERR
2
1
1
7
5
6
8
9
11
10
12 , 13, 14
190862

1.2 Installation of slewing platform ballast

Prerequisite:
- the crane must be horizontally aligned.
- the boom is not yet installed.

D A N G E R: Before ballasting, the maximum permissible ballast variations for installation in chapter 3.06, Installation conditions, must be observed!
If this is not observed, there is a danger of tipping over!

1.3 Installation

Components:

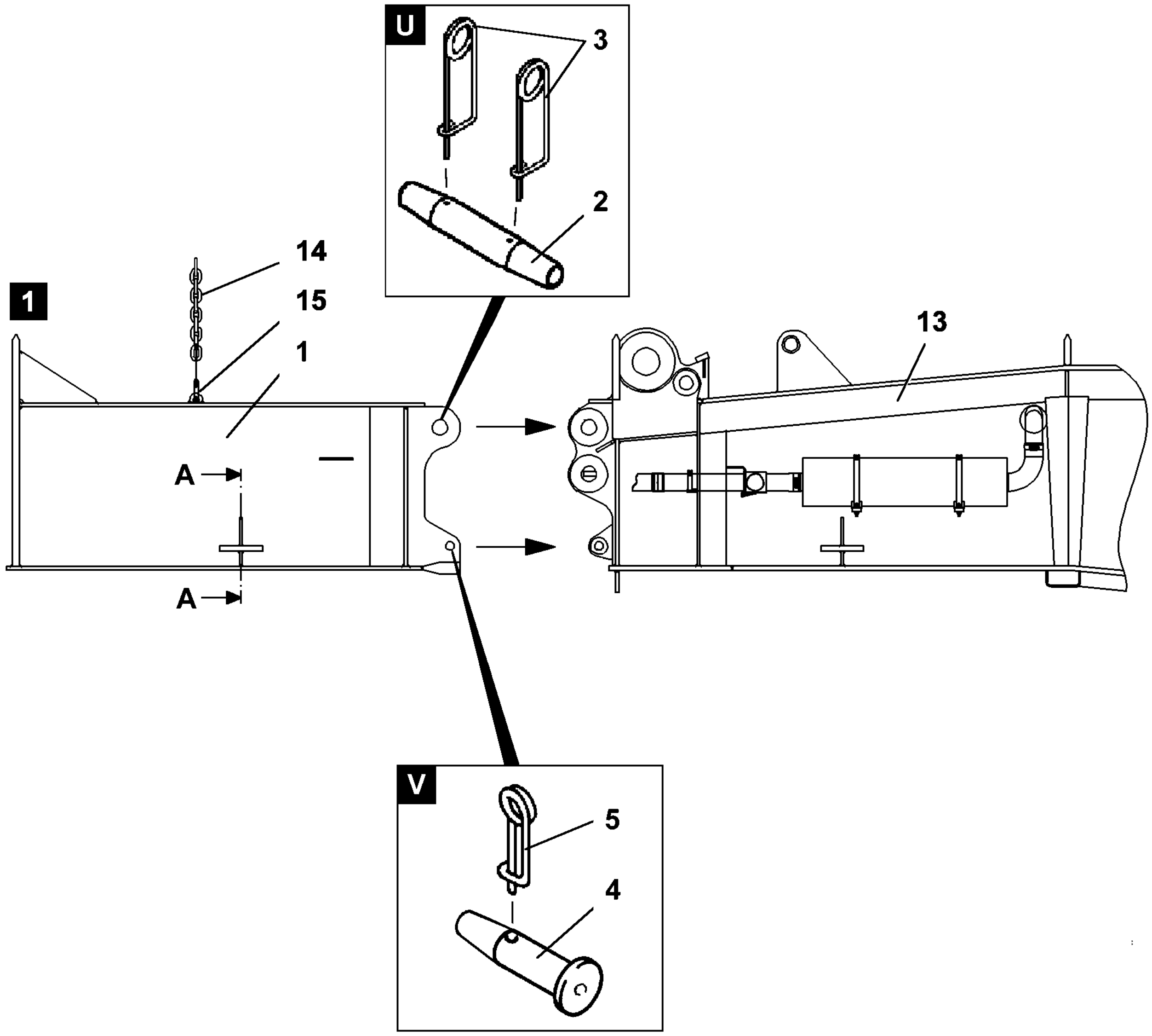
1	bracket
2	ballast plates
3	pin ∅ 80 mm
4	cotter pin ∅ 13 mm
5	pin ∅ 60 mm
6	spring retainer 6
7	pin ∅ 60 mm
8	cotter pin ∅ 10 mm
9	washer
10	retaining chain
11	plate
12	screw M 16
13	nut M 16
14	washer

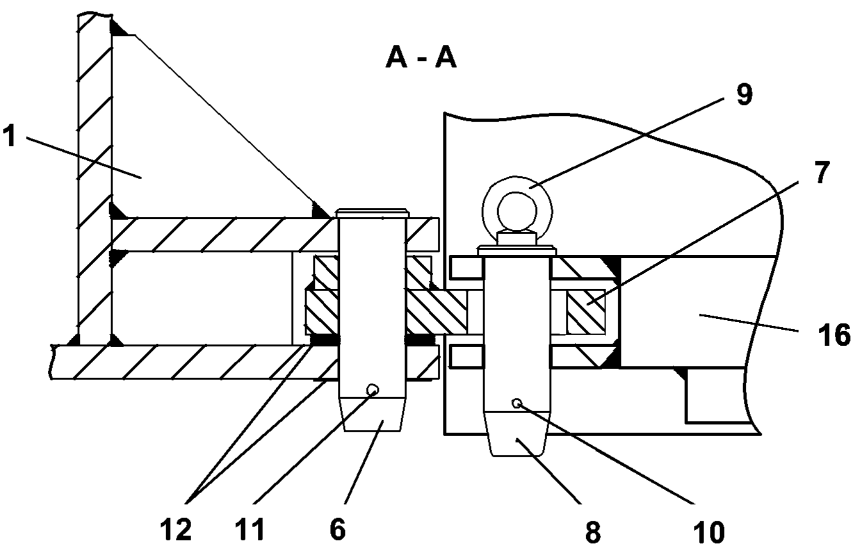
Attach thebrackets (1) with an auxiliary crane to the slewing platform .
Pin brackets (1) on the bottom to brackets with pins (5) and secure with spring retainers (6) .

Stack the maximum permissible ballast plates (2) on brackets (1) .

D A N G E R: The ballast plates must be placed individually, alternately on the left and right side.
If this is not observed, there is a danger of tipping over!

Push the retaining chain (10) through on both sides, push plate (11) in on top and bottom and secure with screw (12), washer (14) and nut (13).





192846

2. SLEWING PLATFORM BALLAST INSTALLED ON EXTENSION OF SLEWING PLATFORM

By installing the ballast frame to the slewing platform, the slewing platform can be extended by approx. 2,5 m. This means, the slewing platform ballast is set back by approx. 2,5 m.
By using the slewing platform extension, higher load carrying capacities can be obtained in operation **WITHOUT** derrick ballast .

2.1 Installation of slewing platform extension

Prerequisite:
- The slewing platform (13) is installed on the crawler center section (chapter 3.02).
- The crane support is installed on the crawler center section of the crawler carriers (chapter 3.05).
- The crane support is swung out, pinned and secured.
- The crane is supported and horizontally aligned.
- The A-bracket is erected (chapter 5.02).

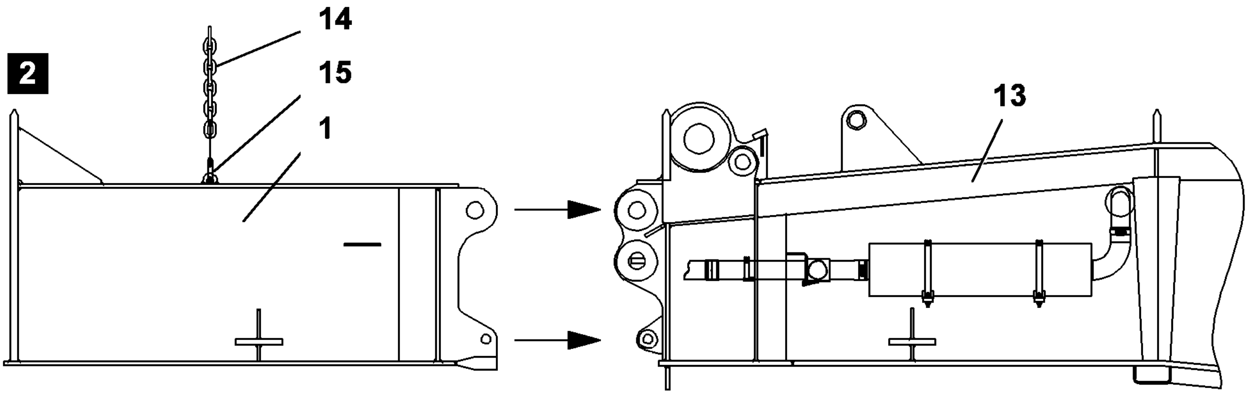
D A N G E R: **- The ballast frame may only be installed if the crane is properly supported with the crane support.**

- Before ballasting, the maximum permissible ballast variations at installation must be observed, see chapter 3.06, Installation conditions!

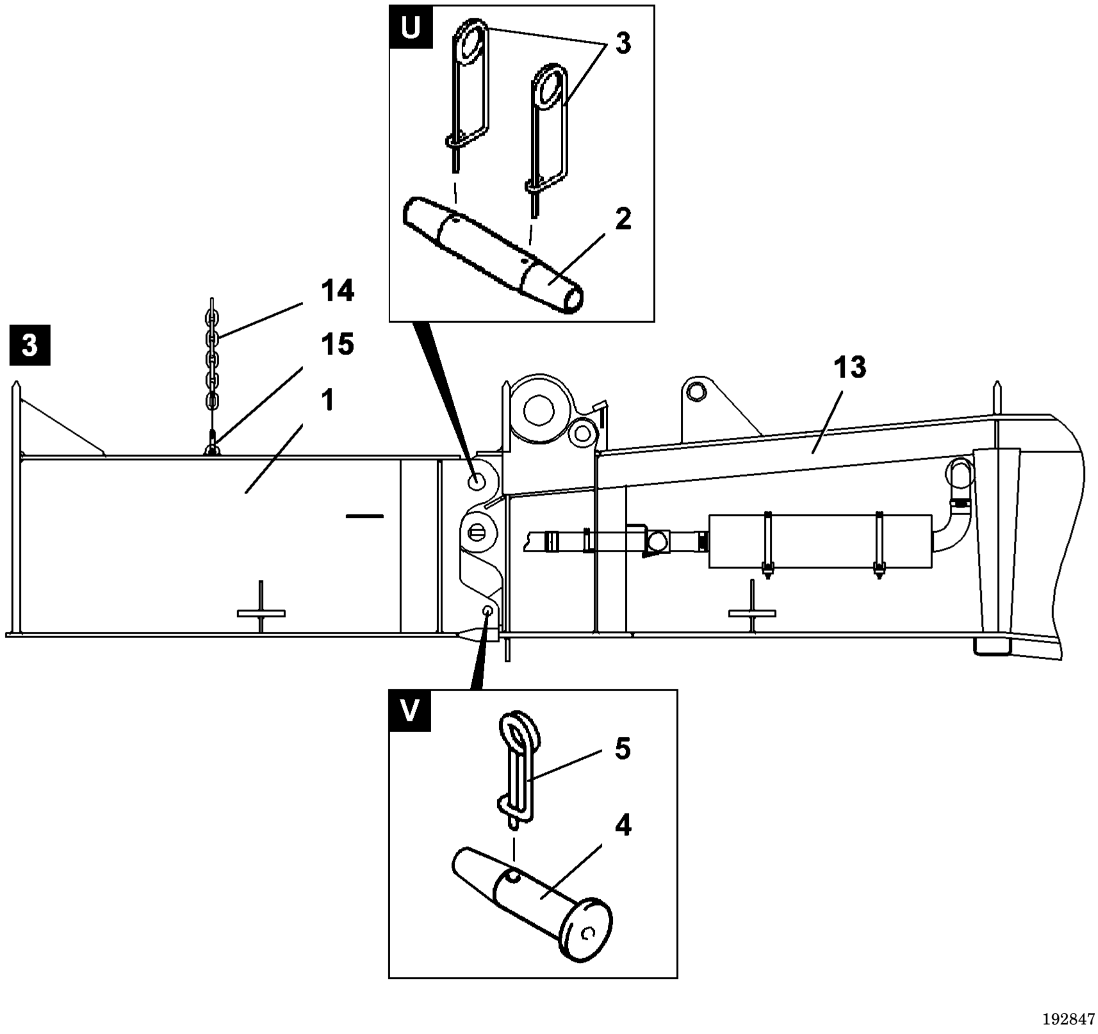
Otherwise there is a danger of tipping over!

2.2 Components for installation ballast frame

Pos.	Description	Qty.
1	ballast frame	1
2	pins ∅ 90x 520 mm	2
3	spring retainer 8	4
4	pins ∅ 50 x 255 mm	2
5	spring retainer 6	4
6	pins ∅ 65 x 200 mm	2
7	bracket	2
8	pins ∅ 60 x 180 mm	2
9	ring screw M16 DIN 580	2
10	spring retainer 6	2
11	cotter pin 10 x 80 DIN 94	2
12	washer 110 x 2	12



2
14
15
1
13



U
3
2
3
14
15
1
13
V
5
4
192847

2.3 Installation of ballast frame

Prerequisites:
- The crane is supported via the crane support.
- The crane must be horizontally aligned.
- The A-bracket must be erected (chapter 5.02).

Note: The weight of the ballast frame = 5.0 t

Description of installation procedure:
Install the ballast frame with an auxiliary crane. Attach the tackle (14) to the eyehooks (15), lift the ballast frame and swing in to the stop on the rear of the slewing platform. Pin the ballast frame on the rear of the slewing platform and then secure the pins.

D A N G E R : **It must be ensured that the tackle is correctly attached to the eyehooks and secured sufficiently to make sure it does not loosen up. If this is not observed, there is a danger of accidents!**

Installation :
- Attach the tackle (14) to the eyehooks (15).
- Lift the ballast frame (1) with the auxiliary crane and swing to the rear of the slewing platform (fig. 1)

D A N G E R : **It must be ensured that there are no persons within the swing range of the auxiliary crane and under the suspended load.
There is a danger of accidents!**

- Run the ballast frame in to the stop on the rear of the slewing platform.

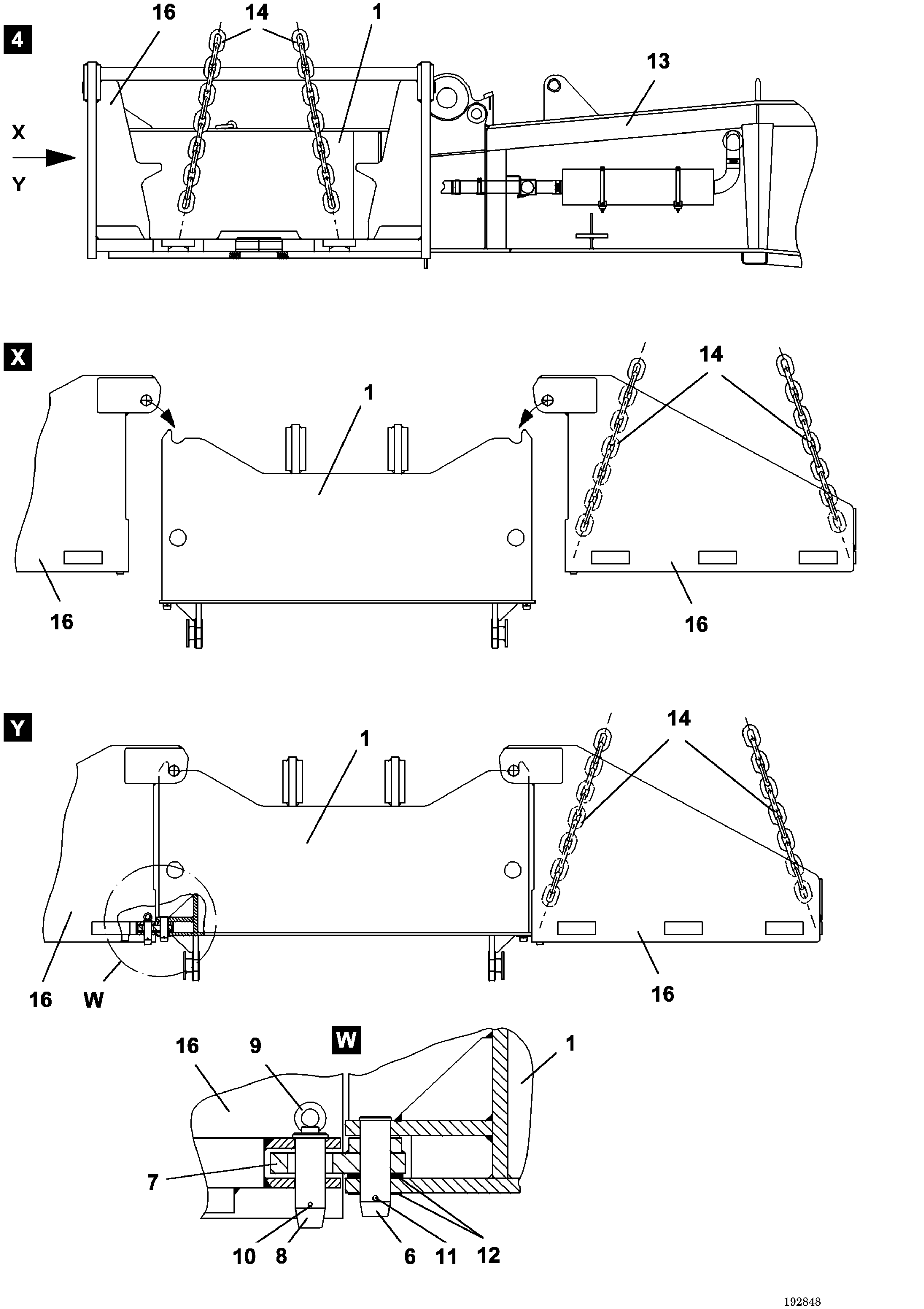
D A N G E R : **No one may remain between the ballast frame and the slewing platform during the swing in procedure or run in of the ballast frame. This is strictly prohibited! There is an increased danger of accidents due to crushing!**

- The ballast frame is pinned on the slewing platform (13) (fig. 3).
- Pin the "upper" pin bores (U) with pins (2) and then secure immediately with spring retainers (3).
- Pin the "lower" pin bores (V) with pins (4) and then secure immediately with spring retainers (5).

D A N G E R : **Before pinning it must be ensured that all pin bores are clear. After pinning, secure the pins immediately!**

- Loosen and remove all tackle (14).

D A N G E R: **Before releasing the tackle, make sure that all pin points are correctly pinned and secured.
There is a danger of accidents!**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2.4 Installation of brackets

Prerequisites:
- The crane is supported with the crane support.
- The crane must be horizontally aligned.
- The ballast frame must be installed, pinned and secured on the slewing platform .

Note: The weight of one bracket = 10.0 t

Description of installation procedure:
Install the brackets (16) with the auxiliary crane to the ballast frame (1) .
Attach the tackle (14) on the studs of thebrackets, lift the brackets with the auxiliary crane and swing to the side to the rear of the slewing platform. Attach the brackets on the brackets (fig. X) of the slewing platform .

D A N G E R : **It must be ensured that there are no persons within the swing range of the auxiliary crane and under the suspended load.**

It must be ensured that the tackle are correctly attached on the eyehooks and that it is secured sufficiently to prevent it from loosening up.

If this is not observed, there is a danger of accidents!

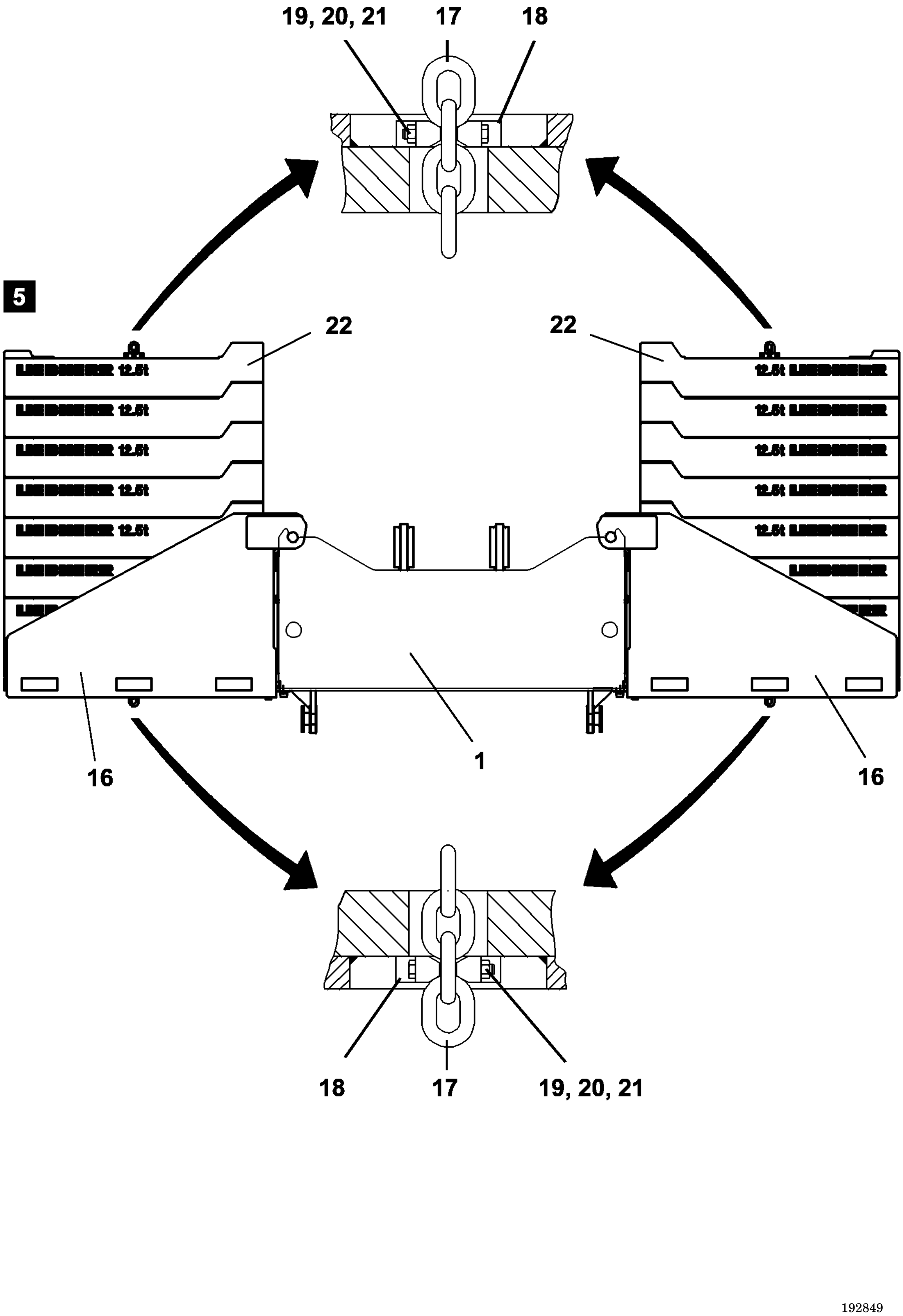
Installation:
- Lift the brackets (16) with the auxiliary crane and attach on the brackets (fig. X) of the slewing platform and the ballast frame.
- Pin the ballast frame (1) with the brackets (16) by using bracket (7) and pins (6 / 8) and secure with spring retainer (10) or cotter pin (11) (fig. Y // W).

D A N G E R: **It must be ensured that there is no one between the brackets and the slewing platform when swinging in the brackets with the auxiliary crane .**

There is a danger of accidents!

- Remove the tackle.

D A N G E R: **Before removing the tackle, the crane operator must make sure that the brackets are correctly installed on theballast frame, that they are pinned and secured.**
If this is not observed, there is a danger of accidents!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2.5 Installation of slewing platform ballast

Prerequisites:
- The crane is supported with the crane support.
- The crane must be horizontally aligned.
- The ballast frame must be installed on the slewing platform, pinned and secured.
- The brackets must be installed, pinned and secured.
- The installation conditions (chapter 3.06) must be observed.

Note: The weight of one ballast plate = 12.5 t

D A N G E R : **The installation conditions (chapter 3.06) must be observed. Otherwise there is a danger of tipping over!**

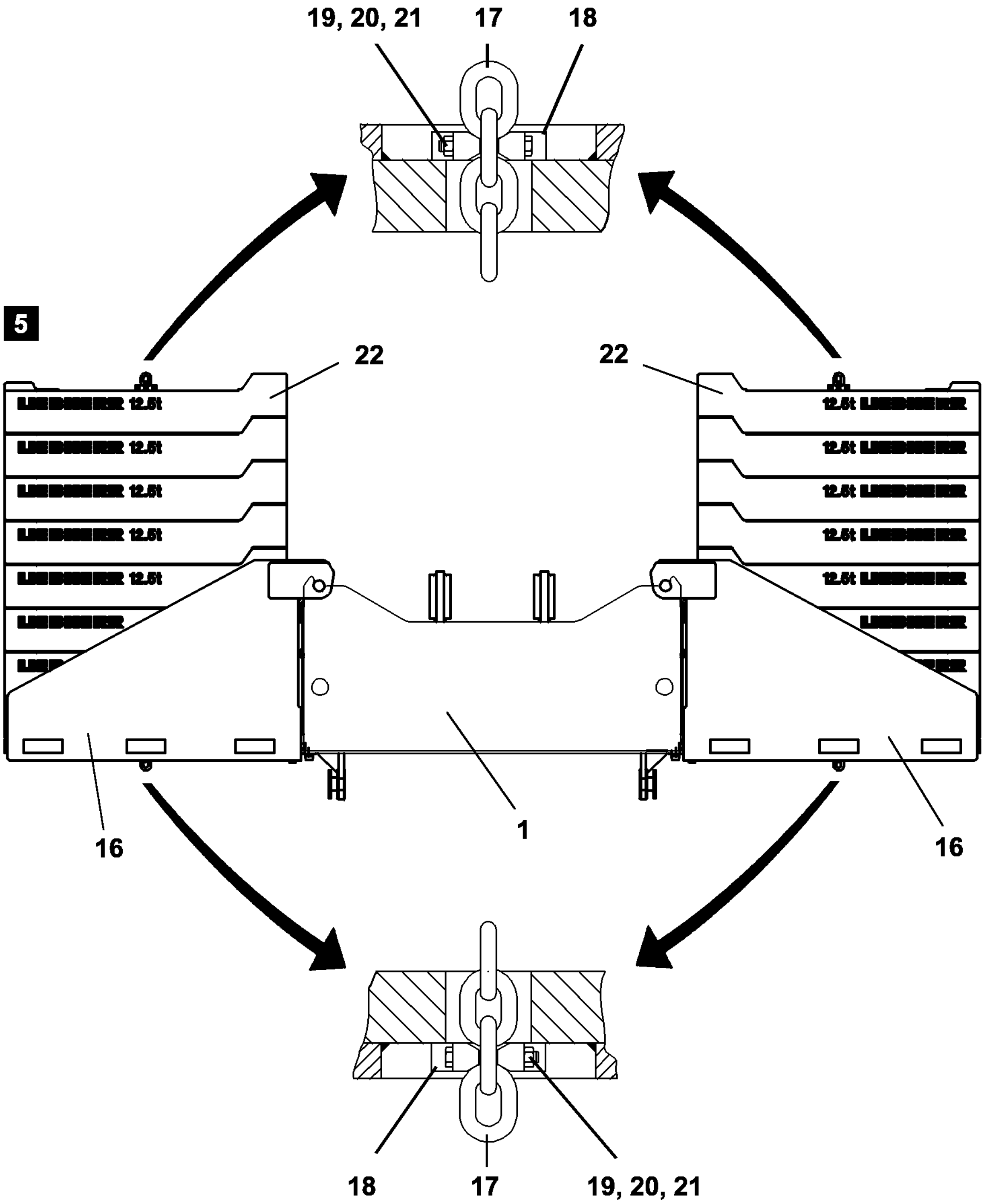
Installation procedure:
- Stack the ballast plates (22) with the auxiliary crane on brackets (16) (fig. 5).
- Attach the tackle on the studs of the ballast plates.

D A N G E R : **It must be ensured that the tackle is correctly attached on the studs on the ballast plates and that it is sufficiently secured to prevent it from loosening up.**
There is a danger of accidents !

- Always attach the counterweight plates individually.
- Always stack the counterweight plates **individually** with the auxiliary crane on the brackets.
- Install the counterweight only according to the load charts.

D A N G E R : **- The ballast plates must be placed individually, alternately on the left and the right side.**
Otherwise there is a danger of tipping over!

Guide the retaining chain (17) from above through the port in the middle of the ballast plates (22). Push the plate (18) in, on top and bottom and secure chain (17) with screw (19), washer (20) and nut (21).



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2.6 Combination of permissible slewing platform ballast combinations

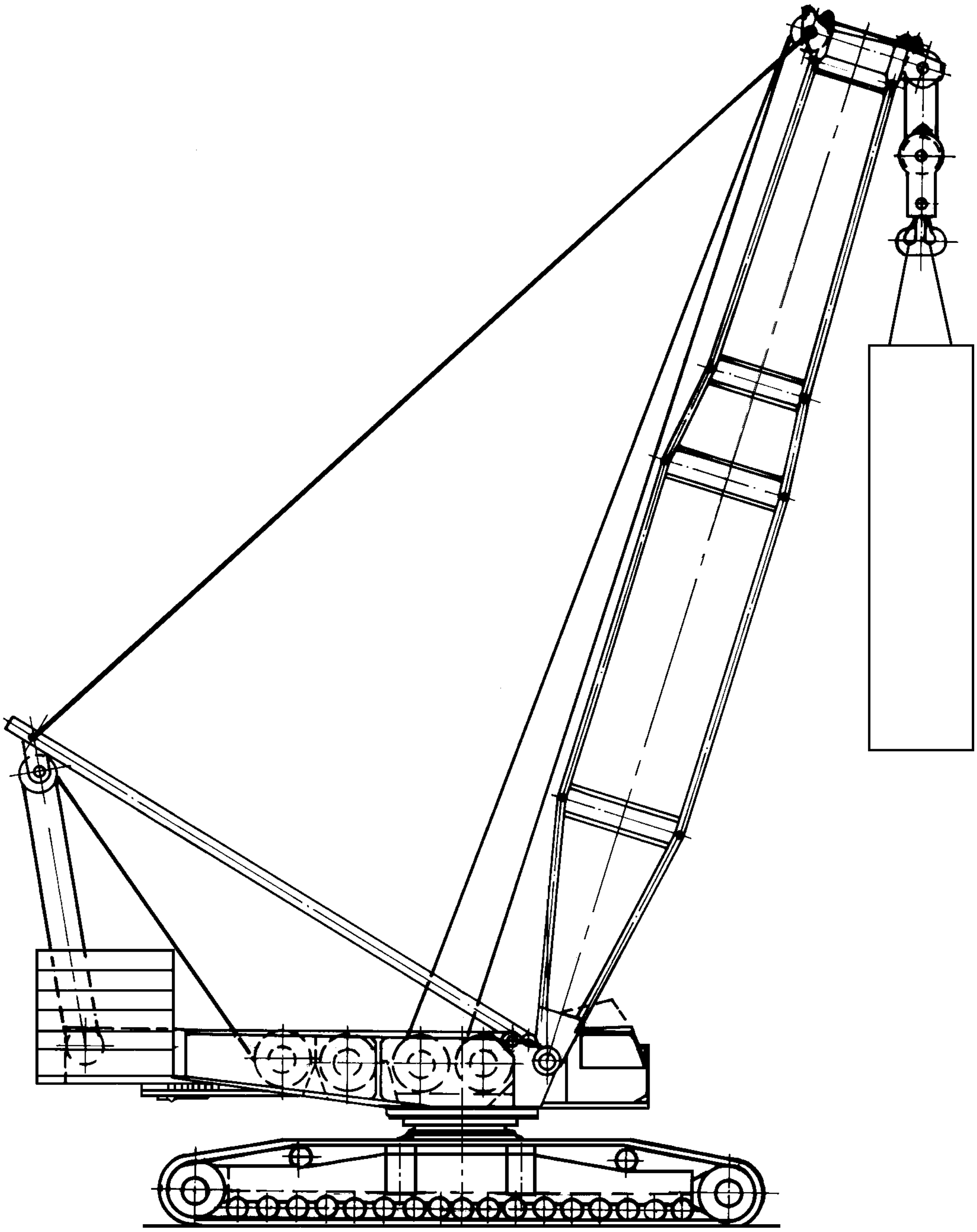
The ballast plates are marked with their own weight.

plate	12.5	t
bracket	10.0	t
ballast frame	5.0	t

D A N G E R: The installed slewing platform ballast must correspond to the data in the erection and take down charts and the data in the load charts. Otherwise there is a danger of accidents!

The following combinations are possible for the extended slewing platform :

Ballast	Combination		
250 t	18	x	plate
	2	x	bracket
	1	x	ballast frame
225 t	16	x	plate
	2	x	bracket
	1	x	ballast frame
200 t	14	x	plate
	2	x	bracket
	1	x	ballast frame
150 t	10	x	plate
	2	x	bracket
	1	x	ballast frame
125 t	8	x	plate
	2	x	bracket
	1	x	ballast frame
100 t	6	x	plate
	2	x	bracket
	1	x	ballast frame
75 t	4	x	plate
	2	x	bracket
	1	x	ballast frame



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Safety-technical notes on working with a load

Note : Refer to the safety-technical notes in Chap. 2.04.

- Always observe the maximum loads as given in the load capacity table.
- Always observe the prescribed working radii as given in the load capacity table.

D A N G E R: **Starting up with a smaller working radii than those given in the load capacity table is prohibited. This also applies to conditions when there is no load suspended on the hook. If this is not observed, there is the danger of accidents.**

- Always make sure that the number of reevings as given in the load capacity table is appropriate to the maximum load.

D A N G E R: **If this is not observed, the cable could snap!**
There is the danger of accidents.

- Swinging the load can be avoided by slowly starting and braking all crane movements.
- If the lowest coil layer of a winch drum is reached, an observer must always make sure that there are at least 3 coils remaining on the drum.

D A N G E R: **If this is not observed, serious accidents can result.**

- No hook blocks larger than that required to hoist the maximum load may be reeved.

Inspection
Before beginning any crane operations, the crane operator must go through an inspection routine and make sure that the operational safety of the crane is ensured.
- Is the crane properly supported and horizontally aligned?
- All applicable values for the current equipment mode as taken from the load capacity table are set and/or fulfilled.
- There are no persons or objects in the danger area of the crane.

D A N G E R: **The crane operator must make sure while slewing the crane superstructure, particularly while operating when the working radius behind the ballasts and chassis are confined, that there are no persons or objects in danger.**
Before beginning any slewing movements, an acoustic signal (horn) must be given.

Visual inspection for damage
The crane operator must report damage or function that do not work properly to the operator who relieves him and to the responsible persons in charge of operations.

D A N G E R: **The crane operator must immediately stop crane operations if any malfunctions should occur which endanger the operational safety of the crane. This applies particularly to:**
- **damage to load-bearing parts of the crane, such as the boom, supports, etc.**
- **overrun of the load (due to hoisting gear brake failure)**
- **faults in the crane control**
- **warning and indicator lamps that have burned out**
- **damage to the hoist cable**
- **damage to the tension cable and tension columns**
- **safety devices that no longer work**
- **crane hydraulics that leak**

Taking on a load
The crane must always be operated in such a manner that the load bearing parts are not destroyed and safety is always guaranteed.

Pulling at an angle is prohibited
The crane is built exclusively for hoisting loads vertically. Pulling at an angle, regardless of whether this is in the direction of the boom, or carried out crosswise to it, causes horizontal forces to occur from the load, besides the vertically acting forces. As these forces are transferred via the hoist cable to the boom jib, they have an effect above a lever arm which corresponds to the height of the boom head pulley.

D A N G E R: **Pulling at an angle is prohibited!**
Pulling at an angle can destroy the crane or cause it to topple over.

Pulling stuck or jammed loads free is prohibited
It is **prohibited** to pull stuck or jammed loads free with the crane.

D A N G E R: **Pulling stuck or jammed loads free with the crane is P R O H I B T E D !**
This can cause the crane to topple over.

Hoisting the load
Hoisting the load must be done with great care. There is the danger of being crushed for persons who are nearest the area of the load to be hoisted. If the hoisting tackle is manually placed in the load to be hoisted, the crane operator must sure that:

- the hands of the persons placing the tackle on the load are not crushed between the tackle and the load.

- arms and legs are not crushed by a swinging load while hoisting.

D A N G E R: **There is the danger of being crushed for persons in the area where the load is being hoisted.**

Crane operation
A swinging load must always be kept under control.

Only safe,, sensitive control of the crane functions can guarantee this. All crane movements must be started and braked slowly so that the load does not begin to swing.

D A N G E R: **A swinging load can damage the crane or cause it to topple over.**

Tag lines
As an aid to crane operator for accurately guiding the load, tag lines are recommended. In this way, undesired load movements and the resulting damage they can cause can be prevented.

Moving persons
The crane is not designed for or meant to move persons. Moving persons from one place to another on a hoisted load is prohibited.

D A N G E R: **Moving persons with the load or load tackle is prohibited.
There is the danger of accidents.**

Danger of being crushed
Lowering the load must be done with great care. There is the danger of being crushed for persons who are nearest the area where the load is to be lowered.

D A N G E R: **Persons or objects must not be under the load when it is being lowered.
There is the danger of accidents.**

Working near overhead high-tension wires
When operating close to electrical overhead wires, make sure these are disconnected by trained personnel. If this is not possible, the danger area must be covered or blocked off.

If these measures are not possible, the following safe distances must always be kept between the crane/boom and the wires:

Rated voltage	Minimum distance in m
up to 1000 V	1
over 1 kV up to 110 kV	3
over 110 kV up to 220 kV	4
over 220 kV up to 380 kV	5
if the rated voltage is unknown	5

Note: If, despite all precautionary measures, a flashover occurs, observe the following:

- Remain calm - do not leave the crane cab.
- Warn all those around the crane to remain standing where they are and not to touch the crane!
- Move the crane out of the danger area.

D A N G E R: **If this is not observed, serious injury or damage can occur.
There is the danger of accidents.**

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.

D A N G E R : 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.

D A N G E R : 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.


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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.**


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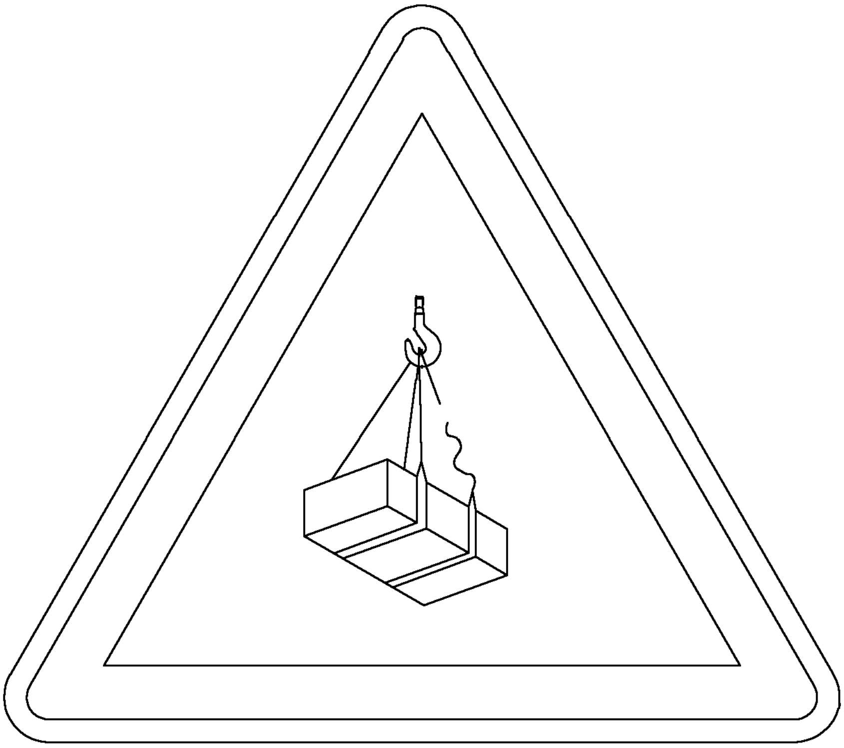
9.3 Actuate the bypass button LICCON

- 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.



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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.

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10.2 Assembly/disassembly of boom

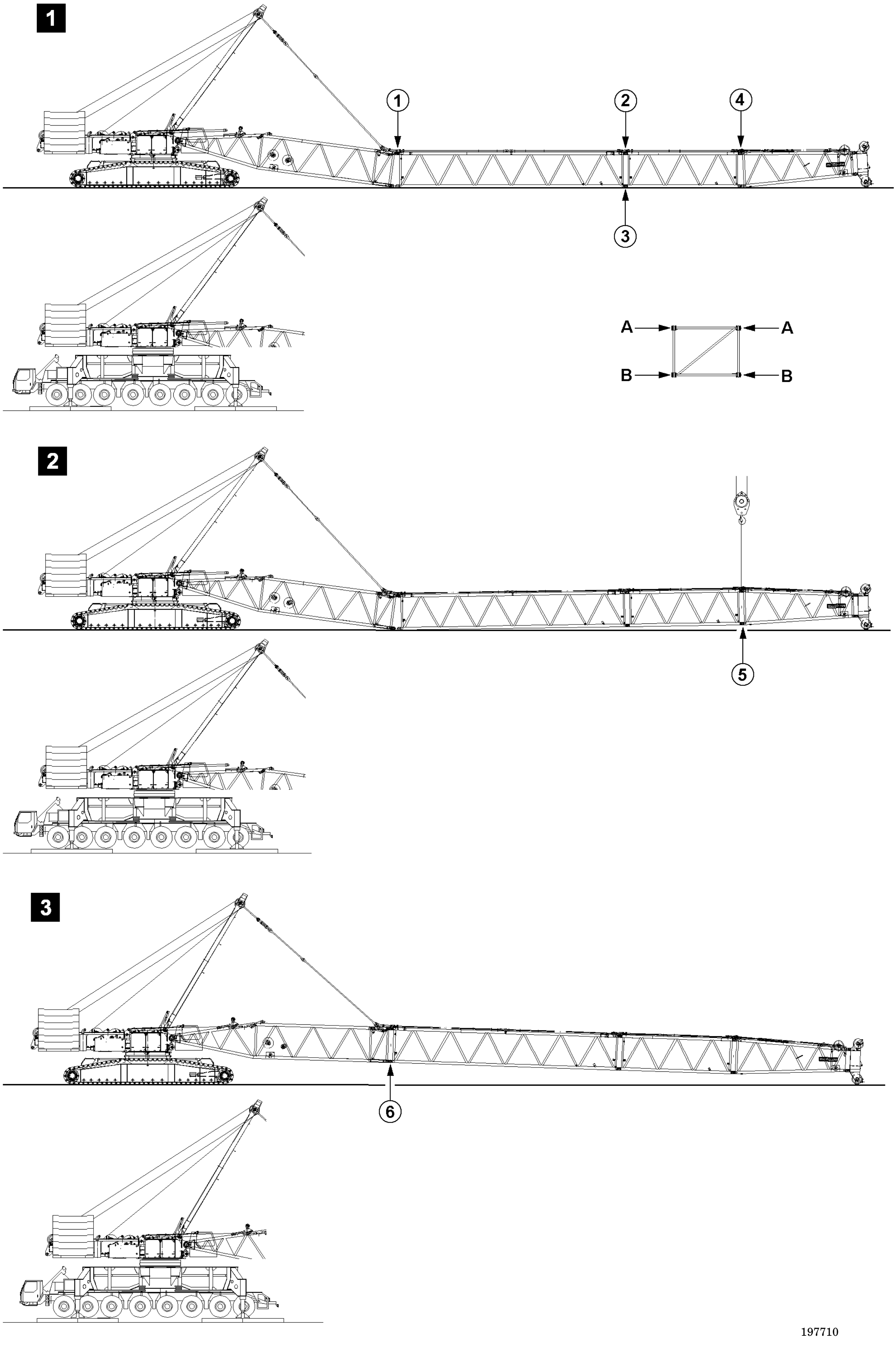
If the lattice sections are not lying on the ground during assembly/disassembly, then they must be supported with suitable materials. The height of the support must be selected in such a way that the lattice sections are no longer in contact with the ground. Make sure that is the case, especially if 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**!



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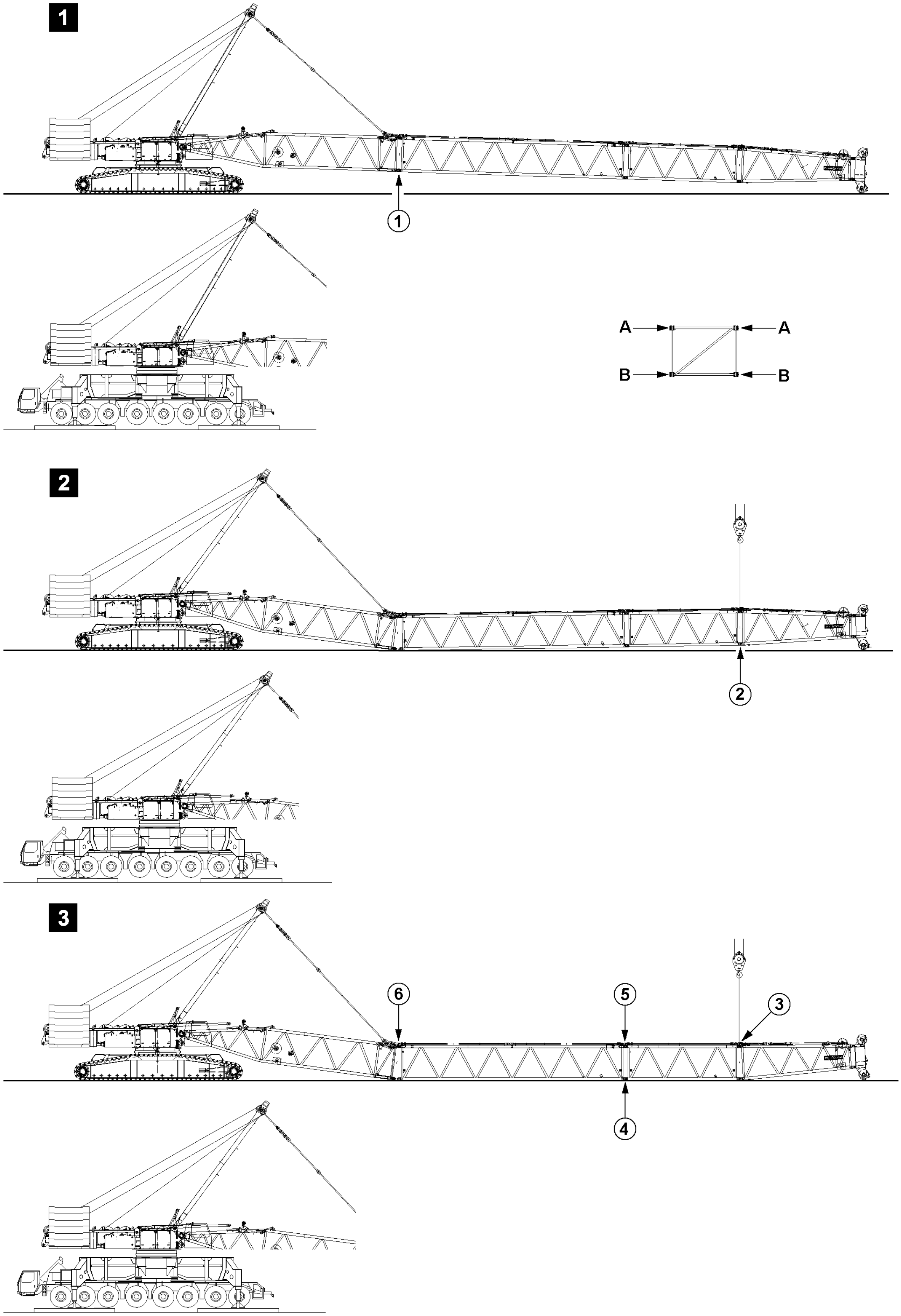
10.2.1 Assembly of lattice sections

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.



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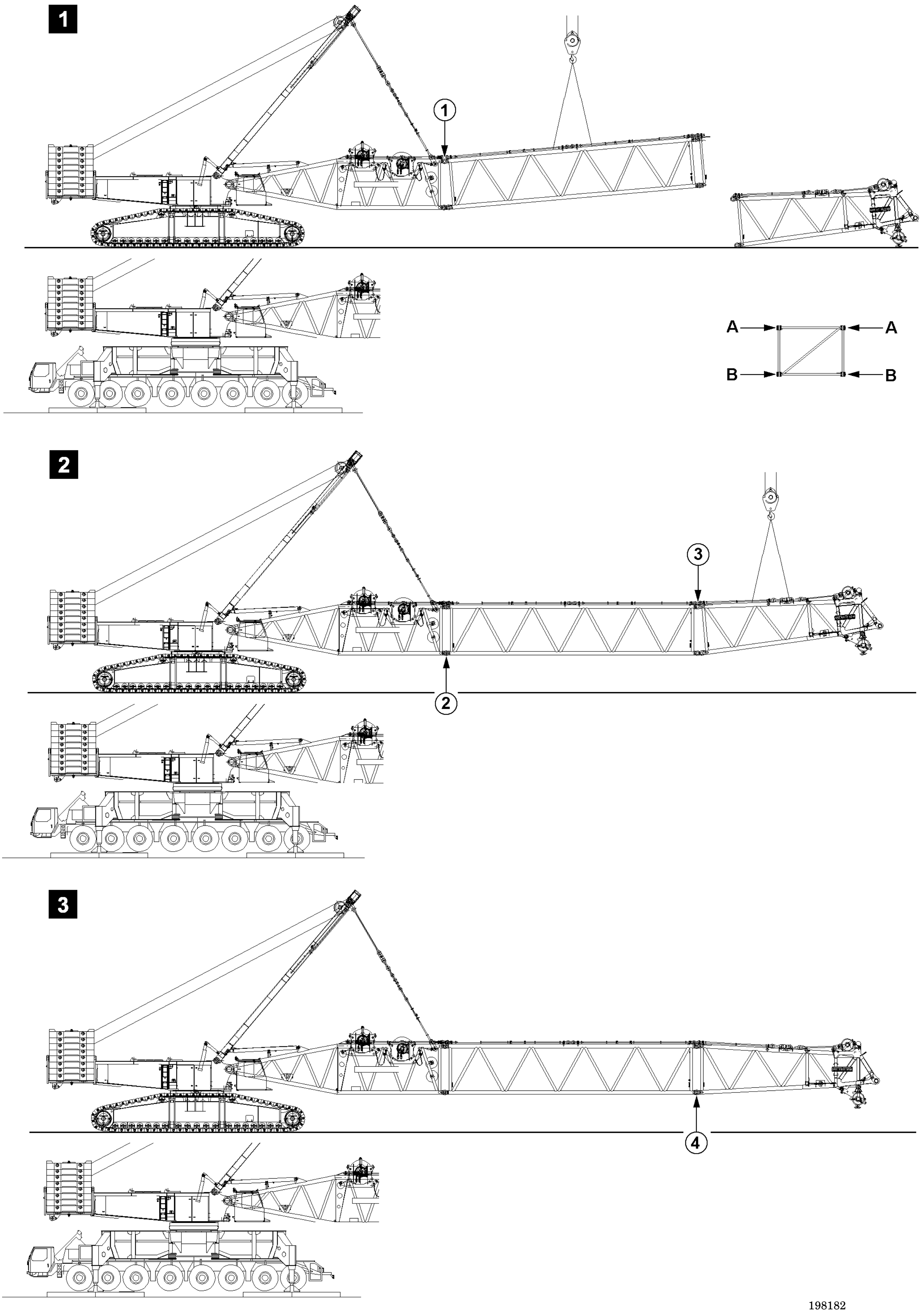
10.2.2 Disassembly of lattice sections

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.

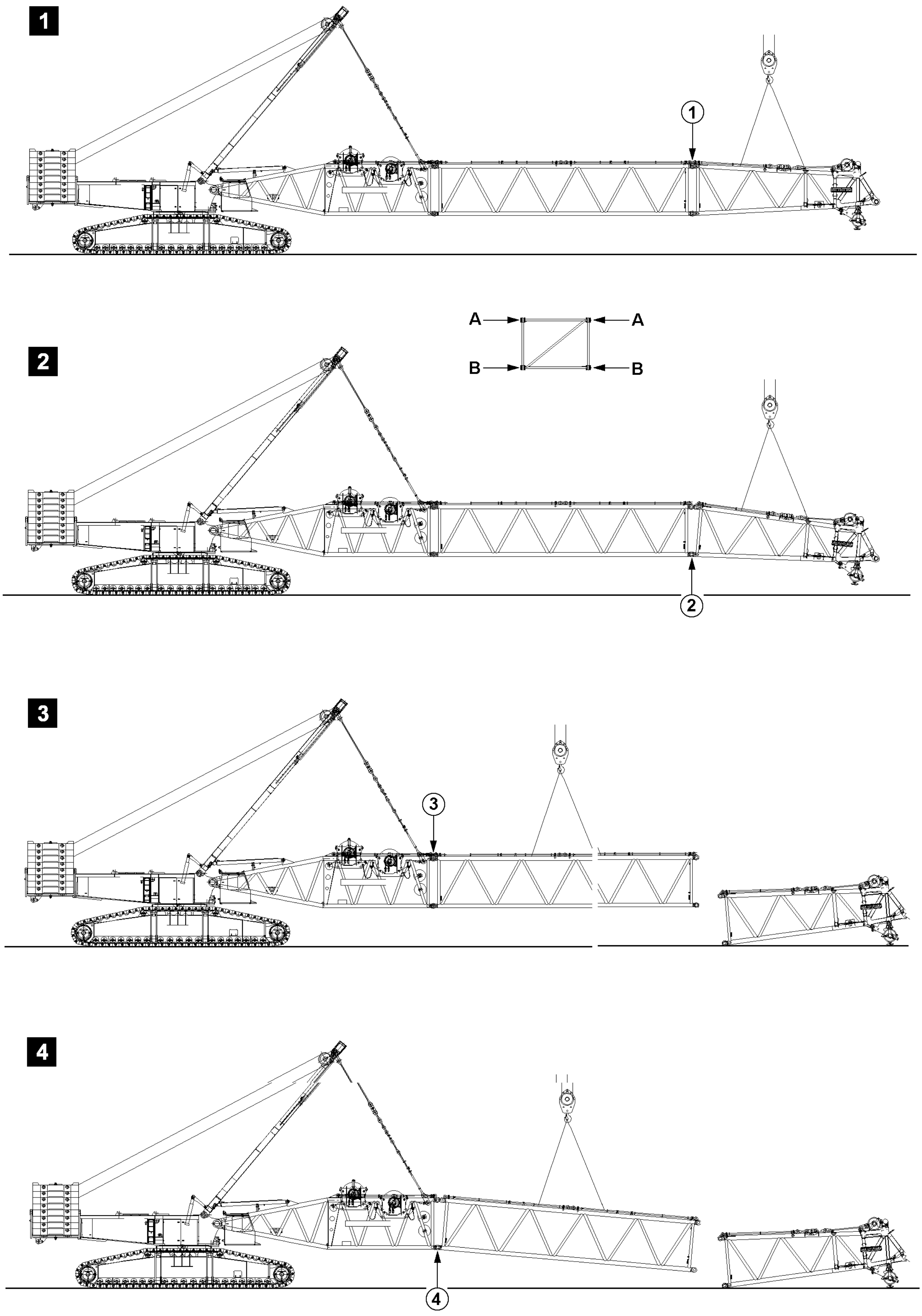

1
1
A
A
B
B
2
3
2
3
4
198182

10.2.3 Flying 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 **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.



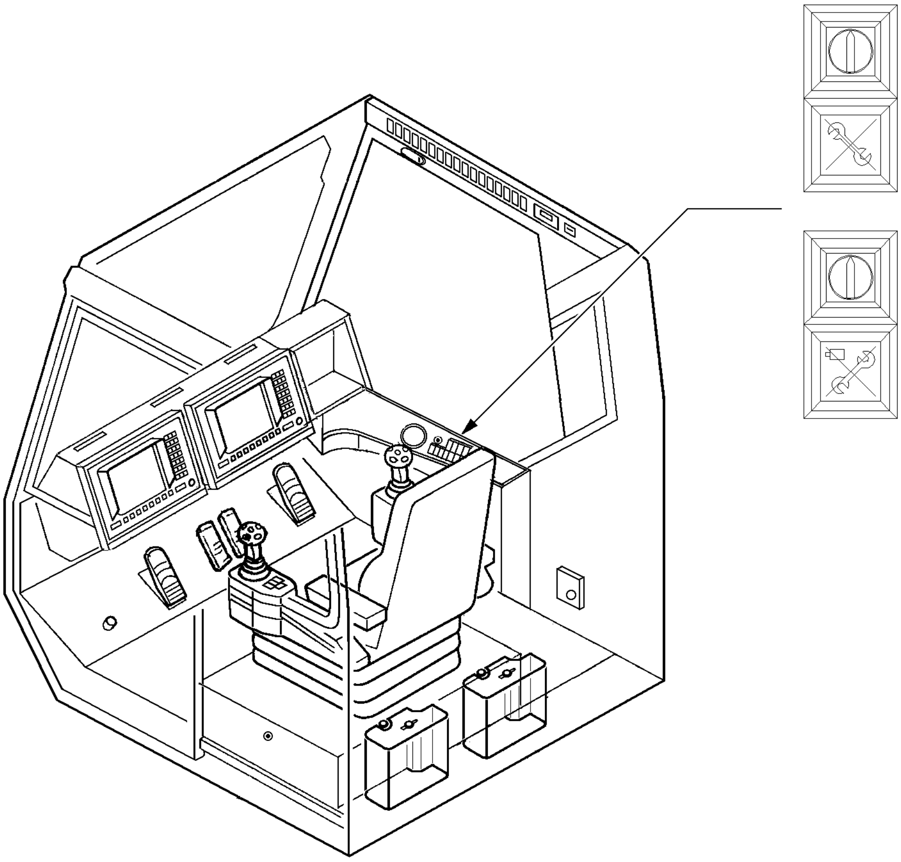
198183

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!

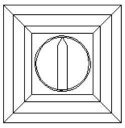
- Release and unpin the pins on both sides (level **A**) on point **1** , fig. 1.
- Release and unpin the pins on both sides (level **B**) on point **2** , fig. 2.
- Release and unpin the pins on both sides (level **A**) on point **3** , fig. 3.
- Release and unpin the pins on both sides (level **B**) on point **4** , fig. 4.



198078

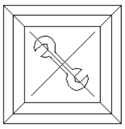
10.3 Bypass button assembly

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!



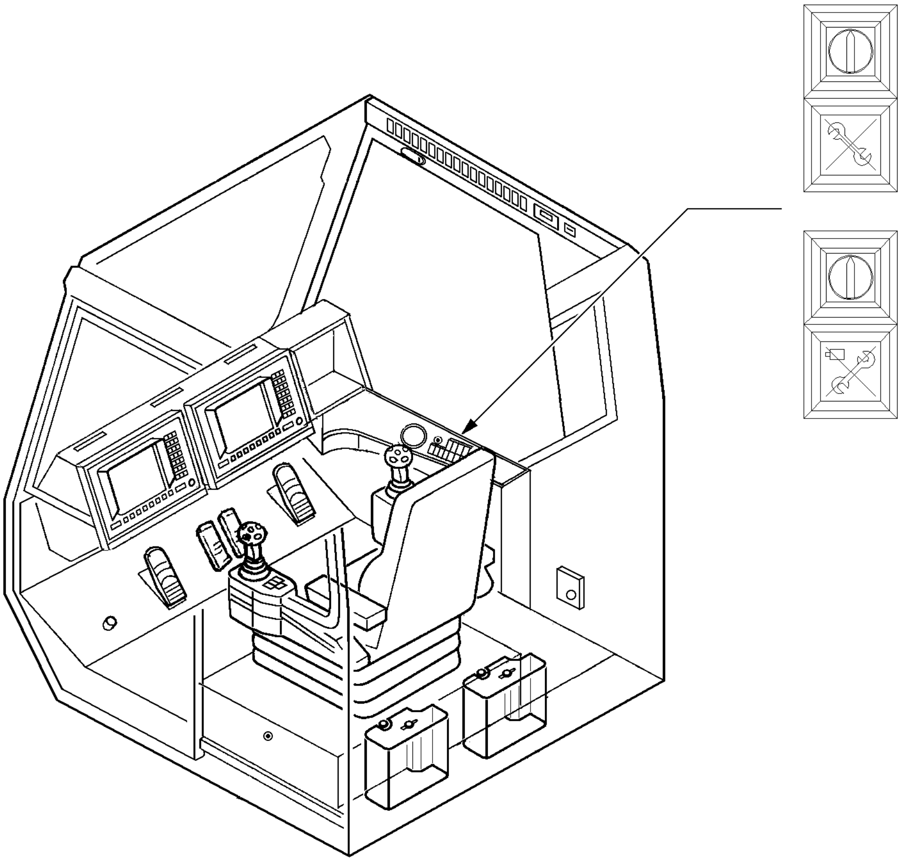
- Actuate the assembly keyed button.

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.



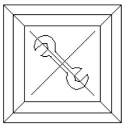
- If the assembly keyed button is to be turned off:
  Turn the assembly keyed button off by actuating the button.

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.



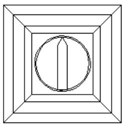
198078

10.4 Bypass button crawler assembly



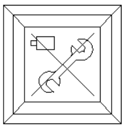
Prerequisite:
- The assembly keyed button is actuated
- The indicator light in the button lights up

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

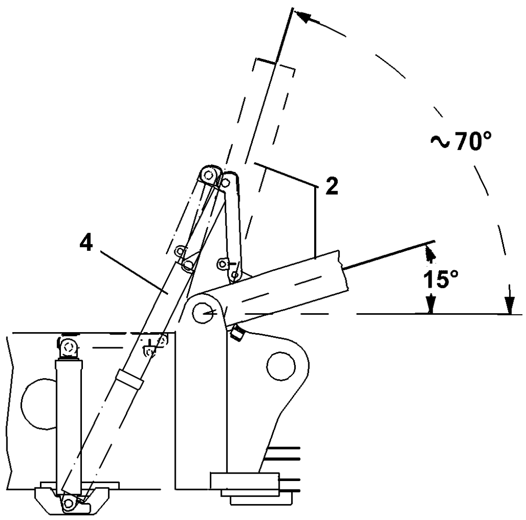
Make sure that the following prerequisites are met:

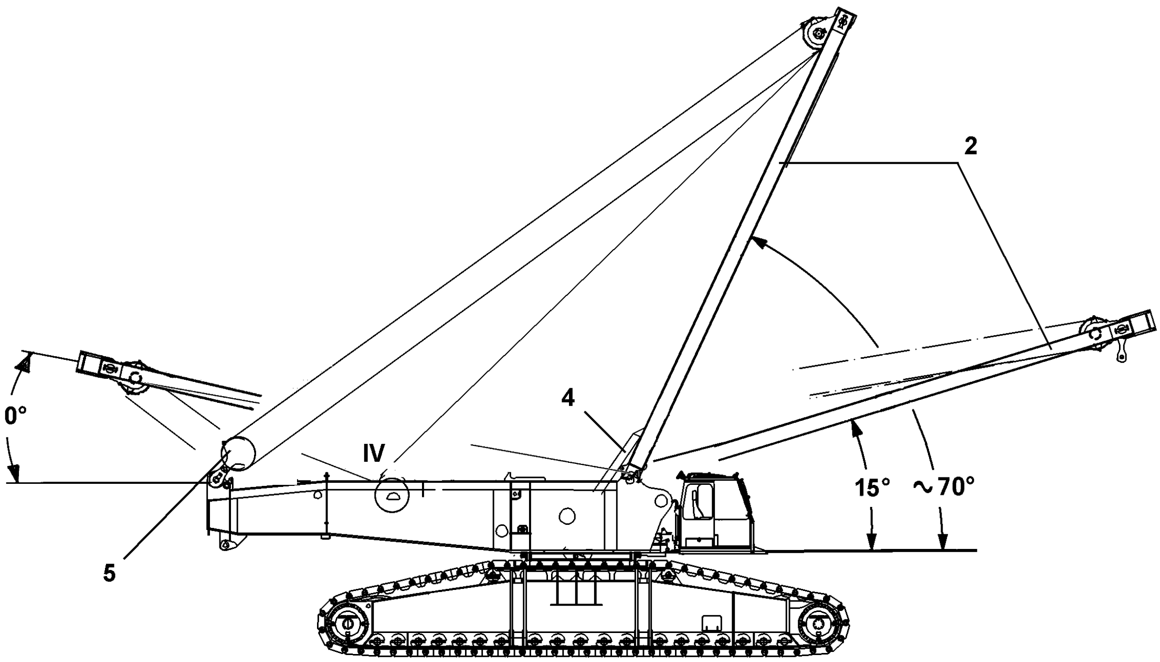
- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform, according to the load chart.
- The boom is installed according to the load chart and the operating manual.
- All limit switches are correctly installed and fully functioning.
- All pin connections are secured.
- 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.

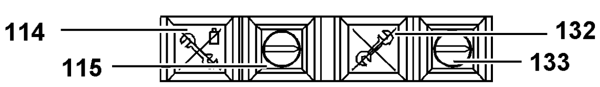
D A N G E R : Incorrectly installed or non-functioning limit switches as well as falling parts (pins, spring retainers, ice, etc.) can cause accidents!

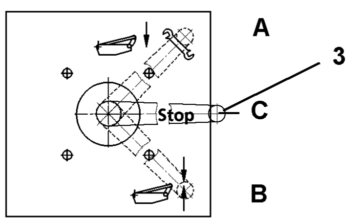
11.1 Check the prerequisities

- Check if all prerequisites are met.









193019

1. Erect the A- Bracket

Prerequisites:
- The cable of winch IV - boom control - is reeved .
- The engine is running - see chapter 4.03.
- Actuate the installation keyed button (133) and keyed button (115) "crawler and boom installation", the indicator lights "Installation" (132) and "crawler and boom installation" (114) light up.
- Set the operating mode on the LICCON, which will be installed.

Note: For master switch assignment with turned on keyed buttons - see chapter 4.05

2. Installation equipment configuration on crawler 9.10m × 8.80m × 1.50m

1 with placed down SA-bracket (with and without cable on winch IV).

2 90° SA-bracket (with and without cable on winch IV).

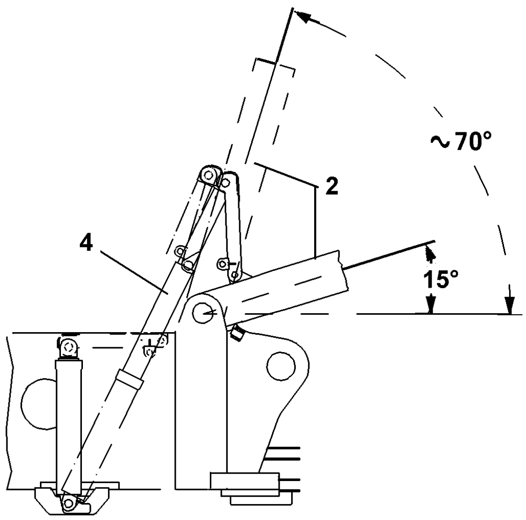
3 bei abgelegtem SA-bracket, winch I and IVwith cable,

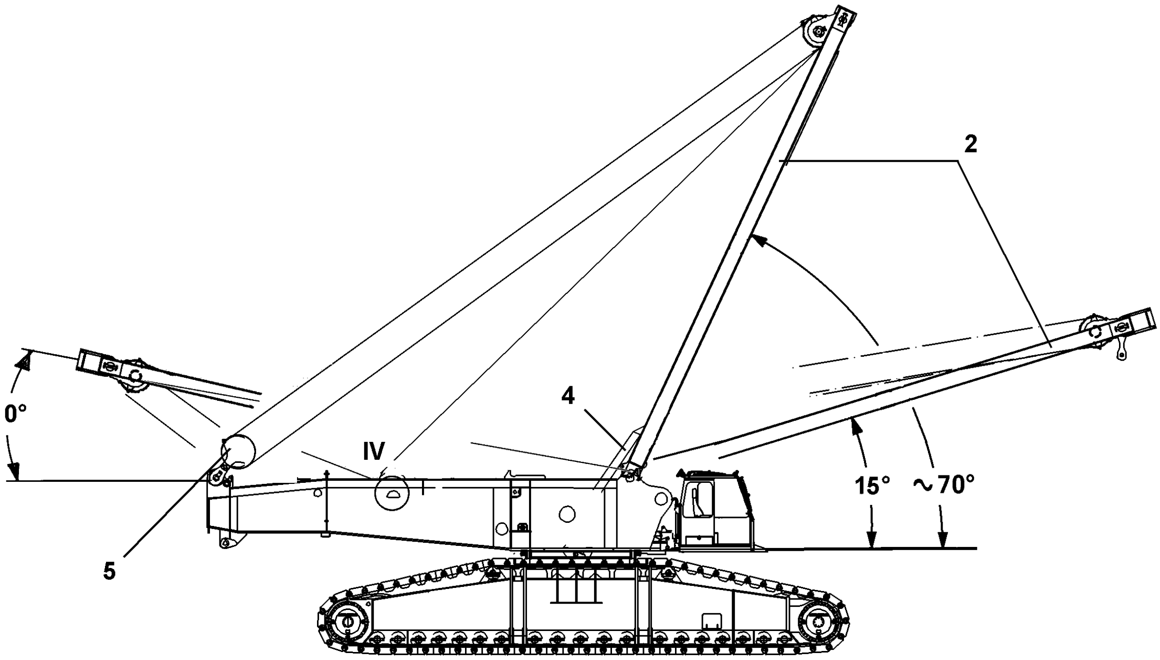
4 90° SA-bracket, winch I and IVwith cable,

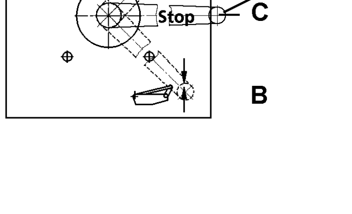
5 90° SA-bracket, winch I and IVwith cable, S- pivot section installed.

D A N G E R: Before turning the slewing platform without derrick or boom, the following must be observed:
- the crawler travel gear with installed slewing platform is in horizontal position.
- the installation conditions (chapter 3.06) must be observed.

If this is not observed, there is a danger of tipping the crane over!







193019

3. Erection

Set the ball cock (3) to **”bottom”** position (B) . The A-bracket is pushed upward by the erection cylinder (4) until the cables are tensioned between the A- bracket (2) and the slewing platform pulley bracket (5) .

Positions of ball cock (3):

A	Position ”up”	- to lower the A- bracket onto the slewing platform, transport position
C	Position ”horizontal”	- STOP, extension and retraction of erection cylinder is blocked
B	Position ”down”	- to extend the erection cylinder, installation and operating position

C A U T I O N : **Check visually, the cables must lay correctly in the corresponding cable pulleys!**
Ball cock remains in position "B".

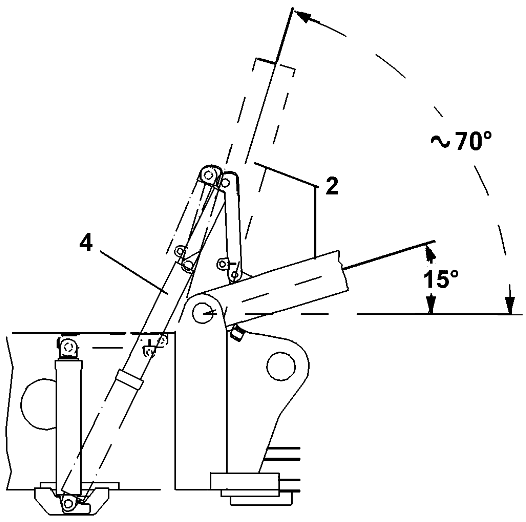
Actuate the master switch (MS 1, 80) and spool out winch IV .The A- bracket (2) is pushed by the erection cylinder (4) upward and up to approx. 70° forward (ca. 70° = erection cylinder fully extended).
Then it lowered to the front, due to its own weight and spooling out of winch IV.
For A- bracket angle smaller than 15°, winch IV "spool out" is shut off. A control error is shown.

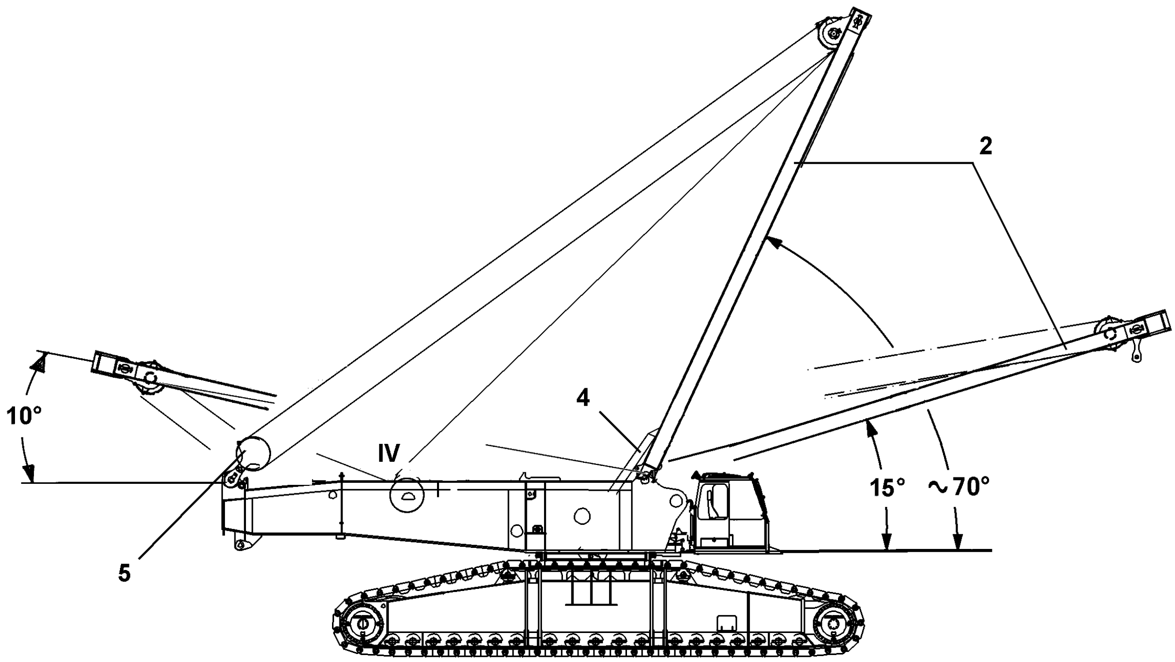
Shut off of winch IV "spool up / out" occurs if the minimum pressure of 30 bar in the erection cylinder is fallen below. A control error is shown.

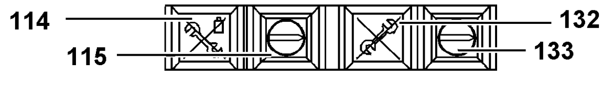
D A N G E R: **During installation and crane operaton, the ball cock (3) must be in position (B) ”down” .**
The ball cock position (C) ”STOP” (horizontal) and (A) ”up” are only permissible when lowering the SA- bracket onto the slewing platform (transport position) !

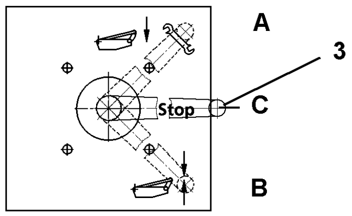
To prevent a change, the ball cock (3) must be secured with a lock
- i m m e d i a t e l y after installation
- during crane operation.

When spooling out winch IV, make sure there is no slack cable!









193019

4. Place the A- bracket onto the slewing platform

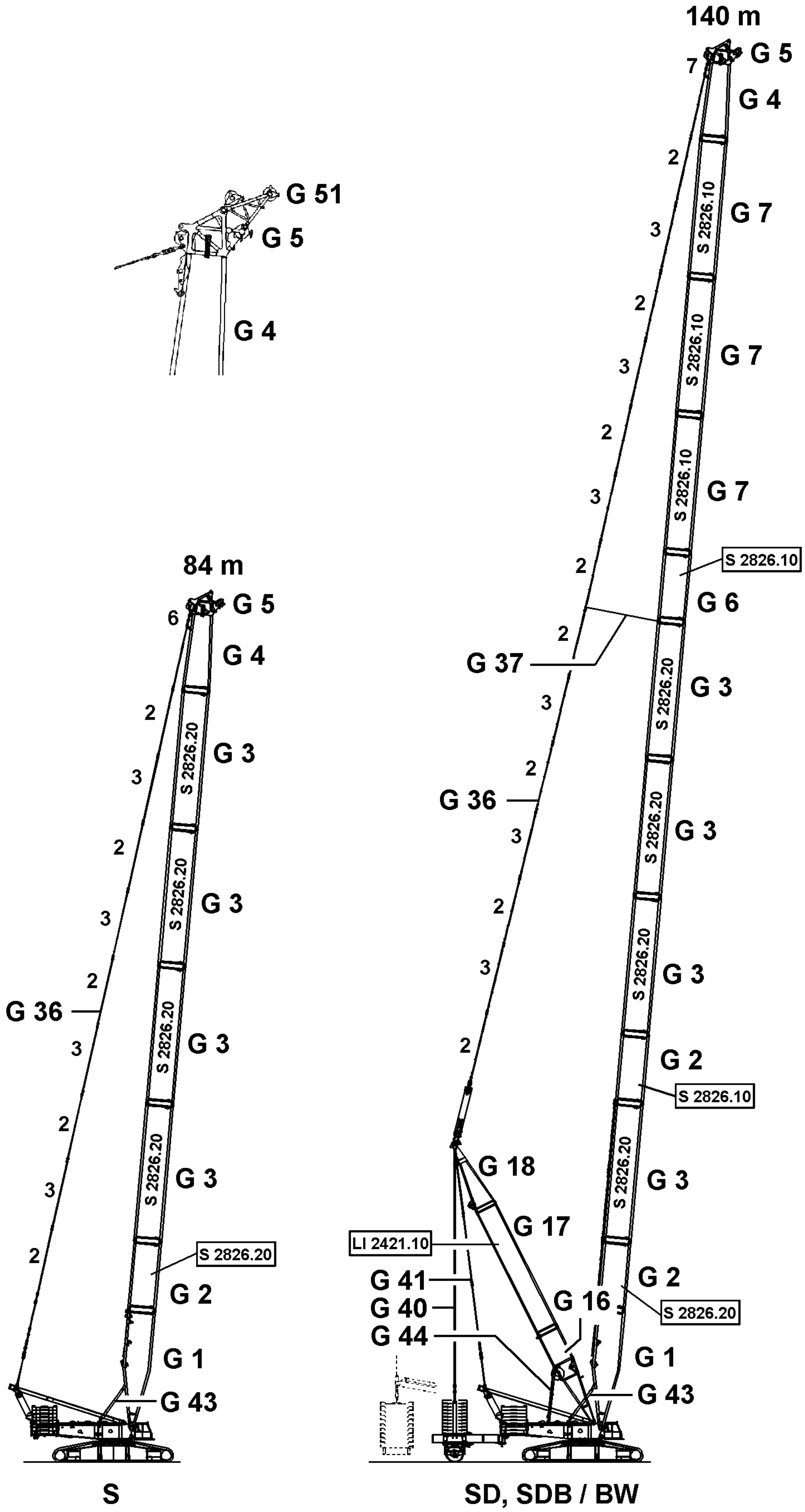
During installation, the ball cock (3) must be in position (B) ”down” .
Actuate the master switch (MS 1, 80) and pull the A-bracket up to approx. 10° to the rear by spooling up the winch IV.
The A- bracket is pulled to the rear against the pressure of the erection cylinder .

D A N G E R: **The ball cock (3) must be in position (B) ”down” .**
Before lowering the A- bracket, the crane operator must make sure that there are no persons or objects within the danger zone.
Danger of crushing!

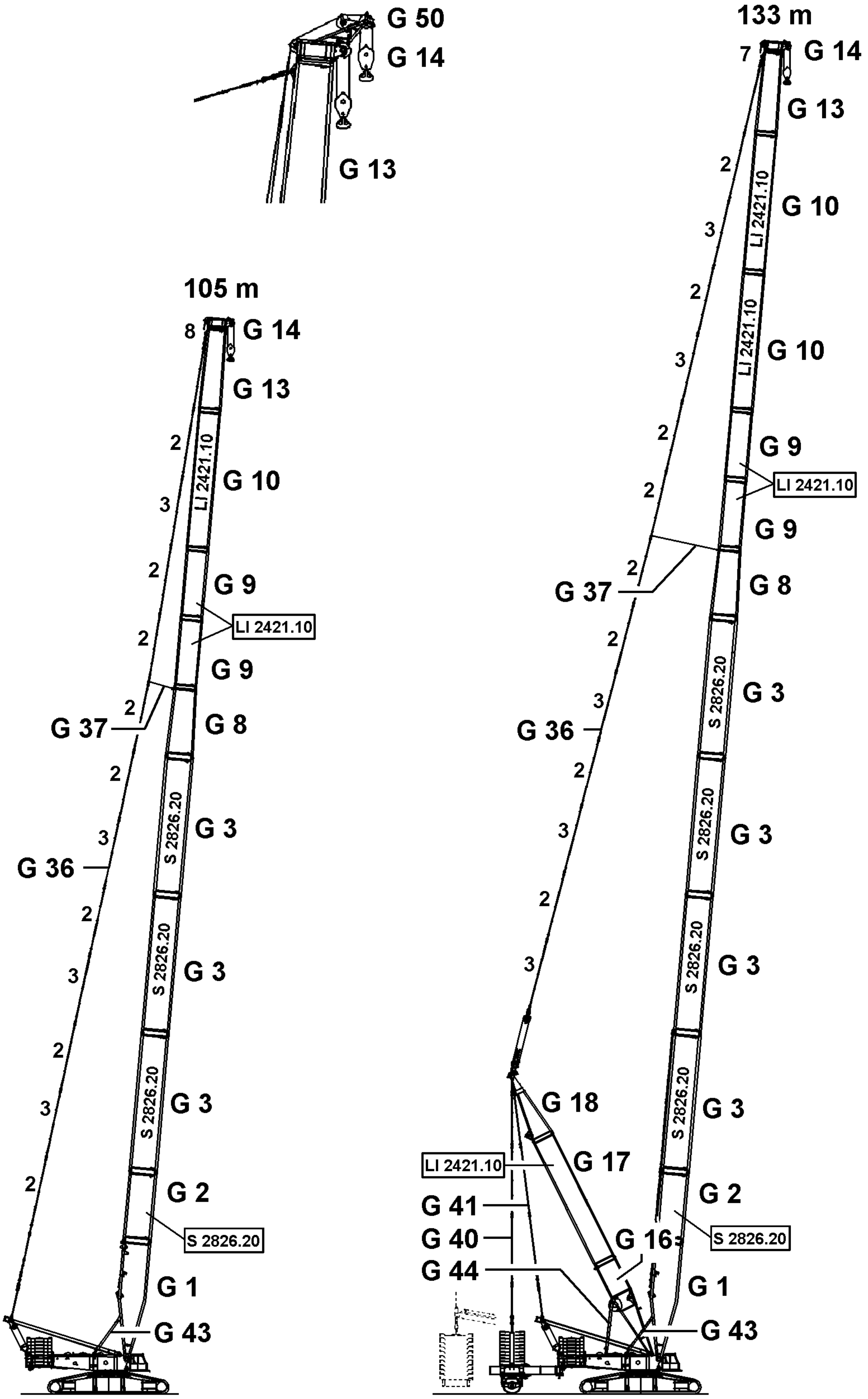
After reaching the A- bracket position of approx. 10°, the ball cock (3) must be switched to position (A) **”up”** . The A- bracket is slowly lowered by the erection cylinders onto the slewing platform, the hydraulic oil flows through a restrictor into the tank.

D A N G E R : **The ball cock position (C) ”STOP” (horizontal) and (A) ”up” are only permitted when lowering the A- bracket from 10° - 0° onto the slewing platform (transport position) !**

C A U T I O N : **At the same time, carefully spool up the intake cable - winch IV, watch for slack cable formation!**
Check visually !

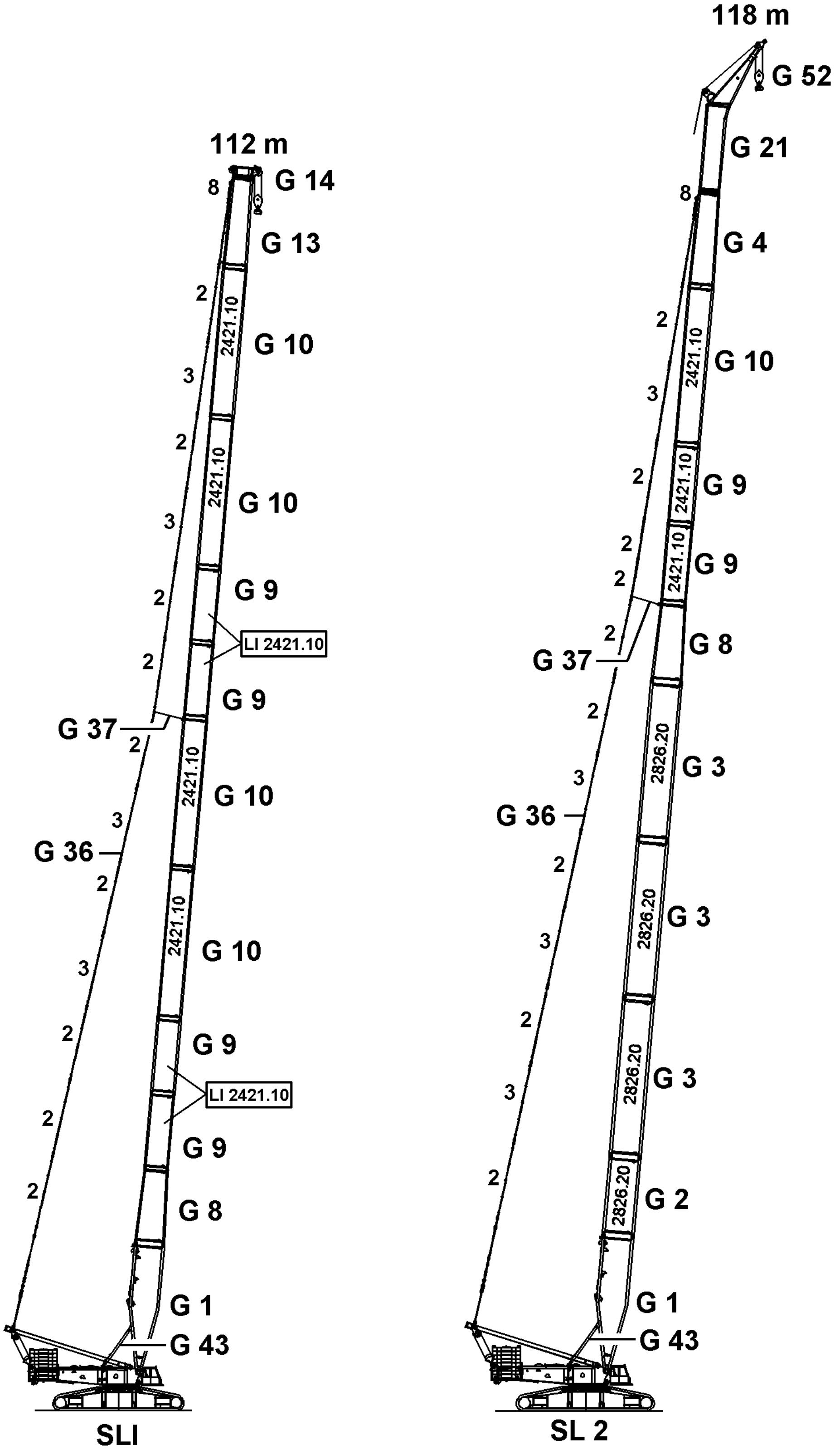

G 51
G 5
G 4
84 m
6
G 5
G 4
S 2826.20
G 3
G 36
2
3
S 2826.20
G 2
G 1
G 43
S
140 m
7
G 5
G 4
S 2826.10
G 7
S 2826.10
G 7
S 2826.10
G 7
S 2826.10
G 6
G 37
S 2826.20
G 3
G 36
S 2826.20
G 3
S 2826.20
G 3
G 2
S 2826.10
G 18
G 17
LI 2421.10
G 41
G 40
G 44
G 16
S 2826.20
G 3
G 2
S 2826.20
G 1
G 43
SD, SDB / BW

192474

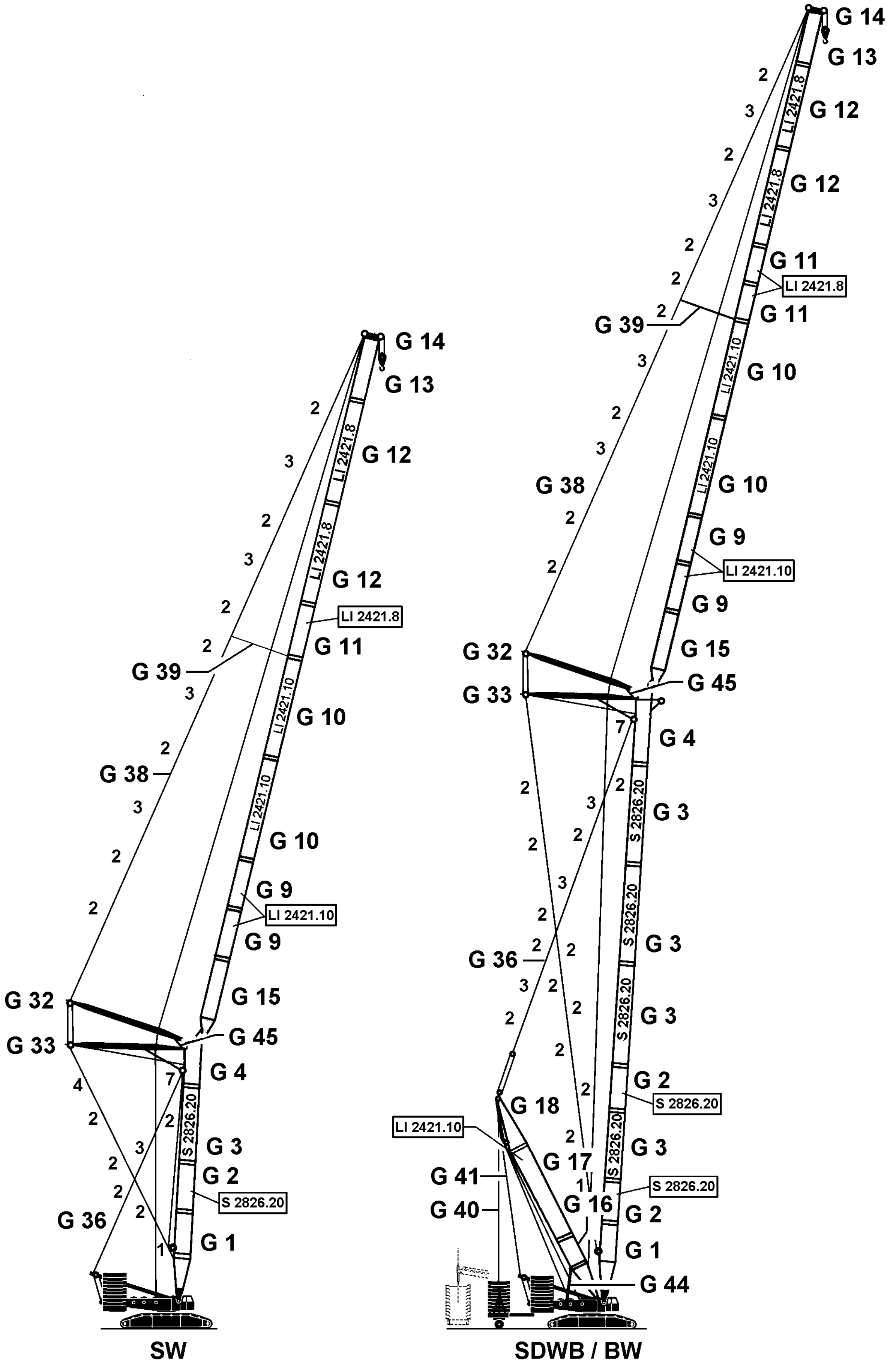


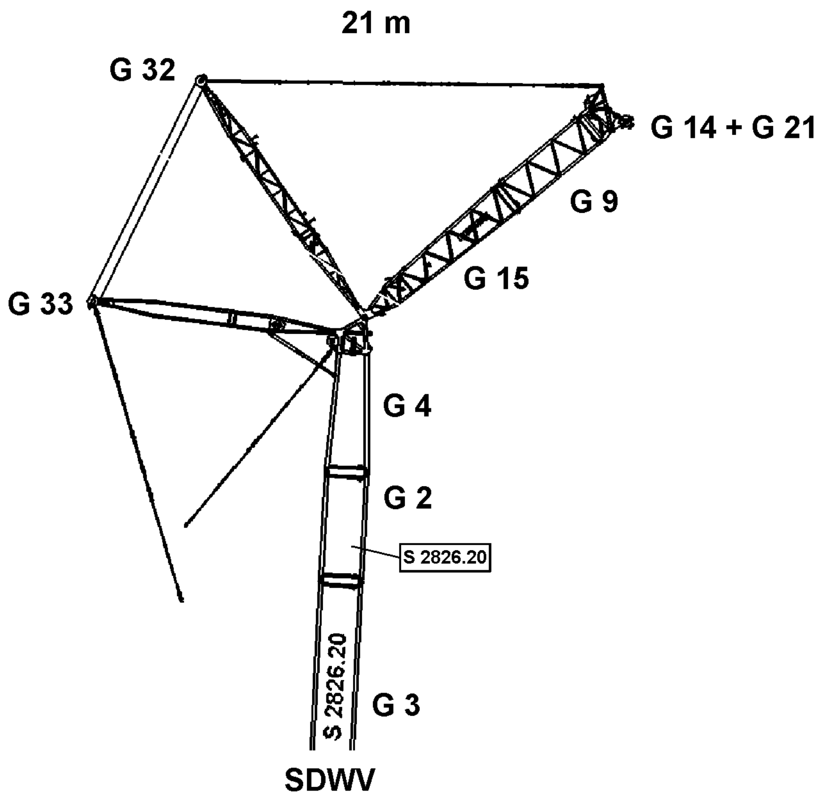
SL SLDB / BW

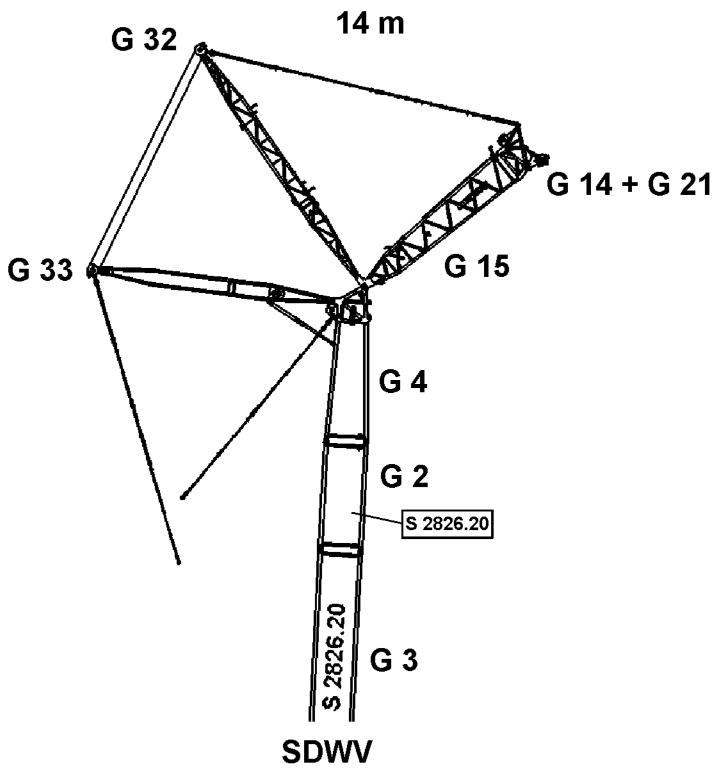
192475


112 m
G 14
8
G 13
2
2421.10
G 10
3
2
2421.10
G 10
3
G 9
2
LI 2421.10
2
G 9
G 37
2
2421.10
G 10
3
G 36
2
2421.10
G 10
3
2
G 9
LI 2421.10
2
G 9
2
G 8
G 1
G 43
SLI
118 m
G 52
G 21
8
G 4
2
2421.10
G 10
3
2
2421.10
G 9
2
2
2421.10
G 9
2
G 37
G 8
2
2826.20
G 3
3
G 36
2
2826.20
G 3
3
2
2826.20
G 3
3
2
2826.20
G 2
G 1
G 43
SL 2

192476


G 14
G 13
G 12
G 12
LI 2421.8
G 11
G 39
G 10
G 38
G 10
G 9
LI 2421.10
G 9
G 15
G 32
G 45
G 33
G 4
S 2826.20
G 3
G 2
G 36
G 1
SW
G 14
G 13
G 12
G 12
G 11
LI 2421.8
G 11
G 39
G 10
G 38
G 10
G 9
LI 2421.10
G 9
G 32
G 15
G 45
G 33
G 4
G 3
G 36
G 3
G 3
G 2
S 2826.20
G 18
LI 2421.10
G 17
G 3
G 41
S 2826.20
G 16
G 2
G 40
G 1
G 44
SDWB / BW
192477


21 m
G 32
G 14 + G 21
G 9
G 15
G 33
G 4
G 2
S 2826.20
S 2826.20
G 3
SDWV


14 m
G 32
G 14 + G 21
G 15
G 33
G 4
G 2
S 2826.20
S 2826.20
G 3
SDWV

192479

Combination of maximum possible attachment

	Description	System	Length (m)	Weight (t)
G 1	S -Pivot section with S + W-rods + retaining cylinder	2826.**20**	12,0	17,0
	S -Pivot section with winch V	2826.**20**	12,0	23,9
	S -Pivot section with winch VI	2826.**20**	12,0	20,8
G 2	S -Intermediate section	2826.**20**	7,0	6,2
G 3	S -Intermediate section	2826.**20**	14,0	11,3
G 4	S-End section		9,0	11,9
G 5	Pulley set 600 / 400 t for S-End section		1,7	2,7
G 6	LA -Intermediate section	2826.**10**	7,0	4,5
G 7	LA -Intermediate section	2826.**10**	14,0	8,1
G 8	SL - Reducer section		7,0	4,3
G 9	LI -Intermediate section	2421.**10**	7,0	3,8
G 10	LI -Intermediate section	2421.**10**	14,0	7,0
G 11	LI -Intermediate section	2421.**8**	7,0	3,1
G 12	LI -Intermediate section	2421.**8**	14,0	5,8
G 13	L - Adapter		8,4	6,0
G 14	L -End section (400 t)		0,6	3,6
G 15	W -Pivot section		12,0	10,6
G 16	D -Pivot sectionwith rods and pulley block	2421.**10**	10,5	12,7
	D -Pivot section with winch III	2421.**10**	10,5	15,4
G 17	D -Intermediate section	2421.**10**	14,0	8,6
G 18	D -End section	2421.**10**	7,0	11,2
G 21	WV- Adapter f. pulley set 600 / 400 t			5,1

Note: For example : 2826.**20** = **.20** (welded on plate on **Intermediate section**)
For two 7 m long intermediate sections, one 14 m long intermediate section can be installed.

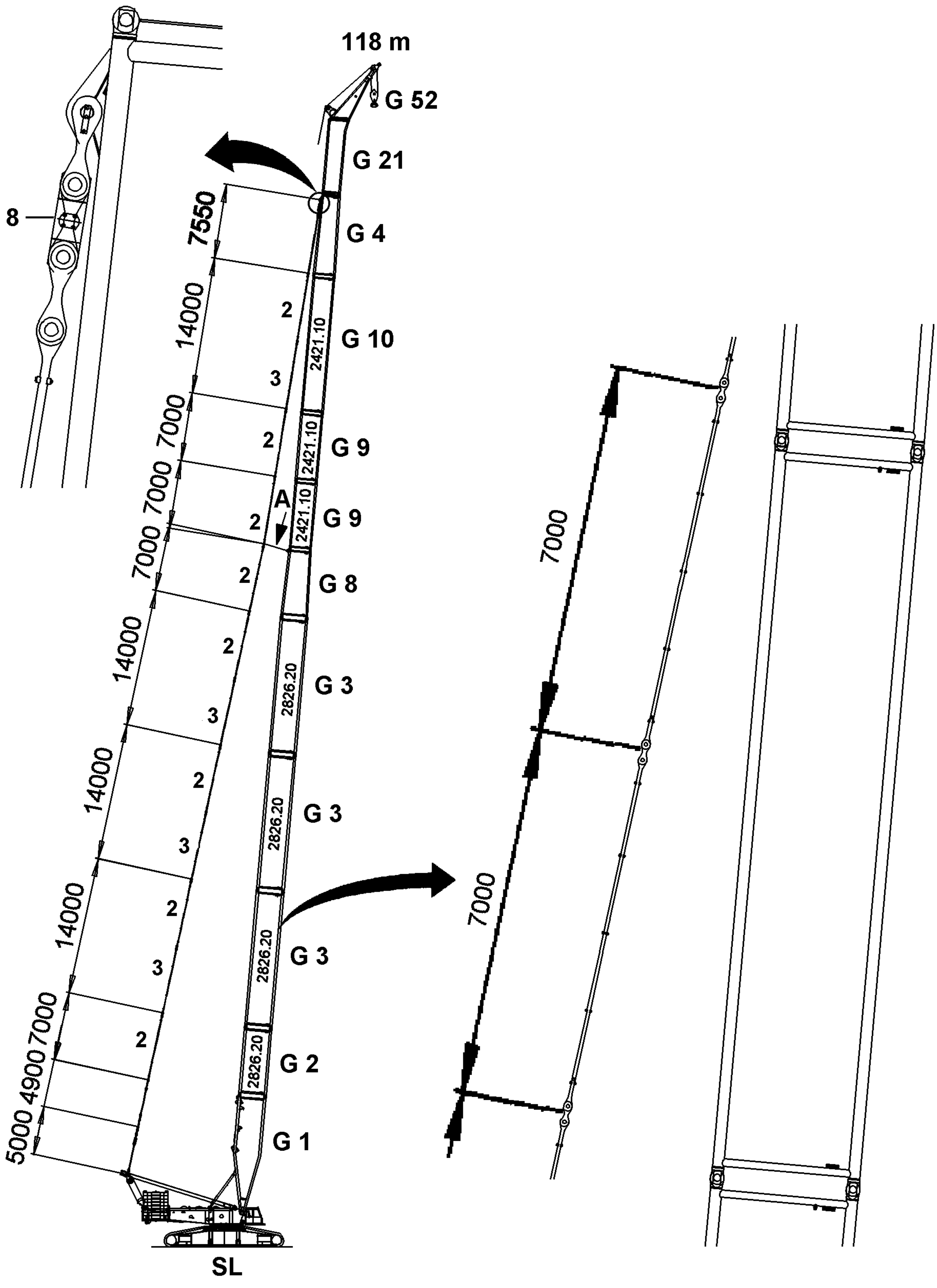
D A N G E R: **Another assembly of the lattice sections and guy rods than noted in the operating manual or in the installation drawing is prohibited!**
There is a danger that the intermediate sections, which are of different dimensions and do NOT look differently externally might be mixed up!
Externally, they only differ by welded on plates (.8, .10, .20)
During the installation of the boom it is extremely important that the intermediate sections are installed according to their description. If this is not observed, there is a great danger of accidents!

Combination of maximum possible attachment

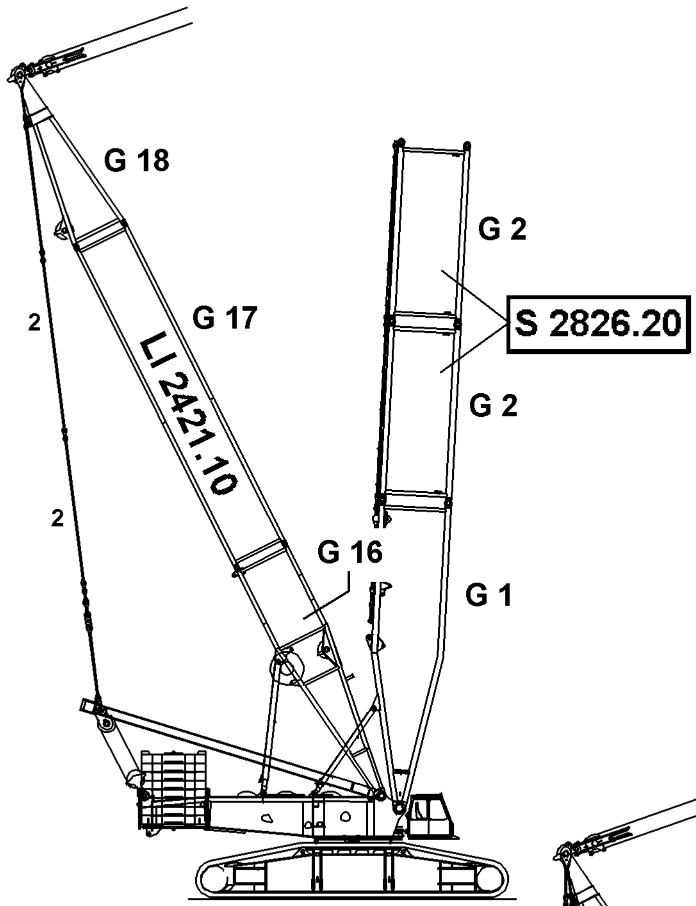
	Description	System	Length (m)	Weight (t)
G 31	W- Installation unit		13,40	10,6
G 32	WA- bracket I		17,50	5,6
G 33	WA- bracket II with rods and cylinder		15,50	11,2
G 34	L- guying			
G 35	L- added guying			
G 36	S- guying			
G 37	S- added guying			
G 38	W- guying			
G 39	W- added guying			
G 40	B or BW- guying			
G 41	D- guying			
G 43	S- retainer			
G 44	D- retainer			
G 45	W- retainer			
G 50	Boom nose (L-End section)		3,1	0,8
G 51	Boom nose (S-End section)		2,8	1,0
G 52	Boom nose 100 t, (for Sl 2- boom)		6,0	

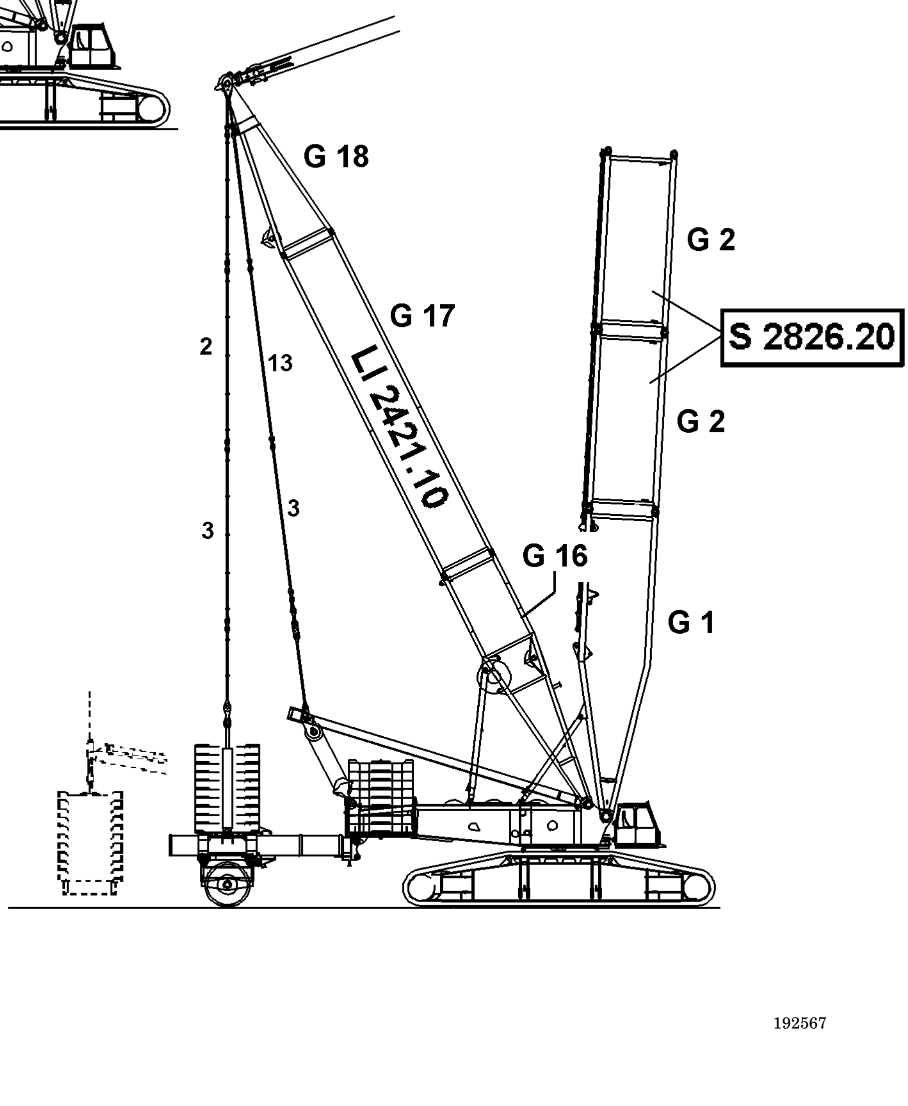
Note: For example: 2826**.20** = **.20** (welded on plate on **Intermediate section**)
** = S-End section (pulley set 600 t)
For two 7 m long intermediate sections, one 14 m long intermediate section can be installed.

D A N G E R: **Another assembly of the lattice sections and guy rods than noted in the operating manual or in the installation drawing is prohibited!**
There is a danger that the intermediate sections, which are of different dimensions and do NOT look differently externally might be mixed up!
Externally, they only differ by welded on plates (.8, .10, .20)
During the installation of the boom it is extremely important that the intermediate sections are installed according to their description. If this is not observed, there is a great danger of accidents!


118 m
G 52
G 21
8
7550
G 4
14000
2
3
2421.10
G 10
7000
2
2421.10
G 9
7000
A
2
2421.10
G 9
7000
2
G 8
14000
2
3
2826.20
G 3
14000
2
3
2826.20
G 3
14000
2
3
2826.20
G 3
7000
2
4900
5000
2826.20
G 2
G 1
SL
7000
7000

192400

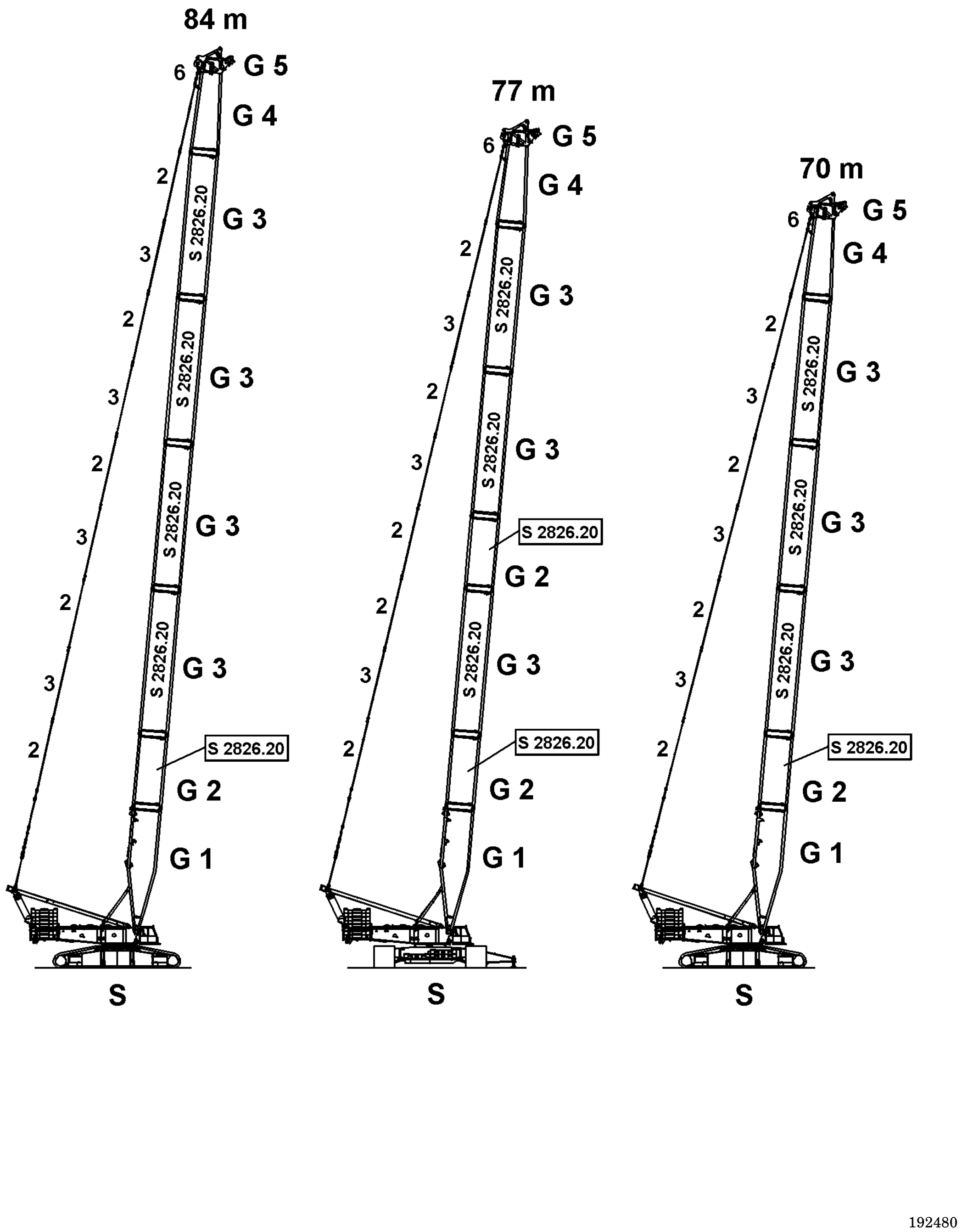

G 18
G 2
2
G 17
S 2826.20
LI 2421.10
G 2
2
G 16
G 1


G 18
G 2
G 17
2
13
S 2826.20
LI 2421.10
G 2
3
3
G 16
G 1

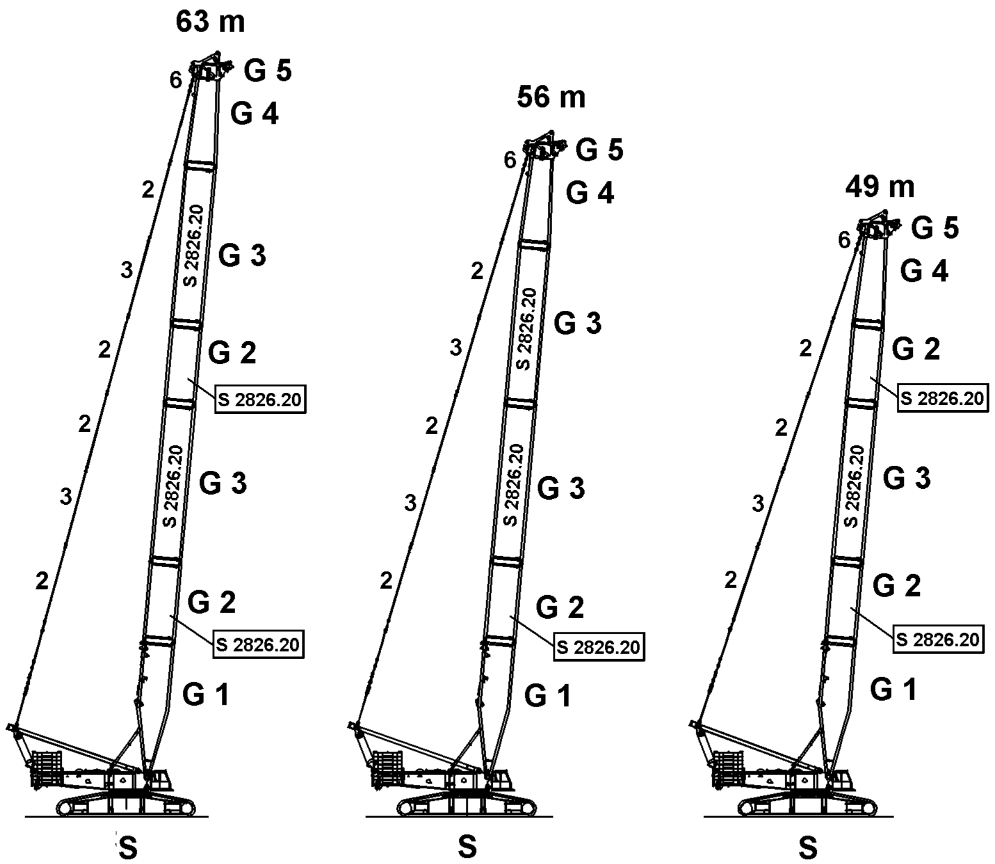
192567

Component overview

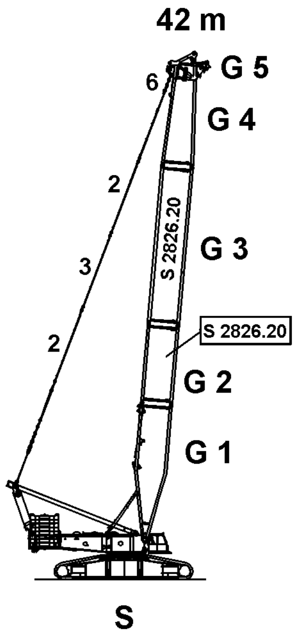
Pos.:	Description	Length
1	Guy rod, complete	5,55 m
2	Guy rod	7,00 m
3	Guy rod	7,00 m
4	Guy rod, complete	1,50 m
5	Guy rod, complete	2,40 m
6	Brackets for S - head	
7	Pull test brackets for SLD / SD / SDW	
8	Brackets for L - Adapter	
9	Pull test brackets for L - Adapter	
10	Brackets for added guying	
11	Guy rod, complete	2,33 m
12	Guy rod, complete	2,20 m
13	Guy rod, complete	5,72 m
14	Cable ∅ 32 mm	4,72 m
15	Pin ∅ 60 x 140 mm	
16	Spring retainer ∅ 5 mm	
17	Cable ∅ 32 mm	6,05 m
18	Cable ∅ 32 mm	7,01 m
19	Chain	
20	Pin ∅ 65 x 255 mm	
21	Spring retainer ∅ 6 mm	
22	Bracket	
23	Cable ∅ 32 mm	2,27 m
24	Cable ∅ 32 mm	7,31 m
25	Cable ∅ 32 mm	6,50 m
26	Pin ∅ 70 x 140 mm	
27	Cable ∅ 32 mm	6,39 m
28	Bracket	
29	Pin ∅ 70 x 171 mm	
30	Nut M 48 x 1,5 mm	
31	Washer ∅ 90 x 25 mm	

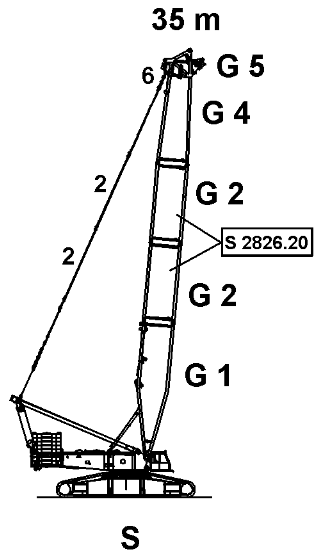


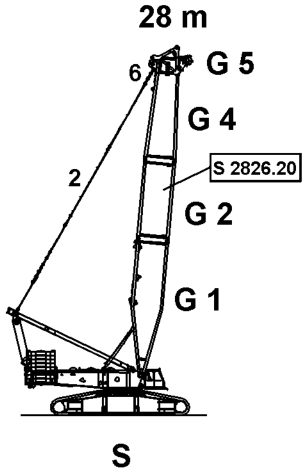
84 m
6
G 5
G 4
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 2
G 1
S
77 m
6
G 5
G 4
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 2
2
S 2826.20
G 3
3
2
S 2826.20
G 2
G 1
S
70 m
6
G 5
G 4
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 2
G 1
S
192480

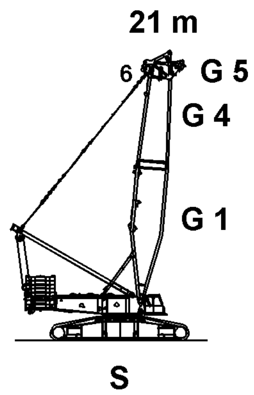

63 m
6
G 5
G 4
2
3
2
2
3
2
S 2826.20
G 3
G 2
S 2826.20
S 2826.20
G 3
G 2
S 2826.20
G 1
S
56 m
6
G 5
G 4
2
3
2
3
2
S 2826.20
G 3
S 2826.20
G 3
G 2
S 2826.20
G 1
S
49 m
6
G 5
G 4
2
2
3
2
G 2
S 2826.20
S 2826.20
G 3
G 2
S 2826.20
G 1
S

192481

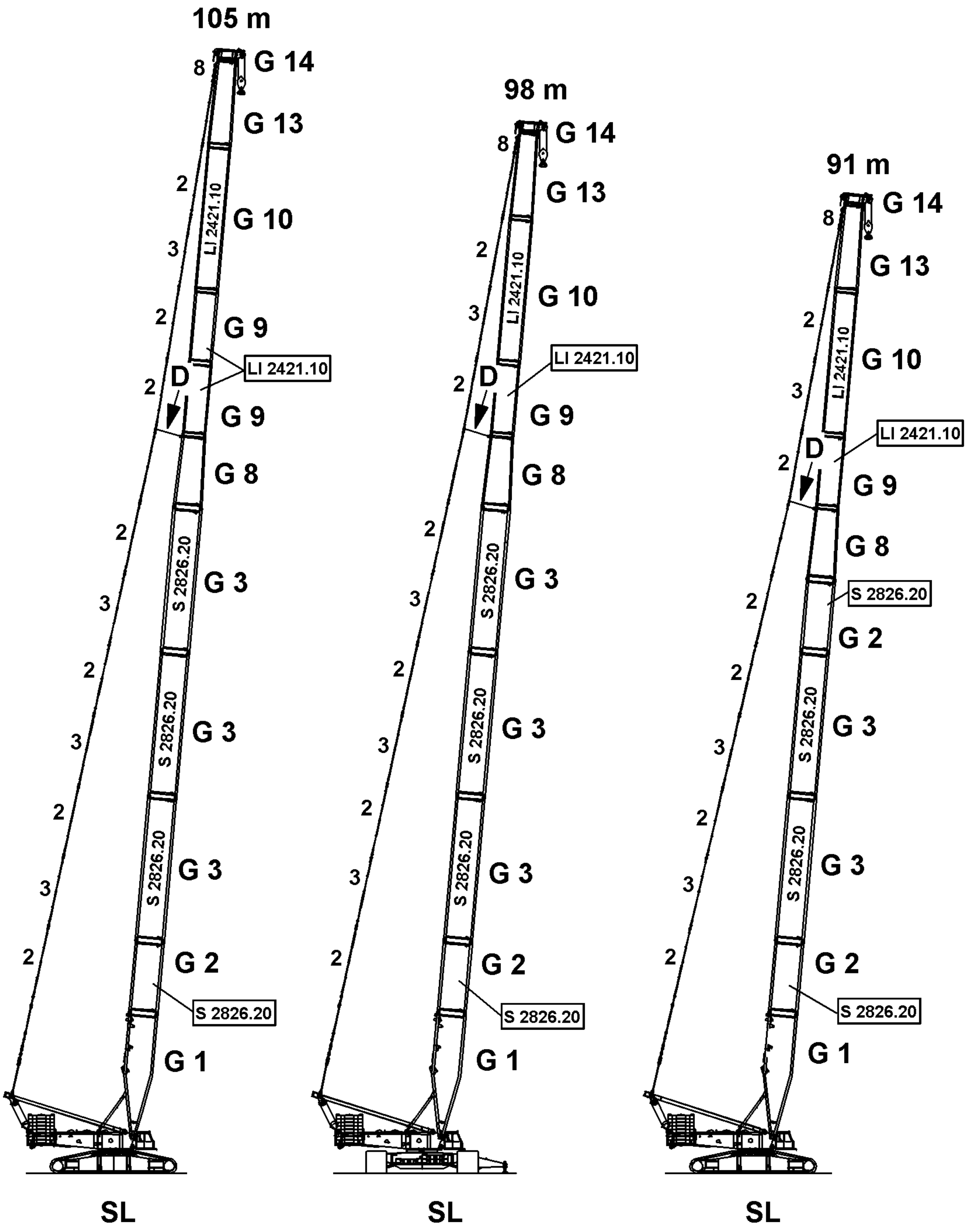

42 m
G 5
6
G 4
2
S 2826.20
G 3
3
S 2826.20
2
G 2
G 1
S


35 m
G 5
6
G 4
2
G 2
S 2826.20
2
G 2
G 1
S


28 m
G 5
6
G 4
2
S 2826.20
G 2
G 1
S

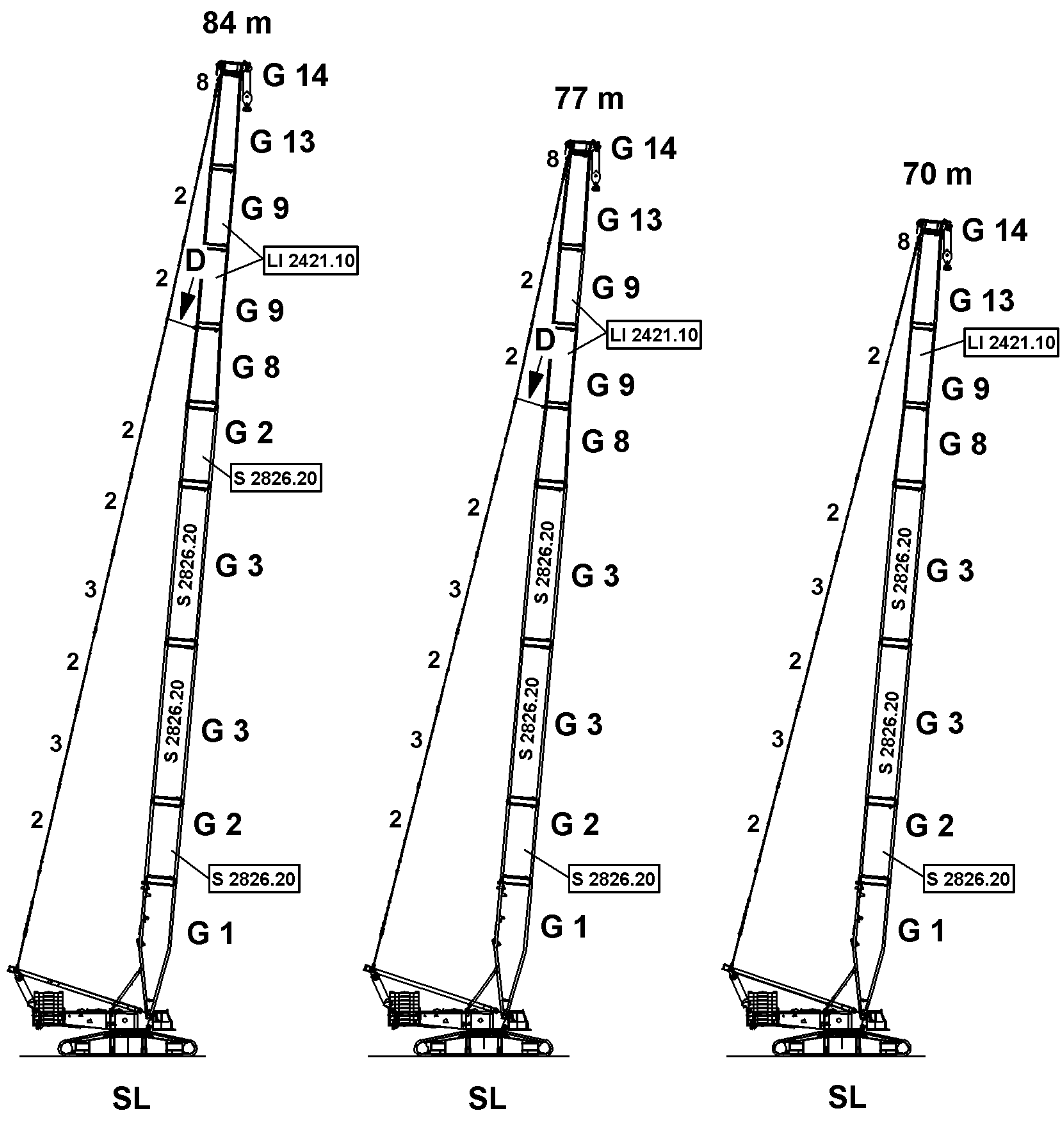

21 m
6
G 5
G 4
G 1
S

192482

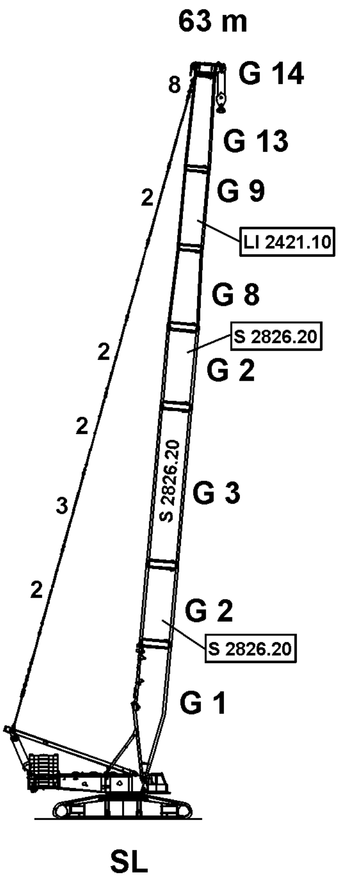


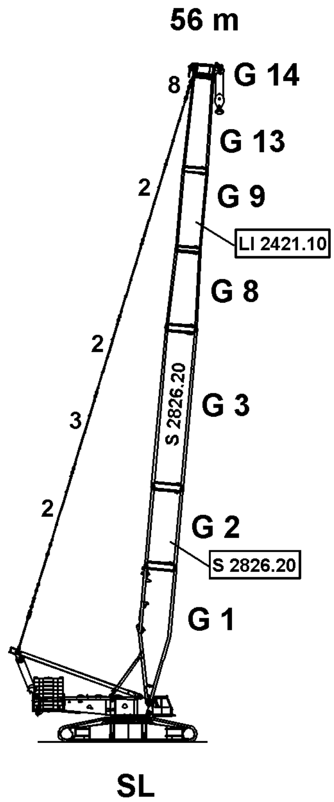
105 m
G 14
8
G 13
2
LI 2421.10
G 10
3
2
G 9
LI 2421.10
2
D
G 9
G 8
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 1
SL
98 m
G 14
8
G 13
2
LI 2421.10
G 10
3
LI 2421.10
2
D
G 9
G 8
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 1
SL
91 m
G 14
8
G 13
2
LI 2421.10
G 10
3
LI 2421.10
D
2
G 9
G 8
S 2826.20
2
G 2
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 1
SL

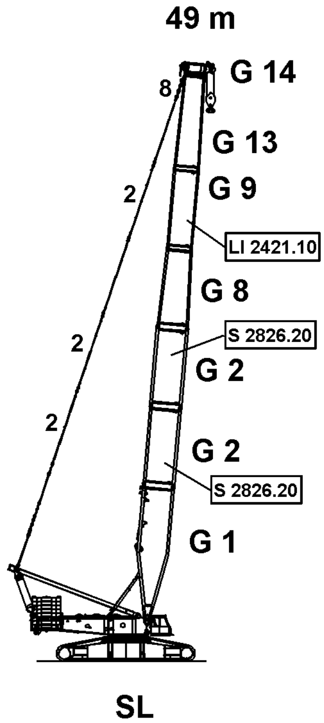
192483


84 m
G 14
8
G 13
2
G 9
LI 2421.10
2
D
G 9
G 8
2
G 2
S 2826.20
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 1
SL
77 m
G 14
8
G 13
2
G 9
LI 2421.10
2
D
G 9
G 8
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 1
SL
70 m
G 14
8
G 13
LI 2421.10
2
G 9
G 8
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 1
SL

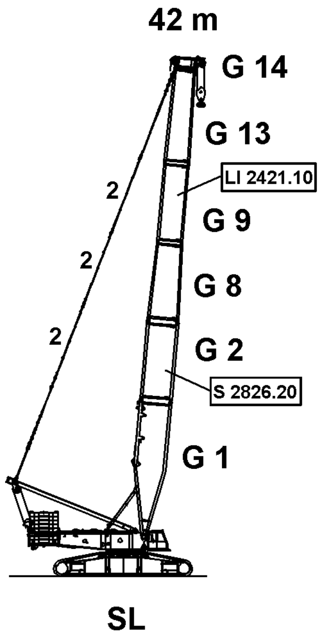
192484

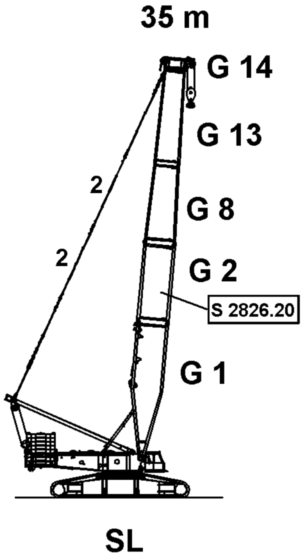

63 m
G 14
8
G 13
2
G 9
LI 2421.10
G 8
S 2826.20
2
G 2
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 1
SL

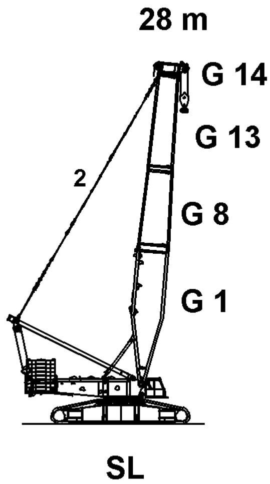

56 m
G 14
8
G 13
2
G 9
LI 2421.10
G 8
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 1
SL


49 m
G 14
8
G 13
2
G 9
LI 2421.10
G 8
S 2826.20
2
G 2
2
G 2
S 2826.20
G 1
SL

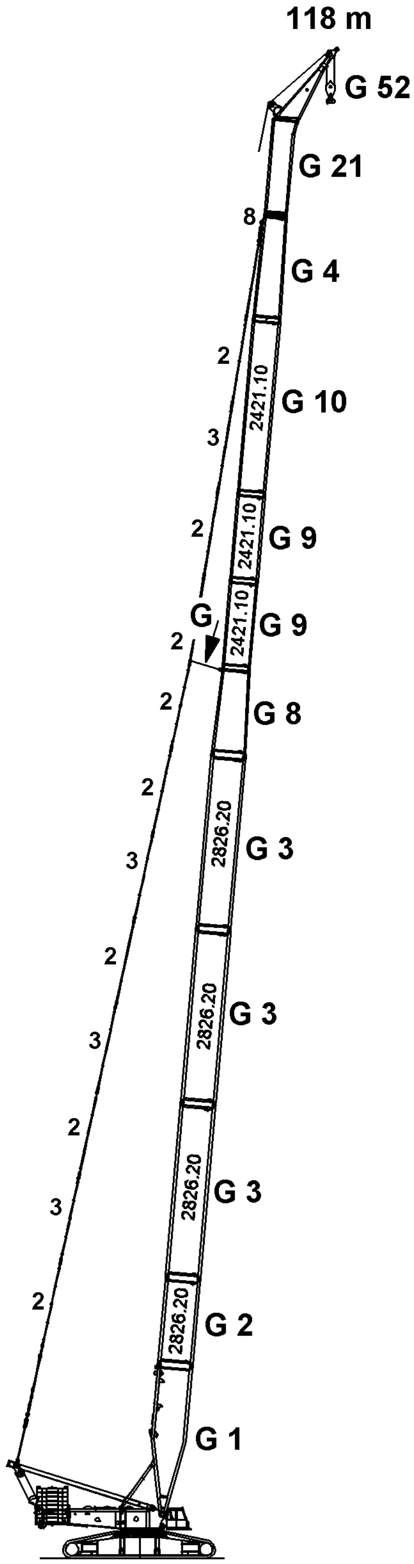
192485


42 m
G 14
G 13
LI 2421.10
G 9
G 8
G 2
S 2826.20
G 1
2
2
2
SL

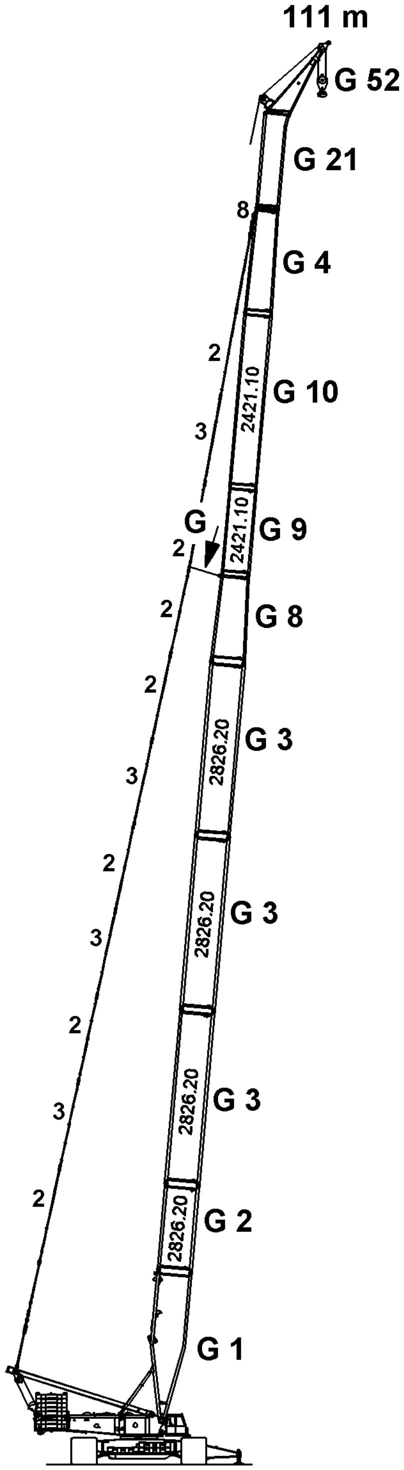

35 m
G 14
G 13
G 8
G 2
S 2826.20
G 1
2
2
SL


28 m
G 14
G 13
G 8
G 1
2
SL

192568

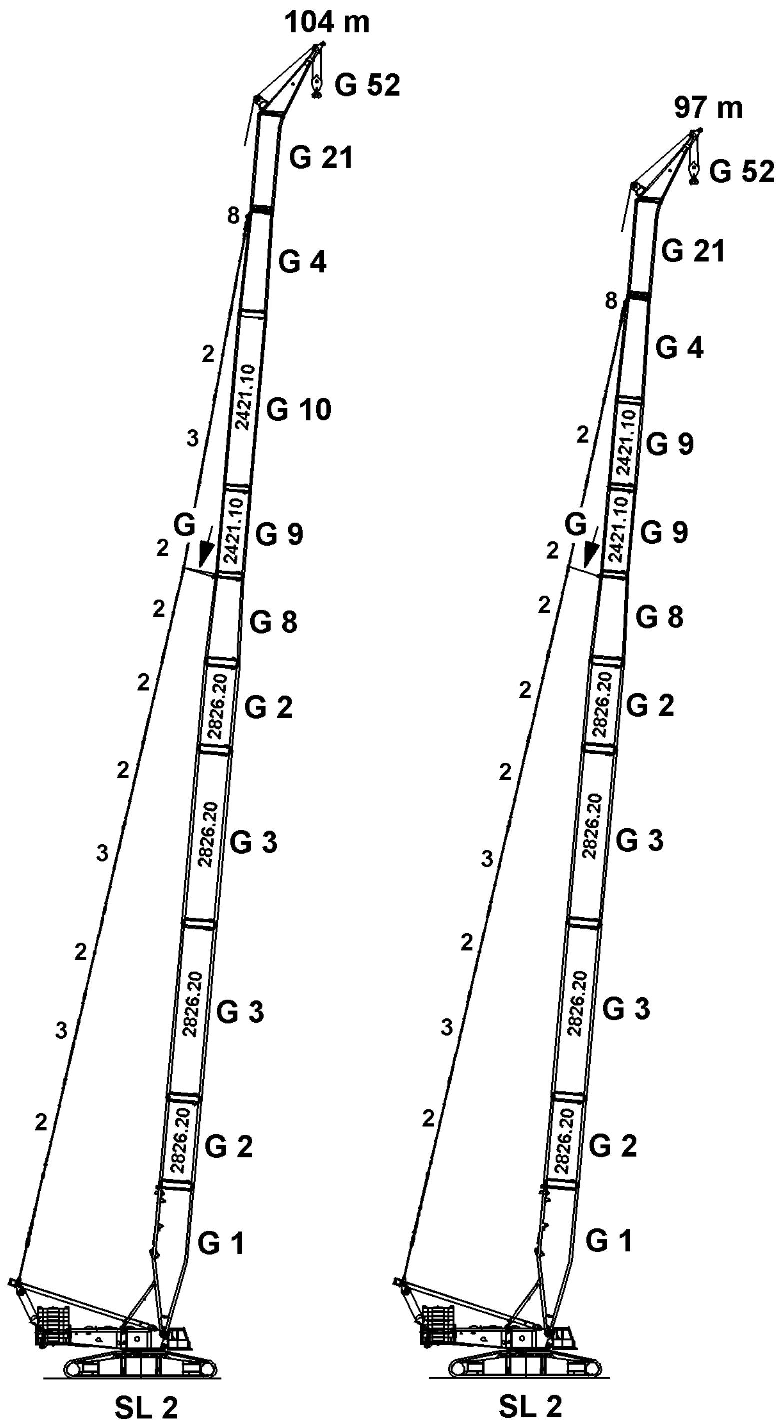


SL 2

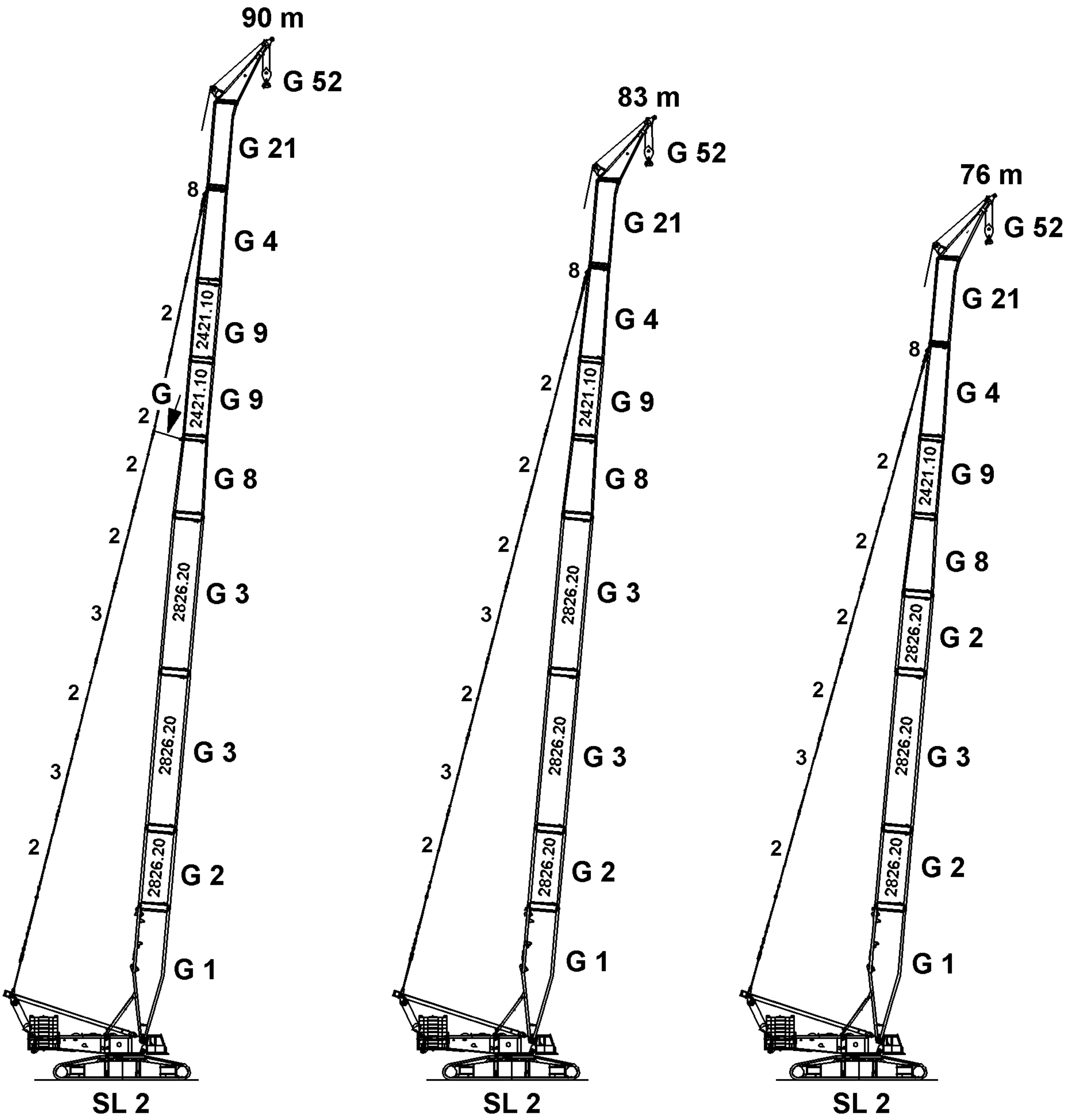


SL 2

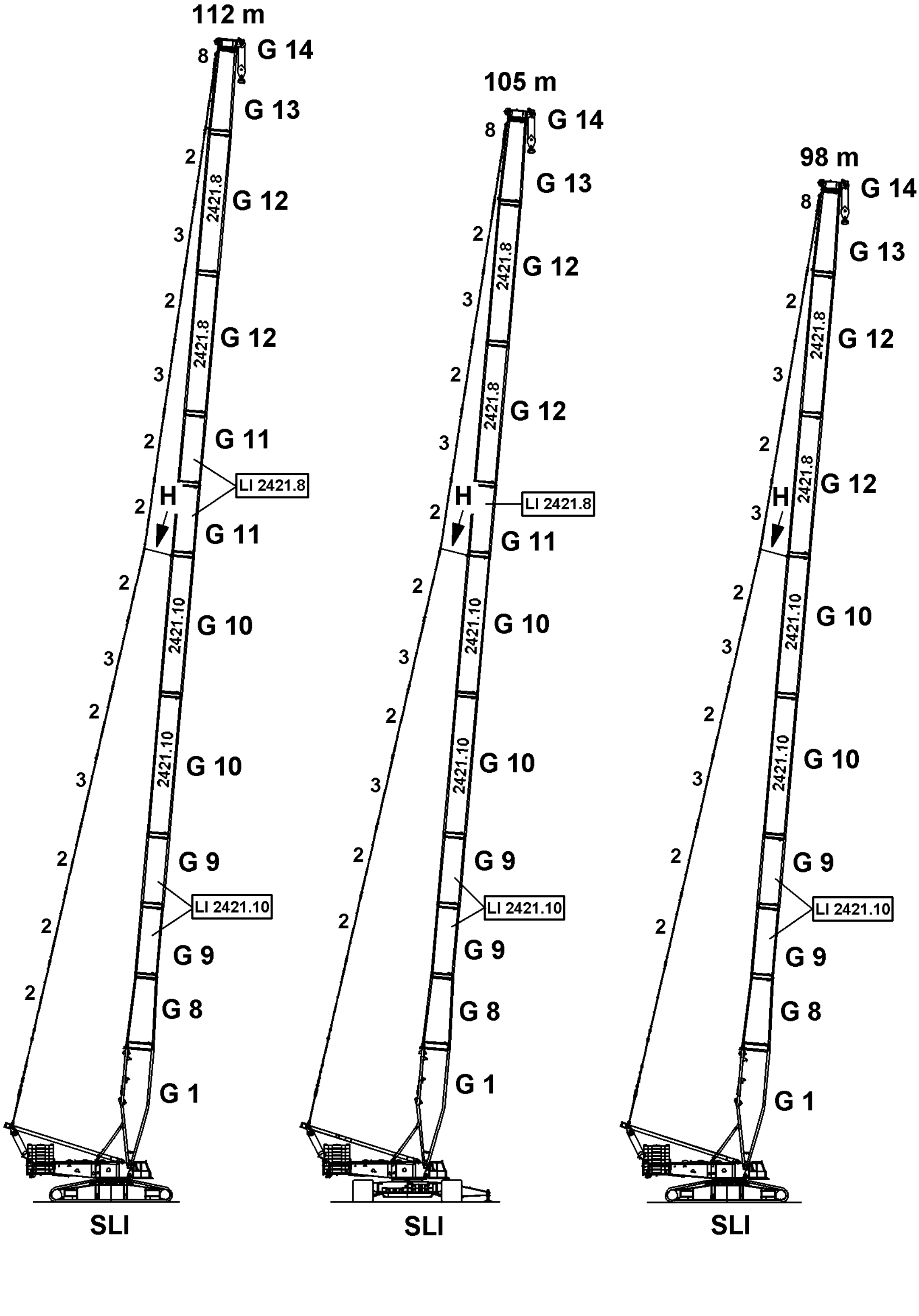
192401

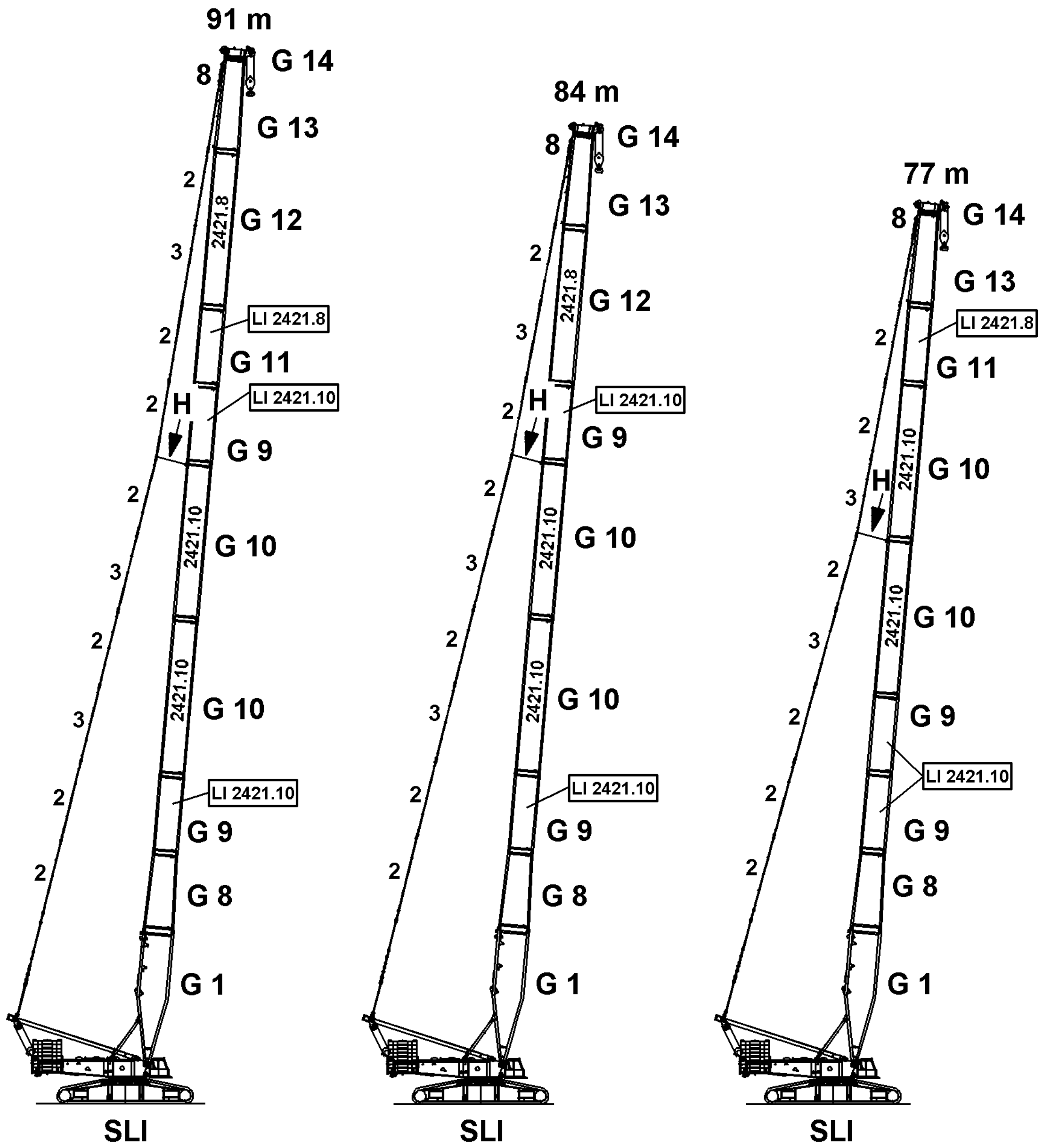

104 m
G 52
G 21
8
G 4
2
2421.10
G 10
3
G
2421.10
G 9
2
G 8
2
2826.20
G 2
2
2
2826.20
G 3
3
2
2826.20
G 3
3
2
2826.20
G 2
G 1
SL 2
97 m
G 52
G 21
8
G 4
2421.10
G 9
2
G
2421.10
G 9
2
G 8
2
2826.20
G 2
2
2
2826.20
G 3
3
2
2826.20
G 3
3
2
2826.20
G 2
G 1
SL 2

192402

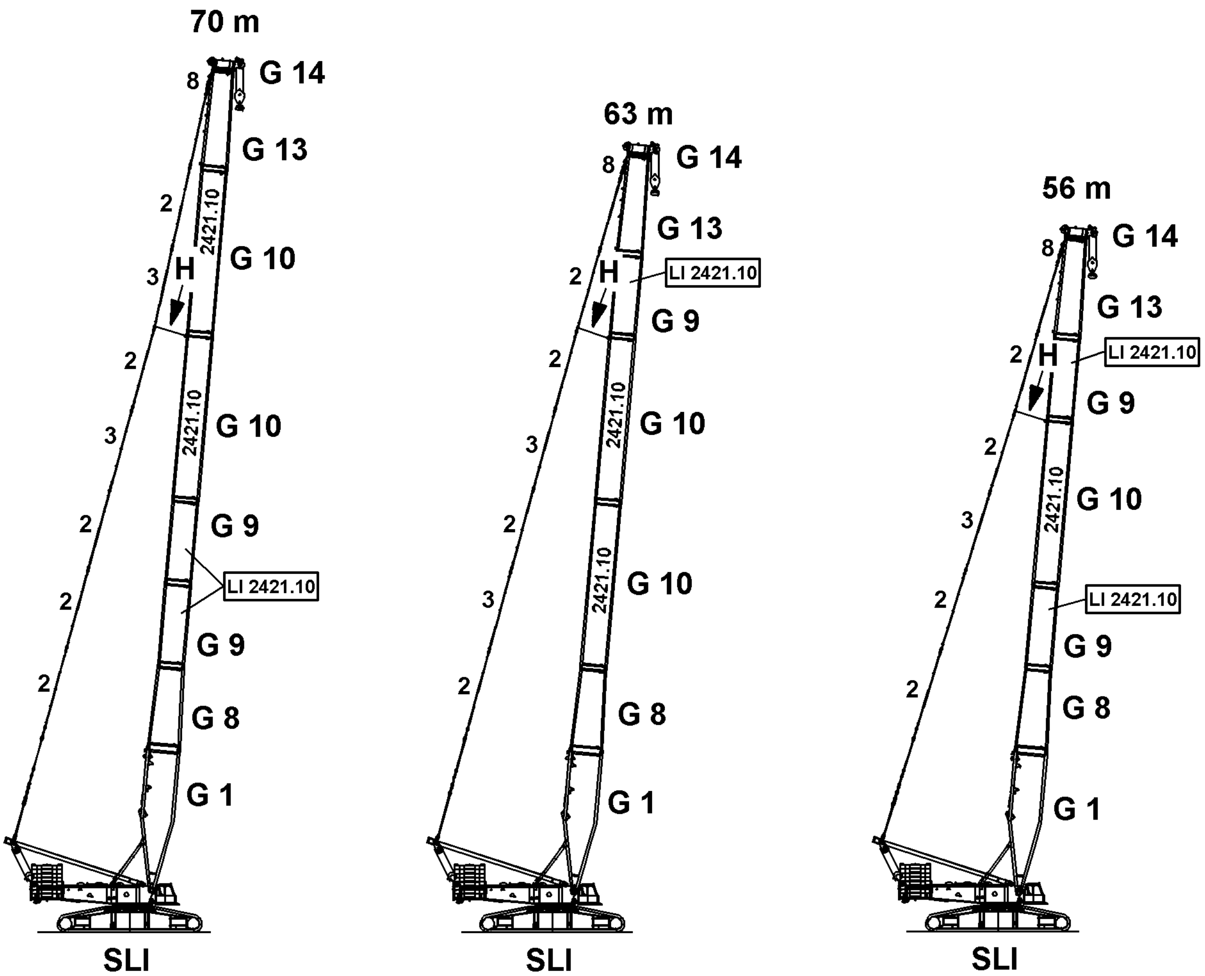

90 m
G 52
G 21
8
G 4
2
2421.10
G 9
G
2
2421.10
G 9
2
G 8
2
2826.20
G 3
3
2
2826.20
G 3
3
2
2826.20
G 2
G 1
SL 2
83 m
G 52
G 21
8
G 4
2
2421.10
G 9
2
G 8
2
2826.20
G 3
3
2
2826.20
G 3
3
2
2826.20
G 2
G 1
SL 2
76 m
G 52
G 21
8
G 4
2
2421.10
G 9
2
G 8
2
2826.20
G 2
2
2826.20
G 3
3
2
2826.20
G 2
G 1
SL 2

192403

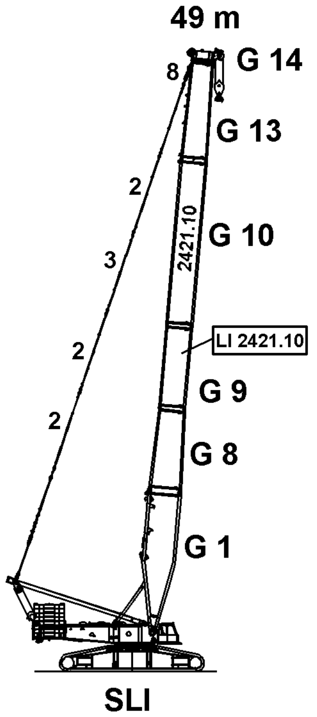

112 m
105 m
98 m
G 14
G 13
G 12
G 11
G 10
G 9
G 8
G 1
H
8
2
3
2421.8
2421.10
LI 2421.8
LI 2421.10
SLI
192561

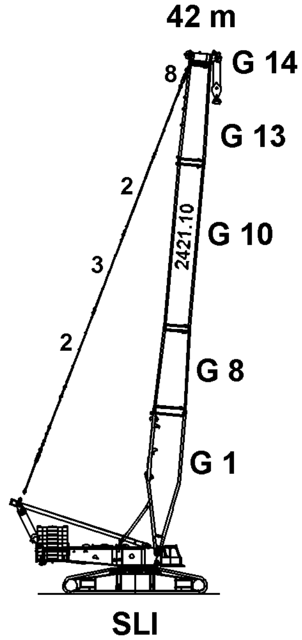

91 m
8
G 14
G 13
2
2421.8
G 12
3
2
LI 2421.8
G 11
2
H
LI 2421.10
G 9
2
2421.10
G 10
3
2
2421.10
G 10
3
2
LI 2421.10
G 9
2
G 8
G 1
SLI
84 m
8
G 14
G 13
2
2421.8
G 12
3
2
H
LI 2421.10
G 9
2
2421.10
G 10
3
2
2421.10
G 10
3
2
LI 2421.10
G 9
2
G 8
G 1
SLI
77 m
8
G 14
G 13
LI 2421.8
2
G 11
2
2421.10
G 10
H
3
2
2421.10
G 10
3
G 9
2
LI 2421.10
2
G 9
2
G 8
G 1
SLI

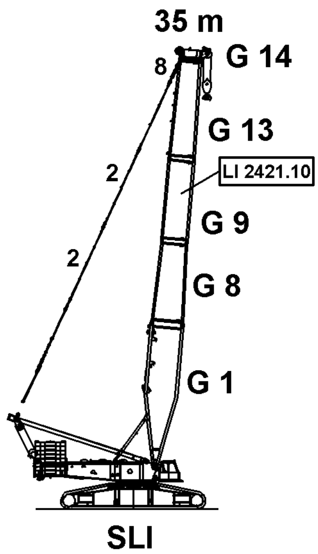
192562

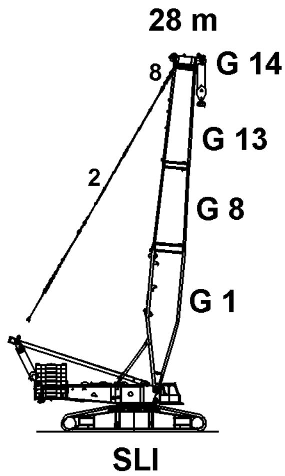

70 m
8
G 14
G 13
2
2421.10
G 10
3
H
2
2421.10
G 10
3
2
G 9
LI 2421.10
2
G 9
2
G 8
G 1
SLI
63 m
8
G 14
G 13
2
H
LI 2421.10
G 9
2
2421.10
G 10
3
2
2421.10
G 10
3
2
G 8
G 1
SLI
56 m
8
G 14
G 13
2
H
LI 2421.10
G 9
2
2421.10
G 10
3
2
LI 2421.10
G 9
2
G 8
G 1
SLI

192563

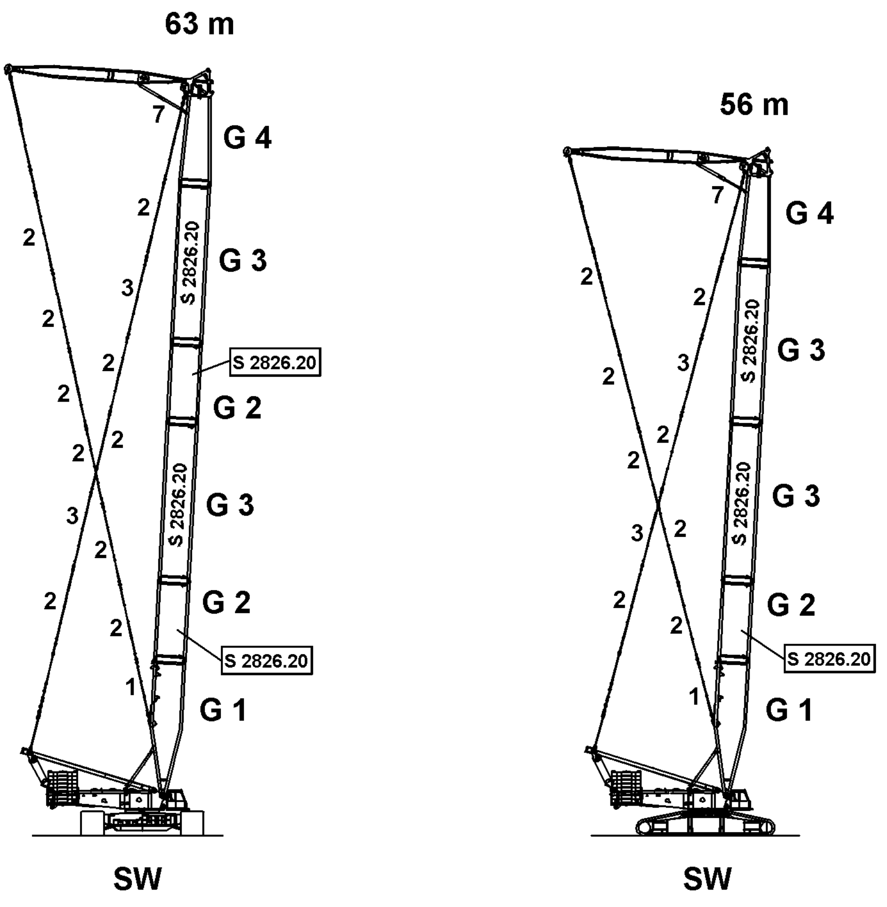

49 m
G 14
8
G 13
2
2421.10
G 10
3
LI 2421.10
2
G 9
2
G 8
G 1
SLI


42 m
G 14
8
G 13
2
2421.10
G 10
3
2
G 8
G 1
SLI

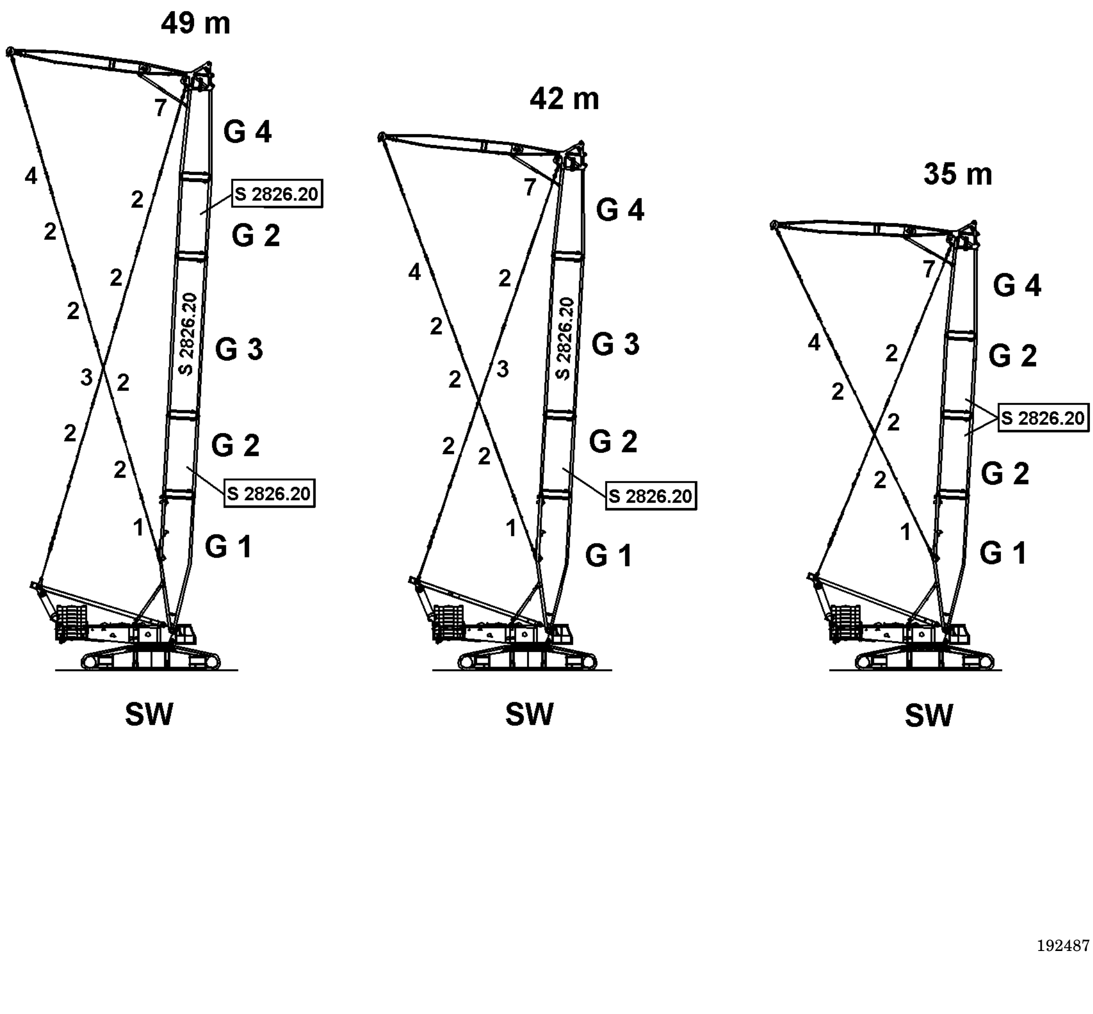

35 m
G 14
8
G 13
2
LI 2421.10
G 9
2
G 8
G 1
SLI

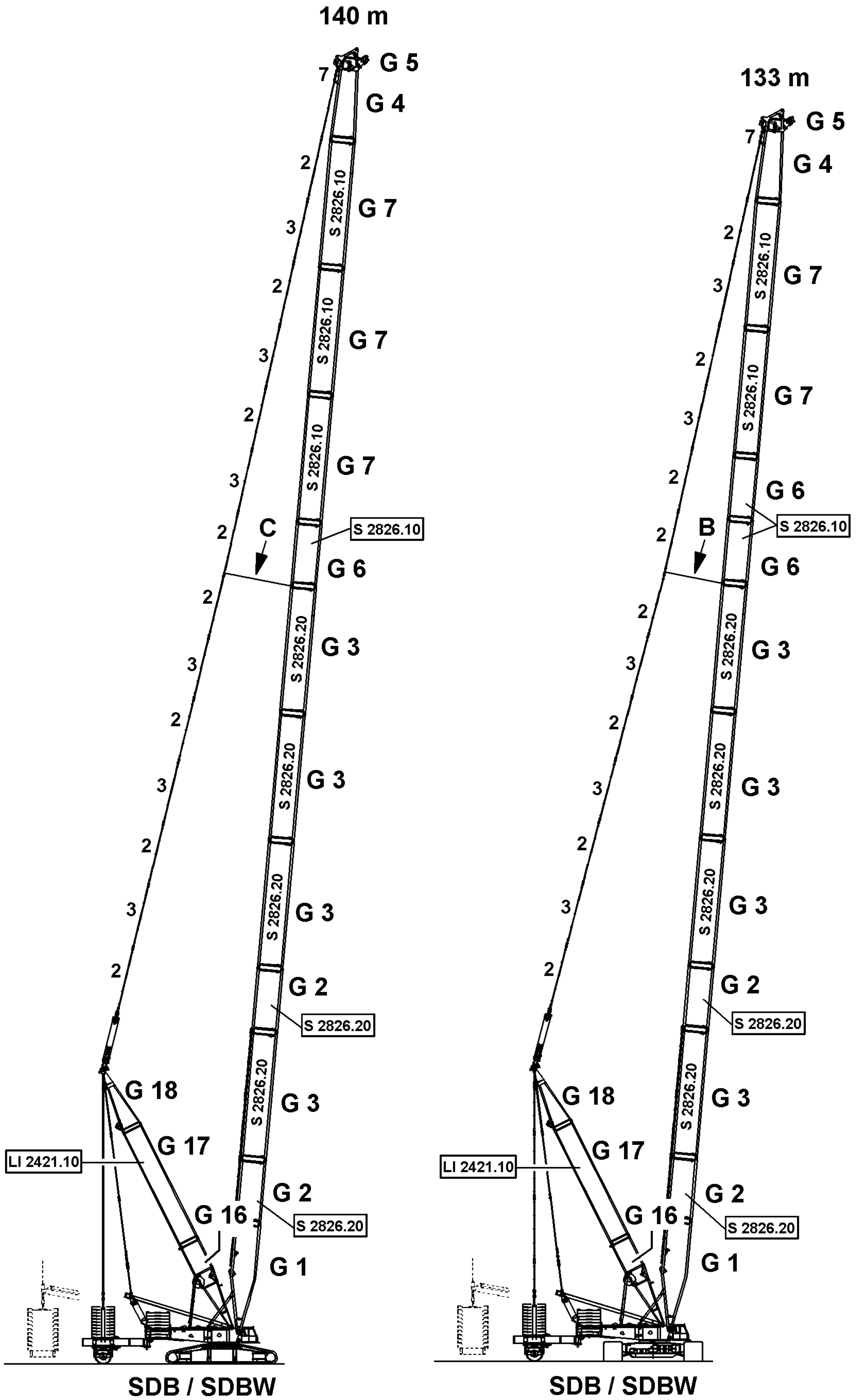

28 m
G 14
8
G 13
2
G 8
G 1
SLI

192564

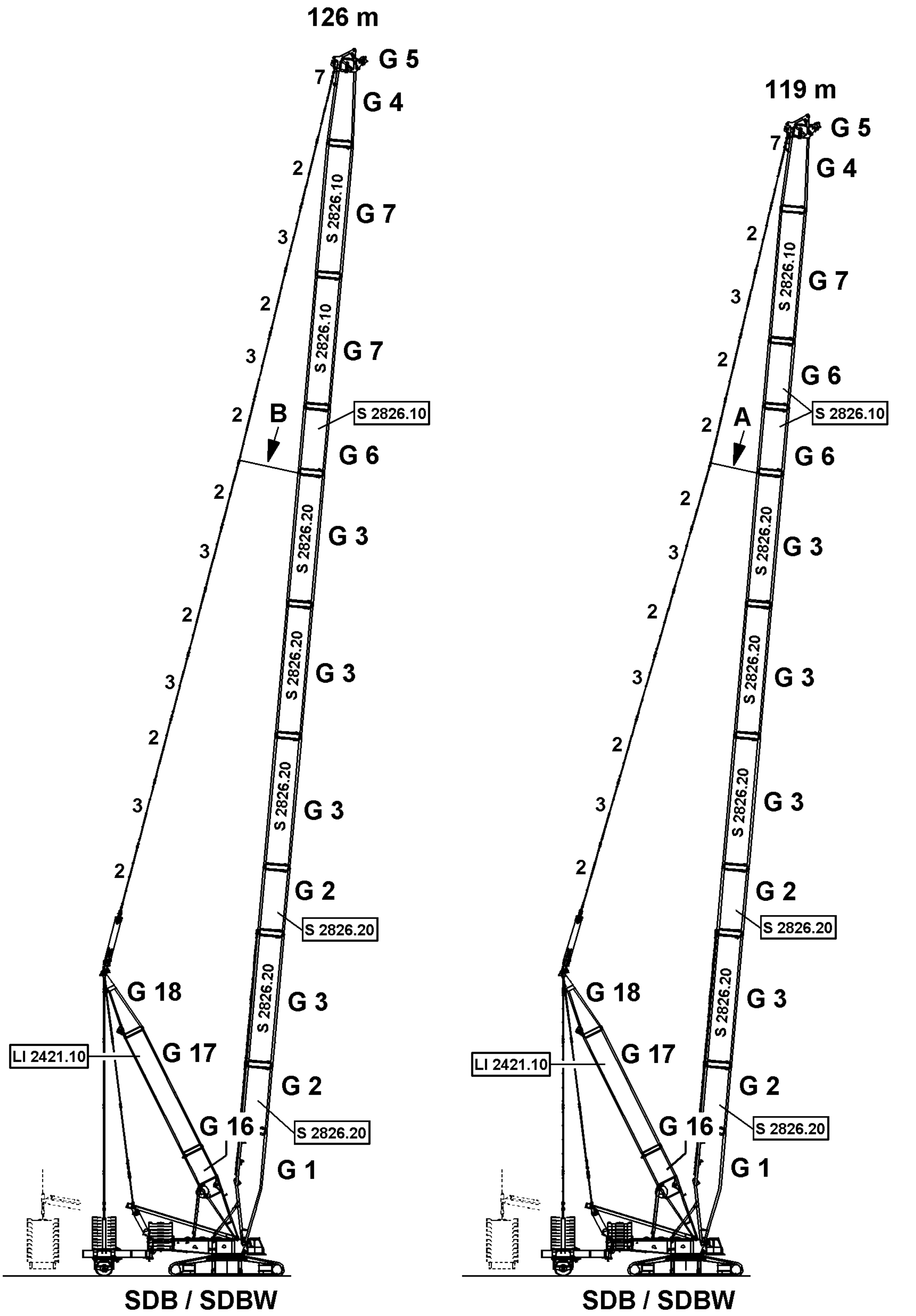

63 m
G 4
G 3
S 2826.20
G 2
G 3
G 2
S 2826.20
G 1
SW
56 m
G 4
G 3
G 3
G 2
S 2826.20
G 1
SW

192486

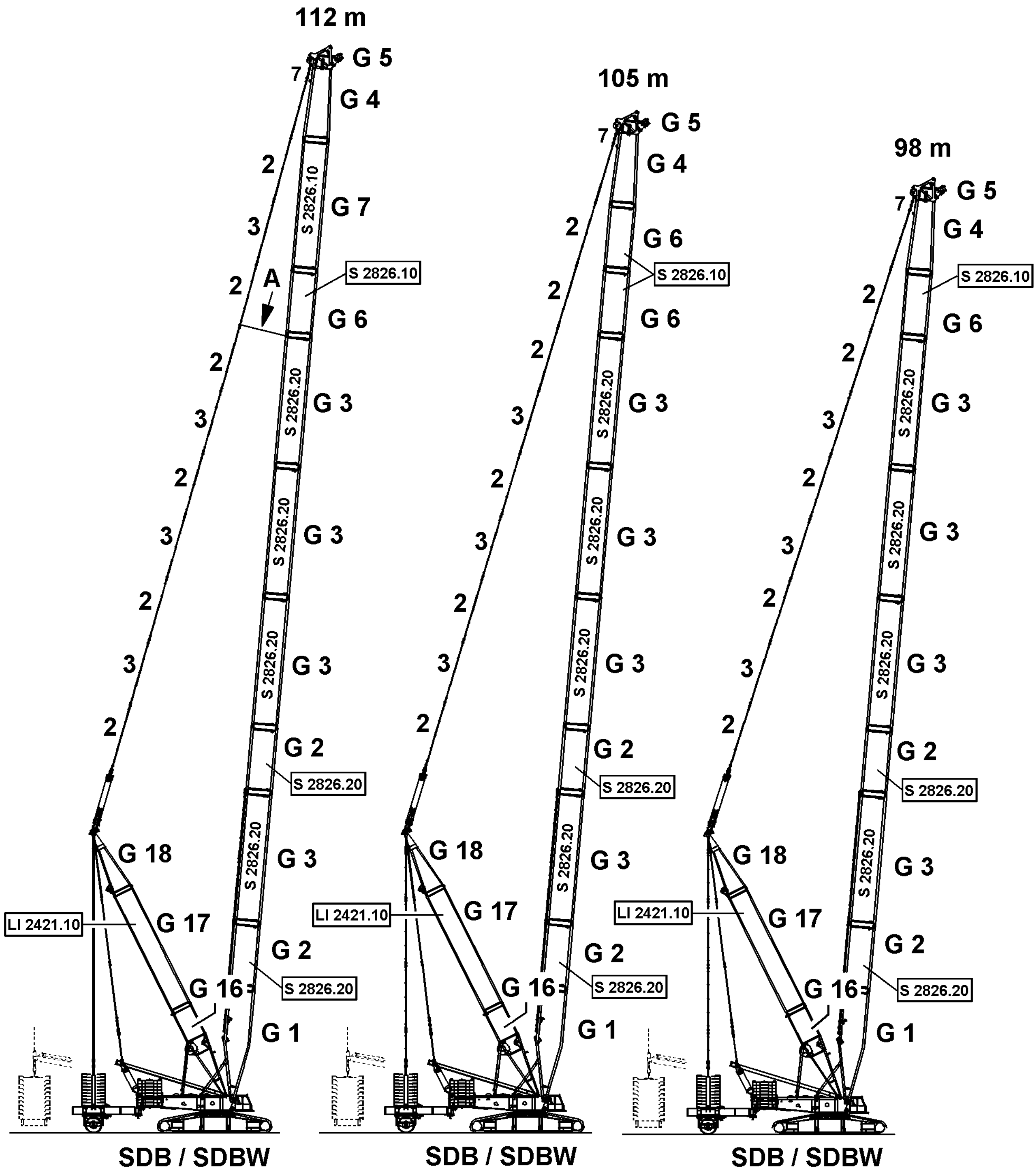

49 m
G 4
S 2826.20
G 2
S 2826.20
G 3
G 2
S 2826.20
G 1
SW
42 m
G 4
S 2826.20
G 3
G 2
S 2826.20
G 1
SW
35 m
G 4
G 2
S 2826.20
G 2
G 1
SW
192487


