en

Operating manual

Hydraulic excavator
R 974 C

from serial number 30724

Document identification

	ORIGINAL OPERATING MANUAL
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1 Product description

1.1 Assembly - overview

This section comprises an overview of the machine and gives, for the shown components, the denominations currently employed in this manual.

1.1.1 Machine with backhoe attachment

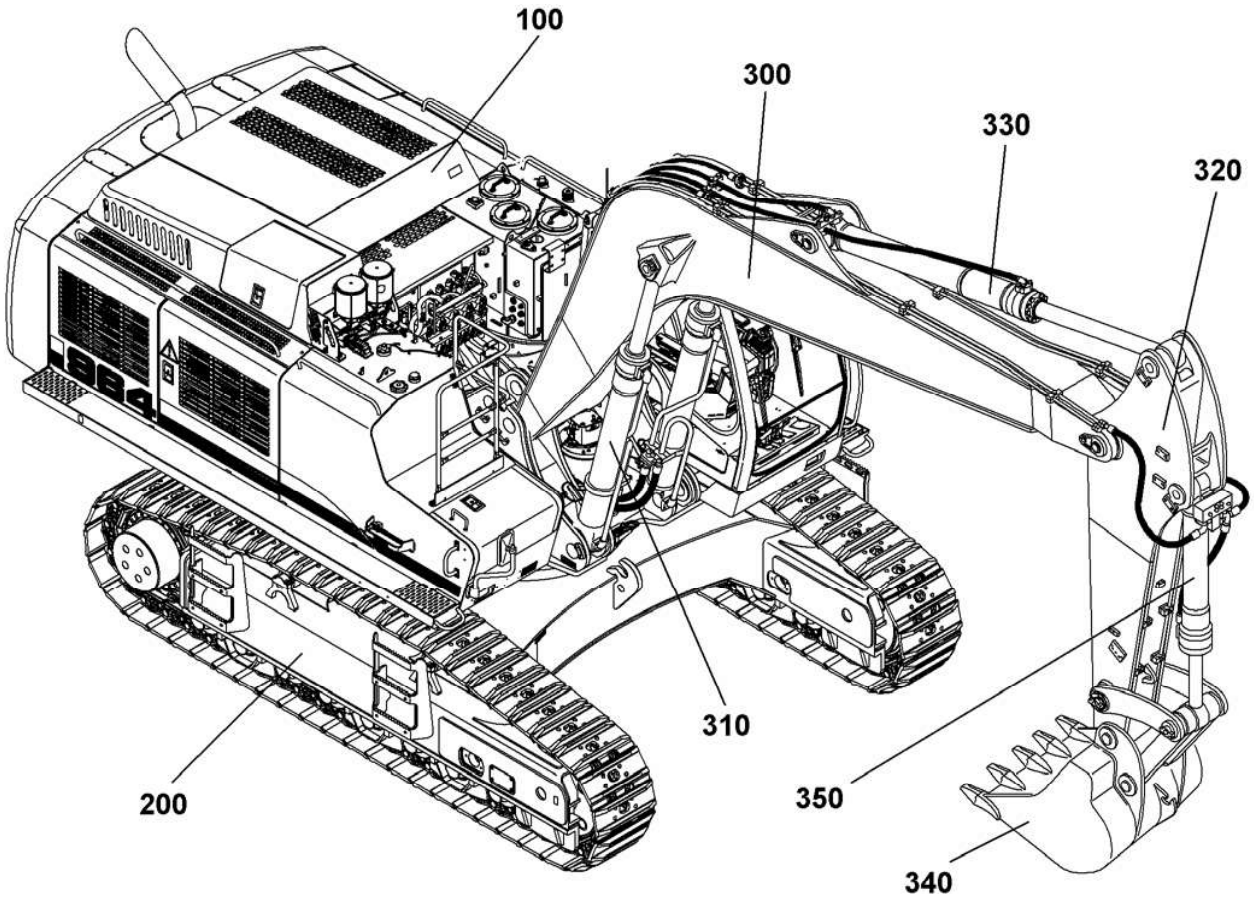

Fig. 1-1 *Machine with backhoe attachment*

100	Uppercarriage	**200**	Undercarriage	**300**	Monobloc boom
310	Boom cylinders	**320**	Stick	**330**	Stick cylinder
340	Backhoe bucket	**330**	Bucket tilt cylinder		

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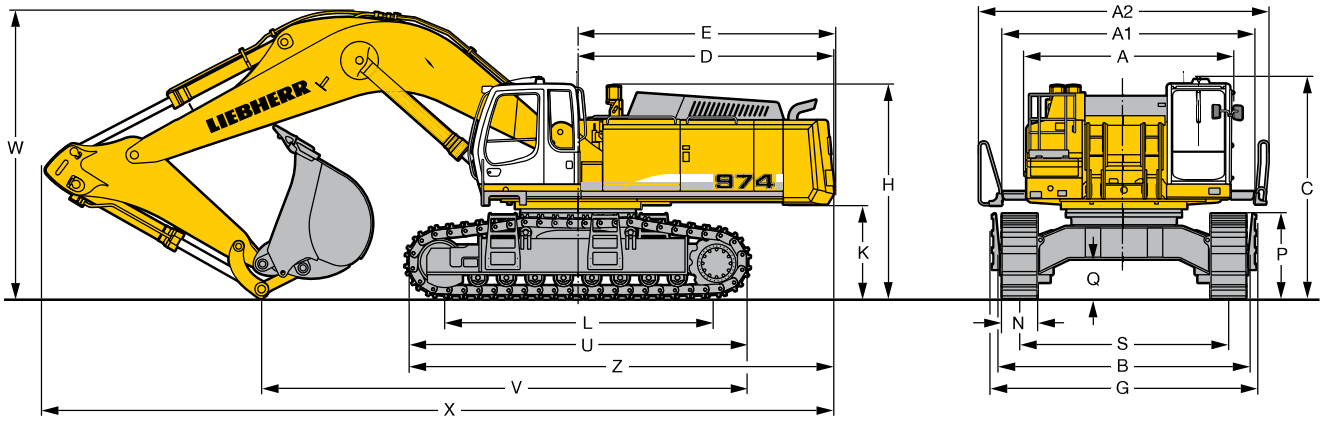
Dimensions



	HD			mm	LC-V			mm
A				3,605				3,605
A1				4,365				4,365
A2				5,000				5,000
C				3,825				3,965
D				4,400				4,400
E				4,440				4,440
H				3,665				3,805
K				1,625				1,765
L				4,770				5,160
P				1,460				1,493
Q				682				955
S				3,600				2,750*/3,590
U				5,953				6,334
N	500	600	750		500	600	750	
B	4,290	4,290	4,350		3,490	3,490	3,500	
G	4,540	4,540	4,540		3,866	3,866	3,866	
Z				7,377				7,567

* Transport position

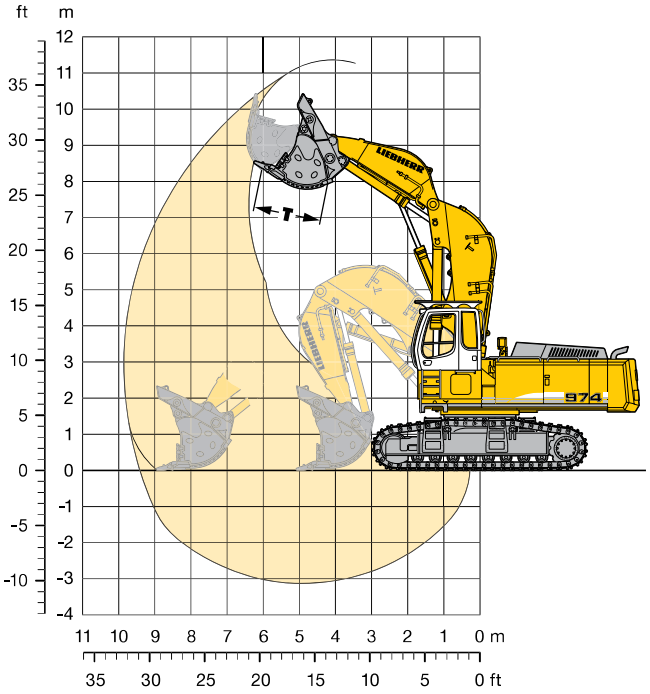
HD-Undercarriage

	Stick Length	Mono Boom 7.20 m	Mono Boom 8.60 m	Mono Boom 10.50 m
	m	mm	mm	mm
V	2.90	8,450	10,150	–
	3.80	8,050	9,800	12,000
	4.70	7,950	9,700	11,800
	5.80	–	–	11,700
W	2.90	5,000	5,250	–
	3.80	5,450	5,550	5,650
	4.70	6,000	6,000	6,000
	5.80	–	–	6,800
X	2.90	13,650	15,100	–
	3.80	13,250	14,600	16,450
	4.70	13,000	14,400	16,300
	5.80	–	–	16,000

LC-V-Undercarriage

	Stick Length	Mono Boom 7.20 m	Mono Boom 8.60 m	Mono Boom 10.50 m
	m	mm	mm	mm
V	2.90	8,600	10,300	–
	3.80	8,200a	9,950	12,150
	4.70	8,050	9,800	11,950
	5.80	–	–	11,850
W	2.90	5,050	5,300	–
	3.80	5,500	5,650	5,750
	4.70	6,050	6,000	6,100
	5.80	–	–	6,800
X	2.90	13,650	15,100	–
	3.80	13,300	14,650	16,500
	4.70	13,100	14,450	16,350
	5.80	–	–	16,100

Front Shovel



Digging Envelope

Max. reach at ground level	9.40 m
Max. dump height	7.80 m
Max. crowd length	3.90 m
Bucket opening width T	1,825 mm
Max. crowd force	630 kN/64.2 t
Max. crowd force at ground level	450 kN/45.9 t
Max. breakout force	460 kN/46.9 t

Operating Weight and Ground Pressure

Operating weight includes basic machine with cab elevation 0.8 m, rock protection, shovel attachment and front shovel 5.10 m³ (9,090 kg), level II.

Undercarriage		HD		
Pad width	mm	500	600	750
Weight	kg	90,200	90,900	92,000
Ground pressure	kg/cm²	1.74	1.46	1.18

Front Shovels

Cutting width mm	Capacity ISO 7451 m³	Weight kg	Wear kit level	HD-Undercarriage Shovel Attachment
2,300	4.40	8,310	II	○
2,300	4.40	9,160	III	○
2,700	5.10	8,430	I	□
2,700	5.10	9,090	II	□
2,700	5.10	10,030	III	□
2,700	5.40	9,920	III	△
2,700	5.60	8,750	I	△
2,700	5.60	9,190	II	△

Level I: For non-abrasive materials, such as limestone without flint inclusion, shot material or easily breakable rock, i.e., deteriorated rock, soft limestone, shale, etc.
Level II: For pre-blasted heavy rock, or deteriorated, cracked material (classification 3 to 4, accord. to DIN 18300)
Level III: For highly-abrasive materials such as rock with a high silica content, sandstone etc.

Max. material weight ○ = ≤ 2.2 t/m³, □ = ≤ 1.8 t/m³, △ = ≤ 1.65 t/m³

Individual Options

Undercarriage

- Different undercarriage versions
- Different track pad width

Uppercarriage

- Electric fuel tank filler pump
- Pedal controlled positioning swing brake
- Protection for front working light
- Heavy counterweight
- Customized paint – compl. machine

Hydraulics

- Bio-degradable hydr. oil
- High lift circuit
- Filter for secondary circuit
- Additional hydraulic circuits

Engine

- Fuel pre-heater

Operator's Cab

- Air pressure operator seat with heating and head-rest
- Extinguisher
- Front guard tiltable or fixed
- Lower windscreen with wiper
- Electric cool box
- Stereo radio
- Beacon
- Sun visor
- Auxiliary heating with clock timer
- Upper protection screen (FOPS)
- Electric drive away lock
- Additional flood lights (rear)
- Additional flood lights (front)

Attachment

- Hydraulic quick coupler
- Piston rod protection
- Hydraulic lines for additional tools
- Liebherr working tools
- Customized colors
- Special application buckets
- Overload warning device
- Central lubrication for lever with protection cover

Options and/or special attachments, supplied by vendors other than Liebherr, are only to be installed with the knowledge and approval of Liebherr in order to retain warranty.

