# Operating manual

EN

Type:

**HS 873 HD**

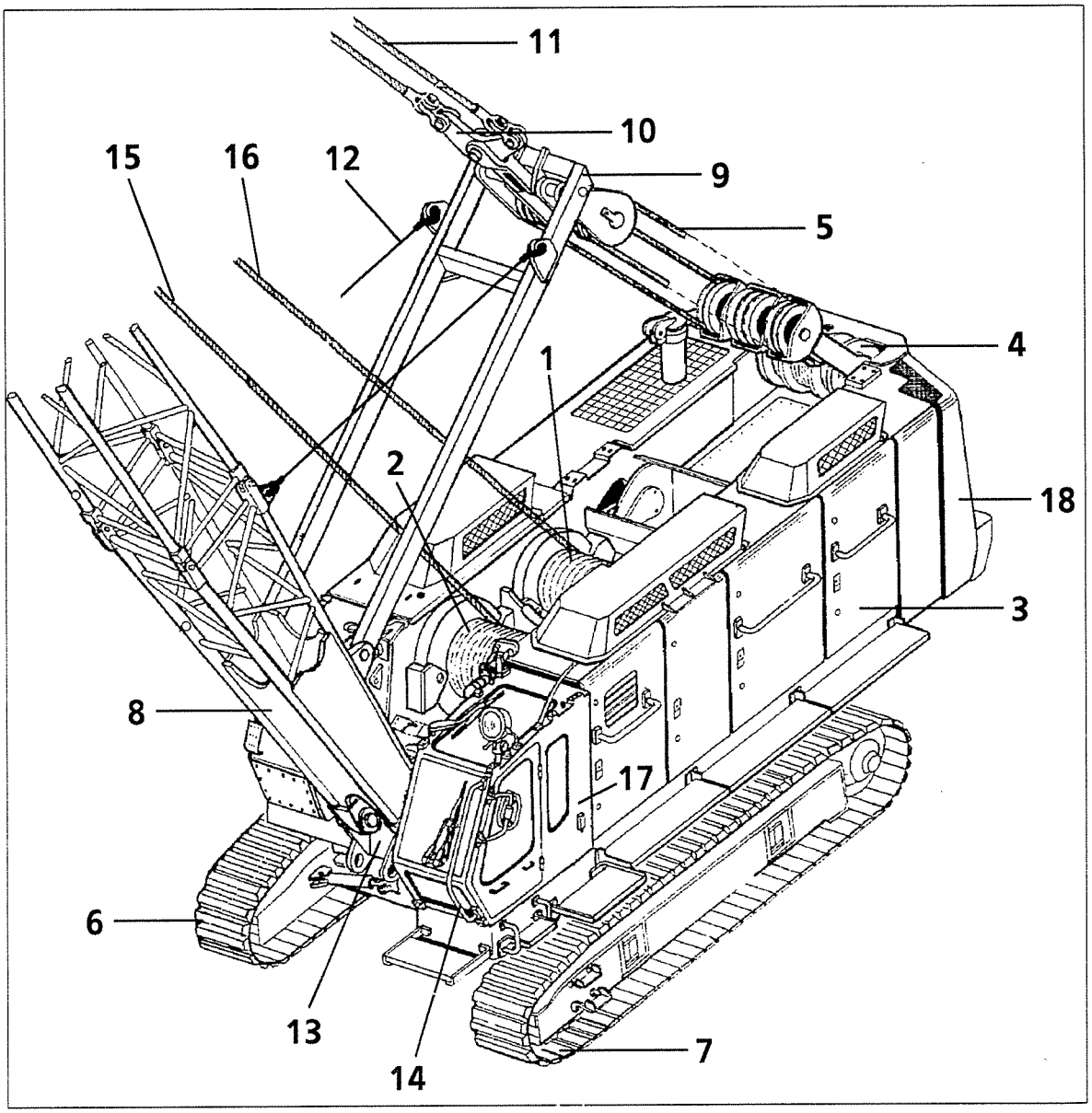
Serial number:

**185 134**

LIEBHERR

# 1. TECHNICAL DATA

## 1.1 MAJOR COMPONENTS OF THE CRAWLER CRANE




Overview of main components

**Figure A**

**Description of components (Figure A):**

1 Winch 1
2 Winch 2
3 Power pack
4 Boom hoist winch
5 Boom hoist wire rope
6 Right crawler
7 Left crawler
8 Boom foot section
9 A- frame
10 Equalizing wing
11 Boom guy cables
12 Assembly ropes
13 Swing gear
14 Operator's cab
15 Hoisting wire rope Winch 2
16 Hoisting wire rope Winch 1
17 Switchbox X1
18 Counterweight

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# 1.4 TECHNICAL DATA HYDRAULIC CRAWLER CRANE

**NOTE !**

**1. Technical Data**

The following Technical Data provides information on transport dimensions, transport weights, and possible equipment versions.

**2. Load Capacities**

The crawler crane must only be operated in accordance with the valid load capacity table listed in chapter 1. The valid load capacity table is also printed on an adhesive foil and located in the operator's cab. The load capacities indicated in the following Technical Data sheets are general information, and concerning information of possible equipment versions, and are **not valid for any operations.**

# 2. SAFETY INFORMATION

Working with a crawler crane can be dangerous and could result in severe injury or death if proper precautions are not taken! **WE URGE YOU TO READ THIS MANUAL CAREFULLY!** This safety information is provided for the operator and maintenance personnel to ensure a safe operation and maintenance for this machine. It is essential, that you read and familiarize yourself with this safety information. This instruction manual explains safety requirements and specific hazards that you must be aware of.

Following these safety information carefully will permit safe operation and maintenance procedure. Doing so could potentially prevent personal injury to yourself and to others, and prevent possible damage to the crawler crane.

Important safety notes, such as **DANGER, WARNING,** and **ATTENTION** are used throughout this manual to emphasize important or critical instructions.

In this manual **DANGER, WARNING,** and **ATTENTION** are defined as follows:

**⚠ DANGER !**

**Indicates an extreme intrinsic hazard, which could result in a high probability of death or serious injury if proper precautions are not taken.**

**⚠ WARNING !**

**Indicates a hazard, which could result in serious injury if proper precautions are not taken.**

**⚠ ATTENTION !**

**Indicates a reminder of safety practices or directs attention to unsafe practices if proper precautions are not taken.**

**IMPORTANT !**

Indicates **important operation and maintenance procedures,** which could result in structural damage of the machine or any of its components if not observed.

**NOTE !**

Describes **operation and maintenance procedures,** which should be followed to keep the machine **operational,** and insure long machine life, and to facilitate certain procedures.

In addition to these safety instructions you must follow the local and national safety regulations applicable to your local work environment and jobsite, and any federal, state, and local safety requirements.

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## 2.13.2 Working in dangerous areas

For dangerous work (demolition or piling operation), where danger of falling objects occurs, an original cab protection device must be mounted to the operator's cab.

## 2.13.3 Driving mode

- Due to the limited visibility afforded to the operator, a signal person should always be on site to guide the machine movements using standard hand signals.

**DRIVING WITH SUSPENDED LOAD**

Driving by using the tavel gear with suspended loads is general always possible.

**NOTE !**

When driving with a long boom subjected to a high utilization of the maximum permissible load capacity, the following can reduce the stability of the machine and can lead to accidents:

- Severely inclined terrain and inability of the soil to support the actual lifted load
- Swinging of the load due to acceleration forces

**The following measures are therefore recommended:**

- Drive with suspended load only on a firm and level ground with sufficient ground stability. Carry the suspended load as close as possible to the ground. Reduce swinging of the load by driving slowly. Do not drive with suspended loads at maximum permissible load capacity. Curves should be performed with the largest possible radius.

## 2.13.4 Assembly operation

- For major conversion work on the machine or on the attachments, always following the assembly instructions in chapter 7 of this instruction manual.
- Major conversion work is for example, when changing the actual mounted attachment.

**Transportation and assembly or disassembly of the machine is explained in chapter 7 of this instruction manual.**

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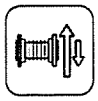
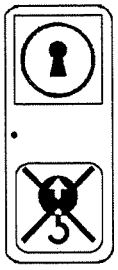
**Freefall On / OFF selector button**

For activating the freefall function of the winch 1 and / or 2. See "Freefall function" in chapter 4.



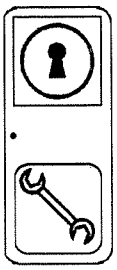
**Button for "Additional winch ON / OFF"**

For activating the additional winch. See chapter 10.



**Key switch for "Bypassing the Load Moment Limiter"**

To bypass the Load Moment Limiter during crane operation for moving the machine out of the danger zone. See chapter 10.



