En

Operating manual

Hydraulic excavator
R944C

from serial number 31021

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

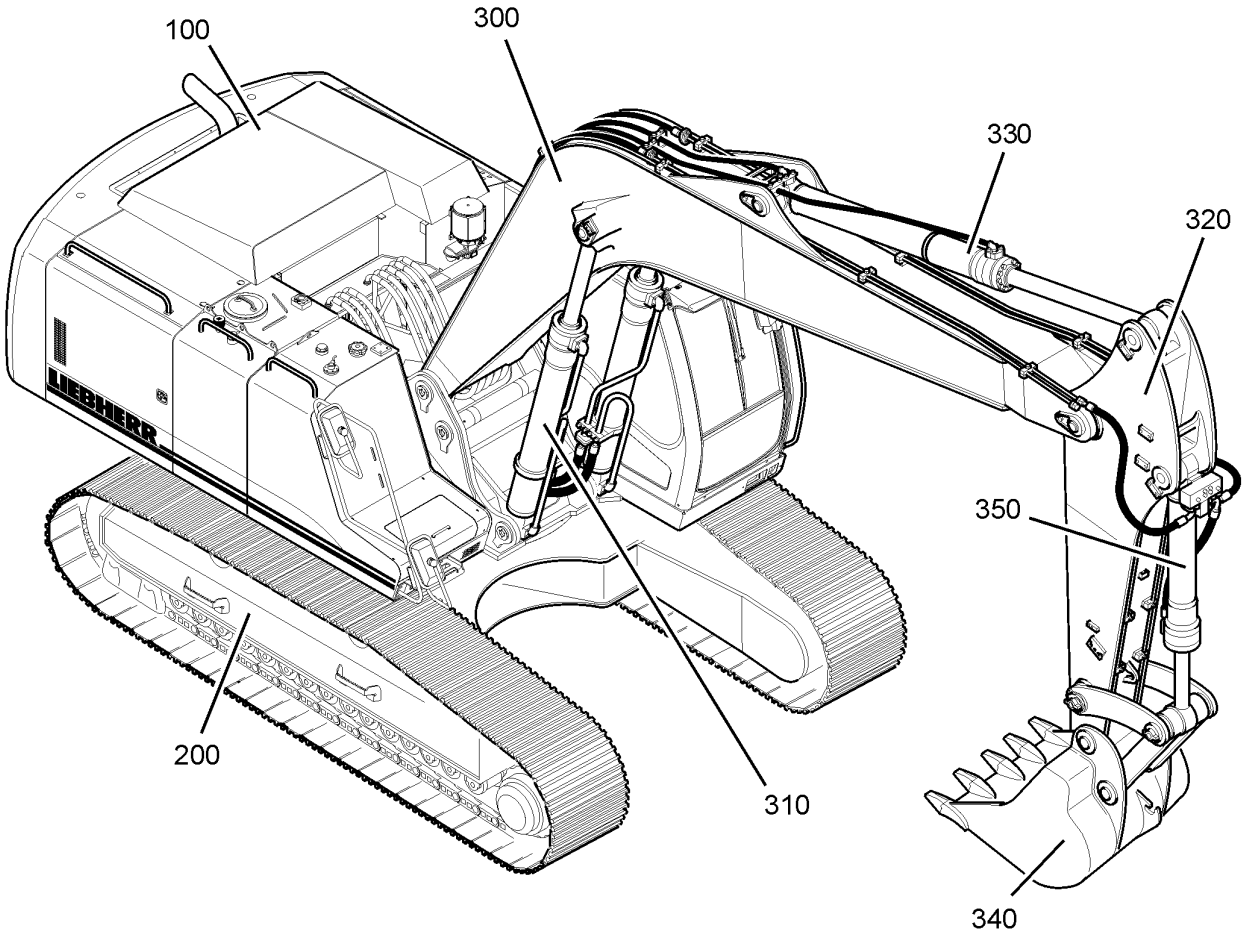

Fig. 1-1 *Machine with backhoe attachment*

100	Uppercarriage	**310**	Boom cylinder	**340**	Bucket
200	Undercarriage	**320**	Stick	**350**	Bucket cylinder
300	Boom	**330**	Stick cylinder		

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Performance

Liebherr crawler excavators feature state-of-the-art technology and high-quality workmanship. The most important components of the drive system are all produced by Liebherr and are perfectly coordinated with one another. The engine generation, as further developed for the “C-series”, assures an effective power delivery, a high degree of efficiency, long life expectancy and complies with the emission standard IIIA / Tier 3.

Reliability

High demand for performance and quality is consequently converted into landmark solutions to achieve the highest level of dependability and reliability. Liebherr has over 50 years experience in the production of hydraulic excavators and has an unparalleled competence in design and know-how.

Comfort

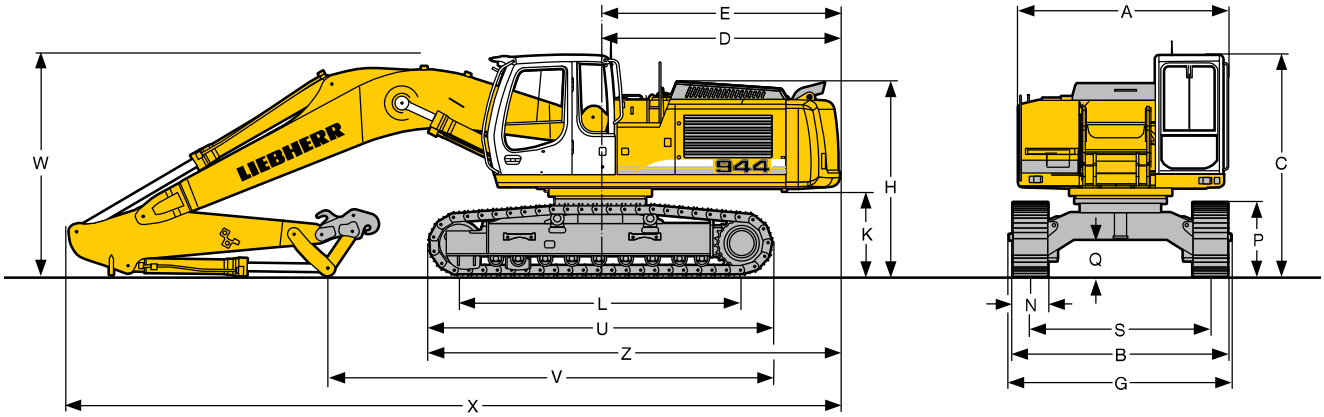
In the operator’s station, the operator can look forward to a comfortable workstation that is designed according to the most up-to-date ergonomically know-how. The standard automatic climate control provides a pleasant working environment in all weather conditions.

Liebherr crawler excavators are particularly service-friendly: Maintenance work is simply and quickly accomplished due to well accessible service points.

Economy

Liebherr crawler excavators stand for maximum productivity. The sensitive excavator controls assure optimal efficiency in the interaction of excavator hydraulics and electronics. A wide selection of attachments, accessory tools and undercarriages with various dimensions provide the correct choice for every application.

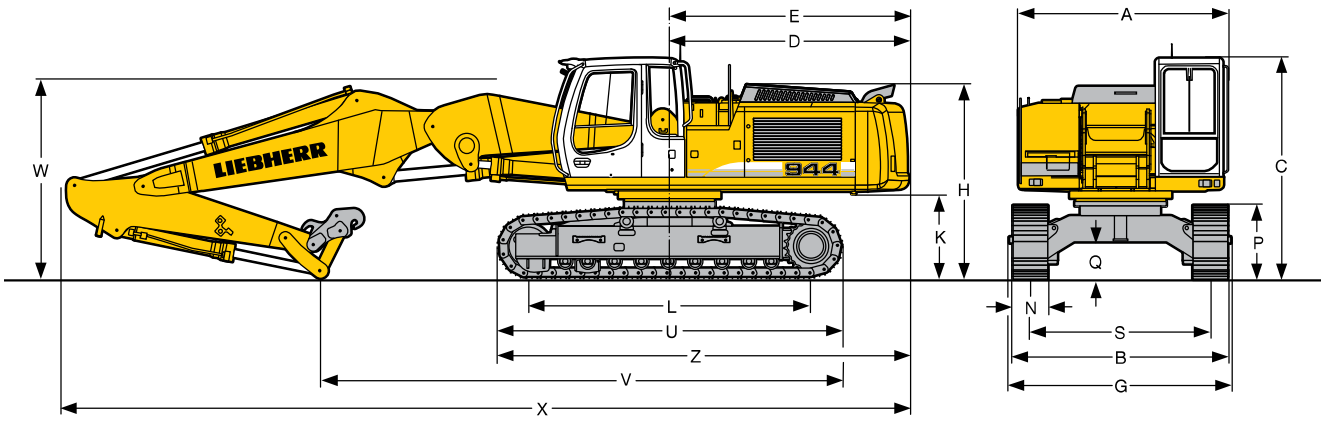
Dimensions



	NLC		mm	LC		mm	S-HD		mm
A			3,060			3,060			3,060
C			3,210			3,210			3,275
D			3,471			3,471			3,471
E			3,471			3,471			3,471
H			2,820			2,820			2,885
K			1,230			1,230			1,300
L			4,108			4,108			4,400
P			1,070			1,070			1,170
Q			539			539			540
U			5,030			5,030			5,378
S			2,390			2,590			2,900
N	500	600	750	500	600	750	500	600	750
B	2,890	2,990	3,140	3,090	3,190	3,340	3,400	3,500	3,650
G	2,982	2,982	3,282	3,182	3,182	3,482	3,732	3,732	3,732
Z			5,990			5,990			6,170

	Stick Length	Gooseneck Boom 6.45 m	Hydraulically Adjustable Boom 4.30 m	Straight Gooseneck Boom 6.80 m
	m	mm	mm	mm
V[1)]	2.10	7,000	8,000	7,350
V[2)]	2.10	7,150	8,250	7,600
V[1)]	2.60	6,450	7,600	7,000
V[2)]	2.60	6,650	7,800	7,200
V[1)]	3.30	5,800	7,050	6,400
V[2)]	3.30	6,050	7,250	6,650
V[1)]	4.10	8,100	6,200	5,600
V[2)]	4.10	8,300	6,400	5,800
W[1)]	2.10	3,200	2,750	2,950
W[2)]	2.10	3,300	2,800	3,050
W[1)]	2.60	3,250	2,900	2,900
W[2)]	2.60	3,300	2,900	2,950
W[1)]	3.30	3,250	3,100	3,100
W[2)]	3.30	3,350	3,100	3,150
W[1)]	4.10	3,250	3,150	3,150
W[2)]	4.10	3,300	3,150	3,200
X[1)]	2.10	11,350	12,400	11,750
X[2)]	2.10	11,350	12,400	11,750
X[1)]	2.60	11,200	12,300	11,700
X[2)]	2.60	11,200	12,300	11,700
X[1)]	3.30	11,250	12,350	11,750
X[2)]	3.30	11,250	12,350	11,750
X[1)]	4.10	11,300	12,350	11,750
X[2)]	4.10	11,300	12,350	11,750