Lift Capacities

with Industrial-Type Gooseneck Boom 12.00 m

Industrial Stick 9.00 m

m	Under-carriage	4.5 m		6.0 m		7.5 m		9.0 m		10.5 m		12.0 m		13.5 m		15.0 m		16.5 m		18.0 m		19.5 m		21.0 m		22.5 m		24.0 m				
																																m
24.0	EW																															
22.5	EW																															
21.0	EW																															
19.5	EW																													10.9*	10.9*	12.66
18.0	EW													12.4*	12.4*															10.0*	10.0*	14.44
16.5	EW															11.7*	11.7*													9.4*	9.4*	15.86
15.0	EW															11.5*	11.5*	10.9*	10.9*											9.1*	9.1*	17.03
13.5	EW															11.4*	11.4*	11.2*	11.2*											8.8*	8.8*	17.99
12.0	EW													11.9*	11.9*	11.5*	11.5*	11.2*	11.2*	11.0*	11.0*									8.7*	8.7*	18.78
10.5	EW													12.3*	12.3*	11.8*	11.8*	11.3*	11.3*	11.0*	11.0*									8.6*	8.6*	19.42
9.0	EW											13.7*	13.7*	12.8*	12.8*	12.1*	12.1*	11.6*	11.6*	11.1*	11.1*	10.3	10.4*							8.5*	8.5*	19.92
7.5	EW									15.9*	15.9*	14.5*	14.5*	13.5*	13.5*	12.6*	12.6*	11.9*	11.9*	11.3*	11.3*	10.2	10.9*							8.6*	8.6*	20.29
6.0	EW					23.1*	23.1*	19.7*	19.7*	17.3*	17.3*	15.5*	15.5*	14.2*	14.2*	13.1*	13.1*	12.3*	12.3*	11.6	11.6*	10.1	11.1*							8.7*	8.7*	20.55
4.5	EW			34.1*	34.1*	26.3*	26.3*	21.7*	21.7*	18.7*	18.7*	16.5*	16.5*	14.9*	14.9*	13.7*	13.7*	12.7*	12.7*	11.3	11.9*	9.9	11.2*							8.8*	8.8*	20.69
3.0	EW			14.1*	14.1*	29.3*	29.3*	23.7*	23.7*	20.1*	20.1*	17.5*	17.5*	15.7*	15.7*	14.2*	14.2*	12.7	13.1*	11.1	12.2*	9.7	11.4*							8.8	9.1*	20.72
1.5	EW			9.9*	9.9*	24.0*	24.0*	25.4*	25.4*	21.3*	21.3*	18.4*	18.4*	16.3*	16.3*	14.3	14.7*	12.4	13.5*	10.8	12.4*	9.6	11.6*							8.8	9.4*	20.64
0	EW	4.8*	4.8*	9.7*	9.7*	18.8*	18.8*	26.7*	26.7*	22.3*	22.3*	19.0	19.2*	16.1	16.9*	13.9	15.2*	12.1	13.8*	10.6	12.6*	9.5	11.6*							8.8	9.7*	20.44
- 1.5	EW	6.7*	6.7*	10.6*	10.6*	17.6*	17.6*	27.5*	27.5*	22.2	23.0*	18.4	19.8*	15.7	17.4*	13.5	15.5*	11.9	14.0*	10.5	12.7*	9.4	11.6*							9.0	10.2*	20.13
- 3.0	EW	8.6*	8.6*	12.0*	12.0*	18.0*	18.0*	27.0	27.8*	21.7	23.3*	18.1	20.1*	15.4	17.6*	13.3	15.6*	11.7	14.1*	10.4	12.7*	9.4	11.3*							9.3	10.9*	19.70
- 4.5	EW	10.5*	10.5*	13.7*	13.7*	19.0*	19.0*	26.8	27.6*	21.5	23.3*	17.9	20.1*	15.2	17.6*	13.2	15.6*	11.6	13.9*	10.4	12.4*									9.7	11.2*	19.13
- 6.0	EW			15.3*	15.3*	20.5*	20.5*	26.9	26.9*	21.5	22.9*	17.8	19.8*	15.2	17.3*	13.2	15.3*	11.7	13.5*	10.5	11.7*									10.2	11.1*	18.43
- 7.5	EW					22.3*	22.3*	25.6*	25.6*	21.6	21.9*	17.9	19.0*	15.3	16.6*	13.3	14.5*	11.8	12.6*											11.0*	11.0*	17.56
- 9.0	EW							23.6*	23.6*	20.4*	20.4*	17.6*	17.6*	15.3*	15.3*	13.1*	13.1*													13.0*	13.0*	15.13
-10.5	EW																															

Height | Can be slewed through 360° | In longitudinal position of undercarriage | Max. reach | * Limited by hydr. capacity

The lift capacities are stated in metric tonnes (t) on the lifting gear's stick tip, and can be lifted 360° on firm, level supporting surface. Capacities are valid for 600 mm wide double grouser pads. Indicated loads are based on ISO 10567 standard and do not exceed 75 % of tipping or 87 % of hydraulic capacity (indicated via *). Lifting capacity of the excavator is limited by machine stability, hydraulic capacity and maximum permissible load of the load hook.

According to European Standard, EN 474-5: In the European Union excavators have to be equipped with an overload warning device, a load diagram and automatic check valves on the hoist cylinders, when they are used for lifting operations which require the use of lifting accessories.

2 Safety instructions, Signs on the machine

Working with the machine holds dangers to which you as the owner, machine operator or maintenance expert could be exposed. If you regularly read and note the safety information, however, you can prevent danger and accidents. This is particularly true for those who are only occasionally in contact with the machine, eg. for maintenance work. The following information comprises safety regulations which, if followed conscientiously, will guarantee your safety and that of other persons, as well as avoid damage to the machine.

Following these precautions does not release you from the responsibility to take note of safety regulations which apply on site or of guidelines given by legal bodies or professional associations.

For EU countries, guideline 2009 / 104 / EC contains the minimum safety information applicable to the owner.

2.1 Meaning of the symbols in this manual

Work processes and actions that could cause danger are accompanied by safety informations in these operating instructions. These safety informations describe various dangers which are emphasized by the terms **Danger**, **Caution** and **Note**.

These terms are identified by symbols in the operating instructions and have the following meaning:

Danger!
Warning relating to a danger that carries with it a high risk of death or serious injury if the appropriate preventative measures are not taken.

Caution!
Warning relating to dangers that could result in physical injury and/or damage to the machine if the appropriate preventative measures are not taken.

Note!
This symbol identifies user tips and operating and maintenance procedures whose use will guarantee a high degree of user-friendliness and longevity to the machine or which will considerably simplify working procedures.

– This symbol identifies a listing.
  • This symbol identifies a sub-listing.

❑ This symbol signifies the following: “The precondition must be fulfilled”. The machine operator or the maintenance personnel must first fulfil the precondition described, i e. the machine must be brought into a particular work position in order to be able to carry out the actions subsequently described.

- Special care should be taken when driving through narrow passages - drive slowly!

When loading and unloading:

- The machine must be supported and aligned horizontally before moving (slewing) the upper structure out of the transport position.
- It is imperative that you check the contact surface of the support (load carrying capacity of the substrate). A support subsiding would have disastrous consequences!
- Carry out all movements with increased care.
- To slew the load, move the equipment as close as possible to the machine **(Caution! swinging grab)**and hold the load close to the undercarriage and above the substrate.
- Avoid braking or accelerating the equipment or upper structure abruptly.
- Do not lift any loads which are heavier than those given in the load chart.

Protection from vibration

– Vibrational loads on mobile building machinery are mainly the result of the type and method of use. The following parameters in particular are decisive influences:
  - Terrain conditions: Uneven areas and potholes;
  - Operational techniques: Speed, steering, brakes, controlling the machine's control elements when driving and working.

– To a large extent, the machine operator determines the vibrational loads since he selects the speed, gearbox ratio, working method and route himself.
  This means that there is a wide range of different vibrational loads for the same machine type.

Whole-body vibrational load for the machine operator can be reduced if the following recommendations are observed:

– Select suitable machines, equipment parts and auxiliary devices for each part of the job.

– Use a machine that has a suitable seat (i.e. for earth-moving machinery such as hydraulic excavators, this should be a seat which corresponds with EN ISO 7096).

– Keep the seat in good condition and adjust it as follows:
  - The seat and its damping action should be adjusted depending on the weight and height of the operator.
  - Check the seat's damping action and adjustment mechanisms regularly and ensure that these seat characteristics remain as per the seat manufacturer's instructions.

– Check the maintenance status of the machine, particularly with respect to: tyre pressure, brakes, steering, mechanical connections etc.

– Do not steer, brake, accelerate, shift gears, move or load the machine's equipment jerkily.

– To reduce vibrational load, adjust the machine speed to suit the route as follows:
  - Reduce speed when driving on difficult terrain;
  - Drive around obstacles and avoid driving on very difficult terrain.

– Keep the terrain on which the machine is working and driving in good condition:
  - Remove large stones and obstacles;
  - Fill in ruts and holes;
  - Have machines ready to prepare and maintain suitable ground conditions and calculate in sufficient time to carry out any work required.

– Drive longer distances (e.g. on public roads) at an appropriate (medium) speed.

– Use special auxiliary systems (if available) which reduce vibration for machines that are driven frequently.

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2.5.2 Arrangement of signs

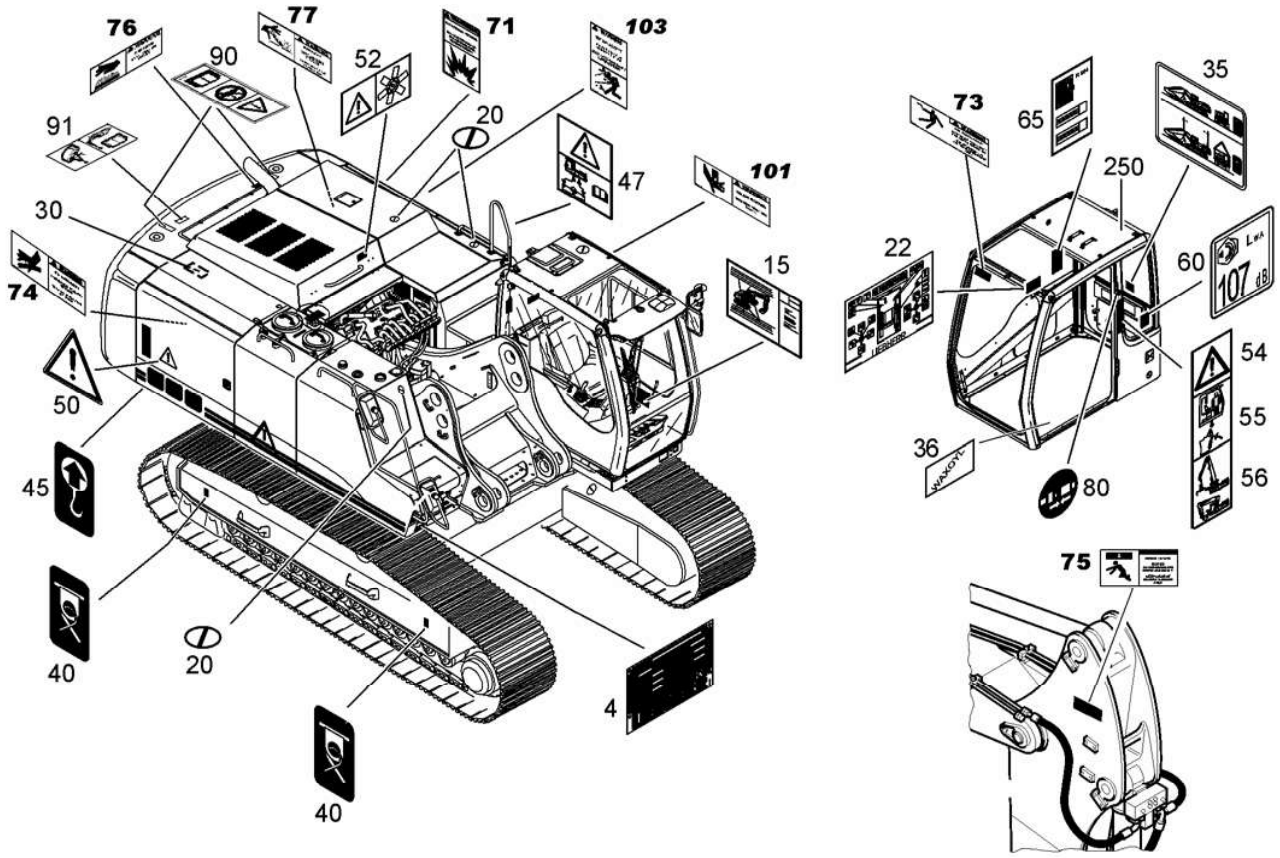


Fig. 2-1 *Arrangement of the signs on the machine*

4	Nameplate	**60**	Sound power level
15	Lubrication chart	**65**	Load chart
20	Prohibiting sign	**71**	Explosion hazard
22	Operating symbols plate	**73**	High voltage
30	Lubrication chart (engine)	**74**	High pressure
35	Loading and lashing points	**75**	Impact and crushing hazard
36*	Waxoyl	**76**	Burn hazard
40	Lashing point	**77**	Hot fluids
45	Lifting point	**80**	Safety belt
47	External start	**90***	Prohibiting sign - no lifting point
50	Crush hazard	**91***	Counterweight removal
52	Engine switch-off	**101**	Crushing hazard
54	Accident prevention	**103**	Hazard of thrown out objects
55	Safety lever	**250***	Emergency exit - Rear window
56	Attachment collision hazard		