**Key switch for "Switching off the Load Moment Limiter"**

To switch off the Load Moment Limiter. This function must only be used for assembly / disassembly procedures! See "Load Moment Limiter" in chapter 10.

**Selector button "Free swing system On / Off"**

To activate the free swing system. See "Free Swing System" in chapter 4.


**Selector button for swing speed stage**

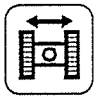
By pressing this button the speed stage for the swing can be adjusted. Three different speed stages are possible. (20%, 60%, or 100%).

**Button for "Searching lights On / Off"**

To activated the search lights.

**Button "Inside lights On / Off"**

For inside lights and engine lighting.



**Button for "Track shifting On / Off"**

To select the track shifting cylinders. Refer to chapter 7 for details.

**Button for "Wiper On / off"**

To activated the corresponding windshield wiper.

**Button for "Intermittant wiper function On / Off"**

To activate the intermittant wiper function for the corresponding windshield wiper.

**Buttton "Windshield washer system On / Off"**

To activate the windshield washer system for the corresponding windshield wiper. See under "Windshield wiper" in chapter 4.

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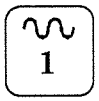
## DESCRIPTION OF SYMBOLS:

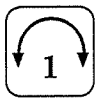

**Symbol "Freefall Winch 2 activated"**


**Symbol "Freefall Winch 1 activated"**


**Symbol "Fast speed winch 2 activated"**




**Symbol "Fast speed winch 1 activated"**




**Indication of selected swing speed**

Shows the selected speed stage of the swing gear. The stages 1, 2 or 3 can be selected via the corresponding selector button at the right control panel.

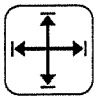
**Symbol "Free swing system activated"**

**Symbol "Warning"**

This symbol flashes at an actual utilization of more than 90%.

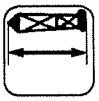

**Symbol "Stop" (Appears instead of the warning- symbol)**

Shut off flashes at an actual utilization of 100%. The following functions will be shut off:
- Winch 1 + 2 "HOISTING"
- Boom hoist winch "LOWERING"



**Symbol "Drive in limitation"**

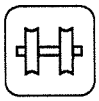
This symbol is installed to recognize "cut off" functions. (Limit switches). The indication occures if one of the following limit switches is tripped, and the corresponding control lever is moved into the switched off direction.



**Symbol for "Boom number"**

**Symbol for "Boom head number or fly jib number"**

**Symbol for "Counterweight number"**

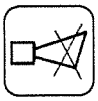


**Symbol for "Reeving"**

**Symbol "Change Page"**

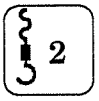
**This symbol flashes:**
- if an error occurs in a system which is not displayed at the moment.
- if several errors on different pages occur.

By pressing the function button **F7** it can be changed to the LICCON- page, where the actual error is displayed by a flashing symbol.



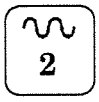
**Symbol "Alarm silencer"**

By pressing the function button **F8** the alarm will be silenced. **NOTE ! This function doesn't clear the error.**



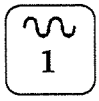

**Symbol "Freefall winch 2 activated"**


**Symbol "Freefall winch 1 activated"**



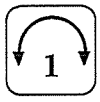

**Symbol "Fast speed winch 2 activated" ***

* Special attachment / otion. Only with switch gear.



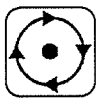

**Symbol "Fast speed winch 1 activated" ***

* Special attachment / option. Only with switch gear.




**Indication of selected swing speed**

Indicates the actual speed stage of the swing gear. The stages 1, 2 or 3 can be selected via the corresponding selector button at the right control panel.



**Symbol "Free swing system activated"**

## 4.1.6 Checking hydraulic oil level of hydraulic tank

When refilling hydraulic oil, note the following:

- With machine standing horizontal the oil level in the hydraulic tank must not be above the upper view glass. (Figure 5, Pos. 1).

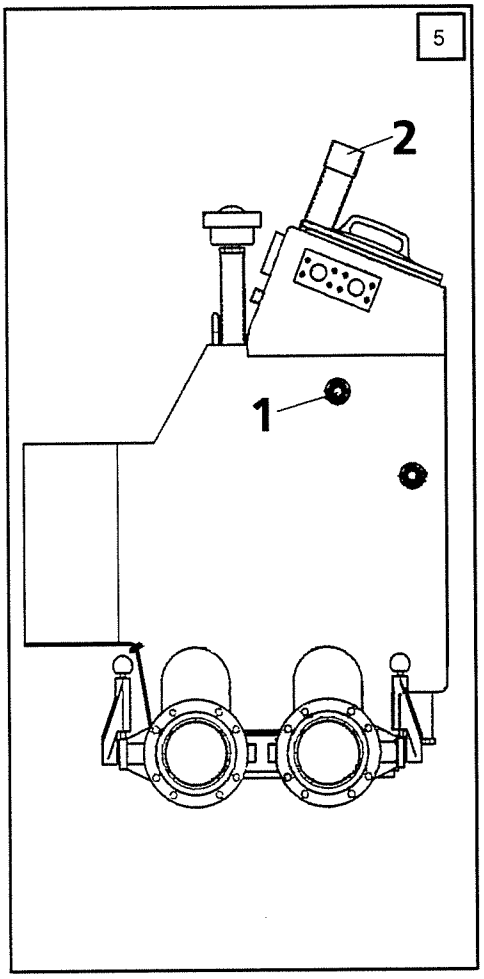
**⚠ ATTENTION !**

**In order to avoid wrong level readings all hydraulic cylinders must be moved in completly. If required, place the additional equipment into transport position.**

**NOTE !**

Only refill the hydraulic tank through the filler pipe at the hydraulic tank. (Figure 5, item 2).

**Use only hydraulic oil with fluid grade and viscosity as specified in chapter 5 of this instruction manual.**




## 4.1.7 Slide valves at the hydraulic tank

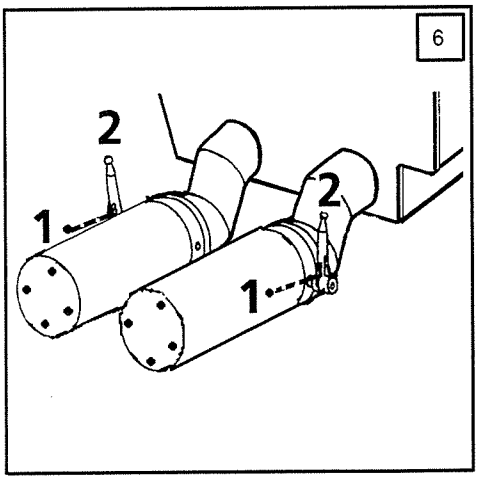
Before starting the diesel engine the setting of the slide valves at the suction pipe of the hydraulic tank must be checked.

**Possible positions:**

- 1 = slide valve open (situated parallel to suction pipe).
- 2 = slide valve closed (situated 90° to suction pipe).

**NOTE !**

**The closed position of the slide valve can be depending on manufacturing turned by 180°.**




## 4.1.8 Electrical system

Check all switches, displays and lighting system for their proper function as well as battery acid level and batteries mounting.

**⚠ ATTENTION !**

**When working on the battery always wear safety goggles and safety gloves. Keep sparks and open flames away from batteries!**

## 4.10.6 Load capacity table

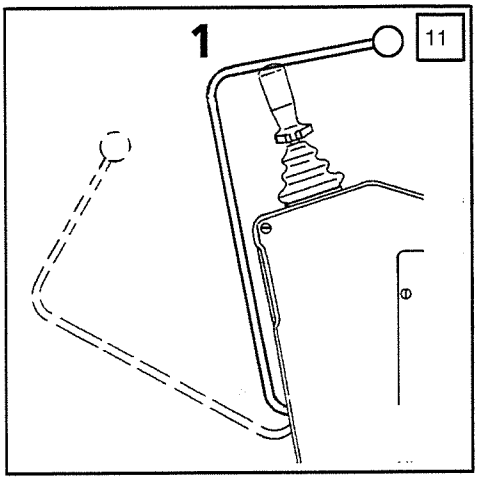
### Load capacity table for crane operation

The values specified in the load capacity table apply only to a machine standing on solid and level ground. The specified load capacities can be turned 360° and are based to overall counterweight, wide crawler tracks, and 75% of maximum tipping load. If these established values are not observed, **the machine may tipple!** The weight of the lifting device (grab, hook block, etc,) must be deducted from the actual load capacity.

### LOAD CAPACITIES FOR SPECIAL ATTACHMENTS

The load capacity and working range tables for special attachments and options are provided by the manufacturer of the attachment.