[1)] NLC-/LC-Undercarriage
[2)] S-HD-Undercarriage



Available Buckets

Stick 2.10 m/2.60 m/3.30 m/4.10 m

Mounting	Execution	Width (mm)	Capacity (m^3)	Teeth	Number of teeth	Weight (kg)
Direct	STD	1,200	1.25	Z 50	4	1,280
Direct	STD	1,350	1.50	Z 50	4	1,370
Direct	STD	1,500	1.75	Z 50	4	1,460
Direct	STD	1,650	2.00	Z 50	5	1,580
Direct	STD	1,650	2.25	Z 50	5	1,690
Direct	STD	1,850	2.50	Z 50	6	1,810
Direct	HD	1,200	1.25	Z 50	4	1,380
Direct	HD	1,350	1.50	Z 50	4	1,470
Direct	HD	1,500	1.75	Z 50	4	1,560
Direct	HD	1,650	2.00	Z 50	5	1,700
Direct	HD	1,650	2.25	Z 50	5	1,820
Direct	HD	1,850	2.50	Z 50	6	1,990
SW 66	STD	1,050	1.00	Z 50	4	1,150
SW 66	STD	1,200	1.25	Z 50	4	1,240
SW 66	STD	1,350	1.50	Z 50	4	1,330
SW 66	STD	1,500	1.75	Z 50	4	1,420
SW 66	STD	1,650	2.00	Z 50	5	1,540
SW 66	STD	1,650	2.25	Z 50	5	1,650
SW 66	STD	1,850	2.50	Z 50	6	1,770
SW 66	HD	1,050	1.00	Z 50	4	1,230
SW 66	HD	1,200	1.25	Z 50	4	1,340
SW 66	HD	1,350	1.50	Z 50	4	1,430
SW 66	HD	1,500	1.75	Z 50	4	1,520
SW 66	HD	1,650	2.00	Z 50	5	1,660
SW 66	HD	1,650	2.25	Z 50	5	1,780
SW 66	HD	1,850	2.50	Z 50	6	1,950

- Stop the swinging motion of the uppercarriage when lowering the attachment into a ditch without striking the attachment on the ditch walls.
- Inspect the machine for damage if the attachment has been swung into a wall or any other obstacles.
- Applications in which the attachment is to be used to strike the material being extracted are not permitted, even when working in a longitudinal direction.
- Repeated strikes against an object leads to damage to the steel structures and machine components.
- Please refer to your LIEBHERR dealer if special teeth for heavy-duty or special applications are required.
- Do not attach too large bucket or bucket with side cutters or that are during operations with rocky material. This would prolong the work cycles and may lead to damage to the bucket as well as further machine components.
- With the 2x45° offset articulation, the offset position may only be employed if the working tool or the attachment does not touch the material.
- Operation of the offset articulation to drill into the material is not permitted.
- Do not lift the machine during operation. Should this happen, lower the machine slowly back to the ground.
- Do not let the machine fall heavily on the ground and do not hold it back with the hydraulics. This would damage the machine.
- During operation with the attachment it is forbidden to raise the machine with the dozing blade (e.g. carving at the ceiling when tunnelling).

Safe use with a hydraulic hammer

- The hydraulic hammer must be selected with particular care. When using a hydraulic hammer not permitted by LIEBHERR, steel structures or the other machine components can become damaged.
- Before beginning breaking tasks, position the machine on firm and level ground.
- Use a hydraulic hammer designed exclusively for breaking stone, concrete and other breakable materials.
- Only operate the hydraulic hammer in the longitudinal direction of the machine and with the windshield closed or with a front protective grid.
- Ensure during hammer operation that no cylinder is entirely extended or retracted and that the stick is not in the vertical position.
- In order to avoid damages to the machine, try not to break stone or concrete while performing retraction and extension motions of the hydraulic hammer.
- Do not apply the hydraulic hammer uninterrupted for more than 15 secs. at a time to the same place. Change the breaking point. Too long uninterrupted operation of the hydraulic hammer leads to an unnecessary overheating of the hydraulic oil.
- Do not use the drop force of the hydraulic hammer to break stone or other materials. Do not move obstacles with the hydraulic hammer. Misuse of this nature would damage both the hammer and the machine.
- Do not use the hydraulic hammer to lift objects

Safe use when loading and unloading (particularly when loading and unloading wood)

- According to use, it can be necessary when working with a grab to move with the equipment raised and the load lifted up; this applies, for example, when loading and unloading wood.

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- For safety reasons, never open and remove a track chain unless having previously totally released the pretension of the chain tensioning unit.
- Never lay under the machine if it is raised with work equipment and has not been securely supported with wooden beams.
- Always jack the machine up in such a way that any weight displacement does not jeopardize stability and prevent metal touching metal while doing this.
- Work on the suspension, brake and steering systems may only be carried out by trained specialist personnel.
- If the machine has to be repaired on a slope, secure the crawler with chocks and connect the upper structure to the chassis using stop bolts.
- Only personnel with special training and experience may work on hydraulic equipment.
- When searching for leakage, wear protective gloves. A fine jet of liquid under pressure can penetrate the skin.
- Do not unscrew any lines or connections before you have set aside the equipment, switched off the engine and depressurized the hydraulic system. After switching off the engine, with the start key in contact position and with the safety lever down into its lowest position, you must operate all pilot control devices (joystick and pedals) in all directions in order to reduce the actuating and dynamic pressures in the work circuits. You must then reduce the internal tank pressure as described in these operating instructions.

Electrical system

- Check the electrical system regularly.
  Have all faults, such as loose connections, blown fuses and lamps and clogged or abraded cables rectified by personnel.
- Only use original fuses with approved current strength.
- For machines with electrical neutral and high tension leads:
  • switch the machine off immediately in the event of malfunctions in the power supply.
- Work on the machine's electrical equipment may only be carried out by skilled electrical personnel or by trained personnel under the supervision of an electrician in accordance with electrical regulations.
- When working on live parts, ensure that a second person is available to operate the emergency-off or the main switch and overvoltage release. Cordon off the working area with a red and white safety chain and a warning sign. Only use insulated tools.
- When working on neutral and high tension subassemblies, after releasing the voltage, briefly disconnect the supply cable at earth and electronic devices such as capacitors using an earthing rod.
- First test the released parts to make sure that they are off circuit, earth them and then disconnect them briefly. Insulate adjacent live parts.
- Disconnect the battery before working on the electrical system or carrying out any electric arc welding on the machine.
  First disconnect the negative, then the positive pole. When reconnecting, proceed in the reverse order.

Hydraulic accumulator

- All work on the hydraulic accumulators must be carried out by trained specialist personnel.

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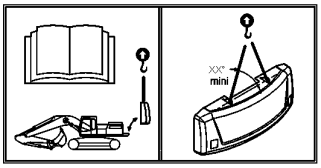
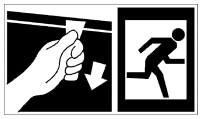
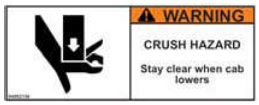
Signs for all countries (except the USA and Canada)	Signs for the USA and Canada	
		**Plate 91: Counterweight removal *** Indicates the minimum angle to be respected by the loading slings when the counterweight is lifting off the machine.
		**Plate 250: Emergency exit – rear window*** The rubber weather-strip can be loosened and removed and the rear window pushed out by pulling the clip on the inside of the rear window.

* = Depends on the excavator's model

Signs relating to optional equipment

Signs for all countries (except the USA and Canada)	Signs for the USA and Canada	
		**Plate 101: Crush hazard** Indicates the crush hazard related to a hydraulic cab. Stay clear when the cab lowers.
		**Plate 103: Thrown objects hazard** Signals the hazard of injuries by thrown objects when the fan is activated. (On machines fitted out with reversible cooler fan).

S18 – Overload warning device (optional equipment)

▶ Press the touch:
  ↳ LED in the touch illuminates,
  ↳ the overload warning device is activated.

▶ Press the touch again:
  ↳ LED in the touch goes out,
  ↳ the overload warning device is deactivated.

❑ If no overload warning device is installed or if it is not correctly initialized on the machine:
  ↳ the indicator symbol "No overload warning device recognized" will appear on the monitoring display at warning device activation (LED in the touch illuminates).

S19 – Rotating device (optional equipment)

The rotating device is an additional hydraulic circuit necessary to drive some specific equipments (such as rotating grapple, rotating bucket, rotating stick, quick change coupling, ...).

▶ Press the touch:
  ↳ LED in the touch illuminates,
  ↳ the control circuit for the rotating device is activated. Now the special equipment (as an ex. the rotating grapple) can be actuated using the push buttons S5L and S5R in the handle of the left joystick unit.

▶ Press the touch again:
  ↳ LED in the touch goes out,
  ↳ the control circuit for the rotating device is deactivated. The actuation of the special equipment via S5L and S5R is no longer possible.

S20 – Engine low idle automatic

▶ Press the touch:
  ↳ LED in the touch illuminates,
  ↳ The low idle automatic is activated.

▶ Press the touch again:
  ↳ LED in the touch goes out,
  ↳ The low idle automatic is deactivated.

Adjustment of the time lag for low idle automatic

The time lag between the return to neutral of all joysticks and pedals and the automatic reduction of the engine RPM to low idle can be adjusted using the touch S20 as follows:

▶ press the touch to activate the low idle automatic and keep the touch depressed.
  ↳ after a few seconds the LED starts blinking rapidly,

▶ release the touch as soon as the blinking duration has reached the desired time lag for low idle automatic (settings from 2 - 9 seconds).

E 522 – Low engine oil pressure - Safety stage

This symbol appears if the engine oil pressure is, during at least 7 seconds, below a programmed value depending on the engine RPM. The buzzer sounds simultaneously.

E 523 – Coolant overheat - Safety stage

This symbol appears if the coolant temperature exceeds 104°C during at least 7 seconds. The buzzer sounds simultaneously and the engine power is reduced.

E 524 – Boost air overheat - Safety stage

This symbol appears if the boost air temperature exceeds 80°C during at least 7 seconds. The buzzer sounds simultaneously and the engine power is reduced.

E 525 – Engine in safety mode

This symbol appears if, when the engine is in safety mode, one of the following engine error is detected: E501, E503, E597, E522, E523 or E524.
Simultaneously the buzzer sounds and the LED H60 lights up

▶ Bring the engine to a low idle and turn it off as soon as possible.

E 526 – Fuel overheat - Warning stage

This symbol appears if the fuel temperature is above the warning limit.

E 527 – Fuel overheat - Safety stage

This symbol appears if the fuel temperature is above the safety limit.

E 528 – High water level in the fuel filter

This symbol appears if a high water level is detected in the fuel filter.

E 530 – Centralized symbol - safety limit exceeded

This symbol appears simultaneously with the one of the safety stage errors : E522, E523, E524, E527, E533, E535, E537 or E539.

