Operating manual

EN

Type:

HS 855 HD

Serial number:

184 872

ORIGINAL

001 - 25.01.2016 / lwnscj0

LIEBHERR

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10. APPENDIX 10 - 1

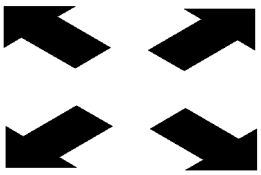
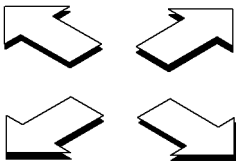
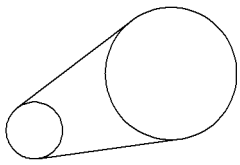
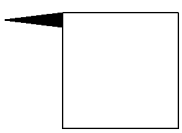
NOTE !

The **NOTE**
- indicates a **potentially damaging situation,**
- relates to operating and maintenance work,
- denotes advice on technical aspects that is helpful and that the user must adhere to.

IMPORTANT!

IMPORTANT is used to **draw attention to practical tips and useful information** which can improve the machine's readiness for operation, lengthen its service life or **make specific operations significantly easier.**

1.2.6 Symbols

Symbol	Meaning
□	Requirement must be met
▶	Carry out task
▷	Outcome of task
	Action arrows
	Result arrows
	Detail using the same perspective as in the image
	Detail using a different perspective to the image

2

2.4 Boom

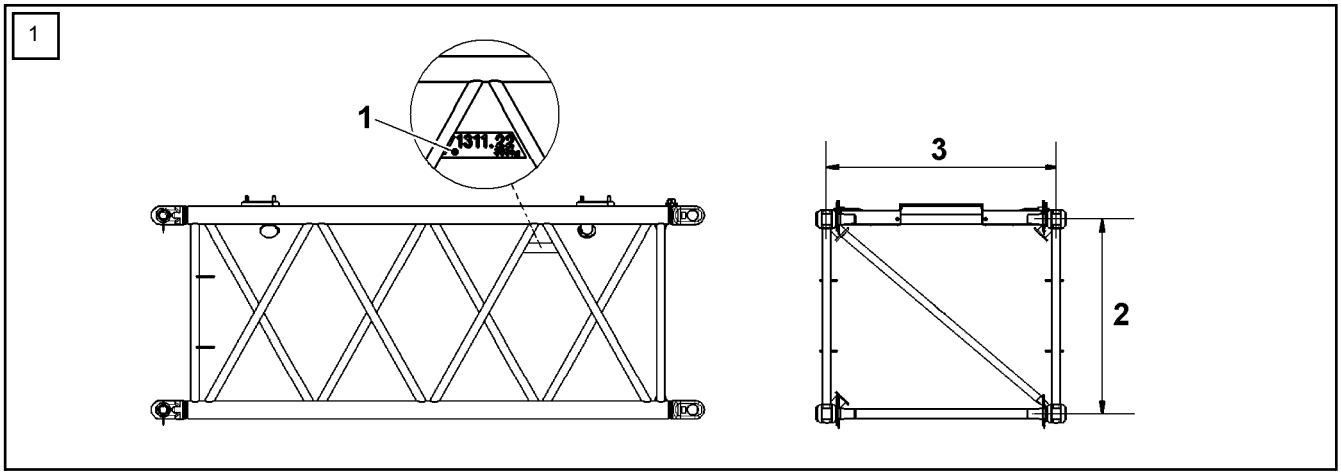
2.4.1 Information on boom designations

The **system number** (e.g. 1311.22) designates boom sections. The system number makes it possible to distinguish the different boom sections in the rope or duty cycle crawler crane series.

The system number contains the following information:

System number: **1311.22**

13xx.xx.....system width
xx**11**.xx.....system height
xxxx.**22**.....wall thickness



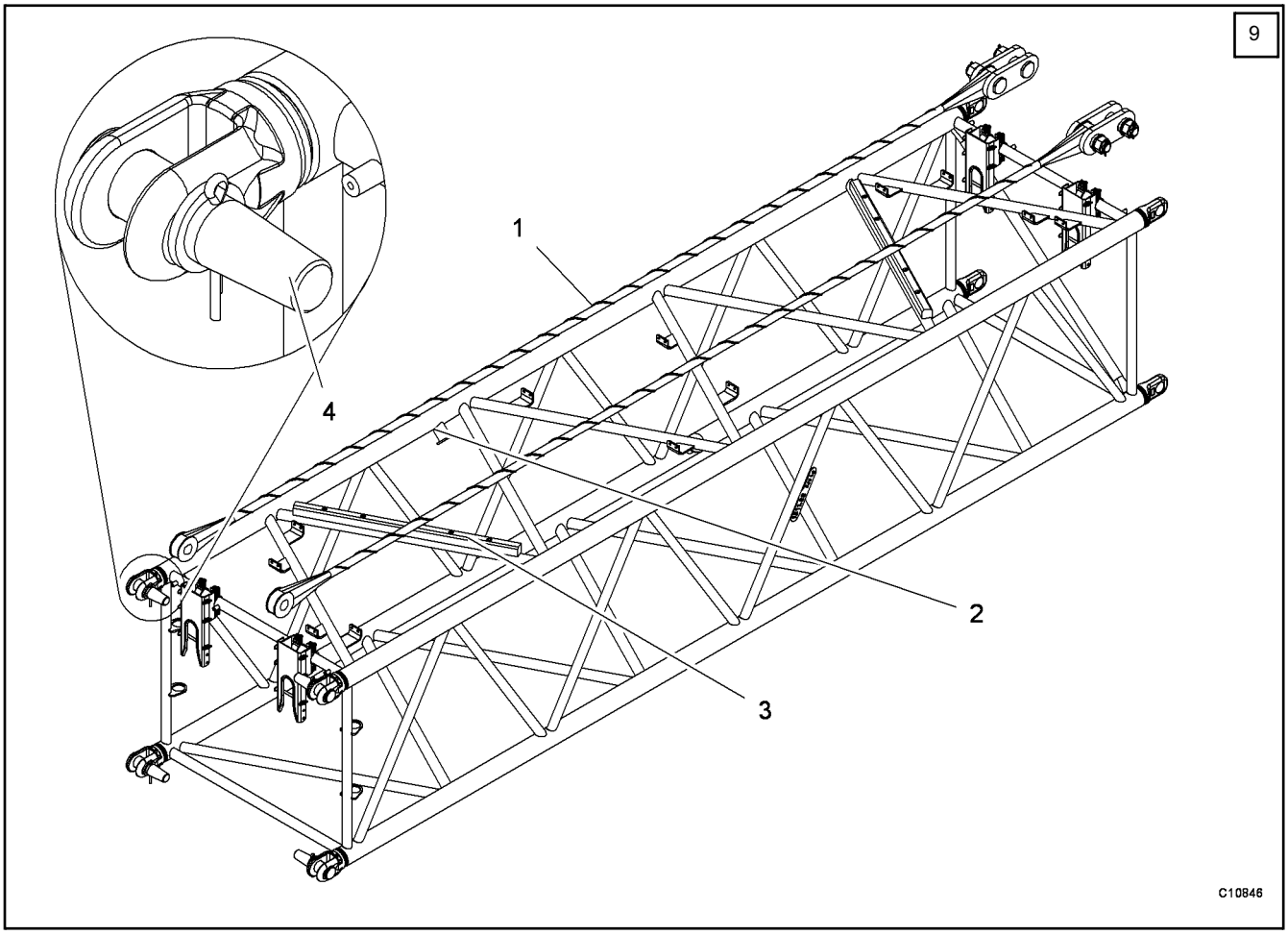
1 Marking
2 System height
3 System width

Each boom section is marked with the system number (Figure 1, item 1). The **System height** (2) refers to the height of the boom section. The **System width** (3) indicates the width of the boom section. The **wall thickness** is defined by a particular wall thickness code.

NOTE!

Only boom sections having the specified system numbers may be used (see following pages). It is vital that you consult Liebherr after sales service before using boom sections with different system numbers!

Boom section 6 m [20 ft]



Boom section 6 m [20 ft], HS 855 HD

1 Main boom pendant straps (2x), 6 m [20 ft]
2 Lifting points
3 Rope supports (2x)
4 Pins (4x) with cotter pins (4x)

The **complete rear counterweight**
- is comprised of base plate (fig. 18, no. 5) and up to ten smaller counterweight plates (no. 1),
- is suspended from optional counterweight assembly chains (no. 2) on two optional ballasting rams,
- is lifted via optional ballasting rams upon assembly of the machine from the ground on to the uppercarriage, or lowered to the ground again upon disassembly.

The optional **counterweight assembly chains** are fitted to the optional **mounting plates** (no. 7). These are bolted to the **base plate** .

The rear counterweight is bolted to the uppercarriage via two front (no. 6) and one rear bolting plates (no. 3).

The **counterweight plates** (no. 1) are
- stacked on the base plate,
- are lashed to the base plate via a round steel chain and a conical spring washer (no. 4).

IMPORTANT!

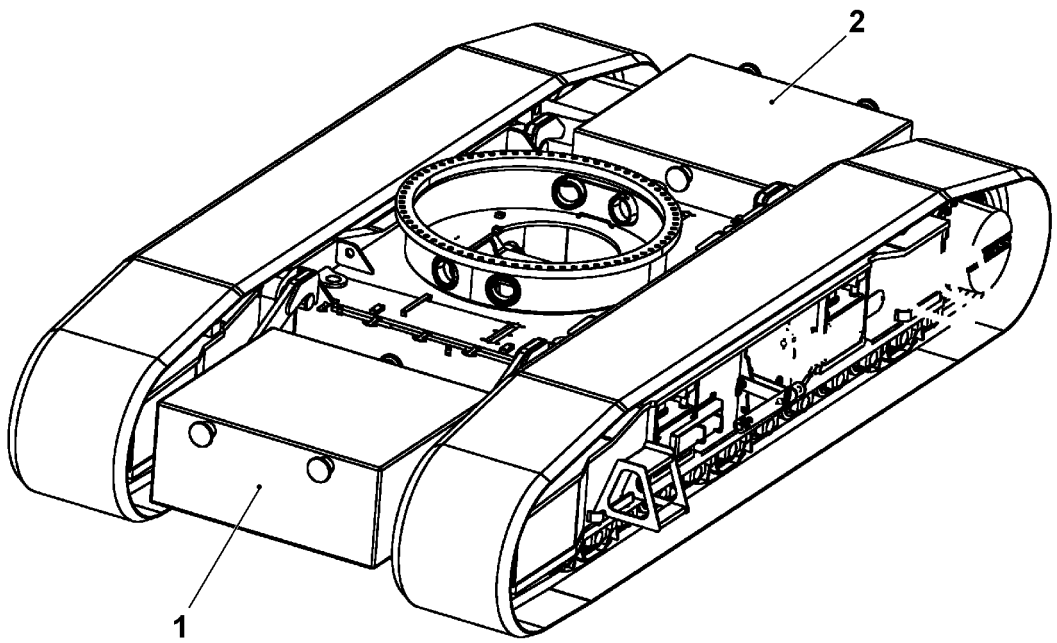
Excavator operation: rear counterweight **max. 26.3 t [57982 lbs]** - central counterweight: **must not be fitted**

Lifting operation: rear counterweight **max. 32.3 t [71209 lbs]** - central counterweight: **15 t [33069 lbs]**

2.7.2 Central counterweight *

Use of the central counterweight * is only permitted when lifting operations are being carried out. It consists of two ballast plates, which are fitted to the front and rear (2) of the central section of the undercarriage.

19



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NOTE!

The central counterweight must only be used for lifting operations, in which case both ballast plates must be fitted.

2.10.6 Winches

Main winches (winch 1 and 2)

The main winches fit to the duty cycle crawler crane
- differ depending on the application,

Version	16 t [35274 lb]	20 t [44092 lb]	25 t [55115 lb]
Free fall	X	X	X
Line pull in kN (nominal load)	160	200	250
Rope diameter in mm [ft]	26 [1 inch]	30 [1.18 inch]	34 [1.34 inch]
Drum diameter in mm [ft] (first layer)	580 [1 ft 11 inch]	630 [2 ft 1 inch]	750 [2 ft 6 inch]
Rope speed in m/min [ft/min]	0 - 99 [0 - 324]	0 - 101 [0 - 331]	0 - 81 [0 - 266]
Rope capacity in m [ft] (first layer)	51.9 [170 ft 3 inch]	40.6 [133 ft 2 inch]	38.8 [127 ft 4 inch]

Main winches, technical data Table 2-06

Further data available from the manufacturer on request.

Outstanding features of the main winches include:
- compact, low-maintenance design,
- load support provided by the hydraulic system,
- spring-loaded multi-disc brakes (holding brakes).

The main winches
- are driven by high-pressure-controlled axial piston displacement motors,
- utilize the full engine power even during operation at partial load by adjusting the speed to the appropriate line pull,
- share the load equally across both main winches in grab operation mode (available as an option),
- adjust the rope speeds to one another in case of unequal multilayer operation (available as an option).

With the free-fall system, an oversize multi-disc brake performs the functions of both clutch and brake. This wet-running, internal multi-disc brake is designed to be wear-resistant and maintenance-free.

Boom winch

The boom winch is equipped with:
- an internal planetary gearbox,
- an axial piston motor,
- a hydraulic, spring-loaded multi-disc brake.

Line pull . . . . . max. 105 kN
Rope diameter . . . . . 20 mm [1 inch]
Rope speed . . . . . max 132 m/min [433 ft/min]

Additional equipment

Auxiliary winch in boom foot . . . . . 70 kn
Tagline winch with free-fall system . . . . . 30 kn

3.3 Requirements of personnel

3.3.1 Machine operator

The machine operator
- has reached the statutory minimum age.
- is physically capable (adequate eyesight and hearing, quick reactions) of safely operating the machine.
- is authorised to operate the machine.
- can accurately estimate distances, heights and clearances.
- is trained:
  - to operate this type of machine
  - in attaching and signalling
  - to operate fire extinguishing equipment
- is aware of the escape routes in the event of an emergency.
- is not suffering from any physical or psychological ailments that lower any of the specified requirements.
- is not under the influence of alcohol or drugs.

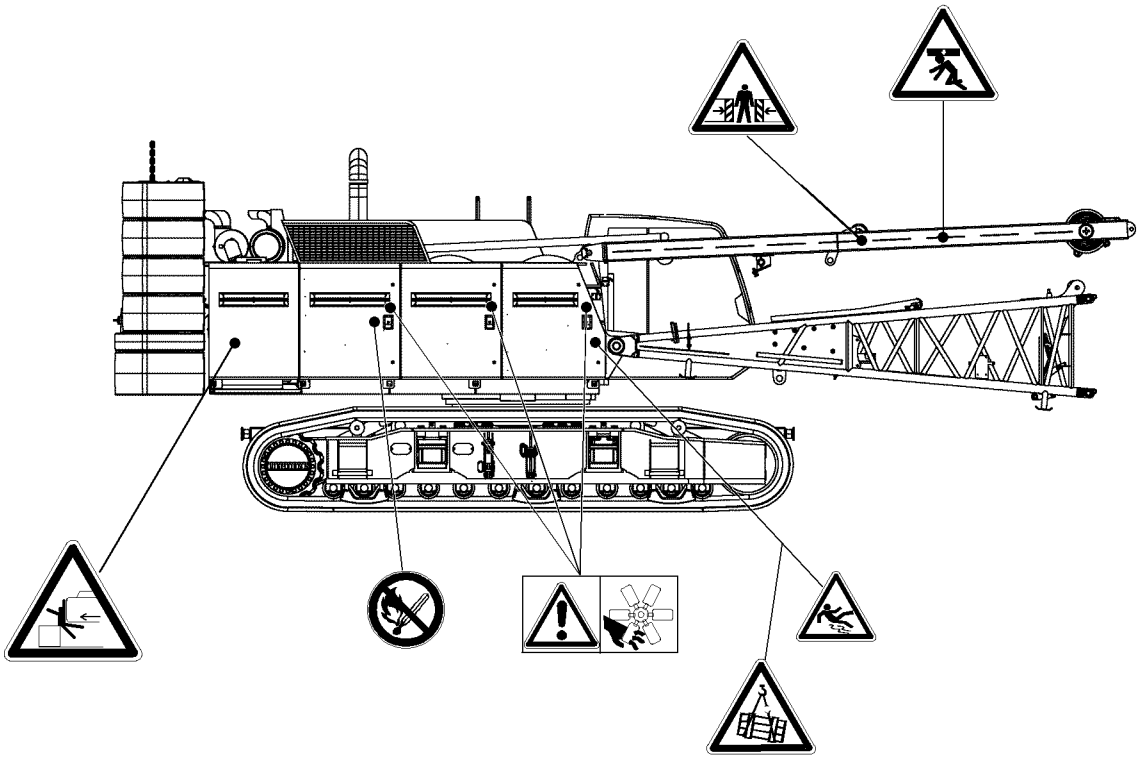
3.3.2 Rigger

The rigger
- has reached the statutory minimum age.
- is physically capable (adequate eyesight and hearing, quick reactions) of safely using/moving the slinging equipment.
- is authorised to rig loads.
- is able:
  - to accurately estimate distances, heights and clearances
  - to accurately estimate mass and load distribution
  - to operate radios and use them to give clear instructions
  - to guide the load and ensure the safe movement of the load and the machine
- is trained:
  - in attaching slinging equipment
  - in signalling and knows the signal signs
  - in selecting the correct slinging equipment
  - in securing against unexpected detachment
  - in preventing damage to the slinging equipment
- is not suffering from any physical or psychological ailments that lower any of the specified requirements.
- is not under the influence of alcohol or drugs.

3.3.3 Signalman

The signalman
- has reached the statutory minimum age.
- is physically capable (adequate eyesight and hearing, quick reactions).
- is authorised to give signal signs.
- is able:
  - to accurately estimate distances, heights and clearances
  - to operate radios and use them to give clear instructions
  - to guide the load and ensure the safe movement of the load and the machine
- is trained in signalling and knows the signal signs.
- is not suffering from any physical or psychological ailments that lower any of the specified requirements.
- is not under the influence of alcohol or drugs.

5



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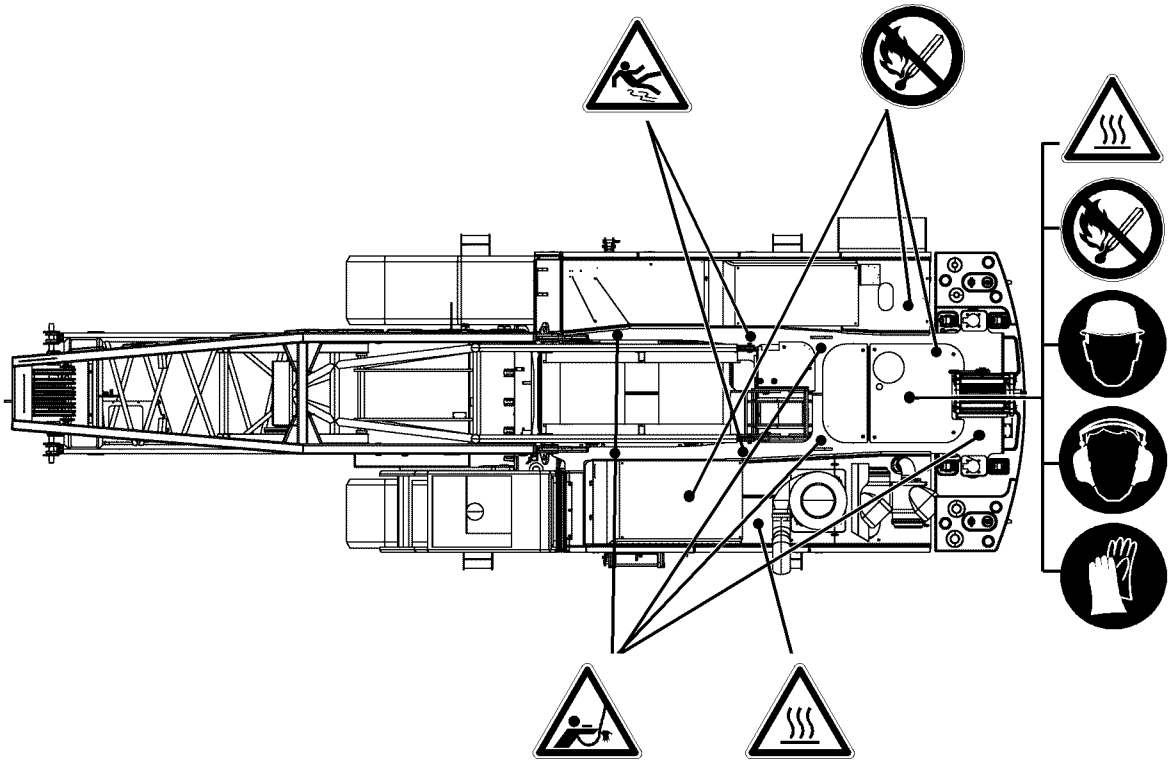
6



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3.10.4 Burns

CAUTION!

Contact with hot surfaces and equipment!
High surface and equipment temperatures can lead to burns or scalding.
- Observe situation-specific safety instructions and those concerned with handling.

NOTE!

Observe the following safety instructions:
- always wear suitable protective gloves when working on hot components.
- allow the machine to stop and cool down before carrying out any work on it.

Examples of burns and scalding:

Burns through contact with the entire drive system.

Scalding from steam exiting from the cooling system or hydraulic oil from the drive system.

First aid

1. Protection/personal safety
• Identify - what is the nature of the emergency?
• Think - what are the dangers for the injured party or the helper?
• Act - make the situation safe.
2. Emergency call
3. Emergency life-saving measures
• Recovery position
• Cardiac massage, artificial respiration and defibrillation
• Staunch bleeding, deal with shock
4. Additional first aid
With first-degree burns (redness of the skin):
• Cool the affected body part by rinsing with cold fresh water.
• Cover injured area(s) with a sterile anti-bacterial bandage. Do not apply pressure.
With second-degree burns (blisters on the skin):
• Cool the affected body part by rinsing with cold fresh water.
• Cover the area using a sterile anti-bacterial bandage. Do not apply pressure.
With third-degree burns (charring of the skin and tissue):
• Cover the area using a sterile anti-bacterial bandage. Do not apply pressure.

3.10.13 Overhead power lines

WARNING!

Live overhead power line!
Electric shock as a result of voltage flashover or step voltage.
- Observe situation-specific safety instructions and those concerned with handling.

NOTE!

Observe the following safety instructions:

- Before starting work inform the power supply company. The power supply company representative will issue written approval for the setting up and operation of the machine.
- Maintain a safe distance as specified in national guidelines or by a representative from the power supply company.
- Inform all employees on the site where the machine is to be used about the dangers of electrical voltage.
- When moving the machine, watch out for unevenness in the ground that could reduce the distance to the power line.
- Assign a signalman to observe the machine and the line, to monitor the safe distance and to maintain continuous contact with the machine operator.

Examples of current transfer from overhead power lines:

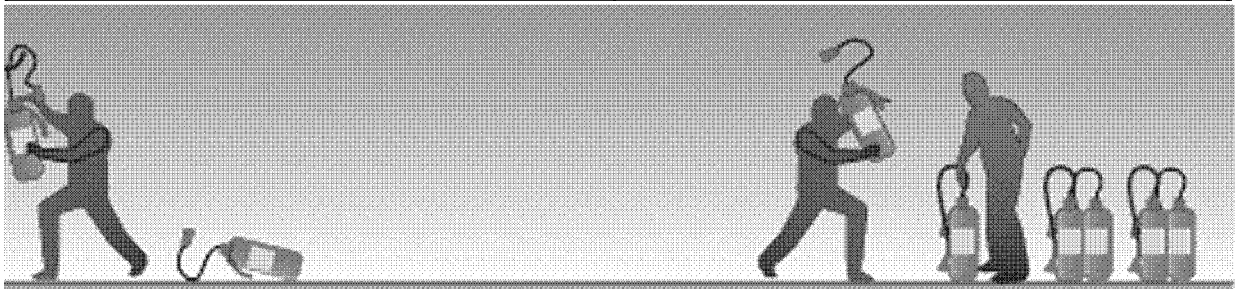
- Coming into direct contact with an overhead power line.
- If the safety distance is not maintained, an arc will form.
- An overhead power line comes down and a dangerous resistance area forms in the ground around it.

The safety systems of the different national electricity grids react differently in the event of a fault. One may not assume that the underground power line will be automatically and permanently shut down after a short to earth. A resistance area develops around the machine and/or the damaged underground cable (see Chapter 3, How to respond in the event of a current transfer).