## 4.10.7 Safety lever foe "electric control"




The safety lever (Figure 11) shut off the electric control, when it is set into upright position. (pos. 1).
In this position the functions of the control levers are blocked. (For swing gear, winches 1 + 2, boom hoist winch and crawler drive).
This is provided so that no movements are unintentionally initiated during climbing in or out of the operator's cab. For this reason the safety lever must be pulled upright, before exit the operator'S cab.

**⚠ ATTENTION !**

- Activation of the safety lever during a swing movement will not bring the superstructure to an abrupt halt. It will, however, make the control lever of the swing gear inoperable!
- In the same way, activation of the safety lever during a freefall movement of winch 1 and/or 2 will not bring the movement to an abrupt halt. It will, however, make freefall mode inoperable, as soon as the winches are on a standstill.

# 4.15 HOOK OPERATIONS WITH WINCH 1 + 2

## 4.15.1 General

Hook operation mode for winch 1 + 2 is automatically selected, every time the diesel engine is started. In crane operation mode the load on the winch 1 + 2 is automatically held by the drive aggregate and additionally secured by the safety brake system. (Lamella disc holding brake).
Hook operations with winch 1 or 2 must be carried out in accordance with the local and national safety regulations.
The maximum permissible load capacity refer to **hook operations with winch 1.** For hook operations with winch 2 a earlier shut off results.

**IMPORTANT !**

To ensure optimum utilization during hook operation the rpm. setting of the diesel engine must be set to **1600 rpm.** Thus the diesel engine is protected against overloading by the electronic power regulation system.

## 4.15.2 Wire rope reeving

The maximum lifting power of the machine depends on the maximum line pull of the winch as well as on the actual wire rope reeving. For heavy loads the wire rope must be reeved in accordance with the principles of pulley operations with the corresponding amount between the pullies at the boom head and the pullies at the hook block. (See wire rope reeving in chapter 8). Rope reeving must be carried out in accordance with the specified reeving values given in the corresponding load capacity table.

**IMPORTANT !**

For each operation the appropriate amount of reeving according to the maximum line pull of the winch, and in accordance to the safety regulations must be used. The maximum of 3 layers at the winch drum must not exceed. Transportation of persons with the winch 1 + 2 is strictly prohibited.

## 4.15.3 Counterweight

The stability of the machine and the maximum load capacity depends on the mounted counterweight. For all operations modes the corresponding counterweight as specified in the load capacity table must be mounted. (See load capacity table in chapter 1).

## 4.15.4 Operations

Operations of winches 1 + 2 are carried out via the control levers (Figure C, pos. 2 + pos. 3). With the control lever (Figure C, pos. 3) the **winch 1** is controlled proportional from 0 to maximum winch speed. Control lever (Figure C, pos. 2) controls the **winch 2** in the same way. For both winches following directions are valid:

- Control lever forward = Winch lowering
- Control lever backward = Winch hoisting

**ATTENTION !**

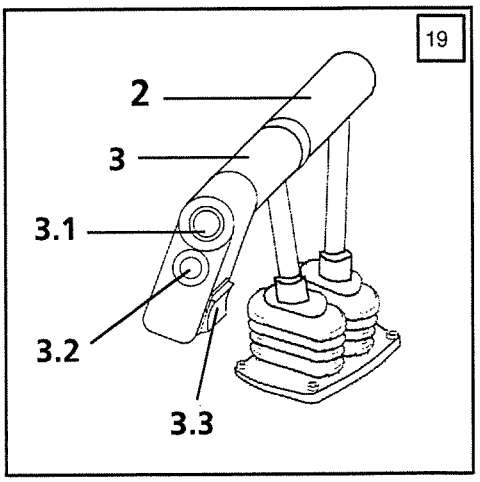
**Demolition operation mode with "demolition ball" is prohibited.**

## 4.15.5 Hoisting limit switch *

A hoisting limit switch * can be attached to the boom head, which prevents the hook block (lifting device) from running against the boom head. With attached hoisting limit switch the hoisting direction for winch 1 and 2 as well as the lowering direction for the boom hoist winch are blocked if the limit switch is activated.

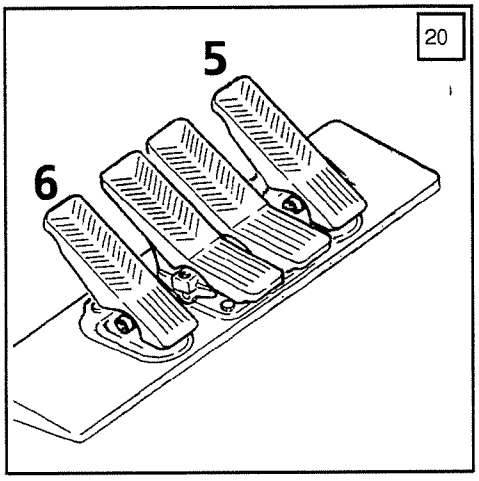
## 4.20 INTERLOCK CONTROL SYSTEM

By means of this control system it is possible to work in dragline operation mode via the brake pedal in "power loaded operation". Because of this, the wear of the freefall brakes will be reduced to a minimum.
The stored kinetic energy of the dragline bucket at the winch 2 will not be discharged as heat. Thru this "non-positive operation", it will now be feeded via hydraulic transmission to the hydraulic system of the winch 1.




### 4.20.1 Interlock control system "On"

Before or during a lifting movement of the dragline bucket by means of activate the control lever for **winch 1** (Fig. 19, pos. 3), the interlock control system can be activated by pressing the push the button at the control lever for winch 1. (Figure 19, pos. 3.1). The winch 2 must be held by means of completly pressed brake pedal.




Then the freefall brake of winch 2 is engaged, and the winch 2 is switched over from freefall operation mode into power loaded operation.

When the interlock control system is activated, the winch 2 can be operated parallel to the freefall operation of winch 1 by means of activating the corresponding brake pedal. (Figure 20, pos. 5) as followed:

- Brake pedal completly pressed = winch at standstill
- Brake pedal released = maximum winch speed

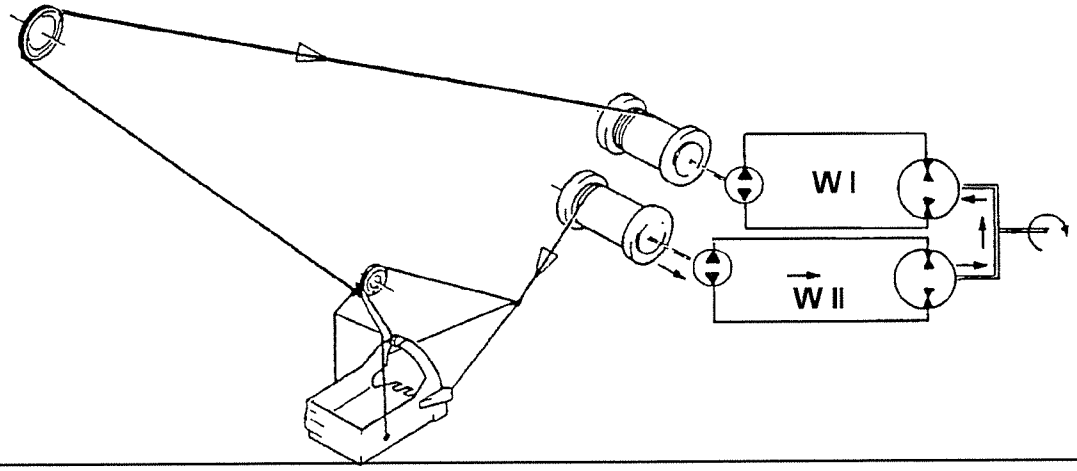
The winch speed can be operated proportional from zero up to maximum speed by controlling the brake pedal.

**IMPORTANT !**

The interlock control system is only activated as long as the push button at the right control lever will continuously be pressed. If the push button will be released, freefall function of winch 2 will be activated again!

- In order to release the interlock control system after a hoisting motion of winch 2 has been performed, the interlock control system must be activated as explained above.