E 532 – Low fuel pressure - Warning stage

This symbol appears if the fuel pressure is under the warning limit.

E 533 – Low fuel pressure - Safety stage

This symbol appears if the fuel pressure is under the safety limit.

E 534 – High fuel pressure - Warning stage

This symbol appears if the fuel pressure is above the warning limit.

E 535 – High fuel pressure - Safety stage

This symbol appears if the fuel pressure is above the safety limit.

E 536 – Low fuel pressure in Rail 1 - Warning stage

This symbol appears if the fuel pressure in the Rail 1 of the injection system passes below the warning limit.

– "hours" : this last line indicates respectively:
  • the operation with the input X2.8 activated (special equipment – not used actually),
  • the operation with the input X2.14 activated (special equipment – not used actually),
  • the operation with the Diesel engine at its standart power curve (at maximum power)

▶ Press the **Menu** key again.
  ↳ The screen 1/... is displayed.

To exit the menu:

▶ Press the **Back** key.
  ↳ The sub-menu will be aborted.

i-I/O

Menu "Info In/Outputs"- Status of hydraulic pumps and of electrical inputs and outputs

The screens 1 to 3 provide information on the regulation parameters for the hydraulic pumps.

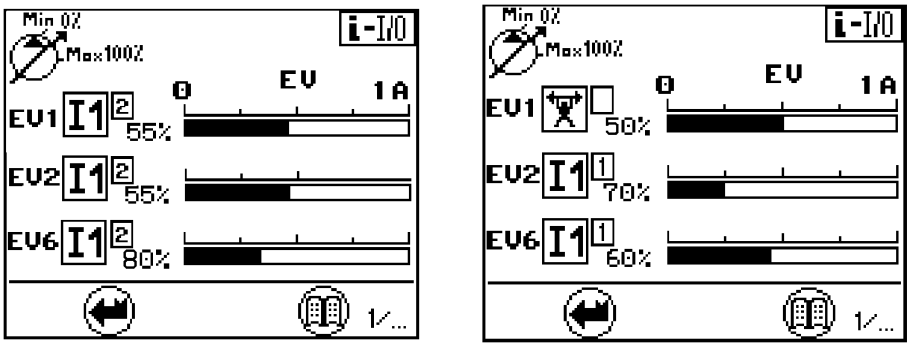


Fig. 3-19 *Menu "Info In/Outputs" Active flow and pressure limitations*

The screen 1/... displays:

– for each of the both working pumps the active flow limitation option and which percentage of the maximum flow is set (solenoid valves EV1 and EV2).
– which is the active pressure limitation for the hydraulic system and which percentage of the maximum pressure is set (solenoid valve EV6).
– 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.

S26 – Touch / Fuel preheater

this touch 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.

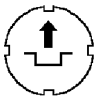
S45 – Touch / Priority for special equipment

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.



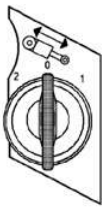
S47 – Push button / Quick change adapter

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.

S50 – 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.

S76 – Touch / Travel parking brake

This touch controls the travel parking brake on the machines fitted with a special undercarriage, or on machines mounted on a loading bridge, a wagon, ...

When the red indicator light in the touch lights up, the travel brake is applied.

On machines with a standard undercarriage, the travel brakes are controlled directly via the travel pedals and the touch S76 does not exist.

S77 – Touch / Pressurized driver's cab

When the touch is depressed, the green indicator light in the touch lights up and an air fan is started to maintain a slight pressurization inside the driver's cab.
The entering of dust or not filtered air into the cab is then almost prevented.

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.

Adjusting lumbar support (in models with pneumatic adjusting mechanism)*:

- ▶ Adjust the curve of the upper and lower section of the backrest upholstery by pressing the two switches **2** at the rear of the seat.

Adjusting shock absorber*:

The shock absorption level can be adjusted to suit the actual road or terrain conditions.

- ▶ Turn the handle **10** to the desired position and release it.
  - Position 1 = hard
  - Position 2 = medium
  - Position 3 = soft

Adjusting horizontal cushioning*:

Under certain operating conditions, you can improve the operator comfort by adjusting the horizontal cushioning mechanism. This helps reduce impact stress in travel direction on the operator as these impacts are better cushioned by the seat.

- ▶ Move the handle **6** to the desired position.
  - Position 1 = horizontal cushioning OFF
  - Position 2 = horizontal cushioning ON
- ▶ After the handle has been moved to position 1, ensure that is engages properly in this position: push the seat back until you hear an audible click.

Adjusting armrests:

- ▶ Turn the hand wheel **5** until the armrests are in the desired position.

If required, the height can be adjusted individually for each armrest:

- ▶ Remove the cover cap **4** from the seat covering.
- ▶ Loosen the hex (wrench size 13 mm).
- ▶ Set the armrest to the desired position.
- ▶ Tighten the hex nut (25 Nm).

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▶ Press the key **7** again, to return to automatic operation.
  ↳ the symbols 23 and 24 will go off, the symbol 20 is displayed again.

Manual setting of the fan speed

▶ Press the key 5 to adjust the fan speed manually.
  ↳ the fan symbol 22 is displayed and will flash for 5 seconds.
  ↳ the bar graph 21, showing the adjusted fan speed, is displayed.

▶ As long as the fan symbol 22 is flashing, the fan speed can be increased or reduced manually using the keys **2** or **3**.

▶ Press the key 5 again, to return to automatic operation.
  ↳ the symbols 22 and 21 will go off, the symbol 20 is displayed again.

Air conditioning operation

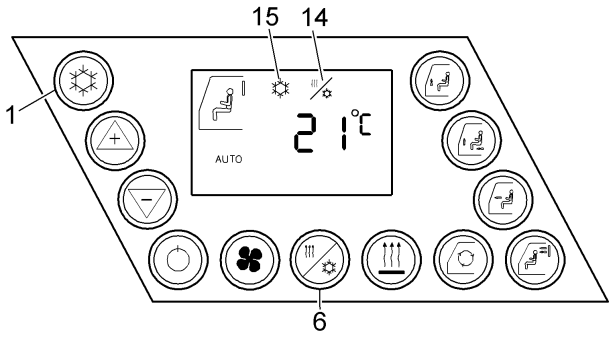

Fig. 3-49 *Air conditioning operation and Reheat-operation*

▶ Press the key **1** turn on the air conditioning operation.
  ↳ the symbol **15** is displayed.
  ↳ the control unit now turns the airco compressor on and off automatically.
  ↳ the control unit automatically adjusts the fan RPM.

▶ Press the key 1 again, to turn off the air conditioning operation.
  ↳ the symbol **15** is no longer displayed, the airco compressor remains off.

Note!
In case of high outside temperature, and especially if the cab has been heated up by the sun, decrease the temperature inside the cab as far as possible before turning on the air conditioner.

▶ Open the windows and the door for a few minutes and adjust the blower fan to maximum RPM via the keys 5 and 2.

Reheat-operation

In order to achieve a quick dehumification of the cab, as an example on morning, when setting the machine into operation, it may be advisable to briefly turn on the air conditioning operation even when the heater is allready operative.

▶ Press the REHEAT-key **6**:
  ↳ the symbol **14** is displayed,
  ↳ the compressor is constantly working,
  ↳ the fan of the heater and airconditioner is running at maximum RPM,
  ↳ the air flaps at the front window and at the legroom are open,
  ↳ as necessary the control unit switches on the heating so to maintain the adjusted cab temperature.

Display of the term of the next service work

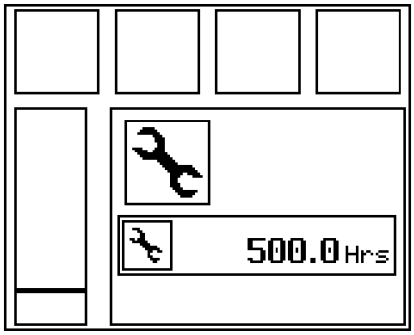

Fig. 3-55 *Display of the term of upcoming maintenance works*

After the automatic check is over, a graphic symbol may appear to indicate that the next preprogrammed periodic maintenance works is due.

The time of the upcoming service is then displayed in place of the usual operating hours information.

The display of the time of the upcoming maintenance will go out after approximately 8 seconds.

3.3.3 Starting the Diesel engine

Attention!
The diesel engine can be damaged if started at altitudes of 2000 meters and above!

- ▶ If the machine is brought at an altitude of 2000 meters or more: Contact the Liebherr customer service before starting the diesel engine.

Attention!
A wrong start can cause damages for the diesel engine!

- ▶ Only operate the starter motor when the Diesel engine is off.
- ▶ Do not operate the starter more than 20 seconds.
- ▶ If the engine does not start after 20 seconds, wait at least 1 minute before attempting to restart.
- ▶ First turn the ignition key back to position **0** before restarting the engine.
- ▶ If the engine does not start after three attempts, find the problem and correct it.

Starting procedure

- ▶ Turn the ignition key to start position **3**.
- ▶ Release the ignition key as soon as the engine starts.
  - ↳ Control lamps H2 and H12 must go out.
  - ↳ The buzzer sounds briefly until the engine oil pressure builds up.

Starting procedure for low temperatures

For low temperatures, the intake air is preheated automatically by flame glow plugs situated in the intake manifolds so, to improve the starting of the engine.

Note!
If no key to be imprinted is recognized within 15 seconds, the imprinting procedure automatically terminates itself.
To imprint several operation keys, the keys may be inserted into the ignition switch in succession. The individual keys must stay in position "1" for at least 1 second.

Up to 10 operation keys may be imprinted per master key.
It is by the fact possible to enable one operation key to several immobilizers, e.g. to create a general operation key valid for several machines or for a machine pool.

Deleting imprinted operating keys

- ❑ Deleting imprinted operating keys may be necessary after the loss of an imprinted key.

During the deletion procedure, all imprinted keys will be deleted. After all keys have been deleted, they must be re-imprinted to recover validity.

- ▶ Insert the master key into the ignition switch, turn it to the contact position "1"and keep it for at least 20 seconds in this position.
  - ↳ all imprinted operation keys for this master key are deleted.
  - ↳ all existing operation keys may be reimprinted .

Note!
The code of the master key will not be deleted during the deletion procedure.

Operation security

Should more than 5 invalid keys be used in the ignition switch within 1 minute, so the immobilizer will be activated for 15 minutes and will not accept any valid keys during this period.
This procedure will prevent the 'trying out' of multiple keys and accidentally finding the correct key.

If several invalid keys are recognized without the ignition switch having been brought into the position '0', the immobilizer stays activated for 15 minutes and will not accept any valid keys during this period.
Only after those 15 minutes have expired, and after the ignition switch has recognized the position '0', will valid keys be accepted again. This will prevent keys from being tested without using the mechanical ignition switch, e.g. when the ignition switch is forcefully brought into position '1'..

Function security

An interruption of the supply line or other control lines will not deactivate the immobilizer or delete data (e.g. data codes).. All relevant data are stored in a non-volatile memory. Magnetic fields will not deactivate the immobilizer.