140 m
G 5
7
G 4
2
S 2826.10
G 7
3
2
S 2826.10
G 7
3
2
S 2826.10
G 7
3
2
C
S 2826.10
G 6
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 18
S 2826.20
G 3
G 17
LI 2421.10
G 2
G 16
S 2826.20
G 1
SDB / SDBW
133 m
G 5
7
G 4
2
S 2826.10
G 7
3
2
S 2826.10
G 7
3
2
G 6
B
S 2826.10
2
G 6
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 18
S 2826.20
G 3
G 17
LI 2421.10
G 2
G 16
S 2826.20
G 1
SDB / SDBW

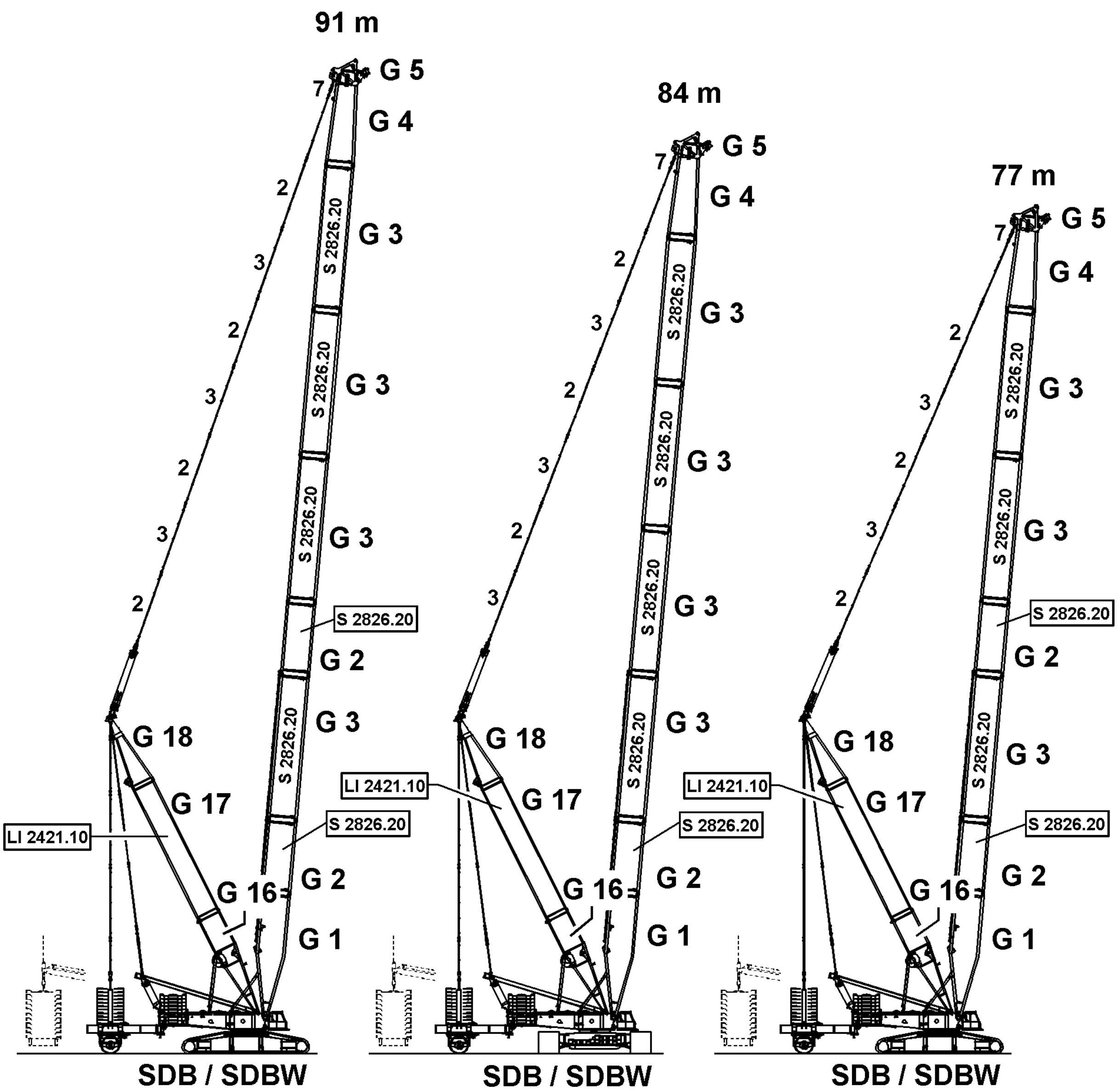
192488


126 m
G 5
7
G 4
2
3
S 2826.10
G 7
2
3
S 2826.10
G 7
2
B
S 2826.10
G 6
2
3
S 2826.20
G 3
2
3
S 2826.20
G 3
2
3
S 2826.20
G 3
2
G 2
S 2826.20
G 18
S 2826.20
G 3
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SDB / SDBW
119 m
G 5
7
G 4
2
3
S 2826.10
G 7
2
G 6
S 2826.10
2
A
G 6
2
3
S 2826.20
G 3
2
3
S 2826.20
G 3
2
3
S 2826.20
G 3
2
G 2
S 2826.20
G 18
S 2826.20
G 3
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SDB / SDBW

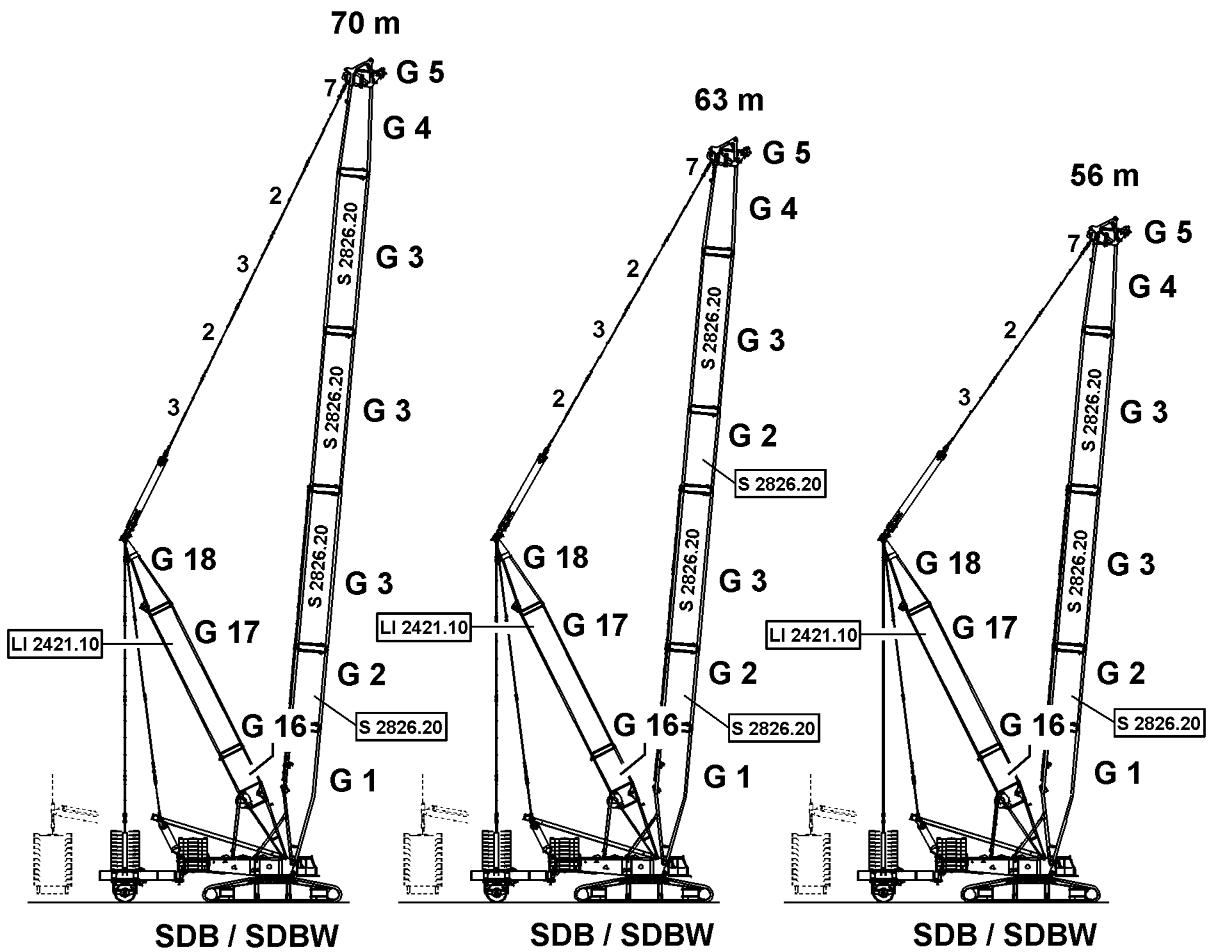
192489


112 m
G 5
7
G 4
2
S 2826.10
G 7
3
S 2826.10
2
A
G 6
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 18
S 2826.20
G 3
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SDB / SDBW
105 m
G 5
7
G 4
2
G 6
S 2826.10
2
G 6
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 18
S 2826.20
G 3
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SDB / SDBW
98 m
G 5
7
G 4
S 2826.10
2
G 6
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 18
S 2826.20
G 3
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SDB / SDBW

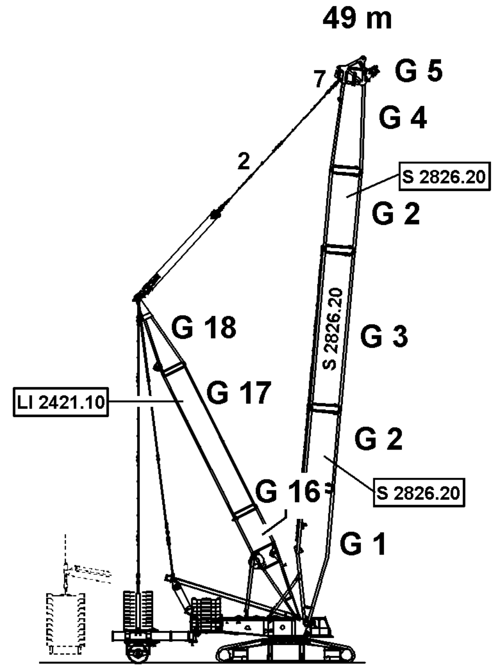
192490


91 m
G 5
7
G 4
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
S 2826.20
2
G 2
S 2826.20
G 3
G 18
G 17
LI 2421.10
S 2826.20
G 2
G 16
G 1
SDB / SDBW
84 m
G 5
7
G 4
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
S 2826.20
G 3
G 18
LI 2421.10
G 17
S 2826.20
G 2
G 16
G 1
SDB / SDBW
77 m
G 5
7
G 4
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 2
S 2826.20
G 3
G 18
LI 2421.10
G 17
S 2826.20
G 2
G 16
G 1
SDB / SDBW

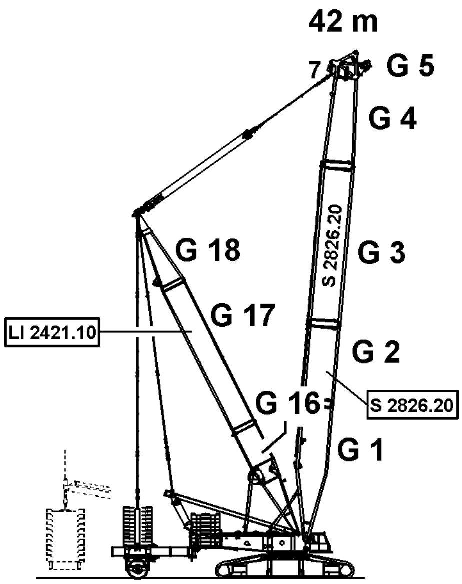
192491


70 m
G 5
7
G 4
2
3
2
3
S 2826.20
G 3
S 2826.20
G 3
S 2826.20
G 3
G 18
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SDB / SDBW
63 m
G 5
7
G 4
2
3
2
S 2826.20
G 3
G 2
S 2826.20
S 2826.20
G 3
G 18
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SDB / SDBW
56 m
G 5
7
G 4
2
3
S 2826.20
G 3
S 2826.20
G 3
G 18
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SDB / SDBW

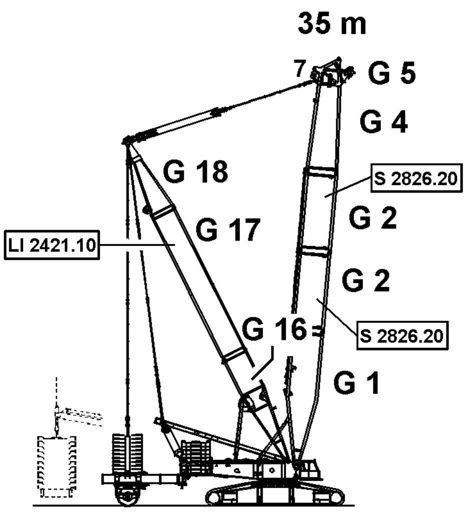
192492



SDB / SDBW

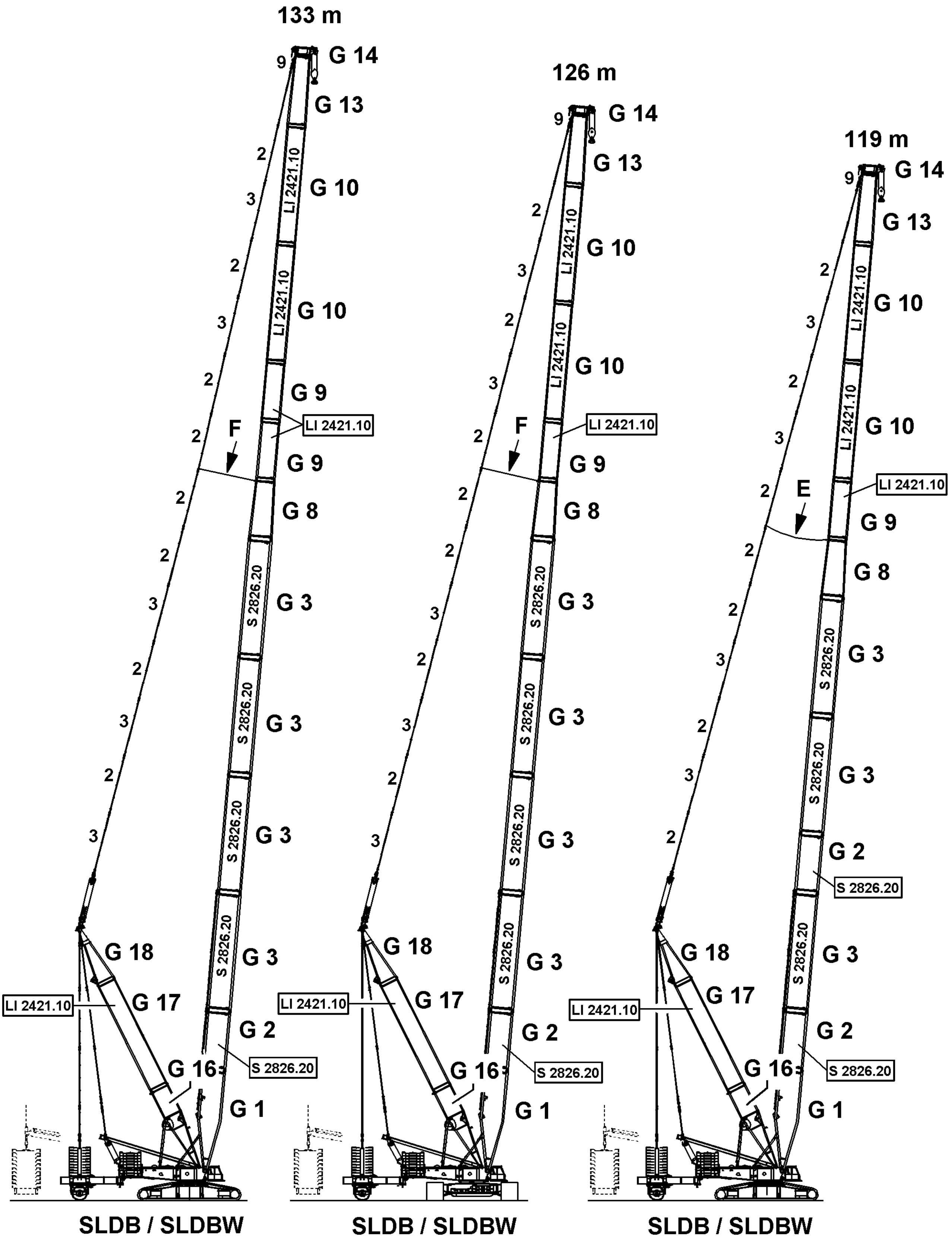


SDB / SDBW

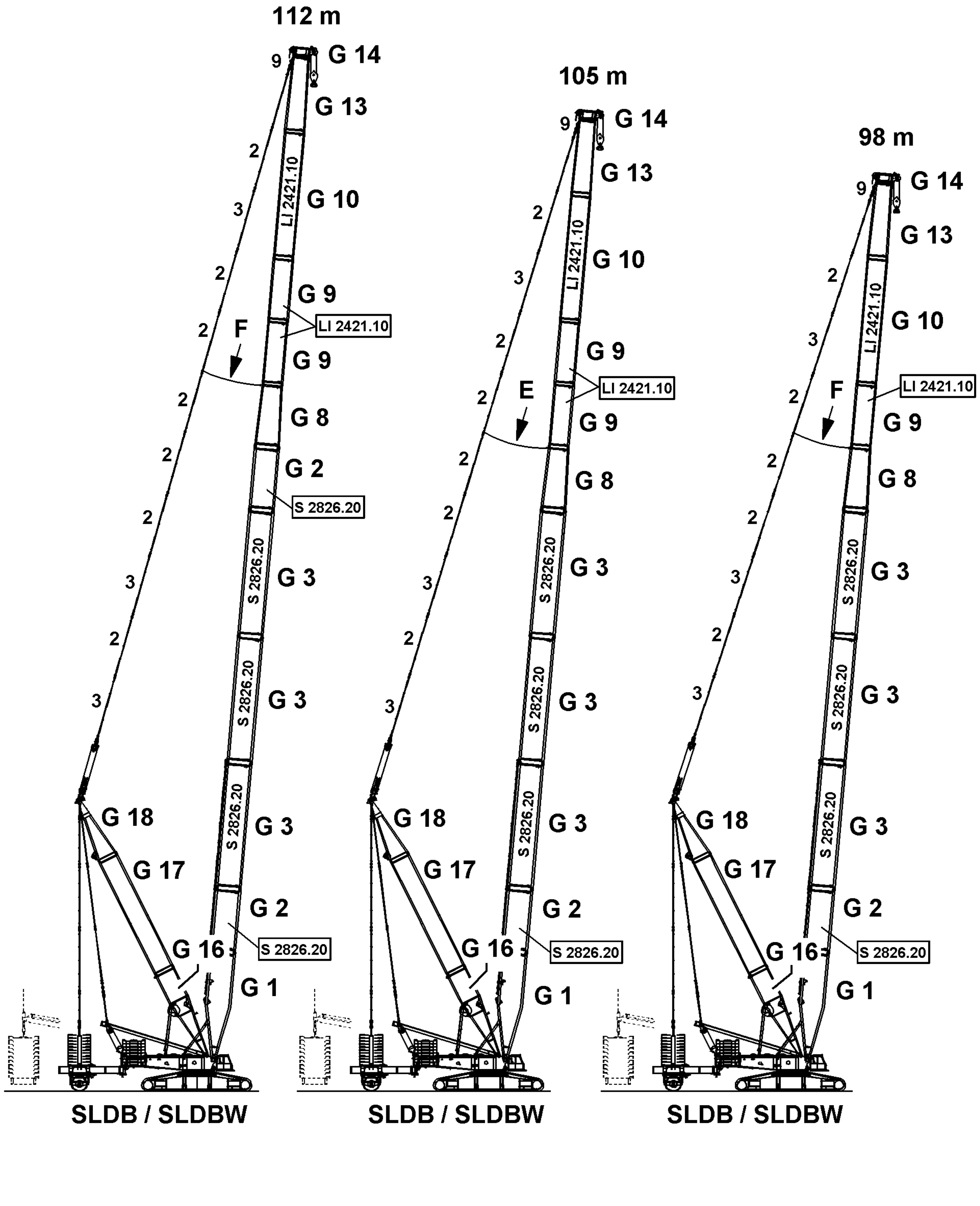


SDB / SDBW

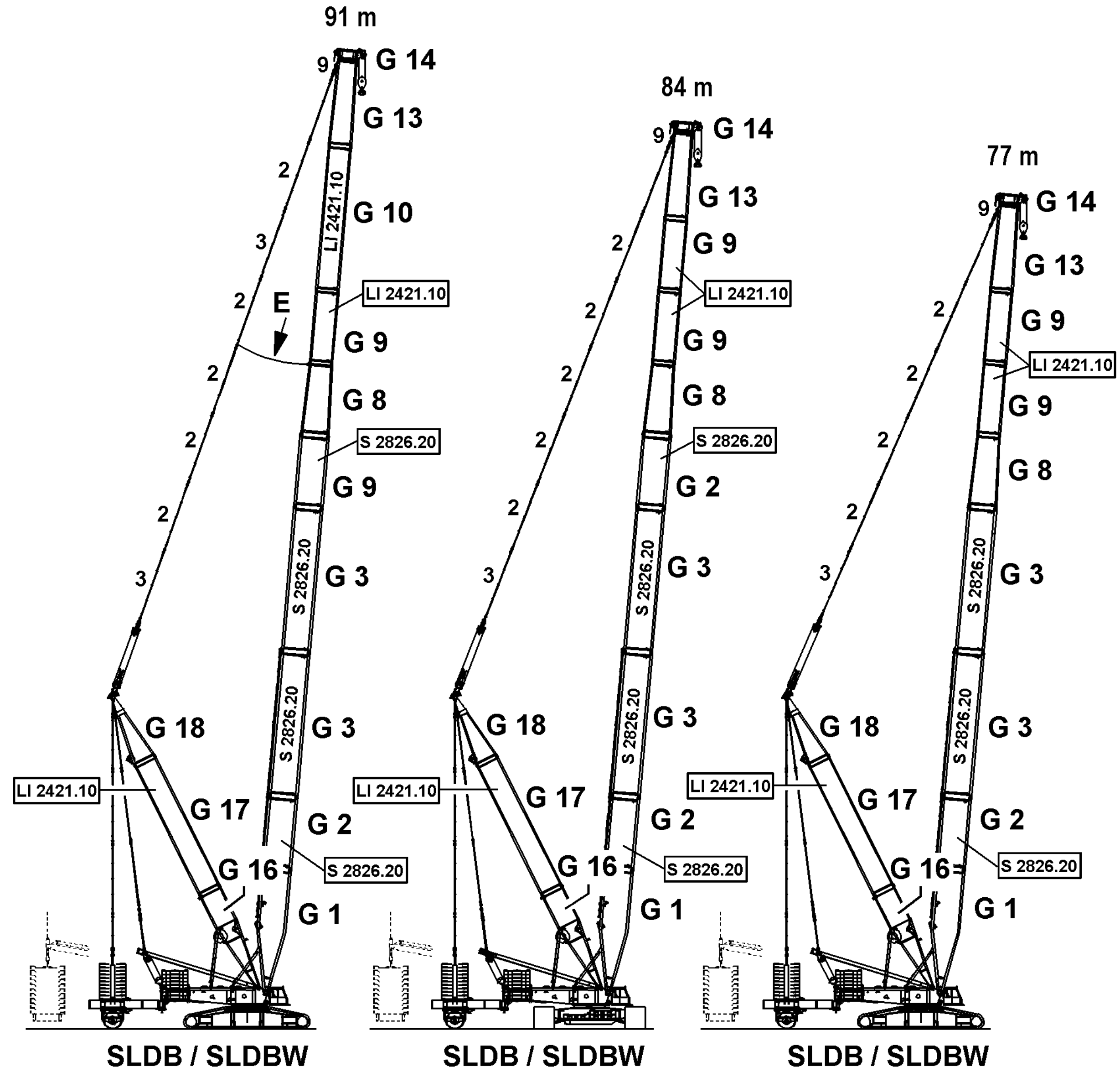
192493


133 m
G 14
9
G 13
2
LI 2421.10
3
G 10
2
LI 2421.10
3
G 10
2
G 9
LI 2421.10
2
F
G 9
2
G 8
2
S 2826.20
3
G 3
2
S 2826.20
3
G 3
2
S 2826.20
3
G 3
S 2826.20
G 18
G 3
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SLDB / SLDBW
126 m
G 14
9
G 13
2
LI 2421.10
3
G 10
2
LI 2421.10
3
G 10
F
LI 2421.10
2
G 9
2
G 8
2
S 2826.20
3
G 3
2
S 2826.20
3
G 3
2
S 2826.20
3
G 3
S 2826.20
G 18
G 3
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SLDB / SLDBW
119 m
G 14
9
G 13
2
LI 2421.10
3
G 10
2
LI 2421.10
3
G 10
LI 2421.10
2
E
G 9
2
G 8
2
S 2826.20
3
G 3
2
S 2826.20
3
G 3
2
G 2
S 2826.20
S 2826.20
G 18
G 3
LI 2421.10
G 17
G 2
G 16
S 2826.20
G 1
SLDB / SLDBW

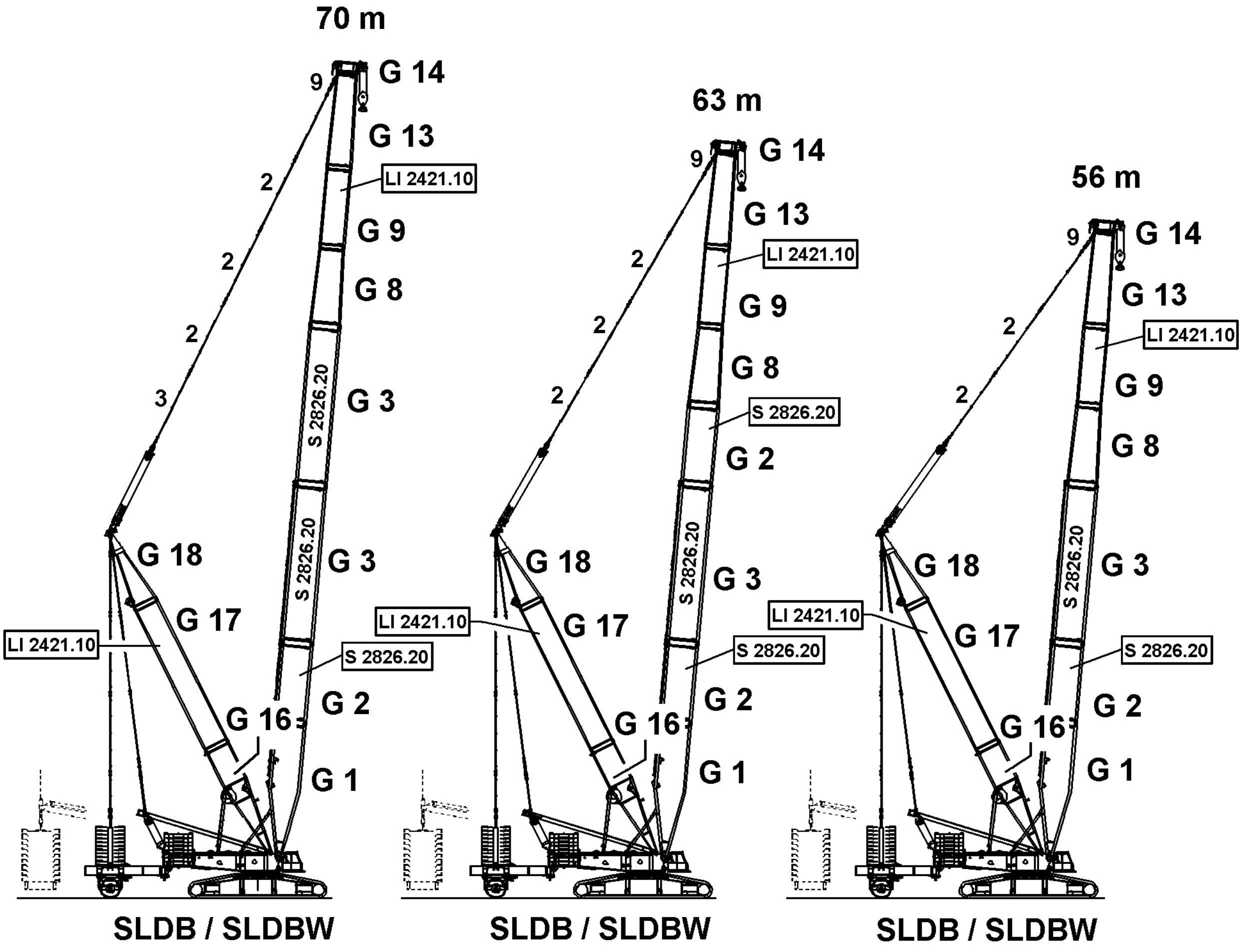
192494


112 m
G 14
9
G 13
2
LI 2421.10
G 10
3
2
G 9
LI 2421.10
2
F
G 9
2
G 8
2
G 2
S 2826.20
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
S 2826.20
G 3
G 18
G 17
G 2
G 16
S 2826.20
G 1
SLDB / SLDBW
105 m
G 14
9
G 13
2
LI 2421.10
G 10
3
2
G 9
LI 2421.10
2
E
G 9
2
G 8
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
S 2826.20
G 3
G 18
G 17
G 2
G 16
S 2826.20
G 1
SLDB / SLDBW
98 m
G 14
9
G 13
2
LI 2421.10
G 10
3
LI 2421.10
2
F
G 9
2
G 8
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
S 2826.20
G 3
G 18
G 17
G 2
G 16
S 2826.20
G 1
SLDB / SLDBW

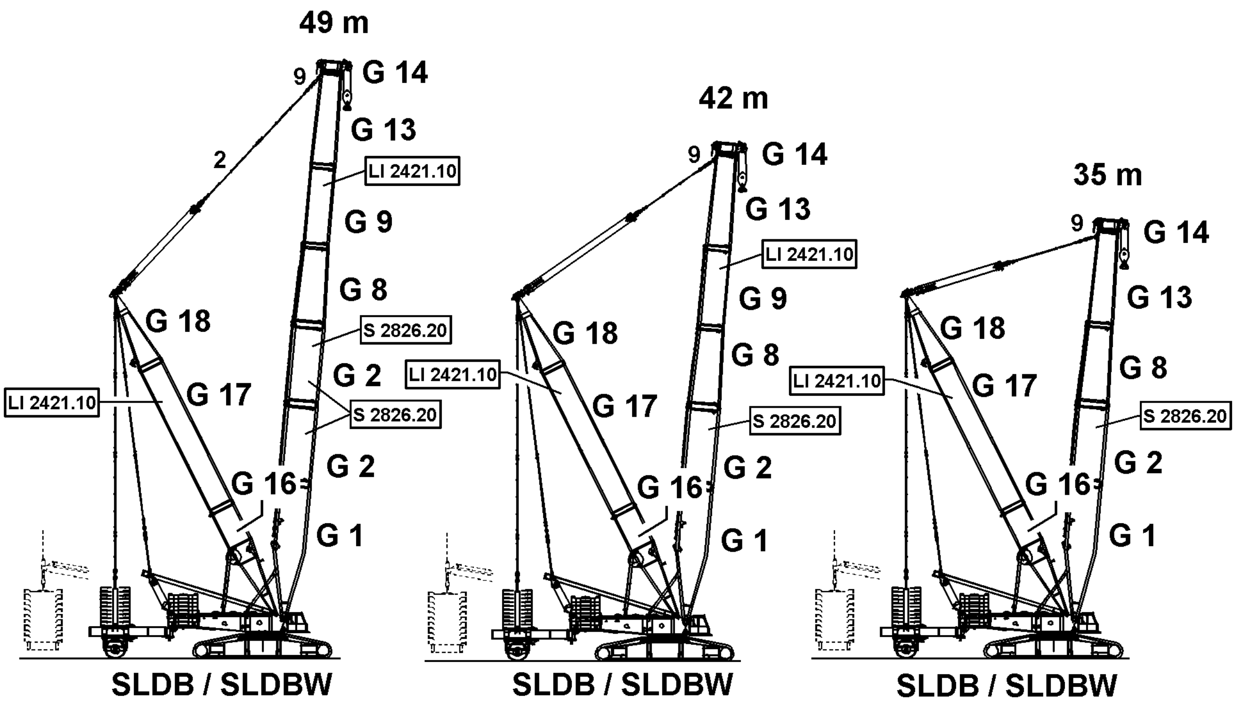
192495


91 m
84 m
77 m
G 14
G 13
G 10
G 9
G 8
G 3
G 2
G 1
G 16
G 17
G 18
E
LI 2421.10
S 2826.20
SLDB / SLDBW
SLDB / SLDBW
SLDB / SLDBW

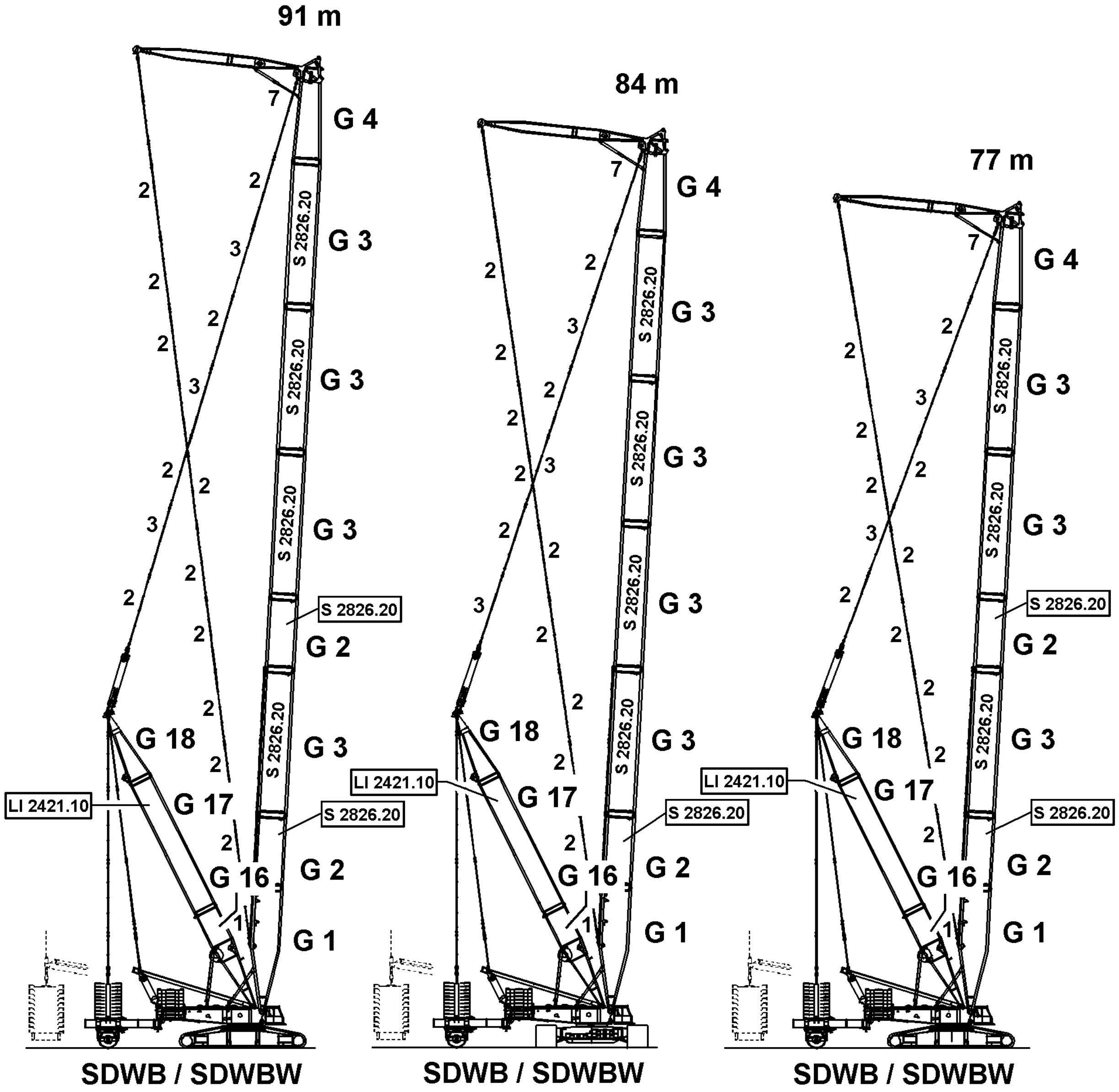
192496

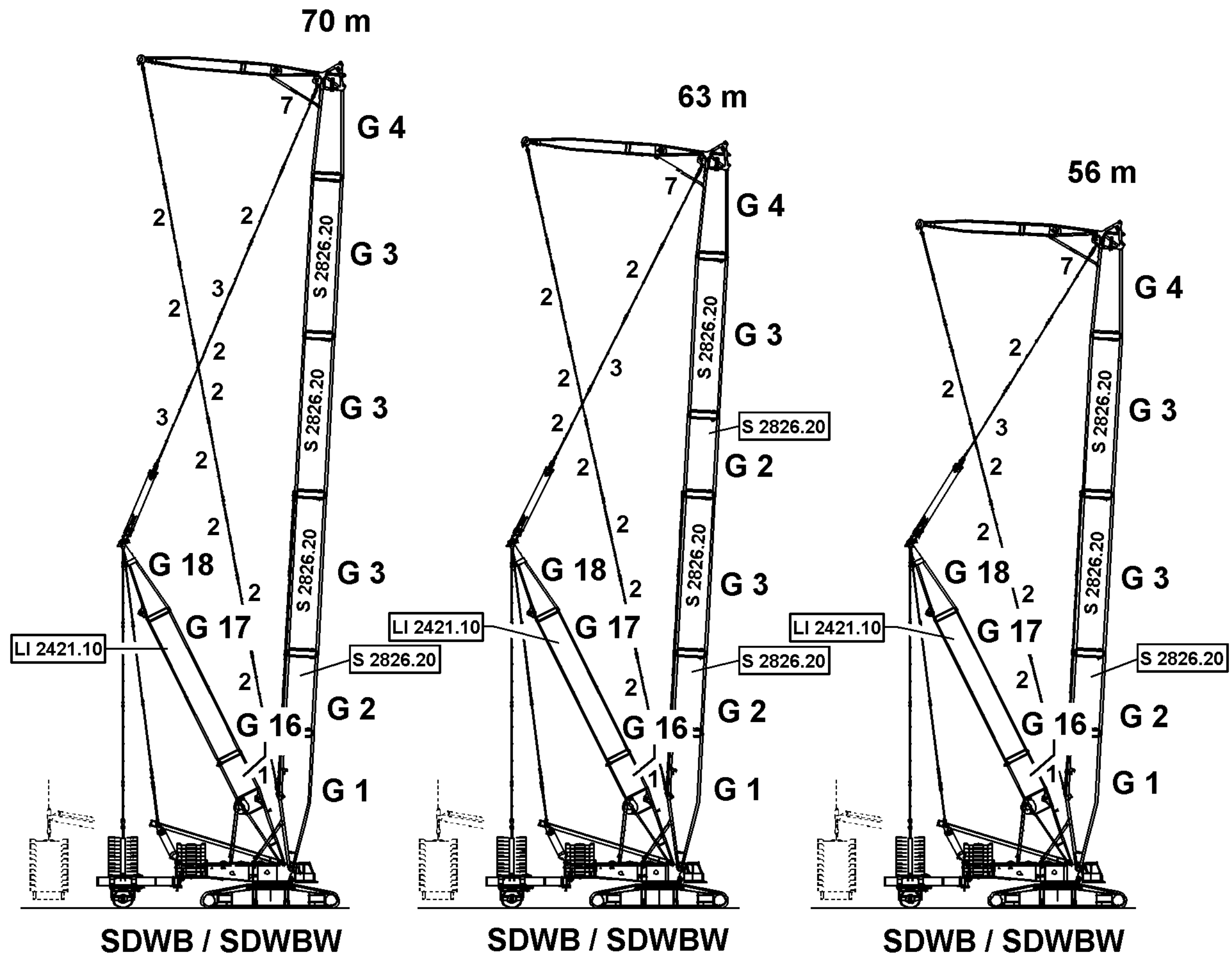

70 m
9
G 14
G 13
2
LI 2421.10
G 9
2
G 8
2
3
S 2826.20
G 3
S 2826.20
G 18
G 3
G 17
LI 2421.10
S 2826.20
G 16
G 2
G 1
SLDB / SLDBW
63 m
9
G 14
G 13
LI 2421.10
2
G 9
2
G 8
2
S 2826.20
G 2
G 18
S 2826.20
G 3
LI 2421.10
G 17
S 2826.20
G 2
G 16
G 1
SLDB / SLDBW
56 m
9
G 14
G 13
2
LI 2421.10
2
G 9
G 8
S 2826.20
G 18
G 3
LI 2421.10
G 17
S 2826.20
G 16
G 2
G 1
SLDB / SLDBW

192497

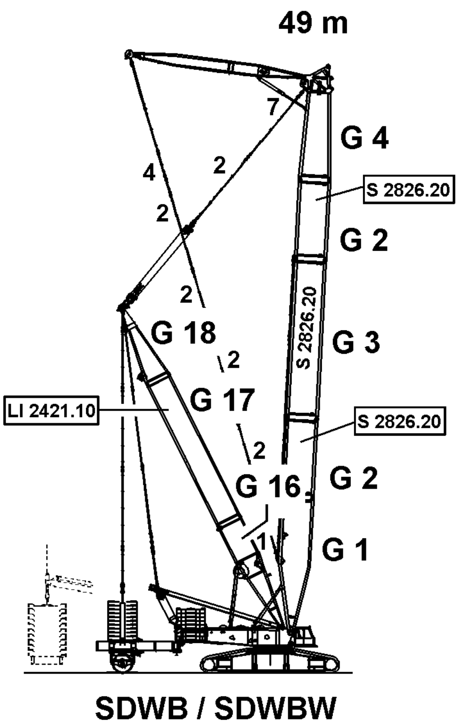

49 m
9
G 14
G 13
2
LI 2421.10
G 9
G 8
G 18
S 2826.20
G 2
LI 2421.10
G 17
S 2826.20
G 16
G 2
G 1
SLDB / SLDBW
42 m
9
G 14
G 13
LI 2421.10
G 9
G 18
G 8
LI 2421.10
G 17
S 2826.20
G 16
G 2
G 1
SLDB / SLDBW
35 m
9
G 14
G 13
G 18
G 8
LI 2421.10
G 17
S 2826.20
G 16
G 2
G 1
SLDB / SLDBW

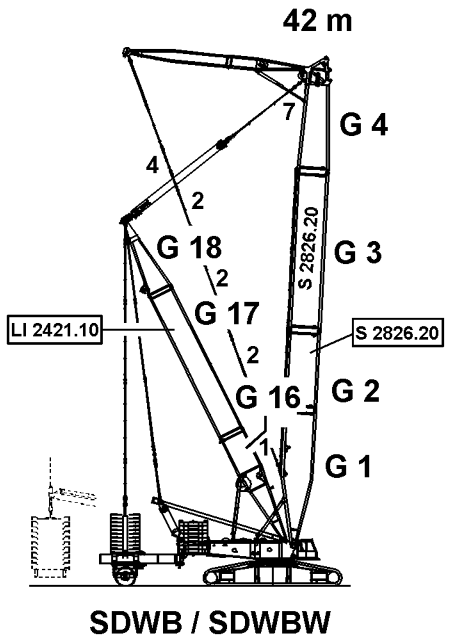
192566

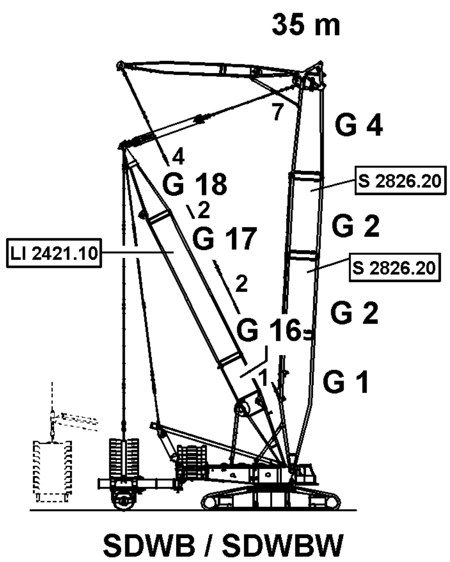

91 m
84 m
77 m
G 4
G 3
G 2
G 1
G 16
G 17
G 18
S 2826.20
LI 2421.10
SDWB / SDWBW
SDWB / SDWBW
SDWB / SDWBW
192498


70 m
7
G 4
2
2
S 2826.20
G 3
3
2
2
S 2826.20
G 3
2
3
2
2
G 18
S 2826.20
G 3
2
LI 2421.10
G 17
S 2826.20
2
G 16
G 2
1
G 1
SDWB / SDWBW
63 m
7
G 4
2
2
S 2826.20
G 3
2
3
S 2826.20
2
G 2
2
2
S 2826.20
G 18
G 3
2
LI 2421.10
G 17
S 2826.20
2
G 16
G 2
1
G 1
SDWB / SDWBW
56 m
7
G 4
2
2
S 2826.20
G 3
3
2
2
G 18
S 2826.20
G 3
2
LI 2421.10
G 17
S 2826.20
2
G 16
G 2
1
G 1
SDWB / SDWBW

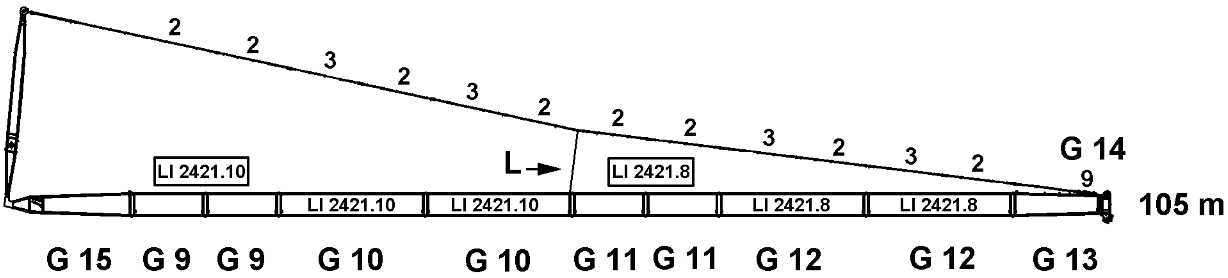
192499

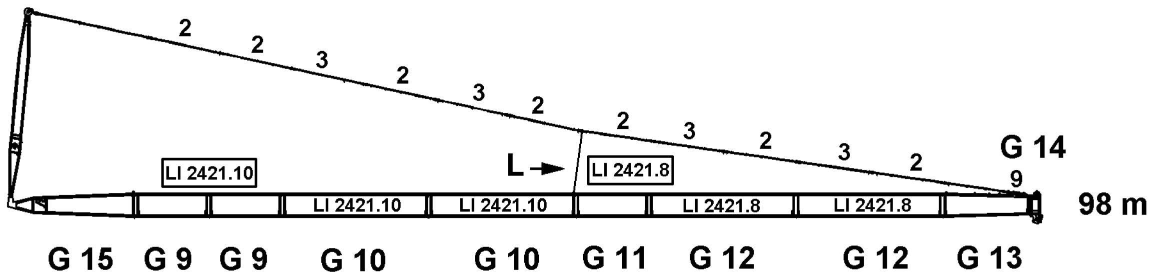

49 m
G 4
S 2826.20
G 2
S 2826.20
G 3
S 2826.20
G 2
G 1
G 18
G 17
G 16
LI 2421.10
7
4
2
1
SDWB / SDWBW

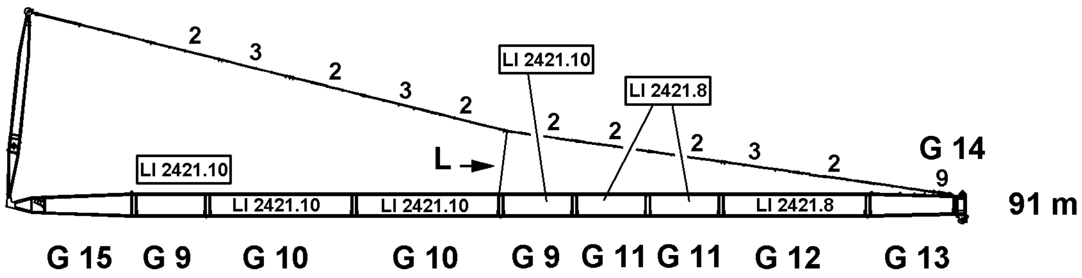

42 m
G 4
S 2826.20
G 3
S 2826.20
G 2
G 1
G 18
G 17
G 16
LI 2421.10
7
4
2
1
SDWB / SDWBW

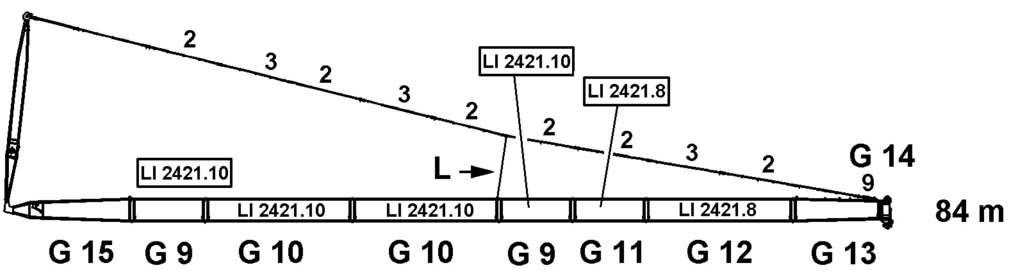

35 m
G 4
S 2826.20
G 2
S 2826.20
G 2
G 1
G 18
G 17
G 16
LI 2421.10
7
4
2
1
SDWB / SDWBW

192500

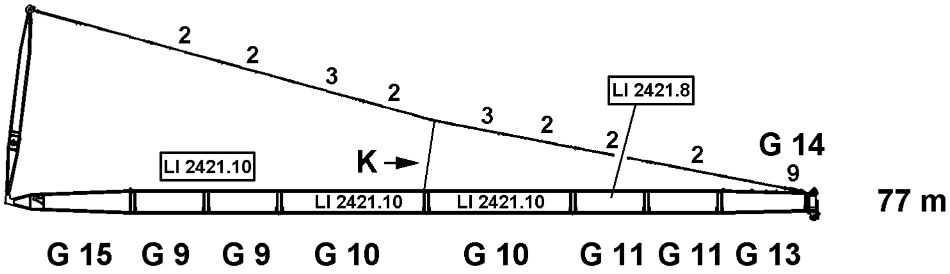

2
2
3
2
3
2
2
2
3
2
3
2
G 14
9
LI 2421.10
L
LI 2421.8
LI 2421.10
LI 2421.10
LI 2421.8
LI 2421.8
105 m
G 15 G 9 G 9 G 10 G 10 G 11 G 11 G 12 G 12 G 13

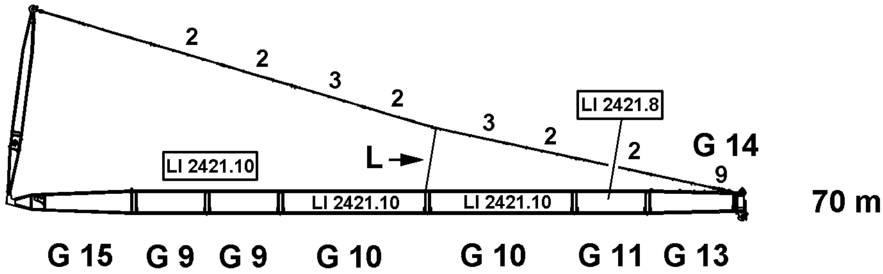

2
2
3
2
3
2
2
3
2
3
2
G 14
9
LI 2421.10
L
LI 2421.8
LI 2421.10
LI 2421.10
LI 2421.8
LI 2421.8
98 m
G 15 G 9 G 9 G 10 G 10 G 11 G 12 G 12 G 13

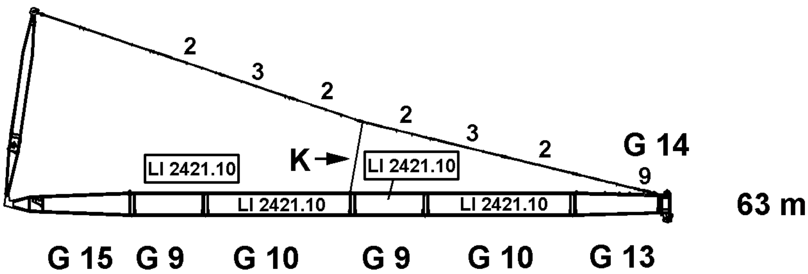

2
3
2
3
2
LI 2421.10
LI 2421.8
2
2
2
3
2
G 14
9
LI 2421.10
L
LI 2421.10
LI 2421.10
LI 2421.8
91 m
G 15 G 9 G 10 G 10 G 9 G 11 G 11 G 12 G 13

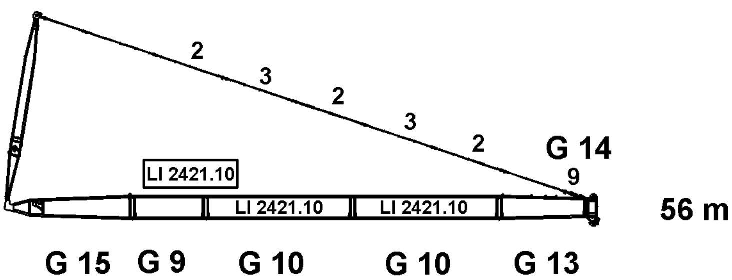

2
3
2
3
2
LI 2421.10
LI 2421.8
2
2
3
2
G 14
9
LI 2421.10
L
LI 2421.10
LI 2421.10
LI 2421.8
84 m
G 15 G 9 G 10 G 10 G 9 G 11 G 12 G 13

192501

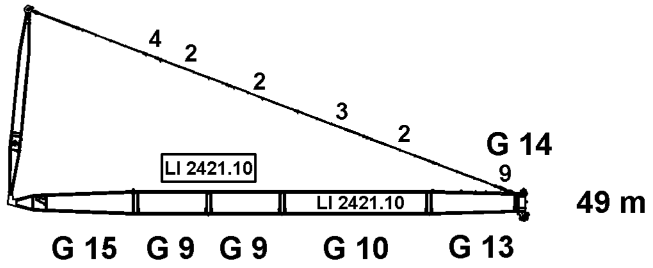

2
2
3
2
3
2
2
2
LI 2421.8
G 14
9
LI 2421.10
K
LI 2421.10
LI 2421.10
77 m
G 15 G 9 G 9 G 10 G 10 G 11 G 11 G 13

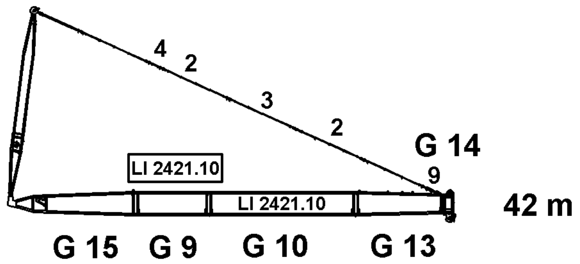

2
2
3
2
3
2
2
LI 2421.8
G 14
9
LI 2421.10
L
LI 2421.10
LI 2421.10
70 m
G 15 G 9 G 9 G 10 G 10 G 11 G 13

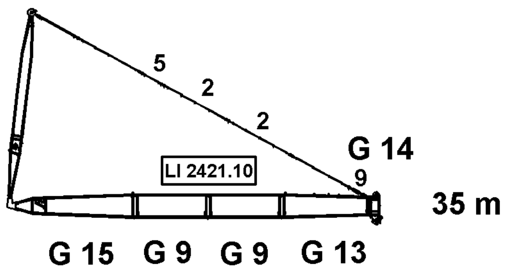

2
3
2
2
3
2
G 14
9
LI 2421.10
K
LI 2421.10
LI 2421.10
LI 2421.10
63 m
G 15 G 9 G 10 G 9 G 10 G 13

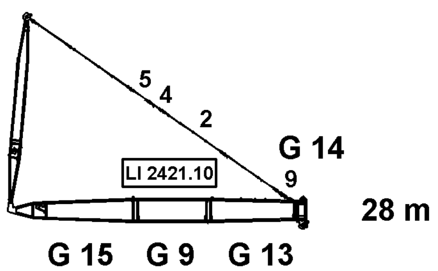

2
3
2
3
2
G 14
9
LI 2421.10
LI 2421.10
LI 2421.10
56 m
G 15 G 9 G 10 G 10 G 13

192502

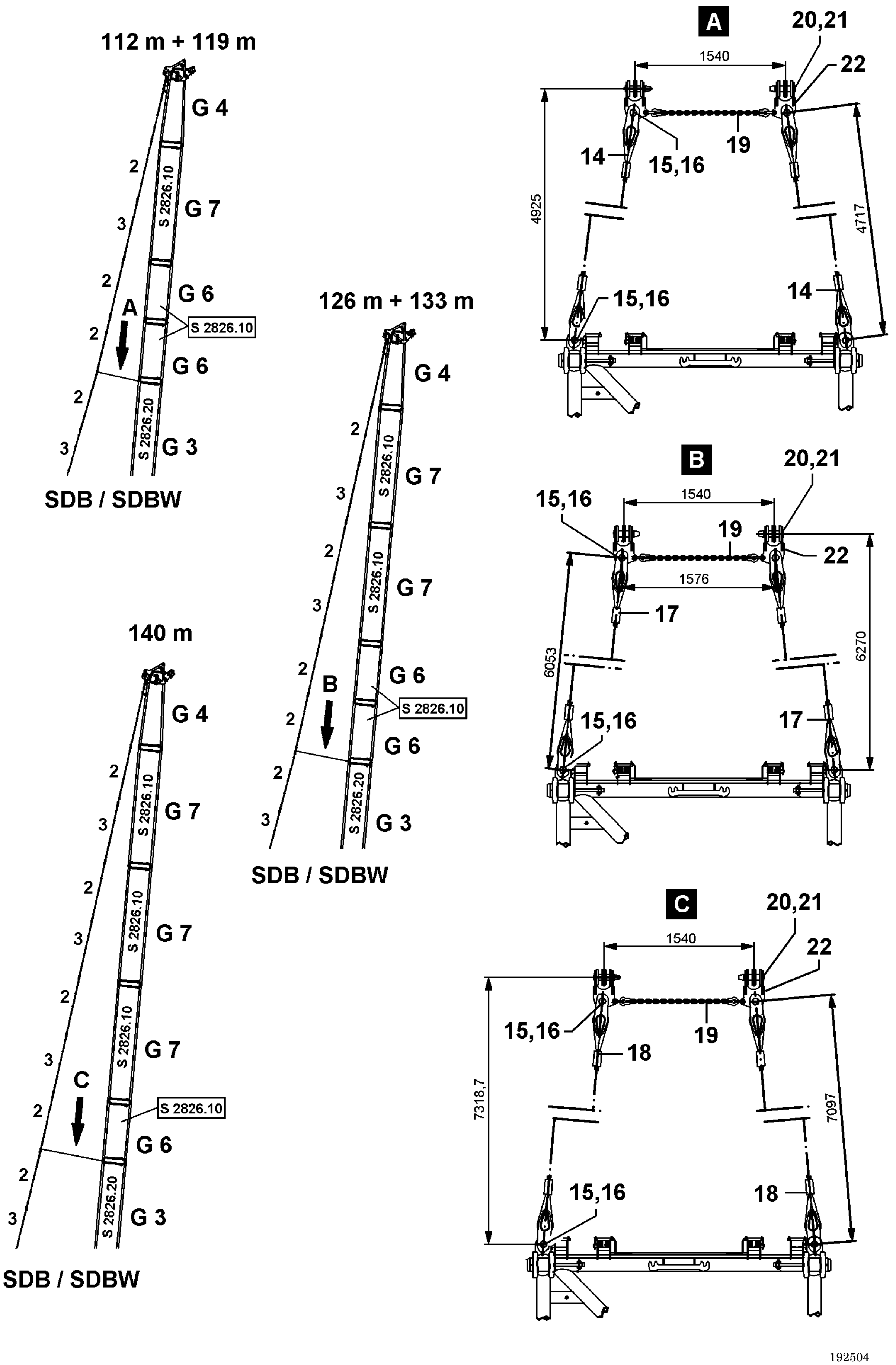

4
2
2
3
2
G 14
9
LI 2421.10
LI 2421.10
49 m
G 15 G 9 G 9 G 10 G 13


4
2
3
2
G 14
9
LI 2421.10
LI 2421.10
42 m
G 15 G 9 G 10 G 13


5
2
2
G 14
9
LI 2421.10
35 m
G 15 G 9 G 9 G 13


5
4
2
G 14
9
LI 2421.10
28 m
G 15 G 9 G 13

192503



112 m + 119 m
G 4
G 7
G 6
G 6
G 3
S 2826.10
S 2826.20
A
SDB / SDBW
126 m + 133 m
G 4
G 7
G 7
G 6
G 6
G 3
S 2826.10
S 2826.20
B
SDB / SDBW
140 m
G 4
G 7
G 7
G 7
G 6
G 3
S 2826.10
S 2826.20
C
SDB / SDBW
A
20,21
22
1540
19
14
15,16
4925
4717
15,16
14
B
20,21
15,16
1540
19
22
1576
17
6053
6270
15,16
17
C
20,21
22
1540
15,16
19
18
7318,7
7097
15,16
18
192504

Added guying SD- Boom

For a SD- boom length of 112m and 119 m, added guying (fig. A) is required between the guy rods and the boom.

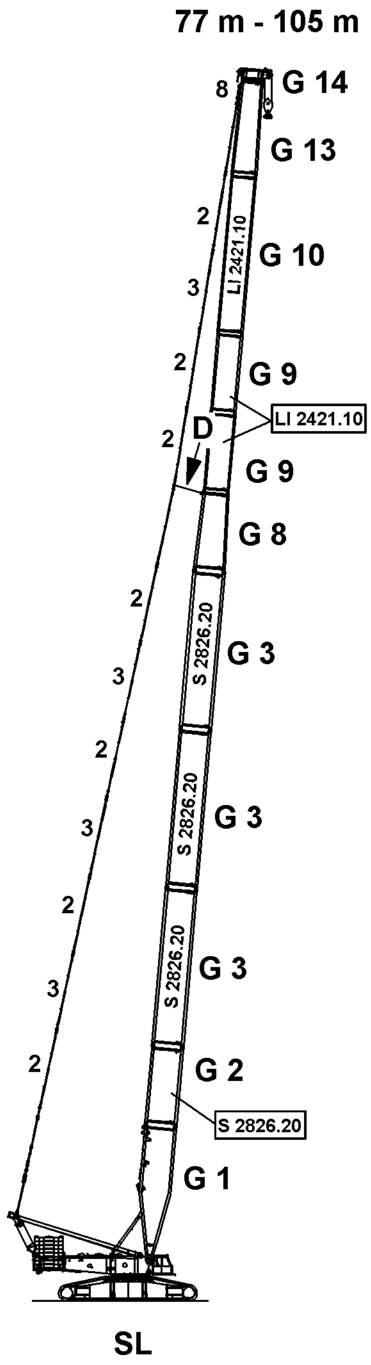
For a SD- boom length of 125 m and 133 m, added guying (fig. B) is required between guy rods and boom.

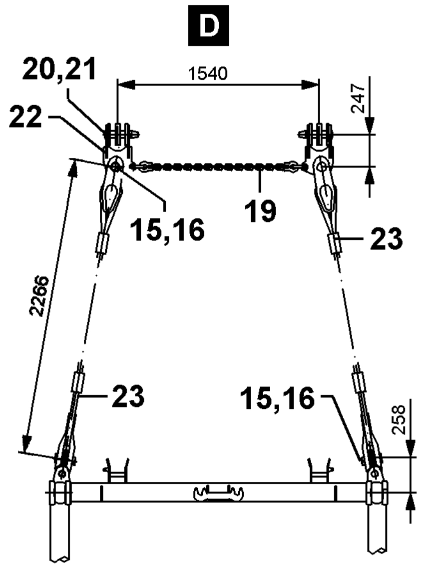
For a SD- boom length of 140 m, added guying (fig. C) is required between guy rods and boom.

The added guying consists of two each guy ropes (14,17 or 18) and two brackets (22).

The guy ropes (14,17 or 18) are pinned on the brackets (22) with pin (15) and secured with spring retainer (16) .

D A N G E R: The added guying must be installed according to the installation drawing.


77 m - 105 m
8
G 14
G 13
2
LI 2421.10
G 10
3
2
G 9
LI 2421.10
2
D
G 9
G 8
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
S 2826.20
G 3
3
2
G 2
S 2826.20
G 1
SL


D
20,21
1540
247
22
15,16
19
23
2266
23
15,16
258

192507

Added guying SL - boom

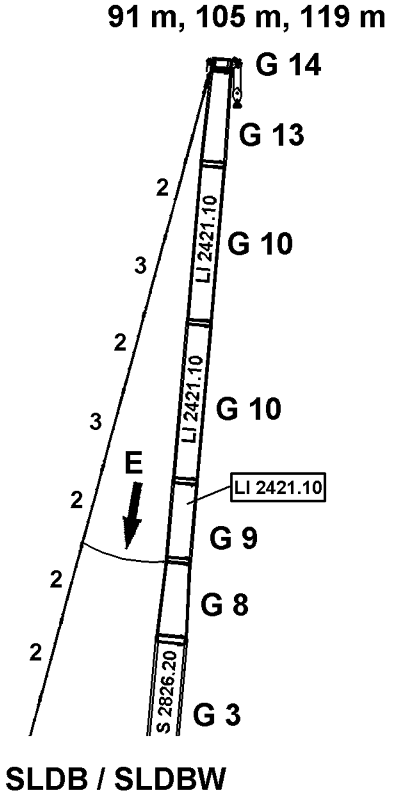
For a SL - boom length of 77 m - 105 m, added guying (fig. D) is required between the guy rods and the boom.

The added guying consists of two guy ropes (23), as well as two brackets (22).

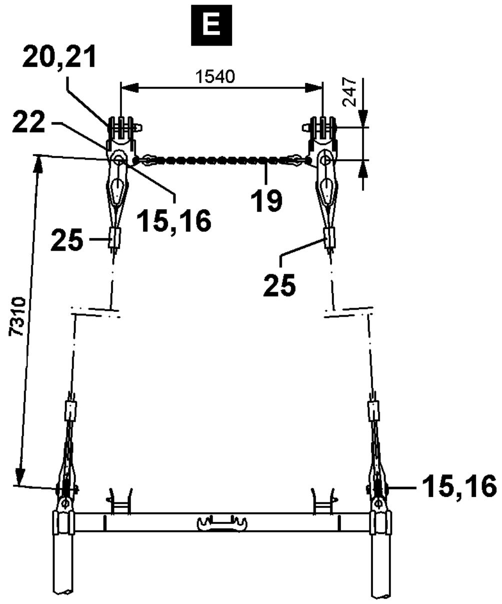
The brackets (22) are pinned to the guy rods with pin (24) and secured with spring retainer (16) .

The guy ropes (23) are pinned on the connector points on the lattice jib with pin (15) and secured with spring retainer (16) .

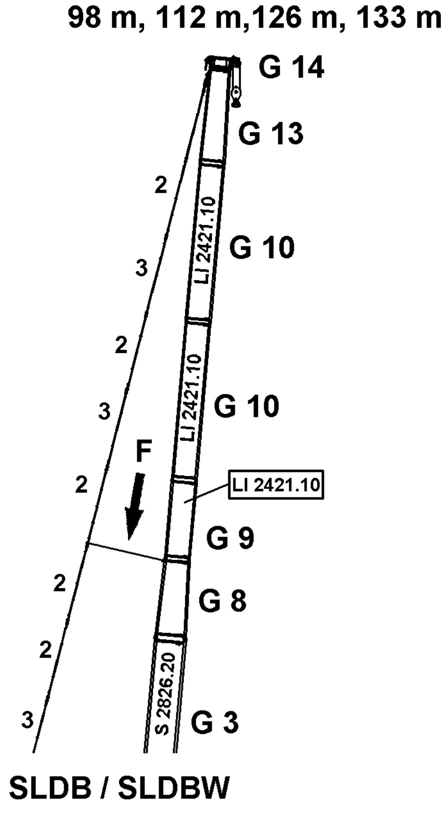
D A N G E R: The added guying must be installed according to the installation drawing.



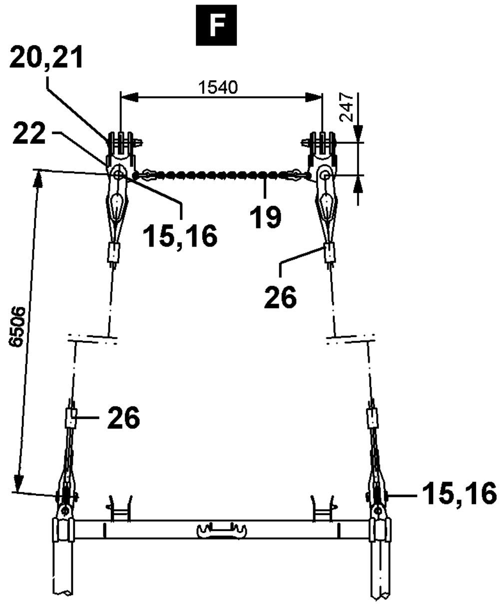
91 m, 105 m, 119 m
G 14
G 13
G 10
G 10
G 9
G 8
G 3
LI 2421.10
LI 2421.10
LI 2421.10
S 2826.20
E
2
3
2
3
2
2
2
SLDB / SLDBW



E
20,21
1540
247
22
19
15,16
25
25
7310
15,16



98 m, 112 m,126 m, 133 m
G 14
G 13
G 10
G 10
G 9
G 8
G 3
LI 2421.10
LI 2421.10
LI 2421.10
S 2826.20
F
2
3
2
3
2
2
2
3
SLDB / SLDBW



F
20,21
1540
247
22
19
15,16
26
6506
26
15,16

192506

Added guying SLD- boom

For a SLD- boom length of 91m, 115 m and 119 m, added guying (fig. E) is required between the guy rods and the boom.

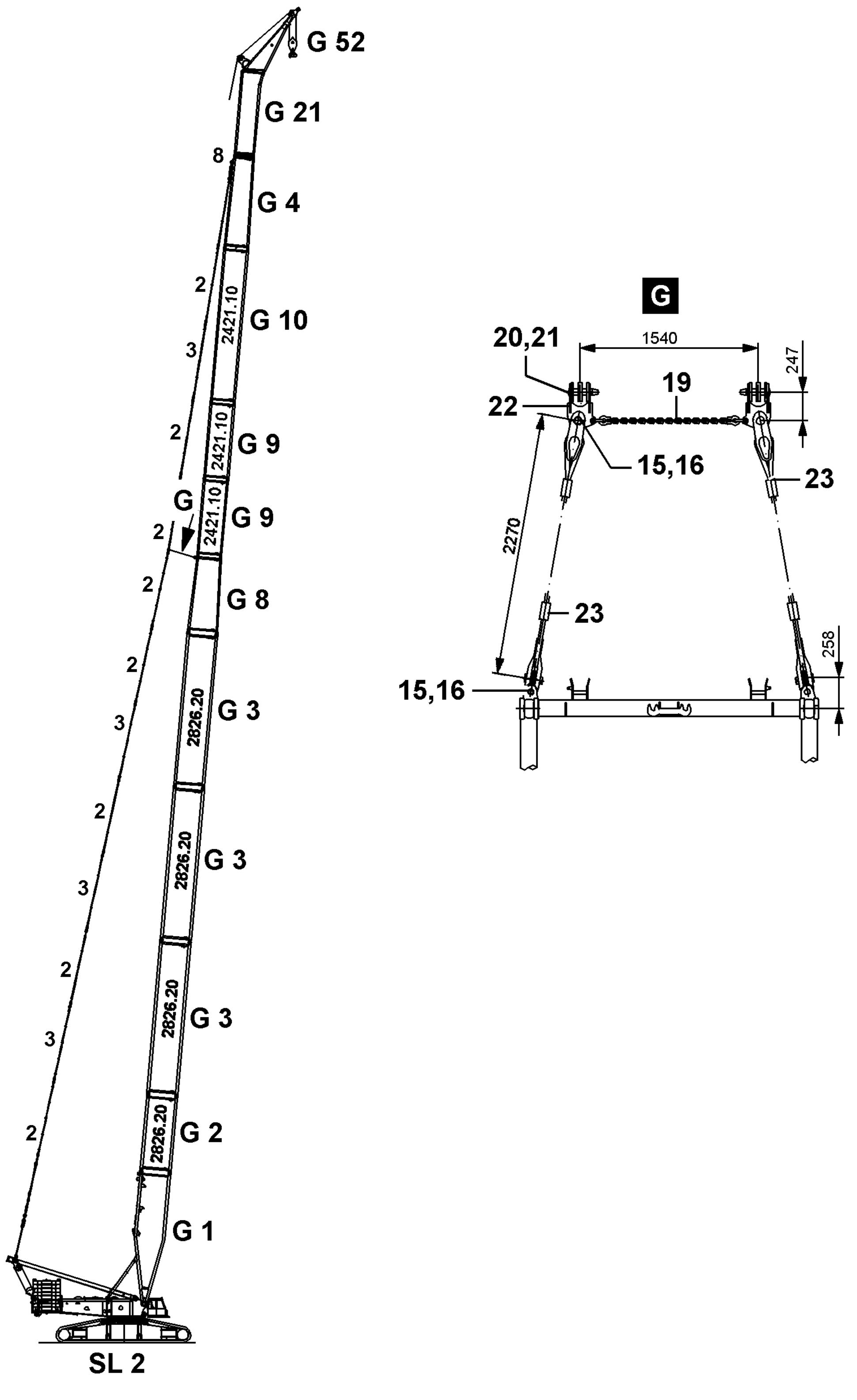
For a SLD- boom length of 98 m, 112 m, 126 m and 133 m , added guying (fig. F) is required between the guy rods and the boom.

The added guying consists of two guy ropes (25 or 26) and two brackets (22).

The guy ropes (25 or 26) are pinned and secured to brackets (22) .

The guy ropes (25 or 26) are pinned on the connector points on the lattice jib with pin (15) and secured with spring retainer (16) .

D A N G E R: The added guying must be installed according to the installation drawing.


G 52
G 21
8
G 4
2
2421.10
G 10
3
2
2421.10
G 9
G
2421.10
G 9
2
2
G 8
2
3
2826.20
G 3
2
3
2826.20
G 3
2
3
2826.20
G 3
2
2826.20
G 2
G 1
SL 2
G
20,21
1540
247
19
22
15,16
23
2270
23
258
15,16

192386

Added guying SL2 - boom

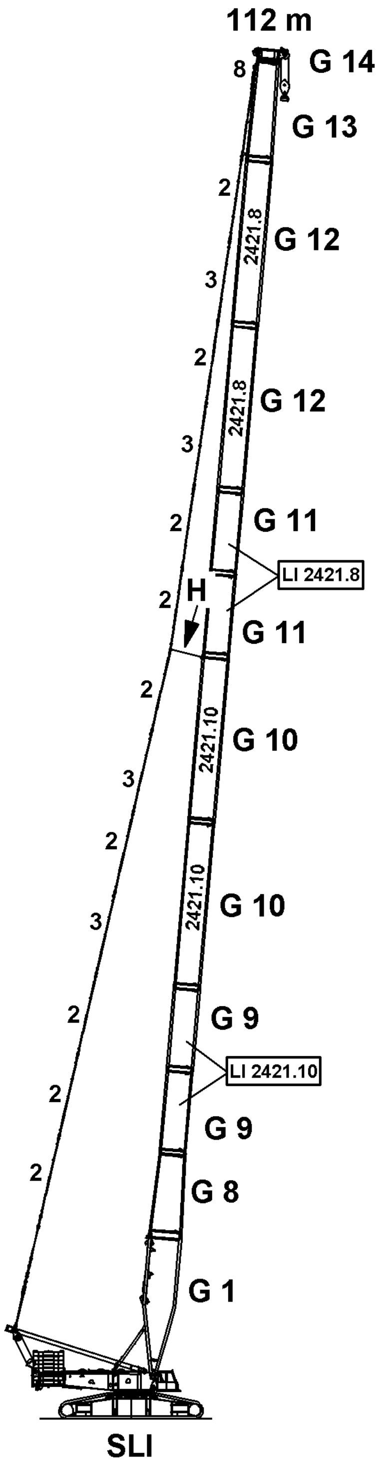
For a SL2 - boom length of 90 m - 118 m, added guying (fig. G) is required between the guy rods and the boom.

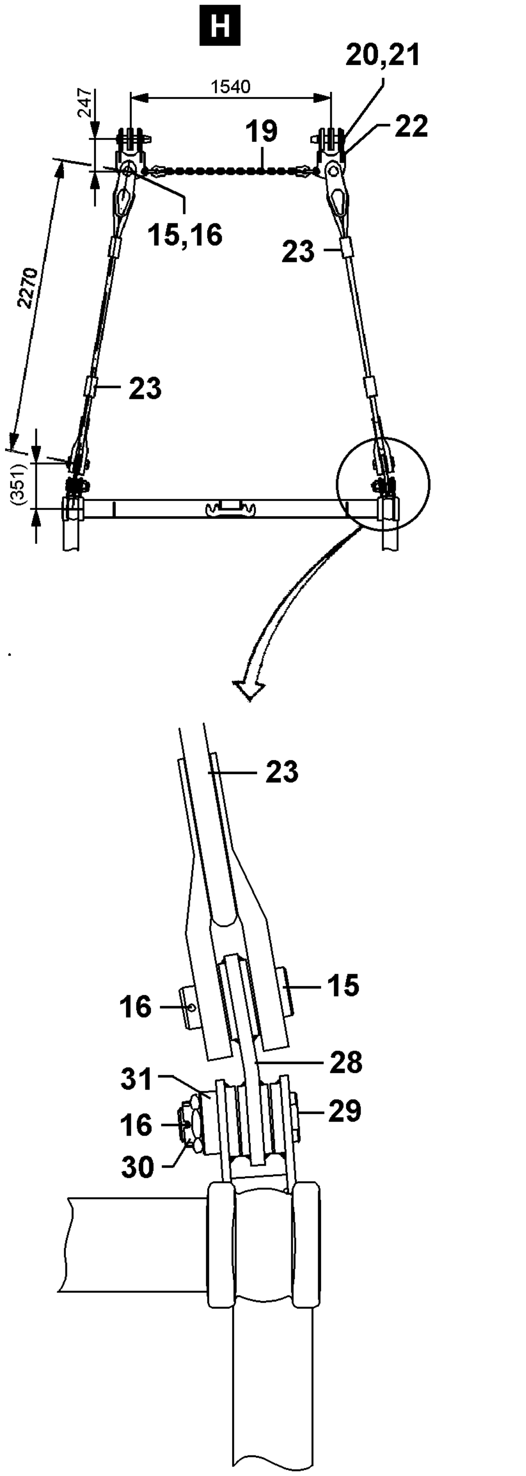
The added guying consists of two guy ropes (23), as well as two brackets (22).

The brackets (22) are pinned to the guy rods with pin (20) and secured with spring retainer (21) .

The guy ropes (23) are pinned on the connector points on the lattice jib with pin (15) and secured with spring retainer (16) .

D A N G E R: The added guying must be installed according to the installation drawing.


112 m
8
G 14
G 13
2
3
2421.8
G 12
G 12
G 11
LI 2421.8
H
G 11
2421.10
G 10
G 10
G 9
LI 2421.10
G 9
G 8
G 1
SLI


H
1540
247
20,21
19
22
15,16
23
2270
(351)
23
15
16
28
31
29
16
30

192565

Added guying SLI - boom

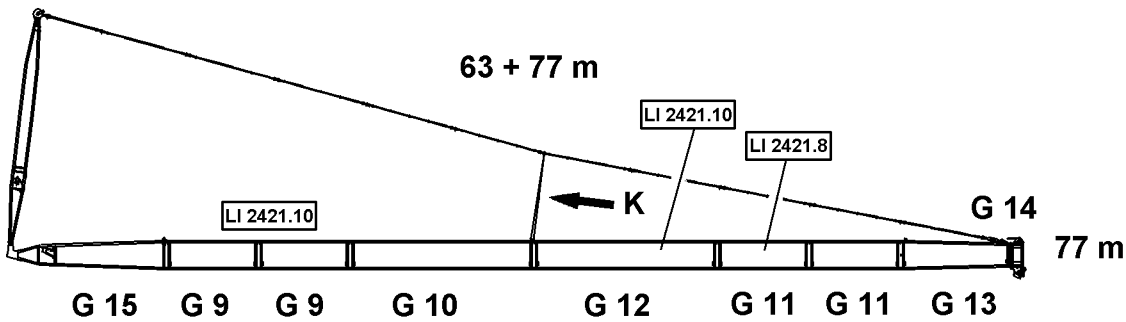
For a SLI - boom length of 56 m - 112 m , added guying (fig. H) is required between the guy rods and the boom.

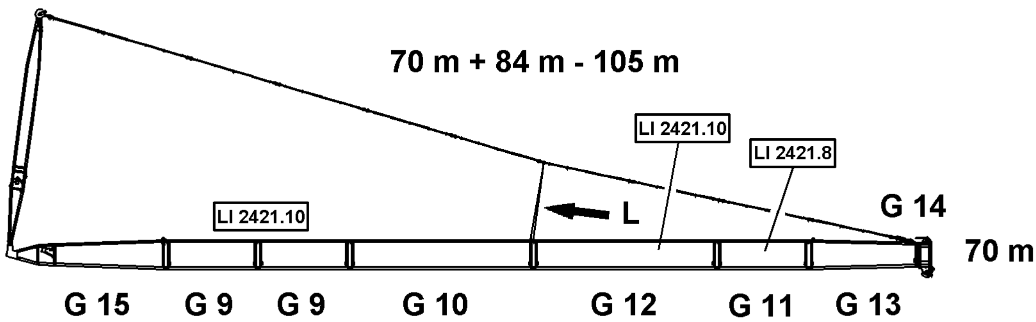
The added guying consists of two guy ropes (23) as well as two brackets (22).

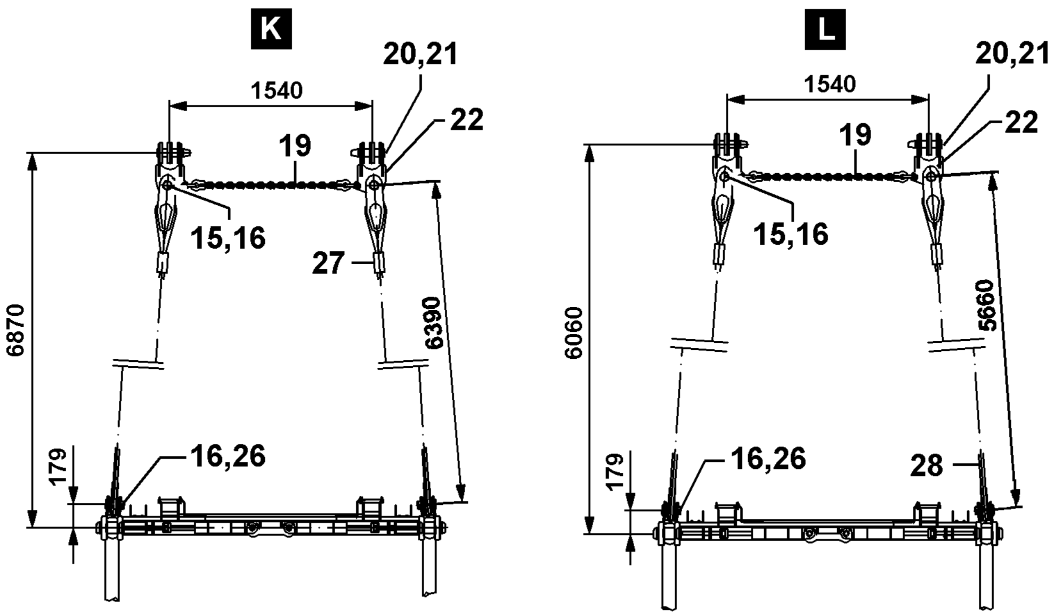
The guy ropes (23) are pinned on brackets (22) as well as on brackets (28) on the boom with pin (15) and secured with spring retainer (16) .

The brackets (28) are pinnedon the connector pins on the boom with pin (29) and secured with washer (31), nut (30) and spring retainer (16) .

D A N G E R: The added guying must be installed according to the installation drawing.


63 + 77 m
LI 2421.10
LI 2421.8
LI 2421.10
K
G 14
77 m
G 15
G 9
G 9
G 10
G 12
G 11
G 11
G 13


70 m + 84 m - 105 m
LI 2421.10
LI 2421.8
LI 2421.10
L
G 14
70 m
G 15
G 9
G 9
G 10
G 12
G 11
G 13


K
1540
20,21
22
19
15,16
27
6870
6390
179
16,26
L
1540
20,21
22
19
15,16
6060
5660
179
16,26
28

192505

Added guying W- lattice jib

For a W- lattice jib length of 63 m and 77m, added guying (fig. K) is required between the guy rods and lattice jib .

For a W- lattice jib length of 70 m, as well as 84 m - 105 m, added guying (fig. L) is required between the guy rods and lattice jib .

The added guying consists of two guy ropes (27 or 28), two brackets (22) and the chain (19).

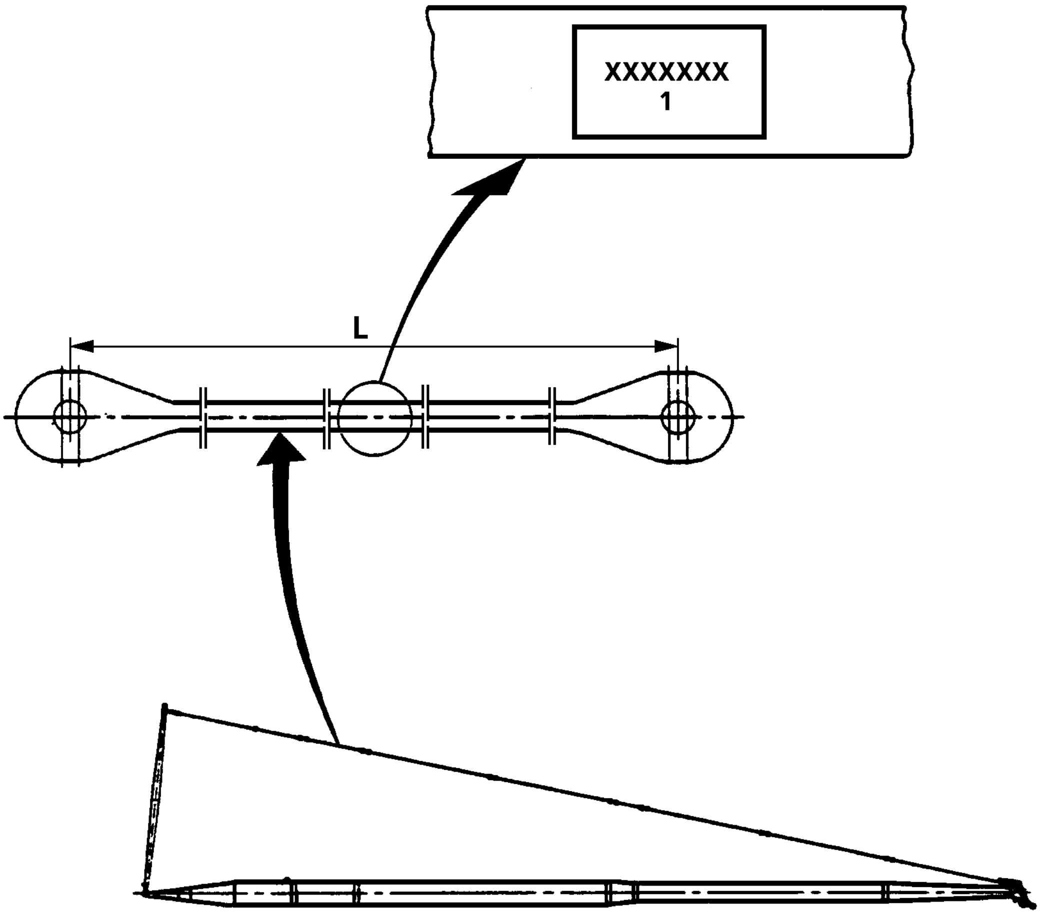
The guy ropes (27 or 28) are pinned on brackets (22) with pin (15) and secured with spring retainer (16) .

The brackets (22) are pinned on the guy rods with pin (20) and secured with spring retainer (21) .

The guy ropes (27 and 28) are pinned on the connector points on the boom with pin (16) and secured with spring retainer (26) .

C A U T I O N : The chain (19) must be installed in any case, otherwise the guy rods will be pulled apart.

D A N G E R: The added guying must be installed according to the installation drawing.



186568

Guy rods

The guy rods must be placed and secured on the lattice section for transport .

Note: If the guy rods were removed, then they must be placed again on the lattice sections for installation acording to the installation drawing.
The numbering on the installation drawing must be compared with the numbering (1) on the guy rods.

D A N G E R : **The guy rods must be installed according to the installation drawing.**
The guy rods must be checked regularly, see chapter "Inspection and maintenance of guy rods".

1. Installation

D A N G E R: **For the installation and removal work**
- a safe installation scaffolding / working platform must be used. There is a danger of accidents due to falling.
- Improvisations are prohibited.
- The lattice sections must be supported from below with suitable, stable materials.
- No one may remain under the lattice jib during pinning and unpinning procedure of the lattice sections. This is strictly prohibited!

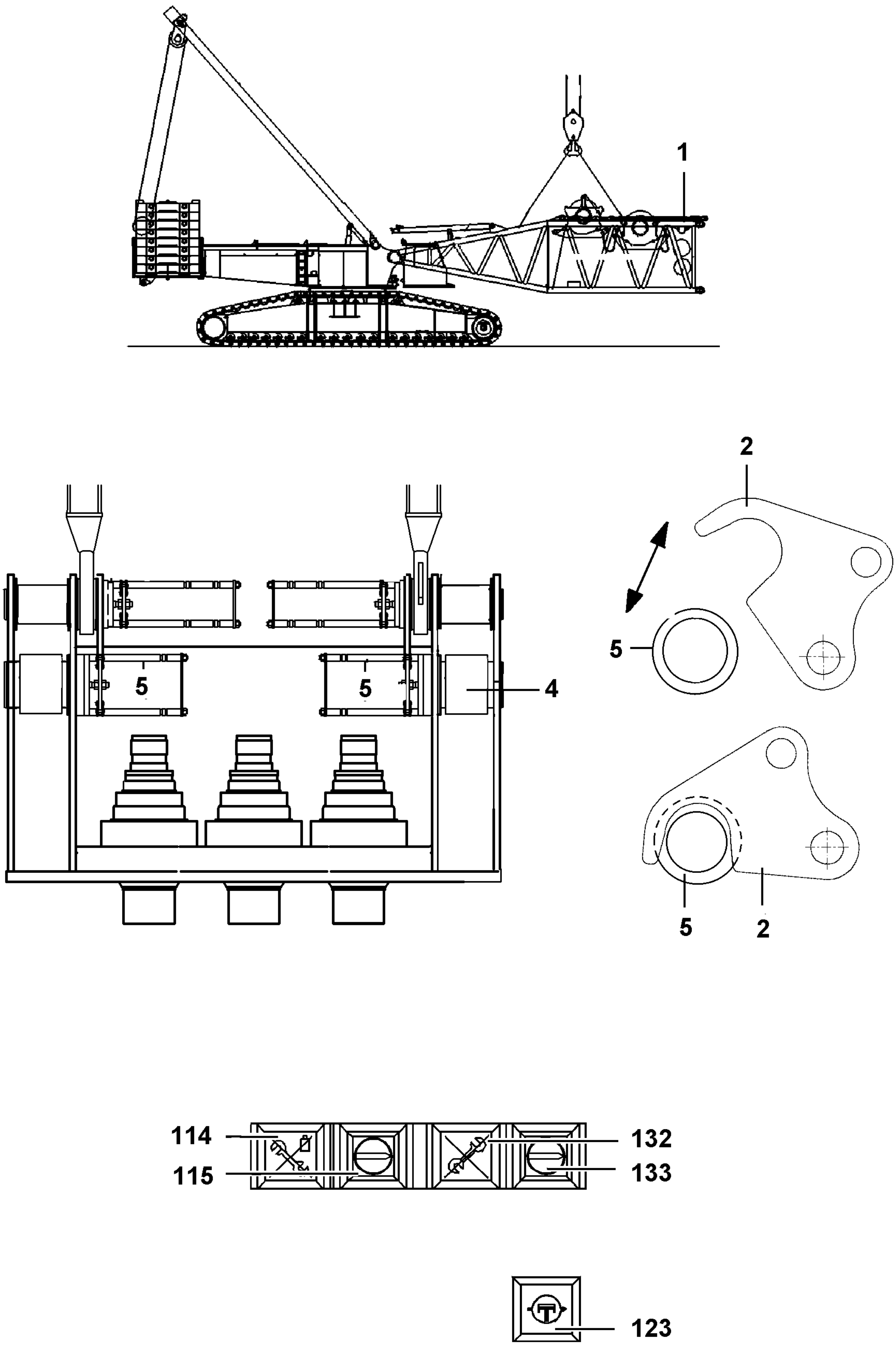
Prerequisites:
- The crane is horizontally aligned.
- An auxiliary crane as well as an installation scaffolding / working platform is available.
- The LICCON system is set according to the data given in the load charts.
- Actuate the installation keyed button (133) , the indicator light ”Installation” lights up (132).
- The installation symbol on the LICCON indicator blinks.

1.1 Installation - boom

Turn the slewing platform until it is positioned in length axle of the crawler gear or to the side.

Note: Observe the data given in the erection and take down charts.

D A N G E R : **Before turning the slewing platform without derrick or boom, the following must be observed:**
- the crawler gear with installed slewing platform is horizontal.
- the maximum permissible ballast variations in chapter 3.06, Installation conditions.
If this is not observed, there is a danger of tipping over!



191471

2. Install the S- pivot section

Lift the S- pivot section (1) with the auxiliary crane and swing it in to the pin points on the slewing platform.

Weights:

Component	Weight
S- pivot section	14350 kg
Relapse cylinder - 2×	1300 kg
S - guy rods	665 kg
W - guy rods	652 kg
Winch V	9500 kg
Winch VI	6390 kg

Fold both retaining hooks (2) from the guides (5) .

Retract the S- pivot section (1) on the slewing platform.

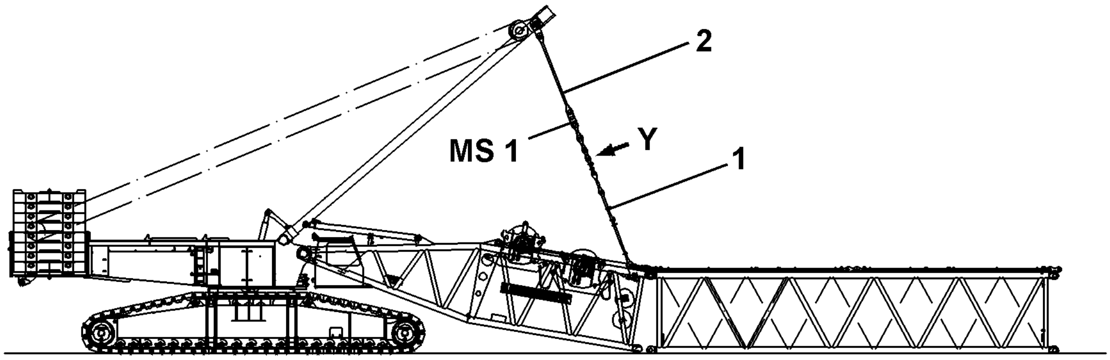
Fold the retaining hook (2) up, actuate the remote control and pin the connector pins (4) .

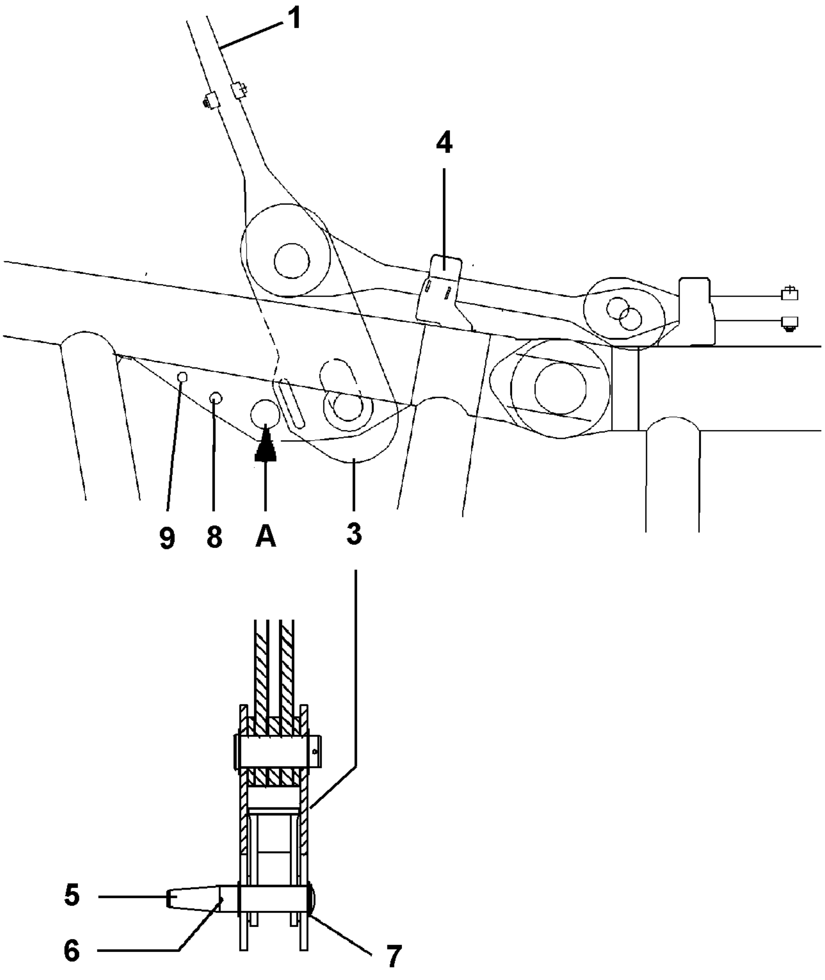
Secure the connector pins (4) by folding the retaining hooks (2) into the guides (5).

D A N G E R: **To prevent inadvertend unpinning, the connector pins (4) must be secured with the retaining hooks (2) .**

Note: For operation of remote control, see chapter 5.08.

Place the S-pivot section on the base support on the ground and remove the auxiliary crane.





191472

2.1 Install the boom

Lower the SA - bracket to the front, see chapter 5.02 " SA-Bracket".
Pin the guy rods (2) from the SA -bracket with the guy rods (1) from the S- pivot section (G1) and secure (Y).
Release the transport retainer (4) of the guy rods.
Pin and secure the installation bracket (3) on the S - pivot section and secure.Use pins (5), washers (7) and spring retainers (6) .

C A U T I O N: The transport retaining pins (8) must be unpinned during installation and operation.
Insert the pins in park position (9) .

Note: **A** = Pin point for flying installation with derrick.

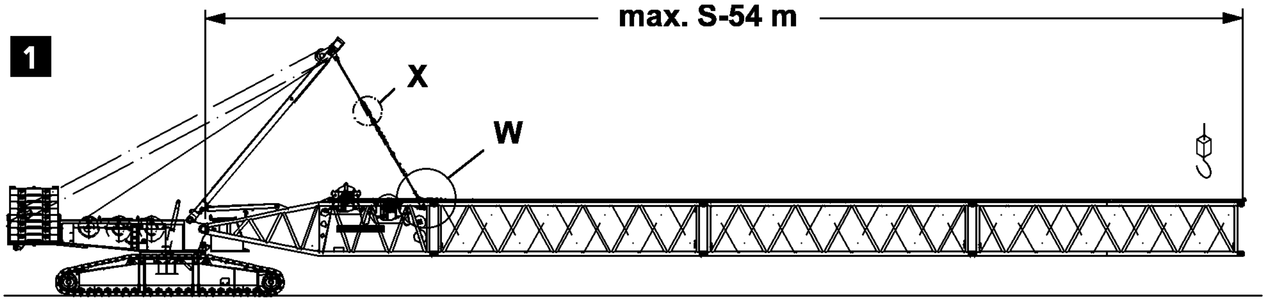
Assemble the boom and the corresponding guy rods to the required length, pin and secure.
Pin the first intermediate section on the pivot section (G1) **"on top".**
Pull up the S- pivot section with the SA-bracket (winch 4) until it can be pinned **"on the bottom"** .

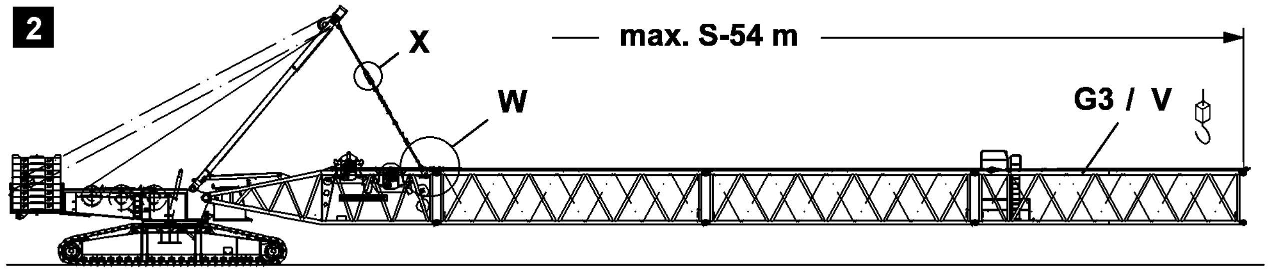
Note: Note the test point 1 - "IST" (Actual) force of monitor 1 in this position, so one knows when removing the boom, which force must be used to secure when unpinning.

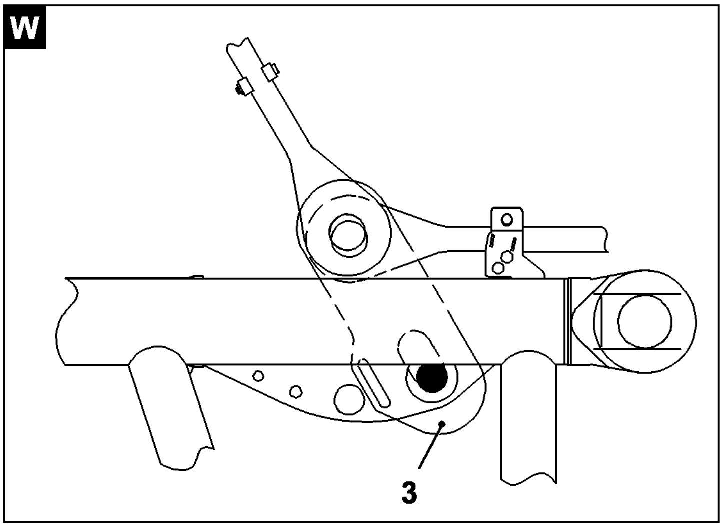
D A N G E R: The maximum permissible total force on test point 1 = F ≤ 160 t.
With the SA-bracket, the following maximum boom lengths can be lifted:
- S 84 m with installed S - and WA-bracket II guy rods
- SL 98 m, only with installed S- guy rods
The end section may not be raised, it must lay on the ground.
If this is not observed, severe damage can occur!

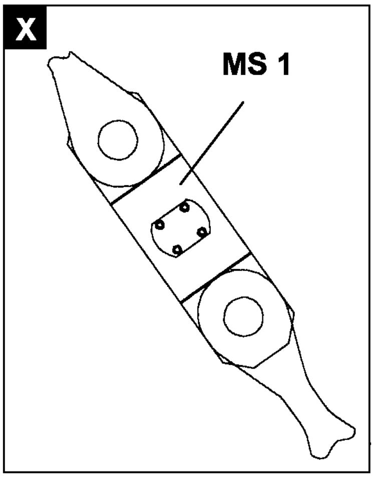
Pin and secure the pivot section (G1) **"on the bottom"** .
Relieve the guy rods by loering the SA- bracket .
Unpin the installation brackets (3) on the S- pivot section .

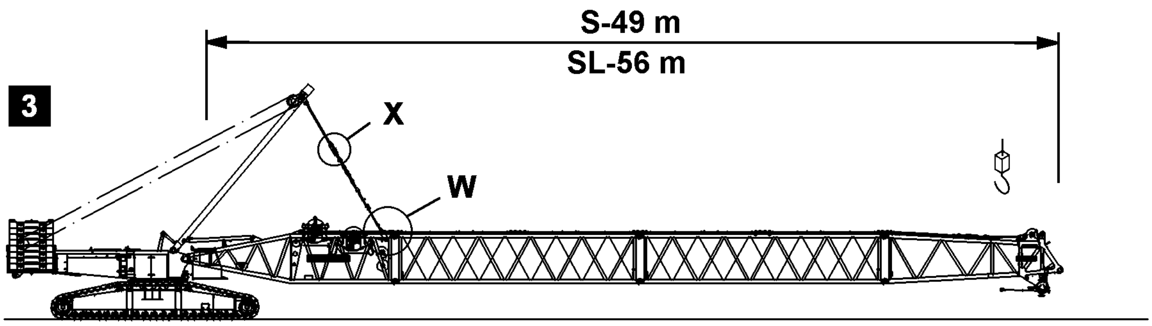
D A N G E R: Before unpinning the guy rods on the installation brackets (3) on the S- pivot section, the boom must be pinned "on the bottom" .
Otherwise there is a danger of accidents, as the boom might suddenly fold down!
The lattice sections must be supported from below with suitable, stable materials.
No one may remain under the lattice jib during pinning and unpinning procedure of the lattice sections. This is strictly prohibited!
There is a danger of accidents!











192900

2.2 Flying installation of the SL / S - boom

Installation

If space is severely limited at the job site for the installation of the boom or is restricted due to nearby buildings, etc. then it is possible to install the boom up to a **max. length** in flying mode:

Fig. 1 / 2 - max. S 54 m
- **without end section, without hook block**
- **with S - and WA-bracket II guy rods**
- **min. slewing platform ballast 120t**
- **min. central ballast 45t**
- **max. permissible total force 160 t on test point MS 1 (Fig-. X)**

Fig. 3 - max. S 49 m
- **with end section, without hook block**
- **with S - and WA-Bock II guy rods**

- max. SL 56m
- **with L - end section, without hook block**
- **with S - guy rods**
- **min. slewing platform ballast 120t**
- **min. central ballast 45t**
- **max. permissible total force 160 t on test point MS 1 (Fig-. X)**

Prerequisites:

- The pivot section is pinned and secured on the guy rods of the SA - bracket and the installation brackets (3) (Fig. W) and pulled up to horizontal position.

Installation

For a flying installation , the intermediate sections can be pinned and secured piece by piece with the auxiliary crane or the completely assembled boom can be pinned and secured on the pivot section .
Pin and secure the pin "**on top**" and "**on the bottom**" .

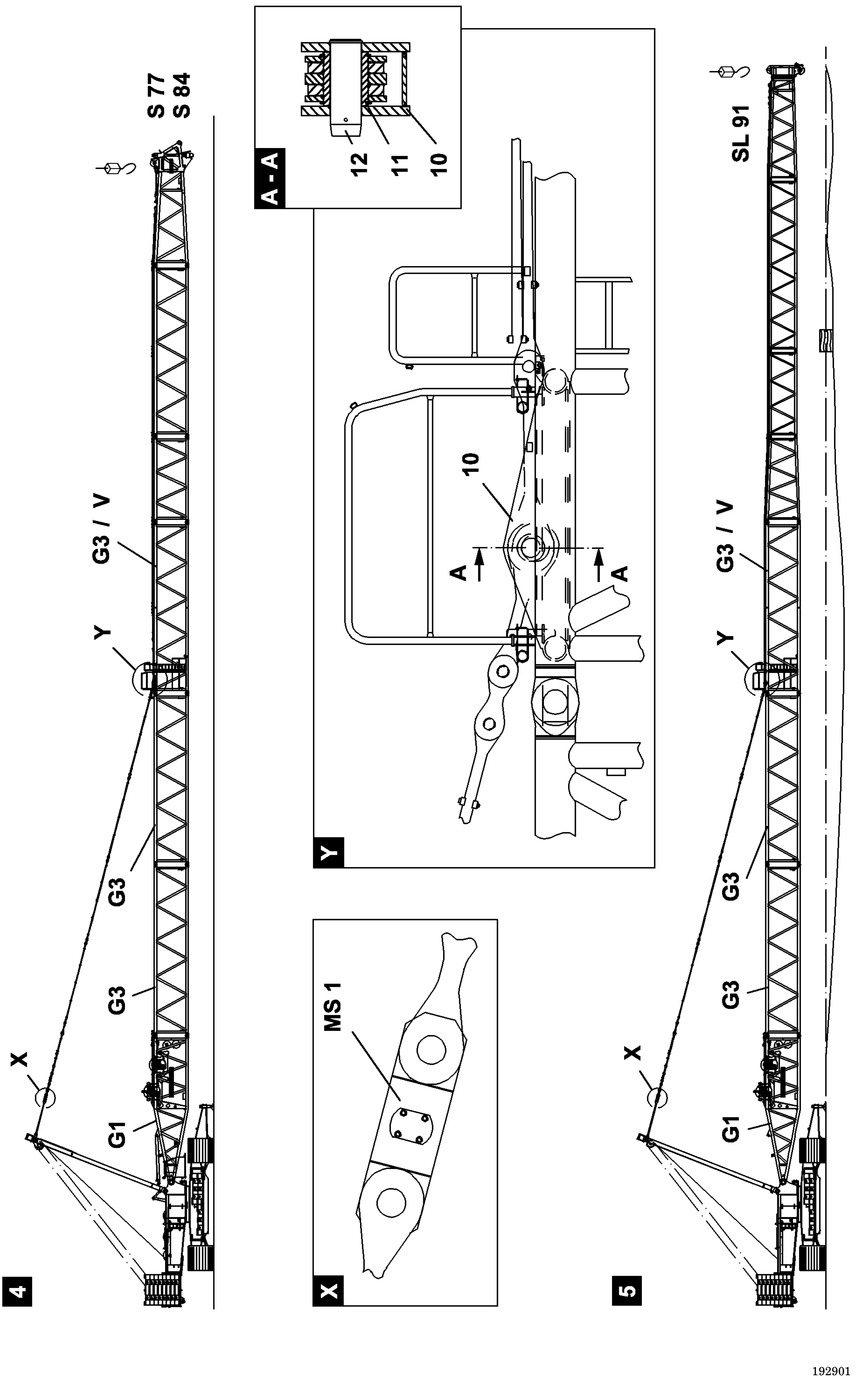
Note: For weight of the lattice sections with placed guy rods, see chapter 5.03.

**D A N G E R: Note the maximum permissible boom lengths for flying installation .
If this is not observed, there is danger of accidents!**

Attach the boom on the front on the auxiliary crane (A) or support it from below with stable materials.
Lower the guy rods (1, 2) to relieve the SA- bracket.
Unpin the installation brackets (3) on the S- pivot section .

Note: The **reinforced** 14 m S- intermediate section (G3 / V) weighs approx. 1.6 t more than the "normal" 14 m S- intermediate sections. This addition of weight of 1.6 t has not been considered in the load charts and therefore counts **as load**, i..e. depending on the boom length, the load indicator on the main boom head is larger by approx. 800 kg due to this intermediate section.

**D A N G E R: The boom must be held with an auxiliary crane (A) or supported from below, before the installation bracket (3) on the S- pivot section is unpinned.
Otherwise there is a danger of accidents, as the boom might suddenly fold down!
The lattice sections must be supported from below with suitable, stable materials.
No one may remain under the lattice jib during pinning and unpinning procedure of the lattice sections. This is strictly prohibited!
There is a danger of accidents!**


4
S 77
S 84
G3 / V
Y
G3
G3
X
G1
A - A
12
11
10
10
A
A
Y
X
MS 1
5
SL 91
G3 / V
Y
G3
G3
X
G1
192901

2.3 Flying installation of the SL / S - boom

Installation
If space is severely limited at the job site for the installation of the boom or is restricted due to nearby buildings, etc. then it is possible to install the boom up to a **max. length** in flying mode:

Fig. 4	**- max. S 77 m**	**- with S - end section, without hook block**
		- with S - and WA-bracket II guy rods
	- max. S 84 m	**- with S - end section, without hook block**
		- with S - guy rods
		- min. slewing platform ballast 170t
		- min. central ballast 45t
		- max. permissible total force 325 t on test point MS 1 (Fig. X)
Fig. 5	**- max. SL 91 m**	**- with L - end section, without hook block**
		- with S - guy rods
		- min. slewing platform ballast 120t
		- min. central ballast 45t
		- max. permissible total force 290 t on test point MS 1 (Fig. X)

Installation description :

- The S - pivot section (G1) and the S - intermediate sections (G3) must be preassembled or fully assembled at a suitable site . It must be observed that the **reinforced** intermediate section (G3 / V) is installed at the "end" of the preassembled S -boom combination (fig. 4 // 5) .

- Swing the preassembled S - boom combination (G1 + G3 + G3 + G3 / V) with the auxiliary crane to the slewing platform . (G3 / **V** = S - intermediate section 14m **reinforced**)

- Pin and secure the S - boom combination with the S - pivot section (G1) on the slewing platform.

- Pin the guy rods on the brackets (10) of the **reinforced** S - intermediate section (fig. Y). The guy rods are connected on the brackets (10) with a hollow axle (11) and must be pinned on the pin point of the brackets (10) with pins (12) (fig. A-A).
  Secure the pins (12) .

- Erect the A - bracket until the guy rods are "tensioned", the boom combination must remain in horizontal position.

- After the boom combination is pinned, secured and tensioned, remove the auxiliary crane.

- Install the additonal S - intermediate sections and the end section, individually or fully assembled with the auxiliary crane on the **reinforced** S - intermediate section (G3 / V) , pin and secure.

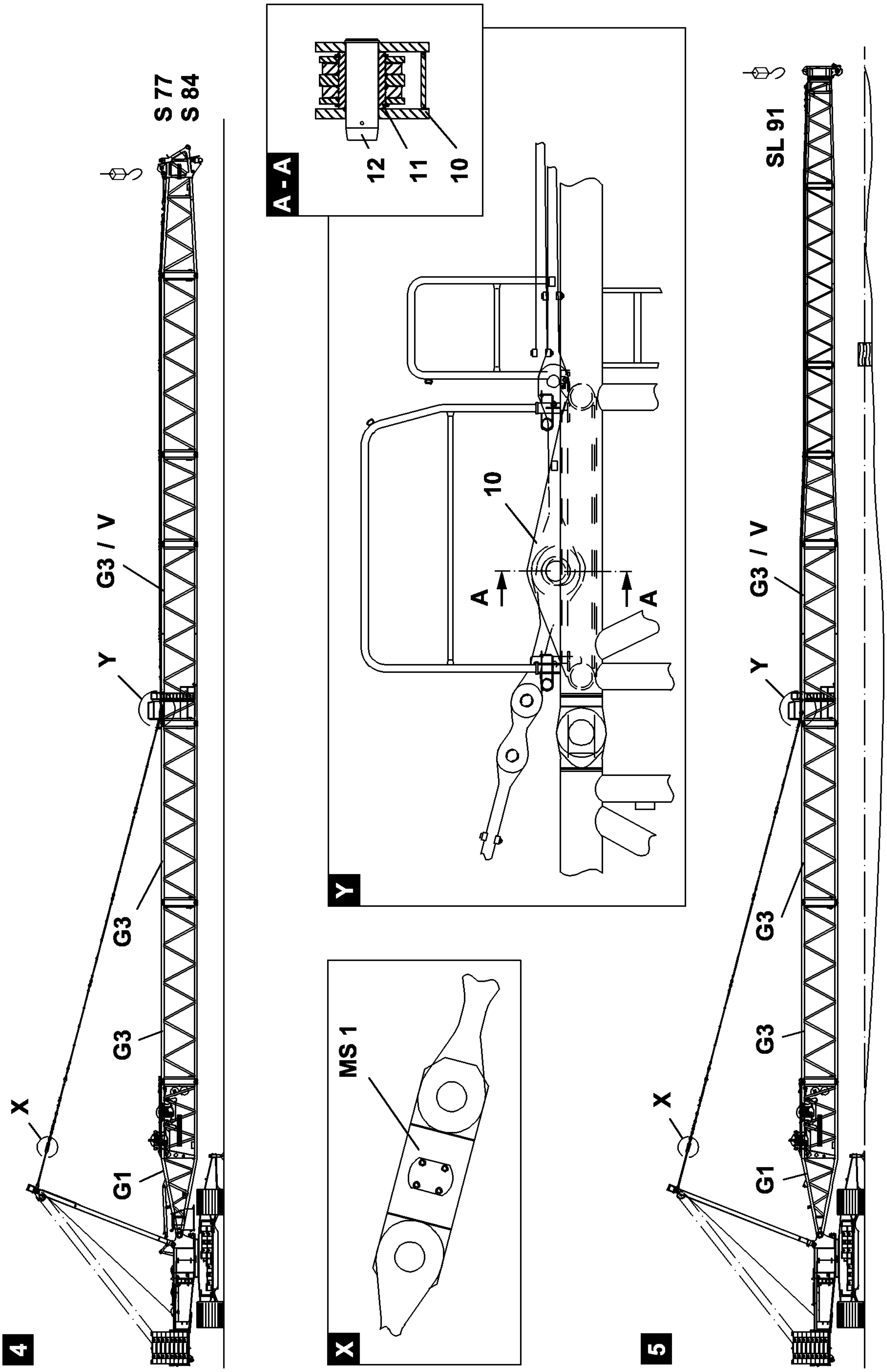
- Pin the guy rods of the lattice sections together, then secure.

- Attach the boom on the front on the end section with the auxiliary crane or support with stable materials .

- Lower the A-bracke to the front until the guy rods are relieved between the A-bracket and the **reinforced** S - end section (G3 / V) .

- Unpin the pins (12) on the brackets (10) .

- Erect the A-bracket until the guy rods are relieved between the A-bracket and the end section.


4
S 77
S 84
G3 / V
Y
G3
G3
X
G1
A - A
12
11
10
Y
10
A
A
X
MS 1
5
SL 91
G3 / V
Y
G3
G3
X
G1

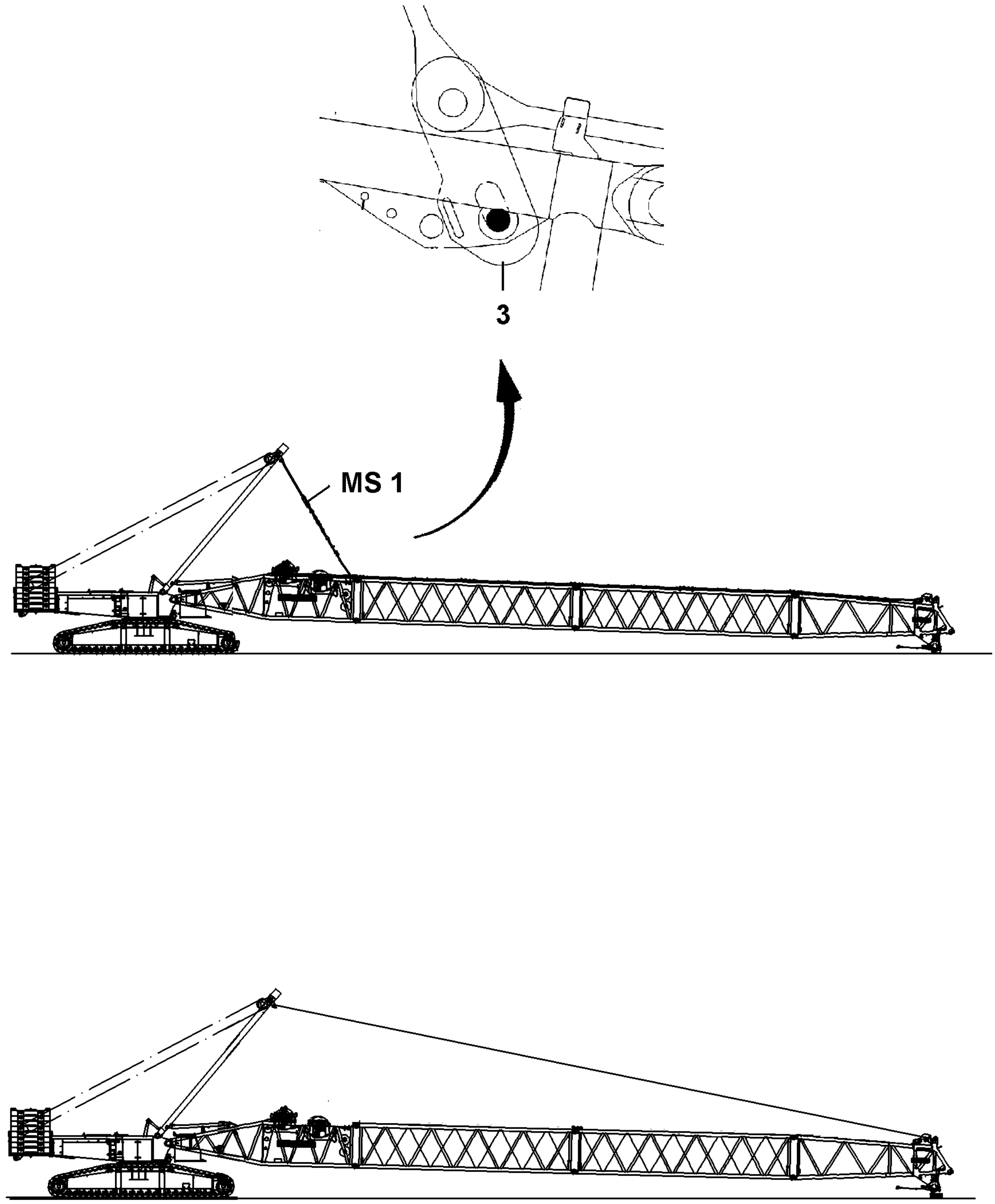
192901

Note: For weight of the lattice sections with placed guy rods, see chapter 5.03.

D A N G E R: **Note the maximum permissible boom lengths for flying installation . If this is not observed, there is danger of accidents!**

Note: The **reinforced** 14 m S- intermediate section (G3 / V) weighs approx. 1.6 t more than the "normal" 14 m S- intermediate sections. This addition of weight of 1.6 t has not been considered in the load charts and therefore counts **as load**, i..e. depending on the boom length, the load indicator on the main boom head is larger by approx. 800 kg due to this intermediate section.

D A N G E R: **The completely installed boom must be held with an auxiliary crane or must be supported from below, only then may the pin (12) be removed on the brackets (10) .**
It is not permitted for anyone to remain under the lattice sections during the pinning or unpinning procedures.
There is a danger of accidents, the boom could suddenly fold down. When removing or installing the lattice sections, they must be supported from below with suitable, stable materials.
There is a danger of accidents!



191474

3. Installation of the guy rods

The guy rods must be installed and secured according to the installation drawings in **chapter 5.03**. Make sure to compare the numbers in the installation drawing with the numbers on the guy rod.

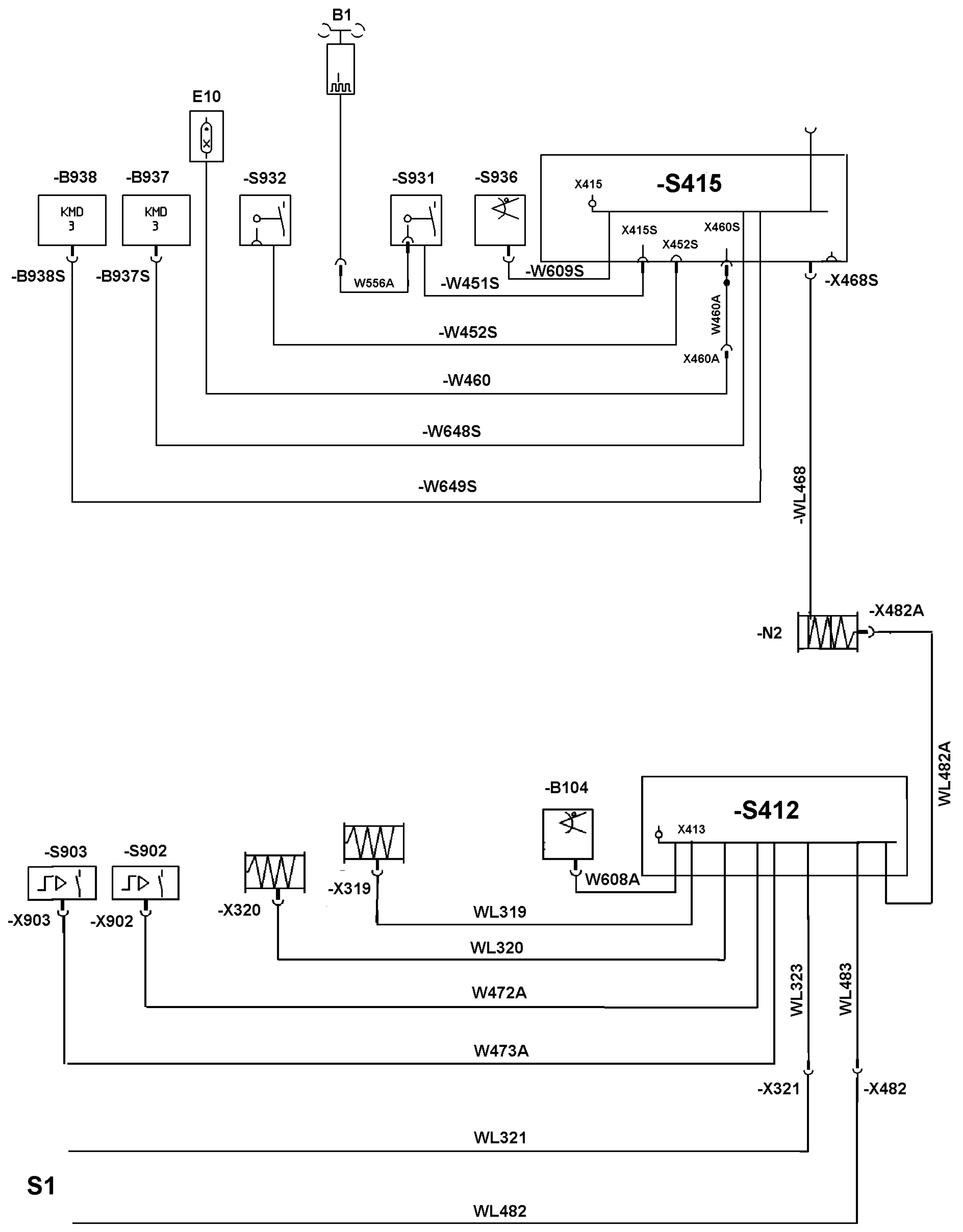
D A N G E R: **The pins of the guy rods must be inserted from the inside to the outside. If this is not observed, the hoist cable will scrape on the pins.**
The guy rods must be checked regularly, see chapter " Inspection and maintenance of guy rods".

Actuate the winch IV and tension the guy rods between the SA-bracket and the end section .

Remove the auxiliary crane on the boom head.

D A N G E R: **Do not remove the auxiliary crane until the guying between the SA- bracket 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.



B1
E10
-B938
-B937
KMD 3
KMD 3
-S932
-S931
-S936
-S415
X415
X415S
X452S
X460S
-B938S
-B937S
W556A
-W451S
-W609S
-X468S
-W452S
W460A
X460A
-W460
-W648S
-W649S
-WL468
-X482A
-N2
WL482A
-B104
-S412
X413
-S903
-S902
-X319
-X320
-X903
-X902
W608A
WL319
WL320
W472A
W473A
WL323
WL483
-X321
-X482
WL321
S1
WL482

191102

4. Electrical connections

Establish the electrical connection from the control box (S1) on the slewing platform to the connector box (-S412).
Connect the cable plug (WL482) with (WL483) and (WL321) with (WL323) .
Establish the electrical connection from the cable drum (N2) to the connector box (-S415) .
Plug the cable plug (WL482A) into the cable drum (N2) .
Establish the electrical connection from the connector box (-S412) to the cable drum (N2) .
Plug the cable plug (WL468A) into the connector box (-S415) .
Establish the electrical connection from the connector box (-S412) to the winches (W5 and W6) . Plug the cable plug (WL319 into W5 and WL320in W6) .
Establish the electrical connection from the connector box (-S412) to the relapse cylidners limit switches (S902 and S903) . Plug the cable plug (W472A in X902 and W473A in X903) .
Establish the electrical conenction to the angle sensor. Plug in the cable plug (WL608A) .
Install the airplane warning light and the wind speed sensor on the S- end section.
Plug in the cable plug (W460) for the airplane warning light on connector box (-S415) .
Plug in the cable plug (W451S) for the hoist limit switch (S931) and cable plug (W452S) for the hoist limit switch (S932) on connector box (-S415) .
Establish the electrical connection from the connector box (-S415) to the connector box (S416) for the boom nose.

4.1 Hydraulic connections

Establish the hydraulic connection (2× quick couplings) to the S- relapse cylinders.

5. Function check

Prerequisites:
- All electrical connections are established.
- The engine is running.

Airplane warning light
Turn on the airplace warning light , check function visually.

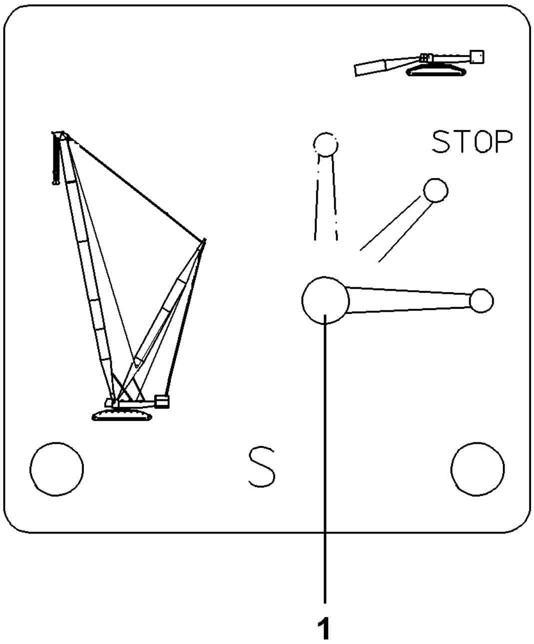
Wind speed sensor
Check the movement and function of the wind speed sensor.

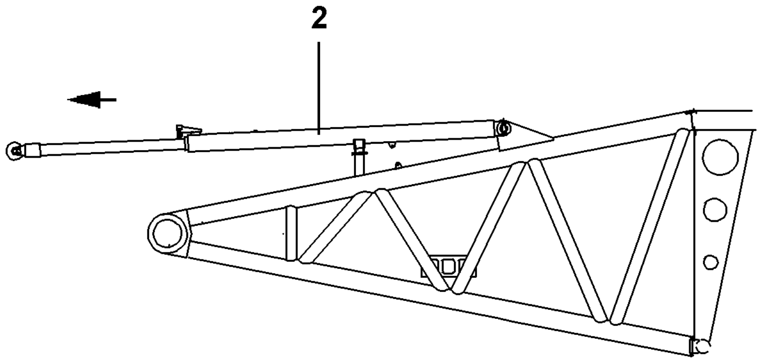
Limit switch

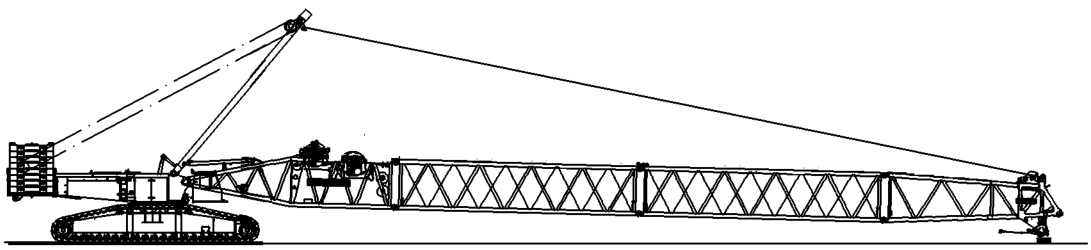
C A U T I O N: **The limit switch functions must be checked individually before crane operation.**
The manual procedure is described below.
The function of the individual limit switch initiators must be determined in the test system - see chapter 7.10 Diagnostics, paragraph 3.

Hoist limit switch
Actuate the hoist limit switch manually.
The hoist winch must turn off when lifting.
The hoist ”top” symbol on the LICCON indicator must blink.

S - relapse cylinder
Cover the limit initiators individually on the S - relapse cylinders with a metal plate.
The S - control winch movement (W III) **"spool up"** must turn off.
The symbol must appear on the LICCON monitor.







191475

6. Erection / take down procedure

The boom combinations must be erected or taken down according to the **Erection and take down charts.**

D A N G E R: **The erection and take down procedure must be made according to the data in the erection and take down chart.**
If this is not observed, the crane can be overloaded or topple over.

Prerequisites:
- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform according to the load chart .
- The boom is installed according to the load chart and the operating manual .
- All limit switches are installed correctly and fully functioning.
- All pin connections are secured.
- The hoist cable is placed correctly into the cable pulleys and secured with cable retaining pins to prevent them from jumping out.
- There are no persons within the danger zone.
- There are no loose parts on the boom and the lattice jib.
- In the cold season: Is the boom and the lattice jib and their components (limit switch, cable drum, airplane warning light, wind speed sensor, etc.) free of snow and ice.

D A N G E R : **Incorrectly installed and non-functioning limit switches as well as falling parts (pins, spring retainers, ice, etc.) can cause accidents!**

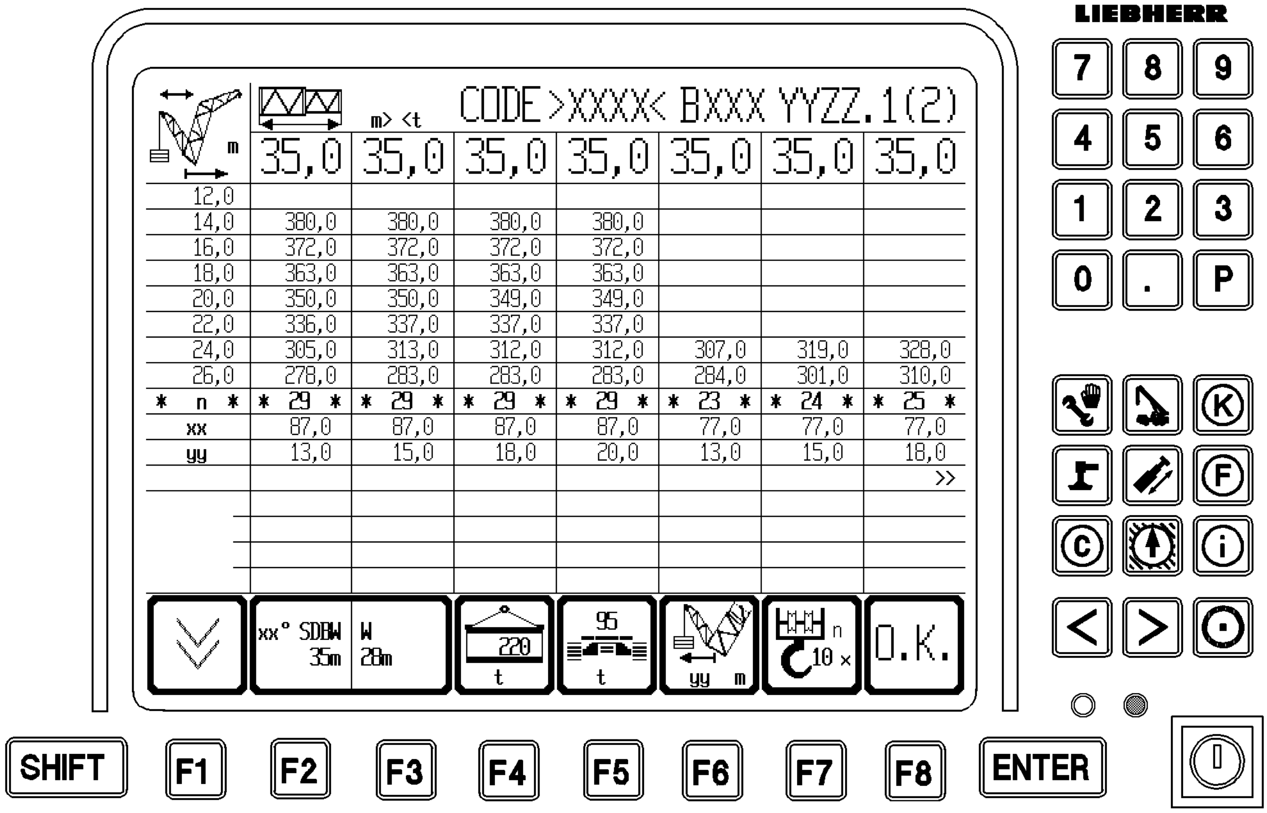
6.1 Extend the S- relapse cylinder (2]

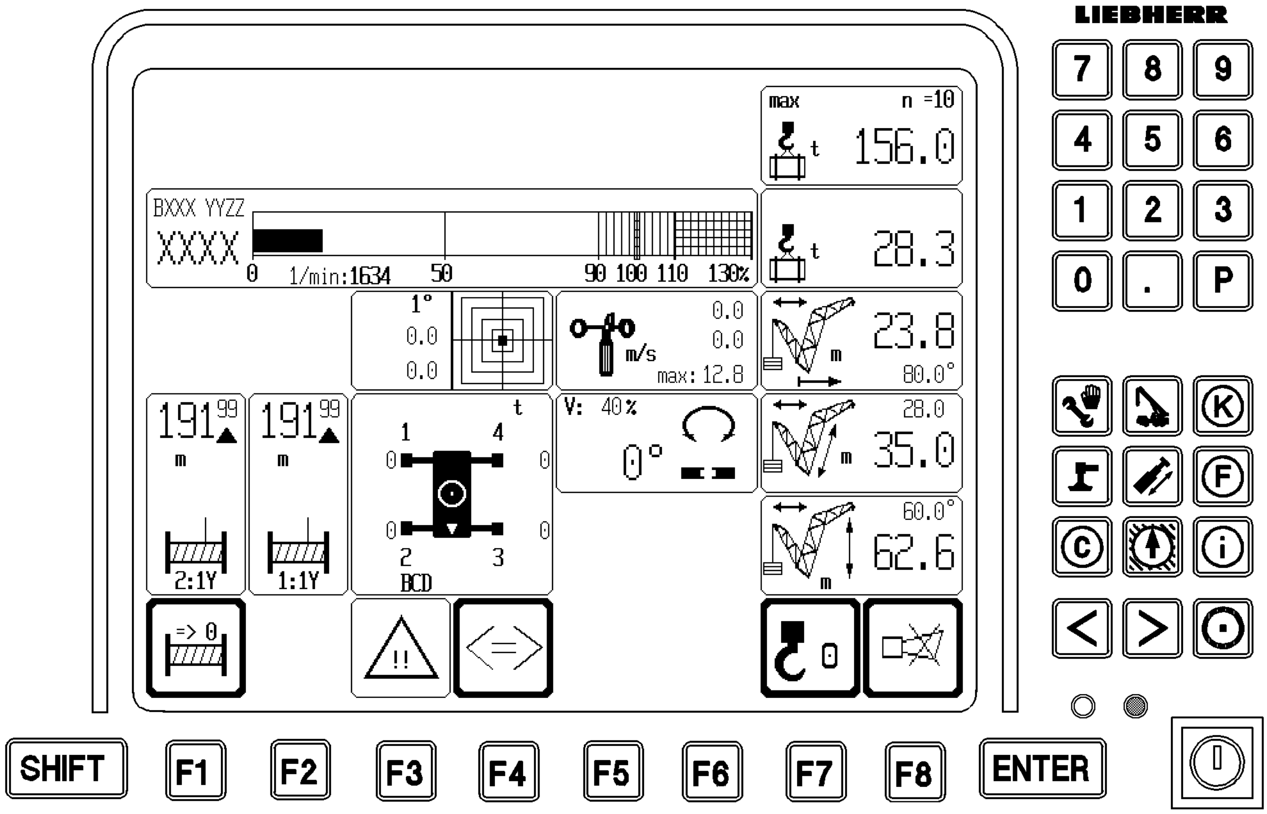
Establish the hydraulic connection from the slewing platform to the S - relapse cylinders.
Move the ball cock lever (1) into horizontal position and extend the piston rod of the S - relapse cylinder.

Lever positions:

Lever horizontal	=	Crane operation, extend piston rod
Lever vertical	=	Installation, retract piston rod
Lever 45°	=	Piston rod cannot be extended or retracted

D A N G E R : **The relapse cylinders must be extended before erection.**
The ball cock lever must be in horizontal direction, and must be secured to prevent it from inadvertent actuation during crane operation.


LIEBHERR
CODE >XXXX< BXXX YYZZ.1(2)
m> <t
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 x
O.K.
7 8 9 4 5 6 1 2 3 0 . P
K F C i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR
max n =10
t 156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
t 28.3
1°
0.0
0.0
0.0
0.0
m/s
max: 12.8
m 23.8
80.0°
191 99 m
191 99 m
2:1Y
1:1Y
1 4 t
0 0
0 0
2 3
BCD
V: 40%
0°
28.0°
m 35.0
60.0°
m 62.6
=> 0
!!
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

190979

6.2 Erection procedure

Prerequisite:
- The LICCON overload safety device is set according to the data in the load chart and the equipment configuration.
- Actuate the installation keyed button . The indicator light "Installation" lights up.
- The installation symbol on the LICCON indicator blinks.

Adjustment on EQUIPMENT CONFIGURATION VIEW on the LICCON (see chapter 4.02)
Enter the 4-digit code number according to the required load chart and confirm with ENTER .
Enter the actual reeving.
Check the current equipment configuratoin with the entered data to make sure they match.
Press the function key -F8- "o.k." , the OPERATING VIEW will appear.

D A N G E R: Compare the LICCON settings with the actual equipment configuration. If this is not observed, there is a danger of overloading the crane or tipping the crane over!

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.**
Attach the hoist limit switch weight.
Luff up the boom to the **lowest** operating position.

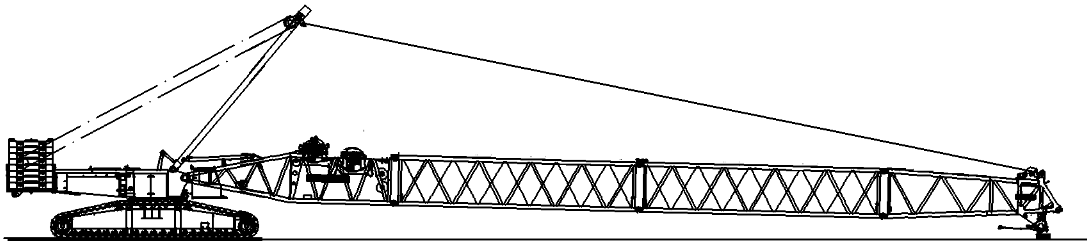
D A N G E R: When erecting long booms, the hook block must remain on the ground in a certain boom angle range to the horizontal, otherwise the crane will be overloaded!
Boom angle range - see Erection and take down charts.

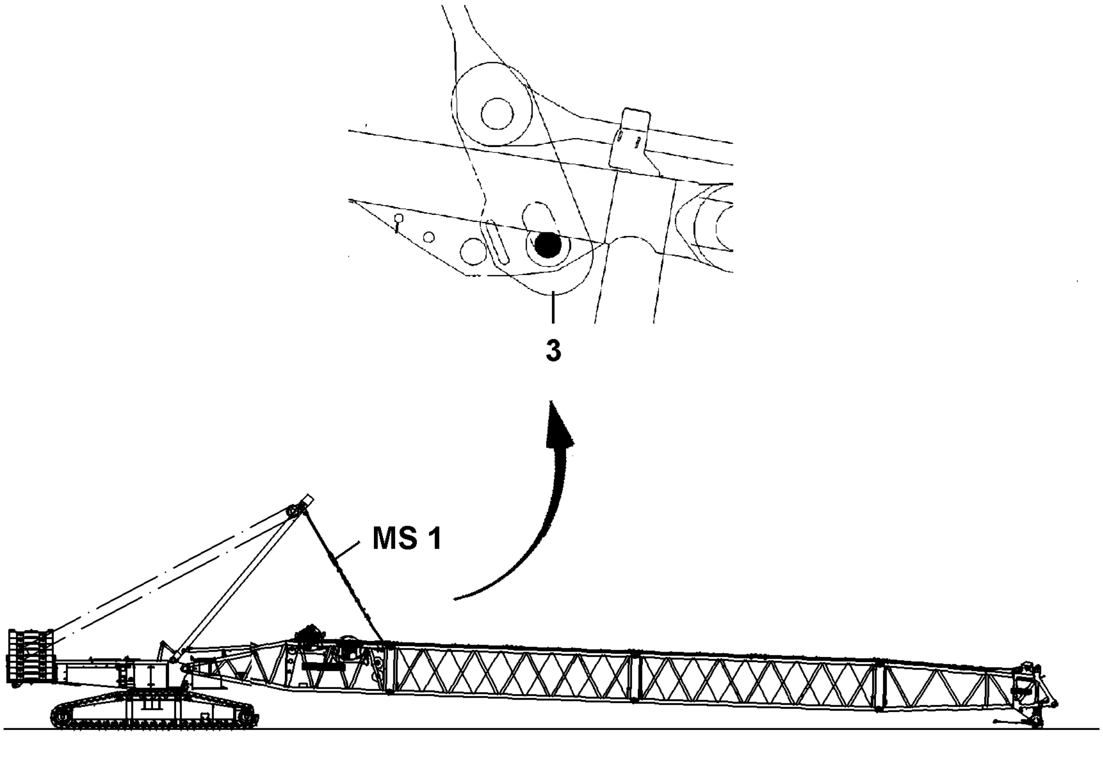
Indications in the OPERATING VIEW during the erection procedure
The following alarm functions are activated (blink) during the erection, until the operating position is reached:
- "STOP"
- "HORN" + Acoustical signal

Note: The **lowest** operating position is reached if the indicators turn off and a load value in tons - t - appears in the symbol "MAX. LOAD" instead of the question marks ("? ? ? ?").

Turn off the installation keyed button by pressing the button.
The installation symbol on the LICCON indicator turns off.

D A N G E R: The installation keyed button must be turned off immediately after reaching the lowest operating position.
The installation keyed button bypasses the 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 topple over!





191477

7. Place down the S - boom

Luff the S- boom down until just before the lowest operating position.

Note: When the **lowest** operating position is reached, the luffing movement shuts off. At the same time, the following alarm functions are activated (blink) in the OPERATING VIEW:
- ”STOP”
- ”HORN” + Acoustical signal

Actuate 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.**

C A U T I O N: **When luffing down, the hoist winch must be spooled out at the same time to prevent the hook block from colliding with the pulley head.**

Actuate the manual control lever and continue to luff down the boom until the hook block touches the ground.

D A N G E R: **When taking down long booms, the hook block must be lowered to the ground in a certain boom angle range to the horizontal, otherwise the crane is overloaded!**
Boom angle range - see Erection and take down charts.

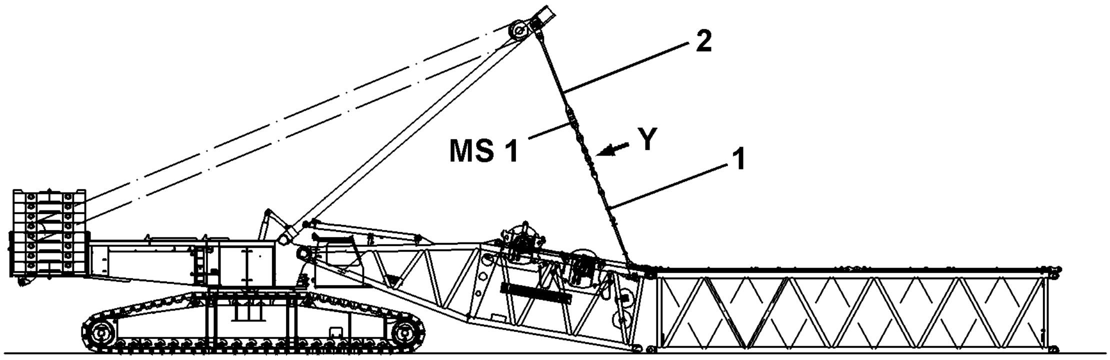
Remove the hoist limit switch weight. Unreeve the hook block.

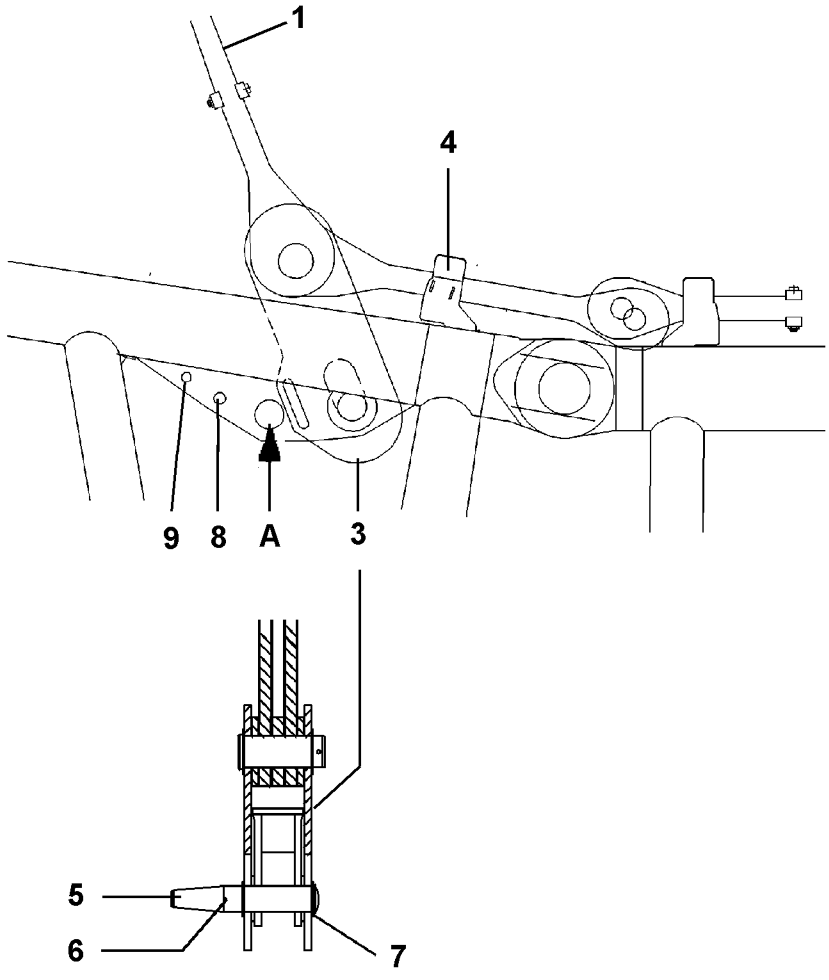
D A N G E R: **When unreeving the hoist cable, no persons may be within the danger zone.**

Spool the hoist cable back to the winch .

D A N G E R : **Do not overspool the winch! If the cable is pulled under the winch when spooling it up, the setting of the cam limit switch, which is to ensure that a minumum of 3 coils remains on the drum, is no longer correct.**
The cam limit switch must be readjusted after any work on the cable or on the winch .

Continue to luff down the S- boom until the end section lays on the ground .





191472

Removal of the S - boom
Lower the SA - bracket to the front, see chapter 5.02 " SA-Bracket".
Pin and secure the installation bracket (3) on the S- pivot section. Use pins (5), washers (7) and spring retainers (6) .

D A N G E R: **The maximum permissible total force on test point 1 = F ≤ 160 t.**
With the SA-bracket, the following maximum boom lengths can be lifted:
- S 84 m with installed S - and WA-bracket II guy rods
- SL 98 m, only with installed S- guy rods
The end section may not be raised, it must lay on the ground.
If this is not observed, severe damage can occur!

Note: With the intake gear, pull until the same F1 - actual force is set as was noted during installation.
The pins can be pulled easier. Otherwise the pins and eyes on the lattice sections will be worn or the pin sticks.

Unpin the pivot section **"on the bottom"** and lower it all the way.

D A N G E R: **Before unpinning the S- pivot section, the instsallation bracket (3) on the S- pivot section must be pinned and secured .**
Otherwise there is a danger of accidents, as the boom might suddenly fold down!
During the removal and installation, the lattice sections must be supported from below with suitable, stable materials.
No one may remain under the lattice jib during pinning and unpinning procedure of the lattice sections. This is strictly prohibited!
There is a danger of accidents!

Unpin the S- pivot section and the intermediate section **"on top"** .

Relieve the guy rods (1, 2) by lowering the SA - bracket.

Unpin the installation brackets (3) on the S- pivot section and pin in bore (A) .
Pin the transport retaining pin (8) .

Unpin the guy rods (2) from the SA- bracket from the guy rods (1) from the S- pivot section (Y).
Place down the guy rods (1, 2) on the S- pivot section and the intermediate section and secure.

Unpin the lattice sections and remove.
Remove the S- pivot section (G1) with the auxiliary crane on the slewing platform.

1. Installation

D A N G E R: For installation and removal work:

- A safe installation scaffolding / working platform must be used. There is a danger of accidents due to falling.

- Improvisations are prohibited.

- The lattice sections must be supported underneath with suitable, stable materials.

- Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections.

Prerequisites:

- The crane is horizontally aligned.

- An auxiliary crane as well as an installation scaffolding / working platform are available.

- The LICCON - overload safety system is set according to the data given in the load charts.

- The keyed button ”installation” (133) is actuated, the indicator light ”installation” (132) lights up.

- The installation symbol on the LICCON - indicator blinks.

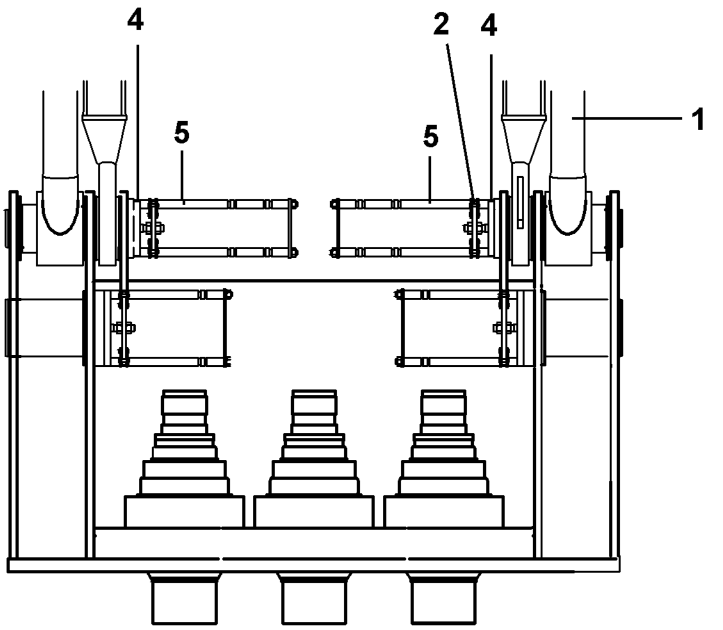
- The boom is not installed.

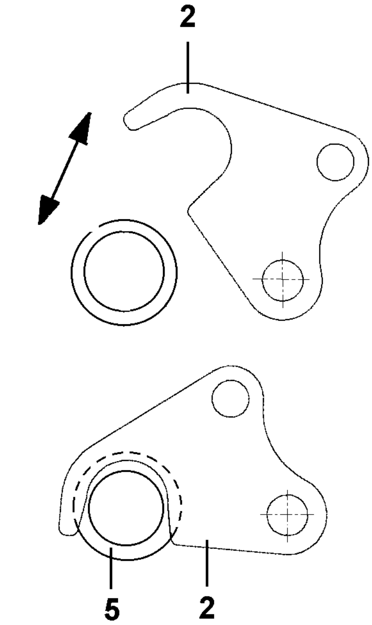
1.1 Installation D - Derrick

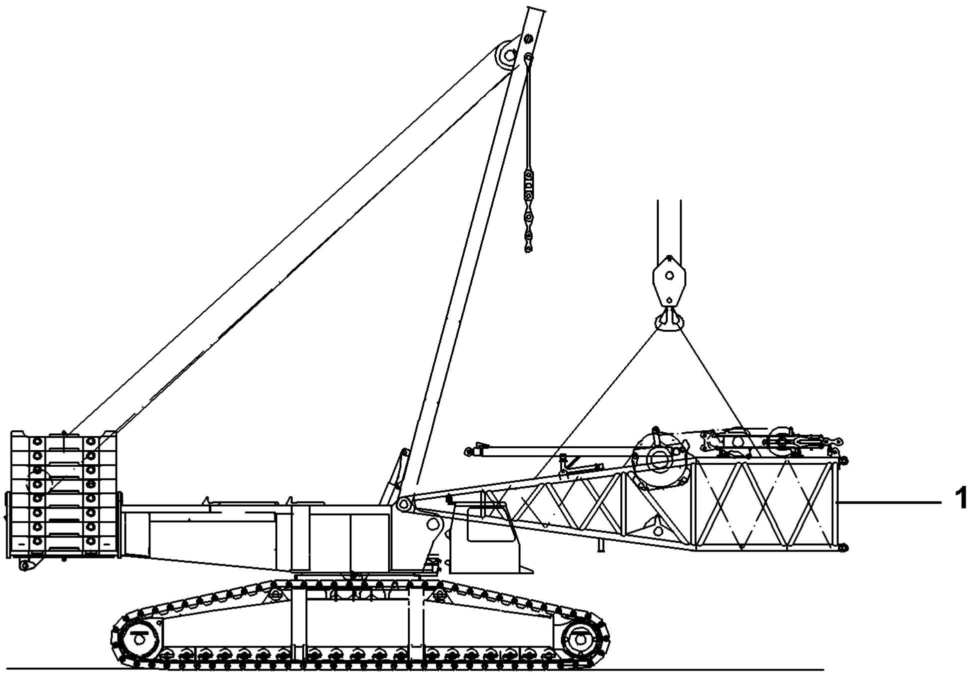
Turn the slewing platform until it is in lengthwise direction or to the side.

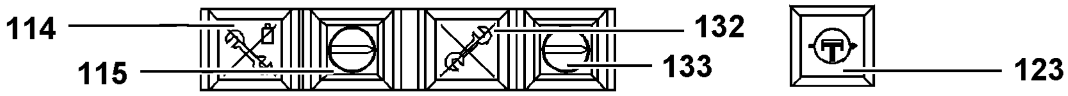
Note: Observe the data given in the erection and take down charts.

C A U T I O N: Before turning the slewing platform without the derrick or boom, the following must be observed:
- the crawler gear with installed slewing platform is in horizontal position.
- the maximum permissible ballast variations in chapter 3.06, Installation conditions.
If this is not observed, there is a danger of tipping the crane over!









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2. Install S- pivot section

Lift the D- pivot section (1) with the auxiliary crane and swing it in to the pin points on the slewing platform.

Weights:

Component	Weight
D-Pivot section	6600 kg
Relapse cylinder - 2×	1316 kg
Rods for suspended ballast	612 kg
Rods for ballast trailer	630 kg
Winch III mit Seil 1250 m	8750 kg
Pulley blocks	3480 kg
D-Pivot section, complete	21400 kg

Fold both retaining hooks (2) from the guides (5) .

Retract the D- pivot section (1) on the slewing platform.

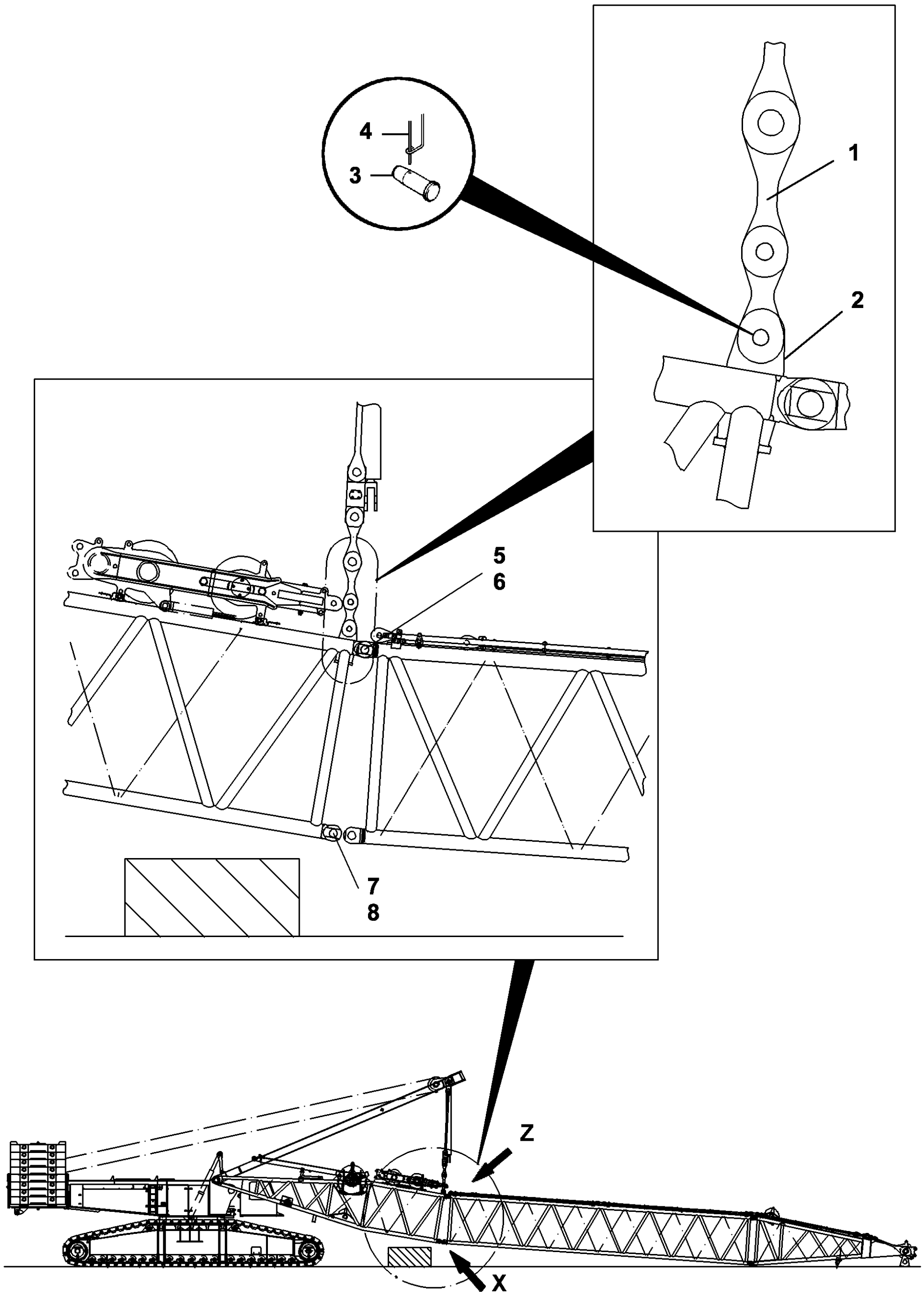
Fold the retaining hook (2) up, actuate the remote control and pin the connector pins (4) .

Secure the connector pins (4) by folding the retaining hooks (2) into the guides (5).

Note: For operation of remote control, see chapter 5.08.

D A N G E R: **To prevent inadvertent unpinning, the connector pins (4) must be secured with the retaining hooks (2) .**

Place the D-pivot section on the support base on the groand and remove the auxiliary crane .



193026

2.1 Install the derrick and the guyrods

Lower the SA - bracket to the front, see chapter 5.02 " SA-Bracket".

Pin the guy rods (1) from the SA-bracket on the installation bracket (2) on the D-pivot section and secure.
Use pins (3) and spring retainers (4) .

Assemble the derrick and the corresponding guy rods to the required length, pin and secure.

Pin the D - intermediate section on the D-pivot section (**Z**) **"on top"** .

Pin pins (5) with the pin pulling device and secure with spring retainers (6).

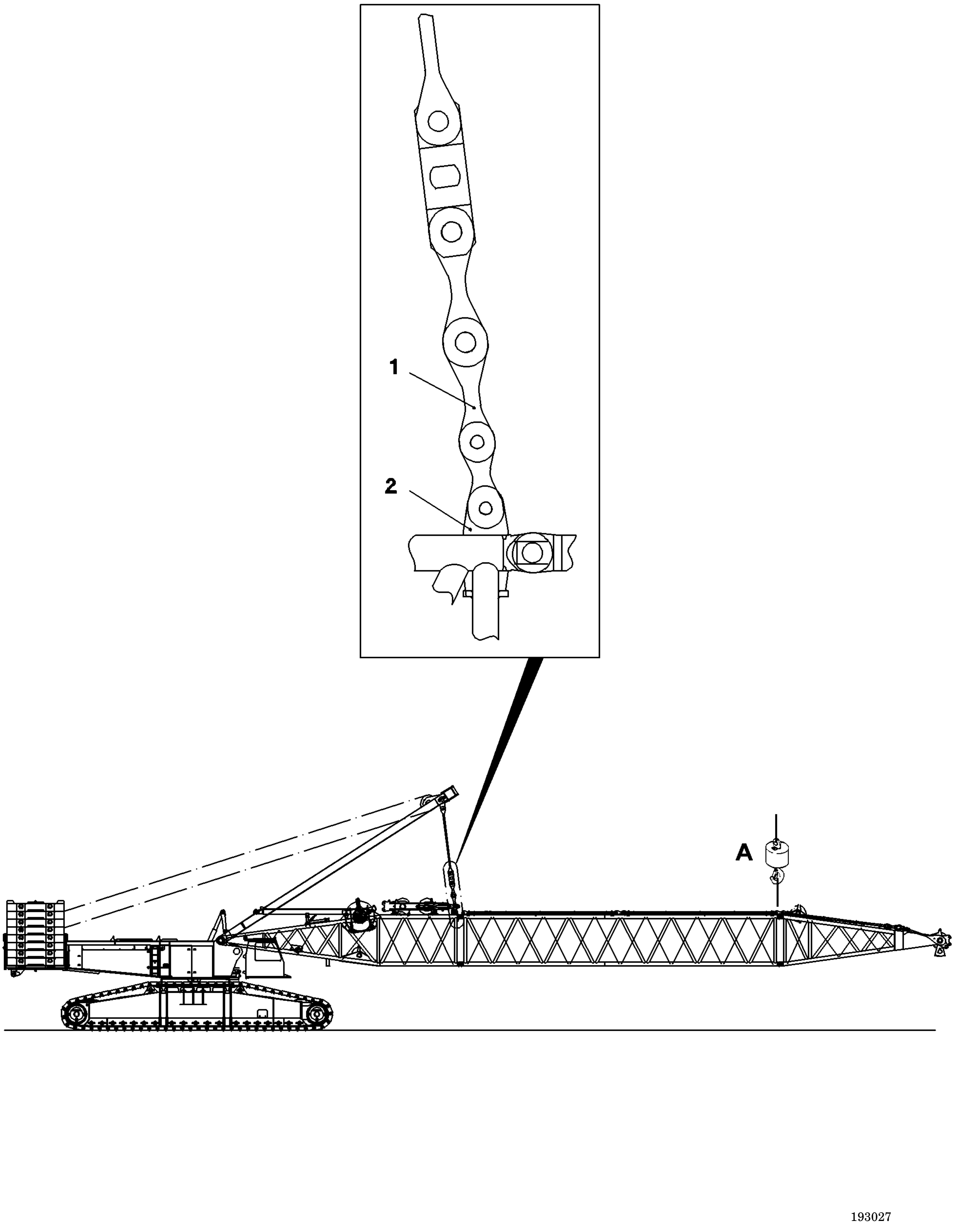
Pull up the D-pivot section with the SA-bracket (winch IV) until it can be pinned on the D-pivot section **"on the bottom" (X)** .

Note: Note the test point 1 - "IST" (Actual) force of monitor 1 in this position, so one knows when removing the boom, which force must be used to secure when unpinning.

Pin and secure on the D-pivot section **"on the bottom" (X)** .
Pin pins (7) with the pin pulling device and secure with spring retainers (8).

Luff down the SA-bracket and unpin guy rods (1) on the installation bracket (2) on the D-pivot section .

**D A N G E R: Before unpinning the guy rods on the installation brackets (2) on the D-pivot section, the derrick must be pinned "on the bottom" .
Nobody may remain under the lattice jib during the unpinning procedure of the lattice sections.
There is a danger of accidents, as the derrick might suddenly fold down!**


1
2
A
193027

2.2 Flying installation of the derricks

Installation
If space is severely limited at the job site for the installation of the derrick, or is restricted due to nearby buildings, etc. then it is possible to install the derrick in flying mode:

Prerequisites:
- The D-pivot section hangs on the guy rods (1).
  The guy rods are pinned and secured on the installation bracket (2) on the D-pivot section .

Installation
For a flying installation , the D- intermediate sections can be pinned and secured individually or the D-intermediate section and D-end section can be pinned and secured completely assembled .
Pin and secure the pin "**on top**" and "**on the bottom**" .

Note: For the weight of the lattice sections with placed guy rods, see chapter 5.03

Attach the D- end section on the auxiliary crane (A) or support it with stable materials.

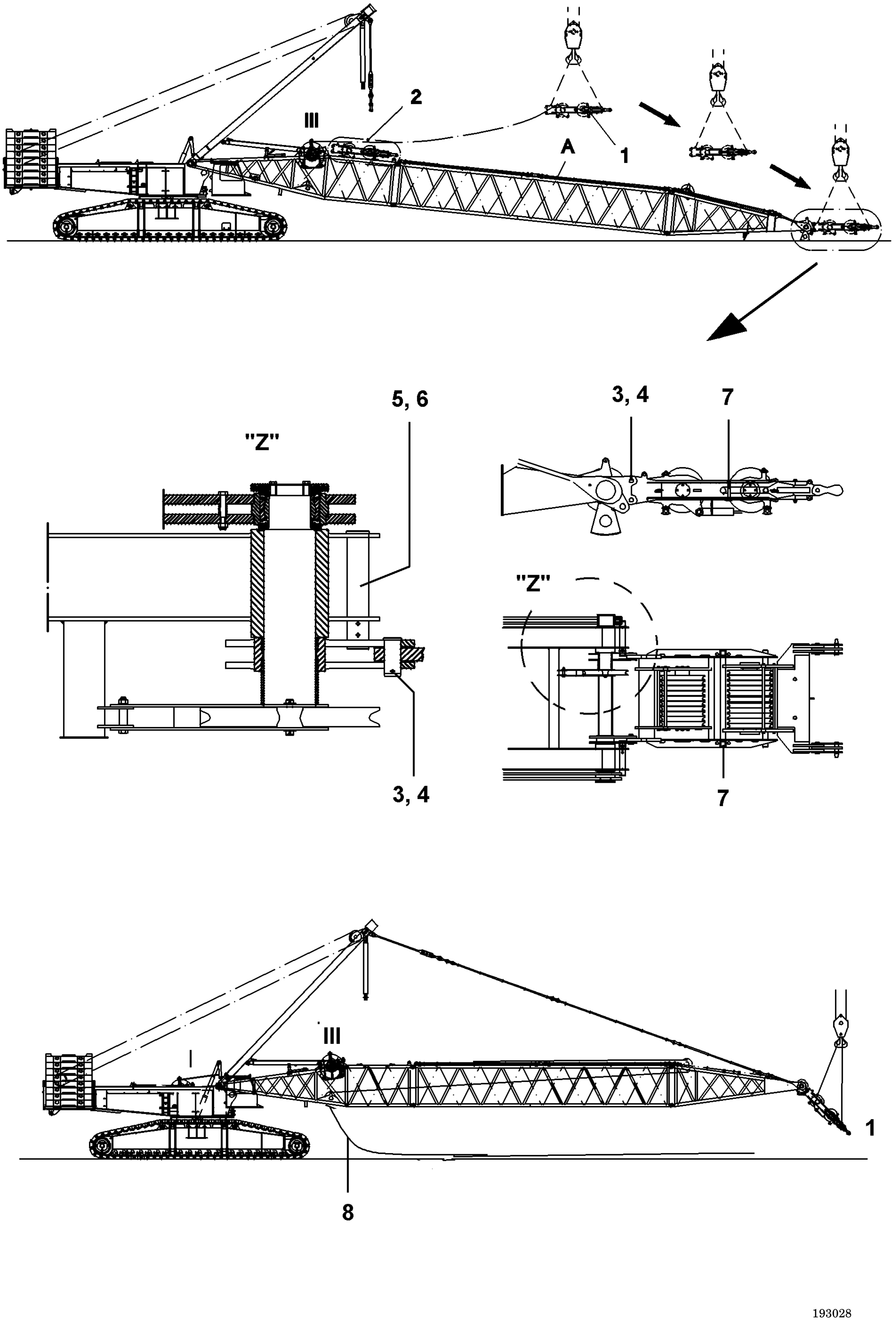
Luff down the SA-bracket to relieve the guy rods (1) .
Unpin the guy rods (1) .

D A N G E R: **The derrick must be held with an auxiliary crane (A) or supported from below, only then may the guy rods (1) on the installation brackets (2) on the D-pivot section be unpinned.**
Nobody may remain under the lattice jib during the unpinning procedure. This is strictly prohibited.
There is a danger of accidents, as the derrick might suddenly fold down!

Lower the SA - bracket to the front, see chapter 5.02 " SA-bracket".
Pin and secure the guy rods from the D-end section with the guy rods from the SA-bracket .

Actuate the winch IV and tension the guy rods between the SA-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 .**
There is a danger of accidents, as the derrick might suddenly fold down!


III
2
A
1
5, 6
"Z"
3, 4
7
"Z"
3, 4
7
III
I
1
8
193028

2.3 Installation of the guy rods

Attach the S- pulley blocks (1) to the auxiliary crane and unpin on receptacle (2) on the D-pivot section.

Note: The weight of the S-pulley block is approx. 3200 kg.

Unpin the S-pulley blocks, while simultaneously spooling out the winch III, pull to the D-End section , pin with pin (3) and secure with spring retainer (4) .
Lock the S-pulley block horizontally with pin (5) and secure with spring retainer (6) on both sides.

Pin and secure guy rods (A) from the D- end section with the guy rods from the SA-bracket .
The guy rods must be installed and secured according to the installation drawings in chapter 5.03. the Make sure to compare the numbers in the installation drawing with the numbers on the guy rod.

D A N G E R: **The pins of the 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 SA-bracket and the D- end section and pull the derrick up to the horizontal.

Unpin the locking pin (5) on both sides.

D A N G E R: **Before unpinning, the S-pulley blocks (1) must hang on the auxiliary crane!**

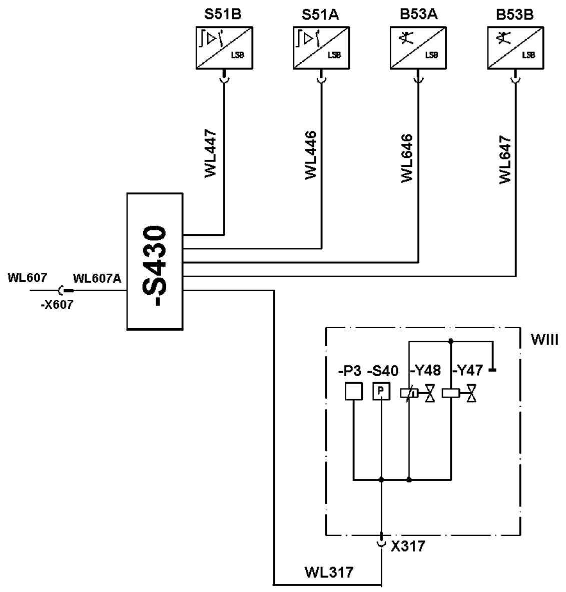
Lower the S-pulley blocks (1) with the auxiliary crane to the ground and unpin the transport pin (7) .

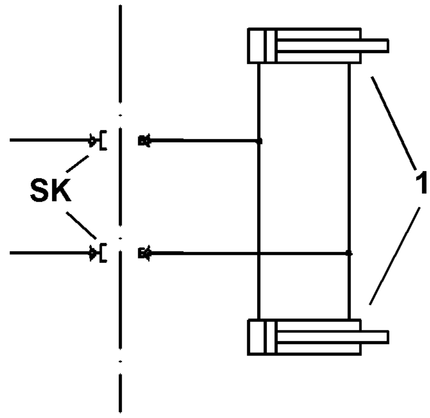
C A U T I O N: **The "lower" and "upper " pulley blocks must be interconnected by the transport pin (7) . In crane operation, they must be unpinned.**

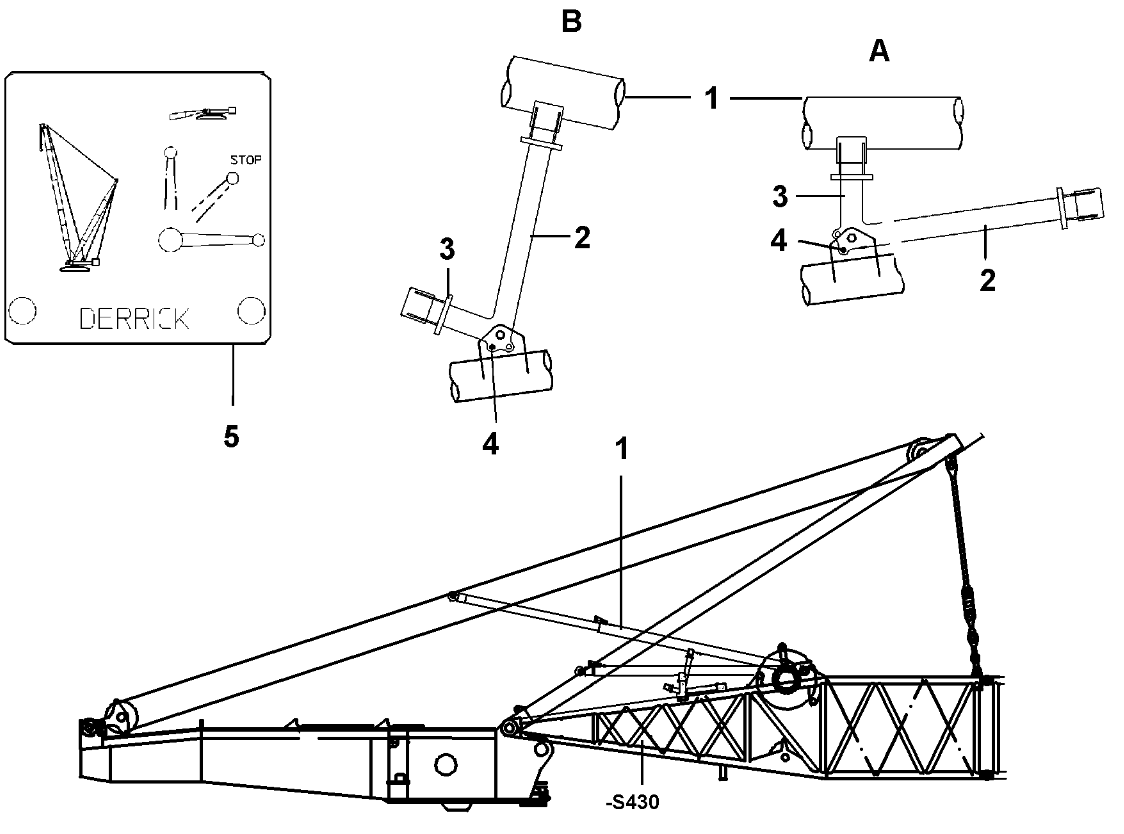
Disengage the auxiliary crane.
Pull the hoist cable (8) with the auxiliary winch over the cable pulleys in the D - end section and D - pivot section .