**PRINCIPLE FOR INTERLOCK CONTROL SYSTEM**




**W I = winch 1**
**W II = winch 2**

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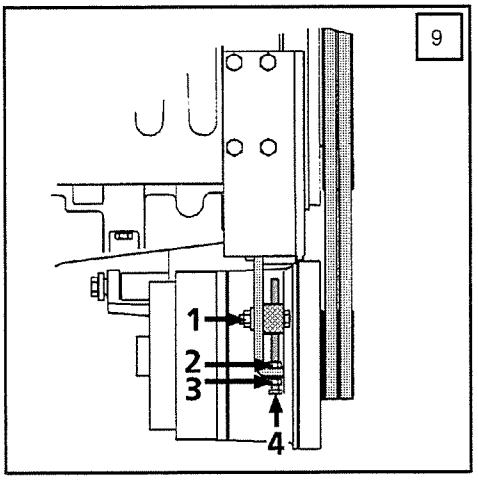
Telefax 0044 - (0)191 - 514-4191




### 6.4.1 Adjusting V- belt tension

- Loosen both clamping screws (Figure 9, pos. 1) and locking nuts (Figure 9, pos. 2 + pos. 3).
- Screw in or out the adjusting screw (Figure 9, pos. 4), until the proper V- belt tension is achieved.
- Retighten the clamping screw (Figure 9, pos. 1) and locking nut. (Figure 9, pos. 2 + 3).

**NOTE !**

Broken or damaged V- belts must be replaced immediately.

### 6.4.2 Changing the V- belt

- Loosen clamping screw (Figure 9, pos. 1) and lock nuts (Figure 9, pos. 2 + pos. 3).
- Screw in or out the adjusting screw (Figure 9,pos. 4) until the V- belt is slack.

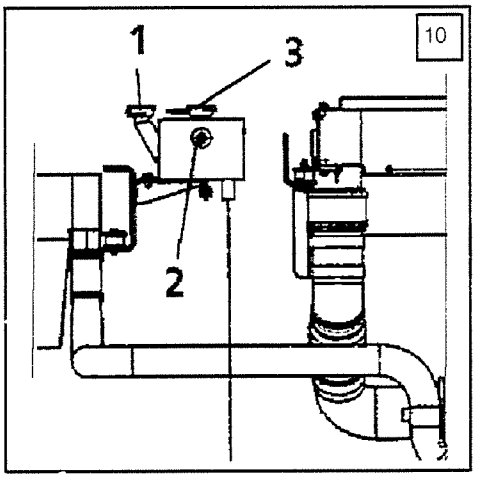
**NOTE !**

For a proper assembly of the V- belt it is necessary to loosen the corresponding additional equipment and tightening device of the V- belt, until it can be fixed without any problems.

- After the new V- belts are mounted, the correct V- belt tension has to be adjusted. Therefore, proceed as explained above.

## 6.5 COOLING SYSTEM OF DIESEL ENGINE

### 6.5.1 Checking the cooling level




**ATTENTION !**

**At operating temperature the engine coolant is hot and under pressure. Avoid contact with components containing coolant it can cause serious burns. Open the filler cap (Figure 10, pos. 1) only, after the expansion reservoir has been cooled down enough to touch. Turn the cap slowly 90° first, to relief pressure.**

The filler cap (Figure 10, pos. 3) is provided as a protection device against overpressure and must not be opened under normal operating conditions. The cap is equiped with a safety valve of 0.7 bar.
After openning the filler cap (Figure 10, pos. 1) the coolant level must be visible at the view glass.
Check cooler, radiator fan and hydraulic motor for possible damages clean if required.
After refilling the cooling system via the filling nozzle (Figure 10, pos. 1), briefly let the diesel engine run with activated heating and check coolant level again.

## 6.6.16 Arrangement of fuel system

The hand pump (Figure A, pos. 5) for bleeding the fuel system, the fuel water separator (Figure A, pos. 3), the shut off valve (Figure A, pos. 4) for service works, as well as the fuel and lube oil filters are arranged directly at the diesel engine.

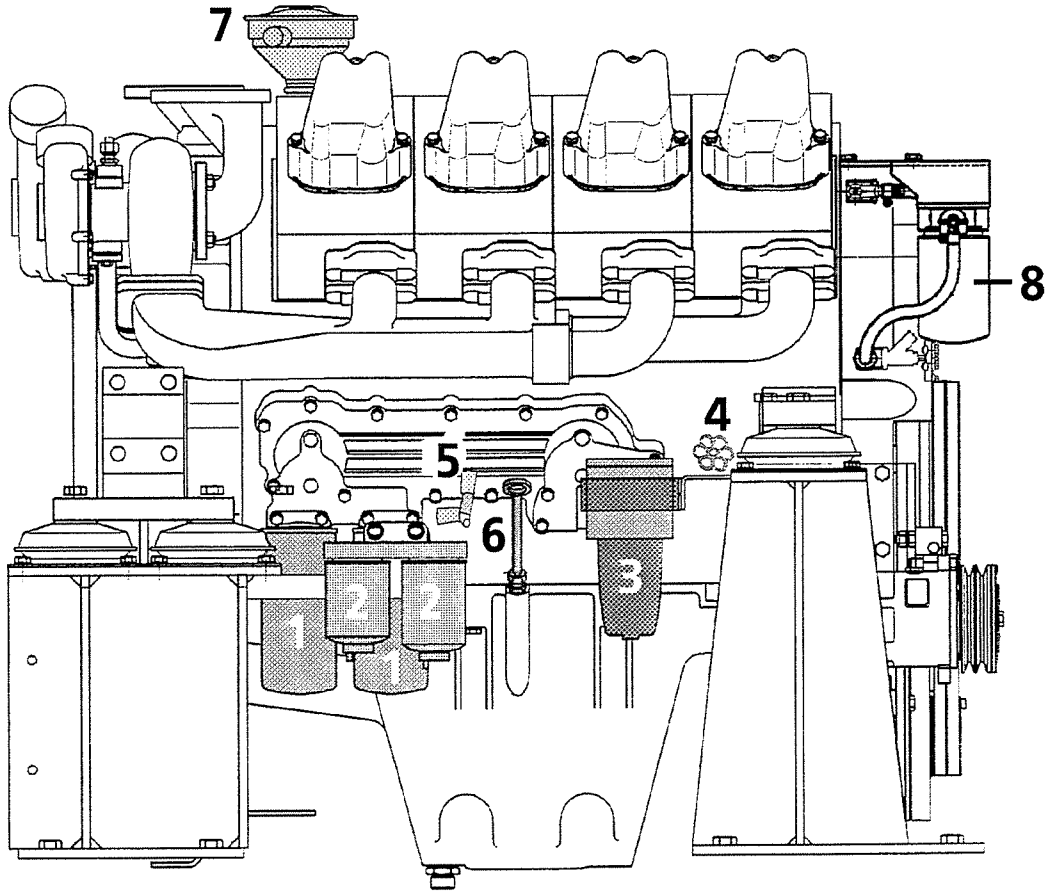



**Figure A**

**Description of components:**

1 Lube oil filter cartridges
2 Fuel filter cartridges
3 Water separator fuel system
4 Shut off valve
5 Hand pump
6 Dip stick
7 Oil separator
8 Waterfilter cooling system

## 6.10 WINCH 1 AND 2

The planetary gear and the bearings of the winches 1 + 2 are located inside the winch drum and are immersion lubricated.

**Before starting the diesel engine, the gear oil level must be checked, and if required, gear oil must be filled. For gear oil type ans specifications see Chapter 5.**

**Checking the oil level** can be done with the dip stick at the drive input side (item 1). The dip stick must be completely screwed in to check the oil level accurately.

**The gear oil must be filled via oil filler inlet (Figure D, pos. 1) at the drive input side.**

### 6.10.1 Changing the gear oil

At the drive input side the gear oil can be drained via hose coupling (Figure D, pos. 2).

**To drain the gear completely the gear oil must be drained via this drain place.**

### 6.10.2 Recommendation for service

**Change the gear oil** whenever possible with gear at operating temperature.
In lower ambient temperarures we recommend rinsing the winch with a partial amount of heated new oil so that sediments can be drained. (See also gearbox inspection).

**NOTE !**

The filling amounts in the capacity chart are only approximate values. (See Chapter 5). The actual filling amount must always be checked with the dip stick.

### 6.10.3 Cooling for freefall brake

The freefall brake is flushed with hydraulic oil. Besides regularly changing the hydraulic oil, the freefall brake requires no special maintenance.

For changing the hydraulic oil see maintenance of hydraulic system in chapter 6.

When changing the hydraulic oil of the hydraulic tank it has to observed, that a part of hydraulic oil remains in the freefall brake housing. This oil must be drained via the oil drain screw (Figure D, pos. 3) by means of the drain hose.