3.4 Working with the machine

3.4.1 Low idle automatic

This device automatically reduces the engine speed to idle after several seconds if no hydraulic functions are activated by the joystick or the pedals. This saves fuel and

▶ Push the joystick **4** forwards **(b)**.
↳ The stick is moved out.

Control of the boom cylinders

The boom cylinders are operated using the right joystick **3**.

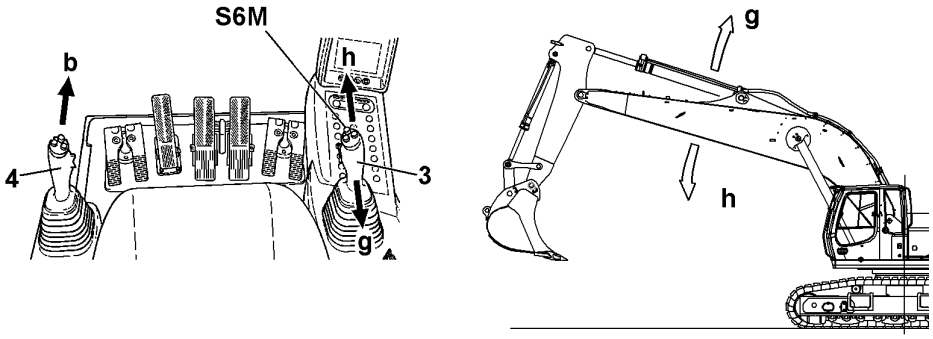

Fig. 3-73 *Boom cylinders control*

▶ Pull the joystick **3** back **(g)**.
↳ The working attachment is raised.

▶ Push the joystick **3** forwards **(h)**.
↳ The working attachment is lowered.

Float position of the boom with shovel attachment

When operating a machine fitted with a shovel attachment, it is possible to turn on the float position of the boom cylinders. Therefore:

▶ push the right joystick **3** foreward **h.**

▶ press the touch **S6M** at the top of the handle of the right joystick **3** and keep it depressed.
↳ the float position of the boom cylinders is now engaged,
↳ the working attachment can move up and down freely, depending on the backlash opposed by the excavated materiel.

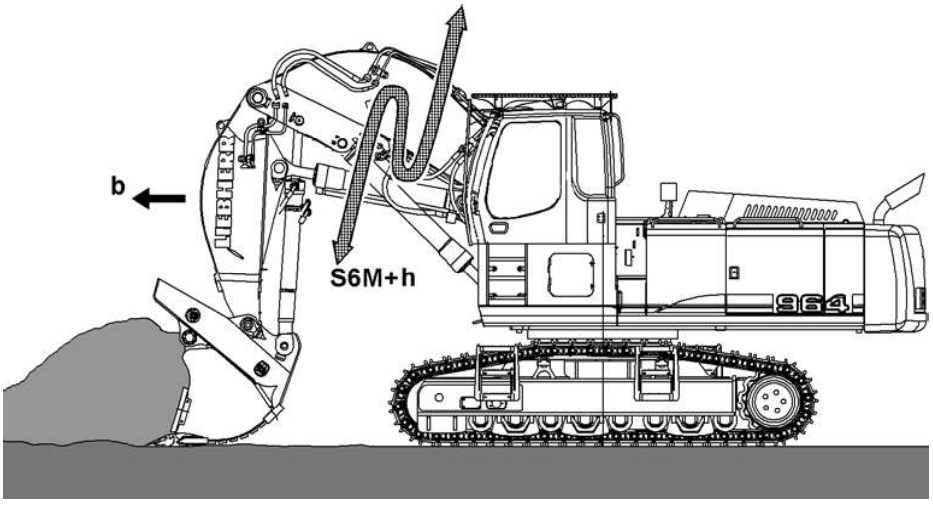

Fig. 3-74 *Float position of the boom cylinders with a shovel attachment*

Standard control

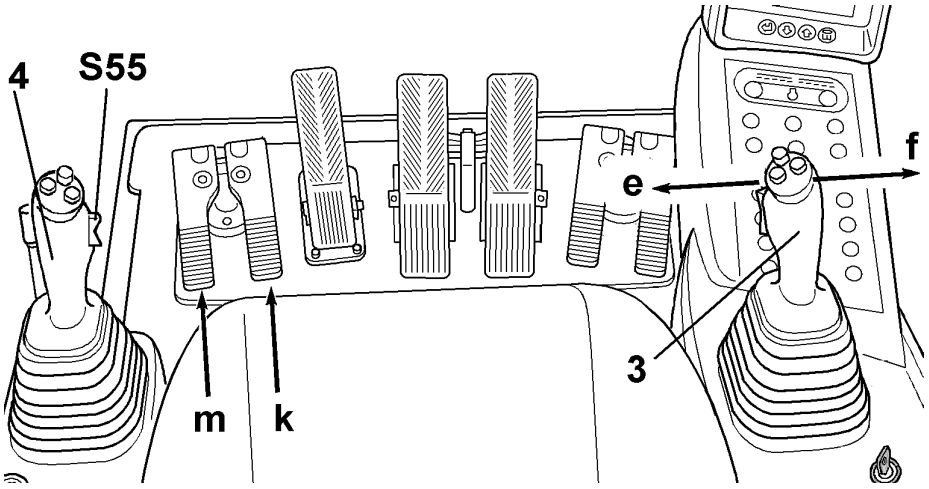

Fig. 3-83 *Commutation of standard control for an additional attachment*

The additional attachment can be operated alternatively with the left double pedal or with the right joystick. The commutation of control can be activated with the key switch **S114** on the rear right control desk.

- ▶ Turn the key switch **S114** to select the **joystick position**.
  - The additional attachment is now operated with the right joystick (movements to **e** and **f**).
  - The bucket tilt function is now operated with the left double pedal (**m-k**).
  - The key is locked in the switch **S114**.
- ▶ Turn the key switch **S114** to select the **foot pedal position**.
  - The additional attachment is now operated with the left double pedal again.
  - The key can be removed from the switch **S114**.

Proportional control

Mini joystick / Joystick

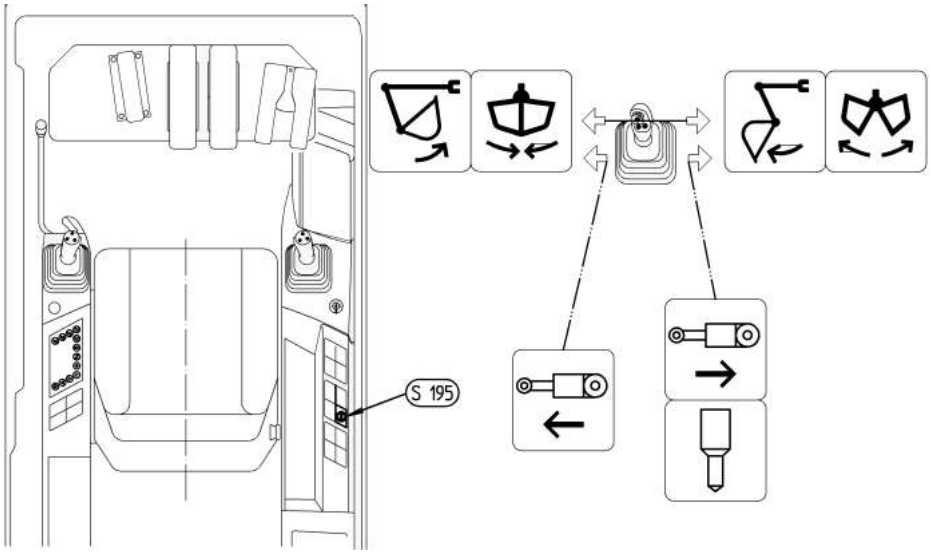

Fig. 3-84 *Commutation of proportional control for an additional attachment*

❑ Make sure that the machine is stationary.

▶ Move and hold the rotary switch **S200** to the left position **2**.
↳ The cab lifts.

Lowering the hydraulic cab

Danger!
Crushing hazard when lowering the hydraulic cab!
Injuries, death.

▶ Make sure that nobody is in the dangerous area.

▶ Keep your arms and legs away from moving parts.

▶ Move and hold the rotary switch **S200** to the right position **1**.
↳ The cab lowers.

Emergency lowering of the hydraulic cab

In case of failure, the hydraulic cab can be lowered:
– from the operator's cab
– from the uppercarriage

Emergency lowering from the operator's seat

The emergency shutoff valve in the cab is on the floor below the right control panel.

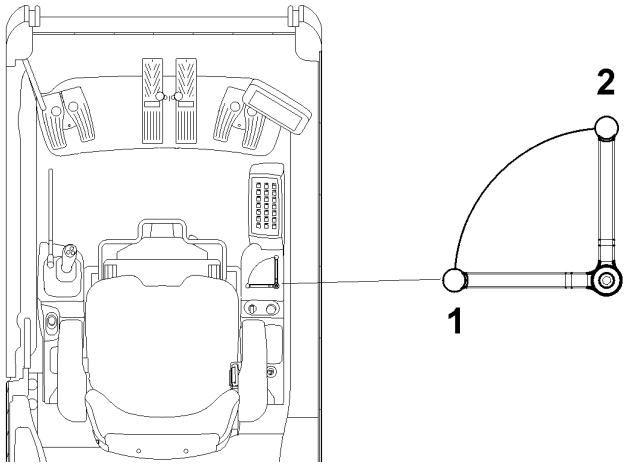

Fig. 3-92 *Emergency shutoff valve from the operator's seat*

Danger!
Crushing hazard when lowering the hydraulic cab!
Injuries, death.

▶ Make sure that nobody is in the dangerous area.

▶ Set the emergency shutoff valve in position **2**.
↳ The cab lowers.

When the cab is fully lowered:

▶ Set the emergency shutoff valve back in position **1**.
↳ The cab can be lifted.

Dismounting a bucket

- ▶ Position the bucket to be attached in such a way that its entire lower part is laying on the ground.
- ▶ Remove the covers **5** and **6**.
- ▶ Remove the protection rings **8** of all the bearing points and draw the O-rings **9** up onto the bushing **1.1** on the bucket side.
- ▶ Drive out the pins **3** and **4**.
- ▶ If necessary, lift the attachment slightly to remove the pin **4**.
- ▶ Take off the O-rings **9** and if necessary replace them.

Attaching a new bucket

- ▶ Position the bucket **1** so that the flat part of the bucket rests on the ground.
- ▶ Draw the O-rings **9** up onto the bushing **1.1** of the digging bucket, as well on bearings bucket to stick as on bearings bucket to connecting link **7**.
- ▶ Start the engine and move the attachments until the stick and bucket bore holes **A** align.
- ▶ Insert pin **4** and reinstall the covers **6** with O-rings.
- ▶ Slowly extend the stick cylinder until the bore of the connecting link **7** is exactly between bore holes **B**.
- ▶ Insert pin **3** and reinstall the covers **5** with O-rings.
- ▶ Slip the O-rings **9** laterally until they are in the grooves between bushings **1.1** and **2.1** (see detail **D**) and install the two piece protection rings **8**.
- ▶ Lubricate all greasing points of pins **3** and **4** directly or with the automatic grease system (if mounted) until clean grease comes out of the greasing points.