Note: For cable routing, see chapter 4.06, Reeving

D A N G E R: **Sufficient hoist cable must be routed over the cable pulleys so that the hoist cable is not pulled backward due to its own weight when the derrick is erected.**
Otherwise there is a danger of accidents!


S51B
S51A
B53A
B53B
WL447
WL446
WL646
WL647
-S430
WL607
WL607A
-X607
WIII
-P3
-S40
-Y48
-Y47
X317
WL317


SK
1


B
A
1
2
3
4
STOP
DERRICK
5
1
-S430

190994

3. Electrical connections

Establish the electrical (W607A) from the slewing platform to the connector box (-S430) .
Establish the electrical connection to the D - relapse cylinders limit switches. Plug in the cable plug (WL446 in -S51A and WL447 in -S51B) .
Plug in the cable plug (WL317 in -X317) for replenishing pressure switch winch III .
Establish the electrical connection to the angle sensor. Plug in the cable plug (WL646 in B53A) in (WL647 in B53B) .

Hydraulic connections
Establish the hydraulic connection (2× Quick couplings) to the D-relapse cylinders.

4. Function check for limit switches

Prerequisites:
- All electrical connections are established.
- The engine is running.

Function check
Cover the limit switch initiators individually on the D - relapse cylinders with a metal plate.
The D- control winch movement (W IV) **"spooling up"** must turn off.
The symbol must appear on the LICCON monitor .

C A U T I O N: **The individual limit switches must be checked for proper function before crane operation.**
Manual testing procedure is described below.
In the test system, the function of the individual limit switch initiators must be determined - see chapter 7.10 Diagnostics, paragraph 3.

5. D- relapse cylinder

A = Transport condition

B = Installation condition

For installation of long parts (2), swing the mechanical support upward and lock with pin (4) .

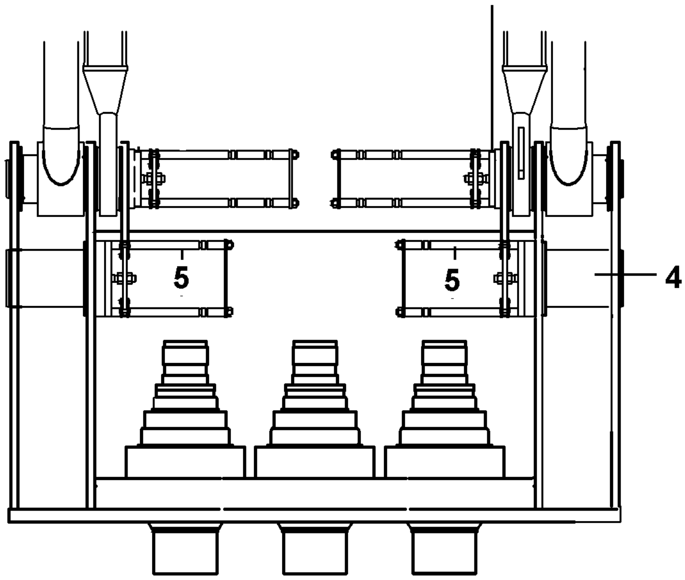
5.1 Extend D - relapse cylinder

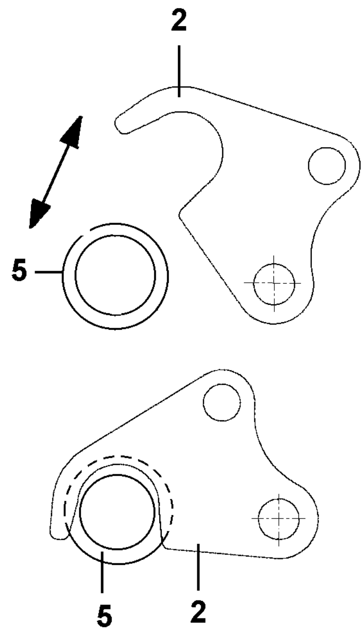
Extend the piston rod of the relapse cylinders into horizontal position by actuating the ball cock lever (1).

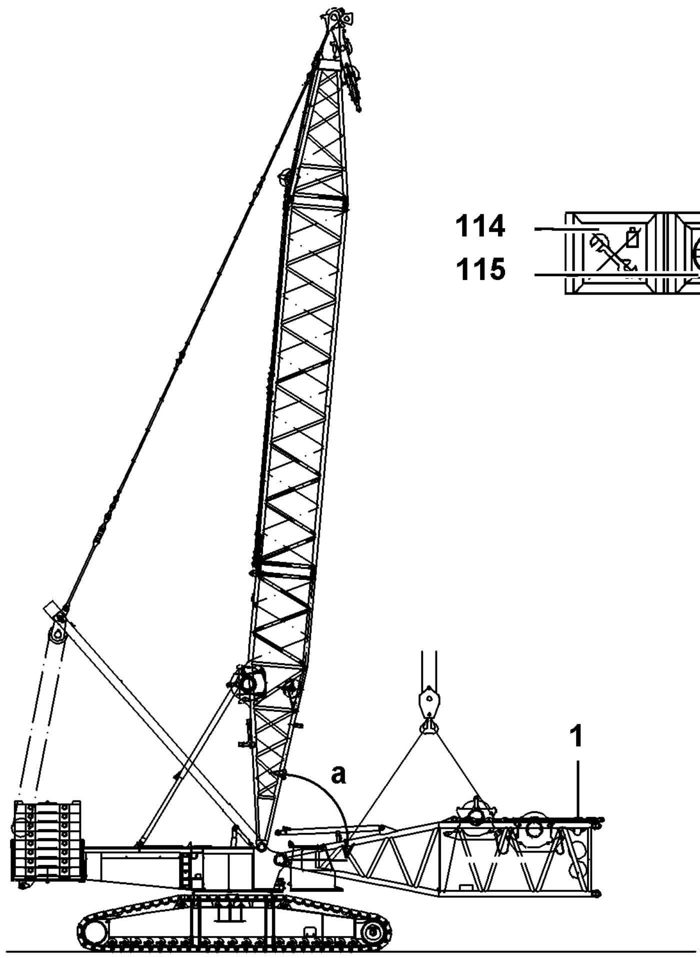
Lever positions:

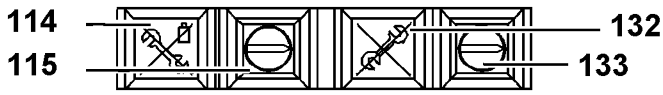
Lever horizontal	=	Crane operation, extend piston rod
Lever vertical	=	Installation, retract piston rod
Lever 45°	=	Piston rod cannot be extended or retracted

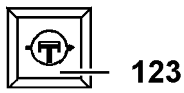
D A N G E R : **The relapse cylinders must be extended before erection.**
The ball cock lever must be in horizontal direction, and must be secured to prevent it from inadvertent actuation during crane operation.











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6. Erect the derrick

Erect the derrick to the point where the boom can be installed without restriction (approx. 75° to max. 85°).

D A N G E R: The derrick may not be erected to the horizontal by more than 85 °. Otherwise there is a danger of tipping the crane over!

7. Install the S-pivot section

Raise the S-pivot section (1) with the auxiliary crane and swing in to the pin points on the slewing platform.

Weights:

Component	Weight
S- pivot section	14350 kg
Relapse cylinder - 2×	1300 kg
S - guy rods	665 kg
W - guy rods	652 kg
Winch V	9500 kg
Winch VI	6390 kg

Fold both retaining hooks (2) from the guides (5) .

Retract the S- pivot section (1) on the slewing platform.

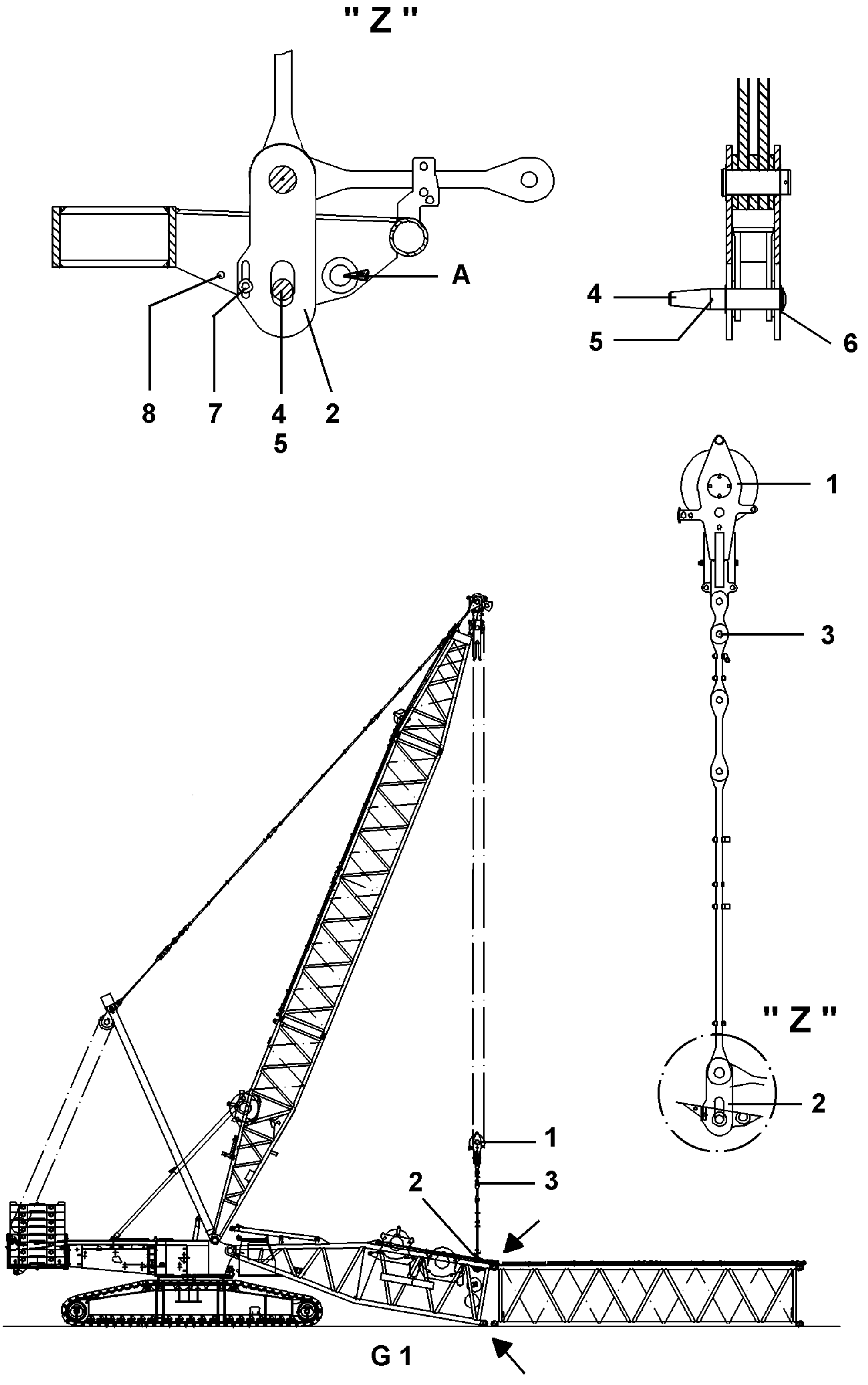
Fold the retaining hook (2) up, actuate the remote control and pin the connector pins (4) .

Secure the connector pins (4) by folding the retaining hooks (2) into the guides (5).

Note: For control of remote control, see chapter 5.08

D A N G E R: To prevent inadvertent unpinning, the connector pins (4) must be secured with the retaining hooks (2) .

Place the S- pivot section on the support base (U) on the ground and remove the auxiliary crane.



190996

7.1 Install the boom

Lower the derrick to the front and lower the lower S-pulley block (1) until it is over the isntallation bracket (2).
Pin the S- pulley block (1) on the guy rods (3).
Pin and secure the installation bracket (2) . Use pins (4), washers (6) and spring retainers (5) .

C A U T I O N: **The transport retaining pins (7) must be unpinned during installation and operation.**
Insert pins in parking position (8) .

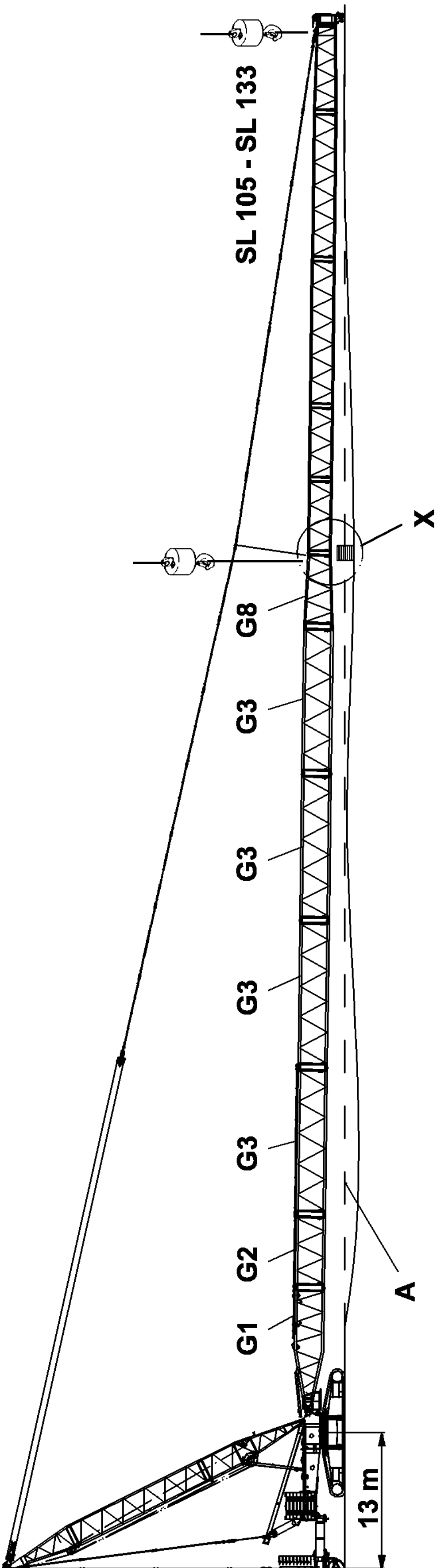
Note: **A** = Pin point for flying installation with SA-bracket .

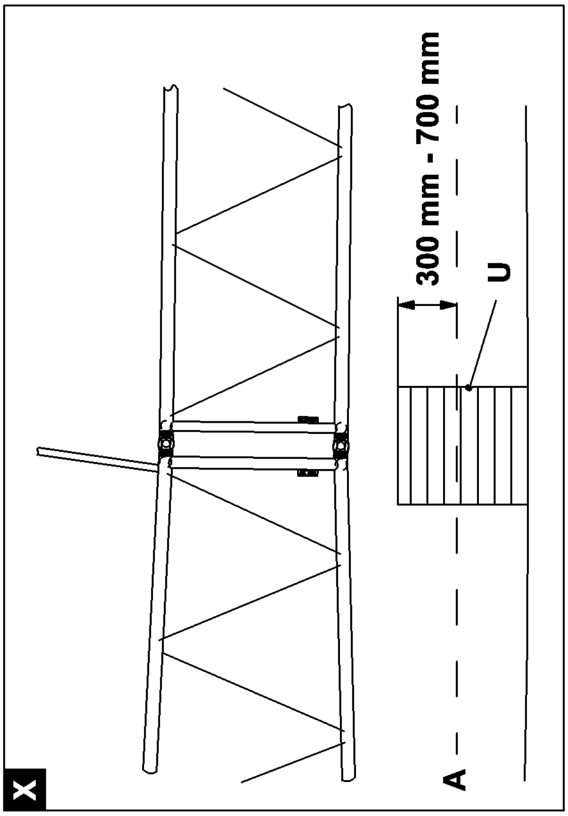
Assemble the boom and the corresponding guy rods to the required length, pin and secure.
Pin the first intermediate section on the S-pivot section (G1) **”on top”** .
Pull up the S-pivot section with the S- pulley block and pin **”on the bottom”** .

D A N G E R: **Pins on the lattice section must be secured with spring retainers .**
With the SA-bracket, the following maximum boom lengths can be lifted:
- S140 m und SL 98 m, only with S- guy rods
- S 91 with S - and WA-bracket II guy rods
The end section may not be lifted, it must remain on the ground.
If this is not observed, severe damage can occur!

Pin and secure the S-pivot section (G1) **”on the bottom”** .
Relieve the guy rods (3) by lowering the S - pulley block (1) and unpin on the installation brackets (2) .
Unpin the guy rods (3) on the S-pulley block (1) .

D A N G E R: **Before unpinning the pulley block or installation brackets , the boom must be pinned ”on the bottom” .**
Otherwise there is a danger of accidents, as the boom might suddenly fold down!
For removal and installation of the lattice sections, they must be supported with suitable, stable materials.
Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections. This is strictly prohibited! Danger of accidents!





193091

7.1.1 Install SL - 105 to SL - 133 boom on uneven ground

Installation

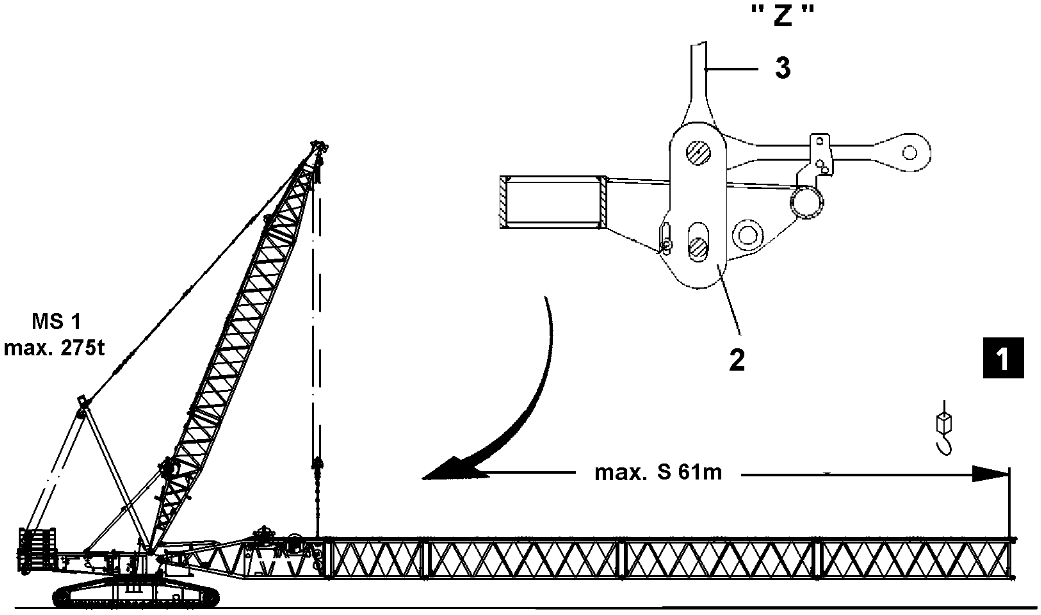
- The derrick must be raised (approx. 75° to max. 85°), so that the boom can be installed without restriction.

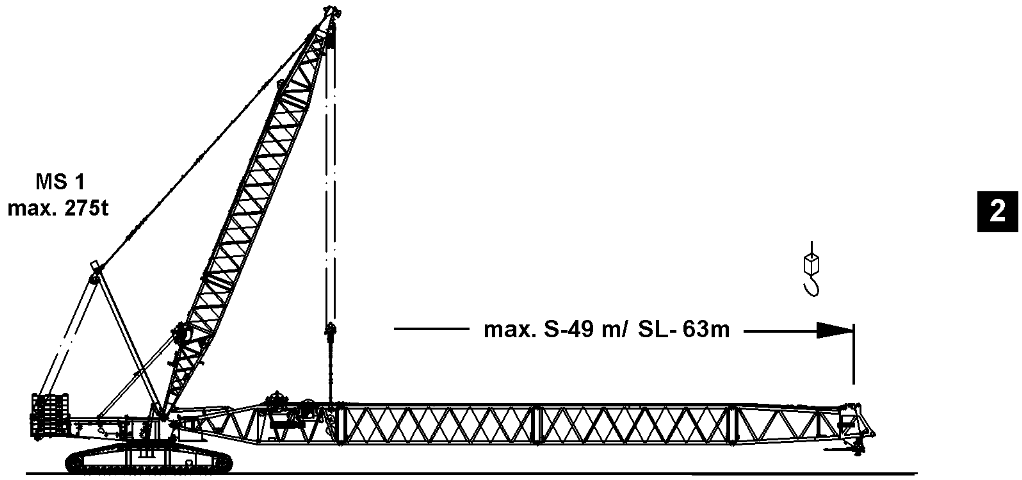
D A N G E R: **The derrick may not be raised further than max. 85° to the horizontal. Otherwise there is a danger of tipping over!**

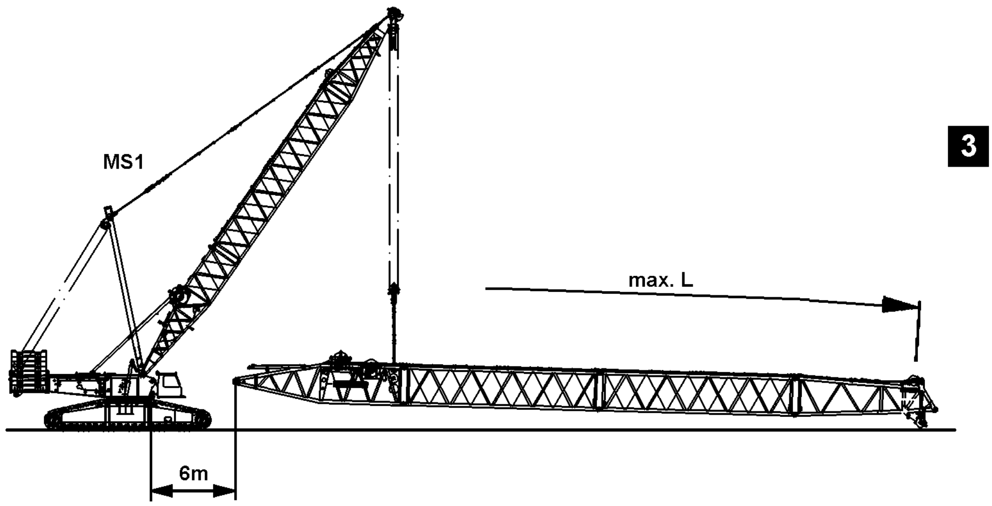
- Swing in the pre-mounted S - boom combination (G1 + G2 + (4 **x** G3) + G8) with the auxiliary crane to the slewing platform.
- Pin and secure the S - boom combination with the S - pivot section (G1) on the slewing platform and secure .
- Place down the pre-mounted S - boom combination on the support (U) (fig. X) or hang onto the auxiliary boom.

Note: The upper edge of the support (U) (fig. X) must be 300 mm to 700 mm over the alignment level (A) (fig. X) .

- Install the remaining L - intermediate sections and the end section individually or fully assembled with the auxiliary crane to the SL - reducer section, pin and secure.


" Z "
3
2
MS 1
max. 275t
1
max. S 61m


MS 1
max. 275t
2
max. S-49 m/ SL- 63m


MS1
3
max. L
6m

191231

7.2 Flying installation of the SL / S -boom

Installation
If space is severely limited at the job site for the installation of the derrick, or is restricted due to nearby buildings, etc. then it is possible to install the boom up to a **max. length** in flying mode:

Fig. 1	**- max. S 61 m**	**- without end section, without hook block** **- with S - and WA-bracket II guy rods** **- slewing platform ballast 120t** **- min. central ballast 45t** **- max. permissible total force 275t on test point MS 1**
Fig. 2	**- max. S 49 m**	**- with end section, without hook block** **- with S - and WA-bracket II guy rods**
	- max. SL 63m	**- with S - guy rods** **- slewing platform ballast 120t** **- min. central ballast 45t** **- max. permissible total force 275t on test point MS 1**
Fig. 3	**- max. S 91 m**	**- with end section, without hook block** **- with S - and WA- bracket II guy rods**
	- max. S 140m	**- with S - guy rods**
	- max. SL 98m	**- with S - guy rods** **- max. permissible total force 245 t on test point MS 1 with slewing platform ballast 120 t and central ballast 45 t** **- max. permissible total force 175 t on test point MS 1 with slewing platform ballast 70 t and central ballast 20 t**

Prerequisites:
- The pivot section is pinned on the guy rods of the pulley block and the installation brackets (2) , secured and pulled up into horizontal position.

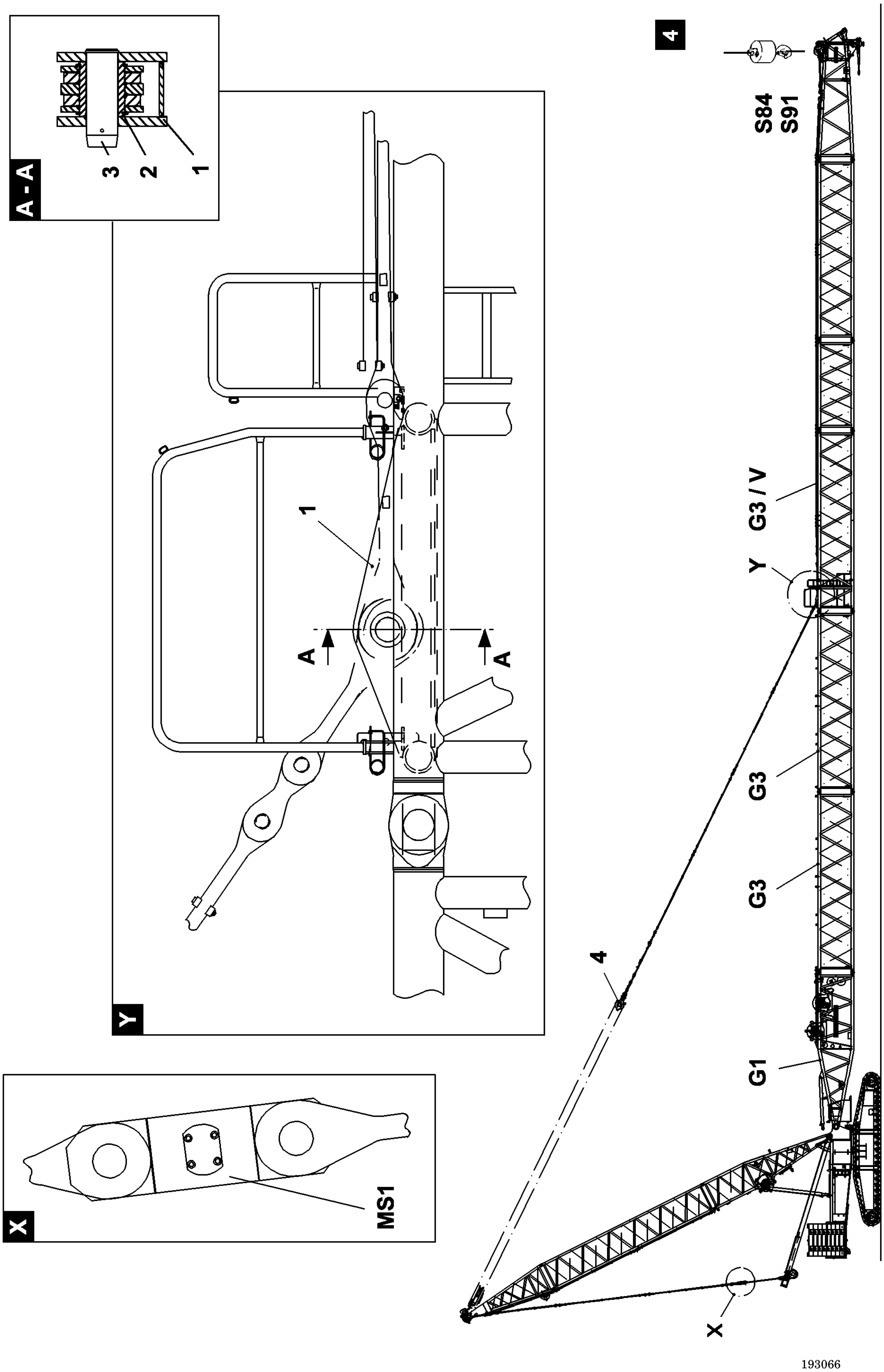
Installation
For a flying installation , the intermediate sections can be pinned and secured piece by piece with the auxiliary crane or the completely assembled boom can be pinned and secured on the pivot section .
Pin and secure the pin "**on top**" and "**on the bottom**" .

Note: For the weight of the lattice sections with placed guy rods, see chapter 5.03

D A N G E R: **Note the maximum permissible boom lengths for flying installation .**
If this is not observed, there is danger of accidents!

Attach the boom on the front on the auxiliary crane or support it from below with stable materials. Relieve the pulley block by lowering it, unpin the guy rods on the pivot section and pin and secure with the guy rods from the end section .

D A N G E R: **The boom must be held with an auxiliary crane (A) or supported from below, only then may the pulley block on the installation bracket (2) on the pivot section be unpinned.**
Nobody may remain under the lattice jib during the unpinning procedure of the lattice sections. This is strictly prohibited!
There is a danger of accidents, as the derrick might suddenly fold down!

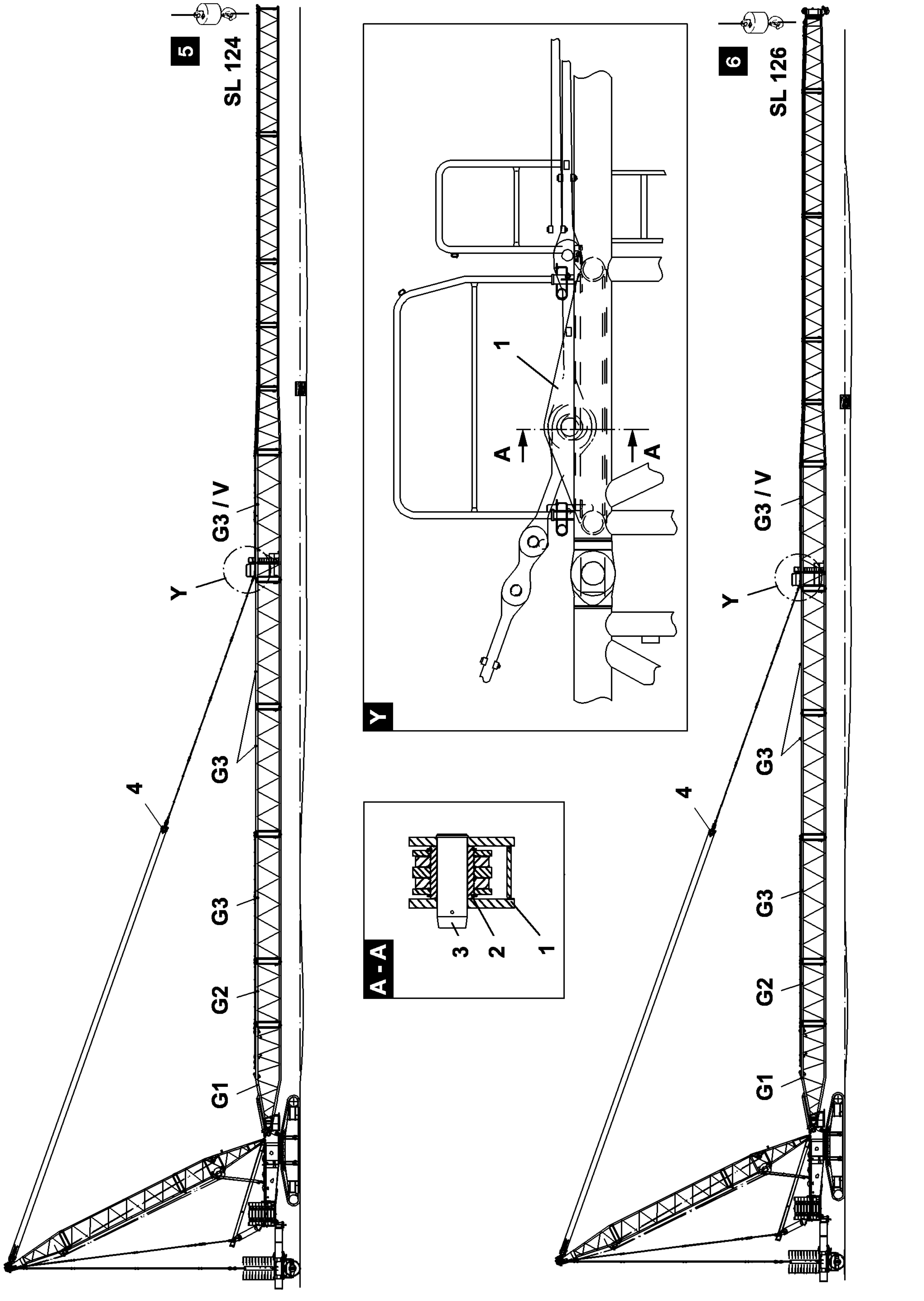

A - A
3
2
1
Y
A
A
1
X
MS1
4
S84
S91
G3 / V
Y
G3
G3
G1
4
X
193066

7.3 Flying installation of the SL / S - boom

Installation
If space is severely limited at the job site for the installation of the derrick, or is restricted due to nearby buildings, etc. then it is possible to install the boom up to a **max. length** in flying mode:

Fig. 4	**- max. S 84 m**	**- with end section, without hook block**
		- with S - and WA-bracket II guy rods
		- min. slewing platform ballast 245 t
		- min. central ballast 95 t
		- max. permissible total force 410 t on test point MS 1 (Fig. X)
	- max. S 91 m	**- with end section, without hook block**
		- with S - and WA-bracket II guy rods
		- min. slewing platform ballast 220 t
		- min. central ballast 95 t
		- min. derrickballast 100 t at 13 m radius

Installation description : see 7.4



193067

7.4 Flying installation of the SL / S - boom

Installation

If space is severely limited at the job site for the installation of the derrick, or is restricted due to nearby buildings, etc. then it is possible to install the boom up to a **max. length** in flying mode:

Fig. 5 **- max. S 124 m**
- without end section, without hook block
- with S - guy rods
- min. slewing platform ballast 170 t
- min. central ballast 45t
- min. derrickballast 200 t at 13 m radius

Fig. 6 **- max. S 126 m**
- with end section, without hook block
- with S -guy rods
- min. slewing platform ballast 170 t
- min. central ballast 45 t
- min. derrickballast 200 t at 13 m radius

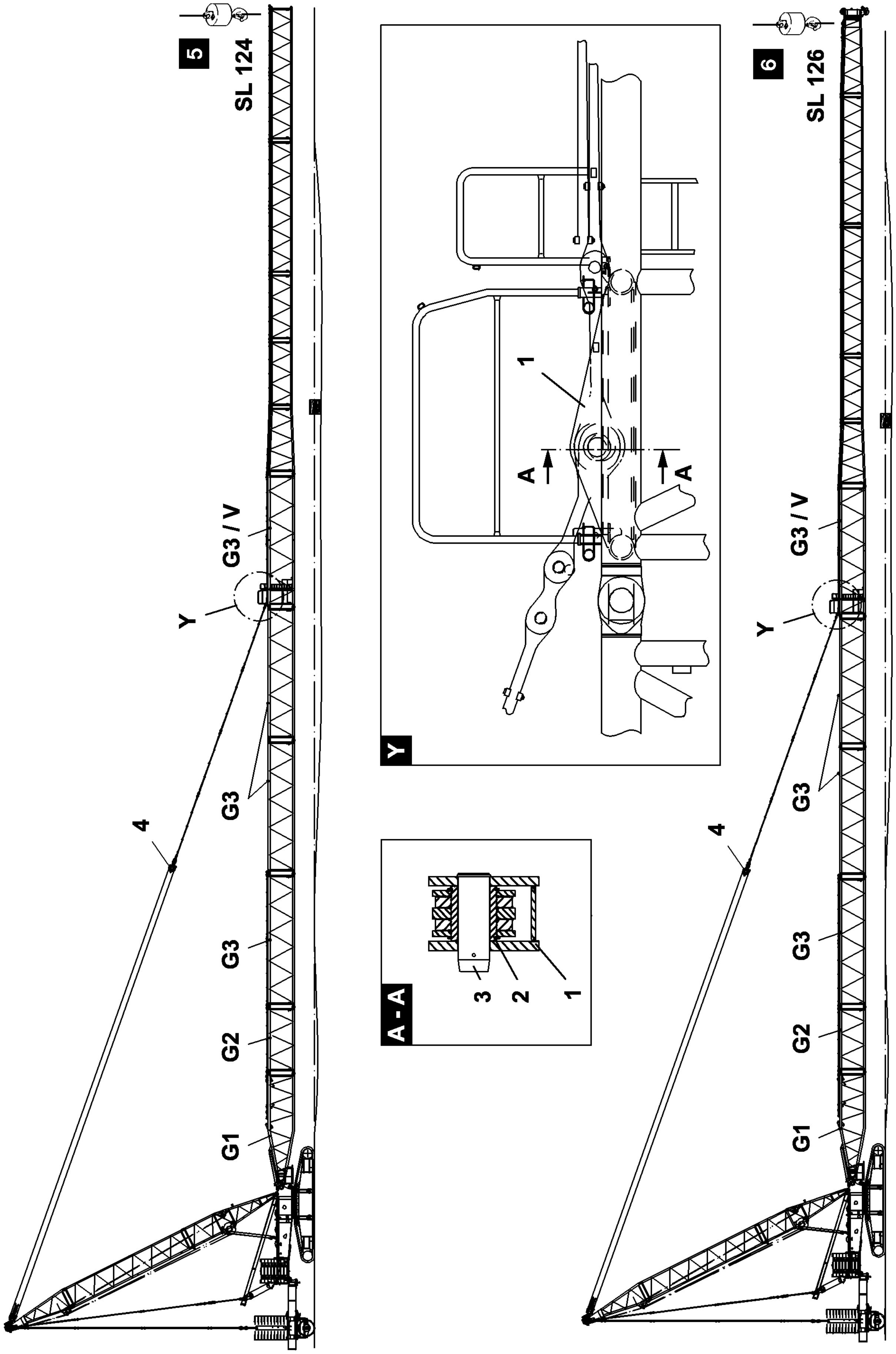
Installation description :

- The S - pivot section (G1) and the S - intermediate sections (G3) must be preassembled or fully assembled at a suitable site . It must be observed that the **reinforced** intermediate section (G3 / V) is installed at the "end" of the preassembled S -boom combination (fig. 4 // 5 // 6) .
- The derrick must be raised (approx. 75° bis max. 85°), so that the boom can be installed without restriction.

D A N G E R: **The derrick may not be raised further than max. 85° to the horizontal. Otherwise there is a danger of tipping over!**

- Swing the preassembled S - boom combination (G1 + G3 + G3 + G3 / V) with the auxiliary crane to the slewing platform . (G3 / **V** = S - intermediate section 14m **reinforced**)
- Pin and secure the S - boom combination with the S - pivot section (G1) on the slewing platform.
- Lower the pulley block (4) to the pivot section or the boom.
- Pin the guy rods on the S - pulley block (4) and on the brackets (1) (fig. Y) of the **reinforced** S - intermediate section (fig. 4 // fig. 5 // fig. 6). The guy rods are connected on the brackets (1) with a hollow axle (2) and must be pinned on the pin point of the brackets (1) with pins (3) (fig. Y // fig. A - A). Secure pin (3) .
- Luff the derrick into operating position (X = 115.1° to 118.1°) (fig. 4 // fig. 5 // fig. 6)

D A N G E R: **It must be ensured when luffing the derrick into operating position, that the guy rods or the cable of control winch W III are not tensioned. This could overload the crane!**



193067

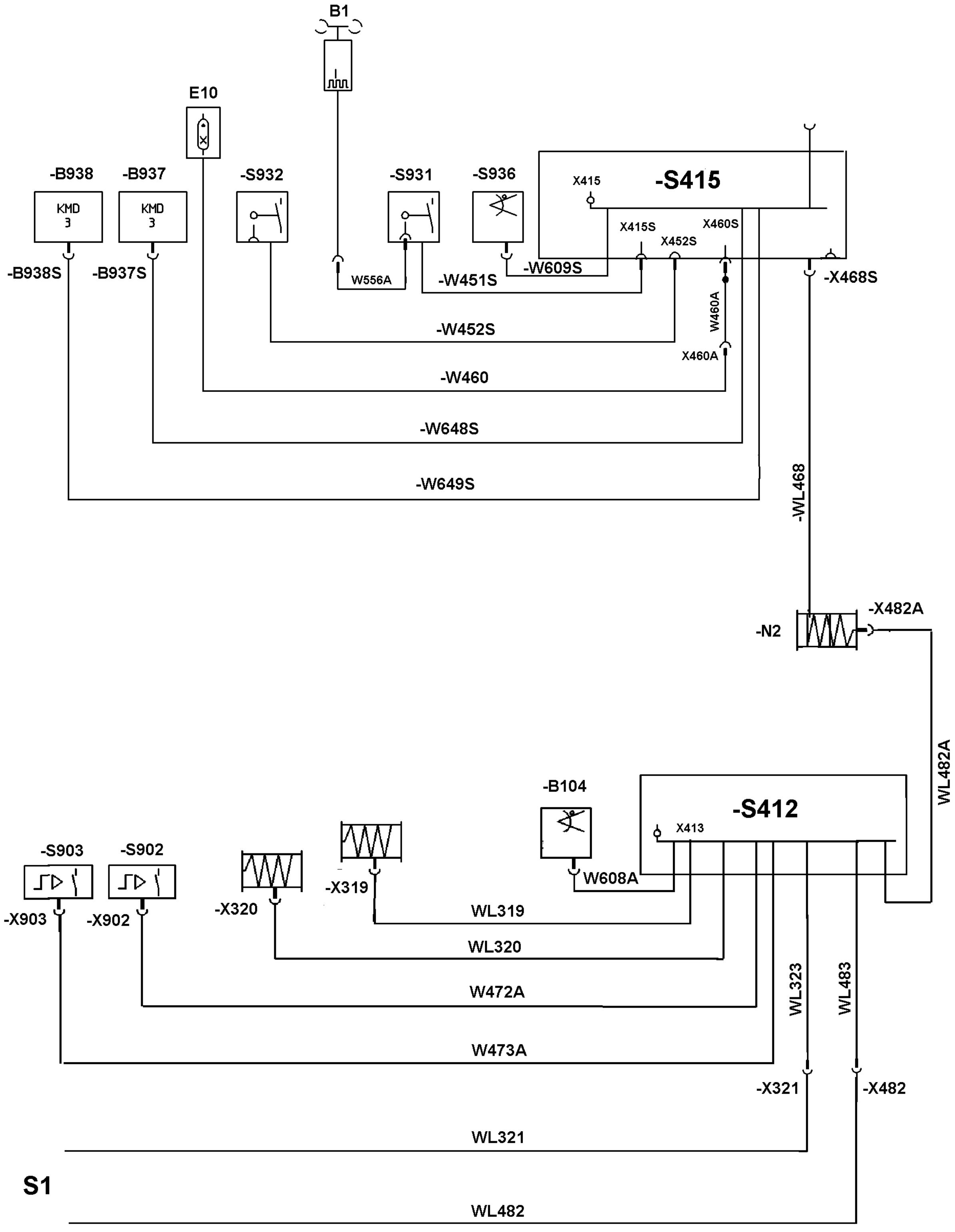
- By spooling up the control winch WIII, bring the guy rods to "tension", until the auxiliary crane is relieved. The boom combinatin must remain in horizontal position.
- After the boom combination is pinned, secured and tensioned, remove the auxiliary crane.
- Install the remaining S - or L - intermediate sections and the end section individually or fully assembled with teh auxiliary crane on the **reinforced** S - intermediate section (G3 / V) , pin and secure .
- The guy rods of the lattice sections must be pinned together, then secured.
- Hand the boom on the front with the auxiliary crane or support with stable materials (fig. 4 //fig. 5 // fig. 6)
- Spool out the cable of the control winch WIII until the guy rods are relieved between the S - pulley block and the **reinforced** S - intermediate section (G3 / V) .
- Unpin the pins (3) on the brackets (1) .

Note: For weight of the lattice sections with placed guy rods, see chapter 5.03.

D A N G E R: **Note the maximum permissible boom lengths for flying installation .**
If this is not observed, there is danger of accidents!

Note: The **reinforced** 14 m S- intermediate section (G3 / V) weighs approx. 1.6 t more than the "normal" 14 m S- intermediate sections. This addition of weight of 1.6 t has not been considered in the load charts and therefore counts **as load**, i..e. depending on the boom length, the load indicator on the main boom head is larger by approx. 800 kg due to this intermediate section.

D A NG E R: **The completely assembled boom must be held with an auxiliary crane or supported from below before the pin (3) on the brackets (1) may be unpinned.**
Make sure that no one is underneath the lattice sections during the pinning or unpinning procedure! This is strictly prohibited.
There is a danger of accidents, as the boom may suddenly fold down.
For removal or installion of the lattice sections, they must be supported from below with suitable, stable materials.
There is a danger of accidents!


B1
E10
-B938
-B937
-S932
-S931
-S936
-S415
X415
X415S
X452S
X460S
-B938S
-B937S
W556A
-W451S
-W609S
-X468S
-W452S
W460A
X460A
-W460
-W648S
-W649S
-WL468
-X482A
-N2
WL482A
-B104
-S412
X413
-S903
-S902
-X903
-X902
-X320
-X319
W608A
WL319
WL320
W472A
W473A
WL323
WL483
-X321
-X482
WL321
S1
WL482
KMD 3
KMD 3

191102

8. Establish the electrical connections

Establish the electrical connection from the control box (S1) on the slewing platform to the connector box (-S412).
Connect the cable plug (WL482) with (WL483) and (WL321) with (WL323) .
Establish the electrical connection from the cable drum (N2) to the connector box (-S415) .
Plug the cable plug (WL468) into the connector box (-S415) .
Establish the electrical connection from the connector box (-S412) to the cable drum (N2) .
Plug the cable plug (WL482A) into the cable drum (N2) .
Install the airplane warning light and wind speed sensor on the S- end section .
Plug in the cable plug (W460) for the airplane warning light on the connector box (-S415) .

8.1 Hydraulic connections

Establish the hydraulic connection (2× Quick couplings) to the S-relapse cylinders.

9. Function check

Prerequisites:
- All electrical connections are established.
- The engine is running.
- The SD - operating mode is set.

Airplane warning light
Turn on the airplace warning light, check function visually.

Wind speed sensor
Check the movement and function of the wind speed sensor.

Limit switch

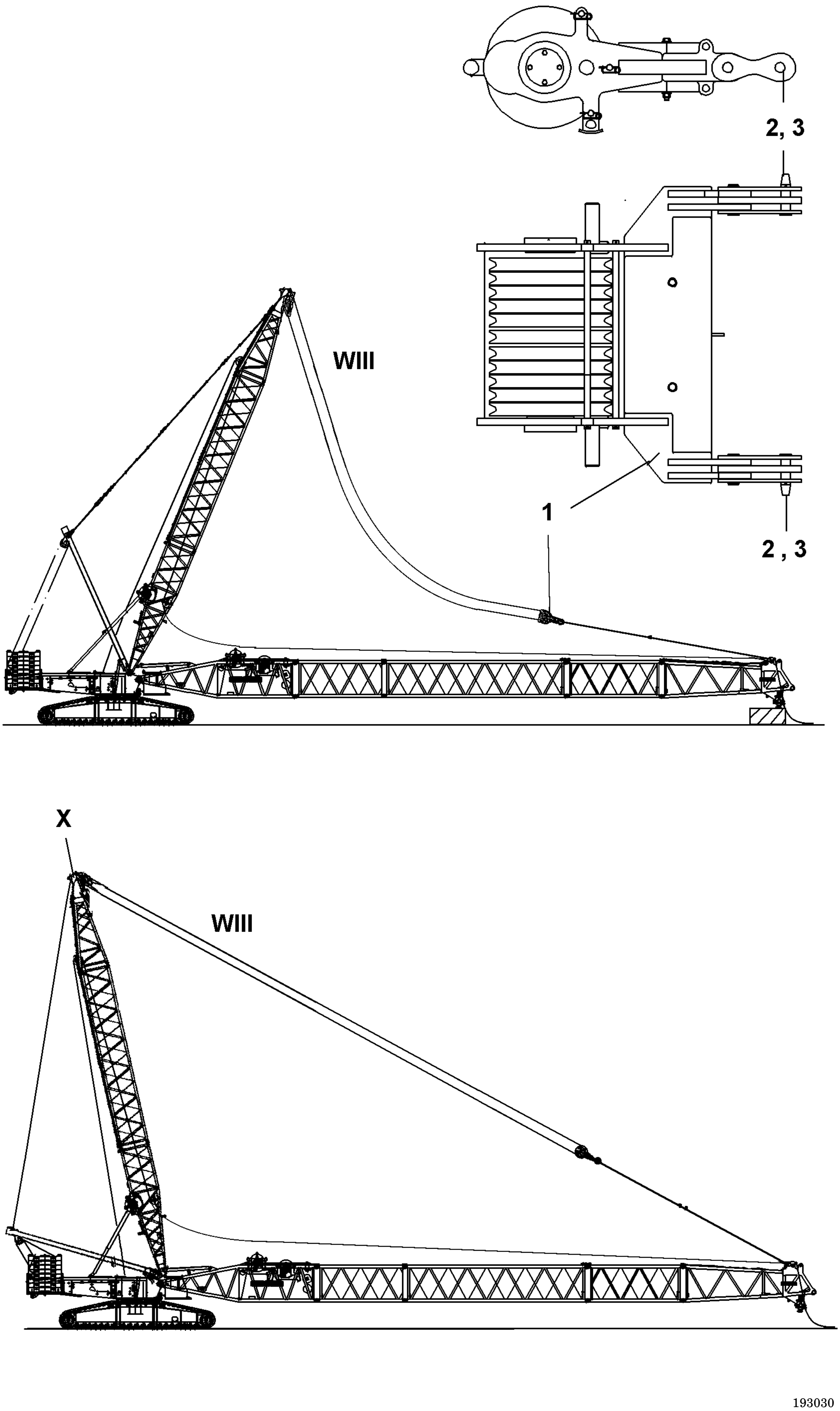
C A U T I O N: **The individual limit switches must be checked for proper function before crane operation.
Manual testing procedure is described below.
In the test system, the function of the individual limit switch initiators must be determined - see chapter 7.10 Diagnostics, paragraph 3.**

Hoist limit switch
Actuate the hoist limit switch manually.
The hoist winch must turn off when lifting.
The hoist "top" symbol on the LICCON - indicator must blink.

Note: When replacing or changing a hoist limit switch (HES) , the HES must have the correct bus address as well as the correct software version to be recognized again by the bus system (LSB).

S - relapse cylinder
Cover the limit switch initiators individually on the S - relapse cylinders with a metal plate.
The S - control winch movement (W III) **"spool up"** must turn off.
The symbol must appear on the LICCON monitor .

D - relapse cylinder
Cover the limit switch initiators individually on the D - relapse cylinders with a metal plate.
The D - control winch movement (W IV) **"spool up"** must turn off.
The symbol must appear on the LICCON monitor .



193030

10. Installation of guy rods

If the boom is installed, lower the derrick to the front.
Lower the S- pulley block (1) to the boom by spooling out winch III and pin and secure with the guy rods.
Use pin (2) and spring retainer (3) .
The guy rods must be installed and secured according to the installation drawings in **Chapter 5.03**.
Make sure to compare the numbers in the installation drawing with the numbers on the guy rod.

D A N G E R: **The pins of the guy rods must be inserted from the inside to the outside. If this is not observed, the hoist cable will scrape on the pins.**
The guy rods must be checked regularly, see chapter " Inspection and maintenance of guy rods".

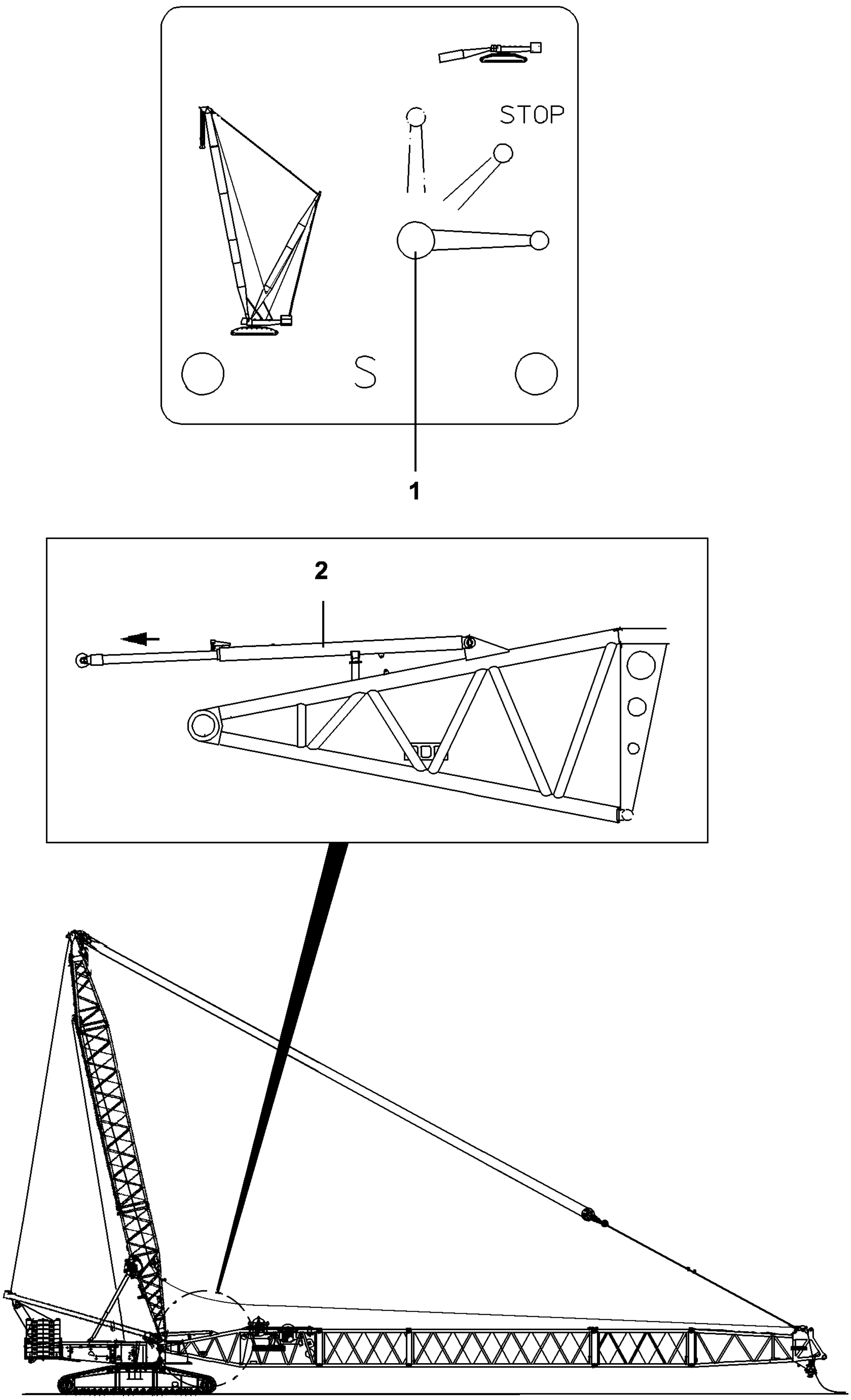
Erect the derrick to the corresponding operating position (X = 115,1° - 118,1°, indicator on monitor 1), while spooling out winch III (S- boom control) at the same time, so that the boom is not pulled up with it.
When the derrick is in operation position, the guying between the derrick and the boom head must be tensioned.

Note: At flying installation tension the guying until the auxiliary crane is relieved.

Remove the auxiliary crane on the boom head.

D A N G E R : **Do not remove the auxiliary crane until the guying is tensioned between the derrick and the boom head and the boom is held by the guy rods.**

Guide the hoist cable over the cable pulley on the end section .



193031

11. Erection / take down procedure

The boom combinations must be erected or taken down according to the **Erection and take down charts.**

D A N G E R: The erection and take down procedure must be made according to the data in the erection and take down chart.
If this is not observed, the crane can be overloaded or topple over.

Prerequisites:

- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform according to the load chart .
- The boom is installed according to the load chart and the operating manual .
- All limit switches are installed correctly and fully functioning.
- All pin connections are secured.
- The hoist cable is placed correctly into the cable pulleys and secured with cable retaining pins to prevent 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 the cold season: Is the boom and the lattice jib and their components (limit switch, cable drum, airplane warning light, wind speed sensor, etc.) free of snow and ice.

D A N G E R : Incorrectly installed and non-functioning limit switches as well as falling parts (pins, spring retainers, ice, etc.) can cause accidents !
The derrick must be in operating position (X = 115,1° - 118,1°, indication on monitor 1) and the S - the relapse cylinder (2) must be extended, only then may the boom be raised.
During the erection procedure, it must be ensured that the hoist cable is not pulled up and falls down backward.

11.1 Extend the S - relapse cylinder (2)

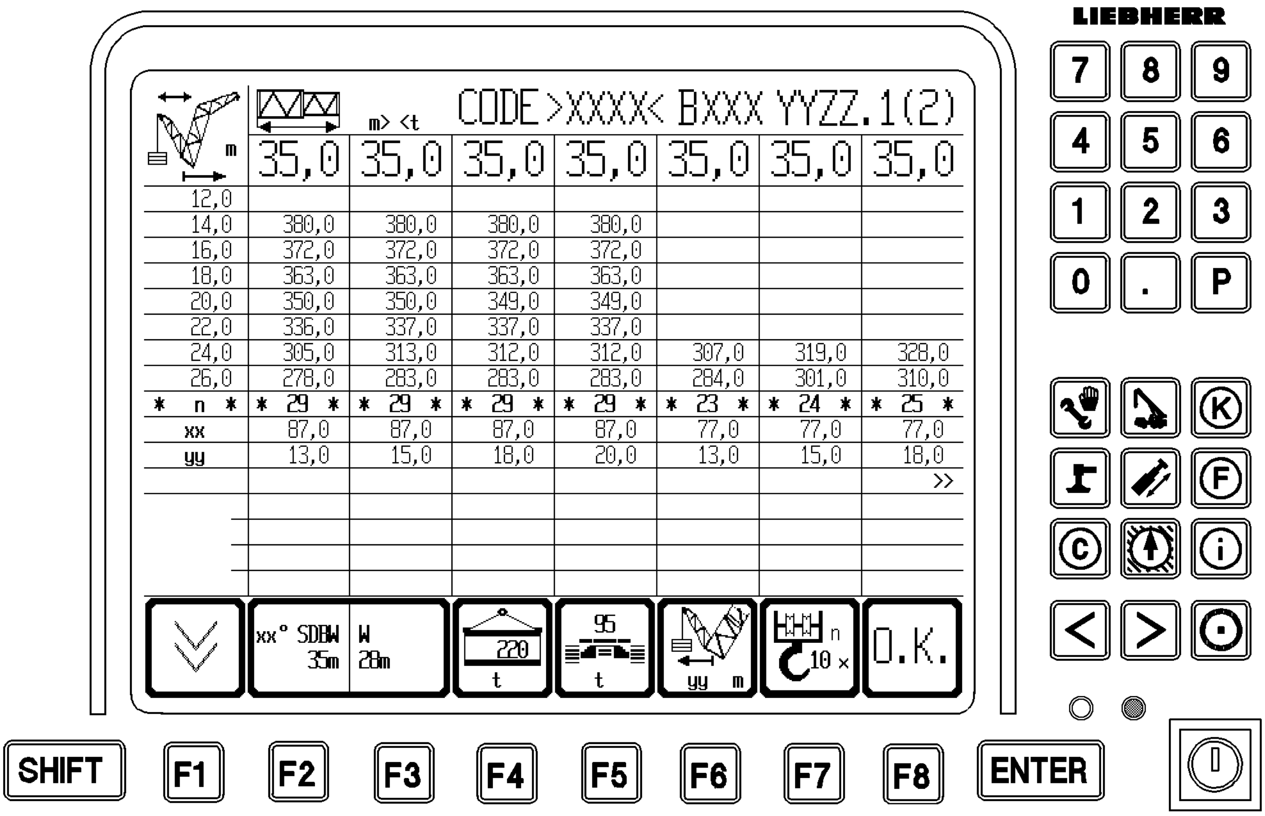
Establish the hydraulic connection from the slewing platform to the S - relapse cylinders.
Move the ball cock lever (1) into horizontal position and extend the piston rod on the S - relapse cylinder.

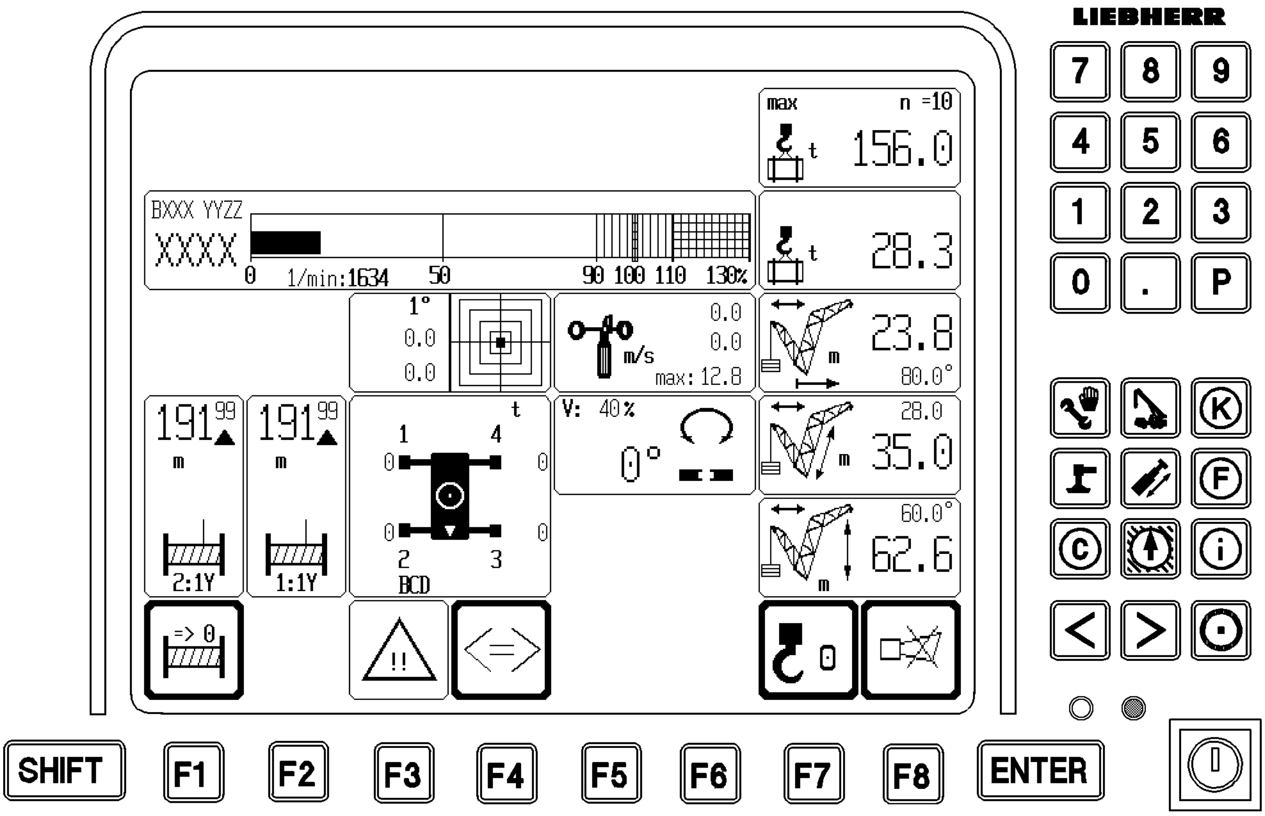
Lever positions:

Lever horizontal	=	Crane operation, extend piston rod
Lever vertical	=	Installation, retract piston rod
Lever 45°	=	Piston rod cannot be extended or retracted

C A U T I O N: The relapse cylinders may only be extended if the derrick is fully raised. If this is not observed, they can 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 direction, and must be secured to prevent it from inadvertent actuation during crane operation.


LIEBHERR
m> <t
CODE >XXXX< BXXX YYZZ.1(2)
m 35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 x
O.K.
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
7 8 9 4 5 6 1 2 3 0 . P


LIEBHERR
max n =10
t 156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
t 28.3
1° 0.0 0.0
0.0 0.0
m/s max: 12.8
m 23.8 80.0°
191 99 m
191 99 m
t
1 4
0 0
0 0
2 3
BCD
2:1Y
1:1Y
V: 40%
0°
28.0 m 35.0
60.0° 62.6 m
=> 0
!!
0
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
7 8 9 4 5 6 1 2 3 0 . P

190979

11.2 Erection procedure

Prerequisites:
- Set the LICCON 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.

Adjustments on EQUIPMENT CONFIGURATION VIEW of LICCON (see chapter 4.02)
Enter the 4-digit code number according to the required load chart and confirm with ENTER .
Enter the actual reeving.
Check the actual equipment configuration of the crane with the entered data to ensure they match.
Press the function key -F8- "o.k." , the OPERATING VIEW will appear.

D A N G E R : **Compare and check the LICCON settings with the actual equipment configuration.**
If this is not observed, the crane can be overloaded or topple over.

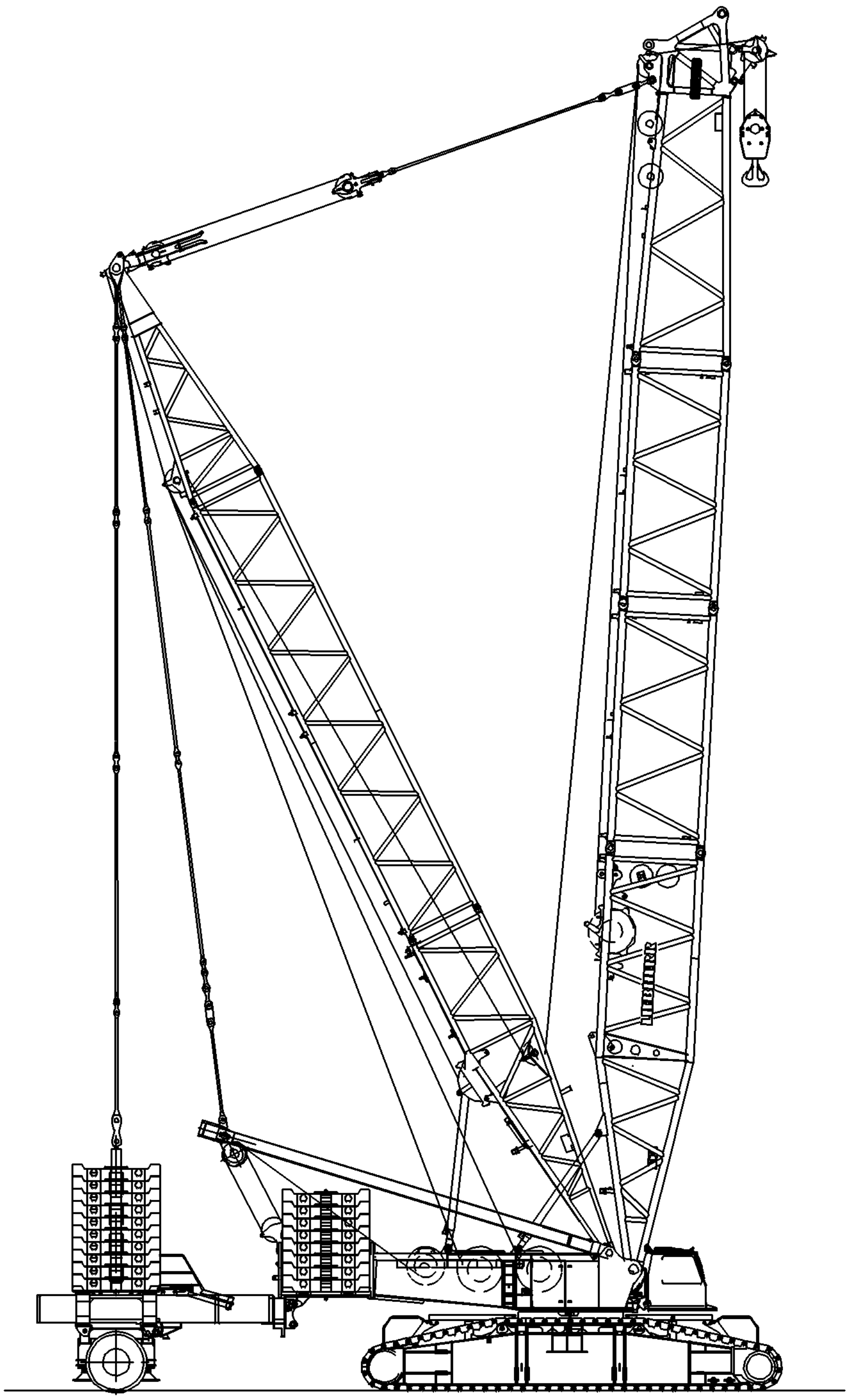
Erection
Luff up the boom until the end section lifts off the ground.
Reeve the hoist cable between the pulley head on the end section and the hook block and secure on the fixed point - see **Chapter 4.06, Reeving plans.**
Attach the hoist limit switch weight.
Luff up the boom to the **lowest** operating position.

Indications in the OPERATING VIEW during the erection procedure
The following alarm functions are activated (blink) during the erection, until the operating position is reached:
- "STOP"
- "HORN" + acoustical signal

Note: The **lowest** operating position is reached if the indicators turn off and a load value in tons - t - appears in the symbol "MAX. LOAD" instead of the question marks ("? ? ? ?")

Turn off the installation keyed button by pressing the button.
The installation symbol on the LICCON - indicator turns off.

D A N G E R: **The installation keyed button must be turned off immediately after reaching the lowest operating position.**
The installation keyed button bypasses the 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 topple over!



191105

12. Crane operation with D - boom combination

D A N G E R: The notes in chapter 4.02 ”LICCON overload safety system, chapter 4.05 ”CRANE OPERATION ” and chapter 4.08 ”WORKING WITH A LOAD ” must be observed.

Prerequisites :

- Set the LICCON system according to the data in the load chart and the equipment configuration **(see chapter 4.02, 4.03)**.
- The installation keyed button is turned off.
- The installation symbol on the LICCON indicator turns off.

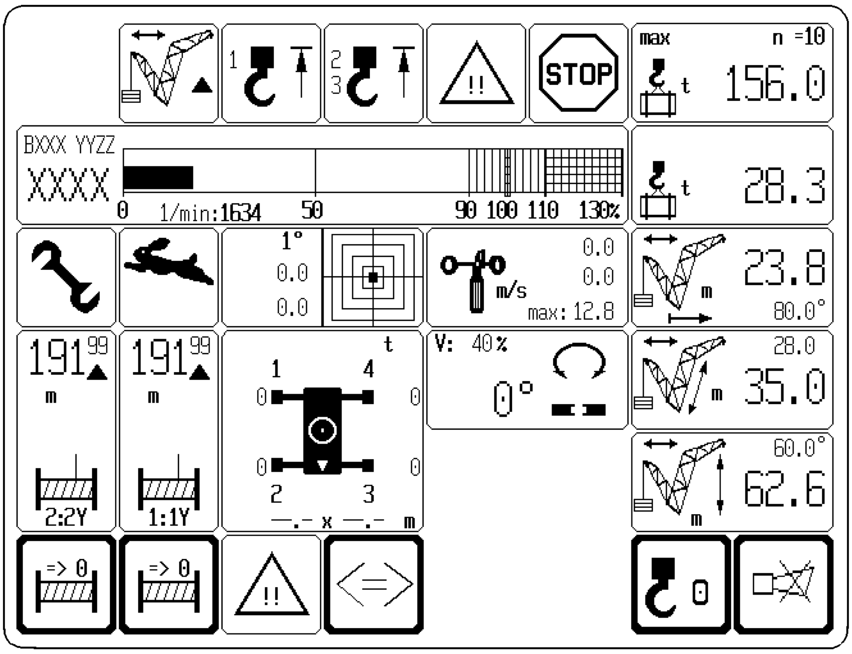
D A N G E R: Check the horizontal position of the crane before and during operation. If the crane operator leaves the cab, even if only for a short time, then he is obligated, before starting to work again, to check the operating mode settings and to readjust them, if necessary.

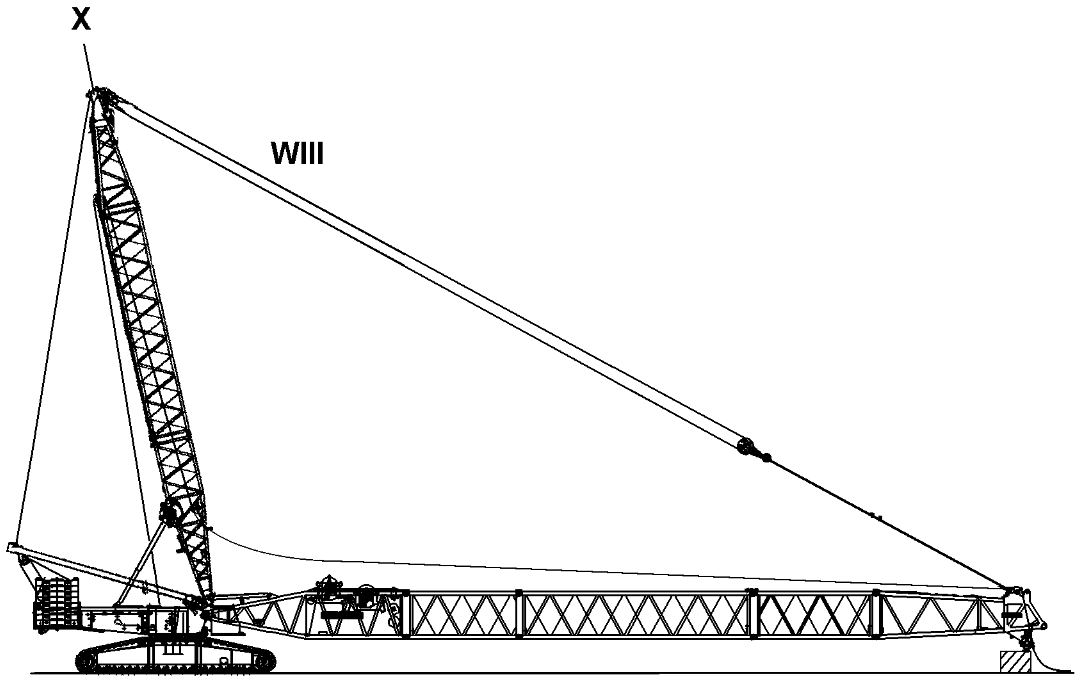
Adjustments / checks

Check the function of the overload safety system by actuating the operating positions **”top”** and **”bottom”** .

Check the function of the hoist limit switch **”top”** by running against the hoist limit switch weight.

Check the function of the limit switch **”boom steep”** by running against the relapse cylinders.


max
n =10
156.0
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
28.3
STOP
1°
0.0
0.0
0.0
0.0
m/s
max: 12.8
23.8
80.0°
191 99
m
2:2Y
191 99
1:1Y
t
1 4
2 3
V: 40%
0°
28.0
35.0
60.0°
62.6
=> 0


X
WIII

193032

13. Place down the S - boom

Luff the S- boom down until just before the lowest operating position.

Note: When reaching the **lowest** operation position, the luffing down movement is shut off. At the same time, the following alarm functions are activated (blink) in the OPERATING VIEW:
- ”STOP”
- ”HORN” + acoustical signal

Actuate 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.

C A U T I O N: When luffing down, the hoist winch must be spooled out at the same time to prevent the hook block from colliding with the pulley head.

Actuate the manual control lever and continue to luff down the boom until the hook block touches the ground.

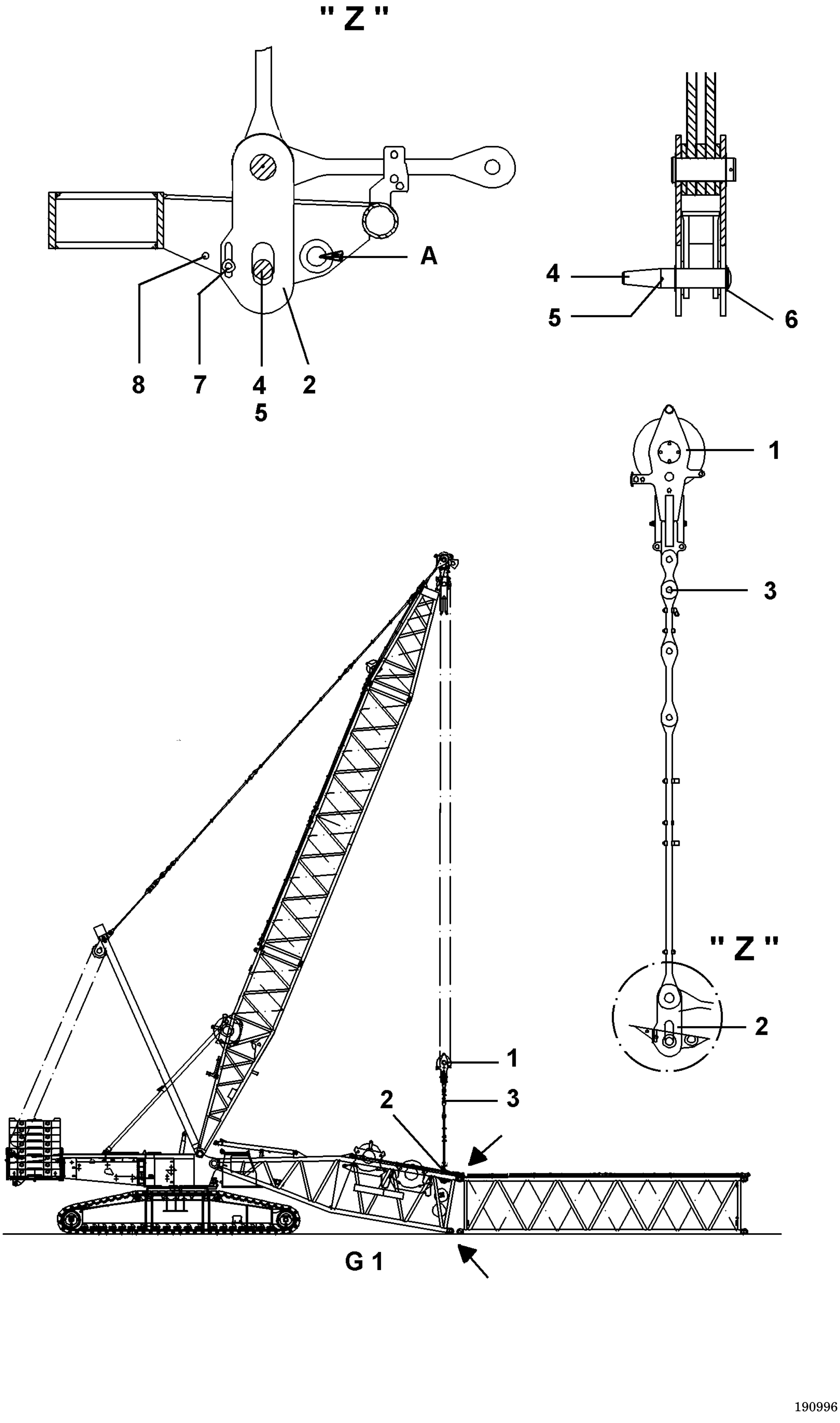
D A N G E R: When taking down long booms, the hook block must be lowered to the ground in a certain boom angle range to the horizontal, otherwise the crane is overloaded!
Boom angle range - see Erection and take down charts.

Remove the hoist limit switch weight. Unreeve the hook block.

D A N G E R : When unreeving the hoist cable, no persons may be within the danger zone.

Continue to luff down the S- boom until the end section lays on the ground.

C A U T I O N: The derrick must remain in operating position until the end section lays on the ground .



" Z "
A
8
7
4
5
2
4
5
6
1
3
" Z "
2
1
2
3
G 1
190996

13.1 Luff down the derrick

Unpin the guy rods and place on the corresponding lattice sections for transport and secure.
Erect the derrick again and lower the S- pulley block (1) until the installation brackets (2) align with the pin hole.
Pin and secure the installation brackets (2) . Use pins (4), washers (6) and spring retainers (5) .

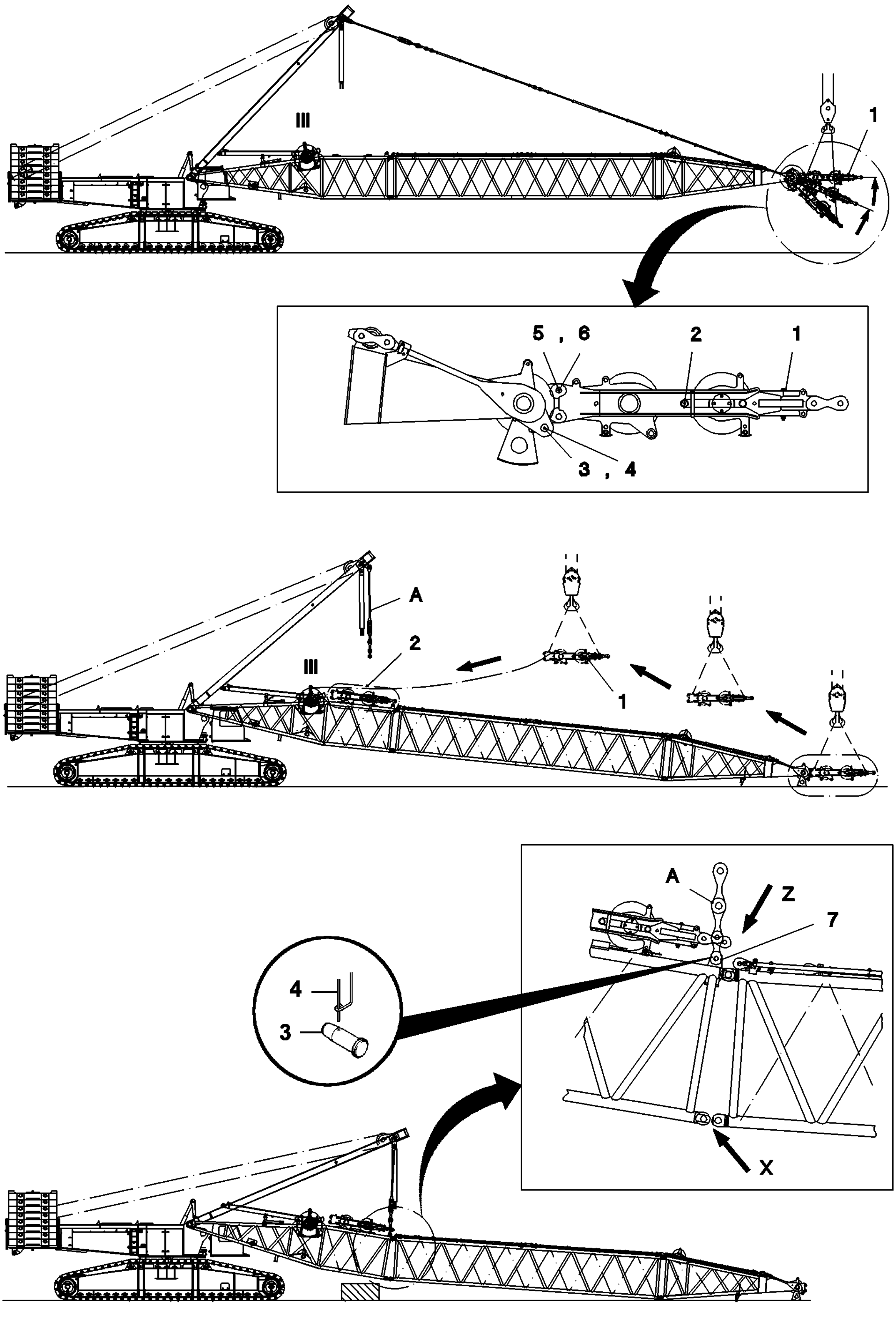
C A U T I O N: The transport retaining pin (7) must be unpinned for installation and during operation.
Pin in park position (8) .

Hold the S- pivot section (G1) with the S-pulley block (1) and unpin the pivot section (G1) **"on the bottom"** .

Note: With the intake gear, pull until the same F1 - actual force is set as was noted during installation.
The pins can be pulled easier. Otherwise the pins and eyes on the lattice sections will be worn or the pin sticks.

D A N G E R: Before unpinning, the boom must hang on the pulley block.
Otherwise there is a danger of accidents, as the boom might suddenly fold down!
Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections. This is strictly prohibited!
With the S - pulley block, the following maximum boom lengths can be lowered :
- S 140m and SL 98m, with S- guy rods
- S 91 with S - and WA-Bracket II guy rods
Danger of accidents!

Set the S-pivot section on the ground and unpin the intermediate section on the S-pivot section **"on top"**.
Unpin the S-pulley block (1) on the guy rods (3) . Place the guy rods (3) on the S- pivot section (G1) and secure.
Unpin the lattice sections and disassemble.
Erect the derrick to the point where the S- pivot section can be disassembled without restriction (approx. 75° to max. 90°) .
Remove the S-pivot section (G1) with the auxiliary crane on the slewing platform.



193029

14. Place down and remove the derrick

Lower the derrick to the horizontal and pull the S- pulley block (1) to the D- end section, by spooling up winch III.

C A U T I O N : **A guide must watch and monitor the spooling up of winch III . When spooling up winch III , there is a danger of collision between the S - pulley block and the D - end section!**

Connect the "lower" and "upper " pulley block with the transport pin (2) .
Lift the S - pulley block (1) with the auxiliary crane, bring it into horizontal position and lock with pin (3) and secure with spring retainers (4) .

Attach the S-pulley blocks (1) to the auxiliary crane and unpin on the D- end section. Loosen the spring retainer (6) and unpin the pin (5) .

Note: The weight of the S- pulley blocks is approx. 3200 kg.

Pull the S-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 on the ground or on the support.
Remove the guy rods .
Lower the SA - bracket to the front, **see chapter 5.02 " SA- bracket"**.
Pin and secure the guy rods (A) from the SA - bracket on the installation bracket (7) on the D- pivot section .
Use pin (8) and spring retainer (9) .
Luff up the SA-bracket and tension guy rods (A) .

Note: With the intake gear, pull until the same F1 - actual force is set as was noted during installation.
The pins can be pulled easier. Otherwise the pins and eyes on the lattice sections will be worn or the pin sticks.

Unpin and secure the D-pivot section **"on the bottom" (X)** .

D A N G E R: **Before unpinning the D-pivot sections "on the bottom", the guy rods (A) on the installation bracket (7) must be pinned and tensioned.**
Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections.
This is strictly prohibited.
There is a danger of accidents, as the boom might suddenly fold down!

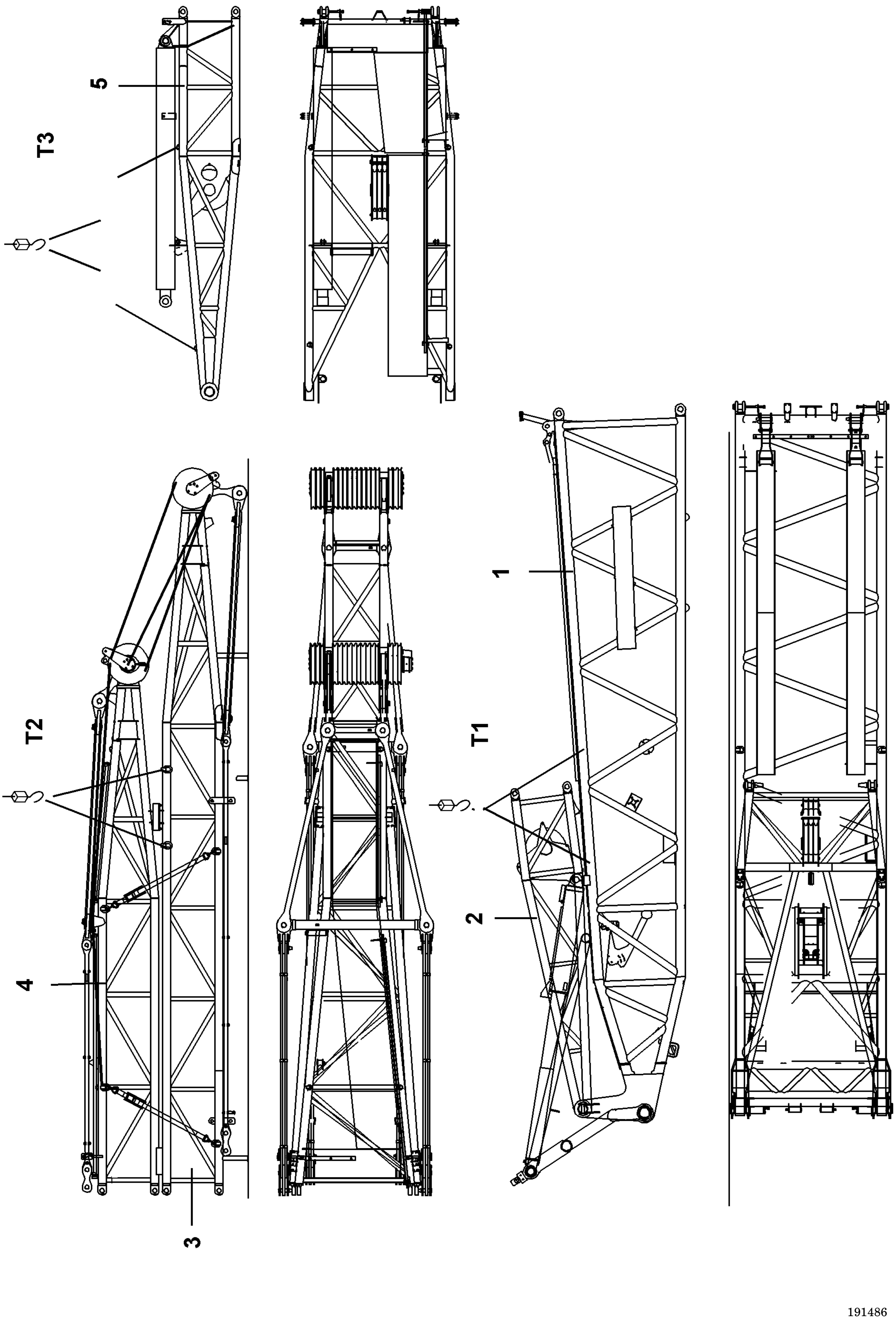
Place the D-pivot section on the support on the ground and remove the auxiliary crane.

C A U T I O N: **The pivot section must be supported, so that it does not lay on the slewing platform and is damaged!**

Remove the D - end section and LI/D - intermediate section.

Note: The removal of the lattice sections is in reverse order as for installation.

C A U T I O N: **The warning and danger notes for installation must also be observed for removal !**


5
T3
T2
T1
1
2
4
3
191486

1. W- installation unit

1	W-Pivot section
2	WA-Bracket I Pivot section
3	WA-Bracket I End section
4	WA-Bracket II End section
5	WA-Bracket II Pivot section

1.1 Transport units

Transport unit 1 (T 1)
consisting of:
- W-Pivot section
- WA-Bracket I Pivot section

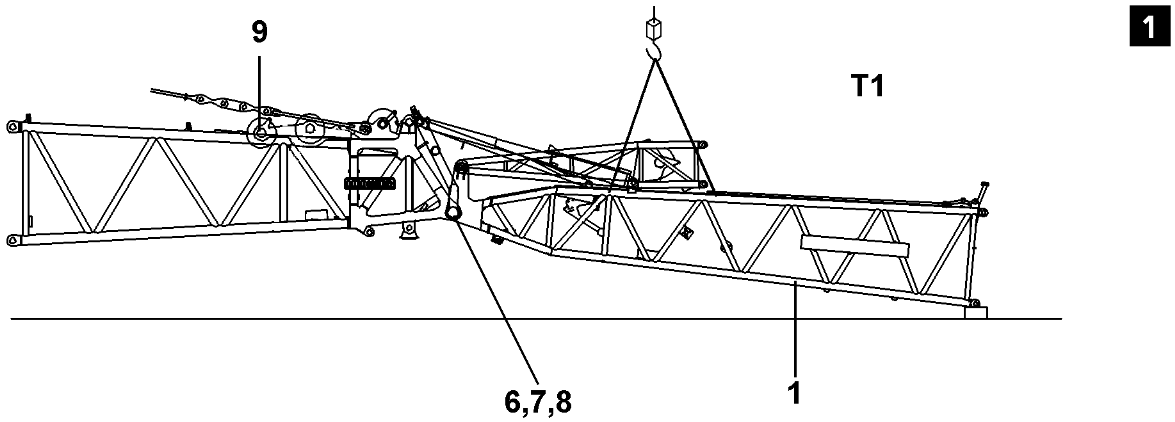
Weight = 10600kg

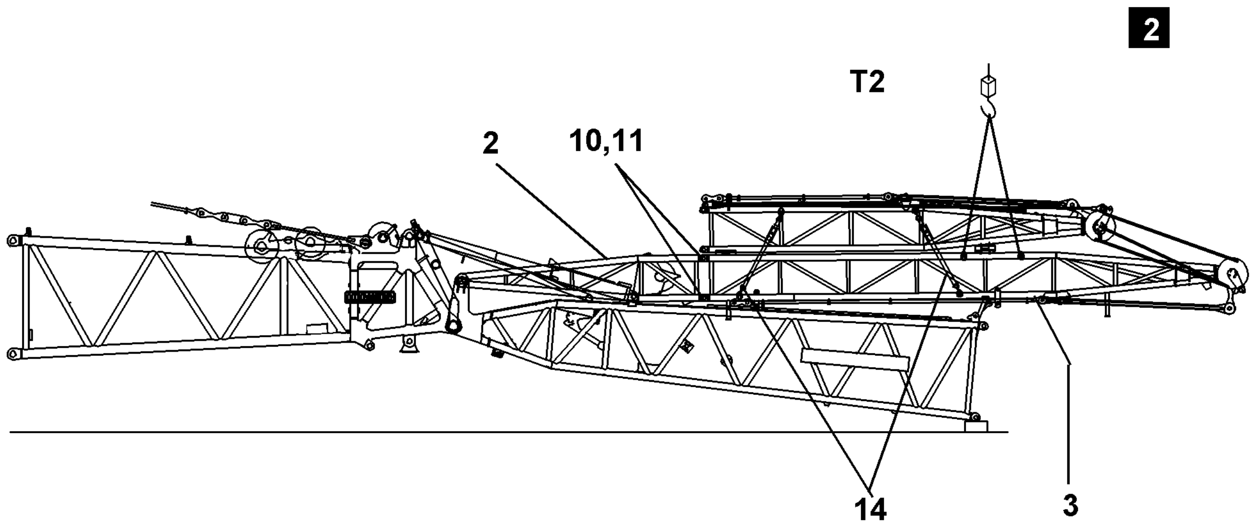
Transport unit 2 (T 2)
consisting of:
- WA-Bracket I End section
- WA-Bracket II End section

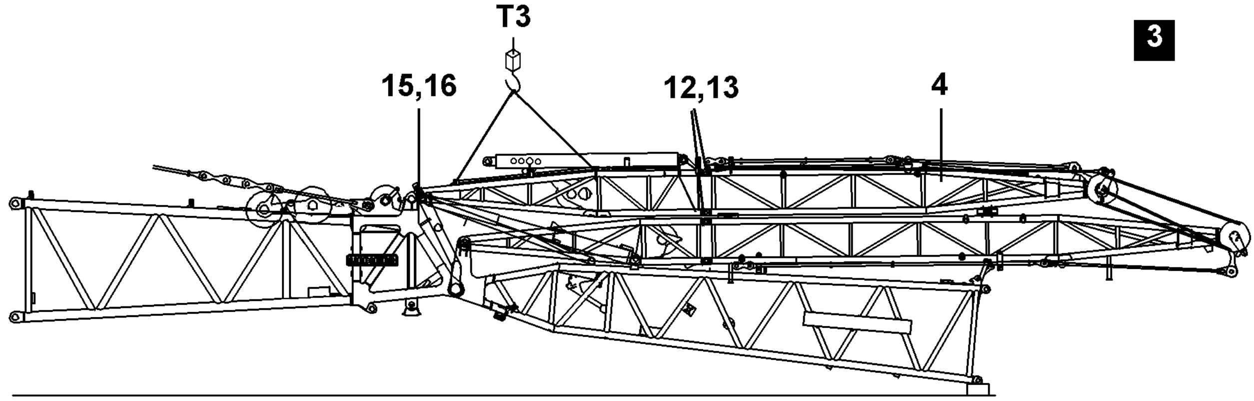
Weight = 8400kg

Transport unit 3 (T 3)
consisting of:
- WA-Bracket II Pivot section

Weight = 3500kg







191613

2. Installation

D A N G E R: **For installation and removal work:**

- **A safe installation scaffolding / working platform must be used. There is a danger of accidents due to falling.**
- **Improvisations are prohibited.**
- **The lattice sections must be supported underneath with suitable, stable materials.**
- **Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections.**

Prerequisites:

- The S-boom is installed and set in horizontal position.
- The crane is horizontally aligned.
- An auxiliary crane as well as an installation scaffolding / working platform is available.
- TheLICCON overload safety system is set according to the data given in the load charts.
- The keyed button ”installation” is actuated, the indicator light ”installation” lights up.
- The installation symbol on the LICCON indicator bleft.

2.1 Fig. 1 Installation Transport unit 1 (T 1)

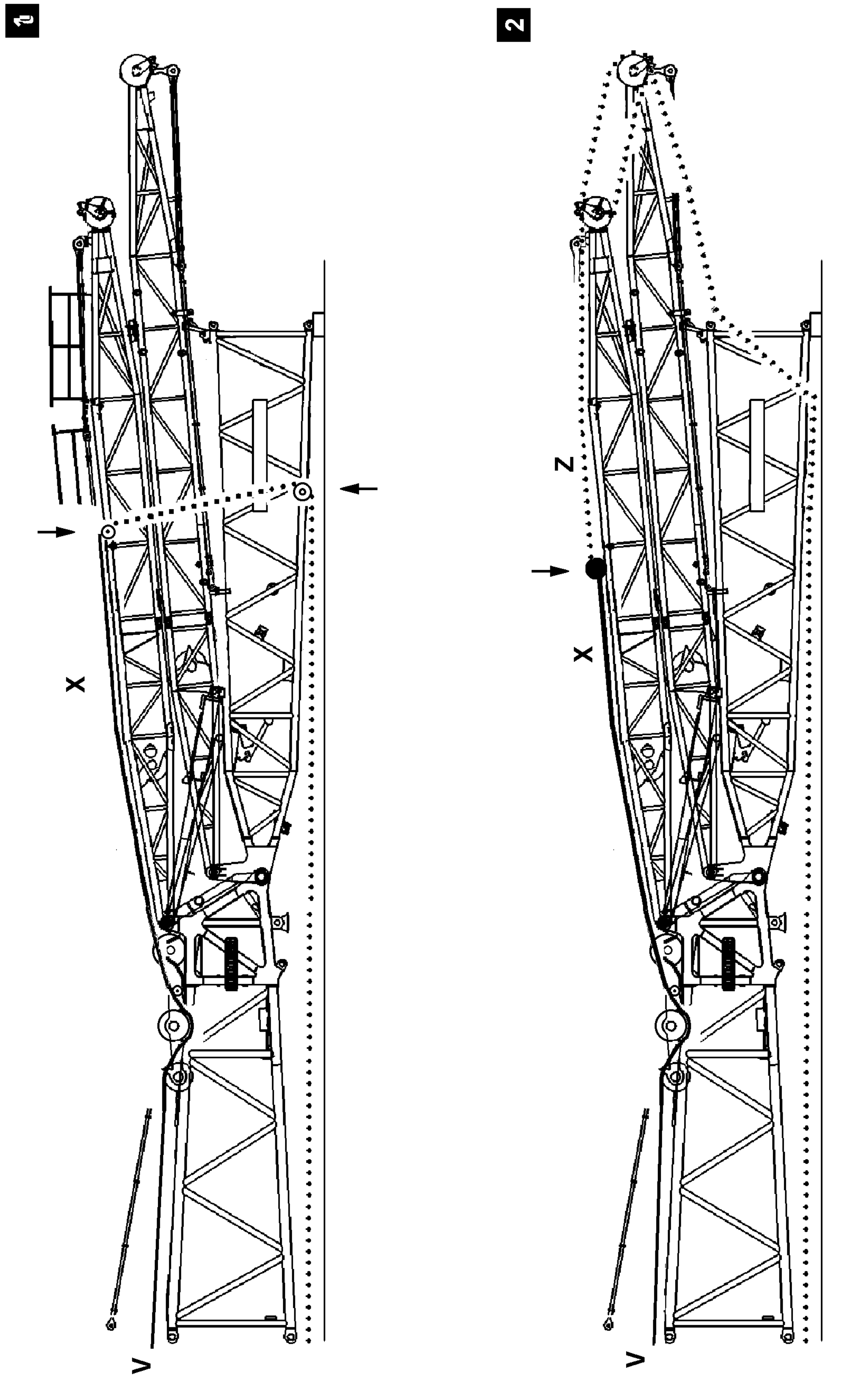
Take on the transport unit 1 (T 1) with the auxiliary crane on the tackle points on the W-pivot section (1)
Pin the transport unit 1 - hanging down on the front - on the S-end section (Z).
Pin the connector pins (6) with the hydraulic pin pulling device, place the retaining plate (7) and secure with spring retainer (8) .
Support the W - pivot section (1) from below.
Lower the transport unit with the auxiliary crane until it rests on the ground.
Pin on the pulley assembly (9) .

2.2 Fig. 2 Installation Transport unit 2 (T 2)

Take on the transport unit 2 (T 2) with the auxiliary crane on the tackle points on the WA-bracket I -end section (3).
Pin the transport unit 2 on the WA-bracket I pivot section (2) .
Pin the connector pin (10), on top and bottom, with the hydraulic pin pulling device and secure with the spring retainer (11) .

2.3 Fig. 3 Installation Transport unit 3 (T 3)

Take on the transport unit 3 (T 3) with the auxiliary crane on the tackle points on the WA-bracket II- pivot section (5) .
Pin the WA-bracket II- pivot section (5) on the WA-bracket II end section (4) .
Pin the connector pin (12), on top and bottom, with the hydraulic pin pulling device and secure with the spring retainer (13) .
Pull up the WA-bracket I and II and pin the WA-bracket II- pivot section (5) on the S-end section .
Pin the connector pin (15) with the hydraulic pin pulling device and secure with the spring retainer (16).
Disengage the rigging belts (14).



191606

3. Reeve the W - control cable between WA-bracket I and II

. . . . **Auxiliary cable**

--------------------- **Control cable**

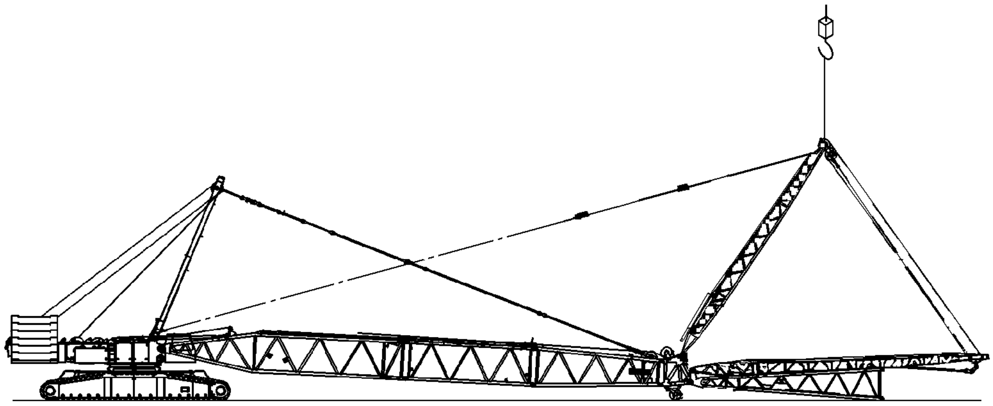
Fig. 1 Auxiliary cable routing when getting the control cable

Pull the auxiliary cable (Z) of the auxiliary winch over the change over pulleys to the slewing platform. Connect the auxiliary cable (Z) with the W - control cable (X) of 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.1**.

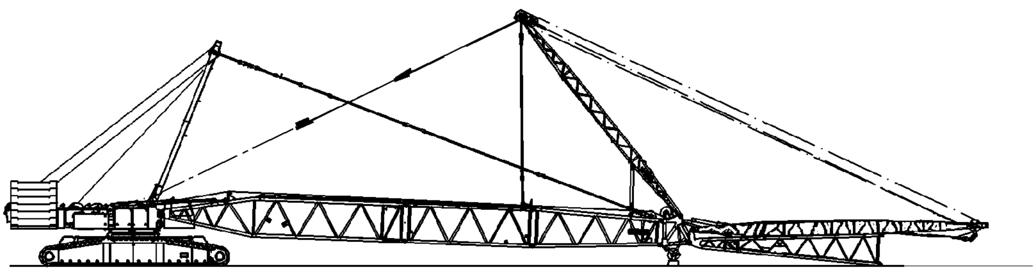
Fig. 2 Auxiliary cable routing when reeving in the control cable

Connect the W - control cable (X) and the auxiliary cable (Z) with the already reeved reeving cable (W), between WA-I and II - for cable routing, see **Fig.2**.
Spool up the auxiliary winch and at the same time, spool out winch V and reeve W - control cable (X) between the WA-bracket I and II - **For reeving, see chapter 4.06**.

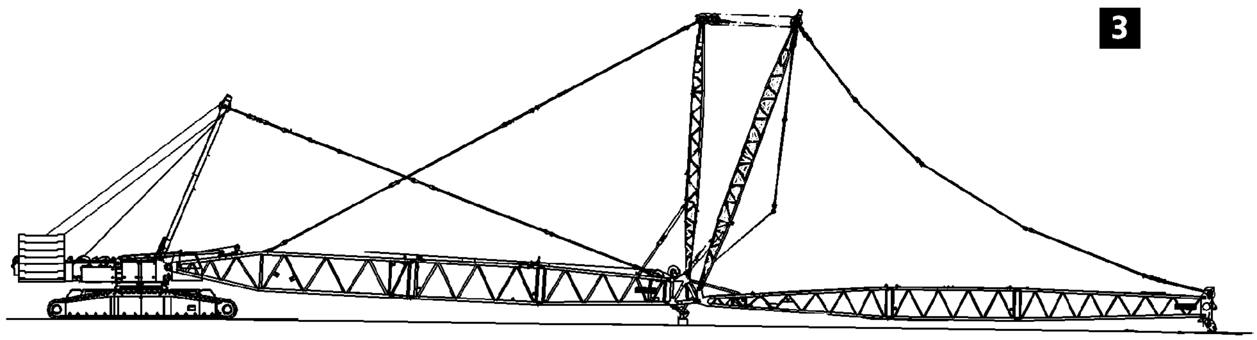
C A U T I O N : When spooling the cable out, make sure that no slack cable forms. This could damage the cable!



1



2



3

191612

4. Installation procedure

Fig. 1

1.0 -Pin the W - installation unit on the S-boom.

1.1 -Reeve the W - control cable between the WA-bracket I and II.

Fig. 2

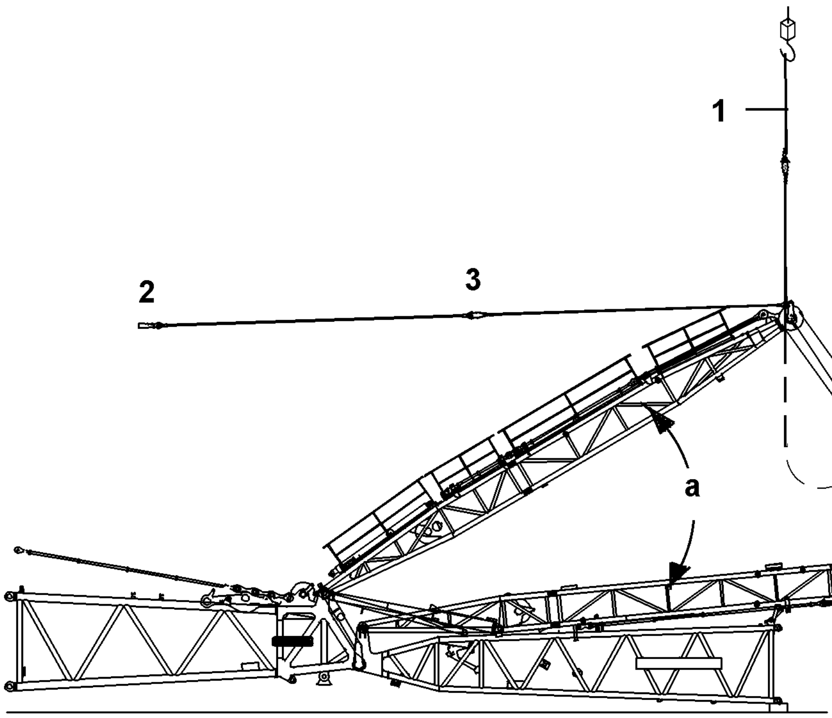
2.0 -Installation of guy rods from WA-bracket II to S-pivot section.

Fig. 3

3.0 -Erect the WA- brackets and tension the guy rods from the WA-bracket II to the S-pivot section .

3.1 -Install the lattice jib and guy rods from the WA-bracket I to the W-end section .

1



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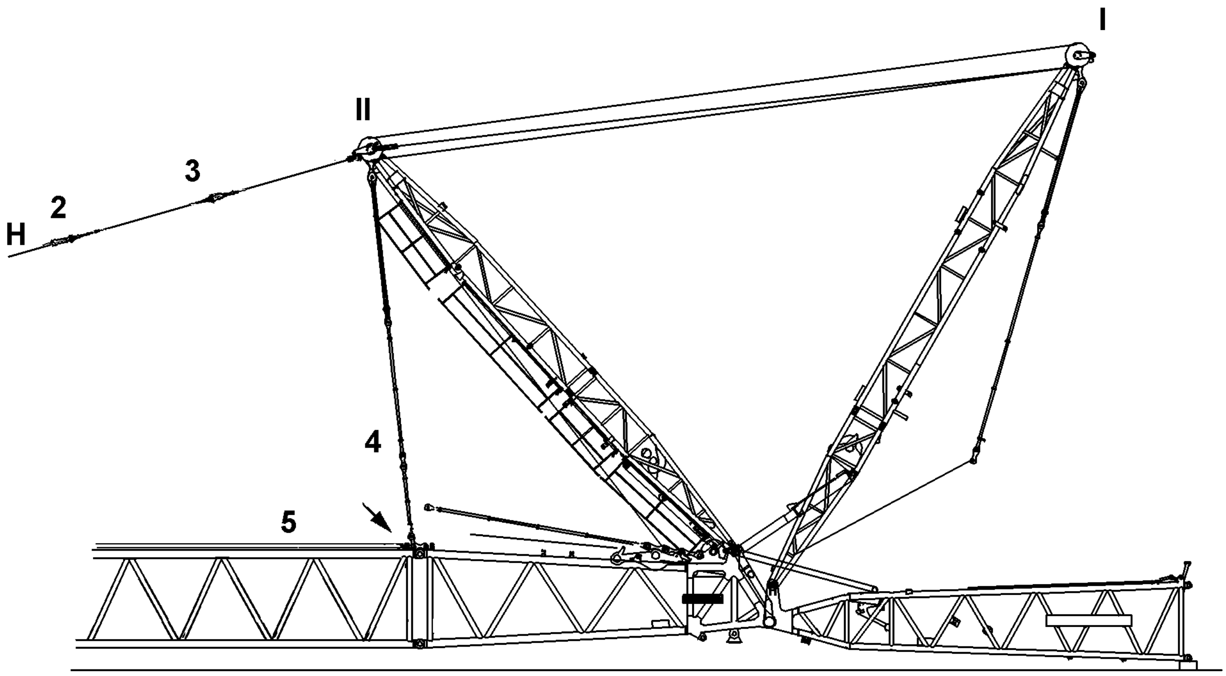

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5. Erect the WA-bracket II

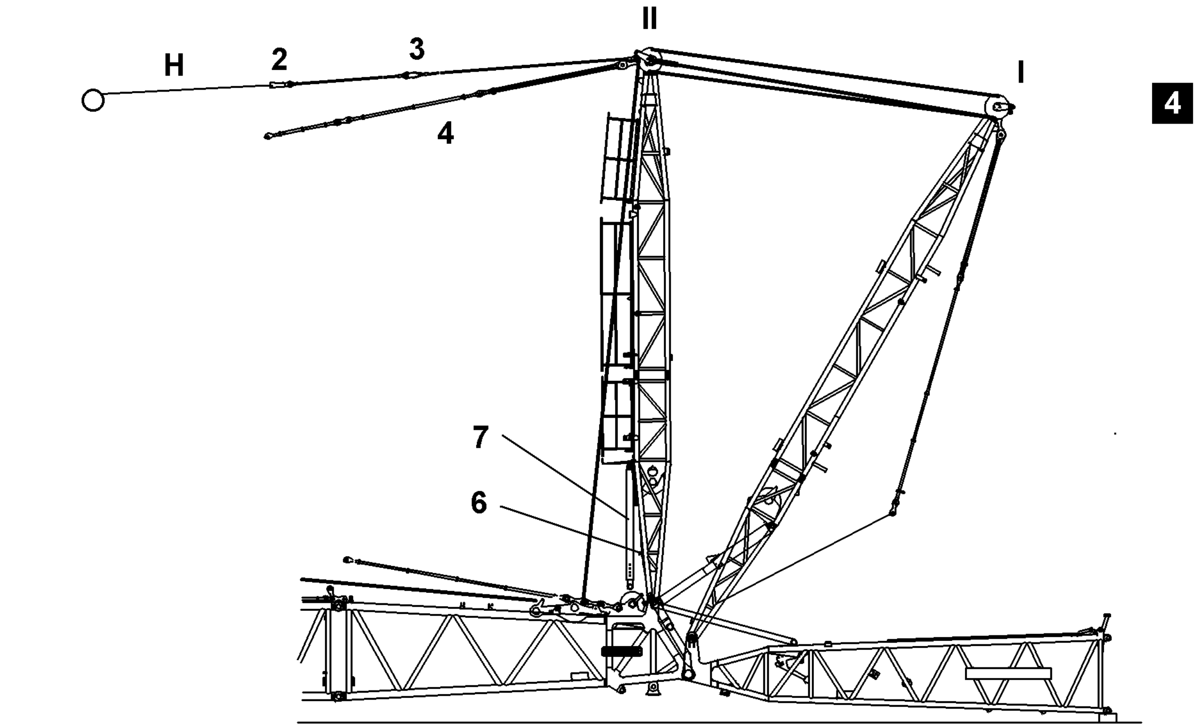
Fig. 1
Attach the auxiliary crane on the installation cable (1) and erect the WA-bracket II to approx. 45° (a) and then pull it further with the hoist cable (H) .

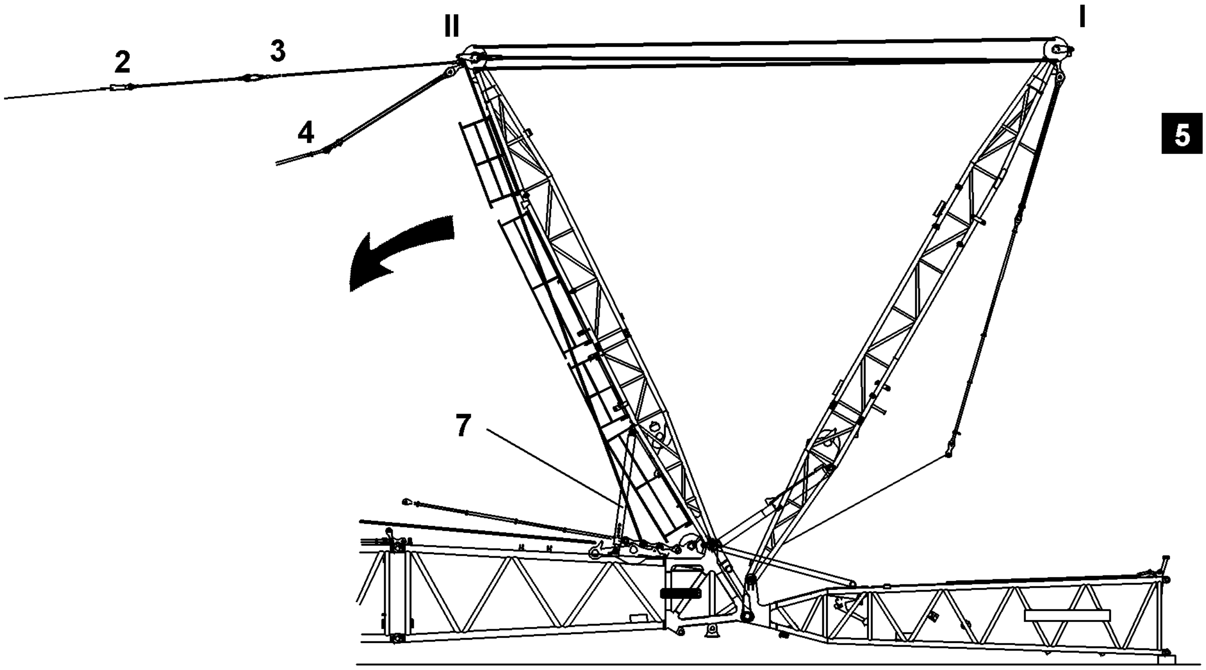
C A U T I O N : The WA-bracket II must be raised to approx. 45° with an auxiliary crane.

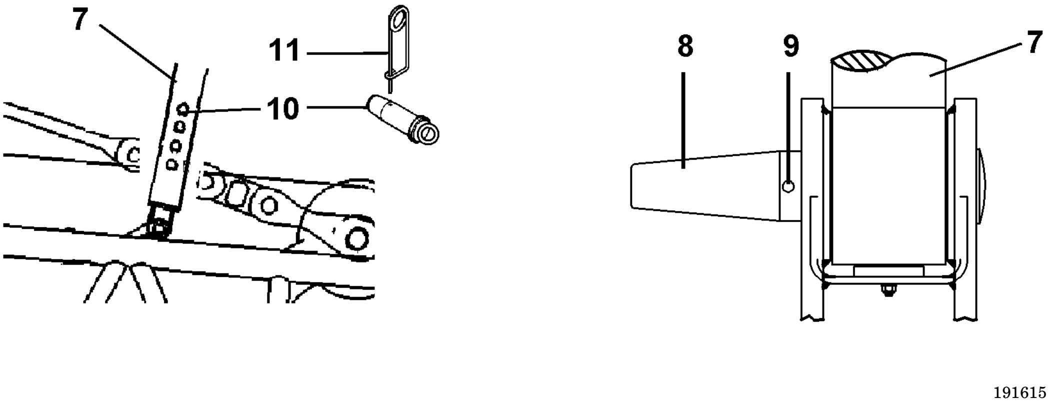
Fig. 2
Installation of guy rods from WA-bracket II to S-pivot section

Hang the hoist cable of winch I/II into the cable lock (2) on the installation cable (3) .
Spool up the hoist winch while **spooling out** the W-control winch at the same time, and pull the WA - bracket II back to the point were the guy rods (4) from WA-bracket II can be pinned and secured with the guy rods (5) of the S - pivot section.

Note: To prevent the WA - bracket I from pulling up, the control winch must be spooled out at the same time!







191615

5.1 Fig. 4
Tension the guy rods from the WA-bracket II to the S-pivot section

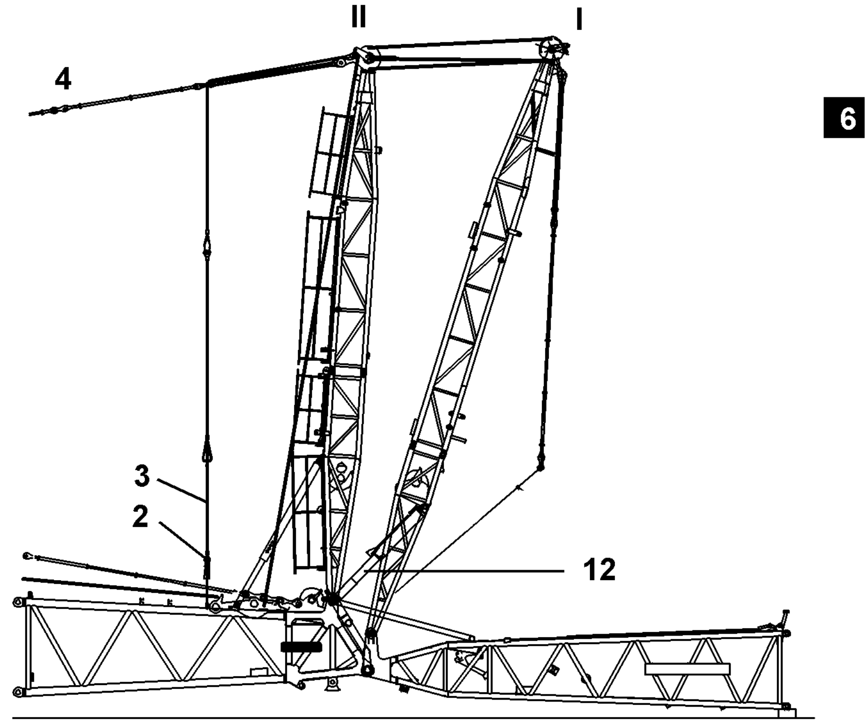
When the guy rods are pinned and secured to each other, then the hoist winch (H) must be **spooled out** and the W- control winch must be **spooled up** at the same time, until the WA-bracket II is positioned vertically.

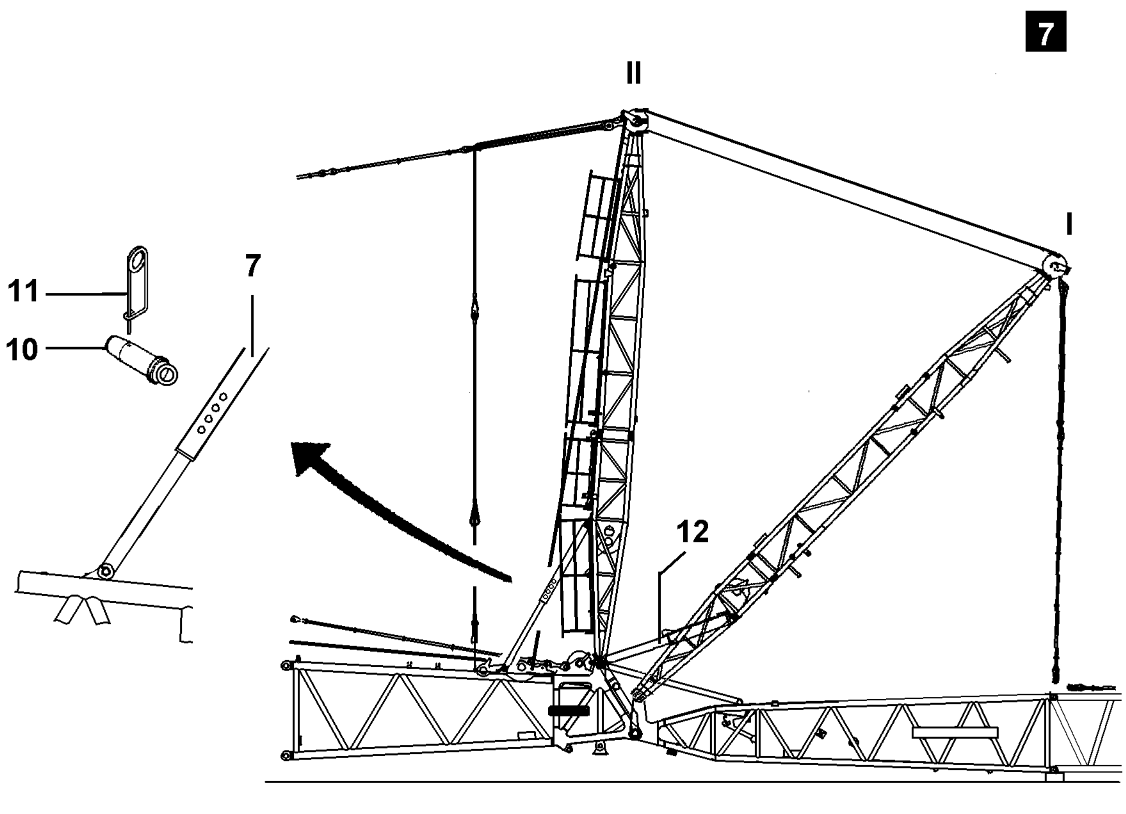
Unpin the transport retainer (6) for the mechanical relapse supports (7) on the WA-bracket II .

5.2 Fig. 5
Spool up the hoist winch while **spooling out** the W- control winch at the same time, and pull the WA - bracket II back to the point where the mechanical relapse supports (7) can be pinned on the S-end section with pins (8) and secured with spring retainers (9) .

After pinning, the pin (10) on the relapse supports (7) must be released and unpinned.

C A U T I O N : **Pin (7) must be unpinned, after the relapse support is pinned on the S - adapter , otherwise the WA - bracket II will be damaged when it is pulled back.**





191616

5.3 Fig. 6
Tension guy rods from WA-bracket II to the S-pivot section

Establish the electrical connections to the limit switches of the W- relapse cylinder (12) .

When the guy rods are pinned and secured to each other, then the hoist winch must be **spooled out** and the W- control winch must be **spooled up** at the same time, until the guying of WA-bracket II (4) to the S-pivot section is tensioned by the counterpressure of the relapse cylinder (12).

Continue to spool out hoist winch, disengage the hoist cable on the cable lock (2) and attach the installation cables (3 and 1) on the S-end section or the WA-bracket II.

5.4 Fig. 7
Erect the WA-bracket I by spooling up the W-control winch until the limit switch on the W-relapse cylinder (12) is pushed.

C A U T I O N : **The electrical connection to the limit switches on the W- relapse cylinder must be established.**

Before erection, manually actuate the limit switches on the relapse cylinders individually. The W- control winch movement "spool up" must turn off.

The symbol on the LICCON monitor bleft.

The WA - bracket I may not be pulled back to the mechanical stop on the relapse cylinder, otherwise it can be damaged!

Pin the WA-bracket II- relapse support (7) in the max. possible length on the next hole with pin (10) and secure with spring retainer (11) .

5.06 SDW BOOM COMBINATION

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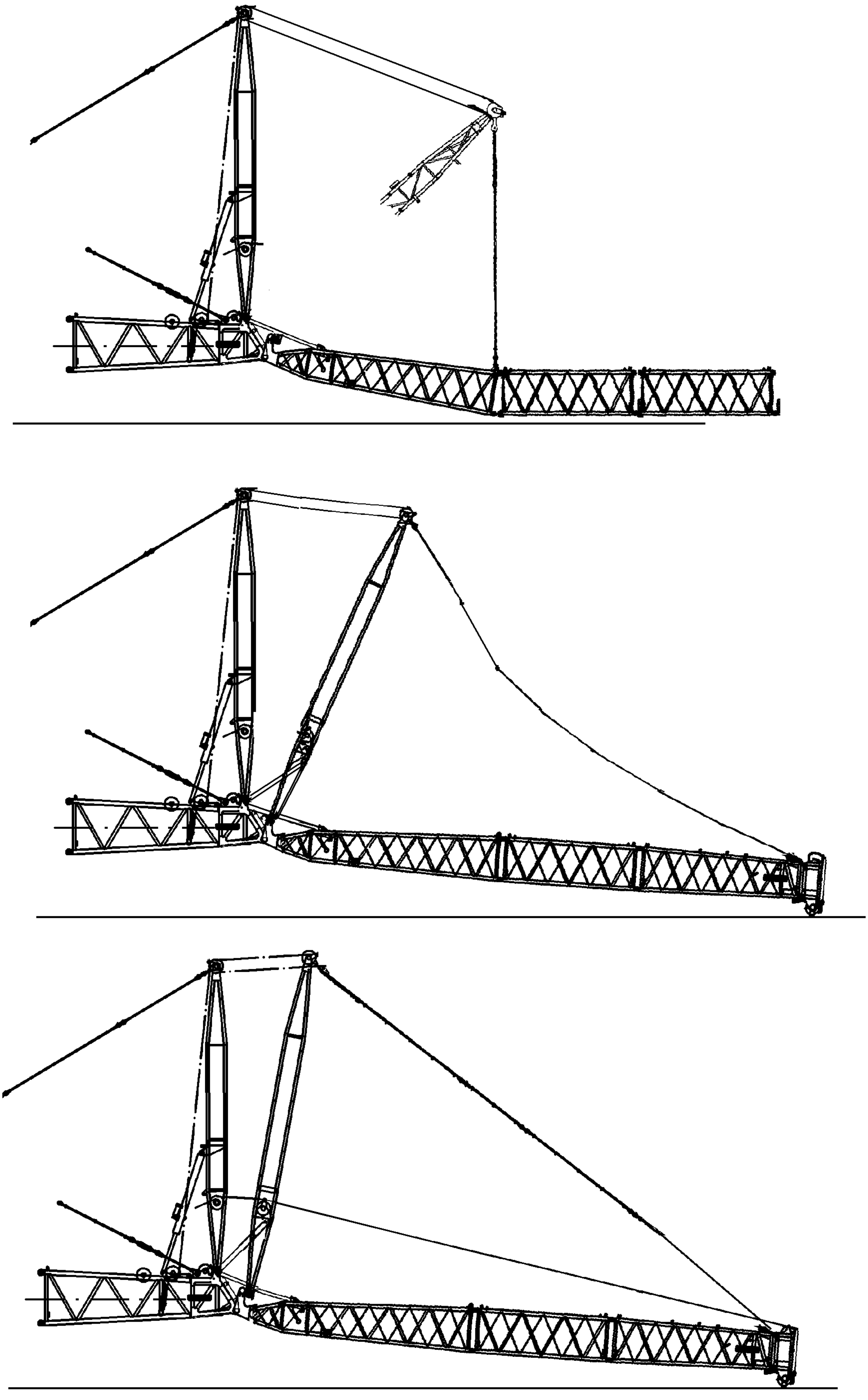


192529

6. Install the W- lattice jib
Assemble the lattice jib to the required length, pin and secure.

D A N G E R: **The pins on the lattice sections must be secured with spring retainers. When removing or installating lattice sections, they must be supported with suitable, stable materials. No persons may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections. This is strictly prohibited!**

Pull the hoist cable to the W-end section and attach it there.
Install the pulley car on the on the W-end section.

Note : Pulley car tire pressure = **9 bar**.

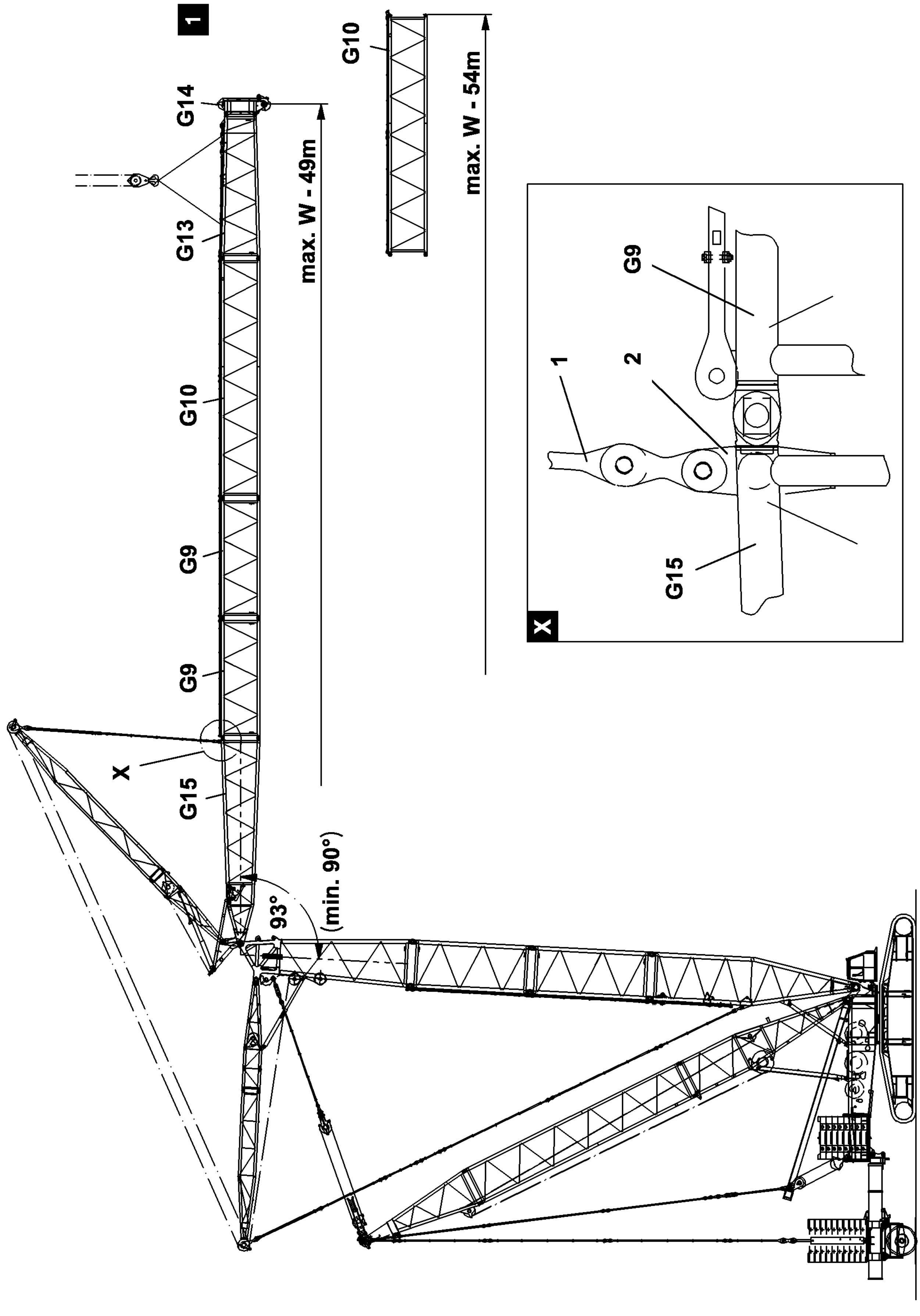
6.1 Install the guy rods from the WA-bracket I to the W-end section
Assemble the guy rods according to the lattice jib length, pin and secure.

Note: The guy rods are placed and attached for transport on the intermediate sections. For installation, the transport retainers must be released.

Pin and secure the guy rods from the W - end section with the guy rods from the WA-bracket I .

Note: The guy rods must be installed and secured according to the installation drawings in chapter 5.03. The numbering on the installation drawing must be compared with the numbering on the guy rod.

D A N G E R: **All pins of the guy rods must be secured. The guy rods must be inspected regularly, see chapter " Inspection and maintenance of guy rods".**


1
G14
G13
G10
G9
G9
G15
X
max. W - 49m
G10
max. W - 54m
93°
(min. 90°)
X
G9
1
2
G15

193118

6.2 Flying installation of W - lattice jib on the W - pivot section

Installation
If the space requirements on the job site are limited for the installation of the W - lattice jib or is restricted due to nearby buildings, etc. then it is possible to install the W - lattice jib to the following **max. length** in flying mode:

Fig. 1	**- max. W - 49 m**	**- with end section, without hook block**
		- with WA - bracket I guy rods
	- max. W - 54 m	**- without end section, without hook block**
		- with WA - bracket I guy rods

D A N G E R: **Install the slewing platform ballast , the central ballast and the derrickballast according to the data in the load charts. Otherwise there is a danger of accidents!**

For flying installation , the W - pivot section must be at an angle of at least 90° to the main boom, otherwise the flying installation is not permitted.

D A N G E R : **For flying installation of the W-lattice jib, the W- pivot section must be at an angle of at least 90° to the main boom. If this is not observed, there is a danger of accidents!**

- Lower the WA - bracket I with the W - control and pin and secure the guy rods (1) from the WA - bracket I on the brackets (2) of the pivot section (G15) (fig. X)
- Swing the additional W - intermediate sections and the end section, individually or completely assembled with the auxiliary crane to the W - pivot section . Install the intermediate sections , pin and secure.

D A N G E R : **It is strictly prohibited for anyone to remain under the lattice sections during the pinning or unpinning procedure. There is a danger of accidents!**

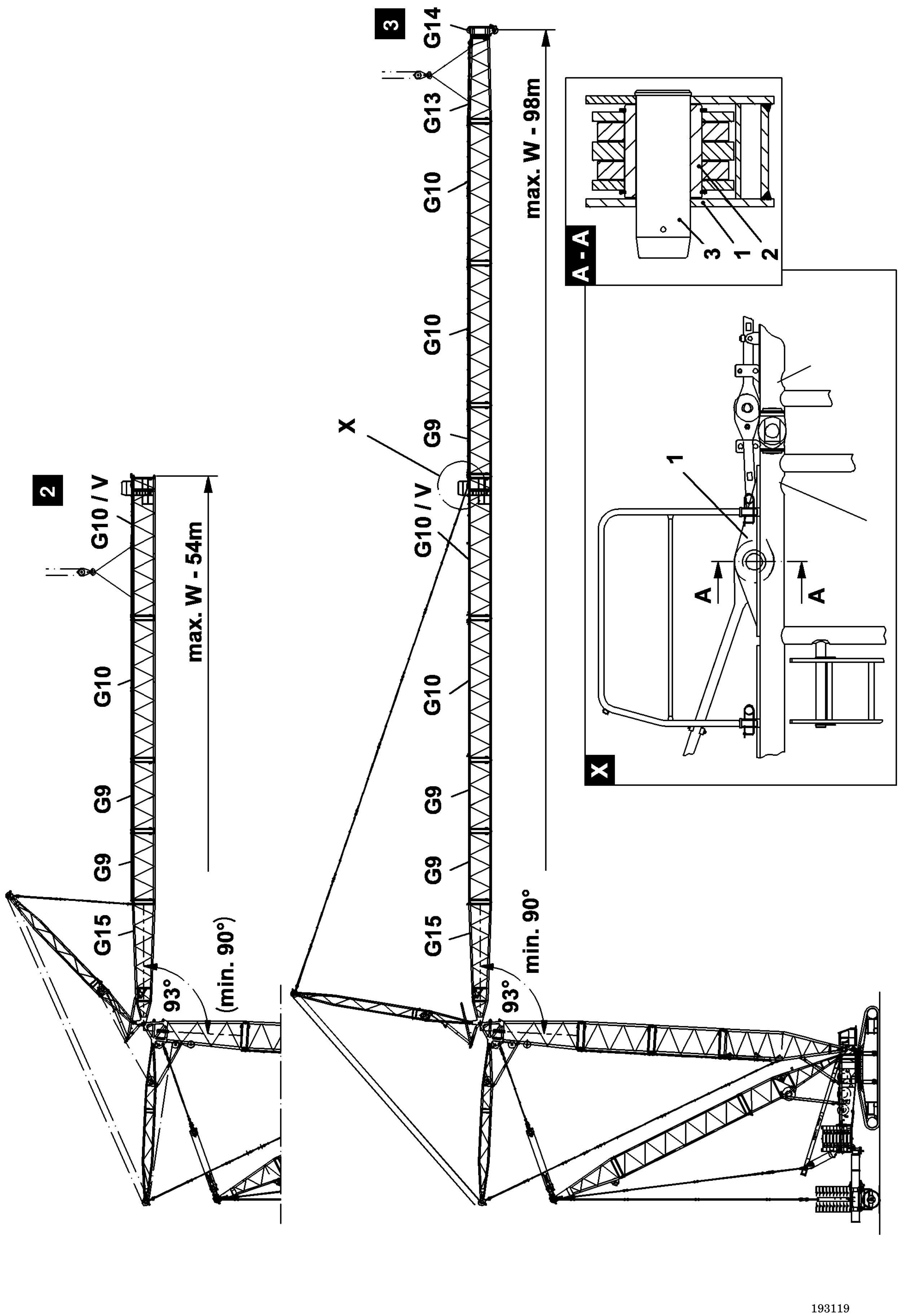
- The guy rods of the lattice sections must be pinned together, and then secured.

C A U T I O N : **For W - lattice jib sections to a length of 49 m, the corresponding additional guy rods must be installed. See chapter 5.03.**

Note: For the weight of the lattice sections with placed guy rods , see chapter 5.03

D A N G E R: **For flying W - lattice jib installation, observe the following:**
- **the max. permissible W - lattice jib lengths**
- **the data in the load charts**

If this is not observed, there is a danger of accidents!


2
G10 / V
G10
G9
G9
G15
max. W - 54m
93°
(min. 90°)
3
G14
G13
G10
G10
G9
G10 / V
G10
G9
G9
G15
max. W - 98m
93°
min. 90°
X
A - A
3
1
2
X
1
A
A

193119

6.3 Flying installation of the W - lattice jib on the intermediate section G10 / V

Montage

If the space requirements on the job site are limited for the installation of the W - lattice jib or is restricted due to nearby buildings, etc. then it is possible to install the W - lattice jib to the following **max. length** in flying mode:

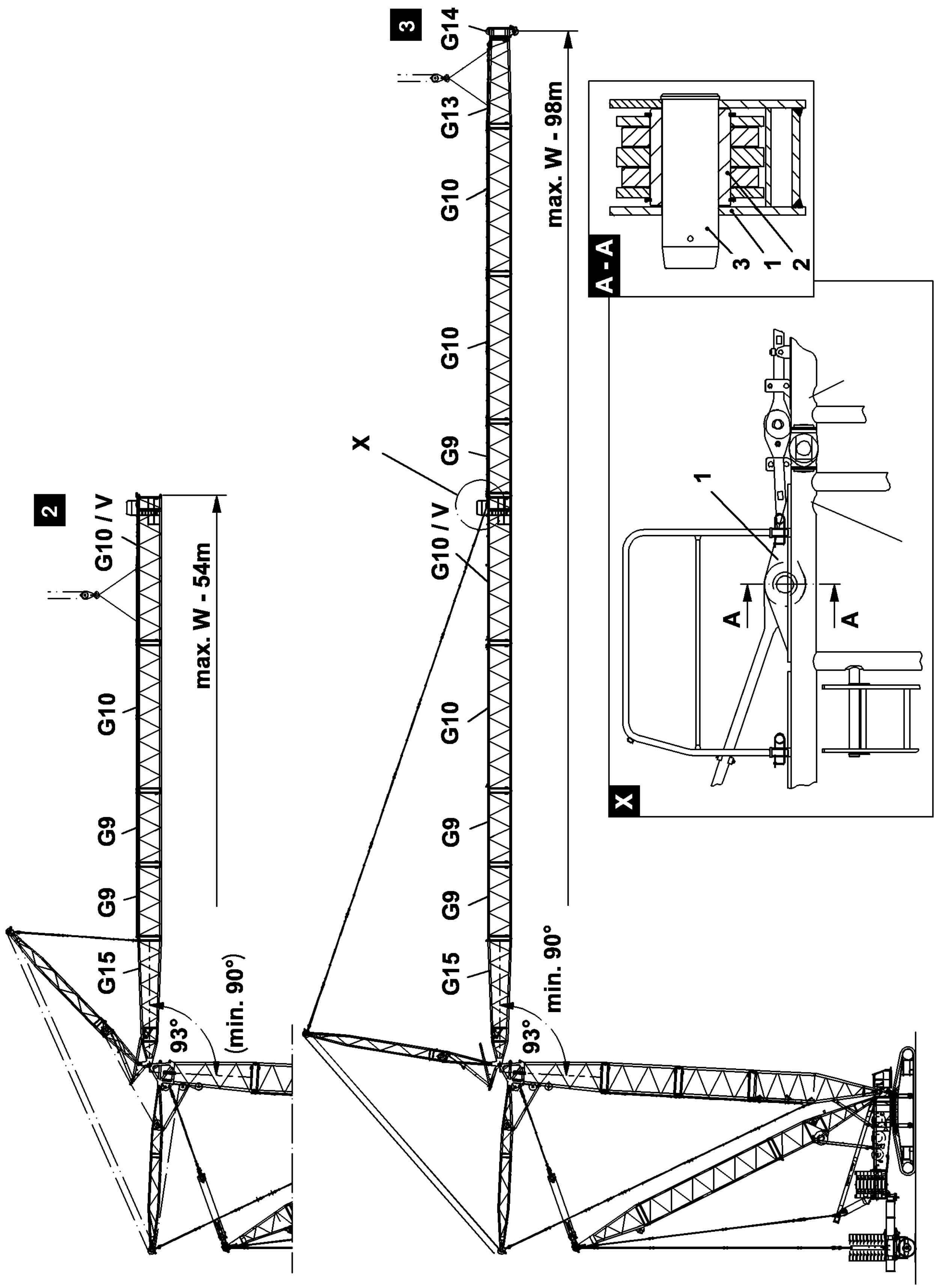
Fig. 2	**- max. 54 m**	**- without end section, without hook block**
		- with WA - bracket I guy rods
	- max. 98 m	**- with end section, without hook block**
		- with WA - bracket I and LI - guy rods

D A N G E R: Install the slewing platform ballast , the central ballast and the derrickballast according to the data in the load charts.
Otherwise there is a danger of accidents!

For flying installation , the W - pivot section must be at an angle of at least 90° to the main boom, otherwise the flying installation is not permitted.

D A N G E R : For flying installation of the W-lattice jib, the W- pivot section must be at an angle of at least 90° to the main boom.
If this is not observed, there is a danger of accidents!

- Lower the WA - bracket I with the W - control and pin and secure the guy rods (1) from the WA - bracket I on brackets (2) of the pivot section (G15) (fig. X, see 6.2).
- Swing the remaining W - intermediate sections to a max. length of 54 m, individually or fully assembled with the auxiliary crane to the W - pivot section , pin and secure (fig. 2)
- Attach the preassembled W - lattice jib on the front of the **reinforced** intermediate section (G10 / V) with the auxiliary crane and lift until the guy rods are relieved on the pivot section .Release and unpin the guy rods on the pivot section .
- Pin and secure the WA - bracket I guy rods with the guy rods of the intermediate section . The guy rods are connected on the bracket (1) (fig. X // A -A) with a hollow axle (2) and must be pinned and secured on the pin point of the brackets (1) with pins (3) (fig. A - A).
- Erect the WA - bracket I with the W - control until the guy rods are **"tensioned"** and the auxiliary crane is relieved. However, the W - lattice jib must remain in horizontal position.
- After the W - lattice jib is pinned, secured and tensioned, remove the auxiliary crane.
- Install the remaining intermediate sections and the end section individually or fully assembled with the auxiliary crane on the **reinforced** intermediate section (G 10 / V), pin and secure (fig. 3)
- The guy rods of the lattice sections must be pinned together, then secured.
- Attach the W - lattice jib on the front with the auxiliary crane until the guy rods between the WA - bracket I and the **reinforced** intermediate section (G10 / V) are relieved.
- Release and unpin the pin (3) on the brackets (1) (Abb. A - A) .
- Erect the WA - bracket I with the W - control to the point where the guy rods between the WA - bracket I and the L - end section are tensioned.


2
G10 / V
G10
G9
G9
G15
max. W - 54m
93°
(min. 90°)
3
G14
G13
G10
G10
G9
G10 / V
G10
G9
G9
G15
max. W - 98m
min. 90°
93°
X
A - A
3
1
2
1
A
A
X

193119

D A N G E R: **It is strictly prohibited for anyone to remain under the lattice sections during the pinning or unpinning procedure.**
There is a danger of accidents!

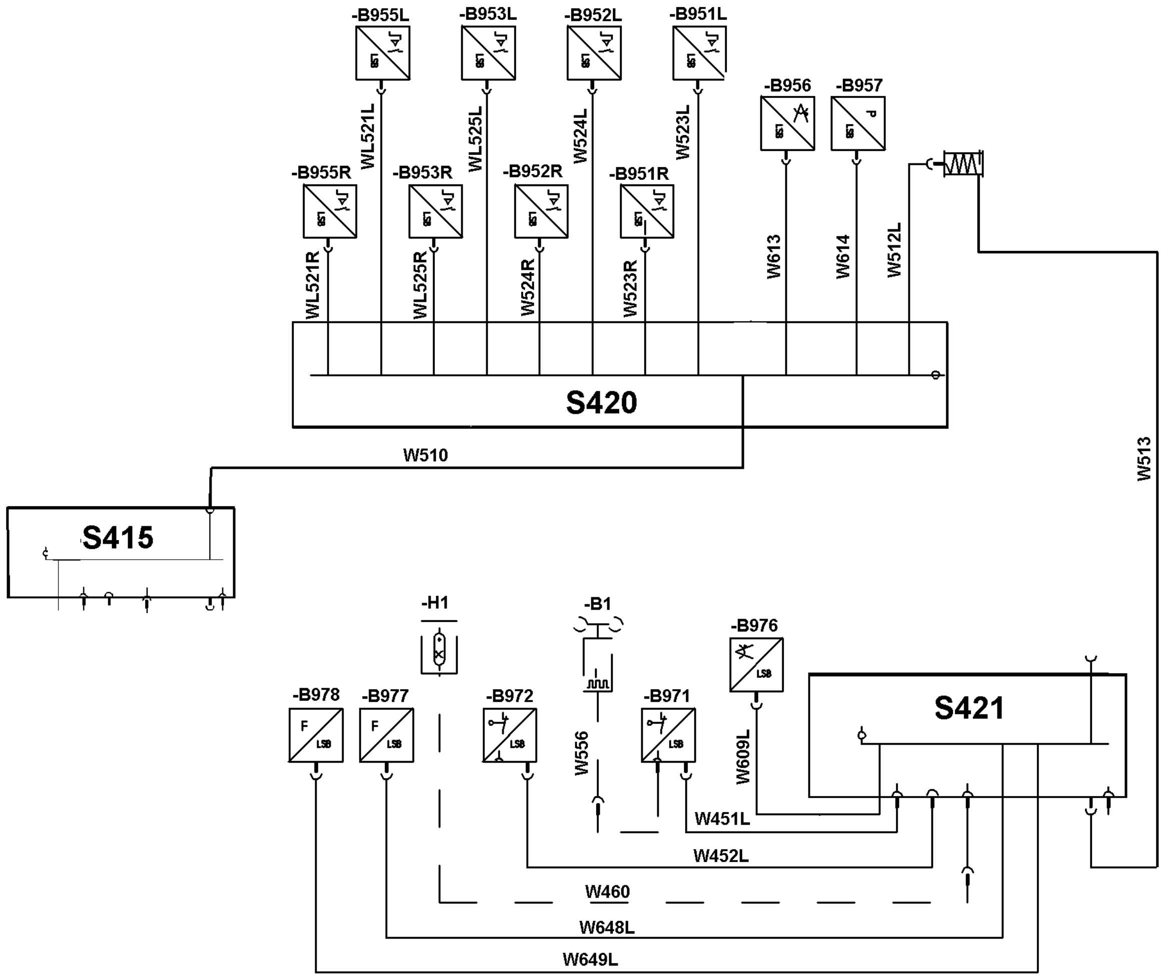
C A U T I O N: **For W - lattice jib length of up to 49 m, the corresponding, additional guy rods must be installed. See chapter 5.03.**

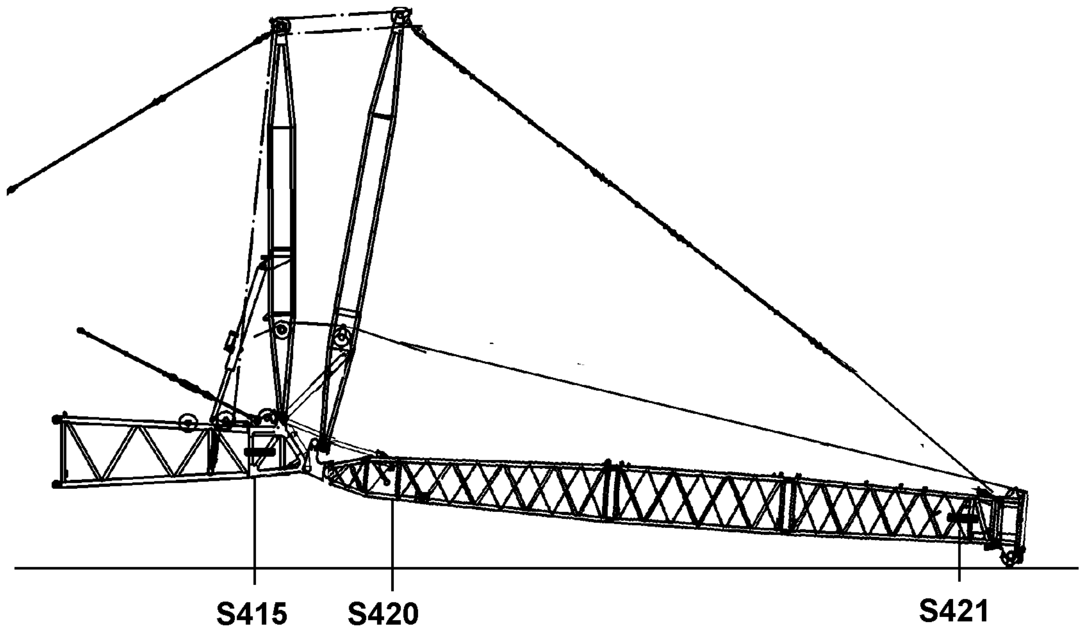
D A N G E R: **For flying W - lattice jib installation, observe the following:**
- **the max. permissible W - lattice jib lengths**
- **the data in the load charts**

If this is not observed, there is a danger of accidents!

Note: For the weight of the lattice sections with placed guy rods , see chapter 5.03

D A N G E R: **The completely installed W - lattice jib must be held with an auxiliary crane before the pin (3) may be unpinned on the brackets (1) .**
If this is not observed, there is a danger of accidents!


-B955L
-B953L
-B952L
-B951L
-B956
-B957
WL521L
WL525L
W524L
W523L
-B955R
-B953R
-B952R
-B951R
WL521R
WL525R
W524R
W523R
W613
W614
W512L
S420
W510
W513
S415
-H1
-B1
-B976
-B978
-B977
-B972
-B971
S421
W556
W609L
W451L
W452L
W460
W648L
W649L


S415
S420
S421

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7. Electrical connections

Establish the electrical connection from the connector box (S 415) to (S 420). Plug in the cable plug (W510) on the connector box (S415) .

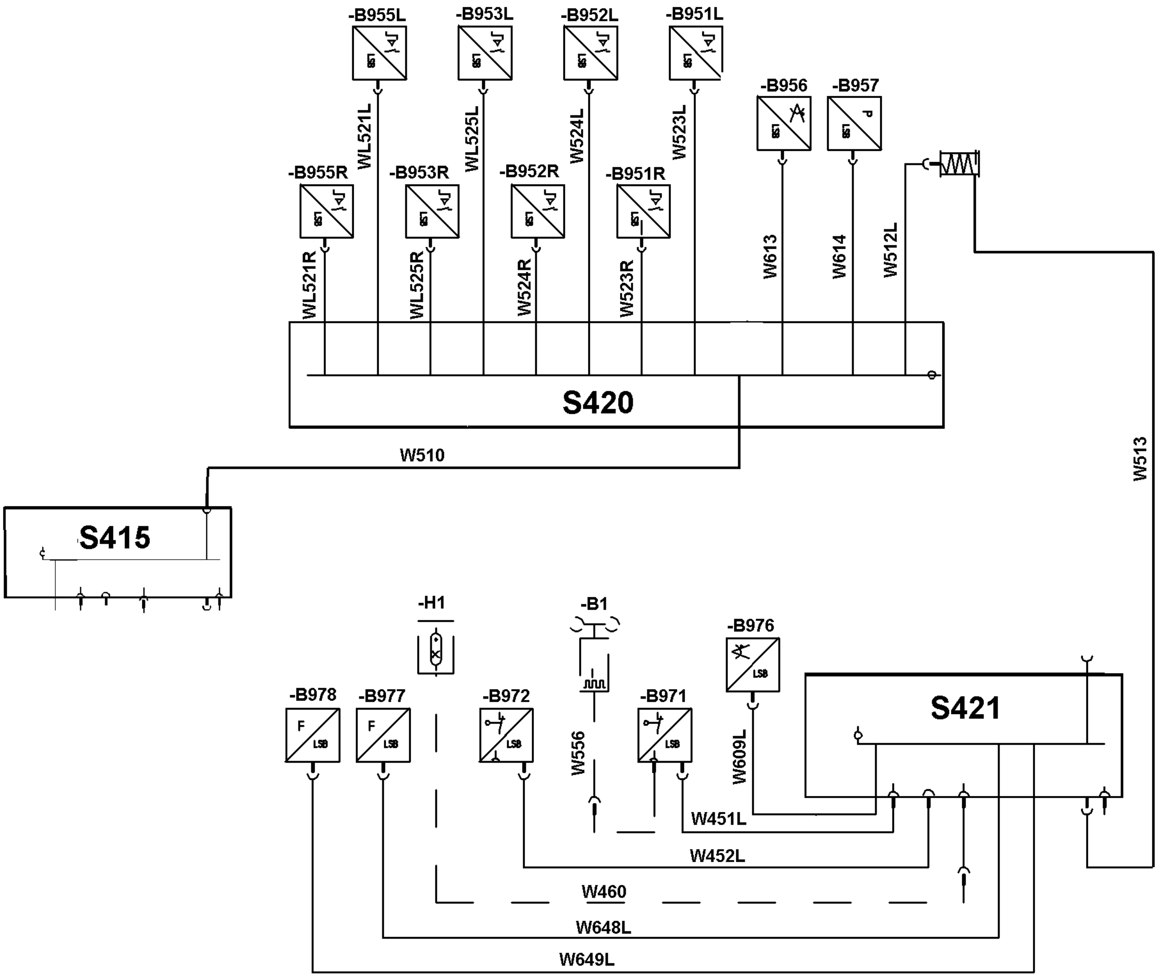
Establish the electrical connection from the cable drum in the W-pivot section, to the connector box (S421). Plug in the cable plug (W513) on the connector box (S421) .

Establish the electrical connection from the connector box (S420) to the cable drum . Plug in the cable plug (WL512) into the cable drum - socket.

Note: Establish the electrical connection from the connector box (S420) to the cable drum only when the cable from the cable drum is spooled out to the connector box (S421) .

Establish the electrical connection on the **connector box (S421) :**

-S971	W451L	Hoist limit switch 2A
-S972	W452L	Hoist limit switch 2B
-H1	W460	Beacon
-B977	W648L	Pull test bracket 2B right
-B978	W649L	Pull test bracket 2A left
-B976	W609L	Angle sensor, luffing jib top


-B955L
-B953L
-B952L
-B951L
-B956
-B957
-B955R
-B953R
-B952R
-B951R
WL521L
WL525L
W524L
W523L
WL521R
WL525R
W524R
W523R
W613
W614
W512L
S420
W510
S415
W513
-H1
-B1
-B976
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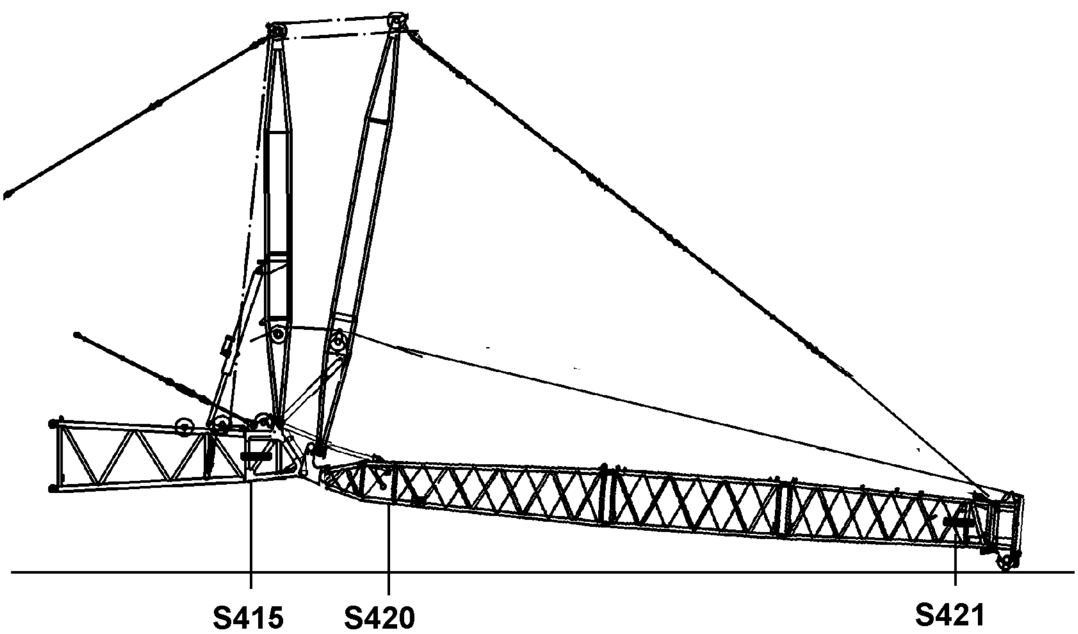
W460
W648L
W649L


S415
S420
S421

192530

7.1 Function check

Prerequisites:
- All electrical connections are established.
- The engine is running.

Airplane warning light
Turn on the airplace warning light , check function visually.

Wind speed sensor
Check the movement and function of the wind speed sensor.

Limit switch

CAUTION: **The limit switch functions must be checked individually before crane operation.**
The manual procedure is described below.
The function of the individual limit switch initiators must be determined in the test system - see chapter 7.10 Diagnostics, paragraph 3.

Hoist limit switch
Actuate the hoist limit switch manually.
The hoist winch must turn off when lifting.
The hoist ”top” symbol on the LICCON indicator must blink.

Limit switch **W - lattice jib ”top”, relapse cylinder**
The W - control winch movement **"spool up"** must turn off.
The symbol must appear on the LICCON monitor .

Limit switch **W - lattice jib ”low”, relapse cylinder**
The W - control winch movement **"spool out"** must turn off.
The symbol must appear on the LICCON monitor .

Note: The shift point of the limit switches on the relapse cylinder must be checked before erection - **see chapter 8.12, Checking the safety controls on the relapse cylinder.**

Limit switch flamp in position and lattice jib , ”steepest ” position, mechanical relapse support
-Cover the limit switch initiators individually with a metal plate.
-The W- control winch movement **”spool up”** must turn off.
-The symbol must appear on the LICCON monitor .

CAUTION: **Before erection, the easy movement of the pendulum of the mechanical relapse retainer must be checked over the complete swing range of the pendulum. If this is not observed, the mechanical relapse support will not engage in steepest lattice jib position.**
There is a danger of accidents, as the lattice jib may tip backward!

8. Erection / take down procedure

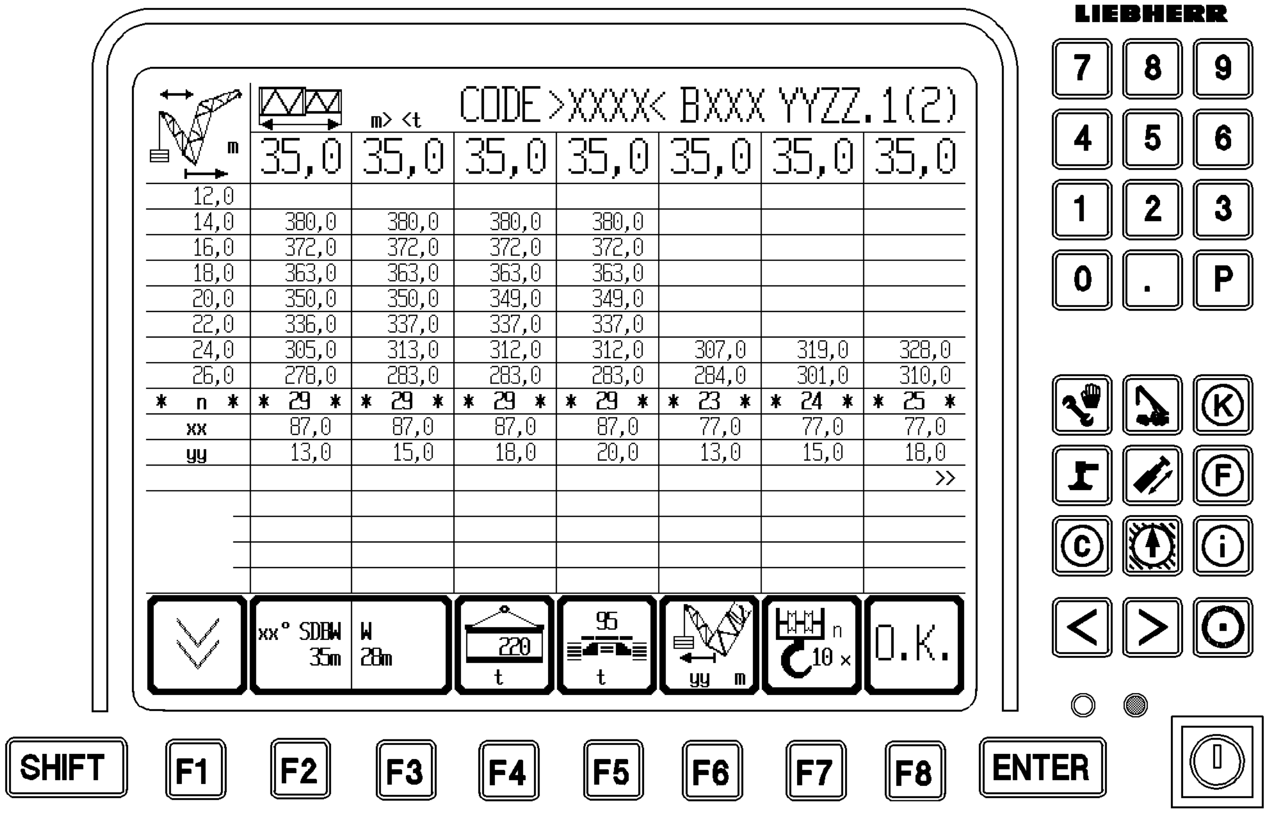
The boom combinations must be erected or taken down according to the Erection and take down charts - see separate charts.

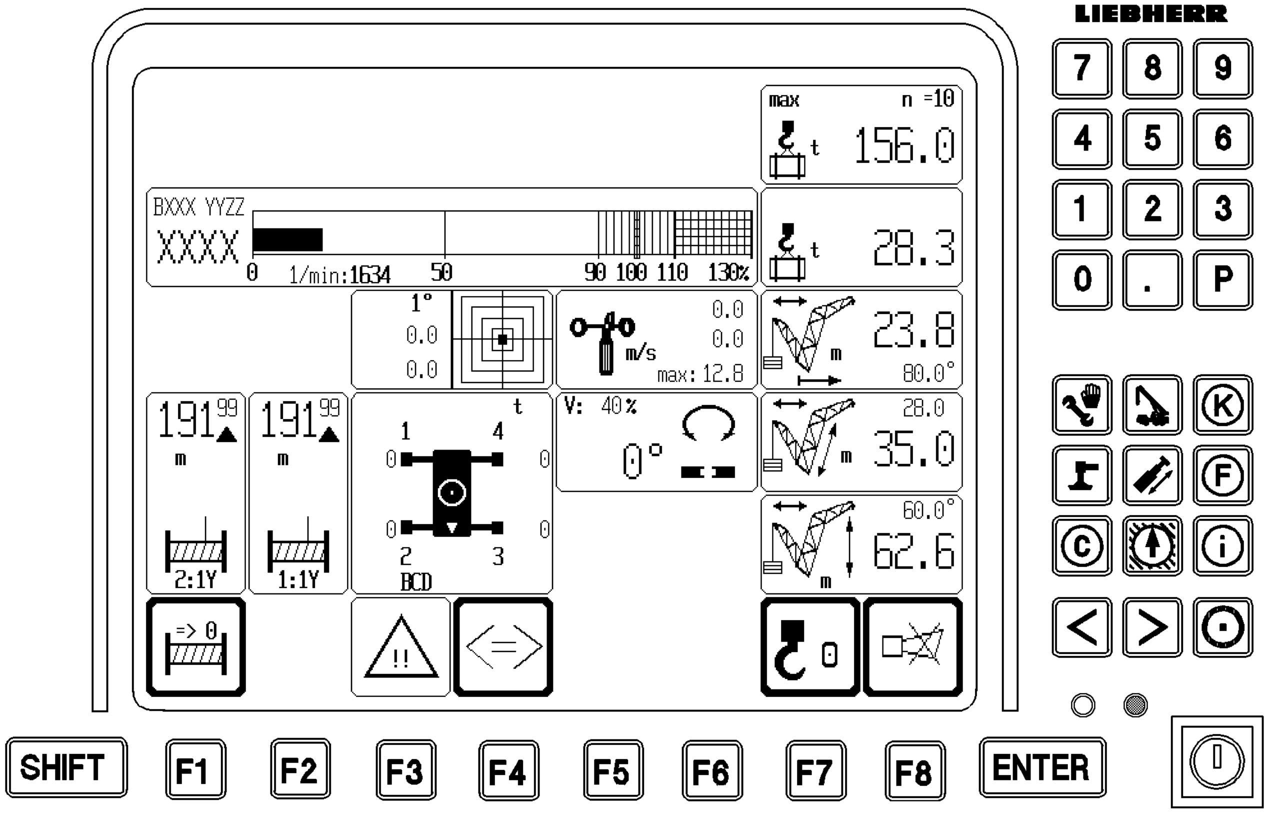
D A N G E R : **The erection and take down procedure must be made according to the data in the erection and take down chart.**
If this is not observed, the crane can be overloaded or topple over.

Prerequisites:

- The crane is horizontally aligned.
- The counterweight is installed on the slewing platform according to the load chart .
- The derrick ballast is placed according to the erection and take down charts.
- The lattice jib is installed according to the load chart and the operating manual .
- All limit switches are installed correctly and fully functioning.
- Before erection, the pendulum of the mechanical relapse retainer must be checked for easy movement over its complete swing range.
- All pin connections are secured.
- The hoist cable is placed correctly into the cable pulleys and secured with cable retaining pins to prevent them from jumping out.
- There are no persons within the danger zone.
- There are no loose parts on the boom and the lattice jib.
- In the cold season: Is the boom and the lattice jib and their components (limit switch, cable drum, airplane warning light, wind speed sensor, etc.) free of snow and ice.

D A N G E R : **Incorrectly installed and non-functioning limit switches as well as falling parts (pins, spring retainers, ice, etc.) can cause accidents!**
Before erection, the pendulum of the mechanical relapse retainer must be checked for easy movement over its complete swing range. If this is not observed, the mechanical relapse support does not engage in steep lattice jib position.
There is a danger of accidents, the lattice jib may tip backward!


LIEBHERR
m> <t
CODE >XXXX< BXXX YYZZ.1(2)
m
35,0 35,0 35,0 35,0 35,0 35,0 35,0
12,0
14,0 380,0 380,0 380,0 380,0
16,0 372,0 372,0 372,0 372,0
18,0 363,0 363,0 363,0 363,0
20,0 350,0 350,0 349,0 349,0
22,0 336,0 337,0 337,0 337,0
24,0 305,0 313,0 312,0 312,0 307,0 319,0 328,0
26,0 278,0 283,0 283,0 283,0 284,0 301,0 310,0
* n * * 29 * * 29 * * 29 * * 29 * * 23 * * 24 * * 25 *
xx 87,0 87,0 87,0 87,0 77,0 77,0 77,0
yy 13,0 15,0 18,0 20,0 13,0 15,0 18,0
>>
xx° SDBW 35m
W 28m
220 t
95 t
yy m
n 10 x
O.K.
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR
max n =10
t 156.0
t 28.3
BXXX YYZZ
XXXX
0 1/min:1634 50 90 100 110 130%
1°
0.0
0.0
0.0
0.0
m/s
max: 12.8
m 23.8
80.0°
191 99
m
2:1Y
1:1Y
t
1 4
0 0
0 0
2 3
BCD
V: 40%
0°
28.0°
m 35.0
60.0°
62.6
m
=> 0
!!
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

190979

8.1 Erection procedure

Prerequisite:
- Set the LICCON overload safety system according to the data given in the load charts and the equipement 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.
- Attach the hoist cable on the end section .

C AU 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.

Adjust in the EQUIPMENT CONFIGURATION VIEW of the LICCON (see chapter 4.02)
Enter the (4-digit) code number, according to the required load chart, and confirm by pressing the ENTER key.
Enter the actual reeving.
Check the actual equipment configuration of the crane with the entered data to ensure it matches.
Press the function key -F8- ”o.k.”, the OPERATING VIEW will appear.

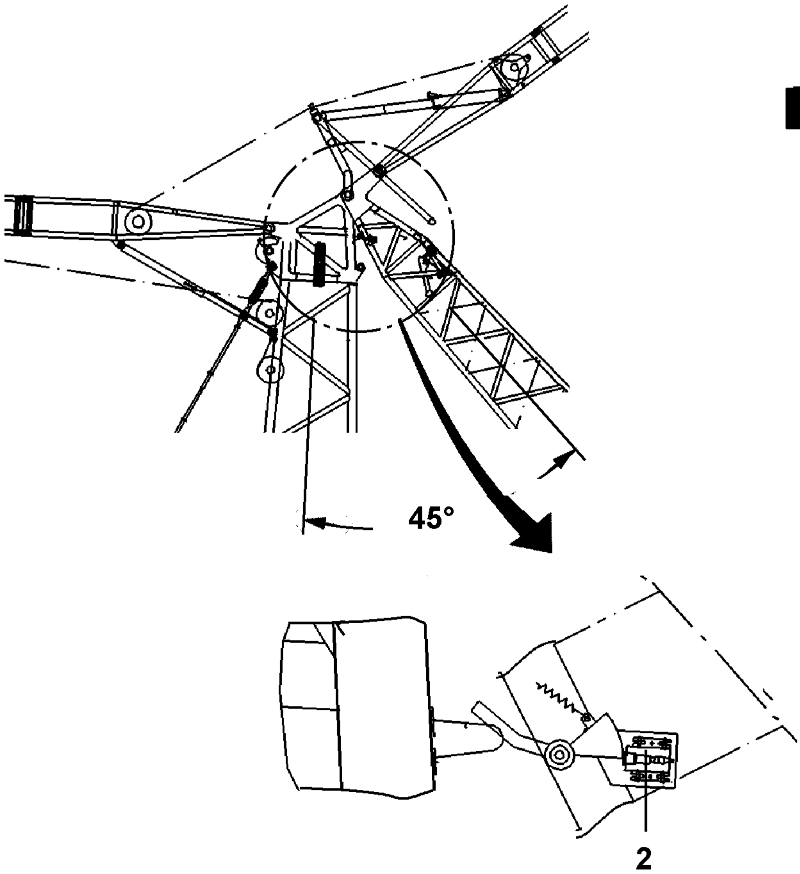
D A NG E R : **Compare and check the LICCON settings with the actual equipment configuration!**
If this is not observed, the crane will be overloaded or topple over!

Indicators 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:
- ”STOP”
- ”HORN” + Acoustical signal

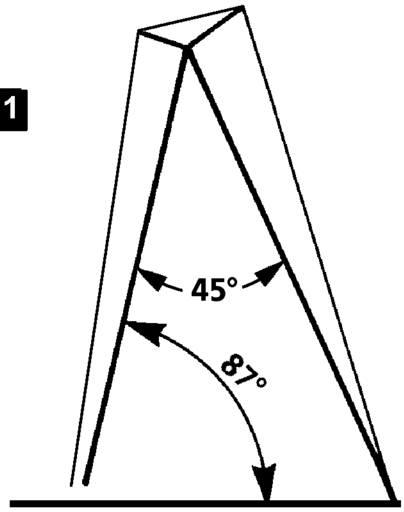
Note: The **lowest** operating position is reached when the indicators turn off and a load value (in tons - t -) appears in the symbol ”MAX. LAST” instead of the question marks ("? ? ? ?") .

Turn off the installation keyed button by pressing the button .
The installation symbol on the LICCON indicator turns off.

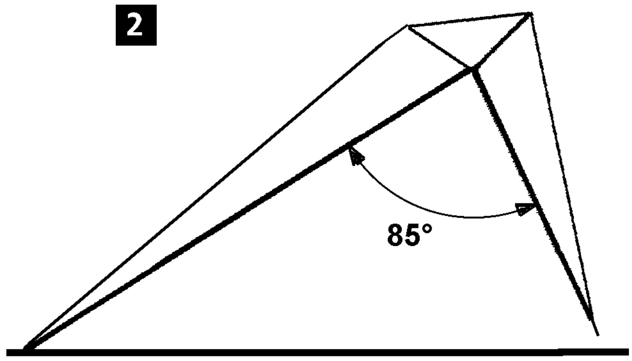
D A N G E R: **After the lowest operating position is reached, the installation keyed button must be turned off immediately.**
The installation keyed button bypasses the safety devices!
The radii given in the load chart may not be exceeded nor fallen below, even without a load on the hook!
If this is not observed, the crane can topple over!

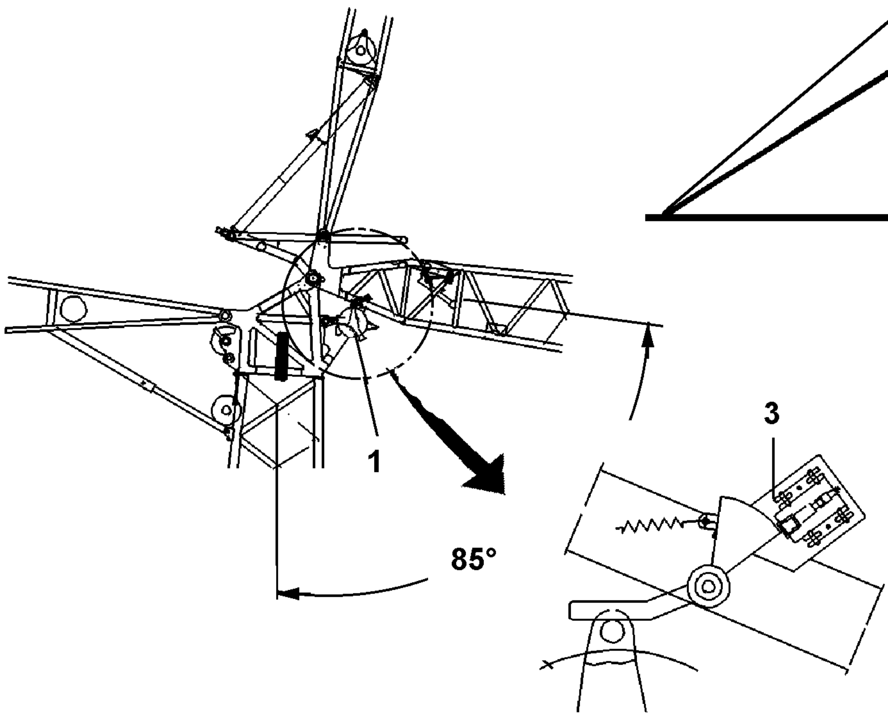


1



2





191766

8.2 Erection

Actuate the manual control lever and luff up the boom.
At the same time, spool out the lattice jib control winch to hold the W-end section, which is laying on the pulley cart on the ground.
The maximum forces in the W- guying **(only SW attachment)** may not be exceeded.

Note: For maximum forces in the W- guying **(only SW attachment) - see Erection and take down chart manual!**

D A N G E R : **When erecting the SW attachment, the maximum permissible forces in the W- guying (test point 2) may not be exceeded - see Erection and take down chart manual!**
Lower the W- lattice jib control in such a way that the maximum forces are not exceeded.
Watch for slack cable formation on the control winch !
If this is not observed, the crane will be overloaded or the crane can topple over!