***** = Depends on the excavator's model

3 Control and operation

3.1 Operating and control elements

3.1.1 Controls in the operator's cab

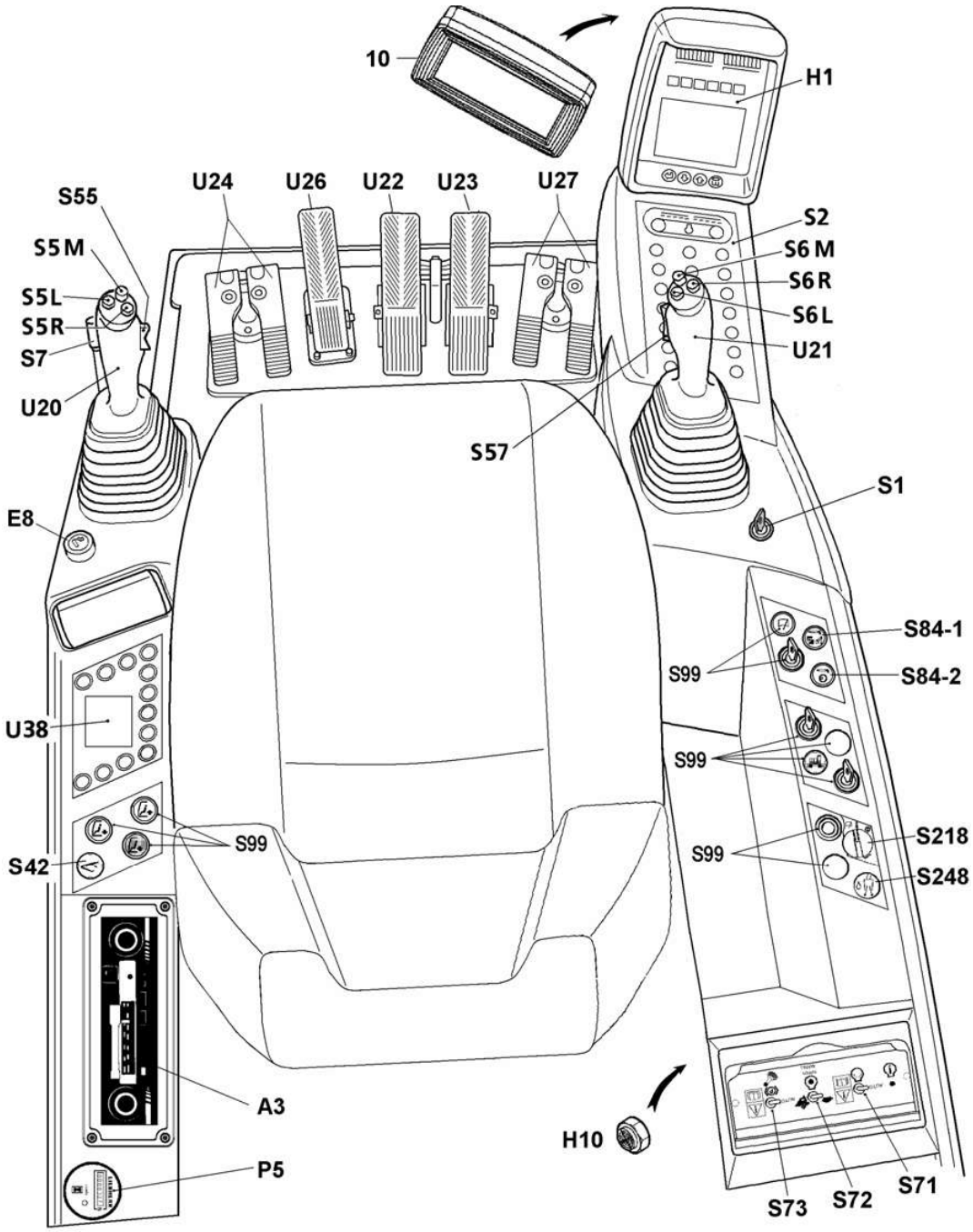


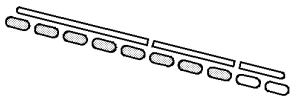
Fig. 3-1 *Controls in the cab*

S86 – Operating mode preselection

Four different operating modes can be selected by pressing the touch.

- **L**: Mode LIFT (RPM stage 5)
- **F**: Mode FINE (RPM stage 10)
- **E**: Mode ECO (RPM stage 8)
- **P**: Mode POWER (RPM stage 10).

The currently active mode is displayed by the LED under the letter.



P4 – Engine RPM indicator

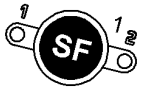
The indicator P4 displays the speed range of the Diesel engine in 10 levels.

S228 – Engine RPM increase

▶ Press the touch:
  ↳ the engine RPM will be increased by one level,
  ↳ an additional LED toward right illuminates on indicator P4.

S229 – Engine RPM decrease

▶ Press the touch:
  ↳ the engine RPM will be decreased by one level,
  ↳ the most right burning LED on indicator P4 goes out.



S354 – No function

B) Warning symbols for special operating states und system errors

In addition to the above mentioned operating faults, also the symbols of the list below may appear in the SY field of the screen to warn the operator of the occurence of particular operating sequences or of some particular system errors.

Quick change adapter (optional equipment)

This symbol appears during the unlocking procedure or when the locking pins of the quick change adapter are not completely out.
No error code is corresponding to this symbol.

Quick change adapter (optional equipment)

This symbol appears when no tool is detected.
No error code is corresponding to this symbol.

One or several solenoid valves are off in the servo control circuit.

This symbol informs that the current flowing to (at least) one solenoid valve in the electro hydraulic servo control circuit is interrupted, due to the faulty connection(s) in the system.

Servo control pressure too low

This symbol shows that the servo pressure has dropped below a given limit value. The trouble free control of the excavator movements is in the case no longer guaranteed.

The symbol also lights up, even if no disturbance exists, if the safety lever S7 is tilted upward, or after several actuations of a servo control device with turned off engine and ignition key in contact position.

Internal default in Master module (U47)

This symbol appears if an internal default is recognized in the module U47 (Master module of the electronic servo control system).

Internal default in one Slave module

This symbol appears if an internal default is recognized in one of the Slave modules (printing plates U48-1, U48-2 or U46) of the electronic servo control system.

CAN communication default

This symbol appears if a communication default is recognized in the CAN networ of the electronic servo control system.

Tab. 3-2 *Warning symbols for special operating sequences and system errors*

Information symbols in the INF field

Preheating

This symbol appears as long as the preheating of the air in the intake manifold is activated (preglow process).

– graphic bars indicating the momentary electric current flowing to the different regulation solenoid valves..

On the left picture, an external limitation (Hardware input I1, option 2) is activated. The currents supplying the flow limitation solenoid valves EV1 and EV2 limit these flows to 55% of their maximal values. The current supplying the pressure limitation solenoid valve EV6 limits the pressure to 80% of its maximal value.

On the right picture, an internal limitation (Pressure increase) and an external limitation (Hardware input I1, option 1) are activated at the same time.
Due to the internal limitation, the flow of the pump P1 is limited to 50% of its maximum value via the solenoid valve EV1.
Due to the external limitation, the flow of the pump P2 is limited to 70% of its maximum value via the solenoid valve EV2 and the pressure in the hydraulic system to 60% of its maximal value via the solenoid valve EV6.

When several limitations are activated at the same time, only the one with the smallest percentage value is decisive for each regulating solenoid valve.

Note!
An external limitation becomes active for example when a pedal controlling an additional equipment is actuated.
The three internal limitations which are the most currently used are the followings:

– The internal limitation M1 is activated when travelling.
– The internal limitation M2 is activated when the pressure increase is actuated (button S56 on the control unit).
– The internal limitation M3 is activated when actuating the shovel flap on machines with shovel attachment.

▶ Press the **Menu** key again.
  ↳ The screen 2/... is displayed.

The screen 2 shows the instantaneous LR current (current flowing to the solenoid valve for power regulation).

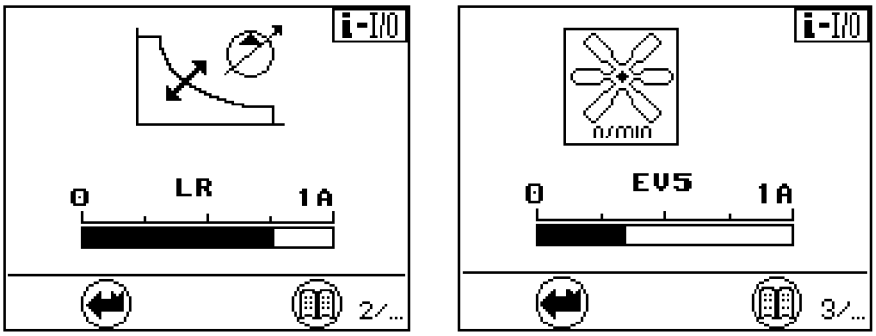


Fig. 3-20 *Menu "Info In/outputs" Currents to the solenoid valves LR and EV5*

▶ Press the **Menu** key again.
  ↳ The screen 3/... is displayed.

This screen shows the instantaneous current flowing to the regulation solenoid valve EV5 which determines the RPMs of the hydrostatic driven cooler fan.

▶ Press the **Menu** key again.
  ↳ The screens 4, 5, 6 and 7/... are successively displayed.

H90 – Control light / Rotation in opposite direction of reversible fan

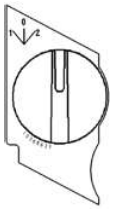
On machines fitted with the special equipment "cooler fan reversible", this control light lights up to indicate that the fan has been changed over to rotation in opposite direction via the push button S160, see also the section "Reversible cooler fan (Optional equipment)" in the chapter "maintenance".

S26 – Touch / Fuel preheater

This button turns on the electrical fuel pre heating system, see the section "Starting aids" in this chapter.

S40 – Touch / Frequency commutation for hydraulic hammer

When actuating this touch a pressure signal is send to the reversing hydraulic hammer, causing the hammer to change over to the second cycle frequency.



S41 – Rotary switch / Emergency lowering of attachment parts

For the function of this rotary switch, refer to the heading "Controls on side desks" previously in this manual.

S42 – **Touch / Emergency lowering of working attachment**

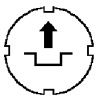
Note :This push button is mounted serially, not as an option, see previous section.

S45 – Touch / Priority for special equipment

If an hydraulic actuator (cylinder, hydraulic motor,) of a special equipment requires a constant oil flow, the speed of the remaining attachment movements can be reduced by depressing the push button S45 (control light inside the button must light).
The necessary oil flow for the hydraulic actuator is maintained, even in case of simultaneous actuation of other attachment movements.

S46 – Touch / Lifting magnet operation

This button turns on and off the control circuit for an optionaly mounted lifting magnet, see "Lifting magnet control system (optional equipment)" in this chapter.



S47 – Push button / Quick change adapter

The push button S47 turns on the control circuit for the quick change adapter for the working tool. See also the section "Hydraulic quick change adapter for working tools (optional equipment)" in this chapter.

S53 – Touch / Special control circuit supply

Actuating this touch makes alive an additional control circuit for a special equipment. The green indicator light in the touch lights up to show that the additional servo control circuit is under pressure.

S54 – Key switch / Unlocking of cylinder end position

On some special working attachments, or on attachment showing particular cinematic capacities (as example on industrial attachment), certain movement(s) may be stopped automatically by electrical end switches. The main purpose of this movement limitation is to prevent possible damages due to components frequently reaching their end stops.
See "Cutoff by end switches of attachment movements (option)" in this chapter.

▶ Sit down on the seat.

▶ Pull the lever **9** briefly upwards.
  ↳ The seat is automatically adjusted to suit the body weight of the operator.

Adjusting seat height (in models with automatic adjusting mechanism)*:

▶ Before adjusting the height, set the shock absorber to "soft".

Caution!
Risk of damage to compressor.

▶ Do not run the compressor continuously for more than 1 minute.

▶ Adjust the seat height by pulling or pushing the lever **9** to the stop.

Adjusting seat depth:

▶ Lift the button **12**.

▶ Sit on the seat and move it horizontally to the desired position.

▶ To adjust the angle of inclination of the seat, press the button **13**.
  ↳ Sit on the seat and move it to the desired angle.

Horizontal adjustment:

▶ Pull up the lever **11**.

▶ Adjust the operator seat in horizontal direction.

▶ Release the lever. Ensure that the lever engages properly in the desired position (audible click).

▶ Carry out the following check: After locking, it must be impossible to move the operator seat to a different position.

Horizontal adjustment with control consoles:

▶ Pull up the lever **7**.

▶ Adjust the operator seat together with the control consoles in horizontal direction.

▶ Release the lever. Ensure that the lever engages properly in the desired position (audible click).

▶ Carry out the following check: After locking, it must be impossible to move the operator seat to a different position.

Adjusting backrest:

▶ Pull up the lever **3**.

▶ Sit on the seat and move the backrest to the desired position.

▶ Release the lever. Ensure that the locking lever engages in the desired position.

▶ Carry out the following check: After locking, it must be impossible to move the backrest to a different position.

Adjusting lumbar support (in models with mechanical adjusting mechanism):

▶ Adjust the height and curve of the lumbar pad by turning the hand wheel **2** at the back of the seat.