First aid

1. Protection/personal safety
• Identify - what is the nature of the emergency?
• Think - what are the dangers for the injured party or the helper?
• Act - make the situation safe.
2. Emergency call
3. Emergency life-saving measures
• Recovery position
• Cardiac massage, artificial respiration and defibrillation
• Staunch bleeding, deal with shock
4. Additional first aid
• (For further information see: Chapter 3, How to respond in the event of a current transfer)

Incorrect	Correct

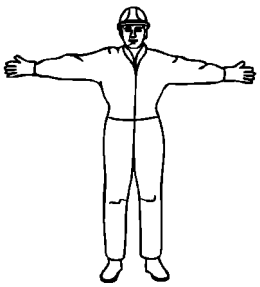


Do not put the fire extinguishers back in place after use - refill them

3.16.1 General hand signals in accordance with BGV A8

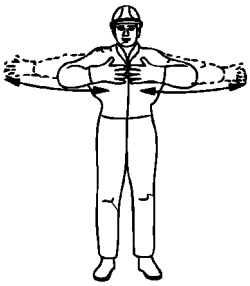
Caution, Start, Stop

- Hold the right arm stretched vertically upwards
- Palm facing forwards



Stop, Interruption

- Stretch out both arms to the side horizontally
- Palms facing forwards



Stop - Danger

- First stretch out both arms horizontally to the sides
- Palms facing forwards
- Now alternately bend in and stretch out the arms

Lift

- Bend the right arm and hold upwards
- Palm facing forwards
- The hand makes a small, circular movement

Names of components in Figure 4-03:

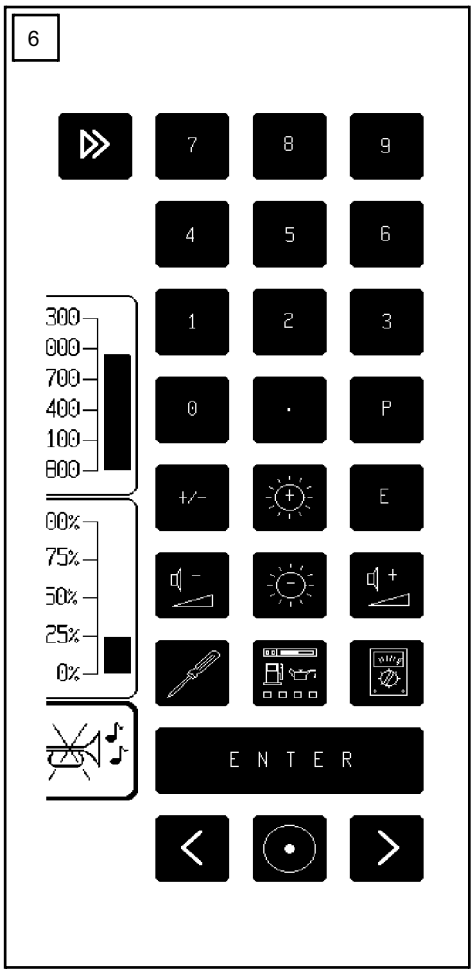
1 Spirit level for inclinometer
2 Brake pedal for free-fall brake* of winch 1
3 Pedal for left-hand crawler
4 Air vent
5 Hand lever for left and right crawlers
6 Pedal for right-hand crawler
7 LCD monitor
8 Right-hand control panel (X23)
9 Inner T-lever for winch 1
10 Outer T-lever for winch 2
11 Ignition switch
12 Emergency stop switch
13 Cigarette lighter
14 Ashtray
15 -
16 Radio
17 Screenwash container, front
18 Oddments tray
19 Cup holder
20 Screenwash container, roof
21 Left-hand control panel (X12)
22 Left-hand control panel (X11)
23 Safety lever for Litronic control system
24 Two-axis control lever for main boom adjustment and swing control
25 Grab handle
26 Mounting position of foot pedal for tagline winch *

Increase brightness

With this button the LCD screen can be
- set to three different levels of brightness,
- switched to inverse display mode (for use at night).

Decrease brightness

With this button the LCD screen can be
- set to three different levels of brightness,
- switched to inverse display mode (for use at night).



4.8.2 Keyboard menu

The menu bar function symbols use Touch Screen functionality to:

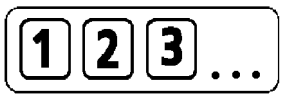
- adjust the volume of the warning buzzer,
- adjust the brightness of the LCD screen,
- switch to the Litronic® test system,
- switch to the menu bar,
- Enter setting and correction values for the Litronic® control system.

CAUTION

Setting and correction values for the Litronic® control system should only be entered or adjusted by authorized qualified personnel.

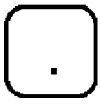
Minimise

Switches from keyboard menu to menu bar.



Numerical values

Enter numerical values.



Decimal point

Enter a decimal point.

P

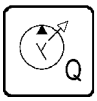
This key is not used with this range of machines.

Potentiometer

The two potentiometers on the right-hand control panel can be used to make various settings, depending on the options installed on the machine. Two separate functions can be assigned to each of the two potentiometers. The function assignment is indicated by the corresponding LED on the selection display.

The potentiometer is adjusted from minimum to maximum by turning it clockwise. It can be turned through two revolutions. It can be fixed in the desired position with the small lever.

Potentiometer 1



Selection display "Casing oscillator capacity"

The function assigned to potentiometer 1 is indicated by the LED.

Grab slow-down height selction display (optional)

Used to adjust the slow-down height.

Potentiometer 2

Selection display "Casing oscillator power regulation"

The function assigned to potentiometer 2 is indicated by the LED

Slack rope cut-out selection display (optional)

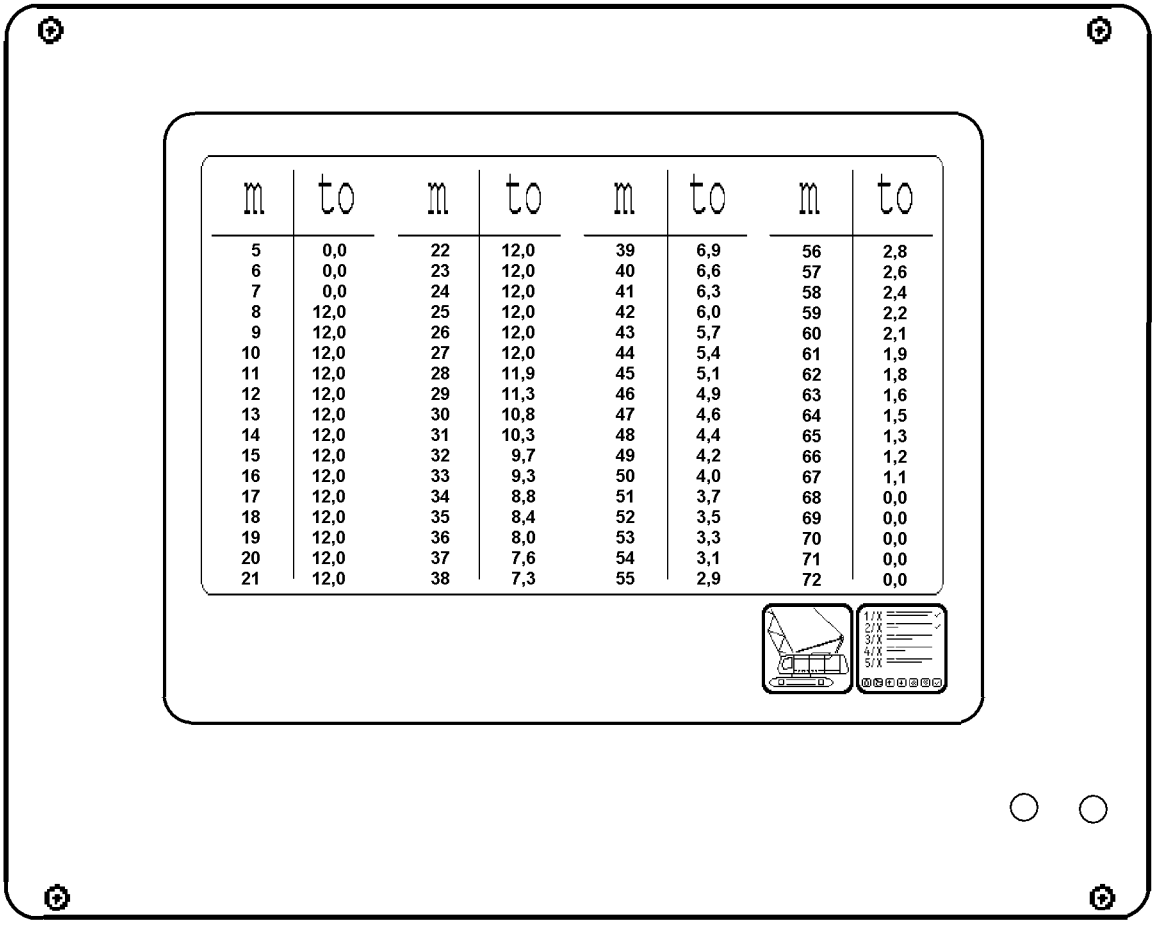
Used to adjust the switching threshold for the slack rope cut-out.

IMPORTANT!
The potentiometer setting always applies to the active selection.
(LED in the selection display lights up.)

4.14.3 Example of a load capacity chart for load moment limitation *

Once the current set-up has been successfully programmed and calculated, the set-up screen will show in table form the calculated load capacities depending on the possible outreach in meters instead of the display values. Values that are not required or not possible are shown as 0.0.

The progression of reach in this load table is given in **m** with the corresponding maximum load in **t** . All the calculated values are spread over the maximum possible number of lines in the table (maximum of 68 values per table).

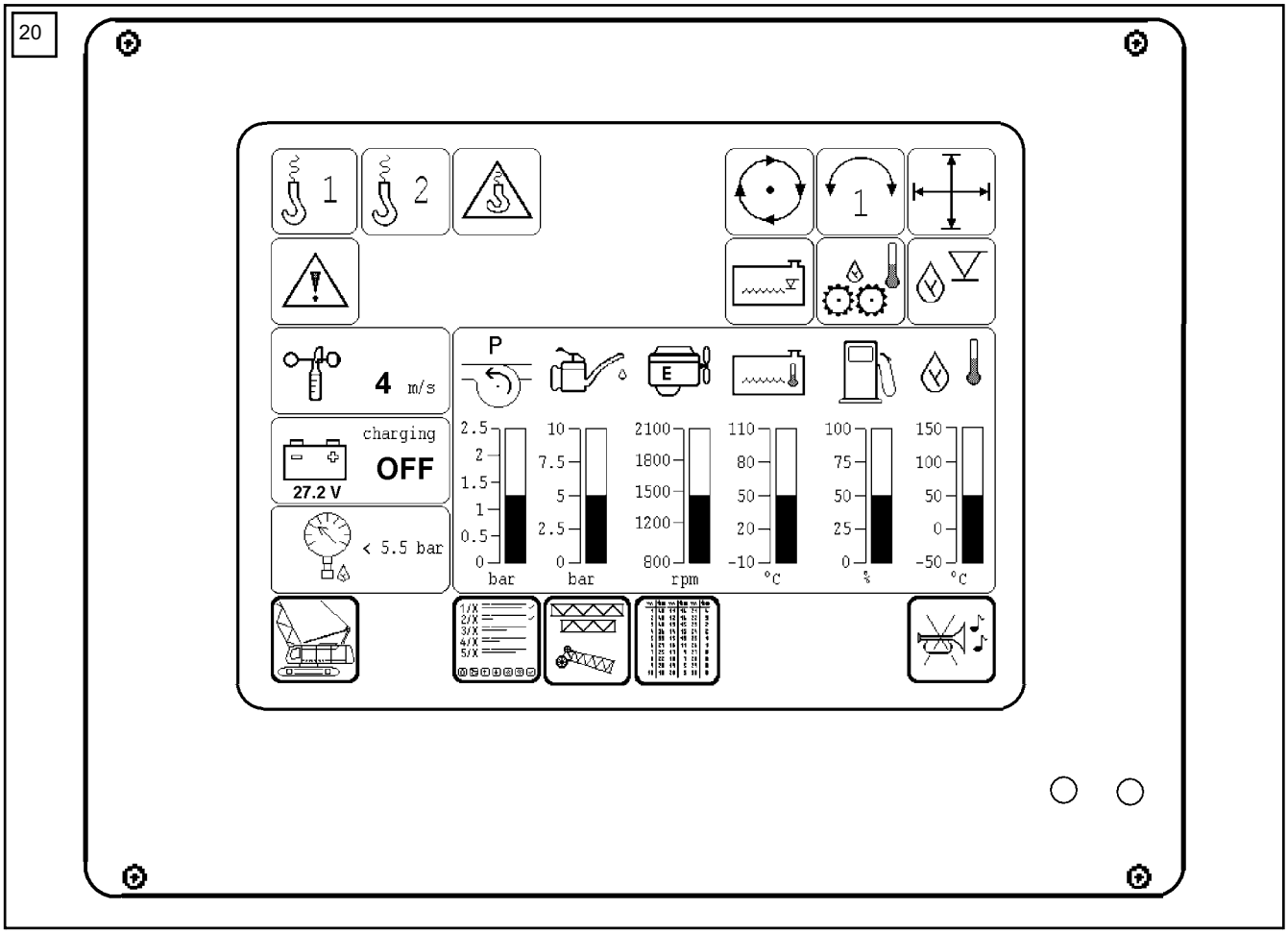


m	to	m	to	m	to	m	to
5	0,0	22	12,0	39	6,9	56	2,8
6	0,0	23	12,0	40	6,6	57	2,6
7	0,0	24	12,0	41	6,3	58	2,4
8	12,0	25	12,0	42	6,0	59	2,2
9	12,0	26	12,0	43	5,7	60	2,1
10	12,0	27	12,0	44	5,4	61	1,9
11	12,0	28	11,9	45	5,1	62	1,8
12	12,0	29	11,3	46	4,9	63	1,6
13	12,0	30	10,8	47	4,6	64	1,5
14	12,0	31	10,3	48	4,4	65	1,3
15	12,0	32	9,7	49	4,2	66	1,2
16	12,0	33	9,3	50	4,0	67	1,1
17	12,0	34	8,8	51	3,7	68	0,0
18	12,0	35	8,4	52	3,5	69	0,0
19	12,0	36	8,0	53	3,3	70	0,0
20	12,0	37	7,6	54	3,1	71	0,0
21	12,0	38	7,3	55	2,9	72	0,0

Example load capacity chart Figure 4-13

*** only possible with the load moment limitation option**

4.17 "Power unit monitoring" screen



"Power unit monitoring" screen

This screen page provides information on the operating status of the central power unit.

Description of status displays

The status displays are described in Chapter 4 under "Mode screen".

Description of the control displays

"Caution" symbol

"Stop" symbol

"Tilting danger" symbol

"Assembly mode" symbol

The four control display symbols shown
- also appear in the "Crane" field on the mode screen,
- are described in Chapter 4 under "Mode screen".

5

Re-programming the set-up

IMPORTANT!

A thorough knowledge of the various set-up screens and their input and display facilities is required when programming the set-up (see section 4 "Set-up screens").

- **Calling up previous set-up screen**

The most recently programmed set-up screen is displayed automatically when the ignition is turned on.

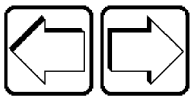
During power operation the set-up screen can be brought up by pressing the illustrated symbol on the LCD screen.

- **Selecting a valid set-up screen**

Set-up screen

Continue pressing the illustrated symbol on the LCD screen until the desired set-up screen appears. (See section 4.12 "Set-up screens").

- **Selecting and modifying display fields**



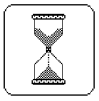
Select the display fields one by one by pressing the illustrated symbols on the LCD screen.

- **Changing the current set-up**

Change each selected display field by pressing the illustrated symbol on the LCD screen for the current set-up. (For information on symbol assignments see section 4.12 "Set-up screens").

- **Calculating the revised set-up**

Before calculating, check the parameters again. Press the illustrated symbol on the LCD screen in order to confirm the data entered and start the calculation.



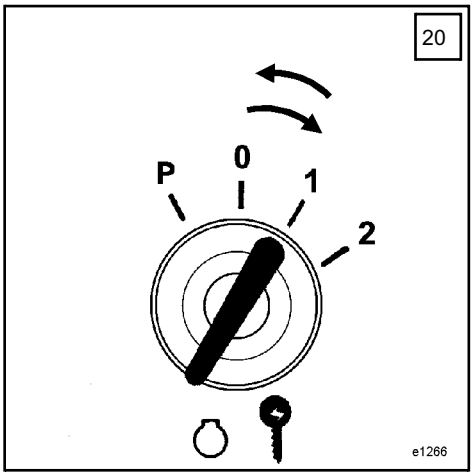
During the calculation this symbol flashes briefly on the LCD screen.

IMPORTANT!

Whilst the calculation is in progress you must be sure not to press any function symbol on the LCD screen as that would lead to abortion of the calculation.

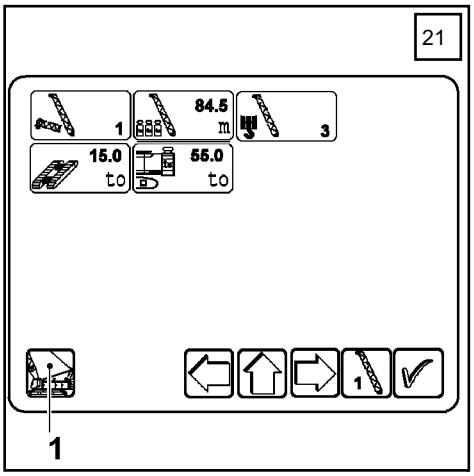
Switch off the ignition to save the new operating mode.

3.) Turn the ignition key to the left (Position "0") (Figure 20).



4.) Wait a few moments and then turn the ignition key to the right (Position 1) (ignition on).

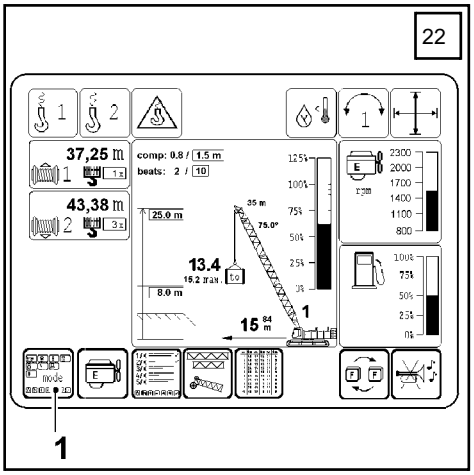
The "Set-up screen" appears on the monitor



Tap on this symbol (Figure 21, item 1) to switch from the "Set-up screen" to the "Piling mode screen".

The "Piling operation screen" page (Figure 22) is displayed on the monitor in place of the "Set- up screen".

Initialization of "Lifting operation" in "Piling mode" has been concluded.



If the machine operator wants to select another operating mode on the monitor, he can switch from the "Piling mode" screen to the "Operating modes" screen by tapping on the "Select operating mode" symbol (Figure 22, item 1).

IMPORTANT!

The machine operator must ensure that the lockable cover on the left-hand control panel (X12) is locked whenever a new operating mode has been initialized.

Limitations of main boom adjustment

This symbol appears if:
- the load moment limitation * is not activated,
- the reach limitation * is activated

As soon as the main boom has reached an angle of 88° or the adjusted angle of the reach limitation when raising, **in lifting operation** , the symbol "Angle-limit switch on upper main boom " starts flashing in status display of the operation diagram and hoisting direction becomes blocked.

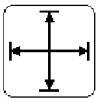
As soon as the main boom exceeds an angle of 82° when raising, **in assembly or lifting operation** the symbol "Angle-limit switch on upper main boom " starts flashing in status display of the operation diagram and hoisting direction becomes blocked.

This symbol appears if:
- the load moment limitation * is not activated,
- the reach limitation * is activated

As soon as the main boom has reached an angle of 14° or the adjusted angle of the reach limitation during lowering, the symbol "Angle limit switch on bottom of main boom" starts flashing in status display of the operation diagram and lowering direction becomes blocked.
The load moment limitation responds during lowering much more quickly.
This symbol does not appear during assembly operation.

IMPORTANT !

The main boom's adjustment range can also be limited via a limit switch.



Should several limit switches respond simultaneously on the crawler crane and a blocked direction of movement can be controlled, the symbol "Drive limited" appears in place of the symbols mentioned.

Position of the A-frame table

As of the specified main boom angles, the A-frame protrudes beyond the rear counterweight. This angle varies according to the main boom angle. (See table).

Table

Main boom length A	Outreach B	A-frame height C	Main boom angle X
17m/56ft	4,4 m	6,5 m	82,5°
32m/105ft	9,1 m	6,5 m	77,5°
41m/135ft	12 m	6,5 m	76°
56m/184ft	16,1 m	6,5 m	75,5°
68m/223ft	19,1 m	6,4 m	75,5°

Tab. 1: Position of the A-frame in relation to the main boom angle at different main boom lengths.

5.8.8 SELECT menu

You can enter values into the select list so that you do not need to be constantly switching between the pages of the in/output and flag menus. You can then view and work on these entries together on the SELECT menu. The select list can consist of several pages.

Should you add a new value to a full select list, the oldest value is dropped from the list.

These select lists can also be saved to the memory card, and reloaded from it.

Options for making entries in the select list

- using the **SELECT** function symbol directly on the INPUT/OUTPUT, MEMORY or CORRECTION menu (gathering the entries)
- using the **ADD** function symbol on the SELECT menu by entering the IEC address
- load from a file using the **LOAD FROM CARD** function symbol on the SELECT menu

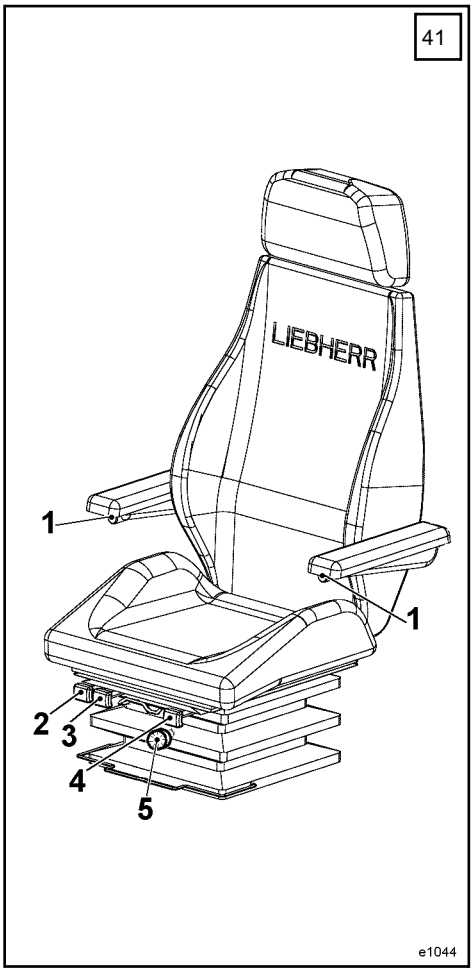
Options for deleting entries on the select list

- using the **SELECT** function symbol directly on the INPUT/OUTPUT, MEMORY or CORRECTION menu to reselect a selected value
- using the **DELETE** function symbol on the SELECT menu to delete the marked entry

Description of the function symbols

- **ADD** inserts a new entry onto the select list. A menu bar appears for you to enter the IEC address (see "Add Selection menu").
- **DELETE** to delete the marked entry from the list.
- **PREVIOUS** and **NEXT** switch between the various entries on the select menu. The marked entry is displayed by an I, O or M shown in inverted display format.
- **NEXT PAGE** switches to the next page of the select list, in order to examine more values.
- **IDENTIFY** displays the in/outputs or flags with the identifier.
- **DOCUMENT** displays the in/outputs or flags with comments.
- **LOAD FROM CARD** loads a new select list from a file. A menu appears for you to select from a list of files, or to enter the name of a file (see "Select File Load menu").
- **SAVE TO CARD** saves the current select list in a file. As you do so a menu appears for you to select the name of a file (see "Select File Save menu").
- **MENU 1/2** switches between the two menu bars.
- **BACK** goes back to the main menu.

5.9.2 Operator's seat



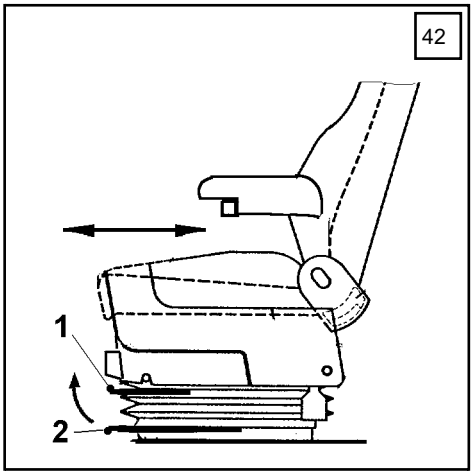
- By pulling up the adjusting lever (fig. 41, no. 8) on the front side of the operator's seat, inclination of the backrest (no. 2) can be adjusted.

Height and inclination adjustment

- Height and inclination of seat front edge (no. 4) is modified via the lever (fig. 41, no. 5 + 6).
- Both arm rests can be adjusted in inclination via adjusting button (fig. 41, no. 3).