Carry out this procedure until the S-boom and the W- lattice jib form an angle of (45° or 85°) or the W- end section has first lifted off the ground .

Note: **Fig. 1 ≥ 45°** without pulley assembly (1) on S- end section, limit switch (2)
Fig. 2 ≥ 85° with bolted on pulley assembly (1) on S-end section, limit switch (3)

Remove the pulley cart on the W- end section .

Now luff up the boom and lift the W- lattice jib off the ground.

Release the hoist cable on the end section and reeve between the pulley head on the end section and the hook block and secure on the fixed point - **see Reeving plans**.

Attach the hoist limit switch weight .

Luff up the boom into the steepest position of 87° .

C AU T I O N: **When erecting, the hoist winch must be spooled out at the same time to prevent the hook block from colliding with the end section of the lattice jib.**

Luff up the lattice jib to operating position.
Turn the installation keyed button off. The installation symbol on the LICCON indicator turns off.

D A N G E R: **After reaching the operating position, the installation keyed button must be turned off immediately.**
The installation keyed button bypasses the 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 topple over!

9. Crane operation with SW/SDW/SDWBW - boom system

C AU T I O N: Observe the notes in
chapter 4.02 " LICCON COMPUTER SYSTEM",
chapter 4.05 " CRANE OPERATION "
chapter 4.08 " WORKING WITH A LOAD ".

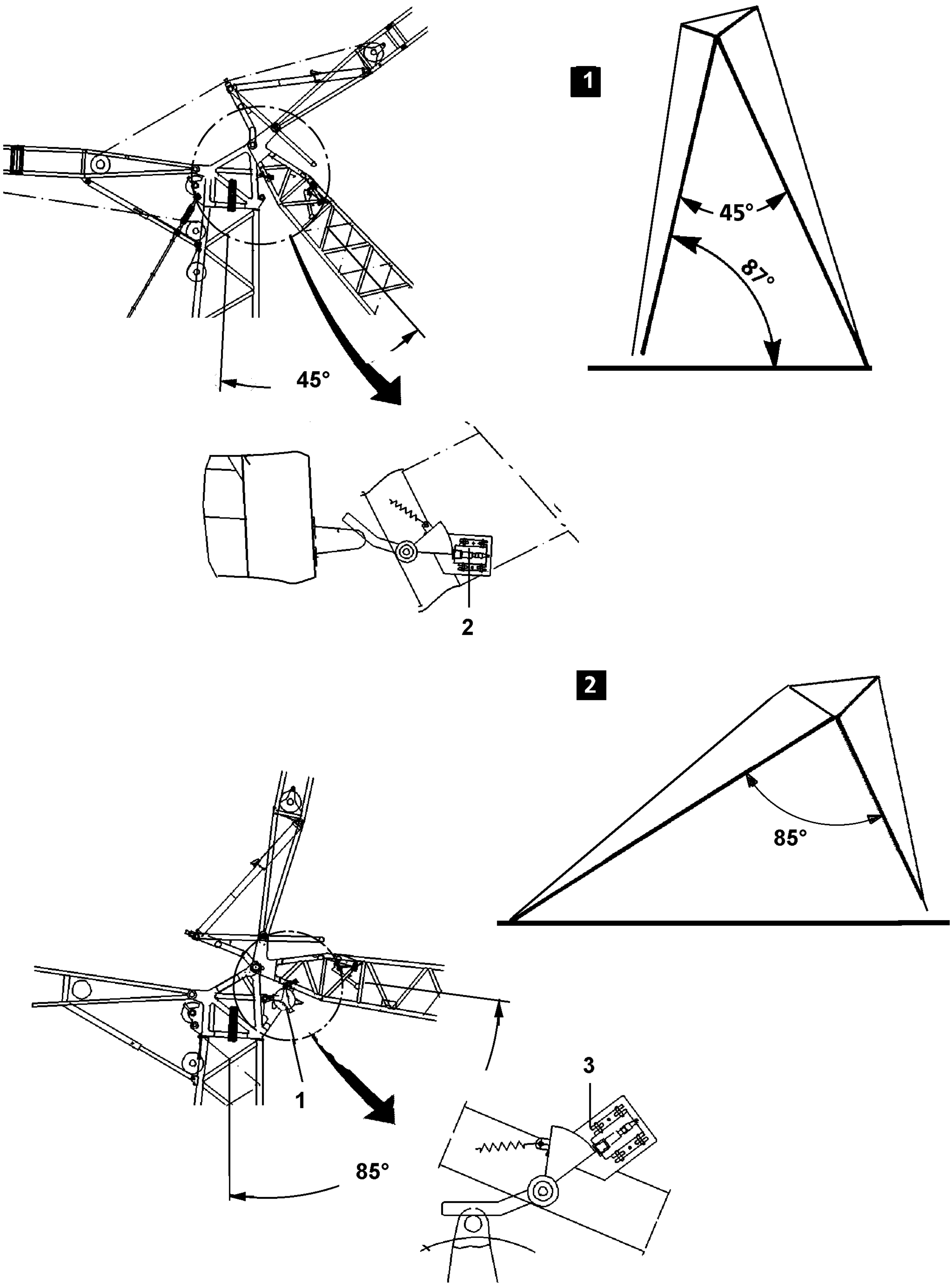
Prerequisite:
- The LICCON overload safety system is set according to the data given in the load chart.
- The installation keyed button is turned off . The installation symbol on the LICCON indicator is off.

D A N G E R: Check the horizontal position of the crane before and during operation. If the crane operator leaves the crane operator's cab, even if only for a short time, then he is obligated to check all operating mode settings and to reset them, if necessary, before starting to work again.

Adjustments / checks
Check the function of the overload safety system by triggering the operating positions "on the top" and "on the bottom".
Check the function of the hoist limit switch "top" by running against the hoist limit switch weight.
Check the function of the limit switch "lattice jib steep" by running against the relapse retainer.

Set the boom to 67° or 77°
Before changing the boom to 67° or 77° , the boom must be raised to the steepest position of 87° and the lattice jib must also be in steepest operating position.

D A N G E R: When changing to 67° or in SDWB - operation, the suspended ballast might already be necessary, even without a load on the hook.



191766

10. Take down procedure

The boom remains in steepest position , 87°.
Actuate the manual control lever and luff down the lattice jib to just before the **lowest** operating position.

Note: When the **lowest** operating position is reached, the luffing down movement is shut off.

C AU T I O N: When luffing down, the hoist winch must be spooled out at the same time to prevent the hook block from colliding with the pulley head.

Actuate the installation keyed button. 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.

Continue to luff down the W- lattice jib until an angle of approx. 45° or 85° is reached between the S-boom and the W- lattice jib. The shut off is made via the limit switch ”W- lattice jib bottom”.
The limit switch symbol on the LICCON indicator blinks.

C AU T I O N: When luffing down the lattice jib, make sure that the hook block does not collide with the end section !
The hook block may not be pulled along the ground.

Luff down the S-boom until the hook block touches the ground.
Remove the hoist limit switch weight .
Unreeve the hook block.

D A N G E R : When unreeving the hoist cable, make sure that no persons are in the danger zone.

Luff down the S-boom until the W-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 .

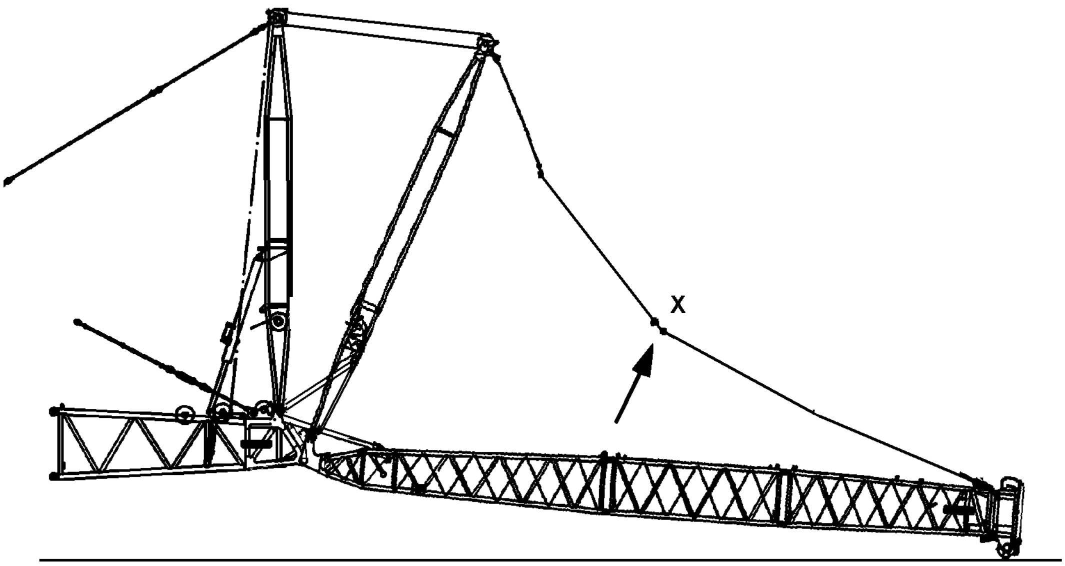
Continue to luff down the S-boom.

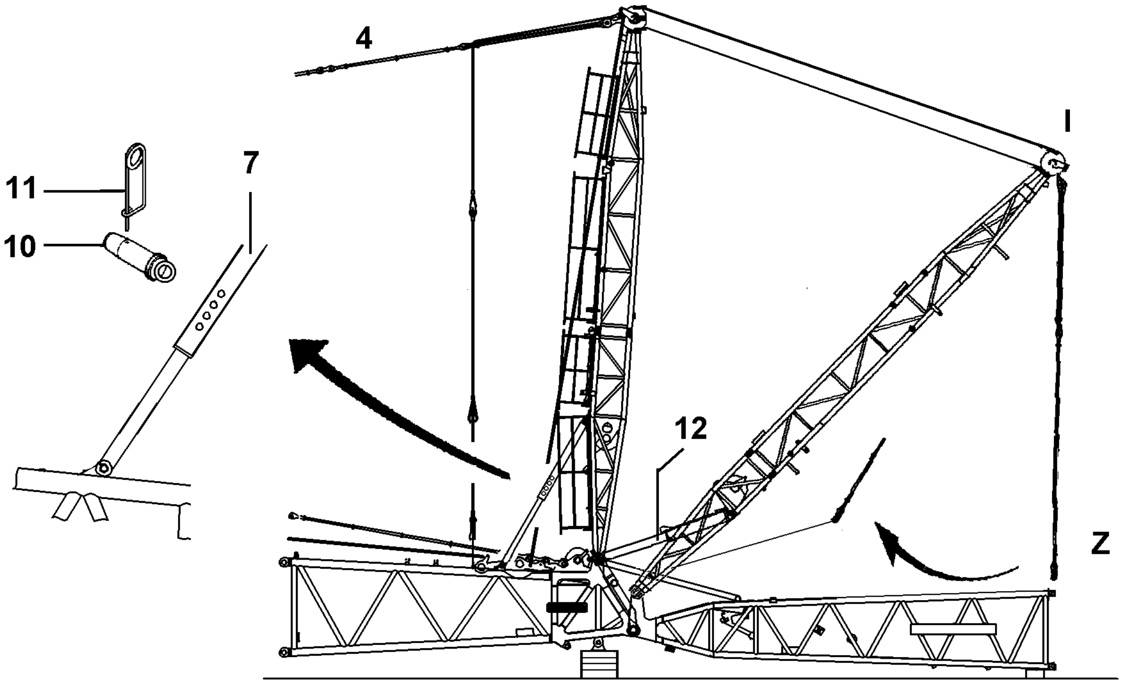
Note: For maximum forces in the W-guying **(only SW attachment) - see Erection and take down manual!**

D A N G E R : When erecting the SW attachment, the maximum permissible forces in the W-guying (test point 2) may not be exceeded - see Erection and take down manual!
Lower the W-lattice jib control in such a way that the maximum forces are not exceeded.
Make sure to watch for slack cable formation on the control winch!
If this is not observed, the crane will be overloaded or can topple over!

Remove the hoist cable.

D A N G E R: When removing the hoist cable, make sure that there are no persons within the danger zone!





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10.1 Place down the WA- bracket I + II

Spool back the hoist cable via the cable pulleys in the WA- brackets to the S- head section.

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 S- head section .**
Make sure that no persons are within the danger zone.
This could cause a serious accident!

Spool out the W- control winch,lower the WA- bracket I to the front. Unpin the guy rods on the connector brackets.

Note: The guy rods are placed for transport on the intermediate sections and secured with transport retainers.

Disconnect the guy rods on the connector bracket (X) . Unplug the spring retainers and pins. Pin the guy rod from the WA-bracket I on the bracket (Z) on the W- pivot section with pins and secure with spring retainers.

Pull the WA- bracket I up again until the guy rods are stretched between the WA-bracket I and the W- pivot section.

D A N G E R: **The W - end section may not be raised, it must remain on the ground.**
If this is not observed, severe damage can occur.

Unpin the W- pivot section **”on the bottom”** . Release the pin and unpin .

Lower the W- pivot section until it rests on the ground.

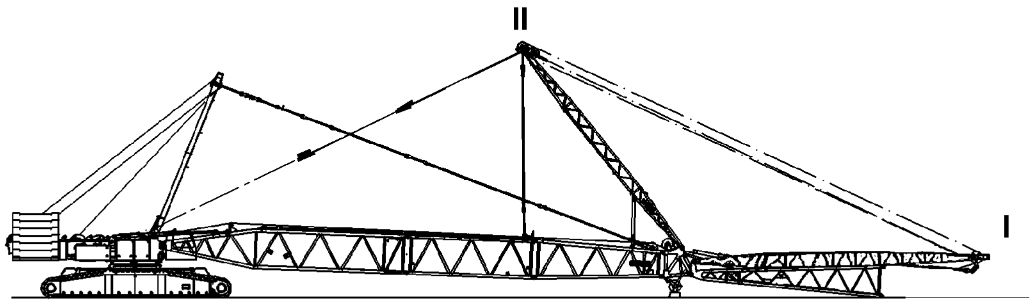
Unpin the W- pivot section **”on top”**. Release the pin and unpin .

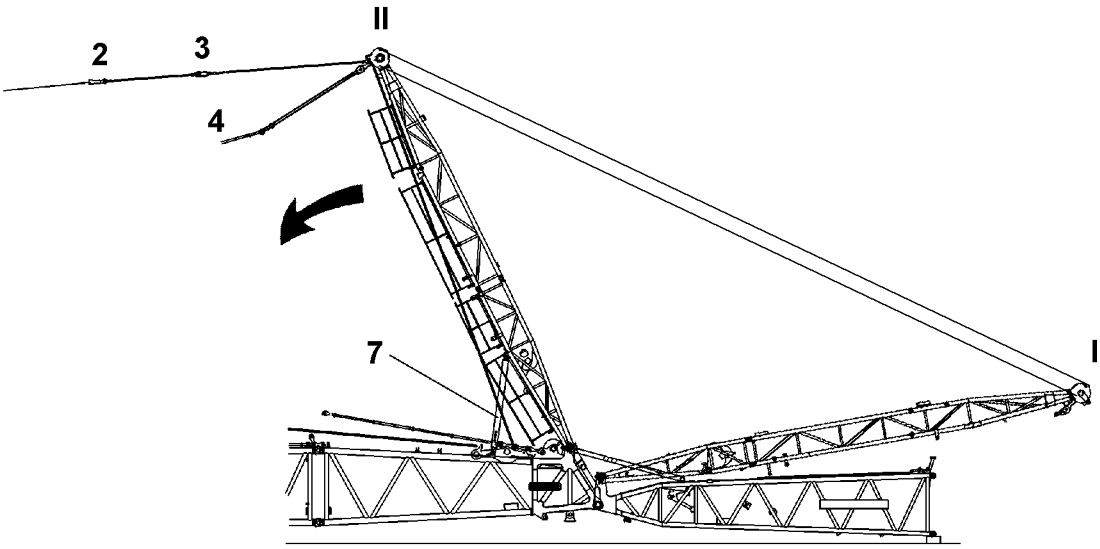
Remove the lattice jib.

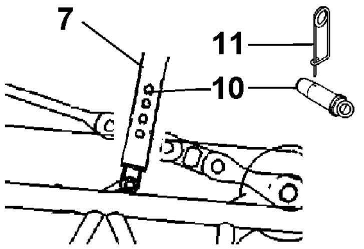
D A N G E R : **Before unpinning, it must be ensured that the pivot section on the bracket (Z) is pinned and held by the guy rods, or that it is supported from below with suitable, stable material.**
No one may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections . This is strictly prohibited!
If this is not observed, there is a danger of accicents, as the lattice jib may suddenly fold down.

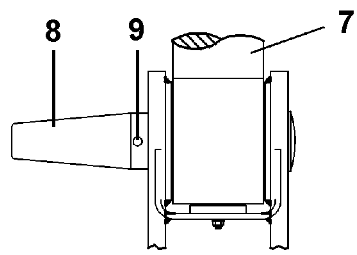
Spool up the W- control winch (V) and pull up the WA- bracket I until the guying from the WA-bracket II to the zum S-pivot section is tensioned by counterpressure of the relapse cylinder (12). The relapse support (7) can now be unpinned. Remove the spring retainer (11) and pin (10).

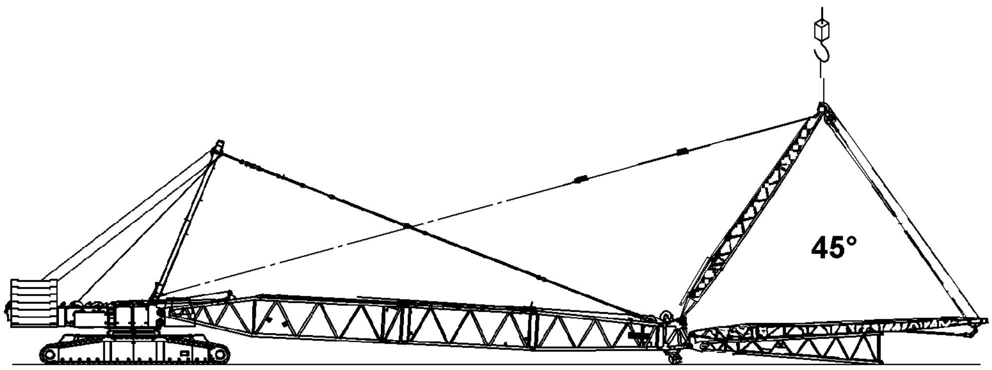
C AU T I O N: **When pulling up, the limit switch on the W- relapse cylinder (12) can be actuated and the spooling up movement of the winch V can shut off, which prevents pulling to block .**
The electrical connection to the limit switchs on the W- relapse cylinder must be established.











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10.2 Place down the WA-bracket II

Lower the WA - bracket I until it is placed on the W- pivot section .

Attach the hoist cable of winch I/II into the cable lock (2) on the installation cable (3) .

Pull the WA- bracket II to the rear by spooling up the hoist winch and simultaneously spooling out the W-control winch and unpinn the guy rods from the WA- bracket II to the S-pivot section .

Place the guy rods on the lattice sections and secure.

C AU T I O N: Before pulling the WA-bracket II back , the pin (10) must be unpinned, otherwise it will be damaged when pulling the WA - brackets II back.

Repin the pin (10) while it is pushed together .

Unpin the WA-relapse support (7) on the S- end section. Remove the pin (10) and spring retainer (11) .

Pull the WA- bracket II to the front by spooling out the hoist winch and simulteneously spooling up the W- control winch to vertical position and on to approx. 45° .

From approx. 45°, attach the auxiliary crane on the installation cable (1) .

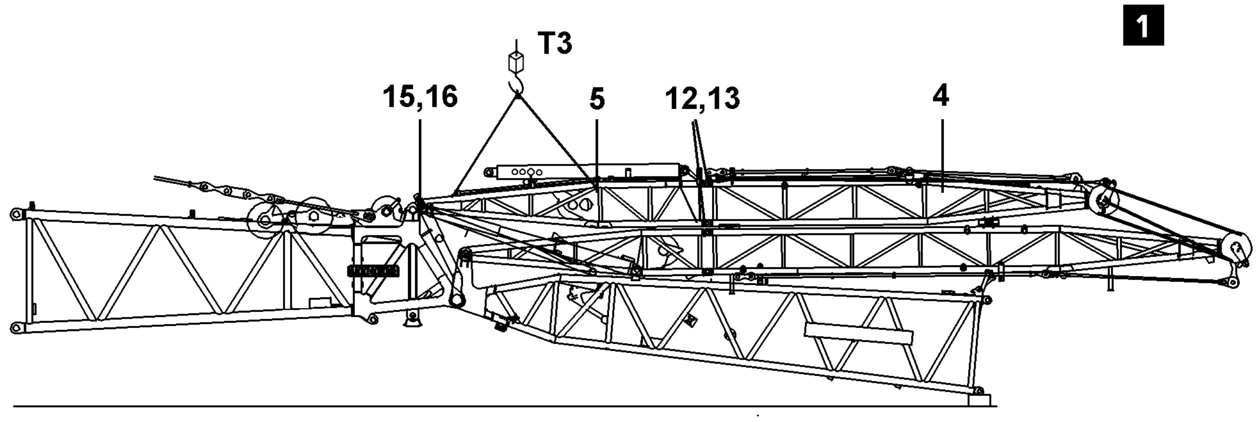
Lower the WA- bracket II by spooling up the W- control and and simultaneously spooling out the hoist cable until it is laying on the WA- bracket I .

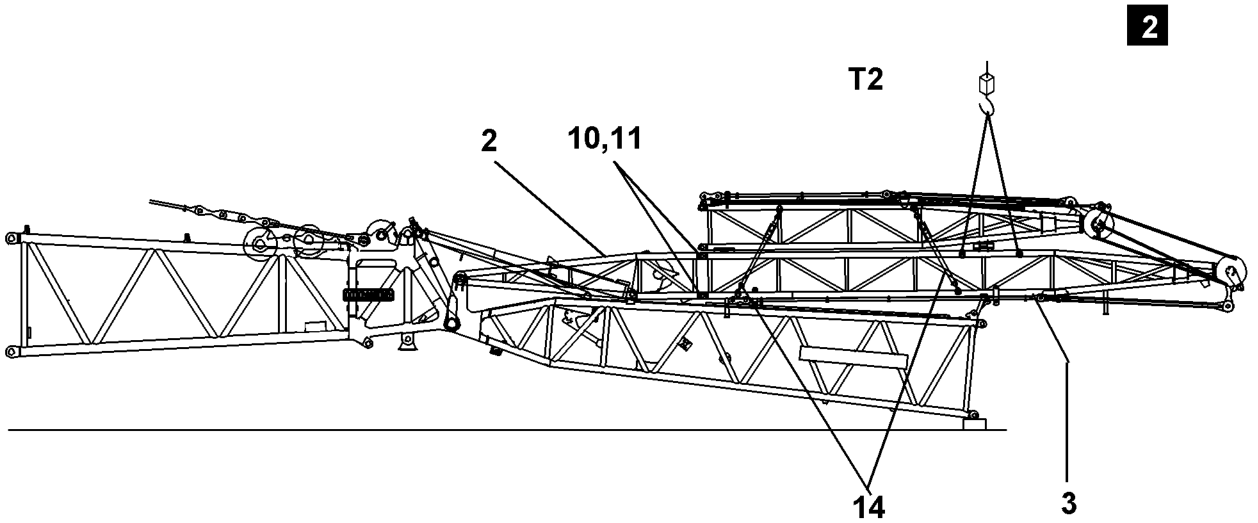
**D A N G E R: From approx. 45° to the horizontal to the front, the WA- bracket II must be heldwith the auxiliary crane and continue to lower it with the crane.
Otherwise the WA-bracket II will fold downward.
There is a danger of accidents.**

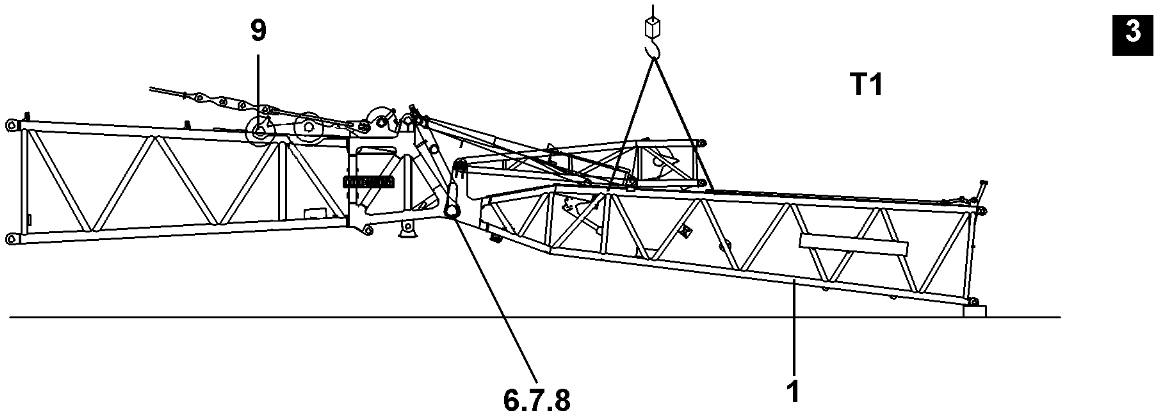
Detach the hoist cable on the cable lock (2) of the installation cable (3) and attach the installation cable on the WA-bracket II.

Detach the installation cable (1) on the auxiliary crane and attach on the WA-bracket II .

Unreeve the control cable and reeve in the auxiliary cable for the reeving at the same time.







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11. Removal

Note: Removal is in reverse order than installation.

D A N G E R: **For installation and removal work:**

- **A safe installation scaffolding / working platform must be used. There is a danger of accidents due to falling.**
- **Improvisations are prohibited.**
- **The lattice sections must be supported underneath with suitable, stable materials.**
- **Nobody may remain under the lattice jib during the pinning and unpinning procedure of the lattice sections.**

Fig. 1 Installation Transport unit 3 (T 3)

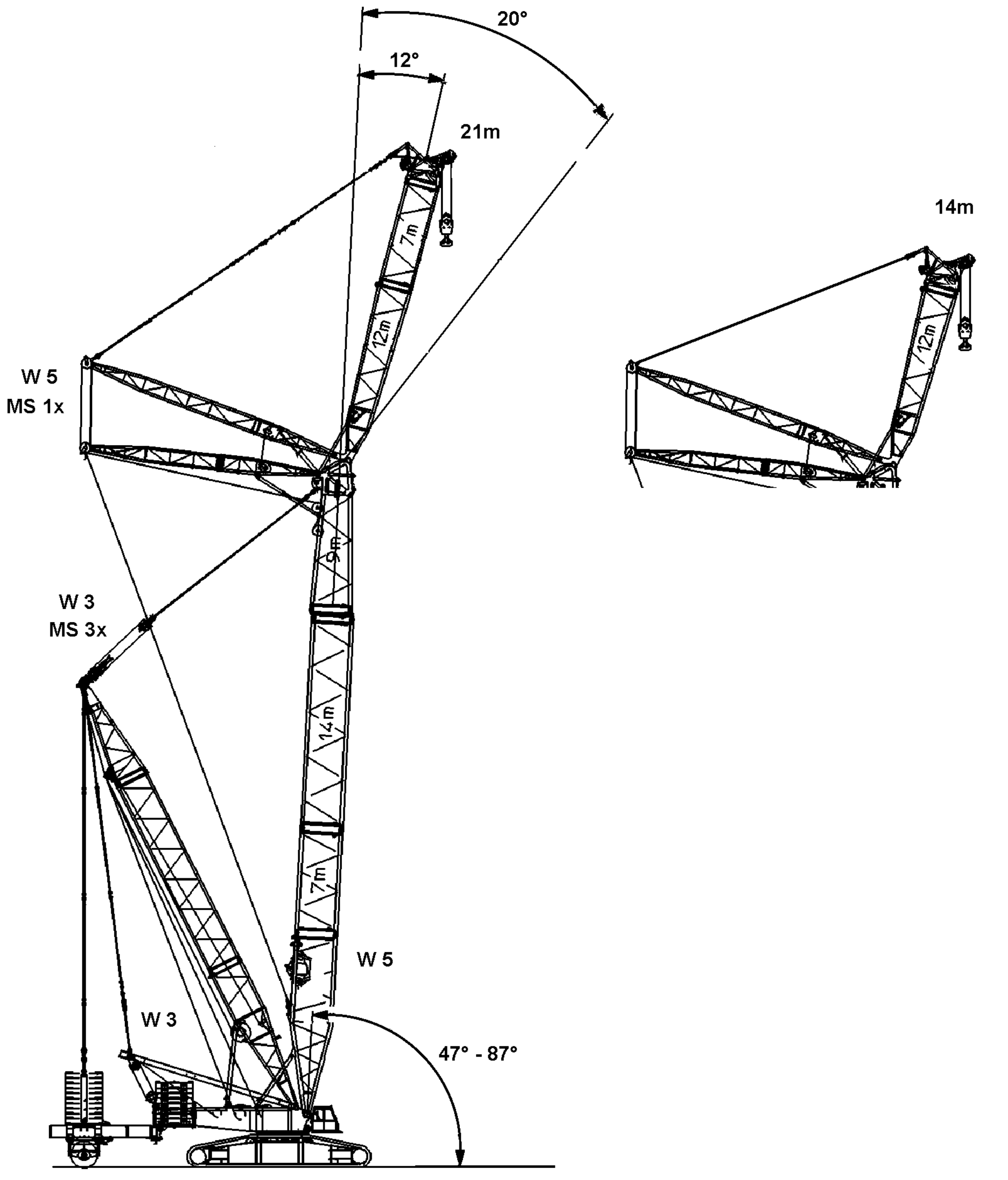
Take on the transport unit 3 (T 3) with the auxiliary crane on the tackle points on the WA-bracket II- pivot section (5) .
Attach the rigging belts (14) .
Unpin the WA-bracket II- pivot section (5) on the WA-bracket II end section (4) . Unpin the connector pins (15) with the hydraulic pin pulling device.
Unpin the connector pins (12), on top and bottom with the hydraulic pin pulling device.

Fig. 2 Installation Transport unit 2 (T 2)

Take on the transport unit 2 (T 2) with the auxiliary crane on the tackle points on the WA-bracket I- end section (3) .
Unpin the transport unit 2 on the WA-bracket I pivot section (2) .
Unpin the connector pins (10), on top and bottom with the hydraulic pin pulling device.

Fig. 3 Installation Transport unit 1 (T 1)

Take on the transport unit 1 (T 1) with the auxiliary crane on the tackle points on the W- pivot section (1).
Unpin the transport unit 1 - hanging down on the front - on the S-end section .
Unpin the connector pins (6) with the hydraulic pin pulling device. Remove the retaining plate (7) and spring retainer (8)
Unpin the pulley assembly (9) .



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Description
The 14 m or the 21m long WV - lattice jib can be adjusted over a range of 12° bis 20° to the S- boom .

D A N G E R: The position of the WV - lattice jib may only be changed if the S- boom is between 87° and 47° , so that the function of the W- relapse retainer remains!

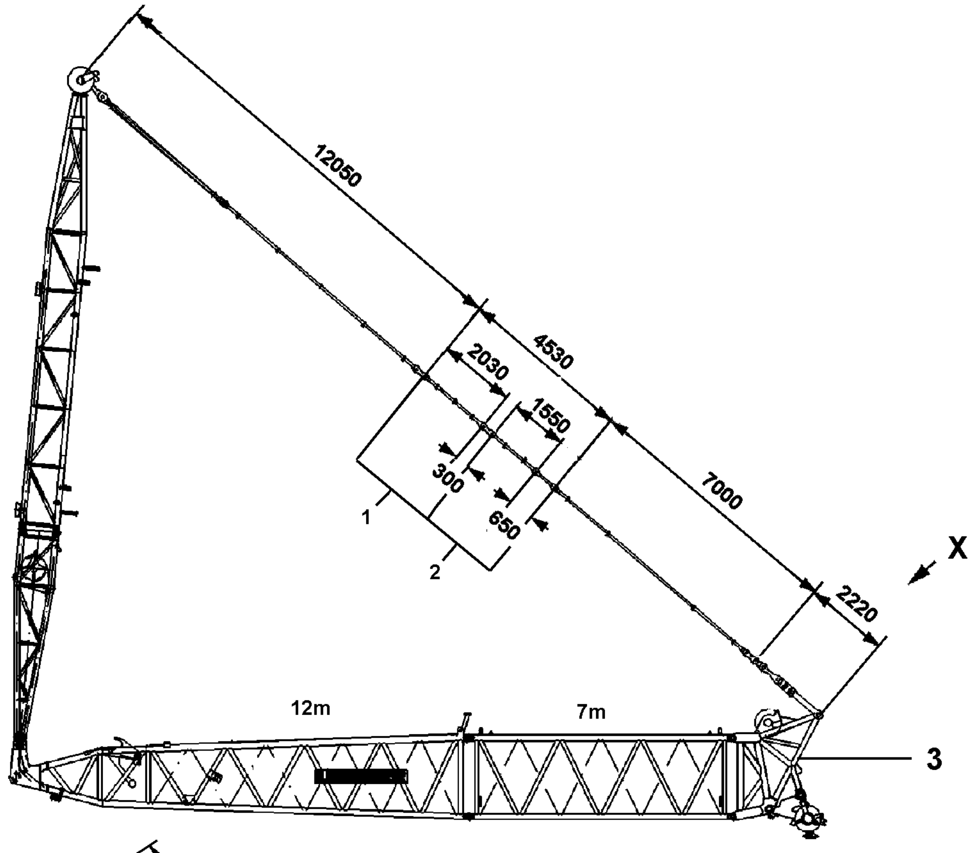
The WV- lattice jib is controlled with winch 5 (W5) and master switch MS1x.
The S- boom is controlled with winch 3 (W3) and master switch MS3x.

Erection / take down procedure
The boom combinations must be erected or taken down according to the erection and take down charts, chapter 5.09.

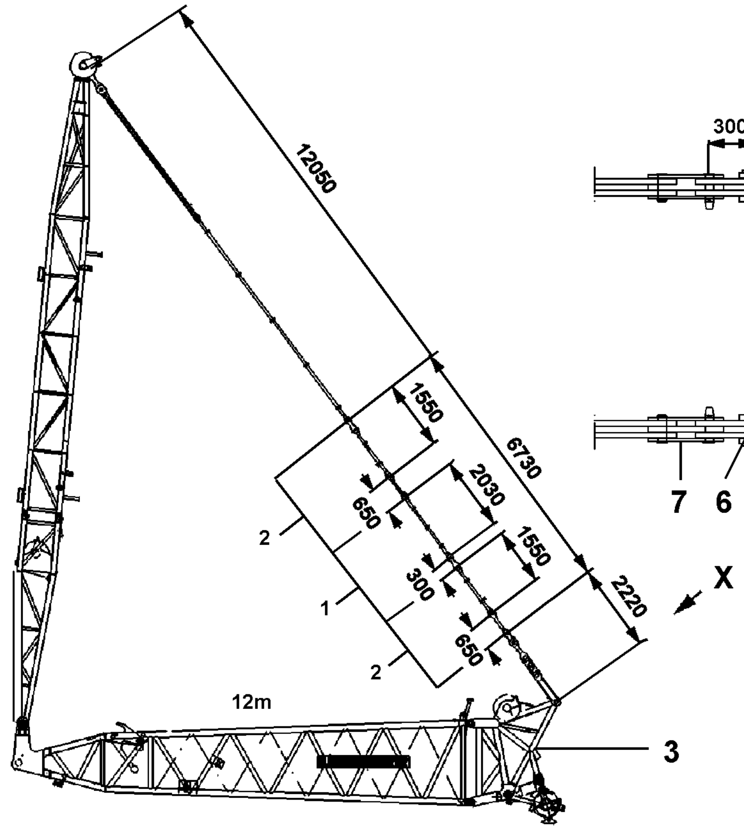
D A N G E R: The boom combinations must be erected or taken down according to the data in the charts .
If this is not observed, the crane will be overloaded and can tip over.

Erection procedure
Set the LICCON system according to the data in the load chart.
Actuate the installation keyed button, the indicator light ”Installation” lights up.
The installation symbol on the LICCON indicator blinks.

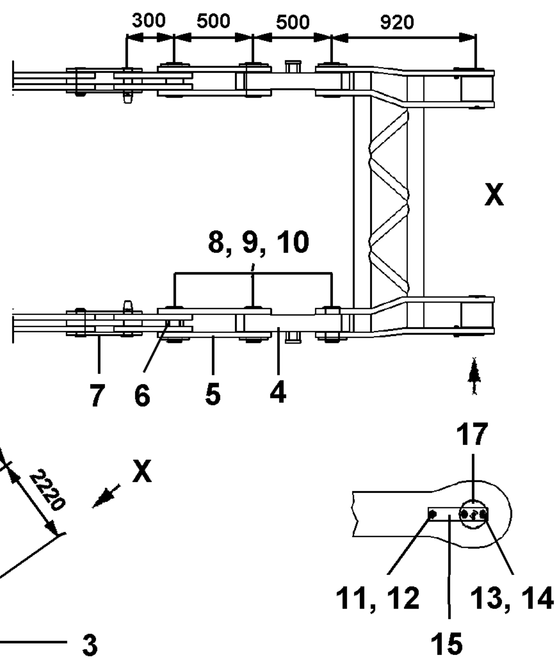
Erection
Luff up the boom until the end section lifts off the ground.
Reeve the hoist cable between the pulley head on the end section and the hook block and secure on the fixed point - see Chapter 4.06, Reeving plans.
Attach the hoist limit switch weight.



12050
4530
2030
1550
300
650
7000
2220
1
2
X
12m
7m
3



12050
1550
6730
2030
650
1550
300
650
2220
2
1
2
X
12m
3



300
500
500
920
X
8, 9, 10
7
6
5
4
17
11, 12
13, 14
15

191225

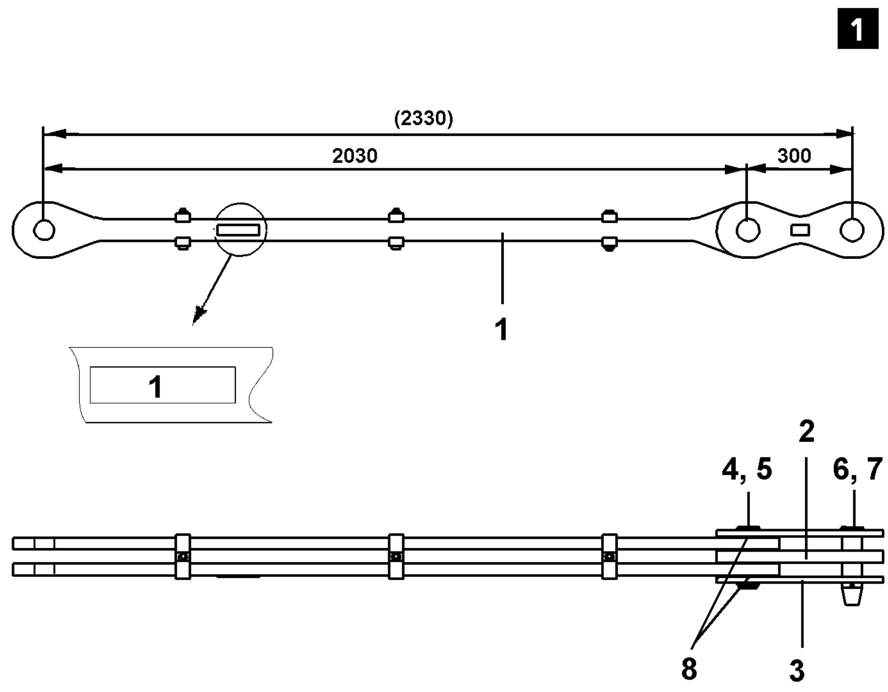
WV guying

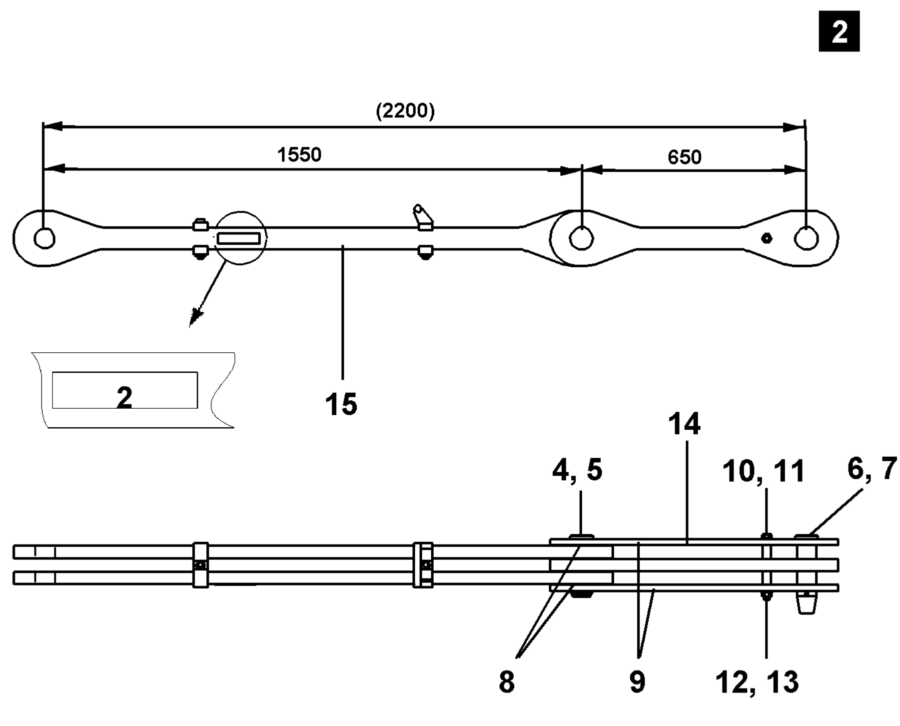
The following added guy rods, complete, must be installed:

21m WV-Lattice jib	1 × rod, complete, Pos. 1
	1 × rod, complete, Pos. 2
14m WV-Lattice jib	1 × rod, complete, Pos. 1
	2 × rod, complete, Pos. 2

Components

1 Rod, complete (2.33m), see **fig. 1**
2 Rod, complete (2.20m), see **fig. 2**
3 W- adapter for pulley head 600t/400t
4 Pull test bracket 500mm
5 Bracket , complete 500mm
6 Pipe
7 Bracket, complete 300mm
8 Pin Rd. 90
9 Retaining ring
10 Washer
11 Nut M16
12 Screw M16×60
13 Spring ring A12
14 Screw M12×25
15 Plate
17 Pin Rd.90


1
(2330)
2030
300
1
1
2
4, 5
6, 7
8
3


2
(2200)
1550
650
2
15
14
4, 5
10, 11
6, 7
8
9
12, 13

191226

Fig. 1

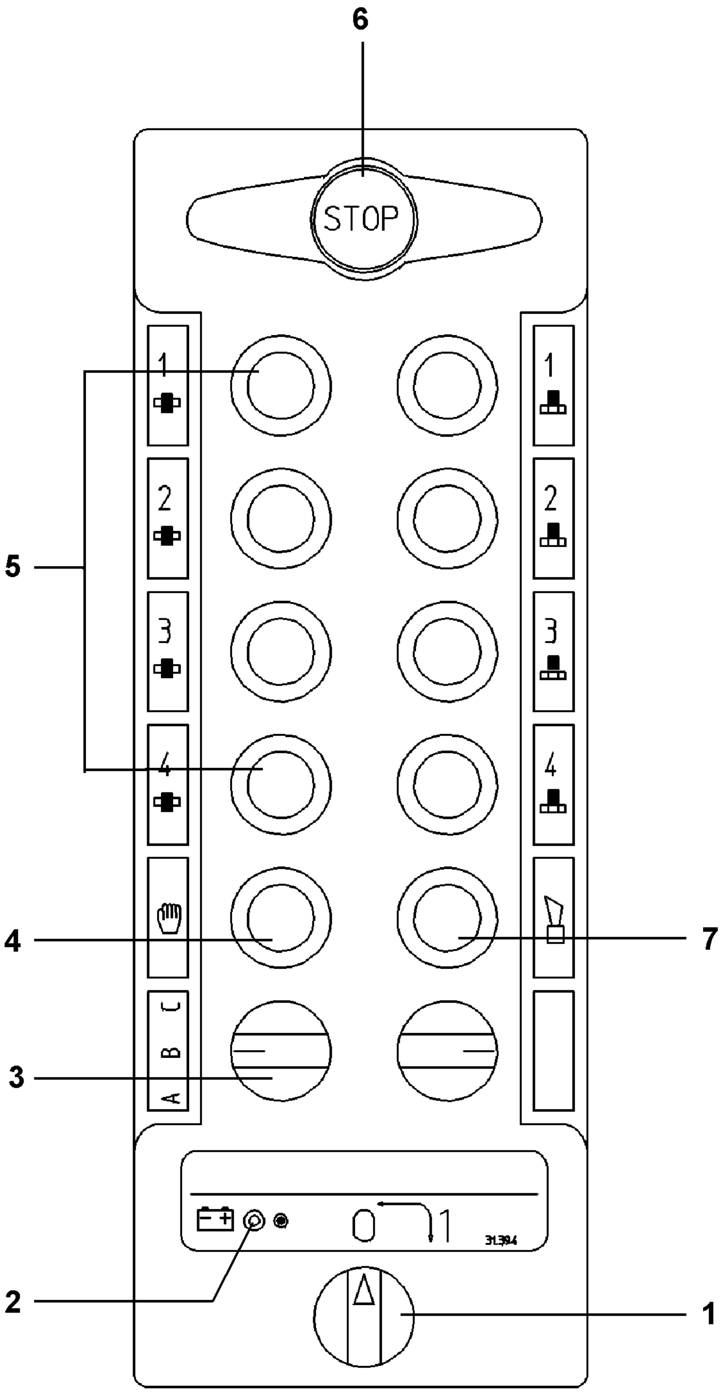
1 Rod, complete (2330 mm) consists of:

1 Stange 2030mm
2 Bracket 300mm
3 Bracket 300mm
4 Pin Rd.56
5 Retaining ring 55×3
6 Pin Rd.56
7 Spring retainer
8 Washer 70×2

Fig. 2

2 Rod, complete (2200 mm) consists of :

4 Pin Rd.56
5 Retaining ring 55×3
6 Pin Rd.56
7 Spring retainer
8 Washer 70×2
9 Bracket 650mm
10 Screw M16×180
11 Pipe
12 Washer A17
13 Nut M16
14 Bracket 650mm
15 Rod 1550mm



191480

1 Radio transmitter

Pinning and unpinning with a radio transmitter simplifies this task. But the operator must still get used to the remote control!

D A N G E R: **The operating manual "RADIO TRANSMITTER MICRON 4" issued by the manufacturer must be read completely, before working with the radio transmitter for the first time!**
If this is not observed, there is a danger of accidents!

2 Remote control

1 Main switch
0 - Off
1 - On

2 Akku - Indicator light

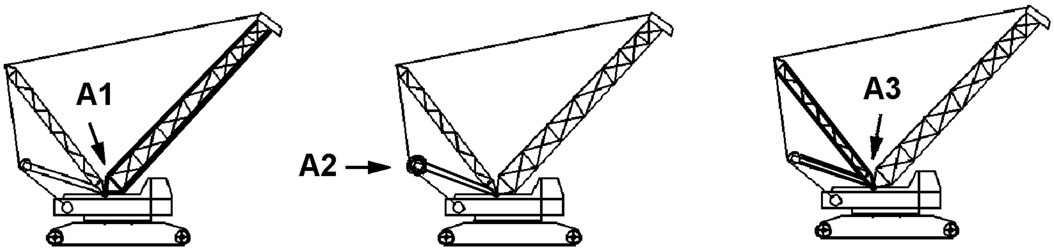
3 Preselection rotary switch
A = Pin on slewing platform
B = Pin on crawler to center section
C = Pin on crane supports to crawler or center section

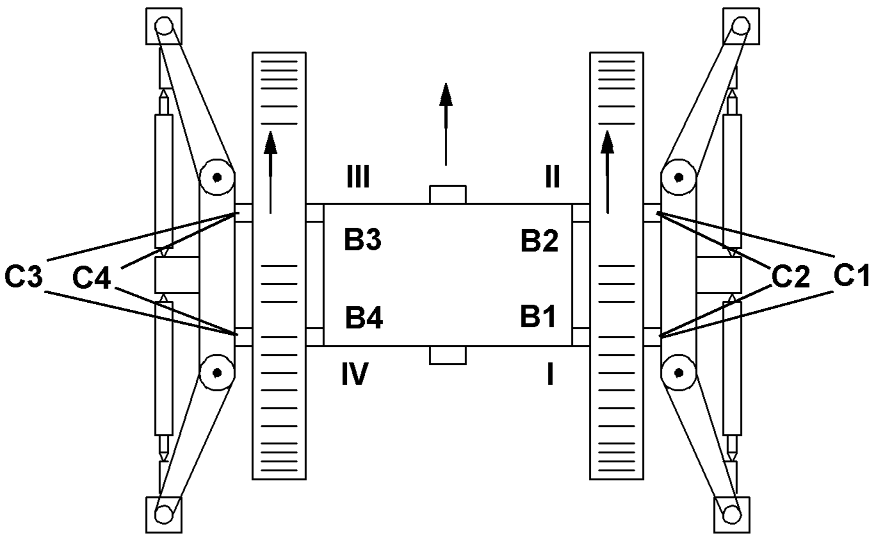
4 Release switch for 2-Hand control

5 Button 1 - Pin
Unpin
Button 2 - Pin
Unpin
Button 3 - Pin
Unpin
Button 4 - Pin
Unpin

6 **EMERGENCY OFF**

7 Signal - Horn





191479

3 Pin points

A Pinning on slewing platform

A1 To pin S/L-pivot section

A2 To pin pulley head on SA-bracket

A3 To pin SA-bracket or derrick

B Pinning on crawler to center section

B1 To pin crawler right rear

B2 To pin ccrawler right front

B3 To pin crawler left front

B4 To pin crawler left rear

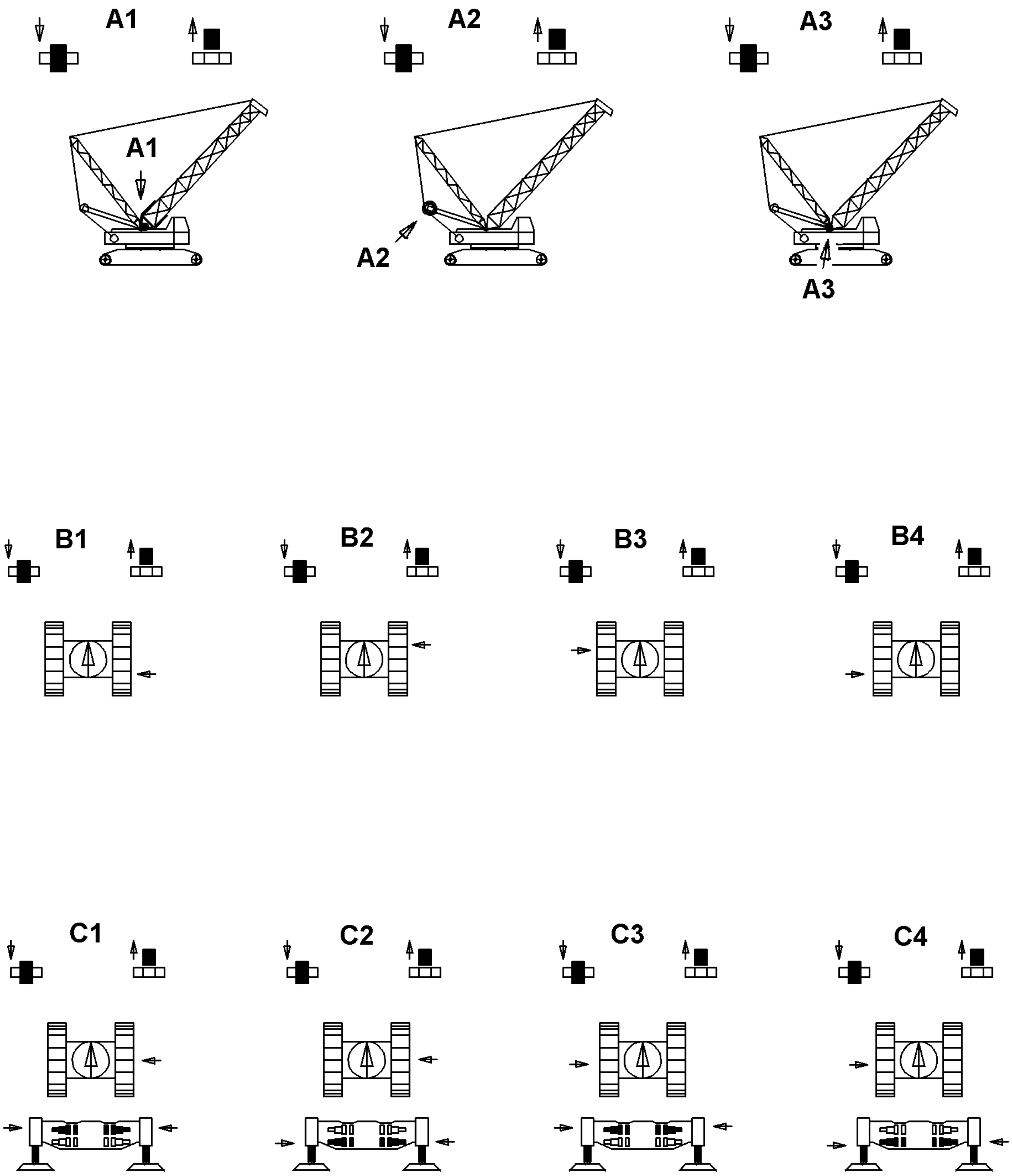
C Pinning on crane supports to crawler or center section

C1 To pin crane support upper right

C2 To pin crane support lower right

C3 To pin crane support upper left

C4 To pin crane support lower left



192903

4 Prerequisite

The engine is off.
Turn on the radio remote control on the instrument panel in the crane cab, -see capter 4.01.

Note: Pull to release the EMERGENCY OFF switch (6) on remote control.

Turn the radio transmitter on. Se the main switch into position 1 .
Start the engine.

5 Control

Rotary switch , preselect A, B or C

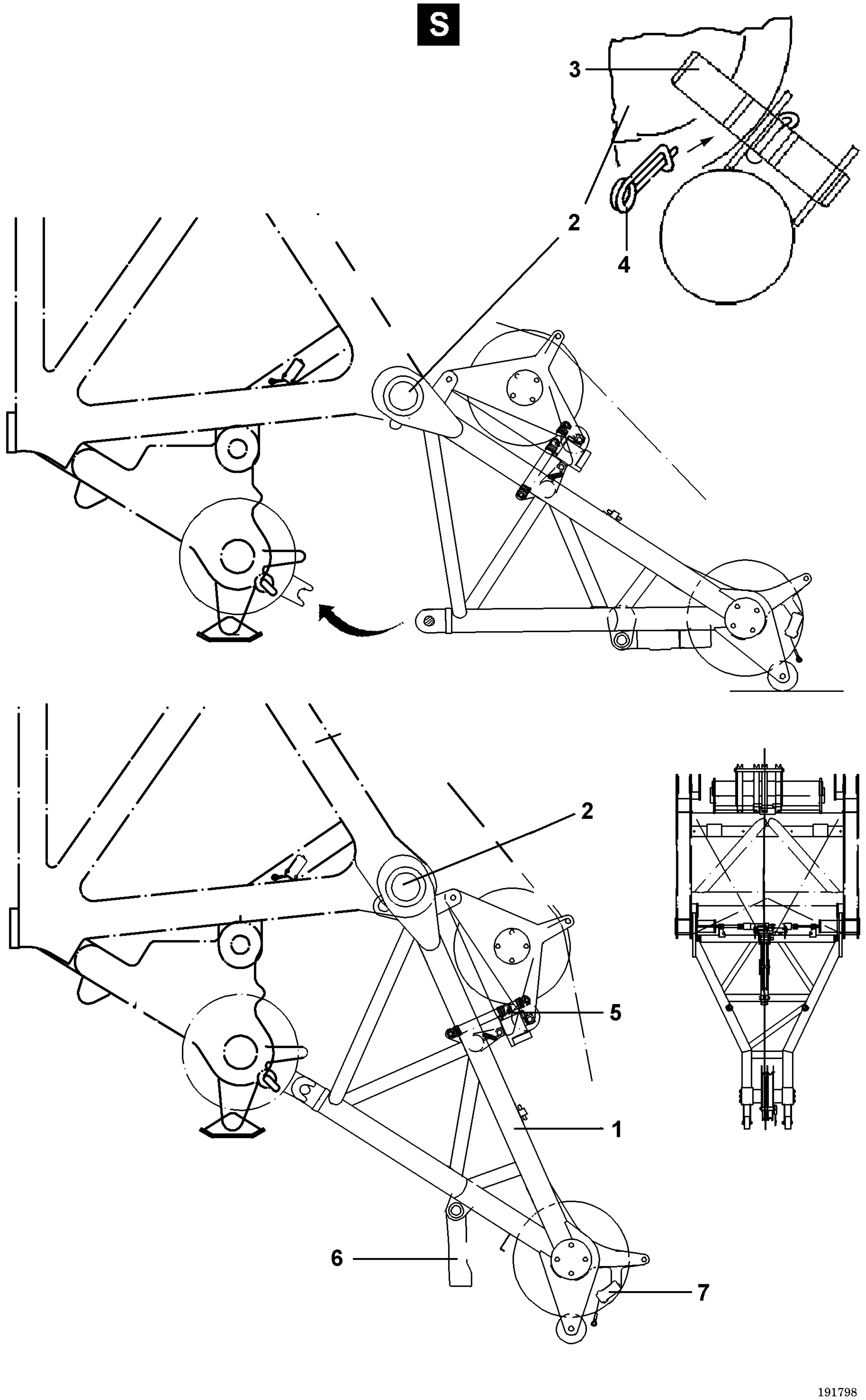
Release switch for 2-Hand control and push the preselected pin or unpin button at the same time.
- left side = pin
- right side = un pin

Button A1	To pin S/L- pivot section
Button A2	To pin pulley head on SA - bracket
Button A3	To pin SA- bracket and derrick
Button B1	To pin crawler right rear
Button B2	To pin crawler right front
Button B3	To pin crawler left front
Button B4	To pin crawler left rear
Button C1	To pin crane support upper right
Button C2	To pin crane support lower right
Button C3	To pin crane support upper left
Button C4	To pin crane support lower left

**D A N G E R: Select a safe location for remote control, from where you can see the complete working range.
Give an acoustical warning signal, to warn any personnel within the vicinity as not to endanger them during operation.**

**Before pinning, it must be ensured that the pin bore is clear.
The pin must be secured immediately after inserting the pin .
Before unpinning the crane supports they must be hung on to a auxilliary crane.
Before unpinning, the retainer on the pin which is to be unpinned must be removed. All other pins must remain secured.**

If his is not observed, there is a danger of accidents!


S
3
2
4
2
5
1
6
7
191798

Installation of boom nose on S- end section

Components

1	Boom nose	
2	Pin	Rd 170 mm
3	Retaining pin	Rd 30 mm
4	Spring retainer	Rd 4,0 mm
5	Overload safety device	
6	Cable fixed point (cable lock)	
7	Hoist limit switch	

Note: Weight of boom nose = 1100 kg

Installation

The boom head is laying on the ground.

Attach the boom nose (1) to the auxiliary crane and pin the pin (2) on the end section **"on top"** with the pin pulling device and secure with retaining pin (3) and spring retainer (4) .

Place the boom nose on the ground, remove the auxiliary crane.

Pull the hoist cable over the cable pulleys - see fig. 1.

Luff up the boom until the pin of the boom nose on the end section **"on the bottom"** is positioned in the receptacle.

Establish the electrical connection to the pressure sensors for the overload safety device (5) .

Connect the hoist limit switch (7) .

C A U T I O N: **Monitor the hoist cable routing of the hook block on the end section during erection, to make sure that it does not link up with the boom nose.**

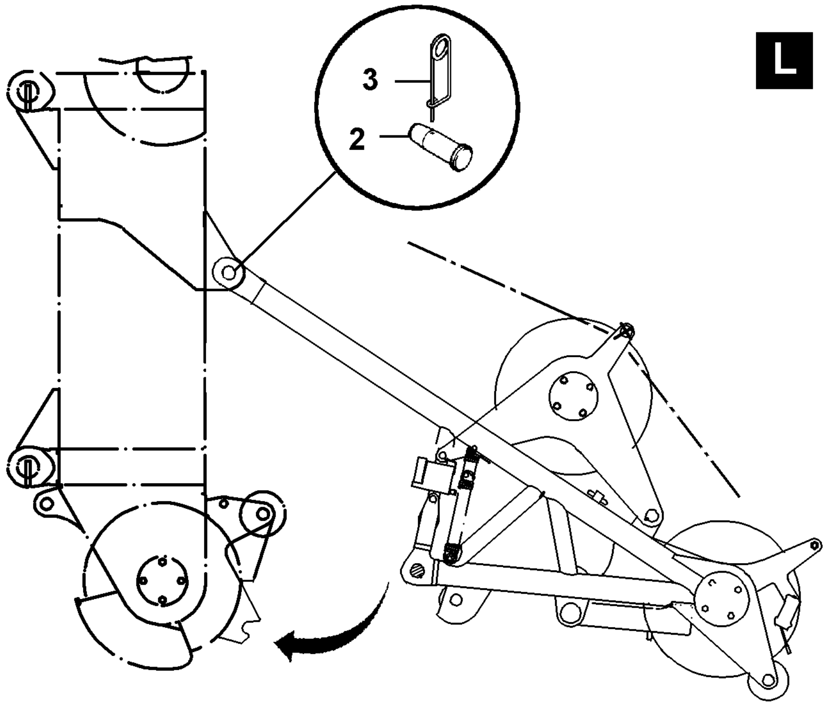
Removal

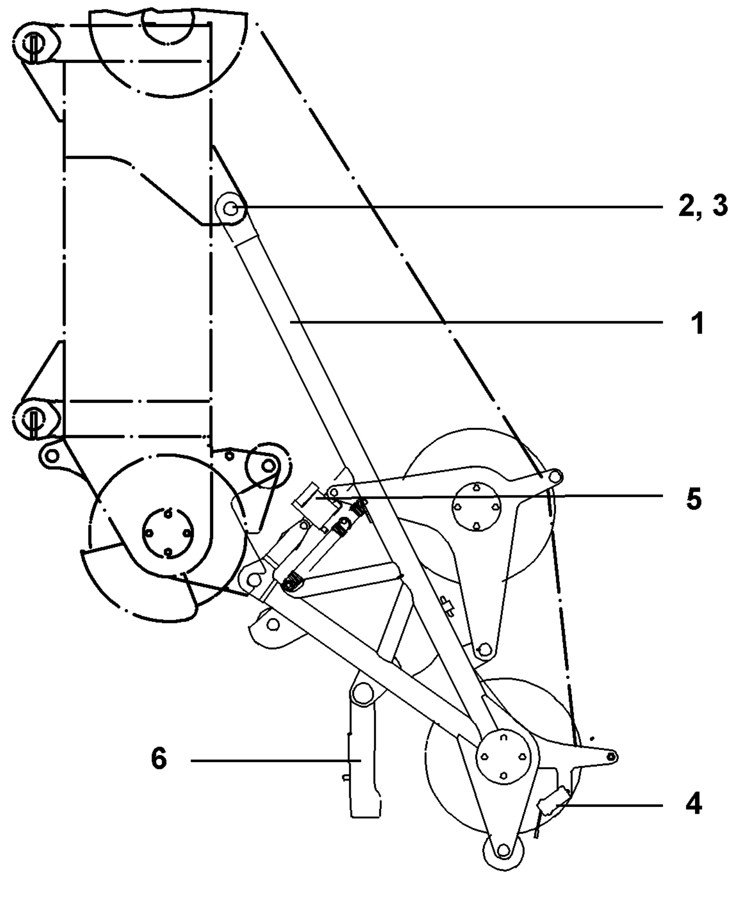
Luff down the S -boom and unreeve the hoist cable on the boom nose.

Continue to luff down the S-boom until it rests on the ground. The boom nose will fold up automatically from the fork connection.

Attach the boom nose (1) on the auxiliary crane.

Remove the spring retainer (4) and retaining pin (3) and unpin the pin (2) on the end section **"on top"** with the pin pulling device.





191797

Installation of the boom nose on the L (W) - end section

Components

1	Boom nose	
2	Pin	Rd 55 mm
3	Spring retainer	Rd 4.5 mm
4	Hoist limit switch	
5	Overload safety device	
6	Cable fixed point (cable lock)	

Note: Weight of the boom nose = 770 kg

Installation

The boom head is laying on the ground.

Attach the boom nose (1) to the auxiliary crane and pin the pin (2) on the end section **"on top"** and secure with spring retainer (3) .

Place the boom nose on the ground, remove the auxiliary crane.

Pull the hoist cable over the cable pulleys .

Luff up the boom until the pin of the boom nose on the end section **"on the bottom"** is positioned in the receptacle.

Establish the electrical connection to the pressure sensors for the overload safety device (5) .

Connect the hoist limit switch (4) .

C A U T I O N : **Monitor the hoist cable routing of the hook block on the end section during erection, to make sure that it does not link up with the boom nose.**

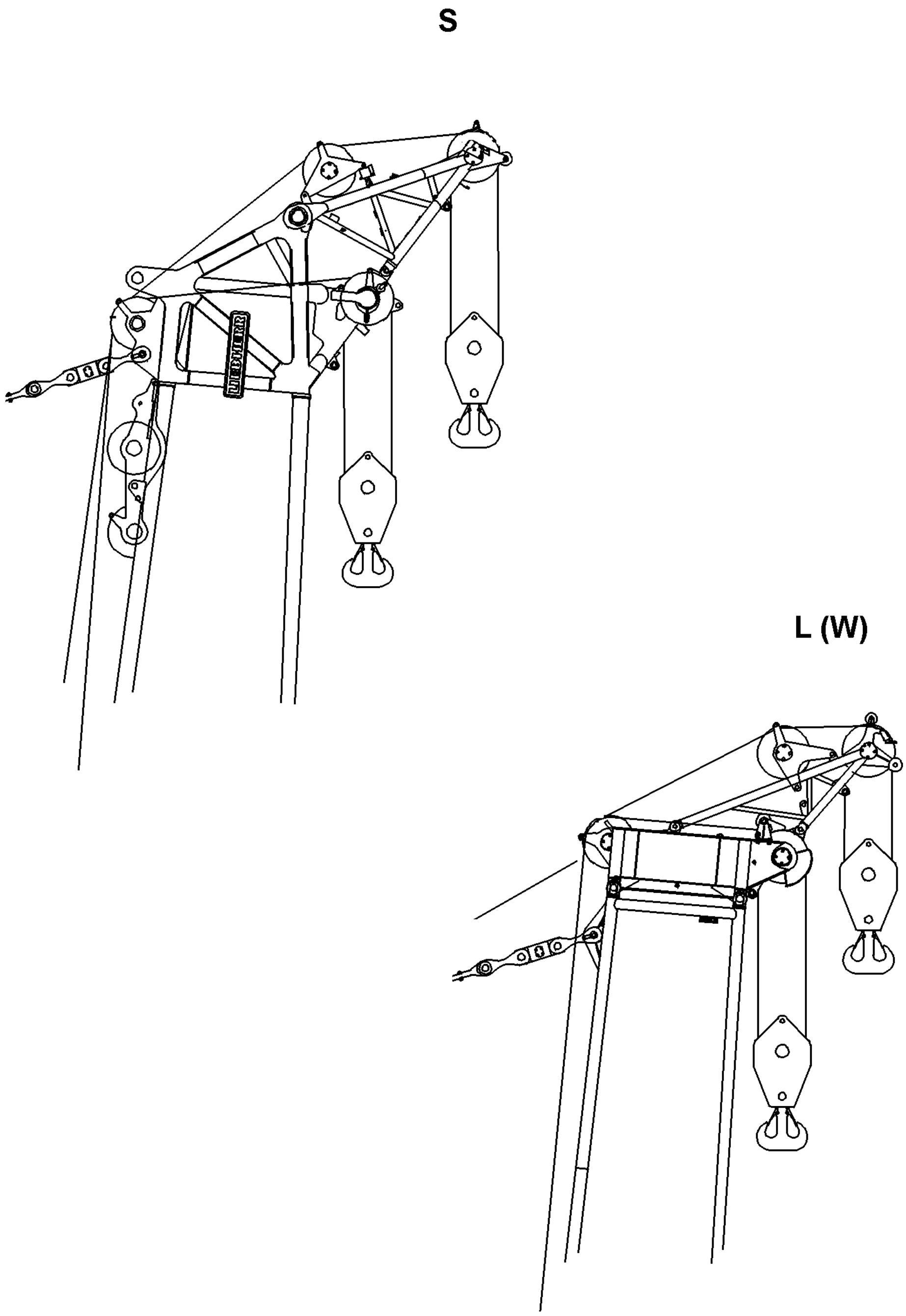
Removal

Luff down the S -boom and unreeve the hoist cable on the boom nose.

Continue to luff down the S-boom until it rests on the ground. The boom nose will fold up automatically from the fork connection.

Attach the boom nose (1) on the auxiliary crane.

Remove the spring retainer (4) and retaining pin (3) and unpin the pin (2) on the end section **"on top"** with the pin pulling device.



191799

Operation with boom nose

Note: The boom combinations must be erected and taken down according to the erection and take down chart (see separate manual).

D A N G E R: **The crane must be erected and taken down according to the data in the chart. If this is not observed, the crane will be overloaded and can topple over!**

Description

This possibility is set up for quick lifts with winch V in S - operation and winch IV in SW, SDW - operation.
The hook block may remain reeved on the boom head.

Set the LICCON overload safety system 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. 3 -way reeving is permissible, otherwise the boom nose will be overloaded.**

Check the function of the hoist limit switchs ”on top” by running against the hoist limit switch weight.

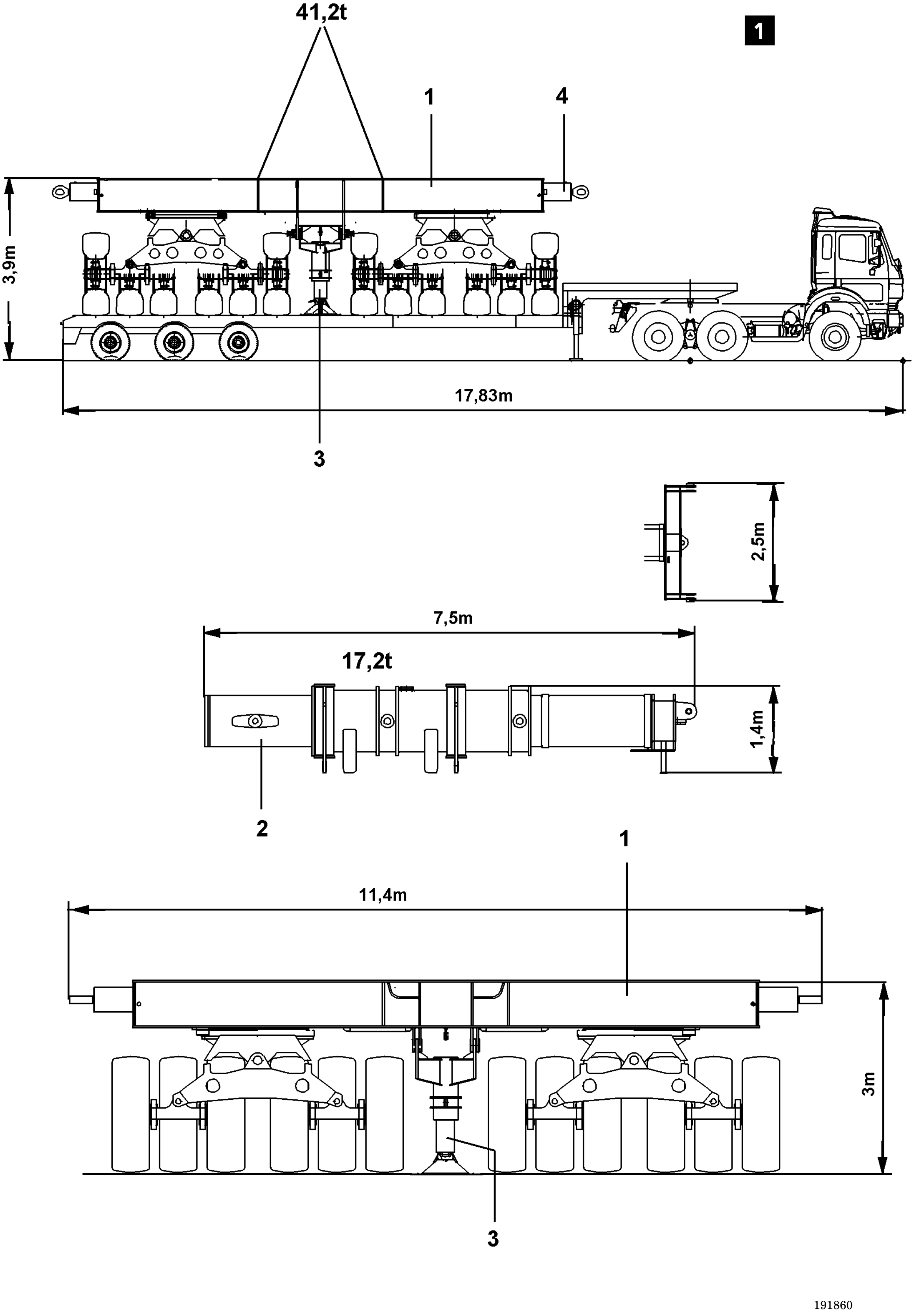
Note : The type of boom nose is stored via the address of the hoist limit switch in the boom nose .
When replacing a hoist limit switch on the boom nose it must be assured that the new hoist limit switch has the same address as the old one.

D A N G E R : **Under no circumstances may the hoist limit switch be installed from one boom nose to another one without matching the address.**
Otherwise the LMB would take on the wrong boom nose. The installed boom nose would then no longer be monitored sufficiently and could be overloaded inadvertently.
This could cause a serious accident!

Operation

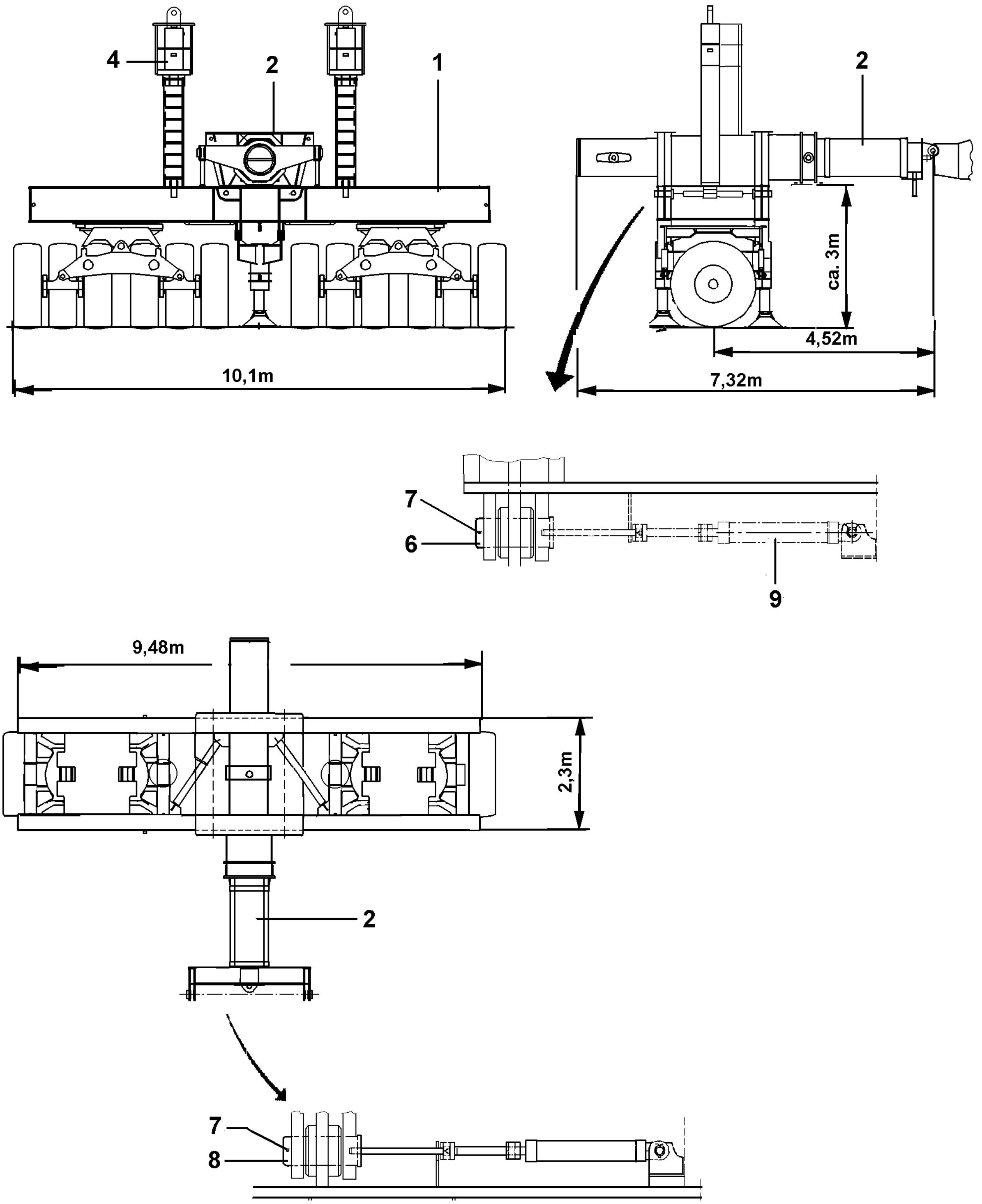
In boom nose operation, the following must be observed.

D A N G E R : **Simultaneous operation with hook block on boom head and boom nose is not permitted in this case!**
The hoist limit switch on the boom nose must be connected.
The load may not be raised off the ground by luffing up the boom.
It must be raised off the ground via the hoist gear !



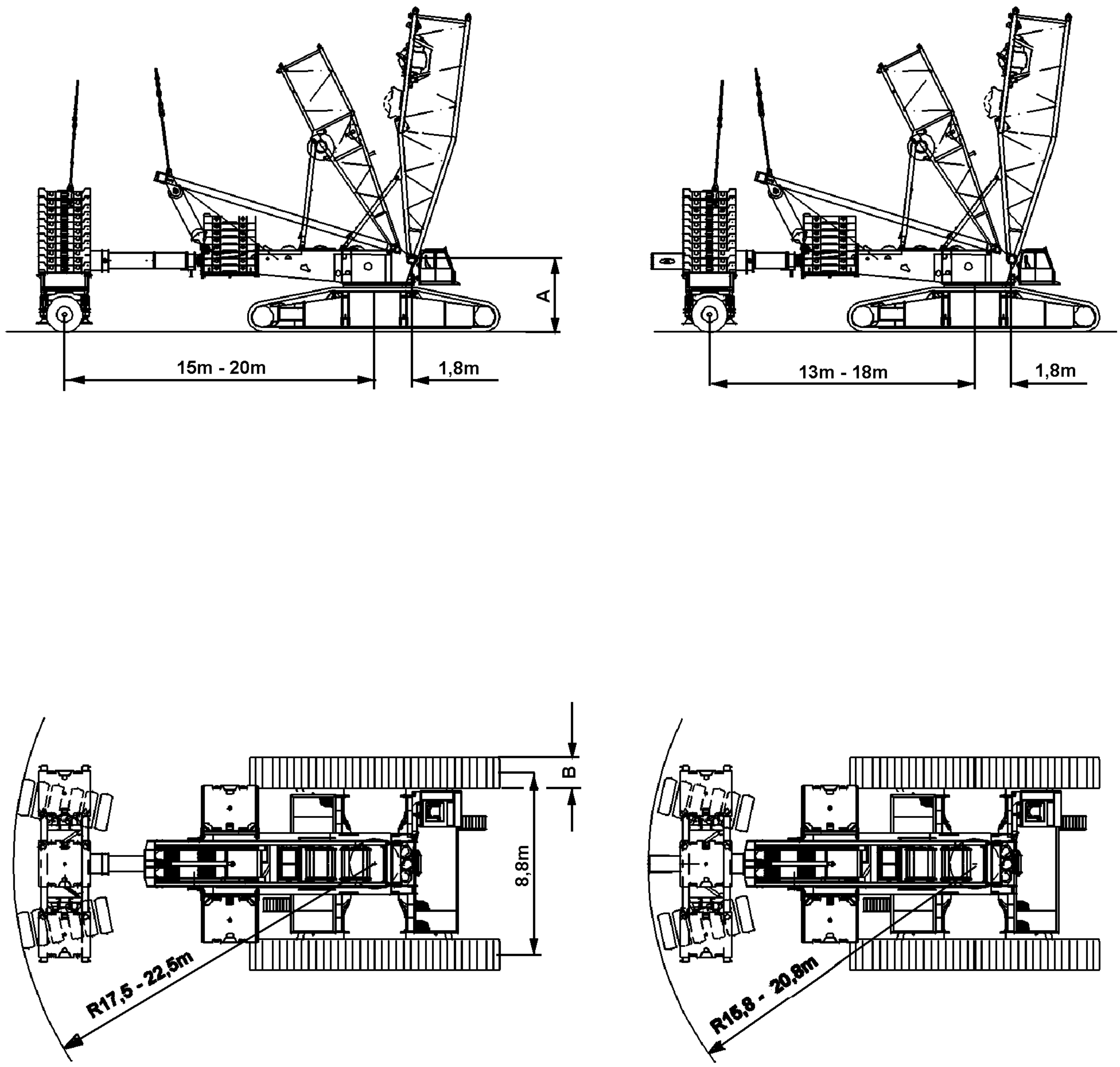
41,2t
1
1
4
3,9m
17,83m
3
2,5m
7,5m
17,2t
1,4m
2
1
11,4m
3m
3
191860

2



191862

3



191861

1. Ballast trailer BW

1.1 General

Ballast trailer consists of:
2 axles with 2 each oscillating axles
Tires 12way, size 21.00 R 25
Hydraulic mechanical steering, electronically adjustable for
- towing
- driving in turns
- parallel operation
- manual steering adjustment

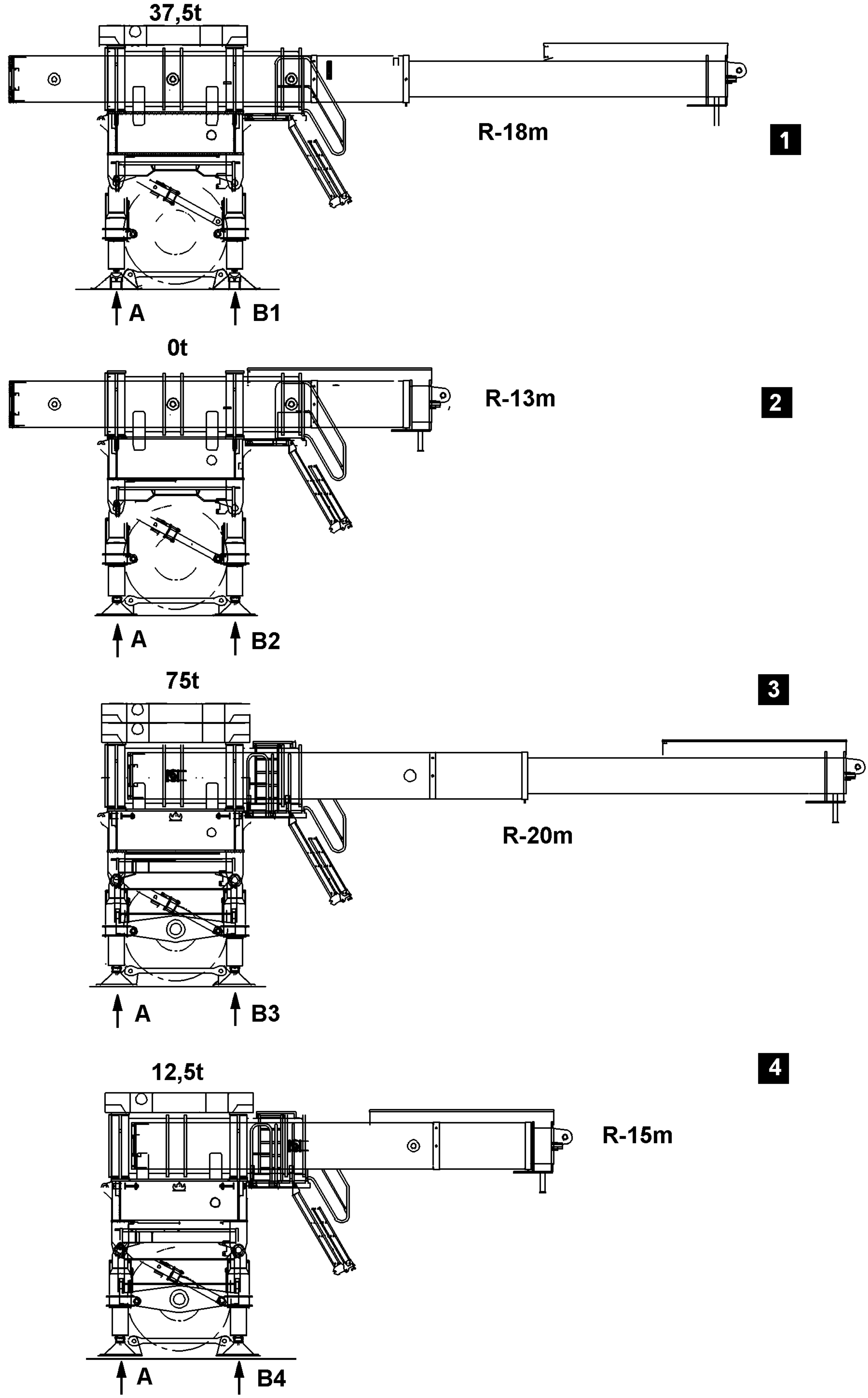
Hydraulically telescopable guide for radii of 13 - 18m or 15 - 20m.
Guy rods ballast trailer - derrick boom with 2 integrated expansion cylinders.
The compensation cylinders can be actuated under load.

1.2 Dimension [m], fig. 1 and 2
Radii [m], fig. 3

Note: The LICCON job planer calculates the turning radius of the ballast trailer only correctly for the ballast guide pinned in outer position, see illustration on the left, BW radius 15-20m.
If the ballast guide is in the inner position, the guide tube extends about 30cm past the turning circuit of the tires, which means the calculated turning radius in the job planer is then about 30 cm too small.

1.3 Weights [t], fig.. 1 and 2

Ballast trailer	approx.	41.2 t
Guide pipe	approx.	17.2 t
Ballast trailer, compl.	approx.	**58.4 t**



192075

1.4 Stability and tipping safety if ballast trailer is not installed

D A N G E R:
- **The locking pin on the strut between the support cylinders must be pinned as long as the ballast trailer is not pinned on the slewing platform.**
- **the ballast trailer must be supported in horizontal direction. Otherwise there is a danger of tipping!**

Fig. 1
- Guide extended - pinned to turning radius R - 18m
- Ballast trailer horizontally supported
- min. 37.5t ballast plates placed

B1 = 86.6t max. support pressure

Fig. 2
- Guide retracted - pinned to turning radius R - 13m
- Ballast trailer horizontally supported
- No ballast required

B2 = 38.6t max. support pressure

Fig. 3

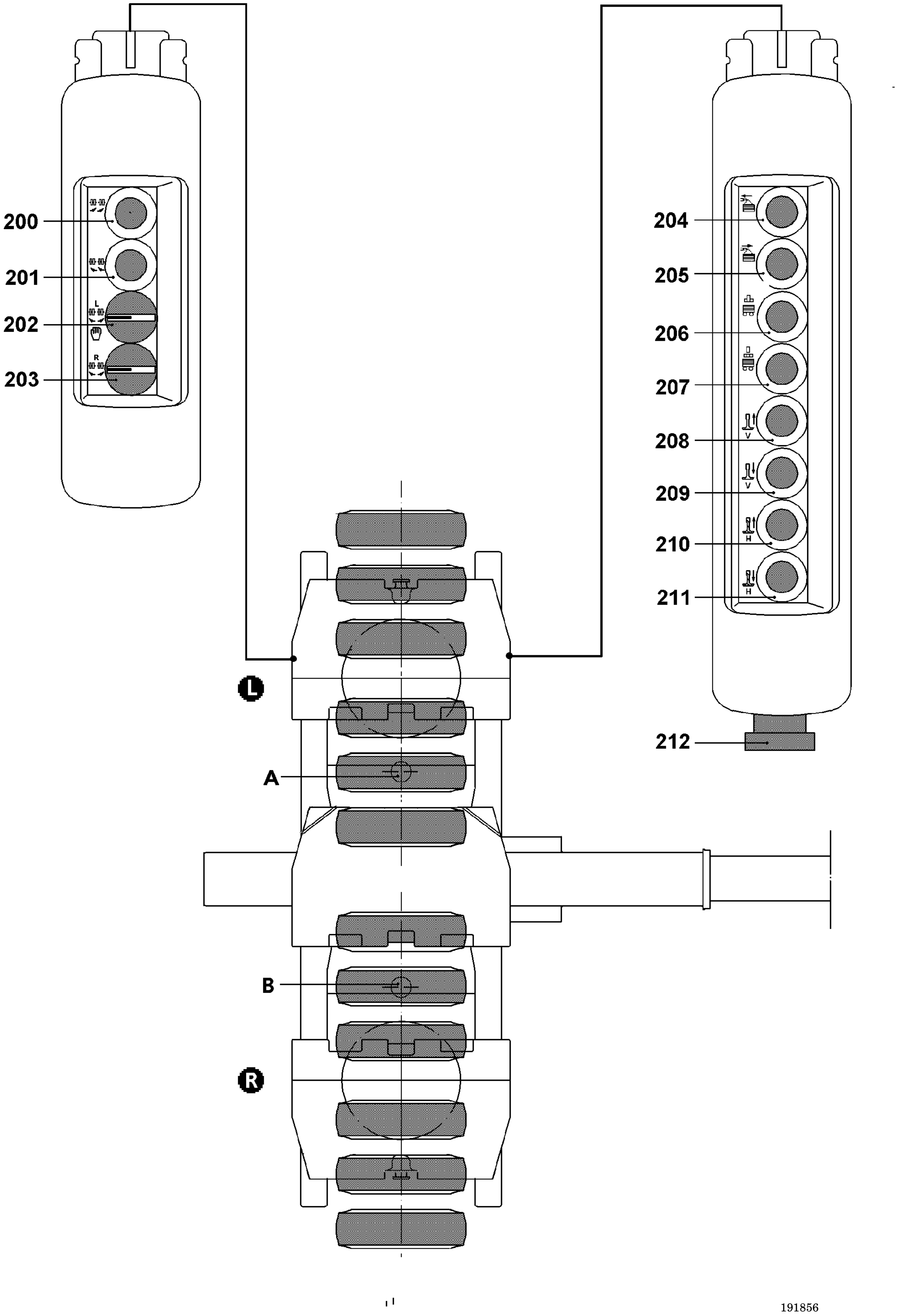
- Guide extended - pinned to turning radius R - 20m
- Ballast trailer horizontally supported
- min. 75t ballast plates placed

B3 = 122.5t max. support pressure

Fig. 4

- Guide retracted - pinned to turning radius R - 15m
- Ballast trailer horizontally supported
- min. 12,5t ballast plates placed

B4 = 62.0t max. support pressure

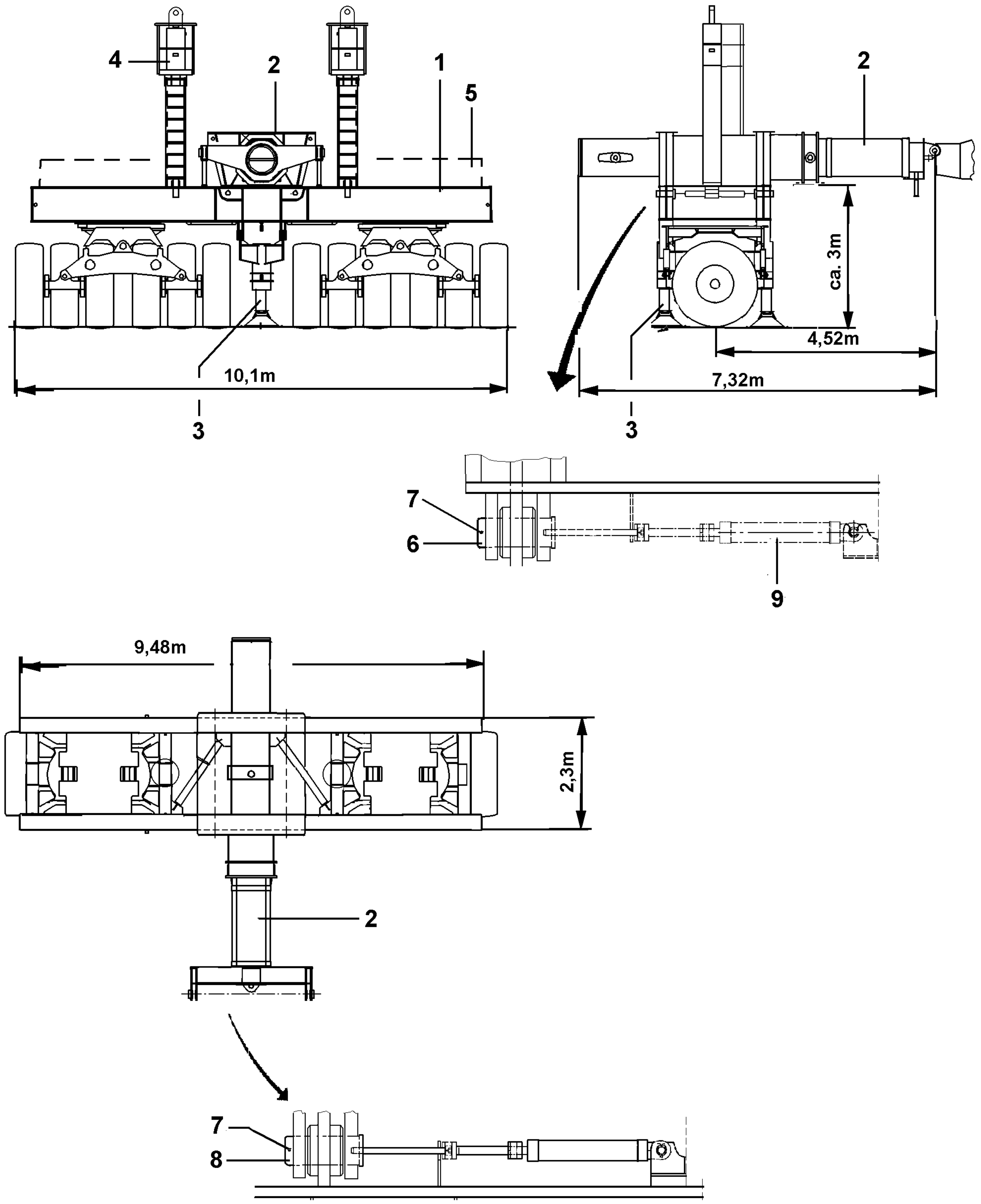

200
201
202
203
204
205
206
207
208
209
210
211
212
A
B
L
R
V
H
191856

2. Control elements on control panels

Pos.:

200	Button	-	Manual steering to the left
201	Button	-	Manual steering to the right
202	Knob	-	Turn wheel set left side to the right or left Manual operation for installation or emergency control
203	Knob	-	Turn wheel set right side to the right or left Manual operation for installation or emergency control
204	Button	-	Ballast trailer, retract sliding cylinder
205	Button	-	Ballast trailer, extend sliding cylinder
206	Button	-	Pinning - pin ballast trailer - slewing platform
207	Button	-	Pinning - unpin ballast trailer - slewing platform
208	Button	-	Retract support cylinder on the front
209	Button	-	Extend support cylinder on the front
210	Button	-	Retract support cylinder on the rear
211	Button	-	Extend support cylinder on the rear
212	Switch	-	**Emergency off**

2



192592

3. Installation of ballast trailer

D A N G E R : **The ballast trailer is n o t equipped with its own braking system. For that reason, it is imperative that it is supported if it is not installed .**

The installation of the ballast trailer may only be carried out on level ground of sufficient load carrying capacity and only by authorized persons.

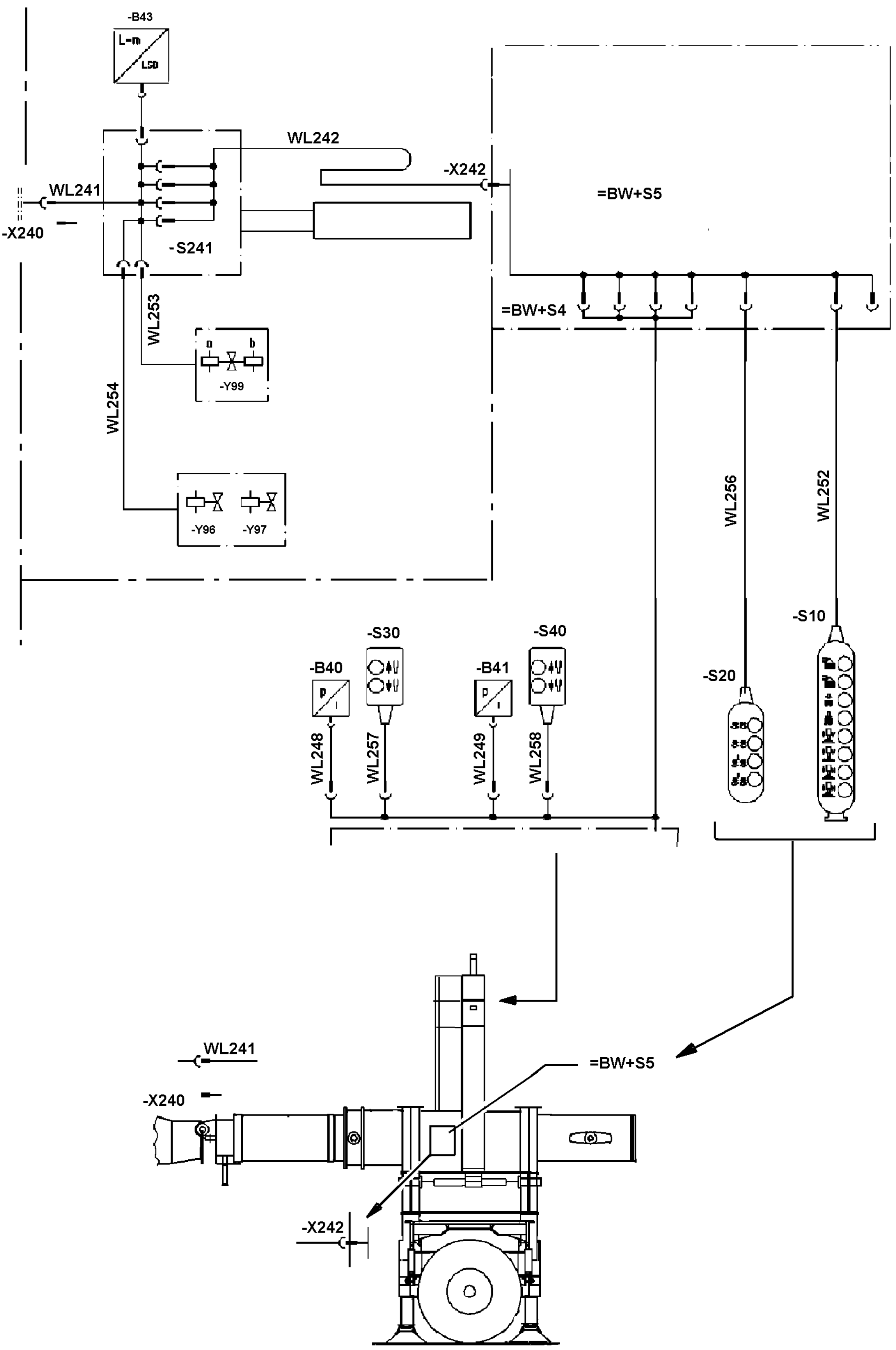
Components
1 Ballast trailer
2 Ballast trailer guide
3 Support cylinder
4 Pull cylinder
5 Ballast plate
6 Pin, pinning of ballast trailer with guide
7 Spring retainer
8 Pin, pinning of ballast trailer with crane

3.1 Pin ballast trailer guide (2) on ballast trailer

- Unload the ballast trailer (1) with the auxiliary crane from the flatbed trailer
- The ballast trailer must be supported.
- Unload the ballast trailer guide (2) with the auxiliary crane and swing to the connector eyes on the ballast trailer .

- Lower the ballast trailer guide (2) and pin on the ballast trailer frame:
  - Connect the pin pulling device (9) with the hydraulic component.
  - Pin the pins (6) with the pin pulling device (9) on both sides and secure with the spring retainers (7).
  - Remove the pin pulling device.

C A U T I O N : **The ballast trailer guide must be held with the auxiliary crane until it is pinned and secured on the ballast trailer and on the slewing platform . Otherwise there is a danger of tipping over!**


-B43
L-m
LSB
WL242
-X242
=BW+S5
WL241
-X240
-S241
=BW+S4
WL253
a
b
-Y99
WL254
-Y96
-Y97
WL256
WL252
-S10
-S30
-S40
-B40
-B41
-S20
p
I
WL248
WL257
WL249
WL258
WL241
-X240
=BW+S5
-X242

192591

3.2 Pin the ballast trailer guide on the crane

- Drive the crane as close as possible to the ballast trailer guide.
- Turn the engine off.
- Connect the supply lines,

Note: For installation, the electrical connection can be established to be able to move the support cylinders as well as the pull cylinders, if necessary.
The releases "Ballast UP / DOWN" is available, if the conditions of the shut off diagrams are fulfilled, independent if the ballast trailer is installed.
The release "Ballast UP" allows retraction of the pull and support cylinders.
The release "Ballast DOWN" allows extension of the pull and support cylinders.
This means that the support cylinders and the pull cylinders can be moved at the same time, even if the signal "Ballast trailer pinned" has not yet been given.

3.2.1 Establish the electrical connection

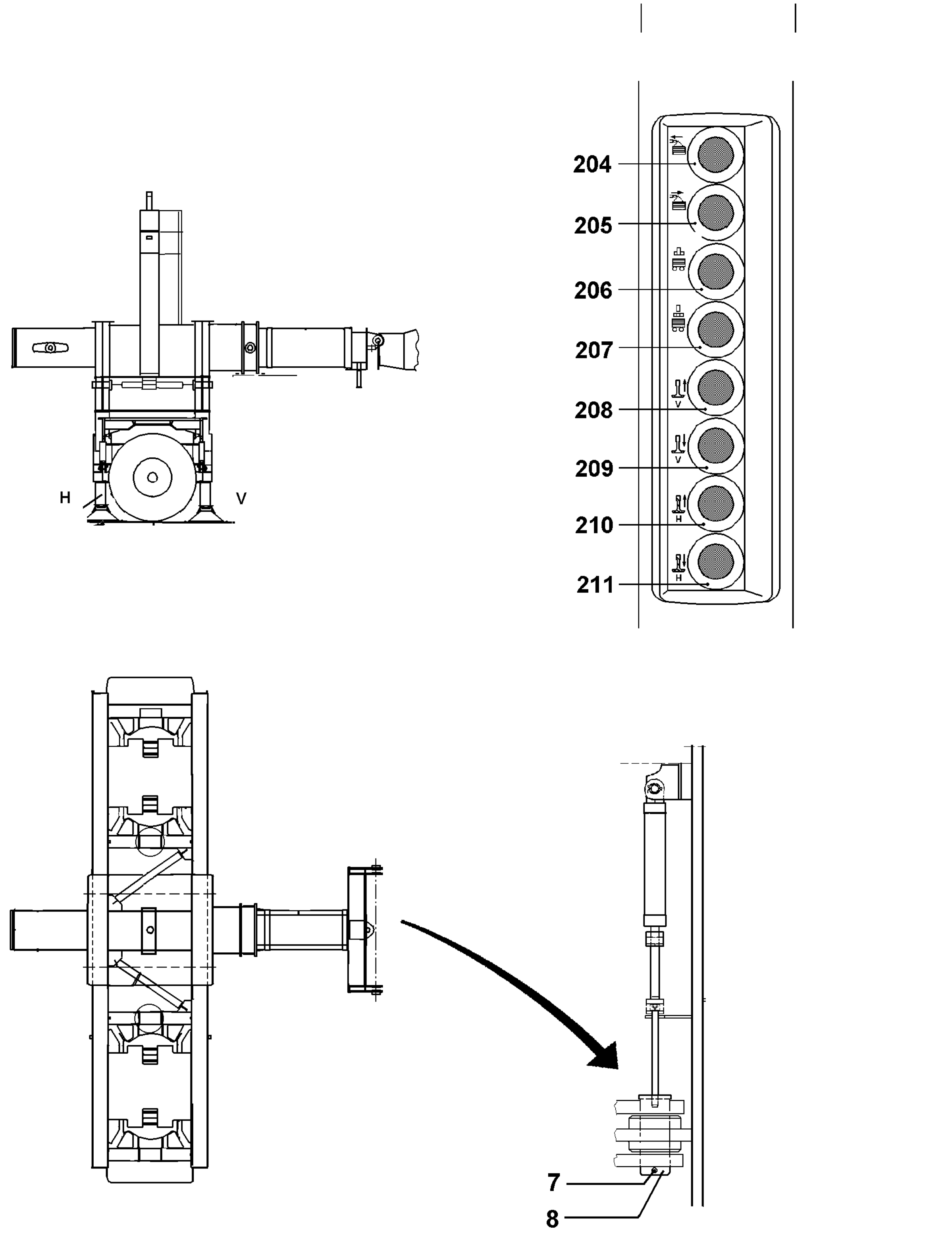
- Remove the dummy plug on the socket -X 240 on the rear of slewing platform.
- Insert the cable WL 241 in socket -X 240.
- Insert the cable WL 242 in socket -X 242 on ballast trailer.

3.2.2 Establish the hydraulic connections

The hydraulic quick couplings, which belong together, are marked.

D A N G E R : When connecting or releasing the hydraulic lines with quick couplings, it must be ensured that the coupling procedure is carried out properly.
Prerequisite for correct coupling connection is:
- **The pressure must be released from the hydraulic system before connecting or releasing the couplings (turn the engine off, wait for approx. 5 minutes).**
- **Interconnect the coupling sections (sleeve and plug) and connect them with the hand nut.**
- **Tighten the nut past the O-ring until you can feel a firm stop.**
- **The couplings may only be tightened by hand - without tools (or couplings will be damaged).**

Improperly connected couplings can cause loss of pressure or sudden leakage and therefore can cause accidents!



191863

3.2.3 Align the ballast trailer

The ballast trailer must be aligned by turning the slewing platform and by raising or lowering the two support cylinders (3) in such a waz that the pins (8) can be pinned.

- Press button (208) to retract the support cylinder on the front
- Press button (209) to extend the support cylinder on the front
- Press button (210) to retract the support cylinder on the rear
- Press button (211) to extend the support cylinder on the rear

3.2.4 Pinning procedure

- Press button (206), the crane - ballast trailer guide is pinned to slewing platform on both sides.
- Secure pin (8) with spring retainers (7).on both sides.

Hinweis: Die Kransteuerung erkennt mittels der Endschalterinitiatoren links (10) und rechts (11), ob die Bolzen (15) an der Drehbühne vollständig eingebolzt sind.

G E F A H R : **Nach dem Verbolzen muss nochmals kontrolliert werden, ob beide Bolzen vorschriftsmäßig verbolzt und gesichert sind und ob die Verbindungsleitungen vollständig und richtig angeschlossen sind.**

Sind beide Bolzen vollständig und richtig verbolzt, erhält die Kransteuerung die Meldung "Ballastwagen verbolzt", d. h.die Drehbühne kann n i c h t gedreht und die Raupe n i c h t gefahren werden.

Erst wenn die Ballastwagenräder in der benötigten Stellung:

- Kreisfahrt

- Schleppfahrt

- Parallelfahrt

stehen, erfolgt Freigabe.

Solange nur ein Bolzen eingebolzt ist erhält die Kransteuerung k e i n e Meldung "Ballastwagen verbolzt", d. h. die Drebühne k a n n gedreht und die Raupe k a n n gefahren werden, damit ein Verbolzen des 2. Bolzen möglich ist.

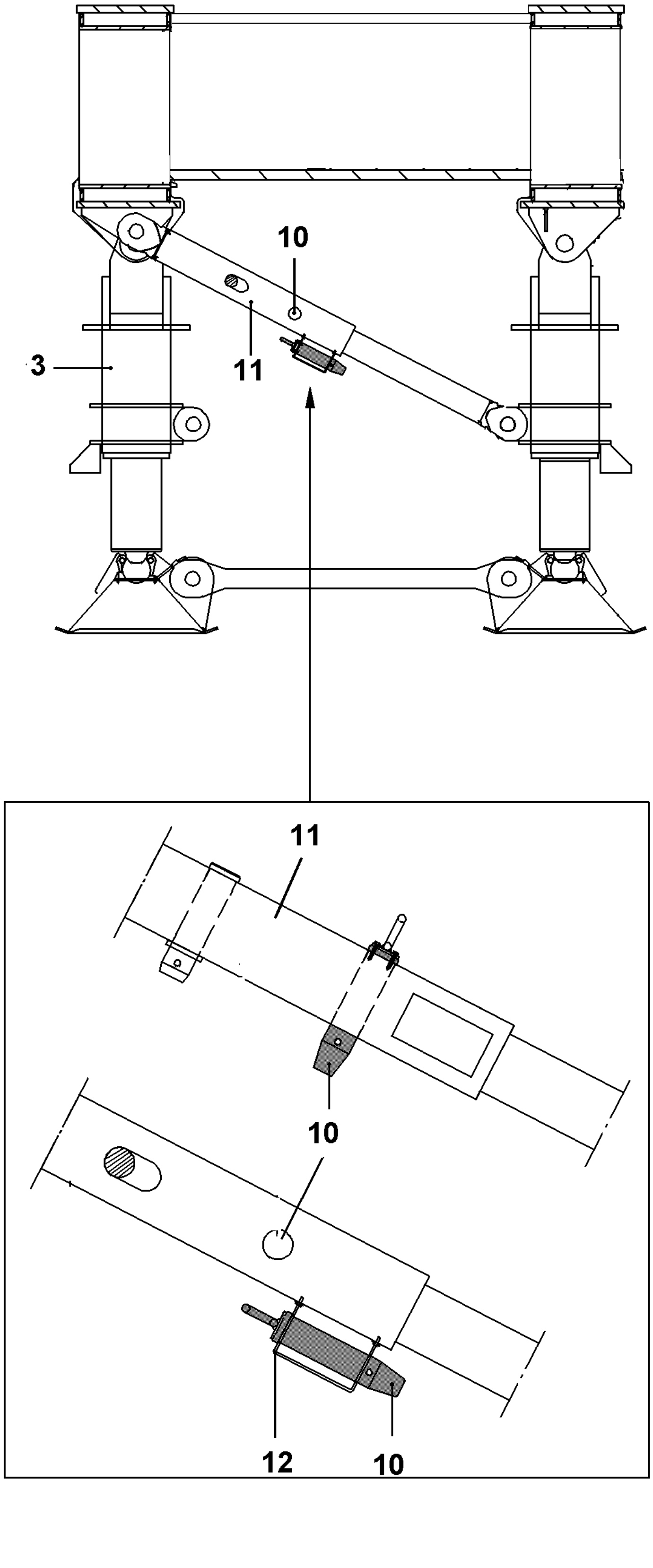
Diese Bewegungen müssen mit äusserster Vorsicht gefahren werden!

Bei Nichtbeachtung, kann es zu Schäden am Kran oder am Ballastwagen kommen!

Es besteht erhöhte Unfallgefahr!

- Press button (208) to retract the support cylinder on the front all the way.
- Press button (210) to retract the support cylinder on the rear all the way.

Note: The support cylinders can be retracted and extended via the corresponding buttons in the cab.



191858

3.2.5 Retract the support cylinder (3) . unpin the locking pin (10) on the strut (11)

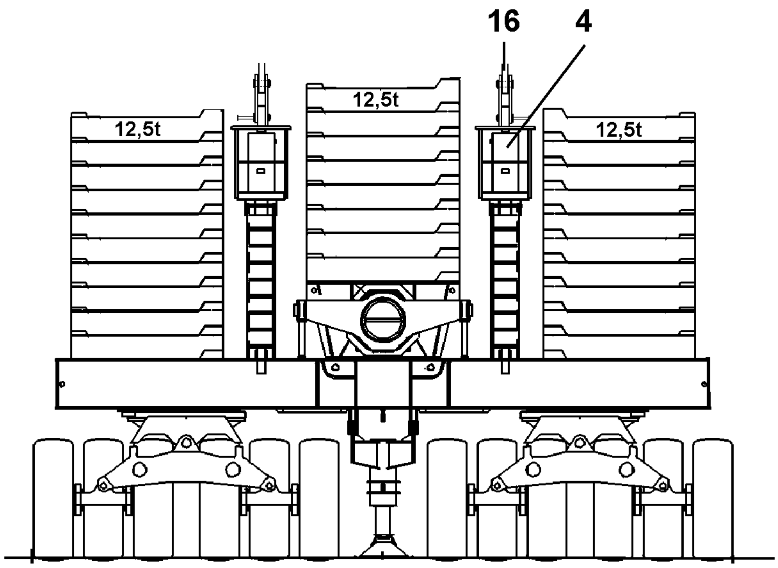
If the ballast trailer is pinned on the slewing platform, the support cylinders (3) must be retracted.

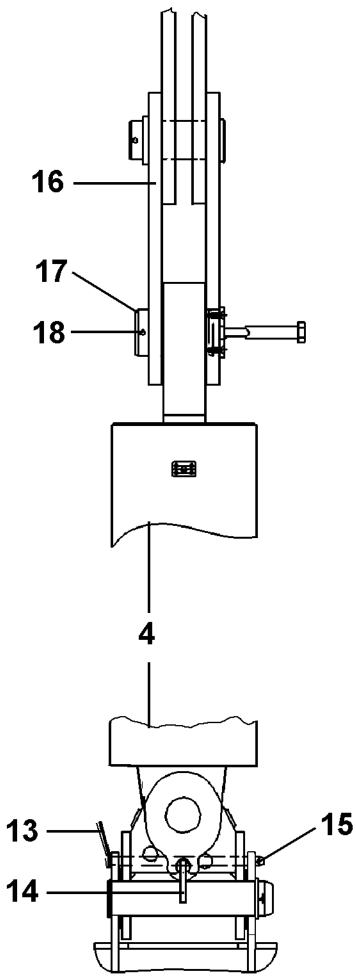
Remove the spring retainer (S) on the support cylinder strut (11) and unpin the locking pin (10) on the strut (11) .
Insert the locking pin (10) into the receptacle (12) .

Note: The locking pin (10) can only be unpinned if support cylinders (3) are retracted.

C A U T I O N : Before placing the ballast plates on the ballast trailer , it must be ensured that the support cylinders (3) are retracted and the locking pin (10) is removed on the strut (11) .
It is imperative that the locking pin is unpinned, so that there is a compensation between the strut and the support cylinders when the ballast plates are placed.
Otherwise the ballast trailer will be damaged!

1





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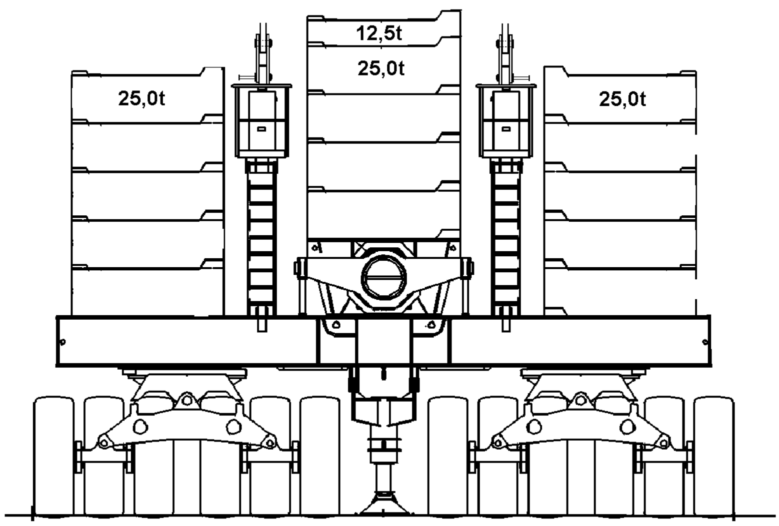

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3.3 Set up the pull cylinder

Set up the pull cylinder (4) with the auxiliary crane and lock with two pins crosswise and lengthwise.
- Insert the handle pin (13) and secure with spring retainers (15) .
- Insert the handle pin (14) and secure with spring retainers (15) .

Note: The weight of the pull cylinder is approx. 1500kg
On each cylinder is a working platform. On this platform is a switch housing with button "Cylinder **OFF**" and "Cylinder **ON**" .
With this buttons, only the one cylinder can be moved on which the switch is installed.

Extend the piston rod and connect the guy rod (16) with cylinder (4), insert pin (17) and secure with spring retainer (18) .

C A U T I O N : Unpin locking pin (13) when guy rods are pinned to the cylinder, therefore cylinders can move transvers.
Otherwise the ballast trailer will be damaged!

3.4 Ballasting of the ballast trailer

C A U T I O N : Before placing the ballast plates on the ballast trailer, it must be ensured that the support cylinders are retracted and the locking pin (10) is removed on the support cylinder strut (11) .
Otherwise the ballast trailer will be damaged!

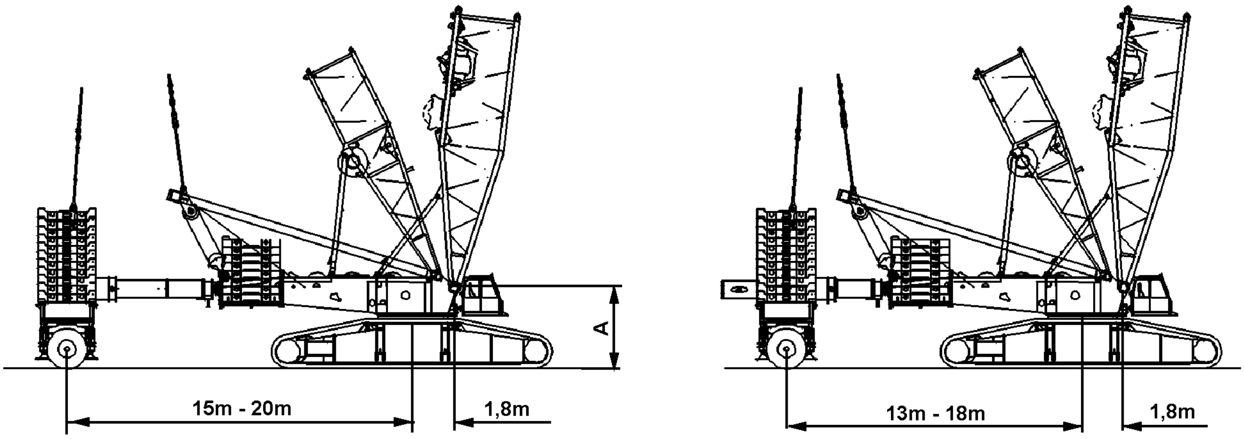
Fig. 1	28 plates	each	12.5t
* **Fig. 2**	14 plates	each	25.0t
	1 plate		12.5t

Place the ballast plates with the auxiliary crane onto the ballast trailer .

D A N G E R: When loading the ballast trailer, make sure the ballast plates are placed correctly.
The ballast plates must be distributed evenly when placed on the ballast trailer .

Note: To determine the correct ballast weight, use the LICCON job planner.

* Optional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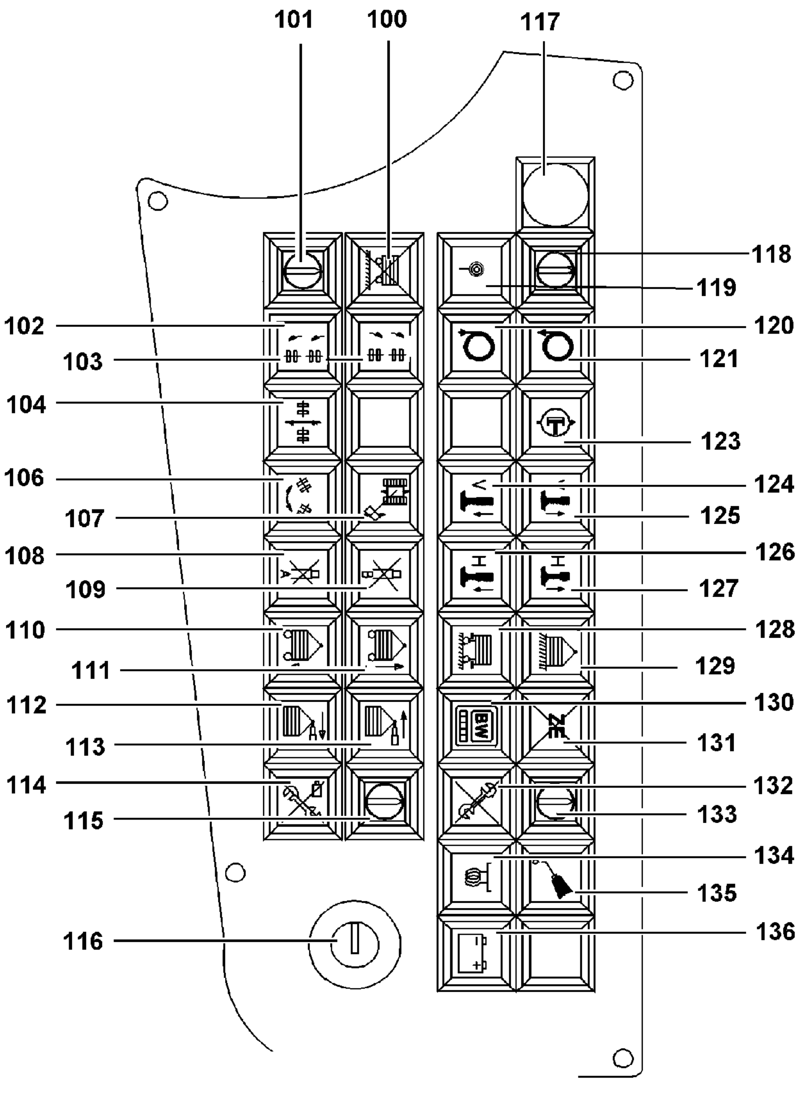
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3.5 Raising and lowering the ballast trailers with the pull cylinders

- Press the button (111) in the cab, the ballast trailer is raised with the pull cylinders ;
- Press the button (110) in the cab, the ballast trailer is lowered with the pull cylinders.

D A N G E R: If the ballast trailer is raised or lowered, make sure the ballast trailer is positioned horizontally.
When the guide is on top, the alignment is automatically carried out with the aid of the level sensor when raising and lowering the ballast trailer.

Note: The ballast trailer can be manually aligned in horizontal direction with buttons (108) "A-Stop" and (109) "B-Stop" .

.

- Press the button (108) in the cab, the ballasting cylinder (A) on the left hand side is blocked;
- Press the button (109) in the cab, the ballasting cylinder (B) on the right hand side is blocked.

D A N G E R: The control panel on the ballast trailer may only be used for the installation.
During crane operation, the crane operator may not raise or lower the ballast trailer from the control panels on the pull cylinders because the monitors cannot be seen from that point.
Raising or lowering during crane operation may only be made from the cab.
When raising or lowering the ballast trailer, it must be ensured that the difference of forces in the ballast guying is not too great.
The LICCON shows both forces and issues a warning if the difference of forces is too great.
See also paragraph 8.8, Difference force monitoring of ballast guying.

5.11 BALLAST TRAILER

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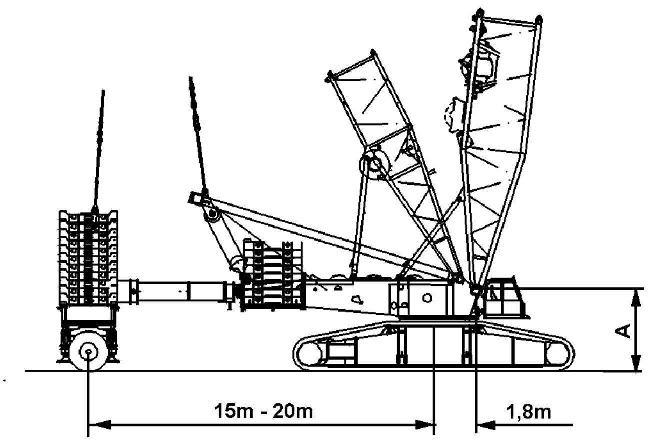
2



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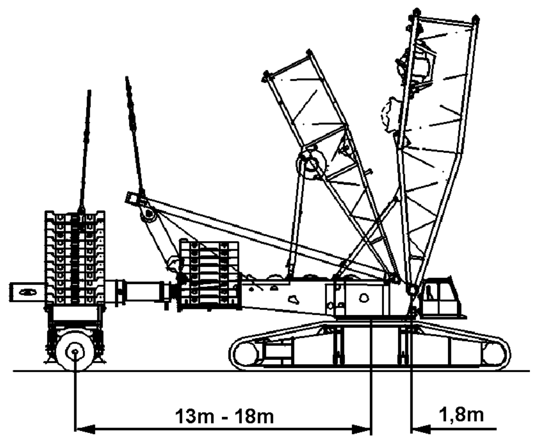

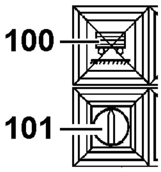

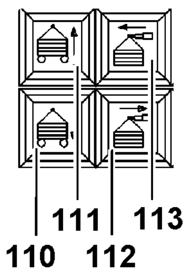

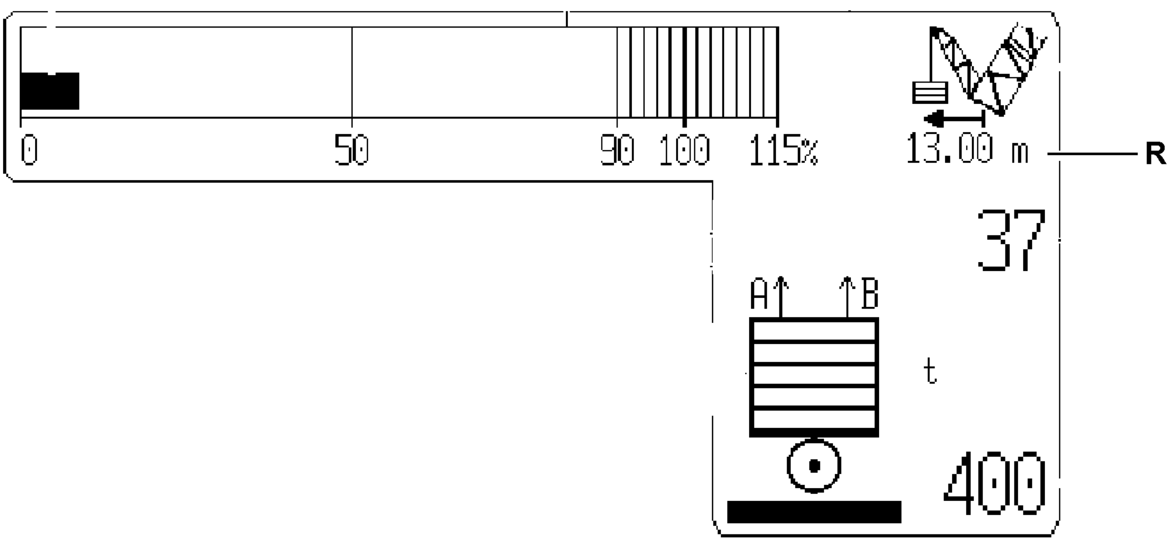

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4. Telescoping the ballast trailer in and out

The ballast trailer is equipped with a telescopable ballast trailer guide, which allows the ballast trailer radius to be matched to the current environment or current hoisting task.
The length of the telescopable ballast trailer guide is:
Fig. 1 = min. 13m - max. 18m
Fig. 2 = min. 15m - max. 20m

The current actual length (R) is shown on the monitor .

Note: Telescoping in and out is only possible if the wheels of the ballast trailer are in towing mode or if the ballast trailer is suspended and if the keyed button (101) has been switched to **"Ballast trailer raised"** .
The warning light (100)**"Ballast trailer raised" blinks** if the keyed button (101) is turned on.
The condition "Ballast trailer raised" is turned off by pressing the button (100) .

D A N G E R: If the wheels are not in towing mode or if the keyed button (101) has not been switched to "Ballast trailer raised" and the wheels of the ballast trailer scrape on the ground, then the ballast trailer can be severely damaged. There is an increased chance of having an accident!

- Press the button (113) to telescope the ballast trailer out;
- Press the button (112) to telescope the ballast trailer in.

D A N G E R: Make sure there are no persons or objects within the danger zone of the ballast trailer . There is a danger of accidents!

C A U T I O N: When telescoping the ballast trailer in and out, the indicated actual length (R) must be monitored. The crane operator may not blindly rely on the measurement of the derrick ballast radius, he must think for himself and check if the measurement can be correct . See also paragraph 8.7, Checking the length value sensor on the ballast trailer.

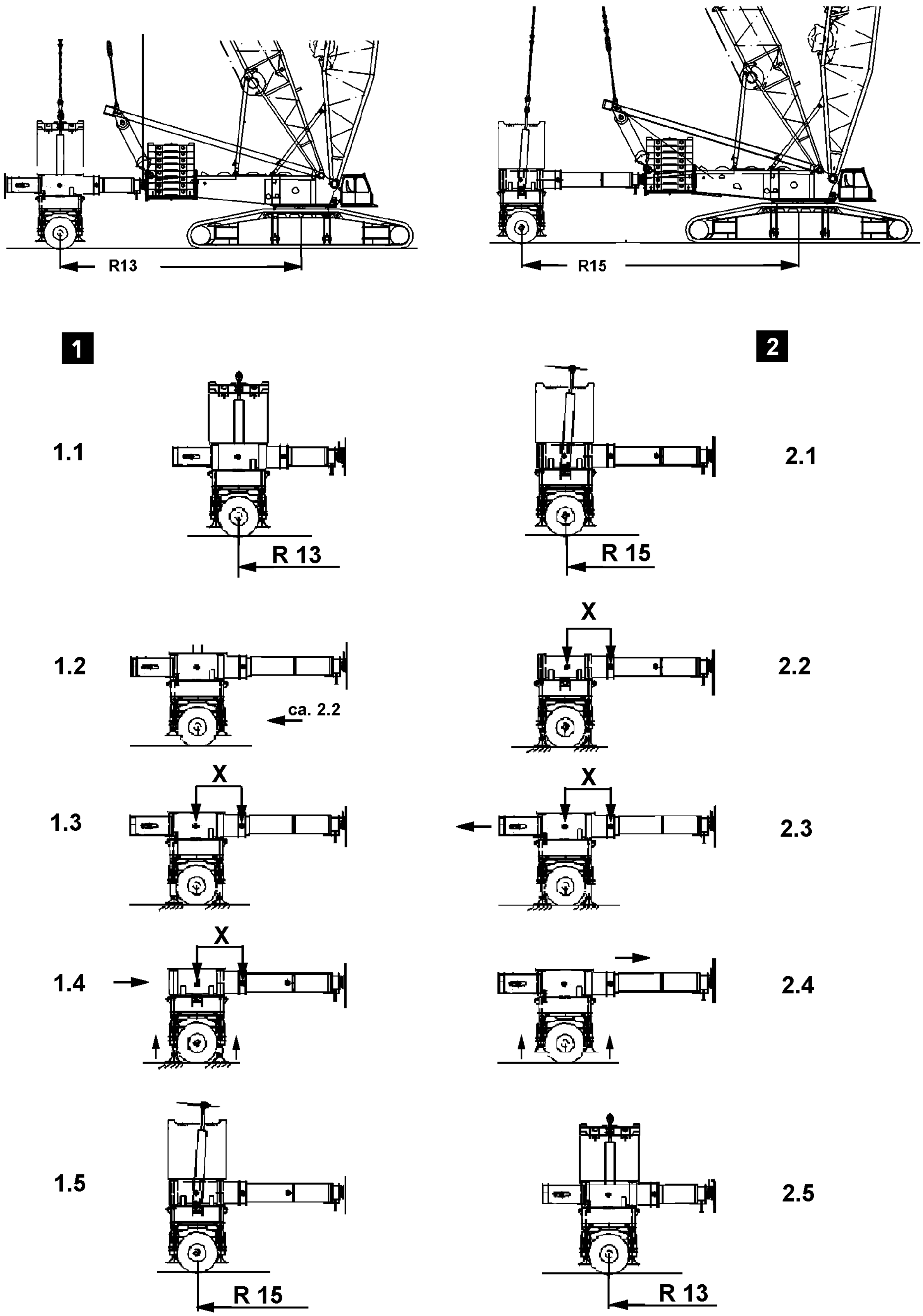

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Fig. 1

1.0 Assembly from R 13m (18m) to R 15 (20m)

1.1 Starting position R 13m
Loosen up guy rods

1.2 Extend ballast trailer appr. 2,2m

1.3 Pin support cylinder strut with locking pin
Support ballast trailer
Unpin guide pipe (X)
Adjust ballast trailerwith support cylinder - visual check on the guide

1.4 Retract guide pipe
Pin guide pipe (X)
Unpin support cylinder strut
Retract support cylinder

1.5 Operating position, R 15m

Fig. 2

2.0 Assembly from R 15m (20m) to R 13 (18m)

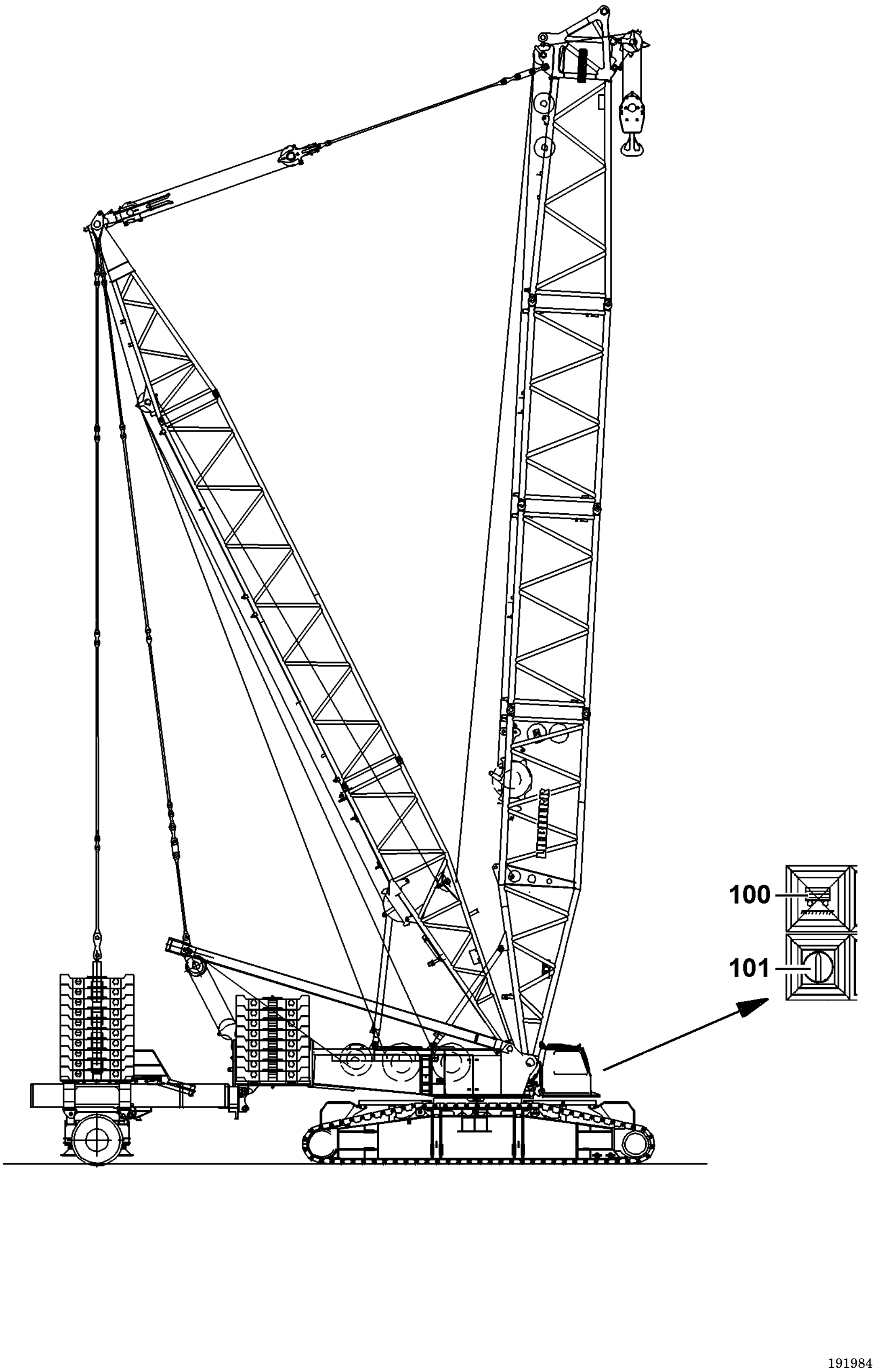
2.1 Starting position R 15m
Loosen up guy rods

2.2 Pin support cylinder strut with locking pin
Support ballast trailer
Unpin guide pipe (X)

2.3 Adjust ballast trailerwith support cylinder - visual check on the guide
Extend guide pipe
Pin guide pipe (X)

2.4 Retract support cylinder
Unpin support cylinder strut
Retract guide pipe to an radius of R 13m

2.5 Operating position, R 13m



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5. Driving with the ballast trailer

The ballast trailer is equipped with computer controlled steering programs.
- Driving in turns ;
- Towing;
- Parallel driving;
- Manual steering adjustment;
- 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.
Manual steering adjustment and support cylinders can be actuated from the cab or by remote control.
Manual operation for installation can only be actuated from the control panel.

Prerequisite

- The wheels of the ballast trailer must be in the required travel position.

Note: If the ballast trailer is operated on the ground, 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 (101) was switched to **"Ballast trailer raised"** . In this case, the crane operator must monitor that the wheels do not scrape.

D A N G E R : If the ballast trailer is on the ground, and the wheel position is not correct and the keyed button (101) had been switched to "Ballast trailer raised", the wheels of the ballast trailer and possible the crane can be damaged when "driving the crawler" .

- The travel route for crane and ballast trailer must be level, horizontal and of sufficient load carrying capacity.

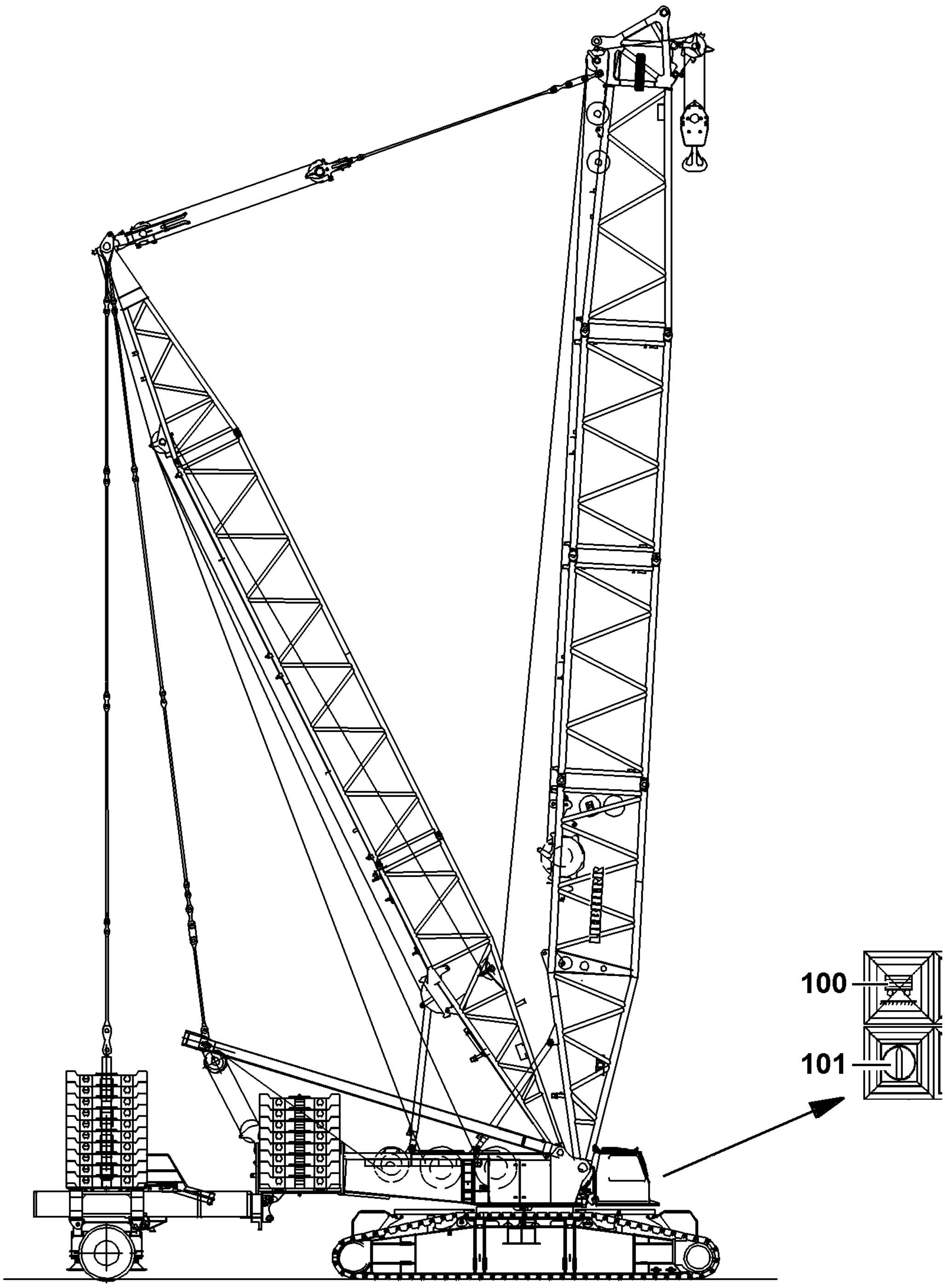
Note: During travel and slewing, a guide must monitor the crane, the luffed up boom, as well as the raised load.
Driving with a load, see chapter 4.05 Crane operation, paragraph : Crawler operation.

- It is only permitted to drive at minimum speed, utmost caution and care, the least possible acceleration as well as careful braking action.

Note: If the ballast trailer is unloaded, the axles can be moved without relieving the tires.
If the ballast trailer is loaded, the tires must be relieved by supporting the ballast trailer.

**C A U T I O N : When supporting the loaded ballast trailer, it must be ensured that the pin on the strut of the support cylinders is unpinned.
Otherwise the ballast trailer will be damaged.**

**D A N G E R: Make sure there are no persons or objects within the danger zone of the ballast trailer .
There is a danger of accidents!**



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5.1.1 Keyed button (101) ”Ballast trailer raised”

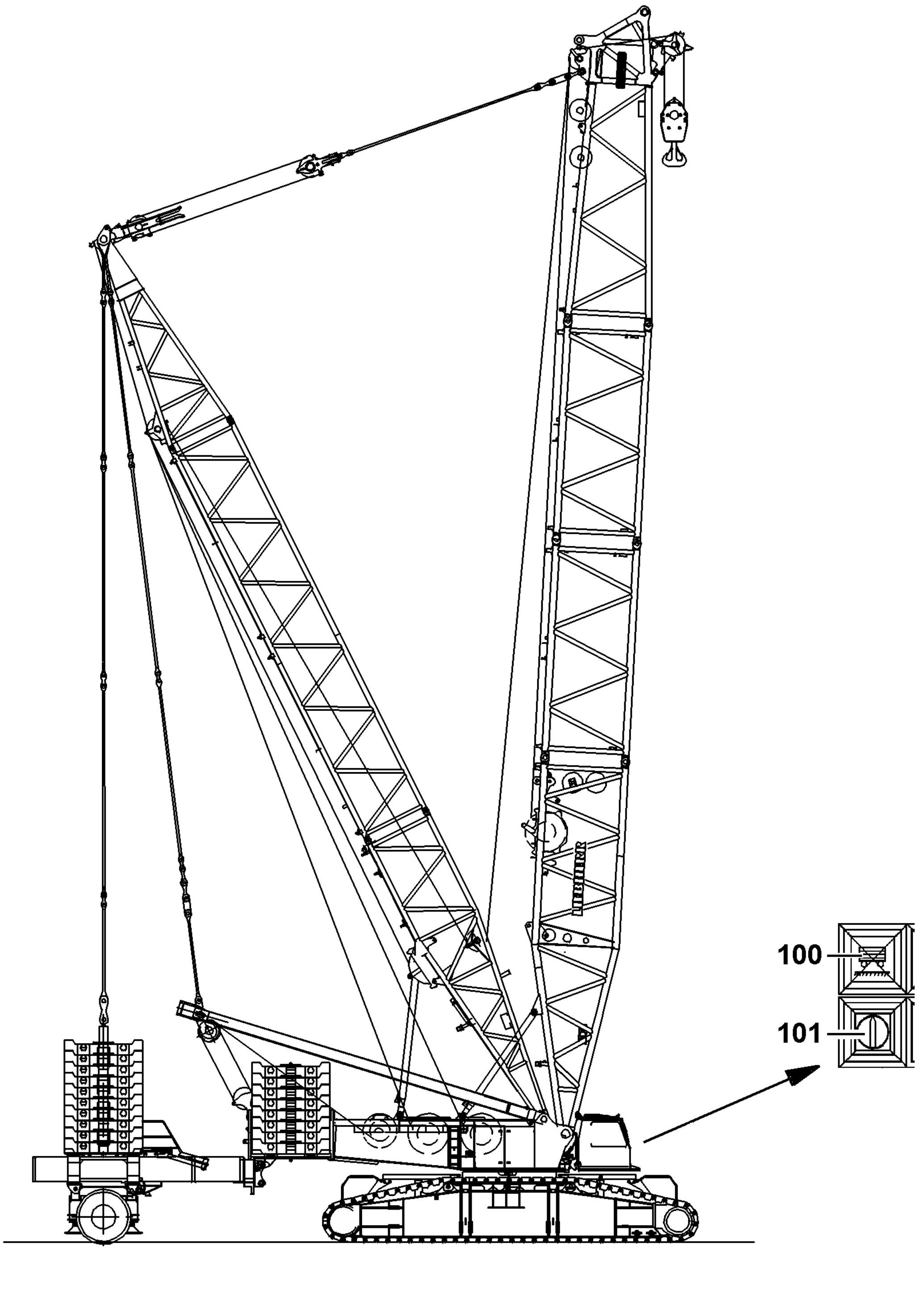
When "driving crawler" and keyed button (101) is **not** actuated, and "ballast trailer is not raised", the slewing brake as well as the hydraulic slewing gear coasting is opened.
If proceeded at "driving crawler" with raised ballast trailer (constant visual check), the keyed button (101) "Ballast trailer raised" must be turned on.

**D A N G E R : If the ballast trailer is raised off the ground (constant visual check), there is the danger that the wind turns the slewing platform away when "driving the crawler", for that reason, the keyed button (101) ”Ballast trailer raised” must be turned on immediately.
In that case, when "driving the crawler", the slewing brake stays closed, the hydraulic slewing gear coasting, however, remains open.
If the ballast trailer scrapes or gets stuck on the ground when "driving the crawler", so that the slewing platform turns with the ballast trailer against the crawler travel gear, the slewing brake will slip. The slewing gear will not be damaged. If the wheels of the ballast trailer are not on towing mode, the ballast trailer or the crane will be damaged.**

C A U T I O N : If, with turned on function "Ballast trailer raised", the indicator light (100) blinks, it is possible to turn the crane superstructure or to drive the crane even though the wheels of the ballast trailer are not set to driving in turns, towing or parallel travel.

If "ballast trailer raised" is turned on with the keyed button (101), then this is shown by the blinking warning light (100). In addition, the ballast trailer symbol is shown on the monitor 1 in suspended condition.

Press the button (100) to turn off ”ballast trailer raised”. The warning light in the button (100) turns off.
The LICCON monitor shows the derrick ballast symbol on the ground.



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5.1.1.1 Operate the ballast trailer in defined mode

The ballast trailer may not be raised or lowered while driving, this must be done before starting to drive.

The ballast trailer should either be

1) defined as set on the ground (keyed button (101) **not** actuated "ballast trailer not raised").
   This means that the ballast trailer is sitting with a remaining load on the ballast trailer tires. This remaining load is so great that the wind cannot turn the crane superstructure if the slewing brake is open when actuating "driving the crawler " .

or

2) defined as raised off the ground (keyed button (101) actuated "ballast trailer raised").
   This means that the slewing brake is not open when "driving the crawler " , and the wind cannot turn the superstructure when "driving the crawler " .

D A N G E R: The ballast trailer must always be operated in defined mode (safely off or on the ground) . Operation of the ballast trailer when not in defined mode is prohibited.
In case of non-defined (solid) setting down of the ballast trailer and non-defined lifting off of the ballast trailer, there is an increased risk of accidents.

C A U T I O N : If the ballast trailer wheels scrape on the ground, they can be damaged despite the setting "ballast trailer raised" .

5.1.1.2 Operate the ballast trailer in non-defined mode

D A N G E R: The ballast trailer must always be operated in defined mode.

Example:
Ballasted ballast trailer is still sitting on the ground with 1 t .

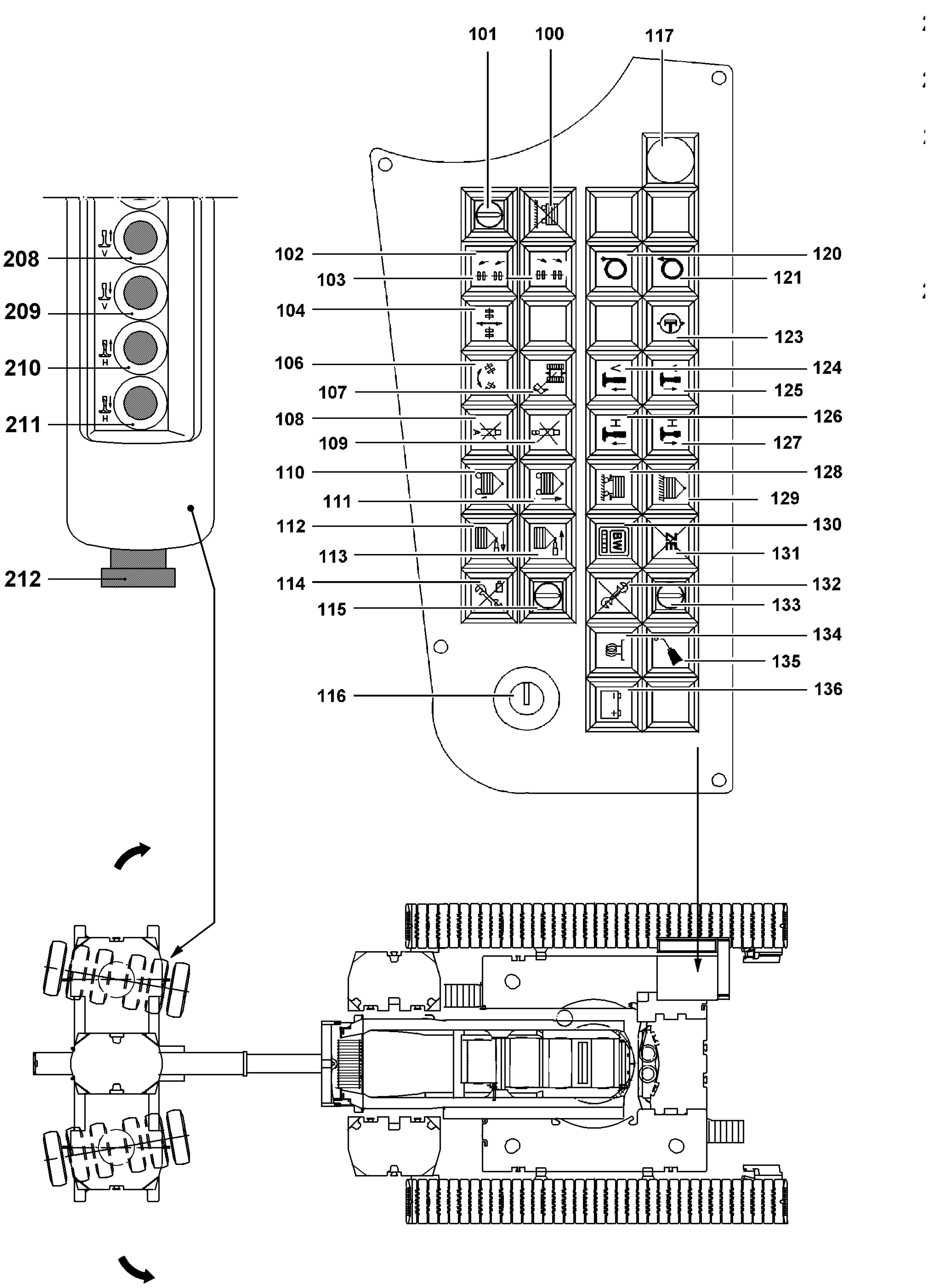
1) If the keyed button (101) is **not** actuated "Ballast trailer not raised"
   The slewing brake opens when driving the crawler. The wind can turn the superstructure and the load can start to swing.

D A N G E R: There is an increased danger of accidents due to collision.

or

2) if keyed button (101) is actuated "Ballast trailer raised"
   The slewing brake remains closed when driving the crawler . When driving the crawler (in curves), the ballast trailer tires or the slewing brake slip .

C A U T I O N : There is the danger that the ballast trailer or the slewing gear will be damaged due to wear.



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5.2 Driving in turns

By telescoping the ballast trailer guide, various turning radii are possible.

Prerequisite
- The crane is at a standstill;
- The ballast trailer is properly installed.

Note: If the ballast trailer is operated on the ground, the wheels must be in the correct travel direction. See also paragraph 5.2.1 to 5.2.3.
If the ballast trailer is suspended, the wheels can be in any position, if the keyed button (101) was switched to "ballast trailer raised" . In this case, the crane operator must monitor that the wheels do not 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 (101) was switched to "Ballast trailer raised", then the wheels of the ballast trailer can be damaged when turning.

5.2.1 Lift the ballast trailer with support cylinders

- Press button (124 and 126) **or**
  press button (209 and 211) , support cylinders front and rear extend.

D A N G E R: The support cylinders should be driven from the cab and the monitor indicators should be observed.
By lifting the ballast with the support cylinders, the force in the test point 1 = F 1 could increased to maximum value. The extension of the support cylinders is then turned off. Do not enter into the shut off, rather stop before that.

5.2.2 Set the axles in circle driving position

- Press the button (106), the axles are turned in turning direction;
  the indicator light in the button blinks until the turning direction is reached;
  the indicator light in the button lights up when the turning direction is reached.

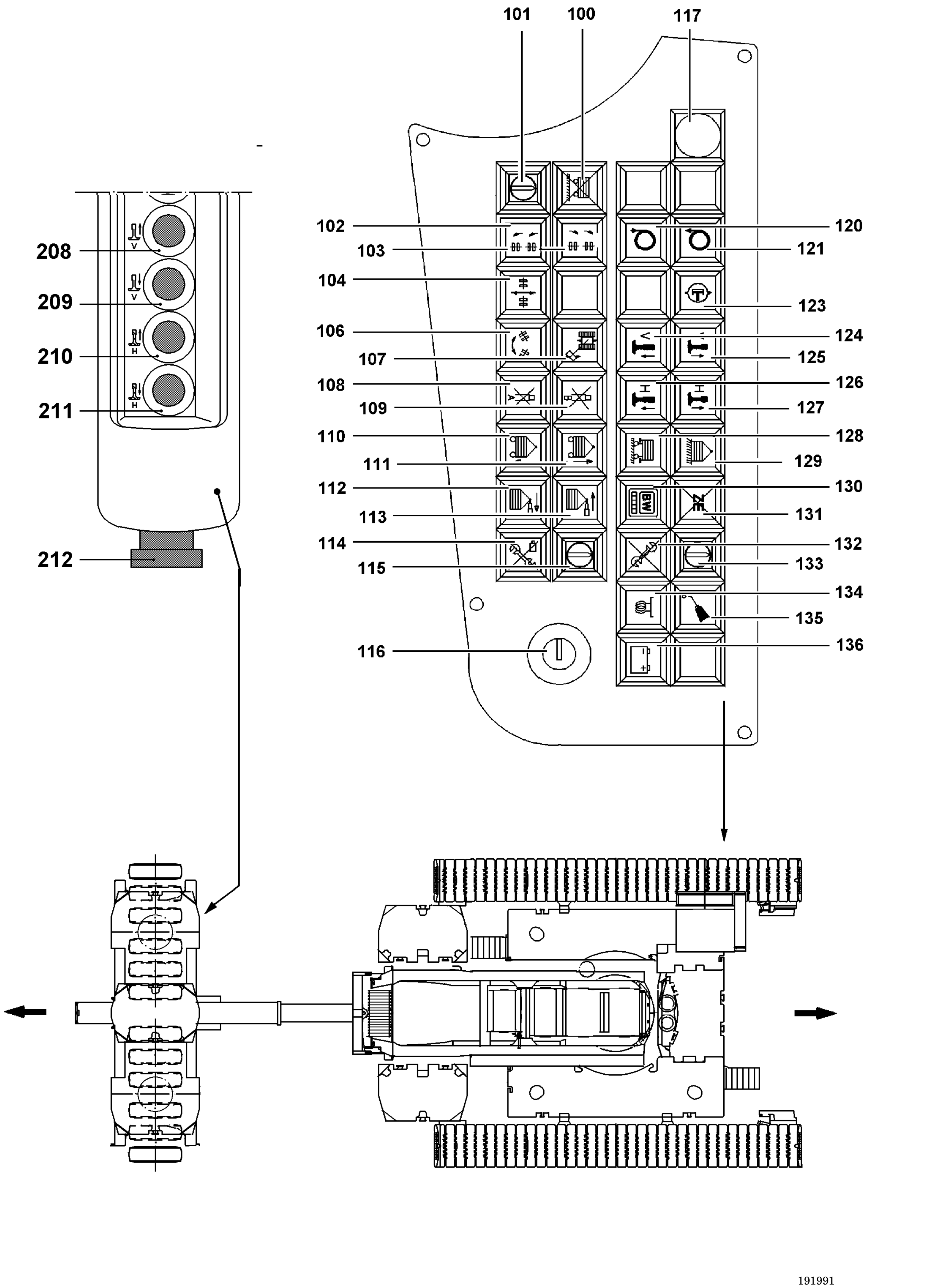
Note: If one of the sets of wheels leaves the stipulated angle, then the indicator light in the button (106) blinks and the axles must be reset as described above.

5.2.3 Lower the ballast trailer with the support cylinders

- Press the button (125 und 127) **or**
  press the button (208 and 210) , the support cylinders on the front and the rear retract;
- the indicator light (128) "supports ballast trailer are retracted" lights up.

Note: The release for ” turning the slewing platform ” is only given when both axles are in turning direction and the support cylinders are retracted.

G E F A H R: Die Abstützzylinder sollten besser aus der Kabine verfahren und die Bildschirmanzeigen beobachtet werden.
Durch das Absenken des Ballastes mit den Abstützzylindern könnte die Kraft in der Messstelle 1 = F 1 bis zum Minimalwert abnehmen. Das Einfahren der Abstützzylinder wird dann abgeschaltet. Es sollte aber nicht in die Abschaltung hineingefahren sondern voher angehalten werden.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5.3 Towing

Prerequisite
- The crane is at a standstill;
- The ballast trailer is properly installed;
- The rocker switch (74) on the left armrest is on crawler operation.

Note: When the ballast trailer is operated on the ground, the wheels must be in the correct travel direction. 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 (101) was switched to "Ballast trailer raised" . In this case, the crane operator must monitor that the wheels do not 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 (101) was switched to "Ballast trailer raised", then the wheels of the ballast trailer and possibly the crane can be damaged when "Driving the crawler" .

5.3.1 Raise the ballast trailer with support cylinders
- Press button (124 and 126) **or**
press button (209 and 211) , support cylinders front and rear extend.

Note: see also 5.2.1

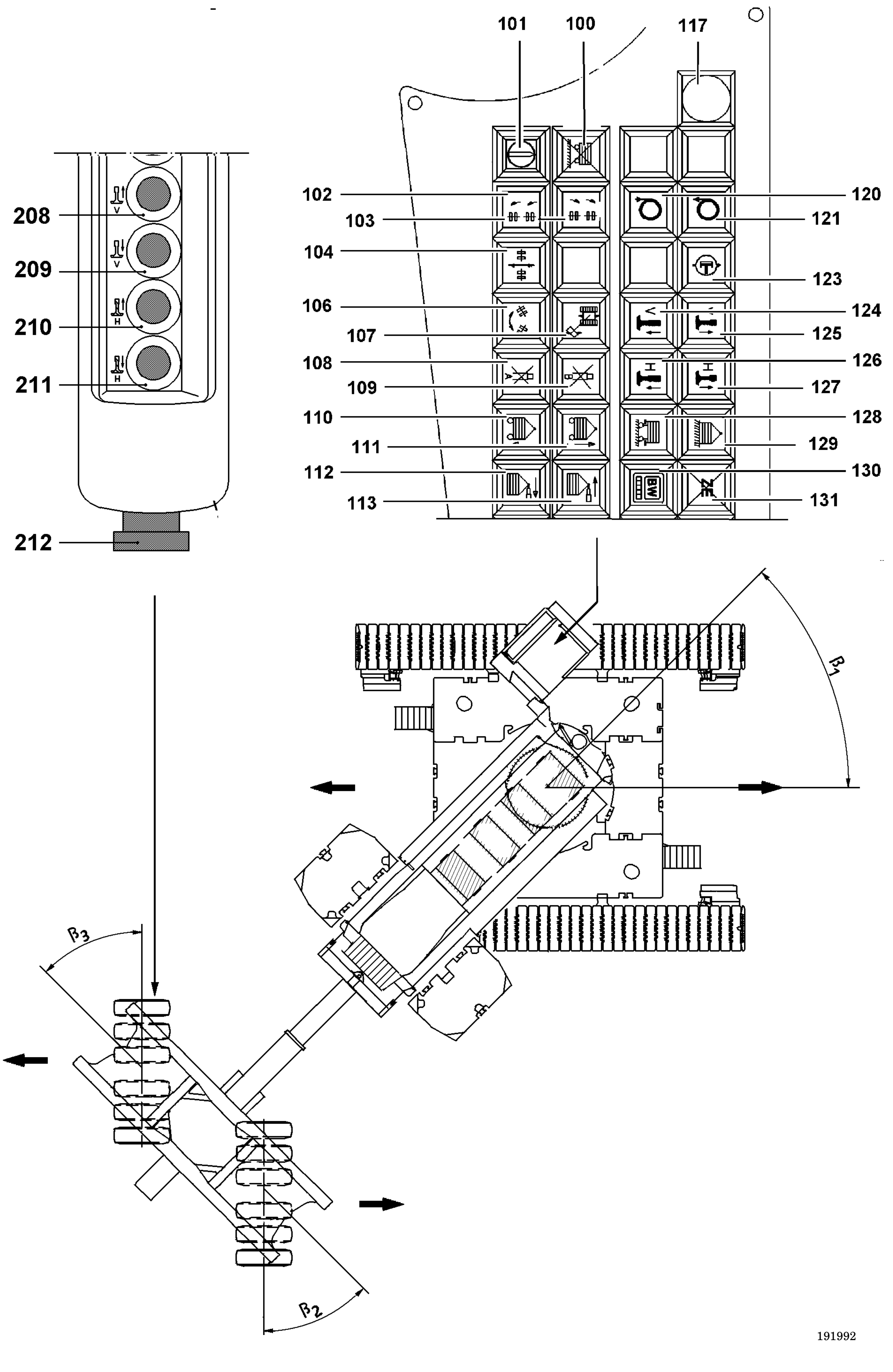
5.3.2 Set the axles to towing position
- Press button (104), the axles are turned in towing position;
the indicator light in the button blinks until the towing position is reached;
the indicator light in the button lights up when the towing position is reached.

Note: It is possible to switch from operating mode towing, after reaching the towing position, to manual steering adjustment and back while driving the crawler .
If operating mode towing is selected from operating mode manual steering adjustment, then the indicator light in button (104) blinks until the towing position is reached.
If one of the sets of wheels leaves the stipulated angle, then the indicator light in the button (104) blinks and the axles must be reset as described above.

In general, the following applies: The sets of wheels only move if either button (102 or 103 or 104) or (200 or 201) on panel, are pressed in the corresponding operating mode or if the crawler is driven.

5.3.3 Lower the ballast trailer with support cylinders
- Press button (125 and 127) **or**
button (208 and 210), the support cylinders on front and rear retract;
- indicator light (128) ”supports ballast trailer are retracted” lights up.

Note: The release for ”towing” is only made if both axles are in travel position (zero position) and the support cylinders are retracted.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5.4 Parallel driving

Prerequisite
- The crane is at a standstill ;
- the ballast trailer is properly installed;
- the rocker switch (74) on the left armrest is on crawler operation.

Note: Regardless of "Ballast trailer on the ground" or "Ballast trailer suspended" , the ballast trailer must be in wheel position for parallel driving.
In any other wheel position, the control shifts to shut off as in towing.

D A N G E R : If the ballast trailer is on the ground, the wheel position is not correct and thekeyed button (101) was switched to "Ballast trailer raised", then , when "Driving the crawler" , the wheels of the ballast trailer and possibly the crane will be damaged.

5.4.1 Raise the ballast trailer with the support cylinders
- Press button (124 and 126) **or** button (209 and 211) , the support cylinders front and rear extend.

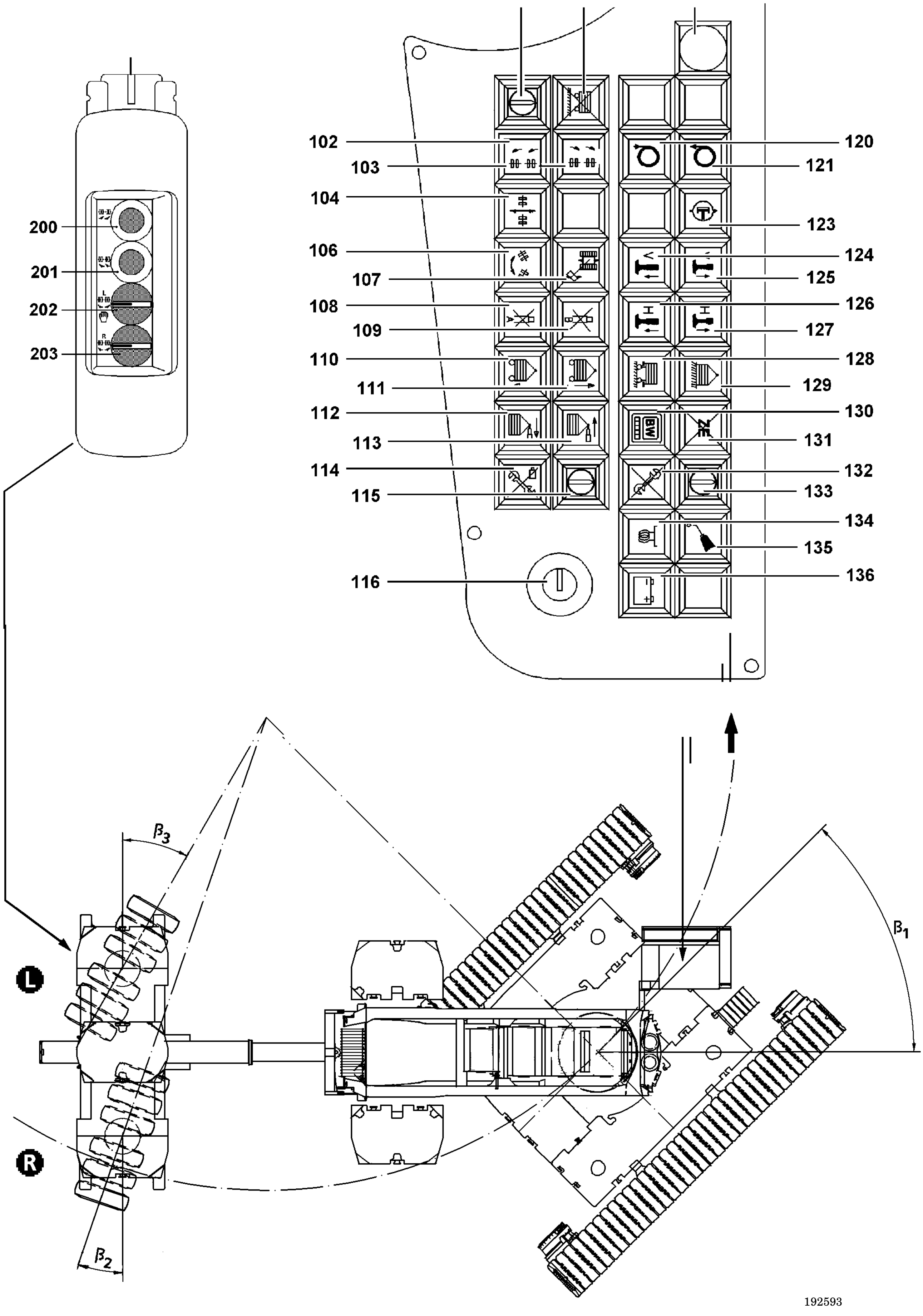
5.4.2 Set the axles in parallel position
- Press button (107), the axles are turned to parallel position; the indicator light in the button blinks until the parallel position is reached ; the indicator light in the button lights up when the parallel position is reached.

Note: If one of the sets of wheels leaves the stipulated angle, the indicator light in the button (107) blinks and the axles must be reset as described above.

5.4.3 Lower the ballast trailer with support cylinders
- Press button (125 and 127) **or** button (208 and 210), the support cylinders front and rear retract;
- the indicator light (128), "Supports ballast trailer are retracted" lights up.

Note: The travel drive of the crawler is locked until the axles are in parallel position.
When "driving the crawler", the slewing brake of the crane remains closed, the hydraulic coasting is opened.
If angles β_2, β_3 in relation to β_1 deviate by more than the permissible limit value, then the crawler gear is stopped.
The indicator light (107) blinks.
The crawler gear is only released if the axles are turned to the stipulated angle, as described above.
By turning on the rocker switch "Parallel operation of crawler " (79), the crawler drives exactly straight forward on proper ground. This makes it easier to drive with the ballast trailer in operating mode "Parallel travel "!

C A U T I O N : In parallel travel ,
the crawler may not be steered, but the function is not shut off.
If it is steered anyway, the mechanical slewing brake can slip, until the crawler travel gear is stopped due to the angle deviation.
A guide must monitor the side tire deformation. If the deformation is more than 100 mm, then the position of the axles must be corrected.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5.5 Manual steering adjustment

Prerequisite
- The ballast trailer is properly installed;
- the rocker switch (74) is on crawler operation.

5.5.1 Steering and steering adjustment of axles

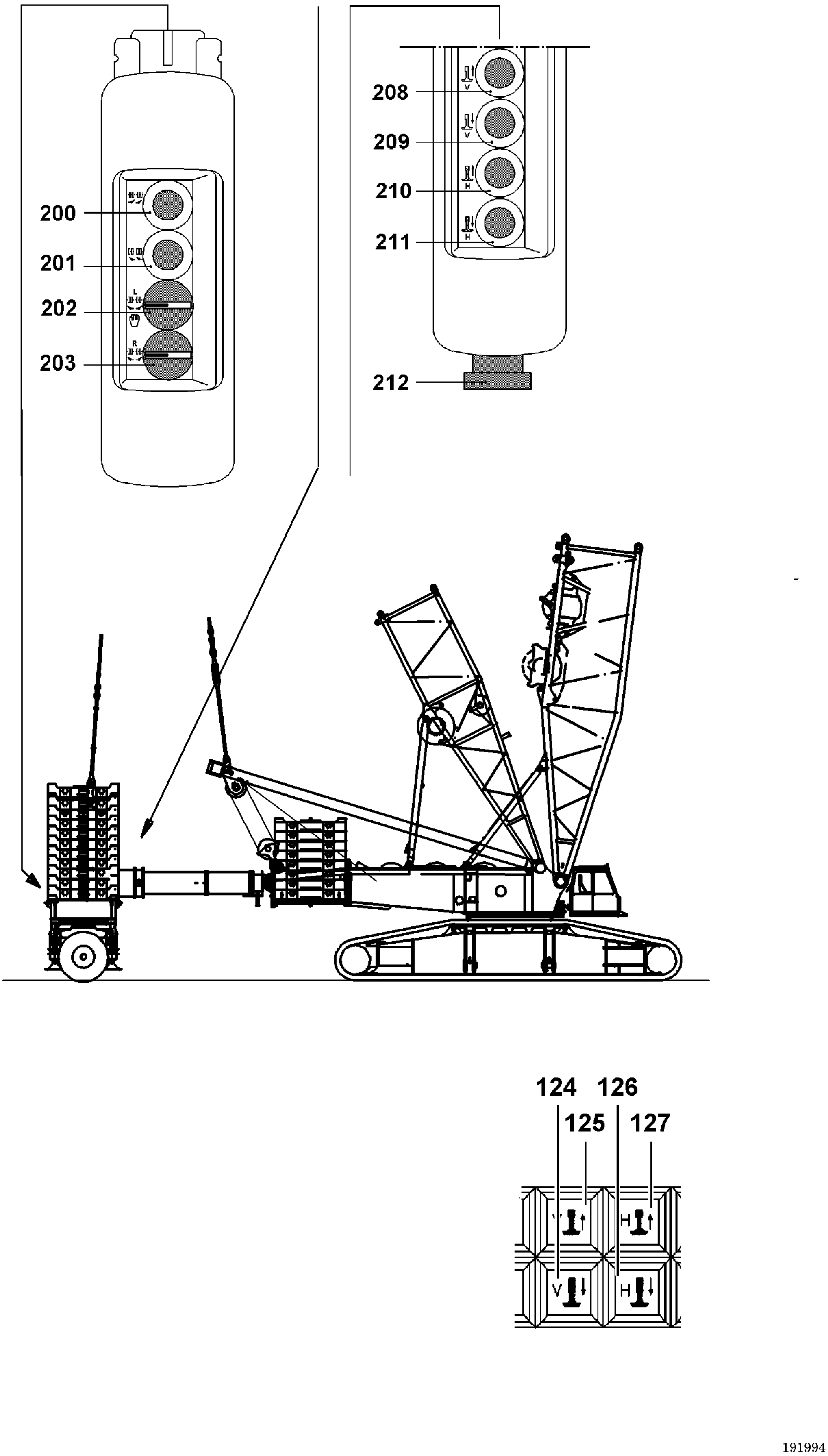
Prerequisite
- Operating mode towing has been preselected
 and ballast trailer axles have reached towing position.

- Press button (103) **or** (201) to turn the ballast trailer wheels to the right;
- press button (102) **or** (200) to turn the ballast trailer wheels to the left.

The right set of wheels is regulated by the computer controlled steerign program in such a way that there is always a steering center available. The angle $ß_1$ is determined by driving the crawler and the angle $ß_3$ by the steering motion made by the operator, whereby angle $ß_2$ is continually adjusted. Changing from operating mode manual steering adjustment to operating mode towing and back, after reaching the towing position, is possible while driving the crawler . If the operating mode manual steering adjustment is selected from operating mode towing, the indicator lights in the buttons (102 and 103) light up.

Note: The left set of wheels can be steered to the stipulated angle $ß_3$. Further steering past this limit is not possible.
The right set of wheels is adjusted according to the steering center. If the adjusted right set of wheels cannot follow the steered left set of wheels, then the steered left set of wheels is stopped until the adjusted right set of wheels has caught up. If the right set of wheels leaves the stipulated angle,then the indicator lights in buttons (102 and 103) blink and towing mode must be started again.
If the angle $ß_1$ of the slewing platform exceeds the given dimension, then the system shifts automatically to towing mode. The indicator lghts in the buttons (102, 103 and 104) blink. If the towing position is reached, the steering can be adjusted manually. The indicator lights in buttons (102 and 103) light up.

Generally, the sets of wheels only move if either button (102 or 103 or 104) or (200 or 201) on panel is pressed in the corresponding operating mode or if the crawler is driven.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124
125
126
127
191994

5.6 Manual operation for installation

The ballast trailer is equipped with a program with which each ballast trailer axle can be turned individually.

Prerequisite

- The crane is at a standstill;
- the ballast trailer is installed properly.

5.6.1 Raise the ballast trailer with support cylinders

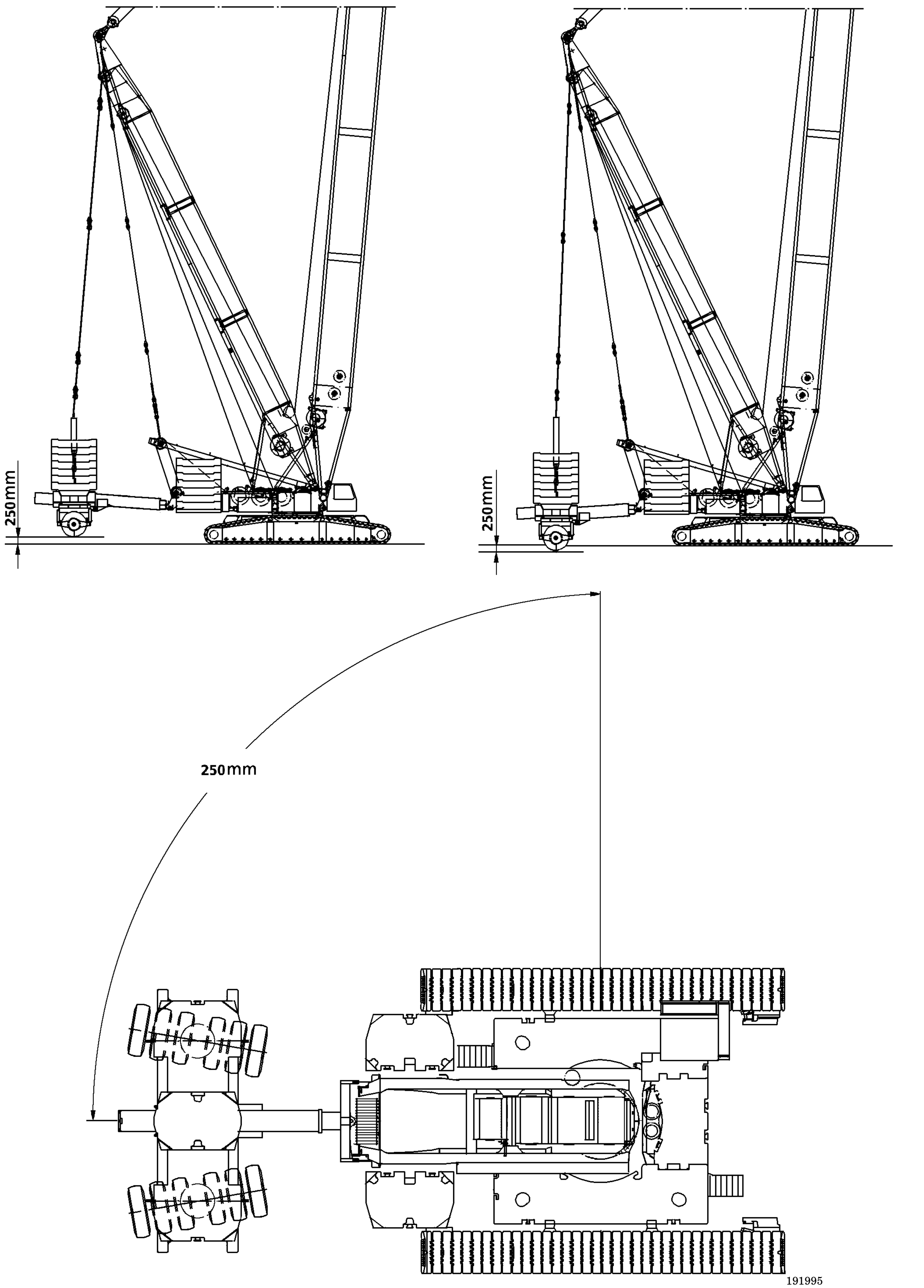
- Press button (124 and 126) **or**
  button (209 and 211), the support cylinders on the front and rear extend.