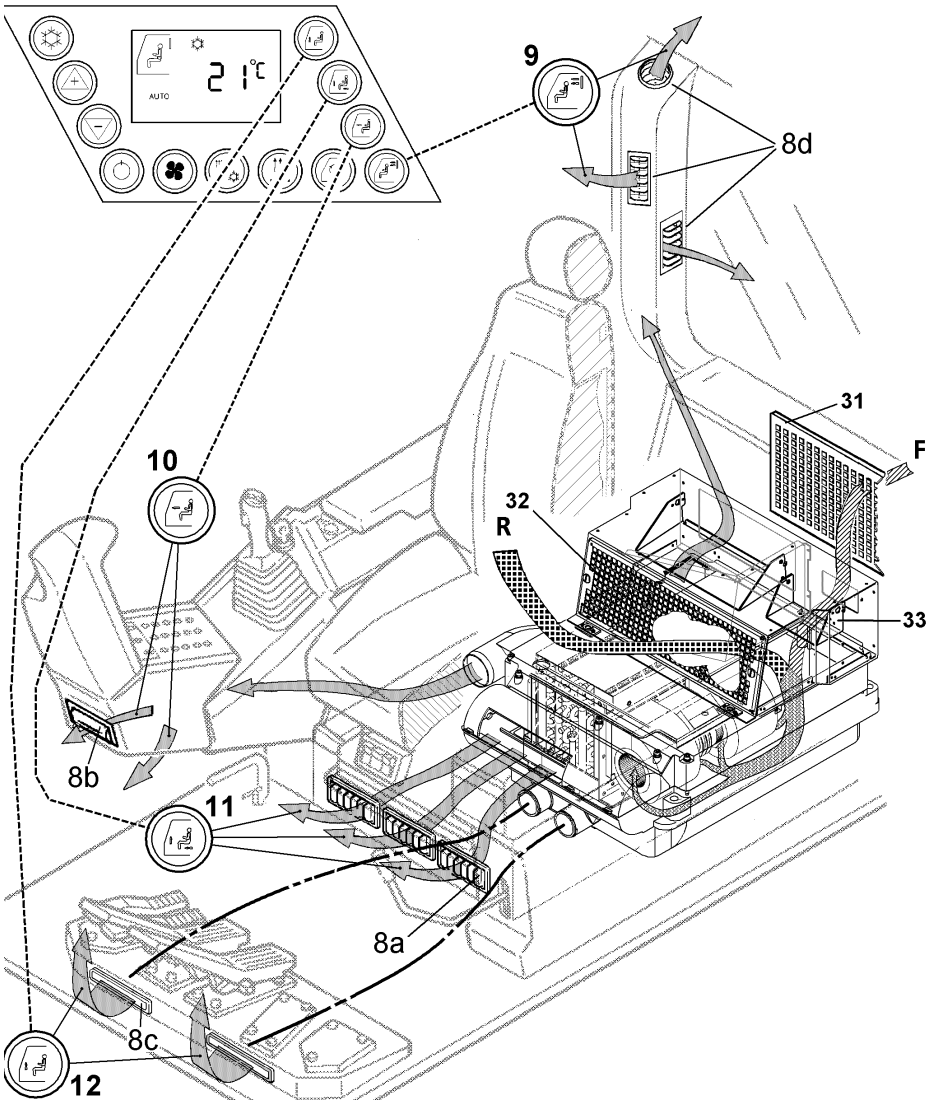


Fig. 3-52 *Air repartition in the cab*

To reach a maximal feeling of comfort:

- For **heating** the air flow must be blown into the cab via the louvers **8a**, **8b** and eventualy **8c**. This is obtained while actuating the keys **10**, **11** and eventualy **12** .
- For **air conditioner operation** the air flow must be blown into the cab via the louvers **8d** and eventualy **8b**. This is obtained while actuating the keys **9** and eventualy **12**.

Note!
To defrost or dehumidify the windshield quickly, blow the whole air flow only out of the louvers 8c at the front windshield and 8b on the right control panel.

- In case of very high outside temperature, preferably close the louvers 8c to avoid an unnecessary warming up of the inside air along the windshield.

In mode **E** and **P**, the engine is running at its rated power curve, in mode **L** and **F** it works at a power reduced by approx. 20%.

The speed level 8 corresponds to the range where the specific fuel consumption of the engine is optimal ("ECO" range).

Engine speed adjustment using the arrow keys

To increase the speed:

▶ Press switch **S228**.
- Speed will be increased by one level.
- One more LED to the right illuminates on the indicator **P4** at the display.

To decrease the speed:

▶ Press switch **S229**.
- Speed will be decreased by one level.
- The most right LED goes out on the indicator **P4** at the display.

The following picture shows the modifications of the speed level and of the engine power by pressing the arrow keys **S228** and **S229.**

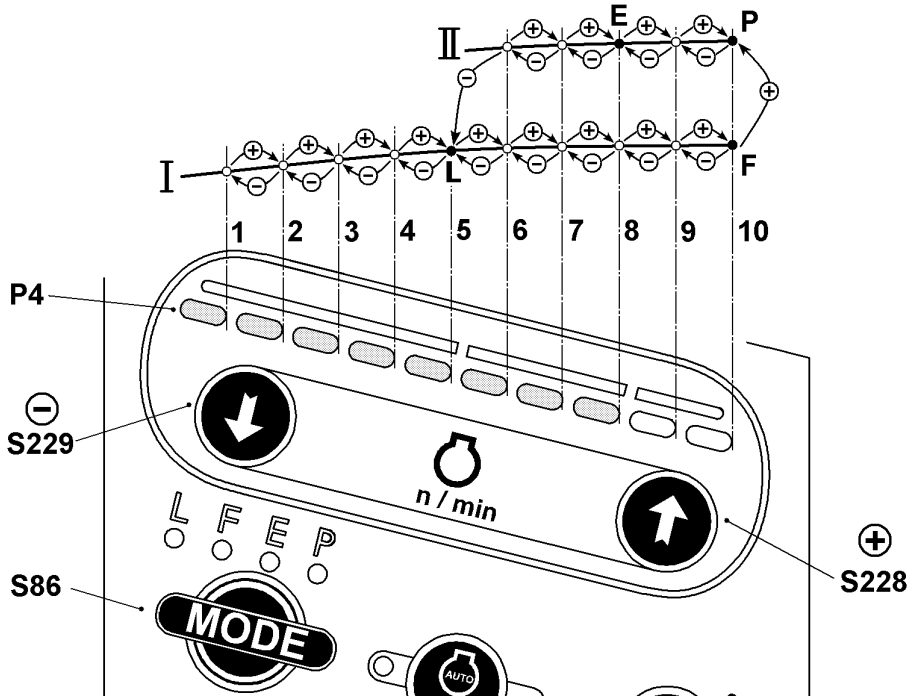


Fig. 3-58 *Engine speed adjustment via the arrow keys S228 and S229*

The lighting LED under the letters next to the mode key S86 shows which is the currently active mode. The selected mode will be memorized when the engine is switched off and will be displayed by a flashing LED above switch **S86** the next time the engine is started.

The mode indicating LED will flash also each time the engine RPM does not any more correspond to the speed level of the currently selected operating mode (as an example if the speed has been adjusted via the arrow keys or if it has been decreased by the low idle automatic).

Turning over one track

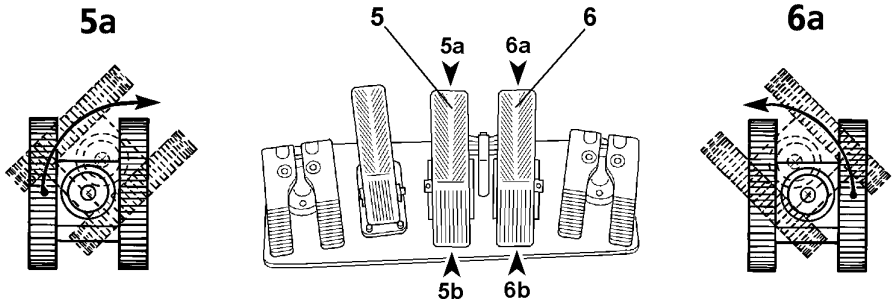


Fig. 3-64 *Turning over one track*

Turning right:

Push the left travel pedal **5** forwards (**5a**).

Turning left:

Push the right travel pedal **6** forwards (**6a**).

Note!
Avoid turning over one track in reverse, this exposes the track drive components to increased strain.

Counter rotation

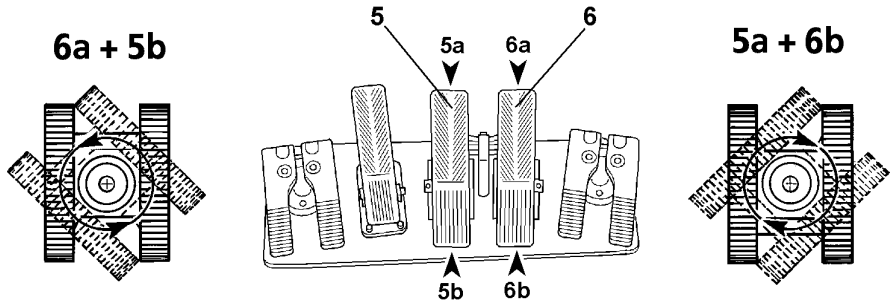


Fig. 3-65 *Counter rotation*

Turning right:

- ▶ Push the left travel pedal **5** forwards (**5a**), ...
- ▶ ... and at the same time push the right travel pedal **6** down (**6b**).

Turning left:

- ▶ Push the right travel pedal **6** forwards (**6a**), ...
- ▶ ... and at the same time push the left travel pedal **5** down (**5b**).

Danger!
Pay attention that, if the uppercarriage is turned by 180° to the undercarriage, all the travel lovements are inverted (left and right, forwards and backwards)!

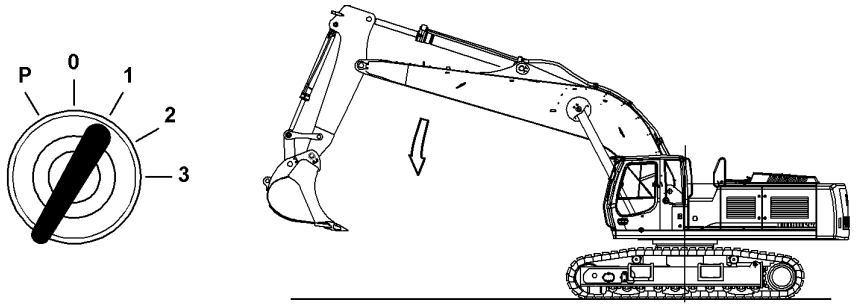


Fig. 3-78 *Lowering the attachment with shut down engine*

- ▶ Turn the ignition key to contact position **1**.
- ▶ Actuate the desired movement(s) while deflecting the joysticks (eventually also the foot pedals in case of special attachment) until the equipment has lowered to the required position.

3.4.7 Rotating, tilting, locking and unlocking a working tool

An additional hydraulic circuit must be activated to operate some specific working tools such as:

- a rotating grapple (A),
- a rotating bucket (B),
- a hydraulic quick-change adapter (C).

The medium pressure circuit is activated via the touch **S19** on the main control unit.

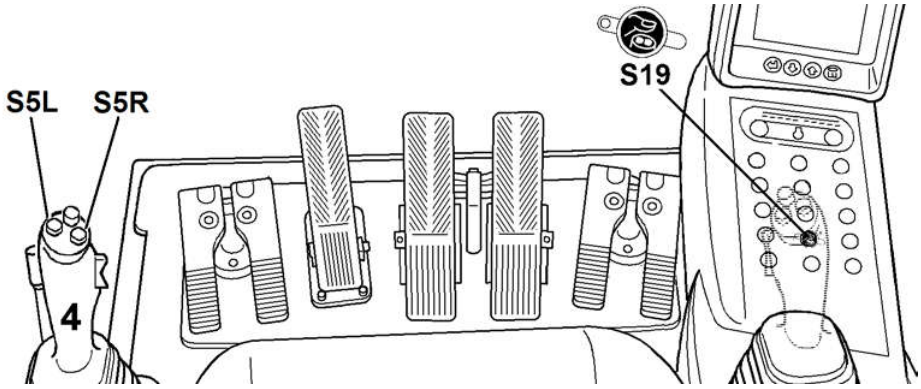


Fig. 3-79 *Activation of the medium pressure circuit (S19) and actuation of the working tool (S5L/S5R)*

The working tool is then actuated via the both push buttons **S5L** and **S5R** mounted at the top of the handle of the left joystick **4**.

- ▶ Press the touch **S19**.
  - ↳ The medium pressure circuit is activated.
  - ↳ The LED of the touch is lighting.
- ▶ Press the left push button **S5L** and keep it pressed.
  - ↳ The working tool is actuated to the left (the grapple is rotated to the left, or the bucket is swivelled to the left, or the locking pins of the hydraulic quick-change adapter are driving out, ...).

– **a load hooking system ensuring the safe attaching and removing of the loads (optional equipment)**
  Safe hooking systems include for example lifting hooks which are mounted in place of the bucket. Safety lifting hooks welded directly to the bucket are also allowed.
– **an overload warning device (optional extra)**
  The overload warning device must alert the machine operator visually or acoustically if the permitted load value has been reached or exceeded, according to the rated lift capacity chart.
– **a boom lowering control device** (such as load check valves) to prevent unintentional lowering or dropping of the boom because of the weight of the load, which could happen if a line in this hydraulic circuit suddenly develops a leak (for example, should a hydraulic line break or a hose burst,...).
  This boom lowering control device must correspond with the requirements of ISO 8643.
  Such a boom lowering device can be installed as an option on all models up to R924C, it is serially installed on all models R934C and above.
– **a rated lift capacity chart** (commonly called load chart), attached inside the cab and within the view of the operator..

If the points referred to above are not or are only partially fulfilled, the machine may not be used for lifting loads overhead**.**

Every LIEBHERR hydraulic excavator can be fitted with all the safety devices required for lifting loads operation.

Danger!

- ▶ Only employ sling ropes and accessories which are permitted for lifting operation, regularly checked and in good condition.
- ▶ No person may fasten or unfasten a load without approval of the operator and this person may only approach the load from one side. The operator may only approve this action when the excavator has stopped and the attachment is not moving.
- ▶ Never lift loads over people.

3.4.13 Overload warning system (option)

Description

The overload warning system indicates to the machine operator when the maximum permitted load capacity is reached or exceeded.

The permitted load capacity depends on the configuration of the machine (undercarriage, working attachment). The maximum load capacity can be found on the load capacity chart in the operator's cab.

The load capacity values achieve a maximum of 75% of the tip load or 87% of the hydraulic lifting power according to ISO 10567.

The permissible load capacity is related to the factors that follow:

– installation or dismantling of parts of the attachment
– changing the tool attachment

The overload warning device does not release the machine operator from the responsibility of only lifting loads that are known and within the safe working load of the machine in accordance with the load lift chart.