### 6.10.4 Wear control of tooth profil shaft hydraulic motor / drive shaft

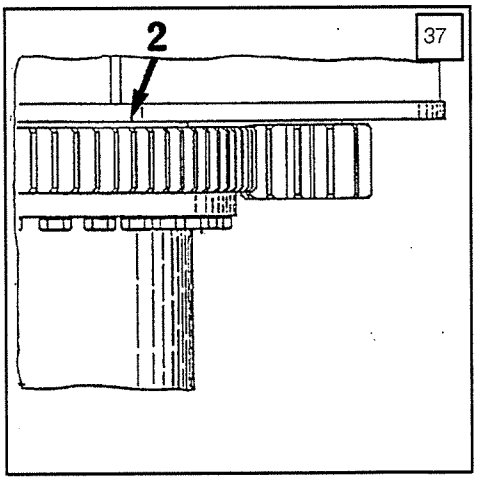
Therefore we recommend to dismount the hydraulic motor (Figure D, pos. 9) and check the wear of the tooth profile shaft after approxiametely **3000 working hours.** In case of less wear, this inspections should be repeated in adequate periods (anually), in order to get an exact information concerning the progress of wear.

In case such wear have caused a reduction of the tooth thickness of more than **30 %** against to new ones, the parts must be replaced.

### 6.10.5 Standstill monitoring

If freefall operation has been selected this sensor enables the hoisting movement if the winch is at a standstill. The standstill sensor on the winches 1 + 2 must be checked weekly for its secure fixation (Figure D, pos. 6).

## 6.16 ROLLER BEARING SWING CONNECTION

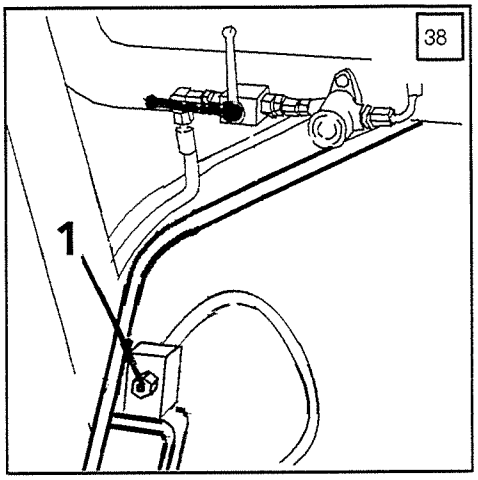



### 6.16.1 Toothing

- The surface of the toothing (Figure 37, Position 2) must be lubricated daily in accordance with the maintenance chart, and by using lubricants listed in chapter 5 of this instruction manual.
- The surface of the toothing must be visually inspected for corrosion after longer standstill periods. The surface characteristics of the teeth, the swing connection, and the swing gear must be inspected.

### 6.16.2 Fastening screws

- The inner and outer fixation screws of the roller bearing must be checked with a torque wrench in accordance to the maintenance chart for proper and secure fixation. **Tightening torque: 1757 Nm**

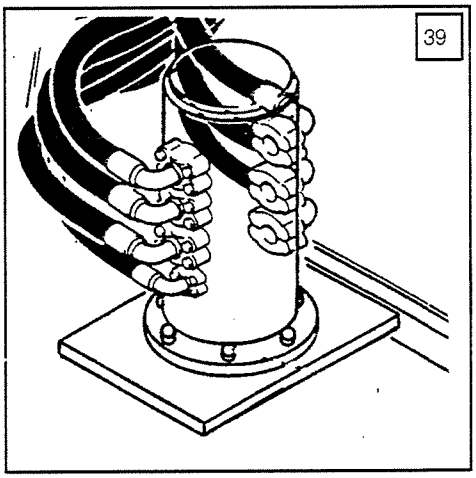



### 6.16.3 Lubricate roller bearing connection

- Lubricate the roller bearing by using the central graising point (Figure 38, Position 1). As a rule the bearing must be greased, until the grease is visible from the outside on the entire rim of the roller bearing. (Figure 36, Position 2).

### 6.16.4 Lubrication procedure

- Apply grease to the provided grase point (Figure 38, Position 1).
- Swing the superstructure **45 ° further,** apply new grease and repeat this greasing procedure **around the entire roller bearing.**
- To ensure a correct distribution of the grease, use the swing gear and turn the superstructure completly.
- Then check correct greasing to ensure, that a closed rim of grease has been formed on top of the roller bearing. (Figure 38, Position 2).




**⚠ ATTENTION !**

**During activatinf the swing gear no persons must be stand within the swing range of the machine !**

### 6.16.5 Checking hydraulic swing connection

Depending on the used additional hydraulic the following hydraulic swing connections are built in:

- 7- way swing connection (Figure 39) for standard equipment
- 11- or 12- way swing connections with additional device such as casing oscilator

The built in hydraulic swing connection must be checked for their proper fixation and seal.

## 6.18.3 Recommendation for single layer operation

Cable for single layer operation with nominal breaking load 1770 N/mm^2

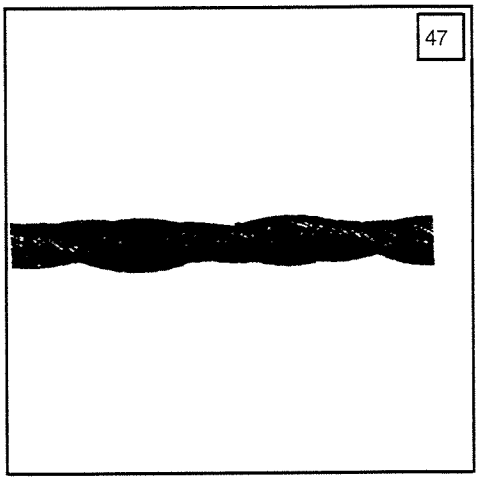
| mode | Winch force [kN] | cable diameter [mm] | breaking force calculated [kN] | breaking force minimum [kN] | Max. allowed cable force hoisting cable [kN] | | Cable type |
|---|---|---|---|---|---|---|---|
| H | 80 | 20 | 417 | 325 | 93 | | PDD1918Z |
| G | | 20 | 337 | 295 | 60 | | PCStratoplast |
| S | | 20 | 337 | 295 | 67 | HOIST CABLE | PCStratoplast |
| S | | 18 | 302 | 253 | 76 | GRAB CABLE | PDPZ371 |
| B | | 20 | 417 | 325 | 108 | | PDD1918Z |
| R | | 20 | 417 | 325 | 65 | | PDD1918Z |
| H | 120 | 24 | 601 | 469 | 134 | | PDD1918Z |
| G | | 24 | 484 | 423 | 86 | | PCStratoplast |
| S | | 24 | 484 | 423 | 97 | HOIST CABLE | PCStratoplast |
| S | | 22 | 456 | 383 | 114 | GRAB CABLE | PDPZ371 |
| B | | 24 | 601 | 469 | 156 | | PDD1918Z |
| R | | 24 | 601 | 469 | 94 | | PDD1918Z |
| H | 160 | 26 | 699 | 545 | 155 | | PDD1918Z |
| G | | 26 | 577 | 505 | 102 | | PCStratoplast |
| S | | 26 | 577 | 505 | 115 | HOIST CABLE | PCStratoplast |
| S | | 24 | 537 | 450 | 134 | GRAB CABLE | PDPZ371 |
| B | | 26 | 699 | 545 | 182 | | PDD1918Z |
| R | | 26 | 699 | 545 | 111 | | PDD1918Z |
| H | 200 | 30 | 938 | 732 | 208 | | PDD1918Z |
| G | | 30 | 761 | 666 | 135 | | PCStratoplast |
| S | | 30 | 761 | 666 | 152 | HOIST CABLE | PCStratoplast |
| S | | 28 | 727 | 611 | 182 | GRAB CABLE | PDPZ371 |
| B | | 30 | 938 | 732 | 244 | | PDD1918Z |
| R | | 30 | 938 | 732 | 147 | | PDD1918Z |
| H | 250 | 34 | 1204 | 939 | 268 | | PDD1918Z |
| G | | 34 | 976 | 854 | 173 | | PCStratoplast |
| S | | 34 | 976 | 854 | 195 | HOIST CABLE | PCStratoplast |
| S | | 32 | 954 | 800 | 239 | GRAB CABLE | PDPZ371 |
| B | | 34 | 1204 | 939 | 313 | | PDD1918Z |
| R | | 34 | 1204 | 939 | 189 | | PDD1918Z |
| H | 300 | 36 | 1340 | 1045 | 298 | | PDD1918Z |
| G | | 36 | 1089 | 952 | 193 | | PCStratoplast |
| S | | 36 | 1089 | 952 | 218 | HOIST CABLE | PCStratoplast |
| S | | 34 | 1090 | 916 | 273 | GRAB CABLE | PDPZ371 |
| B | | 36 | 1340 | 1045 | 348 | | PDD1918Z |
| R | | 36 | 1340 | 1045 | 212 | | PDD1918Z |

**⚠ ATTENTION !**

All values listed in the above tables are not subject to alteration. The listened data and breaking forces are based on calculations on october 1994.This tables are not valid if special wire ropes for special operation modes which are explained in this instruction manual are recommended!