Note!

After installation of a new digging bucket, the restrictor check valves **222** and **232** for stick, respectively bucket tilt cylinders must be eventually readjusted so to have the correct velocity of the working attachment (due to weight differences of the digging bucket).If necessary, consult a LIEBHERR mechanic.

In particular on machines, which are delivered without digging bucket or grapple, this restrictor check valves must be (if mounted) adjusted after installation of the digging tool, so to avoid uneven or jerky movements of the attachment parts.

To lock the quick-change adapter:

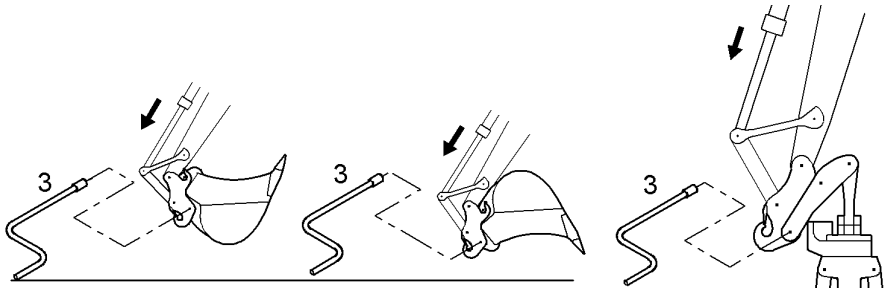

Fig. 3-107 *Locking the quick-change adapter*

Danger!
Before locking, there is no fixed connection between the work tool and the quick-change adapter. The work tool could under certain circumstances fall out and injure people.

- ▶ Approach the quick-change adapter with the utmost care.
- ▶ Push the safety lever up to secure the work equipment against unintentional movement.
  - ↳ No work movements can be carried out when pilot control devices, eg. the joystick or foot pedals, are operated.

- ▶ Insert the crank **3** in the locking pin **1** and turn to the right (clockwise), until both locking pins **1** are extended as far as the stop.
  - ↳ The work tool is bolted on when taking up normally.
- ▶ Screw the locking screw **2** into the locking pin.

Danger!
An incorrectly locked quick-change adapter could open when operating!

- ▶ Ensure that the locking pins are always locked by the sealing plug **4** on the one side and by the locking screw **2** on the other side.
- ▶ Check daily to ensure that the locking screw **2** is correctly positioned.

Caution!
Hydraulic lines are pressurized!

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

- ▶ Connect hydraulic lines or electrical lines, if necessary (eg. when attaching a grab).

Overview

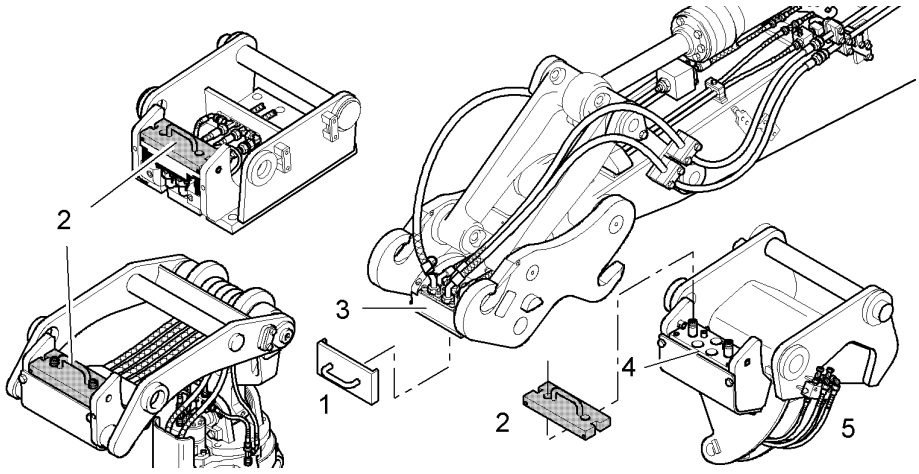

Fig. 3-120 *LIKUFIX*

1 Protective cover on quick-change adapter

2 Protective covering on work tool

3 LIKUFIX hydraulic coupling on quick-change adapter

4 LIKUFIX hydraulic coupling on work tool

5 Alternative hydraulic coupling on work tool

Attaching and dismounting work tools

Attaching and dismounting is carried out as described in the chapter “Hydraulic quick-change adapter”.

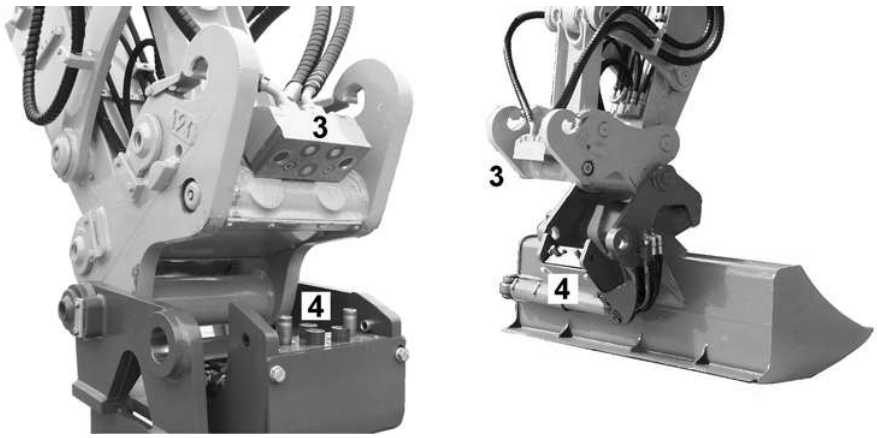

Fig. 3-121 *Connecting LIKUFIX*

Please also note:

- ▶ Before attaching, remove the protective coverings on the quick-change adapter **1** and the work tool **2**.
- ▶ Always keep hydraulic couplings **3** and **4** clean.
- ▶ Perform a visual check for cleanliness before attaching. If necessary, clean all coupling parts and the sealing surfaces with a clean, oil-soaked cloth.

3.8.8 Using an hydraulic hammer

Please also refer to the operating instructions provided by the manufacturer of the hydraulic hammer.

Danger!
The hydraulic hammer must be selected very carefully. Operating requires increased care and attention.

- ▶ Only use hydraulic hammers approved by LIEBHERR.
  - ↳ The use of a hydraulic hammer not approved by LIEBHERR could damage steel parts or other machine components.
- ▶ Only use the hydraulic hammer to break up rocks, concrete and other breakable objects.
- ▶ To avoid damaging the machine, do not try to break up rocks or concrete by moving the lever on the work equipment or by the hydraulic hammer.
- ▶ Do not use the drop power of the hydraulic hammer to break up rocks or other objects. Do not move objects with the hydraulic hammer. Do not lift the machine when using the hydraulic hammer.
  - ↳ This could damage both the hydraulic hammer and the machine.
- ▶ Do not use the hydraulic hammer to lift objects.
- ▶ Only use the hydraulic hammer in the machine's longitudinal direction.
- ▶ Do not operate the hydraulic hammer in the direction of the machine, since exploding rocks or concrete could damage the machine and / or injure the driver.
- ▶ Close all windows in the cab before working.

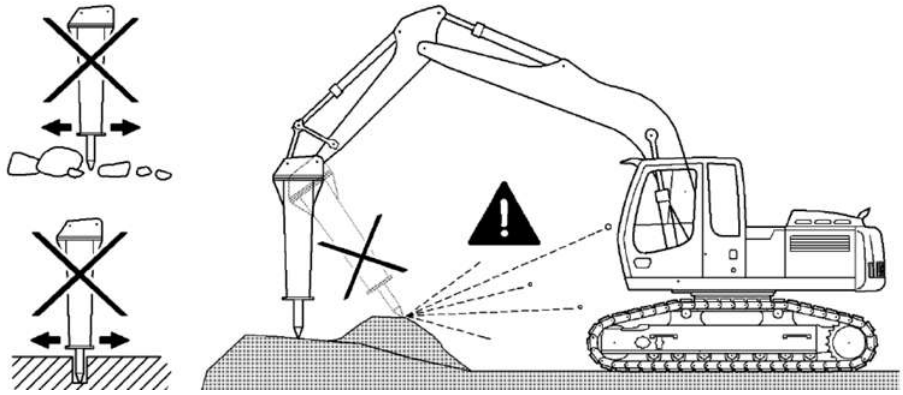

Fig. 3-136 *Hydraulic hammer*

- ❑ The machine must be positioned in the working position on level, solid ground.
- ❑ The stick may not stand vertically.
- ❑ No cylinder may be fully taken in or extended.
- ▶ Do not operate the hydraulic hammer on the same spot continually or for longer than 15 seconds.
  - ↳ Overly continual operation of the hydraulic hammer leads to the hydraulic oil overheating unnecessarily.
- ▶ Change the position of the machine and resume hammering work.

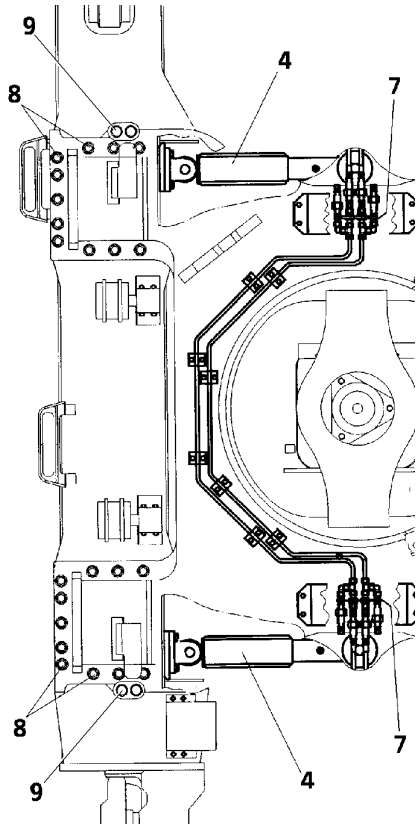

Fig. 3-146

- ❑ Check that both adjustment cylinders **4** are bolted together with the side frame to be moved and that both shut-off valves **5** connected to the piston bottom side are in opened position.
- ▶ Remove the mounting bolts **8** side frame to central part and if necessary coat with grease the sliding surfaces (also consider "Prerequisite to adjustment").
- ▶ Start the engine and actuate the touch **S104** (see Fig. 3-148) so to make the control box **E29** alive.
- ▶ Pull up the safety lever and leave the cab.
- ▶ Move the side frame out or in, using the appropriate button of the control box **E29**.

Normally, i. e. with the excavator on a flat and firm ground, the side frame moves simultaneously on both ends.

Should the side frame glide differently at the front and rear, so the shut-off valve **5** on the side where it moves faster must be temporarily closed until the frame is about in a line with the central part.

- ▶ When the side frame has reached an end position, reinstall and tighten the mounting screws **8**.