5.6.2 Set the axles

- Turn knob (202) to the right, the left axle turns to the right;
- Turn knob (202) to the left, the left axle turns to the left;
- Turn knob (203) to the right, the right axle turns to the right ;
- Turn knob (203) to the left, the right axle turns to the left.

5.4.3 Lower ballast trailer with support cylinders

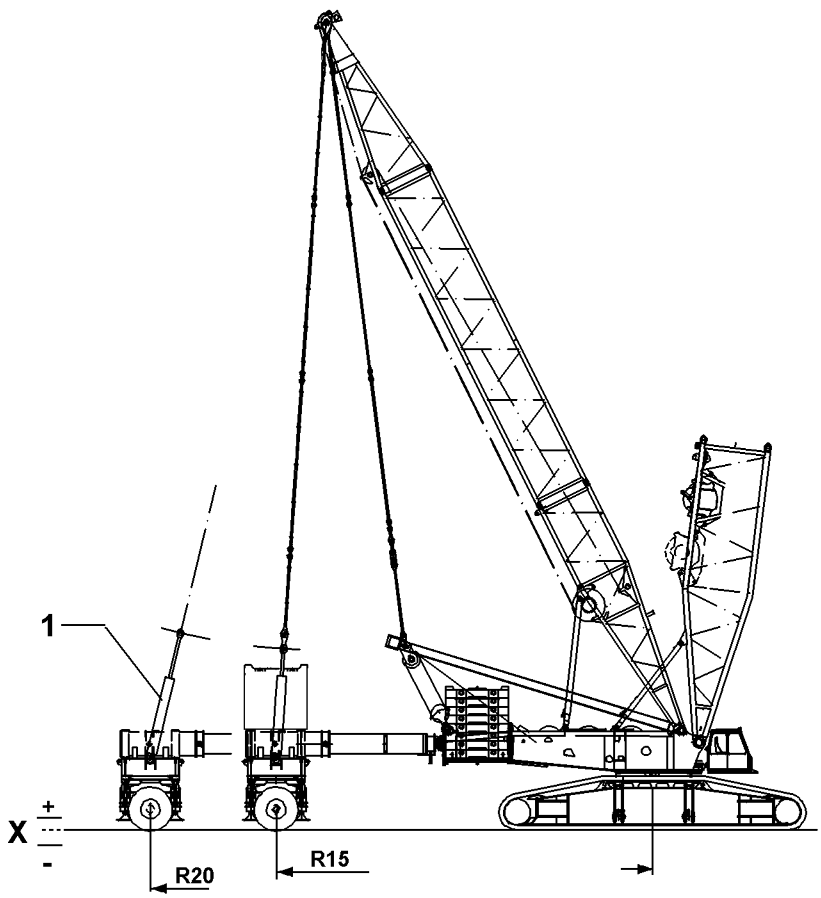
- Press button (125 and 127) **or**
  button (208 and 210), the support cylinders on the front and rear retract;
- indicator light (128) 'supports ballast trailer are retracted' lights up.

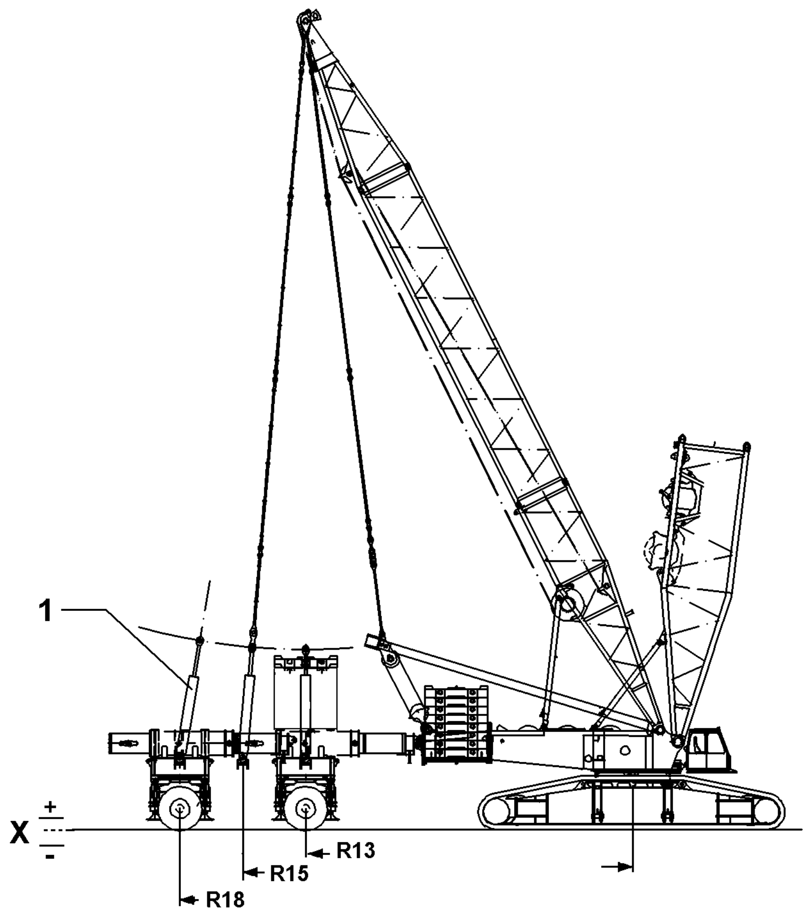

250mm
250mm
250mm
191995

6. Max. permissible uneven ground for towing, parallel driving and driving in turns and manual steering adjustment

Level change between standing surface of crane and ballast trailer when driving or turning.

D A N G E R: The level change ballast trailer travel route surface in relation to the crane travel route surface for towing or parallel driving may not be more than max. ± 250 mm .
The level difference of the ballast trailer travel route surface in relation to the crane travel route surface when driving in turns may not be more than max. ± 250 mm (constant incline or decline) over a 90° turning range.





192173

6.1 Compensation of maximum permissible uneven ground via pull cylinders

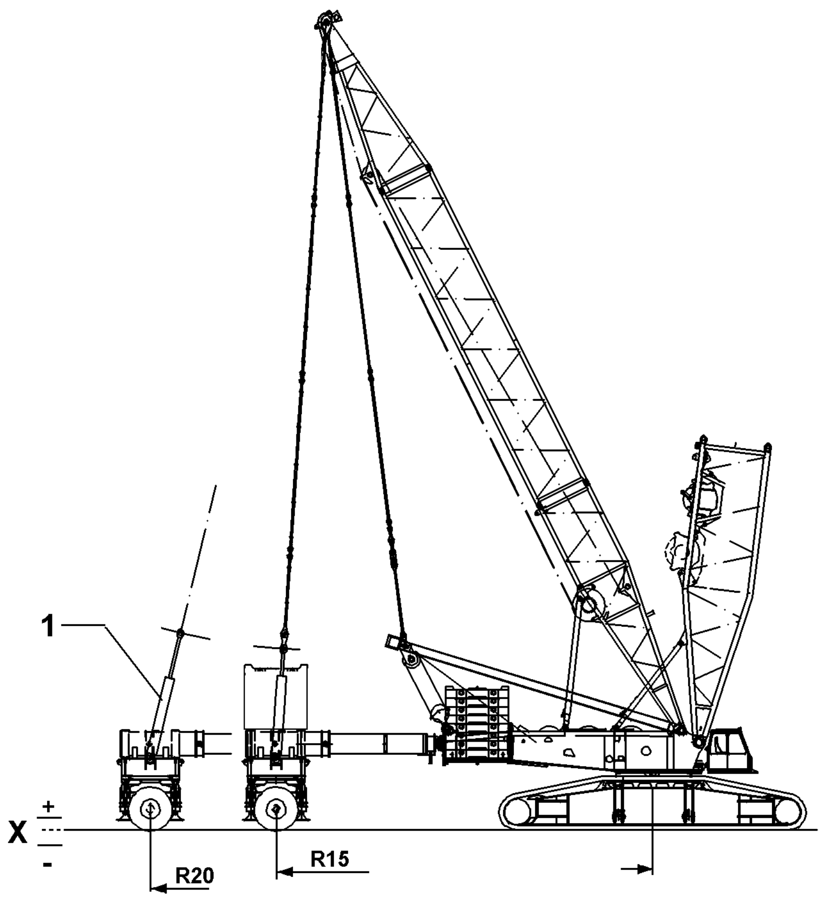
By lifting and lowering the pull cylinders (1), the maximum perssible uneven ground can be compensated for.

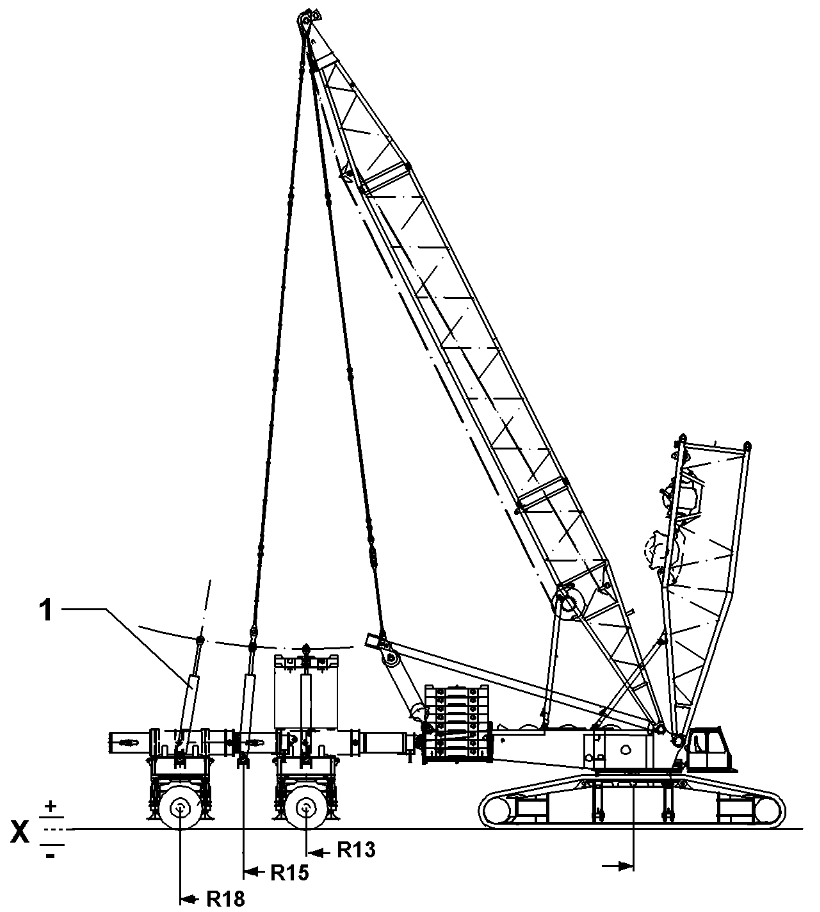
Ballast trailer radius 13 m

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 uneven ground		± 250		± 250
Pull cylinder retracted	0	+ 1080	0	+ 810
Pull cylinder Nominal position	1080	0	810	0
Pull cylinder extended	2500	- 1380	2500	- 1650

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 uneven ground		± 250		± 250
Pull cylinder retracted	0	+ 1155	0	+ 880
Pull cylinder Nominal position	1155	0	880	0
Pull cylinder extended	2500	- 1645	2500	- 1620





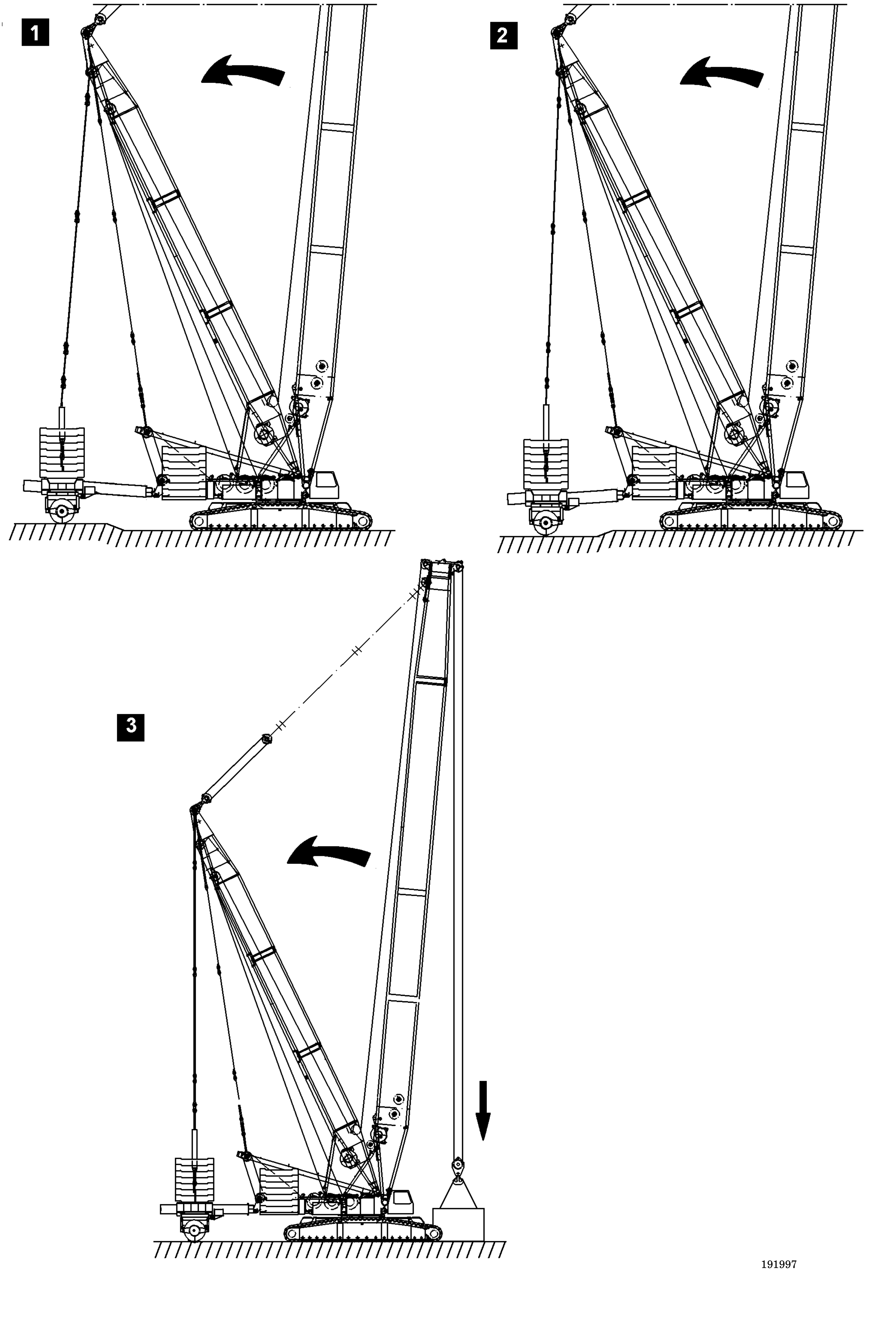
192173

Ballast trailer radius 18 m

Ballast trailer radius **R 18 m**	**with** Quick connection		**without** Quick connection	
	Cylinder stroke **mm**	Dimension X **mm**	Cylinder stroke **mm**	Dimension X **mm**
Max. permissible uneven ground		± 250		± 250
Pull cylinder retracted	0	+ 995	0	+ 1235
Pull cylinder Nominal position	995	0	1235	0
Pull cylinder extended	2500	- 995	2500	- 1265

Ballast trailer radius 20 m

Ballast trailer radius **R 20 m**	**with** Quick connection		**without** Quick connection	
	Cylinder stroke **mm**	Dimension X **mm**	Cylinder stroke **mm**	Dimension X **mm**
Max. permissible uneven ground		± 250		± 250
Pull cylinder retracted	0	+ 1910	0	+ 1635
Pull cylinder Nominal position	1910	0	1635	0
Pull cylinder extended	2500	- 590	2500	- 865


1
2
3
191997

7. Safety guidelines for travel operation

7.1 Relapse cylinder

When the steepest operating position of the main boom is reached, luffing up is shut off by the overload safety system in all operating modes.

Note: However, there are cases where the relapse cylinders move into block position due to a movement of the complete crane system to the rear.

7.2 Block position of relapse cylinder

In normal crane operation without bypass of the overload safety system, a block position is not possible. Should a block position occur anyway, the movement is shut off and the boom limit symbol in the operating view shows which block position has been triggered.

D A N G E R : If a block position on the relapse cylinders occurs in emergency operation, the horn will sound and an indicator light on the instrument panel will light up. In this case, the movements just carried out must be stopped immediately. There is an increased danger of accidents, since the movements are not automatically stoppped.

Using the boom limit symbol, it must be determined which limit switch on which relapse cylinder has been actuated.
The last movement which was carried out must be retracted, until the corresponding limit switch is released again.

7.2.1 **Case 1**, fig. 1

When driving the crane with steeply positioned boom, the ballast trailer can drop down due to the level differences. This pulls the complete boom system to the rear and there is a danger that the relapse cylinder moves in block position.
The same danger occurs when turning, if the ballast trailer drops down due to level differences.

Note: Due to the signals "Main boom relapse cylinder on block" or "Derrick relapse cylinder on block", the movements "Driving the crawler " and " turning " are automatically shut off in operation with ballast trailer.

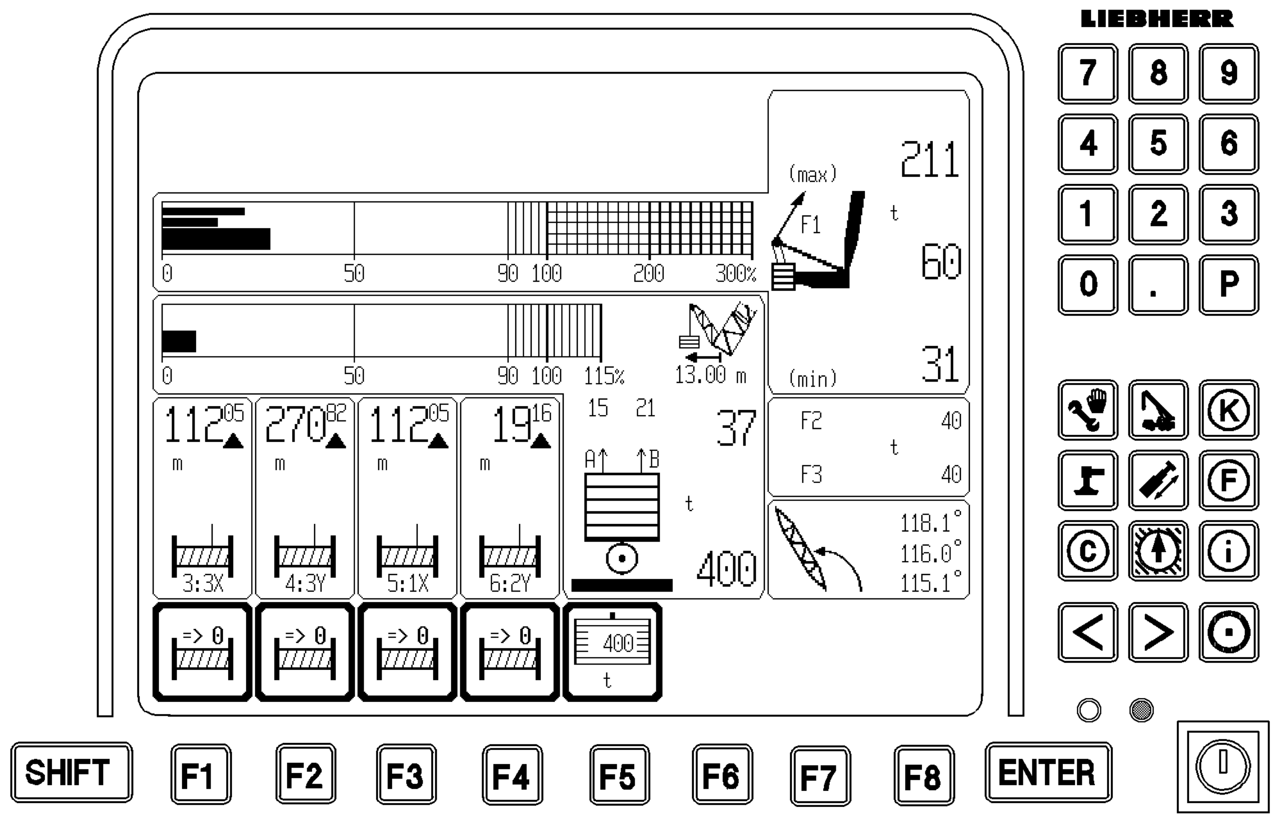
7.2.2 **Case 2**, fig. 2

If the level under the crane is increased, then the boom system is also pulled backwards. There is a danger that the relapse cylinder moves in block position.

Note: Due to the signals "Main boom relapse cylinder on block" or "Derrick relapse cylinder on block", the movements "Driving the crawler " and " turning " are automatically shut off in operation with ballast trailer.

7.2.3 **Case 3**, fig. 3

When setting down the load with the hoist gear, the crane is relieved. This causes the boom to move backward. **There is no shut off of the hoist gear.**


LIEBHERR
7
8
9
4
5
6
1
2
3
0
.
P
211
(max)
F1
t
60
31
(min)
0
50
90 100
200
300%
0
50
90 100
115%
13.00 m
112 05
m
270 82
m
112 05
m
19 16
m
15 21
37
A
B
t
400
F2 40
t
F3 40
118.1°
116.0°
115.1°
3:3X
4:3Y
5:1X
6:2Y
=> 0
=> 0
=> 0
=> 0
400
t
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191201

8. LICCON overload safety system

8.1 General

Prerequisite:
- The required derrick ballast according to the load chart is placed ;
- the derrick is in operating position.

8.1.1 Preadjustments

- Set the LICCON overload safety system according to the data in the load chart and confirm;
- Enter the actually present derrick ballast weight into the LICCON .

Note: Set the derrick ballast - see chapter 4.03, paragraph 8.
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 derrick ballast weight.
An incorrect ballast weight entry can lead to dangerous operating situations.**

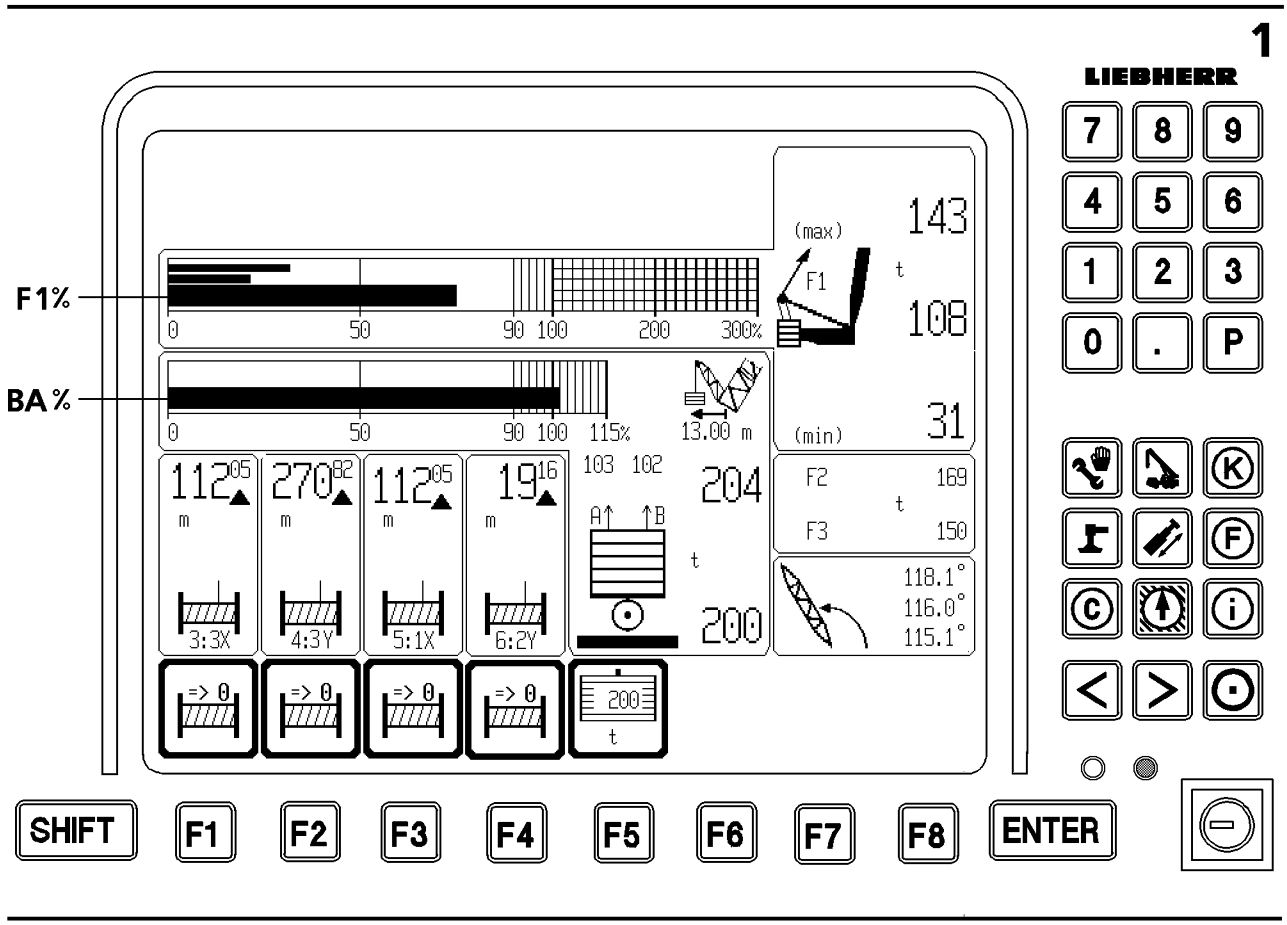
8.1.2 Operation

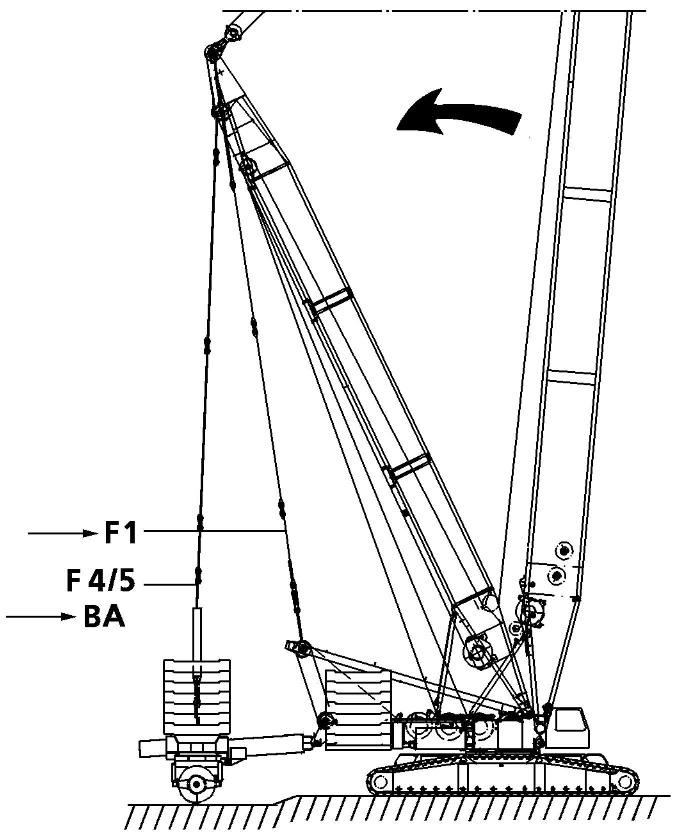
For the operation with derrick ballast, all data in chapter 4.02, paragraph 21 must be observed!

**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 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 suspended derrick ballast could start to swing. This could cause the boom to break and / or cuse 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 pull cylinders.
See paragraph 3.5 Raise and lower with pull cylinders and 8.8 Difference force monitoring of ballast guying.

**D A N G E R: The derrick ballast must always be in horizontal position when raising or lowering with pull cylinders, otherwise there is a danger of tipping over.
Monitor the extension condition of the ballasting cylinders.**


1
LIEBHERR
F1%
BA%
143
(max)
F1
t
108
31
(min)
0 50 90 100 200 300%
0 50 90 100 115%
13.00 m
112 05 m
270 82 m
112 05 m
19 16 m
3:3X
4:3Y
5:1X
6:2Y
103 102
204
A B
t
200
F2 169
t
F3 150
118.1°
116.0°
115.1°
=> 0
200
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


F1
F 4/5
BA
191998

8.2 Safety guidelines

- The test points must be checked for proper function before crane operation.
- The crane must be aligned in horizontal direction at the job site.
- The weight of the load to be lifted must be known.
- The placement surface of the derrick ballast may be no more than max. 0.25 m above or 0.25 m below the standing surface of the crane.
- The placement surface of the suspended derrick ballast at the end of the load lift must be level, horizontal and of sufficient load carrying capacity to take on the weight safely.

C A U T I O N : Before setting down the load and suspended derrick ballast, the crane operator must make sure that he can safely do so.

- There may be no obstacles within the slewing and turning range of crane, derrick ballast and load.
- A guide or the crane operator himself must watch the derrick ballast, if it is to be lifted.

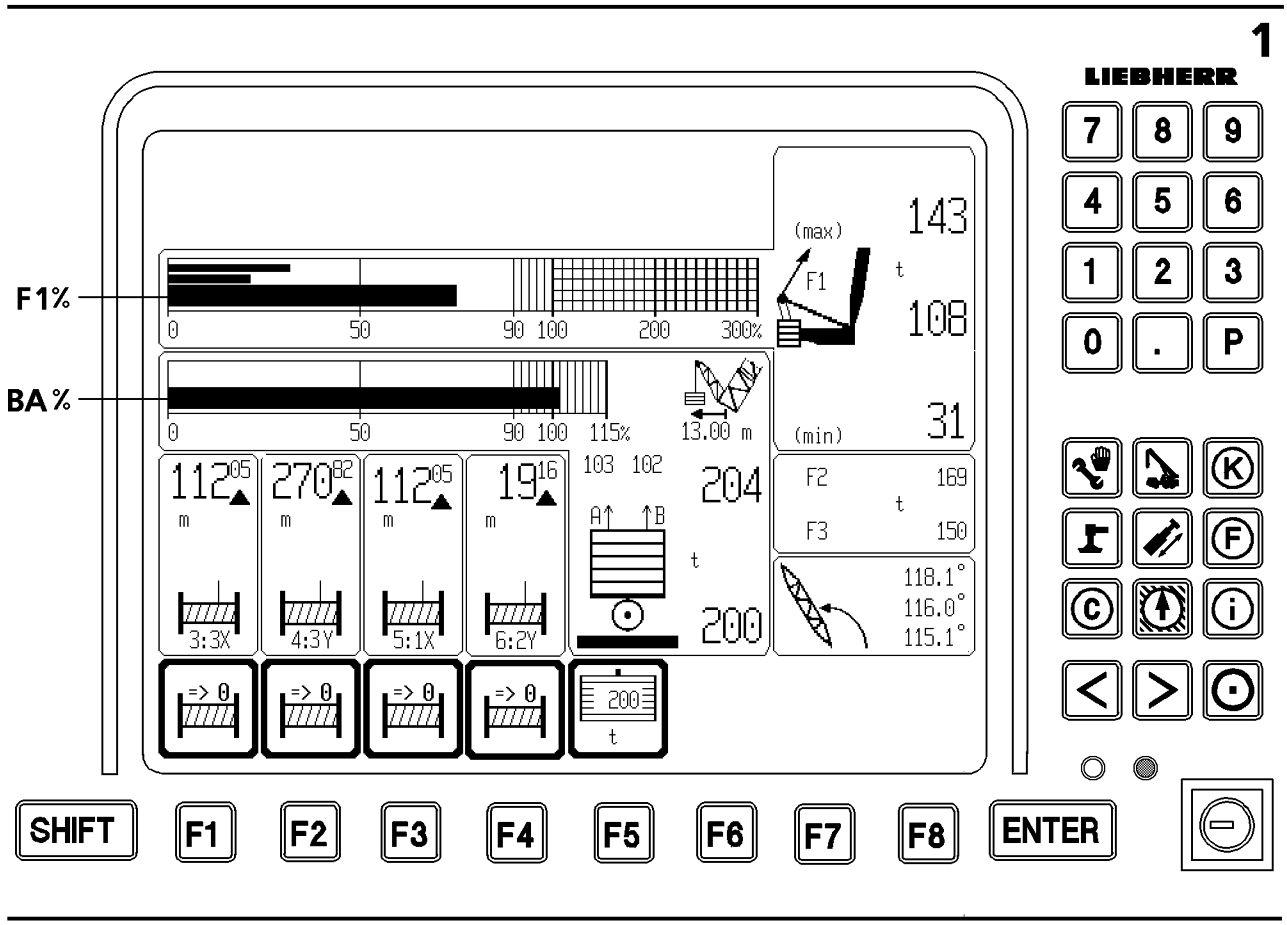
- When taking on a load, **make sure to avoid** diagonal pull , which means the derrick ballast, center of rotation of the slewing platform and the load must always be on one line !

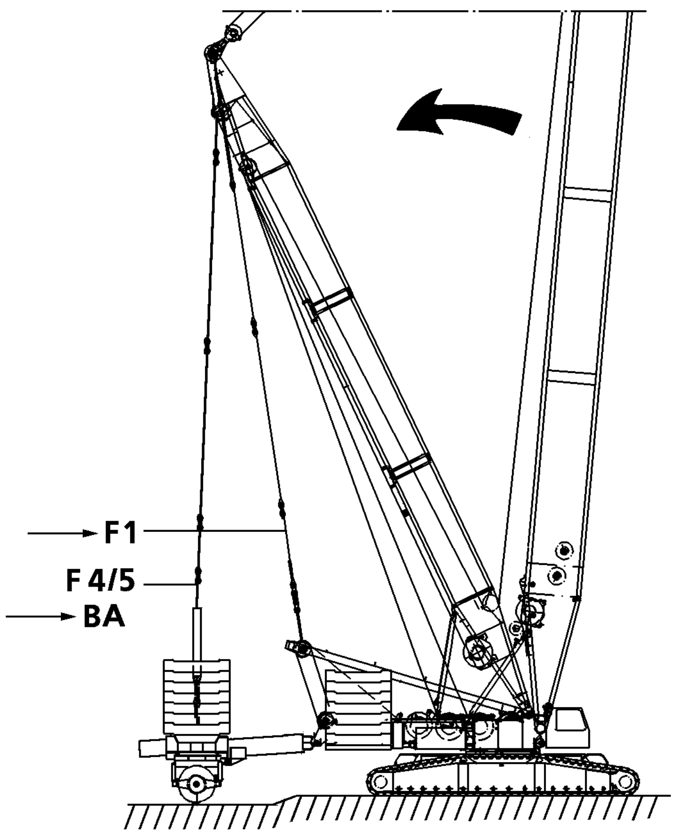
  To ensure this, actuate the pull cylinders to lift the derrick ballast off the ground and set it down again **before** placing the ballast plates.

D A N G E R : If this is not observed, there is a danger of tipping over when lifting the placed ballast plates, which can cause the crane to topple over.

- When taking on 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**.
- The guying between the A- bracket and the derrick end section **test point 1** may **never** be untensioned.

D A N G E R : This could lead to uncontrolled movements of the boom system, which could cause a serious accident.


1
LIEBHERR
F1%
BA%
143
(max)
F1
t
108
31
(min)
0
50
90
100
200
300%
115%
13.00 m
112
m
270
19
3:3X
4:3Y
5:1X
6:2Y
103
102
204
A
B
200
F2
169
F3
150
118.1°
116.0°
115.1°
=> 0
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7
8
9
4
5
6
2
3
0
.
P
K
F
C
i


F1
F 4/5
BA

191998

8.3 Determination of forces in operating mode with derrick ballast

In all operating modes with derrick ballast, the load is distributed onto the guy rods from the derrick end section to the A-bracket (F1) and to the derrick ballast (F4/5).

Note: See also the more detailed description in chapter 4.02 CONTROL AND INDICATOR UNIT OF THE "LICCON" OVERLOAD SAFETY SYSTEM.

8.3.1 Force F1 (Test point 1) between guying A-Bracket - derrick end section

Force F1 (test point 1) is determined in the guy rods from the A-bracket to the derrick end section via 2 force test boxes and indicated on the LICCON as total force at the guying.

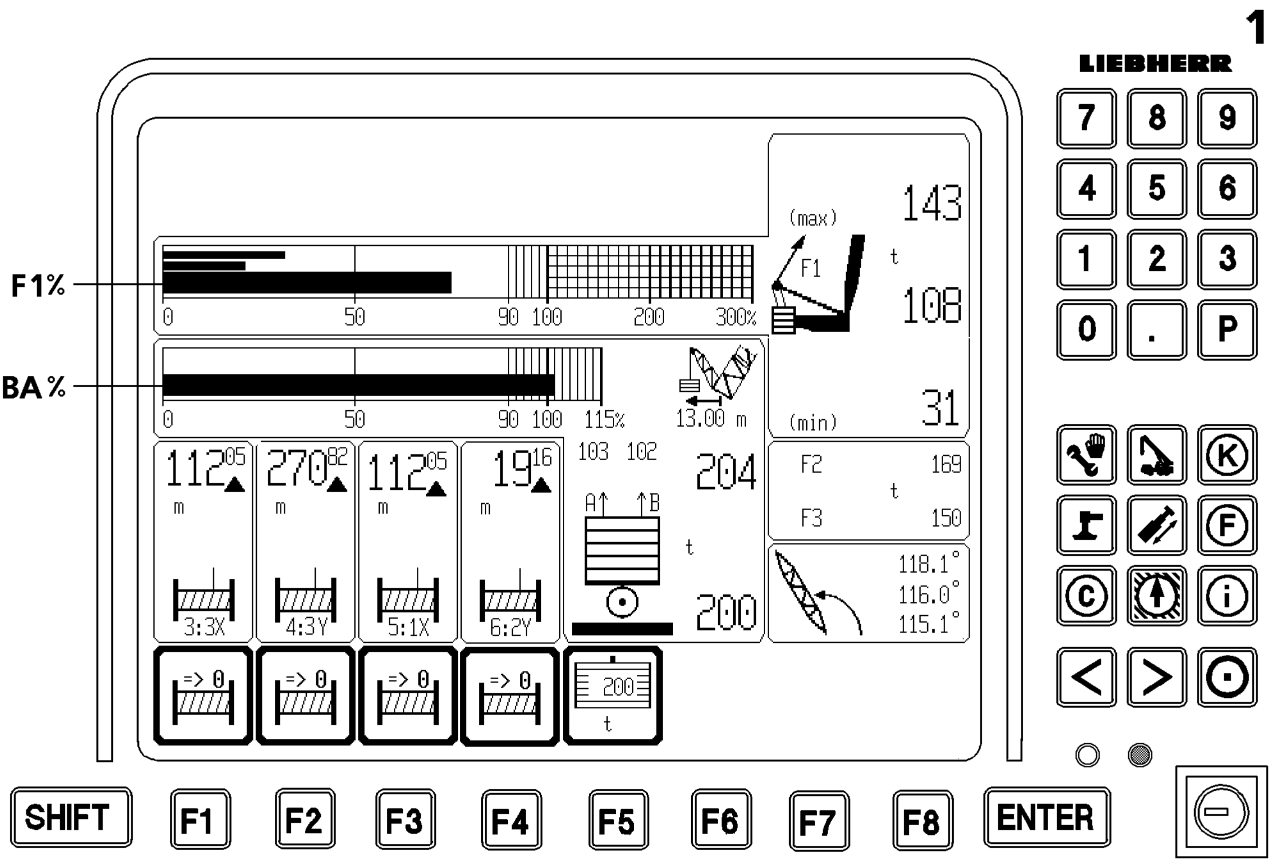
The F1 utilization is determined from operating force F1 and force F1- operation - max. force . This value is shown on the LICCON via a utilization bar graph (F1 %) .

8.3.2 Force F4 / 5 (Test point 4 / 5) guying derrick ballast - derrick end section

Forces F4 / 5 (test point 4 / 5) acts in the guy rods from derrick ballast to derrick end section.

The existing forces in the guy rods (A = left and B = right) are calculated from three pressure sensors, which are installed on the pull cylinders and shown in the LICCON as individual forces.

From the forces of the individual guying, the pulled ballast is calculated, i..e. the part of the ballast which is oulled upward by the guying. The remaining part lays on the ground. The derrick ballast utilization is calculated from the pulled ballast and the placed ballast . This value is shown on the LICCON via a utilization bar graph (BA %) .


1
LIEBHERR
F1%
BA%
143
(max)
F1
t
108
31
(min)
0
50
90
100
200
300%
115%
13.00 m
112
m
270
19
3:3X
4:3Y
5:1X
6:2Y
103 102
204
A
B
t
200
F2
169
F3
150
118.1°
116.0°
115.1°
=> 0
SHIFT
F1
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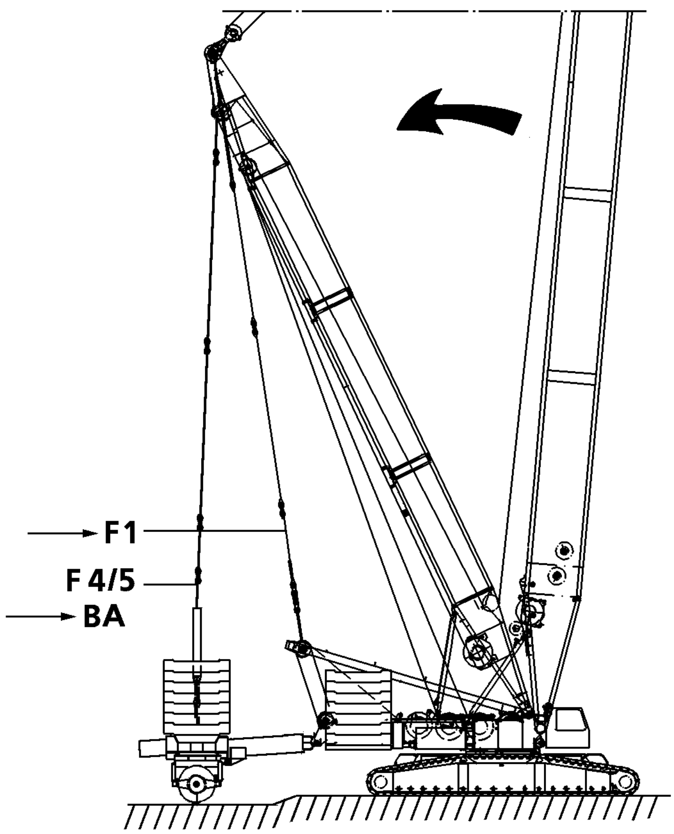
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P


F1
F 4/5
BA

191998

8.3.3 Monitoring of minimum force F1 (Test point 1), F1 min.

Note: See also graphic view and description of shut offs 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 shut off.

D A N G E R : It is prohibited to fall below the minimum force F1 min (test point 1) if more than 50 % of the derrick ballast is being pulled. If this is not observed, the derrick ballast may lift off the ground suddenly at slack guying from test point 1 (F1) and derrick ballast on the ground due to increasing load momentum and the boom system will suddenly move forward!
This will cause the load to swing strongly, which can damage the boom and the crane.

If more than 90% is pulled by the set derrick ballast (ballast utilization bar > 90 %) and the minimum force F1 min. (Test point 1) is fallen below, all **load moment increasing and all load moment decreasing** crane movements are shut off.
The hoist gear ”down” is also shut off.

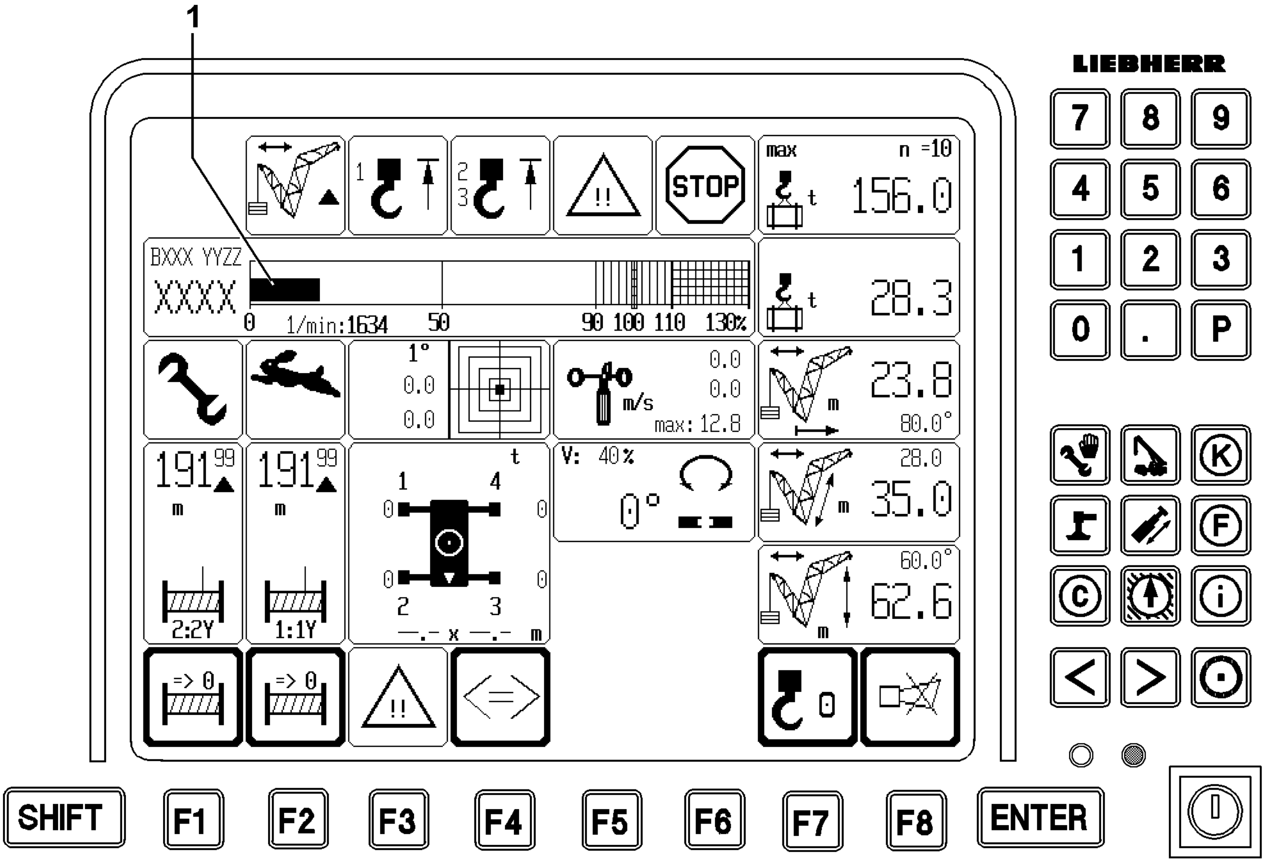
D A N G E R : It is prohibited to fall below the minimum force F1 min (test point 1) if more than 90 % of the derrick ballast is being pulled. If this is not observed, the derrick ballast may set down on the ground suddenly at slack guying from test point 1 (F1) and suspended derrick ballast due to decreasing load momentum and the boom system will suddenly move backward!
This can press the relapse cylinder on block and overload them. There is a danger of damage to the relapse cylinders boom and derrick.
This also will cause the load to swing strongly, which can damage the boom and the crane.

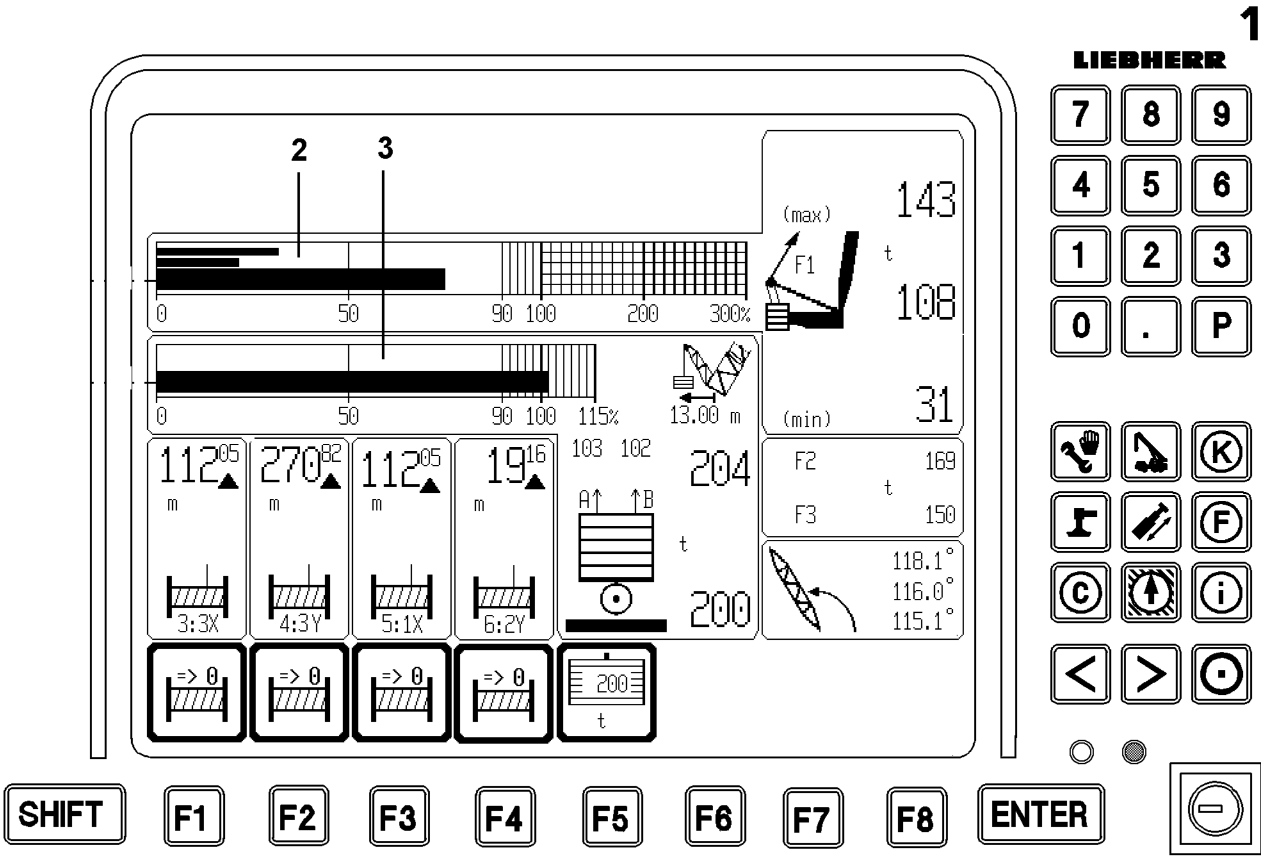
Note: By actuating the installation keyed switch, test point 1 - minimum force (F1 min.) is lowered by a few tons, so that the reverse movement can be run out again if the F1min shut off has been triggered before.
This is the only exception on the crane, in which a load moment increasing movement may be carried out with the installation keyed switch after a shut off .

D A N G E R: **If the overload system is bypassed, there is no further protection against overload of the crane.**
There is an increased danger of accidents!

After a shut off by F1 min, the force F1 must be increased by a movement. If the derrick ballast is suspended, then this can occur by luffing down or if the derrick ballast is on the ground, by setting down the ballast.
If the installation keyed switch has been actuated and the F1 force continues to drop further under the reduced F1 min force which was reduced by the installation keyed switch, then the F1 min shut off can no longer be bypassed.

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) .





191999

8.4 Overload monitoring in operating mode with derrick ballast

Note: All words marked with quotation marks (" ") are explained in chapter 4.02 CONTROL AND INDICATOR UNIT OF THE "LICCON" OVERLOAD SAFETY SYSTEM in paragraph 12.1 Information about crane geometry and load.
See also graphic view, paragraph 8.5 Shut offs in crane operation 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 derrick ballast overload safety system.

8.4.1. The LML overload safety system monitors the "maximum load according to the load chart and reeving".

In operating modes with derrick ballast, this is the maximum load of the current crane condition with optimum derrick ballast. It is shown on monitor 0 . The current utilization of the crane with optimum derrick ballast results from the load utilization bar (1) on monitor 0.

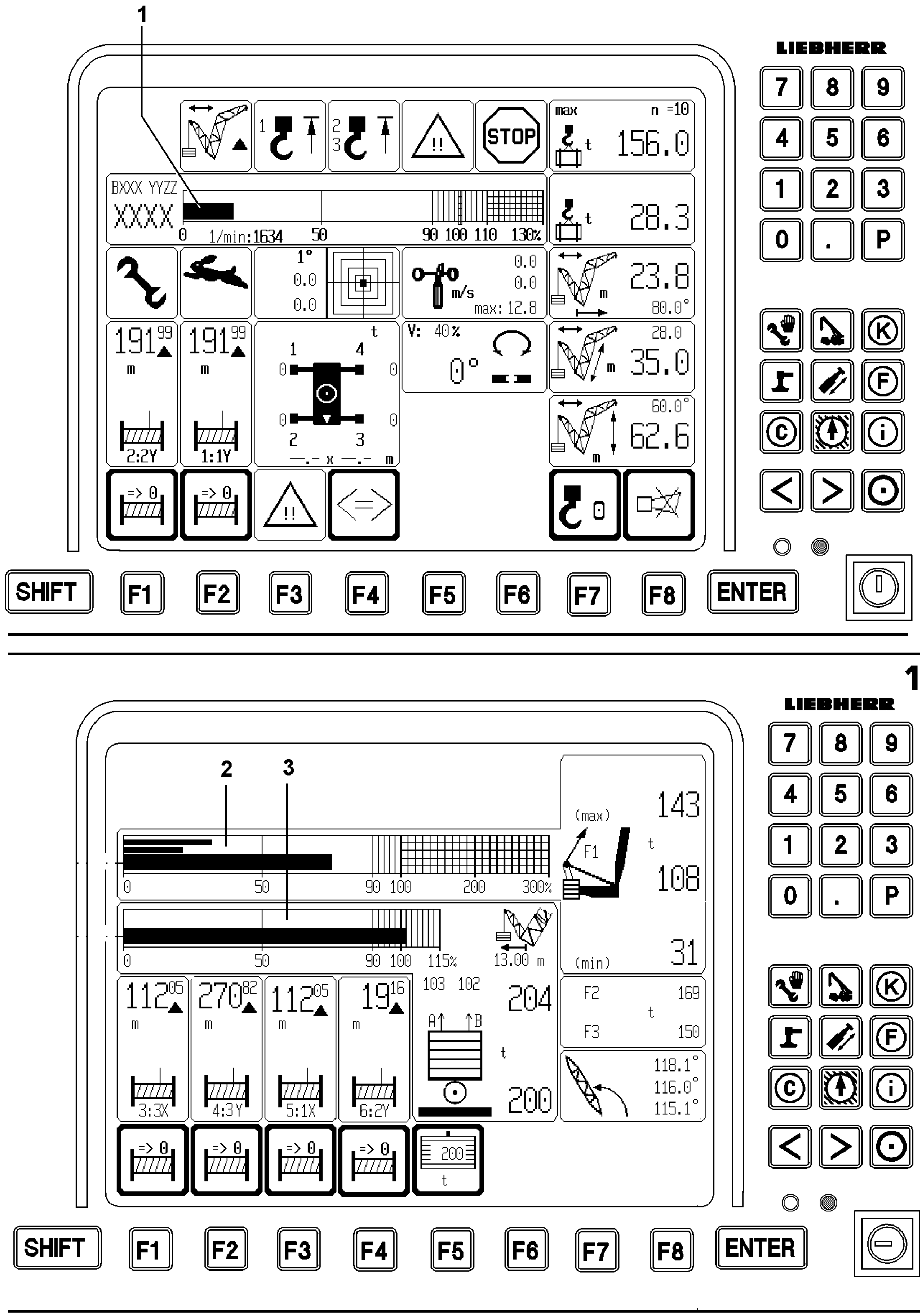
At 90 % on the load utilization bar there is a prewarning with caution symbol and "SHORT HORN" on monitor 0.
At 100%on the load utilization bar there is a shut off of all load moment increasing movements with stop symbol and acoustical warning "HORN" on monitor 0.
The "maximum load of the current crane condition" can no longer be increased.

8.4.2 The derrick ballast overload safety system monitors the "Test point 1- operating maximum force (=F1max)". It is shown on monitor 1.

At 90 % F1max- utilization (utilization bar (2)) , a prewarning is issued with caution symbol and "SHORT HORN" on monitor 1.
At 100% F1max- utilization, there is a shut off of all load moment increasing movements with stop symbol and acoustical warning "HORN" on monitor 1.
If the "maximum load according to load chart and reeving" is not yet reached (Utilization bar (1)) , then the "maximum load of current crane condition" can still be increased by:
- pulling up the derrick ballast, if the derrick ballast is not yet suspended and the currently pulled ballast is still smaller than the optimum ballast;
- telescoping out the derrick ballast if the placed ballast is still smaller than the optimum ballast;
- increasing the derrick ballast by adding additional ballast plates, if the place ballast is still smaller than the optimum ballast.

C A U T I O N: The test point 1- operating maximum force depends in operating modes without moveable equipment (W- luffing jib) also for example SDB, SDBW operation not only on the equipment configuration, but also on the force of the pulled ballast measured with the ballastting cylinders.
If the pulled ballast is larger, then the permissible maximum F1 max- force nomally decreases and reverse.
For that reason it is important to carefully observe the ballast weighing and the value for the pulled ballast, to check if the value can even be right.

D A N G E R: If a value would be determined for the pulled ballased which is too small then possibly the F1 max value would be calculated too high and the crane could be overloaded . There is a great D A N G E R!


1
LIEBHERR
STOP
BXXX YYZZ
XXXX
1/min:1634
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
1
2
3
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

191999

8.4.3 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:

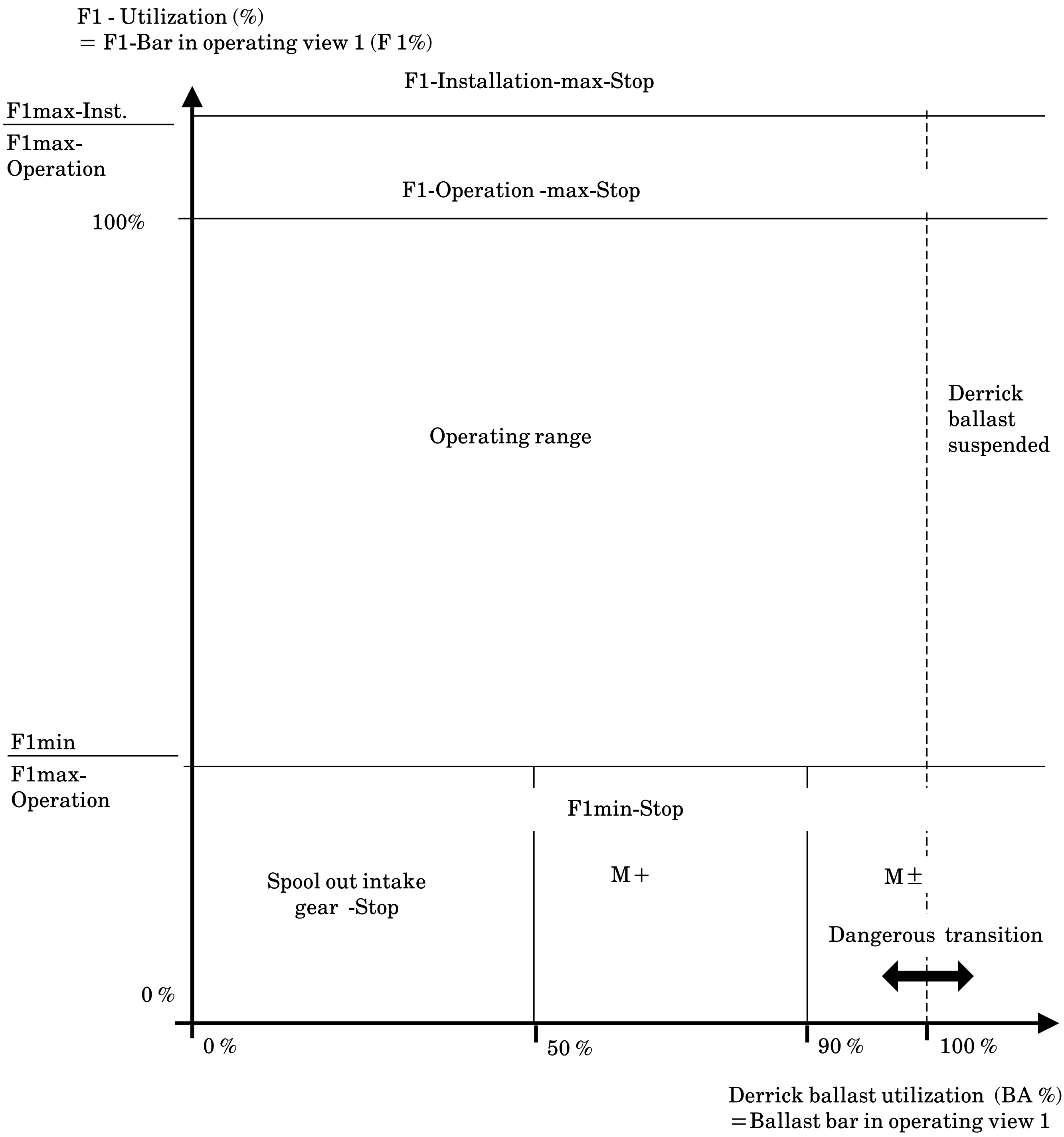
1. Hold the keyed button D_0 on monitor 0 in position "right touching" to bypass the "maximum load carrying capacity according to the load chart and reeving" (see also description in chapter 4.02, paragraph 12.7) and hoist limit switch.
2. Installation keyed button in instrument panel

   This bypasses the "maximum load according to the load chart and reeving ", test point 1- operatign 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.

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 !



See also Operating view on monitor 1

8.5 Shut offs in crane operation with derrick ballast (suspended ballast or bakllast trailer)

Graphic view of various ranges of utilization on test point 1 (F1% utilization bar) and utilization of derrick ballast (Ballast utilization bar, BA %)

8.5.1 F1-Installation-max-Stop

=Shut offs as for F1-Operations-max-Stop, but cannot be bypassed.

8.5.2 F1-Operations-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”.

8.5.3 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.

Note: By actuating the installation keyed switch, the test point 1 - Minimum force (F1 min.) is reduced by a few tons, so that, if the F1min shut off has been triggered before, it can be moved out again via the reverse movement .

8.5.3.1 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.

8.5.3.2 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.

8.5.3.3 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 switching diagram.

8.6 Load chart access procedure

For the:
- Main boom angle interpolation;
- Jib relative angle interpolation;
- Derrick ballast radius interpolation;
- Combination of main boom angle interpolation and derrick ballast radius interpolation
- Combination of jib relative angle interpolation and derrick ballast radius interpolation

see chapter 4.02 CONTROL AND INDICATOR UNIT OF "LICCON" SAFE LOAD INDICATOR SYSTEM, paragraph 30." Load chart access procedure ".

8.7 Check the length sensor value on the ballast trailer

When telescoping the derrick ballast in and out, carefully monitor the derrick ballast radius indicator.
When telescoping the derrick ballast, the indicator must change according to the movement. The crane operator can recognize immediately if the length sensor cable drum would get stuck when spooling up or out.
If the derrick ballast is fully extended or retracted, the derrick ballast indicator must show almost excactly the end position, for example: radius = 13 m or 20 m .
The crane operator may not blindly rely on the derrick ballast radius measurement, but he must think for himself and check if the measurement even still works correctly.

D A N G E R : **If the derrick ballast radius is measured incorrectly then a too large maximum load and a too large test point 1 -Operations-max-force can be calculated due to the incorrect radius.**
The crane can be overload without recognizing it.
There is an increased danger of accidents!

8.8 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.

Note: If one or both pressure sensors in the ring surface of the ballasting cylinders (= test point 4A, 4B) are defective, then the LMB calculates the F1 max value for the most unfavorable case. This means the crane works safely, but then possibly requires more derrick ballast.

D A N G E R : If the difference of these forces is too high, the derrick end section or other crane components will be damaged. There is a danger of accidents!

The forces in the derrick ballast guying A and B are shown on monitor 1 and compared. If the difference exceeds an impermissible value, an acoustical warning is given and the two force values blink. However, there is **no** shut off of movements.

If the difference of the forces of the derrick ballast guying A and B exceeds the given limit value, then this can have different causes:

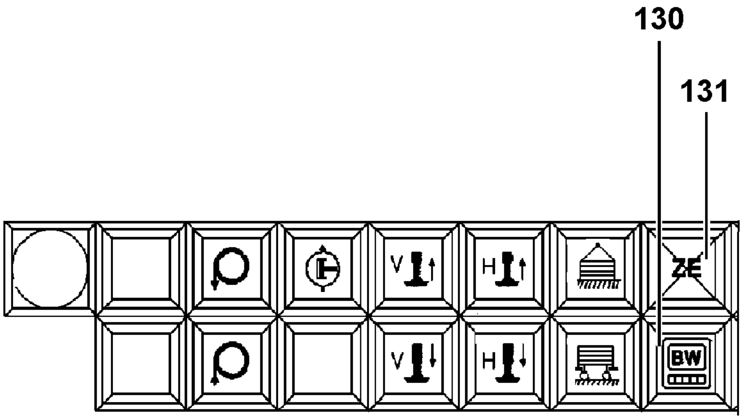
- Take on the load, by relieving the tires on the ballast trailer or by flexation of the slewing platform ;
- The ground under the derrick ballast is uneven;
- The crane is positioned at a side incline;
- The derrickballast is loaded onesided;
- By raising or lowering the derrick ballast with the pull cylinders;
- The force measurement in the guying is incorrect.

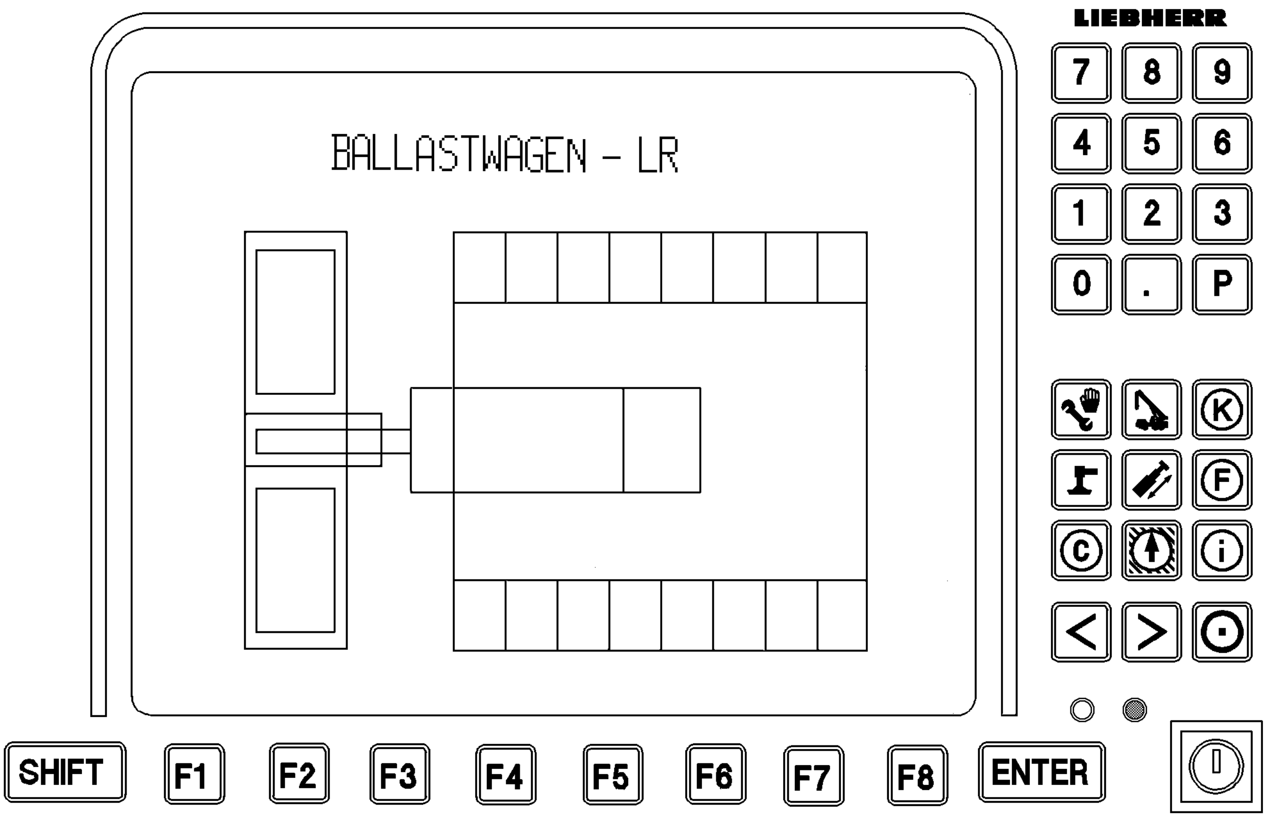
The crane operator must recognize the correct cause and take counter -measures:

1. The error, which led to the one sided force must be removed.
2. The following measure is permitted only in **small** uneven ground conditions : Lock a ballast cylinder and actuate with the other ballast cylinder "lift the ballast" or "lower the ballast" in such a way that the difference between the forces gets smaller. It must be ensured that the derrick ballast is not brought into an impermissible incline position in relation to the crane, otherwise the derrick ballast guide and components will be damaged.

D A N G E R : The derrick ballast cylinder A may be extended by maximal 40 mm more or less than cylinder B! There is a danger of accidents!

3. If 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.


130
131
ZE
BW


LIEBHERR
BALLASTWAGEN - LR
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

192000

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 to quickly and simply localize and fix any errors in the ballast trailer without using additional testing units.

Note: Some safety relevant functions of the test system can only be utilized by especially trained expert personnel, i.e. they are protected from **unauthorized** users.

LICCON in standard operation

Note: The programs and the program run of the LICCON computer system are not influenced, i.e. the ballast trailer continues to be fully functioning and the control can be checked with extensive auxiliary tools of the test system.
At the ballast trailer control with LICCON, the LICCON monitor is used only for the functions of the test system.

8.9.1 Starting the test system

In case of a functional problem, for example indicator light (131) lights up, monitor 1 can be assigned to the ballast trailer control for diagnostics purposes with switch (130).

- Turn the crane engine off;
- actuate the switch (130) ;

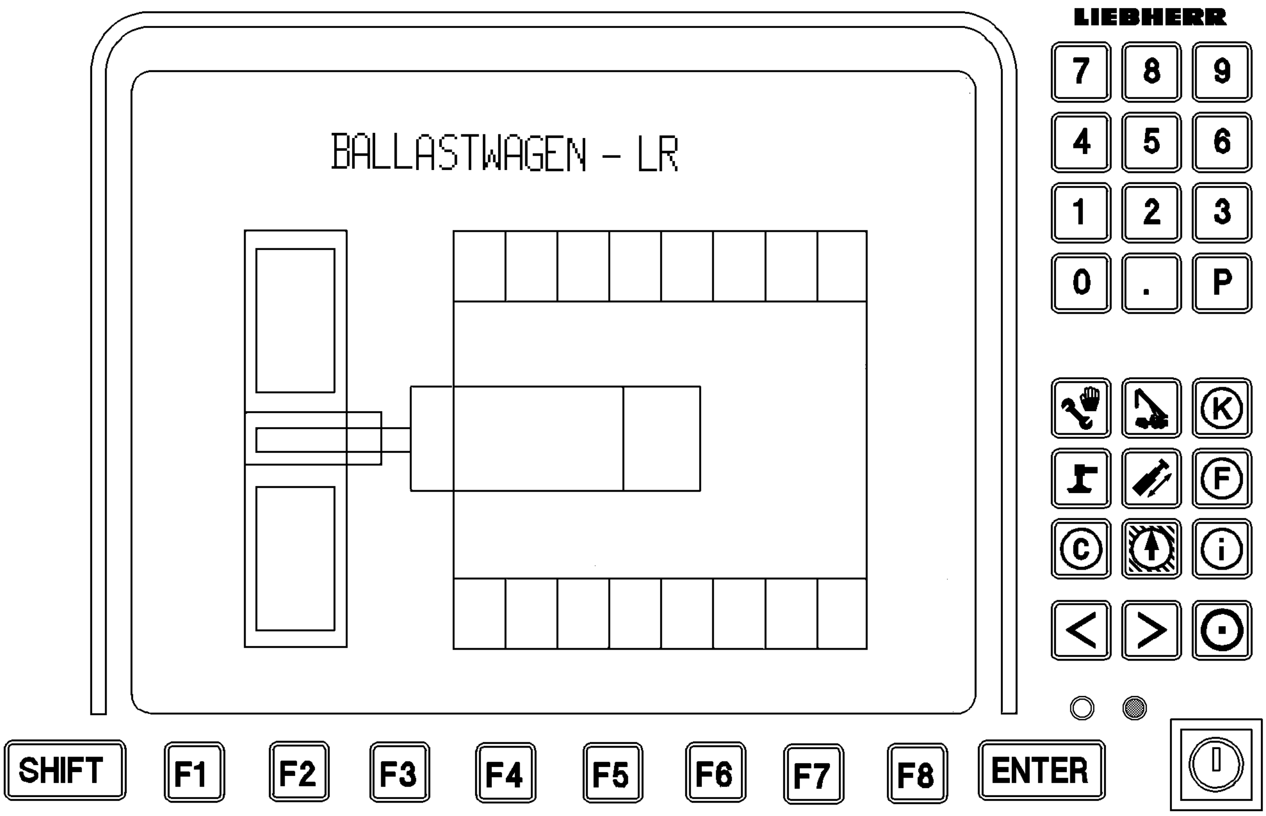
Note: The switch (130) may only be actuated if the crane engine is turned off!

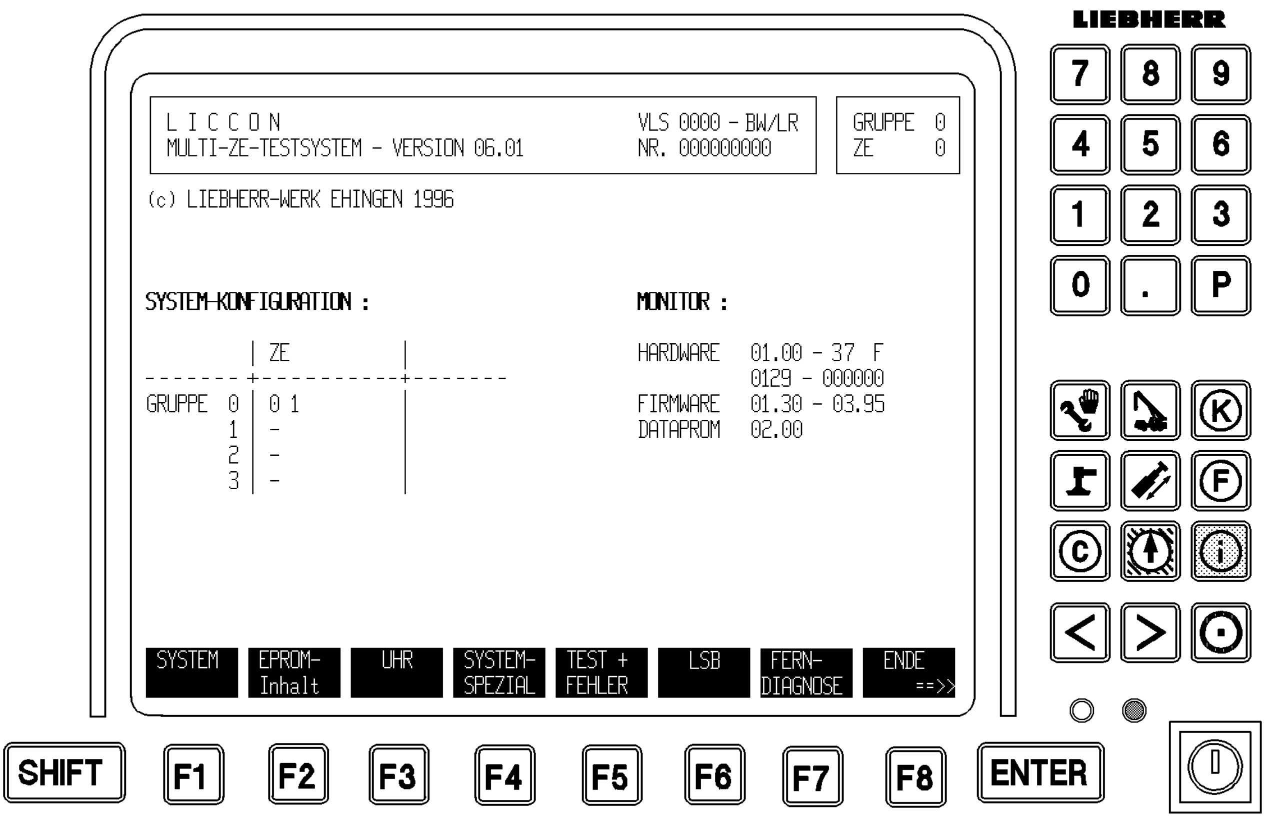
- Turn the crane engine on and wait until the monitor 1 shows the view "Ballast trailer - LR" ;
- call up the test system with the "i" button.
  ⇒ MULTI CPU TEST SYSTEM - VERSION XX.XX

8.9.1.1 The indicator light (131) lights up in case

- the LICCON fails;
- of an error - turn sensor set of wheels left;
- of an error - turn sensor set of wheels right;
- of an error - turn sensor slewing platform (boom direction);
- of an error - length sensor - sliding cylinder.

In case of erroneous or missing turn or length sensors, corresponding system error messages are also issued.
The indicator light blinks while the safety test of the ballast trailer control is carried out (after engine start).


LIEBHERR
BALLASTWAGEN - LR
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR
L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 06.01
VLS 0000 - BW/LR
NR. 000000000
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 + FEHLER
LSB
FERN-DIAGNOSE
ENDE ==>>
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

191064

8.9.2 Main menu

After the start of the LICCON test system, the main menu appears, which contains the basic data of the system. All sub functions can be called up via function keys "F1" to "F8" .

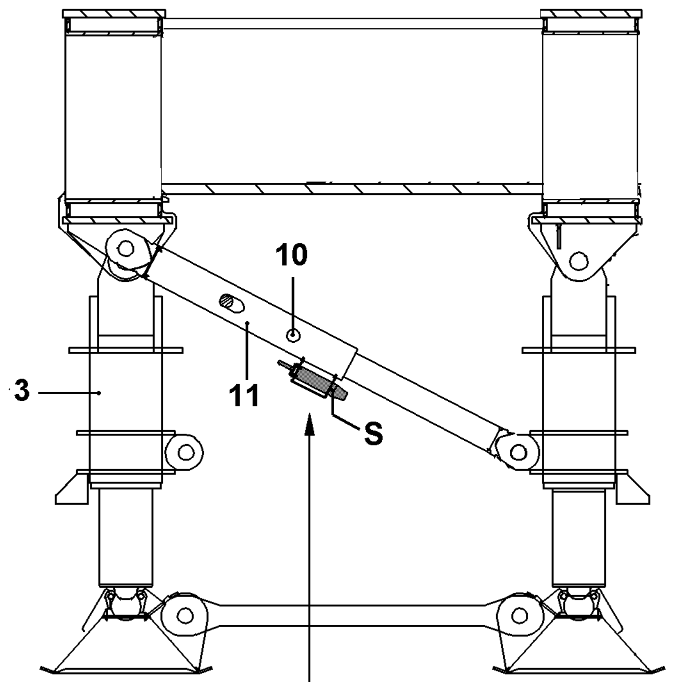
8.9.2.1 Selection of central processing unit or group

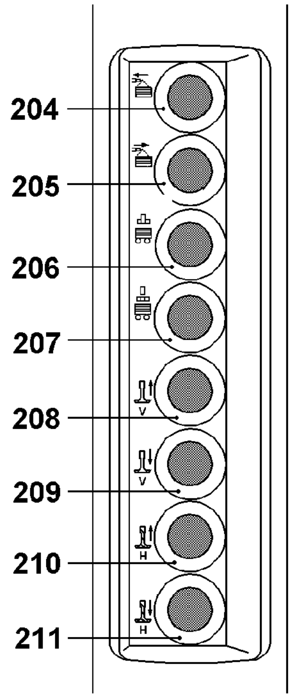
In the right upper window the curser blinks to note the selection of the desired CPU.
- By pressing the "ENTER" key, the cursor changes from "CPU" to "Group" and back.
- Enter the desired group or CPU from the installed units with keys on the alpha numeric keyboard.

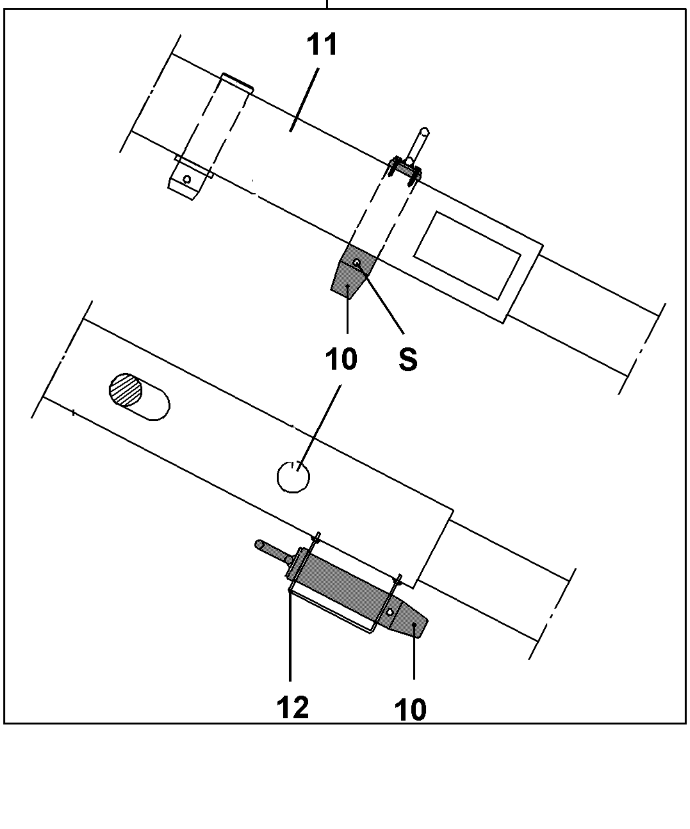
Note: The test system can only access installed units (Group, CPU) .

8.9.2.2 Function key bar - main menu

"F1"	**SYSTEM**	Access of inputs and outlets, AWL-Operands, system internal "Specialities".
"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 trailer.
"F5"	**TEST**	
"F6"	**EXTERN**	Start of remote diagnostics
"F7"	**EXTERN**	
"F8"	**ENDE intern**	Program end







192002

9. Removal of the ballast trailer

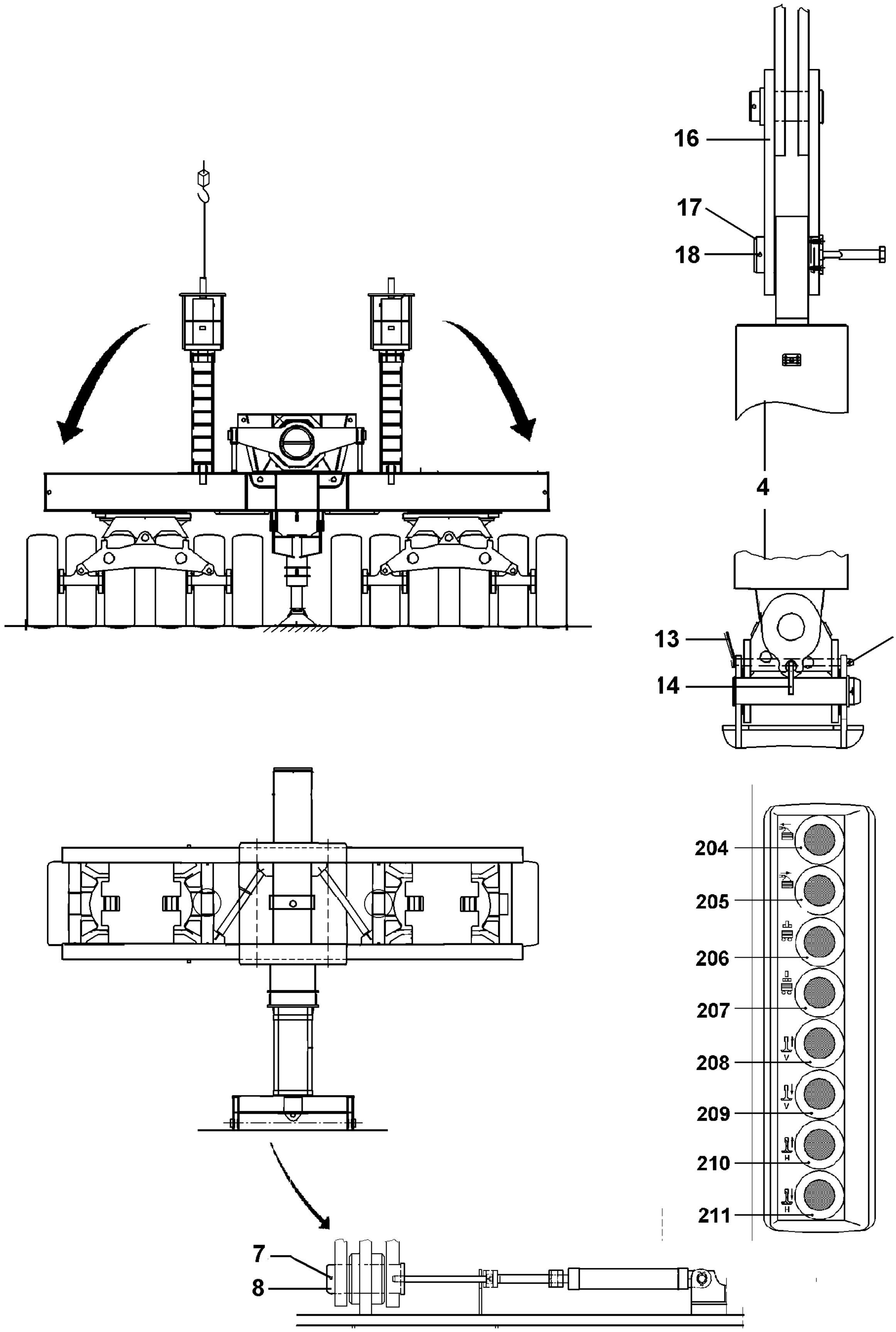
D A N G E R : The ballast trailer may only be removed on level ground of sufficient load carrying capacity and only by authorized persons.

Prerequisite:
- Ballast trailer guide ist retracted.
- Ballast plates are removed.
- Pin the locking pins (10) on the strut (11) and secure with spring retainer (S).

Support the ballast trailer
The ballast trailer must be supported before unpinning on the slewing platform .

Extend the support cylinder (3) :
- Press the button (209) to extend the support cylinder on the front
- Press the button (211) to extend the support cylinder on the rear

**C A U T I O N : Before unpinning the ballast trailer on the slewing platform , it must be ensured that the locking pin (10) is inserted on the strut (11).
The locking pin must be pinned so that the ballast trailer does not tip over.**



192001

9.1 Remove the pull cylinder (4) on the guy rods (16)
Remove the spring retainer (18) and unpin the pin (17) on both sides.

D A N G E R: The pull cylinders must still be locked on the ballast trailer !

Retract the piston rod .

Note: On each cylinder is a working platform. On this platform is a switch housing with button **"**Cylinder **OFF"** and **"**Cylinder **ON"** .
With this buttons, only the one cylinder can be moved on which the switch is installed.

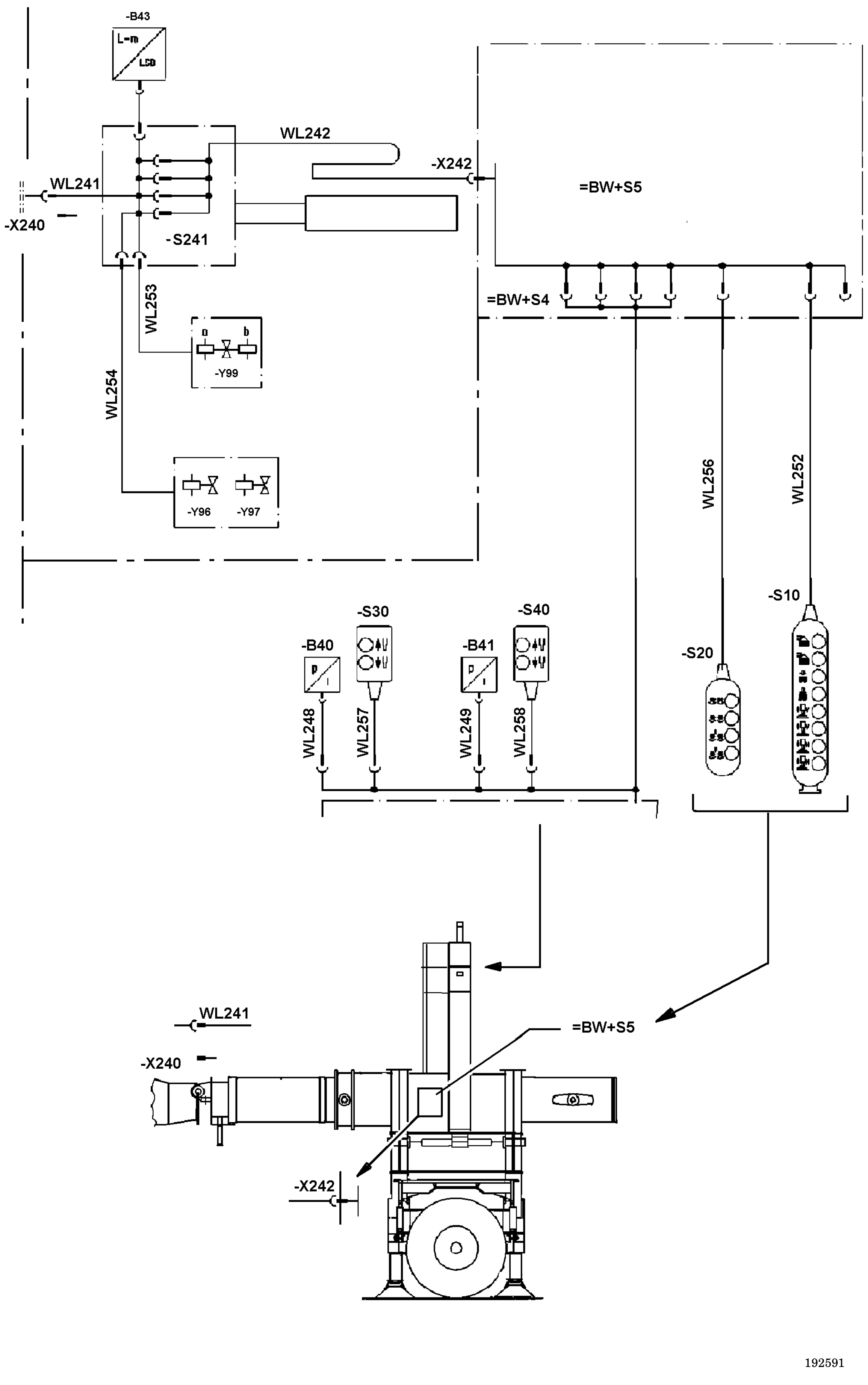
9.1.1 Place down the pull cylinder
Attach the pull cylinder (4) on the auxiliary crane.

Note: Weight, pull cylinder approx. 1500kg

Unpin the locking pin crosswise and lengthwise.
Remove the spring retainers (15) and unpin the handle pin (13, 14) .
Place the pull cylinder with the auxiliary crane on the ballast trailer .

9.2 Unpin the ballast trailer guide on the crane

Remove the spring retainers (7) on both sides.
Press the button (207) and unpin the pin (8) on both sides.


-B43
L-m
LSB
WL242
-X242
=BW+S5
WL241
-X240
-S241
=BW+S4
WL253
-Y99
WL254
-Y96
-Y97
WL256
WL252
-S10
-S30
-S40
-B40
-B41
-S20
WL248
WL257
WL249
WL258
WL241
-X240
=BW+S5
-X242
192591

9.3 Loosen the supply lines

- Turn the engine off.

9.3.1 Release the pneumatic and hydraulic connections

- Loosen the coupling connections ;
- Screw the coupling connections with the plug.

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

Prerequisite for correct coupling connection is:

- **The pressure must be released from the hydraulic system before connecting or releasing the couplings (turn the engine off, wait for approx. 5 minutes).**
- **Interconnect the coupling sections (sleeve and plug) and connect them with the hand nut.**
- **Tighten the nut past the O-ring until you can feel a firm stop.**
- **The couplings may only be tightened by hand - without tools (or couplings will be damaged).**

Improperly connected couplings can cause loss of pressure or sudden leakage and therefore can cause accidents!

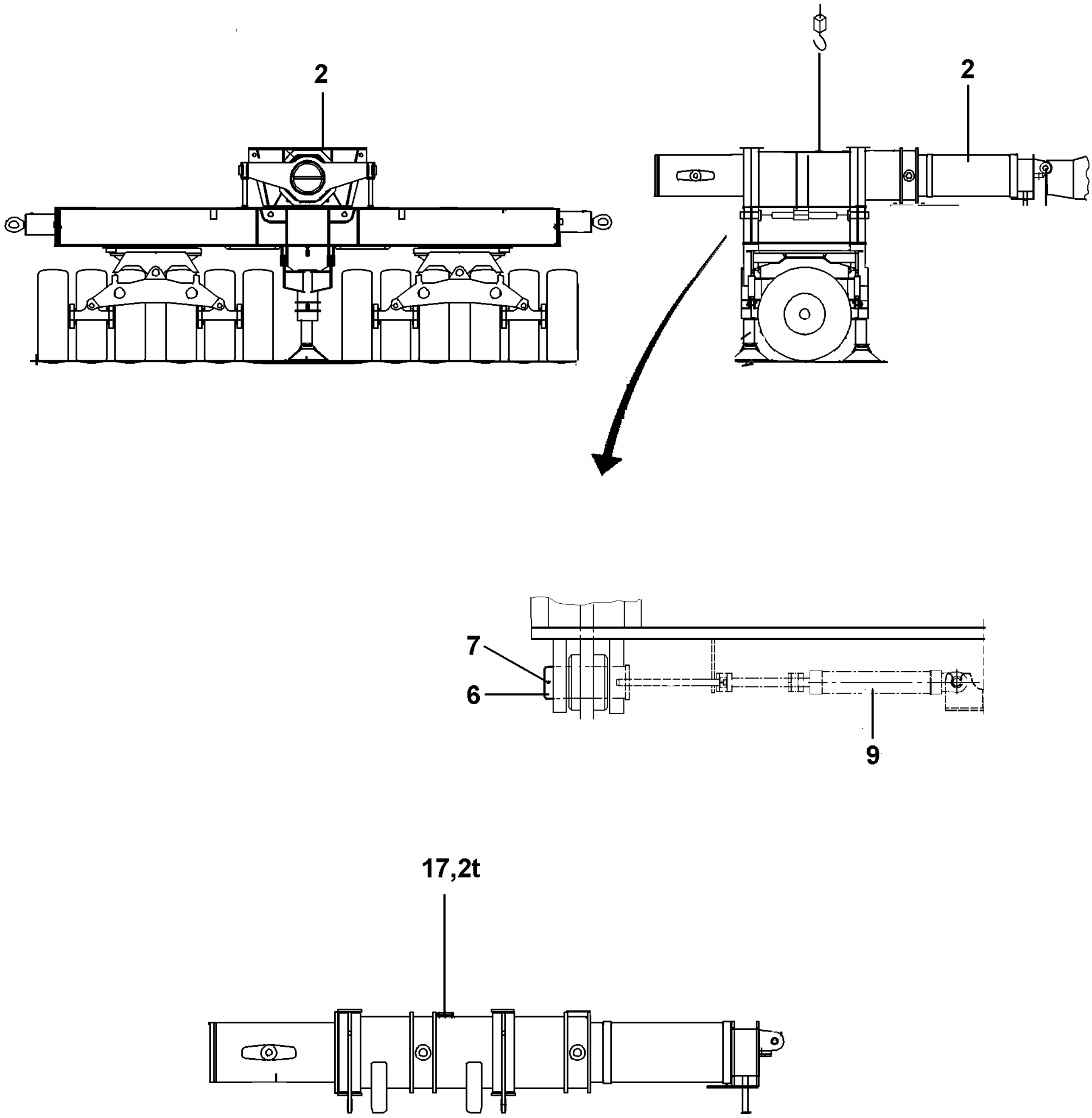
9.3.2 Release the electrical connection

- Unplug the cable WL 242 from socket -X 242 and insert into the dummy plug on the ballast trailer guide ;
- Unplug cable WL 241 from socket -X 240
- Insert the dummy plug in socket -X 240 .

D A N G E R : **The electrical connections may only be released and inserted into the dummy plug if the ballast trailer guide is all the way unpinned on the crane. As soon as one of the two pins is unpinned from the guide frame, the crane control no longer recognizes that the ballast trailer is installed. Now, the crnae can be turned and driven even though the ballast trailer is still installed on the crane (ballast trailer is still connected with a pin with the crane).**
There is a danger of damaging the ballast trailer or the crane if the crawler is driven off or the crane superstructure is turned.

9.3.3 Drive away the crane

To be able to remove the ballast trailer guide, the crane must be driven off.

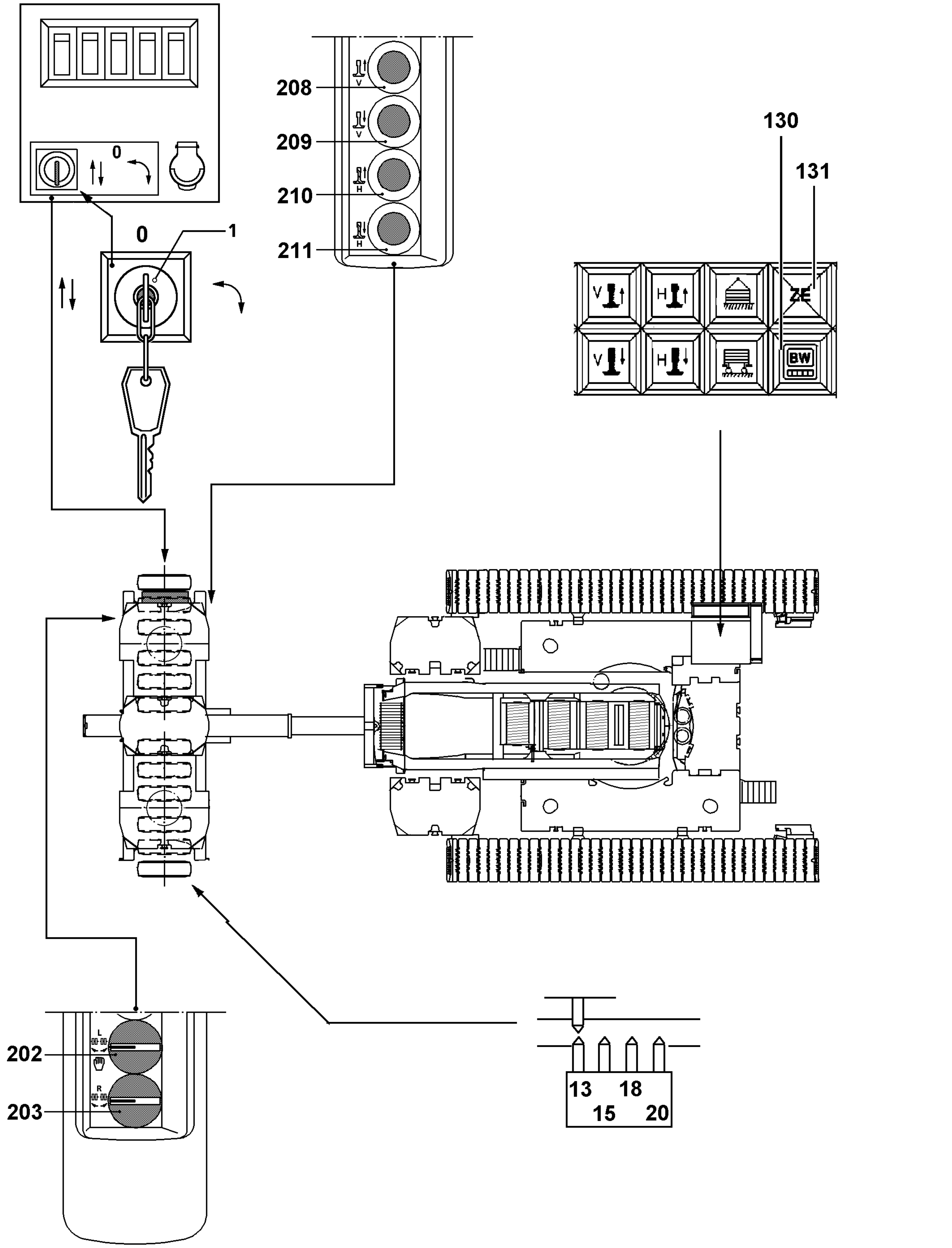


192004

9.4 Unpin the ballast trailer guide (2) on the ballast trailer

- Hold the ballast trailer guide with the auxiliary crane;
- connect the pin pulling device (9) with the hydraulic component;
- remove the spring retainers (7) on pins (6) .
- Unpin the pins (6) with the pin pulling device (3) on both sides ;
- Remove the pin pulling device.
- Place down the ballast trailer guide (2) with the auxiliary crane on the transport vehicle;
- park 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.
Otherwise there is a danger of tipping over.
The ballast trailer is n o t e q u i p p e d with its own brake system. For that reason, it must be supported when not installed.


208
209
210
211
130
131
0
1
V
H
ZE
BW
L
R
202
203
13
18
15
20
192003

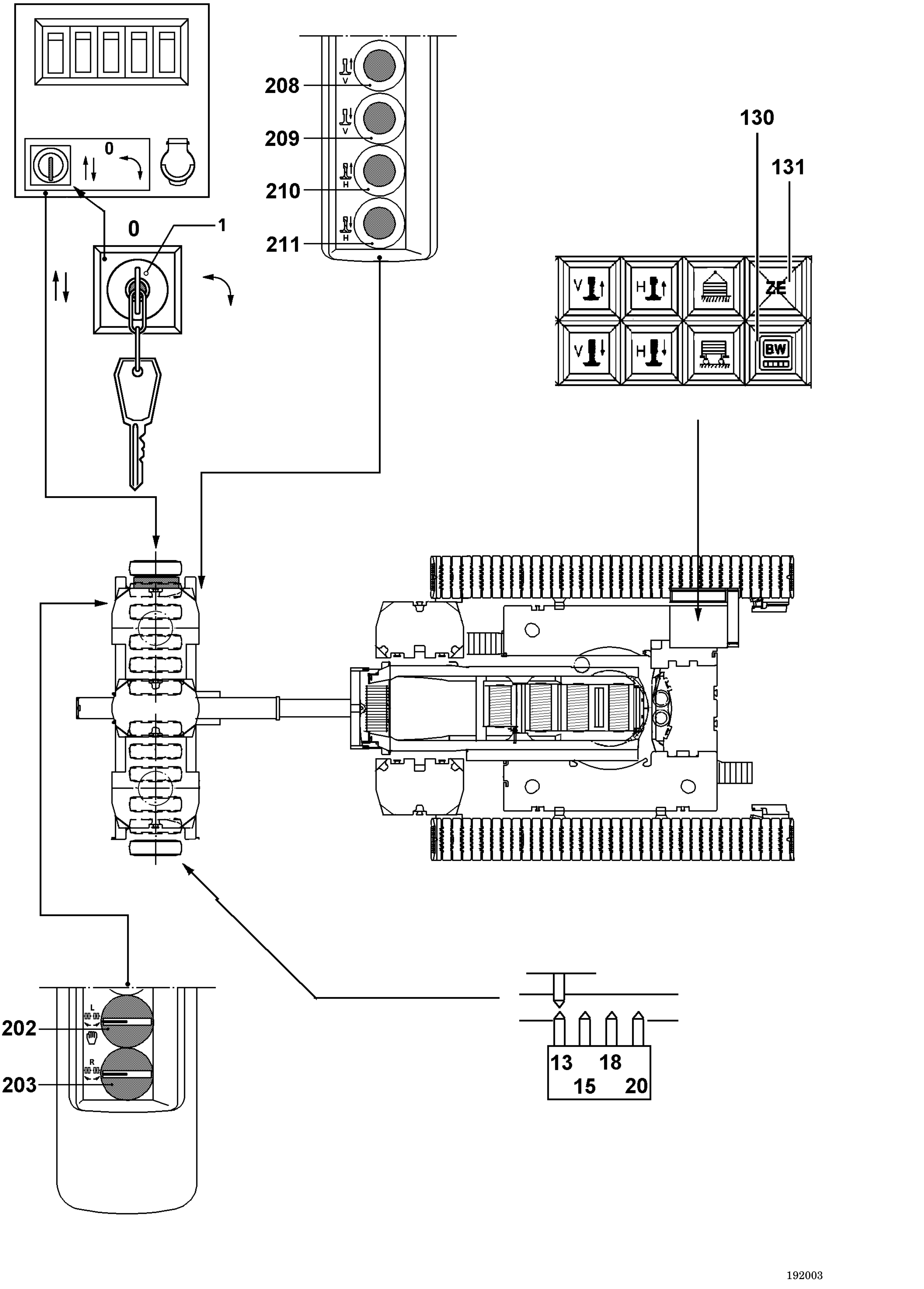
10. Emergency operation for ballast trailer

10.1 General

In case of failure or defect of a central processing unit on the ballast trailer (warning light 131 lights up), the electronic steering of te ballast trailer can not be actuated. The signal **towing** and **driving in turns** can no longer be sent from the ballast trailer control to the crane control.
By actuating the keyed button (1) in the connecter box on the ballast trailer, the central unit can be bypassed.

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 personnel ;
- no other persons may be within the danger zone of the ballast trailer;
- each individual travel movement may only be carried out with utmost caution and care, at the least possible acceleration and with careful braking action.
- The keyed 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 might be in the wrong position.
- The wheel position must be monitored manually. Watch the angle scale on the ballast trailer !

Note: In crane operation (not emergency operation), the keyed button (1) must be set to position 0 (center position) .


208
209
210
211
130
131
0
1
0
V
H
ZE
BW
L
R
202
203
13 18
15 20
192003

10.2 Emergency operation - towing

Prerequisite
- The crane is at a standstill;
- the ballast trailer is properly installed;
- the rocker switch (74) is on cawler operation.

10.2.1 Lift the ballast trailer with support cylinders
- Switch the keyed button (1) on the ballast trailer to the left;

Note: By turning the keyed button (1) to the left, the **Towing** command is forwarded to the crane and the emergency operation is turned on.

Press the button (209 and 211), the support cylinders on the front and rear extend.
In emergency operation the support can only be moved from the control panel on the ballast trailer .

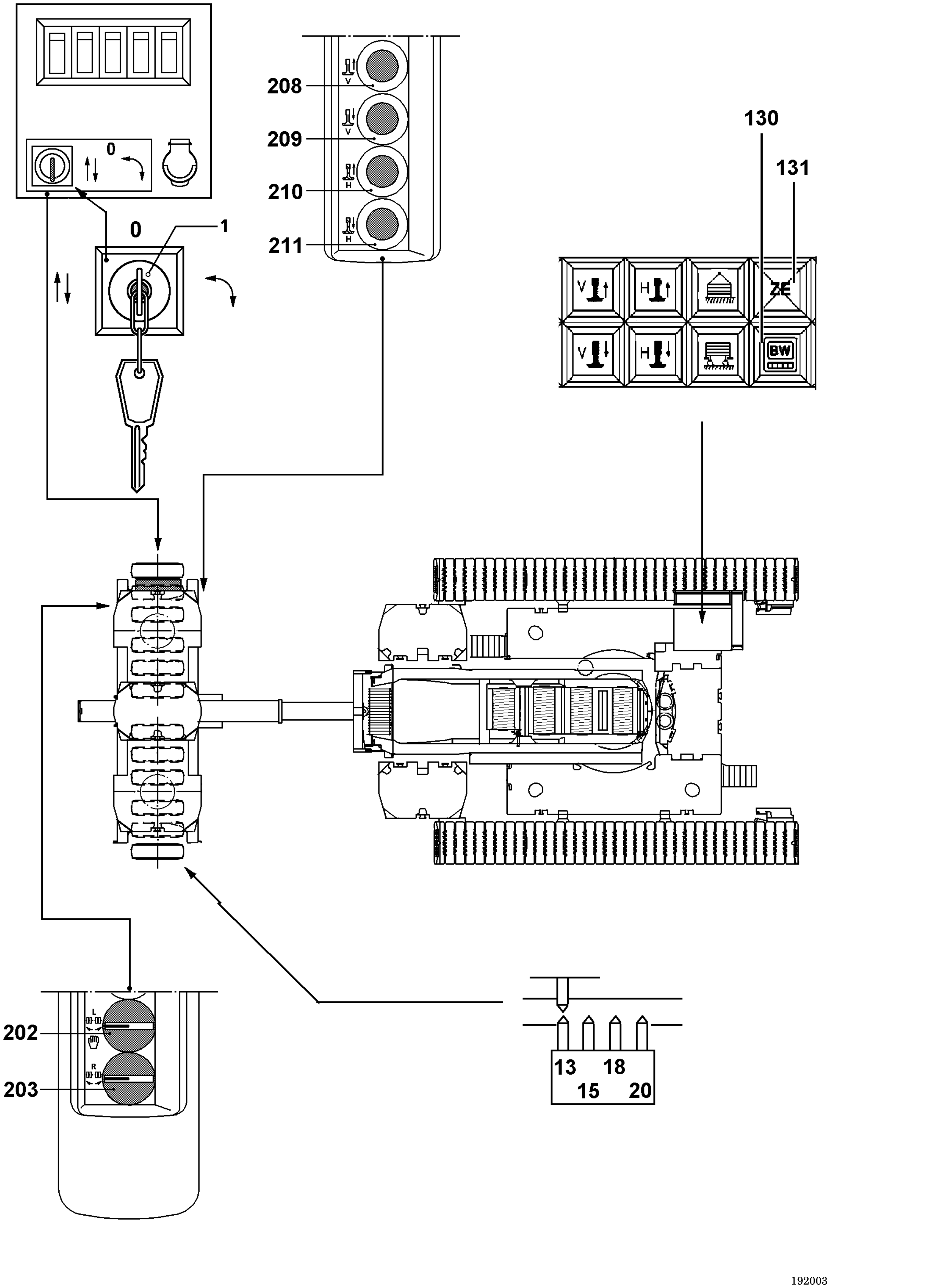
10.2.2 Set the axles to towing position
- Switch the keyed button (1) on the ballast trailer to the left;

Note: By turning the keyed button (1) to the left, the **Towing** command is forwarded to the crane .

- Actuate the knob (202) to bring the left set of wheels to towing position ;
- Actuate the knob (203) to bring the right set of wheels to towing position .

**D A N G E R : The wheel position of the set of wheels must be constantly monitored during travel. Watch the angle scale on the ballast trailer.
In case of excessive deformation of the tires, readjust the position.**

10.2.3 Lower the ballast trailer with the support cylinders
Press the button (208 and 210) , the front and rear support cylinders retract;
- the indicator light (128), supports ballast trailer are retracted, lights up.



192003

10.3 Emergency operation - driving in turns

By telescopiing the ballast trailer, various turning radii are possible.

Prerequisite

- The crane is at a standstill;
- the ballast trailer is properly installed.

10.3.1 Lift the ballast trailer with support cylinders

- Switch the keyed button (1) on the ballast trailer to the **right**;

Note: By turning the keyed button (1) to the r**ight**, the **Driving in turns** command is forwarded to the crane and the emergency operation is turned on.

Press the button (209 and 211), the support cylinders on the front and rear extend.

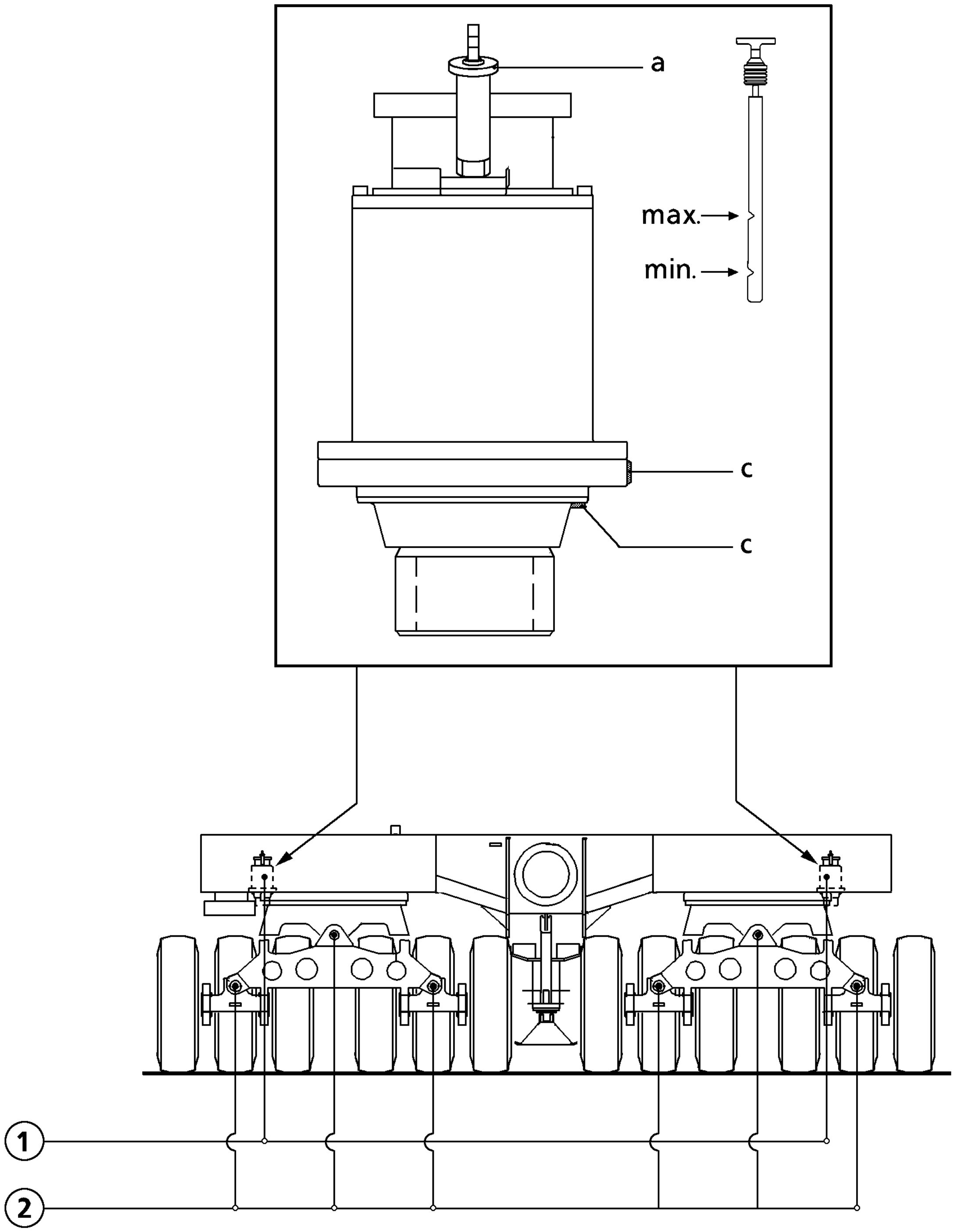
10.3.2 Set the axles to driving in turns position

- Actuate the knob (202) to bring the left set of wheels to driving in turns position until the marks according to the ballast trailer radius align ;
- Actuate the knob (203) to bring the right set of wheels to driving in turns position until the marks according to the ballast trailer radius align.

D A N G E R : The wheel position of the set of wheels must be constantly monitored during travel. Watch the marks on the ballast trailer .
In case of excessive deformation of the tires, readjust the position.

10.3.3 Lower the ballast trailer with the support cylinders

Press the button (208 and 210) , the front and rear support cylinders retract;
- the indicator light (128), supports ballast trailer are retracted, lights up.

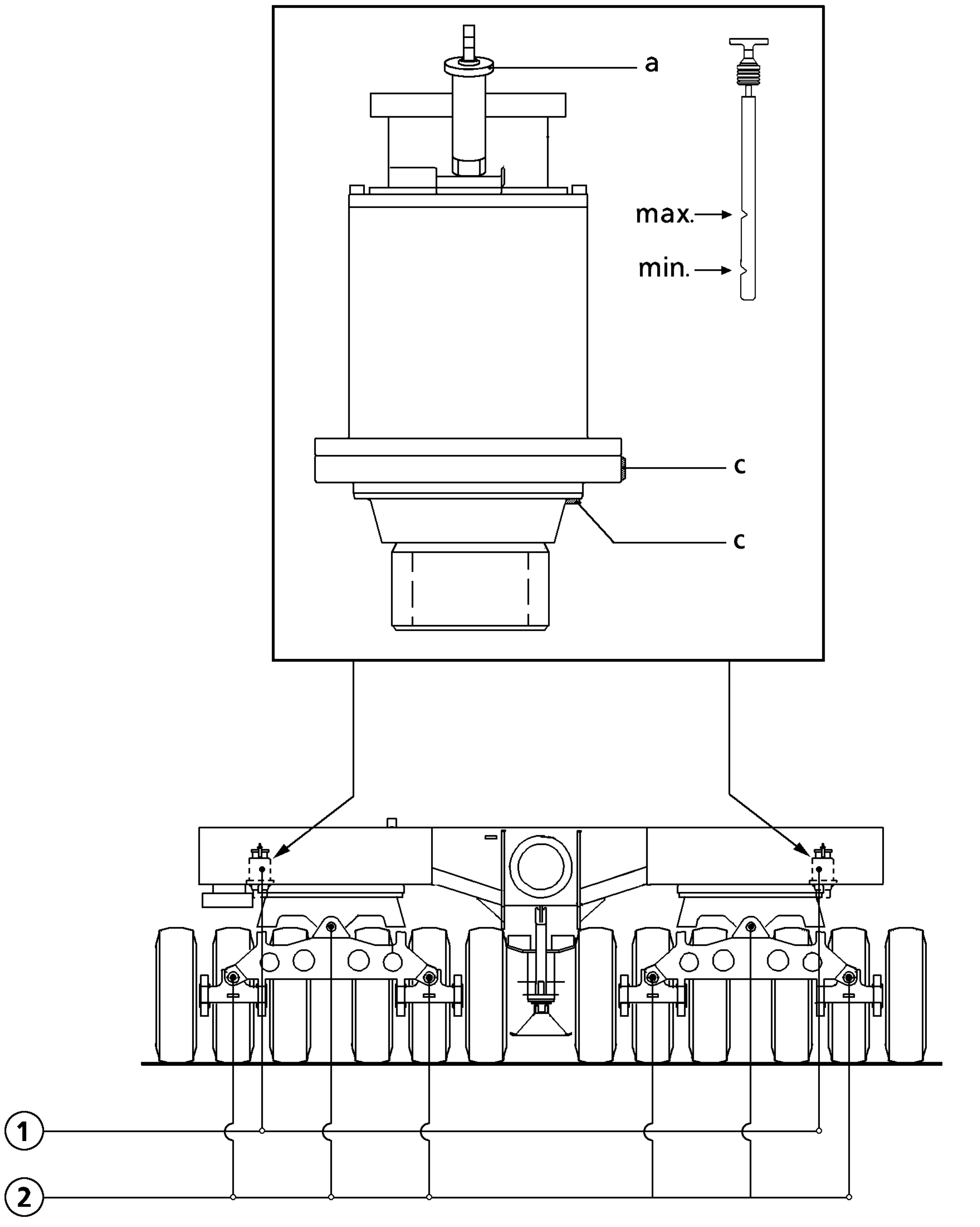


192005

11. Maintenance

11.1 Maintenance intervals

	First maintenance after	Regular maintenance every				Minimum maintenance annually	Checks	
		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.			×		×		
- Oil change					4000 hrs.	every 4 years		
□ **Axle swing**								
- Lubricate			×			×		


a
max.
min.
c
c
1
2
192005

11.2. Slewing gear

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 if the crane is in horizontal position,
- pull the dipstick, wipe it off, reinsert it and pull it out again,
- Reinsert the dipstick into the test point after checking the oil level.
- Add oil **according to the lubrication chart**, as necessary.

C A U T I O N: **If the oil level has dropped below the MIN mark, then oil must be added according to the lubrication chart, until the oil level is again between the MIN and MAX mark.**
If no oil is added, the gear may be severely damaged.

11.2.2 Oil change:

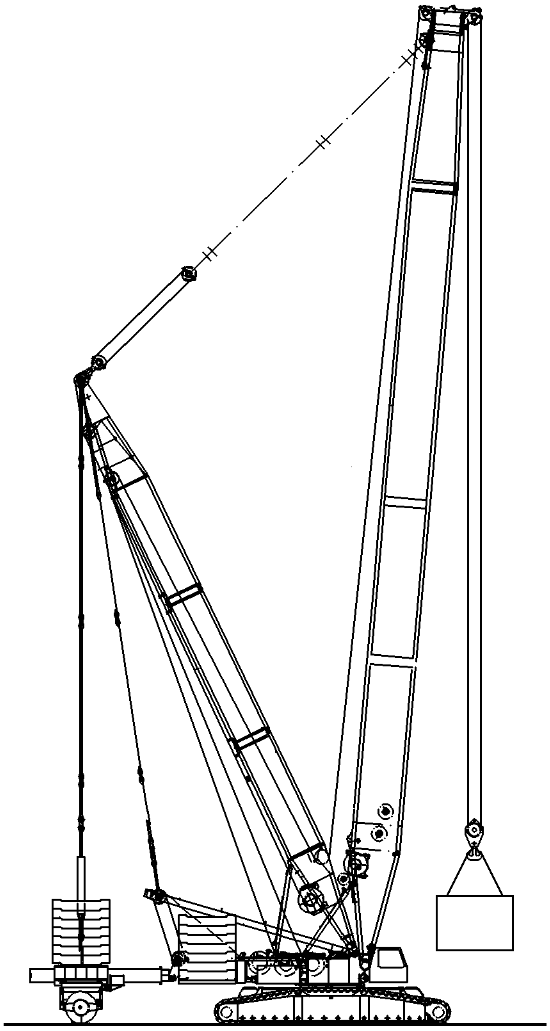
a = oil dipstick and oil filler port

- Pull out the oil dipstick (a) ;
- Unscrew the drain plug (c) with seal ring and clean the sealing surface;
- drain the old oil ;
- reinsert the drain plug (c) with new seal ring and tighten;
- Add oil according to the lubrication chart on the oil filler port (b) ;
- wipe off the dipstick, reinsert it again and pull it out again.
- After checking the oil level, push the dipstick tightly into the test point ;
- repeat the procedure, if necessary.

C A U T I O N: **Observe utmost cleanliness to ensure that no dirt and contamination gets into the inside of 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 condition of tires , check for damage .
  The depth of the tire tread may not fall below the minimum value.
- The tire pressure must be 10 bar .
  The tire pressure must be checked when the tire is cold.
- Before inflation of tires, make sure that the tire is seated properly on the rim and that the lock ring is seated properly.

C A U T I O N : The highest permissible air pressure may not be exceeded!

D A N G E R : When adding air to the tires on the vehicle, make sure that nobody is within the danger zone to prevent injury due to flying parts.
If tires are damaged, if the tire tread is insufficient and the air pressure in the tires differs, there is an increased danger of accidents.

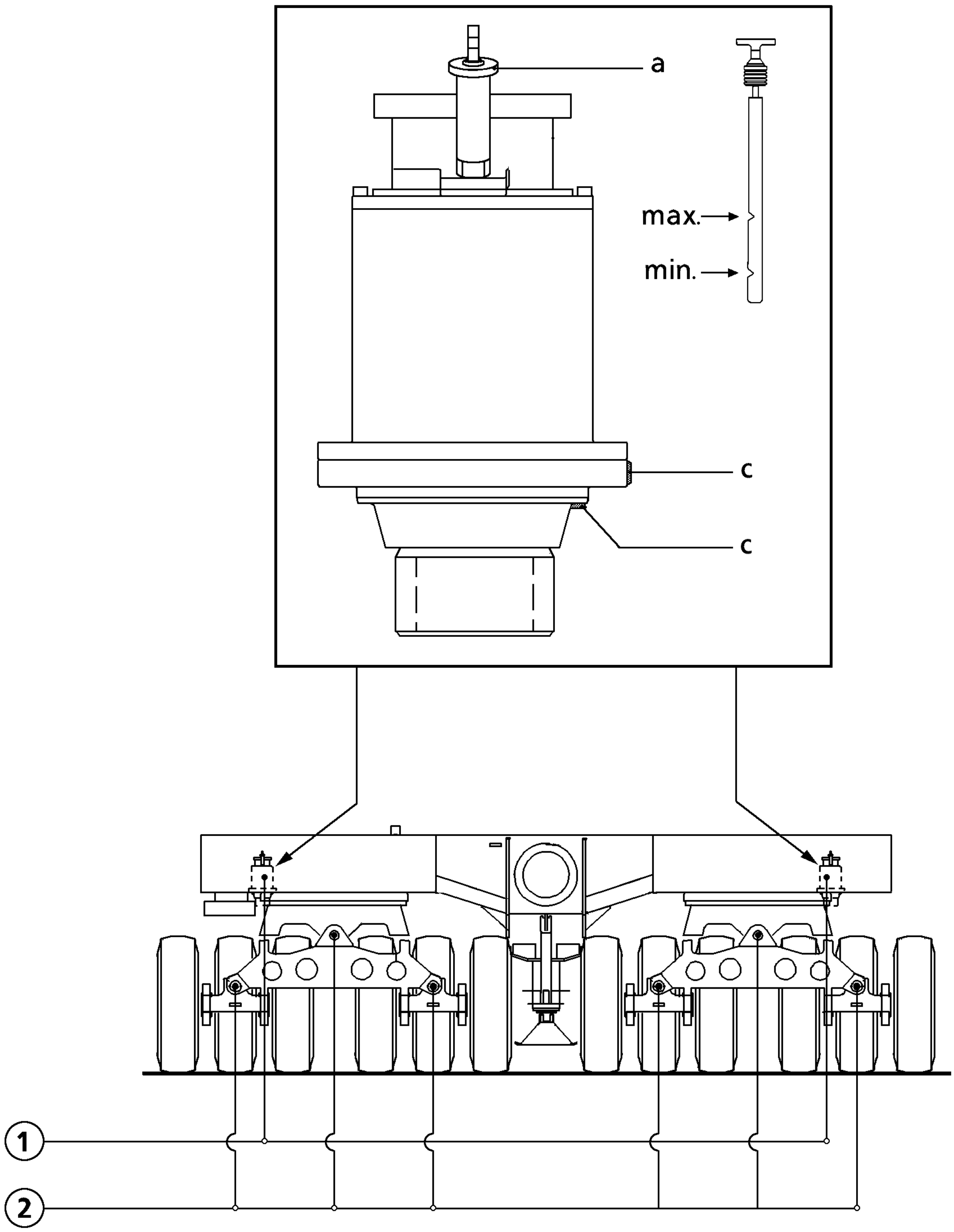
11.4.1 Safety and maintenance guidelines for the wheels (rims)

The below listed safety and maintenance guidelines are recommendations made by the manufacturer, in order to prevent any safety risks due to damaged wheels or rims.
In addition, the manufacturer states that the manufacturer's warranty is only valid if the guidelines noted below have been strictly observed and followed.

The wheel is one of the most important safety components of the vehicle. For this reasons, it is imperative that the following guidelines are followed. When changing the tires, the wheels must be checked, the rim as well as the complete dish, as follows:
- formation of excessive rust or corrosion
- bent rim flanges
- cracks in the rim
- cracks in the wheel dish
- damage on the side and lock rings
- damage to the lug nuts or bolts
- worn or damaged bolt holes
- rim components must match and fit.

If any damaged rim components are found, they must be replaced immediately with new components.
If chipped paint or minor rust is found, the rust layer should be removed and the area should be repaired with commercially available paint. You must make sure that the surface is smooth, especially on the tire seating surface.

D A N G E R : Never perform or allow any welding on the wheel rim or wheel dish. It is strictly prohibited to repair deformed or worn bolt holes or to replace or repair the wheel center .
Any wheels with these defects must be scrapped immediately and replaced with new wheels.
Any repair to these highly stressed parts of the wheel causes structural changes in the material, which can lead to sudden fractures.



192005

11.5 Lubrication schedule, quantities

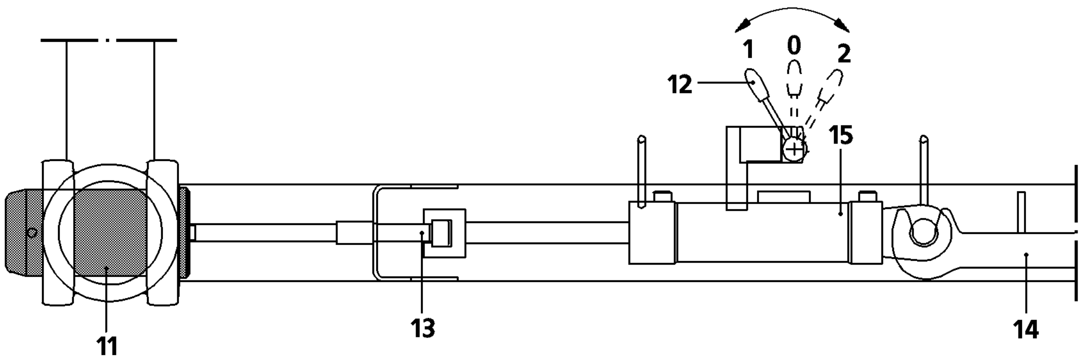
Ballast trailer	
Slewing gear Synthetic gear oil	4.4 l
Central lubrication system Special grease	2.0 kg
Lubrication Special grease	0.1 kg

C A U T I O N: **The given values are orientation values.**
The marks on the dipstick and the control ports or sight gauges are the valid marks for the fluid levels.

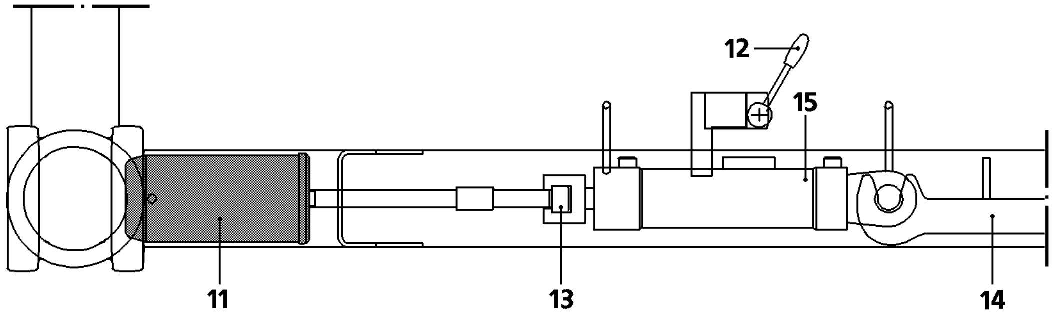
Explanation for lubrication chart:

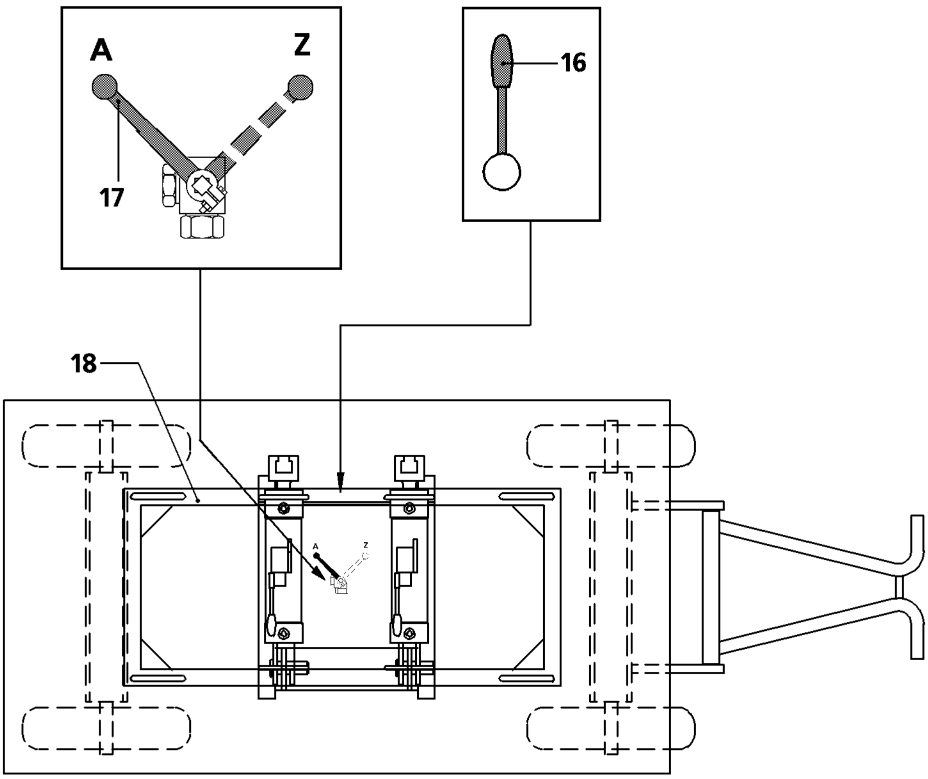
1 Synthetic gear oil
2 Grease

3



4





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

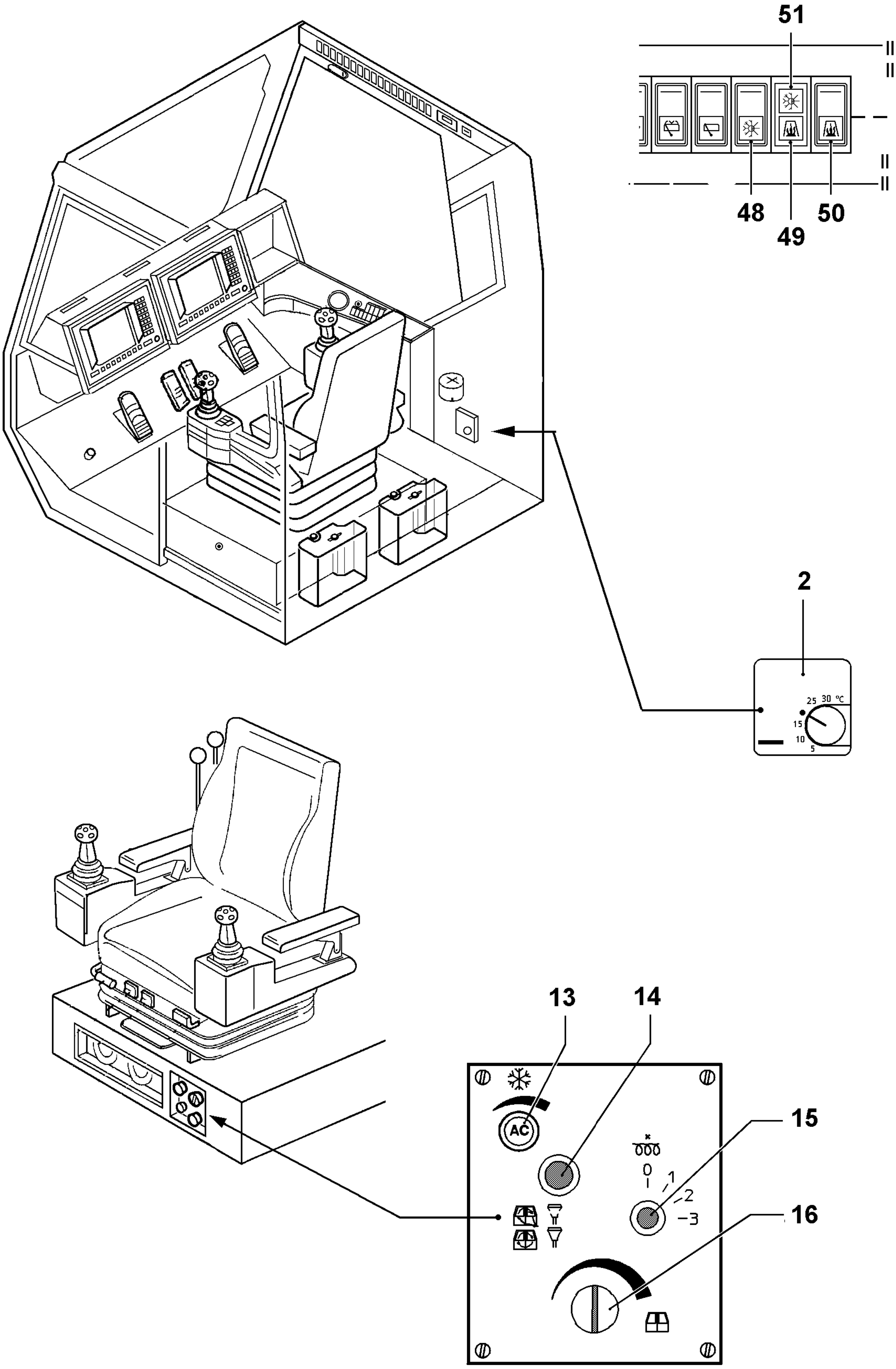
Pin pulling device	approx. Liter
Diesel engine Engine oil	1.2 l
1 Hydraulic tank ATF 86	40.0 l
2 Hydraulic tank * ATF 86	80.0 l

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



191611

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 (16).
The amount of warm air can be regulated with the 3- stage blower switch (15).
Fresh air or recirculated air can be chosen with the switch (14).

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 (15) to step 1, temperature rotary controller (16) to "WARM", and switch on additional heating with switch (50). Indicator lamp (49) will come on.
With the temperature rotary controller (16), the amount of water can be controlled; with the blower switch (15), the amount of air can be controlled.

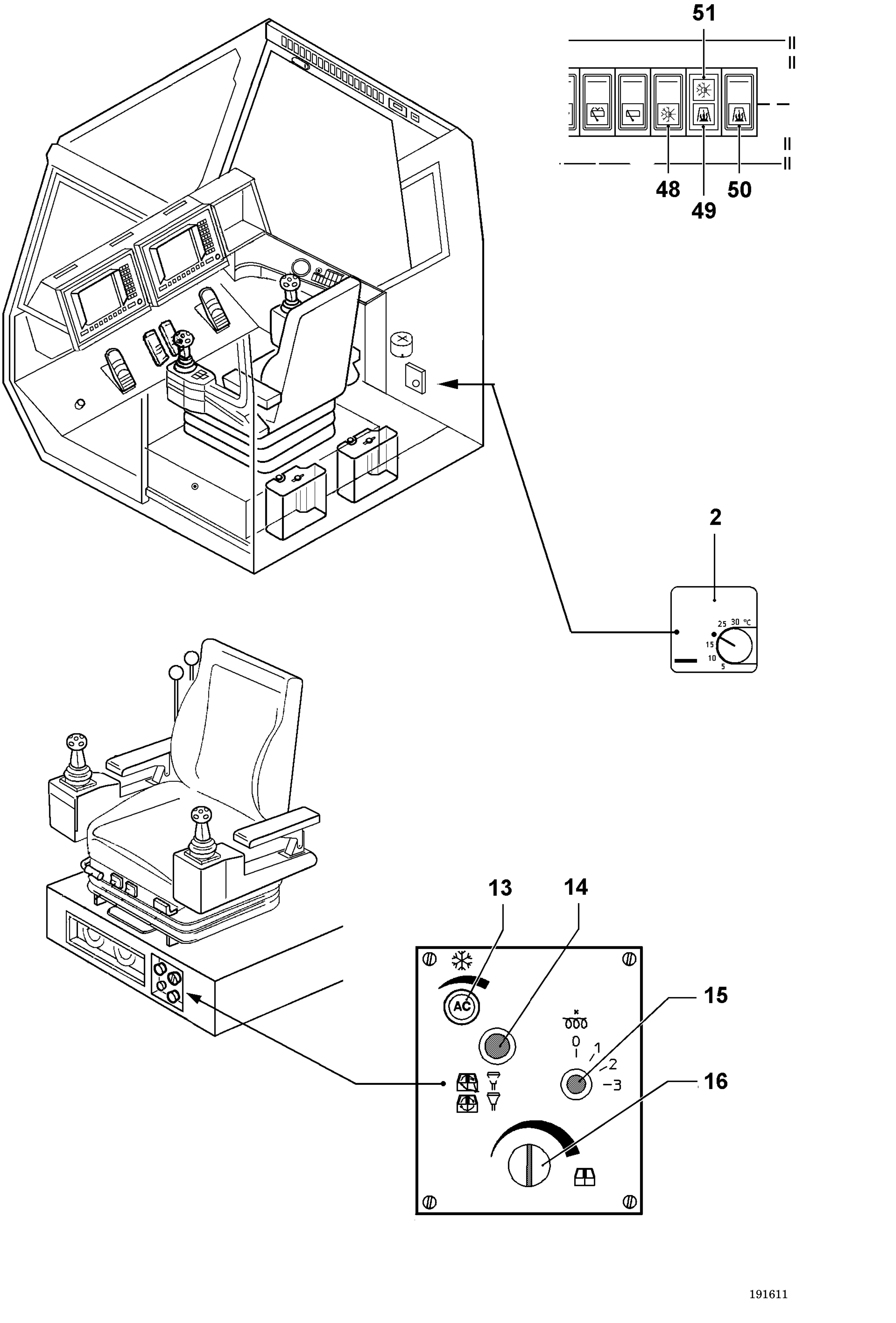
1.2.2 Engine preheating [2)] with additional heating

At temperatures less than $\leq$-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 (16).
With switch (50), switch on additional heating; indicator lamp (49) 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 (2).
The temperature rotary controller (16) must be set to "WARM".

1), 2) *) customers request.


51
48
49
50
2
25 30 °C
15
10
5
13
14
15
16
AC
0
1
2
3
191611

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 (16) to "WARM".

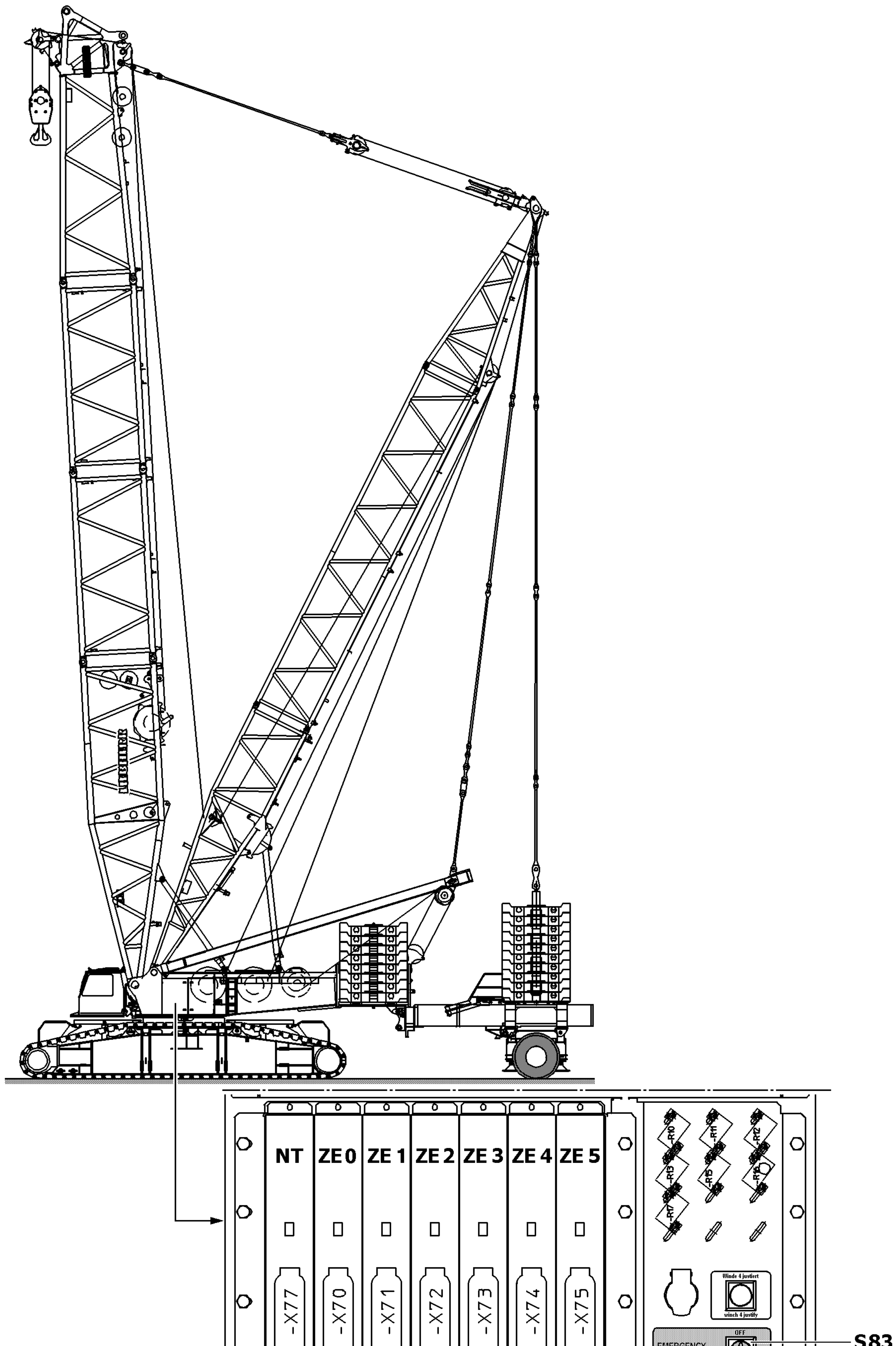
Observe the compensator reservoir to see if any air bubbles rise.

When no more air bubbles can be seen in the compensator reservoir, set the temperature rotary controller (16) 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.


NT
ZE 0
ZE 1
ZE 2
ZE 3
ZE 4
ZE 5
-X77
-X70
-X71
-X72
-X73
-X74
-X75
Winde 4 justiert
winch 4 justify
EMERGENCY OPERATION
ONLY BY AUTHORIZED PERSONS
OFF
ON
CONTROL
ON
S83
S82

192595

1. EMERGENCY CONTROL in case of problem 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.

1.1 Emergency control - general

The emergency control is turned on via the keyed switch (-S83) in the control box, position **"ON"**. The bell on the slewing platform as well as the beacon on the roof of the cab are actuated.
In emergency operation, the LICCON outlets are disconnected from the control valves of the hydraulic pumps via the CPU -ok relay contacts. The hydraulic pumps are actuated via fixed resistors in connection with the corresponding direction contacts of the master switch (manual control lever). Only "black - white operation" is possible. It is possible to change the engine speed slightly with the throttle control.

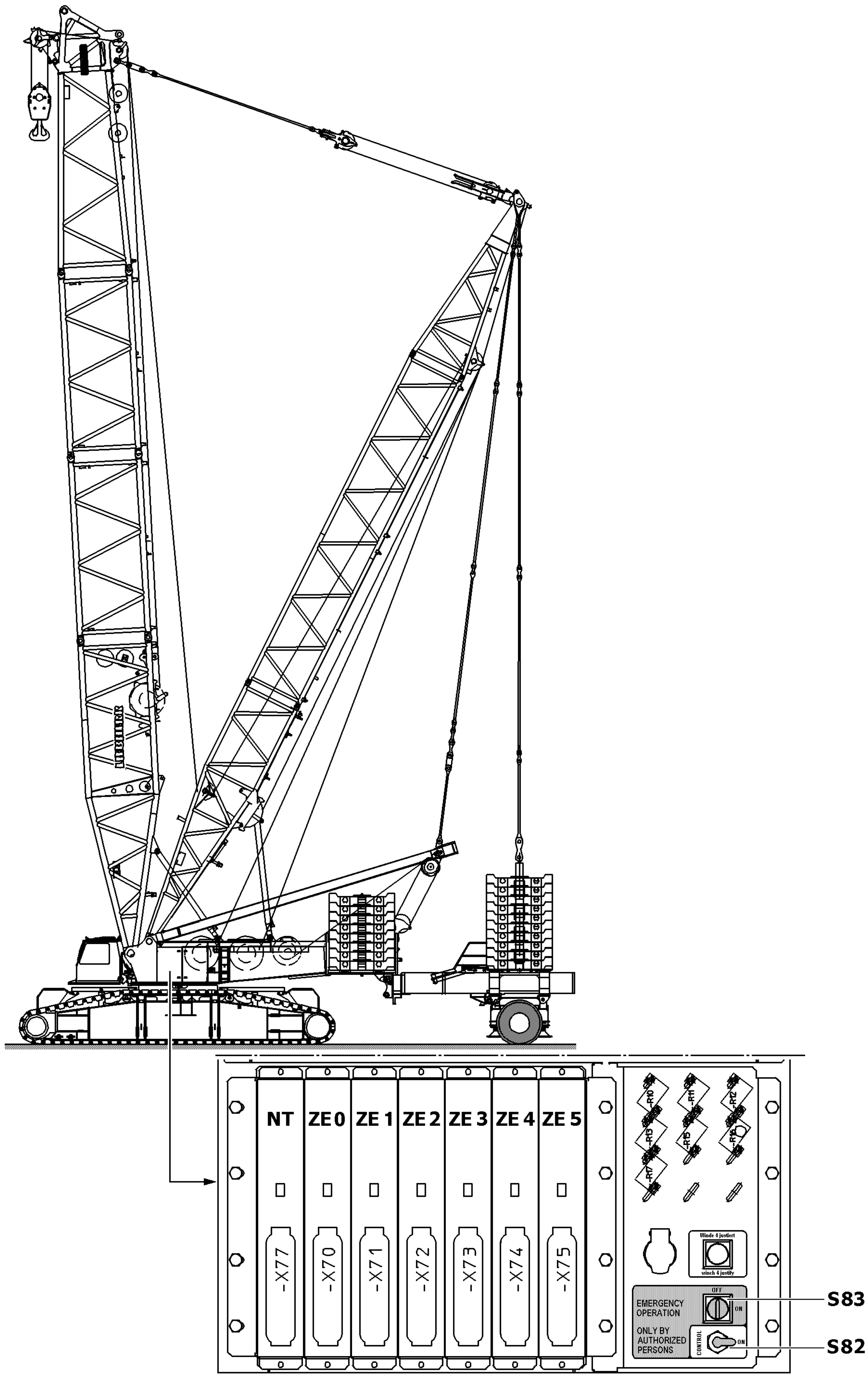
D A N G E R: **In emergency operation, all safety devices, such as the LICCON overload safety system, the straight run in parallel operation, the monitoring functions (limit switches) of the relapse cylinders, block positions, monitoring of forces (test brackets), hoist limit switches, monitoring of "Slewing" and "Driving" in ballast trailer operation, 10° limit switch SA bracket are all out of service.**

1.2 Prerequisites for emergency control

- The crane engine must be running,
- the hydraulic system in the crane superstructure must be fully functioning.
- The keyed switch - S 83 (large control box) is set to "ON" position.

D A N G E R: **The emergency control may only be carried out to bring the hoisting movement to an end if there is a problem, or to take care of a danger situation.**
If a load is suspended from the hook, then it must be placed down first to relieve the boom. Only those crane movements may be carried out, which are required to set down the load, to place down the boom or to drive or turn the crane into a area, where it is no longer an obstacle. Since the monitor is not functioning if there is a problem or failure of the LICCON system, and the working procedures can no longer be shown optically, every step must be carried out and checked with extreme care and caution.
Check visually!
In emergency control, all safety devices are automatically bypassed. The emergency control of the crane may only be carried out by authorized personnel, which is aware of the effects of this bypass .

The hydraulic monitoring function of the replenishing pressures of the winches remains. It the replenishing pressure is not available, the brake on the corresponding winch cannot be released. In addition, it is also not possible to spool out the winches all the way, the safety coils on the winch remain.


NT
ZE 0
ZE 1
ZE 2
ZE 3
ZE 4
ZE 5
-X77
-X70
-X71
-X72
-X73
-X74
-X75
EMERGENCY OPERATION
ONLY BY AUTHORIZED PERSONS
OFF
ON
CONTROL
ON
S83
S82

192595

Keyed switch - S 83:

D A N G E R : **The keyed switch - S 83 (large control box) bypasses the LICCON overload safety device and may only be turned on in emergency sistuations by personnel, who is aware of the effects of this bypass!**
Crane operation with turned on switch - S 83 is strictly prohibited.

After completion of the emergency operation and after the LICCON overload safety device is operational again, the keyed switch - S 83 (large control box) must be set again to the "OFF" position! The crane must also be turned off (engine stop). This is required so that the crane can be inspected for function and safety before continued operation. The key must be pulled after emergency operation and handed to an authorized person for safekeeping!

There is a DANGER OF LIFE AND DEATH!

D A N G E R: **In emergency control, the movements are not controlled in proportion to the deflection of the manual control lever, but turned on or off digitally via the direction contacts of the manual control lever . This causes a jerky movement, on or off. The movement occurs at reduced, constant speed.**

In emergency control, part of the transmitter is not active or the signals are not used.

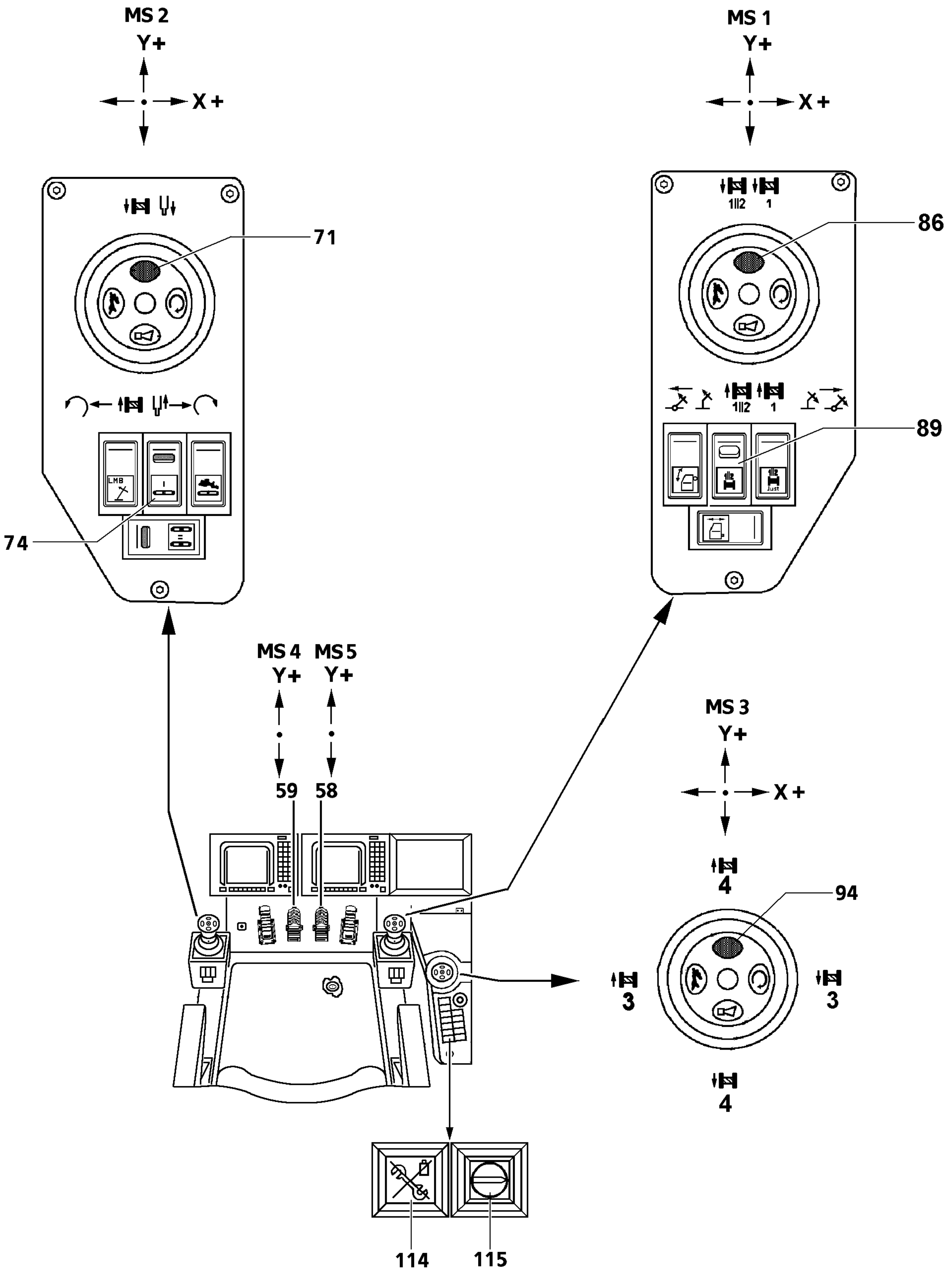
In emergency control, the crane control is carried out with the LICCON, which means the crane control works constantly as a relay control without computer controlling. In emergency control, even if the LICCON and the monitor indication is still functioning, all outlets of the LICCON and therefore all LICCON software emergency shut offs are ignored.

In emergency control, the crane operator is responsible for all movements he carries out. The instructions for emergency control must be strictly adhered to. Every step must be carefully thought through. If the LICCON is still functioning, only those movements may be carried out in emergency control, which cannot be carried out in normal operation due to a technical defect, but which would be permissible according to the operating instructions and the load condition.

The crane operator may never use the emergency control to bypass the safety shut offs of the LICCON system in normal operation !
There is a danger of accidents.

If a movement cannot be slowed down or stopped by resetting the manual control lever or by releasing the corresponding button, then the crane must be stopped immediately by pressing the EMERGENCY OFF button.

There is danger of LIFE AND DEATH!


MS 2
Y+
X +
71
74
LMB
MS 1
Y+
X +
1ll2
1
86
89
Just
MS 4
MS 5
Y+
Y+
59
58
MS 3
Y+
X +
4
94
3
3
4
114
115

192596

1.3 Master switch (MS) assignment in emergency control

Winch 1:	MS1Y	
Winch 2:	MS2Y	Button (115) not actuated → installation cylinder locked
Winch 3:	MS1X	Switch (74) not turned on → crawler locked
Winch 4:	MS3X	Switch (74) and (89) not turned on → winch 6 locked
Winch 5:	MS3Y	
Winch 6:	MS3X	Switch (74) not turned on, wwitch (89) turned on → winch 4 locked
Slewing gear:	MS2X	
Installation cylinder:	MS2Y	Button (115) actuated → winch 2 locked
Crawler left:	MS4Y	Switch (74) turned on → winch 3, 4 and 6 locked.
Crawler right:	MS5Y	Switch (74) turned on → winch 3, 4 and 6 locked.

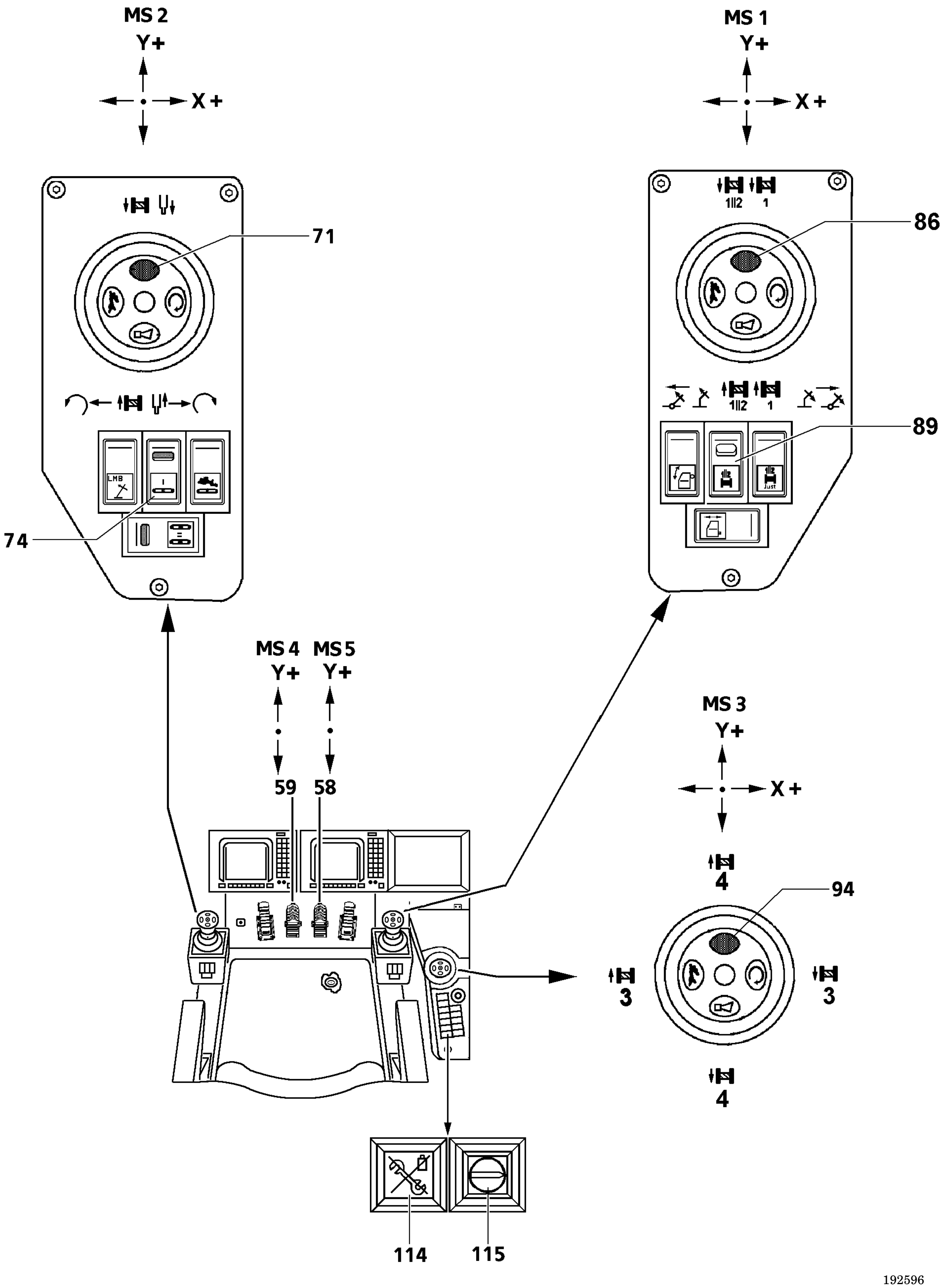
1.4 The following crane movements must be carried out:

Winch 1 - 6	spool up / out
Slewing gear	turn left / right
Installation cylinder	extend / retract
Crawler	drive

Note: Parallel operation of winch 1 ‖ 2 is not possible!

C A U T I O N : **If a double hook is reeved, the winches must be moved with MS1Y and MS2Y. The horizontal alignment of the two pulleys in the double hook must be monitored by the crane operator.**

D A N G E R : **If a load is suspended from thehook, then it must be placed down first and the boom must be relieved.**
There may be no persons or objects in the danger zone.


MS 2
Y+
X +
71
74
MS 1
Y+
X +
1II2
1
86
89
MS 4
MS 5
Y+
Y+
59
58
MS 3
Y+
X +
4
94
3
3
4
114
115
192596

1.4.1 Winch 1 to 6

Winch 1
Release of the manual control lever (MS1) with seat contact switch or by pushing the button (86) on the manual control lever.

Deflect the manual control lever (MS1) to the rear (Y –)	=	spool up
Deflect the 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 seat contact switch or by pressing the button (71) on the manual control lever.

Keyed button (115) not actuated, indicator light in the button (114) does not light up.

Deflect the manual control lever (MS2) to the rear (Y –)	=	spool up
Deflect the manual control lever (MS2) to the front (Y +)	=	spool out
Manual control lever (MS2) in zero position	=	brake is applied, winch 2 stops.

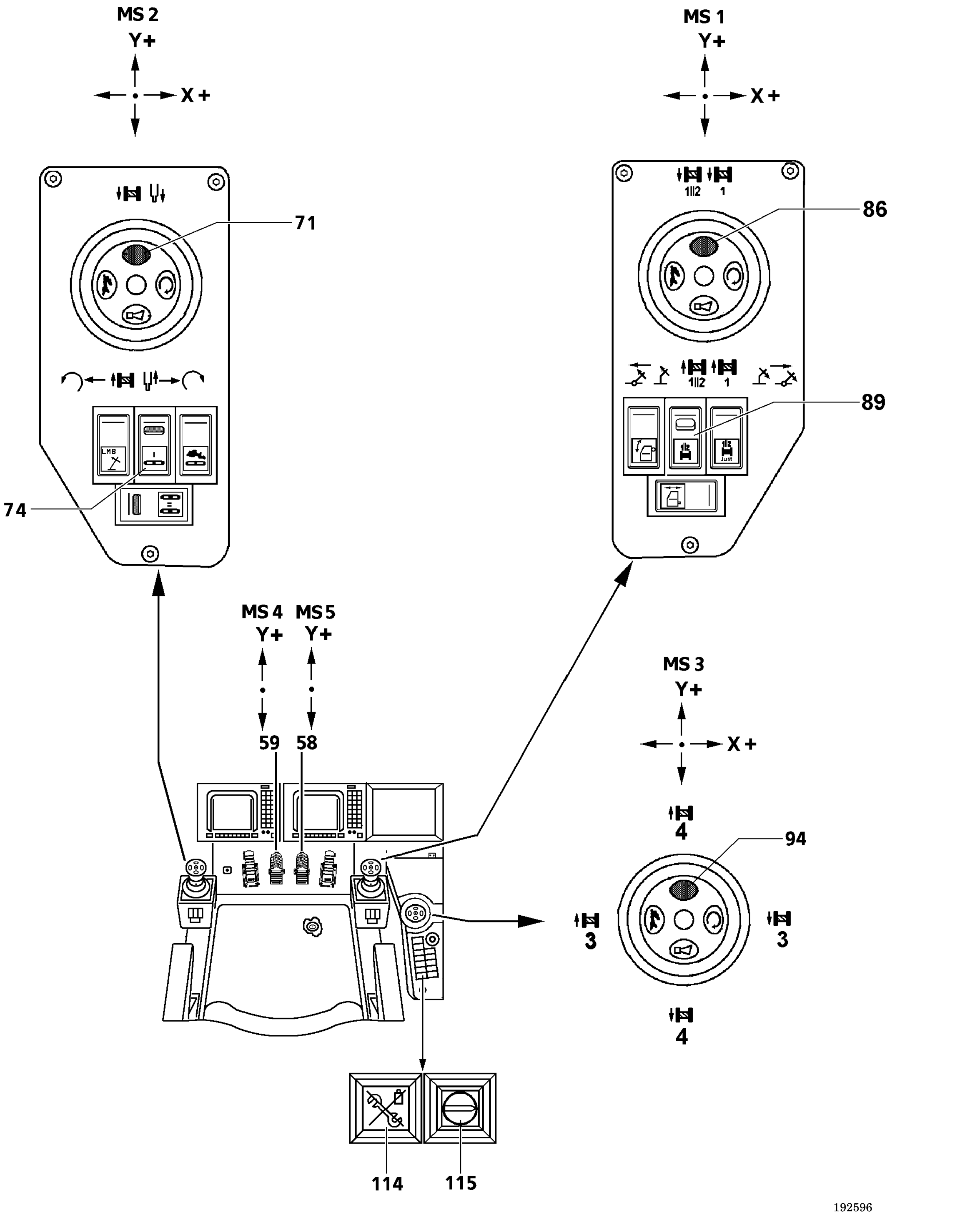
Note: Winch 2 turns at reduced speed
If the limit switch ”Winch spooled out” is triggered, then winch 2 can be spooled up again even in emergency control. The spool up direction remains clear.

Winch 3
Release of the manual control lever (MS1) with seat contact switch or by pressing the button (86) on the manual control lever.

Switch (74) 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.


MS 2
Y+
X +
71
74
MS 1
Y+
X +
86
89
MS 4
MS 5
Y+
Y+
59
58
MS 3
Y+
X +
4
94
3
3
4
114
115
192596

Winch 4
Release of manual control lever (MS3) with seat contact switch or by pushing the button (94) on the manual control lever.
Switch (74) and (89) not turned on.

Deflect the manual control lever (MS3) to the left (Y –)	=	spool up
Deflect the manual control lever (MS3) to the right (Y +)	=	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 manual control lever (MS3) with seat contact switch or by pushing the button (94) on the 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.

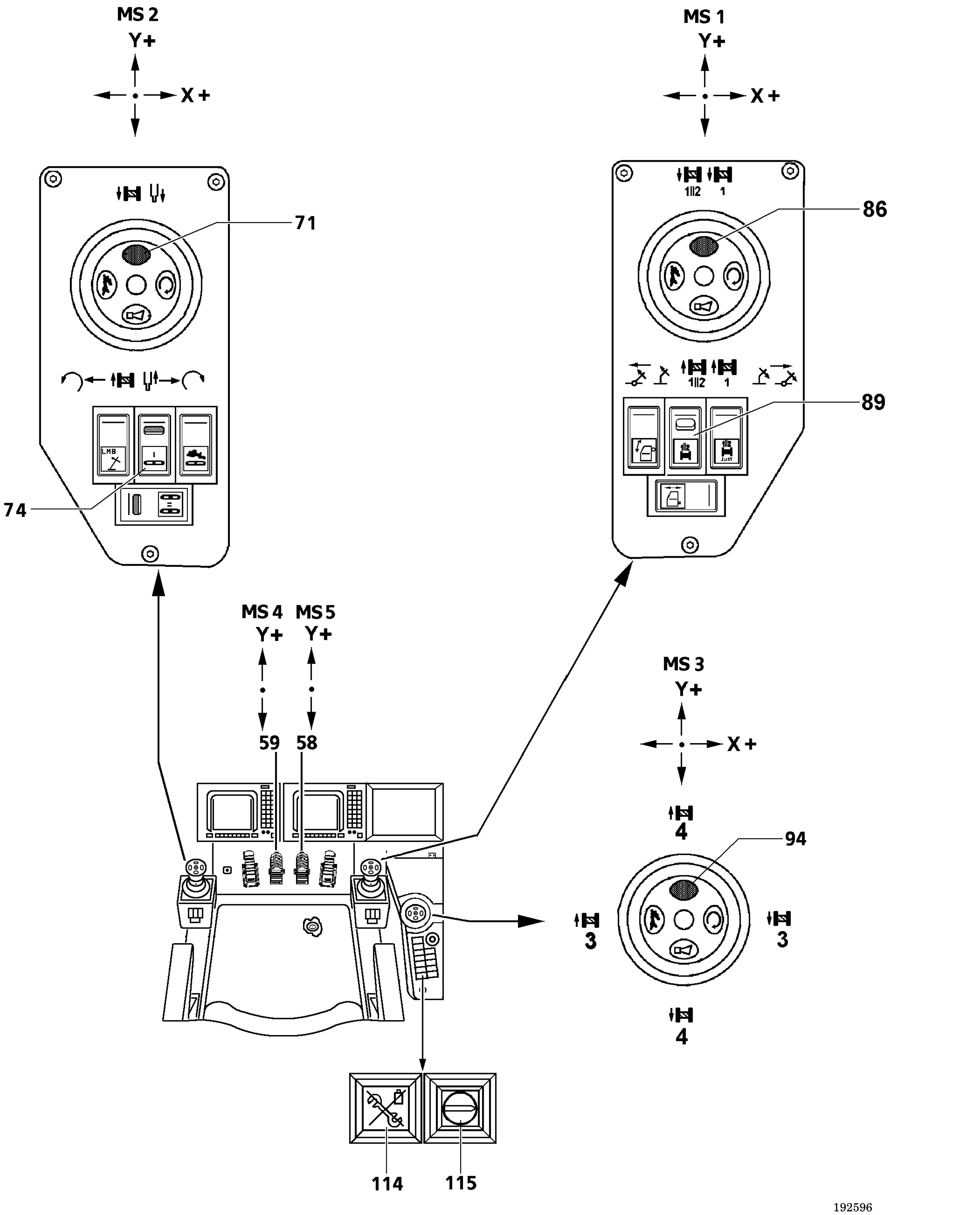
Note: Winch 5 turns at reduced speed
If the limit switch "Winch spooled out" is triggered, then winch 5 can be spooled up again even in emergency control. The spool up direction remains clear.

Winch 6
Release of manual control levers (MS3)with seat contact switch or by pushing the button (94) on the manual control lever.

Switch (74) not turned on.
Switch (89) 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.


MS 2
Y+
X +
71
74
LMB
MS 1
Y+
X +
1||2
1
86
89
Just
MS 4
MS 5
Y+
Y+
59
58
MS 3
Y+
X +
4
94
3
3
4
114
115
192596

1.4.2 Slewing gear

D A N G E R : **Before initiating the ”Slewing” crane movement, the crane operator must make sure that there are no persons or obstacles within the slewing range. If this is not observed, there is a danger of accidents .**

Release of manual control lever (MS2) with seat contact switch or by pushing the button on the manual control lever.

Deflect the manual control lever (MS2) to the left (X –)	=	turn to the left
Deflect the manual control lever (MS2) to the right (X +)	=	turn to the right
Manual control lever (MS2) in zero position	=	brake is applied, slwing gear slows down softly (hydraulic accumulator).

Note: In emergency control, coasting is not possible. The slewing gear turns at reduced speed.

1.4.3 Installation cylinder

Release of manual control lever (MS2) with seat contact switch or by pushing the button (71) on the manual control lever (MS2).

Actuate the keyed button (115)

Deflect the manual 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	=	Movement of installation cylinder stops

Note: Movement of installation cylinder is at reduced speed.

1.4.4 Crawler gear

Turn on the crawler gear with switch (74)

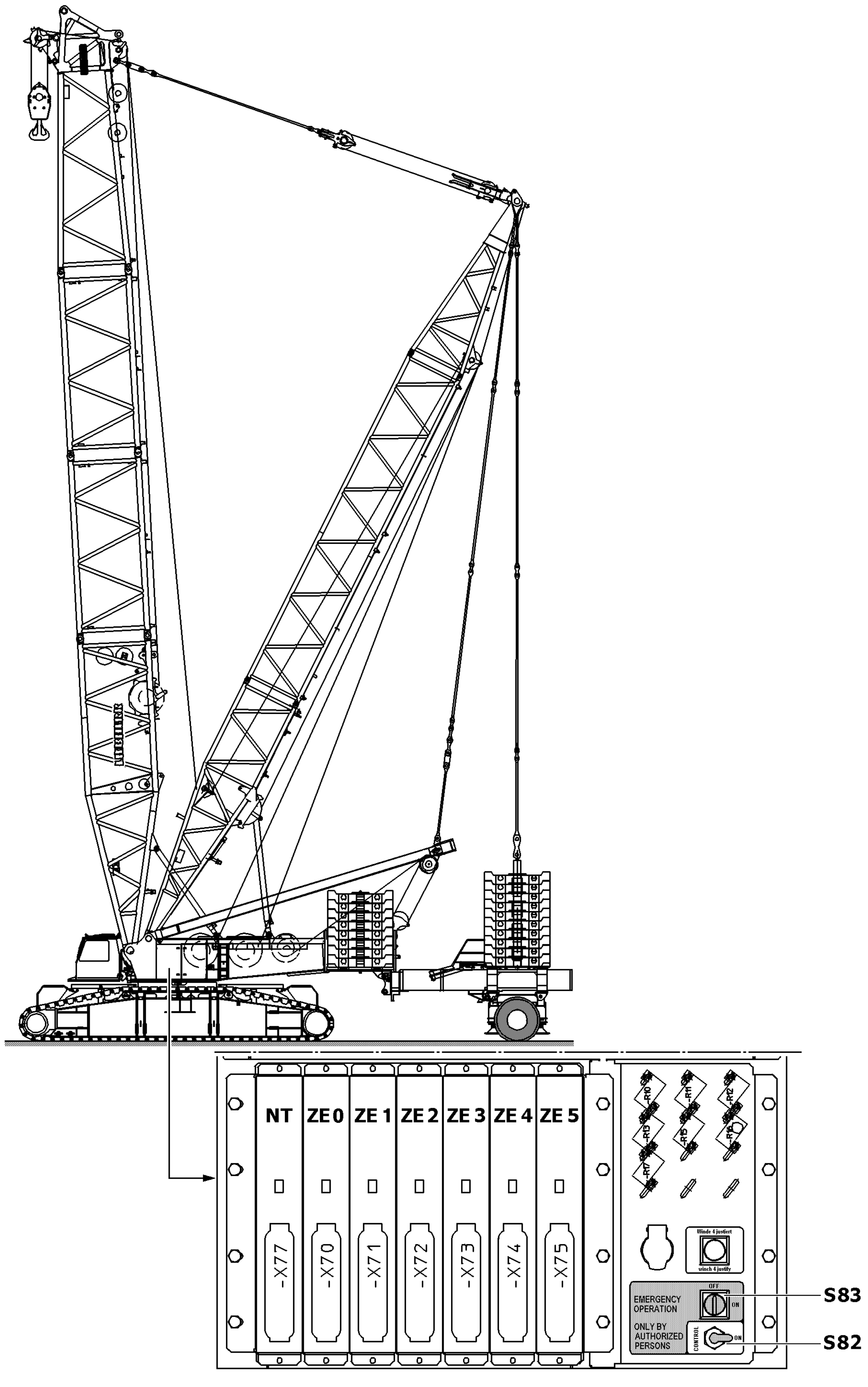
Crawler left

Press the foot pedal left (MS4 (59) to the front (Y +)	=	drive forward
Press the foot pedal left (MS4 (59) to the rear (Y –)	=	drive backward
Foot pedal left (MS4 (59) in zero position	=	brake is applied, the travel gear slows down softly (hydraulic accumulator).

Crawler right

Press the foot pedal right (MS5 (58) to the front (Y +)	=	drive forward
Press the foot pedal right (MS5 (58) to the rear (Y –)	=	drive backward
Foot pedal right (MS5) (58) in zero position	=	brake is applied, the travel gear slows down softly (hydraulic accumulator).

Note: The crawler gear drives at reduced speed.


NT
ZE 0
ZE 1
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ZE 3
ZE 4
ZE 5
-X77
-X70
-X71
-X72
-X73
-X74
-X75
EMERGENCY OPERATION
ONLY BY AUTHORIZED PERSONS
OFF
ON
CONTROL
ON
S83
S82

192595

2. Emergency control with ballast trailer

Function - Ballast "Up or down"
It is possible to raise or 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 "Turning"
It is possible to turn , but without monitoring of the supports and the wheel positoin of the ballast trailer. For that reason it must be ensured that - **with non-suspended ballast trailer** - the wheels are in **"Turning"** position and the supports are retracted.