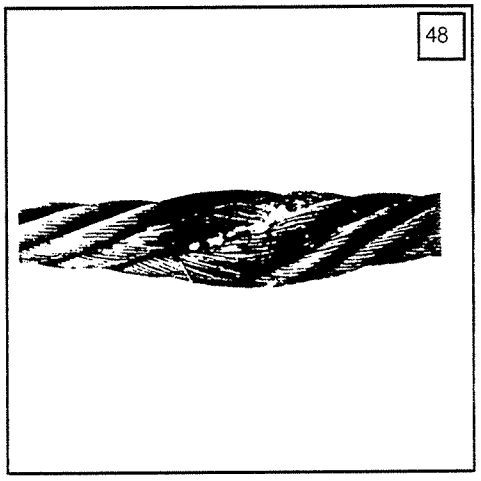
## 6.18.23 Contractions

Contractions (Figure 47) are reductions of diameter of the wire ropes within short distances. Rope parts next to the endfastenings have to be examined more carefully for contractions, because they are very hard to notice. Wire ropes with a considerable number of contractions must be replaced.




## 6.18.24 Flattenings

Flattenings (Figure 48) are deformations of the rope as a result of violent pressure. Flattenings often cause wire breaks and therefore the wire rope must be replaced.

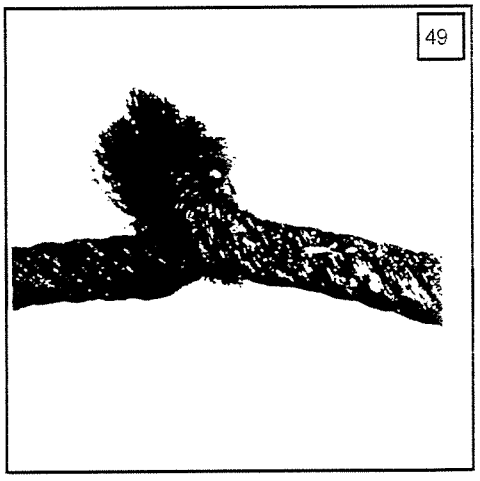



## 6.18.25 Curl- like deformations

Curl- like deformations appears if a loaded wire rope is pulled over an edge. Wire ropes with such kind of deformations must also be replaced.

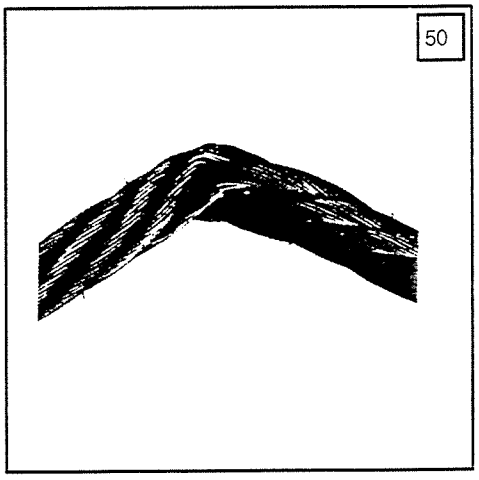
## 6.18.26 Nooses

Nooses (Figure 49) are deformations of the wire rope, which originate from eyelet-shaped loops, that are straightened, and the wire rope cannot equalize its torsion. Wire ropes with one or more nooses must be replaced.




## 6.18.27 Bends

Bends (Figure 50) are deformations of the wire rope, which results from violent outside influences.
Wire ropes with such bends must be replaced.
Wire ropes which have been exposed to extreme heat (rope has tempering colors) must also be replaced immediately.



## 6.21 HEATING AND VENTILATION SYSTEM

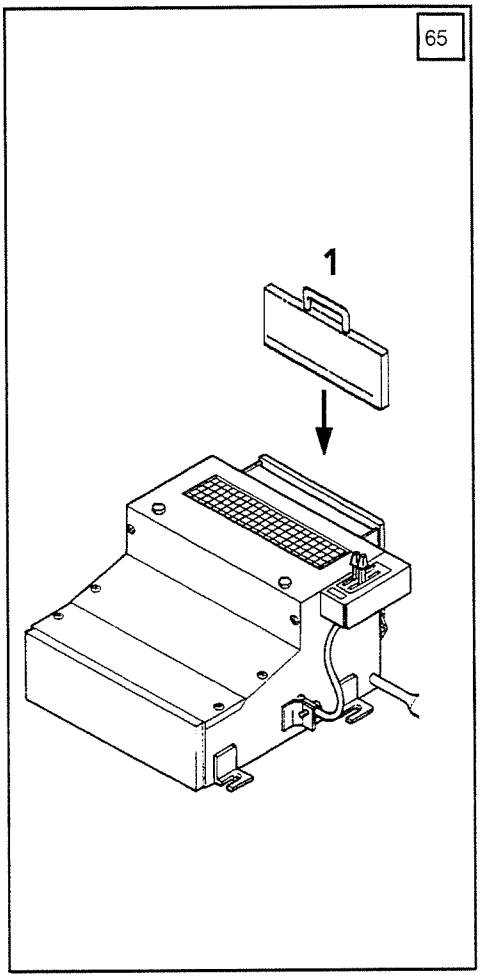
Check the heating and ventilation functions. The following inspections must be carried out at regular intervals, but at least once a year before winter season.

- Check the heating unit for their proper functioning
- Check all warm water connections and lines for their proper seal, and if necessary, retighten it. Worn or damaged hoses must be replaced.
- Check and clean the radiator, radiator fan motor, and heat exchanger unit.
- Turn the heating on to ensure that the coolant contains sufficient antifreeze concentration and corrosion protection.

**Refer to chapter 5 for specifications of used coolant and antifreeze concentration.**

### FRESH AIR FILTER

When necessary, the fresh air filter must be replaced by a new one.
If necessary, remove the filter frame (Figure 65, pos. 1). Dismantle the filter frame, and insert the new filter element.



## 7.2.1 Transporting position

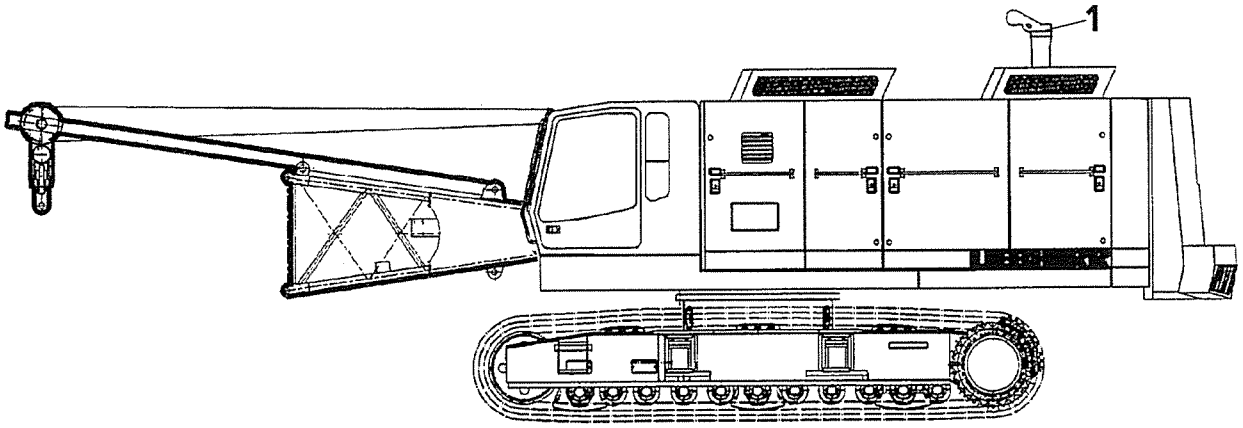
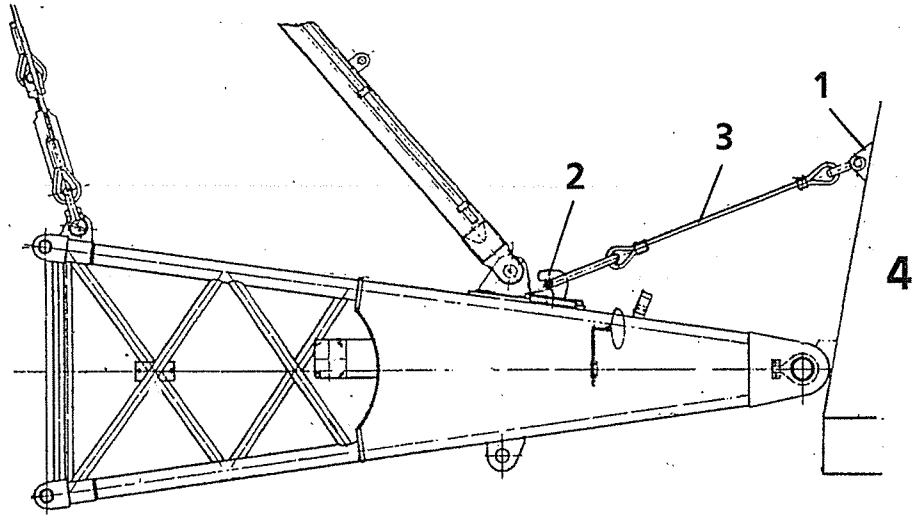