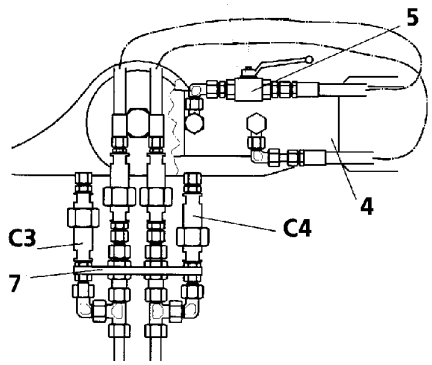

Fig. 3-147

- ▶ Turn off the engine, loosen both adjustment cylinders **4** from the side frame, swing them to the other side and fix them to the second side frame.
- ▶ If necessary, briefly start the engine to adapt the cylinder length. Always turn the engine off before handling the cylinders.
- ▶ Remove the mounting bolts **8** of the second side frame.
- ▶ Bring the frame to the desired end position as described above and reinstall the screws **8**.

3.11.3 Secure the machine (4 tie-down points)

The *lifting points and tie-down points* information sign in the operator's cab shows the tie-down type of the machine.

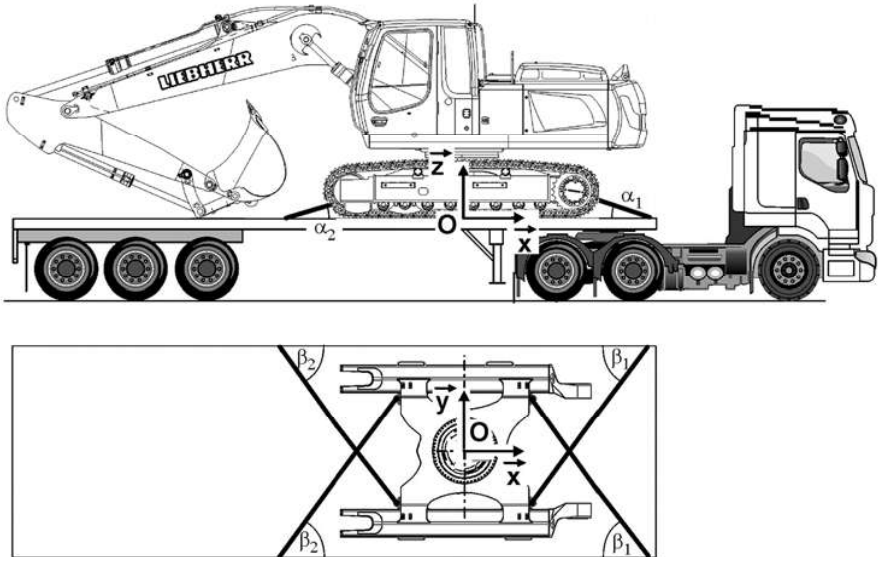

Fig. 3-155 *Secure the machine (4 tie-down points)*

α Tie-down angle between the lashing chain and the horizontal level **Oxy**

β Tie-down angle between the lashing chain and the vertical level **Oxz**

Tie-down angle α	**Tie-down angle β**
$5° < \alpha_1, \alpha_2 < 30°$	$20° < \beta_1, \beta_2 < 60°$

Tab. 3-1 *Tie-down angles*

Make sure the following preconditions are met:

- ❑ Tear-resistant, non-slip straps with a friction coefficient μ over 0.6 in line with standard EN 12195-1 have been placed on low-loader platform.
- ❑ Lashing chains ensure a lashing capacity of 10000 daN in accordance with standard EN 12195-3.
- ❑ Tie-down angles are adhered to. (see Tab. 3-1 on page 169)

- ▶ Attach lashing chains to tie-down points of undercarriage that are indicated by *tie-down point* information signs.
- ▶ Arrange lashing chains crosswise.
- ▶ Attach lashing chains to tie-down points of low-loader.
- ▶ Tie down any removed components.

3.11.4 Secure the machine (6 tie-down points)

The *lifting points and tie-down points* information sign in the operator's cab shows the tie-down type of the machine.

Fault / error	Cause	Solution
Engine starts but stops immediately after or runs irregularly	Fuel tank empty (low pressure in tank)	Fill tank and vent fuel system
	Fuel filter dirty	Clean or change filter and vent fuel system (tank)
	Particularly in winter: too viscous engine oil used	Use engine oil suitable for the outside temperature
	Dry-air filter dirty	Clean or change main filter element
	Air in fuel system	Vent fuel system
	Ventilation in fuel tank obstructed	Clean
	Fuel line bent	Check line and repair if required
Diesel engine emitting grey or black smoke	Dry-air filter dirty	Clean or change filter
Diesel engine continually emitting while smoke (steam)	Water in combustion chamber	Consult customer service
Diesel engine does not reach full speed	Speed adjustment not set to maximum value	Set speed adjustment to maximum value
	Injection system is set incorrectly	Consult customer service
	Dry-air filter dirty	Clean or replace filter
	Bad fuel supply	Clean or change fuel filter, check lines, drain water from tank
Diesel engine becomes too hot	Too little coolant	Fill coolant, check for leaks
	Water pump defective	Repair
	Thermostats do not work	Change thermostats
	Coolant contaminated	Clean coolant
Diesel engine has insufficient oil pressure **Note!** Switch off diesel engine immediately	Oil level too low	Correct oil level
	Oil pressure display faulty	Change oil pressure switch
Diesel engine consumes too much oil	External leak on diesel engine	Retighten screws, replace seals if required
Oil in coolant or coolant in oil		Consult customer service
Unusual noise / sounddevelopment on exhaust side	Exhaust system leaking	Check exhaust system / repair

4.2.2 Hydraulic system

Fault / error	Cause	Solution
Unusual noise / sounddevelopment at hydraulic pumps **Note!** Switch off diesel engine immediately	Shutoff valve on hydraulic tank closed	Open stop cock
	Hydraulic pumps taking in air	Check oil level in hydraulic tank, check intake lines for leaks

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5 Maintenance

5.1 Maintenance access doors

5.1.1 Overview of access doors

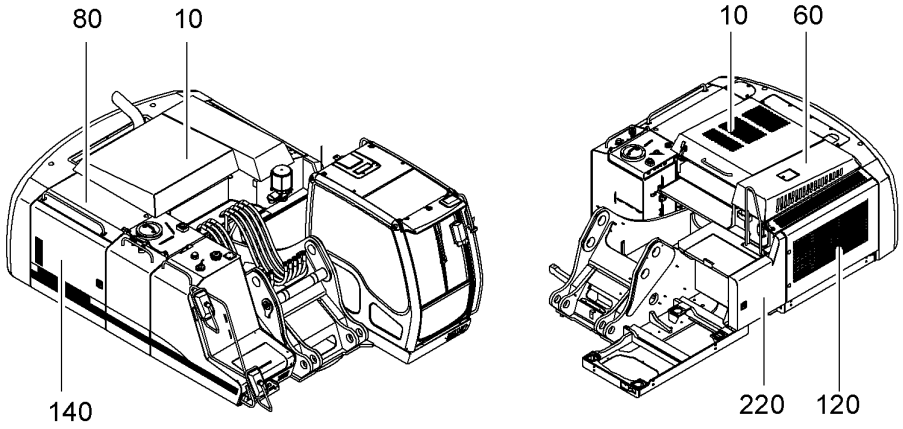

Fig. 5-1 *Access doors on the machine*

10	Engine cover	**120**	Side door, left
60	Radiator cover	**140**	Side door, right
80	Right cover	**220**	Side door, front left

The machine has 6 access doors for maintenance. The locks integrated in the handles must be unlocked before starting to drive.

Caution!
Access doors can close accidentally and trap the operator or maintenance personnel.

▶ When you have opened the access doors, latch them using the retainer.

Access door	Lock	Access to:
Engine cover	Gas pressure spring, auxiliary mechanical retainer	– Diesel engine
Radiator cover	Gas pressure spring	– Radiator
Right cover	Gas pressure spring	– Dry air filter – Control oil unit – Hydraulic pump

Designation	Value / unit
Total alkaline earth metals (water hardness)	0.6 to 2.7 mmol/l (4 to 19 °e)
pH at 20 °C	6.5 to 8.0
Chloride ion concentration	max. 80 mg/l
Sulphate ion concentration	max. 80 mg/l

Tab. 5-4 *Fresh water quality with use of DCA 4**

* = Diesel Coolant Additives

Water analysis results are available from the local authorities.

Mixing ratio for coolant

The coolant must contain min. 50% corrosion inhibitor and antifreeze agent at **all times of the year**.

Outdoor temperature to	Mixing ratio	
	Water %	Corrosion inhibitor/antifreeze agent %
-37 °C	50 %	50 %
-50 °C	40 %	60 %

Tab. 5-5 *Permissible mixing ratio (for all seasons)*

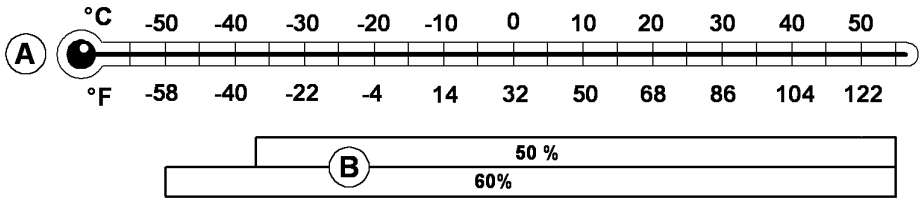

Fig. 5-4 *Temperature-based mixing ratio of water + corrosion inhibitor / antifreeze agent*

A Ambient temperature

B Corrosion inhibitor/antifreeze agent concentration in coolant

Permissible corrosion inhibitors/antifreeze agent

Note!
Improper mixing of different products might negatively affect the properties of the coolant and cause damage to the cooling system.

- ▶ Use only approved products. Do not mix different products.
- ▶ Never mix products containing silicone with silicone-free products.
- ▶ If the recommended LIEBHERR product is not available locally: Contact the LIEBHERR customer service department; choose product conforming to the "Coolant specifications for LIEBHERR diesel engines".

5.6 Diesel engine

Danger !
Before carrying out diverse maintenance tasks, the diesel engine, unless otherwise expressly specified in the description, must be brought into the maintenance position :

- the diesel engine is positioned horizontally,
- the diesel engine is switched off,
- the diesel engine is cooled,
- the battery main switch is switched off.

5.6.1 Checking the oil level in the diesel engine

Danger !
Risk of burning.
The engine oil is hot when it is at operating temperature.

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

❑ The machine must be standing level.

▶ Switch off the engine.

▶ Wait until the oil has collected in the oil sump.