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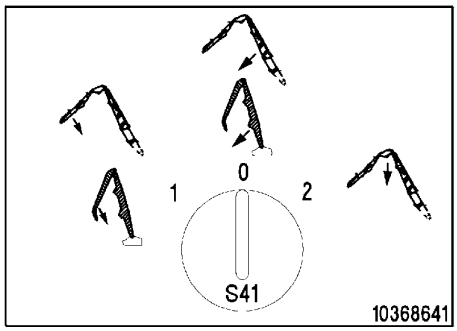

3.5.4 Emergency supply of the boom cylinders (option)

With this option, an external pressure source can be used to supply the boom cylinders with oil. In case of engine or hydraulic system failure, the working attachment can be raised or lowered.

Caution!
Risk of irreparable damage to the hydraulic system!

- ▶ Make sure that the oil supplied by the external source matches the following conditions:
  - the oil corresponds to the hydraulic oil specifications in this manual See chapter 5: "Hydraulic oil",
  - the oil is miscible with the oil in the hydraulic system of the machine,
  - the percentage of purity corresponds at least to the that of the oil in the hydraulic system of the machine (10 – 20 µm filtering).

3.7.3 Attaching and dismounting the grab on stick

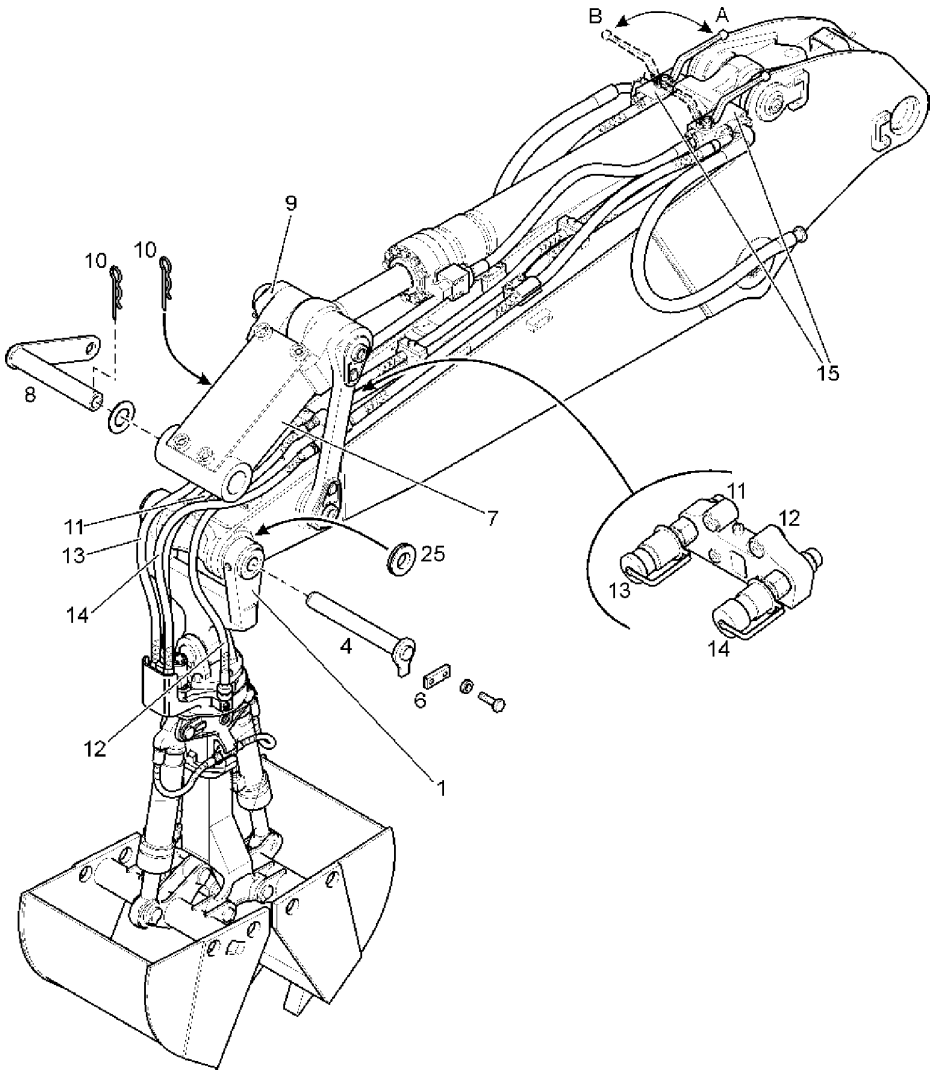

Fig. 3-101 *Attaching and dismounting the grab on the stick*

1	Grab mounting	**11**	Hose
4	Pin	**12**	Hose
6	Locking plate	**13**	Hose
7	Connecting link	**14**	Hose
8	Carrier bracket	**15**	Valve blocks
9	Reversing lever	**25**	Pin bearing sealing
10	Cotter pin		

Detaching a work tool

To move the equipment into position:

Caution!
Hydraulic lines are pressurized!

- ▶ Remove the pressure using the joystick before removing the hydraulic lines (switch off the engine, turn the ignition key into the contact position, operate the joystick).

- ▶ Disconnect hydraulic lines or electrical lines, if necessary (eg. when dismounting a grab).
- ▶ Extend the shovel tilting cylinder fully.

To unlock the quick-change adapter:

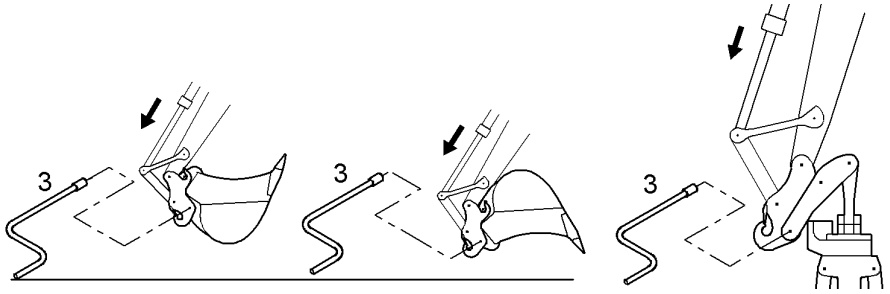

Fig. 3-108 *Unlocking the quick-change adapter*

Danger!
Risk of injury.
Once unlocked, there is no fixed connection between the adapter and the work tool. The work tool could work itself out independently.

- ▶ Ensure that the work equipment cannot be moved by others when this action is being carried out.
- ▶ Always keep the work tool as close to the ground as possible when unlocking to avoid creating conditions which may lead to danger.

- ▶ Approach the quick-change adapter from the side and unscrew the locking screw **2** using the crank **3** from the locking pin **1**.
- ▶ Insert the crank **3** in the locking pin **1** and turn to the left (anti-clockwise), until both locking pins **1** are inserted as far at the stop.

To put down the work tool:

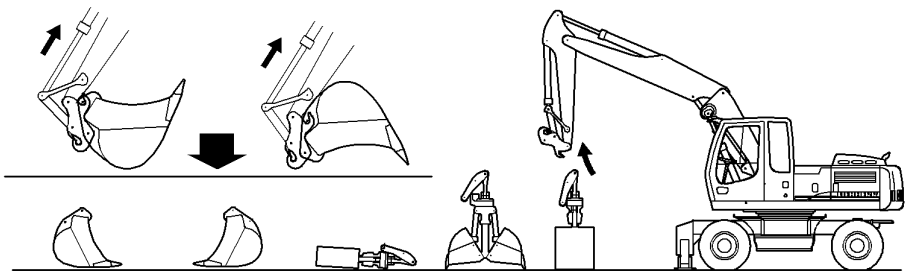

Fig. 3-109 *Putting down the work tool*

- ▶ Connect or separate the hydraulic coupling slowly as with any change of work tool.
- ▶ When attaching the quick-change adapter, tilt until the coupling disks are connected as a result of the self weight of the work tool.
- ▶ Remove the locking pins.
- ▶ If the disks do not connect as a result of self weight, foreign matter (such as stones) may be the cause. In this case, clean all coupling parts to prevent damage occurring when connecting.
- ▶ Oil quantity and pressure must be adapted to suit the work device concerned.
- ▶ When the work is completed, and particularly before transportation, put the protective coverings **1** and **2** back on.

Attaching LIKUFIX work tools to a quick-change adapter without LIKUFIX

It is possible to attach a work tool with a LIKUFIX hydraulic coupling to a machine with a quick-change adapter (mechanical or hydraulic) at any time.

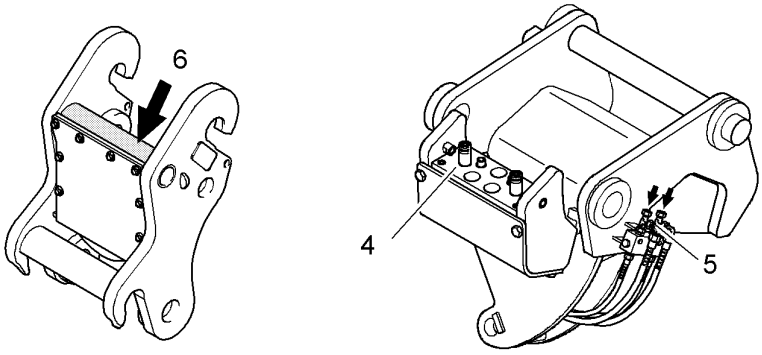

Fig. 3-122 *LIKUFIX work tool on quick-change adapter without LIKUFIX*

Caution!
The LIKUFIX hydraulic coupling could be damaged.

- ▶ Do not use a quick-change adapter with a reinforcement kit since the reinforced steel part **6** could damage the LIKUFIX hydraulic coupling on the work tool.
- ▶ In this case, ensure that you have the quick-change adapter reworked at the LIEBHERR customer service centre.

For attachment without LIKUFIX hydraulic coupling, LIEBHERR work tools usually have an alternative connection option.

Example:

On the ditcher bucket, hydraulic lines are either connected using LIKUFIX **4** or using an auxiliary hydraulic connection **5**.

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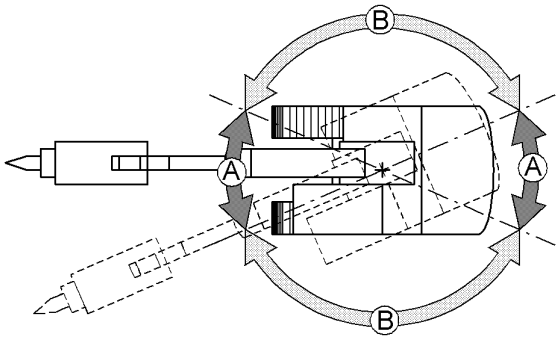


Fig. 3-137 *Permissible **A** and not permissible **B** work areas of the machine with hydraulic hammer*

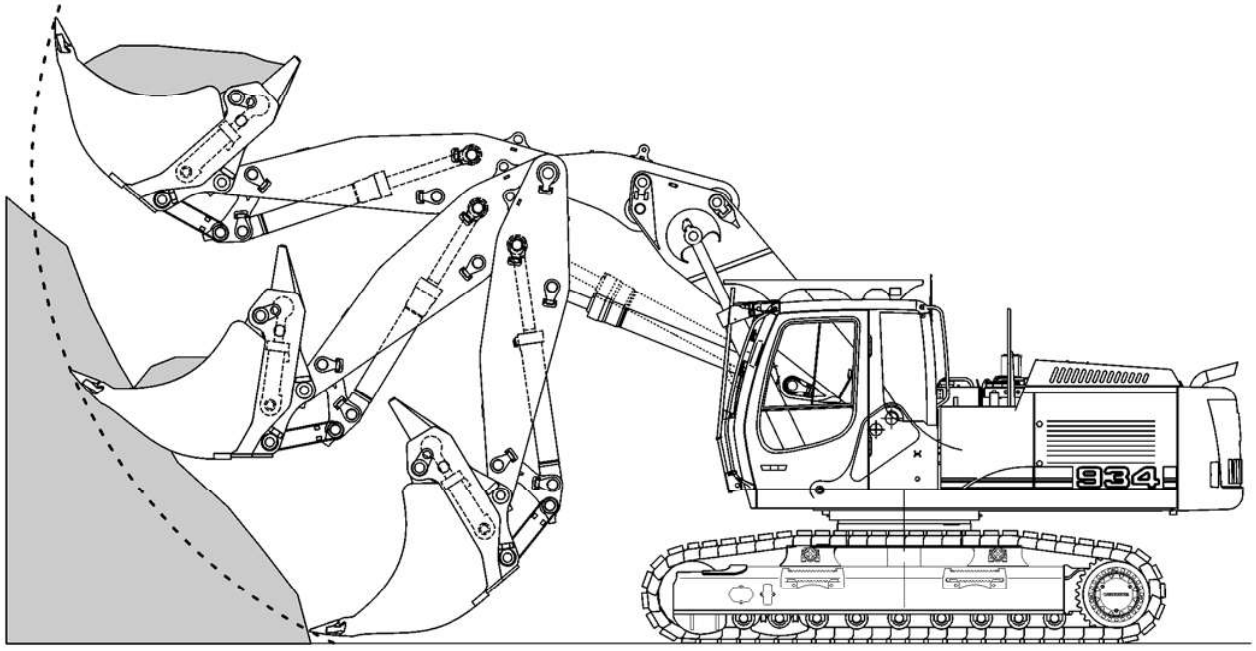
Danger!
The stability of the machine could be affected.
When using a hydraulic hammer, only work with the machine in area **A**.

3.8.9 Working with a bottom dump bucket

Observe the following instructions in order to optimize the machine power as well the digging and breakout forces and the filling of the shovel and to help keeping the working place even and free of obstacles.