Figure B




Pos. 4 = Superstructure

Figue C

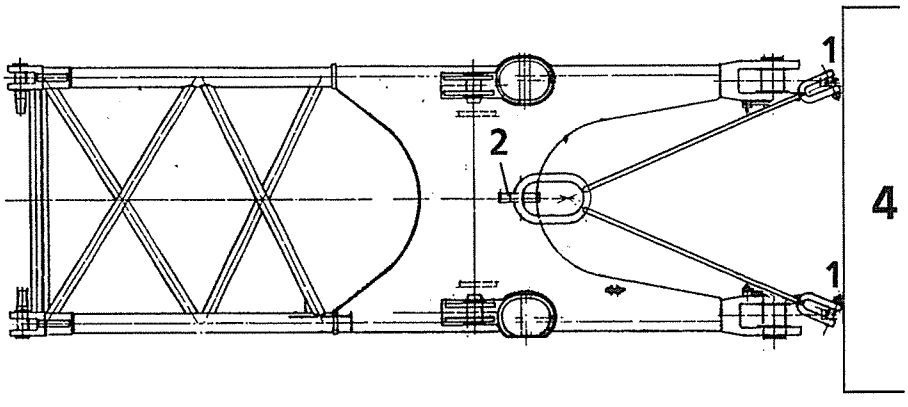
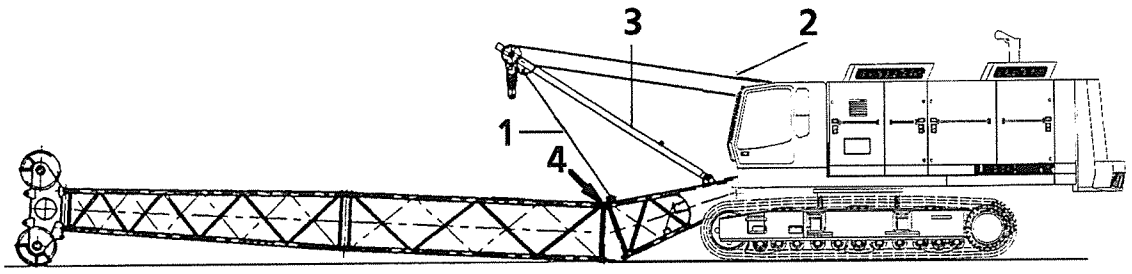
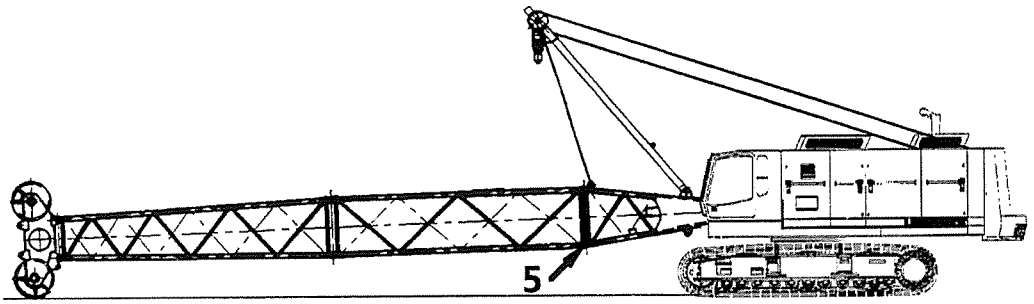



Figure D



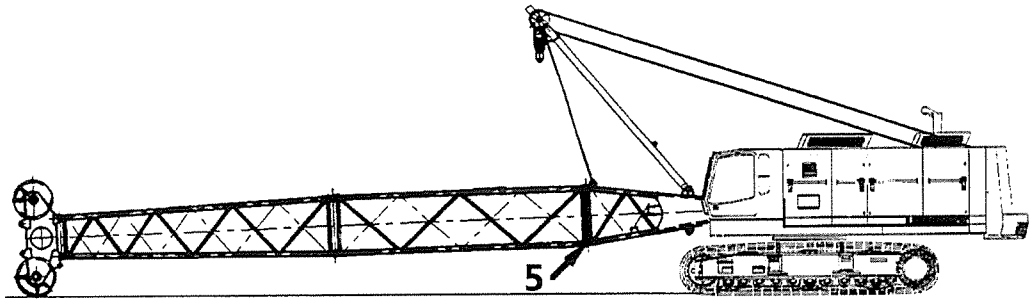

Boom pre- assembled

**Figure O**



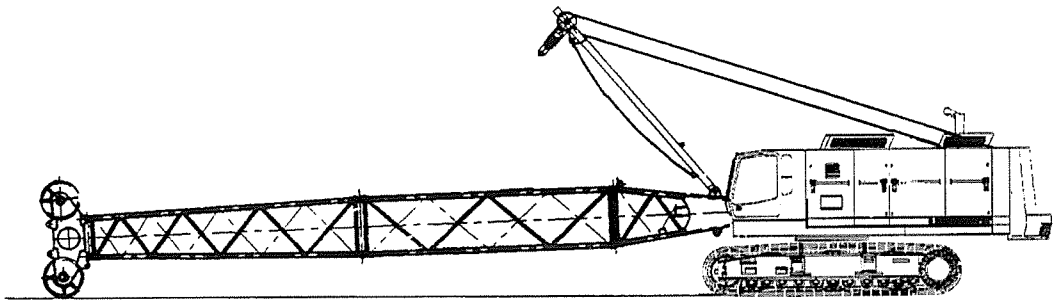

Lower boom fixation pins connected

**Figure P**




Assembly ropes mounted to the A- frame

**Figure Q**



Boom guy cables mounted

**Figure R**

# 8. INSTRUCTIONS ON CHANGING WIRE ROPES

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# 8.4 REPLACEMENT OF HOISTING WIRE ROPES OF WINCH 1 + 2

## 8.4.1 General hints and requirements

When replacing a hoisting wire rope at the hoisting winch make sure, the new wire rope has the same strength rating and specification in accordance to the actual line pull of the winch. Make sure, the new wire rope meets the requirements of the corresponding classification societies for this particular wire rope system.

**a.)** For changing the hoisting wire rope it is necessary, to lower the boom to its horizontal position or lower it completely to the ground.

**b.)** Unwind the old hoisting wire rope until the winch drum is empty. Remove the rope guard and remove the rope from the fixation point at the winch drum. (Figure K). Pull out the old wire rope completely. It must be observed, that the hoisting wire rope must be pulled out completly without any twists or tangels from the winch drum.

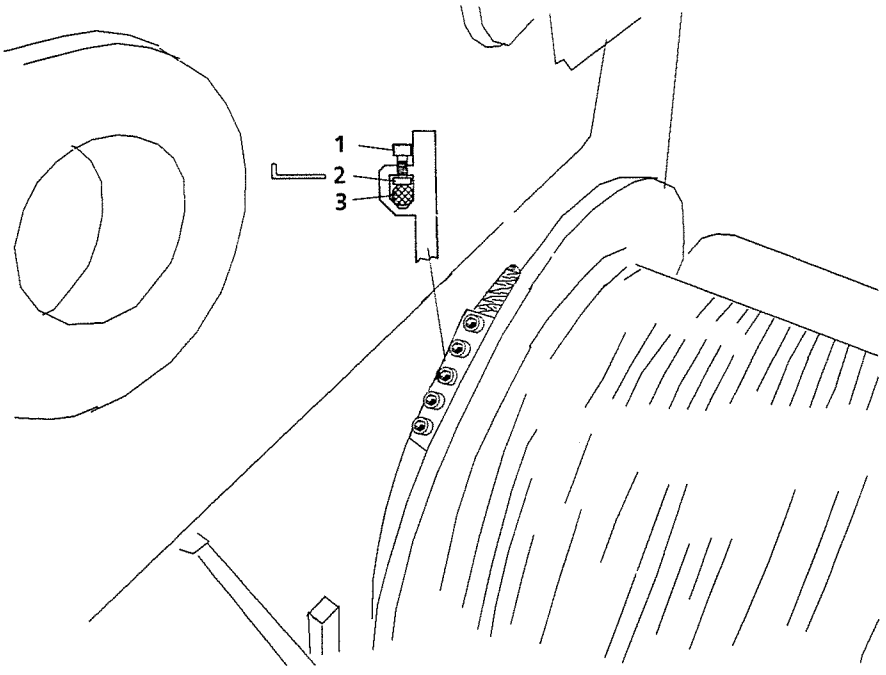
**c.)** Installation and reeving of the new wire rope has to be taken from the corresponding reeving diagram. Reeving the new wire rope can be done by means of an additional reeving cable.