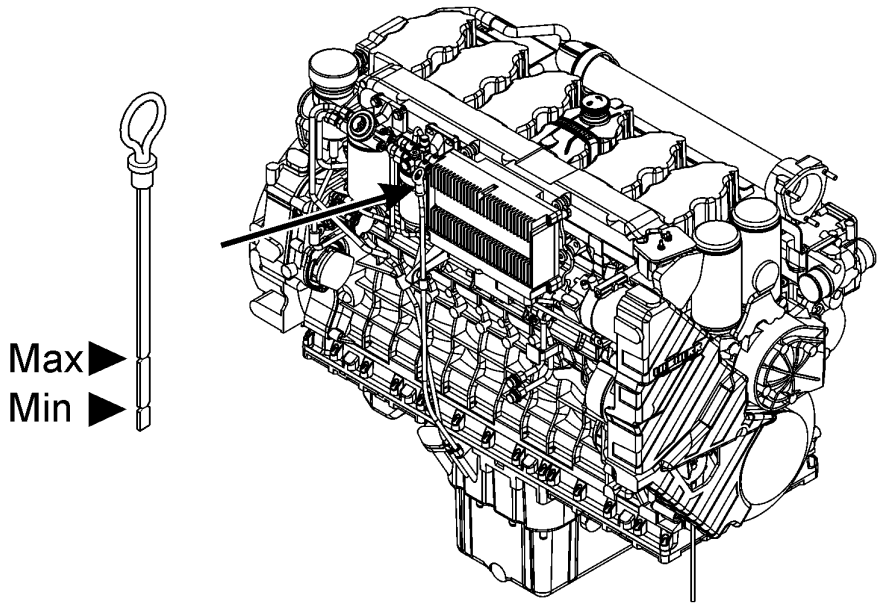

Fig. 5-9 *Oil level markings on the dipstick*

▶ Check the oil level in the engine.
↳ The oil must leave a mark between the **min** and **max** marks on the dipstick.

5.8.2 Checking the coolant level

Danger!
Risk of burning due to hot coolant.
The engine cooling system is hot and pressurized when at operating temperature.

- ▶ Avoid touching coolant or coolant-bearing parts.
- ▶ Only check the coolant level when the cap of the expansion reservoir has cooled sufficiently.

- ▶ Turn the cap a half turn.
- ▶ Relieve any pressure that may be present in this position. After balancing the pressure, slowly turn the cap fully.

When engine is cooled, the coolant must reach the end of the refilling pipe located under the cap of the expansion reservoir.

- ▶ Add coolant if necessary.
- ▶ Close the cap.
- ▶ After adding coolant, allow the engine to run for a short time with the heating switched on and monitor the coolant level once again.

5.8.3 Changing the coolant

Danger!
Risk of burning due to hot coolant.

- ▶ Only change the coolant when the engine is cold.

The following points should be noted when changing the coolant:

- Change the coolant in the entire coolant circuit at least every two years.
- For preference, change the coolant with the shutoff valves **1** for the heating circuit closed.
- Bleed the coolant circuit when refilled.

Note!
If the coolant has been changed without closing the shutoff valves for the heating circuit, the heating circuit must be bled, see chapter "maintenance of heating circuit".
To be sure that the coolant flows threw the heating system, the startkey must be in contact position and the heating system of the cab must be adjusted at maximal temperature.

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5.9.3 Draining the fuel tank

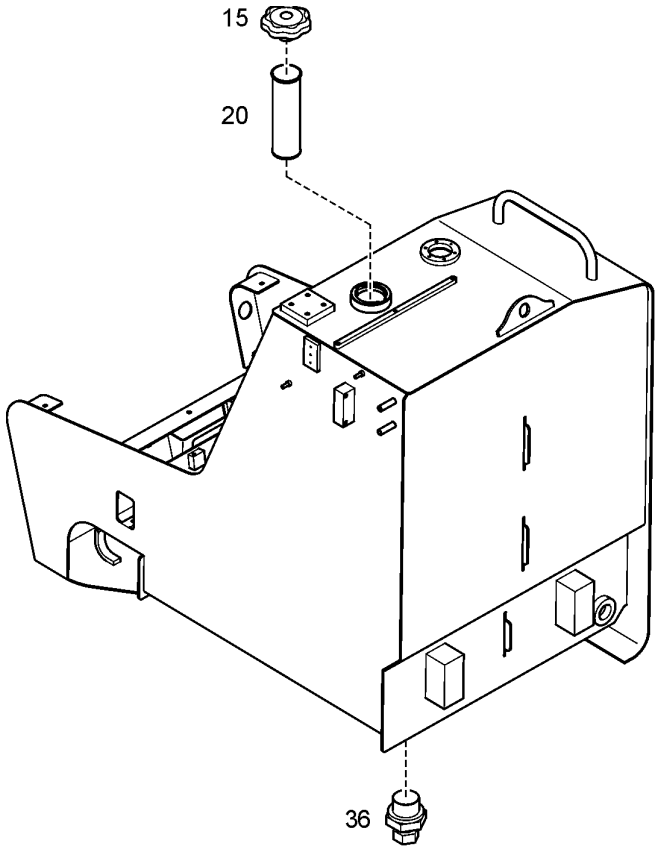


Fig. 5-30 *Draining the fuel tank*

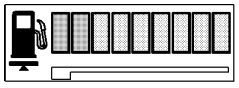
15 Filler cap **20** Fill strainer **36** Drain valve

To drain the fuel tank and the fuel system daily:

- ▶ Place a suitable container underneath.
- ▶ Unscrew the drain valve **36** found on the underside of the fuel tank.
- ▶ Drain off the water until fuel starts to come out.
- ▶ Screw drain valve **36** closed again.

If conditions of use and fuel quality permit, the maintenance interval can be increased to one week.

Note!
To reduce the formation of condensate in the tank, keep the fuel level as high as possible.



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.

- ▶ Insert the main filter cartridge**3** and ensure that it is sealed and positioned correctly.
- ▶ Close the filter housing **2** with cover **1**.

5.10.3 Monitoring the filtered air line

- ▶ Monitor the filtered air line between the filter outlet and the engine intake pipe **20** for damage and leaks each time the filter element is replaced.
- ▶ If necessary, retighten the tensioning clamp screws **21** and **22** (see Fig. 5-37 on page 49).

5.11 Hydraulic system

Maintenance work on the hydraulic system is restricted mainly to the hydraulic tank.

All other units on the system do not require any special maintenance.

The pipe and hose network should be checked at regular intervals for leaks.

Note!
Strict cleanliness is of particular importance for the hydraulic system.

For this reason, the intervals given

- for changing the return-line filters
- for cleaning the oil cooler and
- for changing the oil must be adhered to.

5.11.1 Depressurizing the hydraulic system

Before any intervention on any hydraulic component, you have to depressurize the hydraulic system.

Danger!
Do not inspect leaks with bare hands.
A fine stream of liquid can penetrate the skin when under high pressure and cause serious injury.

Note the following points:

- ❑ The machine must stand level and the attachment must be laid down on even ground.

To depressurize the high pressure system

- ▶ Switch off the engine.
- ▶ Move the pilot control devices (joystick and pedals) briefly in all directions (with the ignition key in the contact position and the safety lever in low position).

To depressurize the servo oil system

- ▶ Move the pilot control devices (joystick and pedals) in all directions (with the ignition key in the contact position and the safety lever in low position).

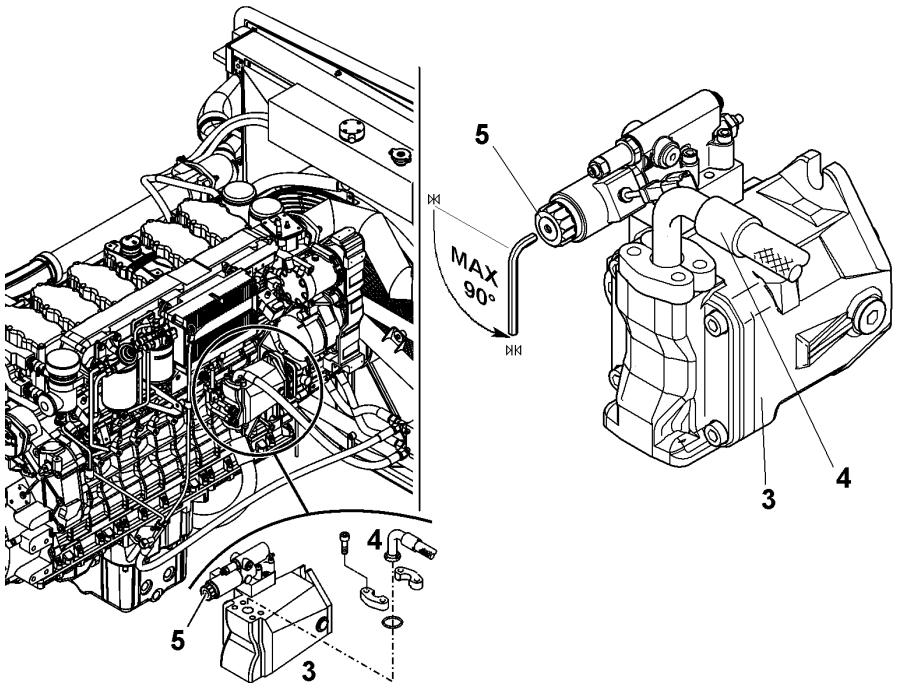


Fig. 5-48 *Cooling pump*

3 Cooling pump **4** Hose **5** Knurled screw

- ▶ To bleed the cooling pump **3**, loosen the hose **4** and let the air escape. As soon as oil flows without air, retighten the hose **4**.
- ▶ Lightly turn down the little screw in the middle of the knurled screw **5** with an Alen key (max 1/4 turn).
- ▶ As soon as oil flows without air, retighten the little screw to 1 Nm.

5.11.9 Bleeding the hydraulic cylinders

A cylinder must be bled after having changed the cylinder or after having worked on the cylinder (Sealing change,...) or after having worked on the cylinder hydraulic circuit (Hose change, ...).

5.12.2 Swing gear - Oil level check and oil change

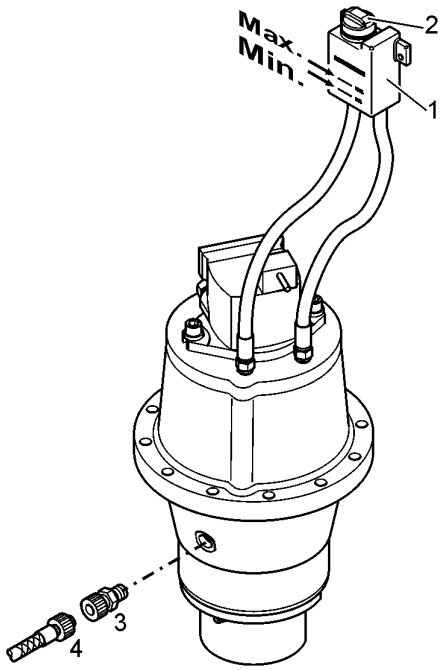


Fig. 5-59 *Checking oil level and changing oil in swing gear*

1 Oil reservoir
2 Cover
3 Drain valve
4 Drain hose

To check the oil level:

When the gear oil is cold, the level in the expansion reservoir **1** should not be below the marking **Min.**

▶ Otherwise add oil until the level reaches the marking **Max.**

To drain the oil:

▶ Remove the cover **2**.