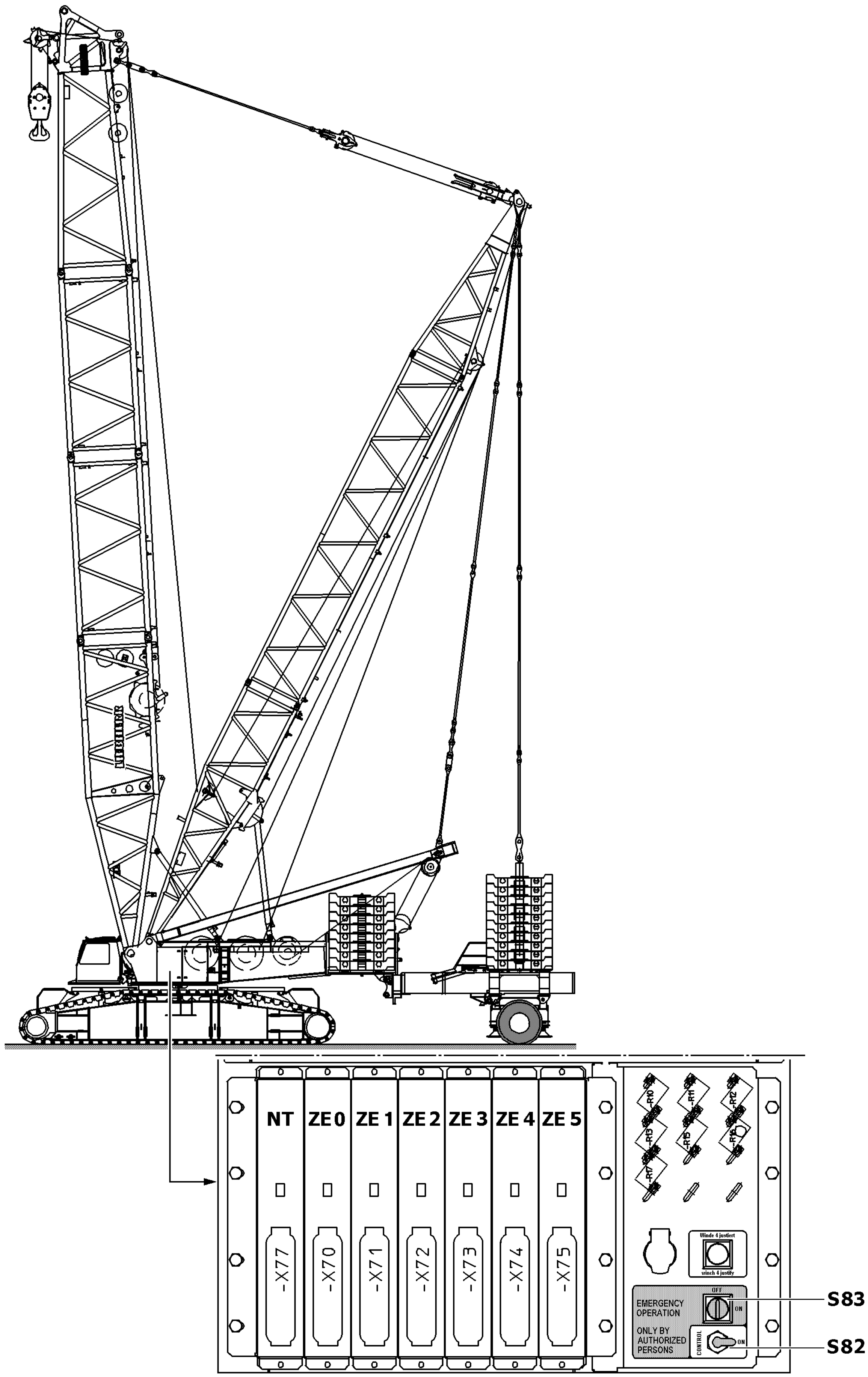
Function "Driving"

Towing :

C A U T I O N : **Towing is not possible, since the slewing gear coasting function cannot be turned on.**

Parallel driving:

C A U T I O N : **Is not possible, since the hydraulic coasting function of the slewing gear cannot be turned on.**


NT
ZE 0
ZE 1
ZE 2
ZE 3
ZE 4
ZE 5
-X77
-X70
-X71
-X72
-X73
-X74
-X75
EMERGENCY OPERATION
ONLY BY AUTHORIZED PERSONS
OFF
ON
CONTROL
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S83
S82

192595

3. EMERGENCY OPERATION in case of problem or failure of a central processing unit (CPU} or a power supply unit (NT)
⇒ basic component group error

Note: Basic component group error, see chapter 7.10, DIAGNOSTICS ; paragraph 2.2.3.

Possible causes

1. **Central processing unit (CPU) defective**

   Note: All CPUs must be fully functioning.

2. **Power supply unit defective**

Error recognition
- Power supply unit indication
- CPU indication
- System error message

Remedy
- Replace the defective CPU with a spare CPU.
- Replace the defective power supply unit with a spare power supply 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 power supplz unit.

Note: A spare CPU as well as a spare power supply unit is in the control box of the crane control. To change the CPU or the power supply unit, see chapter 7.10, DIAGNOSTICS ; paragraph 2.2.3, System error.

C A U T I O N : **When replacing the CPU or the power supply unit, the current must be turned off. When pulling the plug for the power supply unit or the central processing unit from the component group carrier, the Stand-by power supply for the component group is interrupted. This means, the system is rebooted. The stored equipment configuration data and the adjustment figures will be lost.**

Chapter 7

Service and Maintenance

Liebherr After Sales Service - what it means 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.

Note: 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.

DANGER: **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!**

Cleaning and care of the crane

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.

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!

The scope of maintenance works are described in the following chapters.

7.02 MAINTENANCE INTERVALS CRANE CHASSIS

7.03 MAINTENANCE INTERVALS CRANE SUPERSTRUCTURE

Maintenance work must carried out according the crane.

The following chapters describe maintenance work in more detail.

7.04 MAINTENANCE INSTRUCTIONS CRANE CHASSIS

7.05 MAINTENANCE INSTRUCTIONS CRANE SUPERSTRUCTURE

For individual assemblies note manufacturers instructions.

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.

	1st main-tenance after	regular maintenance every			minimum main-tenance annually	inspections	
		250 hrs. 5 000 km	500 hrs. 10 000 km	1 000 hrs. 20 000 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 main-tenance after	regular maintenance every			minimum main-tenance annually	inspections	
		250 hrs. 5 000 km	500 hrs. 10 000 km	1 000 hrs. 20 000 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.		×		×		
□ **Automated transmission**							
- check for proper seals							×
- Oil change				90 000 km	×		
- Replace oil filter				90 000 km	×		

	1st main-tenance after	regular maintenance every			minimum main-tenance annually	inspections	
		250 hrs. 5 000 km	500 hrs. 10 000 km	1 000 hrs. 20 000 km		daily	weekly
□ **Displacement gear**							
- check for proper seals							×
- check fastenings		×					
- oil change	1 000 km			×	×		
□ **Distribution gearbox**							
- Oil change	1 000 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			minimum maintenance annually	inspections	
		250 hrs. 5 000 km	500 hrs. 10 000 km	1 000 hrs. 20 000 km		daily	weekly
□ **Drive shafts (universal drive shafts) and bearing bracket**							
- Grease				25 000 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				25 000 km	every 2 years **		
- Check mounting tightness		×					
- Oil change	1 000 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	1 000 km			×	every 2 years		
□ **Non-driven axles**							
- Grease steering knuckle bearings				25 000 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 maintenance after	regular maintenance every			minimum maintenance annually	inspections	
		250 hrs. 5 000 km	500 hrs. 10 000 km	1 000 hrs. 20 000 km		daily	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)	5 000 km		×				

* in hot regions, 2 × per year

	1st main-tenance after	regular maintenance every			minimum main-tenance annually	inspections	
		250 hrs. 5 000 km	500 hrs. 10 000 km	1 000 hrs. 20 000 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	
		250 hrs. 5 000 km	500 hrs. 10 000 km	1 000 hrs. 20 000 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	
		125 h	250 h	500 h	1 500 h		daily	weekly
□ **Diesel engine**								
- check oil level for further inspections please refer to manufacturers maintenance instructions							×	
- check cooling water level in the extension tank							×	
- change cooling water						every 2 years		
□ **Air filter**								
- check dust indicator							×	
- clean resp. change according to manufacturers maintenance instructions								
□ **Slewing ring**								
- lubricate						every 3 months *		
- inspect and check bolts for tightness	200 hrs.				×	×		
- check tilt play					×	×		
□ **Rope winches**								
- inspect for leaks							×	
- check oil level								×
- check fastening bolts for tightness	200 hrs.			×		×		
- oil change					3 000 hrs.	every 4 years		
□ **Propeller shafts**								
- check flange bolts		×						
- lubricate		×				×		

* if the crane is not moved

	1st maintenance after	regular maintenance every				minimum maintenance annually	inspections	
		125 h	250 h	500 h	1 500 h		daily	weekly
□ **Tension rods**								
- check condition						X		
□ **Overtopping guard struts**								
- lubricate pivots			X			X		
□ **Fall back cylinders**								
- inspect for leaks	X *							
- check preload pressure (nitrogen gas)				X		X		
- check oil quantity				X		X		
□ **A bracket mounting**								
- lubricate			X					
□ **Counterweight**								
- check tightening torque of fastening bolts	1 000 km			or 10 000 km		X		
□ **Ballasting system**								
- lubricate pivots			X			X		
□ **Rope drum contact rollers**								
- grease guides			X			X		
□ **Rope pulleys**								
- inspect and lubricate					X	X		
□ **Ropes**								
- inspect, grease if necessary			X			X		
□ **Hook blocks**								
- lubricate			X			X		

* visual check before starting up the crane

	1st main-tenance after	regular maintenance every				minimum main-tenance annually	inspections	
		125 h	250 h	500 h	1 500 h		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			×			×		

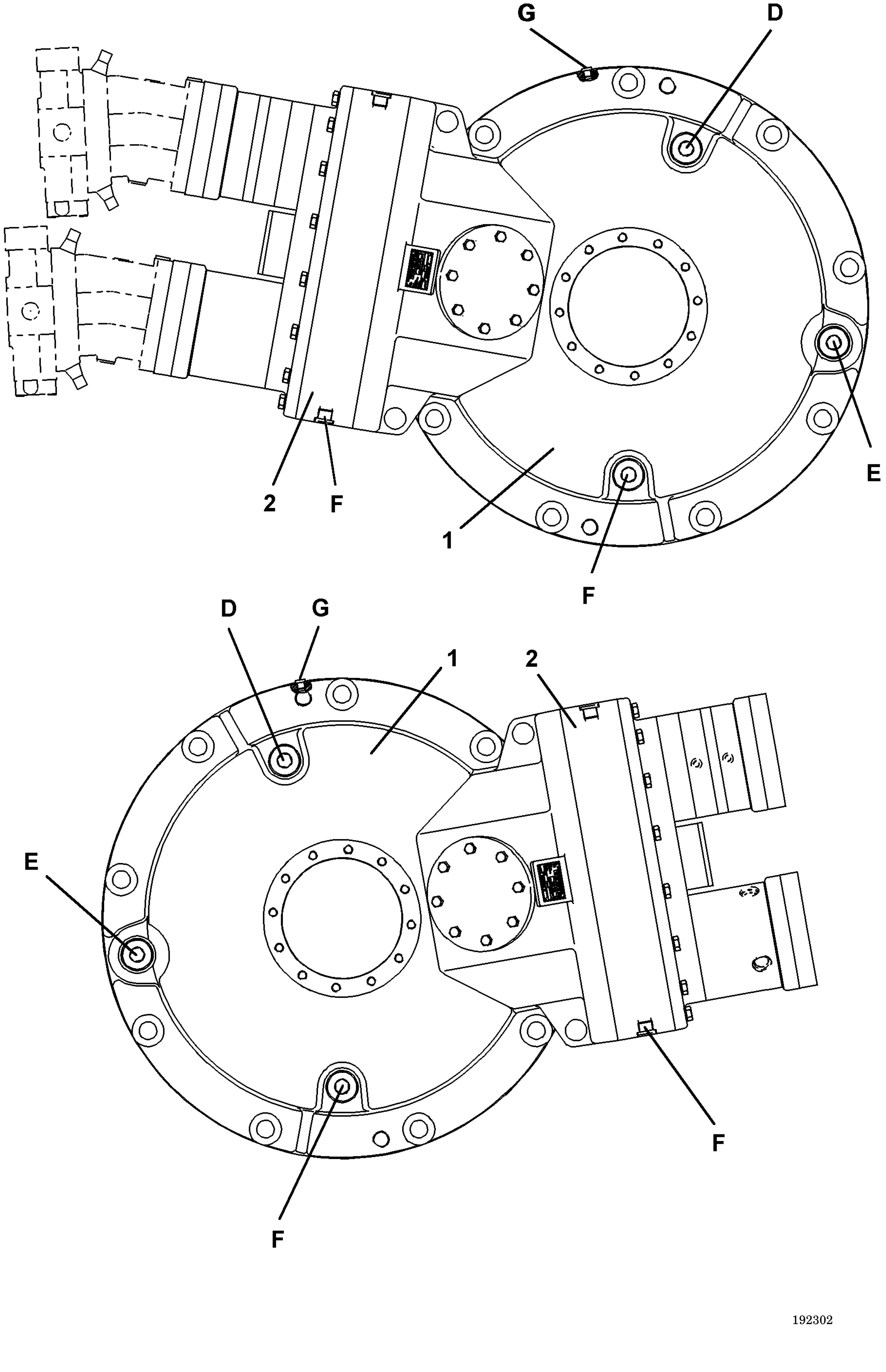
* in hot regions, 2 × per year

	1st maintenance after	regular maintenance every 125 h	250 h	500 h	1 500 h	minimum maintenance annually	inspections 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				× *		× *		
☐ **Compressed air system**								
- Test for proper seals								×
- Check operating pressure								×
- Check shutdown pressure								×
- Check automatic water bleeder valve functioning								×
- Replace air dryer granulate cartridges						×		
- Clean air dryer pre-filter						×		
☐ **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	
		125 h	250 h	500 h	1 500 h		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


G
D
2
F
1
E
F
D
G
1
2
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F
192302

1. Oil level in travel and angular gear

Check the oil level on the oil level plug (E) .

C A U T I O N: Make sure to observe utmost cleanliness, to prevent any dirt infiltration into the gear.

D = Oil fill for travel gear (1) and angular gear (2)
E = Oil level for travel gear and angular gear
F = Oil drain for travel gear and angular gear

G = Grease lubrication

1.1 Check the oil level

Prerequisites:
The crane is in horizontal position.
The travel and angular gear are at a standstill.

The oil chamber of the travel gear is connected with the oil chamber of th angular gear, so that the oil level for both gears can be checked at (E) .

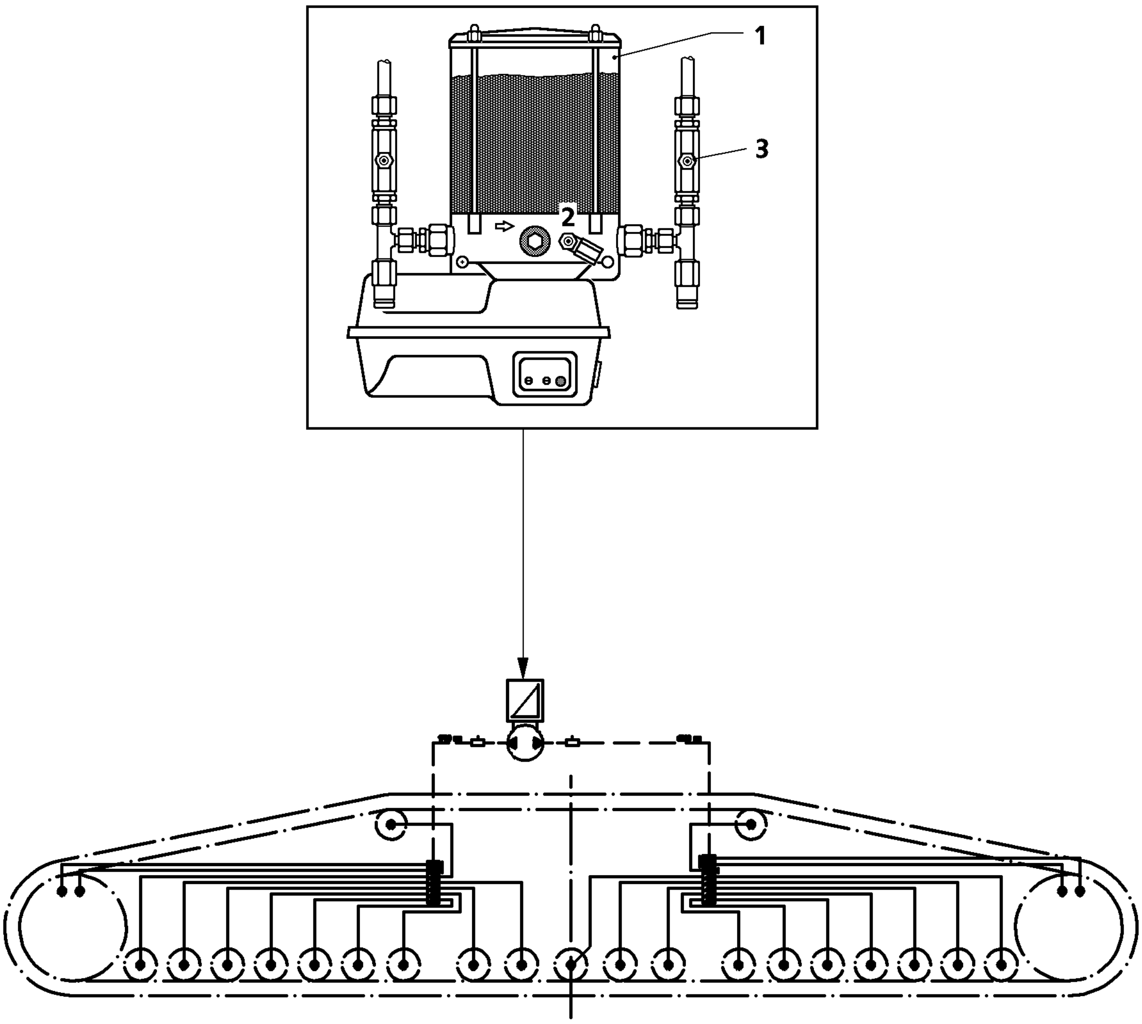
- Turn out the oil level plug (E)
- If oil runs out of the control port (E) or if the oil level reaches the lower edge of the control port (E), then the oil level is correct.
- Turn in the oil level plug and tighten.

Note: The oil level must be at the level of the oil level plug (E) .

C A U T I O N : If the oil level has dropped below the control port (E), then oil according to the lubrication chart must be added until the oil level is again at the lower edge of the control port (E) .
If no oil is added, there is the danger of causing serious gear damage.

1.2 To change the oil

- Open the oil filler plug (D)
- Turn out the oil drain plug (F) of the travel gear (1) with seal ring and drain oil into a suitable container. When the oil chamber of the travel gear is empty (1), clean the oil drain plug and sealing surface.
- Reinsert the oil drain plug with new seal ring and tighten.
- Turn out the oil drain plug (F) for the angular gear (2) with seal ring and drain oil into a suitable container. When the oil chamber of the angular gear is empty (2), clean the oil drain plug and sealing surface .
- Insert the oil drain plug with new seal ring and tighten.
- Turn out the oil level plug (E) .
- Add oil according to the lubrication chart on the oil filler port (D) until oil starts to run over on the oil level port (E) .
- After oil has been added on the oil filler port (D), wait approx. 2 minutes until the oil has distributed in the travel gear and the angular gear .
- Recheck the oil level , add oil as necessary.
- Clean the sealing surfaces. Clean the oil level plug (E) and oil filler plug (D), apply new seal ring, reinsert and tighten.



192303

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 the crawler.

2.1 Fill the grease tank

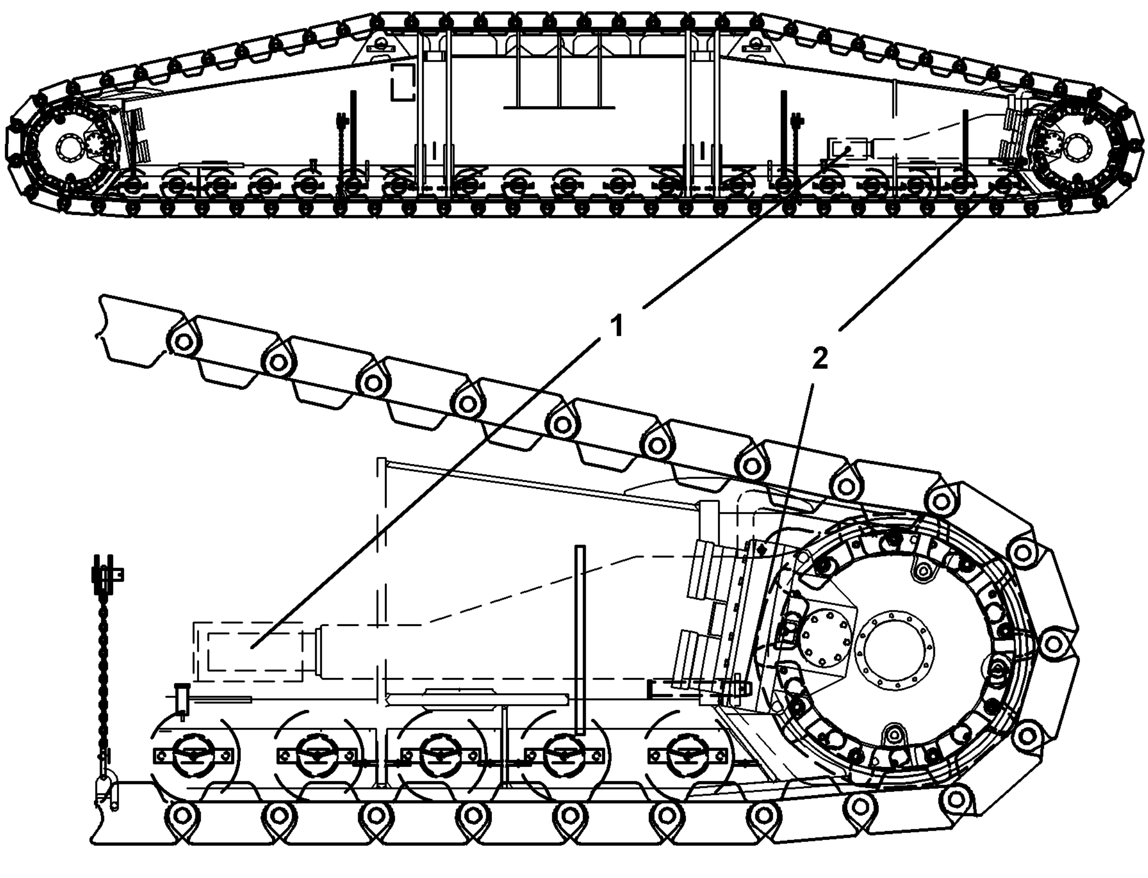
- With a commercially available grease pump, fill the tank (1) via the grease fitting (2) on the central lubrication pump.

**C A U T I O N : Make sure that the grease tank is always filled with grease, according to the lubrication chart.
When filling the grease tank, observe utmost cleanliness to prevent any dirt infiltration!**

2.2 Fill the lube lines

- Fill the lube lines with an external lube pump via the grease fitting (3) .

C A U T I O N : Make sure that the grease lines are refilled after every repair on lubricated components. If this is not observed, the unit will run dry. When filling the lube lines, observe utmost cleanliness!

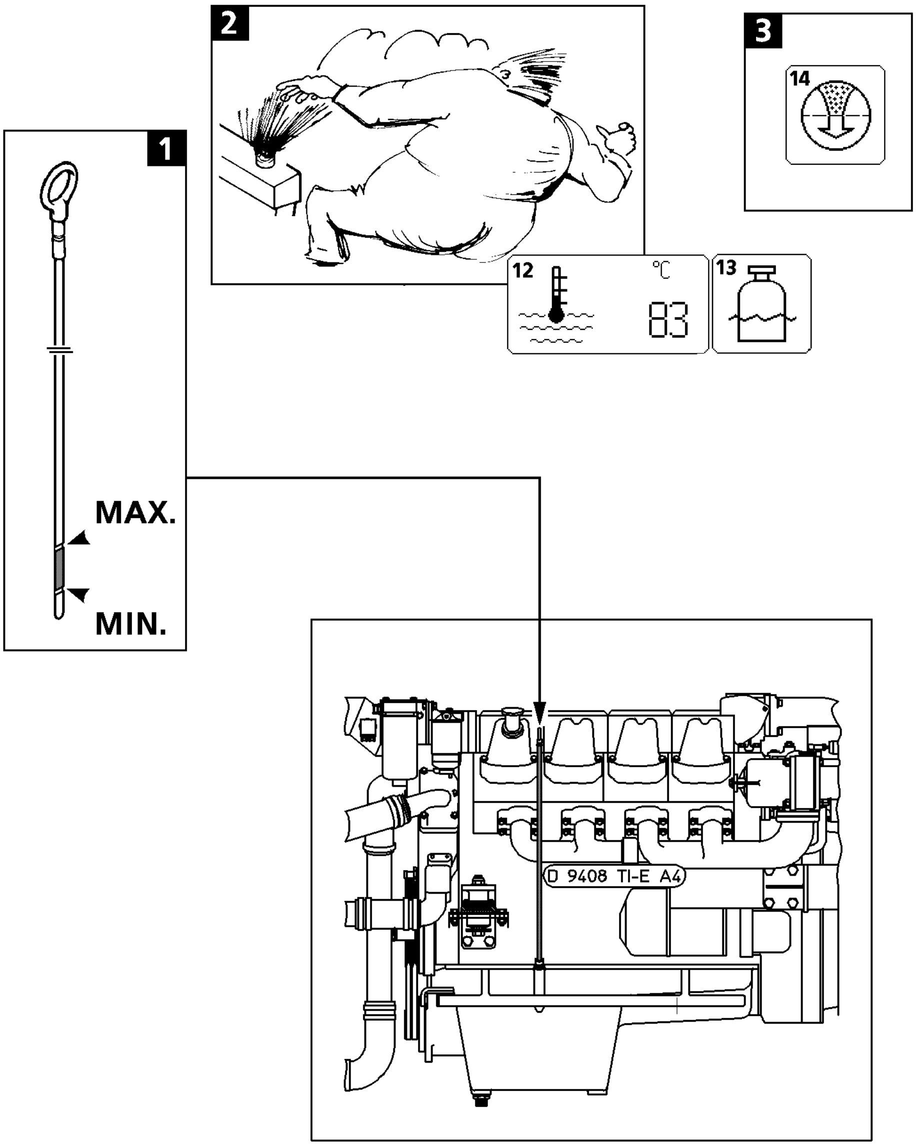

1
2
192304

3. Tension the track chain

- The crane must be positioned on level ground.
- The track chain is tensioned with an hydraulic tensioning cylinder (1) .
- The tensioning cylinder and hand pump are in the tool box.

3.1 Tensioning procedure

- Install the tensioning cylinder (1) in the crawler carrier and extend with the hand pump until the tension resistance is greater than the force on the hand pump.
- Push the spacer plates (2) between the sliding section and the crawler carrier and secure with pin .
- Relieve the tensioning cylinder again.
- The crawler must be moved forward and backward at least by one crawler length to release the tension in the lower chain area.
- If necessary, repeat the tensioning procedure and place additional spacer plates (2) .



192305

1. Crane engine

or maintenance and repairs in the engine area, the following must be observed:

Never step on fuel lines.

D A N G E R : **It must be ensured that the engine area remains free of Diesel fuel, D A N G E R OF FIRE !**

Observe utmost cleanliness, especially when changing filters and bleeding the system! Dry up any spilled fuel immediately!

1.1 Engine oil, Fig. 1

1.1.1 Oil level

Prerequisites:
The crane is in horizontal position.
The engine is turned off, wait for a few minutes until the oil has collected in the oil pan.

- Pull the dipstick, wipe it off,
- reinsert it and pull it out again.
- Check the oil level.

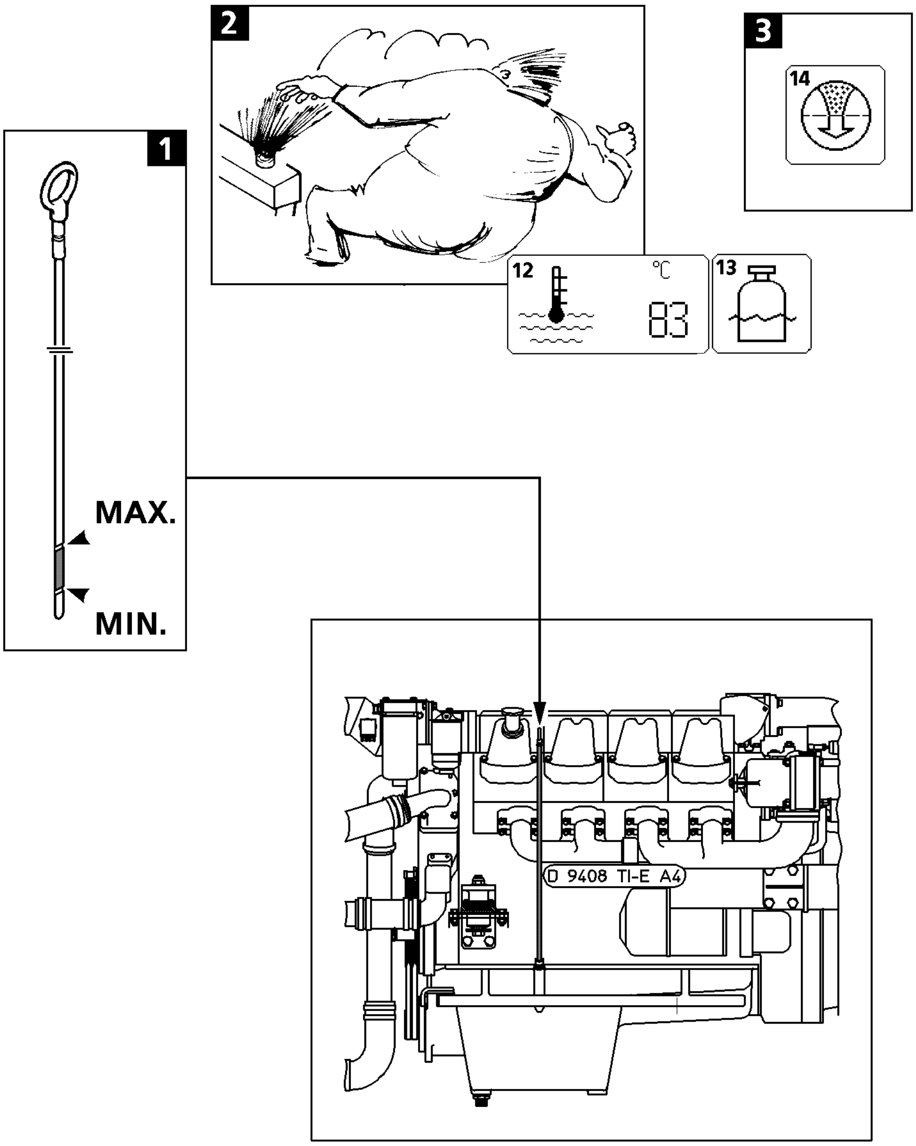
Note: The oil must be between the MIN.- and MAX.- mark on the dipstick.

C A U T I O N : **If the oil level has dropped below the MIN. mark, then engine oil according to the lubrication chart must be added until the oil level is again between the MIN.- and the MAX. mark.**
If no oil is added, there is the danger of causing serious engine damage due to insufficient lubrication.

- Reinsert the dipstick.

1.1.2 To change the oil

refer to the separate operation manual for "LIEBHERR Diesel engines"



192305

1.2 Coolant, engine cooling, Fig. 2

The coolant level is monitored by the LICCON computer system. If the coolant level is too low, the symbol element "coolant level too low" (13) lights up on LICCON monitor . Add coolant in the same mixing ratio, according to the lubrication chart. The coolant temperature - crane engine can be read on symbol element "coolant temperature - engine" (12) on LICCON monitor in degrees [°].

D A N G E R : Check the coolant only when the engine is cold, otherwise there is the DANGER OF INJURY, burns and scalding !

- Turn the cover on the filler neck of the coolant expansion tank to the left or to the first notch and relieve the pressure.
- Remove the cover.
- If necessary, add coolant according to the lubrication chart until it runs over.

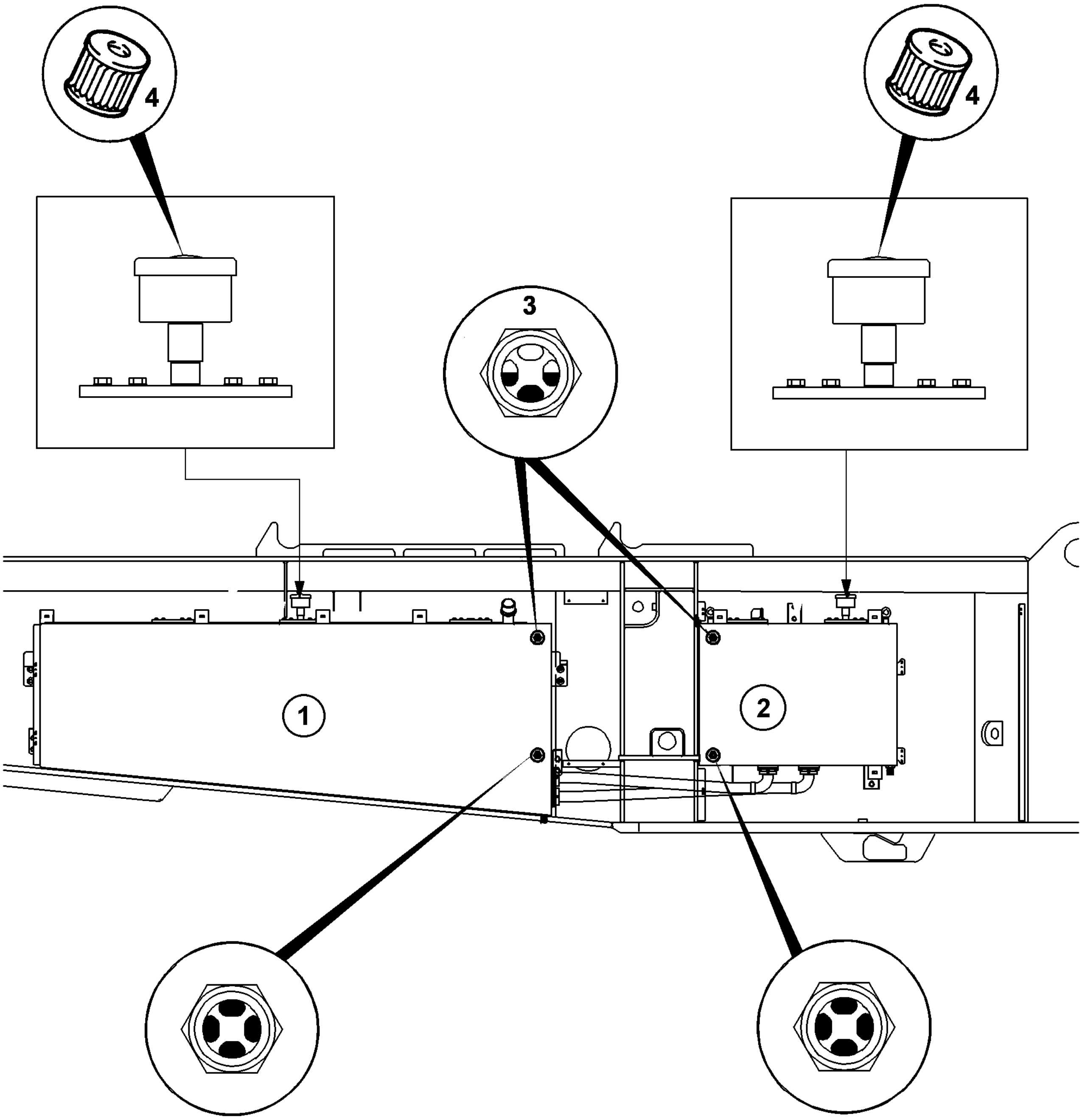
Note: The coolant expansion tank may only be refilled on the filler neck. Use coolant as specified on the lubrication chart. In case the coolant level is low, add coolant in the same mixing ratio.

Mixing ratio: 50 Vol % Corrosion inhibitor and antifreeze,
50 Vol % Fresh water.

1.3 Air filter, Fig. 3

The air filters are electronically monitored by the LICCON system. If a vacuum is created in the intake line due to contaminated filter inserts, the symbol element "air filter contaminated" (14) on the LICCON monitor lights up. In this case, clean the filter inserts or replace them.

Note: For maintenance on air filters, refer to separately issued "LIEBHERR Diesel engines".



192306

2. Oil level - hydraulic fluid reservoir

The cylinders must be completely retracted to check the fluid level.
The oil level must be in the middle of the glass view port.

A C H T U N G: **If no oil is visible in the upper sight gauge (3) of the oil reservoir (1) or the auxiliary oil reservoir (2), then oil must be added according to the lubrication chart, until the oil level is again at the center of the sight gauge. 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.

Add oil

Add oil to the center of the upper sight gauge (3) on oil reservoir (1) . After adding oil, wait for 2 minutes until the oil had distributed evenly in the oil reservoirs (1+2). Recheck the oil level.

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.

2.1 Vent and bleed air filter

Open the cover with the turn lock and check the filters (4) of the oil reservoir (1) and auxiliary oil reservoir (2) for contamination. (Visual inspection)

Note: If the filters (4) are extremly dirty, they must be changed slowly.

Replace the cap.

2.2 Hydraulic hose lines

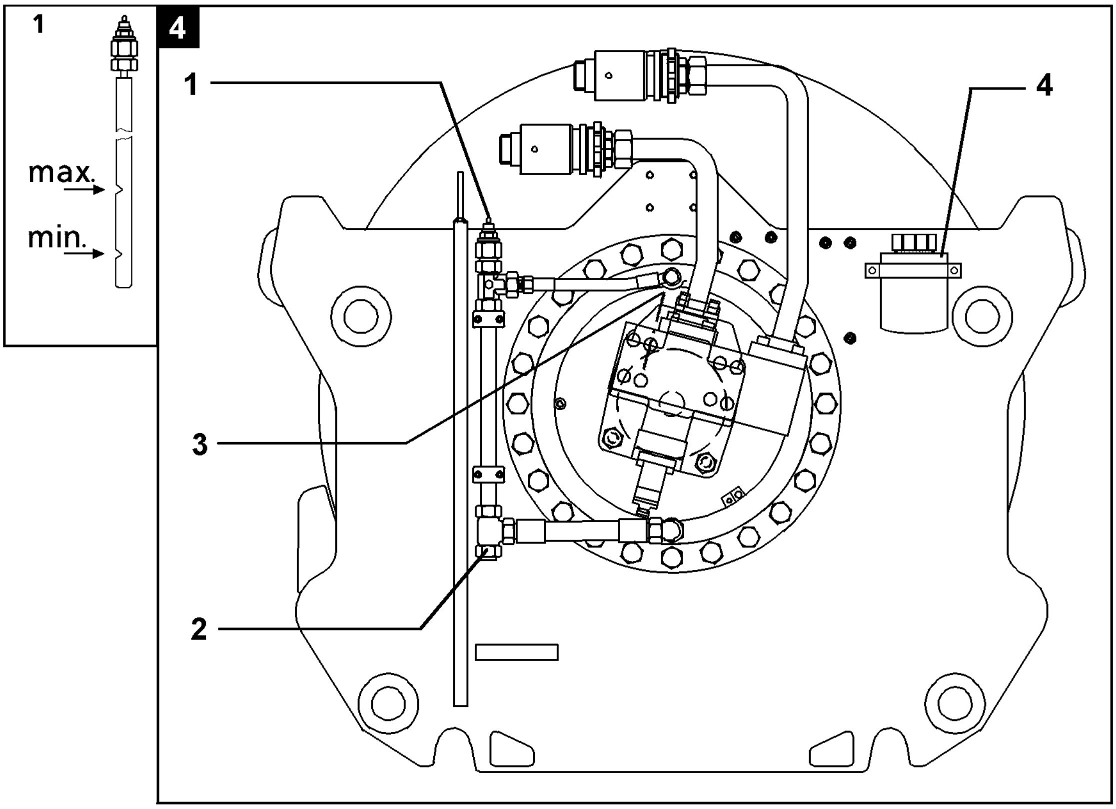
The operational safety of the hydraulic hoses must be checked at least once per year by a trained personnel.

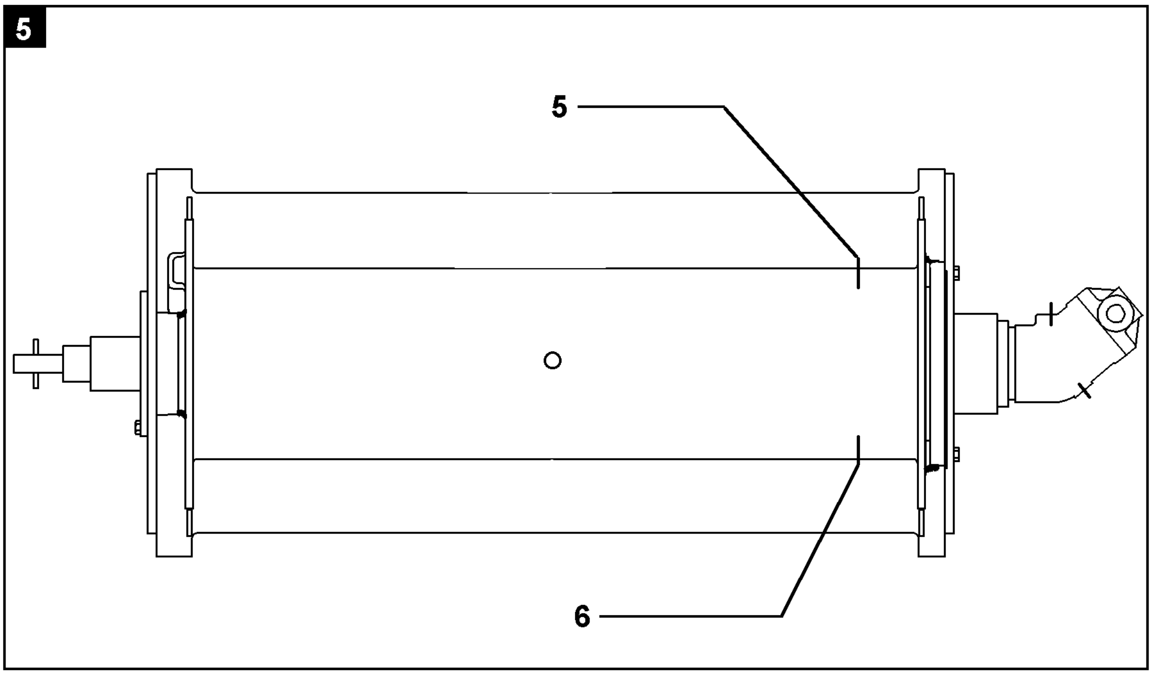
Replacing the hose lines

The hose lines must be replaced at appropriate intervals.
On the basis of our experience we recommend the following maximum periods of use:

Crane operation	Maximum period of use
in severe loading and unloading operation with high operating temperatures and frequent movement cycles	approx 3 years
in loading and unloading operation	approx 6 years
in 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 replaced, as necessary.**





192307

3. **Rope winches** Fig. 4

Check the oil level with the oil dipstick

1 = Oil dipstick, oil fill in hole, vent
2 = Oil drain
3 = Oil fill in hole for hydraulicmotor-shaft (only at assembling)
4 = Overflow reservoir

C A U T I O N : **Always observe utmost cleanliness, to prevent any dirt infiltration, so that the internal area of the gear or disk brake is not contaminated.**

3.1 **Check the oil level**

Prerequisites:
The hoist gear is at a standstill.
The crane is in horizontal position.

- Check the oil level with the oil dipstick (1).
- 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.

3.2 **Overflow reservoir (4)**

When the oil of the hydromotor for the winches is warmed up, oil can get via a check valve into the overflow reservoir (4) , but cannot return to the hydraulic system after it cools off. For that reason, the oil which has collected in the overflow reservoirs (4) must be disposed of in regular intervals.

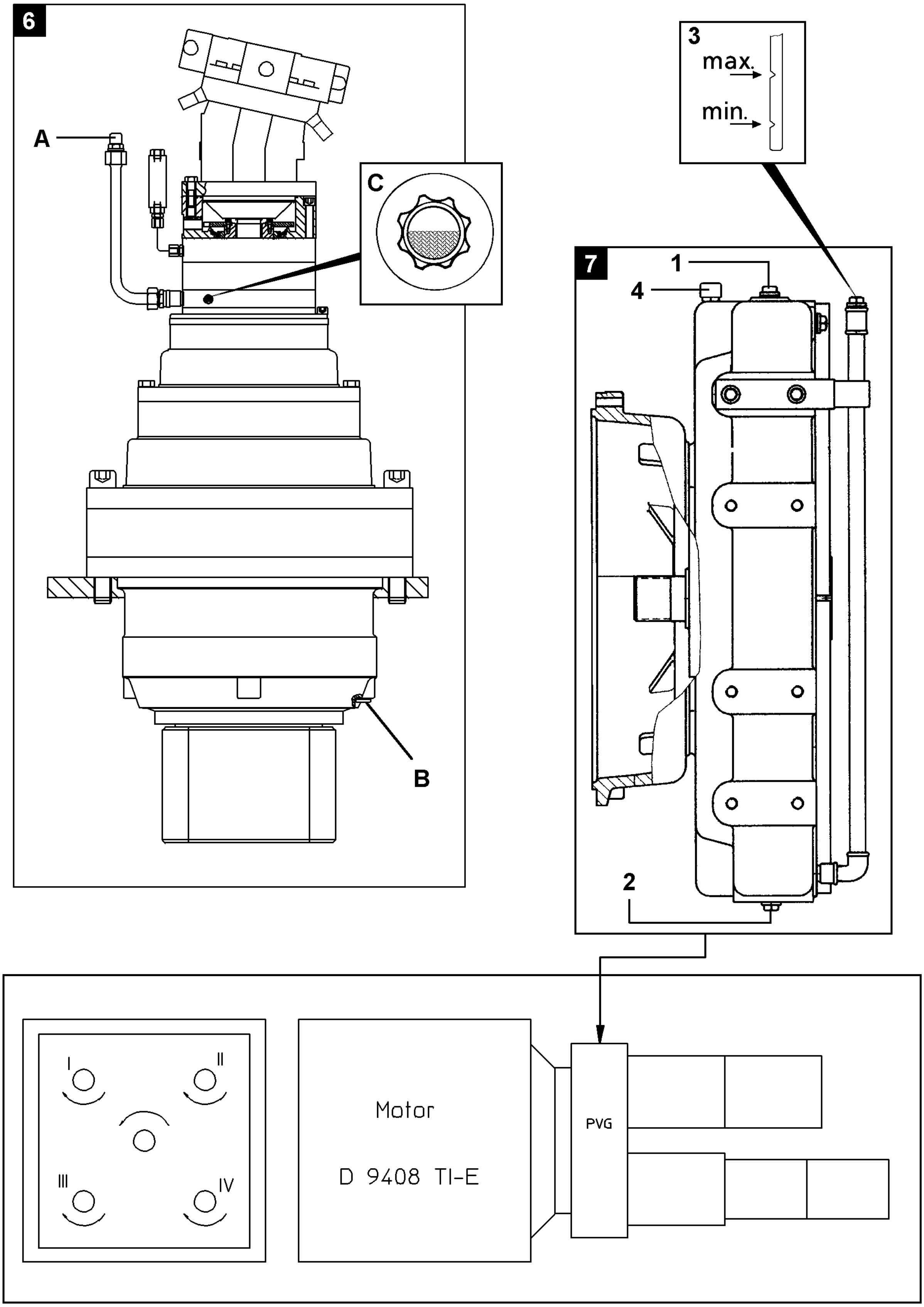
3.3 **Change the oil**

- Remove the oil filler plug (1) for venting.
- Remove the oil drain plug (2) with seal ring and drain the oil into a suitable container.
- Reinstall the oil drain plug (2) with new seal ring and tighten by hand.
- Add oil according to the lubrication chart on the oil filler port (1) .
- Install the oil filler plug (1) and tighten.

3.4 **Installation winch** Fig. 5

5 = Oil filler port
6 = Oil drain

Oil supply for initial installation or after repair of installation winch.



192308

4. Slewing gear Fig 6

Check the oil level at the sight gauge (C)

C A U T I O N : **Always observe utmost cleanliness, to prevent any dirt infiltration, so that the internal area of the gear is not contaminated.**

A = Oil filler port, vent
B = Oil drain
C = Sight gauge

4.1 Check the oil level

Prerequisite:
The crane is in horizontal position.
The slewing gear is at a standstill.

- Check for leaks (visually).
- Check the oil level at the sight gauge (C).

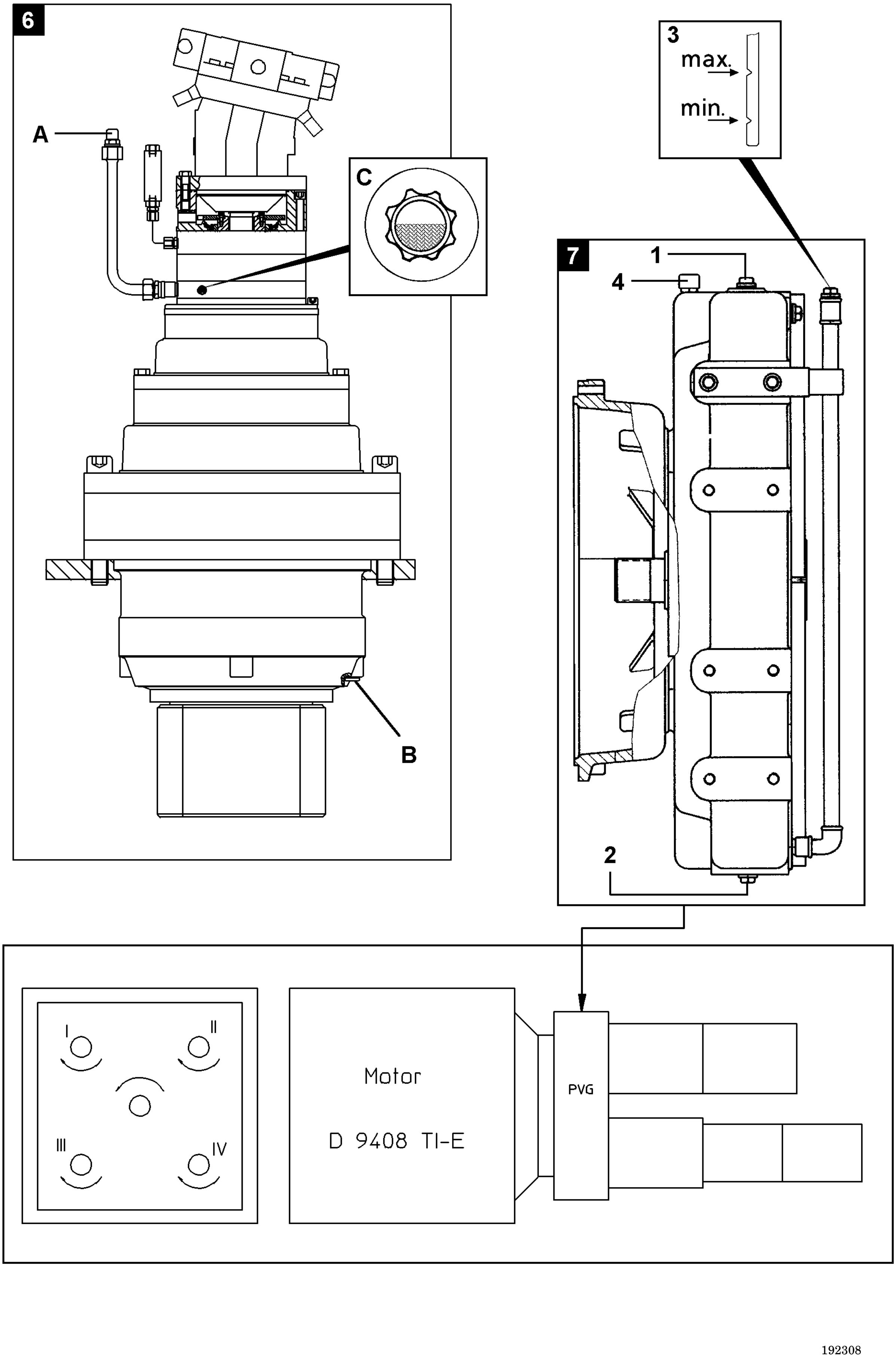
Note: The oil level must be in the middle of the sight gauge (C)

C A U T I O N : **If the oil level has dropped below the sight gauge, then oil must be added according to the lubrication chart until the oil level is again in the middle of the sight gauge.**
If no oil is added, there is a danger of severe gear damage.

4.2 Oil change

Prerequisite:
The crane is in horizontal position.
The slewing gear is at a standstill.
The gear is at operating temperature.

- Open the oil filler / vent (A)
- Unscrew the drain plug (B) with seal ring and drain the oil.
- Clean the drain plug (B) and sealing surface on the housing.
- Reinstall the drain plug (B) with new seal ring and tighten.
- Add oil according to the lubrication chart on the oil filler port until the oil reaches the middle of the sight gauge (C).
- Close the oil filler port / vent (A)
- Check the oil level as described above.


6
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C
B
3
max.
min.
7
1
4
2
I
II
III
IV
Motor
D 9408 TI-E
PVG
192308

5. **Pump transfer case** Fig. 7

With the gears at a standstill, check the oil level with the oil dipstick (3).
The oil must be at a level between the minimum and maximum markings on the dipstick.

C A U T I O N : **Always observe utmost cleanliness, to prevent any dirt infiltration, so that the internal area of the gear is not contaminated.**

1 = oil filler port
2 = vent
3 = oil dipstick
4 = oil drain

5.1 Check the oil level

Prerequisite:
The crane is in horizontal position.
The pump transfer case is at a standstill.
Oil is at operating temperature

- Check for leaks (visually).
- Check the oil level with the dipstick (3)

Note: When checking the oil level, do not screw in the dipstick .

C A U T I O N: **Loss of oil indicates defective shaft seal rings or defective housing sealing. This must be taken care of immediately. If the oil level has fallen below the minimum mark, oil MUST be added according tothe lubrication chart until the oil level is again between the Min. - Max. mark. If no oil is added, the gear could be damaged.**

5.2 Change the oil

Prerequisite:
The crane is in horizontal position.
The pump transfer case is at a standstill.
Oil operation temperature

- Open the oil fill in hole(1) and the vent(4)
- Remove the oil drain plug (2) with seal ring and drain the oil into a suitable container.

- Before refilling, rinse through with oil according to the lubrication table. Drain the oil into a suitable container.

- Clean the drain plug (2) and sealing surface on the housing.
- Reinstall the drain plug (2) with new seal ring and tighten.
- Add oil according to the lubrication chart on the oil filler port (1) until the oil reaches the center of the two notches.
- Reinstall the oil filler plug (1) and close the vent cap (4)
- Check the oil level as described above.

6. Slewing ring connection

C A U T I O N : **Before and after longer down time, especially before and after downtime for winter, carry out the lubrication procedure especially carefully, to ensure the best possible protection from corrosion.**
If the crane is not moved for longer than 3 months, then it must be lubricated every 3 months with an external lube pump on the grease fitting block , until grease emerges on all lube points. Then the corresponding crane movement must be repeated several times and the lubrication procedure must be repeated.

- Grease the slewing ring externally.
- The bearing is being lubricated by the central lubrication system.

6.1 Tilt play of slewing ring connection

The operational readiness of the slewing ring connection is limited by a **maximum permissible tilt play** of the slewing race. The wear dimension can be determined by measuring the tilt play with the slewing ring connection installed .

Tilt play	**Permissible tilt play**	**DANGER ZONE!** (max. permissible tilt play)
1.0 mm	2.0 mm	2.5 mm

Tilt play: Tilt play measured on new machine, with load.

Permissible tilt play: The slewing race can be reconditioned.
Reconditioning is permissible only 1x !!

DANGER ZONE: Maximum permissible tilt play.
If the danger zone is reached, the slewing ring connection must be replaced!!

D A NG E R : **The permissible tilt play of 2.0 mm may not be exceeded. If the maximum permissible tilt play is reached or exceeded, there is a DANGER OF ACCIDENTS!**
The slewing ring must be replaced!

7. Diaphragm reservoir in the hydraulic system

Following diaphragm reservoirs are equipped in the hydraulic system:
- Feed pressure (2 reservoir) each 10 bar

The pretension pressures for the reservoirs is noted in the hydraulic schematics and on each reservoir. The pretension pressure must be measured separately in each reservoir.

C A U T I O N : In strongly fluctuating ambient temperatures, such as in countries with extremely warm or cold temperatures, as well as in countries with large temperature differences between summer and winter, the pressures must be checked and corrected, as necessary.

Prerequisites:
The crane engine is at a standstill, this relieves the reservoirs on the fluid side.

- Check the pretension pressure with a test and inflation device. Correct pressure as necessary.

D A N G E R : When filling the diaphragm reservoir, NEVER use air or oxygen, this can cause an

E X P L O S I O N !!!

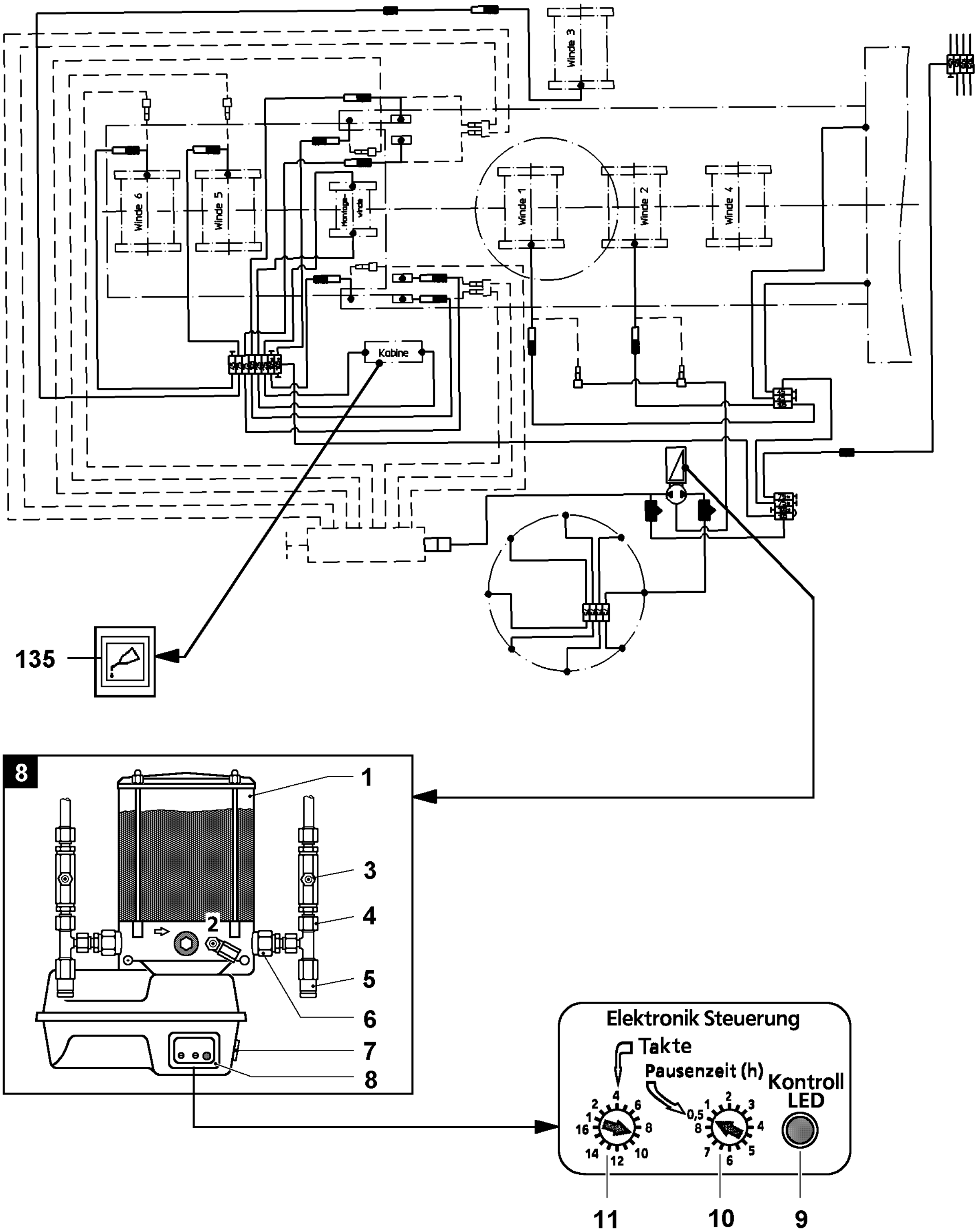
The pressure in the nitrogen cylinder must not exceed the maximum permissible operating pressure of the reservoir or the pressure gauge. Otherwise, a pressure reducing device must be connected between the cylinder and the inflating device.

Note: In addition. all national and regional regulations regarding pressurized container checks and inspections must be observed.

7.1 Pressure filter in crane hydraulic

The pressure filter is equipped with a maintenance indicator. If the red bar is visible when the oil is at opening temperature, then the filter element must be changed .

To change the filter:
- Turn off the crane engine.
- Loosen the filter and catch emerging oil in a suitable container.
- Remove the filter element and dispose of it properly.
- Clean the sealing surface on the filter base,
- Lubricate the rubber seal ring on the new filter with oil.
- Install the filter and tighten .
- Start the engjne and check for leaks.
- Run through all crane movements to bleed the hydraulic system,
- then recheck the oil level, add oil, as necessary.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7
8
Elektronik Steuerung
Takte
Pausenzeit (h)
Kontroll LED
11
10
9

192309

8. Central lubrication system, Fig. 8

The crane superstructure is equipped with a central lubrication system. All lube points (see overview, left) on the slewing connection, the bearing on the pivot section, the bearings of the luffing cylinders and the hoist winches are automatically supplied with the correct amount of grease, depending on the operating hours.

Pump running time: 9 cycle
Break time: 0.5 hours

Note: Cleaning the crane car washes or steam is permissible.

C A U T I O N : **If the crane is not moved for longer than 3 months, then it must be lubricated every 3 months with an external lube pump on the grease fitting block, until grease emerges on all lube points. Then the corresponding crane movement must be repeated several times and the lubrication procedure must be repeated.**

8.1 Components of system

Pos.	Description		
1	Grease container		
2	Grease fitting	-	To supply the central lubrication pump
3	Grease fitting	-	To supply the lube lines
4	Pump outlet		
5	Pressure relief valve		
6	Pump element		
7	Push button		
8	Control		
9	Illuminated diode (yellow)		
10	Notched switch	-	Break time (hrs.)
11	Notched switch	-	cycle

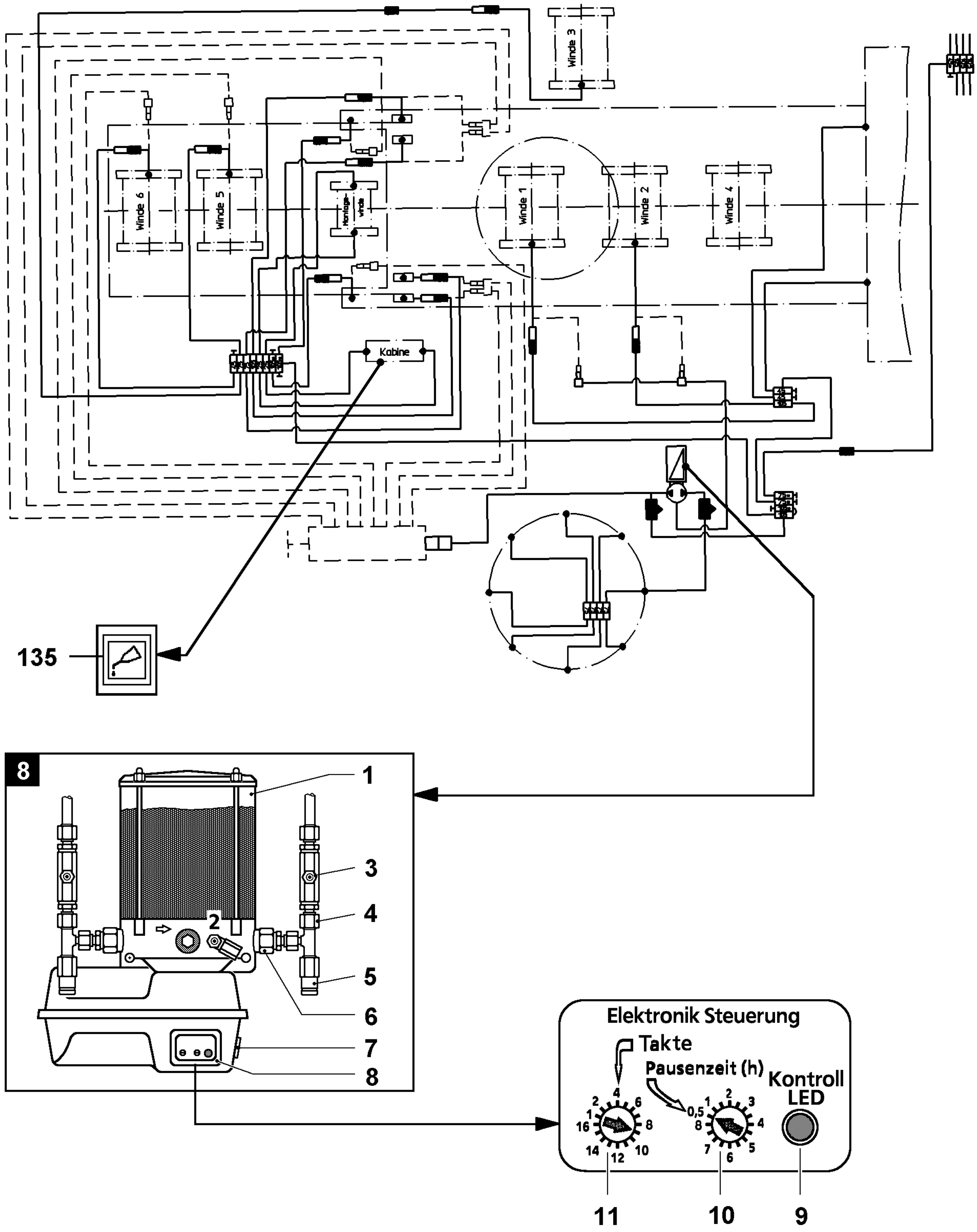
8.2 Set the lubrication and break time

- Turn on the ignition of the crane motor, when the ignition is turned on, the yellow diode (9) lights up for approx. 2 seconds to show the functional readiness of the control (8).

Note: During the lubrication procedure, the yellow diode (9) blinks on the housing in 0.5 second intervals. The lubrication and break time is set at the factory. The times can be changed on the switches (10,11), if necessary.

8.3 Function check

- With the ignition turned on, trigger 2 to 3 additional lubrication impulses, to check if grease emerges on all lube points.
- With the system blocked, but proper function of the electric pump, the lubricant emerges via the pressure relief valve (5). This feature has been designed to protect and to monitor the system.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Elektronik Steuerung
Takte
Pausenzeit (h)
Kontroll LED
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8.4 Cycle control

The central lubrication system is being progressively monitored. This means that a proximity switch translates the piston strokes of the distributor in the central lubrication system into electrical control signals and directs them to the control unit. If the control signals are not available or if they are incomplete, then the indicator light (135) blinks to show that there is an erroneous function or other problem.

8.5 Blinker code, cycle control

During operation
Ignition ON, operational
Indicator light (135) lights up for 1.5 seconds and turns off.

Lubrication is activ
Indicator light (135) lights up for 0.5 seconds and turns off for 0.5 seconds and is off for 0.5 s econds, etc.

In case of a problem
Error - too much pressure
Indicator light (135) lights up for 2 seconds and turns off for 4 seconds, then lights up again for 2 seconds and is off for 4 seconds ,etc.

Error - engine
Indicator light (135) lights up continuously.

Error - monitoring time cycle input
Indicator light (135) lights up 0.5 sec. and is off 0.5 seconds, then the indicator light (135) lights up 0,5 seconds and is off 0,5 second, etc.

8.6 Entry into the automatic lubrication (intermediate lubrication)

- With ignition turned on, actuate the red button (7) on the protective motor housing of the pump.
- This function allows for intermediate lubrications to be made, for example after washing the crane, or to refill the grease lines after a repair.

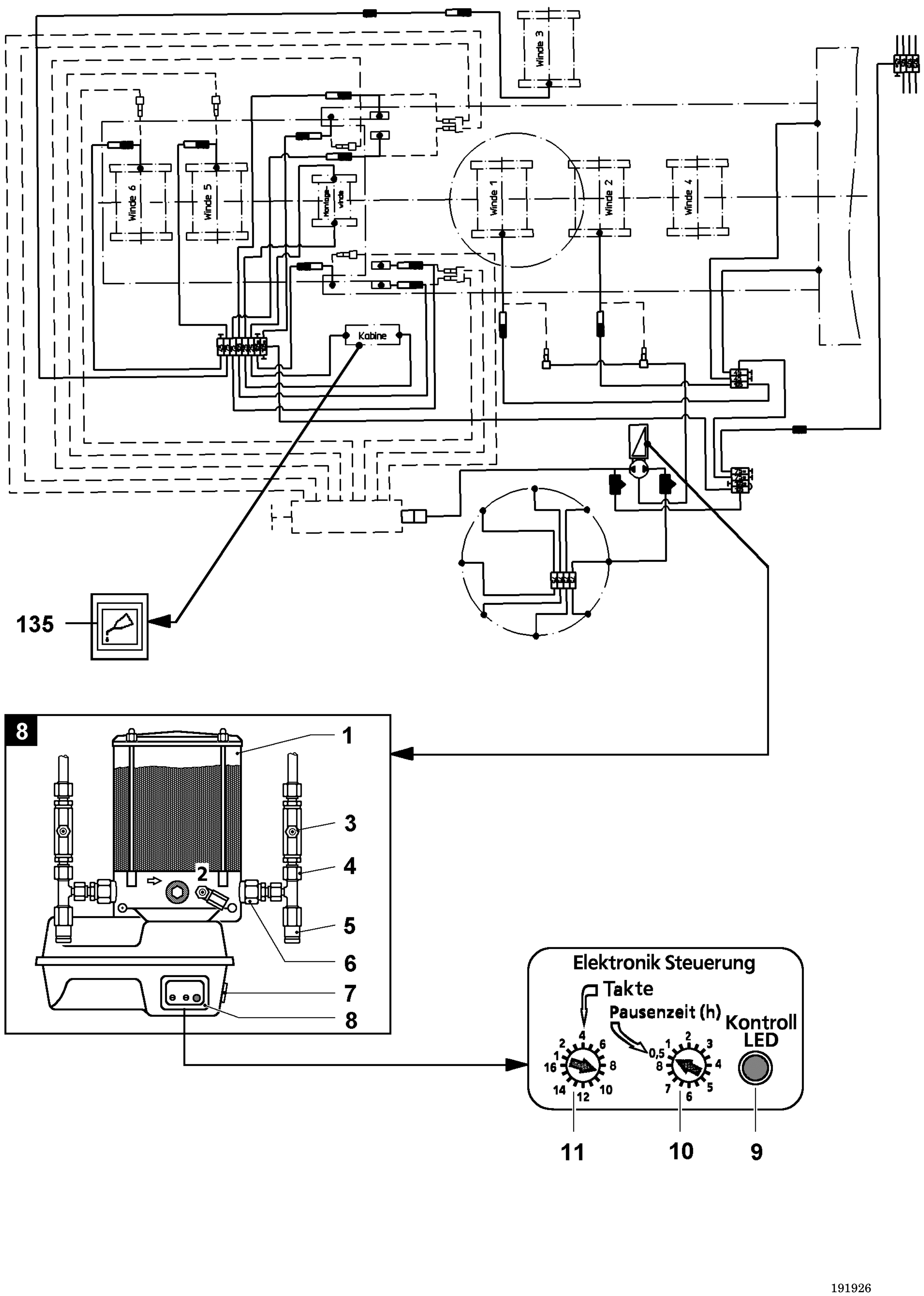
8.7 Fill the grease tank

- With a commercially available grease pump, fill the tank (1) via the grease fitting (2) on the central lubrication pump.

C A U T I O N: **Make sure that the grease tank is always filled with grease, according to the lubrication chart.**
When filling the grease tank, observe utmost cleanliness!

8.8 Bleeding the system

If the grease tank (1) has not been refilled and gets empty, then the system must be bled.
- Fill the grease tank.
- Unscrew the main line from the pump outlet (4).
- Actuate the auxiliary lube impulse until lubricant free of air bubbles emerges on the pump outlet (4).
- Reconnect the main line.
- Carry out an additional lubrication procedure.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7
8
Elektronik Steuerung
Takte
Pausenzeit (h)
Kontroll LED
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9
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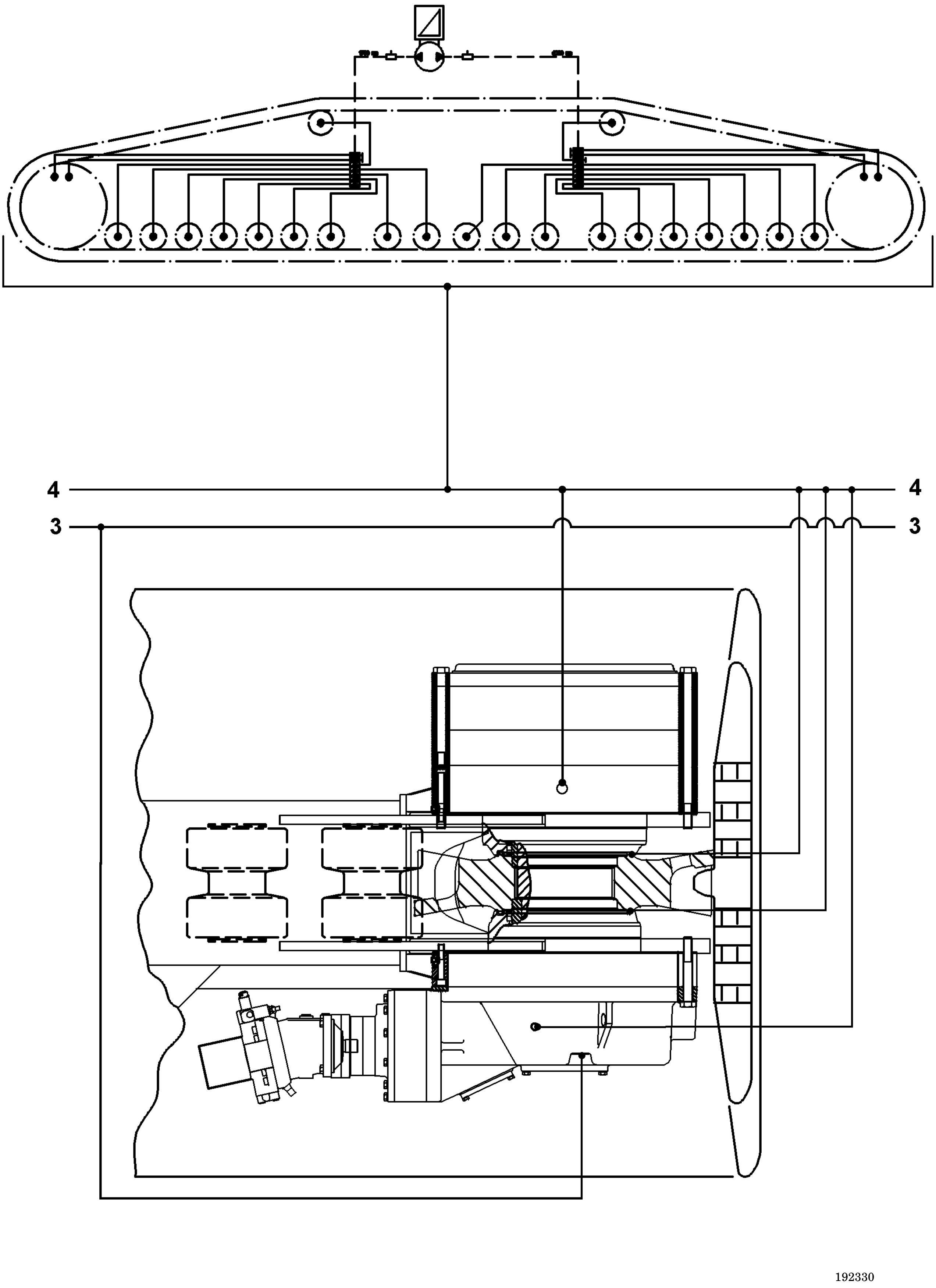
8.9 Fill the lube lines

- With an external lube pump, ass grease via the grease fitting (3) or,
- with the ignition turned on, press the red button (7) on the protective motor housing of the pump.

C A U T I O N : **Make sure that the grease lines are refilled after every repair on lubricated components. If this is not observed, the unit will run dry. When filling the lube lines, observe utmost cleanliness!**

8.10 Troubleshooting on the central lubrication system

Problem	Cause	Remedy
Pump is not working	integrated, electronic control is defective, electrical line is interrupted Pump is defective	Replace the lower part of the protective motor housing. Replace the electrical line. Replace the pump
Pump works but does not supply	Air cushion in supply piston fallen below minimum fill level Pump element is defective	Bleed the pump Fill the reservoir Change the pump element
No grease collar on all lube points	Pump is not working Break time is too high or lube time is too low System is blocked	see "Pump is not working" Reduce break time or increase lube time see "grease emerges on pressure relief valve"
No grease collar on several lube points	Supply lines to auxiliary distributor broken or leaky Screw fittings leak	Change lines Retighten screw fittings or change them
No grease collar on one lube point	Supply line broken or leaky Screw fittings leaks	Change line Retighten screw fittings or change it
Pump RPM decreases	High system pressure low ambient temperature	Check system / bearing points No damage (re-lubricate 1 or 2 x)
Grease emerges on pressure relief valve	System pressure too high Progressive distributor is blocked System is blocked Valve spring is defective	Check system Change distributor Fix plugged / tight bearing points Replace pressure relief valve
Indicator light lights up constantly	Motor overloaded	Contact your LIEBHERR or BekaMax service representative
Indicator light blinks constantly in 0.5 second intervals	Error in monitoring time from cyle input	Proximity switch is defective. Contact your LIEBHERR or BekaMax service representative, as neccessary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3
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3
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1. **Filling capacities** (Crane chassis)

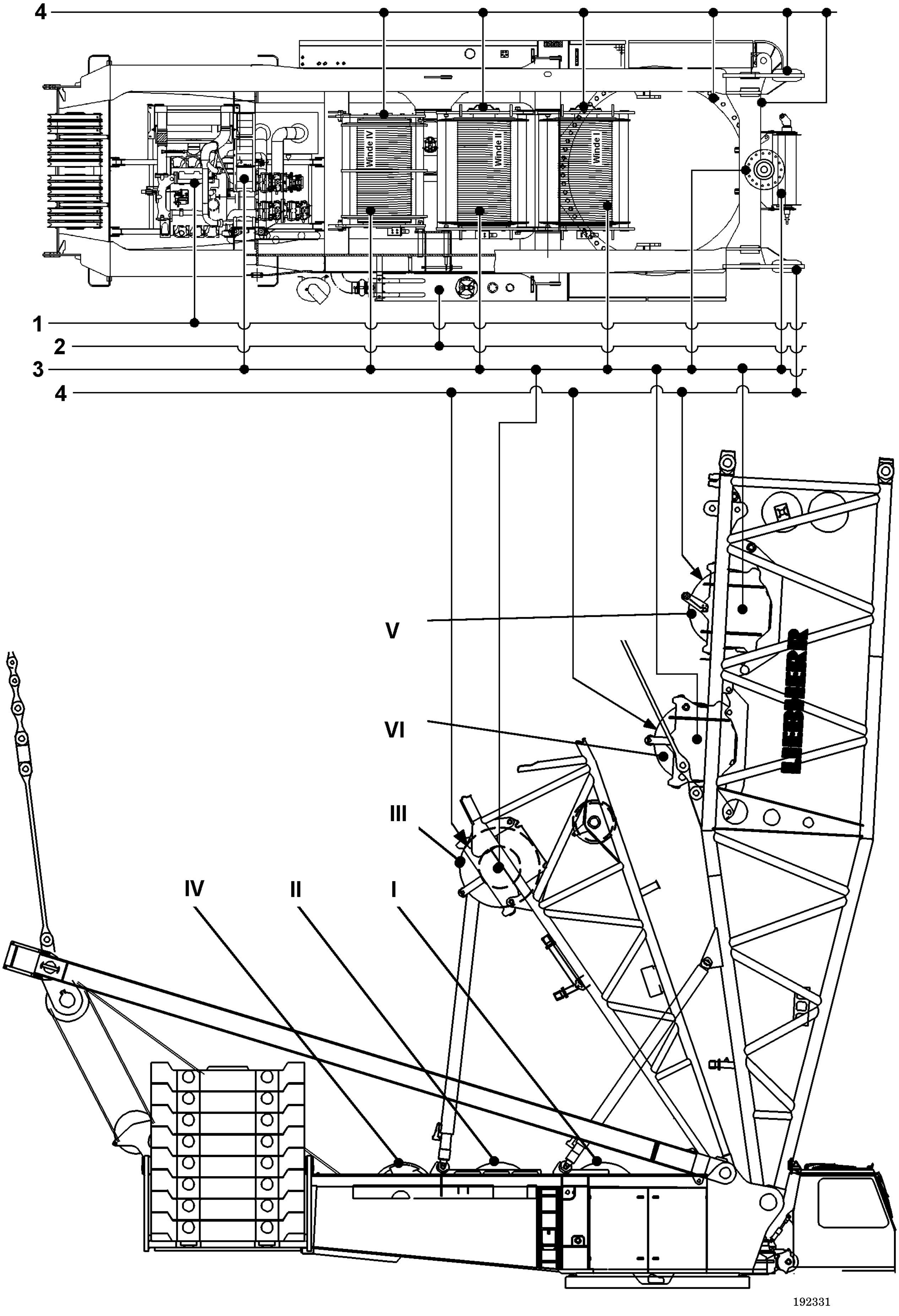
KRAN FAHRGESTELL	ca. Liter
Travel gear boxes **each** Gear oil Typ VSG 220 (synthetic)	60,0
Central lubrication system - crawler rollers, turras bearing Special grease **appr.**	4 kg

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:
3 = Gear oil
4 = Grease


4
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VI
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192331

2. Filling capacities (crane superstructure)

CRANE SUPERSTRUCTURE		appr. Liter
Crane engine Engine oil Coolant		 32,0 80,0
Fuel tank Diesel		 820,0
Pump distribution gear synthetic gear oil		 6,0
Winch I, II, III, V, VI synthetic gear oil	per winch	23,0
Winch IV synthetic gear oil		 32,0
Slewing gear Synthetic gear oil		36,0
Assembly winch synthetic gear oil		 0,4
Hydraulic fluid tank, crane hydraulic* ATF without crane support ATF with crane support		 770,0 1020,0
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
4ˆ = Grease

	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**
1	Dieselmotor diesel engine moteur Diesel	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	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
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 ZF Achsantieb DK-7 axle drive ZF DK-7 entraînement des essieux ZF DK-7 Fahrzeug Verteilergetriebe transfer box boîte de transfert KESSLER (VG 1800 / 2400) STEYR PUCH (VG 1200 / 1600 / 2000 / 3800) STEYR PUCH Versatzgetriebe (drop box) STEYR PUCH drop box STEYR PUCH decaleur de boîte de transfert 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

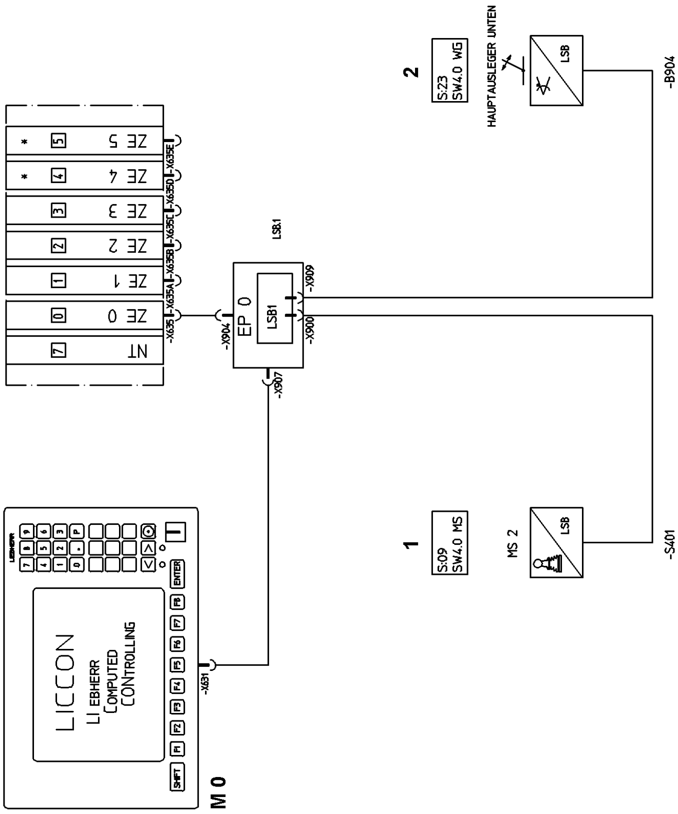
	Vorgeschriebene Schmierstoffe für LIEBHERR Krane **Approved lubricants for LIEBHERR cranes** **Lubrifiants prescrits pour les grues LIEBHERR**		
	Verwendungszweck **Intended use** **Application**	**Umgebungstemperatur für den Fahr- und Kranbetrieb** **Ambient temperature for travel and crane operation** **Température ambiante pour le mode translation et le mode grue**	
		– 25 °C → + 50 °C	**– 40 °C → + 30 °C**
3	ZF Lastschaltgetriebe ZF power shift gears ZF boîtes de vitesse et d'inversion (WG 120 / 150 / 180 / 181 / 200 / 201) ALLISON Versatzgetriebe (drop box) ALLISON drop box ALLISON decaleur de boîte de transfert CLARK Lastschaltgetriebe CLARK power shift gears CLARK boîtes de vitesse et d'inversion	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
4	Automatikgetriebe automatic transmissions boîtes de vitesses automatiques ALLISON (CLBT 740 / 750 / 754 / 755) (HT 755 / HD 4560) ZF Wendegetriebe ZF reversing transmission ZF boîtes d'inversion (WG 210 / 251 / 260 / 310)	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	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	Automatisiertes Schaltgetriebe automatic transmission boîte automatisée ZF-AS Tronic	CASTROL Syntrans LWE-Identnr.: 861903608	CASTROL Syntrans LWE-Identnr.: 861903608 **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

	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**
6	ZF Schaltgetriebe ECO-Split	SAE 30 oder Getriebeöl ZF TE-ML 02 LWE-Identnr.: 861004208	SAE 75W80/90 ZF TE-ML 02 LWE-Identnr.: 861903608
7	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!
8	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.: 890034814
9	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**
10	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
11	Kunststoff-Gleitlagerungen der Teleskopausleger 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**
12	Innengleitlagerung der Teleskopausleger (nur bei Montage) internal slide bearing application of telescopic booms (only at assembly) guidage à glissement intérieur des flèches télescopiques (seulement lors du montage)	Sondervorschrift: LIEBHERR Spezialfett 1336 mit Lösungsmittel LM (Sprühfett) LWE-Identnr.: 861303308 special prescription: LIEBHERR special grease 1336 with LM carrier (spray grease) prescription spéciale: LIEBHERR graisse spéciale 1336 à véhicule LM (graisse à pulvériser)	Sondervorschrift: LIEBHERR Spezialfett 1336 mit Lösungsmittel LM (Sprühfett) LWE-Identnr.: 861303308 special prescription: LIEBHERR special grease 1336 with LM carrier (spray grease) prescription spéciale: LIEBHERR graisse spéciale 1336 à véhicule LM (graisse à pulvériser)
13	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)
14	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

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**
15	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
16	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
17	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


M 0
LICCON
LIEBHERR
COMPUTED
CONTROLLING
SHIFT
ENTER
-X631
-X907
EP 0
LSB1
-X904
-X900
-X909
LSB1
NT
ZE 0
ZE 1
ZE 2
ZE 3
ZE 4
ZE 5
-X635
-X635A
-X635B
-X635C
-X635D
-X635E
1
S:09
SW4.0 MS
MS 2
LSB
-S401
2
S:23
SW4.0 WG
HAUPTAUSLEGER UNTEN
LSB
-B904

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1. Overview Bus system

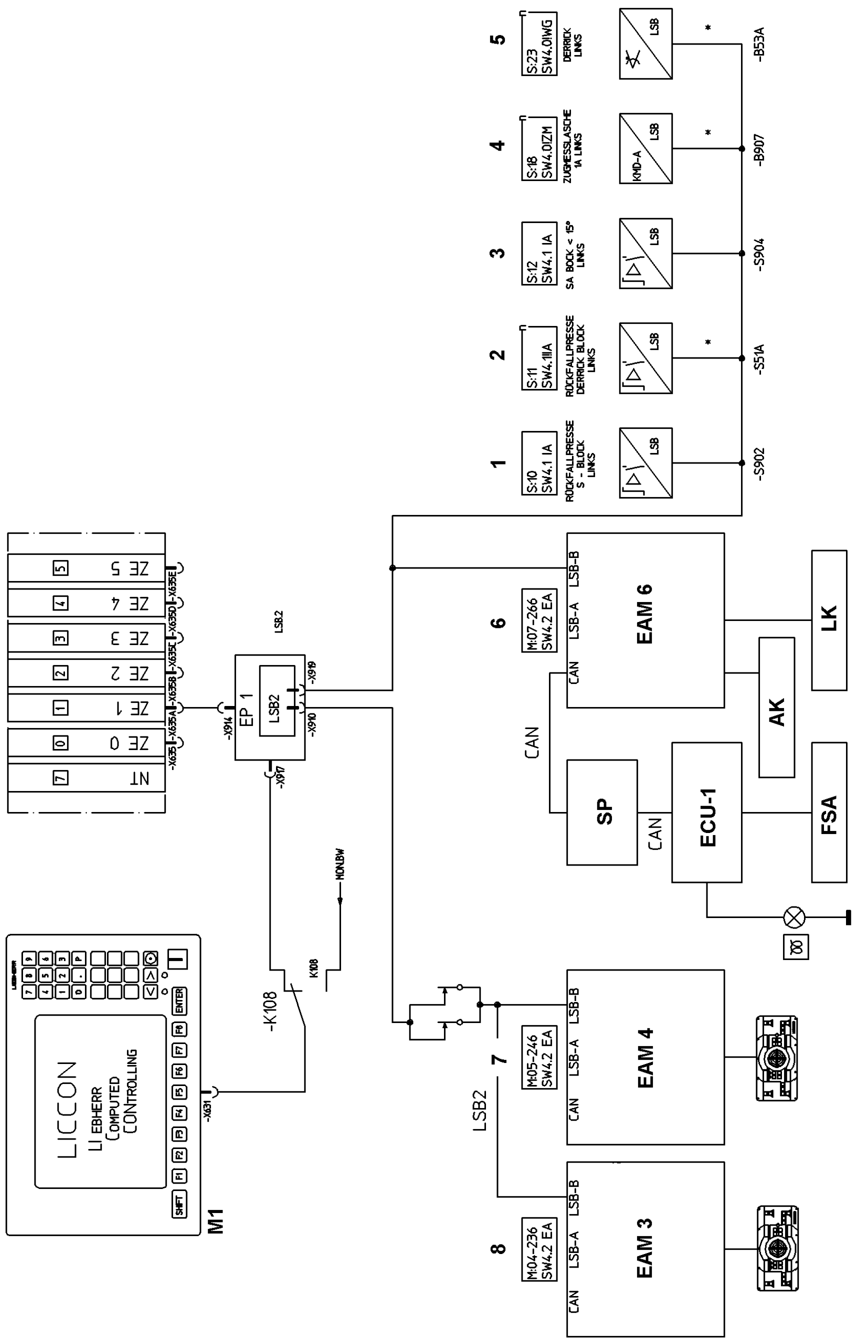
(see illustration)

1.1 Explanation

Description of Bus participants		**Bus address**
CAN	Controller-Aera-Network (Differential data transfer via 2 conductors)	
LSB	LICCON-System-Bus (Data transfer between individual modules via three wire bus)	
LSB 1...6	LICCON-System-Bus 1 ...6	
NT	Power supply unit (switchboard)	

ZE 0	CPU 0 (switchboard)	1
EP 0	Input circuit board0 (switchboard)	
LSB 1	LICCON-System-Bus 1	
M 0	Monitor 0 (crane operator's cab)	
1	Master switch armrest leftMS2	9
2	Angle sensor main boom bottom	23

* Optional


1
2
3
4
5
6
7
8
M1
LICCON
LI EBHERR
COMPUTED
CONTROLLING
EP 1
LSB2
-K108
EAM 6
EAM 4
EAM 3
SP
ECU-1
CAN
LK
AK
FSA
ZE 0
ZE 1
ZE 2
ZE 3
ZE 4
ZE 5
NT
-S902
-S51A
-S904
-B907
-B53A

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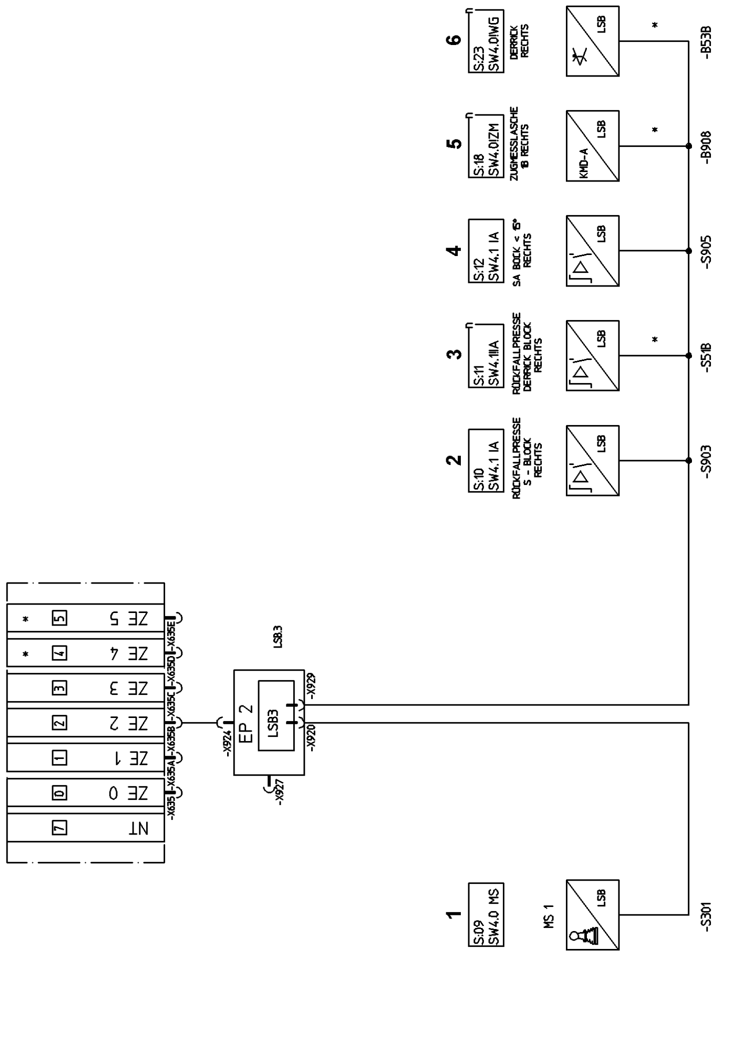
ZE 1	CPU 1 (switchboard)	1
EP 1	Input circuit board1 (switchboard)	
LSB 2	LICCON-System-Bus 2	
M 1	Monitor 1 (crane operator's cab)	
1	Limit switch relapse retainer S (left)	10
2 *	Limit switch relapse retainer D (left)	11
3	Limit switch SA-bracket < 15 degrees (left)	12
4	Pull test bracket test point 1A 2000 KN	18
5 *	Angle sensor Derrick	23
6	Input / output module 6 (EAM6)	7
	Superstructure , engine control	
	AKL Exhaust flap	
	LKL Air vent	
	SP CAN-Bus start point	
	ECU-1 Gear electronic	
	FSA Flame start system	
7	Input / output module 4 (EAM4)	
	Chassis support control unit left	5
8	Input / output module 3 (EAM3)	
	Chassis support control unit right	4

* Optional


1
S:09
SW4.0 MS
MS 1
LSB
-S301
2
S:10
SW4.1 IA
RÜCKFALLPRESSE
S - BLOCK
RECHTS
-S903
3
S:11
SW4.1IIA
RÜCKFALLPRESSE
DERRICK BLOCK
RECHTS
-S518
4
S:12
SW4.1 IA
SA BOCK < 15°
RECHTS
-S905
5
S:18
SW4.0IZM
ZUGMESSLASCHE
IB RECHTS
KMD-A
-B908
6
S:23
SW4.0IWG
DERRICK
RECHTS
-B538
EP 2
LSB3
LSB3
-X924
-X927
-X929
-X920
NT
ZE 0
ZE 1
ZE 2
ZE 3
ZE 4
ZE 5

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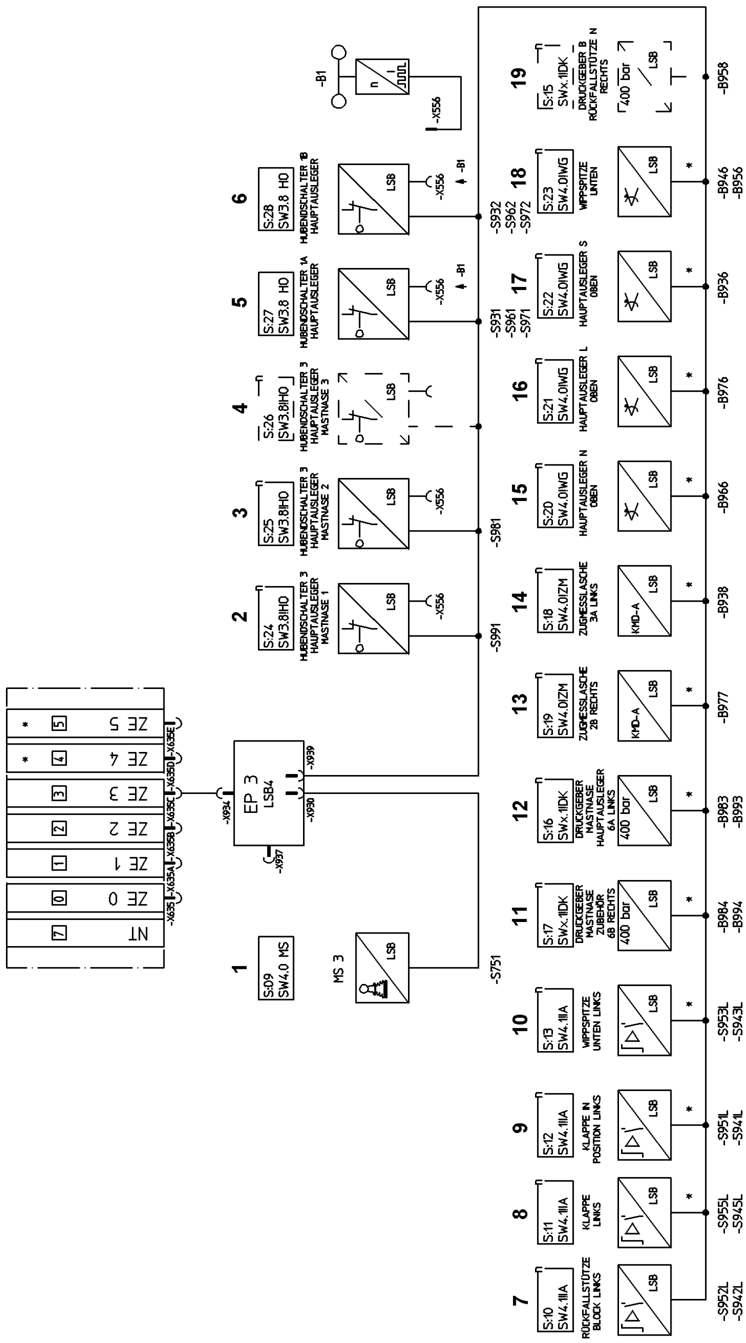
ZE 2	CPU 2 (switchboard)	1
EP 2	Input circuit board2 (switchboard)	
LSB 3	LICCON System Bus 3	
1	Master switch armrest left MS1	9
2	Limit switch relapse retainer S (right)	10
3 *	Limit switch relapse retainer D (right)	11
4	Limit switch SA-bracket <15 degrees (right)	12
5	Pull test bracket test point 1B 2000 KN	18
6 *	Angle sensor Derrick B	23

* Optional



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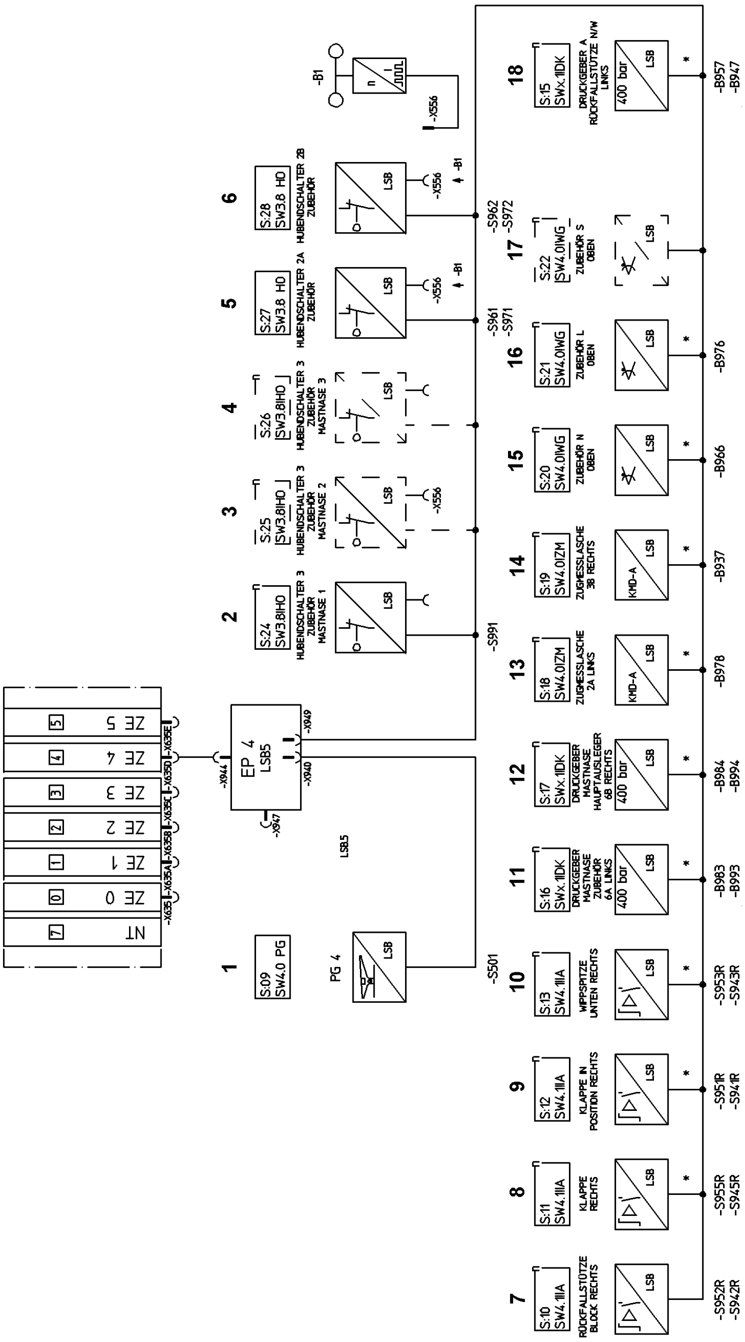
ZE 3	CPU 3 (switchboard)	1
EP 3	Input circuit board3 (switchboard)	
LSB 4	LICCON System Bus 4	
1 *	Master switch right instrument panel MS3	9
2 *	Hoist limit switch 3 main boom, boom nose 1	24
3 *	Hoist limit switch 3 main boom, boom nose 2	25
4 *	Hoist limit switch 3 main boom, boom nose 3	26
5 *	Hoist limit switch 1 A	27
6 *	Hoist limit switch 1 B	28
7 *	Limit switch relapse retainer N and / or N/W (left)	10
8 *	Limit switch flap N (left)	11
9 *	Limit switch flap N in position (left)	12
10 *	Limit switch jib bottom (left)	13
11 *	Pressure sensor boom nose auxiliary equipment test point 6B	17
12 *	Pressure sensor boom nose main boom test point 6A	16
13 *	Pull test bracket test point 3A 2000 KN	19
14 *	Pull test bracket N/W test point 2B 2000 KN	18
15 *	Angle sensor top main boom light	20
16 *	Angle sensor top main boom medium	21
17 *	Angle sensor top main boom heavy	22
18 *	Angle sensor bottom auxiliary equipment	23
19 *	Pressure sensor B relapse retainer W (right)	15

* Optional



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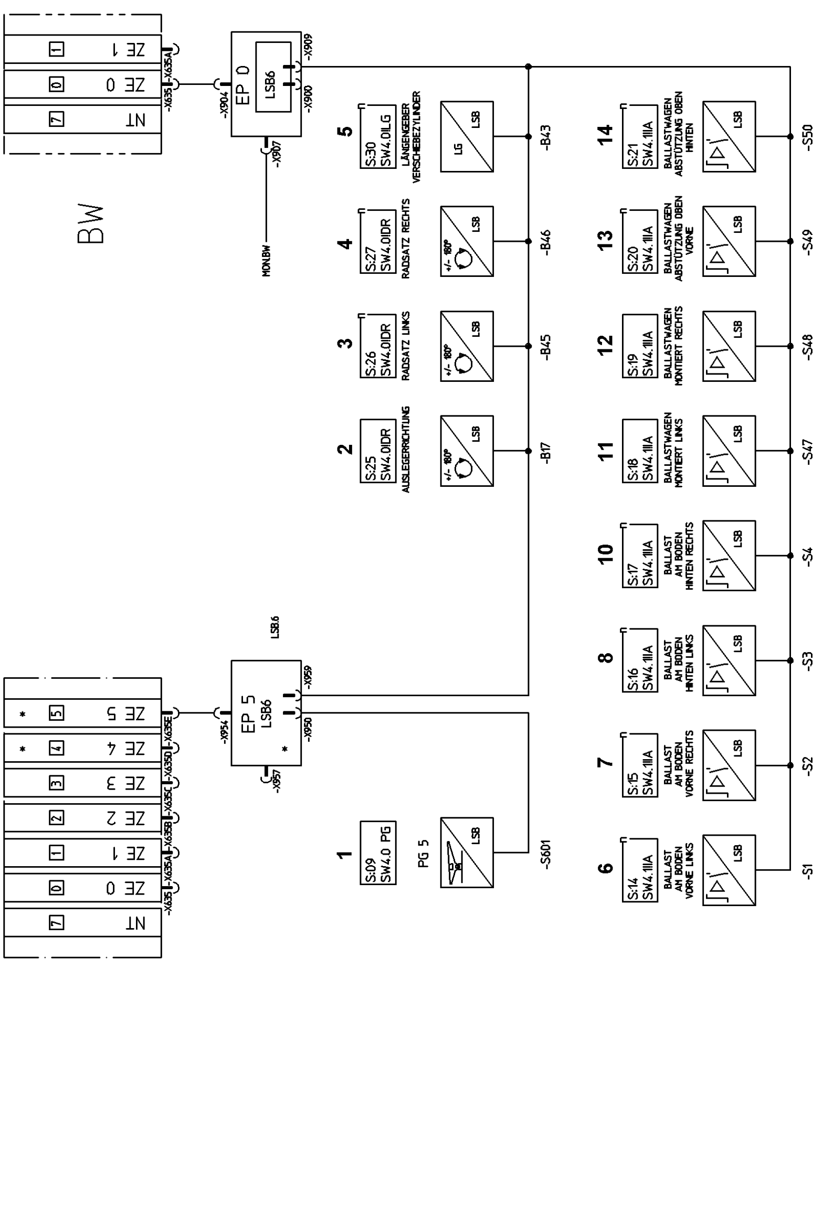
ZE 4	CPU 4 (switchboard)	1
EP 4	Input circuit board 4 (switchboard)	
LSB 5	LICCON System Bus 5	
1	Master switch (foot pedal) MS4 crawler left	9
2 *	Hoist limit switch 3 auxiliary equipment boom nose 1	24
3 *	Hoist limit switch 3 auxiliary equipment boom nose 2	25
4 *	Hoist limit switch 3 auxiliary equipment boom nose 3	26
5 *	Hoist limit switch 2A	27
6 *	Hoist limit switch 2B	28
7 *	Limit switch relapse retainer N (right)	10
8 *	Limit switch flap N	11
9 *	Limit switch flap N in position (right)	12
10 *	Limit switch jib bottom (right)	13
11 *	Pressure sensor boom nose auxiliary equipment test point 6A	16
12 *	Pressure sensor boom nose main boom test point 6B	17
13 *	Pull test bracket N/W test point 2A 2000 KN	18
14 *	Pull test bracket test point 3B 2000 KN	19
15 *	Angle sensor top auxiliary equipment light	20
16 *	Angle sensor top auxiliary equipment medium	21
17 *	Angle sensor top auxiliary equipment heavy	22
18 *	Pressure sensor A relapse retainer N/W (left)	15

* Optional


BW
EP 0
LSB6
EP 5
NT
ZE 0
ZE 1
ZE 2
ZE 3
ZE 4
ZE 5
MONBW
1
S:09 SW4.0 PG
PG 5
-S601
2
S:25 SW4.0IDR
AUSLEGERRICHTUNG
-B17
3
S:26 SW4.0IDR
RADSATZ LINKS
-B45
4
S:27 SW4.0IDR
RADSATZ RECHTS
-B46
5
S:30 SW4.0ILG
LANGENGEBER VERSCHIEBEZYLINDER
-B43
6
S:14 SW4.1IIA
BALLAST AM BODEN VORNE LINKS
-S1
7
S:15 SW4.1IIA
BALLAST AM BODEN VORNE RECHTS
-S2
8
S:16 SW4.1IIA
BALLAST AM BODEN HINTEN LINKS
-S3
10
S:17 SW4.1IIA
BALLAST AM BODEN HINTEN RECHTS
-S4
11
S:18 SW4.1IIA
BALLASTWAGEN MONTIERT LINKS
-S47
12
S:19 SW4.1IIA
BALLASTWAGEN MONTIERT RECHTS
-S48
13
S:20 SW4.1IIA
BALLASTWAGEN ABSTÜTZUNG OBEN VORNE
-S49
14
S:21 SW4.1IIA
BALLASTWAGEN ABSTÜTZUNG OBEN HINTEN
-S50

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ZE 5	CPU 5 group 0 (switchboard)	1
EP 5	Input circuit board5 (switchboard)	
LSB 6	LICCON System Bus 6	
ZE 0	CPU 0 group 1 (switchboard ballast trailer)	
EP 0	Input circuit board0 (switchboard ballast trailer)	
NT	Power supply unit (switchboard ballast trailer)	
BW	Ballast trailer	
1	Master switch (foot pedal) MS5 crawler right	9
2	Turn sensor horizontal slewing platform	25
3 *	Turn sensor horizontal wheel set A	26
4 *	Turn sensor horizontal wheel set B	27
5 *	Length sensor slide cylinder	30
6 *	Limit switch ballast on the ground, left front	14
7 *	Limit switch ballast on the ground, right front	15
8 *	Limit switch ballast on the ground, left rear	16
9 *	Limit switch ballast on the ground, right rear	17
10 *	Limit switch ballast trailer (BW) installed (left)	18
11 *	Limit switch ballast trailer (BW) installed (right)	19
12 *	Limit switch ballast trailer (B W) outriggers retracted front	20
13 *	Limit switch ballast trailer (BW) outriggers retracted rear	21

* Optional

2. Error recognition in LICCON computer system

2.1 General
- 2.1.1 Procedure to localize and fix errors
- 2.1.2 LICCON Error Code (LEC)
  - 2.1.2.1 Indication of error
- 2.1.3 Device code
- 2.1.4 Separate error list
- 2.1.5 LED error code and status indication on input /output modules

2.2 Monitor errors
- 2.2.1 Localize and fix monitor errors
- 2.2.2 Check and replace the monitor

2.3 Basic component errors
- 2.3.1 Clear power supply unit errors
- 2.3.2 Initialization errors
- 2.3.3 System errors
  - 2.3.3.1 Fatal system errors ⇒ LEC [1)]
  - 2.3.3.1 Other system errors
- 2.3.4 Localize and fix basic component errors
  - 2.3.4.1 Error localization
  - 2.3.4.2 Check power supply unit
  - 2.3.4.3 Check CPU

2.4 Application errors
- 2.4.1 Application error without error code
- 2.4.2 Application error with error code ⇒ LEC 1)

2.5 System errors ⇒ LEC [1)]

2.6 Control errors ⇒ LEC [1)]

[1)] Error is shown as Liebherr Error Code (LEC).

2.1 General

Any errors, which might occur, can be classified according to various criteria. The most often used description is the classification by cause of error (see below).

The **LICCON computer system** contains a large number of error diagnostics and self monitoring routines. For some errors, however, the LICCON computer system cannot determine positively which component is defective. For example, if data transfer between two components is not working properly, then one of the two components in question might be damaged or defective (such as the monitor or CPU, power supply unit or CPU, sensor or CPU), or there might be a problem in the transfer route in between (such as the monitor cable, component frames, sensor lines or actor lines). Aside from monitor errors and clear power supply errors, errors are not classified according to the defective component, but rather according to the way they appear. Errors are sorted by the sequence they are checked by the LICCON computer system.

1. Monitor errors (paragraph 2.2)
   Monitor errors are errors, which point to an error on the monitor at the beginning of or during operation. Monitor errors can be recognized though an error message or a bad picture on the monitor.

2. Basic component group errors (paragraph 2.3)
   These are errors, which occur most often due to errors in parts of the basic component group (hardware or software). Basic group errors are separated into the following sub error groups:

   2.1 Clear power supply errors (paragraph 2.3.1)
   These are errors, which point to a defective power supply when the LICCON is turned on. However, they can also be caused by other problems.

   2.2 Initialization errors (paragraph 2.3.2)
   Initialization errors are errors, which were recognized through a special test during the LICCON boot up, for example microprocessor errors, hardware errors. Initialization errors are shown on the 7-segment indicator on the CPU and possibly also through the Liebherr Error Code and plain text on the monitor (error determination view in the "Test system" program).

   2.3 System errors (paragraph 2.3.3)
   System errors are errors, which are recognized shortly after the boot up or in operation through the operating system. The system error programs monitor especially the function of the electronic and the data transfer. System errors are differentiated as follows:

   2.3.1 Fatal system errors (FATAL SYSTEM ERROR) ⇒ LEC (paragraph 2.3.3.1)
   They are shown through a Liebherr Error Code (LEC) on the monitor (error determination view in the "Test system" program).

   2.3.2 Other system errors (paragraph 2.3.3.2)
   They are shown on the 7-segment indicator on the CPU (= CPU indicator).

3. Application errors (paragraph 2.4)
   Application errors are errors, which are found in the so-called application programs (crane operation and telescoping). They comprise a large number of sensor errors.

4. System errors ⇒ LEC
   System errors are internal errors in the input / output modules, applications, CAN-Bus errors, LSB errors, etc.

5. Control errors ⇒ LEC
   Control errors are errors, which are determined through incorrect operation (keyboard, support control units, etc.).

Note: In the **superstructure**, application, system and control errors are reported in the operating view and the telescoping view through an error message (blinking) as well as an acoustical signal (=beep, buzzer).

2.1.1 Procedure to localize and fix errors:

- If an error is shown through the Liebherr Error Code, refer to the error determination view (LICCON test system) or separate error listing.

- If the monitor view is not right (for example if there is no picture, if it flickers or if only an error message is shown without an error number, for example "⇒ DATA LINE FAILURE !!", then refer to → Monitor errors (paragraph 2.2).

- If an error occurs, and the operating view is not shown at all or disappears suddenly, then refer to → Fixing basic component group errors (paragraph 2.3.4).

The error diagnostics makes it possible for the crane operator to recognize any errors immediately. With the error description in the separate error listing or the error documentation in the "Test system" program, errors can be localized and fixed quickly in many cases.

C A U T I O N : If an error cannot be taken care of by the crane operator, LIEBHERR Service must be called in.

When calling in LIEBHERR Service, have the following information ready:
- Crane model
- Crane number
- complete error number and possibly the error message on the monitor
- for basic component group errors also the 7-segment indicators of power supply and CPUs
- current working applications of crane
- action when error occurs
- possibly how often error occurs.

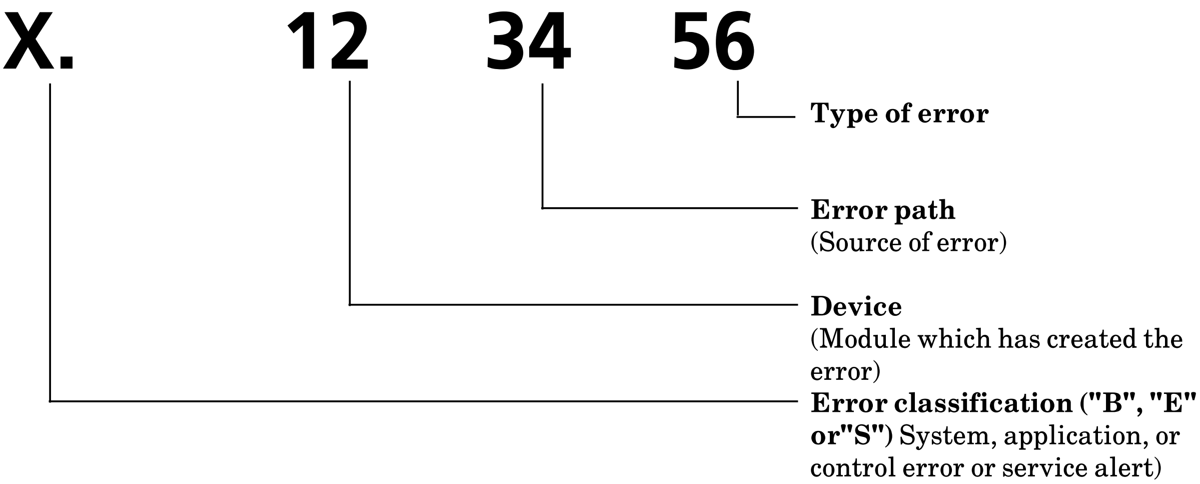
2.1.2 Liebherr Error Code (LEC)

The Liebherr Error Code describes four possible error classifications:

System errors
Control errors
Application errors with error number
Basic component group errors (Fatal system errors)

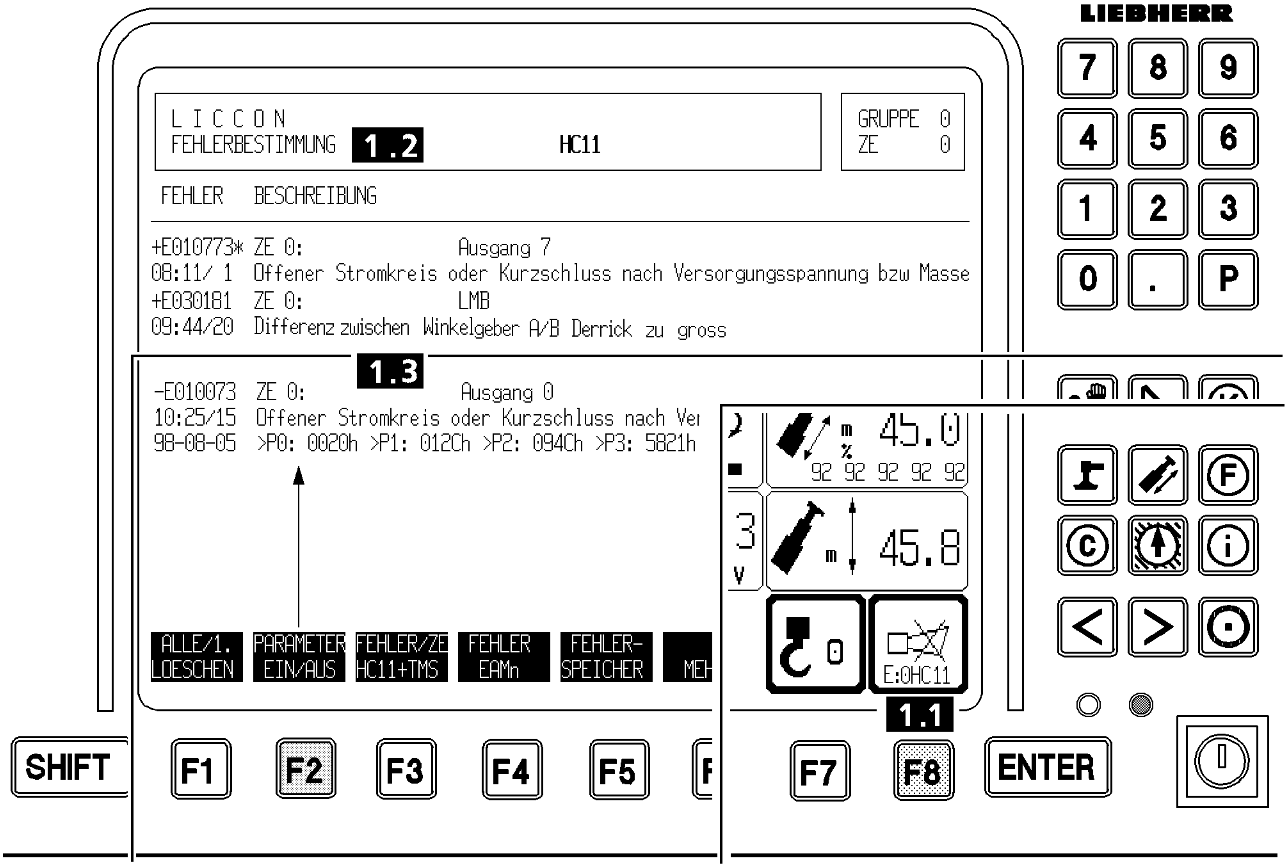
The error code is shown in the chassis (indicator unit) as well as in the superstructure (error determination view in the LICCON Test system). In addition, all errors are listed in a separate error listing (error text, cause, remedy).

The structure of the error code is based on a 6-digit error number as well as the above mentioned error classification.



- There are various error classifications:

Control errors "B" :	Error caused by incorrect operation / control (Support control, ignition switch...)
for example:	**B . 4 9 9 8 9 8**
System errors "E" :	Continuous error, or error occurring for a short time (engine error, module error ....)
for example:	**E . 8 1 3 0 2 3**
Application errors "E"	Error during crane operation (Changing equipment under load, hoist limit switch.....)
for example:	**E. 0 3 0 0 5 9**
Basic component group error "E"	Error in one of the electronic basic component groups
(Fatal system error)	**E. 0 0 0 0 5 1**
Service alerts:	**S**


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG
1.2
HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E030181 ZE 0: LMB
09:44/20 Differenz zwischen Winkelgeber A/B Derrick zu gross
1.3
-E010073 ZE 0: Ausgang 0
10:25/15 Offener Stromkreis oder Kurzschluss nach Ver
98-08-05 >P0: 0020h >P1: 012Ch >P2: 094Ch >P3: 5821h
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
45.0
45.8
E:0HC11
1.1
SHIFT
F1
F2
F3
F4
F5
F7
F8
ENTER

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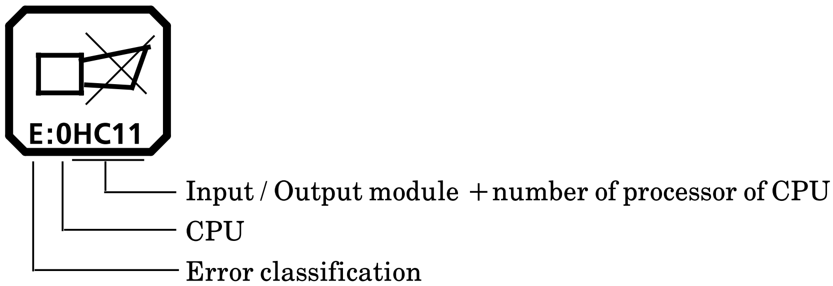
2.1.2.1 Error indication in superstructure (OW) (fig. 1)

If a system, application or control error is present, an error message will appear in the "Crane operation" , "Telescoping" or "support" program in the "Horn" symbol on the LICCON monitor . Indicated by:

- Error classification **"E"** = System error / application error or **"B"** = Control error
- the corresponding CPU
- The processors of the CPU (TMS or HC11) or the corresponding input / output module.

Example:
System error



By pressing the function key "F8" twice (press 1x : Horn off,), change to the error determination view in the "Test system" program (1.2). The page, in which the error is listed in the corresponding error stack will appear. The error is shown and documented with the 6-digit Liebherr error code . Active errors are marked with a "+".

Note: Inactive errors can be shown with function key "F2" in sub-program PARAMETER ON (1.3). They are marked with a "– ". When the ignition is turned off , all inactive errors in the local error stacks are deleted. For inactve errors, see also paragraph 2.5.1.

C A U T I O N : In case of fatal system errors, the 7-segment indicator on the CPUs must also be checked .

2.1.3 Device Code

The device code (0 - 99) shows the module, which has caused the error. (Input / output Module, CPU, TCU...)

Code	Partial error message	Code	Partial error message
00	CPU 0	**50**	CPU 5
01	CPU 0	**51**	CPU 5
02	CPU 0	**52**	CPU 5
03	CPU 0	**53**	CPU 5
04	CPU 0	**54**	CPU 5
05	Relay module 0	**55**	
06	I/O module 0	**56**	I/O module 5
07	I/O module 0	**57**	I/O module 5
08	I/O module 0	**58**	I/O module 5
09	I/O module 0	**59**	I/O module 5
10	CPU 1	**60**	CPU 6
11	CPU 1	**61**	CPU 6
12	CPU 1	**62**	CPU 6
13	CPU 1	**63**	CPU 6
14		**64**	CPU 6
15		**65**	
16	I/O module 1	**66**	I/O module 6
17	I/O module 1	**67**	I/O module 6
18	I/O module 1	**68**	I/O module 6
19	I/O module 1	**69**	I/O module 6
20	CPU 2	**70**	
21	CPU 2	**71**	
22	CPU 2	**72**	
23	CPU 2	**73**	
24		**74**	Indicator unit
25		**75**	Control unit
26	I/O module 2	**76**	Support unit 1A
27	I/O module 2	**77**	Support unit 1B
28	I/O module 2	**78**	Support unit 2A
29	I/O module 2	**79**	Support unit 2B
30	CPU 3	**80**	
31	CPU 3	**81**	ABV
32	CPU 3	**82**	Retarder
33	CPU 3	**83**	Eddy current brake
34	CPU 3	**84**	Heater, air conditioner
35		**85**	Gear CLBT 755
36	I/O module 3	**86**	Gear HD 4560
37	I/O module 3	**87**	
38	I/O module 3	**88**	
39	I/O module 3	**89**	Engine Daimler Benz
40	CPU 4	**90**	Engine Liebherr R4
41	CPU 4	**91**	Engine Liebherr R6
42	CPU 4	**92**	Engine Liebherr V6
43	CPU 4	**93**	Engine Liebherr V8
44	CPU 4	**94**	
45		**95**	Gear 6 WG 210
46	I/O module 4	**96**	Gear 6 WG 260
47	I/O module 4	**97**	
48	I/O module 4	**98**	
49	I/O module 4	**99**	
...		- -	

2.1.4 Separate error listing

The errors are listed on a separate error listing. Error classification "K" and error value "W" are in the last two columns of the error listing.

Note: For device code, see paragraph 2.1.2.1

Example:

Error No.	generated message/ cause / remedy	Plug	Page	K	W
121351	CPU 1: LSBA participant 13 was not for the... entry of error in error memory, otherwise... configuration problem, load new software.	X919:4		E	2
121353	CPU 1: LSBA participant 13 does no longer report...... entry of error in error memory, participant... check connection, if connection is ok, then...	X919:4		E	1
121354	... ...	...		.	.

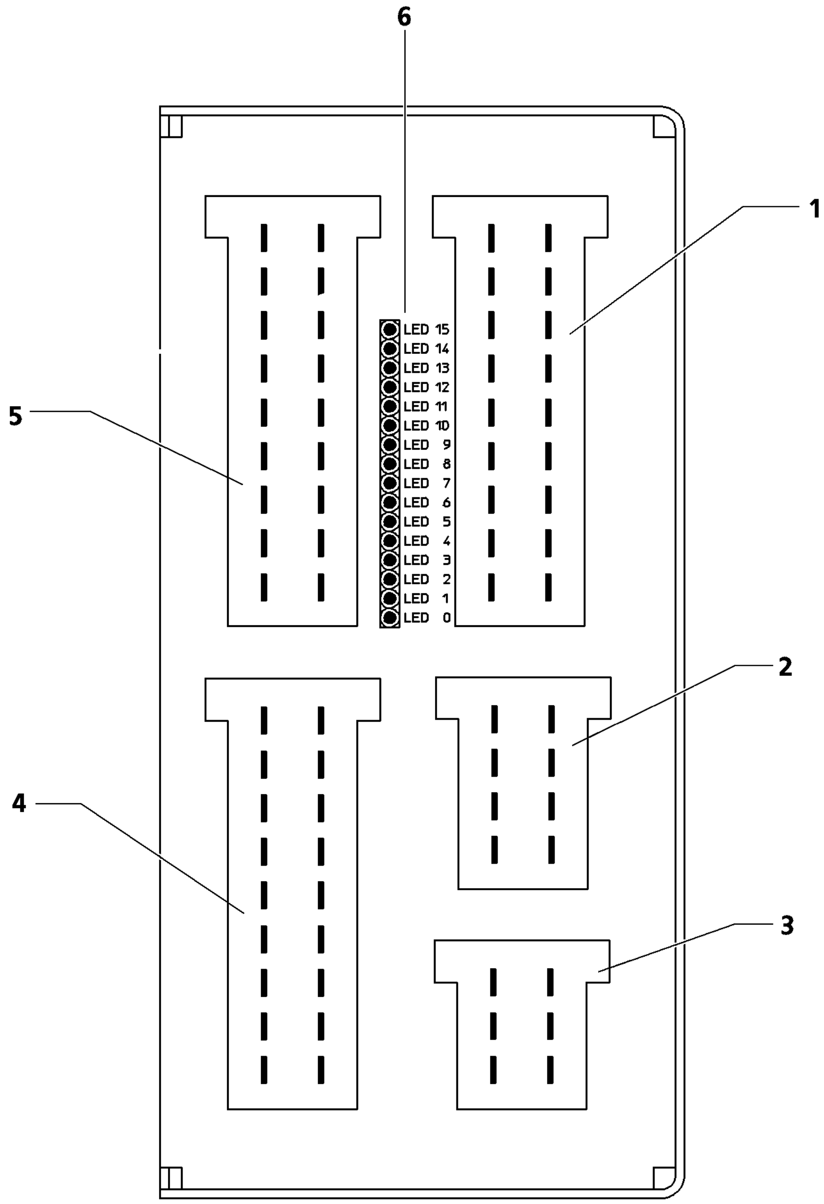
Plug = Plug description of component   K = Error classification
Page = Page in electr. wiring chart   W = Error value

- A differentiation is made between two error classifications:
  - B = Control errors
  - E = System errors, application errors, basic component group errors (fatal system errors)

as well as S = Service alerts

- A differentiation is made between 3 error values:
  - **0** = tolerable errors
  - **1 = Fix error immediately**
  - **2 = STOP THE ENGINE IMMEDIATELY !**

Note: In case of control errors, no value is assigned.


6
1
5
2
4
3
LED 15
LED 14
LED 13
LED 12
LED 11
LED 10
LED 9
LED 8
LED 7
LED 6
LED 5
LED 4
LED 3
LED 2
LED 1
LED 0

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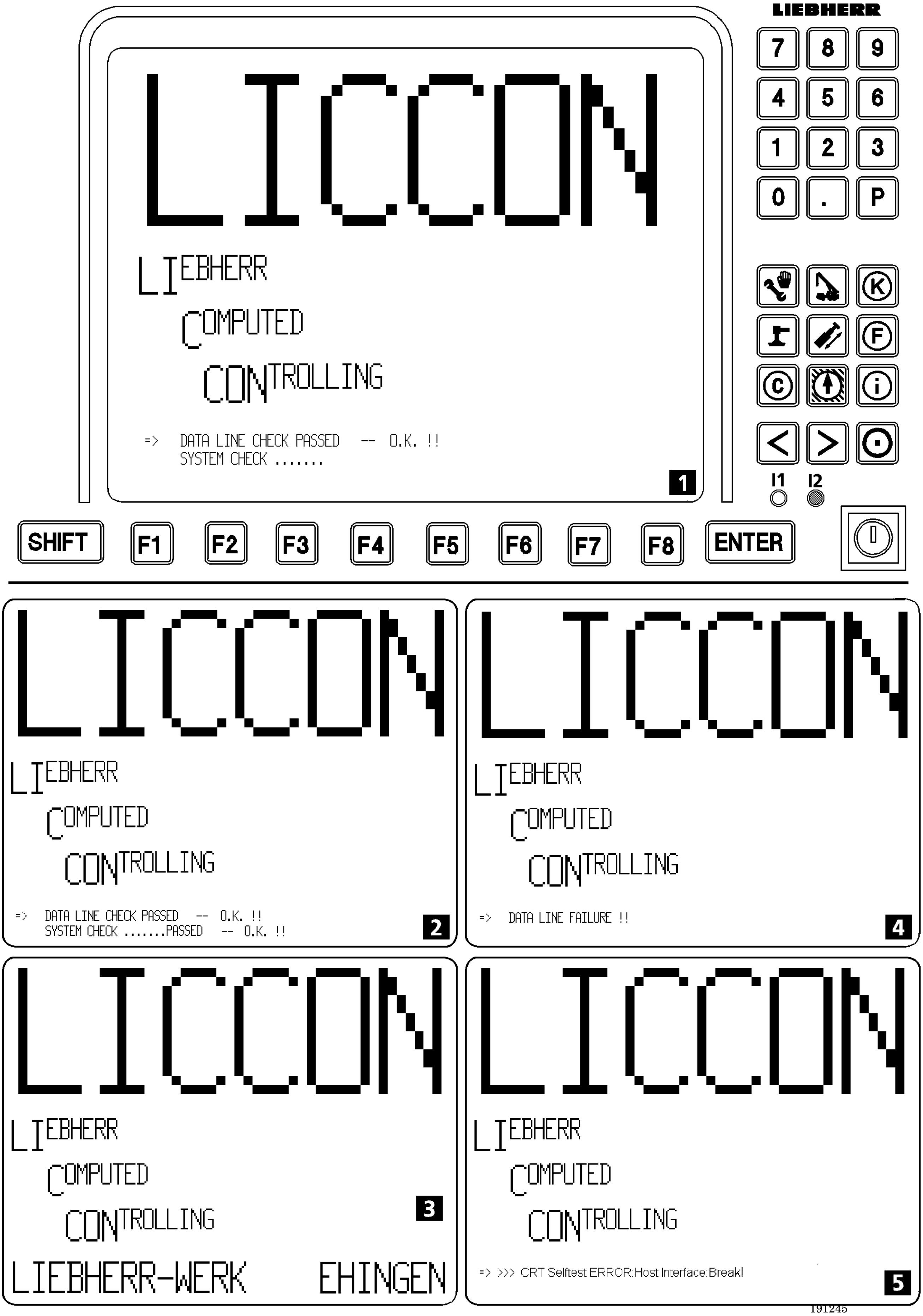
2.1.5 LED error code and status indicator on I/O-Modules

- Inputs and power sources (1)
- SPI-Bus (2)
- CAN-Bus (3)
- Power supply (4)
- Inputs, Outputs, LSB-Bus

LED	Color	Module	Error /Status	Meaning	
				static	blinking
15	red	HW-Watchdog	Error	No error (LED 50% light) Operating condition	Temporary error
14	red	HW-Error	Error	Replace I/O module	-
13	yellow	HW-Error	Status	Output stage is defective	-
12	yellow	HW-Error	Status	Initialization 1)	-
11	yellow	HW-Error	Status	Appl. /Driver Watchdog	Illegal interrupt
10	green	-	-	-	-
9	green	-	-	-	-
8	green	-	-	-	-
7	red	LSB1 Driver	Error	Continuous error on LSB1	Temporary problem on LSB1
6	yellow	LSB1 Driver	Status	LSB1 Bus off	Download via LSB1
5	red	LSB2 Driver	Error	Continuous error on LSB2	Temporary problem on LSB2
4	yellow	LSB2 Driver	Status	LSB2 Bus off	Download via LSB2
3	red	CAN Driver	Error	Continuous error on CAN	Temporary problem on CAN
2	yellow	CAN Driver	Status	all participants missing on CAN	One / more participants missing on CAN
1	red	SSC Driver	Error	Continuous error on SSC	Temporary problem on SSC
0	yellow	SSC Driver	Status	-	-

1) Error at: Register, RAM, ROM, End stage watchdog, Firmware, crane configuration file


LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK ....
1
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
I1 I2
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER
=> DATA LINE CHECK PASSED -- O.K. !!
SYSTEM CHECK ....PASSED -- O.K. !!
2
=> DATA LINE FAILURE !!
4
LIEBHERR-WERK EHINGEN
3
=> >>> CRT Selftest ERROR:Host Interface:Break!
5
191245

2.2 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 CHEK .....

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)

2.2.1 Localizing and fixing monitor errors

Procedure for monitor errors

The following chart shows possible monitor errors, their causes and remedies. The monitor errors are sorted in the order the crane operator or the LICCON will recognize the error.

Error: **When the system is turned on, the screen remains dark LED (I_2) "yellow" DOES NOT light up**

Possible cause: Power supply is missing, safety automatic is turned off

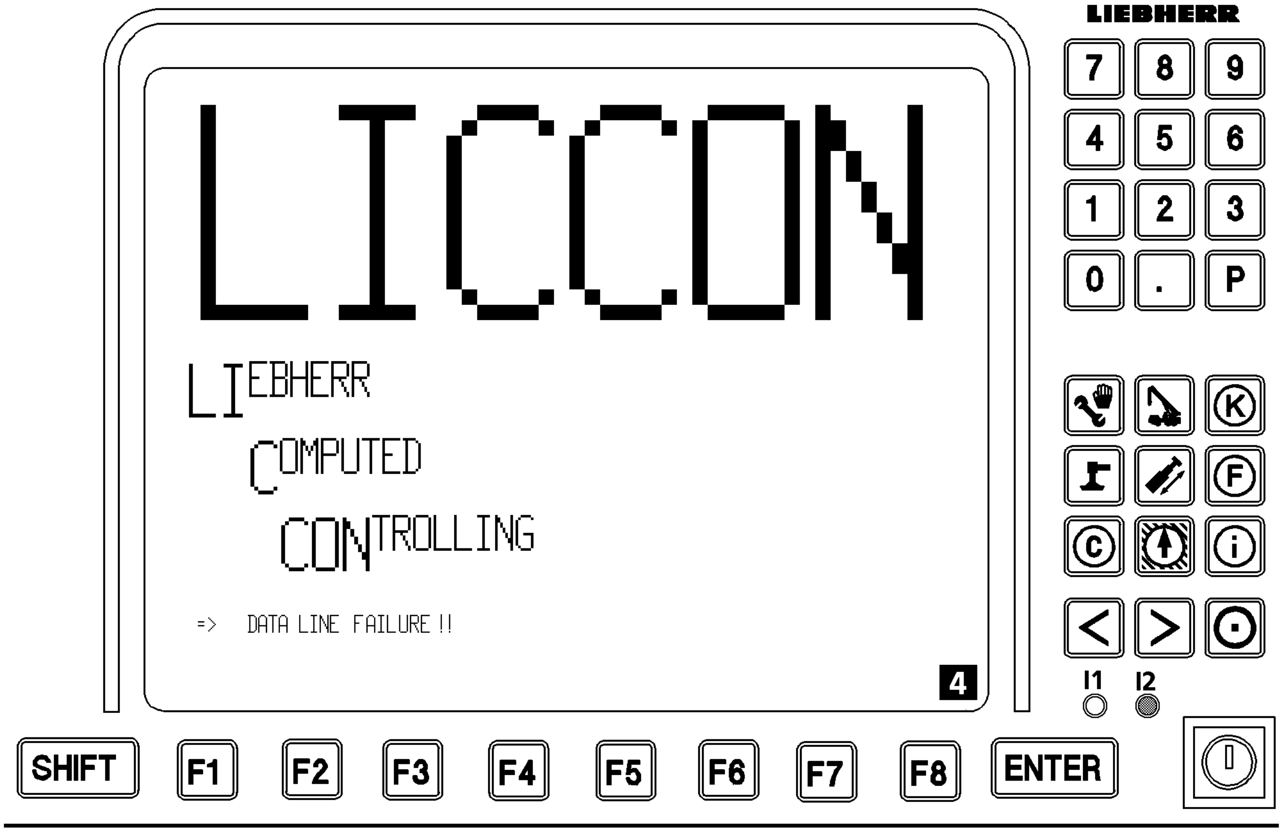
Possible remedy: Check power supply, actuate safety automatic for monitors.

Error : **The monitor has not picture**

Possible cause: At ambient temperatures of < -20° C and > 70° C, the monitor has turned off the picture.
Line to monitor is unplugged or defective or monitor is defective.

Possible remedy: Preheat or cool cab.
Replace the LICCON monitor without the picture with a functioning replacement monitor (paragraph 2.2.2).

In addition: Check supply voltage (V) on monitor connector plug (should be : 18 - 36 V, nominal: 24 V)


LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> DATA LINE FAILURE !!
4
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
I1 I2
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

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Error: **Screen shows the following error message when it is turned on:**

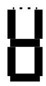
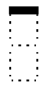
"⇒ DATA LINE FAILURE !!" (Fig. 4)

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.

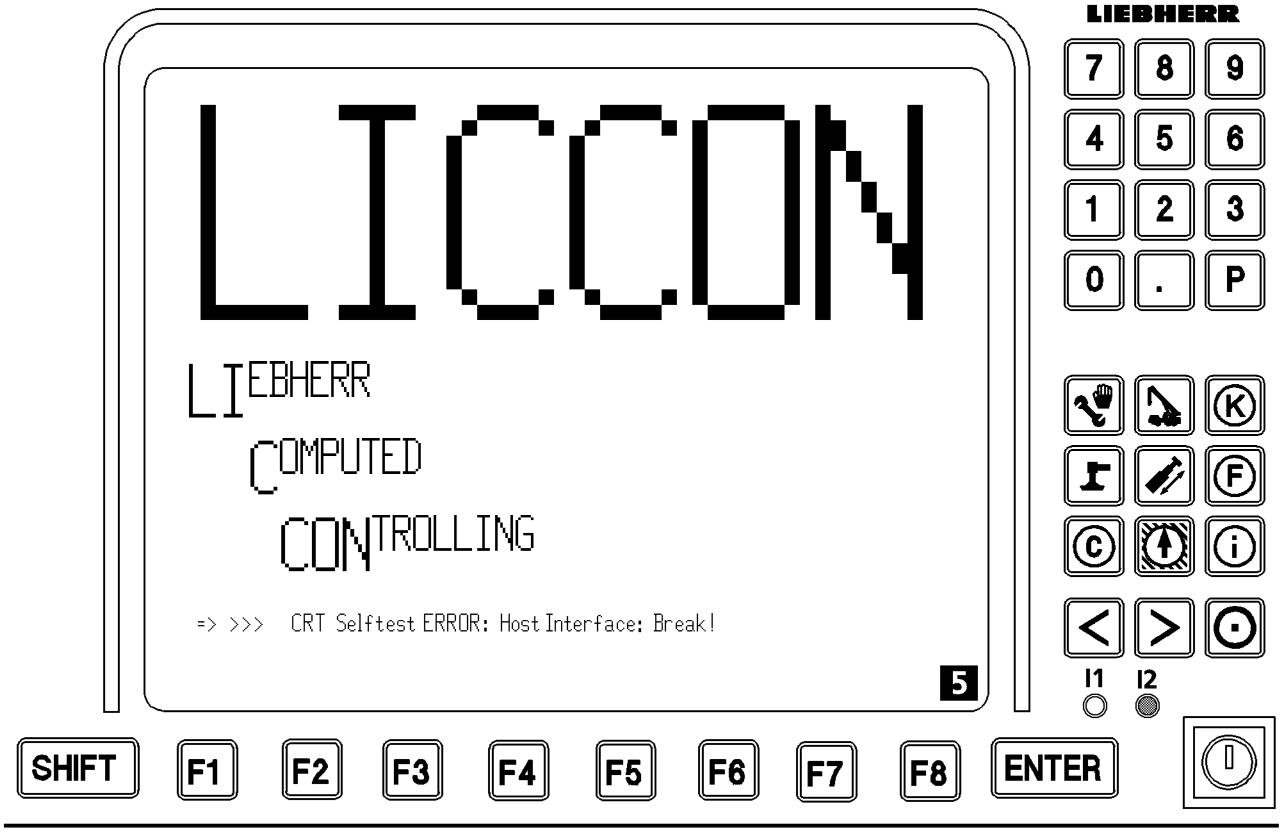
Possible remedy: Open the control box and check the CPU indicator.

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 2.3.4).
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 2.3.4).

Replace the LICCON monitor with error indication with a functioning replacement monitor (paragraph 2.2.2).


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> >>> CRT Selftest ERROR: Host Interface: Break!
5
7 8 9
4 5 6
1 2 3
0 . P
I1 I2
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

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Error: **Screen shows the following error message when turning it on:**

"⇒ >>> CRT Selftest ERROR: Host Interface: Break!" (Fig. 5)

and LED "red" (I_1) lights up

Possible causes: Monitor is defective, connection is defective, power supply is defective, CPU is defective

Possible remedy: Replace the LICCON monitor with the error indication with a functioning replacement monitor (paragraph 2.2.2).
If the previously functioning monitor then also shows the error message:
>>> CRT Selftest: Host interface: BREAK!,
then open the control box and check the power supply unit indicator (see also power supply unit error in paragraph 2.3.1).

If the power supply unit shows "7" after turning it on, then the power supply unit is O.K.
Check the connection from the CPU to the input circuit board and the connection from the input circuit board to the monitor for an interruption. if the connections are O.K., then check the CPU0 (see also notes to check the CPU when fixing basic component group errors in paragraph 2.3.4).

If the "7" is not shown on the power supply unit after turning it on, then check power supply unit error in paragraph 2.3.1).

Error: **Screen shows the following error after turning it on:**

Monitor horn does not work,
keyboard is defective,
brightness control is defective,
keyed switch is defective,
symbol elements are wrong or missing.

Possible causes: Some parts of the monitor (display, keyboard, keyed switch) are defective

Possible remedy: Replace the defective LICCON monitor with a functioning replacement monitor (paragraph 2.2.2.).

2.2.2 Check and replace the monitors

The monitor can be easily replaced by the crane operator with simple tools.

To remove the monitor :

- Turn the crane off.
- Loosen the 4 mounting screws on the front plate on the monitor.
- Lift out the monitor.
- On the monitor connector cable, open the screw fitting and unplug the plug.
- Unscrew the monitor ground cable.

To install replacement monitor :

- Screw on the monitor ground cable.
- Insert the plug on the monitor connector cable and tighten the plug screw fitting.
- Insert the monitor into the instrument panel.
- Attach the monitor with the 4 mounting screws.

D A N G E R: Crane operation without the monitor display is dangerous. If the LICCON screen is defective, then it must be replaced!

2.3 Basic component group error

Basic component group errors are errors, which are mainly caused by errors in parts of the basic component group (hardware).

The basic component group errors are divided into the following sub error groups:

1. Clear power supply unit errors (paragraph 2.3.1)

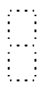
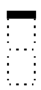
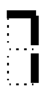
2. Initialization errors (paragraph 2.3.2)

3. System errors (other system error) (paragraph 2.3.3)

Even if the crane operator is able to fix a basic component group error without assistance, the must notify and inform LIEBHERR service about the exact nature of the error.

2.3.1 Clear power supply unit errors

Externally, the power supply unit looks very much like the CPUs. However, the power supply unit is always located on the far left hand side in the basic component group. In normal operation, the 7-segment indicator on the power supply unit shows the messages as noted in the following chart.

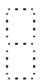
Normal power supply unit reading		
Reading	Type of indication	Meaning
	-	Power supply unit indication is dark; control is off and power is missing. The basic component group is separated from the battery. (This is the case if the slewing platform is dismantled in 2 parts.)
	static	Control is off, battery voltage is available on the basic component group, stand-by-power supply for memory (CPU-RAMs and COMMON-RAMs) is available. **Note:** Must also light up when the ignition is off!
	static	Control is on, battery voltage is available on the basic component group, the power supply unit is O.K.
	static	Control is on, battery voltage is available on the basic component group, power supply unit is O.K. As a result, all CPU's receive this signal and show "P" on their display as confirmation. If this doesn't work, after restarting the program, the LML is shown on the LICCON monitor with the smallest load chart and reeving at zero.

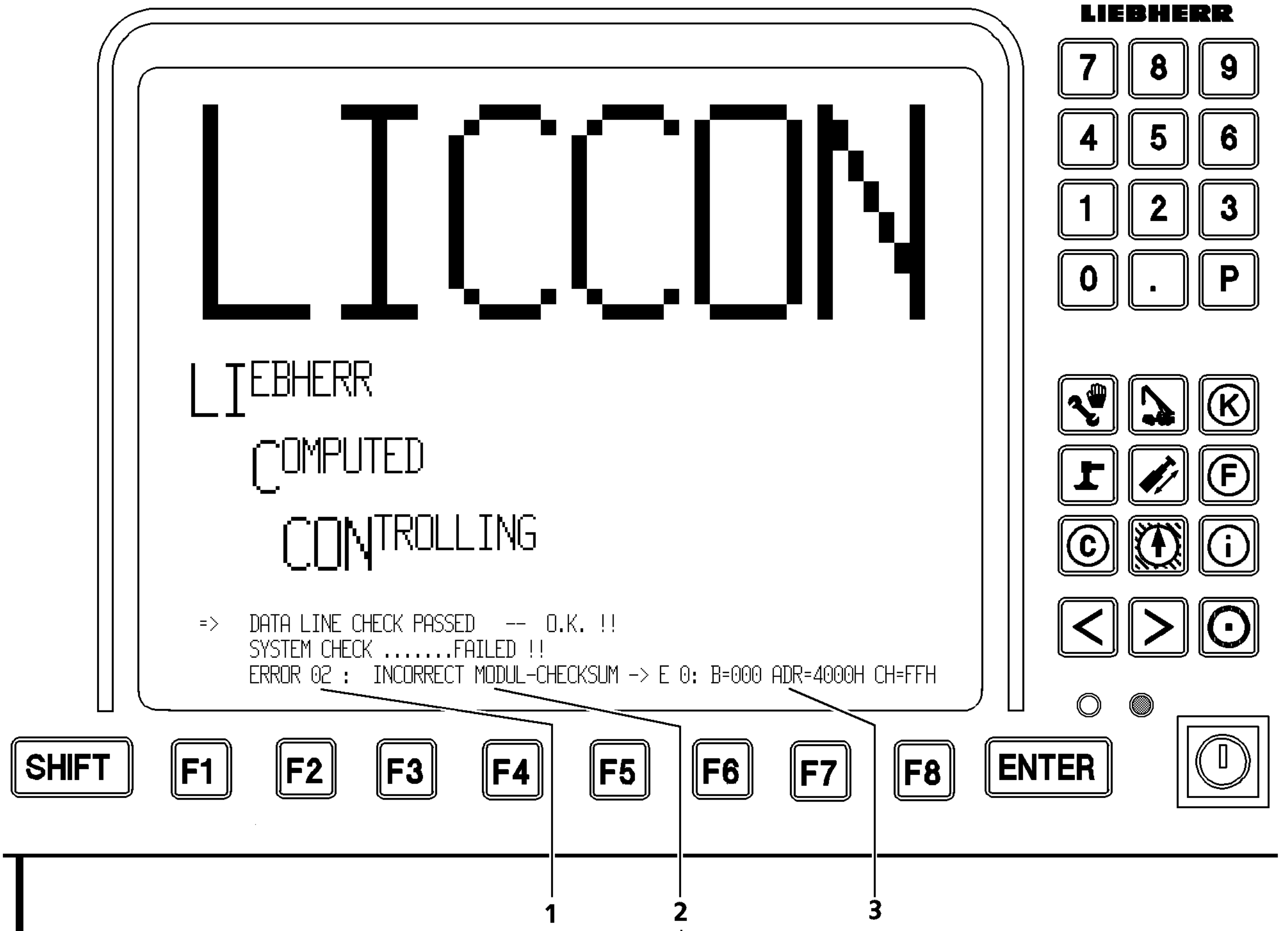
Power supply unit errors are errors, which occur when the LICCON computer system is turned on and which point to a defective power supply unit.

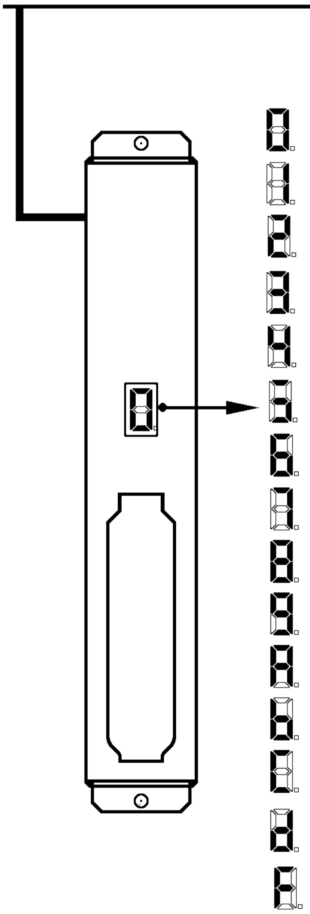
Note: However, they can also have other causes!

Power supply unit errors can only be monitored by watching the power supply unit indicator with the control box open, when the system is turned on or in operation. Refer to the chart below for possible power supply unit errors.

Note: Chapter 2.3.4 describes in detail who basic component group errors can be recognized and the systematic procedure to fix the problem. It also includes a description of how to check the power supply unit and how to replace it.

Clear power supply unit errors				
Power supply unit indication	Type of indication	Error description for Service technician, possible causes	Possible causes	Possible remedy
	-	Power supply unit indication is dark: No power, battery disconnected, power supply unit safety automatic is off	Line interrupted, plug contact problems, power supply unit is defective	Check line, check plug, check safety automatic, check power supply unit check
	static	Control off, auxiliary transformer runs, stand-by - power supply available, but over or undervoltage, → check voltage	Power supply unit is defective, CPU is defective	Check power supply unit, check CPUs one after the other





→ ERROR 00: ILLEGAL INTERRUPT
→ ERROR 01: INCORRECT MODUL-TYPE
→ ERROR 02: INCORRECT MODUL-CHECKSUM
→ ERROR 03: HARDWARE LINE FAILURE
→ ERROR 04: INCORRECT UNIT-NUMBER
→ ERROR 05: LCA-REGISTER FAILURE
→ ERROR 06: RAM-FAILURE
→ ERROR 07: HARDWARE-FAILURE
→ ERROR 08: PS-LCA CONFIGURATION-ERROR
→ –
→ ERROR 0A: CONFIG PROGRAMMING-ERROR
→ ERROR 0b: PPI BUS-ERROR
→ ERROR 0C: HC11 REGISTER-FAILURE
→ ERROR 0d: FIRMWARE-LOADER-ERROR
→ ERROR 0F: INCORRECT EPROM-TYPE

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2.3.2 Initialization error

Initialization errors are hardware errors, which are found at boot-up during the self test run due to special test runs of the LICCON computer system.

Initialization errors are shown through a blinking initialization error sign (= number or sign) on the 7-segment indicator on the CPU (=CPU indicator).

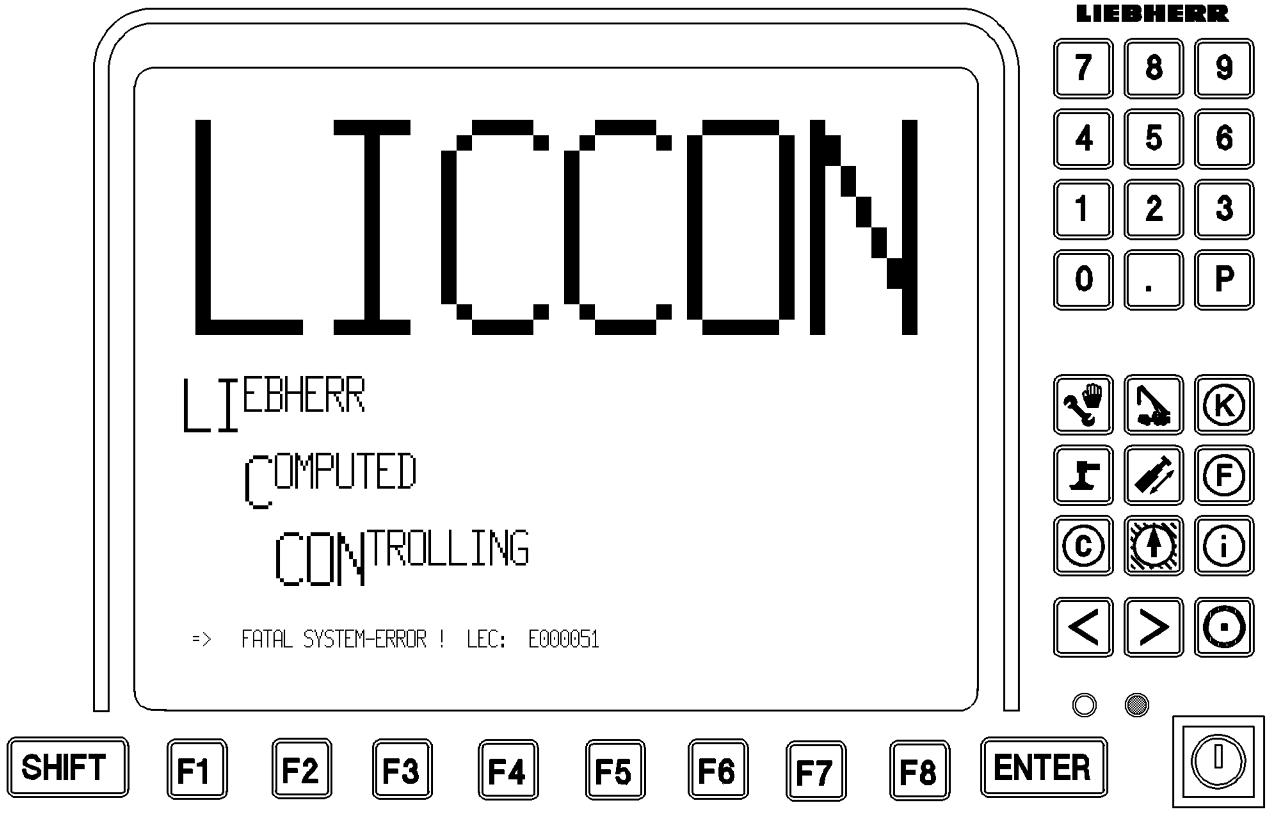
If an initialization error occurs on aCPU, to which a monitor is connected, then this error, if it is timely possible, is also shown on the monitor. On the monitor appear the indications shown on the opposite page. They consist of:

1) Error numbers. The initialization error number corresponds to the CPU indicator.
2) Error description message
3) possibly additional information in the form of values of relevant memory lines.

If an initialization error occurs on one CPU, to which no monitor is connected, then this error is at first not shown on the monitor. The LICCON computer system continues to run for a short time. However, the initialization error then creates a system error, which in turn stops the program execution and is shown on the screen (see also description of system errors in paragraph 2.3.3).

If a hardware error occurs during operation, for example ”EPROM is defective”, then a system error is shown first or the screen display stops or gets dark (see also description of system errors in paragraph 2.3.3).

The localization of the initialization error can always be made with the aid of the CPU indicator. The possible initialization error signs with notes to possible causes and possible remedies are shown in the following chart. In case of initialization and system errors, the crane operator must always open the control box and monitor the CPU indicator. The procedure is described in detail in the description of fixing basic component group errors in paragraph 2.3.4.


LIEBHERR
LICCON
LIEBHERR
COMPUTED
CONTROLLING
=> FATAL SYSTEM-ERROR ! LEC: E000051
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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2.3.3 System errors (Basic component group errors)

are errors in the electronic basic component group, which are recognized by the system shortly after booting the LICCON or in operation. These programs monitor especially the function of the program execution and the data transfer. System errors can also be subsequential errors, which can only be found during initialization. If a system error does not occur as a subsequential error of an initialization error, then the hardware is probably alright. System errors must usually be taken care off by trained service personnel. These instructions note, how the crane operator might be able to fix the crane by checking or replacing components of the LICCON control.

If a system error occurs, all control programs and therefore all crane functions are interrupted. Even if the error can be fixed by the crane operator, he must inform Liebherr Service nevertheless.

The localization of system errors is always made with the CPU indicator and the error determination view. In case of initialization and system errors, the crane operator must always open the control box and monitor the CPU indicators. The procedure is described in detail in the description of taking care of basic component group errors in paragraph 2.3.4. System errors are differentiated as follows:

1. Fatal system errors (FATAL SYSTEM ERROR) (paragraph 2.3.3.1); are shown on the monitor and on the CPU
2. Other system error numbers (paragraph 2.3.3.2); are only shown on the CPU indicator.

2.3.3.1 Fatal system errors (Basic component group errors)

Fatal system errors are shown on the screen as well as a Liebherr Error Code (LEC). On the screen appears the message FATAL SYSTEM ERROR.
I.e.:

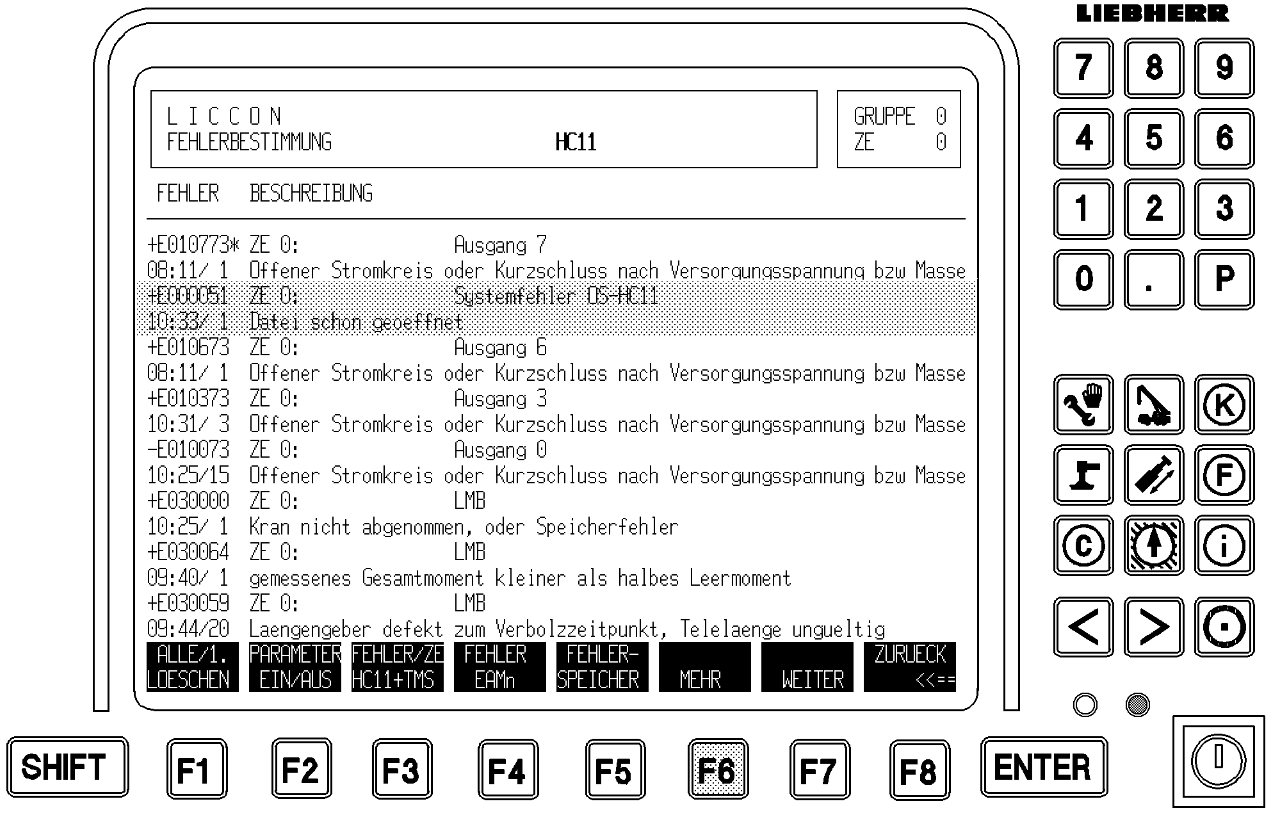
1) Error message "FATAL SYSTEM ERROR !"

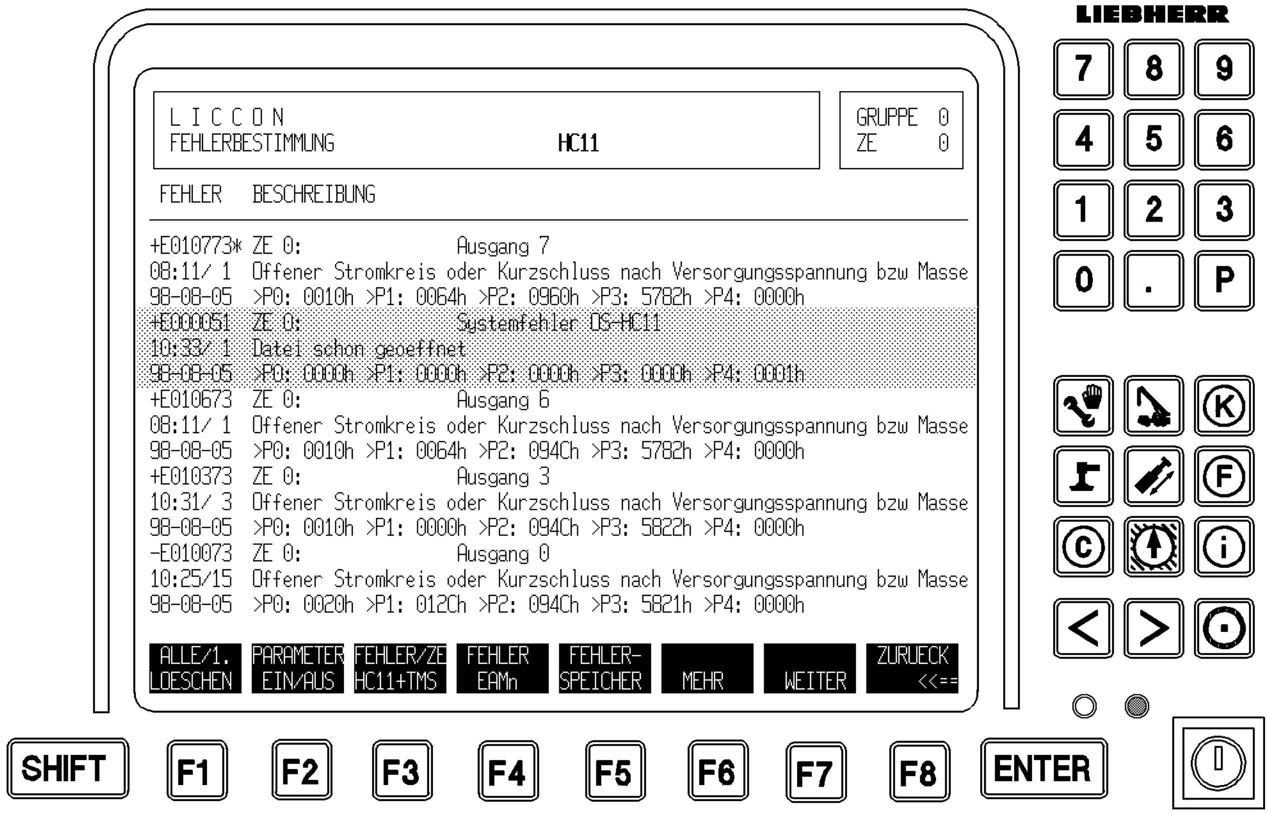
2) Liebherr Error Code (Error number) "LEC: Exxxxxx"

At the same time, on the CPU indicator of the CPU, which first recognizes the error, one of the following descriptions of the error appears as a letter, number of sign :

System errors				
CPU - indicator	Type of indication	Error description for Service technician, possible causes	Possible causes	Possible remedy
E	static	FATAL SYSTEM ERROR occurred (CPU $\neq$ 0)	Error is shown on the monitor	See error description, test system
E.	static	FATAL SYSTEM-ERROR occurred + Global Reset (CPU = 0)	Error is shown on the monitor	See error description, test system

Note: Because the CPU indicators are turned off every 10 milliseconds for additional 10 milliseconds to control the brightness level, after a system stop of a system error, with a 50% probability a subsequent error on another CPU indicator will occur and with a 50% probability, this indicator will turn off.


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E000051 ZE 0: Systemfehler OS-HC11
10:33/ 1 Datei schon geoeffnet
+E010673 ZE 0: Ausgang 6
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E010373 ZE 0: Ausgang 3
10:31/ 3 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
-E010073 ZE 0: Ausgang 0
10:25/15 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E030000 ZE 0: LMB
10:25/ 1 Kran nicht abgenommen, oder Speicherfehler
+E030064 ZE 0: LMB
09:40/ 1 gemessenes Gesamtmoment kleiner als halbes Leermoment
+E030059 ZE 0: LMB
09:44/20 Laengengeber defekt zum Verbolzzeitpunkt, Telelaenge ungueltig
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER- SPEICHER
MEHR
WEITER
ZURUECK <<==
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0064h >P2: 0960h >P3: 5782h >P4: 0000h
+E000051 ZE 0: Systemfehler OS-HC11
10:33/ 1 Datei schon geoeffnet
98-08-05 >P0: 0000h >P1: 0000h >P2: 0000h >P3: 0000h >P4: 0001h
+E010673 ZE 0: Ausgang 6
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0064h >P2: 094Ch >P3: 5782h >P4: 0000h
+E010373 ZE 0: Ausgang 3
10:31/ 3 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0000h >P2: 094Ch >P3: 5822h >P4: 0000h
-E010073 ZE 0: Ausgang 0
10:25/15 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0020h >P1: 012Ch >P2: 094Ch >P3: 5821h >P4: 0000h
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER- SPEICHER
MEHR
WEITER
ZURUECK <<==
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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2.3.3.1.1 Changing to the LICCON error determination view (Test system)

- Turn the LICCON computer system off,
- turn it on again after ca. 5 seconds.
- The system shifts automatically to the error determination view of the LICCON test system (see top illustration), where the system error is shown with a 6-digit error number.
- By calling up the sub program "PARAMETER ON / OFF" with the "F2" key, error specific data as well as the date when the error occurred can be read (see bottom illustration).
- By calling up the sub program " MORE" with the "F6" key , additional errors can be read from the error stack.

Note: You cannot change back directly from the test system via the program keys into other LICCON programs.

- Turn the LICCON computer system off,
- turn it on again after ca. 5 seconds.

2.3.3.2 Other system errors (Basic component group errors)

Other system errors differentiate from fatal system errors only that no screen error number indication is shown. Due to the type of error, a message cannot be placed on the monitor in this type of fatal system errors.
Other system errors on the screen appear in the following manner, for example:

- the screen indication stops
- the screen gets dark
- the screen indication becomes problematic / incorrect.

Other system errors can also be follow-up errors of other errors.
If the screen remains dark, then the error can only be defined with the 7 segment indicator of the CPU.
When searching for the error, proceed as for fatal system errors (see paragraph 2.3.4).

The chart "Other system errors" described the errors as shown on the CPU indicator. The chart lists possible causes and possible remedies.

Chart: Errors on the CPU (page 1)

Errors on the CPU				
CPU - indication	Type of indication	Error description for Service technician, possible causes	Possible causes	Possible remedy
	-	CPU indicator dark, supply missing, program memory card missing or defective, CPU is defective	CPU is defective	Check CPU
0	blinking	HC11 is defective (RAM-REG-A/D), impermissible interrupt in initialization phase	CPU is defective	Check CPU
1	blinking	Module - type not correct; wrong EPROM, EPROM is defective, program memory card wrong / defective	Program memory card or CPU is defective	Check program memory card and CPU
2	blinking	Module Checksum incorrect; EPROM is defective, program memory card is defective	Program memory card or CPU is defective	Check program memory card and CPU
3	blinking	Hardware Error (line test)	CPU is defective	Check CPU
4	blinking	Invalid CPU number; wrong EPROM, program memory card is defective	Program memory card or CPU is defective	Check program memory card and CPU
5	blinking	LCA Register erroneous, LCA is defective, power supply unit status is wrong, component group carrier is wrong	CPU is defective, power supply unit is defective	Check CPU, check power supply
6	blinking	RAM error, RAM is defective	CPU is defective	Check CPU
7	blinking	Hardware error, defective at: Arithmetic processor unit (APU), HC11, AD-converter, DA-converter	CPU is defective	Check CPU
8	blinking	Power supply unit - LCA load error: LCA on power supply unit is defective, component group carrier is defective	Power supply unit is defective	Check power supply unit
9	blinking	Monitor not correct, line from monitor to CPU problematic, CPU not correct	Monitor is defective, line is defective, CPU is defective	Check monitor, line and CPU, see paragraph 4.3

Chart: Error on CPU (page 2)

Errors on the CPU				
CPU - indication	Type of indication	Error description for Service technician, possible causes	Possible causes	Possible remedies
A	blinking	"CONFIG" Programming Error, HC11 is defective, CPU is defective	CPU is defective	Change CPU
b	blinking	Bus-Controller-Error, common memory card in power supply unit is missing, component group carrier erroneous	Power supply unit is defective, common memory card or CPU is defective	Check Common memory card, check power supply unit, check CPU
C	blinking	HC11 Hardware Error, AD converter is defective, CPU is defective	CPU is defective	Check CPU
d	blinking	Firmware Loader Error	Program memory card is defective or wrong version of software Possibly CPU is defective	Change program memory card or software Change CPU
F	blinking	Wrong EPROM-Type (P = Program EPROM = E0, T = Chart EPROM = E1) (1. letter in directory) EPROM interchanged or defective, program memory card interchanged or defective	Program memory card wrong or defective, CPU is defective	Check program memory card, check CPU

Chart: Other system errors

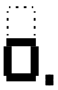
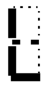
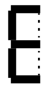
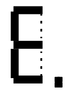
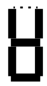
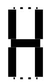
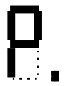
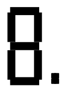
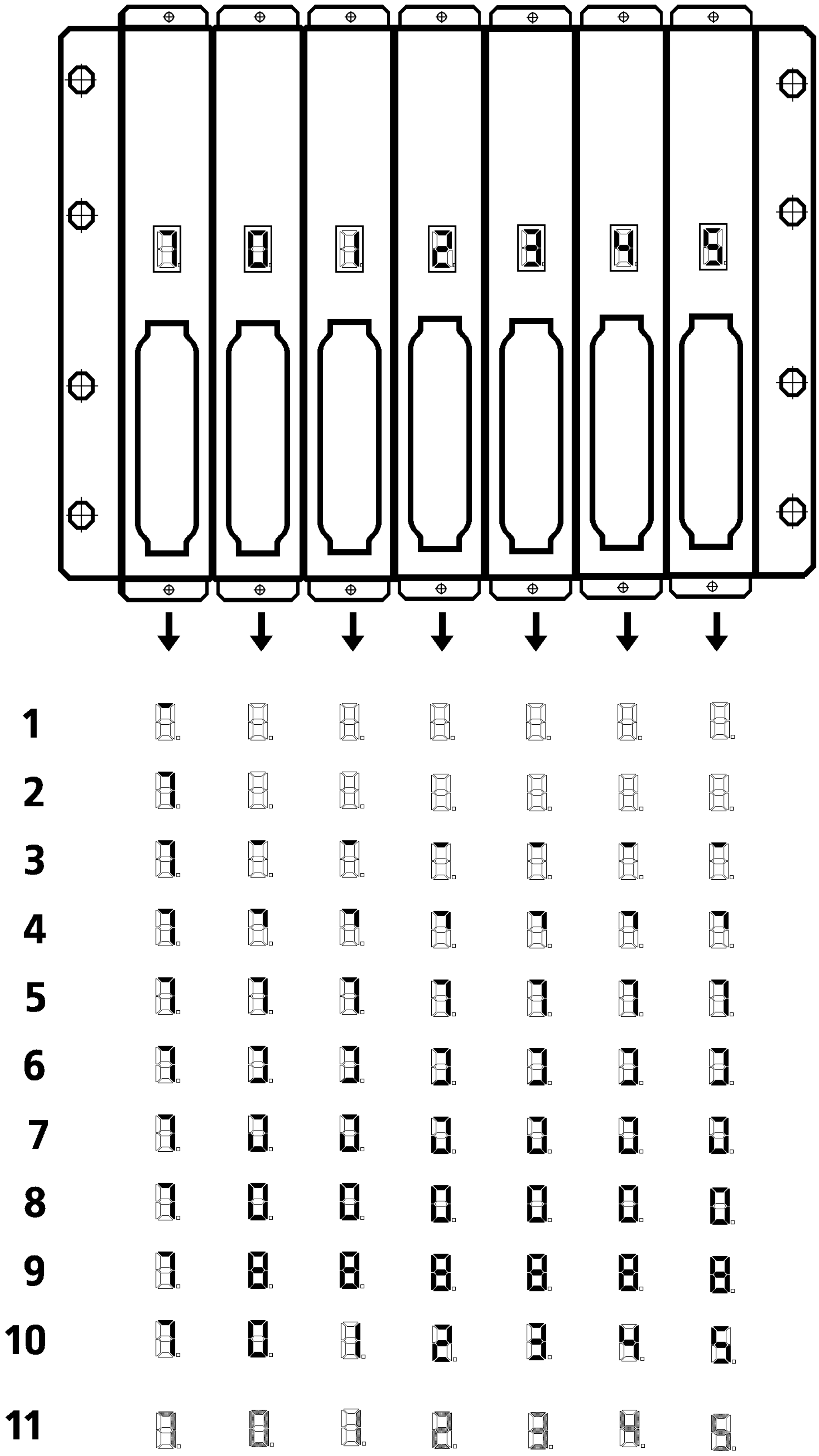
Other system errors				
CPU indicator	Type of indicator	Error description for Service technician, possible causes	Possible causes	Possible remedy
	static	Watchdog occurred + Global-Reset	Program run error, CPU is defective	Check CPU
	static	recursive error PPI-Bus-Driver + Global Reset (possibly Interrupt logic is defective)	Program run error, system overload CPU is defective	Check CPU, check power supply unit
	static	Clock Monitor Fail + Global Reset, Oscillator is defective, CPU is defective	CPU is defective	Check CPU

Chart: System conditions

System conditions

CPU indicator	Type of indicator	Error description for Service technician, possible causes	Possible causes	Possible remedy
	temporary	Firmware is being loaded **Note:** the center segment is blinking.	Occurs during the first start, new TMS-Software is being loaded.	Status indication
	static	FATAL SYSTEM-ERROR occurred (CPU ≠ 0)	Error is shown on the monitor	See error description for test system
	static	FATAL SYSTEM-ERROR occurred + Global-Reset (CPU = 0)	Error is shown on the monitor	See error description for test system
	blinking	No monitor connected to CPU	Monitor is defective, line is defective, CPU is defective	Check monitor, check line, check, CPU
	blinking	T×D / R×D short circuited (monitor line test with short circuit plug)	Indication only for monitor line test	-
	temporär	CPU0 has recognized "Steuerung AUS (Control OFF)" (from NT P) and has saved data, then shut down system.	Indicator stops, power supply unit error	Replace power supply unit or CPU0
	static	Error function of CPU	Hardware is defective	Replace program memory card or CPU



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2.3.4 Localizing and fixing basic component group errors (=clear power supply unit errors, initialization and system errors)

If one of these errors occurs during the start of the LICCON or during operation (indicated as described in paragraph 2.3.1 - 2.3.3), then note the following:

- The indicated error can be caused by a defective or bad contact or by fluctuations in the power supply and therefore might occur only for a short time.
- The error shown on the monitor can be a subsequential error and can also cause subsequential errors which are shown on the CPU displays.