Weight adjustment

- The springs in the operator's seat can be adapted to the bodyweight of the machine operator via the handwheel (fig. 41, no. 7). Weight adjustment is displayed on the handwheel.



Horizontal adjustment whole seat

- In order to find the correct distances to the pedals, operator's seat including control stand can be moved left and right via lever (fig. 42, no. 2) and also back and forward. Only the operator's seat can be shifted with this lever (no. 1).
- The operator's seat must always be adjusted so that all operating elements are easily accessible to machine operator and that he remains fatigue- free.

IMPORTANT !

If used as directed, it can be ensured with application of this operator's seat that the rated swing accelerations measured in accordance with ISO 2631 part 1 fulfil all requirements protecting against whole-body vibrations.

5.10.6 Lowering control (SWG-control) *

General

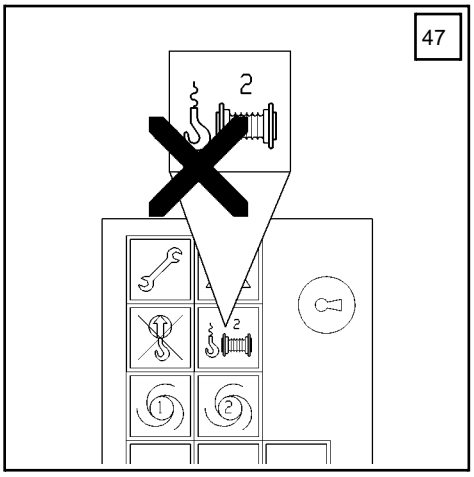
The lowering control
- is designed for **grab operation mode** ,
- works in conjunction with free-fall control,
- makes it possible to lower the grab in free-fall operation by gravity, friction-controlled via the brake pedals,
- prevents excessive stress on the free-fall brakes due to overheating, thus minimizing wear.

Preset lowering control

Lowering control is selected by default for both winches, unless the "interlock control" selection button is pressed. Change-over is only possible with the Litronic control system turned off.

- "Interlock control" selection button not pressed = lowering control for both winches
- "Interlock control" selection button pressed = interlock control (lowering control for winch 2)

(see Chapter 5 under "Interlock control")

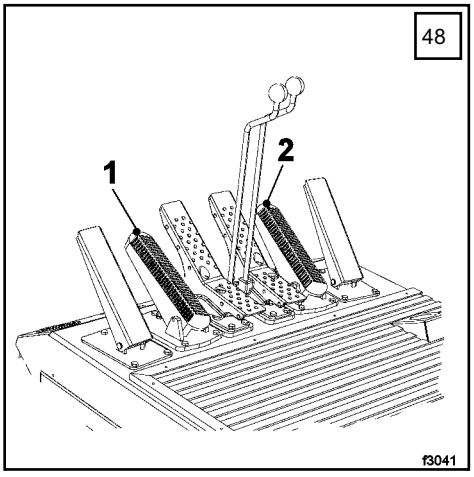


Using lowering control

Select free-fall operation

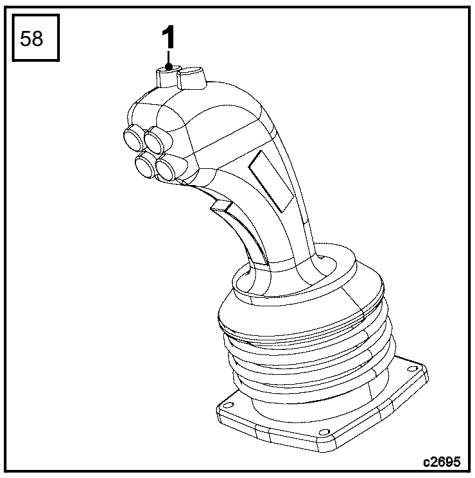
Lowering control only works in conjunction with free-fall control, see Chapter 5 "Selecting free-fall operation". It can be used in both secured and unsecured free-fall operation. When **free-fall operation is active** , keep the **brake pedals depressed**, as the lowering control can only be activated with the winches at a standstill.

IMPORTANT!
If free-fall operation is activated for both winches and interlock control is selected for winch 2, winch 1 is in free-fall operation (see interlock operation).



DANGER !

An incorrectly set pile-driver control can lead to serious accident!
Initial start-up and opportunely required adjustments (readjustments), other than those quoted above must only be carried out by Liebherr service personnel.



Switching on pile-driver control

In order to be able to switch on the pile-driver control, the following requirements must be met:

- The ram weight is lying on the ground. The hoist cable(s) are not tensioned.
- The pile-driver control has been pre-selected and adjusted in the manner described previously.
- The Litronic control has not indicated any error reports.

The pile-driver control is switched on upon actuation of key (fig. 58, no. 1) on the left-hand joystick.

- **Key (fig. 58, no. 1) for pile-driver control (automatic on/ off)**

If the pile-driver control (automatic) is switched on, the following symbols corresponding with the procedure are overlayed on the **LCD display screen** :

Symbol "Automatic on winch 1"

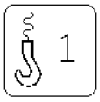
This symbol indicates that the pile-driver control has been switched on, and winch 1 has been selected for pile-driver.

Symbol "Automatic on winch 2"

This symbol indicates that the pile-driver control has been switched on, and winch 2 has been selected for pile-driver.

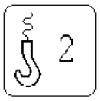
Symbol " Automatic on winches 1 + 2"

This symbol indicates that the pile-driver control has been switched on, and both winches have been selected for pile-driver.



Symbol "Open coupling winch 1"

This symbol indicates that the winch 1 is in free-fall. This symbol flashes during the lifting direction.



Symbol "Open coupling winch 2"

This symbol indicates that winch 2 is currently in free-fall. This symbol flashes during the lifting movement.

5.12.2 Using the emergency operation controller

- ▶ Switch off the machine: turn ignition key to position "0".
- ▶ Open the frontmost door on the left of the uppercarriage.
- ▶ Remove control panel from the compartment behind the cab.
- ▶ Unplug the standard "X8" socket connection.
- ▶ Insert and lock the connecting plugs of the control desk in socket "X8".

The connector plug for special equipment is only used if the machine has special equipment. In this case a second socket "X9" is mounted beside the "X8" socket.

⚠ WARNING!

Unauthorized use of the emergency operation controller!

- ▶ The emergency operation controller may only be used in the operator's cab.

- ▶ Sit in the operator's cab.
- ▶ Fold down the safety lever in the operator's cab.
- ▶ Turn ignition key to position 1.

As soon as the ignition is turned on:

- emergency control system symbol appears in the status display of the monitor.

Emergency control system display

"Emergency operation controller" indication switched on

The symbol in the status display on the monitor shows that the emergency operation controller is connected via the socket.

- ▶ Start the diesel engine using the ignition key.
- ▶ Use the emergency operation controller.
- ▶ After the diesel engine is started,

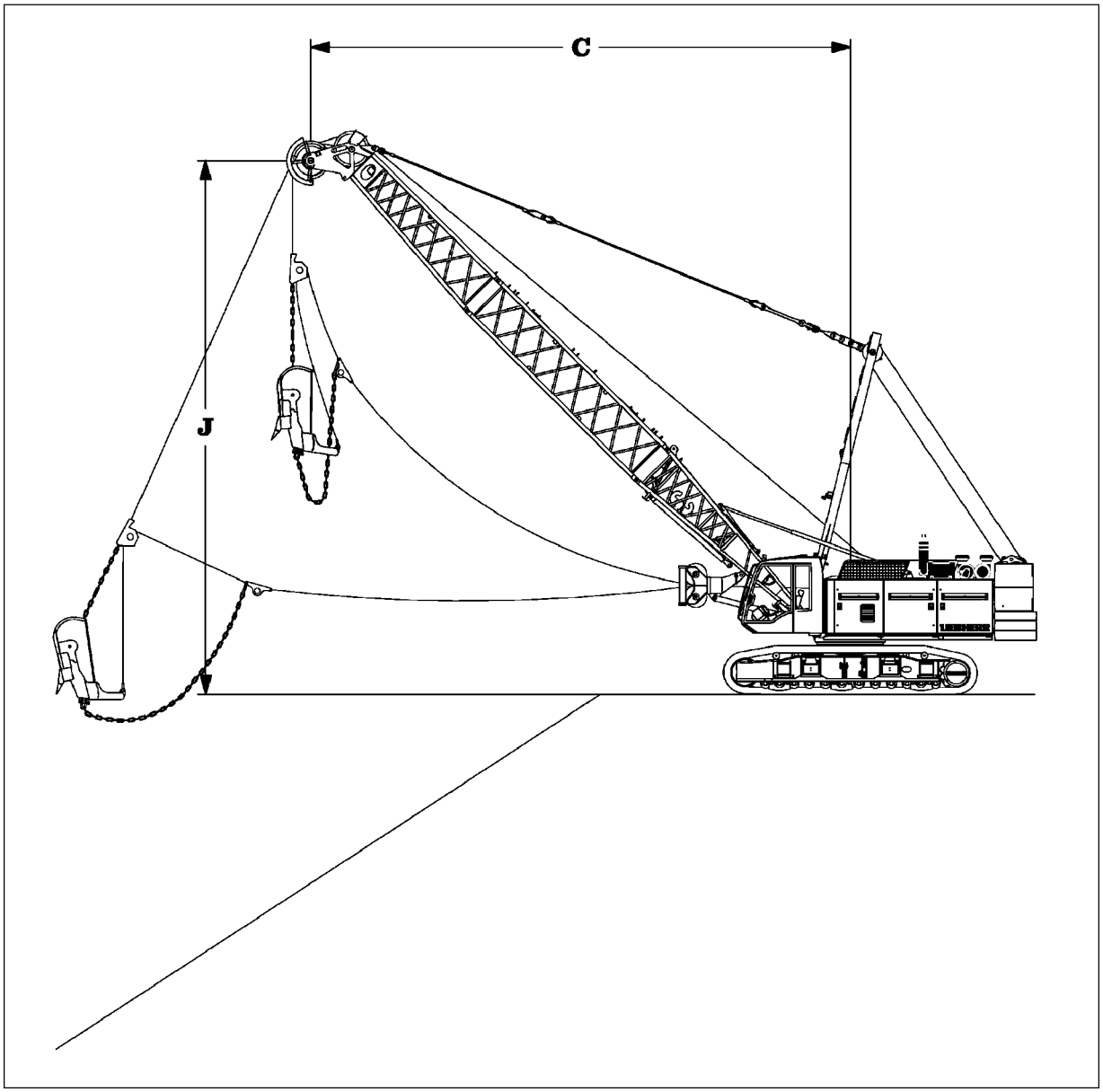
- ▶ the status display on the control desk lights up.

- ▶ the warning light on the cab roof comes on.

When the machine has been moved out of the danger area:

- ▶ Switch off machine.
- ▶ Unplug the emergency operation control panel.
- ▶ Begin repairs and overhaul.

Dragline bucket operation



Dragline bucket, HS 855 HD Fig.6-02

6.4 Notes for assembly operation

The entire assembly and disassembly of the HS 855 HD is resulted in assembly operation. This special operation type is activated via a pre-selection key on the left-hand control panel (X12).

During assembly operation
- the safety shut-down of the electronic load moment limitation (LMB) does **not**function,
- all cylinder adjustment functions are authorised,
- extended angle or limit areas for A-frame 1 boom foot, etc are valid.

6.4.1 Operation in assembly operation

Main boom luffing winch

The main boom luffing winch is selected in assembly operation with the left-hand control lever, as in lifting operation with main boom.

Hydraulic cylinders

All cylinder adjustment functions are available during lifting operation. To select a cylinder, the pre-selection key "Cylinder function on" on the right-hand control panel must first be activated and then the key or control lever connected to it. Cylinder functions that are especially necessary for assembly and disassembly of the machine cannot be activated during lifting operation.

Undercarriage

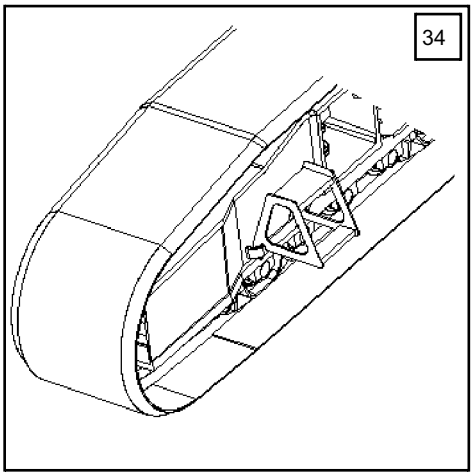
In assembly operation, as in lifting operation, the undercarriage is controlled using both foot-pedals in the operator's cab. Additionally, a control lever can be screwed onto the foot-pedal for slow and precise movements.
For example, precise control of the crawler may be required
- for loading and unloading the basic machine,
- for mounting of the main boom to the basic machine or
- mounting a counterweight.

Swing

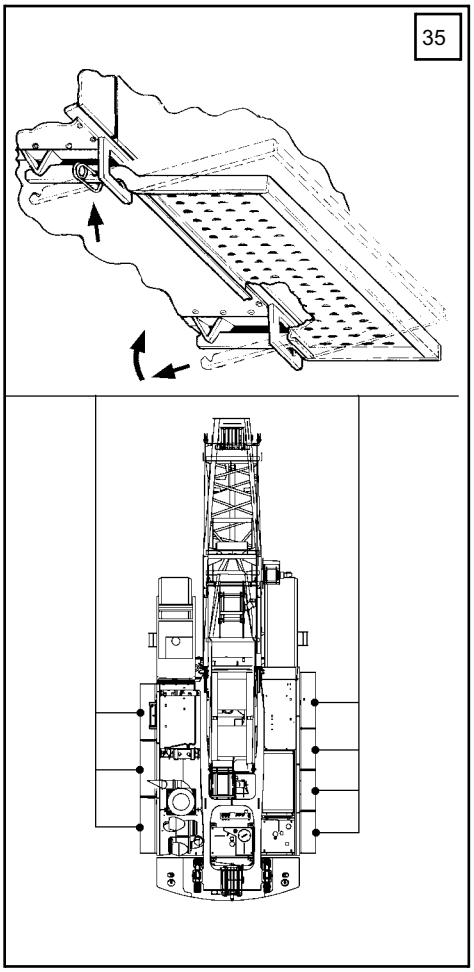
As in lifting operation, the swing is controlled via the left-hand control lever in assembly operation.

6.5.12 Mount walkways and platforms

- Hang on ladders to both crawlers (fig. 34).
- Install spring plug.



- Mount platform into fixtures on the uppercarriage (fig. 35):
  Push retaining rods into the guides up until the stop.
  Swing platform up, guide it under the retainers with the retaining rods and lower the platform.
  Install spring plug.



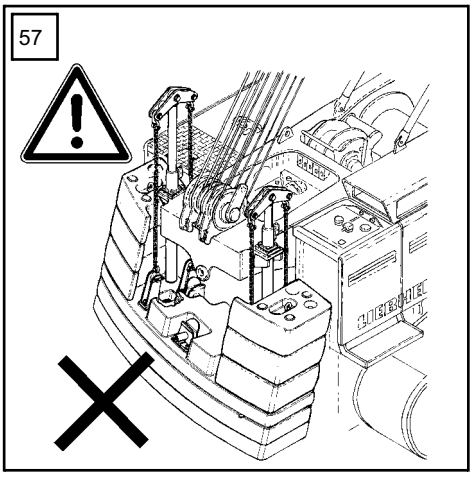
IMPORTANT !

The platforms * can be bolted to each other.

CAUTION !

Danger of toppling !
The platforms can be pulled out inadvertently when mounting the crawler track carrier.
Secure the platforms via installation of a spring plug.

57



DANGER !

Situations which could be resulted when lifting the rear counterweight are described below. It is imperative that these situations are avoided!

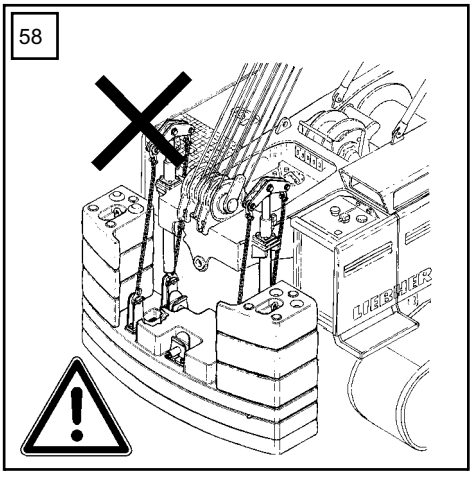
Basic machine shifted offset to the rear counterweight - prohibited!

(fig. 57) shows the rear counterweight shifted offset to the basic machine.

CAUTION !

The basic machine is not aligned precisely above the rear counterweight. When lifting the rear counterweight, impermissible oscillation is resulted which could lead to damage to the ballasting rams and the basic machine.

58



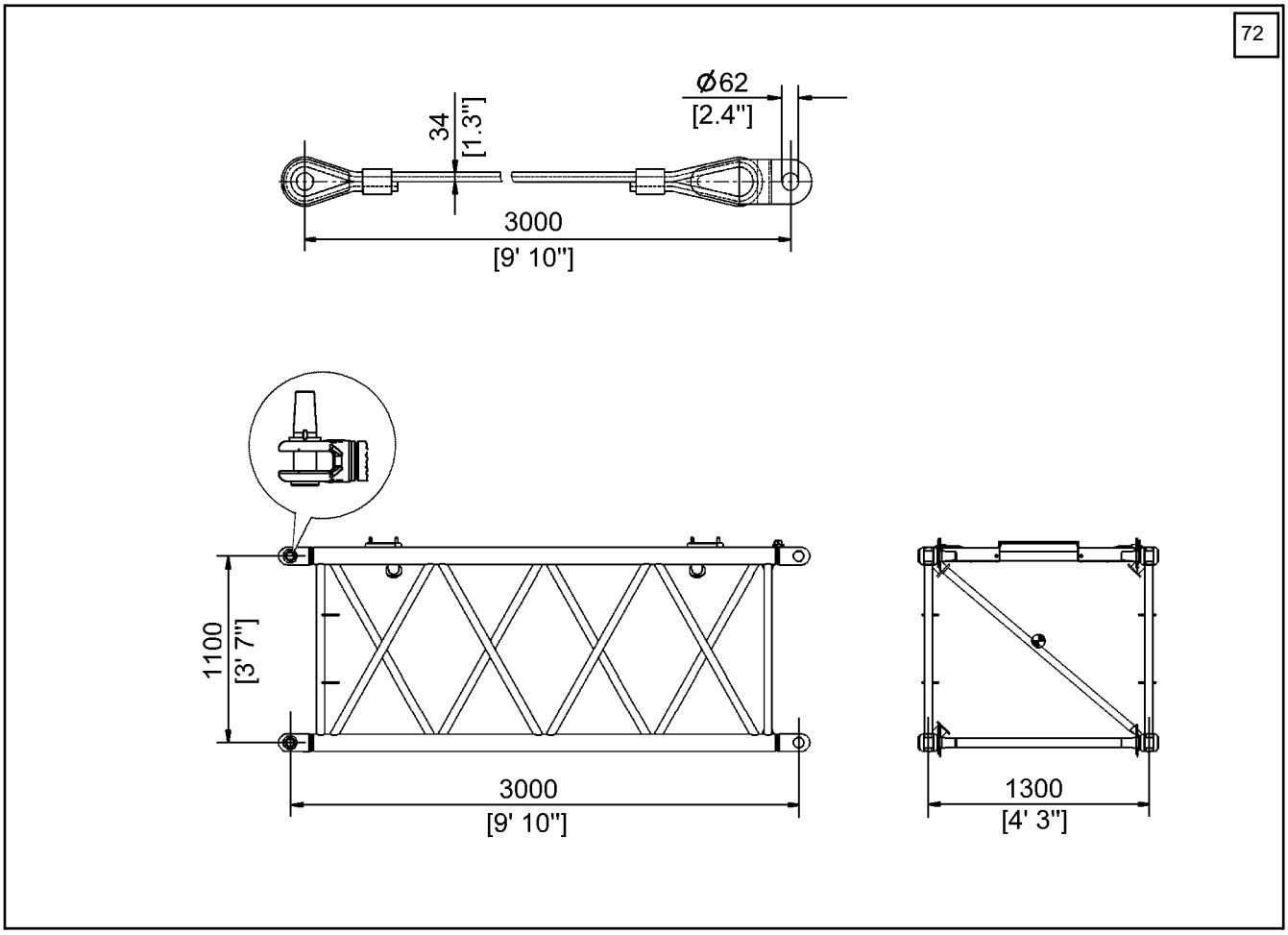
Distance between basic machine when in longitudinal direction to rear counterweight - prohibited!

(Fig. 58) shows too great a distance between rear counterweight when in longitudinal direction and basic machine.

CAUTION !

When lifting the rear counterweight, impermissible traction is resulted to the ballasting rams.
Additionally, the rear counterweight could begin to oscillate when lifted leading to damage to the ballasting rams and to the basic machine.

Main boom intermediate piece 3 m [10 ft]



Retaining cables on the main boom intermediate piece 3 m [10 ft], HS 855 HD

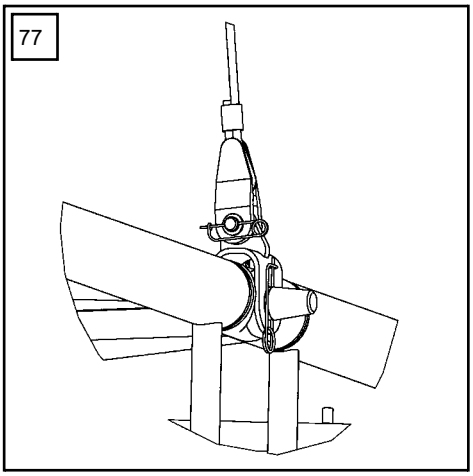
6.6.8 Main boom intermediate tensioning *

DANGER!

If the main boom is more than 47 m [154 ft] in length, the installation of intermediate tensioning is mandatory.

Missing or incorrectly rigged tensioning ropes can cause the boom to buckle!
Rigging of the tensioning ropes (length and position in boom system) is to be checked during assembly.

77

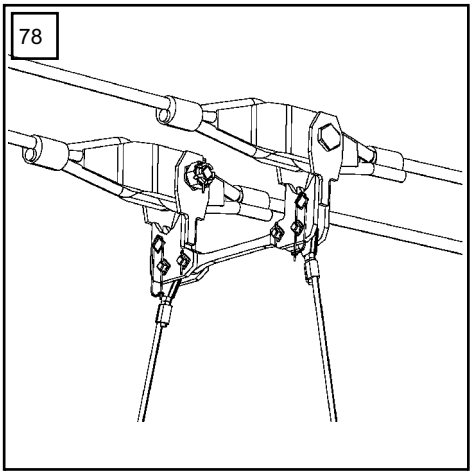


Installation of intermediate tensioning on main boom.

The following points must be noted during the installation of intermediate tensioning:

The fork (Fig. 77) is bolted in place while the main boom intermediate pieces are being assembled. The bolts on the main boom are to be secured using retaining springs.
The washer must not be re-used.

78



The fork (Fig. 78) is bolted in place while the main boom guy ropes are being assembled.
Special (longer) bolts are used when assembling the guy ropes.

All bolts on the guy ropes are to be secured using washers and retaining springs.
Install the corresponding connecting rod between the main boom guy ropes.
The tensioning ropes must be installed free of twists.

6.7.1 Luffing hoist cable

The hoist cable is usually located on the hoist winches during transport.

The hoist cable is unwound from the winch or winches and pulled forward onto the boom. This can be resulted manually, via an auxiliary cable or via an optionally installed cable luffing winch.
Luffing between S-boom head and load hook is dependent upon the operation type.

IMPORTANT !
With long main booms, the cable guide must be mounted additionally and the hoist cable guided through this cable guide (see under point 6.6.8. in this chapter).

Cable luffing winch *

CAUTION!

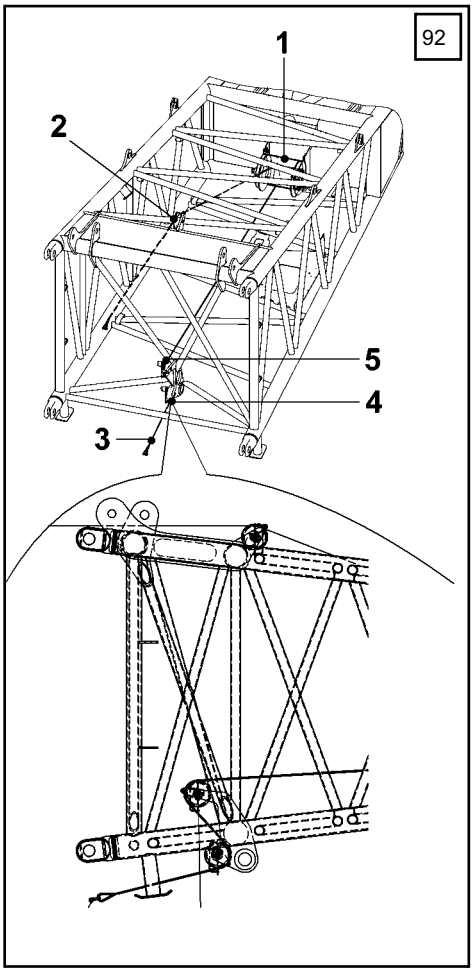
The cable luffing winch * is only provided for luffing or reeving the hoisting cable and is arranged accordingly. It may not be applied for hoisting.