Filling the bottom dump shovel

Note!
Avoid digging with the attachment in a crosswise direction to the tracks.



▶ Reinstall the covers **6**.

3.11 Hydraulic removable counterweight

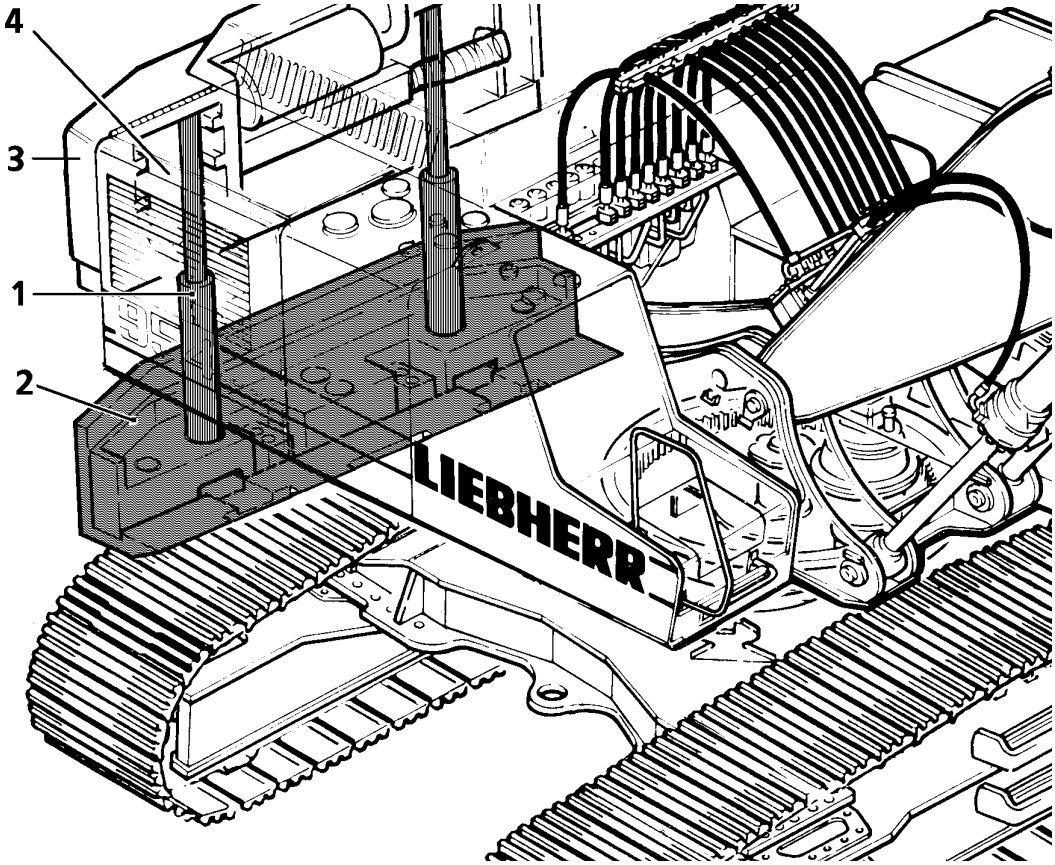
This optional equipment makes it possible to let down and lift the counterweight of the machine quickly and without needing an additional lifting device (as an example to make the conveyance easier). This is achieved via two telescoping cylinders and using the hydraulic power of the machine.

3.11.1 Safety guidelines for lifting and lowering the counterweight

Danger!
In order to maintain the stability of the machine, a part of the working attachment is to be removed before lowering the counterweight.
As a basic rule we recommend to remove all the attachment parts with exception of the boom (gooseneck boom, main boom or shovel boom) and to lower the boom to the ground.

▶ Before attempting to lower or to raise the counterweight, always check that the mounting pins **7** are mounted and fully engaged in their bores.

▶ Never stand below the counterweight during its down or up motion and as long as it is not properly secured with its fastening screws.



Rear lifting gear 974 C

- ▶ Position the rear lifting gear **3** at the rear of the uppercarriage.
- ▶ Attach the rear lifting gear **3** with the nut-screw drive **2** (M42 - 10.9, tightening torque 4500 N.m). The screws have to be mounted **only one time**.

Lifting the machine

- ▶ Connect the shackles of the lifting gear with the lashing points of the lifting crane.
- ▶ Carefully lift the machine with the crane to pretension the slings.
- ▶ On machine fitted with removable side frames:
- – Disconnect all hydraulic lines of the travel motors at the travel motors.
- – Remove the mounting bolts between side frames and undercarriage central part.

Note

- ▶ After 10 dismountings, replace the mounting bolts of the side frames by new ones.

- ▶ Lift the machine.

3.12.3 Lashing the machine

Danger!
If the machine is badly secured, it could slip or fall.

- ▶ Before the transport, secure the machine and each separately transported components on the trailer.
- ▶ Avoid contact metal on metal.

Notice
Preferably get your machine fitted out with the LIEBHERR original stowage ears. This equipment aims an optimal stowing of the machine on the trailer.

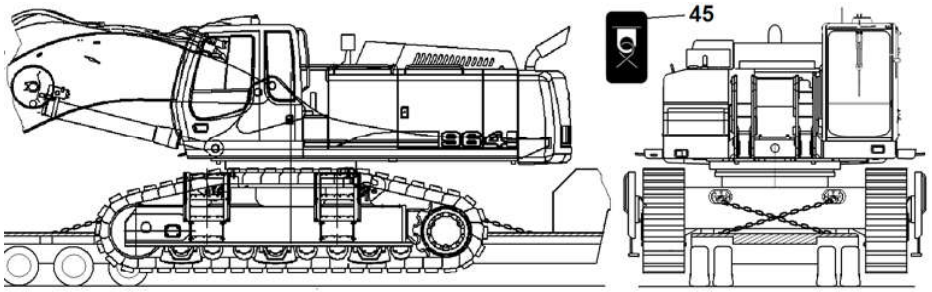
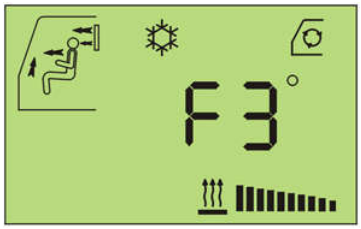


Fig. 3-152 *To secure a machine fitted out with stowage ears*

Error code	Effect	Cause	Measure / remedy
E 280	Possibly incorrect function of the servo control for swing left	Short circuit to ground or to +24V in the load circuit Yr150	Check, if necessary repair the regulation solenoid valve Yr150 and its connecting circuit
E 281		Broken wire in load circuit to regulation solenoid valve Yr150	
E 282	Possibly incorrect function of the servo control for swing right	Short circuit to ground or to +24V in the load circuit Yr151	Check, if necessary repair the regulation solenoid valve Yr151 and its connecting circuit
E 283		Broken wire in load circuit to regulation solenoid valve Yr151	
E 268 to E 283 Simultaneously	No or incorrect function of the servo control	Missing 24V supply of the servo control plate U48-2/A , connector X850-3	Check 24V supply circuit, r(epair as necessary (Fuse F152, connector X850-3, .)
E 284	Possibly incorrect function of the servo control for pressureless lowering	Short circuit to ground or to +24V in the load circuit Yr401	Check, if necessary repair the regulation solenoid valve Yr401 and its connecting circuit
E 285		Broken wire in load circuit to regulation solenoid valve Yr401	
E286, 88, 90, to E298	Possibly incorrect function of the servo control for additional movement	Short circuit to ground or to +24V in the load circuit	Check, if necessary repair the regulation solenoid valve for additional movement and its connecting circuit
E287, 89, 91, to E299		Broken wire in load circuit to regulation solenoid valve	
E284 to E299 Simultaneously	No or incorrect function of the servo control	Missing 24V supply of the servo control plate U48-2/A , connector X850-1	Check 24V supply circuit, r(epair as necessary (Fuse F152, connector X850-1, .)
E 302	No entry possible using keypad	No coding plug	Consult LIEBHERR customer service.
E 303	Diesel engine speed cannot be adjusted using keypad, hydraulic power is reduced.	No CAN bus connection between keypad and BST plate (message also appears if bus arbiter not operating, e g. if no power supply is present).	Switch to emergency control speed adjustment **S71** and **S72** and emergency operation work pumps **Y50**, consult LIEBHERR customer service.
E 305	Malfunctions, e g. swing gear brake, servo control	No CAN bus connection between keypad and ESP01 board (message also appears if ESP01 not operating).	Switch to emergency switching of servo pressure circuits **S73**, consult LIEBHERR customer service.
E 307		No CAN bus connection between keypad and engine control system PLD	Switch to emergency control speed adjustment **S71** and **S72** and emergency operation work pumps **Y50**, consult LIEBHERR customer service.
E 308	No display or incorrect display on screen	No connection keypad / screen or keypad not operating	Consult LIEBHERR customer service.
E 309		No Software compatibility between screen and keypad	
E 310		For boring excavators, Hardware coding and software coding are not in concordance.	Consult LIEBHERR customer service.

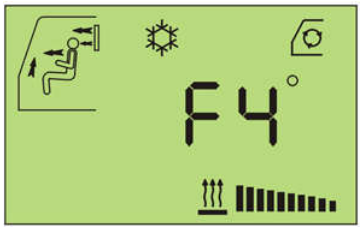


Error code “F3“ faulty vent flap foot room area and front window:

The control unit has recognised a faulty vent flap in the air duct to the front window and foot area, the regulation is once again ready for operation.

Cause of flap fault: short-circuit or interruption of the power supply line, defective plug connection on flap motor or on control unit, or flap motor faulty.

After remedying of the fault, the fault is no longer displayed.
Should a flap error occur, the regulator carries on working as usual, only the middle position of the vent flap can no longer be started.

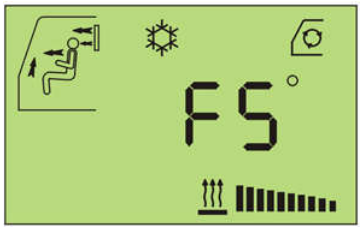


Error code “F4“ pressure fault and faulty magnetic coupling:

The control unit has recognised a faulty vent flap room area and front window, the regulation is once again ready for operation.

Cause of flap fault: short-circuit or interruption of the power supply line, plug connection on fan flap motor or control unit, flap motor faulty.

After remedying of the fault, the fault is no longer displayed!
Should a pressure fault or faulty magnetic coupling occur, the regulator carries on working as usual, only the magnetic coupling output is interrupted.



Error code “F5“ faulty data transmission operating feature / control unit:

Data transmission from the operating feature to the control unit is faulty.

Cause of the fault: short-circuit or interruption of the data line to control unit, plug connection on operating feature or control unit.

The operating feature continues to try to establish data connection to the control unit, if the connection is once again OK, “F5“ – fault will no longer be displayed.
If the data transmission from the operating feature can not be established again, the ignition must be switched off, and RESET will be carried out following the restart.

4.2.7 LIEBHERR particles filter system

Chart of errors on particle filter control unit A175.

LCD display message	LED	Cause	Remedy
"Themo element 1 (or 2) is defective" (or "Thermoelement 1 (oder 2) defekt") Buzzer (H) is activated.	orange + green	Defektive or interruption ot a temperature sensor	Press key **E**: Deactivation of the acoustic alarm (buzzer). Check temperature sensor, connect or, if necessary, replace.
"ERROR idling / Temp. ignition block active" (or "Fehler Leerlauf / Temp. Zündungssperre aktiv") Buzzer (H) is activated.	orange + green	Too long operation with low exhaust gas temperature (low engine load)	Press key **E**: Deactivation of the acoustic alarm (buzzer). Increase engine load (full load operation)
		Idling operation too long	Operate machine with higher speed.
"Error interrupt. Terminal W" (or "Fehler Unterbr. Klemme W") Buzzer (H) is activated.	orange + green	Interruption of the of the speed logging.	Press key **E**: Deactivation of the acoustic alarm (buzzer). Check the circuit for speed logging and, if necessary, replace.

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Clean and regularly treat the rubber seals on doors and panelling elements with a care product. This helps prevent premature wear and protects the rubber seals during the cold season.

Recommended care products: Silicone, talcum powder, deer tallow

5.4 Lubricants and fluids

5.4.1 General information

Observe the instructions for lubricants and process chemicals. Lubricate the machine and change the oils at the prescribed intervals. For more information, see lubrication chart and inspection and maintenance schedule.

Keep workplaces for these activities clean. This enhances the service life and reliability of the machine.

- ▶ All work on the machine must be carried out while it is standing on firm and level ground.
- ▶ Switch off the diesel engine, remove the ignition key and set the battery main switch to position 0 (OFF).
- ▶ Clean lubricating nipples before adding grease.
- ▶ Clean all filling points and the area around them before opening the caps and screws.
- ▶ The oil should be changed while it is at operating temperature.
- ▶ After each oil change or refilling, check the fill level in the respective unit (the specified fill levels are guide values).
- ▶ Collect old oil and chemicals in suitable containers and dispose of them according to the applicable statutory regulations.