2.3.4.1 Error localization

Proceed as follows:

- Turn the LICCON off and restart it after about 5 seconds.
  Repeat this procedure up to three times (wait for 2 minutes after starting it 3 times).
  If a hardware error was the cause, then it has probably been recognized during the initialization as an initialization error. Initialization errors can only be shown on the monitor if they are found on a CPU, which is connected to a monitor.
- If the same error view appears several times, then turn the LICCON off.
- Open the control box on the slewing platform to monitor the CPU indicators.
- One person must restart the crane from the crane operator's cab and the second person must monitor the CPU indicators for the basic component group in the control box.
  The running nominal condition is shown in the illustration on the left page:
  1. Power supply unit shows a line, the CPU indicators are dark, i.e. the control is turned off.
  2. Power supply unit shows "7", CPUs are dark. This indication is shown when the crane is being turned on.
  3.-9. Power supply unit shows "7". During LICCON boot-up, to indicate the continuing successful self-test, the various segments of the CPU indicators are shown one after the other, see illustration on the left. It is possible that some CPUs, especially whose with monitor might boot up a little slower.
  10. After boot-up, i. e. after the end of the check for initialization errors, each CPU shows the CPU number in its indicator.
  11. The CPU indicator reduces its brightness level immediately to half the previous level. Now starts the test for system errors.

Error diagnostics:

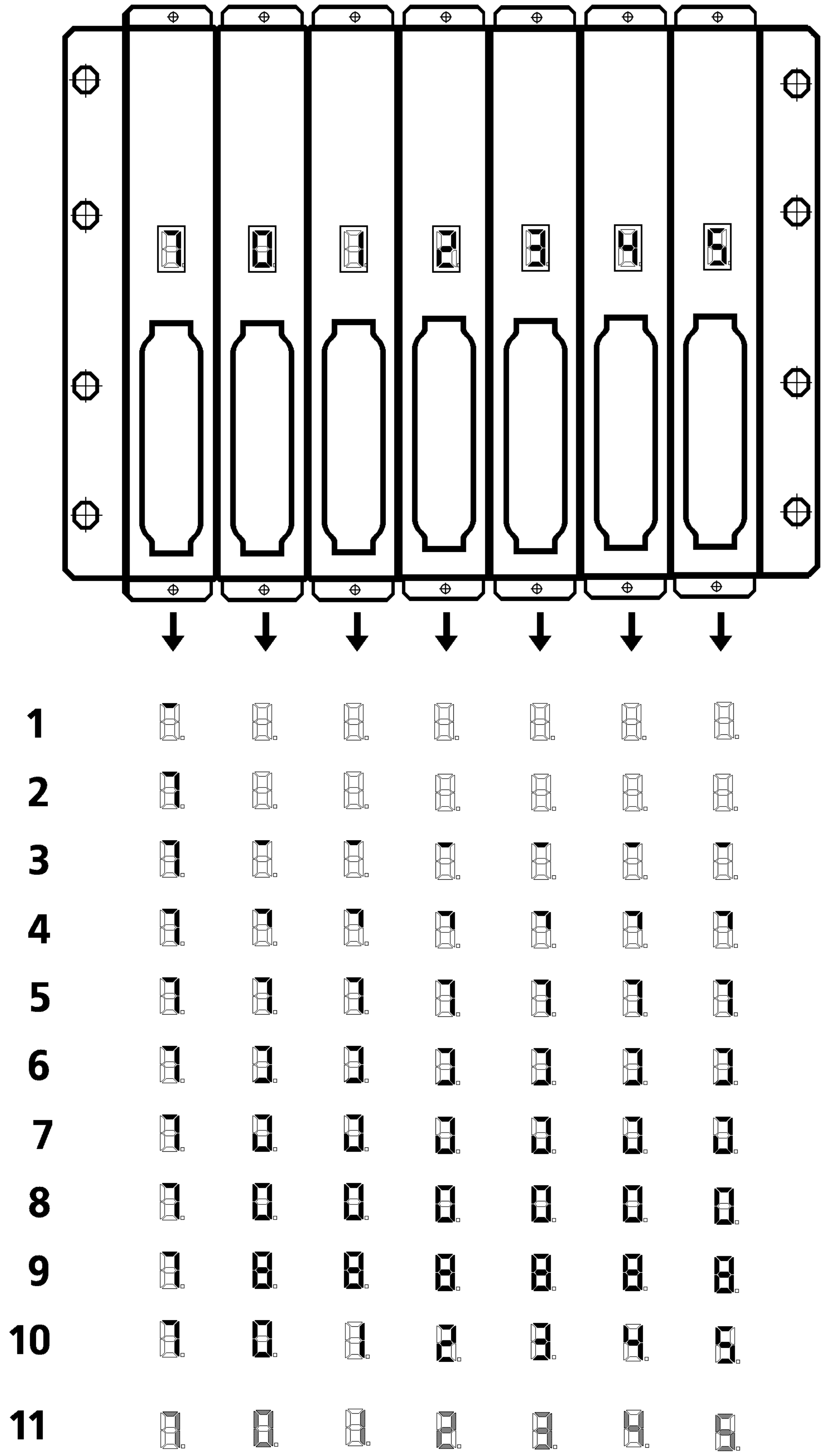
First watch the power supply unit indicator. If the power supply unit indicator does not match the nominal indication, then there is probably a **clear power supply unit error**.

If the power supply unit does not show a "7", then there is probably a power supply unit error. → check power supply for LICCON computer system,
→ check power supply unit, see description in paragraph 2.3.4.2.

If the power supply unit shows a "7" and the CPU indicators all remain dark, then there might be an error on a CPU or program memory card in this group,
→ check all CPUs, see description in paragraph 2.3.4.3.

If the power supply unit shows a "7" and one CPU indicator remains dark, then there might be an error on this CPU or its program memory card.
→ check all CPUs, see description in paragraph 2.3.4.3.

The following applies in general: The CPU, which deviates first from the nominal indicator sequence has found the error. It is probable that the error (hardware, software, inputs, outputs) is at this CPU.


1
2
3
4
5
6
7
8
9
10
11
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If the first CPU indicator which deviates from the nominal condition is noted before the end of the boot-up period, i.e. if this indication occurs before all CPUs show their CPU number for the first time (= condition No. 10), then an **initialization error** has occurred. This first CPU indicator which deviates from the nominal condition is a blinking sign, as shown in paragraph 2.3.2 in the chart. Possible measure to fix the error are listed in the Initialization error chart in paragraph 2.3.2.

If the first CPU indicator which deviates from the nominal condition does not show up until the boot-up period is finished, i.e. if this indication is shown after all CPUs have shown their CPU number for the first time (condition No. 9), then a **system error** has occurred.

If the first CPU indicator, which deviates from the nominal condition is a static "E", as shown in the chart in paragraph 2.3.3.1, then the error is a fatal system error. Possible measure to fix the error are listed in the fatal system error chart (FATAL SYSTEM ERROR) in paragraph 2.3.3.1.

If the first CPU indicator, which deviates from the nominal condition is a static or blinking sign, as shown in the chart in paragraph 2.3.3.1, then the error is "another system error". Possible measure to fix the error are listed in the chart. The measures are described in detail below.

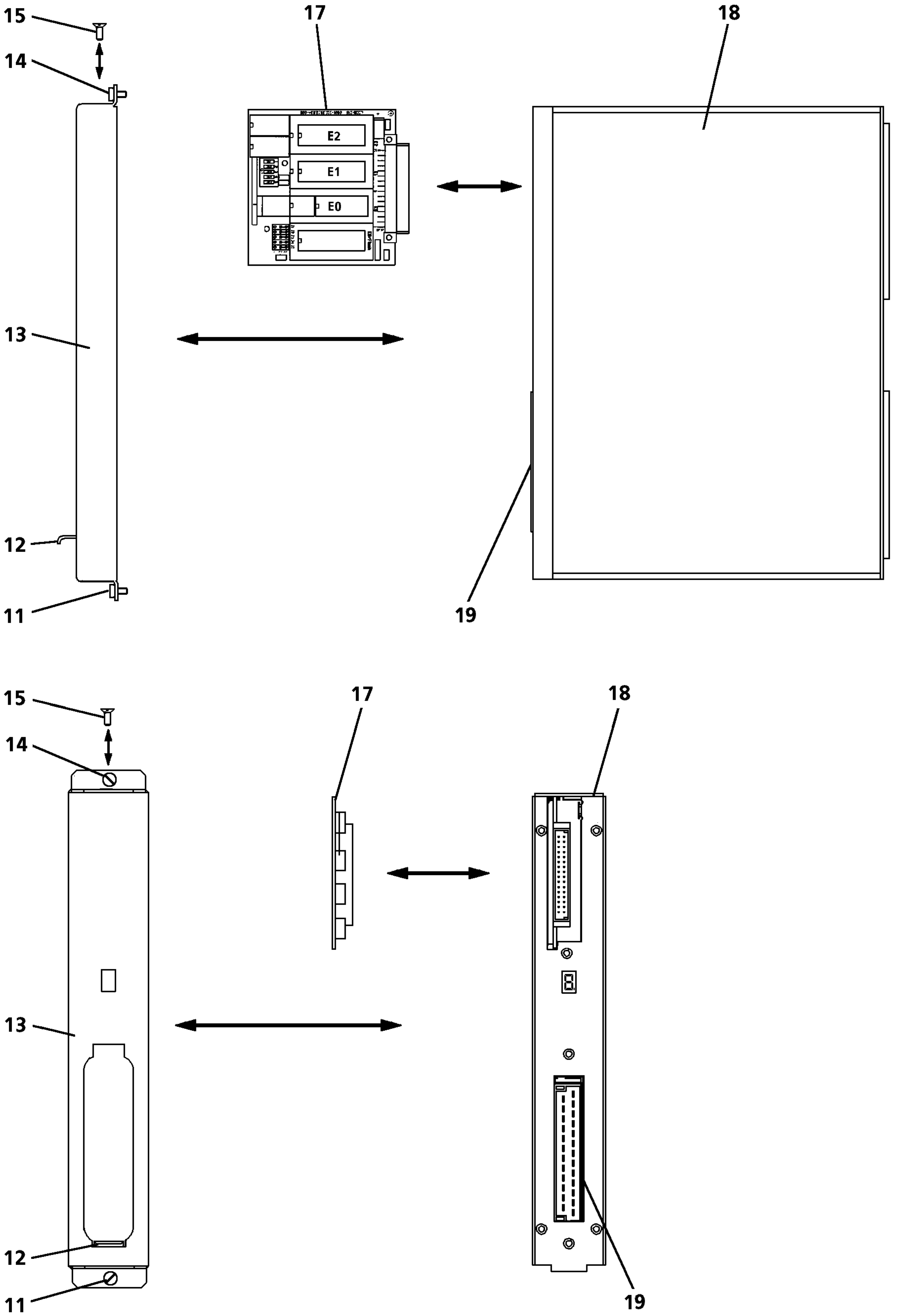
Due to the complexity of the system, the error causes and remedies listed in the charts cannot be complete. The charts will give the crane operator some clues, so he might be able to fix the crane without outside help if the problem is not severe.

The terms used in the charts have the following meanings:

Program run error: The program run (execution) has failed due to an error.

System overload: Due to an error, the maximum permissible times for the program execution, data transfer, etc. cannot be adhered to.

Note: In case of each clear power supply unit error, initialization error or system error, you must notify LIEBHERR service about the error indication, even if the crane operator was able to fix the crane without outside help.



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2.3.4.2 Check power supply unit

The illustration on the left shows the power supply unit when removed. The upper illustration shows the side view, the lower illustration shows the top view.
The power supply unit can be easily checked and replaced by the crane operator with simple tools.
When checking the power supply unit,proceed as follows:

- Turn the crane off,

check, if the power supply unit (8) and the inserted common memory card (7) are tightly inserted. To do so, remove and reinstall the corresponding power supply unit, as well as the common memory card (7) (=Check common memory card):

Remove the power supply unit
- Pull the plug for the power supply unit from the connector plug (9). To do so, use a screw driver and lightly push down the locking springs (2) on the front cap (3) to unlock the connector and pull the plug out at the same time.
- Unscrew the two screws (1) and (4). The screws remain on the front cap (3).
- Pull out the power supply unit insert (power supply unit with front cap and common memory card).
- Loosen the screw (5) on the front cap (3) of the power supply unit and remove the front cap. (The front cap (3) is attached on the bottom of the power supply unit (8).
- Pull out the common memory card (7) by the retainer (6) from the power supply unit (8).

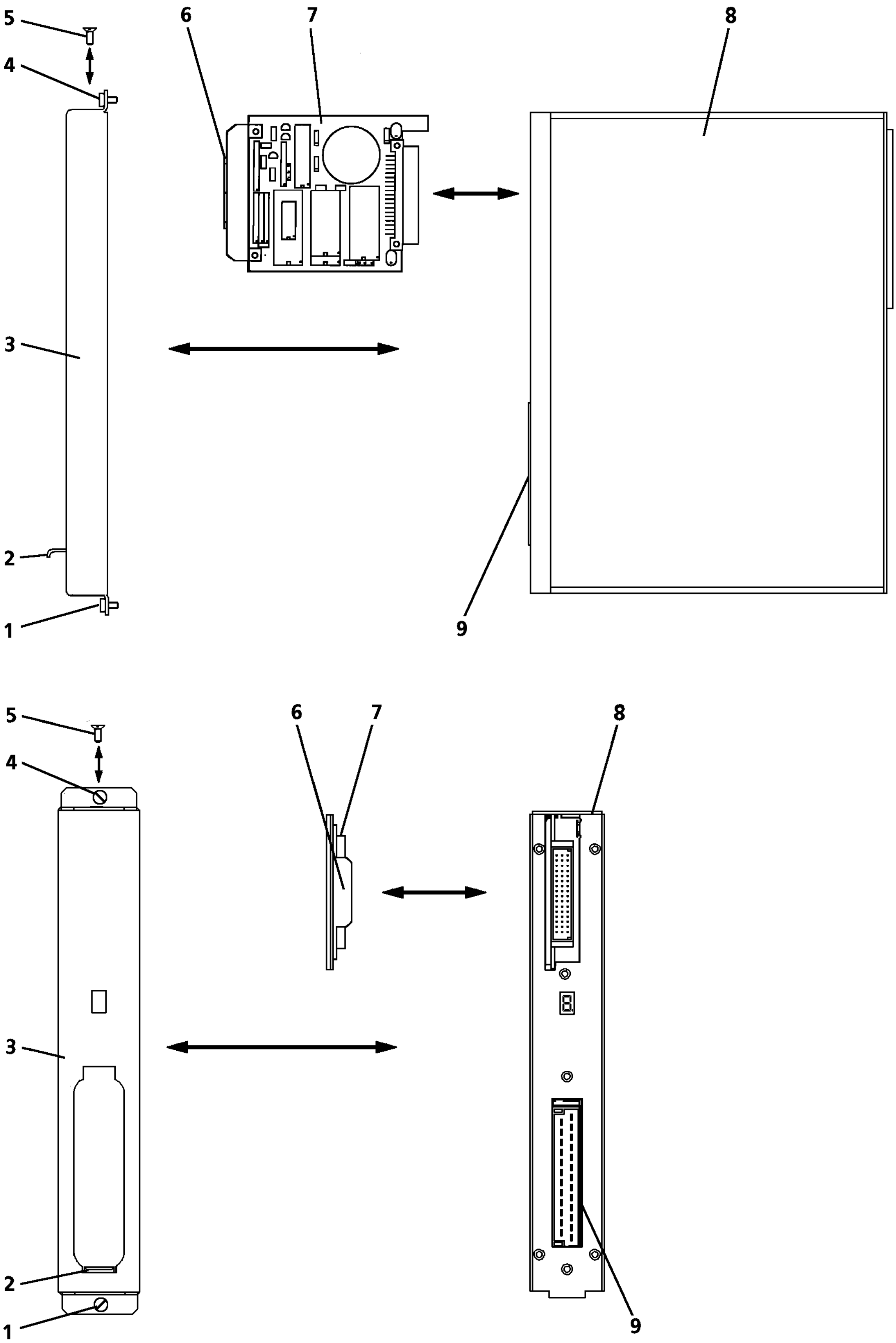
Reinstall the power supply unit
- Hold the common memory card (7) by the retainer (6), push it into the power supply unit (8), push it in lightly at first, then all the way to the stop.
- Install the front cap (3): Attach the front cap on the bottom on the power supply unit (8) and attach with the screw (5) on top on the power supply unit.
- Push in the power supply unit insert into the basic component group carrier, push it in lightly at first, then all the way to the stop.
- Attach the power supply unit insert with screws (1) and (4) on the front cap (3) to the basic component group carrier.
- Insert the power supply unit plug on the connector plug (9). Make sure that the plug locking spring (2) engages and holds the plug in place.
- Start the crane and check if the error occurs again.

If the previous error occurs again, then replace the old power supply unit with a spare power supply unit :

Remove the power supply unit (as described above)

Install the power supply unit
- Hold the common memory card (7) by the retainer (6), push it in the new power supply unit (8), push it in lightly at first, then all the way to the stop.
- Install this power supply unit into the basic component group carrier as described above.

CAUTION: **When pulling the plug for the power supply unit from the connector plug (9), the stand-by-power supply for the component group is interrupted. This means, a cold boot is carried out. The stored equipment configuration data and settings will be lost.**
When pushing in the common memory card and the power supply unit, make sure that the connector plugs are not damaged. Push them in lightly at first, then all the way to the stop.
When plugging in the plug for the power supply unit into the plug connection (9), make sure the locking pin (2) engages and holds the plug in place.



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2.3.4.3 Check the central processing unit (CPU)

The illustration on the left shows a CPU when it is removed. The top illustration is a side view, the bottom illustration shows the view onto the control box. The CPU can be easily checked and replaced by the crane operator with simple tools.
To check the CPU, proceed as follows:

- Turn the crane off,

Check, if the CPU (18) and the inserted program memory card (17) are pushed in tightly. To do so, remove and reinsert the corresponding CPU as well as the program memory card (17) (= check program memory card) :

Remove the CPU
- Pull the output plug on the connector plug (19). To do so, use a screw driver and lightly push down the locking springs (12) on the front cap (13) to unlock the connector and pull the plug out at the same time.
- Unscrew 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 card).
- Loosen 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 card (17) from the CPU (18).

Reinstall the CPU
- Push the program memory card (17) into the CPU (18), push it in lightly at first, then all the way to the stop.
- Install the front cap (13): Attach the front cap on the bottom on the CPU (18) and attach with the screw (15) on top on the CPU.
- Push in the CPU insert into the basic component group carrier, push it in lightly at first, then all the way to the stop.
- Attach the CPU insert with screws (11) and (14) on the front cap (13) to the basic component group carrier.
- Insert the output plug on the connector plug (19). Make sure that the plug locking spring (12) engages and holds the plug in place.
- Start the crane and check if the error occurs again.

If the previous error occurs again, then replace the old CPUwith a spare unit :

Remove the CPU (as described above)
Install the CPU
- Push the program memory card (17) into the new CPU (18), push it in lightly at first, then all the way to the stop.
- Install this CPU into the basic component group carrier as described above.

CAUTION: **When pulling the CPU from the component group carrier, the stand-by-power supply for the CPU is interrupted. This means, a cold boot is carried out for this CPU. The equipment configuration data and settings stored on this CPU will be lost. The values must be reset.**
When pushing in the program memory card and the CPU, make sure that the connector plugs are not damaged. Push them in lightly at first, then all the way to the stop.
When plugging in the output plug into the plug connection (19), make sure the locking pin (12) engages and holds the plug in place.

2.4 Application errors

Application errors are errors, which can occur during crane operation due to incomplete crane assembly, erroneous operation and external influences.

The application errors shown on the monitor can be differentiated as follows:

1. Application errors **without** error number
2. Application errors **with** error number

Errors which occur during crane operation are differentiated as follows:

a) Errors, which **cause shut down**.
The shut down is always shown via the shut down symbol.

b) Errors, which **do not cause shut down**.
In this case, the crane operator receives a warning signal.

2.4.1 Application errors without LICCON ErrorCode

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 start of the LICCON system after data loss in the battery supported data memory bank of the CPU(s).

This loss of data on a CPU occurs,

- if the CPU is pulled from the basic component group,
- if the power supply unit is pulled from the basic component group,
- if the power supply to the LICCON is interrupted (for example, when replacing the battery or when disconnecting the electrical connection.)

The consequences and signs for data loss are:

- The old equipment configuration setting is lost. The 1st equipment configuration is set in the equipment configuration view.
- The displayed equipment configuration has a reeving of "0".
- The increment counter for the affected CPUs are set to "0". This causes a loss of the absolute winch path measurement and the current angle radius.

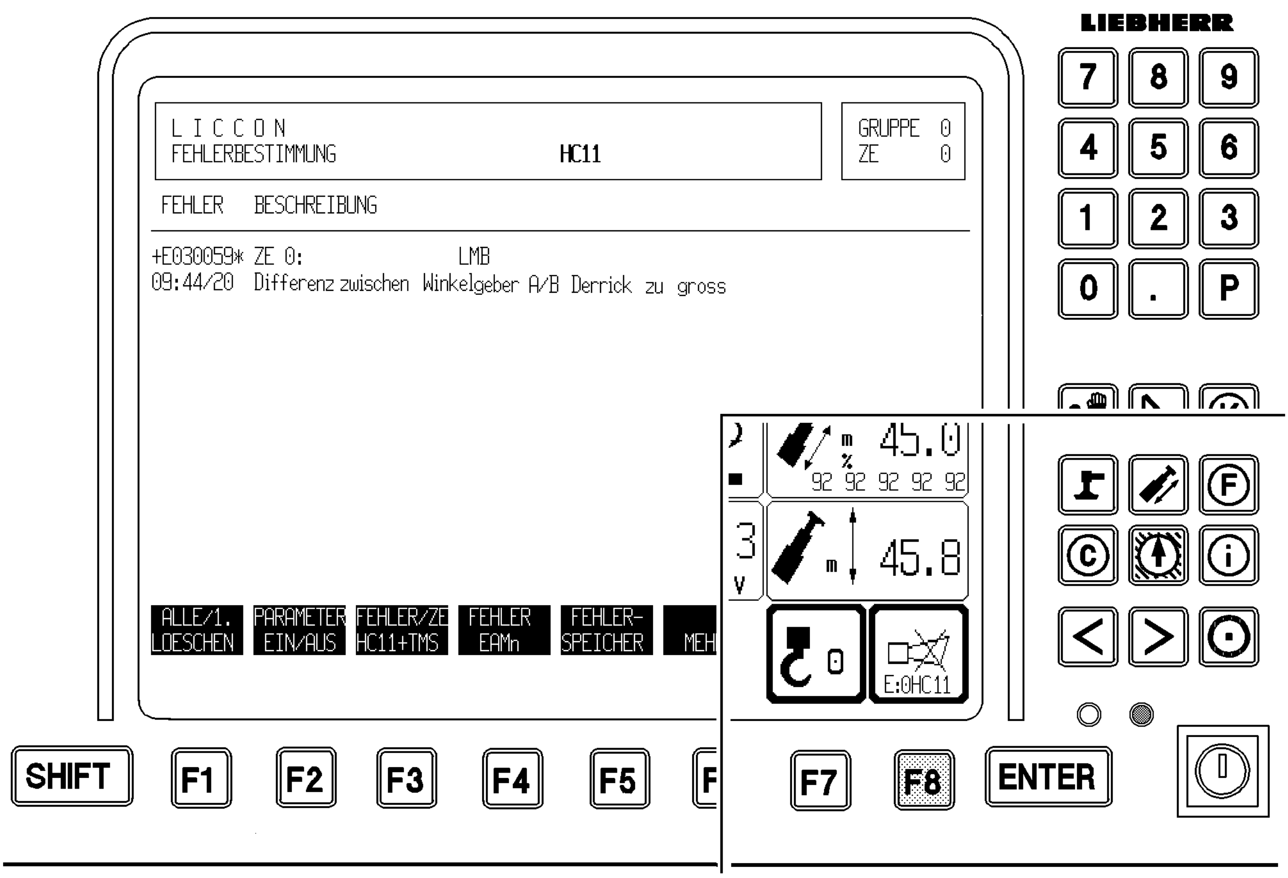
Note: The winch indication is running, but it is wrong!

The following measures must be carried out in case of cold start data loss:

- Ensure power supply for all power supply units and CPUs.
- Reset lost parameters in the "Equipment configuration set up" and "Control Parameter" programs.
- Readjust the winches.
(Run against the "bottom" spindle limit switch.

C A U T I O N : There are three dangerous operating conditions, indicated though a blinking symbol, but without Liebherr error code (LEC).
- overload ⇒ LICCON turns off
- hoist limit switch was actuated ⇒ LICCON turns off
- max. permissible wind speed has been exceeded ⇒ LICCON does not turn off
(see description in the chart)

LEC	Error description	Possible cause	Possible remedy
without LEC	Overload -STOP- Symbol blinks-	The permissible "maximum load according to the load capacity chart and reeving" for the corresponding equipment configuration and operating condition has been exceeded.	Taking care of the overload condition depends on how the overload was created and must be evaluated by the crane operator on a case by case basis. Generally, to bypass the overload safety device, only the opposing crane movement may be carried out, which caused the overload shut off. Some measures are: a) Set down load with hoist gear. b) through an additional switch on the left armrest, luffing up may be permitted to reduce the load momentum. **There is a danger of accidents!**
without LEC	Hoist limit switch was actuated -Hoist limit switch symbol blinks-	The hook block has raised the hoist limit switch weight and actuated the hoist limit switch.	On the affected winch, lower the hoist gear until the hook block is no longer in contact with the hoist limit switch weight. The hook block must be monitored carefully. It must be ensured that the hook block will not move further upward. **There is a danger of accidents!**
without LEC	Wind sensor symbol blinks	The max. permissible wind speed has been exceeded	If possible, set an operating mode or an equipment configuration which has a more favorable load capacity chart, otherwise stop crane operation. Take down the crane, if necessary. **There is a danger of accidents!**


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG
HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E030059* ZE 0: LMB
09:44/20 Differenz zwischen Winkelgeber A/B Derrick zu gross
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
MEH
45.0
92 92 92 92 92
45.8
E:0HC11
SHIFT
F1
F2
F3
F4
F5
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P

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2.4.2 Application errors with Liebherr Error Code

Note: See also paragraph 3.5, LICCON error determination.

Application errors are shown in the "operating view" and in the "telescoping ", "support" program with an error message, dynamically. In addition, an acoustical signal can be heard.

- Press function key "F8" 1x ⇒ Turn acoustical signal off!
- Press function key "F8" 2x ⇒ Change automatically into the error determination view, in the "Test system" program. The application error is shown in the Liebherr Error Code (LEC) as a message.

The functions of the following sensors are being monitored:
- Hoist limit switch
- Angle sensor
- Pressure sensor
- Length sensor

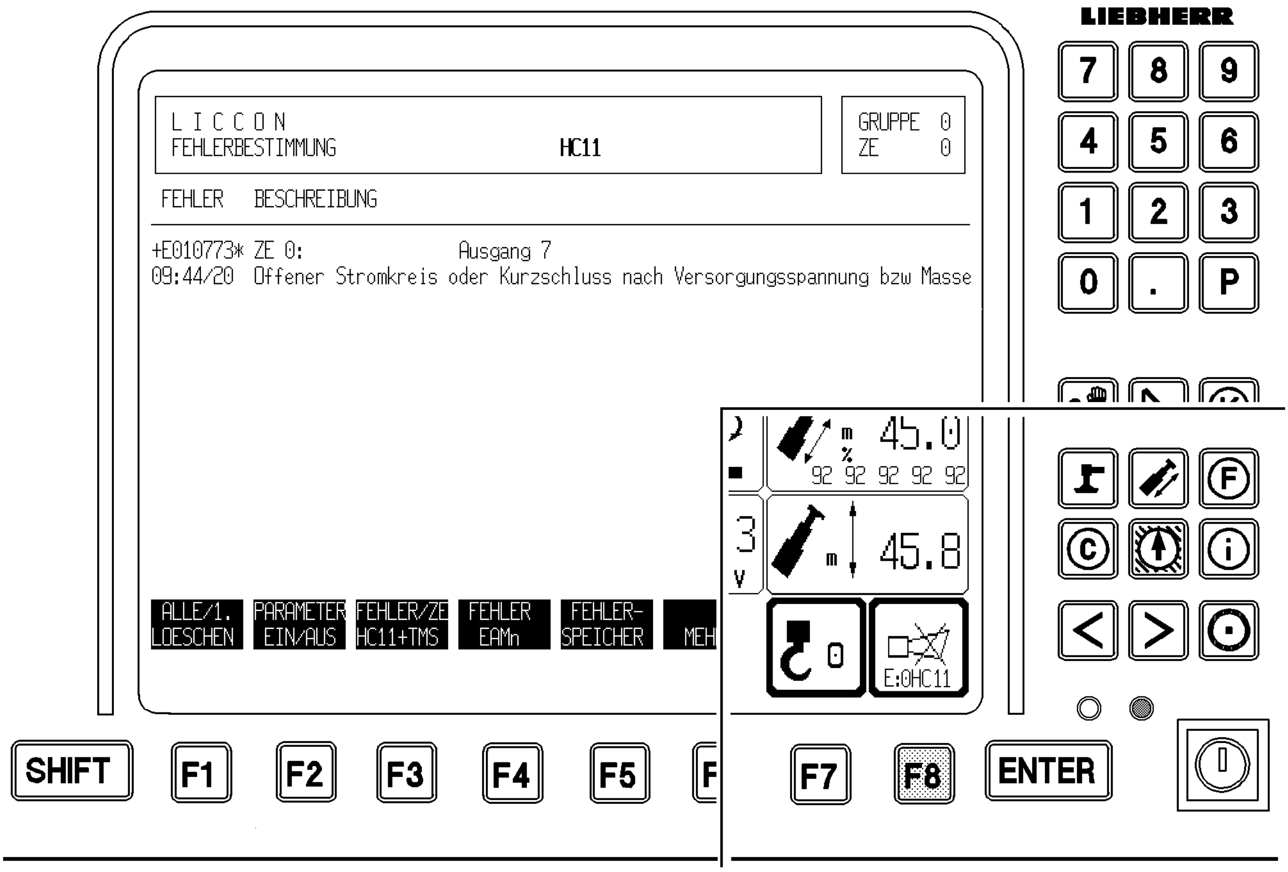
The limits of the sensor are monitored for the following limit errors:
- Broken wires
- Short circuit against ground
- Short circuit against +24 Volt (supply voltage)

The following types of application errors are differentiated:
- Error due to a technical defect
- Error due to crane operation
- Error due to external influences

Note: The higher the Liebherr Error Code for an LML error (4th, 5th and 6th digit), the higher the danger is usually.

$0 < LEC < 64$ ⇒ no LML shut off, actual value calculation
$64 \leq LEC$ ⇒ LML shut off = shut off of movements which increase the load momentum.

Valid only for LML error !


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
09:44/20 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER- SPEICHER
45.0
92 92 92 92 92
45.8
E:0HC11
SHIFT
F1
F2
F3
F4
F5
F7
F8
ENTER

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2.5 System errors

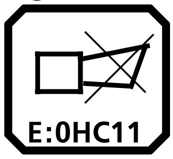
Note: See also paragraph 3.5, LICCON error determination.

2.5.1 Superstructure

Active system errors

System errors are shown dynamically in the "Operation ", "Telescopingn", "Support" program with an error message. In addition, an acoustical signal can be heard..

Example: System error OW



- Press function key "F8" 1x ⇒ Turn acoustical signal off.
- Press function key "F8" 2x ⇒ Change automatically into the error determination view, in the "Test system" program. The system error is shown in the Liebherr Error Code (LEC) as a message (documentary).

Example: Active system error OW +E010773

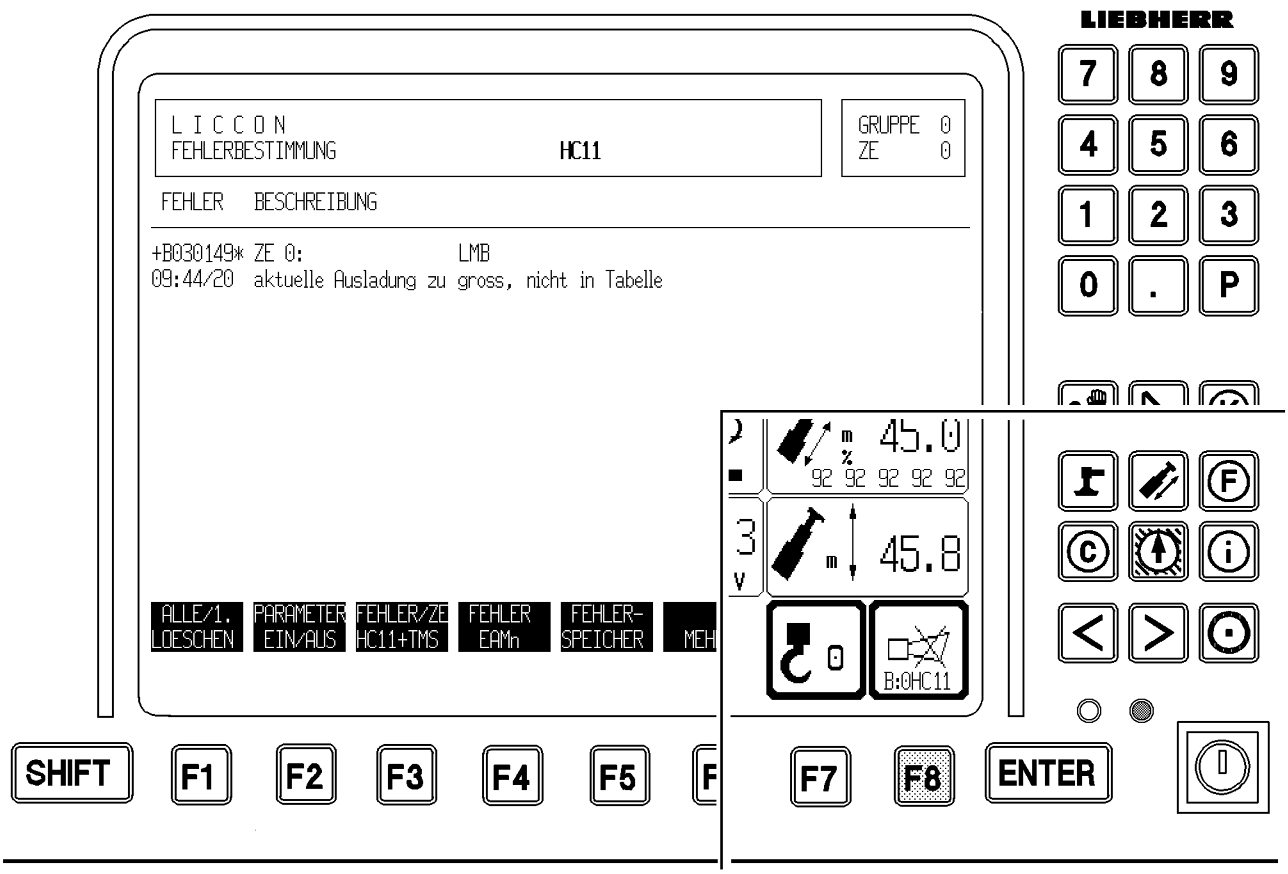
Note: Only active engine and gear errors are classified and shown as system errors.

2.5.2 Inactive system errors

Inactive errors can be shown with function key "F2" in the sub program PARAMETER ON . They are marked with "– ".

Example: inactive system error OW – E010773

Note: When the igition is turned off, all inactive errors in the local error stack are deleted.


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG
HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+B030149* ZE 0: LMB
09:44/20 aktuelle Ausladung zu gross, nicht in Tabelle
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER- SPEICHER
45.0
92 92 92 92 92
45.8
B:0HC11
SHIFT
F1
F2
F3
F4
F5
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P

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2.6 Control errors

Note: See also paragraph 3.5, LICCON error determination .

2.6.1 Control errors in the "Operation" , "Support" program

Control errors are shown dynamically in the "Operation ", "Telescoping "and "Support" program with an error message (dynamically). In addition, an acoustical signal can be heard.

- Press the function key "F8" 1x ⇒ Turn the acoustical signal off.
- Press the function key "F8" 2x ⇒ Change automatically into the error determination view, in the "Test system" program. The control error is shown in the Liebherr Error Code (LEC) as a message.

Note: When pressing the "F8"-key to change into the error determination view, the control error is always on top in the error stack.

If several control errors exist on different CPU's, I/O modules, press the "F8" key to change into the error determination view and to show the error(s) with the lowest CPU number or I/O module number.

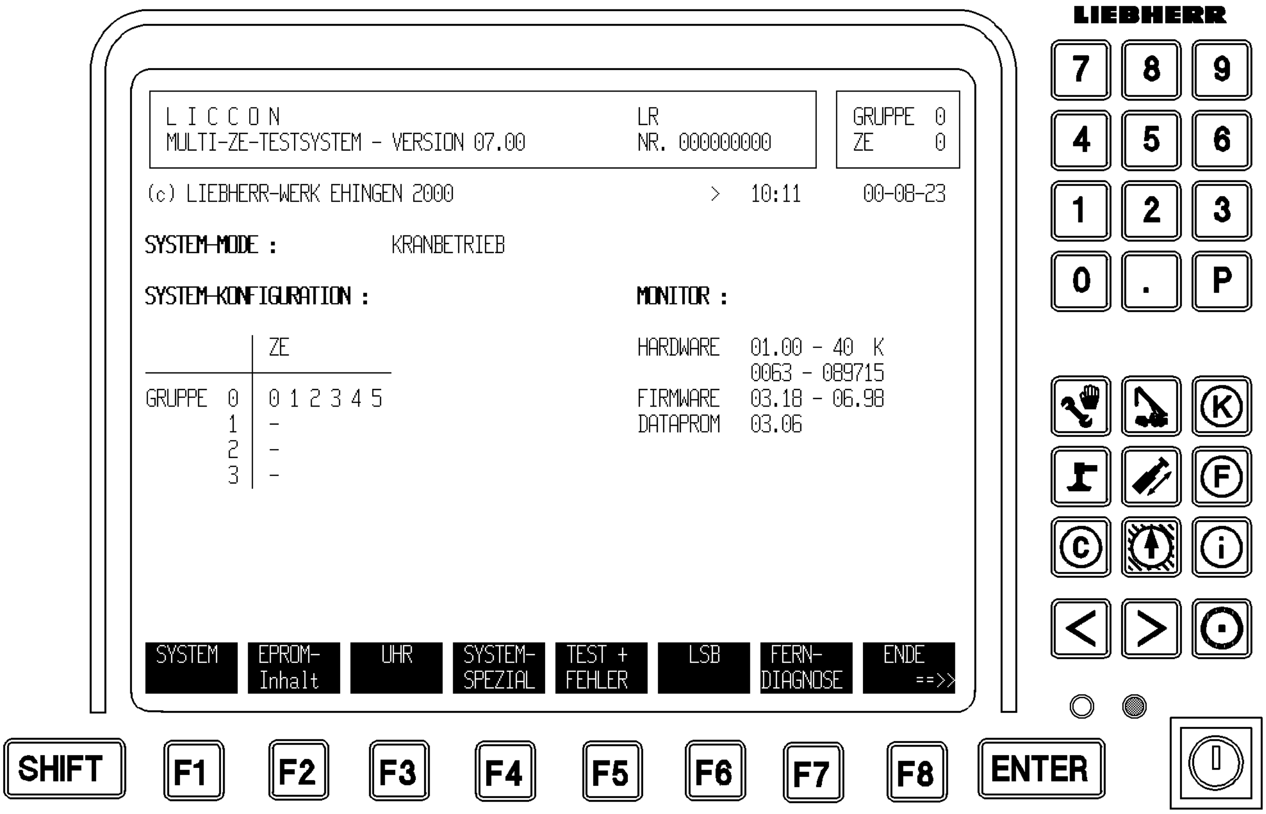
In case several control errors have occured, to be able to determine why a crane function is not functioning, change to that CPU in the error determination view, where the corresponding crane function is carried out.

2.6.2 Control error in the "equipment set up" program

In the equipment configuration view, only control errors caused in the "set up" program are shown for approx. 5 seconds. If the function key "F8" is pressed within these 5 seconds, the view changes to the error determination view in the test system .

By pressing the "F8" function key again, you can change back to the initial "set up" program.

Note: You cannot change via the program keys into other LICCON programs, such as crane operation. This is to ensure that the equipment configuration has been entered correctly in the "set up" program, so it can take over the parameters into the "Operation" program.


LIEBHERR
L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 07.00
LR
NR. 000000000
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 2000
> 10:11
00-08-23
SYSTEM-MODE : KRANBETRIEB
SYSTEM-KONFIGURATION :
ZE
GRUPPE 0 0 1 2 3 4 5
1 -
2 -
3 -
MONITOR :
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.06
SYSTEM
EPROM- Inhalt
UHR
SYSTEM- SPEZIAL
TEST + FEHLER
LSB
FERN- DIAGNOSE
ENDE ==>>
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P

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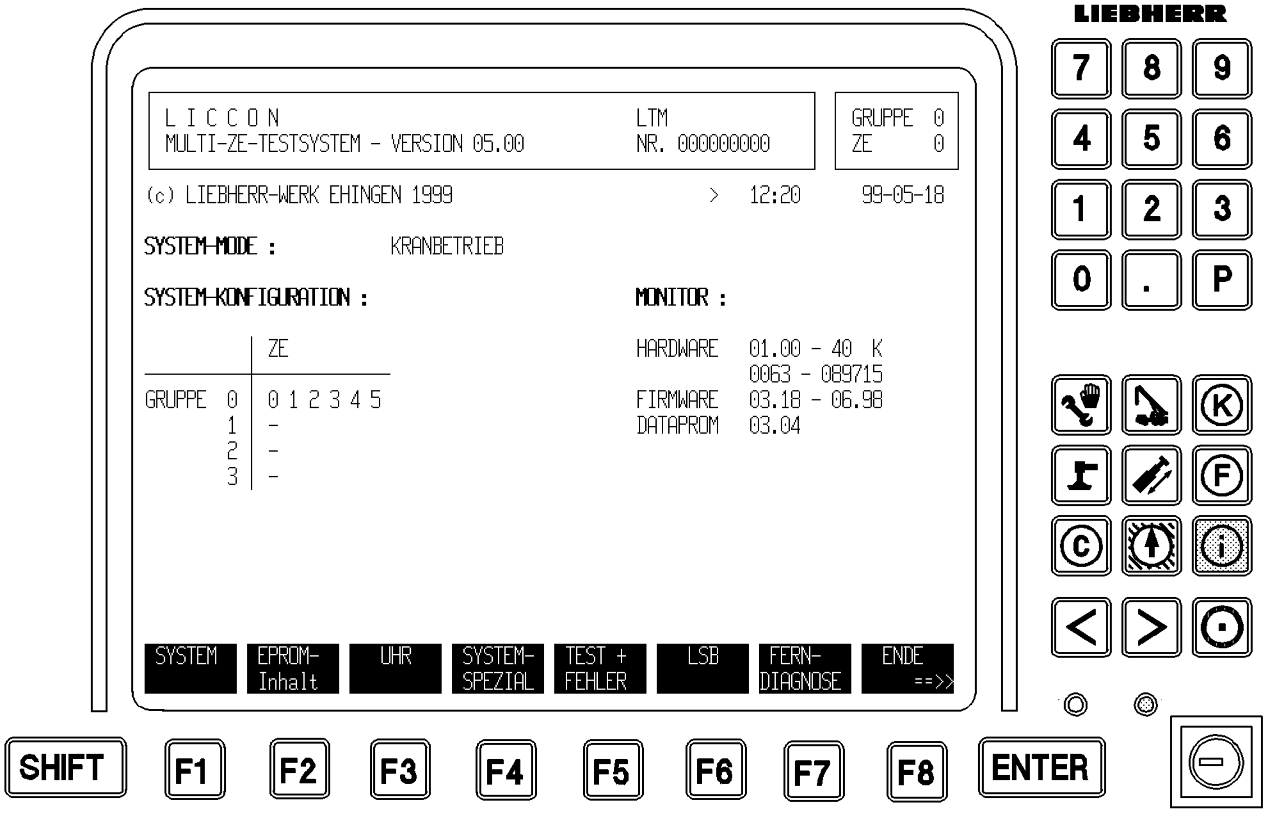
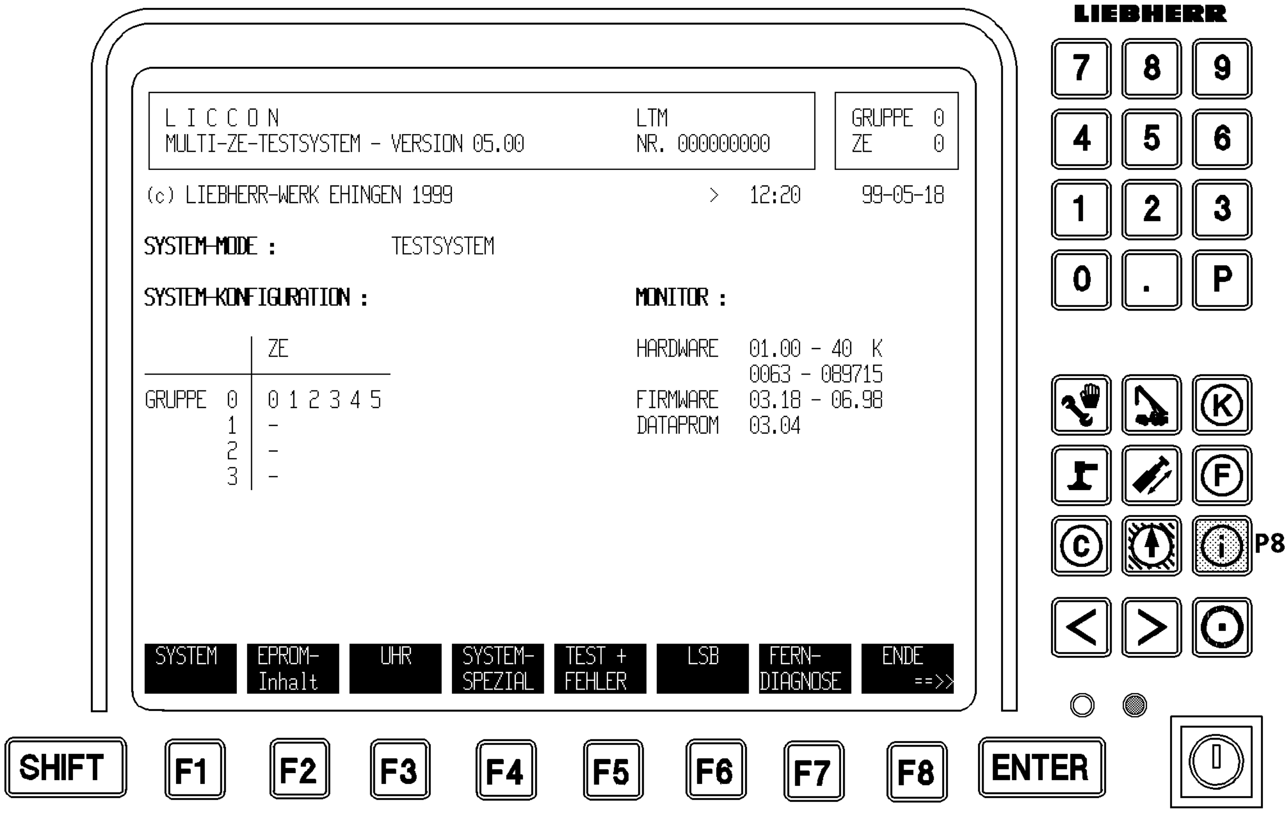
3. Multi CPUTest system

Note: The monitor illustrations in this chapter are only examples! The numeric values and crane configurations shown in the individual illustrations might not necessarily match your crane.


LIEBHERR
L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 05.00
LTM
NR. 000000000
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 1999
> 12:20 99-05-18
SYSTEM-MODE : KRANBETRIEB
SYSTEM-KONFIGURATION :
MONITOR :
ZE
GRUPPE 0 0 1 2 3 4 5
1 -
2 -
3 -
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.04
SYSTEM
EPROM- Inhalt
UHR
SYSTEM- SPEZIAL
TEST + FEHLER
LSB
FERN- DIAGNOSE
ENDE ==>>
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P
K
F
C


LIEBHERR
L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 05.00
LTM
NR. 000000000
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 1999
> 12:20 99-05-18
SYSTEM-MODE : TESTSYSTEM
SYSTEM-KONFIGURATION :
MONITOR :
ZE
GRUPPE 0 0 1 2 3 4 5
1 -
2 -
3 -
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.04
SYSTEM
EPROM- Inhalt
UHR
SYSTEM- SPEZIAL
TEST + FEHLER
LSB
FERN- DIAGNOSE
ENDE ==>>
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
P8

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3. Multi CPU Test system

The Multi CPU Test system is a diagnostics tool, which makes it possible to quickly and simply localize and fix problems on LSB components (Input / output modules, hoist limit switch, length and angle sensor ...).

Note: The monitor illustrations in this chapter are only examples!

C A U T I O N : Some safety relevant functions of the test system can only be utilized by expert personnel, i.e. they are protected to prevent unauthorized use.

3.1 Starting the Multi CPU test systems

The Multi CPU test system can be started either from standard operation (crane operation) in **SYSTEM-MODE: CRANE OPERATION** or during the boot up phase of the LICCON Computer system in **SYSTEM-MODE: TEST SYSTEM** .

3.1.1 Multi CPU test system in crane operation mode

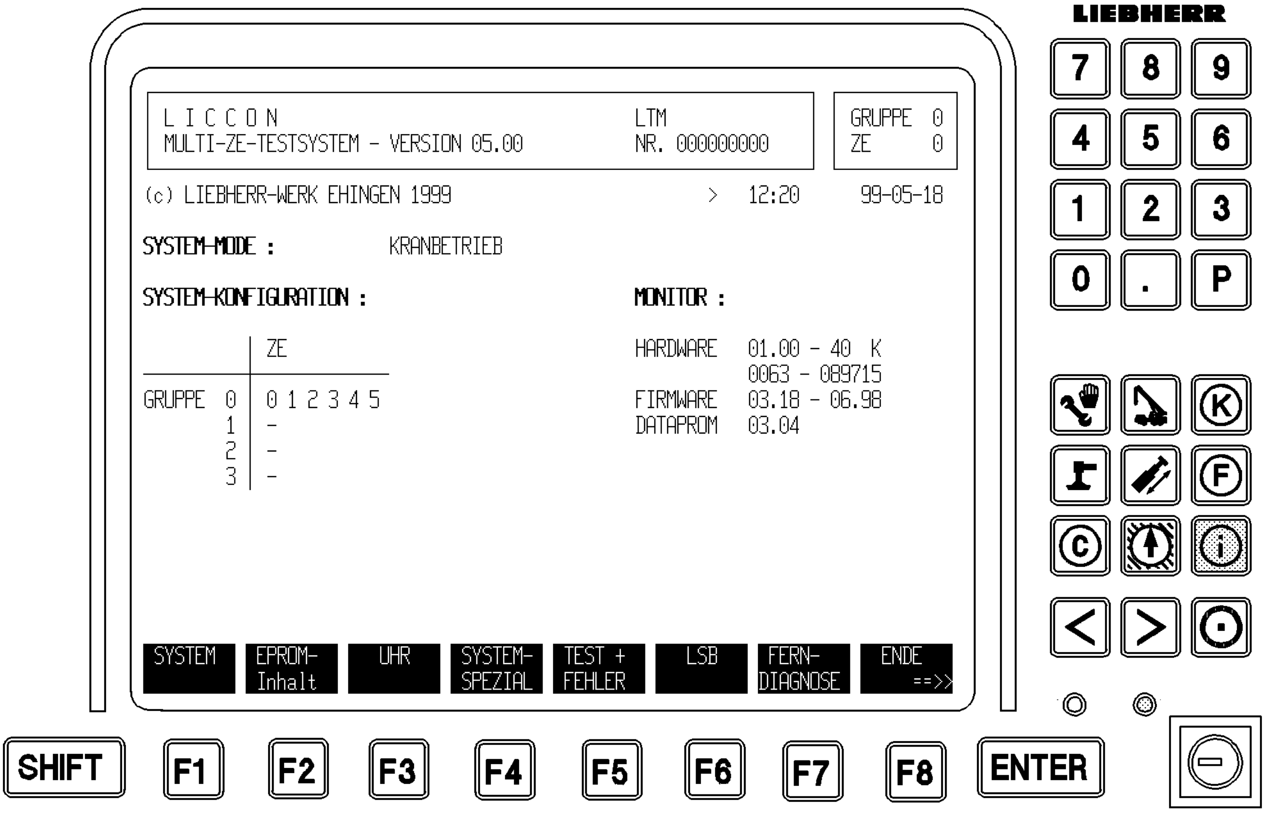
Note: The programs and program execution of the LICCON computer system are not influenced, i. e. the crane remains fully functioning and the control can be checked with the extensive aids of the Multi CPU test system.

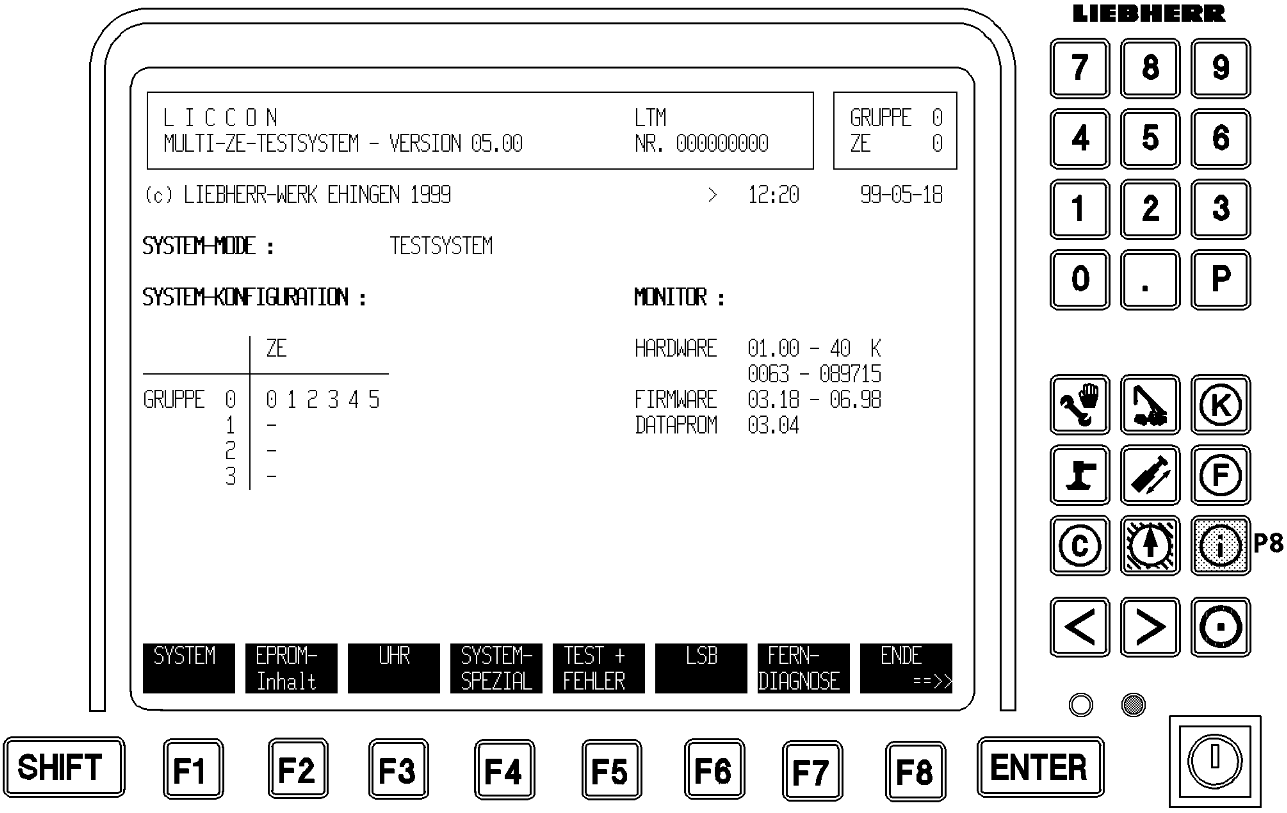
D A N G E R : **In the Multi CPU test system, the LICCON monitor is exclusively used for functions of the test system. No warnings will appear, to alert the operator that the crane is operated within the limit ranges! For that reason, special care must be exercised for crane operation !**

Starting the Multi CPU test systems

- Confirm the operating mode of the crane by pressing the "F8" key.
- Call up the test system by pressing the "P8" (i- key) key.
  The Multi CPU test system is started in

SYSTEM-MODE: CRANE OPERATION


LIEBHERR
L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 05.00
LTM
NR. 000000000
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 1999
> 12:20 99-05-18
SYSTEM-MODE : KRANBETRIEB
SYSTEM-KONFIGURATION :
MONITOR :
ZE
GRUPPE 0 | 0 1 2 3 4 5
1 | -
2 | -
3 | -
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.04
SYSTEM
EPROM- Inhalt
UHR
SYSTEM- SPEZIAL
TEST + FEHLER
LSB
FERN- DIAGNOSE
ENDE ==>>
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P


LIEBHERR
L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 05.00
LTM
NR. 000000000
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 1999
> 12:20 99-05-18
SYSTEM-MODE : TESTSYSTEM
SYSTEM-KONFIGURATION :
MONITOR :
ZE
GRUPPE 0 | 0 1 2 3 4 5
1 | -
2 | -
3 | -
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.04
SYSTEM
EPROM- Inhalt
UHR
SYSTEM- SPEZIAL
TEST + FEHLER
LSB
FERN- DIAGNOSE
ENDE ==>>
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P
P8

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3.1.2 Multi CPU test system in test system mode

Note: Only the programs necessary for the operation of the Multi CPU test system will be started in the LICCON computer program. For safetyreasons, it is not possible to switch from the test system mode into the crane operation mode . The LICCON computer system must be turned off and restarted without pressing the program key "P8" ("i"-key) .

C A U T I O N : The crane is not operational!

Starting the Multi CPU test system
Immediately after turning the LICCON computer system on, an acoustical signal can be heard.
- Press the program key "P8" ("i"-key) for up to (approx. 10 seconds):

SYSTEM - CHECK . . . . PASSED - - O.K. ! !

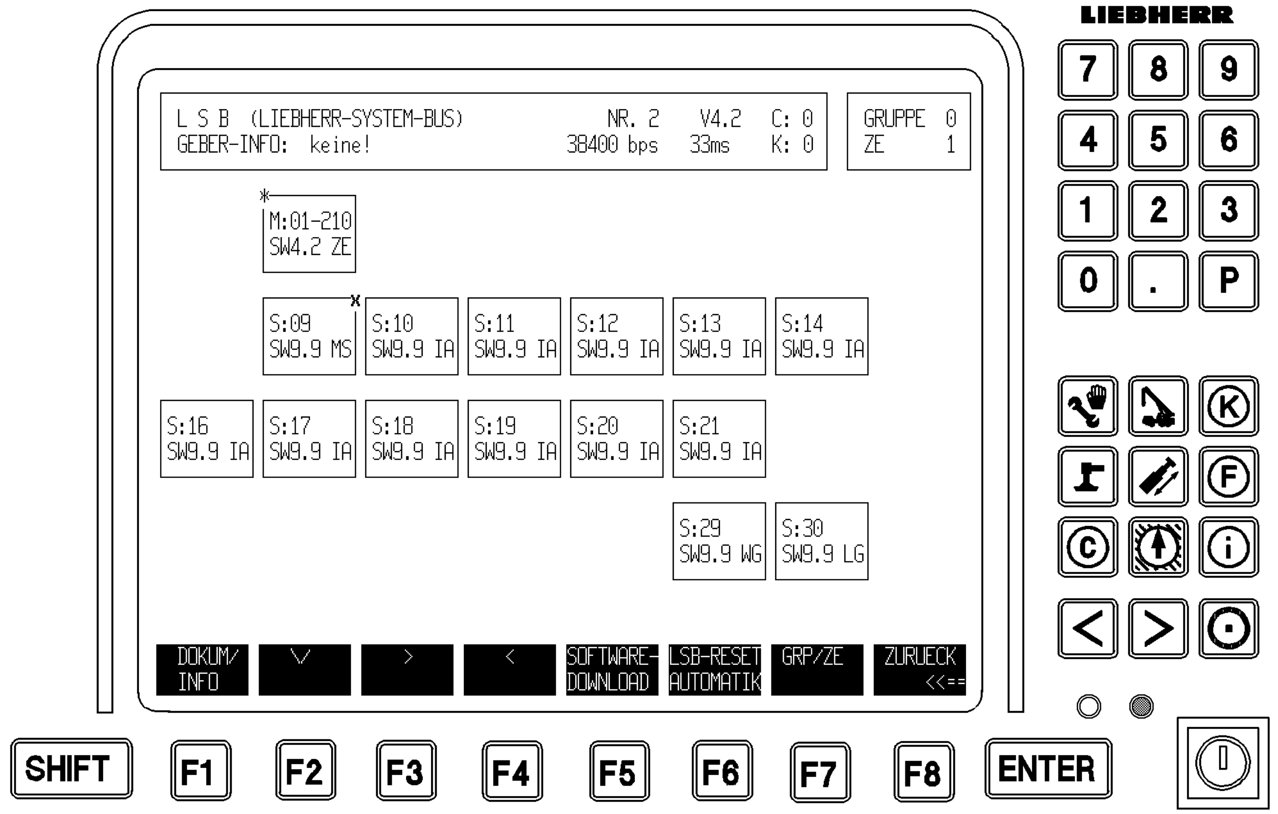
The Multi CPU test system is started in

SYSTEM-MODE: TESTSYSTEM.

3.1.3 Selection of CPU or group

In the upper right selection window, the cursor blinks to point to the selection of the desired CPU.
- By pressing the "ENTER" key, the cursor changes from "ZE (CPU) " to "Gruppe (group)" or vice versa.
- Enter the desired group or CPU from the installed units with the number keys on the alpha-numeric keyboard.

Note: The test system can only check the installed units (group, CPU).


L S B (LIEBHERR-SYSTEM-BUS) NR. 2 V4.2 C: 0
GEBER-INFO: keine! 38400 bps 33ms K: 0
GRUPPE 0
ZE 1
M:01-210
SW4.2 ZE
S:09 SW9.9 MS
S:10 SW9.9 IA
S:11 SW9.9 IA
S:12 SW9.9 IA
S:13 SW9.9 IA
S:14 SW9.9 IA
S:16 SW9.9 IA
S:17 SW9.9 IA
S:18 SW9.9 IA
S:19 SW9.9 IA
S:20 SW9.9 IA
S:21 SW9.9 IA
S:29 SW9.9 WG
S:30 SW9.9 LG
DOKUM/ INFO
SOFTWARE- DOWNLOAD
LSB-RESET AUTOMATIK
GRP/ZE
ZURUECK
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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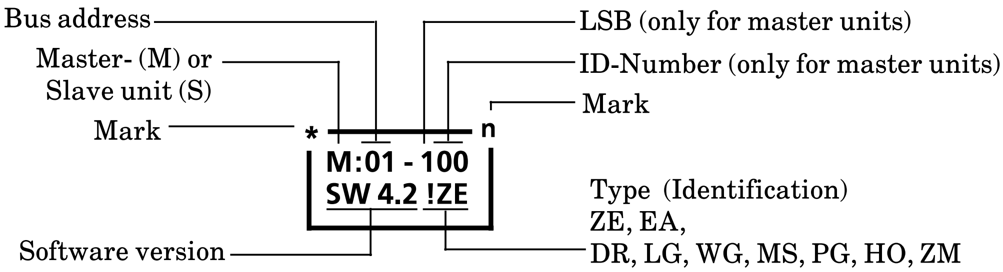
3.2 LSB overview

3.2.1 Graphic LSB overview

In the overview of the selected CPU, all LSB components, which are on the "Liebherr-System-Bus" (LSB) are shown.

- Call up LSB overview with function key "F6" (**LSB**).

A "box" is assigned to each individual participant, which containss the most important data and a symbolic mark.



Information

The information for the individual LSB components is set up as follows:

M:02 116	⇒	**M**aster unit - Bus address **01** - LSB**1** - Identification **16** (EAM1)
SW4.2 EA	⇒	Software version 4.2 (LSB driver) - Identification **EA**
S:23	⇒	**S**lave unit - Bus address **23**
SW4.2 HO	⇒	**S**oftware version **4.2** (LSB driver) - Identification **H**oist-**Top**
or:		
SW:4.2!HO	⇒	**S**oftware version **4.2** (LSB driver) - Identification **H**oist-**Top** "!" = Type sign Nominal / actual deviates
or:		
SW:4.2!??	⇒	**S**oftware version **4.2** (LSB driver) "!" = Type sign Nominal / actual deviates "??" = Invalid type

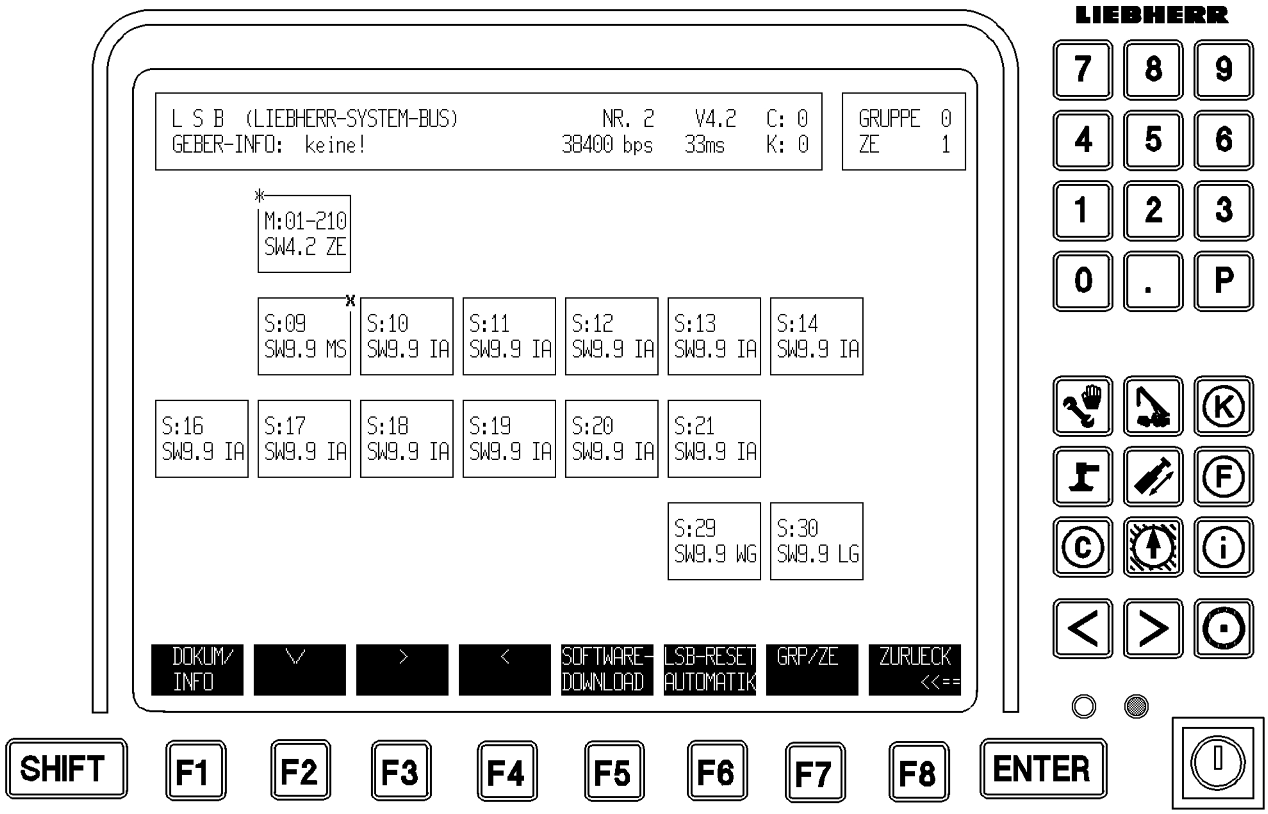
3.2.2 Signs

Signs on the upper right or left corner on the LSB components.

- x ⇒ Sensor is available, but a configuration error has been detected (Actual / nominal comparison).
- o ⇒ Sensor is not available, even though it is required.
- + ⇒ An additional sensor has been detected, which has not been configured on the bus.
- * ⇒ Marks the selected LSB participant for closer inspection.
- s ⇒ LSB components (sensor) is in simulation mode
- n ⇒ Optional participant (customer option) is missing

- * ⇒ Markiert den zur genaueren Betrachtung ausgewählten LSB-Teilnehmer.

Note: On the right hand side is always the status, on the left hand side the sign for the LSB component.


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 2 V4.2 C: 0
GEBER-INFO: keine! 38400 bps 33ms K: 0
GRUPPE 0
ZE 1
M:01-210
SW4.2 ZE
S:09 SW9.9 MS
S:10 SW9.9 IA
S:11 SW9.9 IA
S:12 SW9.9 IA
S:13 SW9.9 IA
S:14 SW9.9 IA
S:16 SW9.9 IA
S:17 SW9.9 IA
S:18 SW9.9 IA
S:19 SW9.9 IA
S:20 SW9.9 IA
S:21 SW9.9 IA
S:29 SW9.9 WG
S:30 SW9.9 LG
DOKUM/ INFO
SOFTWARE- DOWNLOAD
LSB-RESET AUTOMATIK
GRP/ZE
ZURUECK
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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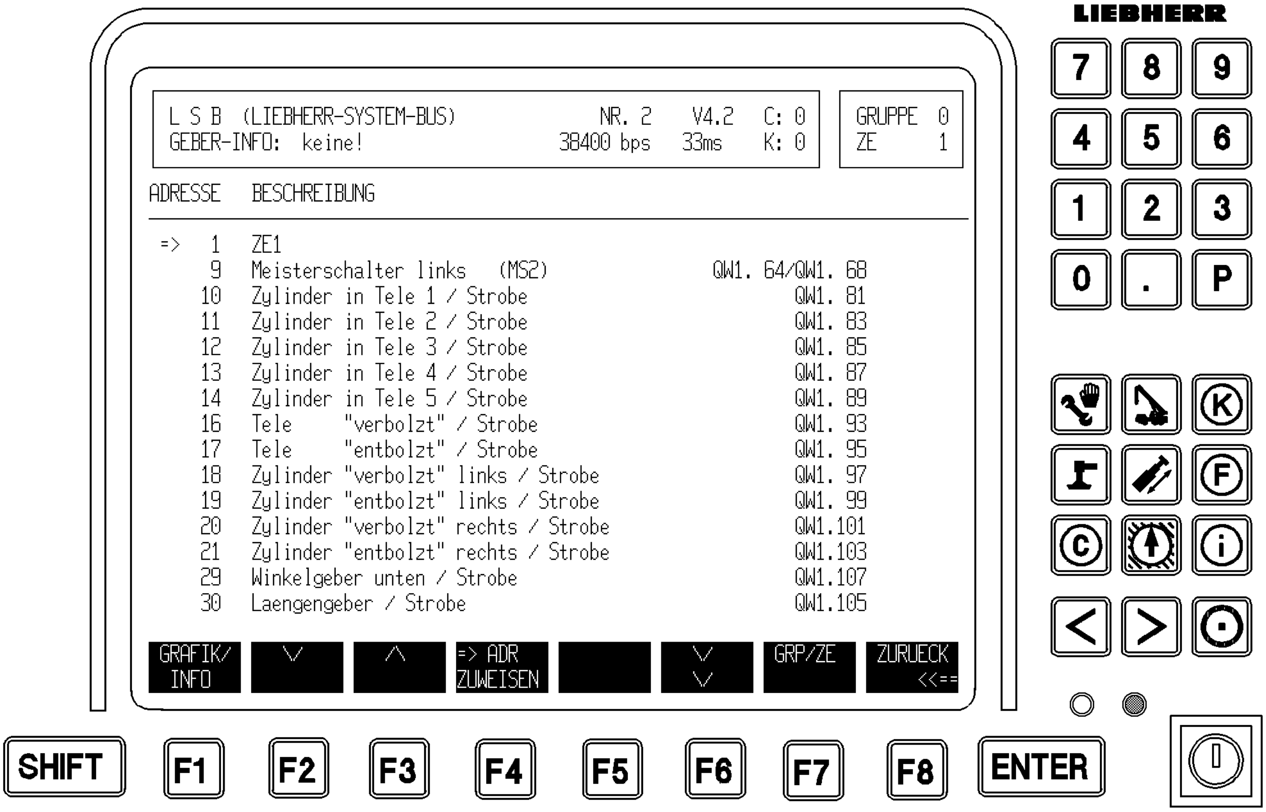
Function key bar - Graphic

"F1"	**DOKUM / INFO**	Documentation of graphic LSB overview
"F2 - F4"	>, <, ∨	Selection of a participants (LSB component)
"F5"	**SOFTWARE DOWNLOAD**	Access only possible with code ! Allows automatic update for software on all input / output modules. **Note:** This function is only possible if all required input / output modules are connected, and if they already contain a functioning software.
"F6"	**LSB-RESET**	Via the LSB-Reset, the LSB (Liebherr System Bus) can be reset and reinitialized, for example when a newly added sensor is not automatically recognized.
"SHIFT" + "F6"	**AUTOMATIK**	Automatic LSB sensor programming, see paragraph "Procedure for LSB sensor programming".
"F7"	**GRP/ZE**	Selection of desired group or CPU. Via the number keys, the desired GRUPPE (GROUP) or ZE (CPU) can be selected from the installed units.
"F8"	**ZURÜCK** <<==	Back in direction of "Main menu".

Call up the individual LSB participants

- Select the individual LSB participants with function keys described above.
- Push the "ENTER" key to show the selected LSB participant ⇒ "LSB -Detail view".


L S B (LIEBHERR-SYSTEM-BUS) NR. 2 V4.2 C: 0
GEBER-INFO: keine! 38400 bps 33ms K: 0
GRUPPE 0
ZE 1
ADRESSE BESCHREIBUNG
=> 1 ZE1
9 Meisterschalter links (MS2) QW1. 64/QW1. 68
10 Zylinder in Tele 1 / Strobe QW1. 81
11 Zylinder in Tele 2 / Strobe QW1. 83
12 Zylinder in Tele 3 / Strobe QW1. 85
13 Zylinder in Tele 4 / Strobe QW1. 87
14 Zylinder in Tele 5 / Strobe QW1. 89
16 Tele "verbolzt" / Strobe QW1. 93
17 Tele "entbolzt" / Strobe QW1. 95
18 Zylinder "verbolzt" links / Strobe QW1. 97
19 Zylinder "entbolzt" links / Strobe QW1. 99
20 Zylinder "verbolzt" rechts / Strobe QW1.101
21 Zylinder "entbolzt" rechts / Strobe QW1.103
29 Winkelgeber unten / Strobe QW1.107
30 Laengengeber / Strobe QW1.105
GRAFIK/ INFO
=> ADR ZUWEISEN
GRP/ZE
ZURUECK <<==
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

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3.2.2 Documentation of LSB overview

- By pressing the "F1" key (**DOKUM**), the LSB overview is shown as a document.

Information

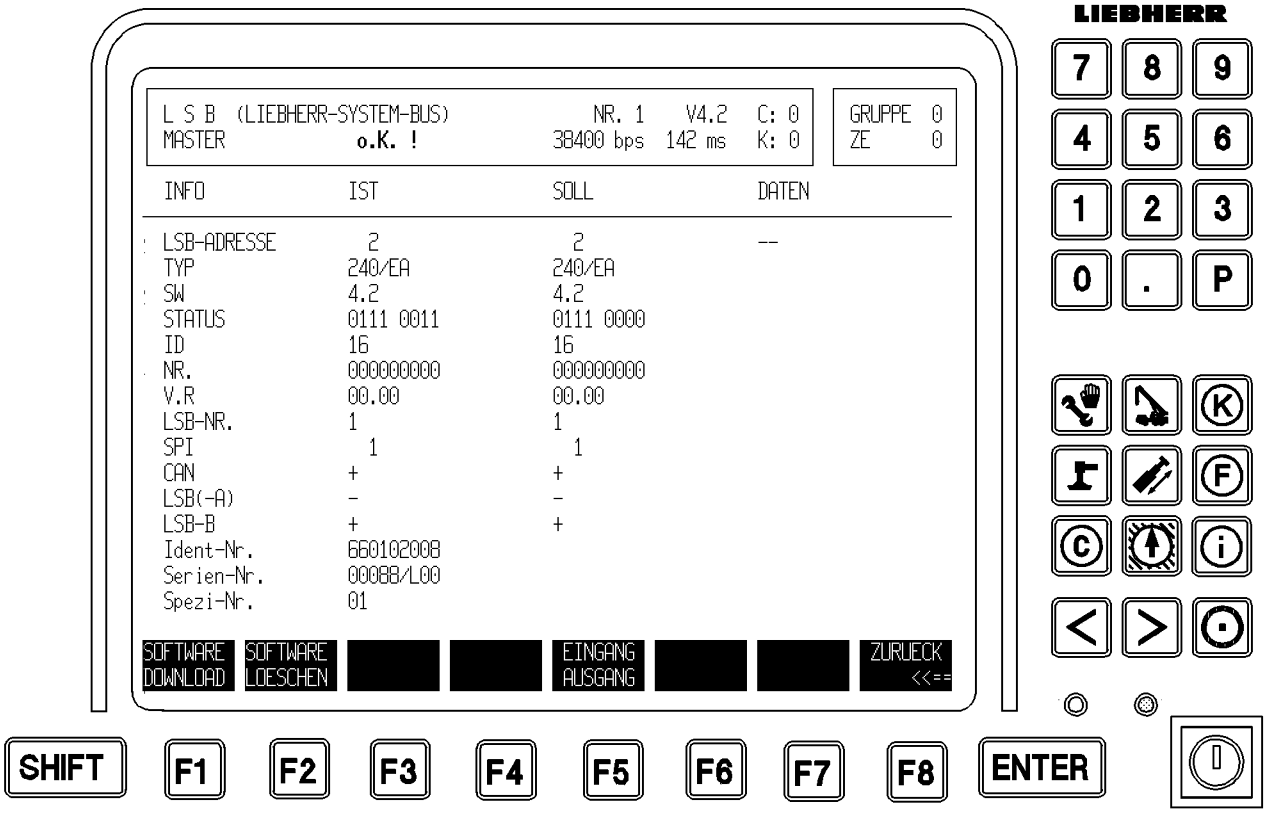
- Bus address
- Description of LSB participants in document form
- Operand
- Option

Function keybar - Documentation

"F1"	**GRAFIK / INFO**	Shift back to graphic overview.
"F2 - F3"	>, <	Selection of participant.
"F4"	**=> ADR ZUWEISEN**	Semi automatic LSB sensor programming. Sensor is programmed by address 0 on final location. See paragraph "Procedure for LSB sensor programming".
"F5"		not used
"F6"		Page to next page.
"F7"	**GRP/ZE**	Selection of desired group or CPU
"F8"	**ZURÜCK <<==**	Back in direction of "main menu".

Call up the individual LSB participants

- Select the individual LSB participants with function keys described above.
- Push the "ENTER" key to show the selected LSB participant ⇒ "LSB -Detail view".


L S B (LIEBHERR-SYSTEM-BUS) NR. 1 V4.2 C: 0
MASTER o.K. ! 38400 bps 142 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 2 2 --
TYP 240/EA 240/EA
SW 4.2 4.2
STATUS 0111 0011 0111 0000
ID 16 16
NR. 000000000 000000000
V.R 00.00 00.00
LSB-NR. 1 1
SPI 1 1
CAN + +
LSB(-A) - -
LSB-B + +
Ident-Nr. 660102008
Serien-Nr. 00088/L00
Spezi-Nr. 01
SOFTWARE DOWNLOAD
SOFTWARE LOESCHEN
EINGANG AUSGANG
ZURUECK <<==
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

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3.3 Detail view - Master

3.3.1 Input / output module

3.3.1.1 Information

In the detail view, the actual / nominal comparison of the type characteristic is shown

INFO / IST / SOLL (= INFO / ACTUAL / NOMINAL)

LSB-ADRESSE Describes the address on the bus, under which a sensor is listed. Each participant must have a clear address.

TYP Each participant on the bus is identified by a type characteristic. This characteristic is already fixed and programmed into the sensor by the manufacturer.

240 Master station (for example: CPU or Input / output module)

SW Depicts the version number of the sensor firmware. Only participants with the same or higher software version than the nominal version are compatible with each other.

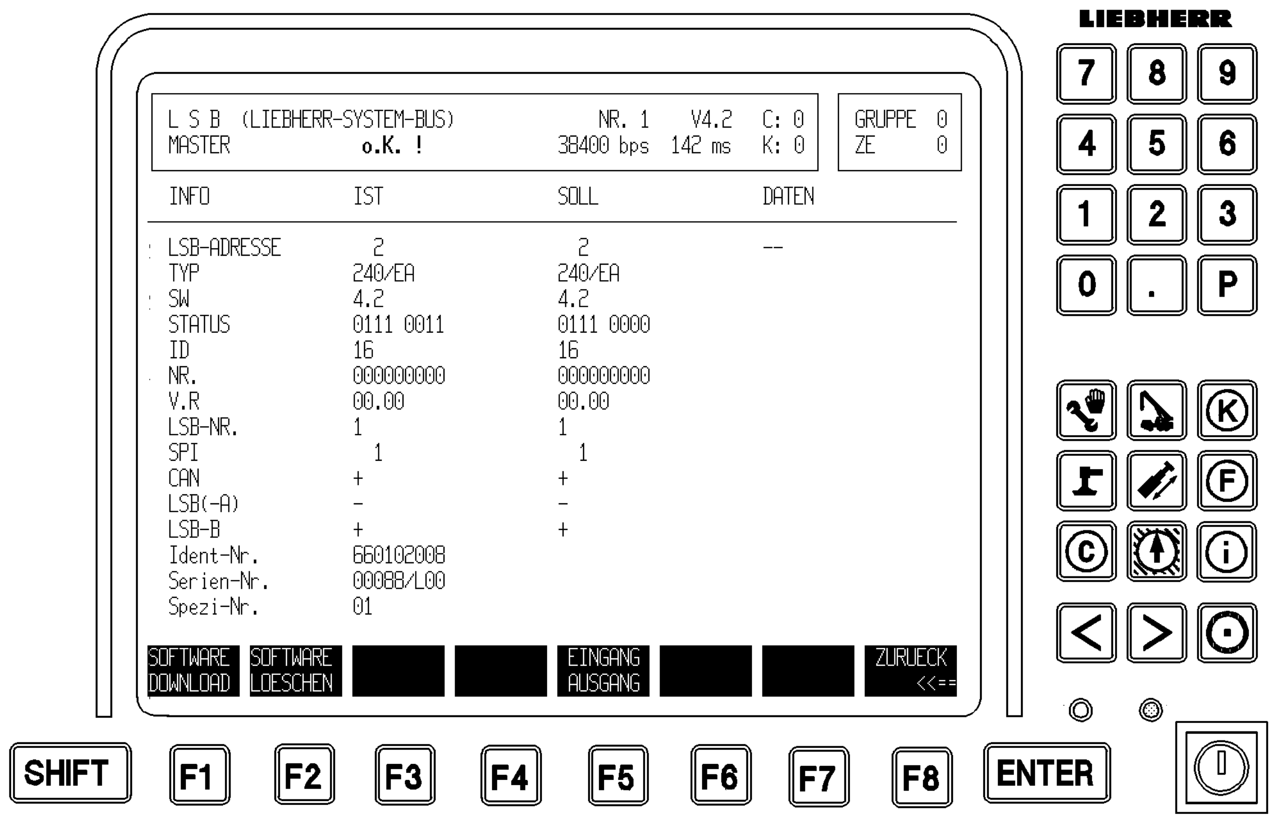
STATUS The status shows the operating view of the participants in compressed form. See paragraph 1.3, LSB detail view - hoist limit switch with wind velocity sensor.

ID Additional identification number, which permits clear identification of the participant. It is used for internal programming procedures.

NR. Machine number of the crane. It must be the same for all master participants connected to the bus. During LSB boot-up, a check is made to ensure that all components have the same number.

V.R Version number of total application, which is programmed on input / output module.

LSB-NR. The LSB number shows, to which bus the input / output module is connected to. In case of several CPU's, there might be several bus numbers. They are marked by a running number.


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 1 V4.2 C: 0
MASTER o.K. ! 38400 bps 142 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 2 2 --
TYP 240/EA 240/EA
SW 4.2 4.2
STATUS 0111 0011 0111 0000
ID 16 16
NR. 000000000 000000000
V.R 00.00 00.00
LSB-NR. 1 1
SPI 1 1
CAN + +
LSB(-A) - -
LSB-B + +
Ident-Nr. 660102008
Serien-Nr. 00088/L00
Spezi-Nr. 01
SOFTWARE DOWNLOAD
SOFTWARE LOESCHEN
EINGANG AUSGANG
ZURUECK <<==
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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SPI This number shows which serial control unit is connected on the input / output module. There are various numbers:

1 Keyboard unit - driver's cab
2 Indicator unit - driver's cab
3 Support control unit

CAN
+ ⇒ additional components are connected to input / output module
– ⇒ no CAN-Bus active

LSB-A
+ ⇒ on input / output module LSB-A is active
– ⇒ no LSB-A active

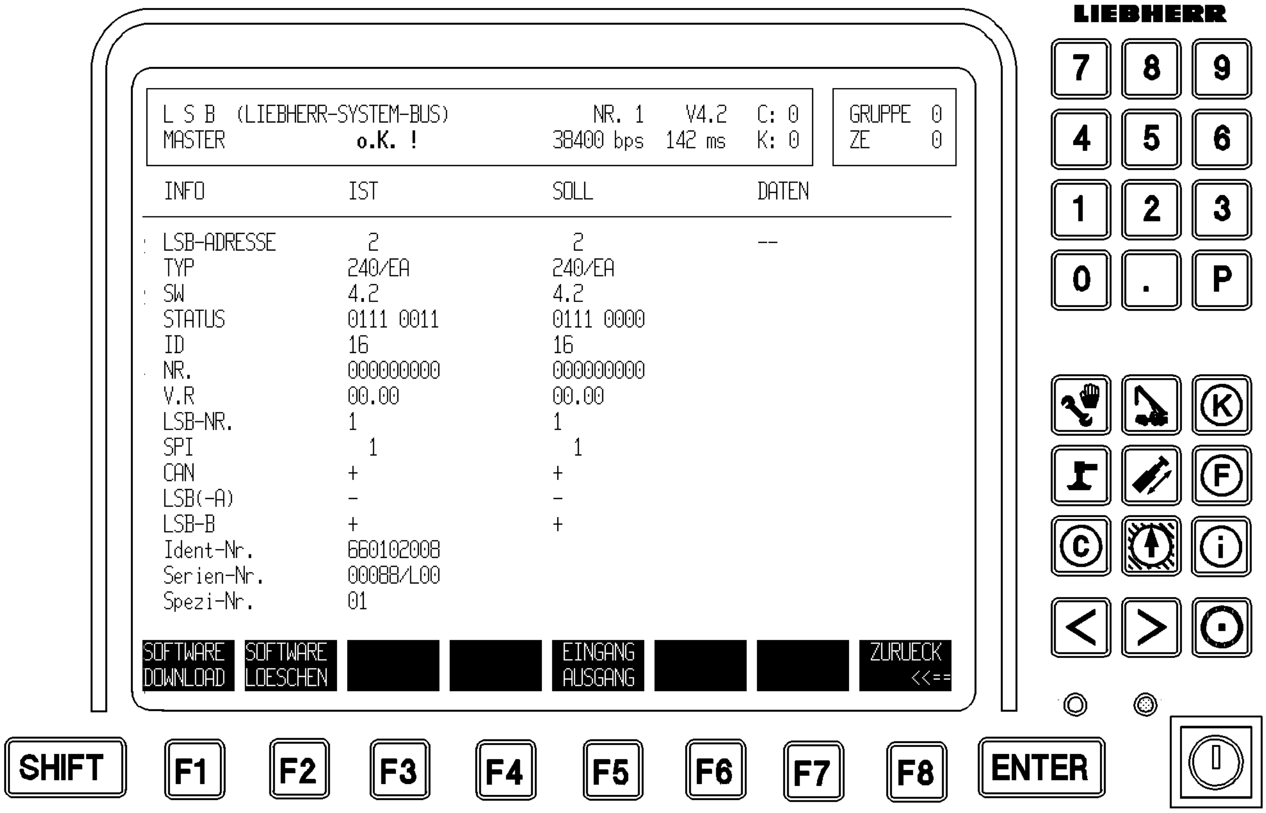
LSB-B
+ ⇒ on input / output module LSB-B is active
– ⇒ no LSB-B active

Ident-Nr. Programmed Id. number of LSB participants.

Serien-Nr. Programmed Serial number of LSB participants.

Spezi-Nr. Programmed specification number of LSB participants.

DATEN (DATA)
On the input / output module or CPU, no data is shown, because they interchange large data blocks. The contents of these data blocks is not readable by the user.


L S B (LIEBHERR-SYSTEM-BUS) NR. 1 V4.2 C: 0
MASTER o.K. ! 38400 bps 142 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 2 2 --
TYP 240/EA 240/EA
SW 4.2 4.2
STATUS 0111 0011 0111 0000
ID 16 16
NR. 000000000 000000000
V.R 00.00 00.00
LSB-NR. 1 1
SPI 1 1
CAN + +
LSB(-A) - -
LSB-B + +
Ident-Nr. 660102008
Serien-Nr. 00088/L00
Spezi-Nr. 01
SOFTWARE DOWNLOAD
SOFTWARE LOESCHEN
EINGANG AUSGANG
ZURUECK <<==
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

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3.3.1.2 Function key bar

"F1" **SOFTWARE DOWNLOAD**

Access only possible with code!
Via this key, software for previously selected and indicated input / output module can be loaded. Download is only possible:

- if all input / output modules are already programmed and therefore have a bus address,
- if only one non-programmed module is on the LSB,
- if the firmware is on the input / output module.

Otherwise the downloader interrupts with an error code.

Error code	Cause
1	Participant not available
2	Participant not able to download, for example due to sensor
3	more than one non-programmed input / output module on the bus
4	Trans fer error

Note: Download is only possible to input / output modules !

"F2" **SOFTWARE LOESCHEN**

Access only possible with code!

"F3 - F4"

not used

"F5" **INPUT OUTPUT**

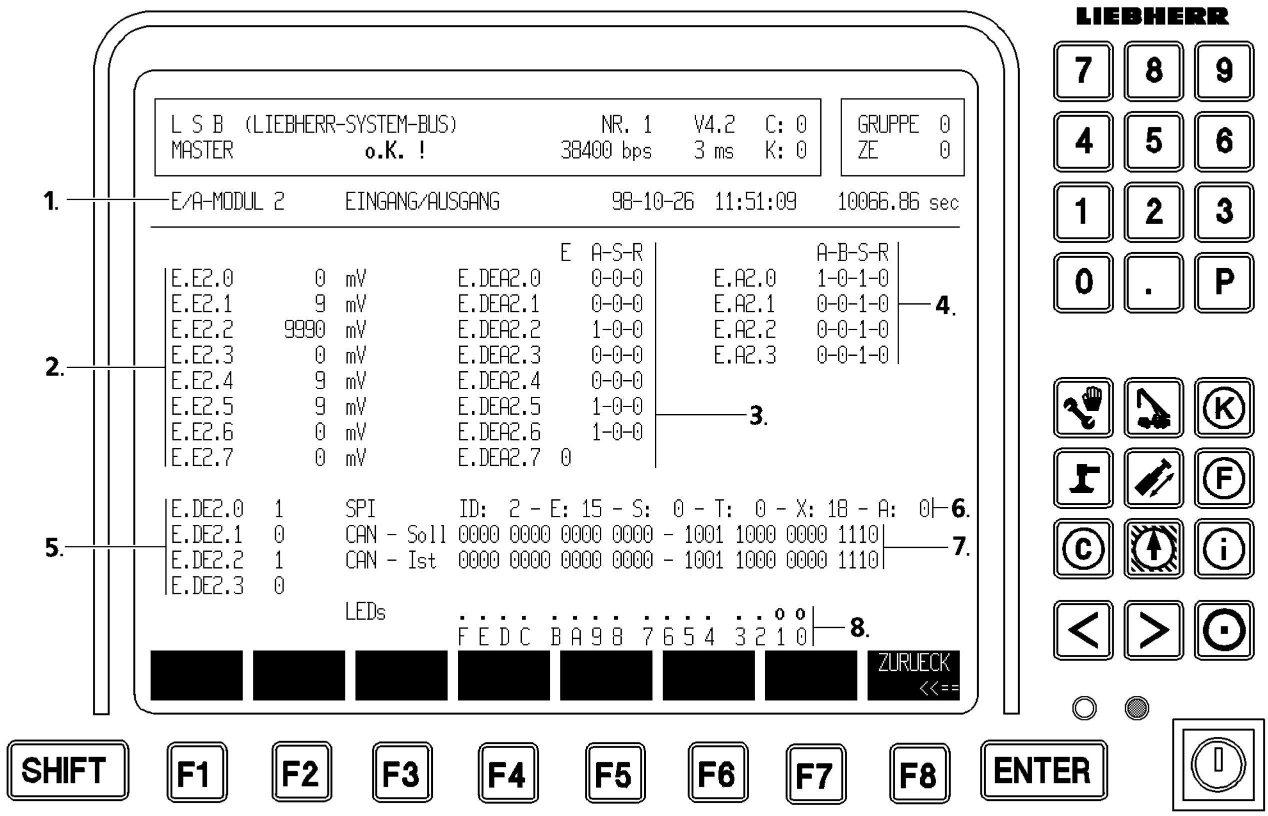
Call up sub-function input / output module x (see paragraph 3.3.1.3)

"F6 - F7"

not used

"F8" **ZURUECK <<==**

Back in direction of "Main menu".


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 1 V4.2 C: 0
MASTER o.K. ! 38400 bps 3 ms K: 0
GRUPPE 0
ZE 0
1.
E/A-MODUL 2 EINGANG/AUSGANG 98-10-26 11:51:09 10066.86 sec
E A-S-R
A-B-S-R
E.E2.0 0 mV E.DEA2.0 0-0-0 E.A2.0 1-0-1-0
E.E2.1 9 mV E.DEA2.1 0-0-0 E.A2.1 0-0-1-0
E.E2.2 9990 mV E.DEA2.2 1-0-0 E.A2.2 0-0-1-0
E.E2.3 0 mV E.DEA2.3 0-0-0 E.A2.3 0-0-1-0
E.E2.4 9 mV E.DEA2.4 0-0-0
E.E2.5 9 mV E.DEA2.5 1-0-0
E.E2.6 0 mV E.DEA2.6 1-0-0
E.E2.7 0 mV E.DEA2.7 0
2.
3.
4.
E.DE2.0 1 SPI ID: 2 - E: 15 - S: 0 - T: 0 - X: 18 - A: 0
E.DE2.1 0 CAN - Soll 0000 0000 0000 0000 - 1001 1000 0000 1110
E.DE2.2 1 CAN - Ist 0000 0000 0000 0000 - 1001 1000 0000 1110
E.DE2.3 0
LEDs
F E D C B A 9 8 7 6 5 4 3 2 1 0
5.
6.
7.
8.
ZURUECK
<<==
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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3.3.1.3 Sub-function input / output module x

1. Module number

2. Voltage inputs [0 ... 10.000mV]

3. Digital inputs / outputs [0 /24V]
   E = Input value
   A = Output value
   S = Status
   R = Back measurement Pin

4. Digital inputs / outputs [0 /24V]
   A = Output value
   B = Bridge circuit
   S = Status
   R = Back measurement Pin

5. Digital inputs [0 /24V]

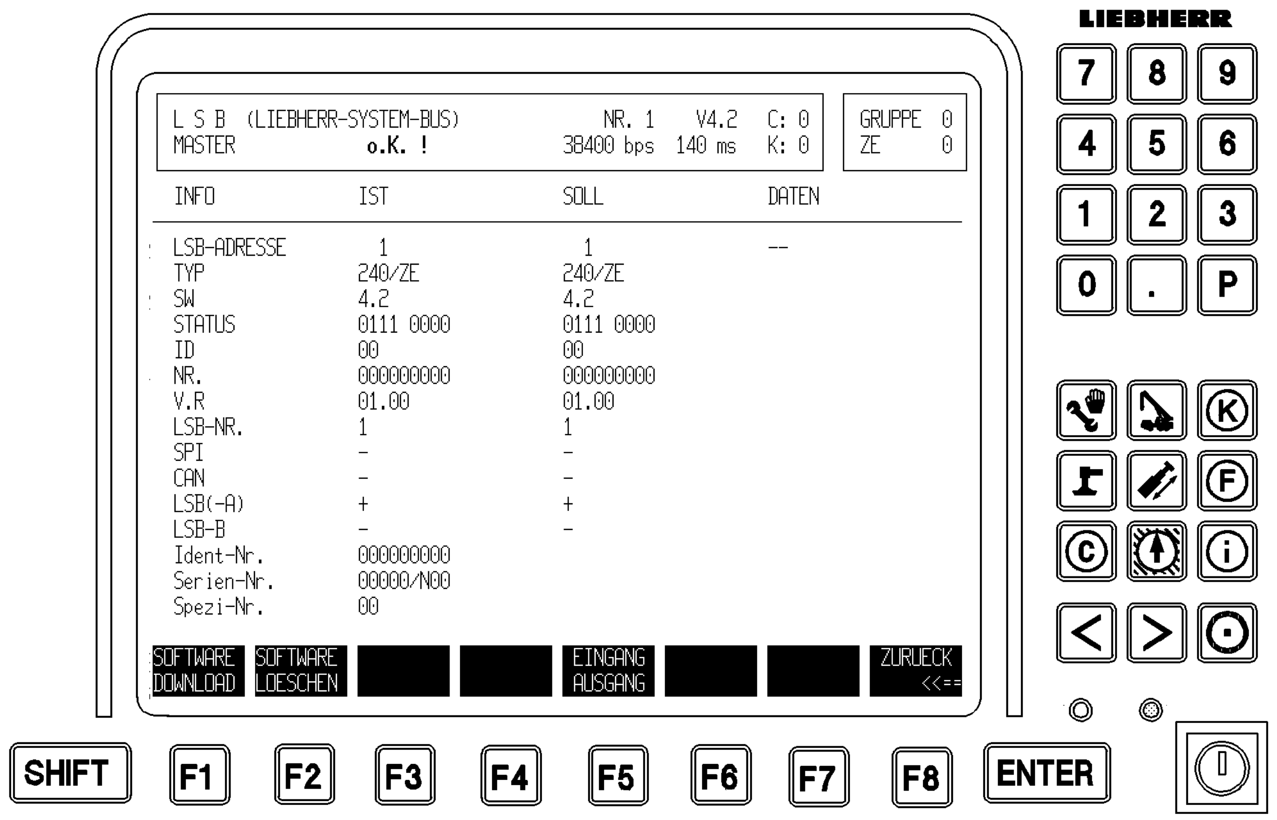
6. Identification SPI
   ID = Type
   1 ⇒ Keyboard
   2 ⇒ Indicator unit
   3 ⇒ Support keyboard 1
   4 ⇒ Support keyboard 2
   E = Inputs
   S = Status
   T = Keys
   X = Other
   A = Outputs

7. CAN - configuration nominal / actual comparison

8. LED status indication and error code
   (see also paragraph 2.1.3)

Function keybar

F8"	**ZURUECK <<==**	Back to LSB detail view.


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 1 V4.2 C: 0
MASTER o.K. ! 38400 bps 140 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 1 1 --
TYP 240/ZE 240/ZE
SW 4.2 4.2
STATUS 0111 0000 0111 0000
ID 00 00
NR. 000000000 000000000
V.R 01.00 01.00
LSB-NR. 1 1
SPI - -
CAN - -
LSB(-A) + +
LSB-B - -
Ident-Nr. 000000000
Serien-Nr. 00000/N00
Spezi-Nr. 00
SOFTWARE DOWNLOAD
SOFTWARE LOESCHEN
EINGANG AUSGANG
ZURUECK <<==
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

190453

3.3.2 CPU

3.3.2.1 Information

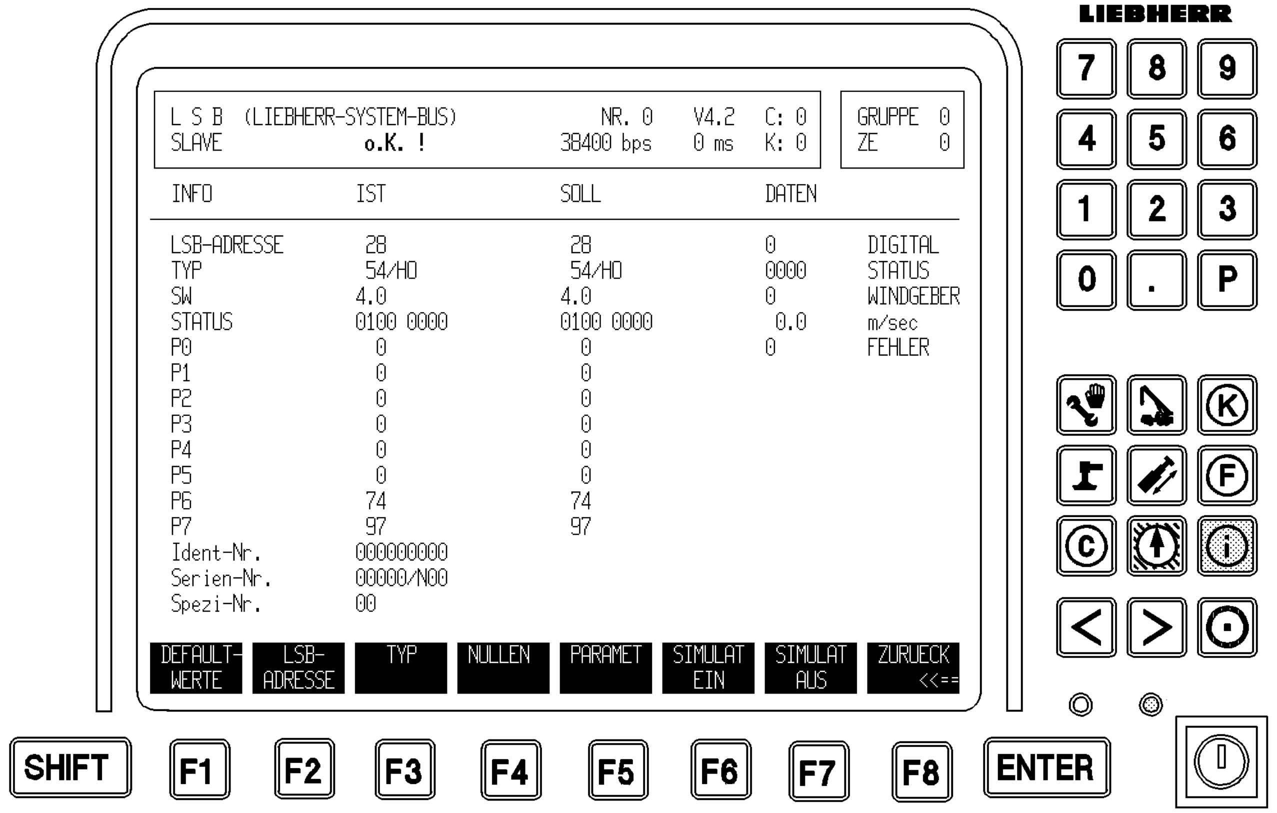
In the detail view, the actual / nominal comparison for the type characteristic is shown.

INFO / IST / SOLL (= INFO / ACTUAL / NOMINAL)
See LSB detail view Master ⇒ Input / output module

DATEN (= DATA)
No data is shown on the CPU, because they interchange large data blocks. The contents of these data blocks is not readable by the user.

3.3.2.2 Function key bar

See detail view Master ⇒ Input / output module


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 0 V4.2 C: 0
SLAVE o.K. ! 38400 bps 0 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 28 28 0 DIGITAL
TYP 54/HO 54/HO 0000 STATUS
SW 4.0 4.0 0 WINDGEBER
STATUS 0100 0000 0100 0000 0.0 m/sec
P0 0 0 0 FEHLER
P1 0 0
P2 0 0
P3 0 0
P4 0 0
P5 0 0
P6 74 74
P7 97 97
Ident-Nr. 000000000
Serien-Nr. 00000/N00
Spezi-Nr. 00
DEFAULT- WERTE
LSB- ADRESSE
TYP
NULLEN
PARAMET
SIMULAT EIN
SIMULAT AUS
ZURUECK <<==
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

190454

3.4. LSB detail view - Slave

3.4.1 Hoist limit switch with wind velocity sensor (HO)

3.4.1.1 Information

In the detail view, the actual / nominal comparison of the type characteristic is shown.

INFO / IST / SOLL (= INFO / ACTUAL / NOMINAL)

LSB-ADRESSE Describes the address on the Liebherr System Bus, under which a sensor is addressed. Each participant must have a clear address.

TYP Each participant on the bus is identified by a type characteristic. This type characteristic has already been programmed by the sensor manufacturer.

01	Inductive sensor / digital	(ID)
49	Inductive sensor 16 / analog	(IA)
50	Type characteristic Angle sensor	(WG)
53	Type characteristic Length sensor	(LG)
54	Type characteristic Hoist top / Wind sensor	(HO)
56	Slewing sensor horizontal	(DR)
59	Pull test bracket	(ZM)
74	Master switch	(MS)
76	Pedal sensor (foot pedal)	(PG)

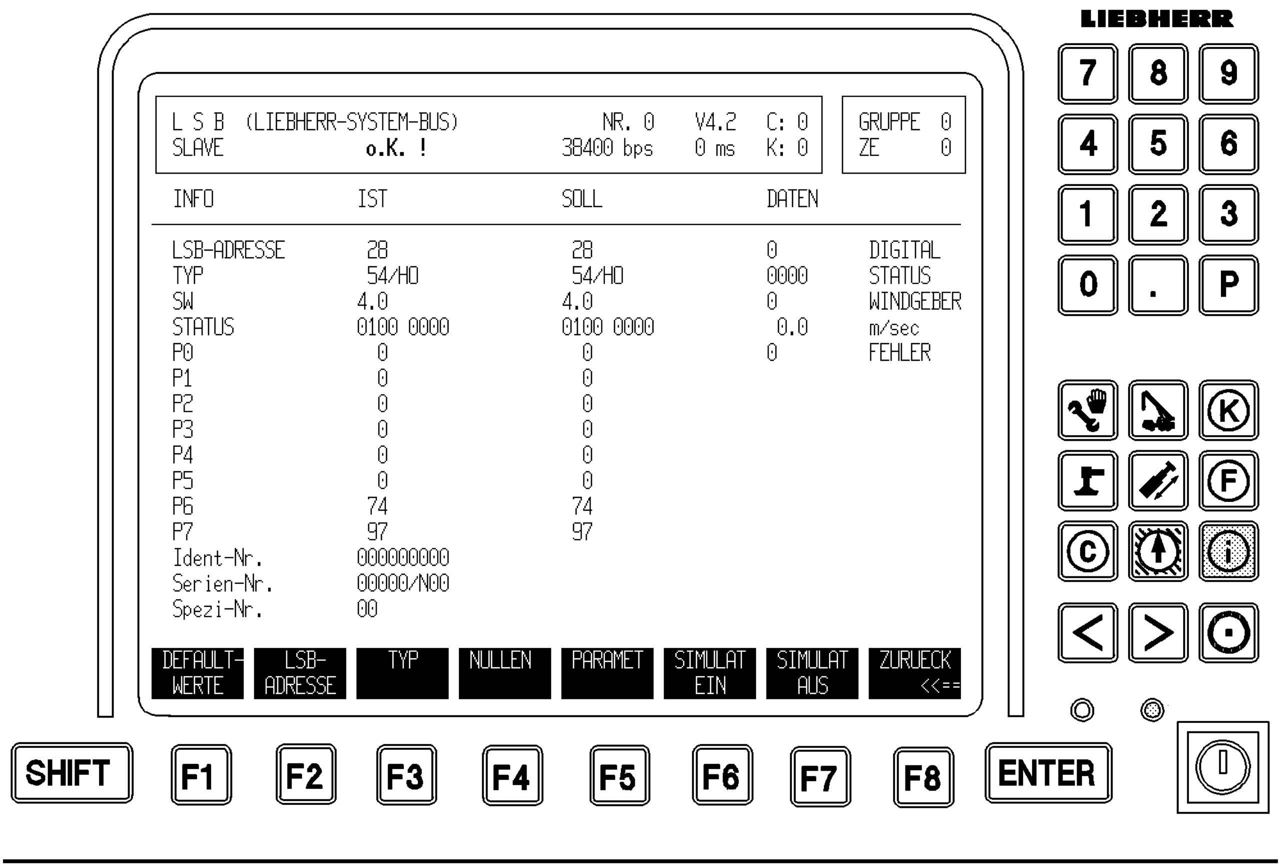
SW Depicts the version number of the sensor firmware. Only participants with the same or higher software version than the nominal version are compatible with each other.

STATUS The status shows the operating view of the participant in compressed form. It is shown as a binary number.
The meaning of the various bits is as follows:

TERR	TACT	PRES	TLIS	TSIM	TFLT	ER1	ER0
0	**1**	**1**	**0**	**0**	**0**	**0**	**0**

TERR	Participant error bit set, if an error occurs on participant.	**0** = O.K.	**1** = Error
TACT	Participant active, if bit is set, otherwise participant is missing	**0** = missing	**1** = O.K.
PRES	Participant must be present.	**0** = no	**1** = yes
TLIS	Suppress participant query, if listening occurred.	**0** = no	**1** = yes
TSIM	Set if participant is on simulation.	**0** = no	**1** = yes
TFLT	Set, if filter on sensor is activated.	**0** = no	**1** = yes
ER0 / ER1	Error bits of sensor are set, if an error was found during sensor internal self -test.	**0** = no	**1** = yes

ER1	ER0	Error
0	**0**	no error, Sensor O.K.
0	**1**	tolerable error
1	**0**	periodic error
1	**1**	non-tolerable continuous error


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 0 V4.2 C: 0
SLAVE o.K. ! 38400 bps 0 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 28 28 0 DIGITAL
TYP 54/HO 54/HO 0000 STATUS
SW 4.0 4.0 0 WINDGEBER
STATUS 0100 0000 0100 0000 0.0 m/sec
P0 0 0 0 FEHLER
P1 0 0
P2 0 0
P3 0 0
P4 0 0
P5 0 0
P6 74 74
P7 97 97
Ident-Nr. 000000000
Serien-Nr. 00000/N00
Spezi-Nr. 00
DEFAULT-WERTE
LSB-ADRESSE
TYP
NULLEN
PARAMET
SIMULAT EIN
SIMULAT AUS
ZURUECK <<==
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

190454

P0 to P7 For every sensor there is a parameter block (P0 to P7), which can be used to control the function of each participant.
For master participants (such as: Input / output modules or CPU), the parameter block is used for other system information.

Ident-Nr. Programmed Id. number for LSB participants.
(=Id. No.)

Serien-Nr. Programmed serial number for LSB participants.
(= S/N)

Spezi-Nr. Programmed specification No. for LSB participants.
(= Specification No.)

Data

Depending on the type characteristics of the participant, data of the participant are shown in decoded form.

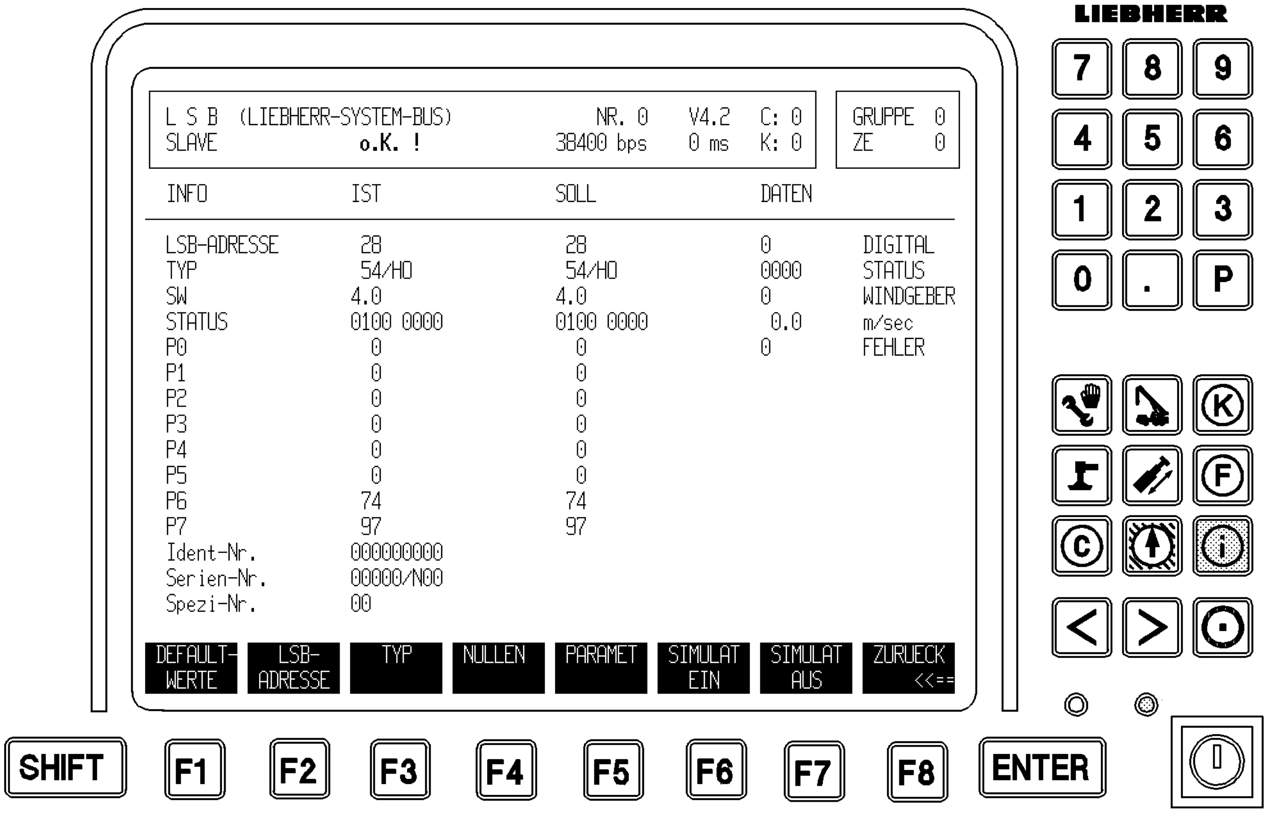
DIGITAL Supplies digital control information, 0 or 1.

STATUS Current position of reed contacts, from which the control information has been derived from.

WINDGEBER (= Wind sensor) Shows if a wind velocity sensor is connected or not.

m/sec Supplied wind speed.

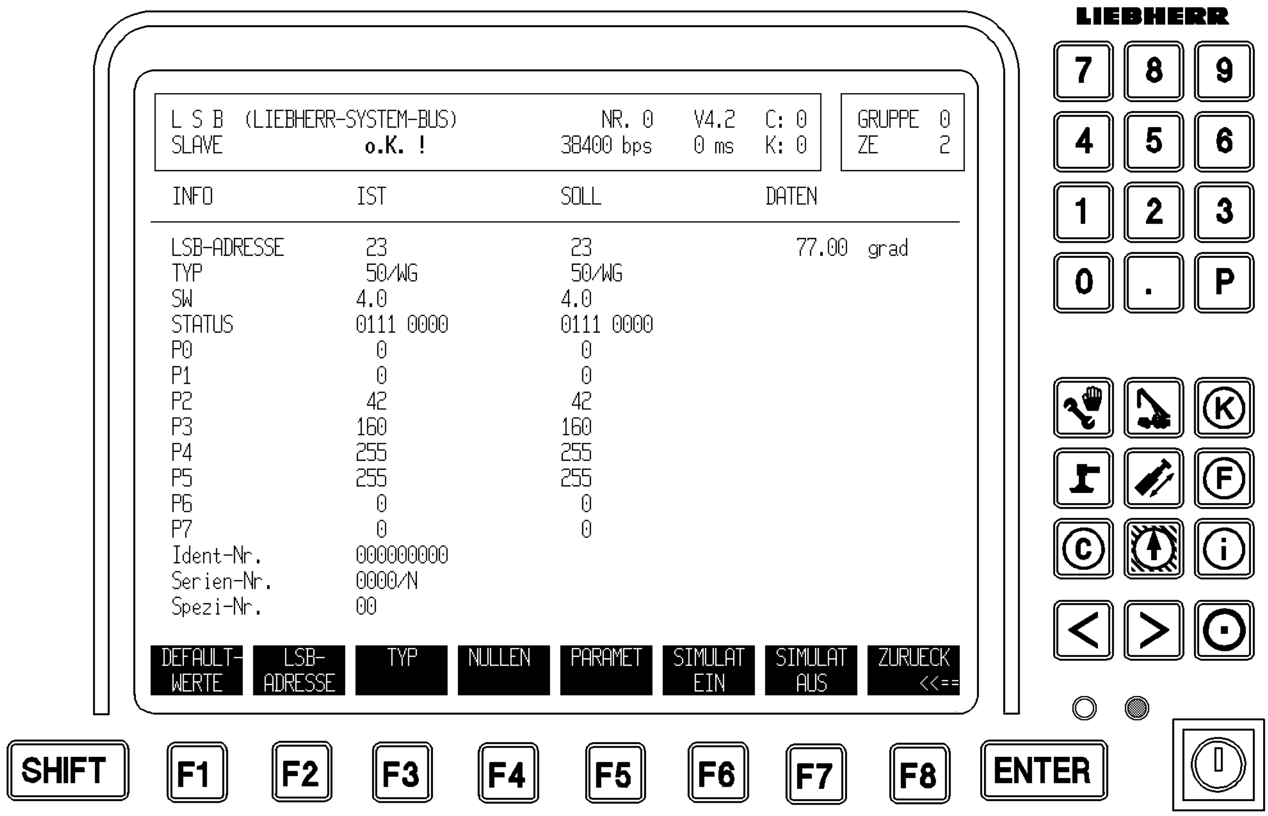
ERROR Shows if wind measurement is O.K. or not.

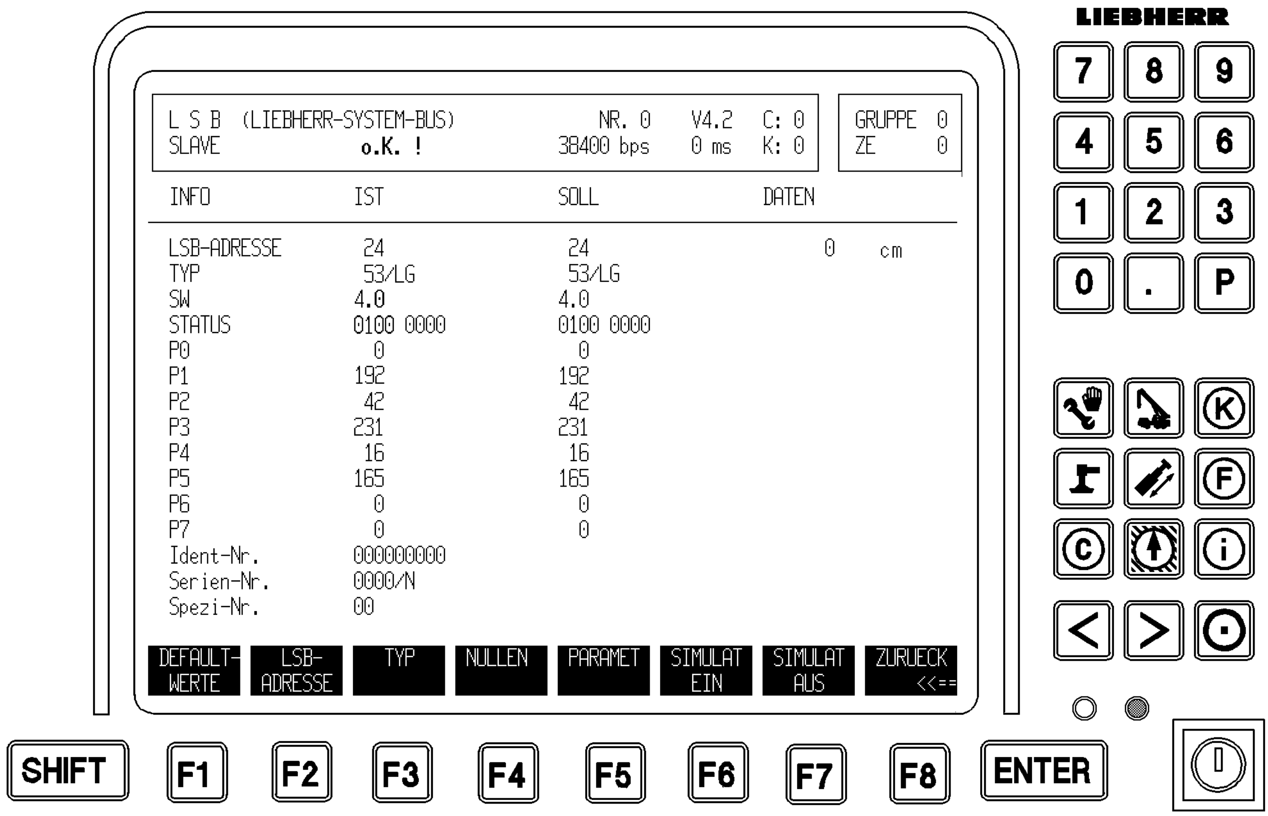

LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 0 V4.2 C: 0
SLAVE o.K. ! 38400 bps 0 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 28 28 0 DIGITAL
TYP 54/HO 54/HO 0000 STATUS
SW 4.0 4.0 0 WINDGEBER
STATUS 0100 0000 0100 0000 0.0 m/sec
P0 0 0 0 FEHLER
P1 0 0
P2 0 0
P3 0 0
P4 0 0
P5 0 0
P6 74 74
P7 97 97
Ident-Nr. 000000000
Serien-Nr. 00000/N00
Spezi-Nr. 00
DEFAULT- WERTE
LSB- ADRESSE
TYP
NULLEN
PARAMET
SIMULAT EIN
SIMULAT AUS
ZURUECK <<==
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

190454

3.4.1.2 Function key bar

"F1"	**DEFAULT-WERTE**	Via this key, nominal values can be entered for the currently displayed participant. The type characteristic and parameters are automatically assigned and the sensor is "zeroed out", if it is possible for this sensor type. The address is not changed.
"F2"	**LSB-ADRESSE**	(= LSB address) Access only possible with code! Via this key, a new bus address can be assigned to the sensor.
"F3"	**TYP**	(= Type) Access only possible with code! Via this key, a new type characteristic can be assigned to the sensor.
"F4"	**NULLEN**	(=Zero) Access only possible with code! Via this key, the sensor is set to "zero" in its current position. This is only possible for some sensor types. The program decides, if it can be set to zero.
"F5"	**PARAMET**	Access only possible with code! Via this key, the individual parameters of the sensor can be changed. **D A N G E R : This function may only be used if the parameters of the sensor are known exactly. The sensor can be changed to a condition, where it functions incorrectly or not all ! To remedy this condition, assign the default values.**
"F6, F7"	**SIMULAT EIN / AUS**	Access only possible with code! (=ON / OFF) Via these keys, a simulation value can be entered for this sensor, which it returns instead of the actual test value. This is shown in the data range, as long as the sensor is on simulation. The simulation can be ended via the LSB-Reset or simulation key.
"F8"	**ZURUECK <<==**	Back in direction of "Main menu"


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 0 V4.2 C: 0
SLAVE o.K. ! 38400 bps 0 ms K: 0
GRUPPE 0
ZE 2
INFO IST SOLL DATEN
LSB-ADRESSE 23 23 77.00 grad
TYP 50/WG 50/WG
SW 4.0 4.0
STATUS 0111 0000 0111 0000
P0 0 0
P1 0 0
P2 42 42
P3 160 160
P4 255 255
P5 255 255
P6 0 0
P7 0 0
Ident-Nr. 000000000
Serien-Nr. 0000/N
Spezi-Nr. 00
DEFAULT-WERTE
LSB-ADRESSE
TYP
NULLEN
PARAMET
SIMULAT EIN
SIMULAT AUS
ZURUECK <<==
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
L S B (LIEBHERR-SYSTEM-BUS) NR. 0 V4.2 C: 0
SLAVE o.K. ! 38400 bps 0 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 24 24 0 cm
TYP 53/LG 53/LG
SW 4.0 4.0
STATUS 0100 0000 0100 0000
P0 0 0
P1 192 192
P2 42 42
P3 231 231
P4 16 16
P5 165 165
P6 0 0
P7 0 0
Ident-Nr. 000000000
Serien-Nr. 0000/N
Spezi-Nr. 00
DEFAULT-WERTE
LSB-ADRESSE
TYP
NULLEN
PARAMET
SIMULAT EIN
SIMULAT AUS
ZURUECK <<==
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

190455

3.4.2 Angle sensor T top (WG)

3.4.2.1 Information

In the detail view, the actual / nominal comparison for the type characteristic is shown.

INFO / IST / SOLL (= INFO / ACTUAL / NOMINAL)
See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor.

DATEN (= DATA)
In the field **grad** (= degrees), the main boom angle to the horizontal is given in degrees [grad].

3.4.2.2 Function key bar

See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor.

3.4.3 Length sensor (LG)

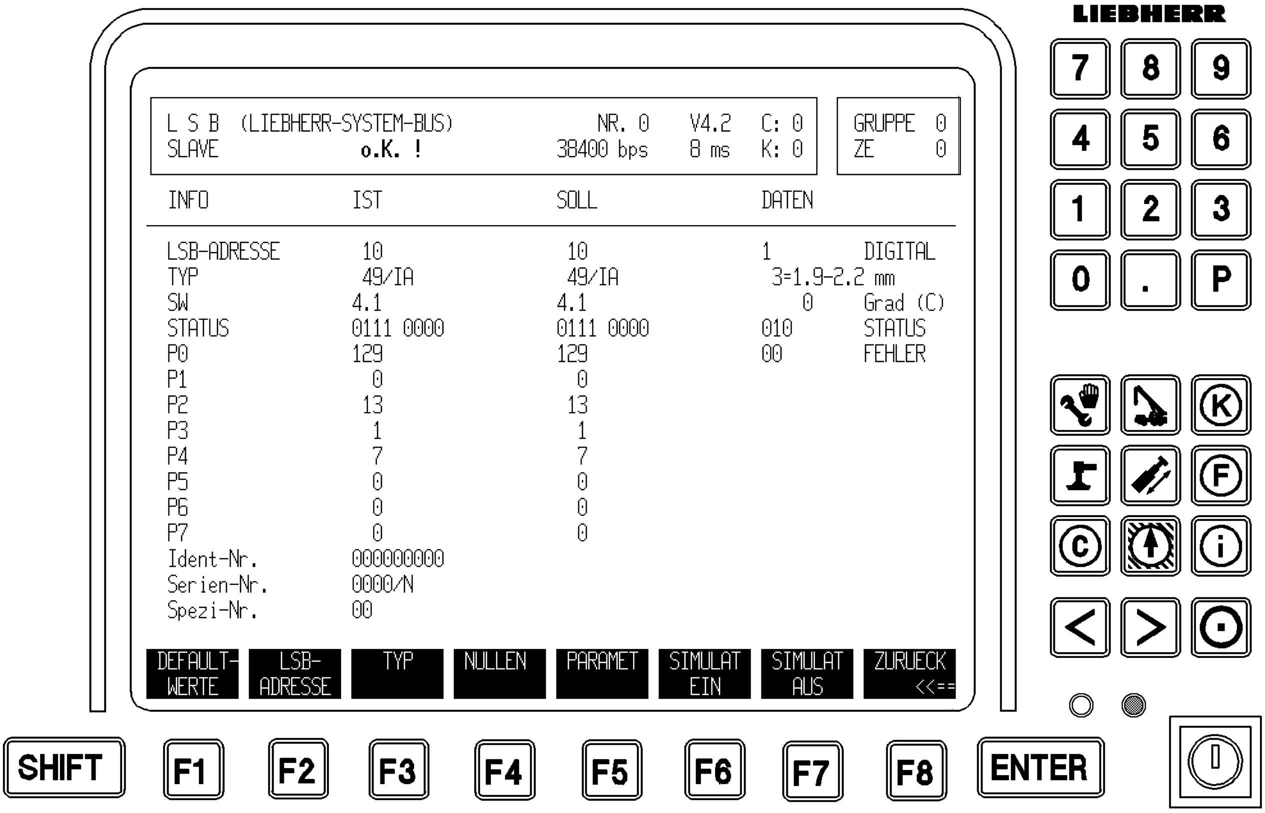
3.4.3.1 Information

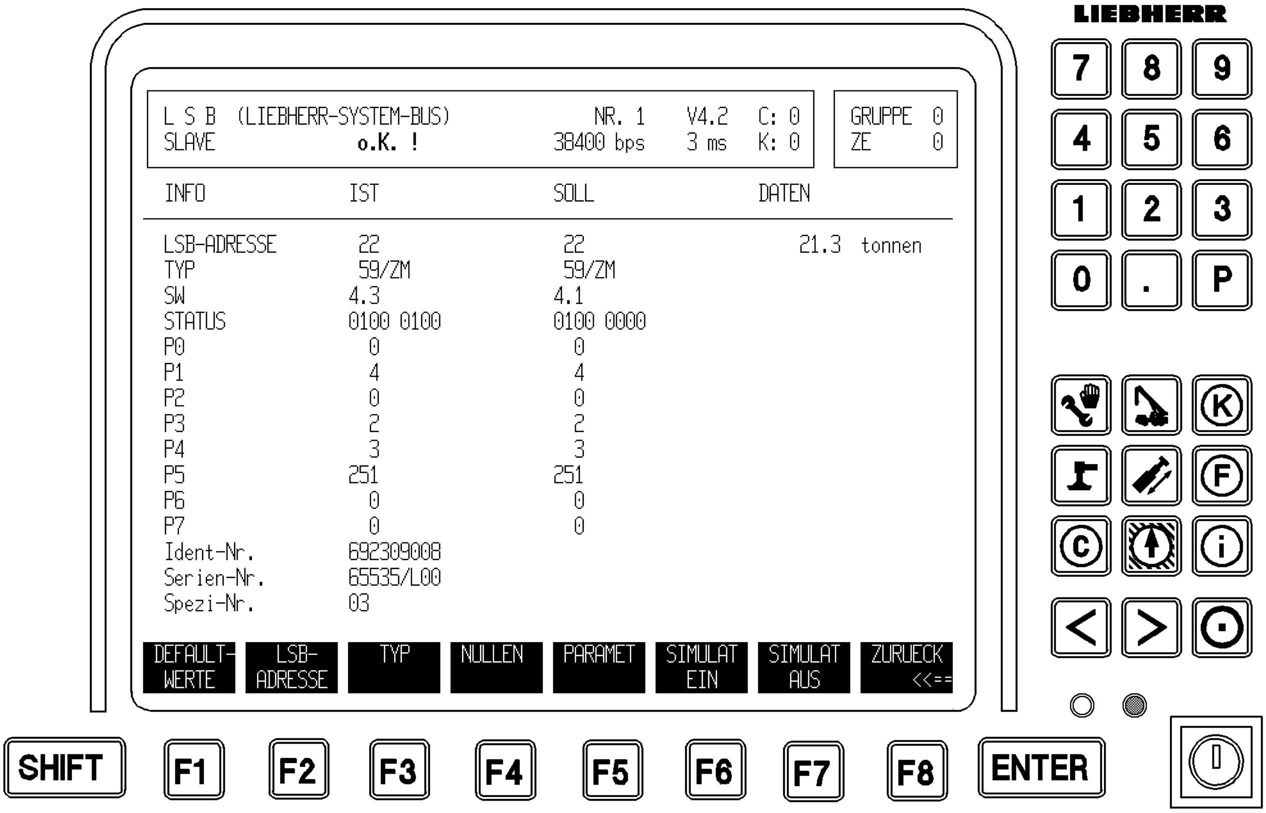
INFO / IST / SOLL (= INFO / ACTUAL / NOMINAL)
See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor.

DATEN (= DATA)
In the field **cm** is the current value of the length sensors in [cm].

3.4.3.2 Function key bar

See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor.


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 0 V4.2 C: 0
SLAVE o.K. ! 38400 bps 8 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 10 10 1 DIGITAL
TYP 49/IA 49/IA 3=1.9-2.2 mm
SW 4.1 4.1 0 Grad (C)
STATUS 0111 0000 0111 0000 010 STATUS
P0 129 129 00 FEHLER
P1 0 0
P2 13 13
P3 1 1
P4 7 7
P5 0 0
P6 0 0
P7 0 0
Ident-Nr. 000000000
Serien-Nr. 0000/N
Spezi-Nr. 00
DEFAULT-WERTE
LSB-ADRESSE
TYP
NULLEN
PARAMET
SIMULAT EIN
SIMULAT AUS
ZURUECK <<==
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
L S B (LIEBHERR-SYSTEM-BUS) NR. 1 V4.2 C: 0
SLAVE o.K. ! 38400 bps 3 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 22 22 21.3 tonnen
TYP 59/ZM 59/ZM
SW 4.3 4.1
STATUS 0100 0100 0100 0000
P0 0 0
P1 4 4
P2 0 0
P3 2 2
P4 3 3
P5 251 251
P6 0 0
P7 0 0
Ident-Nr. 692309008
Serien-Nr. 65535/L00
Spezi-Nr. 03
DEFAULT-WERTE
LSB-ADRESSE
TYP
NULLEN
PARAMET
SIMULAT EIN
SIMULAT AUS
ZURUECK <<==
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

190456

3.4.4 Inductive sensor / analog (IA)

3.4.4.1 Information
In the detail view, the actual / nominal comparison of the type characteristic is shown.

INFO / IST / SOLL (= INFO / ACTUAL / NOMINAL)
See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor.

DATEN (= DATA)

DIGITAL	Supplies digital control information, 0 or 1.
mm	Analog value of sensors (in this case 3), corresponds to a distance of 1.9 - 2.2 mm.
GRAD (C)	Temperature sensor in [°C]
STATUS	Current position of reed contacts, from which the control information is derived.
ERROR	Shows if the measurement is O.K. or not.

3.4.4.2 Function key bar
See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor.

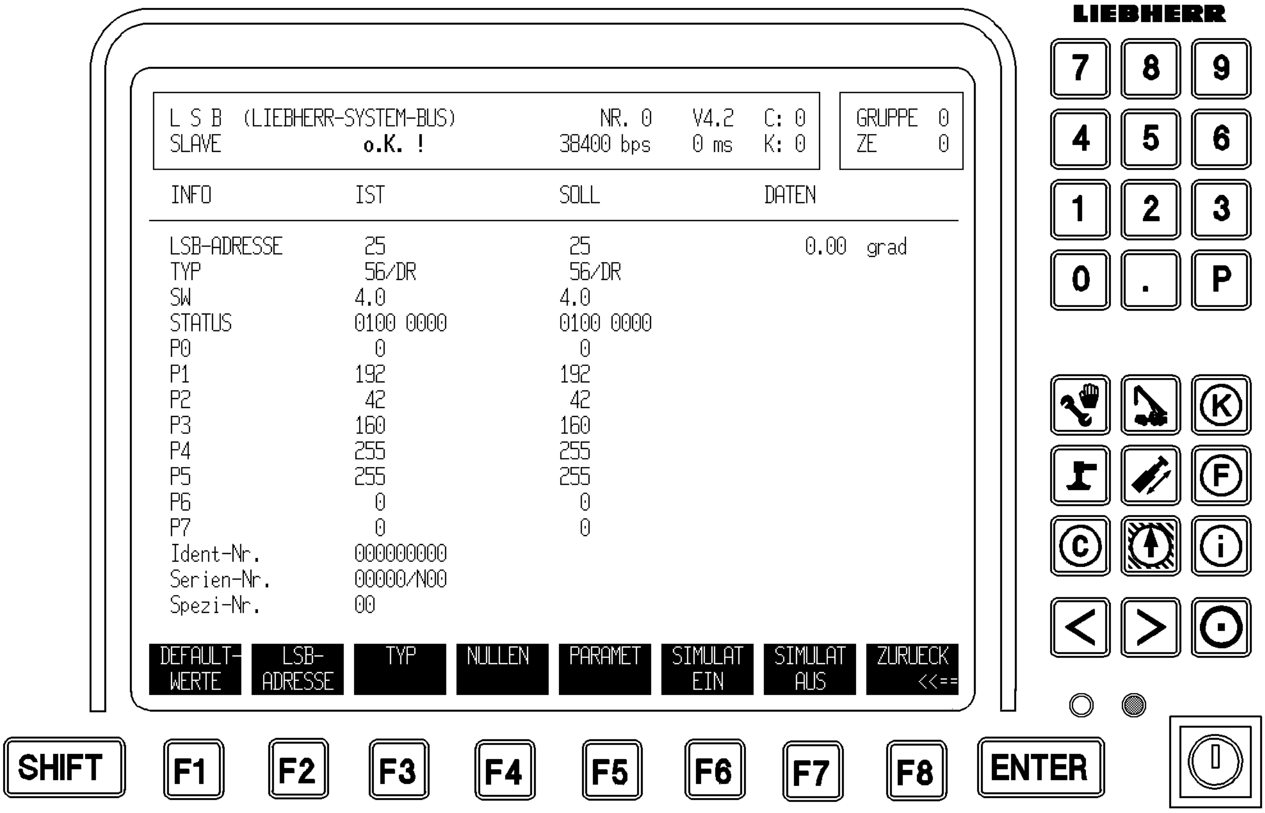
3.4.5 Pull test bracket (ZM)

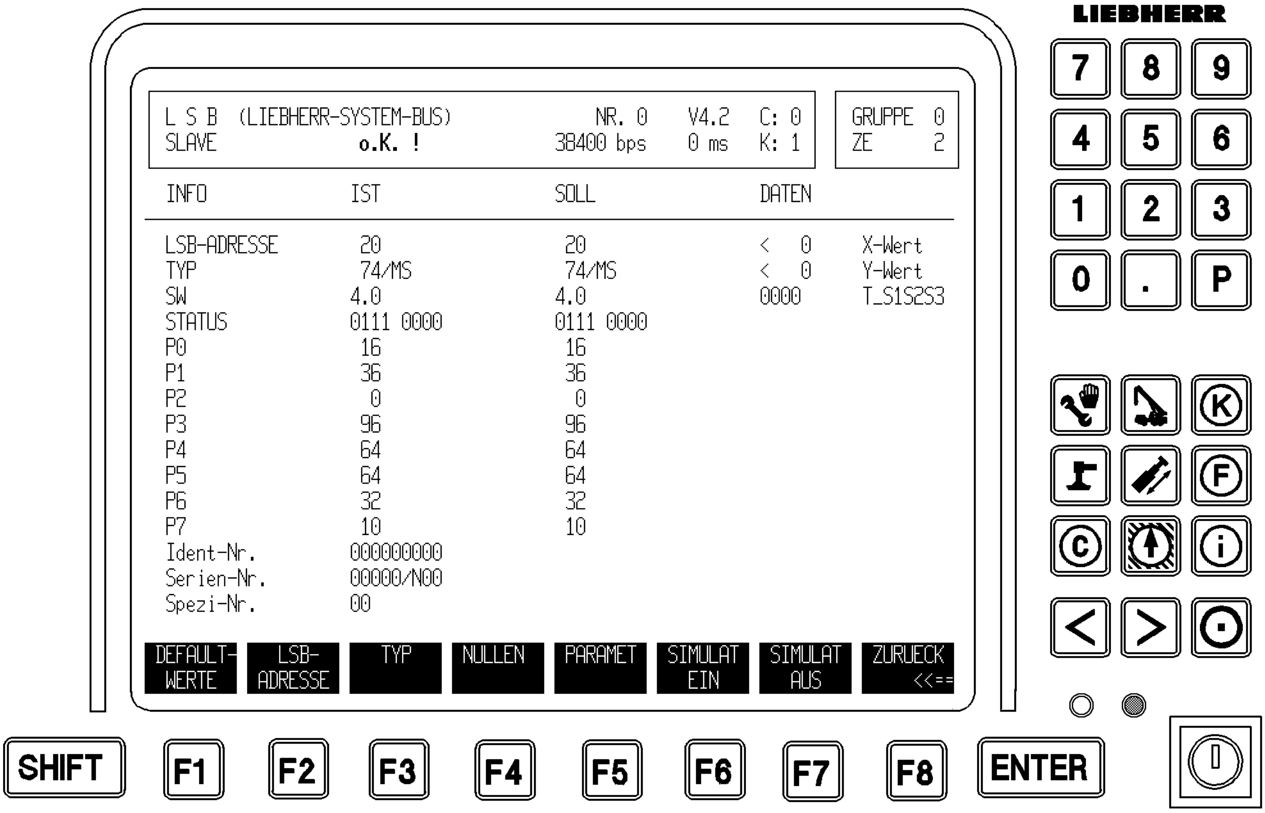
3.4.5.1 Information
In the detail view, the actual / nominal comparison of the type characteristic is shown.

INFO / IST / SOLL (INFO / ACTUAL / NOMINAL)
See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor .

DATEN (DATA)
In the field tons, the current pull force is shown in tons [t].

3.4.5.2 Function key bar
See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor.


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 0 V4.2 C: 0
SLAVE o.K. ! 38400 bps 0 ms K: 0
GRUPPE 0
ZE 0
INFO IST SOLL DATEN
LSB-ADRESSE 25 25 0.00 grad
TYP 56/DR 56/DR
SW 4.0 4.0
STATUS 0100 0000 0100 0000
P0 0 0
P1 192 192
P2 42 42
P3 160 160
P4 255 255
P5 255 255
P6 0 0
P7 0 0
Ident-Nr. 000000000
Serien-Nr. 00000/N00
Spezi-Nr. 00
DEFAULT-WERTE
LSB-ADRESSE
TYP
NULLEN
PARAMET
SIMULAT EIN
SIMULAT AUS
ZURUECK <<==
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
L S B (LIEBHERR-SYSTEM-BUS) NR. 0 V4.2 C: 0
SLAVE o.K. ! 38400 bps 0 ms K: 1
GRUPPE 0
ZE 2
INFO IST SOLL DATEN
LSB-ADRESSE 20 20 < 0 X-Wert
TYP 74/MS 74/MS < 0 Y-Wert
SW 4.0 4.0 0000 T_S1S2S3
STATUS 0111 0000 0111 0000
P0 16 16
P1 36 36
P2 0 0
P3 96 96
P4 64 64
P5 64 64
P6 32 32
P7 10 10
Ident-Nr. 000000000
Serien-Nr. 00000/N00
Spezi-Nr. 00
DEFAULT-WERTE
LSB-ADRESSE
TYP
NULLEN
PARAMET
SIMULAT EIN
SIMULAT AUS
ZURUECK <<==
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

190457

3.4.6 Slewing sensor horizontal (DR)

3.4.6.1 Information

In the detail view, the actual / nominal comparison of the type characteristic is shown.

INFO / IST / SOLL (= INFO / ACTUAL / NOMINAL)
See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor.

DATEN (=DATA)
In the field **grad** (degrees), the current position of the crane superstructure in relation to its main working direction ”to the rear” is given in degrees [grad].

3.4.6.2 Function key bar

See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor.

3.4.7 Master switch (MS)

3.4.7.1 Information

In the detail view, the actual / nominal comparison of the type characteristic is shown.

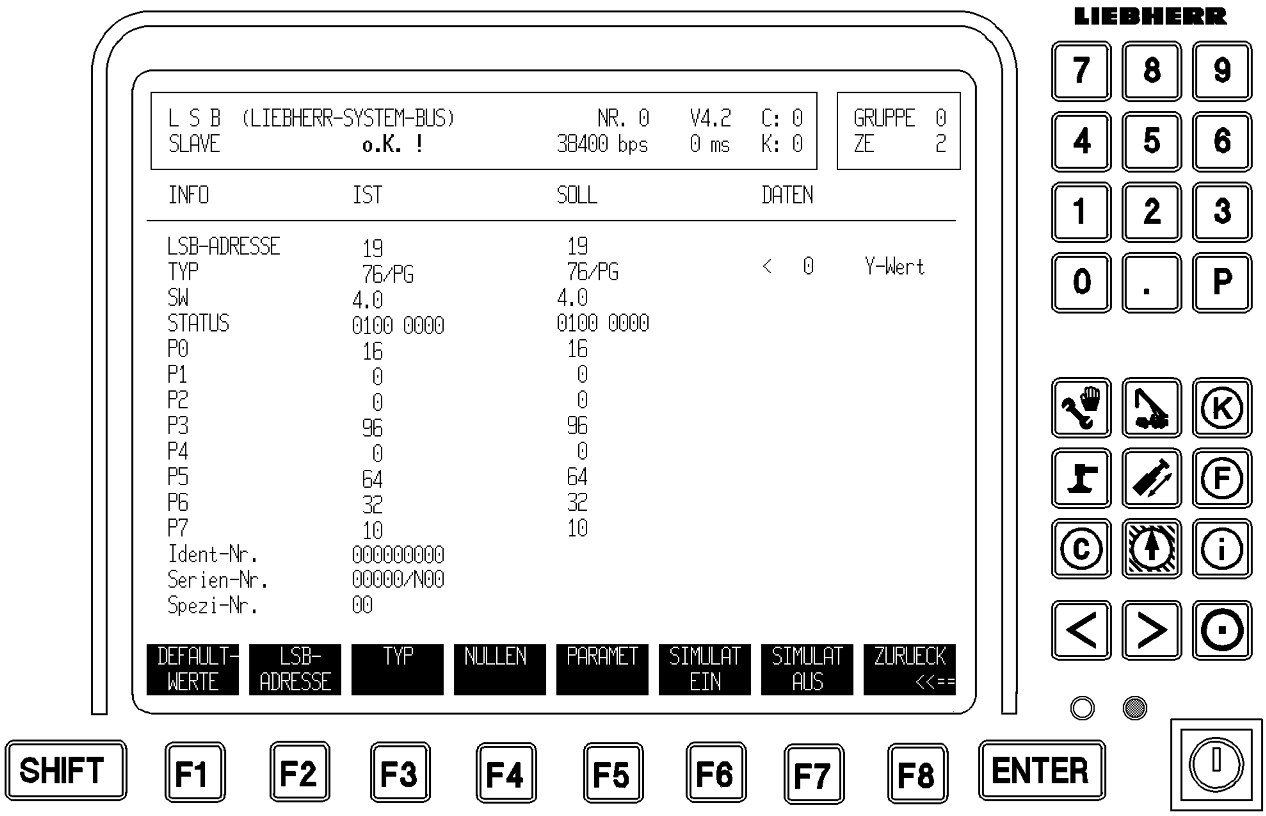
INFO / IST / SOLL (INFO / ACTUAL / NOMINAL)
See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor .

DATEN (DATA)

< 0	X-value	Deflection in X - direction in percentages [%]
< 0	Y-value	Deflection in Y - direction in percentages [%]
0000	T_S1S2S3	Button assignment on master switch

3.4.7.2 Function key bar

See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor .


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 0 V4.2 C: 0
SLAVE o.K. ! 38400 bps 0 ms K: 0
GRUPPE 0
ZE 2
INFO IST SOLL DATEN
LSB-ADRESSE 19 19
TYP 76/PG 76/PG < 0 Y-Wert
SW 4.0 4.0
STATUS 0100 0000 0100 0000
P0 16 16
P1 0 0
P2 0 0
P3 96 96
P4 0 0
P5 64 64
P6 32 32
P7 10 10
Ident-Nr. 000000000
Serien-Nr. 00000/N00
Spezi-Nr. 00
DEFAULT-WERTE
LSB-ADRESSE
TYP
NULLEN
PARAMET
SIMULAT EIN
SIMULAT AUS
ZURUECK <<==
7 8 9
4 5 6
1 2 3
0 . P
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

190458

3.4.8 Pedal sensor (PG)

3.4.8.1 Information

In the detail view, the actual / nominal comparison of the type characteristic is shown.

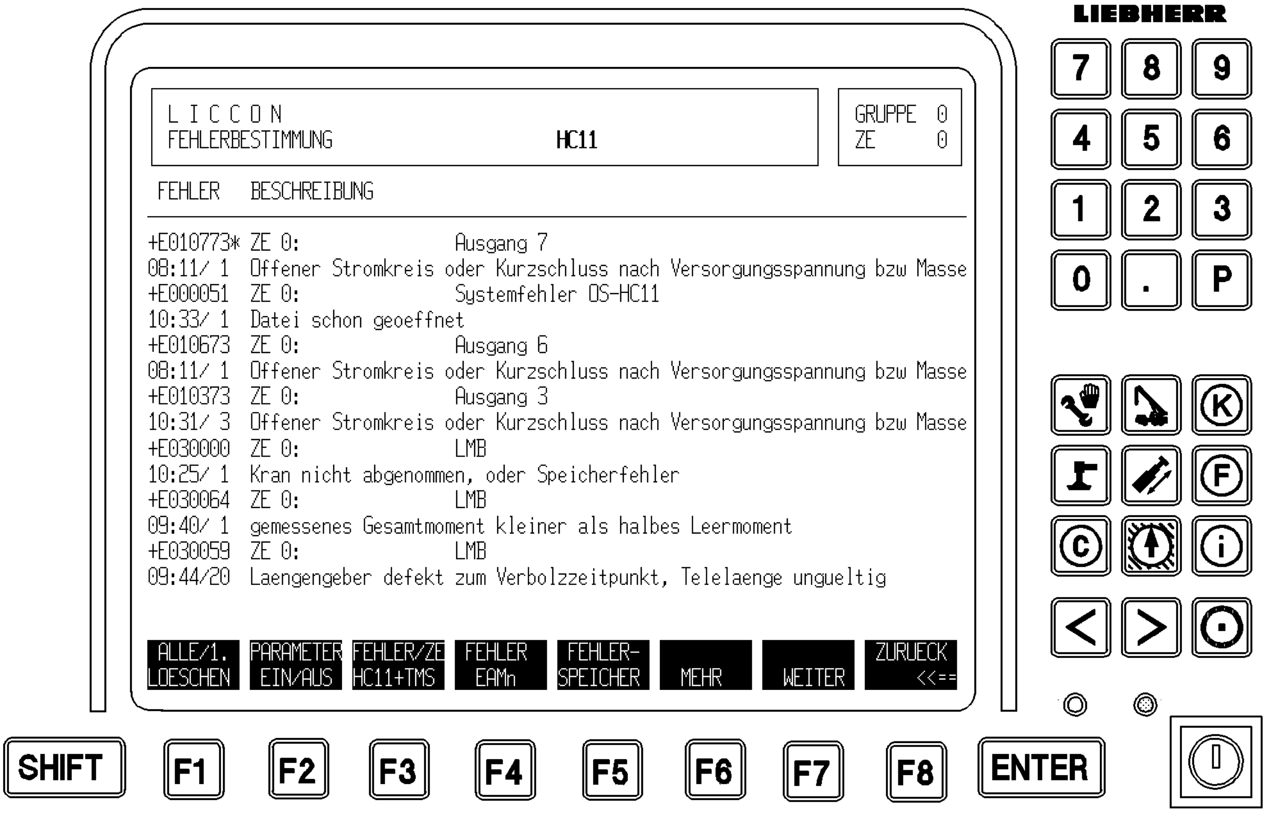
INFO / IST / SOLL (INFO / ACTUAL / NOMINAL)
See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor .

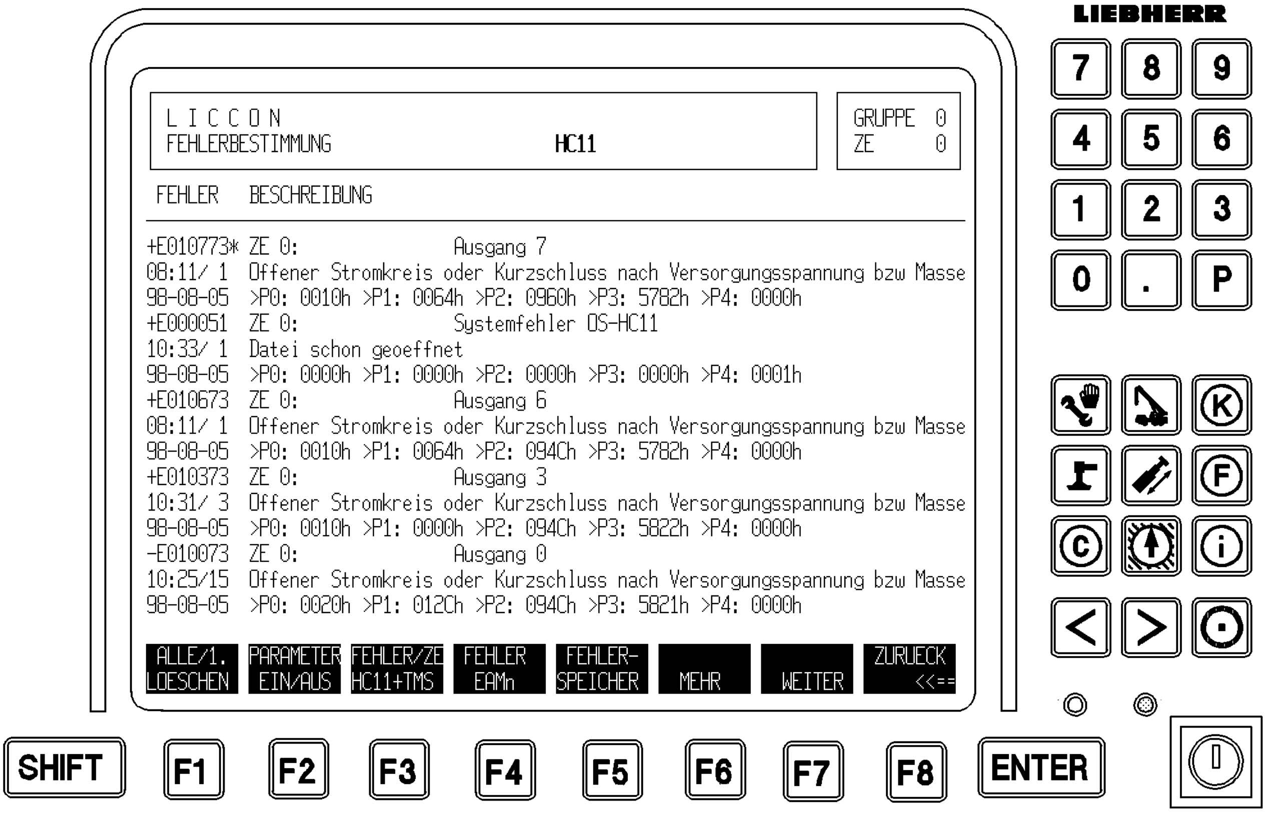
DATEN (DATA)

< 0	X-value	Deflection in X - direction in percentages [%]

3.4.8.2 Function key bar

See LSB detail view Slave ⇒Hoist limit switch with wind velocity sensor .


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E000051 ZE 0: Systemfehler OS-HC11
10:33/ 1 Datei schon geoeffnet
+E010673 ZE 0: Ausgang 6
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E010373 ZE 0: Ausgang 3
10:31/ 3 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E030000 ZE 0: LMB
10:25/ 1 Kran nicht abgenommen, oder Speicherfehler
+E030064 ZE 0: LMB
09:40/ 1 gemessenes Gesamtmoment kleiner als halbes Leermoment
+E030059 ZE 0: LMB
09:44/20 Laengengeber defekt zum Verbolzzeitpunkt, Telelaenge ungueltig
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
MEHR
WEITER
ZURUECK <<==
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0064h >P2: 0960h >P3: 5782h >P4: 0000h
+E000051 ZE 0: Systemfehler OS-HC11
10:33/ 1 Datei schon geoeffnet
98-08-05 >P0: 0000h >P1: 0000h >P2: 0000h >P3: 0000h >P4: 0001h
+E010673 ZE 0: Ausgang 6
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0064h >P2: 094Ch >P3: 5782h >P4: 0000h
+E010373 ZE 0: Ausgang 3
10:31/ 3 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0000h >P2: 094Ch >P3: 5822h >P4: 0000h
-E010073 ZE 0: Ausgang 0
10:25/15 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0020h >P1: 012Ch >P2: 094Ch >P3: 5821h >P4: 0000h
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
MEHR
WEITER
ZURUECK <<==
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

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3.5 LICCON error determination

Error messages are created by erroneous functions in the LICCON computer system. Adifferentiation is made between **operating errors** and **system errors**. **System errors** are divided into :

Active system errors :	Errors, which are permanent, for example broken wires, sensor defective, etc. Marked with the "+" sign
Inactive system errors:	Errors, which occur only for a short time, for example loose contact, short term failure of a sensor, etc. Marked with the "-" sign

Note: See paragraph 2 "Error recognition LICCON Computer system".

3.5.1 Error stack

Each CPU has one processor HC11 and TMS. These processors have a memory area (error stack), which allows storage for up to 9 errors . Just as the CPUs, each input / output module has an error stack, which allows storage for up to 9 errors . All errors with LICCON-Error-Code (LEC) are shown with their error number and are stored and documented in the corresponding error stack.

Note:
- If an error stack of one processor is full (9 errors), then inactive errors are overwritten by new, active errors.
- If only active system errors are in the error stack, than no other system error can be stored in the error stack.
- If the error stack contains only active system errors, then a system error is overwritten if an operating error occurs .
- If an error is still valid or if the cause of the error has not been taken care of, then a new active error message is created and shown, i.e. new date, new time.

C A U T I O N : When the ignition is turned off, all error messages (active and inactive) in the error stacks are deleted.

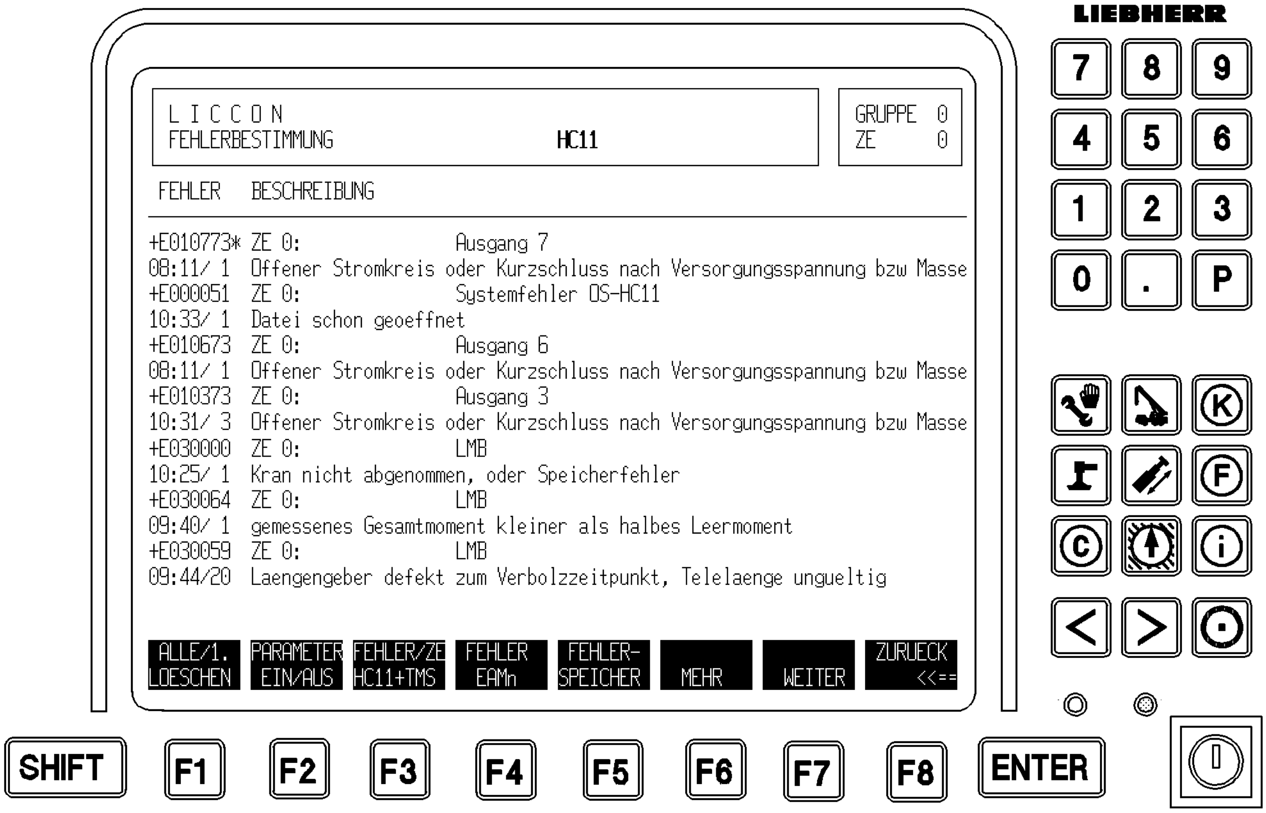
Note: For error storage in the permantent **error stack**, see paragraph 3.5.2.

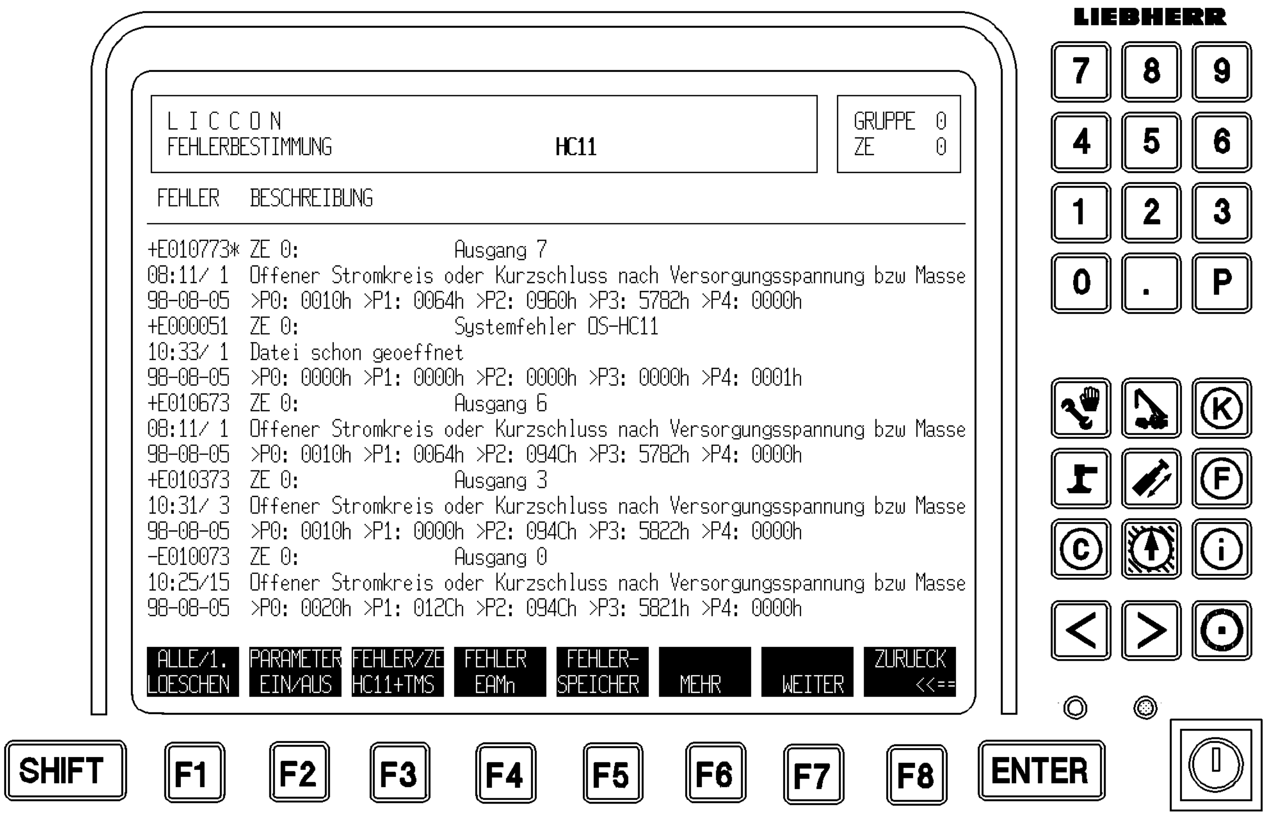
There are two possibilities to determine the errors:

a) **Error determination from the Operating / Telescoping /equipment configuration view**
If a system or operating error is triggered, then an error message appears in the "Crane operation ", "Telescoping " or "Set up" program, in symbol element "Horn" via function key "F8", for example **E:0HC11**.

- Press the function key "F8" to turn the acoustical signal off.
- Call up theMulti CPU test system by pressing the function key "F8" again.
  ⇒ LICCON error determination

Note: The system shifts automatically into the error stack, where the first error has been stored.


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E000051 ZE 0: Systemfehler OS-HC11
10:33/ 1 Datei schon geoeffnet
+E010673 ZE 0: Ausgang 6
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E010373 ZE 0: Ausgang 3
10:31/ 3 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E030000 ZE 0: LMB
10:25/ 1 Kran nicht abgenommen, oder Speicherfehler
+E030064 ZE 0: LMB
09:40/ 1 gemessenes Gesamtmoment kleiner als halbes Leermoment
+E030059 ZE 0: LMB
09:44/20 Laengengeber defekt zum Verbolzzeitpunkt, Telelaenge ungueltig
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER- SPEICHER
MEHR
WEITER
ZURUECK <<==
7 8 9 4 5 6 1 2 3 0 . P
K F C i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0064h >P2: 0960h >P3: 5782h >P4: 0000h
+E000051 ZE 0: Systemfehler OS-HC11
10:33/ 1 Datei schon geoeffnet
98-08-05 >P0: 0000h >P1: 0000h >P2: 0000h >P3: 0000h >P4: 0001h
+E010673 ZE 0: Ausgang 6
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0064h >P2: 094Ch >P3: 5782h >P4: 0000h
+E010373 ZE 0: Ausgang 3
10:31/ 3 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0000h >P2: 094Ch >P3: 5822h >P4: 0000h
-E010073 ZE 0: Ausgang 0
10:25/15 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0020h >P1: 012Ch >P2: 094Ch >P3: 5821h >P4: 0000h
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER- SPEICHER
MEHR
WEITER
ZURUECK <<==
7 8 9 4 5 6 1 2 3 0 . P
K F C i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

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b) Call up via the Multi CPU test system
- Call up the "Test system" program with the "P8" program key
- Select the CPU in the main menu
- Call up the sub function "TEST+ERROR" with the "F5" function key
  Call up the sub function "TEST" with the "F5" function key
  ⇒ LICCON Error determination
- Select the error stack (HC11, TMS, EAMn) with function keys "F3", "F4" or "F5".

Note: Press the function key "F7" repeatedly to show each EAM error stack.

3.5.1.1 Information

The information for an error is split on two or three [1] lines. By calling up the subprogram "PARAMETER EIN/AUS (ON /OFF) " (F2) , error specific data as well as the date when the error occurred are shown on the third line. In addition, all non active errors (inactive errors " - ") are shown.

± LEC (*)	Device Code	Error path	Line 1
Time /error frequency	Type of error		Line 2
Date	Error specific data		Line 3[1]

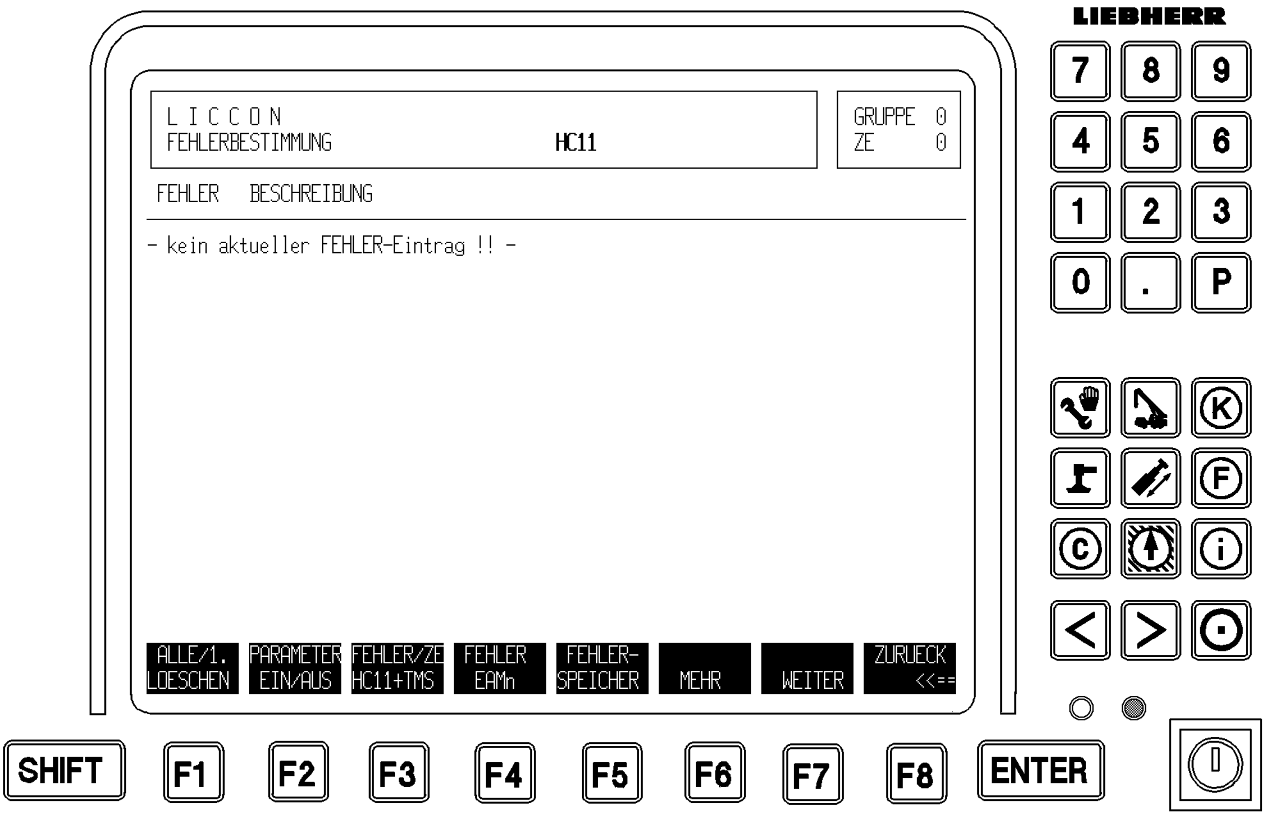
Line 1: - Liebherr Error Code
+ = active error
− = inactive error [1]
- Device Code
Module which has created the error.
- Error path
Source of errors

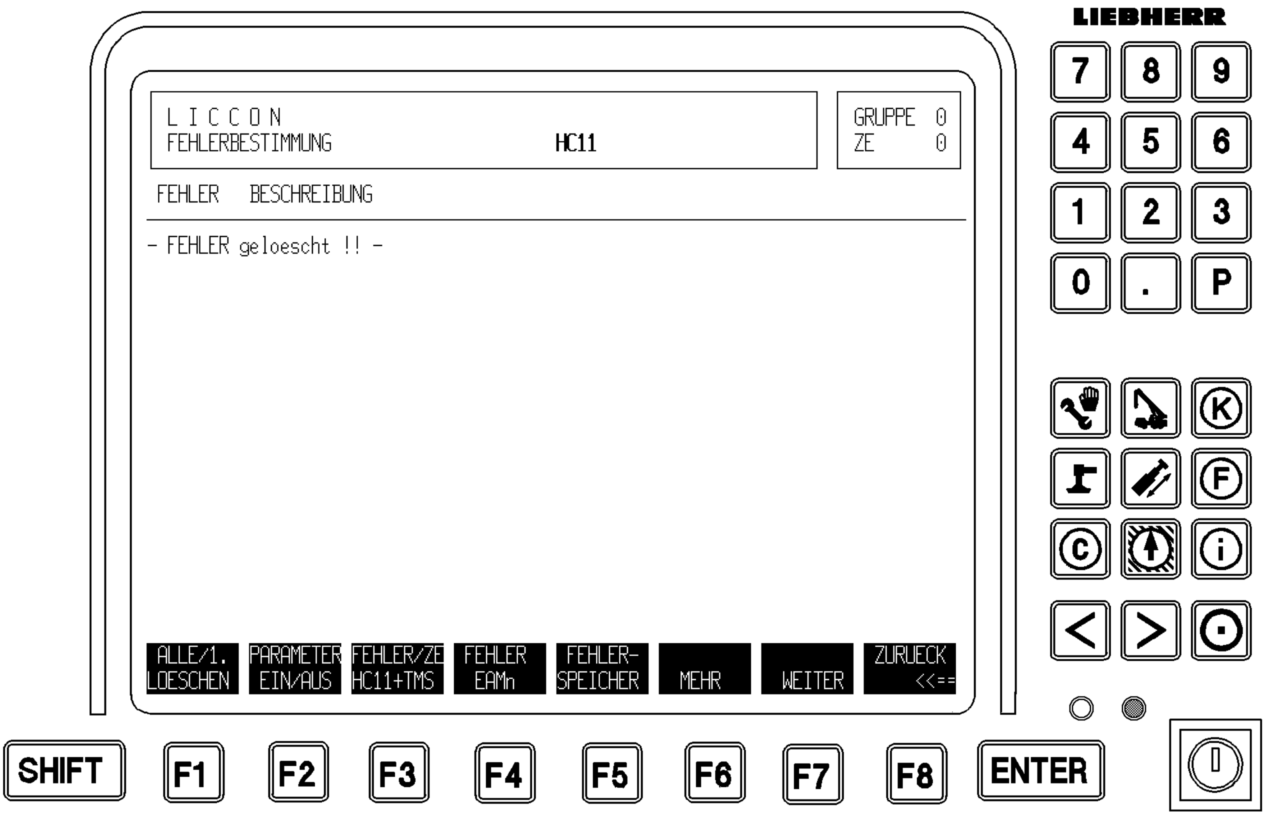
- *
1. error on page 1 of selected error stack

Line 2: - Time of day / error frequency
Time when the error occurred last
Frequency of error
- Type of error
Documentary description of error

Line 3 [1]: - Date
- error specific data, in hexa-decimal form

[1] In case of call up of sub function PARAMETER ON


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
- kein aktueller FEHLER-Eintrag !! -
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
MEHR
WEITER
ZURUECK <<==
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
- FEHLER geloescht !! -
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
MEHR
WEITER
ZURUECK <<==
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

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3.5.1.2 Error stack in blank condition

The blank condition of the selected error stack depends on the sub function PARAMETER ON / OFF.

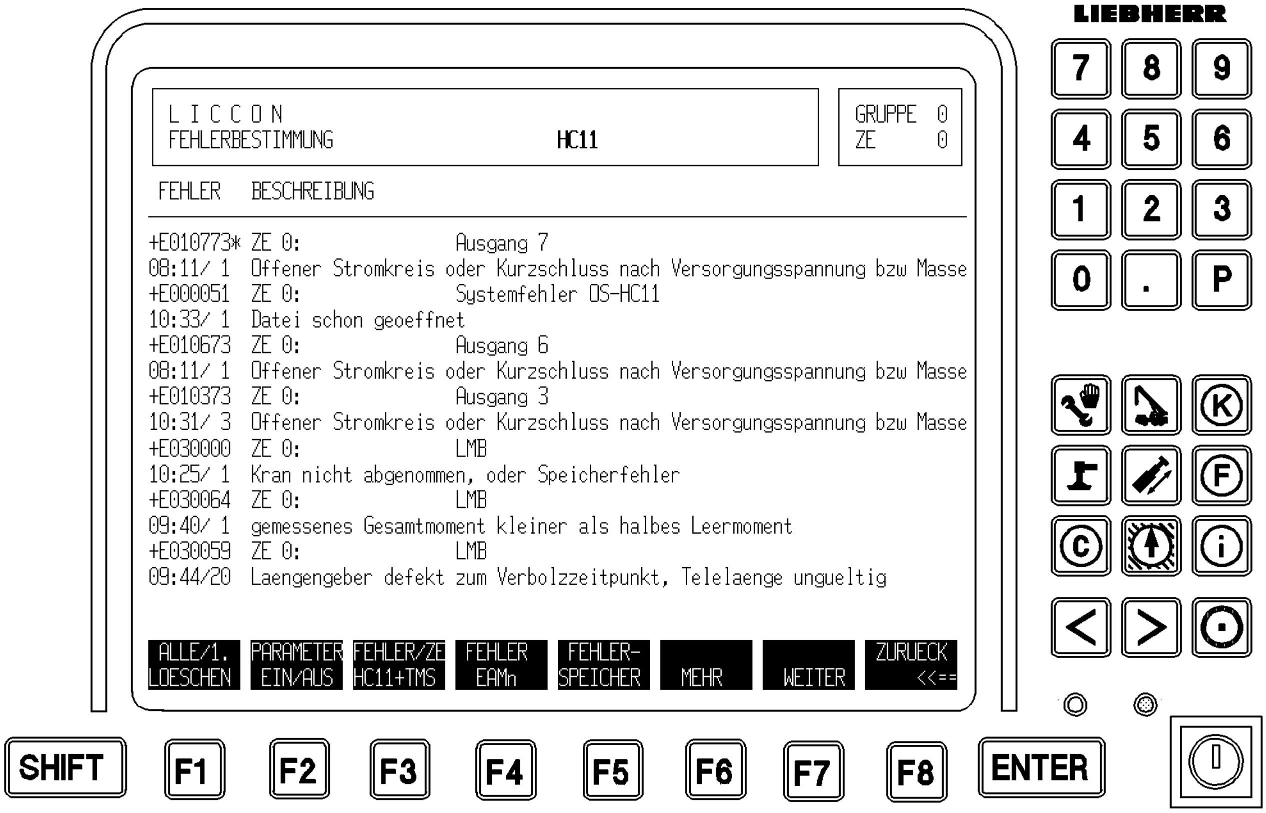
Sub function PARAMETER OFF

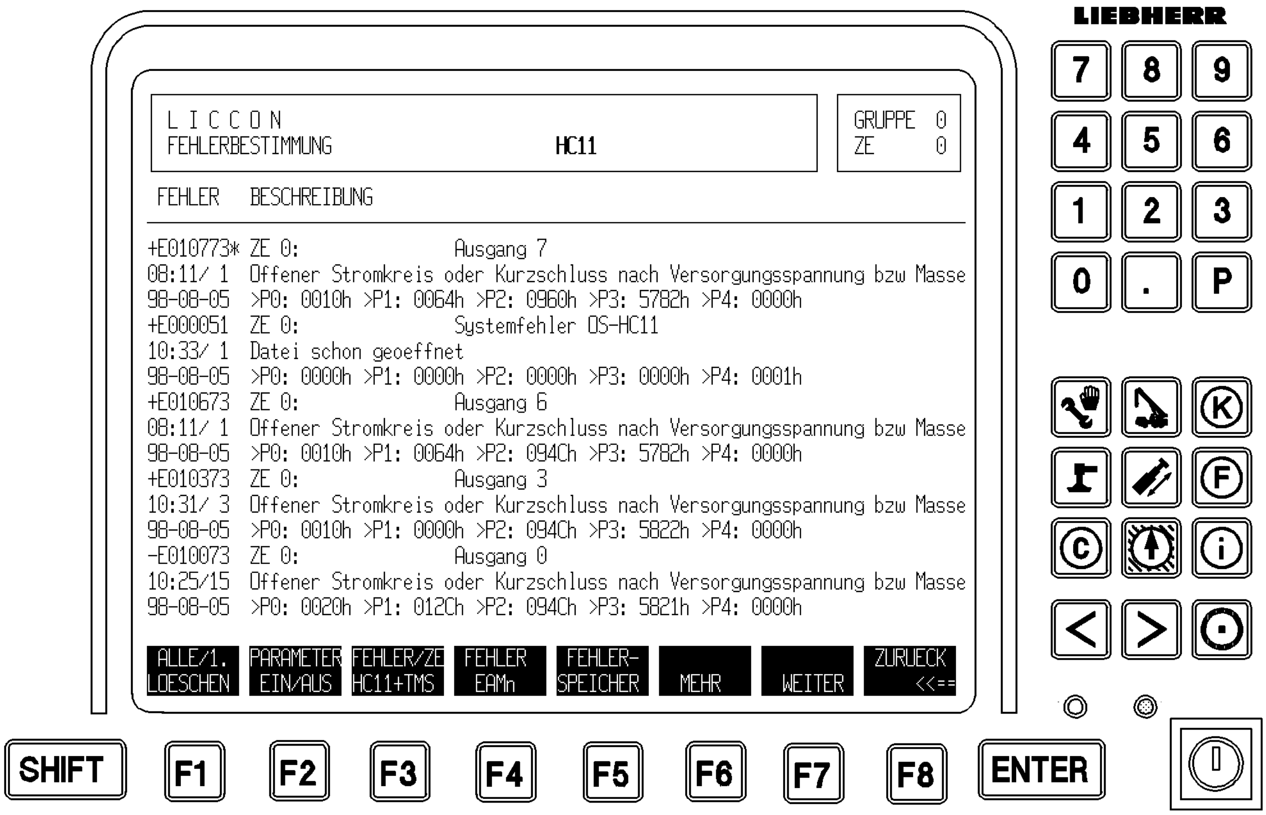
If no active error and no control error exisits, the note **" - no current ERROR entry ! ! -"** is shown on the monitor.