Mounting cable guide pulley (fig. 92)

If required, both cable guide pulleys can be installed into three fixtures. Dismantle safety spring and cable guard, remove pulley and mount into corresponding fixture. Should the hoist cable be located on the winch (winch 1 or 2), both lower fixtures (no. 4 + 5) are to be used.

Should a new hoist cable be luffed, the upper fixture (no. 2)is to be used.

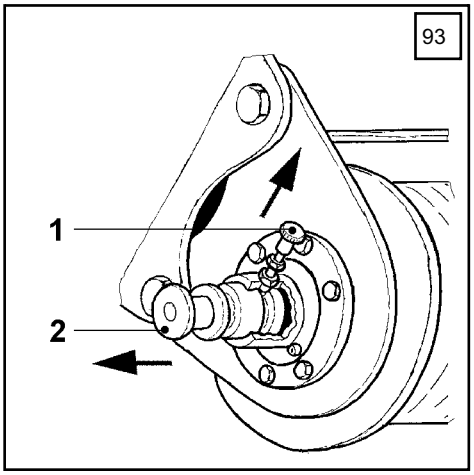
92



Switching cable luffing winch * to free-wheel

The cable luffing winch * can be switched to free-wheel (disengaged). This is necessary for luffing of the cable from the cable drum. Locking of the change-over lever (fig. 93, no. 1) should thus be extracted while simultaneously extracting the change-over lever (2) for free-wheel completely. The cable luffing winch will now turn much more easily.

93



6.7.5 Mounting main boom

Prerequisites of mounting

Before assembly of the main boom can begin, the following points should be checked:

- The optional jib head is mounted.
- No **safety guidelines** may be violated during assembly (see chapter 3 and beginning of chapter 6).
- **Mounting** of the assembled main boom is **permissible** (see chapter 6 under "Application planning" and chapter 2 under "Intended use").
- **Check assembly**
  The following points are to be checked:
  - all bolt connections are professionally secured (washer and cotter pin/ spring plug or washer, nut and cotter pin)
  - all pipes in optional cable guide are installed and secured (washer and spring plug)
  - loose parts, tools and accessories have been removed

⚠ DANGER !

Falling parts can lead to fatal injury!
It is prohibited to remain under the main boom during mounting.

- **Checking attachment**
  Check mounted hoist cable and correct reeving of load hook. Ensure professional assembly!

  The necessary additional equipment has been mounted independent of application (hoist limit switch, cable guide, intermediate tensioning, rope hoop, warning lamp, etc.). The corresponding connecting cable is mounted and is connected to the front, right-hand side of the uppercarriage. Ensure professional assembly!

- **Check set-up stage**
  Correct programming of the load moment limitation should be checked (see chapter 5).

6.9.6 Procedure during setting down

Lowering main boom

Set down main boom via actuation of main boom adjusting winch. Observe load hook and, if necessary, select corresponding hoist winch simultaneously in order that the load hook does not scrape along the ground.

CAUTION!

The load hook must be observed constantly during setting down of the boom and may not be scraped along the ground!

Setting down load hook

Remove cable guard rods of load hook.

With long main boom lengths, lay the load hook onto the ground prematurely (to the side of the boom slightly).
With short main boom lengths, lay down the load hook later, upon bridging of the hoist limit switch.

Bridging hoist limit switch *

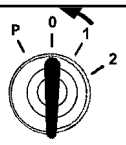
Bridge hoist limit switch via "Bridging limit switch" key on the right-hand control panel.

Set down main boom onto ground

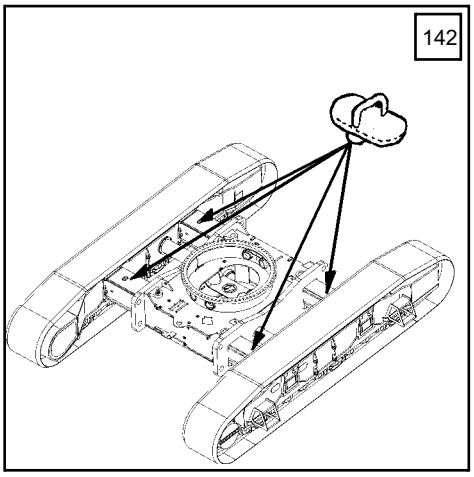
Observe running of hoist cable.

Disassemble hoist limit switch *

Disassemble limit switch weight and chain of hoist limit switch.

• **Loading the basic machine ***	
	Secure mounting cylinder for transport. **Extend support cylinder on basic machine to loading height of low loader.** **Position the low loader under the basic machine.** **Fully retract the support cylinders.** The hydraulic jacks must be pinned to the lower fastening positions on the undercarriage.
• **Adjust crawler side frame on transport track**	
	Remove 4 covers from the crossbeams. **Loosen crossbeam wedging on central undercarriage section.** **Enable the cylinder adjustment functions in the cab.** Lower the safety lever. **Remove both pins from the right central undercarriage section.** **Adjust right crawler side frame to transport track.** **Insert both pins in the right central undercarriage section.** **Adjust left crawler side frame to transport track** in the manner described for the first crawler side frame. **Remove steps and boom walkways.**
• **Driving the machine onto the low loader**	
• **Dismantling the assembly crane**	
	**Lay down A-frame 1.** Using the left-hand joystick, lower A-frame 1 forwards until it rests in the supports. **Fully retract tilting-back support cylinders.**
• **Fitting the uppercarriage locking**	
• **Taking the basic machine out of operation**	
	**Turn off the diesel engine and remove the ignition key.** **Close the windows and lock the cab and side doors on the uppercarriage.** **Fold up and lock boom walkway beside the cab.** **Move the exhaust pipe into the transport position** Undo the exhaust pipe fixture and turn the pipe elbow 90° inwards Lay the exhaust pipe down facing backwards.

- Remove cover from struts and store away safely (fig. 142).



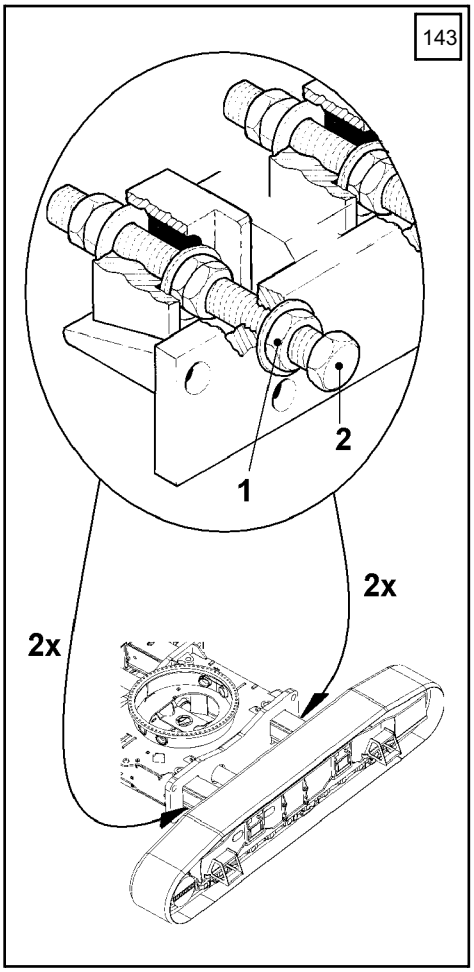
IMPORTANT !

If necessary: clean all uncovered smooth surfaces of the struts before initiating procedure.

- Loosen all strut wedgings on the undercarriage centre section, left and right (fig. 143).

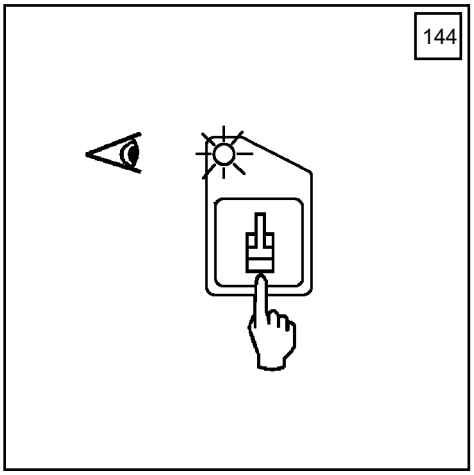
With every strut wedge:

- first loosen nut (1).
- then turn screw (2) clockwise until the wedge is sufficiently loosened



Retracting right-hand crawler track carrier

- Check or actuate pre-selection key "Cylinder adjustment function On/Off" in the operator's cab on the right-hand control panel: The LED in the keyboard must light up (fig. 144).



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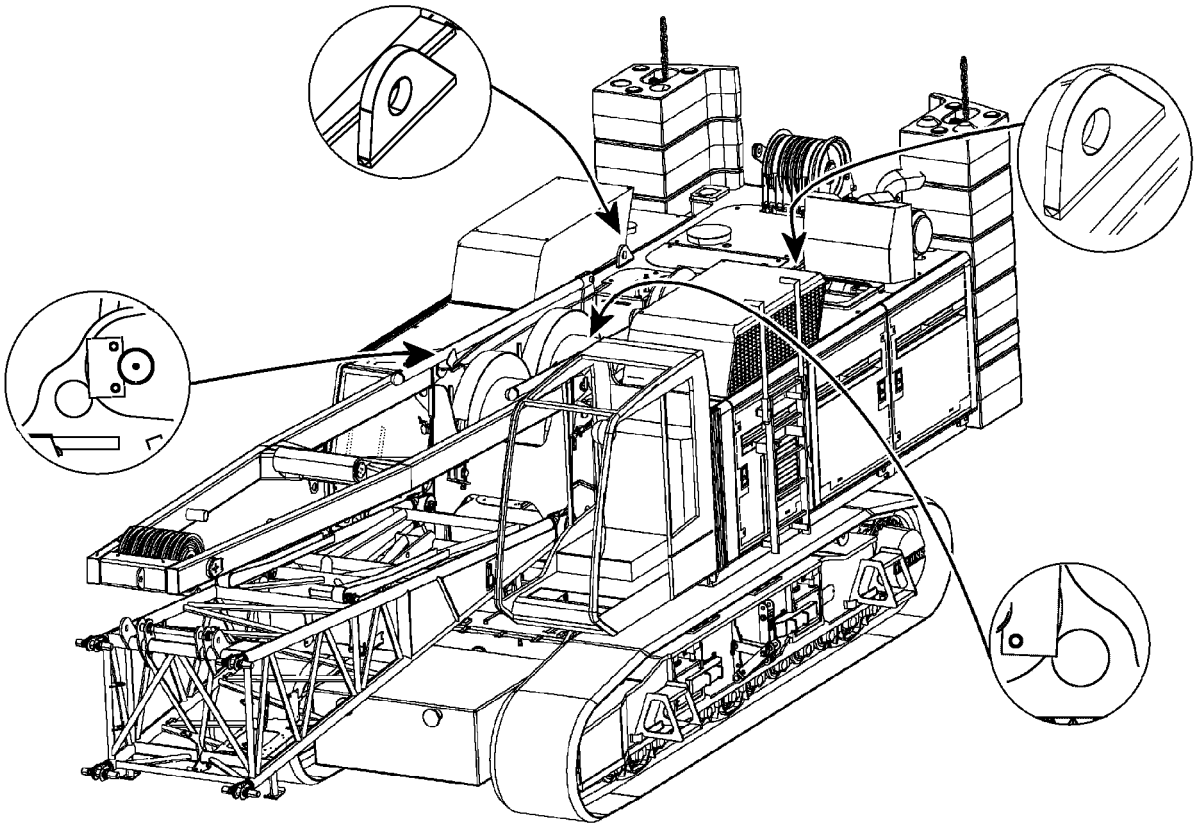

	Height . . . . . A	7865 mm [25 10"]
B	Rope length	8004 mm [26 3"]
C	Rope length	at least 8000 mm [26 2"]
D	Length of crossbar	1300 mm [4 3"]
E	Center of machine to center of crossbar	100 mm [4"]
F1	Force 1	51.7 to [113,978 lbs]
F2	Force 2	50.4 to [111,112 lbs]
F tot.	Total force	100 to [220,462 lbs]
a	Angle	10,7 °
b	Angle	11,1°
X	Distance from center of slewing ring to center of gravity	1340 mm [4 4"]
Z	Distance from ground to center of gravity	1658 mm [5 5"]

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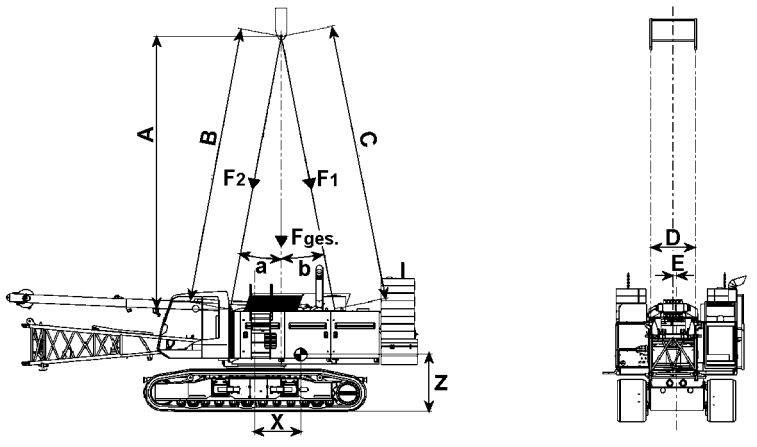

7.2 Maintenance chart

7.2.1 Work to be carried out

Maintenance/inspection according to Operating hours								WORK TO BE CARRIED OUT **by maintenance personnel** x One-off task o At regular intervals + As and when necessary * Every year at the start of the cold season **by authorised qualified personnel** x One-off task o At regular intervals + As and when necessary * Every year at the start of the cold season
8 hrs/daily	40 hrs/weekly	500 hrs/3-monthly	1000 hrs/half-yearly	2000 hrs/annually	4000 hrs/every 2 years	6000 hrs/every 3 years	special intervals	
HYDRAULIC SYSTEM								
o								Check oil level in the hydraulic tank through the top sight glass and top up if necessary. See chapter 7 for the oil type and filling capacity. All cylinders must be retracted. Exception: Tilting-back support cylinders on LR/HS
							o	Carry out a hydraulic oil analysis ten hours after every oil change (reference measurement)
							x	Carry out a hydraulic oil analysis after 500 h
							o	Carry out a hydraulic oil analysis after 1000 h / 1 year
							o	Change NON-LIEBHERR hydraulic oil after 2000 h / 2 years
							o	Change Liebherr "Hydraulik 37" hydraulic oil after 4000 h / 4 years
							o	Change Liebherr "Hydraulik Plus" and "Hydraulik Plus Arctic" oil after 6000 hrs / 6 years
o								Check the hydraulic system for leaks
				o				Check all hydraulic hoses
							o	Recommendation: Change all the hydraulic hoses every 12000 hrs; time interval depends on embossed date
			o					Check and if necessary adjust the working pressures of the hydraulic system
		o						Check that the rotary connection is firmly attached and does not leak
		o						Change the ventilation filter on the hydraulic tank
		o						Change the hydraulic filter elements
		o					o	Clean the magnetic rod in the return filter (weekly for the first 250 operating hours)
		o						Check and clean oil cooler if dirty
		o						Check that the units and the screw fittings are tight and retighten if necessary
		o						Check all hydraulic cylinders for leaks and tight fit
		o						Check the accumulator
					o			Replace the accumulator
	o							Lubricate the piston rods of all exposed cylinders
	o							Protecting the hydraulic cylinder piston rods against corrosion
							o	Applying protective agent to the hydraulic system piston rods during extended periods of down time
	o							Check Partial Flow Fine Filtering System
		o						Replace Filter Partial Flow Fine Filtering System

Service/Inspection according to operating hours								WORK TO BE CARRIED OUT
8 hrs / daily	40 hrs / weekly	500 hrs / 3-monthly	1000 hrs / half-yearly	2000 hrs / annually	4000 hrs / every 2 years	6000 hrs / every 3 years	Special intervals	**by maintenance personnel** x one-off task o at regular intervals + as and when necessary * every year at the start of the cold season **by authorized qualified personnel** x one-off task o at regular intervals + as and when necessary * every year at the start of the cold season
CRAWLER DRIVE								
		o						Checking the oil level
		x	o					Changing gear oil
		o						Changing gear oil (if the crawlers are used a lot, more than 15% of the engine operating hours)
			o					Check fastening screws for tight fit
				o				Check tumbler wheel and crawler engine fastening screws for tight fit
	o							Check gearbox and hydraulic connections for leaks
CRAWLERS								
		o						Visually check crawler components (carrying rollers, running rollers, idlers, track pads)
	o							Clean the crawlers, earlier if necessary
		o						Checking screws, nuts and fixing pins for tight fit
	o							On telescopic undercarriages, check the locking screws on the chords of the crawler side frames for tight fit and tighten if necessary (HS855 or LR1100: always tighten them until there is absolutely no play)
		o						Check chain guides for wear and tight fit
	o							Check chain tension and re-tension if required (earlier if necessary); note: re-tensioning must be done using the crawler control in the case of hydraulic pretensioning
		o						Tighten track pad screws
				o				Check tensioning cylinders for leaks

7.6.2 General

The dry air filters are mounted to the left of the uppercarriage above the diesel engine and are easily accessible from the side. The filter elements are just as easy to change. Maximum protection for the engine against faults caused by dust is only possible if the air filter is regularly cleaned or replaced.

The dry air filter is designed to give maximum protection against the engine with longer maintenance intervals.

It is recommended that the filter elements only be removed when an "Air filter contaminated" error report is resulted on the display screen page "Error displays", however **at least once a year** . If the cartridges are installed and disassembled too regularly, the seals between the filter element and the housing could become impaired.

NOTE!

The filter element may not be forced in as this could lead to damage.

- Clean the filter housing and the sealing surface in the housing with a damp rag. Do not blow out the filter housing with compressed air.
- Check the filter medium with the help of an electric light bulb which is pushed into the filter element. The smallest amount of damage is displayed by the emergence of a light beam. In this case the element must be replaced with a new one.
- It is necessary to carry out a visual inspection for leaks and all metal parts of the filter element. If the element's end cover is damaged the filter element should be replaced.
- Both filters are self-centralising, self-aligning and self-sealing (radial sealing).

7.14 Checking the chain tension

NOTE!

Too high a tension causes increased wear.
Too little tension results in unwinding of the crawler chain.

- Move the machine forwards 3 m
- Move it back again in order to compensate for any play in the chain.
- Place the measuring rod on the crawler side frame (Figure 15).
- Measure the distance between the measuring rod and the chain (Figure 15, x), **maximum permissible distance: 40 mm [1.57 inch].**

  - value OK, no further action required.

  - value too high, tension the chain.

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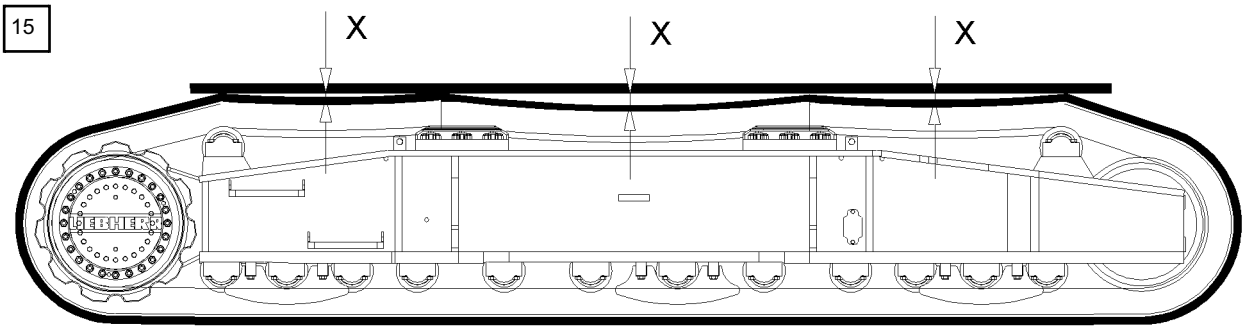

7.14.1 Tensioning the chain with grease tensioner

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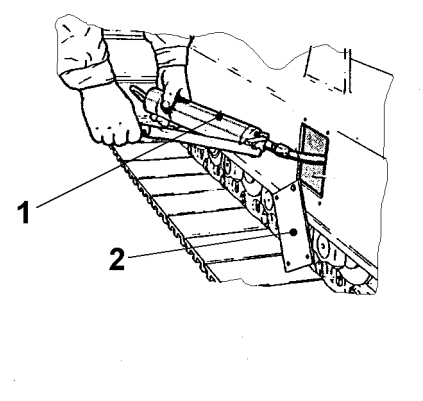

- Unscrew the cover (Figure 16, item 1) on the crawler side frame.
- Connect the grease gun to the grease nipple on the guide wheel rope tensioning cylinder (Figure 16).
- Apply grease until the pressure gauge in the grease gun displays a pressure of approx. **160 - 180 bar**.
- Check the chain tension again

1 Winch fixings
2 Oil drainage
3 Oil dipstick
4 Grease nipple cable protection
5 Cable protection
6 Cable bench mark fixing (210 Nm)
7 Cable drum
8 Grease nipple support
9 Sign for brake oil
10 Gear aeration
11 Bleeder screw oil filling
12 Oil filling brake
13 Pressurised oil connection brake
14 Oil level brake
15 Seal lubrication
16 Oil drainage brake
17 Name plate

7.17.2 Checking the oil level

Checking of the oil level on the auxiliary winch * may **only** be carried out after the main boom has been set down. It is only possible to ascertain the oil level of the winch in this boom position.
Checking of the oil level is resulted via the oil dipstick on the same side as the drive (fig. 7-03, no. 3). For an accurate check, insert the oil dipstick completely and then read the oil level. Oil level in the winch should be checked before start-up.

7.17.3 Lubrication of the auxiliary winch *

The auxiliary winch * must be lubricated via the grease nipple on the support (fig. 7-03, no.8). The bearing on the cable protection (fig. 7-03, no. 4) should also be lubricated as required.

Troubleshooting:
Does the number of wire breaks exceed the number of permitted wire breaks?
- Stop using the machine and if possible determine the cause of the damage.
- Change the rope or pair of ropes immediately.

7.18.8 Selecting a rope

When selecting a rope, make sure that only rope of the same type and strength equivalent to that originally chosen is used. Ropes from manufacturers not approved by LIEBHERR may only be used following consultation with the relevant manufacturer.

DANGER!

Using ropes that do not conform to the manufacturer's specifications poses a threat to life!

- Always use ropes that conform to LIEBHERR specifications.

DANGER!

Damage to the rope.

- The fitting of swivels to any of the ropes that are attached to the machine is prohibited!
- Exceptions to this are only permitted after special consultation with the manufacturer.

NOTE!
The actual rope diameter may be no more than 4% greater than the nominal rope diameter. Observe the rope plan for the correct arrangement of the rope lay direction.

Rope lay direction

The correct choice of lay direction for the wire rope is critical to the correct operation of the rope drive. Under stress any wire rope will tend to untwist. For this reason the rope lay direction must be chosen so that this untwisting torque is not encouraged by the drum or the rope reeving, but is compensated for by them instead. For example, a rope with a left-hand lay direction can be wound around a left-hand drum, a right-hand drum, however, would counteract the untwisting torque of the rope.

Rope lay direction in the case of multi-strand reeving

In the case of a multi-reeved rope drive, the influence of the angle of deflexion between the pulleys is greater than the influence of the drum itself. In such situations, the rope lay direction should be adapted to match the reeving. In addition, the lay direction of the reeving must always correspond to the lay direction of the drum.

Right-hand lay direction reeving:
- rope with left-hand lay direction

Left-hand lay direction reeving:
- rope with right-hand lay direction

CAUTION!

Rope destruction.

- If the winding area of the rope is more in the upper rope layer when operating winches with multiple-layer spooling, the lower rope layer may become loose.
- This results in a slight ovalisation of the rope that changes the winding diameter across the width of the drum. This leads to gaps in the running rope layer, which impairs the spooling properties and increases rope wear.
- To improve the spooling properties and to reduce rope wear, the rope should be completely unwound at regular intervals and then re-wound under tension (1 - 2% of the rope's minimum breaking force).

NOTE!

▪A rope works most economically when its entire length is used. It is therefore recommended that an appropriate length of rope is used for lengthy operations.

Ensure that the following conditions are satisfied:
- Protective clothing is being worn

NOTE!

▪Contamination: The rope must not be pulled over the ground (Figure 39).