5.4.2 Filling quantities and lubricating chart

Recommended lubricants

Designation	Recommended lubricant	Symbol	Volume [litre]*
Diesel engine	Liebherr Motoroil 10W-40 Liebherr Motoroil 10W-40 low ash Liebherr Motoroil 5W-30 Liebherr Motoroil 5W-30 low ash		70
Hydraulic system (system capacity / oil change volume)	Liebherr Hydraulic Basic 68 Liebherr Hydraulic Basic 100 Liebherr Hydraulic HVI Liebherr Hydraulic Plus Liebherr Hydraulic Plus Arctic		1350 / 840
Slewing gear mechanism	Liebherr Gear Basic 90 LS		32

Single-grade oils (1)	API - CD / ACEA - E1 (MB 226.0 and 227.0)
Multigrade oils (2)	API - CD, CE, CF / ACEA - E2, E3, E4 (MB 227.5, 228.1, 228.3 and 228.5)

Tab. 5-7 *Classification of products, engine oils for use as hydraulic oils*

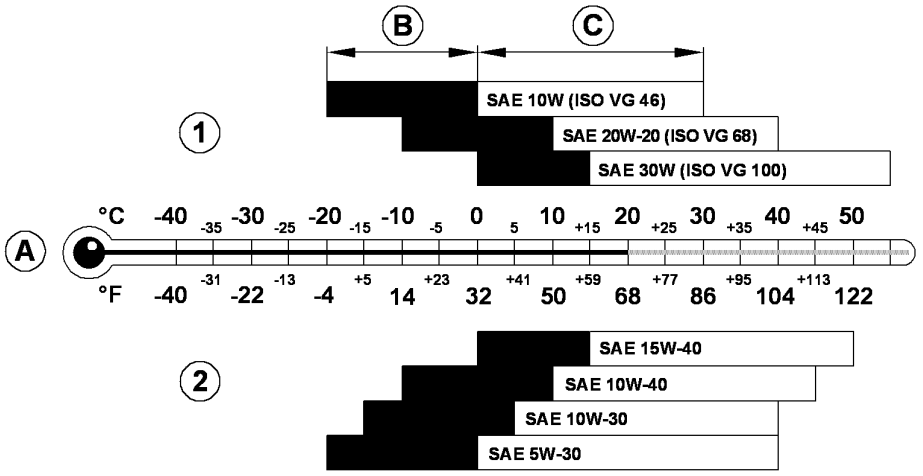

Fig. 5-8 *Engine oil for use as hydraulic oil, viscosity grade selection based on temperature**

A Ambient temperature
B Cold-start range with warm-up instruction
C Operating range
1 Single-grade oils
2 Multigrade oils

* for deviating viscosity grade, contact the Liebherr customer service.

Warm-up instructions

The black bar **B** indicates ambient temperatures that are up to 20 °C below the operating range **C**.

For cold starting at an ambient temperature below range **B**, the following warm-up instructions for the hydraulic oil apply:

- ▶ **1.** Start the Diesel engine and set it to medium speed (not exceeding 50% of maximum speed).
- ▶ **2.** Carefully activate the working hydraulics. Operate the hydraulic cylinders and move them briefly to the stop.
- ▶ **3.** After approximately 5 minutes, start the travel hydraulics. The total warm-up time is approximately 10 minutes.

For cold starting at lower ambient temperatures: Before starting the engine, warm up the hydraulic oil tank. Then follow warm-up instructions **1** to **3**.

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Notice !
On the machines delivered before Mai 2010, the filter cover **11** and the guiding tube **15** consisted of two separable parts.
These separable covers have been basicaly replaced at customers at the latest before end of December 2010 by covers in non separable monobloc execution.

- ❑ Should you, passed this date, notice during removal of a cover **11**, that the guiding tube **15** remains in the filter element **14**:
- ▶ Pull the guiding tube **15** out of the filter element **14** et reinsert it into the cover **11**.
- ▶ Immediately report this statement to the responsible for the machine maintenance in order to initiate as soon as possible the replacement by covers in monoblock execution (as per the Service Information LFR 04-53-13 / 10).

- ▶ Dispose of the old filter elements **14** for their elimination in conformity with the respect of the environment
- ▶ Slightly coat new O-rings **12** and **13** with oil and install them.
- ▶ Install the new filter elements **14** onto the covers **11**.
- ▶ Reinsert the oil filter covers **11** previously assembled with the elements **14** into their housings and retighten (tightening torque is 40^{+10} Nm - 30^{+7} ft.lbs).

Refilling the Diesel engine with oil:

- ▶ Add the oil via the filler neck **2** until the oil level is between the **min** and **max** marks of the dipstick **1**.
- ▶ Clean the filler plug and reinstall it to the filler neck **2**.
- ▶ Start the Diesel engine.
- ▶ Check the oil pressure indication on the monitoring display of the machine and check the oil filter covers **11** for leaks.
- ▶ Turn the Diesel engine off.
- ▶ Wait for 2 or 3 minutes and check the oil level again.

For oil quantity and oil quality see the lubricants chart.
For the oil change intervall, see the maintenance chart.

5.6.3 Polyvee belt for the airco compressor and alternator drive

The Diesel engine is fitted with a tensioning device for the belts. This device is self-tensioning and is therefore maintenance-free.

- ▶ Regularly check the belt for damage and wear and replaced it if necessary.

The following damages to the belt make its replacement necessary:
- – Rib fractures
- – Transversal fractures in several ribs
- – Rubber nodules in between the ribs
- – Deposition of dirt or stones
- – Ribs becoming loosened at the base of the ribs
- – Transversal fractures on the belt exterior

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– Bleed the coolant circuit when refilled

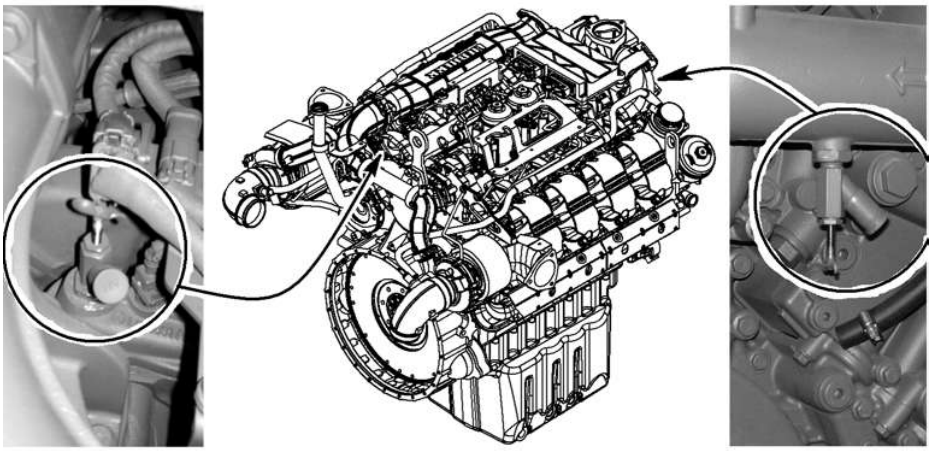


Fig. 5-27 *Shutoff valves for cab heating circuit*

Note!
If the coolant has been changed without closing the shutoff valves for the cab heating circuit, the heating circuit must be bled, see chapter "maintenance of heating circuit".
To be sure that the coolant flows through the heating system, the ignition key must be in contact position and the cab heater must be set manually to maximum heating power.

Draining the coolant

▶ Remove the filler cap 6 at the filler neck.

To drain the coolant at the Diesel engine:

▶ Unscrew the protection cap of the drain valve **1** on the front side of the engine, screw the supplied drain hose to the drain valve **1** and let the coolant drain into a suitable container.

Fig. 5-28 *Coolant draining valve and screw on engine front side*

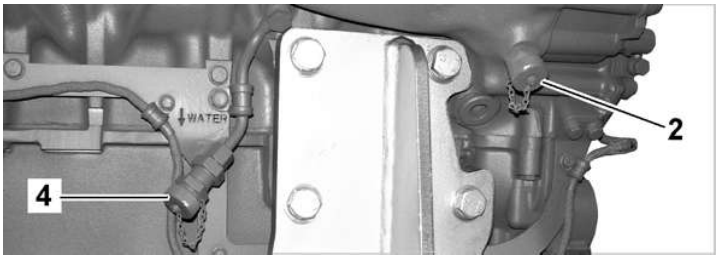


Fig. 5-29 *Coolant draining valves on engine rear side*

5.9.3 Draining the fuel tank

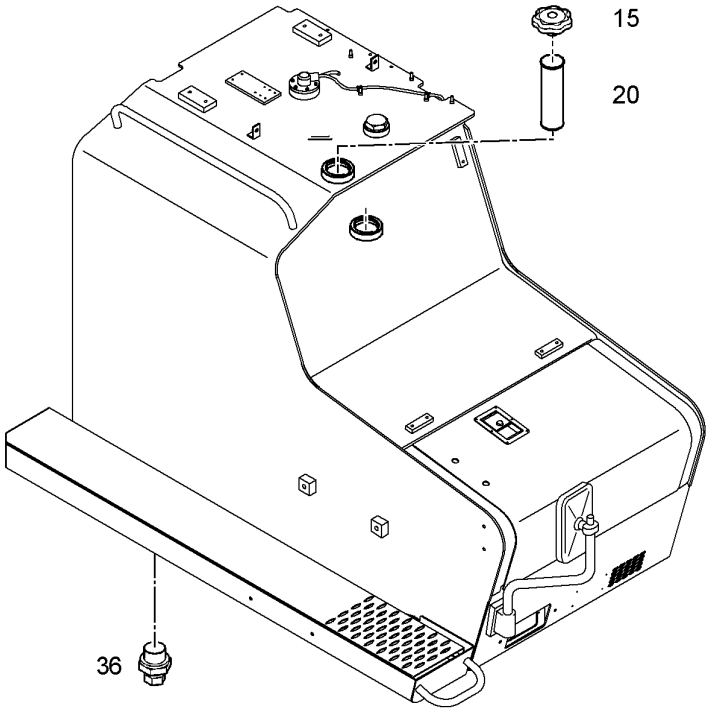


Fig. 5-38 *Fuel tank*

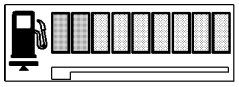
15 Filler cap **20** Filler sieve **36** Drain valve

To daily drain the fuel tank and the fuel system:

- ▶ Place a suitable container underneath.
- ▶ Unscrew the drain valve **36** mounted to the bottom sheet of the fuel tank.
- ▶ Drain off the water until water free fuel escapes.
- ▶ Close the drain valve **36** again.

If the operating conditions and the fuel quality allows, the water draining interval can be increased to once a week.

Note!
To reduce the formation of condensate in the tank, keep the fuel level as high as possible. Preferably refuel the tank at the end of the working day.



Display **P3** indicates the fuel level.

When the red bar **P3.1** illuminates, a low reserve quantity is still in the tank.

- ▶ In the event of a low fuel level, refill the tank before starting to work..

5.9.4 Emptying and cleaning the fuel tank

The bottom of the tank is fitted with a drain valve **36**.

- ▶ Place a suitable container underneath.

Danger!
The hydraulic oil is hot when at operating temperature and could be pressurized.

▶ Do not allow the hot oil or oil-bearing parts to touch the skin.

5.11.2 Checking the oil level, emptying and refilling the hydraulic tank

Machine position

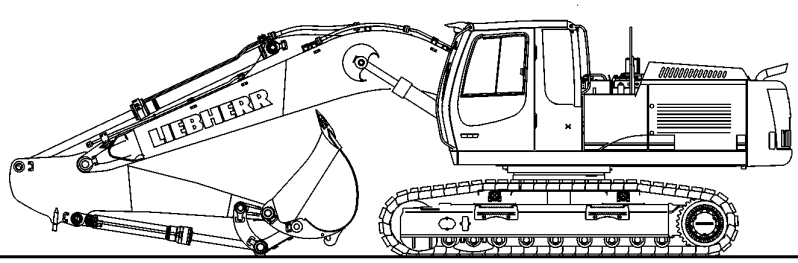


Fig. 5-49 *Machine position for checking the oil level in the hydraulic tank*

When checking the oil level or refilling the oil:

– the machine must stand on level floor,
– the attachment must be laid down on even ground with the stick and bucket cylinders fully extended (bucket and stick fully tilted in),
– the Diesel engine must be switched off.
– if applying the bottom dump bucket must be closed.

Checking the oil level in the hydraulic tank

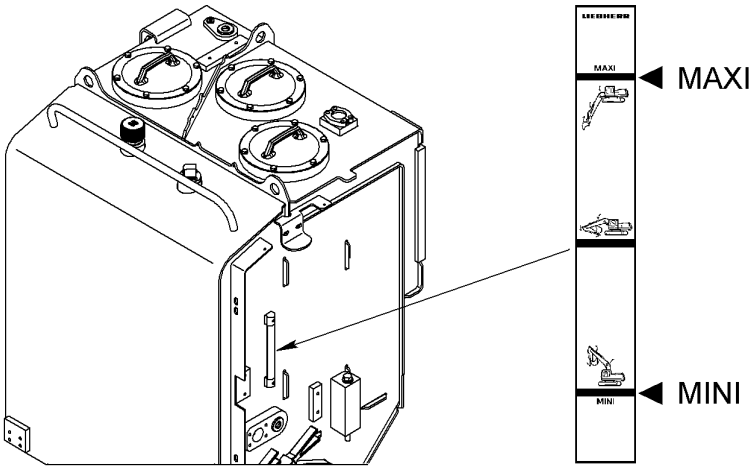


Fig. 5-50 *Hydraulic tank oil level*

When the machine is in the check position, the level must not be below the middle marking on the sight gauge.

▶ If this is not the case, fill oil through the return filter until the oil level reaches the middle marking.

5.11.11 Removing the suction hose to the pumps

For maintenance reasons (change of a suction hose, removal of a pump), the suction hoses to the pumps can be isolated from the hydraulic tank thanks to shut off valves.