▶ Unscrew the cover of the drain valve **3** via the opening on the upperdeck.

▶ Screw the drain hose provided **4** to the drain valve **3** and let the oil flow out into a suitable container.

▶ Remove the hose **4**.

▶ Screw the cover of the drain valve **3** back on.

To add the oil:

▶ Add the oil in the reservoir until the level reaches the **Max.** marking.

▶ Screw the cover **2** back on.

The following schedules indicate the variant installed for all types and models of LIEBHERR hydraulic excavators of the C series featuring adjustable track gauge:

Machine models	Types	Possible track gauges (mm)
R 924 C	1136	2000 - 2500
R 934 C	033	2300 - 3200
R 944 C	1000 1256	2380 - 3300
R 954 C	785 1276	2380 - 3300
R 974 C	1057	3400 - 4700

Machine models	Types	Possible track gauges (mm)
R 954C VH-HD	1175	2850 - 3850

5.14.1 Adjusting the track gauge of the undercarriage

Danger !
Do not allow any unauthorised persons to remain within immediate proximity of the undercarriage during the track gauge adjustment procedure.

Controls in the cab for track width adjustment

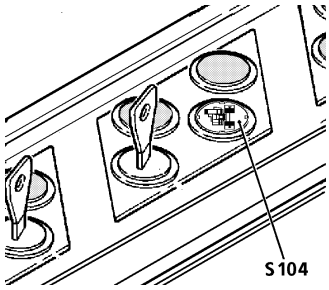
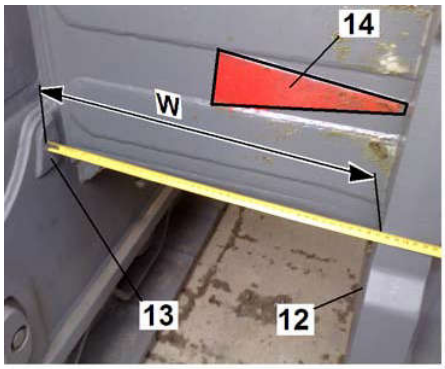


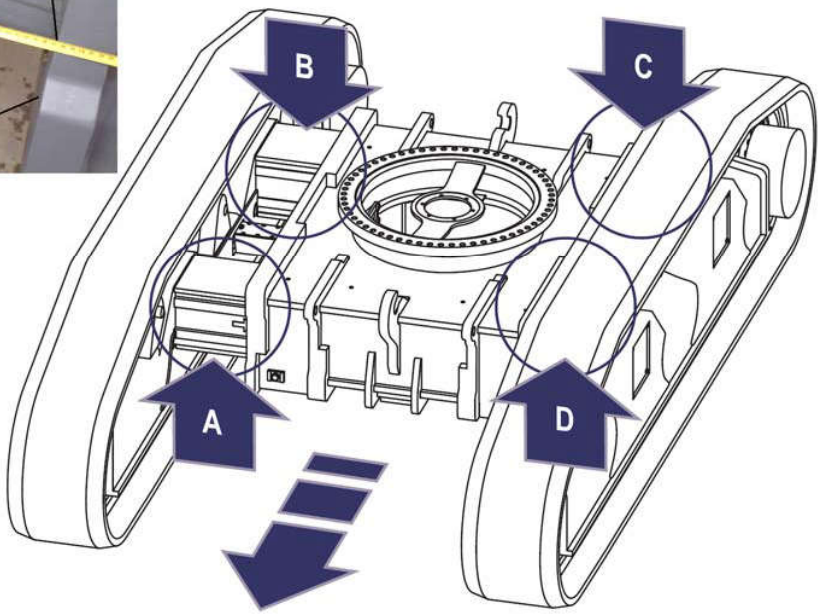
Fig. 5-71 *Push-button S104 - preselection of width adjustment*

The adjustment of the undercarriage width is resulted via the left foot pedal **5**, while push-button **S104** on the rear control desk is held pressed at the same time (indicator lamp in the button lights up).

Push down the front of the left pedal (**5a**) to retract the side frame.

Push down the rear of the left pedal (**5b**) to extend the side frame.





Note !
Measure the spread W between the external face of the undercarriage central part **12** and the side frame protrusion **13**, which comes to contact with this external face when the track gauge is reduced to the stop.

▶ Compare the measured spread **W** with the value **Wn** indicated in the following schedule for the corresponding machine type.

Excavator models	Excavator types	Undercarriage series	Nominal spread Wn [mm]
R 924 C	1136	SC 4527	250
R 934 C	033	SC 5063	450
R 944 C	1000 1256	SC 7057 SC 7073 SC7075	475
R 954 C	785 1276	SC 9007 SC 9017 SC 9026 SC 9032	475
R 974 C	1057	SC 9020 SC 9036	650

▶ The measured spread must be within the range:
Wn - 10mm < W < Wn + 15mm .

Filter removing:

- ❑ Engine stopped.
- ▶ Remove the cover **4**.
- ▶ Remove the main element **2** with caution.
- ▶ Remove the safety element **3** with caution.

Filter assembling:

- ▶ Insert with caution the safety element **3**.
- ▶ Insert with caution the main element **2**.
- ▶ Reinstall the cover **4**.

5.17 Greasing the machine

5.17.1 The centralized lubrication system

With this system all or nearly all of the lube points of the machine which require at least daily lubrication are lubricated via an electrical driven grease pump which is turned on during machine operation.

This grease pump is mounted in the area behind the driver's cab.

Construction and operation of the centralized lubrication system .

The grease delivered by the pump U4 is distributed to the different lubrication points LP in metered quantities, first via the main distributor **2** and further via the secondary distributors **3, 4, 5,** ... mounted to the front of the upper carriage and to the working attachment.

The lubrication unit complete **U4** mainly consists of a transparent grease container **13**, and an electric motor **14** driving a lube pump **15**.

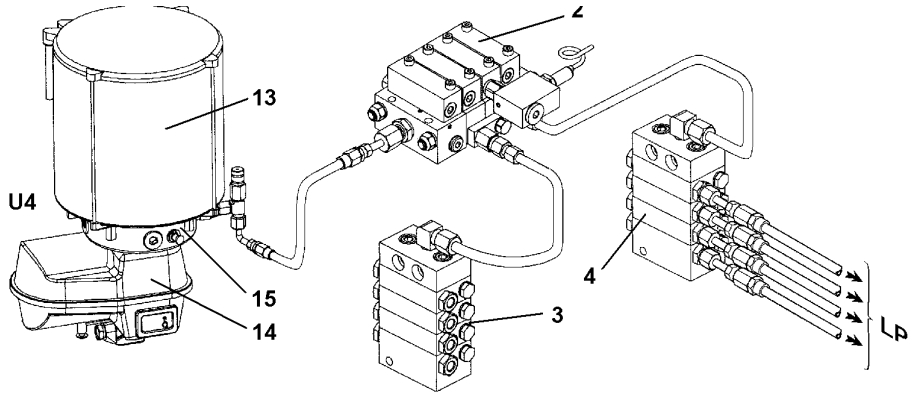


Fig. 5-86 *Centralized lubrication system*

2	Main distributor	**3**	Sercondary distributor
4	Sercondary distributor	**13**	Grease container

Replacing the sealing ring

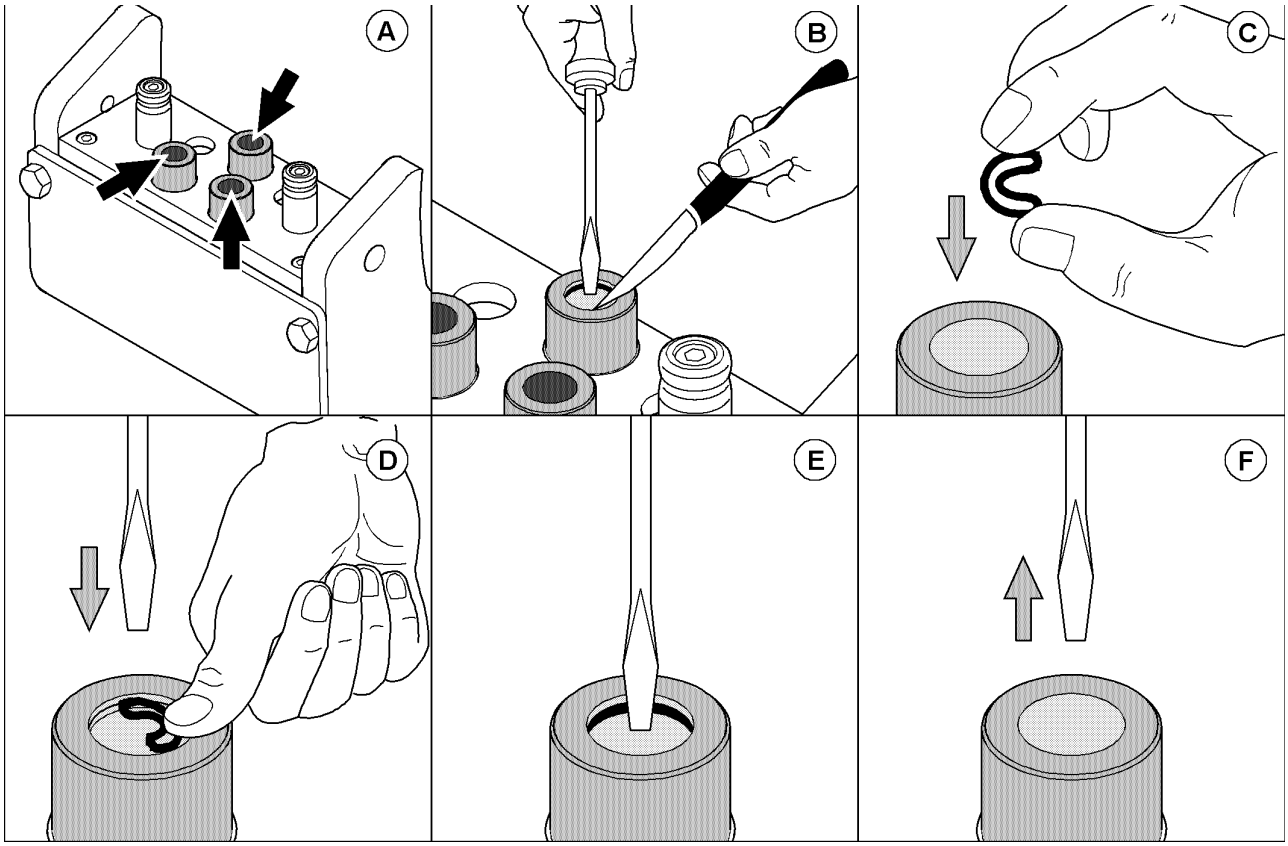


Fig. 5-97 *Replacing the sealing ring*

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.

5.19 Check mounting bolts for tightness

The mounting bolts listed below must be regularly checked and retighten if necessary. See maintenance chart for the checks intervals.