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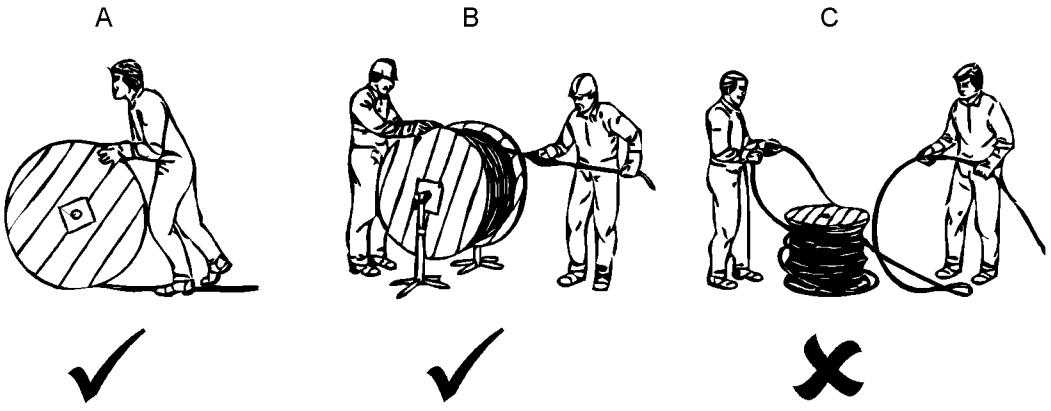
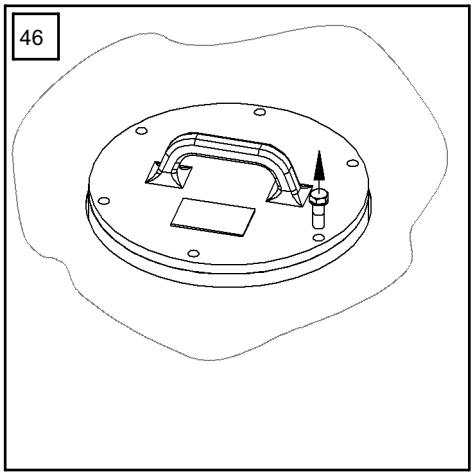


- Unwind ropes from the drum in the winding direction (Figure 40).

Unwinding to the side causes the rope to twist until it is destroyed by kink formation.



7.20.4 Cleaning the magnetic rod in the return filter

Ensure that a torque wrench of 69 Nm (width across flats 19) is available.

Opening the return filter

CAUTION!

Hot engine parts and hydraulic oil!
Risk of burns.

- Do not open the cover of the return filter unless the engine is switched off and the temperature of the hydraulic oil is 40° or less.
- Wear protective equipment.

- Undo all cylinder screws.

CAUTION!

Dirt and foreign bodies in return filter!
Damage to the hydraulic system.

- Ensure that no dirt or foreign bodies enter the return filter.

- Remove the cover from the filter housing.

7.27 Maintenance of the counterweight

Overall view rear counterweight

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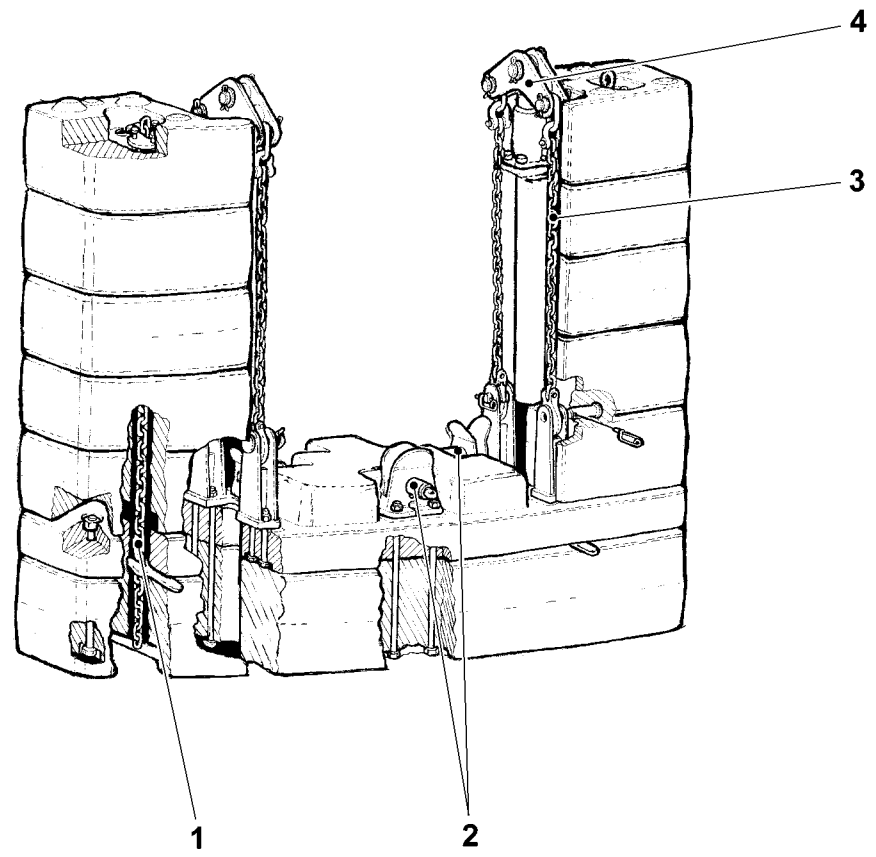

Rear counterweight, HS 855 HD

7.27.1 Rear counterweight

The steel chains for lashing of the counterweight (fig. 64, no. 1) must be checked for secure fixing and correct lashing, in progress of the weekly visual inspection.

Check for correct bolting on the uppercarriage (2).

The screws for the bolting shackles (2) should be checked regularly for secure fixing.

The ballasting cylinders (4) should be checked for leaks in accordance with the visual inspection.

The counterweight assembly chains (3) have a special steel grade and should be checked with the gauge included in delivery. This is advisable on the counterweight assembly chain. If expansion of the chain is so far advanced, that a chain link no longer corresponds to the test gauge, the chain must be replaced.

NOTE !

Only use original chains from **LIEBHERR-WERK-NENZING** !

7.27.2 Central ballast *

With the central ballast, correct fixing onto the undercarriage centre section should be checked.

7.34.7 Checking the connecting pins

Check the connecting pins on the pendant straps regularly for signs of wear and tear (deformation) and corrosion and replace them if necessary with new original Liebherr pins.

- Likewise, check the locking elements (washer, nut, spring) on the pendant straps regularly for signs of wear and tear (deformation) and corrosion and replace them if necessary with new original Liebherr locking elements.

7.34.8 Inspecting the coupling links

Check the pendant strap coupling links regularly for signs of wear and tear (deformation) and corrosion and replace them if necessary with new original Liebherr coupling links.

7.34.9 Replacing the pendant straps

In the event of damage as listed above the pendant straps must be replaced by new original Liebherr pendant straps.

- As use of the machine increases, so the test cycle become shorter.

The fibers themselves provide long-term service. Adjacent components will provide long-term service if maintained, handled and used correctly.

The following applies to the coupling links:

Light installation work

- 5 cycles per hour (light loads) - 63,000 cycles

- The coupling links must be replaced after 12600 hours of use.

Medium loading and unloading operation:

- 20 cycles per hour (light to medium loads) - 32,000 cycles

The coupling links must be replaced after 1600 hours of use.

NOTE !

A load cycle comprises lifting, moving (rocking, turning) and setting down the load.

7.34.10 Transporting the pendant straps

The pendant straps, which are dispatched individually, must be packed and stored on a soft (wooden) base.

NOTE !

The pendant straps must be handled with care.

7.39 Diesel engine coolant

The coolant is a mixture of water and anticorrosion and antifreeze additives.
Coolant
- can be mixed with the following products.
- is available in a pre-mixed form (Permix).

General recommendations

The cooling system only works reliably when under pressure. Keep the cooling system clean and free of leaks. The coolant shut-off and working valves must be in good working order. Maintain the required coolant level.
The anticorrosion/antifreeze agents approved by LIEBHERR
- guarantee adequate protection against freezing, corrosion and cavitation.
- do not attack seals and tubes.
- do not foam.

Coolants cause cavitation or corrosion damage in the cooling system if they contain unsuitable anticorrosion/antifreeze agents or are prepared incorrectly. Thermally-insulating deposits on heat-conducting components will result in overheating and failure of the diesel engine.

NOTE!

Emulsifiable anticorrosion oils are prohibited.
Anticorrosion agents without any antifreeze (e.g. DCA) are generally never used. Their use is possible under certain circumstances (see "Permitted anticorrosion agents (inhibitors) without anti-freeze").

Water (fresh water)

Colourless, clear, free from mechanical contamination, potable tap water with the following restricted analysis values is suitable.
Sea water, brackish water, brine or industrial waste water are not suitable.

Designation	Value
Total alkaline earths (water hardness)	0.6 mmol/dm³ to 3.6 mmol/dm³ (3 °d to 20 °d)
Ph value at 20 °C	6.5 to 8.5
Chloride ion content	max. 80 mg/dm³
Sulphate ion content	max. 100 mg/dm³

Fresh water quality

Designation	Value
Total alkaline earths (water hardness)	0.6 mmol/dm³ to 2.7 mmol/dm³ (3 °d to 15 °d)
Ph value at 20 °C	6.5 to 8.0
Chloride ion content	max. 80 mg/dm³
Sulphate ion content	max. 80 mg/dm³

Fresh water quality when using DCA 4

Ask the relevant municipal authority for their water analysis results.

Subtropical climate

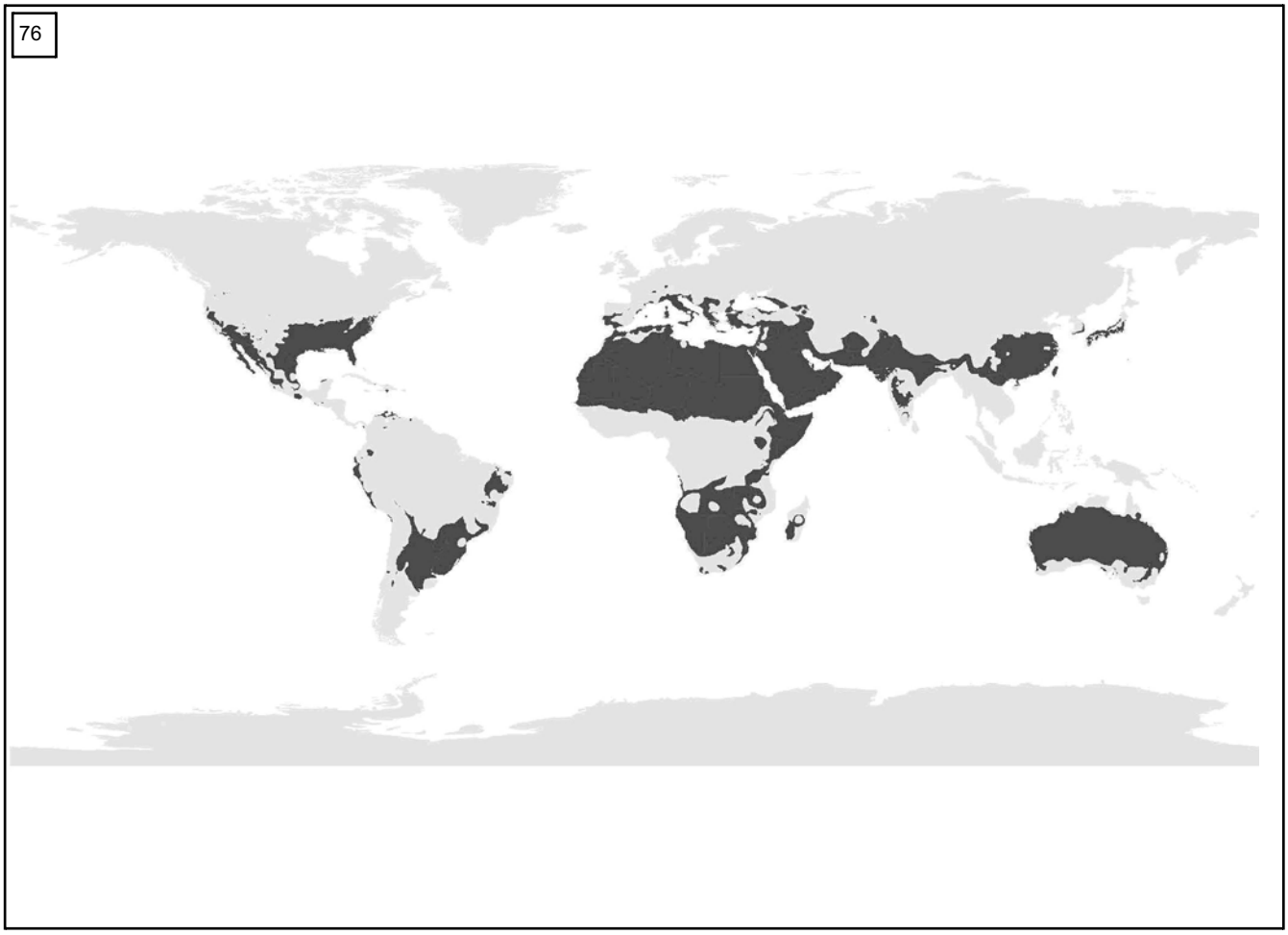

Figure 76: Subtropical climate

7.43 Preservation medium (anti-corrosion coating)

The following preservation media are recommended for anti-corrosion coating:

- **DINITROL 3650** (soft, waxy protective coating)
  Id.No.: 890036814 (20 l [5.28 Gallon])

- **DINITROL 4010** (hard, waxy protective coating)
  Id.No.: 890036914 (20 l [5.28 Gallon])

- **LPS 1** Id.No.: Aerosol can: 861010014
  Id.No.: 25 Liter [6.6 gal] drums: 861010014

- **LPS 2** Id.No.: Aerosol can: 861009714
  Id.No.: 20 Liter [5.2 gal] drums: 861009814

- **LPS 3** Id.No.: Aerosol can: 861009614
  Id.No.: 5 Liter [1.3 gal] drums: 861009514
  Id.No.: 200 Liter [52.8 gal] drums: 861009414

- **DENSO-Tape** (sheave 100 mm x 10 mm [3.9 in x 0.39 in] 10 m [3 ft])
  Id.No.: 693058914

- **DENSO-Tape** (sheave 50 mm x 10 mm [1.96 in x 0.39 in] 10 m [3 ft])
  Id.No.: 603231914

- **CORTEC VCI 368**
  Id.No.: 5 Liter [1.3 gal] drums: 861008714

For further information, please contact Liebherr after sales service.

"First aid" after contact with DINITROL

- **Skin contact:** Rinse with plenty of soap and clear water.
- **Eye contact:** Remove anti-corrosion coating agents immediately by rinsing the eyes for several minutes with copious quantities of fresh water. Seek medical attention immediately!
- **Swallowing:** if anti-corrosive agent has been swallowed, drink copious quantities of milk or water. Do not induce vomiting! Seek medical attention immediately!
- **Breathing in:** if high concentrations of anti-corrosive agent have been breathed in, take the affected person outside immediately. Seek medical attention immediately!

Safety information

- When not being used, store the anti-corrosive agent in a cool, dry place (storage temperature c. 15 - 20 °C).
- Keep the container away from naked flame, fire, sparks and other ignition sources.
- In the event of fire, use CO2 extinguishers, foam or a chemical extinguisher. Do not use water under any circumstances! When fighting a fire, wear appropriate safety apparel and breathing apparatus.

8.7.1 Select cables

Only when cables are fitted without twists and without damage can fault-free work be executed.

A cable works the most economically when it is always used in its entire length. Consequently we recommend using an adapted cable length for longer periods of operation.

CAUTION !

Improper handling of steel cables!
Damage to the cables.

- Only wind cables as described below.

If during work deployment of winches with multilayer winding, the winding area of the cable is more in the upper cable layers, it is possible that lower cable layers will loosen during operation. This results in slight ovalisation of the cable that changes the winding diameter over the drum width. This causes gaps in the higher layers of cable that worsen winding behaviour and increase cable wear.

CAUTION !

Loosening in the lower cable layers!
Damage to the cable.

- Improve winding behaviour and reduce cable wear: At regular intervals, completely unwind cable and rewind it under primary tension (1 to 2% of the minimum break force of the cable).

CAUTION !

Improper handling!
Damage to the cable.

- When winding the cable on the winch for the first time, draw it in under primary tension. Primary tension force is achieved by braking the paddle and must be 1 to 2% of the minimum break force of the cable.
- Do not directly brake the cable.
- Do not pull cable over the ground.

Winch

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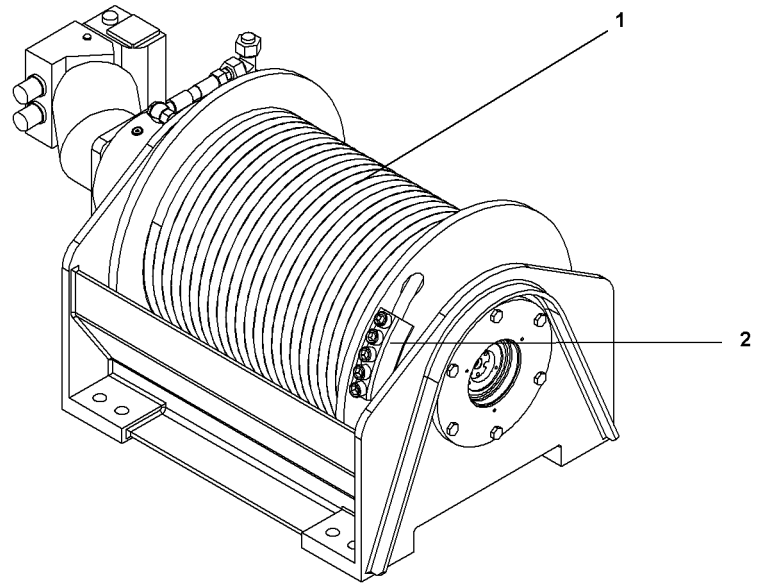


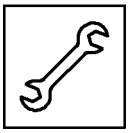
1 Cable drum

2 Cable fixing point

▶ Unwind winch1/winch2 until 3-wind limit switch switches.

Bypass the 3-wind limit switch

To bypass the 3-wind limit switch the following conditions must be satisfied



Switch - set-up mode

Activate set-up mode by pressing the switch.
Set-up mode is designed exclusively for setting up the machine, retrofitting the machine, and removing components from the machine.

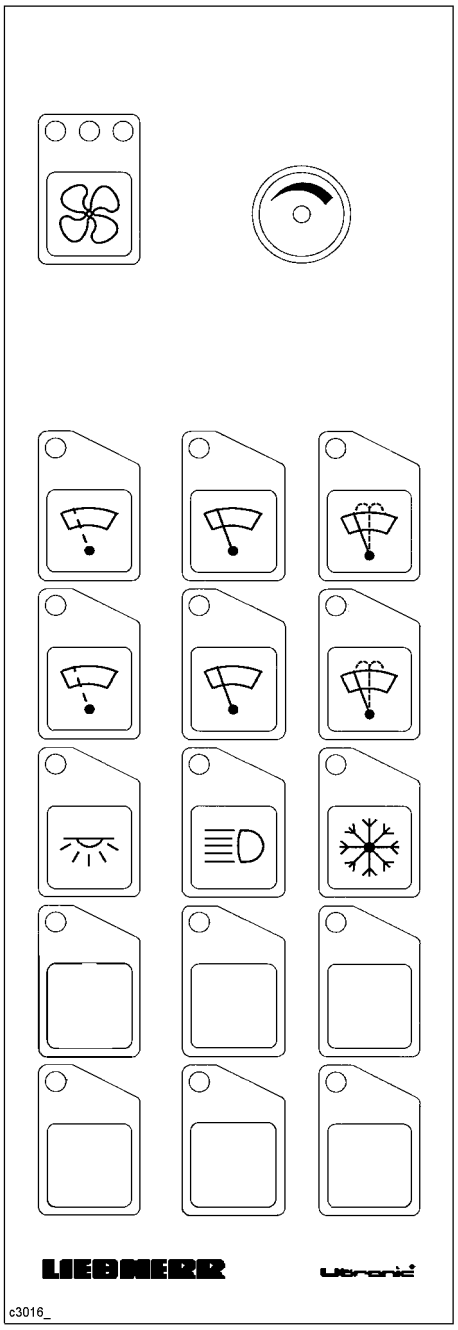
Bypass limit switch button.

To bypass the 3-wind limit switch, press the button and keep it depressed.

▶ Run winch1/winch2 three turns lower.

9.2.3 Operation

The adjustment of the heating and air conditioning system takes place at the left control panel (Fig. 9-01).



Button for blower setting heating

Three blower settings for the heating or air conditioning system can be set using this button. A corresponding number of LEDs indicates the current blower setting. The next higher blower setting is activated by pressing the button once again.

Button air conditioning on/off

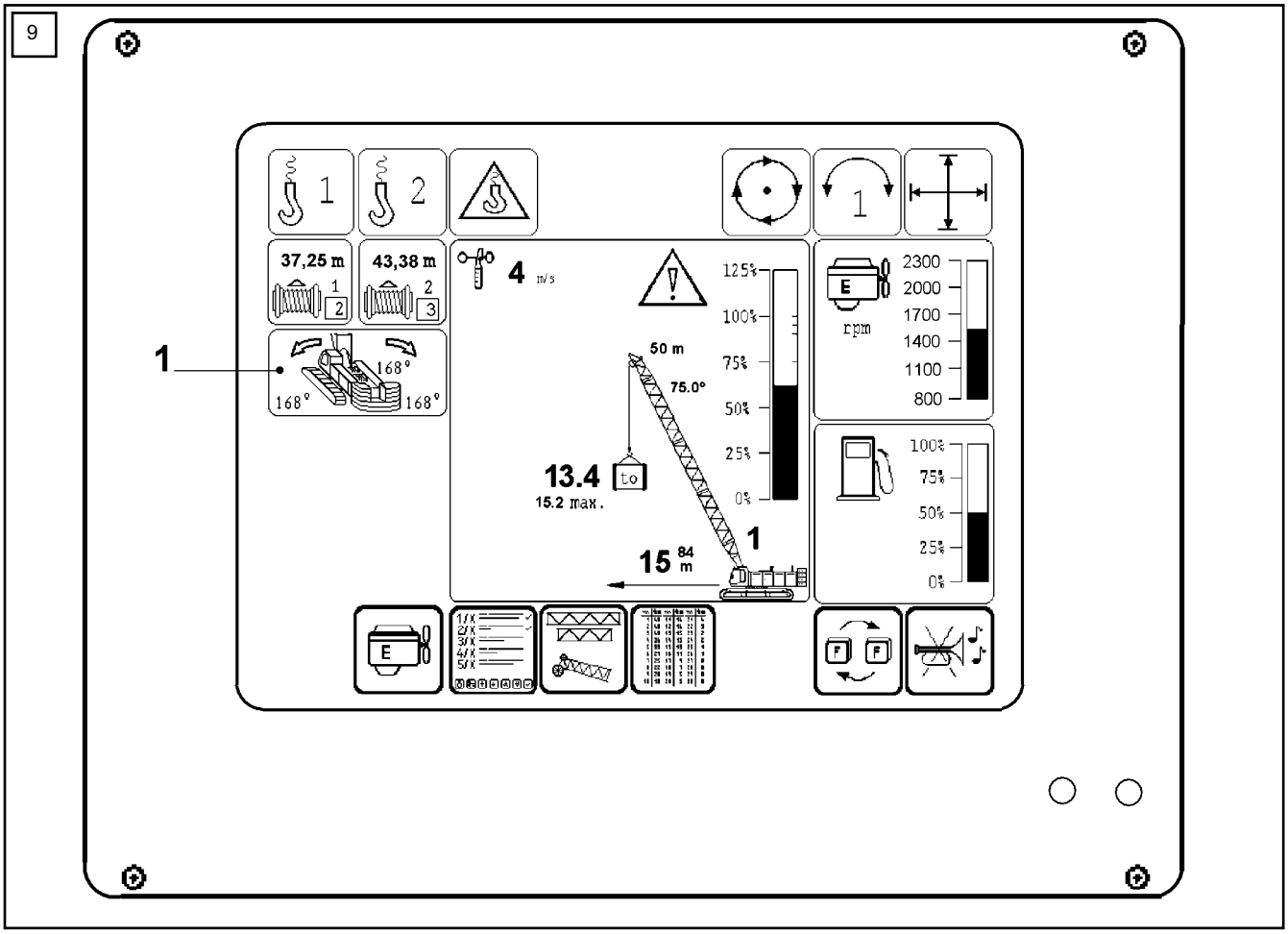
This button serves for switching the air conditioning on and off. For this, the heating must be switched on to at least setting 1.

Temperature controller heating/air conditioning

The rotary switch serves for adjusting the temperature for the heating and/or air conditioning. The temperature is electronically controlled.