Note: It is possible that inactive errors are in the error stack. To show them, call up sub function PARAMETER ON with "F2" .

Sub function PARAMETER ON

If the error stack is absolutely empty, which means there are no "old" or inactive errors, the note " - **ERRORS deleted ! !** -" is shown on the monitor with PARAMETER ON.


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E000051 ZE 0: Systemfehler OS-HC11
10:33/ 1 Datei schon geoeffnet
+E010673 ZE 0: Ausgang 6
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E010373 ZE 0: Ausgang 3
10:31/ 3 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E030000 ZE 0: LMB
10:25/ 1 Kran nicht abgenommen, oder Speicherfehler
+E030064 ZE 0: LMB
09:40/ 1 gemessenes Gesamtmoment kleiner als halbes Leermoment
+E030059 ZE 0: LMB
09:44/20 Laengengeber defekt zum Verbolzzeitpunkt, Telelaenge ungueltig
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
MEHR
WEITER
ZURUECK <<==
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG HC11
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG
+E010773* ZE 0: Ausgang 7
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0064h >P2: 0960h >P3: 5782h >P4: 0000h
+E000051 ZE 0: Systemfehler OS-HC11
10:33/ 1 Datei schon geoeffnet
98-08-05 >P0: 0000h >P1: 0000h >P2: 0000h >P3: 0000h >P4: 0001h
+E010673 ZE 0: Ausgang 6
08:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0064h >P2: 094Ch >P3: 5782h >P4: 0000h
+E010373 ZE 0: Ausgang 3
10:31/ 3 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0010h >P1: 0000h >P2: 094Ch >P3: 5822h >P4: 0000h
-E010073 ZE 0: Ausgang 0
10:25/15 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
98-08-05 >P0: 0020h >P1: 012Ch >P2: 094Ch >P3: 5821h >P4: 0000h
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
MEHR
WEITER
ZURUECK <<==
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
i
SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

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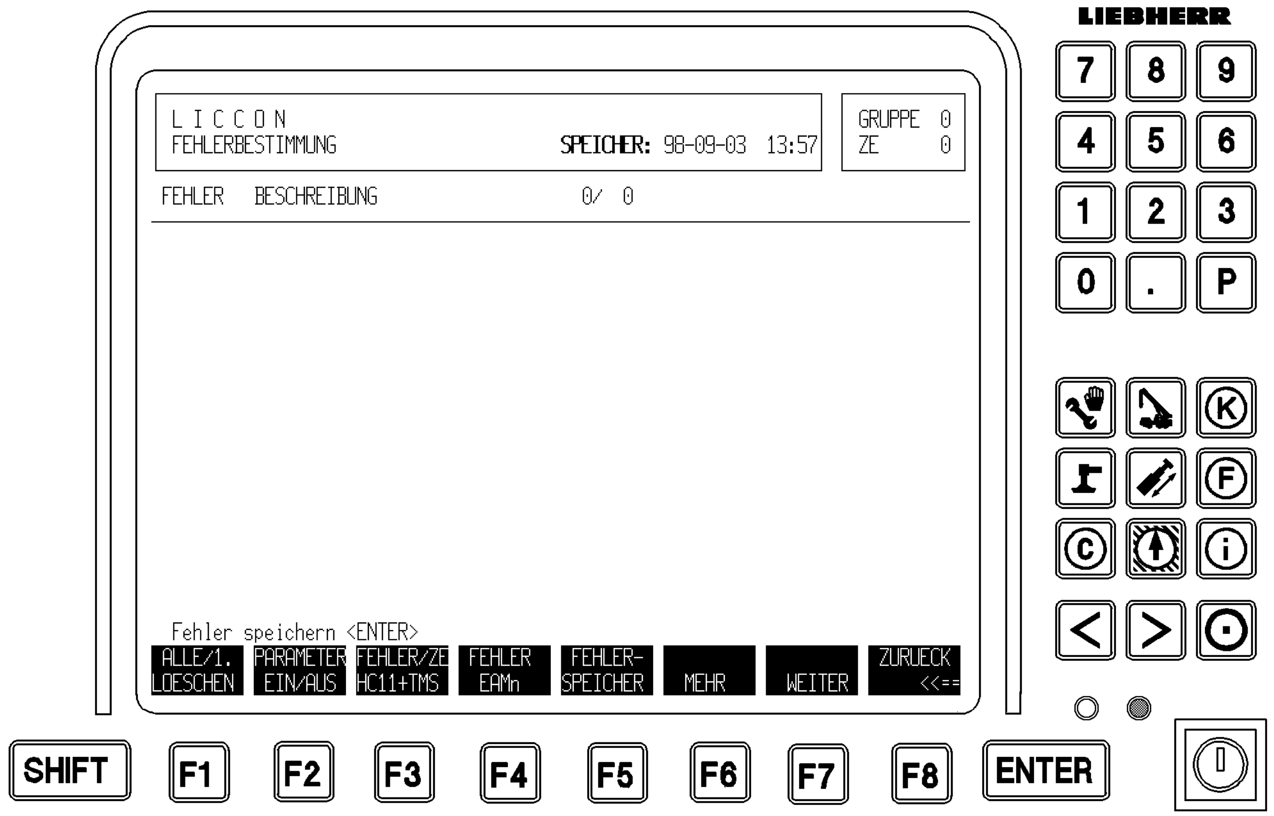
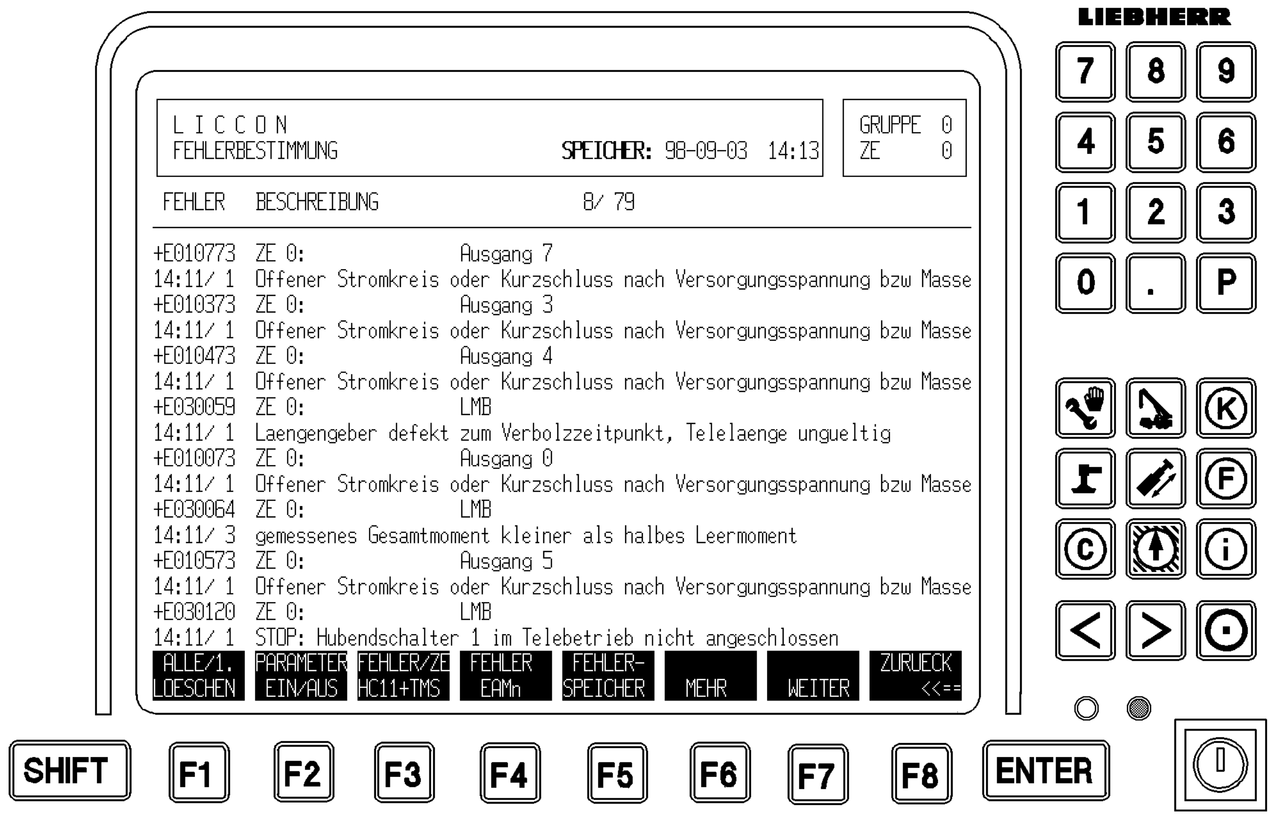
3.5.1.3 Function key bar

F1"	**ALLE/1. LOESCHEN**	Delete all errors. Active errors are shown again with the current date. **Note:** Press "SHIFT+F1" to delete the 1st error (*) on page 1 of the error stack.
"F2"	**PARAMETER EIN/AUS**	(ON / OFF) Detailed view of error stack. Active and inactive errors as well as operating errors are in the 3rd line with additional information of date and parameters P0 .. P2 (P4) In PARAMETER VIEW ON, maximum 5 error entries per page are shown.
"F3"	**FEHLER/ZE HC11+TMS**	Call up HC11 or TMS error stack
"F4"	**FEHLER EAMn**	Call up the error stack of input / output module 1 Press the "F7" key repeatedly to call up the error stacks for all input / output modules . **Note:** With key combination "SHIFT"+"FEHLER EAMn" , combination SHIFT+Error EAMn , the first page of the selected input / output module is shown again.
"F5"	**FEHLER SPEICHER**	(ERROR STACK)Call up the stored error condition. **Note:** With key combination "SHIFT" + "F5", all present errors can be stored in the permanent error stack of the power supply unit. (see also paragraph 3.5.3)
"F6"	**MEHR**	(MORE) Call up additional error pages (if present).
"F7"	**WEITER**	Press the "F7" key to call up all error stacks , one after the other.
"F8"	**ZURUECK <<==**	Back in direction of "Main menu".


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG
SPEICHER: 98-09-03 13:57
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG 0/ 0
Fehler speichern <ENTER>
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
MEHR
WEITER
ZURUECK <<==
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P


LIEBHERR
L I C C O N
FEHLERBESTIMMUNG
SPEICHER: 98-09-03 14:13
GRUPPE 0
ZE 0
FEHLER BESCHREIBUNG 8/ 79
+E010773 ZE 0: Ausgang 7
14:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E010373 ZE 0: Ausgang 3
14:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E010473 ZE 0: Ausgang 4
14:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E030059 ZE 0: LMB
14:11/ 1 Laengengeber defekt zum Verbolzzeitpunkt, Telelaenge ungueltig
+E010073 ZE 0: Ausgang 0
14:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E030064 ZE 0: LMB
14:11/ 3 gemessenes Gesamtmoment kleiner als halbes Leermoment
+E010573 ZE 0: Ausgang 5
14:11/ 1 Offener Stromkreis oder Kurzschluss nach Versorgungsspannung bzw Masse
+E030120 ZE 0: LMB
14:11/ 1 STOP: Hubendschalter 1 im Telebetrieb nicht angeschlossen
ALLE/1. LOESCHEN
PARAMETER EIN/AUS
FEHLER/ZE HC11+TMS
FEHLER EAMn
FEHLER-SPEICHER
MEHR
WEITER
ZURUECK <<==
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER
7 8 9
4 5 6
1 2 3
0 . P

190461

3.5.2 Error memory

All current errors ,which occured for a short period or permanently during crane operation or travel operation (only on machines with two engines), can be saved in a permanent error memory bank (RAM), max. 160 errors .

Note: On machine models with only one motor (UW= chassis), input /output module errors **cannnot** be saved in the RAM error stack. The reason is that one must switch to the superstructure to start the LICCON computer system. However, this action automaticcally turns off the ignition in the chassis and thereby deletes all the errors in the error stack of the input / output module.

To save all currently existing errors
- press key combination "SHIFT"+"F5".
- Confirm storage with the "ENTER" key.

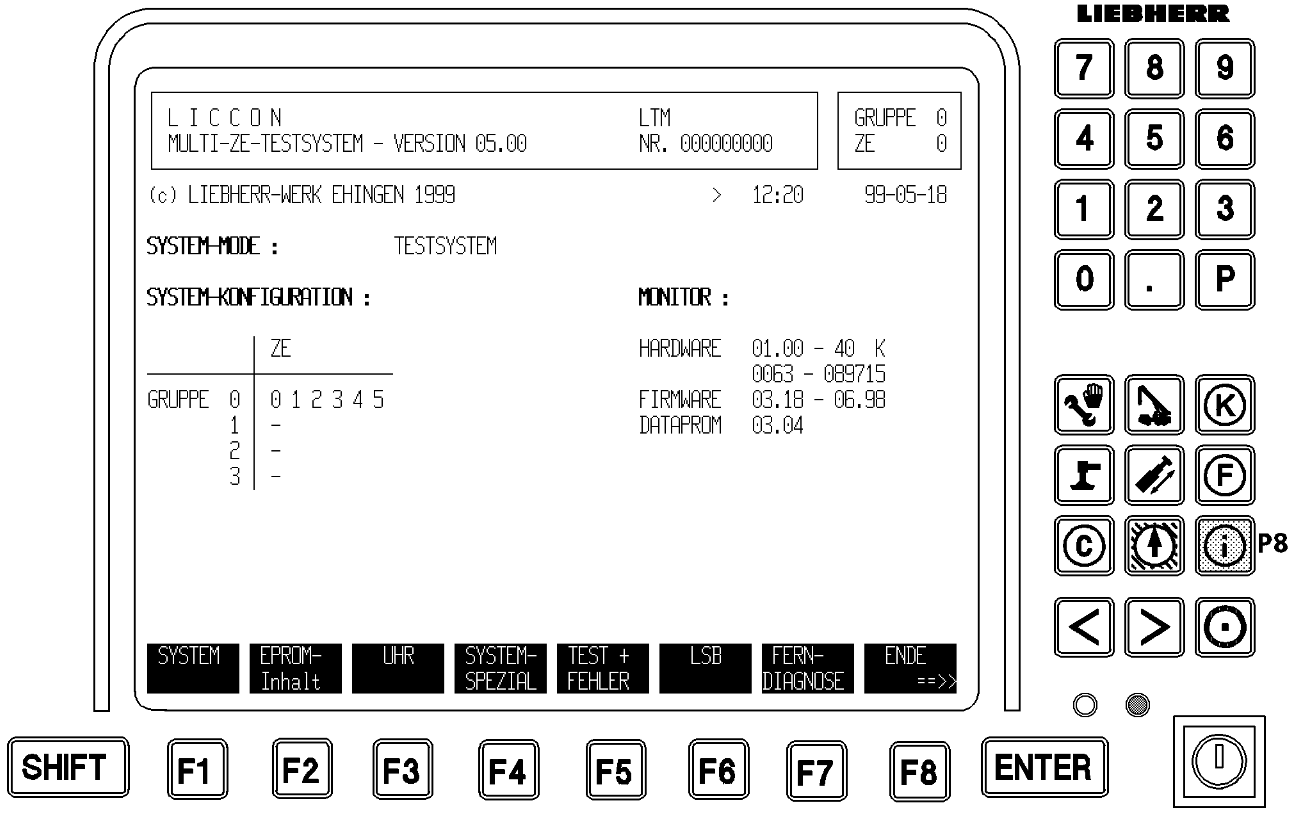
Call up the saved error in the error determination view
- Press the "F5" key.

In the top line, the date as well as the time of day is given,when the error was saved.

SPEICHER: 98-09-03 14:13

3.5.2.1 Function key bar

The function key assignment corresponds to that of the error determination view.


LIEBHERR
L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 05.00
LTM
NR. 000000000
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 1999
> 12:20
99-05-18
SYSTEM-MODE : TESTSYSTEM
SYSTEM-KONFIGURATION :
ZE
GRUPPE 0 0 1 2 3 4 5
1 -
2 -
3 -
MONITOR :
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.04
SYSTEM
EPROM-Inhalt
UHR
SYSTEM-SPEZIAL
TEST + FEHLER
LSB
FERN-DIAGNOSE
ENDE ==>>
7 8 9
4 5 6
1 2 3
0 . P
P8
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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3.6 Procedure for LSB sesor programming

Note: The LSB sensor programming requires no release with code.
For safety reasons, the LSB sensor programming can **only** be activated in system mode "TEST SYSTEM" .

1. **Automatic assignment of a clearly identifiable sensor**

2. **Semi-automatic assignment of a non- clearly identifiable sensor**

Note: A clearly identifiable sensor is one:
- where the address of the sensor is not yet present on the corresponding LICCON System Bus ,
- the sensor has a clear type identification.

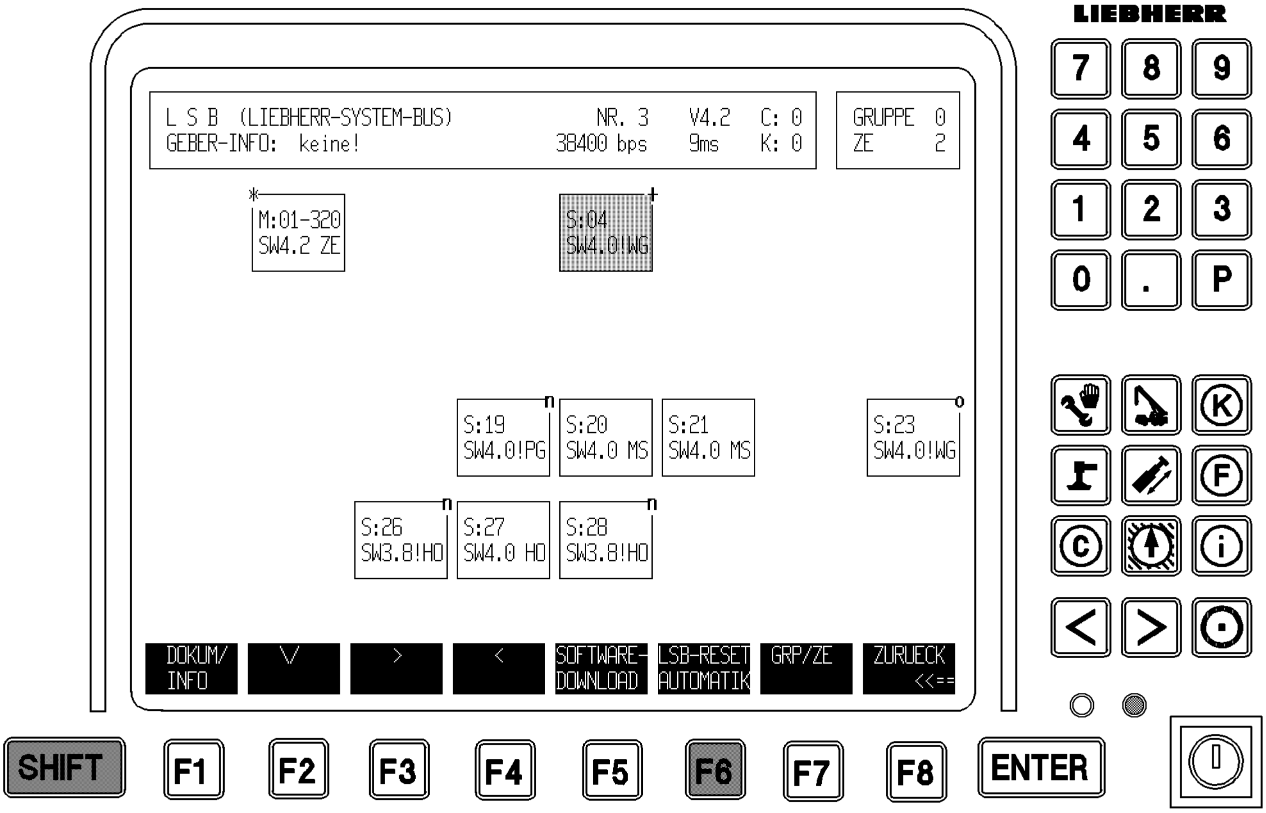
3.6.1 Start the LICCON computer system in system mode "TEST SYSTEM"

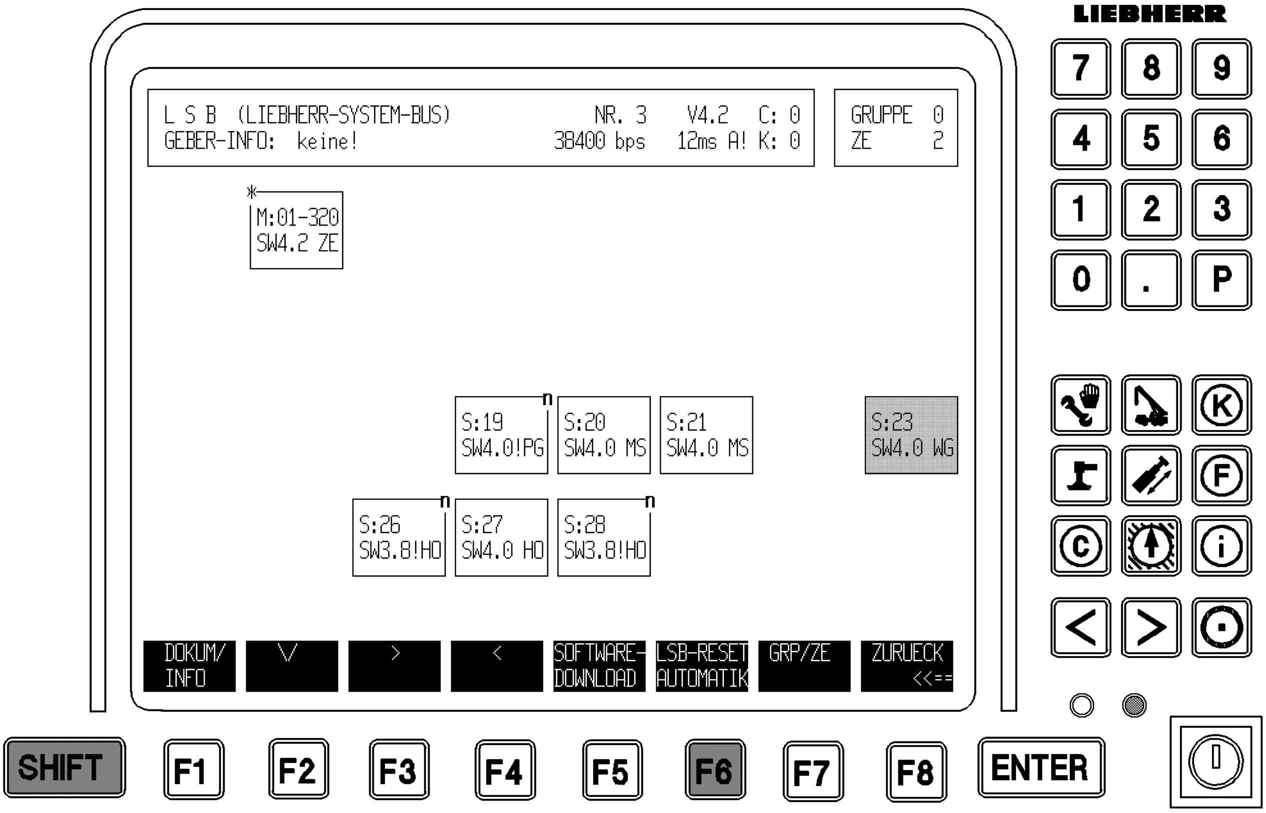
- Start the LICCON computer system with program key "P8" ("i"-key) .
  Immediately after turning the LICCON computer system on, an acoustical signal can be heard.
- Press the program key "P8" ("i"-key) for up to (approx. 10 seconds):

SYSTEM - CHECK . . . . PASSED - - O.K. ! !

The Multi CPU test system is started in

SYSTEM - MODE: TESTSYSTEM


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 3 V4.2 C: 0
GEBER-INFO: keine! 38400 bps 9ms K: 0
GRUPPE 0
ZE 2
M:01-320
SW4.2 ZE
S:04
SW4.0!WG
S:19
SW4.0!PG
S:20
SW4.0 MS
S:21
SW4.0 MS
S:23
SW4.0!WG
S:26
SW3.8!HO
S:27
SW4.0 HO
S:28
SW3.8!HO
DOKUM/
INFO
SOFTWARE-
DOWNLOAD
LSB-RESET
AUTOMATIK
GRP/ZE
ZURUECK
<<==
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


LIEBHERR
L S B (LIEBHERR-SYSTEM-BUS) NR. 3 V4.2 C: 0
GEBER-INFO: keine! 38400 bps 12ms A! K: 0
GRUPPE 0
ZE 2
M:01-320
SW4.2 ZE
S:19
SW4.0!PG
S:20
SW4.0 MS
S:21
SW4.0 MS
S:23
SW4.0 WG
S:26
SW3.8!HO
S:27
SW4.0 HO
S:28
SW3.8!HO
DOKUM/
INFO
SOFTWARE-
DOWNLOAD
LSB-RESET
AUTOMATIK
GRP/ZE
ZURUECK
<<==
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

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3.6.2 Automatic assignment of a clearly identifiable sensor

Example: Angle sensor with incorrect, but not yet assigned address

Note : Always install only one sensor on the LSB-Bus and then assign! Note possible bus conflicts .

- Install sensor.

- Start the Multi CPU test system in the system mode "Test system" .

- Call up the "LSB overview " with function key "F6" .

Note: Sensor appears with a " + " sign.

- Start automatic assignment with keys "SHIFT" + "F6" (**AUTOMATIK**) .
  The automatic assignment is shown by the **"A!"** in the header of the LSB overview.

Note: The assignment refers only to this LICCON System Bus.

All sensors, which are on their assigned location, are checked and are automatically assigned default values (given values). The manual assignment of default values is not applicable if the automatic is active.
All sensors, which are clearly assignable to a bus strand are programmed to their predtermined address and are automatically assigned default values. Their assignment is made according to type identification, which each sensor has.

Note: If the sensor is placed on address 0, because it could not be clearly assigned, then it must be configured through simple manual assignment .
See paragraph 3.6.4

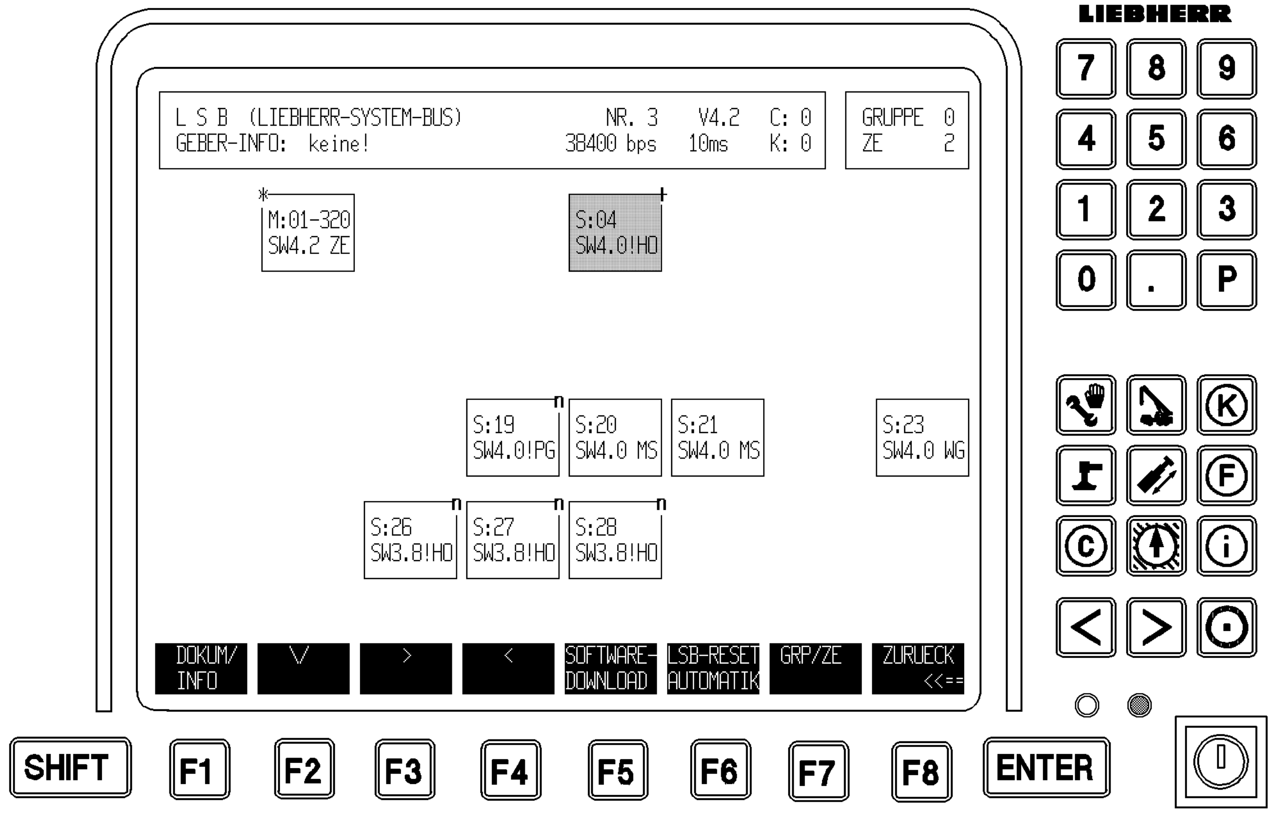
The automatic can only identify a sensor through type recognition , for that reason it is possible that two same sensor functions can be mixed up as far as the function is concerned (for example length sensor with angle sensor).
The change of two sensors must be made according to general procedure (release programming function via LICCON Code and manually assign address with automatic turned off) or bring sensor via automatic to another LSB on address 0.

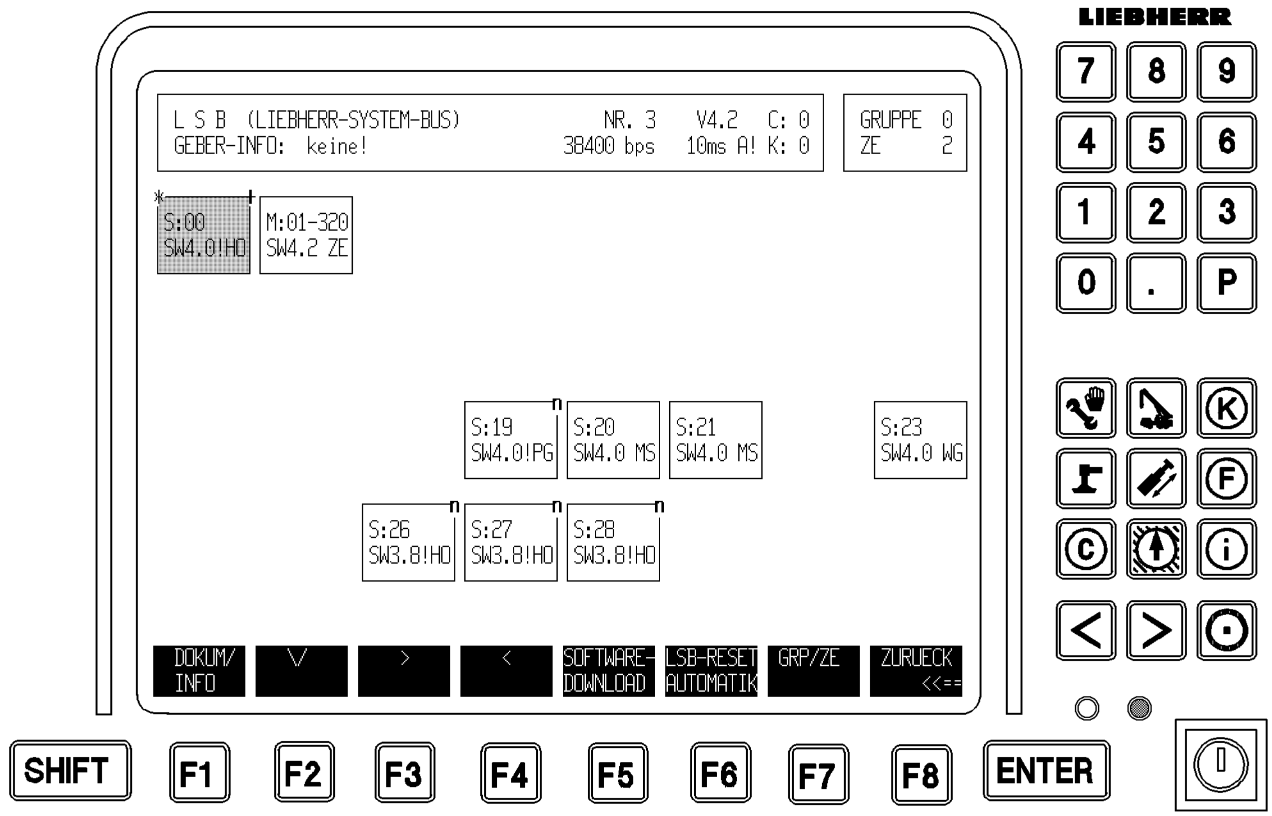
An exception are **Master switch (MS)** and **pedal sensor (PG)**.
These sensor types offer additional information through an external switch in connector plug , which is used at recognition and automatic assignment to the corresponding address. These sensors can be clearly assigned, also if several of the same sensors exist on a LICCON System Bus . Prerequisite is that the coding in the plug differs on all master switches or pedal sensors.

- End automatic assignment with keys "SHIFT" + "F6" .

- Restart LICCON Computer system without actuating the program key "P8" ("i"-key) .

Note: For safety reasons, a change from system mode "Test system" into system mode "Crane operation " is not possible.


L S B (LIEBHERR-SYSTEM-BUS) NR. 3 V4.2 C: 0
GEBER-INFO: keine! 38400 bps 10ms K: 0
GRUPPE 0
ZE 2
M:01-320
SW4.2 ZE
S:04
SW4.0!HO
S:19
SW4.0!PG
S:20
SW4.0 MS
S:21
SW4.0 MS
S:23
SW4.0 WG
S:26
SW3.8!HO
S:27
SW3.8!HO
S:28
SW3.8!HO
DOKUM/
INFO
SOFTWARE-
DOWNLOAD
LSB-RESET
AUTOMATIK
GRP/ZE
ZURUECK
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


L S B (LIEBHERR-SYSTEM-BUS) NR. 3 V4.2 C: 0
GEBER-INFO: keine! 38400 bps 10ms A! K: 0
GRUPPE 0
ZE 2
S:00
SW4.0!HO
M:01-320
SW4.2 ZE
S:19
SW4.0!PG
S:20
SW4.0 MS
S:21
SW4.0 MS
S:23
SW4.0 WG
S:26
SW3.8!HO
S:27
SW3.8!HO
S:28
SW3.8!HO
DOKUM/
INFO
SOFTWARE-
DOWNLOAD
LSB-RESET
AUTOMATIK
GRP/ZE
ZURUECK
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

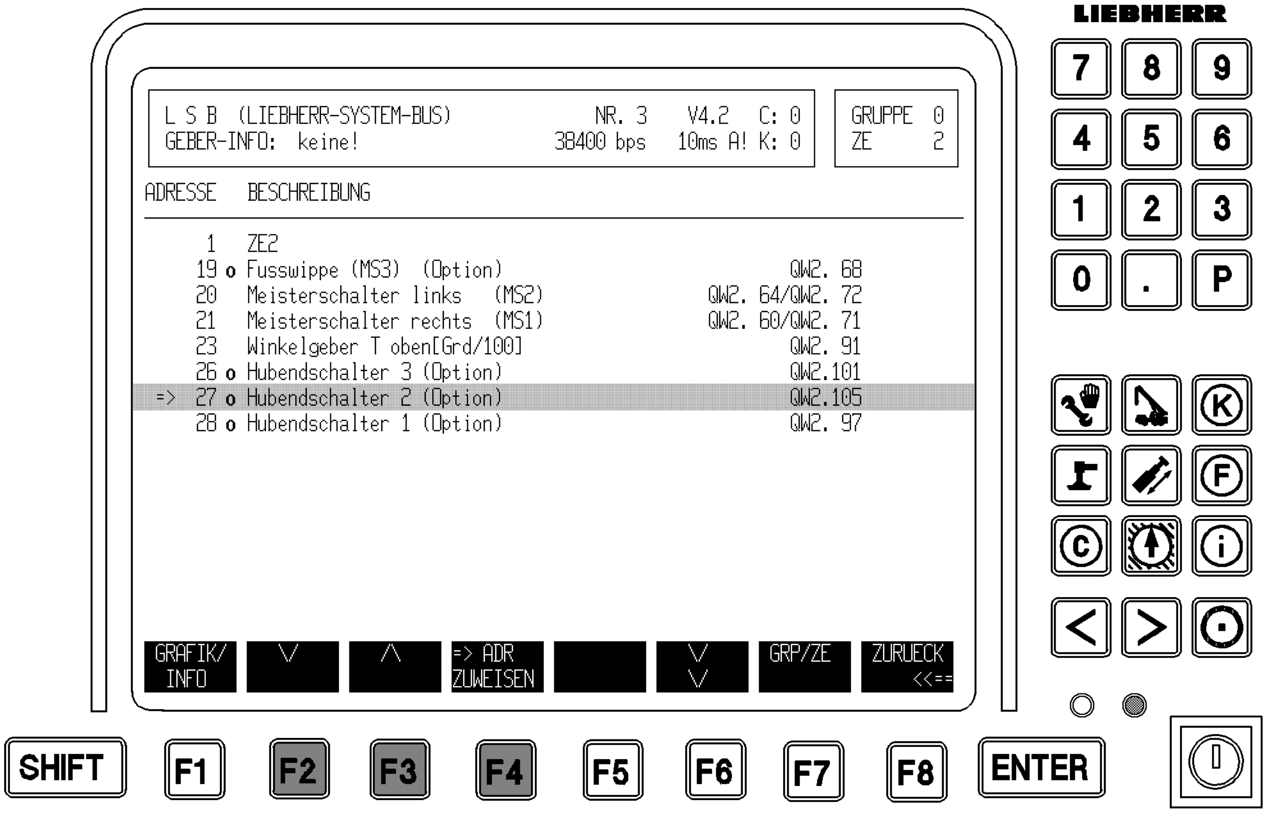
190433

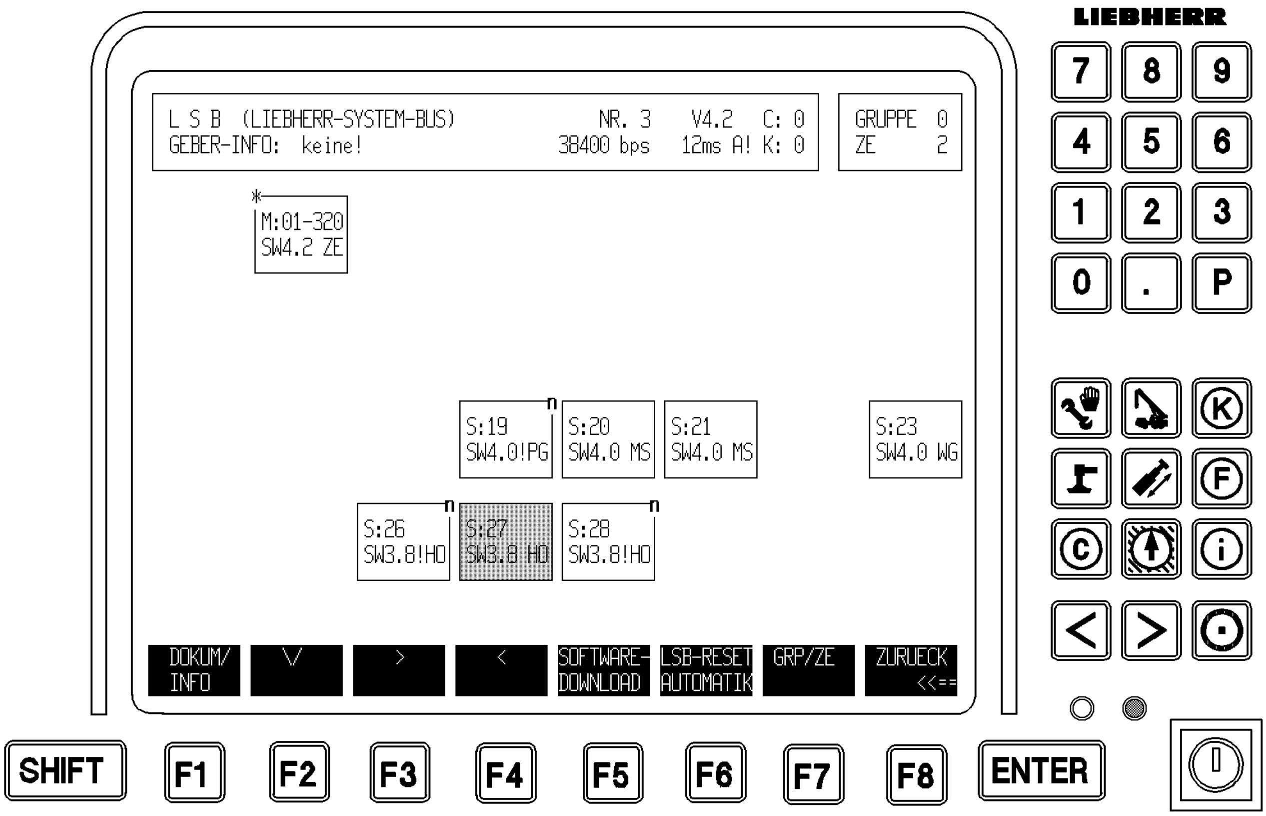
3.6.3 Sensor cannot be assigned via automatic assignment

Example: Hoist top limit switch with incorrect, but not assigned address

If the sensor is at an address for which the type identification does not match, then it is removed from that place and directly assigned to a clearly assignable location. If the assignment is not clear, then the sensor is assigned to address 0.

Note: In case the address 0 is already occupied by another sensor, then the next clear (non-configured) position is chosen. All not clearly assignable sensors are placed to address 0 so that they can be programmed to their final location with manual support. As soon as address 0 becomes free, the automatic ensures that the next non-assignable sensor is reassigned to address 0 and is thereby available again for manual assignment.


L S B (LIEBHERR-SYSTEM-BUS) NR. 3 V4.2 C: 0
GEBER-INFO: keine! 38400 bps 10ms A! K: 0
GRUPPE 0
ZE 2
ADRESSE BESCHREIBUNG
1 ZE2
19 o Fusswippe (MS3) (Option) QW2. 68
20 Meisterschalter links (MS2) QW2. 64/QW2. 72
21 Meisterschalter rechts (MS1) QW2. 60/QW2. 71
23 Winkelgeber T oben[Grd/100] QW2. 91
26 o Hubendschalter 3 (Option) QW2.101
=> 27 o Hubendschalter 2 (Option) QW2.105
28 o Hubendschalter 1 (Option) QW2. 97
GRAFIK/ INFO
=> ADR ZUWEISEN
GRP/ZE
ZURUECK <<==
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


L S B (LIEBHERR-SYSTEM-BUS) NR. 3 V4.2 C: 0
GEBER-INFO: keine! 38400 bps 12ms A! K: 0
GRUPPE 0
ZE 2
M:01-320
SW4.2 ZE
S:19
SW4.0!PG
S:20
SW4.0 MS
S:21
SW4.0 MS
S:23
SW4.0 WG
S:26
SW3.8!HO
S:27
SW3.8 HO
S:28
SW3.8!HO
DOKUM/ INFO
SOFTWARE- DOWNLOAD
LSB-RESET AUTOMATIK
GRP/ZE
ZURUECK <<==
LIEBHERR
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER

190434

3.6.4 Semi-automatic assignment of a not clearly identifiable sensor

Example: Hoist top limit switch

If a participant appears in the LSB overview on address 0, then it can be assigned manually to its final location.

Note: Prerequisite for manual assignment is that the sensor which needs to be configured is on address 0. Sensors which are not on address 0 also canot be manually assigned to another location.

Procedure

- Start the Multi CPU test system with program key "P8" ("i"-key) in
  SYSTEM-MODE: TESTSYSTEM.

- With function key "F6", call up sub program "LSB overview " .

- With function keys "SHIFT" + "F6" (**AUTOMATIK**) , activate the automatic assignment.

- With function key "F1" change to dokumentation view of LSB overview.

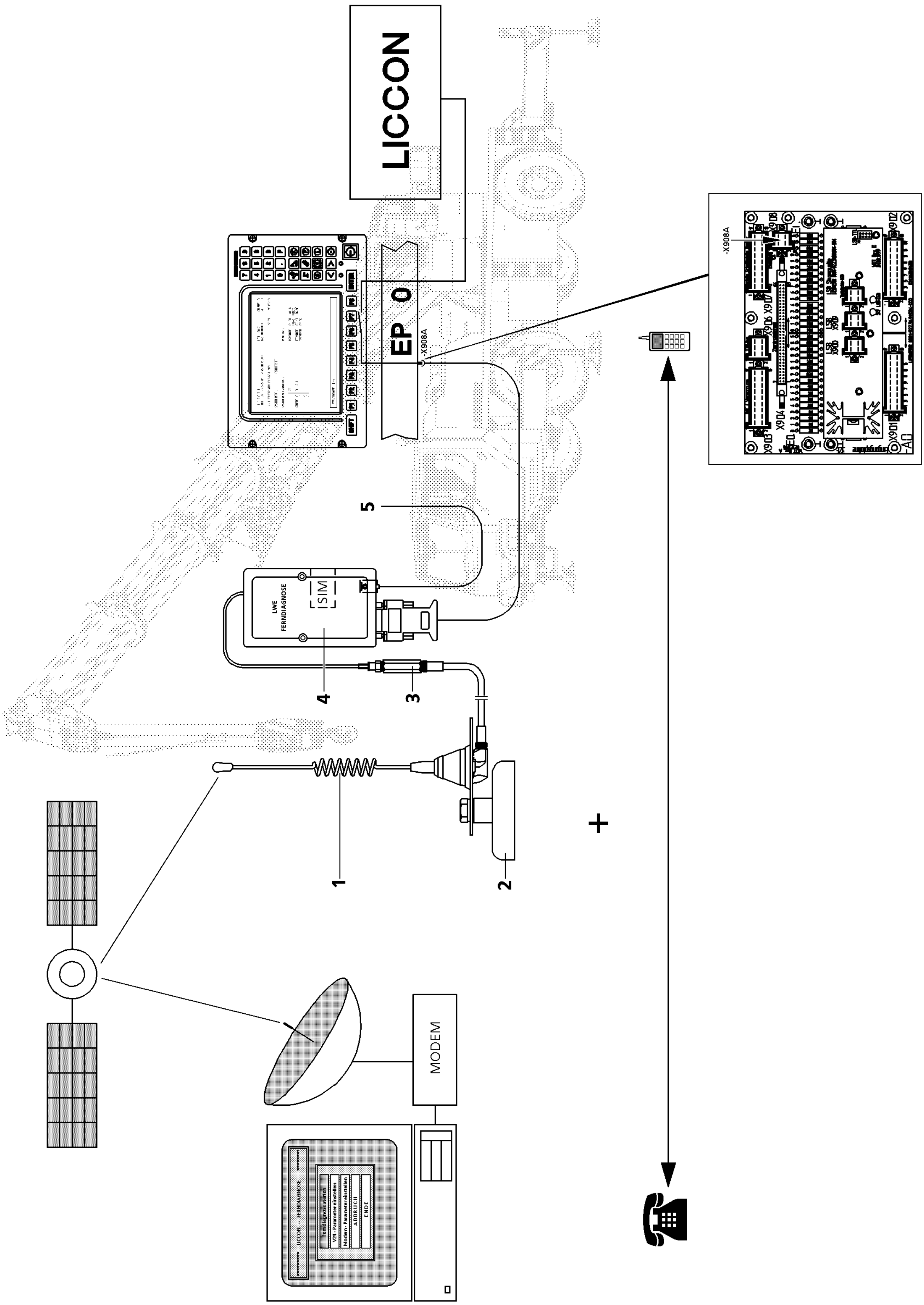
- With function keys "F2" or "F3", set the selection pointer to the final participant.

  Note: The possible final participants are marked with an **"o"** .

- With function key "F4" (⇒**ADR ZUWEISEN**) the sensor is assigned from address 0 to the final location.

  Note: If the **automatic is not active,** the default values might have to be assigned manually (possible without code).
  During the manual assignment, if the **Automatik** is **aktiv** (**A!**) , (automatic active), then the newly assigned participant is checked automatically and assigned default values.

- Leave the Multi CPU test system and restart the LICCON Computer system.



190748

3.7 Remote diagnostics

The LWE remote diagnostics makes it possible to check the crane from a remote location in case of a problem. The LWE remote diagnostics module must be connected with the LICCON Computer system. A mobile phone must be used to call the service location. From there, data can be read via the Multi CPU test system from the LICCO Computer system and transferred to a computer in the service location.

The LICCON monitor is in remote desgnostics mode as long as the connection between service location to the LWE remote diagnostics module exists.

D A N G E R : All crane functions can be carried out, without an operating view. For that reason, the crane must be operated especially careful. It is imperative that the crane operator and the service location are in direct voice contact via a mobile phone .

Note: In the LWE remote diagnostics module is a GSM module, in which a SIM card must be installed. This SIM card must be released for data transfer and the PIN request must be turned off.

The SIM card is not part of the LWE remote diagnostics module !

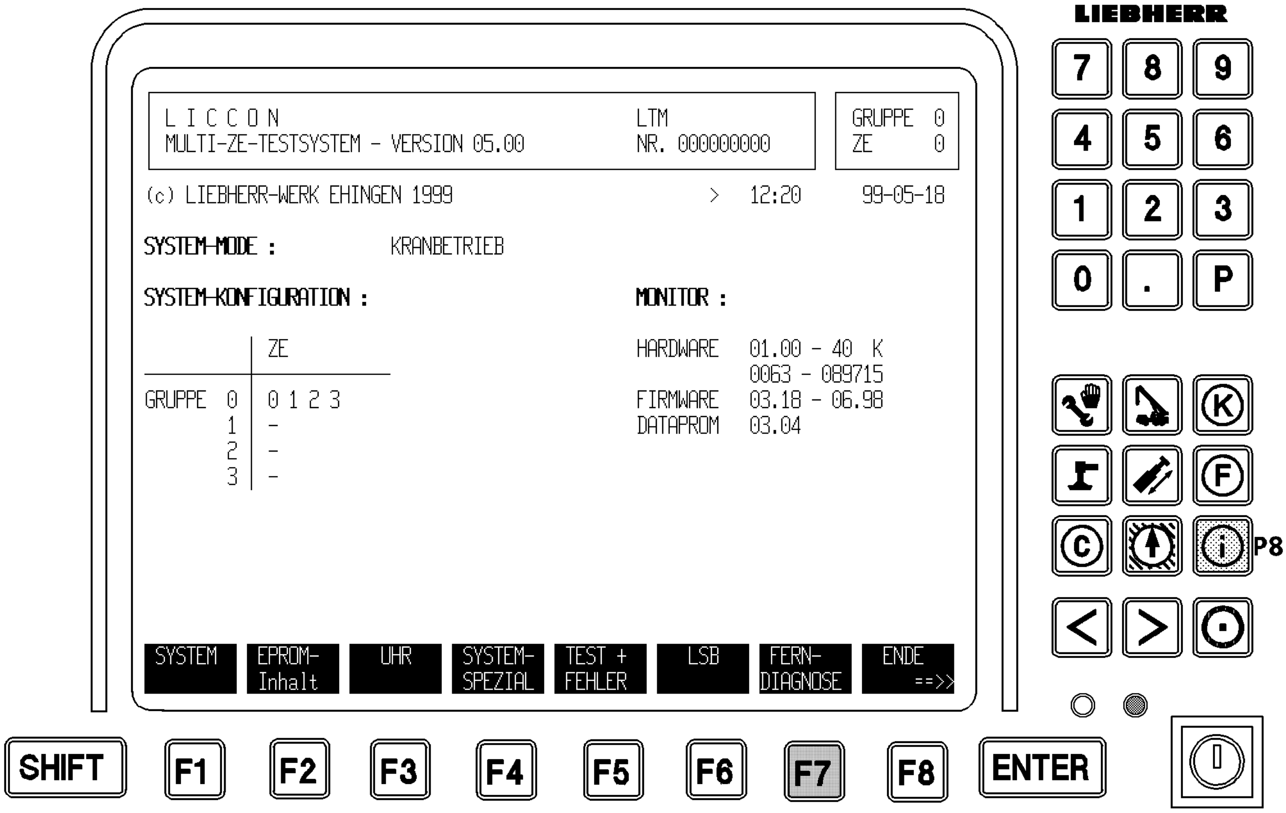
3.7.1 LWE remote diagnostics module

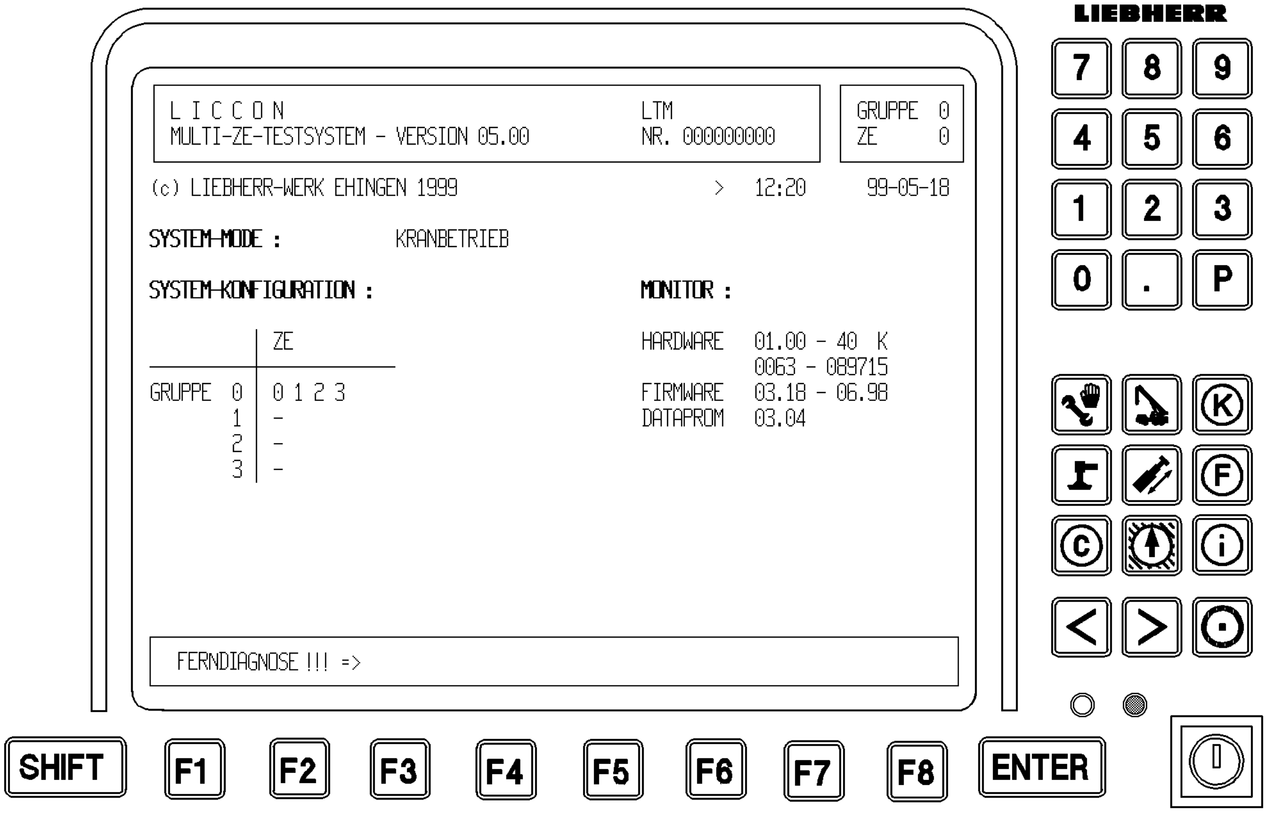
- Set the antenna (1) with magnetic base (2) on the crane operator´s cab.
- Open the control box.
- Connect the antenna (1) and remote diagnostics module (4) with extension cord (3) .
- Plug in the 4-pole plug (-X908A) of the LWE remote diagnostics module into the expansion interface on the input circuit board 0 (EP0) . (Only applicable if the LWE remote diagnostics module has been retrofitted.)

Note: The 4-pole plug must be inserted into the expansion interface of **EP 0** . If there is already a plug inserted, then it must be pulled first.

- Establish the power supply (5) for the LWE remote diagnostics module in the control box. (Only applicable if the LWE remote diagnostics module has been retrofitted.)

* Optional


L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 05.00
LTM
NR. 000000000
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 1999
> 12:20 99-05-18
SYSTEM-MODE : KRANBETRIEB
SYSTEM-KONFIGURATION :
ZE
GRUPPE 0 0 1 2 3
1 -
2 -
3 -
MONITOR :
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.04
SYSTEM
EPROM- Inhalt
UHR
SYSTEM- SPEZIAL
TEST + FEHLER
LSB
FERN- DIAGNOSE
ENDE ==>>
LIEBHERR
7 8 9
4 5 6
1 2 3
0 . P
K
F
C
P8
SHIFT
F1
F2
F3
F4
F5
F6
F7
F8
ENTER


L I C C O N
MULTI-ZE-TESTSYSTEM - VERSION 05.00
LTM
NR. 000000000
GRUPPE 0
ZE 0
(c) LIEBHERR-WERK EHINGEN 1999
> 12:20 99-05-18
SYSTEM-MODE : KRANBETRIEB
SYSTEM-KONFIGURATION :
ZE
GRUPPE 0 0 1 2 3
1 -
2 -
3 -
MONITOR :
HARDWARE 01.00 - 40 K
0063 - 089715
FIRMWARE 03.18 - 06.98
DATAPROM 03.04
FERNDIAGNOSE !!! =>
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

190749

3.7.2 Start the data transfer

- Call the service location via the mobile phone .
- As instructed bz the service location, boot up the LICCON computer system .
- Push the function key "F8" (OK) .
- Start the Multi CPU test systems with the program key "P8" (i).
- Start the remote diagnostics session with function key "F7" (**FERNDIAGNOSE**).
  The LED indicator on the LWE remote diagnostics module transfers with a slight delay from Status 1 to Status 2 .
  The connection between LWE remote diagnostics module and service location is now established and data can be transferred to the service location.
- Feedback to service location was made by changing into remote diagnostics mode.
  The service location can now set up the connection to the LWE remote diagnostics module and read the data of the Multi CPU test system.

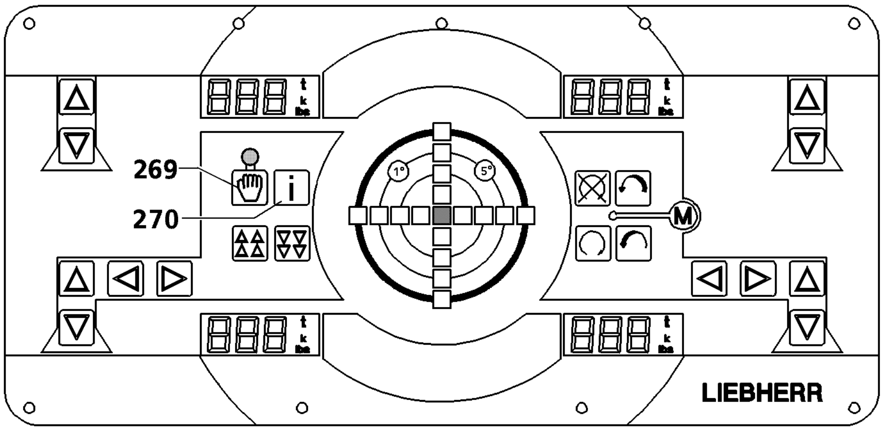
CAUTION: **During this whole time, the monitor is in remmote diagnostics mode, therefore without operating view. For that reason, the crane must be operated especially careful. It is imperative that the crane operator and the service location are in direct voice contact via a mobile phone .**

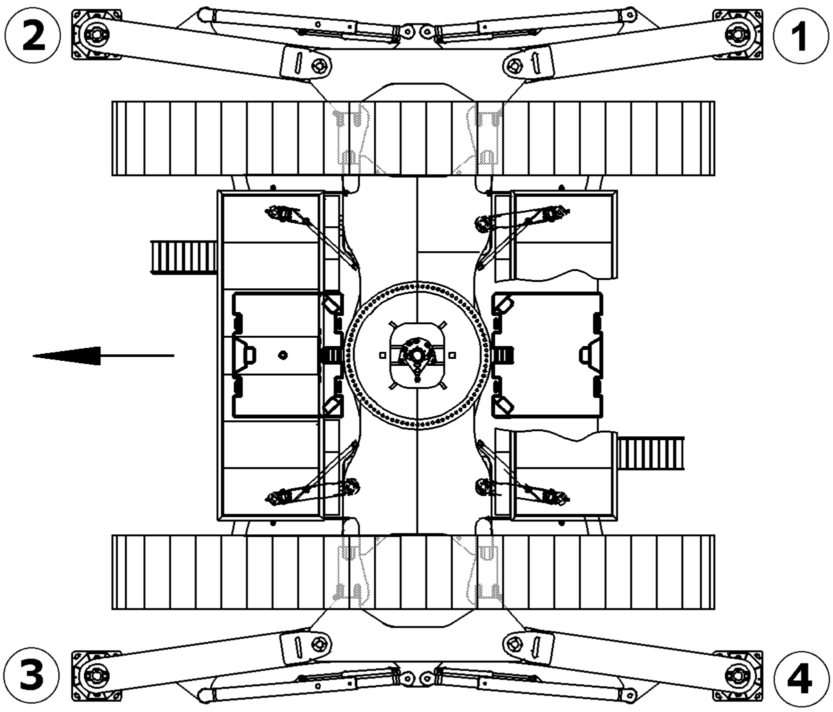
Note: In some cases there can be a problem with the PIN request / telephone number, so that the service location cannot establish a connection to the LWE remote diagnostics module. In this case, the PIN request / telephone number can be turned off in the LICCON computer system. However, this may only be done after consulting trained Liebherr Service personnel .

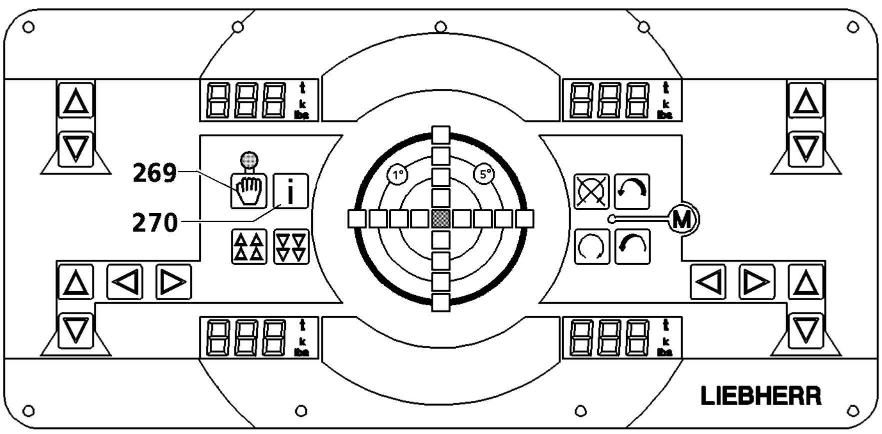
3.7.3 Status LWE remote diagnostics module

0 Initialiyation
1 LWE remote diagnostics module operational
2 Connection to LICCON is set up
(remote diagnostics mode, but no call on LWE remote diagnostics mode)
A LWE remote diagnostics module is being called at this time
3 LWE remote diagnostics module has been called and is now "on line", but no connection yet to LICCON
4 Connection active
5 Phone number is being dialed / connection active

* Optional







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4. Test program left / right support control unit *

The test program can be started on the left or right support control unit.

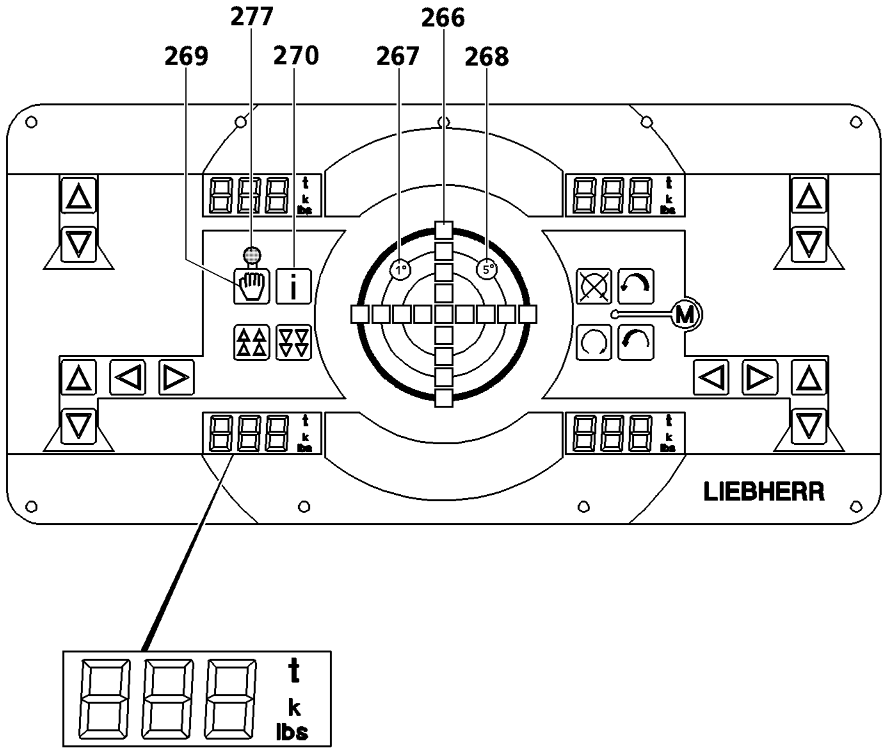
The following tests are carried out:
- Data transfer between I / O module and support control unit
- 7-segment indicators, shows "t" (tons) "klbs" (kilo pounds) and "LED's"
- Buttons

4.1 General

To be able to carry out the individual tests, certain requirements must be met:
- Connection from I / O module to assigned participant (support control units)
- working LSB bus connection
- correct power supply of individual components (I / O module, support control units)

To be able to start the test program, the following requirements must be met:
- Engine OFF
- Ignition ON

Note: When the test program left or right support control units is activated, the application for "normal" crane operation becomes inoperative on each I / O module. This is necessary so that no "crane movements " can be carried out during the individual test runs when the various keys on the support control unit are actuated.



191436

4.2 To activate the test program, with the engine OFF

- Press the keys (269 and 270) at the same time.

If the test program is activated on the right support control unit (I / O module 3), then the corresponding tests are made on the right support control unit . The I / O module 4 (test program for the left support control unit) is then in readiness mode. The readiness mode is also shown by simultaneous blinking (2x per second) of the LED 1° (267) and 5° (268) .

If the test program is activated on the left support control unit (I / O module 4), then the corresponding tests are made on the left support control unit. The I / O module 3 (test program for the right support control unit) is then in readiness mode. The readiness mode is also shown by simultaneous blinking (2x per second) of the LED 1° (267) and 5° (268) .

Note: The remaining indicators on the support control unit are dark. The key illumination is always turned on. If the test program is activated on the individual modules, the system runs through initialization phase first. First both support control units are turned off.

Note: Engine ON is not possible during the test program.

4.3 Operating conditions of individual test programs

A differentiation is made between the following operating conditions of the test programs :

Test program activated on the right support control unit, from "normal" crane operation
- Test the right support control unit
- Left support control unit is in readiness mode

Test program activated on the left support control unit, from "normal" crane operation
- Test the left support control unit
- Right support control unit is in readiness mode

Start the test program on the right support control unit from the readiness mode
(Test program was activated on left support control unit)
- Test the right support control unit

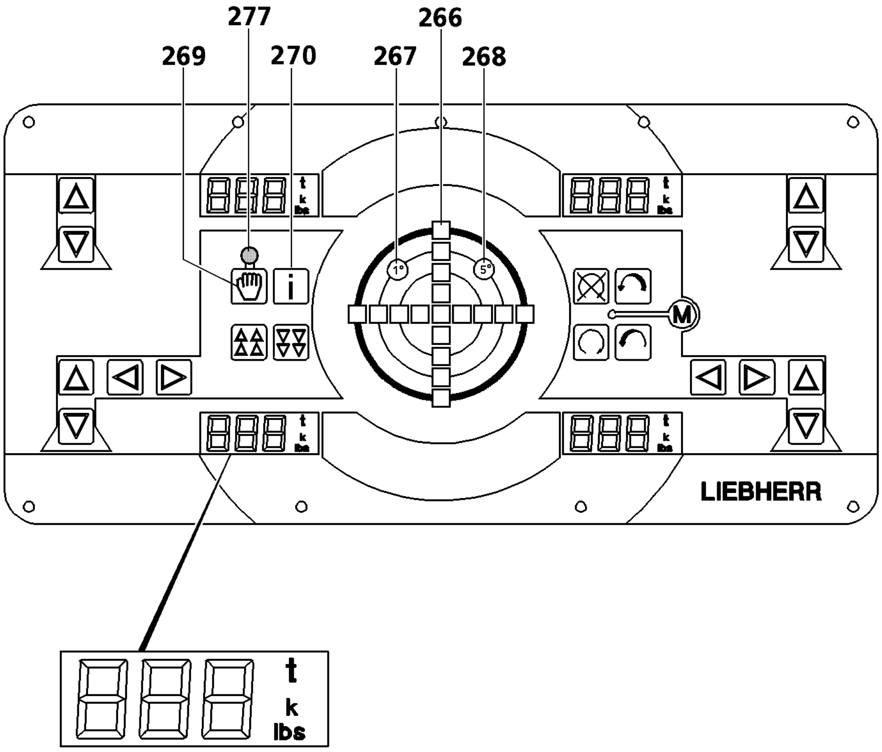
Start the test program on the left support control unit from the readiness mode
(Test program was activated on right support control unit)
- Test the left support control unit

Note: Readiness mode = "Normal" crane operation is stopped, but the test program on the right support control unit or the left support control unit has not yet started.

4.3 End the test program

The test program is ended via ignition OFF.

Note: Return to "normal" crane operating mode is only possible if the ignition is turned off and the crane is started again .



191436

4.4 Test program

4.4.1 Support control unit, right

Start the test program on the right support control unit
- Press the "Hand" key (269) and the "i" key (270) at the same time for 2 seconds.

Note: The test program can be restarted during the test and at the end of the test.

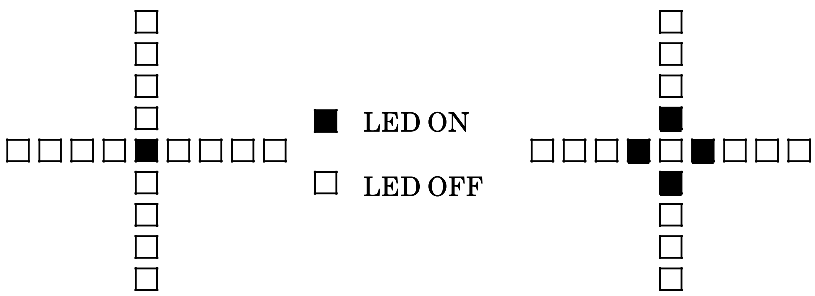
4.4.1.1 Data transfer between the I / O module and the support control unit

Test run
In normal operation, the data transfer between the I / O module and the indicator unit runs at a data transfer rate of 50 kBaud. During this test, the program checks if the transfer rate is outside its tolerance. This test runs only for a certain period of time (5 seconds). Then an error code is issued.

Note: During the test, the indicator blinks 2 x in 5 seconds.

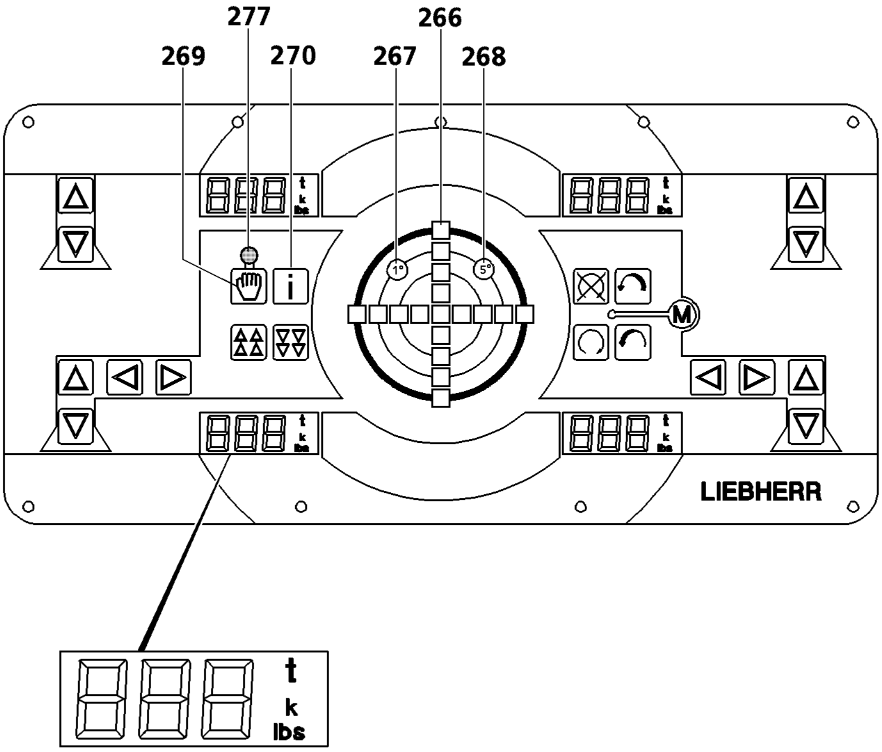
Error code: 08 Data tranfer rate for the right support control unit right is outside the tolerance
10 Error when carrying out this test

Example: Pulling the SPI plug on the right support control unit for a short time during the test corresponds to error code 08.
Error code 08 and error code 10 are shown after the 2nd test (indicator light test) on the right support control unit, as follows.



Error code 08 Error code 10

Note: If no error occurs, all LED's are OFF.



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4.4.1.2 Indicator lights

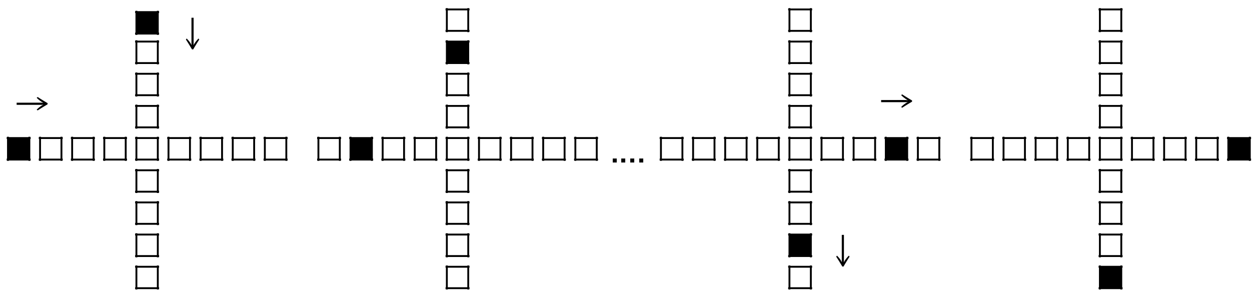
Test run
All indiator lights (7-segment indicators, LED's and indications in t (tons) and indications in klbs (Kilo pounds) are tested.

Note: The green LED (277) for the release is tested indirectly during normal crane operation.

To start the test, all indicator lights are turned off.
All indicator lights are turned on one after the other from the upper left to the lower left and from the upper right to the lower right, beginning with "t" (tons), then "klbs" (Kilo pounds) , then 3 x 7 segment indicators .

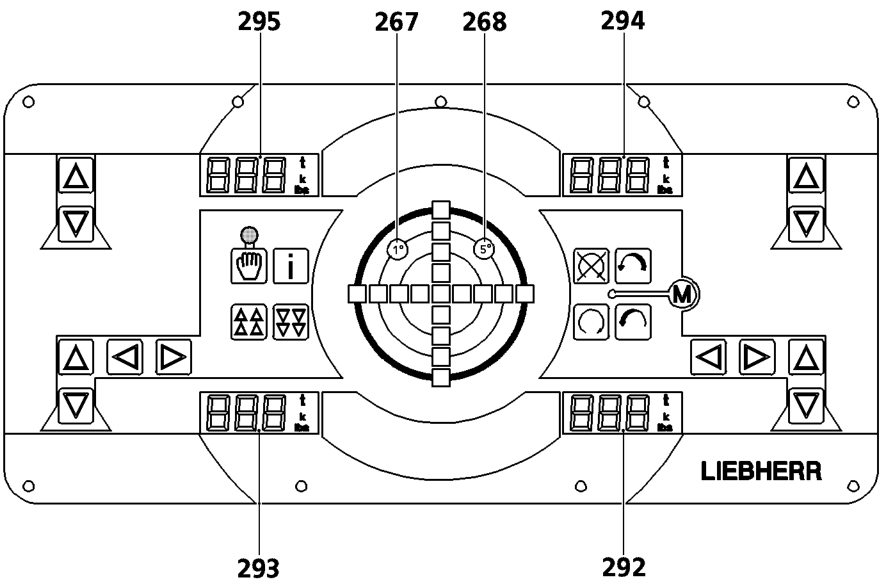
The individual 7-segment indicators are counted up from the right to the left from 0 .. 9, after reaching the 9, an 8 is shown with decimal point.

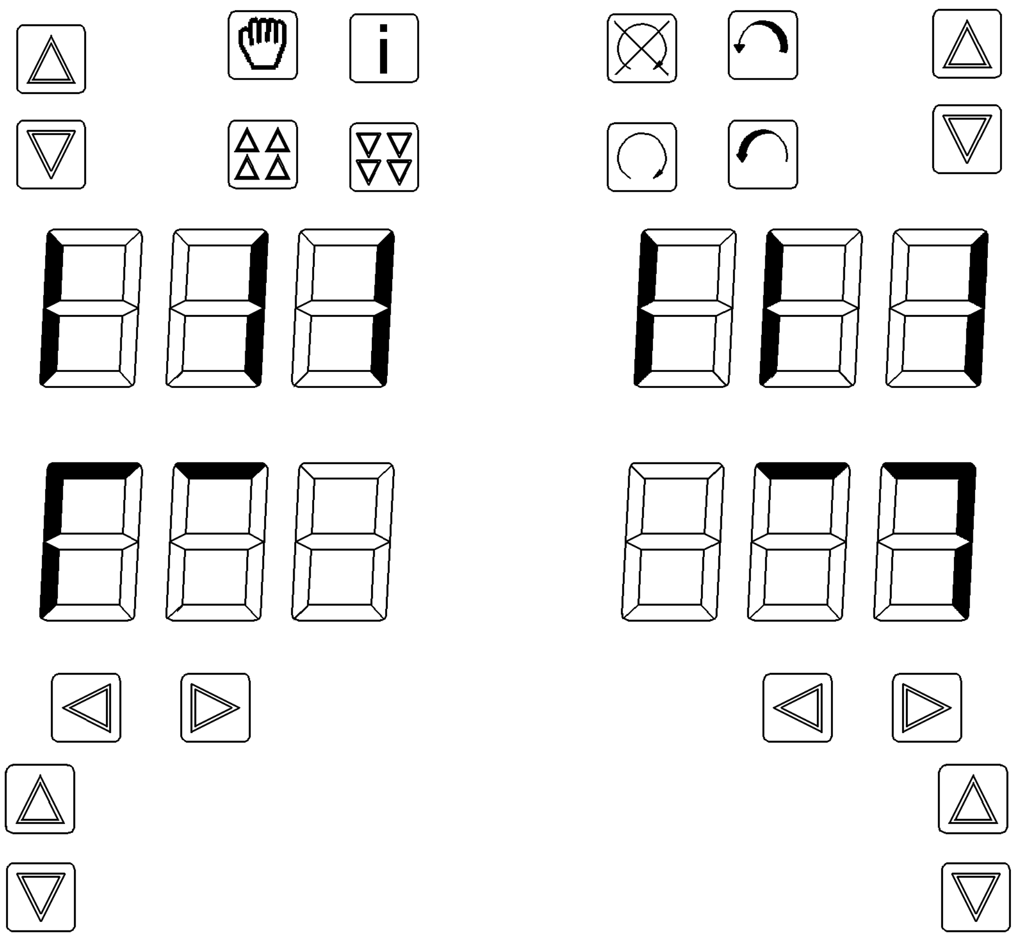
After the last 8 is shown with decimal point, at the lower right, all LED's for the electric incline sensor are turned on, continuously (see illustration below).



Then all LED's for the incline sensor and also LED 1° (267) and 5° (268) are turned on.
All indicator lights are turned on for approx. 4 seconds. After these 4 seconds, all indicator lights are turned off again, except LED 1° (267) and LED 5° (268), they signal, that the key test is activated.

Error code: During this test, no error code is issued, since it is only an optical check.





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4.4.1.3 Keys

Test run
Via the 7-segment indicators (292), (293), (294), (295) on the right support control unit, the function of the individual keys for the right support control unit is shown. One key (see illustraton below) is assigned to each segment of the 7 segment indicators . When the test is running, the keys for the right support control unit can be actuated in any desired sequence.

Note: On the support control units, the release key (269) might have to be pressed, to ensure the functions of the other keys .

To begin the test, all segments of the corresponding 7 - segment indicators are turned off .
If a key is actuated within 3 seconds and released again, then the corresponding segment is turned on and remains in this condition.
During the key test, LED 1° (267) and LED 5° (268) are turned on.

Key assignment to segments:
(see illustration , bottom left)

The test program is ended via ignition OFF.

Error code: If a key is actuated for more than 3 seconds, then the corresponding segment starts to blink. If a key is not actuated or if a key is defective, then the corresponding segment remains dark.

4.4.2 Support control unit left

Note: The test program on the left support control unit is started the same way as for the right support control unit .

4.4.2.1 Data transfer between I / O module and support control unit
See: Test program on the right support control unit.

4,4.2.2 Indicator lights
See: Start test program on the right support control unit .

4.4.2.3 Keys
See: Start the test program on the right support control unit.

Error code
09 Data tranfer rate for left support control unit is outside tolerance
10 Error when carrying out the test

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.

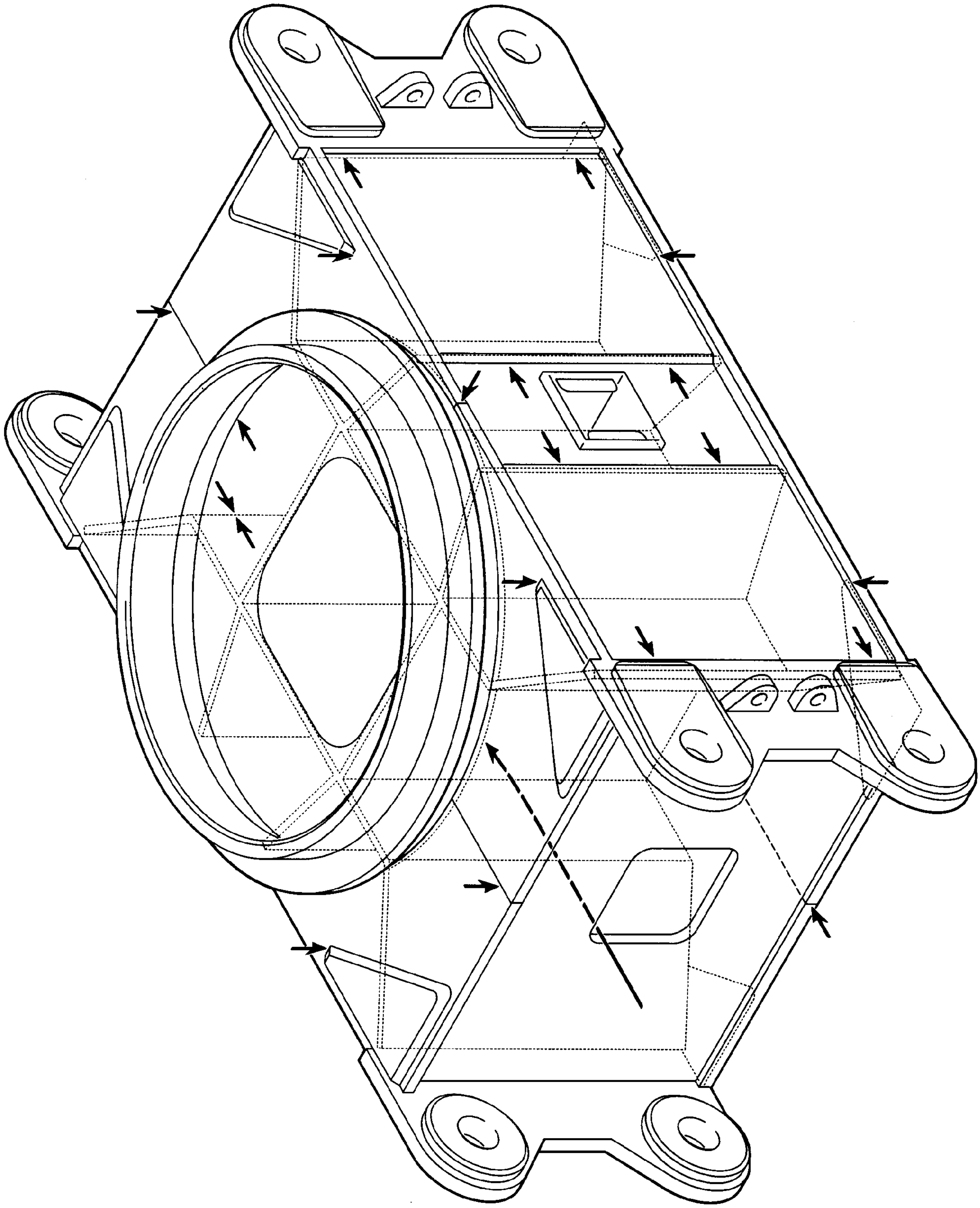
If the crane was subjected to excessive stress, for example an unusual shock or impact during its time in operation , the inspection of load baring components must be carried out immediately.

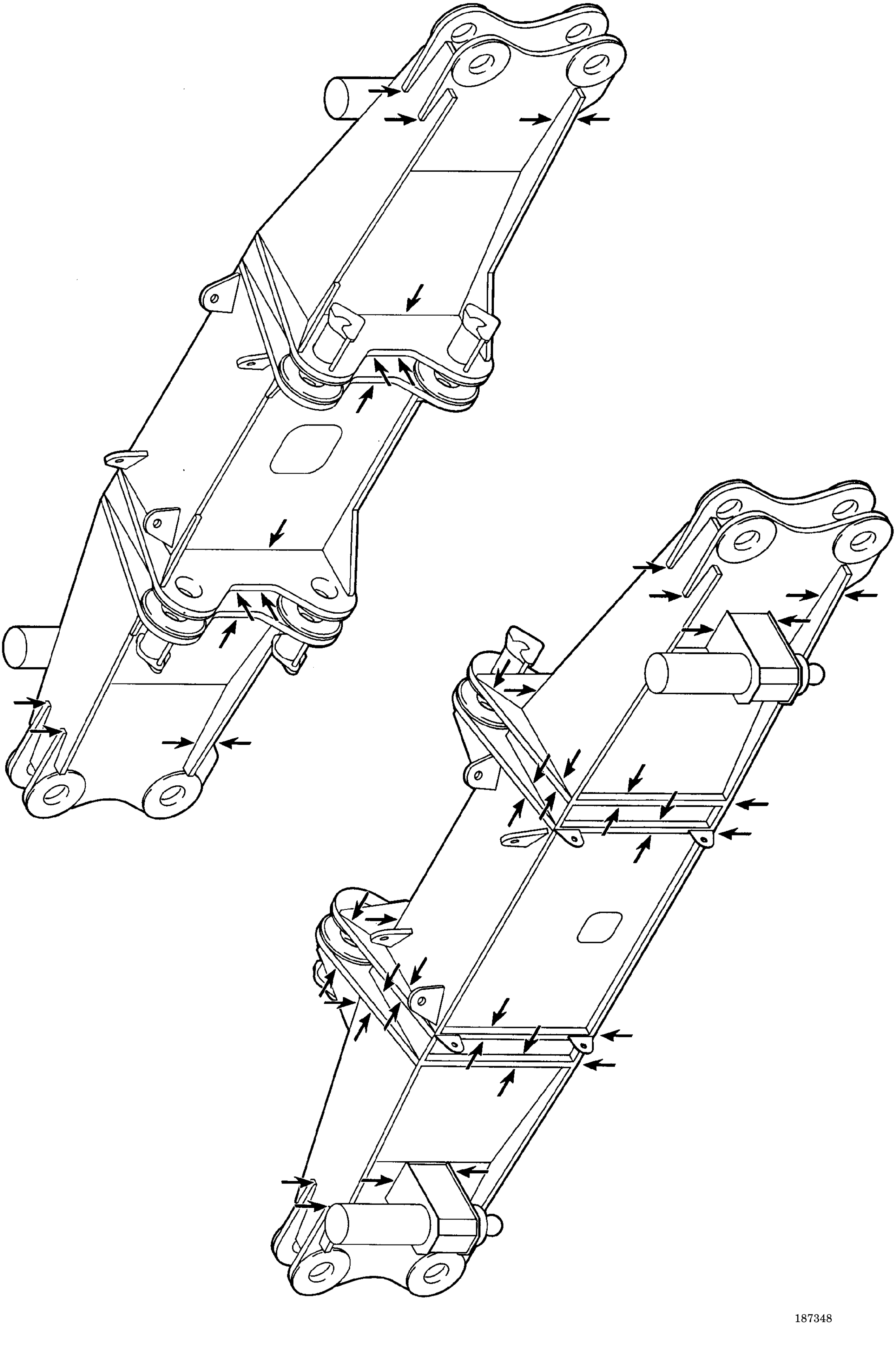
If any damage, such as cracks, can be found at any point of the steel construction, then the extend of damage must be determined by expert personnel with the aid of material analysis methods, such as magnetic powder test, ultra sound or X-ray tests. Then it must be determined by expert personnel if the defective section can be repaired by repair welding or by other means.

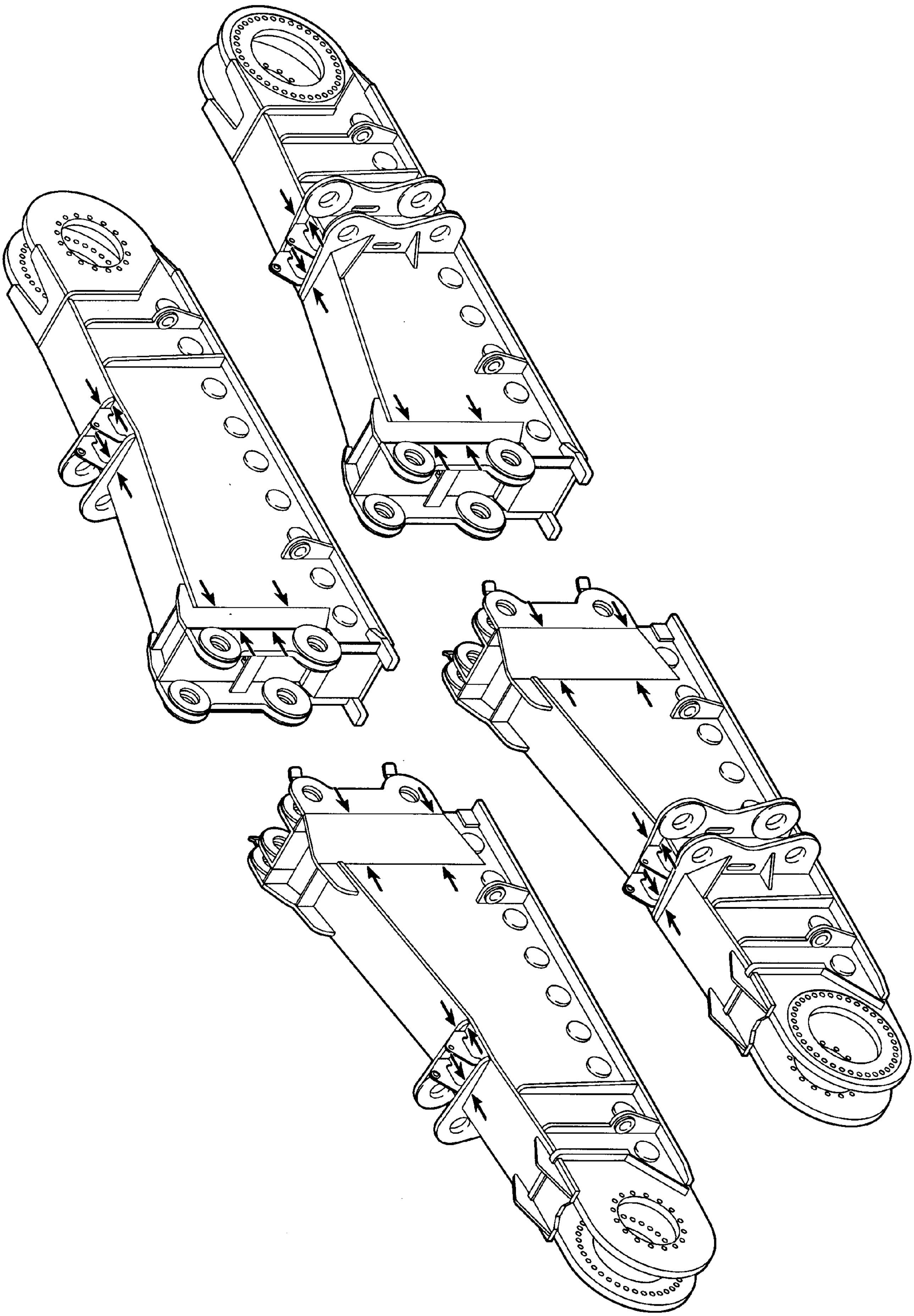
The following drawings show examples of load bearing welding constructions. For example, welding seams which need to be checked can occur in multiple areas on the steel components and in a variety of shapes. The connections or zones around the points marked by arrows must be checked.

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!

Crawler middle section




187348



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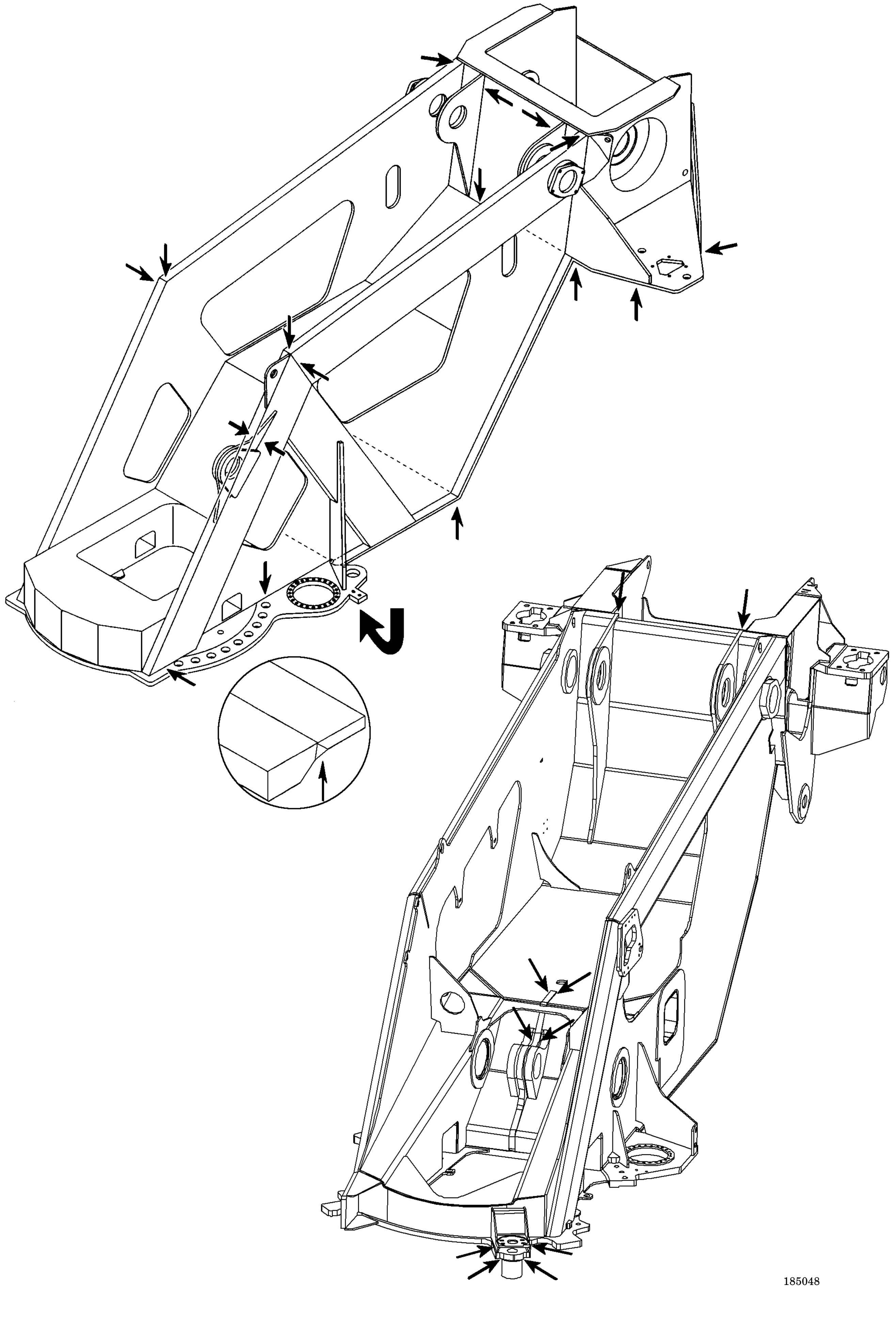
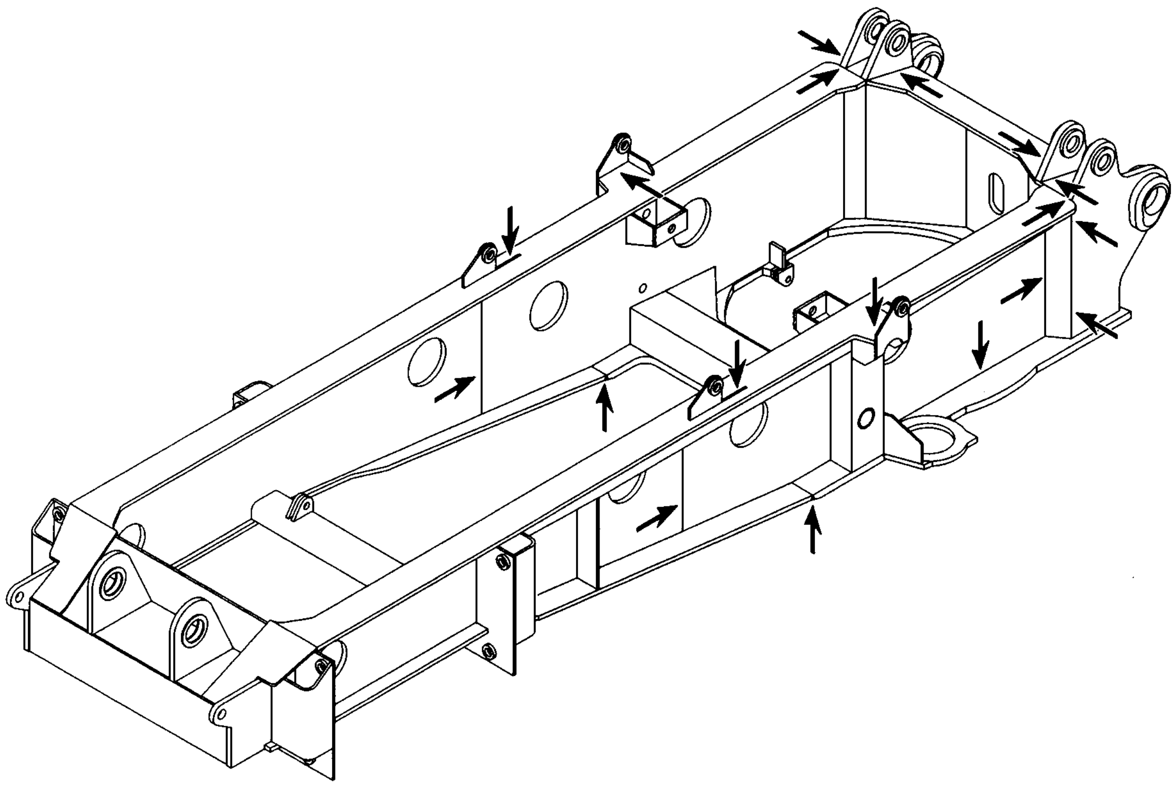
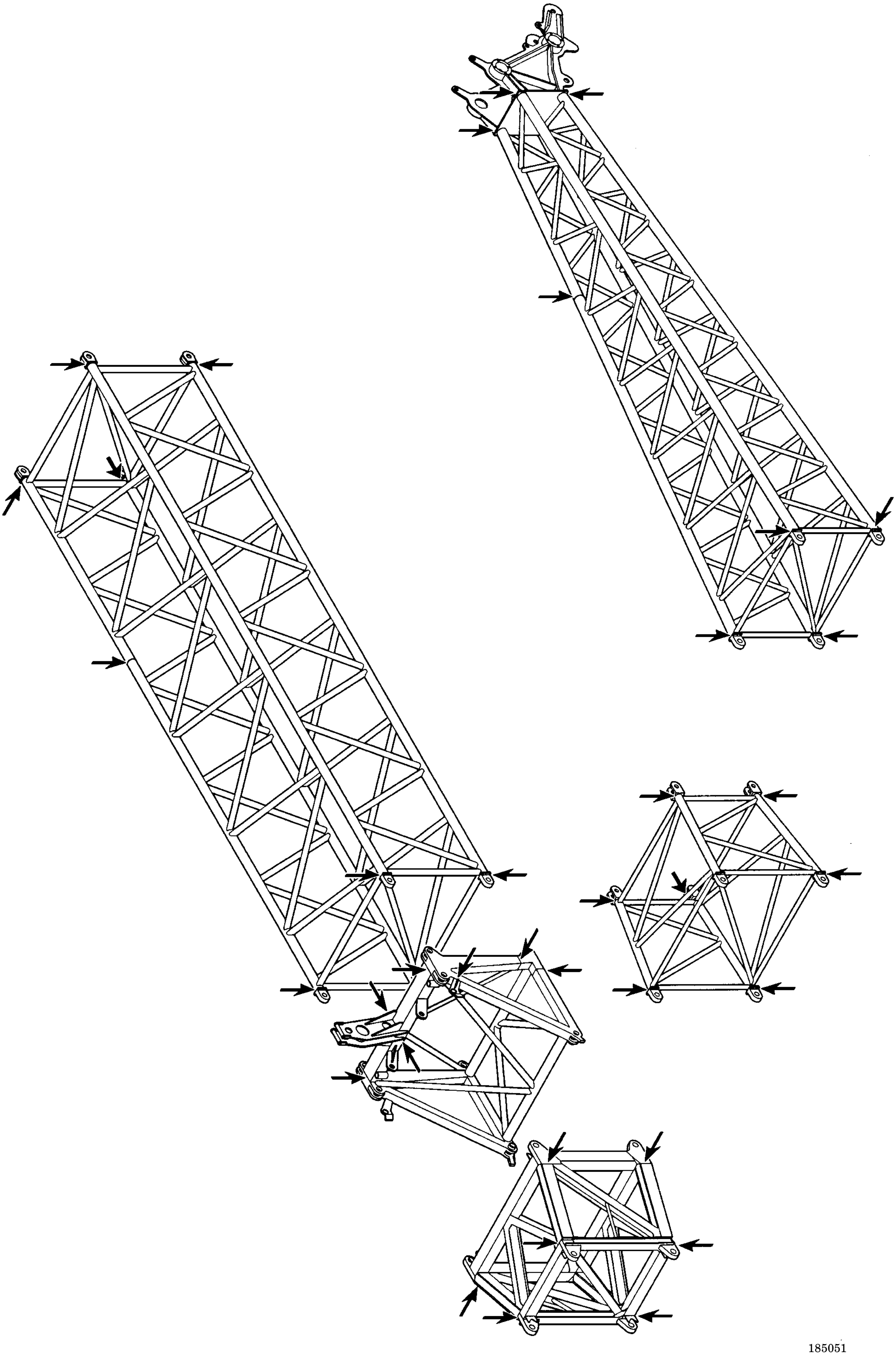

185048

Slewing platform frame

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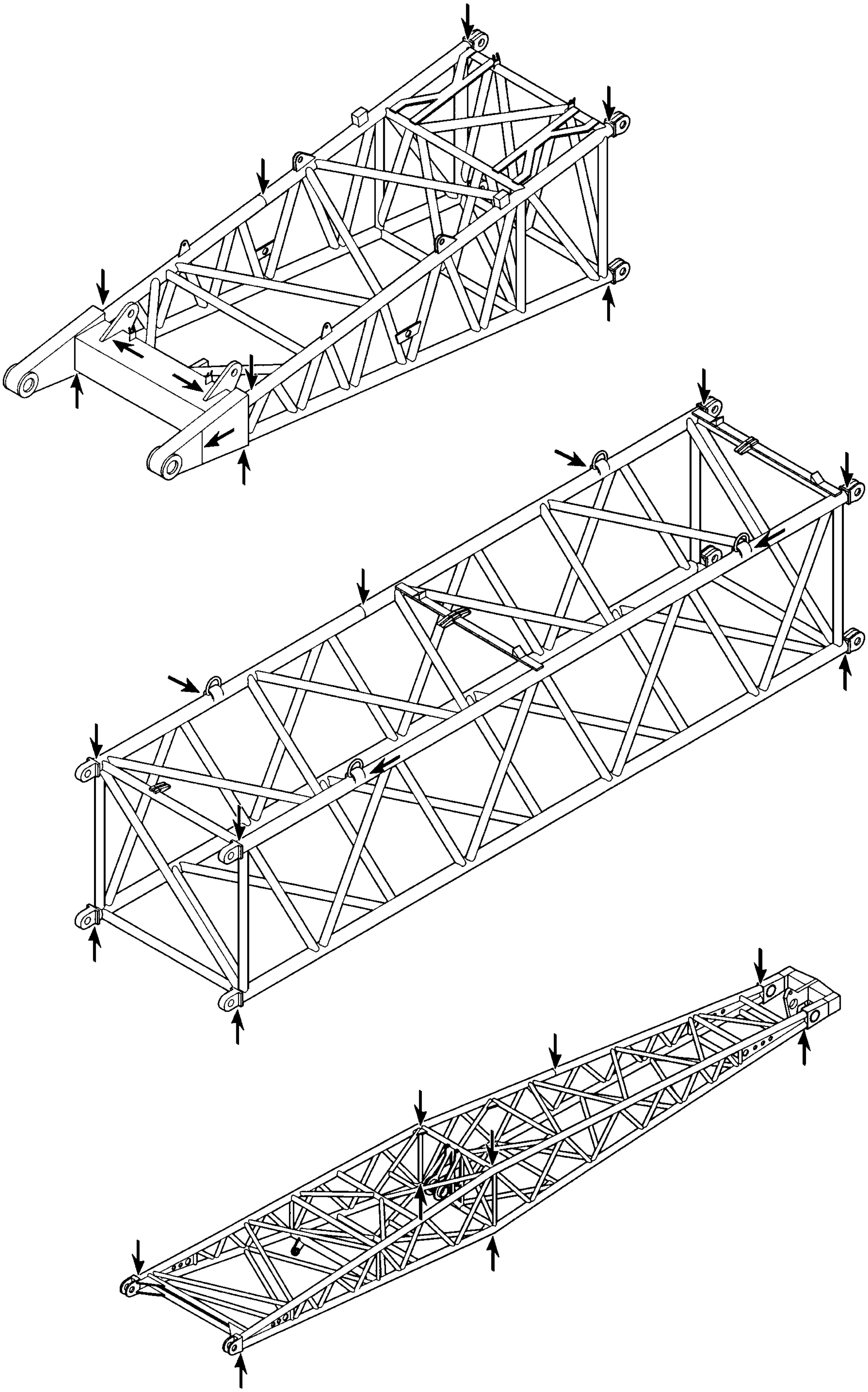
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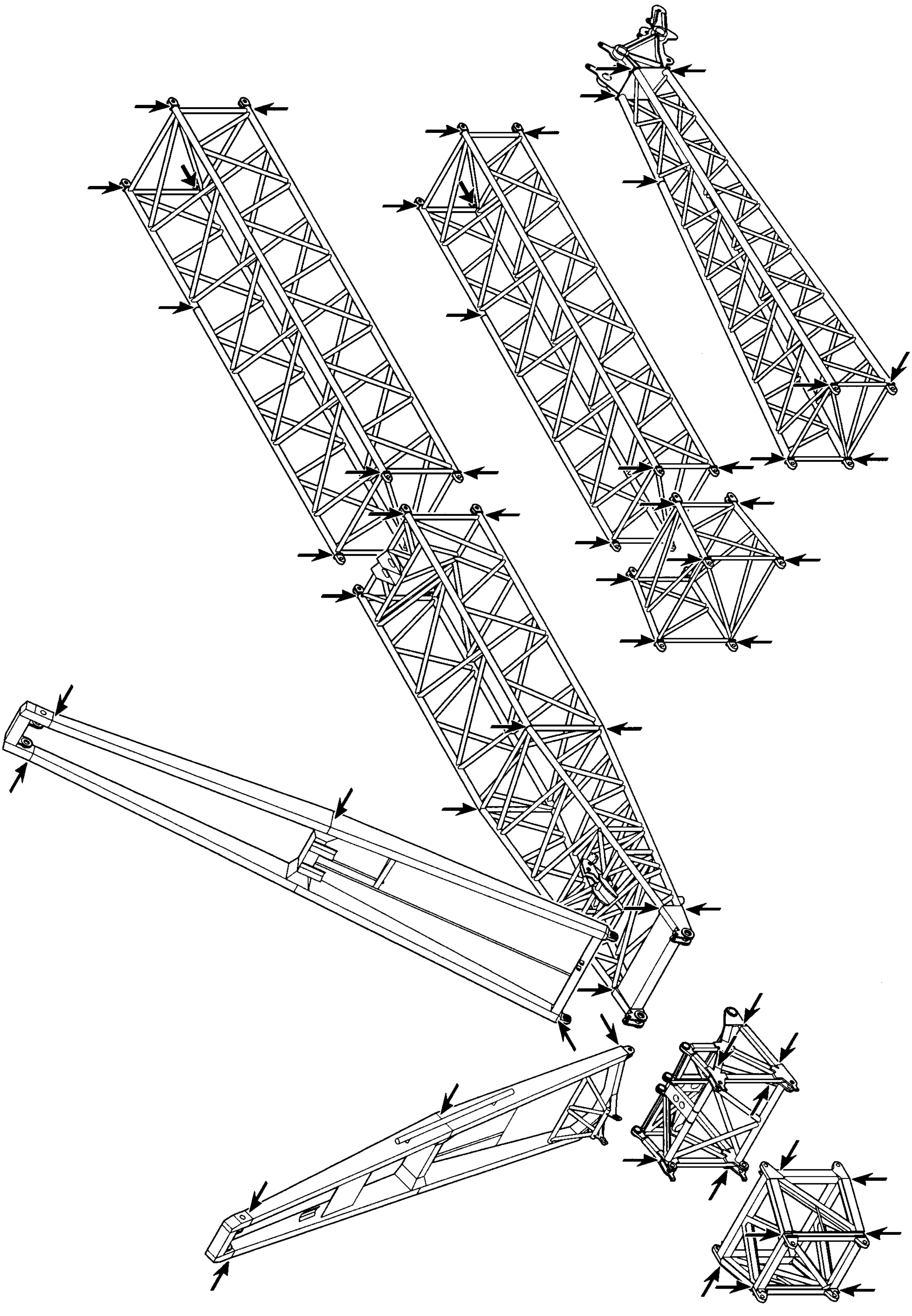
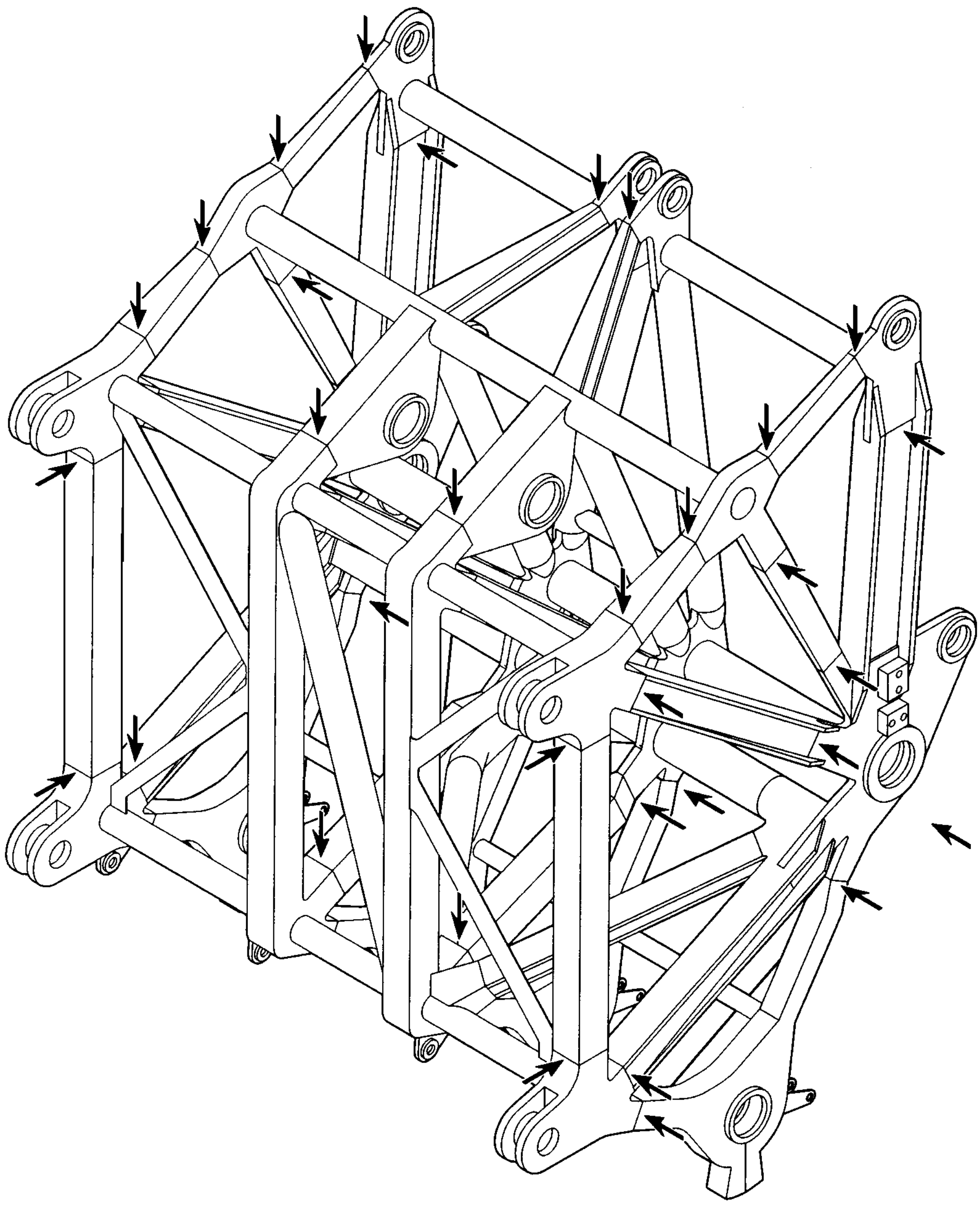
Installation unit with lattice jib



185053

Pulley head



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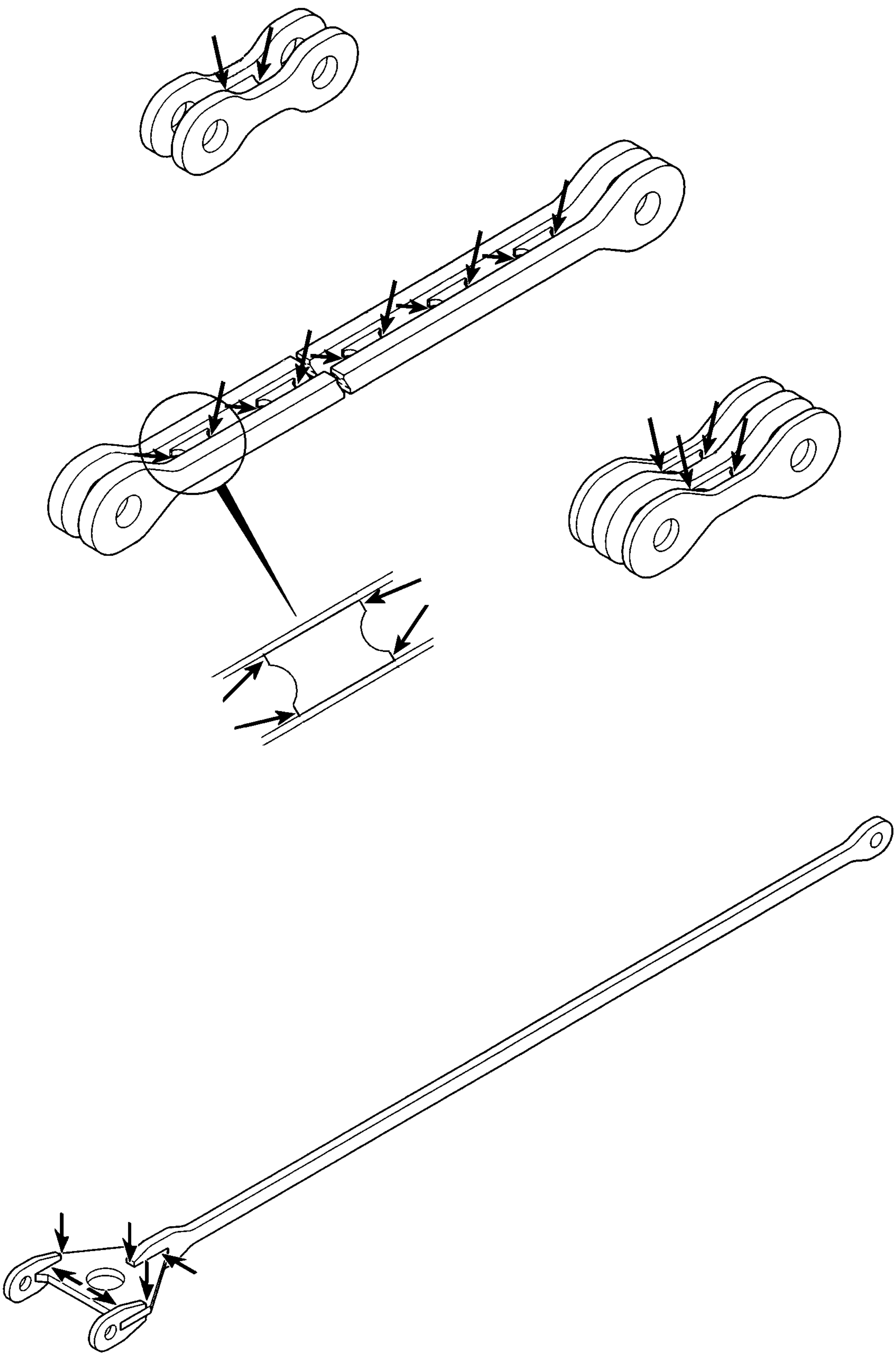

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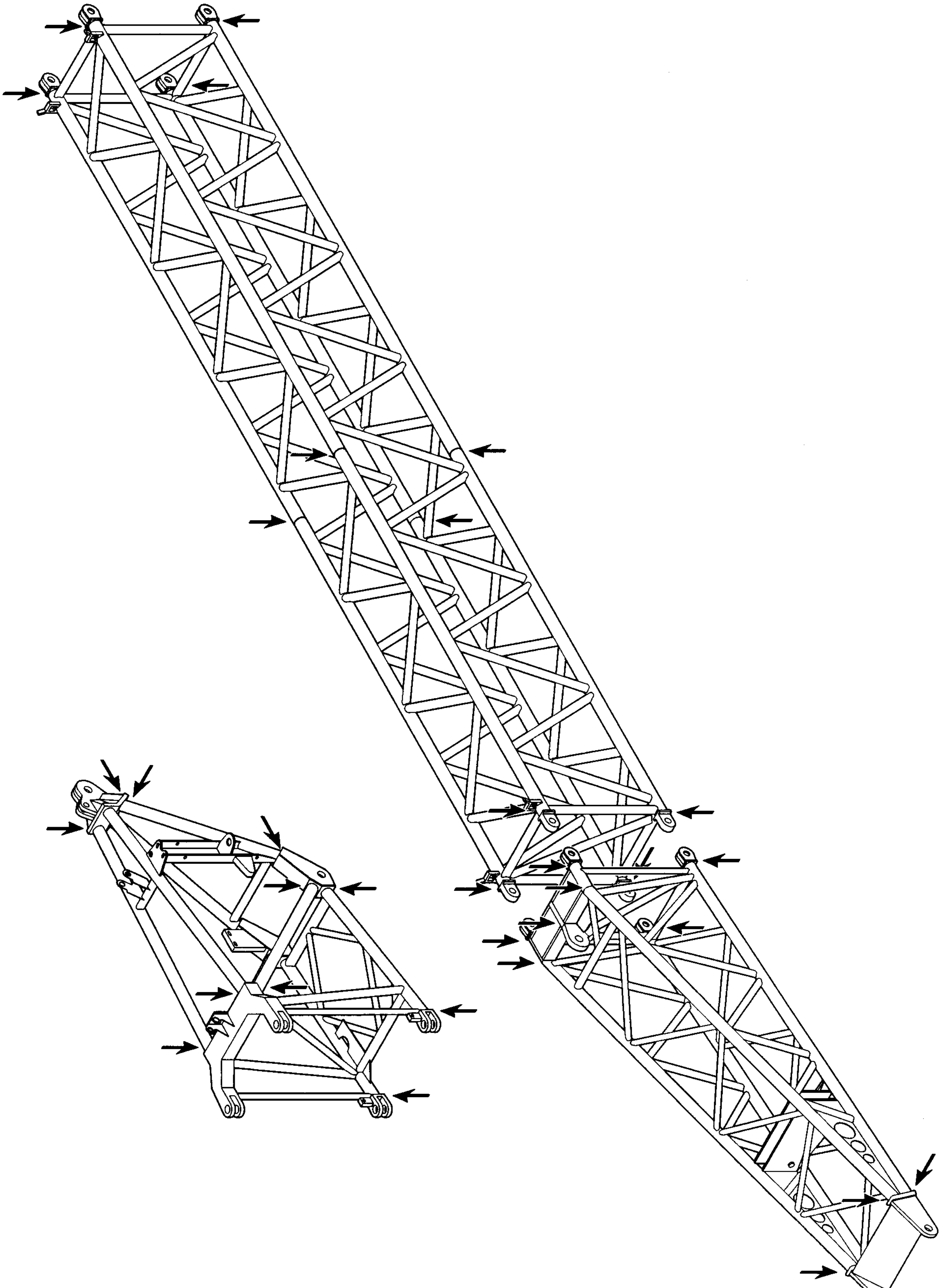

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2. Inspection of hoist and pull in winches

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 k_m:	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.

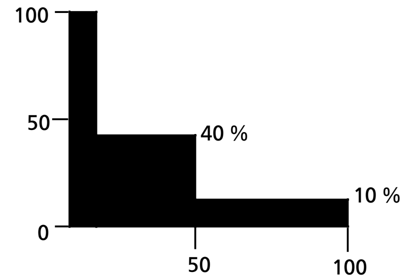
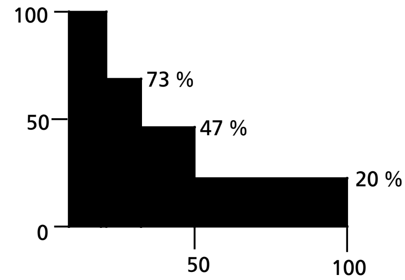
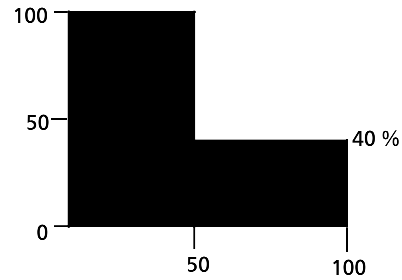
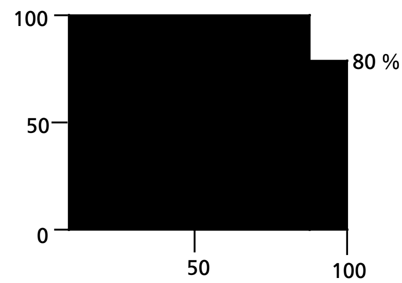
When determining the used portion of the theoretical service life, the actual operating conditions (load collective) and the operating hours of hoist gears per inspection interval must be determined. The user is responsible to have it documented in the crane inspection booklet.

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, ISO 4301/1 or FEM 9.511.

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.

Note: For mobile cranes in assembly operation, we normally use the load collective L1 (Q1), with the load collective factor $k_m = 0.125$.

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	$k_m = 0{,}125$	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	$k_m = 0{,}25$	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	$k_m = 0{,}5$	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	$k_m = 1$	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, differentiated by the following 4 points:

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:

$$S_i = \frac{k_{mi}}{k_m} \times T_i$$

k_m = Factor of load collective, which was the basis when calculating the winch. This factor can be taken from the Operation Manual.

k_{mi} = 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.

In any case, it must be reconditioned or overhauled at the latest after 10 years after putting the crane into service.

The general reconditioning or overhaul must be initiated by the operator and must be done by the manufacturer or by a person authorized by the manufacturer and the overhaul must be documented in the inspection booklet.

After the general reconditioning or overhaul, the manufacturer or the person authorized by the manufacturer will note a new theoretical service life D.

In any case, the maximum time frame to the next general overhaul is max. 10 years.

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, $k_m = 0.125$
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 $k_{m1} = 0.125$.

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 $k_{m2} = 0.5$

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 $k_{m3} = 0.25$

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 k_m: 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
k_m = Factor of load collective, which was taken for calculation of winch. This factor is to be taken from the Operating Manual
k_{mi} = 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

Inspection No. i	Date of initial service, data of inspection	Operating conditions since last inspection (load collective)	Factor of load connective k_{mi}	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: $S_i = \frac{k_{mi}}{k_m} \times T_i$ [h]	Remaining theoretical service life $D_i = D_{i-1} - S_i$ [h]	Name of inspector	Signa-ture	Remarks
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		

C A U T I O N: Perform general overhaul at least once every 10 years.
General overhaul last performed on : ....

Chart to determine the remaining theoretical service life of winch No. ....

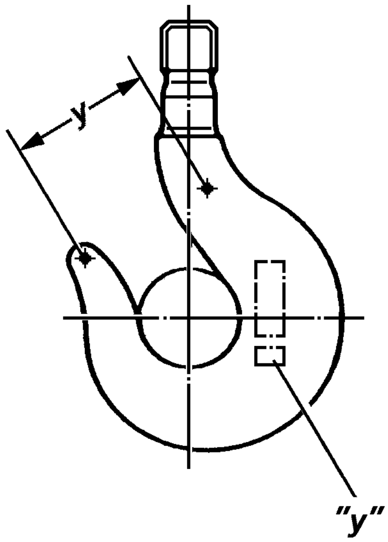
Crane type: ....
Fabrication No.: ....
Put in service: ....
Serial number of winch according to data tag: ....
Last general overhaul performed on: ....
Configuration data of winch (see Operating Manual): ....
Drive gear group: M...............
Load collective: Q.......(L.....)
Factor of load collective k_m: ....
Theoretical service life D: ....

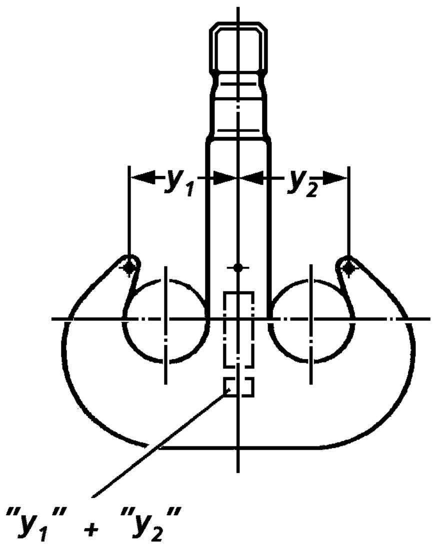
S_i = Used part of theoretical service life since last inspection
D_i = Remaining theoretical service life
D_{i-1} = Remaining theoretical service life after previous inspection
k_m = Factor of load collective, which was taken for calculation of winch. This factor is to be taken from the Operating Manual
k_{mi} = 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

Inspection No. i	Date of initial service, data of inspection	Operating conditions since last inspection (load collective)	Factor of load connective k_{mi}	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: $S_i = \frac{k_{mi}}{k_m} \times T_i$ [h]	Remaining theoretical service life $D_i = D_{i-1} - S_i$ [h]	Name of inspector	Signa-ture	Remarks

C A U T I O N : Perform general overhaul at least once every 10 years.

General overhaul last performed on : ....





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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 .

refer to chapter

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.

Discarding ropes due to wire breaks

Non-twisting ropes

Hoisting ropes

Crane LR 1600/1	Rope∅ [mm]	Rope lay	Number of load-bearing wires in the outer strands	Number of visible wire breaks for discarding at a length of	
				6 × rope∅	30 × rope∅
Winch 1	28	Lang's lay	126	3	6
Winch 2	28	Lang's lay	126	3	6
Winch 5 (3)	28	Lang's lay	126	3	6

Twisting ropes

Adjusting - ropes

Crane LR 1600/1	Rope∅ [mm]	Rope lay	Number of load-bearing wires in the outer strands	Number of visible wire breaks for discarding at a length of	
				6 × rope∅	30 × rope∅
Winch 4	28	Lang's lay	260	5	21

C A U T I O N: **The cable on winch V can be used as a hoist cable for jib control as well as for the boom nose.**
For that reason, a torsion free cable has been placed on this winch.
If frequent luffing movements must be carried out, then a non- torsion free control cable must be placed on the winch. If this is not observed, the cable can be damaged.

Monitoring
The ropes must be regularely inspected. This is especially the case right after the ropes are mounted or attached; additionally, if the operator or other personnel suspect that an unusually high load or strain has been placed on any of the ropes, or if damage that is not visible is suspected, the respective rope must be thoroughly inspected.

The operational safety of a rope can be judged according to the following criteria:

- Type and number of wire breaks (see table)
- Location and consequence (s) of wire break,
- Reduction of the rope diameter during operation times,
- Corrosion, wear, rope deformation,
- The effects of heat
- Total time in operation.

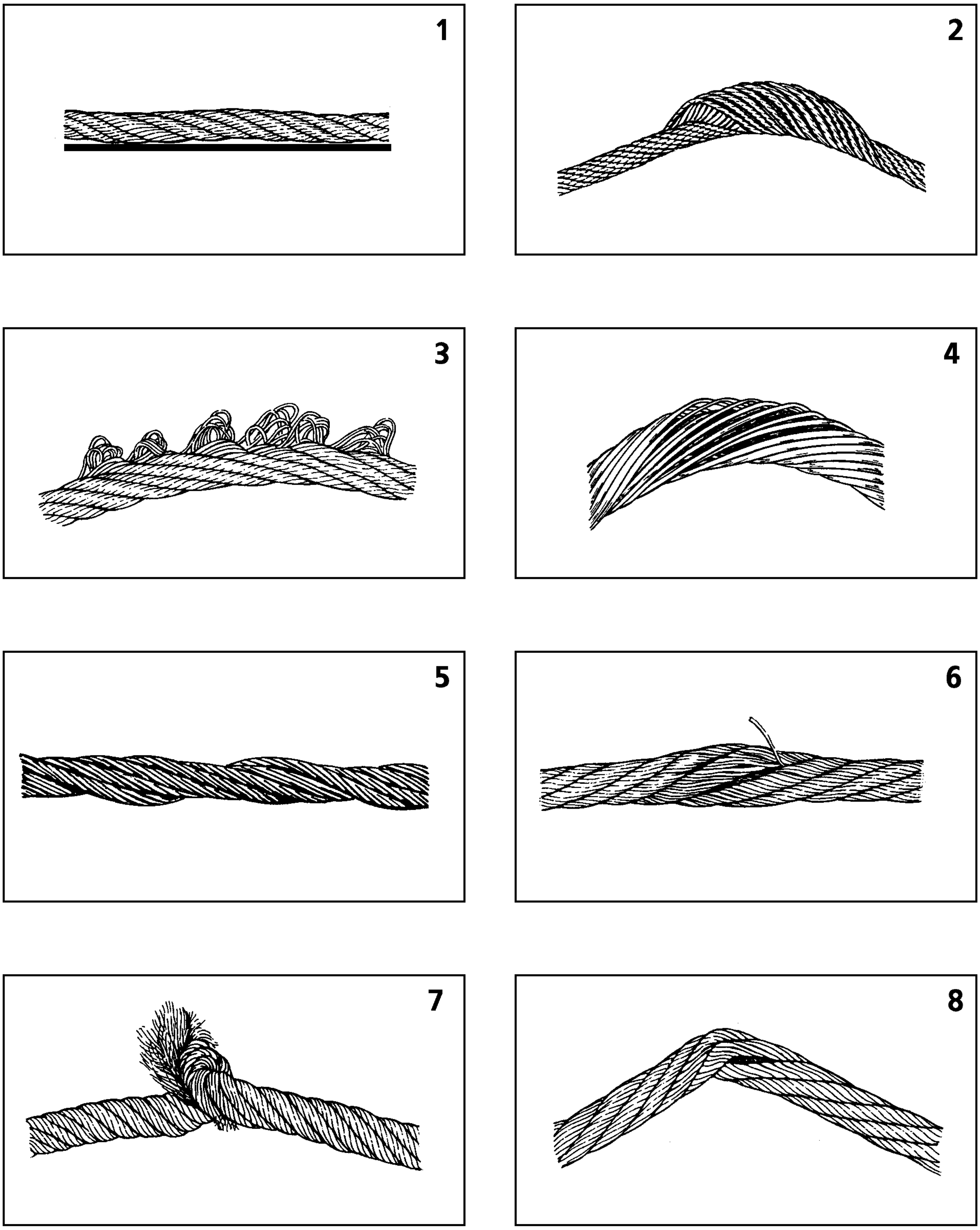
In addition, rope connections and rope suspensions must also be inspected to make sure that they are in proper order.
The indvidual elements of the rope drive, rope drum, and pulleys must be able move smoothly in their bearings and there must be no indication of rope indentations in the groove channels.

Note: The channel radius on drums and pulleys must be 0,595 × rope - nominal diameter.

Any beginning changes in rope behavior must be thoroughly investigated.

D A N G E R : **Should any of the ropes strike together above the hook block, there is a danger of serious rope damage.**
The cause is always additional twisting tension in the non- twisting hoisting rope, which itself can be caused by various operational effects and malfunctions, but also by excess stretching of the hoisting rope if it has been put to particularly hard use.

Note: See section on "Stretch twisting" of non- twisting hoisting ropes and its rectification.



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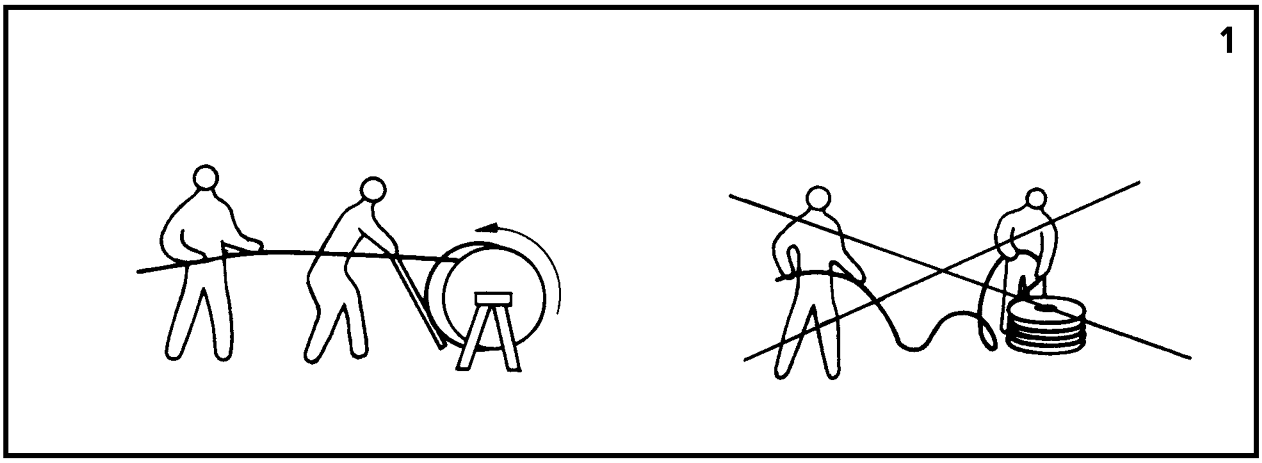
When to discard ropes

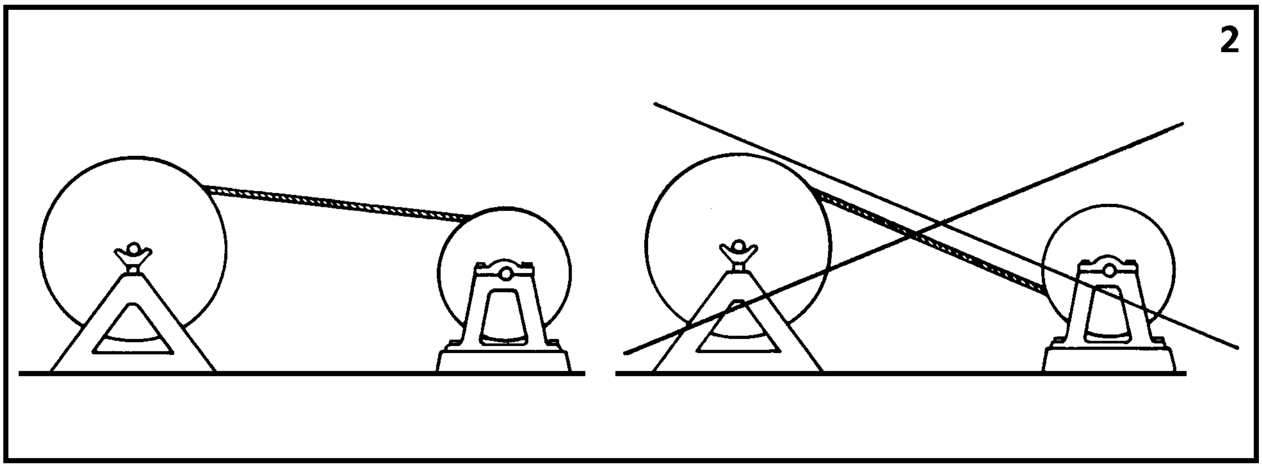
D A N G E R: Ropes must be discarded immediately is any one or any combination of the following defects is found:

- Broken strand (s)
- Formation of broken wire clusters
- If the amount of broken wires as defined in the table is reached
- Corkscrew- type deformations more than 1/3 of the rope diameter (Figure 1)
- ”Basket ” formation (Figure 2)
- Sharp protruding strands or strand clusters (Figure 3)
- Decrease of rope diameter by more than 15% of the nominal diameter or
- 10% should corrosion or wear be present (Figure 4)
- Loosening of the rope structure (Figure 4)
- Construction (Figure 5)
- Sharp bends and contusions (Figure 6+8)
- Kinking section of snapped strands (Figure 7)

Should any of the above damages are discovered or any other damages occur, the cause must be established before attaching or mounting a new rope.
Note that damage and rope marks left on construction components of the crane can be useful in determining such causes.

C A U T I O N: If there is any doubt about the operational safety of any ropes, it should be removed or experts should be consulted.





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Replacing ropes

D A N G E R: When replacing ropes, the new ropes must be of the same design, strength rating and diameter as the old ones.
Should another type of wire rope be used, permission must first be obtained from the crane manufacterer.

Ropes are very sensitive and transporting and replacing must be accordingly carried out.
Reserve ropes must be kept clean, cool and dry. They should be prevented from coming in contact with the ground.

Trouble- free operations are only guaranteed if ropes without deformations or other damages are used.

Spool in procedure
The rope must be pulled in by the spool or ring in the direction of twist (Figure 1).
Pulling from the side causes the rope to be twisted until kinking finally destroys it.

Spooling the rope onto a drum with a jacked up spool is recommendet (Figure 2).
Winding in the same rotational twist direction avoids additional tension in the rope and results in easier winding onto the drum.

C A U T I O N: Ropes must not be pulled over the ground and must be kept clean.

For the spooling operation itself, the new rope is attached to the old rope or to a starting rope. They can be connectedby means of a rope hose or welded ring. However, please make sure that the new rope is not twisted by the old or starting rope.

Non- twisting ropes must be protected from forced twisting by means of swivels.

For multiple- layer coils, the lower coils must be tightened with a preliminary tension of 1 to 2% of its minimum failure load. This tension can be achieved by braking the rope spool.

For multistrand reevings, the rope should be spooled in the same direction of spiral as that of the drum. Should a limited length of rope be placed on the ground in order to reeve into the hook block, make sure the rope runs in without twisting.

After replacing the rope, it must be broken; this is done by loading it only partially at first, and then, alternately, with loaded and unloaded hook block, in several hoist movements. This ensures that the rope spiralling is more flexibly adapted to the pulleys and drum.

Maintenance and care
Regular and periodic care of the ropes enhances the safety of crane operations and substantially increases the rope's useful life.

Wire ropes must be greased or oiled at regular intervals, especially around the drums and pulleys, areas where they are turned and flexed the most.
Well lubricated ropes demonstrate 4 times as much flex-plays as unlubricated ones.
The grease or oil must be compatible with that already on the ropes.

Note: The ropes must be greased or oiled with commercially available lubricants as suggested by the crane manufacturerfor open gearing.
See lubrication table.

Extremely dirty ropes must be cleaned regularely; the best results are achieved by brushing.

If the lower layers on the drum are hardly used, or not used at all, they must be unwound from time to time and then rewound under preliminary tension.
A rope works most economically when it is always used in its entire straight length.
For this reason, an appropriately adapted rope length should be used for crane operations of long durations.

If partial sections of a rope are subject to different and varying loads, the rope, after a certain time, can be turned around.
To do this, the previously free end of the rope is attached in the drum so that the part of the rope which has been subjected to the most wear and hard use is now in the ”quiet” zone, and vice- versa.
The service life of a rope can be noticeably increasaed.

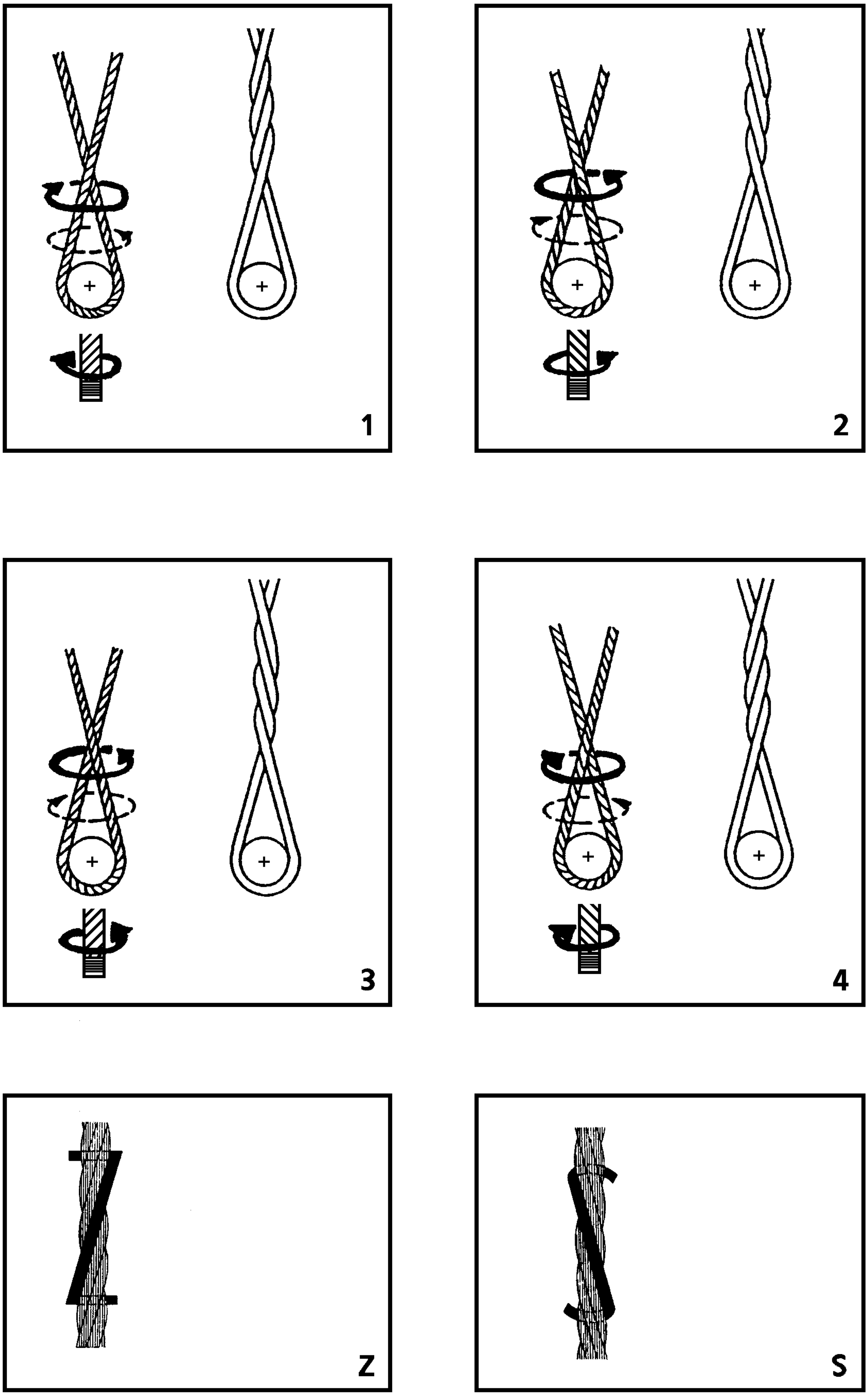
If wear results mainly in the multi-layer winding of the Lebus drum, the service life of the rope can be increased by shortening it up to a factor of 3 on the drum end by a length corresponding to 1/3 of the drum circumfence.

Extension torsion in torsion free hoist cables and its elimination
A torsion compensation is not only required after a new cable has been placed, but also if extension torsion has been building up after a longer working period, resulting from stretching and settling of the cable structure.

Torsion compensation can be noticed when the hook block turns in multi reeve operation and when **the load is set down** and / or the **outer strands seem to loosen up and if, in extreme cases, the cable shows an arch formation.**

Measures to take care of an elongation cable twist are noted below.
If a crane is operated for a longer period of time with the same reeving, without unreeving or changing the hoist cable reeving, then we recommend installation of a cable twist catcher on the fixed point of the hoist cable.

C A U T I O N : **If this is not observed, the cable can be damaged!**



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Measures to eliminate torsion compensation:

1 **Set down the hook block**
Lower the hook block as much as possible, so that the greatest cable length between pulley head and hook block is exposed to compensation (twist, point 4).

2 **Determine the turning direction**
First determine in which direction the hook block is twisted.
The turning directions are shown on the illustration with a continuously lined arrow.
Since this is difficult, especially in large hoisting heights, check it by turning in direction of the dashed arrow. The ”braid” must dissolve.

3 **Loosen the cable on the fixed point**
When the direction of rotation has been determined, release the cable on the fixed point on the hook block.

Note: It is advantageous if, for torsion compensation, the hook block has been reeved in an uneven number or that such a number will be reeved.
In that case,the fixed point of the cable is easily accessible on the hook block and it can easily be released.

4 **Carefully turn the end of the cable by 180° to 360°, to compensate for the turn of the hook block**
To compensate for the turn, turn the separately shown end of the cable, as marked by the solid line arrow.

Note: It is important that the correct reference point is taken and that the crane operator holds the cable in front of him .

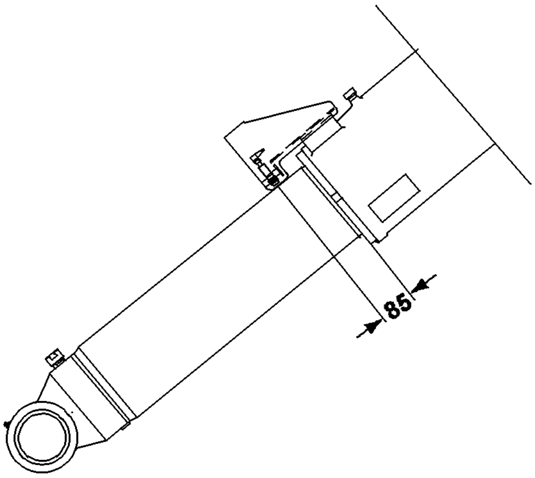
The right moving cable (**Z**), as shown in fig. 1 and the left moving (**S**) cable, as shown in fig. 4, is turned in for compensation, while the right moving cable (**Z**), as shown in fig. 2, and the left moving cable (**S**), as shown in fig. 3, must be turned out.
The rule is that for torsion compensation, the end of the cable must be turned against the direction of rotation, which caused the release of the ”braid” in the above test.

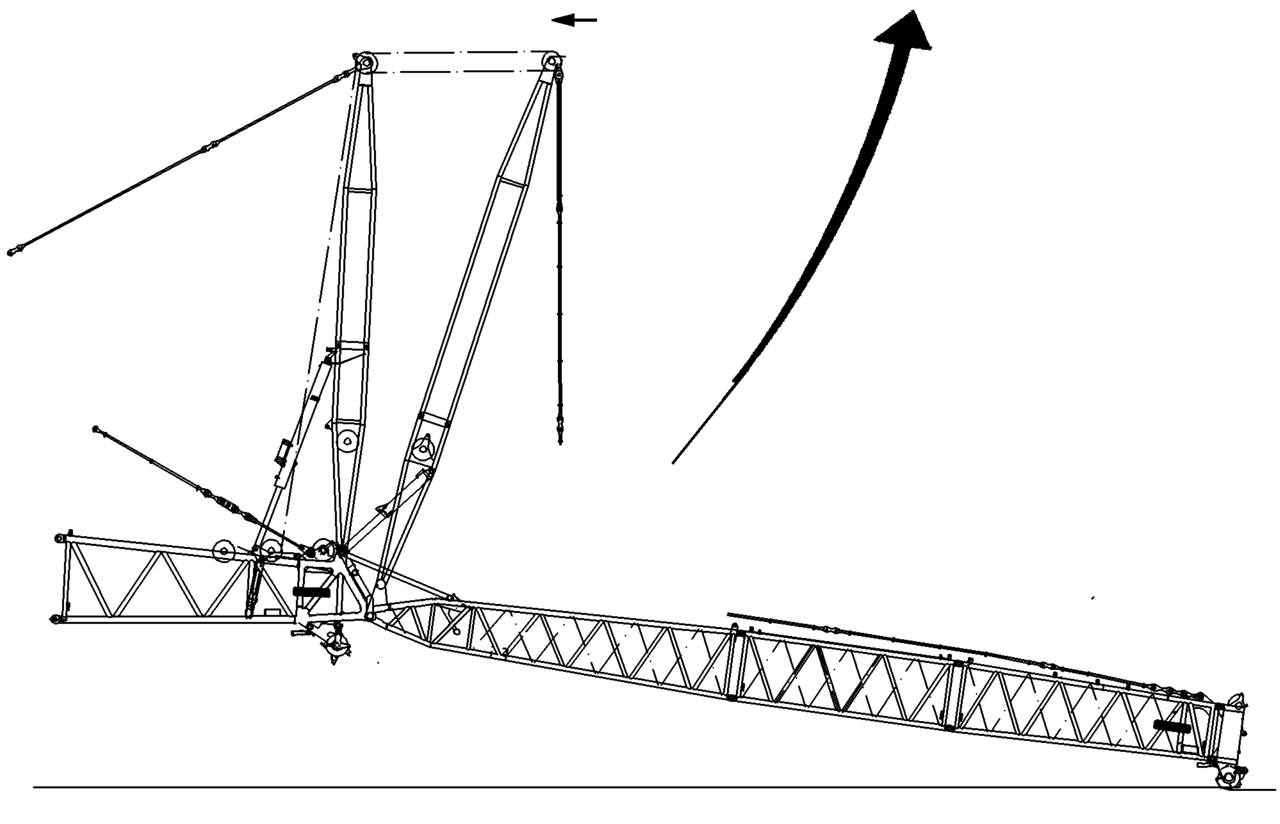
C A U T I O N: **The cable section should be as long as possible for the turn. Through a hoisting movement without a load, this turn should be distributed over the complete length of the cable.**
Under no circumstances turn the cable by force over a short section, because this would destroy the cable structure permanently.

5 **Reattach the cable on the fixed point**
The end of the cable must be reattached and secured on the fixed point after the turn.

6 **Carefully lift the hook block, raise it without a load and repeat the procedure, if necessary**
Since a non-stretch cable construction is relatively safe from torsion, the cable can only be stretched a little (actually, the torsion does not continue over the cable pulley), so that the hoisting movements with out a load must be repeated several times.
After getting the compensating turn to the end of the cable, reattach the cable end again to the fixed point and repeat the hoisting movements with out a load one or several times so that the torsion compensation can be distributed over the complete length of the cable past the cable pulley.

Note: If necessary, in case the stretch was especially severe (multiple twisting of the lower pulley block and / or slackening of outer strands over a longer stretch, or at several points) then repeat this procedure several times, depending on hoist cable length.





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Functional test of limit switch initiators on hydro-accumulator cylinders

1. **Cover the limit switch initiators** individually with a metal plate.
   The control winch "**spool up**" movement must turn off.
   The symbol on the LICCON monitor must appear.

2. Check the shift point on the hydro-accumulator cylinders as follows:

   - The function of the installed limit switch must be checked before erecting the boom. To do so,move the two A- brackets together resp. raise the A- brackets until they open the shift contact at the given dimension (see illustration) and the control winch **"spool up"** movement turns off.

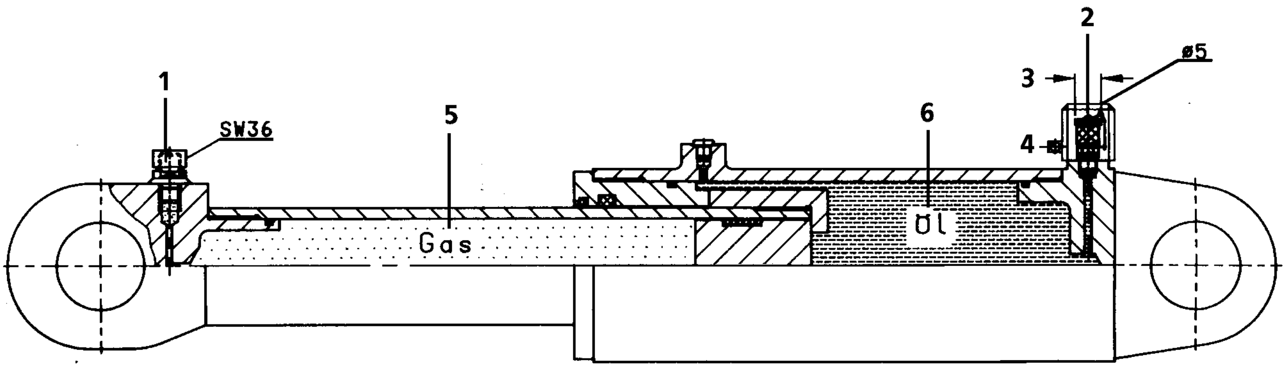
   After completing the test successfully, reset the A-brackets to erection condition.

Note: Abb. = Relapse retainer with hydro -accumulator cylinder **Id. No. 512381508**

The crane can be put into service after all additional limit switches for lattice jib angle limitation have been checked for proper function.

8.13 CHECKING THE RELAPSE ACCUMULATOR CYLINDERS WITHOUT PRESSURE MONITOR

1



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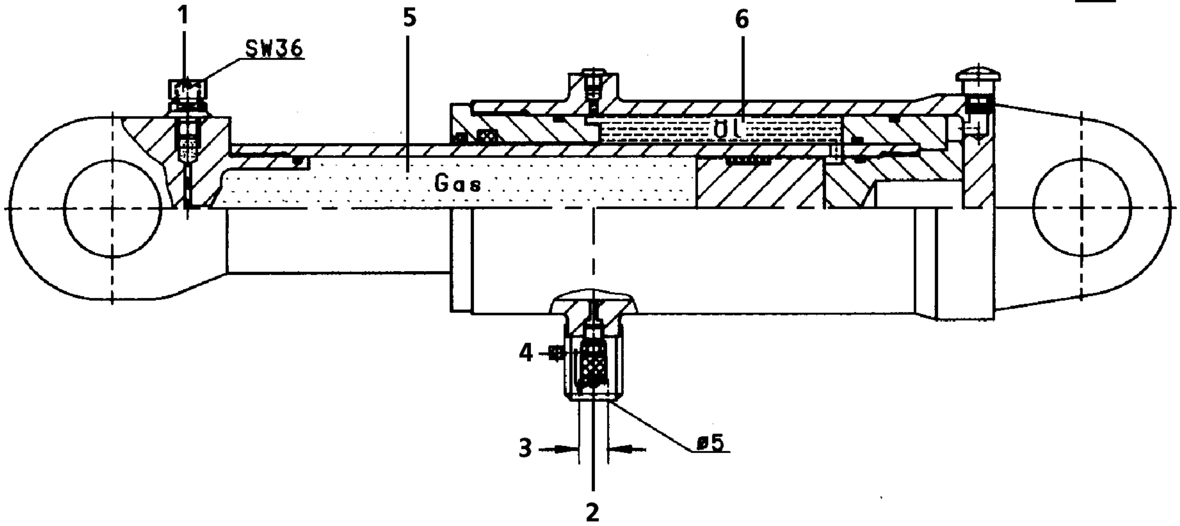

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Hydro - accumulator cylinder used as a relapse cylinder for the lattice fly jib

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, 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” (fig. 4)**!

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. 5**). 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.

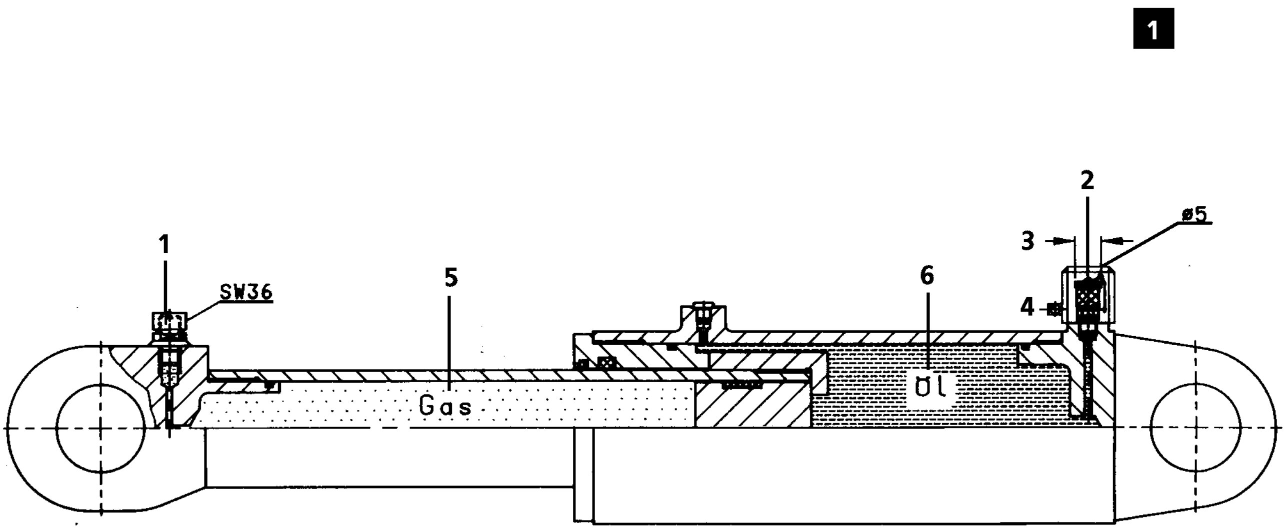
e) Check the function of the limit switch on the accumulator cylinders
Check the function of the limit switches before putting the crane in operation, according chapter 8.12.

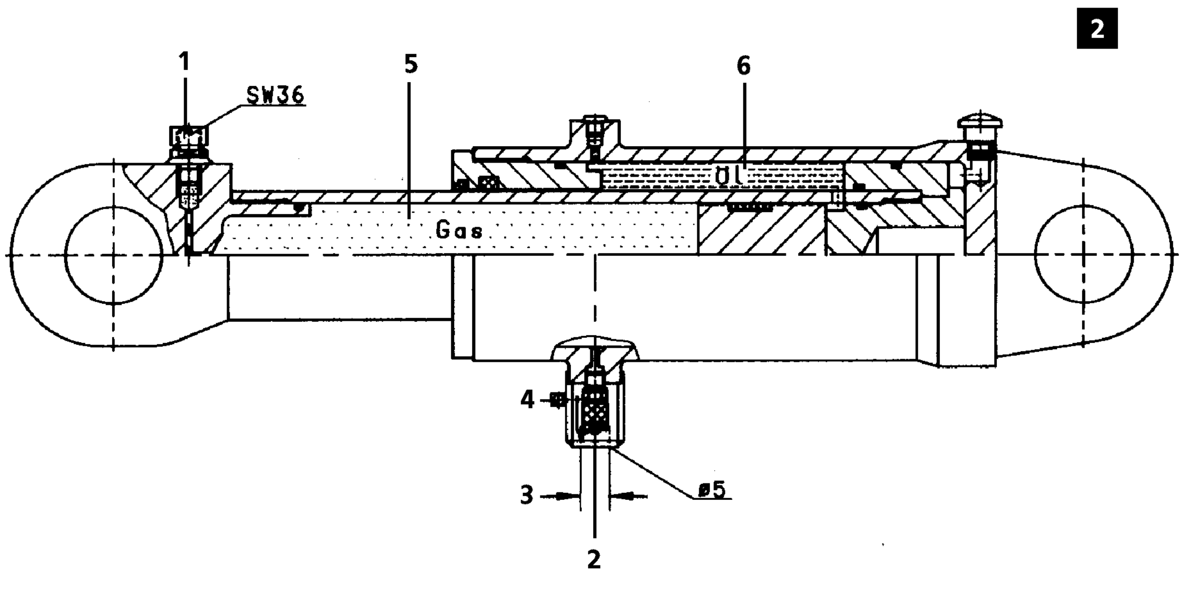
8.13 CHECKING THE RELAPSE ACCUMULATOR CYLINDERS WITHOUT A PRESSURE MONITOR

Hydro - accumulator cylinder (512381508)

Gas pressure depending on ambient temperature (fig.4)

Temperatur °C	**Pressure bar**
- 40	107,3
- 20	116,5
0	125,7
+20	135,0
+40	144,0





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8.13 CHECKING THE RELAPSE ACCUMULATOR CYLINDERS WITHOUT A PRESSURE MONITOR

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

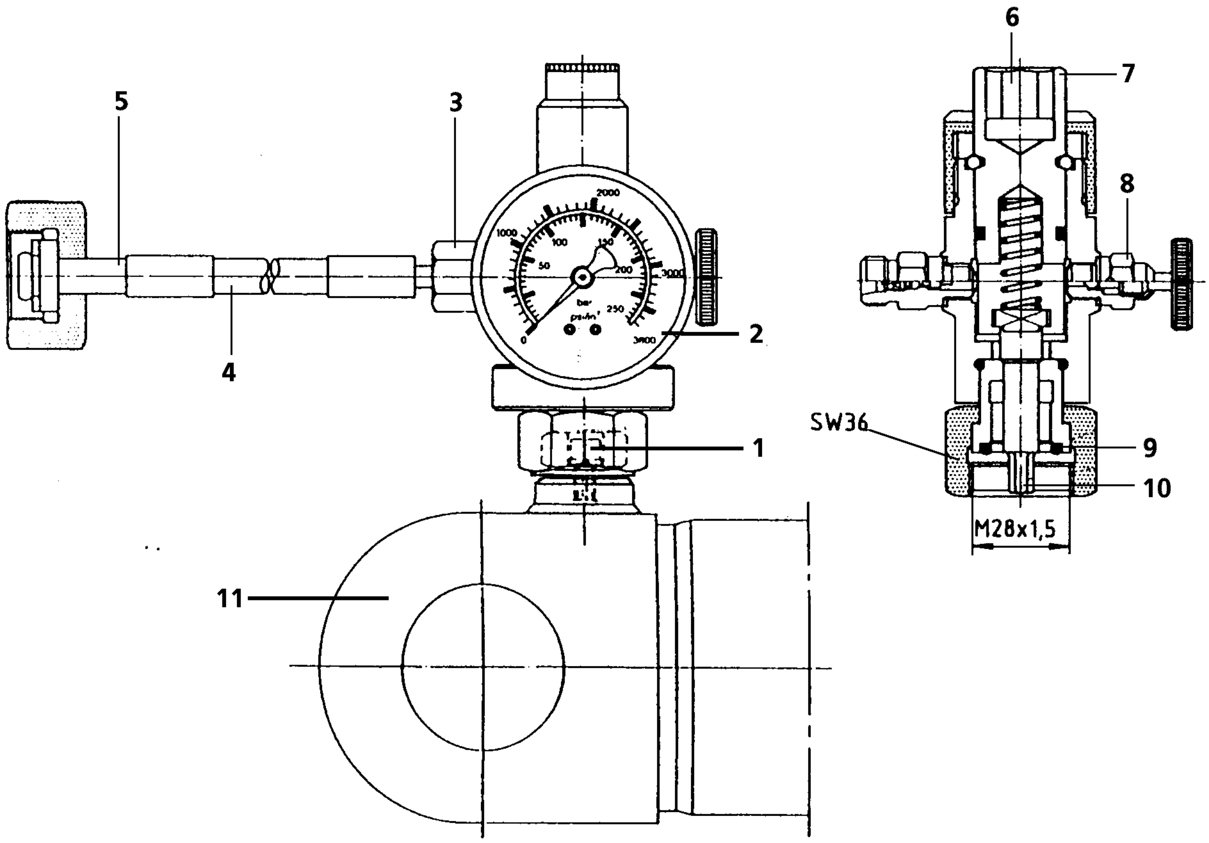
Components of the gas filling device (Fig. 3)

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



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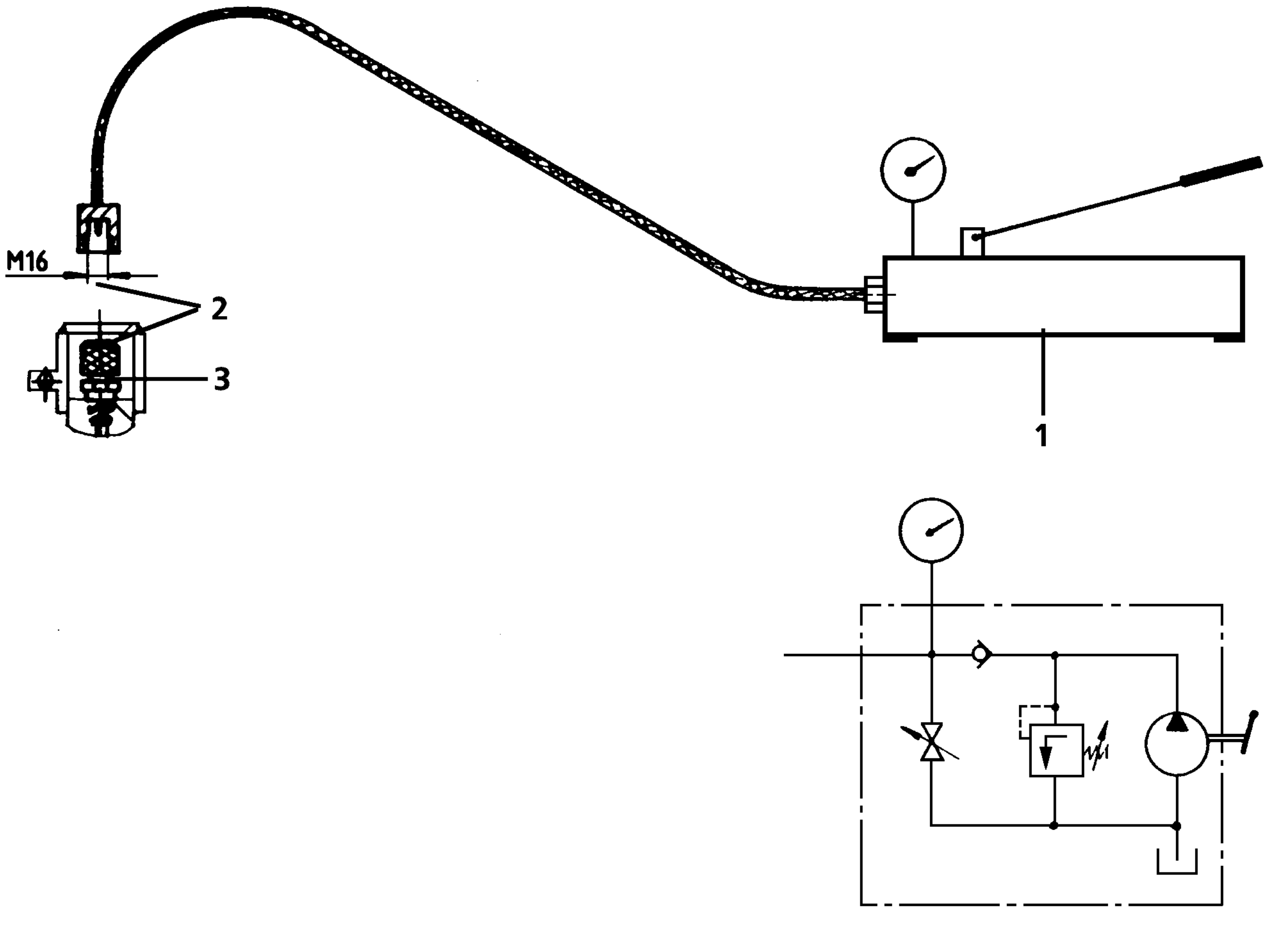
4



8.14 CHECKING THE RELAPSE ACCUMULATOR CYLINDERS WITH PRESSURE MONITOR

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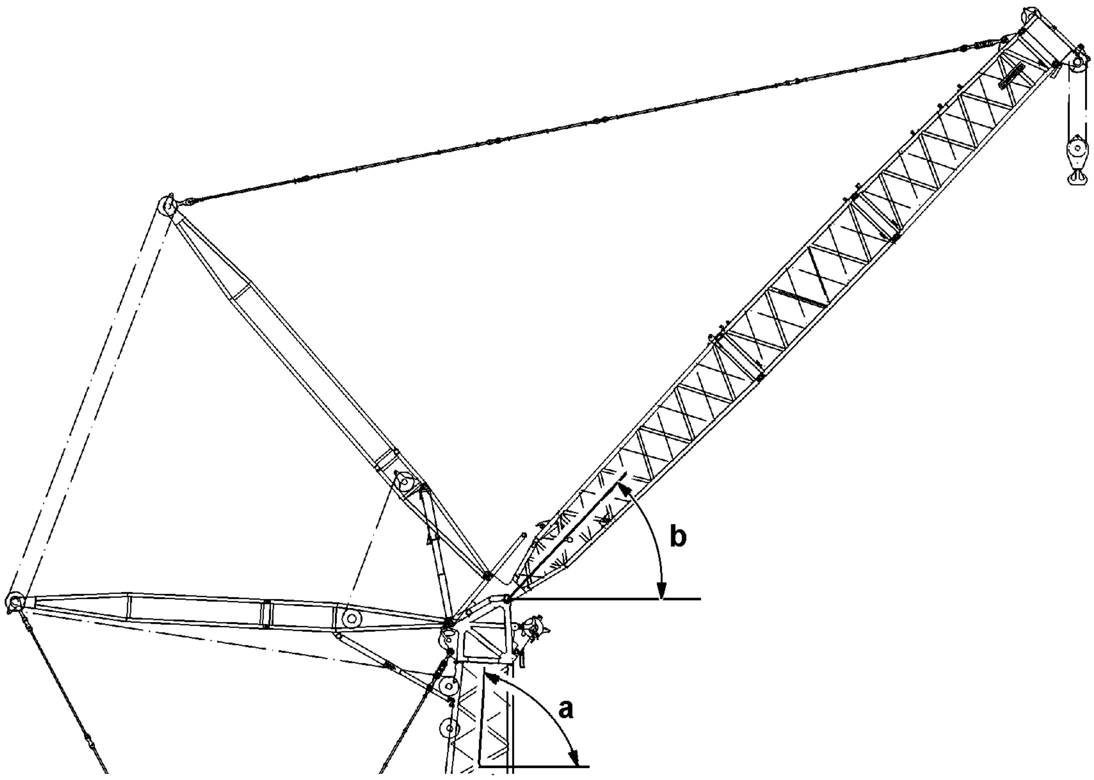

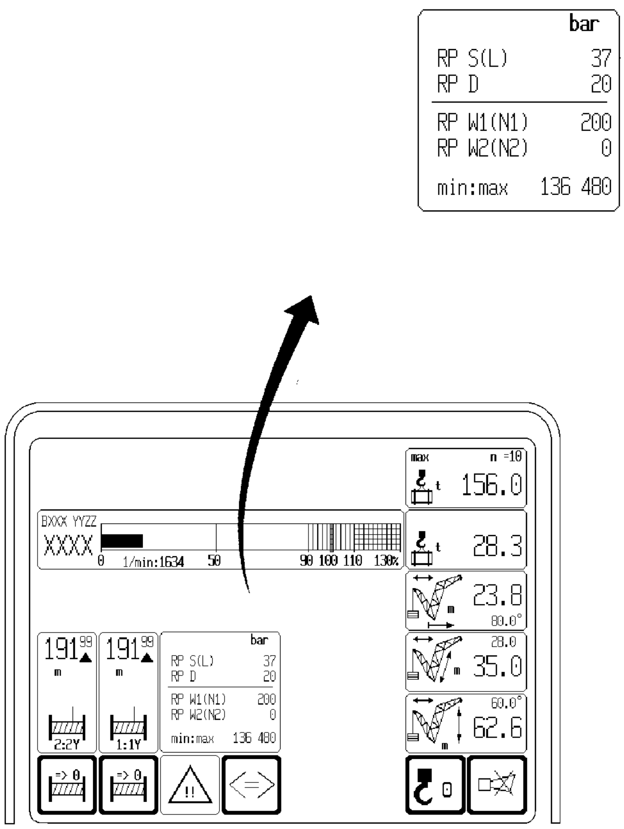

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8.14 CHECKING THE RELAPSE ACCUMULATOR CYLINDERS WITH PRESSURE MONITOR

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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)				
					-40° C	-20° C	0° C	+20° C	+40°C
Checking position cylinder fully extended	87 °	44,6 °	5050	0	107,3	116,5	125,7	134,9	144,1

to **2**. **Check the specified cylinder pressure on operating position, boom and fly jib raised:**

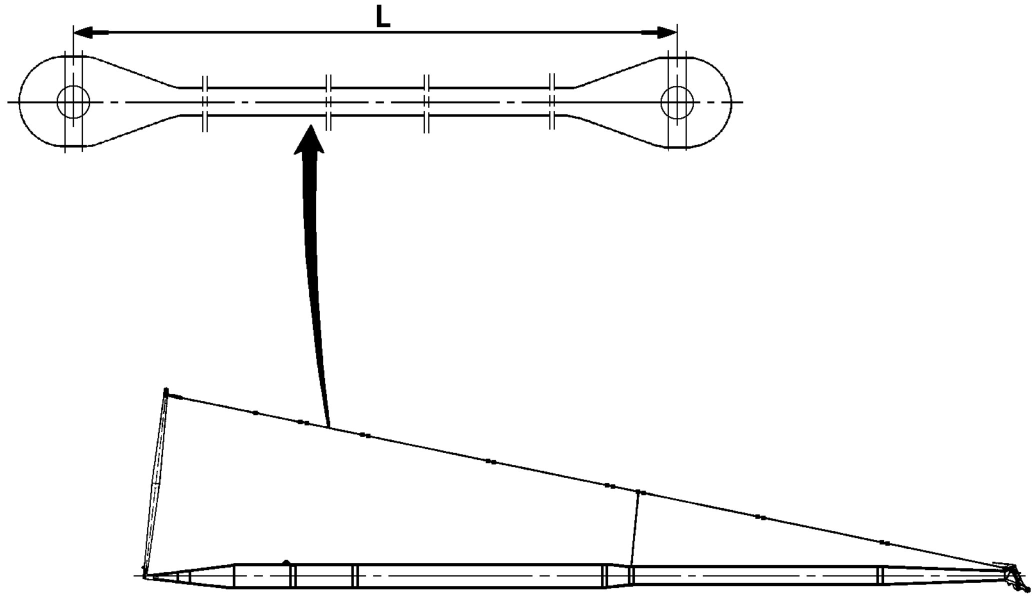
Checking position: Adjust the main boom and the lattice fly jib to an angle in relation to the horizontal line, as noted on the chart 2.
The displayed operating pressure on monitor ”0” must be the same as the nominal pressure noted on chart 2 below.

Chart 2

	Boom angle [a]	Fly jib angle [b]	Cylinder length [mm]	Strok e [mm]	Pressure (bar)				
					-40° C	-20° C	0° C	+20° C	+40°C
Checking position	87 °	46 °+2 °	4997	53	110,0	119,5	129,0	138,4	147,9

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.



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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

9.02 GUIDELINES TO PREVENT FIRES IN THE ENGINE AREA AND IMPORTANT SERVICE WORK TO BE PERFORMED

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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 chapter 7.01.

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.