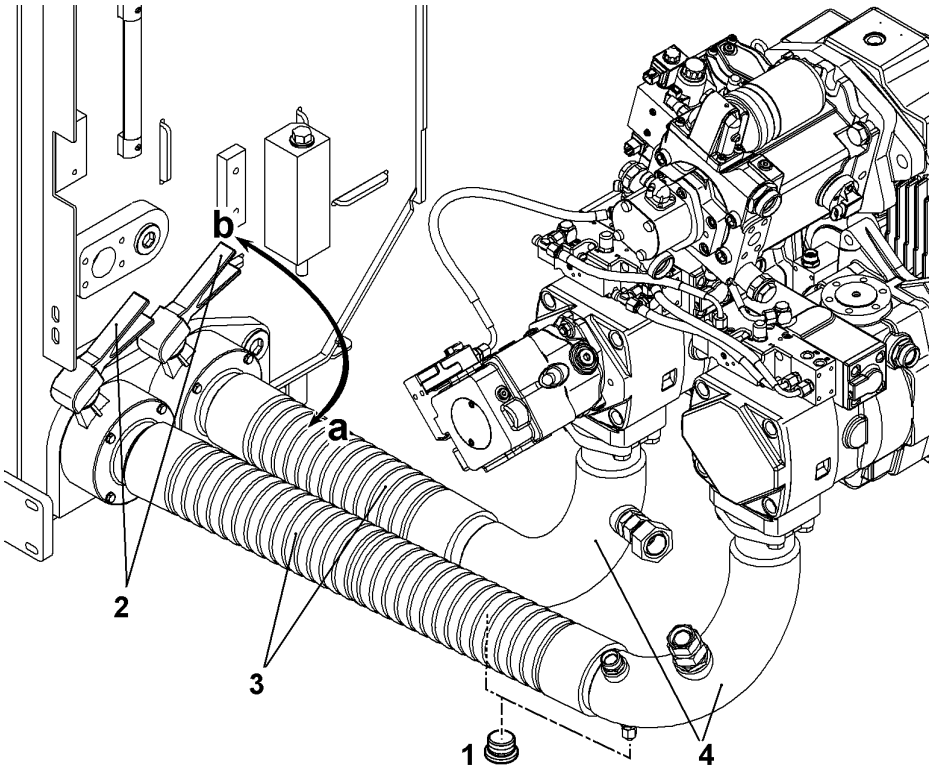


Fig. 5-59 *Shut off valves and suction hoses to the hydraulic pumps*

1 Drain plug
2 Shut off valve
3 Suction hose
4 Pump suction neck

The shut off valve on the hydraulic tank to the suction hose has two positions :

– **a** open
– **b** closed

▶ Depressurize the hydraulic system.

▶ Close the shut off valve on the hydraulic tank **b**.

▶ Unscrew the drain plug **1** in the pump suction neck.

▶ Drain the hydraulic oil out of the pump and suction hose.

▶ Once the repair work is completed, turn the shut off valve back to its initial position **a** and engage.

▶ Retighten the vent filter on the hydraulic tank.

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5.13.1 Checking the mounting screws of the track components

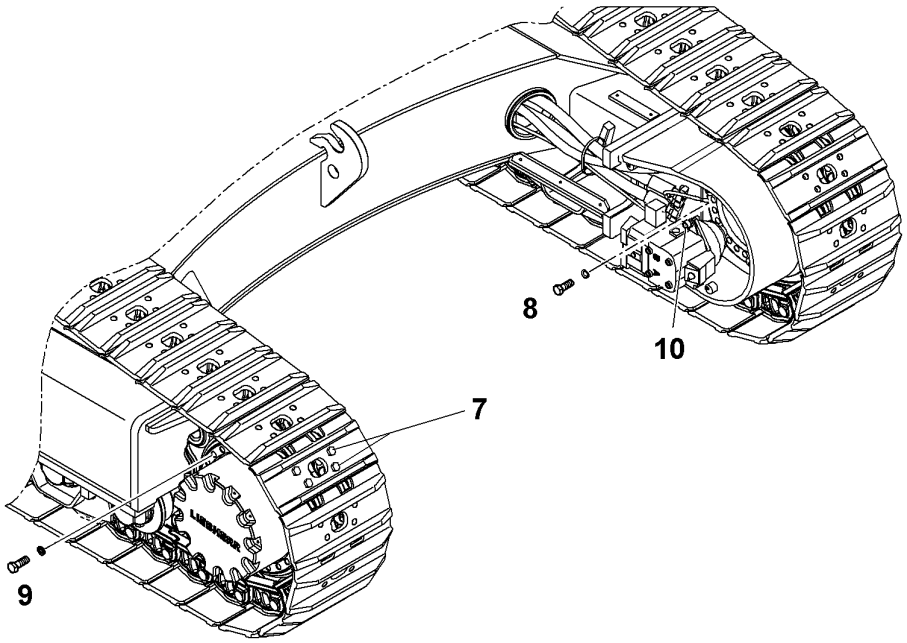

Fig. 5-69 *Track components mounting screws*

- ▶ Regularly carry out a visual inspection for loose mounting screws on the track pads and travel drives.
- ▶ Regularly check the tightening torques of some screws (take a random sample of about ten screws regularly distributed on the upper side of each chain) and retighten all the screws if you notice that at least one screw has loosened.
- – The track pads mounting screws **7** must be torqued to:

Component	Mounting bolt	Test torque	Pre-tightening torque and turning angle
B9S and B9HDS	1" 1/8 - 12 UNF - 12.9	2100 Nm (1550 ft.lbs)	810 Nm + 120°
D9G	1" 1/8 - 12 UNF - 12.9	1900 Nm (1402 ft.lbs)	833 Nm + 120°

- – The mounting screws **8** of the travel gears to the side trames must be torqued to:
  - (Screws - M24 - 12.9) : **1120 Nm (830 ft.lbs)**
  - (Screws - M30 - 10.9) : **1900 Nm (1400 ft.lbs)**
- – The mounting screws **9** of the sprocket wheels must be torqued to:
  - (Screws - M24 - 12.9) : **1120 Nm (830 ft.lbs)**
  - (Screws - M30 - 10.9) : **1900 Nm (1400 ft.lbs)**
- – The mounting screws **10** of hydraulic motors to travel gears must be torqued to:
  - (Screws - M24 - 10.9) : **960 Nm (710 ft.lbs)**

5.13.2 Checking the track chains tension

Due to normal wear of the tracks, the chain tension needs to be checked regularly, and, if necessary, the chains must be tightened.

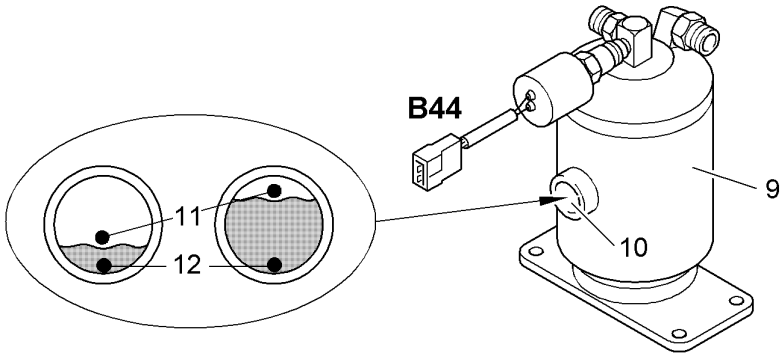

Fig. 5-79 *Dryer-accumulator unit*

To check the dryer-accumulator unit:

▶ With the diesel engine running and the air-conditioning system switched on, check the refrigerant level in the inspection glass **10** of dryer-accumulator unit **9**.

Note!
If there is insufficient refrigerant, the white float **11** lays at the bottom of the inspection glass.

▶ If the cooling effect is diminishing, have the system refilled by a refrigeration engineer.

▶ Determine the degree of moisture of the desiccant in dryer-accumulator unit **9**.

▶ To do this, observe the colour of the indicator pearl **12** in the inspection glass.

If the pearl is orange, the degree of moisture in the coolant circuit is OK. If, however, the pearl is not coloured, the dryer-accumulator unit is saturated with moisture.

▶ Change dryer-accumulator unit **9** immediately.

▶ Perform a visual check on the condition of dryer-accumulator unit **9**.

▶ If it is observed that dryer-accumulator unit **9** is rusted or damaged (e g. on the panel fastening or on the hose connection), replace dryer-accumulator unit **9** (pressure tank).

In the two cases referred to above and at least once a year, have the dryer-accumulator unit **9** replaced by a fitter trained in refrigeration engineering.

The coolant circuit must be emptied, checked for leaks and refilled. Check for abrasion, replace and if necessary retighten the hose connections on the hoses.

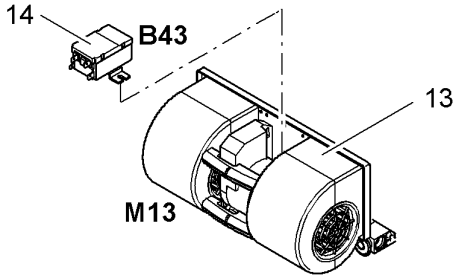

Fig. 5-80 *Fan motor on the heating/air-conditioning device*

5.17.3 LIKUFIX (option)

Cleaning LIKUFIX

The LIKUFIX hydraulic coupling system is mostly maintenance-free.

It is recommended that the system is cleaned at regular intervals and sprayed with lubricating varnish (see Workshop manual). This will prevent dirt adhering and icing up.

If the system is kept properly clean, the seals are very durable.

Replacing the sealing ring

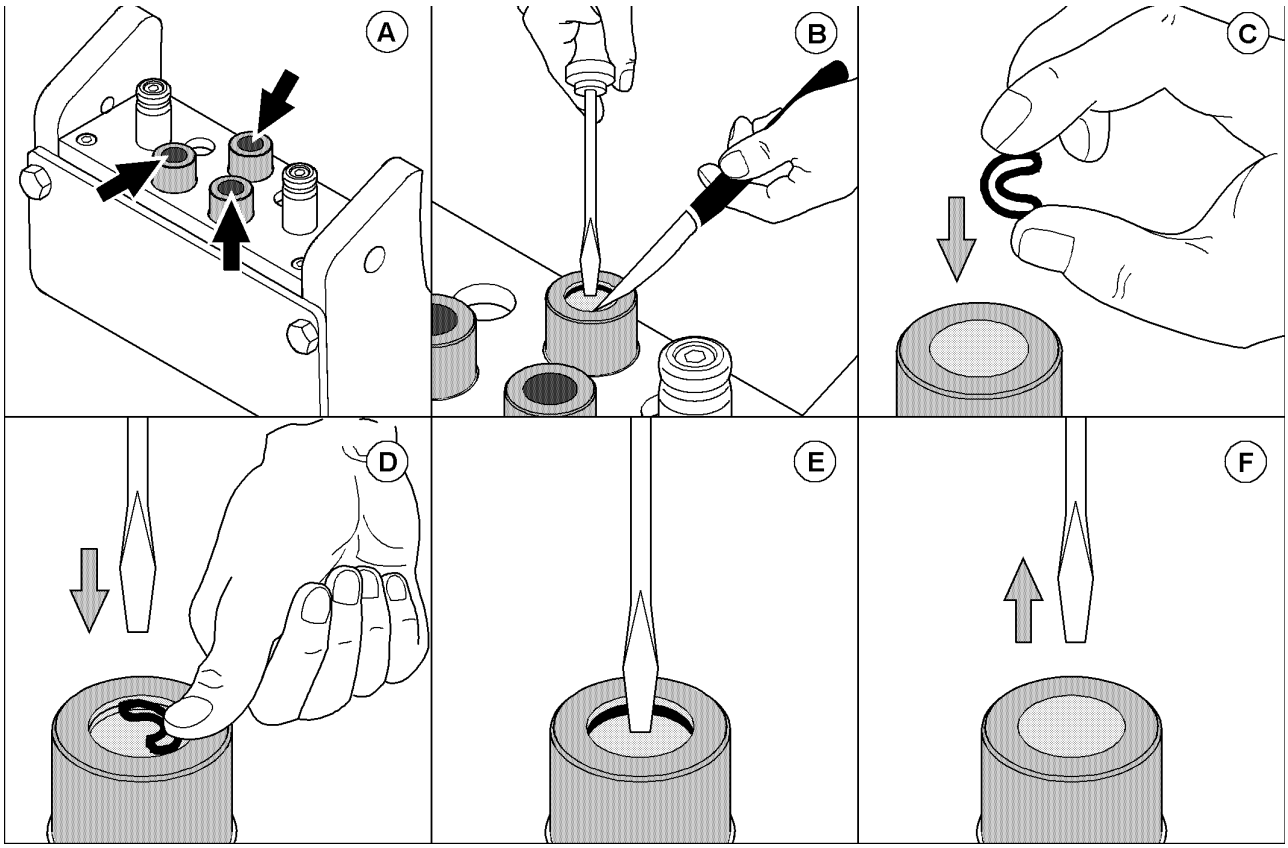

Fig. 5-91 *Replacing the sealing ring*

If leaks occur at the coupler plugs (**A** , see arrows), the sealing rings should be replaced.

- ▶ Use a screwdriver to push down the sealing washer and lever out the defective sealing ring using a pointed object (**B**).
- ▶ Press the new sealing ring together and place it on the sealing washer with the open side down (**C**).
- ▶ Press down the washer as far as the groove, place the screwdriver in the middle of the sealing ring and move your hand away (**D**).
- ▶ Allow the sealing ring to jump into the groove (**E**).
- ▶ Remove the screwdriver (**F**).
  - ↳ The sealing washer must move upwards. If necessary, press the sealingring again until the sealing washer is flexible.