Left control panel (X11) Fig. 9-01

9.7 Slewing gear limitation



Slewing gear limitation

The optional slewing gear limitation (Figure 9, item 1) in the power operation screen
- limits the slewing range of the superstructure,
- stops the boom from hitting buildings and obstacles within the machine's operating range,
- is supplemented with the optional outreach limitation, which restricts the boom's adjustment range in height and outreach.

The following information appears in the slewing gear limitation display
- the current slewing angle in degrees in the top right corner,
- the limit angle in degrees determined for the left and right limit stop at the bottom.

CAUTION!

Danger of accident or damage!
If there are dangerous obstacles within the operating area (electrical power lines, etc.), using the slewing limitation* by itself is not adequate! In such cases additional safety measures must be taken (see Chapter 3 "Safety precautions").

IMPORTANT!

The slewing gear limitation* can also be employed together with boom limitation in loading and unloading mode. Fixing the loading and/or unloading locations for the grab facilitates the machine operator's work.

⚠ DANGER !

There is danger of an electrical shock from a damaged power cord.

Preventive measures:

- In crane or assembly operations it is prohibited to have the power cord plugged in - it could be torn off.
- Protect the power cord from damage with a cover while moving it around the construction site.
- Lead the power cord through the opening in the underside of the upper carriage to the appliance socket. Slamming the side door shut can no longer damage the power cord.

Notices to the crane operator

If the crawler crane is equipped with or without fly-jib depends on the application:
while erecting the boom check if the helicopter warning light has been mounted on the highest position. There are electrical sockets on the Main boom head and on the fly-jib head to connect the helicopter warning light.

IMPORTANT ! with the ignition switched off the batteries of the crawler crane are charged at the same time - make use of this!

If the ignition is switched on using the external power supply
- the batteries are no longer being charged,
- the helicopter warning light is supplied by the charger and does not affect the start-up process as it is not an additional electrical power consumer.

⚠ CAUTION !

The helicopter warning light may discharge the batteries of the crawler crane!

Preventive measures:

Do not keep the ignition on over long periods without starting the diesel engine, if the power cord **is not plugged in** . The helicopter warning light feeds off the batteries in such a case.

If a warning light bulb fails, replace the defective bulb at once.

9.13.3 Heating the hydraulic oil

Functioning

As soon as the hydraulic oil temperature falls below -20 °C, the heating is activated automatically via the Litronic control.
- the flow rate of the LPV-pump 2 is reduced,
- the hydraulic oil is channelled via pressure limitation and thus heated,

While the hydraulic oil heating is active, the "Hydraulic oil temperature too low" symbol is overlayed in the status display on the LCD display screen.

- all movements and functions can be controlled,
- speed and pressure is reduced,

As soon as the hydraulic oil temperature rises above -15 °C, the heating is switched off automatically via the Litronic control and all functions are authorised without limitation. The "Hydraulic oil temperature too low" symbol fades.

9.19 Supplemental heaters

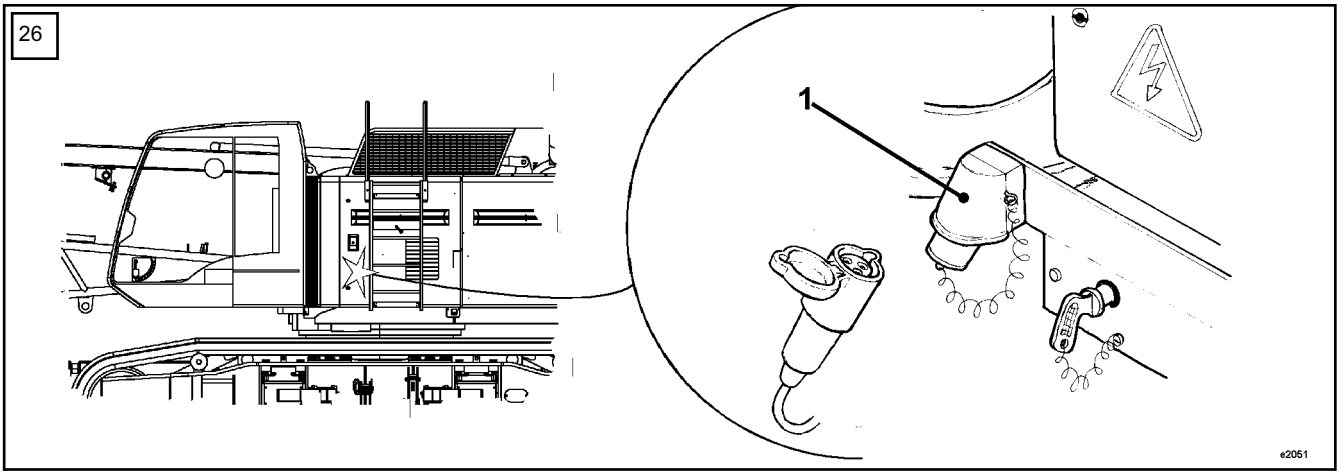
The machine has a cool water heating system in the engine and a heating system for the hydraulic oil with two electric heaters in the hydraulic oil tank.

The heaters are automatically regulated by an internal thermostat. Through the energy supply via the external feed ((Fig. 25, Pos. 1) the heaters switch on or off automatically if needed.

IMPORTANT!

The supplemental heaters will only be activated if the power supply is available via an external cable 5 x 2.5 mm² ; in accordance with national regulations), and if a 16A/400V50/60HZ DIN VDE 0623 / EN60309-2 CEE FORM 23806 plug-type connector is present.

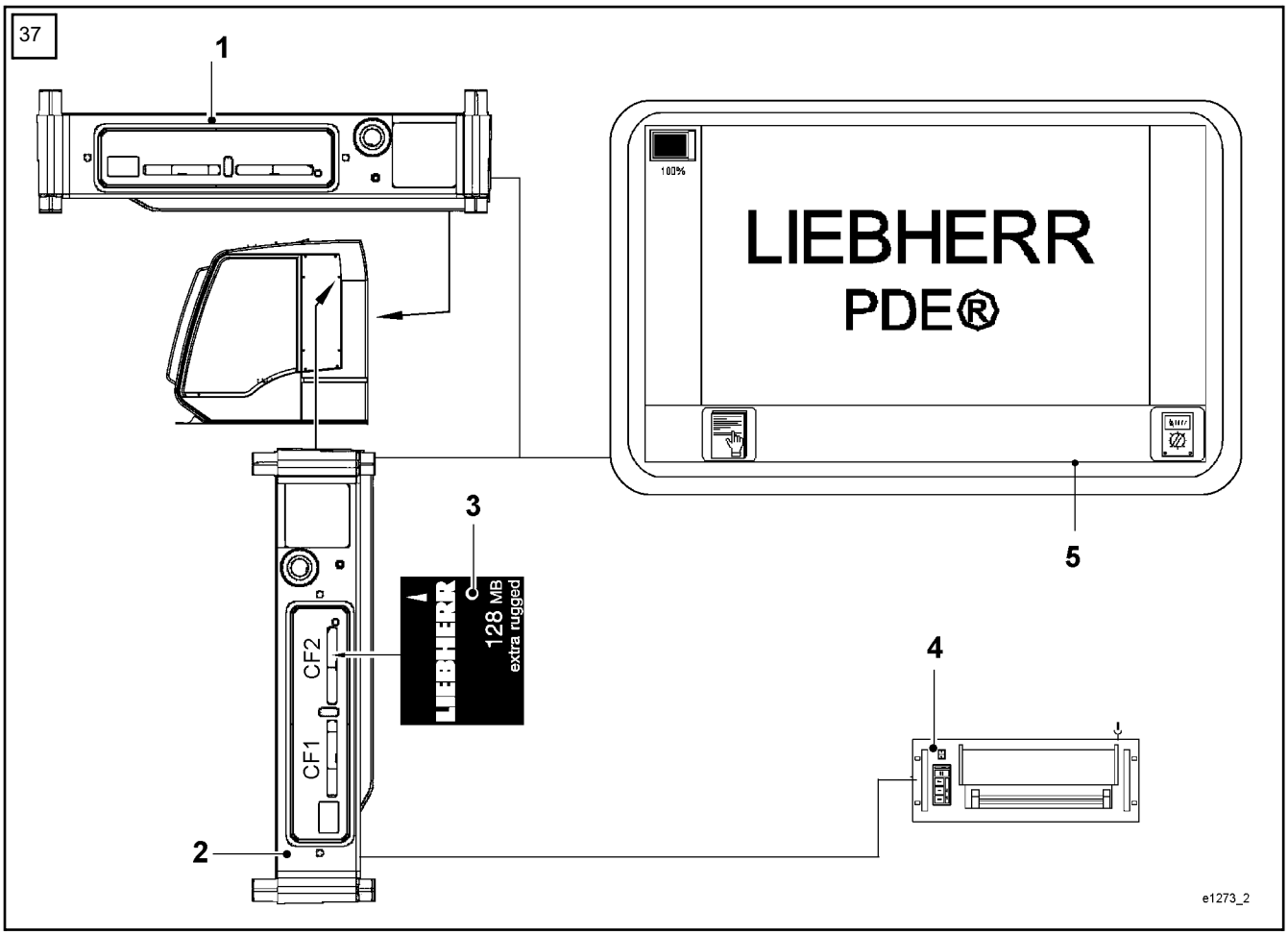
26



Warning shock hazard

This sign is affixed on the X 1.1 electrical cabinet.
Missing or illegible warning signs must be immediately replaced with new original signs.

9.25.2 Data evaluation



Litronic PDE components

1 Control system, switch cabinet X1
2 Control system PDE, cabin
3 Compact flash card (customer card)
4 PDE printer
5 PDE monitor

9.25.4 Operation

General

When the control has started up (ignition on), the PDE system carries out a self-test. Potential errors are indicated by the Litronic control system on the error page as an error message.

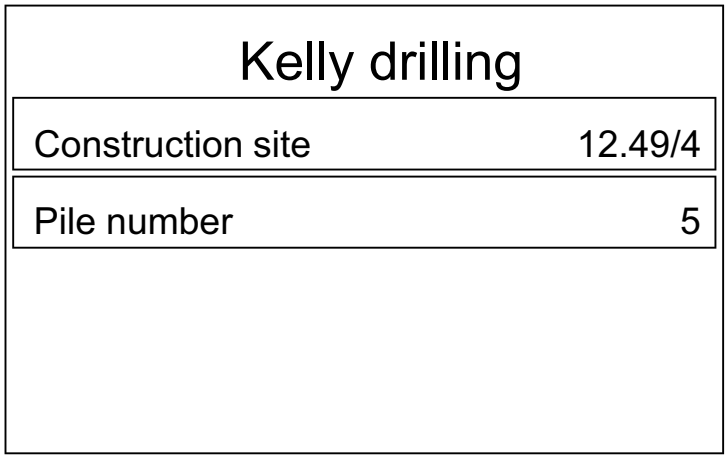
Operating the PDE monitor

To operate the monitor, tap fields with a gray background or fields in a box.
When you tap a field, a beep is heard.

To simplify operation, a **green guide** is provided in the menu navigation. A green box appears around fields or symbols that have been tapped.

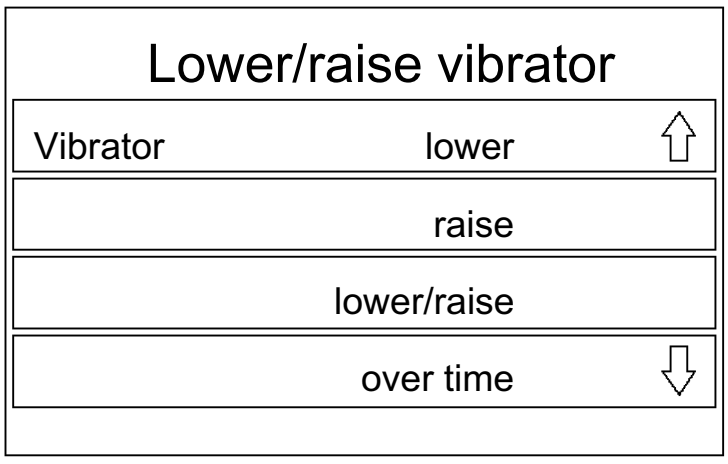
Selecting the operating mode

The operating mode is indicated by the mode selected on the LCD screen.
The submode (vibrator) is selected by tapping the relevant field on the PDE monitor.



e0496

Kelly drilling mode



e0494

Select vibrator submode

Programming rope layer switch

To display the rope length exactly, a rope layer switch must be programmed for the winch concerned.

The rope layer switch
- is already programmed upon delivery of the machine,
- normally only has to be reprogrammed after a rope change or winch repair.

"Toggle function symbols" symbol

After pressing the indicated symbol again, special function key symbols for programming the rope layer switch are shown.

IMPORTANT!

Description of the function key symbols for programming the rope layer switch

"Set rope layer switch 1-2" symbol

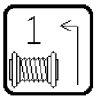
Press the illustrated symbol to program the rope layer switch for the selected winch from the 1st to the 2nd rope layer.

"Set rope layer switch 3-4" symbol

Press the illustrated symbol to program the rope layer switch for the selected winch from the 3rd to the 4th rope layer.

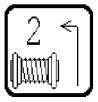
"Set rope layer switch 5-6" symbol

Press the illustrated symbol to program the rope layer switch for the selected winch from the 5th to the 6th rope layer.



"Rope layer switch winch 1" symbol

Pressing the illustrated symbol selects winch 1 for programming the rope layer switch.



"Rope layer switch winch 2" symbol

Pressing the illustrated symbol selects winch 2 for programming the rope layer switch.

9.32.2 Filling the grease reservoir

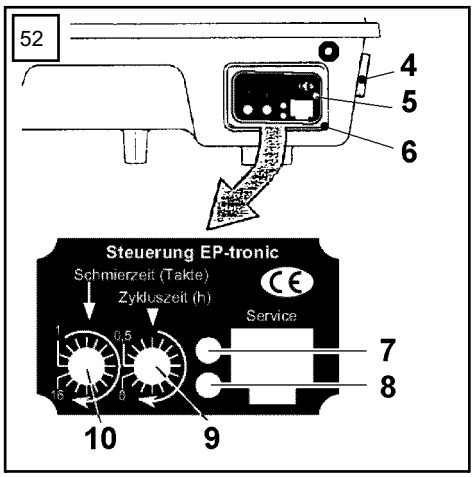
The grease reservoir (Figure 51, item 1) must **only be filled via the lubricating nipple (3).**

CAUTION!

Ensure maximum cleanliness when filling the reservoir! Otherwise the system can easily become blocked by dirt!

Approved lubrication grease

The system is filled ex works with lubrication grease of the type: **AVIALITH 2 EP multi-purpose grease** .
Approved grease: see lubrication chart.



9.32.3 Programming the time intervals

The switch unit (Figure 52, item 5) is mounted directly on the lubrication pump. To set the cycles (lubrication time) and cycle time, first remove the red guard frame (Figure 52, item 6). Then take off the protective cover.

Setting the number of cycles (lubrication time)

- The switch (Figure 52, item 10) can be actuated using a screwdriver to program the number of cycles (lubrication time). (Range of adjustment 1 - 16 cycles).

Setting the cycle time

- The switch (Figure 52, item 9) can be actuated using a screwdriver to program the cycle time. (Range of adjustment 0.5 - 8 hours).

IMPORTANT!

The number of cycles (lubrication time) and cycle time are already set ex works.
After making the settings, properly reattach and fasten the protective cover so that no water can get into the programming unit.

9.36 Winch synchronisation

Winch synchronisation involves synchronising the rope speeds of winches 1 and 2.

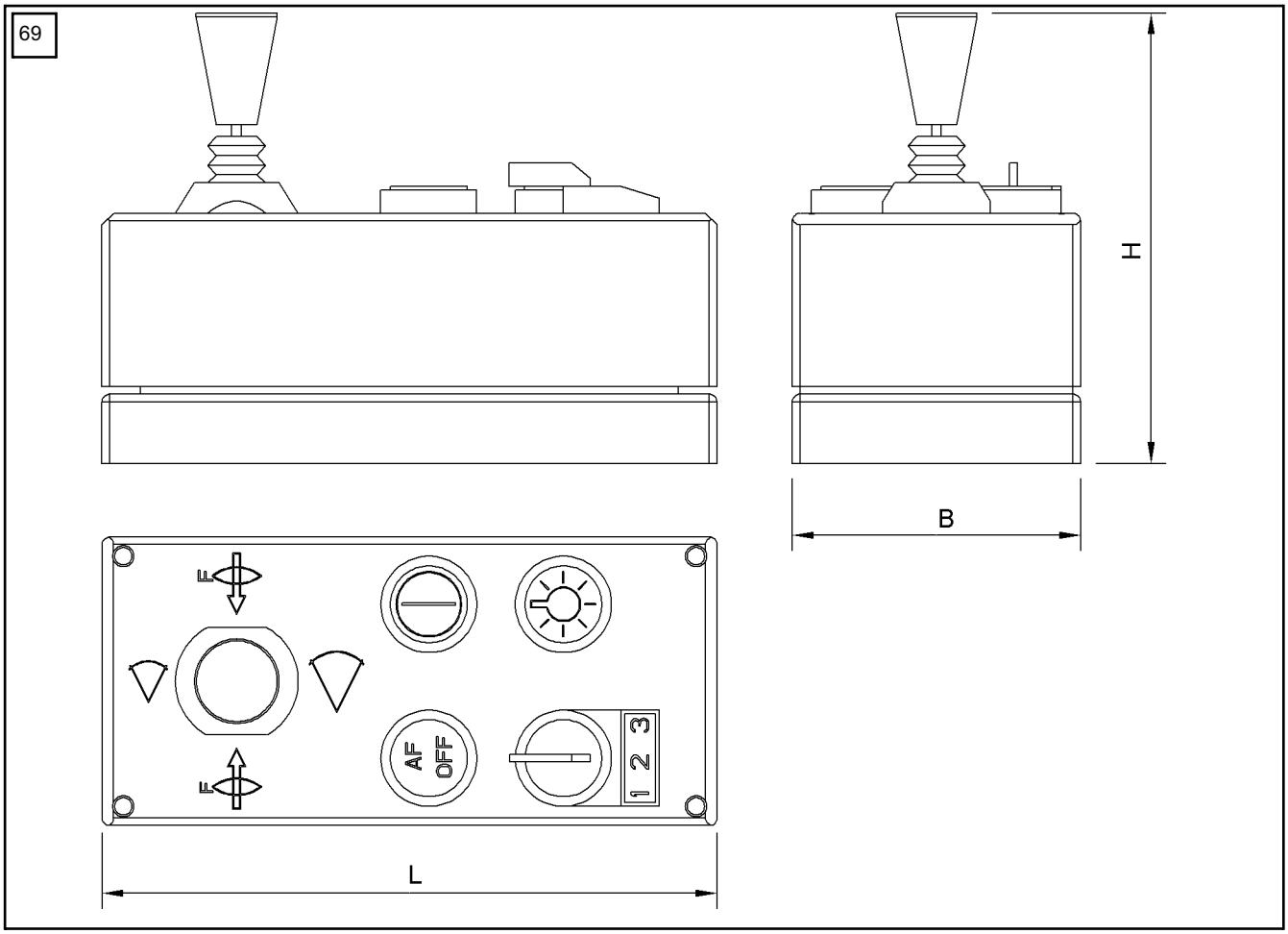
Winch synchronisation is used:
- when two ropes are reeved on one hook.
- when working with crossbars.

NOTE!

The winch synchronization can only be used in the lifting direction.

After triggering of the hoisting limit switch or the 3-windings limit switch both hoist winches stop.

Ensure that the following requirements are met: Winch synchronisation is installed. There is a rope of the same length on each winch.



Video monitoring system control panel dimensions

Designation		**Value**
L	Length	200 mm [8 inch]
B	Width	89 mm [4]
H	Height	117 mm [5 inch]
Input voltage		18 V to 32 V
Current consumption		max. 1 A
Protection class		IP 65
Resistance to shocks		5 g
Operating temperature		-25 °C [-13 F] to 75 °C [167 F]
Storage temperature		-40 °C [-40 F] to 90 °C [194 F]
Weight (without connecting cable)		1.6 kg [35,2 lbs]

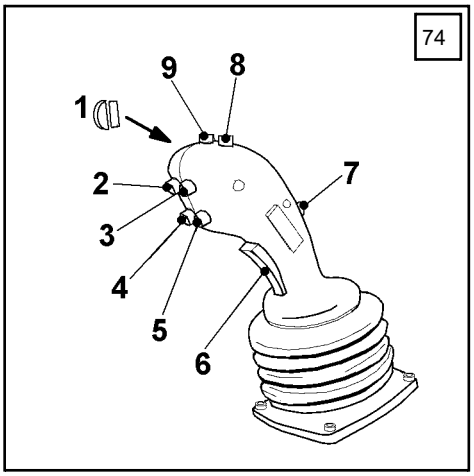
Video monitoring system control panel technical data

Joysticks, pedals, handwheels

Joystick, left (Figure 74)

The two-axis joystick on the left is used to adjust the slewing gear and main boom and to incline the Soilmec grab.
The buttons on the left-hand 2-axis joystick perform the following functions:

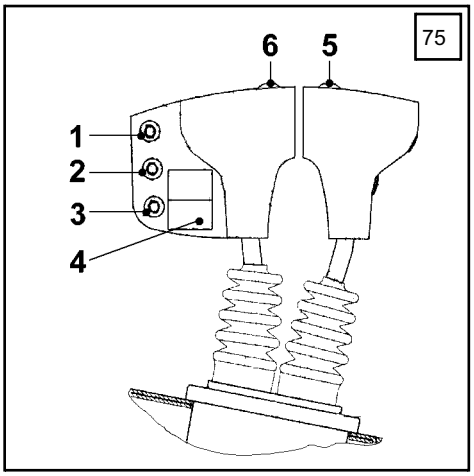
1 Turn capacity control for grab
2 Slew grab to the right
3 Slew grab to the left
4 Slewing gear free-wheel
5 Constant tension override
6 Open/close grab
7 Vibrator button
8 Hooter
9 not used at present



Double joystick, right (Figure 75)

The outer T-bar joystick is used to control winch 2. The inner T-bar joystick is used to control winch 1. The buttons on the double T-bar joystick have the following functions:

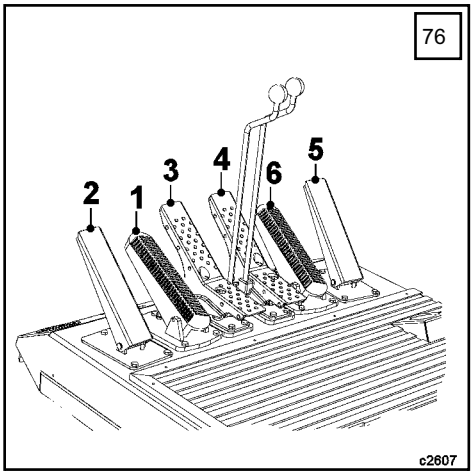
1 Button for lowering control
2 not used at present
3 Button for constant gas programming
4 Rocker switch for diesel engine gas adjustment
5 Vibrator button winch 2
6 Vibrator button winch 1



Pedal arrangement (Figure 76)

The pedals in the cab have the following functions:

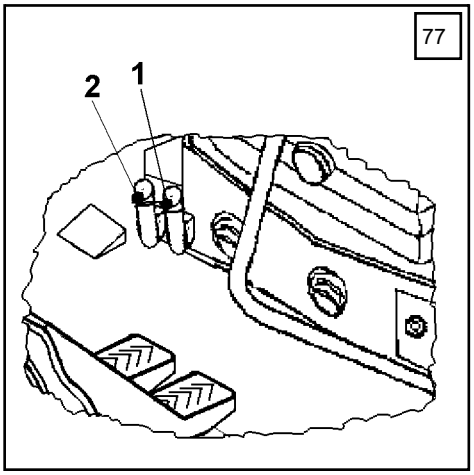
1 Brake pedal for free-fall brake on winch 1
2 Foot pedal for tugger winch
3 Foot pedal for left-hand travel gear
4 Foot pedal for right-hand travel gear
5 Gas pedal
6 Brake pedal for free-fall brake on winch 2



Handwheels (Figure 77)

The handwheels in the cab are used in conjunction with the free-fall winches and have the following functions:

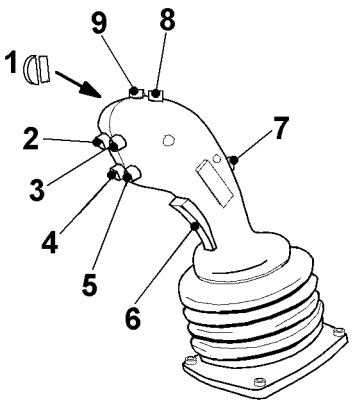
1 Handwheel for free-fall brake on winch 1
2 Handwheel for free-fall brake on winch 2



IMPORTANT!

If Grab mode is not switched on, the buttons are assigned to the functions described in Chapter 4 or the relevant option in Chapter 9.