**d.)** Pull the new wire rope to the fixation point at the winch drum, and make sure that it is running in the grooves of the winch drum and of the rope pullies.

**e.)** Push the end of the new wire rope from the center to the outside into the endfastening at the winch drum and mount it to the fixation point.

**f.)** Assemble the rope guard and wind up the new wire rope to the winch drum. While winding up check, that it is correctly reeved and properly lies in the groves of the winch drum and rope pullies.

## 8.4.2 Arrangement of wire rope fixation on winch 1 + 2




Wire rope fixation point at winch 1 + 2

**Figure K**

1 Fixation screw
2 Rope clamp
3 Hoisting wire rope

# LWN - STANDARD

**LWN 2 - 07 - 004**

## ANZUGSMOMENTE FÜR SCHRAUBEN - FEINGEWINDE
Tightening Torque for Bolts - Fine Thread

**Ausgabe**/Edition: **02**

**Seite**/Page: **3/5**

**ANZUGSMOMENTE FÜR SCHRAUBEN (FEINGEWINDE, DIN 13/Bl.1; ISO/R 261)**
Tightening Torque for Bolts (Fine Thread DIN 13/Pt. 1; ISO/R 261)

**Schrauben für allg. Anwendungen ohne besondere Angaben auf der Zeichnung**
Bolts for general applications without specific particulars in the drawing

**Kontaktflächen** / Contact Surfaces

| | |
|---|---|
| **Schraube, Mutter Oberfläche, Stahlteile**<br>Bolt, Nut Surface, Steel Items | **SCHWARZ** / METAL BLANK |
| **Beilagscheibe**<br>Washer | **GALV. VERZINKT** / EL. PLATED |
| **Festigkeitsklasse nach DIN 267**<br>Strength Class acc. to DIN 267 | **10.9** |

| **Gewindegröße**<br>Thread Size | **Vorspannkraft**[4]<br>Pre-Tensioning Force[4] | **Kontaktflächen** / Contact Surfaces | | | |
|---|---|---|---|---|---|
| | | **Trocken**<br>Dry Surfaces | **Leicht geölt**[1]<br>Light Oiled[1] | **Geschmiert mit $MoS_2$**[2]<br>Greased by $MoS_2$[2] | **Loctite 243**[3]<br>Treated by Loctite 243[3] |
| | N | Nm | Nm | Nm | Nm |
| **M8 x 1** | 19034 | 23 | 22 | 19 | 29 |
| **M10 x 1** | 31935 | 47 | 45 | 38 | 60 |
| **M10 x 1,5** | 29741 | 44 | 43 | 37 | 57 |
| **M12 x 1,25** | 45452 | 84 | 81 | 69 | 110 |
| **M12 x 1,5** | 42827 | 76 | 74 | 63 | 98 |
| **M14 x 1,5** | 61349 | 122 | 117 | 100 | 157 |
| **M16 x 1,5** | 83187 | 192 | 184 | 156 | 248 |
| **M18 x 1,5** | 108339 | 277 | 265 | 224 | 359 |
| **M18 x 2** | 100280 | 262 | 252 | 215 | 337 |
| **M20 x 1,5** | 136805 | 385 | 368 | 311 | 500 |
| **M22 x 1,5** | 168584 | 519 | 494 | 416 | 675 |
| **M24 x 1,5** | 203677 | 680 | 647 | 544 | 886 |
| **M24 x 2** | 192602 | 655 | 626 | 530 | 848 |
| **M27 x 1,5** | 262529 | 979 | 931 | 780 | 1278 |
| **M27 x 2** | 249948 | 949 | 906 | 764 | 1233 |
| **M30 x 1,5** | 328835 | 1362 | 1294 | 1082 | 1783 |
| **M30 x 2** | 314750 | 1323 | 1261 | 1061 | 1722 |
| **M33 x 1,5** | 402596 | 1830 | 1737 | 1451 | 2400 |
| **M33 x 2** | 387006 | 1783 | 1697 | 1425 | 2327 |
| **M36 x 1,5** | 483811 | 2382 | 2259 | 1884 | 3125 |
| **M36 x 3** | 433354 | 2213 | 2115 | 1790 | 2866 |

[1] **Geölt mit Motoren-Mineralöl bzw. Hydraulik-Öl** / Oiled by engine or hydraulic oil
[2] **Schmierfett $MoS_2$ (Id.Nr.: 811202814)** / Grease $MoS_2$ (Id.Nr.: 811202814)
[3] **Mit Loctite 243 (Id.Nr.: 862819203) nur ca. 1/3 der Schraubengewinde** / Only 1/3 of the bolt thread treated by Loctite 243 (Id.Nr.: 862819203)
[4] **Bei $MoS_2$ müssen die Vorspannkräfte um 12% erhöht werden** / Pre-tensioning forces are to be increased by 12% when $MoS_2$ grease is applied

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## 10.1.3 Introduction

Although this system automatically registers load sizes, when the machine operation is set, as well as automatically triggering optical and acoustic warnings, there should never be any doubt that the load moment limiter is comprised of numerous electrical and mechanical components, and thus is not absolutely fail-safe.
Furthermore, you must be fully aware of the fact that this system in no way is a replacement for sufficient work experience on the part of the operator, because it is the operator who is responsible for the entire operation and its possible consequences.
Before you begin working with the machine, the system must be set to the respective rigging condition as otherwise information is given which does not apply to the actual operating conditions of the machine. For this reason, the operating instructions in this instruction manual should be carefully read so that the operator is completely familiar with the behavior, construction, and design of the load moment limiter as well as the handling of the machine for which he is responsible.

## 10.1.4 Description of the load moment limiter

### 1. DESIGN

The load moment limiter is an electro- mechanical- measuring system by which the actual values of the measuring components are compared with the programmed values of the calculated load capacity table.

### 2. DISPLAY

After correct programming of the actual rigging condition the following values can be read on the LICCON- monitor:

- Programmed counterweight
- Programmed boom length
- Programmed boom head or needle boom length
- Programmed reeving of the hoisting wire rope
- Actual outreach
- Indication of actual utilization
- Load display (optional)

### 3. FUNCTION

The load moment limiter continuously reads the boom angle and the actual pulling forces in the boom hoist gear. These values are compared and evaluated with the electronically programmed load capacity charts.

**The following conditions are possible:**

**a)** The actual load moves below the maximum permissible load capacity. The entire load moment, consisting of actual load, slinging tackle, its own weight and dynamic forces are displayed on the load moment indication.

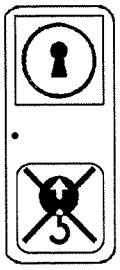
**b)** The load approaches the maximum permissible load capacity. The bar of the indication moves to the right side. The prewarning indication flashes at 90% load utilization.

**c)** The load reaches the maximum permissible load capacity (100%). The bar is completely at the right side. The shut off symbol appears and flashes instead of the prewarning symbol. A buzzer sounds and a shut off of the load moment increasing movements is near.

**The following movements are no longer possible:**

- Lowering the boom
- Lifting the load with winches 1 + 2

## 10.1.13 Bypassing the load moment limiter

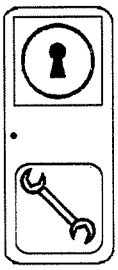


After the load moment limiter responds, the "HOISTING" function of winch 1 and 2 can be bypassed with the key switch at the right control panel. The control lamp below the key switch comes on if the bypass function is activated.

**⚠ ATTENTION !**

**The key switch at the right control panel must only be used in case of malfunction, and for leaving the danger zone. It must never used for bypassing the load moment limiter! The operator uses this bypass function at his own risk and is fully responsible for any consequences resulting from bypassing the load moment limiter!**

## 10.1.14 Switching off the load moment limiter



This key switch at the right control panel can be used to shut off the load moment limiter.

If the load moment limiter system is shut off the indication lamp in this key switch illuminates.

**⚠ ATTENTION !**

**The load moment limiter must only be deactivated for assembly or disassembly operation mode.**

- If the load moment limiter fails due to technical defects bypassing of the load moment limiter is only allowed for moving the machine out of the danger zone!

**Bypassing the load moment limiter for any other reason can lead to serious accidents and structural damage of the machine! The operator is fully responsible for any consequences resulting from shutting off the load moment limiter.**