87



Slew grab

The grab is moved using the buttons on the left-hand 2-axis joystick (Figure 87):

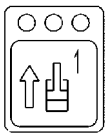
- Front right button (2) = slew grab to the right
- Front left button (3) = slew grab to the left

Adjusting the speed

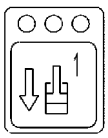
The potentiometer (Fig 87, item 1) on the left-hand joystick is used to set the oil quantity and thereby the grab slewing speed. The speed is increased by turning the potentiometer higher.

Hose winch adjustment

This function is used only with the **Soletanche grab**. It is controlled using two buttons on control panel X27.



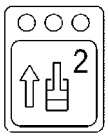
This button is used to retract the hose reel adjuster (adjusting it towards the unit).



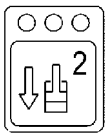
This button is used to extend the hose reel adjuster (adjusting it away from the unit).

Locking cylinder

This function is used only with the **Soletanche grab**. It is controlled using two buttons on the right-hand control panel (X27).



This button is used to extend the locking bolt for the kelly guide.



This button is used to retract the locking bolt for the kelly guide.

9.44 Additional searchlights

9.44.1 Floodlight on the superstructure

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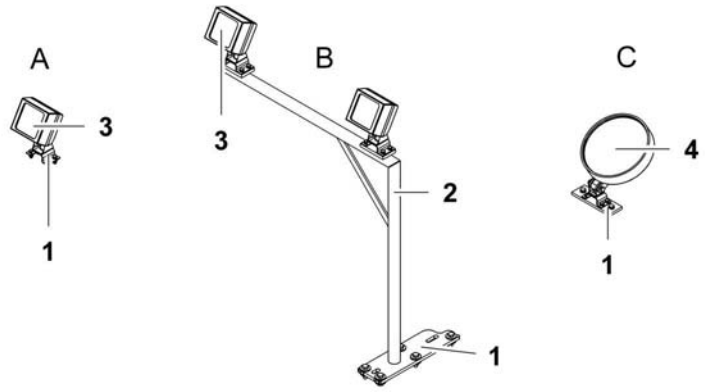


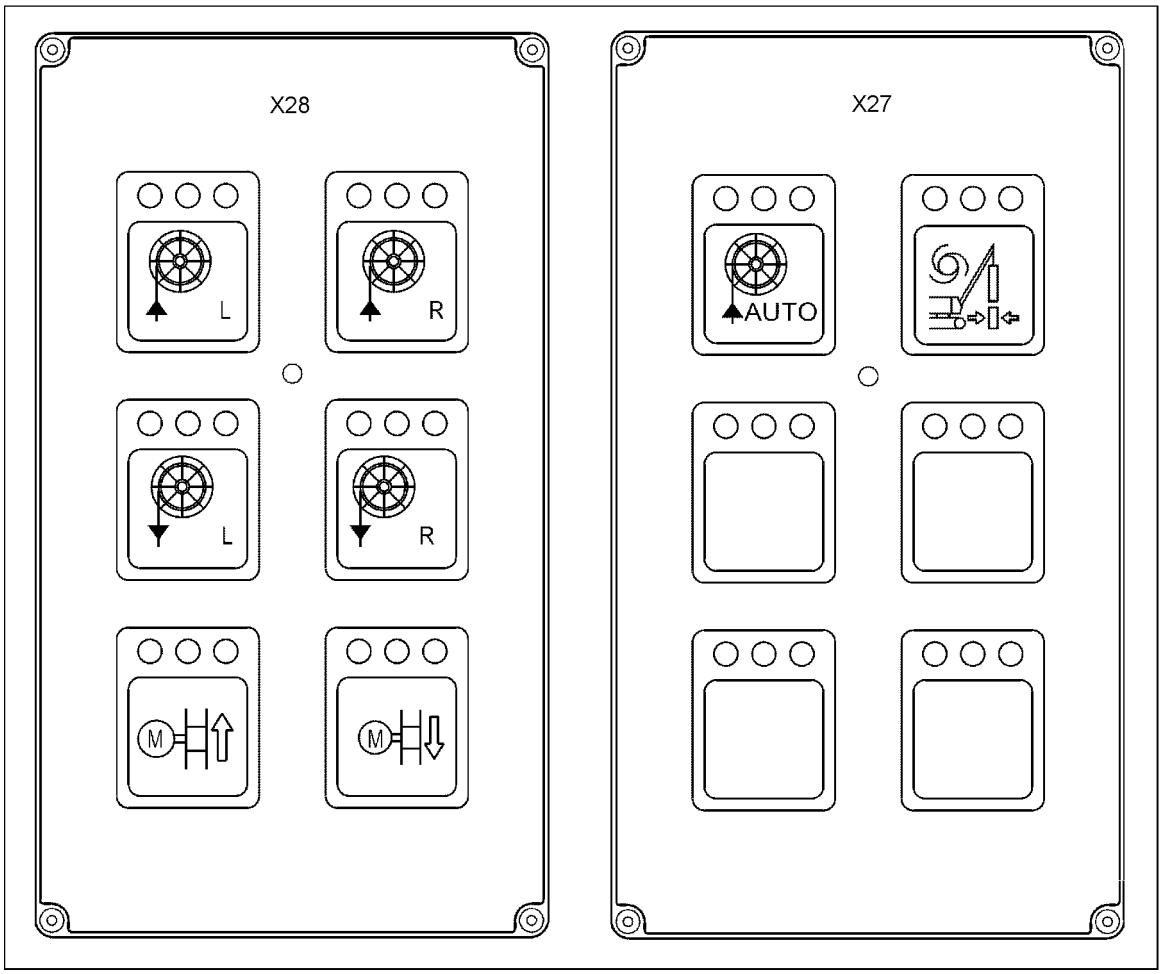
Floodlight on the superstructure

A Searchlight
B Headlight with upright
C Round headlight
1 Mounting (3x) for securing to uppercarriage
2 Frame
3 Floodlight (3x)
4 Searchlights

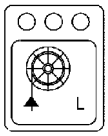
Floodlight is mounted on the superstructure

The exact assembly position varies for each type of machine.

Control panel (X28) and (X27)

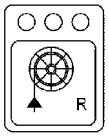


Description of buttons



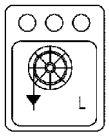
"Raise left-hand hose winch manually" button

Activates the left-hand hose winch in the lifting direction.



"Raise right-hand hose winch manually" button

Activates the right-hand hose winch in the lifting direction.



"Lower left-hand hose winch manually" button

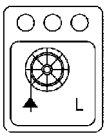
Activates the left-hand hose winch in the lowering direction.

Actuate hose winches and cable winch

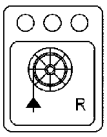
The hose winches and the cable winch are actuated using the buttons on the control panel (X28).

Manual actuation

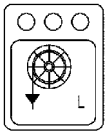
The hose winches and cable winches may be controlled manually in both directions for assembly purposes. These are momentary-contact button functions.



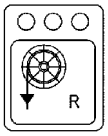
This button switches the left hose winch to raise.



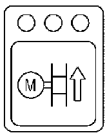
This button switches the right hose winch to raise.



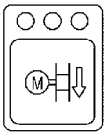
This button switches the left hose winch to lower.



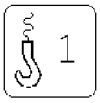
This button switches the right hose winch to lower.



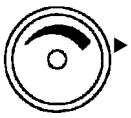
This button switches the cable winch to raise.



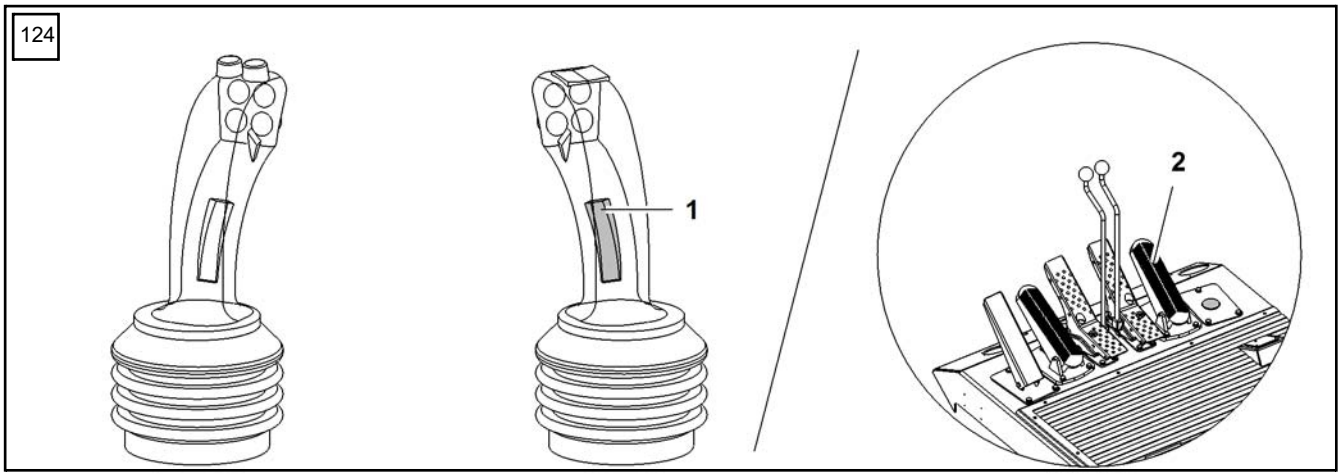
This button switches the cable winch to lower.



▶ Dig a trench 5 m [16 ft 4 inch] deep.
▷ Free-fall symbol appears on the monitor.
▷ Grab free-fall within slow-down height is enabled.



▶ Set slow-down height using potentiometer on control panel X23.



▶ Press button (1) and foot pedal (2).
▷ Grab free-fall within slow-down height* is activated.

▶ Release foot pedal.
▷ Slurry wall grab is in free fall.

The grab free-fall within slow-down height* goes out if:
- the slurry wall grab is moved out of the slow-down height.
- the trigger switch on the right-hand multi-directional control lever is pressed again.

Initializing "Vibratory hammer operation" mode

Additional steps need to be carried out to initialize "Vibratory hammer operation" mode.

"Operating mode" button

1.) Press and hold down the button shown on the left-hand control panel (X12).

"Operating mode switch activated" symbol

As soon as the "Operating mode" switch is activated and held, the symbol shown will appear in the bottom right-hand corner of the screen.

"Operating mode switch activated" symbol

2.) Now touch the symbol displayed on the screen.

"Switch off ignition" symbol

After carrying out the above two steps, the "Switch ignition off" symbol appears instead of the "Operating mode selected" symbol.

This symbol flashes on the screen!

IMPORTANT!

While this symbol is displayed, all machine functions are blocked for safety reasons.

9.49.2 Connecting the concrete cutters

NOTE!

Special bolts are fitted to attach the console. The console fixture is bolted in place along with the boom intermediate pieces.

How to attach the main boom is described in Chapter 6.

CAUTION!

Do not connect or disconnect hydraulic hoses unless the machine is switched off.

(Ignition key in position 0).

Use a suitable tool to tighten the hydraulic hoses.

Connect all hydraulic lines and check for leaks.

- **Hoisting limit switch**
  Disconnect the connecting cable for the hoisting limit switch from the cable drum, feed through the opening at the front right of the uppercarriage, plug into the socket and secure with retaining clips.
- Unplug the other connecting cable from the cable drum and feed it along the boom to the electrical box on the boom head. Insert plug and secure it with the retaining clips. (See Chapter 6 "Connecting the electrics").

CAUTION!

A large quantity of oil is required to operate the concrete cutters. The hydraulic tank is not designed for such a large quantity of oil. Therefore two full oil drums (capacity approx. 250 litres) are included in the scope of supply. This means that the hydraulic lines to the concrete cutters should first be filled by temporarily operating the cutters. While the lines are being filled, the quantity in the hydraulic tank must be monitored. This is done by watching the sight glasses on the hydraulic tank. If the oil quantity drops below the lower sight glass, the diesel engine must be switched off and the amount of oil required must be added to the tank via the return filter.

9.50.6 Releasing the hydraulic oil

A large quantity of oil is required to operate the concrete cutters. The hydraulic tank is only designed to hold a certain amount of oil. Before the hydraulic lines on the main boom for opening and closing the concrete cutters are dismantled, some of the oil must therefore be drained into the oil drums supplied. Drainage is carried out via the quick-locking couplings on the uppercarriage.

Quick-locking couplings on the uppercarriage

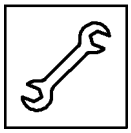
The quick-locking couplings are fitted on the inside of the uppercarriage on the right. The hydraulic oil is drained into the supplied drums via these couplings. The drain hose and the drums are included in the manufacturer's scope of supply.

Ball valves

The hydraulic oil can be drained into the tank via the ball valves that are fitted on the inside of the uppercarriage on the right. There are also ball valves on the hose ends that run from the main boom to the console. Before operating the concrete cutters, make sure that the ball valves on the inside of the uppercarriage on the right-hand side are closed and that the ball valves on the hose ends on the main boom are open.

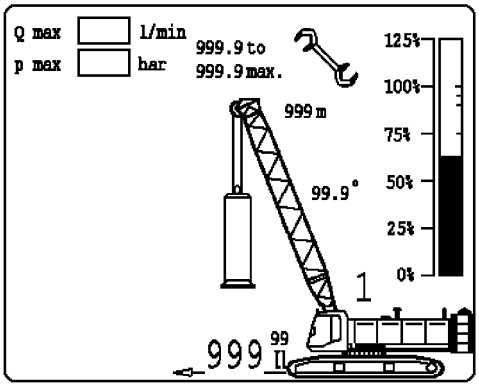
9.51.5 Settings

Assembly operation selection button



When the "Assembly operation" selection button on control panel X12 is pressed, the hammer in setting mode display field illustrated below appears on the LCE screen instead of the hammer operation display field.

The following parameters can be set:



Hammer in setting mode display field

Q max ☐ l/min — 0 - maximum flow rate in l/min

p max ☐ bar — 0 - maximum working pressure in bar

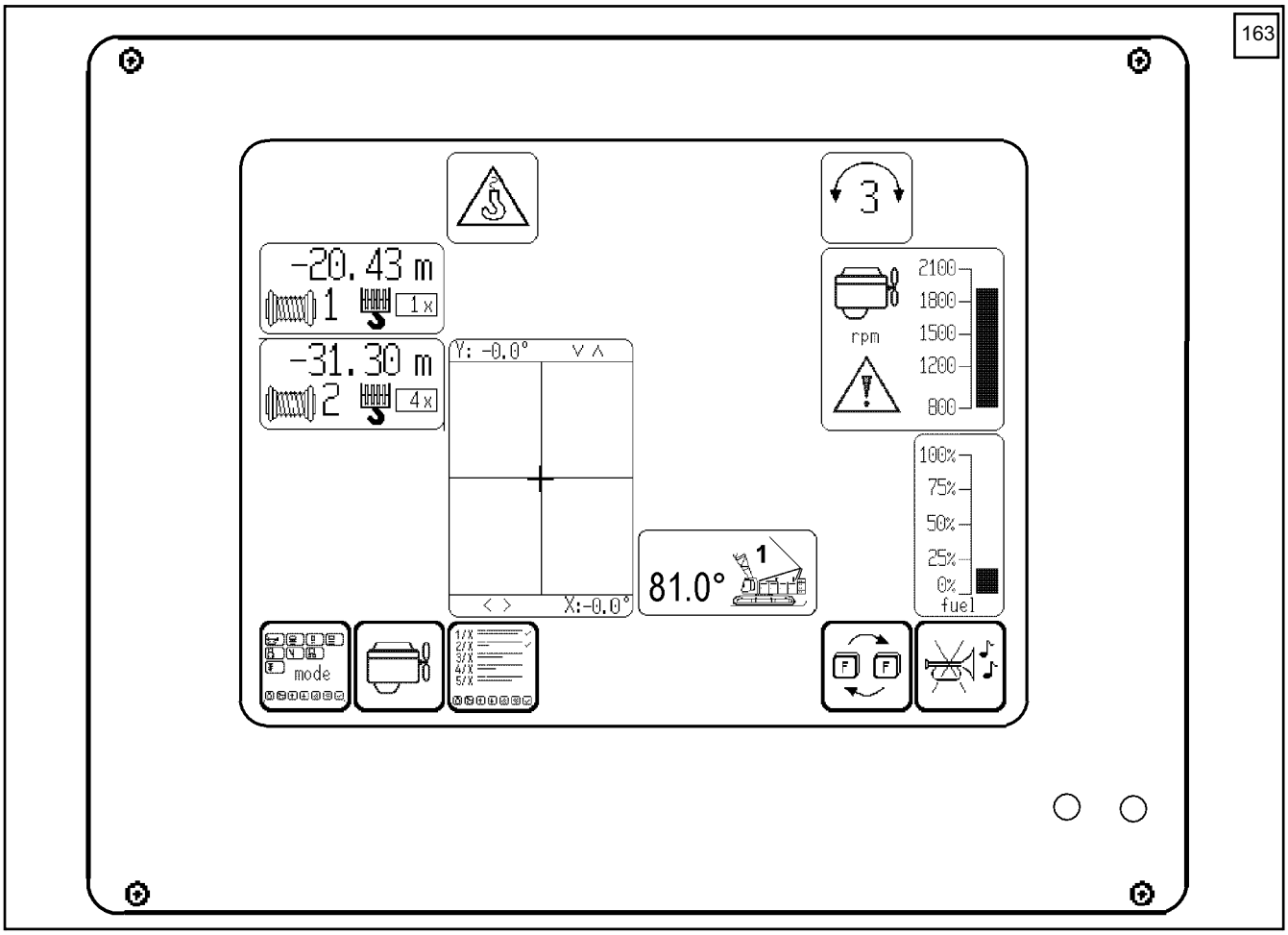
⚠ CAUTION!

To avoid damaging the attachment, ensure the values entered are within the range specified for the attachment.

Take note of the information provided by the manufacturer and adjust the values accordingly on the Litronic control system.

Technical data, special safety precautions, operating and maintenance instructions for the attachments can be found in the relevant manufacturer's operating manual.

9.52.5 "Leader operation" screen



"Leader operation" screen

9.52.11 Leader height adjusting winch

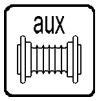
9.52.12 General

The leader height adjustment winch is secured to the boom foot. After the selection has been made on the additional control panel X25 the luffing mechanism becomes active and leader adjustment is enabled.

Selection

"Leader height adjustment winch on/off" selection button

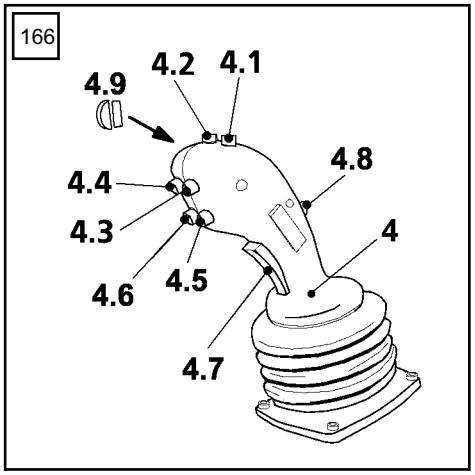
Press the button on the additional control panel X25 to select the leader height adjustment winch. The LEDs in the preselection key and in the "Auxiliary winch on/off" preselection key in the right control panel X23 light up to show that the selection is active.



"Auxiliary winch on/off" button

The LED in the "Auxiliary winch on/off" preselection key in the right control panel X23 also lights up.

After "Leader height adjustment winch" has been selected, the leader can be moved up or down by actuating the left-hand control lever.
The luffing winch is disabled.



9.52.13 Left-hand control lever

- Move control lever back = raise leader
- Joystick in zero position = leader maintains position
- Move joystick forwards = lower leader

"Leader height adjustment winch" deselection

"Leader height adjustment winch on/off" deselection

With the left-hand joystick is in the neutral position, press the selection button on the additional control panel X25 once more to switch the platform adjustment winch off. The LED in the preselection button and the LED for "Auxiliary winch on/off" preselection in the control panel go out.

The luffing winch can once again be controlled using the left-hand control lever.

9.53.5 Operating the grab

The grab and the main boom adjusting winch are both operated using the left-hand joystick. It is therefore necessary to select either the main boom adjusting winch or the grab, or switch from one to the other.

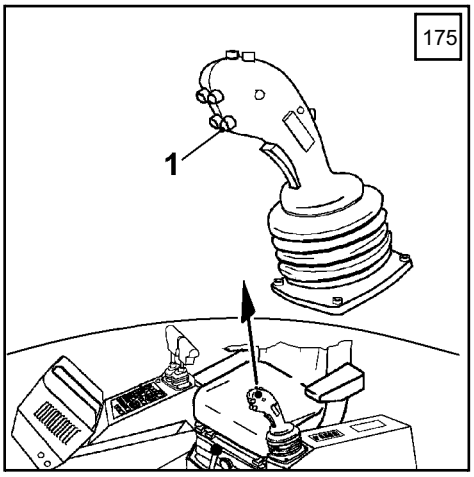
Activating the grab

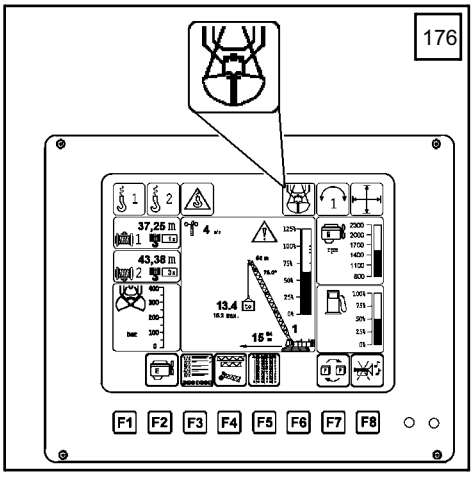
Activation (or switchover) is performed by
- press the button (Figure 175, item 1).

The selection (or switchover) can only be made with the main boom adjusting winch at a standstill.

Display:

If the grab is selected, the "grab" symbol (Figure 176) is displayed in the status bar on the LCD screen.

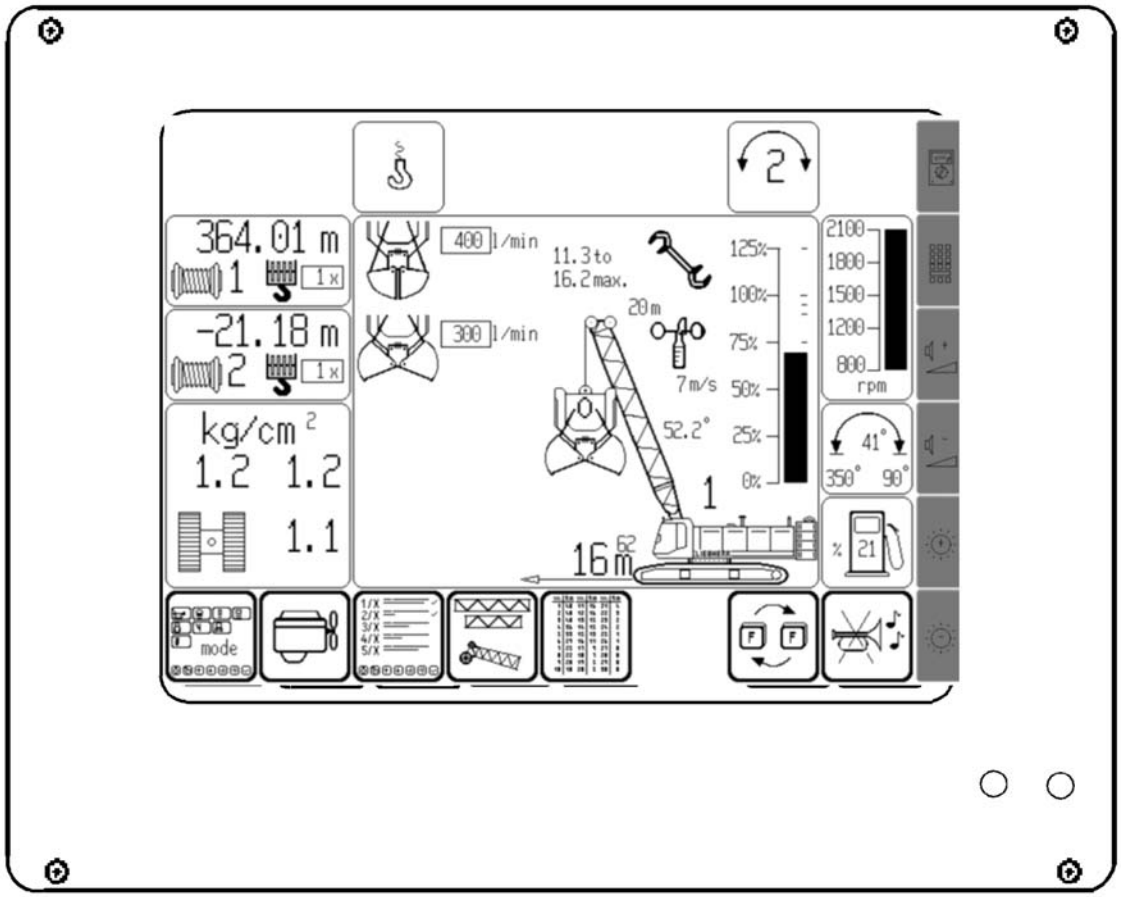


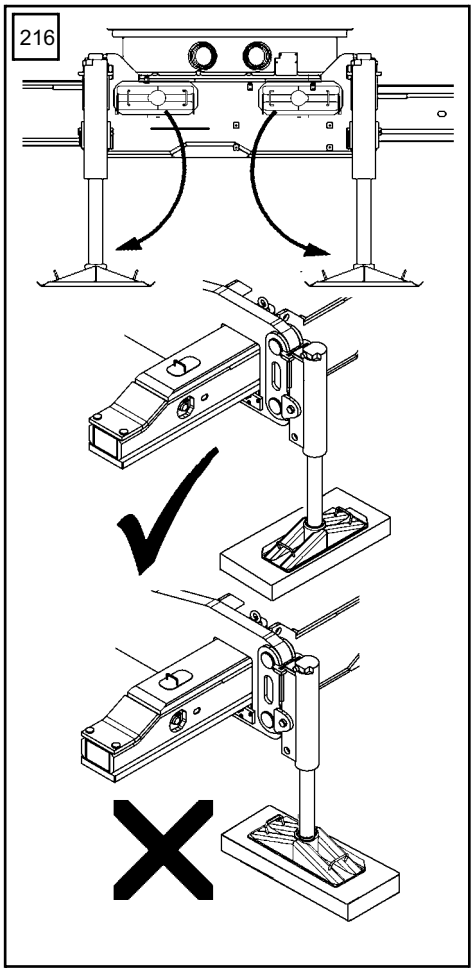


9.58.3 "Grab operation mode" display field

The display field for grab operation tells the machine operator the current status of the machine and the grab.

201





Establishing the support height

The support height required for unloading the basic machine is dependent upon the loading surface height of the flat-bed trailer and ground composition at the erection site.

Example:
Ground clearance of the flat-bed trailer: 1000 mm [3 ft 3.4 inch]
Maximum support height of the
basic machine: 974 mm [3 ft 2.3 inch]
Ground composition: Level asphalt ground with
sufficient load capacity

Measure: For unloading of the basic machine, insert the support plates underneath at a height of approx. 100 mm [4 inch].

⚠ WARNING !

The basic machine may tip over if the support plates are not properly inserted.

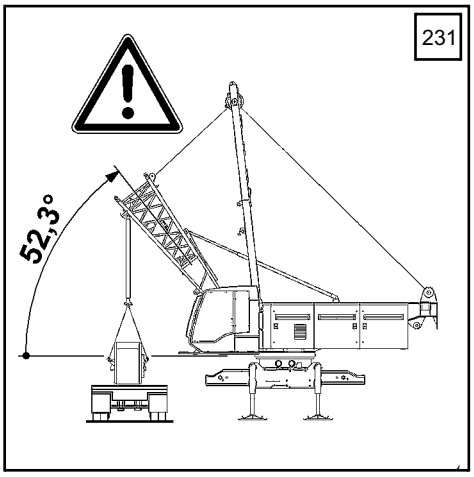
Countermeasures:
Insert support plates featuring large surfaces and of a stable material.
Use gummed wooden, concrete or steel plates.
Insert all support plates of the same material.

Insert support plates and align (fig. 216)

- Remove support plates from the fixings on the undercarriage and lay down by the support cylinders.
- Support plates
  - are aligned lengthways alongside the flat-bed trailer,
  - are inserted underneath to achieve the required height,
  - are aligned underneath the support cylinders.

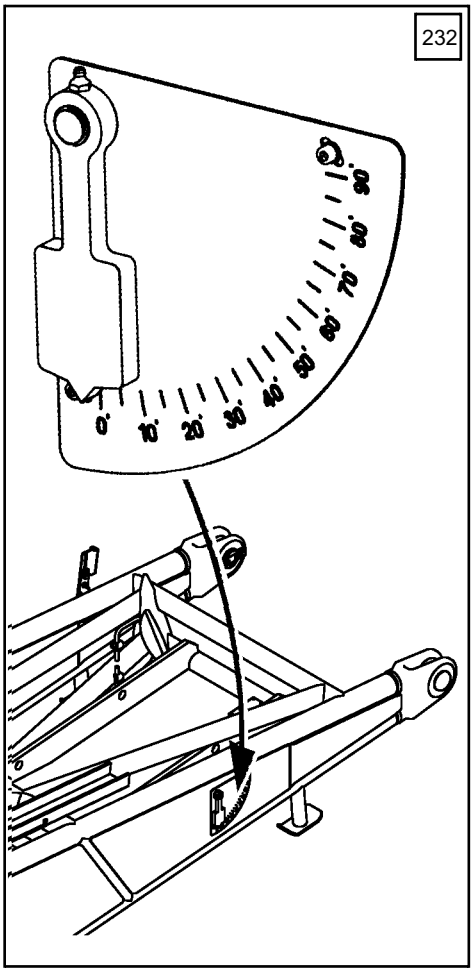
IMPORTANT !

Observe the track width of the flat-bed trailer. The supports may not protrude into the tyre track.



CAUTION!

Do not lift the boom base section too far.
The basic machine could be damaged by the crawler side frame.



Maximum radius of the boom base section for the first crawler side frame

The maximum radius results from the minimum boom angle (Figure 231).
Do not let the minimum boom angle of 52.3° be undercut when assembling the crawler side frame.

WARNING!

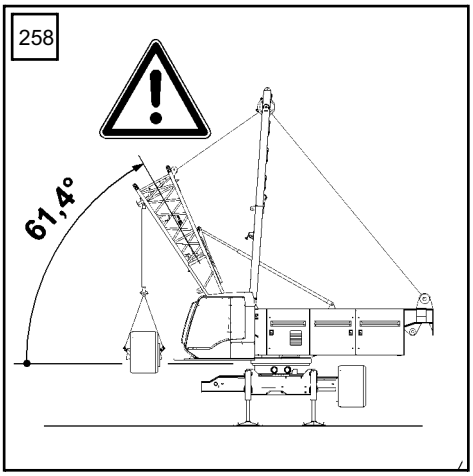
If the boom base section is lowered too far, the basic machine could topple over.
The minimum boom angle must not be undershot.

Always keep an eye on the boom angle indicator on the boom base section during assembly (Figure 232).

CAUTION!

The boom angle indicator must not be dirty.
It must function freely or else a wrong angle may be displayed.

258

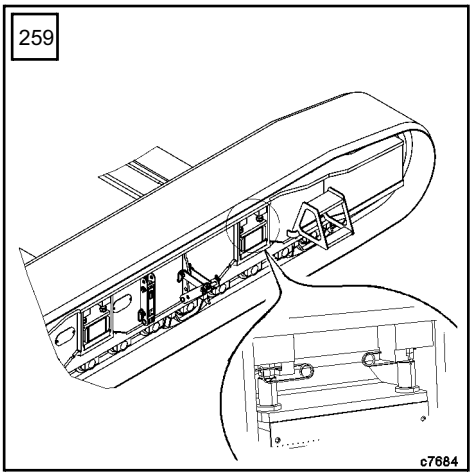


Once the second crawler side frame is hanging on the boom base section, the critical angle of 61.4° may be exceeded (Figure 258).

WARNING!

Both crawler side frames must be set to working width (wide track) on the undercarriage!

259



Set second crawler side frame to working width (wide track)

- Pull up the crawler side frames as far as their stops on both crossbeams.
- Clamp crawler side frames to both crossbeams (Figure 259, item 1).

Procedure for support heights up to approx. 724 mm [2 ft 4.5 inch] (supports not taken into consideration)

IMPORTANT !

With the following lifting, the inclination of the basic machine may not exceed 1° in the desired direction. This means that the air bubble in the spirit level may not shift beyond the outer circle.

Due to the varying weight distribution on the basic machine, the support cylinders move at different speeds with the same lever position - Operate the adjustment lever with the utmost sensitivity!

- Push the adjusting lever upwards until all support cylinders are extended to just above the support plates.
- Position the support plates precisely beneath the support cylinders.
- Lower the support cylinders, one after the other, slowly into the support plates.

IMPORTANT !

The angle display could show an incorrect inclination angle. Display of the angle display is only an approximation.

In order that incorrect displays are avoided, the basic machine must be levelled as precisely as possible. Functioning of the angle display may not be impaired via dirt, snow, ice or foreign bodies.

- Retract the assembly cylinder slowly and lift the crawler track carrier above the loading surface height.
- Swing the crawler track carrier slowly over the loading surface and lower.
- Extend the assembly cylinder until the transport fixtures on the crawler track carrier have been completely lowered.
- Suspend assembly tackle from the crawler track carrier: One after the other on all three transport fixtures
  - remove retaining springs,
  - pull out pins and suspend the round sling of the assembly tackle.
- Then fasten the transport fixture to the crawler track carrier via pin and retaining spring.

NOTE !

The lifting chain can remain mounted on the crawler track carrier as they will be required again for assembly of the crawler track carrier.

- Swing away assembly crane from the loading surface.
- Drive away transporter.

Jib angle depending on jib length

Jib length	exact angle at 15°	exact angle at 30°
11 m [36']	11,5°	25,5°
14 m [46']	13,9°	27,8°
17 m [56']	15,4°	29,4°
20 m [67']	16,4°	30,4°
23 m [75']	17,2°	31,2°
26 m [85']	17,8°	31,8°
29 m [95']	18,3°	32,3°
32 m [105']	18,7°	32,7°

Precise boom angle of the fixed jib Table 9-01

The table below shows the possible lengths of a fixed jib on the 1311.22 heavy boom head.

Number of 0806 jib components:						
Jib head section, 5.5 m [18 ft]						
Section, 6 m [20 ft]						
Section, 3 m [10 ft]						
Jib base section, 5.5 m [18 ft]						
Total jib length in:	**m**	**[ft]**				
	11	36	1	0	0	1
	14	46	1	1	0	1
	17	56	1	0	1	1
	20	67	1	1	1	1
	23	75	1	0	2	1
	26	85	1	1	2	1
	29 [1)]	95 [1)]	1	0	3	1
	32 [1)]	105 [1)]	1	1	3	1

_[1)] with mid-point suspension

Possible jib lengths, HS 855 HD Table 9-02

9.61.6 Assembling the fly jib pendant straps

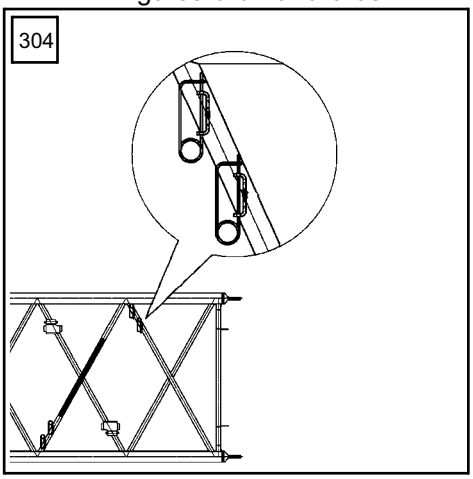
DANGER!

Incorrect arrangement of the pendant straps can lead to malfunctioning of safety devices, damage to the equipment and serious accidents! The arrangement of the pendant straps (length and position in boom system) should be checked precisely for every assembly.

IMPORTANT!

The system dimensions of the boom sections and "fixed jib" pendant straps are shown in detail in Figures 9-02 and 9-03.

304



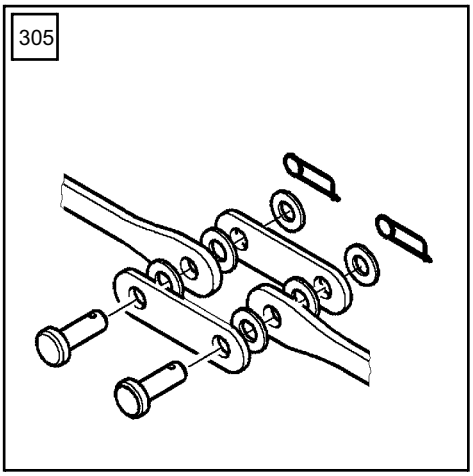
Connect the pendant straps

The appropriate pendant straps are provided for the 0806 jib head and each section. The pendant straps are always supplied with the relevant section located in the transport fixations.

The equalizer including tension load cells are already mounted on the 0806 jib head and on the A-frame.
The pendant straps of the sections are mounted between the equalizer of the 0806 jib head and the A-frame.

Remove the retaining springs (Figure 304.

305



DANGER!

No damaged or corroded pins and locking elements may be used.
Full tensioning force must be applied to the retaining springs.

If necessary, replace all damaged parts with new original parts.
The pendant straps must be checked (see section 7.17.1 "Checking the boom pin and pendant strap connections").

- Bolt the pendant straps (Figure 305) to one another and secure using the safety elements supplied (washer and retaining spring).

NOTE!

Fit the connecting pins of the pendant straps **from the outside inwards** .

9.61.14 Assembling the main boom

IMPORTANT!

The assembly of the main boom and the fitting of the main boom pivot piece is described in Chapter 6 "Assembling the main boom".
The assembly of the main boom and the tensioning and installation of the hoist rope steadying and rope guides is carried out in the same positions as described in chapter 6.

IMPORTANT!

When bolting the main boom sections to the heavy boom head, the connecting links must be bolted using special pins.
See "Attaching coupling links".

9.61.23 Reeving the pulley block/load hook on the 0806 jib head

The hoist rope of winch 1 is fed over the 0806 jib head and reeved according to the reeving systems below.

NOTE!

In order to reeve the rope, the boom must be raised somewhat.

With short boom lengths, the boom head must be swung over the pulley block (or load hook) so that no diagonal pull occurs when luffing the rope.

NOTE!

Make sure that the hoist rope is fed over the rope guide pulley on the A-frame of the fixed jib!

NOTE!

The required hoist rope length depends on the boom configuration and the reeving of the pulley block/load hook and the type of application.

DANGER!

To prevent the fixed jib falling backwards in the case of short jib booms, a minimum empty hook weight must be maintained.
The values are shown in the following table.

11m [36 ft] jib length with 15° tensioning		
Main boom angle	Minimum hook weight	
	[t]	[lbs]
84° - 86°	2	4409
75° - 84°	1,5	3310
14m [46 ft] jib length with 15° tensioning		
75° - 84°	1,5	3310

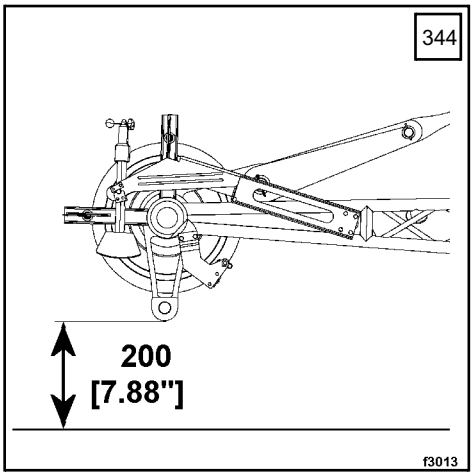
9.61.30 Setting down the fixed jib

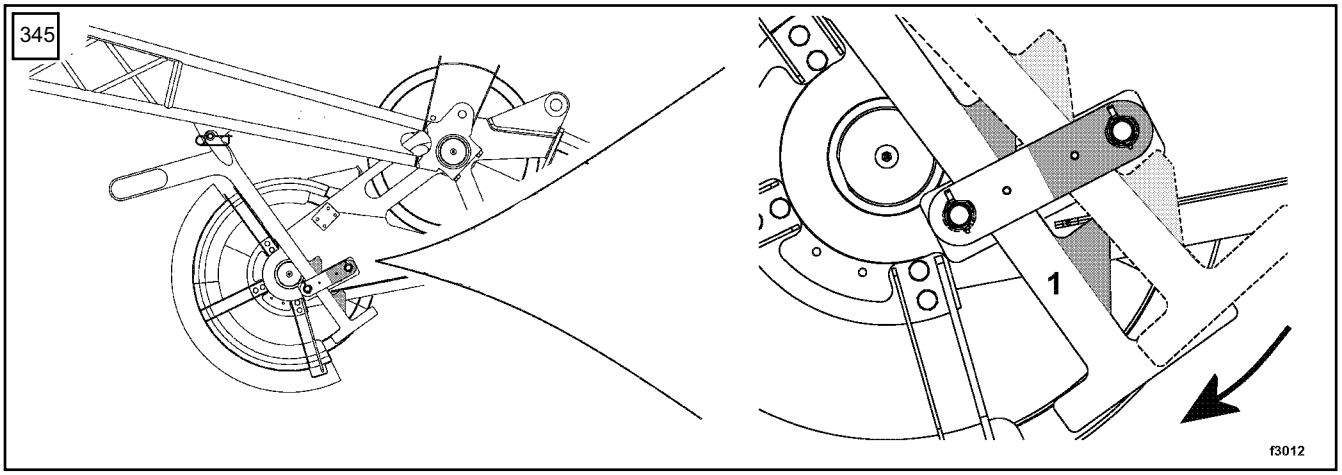
Setting down the fixed jib is performed in the reverse sequence to setting it up.

When setting down the fixed jib, watch the retaining device to ensure that it is extended. The position of the retaining device can be more accurately set (Figure 344, item 3) thanks to colored markings on the locking shackle.

WARNING!

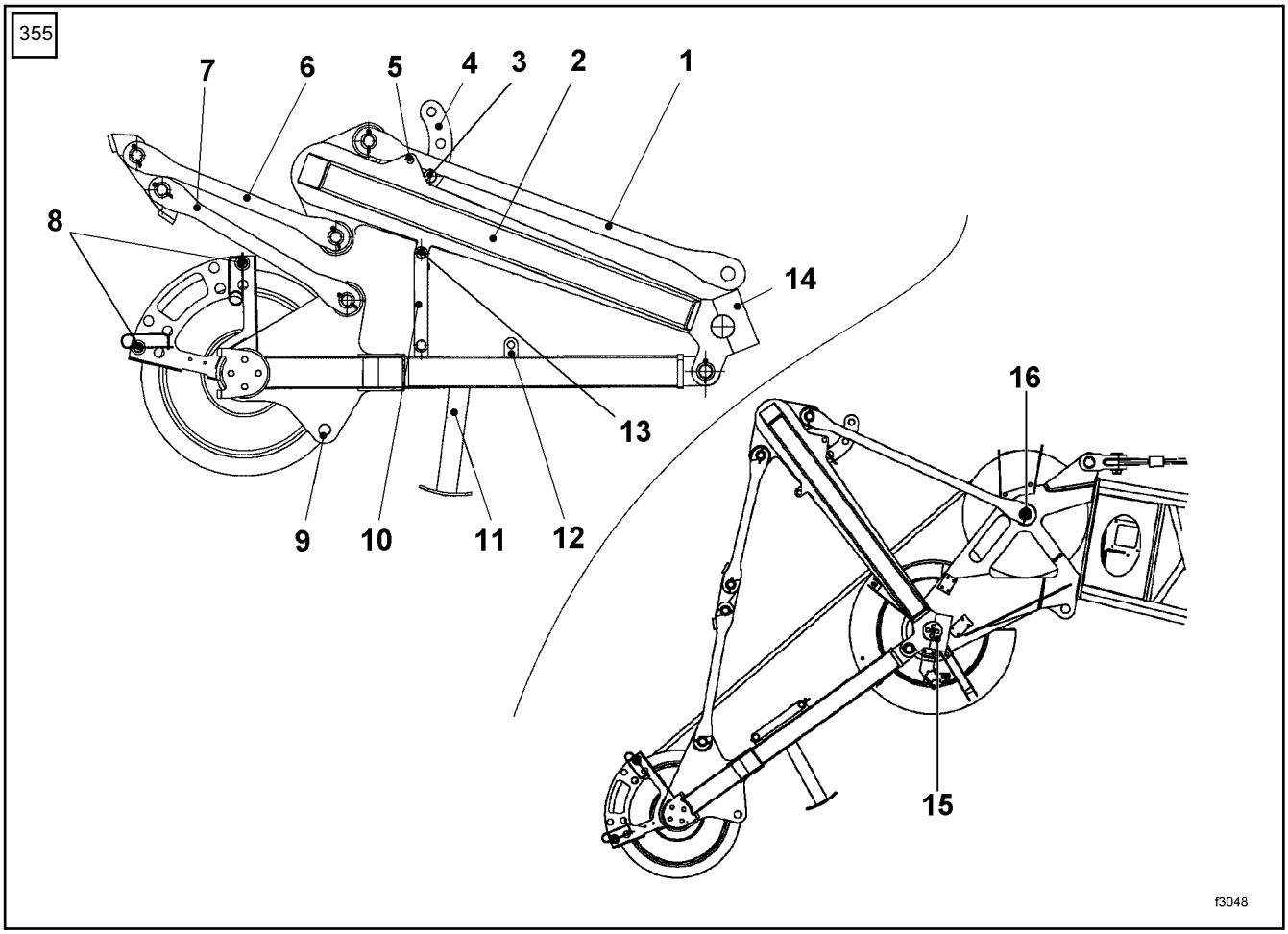
If the tip of the jib is more than 200 mm [7.88 inches] above the ground (Figure 344) **it must be ensured that the retaining device is unlocked** (Figure 345, item 1).





IMPORTANT!

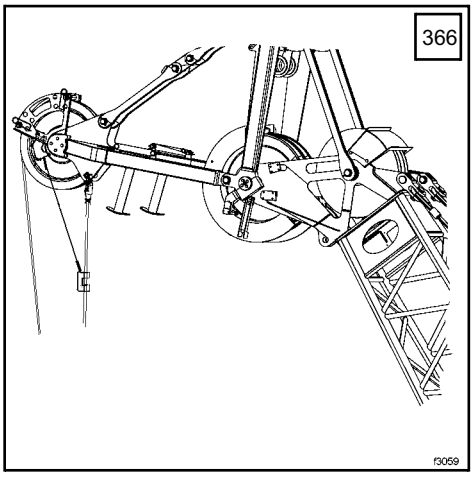
The parts hatched in grey (Figure 345) are color-coded to assist in visually checking the position of the retaining device.



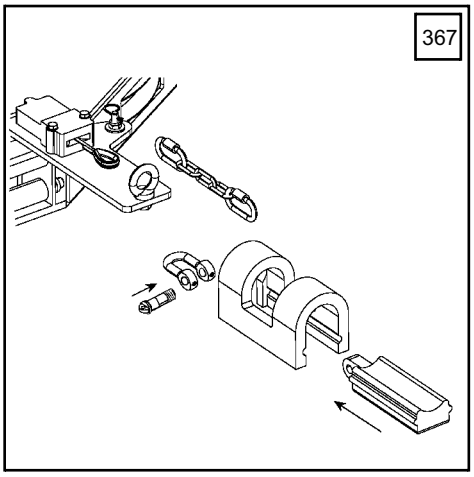
Tip boom HS 855 HD

1 Anchor bar
2 A-frame tip boom
3 Rig bolt
4 Positioning bar
5 Attachment point
6 Shackle
7 Tensioning shackle
8 Rope guard tubes
9 Rope fixation
10 Transport shackle
11 Support
12 Shackle
13 Rig bolt
14 Half shell
15 Lower pivot point
16 Upper pivot point

9.64 Maintenance of the tip boom



- Check that the half shell is securely fastened to the lower pivot point.
- Check the tip boom for cracks, deformation and corrosion and have repaired by Liebherr Customer Service if necessary.



IMPORTANT!

Maintenance work may only be carried out by **qualified personnel** under the direction of **LIEBHERR CUSTOMER SERVICE** .

Hoisting limit switch

Function testing the hoisting limit switch

- Luff the hoisting rope and carefully start the load hook moving against the weight of the hoisting limit switch (Figure 366, 2).

If it is functioning properly, the **"raise" function of winch 2 and the "lower" function of the main boom adjusting winch** will be disabled.

Check the freedom of movement of the limit switch fittings by hand, and if necessary spray with bonding lubricant.

Hose winches lower limit switches

Both hose winches are fitted with a "lower limit switch". When the limit switch is reached, the lowering movement of the hose winch being operated is switched off.

Limit switch symbols on the screen:

Limit switch symbol for bottom left hose winch.

The lowering movement of the "bottom left" hose winch is switched off.

Limit switch symbol for bottom right hose winch.

The lowering movement of the "bottom right" hose winch is switched off.

Upper limit switch (hoist limit switch) for hose winches

The two winches also have a "hoist limit switch" (upper limit switch). When the limit switch is reached, the lifting movement of the hose winches is switched off.

Limit switch symbols on the screen:

Limit switch symbol for top left hose winch.

The lifting movement of the "top left" hose winch is switched off.

Limit switch symbol for top right hose winch.

The lifting movement of the "top right" hose winch is switched off.

Any activated limit switch can be overridden in assembly mode and limit switch override mode.